# X-FUSE Catalogue – Aldinet

X-FUSE by FUZETEC

# FUZETEC

## PPTC Resettable Fuse

2021
PPTC
Resettable Fuse
Catalog

Automotive

Internet of Things

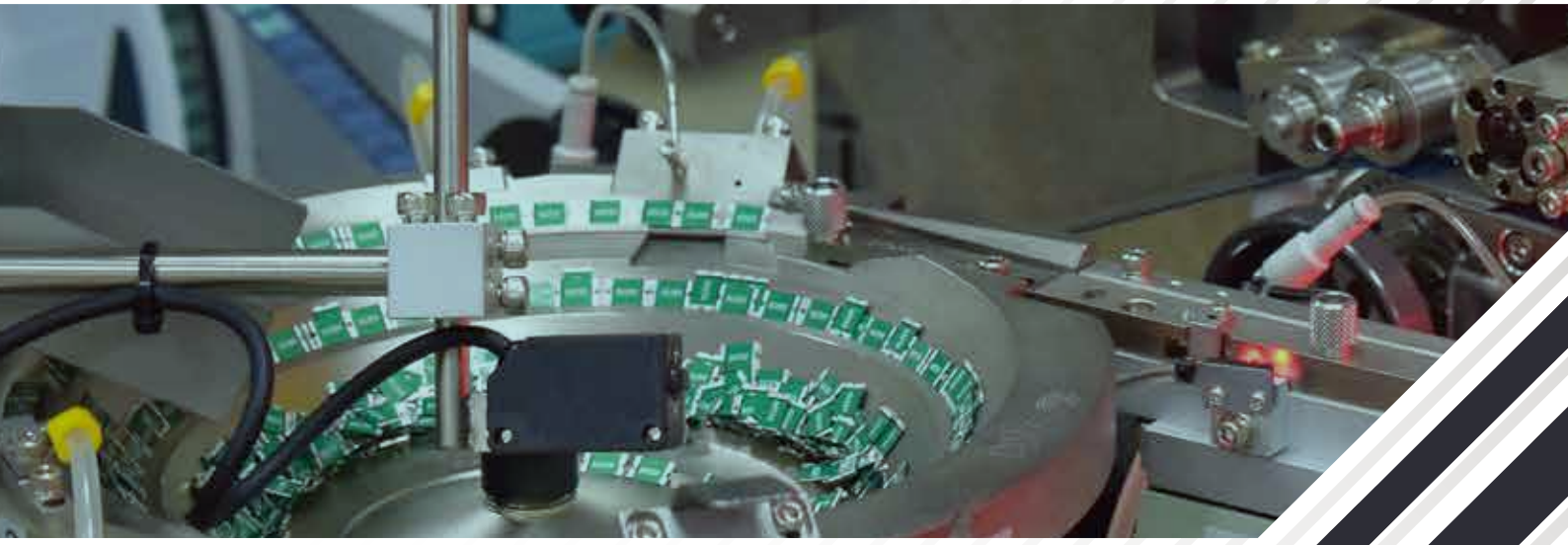
Industry 4.0

FUZETEC Circuit Protection Solutions for Today & Tomorrow's Industries

# Contents

# FUZETEC

Committed to provide continuous circuit protection solutions
to today's and tomorrow's electronic and electrical industries.



## Fuzetec Technology

Founded in 1999, as a world leading PPTC resettable fuse manufacturer and designer, Fuzetec Technology Co., Ltd. (FUZETEC™) is committed to provide continuous circuit protection solutions to today's and tomorrow's electronic and electrical industries.
Fuzetec is a public company in Taiwan, Taipei Exchange Market (stock code: 6642 )

## Products & Application

With the most advanced Positive Temperature Coefficient (PTC) conductive polymer technologies, FUZETEC™ offers a wide variety of Polymeric PTC resettable fuses to fulfill the needs of modern demanding high-tech applications. They include, but are not limited to: Automotives, Smart Application & IoT, Industrial Control , Energy Solutions etc.

# Safety, Quality and Customer Satisfaction

With third party approvals (UL, C-UL and TÜV), FUZETEC™ products are ensured to provide long lasting safety and performance. From product design and development, through manufacturing and quality control to delivery and shipment, Fuzetec Technology strictly implements IATF16949, ISO9001 and ISO14001 quality standards to assure its products' quality and consistency. Besides, as our long term involvement in the Auto industry, all FUZETEC™ automotive PPTC products are set to be tested and qualified using the AEC-Q200 specification for electronic components used in Auto industry. With continuous improvement, we are committed to provide top products and services to better satisfy our customers' needs. We strongly believe that excellent partnership between customers and us are the best and the only route to achieve success in tomorrow's competing business world.

## Fuzetec Patents & Formula

FUZETEC™ holds 67 self-developed PTC patents (US x 27, TW x 25, CN x 15 ) and continue applies multiple patents each year. These expertises of polymeric PTC material and product engineering, grants us the flexibility and advantage on new product development. With our own patented PPTC formula, we can custom the product electrical characteristics to meet customer specific requirements and design PPTC device structure for special application. Fuzetec's technical know-how and engineering expertise altogether, is your solution provider for circuit protection.



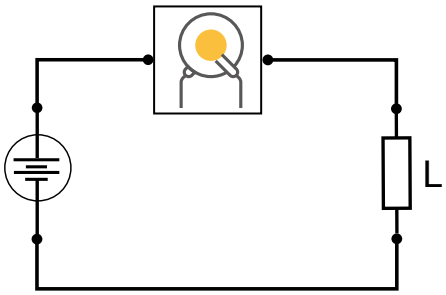
NOTE : All Specifications subject to change without notice.

# How Does the Resettable Fuse Work

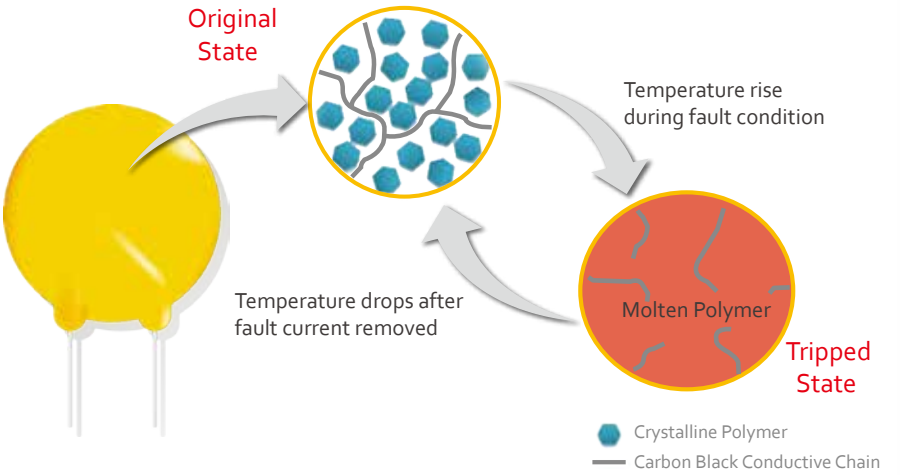
FUZETEC™ resettable fuses are designed and made of patented novel polymeric PTC material in thin chip form, developed solely by FUZETEC™. With electrodes and leads attached on both sides, it is placed in series to protect a circuit. At "normal operating condition" the device remains at an extremely low resistance (milli-ohms) and allows the electrical current to flow through it without any restriction. When overcurrent conditions occur, the polymeric PTC material heats up and its resistance increases sharply. Such a sharp resistance increase (to an insulated status) cuts off the current in the circuit, and consequently protects the element and device in the circuit. Upon fault current being removed, the resettable fuse cools down and its resistance drops to the original extremely low value. The resettable fuse is "reset" and allows the current flow through the circuit again.

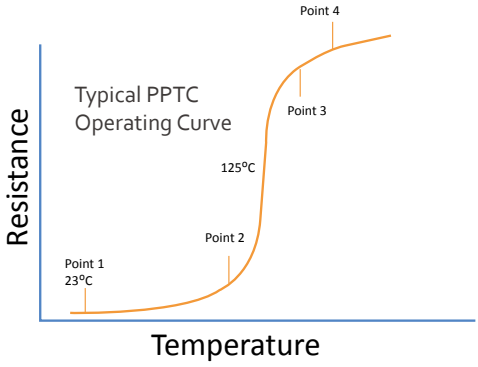
## PPTC in Circuit

The typical PPTC application is to be used as a series component in a circuit.




## How It Works

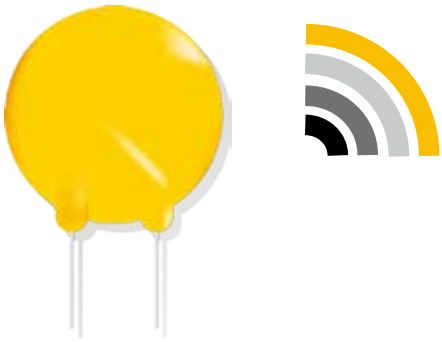



## Basic Structure

Epoxy Coating  Solder Layer

Nickel Plated Copper Foil  PTC Element



FUZETEC

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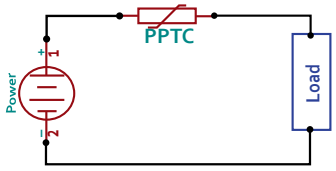
# PPTC Selection Guide

SELECTION GUIDE

## 1 Circuit Parameters

Determine your circuit parameters




- Circuit Operating Current
- Maximum Operating Voltage
- Maximum Interrupt Current
- Maximum Ambient Operating Temperature

## 2 Voltage & Current Rating

Select a Fuzetec PPTC Device with proper electrical characteristics

$V_{Max}$/$I_{Max}$ are the maximum voltage/current PPTC devices can withstand without damage

Hold Current ($I_H$) is the maximum current which a PPTC device will keep in low resistance state at 23°C

Trip Current ($I_T$) is the minimum current which a PPTC will trip at 23°C

Check the electrical characteristics table to ensure the PPTC device can match the circuit parameters

## 3 Ambient Temperature

Evaluate the maximum circuit operating ambient temperature

PPTC device is temperature sensitive, check the Thermal Derating table to verify the performance of PPTC device you select in Step 2 under different ambient temperature

## 4 Time to Trip

Determine Time to Trip for desired protection capabilities

Time to Trip is the amount of time that a PPTC device need to transfer low resistance state to high resistance "Tripped" state under fault condition. Make sure the PPTC device to provide the desired protection capabilities

## 5 Check Dimension

Fuzetec provide a various types of packages and different dimensions, use the dimension table to compare the PPTC device you selected and your application's design consideration.

## Glossary of Terms

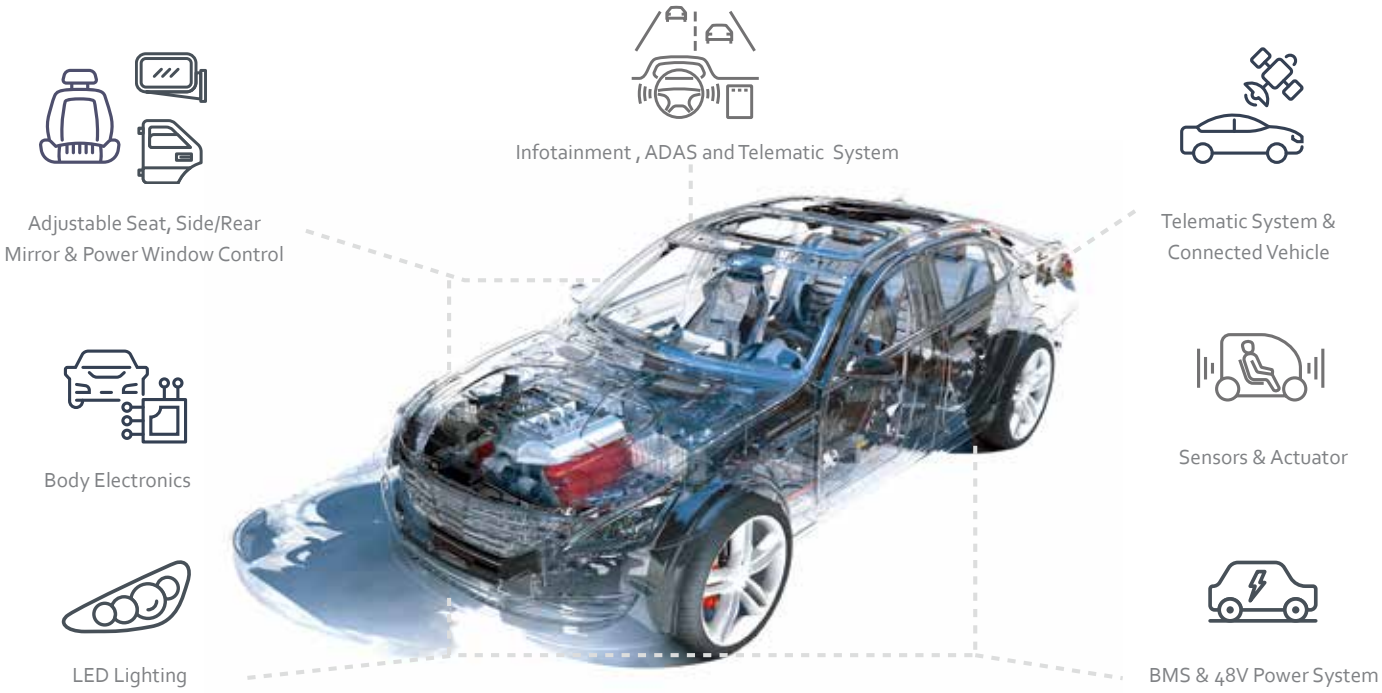
| | | |
|---|---|---|
| $I_H$ | : | Hold Current - Maximum current at which the device will not trip at 23°C still air. |
| $I_T$ | : | Trip Current - Minimum current at which the device will always trip at 23°C still air. |
| $V_{Max}$ | : | Maximum voltage device can withstand without damage at its rated current. |
| $I_{Max}$ | : | Maximum fault current device can withstand without damage at rated voltage ($V_{MAX}$). |
| Pd | : | Maximum power dissipated from device when in tripped state in 23°C still air environment. |
| $R_{MIN}$ | : | Minimum device resistance at 23°C. |
| $R_{Max}$ | : | Maximum device resistance at 23°C. |
| $R1_{Max}$ | : | 1) Maximum resistance of device at 23°C measured 1 hour, after tripping for all product series;<br>2) or after REFLOW soldering of 260°C for 20 seconds for all SMD series;<br>3) or after WAVE soldering of 260°C for less than 5 seconds for all DIP series.<br>Special Note :<br>-In the event that TWO of the above three conditions were experienced once each, the acceptance criteria will become 1.3 times of $R1_{Max}$.<br>- In the event that ALL of the above three conditions were experienced once each, the acceptance criteria will become 1.5 times of $R1_{Max}$. |

# Automotive

Fuzetec has been partner of major automotive industry companies and OEMs for more than 10 years. We provide surface-mount, radial leaded and custom shaped chip/disc type PPTC resettable fuses for vehicle electronic equipment overcurrent circuit protections.

Automotive devices that operate under rigid environment need robust and reliable circuit protections, therefore our automotive product lineup are set to satisfy AEC-Q200 standard for electronic components used in the automotive industry.

## Automotive PPTC Resettable Fuse Application




DC Motor Protection
Fuzetec Radial Leaded & Custom Shaped PPTC are ideal for DC motors employed in power operated automotive applications

Infotainment & ADAS System
As the vehicle system evolved to more intelligent and more complex application, Fuzetec offers a wide range of PPTC devices for application from In-Car multimedia to Advanced Driver Assistance System

48V Vehicle System
Fuzetec PPTC devices has developed test plan following AEC-Q200 guidelines to test for suitability and reliability for automotive industry's Latest voltage system & applications.

### Feature

IATF-16949 & AEC-Q200 Auto Industry Standard
Applicable Resettable overcurrent circuit protection
RoHS Compliant, Lead-Free and Halogen-Free( HF )
Resistance range binned and sorted available
Customized products Available

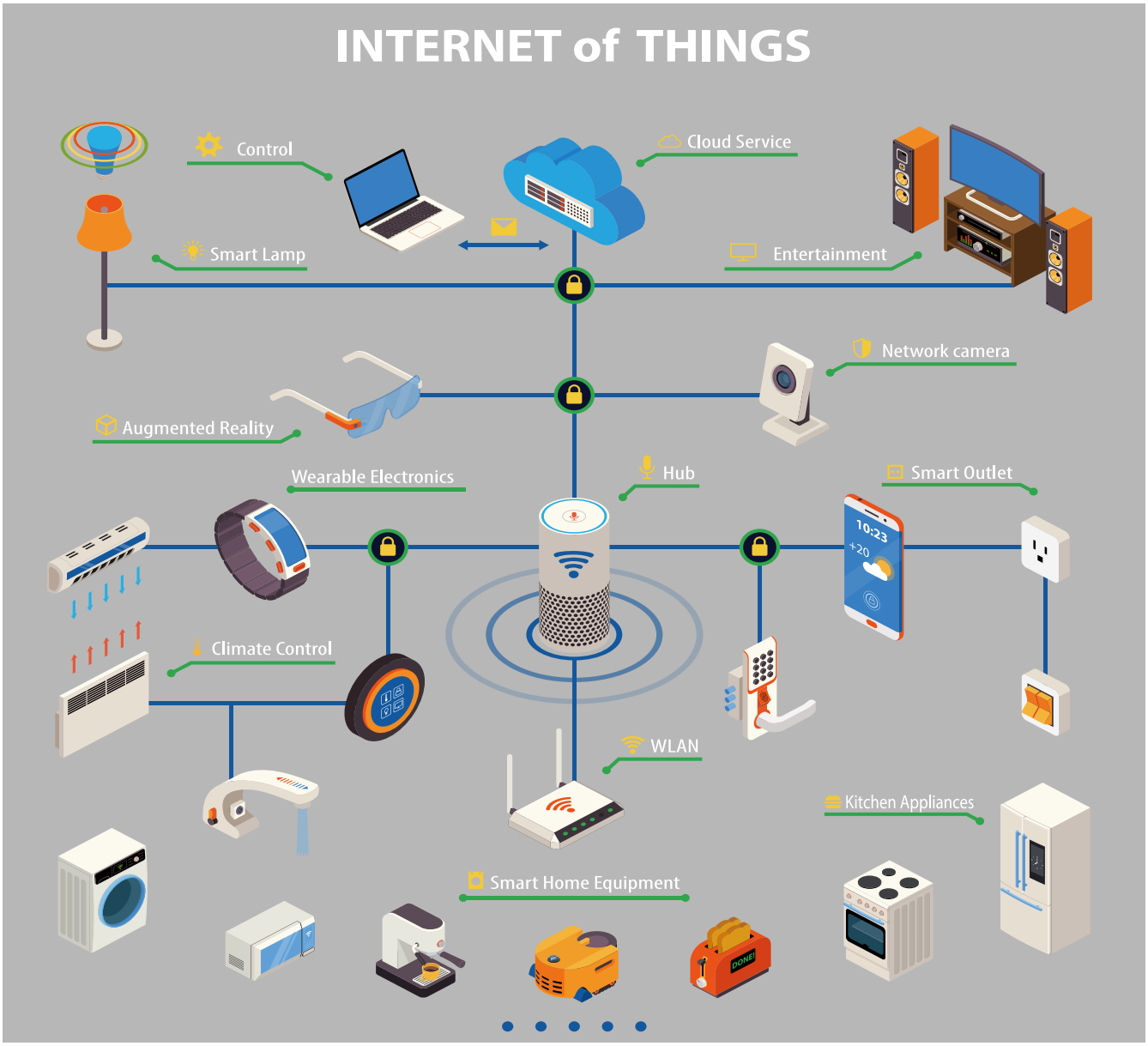
### Application

DC Motor & Motor Circuit Protection
Sensors & Actuator
Car Infotainment System, ADAS and Telematic System
Automotive Body Electronics
48V Power System, BMS & Automotive Backup Batteries

# Smart Application & IoT

From Network Infrastructure to IoT node & gateway; from Telecommunication Network to personal wearable devices. Fuzetec provides, a full range of overcurrent circuit protection solutions with its compact size, flexible design and cost competitive Polymeric Positive Temperature Coefficient ( PPTC ) resettable fuses.

For more than 10 years, Fuzetec has been providing test proven products to assist telecom equipment to meet test requirements of power cross and power induction surge defined by ITU-T, UL and Telecordia GR-1089 safety standards.




## Feature:

Function-oriented design (High hold current/Fast trip time/High Ambient Temp/High Rated Voltage Current )
RoHS Compliant, Lead-Free and Halogen-Free( HF )
Resistance range binned and sorted available UL60950, UL497A, ITU-T K20/K21 & GR-1089 Compliant

## Application:

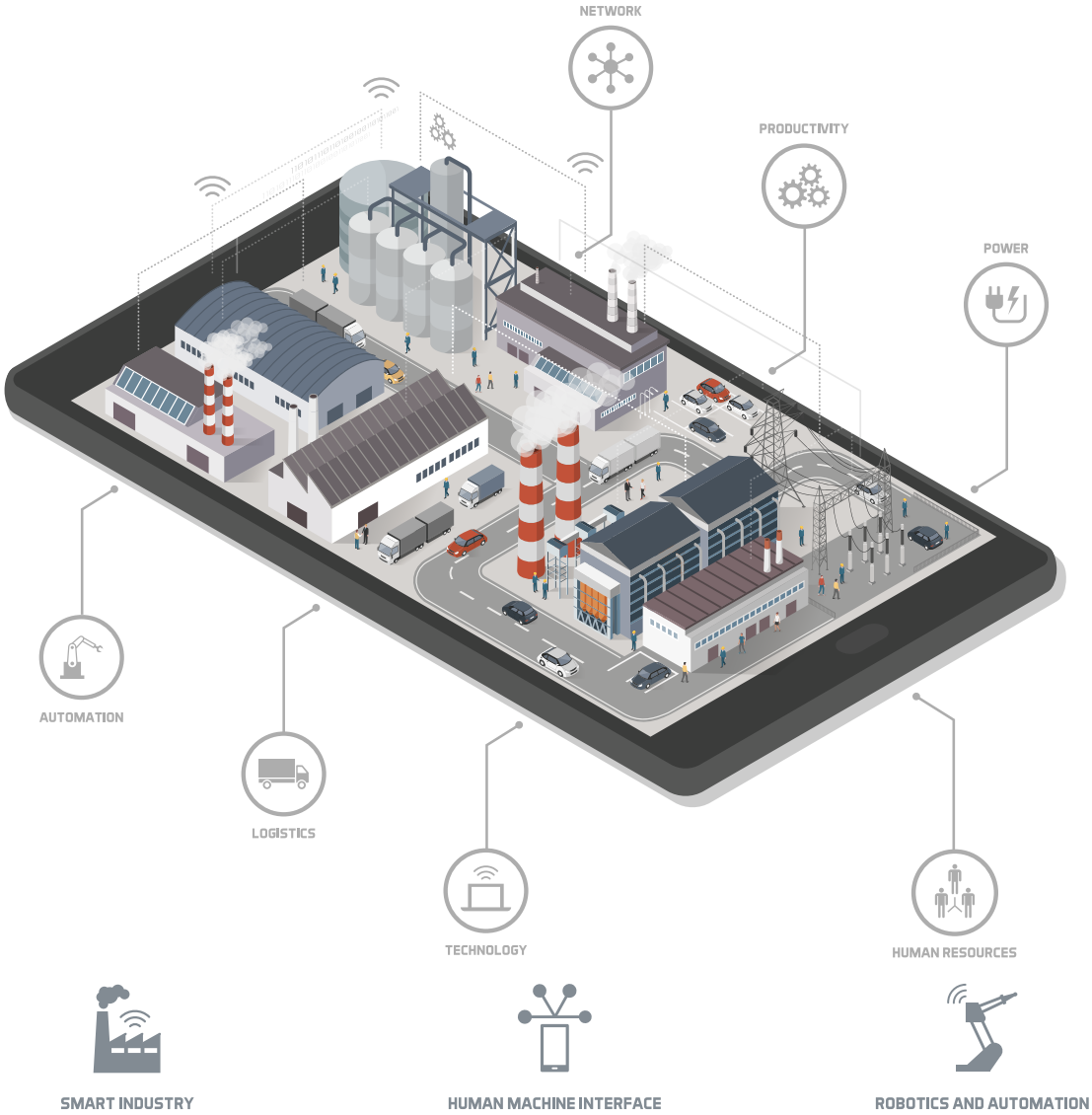
Wearable & Smart Home Devices
IoT Node & Gateway Devices
Gaming & Entertainment
Data Center & Network Solution
Line Voltage Protection

# Industry 4.0

Indusrty 4.0 is the current industrial transformation with automation, data exchanges, cloud, cyber-physical system, Big Data, and autonomous industrial techniques.

Fuzetec specializes in providing circuit protection with high reliability to Industrial, Transportation, and Medical markets under harsh and critical environment.

With the emerging trends of automation, electrification and digitalization of industrial technology, such as facility monitoring system, digital power supply, intergrated security system and internet connectivity. Fuzetec solution meets industrial standard and offers reliable circuit protection for these industrial applications against electrical faults for 24/7 industrial operation.




## Feature

Resettable overcurrent circuit protection
RoHS Compliant, Lead-Free and Halogen-Free( HF )
Resistance range binned and sorted available
Function-oriented design (High hold current/Fast trip time/High Ambient Temp/High Rated Voltage Current )

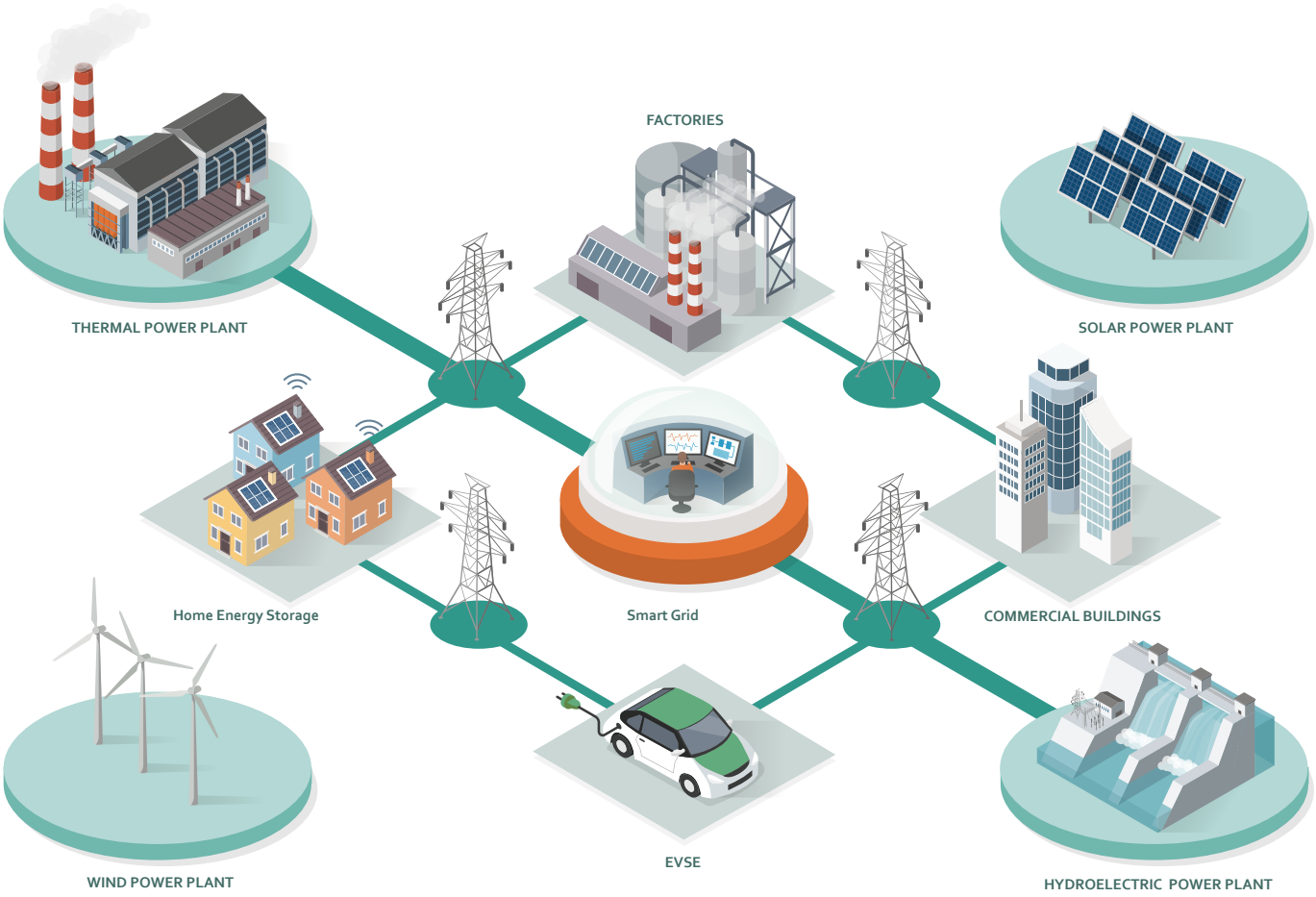
## Application

Automation & Control System, Industrial Machinery, Power Supply, Security Surveillance, Semiconductor Equipment, Fleet Control System Medical Equipment

# Energy

The global renewable energy market is driven by government support. Improving battery technologies and reducing of initial cost has boosted the demand of battery energy storage systems. Integrate renewable sources with energy storage system can provide solution to on/off grid flexibility to reduce peak demand charges.

Fuzetec, a reliable partner for major Li-ion battery manufacturer in Asia, Europe and America, has developed a comprehensive line of circuit protection solutions for potential overcurrent and overheating condition. Fuzetec SMD, Low Rho SMD/Strap and custom PPTC disc devices offer flexibility for battery application with different performance characteristics.




## Feature:

Ultra Low Resistance for Better Battery Life
Resettable overcurrent circuit protection
RoHS Compliant, Lead-Free and Halogen-Free( HF )
Resistance range binned and sorted available

## Application:

Lithium Ion Battery Cell and Packs
Battery PCM
Smart Grid
Solar Energy DC/AC Inverter

# FRX Series

**Application**
Wide variety of electronic equipment
**Product Features**
Low hold current, Solid state Radial-leaded product ideal for up to 60$V_{DC}$

**Operation Current**
0.05A ~ 3.75A
**Maximum Voltage**
60$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

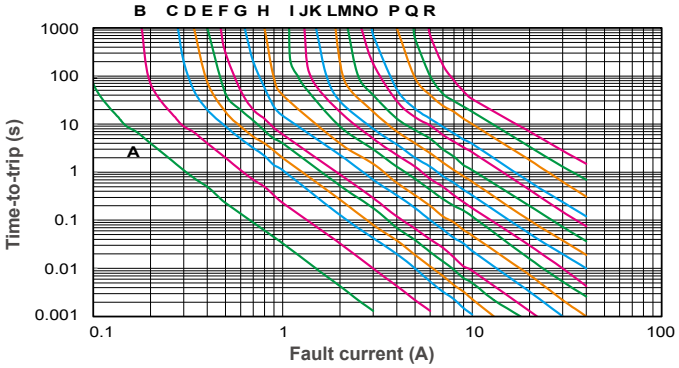
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FRX005-60F | 0.05 | 0.10 | 5.0 | 40 | 60 | 0.26 | 7.30 | 20.00 |
| FRX010-60F | 0.10 | 0.20 | 4.0 | 40 | 60 | 0.38 | 2.50 | 7.50 |
| FRX017-60F | 0.17 | 0.34 | 3.0 | 40 | 60 | 0.48 | 2.00 | 8.00 |
| FRX020-60F | 0.20 | 0.40 | 2.2 | 40 | 60 | 0.41 | 1.83 | 4.40 |
| FRX025-60F | 0.25 | 0.50 | 2.5 | 40 | 60 | 0.45 | 1.25 | 3.00 |
| FRX030-60F | 0.30 | 0.60 | 3.0 | 40 | 60 | 0.49 | 0.88 | 2.10 |
| FRX040-60F | 0.40 | 0.80 | 3.8 | 40 | 60 | 0.56 | 0.55 | 1.29 |
| FRX050-60F | 0.50 | 1.00 | 4.0 | 40 | 60 | 0.77 | 0.50 | 1.17 |
| FRX065-60F | 0.65 | 1.30 | 5.3 | 40 | 60 | 0.88 | 0.31 | 0.72 |
| FRX075-60F | 0.75 | 1.50 | 6.3 | 40 | 60 | 0.92 | 0.25 | 0.60 |
| FRX090-60F | 0.90 | 1.80 | 7.2 | 40 | 60 | 0.99 | 0.20 | 0.47 |
| FRX110-60F | 1.10 | 2.20 | 8.2 | 40 | 60 | 1.50 | 0.15 | 0.38 |
| FRX135-60F | 1.35 | 2.70 | 9.6 | 40 | 60 | 1.70 | 0.12 | 0.30 |
| FRX160-60F | 1.60 | 3.20 | 11.4 | 40 | 60 | 1.90 | 0.09 | 0.22 |
| FRX185-60F | 1.85 | 3.70 | 12.6 | 40 | 60 | 2.10 | 0.08 | 0.19 |
| FRX250-60F | 2.50 | 5.00 | 15.6 | 40 | 60 | 2.50 | 0.05 | 0.13 |
| FRX300-60F | 3.00 | 6.00 | 19.8 | 40 | 60 | 2.80 | 0.04 | 0.10 |
| FRX375-60F | 3.75 | 7.50 | 24.0 | 40 | 60 | 3.20 | 0.03 | 0.08 |

## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 158% | 138% | 119% | 100% | 90% | 81% | 70% | 60% | 50% | 36% |

## Typical Time-To-Trip at 23°C

A = FRX005-60F
B = FRX010-60F
C = FRX017-60F
D = FRX020-60F
E = FRX025-60F
F = FRX030-60F
G = FRX040-60F
H = FRX050-60F
I = FRX065-60F
J = FRX075-60F
K = FRX090-60F
L = FRX110-60F
M = FRX135-60F
N = FRX160-60F
O = FRX185-60F
P = FRX250-60F
Q = FRX300-60F
R = FRX375-60F




## FRX Product Dimensions (mm)

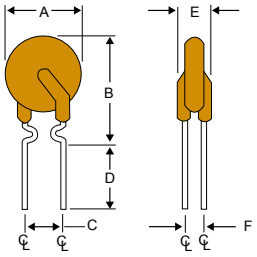



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

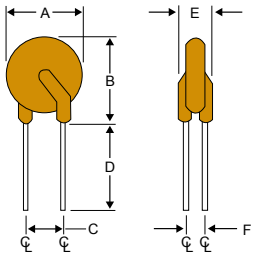



Fig.2
Lead Size : 20AWG
Φ 0.81 mm Diameter

| Part Number | Fig. | A Max. | B Max. | C Typ. | D Min. | E Max. | F Typ. |
|---|---|---|---|---|---|---|---|
| FRX005-60F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX010-60F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX017-60F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX020-60F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX025-60F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX030-60F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX040-60F | 1 | 7.6 | 13.5 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX050-60F | 1 | 7.9 | 13.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX065-60F | 1 | 9.7 | 14.5 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX075-60F | 1 | 10.4 | 15.2 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX090-60F | 1 | 11.7 | 15.8 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX110-60F | 2 | 13.0 | 18.0 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX135-60F | 2 | 14.5 | 19.6 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX160-60F | 2 | 16.3 | 21.3 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX185-60F | 2 | 17.8 | 22.9 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX250-60F | 2 | 21.3 | 26.4 | 10.2 | 7.6 | 3.1 | 1.4 |
| FRX300-60F | 2 | 24.9 | 30.0 | 10.2 | 7.6 | 3.1 | 1.4 |
| FRX375-60F | 2 | 28.5 | 33.5 | 10.2 | 7.6 | 3.1 | 1.4 |

## Part Numbering System

FRX □□□—□□ F

- F — RoHS Compliant/ Lead Free
- □□ — Voltage Rating
- □□□ — Current Rating

## Part Marking System


Example

F — Fuzetec Logo
RX □□□ F
- F — RoHS Compliant/ Lead Free
- □□□ — Part Identification
- RX — Product Family
- □□□□ — Date Code/Lot Number

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRX005-60F~FRX050-60F | : | 500 Pcs/Bag, 3.0K Reel/Tape |
| FRX065-60F~FRX090-60F | : | 300 Pcs/Bag, 3.0K Reel/Tape |
| FRX110-60F | : | 300 Pcs/Bag, 1.5K Reel/Tape |
| FRX135-60F~FRX185-60F | : | 200 Pcs/Bag, 1.5K Reel/Tape |
| FRX250-60F~FRX375-60F | : | 100 Pcs/Bag, 1.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Lead material | FRX005-60F~FRX040-60F Tin plated copper clad steel, 24 AWG. |
| | FRX050-60F~FRX090-60F Tin plated copper, 24 AWG. |
| | FRX110-60F~FRX375-60F Tin plated copper, 20 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

NOTE : All Specifications subject to change without notice.

# FRX90V Series

**Application**
Telecom & wide variety of electronic equipment

**Product Features**
Low hold current, Solid state, Radial leaded product ideal for up to 90$V_{DC}$

**Operation Current**
0.10A~3.75A

**Maximum Voltage**
Up to 90$V_{DC}$

**Temperature Range**
-40°C to 85°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FRX010-90F | 0.10 | 0.20 | 4.0 | 40 | 72/90 | 0.38 | 2.50 | 7.50 |
| FRX015-90F | 0.15 | 0.35 | 10.0 | 40 | 72/90 | 0.70 | 2.40 | 7.00 |
| FRX017-90F | 0.17 | 0.34 | 3.0 | 40 | 72/90 | 0.48 | 2.00 | 8.00 |
| FRX020-90F | 0.20 | 0.40 | 2.2 | 40 | 72/90 | 0.41 | 1.83 | 4.40 |
| FRX025-90F | 0.25 | 0.50 | 2.5 | 40 | 72/90 | 0.45 | 1.25 | 3.00 |
| FRX030-90F | 0.30 | 0.60 | 3.0 | 40 | 72/90 | 0.49 | 0.88 | 2.10 |
| FRX035-90F | 0.35 | 0.75 | 10.0 | 40 | 72/90 | 1.30 | 0.70 | 2.50 |
| FRX040-90F | 0.40 | 0.80 | 3.8 | 40 | 72/90 | 0.56 | 0.55 | 1.29 |
| FRX050-90F | 0.50 | 1.00 | 4.0 | 40 | 72/90 | 0.77 | 0.50 | 1.17 |
| FRX055-90F | 0.55 | 1.20 | 10.0 | 40 | 72/90 | 1.50 | 0.40 | 1.50 |
| FRX065-90F | 0.65 | 1.30 | 5.3 | 40 | 72/90 | 0.88 | 0.31 | 0.72 |
| FRX075-90F | 0.75 | 1.50 | 6.3 | 40 | 72/90 | 0.92 | 0.25 | 0.60 |
| FRX090-90F | 0.90 | 1.80 | 7.2 | 40 | 72/90 | 0.99 | 0.20 | 0.47 |
| FRX110-90F | 1.10 | 2.20 | 8.2 | 40 | 72/90 | 1.50 | 0.15 | 0.38 |
| FRX135-90F | 1.35 | 2.70 | 9.6 | 40 | 72/90 | 1.70 | 0.12 | 0.30 |
| FRX160-90F | 1.60 | 3.20 | 11.4 | 40 | 72/90 | 1.90 | 0.09 | 0.22 |
| FRX185-90F | 1.85 | 3.70 | 12.6 | 40 | 72/90 | 2.10 | 0.08 | 0.19 |
| FRX250-90F | 2.50 | 5.00 | 15.6 | 40 | 72/90 | 2.50 | 0.05 | 0.13 |
| FRX300-90F | 3.00 | 6.00 | 19.8 | 40 | 72/90 | 2.80 | 0.04 | 0.10 |
| FRX375-90F | 3.75 | 7.50 | 24.0 | 40 | 72/90 | 3.20 | 0.03 | 0.08 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

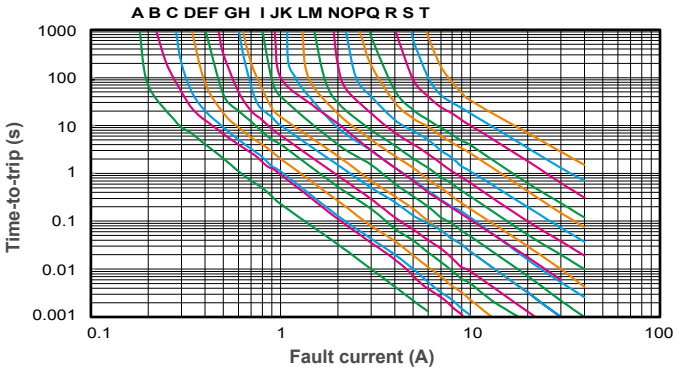
| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 158% | 138% | 119% | 100% | 90% | 81% | 70% | 60% | 50% | 36% |



NOTE : All Specifications subject to change without notice.

## Typical Time-To-Trip at 23°C

A = FRX010-90F
B = FRX015-90F
C = FRX017-90F
D = FRX020-90F
E = FRX025-90F
F = FRX030-90F
G = FRX035-90F
H = FRX040-90F
I = FRX050-90F
J = FRX055-90F
K = FRX065-90F
L = FRX075-90F
M = FRX090-90F
N = FRX110-90F
O = FRX135-90F
P = FRX160-90F
Q = FRX185-90F
R = FRX250-90F
S = FRX300-90F
T = FRX375-90F




## FRX90V Product Dimensions (mm)

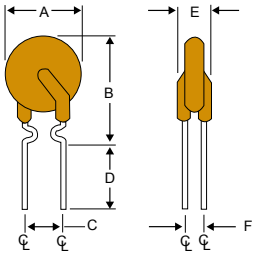



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

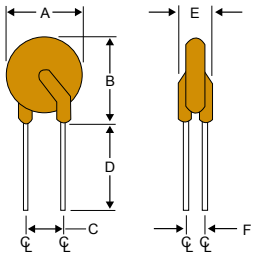



Fig.2
Lead Size : 20AWG
Φ 0.81 mm Diameter

| Part Number | Fig. | A Max. | B Max. | C Typ. | D Min. | E Max. | F Typ. |
|---|---|---|---|---|---|---|---|
| FRX010-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX015-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX017-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX020-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX025-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX030-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX035-90F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX040-90F | 1 | 7.6 | 13.5 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX050-90F | 1 | 7.9 | 13.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX055-90F | 1 | 9.7 | 14.0 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX065-90F | 1 | 9.7 | 14.5 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX075-90F | 1 | 10.4 | 15.2 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX090-90F | 1 | 11.7 | 15.8 | 5.1 | 7.6 | 3.1 | 1.1 |
| FRX110-90F | 2 | 13.0 | 18.0 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX135-90F | 2 | 14.5 | 19.6 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX160-90F | 2 | 16.3 | 21.3 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX185-90F | 2 | 17.8 | 22.9 | 5.1 | 7.6 | 3.1 | 1.4 |
| FRX250-90F | 2 | 21.3 | 26.4 | 10.2 | 7.6 | 3.1 | 1.4 |
| FRX300-90F | 2 | 24.9 | 30.0 | 10.2 | 7.6 | 3.1 | 1.4 |
| FRX375-90F | 2 | 28.5 | 33.5 | 10.2 | 7.6 | 3.1 | 1.4 |

## Part Numbering System

FRX □ □ □ — □ □ F

- RoHS Compliant/ Lead Free
- Voltage Rating
- Current Rating

## Part Marking System


Example

F 9 — Fuzetec Logo, 90V
R X □ □ □ F
- F: RoHS Compliant/ Lead Free
- □ □ □: Part Identification
- R X: Product Family
- □ □ □ □: Date Code/Lot Number

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRX010-90F~FRX055-90F | : | 500Pcs/Bag, 3.0K Reel/Tape |
| FRX065-90F~FRX090-90F | : | 300Pcs/Bag, 3.0K Reel/Tape |
| FRX110-90F | : | 300Pcs/Bag, 1.5K Reel/Tape |
| FRX135-90F~FRX185-90F | : | 200Pcs/Bag, 1.5K Reel/Tape |
| FRX250-90F~FRX375-90F | : | 100Pcs/Bag, 1.0K Reel/Tape |

## Physical specifications

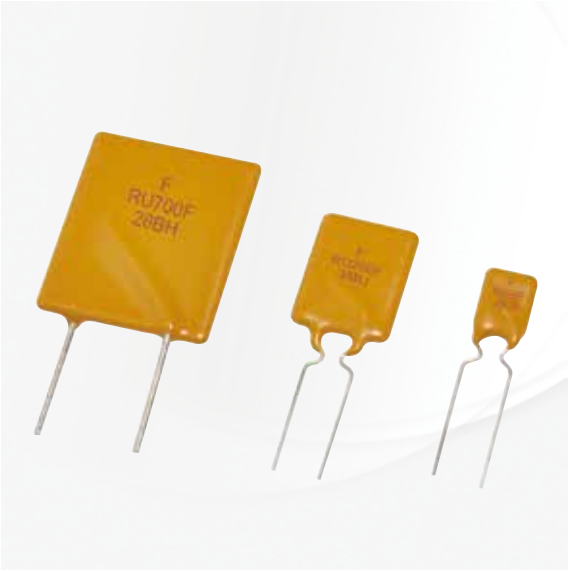
| | |
|---|---|
| Lead material | FRX010-90F~FRX040-90F Tin plated copper clad steel, 24 AWG. |
| | FRX050-90F~FRX090-90F Tin plated copper, 24 AWG. |
| | FRX110-90F~FRX375-90F Tin plated copper, 20 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

NOTE : All Specifications subject to change without notice.

# FRU Series



**Application**
Wide variety of electronic equipment
**Product Features**
Low resistance, High hold current, Solid state
Radial-leaded product ideal for up to 30$V_{DC}$

**Operation Current**
0.90A~9.00A
**Maximum Voltage**
30$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FRU090-30F | 0.90 | 1.80 | 5.9 | 100 | 30 | 0.6 | 0.070 | 0.220 |
| FRU110-30F | 1.10 | 2.20 | 6.6 | 100 | 30 | 0.7 | 0.050 | 0.170 |
| FRU135-30F | 1.35 | 2.70 | 7.3 | 100 | 30 | 0.8 | 0.040 | 0.130 |
| FRU160-30F | 1.60 | 3.20 | 8.0 | 100 | 30 | 0.9 | 0.030 | 0.110 |
| FRU185-30F | 1.85 | 3.70 | 8.7 | 100 | 30 | 1.0 | 0.030 | 0.090 |
| FRU250-30F | 2.50 | 5.00 | 10.3 | 100 | 30 | 1.2 | 0.020 | 0.070 |
| FRU300-30F | 3.00 | 6.00 | 10.8 | 100 | 30 | 2.0 | 0.020 | 0.080 |
| FRU400-30F | 4.00 | 8.00 | 12.7 | 100 | 30 | 2.5 | 0.010 | 0.050 |
| FRU500-30F | 5.00 | 10.00 | 14.5 | 100 | 30 | 3.0 | 0.010 | 0.050 |
| FRU600-30F | 6.00 | 12.00 | 16.0 | 100 | 30 | 3.5 | 0.005 | 0.040 |
| FRU700-30F | 7.00 | 14.00 | 17.5 | 100 | 30 | 3.8 | 0.005 | 0.030 |
| FRU800-30F | 8.00 | 16.00 | 18.8 | 100 | 30 | 4.0 | 0.005 | 0.020 |
| FRU900-30F | 9.00 | 18.00 | 20.0 | 100 | 30 | 4.2 | 0.005 | 0.020 |

## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

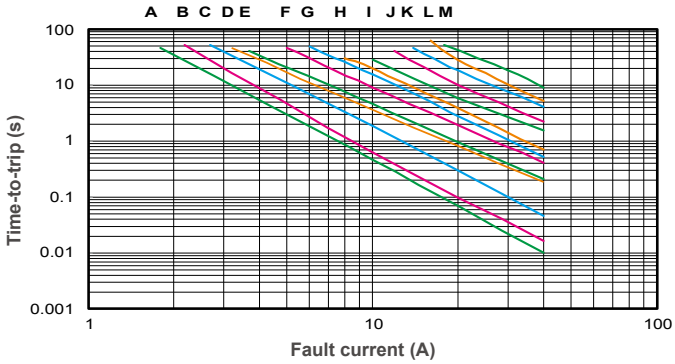
| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 84% | 76% | 70% | 61% | 50% |



NOTE : All Specifications subject to change without notice.

## Typical Time-To-Trip at 23°C

A = FRU090-30F
B = FRU110-30F
C = FRU135-30F
D = FRU160-30F
E = FRU185-30F
F = FRU250-30F
G = FRU300-30F
H = FRU400-30F
I = FRU500-30F
J = FRU600-30F
K = FRU700-30F
L = FRU800-30F
M = FRU900-30F




## FRU Product Dimensions (mm)

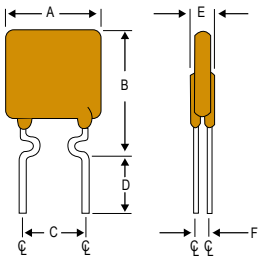



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

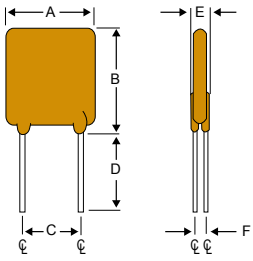
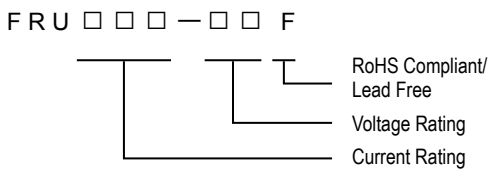



Fig.2
Lead Size : 20AWG
Φ 0.81 mm Diameter

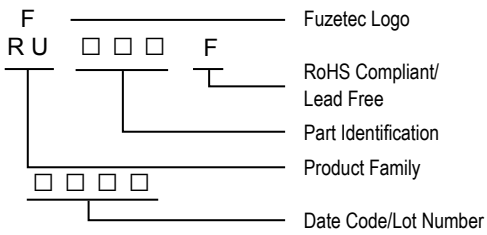
| Part Number | Fig. | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| | | Max. | Max. | Typ. | Min. | Max. | Typ. |
| FRU090-30F | 1 | 7.4 | 12.2 | 5.1 | 7.6 | 3.0 | 0.9 |
| FRU110-30F | 1 | 7.4 | 14.2 | 5.1 | 7.6 | 3.0 | 0.9 |
| FRU135-30F | 1 | 8.9 | 13.5 | 5.1 | 7.6 | 3.0 | 0.9 |
| FRU160-30F | 1 | 8.9 | 15.2 | 5.1 | 7.6 | 3.0 | 0.9 |
| FRU185-30F | 1 | 10.2 | 15.7 | 5.1 | 7.6 | 3.0 | 0.9 |
| FRU250-30F | 1 | 11.4 | 18.3 | 5.1 | 7.6 | 3.0 | 0.9 |
| FRU300-30F | 2 | 11.4 | 17.3 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRU400-30F | 2 | 14.0 | 20.1 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRU500-30F | 2 | 14.0 | 24.9 | 10.2 | 7.6 | 3.0 | 1.2 |
| FRU600-30F | 2 | 16.5 | 24.9 | 10.2 | 7.6 | 3.0 | 1.2 |
| FRU700-30F | 2 | 19.1 | 26.7 | 10.2 | 7.6 | 3.0 | 1.2 |
| FRU800-30F | 2 | 21.6 | 29.2 | 10.2 | 7.6 | 3.0 | 1.2 |
| FRU900-30F | 2 | 24.1 | 29.7 | 10.2 | 7.6 | 3.0 | 1.2 |

## Part Numbering System




## Part Marking System


Example




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRU090-30F~FRU110-30F | : | 500 Pcs/Bag, 3.0K Reel/Tape |
| FRU135-30F~FRU250-30F | : | 300 Pcs/Bag, 3.0K Reel/Tape |
| FRU300-30F~FRU400-30F | : | 200 Pcs/Bag, 1.5K Reel/Tape |
| FRU500-30F | : | 200 Pcs/Bag, 1.0K Reel/Tape |
| FRU600-30F~FRU900-30F | : | 100 Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | FRU090-30F~FRU250-30F Tin plated copper clad steel, 24 AWG. |
| | FRU300-30F~FRU900-30F Tin plated copper, 20 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FRT Series

**Application**
IEEE 1394 Firewire, Computers & Consumer electronics

**Product Features**
Fast trip time, Lower Trip-to-hold Ratio, Radial-leaded product ideal for up to 36$V_{DC}$

**Operation Current**
0.50A~2.50A

**Maximum Voltage**
36$V_{DC}$

**Temperature Range**
-40°C to 85°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

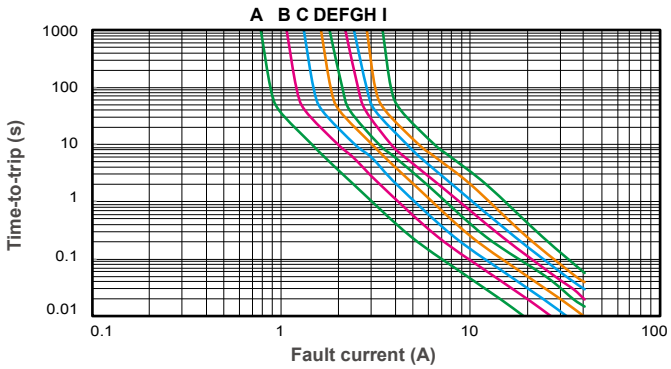
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, S | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FRT050-33F | 0.50 | 1.00 | 5.0 | 40 | 36 | 0.67 | 0.140 | 0.448 |
| FRT075-33F | 0.75 | 1.50 | 4.0 | 40 | 36 | 0.71 | 0.115 | 0.368 |
| FRT090-33F | 0.90 | 1.80 | 3.5 | 40 | 36 | 0.74 | 0.090 | 0.288 |
| FRT120-33F | 1.20 | 2.30 | 3.5 | 40 | 36 | 0.78 | 0.074 | 0.180 |
| FRT135-33F | 1.35 | 2.50 | 4.5 | 40 | 36 | 0.84 | 0.059 | 0.143 |
| FRT160-33F | 1.60 | 2.75 | 4.5 | 40 | 36 | 0.86 | 0.041 | 0.131 |
| FRT190-33F | 1.90 | 3.00 | 3.5 | 40 | 36 | 0.90 | 0.045 | 0.092 |
| FRT220-33F | 2.20 | 3.50 | 6.5 | 40 | 36 | 0.95 | 0.025 | 0.080 |
| FRT250-33F | 2.50 | 4.00 | 8.0 | 40 | 36 | 0.99 | 0.020 | 0.064 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 148% | 134% | 120% | 100% | 98% | 90% | 84% | 78% | 70% | 59% |

## Typical Time-To-Trip at 23°C

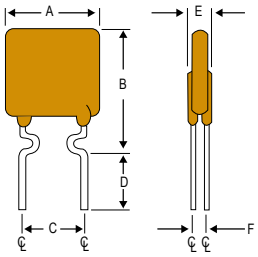
A = FRT050-33F
B = FRT075-33F
C = FRT090-33F
D = FRT120-33F
E = FRT135-33F
F = FRT160-33F
G = FRT190-33F
H = FRT220-33F
I = FRT250-33F






NOTE : All Specifications subject to change without notice.

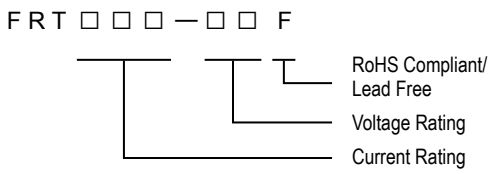
## FRT Product Dimensions (mm)




Lead Size : 24AWG
Φ 0.51 mm Diameter

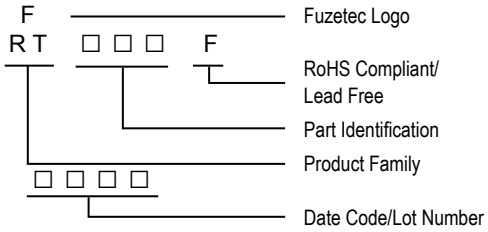
| Part Number | A Max. | B Max. | C Typ. | D Min. | E Max. | F Typ. |
|---|---|---|---|---|---|---|
| FRT050-33F | 7.4 | 12.2 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT075-33F | 7.4 | 12.2 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT090-33F | 7.4 | 12.2 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT120-33F | 7.4 | 12.2 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT135-33F | 7.4 | 14.2 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT160-33F | 7.4 | 14.0 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT190-33F | 9.0 | 13.5 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT220-33F | 10.0 | 17.0 | 5.1 | 7.6 | 3.0 | 1.1 |
| FRT250-33F | 10.0 | 19.5 | 5.1 | 7.6 | 3.0 | 1.1 |

## Part Numbering System




## Part Marking System


Example




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRT050-33F~FRT250-33F | : | 500Pcs/Bag, 3.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Lead material | Tin plated copper clad steel, 24 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FUSB Series

**Application**
Low voltage USB equipment
**Product Features**
Low resistance, Fast trip time, Lower Trip-to-hold Ratio

**Operation Current**
0.75A ~2.50A
**Maximum Voltage**
16V/30$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

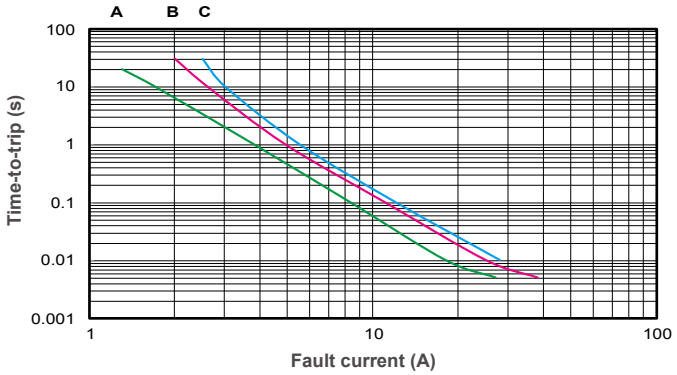
| Part Number | Hold Current | Trip Current | Max. Time to trip | | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Current | Time | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | A | Sec | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FUSB075F | 0.75 | 1.30 | 8.0 | 0.4 | 40 | 16 | 0.3 | 0.08 | 0.23 |
| FUSB090F | 0.90 | 1.80 | 8.0 | 1.2 | 40 | 16/30 | 0.6 | 0.07 | 0.18 |
| FUSB110F | 1.10 | 2.20 | 8.0 | 2.3 | 40 | 16/30 | 0.7 | 0.05 | 0.14 |
| FUSB120F | 1.20 | 2.00 | 8.0 | 0.7 | 40 | 16 | 0.6 | 0.04 | 0.14 |
| FUSB135F | 1.35 | 2.70 | 8.0 | 4.5 | 40 | 16/30 | 0.8 | 0.04 | 0.12 |
| FUSB155F | 1.55 | 2.70 | 7.8 | 2.2 | 40 | 16 | 0.7 | 0.03 | 0.12 |
| FUSB160F | 1.60 | 3.20 | 8.0 | 9.0 | 40 | 16/30 | 0.9 | 0.03 | 0.11 |
| FUSB185F | 1.85 | 3.70 | 8.0 | 10.0 | 40 | 16/30 | 1.0 | 0.03 | 0.09 |
| FUSB250F | 2.50 | 5.00 | 8.0 | 40.0 | 40 | 16/30 | 1.2 | 0.02 | 0.07 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 91% | 83% | 78% | 70% | 61% | 50% |

## Typical Time-To-Trip at 23°C

A = FUSB075F
B = FUSB120F
C = FUSB155F

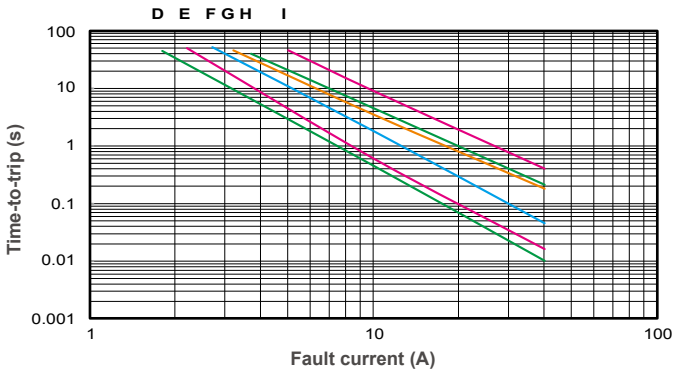





NOTE : All Specifications subject to change without notice.

## Typical Time-To-Trip at 23°C

D = FUSB090F
E = FUSB110F
F = FUSB135F
G = FUSB160F
H = FUSB185F
I = FUSB250F




## FUSB Product Dimensions (mm)

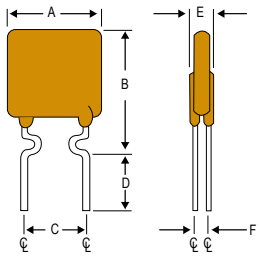



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

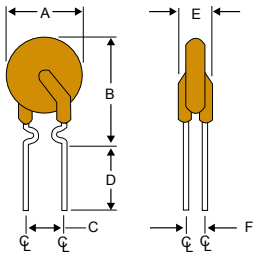
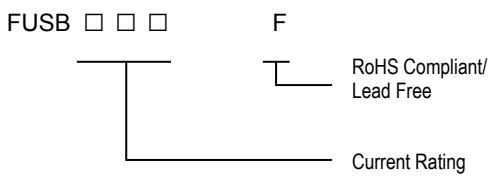



Fig.2
Lead Size : 24AWG
Φ 0.51 mm Diameter

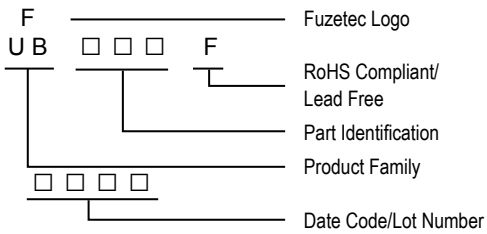
| Part Number | Fig. | A Max. | B Max. | C Typ. | D Min. | E Max. | F Typ. |
|---|---|---|---|---|---|---|---|
| FUSB075F | 2 | 6.9 | 11.4 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB090F | 1 | 7.4 | 12.2 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB110F | 1 | 7.4 | 14.2 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB120F | 2 | 6.9 | 11.7 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB135F | 1 | 8.9 | 13.5 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB155F | 2 | 6.9 | 11.7 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB160F | 1 | 8.9 | 15.2 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB185F | 1 | 10.2 | 15.7 | 5.1 | 7.6 | 3.0 | 0.8 |
| FUSB250F | 1 | 11.4 | 18.3 | 5.1 | 7.6 | 3.0 | 0.8 |

## Part Numbering System




## Part Marking System


Example




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FUSB075F~FUSB250F | : | 500Pcs/Bag, 3.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Lead material | Tin plated copper clad steel, 24 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy polymer, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FRG Series

**Application**
Wide variety of electronic equipment
**Product Features**
Very high hold current, Solid state Radial-leaded product ideal for up to 16$V_{DC}$

**Operation Current**
2.50 A~14.00A
**Maximum Voltage**
16$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

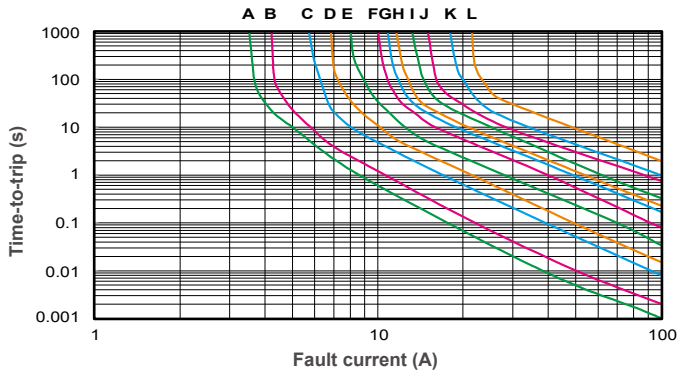
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FRG250-16F | 2.5 | 4.7 | 5.0 | 100 | 16 | 1.0 | 0.022 | 0.053 |
| FRG300-16F | 3.0 | 5.1 | 2.0 | 100 | 16 | 2.3 | 0.034 | 0.105 |
| FRG400-16F | 4.0 | 6.8 | 3.5 | 100 | 16 | 2.4 | 0.020 | 0.063 |
| FRG500-16F | 5.0 | 8.5 | 3.6 | 100 | 16 | 2.6 | 0.014 | 0.044 |
| FRG600-16F | 6.0 | 10.2 | 5.8 | 100 | 16 | 2.8 | 0.009 | 0.033 |
| FRG700-16F | 7.0 | 11.9 | 8.0 | 100 | 16 | 3.0 | 0.006 | 0.021 |
| FRG800-16F | 8.0 | 13.6 | 9.0 | 100 | 16 | 3.0 | 0.005 | 0.018 |
| FRG900-16F | 9.0 | 15.3 | 12.0 | 100 | 16 | 3.3 | 0.004 | 0.015 |
| FRG1000-16F | 10.0 | 17.0 | 12.5 | 100 | 16 | 3.3 | 0.003 | 0.012 |
| FRG1100-16F | 11.0 | 18.7 | 13.5 | 100 | 16 | 3.7 | 0.003 | 0.010 |
| FRG1200-16F | 12.0 | 20.4 | 16.0 | 100 | 16 | 4.2 | 0.002 | 0.009 |
| FRG1400-16F | 14.0 | 23.8 | 20.0 | 100 | 16 | 4.6 | 0.002 | 0.008 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 148% | 132% | 116% | 100% | 91% | 84% | 76% | 69% | 60% | 48% |

## Typical Time-To-Trip at 23°C

A = FRG250-16F
B = FRG300-16F
C = FRG400-16F
D = FRG500-16F
E = FRG600-16F
F = FRG700-16F
G = FRG800-16F
H = FRG900-16F
I = FRG1000-16F
J = FRG1100-16F
K = FRG1200-16F
L = FRG1400-16F






NOTE : All Specifications subject to change without notice.

## FRG Product Dimensions (mm)

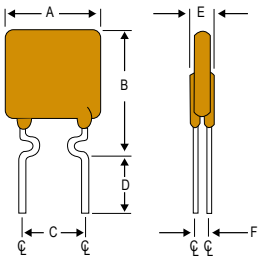



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

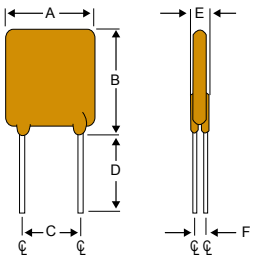



Fig.2
Lead Size : 20AWG
Φ 0.81 mm Diameter

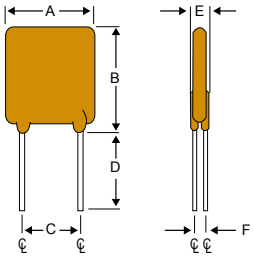
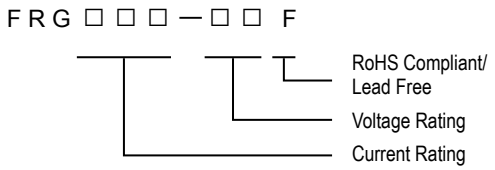



Fig.3
Lead Size : 18AWG
Φ 1.0 mm Diameter

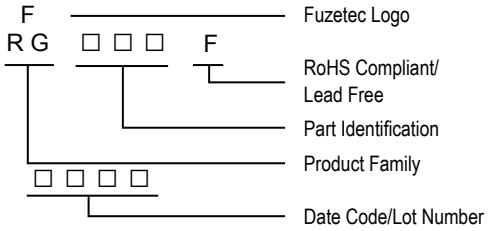
| Part Number | Fig. | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| | | Max. | Max. | Typ. | Min. | Max. | Typ. |
| FRG250-16F | 1 | 8.9 | 12.8 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG300-16F | 2 | 7.1 | 11.0 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG400-16F | 2 | 8.9 | 12.8 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG500-16F | 2 | 10.4 | 14.3 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG600-16F | 2 | 10.7 | 17.1 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG700-16F | 2 | 11.2 | 19.7 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG800-16F | 2 | 12.7 | 20.9 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG900-16F | 2 | 14.0 | 21.7 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG1000-16F | 2 | 16.5 | 24.1 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG1100-16F | 2 | 17.5 | 26.0 | 5.1 | 7.6 | 3.0 | 1.2 |
| FRG1200-16F | 3 | 17.5 | 28.0 | 10.2 | 7.6 | 3.6 | 1.4 |
| FRG1400-16F | 3 | 27.9 | 27.9 | 10.2 | 7.6 | 3.6 | 1.4 |

## Part Numbering System




## Part Marking System


Example




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRG250-16F~FRG300-16F | : | 500 Pcs/Bag, 2.5K Reel/Tape |
| FRG400-16F~FRG600-16F | : | 300 Pcs/Bag, 2.5K Reel/Tape |
| FRG700-16F | : | 200 Pcs/Bag, 1.5K Reel/Tape |
| FRG800-16F~FRG900-16F | : | 200 Pcs/Bag |
| FRG1000-16F~FRG1400-16F | : | 100 Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | FRG250-16F Tin plated copper clad steel, 24 AWG. |
| | FRG300-16F~FRG1100-16F Tin plated copper, 20 AWG. |
| | FRG1200-16F~FRG1400-16F Tin plated copper, 18 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FRHV Series

**Application**
Telecommunication and Data transmitting
**Product Features**
Low hold current, Solid state

**Operation Current**
0.08 A~0.40A
**Maximum Operating Voltage**
60V/100V/250$V_{DC}$
**Maximum Interrupt Voltage**
250V/600$V_{AC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50138901) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

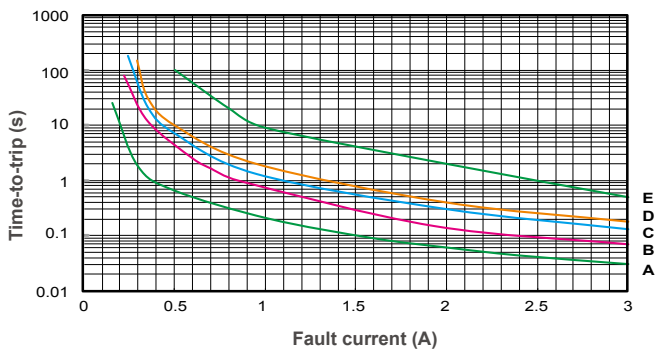
| Part Number | Hold Current | Trip Current | Max. Time to trip | | Max. Current | Max. Oper. Voltage | Max. Int. Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Current | Time | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | A | Sec | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | $V_{I-MAX}$, $V_{AC}$ | Pd, W | Ohms | Ohms |
| FRH080-250VF | 0.08 | 0.16 | 0.35 | 4.0 | 3.0 | 100 | 250 | 1.0 | 14.00 | 33.00 |
| FRH110-250VF | 0.11 | 0.22 | 1.00 | 2.0 | 3.0 | 100 | 250 | 1.0 | 5.00 | 16.00 |
| FRH120-250VF | 0.12 | 0.24 | 1.00 | 2.0 | 3.0 | 100 | 250 | 1.0 | 4.00 | 16.00 |
| FRH145-250VF | 0.15 | 0.29 | 1.00 | 2.5 | 3.0 | 100 | 250 | 1.0 | 3.00 | 12.00 |
| FRH180-250XF | 0.18 | 0.65 | 3.00 | 2.0 | 10.0 | 100 | 250 | 1.0 | 0.80 | 4.00 |
| FRH150-600MF | 0.15 | 0.30 | 1.00 | 4.0 | 3.0 | 250 | 600 | 1.0 | 6.00 | 17.00 |
| FRH160-600MF | 0.16 | 0.32 | 1.00 | 7.0 | 3.0 | 250 | 600 | 1.0 | 4.00 | 16.00 |
| FRH160-600VF | 0.16 | 0.32 | 1.00 | 7.0 | 3.0 | 250 | 600 | 1.0 | 4.00 | 18.00 |
| FRH200-600VF | 0.20 | 0.40 | 1.00 | 12.0 | 3.0 | 250 | 600 | 1.0 | 4.00 | 13.50 |
| FRH250-600VF | 0.25 | 0.85 | 3.00 | 1.0 | 3.0 | 250 | 600 | 1.0 | 1.00 | 7.00 |
| FRH400-600F | 0.40 | 1.00 | 3.00 | 4.0 | 3.0 | 60 | 600 | 1.0 | 0.95 | 1.90 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 158% | 138% | 119% | 100% | 92% | 83% | 73% | 64% | 54% | 40% |

## Typical Time-To-Trip at 23°C

A = FRH080-250VF
B = FRH110-250VF
C = FRH120-250VF
D = FRH145-250VF
E = FRH180-250XF

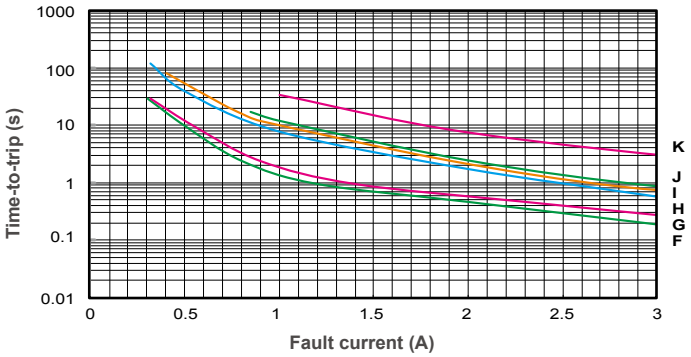





NOTE : All Specifications subject to change without notice.

## Typical Time-To-Trip at 23°C

F = FRH150-600MF
G = FRH160-600MF
H = FRH160-600VF
I = FRH200-600VF
J = FRH250-600VF
K = FRH400-600F




## FRHV Product Dimensions (mm)

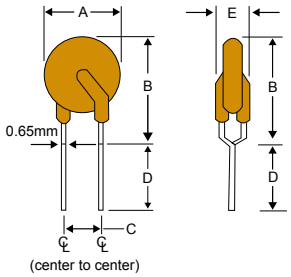



Fig.1
Lead Size : 22AWG
Φ 0.65 mm Diameter

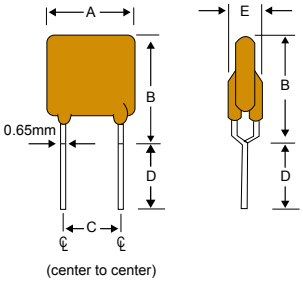



Fig.2
Lead Size : 22AWG
Φ 0.65 mm Diameter

| Part Number | Fig. | A Max. | B Max. | C Typ. | D Min. | E Max. |
|---|---|---|---|---|---|---|
| FRH080-250VF | 1 | 5.8 | 9.6 | 5.0 | 4.7 | 4.6 |
| FRH110-250VF | 1 | 6.8 | 9.9 | 5.0 | 4.7 | 4.6 |
| FRH120-250VF | 2 | 6.5 | 11.0 | 5.0 | 4.7 | 4.6 |
| FRH145-250VF | 2 | 6.5 | 11.0 | 5.0 | 4.7 | 4.6 |
| FRH180-250XF | 1 | 9.0 | 12.0 | 5.0 | 4.7 | 3.8 |
| FRH150-600MF | 2 | 9.0 | 12.5 | 5.0 | 4.7 | 4.6 |
| FRH160-600MF | 2 | 9.0 | 12.5 | 5.0 | 4.7 | 4.6 |
| FRH160-600VF | 2 | 16.0 | 12.6 | 5.0 | 4.7 | 6.0 |
| FRH200-600VF | 2 | 12.0 | 14.0 | 5.0 | 4.7 | 6.0 |
| FRH250-600VF | 2 | 12.0 | 15.0 | 5.0 | 4.7 | 6.0 |
| FRH400-600F | 2 | 15.0 | 18.0 | 5.0 | 4.7 | 6.0 |

## Part Numbering System

FRH□□□-□□□ V F

- F — RoHS Compliant/ Lead Free
- V : High Operating Voltage Device
- X : Round Type
- M : Special Type
- □□□ — Maximum Interrupt Voltage Rating
- □□□ — Current Rating

## Part Marking System


Example

F — Fuzetec Logo
RH □□□ F
- F — RoHS Compliant/ Lead Free
- □□□ — Part Identification
- RH — Product Family
- □□□□ — Date Code/Lot Number

* FRH150-600MF Marking : RH6150F
* FRH160-600MF Marking : RH6160F
* FRH160-600VF Marking : RH6160F
* FRH200-600VF Marking : RH6200F
* FRH250-600VF Marking : RH6250F
* FRH400-600F Marking : RH6400F

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRH080-250VF~FRH145-250VF | : | 300 Pcs/Bag, 1.5K Reel/Tape |
| FRH180-250XF | : | 200 Pcs/Bag, 1.5K Reel/Tape |
| FRH150-600MF~FRH160-600MF | : | 100 Pcs/Bag, 1.2K Reel/Tape |
| FRH160-600VF | : | 100 Pcs/Bag, 0.6K Reel/Tape |
| FRH200-600VF~FRH400-600F | : | 100 Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | Tin plated copper, 22 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

*NOTE : All FRHV products are designed to assist equipment to pass ITU K20/K21 UL60950 or GR1089 specification.

*FRH150-600MF, FRH160-600VF meet UL497A Overvoltage and Endurance Conditioning requirements for Thermistor type component.

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

NOTE : All Specifications subject to change without notice.

# FRV Series

**Application**
Line Voltage Power Supply, Transformer and Appliances

**Product Features**
Low hold current, Solid state, Radial leaded product ideal for up to 265$V_{AC/DC}$

**Maximum Operation Current**
0.05A~2.00A

**Maximum Operating Voltage**
240$V_{AC/DC}$

**Maximum Interrupt Voltage**
265$V_{AC/DC}$

**Temperature Range**
-40°C to 85°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50087018) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

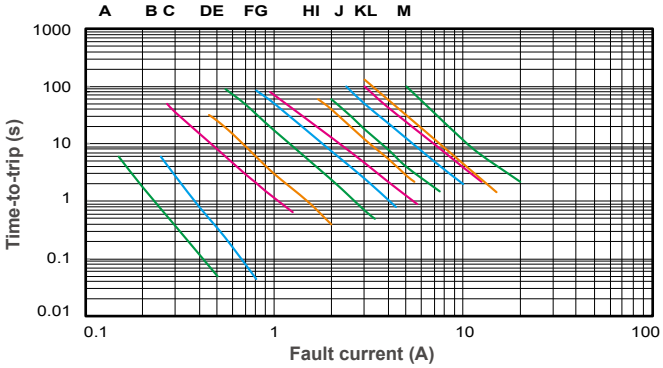
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Max. Int. Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, S | $I_{MAX}$, A | $V_{MAX}$, $V_{AC/DC}$ | $V_{I-MAX}$, $V_{AC/DC}$ | Pd, W | Ohms | Ohms |
| FRV005-240F | 0.05 | 0.12 | 15.0 | 1.0 | 240 | 265 | 0.70 | 18.50 | 65.00 |
| FRV008-240F | 0.08 | 0.19 | 15.0 | 1.2 | 240 | 265 | 0.80 | 7.40 | 26.00 |
| FRV012-240F | 0.12 | 0.30 | 15.0 | 1.2 | 240 | 265 | 1.00 | 3.00 | 12.00 |
| FRV016-240F | 0.16 | 0.37 | 15.0 | 2.0 | 240 | 265 | 1.40 | 2.50 | 7.80 |
| FRV025-240F | 0.25 | 0.56 | 18.5 | 3.5 | 240 | 265 | 1.50 | 1.30 | 3.80 |
| FRV033-240F | 0.33 | 0.74 | 21.0 | 4.5 | 240 | 265 | 1.70 | 0.83 | 2.60 |
| FRV040-240F | 0.40 | 0.90 | 24.0 | 5.5 | 240 | 265 | 2.00 | 0.60 | 1.90 |
| FRV055-240F | 0.55 | 1.25 | 26.0 | 7.0 | 240 | 265 | 3.40 | 0.45 | 1.45 |
| FRV075-240F | 0.75 | 1.50 | 18.0 | 7.5 | 240 | 265 | 2.60 | 0.32 | 0.84 |
| FRV100-240F | 1.00 | 2.00 | 21.0 | 10.0 | 240 | 265 | 2.90 | 0.22 | 0.58 |
| FRV125-240F | 1.25 | 2.50 | 23.0 | 12.5 | 240 | 265 | 3.30 | 0.17 | 0.44 |
| FRV150-240F | 1.50 | 3.00 | 23.0 | 15.0 | 240 | 265 | 3.70 | 0.12 | 0.32 |
| FRV200-240F | 2.00 | 4.00 | 28.0 | 20.0 | 240 | 265 | 4.50 | 0.09 | 0.22 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 150% | 134% | 116% | 100% | 90% | 81% | 74% | 65% | 58% | 44% |

## Typical Time-To-Trip at 23°C

A = FRV005-240F
B = FRV008-240F
C = FRV012-240F
D = FRV016-240F
E = FRV025-240F
F = FRV033-240F
G = FRV040-240F
H = FRV055-240F
I = FRV075-240F
J = FRV100-240F
K = FRV125-240F
L = FRV150-240F
M = FRV200-240F




## FRV Product Dimensions (mm)

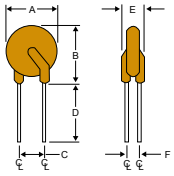


Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

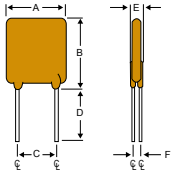


Fig.2
Lead Size : 22AWG
Φ 0.65 mm Diameter

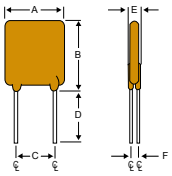


Fig.3
Lead Size : 20AWG
Φ 0.81 mm Diameter

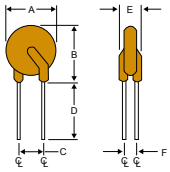
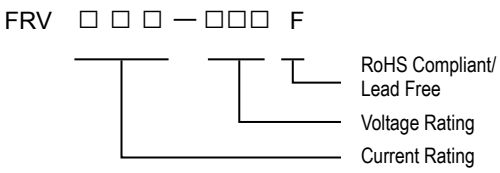


Fig.4
Lead Size : 20AWG
Φ 0.81 mm Diameter

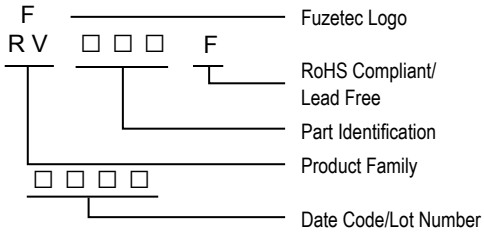
| Part Number | Fig | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| | | Max. | Max. | Typ. | Min. | Max. | Typ. |
| FRV005-240F | 1 | 8.3 | 10.7 | 5.1 | 7.6 | 3.8 | 1.6 |
| FRV008-240F | 1 | 8.3 | 10.7 | 5.1 | 7.6 | 3.8 | 1.6 |
| FRV012-240F | 1 | 8.3 | 10.7 | 5.1 | 7.6 | 3.8 | 1.6 |
| FRV016-240F | 1 | 9.9 | 12.5 | 5.1 | 7.6 | 3.8 | 1.6 |
| FRV025-240F | 2 | 9.6 | 17.4 | 5.1 | 7.6 | 3.8 | 1.8 |
| FRV033-240F | 2 | 11.4 | 16.5 | 5.1 | 7.6 | 3.8 | 1.8 |
| FRV040-240F | 2 | 11.5 | 19.5 | 5.1 | 7.6 | 3.8 | 1.8 |
| FRV055-240F | 3 | 14.0 | 21.7 | 5.1 | 7.6 | 4.1 | 1.9 |
| FRV075-240F | 3 | 11.5 | 23.4 | 5.1 | 7.6 | 4.8 | 1.9 |
| FRV100-240F | 4 | 18.7 | 24.4 | 10.2 | 7.6 | 5.1 | 1.9 |
| FRV125-240F | 4 | 21.2 | 27.4 | 10.2 | 7.6 | 5.3 | 1.9 |
| FRV150-240F | 4 | 23.4 | 30.9 | 10.2 | 7.6 | 5.3 | 1.9 |
| FRV200-240F | 3 | 24.9 | 33.8 | 10.2 | 7.6 | 6.1 | 1.9 |

## Part Numbering System




## Part Marking System


Example




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRV005-240F~FRV016-240F | : | 500 Pcs/Bag, 2.0K Reel/Tape |
| FRV025-240F | : | 300 Pcs/Bag, 2.0K Reel/Tape |
| FRV033-240F~FRV040-240F | : | 200 Pcs/Bag, 2.0K Reel/Tape |
| FRV055-240F | : | 200 Pcs/Bag, 1.0K Reel/Tape |
| FRV075-240F | : | 200 Pcs/Bag, 2.0K Reel/Tape |
| FRV100-240F~FRV200-240F | : | 100 Pcs/Bag |

## Physical specifications

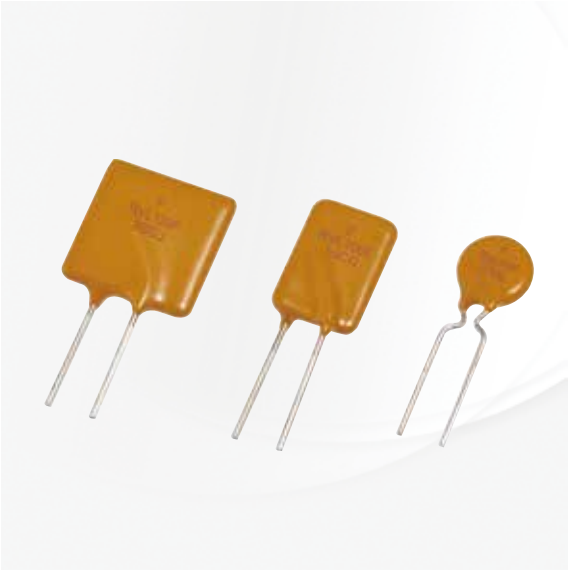
| | |
|---|---|
| Lead material | FRV005-240F~FRV016-240F Tin plated copper clad steel, 24AWG. |
| | FRV025-240F~FRV040-240F Tin plated copper, 22AWG. |
| | FRV055-240F~FRV200-240F Tin plated copper, 20AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

NOTE : All Specifications subject to change without notice.

# FRVL Series



**Application**
Line Voltage Power Supply, Transformer and Appliances Product

**Features**
Solid state, Radial leaded product ideal for up to120$V_{AC/DC}$

**Maximum Operation Current**
0.10A~3.75A

**Maximum Voltage**
120$V_{AC/DC}$

**Maximum Interrupt Voltage**
135$V_{AC/DC}$

**Temperature Range**
-40°C to 85°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50122733) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

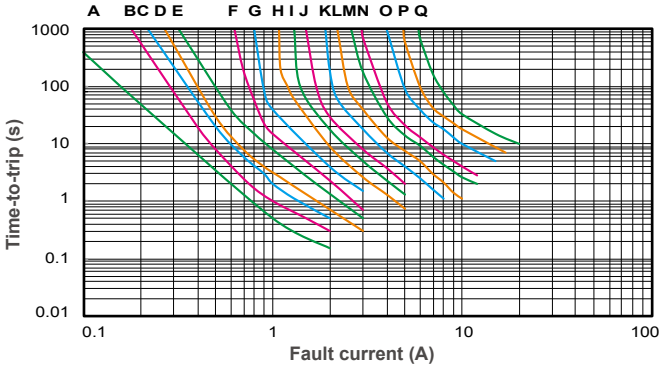
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Max. Oper. Voltage | Max. Int. Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{AC/DC}$ | $V_{I-MAX}$, $V_{AC/DC}$ | Pd, W | Ohms | Ohms |
| FRVL010-120F | 0.10 | 0.20 | 10.0 | 2.0 | 120 | 135 | 0.84 | 3.00 | 7.50 |
| FRVL017-120F | 0.17 | 0.34 | 10.0 | 2.0 | 120 | 135 | 0.84 | 2.00 | 7.00 |
| FRVL020-120F | 0.20 | 0.40 | 9.0 | 2.0 | 120 | 135 | 1.08 | 1.83 | 4.40 |
| FRVL025-120F | 0.25 | 0.50 | 7.5 | 3.0 | 120 | 135 | 1.08 | 1.25 | 3.00 |
| FRVL030-120F | 0.30 | 0.60 | 8.5 | 3.0 | 120 | 135 | 1.44 | 0.88 | 2.10 |
| FRVL040-120F | 0.40 | 0.80 | 6.5 | 3.0 | 120 | 135 | 1.44 | 0.55 | 1.29 |
| FRVL050-120F | 0.50 | 1.00 | 6.0 | 3.0 | 120 | 135 | 1.56 | 0.50 | 1.17 |
| FRVL065-120F | 0.65 | 1.30 | 5.7 | 5.0 | 120 | 135 | 1.68 | 0.31 | 0.72 |
| FRVL070-120F | 0.75 | 1.50 | 6.3 | 5.0 | 120 | 135 | 1.80 | 0.25 | 0.60 |
| FRVL075-120F | 0.75 | 1.50 | 15.0 | 7.5 | 120 | 135 | 2.64 | 0.25 | 0.69 |
| FRVL090-120F | 0.90 | 1.80 | 7.2 | 5.0 | 120 | 135 | 1.80 | 0.20 | 0.47 |
| FRVL100-120F | 1.00 | 2.00 | 15.0 | 10.0 | 120 | 135 | 2.64 | 0.18 | 0.47 |
| FRVL110-120F | 1.10 | 2.20 | 8.2 | 8.0 | 120 | 135 | 2.28 | 0.15 | 0.38 |
| FRVL125-120F | 1.25 | 2.50 | 20.0 | 12.5 | 120 | 135 | 2.88 | 0.11 | 0.33 |
| FRVL130-120F | 1.35 | 2.70 | 9.6 | 10.0 | 120 | 135 | 2.64 | 0.12 | 0.30 |
| FRVL135-120F | 1.35 | 2.70 | 20.0 | 13.5 | 120 | 135 | 3.12 | 0.11 | 0.30 |
| FRVL160-120F | 1.60 | 3.20 | 11.4 | 12.0 | 120 | 135 | 3.12 | 0.09 | 0.22 |
| FRVL185-120F | 1.85 | 3.70 | 12.6 | 12.0 | 120 | 135 | 3.36 | 0.08 | 0.19 |
| FRVL200-120F | 2.00 | 4.20 | 36.0 | 20.0 | 120 | 135 | 4.32 | 0.08 | 0.21 |
| FRVL250-120F | 2.50 | 5.00 | 15.6 | 15.0 | 120 | 135 | 4.44 | 0.05 | 0.13 |
| FRVL300-120F | 3.00 | 6.00 | 19.8 | 17.0 | 120 | 135 | 4.56 | 0.04 | 0.10 |
| FRVL375-120F | 3.75 | 7.50 | 24.0 | 20.0 | 120 | 135 | 4.80 | 0.03 | 0.08 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

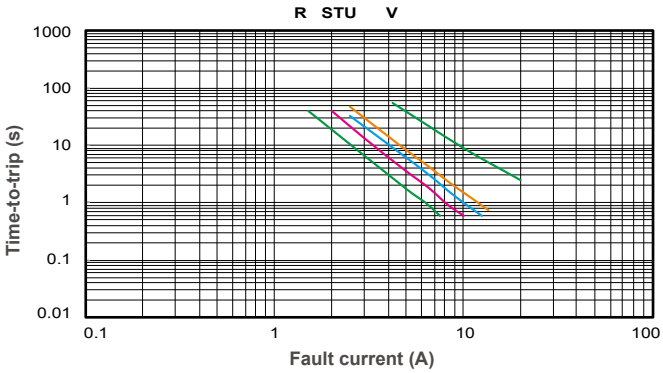
| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 158% | 138% | 119% | 100% | 90% | 80% | 70% | 60% | 50% | 38% |

## Typical Time-To-Trip at 23°C

A = FRVL010-120F
B = FRVL017-120F
C = FRVL020-120F
D = FRVL025-120F
E = FRVL030-120F
F = FRVL040-120F
G = FRVL050-120F
H = FRVL065-120F
I = FRVL070-120F
J = FRVL090-120F
K = FRVL110-120F
L = FRVL130-120F
M = FRVL160-120F
N = FRVL185-120F
O = FRVL250-120F
P = FRVL300-120F
Q = FRVL375-120F




R = FRVL075-120F
S = FRVL100-120F
T = FRVL125-120F
U = FRVL135-120F
V = FRVL200-120F




## FRVL Product Dimensions (mm)

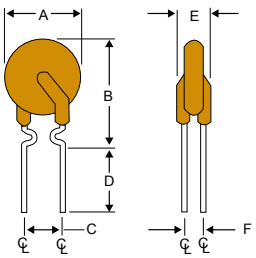



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

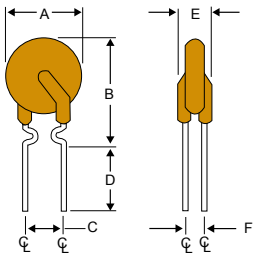



Fig.2
Lead Size : 22AWG
Φ 0.65 mm Diameter

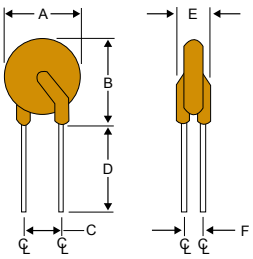



Fig.3
Lead Size : 20AWG
Φ 0.81 mm Diameter

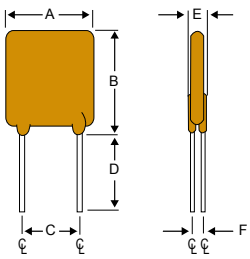



Fig.4
Lead Size : 20AWG
Φ 0.81 mm Diameter

| Part Number | Fig. | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| | | Max. | Max. | Typ. | Min. | Max. | Typ. |
| FRVL010-120F | 1 | 7.9 | 13.0 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL017-120F | 1 | 7.9 | 13.0 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL020-120F | 2 | 7.9 | 13.0 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL025-120F | 2 | 7.9 | 13.0 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL030-120F | 2 | 7.9 | 13.0 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL040-120F | 2 | 8.2 | 14.2 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL050-120F | 2 | 9.2 | 14.9 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL065-120F | 2 | 9.7 | 14.9 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL070-120F | 2 | 10.6 | 15.5 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL075-120F | 4 | 10.9 | 17.0 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL090-120F | 2 | 11.9 | 15.9 | 5.1 | 7.6 | 3.8 | 2.2 |
| FRVL100-120F | 4 | 11.5 | 20.1 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL110-120F | 3 | 13.3 | 18.3 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL125-120F | 4 | 14.0 | 21.7 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL130-120F | 3 | 15.5 | 20.6 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL135-120F | 4 | 16.3 | 21.7 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL160-120F | 3 | 17.5 | 22.5 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL185-120F | 3 | 19.9 | 24.9 | 5.1 | 7.6 | 4.1 | 2.2 |
| FRVL200-120F | 4 | 23.5 | 27.9 | 10.2 | 7.6 | 4.1 | 2.2 |
| FRVL250-120F | 3 | 22.5 | 27.5 | 10.2 | 7.6 | 4.1 | 2.2 |
| FRVL300-120F | 3 | 25.5 | 30.0 | 10.2 | 7.6 | 4.1 | 2.2 |
| FRVL375-120F | 3 | 29.5 | 34.0 | 10.2 | 7.6 | 4.1 | 2.2 |

## Part Numbering System

FRVL □ □ □ — □□□ F

- RoHS Compliant/ Lead Free
- Voltage Rating
- Current Rating

## Part Marking System

Example

F
RVL □ □ F

- Fuzetec Logo
- RoHS Compliant/ Lead Free
- Part Identification
- Product Family
- □ □ □ □ — Date Code/Lot Number

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FRVL010-120F~FRVL050-120F | : | 500 Pcs/Bag, 2.0K Reel/Tape |
| FRVL065-120F~FRVL075-120F | : | 300 Pcs/Bag, 1.5K Reel/Tape |
| FRVL090-120F | : | 300 Pcs/Bag, 2.0K Reel/Tape |
| FRVL100-120F~FRVL110-120F | : | 300 Pcs/Bag, 1.5K Reel/Tape |
| FRVL125-120F~FRVL135-120F | : | 200 Pcs/Bag, 1.0K Reel/Tape |
| FRVL160-120F | : | 200 Pcs/Bag |
| FRVL185-120F~FRVL375-120F | : | 100 Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | FRVL010-120F Tin plated copper clad steel, 24AWG. |
| | FRVL017-120F Tin plated copper, 24AWG. |
| | FRVL020-120F~FRVL070-120F and FRVL090-120F Tin plated copper, 22AWG. |
| | FRVL075-120F and FRVL100-120F~FRVL375-120F Tin plated copper, 20AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FUZETEC

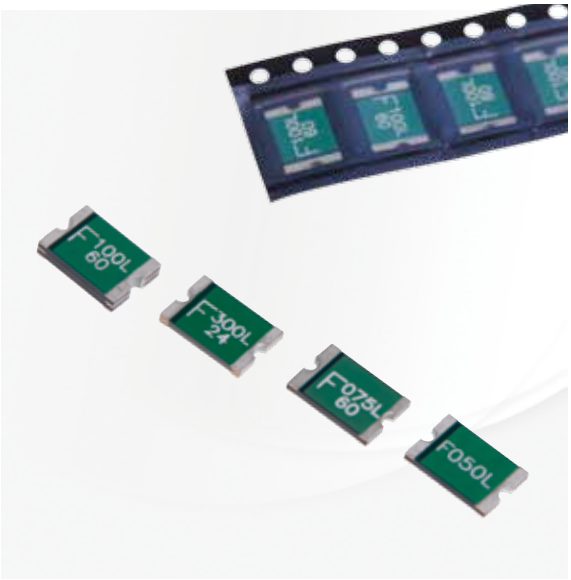

Package Size: 2920 - 0402

Current Rating: Up to 3A

Voltage Rating: 6 - 60V

# SMD PPTC Series

# FSMD2920 Series




**Application**
All high-density boards
**Product Features**
2920 Dimension, Surface mountable, Solid state, Faster time to trip than standard SMD devices.

