

MEFTECH Catalogue - Aldinet

1. Index.....	1
2. Chip SMD resistor	3
3. CR series Spec	69
4. Film Resistor	71
5. FM series Spec	89
6. KNP series Spec.....	91
7. MF series Spec	93
8. RA series Spec.....	97
9. RSS&RSF series Spec	100
10. RV(RVS)series Spec.....	103
11. SQP,SQM related type Spec	105
12. Network resistors	109
13. Wirewound Resistors.....	120
14. Capacitors_1	134
15. Capacitors_4	138
16. Capacitors_7	142
17. Capacitors_9	146
18. Capacitors_12	151
19. Capacitors_15	160
20. Ceramic Disc cap-2KV~3KV.....	168
21. Ceramic Disc cap-16V-50V	173
22. Ceramic Disc cap-Class I 50V-1KV	177
23. Ceramic Disc cap-Class II 50V-1KV	181
24. Multilayer ceramic disc cap -RD series	185
25. Tant Dip Cap.....	194
26. Tant SMD Cap.....	198
27. X1-Y1Y2	202
28. CB1B TUNING FORK SMD.....	218

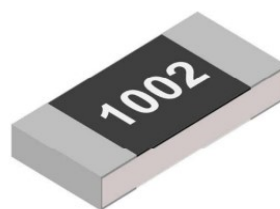
29. CB2B TUNING FORK SMD.....	221
30. CS4B TUNING FORK SMD	223
31. Quartz_C2025	225
32. Quartz_C3225	227
33. Quartz_C5032	229
34. Quartz_C6035	231
35. Quartz_C7050	233
36. Quartz_HC49SMD	235
37. Quartz_HC49U.....	237
38. Quartz_HC49US.....	239
39. OSC3225.....	241
40. OSC5032.....	243

THIN FILM HIGH POWER CHIP RESISTORS

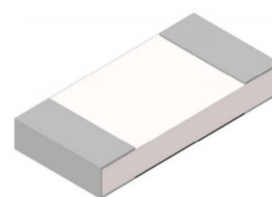
(RMT / RPT / RPTH SERIES)

Applications

- * Computer & relative products
- * Communication devices
- * Measuring instrument, Printer, Smart phone
- * Converters, Battery
- * Automatic Equipment Controllers

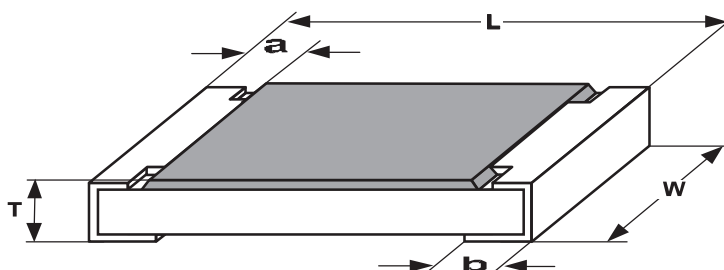


Top view



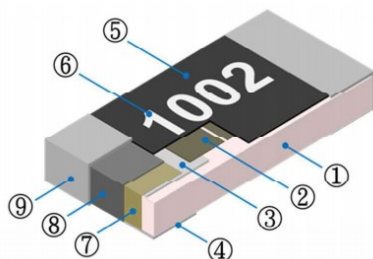
Bottom view

Dimension Specifications



STYLE (size)				Dimensions : mm				
				L	W	T	a	b
RMT-02/RPT-02		0201		0.60 ±0.05	0.30 ±0.05	0.23 ±0.05	0.12 ±0.05	0.15 ±0.05
RMT-04	RPT-04	RPTH-04	0402	1.00 ±0.10	0.50 ±0.05	0.30 ±0.05	0.20 ±0.10	0.20 ±0.10
RMT-06	RPT-06	RPTH-06	0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.30 ±0.20	0.30 ±0.20
RMT-10	RPT-10	RPTH-10	0805	2.00 ±0.15	1.25 ±0.15	0.55 ±0.10	0.35 ±0.20	0.40 ±0.20
RMT-18	RPT-18	RPTH-18	1206	3.10 ±0.15	1.60 ±0.15	0.55 ±0.10	0.45 ±0.20	0.50 ±0.20
RMT-20	RPT-20	RPTH-20	1210	3.10 ±0.15	2.50 ±0.15	0.55 ±0.10	0.45 ±0.20	0.50 ±0.20
RMT-22	RPT-22	RPTH-22	2010	5.00 ±0.15	2.50 ±0.15	0.55 ±0.10	0.60 ±0.20	0.60 ±0.20
RMT-24	RPT-24	RPTH-24	2512	6.30 ±0.15	3.20 ±0.15	0.55 ±0.10	0.60 ±0.20	0.60 ±0.20

Construction



1	Alumina Substrate	6	Marking
2	Resistive Layer	7	Side Electrode
3	Top Electrode	8	Nickel Barrier
4	Bottom Electrode	9	Solder Coating(Sn)
5	Overcoat		



RMT SERIES (Standard Thin Film Type)

Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R ppm/℃	Resistance value					
					±0.01%(T)	±0.05%(A)	±0.1%(B)	±0.25%(C)	±0.5%(D)	±1%(F)
RMT-02/0201	1/32W	15V	30V	±25 ±50	--	--	22Ω ~ 75KΩ			
RMT-04/0402	1/16W	50V	100V			49.9Ω ~ 12KΩ	4 Ω ~ 511KΩ			
RMT-06/0603	1/16W	50V	100V			4.7Ω ~ 332KΩ	1 Ω ~ 1MΩ			
RMT-10/0805	1/10W	100V	200V			4.7Ω ~ 1MΩ	1 Ω ~ 2MΩ			
RMT-18/1206	1/8W	150V	300V				1 Ω ~ 2.5MΩ			
RMT-20/1210	1/4W						1 Ω ~ 3MΩ			
RMT-22/2010	1/4W									
RMT-24/2512	1/2W									

RPT SERIES (High Power / Precision Thin Film Type)

Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R ppm/℃	Resistance value					
					±0.01%(T)	±0.05%(A)	±0.1%(B)	±0.25%(C)	±0.5%(D)	±1%(F)
RPT-02/0201	1/20W	25V	50V	±10, ±15 ±25, ±50	--		10Ω ~ 5.1KΩ			
							10Ω ~ 82KΩ			
RPT-04/0402	1/16W	50V	100V	±5	49.9Ω ~ 20KΩ					
				±10, ±15	49.9Ω ~ 20KΩ		10Ω ~ 100KΩ			
				±25	49.9Ω ~ 20KΩ		4.7Ω ~ 220KΩ		2.49Ω ~ 220KΩ	
				±50	---		4.7Ω ~ 220KΩ		2.49Ω ~ 220KΩ	
RPT-06/0603	1/10W	75V	150V	±5	24.9Ω ~ 60KΩ		20Ω ~ 60KΩ			
				±10, ±15	4.7Ω ~ 511KΩ					
				±25	24.9 ~ 100KΩ	4.7 ~ 332KΩ	1.0 Ω ~ 1MΩ		1.0 Ω ~ 3M32KΩ	
				±50			1.0 Ω ~ 1MΩ		1.0 Ω ~ 3M32KΩ	
RPT-10/0805	1/8W	150V	300V	±5	24.9 ~ 150KΩ					
				±10, ±15	24.9 ~ 200KΩ	4.7 ~ 511KΩ	4.7Ω ~ 1MΩ			
				±25			1.0Ω ~ 1MΩ		1.0 Ω ~ 3M32KΩ	
				±50			1.0Ω ~ 1MΩ		1.0 Ω ~ 3M32KΩ	
RPT-18/1206	1/4W	200V	400V	±5	24.9Ω ~ 300KΩ					
				±10, ±15	24.9 ~ 499KΩ	4.7 ~ 1MΩ	4.7Ω ~ 1MΩ			
				±25		1.0 Ω ~ 1MΩ	1.0Ω ~ 1M5Ω		1.0 Ω ~ 3M32KΩ	
				±50		1MΩ	1.0Ω ~ 1M5Ω		1.0 Ω ~ 3M32KΩ	
RPT-20/1210	1/4W			±5	49.9Ω ~ 100KΩ		20Ω ~ 100KΩ			
				±10, ±15			10Ω ~ 1MΩ			
				±25			4.7Ω ~ 1MΩ		2.49Ω ~ 1MΩ	
				±50			---		4.7Ω ~ 1MΩ	
RPT-22/2010	1/2W			±5	49.9Ω ~ 100KΩ		20Ω ~ 100KΩ			
				±10, ±15	24.9 ~ 100KΩ	4.7 ~ 1MΩ	4.7Ω ~ 1MΩ			
				±25			4.7Ω ~ 1MΩ		1.0Ω ~ 1MΩ	
				±50			4.7Ω ~ 1MΩ		1.0Ω ~ 1MΩ	
RPT-24/2512	3/4W			±5	49.9Ω ~ 100KΩ		20Ω ~ 100KΩ			
				±10, ±15	24.9 ~ 100KΩ	4.7 ~ 1MΩ	4.7Ω ~ 1MΩ			
				±25			4.7Ω ~ 1MΩ		1.0Ω ~ 1MΩ	
				±50			4.7Ω ~ 1MΩ		1.0Ω ~ 1MΩ	