**Operation Current**
0.30A~5.00A
**Maximum Voltage**
6V~60$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD030-2920-R | 0.30 | 0.60 | 60 | 100 | 1.5 | 1.5 | 3.0 | 1.000 | 4.800 |
| FSMD050-2920-R | 0.50 | 1.00 | 60 | 100 | 1.5 | 2.5 | 4.0 | 0.300 | 1.400 |
| FSMD075-2920-R | 0.75 | 1.50 | 33 | 100 | 1.5 | 8.0 | 0.3 | 0.180 | 1.000 |
| FSMD075-60-2920-R | 0.75 | 1.50 | 60 | 100 | 1.5 | 8.0 | 0.3 | 0.180 | 1.000 |
| FSMD100-2920-R | 1.10 | 2.20 | 33 | 100 | 1.5 | 8.0 | 0.5 | 0.090 | 0.410 |
| FSMD110-60-2920R | 1.10 | 2.20 | 60 | 100 | 1.5 | 8.0 | 0.5 | 0.090 | 0.410 |
| FSMD125-2920-R | 1.25 | 2.50 | 33 | 100 | 1.5 | 8.0 | 2.0 | 0.050 | 0.250 |
| FSMD150-2920-R | 1.50 | 3.00 | 33 | 100 | 1.5 | 8.0 | 2.0 | 0.050 | 0.230 |
| FSMD185-2920-R | 1.85 | 3.70 | 33 | 100 | 1.5 | 8.0 | 2.5 | 0.040 | 0.150 |
| FSMD200-2920-R | 2.00 | 4.00 | 16 | 100 | 1.5 | 8.0 | 5.0 | 0.035 | 0.120 |
| FSMD200-24-2920-R | 2.00 | 4.00 | 24 | 100 | 1.5 | 8.0 | 5.0 | 0.035 | 0.120 |
| FSMD250-2920-R | 2.50 | 5.00 | 16 | 100 | 1.5 | 8.0 | 16.0 | 0.025 | 0.085 |
| FSMD260-2920-R | 2.60 | 5.20 | 6 | 100 | 1.5 | 8.0 | 20.0 | 0.020 | 0.075 |
| FSMD260-24-2920R | 2.60 | 5.20 | 24 | 100 | 1.5 | 8.0 | 20.0 | 0.020 | 0.075 |
| FSMD300-2920-R | 3.00 | 5.20 | 6 | 100 | 1.5 | 8.0 | 25.0 | 0.010 | 0.048 |
| FSMD300-15-2920R | 3.00 | 5.20 | 15 | 100 | 1.5 | 8.0 | 20.0 | 0.010 | 0.048 |
| FSMD300-24-2920R | 3.00 | 5.20 | 24 | 100 | 1.5 | 8.0 | 20.0 | 0.010 | 0.048 |
| FSMD330-2920R | 3.30 | 5.50 | 24 | 100 | 1.5 | 8.0 | 20.0 | 0.010 | 0.048 |
| FSMD400-16-2920R | 4.00 | 8.00 | 16 | 100 | 1.5 | 20.0 | 4.0 | 0.010 | 0.040 |
| FSMD500-16-2920R | 5.00 | 10.00 | 16 | 100 | 1.5 | 20.0 | 5.0 | 0.005 | 0.025 |

## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

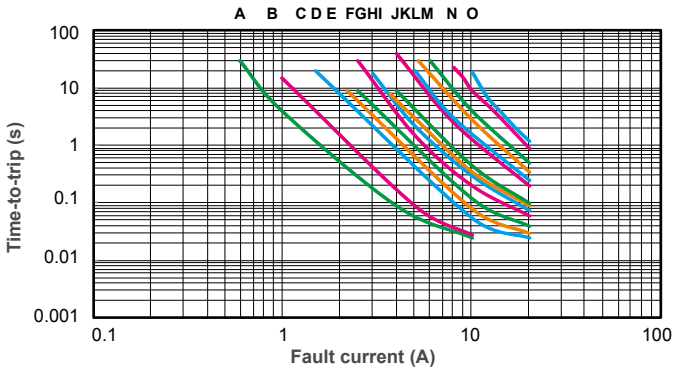
| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 85% | 78% | 70% | 62% | 50% |



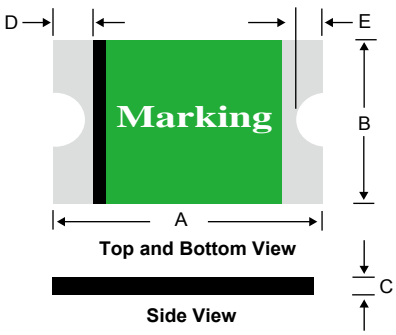
NOTE : All Specifications subject to change without notice.

## Typical Time-To-Trip at 23°C

A = FSMD030-2920-R
B = FSMD050-2920-R
C = FSMD075-2920-R / 075-60-2920-R
D = FSMD100-2920-R
E = FSMD110-60-2920R
F = FSMD125-2920-R
G = FSMD150-2920-R
H = FSMD185-2920-R
I = FSMD200-2920-R / 200-24-2920-R
J = FSMD250-2920-R
K = FSMD260-2920-R / 260-24-2920R
L = FSMD300-2920R / 300-15-2920R / 300-24-2920R
M = FSMD330-2920R
N = FSMD400-16-2920R
O = FSMD500-16-2920R




## FSMD2920 Product Dimensions (mm)




*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD030-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.60 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD050-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.60 | 1.15 | 0.50 | Max | Min | 0.90 |
| FSMD075-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD075-60-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.60 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD100-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 1.00 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD110-60-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 1.70 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD125-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD150-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD185-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.30 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD200-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.30 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD200-24-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.20 | 0.80 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD250-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.30 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD260-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.30 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD260-24-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.65 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD300-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 0.90 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD300-15-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD300-24-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.65 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD330-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.65 | 1.15 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD400-16-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 1.50 | 0.50 | 1.20 | 0.50 | 0.90 |
| FSMD500-16-2920R | 6.73 | 7.98 | 4.80 | 5.44 | 0.40 | 1.50 | 0.50 | 1.20 | 0.50 | 0.90 |

## Part Numbering System

FSMD □ □ □ — □ □ - 2920 - R

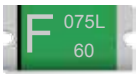
- Voltage Rating
- Current Rating

## Part Marking System


Example

F □ □ □ L

- Part Identification
- Fuzetec Logo




Example

F □ □ □ L □ □

- Part Identification
- Fuzetec Logo

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD030-2920-R~FSMD100-2920-R | : | 2.0K Reel/Tape |
| FSMD110-60-2920R | : | 1.0K Reel/Tape |
| FSMD125-2920-R~FSMD330-2920R | : | 2.0K Reel/Tape |
| FSMD400-16-2920R~FSMD500-16-2920R | : | 1.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

NOTE : All Specifications subject to change without notice.

# FSMD2016 Series


**Application**
All high-density boards
**Product Features**
Small surface mount, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.30A~2.00A
**Maximum Voltage**
6V~60VDC

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

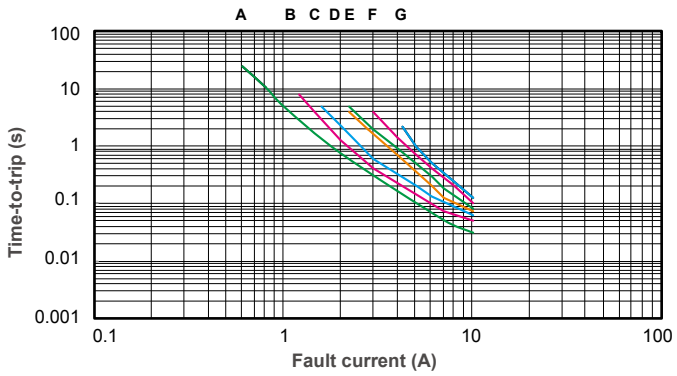
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | RMIN | R1MAX |
| | IH, A | IT, A | VMAX, VDC | IMAX, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD030-2016-R | 0.30 | 0.60 | 60 | 100 | 1.4 | 1.5 | 3.0 | 0.400 | 2.300 |
| FSMD050-2016R | 0.55 | 1.10 | 60 | 100 | 1.4 | 2.5 | 5.0 | 0.200 | 1.000 |
| FSMD075-2016R | 0.75 | 1.50 | 60 | 100 | 1.4 | 8.0 | 0.5 | 0.130 | 0.900 |
| FSMD100-2016-R | 1.10 | 2.20 | 15 | 100 | 1.4 | 8.0 | 0.5 | 0.070 | 0.400 |
| FSMD100-33-2016-R | 1.10 | 2.20 | 33 | 100 | 1.4 | 8.0 | 0.5 | 0.070 | 0.400 |
| FSMD150-2016-R | 1.50 | 3.00 | 15 | 100 | 1.4 | 8.0 | 0.8 | 0.050 | 0.180 |
| FSMD200-2016-R | 2.00 | 4.20 | 6 | 100 | 1.4 | 8.0 | 3.0 | 0.030 | 0.100 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 157% | 133% | 118% | 100% | 90% | 81% | 70% | 60% | 51% | 36% |

## Typical Time-To-Trip at 23°C

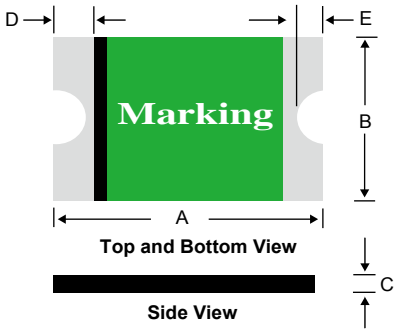
A = FSMD030-2016-R
B = FSMD050-2016R
C = FSMD075-2016R
D = FSMD100-2016-R
E = FSMD100-33-2016-R
F = FSMD150-2016-R
G = FSMD200-2016-R






NOTE : All Specifications subject to change without notice.

## FSMD2016 Product Dimensions (mm)




| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD030-2016-R | 4.72 | 5.44 | 3.70 | 4.43 | 0.40 | 1.15 | 0.30 | 1.50 | 0.25 | 0.65 |
| FSMD050-2016R | 4.72 | 5.44 | 3.70 | 4.43 | 0.40 | 1.70 | 0.30 | 1.50 | 0.25 | 0.65 |
| FSMD075-2016R | 4.72 | 5.44 | 3.70 | 4.43 | 0.40 | 1.70 | 0.30 | 1.50 | 0.25 | 0.65 |
| FSMD100-2016-R | 4.72 | 5.44 | 3.70 | 4.43 | 0.30 | 0.70 | 0.30 | 1.50 | 0.25 | 0.65 |
| FSMD100-33-2016-R | 4.72 | 5.44 | 3.70 | 4.43 | 0.30 | 0.70 | 0.30 | 1.50 | 0.25 | 0.65 |
| FSMD150-2016-R | 4.72 | 5.44 | 3.70 | 4.43 | 0.25 | 0.65 | 0.30 | 1.50 | 0.25 | 0.65 |
| FSMD200-2016-R | 4.72 | 5.44 | 3.70 | 4.43 | 0.25 | 0.55 | 0.30 | 1.50 | 0.25 | 0.65 |

*For Reflow Soldering Profile information, please refer to P.73 “IX APPENDIX – SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS ”

## Part Numbering System

FSMD □ □ □ - 2016 R

FSMD □ □ □ - 2016 - R

Current Rating

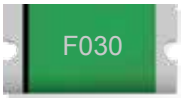
**OR**

FSMD □ □ □ — □ □ - 2016 - R

Voltage Rating

Current Rating

## Part Marking System

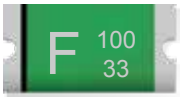



Example

F □ □ □

Part Identification

Fuzetec Logo




Example

F □ □ □ □ □

Part Identification

Fuzetec Logo

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD030-2016-R | : | 2.0K Reel/Tape |
| FSMD050-2016R~FSMD075-2016R | : | 1.0K Reel/Tape |
| FSMD100-2016-R~FSMD200-2016-R | : | 2.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FSMD1812 Series


**Application**
All high-density boards
**Product Features**
Small surface mount, Solid state Faster time to trip than standard SMD devices Lower resistance than standard SMD devices

**Operation Current**
0.10A~3.00A
**Maximum Voltage**
6V~60$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084/R50090556) |

RoHS
HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD010-R | 0.10 | 0.30 | 60.0 | 100 | 0.8 | 8.0 | 0.020 | 1.600 | 15.000 |
| FSMD014-R | 0.14 | 0.30 | 60.0 | 100 | 0.8 | 8.0 | 0.008 | 1.200 | 6.500 |
| FSMD020-R | 0.20 | 0.40 | 30.0 | 100 | 0.8 | 8.0 | 0.020 | 0.800 | 5.000 |
| FSMD020-60-R | 0.20 | 0.40 | 60.0 | 100 | 0.8 | 8.0 | 0.020 | 0.800 | 5.000 |
| FSMD030-R | 0.30 | 0.60 | 30.0 | 100 | 0.8 | 8.0 | 0.100 | 0.200 | 1.750 |
| FSMD035-R | 0.35 | 0.70 | 16.0 | 100 | 0.8 | 8.0 | 0.100 | 0.320 | 1.500 |
| FSMD035-30-R | 0.35 | 0.70 | 30.0 | 100 | 0.8 | 8.0 | 0.100 | 0.320 | 1.500 |
| FSMD050-R | 0.50 | 1.00 | 16.0 | 100 | 0.8 | 8.0 | 0.150 | 0.150 | 1.000 |
| FSMD050-30-R | 0.50 | 1.00 | 30.0 | 100 | 0.8 | 8.0 | 0.150 | 0.150 | 1.000 |
| FSMD075-R | 0.75 | 1.50 | 16.0 | 100 | 0.8 | 8.0 | 0.200 | 0.110 | 0.450 |
| FSMD075-24R | 0.75 | 1.50 | 24.0 | 100 | 1.0 | 8.0 | 0.200 | 0.110 | 0.290 |
| FSMD075-33R | 0.75 | 1.50 | 33.0 | 100 | 1.0 | 8.0 | 0.200 | 0.110 | 0.400 |
| FSMD110-R | 1.10 | 2.20 | 8.0 | 100 | 0.8 | 8.0 | 0.300 | 0.040 | 0.210 |
| FSMD110-16-R | 1.10 | 2.20 | 16.0 | 100 | 0.8 | 8.0 | 0.500 | 0.060 | 0.180 |
| FSMD110-24R | 1.10 | 2.20 | 24.0 | 100 | 1.0 | 8.0 | 0.500 | 0.060 | 0.200 |
| FSMD110-33R | 1.10 | 2.20 | 33.0 | 100 | 0.8 | 8.0 | 0.500 | 0.060 | 0.200 |
| FSMD125-R | 1.25 | 2.50 | 6.0 | 100 | 0.8 | 8.0 | 0.400 | 0.050 | 0.140 |
| FSMD125-16R | 1.25 | 2.50 | 16.0 | 100 | 0.8 | 8.0 | 0.400 | 0.050 | 0.140 |
| FSMD150-R | 1.50 | 3.00 | 8.0 | 100 | 0.8 | 8.0 | 0.500 | 0.040 | 0.110 |
| FSMD150-12R | 1.50 | 3.00 | 12.0 | 100 | 1.0 | 8.0 | 0.500 | 0.040 | 0.110 |
| FSMD150-24R | 1.50 | 3.00 | 24.0 | 100 | 1.0 | 8.0 | 1.500 | 0.040 | 0.120 |
| FSMD160-R | 1.60 | 3.20 | 8.0 | 100 | 0.8 | 8.0 | 0.500 | 0.030 | 0.100 |
| FSMD160-12R | 1.60 | 3.20 | 12.0 | 100 | 1.0 | 8.0 | 1.000 | 0.030 | 0.100 |
| FSMD160-16R | 1.60 | 3.20 | 16.0 | 100 | 1.0 | 8.0 | 1.000 | 0.030 | 0.100 |
| FSMD160-24R | 1.60 | 3.20 | 24.0 | 100 | 1.0 | 8.0 | 1.000 | 0.030 | 0.100 |
| FSMD200R | 2.00 | 3.50 | 8.0 | 100 | 1.0 | 8.0 | 2.000 | 0.020 | 0.070 |
| FSMD200-16R | 2.00 | 3.50 | 16.0 | 100 | 1.0 | 8.0 | 5.000 | 0.020 | 0.085 |
| FSMD260R | 2.60 | 5.00 | 8.0 | 100 | 1.0 | 8.0 | 2.500 | 0.015 | 0.047 |
| FSMD260-13R | 2.60 | 5.00 | 13.2 | 100 | 1.3 | 8.0 | 5.000 | 0.015 | 0.050 |
| FSMD260-16R | 2.60 | 5.00 | 16.0 | 100 | 1.3 | 8.0 | 5.000 | 0.015 | 0.050 |
| FSMD300R | 3.00 | 5.00 | 6.0 | 100 | 1.0 | 8.0 | 4.000 | 0.012 | 0.040 |



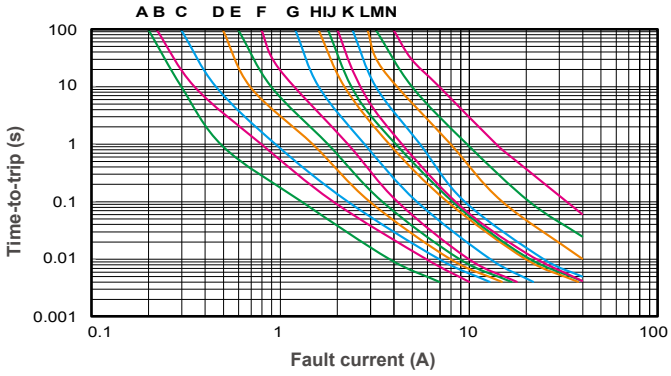
NOTE : All Specifications subject to change without notice.

## Thermal Derating for PPTC Device at Various Ambient Temperatures

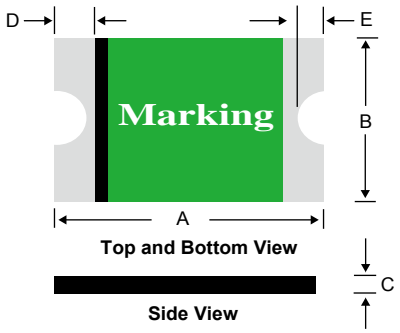
| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 116% | 100% | 91% | 84% | 78% | 69% | 61% | 50% |

## Typical Time-To-Trip at 23°C

A = FSMD010-R
B = FSMD014-R
C = FSMD020-R / 020-60-R
D = FSMD030-R
E = FSMD035-R / 035-30-R
F = FSMD050-R / 050-30-R
G = FSMD075-R / 075-24R/075-33R
H = FSMD110-R / 110-16-R / 110-24R / 110-33R
I = FSMD125-R / 125-16R
J = FSMD150-R / 150-12R / 150-24R
K = FSMD160-R / 160-12R / 160-16R / 160-24R
L = FSMD200R / 200-16R
M = FSMD260R / 260-13R / 260-16R
N = FSMD300R




## FSMD1812 Product Dimensions (mm)




*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD010-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 0.90 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD014-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 0.90 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD020-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 0.90 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD020-60-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 0.90 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD030-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.40 | 0.70 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD035-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.40 | 0.70 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD035-30-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.40 | 0.70 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD050-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.35 | 0.65 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD050-30-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.45 | 0.75 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD075-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.35 | 0.65 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD075-24R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD075-33R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD110-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.55 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD110-16-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.90 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD110-24R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.30 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD110-33R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.30 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD125-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.55 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD125-16R | 4.37 | 4.73 | 3.07 | 3.41 | 0.50 | 1.00 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD150-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.55 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD150-12R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 1.10 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD150-24R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD160-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.90 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMD160-12R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 1.35 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD160-16R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 1.35 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD160-24R | 4.37 | 4.73 | 3.07 | 3.41 | 0.55 | 1.20 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD200R | 4.37 | 4.73 | 3.07 | 3.41 | 0.55 | 1.20 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD200-16R | 4.37 | 4.73 | 3.07 | 3.41 | 0.60 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD260R | 4.37 | 4.73 | 3.07 | 3.41 | 0.55 | 1.20 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD260-13R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD260-16R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |
| FSMD300R | 4.37 | 4.73 | 3.07 | 3.41 | 0.80 | 1.55 | 0.25 | 0.95 | 0.25 | 0.65 |

## Part Numbering System

FSMD □ □ □ - R

Current Rating

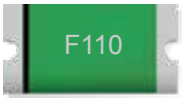
**OR**

FSMD □ □ □ — □ □ - R

Voltage Rating

Current Rating

## Part Marking System

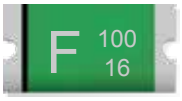



Example

F □ □ □

Part Identification

Fuzetec Logo




Example

F □ □ □ □ □

Part Identification

Fuzetec Logo

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD010-R~FSMD075-R | : | 2.0K Reel/Tape |
| FSMD075-24R~FSMD075-33R | : | 1.5K Reel/Tape |
| FSMD110-R~FSMD110-16-R | : | 2.0K Reel/Tape |
| FSMD110-24R~FSMD110-33R | : | 1.5K Reel/Tape |
| FSMD125-R | : | 2.0K Reel/Tape |
| FSMD125-16R | : | 1.5K Reel/Tape |
| FSMD150-R~FSMD200R | : | 2.0K Reel/Tape |
| FSMD200-16R | : | 1.5K Reel/Tape |
| FSMD260R | : | 2.0K Reel/Tape |
| FSMD260-13R~FSMD300R | : | 1.5K Reel/Tape |

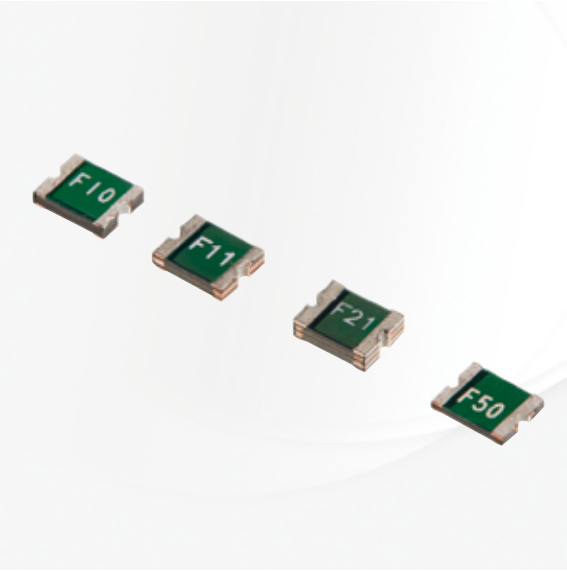
## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FSMD1210 Series




**Application**
All high-density boards
**Product Features**
Small surface mount, Solid state Faster time to trip than standard SMD devices Lower resistance than standard SMD devices

**Operation Current**
0.05A~2.00A
**Maximum Voltage**
6V~60VDC

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

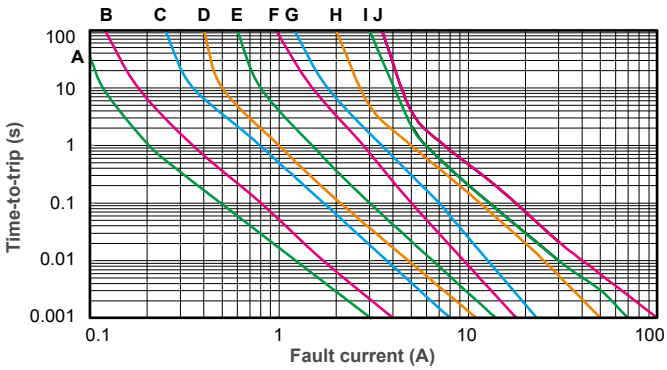
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | RMIN | R1MAX |
| | IH, A | IT, A | VMAX, VDC | IMAX, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD005-1210-R | 0.05 | 0.15 | 60 | 100 | 0.60 | 0.25 | 1.50 | 3.600 | 50.000 |
| FSMD010-1210-R | 0.10 | 0.25 | 60 | 100 | 0.60 | 0.50 | 1.50 | 1.600 | 15.000 |
| FSMD020-1210-R | 0.20 | 0.40 | 30 | 100 | 0.60 | 8.00 | 0.02 | 0.800 | 5.000 |
| FSMD035-1210-R | 0.35 | 0.70 | 16 | 100 | 0.60 | 8.00 | 0.20 | 0.320 | 1.300 |
| FSMD050-1210-R | 0.50 | 1.00 | 16 | 100 | 0.60 | 8.00 | 0.10 | 0.250 | 0.900 |
| FSMD075-1210-R | 0.75 | 1.50 | 8 | 100 | 0.60 | 8.00 | 0.10 | 0.130 | 0.400 |
| FSMD075-24-1210R | 0.75 | 1.50 | 24 | 100 | 0.60 | 8.00 | 0.10 | 0.130 | 0.400 |
| FSMD110-1210R | 1.10 | 2.20 | 8 | 100 | 0.80 | 8.00 | 0.30 | 0.060 | 0.210 |
| FSMD110-16-1210R | 1.10 | 2.20 | 16 | 100 | 0.80 | 8.00 | 0.30 | 0.060 | 0.210 |
| FSMD150-1210R | 1.50 | 3.00 | 6 | 100 | 0.80 | 8.00 | 0.50 | 0.040 | 0.110 |
| FSMD175-1210R | 1.75 | 3.50 | 6 | 100 | 0.80 | 8.00 | 0.60 | 0.020 | 0.080 |
| FSMD200-1210R | 2.00 | 4.00 | 6 | 100 | 0.80 | 8.00 | 1.00 | 0.015 | 0.070 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 83% | 76% | 70% | 62% | 50% |

## Typical Time-To-Trip at 23°C

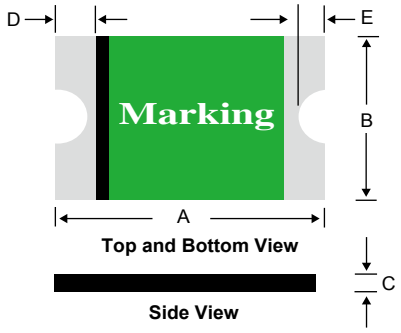
A = FSMD005-1210-R
B = FSMD010-1210-R
C = FSMD020-1210-R
D = FSMD035-1210-R
E = FSMD050-1210-R
F = FSMD075-1210-R / 075-24-1210R
G = FSMD110-1210R / 110-16-1210R
H = FSMD150-1210R
I = FSMD175-1210R
J = FSMD200-1210R






NOTE : All Specifications subject to change without notice.

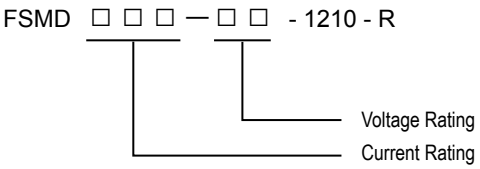
## FSMD1210 Product Dimensions (mm)



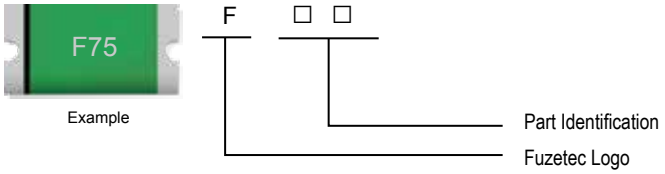

*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

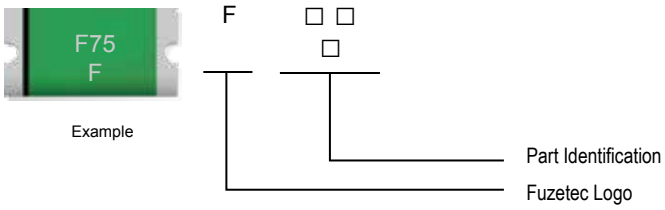
| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD005-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.60 | 1.15 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD010-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.60 | 1.15 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD020-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.40 | 0.85 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD035-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.40 | 0.80 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD050-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.30 | 0.75 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD075-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD075-24-1210R | 3.00 | 3.43 | 2.35 | 2.80 | 0.80 | 1.20 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD110-1210R | 3.00 | 3.43 | 2.35 | 2.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD110-16-1210R | 3.00 | 3.43 | 2.35 | 2.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD150-1210R | 3.00 | 3.43 | 2.35 | 2.80 | 0.50 | 0.90 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD175-1210R | 3.00 | 3.43 | 2.35 | 2.80 | 0.80 | 1.40 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD200-1210R | 3.00 | 3.43 | 2.35 | 2.80 | 0.80 | 1.40 | 0.25 | 0.75 | 0.10 | 0.45 |

## Part Numbering System




## Part Marking System




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD005-1210-R~FSMD020-1210-R | : | 3.0K Reel/Tape |
| FSMD035-1210-R~FSMD075-1210-R | : | 4.0K Reel/Tape |
| FSMD075-24-1210R~FSMD200-1210R | : | 3.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

FUZETEC

# FSMD1206 Series


**Application**
All high-density boards
**Product Features**
Small surface mount, Solid state Faster time to trip than standard SMD devices Lower resistance than standard SMD devices

**Operation Current**
0.05A~2.00A
**Maximum Voltage**
6V~60VDC

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

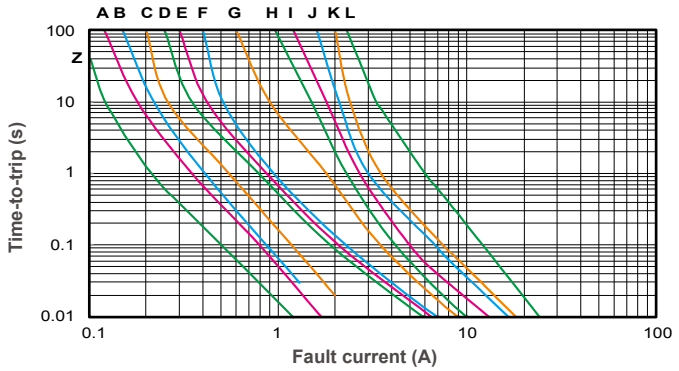
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | RMIN | R1MAX |
| | IH, A | IT, A | VMAX, VDC | IMAX, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD005-1206-R | 0.05 | 0.15 | 60 | 100 | 0.4 | 0.25 | 1.50 | 3.600 | 50.000 |
| FSMD010-1206-R | 0.10 | 0.25 | 60 | 100 | 0.4 | 0.50 | 1.00 | 1.600 | 15.000 |
| FSMD012-1206-R | 0.12 | 0.39 | 48 | 100 | 0.5 | 1.00 | 0.20 | 1.400 | 6.500 |
| FSMD016-1206-R | 0.16 | 0.45 | 48 | 100 | 0.5 | 1.00 | 0.30 | 1.100 | 5.000 |
| FSMD020-1206-R | 0.20 | 0.40 | 30 | 100 | 0.4 | 8.00 | 0.10 | 0.600 | 2.500 |
| FSMD025-1206-R | 0.25 | 0.50 | 16 | 100 | 0.6 | 8.00 | 0.08 | 0.550 | 2.300 |
| FSMD025-24-1206-R | 0.25 | 0.50 | 24 | 100 | 0.6 | 8.00 | 0.08 | 0.550 | 2.300 |
| FSMD035-1206-R | 0.35 | 0.75 | 16 | 100 | 0.4 | 8.00 | 0.10 | 0.300 | 1.200 |
| FSMD035-30-1206R | 0.35 | 0.75 | 30 | 100 | 0.6 | 8.00 | 0.10 | 0.300 | 1.200 |
| FSMD050-1206-R | 0.50 | 1.00 | 8 | 100 | 0.4 | 8.00 | 0.10 | 0.150 | 0.700 |
| FSMD050-24-1206R | 0.50 | 1.00 | 24 | 100 | 0.6 | 8.00 | 0.10 | 0.150 | 0.750 |
| FSMD075-1206R | 0.75 | 1.50 | 8 | 100 | 0.6 | 8.00 | 0.20 | 0.090 | 0.290 |
| FSMD075-16-1206R | 0.75 | 1.50 | 16 | 100 | 0.6 | 8.00 | 0.20 | 0.090 | 0.290 |
| FSMD100-1206R | 1.00 | 1.80 | 6 | 100 | 0.6 | 8.00 | 0.30 | 0.055 | 0.210 |
| FSMD110-1206R | 1.10 | 2.20 | 8 | 100 | 0.8 | 8.00 | 0.30 | 0.040 | 0.180 |
| FSMD110-16-1206R | 1.10 | 2.20 | 16 | 100 | 0.8 | 8.00 | 0.30 | 0.040 | 0.180 |
| FSMD150-1206R | 1.50 | 3.00 | 8 | 100 | 0.8 | 8.00 | 1.00 | 0.040 | 0.120 |
| FSMD200-1206R | 2.00 | 3.50 | 6 | 100 | 0.8 | 8.00 | 1.50 | 0.018 | 0.080 |

## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

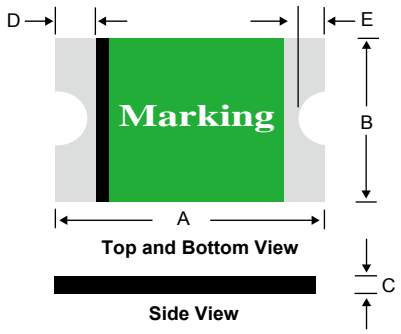
| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 84% | 78% | 69% | 62% | 50% |

## Typical Time-To-Trip at 23°C

Z = FSMD005-1206-R
A = FSMD010-1206-R
B = FSMD012-1206-R
C = FSMD016-1206-R
D = FSMD020-1206-R
E = FSMD025-1206-R / 025-24-1206-R
F = FSMD035-1206-R / 035-30-1206R
G = FSMD050-1206-R / FSMD050-24-1206R
H = FSMD075-1206R / FSMD075-16-1206
I = FSMD100-1206R
J = FSMD110-1206R / 110-16-1206R
K = FSMD150-1206R
L = FSMD200-1206R




## FSMD1206 Product Dimensions (mm)




*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

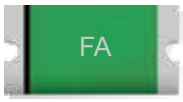
| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD005-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.85 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD010-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.85 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD012-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.85 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD016-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.75 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD020-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.75 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD025-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.75 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD025-24-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 0.75 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD035-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.75 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD035-30-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.90 | 1.30 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD050-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.25 | 0.55 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMD050-24-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.80 | 1.20 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD075-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 1.25 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD075-16-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 1.25 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD100-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD110-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.45 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD110-16-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.80 | 1.40 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD150-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.80 | 1.40 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD200-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.85 | 1.60 | 0.25 | 0.75 | 0.10 | 0.45 |

## Part Numbering System

FSMD □ □ □ — □ □ - 1206 - R

- Voltage Rating
- Current Rating

## Part Marking System




Example

F □

- Part Identification
- Fuzetec Logo

FZ = FSMD005-1206-R
FA = FSMD010-1206-R
FJ = FSMD012-1206-R
FK = FSMD016-1206-R
FB = FSMD020-1206-R
FL = FSMD025-1206-R
FP = FSMD025-24-1206-R
FC = FSMD035-1206-R
FM = FSMD035-30-1206R
FD = FSMD050-1206-R
FN = FSMD050-24-1206R
FE = FSMD075-1206R
FO = FSMD075-16-1206R
FF = FSMD100-1206R
FG = FSMD110-1206R
FQ = FSMD110-16-1206R
FH = FSMD150-1206R
FI = FSMD200-1206R

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD005-1206-R~ FSMD025-24-1206-R | : | 3.0K Reel/Tape |
| FSMD035-1206-R | : | 4.0K Reel/Tape |
| FSMD035-30-1206R | : | 3.0K Reel/Tape |
| FSMD050-1206-R | : | 4.0K Reel/Tape |
| FSMD050-24-1206R~FSMD110-1206R | : | 3.0K Reel/Tape |
| FSMD110-16-1206R~FSMD200-1206R | : | 2.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

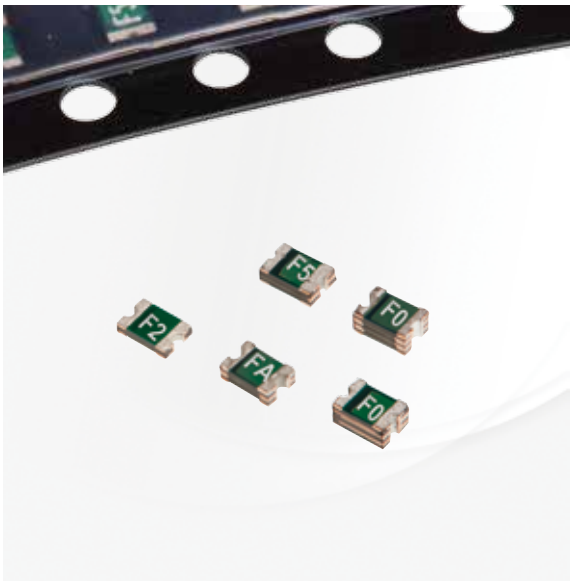
**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.



NOTE : All Specifications subject to change without notice.

# FSMD0805 Series




**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.10A~1.10A
**Maximum Voltage**
6V~24$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

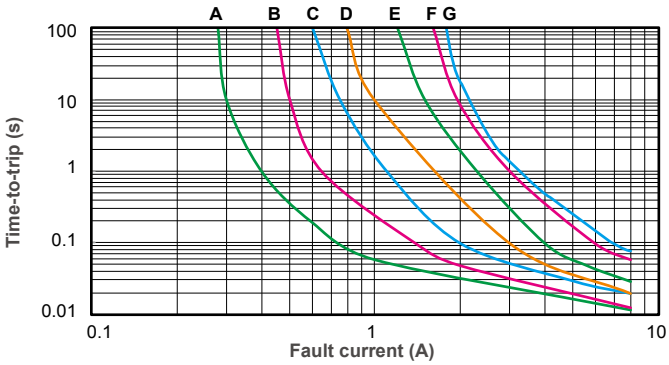
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD010-0805-R | 0.10 | 0.30 | 15 | 100 | 0.5 | 0.50 | 1.50 | 0.700 | 6.000 |
| FSMD010-24-0805-R | 0.10 | 0.30 | 24 | 100 | 0.5 | 0.50 | 1.50 | 0.700 | 6.000 |
| FSMD020-0805-R | 0.20 | 0.50 | 9 | 100 | 0.5 | 8.00 | 0.02 | 0.400 | 3.500 |
| FSMD035-0805-R | 0.35 | 0.75 | 6 | 100 | 0.5 | 8.00 | 0.10 | 0.250 | 1.200 |
| FSMD050-0805R | 0.50 | 1.00 | 6 | 100 | 0.5 | 8.00 | 0.10 | 0.150 | 0.850 |
| FSMD050-9-0805R | 0.50 | 1.00 | 9 | 100 | 0.5 | 8.00 | 0.10 | 0.150 | 0.850 |
| FSMD075-0805R | 0.75 | 1.50 | 6 | 100 | 0.6 | 8.00 | 0.20 | 0.090 | 0.350 |
| FSMD100-0805R | 1.00 | 1.95 | 6 | 100 | 0.6 | 8.00 | 0.30 | 0.060 | 0.210 |
| FSMD110-0805R | 1.10 | 2.20 | 6 | 100 | 0.6 | 8.00 | 0.20 | 0.050 | 0.200 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 116% | 100% | 91% | 84% | 76% | 69% | 61% | 50% |

## Typical Time-To-Trip at 23°C

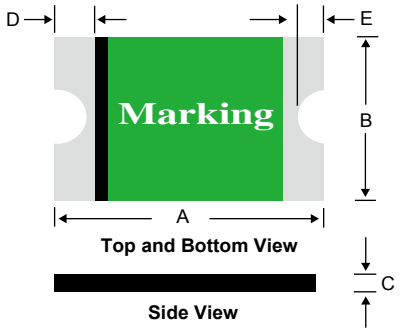
A = FSMD010-0805-R / FSMD010-24-0805-R
B = FSMD020-0805-R
C = FSMD035-0805-R
D = FSMD050-0805R / FSMD050-9-0805R
E = FSMD075-0805R
F = FSMD100-0805R
G = FSMD110-0805R






NOTE : All Specifications subject to change without notice.

## FSMD0805 Product Dimensions (mm)




| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD010-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.30 | 1.00 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD010-24-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.30 | 1.00 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD020-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.30 | 1.00 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD035-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.25 | 0.75 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD050-0805R | 2.00 | 2.30 | 1.20 | 1.50 | 0.55 | 1.25 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD050-9-0805R | 2.00 | 2.30 | 1.20 | 1.50 | 0.55 | 1.25 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD075-0805R | 2.00 | 2.30 | 1.20 | 1.50 | 0.55 | 1.25 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD100-0805R | 2.00 | 2.30 | 1.20 | 1.50 | 0.75 | 1.80 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD110-0805R | 2.00 | 2.30 | 1.20 | 1.50 | 0.75 | 1.80 | 0.20 | 0.60 | 0.10 | 0.45 |

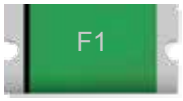
*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

## Part Numbering System

FSMD □ □ □ — □ □ - 0805 - R

- □ □ □ — Current Rating
- □ □ — Voltage Rating

## Part Marking System




Example

F □

- F — Fuzetec Logo
- □ — Part Identification

F1 = FSMD010-0805-R
FB = FSMD010-24-0805-R
F2 = FSMD020-0805-R
F3 = FSMD035-0805-R
F5 = FSMD050-0805R
FA = FSMD050-9-0805R
F7 = FSMD075-0805R
F0 = FSMD100-0805R
FC = FSMD110-0805R

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD010-0805-R~FSMD035-0805-R | : | 4.0K Reel/Tape |
| FSMD050-0805R~FSMD110-0805R | : | 3.0K Reel/Tape |

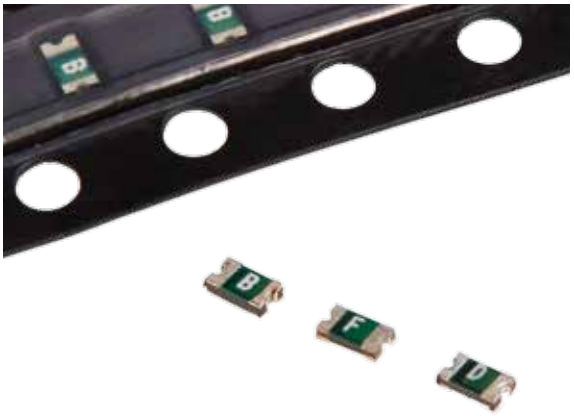
## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FSMD0603 Series



**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.01A~0.25A
**Maximum Voltage**
9V~60$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

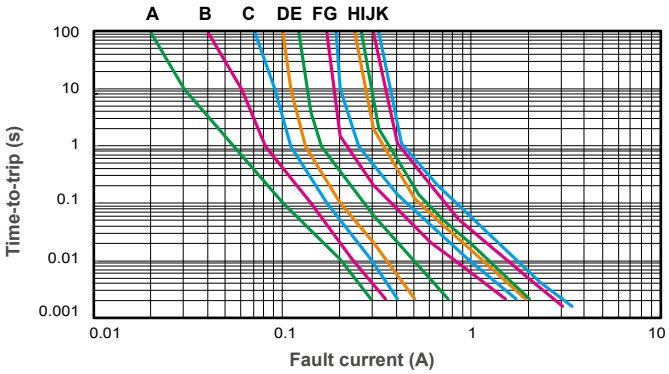
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD001-0603-R | 0.01 | 0.03 | 60 | 40 | 0.5 | 0.20 | 1.00 | 15.00 | 100.00 |
| FSMD002-0603-R | 0.02 | 0.06 | 60 | 40 | 0.5 | 0.20 | 1.00 | 12.00 | 70.00 |
| FSMD003-0603-R | 0.03 | 0.09 | 30 | 40 | 0.5 | 0.20 | 1.00 | 6.00 | 50.00 |
| FSMD004-0603-R | 0.04 | 0.12 | 24 | 40 | 0.5 | 0.20 | 1.00 | 4.00 | 40.00 |
| FSMD005-0603-R | 0.05 | 0.15 | 15 | 40 | 0.5 | 0.50 | 0.10 | 3.80 | 30.00 |
| FSMD008-0603-R | 0.08 | 0.20 | 15 | 40 | 0.5 | 0.60 | 0.10 | 2.80 | 14.00 |
| FSMD010-0603-R | 0.10 | 0.25 | 15 | 40 | 0.5 | 0.70 | 0.10 | 0.90 | 8.00 |
| FSMD012-0603-R | 0.12 | 0.30 | 9 | 40 | 0.5 | 0.80 | 0.10 | 1.10 | 5.80 |
| FSMD016-0603-R | 0.16 | 0.40 | 9 | 40 | 0.5 | 1.00 | 0.10 | 1.00 | 4.20 |
| FSMD020-0603-R | 0.20 | 0.45 | 9 | 40 | 0.5 | 2.00 | 0.10 | 0.55 | 3.50 |
| FSMD025-0603-R | 0.25 | 0.55 | 9 | 40 | 0.5 | 8.00 | 0.08 | 0.50 | 3.00 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 157% | 137% | 118% | 100% | 89% | 80% | 70% | 60% | 51% | 37% |

## Typical Time-To-Trip at 23°C

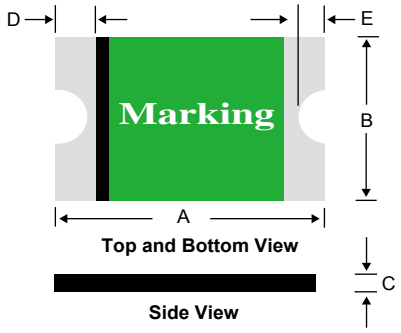
A = FSMD001-0603-R
B = FSMD002-0603-R
C = FSMD003-0603-R
D = FSMD004-0603-R
E = FSMD005-0603-R
F = FSMD008-0603-R
G = FSMD010-0603-R
H = FSMD012-0603-R
I = FSMD016-0603-R
J = FSMD020-0603-R
K = FSMD025-0603-R






NOTE : All Specifications subject to change without notice.

## FSMD0603 Product Dimensions (mm)




| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| FSMD001-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.85 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD002-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.85 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD003-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD004-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD005-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD008-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD010-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD012-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD016-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD020-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD025-0603-R | 1.40 | 1.80 | 0.45 | 1.00 | 0.35 | 0.75 | 0.10 | 0.50 | 0.08 | 0.40 |

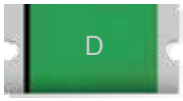
*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

## Part Numbering System

FSMD □ □ □ - 0603 - R

Current Rating

## Part Marking System




Example

□

Part Identification

X = FSMD001-0603-R
Y = FSMD002-0603-R
Z = FSMD003-0603-R
A = FSMD004-0603-R
B = FSMD005-0603-R
C = FSMD008-0603-R
D = FSMD010-0603-R
E = FSMD012-0603-R
F = FSMD016-0603-R
G = FSMD020-0603-R
V = FSMD025-0603-R

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD001-0603-R~FSMD025-0603-R | : | 4.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FUZETEC

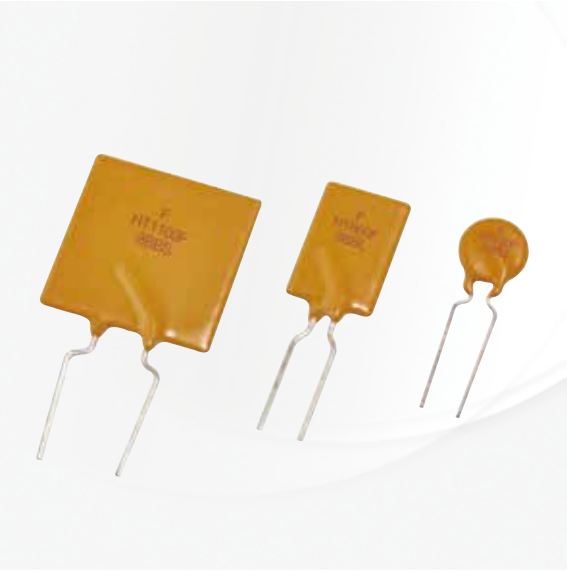
Dip & SMD Package

Temperature Range:-40°C to 125°C

ideal for industrial and automotive application

# High Temperature PPTC

# FHT Series



**Application**
Wide variety of electronic equipment

**Product Features**
Very Low resistance, Very High hold current, Solid state, Radial leaded product ideal for up to 16V/30$V_{DC}$ and operating temperatures up to 125°C.

**Operation Current**
0.50A~15.00A

**Maximum Voltage**
16V/30$V_{DC}$

**Temperature Range**
-40°C to 125°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

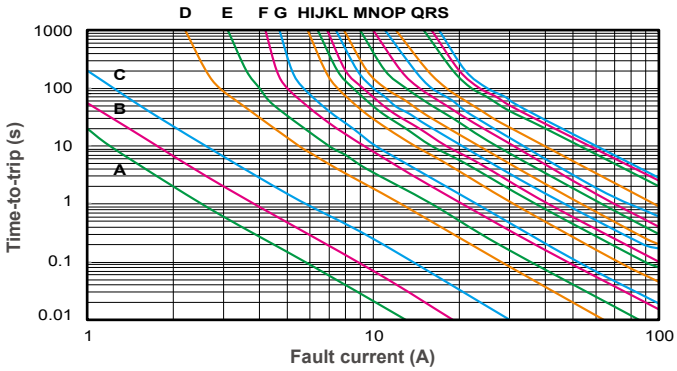
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FHT050-30F | 0.5 | 0.9 | 2.5 | 40 | 30 | 0.9 | 0.4800 | 1.1000 |
| FHT070-30F | 0.7 | 1.4 | 3.2 | 40 | 30 | 1.4 | 0.3000 | 0.8000 |
| FHT100-30F | 1.0 | 1.8 | 5.2 | 40 | 30 | 1.4 | 0.1800 | 0.4300 |
| FHT200-16F | 2.0 | 3.8 | 3.0 | 100 | 16 | 1.4 | 0.0450 | 0.1100 |
| FHT300-16F | 3.0 | 6.0 | 5.0 | 100 | 16 | 3.0 | 0.0330 | 0.0790 |
| FHT400-16F | 4.0 | 7.0 | 5.0 | 100 | 16 | 3.3 | 0.0240 | 0.0600 |
| FHT450-16F | 4.5 | 7.8 | 3.0 | 100 | 16 | 3.6 | 0.0220 | 0.0540 |
| FHT550-16F | 5.5 | 10.0 | 6.0 | 100 | 16 | 3.5 | 0.0150 | 0.0370 |
| FHT600-16F | 6.0 | 10.8 | 5.0 | 100 | 16 | 4.1 | 0.0130 | 0.0320 |
| FHT650-16F | 6.5 | 12.0 | 5.5 | 100 | 16 | 4.3 | 0.0110 | 0.0260 |
| FHT700-16F | 7.0 | 13.0 | 7.0 | 100 | 16 | 4.0 | 0.0100 | 0.0250 |
| FHT750-16F | 7.5 | 13.1 | 7.0 | 100 | 16 | 4.5 | 0.0094 | 0.0220 |
| FHT800-16F | 8.0 | 15.0 | 8.0 | 100 | 16 | 4.2 | 0.0080 | 0.0200 |
| FHT900-16F | 9.0 | 16.5 | 10.0 | 100 | 16 | 5.0 | 0.0074 | 0.0170 |
| FHT1000-16F | 10.0 | 18.5 | 9.0 | 100 | 16 | 5.3 | 0.0062 | 0.0150 |
| FHT1100-16F | 11.0 | 20.0 | 11.0 | 100 | 16 | 5.5 | 0.0055 | 0.0130 |
| FHT1300-16F | 13.0 | 24.0 | 13.0 | 100 | 16 | 6.9 | 0.0041 | 0.0100 |
| FHT1400-16F | 14.0 | 27.0 | 13.0 | 100 | 16 | 6.9 | 0.0030 | 0.0090 |
| FHT1500-16F | 15.0 | 28.0 | 20.0 | 100 | 16 | 7.0 | 0.0032 | 0.0092 |

## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C | 125°C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 143% | 129% | 116% | 100% | 93% | 87% | 80% | 72% | 65% | 55% | 26% |

## Typical Time-To-Trip at 23°C

A = FHT050-30F
B = FHT070-30F
C = FHT100-30F
D = FHT200-16F
E = FHT300-16F
F = FHT400-16F
G = FHT450-16F
H = FHT550-16F
I = FHT600-16F
J = FHT650-16F
K = FHT700-16F
L = FHT750-16F
M = FHT800-16F
N = FHT900-16F
O = FHT1000-16F
P = FHT1100-16F
Q = FHT1300-16F
R = FHT1400-16F
S = FHT1500-16F




## FHT Product Dimensions (mm)

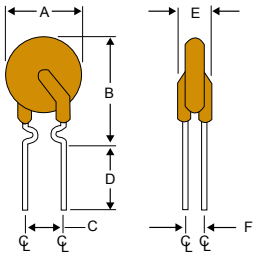



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

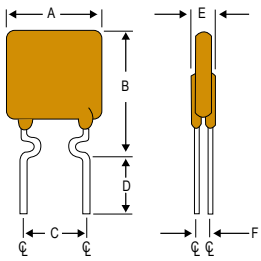



Fig.2
Lead Size : 24AWG
Φ 0.51 mm Diameter

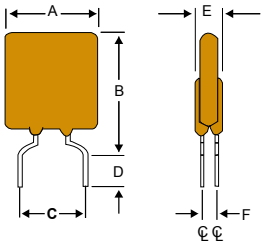



Fig.3
Lead Size : 20AWG
Φ 0.81 mm Diameter

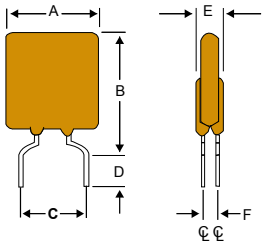



Fig.4
Lead Size : 18AWG
Φ 1.00 mm Diameter

| Part Number | Fig. | A Max. | B Max. | C Typ. | D Min. | E Max. | F Typ. |
|---|---|---|---|---|---|---|---|
| FHT050-30F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT070-30F | 2 | 6.9 | 10.8 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT100-30F | 1 | 9.7 | 13.6 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT200-16F | 1 | 9.4 | 14.4 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT300-16F | 3 | 8.8 | 13.8 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT400-16F | 3 | 10.0 | 15.0 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT450-16F | 3 | 10.4 | 15.6 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT550-16F | 3 | 11.2 | 18.9 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT600-16F | 3 | 11.2 | 21.0 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT650-16F | 3 | 12.7 | 22.2 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT700-16F | 3 | 14.0 | 21.9 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT750-16F | 3 | 14.0 | 23.5 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT800-16F | 3 | 16.5 | 22.5 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT900-16F | 3 | 16.5 | 25.7 | 5.1 | 7.6 | 3.0 | 1.2 |
| FHT1000-16F | 3 | 17.5 | 26.5 | 10.2 | 7.6 | 3.0 | 1.2 |
| FHT1100-16F | 3 | 21.0 | 26.1 | 10.2 | 7.6 | 3.0 | 1.2 |
| FHT1300-16F | 4 | 23.5 | 28.7 | 10.2 | 7.6 | 3.6 | 1.4 |
| FHT1400-16F | 4 | 23.5 | 28.7 | 10.2 | 7.6 | 3.6 | 1.4 |
| FHT1500-16F | 4 | 23.5 | 28.7 | 10.2 | 7.6 | 3.6 | 1.4 |

## Part Numbering System

F H T □ □ □ — □ □ F

- F — RoHS Compliant/ Lead Free
- □ □ — Voltage Rating
- □ □ □ — Current Rating

## Part Marking System


Example

F — Fuzetec Logo
H T □ □ □ F
- F — RoHS Compliant/ Lead Free
- □ □ □ — Part Identification
- H T — Product Family
- □ □ □ □ — Date Code/Lot Number

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FHT050-30F~FHT300-16F | : | 500 Pcs/Bag, 2.5K Reel/Tape |
| FHT400-16F | : | 300 Pcs/Bag, 2.5K Reel/Tape |
| FHT450-16F~FHT550-16F | : | 300 Pcs/Bag, 1.5K Reel/Tape |
| FHT600-16F | : | 200 Pcs/Bag, 1.5K Reel/Tape |
| FHT650-16F~FHT700-16F | : | 200 Pcs/Bag |
| FHT750-16F~FHT1500-16F | | 100 Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | FHT050-30F~FHT100-30F and FHT200-16F Tin plated copper clad steel, 24 AWG. |
| | FHT300-16F~FHT1100-16F Tin plated copper, 20 AWG. |
| | FHT1300-16F~FHT1500-16F Tin plated copper, 18 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

NOTE : All Specifications subject to change without notice.

# FHE Series

**Application**
Wide variety of electronic equipment

**Product Features**
Very Low resistance, Very High hold current, Solid state, Radial leaded product ideal for up to 32V and Operating temperatures up to 125°C.

**Operation Current**
0.50A~10.00A

**Maximum Voltage**
32V

**Temperature Range**
-40°C to 125°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | Pb Lead Free
SVHC Compliant

## Electrical Characteristics (23°C)

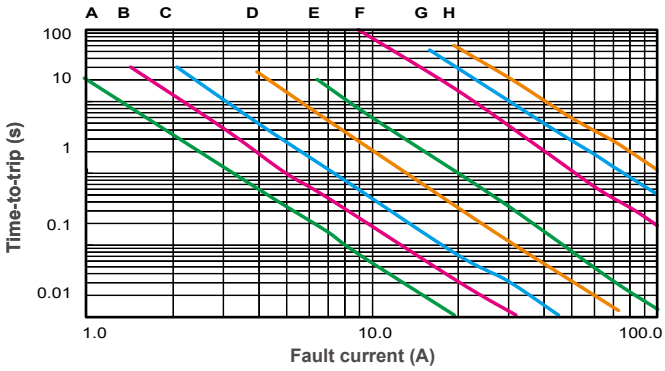
| Part Number | Hold Current | Trip Current | Max. Time to trip | Max. Current | Rated Voltage | Typ. Power | Resistance | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, s | $I_{MAX}$, A | $V_{MAX}$, $V_{DC}$ | Pd, W | Ohms | Ohms |
| FHE050-32F | 0.5 | 1.0 | 3.0 | 100 | 32 | 0.9 | 0.3500 | 1.1000 |
| FHE070-32F | 0.7 | 1.4 | 3.2 | 100 | 32 | 1.4 | 0.2300 | 0.8000 |
| FHE100-32F | 1.0 | 1.9 | 6.2 | 100 | 32 | 1.4 | 0.1500 | 0.4300 |
| FHE200-32F | 2.0 | 4.0 | 5.5 | 100 | 32 | 2.2 | 0.0650 | 0.2500 |
| FHE300-32F | 3.0 | 6.0 | 5.0 | 100 | 32 | 3.2 | 0.0350 | 0.1100 |
| FHE500-32F | 5.0 | 10.0 | 9.0 | 100 | 32 | 5.3 | 0.0150 | 0.0400 |
| FHE750-32F | 7.5 | 15.0 | 13.0 | 100 | 32 | 6.5 | 0.0074 | 0.0230 |
| FHE1000-32F | 10.0 | 20.0 | 15.0 | 100 | 32 | 7.0 | 0.0060 | 0.0160 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C | 125°C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 143% | 130% | 115% | 100% | 92% | 88% | 80% | 72% | 65% | 55% | 28% |

## Typical Time-To-Trip at 23°C

A = FHE050-32F
B = FHE070-32F
C = FHE100-32F
D = FHE200-32F
E = FHE300-32F
F = FHE500-32F
G = FHE750-32F
H = FHE1000-32F






NOTE : All Specifications subject to change without notice.

## FHE Product Dimensions (mm)

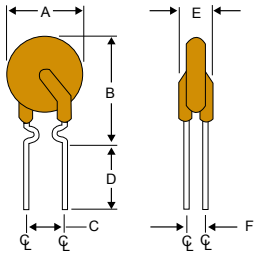



Fig.1
Lead Size : 24AWG
Φ 0.51 mm Diameter

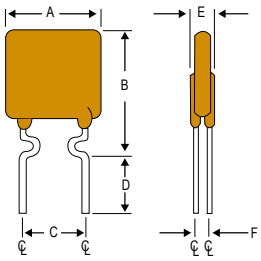



Fig.2
Lead Size : 24AWG
Φ 0.51 mm Diameter

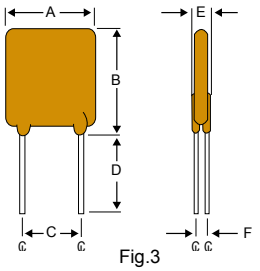



Fig.3
Lead Size : 20AWG
Φ 0.81 mm Diameter

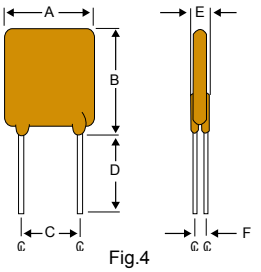
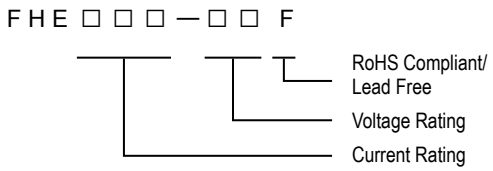



Fig.4
Lead Size : 18AWG
Φ 1.00 mm Diameter

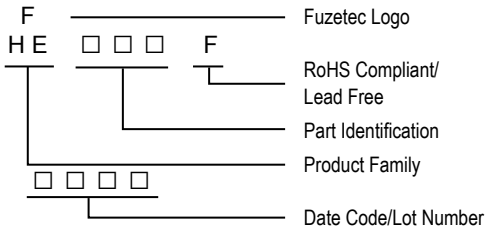
| Part Number | Fig. | A | B | C | D | E |
|---|---|---|---|---|---|---|
| | | Max. | Max. | Typ. | Min. | Max. |
| FHE050-32F | 1 | 7.4 | 12.7 | 5.1 | 7.6 | 3.3 |
| FHE070-32F | 2 | 6.9 | 10.8 | 5.1 | 7.6 | 3.0 |
| FHE100-32F | 1 | 9.7 | 13.6 | 5.1 | 7.6 | 3.0 |
| FHE200-32F | 3 | 9.5 | 13.5 | 5.1 | 7.6 | 3.0 |
| FHE300-32F | 3 | 10.2 | 15.5 | 5.1 | 7.6 | 3.8 |
| FHE500-32F | 3 | 14.0 | 24.1 | 5.1 | 7.6 | 3.8 |
| FHE750-32F | 3 | 21.1 | 24.9 | 10.2 | 7.6 | 3.8 |
| FHE1000-32F | 4 | 23.5 | 27.9 | 10.2 | 7.6 | 4.0 |

## Part Numbering System




## Part Marking System


Example




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FHE050-32F~FHE070-32F | : | 500Pcs/Bag, 2.5K Reel/Tape |
| FHE100-32F~FHE200-32F | : | 300Pcs/Bag, 1.5K Reel/Tape |
| FHE300-32F | : | 200Pcs/Bag, 1.5K Reel/Tape |
| FHE500-32F | : | 200Pcs/Bag |
| FHE750-32F~FHE1000-32F | : | 100Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | FHE050-32F~FHE100-32F Tin plated copper clad steel, 24 AWG. |
| | FHE200-32F~FHE750-32F Tin plated copper, 20 AWG. |
| | FHE1000-32F Tin plated copper, 18 AWG. |
| Soldering characteristics | MIL-STD-202, Method 208E. |
| Insulating coating | Flame retardant epoxy, meets UL-94V-0 requirement. |

*NOTE : Font on Marking may look slightly different due to fine turning of each Marking printer.

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# FSMDH Series


**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.05A~1.10A
**Maximum Voltage**
6V~30$V_{DC}$

**Temperature Range**
-40°C to 125°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMDH005-0805-R | 0.05 | 0.18 | 16 | 40 | 0.6 | 0.50 | 0.08 | 3.50 | 38.00 |
| FSMDH010-0805-R | 0.10 | 0.60 | 16 | 40 | 1.0 | 2.50 | 1.50 | 1.00 | 12.00 |
| FSMDH020-0805-R | 0.20 | 0.70 | 16 | 40 | 0.9 | 8.00 | 0.10 | 0.75 | 3.40 |
| FSMDH010-1206-R | 0.10 | 0.35 | 30 | 10 | 0.8 | 1.00 | 0.10 | 1.10 | 10.00 |
| FSMDH016-1206-R | 0.16 | 0.80 | 30 | 80 | 0.9 | 8.00 | 0.10 | 0.70 | 6.00 |
| FSMDH020-1206-R | 0.20 | 0.50 | 30 | 10 | 0.9 | 8.00 | 0.10 | 0.60 | 4.50 |
| FSMDH035-1206-R | 0.35 | 0.95 | 16 | 80 | 1.0 | 3.50 | 0.20 | 0.20 | 1.60 |
| FSMDH035-30-1206R | 0.35 | 1.75 | 30 | 80 | 1.2 | 8.00 | 0.10 | 0.40 | 2.20 |
| FSMDH050-24-1206-R | 0.50 | 2.50 | 24 | 20 | 1.7 | 8.00 | 0.10 | 0.20 | 1.60 |
| FSMDH010-1210-R | 0.10 | 0.35 | 30 | 10 | 0.9 | 1.00 | 0.50 | 1.20 | 11.00 |
| FSMDH020-1210-R | 0.20 | 0.50 | 30 | 10 | 0.9 | 8.00 | 0.10 | 0.80 | 5.00 |
| FSMDH050-1210-R | 0.50 | 1.50 | 6 | 10 | 1.1 | 8.00 | 0.05 | 0.190 | 0.900 |
| FSMDH050-R | 0.50 | 1.60 | 30 | 20 | 1.2 | 8.00 | 0.10 | 0.20 | 1.35 |
| FSMDH110-R | 1.10 | 2.20 | 6 | 40 | 1.2 | 8.00 | 1.00 | 0.050 | 0.430 |
| FSMDH110-2920-R | 1.10 | 2.20 | 16 | 50 | 2.0 | 8.00 | 2.00 | 0.090 | 0.410 |

*Note: FSMDH005-0805-R, FSMDH020-0805-R, FSMDH035-30-1206R, FSMDH050-24-1206-R, FSMDH050-R UL/C-UL and TÜV Pending.

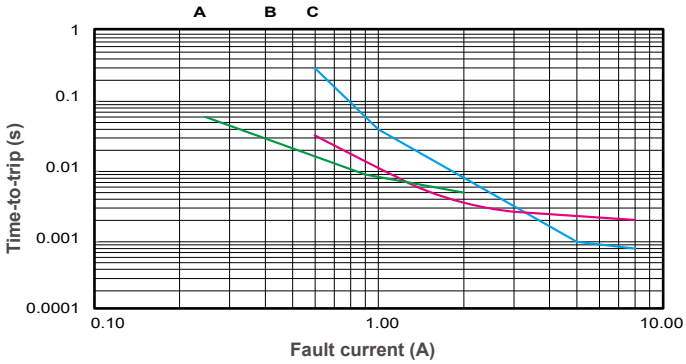
## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 40°C | 60°C | 85°C | 100°C | 125°C |
|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 135% | 122% | 110% | 100% | 90% | 75% | 65% | 53% | 40% |

## Typical Time-To-Trip at 23°C

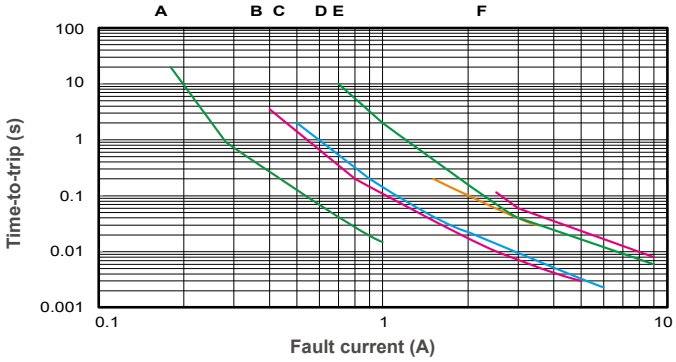
### FSMDH0805 Series

A = FSMDH005-0805-R
B = FSMDH010-0805-R
C = FSMDH020-0805-R



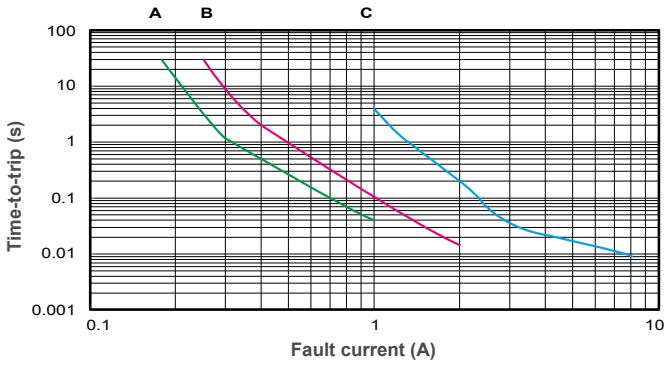

### FSMDH1206 Series

A = FSMDH010-1206-R
B = FSMDH016-1206-R
C = FSMDH020-1206-R
D = FSMDH035-1206-R
E = FSMDH035-30-1206R
F = FSMDH050-24-1206-R



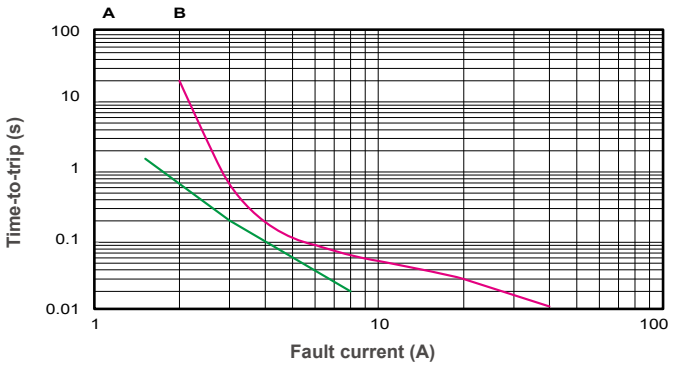

### FSMDH1210 Series

A = FSMDH010-1210-R
B = FSMDH020-1210-R
C = FSMDH050-1210-R



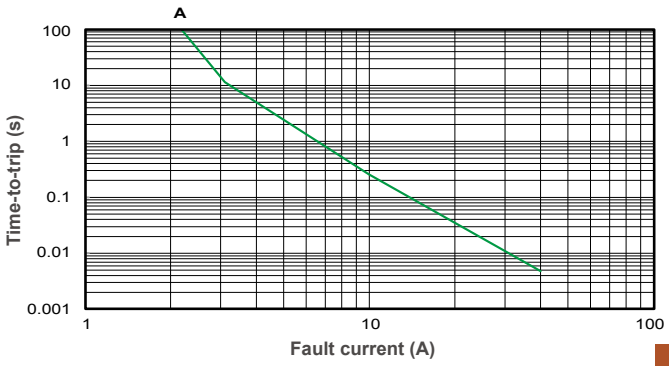

### FSMDH1812 Series

A = FSMDH050-R
B = FSMDH110-R



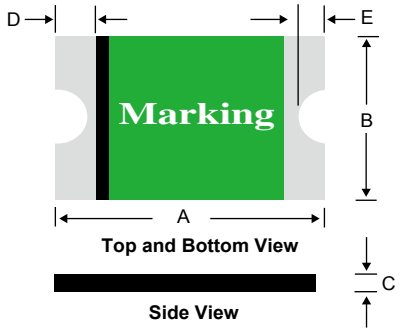

### FSMDH2920 Series

A = FSMDH110-2920-R




NOTE : All Specifications subject to change without notice.

## FSMDH Product Dimensions (mm)




*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMDH005-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.40 | 0.80 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMDH010-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.40 | 0.80 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMDH020-0805-R | 2.00 | 2.30 | 1.20 | 1.50 | 0.40 | 0.80 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMDH010-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.20 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMDH016-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.10 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMDH020-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.10 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMDH035-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.10 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMDH035-30-1206R | 3.00 | 3.50 | 1.50 | 1.80 | 0.40 | 1.70 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMDH050-24-1206-R | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.10 | 0.10 | 0.75 | 0.10 | 0.45 |
| FSMDH010-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.30 | 1.20 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMDH020-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.30 | 1.20 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMDH050-1210-R | 3.00 | 3.43 | 2.35 | 2.80 | 0.30 | 1.20 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMDH050-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.75 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMDH110-R | 4.37 | 4.73 | 3.07 | 3.41 | 0.25 | 0.75 | 0.30 | 0.95 | 0.25 | 0.65 |
| FSMDH110-2920-R | 6.73 | 7.98 | 4.80 | 5.44 | 0.30 | 1.70 | 0.50 | 1.20 | 0.50 | 0.90 |

## Part Numbering System

FSMDH □□□—□□□□ - R

- Size
- Current Rating

FSMDH □□□—□□—□□□□ - R

- Size
- Voltage Rating
- Current Rating

## Part Marking System


Example

□□□□H

- Part Identification

| | | |
|---|---|---|
| DH | = | FSMDH005-0805-R |
| 1H | = | FSMDH010-0805-R |
| 2H | = | FSMDH020-0805-R |
| AH | = | FSMDH010-0805-R |
| KH | = | FSMDH016-1206-R |
| BH | = | FSMDH020-1206-R |
| MH | = | FSMDH0305-1206-R |
| CH | = | FSMDH035-30-1206R |
| NH | = | FSMDH050-24-1206-R |
| 10H | = | FSMDH010-1210-R |
| 20H | = | FSMDH020-1210-R |
| 50H | = | FSMDH050-1210-R |
| 050H | = | FSMDH050-R |
| 110H | = | FSMDH110-R |
| 110LH | = | FSMDH110-2920-R |

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMDH005-0805-R~FSMDH020-0805-R | : | 4.0K Reel/Tape |
| FSMDH010-1206-R~FSMDH020-1206-R | : | 3.0K Reel/Tape |
| FSMDH035-1206-R | : | 4.0K Reel/Tape |
| FSMDH035-30-1206R | : | 2.0K Reel/Tape |
| FSMDH050-24-1206-R | : | 3.0K Reel/Tape |
| FSMDH010-1210-R~ FSMDH050-1210-R | : | 3.0K Reel/Tape |
| FSMDH050-R~ FSMDH110-R | : | 2.0K Reel/Tape |
| FSMDH110-2920-R | : | 1.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.



NOTE : All Specifications subject to change without notice.

# STRAP Series


**Application**
Rechargeable battery packs, Lithium cell and battery packs

**Product Features**
Low profile, Solid state

**Operation Current**
FLR Series 1.90A~9.00A ; FSR Series 1.20A~4.20A

**Maximum Voltage**
15V ~ 30VDC

**Temperature Range**
-40°C to 85°C

**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50004084) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

| Part Number | Hold Current | Trip Current | Max. Time to trip | Rated Voltage | Max. Current | Typ. Power | Resistance | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $R_{MIN}$ | $R_{MAX}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | at 5x$I_H$, S | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | Ohms | Ohms | Ohms |
| FSR120F | 1.20 | 2.70 | 5.0 | 15 | 100 | 1.2 | 0.085 | 0.160 | 0.220 |
| FSR175F | 1.75 | 3.80 | 5.0 | 15 | 100 | 1.5 | 0.050 | 0.090 | 0.120 |
| FSR200F | 2.00 | 4.40 | 4.0 | 30 | 100 | 1.9 | 0.030 | 0.060 | 0.100 |
| FSR350F | 3.50 | 6.30 | 3.0 | 30 | 100 | 2.5 | 0.017 | 0.031 | 0.050 |
| FSR420F | 4.20 | 7.60 | 6.0 | 30 | 100 | 2.9 | 0.012 | 0.024 | 0.040 |
| FLR190F | 1.90 | 3.90 | 5.0 | 15 | 100 | 1.2 | 0.039 | 0.072 | 0.102 |
| FLR260F | 2.60 | 5.80 | 5.0 | 15 | 100 | 2.5 | 0.020 | 0.042 | 0.063 |
| FLR380F | 3.80 | 8.30 | 5.0 | 15 | 100 | 2.5 | 0.013 | 0.026 | 0.037 |
| FLR450F | 4.50 | 8.90 | 5.0 | 20 | 100 | 2.5 | 0.011 | 0.020 | 0.028 |
| FLR550F | 5.50 | 10.50 | 5.0 | 20 | 100 | 2.8 | 0.009 | 0.016 | 0.022 |
| FLR600F | 6.00 | 11.70 | 5.0 | 20 | 100 | 2.8 | 0.007 | 0.014 | 0.019 |
| FLR730F | 7.30 | 14.10 | 5.0 | 20 | 100 | 3.3 | 0.006 | 0.012 | 0.015 |
| FLR900F | 9.00 | 16.70 | 5.0 | 20 | 100 | 3.8 | 0.006 | 0.010 | 0.014 |

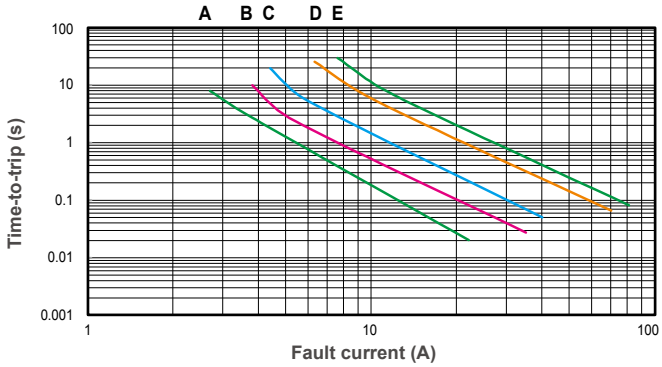
## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| FSR Series | 152% | 135% | 118% | 100% | 90% | 82% | 74% | 65% | 56% | 42% |
| FLR Series | 147% | 132% | 117% | 100% | 94% | 86% | 80% | 71% | 61% | 52% |

## Typical Time-To-Trip at 23°C

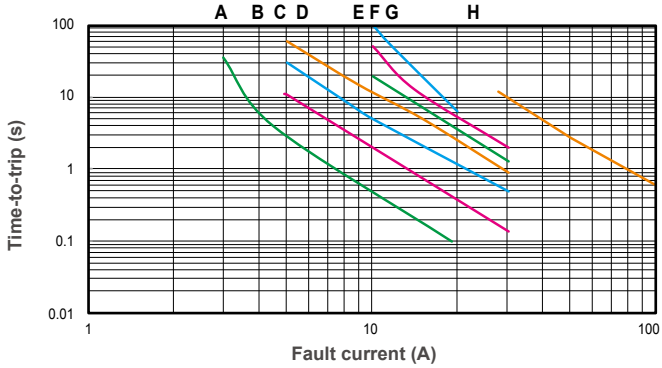
### FSR Series

A = FSR120F
B = FSR175F
C = FSR200F
D = FSR350F
E = FSR420F

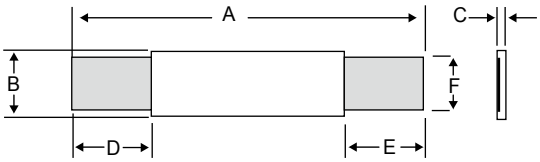



### FLR Series

A = FLR190F
B = FLR260F
C = FLR380F
D = FLR450F
E = FLR550F
F = FLR600F
G = FLR730F
H = FLR900F



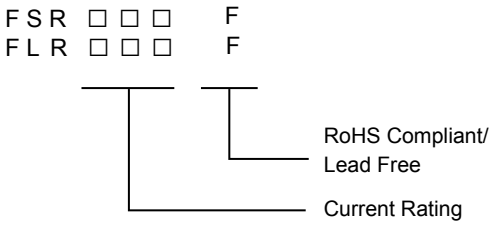

## Product Dimensions (mm)



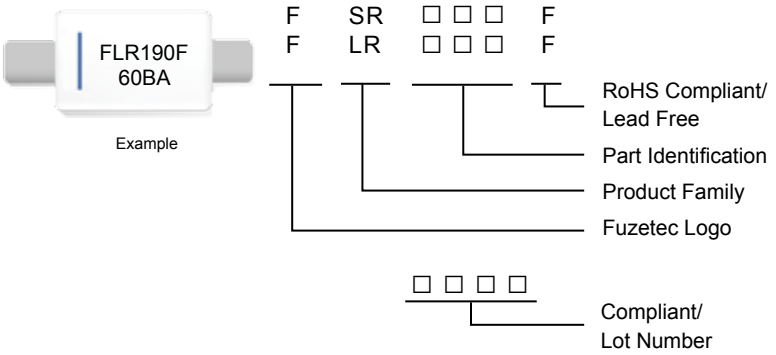

**Top view**

| Part Number | A | | B | | C | | D | | E | | F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSR120F | 19.9 | 22.1 | 4.9 | 5.2 | 0.6 | 1.0 | 5.5 | 7.5 | 5.5 | 7.5 | 3.9 | 4.1 |
| FSR175F | 20.9 | 23.1 | 4.9 | 5.2 | 0.6 | 1.0 | 4.1 | 5.5 | 4.1 | 5.5 | 3.9 | 4.1 |
| FSR200F | 21.3 | 23.4 | 10.2 | 11.0 | 0.5 | 1.1 | 5.0 | 7.6 | 5.0 | 7.6 | 4.8 | 5.4 |
| FSR350F | 28.4 | 31.8 | 13.0 | 13.5 | 0.5 | 1.1 | 6.3 | 8.9 | 6.3 | 8.9 | 5.9 | 6.1 |
| FSR420F | 30.6 | 32.4 | 12.9 | 13.6 | 0.5 | 1.1 | 5.0 | 7.5 | 5.0 | 7.5 | 5.9 | 6.1 |
| FLR190F | 19.9 | 22.1 | 4.9 | 5.5 | 0.6 | 1.0 | 5.5 | 7.5 | 5.5 | 7.5 | 3.9 | 4.1 |
| FLR260F | 20.9 | 23.1 | 4.9 | 5.5 | 0.6 | 1.0 | 4.1 | 5.5 | 4.1 | 5.5 | 3.9 | 4.1 |
| FLR380F | 24.0 | 26.0 | 6.9 | 7.5 | 0.6 | 1.0 | 4.1 | 5.5 | 4.1 | 5.5 | 4.9 | 5.1 |
| FLR450F | 24.0 | 26.0 | 9.9 | 10.5 | 0.6 | 1.0 | 5.3 | 6.7 | 5.3 | 6.7 | 5.9 | 6.1 |
| FLR550F | 35.0 | 37.0 | 6.9 | 7.5 | 0.6 | 1.0 | 5.3 | 6.7 | 5.3 | 6.7 | 4.9 | 5.1 |
| FLR600F | 24.0 | 26.0 | 13.9 | 14.5 | 0.6 | 1.0 | 4.1 | 5.5 | 4.1 | 5.5 | 5.9 | 6.1 |
| FLR730F | 27.1 | 29.1 | 13.9 | 14.5 | 0.6 | 1.0 | 4.1 | 5.5 | 4.1 | 5.5 | 5.9 | 6.1 |
| FLR900F | 45.4 | 47.6 | 7.9 | 8.5 | 0.6 | 1.3 | 5.2 | 7.9 | 5.2 | 7.9 | 5.9 | 6.1 |

## Part Numbering System




## Part Marking System




## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSR120F~FSR175F | : | 1.0K Pcs/Bag |
| FSR200F~FSR420F | : | 500 Pcs/Bag |
| FLR190F~FLR380F | : | 1.0K Pcs/Bag |
| FLR450F~FLR900F | : | 500 Pcs/Bag |

## Physical specifications

| | |
|---|---|
| Lead material | 0.13mm nominal thickness, quarter-hard nickel. |
| Insulating coating | Polyester tape. |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.

# Low Rho FSMD1206 Series


**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.50A~6.00A
**Maximum Voltage**
$6V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## *Electrical Characteristics (23°C)*

| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD050-1206RZ | 0.50 | 1.50 | 6 | 100 | 0.8 | 8.0 | 0.20 | 0.025 | 0.200 |
| FSMD075-1206RZ | 0.75 | 1.80 | 6 | 100 | 0.8 | 8.0 | 0.30 | 0.018 | 0.180 |
| FSMD110-1206RZ | 1.10 | 2.20 | 6 | 100 | 0.8 | 8.0 | 0.30 | 0.015 | 0.100 |
| FSMD150-1206RZ | 1.50 | 3.00 | 6 | 100 | 0.8 | 8.0 | 0.30 | 0.010 | 0.065 |
| FSMD175-1206RZ | 1.75 | 3.50 | 6 | 100 | 0.8 | 8.0 | 0.40 | 0.005 | 0.030 |
| FSMD200-1206RZ | 2.00 | 4.00 | 6 | 100 | 0.8 | 8.0 | 0.50 | 0.005 | 0.025 |
| FSMD260-1206RZ | 2.60 | 5.20 | 6 | 100 | 0.8 | 8.0 | 4.00 | 0.003 | 0.025 |
| FSMD300-1206RZ | 3.00 | 6.00 | 6 | 100 | 0.8 | 8.0 | 4.00 | 0.003 | 0.020 |
| FSMD350-1206RZ | 3.50 | 7.00 | 6 | 100 | 0.8 | 8.0 | 5.00 | 0.003 | 0.018 |
| FSMD380-1206RZ | 3.80 | 8.00 | 6 | 100 | 0.8 | 8.0 | 5.00 | 0.002 | 0.014 |
| FSMD400-1206RZ | 4.00 | 8.00 | 6 | 100 | 0.8 | 8.0 | 5.00 | 0.002 | 0.014 |
| FSMD450-1206RZ | 4.50 | 9.00 | 6 | 100 | 0.8 | 22.5 | 2.00 | 0.001 | 0.014 |
| FSMD500-1206RZ | 5.00 | 10.00 | 6 | 100 | 0.8 | 25.0 | 5.00 | 0.001 | 0.012 |
| FSMD600-1206RZ | 6.00 | 12.00 | 6 | 100 | 1.0 | 30.0 | 2.00 | 0.001 | 0.010 |

## *Thermal Derating for PPTC Device at Various Ambient Temperatures*

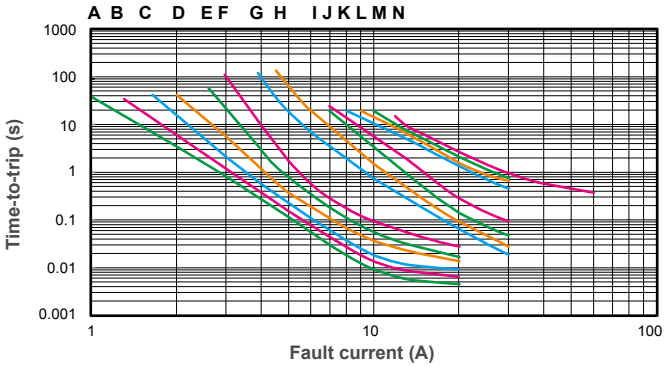
| TEMPERATURE | -40°C | -20 | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 84% | 77% | 69% | 61% | 50% |



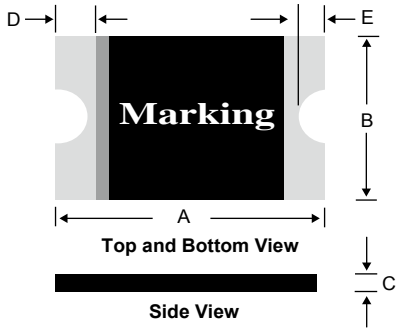
NOTE : All Specifications subject to change without notice.

## Typical Time-To-Trip at 23°C

A = FSMD050-1206RZ
B = FSMD075-1206RZ
C = FSMD110-1206RZ
D = FSMD150-1206RZ
E = FSMD175-1206RZ
F = FSMD200-1206RZ
G = FSMD260-1206RZ
H = FSMD300-1206RZ
I = FSMD350-1206RZ
J = FSMD380-1206RZ
K = FSMD400-1206RZ
L = FSMD450-1206RZ
M = FSMD500-1206RZ
N = FSMD600-1206RZ




## Low Rho FSMD1206 Product Dimensions (mm)




*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD050-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD075-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD110-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD150-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD175-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD200-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 0.70 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD260-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD300-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.30 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD350-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD380-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD400-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD450-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD500-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |
| FSMD600-1206RZ | 3.00 | 3.50 | 1.50 | 1.80 | 0.60 | 1.00 | 0.25 | 0.75 | 0.10 | 0.45 |

## Part Numbering System

FSMD □ □ □ - 1206 RZ

Special Code

Current Rating

## Part Marking System


Example

□ □

Part Identification

EZ = FSMD050-1206RZ
FZ = FSMD075-1206RZ
HZ = FSMD110-1206RZ
JZ = FSMD150-1206RZ
KZ = FSMD175-1206RZ
MZ = FSMD200-1206RZ
QZ = FSMD260-1206RZ
SZ = FSMD300-1206RZ
VZ = FSMD350-1206RZ
WZ = FSMD380-1206RZ
XZ = FSMD400-1206RZ
YZ = FSMD450-1206RZ
ZZ = FSMD500-1206RZ
BZ = FSMD600-1206RZ

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD050-1206RZ~ FSMD200-1206RZ | : | 4.0K Reel/Tape |
| FSMD260-1206RZ~ FSMD600-1206RZ | : | 3.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.
- Avoid PPTC devices being exposed to prolonged high temperature and/or high humidity storage environment such as 85°C and/or 85RH% which could diminish PPTC's performance.