RPTH SERIES (Ultra High Power Thin Film Type)

Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R ppm/℃	Resistance value					
					±0.01%(T)	±0.05%(A)	±0.1%(B)	±0.25%(C)	±0.5%(D)	±1%(F)
RPTH-04/0402	1/10W	50V	100V	±5	49.9 ~ 20KΩ					
				±10, ±15	49.9~12KΩ		49.9 ~ 100KΩ			
				±25	---	49.9Ω ~ 12KΩ	4.7Ω ~255KΩ		2.49Ω ~255KΩ	
				±50			4.7Ω ~255KΩ		1.0Ω ~255KΩ	
RPTH-06/0603	1/6W	100V	150V	±25, ±50	---	10Ω ~332KΩ				
	1/8W	150V	300V	±10, ±15	---		10Ω ~47KΩ			
				±25	---		4.7Ω ~ 47KΩ		2.49Ω ~ 47KΩ	
				±50			1.0Ω ~ 47KΩ			
RPTH-10/0805	1/4W	150V	300V	±10, ±15	---		10Ω ~47KΩ			
				±25	---	10Ω ~ 499KΩ	4.7Ω ~499KΩ		2.49Ω ~499KΩ	
				±50			1.0Ω ~499KΩ			
RPTH-18/1206	1/3W	200V	400V	±25, ±50	---	10Ω ~ 1MΩ				
	1/2W			±10, ±15	---		10Ω ~100KΩ			
				±25			4.7Ω ~100KΩ		2.49Ω ~100KΩ	
				±50			1.0Ω ~100KΩ			
RPTH-20/1210	1/3W			±5	24.9Ω ~ 300KΩ					
				±10, ±15	24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ				
				±25, ±50		1Ω ~ 1MΩ				
	1/2W			±10, ±15	---		10Ω ~100KΩ			
				±25			4.7Ω ~1MΩ		2.49Ω ~3M32Ω	
±50	1.0Ω ~3M32Ω									
RPTH-22/2010	3/4W			±10, ±15	---		10Ω ~100KΩ			
				±25			4.7Ω ~1MΩ		2.49Ω ~3M32Ω	
				±50			1.0Ω ~3M32Ω			
RPTH-24/2512	1W			±10, ±15	24.9Ω ~ 499KΩ	4.7~1MΩ	4.7Ω ~1MΩ			
				±25			4.7Ω ~1MΩ		2.49Ω ~3M32Ω	
				±50			1.0Ω ~3M32Ω			

- For non standard parts, please contact our sales dept.

- Operating Temperature Range: -55°C~+155°C

- Lower Resistance : 1~10Ω; High Power Rating



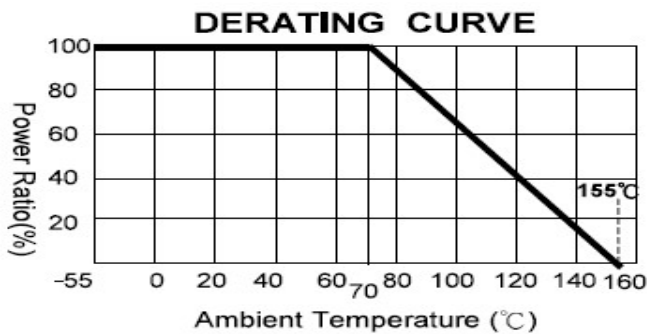
RMT SERIES - Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C / +125°C, 25°C is the reference temperature	Refer to RMT type pag.2
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 Sec.	$\pm (0.2\% + 0.05\Omega)$ No Visual damage
Insulation Resistance	JIS -C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	$\geq 10G \Omega$
Solderability	JIS- C- 5201-1 4.17 IEC-60115-1 4.17	245 $\pm$ 5°C for 3 seconds.	> 95% min. coverage
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	$\pm (0.1\% + 0.05\Omega)$ No Visual damage
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds.	> 95% Coverage No Visual damage
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +150°C, 100 cycles	$\pm (0.2\% + 0.05\Omega)$ No Visual damage
High Temperature Exposure	JIS -C- 5201-1 4.25 IEC-60068-2-2	At 155 $\pm$ 5°C for 1000	$\pm(0.5\%+ 0.05\Omega)$
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm$ 2°C, 90~95% R.H RCWV or Max.working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	$\pm(0.3\%+ 0.05\Omega)$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm$ 2°C, RCWV or Max.working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	$\pm (0.2\% + 0.05\Omega)$ 0201: > 7K Ω -> $\Delta R \pm 0.5\%$; $\leq 7K\Omega$ -> $\Delta R \pm 0.2\%$
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D:0201,0402,0603,0805= 3mm; 1206,1210= 3mm 2010, 2512 =2mm	$\pm (0.1\% + 0.05\Omega)$

RPT / RPTH SERIES - Reliability Test and

Test Item	Test Method	Procedure	Requirements			
			RPT SERIES		RPTH SERIES	
			$\pm 0.01\%$, $\pm 0.05\%$	$\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$	$\pm 0.01\%$, $\pm 0.05\%$	$\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C / +125°C, 25°C is the reference temperature	Refer to PRT type pag.2		Refer to RPTH ype, page 3	
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 Sec.	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$ 100K Ω ~ 3M32 Ω : $\pm(1.0\% + 0.05\Omega)$
Insulation Resistance	JIS -C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	$\geq 10G\Omega$ RPTH series 100K Ω ~ 3M32 Ω : Individual leaching area $\leq 5\%$; total leaching area $\leq 10\%$			
Solderability	JIS- C- 5201-1 4.17 IEC-60115-1 4.17	245 $\pm 5^\circ\text{C}$ for 3 seconds.	> 95% Coverage No Visual damage			
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm 5^\circ\text{C}$ for 10 seconds.	$\pm(0.1\% + 0.05\Omega)$ No Visual damage	$\pm(0.1\% + 0.05\Omega)$ No Visual damage	$\pm(0.1\% + 0.05\Omega)$ No Visual damage	$\pm(0.5\% + 0.05\Omega)$ No Visual damage
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm 5^\circ\text{C}$ for 30 seconds.	> 95% Coverage No Visual damage			
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	$\pm(0.2\% + 0.05\Omega)$ No Visual damage	$\pm(0.2\% + 0.05\Omega)$ No Visual damage	$\pm(0.2\% + 0.05\Omega)$ No Visual damage	$\pm(0.5\% + 0.05\Omega)$ No Visual damage
High Temperature Exposure	JIS -C- 5201-1 4.25 IEC-60068-2-2	At 155 $\pm 5^\circ\text{C}$ for 1000	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$
Resistance to Solvent	JIS -C- 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25 °C for 60 secs. Then the resistor is left in the room for 48 hrs.	$\pm(0.1\% + 0.05\Omega)$ No Visual damage	$\pm(0.5\% + 0.05\Omega)$ No Visual damage	$\pm(0.1\% + 0.05\Omega)$ No Visual damage	$\pm(0.5\% + 0.05\Omega)$ No Visual damage
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm 2^\circ\text{C}$, 90~95% R.H RCWV or Max.working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$; 100K Ω ~ 3M32 Ω : $\pm(1.0\% + 0.05\Omega)$
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C /85% RH, 10% of operationg power. Measurement at 24 ± 4 hours after test conclusion	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.2\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm 2^\circ\text{C}$, RCWV or Max.working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$; 100K Ω ~ 3M32 Ω : $\pm(1.0\% + 0.05\Omega)$
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D:0201,0402,0603,0805= 5mm; 1206 ,1210= 3mm 2010 · 2512 =2mm	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.1\% + 0.05\Omega)$	$\pm(0.5\% + 0.05\Omega)$; 100K Ω ~ 3M32 Ω : $\pm(1.0\% + 0.05\Omega)$

Derating Curve



The Operating Temperature Range: $-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$. Power Rating is in the case based on continuous full-load at ambient temperature of 70°C . For operation at ambient temperature in excess of 70°C , the load should be derated in accordance with figure of derating curve.