NOTE : All Specifications subject to change without notice.

# Low Rho FSMD0805 Series

**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.75A~3.50A
**Maximum Voltage**
6$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

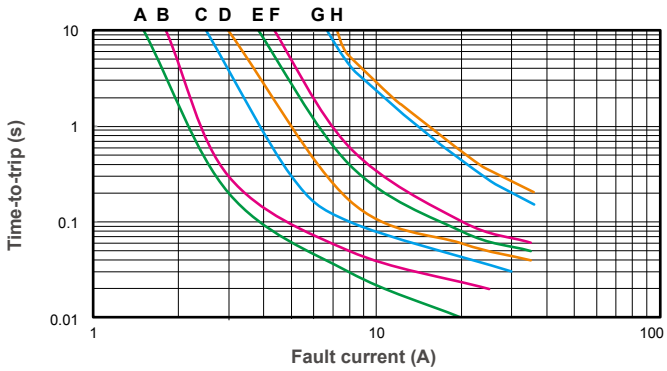
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD075-0805RZ | 0.75 | 1.50 | 6 | 100 | 0.6 | 8.0 | 0.20 | 0.040 | 0.160 |
| FSMD110-0805RZ | 1.10 | 1.80 | 6 | 100 | 0.6 | 8.0 | 0.30 | 0.030 | 0.130 |
| FSMD125-0805RZ | 1.25 | 2.50 | 6 | 100 | 0.6 | 8.0 | 0.30 | 0.025 | 0.110 |
| FSMD150-0805RZ | 1.50 | 3.00 | 6 | 100 | 0.6 | 8.0 | 0.30 | 0.015 | 0.065 |
| FSMD175-0805RZ | 1.75 | 3.50 | 6 | 100 | 0.6 | 8.0 | 0.60 | 0.005 | 0.055 |
| FSMD200-0805RZ | 2.00 | 4.00 | 6 | 100 | 0.6 | 8.0 | 1.00 | 0.005 | 0.045 |
| FSMD300-0805RZ | 3.00 | 6.00 | 6 | 100 | 0.6 | 8.0 | 5.00 | 0.003 | 0.030 |
| FSMD350-0805RZ | 3.50 | 7.00 | 6 | 100 | 0.6 | 8.0 | 5.00 | 0.002 | 0.025 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 84% | 77% | 69% | 61% | 50% |

## Typical Time-To-Trip at 23°C

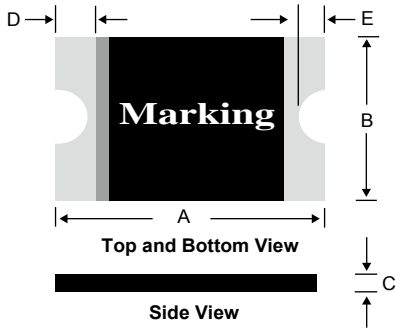
A = FSMD075-0805RZ
B = FSMD110-0805RZ
C = FSMD125-0805RZ
D = FSMD150-0805RZ
E = FSMD175-0805RZ
F = FSMD200-0805RZ
G = FSMD300-0805RZ
H = FSMD350-0805RZ






NOTE : All Specifications subject to change without notice.

## Low Rho FSMD0805 Product Dimensions (mm)




| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD075-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.30 | 0.70 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD110-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.30 | 0.70 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD125-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.30 | 0.70 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD150-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.30 | 0.70 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD175-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.30 | 0.70 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD200-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.30 | 1.00 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD300-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.60 | 1.40 | 0.20 | 0.60 | 0.10 | 0.45 |
| FSMD350-0805RZ | 2.00 | 2.20 | 1.20 | 1.50 | 0.60 | 1.40 | 0.20 | 0.60 | 0.10 | 0.45 |

*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

## Part Numbering System

FSMD □ □ □ - 0805 RZ

- Special Code
- Current Rating

## Part Marking System


Example

□

Part Identification

F = FSMD075-0805RZ
H = FSMD110-0805RZ
I = FSMD125-0805RZ
J = FSMD150-0805RZ
K = FSMD175-0805RZ
M = FSMD200-0805RZ
S = FSMD300-0805RZ
V = FSMD350-0805RZ

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD075-0805RZ~ FSMD200-0805RZ | : | 4.0K Reel/Tape |
| FSMD300-0805RZ~ FSMD350-0805RZ | : | 3.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.
- Avoid PPTC devices being exposed to prolonged high temperature and/or high humidity storage environment such as 85°C and/or 85RH% which could diminish PPTC's performance.

# Low Rho FSMD0603 Series

**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.25A~1.00A
**Maximum Voltage**
6V~9$V_{DC}$

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

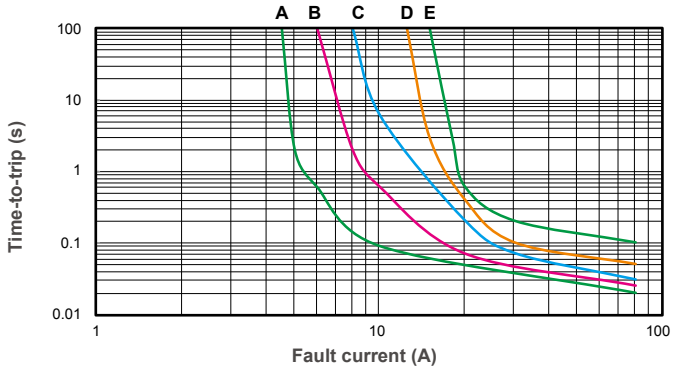
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | $R_{MIN}$ | $R1_{MAX}$ |
| | $I_H$, A | $I_T$, A | $V_{MAX}$, $V_{DC}$ | $I_{MAX}$, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD025-0603RZ | 0.25 | 0.55 | 9 | 100 | 0.5 | 8.0 | 0.08 | 0.500 | 3.000 |
| FSMD035-0603RZ | 0.35 | 0.75 | 6 | 100 | 0.5 | 8.0 | 0.10 | 0.200 | 1.000 |
| FSMD050-0603RZ | 0.50 | 1.00 | 6 | 100 | 0.6 | 8.0 | 0.10 | 0.070 | 0.350 |
| FSMD075-0603RZ | 0.75 | 1.50 | 6 | 100 | 0.6 | 8.0 | 0.20 | 0.050 | 0.250 |
| FSMD100-0603RZ | 1.00 | 1.80 | 6 | 100 | 0.6 | 8.0 | 0.30 | 0.040 | 0.120 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 84% | 77% | 69% | 61% | 50% |

## Typical Time-To-Trip at 23°C

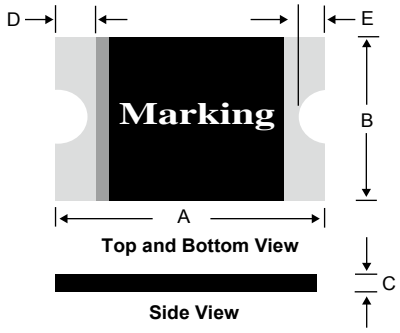
A = FSMD025-0603RZ
B = FSMD035-0603RZ
C = FSMD050-0603RZ
D = FSMD075-0603RZ
E = FSMD100-0603RZ






NOTE : All Specifications subject to change without notice.

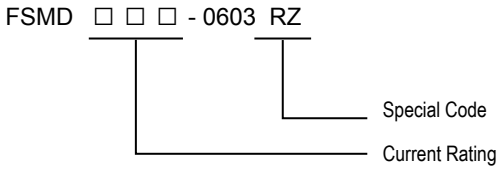
## Low Rho FSMD0603 Product Dimensions (mm)




| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD025-0603RZ | 1.40 | 1.80 | 0.45 | 1.00 | 0.30 | 0.70 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD035-0603RZ | 1.40 | 1.80 | 0.45 | 1.00 | 0.30 | 0.70 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD050-0603RZ | 1.40 | 1.80 | 0.45 | 1.00 | 0.30 | 0.70 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD075-0603RZ | 1.40 | 1.80 | 0.45 | 1.00 | 0.30 | 0.70 | 0.10 | 0.50 | 0.08 | 0.40 |
| FSMD100-0603RZ | 1.40 | 1.80 | 0.45 | 1.00 | 0.30 | 0.70 | 0.10 | 0.50 | 0.08 | 0.40 |

*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

## Part Numbering System




## Part Marking System


Example


H = FSMD025-0603RZ
I = FSMD035-0603RZ
J = FSMD050-0603RZ
K = FSMD075-0603RZ
L = FSMD100-0603RZ

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD025-0603RZ~ FSMD100-0603RZ | : | 4.0K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.
- Avoid PPTC devices being exposed to prolonged high temperature and/or high humidity storage environment such as 85°C and/or 85RH% which could diminish PPTC's performance.

# Low Rho FSMD0402 Series

**Application**
All high-density boards
**Product Features**
Small surface mountable, Solid state, Faster time to trip than standard SMD devices, Lower resistance than standard SMD devices

**Operation Current**
0.10A~0.50A
**Maximum Voltage**
6VDC

**Temperature Range**
-40°C to 85°C
**Agency Recognition**

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| | UL(E211981) |
| | C-UL(E211981) |
| | TÜV (R50090556) |

RoHS | HF Halogen Free
SVHC Compliant

## Electrical Characteristics (23°C)

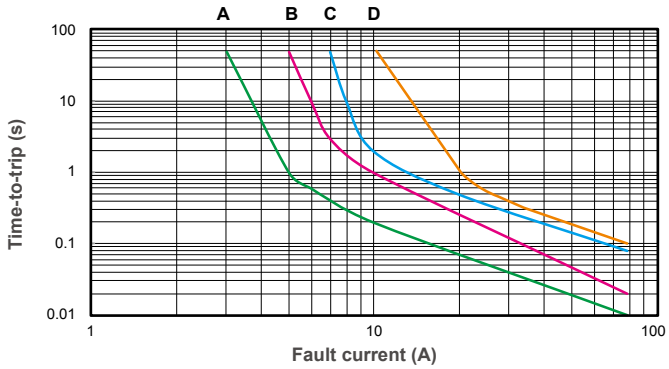
| Part Number | Hold Current | Trip Current | Rated Voltage | Max. Current | Typ. Power | Max. Time to trip | | Resistance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Current | Time | RMIN | R1MAX |
| | IH, A | IT, A | VMAX, VDC | IMAX, A | Pd, W | A | Sec | Ohms | Ohms |
| FSMD010-0402RZ | 0.10 | 0.30 | 6 | 100 | 0.5 | 0.5 | 1.0 | 0.150 | 2.000 |
| FSMD020-0402RZ | 0.20 | 0.50 | 6 | 100 | 0.5 | 1.0 | 1.0 | 0.100 | 1.250 |
| FSMD035-0402RZ | 0.35 | 0.70 | 6 | 100 | 0.5 | 8.0 | 0.1 | 0.050 | 0.700 |
| FSMD050-0402RZ | 0.50 | 1.00 | 6 | 100 | 0.5 | 8.0 | 0.1 | 0.040 | 0.400 |

## Thermal Derating for PPTC Device at Various Ambient Temperatures

| TEMPERATURE | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C |
|---|---|---|---|---|---|---|---|---|---|---|
| DERATING % | 145% | 130% | 115% | 100% | 92% | 84% | 77% | 69% | 61% | 50% |

## Typical Time-To-Trip at 23°C

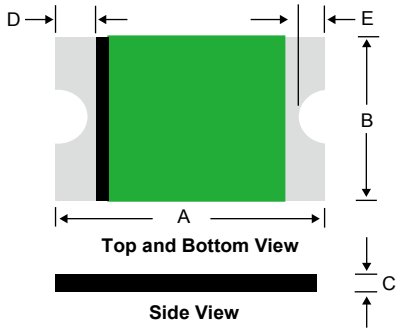
A = FSMD010-0402RZ
B = FSMD020-0402RZ
C = FSMD035-0402RZ
D = FSMD050-0402RZ






NOTE : All Specifications subject to change without notice.

## Low Rho FSMD0402 Product Dimensions (mm)




| Part Number | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| FSMD010-0402RZ | 0.85 | 1.15 | 0.35 | 0.65 | 0.30 | 0.60 | 0.10 | 0.45 | 0.05 | 0.40 |
| FSMD020-0402RZ | 0.85 | 1.15 | 0.35 | 0.65 | 0.30 | 0.60 | 0.10 | 0.45 | 0.05 | 0.40 |
| FSMD035-0402RZ | 0.85 | 1.15 | 0.35 | 0.65 | 0.30 | 0.60 | 0.10 | 0.45 | 0.05 | 0.40 |
| FSMD050-0402RZ | 0.85 | 1.15 | 0.35 | 0.65 | 0.30 | 0.60 | 0.10 | 0.45 | 0.05 | 0.40 |

*For Reflow Soldering Profile information, please refer to P.73 " IX APPENDIX - SMD PRODUCT SOLDER REFLOW RECOMMENDATIONS "

## Part Numbering System

FSMD □ □ □ - 0402 RZ

- Special Code
- Current Rating

## Package Information

| Part Number | | Standard Package |
|---|---|---|
| FSMD010-0402RZ~ FSMD050-0402RZ | : | 10K Reel/Tape |

## Physical specifications

| | |
|---|---|
| Termination pad materials | Pure Tin |
| Soldering characteristics | Meets EIA specification RS 186-9E, ANSI/J-std-002 Category 3 |

**Warning :**

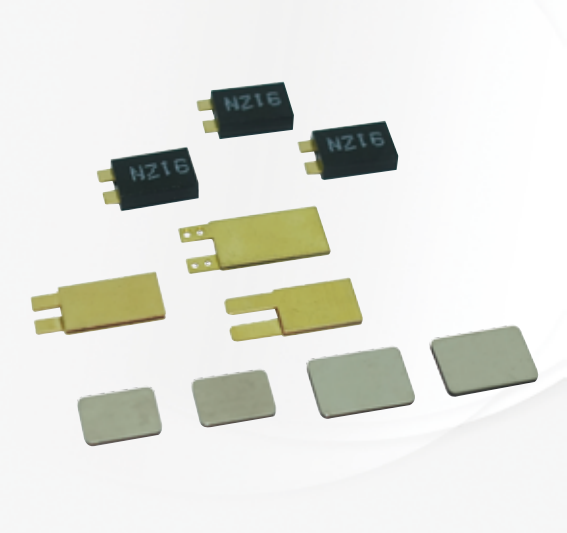
- Each product should be carefully evaluated and tested for their suitability of application.
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.
- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.
- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.
- Avoid PPTC devices being exposed to prolonged high temperature and/or high humidity storage environment such as 85°C and/or 85RH% which could diminish PPTC's performance.

# FUZETEC

Fuzetec Disc, Ring & Custom Shaped PPTC Devices Offers Customized Overcurrent Protections to Tailor Fit Engineer Design Specification and Meet Customer Requirements

# Customized Products

# Automotive Customized Products




**Application**
Automotive motor applications.
**Product Features**
Custom shaped PPTC devices to fit into motor structure.
Trip-time & resistance adjustable.
Outstanding shock & vibration resistant
Automotive grade high temperature up to 125°C

**Operation Current**
Trip Current up to 15A/Maximum current capability up to 50A
**Operation Voltage**
12V~30$V_{DC}$; High voltage capability up to 60$V_{DC}$

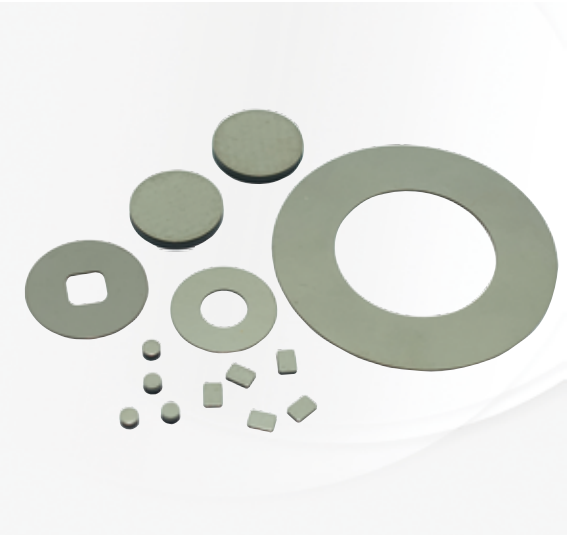
**Temperature Range**
-40°C ~ 85°C/125°C

**Terminal PPTC**
**FCTS XXXXX**
Special terminal PPTC devices are designed for automotive motor applications, protect potential motor stalling overcurrent condition casued by abnormal operation; custom shape and configuration offer better design flexibility.

**Terminal PPTC w/ Housing**
**FCTS XXXXX-S**
Terminal PPTC devices with exterior housing, provide more reliable performance under high temperature enviroment.

**Chip PPTC**
Small-sized custom shaped PPTC for small electric motor application.

# Battery/Energy Customized



**Application**
Battery and Energy Applications
**Product Features**
Hight Current / High Voltage capability for the emerging market demand for high power battery and energy solution for connected equipments.

**Operation Current**
**Battery Series**
2.00A~8A; high current capability up to 33A for special battery applications
**Energy Series**
0.16A~2.00A for high voltage AC/DC application

**Operation Voltage**
**Battery Series**
3V~16$V_{DC}$; High voltage capability up to 60$V_{DC}$
**Energy Series**
Rated Voltage 240$V_{AC/DC}$, Max.Int. Voltage 265$V_{AC/DC}$

**Temperature Range**
-40°C ~ 85°C/125°C

**Battery Disc/Ring PPTC**
**FDC XXXXX**
Custom designed disc and ring shaped PPTC devices for consumer, vehicle, ship and military battery applications, high current and voltage rating products available.

**Energy Chip PPTC Series**
**FCT XXXXX**
Base on Fuzetec high voltage PPTC formulation, special design for energy applications with surge immunity requirements, for more information about Energy Chip PPTC series, please contact with Fuzetec.

# X - APPENDIX- CROSS REFERENCE



| Fuzetec | | Tyco (Raychem) | | Bourns | | Littelfuse | | Polytronics | |
|---|---|---|---|---|---|---|---|---|---|
| FRX | 005-60F | RXEF | 005 | MF-R | 005 | -- | -- | RLD60P | 005XF |
| FRX | 010-60F | RXEF | 010 | MF-R | 010 | 60R | 010X | RLD60P | 010XF |
| FRX | 017-60F | RXEF | 017 | MF-R | 017 | 60R | 017X | RLD60P | 017XF |
| FRX | 020-60F | -- | -- | MF-R | 020 | 60R | 020X | RLD60P | 020XF |
| FRX | 025-60F | -- | -- | MF-R | 025 | 60R | 025X | RLD60P | 025XF |
| FRX | 030-60F | -- | -- | MF-R | 030 | 60R | 030X | RLD60P | 030XF |
| FRX | 040-60F | -- | -- | MF-R | 040 | 60R | 040X | RLD60P | 040XF |
| FRX | 050-60F | -- | -- | MF-R | 050 | 60R | 050X | RLD60P | 050XF |
| FRX | 065-60F | -- | -- | MF-R | 065 | 60R | 065X | RLD60P | 065XF |
| FRX | 075-60F | -- | -- | MF-R | 075 | 60R | 075X | RLD60P | 075XF |
| FRX | 090-60F | -- | -- | MF-R | 090 | 60R | 090X | RLD60P | 090XF |
| FRX | 110-60F | -- | -- | MF-RX | 110 | 60R | 110X | RLD60P | 110XF |
| FRX | 135-60F | -- | -- | MF-RX | 135 | 60R | 135X | RLD60P | 135XF |
| FRX | 160-60F | -- | -- | MF-RX | 160 | 60R | 160X | RLD60P | 160XF |
| FRX | 185-60F | -- | -- | MF-RX | 185 | 60R | 185X | RLD60P | 185XF |
| FRX | 250-60F | -- | -- | MF-RX | 250 | 60R | 250X | RLD60P | 250XF |
| FRX | 300-60F | -- | -- | MF-RX | 300 | 60R | 300X | RLD60P | 300XF |
| FRX | 375-60F | -- | -- | MF-RX | 375 | 60R | 375X | RLD60P | 375XF |
| FRX | 010-90F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRX | 015-90F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRX | 017-90F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRX | 020-90F | RXEF | 020 | MF-RX | 020/72 | 72R | 020X | RLD72P | 020XF |
| FRX | 025-90F | RXEF | 025 | MF-RX | 025/72 | 72R | 025X | RLD72P | 025XF |
| FRX | 030-90F | RXEF | 030 | MF-RX | 030/72 | 72R | 030X | RLD72P | 030XF |
| FRX | 035-90F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRX | 040-90F | RXEF | 040 | MF-RX | 040/72 | 72R | 040X | RLD72P | 040XF |
| FRX | 050-90F | RXEF | 050 | MF-RX | 050/72 | 72R | 050X | RLD72P | 050XF |
| FRX | 055-90F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRX | 065-90F | RXEF | 065 | MF-RX | 065/72 | 72R | 065X | RLD72P | 065XF |
| FRX | 075-90F | RXEF | 075 | MF-RX | 075/72 | 72R | 075X | RLD72P | 075XF |
| FRX | 090-90F | RXEF | 090 | MF-RX | 090/72 | 72R | 090X | RLD72P | 090XF |
| FRX | 110-90F | RXEF | 110 | MF-RX | 110/72 | 72R | 110X | RLD72P | 110XF |
| FRX | 135-90F | RXEF | 135 | MF-RX | 135/72 | 72R | 135X | RLD72P | 135XF |
| FRX | 160-90F | RXEF | 160 | MF-RX | 160/72 | 72R | 160X | RLD72P | 160XF |
| FRX | 185-90F | RXEF | 185 | MF-RX | 185/72 | 72R | 185X | RLD72P | 185XF |
| FRX | 250-90F | RXEF | 250 | MF-RX | 250/72 | 72R | 250X | RLD72P | 250XF |
| FRX | 300-90F | RXEF | 300 | MF-RX | 300/72 | 72R | 300X | RLD72P | 300XF |
| FRX | 375-90F | RXEF | 375 | MF-RX | 375/72 | 72R | 375X | RLD72P | 375XF |
| FUSB | 075F | RUSBF | 075 | -- | -- | 06R | 075B | RLD06P | 075BF |
| FUSB | 090F | RUSBF | 090 | -- | -- | 16R | 090B | RLD16P | 090BF |
| FUSB | 110F | RUSBF | 110 | -- | -- | 16R | 110B | RLD16P | 110BF |
| FUSB | 120F | RUSBF | 120 | -- | -- | 06R | 120B | RLD06P | 120BF |
| FUSB | 135F | RUSBF | 135 | -- | -- | 16R | 135B | RLD16P | 135BF |
| FUSB | 155F | RUSBF | 155 | -- | -- | 06R | 155B | RLD06P | 155BF |
| FUSB | 160F | RUSBF | 160 | -- | -- | 16R | 160B | RLD16P | 160BF |
| FUSB | 185F | RUSBF | 185 | -- | -- | 16R | 185B | RLD16P | 185BF |
| FUSB | 250F | RUSBF | 250 | -- | -- | 16R | 250B | RLD16P | 250BF |
| FRU | 090-30F | RUEF | 090 | MF-R | 090-0-9 | 30R | 090U | RLD30P | 090UF |
| FRU | 110-30F | RUEF | 110 | MF-R | 110 | 30R | 110U | RLD30P | 110UF |
| FRU | 135-30F | RUEF | 135 | MF-R | 135 | 30R | 135U | RLD30P | 135UF |
| FRU | 160-30F | RUEF | 160 | MF-R | 160 | 30R | 160U | RLD30P | 160UF |
| FRU | 185-30F | RUEF | 185 | MF-R | 185 | 30R | 185U | RLD30P | 185UF |
| FRU | 250-30F | RUEF | 250 | MF-R | 250 | 30R | 250U | RLD30P | 250UF |
| FRU | 300-30F | RUEF | 300 | MF-R | 300 | 30R | 300U | RLD30P | 300UF |
| FRU | 400-30F | RUEF | 400 | MF-R | 400 | 30R | 400U | RLD30P | 400UF |
| FRU | 500-30F | RUEF | 500 | MF-R | 500 | 30R | 500U | RLD30P | 500UF |
| FRU | 600-30F | RUEF | 600 | MF-R | 600 | 30R | 600U | RLD30P | 600UF |
| FRU | 700-30F | RUEF | 700 | MF-R | 700 | 30R | 700U | RLD30P | 700UF |
| FRU | 800-30F | RUEF | 800 | MF-R | 800 | 30R | 800U | RLD30P | 800UF |
| FRU | 900-30F | RUEF | 900 | MF-R | 900 | 30R | 900U | RLD30P | 900UF |

| Fuzetec | | Tyco (Raychem) | | Bourns | | Littelfuse | | Polytronics | |
|---|---|---|---|---|---|---|---|---|---|
| FRT | 050-33F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRT | 075-33F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRT | 090-33F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRT | 120-33F | RTEF | 120 | -- | -- | -- | -- | -- | -- |
| FRT | 135-33F | RTEF | 135 | -- | -- | -- | -- | -- | -- |
| FRT | 160-33F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRT | 190-33F | RTEF | 190 | -- | -- | -- | -- | -- | -- |
| FRT | 220-33F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRT | 250-33F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRG | 250-16F | RGEF | 250 | -- | -- | 16R | 250G | RLD16P | 250GF |
| FRG | 300-16F | RGEF | 300 | MF-RG | 300 | 16R | 300G | RLD16P | 300GF |
| FRG | 400-16F | RGEF | 400 | MF-RG | 400 | 16R | 400G | RLD16P | 400GF |
| FRG | 500-16F | RGEF | 500 | MF-RG | 500 | 16R | 500G | RLD16P | 500GF |
| FRG | 600-16F | RGEF | 600 | MF-RG | 600 | 16R | 600G | RLD16P | 600GF |
| FRG | 700-16F | RGEF | 700 | MF-RG | 700 | 16R | 700G | RLD16P | 700GF |
| FRG | 800-16F | RGEF | 800 | MF-RG | 800 | 16R | 800G | RLD16P | 800GF |
| FRG | 900-16F | RGEF | 900 | MF-RG | 900 | 16R | 900G | RLD16P | 900GF |
| FRG | 1000-16F | RGEF | 1000 | MF-RG | 1000 | 16R | 1000G | RLD16P | 1000GF |
| FRG | 1100-16F | RGEF | 1100 | MF-RG | 1100 | 16R | 1100G | RLD16P | 1100GF |
| FRG | 1200-16F | RGEF | 1200 | -- | -- | 16R | 1200G | RLD16P | 1200GF |
| FRG | 1400-16F | RGEF | 1400 | -- | -- | 16R | 1400G | RLD16P | 1400GF |
| FHT | 050-30F | RHEF | 050 | MF-RHT | 050 | -- | -- | -- | -- |
| FHT | 070-30F | RHEF | 070 | MF-RHT | 070 | -- | -- | -- | -- |
| FHT | 100-30F | RHEF | 100 | MF-RHT | 100 | -- | -- | -- | -- |
| FHT | 200-16F | RHEF | 200 | MF-RHT | 200 | -- | -- | -- | -- |
| FHT | 300-16F | RHEF | 300 | MF-RHT | 300 | -- | -- | -- | -- |
| FHT | 400-16F | RHEF | 400 | MF-RHT | 400 | -- | -- | -- | -- |
| FHT | 450-16F | RHEF | 450 | MF-RHT | 450 | -- | -- | -- | -- |
| FHT | 550-16F | RHEF | 550 | MF-RHT | 550 | -- | -- | -- | -- |
| FHT | 600-16F | RHEF | 600 | MF-RHT | 600 | -- | -- | -- | -- |
| FHT | 650-16F | RHEF | 650 | MF-RHT | 650 | -- | -- | -- | -- |
| FHT | 700-16F | RHEF | 700 | MF-RHT | 700 | -- | -- | -- | -- |
| FHT | 750-16F | RHEF | 750 | MF-RHT | 750 | -- | -- | -- | -- |
| FHT | 800-16F | RHEF | 800 | MF-RHT | 800 | -- | -- | -- | -- |
| FHT | 900-16F | RHEF | 900 | MF-RHT | 900 | -- | -- | -- | -- |
| FHT | 1000-16F | RHEF | 1000 | MF-RHT | 1000 | -- | -- | -- | -- |
| FHT | 1100-16F | RHEF | 1100 | MF-RHT | 1100 | -- | -- | -- | -- |
| FHT | 1300-16F | RHEF | 1300 | MF-RHT | 1300 | -- | -- | -- | -- |
| FHT | 1400-16F | RHEF | 1400 | -- | -- | -- | -- | -- | -- |
| FHT | 1500-16F | RHEF | 1500 | -- | -- | -- | -- | -- | -- |
| FHE | 050-32F | AHEF | 050 | -- | -- | -- | -- | -- | -- |
| FHE | 070-32F | AHEF | 070 | -- | -- | -- | -- | -- | -- |
| FHE | 100-32F | AHEF | 100 | -- | -- | -- | -- | -- | -- |
| FHE | 200-32F | -- | -- | -- | -- | -- | -- | -- | -- |
| FHE | 300-32F | AHEF | 300 | -- | -- | -- | -- | -- | -- |
| FHE | 500-32F | AHEF | 500 | -- | -- | -- | -- | -- | -- |
| FHE | 750-32F | AHEF | 750 | -- | -- | -- | -- | -- | -- |
| FHE | 1000-32F | AHEF | 1000 | -- | -- | -- | -- | -- | -- |
| FRH | 080-250VF | TRF | 250-080T | -- | -- | 250R | 080 | HVR250P | 080CF |
| FRH | 110-250VF | -- | -- | -- | -- | -- | -- | -- | -- |
| FRH | 120-250VF | TRF | 250-120 | MF-RX | 012/250 | 250R | 120 | HVR250P | 120CF |
| FRH | 145-250VF | TRF | 250-145 | MF-RX | 014/250 | 250R | 145 | HVR250P | 145CF |
| FRH | 180-250XF | TRF | 250-180 | MF-RX | 018/250 | 250R | 180 | HVR250P | 180CF |
| FRH | 150-600MF | TRF | 600-150 | MF-R | 015/600 | 600R | 150 | HVR600P | 150CF |
| FRH | 160-600MF | -- | -- | -- | -- | -- | -- | -- | -- |
| FRH | 160-600VF | TRF | 600-160 | MF-R | 016/600 | 600R | 160 | HVR600P | 160CF |
| FRH | 200-600VF | -- | -- | -- | -- | -- | -- | -- | -- |
| FRH | 250-600VF | TRF | 600-250 | -- | -- | -- | -- | -- | -- |
| FRH | 400-600F | TRF | 600-400 | -- | -- | -- | -- | -- | -- |

# X - APPENDIX- CROSS REFERENCE



| Fuzetec | | Tyco (Raychem) | | Bourns | | Littelfuse | | Polytronics | |
|---|---|---|---|---|---|---|---|---|---|
| FRV | 005-240F | LVR | 005NS | MF-RM | 005/240 | -- | -- | -- | -- |
| FRV | 008-240F | LVR | 008NS | MF-RM | 008/240 | -- | -- | -- | -- |
| FRV | 012-240F | LVR | 012S | MF-RM | 012/240 | -- | -- | -- | -- |
| FRV | 016-240F | LVR | 016S | MF-RM | 016/240 | -- | -- | -- | -- |
| FRV | 025-240F | LVR | 025S | MF-RM | 025/240 | -- | -- | -- | -- |
| FRV | 033-240F | LVR | 033S | MF-RM | 033/240 | -- | -- | -- | -- |
| FRV | 040-240F | LVR | 040S | MF-RM | 040/240 | -- | -- | -- | -- |
| FRV | 055-240F | LVR | 055S | MF-RM | 055/240 | -- | -- | -- | -- |
| FRV | 075-240F | LVR | 075S | -- | -- | -- | -- | -- | -- |
| FRV | 100-240F | LVR | 100S | -- | -- | -- | -- | -- | -- |
| FRV | 125-240F | LVR | 125S | -- | -- | -- | -- | -- | -- |
| FRV | 150-240F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRV | 200-240F | LVR | 200S | -- | -- | -- | -- | -- | -- |
| FRVL | 010-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 017-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 020-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 025-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 030-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 040-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 050-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 065-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 070-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 075-120F | LVRL | 075S | -- | -- | -- | -- | -- | -- |
| FRVL | 090-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 100-120F | LVRL | 100S | -- | -- | -- | -- | -- | -- |
| FRVL | 110-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 125-120F | LVRL | 125S | -- | -- | -- | -- | -- | -- |
| FRVL | 130-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 135-120F | LVRL | 135S | -- | -- | -- | -- | -- | -- |
| FRVL | 160-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 185-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 200-120F | LVRL | 200S | -- | -- | -- | -- | -- | -- |
| FRVL | 250-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 300-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FRVL | 375-120F | -- | -- | -- | -- | -- | -- | -- | -- |
| FSR | 120F | SRP | 120F | MF-S | 120 | -- | -- | STD | 120F |
| FSR | 175F | SRP | 175F | MF-S | 175 | -- | -- | STD | 175F |
| FSR | 200F | SRP | 200F | MF-S | 200 | -- | -- | STD | 200F |
| FSR | 350F | SRP | 350F | MF-S | 350 | -- | -- | STD | 350F |
| FSR | 420F | SRP | 420F | MF-S | 420 | -- | -- | STD | 420F |
| FLR | 190F | LR4 | 190F | MF-LR | 190 | -- | -- | LRD | 190F |
| FLR | 260F | LR4 | 260F | MF-LR | 260 | -- | -- | LRD | 260F |
| FLR | 380F | LR4 | 380F | MF-LR | 380 | -- | -- | LRD | 380F |
| FLR | 450F | LR4 | 450F | MF-LR | 450 | -- | -- | LRD | 450F |
| FLR | 550F | LR4 | 550F | MF-LR | 550 | -- | -- | LRD | 550F |
| FLR | 600F | LR4 | 600F | MF-LR | 600 | -- | -- | LRD | 600F |
| FLR | 730F | LR4 | 730F | MF-LR | 730 | -- | -- | LRD | 730F |
| FLR | 900F | LR4 | 900F | MF-LR | 900 | -- | -- | LRD | 900F |

| Fuzetec | | Tyco (Raychem) | | Bourns | | Littelfuse | | Polytronics | |
|---|---|---|---|---|---|---|---|---|---|
| FSMD* | 030-2920-R | SMD | 030F | MF-SM | 030 | 2920L | 030 | SMD2920P | 030TF |
| FSMD* | 050-2920-R | SMD | 050F | MF-SM | 050 | 2920L | 050 | SMD2920P | 050TF |
| FSMD* | 075-2920-R | SMD | 075F | MF-SM | 075 | 2920L | 075 | SMD2920P | 075TF |
| FSMD* | 075-60-2920-R | SMD | 075F/60 | MF-SM | 075/60 | 2920L | 075/60 | SMD2920P | 075TF/60 |
| FSMD* | 100-2920-R | SMD | 100F | MF-SM | 100/33 | 2920L | 100 | SMD2920P | 100TF |
| FSMD | 110-60-2920R | -- | -- | -- | -- | 2920L | 110/60 | SMD2920P | 110TF |
| FSMD* | 125-2920-R | SMDC | 125F/33 | MF-SM | 125 | 2920L | 125 | SMD2920P | 125TF |
| FSMD** | 150-2920-R | SMD | 150F/33 | MF-SM | 150/33 | 2920L | 150 | SMD2920P | 150TF |
| FSMD** | 185-2920-R | SMD | 185F/33 | MF-SM | 185/33 | 2920L | 185 | SMD2920P | 185TF |
| FSMD** | 200-2920-R | SMD | 200F | MF-SM | 200 | 2920L | 200 | -- | -- |
| FSMD** | 200-24-2920-R | SMD | 200F/24 | -- | -- | 2920L | 200/24 | SMD2920P | 200TF/24 |
| FSMD** | 250-2920-R | SMD | 250F/15 | MF-SM | 250 | 2920L | 250 | SMD2920P | 250TF |
| FSMD** | 260-2920-R | SMD | 260F | MF-SM | 260 | 2920L | 260 | SMD2920P | 260TF |
| FSMD* | 260-24-2920R | -- | -- | -- | -- | 2920L | 260/24 | SMD2920P | 260TF/24 |
| FSMD** | 300-2920-R | SMD | 300F | MF-SM | 300 | 2920L | 300 | -- | -- |
| FSMD** | 300-15-2920R | SMD | 300F/15 | -- | -- | 2920L | 300/15 | SMD2920P | 300TF/15 |
| FSMD** | 300-24-2920R | SMDC | 300F/24 | MF-LSMF | 300/24X | -- | -- | -- | -- |
| FSMD | 330-2920R | -- | -- | -- | -- | 2920L | 330/24 | SMD2920P | 330TF |
| FSMD* | 400-16-2920R | -- | -- | -- | -- | -- | -- | SMD2920P | 400TF |
| FSMD* | 500-16-2920R | -- | -- | -- | -- | 2920L | 500/16 | SMD2920P | 500TF/16 |
| FSMD | 030-2016-R | -- | -- | -- | -- | 2016L | 030 | SMD2016P | 030TF |
| FSMD | 050-2016R | -- | -- | -- | -- | 2016L | 050 | SMD2016P | 050TF |
| FSMD | 075-2016R | -- | -- | -- | -- | 2016L | 075/60 | SMD2016P | 075TF |
| FSMD | 100-2016-R | -- | -- | -- | -- | 2016L | 100 | SMD2016P | 100TF |
| FSMD | 100-33-2016-R | -- | -- | -- | -- | 2016L | 100/33 | SMD2016P | 100TF/33 |
| FSMD | 150-2016-R | -- | -- | -- | -- | 2016L | 150 | SMD2016P | 150TF |
| FSMD | 200-2016-R | -- | -- | -- | -- | 2016L | 200 | SMD2016P | 200TF |
| FSMD | 010-R | miniSMDC | 010F | MF-MSMF | 010 | 1812L | 010 | SMD1812P | 010TF |
| FSMD | 014-R | miniSMDC | 014F | MF-MSMF | 014 | 1812L | 014 | SMD1812P | 014TF |
| FSMD | 020-R | miniSMDC | 020F | MF-MSMF | 020 | 1812L | 020 | SMD1812P | 020TF |
| FSMD | 020-60-R | -- | -- | MF-MSMF | 020/60 | 1812L | 020/60 | SMD1812P | 020TF-J |
| FSMD | 030-R | miniSMDC | 030F | MF-MSMF | 030 | -- | -- | -- | -- |
| FSMD | 035-R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 035-30-R | -- | -- | -- | -- | 1812L | 035/30 | SMD1812P | 035TF/30 |
| FSMD | 050-R | -- | -- | MF-MSMF | 050 | 1812L | 050 | SMD1812P | 050TF |
| FSMD | 050-30-R | miniSMDC | 050F | MF-MSMF | 050/30X | 1812L | 050/30 | SMD1812P | 050TF/30 |
| FSMD | 075-R | miniSMDC | 075F | MF-MSMF | 075 | 1812L | 075 | SMD1812P | 075TF |
| FSMD | 075-24R | miniSMDC | 075F/24 | MF-MSMF | 075/24 | 1812L | 075/24 | SMD1812P | 075TF/24 |
| FSMD | 075-33R | miniSMDC | 075F/33 | MF-MSMF | 075/33X | 1812L | 075/33 | SMD1812P | 075TF/33 |
| FSMD | 110-R | miniSMDC | 110F | MF-MSMF | 110 | 1812L | 110 | SMD1812P | 110TF |
| FSMD | 110-16-R | miniSMDC | 110F/16 | MF-MSMF | 110/16 | 1812L | 110/16 | SMD1812P | 110TF/16 |
| FSMD | 110-24R | miniSMDC | 110F/24 | MF-MSMF | 110/24X | 1812L | 110/24 | SMD1812P | 110TF/24 |
| FSMD | 110-33R | -- | -- | -- | -- | 1812L | 110/33 | SMD1812P | 110TF/33 |
| FSMD | 125-R | miniSMDC | 125F | MF-MSMF | 125 | 1812L | 125/6 | -- | -- |
| FSMD | 125-16R | miniSMDC | 125F/16 | -- | -- | 1812L | 125/16 | SMD1812P | 125TF/16 |
| FSMD | 150-R | miniSMDC | 150F | MF-MSMF | 150 | 1812L | 150 | SMD1812P | 150TF/8 |
| FSMD | 150-12R | miniSMDC | 150F/12 | MF-MSMF | 150/12 | 1812L | 150/12 | SMD1812P | 150TF/12 |
| FSMD | 150-24R | miniSMDC | 150F/24 | MF-MSMF | 150/24X | 1812L | 150/24 | SMD1812P | 150TF/24 |
| FSMD | 160-R | miniSMDC | 160F | MF-MSMF | 160 | 1812L | 160 | SMD1812P | 160TF/8 |
| FSMD | 160-12R | -- | -- | -- | -- | 1812L | 160/12 | -- | -- |

# X - APPENDIX- CROSS REFERENCE



| Fuzetec | | Tyco (Raychem) | | Bourns | | Littelfuse | | Polytronics | |
|---|---|---|---|---|---|---|---|---|---|
| FSMD | 160-16R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 160-24R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 200R | miniSMDC | 200F | MF-MSMF | 200 | 1812L | 200TH | SMD1812P | 200TFT |
| FSMD | 200-16R | miniSMDC | 200F/16 | -- | -- | 1812L | 200/16 | SMD1812P | 200TF/16 |
| FSMD | 260R | miniSMDC | 260F | MF-MSMF | 260 | 1812L | 260TH | SMD1812P | 260TFT |
| FSMD | 260-13R | miniSMDC | 260F/13.2 | -- | -- | 1812L | 260/12 | SMD1812P | 260TF/12 |
| FSMD | 260-16R | miniSMDC | 260F/16 | -- | -- | 1812L | 260/16 | SMD1812P | 260TF/16 |
| FSMD | 300R | miniSMDC | 300F | -- | -- | 1812L | 300 | SMD1812P | 300TFT |
| FSMD | 005-1210-R | microSMD | 005F | MF-USMF | 005 | 1210L | 005 | SMD1210P | 005TF |
| FSMD | 010-1210-R | microSMD | 010F | MF-USMF | 010 | 1210L | 010 | SMD1210P | 010TF |
| FSMD | 020-1210-R | -- | -- | MF-USMF | 020 | 1210L | 020 | SMD1210P | 020TF |
| FSMD | 035-1210-R | microSMD | 035F | MF-USMF | 035 | 1210L | 035 | SMD1210P | 035TF |
| FSMD | 050-1210-R | microSMD | 050F | MF-USMF | 050 | 1210L | 050 | SMD1210P | 050TF |
| FSMD | 075-1210-R | microSMD | 075F | MF-USMF | 075 | 1210L | 075 | SMD1210P | 075TF |
| FSMD | 075-24-1210R | -- | -- | -- | -- | 1210L | 075/24 | SMD1210P | 075TF/24 |
| FSMD | 110-1210R | microSMD | 110F | MF-USMF | 110 | 1210L | 110 | SMD1210P | 110TFT |
| FSMD | 110-16-1210R | -- | -- | -- | -- | 1210L | 110/16 | SMD1210P | 110TF/16 |
| FSMD | 150-1210R | microSMD | 150F | MF-USMF | 150 | 1210L | 150 | SMD1210P | 150TFT |
| FSMD | 175-1210R | microSMD | 175F | MF-USMF | 175 | 1210L | 175 | SMD1210P | 175TF |
| FSMD | 200-1210R | microSMD | 200F | -- | -- | 1210L | 200 | SMD1210P | 200TF |
| FSMD | 005-1206-R | -- | -- | -- | -- | 1206L | 005/60 | SMD1206P | 005TF |
| FSMD | 010-1206-R | nanoSMDC | 010F | -- | -- | 1206L | 010/60 | SMD1206P | 010TF |
| FSMD | 012-1206-R | nanoSMDC | 012F | MF-NSMF | 012 | 1206L | 012 | SMD1206P | 012TF |
| FSMD | 016-1206-R | nanoSMDC | 016F | MF-NSMF | 016 | 1206L | 016 | SMD1206P | 016TF |
| FSMD | 020-1206-R | nanoSMDC | 020F | MF-NSMF | 020X | 1206L | 020 | SMD1206P | 020TF/24 |
| FSMD | 025-1206-R | nanoSMDC | 025F | MF-NSMF | 025X | 1206L | 025 | SMD1206P | 025TF |
| FSMD | 025-24-1206-R | -- | -- | -- | -- | -- | -- | SMD1206P | 025TF/24 |
| FSMD | 035-1206-R | nanoSMDC | 035F | MF-NSMF | 035X | 1206L | 035/16 | SMD1206P | 035TF/16 |
| FSMD | 035-30-1206R | -- | -- | -- | -- | 1206L | 035/30 | SMD1206P | 035TF/30 |
| FSMD | 050-1206-R | -- | -- | -- | -- | 1206L | 050 | SMD1206P | 050TF |
| FSMD | 050-24-1206R | nanoSMDC | 050F/13.2 | MF-NSMF | 050 | 1206L | 050/15 | SMD1206P | 050TF/15 |
| FSMD | 075-1206R | nanoSMDC | 075F | MF-NSMF | 075 | 1206L | 075TH | SMD1206P | 075TFT |
| FSMD | 075-16-1206R | -- | -- | -- | -- | 1206L | 075/16 | SMD1206P | 075TF/16 |
| FSMD | 100-1206R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 110-1206R | nanoSMDC | 110F | MF-NSMF | 110 | 1206L | 110TH | SMD1206P | 110TFT |
| FSMD | 110-16-1206R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 150-1206R | nanoSMDC | 150F | MF-NSMF | 150 | 1206L | 150TH | SMD1206P | 150TFT |
| FSMD | 200-1206R | nanoSMDC | 200F | MF-NSMF | 200 | 1206L | 200 | SMD1206P | 200TF |
| FSMD | 010-0805-R | picoSMDC | 010S | MF-PSMF | 010X | 0805L | 010 | SMD0805P | 010TF |
| FSMD | 010-24-0805-R | -- | -- | MF-PSMF | 010/24X | 0805L | 010/24 | SMD0805P | 010TF/24 |
| FSMD | 020-0805-R | picoSMDC | 020S | MF-PSMF | 020X | 0805L | 020 | SMD0805P | 020TF |
| FSMD | 035-0805-R | picoSMDC | 035S | MF-PSMF | 035X | 0805L | 035 | SMD0805P | 035TF |
| FSMD | 050-0805R | picoSMDC | 050S | MF-PSMF | 050X | 0805L | 050 | SMD0805P | 050TF |
| FSMD | 050-9-0805R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 075-0805R | picoSMDC | 075S | MF-PSMF | 075X | 0805L | 075 | SMD0805P | 075TF |
| FSMD | 100-0805R | -- | -- | -- | -- | 0805L | 100 | SMD0805P | 100TFT |
| FSMD | 110-0805R | picoSMDC | 110S | MF-PSMF | 110X | 0805L | 110 | SMD0805P | 110TF |
| FSMD | 001-0603-R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 002-0603-R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 003-0603-R | -- | -- | -- | -- | -- | -- | -- | -- |
| FSMD | 004-0603-R | -- | -- | -- | -- | 0603L | 004 | SMD0603P | 004TF |
| FSMD | 005-0603-R | femtoSMDC | 005F | -- | -- | -- | -- | -- | -- |
| FSMD | 008-0603-R | femtoSMDC | 008F | -- | -- | -- | -- | -- | -- |
| FSMD | 010-0603-R | femtoSMDC | 010F | MF-FSMF | 010X | 0603L | 010 | SMD0603P | 010TF |
| FSMD | 012-0603-R | femtoSMDC | 012F | -- | -- | -- | -- | -- | -- |
| FSMD | 016-0603-R | femtoSMDC | 016F | -- | -- | -- | -- | -- | -- |
| FSMD | 020-0603-R | femtoSMDC | 020F | MF-FSMF | 020X | 0603L | 020 | SMD0603P | 020TF |
| FSMD | 025-0603-R | -- | -- | MF-FSMF | 025X | 0603L | 025 | SMD0603P | 025TF |

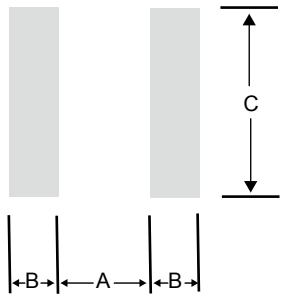
| Fuzetec | | Tyco (Raychem) | | Bourns | | Littelfuse | | Polytronics | |
|---|---|---|---|---|---|---|---|---|---|
| FSMD | 050-1206RZ | -- | -- | -- | -- | -- | -- | SMD1206P | 050SLR |
| FSMD | 075-1206RZ | -- | -- | -- | -- | 1206L | 075SL | SMD1206P | 075SLR |
| FSMD | 110-1206RZ | -- | -- | -- | -- | 1206L | 110SL | SMD1206P | 110SLR |
| FSMD | 150-1206RZ | -- | -- | MF-NSML | 150 | 1206L | 150SL | SMD1206P | 150SLR |
| FSMD | 175-1206RZ | nanoSMD | 175LR | MF-NSML | 175 | 1206L | 175SL | SMD1206P | 175SLR |
| FSMD | 200-1206RZ | nanoSMD | 200LR | MF-NSML | 200 | 1206L | 200SL | SMD1206P | 200SLR |
| FSMD | 260-1206RZ | -- | -- | MF-NSML | 260 | 1206L | 260SLTH | SMD1206P | 260SLR |
| FSMD | 300-1206RZ | -- | -- | MF-NSML | 300 | 1206L | 300SLTH | SMD1206P | 300SLR |
| FSMD | 350-1206RZ | nanoSMD | 350LR | MF-NSML | 350 | 1206L | 350SLTH | SMD1206P | 350SLRT |
| FSMD | 380-1206RZ | nanoSMD | 380LR | MF-NSML | 380 | 1206L | 380SLTH | SMD1206P | 380SLR |
| FSMD | 400-1206RZ | nanoSMD | 400LR | MF-NSML | 400 | 1206L | 400SL | SMD1206P | 400SLR |
| FSMD | 450-1206RZ | nanoSMD | 450LR | MF-NSML | 450 | 1206L | 450SL | SMD1206P | 450SLR |
| FSMD | 500-1206RZ | nanoSMD | 500LR | MF-NSML | 500 | -- | -- | SMD1206P | 500SLR |
| FSMD | 600-1206RZ | nanoSMD | 600LR | MF-NSML | 600 | -- | -- | SMD1206P | 600SLR |
| FSMD | 075-0805RZ | -- | -- | MF-PSML | 075 | 0805L | 075SL | SMD0805P | 075SLR |
| FSMD | 110-0805RZ | -- | -- | MF-PSML | 110 | 0805L | 110SL | SMD0805P | 110SLR |
| FSMD | 125-0805RZ | -- | -- | -- | -- | -- | -- | SMD0805P | 125SLR |
| FSMD | 150-0805RZ | -- | -- | MF-PSML | 150 | 0805L | 150SL | SMD0805P | 150SLR |
| FSMD | 175-0805RZ | -- | -- | MF-PSML | 175 | 0805L | 175SL | SMD0805P | 175SLR |
| FSMD | 200-0805RZ | -- | -- | MF-PSML | 200 | 0805L | 200SLTH | SMD0805P | 200SLRT |
| FSMD | 300-0805RZ | -- | -- | MF-PSML | 300 | 0805L | 300SL | SMD0805P | 300SLRT |
| FSMD | 350-0805RZ | -- | -- | MF-PSML | 350 | -- | -- | -- | -- |
| FSMD | 025-0603RZ | -- | -- | MF-FSMF | 025X | -- | -- | SMD0603P | 025TF |
| FSMD | 035-0603RZ | -- | -- | MF-FSMF | 035X | -- | -- | SMD0603P | 035TF |
| FSMD | 050-0603RZ | -- | -- | MF-FSMF | 050X | 0603L | 050SL | SMD0603P | 050SLR |
| FSMD | 075-0603RZ | -- | -- | -- | -- | 0603L | 075SL | SMD0603P | 075SLR |
| FSMD | 100-0603RZ | -- | -- | -- | -- | 0603L | 100SL | SMD0603P | 100SLR |
| FSMD | 010-0402RZ | -- | -- | -- | -- | 0402L | 010SL | SMD0402P | 010SLR |
| FSMD | 020-0402RZ | -- | -- | -- | -- | 0402L | 020SL | SMD0402P | 020SLR |
| FSMD | 035-0402RZ | -- | -- | -- | -- | 0402L | 035SL | SMD0402P | 035SLR |
| FSMD | 050-0402RZ | -- | -- | -- | -- | 0402L | 050SL | SMD0402P | 050SLR |

# Thermal Derating for PPTC Device at Various Ambient Temperatures.

| FUZETEC PPTC Family | -40°C | -20°C | 0°C | 23°C | 30°C | 40°C | 50°C | 60°C | 70°C | 85°C | 100°C | 125°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FRX-60/90 | 158% | 138% | 119% | 100% | 90% | 81% | 70% | 60% | 50% | 36% | - | - |
| FRU | 145% | 130% | 115% | 100% | 92% | 84% | 76% | 70% | 61% | 50% | - | - |
| FRT | 148% | 134% | 120% | 100% | 98% | 90% | 84% | 78% | 70% | 59% | - | - |
| FUSB | 145% | 130% | 115% | 100% | 91% | 83% | 78% | 70% | 61% | 50% | - | - |
| FRG | 148% | 132% | 116% | 100% | 91% | 84% | 76% | 69% | 60% | 48% | - | - |
| FHT | 143% | 129% | 116% | 100% | 93% | 87% | 80% | 72% | 65% | 55% | - | 26% |
| FHE | 143% | 130% | 115% | 100% | 92% | 88% | 80% | 72% | 65% | 55% | - | 28% |
| FRHV | 158% | 138% | 119% | 100% | 92% | 83% | 73% | 64% | 54% | 40% | - | - |
| FRVL | 158% | 138% | 119% | 100% | 90% | 80% | 70% | 60% | 50% | 38% | - | - |
| FRV | 150% | 134% | 116% | 100% | 90% | 81% | 74% | 65% | 58% | 44% | - | - |
| FSMD-2920 | 145% | 130% | 115% | 100% | 92% | 85% | 78% | 70% | 62% | 50% | - | - |
| FSMD-2016 | 157% | 133% | 118% | 100% | 90% | 80% | 70% | 60% | 51% | 36% | - | - |
| FSMD-1812 | 145% | 130% | 116% | 100% | 91% | 84% | 78% | 69% | 61% | 50% | - | - |
| FSMD-1210 | 145% | 130% | 115% | 100% | 92% | 83% | 76% | 70% | 62% | 50% | - | - |
| FSMD-1206 | 145% | 130% | 115% | 100% | 92% | 84% | 78% | 69% | 62% | 50% | - | - |
| FSMD-0805 | 145% | 130% | 116% | 100% | 91% | 84% | 76% | 69% | 61% | 50% | - | - |
| FSMD-0603 | 157% | 137% | 118% | 100% | 89% | 80% | 70% | 60% | 51% | 37% | - | - |
| FSMDH | 135% | 122% | 110% | 100% | - | 90% | - | 75% | - | 65% | 53% | 40% |
| FSR | 157% | 137% | 118% | 100% | 89% | 80% | 70% | 60% | 51% | 37% | - | - |
| FLR | 147% | 132% | 117% | 100% | 94% | 86% | 80% | 71% | 61% | 52% | - | - |
| Low Rho FSMD-1206/0805/0603/0402 | 145% | 130% | 115% | 100% | 92% | 84% | 77% | 69% | 61% | 50% | - | - |

# Pad Layouts、Solder Reflow Recommendations

The dimensions in the table below provide the recommended pad layout for Surface Mount Device in different footprints.




| Pad dimensions (Millimeter) | | | |
|---|---|---|---|
| Device | A Nominal | B Nominal | C Nominal |
| All 2920 Series | 5.10 | 2.30 | 5.60 |
| All 2016 Series | 3.40 | 1.50 | 4.60 |
| All 1812 Series | 3.45 | 1.78 | 3.50 |
| All 1210 Series | 2.00 | 1.00 | 2.80 |
| All 1206 Series | 2.00 | 1.00 | 1.90 |
| All 0805 Series | 1.20 | 1.00 | 1.50 |
| All 0603 Series | 0.80 | 0.60 | 0.80 |
| All 0402 Series | 0.40 | 0.60 | 0.70 |

| Profile Feature | Pb-Free Assembly |
|---|---|
| **Average Ramp-Up Rate (Tsmax to Tp)** | 3°C/second max. |
| **Preheat :**<br>Temperature Min (Tsmin)<br>Temperature Max (Tsmax)<br>Time (tsmin to tsmax) | 150°C<br>200°C<br>60-180 seconds |
| **Time maintained above :**<br>Temperature($T_L$)<br>Time ($t_L$) | 217°C<br>60-150 seconds |
| **Peak/Classification Temperature(Tp) :** | 260°C |
| **Time within 5°C of actual Peak :**<br>Temperature (tp) | 20-40 seconds |
| **Ramp-Down Rate :** | 6°C/second max. |
| **Time 25°C to Peak Temperature :** | 8 minutes max. |

Note 1 : All temperatures refer to the package, measured on the package body surface.

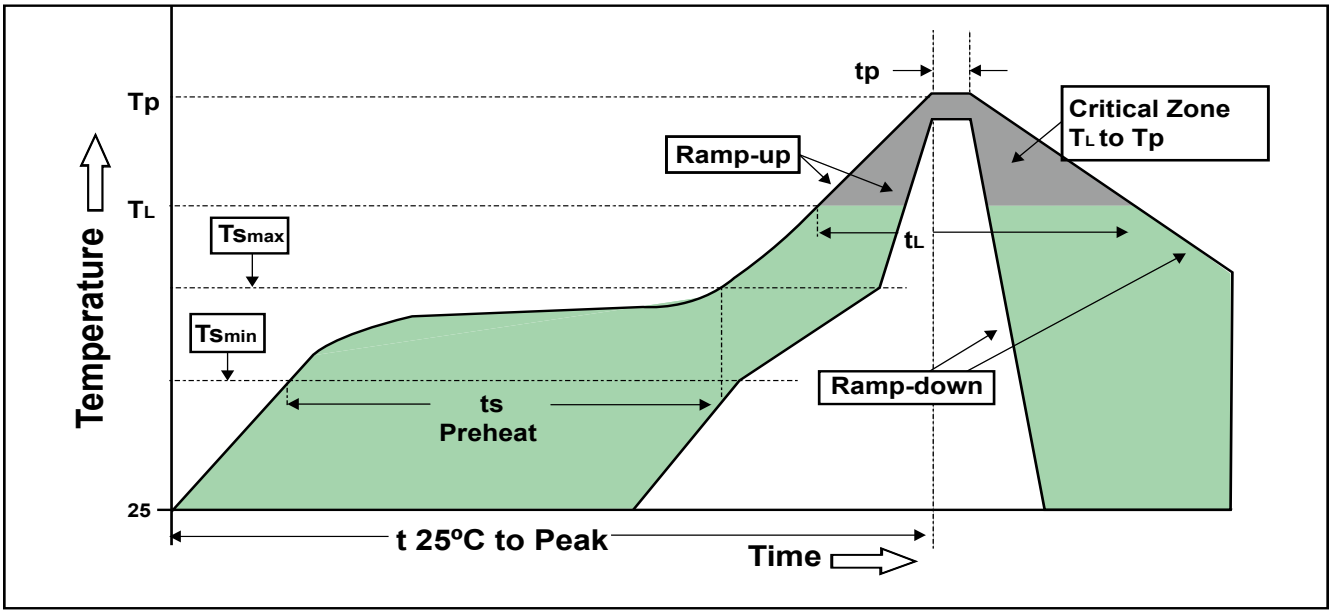
**Solder reflow**

※ Due to " Lead Free " nature, Temperature and Dwelling Time for the soldering zone is higher than those for Regular. This may cause damage to other components.

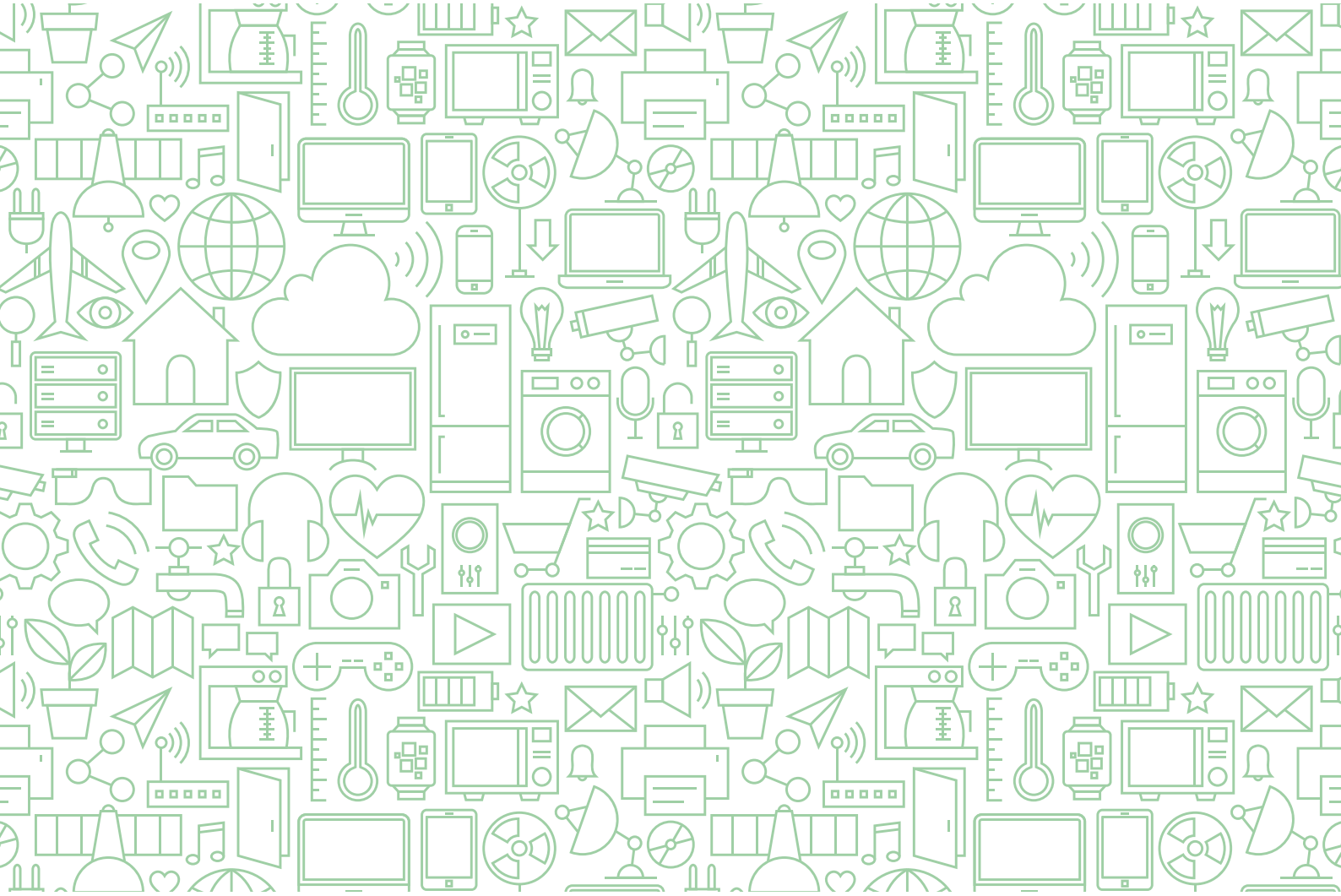
1. Recommended max paste thickness is 0.25mm.(Nominal)
2. Devices can be cleaned using standard methods and aqueous solvent.
3. Rework use standard industry practices.
4. Storage Environment : < 30°C / 60% RH

**Caution :**

1. If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.
2. Devices are not designed to be wave soldered to the bottom side of the board



# MEMO



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*Agent*

*2021*

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# TVS Diode

## Transient Voltage Suppression Devices

## Fuzetec Technology

## 2021 TVS Product Catalog

www.fuzetec.com

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# TVS Products

| Peak Pulse Power | Series Name | Package Type | Page |
|---|---|---|---|
| **SMD Standard TVS** | | | |
| 400W | SMAJ | DO-214AC | P4 |
| | P4SMA | DO-214AC | P9 |
| 600W | SMA6J | DO-214AC | P14 |
| | SMBJ | DO-214AA | P19 |
| | P6SMB | DO-214AA | P24 |
| 1500W | SMCJ | DO-214AB | P29 |
| | 1.5SMC | DO-214AB | P34 |
| 3000W | SMDJ | DO-214AB | P39 |
| 5000W | 5.0SMDJ | DO-214AB | P44 |
| **Automotive SMD TVS** | | | |
| 3600W | SM5Z | DO-218AB | P50 |
| 4600W | SM6Z | DO-218AB | P54 |
| 6600W | SM8Z | DO-218AB | P58 |
| **Axial Leaded High Power TVS** | | | |
| 15000W | 15KPA | R6/P600 | P63 |
| 30000W | 30KPA | R6/P600 | P67 |
| | KA | Custom | P72 |

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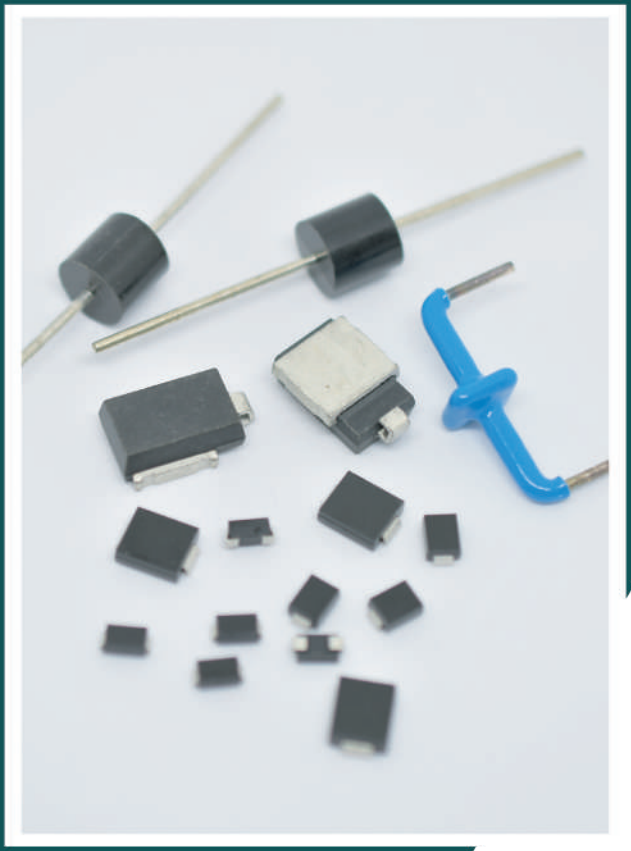
# Transient Surge Protection

## Transient Surges

Transient surges are brief overvoltage spikes or disturbances ona power waveform that can damage, degrade, or destroy electronic equipment. Transient surges originate from a variety of electrical circuits and sources regardless of whether they operate from an AC or DC supply as they are often generated within the circuit itself or transmitted into the circuit from external sources.

Transients within a circuit can increase the voltage to several thousand volts with aduration of less than a half-cycle of the normal voltage waveform,and it is these voltage spikes which must be prevented fromappearing across delicate electronic circuits and components.



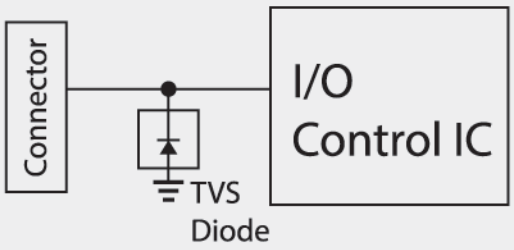
## TVS Diodes

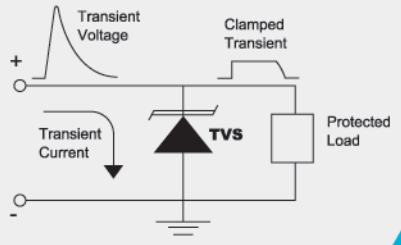
TVS Diodes are electronic components designed to protect sensitive electronics from high-voltage transients. They can respond to overvoltage events faster than most other types of circuit protection devices, and are offered in a variety of surface mount and through-hole circuit board mounting formats.

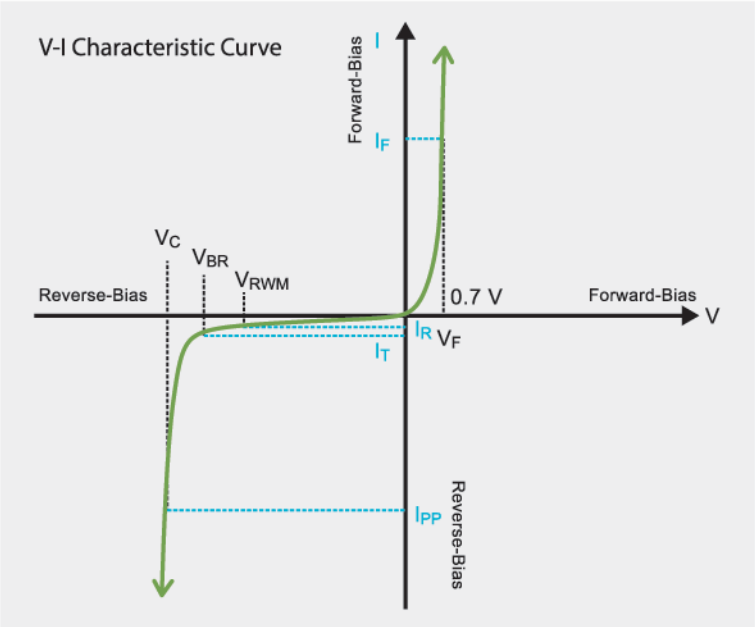
Fuzetec TVS Diodes can fit a wide range of circuit protection applications but were primarily designed to protect I/O interfaces in telecommunication and industrial equipment, computers and consumer electronics.

# How a TVS Diode Work

TVS diodes function by limiting voltage to a certain level (referred to as a "clamping" device) with p-n junctions that have a larger cross-sectional area than those of a normal diode, allowing them to conduct large currents to ground without sustaining damage.




# TVS Diode Characteristics

| Symbol | Parameter |
|---|---|
| $V_F$ | Forward Voltage @ $I_F$ |
| $V_{RWM}$ | Working Peak Reverse Voltage |
| $V_{BR}$ | Breakdown Voltage @ $I_T$ |
| $V_C$ | Clamping Voltage @ $I_{PP}$ |
| $I_F$ | Forward Current |
| $I_R$ | Maximum Reverse Leak Current @ $V_{RWM}$ |
| $I_T$ | Test Current |
| $I_{PP}$ | Maximum Reverse Peak Pulse Current |

# SMAJ Series

## 400W

Operating Voltage: 5.0 to 440V
Peak Pulse Power: 400W

***SMA/ DO-214AC***


RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 400 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle) : 0.01%
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix; suffixes without A, the VBR is ± 10%.
  (e.g. SMAJ5.0C , SMAJ440CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25˚C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 400 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 40 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMAJ5.0A | SMAJ5.0CA | AE | WE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 43.5 | 800 |
| SMAJ6.0A | SMAJ6.0CA | AG | WG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 38.8 | 800 |
| SMAJ6.5A | SMAJ6.5CA | AK | WK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 35.7 | 500 |
| SMAJ7.0A | SMAJ7.0CA | AM | WM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 33.3 | 200 |
| SMAJ7.5A | SMAJ7.5CA | AP | WP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 31.0 | 100 |
| SMAJ8.0A | SMAJ8.0CA | AR | WR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 29.4 | 50 |
| SMAJ8.5A | SMAJ8.5CA | AT | WT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 27.8 | 20 |
| SMAJ9.0A | SMAJ9.0CA | AV | WV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 26.0 | 10 |
| SMAJ10A | SMAJ10CA | AX | WX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 23.5 | 5 |
| SMAJ11A | SMAJ11CA | AZ | WZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 22.0 | 1 |
| SMAJ12A | SMAJ12CA | BE | XE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 20.1 | 1 |
| SMAJ13A | SMAJ13CA | BG | XG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 18.6 | 1 |
| SMAJ14A | SMAJ14CA | BK | XK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 17.2 | 1 |
| SMAJ15A | SMAJ15CA | BM | XM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 16.4 | 1 |
| SMAJ16A | SMAJ16CA | BP | XP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 15.4 | 1 |
| SMAJ17A | SMAJ17CA | BR | XR | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 14.5 | 1 |
| SMAJ18A | SMAJ18CA | BT | XT | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 13.7 | 1 |
| SMAJ20A | SMAJ20CA | BV | XV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 12.3 | 1 |
| SMAJ22A | SMAJ22CA | BX | XX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 11.3 | 1 |
| SMAJ24A | SMAJ24CA | BZ | XZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 10.3 | 1 |
| SMAJ26A | SMAJ26CA | CE | YE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 9.5 | 1 |
| SMAJ28A | SMAJ28CA | CG | YG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 8.8 | 1 |
| SMAJ30A | SMAJ30CA | CK | YK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 8.3 | 1 |
| SMAJ33A | SMAJ33CA | CM | YM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 7.5 | 1 |
| SMAJ36A | SMAJ36CA | CP | YP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 6.9 | 1 |
| SMAJ40A | SMAJ40CA | CR | YR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 6.2 | 1 |
| SMAJ43A | SMAJ43CA | CT | YT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 5.8 | 1 |
| SMAJ45A | SMAJ45CA | CV | YV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 5.5 | 1 |
| SMAJ48A | SMAJ48CA | CX | YX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 5.2 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25℃ unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMAJ51A | SMAJ51CA | CZ | YZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 4.9 | 1 |
| SMAJ54A | SMAJ54CA | RE | ZE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 4.6 | 1 |
| SMAJ58A | SMAJ58CA | RG | ZG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 4.3 | 1 |
| SMAJ60A | SMAJ60CA | RK | ZK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 4.1 | 1 |
| SMAJ64A | SMAJ64CA | RM | ZM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 3.9 | 1 |
| SMAJ70A | SMAJ70CA | RP | ZP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 3.5 | 1 |
| SMAJ75A | SMAJ75CA | RR | ZR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 3.3 | 1 |
| SMAJ78A | SMAJ78CA | RT | ZT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 3.2 | 1 |
| SMAJ85A | SMAJ85CA | RV | ZV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 2.9 | 1 |
| SMAJ90A | SMAJ90CA | RX | ZX | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 2.7 | 1 |
| SMAJ100A | SMAJ100CA | RZ | ZZ | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 2.5 | 1 |
| SMAJ110A | SMAJ110CA | SE | VE | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 2.3 | 1 |
| SMAJ120A | SMAJ120CA | SG | VG | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 2.1 | 1 |
| SMAJ130A | SMAJ130CA | SK | VK | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 1.9 | 1 |
| SMAJ150A | SMAJ150CA | SM | VM | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 1.6 | 1 |
| SMAJ160A | SMAJ160CA | SP | VP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 1.5 | 1 |
| SMAJ170A | SMAJ170CA | SR | VR | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 1.5 | 1 |
| SMAJ180A | SMAJ180CA | ST | VT | 180.0 | 201.00 | 222.00 | 1 | 292.0 | 1.4 | 1 |
| SMAJ200A | SMAJ200CA | SV | VV | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 1.2 | 1 |
| SMAJ220A | SMAJ220CA | SX | VX | 220.0 | 246.00 | 272.00 | 1 | 356.0 | 1.1 | 1 |
| SMAJ250A | SMAJ250CA | SZ | VZ | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 1.0 | 1 |
| SMAJ300A | SMAJ300CA | TE | UE | 300.0 | 335.00 | 371.00 | 1 | 486.0 | 0.8 | 1 |
| SMAJ350A | SMAJ350CA | TG | UG | 350.0 | 391.00 | 432.00 | 1 | 567.0 | 0.7 | 1 |
| SMAJ400A | SMAJ400CA | TK | UK | 400.0 | 447.00 | 494.00 | 1 | 648.0 | 0.6 | 1 |
| SMAJ440A | SMAJ440CA | TM | UM | 440.0 | 492.00 | 543.00 | 1 | 713.0 | 0.6 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

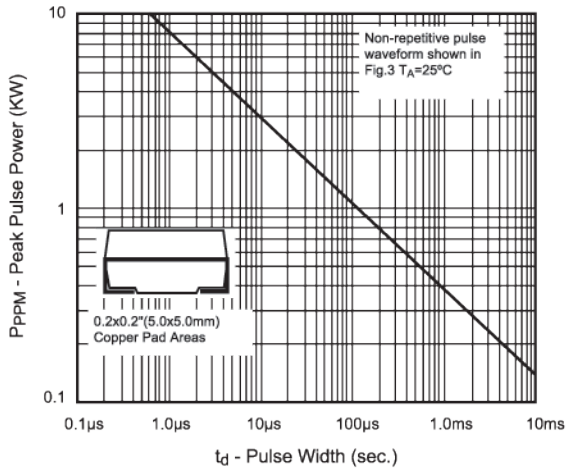



**Fig. 2 - Pulse Derating Curve**

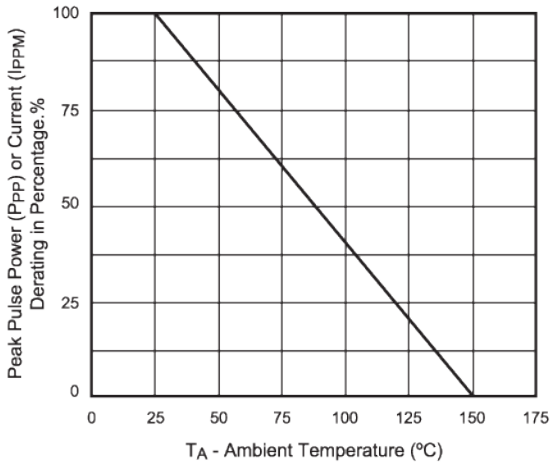



**Fig. 3 - Pulse Waveform**

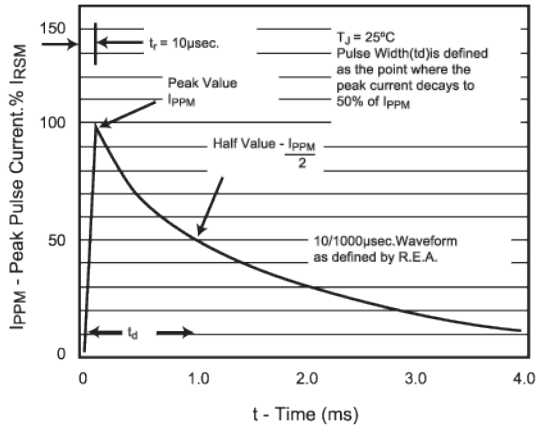



**Fig. 4 - Typical Junction Capacitance**

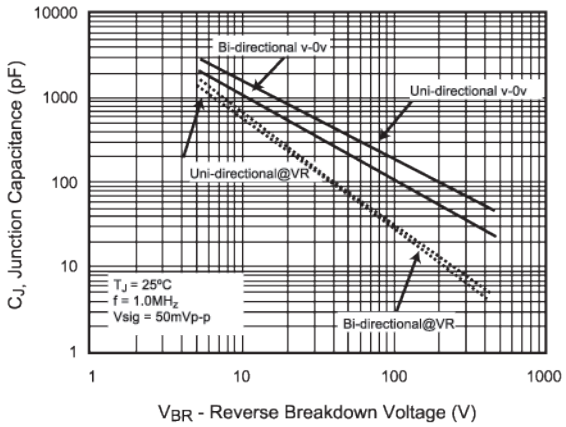



**Fig. 5 - Steady State Power Derating Curve**

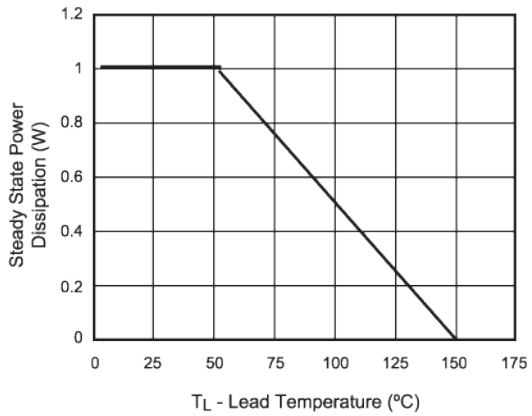
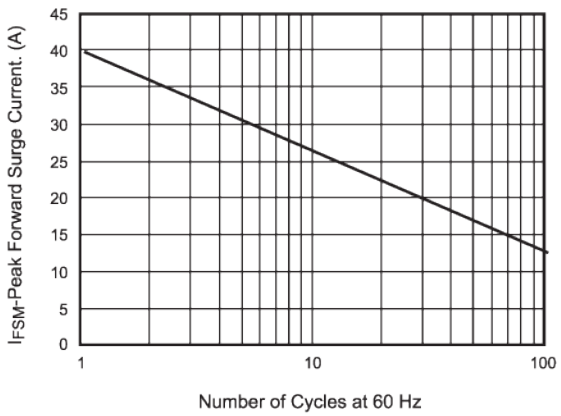
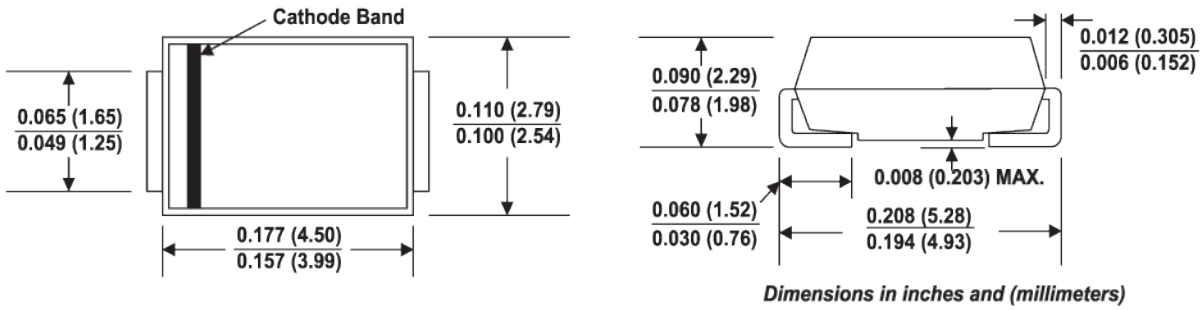



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**

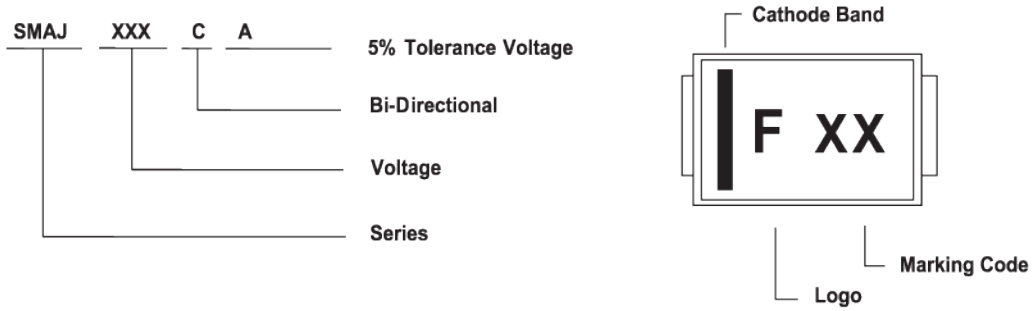


## Dimension / DO-214AC (SMA)




*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| SMAJxxxXX | DO-214AC | 5000 | Tape & Reel - 12mm/13" tape | EIA STD RS-481 |
| SMAJxxxXX | DO-214AC | 1000 | Tape & Reel - 12mm/ 7" tape | EIA STD RS-481 |

# P4SMA Series

## 400W

Operating Voltage : 6.8 to 550V
Peak Pulse Power : 400W

***SMA/ DO-214AC***


RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 400 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate ( duty cycle ) : 0.01 %
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix ; suffixes without A, the VBR is ± 10%.
  (e.g. P4SMAJ6.8C , P4SMA550CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25˚C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 400 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 40 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| P4SMA6.8A | P4SMA6.8CA | 6V8A | 6V8C | 5.8 | 6.45 | 7.14 | 10 | 10.5 | 39.0 | 1000 |
| P4SMA7.5A | P4SMA7.5CA | 7V5A | 7V5C | 6.4 | 7.13 | 7.88 | 10 | 11.3 | 36.3 | 500 |
| P4SMA8.2A | P4SMA8.2CA | 8V2A | 8V2C | 7.0 | 7.79 | 8.61 | 10 | 12.1 | 33.9 | 200 |
| P4SMA9.1A | P4SMA9.1CA | 9V1A | 9V1C | 7.8 | 8.65 | 9.55 | 1 | 13.4 | 30.6 | 50 |
| P4SMA10A | P4SMA10CA | 10A | 10C | 8.6 | 9.50 | 10.50 | 1 | 14.5 | 28.3 | 10 |
| P4SMA11A | P4SMA11CA | 11A | 11C | 9.4 | 10.50 | 11.60 | 1 | 15.2 | 26.3 | 5 |
| P4SMA12A | P4SMA12CA | 12A | 12C | 10.2 | 11.40 | 12.60 | 1 | 16.7 | 24.6 | 5 |
| P4SMA13A | P4SMA13CA | 13A | 13C | 11.1 | 12.40 | 13.70 | 1 | 18.2 | 22.5 | 1 |
| P4SMA15A | P4SMA15CA | 15A | 15C | 12.8 | 14.30 | 15.80 | 1 | 21.2 | 19.3 | 1 |
| P4SMA16A | P4SMA16CA | 16A | 16C | 13.6 | 15.20 | 16.80 | 1 | 22.5 | 18.2 | 1 |
| P4SMA18A | P4SMA18CA | 18A | 18C | 15.3 | 17.10 | 18.90 | 1 | 25.3 | 16.1 | 1 |
| P4SMA20A | P4SMA20CA | 20A | 20C | 17.1 | 19.00 | 21.00 | 1 | 27.7 | 14.8 | 1 |
| P4SMA22A | P4SMA22CA | 22A | 22C | 18.8 | 20.90 | 23.10 | 1 | 30.6 | 13.4 | 1 |
| P4SMA24A | P4SMA24CA | 24A | 24C | 20.5 | 22.80 | 25.20 | 1 | 33.2 | 12.3 | 1 |
| P4SMA27A | P4SMA27CA | 27A | 27C | 23.1 | 25.70 | 28.40 | 1 | 37.5 | 10.9 | 1 |
| P4SMA30A | P4SMA30CA | 30A | 30C | 25.6 | 28.50 | 31.50 | 1 | 41.4 | 9.9 | 1 |
| P4SMA33A | P4SMA33CA | 33A | 33C | 28.2 | 31.40 | 34.70 | 1 | 45.7 | 9.0 | 1 |
| P4SMA36A | P4SMA36CA | 36A | 36C | 30.8 | 34.20 | 37.80 | 1 | 49.9 | 8.2 | 1 |
| P4SMA39A | P4SMA39CA | 39A | 39C | 33.3 | 37.10 | 41.00 | 1 | 53.9 | 7.6 | 1 |
| P4SMA43A | P4SMA43CA | 43A | 43C | 36.8 | 40.90 | 45.20 | 1 | 59.3 | 6.9 | 1 |
| P4SMA47A | P4SMA47CA | 47A | 47C | 40.2 | 44.70 | 49.40 | 1 | 64.8 | 6.3 | 1 |
| P4SMA51A | P4SMA51CA | 51A | 51C | 43.6 | 48.50 | 53.60 | 1 | 70.1 | 5.8 | 1 |
| P4SMA56A | P4SMA56CA | 56A | 56C | 47.8 | 53.20 | 58.80 | 1 | 77.0 | 5.3 | 1 |
| P4SMA62A | P4SMA62CA | 62A | 62C | 53.0 | 58.90 | 65.10 | 1 | 85.0 | 4.8 | 1 |
| P4SMA68A | P4SMA68CA | 68A | 68C | 58.1 | 64.60 | 71.40 | 1 | 92.0 | 4.5 | 1 |
| P4SMA75A | P4SMA75CA | 75A | 75C | 64.1 | 71.30 | 78.80 | 1 | 103.0 | 4.0 | 1 |
| P4SMA82A | P4SMA82CA | 82A | 82C | 70.1 | 77.90 | 86.10 | 1 | 113.0 | 3.6 | 1 |
| P4SMA91A | P4SMA91CA | 91A | 91C | 77.8 | 86.50 | 95.50 | 1 | 125.0 | 3.3 | 1 |
| P4SMA100A | P4SMA100CA | 100A | 100C | 85.5 | 95.00 | 105.00 | 1 | 137.0 | 3.0 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| P4SMA110A | P4SMA110CA | 110A | 110C | 94.0 | 105.00 | 116.00 | 1 | 152.0 | 2.7 | 1 |
| P4SMA120A | P4SMA120CA | 120A | 120C | 102.0 | 114.00 | 126.00 | 1 | 165.0 | 2.5 | 1 |
| P4SMA130A | P4SMA130CA | 130A | 130C | 111.0 | 124.00 | 137.00 | 1 | 179.0 | 2.3 | 1 |
| P4SMA150A | P4SMA150CA | 150A | 150C | 128.0 | 143.00 | 158.00 | 1 | 207.0 | 2.0 | 1 |
| P4SMA160A | P4SMA160CA | 160A | 160C | 136.0 | 152.00 | 168.00 | 1 | 219.0 | 1.9 | 1 |
| P4SMA170A | P4SMA170CA | 170A | 170C | 145.0 | 162.00 | 179.00 | 1 | 234.0 | 1.8 | 1 |
| P4SMA180A | P4SMA180CA | 180A | 180C | 154.0 | 171.00 | 189.00 | 1 | 246.0 | 1.7 | 1 |
| P4SMA200A | P4SMA200CA | 200A | 200C | 171.0 | 190.00 | 210.00 | 1 | 274.0 | 1.5 | 1 |
| P4SMA220A | P4SMA220CA | 220A | 220C | 185.0 | 209.00 | 231.00 | 1 | 328.0 | 1.3 | 1 |
| P4SMA250A | P4SMA250CA | 250A | 250C | 214.0 | 237.00 | 263.00 | 1 | 344.0 | 1.2 | 1 |
| P4SMA300A | P4SMA300CA | 300A | 300C | 256.0 | 285.00 | 315.00 | 1 | 414.0 | 1.0 | 1 |
| P4SMA350A | P4SMA350CA | 350A | 350C | 300.0 | 332.00 | 368.00 | 1 | 482.0 | 0.9 | 1 |
| P4SMA400A | P4SMA400CA | 400A | 400C | 342.0 | 380.00 | 420.00 | 1 | 548.0 | 0.8 | 1 |
| P4SMA440A | P4SMA440CA | 440A | 440C | 376.0 | 418.00 | 462.00 | 1 | 602.0 | 0.7 | 1 |
| P4SMA480A | P4SMA480CA | 480A | 480C | 408.0 | 456.00 | 504.00 | 1 | 658.0 | 0.6 | 1 |
| P4SMA510A | P4SMA510CA | 510A | 510C | 434.0 | 485.00 | 535.00 | 1 | 698.0 | 0.6 | 1 |
| P4SMA530A | P4SMA530CA | 530A | 530C | 477.0 | 503.50 | 556.50 | 1 | 725.0 | 0.6 | 1 |
| P4SMA540A | P4SMA540CA | 540A | 540C | 486.0 | 513.00 | 567.00 | 1 | 740.0 | 0.5 | 1 |
| P4SMA550A | P4SMA550CA | 550A | 550C | 495.0 | 522.50 | 577.50 | 1 | 760.0 | 0.5 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