* Rate voltage

Resistance range: $\geq 1\Omega$

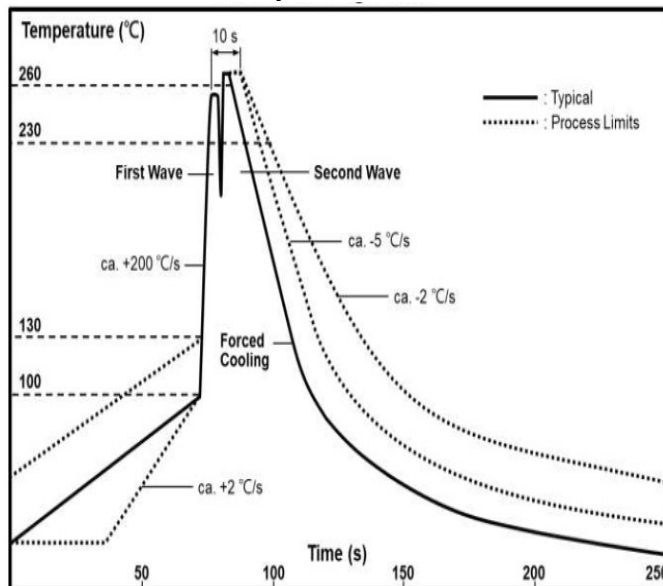
Rated voltage: The resistor shall have a DC continuous working voltage or a RMS AC(ms) continuous working voltage at commercial - line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

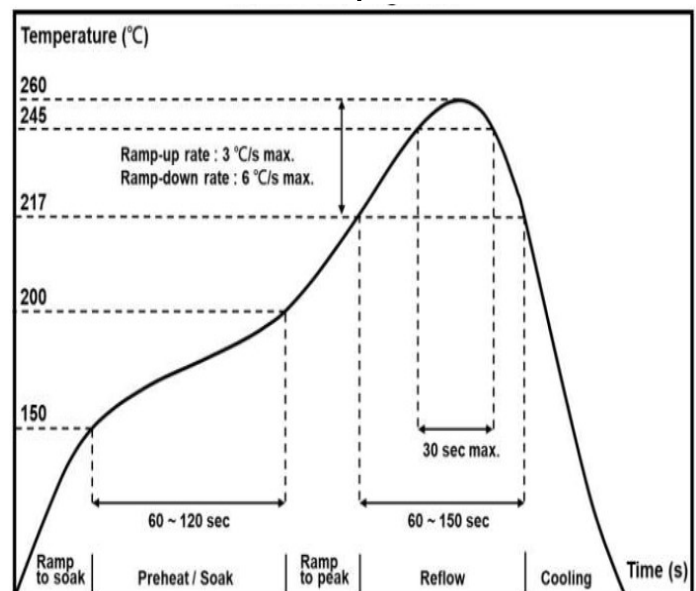
E=Rated voltage(V)
P=Power rating(W)
R=Nominal resistance(Ω)

Recommended Customer Soldering Parameters

* Wave solder Temperature Condition



* Solder reflow Temperature Condition



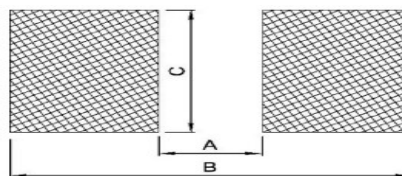
* Rework Temperature (hot air equipment: 350°C , 3~5 seconds)

* Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temp. exceed the recommended profile, devices may not meet the performance requirements.

* Recommend Land Pattern Design



Type	0201	0402	0603	0805	1206	1210	2010	2512
A	0.25	0.60	0.85	1.30	2.20	2.00	3.80	4.90
B	0.85	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.35	0.70	1.00	1.40	1.70	2.70	2.70	3.40



Marking



0201, 0402 no marking



0603: 3 digits code



0805~2512 : 3 digits code

0805~2512 1%
4 digits code

* 0603 1%: EIA-96 Marking. Please refer to data form as below:

code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value
01	100	13	133	25	178	37	237	49	316	61	422	73	562	85	750
02	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768
03	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787
04	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806
05	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825
06	113	18	150	30	200	42	267	54	357	66	475	78	634	90	845
07	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866
08	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887
09	121	21	162	33	215	45	287	57	383	69	511	81	681	93	909
10	124	22	165	34	221	46	294	58	392	70	523	82	698	94	931
11	127	23	169	35	226	47	301	59	402	71	536	83	715	95	953
12	130	24	174	36	232	48	309	60	412	72	549	84	732	96	976

This table shows the first two digits for the three-digit EIA-96 part marking scheme. The third character is a letter multiplier:

$Y=10^{-2}$ $X=10^{-1}$ $A=10^0$ $B=10^1$ $C=10^2$ $D=10^3$ $E=10^4$ $F=10^5$

* E24 & E96 data form

E24		E96							
10	33	100	178	316	562	133	237	422	750
11	36	102	182	324	576	137	243	432	768
12	39	105	187	332	590	140	249	442	787
13	43	107	191	340	604	143	255	453	806
15	47	110	196	348	619	147	261	464	825
16	51	113	200	357	634	150	267	475	845
18	56	115	205	365	649	154	274	487	866
20	62	118	210	374	665	158	280	499	887
22	68	121	215	383	681	162	287	511	909
24	75	124	221	392	698	165	294	523	931
27	82	127	226	402	715	169	301	536	953
30	91	130	232	412	732	174	309	549	976

Parts Number System

RPT -

Type

RMT Series -

Standard

Resistance type

RPT Series-

High Power/
Precision type

RPTH Series-

Ultra High
Power type

18 -

Size

02=0201

04=0402

06=0603

10=0805

18=1206

20=1210

22=2010

24=2512

1004

Resistance

0R = 0R00

1R = 1R00

9R7 = 9R70

10R = 10R0

100R = 1000

1KR = 1001

1MR = 1004

C

Tolerance

A = $\pm 0.05\%$ T = $\pm 0.01\%$ B = $\pm 0.1\%$ C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1\%$

R

Standard

Packing

R=Paper
tape reelK=Embossed
plastic tape
reel

E

TCR/ppm°C

S = $\pm 5\text{ppm}$ T = $\pm 10\text{ppm}$ H = $\pm 15\text{ppm}$ E = $\pm 25\text{ppm}$ C = $\pm 50\text{ppm}$

THIN FILM AUTOMOTIVE CHIP RESISTORS

(RMFT SERIES)

(AUTOMOTIVE GRADE)

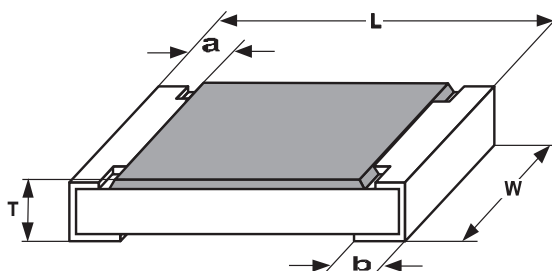
Features

1. Tolerance to 0.05%
2. Low TCR to $\pm 10\text{ppm}/^{\circ}\text{C}$
3. AEC-Q200 compliant
4. Halogen free and lead free
5. RoHS compliant

Applications

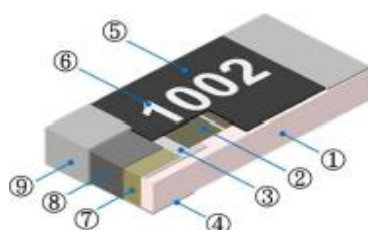
1. Industrial electronics
2. Communication devices
3. Measuring instrument
4. Converters

Dimensional Specifications



STYLE	Size code	Dimensions : mm				
		L	W	T	a	b
RMFT-04	0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
RMFT-06	0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
RMFT-10	0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
RMFT-18	1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20

Construction



1. Alumina Substrates
2. Resistive Layer
3. Top Inner Electrode
4. Bottom Inner Electrode
5. Protective Overcoat
6. Marking
7. Side Inner Electrode
8. Nickel Barrier
9. Solder coating (Sn)



General Specification

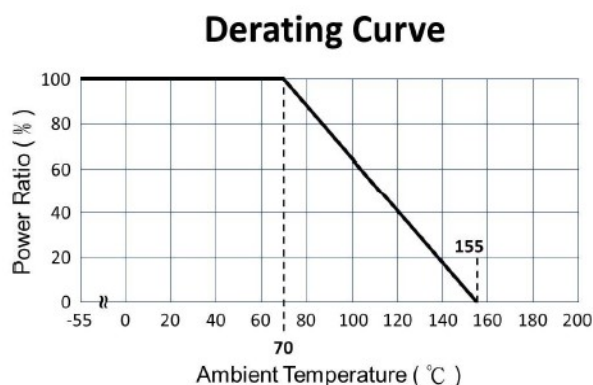
Type	Power Rating at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R (PPM/°C)	Resistance Range(Ω)				
					±0.05%	±0.1%	±0.25%	±0.5%	±1%
RMFT-04 0402	1/16W	50V	100V	±10, ±15 ±25, ±50	49.9Ω~ 12KΩ	10Ω~68KΩ			
						4.7Ω~220KΩ			
RMFT-06 0603	1/10W	75V	150V	±10, ±15 ±25, ±50	49.9Ω~ 30KΩ	10Ω~332KΩ			
						4.7Ω~680KΩ			
RMFT-10 0805	1/8W	150V	300V	±10, ±15 ±25, ±50	49.9Ω~ 50KΩ	10Ω~680KΩ			
						4.7Ω~1MΩ			
RMFT-18 1206	1/4W	200V	400V	±10, ±15 ±25, ±50	49.9Ω~ 100KΩ	10Ω~1MΩ			
						4.7Ω~1.5MΩ			

- Operating Temperature Range: -55°C~+155°C.
- For non-standard parts, please contact our sales department.