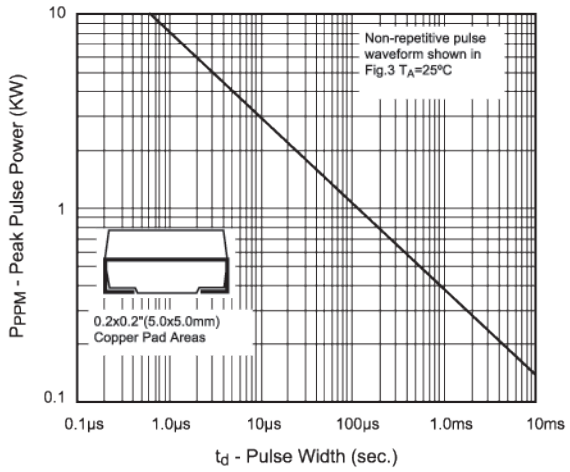



**Fig. 2 - Pulse Derating Curve**

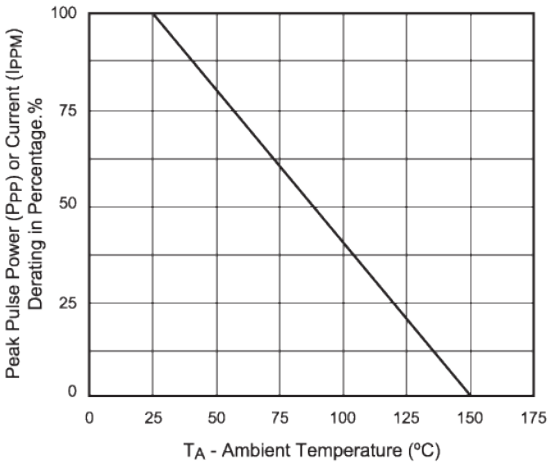



**Fig. 3 - Pulse Waveform**

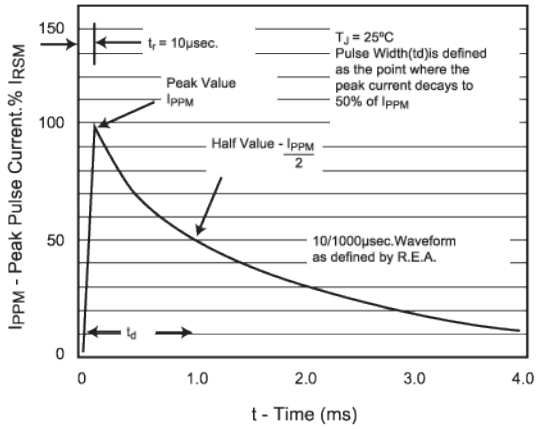



**Fig. 4 - Typical Junction Capacitance**

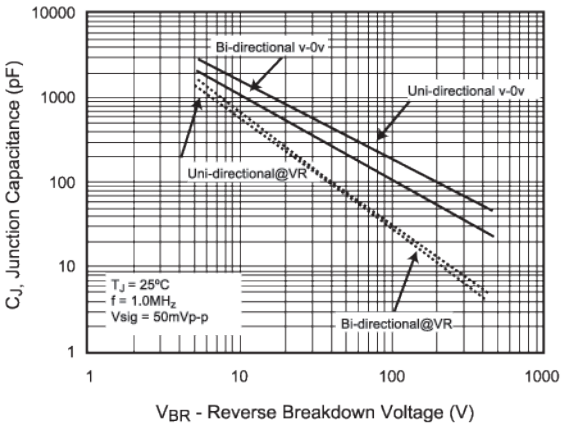



**Fig. 5 - Steady State Power Derating Curve**

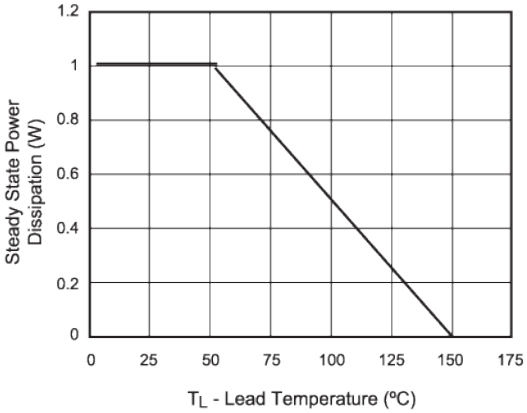
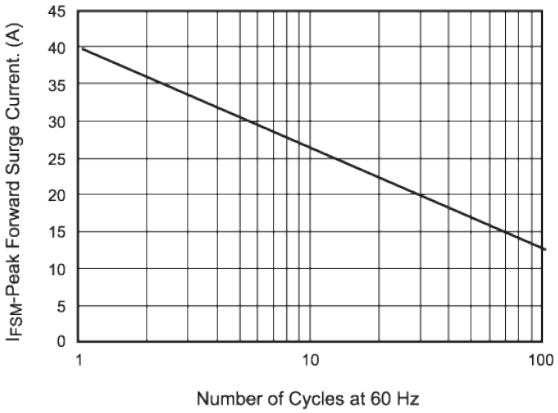
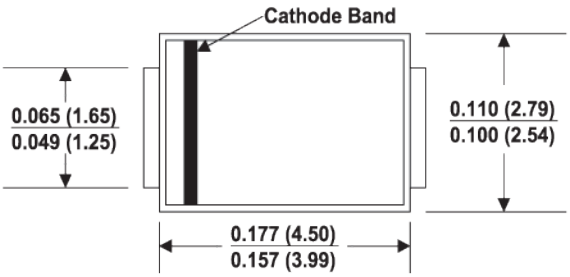
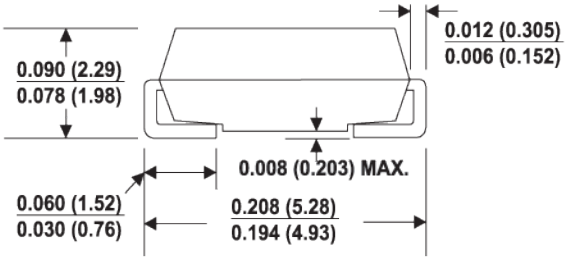



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**



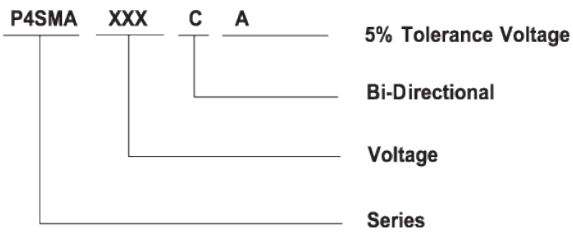
## Dimension / DO-214AC (SMA)

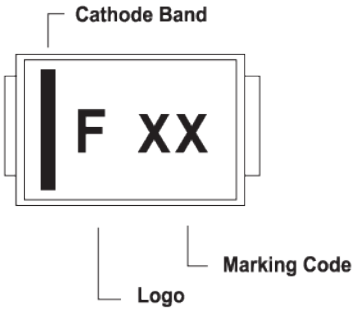



*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| P4SMAxxxXX | DO-214AC | 5000 | Tape & Reel - 12mm/13" tape | EIA STD RS-481 |
| P4SMAxxxXX | DO-214AC | 1000 | Tape & Reel - 12mm/ 7" tape | EIA STD RS-481 |

# SMA6J Series

## 600W

Operating Voltage : 5.0 to 130V
Peak Pulse Power: 600W

***SMA/ DO-214AC***


RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 600 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle) : 0.01%
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix; suffixes without A, the VBR is ± 10%.
  (e.g. SMA6J5.0C, SMA6J90CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25˚C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 600 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 65 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMA6J5.0A | SMA6J5.0CA | KE | TE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 65.3 | 800 |
| SMA6J6.0A | SMA6J6.0CA | KG | TG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 58.3 | 800 |
| SMA6J6.5A | SMA6J6.5CA | KK | TK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 53.6 | 500 |
| SMA6J7.0A | SMA6J7.0CA | KM | TM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 50.0 | 200 |
| SMA6J7.5A | SMA6J7.5CA | KP | TP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 46.6 | 100 |
| SMA6J8.0A | SMA6J8.0CA | KR | TR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 44.2 | 50 |
| SMA6J8.5A | SMA6J8.5CA | KT | TT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 41.7 | 20 |
| SMA6J9.0A | SMA6J9.0CA | KV | TV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 39.0 | 10 |
| SMA6J10A | SMA6J10CA | KX | TX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 35.3 | 5 |
| SMA6J11A | SMA6J11CA | KZ | TZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 33.0 | 1 |
| SMA6J12A | SMA6J12CA | LE | UE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 30.2 | 1 |
| SMA6J13A | SMA6J13CA | LG | UG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 28.0 | 1 |
| SMA6J14A | SMA6J14CA | LK | UK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 25.9 | 1 |
| SMA6J15A | SMA6J15CA | LM | UM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 24.6 | 1 |
| SMA6J16A | SMA6J16CA | LP | UP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 23.1 | 1 |
| SMA6J17A | SMA6J17CA | LR | UR | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 21.8 | 1 |
| SMA6J18A | SMA6J18CA | LT | UT | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 20.6 | 1 |
| SMA6J20A | SMA6J20CA | LV | UV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 18.6 | 1 |
| SMA6J22A | SMA6J22CA | LX | UX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 16.9 | 1 |
| SMA6J24A | SMA6J24CA | LZ | UZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 15.5 | 1 |
| SMA6J26A | SMA6J26CA | ME | WE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 14.3 | 1 |
| SMA6J28A | SMA6J28CA | MG | WG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 13.3 | 1 |
| SMA6J30A | SMA6J30CA | MK | WK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 12.4 | 1 |
| SMA6J33A | SMA6J33CA | MM | WM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 11.3 | 1 |
| SMA6J36A | SMA6J36CA | MP | WP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 10.4 | 1 |
| SMA6J40A | SMA6J40CA | MR | WR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 9.3 | 1 |
| SMA6J43A | SMA6J43CA | MT | WT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 8.7 | 1 |
| SMA6J45A | SMA6J45CA | MV | WV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 8.3 | 1 |
| SMA6J48A | SMA6J48CA | MX | WX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 7.8 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMA6J51A | SMA6J51CA | MZ | WZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 7.3 | 1 |
| SMA6J54A | SMA6J54CA | NE | XE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 6.9 | 1 |
| SMA6J58A | SMA6J58CA | NG | XG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 6.5 | 1 |
| SMA6J60A | SMA6J60CA | NK | XK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 6.2 | 1 |
| SMA6J64A | SMA6J64CA | NM | XM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 5.9 | 1 |
| SMA6J70A | SMA6J70CA | NP | XP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 5.3 | 1 |
| SMA6J75A | SMA6J75CA | NR | XR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 5.0 | 1 |
| SMA6J78A | SMA6J78CA | NT | XT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 4.8 | 1 |
| SMA6J85A | SMA6J85CA | NV | XV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 4.4 | 1 |
| SMA6J90A | SMA6J90CA | PE | YE | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 4.1 | 1 |
| SMA6J100A | - | PG | - | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 3.7 | 1 |
| SMA6J110A | - | PK | - | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 3.4 | 1 |
| SMA6J120A | - | PM | - | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 3.1 | 1 |
| SMA6J130A | - | PP | - | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 2.9 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

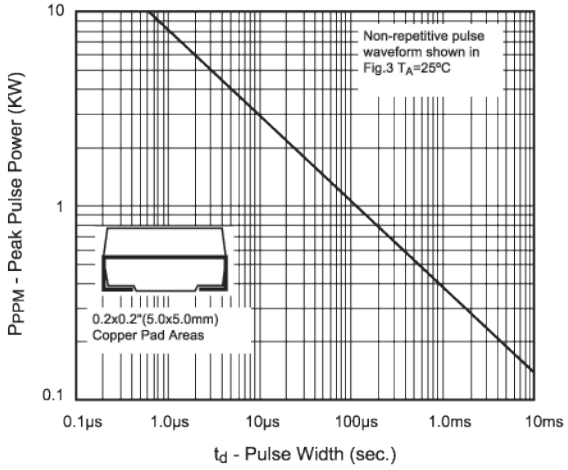



**Fig. 2 - Pulse Derating Curve**

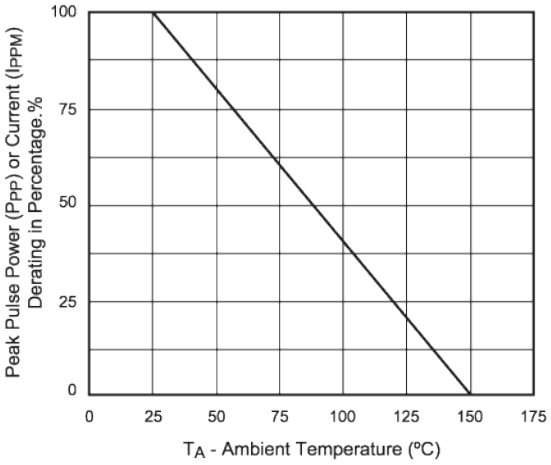



**Fig. 3 - Pulse Waveform**

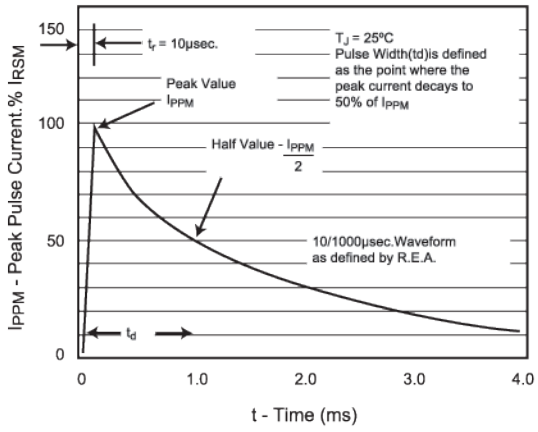



**Fig. 4 - Typical Junction Capacitance**

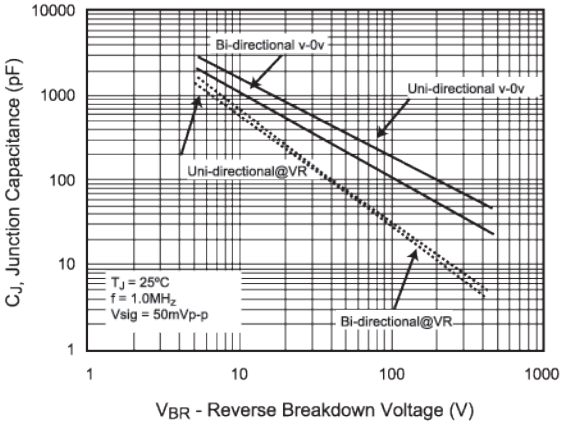



**Fig. 5 - Steady State Power Derating Curve**

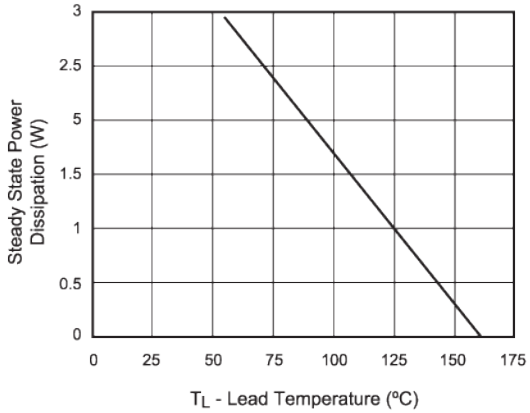
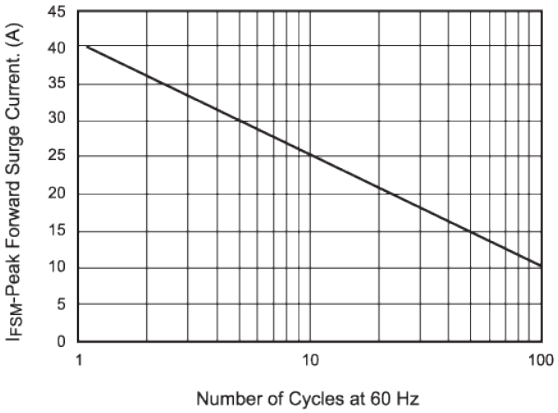
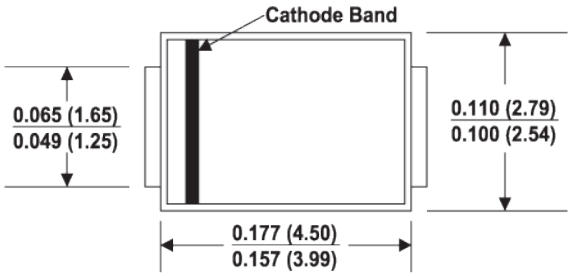
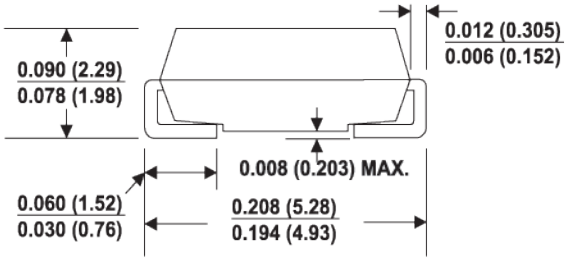



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**



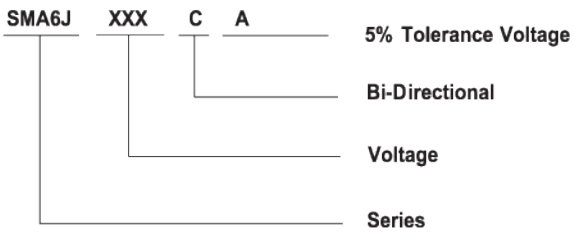
## Dimension / DO-214AC (SMA)

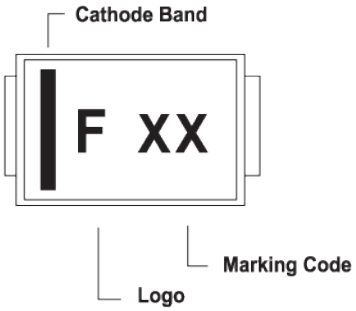



*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| SMA6JxxxXX | DO-214AC | 5000 | Tape & Reel - 12mm/13" tape | EIA STD RS-481 |
| SMA6JxxxXX | DO-214AC | 1000 | Tape & Reel - 12mm/ 7" tape | EIA STD RS-481 |

# SMBJ Series

## 600W

Operating Voltage : 5.0 to 440V
Peak Pulse Power: 600W

***SMB/ DO-214AA***

RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 600 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle) : 0.01%
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix; suffixes without A, the VBR is ± 10%.
  (e.g. SMBJ5.0C , SMBJ440CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 600 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 100 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMBJ5.0A | SMBJ5.0CA | KE | AE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 65.3 | 800 |
| SMBJ6.0A | SMBJ6.0CA | KG | AG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 58.3 | 800 |
| SMBJ6.5A | SMBJ6.5CA | KK | AK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 53.6 | 500 |
| SMBJ7.0A | SMBJ7.0CA | KM | AM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 50.0 | 200 |
| SMBJ7.5A | SMBJ7.5CA | KP | AP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 46.6 | 100 |
| SMBJ8.0A | SMBJ8.0CA | KR | AR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 44.2 | 50 |
| SMBJ8.5A | SMBJ8.5CA | KT | AT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 41.7 | 20 |
| SMBJ9.0A | SMBJ9.0CA | KV | AV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 39.0 | 10 |
| SMBJ10A | SMBJ10CA | KX | AX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 35.3 | 5 |
| SMBJ11A | SMBJ11CA | KZ | AZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 33.0 | 1 |
| SMBJ12A | SMBJ12CA | LE | BE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 30.2 | 1 |
| SMBJ13A | SMBJ13CA | LG | BG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 28.0 | 1 |
| SMBJ14A | SMBJ14CA | LK | BK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 25.9 | 1 |
| SMBJ15A | SMBJ15CA | LM | BM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 24.6 | 1 |
| SMBJ16A | SMBJ16CA | LP | BP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 23.1 | 1 |
| SMBJ17A | SMBJ17CA | LR | BR | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 21.8 | 1 |
| SMBJ18A | SMBJ18CA | LT | BT | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 20.6 | 1 |
| SMBJ20A | SMBJ20CA | LV | BV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 18.6 | 1 |
| SMBJ22A | SMBJ22CA | LX | BX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 16.9 | 1 |
| SMBJ24A | SMBJ24CA | LZ | BZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 15.5 | 1 |
| SMBJ26A | SMBJ26CA | ME | CE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 14.3 | 1 |
| SMBJ28A | SMBJ28CA | MG | CG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 13.3 | 1 |
| SMBJ30A | SMBJ30CA | MK | CK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 12.4 | 1 |
| SMBJ33A | SMBJ33CA | MM | CM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 11.3 | 1 |
| SMBJ36A | SMBJ36CA | MP | CP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 10.4 | 1 |
| SMBJ40A | SMBJ40CA | MR | CR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 9.3 | 1 |
| SMBJ43A | SMBJ43CA | MT | CT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 8.7 | 1 |
| SMBJ45A | SMBJ45CA | MV | CV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 8.3 | 1 |
| SMBJ48A | SMBJ48CA | MX | CX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 7.8 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMBJ51A | SMBJ51CA | MZ | CZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 7.3 | 1 |
| SMBJ54A | SMBJ54CA | NE | DE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 6.9 | 1 |
| SMBJ58A | SMBJ58CA | NG | DG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 6.5 | 1 |
| SMBJ60A | SMBJ60CA | NK | DK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 6.2 | 1 |
| SMBJ64A | SMBJ64CA | NM | DM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 5.9 | 1 |
| SMBJ70A | SMBJ70CA | NP | DP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 5.3 | 1 |
| SMBJ75A | SMBJ75CA | NR | DR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 5.0 | 1 |
| SMBJ78A | SMBJ78CA | NT | DT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 4.8 | 1 |
| SMBJ85A | SMBJ85CA | NV | DV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 4.4 | 1 |
| SMBJ90A | SMBJ90CA | NX | DX | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 4.1 | 1 |
| SMBJ100A | SMBJ100CA | NZ | DZ | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 3.7 | 1 |
| SMBJ110A | SMBJ110CA | PE | EE | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 3.4 | 1 |
| SMBJ120A | SMBJ120CA | PG | EG | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 3.1 | 1 |
| SMBJ130A | SMBJ130CA | PK | EK | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 2.9 | 1 |
| SMBJ150A | SMBJ150CA | PM | EM | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 2.5 | 1 |
| SMBJ160A | SMBJ160CA | PP | EP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 2.3 | 1 |
| SMBJ170A | SMBJ170CA | PR | ER | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 2.2 | 1 |
| SMBJ180A | SMBJ180CA | PT | ET | 180.0 | 201.00 | 222.00 | 1 | 292.0 | 2.1 | 1 |
| SMBJ200A | SMBJ200CA | PV | EV | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 1.9 | 1 |
| SMBJ220A | SMBJ220CA | PX | EX | 220.0 | 246.00 | 272.00 | 1 | 356.0 | 1.7 | 1 |
| SMBJ250A | SMBJ250CA | PZ | EZ | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 1.5 | 1 |
| SMBJ300A | SMBJ300CA | QE | FE | 300.0 | 335.00 | 371.00 | 1 | 486.0 | 1.3 | 1 |
| SMBJ350A | SMBJ350CA | QG | FG | 350.0 | 391.00 | 432.00 | 1 | 567.0 | 1.1 | 1 |
| SMBJ400A | SMBJ400CA | QK | FK | 400.0 | 447.00 | 494.00 | 1 | 648.0 | 0.9 | 1 |
| SMBJ440A | SMBJ440CA | QM | FM | 440.0 | 492.00 | 543.00 | 1 | 713.0 | 0.9 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

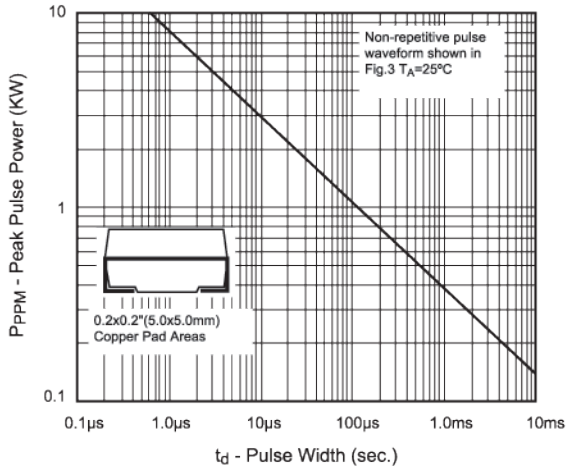



**Fig. 2 - Pulse Derating Curve**

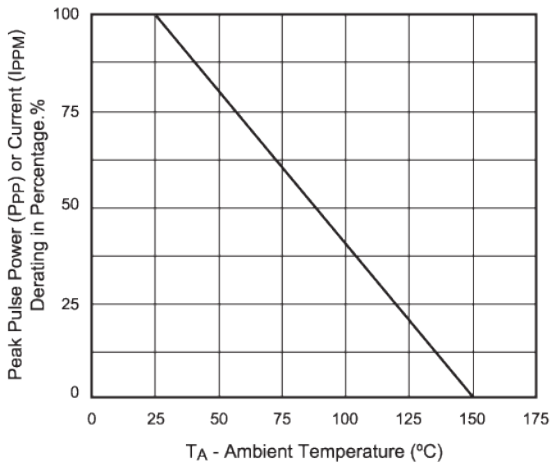



**Fig. 3 - Pulse Waveform**

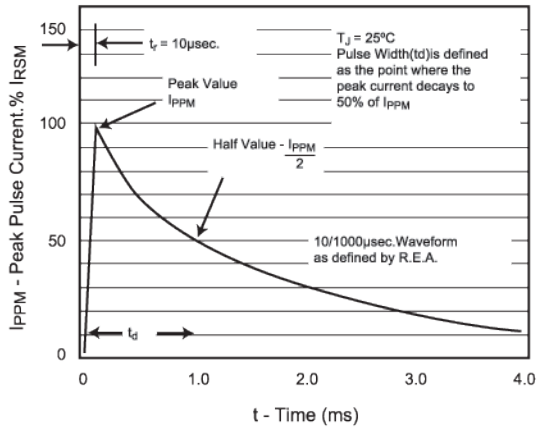



**Fig. 4 - Typical Junction Capacitance**

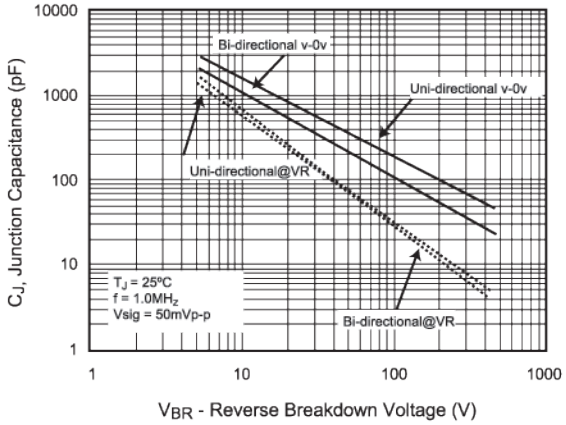



**Fig. 5 - Steady State Power Derating Curve**

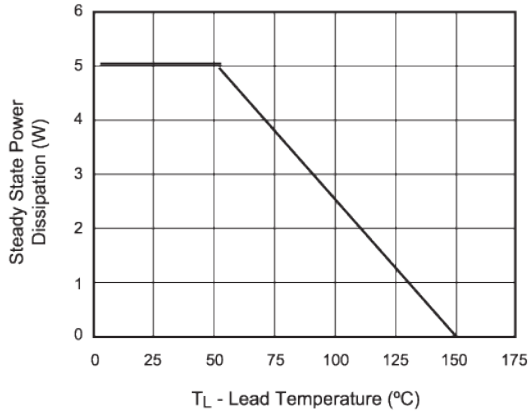
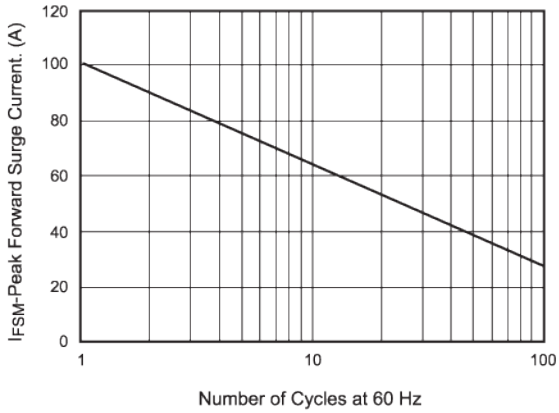
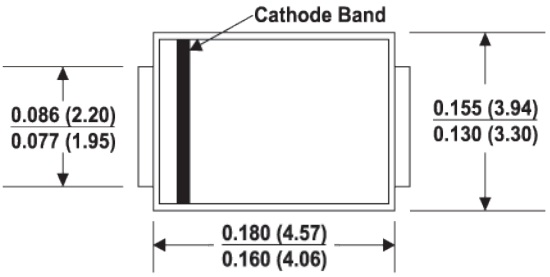
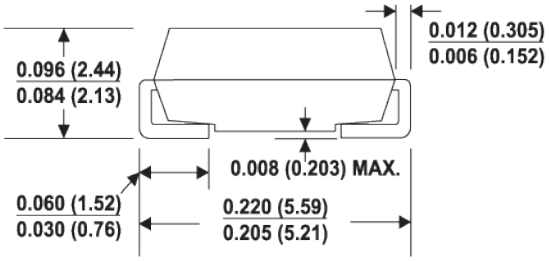



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**



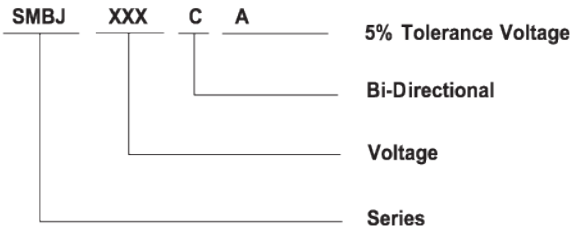
## Dimension / DO-214AA (SMB J-Bend)

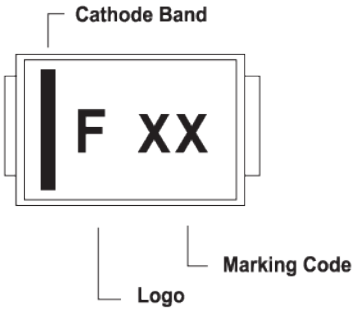



*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| SMBJxxxXX | DO-214AA | 3000 | Tape & Reel - 12mm/13" tape | EIA STD RS-481 |
| SMBJxxxXX | DO-214AA | 500 | Tape & Reel - 12mm/ 7" tape | EIA STD RS-481 |

# P6SMB Series

## 600W

Operating Voltage : 6.8 to 550V
Peak Pulse Power: 600W

***SMB/ DO-214AA***


RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 600 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate ( duty cycle ) : 0.01 %
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix ; suffixes without A, the VBR is ± 10%.
  (e.g. P6SMB6.8C , P6SMB550CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 600 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 100 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| P6SMB6.8A | P6SMB6.8CA | 6V8A | 6V8C | 5.8 | 6.45 | 7.14 | 10 | 10.5 | 58.1 | 1000 |
| P6SMB7.5A | P6SMB7.5CA | 7V5A | 7V5C | 6.4 | 7.13 | 7.88 | 10 | 11.3 | 54.0 | 500 |
| P6SMB8.2A | P6SMB8.2CA | 8V2A | 8V2C | 7.0 | 7.79 | 8.61 | 10 | 12.1 | 50.4 | 200 |
| P6SMB9.1A | P6SMB9.1CA | 9V1A | 9V1C | 7.8 | 8.65 | 9.55 | 1 | 13.4 | 45.5 | 50 |
| P6SMB10A | P6SMB10CA | 10A | 10C | 8.6 | 9.50 | 10.50 | 1 | 14.5 | 42.1 | 10 |
| P6SMB11A | P6SMB11CA | 11A | 11C | 9.4 | 10.50 | 11.60 | 1 | 15.2 | 39.1 | 5 |
| P6SMB12A | P6SMB12CA | 12A | 12C | 10.2 | 11.40 | 12.60 | 1 | 16.7 | 36.5 | 5 |
| P6SMB13A | P6SMB13CA | 13A | 13C | 11.1 | 12.40 | 13.70 | 1 | 18.2 | 33.5 | 1 |
| P6SMB15A | P6SMB15CA | 15A | 15C | 12.8 | 14.30 | 15.80 | 1 | 21.2 | 28.8 | 1 |
| P6SMB16A | P6SMB16CA | 16A | 16C | 13.6 | 15.20 | 16.80 | 1 | 22.5 | 27.1 | 1 |
| P6SMB18A | P6SMB18CA | 18A | 18C | 15.3 | 17.10 | 18.90 | 1 | 25.5 | 24.2 | 1 |
| P6SMB20A | P6SMB20CA | 20A | 20C | 17.1 | 19.00 | 21.00 | 1 | 27.7 | 22.0 | 1 |
| P6SMB22A | P6SMB22CA | 22A | 22C | 18.8 | 20.90 | 23.10 | 1 | 30.6 | 19.9 | 1 |
| P6SMB24A | P6SMB24CA | 24A | 24C | 20.5 | 22.80 | 25.20 | 1 | 33.2 | 18.4 | 1 |
| P6SMB27A | P6SMB27CA | 27A | 27C | 23.1 | 25.70 | 28.40 | 1 | 37.5 | 16.3 | 1 |
| P6SMB30A | P6SMB30CA | 30A | 30C | 25.6 | 28.50 | 31.50 | 1 | 41.4 | 14.7 | 1 |
| P6SMB33A | P6SMB33CA | 33A | 33C | 28.2 | 31.40 | 34.70 | 1 | 45.7 | 13.3 | 1 |
| P6SMB36A | P6SMB36CA | 36A | 36C | 30.8 | 34.20 | 37.80 | 1 | 49.9 | 12.2 | 1 |
| P6SMB39A | P6SMB39CA | 39A | 39C | 33.3 | 37.10 | 41.00 | 1 | 53.9 | 11.3 | 1 |
| P6SMB43A | P6SMB43CA | 43A | 43C | 36.8 | 40.90 | 45.20 | 1 | 59.3 | 10.3 | 1 |
| P6SMB47A | P6SMB47CA | 47A | 47C | 40.2 | 44.70 | 49.40 | 1 | 64.8 | 9.4 | 1 |
| P6SMB51A | P6SMB51CA | 51A | 51C | 43.6 | 48.50 | 53.60 | 1 | 70.1 | 8.7 | 1 |
| P6SMB56A | P6SMB56CA | 56A | 56C | 47.8 | 53.20 | 58.80 | 1 | 77.0 | 7.9 | 1 |
| P6SMB62A | P6SMB62CA | 62A | 62C | 53.0 | 58.90 | 65.10 | 1 | 85.0 | 7.2 | 1 |
| P6SMB68A | P6SMB68CA | 68A | 68C | 58.1 | 64.60 | 71.40 | 1 | 92.0 | 6.6 | 1 |
| P6SMB75A | P6SMB75CA | 75A | 75C | 64.1 | 71.30 | 78.80 | 1 | 103.0 | 5.9 | 1 |
| P6SMB82A | P6SMB82CA | 82A | 82C | 70.1 | 77.90 | 86.10 | 1 | 113.0 | 5.4 | 1 |
| P6SMB91A | P6SMB91CA | 91A | 91C | 77.8 | 86.50 | 95.50 | 1 | 125.0 | 4.9 | 1 |
| P6SMB100A | P6SMB100CA | 100A | 100C | 85.5 | 95.00 | 105.00 | 1 | 137.0 | 4.5 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| P6SMB110A | P6SMB110CA | 110A | 110C | 94.0 | 105.00 | 116.00 | 1 | 152.0 | 4.0 | 1 |
| P6SMB120A | P6SMB120CA | 120A | 120C | 102.0 | 114.00 | 126.00 | 1 | 165.0 | 3.7 | 1 |
| P6SMB130A | P6SMB130CA | 130A | 130C | 111.0 | 124.00 | 137.00 | 1 | 179.0 | 3.4 | 1 |
| P6SMB150A | P6SMB150CA | 150A | 150C | 128.0 | 143.00 | 158.00 | 1 | 207.0 | 2.9 | 1 |
| P6SMB160A | P6SMB160CA | 160A | 160C | 136.0 | 152.00 | 168.00 | 1 | 219.0 | 2.8 | 1 |
| P6SMB170A | P6SMB170CA | 170A | 170C | 145.0 | 162.00 | 179.00 | 1 | 234.0 | 2.6 | 1 |
| P6SMB180A | P6SMB180CA | 180A | 180C | 154.0 | 171.00 | 189.00 | 1 | 246.0 | 2.5 | 1 |
| P6SMB200A | P6SMB200CA | 200A | 200C | 171.0 | 190.00 | 210.00 | 1 | 274.0 | 2.2 | 1 |
| P6SMB220A | P6SMB220CA | 220A | 220C | 185.0 | 209.00 | 231.00 | 1 | 328.0 | 1.9 | 1 |
| P6SMB250A | P6SMB250CA | 250A | 250C | 214.0 | 237.00 | 263.00 | 1 | 344.0 | 1.8 | 1 |
| P6SMB300A | P6SMB300CA | 300A | 300C | 256.0 | 285.00 | 315.00 | 1 | 414.0 | 1.5 | 1 |
| P6SMB350A | P6SMB350CA | 350A | 350C | 300.0 | 332.00 | 368.00 | 1 | 482.0 | 1.3 | 1 |
| P6SMB400A | P6SMB400CA | 400A | 400C | 342.0 | 380.00 | 420.00 | 1 | 548.0 | 1.1 | 1 |
| P6SMB440A | P6SMB440CA | 440A | 440C | 376.0 | 418.00 | 462.00 | 1 | 602.0 | 1.0 | 1 |
| P6SMB480A | P6SMB480CA | 480A | 480C | 408.0 | 456.00 | 504.00 | 1 | 658.0 | 0.9 | 1 |
| P6SMB510A | P6SMB510CA | 510A | 510C | 434.0 | 485.00 | 535.00 | 1 | 698.0 | 0.9 | 1 |
| P6SMB530A | P6SMB530CA | 530A | 530C | 477.0 | 503.50 | 556.50 | 1 | 725.0 | 0.8 | 1 |
| P6SMB540A | P6SMB540CA | 540A | 540C | 486.0 | 513.00 | 567.00 | 1 | 740.0 | 0.8 | 1 |
| P6SMB550A | P6SMB550CA | 550A | 550C | 495.0 | 522.50 | 577.50 | 1 | 760.0 | 0.8 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

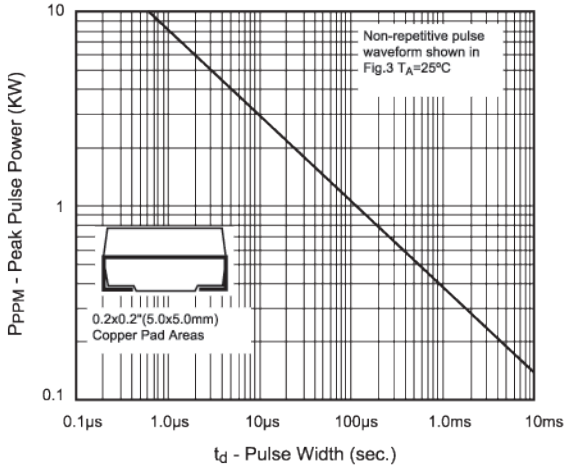



**Fig. 2 - Pulse Derating Curve**

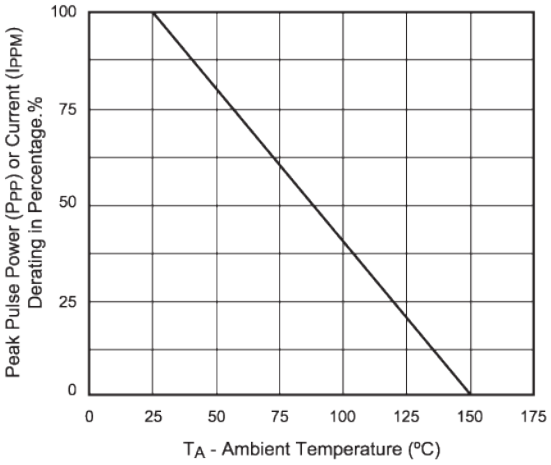



**Fig. 3 - Pulse Waveform**

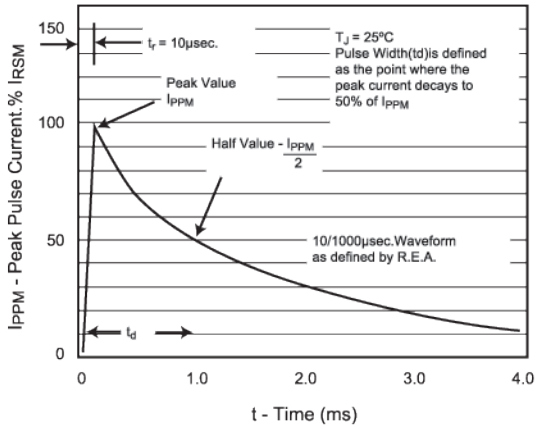



**Fig. 4 - Typical Junction Capacitance**

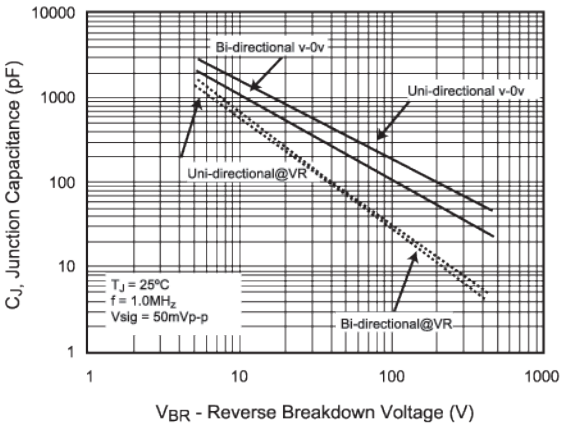



**Fig. 5 - Steady State Power Derating Curve**

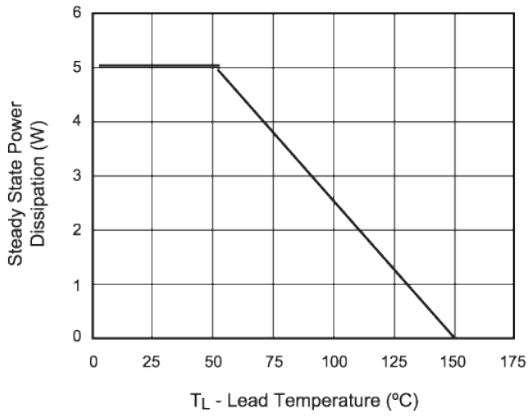
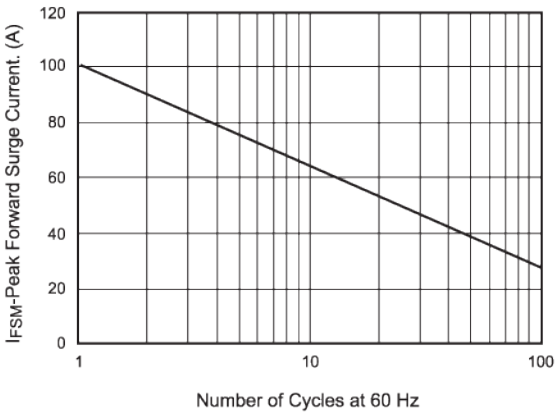
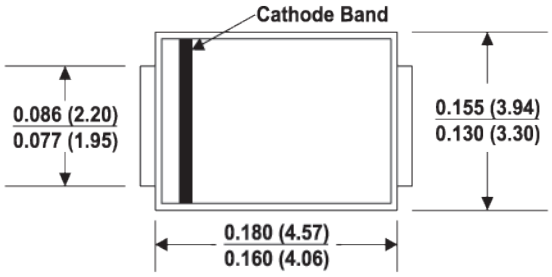
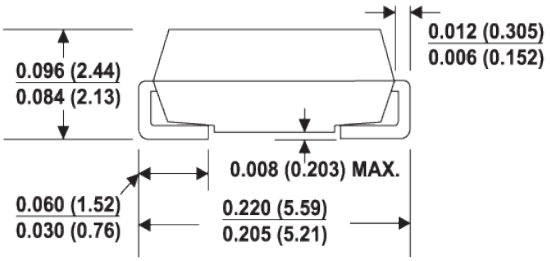



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**



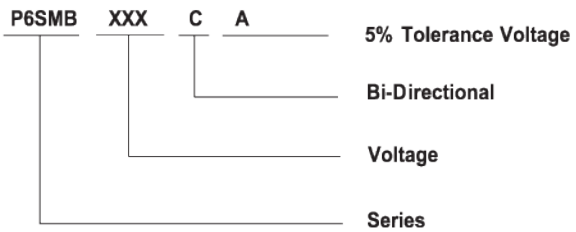
## Dimension / DO-214AA (SMB J-Bend)

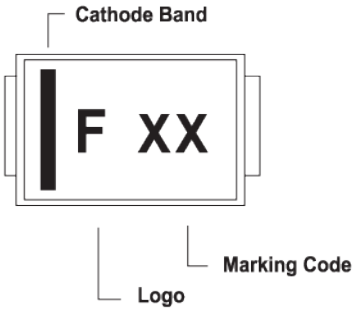



*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

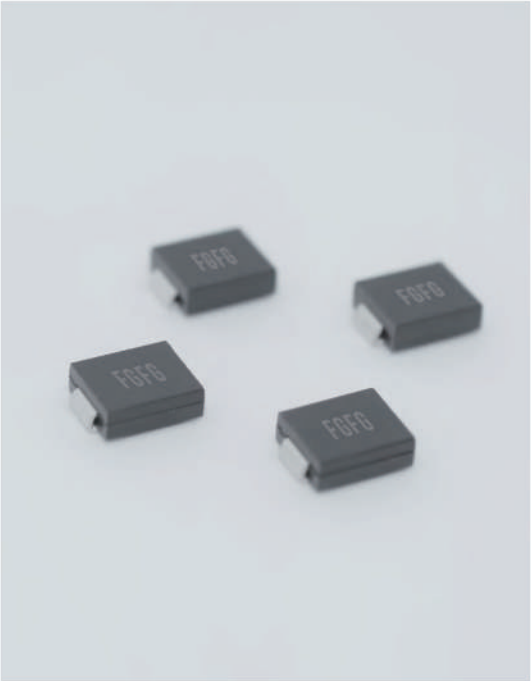
| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| P6SMBxxxXX | DO-214AA | 3000 | Tape & Reel - 12mm/13" tape | EIA STD RS-481 |
| P6SMBxxxXX | DO-214AA | 500 | Tape & Reel - 12mm/ 7" tape | EIA STD RS-481 |

# SMCJ Series

## 1500W

Operating Voltage : 5.0 to 440V
Peak Pulse Power: 1500W

***SMC/ DO-214AB***



RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 1500 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate ( duty cycle ) : 0.01 %
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant
- IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix ; suffixes without A, the VBR is ± 10%.
  (e.g. SMCJ5.0C , SMCJ440CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 1500 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 200 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMCJ5.0A | SMCJ5.0CA | GDE | GDE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 163.0 | 800 |
| SMCJ6.0A | SMCJ6.0CA | GDG | GDG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 145.7 | 800 |
| SMCJ6.5A | SMCJ6.5CA | GDK | GDK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 134.0 | 500 |
| SMCJ7.0A | SMCJ7.0CA | GDM | GDM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 125.0 | 200 |
| SMCJ7.5A | SMCJ7.5CA | GDP | GDP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 116.3 | 100 |
| SMCJ8.0A | SMCJ8.0CA | GDR | GDR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 110.3 | 50 |
| SMCJ8.5A | SMCJ8.5CA | GDT | GDT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 104.2 | 20 |
| SMCJ9.0A | SMCJ9.0CA | GDV | GDV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 97.4 | 10 |
| SMCJ10A | SMCJ10CA | GDX | GDX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 88.3 | 5 |
| SMCJ11A | SMCJ11CA | GDZ | GDZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 82.5 | 1 |
| SMCJ12A | SMCJ12CA | GEE | GEE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 75.4 | 1 |
| SMCJ13A | SMCJ13CA | GEG | GEG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 69.8 | 1 |
| SMCJ14A | SMCJ14CA | GEK | GEK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 64.7 | 1 |
| SMCJ15A | SMCJ15CA | GEM | GEM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 61.5 | 1 |
| SMCJ16A | SMCJ16CA | GEP | GEP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 57.7 | 1 |
| SMCJ17A | SMCJ17CA | GER | GER | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 54.4 | 1 |
| SMCJ18A | SMCJ18CA | GET | GET | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 51.4 | 1 |
| SMCJ20A | SMCJ20CA | GEV | GEV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 46.3 | 1 |
| SMCJ22A | SMCJ22CA | GEX | GEX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 42.3 | 1 |
| SMCJ24A | SMCJ24CA | GEZ | GEZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 38.6 | 1 |
| SMCJ26A | SMCJ26CA | GFE | GFE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 35.7 | 1 |
| SMCJ28A | SMCJ28CA | GFG | GFG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 33.1 | 1 |
| SMCJ30A | SMCJ30CA | GFK | GFK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 31.0 | 1 |
| SMCJ33A | SMCJ33CA | GFM | GFM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 28.2 | 1 |
| SMCJ36A | SMCJ36CA | GFP | GFP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 25.9 | 1 |
| SMCJ40A | SMCJ40CA | GFR | GFR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 23.3 | 1 |
| SMCJ43A | SMCJ43CA | GFT | GFT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 21.7 | 1 |
| SMCJ45A | SMCJ45CA | GFV | GFV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 20.6 | 1 |
| SMCJ48A | SMCJ48CA | GFX | GFX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 19.4 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMCJ51A | SMCJ51CA | GFZ | BFZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 18.2 | 1 |
| SMCJ54A | SMCJ54CA | GGE | BGE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 17.3 | 1 |
| SMCJ58A | SMCJ58CA | GGG | BGG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 16.1 | 1 |
| SMCJ60A | SMCJ60CA | GGK | BGK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 15.5 | 1 |
| SMCJ64A | SMCJ64CA | GGM | BGM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 14.6 | 1 |
| SMCJ70A | SMCJ70CA | GGP | BGP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 13.3 | 1 |
| SMCJ75A | SMCJ75CA | GGR | BGR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 12.4 | 1 |
| SMCJ78A | SMCJ78CA | GGT | BGT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 11.9 | 1 |
| SMCJ85A | SMCJ85CA | GGV | BGV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 11.0 | 1 |
| SMCJ90A | SMCJ90CA | GGX | BGX | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 10.3 | 1 |
| SMCJ100A | SMCJ100CA | GGZ | BGZ | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 9.3 | 1 |
| SMCJ110A | SMCJ110CA | GHE | BHE | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 8.5 | 1 |
| SMCJ120A | SMCJ120CA | GHG | BHG | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 7.8 | 1 |
| SMCJ130A | SMCJ130CA | GHK | BHK | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 7.2 | 1 |
| SMCJ150A | SMCJ150CA | GHM | BHM | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 6.2 | 1 |
| SMCJ160A | SMCJ160CA | GHP | BHP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 5.8 | 1 |
| SMCJ170A | SMCJ170CA | GHR | BHR | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 5.5 | 1 |
| SMCJ180A | SMCJ180CA | GHT | BHT | 180.0 | 201.00 | 222.00 | 1 | 292.0 | 5.1 | 1 |
| SMCJ200A | SMCJ200CA | GHV | BHV | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 4.6 | 1 |
| SMCJ220A | SMCJ220CA | GHX | BHX | 220.0 | 246.00 | 272.00 | 1 | 356.0 | 4.2 | 1 |
| SMCJ250A | SMCJ250CA | GHZ | BHZ | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 3.7 | 1 |
| SMCJ300A | SMCJ300CA | GJE | BJE | 300.0 | 335.00 | 371.00 | 1 | 486.0 | 3.1 | 1 |
| SMCJ350A | SMCJ350CA | GJG | BJG | 350.0 | 391.00 | 432.00 | 1 | 567.0 | 2.6 | 1 |
| SMCJ400A | SMCJ400CA | GJK | BJK | 400.0 | 447.00 | 494.00 | 1 | 648.0 | 2.3 | 1 |
| SMCJ440A | SMCJ440CA | GJM | BJM | 440.0 | 492.00 | 543.00 | 1 | 713.0 | 2.1 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

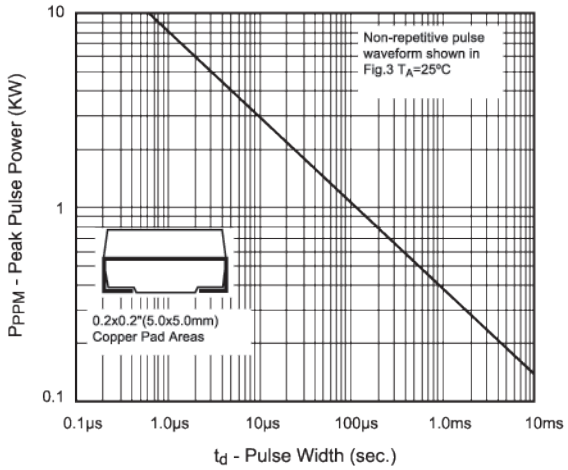



**Fig. 2 - Pulse Derating Curve**

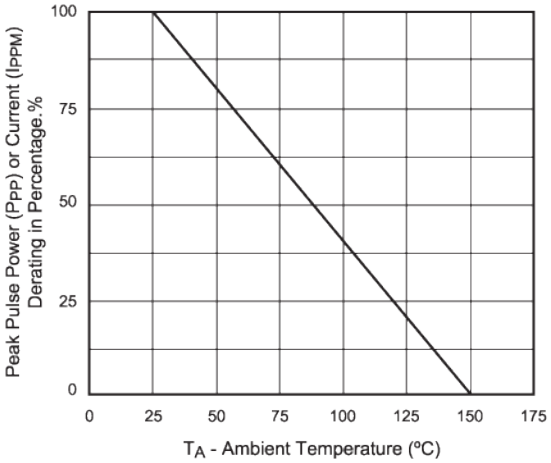



**Fig. 3 - Pulse Waveform**

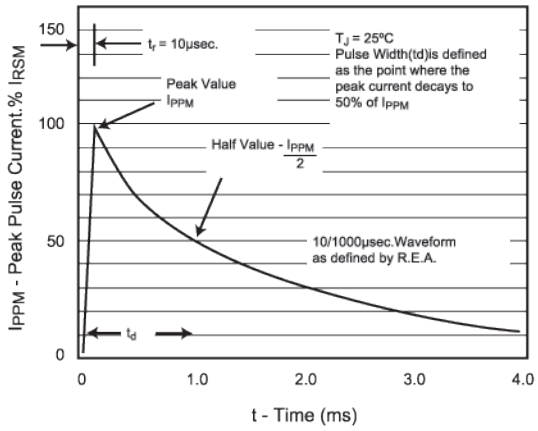



**Fig. 4 - Typical Junction Capacitance**

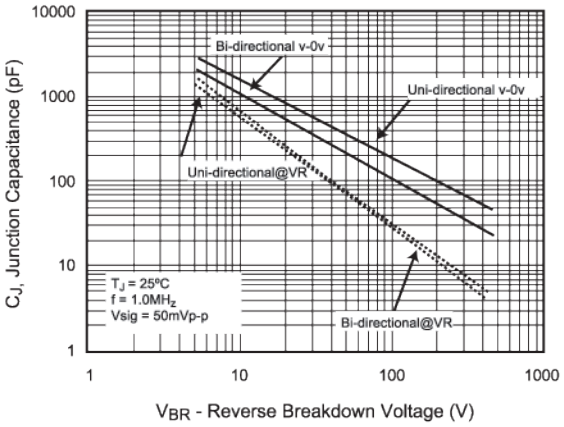



**Fig. 5 - Steady State Power Derating Curve**

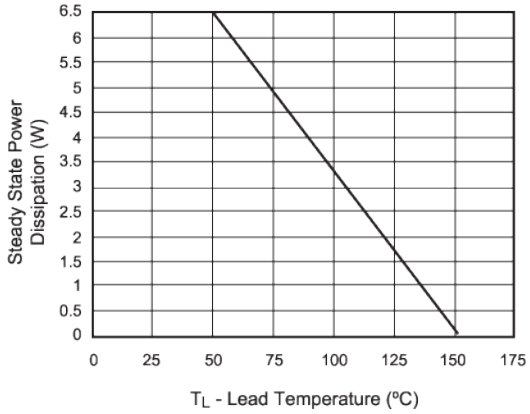
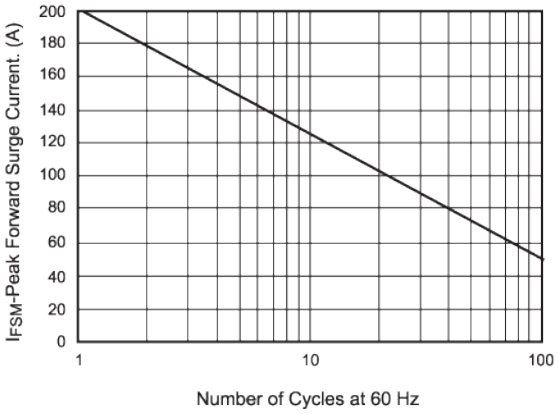
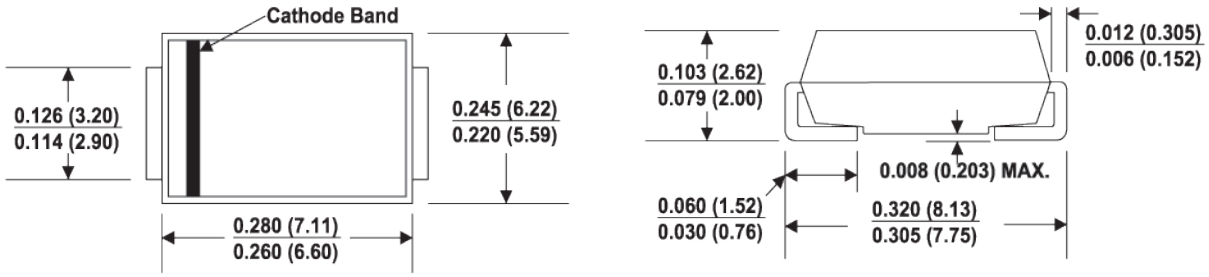



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**

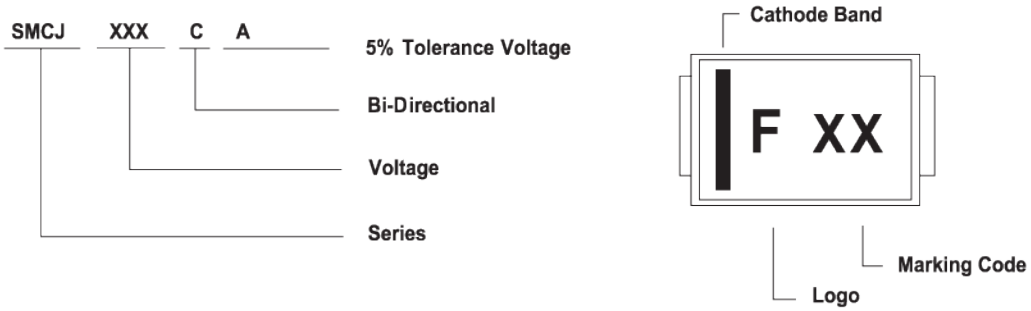


## Dimension / DO-214AB (SMC J-Bend)




*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| SMCJxxxXX | DO-214AB | 3000 | Tape & Reel - 12mm/13" tape | EIA STD RS-481 |
| SMCJxxxXX | DO-214AB | 500 | Tape & Reel - 12mm/ 7" tape | EIA STD RS-481 |

# 1.5SMC Series

## 1500W

Operating Voltage : 5.8 to 550V
Peak Pulse Power: 1500W

***SMC/ DO-214AB***


RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 1500 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle) : 0.01%
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix; suffixes without A, the VBR is ± 10%. (e.g. 1.5SMC6.8C, 1.5SMC440CA). Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 1500 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 200 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 8.0mm x 8.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| 1.5SMC6.8A | 1.5SMC6.8CA | 6V8A | 6V8C | 5.8 | 6.45 | 7.14 | 10 | 10.5 | 144.8 | 1000 |
| 1.5SMC7.5A | 1.5SMC7.5CA | 7V5A | 7V5C | 6.4 | 7.13 | 7.88 | 10 | 11.3 | 134.5 | 500 |
| 1.5SMC8.2A | 1.5SMC8.2CA | 8V2A | 8V2C | 7.0 | 7.79 | 8.61 | 10 | 12.1 | 125.6 | 200 |
| 1.5SMC9.1A | 1.5SMC9.1CA | 9V1A | 9V1C | 7.8 | 8.65 | 9.50 | 1 | 13.4 | 113.4 | 50 |
| 1.5SMC10A | 1.5SMC10CA | 10A | 10C | 8.6 | 9.50 | 10.50 | 1 | 14.5 | 104.8 | 10 |
| 1.5SMC11A | 1.5SMC11CA | 11A | 11C | 9.4 | 10.50 | 11.60 | 1 | 15.6 | 97.4 | 5 |
| 1.5SMC12A | 1.5SMC12CA | 12A | 12C | 10.2 | 11.40 | 12.60 | 1 | 16.7 | 91.0 | 5 |
| 1.5SMC13A | 1.5SMC13CA | 13A | 13C | 11.1 | 12.40 | 13.70 | 1 | 18.2 | 83.5 | 1 |
| 1.5SMC15A | 1.5SMC15CA | 15A | 15C | 12.8 | 14.30 | 15.80 | 1 | 21.2 | 71.7 | 1 |
| 1.5SMC16A | 1.5SMC16CA | 16A | 16C | 13.6 | 15.20 | 16.80 | 1 | 22.5 | 67.6 | 1 |
| 1.5SMC18A | 1.5SMC18CA | 18A | 18C | 15.3 | 17.10 | 18.90 | 1 | 25.2 | 60.3 | 1 |
| 1.5SMC20A | 1.5SMC20CA | 20A | 20C | 17.1 | 19.00 | 21.00 | 1 | 27.7 | 54.9 | 1 |
| 1.5SMC22A | 1.5SMC22CA | 22A | 22C | 18.8 | 20.90 | 23.10 | 1 | 30.6 | 49.7 | 1 |
| 1.5SMC24A | 1.5SMC24CA | 24A | 24C | 20.5 | 22.80 | 25.20 | 1 | 33.2 | 45.8 | 1 |
| 1.5SMC27A | 1.5SMC27CA | 27A | 27C | 23.1 | 25.70 | 28.40 | 1 | 37.5 | 40.5 | 1 |
| 1.5SMC30A | 1.5SMC30CA | 30A | 30C | 25.6 | 28.50 | 31.50 | 1 | 41.4 | 36.7 | 1 |
| 1.5SMC33A | 1.5SMC33CA | 33A | 33C | 28.2 | 31.40 | 34.70 | 1 | 45.7 | 33.3 | 1 |
| 1.5SMC36A | 1.5SMC36CA | 36A | 36C | 30.8 | 34.20 | 37.80 | 1 | 49.9 | 30.5 | 1 |
| 1.5SMC39A | 1.5SMC39CA | 39A | 39C | 33.3 | 37.10 | 41.00 | 1 | 53.9 | 28.2 | 1 |
| 1.5SMC43A | 1.5SMC43CA | 43A | 43C | 36.8 | 40.90 | 45.20 | 1 | 59.3 | 25.6 | 1 |
| 1.5SMC47A | 1.5SMC47CA | 47A | 47C | 40.2 | 44.70 | 49.40 | 1 | 64.8 | 23.5 | 1 |
| 1.5SMC51A | 1.5SMC51CA | 51A | 51C | 43.6 | 48.50 | 53.60 | 1 | 70.1 | 21.7 | 1 |
| 1.5SMC56A | 1.5SMC56CA | 56A | 56C | 47.8 | 53.20 | 58.80 | 1 | 77.0 | 19.7 | 1 |
| 1.5SMC62A | 1.5SMC62CA | 62A | 62C | 53.0 | 58.90 | 65.10 | 1 | 85.0 | 17.9 | 1 |
| 1.5SMC68A | 1.5SMC68CA | 68A | 68C | 58.1 | 64.60 | 71.40 | 1 | 92.0 | 16.5 | 1 |
| 1.5SMC75A | 1.5SMC75CA | 75A | 75C | 64.1 | 71.30 | 78.80 | 1 | 103.0 | 14.8 | 1 |
| 1.5SMC82A | 1.5SMC82CA | 82A | 82C | 70.1 | 77.90 | 86.10 | 1 | 113.0 | 13.5 | 1 |
| 1.5SMC91A | 1.5SMC91CA | 91A | 91C | 77.8 | 86.50 | 95.50 | 1 | 125.0 | 12.2 | 1 |
| 1.5SMC100A | 1.5SMC100CA | 100A | 100C | 85.5 | 95.00 | 105.00 | 1 | 137.0 | 11.1 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| 1.5SMC110A | 1.5SMC110CA | 110A | 110C | 94.0 | 105.00 | 116.00 | 1 | 152.0 | 10.0 | 1 |
| 1.5SMC120A | 1.5SMC120CA | 120A | 120C | 102.0 | 114.00 | 126.00 | 1 | 165.0 | 9.2 | 1 |
| 1.5SMC130A | 1.5SMC130CA | 130A | 130C | 111.0 | 124.00 | 137.00 | 1 | 179.0 | 8.5 | 1 |
| 1.5SMC150A | 1.5SMC150CA | 150A | 150C | 128.0 | 143.00 | 158.00 | 1 | 207.0 | 7.3 | 1 |
| 1.5SMC160A | 1.5SMC160CA | 160A | 160C | 136.0 | 152.00 | 168.00 | 1 | 219.0 | 6.9 | 1 |
| 1.5SMC170A | 1.5SMC170CA | 170A | 170C | 145.0 | 162.00 | 179.00 | 1 | 234.0 | 6.5 | 1 |
| 1.5SMC180A | 1.5SMC180CA | 180A | 180C | 154.0 | 171.00 | 189.00 | 1 | 246.0 | 6.2 | 1 |
| 1.5SMC200A | 1.5SMC200CA | 200A | 200C | 171.0 | 190.00 | 210.00 | 1 | 274.0 | 5.5 | 1 |
| 1.5SMC220A | 1.5SMC220CA | 220A | 220C | 185.0 | 209.00 | 231.00 | 1 | 328.0 | 4.6 | 1 |
| 1.5SMC250A | 1.5SMC250CA | 250A | 250C | 214.0 | 237.00 | 263.00 | 1 | 344.0 | 4.4 | 1 |
| 1.5SMC300A | 1.5SMC300CA | 300A | 300C | 256.0 | 285.00 | 315.00 | 1 | 414.0 | 3.7 | 1 |
| 1.5SMC350A | 1.5SMC350CA | 350A | 350C | 300.0 | 332.00 | 368.00 | 1 | 482.0 | 3.2 | 1 |
| 1.5SMC400A | 1.5SMC400CA | 400A | 400C | 342.0 | 380.00 | 420.00 | 1 | 548.0 | 2.8 | 1 |
| 1.5SMC440A | 1.5SMC440CA | 440A | 440C | 376.0 | 418.00 | 462.00 | 1 | 602.0 | 2.5 | 1 |
| 1.5SMC480A | 1.5SMC480CA | 480A | 480C | 408.0 | 456.00 | 504.00 | 1 | 658.0 | 2.3 | 1 |
| 1.5SMC510A | 1.5SMC510CA | 510A | 510C | 434.0 | 485.00 | 535.00 | 1 | 698.0 | 2.1 | 1 |
| 1.5SMC530A | 1.5SMC530CA | 530A | 530C | 477.0 | 503.50 | 556.50 | 1 | 725.0 | 2.1 | 1 |
| 1.5SMC540A | 1.5SMC540CA | 540A | 540C | 486.0 | 513.00 | 567.00 | 1 | 740.0 | 2.0 | 1 |
| 1.5SMC550A | 1.5SMC550CA | 550A | 550C | 495.0 | 522.50 | 577.50 | 1 | 760.0 | 2.0 | 1 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

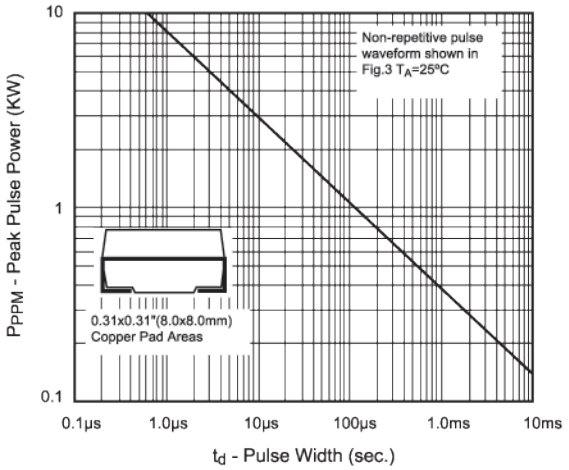



**Fig. 2 - Pulse Derating Curve**

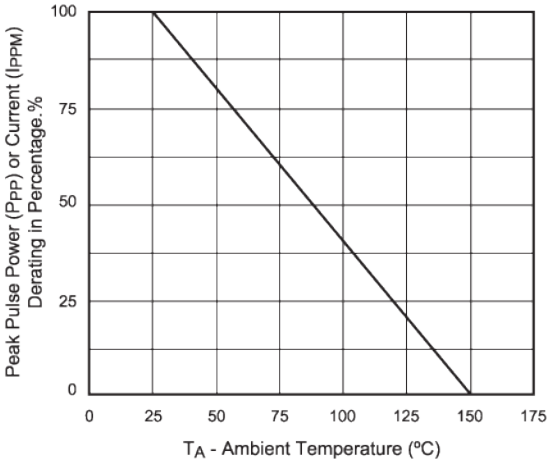



**Fig. 3 - Pulse Waveform**

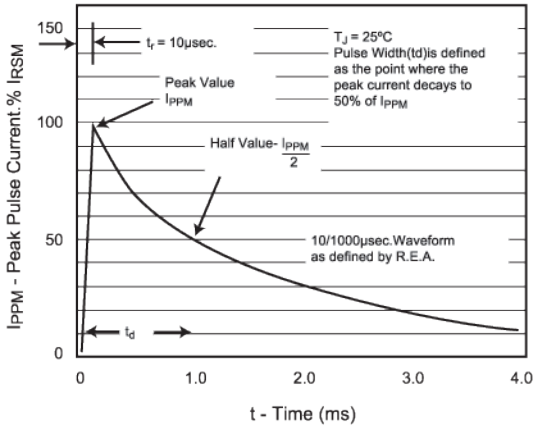



**Fig. 4 - Typical Junction Capacitance**

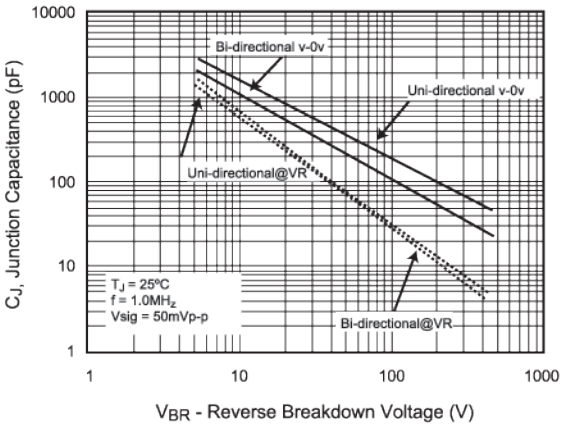



**Fig. 5 - Steady State Power Derating Curve**

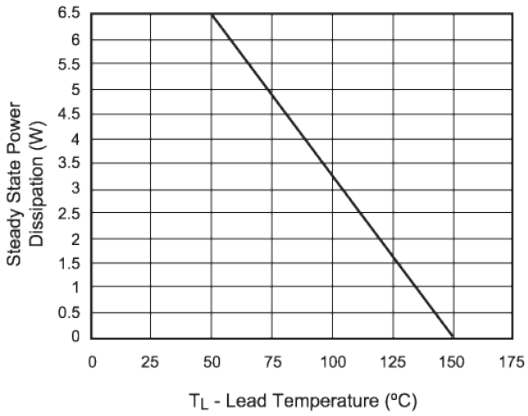
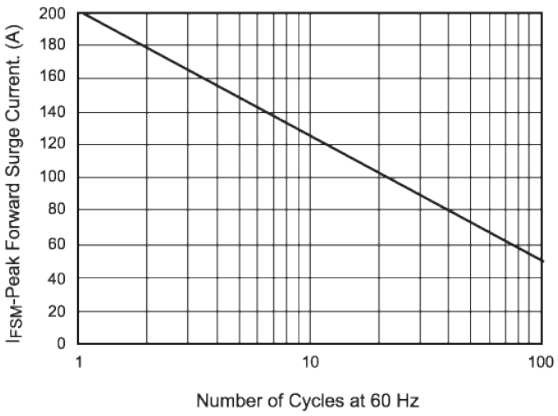
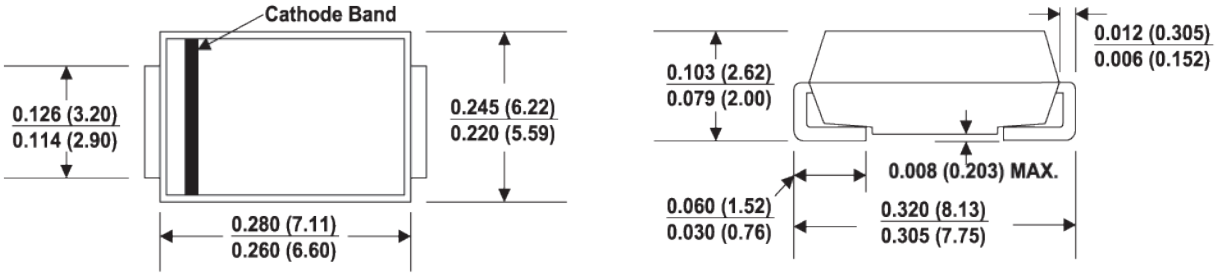



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**

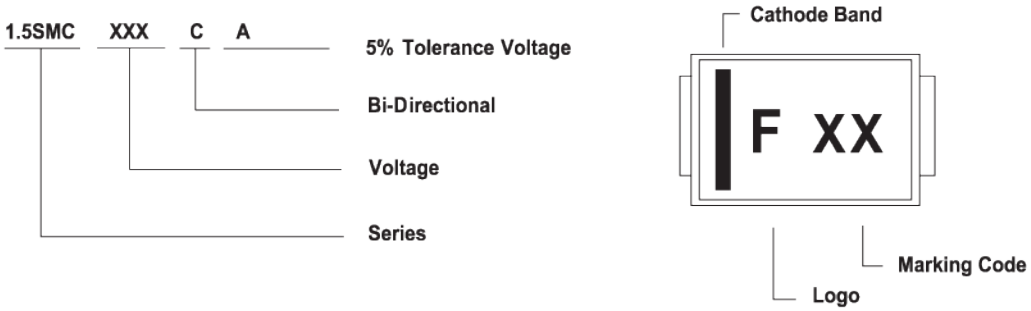


## Dimension / DO-214AB (SMC J-Bend)




*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

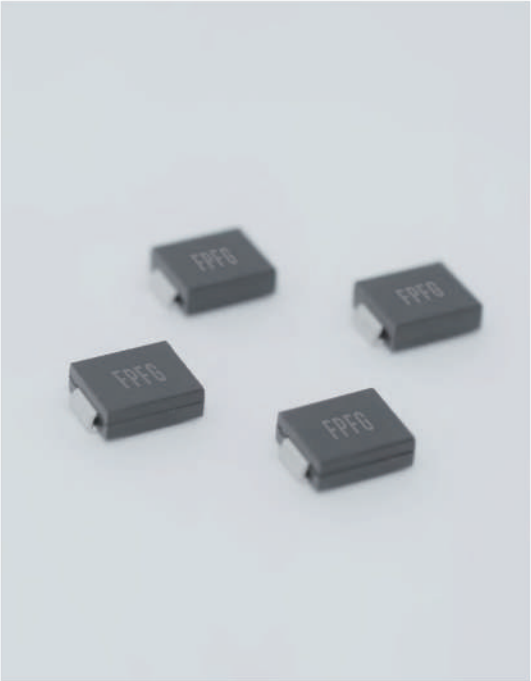
| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| 1.5SMCxxxXX | DO-214AB | 3000 | Tape & Reel - 16mm/13" tape | EIA STD RS-481 |
| 1.5SMCxxxXX | DO-214AB | 500 | Tape & Reel - 16mm/ 7" tape | EIA STD RS-481 |

# SMDJ Series

## 3000W

Operating Voltage : 5.0 to 250V
Peak Pulse Power: 3000W

***SMC/ DO-214AB***



RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 3000 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate ( duty cycle ) : 0.01 %
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant
- IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix ; suffixes without A, the VBR is ± 10%.
  (e.g. SMDJ5.0C, SMDJ40CA).
  Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 3000 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 300 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 8.0mm x 8.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMDJ5.0A | SMDJ5.0CA | RDE | DDE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 326.1 | 800 |
| SMDJ6.0A | SMDJ6.0CA | RDG | DDG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 291.3 | 800 |
| SMDJ6.5A | SMDJ6.5CA | RDK | DDK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 267.9 | 500 |
| SMDJ7.0A | SMDJ7.0CA | PDM | DDM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 250.0 | 200 |
| SMDJ7.5A | SMDJ7.5CA | PDP | DDP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 232.6 | 100 |
| SMDJ8.0A | SMDJ8.0CA | PDR | DDR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 220.6 | 50 |
| SMDJ8.5A | SMDJ8.5CA | PDT | DDT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 208.3 | 20 |
| SMDJ9.0A | SMDJ9.0CA | PDV | DDV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 194.8 | 10 |
| SMDJ10A | SMDJ10CA | PDX | DDX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 176.5 | 5 |
| SMDJ11A | SMDJ11CA | PDZ | DDZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 164.8 | 2 |
| SMDJ12A | SMDJ12CA | PEE | DEE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 150.8 | 2 |
| SMDJ13A | SMDJ13CA | PEG | DEG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 139.5 | 2 |
| SMDJ14A | SMDJ14CA | PEK | DEK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 129.3 | 2 |
| SMDJ15A | SMDJ15CA | PEM | DEM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 123.0 | 2 |
| SMDJ16A | SMDJ16CA | PEP | DEP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 115.4 | 2 |
| SMDJ17A | SMDJ17CA | PER | DER | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 108.7 | 2 |
| SMDJ18A | SMDJ18CA | PET | DET | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 102.7 | 2 |
| SMDJ20A | SMDJ20CA | PEV | DEV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 92.6 | 2 |
| SMDJ21A | SMDJ21CA | PHV | DHV | 21.0 | 23.31 | 25.73 | 1 | 34.1 | 88.0 | 2 |
| SMDJ22A | SMDJ22CA | PEX | DEX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 84.5 | 2 |
| SMDJ24A | SMDJ24CA | PEZ | DEZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 77.1 | 2 |
| SMDJ26A | SMDJ26CA | PFE | DFE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 71.3 | 2 |
| SMDJ28A | SMDJ28CA | PFG | DFG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 66.1 | 2 |
| SMDJ30A | SMDJ30CA | PFK | DFK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 62.0 | 2 |
| SMDJ33A | SMDJ33CA | PFM | DFM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 56.3 | 2 |
| SMDJ36A | SMDJ36CA | PFP | DFP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 51.6 | 2 |
| SMDJ40A | SMDJ40CA | PFR | DFR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 46.5 | 2 |
| SMDJ43A | SMDJ43CA | PFT | DFT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 43.2 | 2 |
| SMDJ45A | SMDJ45CA | PFV | DFV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 41.3 | 2 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| SMDJ48A | SMDJ48CA | PFX | DFX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 38.8 | 2 |
| SMDJ51A | SMDJ51CA | PFZ | DFZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 36.4 | 2 |
| SMDJ54A | SMDJ54CA | RGE | DGE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 34.4 | 2 |
| SMDJ58A | SMDJ58CA | PGG | DGG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 32.1 | 2 |
| SMDJ60A | SMDJ60CA | PGK | DGK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 31.0 | 2 |
| SMDJ64A | SMDJ64CA | PGM | DGM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 29.1 | 2 |
| SMDJ70A | SMDJ70CA | PGP | DGP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 26.5 | 2 |
| SMDJ75A | SMDJ75CA | PGR | DGR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 24.8 | 2 |
| SMDJ78A | SMDJ78CA | PGT | DGT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 23.8 | 2 |
| SMDJ85A | SMDJ85CA | PGV | DGV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 21.9 | 2 |
| SMDJ90A | SMDJ90CA | PGX | DGX | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 20.5 | 2 |
| SMDJ100A | SMDJ100CA | PGZ | DGZ | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 18.5 | 2 |
| SMDJ110A | SMDJ110CA | PHE | DHE | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 16.9 | 2 |
| SMDJ120A | SMDJ120CA | PHG | DHG | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 15.5 | 2 |
| SMDJ130A | SMDJ130CA | PHK | DHK | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 14.4 | 2 |
| SMDJ150A | SMDJ150CA | PHM | DHM | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 12.3 | 2 |
| SMDJ160A | SMDJ160CA | PHP | DHP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 11.6 | 2 |
| SMDJ170A | SMDJ170CA | PHR | DHR | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 10.9 | 2 |
| SMDJ180A | SMDJ180CA | PHT | DHT | 180.0 | 201.00 | 222.00 | 1 | 292.0 | 10.3 | 2 |
| SMDJ200A | SMDJ200CA | PHX | DHX | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 9.3 | 2 |
| SMDJ220A | SMDJ220CA | PHZ | DHZ | 220.0 | 246.00 | 272.00 | 1 | 356.0 | 8.4 | 2 |
| SMDJ250A | SMDJ250CA | PIE | DIE | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 7.5 | 2 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

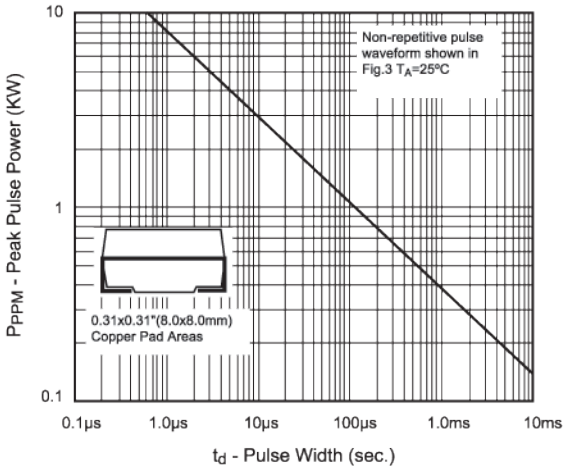



**Fig. 2 - Pulse Derating Curve**

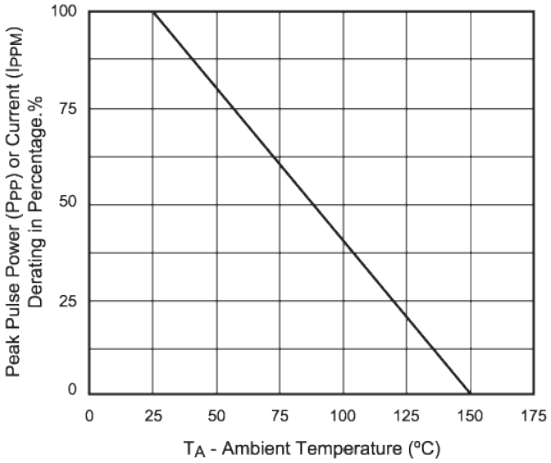



**Fig. 3 - Pulse Waveform**

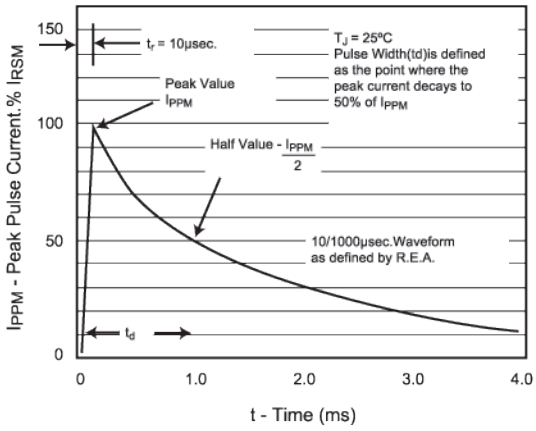



**Fig. 4 - Typical Junction Capacitance**

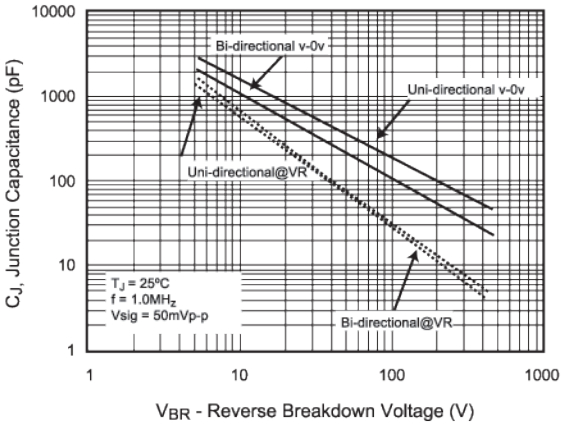



**Fig. 5 - Steady State Power Derating Curve**

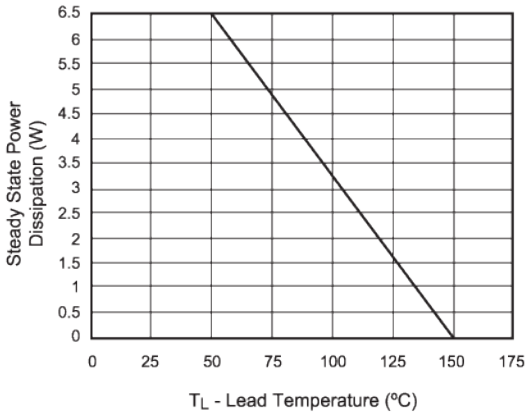
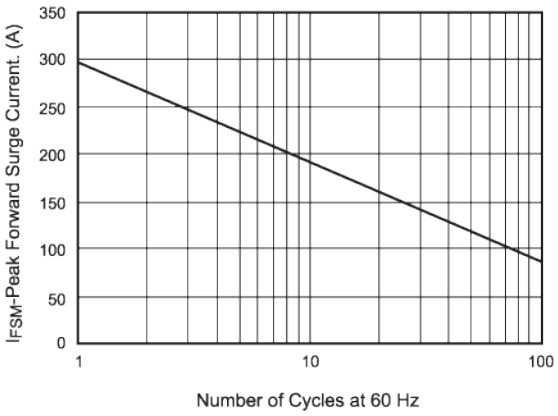
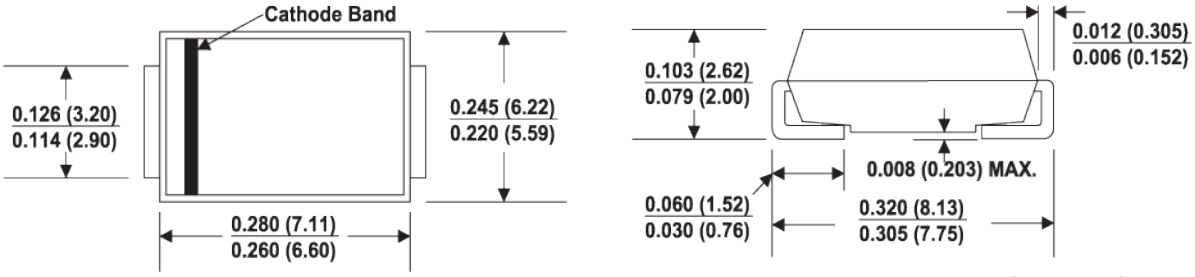



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**

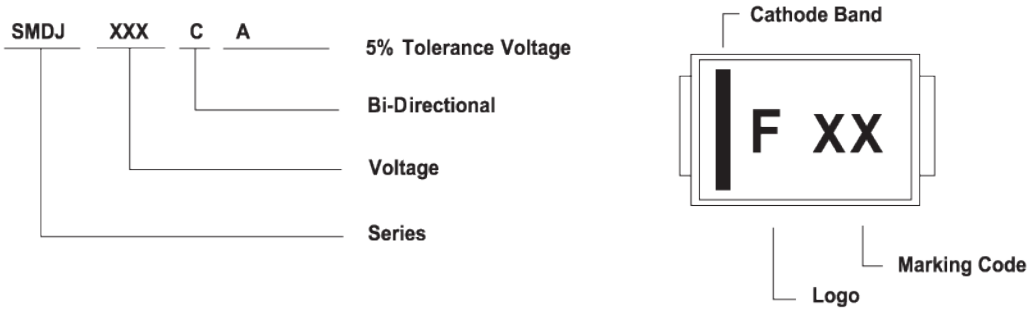


## Dimension / DO-214AB (SMC J-Bend)




*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System




## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| SMDJxxxXX | DO-214AB | 3000 | Tape & Reel - 16mm/13" tape | EIA STD RS-481 |
| SMDJxxxXX | DO-214AB | 500 | Tape & Reel - 16mm/ 7" tape | EIA STD RS-481 |

# 5.0SMDJ Series

## 5000W

Operating Voltage : 5.0 to 170V
Peak Pulse Power: 5000W

***SMC/ DO-214AB***


RoHS | HF Halogen Free

## Features

- Glass passivated chip
- 5000 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle) : 0.01%
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-750, method 2026
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

## Devices For Bipolar Application

- For Bidirectional types, use C or CA as suffix; suffixes without A, the VBR is ± 10%. (e.g. 5.0SMDJ5.0C, 5.0SMDJ40CA). Electrical characteristics apply in both directions

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1000μs waveform (Note 1,2 ,Fig.1) | $P_{PPM}$ | Minimum 5000 | Watts |
| Peak Pulse Current of on 10/1000μs waveform (Note 1,Fig.3) | $I_{PP}$ | SEE TABLE 1 | Amps |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (Note2,3) | $I_{FSM}$ | 300 | Amps |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 150 | °C |

**Notes :** 1. Non-repetitive current pulse , per Fig. 3 and derated above TA = 25°C per Fig. 2
2. Mounted on 8.0mm x 8.0mm (0.03mm thick) Copper Pads to each terminal
3. 8.3ms single half sine-wave , or equivalent square wave, Duty cycle = 4 pulses per minutes maximum

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| 5.0SMDJ5.0A | 5.0SMDJ5.0CA | 5RDE | 5DDE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 543.6 | 1050 |
| 5.0SMDJ6.0A | 5.0SMDJ6.0CA | 5RDG | 5DDG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 485.5 | 1050 |
| 5.0SMDJ6.5A | 5.0SMDJ6.5CA | 5RDK | 5DDK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 446.5 | 750 |
| 5.0SMDJ7.0A | 5.0SMDJ7.0CA | 5PDM | 5DDM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 416.8 | 300 |
| 5.0SMDJ7.5A | 5.0SMDJ7.5CA | 5PDP | 5DDP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 387.7 | 150 |
| 5.0SMDJ8.0A | 5.0SMDJ8.0CA | 5PDR | 5DDR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 367.7 | 70 |
| 5.0SMDJ8.5A | 5.0SMDJ8.5CA | 5PDT | 5DDT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 347.3 | 30 |
| 5.0SMDJ9.0A | 5.0SMDJ9.0CA | 5PDV | 5DDV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 324.8 | 12 |
| 5.0SMDJ10A | 5.0SMDJ10CA | 5PDX | 5DDX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 294.2 | 6 |
| 5.0SMDJ11A | 5.0SMDJ11CA | 5PDZ | 5DDZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 274.8 | 2 |
| 5.0SMDJ12A | 5.0SMDJ12CA | 5PEP | 5BEP | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 252.0 | 2 |
| 5.0SMDJ13A | 5.0SMDJ13CA | 5PEQ | 5BEQ | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 233.0 | 2 |
| 5.0SMDJ14A | 5.0SMDJ14CA | 5PER | 5BER | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 216.0 | 2 |
| 5.0SMDJ15A | 5.0SMDJ15CA | 5PES | 5BES | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 205.0 | 2 |
| 5.0SMDJ16A | 5.0SMDJ16CA | 5PET | 5BET | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 193.0 | 2 |
| 5.0SMDJ17A | 5.0SMDJ17CA | 5PEU | 5BEU | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 181.0 | 2 |
| 5.0SMDJ18A | 5.0SMDJ18CA | 5PEV | 5BEV | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 172.0 | 2 |
| 5.0SMDJ20A | 5.0SMDJ20CA | 5PEW | 5BEW | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 155.0 | 2 |
| 5.0SMDJ22A | 5.0SMDJ22CA | 5PEX | 5BEX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 141.0 | 2 |
| 5.0SMDJ24A | 5.0SMDJ24CA | 5PEZ | 5BEZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 129.0 | 2 |
| 5.0SMDJ26A | 5.0SMDJ26CA | 5PFE | 5BFE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 119.0 | 2 |
| 5.0SMDJ28A | 5.0SMDJ28CA | 5PFG | 5BFG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 110.0 | 2 |
| 5.0SMDJ30A | 5.0SMDJ30CA | 5PFK | 5BFK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 103.0 | 2 |
| 5.0SMDJ33A | 5.0SMDJ33CA | 5PFM | 5BFM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 93.9 | 2 |
| 5.0SMDJ36A | 5.0SMDJ36CA | 5PFP | 5BFP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 86.1 | 2 |
| 5.0SMDJ40A | 5.0SMDJ40CA | 5PFR | 5BFR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 77.6 | 2 |
| 5.0SMDJ43A | 5.0SMDJ43CA | 5PFT | 5BFT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 72.1 | 2 |
| 5.0SMDJ45A | 5.0SMDJ45CA | 5PFV | 5BFV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 68.8 | 2 |
| 5.0SMDJ48A | 5.0SMDJ48CA | 5PFX | 5BFX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 64.7 | 2 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage $V_{RWM}$(V) | Breakdown Voltage $V_{BR}$(V) @$I_T$ | | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$(V)@$I_{PP}$ | Maximum Peak Pulse Current ($I_{PP}$) | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Uni-Polar | Bi-Polar | Uni | Bi | | Min | Max | | | | |
| 5.0SMDJ51A | 5.0SMDJ51CA | 5PFZ | 5BFZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 60.7 | 2 |
| 5.0SMDJ54A | 5.0SMDJ54CA | 5RGE | 5BGE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 57.5 | 2 |
| 5.0SMDJ58A | 5.0SMDJ58CA | 5PGG | 5BGG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 53.5 | 2 |
| 5.0SMDJ60A | 5.0SMDJ60CA | 5PGK | 5BGK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 51.7 | 2 |
| 5.0SMDJ64A | 5.0SMDJ64CA | 5PGM | 5BGM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 48.6 | 2 |
| 5.0SMDJ70A | 5.0SMDJ70CA | 5PGP | 5BGP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 44.3 | 2 |
| 5.0SMDJ75A | 5.0SMDJ75CA | 5PGR | 5BGR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 41.4 | 2 |
| 5.0SMDJ78A | 5.0SMDJ78CA | 5PGT | 5BGT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 39.7 | 2 |
| 5.0SMDJ85A | 5.0SMDJ85CA | 5PGV | 5BGV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 36.5 | 2 |
| 5.0SMDJ90A | - | 5PGX | - | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 34.3 | 2 |
| 5.0SMDJ100A | - | 5PGZ | - | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 30.9 | 2 |
| 5.0SMDJ110A | - | 5PHE | - | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 28.3 | 2 |
| 5.0SMDJ120A | - | 5PHG | - | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 26.0 | 2 |
| 5.0SMDJ130A | - | 5PHK | - | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 24.0 | 2 |
| 5.0SMDJ150A | - | 5PHM | - | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 20.6 | 2 |
| 5.0SMDJ160A | - | 5PHP | - | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 19.3 | 2 |
| 5.0SMDJ170A | - | 5PHR | - | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 18.2 | 2 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Peak Pulse Power Rating**

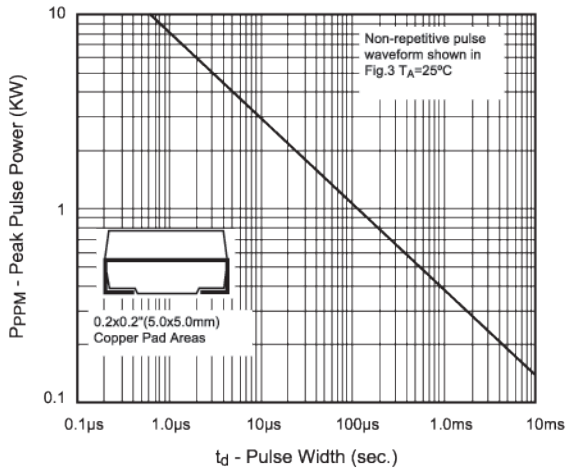



**Fig. 2 - Pulse Derating Curve**

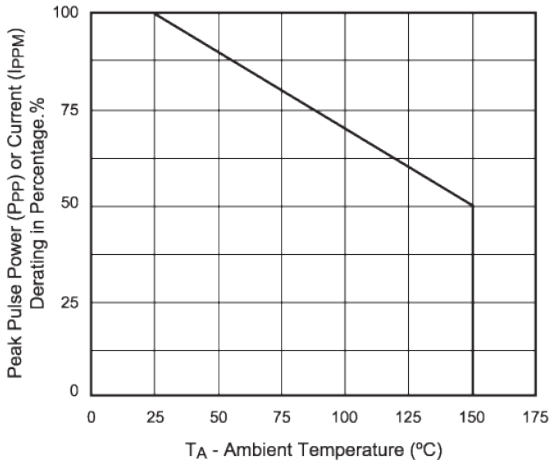



**Fig. 3 - Pulse Waveform**

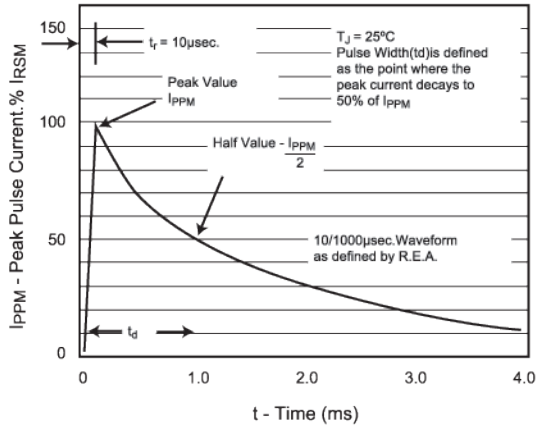



**Fig. 4 - Typical Junction Capacitance**

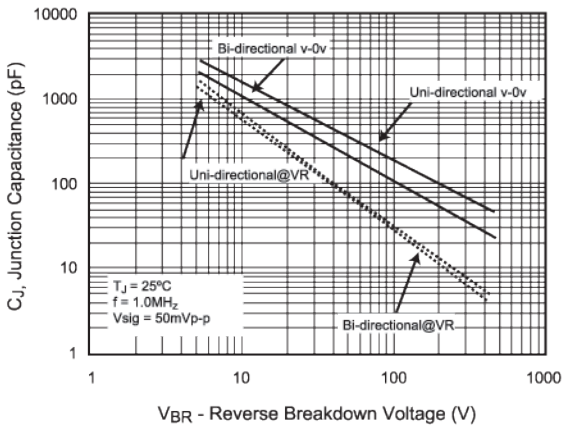



**Fig. 5 - Steady State Power Derating Curve**

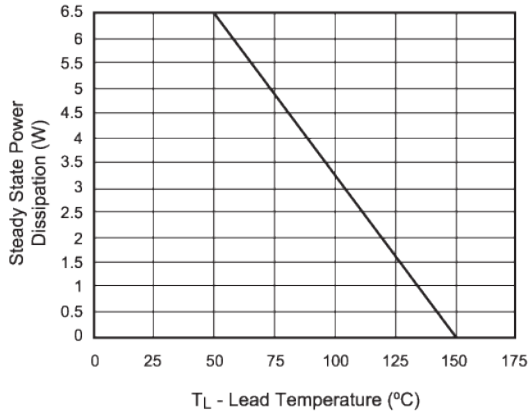
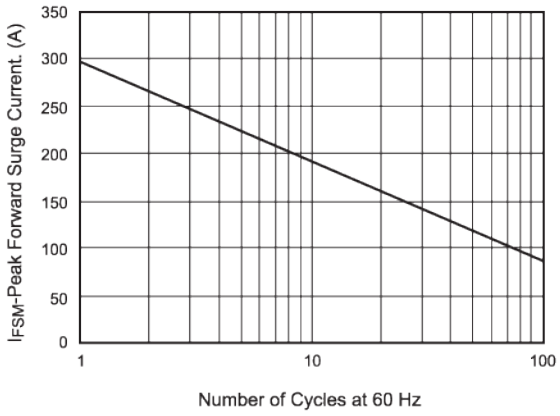
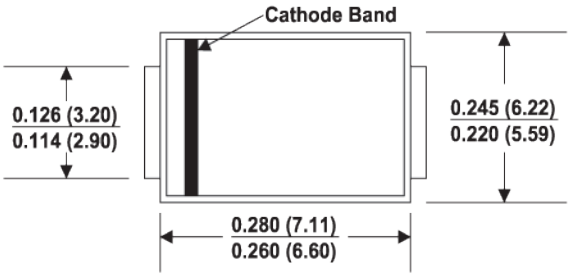
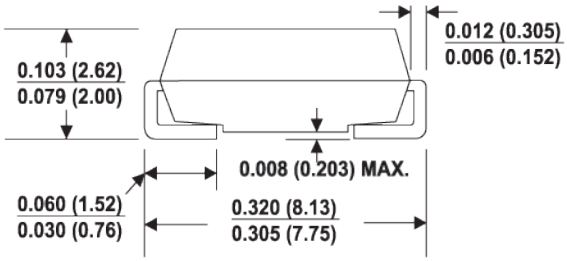



**Fig. 6 - Maximum Non-repetitive Forward Surge current uni-directional only**



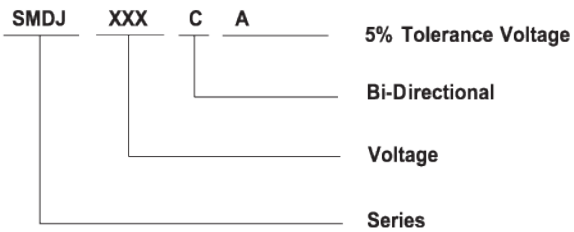
## Dimension / DO-214AB (SMC J-Bend)

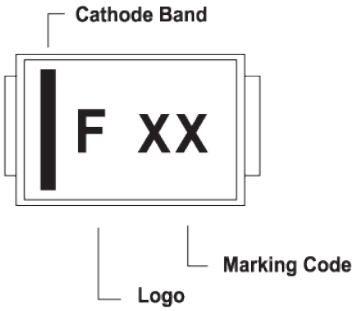



*Dimensions in inches and (millimeters)*

## Part Numbering and Marking System

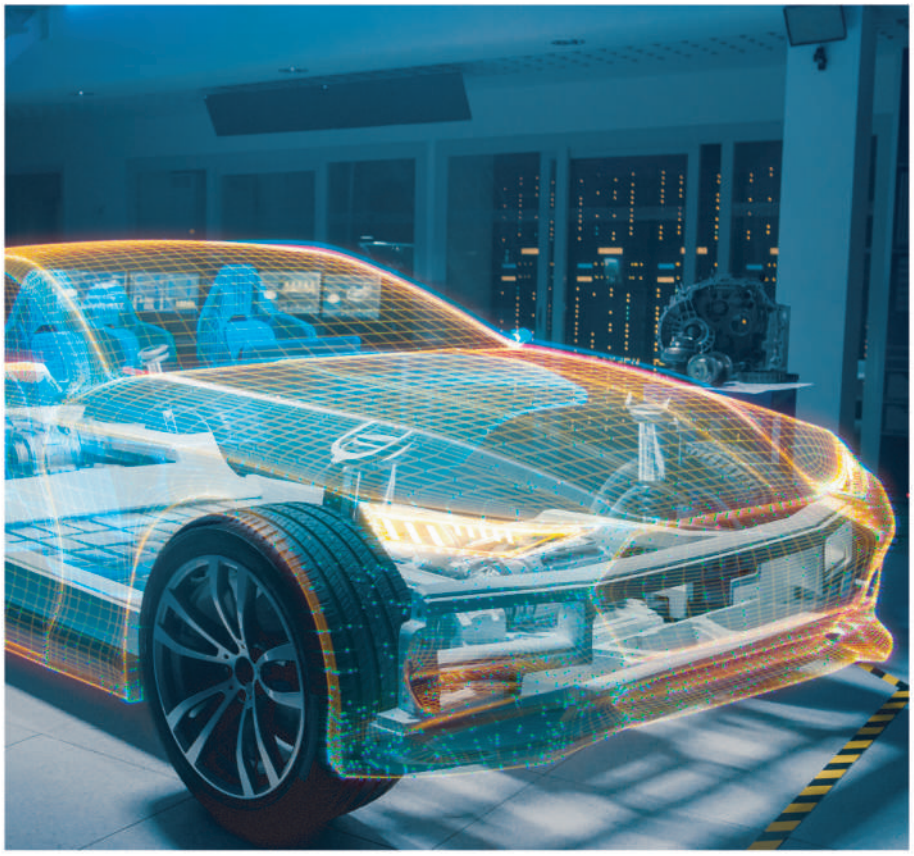



## Packaging Specification

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| 5.0SMDJxxxXX | DO-214AB | 3000 | Tape & Reel - 16mm/13" tape | EIA STD RS-481 |
| 5.0SMDJxxxXX | DO-214AB | 500 | Tape & Reel - 16mm/ 7" tape | EIA STD RS-481 |

# Automotive
## TVS Series



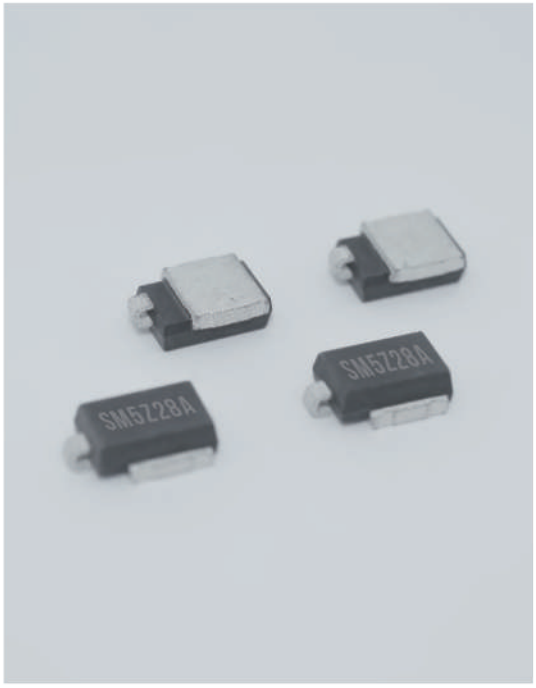
AEC Q-101 qualified TVS diodes, provide high quality automotive transient voltage solutions, protect auto-semiconductors from damage caused by load-dump or power rail transient.