Derating Curve

The operating temperature range : -55°C ~ +155°C

Power rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating curve.



Rated Voltage

Resistance Range: $\geq 1\Omega$

Rated Voltage: the resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating as determined formula as folling:

$$V = \sqrt{P \times R}$$

V = Rated voltage (V)
P = Rated power (W)
R = Nominal resistance (Ω)

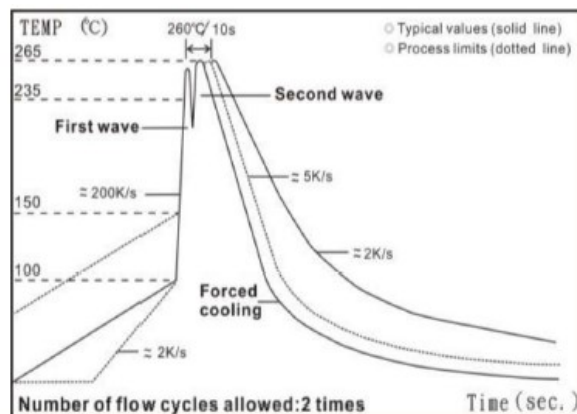


Reliability tests

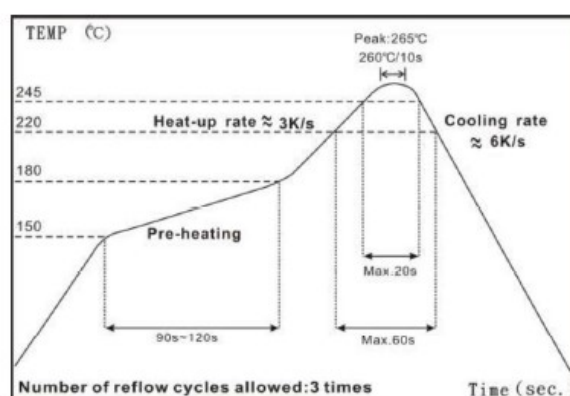
Test Items	Test Method	Condition of Test	Requirement
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC 60115-1 4.8	AT +25/-55°C and +25/+125°C ,25°C is the reference temperature	Refer to standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC 60115-1 4.13	2.5 times RCWV or Max. overload voltage whichever is less for 5 sec.	$\pm(0.1\% + 0.05\Omega)$ No visual damage
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds	> 95% Coverage No visual damage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1-4.18	260 $\pm$ 5°C for 10 seconds	$\pm(0.1\% + 0.05\Omega)$ No visual damage
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute	$\geq 10G\Omega$
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24 $\pm$ 4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	$\pm(0.3\% + 0.05\Omega)$ No visual damage
Resistance to Solvent	MIL-STD-202 Method 215	Add Aqueous wash chemical - OKEM clean or equivalent	$\pm(0.1\% + 0.05\Omega)$ No visual damage
Biased Humidity	MIL-STD-202 Method 103	1000 hours; 85°C /85% RH, 10% of operating power. Measurement at 24 $\pm$ 4 hours after test conclusion	$\pm(0.3\% + 0.05\Omega)$
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @T=155°C . Unpowered Measurement at 24 $\pm$ 4 hours after test conclusion.	$\pm(0.3\% + 0.05\Omega)$
Operation Life	MIL-STD-202 Method 108	Condition D steady state TA=125°C at derated power. Measurement at 24 $\pm$ 4 hours after test conclusion.	$\pm(0.3\% + 0.05\Omega)$
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and	No Visual damage
Mechanical Shock	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6(ms).	$\pm(0.1\% + 0.05\Omega)$
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000H	$\pm(0.1\% + 0.05\Omega)$
ESD	AEC-Q200-002 or ISO/DIS 10605	Human body model 0402 : 400V / 0603 : 1000V 0805 : 1500V / 1206 : 2000V	$\pm(0.5\% + 0.05\Omega)$
Solderability	J-STD-002	(1) 4 hrs 155°C dry heat (2) 245 $\pm$ 5°C 3 sec.	>95% Coverage No Visual damage
Terminal Strength (SMD)	AEC Q200-006	Pressurizing force for 60 seconds 0402 / 0603 : 8N ; 0805 / 1206 : 17.7N	No broken
Board Flex	AEC Q200-005	Beading once for 60 seconds 0402/0603/0805/1206 : 3mm	$\pm(0.1\% + 0.05\Omega)$
Sulfuration Test (FoS)	ASTM B809-95 ANSI/EIA-977	105 $\pm$ 2°C, no power rating for 1000hrs	$\pm(1.0\% + 0.05\Omega)$