# SM5Z Series

## 3600W

Operating Voltage : 10 to 43V
Peak Pulse Power: 3600W

***DO-218AB***




RoHS | HF Halogen Free

## Features

- Optimized glass passivated chip
- TJ = 175 °C capability suitable for high reliability and automotive requirement
- 3600 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle):0.01 %
- Meet ISO 7637-2 5a/5b and ISO 16750 load dump test (varied by test condition)
- AEC-Q101 qualified
- Low leakage current
- Low forward voltage drop
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: DO-218AB
- Molding compound: UL94V-0 flammability
- Polarity: Heatsink is anode

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1,000μs waveform(1) | $P_{PPM}$ | 3600 | Watts |
| Watts Peak Pulse Power Dissipation on 10/10,000μs waveform | $I_{PP}$ | 2800 | Amps |
| Amps Peak pulse current with a 10/1,000μs waveform(1) | $I_{PP}$ | See Next Table | A |
| A Power dissipation on infinite heatsink at TL = 75 °C | $P_D$ | 5.0 | W |
| W Peak forward surge current, 8.3 ms single half sine-wave | $I_{FSM}$ | 500 | C |
| A Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 175 | °C |

**Notes :** 1. Non-repetitive current pulse per Fig.2 and derated above TA= 25 °C per Fig.1

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number (Uni) | Breakdown Voltage $V_{BR}$ @$I_T$ | | | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) | Maximum $I_R$ @$V_{RWM}$ $T_J$=175 (uA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$ (A)(1) | Maximum Clamping Voltage $V_C$ @$I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| | Min (V) | Max (V) | $I_T$ (mA) | | | | | |
| SM5Z10A | 11.1 | 12.3 | 5.0 | 15 | 250 | 10 | 212 | 17.0 |
| SM5Z11A | 12.2 | 13.5 | 5.0 | 10 | 150 | 11 | 198 | 18.2 |
| SM5Z12A | 13.3 | 14.7 | 5.0 | 10 | 150 | 12 | 181 | 19.9 |
| SM5Z13A | 14.4 | 15.9 | 5.0 | 10 | 150 | 13 | 167 | 21.5 |
| SM5Z14A | 15.6 | 17.2 | 5.0 | 10 | 150 | 14 | 155 | 23.2 |
| SM5Z15A | 16.7 | 18.5 | 5.0 | 10 | 150 | 15 | 148 | 24.4 |
| SM5Z16A | 17.8 | 19.7 | 5.0 | 10 | 150 | 16 | 138 | 26.0 |
| SM5Z17A | 18.9 | 20.9 | 5.0 | 10 | 150 | 17 | 130 | 27.6 |
| SM5Z18A | 20.0 | 22.1 | 5.0 | 10 | 150 | 18 | 123 | 29.2 |
| SM5Z20A | 22.2 | 24.5 | 5.0 | 10 | 150 | 20 | 111 | 32.4 |
| SM5Z22A | 24.4 | 26.9 | 5.0 | 10 | 150 | 22 | 101 | 35.5 |
| SM5Z24A | 26.7 | 29.5 | 5.0 | 10 | 150 | 24 | 93 | 38.9 |
| SM5Z26A | 28.9 | 31.9 | 5.0 | 10 | 150 | 26 | 86 | 42.1 |
| SM5Z28A | 31.1 | 34.4 | 5.0 | 10 | 150 | 28 | 79 | 45.4 |
| SM5Z30A | 33.3 | 36.8 | 5.0 | 10 | 150 | 30 | 74 | 48.4 |
| SM5Z33A | 36.7 | 40.6 | 5.0 | 10 | 150 | 33 | 68 | 53.3 |
| SM5Z36A | 40.0 | 44.2 | 5.0 | 10 | 150 | 36 | 62 | 58.1 |
| SM5Z40A | 44.4 | 49.1 | 5.0 | 10 | 150 | 40 | 56 | 64.5 |
| SM5Z43A | 47.8 | 52.8 | 5.0 | 10 | 150 | 43 | 52 | 69.4 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Pulse Derating Curve**

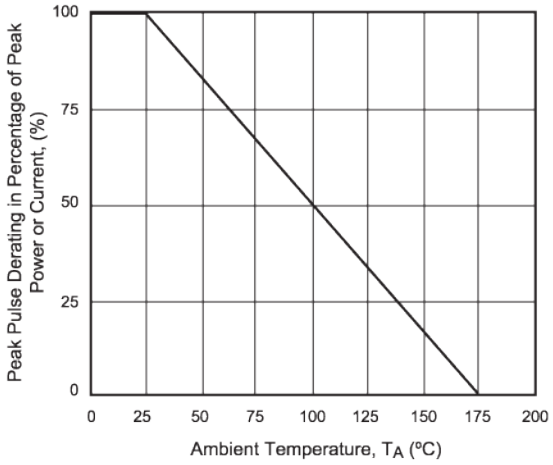



**Fig. 2 - Pulse Waveform**

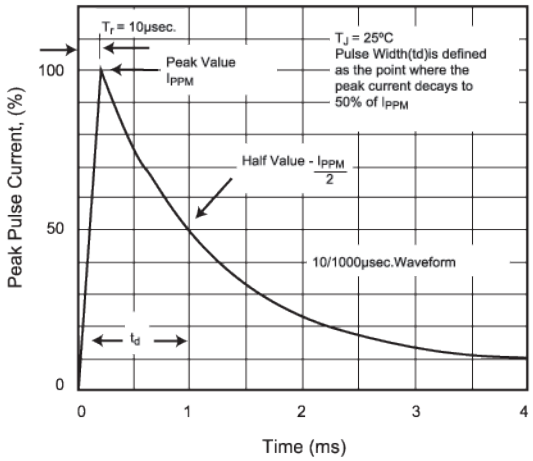



**Fig. 3 - Steady State Power Derating Curve**

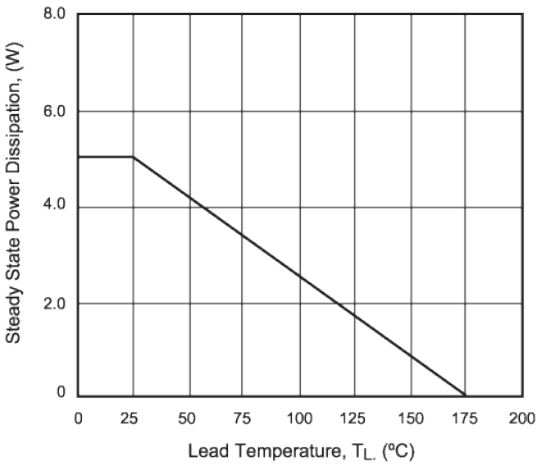
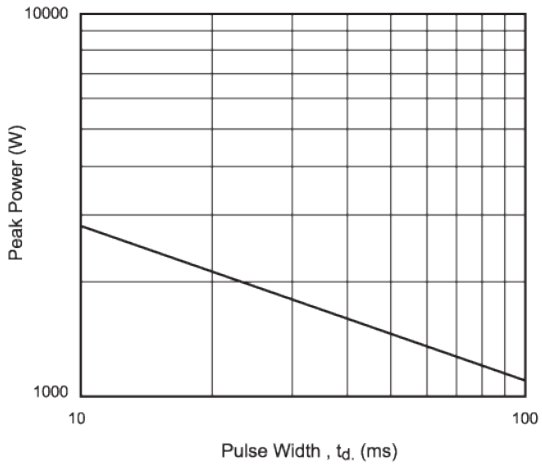
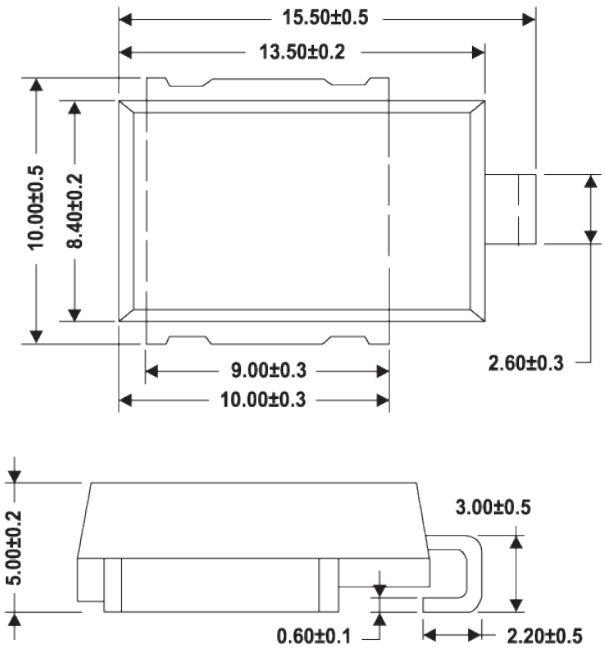


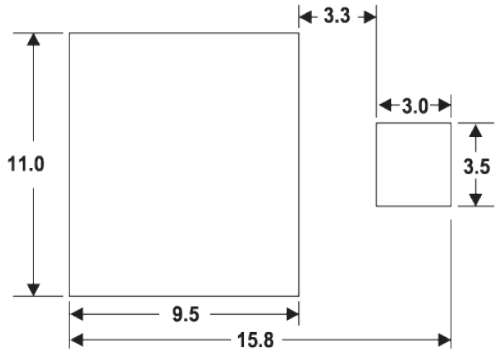

**Fig. 4 - Peak Pulse Power Rating Curve**



## Package Outline Dimensions (millimeters)

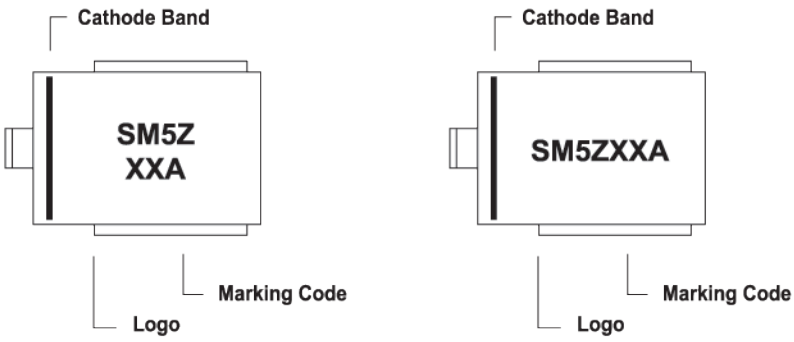



Recommended Mounting Pad Layout.




## Product Marking System

Product marking is the same as product series name.

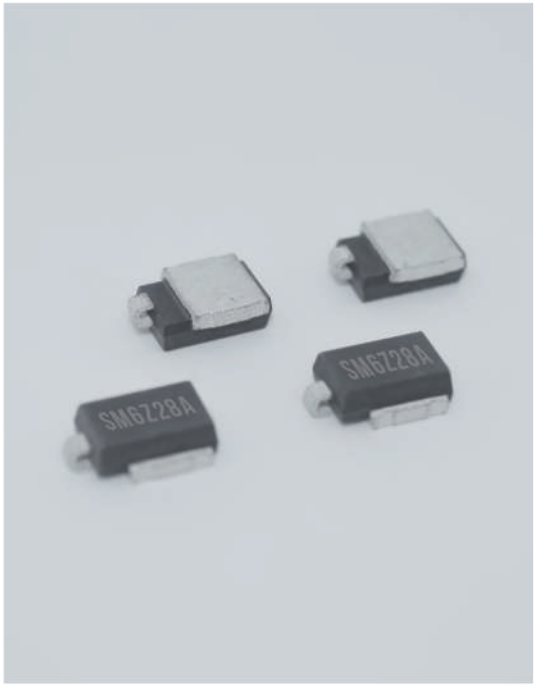


# SM6Z Series

## 4600W

Operating Voltage : 10 to 43V
Peak Pulse Power: 4600W

***DO-218AB***




RoHS | HF Halogen Free

## Features

- Optimized glass passivated chip
- TJ = 175 °C capability suitable for high reliability and automotive requirement
- 4600 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle):0.01 %
- Meet ISO 7637-2 5a/5b and ISO 16750 load dump test (varied by test condition)
- AEC-Q101 qualified
- Low leakage current
- Low forward voltage drop
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: DO-218AB
- Molding compound: UL94V-0 flammability
- Polarity: Heatsink is anode

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1,000μs waveform(1) | $P_{PPM}$ | 4600 | Watts |
| Watts Peak Pulse Power Dissipation on 10/10,000μs waveform | $I_{PP}$ | 3600 | Amps |
| Amps Peak pulse current with a 10/1,000μs waveform(1) | $I_{PP}$ | See Next Table | A |
| A Power dissipation on infinite heatsink at TL = 75 °C | $P_D$ | 6.0 | W |
| W Peak forward surge current, 8.3 ms single half sine-wave | $I_{FSM}$ | 600 | A |
| A Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 175 | °C |

**Notes :** 1. Non-repetitive current pulse per Fig.2 and derated above TA= 25 °C per Fig.1

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number (Uni) | Breakdown Voltage $V_{BR}$ @$I_T$ | | | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) | Maximum $I_R$ @$V_{RWM}$ $T_J$=175 (uA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$ (A)(1) | Maximum Clamping Voltage $V_C$ @$I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| | Min (V) | Max (V) | $I_T$ (mA) | | | | | |
| SM6Z10A | 11.1 | 12.3 | 5.0 | 15 | 250 | 10 | 271 | 17.0 |
| SM6Z11A | 12.2 | 13.5 | 5.0 | 10 | 150 | 11 | 253 | 18.2 |
| SM6Z12A | 13.3 | 14.7 | 5.0 | 10 | 150 | 12 | 231 | 19.9 |
| SM6Z13A | 14.4 | 15.9 | 5.0 | 10 | 150 | 13 | 214 | 21.5 |
| SM6Z14A | 15.6 | 17.2 | 5.0 | 10 | 150 | 14 | 198 | 23.2 |
| SM6Z15A | 16.7 | 18.5 | 5.0 | 10 | 150 | 15 | 189 | 24.4 |
| SM6Z16A | 17.8 | 19.7 | 5.0 | 10 | 150 | 16 | 177 | 26.0 |
| SM6Z17A | 18.9 | 20.9 | 5.0 | 10 | 150 | 17 | 167 | 27.6 |
| SM6Z18A | 20.0 | 22.1 | 5.0 | 10 | 150 | 18 | 158 | 29.2 |
| SM6Z20A | 22.2 | 24.5 | 5.0 | 10 | 150 | 20 | 142 | 32.4 |
| SM6Z22A | 24.4 | 26.9 | 5.0 | 10 | 150 | 22 | 130 | 35.5 |
| SM6Z24A | 26.7 | 29.5 | 5.0 | 10 | 150 | 24 | 118 | 38.9 |
| SM6Z26A | 28.9 | 31.9 | 5.0 | 10 | 150 | 26 | 109 | 42.1 |
| SM6Z28A | 31.1 | 34.4 | 5.0 | 10 | 150 | 28 | 101 | 45.4 |
| SM6Z30A | 33.3 | 36.8 | 5.0 | 10 | 150 | 30 | 95 | 48.4 |
| SM6Z33A | 36.7 | 40.6 | 5.0 | 10 | 150 | 33 | 86 | 53.3 |
| SM6Z36A | 40.0 | 44.2 | 5.0 | 10 | 150 | 36 | 79 | 58.1 |
| SM6Z40A | 44.4 | 49.1 | 5.0 | 10 | 150 | 40 | 71 | 64.5 |
| SM6Z43A | 47.8 | 52.8 | 5.0 | 10 | 150 | 43 | 66 | 69.4 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Pulse Derating Curve**

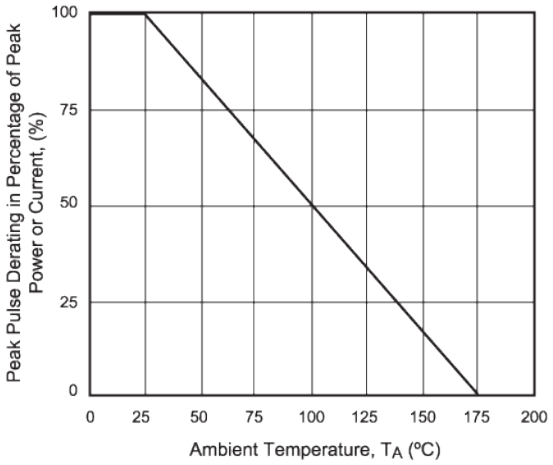



**Fig. 2 - Pulse Waveform**

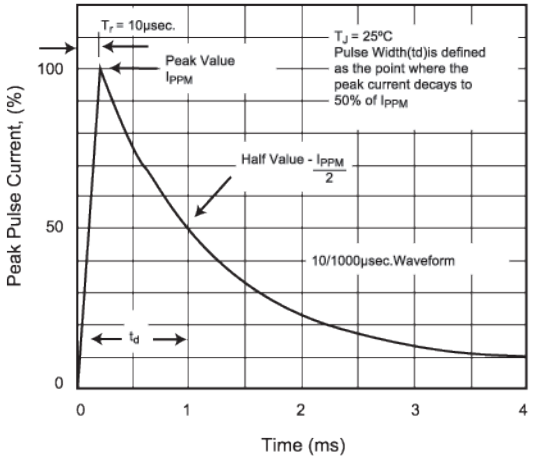



**Fig. 3 - Steady State Power Derating Curve**

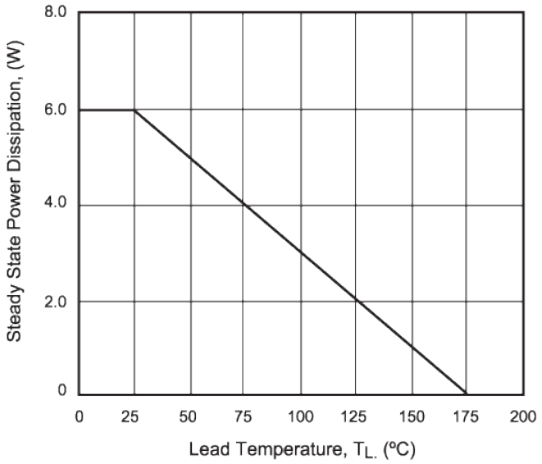
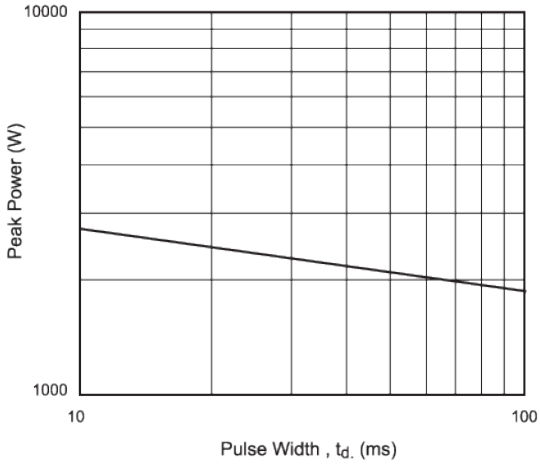
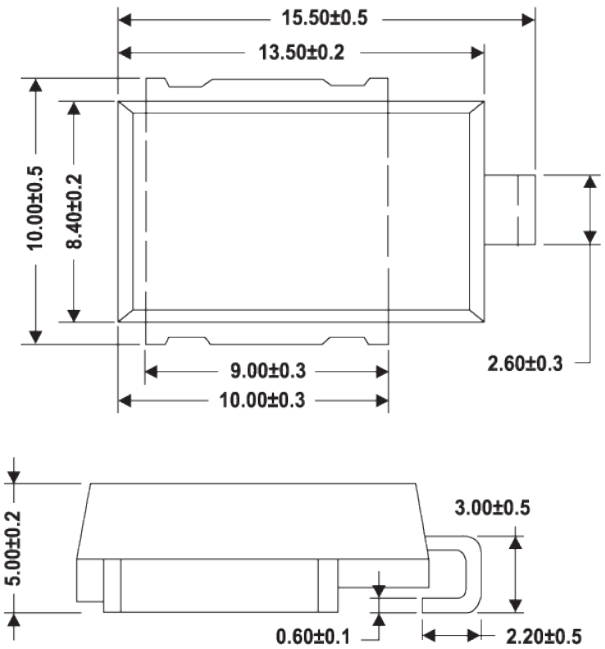


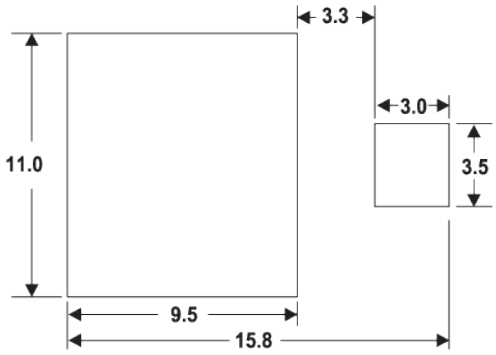

**Fig. 4 - Peak Pulse Power Rating Curve**



## Package Outline Dimensions (millimeters)

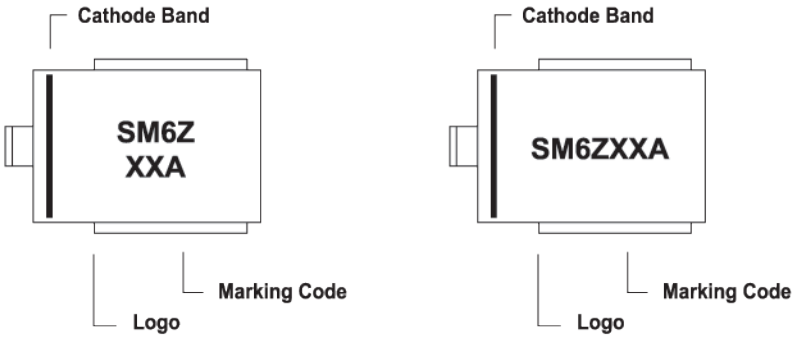



Recommended Mounting Pad Layout.




## Product Marking System

Product marking is the same as product series name.

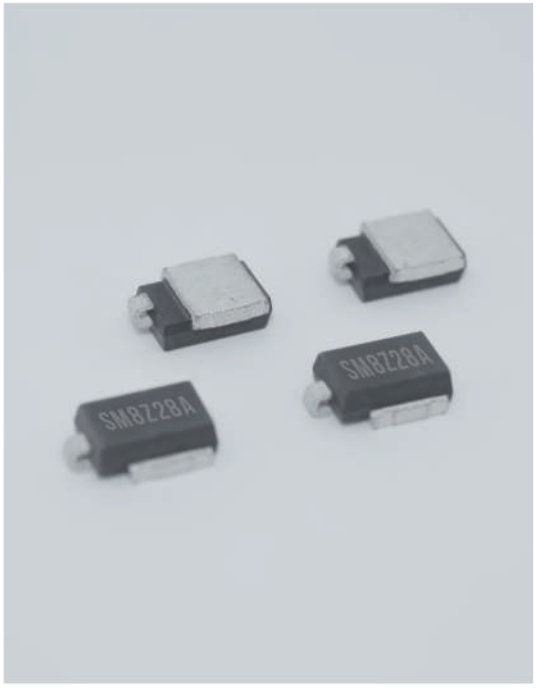


# SM8Z Series

## 6600W

Operating Voltage : 10 to 48V
Peak Pulse Power: 6600W

***DO-218AB***




RoHS | HF Halogen Free

## Features

- Optimized glass passivated chip
- TJ = 175 °C capability suitable for high reliability and automotive requirement
- 6600 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle):0.01 %
- Meet ISO 7637-2 5a/5b and ISO 16750 load dump test (varied by test condition)
- AEC-Q101 qualified
- Low leakage current
- Low forward voltage drop
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: DO-218AB
- Molding compound: UL94V-0 flammability
- Polarity: Heatsink is anode

## Maximum Ratings and Characteristics ( 25°C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1,000μs waveform(1) | $P_{PPM}$ | 6600 | Watts |
| Watts Peak Pulse Power Dissipation on 10/10,000μs waveform | $I_{PP}$ | 5200 | Amps |
| Amps Peak pulse current with a 10/1,000μs waveform(1) | $I_{PP}$ | See Next Table | A |
| A Power dissipation on infinite heatsink at TL = 75 °C | $P_D$ | 8.0 | W |
| W Peak forward surge current, 8.3 ms single half sine-wave | $I_{FSM}$ | 700 | A |
| A Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 175 | °C |

**Notes :** 1. Non-repetitive current pulse per Fig.2 and derated above TA= 25 °C per Fig.1

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number (Uni) | Breakdown Voltage $V_{BR}$ @$I_T$ | | | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) | Maximum $I_R$ @$V_{RWM}$ $T_J$=175 (uA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$ (A)(1) | Maximum Clamping Voltage $V_C$ @$I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| | Min (V) | Max (V) | $I_T$ (mA) | | | | | |
| SM8Z10A | 11.1 | 12.3 | 5.0 | 15 | 250 | 10 | 388 | 17.0 |
| SM8Z11A | 12.2 | 13.5 | 5.0 | 10 | 150 | 11 | 363 | 18.2 |
| SM8Z12A | 13.3 | 14.7 | 5.0 | 10 | 150 | 12 | 332 | 19.9 |
| SM8Z13A | 14.4 | 15.9 | 5.0 | 10 | 150 | 13 | 307 | 21.5 |
| SM8Z14A | 15.6 | 17.2 | 5.0 | 10 | 150 | 14 | 284 | 23.2 |
| SM8Z15A | 16.7 | 18.5 | 5.0 | 10 | 150 | 15 | 270 | 24.4 |
| SM8Z16A | 17.8 | 19.7 | 5.0 | 10 | 150 | 16 | 254 | 26.0 |
| SM8Z17A | 18.9 | 20.9 | 5.0 | 10 | 150 | 17 | 239 | 27.6 |
| SM8Z18A | 20.0 | 22.1 | 5.0 | 10 | 150 | 18 | 226 | 29.2 |
| SM8Z20A | 22.2 | 24.5 | 5.0 | 10 | 150 | 20 | 204 | 32.4 |
| SM8Z22A | 24.4 | 26.9 | 5.0 | 10 | 150 | 22 | 186 | 35.5 |
| SM8Z24A | 26.7 | 29.5 | 5.0 | 10 | 150 | 24 | 170 | 38.9 |
| SM8Z26A | 28.9 | 31.9 | 5.0 | 10 | 150 | 26 | 157 | 42.1 |
| SM8Z28A | 31.1 | 34.4 | 5.0 | 10 | 150 | 28 | 145 | 45.4 |
| SM8Z30A | 33.3 | 36.8 | 5.0 | 10 | 150 | 30 | 136 | 48.4 |
| SM8Z33A | 36.7 | 40.6 | 5.0 | 10 | 150 | 33 | 124 | 53.3 |
| SM8Z36A | 40.0 | 44.2 | 5.0 | 10 | 150 | 36 | 114 | 58.1 |
| SM8Z40A | 44.4 | 49.1 | 5.0 | 10 | 150 | 40 | 102 | 64.5 |
| SM8Z43A | 47.8 | 52.8 | 5.0 | 10 | 150 | 43 | 95.1 | 69.4 |
| SM8Z48A | 53.3 | 58.9 | 5.0 | 10 | 150 | 48 | 85.2 | 77.4 |

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Pulse Derating Curve**

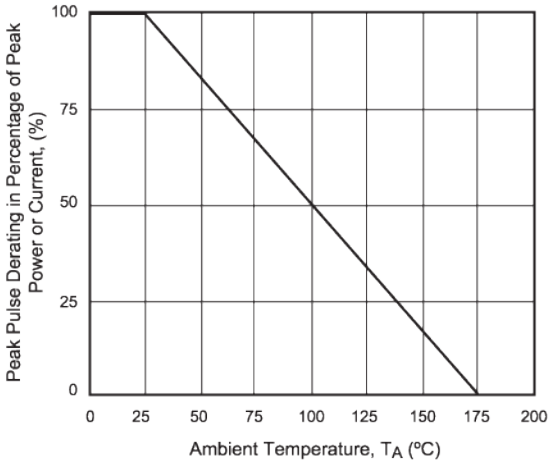



**Fig. 2 - Pulse Waveform**

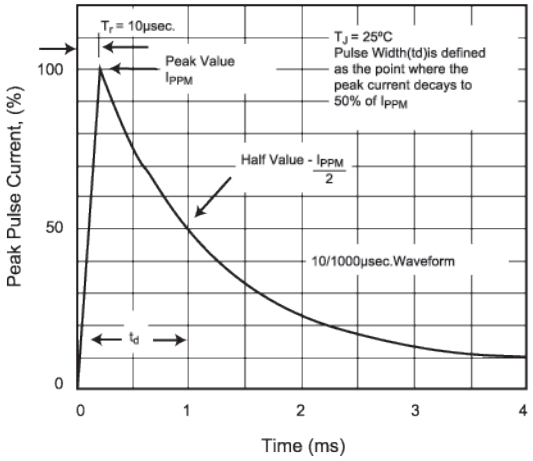



**Fig. 3 - Steady State Power Derating Curve**

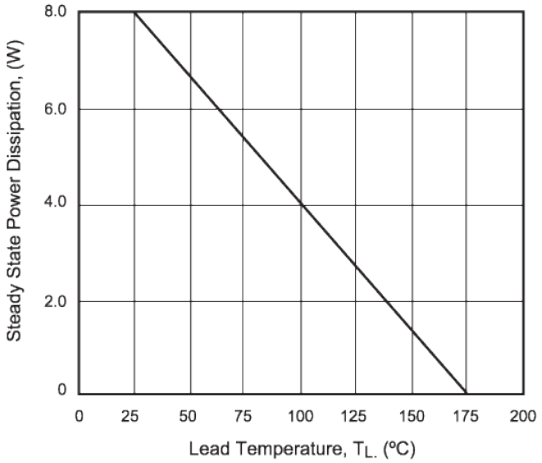
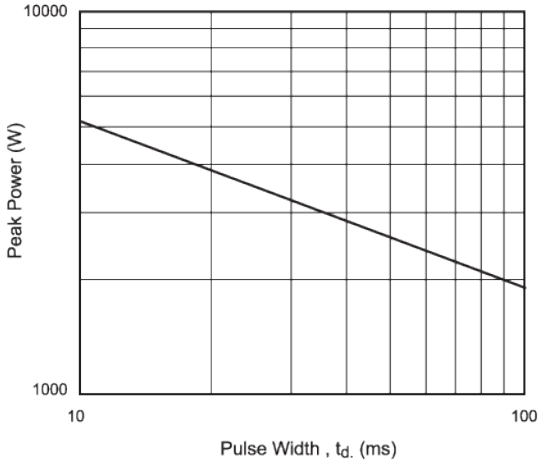
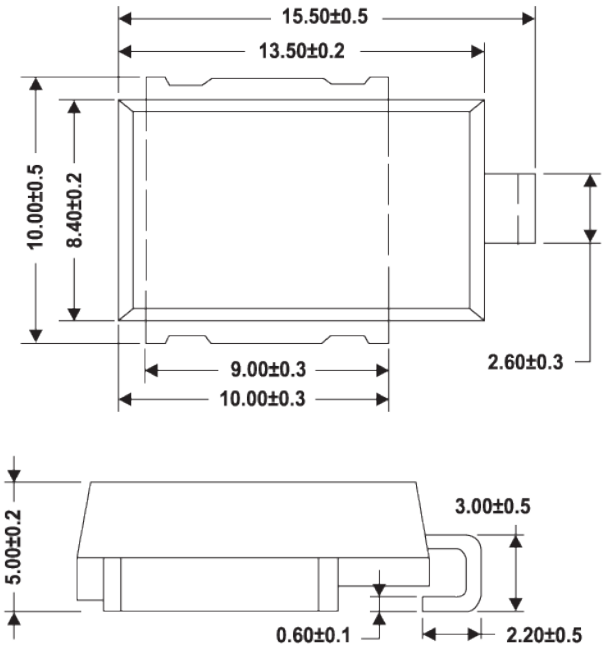


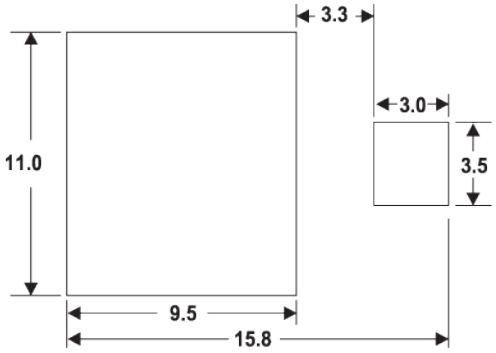

**Fig. 4 - Peak Pulse Power Rating Curve**



## Package Outline Dimensions (millimeters)

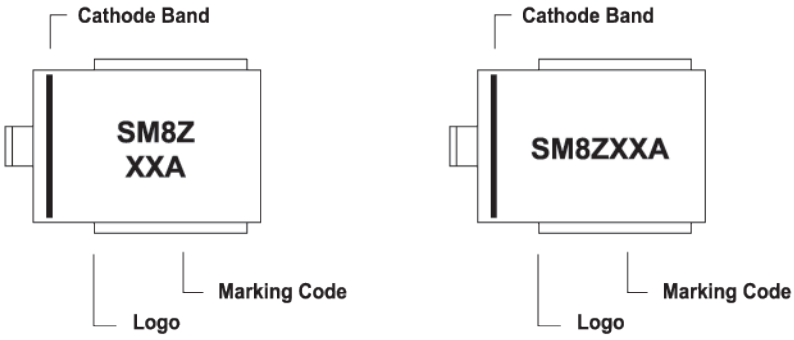



Recommended Mounting Pad Layout.




## Product Marking System

Product marking is the same as product series name.



Aldinet

# Axial Leaded
## TVS Series

Axial leaded and custom TVS diodes are the perfect solution for high voltage transients induced by lightning or electromagnetic pulses, ideal for industrial and telecom applications.

# 15KPA Series

## 15000W

Operating Voltage : 17 to 280V
Peak Pulse Power: 15000W

***R6/P600***

## Features

- Glass passivated chip
- 15000 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (dutycycle):0.01 %
- Low leakage current
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-202, method 208 guaranteed
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

RoHS | HF Halogen Free

## Maximum Ratings and Characteristics ( 25˚C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1,000μs waveform(1) | $P_{PPM}$ | 15000 | W |
| Peak Pulse Current with a 10/1,000μs waveform(1) | $I_{PP}$ | See Next Table | A |
| Power dissipation on infinite heatsink at TL = 75 °C | $P_D$ | 8.0 | W |
| Peak forward surge current, 8.3 ms single half sine- wave unidirectional only(2) | $I_{FSM}$ | 500 | A |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 175 | °C |

**Notes :** 1. Non-repetitive current pulse per Fig.5 and derated above TA = 25 °C per Fig.1
2. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number | | Breakdown Voltage $V_{BR}$ @$I_T$ | | | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$ (A) | Maximum Clamping Voltage $V_C$ @$I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| (Uni) | (Bi) | Min (V) | Max (V) | $I_T$ (mA) | | | | |
| 15KPA17A | 15KPA17CA | 18.99 | 20.79 | 50 | 5000 | 17 | 515.4 | 29.3 |
| 15KPA18A | 15KPA18CA | 20.11 | 22.01 | 50 | 5000 | 18 | 488.7 | 30.9 |
| 15KPA20A | 15KPA20CA | 22.34 | 24.46 | 20 | 1500 | 20 | 440.2 | 34.3 |
| 15KPA22A | 15KPA22CA | 24.57 | 26.91 | 10 | 500 | 22 | 407.0 | 37.1 |
| 15KPA24A | 15KPA24CA | 26.81 | 29.35 | 5 | 150 | 24 | 371.0 | 40.7 |
| 15KPA26A | 15KPA26CA | 29.04 | 31.80 | 5 | 50 | 26 | 343.2 | 44.0 |
| 15KPA28A | 15KPA28CA | 31.28 | 34.24 | 5 | 25 | 28 | 317.9 | 47.5 |
| 15KPA30A | 15KPA30CA | 33.51 | 36.70 | 5 | 15 | 30 | 297.8 | 50.7 |
| 15KPA33A | 15KPA33CA | 36.90 | 40.40 | 5 | 2 | 33 | 276.1 | 54.7 |
| 15KPA36A | 15KPA36CA | 40.20 | 44.00 | 5 | 2 | 36 | 252.5 | 59.8 |
| 15KPA40A | 15KPA40CA | 44.70 | 48.90 | 5 | 2 | 40 | 229.5 | 65.8 |
| 15KPA43A | 15KPA43CA | 48.00 | 52.60 | 5 | 2 | 43 | 216.3 | 69.8 |
| 15KPA45A | 15KPA45CA | 50.30 | 55.00 | 5 | 2 | 45 | 207.4 | 72.8 |
| 15KPA48A | 15KPA48CA | 53.60 | 58.70 | 5 | 2 | 48 | 194.3 | 77.7 |
| 15KPA51A | 15KPA51CA | 57.00 | 62.40 | 5 | 2 | 51 | 182.1 | 82.9 |
| 15KPA54A | 15KPA54CA | 60.30 | 66.00 | 5 | 2 | 54 | 172.2 | 87.7 |
| 15KPA58A | 15KPA58CA | 64.80 | 70.90 | 5 | 2 | 58 | 161.0 | 93.8 |
| 15KPA60A | 15KPA60CA | 67.00 | 73.40 | 5 | 2 | 60 | 155.0 | 97.4 |
| 15KPA64A | 15KPA64CA | 71.50 | 78.30 | 5 | 2 | 64 | 144.9 | 104.2 |
| 15KPA70A | 15KPA70CA | 78.20 | 85.60 | 5 | 2 | 70 | 132.9 | 113.6 |
| 15KPA75A | 15KPA75CA | 83.80 | 91.70 | 5 | 2 | 75 | 123.8 | 122.0 |
| 15KPA78A | 15KPA78CA | 87.10 | 95.40 | 5 | 2 | 78 | 119.7 | 126.1 |
| 15KPA85A | 15KPA85CA | 94.90 | 104.00 | 5 | 2 | 85 | 109.7 | 137.6 |
| 15KPA90A | 15KPA90CA | 100.50 | 110.10 | 5 | 2 | 90 | 103.7 | 145.6 |
| 15KPA100A | 15KPA100CA | 111.70 | 122.30 | 5 | 2 | 100 | 93.6 | 161.3 |
| 15KPA110A | 15KPA110CA | 122.90 | 134.50 | 5 | 2 | 110 | 84.5 | 178.6 |
| 15KPA120A | 15KPA120CA | 134.00 | 146.80 | 5 | 2 | 120 | 78.5 | 192.3 |
| 15KPA130A | 15KPA130CA | 145.20 | 159.00 | 5 | 2 | 130 | 72.5 | 208.3 |
| 15KPA150A | 15KPA150CA | 167.60 | 183.50 | 5 | 2 | 150 | 62.4 | 241.9 |
| 15KPA160A | 15KPA160CA | 178.70 | 195.70 | 5 | 2 | 160 | 58.4 | 258.6 |
| 15KPA170A | 15KPA170CA | 189.90 | 207.90 | 5 | 2 | 170 | 55.4 | 272.7 |
| 15KPA180A | 15KPA180CA | 201.10 | 220.10 | 5 | 2 | 180 | 52.3 | 288.5 |
| 15KPA200A | 15KPA200CA | 223.40 | 244.60 | 5 | 2 | 200 | 47.3 | 319.1 |
| 15KPA220A | 15KPA220CA | 245.70 | 269.10 | 5 | 2 | 220 | 42.4 | 356.0 |
| 15KPA240A | 15KPA240CA | 268.10 | 293.50 | 5 | 2 | 240 | 39.3 | 384.6 |
| 15KPA260A | 15KPA260CA | 290.40 | 318.00 | 5 | 2 | 260 | 36.2 | 416.7 |
| 15KPA280A | 15KPA280CA | 312.80 | 342.40 | 5 | 2 | 280 | 33.2 | 454.5 |

* For Bi-Directional devices having VR of 30 volts and under, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Pulse Derating Curve**

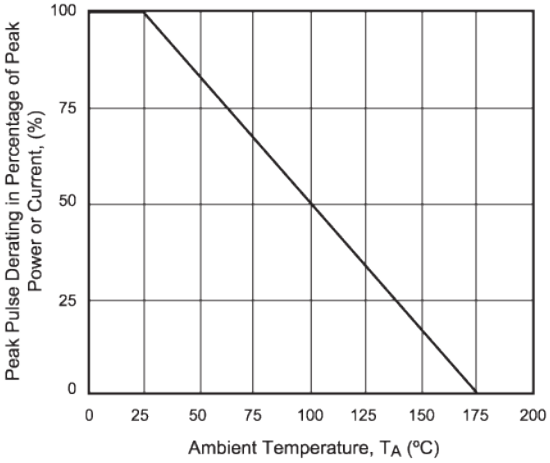



**Fig. 2 - Maximum Non-Repetitive Surge Current**

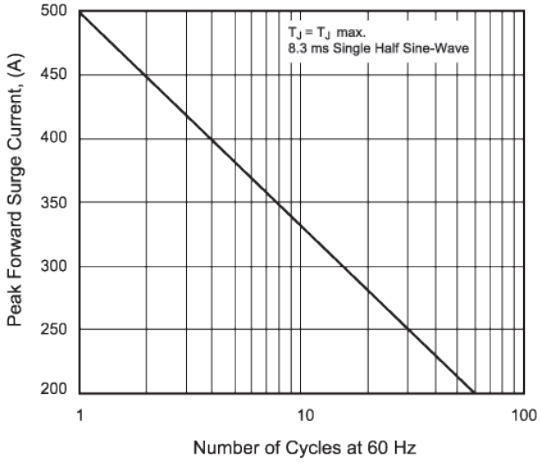



**Fig. 3 - Steady State Power Derating Curve**

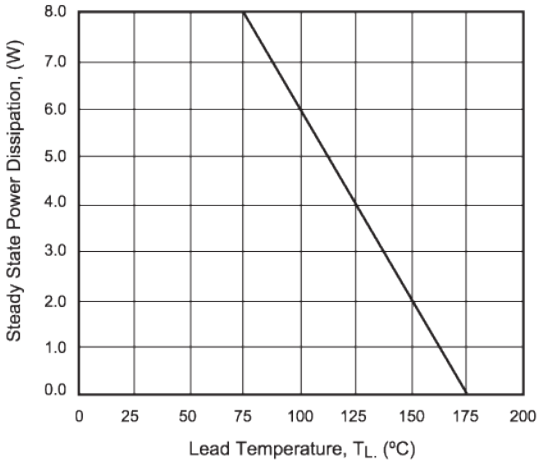



**Fig. 4 - Peak Pulse Power Rating Curve**

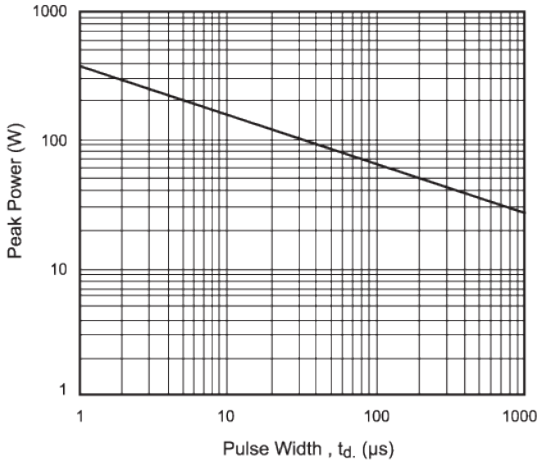



**Fig. 5 - Pulse Waveform**

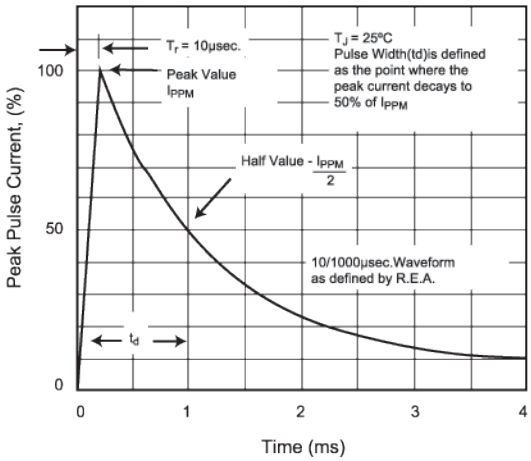
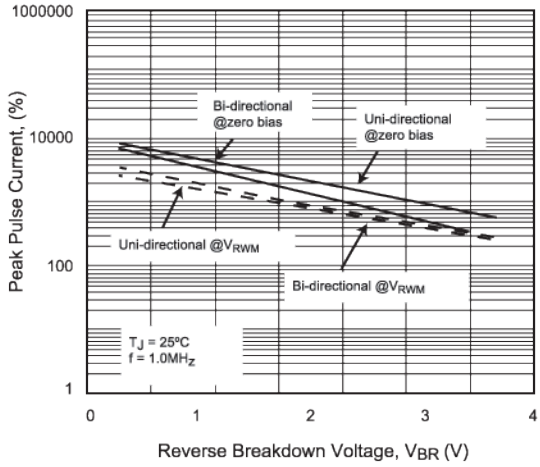
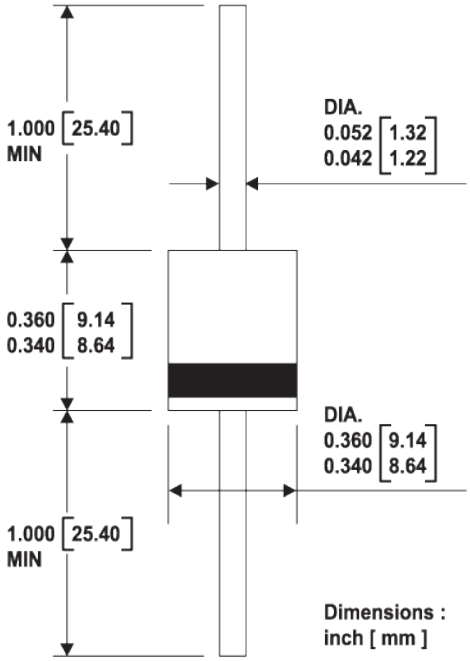



**Fig. 6 - Typical Junction Capacitance**



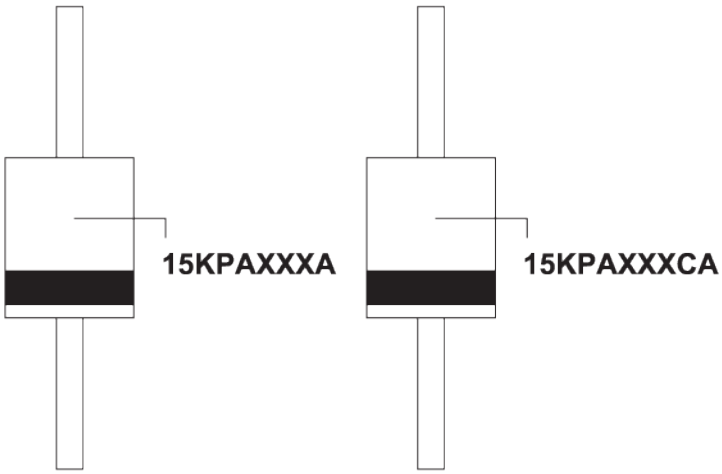
## Package Outline Dimensions (millimeters)

R-6/P600




## Product Marking System

Product marking is the same as product series name.



# 30KPA Series

## 30000W

Operating Voltage : 28 to 320V
Peak Pulse Power: 30000W

***R6/P600***

## Features

- Glass passivated chip
- 30000 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (dutycycle):0.01 %
- Low leakage current
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

## Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-202, method 208 guaranteed
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

RoHS | HF Halogen Free

## Maximum Ratings and Characteristics ( 25˚C)

| Rating | Symbol | Value | Units |
|---|---|---|---|
| Peak Pulse Power Dissipation on 10/1,000μs waveform(1) | $P_{PPM}$ | 30000 | W |
| Peak Pulse Current with a 10/1,000μs waveform(1) | $I_{PP}$ | See Next Table | A |
| Power dissipation on infinite heatsink at TL = 75 °C | $P_D$ | 8.0 | W |
| Peak forward surge current, 8.3 ms single half sine- wave unidirectional only(2) | $I_{FSM}$ | 500 | A |
| Operating junction and Storage Temperature Range | $T_J$ , $T_{STG}$ | -55 to + 175 | °C |

**Notes :** 1. Non-repetitive current pulse per Fig.5 and derated above TA = 25 °C per Fig.1
2. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Breakdown Voltage $V_{BR}$ @$I_T$ | | | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$ (A) | Maximum Clamping Voltage $V_C$ @$I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| (Uni) | (Bi) | Min (V) | Max (V) | $I_T$ (mA) | | | | |
| 30KPA28A | 30KPA28CA | 31.28 | 34.41 | 50 | 5000 | 28 | 606.0 | 50.0 |
| 30KPA30A | 30KPA30CA | 33.51 | 36.86 | 50 | 5000 | 30 | 548.9 | 55.2 |
| 30KPA33A | 30KPA33CA | 36.90 | 40.59 | 50 | 5000 | 33 | 517.9 | 58.5 |
| 30KPA36A | 30KPA36CA | 40.20 | 44.22 | 50 | 5000 | 36 | 490.3 | 61.8 |
| 30KPA39A | 30KPA39CA | 43.60 | 47.96 | 20 | 2000 | 39 | 450.9 | 67.2 |
| 30KPA42A | 30KPA42CA | 46.90 | 51.59 | 10 | 1000 | 42 | 420.8 | 72.0 |
| 30KPA43A | 30KPA43CA | 48.00 | 52.80 | 10 | 1000 | 43 | 415.1 | 73.0 |
| 30KPA45A | 30KPA45CA | 50.30 | 55.33 | 5 | 250 | 45 | 391.5 | 77.4 |
| 30KPA48A | 30KPA48CA | 53.60 | 58.96 | 5 | 150 | 48 | 371.3 | 81.6 |
| 30KPA51A | 30KPA51CA | 57.00 | 62.70 | 5 | 50 | 51 | 350.7 | 86.4 |
| 30KPA54A | 30KPA54CA | 60.30 | 66.33 | 5 | 20 | 54 | 331.5 | 91.4 |
| 30KPA58A | 30KPA58CA | 64.80 | 71.28 | 5 | 20 | 58 | 327.9 | 92.4 |
| 30KPA60A | 30KPA60CA | 67.00 | 73.70 | 5 | 15 | 60 | 297.1 | 102.0 |
| 30KPA64A | 30KPA64CA | 71.50 | 78.65 | 5 | 10 | 64 | 291.3 | 104.0 |
| 30KPA66A | 30KPA66CA | 73.70 | 81.07 | 5 | 2 | 66 | 283.2 | 107.0 |
| 30KPA70A | 30KPA70CA | 78.20 | 86.02 | 5 | 2 | 70 | 278.0 | 109.0 |
| 30KPA71A | 30KPA71CA | 79.30 | 87.23 | 5 | 2 | 71 | 271.7 | 111.5 |
| 30KPA72A | 30KPA72CA | 80.40 | 88.44 | 5 | 2 | 72 | 265.8 | 114.0 |
| 30KPA75A | 30KPA75CA | 83.80 | 92.18 | 5 | 2 | 75 | 253.8 | 119.4 |
| 30KPA78A | 30KPA78CA | 87.10 | 95.81 | 5 | 2 | 78 | 234.9 | 129.0 |
| 30KPA84A | 30KPA84CA | 93.80 | 103.18 | 5 | 2 | 84 | 217.7 | 139.2 |
| 30KPA90A | 30KPA90CA | 100.50 | 110.55 | 5 | 2 | 90 | 207.0 | 146.4 |
| 30KPA96A | 30KPA96CA | 107.20 | 117.92 | 5 | 2 | 96 | 194.2 | 156.0 |
| 30KPA102A | 30KPA102CA | 113.90 | 125.29 | 5 | 2 | 102 | 183.0 | 165.6 |
| 30KPA108A | 30KPA108CA | 120.60 | 132.66 | 5 | 2 | 108 | 172.9 | 175.2 |
| 30KPA120A | 30KPA120CA | 134.00 | 147.40 | 5 | 2 | 120 | 155.9 | 194.4 |
| 30KPA132A | 30KPA132CA | 147.40 | 162.14 | 5 | 2 | 132 | 142.3 | 213.0 |
| 30KPA144A | 30KPA144CA | 160.80 | 176.88 | 5 | 2 | 144 | 135.8 | 223.2 |
| 30KPA150A | 30KPA150CA | 167.60 | 184.36 | 5 | 2 | 150 | 129.8 | 233.4 |
| 30KPA156A | 30KPA156CA | 174.30 | 191.73 | 5 | 2 | 156 | 123.7 | 245.0 |

* For Bi-Directional devices having VR of 30 volts and under, the IR limit is double.

## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | | Breakdown Voltage $V_{BR}$ @$I_T$ | | | Maximum Reverse Leakage $I_R$@ $V_{RWM}$ (μA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$ (A) | Maximum Clamping Voltage $V_C$ @$I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| (Uni) | (Bi) | Min (V) | Max (V) | $I_T$ (mA) | | | | |
| 30KPA160A | 30KPA160CA | 178.70 | 196.57 | 5 | 2 | 160 | 120.0 | 252.6 |
| 30KPA168A | 30KPA168CA | 187.70 | 206.47 | 5 | 2 | 168 | 111.2 | 272.4 |
| 30KPA170A | 30KPA170CA | 189.90 | 208.89 | 5 | 2 | 170 | 110.2 | 275.0 |
| 30KPA180A | 30KPA180CA | 201.10 | 221.21 | 5 | 2 | 180 | 104.3 | 290.4 |
| 30KPA198A | 30KPA198CA | 221.20 | 243.32 | 5 | 2 | 198 | 94.7 | 319.8 |
| 30KPA216A | 30KPA216CA | 241.30 | 265.43 | 5 | 2 | 216 | 86.9 | 348.6 |
| 30KPA240A | 30KPA240CA | 268.10 | 294.91 | 5 | 2 | 240 | 78.3 | 387.0 |
| 30KPA258A | 30KPA258CA | 288.20 | 317.02 | 5 | 2 | 258 | 72.8 | 416.4 |
| 30KPA260A | 30KPA260CA | 290.40 | 319.44 | 5 | 2 | 260 | 72.8 | 416.0 |
| 30KPA270A | 30KPA270CA | 301.60 | 331.76 | 5 | 2 | 270 | 69.5 | 436.2 |
| 30KPA280A | 30KPA280CA | 312.80 | 344.08 | 5 | 2 | 280 | 65.3 | 464.0 |
| 30KPA288A | 30KPA288CA | 321.70 | 353.87 | 5 | 2 | 288 | 64.5 | 469.9 |
| 30KPA300A | 30KPA300CA | 334.00 | 367.40 | 5 | 2 | 300 | 62.0 | 484.0 |
| 30KPA320A | 30KPA320CA | 356.00 | 392.00 | 5 | 2 | 320 | 57.0 | 530.0 |

* For Bi-Directional devices having VR of 30 volts and under, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

**Fig. 1 - Pulse Derating Curve**

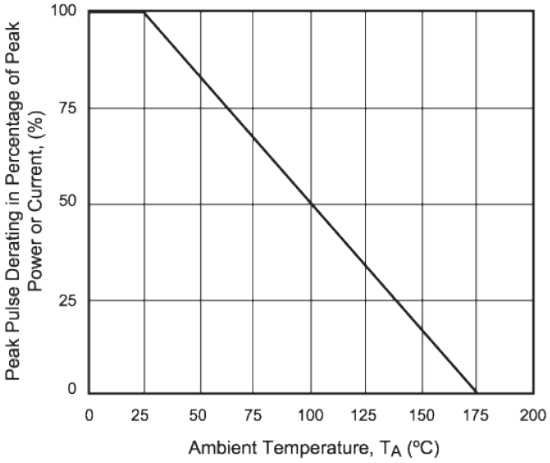



**Fig. 2 - Maximum Non-Repetitive Surge Current**

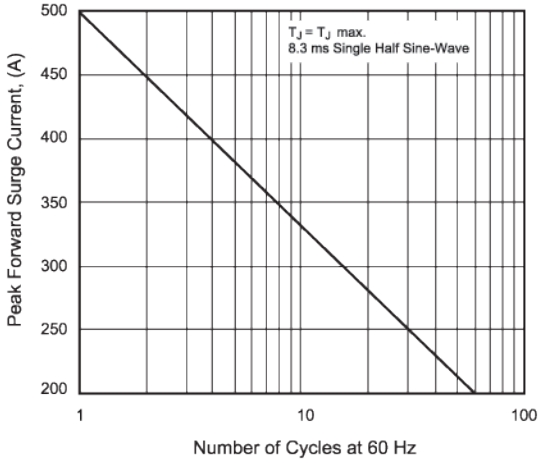



**Fig. 3 - Steady State Power Derating Curve**

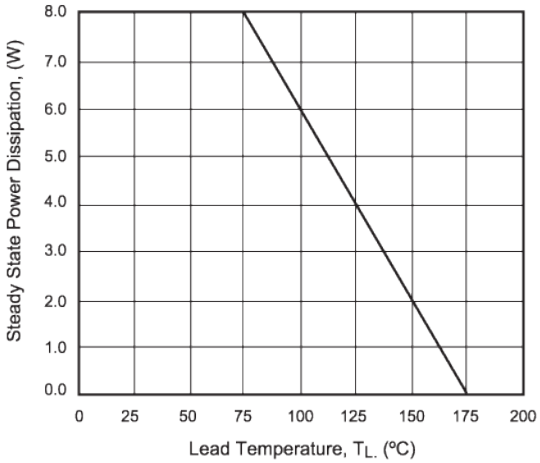



**Fig. 4 - Peak Pulse Power Rating Curve**

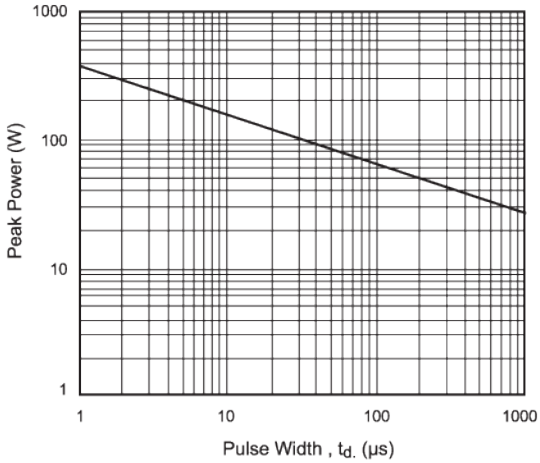



**Fig. 5 - Pulse Waveform**

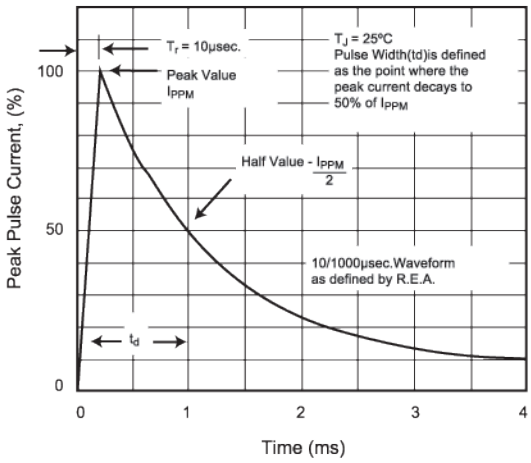
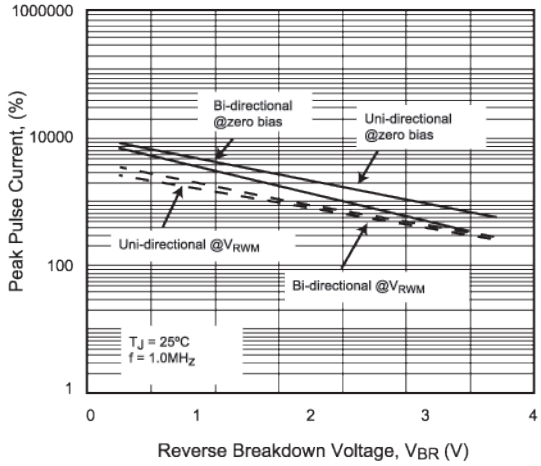
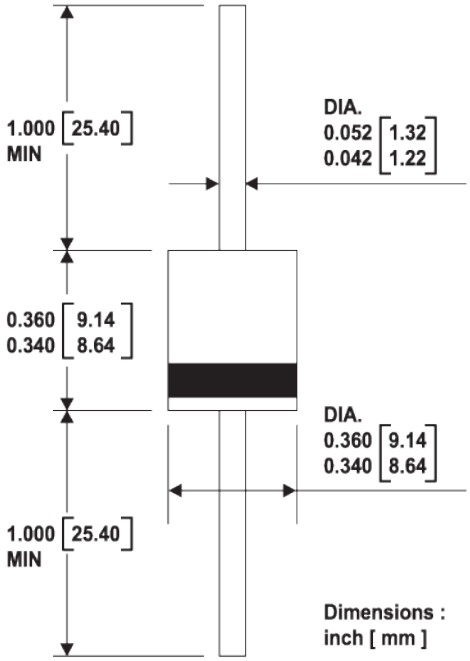



**Fig. 6 - Typical Junction Capacitance**



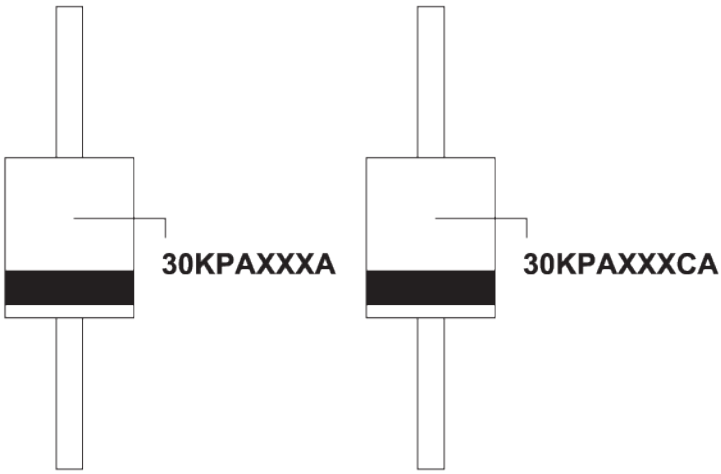
## Package Outline Dimensions (millimeters)

R-6/P600




## Product Marking System

Product marking is the same as product series name.



# KA Series

## Operating Voltage : 12.8 to 380V

***Custom Part***

## Features

- High current transient suppressors
- Excellent Clamping Capability
- Glass passivated chip
- Bidirectional
- Low Slope Resistance
- Hazardous Substances Free
- RoHS Compliant
- High Temperature soldering: 260°C/10 seconds at terminals
- Epoxy Encapsulated
- UL certified

RoHS | HF Halogen Free

## Maximum Ratings and Characteristics ( 25˚C)

| Rating | Symbol | Value | | Units |
|---|---|---|---|---|
| Current Rating, Rated IPP measured with 8/20us pulse | IPP | K1 | 1 | Kamps |
| | | KA | 3 | |
| | | KB | 6 | |
| | | KC | 10 | |
| | | KD | 15 | |
| Operating junction and Storage Temperature Range | TJ , TSTG | -55 to + 175 | | °C |

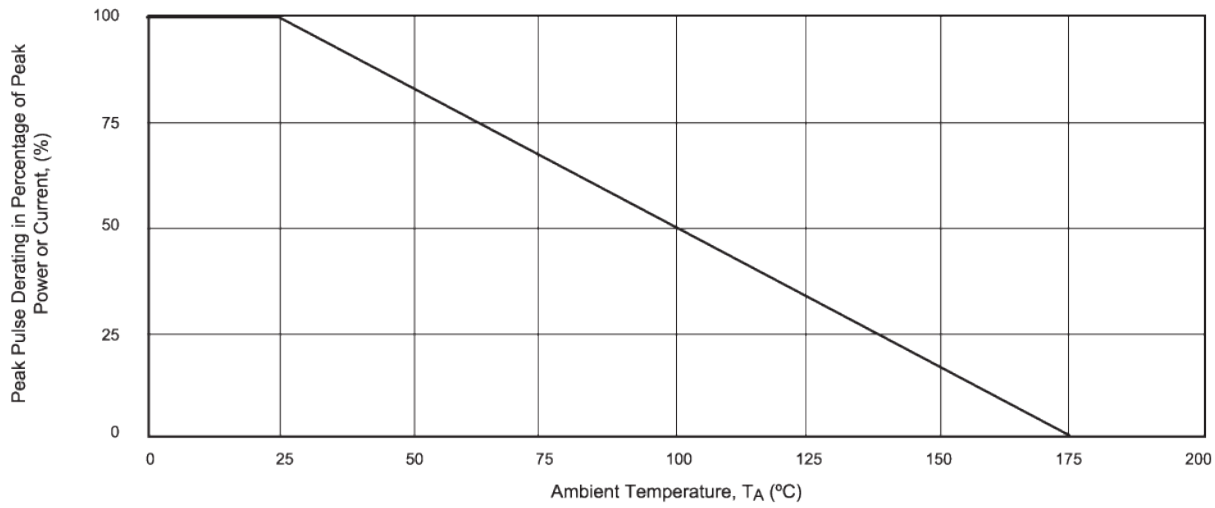
## Electrical Characteristics (TA=25˚C unless otherwise noted)

| Part Number | Reverse Stand-Off Voltage | | Breakdown Voltage | Test Current | Current Rating | Maximum Clamping Voltage | Reverse Leakage |
|---|---|---|---|---|---|---|---|
| | VAC (V) | VDC(V) | VBR(V) MIN.@IT | $I_T$ (mA) | 8/20μs (KA) | VC(V) @IPP | IR(μA) @VDC |
| K1076 | 54 | 76 | 83 | 10 | 1 | 135 | 20 |
| KA012 | 8.5 | 12.8 | 14 | 10 | 3 | 28 | 20 |
| KA015 | 11 | 15 | 17 | 10 | 3 | 30 | 20 |
| KA020 | 14 | 20 | 22 | 10 | 3 | 40 | 20 |
| KA025 | 17 | 25 | 28 | 10 | 3 | 50 | 20 |
| KA030 | 21 | 30 | 33 | 10 | 3 | 90 | 20 |
| KA042 | 30 | 42 | 47 | 10 | 3 | 77 | 20 |
| KA058 | 40 | 58 | 64 | 10 | 3 | 110 | 20 |
| KA076 | 54 | 76 | 85 | 10 | 3 | 140 | 20 |
| KA380 | 275 | 380 | 401 | 10 | 3 | 520 | 20 |
| KB066 | 45 | 66 | 70 | 10 | 6 | 125 | 20 |
| KB076 | 54 | 76 | 83 | 10 | 6 | 135 | 20 |
| KB170 | 130 | 170 | 180 | 10 | 6 | 260 | 20 |
| KB190 | 145 | 190 | 200 | 10 | 6 | 290 | 20 |
| KB240 | 180 | 240 | 250 | 10 | 6 | 340 | 20 |
| KC076 | 54 | 76 | 83 | 10 | 10 | 135 | 20 |
| KC170 | 130 | 170 | 180 | 10 | 10 | 260 | 20 |
| KC190 | 145 | 190 | 200 | 10 | 10 | 290 | 20 |
| KC240 | 180 | 240 | 250 | 10 | 10 | 340 | 20 |
| KC380 | 275 | 380 | 401 | 10 | 10 | 520 | 20 |
| KD012 | 8.5 | 12.8 | 14 | 10 | 15 | 50 | 20 |
| KD042 | 30 | 42 | 47 | 10 | 15 | 100 | 20 |
| KD058 | 40 | 58 | 64 | 10 | 15 | 110 | 20 |
| KD076 | 54 | 76 | 85 | 10 | 15 | 150 | 20 |

* For Bi-Directional devices having VR of 30 volts and under, the IR limit is double.

## Ratings and Characteristic Curves(TA=25˚C unless otherwise noted)

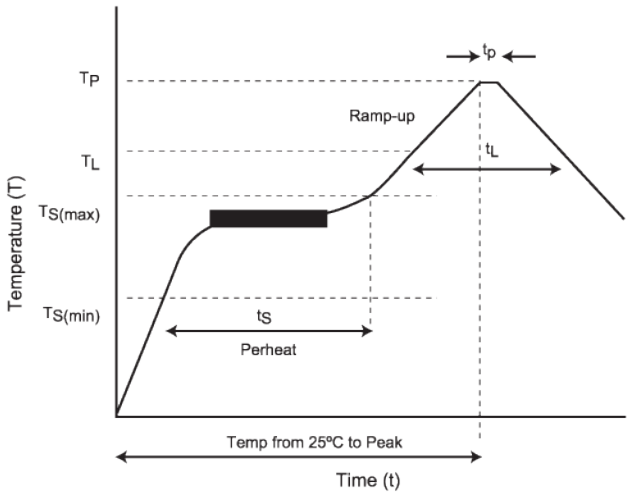
**Fig. 1 - Pulse Derating Curve**



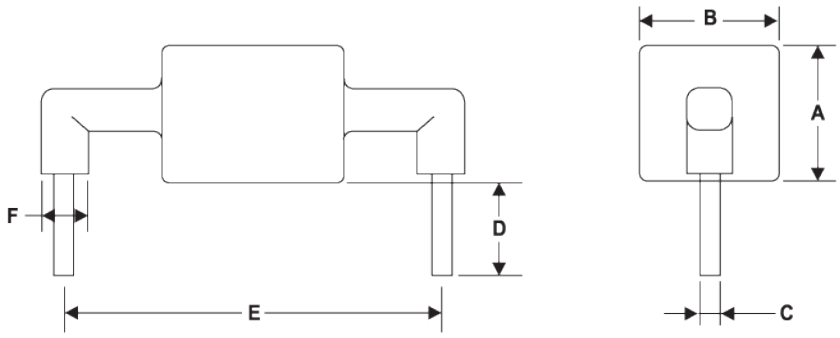

## Soldering Parameters

| IR-Reflow Condition | | | |
|---|---|---|---|
| Pre Heat | Temp. min | 150 | °C |
| | Temp. max | 200 | °C |
| | Time (min to max) | 60-180 | sec |
| Ramp up rate (150-200°C) | | < 3 | °C/sec |
| Reflow | Liquidus Temp. | > 220 | °C |
| | Peak Temp. | 255-260 | °C |
| | Time (Liq. to Peak) | 60-150 | sec |
| Ramp up rate (220-200°C) | | < 3 | °C/sec |
| Time within actual peak temp. | | 10-30 | sec |

| | | |
|---|---|---|
| Ramp down Rate | < | °C/sec |
| Time (25°C to Peak Temp.) | < 6 | min |
| Do not exceed | 280 | °C |



## Package Outline Dimensions (inches & millimeters)




| K1 Series | | |
|---|---|---|
| Dimensions | Inches | Millimeters |
| A | max 0.571 | max 14.5 |
| B | max 0.500 | max 12.7 |
| C | 0.051 ± 0.004 | 1.30 ± 0.10 |
| D | 0.276 ± 0.019 | 7.00 ± 0.50 |
| E | 0.95 ± 0.028 | 24.15 ± 0.7 |
| F | max 0.158 | max 4 |

| KA Series | | |
|---|---|---|
| Dimensions | Inches | Millimeters |
| A | max 0.571 | max 14.5 |
| B | max 0.500 | max 12.7 |
| C | 0.051 ± 0.004 | 1.30 ± 0.10 |
| D | 0.276 ± 0.019 | 7.00 ± 0.50 |
| E | 0.95 ± 0.028 | 24.15 ± 0.7 |
| F | max 0.158 | max 4 |

| KB Series | | |
|---|---|---|
| Dimensions | Inches | Millimeters |
| A | max 0.571 | max 14.5 |
| B | max 0.500 | max 12.7 |
| C | 0.051 ± 0.004 | 1.30 ± 0.10 |
| D | 0.276 ± 0.019 | 7.00 ± 0.50 |
| E | 0.95 ± 0.028 | 24.15 ± 0.7 |
| F | max 0.158 | max 4 |

| KC Series | | |
|---|---|---|
| Dimensions | Inches | Millimeters |
| A | max 0.630 | max 16 |
| B | max 0.571 | max 14.5 |
| C | 0.051 ± 0.004 | 1.30 ± 0.10 |
| D | 0.276 ± 0.019 | 7.00 ± 0.50 |
| E | 0.95 ± 0.028 | 24.15 ± 0.7 |
| F | max 0.158 | max 4 |

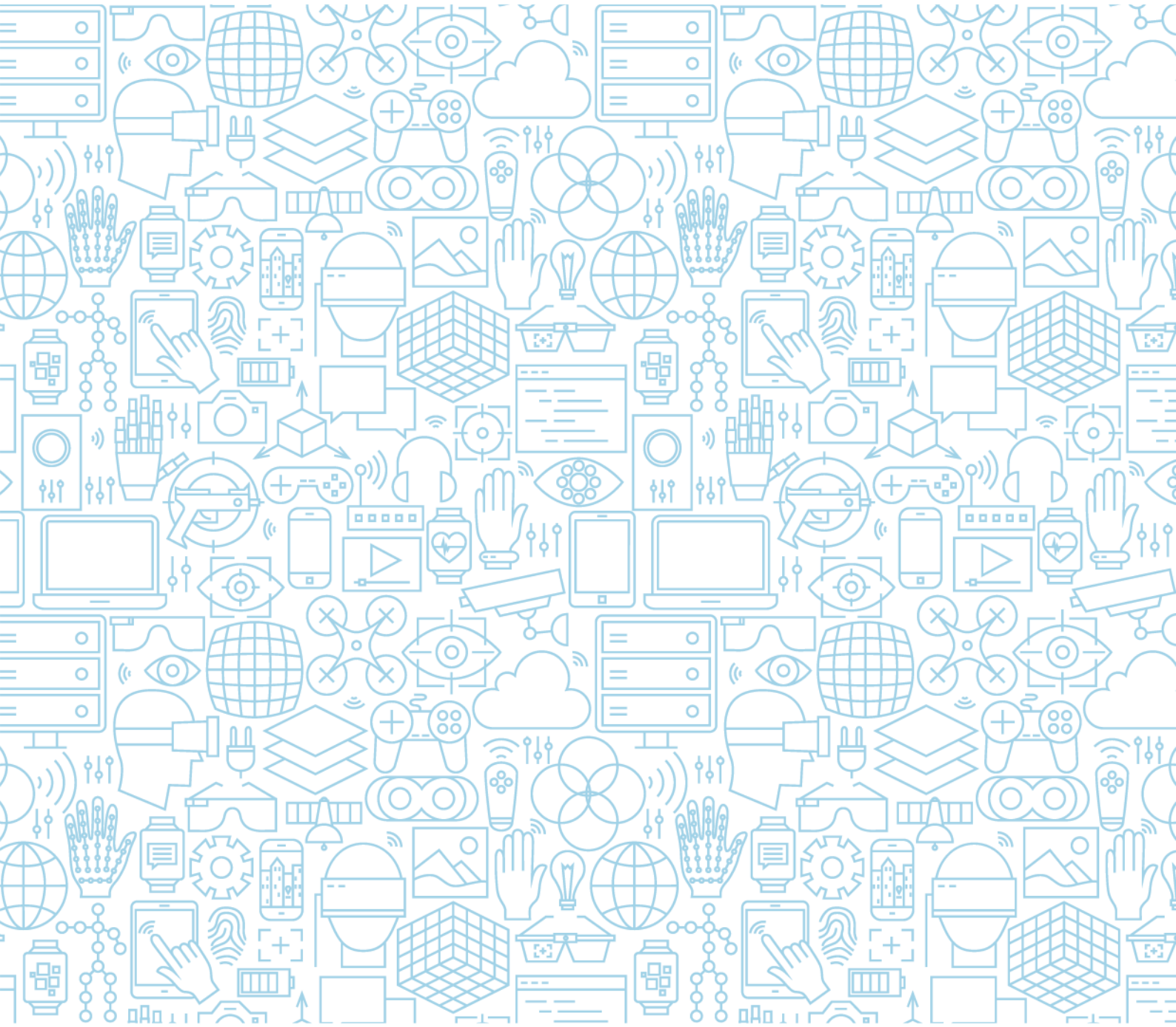
| KD Series | | |
|---|---|---|
| Dimensions | Inches | Millimeters |
| A | max 0.685 | max 17.40 |
| B | max 0.626 | max 15.90 |
| C | 0.051 ± 0.004 | 1.30 ± 0.10 |
| D | 0.276 ± 0.019 | 7.00 ± 0.50 |
| E | 0.95 ± 0.028 | 24.15 ± 0.7 |
| F | max 0.158 | max 4 |

# MEMO

FUZETEC



NOTE : All Specifications subject to change without notice.



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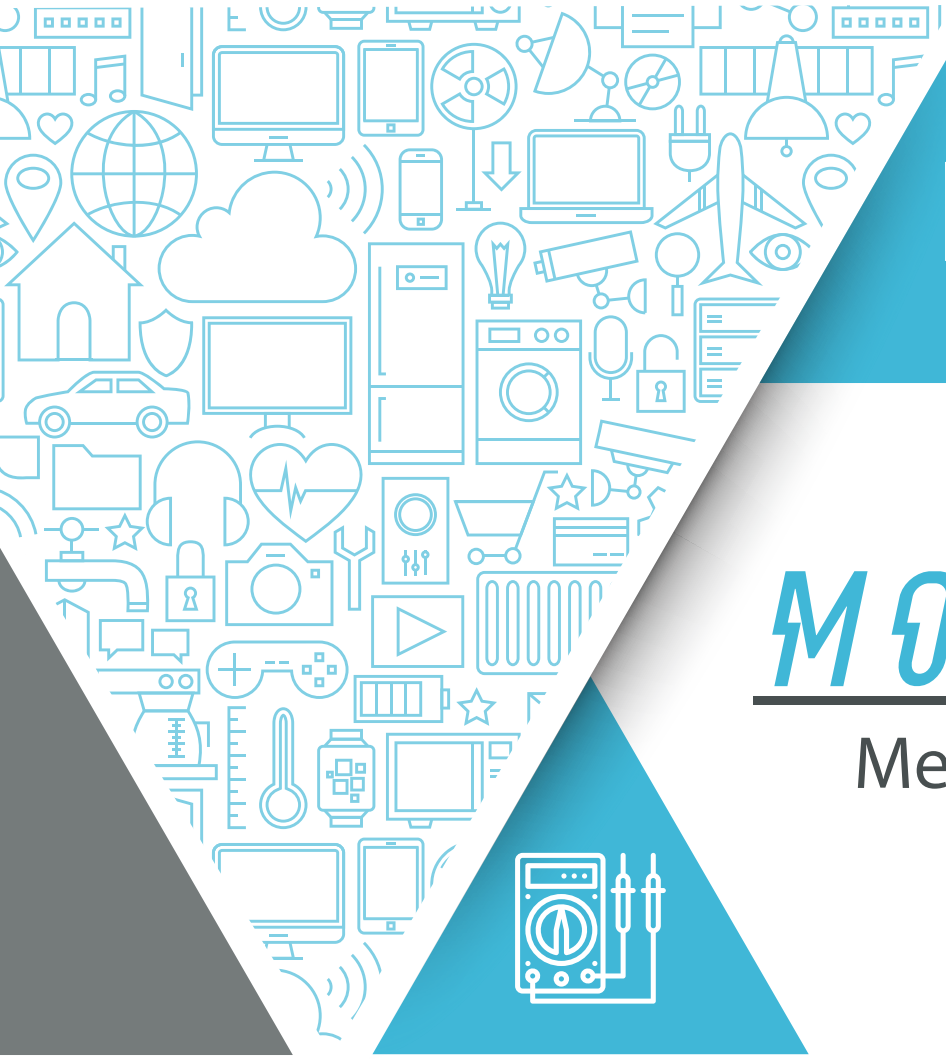
***Agent***

*2021*



# FUZETEC

# MOV Catalog

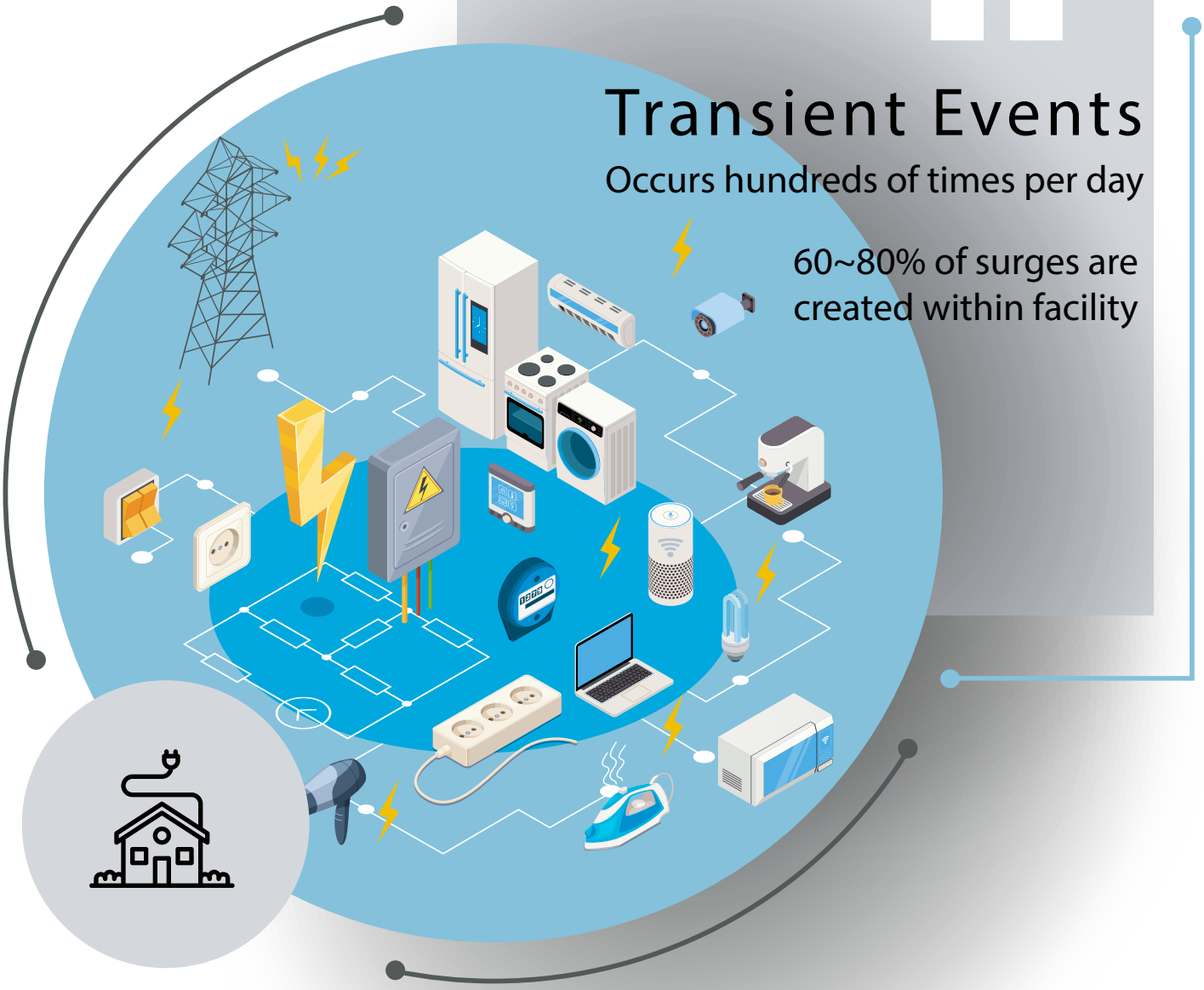
## Metal Oxide Varistor OverVoltage Circuit Protection

FUZETEC

Circuit Protection Solutions for Today & Tomorrow's Industries

# Contents

FUZETEC




# Over voltage Circuit Protection

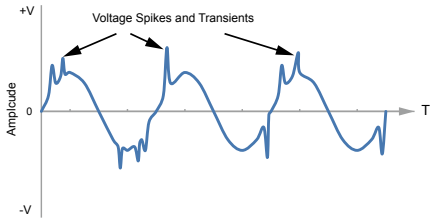
Over voltage circuit Protection on AC and DC power lines is necessary for just about any device. Varying levels of exposure to lightning and switching transients, poor line voltage regulation rural and developing areas and inconsistency among different grids around the globe means that there is no recognized single universal solution.

# Threats from Transient Surge

## External Sources

The most recognizable source of surges generated outside the facility is lightning. Lightning surge is energy induced into the power grid by lightning strike. It can be magnetic coupling or direct hit. The event causes momentary high voltage on the power lines feeding a home or business.

Other external sources of surges include utility-initiated grid and capacitor bank switching. Power quality disturbances can be delivered during the normal operation of the electric power system




## Transient Surges

Transient surges are brief overvoltage spikes or disturbances on a power waveform that can damage, degrade, or destroy electronic equipment. Transient surges originate from a variety of electrical circuits and sources regardless of whether they operate from an AC or DC supply as they are often generated within the circuit itself or transmitted into the circuit from external sources. Transients within a circuit can increase the voltage to several thousand volts with a duration of less than a half-cycle of the normal voltage waveform, and it is these voltage spikes which must be prevented from appearing across delicate electronic circuits and components.

## Internal Sources:

Switching of Electrical Loads
- Starting and stopping of loads
- Switching of capacitor banks & loads
- Discharge of inductive devices (motors, transformers, etc.)
- Contactor, relay and breaker operations

Magnetic and Inductive coupling
- Elevators
- HVAC with Variable frequency driver
- Computer/ Copy Machines

Static electricity
- Electrostatic discharge (ESD) phenomena

MOVs are designed to protect sensitive circuits against external transients (lightning) and internal transients (inductive load switching, relay switching and capacitor discharges). And other high level transients found in industrial, AC line application or lower level transients found in automotive DC line applications

# Fuzetec Technology
# Overvoltage Circuit Protection

Fuzetec has been a trusted name in circuit protection industry for 20 years. We provide highest quality PPTC resettable overcurrent protection solutions for industries which require high reliability, high design flexibility and outstanding product performance, such as Automotive and Industrial markets.

Circuit protection is never complete without overvoltage protection, as an established provider of overcurrent protection, we realized the demand for better integration between the two circuit protection design solution.

## MOV Structure

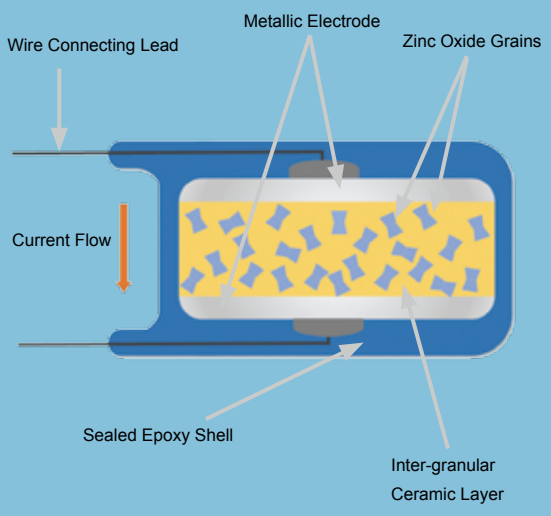



Fig.1

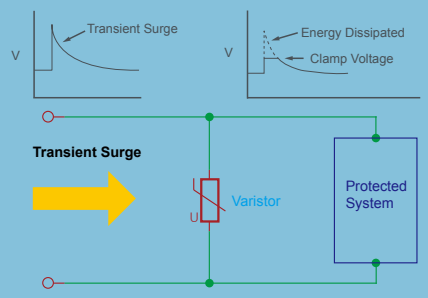



Fig.2

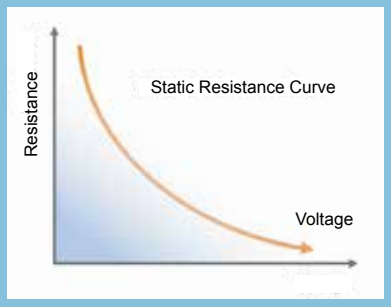



Fig.3

## MOV Characteristics

The Metal Oxide Varistor or MOV, is a voltage dependent resistor in which the resistance material is a metallic oxide, primarily zinc oxide (ZnO) as a ceramic base, plus other filler materials for the formation of junctions between the zinc oxide grains. Conductive ZnO grains separated by grain boundaries providing P–N j unction semiconductor characteristics.

Under normal operation the varistor has a very high resistance, operating in a similar way to the zener diode by allowing lower threshold voltages to pass unaffected.

However, when the voltage across the varistor (either polarity) exceeds the varistors rated value, its effective resistance decreases strongly with an increasing voltage as shown.

The varistor changes its resistance value automatically with the change in voltage across it making it a voltage-dependent, non-linear resistor. The potentially destructive energy of the incoming transient pulse is absorbed by the Varistor and dissipates it as heat, thereby protecting vulnerable circuit components and preventing system damage.

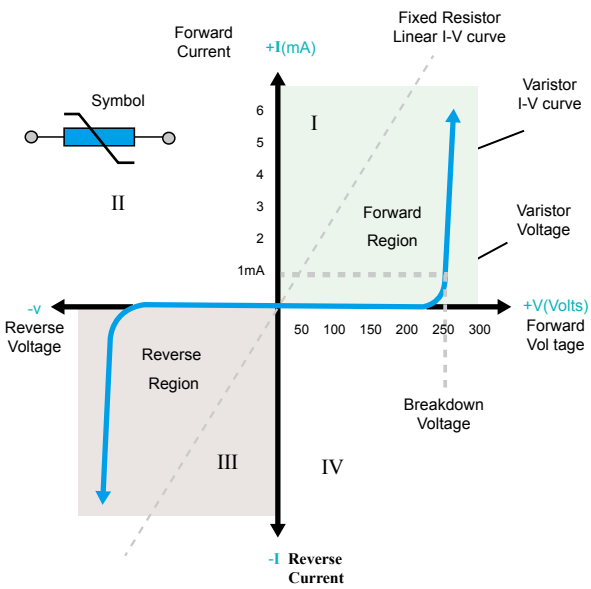
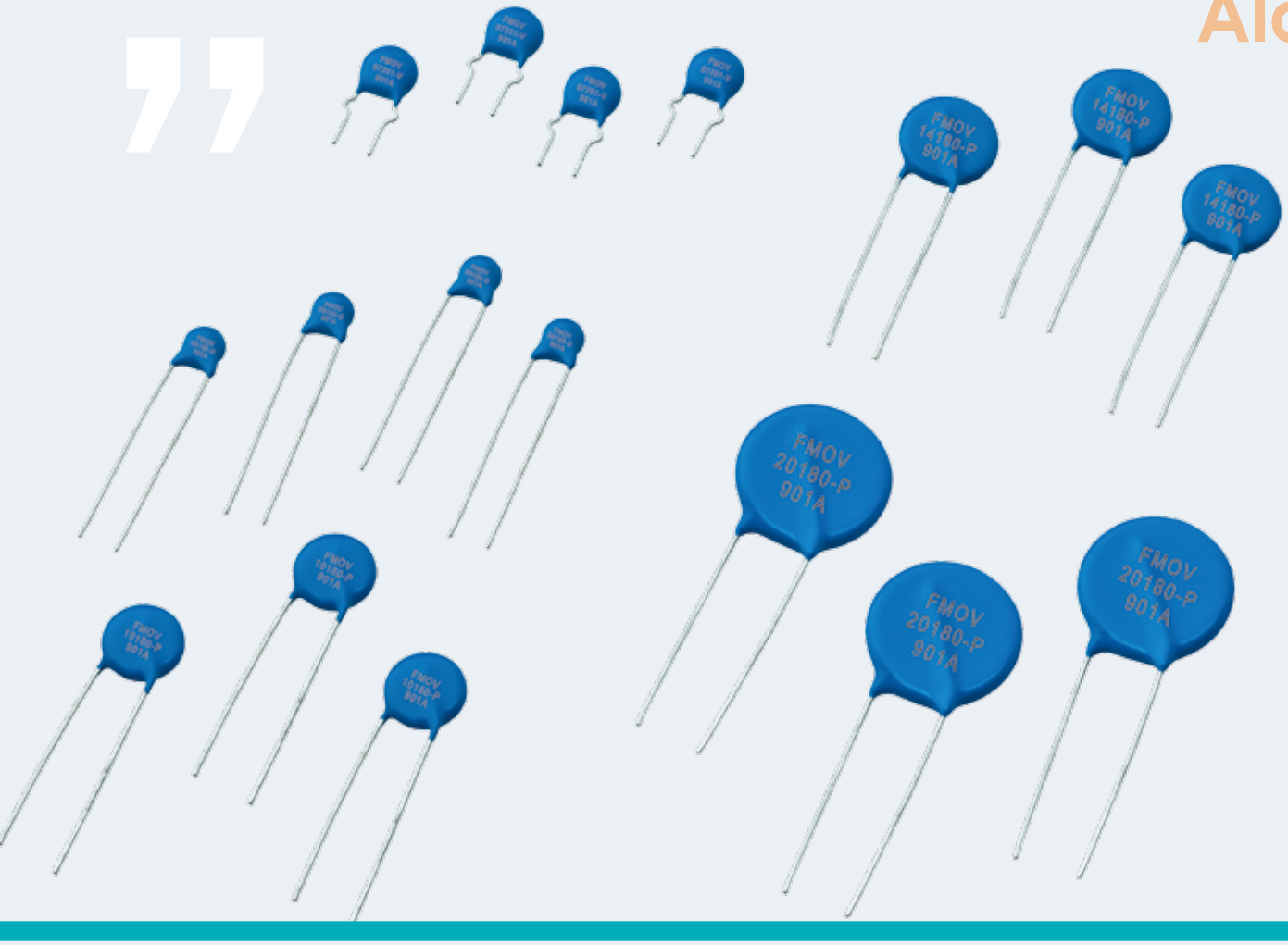



Fig.4

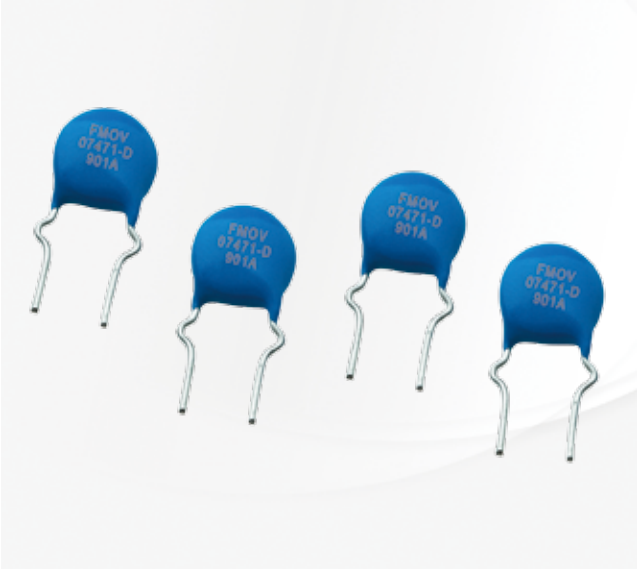



We can see from Fig. 4, that the varistor has symmetrical bi-directional characteristics that is the varistor operates in both directions (quadrant I and III) of a sinusoidal waveform behaving in a similar way to two zener diodes connected back-to-back. When not conducting, the I-V curve shows a linear relationship as the current flowing through the varistor remains constant and low at only a few micro-amperes of "leakage" current. This is due to its high resistance acting as an open circuit and remains constant until the voltage across the varistor (either polarity) reaches a particular "rated voltage".

This rated or "varistor voltage" is the voltage across the varistor measured with the specified DC current of 1mA. That is, the DC voltage level applied across its terminals that allows a current of 1mA to flow through the varistors. At this voltage level, the varistor begins to change from its insulating state into its conducting state.

When the transient voltage across the varistor is equal to or greater than the rated value, the resistance of the device suddenly becomes very small turning the varistor into a conductor due to the avalanche effect of its semiconductor material. The small leakage current flowing through the varistor rapidly rises but the voltage across it is limited to a level just above the varistor voltage.

In other words, the varistor self-regulates the transient voltage across it by allowing more current to flow through it and because of its steep non-linear I-V curve it can pass widely varying currents over a narrow voltage range clipping-off any voltage spikes.




## Description :

Fuzetec D Series Metal Oxide Varistors (MOV) are the standard radial leaded MOV products designed for continuous AC power applications. Available in wide range of voltage & current ratings, the standard D series is design for circuit systems requiring low to medium level of surge immunity. MOV products have specific nonlinear and symmetrical V-I characteristics curve and unparalleled large peak current capability are used for absorption of transient voltage, suppression of pulse noise and circuit voltage stabilization.

## Features :

- RoHS compliant
- Halogen-free series are available
- Body size: Φ 05 ~ Φ 20mm

## Applications :

- Power supply
- Home appliance
- Industrial equipment
- Telecommunication system
- Smart meter
- Lighting products
- Photovoltaic industry

## Agency Approvals

| Agency | Agency Approvals | File Number |
|---|---|---|
| c UL us | UL 1449 4th & cUL | VZCA2.E515006<br>VZCA8.E515006 |

RoHS | HF Halogen Free

SVHC Compliant

| Absolute Maximum Ratings | | |
|---|---|---|
| | D Series | Units |
| **Steady State :** | | |
| AC Voltage Range ($V_{AC}$) | 11 to 1000 | V |
| DC Voltage Range($V_{DC}$) | 14 to 1465 | V |
| **Transients :** | | |
| Peak Current for 8/20μS Current Wave | 100 to 6500 | A |
| Energy Range For 10/1000μS Current Wave | 0.4 to 620 | J |
| Operation Ambient Temperature Range | -40 to +105 | °C |
| Storage Temperature Range | -40 to +125 | °C |
| Varistor Voltage Range Vn($V_{DC}$) | 18 to 1800 | V |
| Insulation Resistance | >1000 | MΩ |
| Typical Response Time | <25 | ns |

# FMOV05-D Series

| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV05180-D | 11 | 14 | 18 | 16 | 20 | 40 | 1 | 0.4 | 100 | 0.01 | 1600 | |
| FMOV05220-D | 14 | 18 | 22 | 20 | 24 | 48 | 1 | 0.5 | 100 | 0.01 | 1500 | |
| FMOV05270-D | 17 | 22 | 27 | 24 | 30 | 60 | 1 | 0.6 | 100 | 0.01 | 1450 | |
| FMOV05330-D | 20 | 26 | 33 | 30 | 36 | 73 | 1 | 0.8 | 100 | 0.01 | 1400 | |
| FMOV05390-D | 25 | 31 | 39 | 35 | 43 | 86 | 1 | 0.9 | 100 | 0.01 | 700 | |
| FMOV05470-D | 30 | 38 | 47 | 42 | 52 | 104 | 1 | 1.1 | 100 | 0.01 | 650 | |
| FMOV05560-D | 35 | 45 | 56 | 50 | 62 | 123 | 1 | 1.3 | 100 | 0.01 | 600 | |
| FMOV05680-D | 40 | 56 | 68 | 61 | 75 | 150 | 1 | 1.6 | 100 | 0.01 | 580 | |
| FMOV05820-D | 50 | 65 | 82 | 74 | 90 | 145 | 5 | 2.5 | 400 | 0.10 | 310 | |
| FMOV05101-D | 60 | 85 | 100 | 90 | 110 | 175 | 5 | 3.0 | 400 | 0.10 | 290 | |
| FMOV05121-D | 75 | 100 | 120 | 108 | 132 | 210 | 5 | 4.0 | 400 | 0.10 | 270 | |
| FMOV05151-D | 95 | 125 | 150 | 135 | 165 | 260 | 5 | 4.8 | 400 | 0.10 | 240 | |
| FMOV05181-D | 115 | 150 | 180 | 162 | 198 | 315 | 5 | 5.9 | 400 | 0.10 | 140 | |
| FMOV05201-D | 130 | 170 | 200 | 180 | 220 | 355 | 5 | 6.5 | 400 | 0.10 | 120 | c UL us |
| FMOV05221-D | 140 | 180 | 220 | 198 | 242 | 380 | 5 | 7.0 | 400 | 0.10 | 110 | |
| FMOV05241-D | 150 | 200 | 240 | 216 | 264 | 415 | 5 | 8.0 | 400 | 0.10 | 110 | |
| FMOV05271-D | 175 | 225 | 270 | 243 | 297 | 475 | 5 | 8.5 | 400 | 0.10 | 100 | |
| FMOV05301-D | 195 | 250 | 300 | 270 | 330 | 505 | 5 | 9.0 | 400 | 0.10 | 100 | |
| FMOV05331-D | 215 | 275 | 330 | 297 | 363 | 585 | 5 | 10.0 | 400 | 0.10 | 90 | |
| FMOV05361-D | 230 | 300 | 360 | 324 | 396 | 620 | 5 | 10.0 | 400 | 0.10 | 80 | |
| FMOV05391-D | 250 | 320 | 390 | 351 | 429 | 675 | 5 | 12.0 | 400 | 0.10 | 80 | |
| FMOV05431-D | 275 | 350 | 430 | 387 | 473 | 745 | 5 | 13.0 | 400 | 0.10 | 70 | |
| FMOV05471-D | 300 | 385 | 470 | 423 | 517 | 810 | 5 | 15.0 | 400 | 0.10 | 70 | |
| FMOV05511-D | 320 | 410 | 510 | 459 | 561 | 878 | 5 | 16.0 | 400 | 0.10 | 65 | |
| FMOV05561-D | 350 | 460 | 560 | 504 | 616 | 940 | 5 | 18.0 | 400 | 0.10 | 65 | |
| FMOV05621-D | 395 | 510 | 620 | 558 | 682 | 1050 | 5 | 18.0 | 400 | 0.10 | 65 | |
| FMOV05681-D | 420 | 560 | 680 | 612 | 748 | 1120 | 5 | 18.0 | 400 | 0.10 | 60 | |
| FMOV05751-D | 460 | 615 | 750 | 675 | 825 | 1240 | 5 | 18.0 | 400 | 0.10 | 60 | |

# FMOV07-D Series

| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV07180-D | 11 | 14 | 18 | 16 | 20 | 36 | 2.5 | 0.9 | 250 | 0.02 | 3800 | |
| FMOV07220-D | 14 | 18 | 22 | 20 | 24 | 43 | 2.5 | 1.1 | 250 | 0.02 | 3600 | |
| FMOV07270-D | 17 | 22 | 27 | 24 | 30 | 53 | 2.5 | 1.4 | 250 | 0.02 | 3400 | |
| FMOV07330-D | 20 | 26 | 33 | 30 | 36 | 65 | 2.5 | 1.7 | 250 | 0.02 | 2900 | |
| FMOV07390-D | 25 | 31 | 39 | 35 | 43 | 77 | 2.5 | 2.1 | 250 | 0.02 | 1600 | |
| FMOV07470-D | 30 | 38 | 47 | 42 | 52 | 93 | 2.5 | 2.5 | 250 | 0.02 | 1550 | |
| FMOV07560-D | 35 | 45 | 56 | 50 | 62 | 110 | 2.5 | 3.1 | 250 | 0.02 | 1500 | |
| FMOV07680-D | 40 | 56 | 68 | 61 | 75 | 135 | 2.5 | 3.6 | 250 | 0.02 | 1200 | |
| FMOV07820-D | 50 | 65 | 82 | 74 | 90 | 135 | 10 | 5.5 | 1200 | 0.25 | 860 | |
| FMOV07101-D | 60 | 85 | 100 | 90 | 110 | 165 | 10 | 6.5 | 1200 | 0.25 | 750 | |
| FMOV07121-D | 75 | 100 | 120 | 108 | 132 | 200 | 10 | 7.8 | 1200 | 0.25 | 530 | |
| FMOV07151-D | 95 | 125 | 150 | 135 | 165 | 250 | 10 | 9.7 | 1200 | 0.25 | 410 | |
| FMOV07181-D | 115 | 150 | 180 | 162 | 198 | 300 | 10 | 11.7 | 1200 | 0.25 | 300 | |
| FMOV07201-D | 130 | 170 | 200 | 180 | 220 | 340 | 10 | 13 | 1200 | 0.25 | 250 | |
| FMOV07221-D | 140 | 180 | 220 | 198 | 242 | 360 | 10 | 14 | 1200 | 0.25 | 250 | c UL us |
| FMOV07241-D | 150 | 200 | 240 | 216 | 264 | 395 | 10 | 15 | 1200 | 0.25 | 240 | |
| FMOV07271-D | 175 | 225 | 270 | 243 | 297 | 455 | 10 | 18 | 1200 | 0.25 | 220 | |
| FMOV07301-D | 195 | 250 | 300 | 270 | 330 | 500 | 10 | 21 | 1200 | 0.25 | 190 | |
| FMOV07331-D | 215 | 275 | 330 | 297 | 363 | 550 | 10 | 25 | 1200 | 0.25 | 180 | |
| FMOV07361-D | 230 | 300 | 360 | 324 | 396 | 595 | 10 | 25 | 1200 | 0.25 | 170 | |
| FMOV07391-D | 250 | 320 | 390 | 351 | 429 | 650 | 10 | 25 | 1200 | 0.25 | 160 | |
| FMOV07431-D | 275 | 350 | 430 | 387 | 473 | 710 | 10 | 28 | 1200 | 0.25 | 150 | |
| FMOV07471-D | 300 | 385 | 470 | 423 | 517 | 775 | 10 | 30 | 1200 | 0.25 | 130 | |
| FMOV07511-D | 320 | 410 | 510 | 459 | 561 | 845 | 10 | 33 | 1200 | 0.25 | 120 | |
| FMOV07561-D | 350 | 460 | 560 | 504 | 616 | 915 | 10 | 33 | 1200 | 0.25 | 120 | |
| FMOV07621-D | 395 | 510 | 620 | 558 | 682 | 1020 | 10 | 35 | 1200 | 0.25 | 120 | |
| FMOV07681-D | 420 | 560 | 680 | 612 | 748 | 1120 | 10 | 35 | 1200 | 0.25 | 110 | |
| FMOV07751-D | 465 | 615 | 750 | 675 | 825 | 1235 | 10 | 38 | 1200 | 0.25 | 100 | |
| FMOV07781-D | 485 | 640 | 780 | 702 | 858 | 1290 | 10 | 40 | 1200 | 0.25 | 90 | |
| FMOV07821-D | 510 | 670 | 820 | 738 | 902 | 1355 | 10 | 42 | 1200 | 0.25 | 90 | |

# FMOV10-D Series

| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV10180-D | 11 | 14 | 18 | 16 | 20 | 36 | 5 | 2.1 | 500 | 0.05 | 16000 | |
| FMOV10220-D | 14 | 18 | 22 | 20 | 24 | 43 | 5 | 2.5 | 500 | 0.05 | 11000 | |
| FMOV10270-D | 17 | 22 | 27 | 24 | 30 | 53 | 5 | 3.0 | 500 | 0.05 | 8000 | |
| FMOV10330-D | 20 | 26 | 33 | 30 | 36 | 65 | 5 | 4.0 | 500 | 0.05 | 6300 | |
| FMOV10390-D | 25 | 31 | 39 | 35 | 43 | 77 | 5 | 4.6 | 500 | 0.05 | 5200 | |
| FMOV10470-D | 30 | 38 | 47 | 42 | 52 | 93 | 5 | 5.5 | 500 | 0.05 | 4600 | |
| FMOV10560-D | 35 | 45 | 56 | 50 | 62 | 110 | 5 | 7.0 | 500 | 0.05 | 3750 | |
| FMOV10680-D | 40 | 56 | 68 | 61 | 75 | 135 | 5 | 8.2 | 500 | 0.05 | 2800 | |
| FMOV10820-D | 50 | 65 | 82 | 74 | 90 | 135 | 25 | 12 | 2500 | 0.4 | 1920 | |
| FMOV10101-D | 60 | 85 | 100 | 90 | 110 | 165 | 25 | 15 | 2500 | 0.4 | 1800 | |
| FMOV10121-D | 75 | 100 | 120 | 108 | 132 | 200 | 25 | 18 | 2500 | 0.4 | 1500 | |
| FMOV10151-D | 95 | 125 | 150 | 135 | 165 | 250 | 25 | 22 | 2500 | 0.4 | 1200 | |
| FMOV10181-D | 115 | 150 | 180 | 162 | 198 | 300 | 25 | 27 | 2500 | 0.4 | 620 | |
| FMOV10201-D | 130 | 170 | 200 | 180 | 220 | 340 | 25 | 30 | 2500 | 0.4 | 570 | |
| FMOV10221-D | 140 | 180 | 220 | 198 | 242 | 360 | 25 | 32 | 2500 | 0.4 | 560 | |
| FMOV10241-D | 150 | 200 | 240 | 216 | 264 | 395 | 25 | 35 | 2500 | 0.4 | 550 | |
| FMOV10271-D | 175 | 225 | 270 | 243 | 297 | 455 | 25 | 40 | 2500 | 0.4 | 530 | c US |
| FMOV10301-D | 195 | 250 | 300 | 270 | 330 | 500 | 25 | 42 | 2500 | 0.4 | 500 | |
| FMOV10331-D | 215 | 275 | 330 | 297 | 363 | 550 | 25 | 47 | 2500 | 0.4 | 450 | |
| FMOV10361-D | 230 | 300 | 360 | 324 | 396 | 595 | 25 | 47 | 2500 | 0.4 | 450 | |
| FMOV10391-D | 250 | 320 | 390 | 351 | 429 | 650 | 25 | 60 | 2500 | 0.4 | 430 | |
| FMOV10431-D | 275 | 350 | 430 | 387 | 473 | 710 | 25 | 65 | 2500 | 0.4 | 400 | |
| FMOV10471-D | 300 | 385 | 470 | 423 | 517 | 775 | 25 | 70 | 2500 | 0.4 | 300 | |
| FMOV10511-D | 320 | 410 | 510 | 459 | 561 | 845 | 25 | 70 | 2500 | 0.4 | 260 | |
| FMOV10561-D | 350 | 460 | 560 | 504 | 616 | 915 | 25 | 70 | 2500 | 0.4 | 200 | |
| FMOV10621-D | 395 | 510 | 620 | 558 | 682 | 1020 | 25 | 70 | 2500 | 0.4 | 170 | |
| FMOV10681-D | 420 | 560 | 680 | 612 | 748 | 1120 | 25 | 70 | 2500 | 0.4 | 160 | |
| FMOV10751-D | 465 | 615 | 750 | 675 | 825 | 1235 | 25 | 75 | 2500 | 0.4 | 150 | |
| FMOV10781-D | 485 | 640 | 780 | 702 | 858 | 1290 | 25 | 80 | 2500 | 0.4 | 150 | |
| FMOV10821-D | 510 | 670 | 820 | 738 | 902 | 1355 | 25 | 85 | 2500 | 0.4 | 150 | |
| FMOV10911-D | 550 | 745 | 910 | 819 | 1001 | 1500 | 25 | 93 | 2500 | 0.4 | 140 | |
| FMOV10102-D | 625 | 825 | 1000 | 900 | 1100 | 1650 | 25 | 102 | 2500 | 0.4 | 140 | |
| FMOV10112-D | 680 | 895 | 1100 | 990 | 1210 | 1815 | 25 | 115 | 2500 | 0.4 | 130 | |
| FMOV10182-D | 1000 | 1465 | 1800 | 1620 | 1980 | 2950 | 25 | 185 | 2500 | 0.4 | 75 | |

# FMOV14-D Series

## Device Ratings and Characteristics

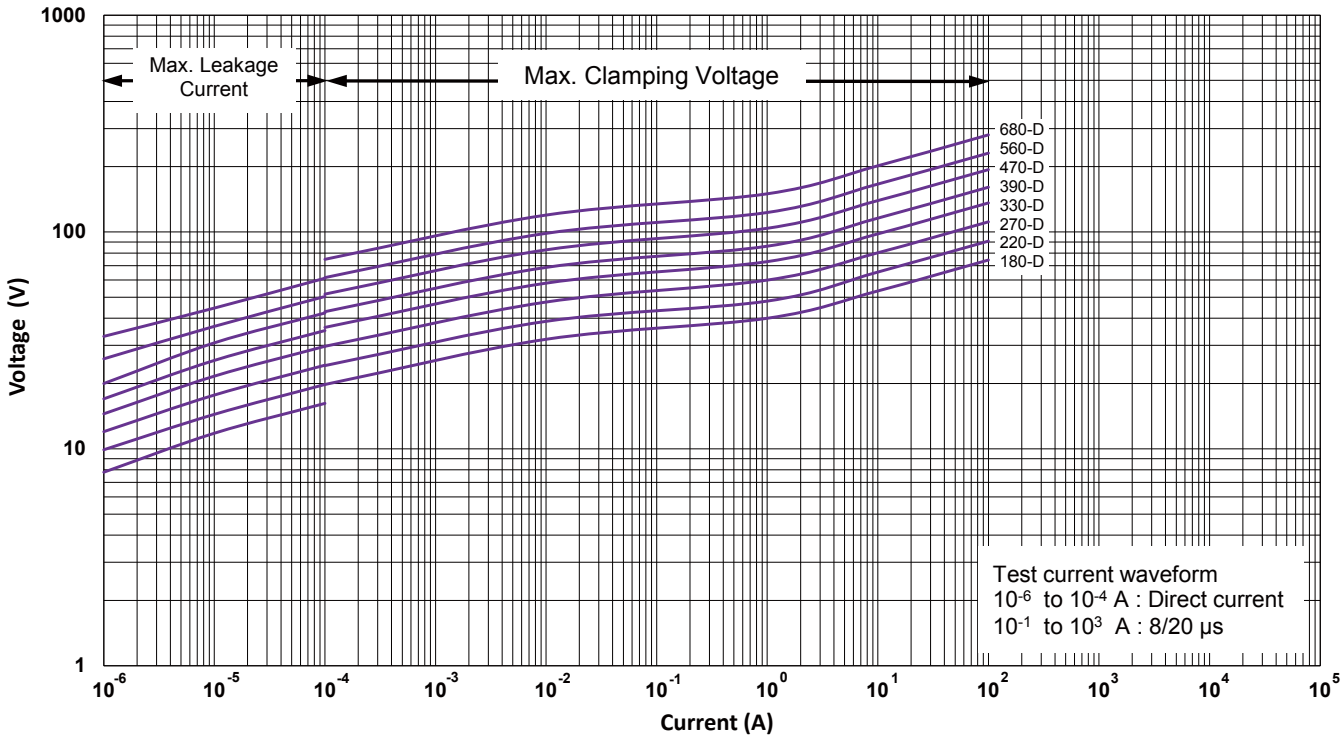
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV14180-D | 11 | 14 | 18 | 16 | 20 | 36 | 10 | 4 | 1000 | 0.1 | 25000 | |
| FMOV14220-D | 14 | 18 | 22 | 20 | 24 | 43 | 10 | 5 | 1000 | 0.1 | 20000 | |
| FMOV14270-D | 17 | 22 | 27 | 24 | 30 | 53 | 10 | 6 | 1000 | 0.1 | 16000 | |
| FMOV14330-D | 20 | 26 | 33 | 30 | 36 | 65 | 10 | 7.5 | 1000 | 0.1 | 12200 | |
| FMOV14390-D | 25 | 31 | 39 | 35 | 43 | 77 | 10 | 8.6 | 1000 | 0.1 | 7000 | |
| FMOV14470-D | 30 | 38 | 47 | 42 | 52 | 93 | 10 | 10 | 1000 | 0.1 | 6750 | |
| FMOV14560-D | 35 | 45 | 56 | 50 | 62 | 110 | 10 | 11 | 1000 | 0.1 | 6500 | |
| FMOV14680-D | 40 | 56 | 68 | 61 | 75 | 135 | 10 | 14 | 1000 | 0.1 | 5500 | |
| FMOV14820-D | 50 | 65 | 82 | 74 | 90 | 135 | 50 | 22 | 4500 | 0.6 | 4300 | |
| FMOV14101-D | 60 | 85 | 100 | 90 | 110 | 165 | 50 | 28 | 4500 | 0.6 | 3500 | |
| FMOV14121-D | 75 | 100 | 120 | 108 | 132 | 200 | 50 | 32 | 4500 | 0.6 | 2500 | |
| FMOV14151-D | 95 | 125 | 150 | 135 | 165 | 250 | 50 | 40 | 4500 | 0.6 | 2100 | |
| FMOV14181-D | 115 | 150 | 180 | 162 | 198 | 300 | 50 | 52 | 4500 | 0.6 | 1250 | |
| FMOV14201-D | 130 | 170 | 200 | 180 | 220 | 340 | 50 | 57 | 4500 | 0.6 | 1150 | |
| FMOV14221-D | 140 | 180 | 220 | 198 | 242 | 360 | 50 | 60 | 4500 | 0.6 | 1100 | |
| FMOV14241-D | 150 | 200 | 240 | 216 | 264 | 395 | 50 | 63 | 4500 | 0.6 | 1050 | |
| FMOV14271-D | 175 | 225 | 270 | 243 | 297 | 455 | 50 | 70 | 4500 | 0.6 | 1000 | c UL us |
| FMOV14301-D | 195 | 250 | 300 | 270 | 330 | 500 | 50 | 78 | 4500 | 0.6 | 900 | |
| FMOV14331-D | 215 | 275 | 330 | 297 | 363 | 550 | 50 | 93 | 4500 | 0.6 | 850 | |
| FMOV14361-D | 230 | 300 | 360 | 324 | 396 | 595 | 50 | 93 | 4500 | 0.6 | 800 | |
| FMOV14391-D | 250 | 320 | 390 | 351 | 429 | 650 | 50 | 100 | 4500 | 0.6 | 800 | |
| FMOV14431-D | 275 | 350 | 430 | 387 | 473 | 710 | 50 | 115 | 4500 | 0.6 | 650 | |
| FMOV14471-D | 300 | 385 | 470 | 423 | 517 | 775 | 50 | 125 | 4500 | 0.6 | 550 | |
| FMOV14511-D | 320 | 410 | 510 | 459 | 561 | 845 | 50 | 125 | 4500 | 0.6 | 450 | |
| FMOV14561-D | 350 | 460 | 560 | 504 | 616 | 915 | 50 | 125 | 4500 | 0.6 | 400 | |
| FMOV14621-D | 395 | 510 | 620 | 558 | 682 | 1020 | 50 | 125 | 4500 | 0.6 | 350 | |
| FMOV14681-D | 420 | 560 | 680 | 612 | 748 | 1120 | 50 | 130 | 4500 | 0.6 | 350 | |
| FMOV14751-D | 465 | 615 | 750 | 675 | 825 | 1235 | 50 | 143 | 4500 | 0.6 | 330 | |
| FMOV14781-D | 485 | 640 | 780 | 702 | 858 | 1290 | 50 | 148 | 4500 | 0.6 | 330 | |
| FMOV14821-D | 510 | 670 | 820 | 738 | 902 | 1355 | 50 | 157 | 4500 | 0.6 | 330 | |
| FMOV14911-D | 550 | 745 | 910 | 819 | 1001 | 1500 | 50 | 175 | 4500 | 0.6 | 300 | |
| FMOV14102-D | 625 | 825 | 1000 | 900 | 1100 | 1650 | 50 | 190 | 4500 | 0.6 | 300 | |
| FMOV14112-D | 680 | 895 | 1100 | 990 | 1210 | 1815 | 50 | 213 | 4500 | 0.6 | 200 | |
| FMOV14182-D | 1000 | 1465 | 1800 | 1620 | 1980 | 2950 | 50 | 354 | 4500 | 0.6 | 150 | |

# FMOV20-D Series

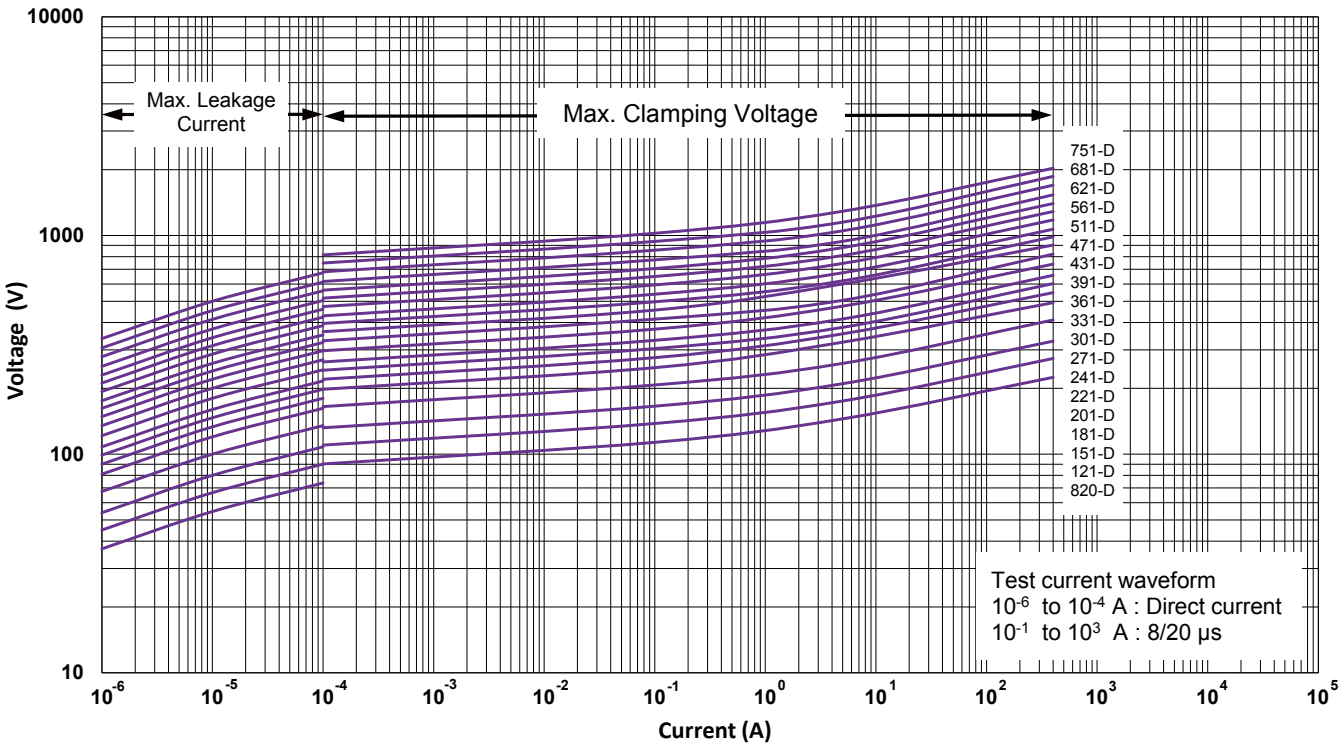
| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV20180-D | 11 | 14 | 18 | 16 | 20 | 36 | 20 | 11 | 2000 | 0.2 | 40000 | |
| FMOV20220-D | 14 | 18 | 22 | 20 | 24 | 43 | 20 | 14 | 2000 | 0.2 | 30000 | |
| FMOV20270-D | 17 | 22 | 27 | 24 | 30 | 53 | 20 | 18 | 2000 | 0.2 | 24500 | |
| FMOV20330-D | 20 | 26 | 33 | 30 | 36 | 65 | 20 | 23 | 2000 | 0.2 | 20000 | |
| FMOV20390-D | 25 | 31 | 39 | 35 | 43 | 77 | 20 | 26 | 2000 | 0.2 | 13800 | |
| FMOV20470-D | 30 | 38 | 47 | 42 | 52 | 93 | 20 | 33 | 2000 | 0.2 | 13500 | |
| FMOV20560-D | 35 | 45 | 56 | 50 | 62 | 110 | 20 | 41 | 2000 | 0.2 | 12200 | |
| FMOV20680-D | 40 | 56 | 68 | 61 | 75 | 135 | 20 | 46 | 2000 | 0.2 | 11500 | |
| FMOV20820-D | 50 | 65 | 82 | 74 | 90 | 135 | 100 | 48 | 6500 | 1 | 8200 | |
| FMOV20101-D | 60 | 85 | 100 | 90 | 110 | 165 | 100 | 51 | 6500 | 1 | 8000 | |
| FMOV20121-D | 75 | 100 | 120 | 108 | 132 | 200 | 100 | 55 | 6500 | 1 | 5500 | |
| FMOV20151-D | 95 | 125 | 150 | 135 | 165 | 250 | 100 | 70 | 6500 | 1 | 4200 | |
| FMOV20181-D | 115 | 150 | 180 | 162 | 198 | 300 | 100 | 85 | 6500 | 1 | 2500 | |
| FMOV20201-D | 130 | 170 | 200 | 180 | 220 | 340 | 100 | 95 | 6500 | 1 | 2300 | |
| FMOV20221-D | 140 | 180 | 220 | 198 | 242 | 360 | 100 | 100 | 6500 | 1 | 2200 | |
| FMOV20241-D | 150 | 200 | 240 | 216 | 264 | 395 | 100 | 108 | 6500 | 1 | 2200 | |
| FMOV20271-D | 175 | 225 | 270 | 243 | 297 | 455 | 100 | 127 | 6500 | 1 | 2100 | c UL us |
| FMOV20301-D | 195 | 250 | 300 | 270 | 330 | 500 | 100 | 150 | 6500 | 1 | 1800 | |
| FMOV20331-D | 215 | 275 | 330 | 297 | 363 | 550 | 100 | 163 | 6500 | 1 | 1750 | |
| FMOV20361-D | 230 | 300 | 360 | 324 | 396 | 595 | 100 | 163 | 6500 | 1 | 1700 | |
| FMOV20391-D | 250 | 320 | 390 | 351 | 429 | 650 | 100 | 180 | 6500 | 1 | 1400 | |
| FMOV20431-D | 275 | 350 | 430 | 387 | 473 | 710 | 100 | 190 | 6500 | 1 | 1350 | |
| FMOV20471-D | 300 | 385 | 470 | 423 | 517 | 775 | 100 | 220 | 6500 | 1 | 1200 | |
| FMOV20511-D | 320 | 410 | 510 | 459 | 561 | 845 | 100 | 220 | 6500 | 1 | 1050 | |
| FMOV20561-D | 350 | 460 | 560 | 504 | 616 | 915 | 100 | 220 | 6500 | 1 | 850 | |
| FMOV20621-D | 395 | 510 | 620 | 558 | 682 | 1020 | 100 | 220 | 6500 | 1 | 570 | |
| FMOV20681-D | 420 | 560 | 680 | 612 | 748 | 1120 | 100 | 230 | 6500 | 1 | 550 | |
| FMOV20751-D | 465 | 615 | 750 | 675 | 825 | 1235 | 100 | 255 | 6500 | 1 | 530 | |
| FMOV20781-D | 485 | 640 | 780 | 702 | 858 | 1290 | 100 | 265 | 6500 | 1 | 500 | |
| FMOV20821-D | 510 | 670 | 820 | 738 | 902 | 1355 | 100 | 282 | 6500 | 1 | 500 | |
| FMOV20911-D | 550 | 745 | 910 | 819 | 1001 | 1500 | 100 | 310 | 6500 | 1 | 480 | |
| FMOV20102-D | 625 | 825 | 1000 | 900 | 1100 | 1650 | 100 | 342 | 6500 | 1 | 460 | |
| FMOV20112-D | 680 | 895 | 1100 | 990 | 1210 | 1815 | 100 | 383 | 6500 | 1 | 400 | |
| FMOV20182-D | 1000 | 1465 | 1800 | 1620 | 1980 | 2950 | 100 | 620 | 6500 | 1 | 300 | |

# Transient V-I Characteristic Curves

## FMOV05180-D to FMOV-05680-D

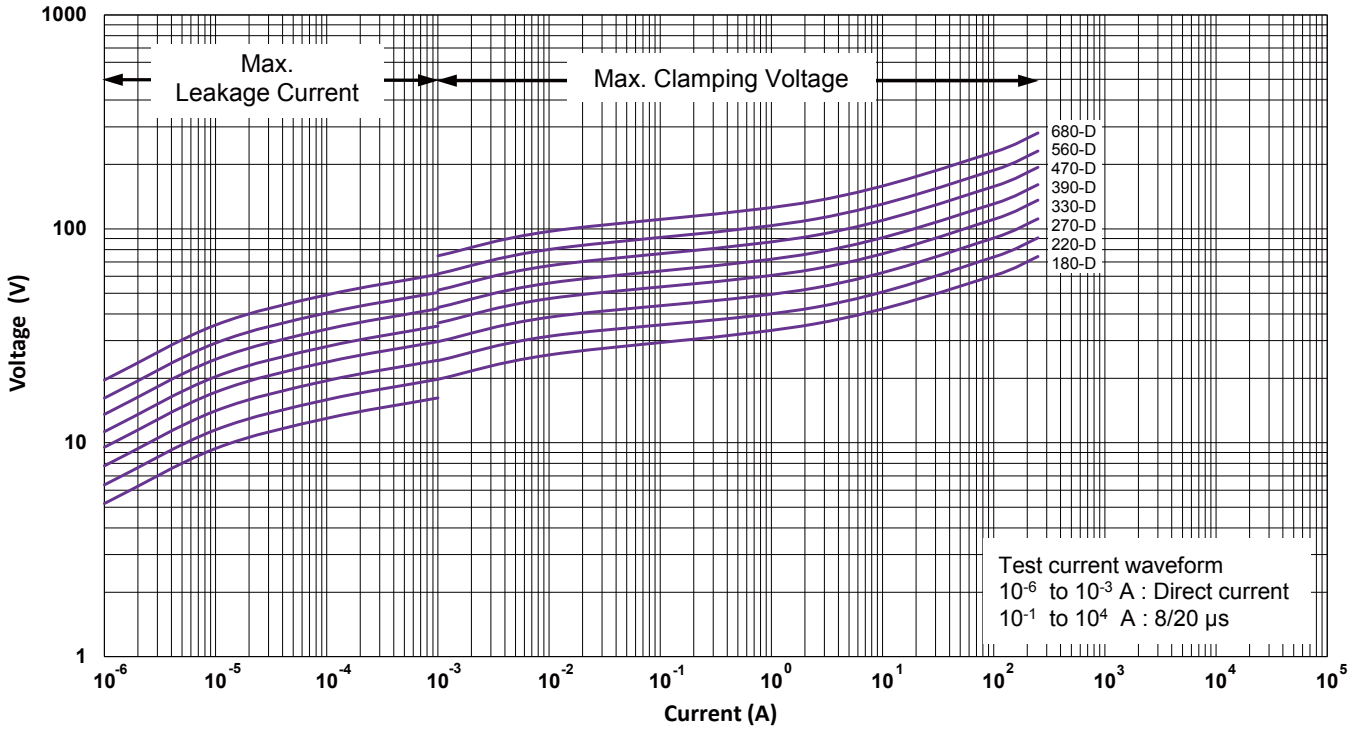



## FMOV05820-D to FMOV-05751-D

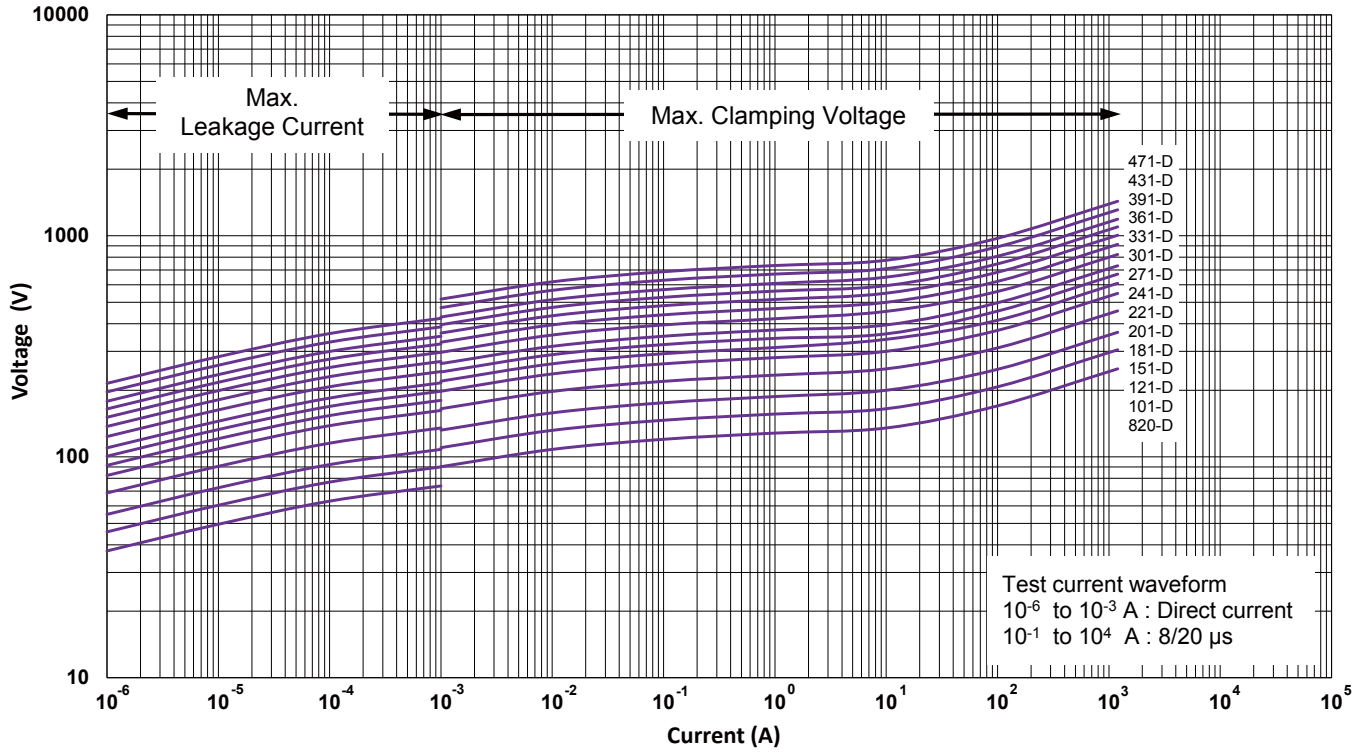


# Transient V-I Characteristic Curves

## FMOV07180-D to FMOV07680-D

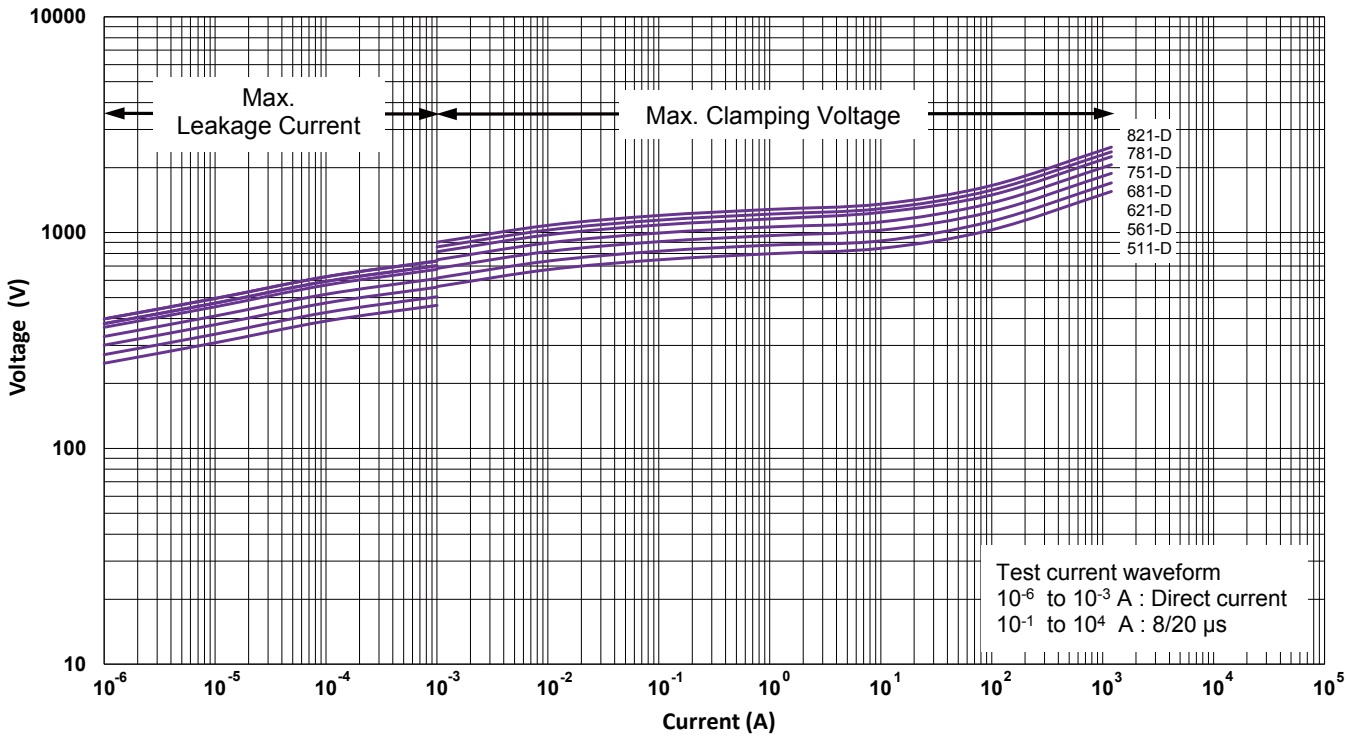



## FMOV07820-D to FMOV07471-D

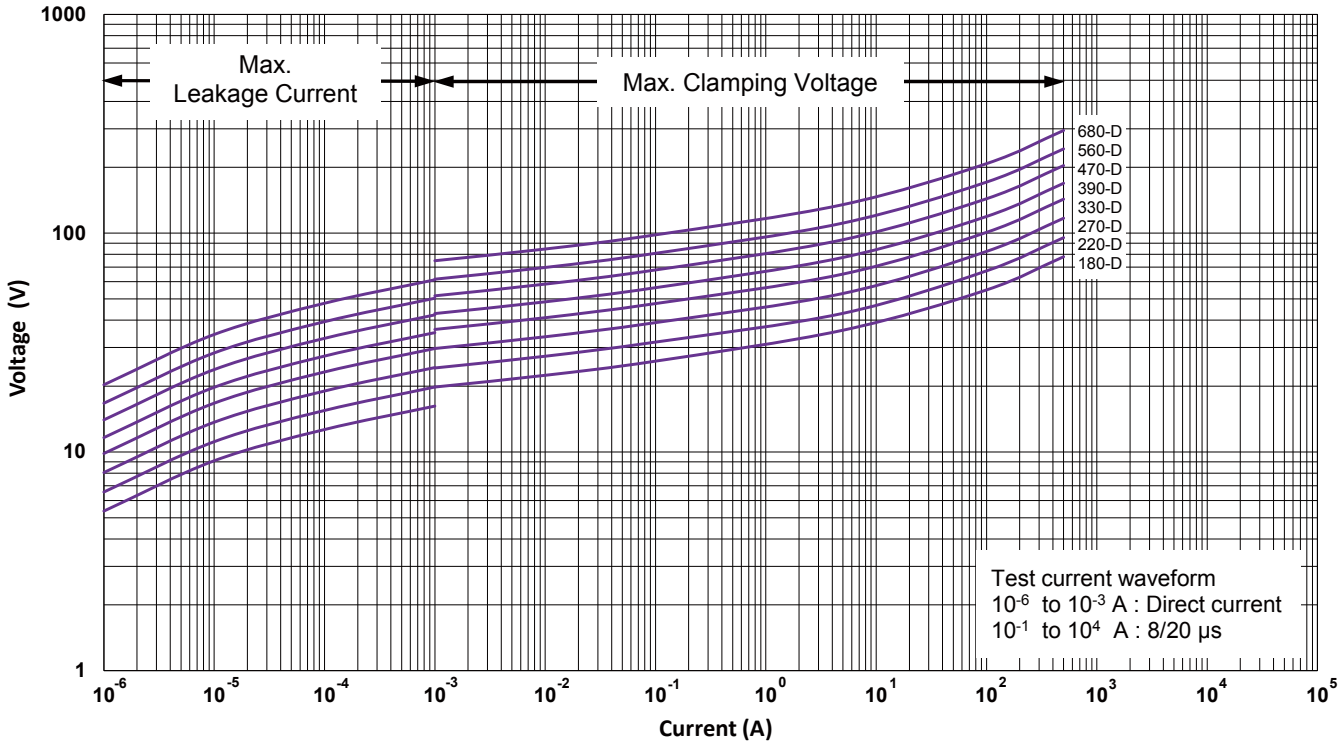


# Transient V-I Characteristic Curves

## FMOV07511-D to FMOV07821-D

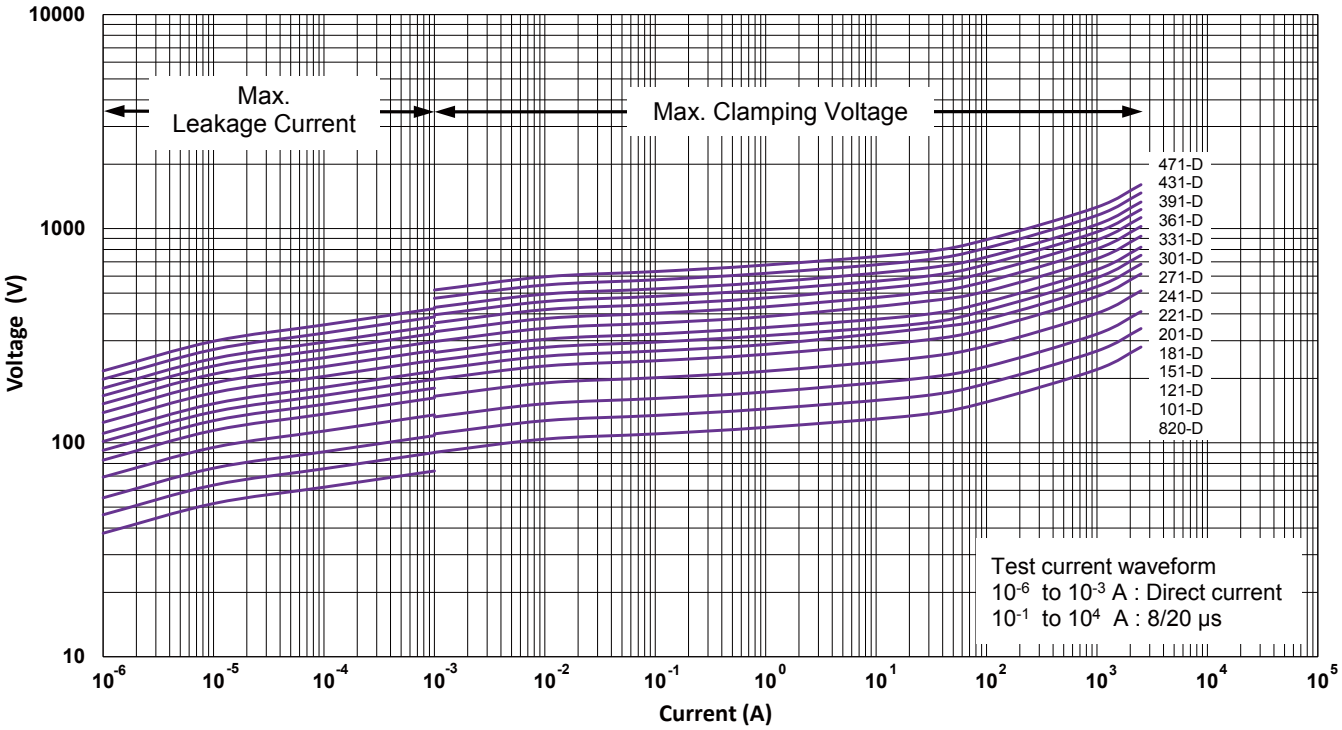



## FMOV10180-D to FMOV10680-D

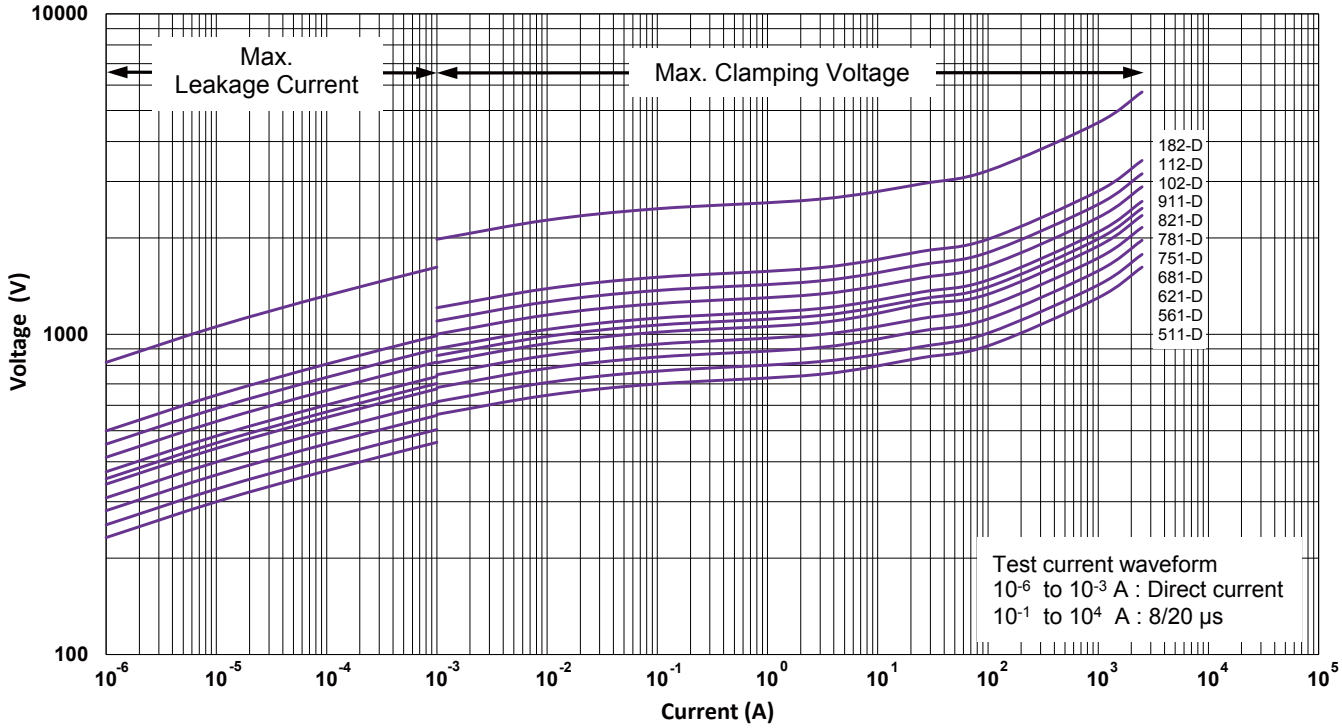


# Transient V-I Characteristic Curves

## FMOV10820-D to FMOV10471-D

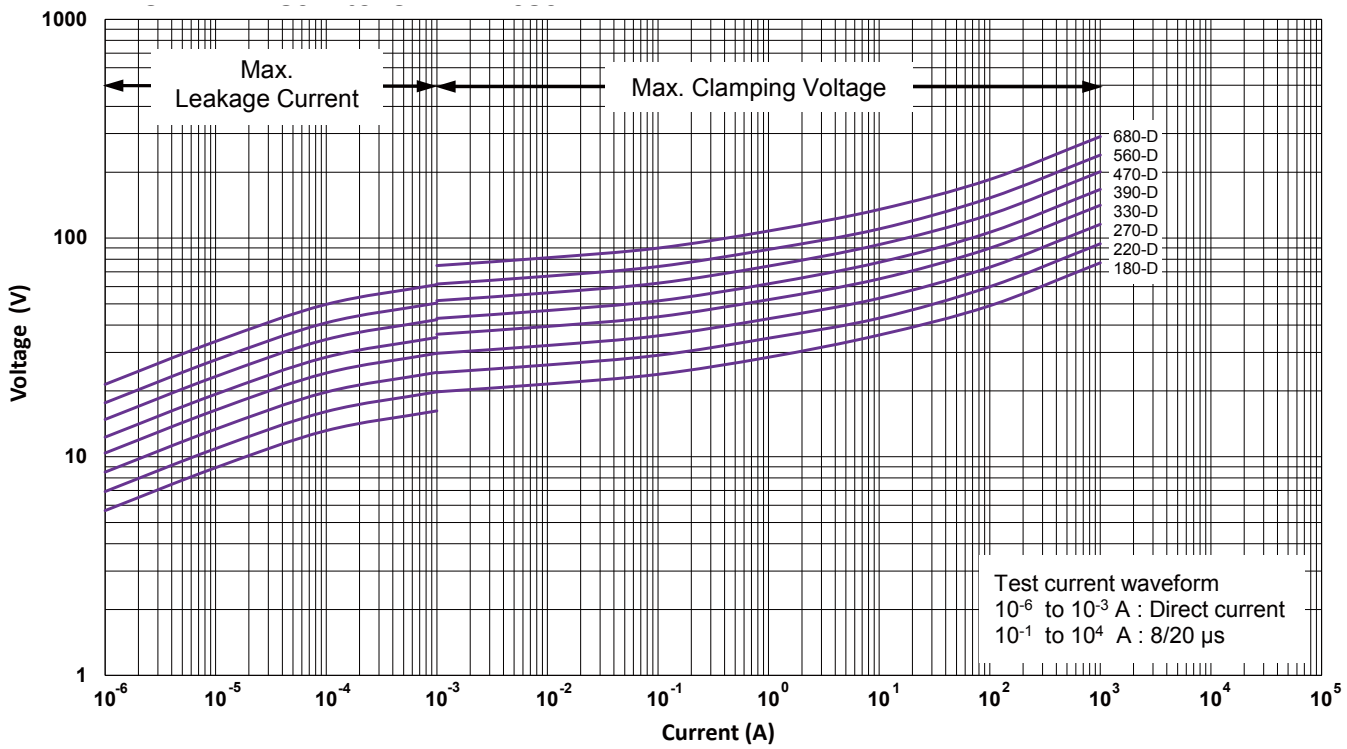



## FMOV10511-D to FMOV10182-D

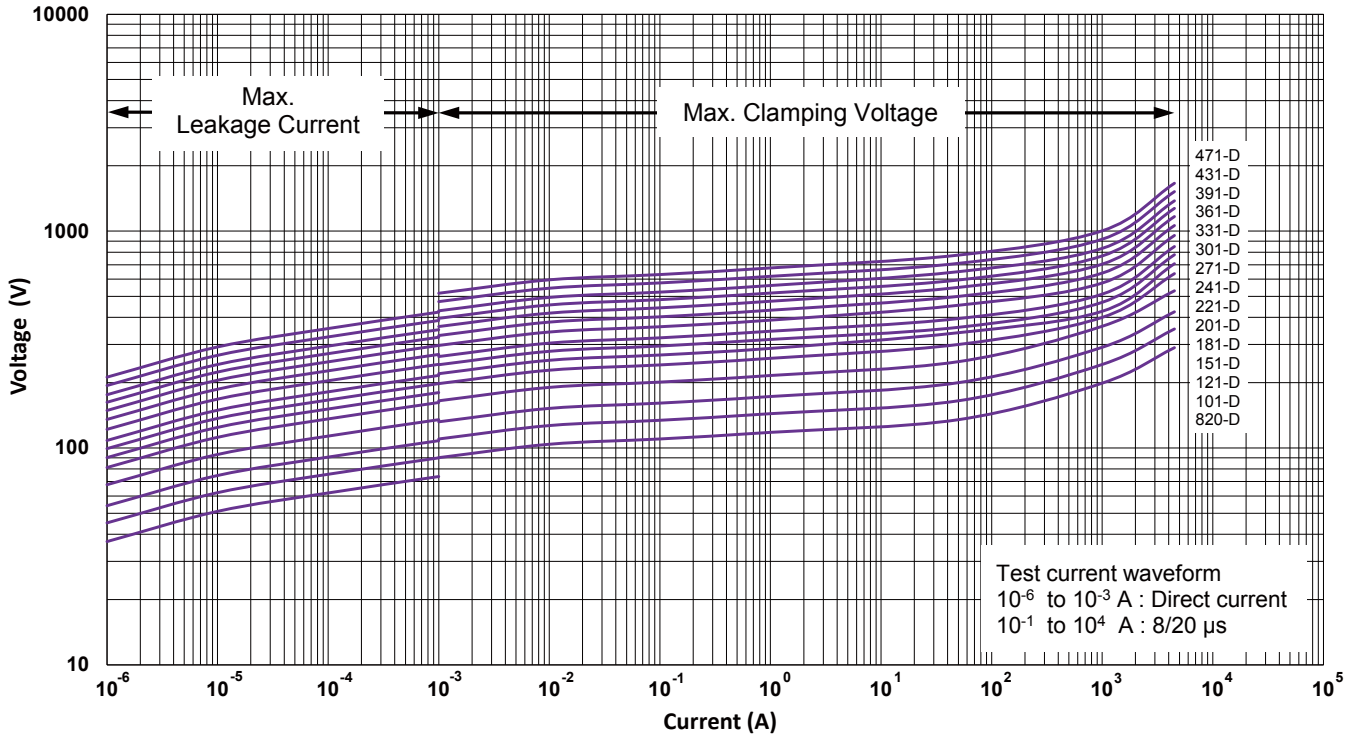


# Transient V-I Characteristic Curves

## FMOV14180-D to FMOV14680-D

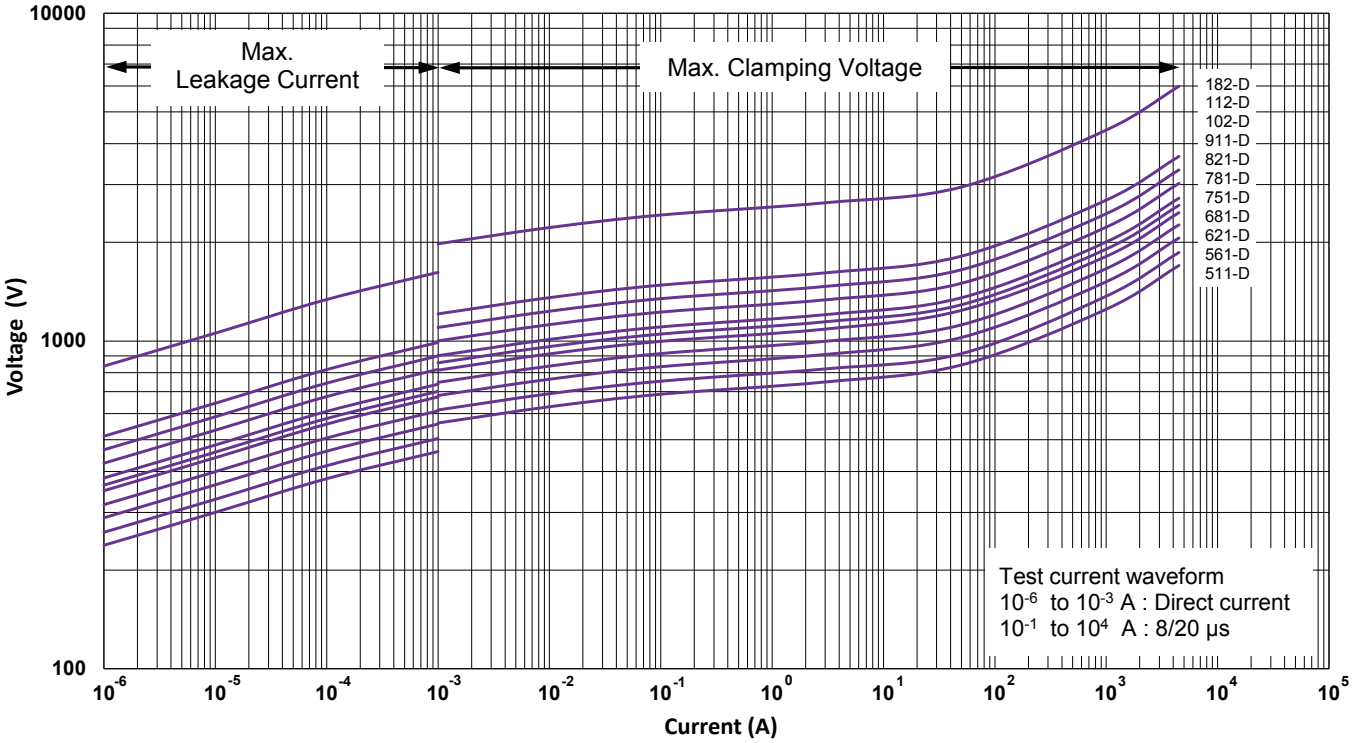



## FMOV14820-D to FMOV14471-D

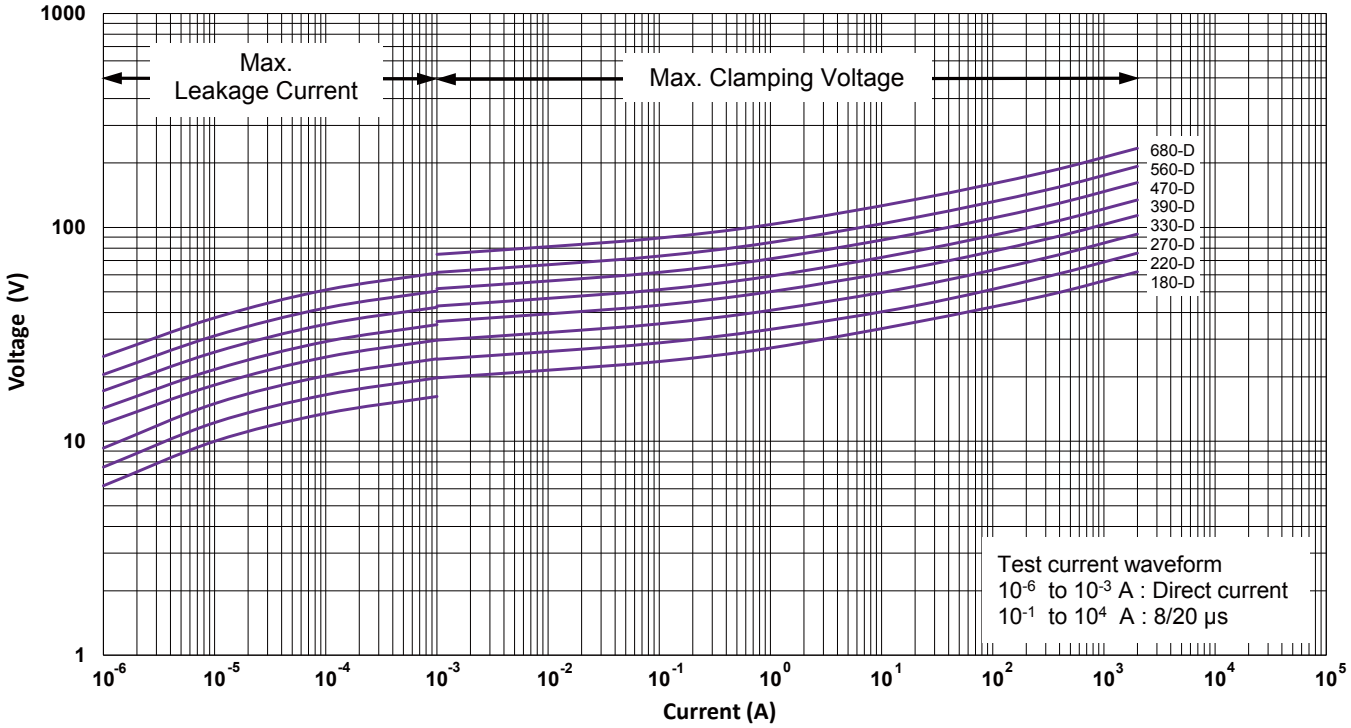


# Transient V-I Characteristic Curves

## FMOV14511-D to FMOV14182-D

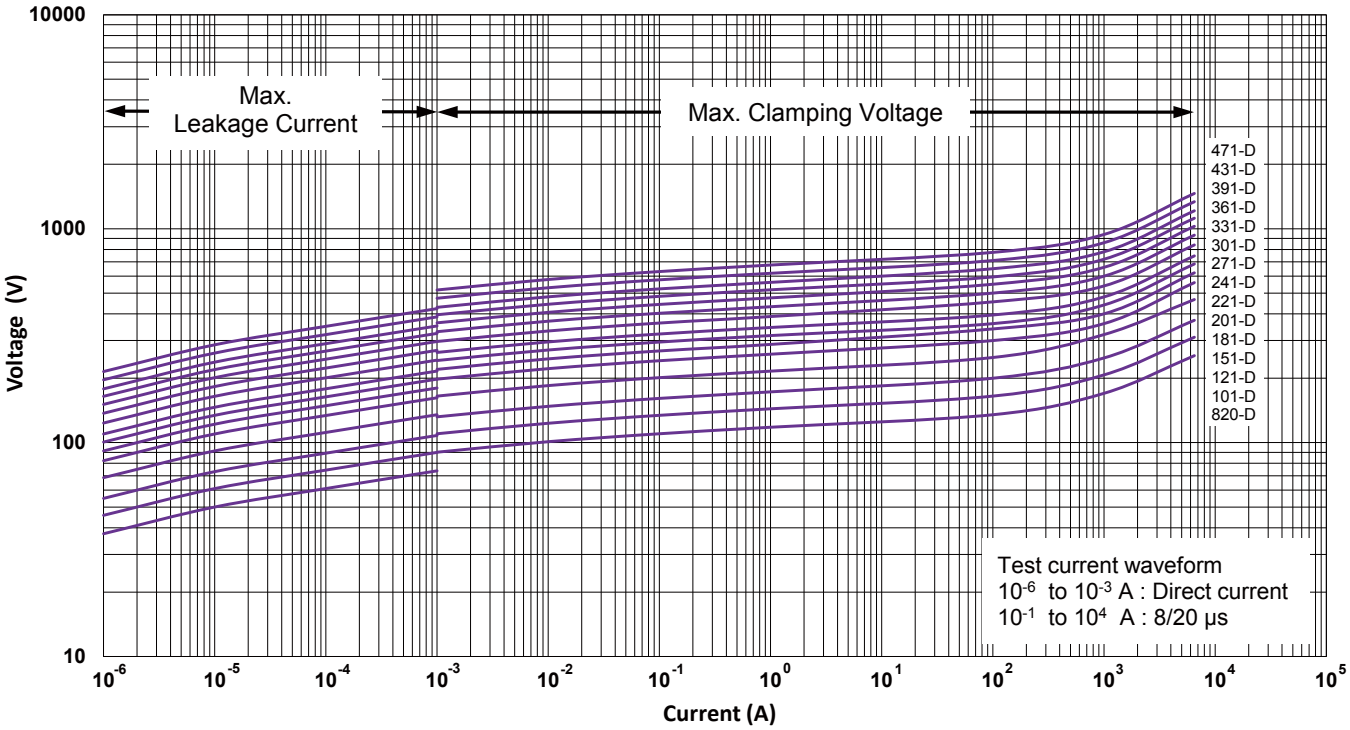



## FMOV20180-D to FMOV20680-D

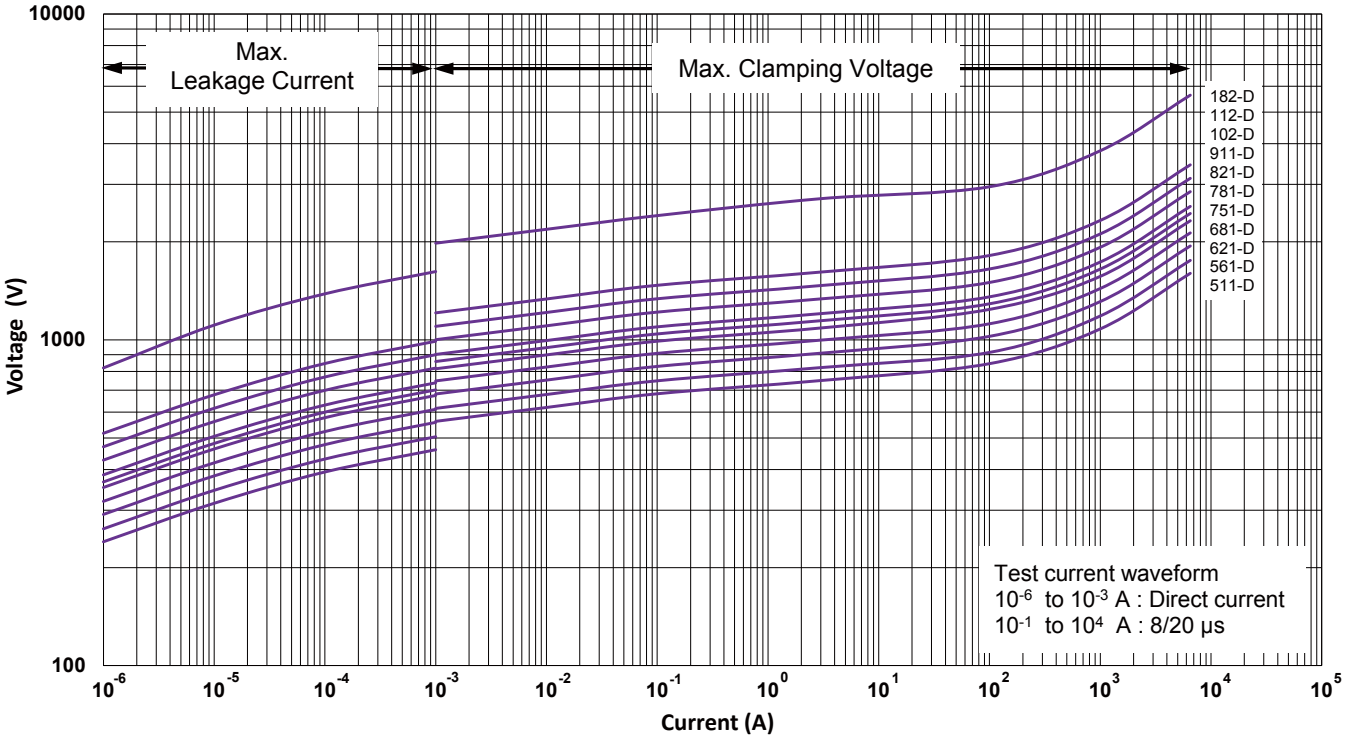


# Transient V-I Characteristic Curves

## FMOV20820-D to FMOV20471-D

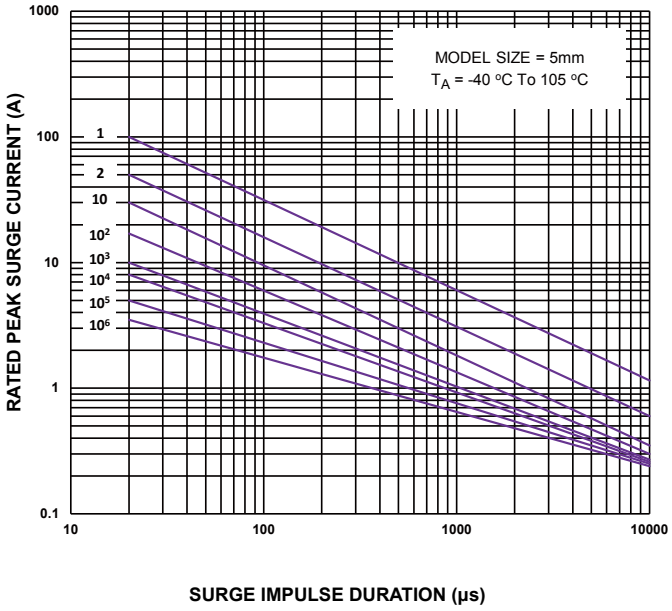



## FMOV20511-D to FMOV20182-D

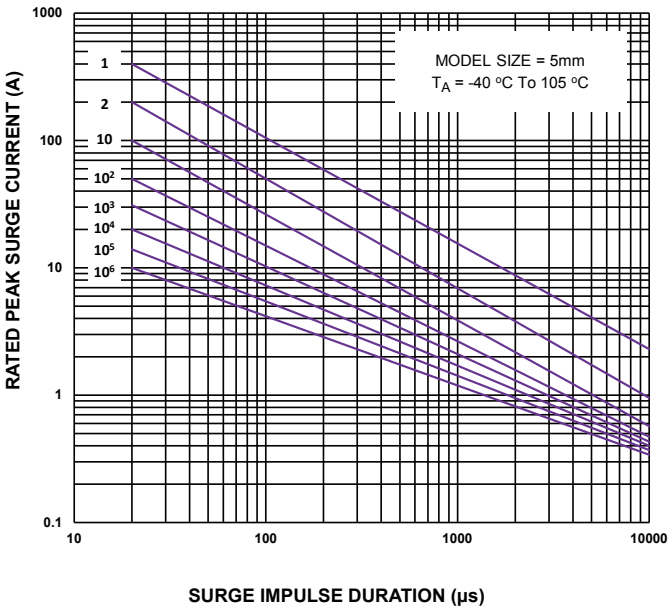


# Impulse Life Time Rating Curves

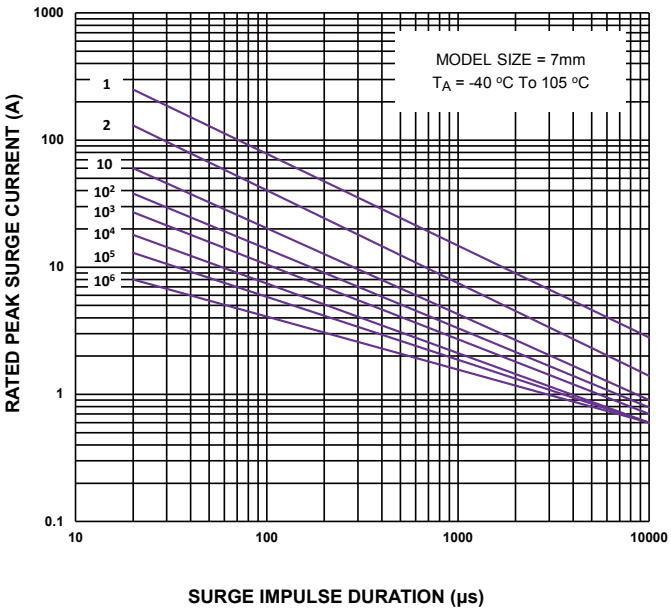
## FMOV05180-D to FMOV05680-D



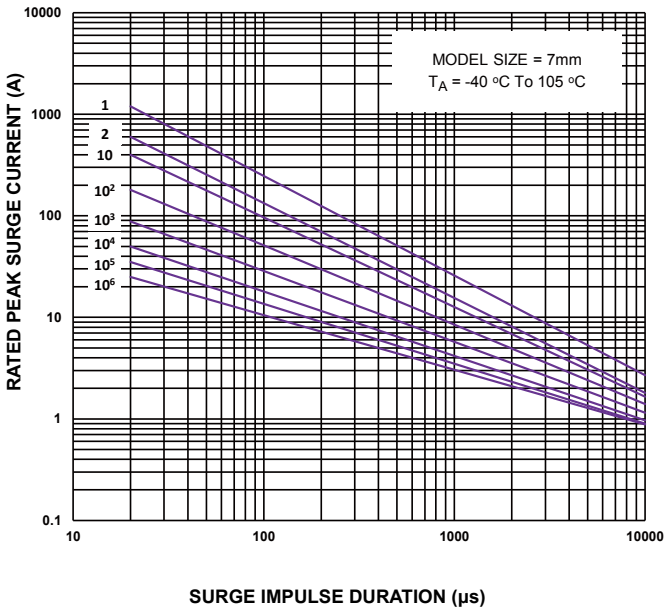

## FMOV05820-D to FMOV05751-D




## FMOV07180-D to FMOV07680-D

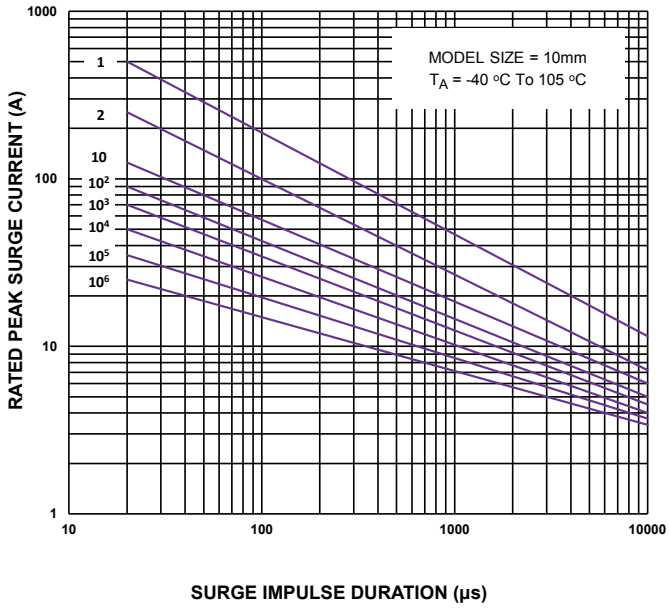



## FMOV07820-D to FMOV07821-D

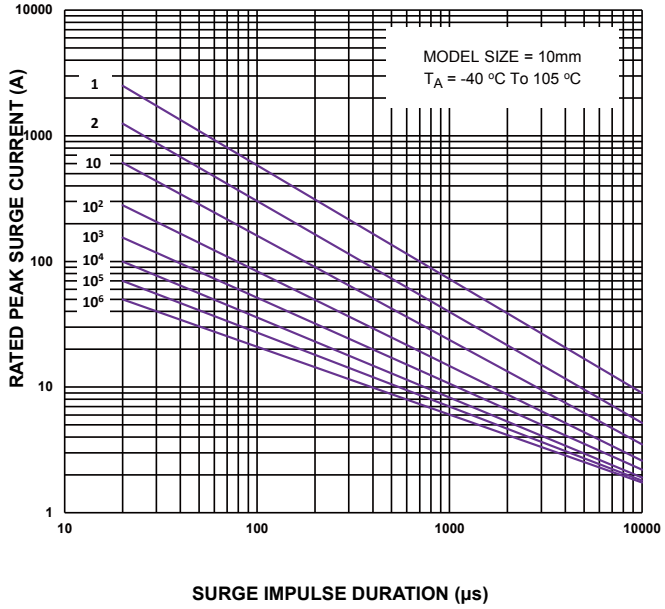


# Impulse Life Time Rating Curves

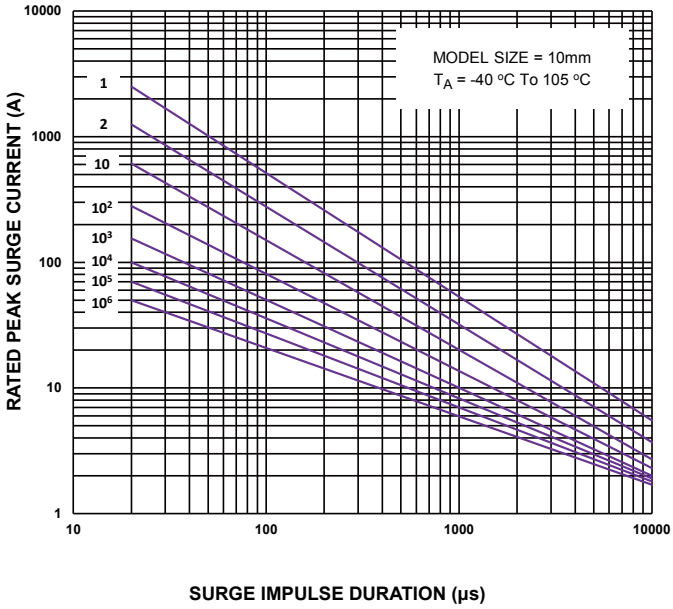
## FMOV10180-D to FMOV10680-D



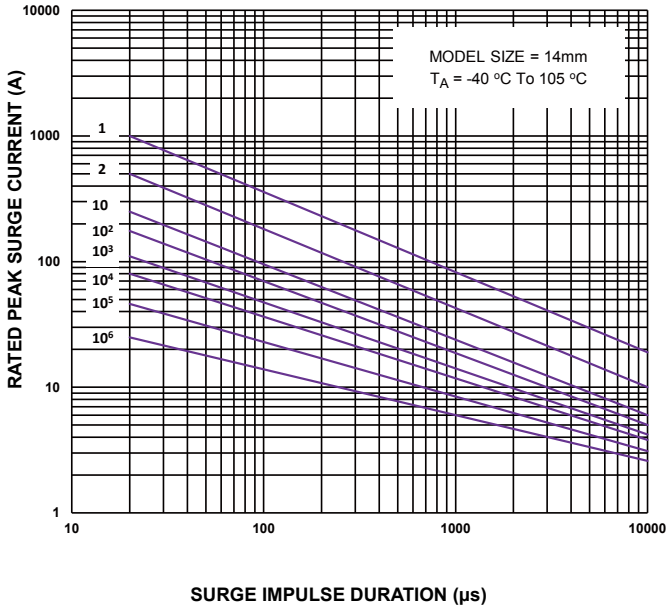

## FMOV10820-D to FMOV10751-D




## FMOV10781-D to FMOV10182-D

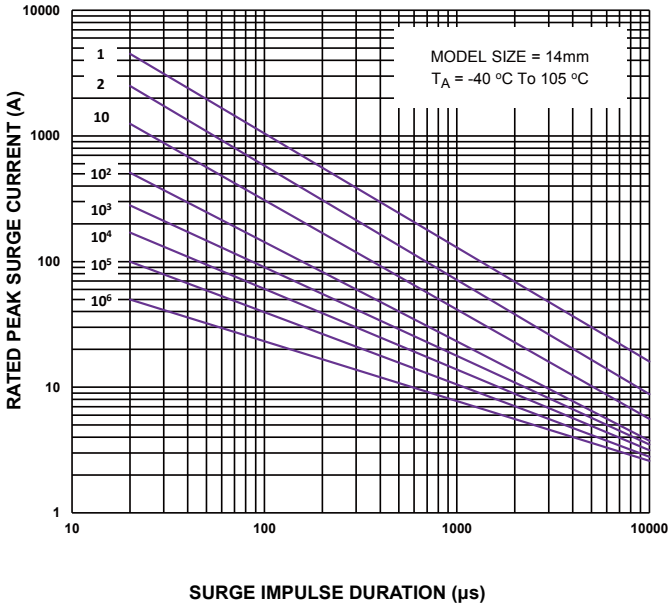



## FMOV14180-D to FMOV14680-D

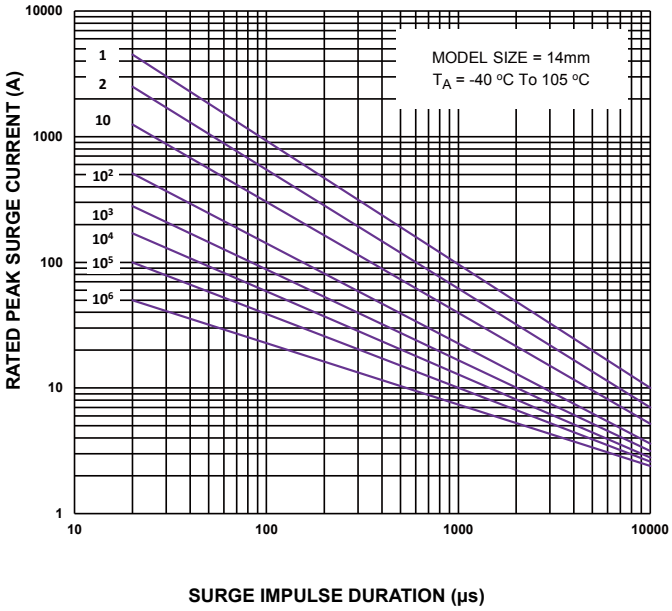


# Impulse Life Time Rating Curves

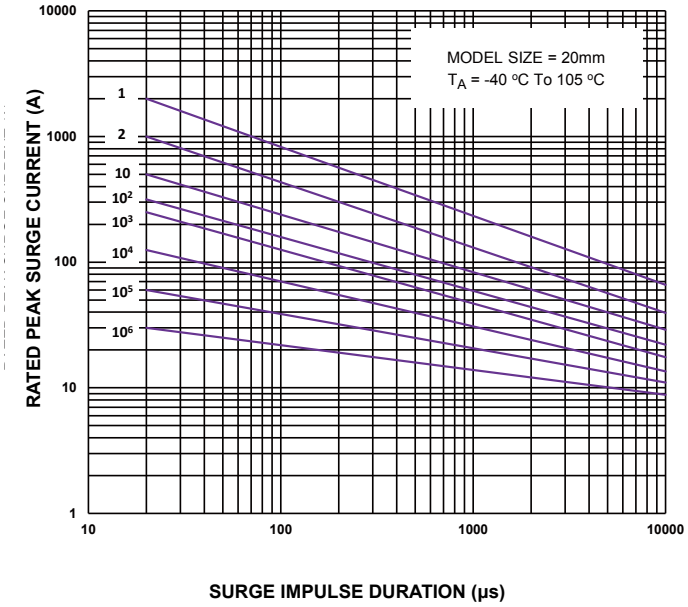
## FMOV14820-D to FMOV14751-D



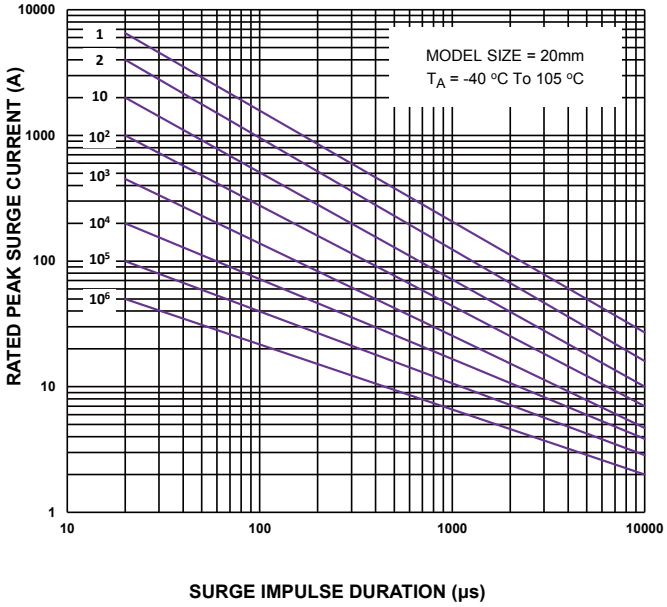

## FMOV14781-D to FMOV14182-D




## FMOV20180-D to FMOV20680-D

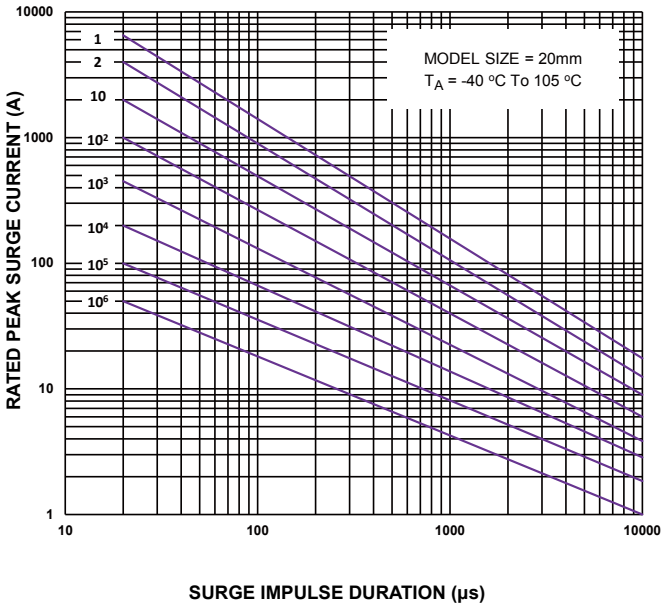



## FMOV20820-D to FMOV20751-D



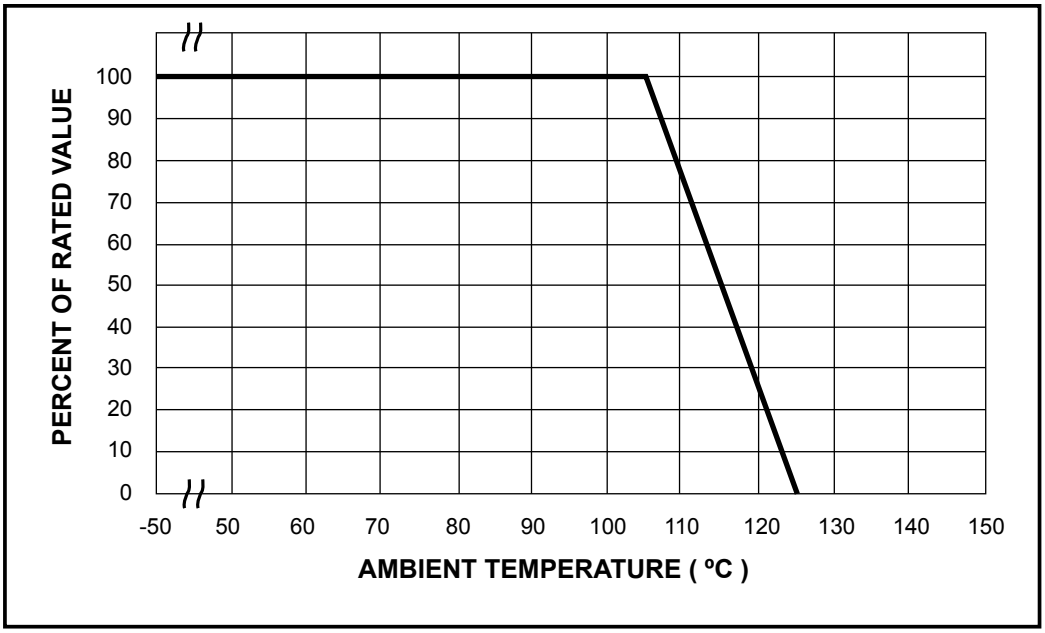
# Impulse Life Time Rating Curves

## *FMOV20781-D to FMOV20182-D*

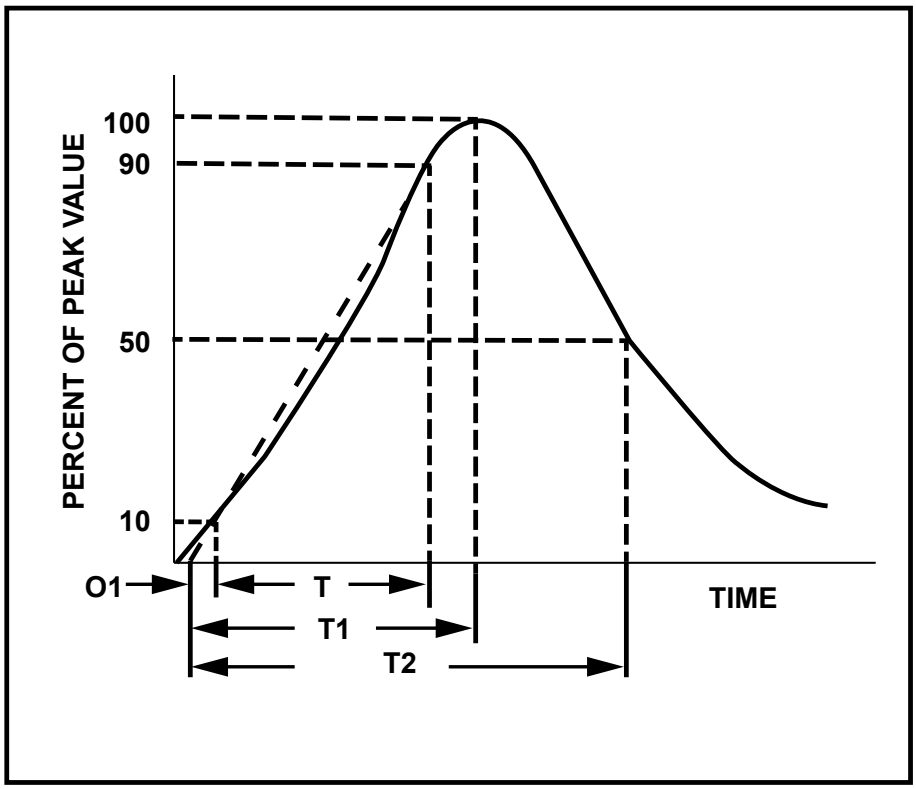


## Power Derating Curve

Should transients occur in rapid succession, the average power dissipation is the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be with the specifications shown on the Device Ratings and Specifications Table for the specific device. The operating values of a MOV need to be derated at high temperatures as shown above. Because varistors only dissipate a relatively small amount of average power they are not suitable for repetitive applications that involve substantial amounts of average power dissipation.




## Surge Current Standard Waveform




O1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T1 = Rise Time = 1.25 x T
T2 = Decay Time
Example - For an 8/20 µs Current Waveform :
8µs = T1 = Rise Time
20µs = T2 = Decay Time

## Product Dimensions

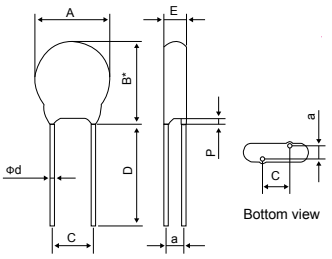



Fig 1. Straight Lead

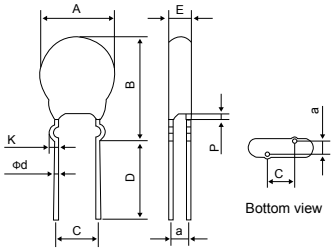



Fig 2. Outside Kink Lead

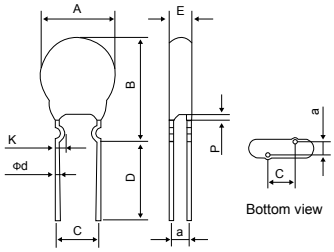



Fig 3. Inside Kink Lead

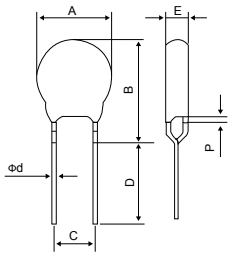



Fig 4. In Line Kink Lead

Dimension Table

Unit : mm

| Symbol \ Model size | | 05D | | 07D | | 10D | | 14D | | 20D | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| A | | 5.5 | 7.5 | 7.5 | 9.0 | 10.5 | 14.0 | 13.5 | 17.5 | 19.2 | 25.0 |
| B(Max.) | 180-D ~ 271-D | - | 13.0 | - | 15.0 | - | 19.5 | - | 22.5 | - | 30.0 |
| | >271-D | - | 13.0 | - | 15.0 | - | 20.5 | - | 22.5 | - | 31.0 |
| B*(Max.) | | - | 10.0 | - | 12.0 | - | 17.0 | - | 20.5 | - | 28.0 |
| C(±1.0) | | 5.0 | | 5.0 | | 7.5 | | 7.5 | | 10.0 | |
| D(Typ.) | | 25.0 | | 25.0 | | 25.0 | | 25.0 | | 25.0 | |
| P(Max.) | | - | 3.0 | - | 3.0 | - | 3.0 | - | 3.0 | - | 3.0 |
| K | | 0.8 | 1.6 | 0.8 | 1.6 | 1.0 | 1.8 | 1.0 | 1.8 | 1.0 | 1.8 |
| Φd(±0.05) | | 0.60 | | 0.6 | | 0.8 | | 0.8 | | 1.0 | |
| E | | E Max. Table | | | | | | | | | |

E Max. Table

Unit : mm

| Model | 05D | 07D | 10D | 14D | 20D | a (±1.0) | Model | 05D | 07D | 10D | 14D | 20D | a (±1.0) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 180-D | 3.3 | 3.5 | 3.9 | 4.0 | 4.4 | 1.5 | 301-D | 3.9 | 4.1 | 4.3 | 4.4 | 4.7 | 1.9 |
| 220-D | 3.6 | 3.8 | 4.2 | 4.3 | 4.6 | 1.6 | 331-D | 4.0 | 4.2 | 4.5 | 4.6 | 4.9 | 2.0 |
| 270-D | 3.8 | 4.0 | 4.4 | 4.5 | 4.8 | 1.7 | 361-D | 4.1 | 4.3 | 4.7 | 4.8 | 5.1 | 1.7 |
| 330-D | 3.3 | 3.5 | 3.9 | 4.0 | 4.9 | 1.6 | 391-D | 4.2 | 4.4 | 4.8 | 4.9 | 5.2 | 1.8 |
| 390-D | 3.5 | 3.7 | 4.1 | 4.2 | 5.1 | 1.8 | 431-D | 4.4 | 4.6 | 5.0 | 5.1 | 5.4 | 1.9 |
| 470-D | 3.7 | 3.9 | 4.3 | 4.4 | 5.3 | 1.9 | 471-D | 4.6 | 4.8 | 5.2 | 5.3 | 5.6 | 2.0 |
| 560-D | 4.0 | 4.2 | 4.6 | 4.7 | 5.4 | 2.0 | 511-D | 4.8 | 5.0 | 5.3 | 5.4 | 5.7 | 2.2 |
| 680-D | 4.3 | 4.5 | 4.9 | 5.0 | 5.6 | 2.2 | 561-D | 5.0 | 5.2 | 5.5 | 5.6 | 5.9 | 2.3 |
| 820-D | 3.3 | 3.5 | 3.9 | 4.0 | 5.8 | 1.5 | 621-D | 5.3 | 5.5 | 5.7 | 5.8 | 6.1 | 2.5 |
| 101-D | 3.6 | 3.8 | 4.2 | 4.3 | 5.9 | 1.5 | 681-D | 5.4 | 5.6 | 5.8 | 5.9 | 6.2 | 2.7 |
| 121-D | 3.8 | 4.0 | 4.4 | 4.5 | 6.1 | 1.6 | 751-D | 5.6 | 5.8 | 6.0 | 6.1 | 6.4 | 2.9 |
| 151-D | 4.1 | 4.3 | 4.7 | 4.8 | 6.4 | 1.8 | 778-D | - | 6.0 | 6.3 | 6.4 | 6.7 | 3.0 |
| 181-D | 3.2 | 3.4 | 3.8 | 3.9 | 6.6 | 1.5 | 821-D | - | 6.3 | 6.5 | 6.6 | 6.9 | 3.1 |
| 201-D | 3.3 | 3.5 | 3.9 | 4.0 | 6.7 | 1.5 | 911-D | - | - | 6.6 | 6.7 | 7.0 | 3.5 |
| 221-D | 3.4 | 3.6 | 4.0 | 4.1 | 7.1 | 1.6 | 102-D | - | - | 7.0 | 7.1 | 7.4 | 3.8 |
| 241-D | 3.5 | 3.7 | 4.1 | 4.2 | 7.5 | 1.7 | 112-D | - | - | 7.4 | 7.5 | 7.9 | 4.1 |
| 271-D | 3.7 | 3.9 | 4.2 | 4.3 | 11.5 | 1.8 | 182-D | - | - | 11.3 | 11.5 | 11.9 | 6.0 |



NOTE : All Specifications subject to change without notice.

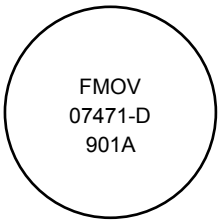
## Part Numbering and Marking System

**Part Numbering System :**

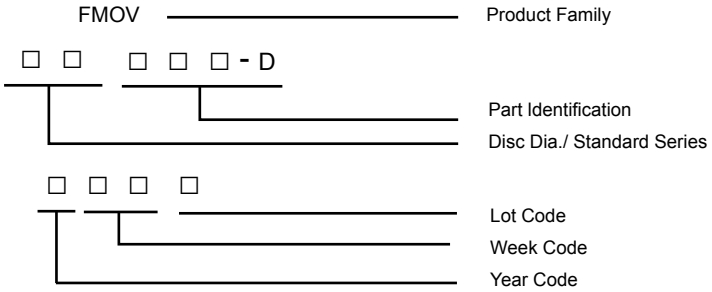
FMOV 07 471 - D + Tolerance Code + Option Code (See notes below)

- Tolerance Code: Tolerance of $V_{1MA}$ (K=±10% / L=±15%)
- D: Standard Series
- 471: Varsitor Voltage Two significant figures plus number of zeros that above.i.e. 471 is 470$V_{DC}$
- 07: Disc Diameter
- FMOV: Product Family

**Marking System :**




Example




## Order Notes

**Main Part Code :**

**Part No + Tolerance Code + Packaging + Lead Type Designators + Option Code**

**Ordering examples :**

| Straight Lead Bulk Pack (Standard) | Straight Lead (Short Cut) Bulk Pack | Straight Lead Tape & Reel Pack | Straight Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-DKBS | FMOV05471-DKBSXXX | FMOV05471-DKTS | FMOV05471-DKAS |
| FMOV07471-DKBS | FMOV07471-DKBSXXX | FMOV07471-DKTS | FMOV07471-DKAS |
| FMOV10471-DKBS | FMOV10471-DKBSXXX | FMOV10471-DKTS | FMOV10471-DKAS |
| FMOV14471-DKBS | FMOV14471-DKBSXXX | FMOV14471-DKTS | FMOV14471-DKAS |
| FMOV20471-DKBS | FMOV20471-DKBSXXX | - | - |

| Outside Kink Lead Bulk Pack | Outside Kink lead (Short Cut) Bulk Pack | Outside Kink Lead Tape & Reel Pack | Outside Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-DKBO | FMOV05471-DKBOXXX | FMOV05471-DKTO | FMOV05471-DKAO |
| FMOV07471-DKBO | FMOV07471-DKBOXXX | FMOV07471-DKTO | FMOV07471-DKAO |
| FMOV10471-DKBO | FMOV10471-DKBOXXX | FMOV10471-DKTO | FMOV10471-DKAO |
| FMOV14471-DKBO | FMOV14471-DKBOXXX | FMOV14471-DKTO | FMOV14471-DKAO |
| FMOV20471-DKBO | FMOV20471-DKBOXXX | - | - |

| Inside Kink lead Bulk Pack | Inside Kink Lead (Short Cut) Bulk Pack | Inside Kink Lead Tape & Reel Pack | Inside Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-DKBK | FMOV05471-DKBKXXX | FMOV05471-DKTK | FMOV05471-DKAK |
| FMOV07471-DKBK | FMOV07471-DKBKXXX | FMOV07471-DKTK | FMOV07471-DKAK |
| FMOV10471-DKBK | FMOV10471-DKBKXXX | FMOV10471-DKTK | FMOV10471-DKAK |
| FMOV14471-DKBK | FMOV14471-DKBKXXX | FMOV14471-DKTK | FMOV14471-DKAK |
| FMOV20471-DKBK | FMOV20471-DKBKXXX | - | - |

| In Line Kink Lead Bulk Pack | In Line Kink Lead (Short Cut) Bulk Pack | In Line Kink Lead Tape& Reel Pack | In Line Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-DKBI | FMOV05471-DKBIXXX | FMOV05471-DKTI | FMOV05471-DKAI |
| FMOV07471-DKBI | FMOV07471-DKBIXXX | FMOV07471-DKTI | FMOV07471-DKAI |
| FMOV10471-DKBI | FMOV10471-DKBIXXX | FMOV10471-DKTI | FMOV10471-DKAI |
| FMOV14471-DKBI | FMOV14471-DKBIXXX | FMOV14471-DKTI | FMOV14471-DKAI |
| FMOV20471-DKBI | FMOV20471-DKBIXXX | - | - |

| Tape & Reel Pack Feed Hole Pitch |
|---|
| FMOV05471-DKTSA |
| FMOV05471-DKTSB |
| FMOV07471-DKTSA |
| FMOV07471-DKTSB |
| FMOV10471-DKTSA |
| FMOV10471-DKTSB |
| FMOV14471-DKTSA |
| FMOV14471-DKTSB |

**A : P0 → 12.7mm±0.2mm**
**B : P0 → 15.0mm±0.2mm**

## *Tape and Reel Specifications*

Radial devices on tape are supplied with straight leads or inline kink leads

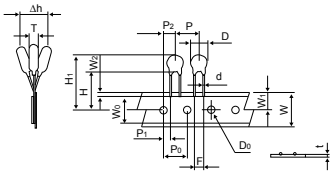


Figure: A

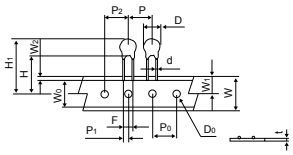


Figure: B

Straight Leads

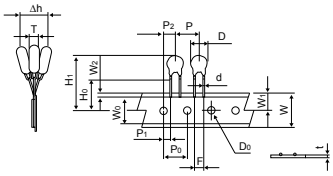


Figure: C

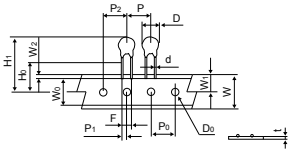


Figure: D

Inline Kink Leads

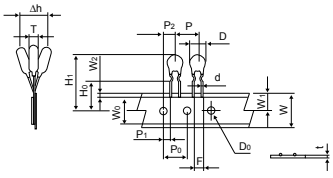


Figure: E

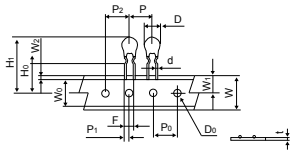


Figure: F

Inside Kink Leads

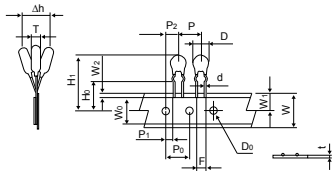


Figure: G

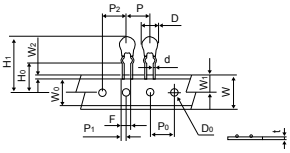


Figure: H

Outside Kink Leads

| Symbol | Parameter | Model | | | | | |
|---|---|---|---|---|---|---|---|
| | | 05D | 07D | 10D | | 14D | |
| **P** | Pitch of Component | 12.7±1.0 | 12.7±1.0 | 12.7±1.0 | 15.0±1.0 | 25.4±1.0 | 30.0±1.0 |
| **P0** | Feed Hole Pitch | 12.7±0.2 | 12.7±0.2 | 12.7±0.2 | 15.0±0.2 | 12.7±0.2 | 15.0±0.2 |
| **P1** | Feed Hole Center Lead | 3.85±0.7 | 3.85±0.7 | 3.85±0.7 | 3.75±0.7 | 8.95±0.7 | 3.75±0.7 |
| **P2** | Hole center to Component Center | 6.35±0.7 | 6.35±0.7 | 6.35±0.7 | 7.5±0.7 | 12.7±0.7 | 7.5±0.7 |
| **F** | Lead to Lead Distance | 5.0±0.8 | 5.0±0.8 | 7.5±0.8 | 7.5±0.8 | 7.5±0.8 | 7.5±0.8 |
| **Δh** | Component Alignment | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max |
| **W** | Tape Width | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 |
| | | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 |
| **W0** | Hold Down Tape Width | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min |
| **W1** | Hole Position | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 |
| | | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 |
| **W2** | Hold Down Tape Position | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max |
| **H** | Height from Tape Center to Component Base | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 |
| | | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 |
| **H0** | Seating Plane Height | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 |
| **H1** | Component Height | 29.0 Max | 32.0 Max | 36.0 Max | 36.0 Max | 40.0 Max | 40.0 Max |
| **D0** | Feed Hole Diameter | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 |
| **t** | Total Tape Thickness | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 |
| **L** | Length of Clopped Lead | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max |
| **Figure** | | ACEG | ACEG | BDFH | ACEG | BDFH | ACEG |

Unit: mm

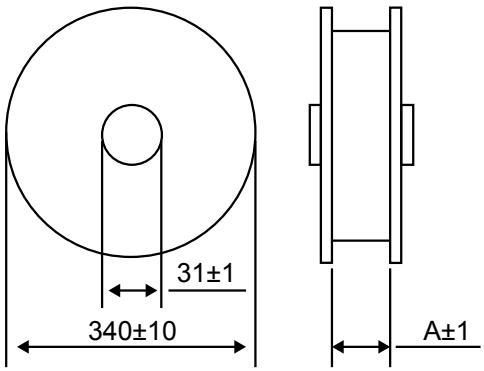
## Packaging Specifications

### Bulk Product Packing

| Series | Straight Lead Type Quantity (pcs/bag) | Outside Kink Lead Type Quantity (pcs/bag) | Inside Kink Lead Type Quantity (pcs/bag) | In Line Kink Lead Type Quantity (pcs/bag) |
|---|---|---|---|---|
| FMOV05-D Series | 1000 | 1000 | 1000 | 1000 |
| FMOV07-D Series | 1000 | 1000 | 1000 | 1000 |
| FMOV10-D Series | 500 | 500 | 500 | 500 |
| FMOV14-D Series | 500 | 500 | 500 | 500 |
| FMOV20-D Series | 250 | 250 | 250 | 250 |

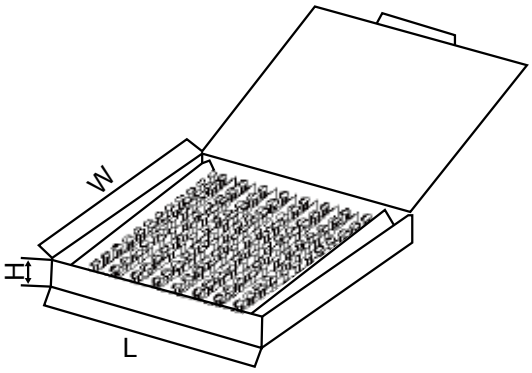
### Tape & Reel Product Packing

| Series | A (mm) | Quantity (pcs/reel) |
|---|---|---|
| FMOV05(180~391)-D-T- | 43 | 2000 |
| FMOV05(431~751)-D-T- | | 1500 |
| FMOV07(180~391)-D-T- | | 2000 |
| FMOV07(431~821)-D-T- | | 1500 |
| FMOV10(180~621)-D-T- | | 1000 |
| FMOV10(681~112)-D-T- | | 800 |
| FMOV14(180~391)-D-T- | 56 | 800 |
| FMOV14(431~621)-D-T- | | 700 |
| FMOV14(681~112)-D-T- | | 600 |

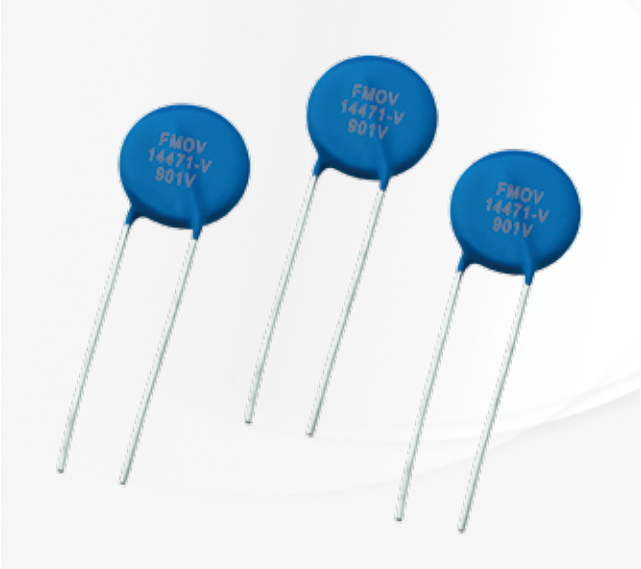



### Box Product Packing

| Series | Quantity (pcs/reel) |
|---|---|
| FMOV05(180~621)-D-A- | 1000 |
| FMOV05(681~751)-D-A- | 800 |
| FMOV07(180~391)-D-A- | 1000 |
| FMOV07(431~821)-D-A- | 800 |
| FMOV10(180~621)-D-A- | 1000 |
| FMOV10(681~112)-D-A- | 800 |
| FMOV14(180~621)-D-A- | 500 |
| FMOV14(681~112)-D-A- | 400 |




| Series | L ± 5 | W ± 5 | H ± 5 |
|---|---|---|---|
| FMOV05~07-D Series | 340 | 245 | 45 |
| FMOV10~14-D Series | 340 | 245 | 50 |




## Description :

Fuzetec V Series Metal Oxide Varistors (MOV) are designed for applications which require medium level of surge protection. They are ideal for AC Line Voltage applications, inductive load switching and products that require voltage clamping of higher transient surge currents from power sources. MOV products have specific nonlinear and symmetrical V-I characteristics curve and unparalleled large peak current capability are used for absorption of transient voltage, suppression of pulse noise and circuit voltage stabilization.

## Features :

- RoHS compliant
- Halogen-free series are available
- Body size: Φ 05 ~ Φ 20mm

## Applications :

- Power supply
- Home appliance
- Industrial equipment
- Telecommunication system
- Smart meter
- Lighting products
- Photovoltaic industry

## Agency Approvals

| Agency | Agency Approvals | File Number |
|---|---|---|
| c UL us | UL 1449 4th & cUL | VZCA2.E515006<br>VZCA8.E515006 |

RoHS | HF Halogen Free

SVHC Compliant

| Absolute Maximum Ratings | | |
|---|---|---|
| | V Series | Units |
| **Steady State :** | | |
| AC Voltage Range ($V_{AC}$) | 130 to 680 | V |
| DC Voltage Range($V_{DC}$) | 170 to 895 | V |
| **Transients :** | | |
| Peak Current for 8/20μS Current Wave | 800 to 10000 | A |
| Energy Range For 10/1000μS Current Wave | 17.5 to 620 | J |
| Operation Ambient Temperature Range | -40 to +105 | °C |
| Storage Temperature Range | -40 to +125 | °C |
| Varistor Voltage Range Vn($V_{DC}$) | 200 to 1100 | V |
| Insulation Resistance | >1000 | MΩ |
| Typical Response Time | <25 | ns |



NOTE : All Specifications subject to change without notice.

## FMOV05-V Series

| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV05201-V | 130 | 170 | 200 | 180 | 220 | 355 | 5 | 17.5 | 800 | 0.25 | 70 | |
| FMOV05221-V | 140 | 180 | 220 | 198 | 242 | 380 | 5 | 19 | 800 | 0.25 | 60 | |
| FMOV05241-V | 150 | 200 | 240 | 216 | 264 | 415 | 5 | 21 | 800 | 0.25 | 60 | |
| FMOV05271-V | 175 | 225 | 270 | 243 | 297 | 475 | 5 | 24 | 800 | 0.25 | 50 | |
| FMOV05301-V | 195 | 250 | 300 | 270 | 330 | 505 | 5 | 26 | 800 | 0.25 | 50 | |
| FMOV05331-V | 215 | 275 | 330 | 297 | 363 | 585 | 5 | 28 | 800 | 0.25 | 45 | |
| FMOV05361-V | 230 | 300 | 360 | 324 | 396 | 620 | 5 | 32 | 800 | 0.25 | 40 | c UL us |
| FMOV05391-V | 250 | 320 | 390 | 351 | 429 | 675 | 5 | 35 | 800 | 0.25 | 40 | |
| FMOV05431-V | 275 | 350 | 430 | 387 | 473 | 745 | 5 | 40 | 800 | 0.25 | 35 | |
| FMOV05471-V | 300 | 385 | 470 | 423 | 517 | 810 | 5 | 42 | 800 | 0.25 | 30 | |
| FMOV05511-V | 320 | 410 | 510 | 459 | 561 | 878 | 5 | 45 | 800 | 0.25 | 30 | |
| FMOV05561-V | 350 | 460 | 560 | 504 | 616 | 940 | 5 | 45 | 800 | 0.25 | 30 | |
| FMOV05621-V | 395 | 510 | 620 | 558 | 682 | 1050 | 5 | 45 | 800 | 0.25 | 26 | |
| FMOV05681-V | 420 | 560 | 680 | 612 | 748 | 1120 | 5 | 48 | 800 | 0.25 | 20 | |
| FMOV05751-V | 465 | 615 | 750 | 675 | 825 | 1240 | 5 | 48 | 800 | 0.25 | 20 | |

# FMOV07-V Series

| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV07201-V | 130 | 170 | 200 | 180 | 220 | 355 | 10 | 17.5 | 1800 | 0.25 | 200 | |
| FMOV07221-V | 140 | 180 | 220 | 198 | 242 | 380 | 10 | 19 | 1800 | 0.25 | 190 | |
| FMOV07241-V | 150 | 200 | 240 | 216 | 264 | 415 | 10 | 21 | 1800 | 0.25 | 170 | |
| FMOV07271-V | 175 | 225 | 270 | 243 | 297 | 475 | 10 | 24 | 1800 | 0.25 | 150 | |
| FMOV07301-V | 195 | 250 | 300 | 270 | 330 | 505 | 10 | 26 | 1800 | 0.25 | 140 | |
| FMOV07331-V | 215 | 275 | 330 | 297 | 363 | 585 | 10 | 28 | 1800 | 0.25 | 130 | |
| FMOV07361-V | 230 | 300 | 360 | 324 | 396 | 620 | 10 | 32 | 1800 | 0.25 | 130 | |
| FMOV07391-V | 250 | 320 | 390 | 351 | 429 | 675 | 10 | 35 | 1800 | 0.25 | 130 | |
| FMOV07431-V | 275 | 350 | 430 | 387 | 473 | 745 | 10 | 40 | 1800 | 0.25 | 120 | c UL us |
| FMOV07471-V | 300 | 385 | 470 | 423 | 517 | 810 | 10 | 42 | 1800 | 0.25 | 100 | |
| FMOV07511-V | 320 | 410 | 510 | 459 | 561 | 878 | 10 | 45 | 1800 | 0.25 | 90 | |
| FMOV07561-V | 350 | 460 | 560 | 504 | 616 | 940 | 10 | 45 | 1800 | 0.25 | 90 | |
| FMOV07621-V | 395 | 510 | 620 | 558 | 682 | 1050 | 10 | 45 | 1800 | 0.25 | 90 | |
| FMOV07681-V | 420 | 560 | 680 | 612 | 748 | 1120 | 10 | 48 | 1800 | 0.25 | 80 | |
| FMOV07751-V | 465 | 615 | 750 | 675 | 825 | 1240 | 10 | 48 | 1800 | 0.25 | 80 | |
| FMOV07781-V | 485 | 640 | 780 | 702 | 858 | 1290 | 10 | 50 | 1800 | 0.25 | 80 | |
| FMOV07821-V | 510 | 670 | 820 | 738 | 902 | 1355 | 10 | 50 | 1800 | 0.25 | 70 | |

# FMOV10-V Series

*Device Ratings and Characteristics*

| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV10201-V | 130 | 170 | 200 | 180 | 220 | 340 | 25 | 35 | 3500 | 0.4 | 430 | |
| FMOV10221-V | 140 | 180 | 220 | 198 | 242 | 360 | 25 | 39 | 3500 | 0.4 | 410 | |
| FMOV10241-V | 150 | 200 | 240 | 216 | 264 | 395 | 25 | 42 | 3500 | 0.4 | 380 | |
| FMOV10271-V | 175 | 225 | 270 | 243 | 297 | 455 | 25 | 49 | 3500 | 0.4 | 350 | |
| FMOV10301-V | 195 | 250 | 300 | 270 | 330 | 500 | 25 | 55 | 3500 | 0.4 | 330 | |
| FMOV10331-V | 215 | 275 | 330 | 297 | 363 | 550 | 25 | 58 | 3500 | 0.4 | 300 | |
| FMOV10361-V | 230 | 300 | 360 | 324 | 396 | 595 | 25 | 65 | 3500 | 0.4 | 300 | |
| FMOV10391-V | 250 | 320 | 390 | 351 | 429 | 650 | 25 | 70 | 3500 | 0.4 | 300 | |
| FMOV10431-V | 275 | 350 | 430 | 387 | 473 | 710 | 25 | 80 | 3500 | 0.4 | 270 | |
| FMOV10471-V | 300 | 385 | 470 | 423 | 517 | 775 | 25 | 85 | 3500 | 0.4 | 230 | c UL us |
| FMOV10511-V | 320 | 410 | 510 | 459 | 561 | 845 | 25 | 92 | 3500 | 0.4 | 210 | |
| FMOV10561-V | 350 | 460 | 560 | 504 | 616 | 915 | 25 | 92 | 3500 | 0.4 | 200 | |
| FMOV10621-V | 395 | 510 | 620 | 558 | 682 | 1020 | 25 | 95 | 3500 | 0.4 | 180 | |
| FMOV10681-V | 420 | 560 | 680 | 612 | 748 | 1120 | 25 | 98 | 3500 | 0.4 | 150 | |
| FMOV10751-V | 465 | 615 | 750 | 675 | 825 | 1235 | 25 | 100 | 3500 | 0.4 | 140 | |
| FMOV10781-V | 485 | 640 | 780 | 702 | 858 | 1290 | 25 | 100 | 3500 | 0.4 | 140 | |
| FMOV10821-V | 510 | 670 | 820 | 738 | 902 | 1355 | 25 | 110 | 3500 | 0.4 | 140 | |
| FMOV10911-V | 550 | 745 | 910 | 819 | 1001 | 1500 | 25 | 130 | 3500 | 0.4 | 130 | |
| FMOV10102-V | 625 | 825 | 1000 | 900 | 1100 | 1650 | 25 | 140 | 3500 | 0.4 | 130 | |
| FMOV10112-V | 680 | 895 | 1100 | 990 | 1210 | 1815 | 25 | 155 | 3500 | 0.4 | 120 | |

# FMOV14-V Series

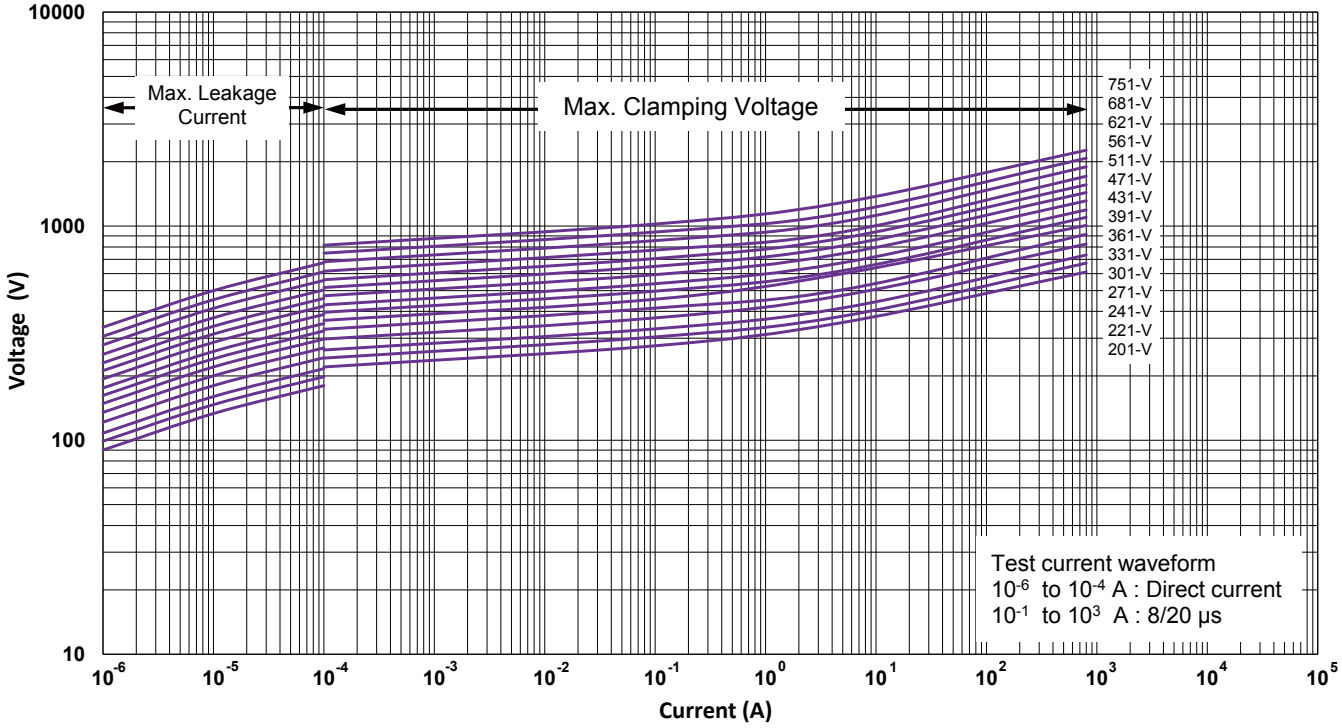
| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV14201-V | 130 | 170 | 200 | 180 | 220 | 340 | 50 | 84 | 6000 | 0.6 | 770 | |
| FMOV14221-V | 140 | 180 | 220 | 198 | 242 | 360 | 50 | 91 | 6000 | 0.6 | 740 | |
| FMOV14241-V | 150 | 200 | 240 | 216 | 264 | 395 | 50 | 98 | 6000 | 0.6 | 700 | |
| FMOV14271-V | 175 | 225 | 270 | 243 | 297 | 455 | 50 | 112 | 6000 | 0.6 | 640 | |
| FMOV14301-V | 195 | 250 | 300 | 270 | 330 | 500 | 50 | 123 | 6000 | 0.6 | 400 | |
| FMOV14331-V | 215 | 275 | 330 | 297 | 363 | 550 | 50 | 133 | 6000 | 0.6 | 580 | |
| FMOV14361-V | 230 | 300 | 360 | 324 | 396 | 595 | 50 | 147 | 6000 | 0.6 | 540 | |
| FMOV14391-V | 250 | 320 | 390 | 351 | 429 | 650 | 50 | 161 | 6000 | 0.6 | 500 | |
| FMOV14431-V | 275 | 350 | 430 | 387 | 473 | 710 | 50 | 182 | 6000 | 0.6 | 450 | |
| FMOV14471-V | 300 | 385 | 470 | 423 | 517 | 775 | 50 | 196 | 6000 | 0.6 | 400 | |
| FMOV14511-V | 320 | 410 | 510 | 459 | 561 | 845 | 50 | 210 | 6000 | 0.6 | 350 | c UL us |
| FMOV14561-V | 350 | 460 | 560 | 504 | 616 | 915 | 50 | 231 | 6000 | 0.6 | 350 | |
| FMOV14621-V | 395 | 510 | 620 | 558 | 682 | 1020 | 50 | 252 | 6000 | 0.6 | 330 | |
| FMOV14681-V | 420 | 560 | 680 | 612 | 748 | 1120 | 50 | 266 | 6000 | 0.6 | 310 | |
| FMOV14751-V | 465 | 615 | 750 | 675 | 825 | 1235 | 50 | 280 | 6000 | 0.6 | 300 | |
| FMOV14781-V | 485 | 640 | 780 | 702 | 858 | 1290 | 50 | 280 | 6000 | 0.6 | 300 | |
| FMOV14821-V | 510 | 670 | 820 | 738 | 902 | 1355 | 50 | 280 | 6000 | 0.6 | 270 | |
| FMOV14911-V | 550 | 745 | 910 | 819 | 1001 | 1500 | 50 | 308 | 6000 | 0.6 | 260 | |
| FMOV14102-V | 625 | 825 | 1000 | 900 | 1100 | 1650 | 50 | 336 | 6000 | 0.6 | 250 | |
| FMOV14112-V | 680 | 895 | 1100 | 990 | 1210 | 1815 | 50 | 364 | 6000 | 0.6 | 240 | |

# FMOV20-V Series

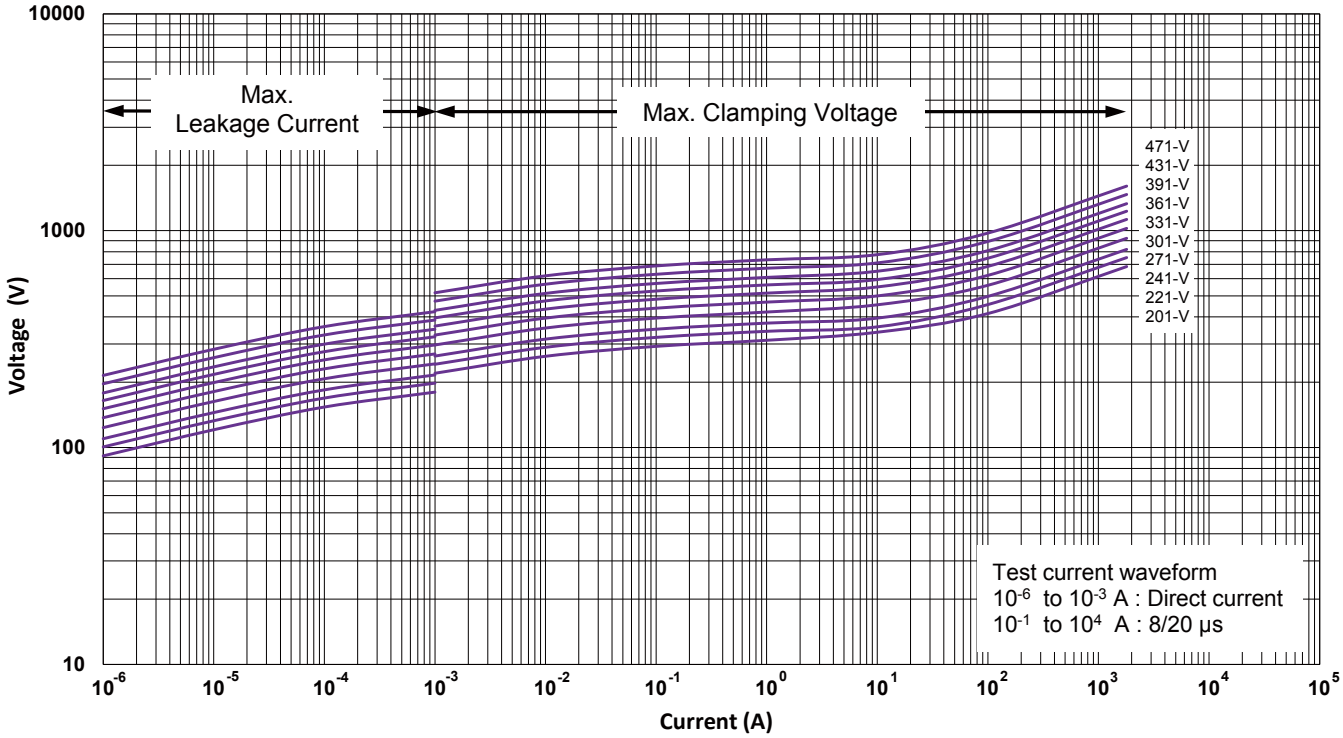
| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approvals |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV20201-V | 130 | 170 | 200 | 180 | 220 | 340 | 100 | 140 | 10000 | 1 | 1700 | |
| FMOV20221-V | 140 | 180 | 220 | 198 | 242 | 360 | 100 | 155 | 10000 | 1 | 1600 | |
| FMOV20241-V | 150 | 200 | 240 | 216 | 264 | 395 | 100 | 170 | 10000 | 1 | 1500 | |
| FMOV20271-V | 175 | 225 | 270 | 243 | 297 | 455 | 100 | 190 | 10000 | 1 | 1300 | |
| FMOV20301-V | 195 | 250 | 300 | 270 | 330 | 500 | 100 | 215 | 10000 | 1 | 1200 | |
| FMOV20331-V | 215 | 275 | 330 | 297 | 363 | 550 | 100 | 228 | 10000 | 1 | 1100 | |
| FMOV20361-V | 230 | 300 | 360 | 324 | 396 | 595 | 100 | 255 | 10000 | 1 | 1100 | |
| FMOV20391-V | 250 | 320 | 390 | 351 | 429 | 650 | 100 | 275 | 10000 | 1 | 1100 | |
| FMOV20431-V | 275 | 350 | 430 | 387 | 473 | 710 | 100 | 303 | 10000 | 1 | 1000 | |
| FMOV20471-V | 300 | 385 | 470 | 423 | 517 | 775 | 100 | 350 | 10000 | 1 | 900 | |
| FMOV20511-V | 320 | 410 | 510 | 459 | 561 | 845 | 100 | 382 | 10000 | 1 | 800 | |
| FMOV20561-V | 350 | 460 | 560 | 504 | 616 | 915 | 100 | 382 | 10000 | 1 | 750 | |
| FMOV20621-V | 395 | 510 | 620 | 558 | 682 | 1020 | 100 | 400 | 10000 | 1 | 570 | |
| FMOV20681-V | 420 | 560 | 680 | 612 | 748 | 1120 | 100 | 420 | 10000 | 1 | 550 | |
| FMOV20751-V | 465 | 615 | 750 | 675 | 825 | 1235 | 100 | 420 | 10000 | 1 | 530 | |
| FMOV20781-V | 485 | 640 | 780 | 702 | 858 | 1290 | 100 | 440 | 10000 | 1 | 500 | |
| FMOV20821-V | 510 | 670 | 820 | 738 | 902 | 1355 | 100 | 460 | 10000 | 1 | 500 | |
| FMOV20911-V | 550 | 745 | 910 | 819 | 1001 | 1500 | 100 | 510 | 10000 | 1 | 480 | |
| FMOV20102-V | 625 | 825 | 1000 | 900 | 1100 | 1650 | 100 | 565 | 10000 | 1 | 460 | |
| FMOV20112-V | 680 | 895 | 1100 | 990 | 1210 | 1815 | 100 | 620 | 10000 | 1 | 400 | |

# Transient V-I Characteristic Curves

## FMOV05201-V to FMOV05751-V

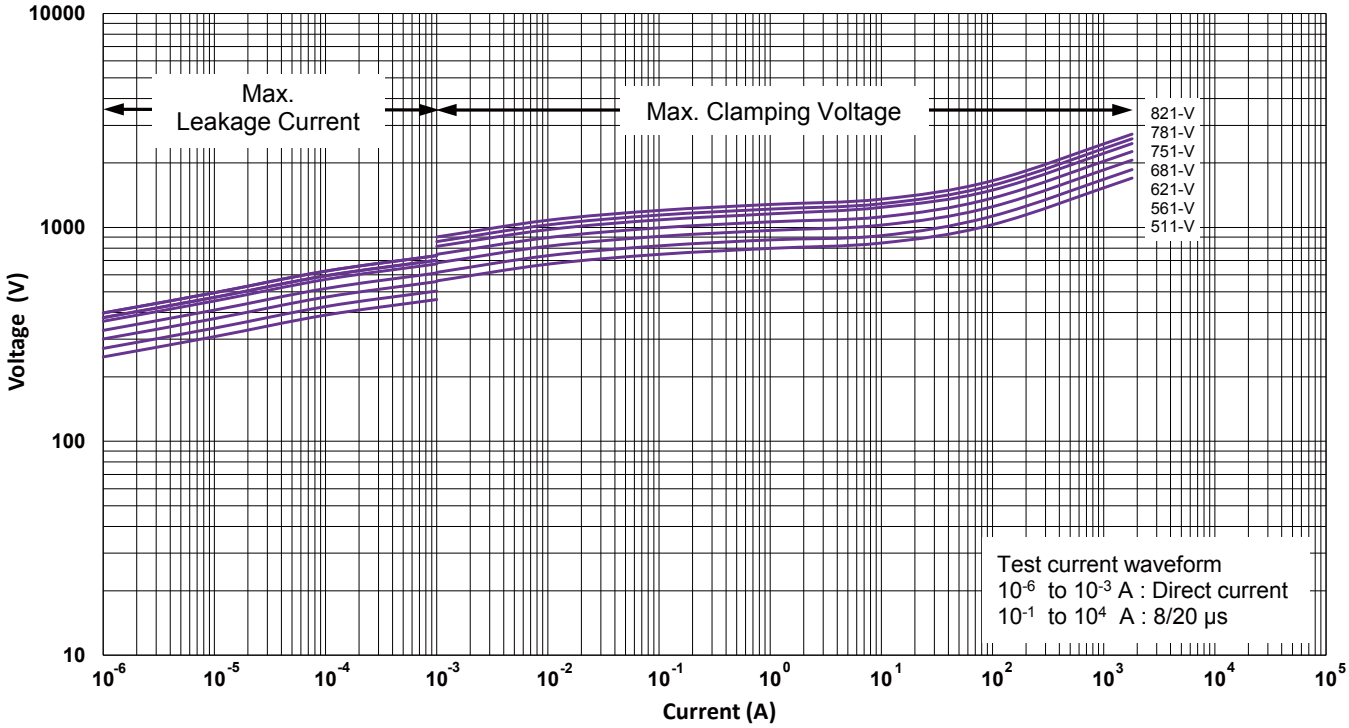



## FMOV07201-V to FMOV07471-V

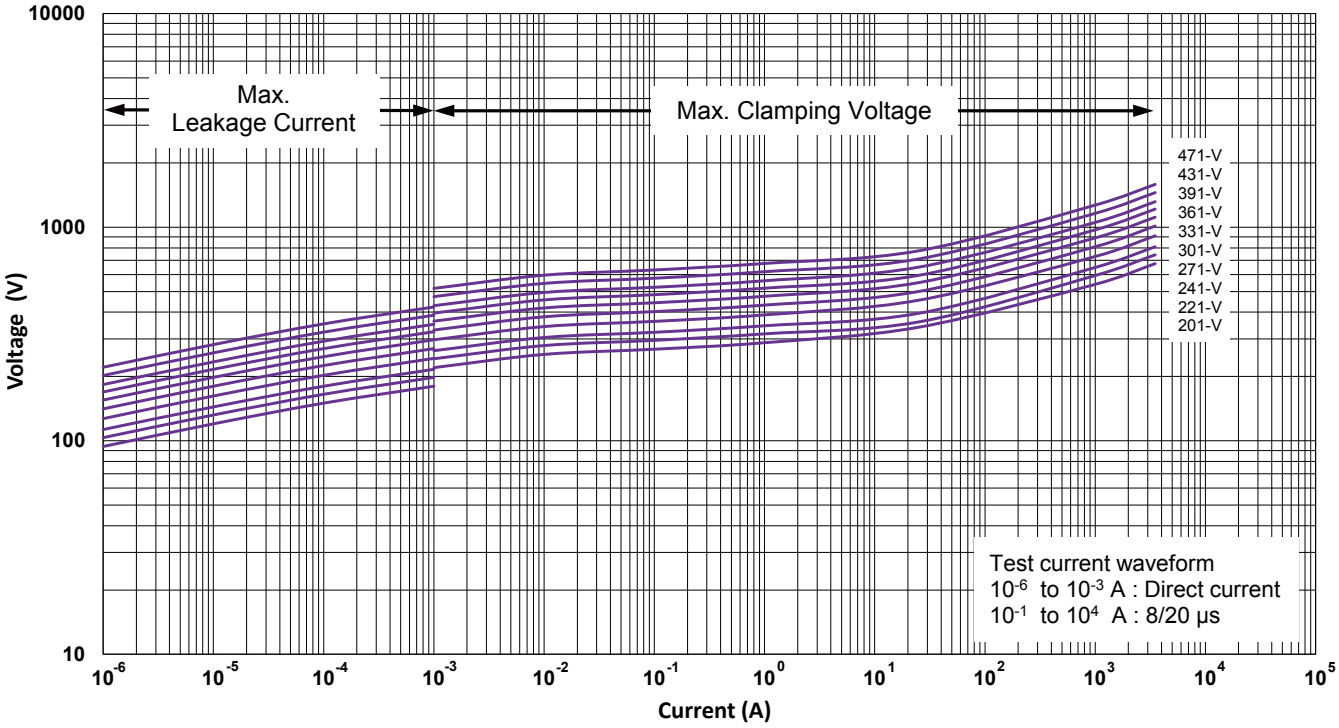


## Transient V-I Characteristic Curves

### FMOV07511-V to FMOV07821-V

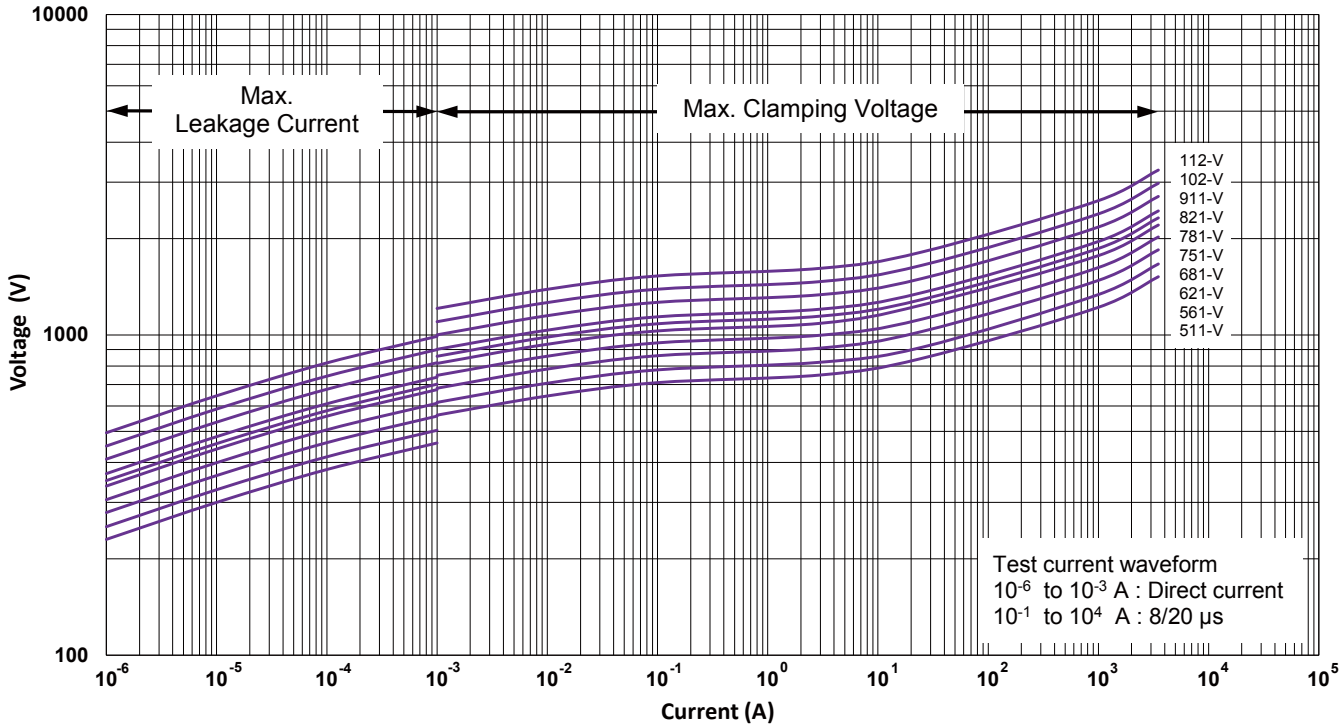



### FMOV10201-V to FMOV10471-V

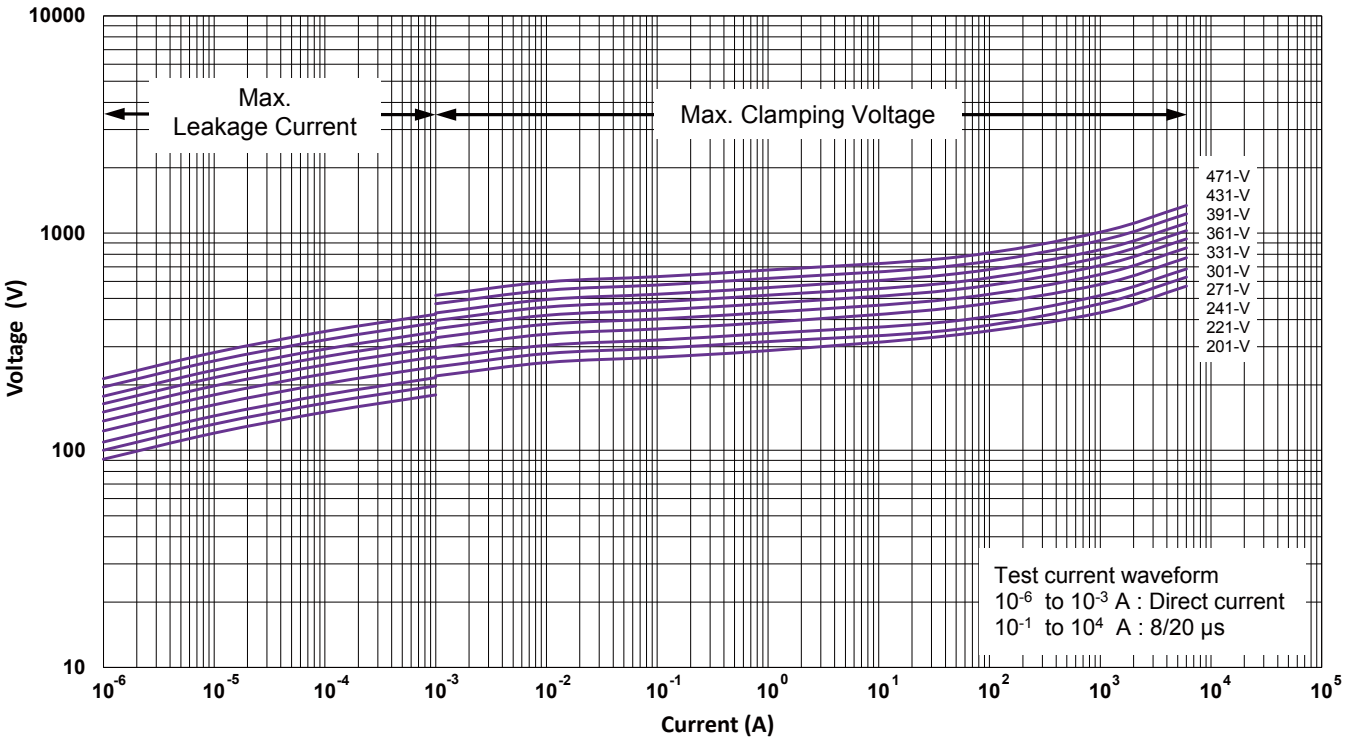


# Transient V-I Characteristic Curves

## FMOV10511-V to FMOV10112-V

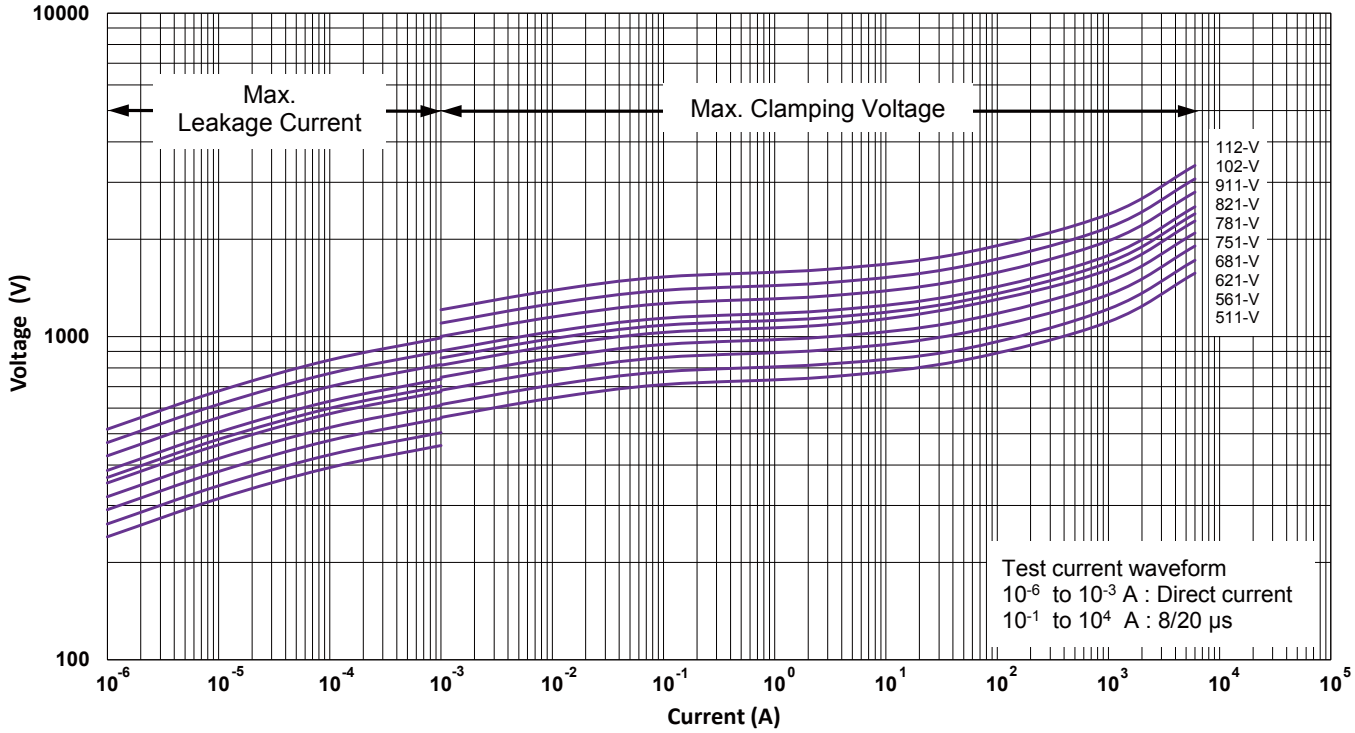



## FMOV14201-V to FMOV14471-V

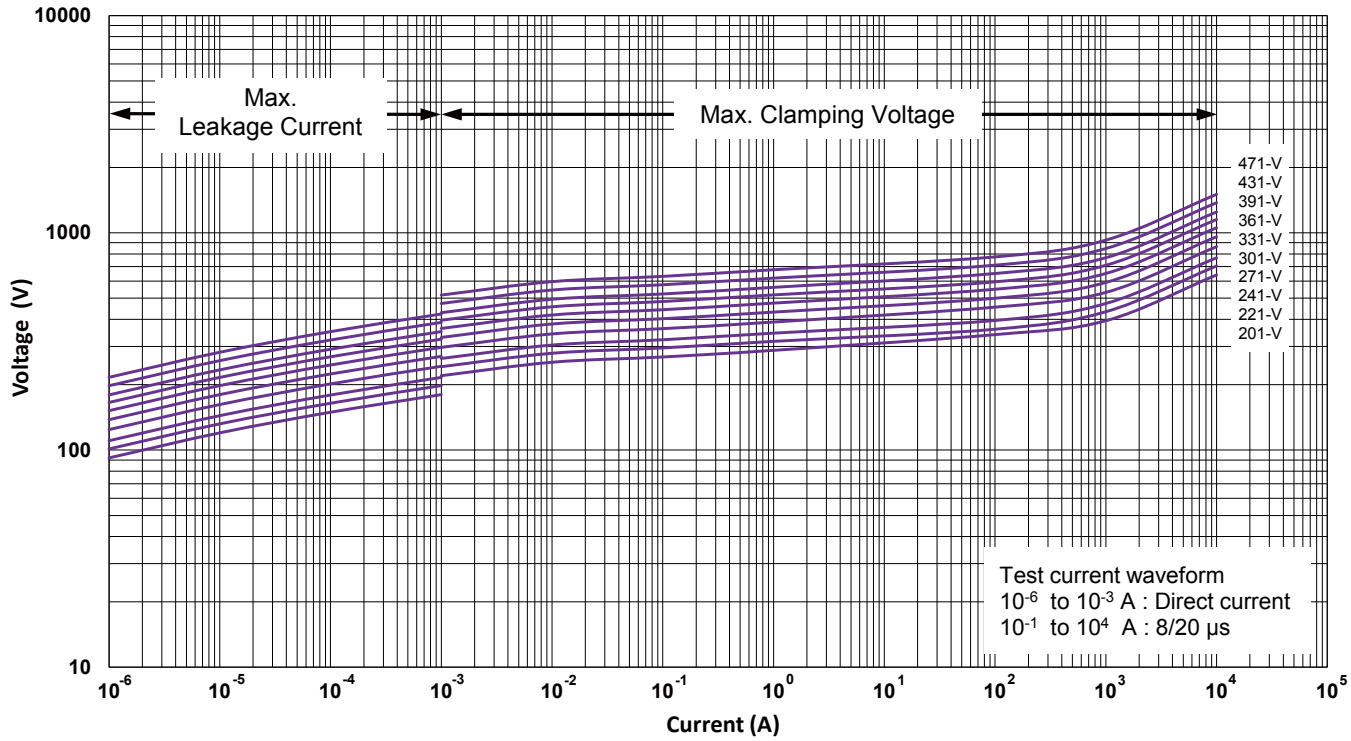


# Transient V-I Characteristic Curves

## FMOV14511-V to FMOV14112-V

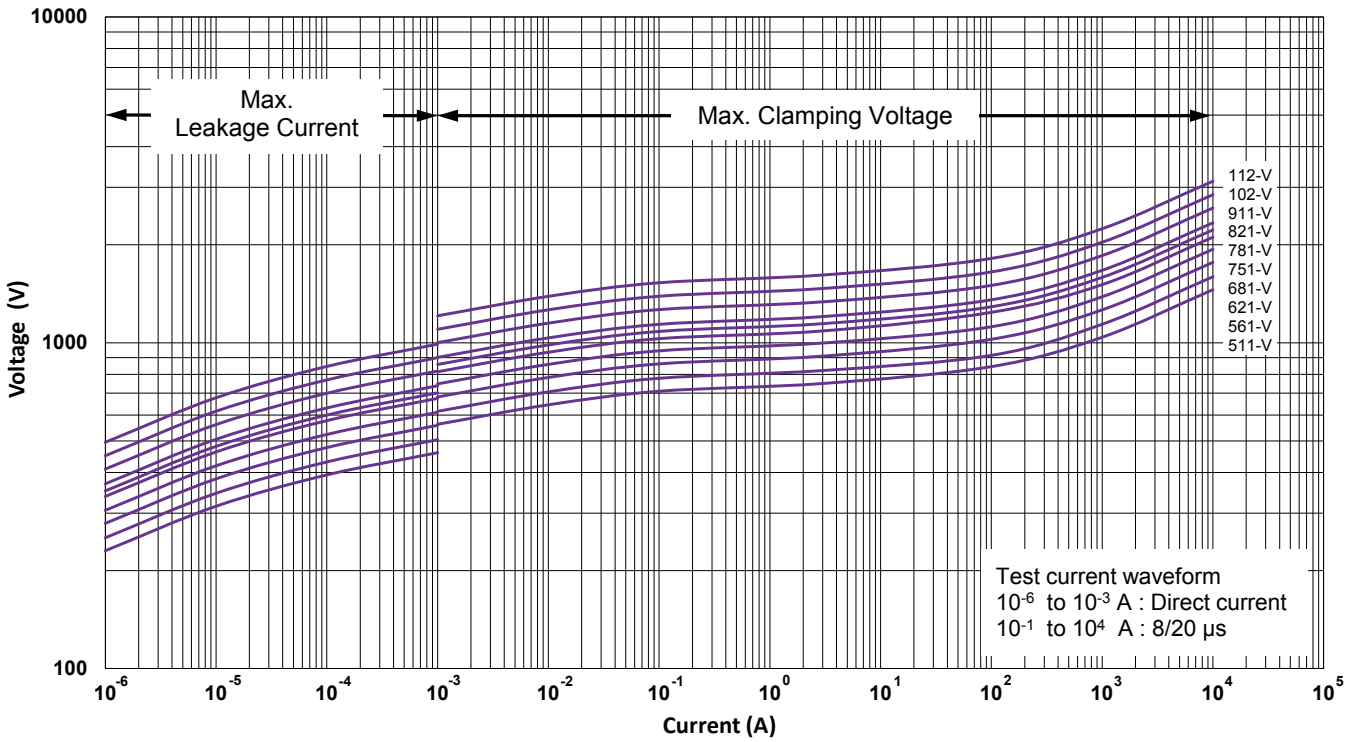



## FMOV20201-V to FMOV20471-V



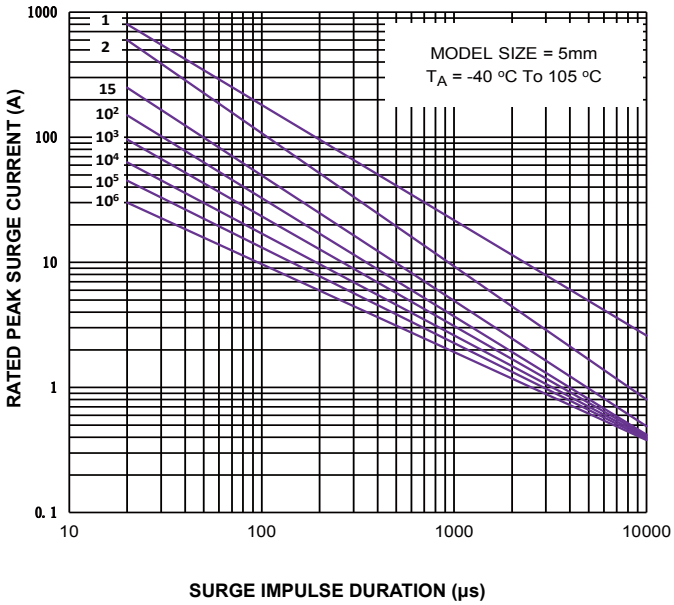
# Transient V-I Characteristic Curves

## *FMOV20511-V to FMOV20112-V*

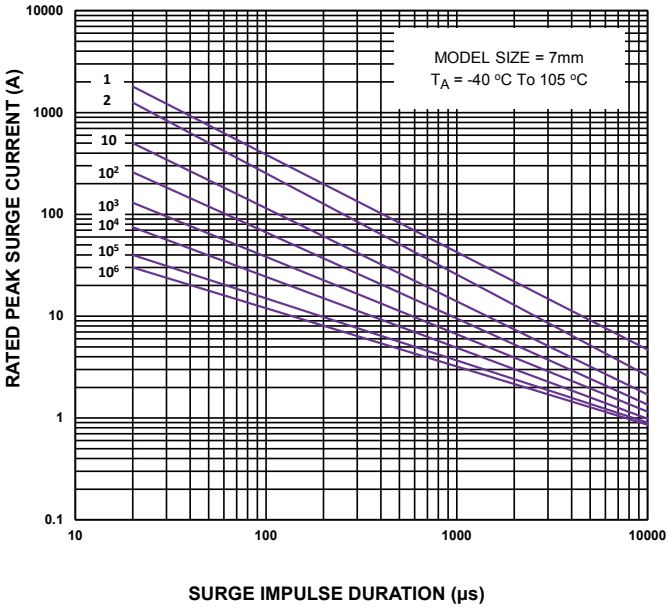


# Impulse Life Time Rating Curves

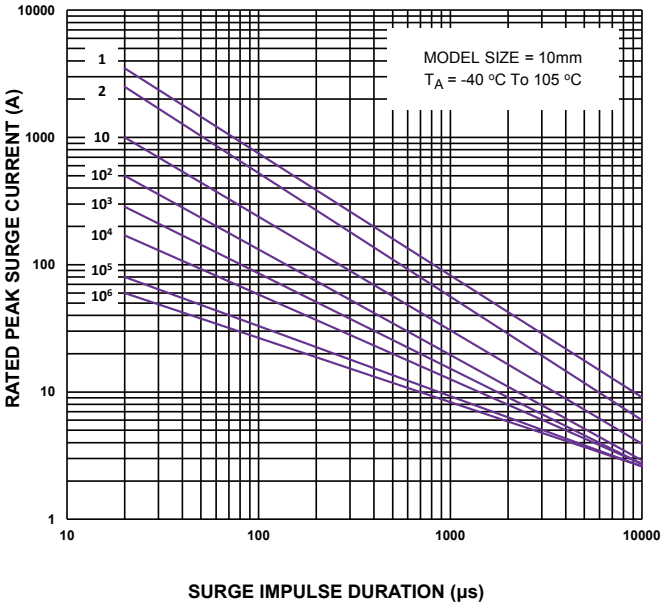
## FMOV05201-V to FMOV05751-V



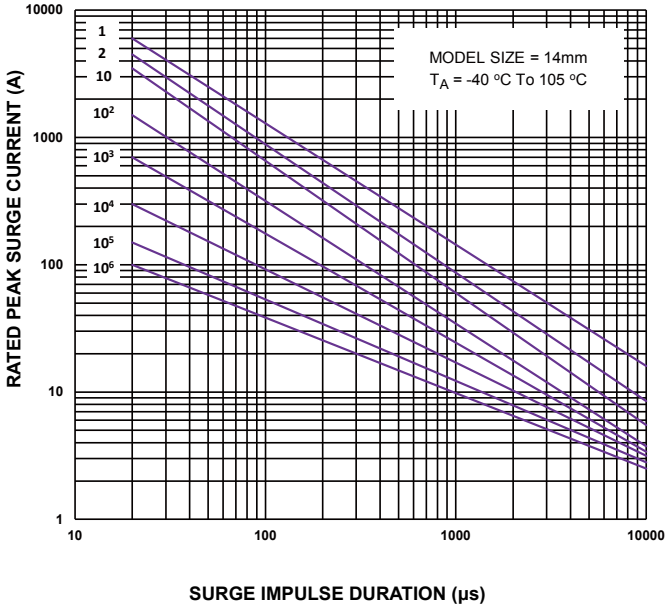

## FMOV07201-V to FMOV07821-V




## FMOV10201-V to FMOV101121-V

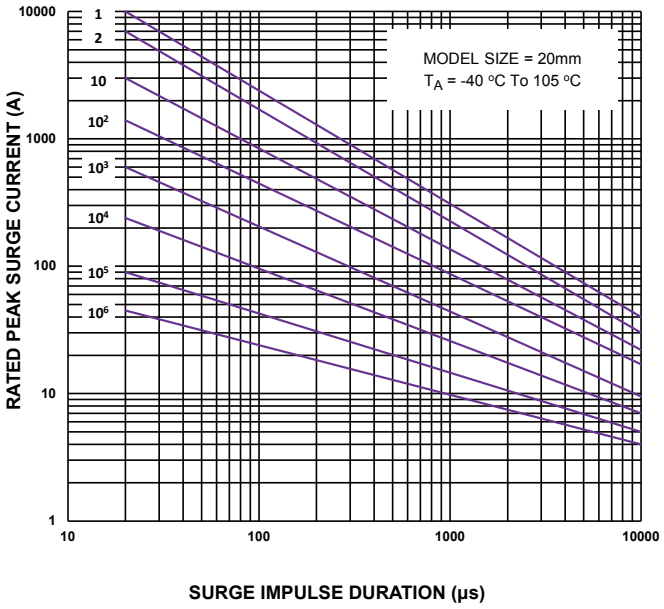



## FMOV14201-V to FMOV14112-V



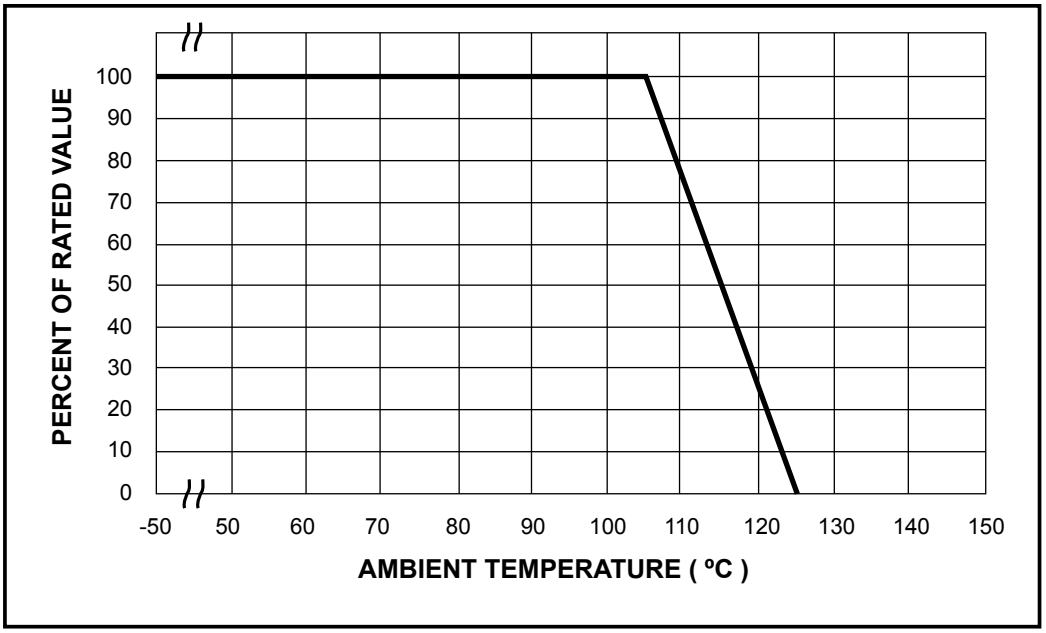
# Impulse Life Time Rating Curves

## *FMOV20201-V to FMOV20112-V*

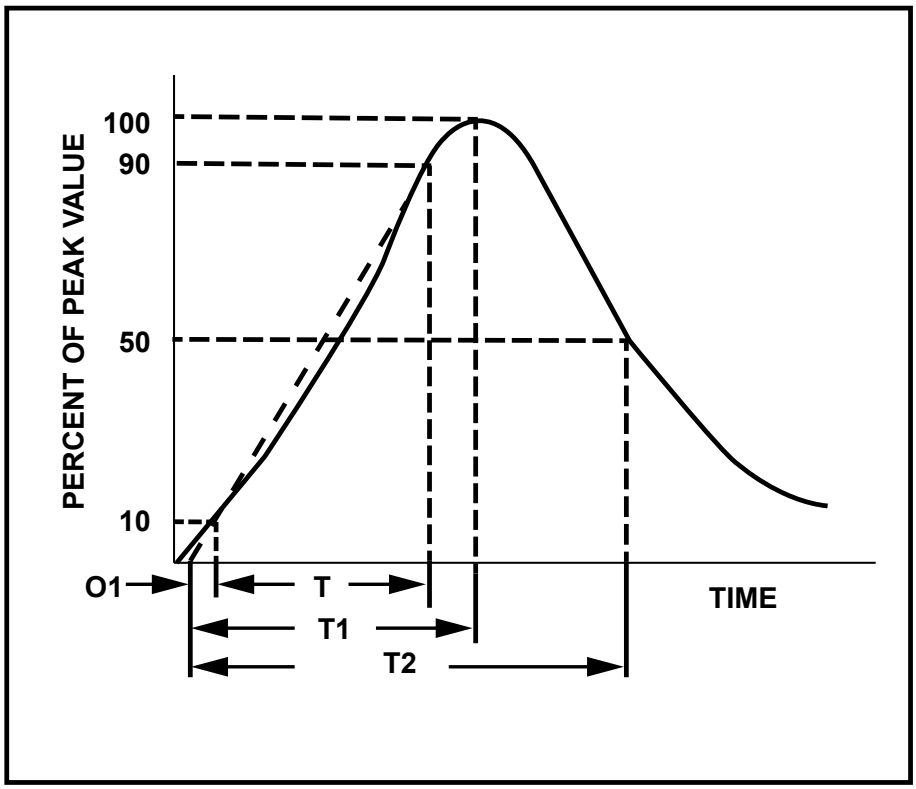


## Power Derating Curve

Should transients occur in rapid succession, the average power dissipation is the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be with the specifications shown on the Device Ratings and Specifications Table for the specific device. The operating values of a MOV need to be derated at high temperatures as shown above. Because varistors only dissipate a relatively small amount of average power they are not suitable for repetitive applications that involve substantial amounts of average power dissipation.




## Surge Current Standard Waveform




O1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T1 = Rise Time = 1.25 x T
T2 = Decay Time
Example - For an 8/20 µs Current Waveform :
8µs = T1 = Rise Time
20µs = T2 = Decay Time

## Product Dimensions

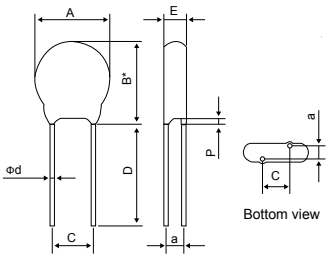



Fig 1. Straight Lead

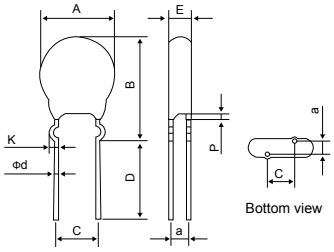



Fig 2. Outside Kink Lead

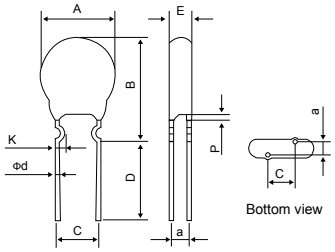



Fig 3. Inside Kink Lead

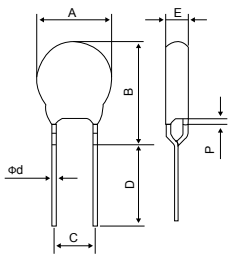



Fig 4. In Line Kink Lead

Dimension Table

Unit : mm

| Symbol \ Model size | | 05V | | 07V | | 10V | | 14V | | 20V | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| A | | 5.5 | 7.5 | 7.5 | 9.0 | 10.5 | 14.0 | 13.5 | 17.5 | 19.5 | 25.0 |
| B(Max.) | 180-V ~ 271-V | - | 13.0 | - | 15.0 | - | 19.5 | - | 22.5 | - | 30.0 |
| | >271-V | - | 13.0 | - | 15.0 | - | 20.5 | - | 23.5 | - | 31.0 |
| B*(Max.) | | - | 10.0 | - | 12.0 | - | 17 | - | 20.5 | - | 28.0 |
| C(±1.0) | | 5.0 | | 5.0 | | 7.5 | | 7.5 | | 10.0 | |
| D(Typ.) | | 25.0 | | 25.0 | | 25.0 | | 25.0 | | 25.0 | |
| P(Max.) | | - | 3.0 | - | 3.0 | - | 3.0 | - | 3.0 | - | 3.0 |
| K | | 0.8 | 1.6 | 0.8 | 1.6 | 0.8 | 1.6 | 0.8 | 1.6 | 0.8 | 1.6 |
| Φd(±0.05) | | 0.60 | | 0.6 | | 0.8 | | 0.8 | | 1.0 | |
| E | | E Max. Table | | | | | | | | | |

E Max. Table

Unit : mm

| Model | 05V | 07V | 10V | 14D | 20V | a (±1.0) | Model | 05V | 07V | 10V | 14V | 20V | a (±1.0) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201-V | 3.3 | 3.5 | 3.9 | 4.0 | 4.3 | 1.5 | 511-V | 4.8 | 5.0 | 5.3 | 5.4 | 5.7 | 2.6 |
| 221-V | 3.4 | 3.6 | 4.0 | 4.1 | 4.4 | 1.6 | 561-V | 5.0 | 5.2 | 5.5 | 5.6 | 5.9 | 2.8 |
| 241-V | 3.5 | 3.7 | 4.1 | 4.2 | 4.5 | 1.7 | 621-V | 5.3 | 5.5 | 5.7 | 5.8 | 6.1 | 3.1 |
| 271-V | 3.7 | 3.9 | 4.2 | 4.3 | 4.6 | 1.8 | 681-V | 5.4 | 5.6 | 5.8 | 5.9 | 6.2 | 3.3 |
| 301-V | 3.9 | 4.1 | 4.3 | 4.4 | 4.7 | 1.9 | 751-V | 5.6 | 5.8 | 6.0 | 6.1 | 6.4 | 3.6 |
| 331-V | 4.0 | 4.2 | 4.5 | 4.6 | 4.9 | 2.0 | 781-V | - | 6.0 | 6.3 | 6.4 | 6.7 | 3.8 |
| 361-V | 4.1 | 4.3 | 4.7 | 4.8 | 5.1 | 2.1 | 821-V | - | 6.3 | 6.5 | 6.6 | 6.9 | 4.0 |
| 391-V | 4.2 | 4.4 | 4.8 | 4.9 | 5.2 | 2.3 | 911-V | - | - | 6.6 | 6.7 | 7.0 | 4.3 |
| 431-V | 4.4 | 4.6 | 5.0 | 5.1 | 5.4 | 2.4 | 102-V | - | - | 7.0 | 7.1 | 7.4 | 4.6 |
| 471-V | 4.6 | 4.8 | 5.2 | 5.3 | 5.6 | 2.5 | 112-V | - | - | 7.4 | 7.5 | 7.9 | 5.2 |

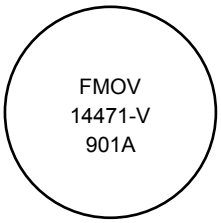
## Part Numbering and Marking System

**Part Numbering System :**

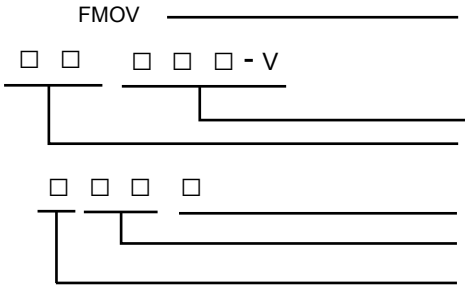
FMOV 14 471 - V + Tolerance Code + Option Code (See notes below)

- Tolerance Code: Tolerance of $V_{1MA}$ (K=±10% / L=±15%)
- V: Medium Surge Series
- 471: Varsitor Voltage Two significant figures plus number of zeros that above.i.e. 471 is 470$V_{DC}$
- 14: Disc Diameter
- FMOV: Product Family

**Marking System :**




Example




- FMOV: Product Family
- □ □ □ □ □ - V: Part Identification
- □ □: Disc Dia./ Standard Series
- □ □ □ □: Lot Code
- □ □: Week Code
- □: Year Code

## Order Notes

**Main Part Code :**

**Part No + Tolerance Code + Packaging + Lead Type Designators + Option Code**

**Ordering examples :**

| Straight Lead Bulk Pack (Standard) | Straight Lead (Short Cut) Bulk Pack | Straight Lead Tape & Reel Pack | Straight Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-VKBS | FMOV05471-VKBSXXX | FMOV05471-VKTS | FMOV05471-VKAS |
| FMOV07471-VKBS | FMOV07471-VKBSXXX | FMOV07471-VKTS | FMOV07471-VKAS |
| FMOV10471-VKBS | FMOV10471-VKBSXXX | FMOV10471-VKTS | FMOV10471-VKAS |
| FMOV14471-VKBS | FMOV14471-VKBSXXX | FMOV14471-VKTS | FMOV14471-VKAS |
| FMOV20471-VKBS | FMOV20471-VKBSXXX | - | - |

| Outside Kink Lead Bulk Pack | Outside Kink lead (Short Cut) Bulk Pack | Outside Kink Lead Tape & Reel Pack | Outside Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-VKBO | FMOV05471-VKBOXXX | FMOV05471-VKTO | FMOV05471-VKAO |
| FMOV07471-VKBO | FMOV07471-VKBOXXX | FMOV07471-VKTO | FMOV07471-VKAO |
| FMOV10471-VKBO | FMOV10471-VKBOXXX | FMOV10471-VKTO | FMOV10471-VKAO |
| FMOV14471-VKBO | FMOV14471-VKBOXXX | FMOV14471-VKTO | FMOV14471-VKAO |
| FMOV20471-VKBO | FMOV20471-VKBOXXX | - | - |

| Inside Kink lead Bulk Pack | Inside Kink Lead (Short Cut) Bulk Pack | Inside Kink Lead Tape & Reel Pack | Inside Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-VKBK | FMOV05471-VKBKXXX | FMOV05471-VKTK | FMOV05471-VKAK |
| FMOV07471-VKBK | FMOV07471-VKBKXXX | FMOV07471-VKTK | FMOV07471-VKAK |
| FMOV10471-VKBK | FMOV10471-VKBKXXX | FMOV10471-VKTK | FMOV10471-VKAK |
| FMOV14471-VKBK | FMOV14471-VKBKXXX | FMOV14471-VKTK | FMOV14471-VKAK |
| FMOV20471-VKBK | FMOV20471-VKBKXXX | - | - |

| In Line Kink Lead Bulk Pack | In Line Kink Lead (Short Cut) Bulk Pack | In Line Kink Lead Tape& Reel Pack | In Line Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV05471-VKBI | FMOV05471-VKBIXXX | FMOV05471-VKTI | FMOV05471-VKAI |
| FMOV07471-VKBI | FMOV07471-VKBIXXX | FMOV07471-VKTI | FMOV07471-VKAI |
| FMOV10471-VKBI | FMOV10471-VKBIXXX | FMOV10471-VKTI | FMOV10471-VKAI |
| FMOV14471-VKBI | FMOV14471-VKBIXXX | FMOV14471-VKTI | FMOV14471-VKAI |
| FMOV20471-VKBI | FMOV20471-VKBIXXX | - | - |

| Tape & Reel Pack Feed Hole Pitch |
|---|
| FMOV05471-VKTSA |
| FMOV05471-VKTSB |
| FMOV07471-VKTSA |
| FMOV07471-VKTSB |
| FMOV10471-VKTSA |
| FMOV10471-VKTSB |
| FMOV14471-VKTSA |
| FMOV14471-VKTSB |

**A : P0 → 12.7mm±0.2mm**
**B : P0 → 15.0mm±0.2mm**

## Tape and Reel Specifications

Radial devices on tape are supplied with straight leads or inline kink leads

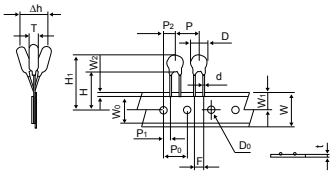


Figure: A

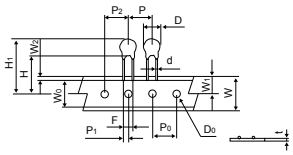


Figure: B

Straight Leads

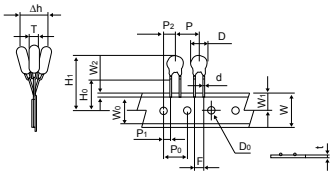


Figure: C

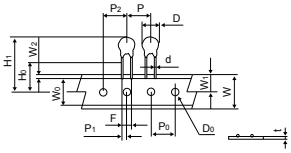


Figure: D

Inline Kink Leads

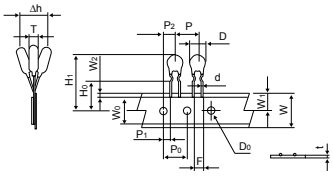


Figure: E

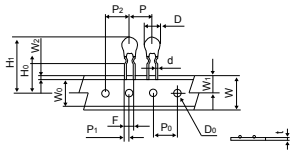


Figure: F

Inside Kink Leads

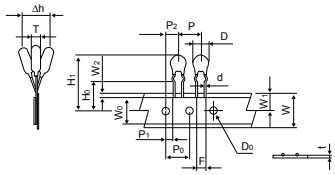


Figure: G

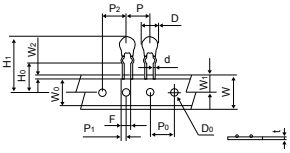


Figure: H

Outside Kink Leads

| Symbol | Parameter | Model | | | | | |
|---|---|---|---|---|---|---|---|
| | | 05V | 07V | 10V | | 14V | |
| P | Pitch of Component | 12.7±1.0 | 12.7±1.0 | 12.7±1.0 | 15.0±1.0 | 25.4±1.0 | 30.0±1.0 |
| P0 | Feed Hole Pitch | 12.7±0.2 | 12.7±0.2 | 12.7±0.2 | 15.0±0.2 | 12.7±0.2 | 15.0±0.2 |
| P1 | Feed Hole Center Lead | 3.85±0.7 | 3.85±0.7 | 3.85±0.7 | 3.75±0.7 | 8.95±0.7 | 3.75±0.7 |
| P2 | Hole center to Component Center | 6.35±0.7 | 6.35±0.7 | 6.35±0.7 | 7.5±0.7 | 12.7±0.7 | 7.5±0.7 |
| F | Lead to Lead Distance | 5.0±0.8 | 5.0±0.8 | 7.5±0.8 | 7.5±0.8 | 7.5±0.8 | 7.5±0.8 |
| Δh | Component Alignment | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max |
| W | Tape Width | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 |
| | | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 |
| W0 | Hold Down Tape Width | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min |
| W1 | Hole Position | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 |
| | | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 |
| W2 | Hold Down Tape Position | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max |
| H | Height from Tape Center to Component Base | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 |
| | | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 |
| H0 | Seating Plane Height | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 |
| H1 | Component Height | 32.0 Max | 32.0 Max | 36.0 Max | 36.0 Max | 40.0 Max | 40.0 Max |
| D0 | Feed Hole Diameter | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 |
| t | Total Tape Thickness | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 |
| L | Length of Clopped Lead | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max |
| Figure | | ACEG | ACEG | BDFH | ACEG | BDFH | ACEG |

Unit: mm

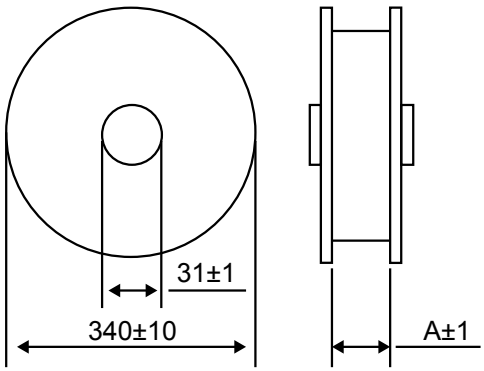
## Packaging Specifications

### Bulk Product Packing

| Series | Straight Lead Type Quantity (pcs/bag) | Outside Kink Lead Type Quantity (pcs/bag) | Inside Kink Lead Type Quantity (pcs/bag) | In Line Kink Lead Type Quantity (pcs/bag) |
|---|---|---|---|---|
| FMOV05-V Series | 1000 | 1000 | 1000 | 1000 |
| FMOV07-V Series | 1000 | 1000 | 1000 | 1000 |
| FMOV10-V Series | 500 | 500 | 500 | 500 |
| FMOV14-V Series | 500 | 500 | 500 | 500 |
| FMOV20-V Series | 250 | 250 | 250 | 250 |

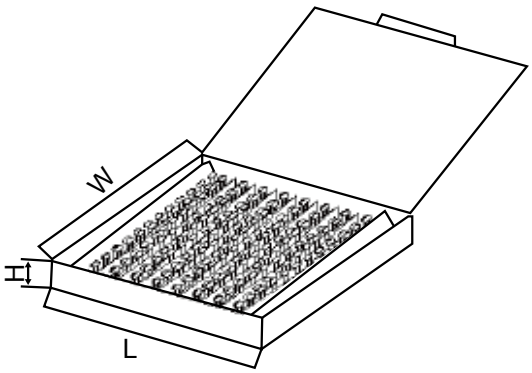
### Tape & Reel Product Packing

| Series | A (mm) | Quantity (pcs/reel) |
|---|---|---|
| FMOV05(201~391)-V-T- | 43 | 2000 |
| FMOV05(431~751)-V-T- | | 1500 |
| FMOV07(201~391)-V-T- | | 2000 |
| FMOV07(431~821)-V-T- | | 1500 |
| FMOV10(201~621)-V-T- | | 1000 |
| FMOV10(681~112)-V-T- | | 800 |
| FMOV14(201~391)-V-T- | 56 | 800 |
| FMOV14(431~621)-V-T- | | 700 |
| FMOV14(681~112)-V-T- | | 600 |




### Box Product Packing

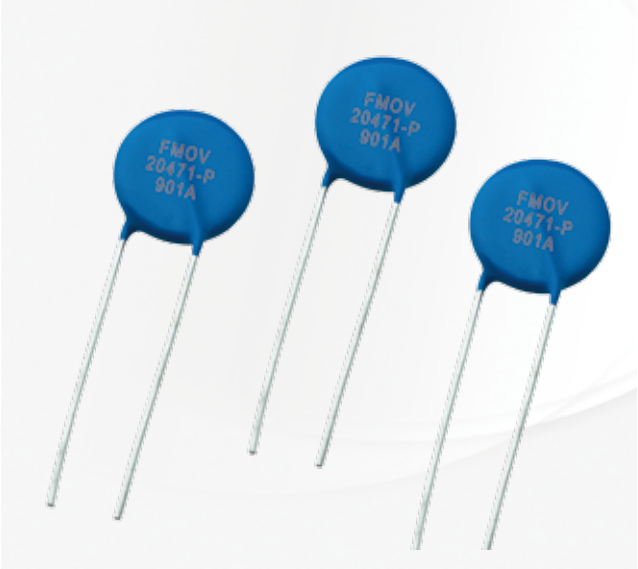
| Series | Quantity (pcs/reel) |
|---|---|
| FMOV05(201~391)-V-A- | 1000 |
| FMOV05(431~751)-V-A- | 800 |
| FMOV07(201~391)-V-A- | 1000 |
| FMOV07(431~821)-V-A- | 800 |
| FMOV10(201~621)-V-A- | 1000 |
| FMOV10(681~112)-V-A- | 800 |
| FMOV14(201~621)-V-A- | 500 |
| FMOV14(681~112)-V-A- | 400 |




| Series | L ± 5 | W ± 5 | H ± 5 |
|---|---|---|---|
| FMOV05~07-V Series | 340 | 245 | 45 |
| FMOV10~14-V Series | 340 | 245 | 50 |

# High Energy P Series






## Description :

Fuzetec P Series MOV products are specially designed for applications requiring high surge energy absorption ratings and peak current capability. Available in 3 different sizes:10mm/14mm/20mm, the high energy P series MOV offers higher surge suppression ability in compact packaging. MOV products have specific nonlinear and symmetrical V-I characteristics curve and unparalleled large peak current capability are used for absorption of transient voltage, suppression of pulse noise and circuit voltage stabilization.

## Features :

- RoHS compliant
- Halogen-free series are available
- Body size: Φ 10 ~ Φ 20mm
- FMOV10201-P~10112-P ;
  FMOV14201-P~14112-P ;
  FMOV20201-P~20112-P,
  meet IEC 60950-1 Annex Q requirement.
  **IEC 60950-1 will be replaced by IEC 62368-1 at the beginning of 2021.

## Applications :

- Power supply
- Home appliance
- Industrial equipment
- Telecommunication system
- Smart meter
- Lighting products
- Photovoltaic industry

## Agency Approvals

| Agency | Agency Approvals | File Number |
|---|---|---|
| c UL us | UL 1449 4th & cUL | VZCA2.E515006<br>VZCA8.E515006 |
| VDE | IEC 61051-1:2007<br>IEC 61051-2:1991<br>IEC 61051-2:1991/AMD1:2009<br>IEC 61051-2-2:1991<br>*IEC 60950-1 Annex Q<br>**IEC 62368-1:2018 | 40051896 |

RoHS | HF Halogen Free

SVHC Compliant

| Absolute Maximum Ratings | | |
|---|---|---|
| | P Series | Units |
| **Steady State:** | | |
| AC Voltage Range ($V_{AC}$) | 11 to 680 | V |
| DC Voltage Range($V_{DC}$) | 14 to 895 | V |
| **Transients:** | | |
| Peak Current for 8/20μS Current Wave | 1500 to 15000 | A |
| Energy Range For 10/1000μS Current Wave | 4 to 720 | J |
| Operation Ambient Temperature Range | -40 to +105 | °C |
| Storage Temperature Range | -40 to +125 | °C |
| Varistor Voltage Range Vn($V_{DC}$) | 18 to 1100 | V |
| Insulation Resistance | >1000 | MΩ |
| Typical Response Time | <25 | ns |



NOTE : All Specifications subject to change without notice.

# FMOV10-P Series

| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approval |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV10180-P | 11 | 14 | 18 | 16 | 20 | 36 | 5 | 4 | 1500 | 0.08 | 8000 | |
| FMOV10220-P | 14 | 18 | 22 | 20 | 24 | 43 | 5 | 5 | 1500 | 0.08 | 7000 | |
| FMOV10270-P | 17 | 22 | 27 | 24 | 30 | 53 | 5 | 6 | 1500 | 0.08 | 5500 | |
| FMOV10330-P | 20 | 26 | 33 | 30 | 36 | 65 | 5 | 7.5 | 1500 | 0.08 | 4100 | |
| FMOV10390-P | 25 | 31 | 39 | 35 | 43 | 77 | 5 | 8.6 | 1500 | 0.08 | 3900 | |
| FMOV10470-P | 30 | 38 | 47 | 42 | 52 | 93 | 5 | 10 | 1500 | 0.08 | 3300 | |
| FMOV10560-P | 35 | 45 | 56 | 50 | 62 | 110 | 5 | 11 | 1500 | 0.08 | 2800 | |
| FMOV10680-P | 40 | 56 | 68 | 61 | 75 | 135 | 5 | 14 | 1500 | 0.08 | 2300 | |
| FMOV10201-P | 130 | 170 | 200 | 180 | 220 | 340 | 25 | 52 | 4000 | 0.4 | 625 | |
| FMOV10221-P | 140 | 180 | 220 | 198 | 242 | 360 | 25 | 58 | 4000 | 0.4 | 570 | |
| FMOV10241-P | 150 | 200 | 240 | 216 | 264 | 395 | 25 | 64 | 4000 | 0.4 | 525 | |
| FMOV10271-P | 175 | 225 | 270 | 243 | 297 | 455 | 25 | 67 | 4000 | 0.4 | 470 | |
| FMOV10301-P | 195 | 250 | 300 | 270 | 330 | 500 | 25 | 70 | 4000 | 0.4 | 415 | |
| FMOV10331-P | 215 | 275 | 330 | 297 | 363 | 550 | 25 | 72 | 4000 | 0.4 | 350 | |
| FMOV10361-P | 230 | 300 | 360 | 324 | 396 | 595 | 25 | 76 | 4000 | 0.4 | 350 | |
| FMOV10391-P | 250 | 320 | 390 | 351 | 429 | 650 | 25 | 82 | 4000 | 0.4 | 325 | |
| FMOV10431-P | 275 | 350 | 430 | 387 | 473 | 710 | 25 | 93 | 4000 | 0.4 | 290 | |
| FMOV10471-P | 300 | 385 | 470 | 423 | 517 | 775 | 25 | 99 | 4000 | 0.4 | 260 | |
| FMOV10511-P | 320 | 410 | 510 | 459 | 561 | 845 | 25 | 107 | 4000 | 0.4 | 240 | |
| FMOV10561-P | 350 | 460 | 560 | 504 | 616 | 915 | 25 | 113 | 4000 | 0.4 | 220 | |
| FMOV10621-P | 395 | 510 | 620 | 558 | 682 | 1020 | 25 | 125 | 4000 | 0.4 | 200 | |
| FMOV10681-P | 420 | 560 | 680 | 612 | 748 | 1120 | 25 | 128 | 4000 | 0.4 | 190 | |
| FMOV10751-P | 465 | 615 | 750 | 675 | 825 | 1235 | 25 | 134 | 4000 | 0.4 | 175 | |
| FMOV10781-P | 485 | 640 | 780 | 702 | 858 | 1290 | 25 | 140 | 4000 | 0.4 | 170 | |
| FMOV10821-P | 510 | 670 | 820 | 738 | 902 | 1355 | 25 | 146 | 4000 | 0.4 | 160 | |
| FMOV10911-P | 550 | 745 | 910 | 819 | 1001 | 1500 | 25 | 152 | 4000 | 0.4 | 140 | |
| FMOV10102-P | 625 | 825 | 1000 | 900 | 1100 | 1650 | 25 | 170 | 4000 | 0.4 | 132 | |
| FMOV10112-P | 680 | 895 | 1100 | 990 | 1210 | 1815 | 25 | 180 | 4000 | 0.4 | 120 | |



NOTE : All Specifications subject to change without notice.

# FMOV14-P Series

## Device Ratings and Characteristics

| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approval |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV14180-P | 11 | 14 | 18 | 16 | 20 | 36 | 10 | 11 | 3000 | 0.15 | 18500 | |
| FMOV14220-P | 14 | 18 | 22 | 20 | 24 | 43 | 10 | 14 | 3000 | 0.15 | 16400 | |
| FMOV14270-P | 17 | 22 | 27 | 24 | 30 | 53 | 10 | 18 | 3000 | 0.15 | 13000 | |
| FMOV14330-P | 20 | 26 | 33 | 30 | 36 | 65 | 10 | 23 | 3000 | 0.15 | 9500 | c UL us |
| FMOV14390-P | 25 | 31 | 39 | 35 | 43 | 77 | 10 | 26 | 3000 | 0.15 | 8800 | |
| FMOV14470-P | 30 | 38 | 47 | 42 | 52 | 93 | 10 | 33 | 3000 | 0.15 | 7700 | |
| FMOV14560-P | 35 | 45 | 56 | 50 | 62 | 110 | 10 | 41 | 3000 | 0.15 | 6400 | |
| FMOV14680-P | 40 | 56 | 68 | 61 | 75 | 135 | 10 | 46 | 3000 | 0.15 | 5600 | |
| FMOV14201-P | 130 | 170 | 200 | 180 | 220 | 340 | 50 | 96 | 8000 | 0.6 | 770 | |
| FMOV14221-P | 140 | 180 | 220 | 198 | 242 | 360 | 50 | 104 | 8000 | 0.6 | 740 | |
| FMOV14241-P | 150 | 200 | 240 | 216 | 264 | 395 | 50 | 112 | 8000 | 0.6 | 700 | |
| FMOV14271-P | 175 | 225 | 270 | 243 | 297 | 455 | 50 | 120 | 8000 | 0.6 | 640 | |
| FMOV14301-P | 195 | 250 | 300 | 270 | 330 | 500 | 50 | 136 | 8000 | 0.6 | 600 | |
| FMOV14331-P | 215 | 275 | 330 | 297 | 363 | 550 | 50 | 152 | 8000 | 0.6 | 580 | |
| FMOV14361-P | 230 | 300 | 360 | 324 | 396 | 595 | 50 | 164 | 8000 | 0.6 | 540 | |
| FMOV14391-P | 250 | 320 | 390 | 351 | 429 | 650 | 50 | 176 | 8000 | 0.6 | 500 | |
| FMOV14431-P | 275 | 350 | 430 | 387 | 473 | 710 | 50 | 200 | 8000 | 0.6 | 450 | c UL us |
| FMOV14471-P | 300 | 385 | 470 | 423 | 517 | 775 | 50 | 220 | 8000 | 0.6 | 400 | |
| FMOV14511-P | 320 | 410 | 510 | 459 | 561 | 845 | 50 | 240 | 8000 | 0.6 | 350 | VDE |
| FMOV14561-P | 350 | 460 | 560 | 504 | 616 | 915 | 50 | 240 | 8000 | 0.6 | 350 | |
| FMOV14621-P | 395 | 510 | 620 | 558 | 682 | 1020 | 50 | 250 | 8000 | 0.6 | 330 | |
| FMOV14681-P | 420 | 560 | 680 | 612 | 748 | 1120 | 50 | 260 | 8000 | 0.6 | 320 | |
| FMOV14751-P | 465 | 615 | 750 | 675 | 825 | 1235 | 50 | 270 | 8000 | 0.6 | 300 | |
| FMOV14781-P | 485 | 640 | 780 | 702 | 858 | 1290 | 50 | 275 | 8000 | 0.6 | 300 | |
| FMOV14821-P | 510 | 670 | 820 | 738 | 902 | 1355 | 50 | 280 | 8000 | 0.6 | 270 | |
| FMOV14911-P | 550 | 745 | 910 | 819 | 1001 | 1500 | 50 | 295 | 8000 | 0.6 | 260 | |
| FMOV14102-P | 625 | 825 | 1000 | 900 | 1100 | 1650 | 50 | 335 | 8000 | 0.6 | 250 | |
| FMOV14112-P | 680 | 895 | 1100 | 990 | 1210 | 1815 | 50 | 360 | 8000 | 0.6 | 240 | |



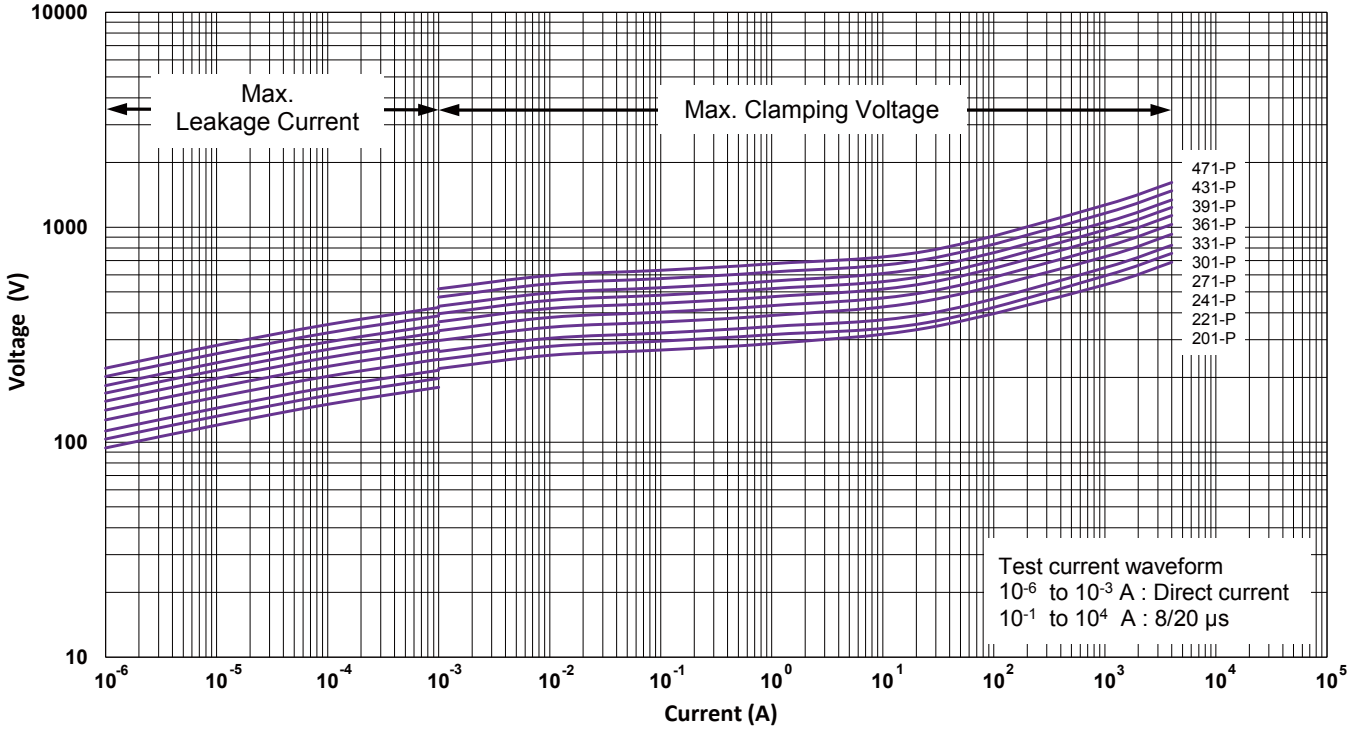
NOTE : All Specifications subject to change without notice.

# FMOV20-P Series

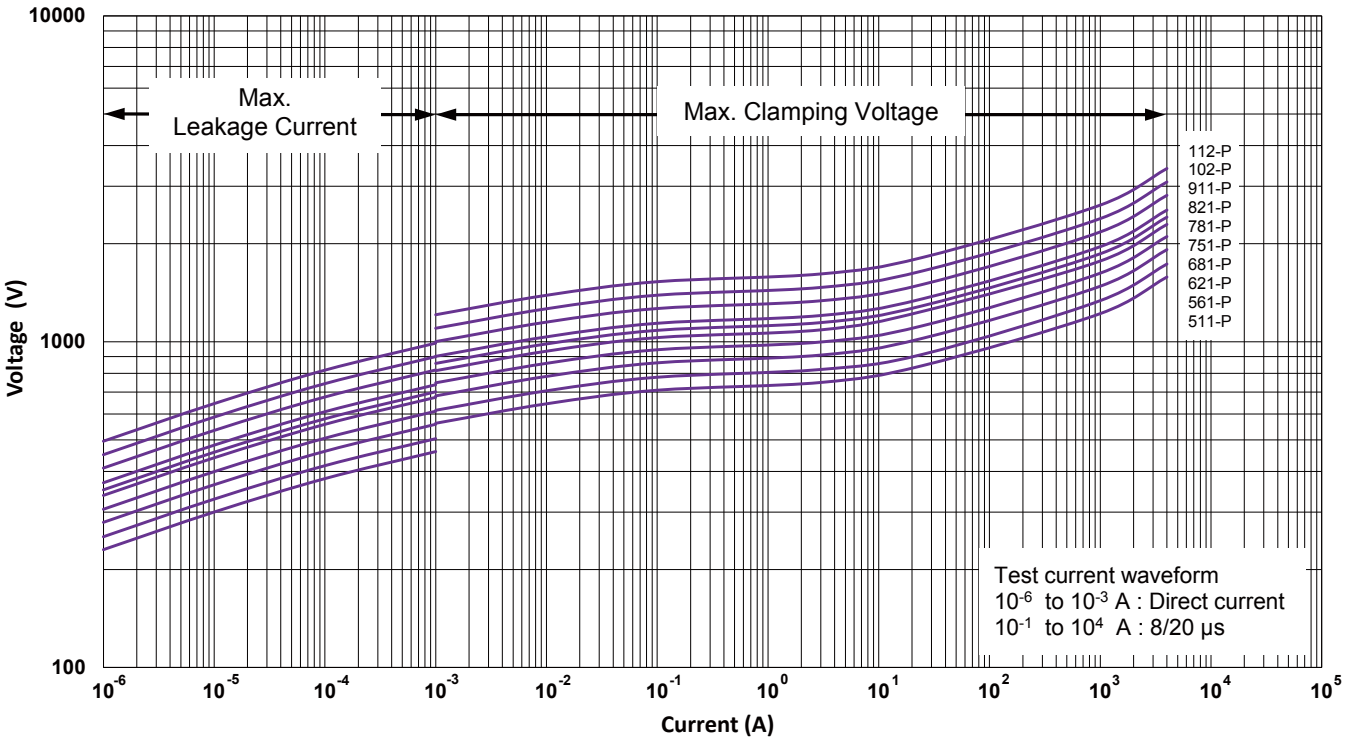
| Device Ratings and Characteristics | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part Number | Maximum Continuous Voltage | | Varistor Voltage (@1mA) | | | Maximum Clamping Voltage @Test Current (@8/20μs) | | Maximum Energy (@10/1000μs) | Maximum Peak Current (@8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Agency Approval |
| | ACrms(V) | DC(V) | Vn($V_{DC}$) | Min. | Max. | Vc(V) | Ip(A) | (J) | (A) | (W) | (pF) | |
| FMOV20180-P | 11 | 14 | 18 | 16 | 20 | 36 | 20 | 20 | 6000 | 0.3 | 42000 | |
| FMOV20220-P | 14 | 18 | 22 | 20 | 24 | 43 | 20 | 26 | 6000 | 0.3 | 37000 | |
| FMOV20270-P | 17 | 22 | 27 | 24 | 30 | 53 | 20 | 31 | 6000 | 0.3 | 29200 | |
| FMOV20330-P | 20 | 26 | 33 | 30 | 36 | 65 | 20 | 39 | 6000 | 0.3 | 21400 | c UL us |
| FMOV20390-P | 25 | 31 | 39 | 35 | 43 | 77 | 20 | 44 | 6000 | 0.3 | 19800 | |
| FMOV20470-P | 30 | 38 | 47 | 42 | 52 | 93 | 20 | 52 | 6000 | 0.3 | 17300 | |
| FMOV20560-P | 35 | 45 | 56 | 50 | 62 | 110 | 20 | 57 | 6000 | 0.3 | 14400 | |
| FMOV20680-P | 40 | 56 | 68 | 61 | 75 | 135 | 20 | 72 | 6000 | 0.3 | 12600 | |
| FMOV20201-P | 130 | 170 | 200 | 180 | 220 | 340 | 100 | 175 | 15000 | 1 | 1700 | |
| FMOV20221-P | 140 | 180 | 220 | 198 | 242 | 360 | 100 | 185 | 15000 | 1 | 1600 | |
| FMOV20241-P | 150 | 200 | 240 | 216 | 264 | 395 | 100 | 198 | 15000 | 1 | 1500 | |
| FMOV20271-P | 175 | 225 | 270 | 243 | 297 | 455 | 100 | 220 | 15000 | 1 | 1300 | |
| FMOV20301-P | 195 | 250 | 300 | 270 | 330 | 500 | 100 | 245 | 15000 | 1 | 1200 | |
| FMOV20331-P | 215 | 275 | 330 | 297 | 363 | 550 | 100 | 268 | 15000 | 1 | 1100 | |
| FMOV20361-P | 230 | 300 | 360 | 324 | 396 | 595 | 100 | 315 | 15000 | 1 | 1100 | |
| FMOV20391-P | 250 | 320 | 390 | 351 | 429 | 650 | 100 | 350 | 15000 | 1 | 1100 | |
| FMOV20431-P | 275 | 350 | 430 | 387 | 473 | 710 | 100 | 380 | 15000 | 1 | 1000 | c UL us |
| FMOV20471-P | 300 | 385 | 470 | 423 | 517 | 775 | 100 | 405 | 15000 | 1 | 900 | |
| FMOV20511-P | 320 | 410 | 510 | 459 | 561 | 845 | 100 | 445 | 15000 | 1 | 800 | VDE |
| FMOV20561-P | 350 | 460 | 560 | 504 | 616 | 915 | 100 | 475 | 15000 | 1 | 750 | |
| FMOV20621-P | 395 | 510 | 620 | 558 | 682 | 1020 | 100 | 490 | 15000 | 1 | 570 | |
| FMOV20681-P | 420 | 560 | 680 | 612 | 748 | 1120 | 100 | 500 | 15000 | 1 | 550 | |
| FMOV20751-P | 465 | 615 | 750 | 675 | 825 | 1235 | 100 | 525 | 15000 | 1 | 530 | |
| FMOV20781-P | 485 | 640 | 780 | 702 | 858 | 1290 | 100 | 535 | 15000 | 1 | 500 | |
| FMOV20821-P | 510 | 670 | 820 | 738 | 902 | 1355 | 100 | 545 | 15000 | 1 | 500 | |
| FMOV20911-P | 550 | 745 | 910 | 819 | 1001 | 1500 | 100 | 595 | 15000 | 1 | 480 | |
| FMOV20102-P | 625 | 825 | 1000 | 900 | 1100 | 1650 | 100 | 650 | 15000 | 1 | 460 | |
| FMOV20112-P | 680 | 895 | 1100 | 990 | 1210 | 1815 | 100 | 720 | 15000 | 1 | 400 | |

# Transient V-I Characteristic Curves

## FMOV10201-P to FMOV10471-P

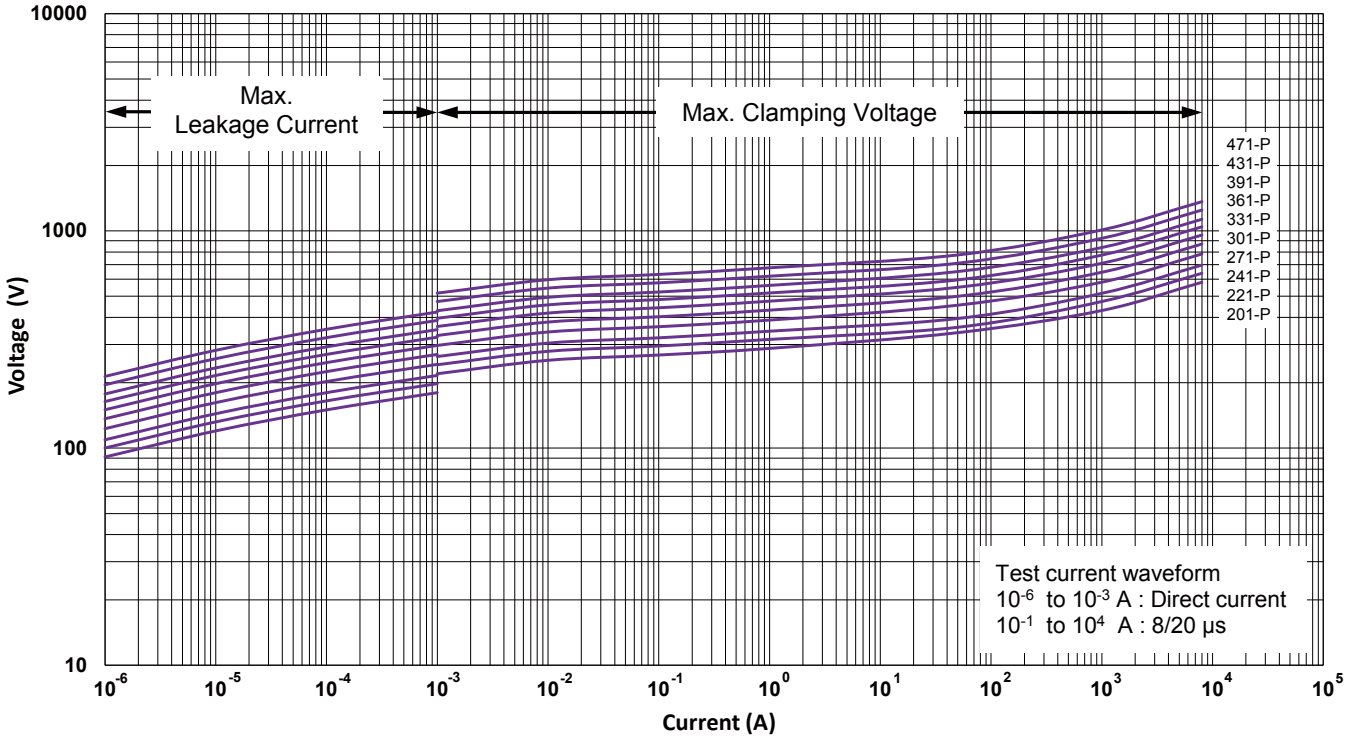



## FMOV10511-P to FMOV10112-P

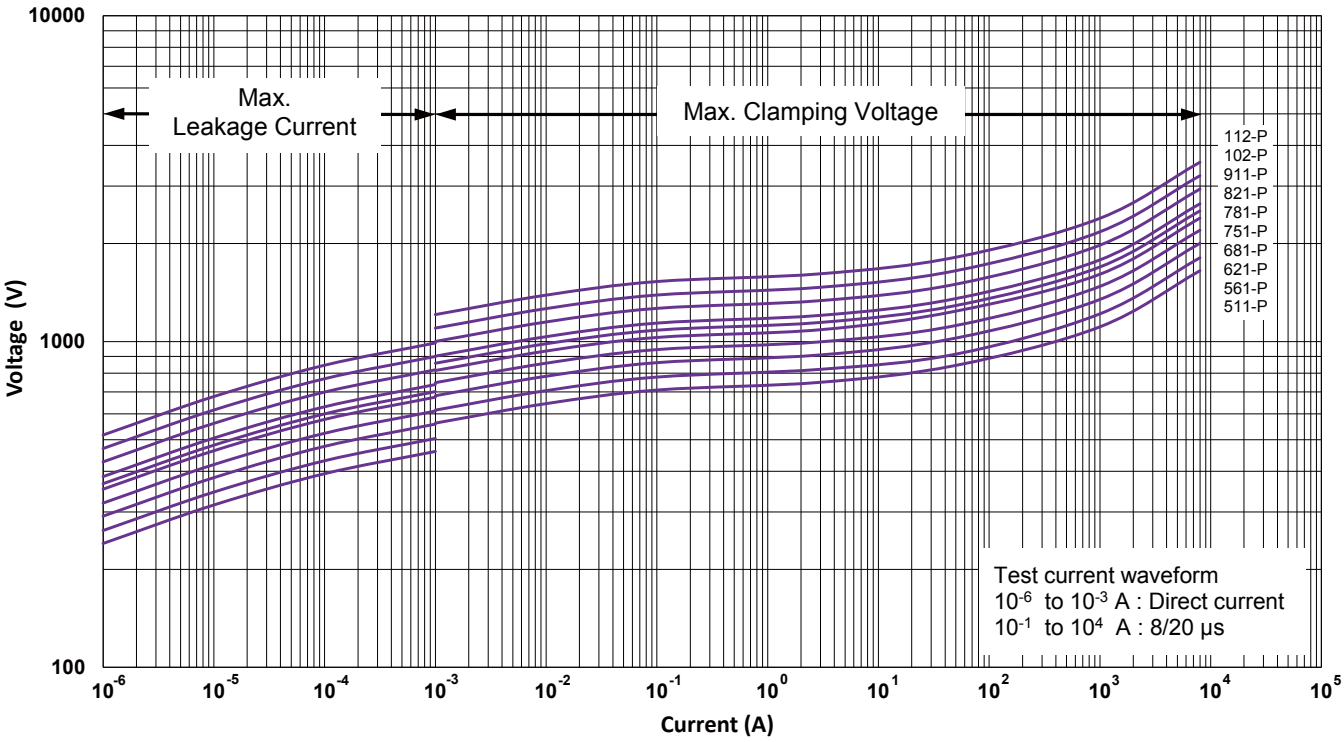


# Transient V-I Characteristic Curves

## FMOV14201-P to FMOV14471-P

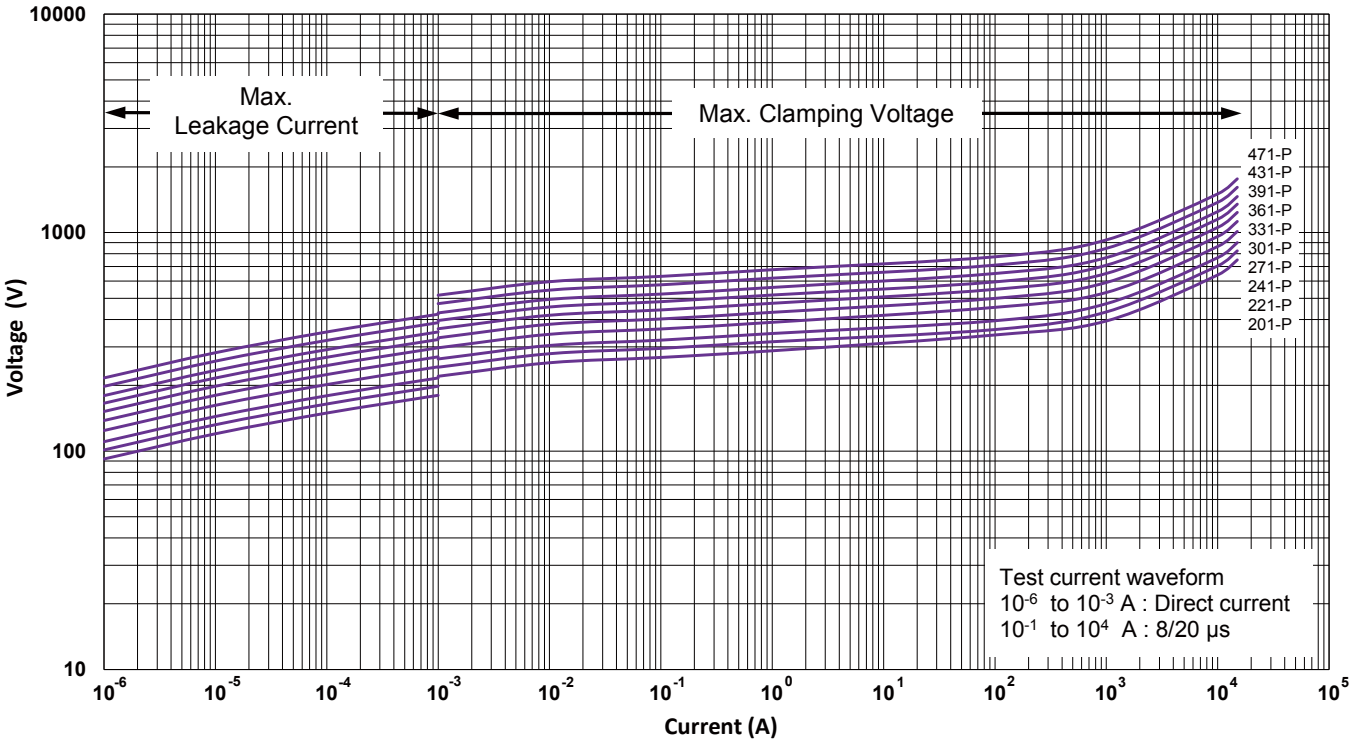



## FMOV14511-P to FMOV14112-P

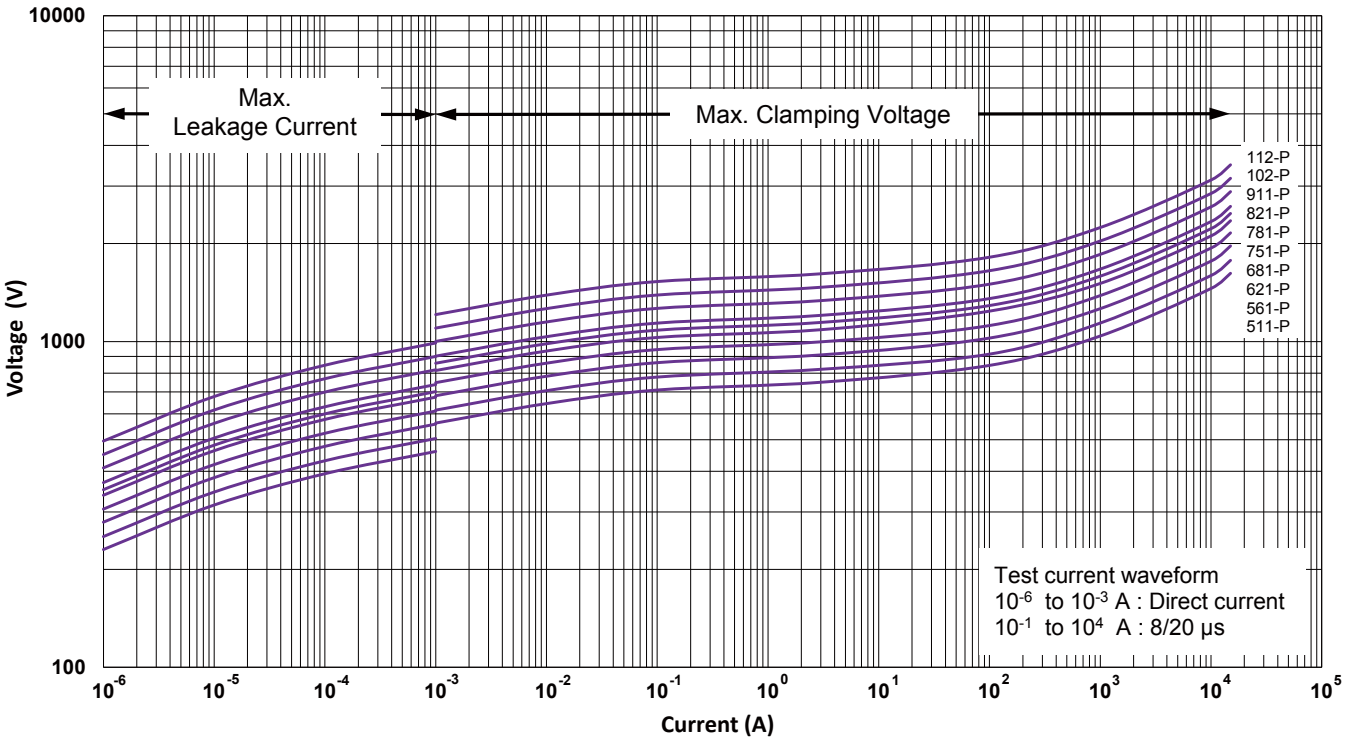


# Transient V-I Characteristic Curves

## FMOV20201-P to FMOV20471-P

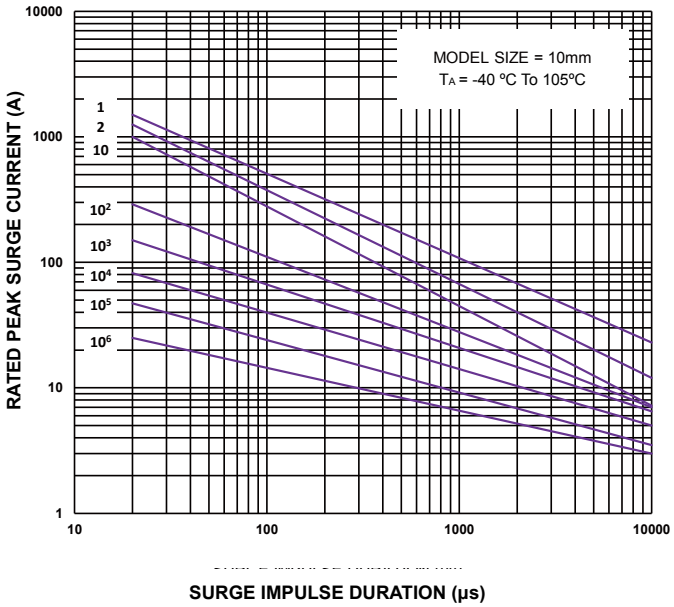



## FMOV20511-P to FMOV20112-P

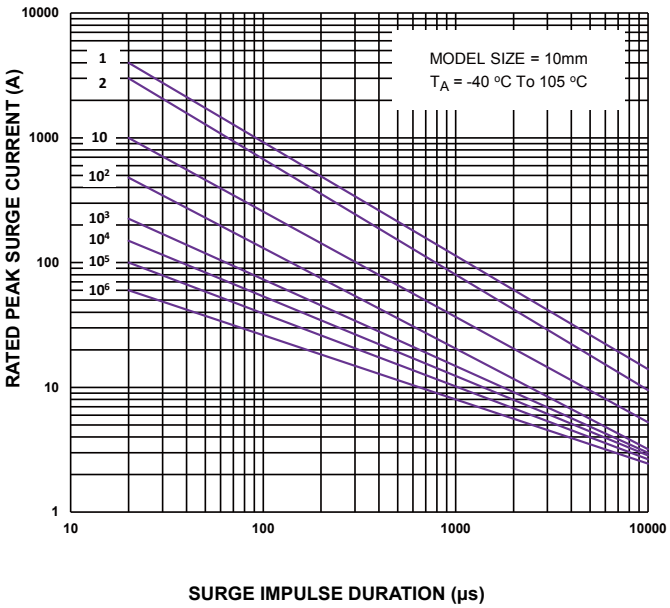


# Impulse Life Time Rating Curves

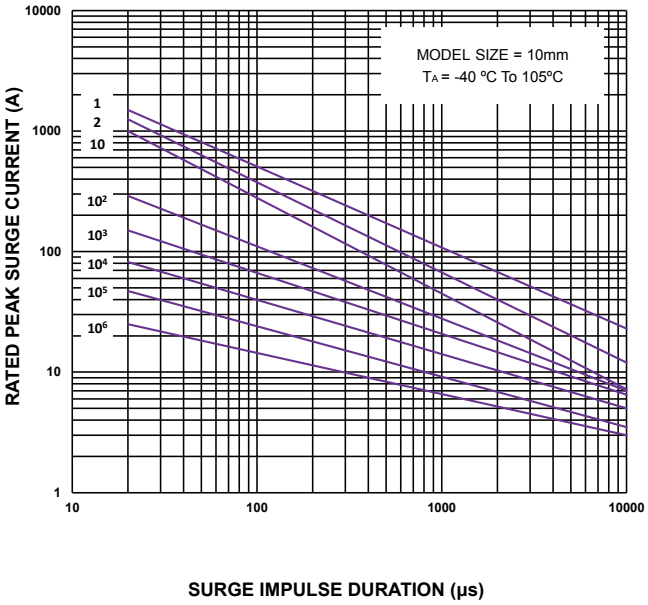
## FMOV10180-P to FMOV10680-P



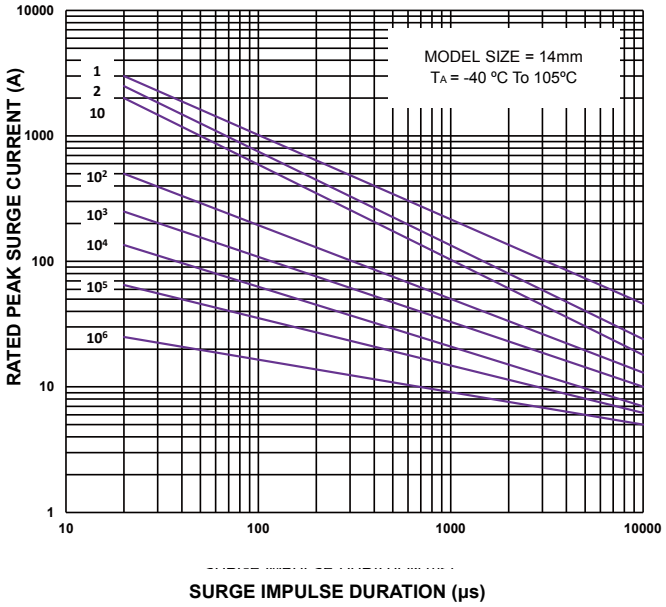

## FMOV10201-P to FMOV10751-P




## FMOV10781-P to FMOV10112-P

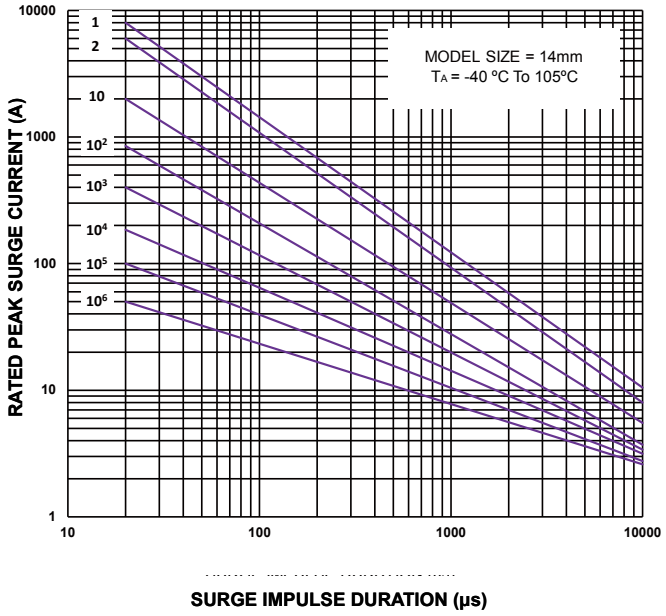



## FMOV14180-P to FMOV14680-P

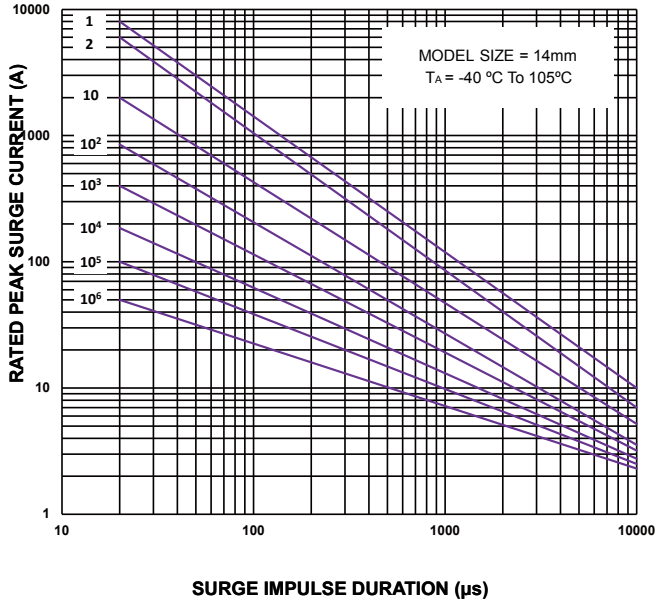


# Impulse Life Time Rating Curves

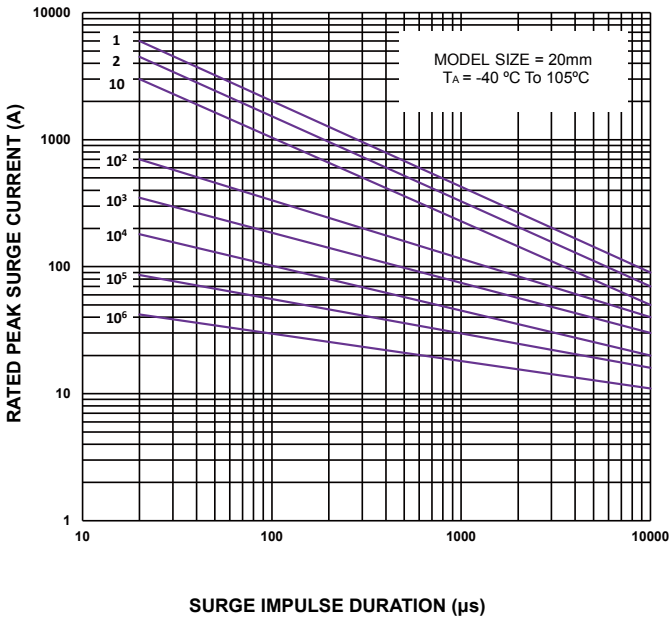
## FMOV14201-P to FMOV14751-P



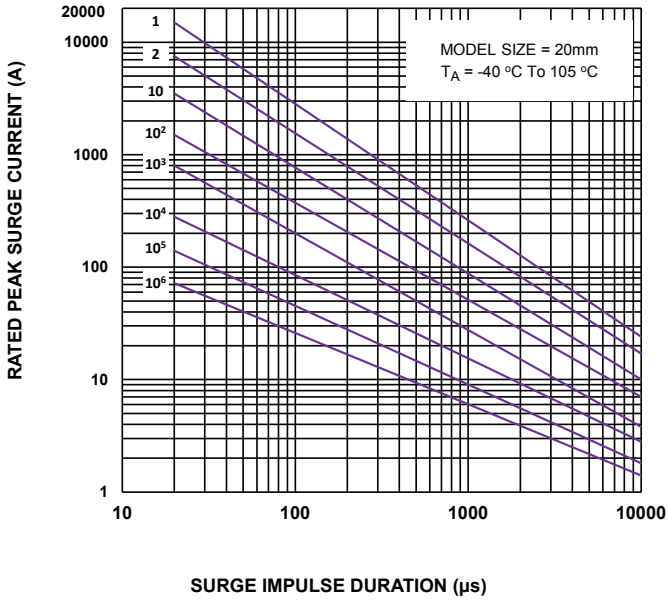

## FMOV14781-P to FMOV14112-P




## FMOV20180-P to FMOV20680-P

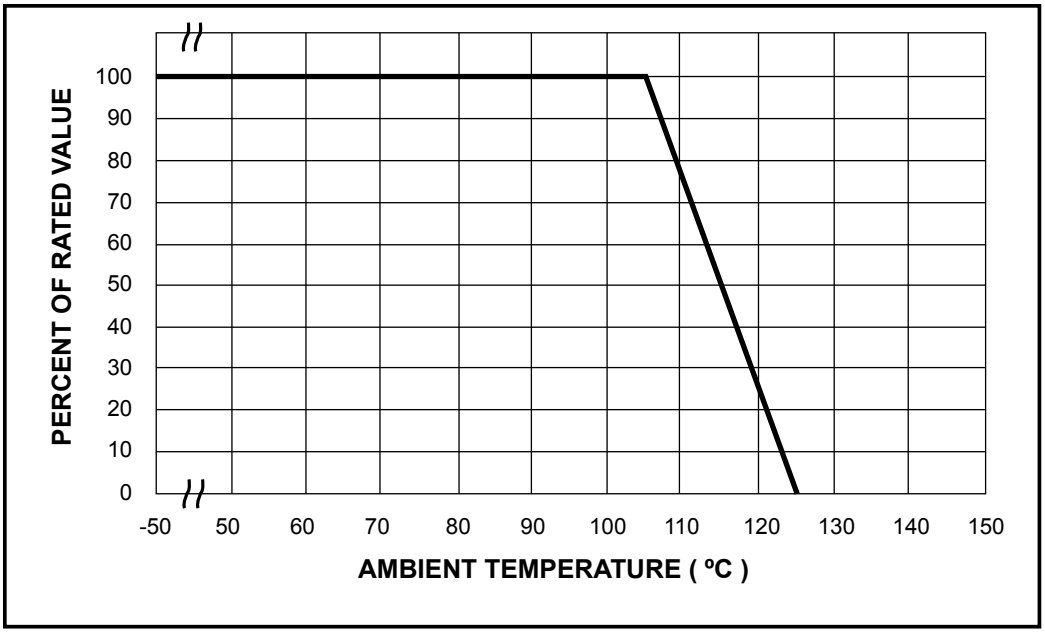



## FMOV20201-P to FMOV20112-P

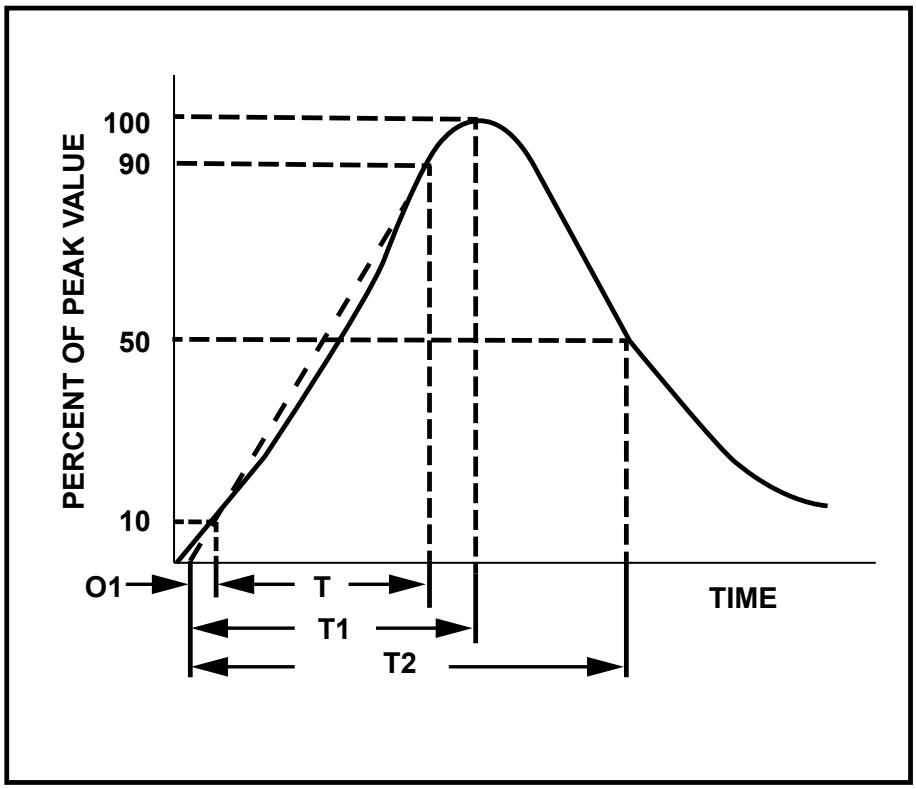


## Power Derating Curve

Should transients occur in rapid succession, the average power dissipation is the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be with the specifications shown on the Device Ratings and Specifications Table for the specific device. The operating values of a MOV need to be derated at high temperatures as shown above. Because varistors only dissipate a relatively small amount of average power they are not suitable for repetitive applications that involve substantial amounts of average power dissipation.




## Surge Current Standard Waveform




O1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T1 = Rise Time = 1.25 x T
T2 = Decay Time
Example - For an 8/20 µs Current Waveform :
8µs = T1 = Rise Time
20µs = T2 = Decay Time

## Product Dimensions

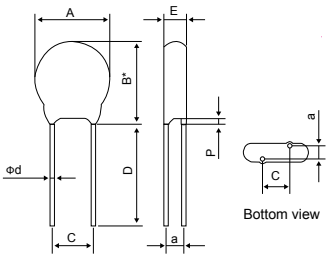



Fig 1. Straight Lead

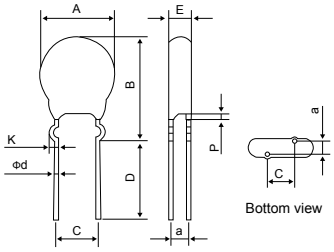



Fig 2. Outside Kink Lead

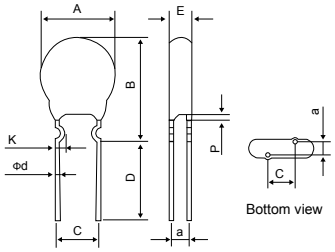



Fig 3. Inside Kink Lead

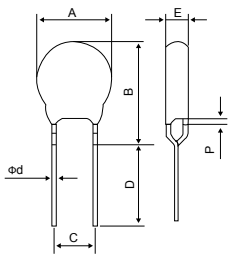



Fig 4. In Line Kink Lead

Dimension Table

Unit : mm

| Symbol \ Model size | | 10P | | 14P | | 20P | |
|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Min. | Max. | Min. | Max. |
| A | | 10.5 | 14.0 | 13.5 | 17.5 | 19.2 | 25.0 |
| B(Max.) | 201-P ~ 271-P | - | 19.5 | - | 22.5 | - | 30.0 |
| | >271-P | - | 20.5 | - | 23.5 | - | 31.0 |
| B*(Max.) | | - | 17 | - | 20.5 | - | 28.0 |
| C(±1.0) | | 7.5 | | 7.5 | | 10.0 | |
| D(Typ.) | | 25.0 | | 25.0 | | 25.0 | |
| P(Max.) | | - | 3.0 | - | 3.0 | - | 3.0 |
| K | | 1.0 | 1.8 | 1.0 | 1.8 | 1.0 | 1.8 |
| Φd(±0.05) | | 0.8 | | 0.8 | | 1.0 | |
| E | | E Max. Table | | | | | |

E Max. Table

Unit : mm

| Model | 10p | 14p | 20p | a (±1.0) | Model | 10p | 14p | 20p | a (±1.0) |
|---|---|---|---|---|---|---|---|---|---|
| 180-P | 3.9 | 4.0 | 4.2 | 1.5 | 361-P | 5.4 | 5.5 | 6.0 | 2.1 |
| 220-P | 4.2 | 4.3 | 4.6 | 1.7 | 391-P | 5.5 | 5.6 | 6.1 | 2.3 |
| 270-P | 4.4 | 4.5 | 4.8 | 1.8 | 431-P | 5.7 | 5.8 | 6.4 | 2.4 |
| 330-P | 3.9 | 4.0 | 4.3 | 1.9 | 471-P | 5.9 | 6.0 | 6.6 | 2.5 |
| 390-P | 4.1 | 4.2 | 4.5 | 1.9 | 511-P | 6.1 | 6.2 | 6.7 | 2.6 |
| 470-P | 4.3 | 4.4 | 4.7 | 2.1 | 561-P | 6.3 | 6.4 | 6.9 | 2.8 |
| 560-P | 4.6 | 4.7 | 5.0 | 2.3 | 621-P | 6.5 | 6.6 | 7.2 | 3.1 |
| 680-P | 4.9 | 5.0 | 5.3 | 2.6 | 681-P | 6.6 | 6.7 | 7.3 | 3.3 |
| 201-P | 4.5 | 4.6 | 5.1 | 1.5 | 751-P | 6.8 | 6.9 | 7.5 | 3.6 |
| 221-P | 4.6 | 4.7 | 5.2 | 1.6 | 781-P | 7.2 | 7.3 | 7.9 | 3.8 |
| 241-P | 4.7 | 4.8 | 5.3 | 1.7 | 821-P | 7.4 | 7.5 | 8.1 | 4.0 |
| 271-P | 4.8 | 4.9 | 5.4 | 1.8 | 911-P | 7.5 | 7.6 | 8.2 | 4.3 |
| 301-P | 4.9 | 5.0 | 5.5 | 1.9 | 102-P | 8.0 | 8.1 | 8.7 | 4.6 |
| 331-P | 5.1 | 5.2 | 5.8 | 2.0 | 112-P | 8.9 | 9.0 | 9.3 | 5.2 |

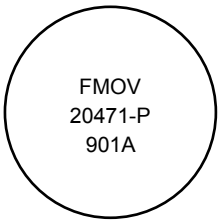
## Part Numbering and Marking System

**Part Numbering System :**

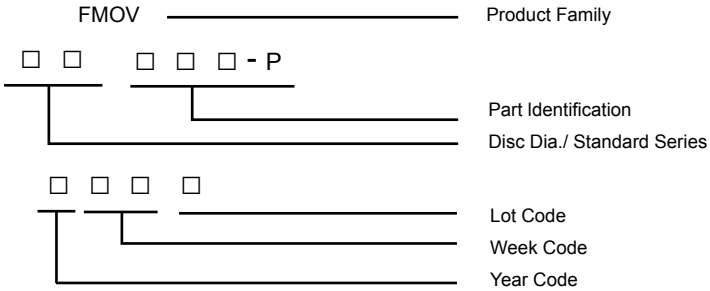
FMOV 20 471 - P + Tolerance Code + Option Code (See notes below)

- Tolerance Code: Tolerance of $V_{1MA}$ (K=±10% / L=±15%)
- P: High Surge Series
- 471: Varsitor Voltage Two significant figures plus number of zeros that above.i.e.471 is 470$V_{DV}$
- 20: Disc Diameter
- FMOV: Product Family

**Marking System :**




Example




- FMOV: Product Family
- □ □ □ □ □ - P: Part Identification
- □ □: Disc Dia./ Standard Series
- □ □ □ □: Lot Code
- □ □: Week Code
- □: Year Code

## Order Notes

**Main Part Code :**

**Part No + Tolerance Code + Packaging + Lead Type Designators + Option Code**

**Ordering examples :**

| Straight Lead Bulk Pack (Standard) | Straight Lead (Short Cut) Bulk Pack | Straight Lead Tape & Reel Pack | Straight Lead Flat Box Pack |
|---|---|---|---|
| FMOV10471-PKBS | FMOV10471-PKBSXXX | FMOV10471-PKTS | FMOV10471-PKAS |
| FMOV14471-PKBS | FMOV14471-PKBSXXX | FMOV14471-PKTS | FMOV14471-PKAS |
| FMOV20471-PKBS | FMOV20471-PKBSXXX | - | - |

| Tape & Reel Pack Feed Hole Pitch |
|---|
| FMOV10471-PKTSA |
| FMOV10471-PKTSB |
| FMOV14471-PKTSA |
| FMOV14471-PKTSB |

**A : P0 → 12.7mm±0.2mm**
**B : P0 → 15.0mm±0.2mm**

| Outside Kink Lead Bulk Pack | Outside Kink lead (Short Cut) Bulk Pack | Outside Kink Lead Tape & Reel Pack | Outside Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV10471-PKBO | FMOV10471-PKBOXXX | FMOV10471-PKTO | FMOV10471-PKAO |
| FMOV14471-PKBO | FMOV14471-PKBOXXX | FMOV14471-PKTO | FMOV14471-PKAO |
| FMOV20471-PKBO | FMOV20471-PKBOXXX | - | - |

| Inside Kink lead Bulk Pack | Inside Kink Lead (Short Cut) Bulk Pack | Inside Kink Lead Tape & Reel Pack | Inside Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV10471-PKBK | FMOV10471-PKBKXXX | FMOV10471-PKTK | FMOV10471-PKAK |
| FMOV14471-PKBK | FMOV14471-PKBKXXX | FMOV14471-PKTK | FMOV14471-PKAK |
| FMOV20471-PKBK | FMOV20471-PKBKXXX | - | - |

| In Line Kink Lead Bulk Pack | In Line Kink Lead (Short Cut) Bulk Pack | In Line Kink Lead Tape& Reel Pack | In Line Kink Lead Flat Box Pack |
|---|---|---|---|
| FMOV10471-PKBI | FMOV10471-PKBIXXX | FMOV10471-PKTI | FMOV10471-PKAI |
| FMOV14471-PKBI | FMOV14471-PKBIXXX | FMOV14471-PKTI | FMOV14471-PKAI |
| FMOV20471-PKBI | FMOV20471-PKBIXXX | - | - |

## Tape and Reel Specifications

Radial devices on tape are supplied with straight leads or inline kink leads

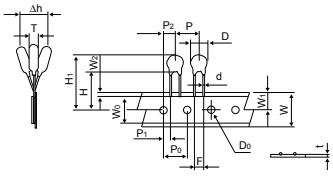


Figure: A

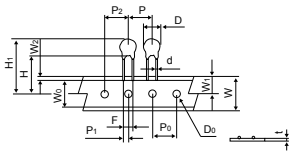


Figure: B

Straight Leads

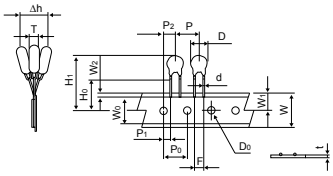


Figure: C

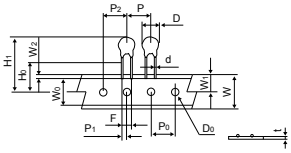


Figure: D

Inline Kink Leads

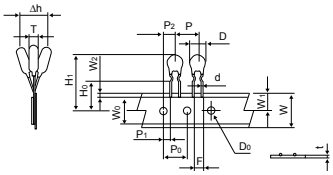


Figure: E

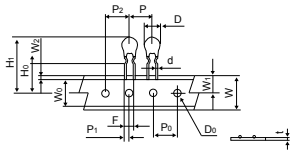


Figure: F

Inside Kink Leads

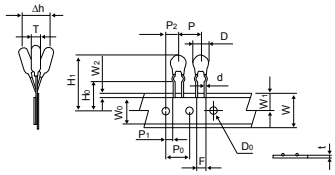


Figure: G

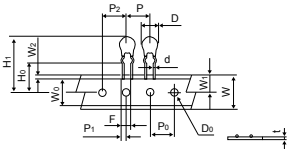


Figure: H

Outside Kink Leads

| Symbol | Parameter | Model | | | |
|---|---|---|---|---|---|
| | | 10P | | 14P | |
| **P** | Pitch of Component | 12.7±1.0 | 15.0±1.0 | 25.4±1.0 | 30.0±1.0 |
| **P0** | Feed Hole Pitch | 12.7±0.2 | 15.0±0.2 | 12.7±0.2 | 15.0±0.2 |
| **P1** | Feed Hole Center Lead | 3.85±0.7 | 3.75±0.7 | 8.95±0.7 | 3.75±0.7 |
| **P2** | Hole center to Component Center | 6.35±0.7 | 7.5±0.7 | 12.7±0.7 | 7.5±0.7 |
| **F** | Lead to Lead Distance | 7.5±0.8 | 7.5±0.8 | 7.5±0.8 | 7.5±0.8 |
| **Δh** | Component Alignment | 2.0 Max | 2.0 Max | 2.0 Max | 2.0 Max |
| **W** | Tape Width | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 | 18.0+1.0 |
| | | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 | 18.0-0.5 |
| **W0** | Hold Down Tape Width | 5.0 Min | 5.0 Min | 5.0 Min | 5.0 Min |
| **W1** | Hole Position | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 | 9.0+0.75 |
| | | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 | 9.0-0.50 |
| **W2** | Hold Down Tape Position | 3.0 Max | 3.0 Max | 3.0 Max | 3.0 Max |
| **H** | Height from Tape Center to Component Base | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 | 18.0+2.0 |
| | | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 | 18.0-0.0 |
| **H0** | Seating Plane Height | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 | 16.0±0.5 |
| **H1** | Component Height | 36.0 Max | 36.0 Max | 40.0 Max | 40.0 Max |
| **D0** | Feed Hole Diameter | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 | 4.0±0.2 |
| **t** | Total Tape Thickness | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 | 0.7±0.2 |
| **L** | Length of Clopped Lead | 11.0 Max | 11.0 Max | 11.0 Max | 11.0 Max |
| **Figure** | | ACEG | BDFH | ACEG | BDFH |

Unit: mm

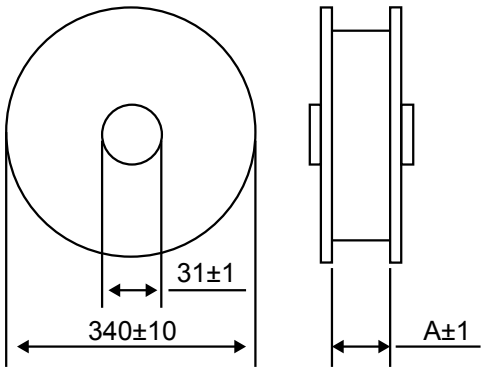
## Packaging Specifications

### Bulk Product Packing

| Series | Straight Lead Type Quantity (pcs/bag) | Outside Kink Lead Type Quantity (pcs/bag) | Inside Kink Lead Type Quantity (pcs/bag) | In Line Kink Lead Type Quantity (pcs/bag) |
|---|---|---|---|---|
| FMOV10-P Series | 500 | 500 | 500 | 500 |
| FMOV14-P Series | 500 | 500 | 500 | 500 |
| FMOV20-P Series | 250 | 250 | 250 | 250 |

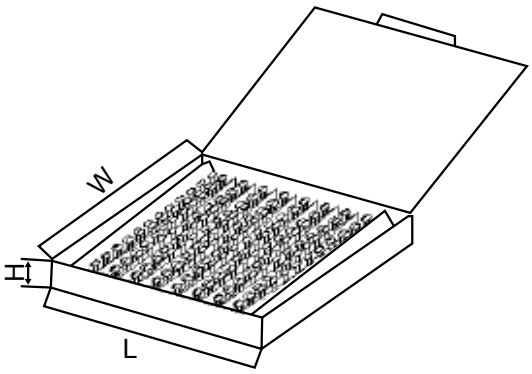
### Tape & Reel Product Packing

| Series | A (mm) | Quantity (pcs/reel) |
|---|---|---|
| FMOV10(180~391)-P-T- | 43 | 800 |
| FMOV10(431~621)-P-T- | | 700 |
| FMOV10(681~112)-P-T- | | 600 |
| FMOV14(180~391)-P-T- | 56 | 800 |
| FMOV14(431~621)-P-T- | | 700 |
| FMOV14(681~112)-P-T- | | 600 |




### Box Product Packing

| Series | Quantity (pcs/reel) |
|---|---|
| FMOV10(180~391)-P-A- | 500 |
| FMOV10(431~621)-P-A- | 500 |
| FMOV10(681~112)-P-A- | 400 |
| FMOV14(180~391)-P-A- | 500 |
| FMOV14(431~621)-P-A- | 500 |
| FMOV14(681~112)-P-A- | 400 |




| Series | L ± 5 | W ± 5 | H ± 5 |
|---|---|---|---|
| FMOV10-P Series | 340 | 245 | 45 |
| FMOV14-P Series | 340 | 245 | 50 |

# Product Reliability

| Characteristics | Standard | Test Conditions | Specifications |
|---|---|---|---|
| Robustness of terminations | IEC 60068-2-21<br>Test Ua1 | F = 10 N (d ≤ 0.8 mm) ,F = 20 N ( d = 1 mm) | $\Delta V_{1mA}$ /$V_{1mA}$≤±10%<br>No visible damage |
| Solderability | IEC 60068-2-20<br>Test Ta (Method 1) | T = 235±5°C, d = 2±0.5s | Approximately≥95% |
| Resistance to soldering heat | IEC 60068-2-20<br>Test Tb (Method 1A) | T = 260±5°C, d = 10±1s | $\Delta V_{1mA}$ /$V_{1mA}$≤±5%<br>No visible damage |
| Shock | IEC 60068-2-27<br>Test Ea | Pulse shape: half-sine. a = 490 m/s$^2$,<br>d = 11ms. N = 6 x 3 shocks | $\Delta V_{1mA}$ /$V_{1mA}$≤±5%<br>No visible damage |
| Vibration | IEC 60068-2-6<br>Test Fc Method B4 | Frequency range : 10 Hz to 55 Hz ,a = 0.75 mm or 98 m/s2 (whichever is the less), d = 3x2 h | $\Delta V/_{1mA}$ $V_{1mA}$≤±5%<br>No visible damage |
| Needle flame test | IEC 60695-11-5 | Severity : Vertical 10 s | Duration of burning:<br>5 s max. |
| Voltage under pulse condition | IEC 61051-2 | At class current, 8/20 μs, | As specified in specification |
| Voltage proof | IEC 61051-2 | Metal balls method (4.8.1.2) 2500 V, 60 s | No breakdown or flashover |
| Pulse current<br>- 8/20 μs | IEC 61051-2 | 8/20 μs, 10 times, Ipeak = 0.25*Imax | ΔV/V≤±10%<br>No visible damage |
| Pulse current<br>- 10/1000 μs | IEC 61051-2 | 10/1000 μs, 10 times, Ipeak = 0.0075* Imax | $\Delta V_{1mA}$ /$V_{1mA}$≤±10%<br>No visible damage |
| Combination pulse | IEC 60950-1:2013<br>Annex Q | Additional test :<br>10 pulses (combination pulse 6KV/3KA),<br>in one direction, 1 per min | $\Delta V_{1mA}$ /$V_{1mA}$≤±10%<br>No visible damage<br>U ≤ 1.1 $U_{initial}$<br>Voltage proof :<br>No breakdown or flashover |
| Rapid change of temperature | IEC 60068-2-14<br>Test Na | N = 5 cycles, d = 30 min , θA = -40±3°C,<br>θB = 85±2°C | $\Delta V_{1mA}$ /$V_{1mA}$≤±10%<br>No visible damage |
| Climatic sequence | IEC 60068-2-2 Test Ba<br>IEC 60068-2-30 Test Db<br>IEC 60068-2-1 Test Aa<br>IEC 60068-2-30 Test Db | Dry heat, Test Ba:16±2h, T = 85±2°C<br>Damp heat, Test Db first cycle : 24h, T = 55±2°C<br>Cold, Test Aa : 2h, T = -40±3°C<br>Damp heat Test Ba remaining cycles:5 cycle | $\Delta V_{1mA}$ /$V_{1mA}$≤±10%<br>No visible damage<br>RISO≥100MΩ<br>Voltage proof :<br>No breakdown or flashover |
| Endurance at upper category temperature | IEC 61051-1 (4.21) | T : max temperature as specified ,<br>Duration : 1000 h, Voltage : max. a. c. voltage | ΔV/V≤±10%<br>No visible damage<br>RISO≥1000MΩ<br>U ≤ 1,1 Uinitial |
| Damp heat<br>(Steady state) | IEC 60068-2-78<br>Test Ca | T = 40±2°C, RH = 93(+2/-3)%, 56d ,<br>4 specimens : No voltage applied ,Other 4 specimens :<br>Applied voltage : 10% of the max. d. c. voltage | $\Delta V_{1mA}$/$V_{1mA}$≤±10%<br>RISO≥100MΩ |
| Maximum Peak Current | Specification Standard | Imax, 8/20 μs, 1 time. | $\Delta V_{1mA}$/$V_{1mA}$≤±10%<br>No visible damage |
| Nominal Discharge Current Test | UL1449 4th | In, 8/20 μs, 15 times, Interval 60s | ΔV/V≤±10%<br>No visible damage |
| Varistor Voltage Temp. Coefficient | Specification Standard | $\frac{V_{1mA}\text{ at }85°C - V_{1mA}\text{ at }25°C}{V_{1mA}\text{ at }25°C} \times \frac{1}{60} \times 100(\%°C)$ | 0.05≤TC≤0.05(%/°C) |
| High Temperature Storage | IEC60068-2-2 | 1000h, T = 125±2°C | ΔV/V≤±5%<br>No visible damage |
| Max. Energy | Specification Standard | 10/1000 μs, 1 times, Max. Energy | ΔV/V≤±10%<br>No visible damage |
| Operating duty cycle test * | UL1449 | 6 kV/3 kA combination wave surges,<br>phase angle of 90 (+0, -15) degrees, positive polarity 8times, negative polarity 7 times, interval of 60s. | ΔV/V≤±10%<br>No visible damage |
| Surge Immunity Test * | IEC 61000-4-5 | 4kV/2kA combination wave surges,<br>phase angle of 90 (+0, -15) degrees, positive polarity 20times, negative polarity 20times, interval of 60s. | ΔV/V≤±10%<br>No visible damage |



NOTE : All Specifications subject to change without notice.

## Varistor Characteristic

| Varistor Voltage | Symbol |
|---|---|
| The voltage between two terminals with the specified measuring current CmA DC applied is called $V_C$ or $V_C$ mA. The measurement shall be made as fast as possible to avoid affection | $V_N$ |
| **Maximum Allowable Voltage** | |
| The maximum sinusoidal RMS voltage or maximum DC voltage that can be applied continuously in the specified environmental temperature range | V |
| **Clamping Voltage** | |
| The maximum voltage between two terminals with the specified standard<br>*impulse current (8/20 μS) is applied<br>*Illustrated a below | $V_C$ |
| **Rated Power** | |
| The power that can be applied in the specified ambient temperature | W |
| **Maximum Energy** | |
| The maximum energy within the varistor change of ± 10% when one impulse of 2 ms or 10/100 μS is applied. | J |
| **Maximum Peak Current (Withstanding Surge Current)** | |
| 2 times : The maximum current within the varistor change of ± 10% with the standard impulse current (8/20 μS) applied two times with an interval of 5 minutes. | A |
| 1 times : The maximum current within the varistor change of ± 10% with the standard impulse current (8/20 μS) applied one time. | |
| **Temperature Coefficient of Varistor Voltage** | |
| $\frac{V_C\ @85°C - V_C\ @25°C}{V_C\ @25°C} \times \frac{1}{60} \times 100(\%°C)$ | -0.05%/°C max |
| **Capacitance** | |
| Capacitance shall be measured at 1 KHz ± 10%, 1 V_rms max, 0V bias and 20 ± 2°C. | C(pF) |
| **Dissipation** | |
| Dissipation Factor is measured at 1 KHz ± 10%, 1 V_rms max. 0V bias and 20 ± 2°C | |
| **Withstanding Voltage (Body Insulation)** | |
| The specified voltage shall be applied both terminals of the specimen connected together and metal foil closely wrapped round its body for 1 minute. Electrical breakdown shall be examined. | |

| Classification (Nominal Varistor Voltage) | Test Voltage (AC) |
|---|---|
| $V_{0.1\ mA}$, $V_{1\ mA} \leq 330V$ | 1000 $V_{rms}$ |
| $V_{0.1\ mA}$, $V_{1\ mA} > 330V$ | 1500 $V_{rms}$ |

* (According to customer requirements to meet the test items)

## Lead Material (Tin Plated Copper Clad Steel or Tin Plated Copper)

| Product Dimension | Voltage Range | Lead Diameter (±0.05 mm) | Pitch (mm) |
|---|---|---|---|
| 05 D/V | 180~751 | 0.60 (CP) | 5.0 ± 1.0 |
| 07 D/V | 180~821 | 0.60 (CP) | 5.0 ± 1.0 |
| 10 D/V | 180~112 | 0.75 (CP) | 7.5 ± 1.0 |
| 14 D/V | 180~112 | 0.75 (CP) | 7.5 ± 1.0 |
| 20 D/V/P | 180~112 | 1.00 (CU) | 10.0 ± 1.0 |
| 07 P | 180~821 | 0.60 (CU) | 5.0 ± 1.0 |
| 10 P | 180~112 | 0.80 (CU) | 7.5 ± 1.0 |
| 14 P | 180~112 | 0.80 (CU) | 7.5 ± 1.0 |
| *CP: Tin Plated Copper Clad Steel; CU: Tin Plated Copper | | | |

## Insulating Coating

Flame retardant epoxy, meets UL-94V-0 requirement

### RoHS Compliant Declaration

We hereby declare that the components delivered to your company are compliant with RoHS Directive 2002/95/EC

### Storage Conditions of Products

**(I) Storage Conditions :**

a. Storage Temperature : -10℃~+40°C

b. Relative Humidity :±75%RH

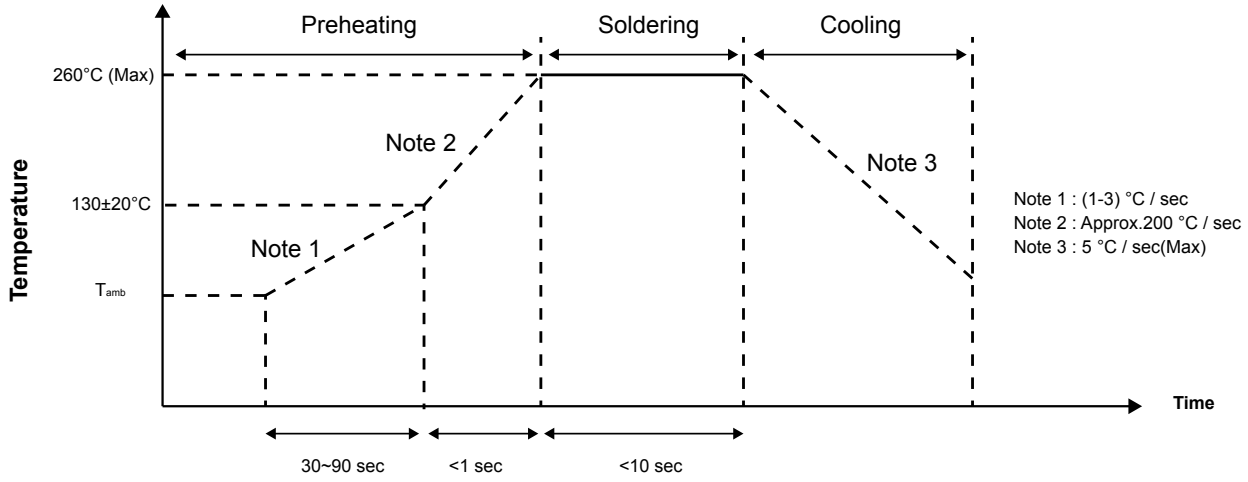
c. Keep away from corrosive atmosphere and sunlight

d. Solvent Resistance : MIL–STD–202, Method 215F

e. Moisture Sensitivity : Level 1, J-STD-020

**(II) Period of Storage : 1 year**

## *Solder Recommendation*

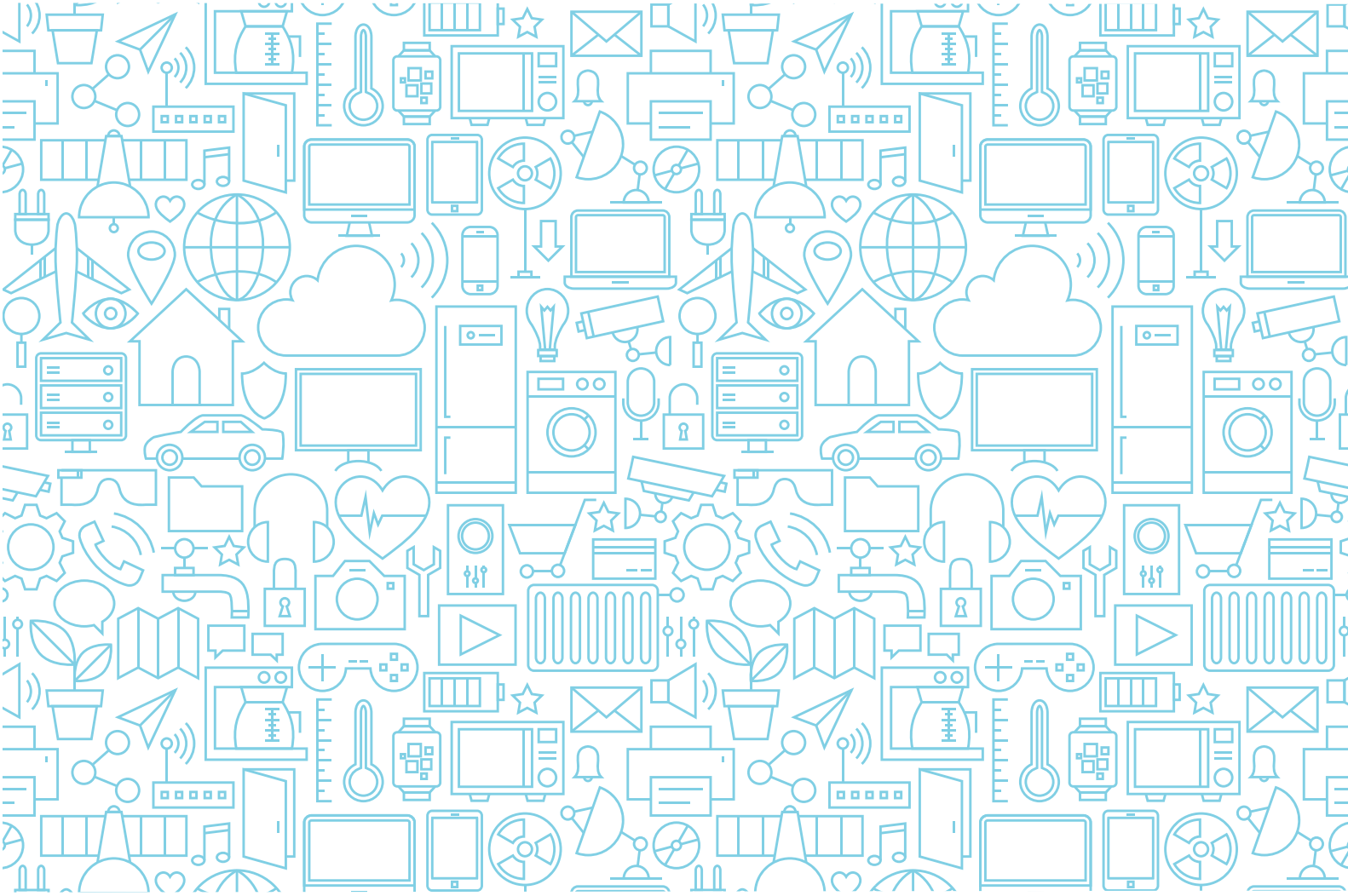



## *Recommendation Reworking Conditions with Soldering Iron*

| Item | Conditions |
|---|---|
| Temperature of soldering Iron-tip | 360°C(Max) |
| Soldering Time | 3 sec (Max) |
| Distance from Varistor | 2mm (Min) |

| Cross Reference | | | | | |
|---|---|---|---|---|---|
| | **Fuzetec** | **Littelfuse** | **TDK&EPCOS** | **Thinking** | **BrightKing** |
| **Standard Series** | **D-Series** | **ZA/ LA** | **StandarD** | **TVR** | **VDR/ZOV/DB** |
| | FMOV05201-D | - | SIOV-S5K130 | TVR05201 | 201KD05 |
| | FMOV07201-D | V130LA1P | SIOV-S7K130 | TVR07201 | 201KD07 |
| | FMOV10201-D | V130LA5P | SIOV-S10K130 | TVR10201 | 201KD10 |
| | FMOV14201-D | V130LA10AP | SIOV-S14K130 | TVR14201 | 201KD14 |
| | FMOV20201-D | V130LA20AP | SIOV-S20K130 | TVR20201 | 201KD20 |
| **Medium Surge Series** | **V-Series** | **Ultra MOV** | **AdvanceD** | **TVR-V** | **High Energy** |
| | FMOV05201-V | - | - | - | 201KD05J |
| | FMOV07201-V | V07E130P | - | - | 201KD07J |
| | FMOV10201-V | V10E130P | SIOV-S10K130E2 | TVR10201-V | 201KD10J |
| | FMOV14201-V | V14E130P | SIOV-S14K130E2 | TVR14201-V | 201KD14J |
| | FMOV20201-V | V20E130P | SIOV-S20K130E2 | - | 201KD20J |
| **High Surge Series** | **P-Series** | **C III** | **AdvanceD-MP/ SuperioR** | **TVR-D** | **-** |
| | FMOV10201-P | V130LA5CP | SIOV-S10K130E2K1 | TVR07201KSW | - |
| | FMOV14201-P | V130LA10CP | SIOV-S14K130E2K1 | TVR10201KSW | - |
| | FMOV20201-P | V130LA20CP | SIOV-S20K130E3K1 | TVR20201KSW | - |

# MEMO



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*Agent*

*2020*