Recommended Customer Soldering Parameters

◎ Wave Solder Temperature Condition



◎ Solder reflow Temperature condition



Rework temperature (hot air equipment): 350, 3~5 seconds

Recommended reflow methods

- IR, vapor phase oven, hot air oven
- if reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

Parts Number System

RMFT -	18 -	1004	C	R	E
Type	Size	Resistance	Tolerance	Standard Packing	TCR/ppm°C
RMFT	04=0402	0R = 0R00	A = ±0.05%	R=Paper	T= ±10ppm
Automotive	06=0603	1R = 1R00	B = ±0.1%	tape reel	H= ±15ppm
Grade	10=0805	10R = 10R0	C = ±0.25%	5Kpcs/Reel	E= ±25ppm
Thin Film	18=1206	100R = 1000	D = ±0.5%		C= ±50ppm
Chip		1MR = 1004	F = ±1%		
Resistor					

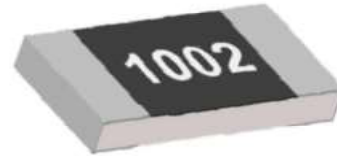


THICK FILM GENERAL PURPOSE CHIP RESISTORS

(RMC SERIES)

Application

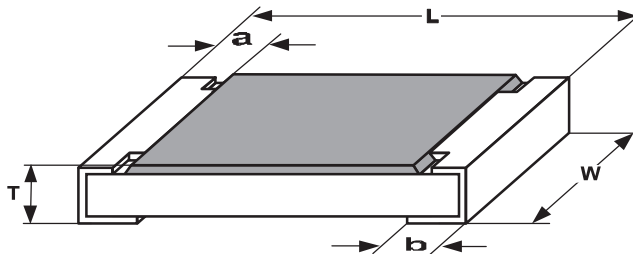
- * Power equipment
- * Telecommunication Equipments
- * Consumer Electrical, Electronic device
- * Home Appliance: Air conditioner, Refrigerator
- * Computer & relative products



Features

- * Reduce assembly costs.
- * Miniature size for compact PC Board.
- * Excellent mechanical strength and electrical stability.

Dimension Specifications



Style		Dimension					mm
		L	W	T	a	b	
RMC-01	01005	0.40 ±0.02	0.20 ±0.02	0.1 ±0.03	0.10 ±0.05	0.13 ±0.05	
RMC-02	0201	0.60 ±0.08	0.30 ±0.03	0.23 ±0.05	0.15 ±0.05	0.15±0.05	
RMC-04	0402	1.00 ±0.10	0.50 ±0.05	0.20 ±0.10	0.15 ±0.10	0.25 ±0.05	
RMC-06	0603	1.60 ±0.10	0.80 ±0.10	0.30 ±0.20	0.30 ±0.20	0.30 ±0.10	
RMC-10	0805	2.00 ±0.10	1.25 ±0.10	0.40 ±0.20	0.40 ±0.20	0.50 ±0.10	
RMC-18	1206	3.10 ±0.20	1.60±0.10	0.50 ±0.25	0.40±0.25	0.55 ±0.10	
RMC-20	1210	3.10 ±0.20	2.60 ±0.15	0.50 ±0.25	0.50±0.20	0.55 ±0.10	
RMC-22	2010	5.00 ±0.20	2.50 ±0.15	0.60 ±0.25	0.60±0.20	0.60 ±0.20	
RMC-24	2512	6.35 ±0.20	3.20 ±0.15	0.60 ±0.25	0.60±0.20	0.60 ±0.20	
RMC-26	1812	4.50 ±0.10	3.10 ±0.15	0.55 ±0.10	0.55 ±0.20	0.70 ±0.20	
RMC-28	1218	3.10 ±0.10	4.60 ±0.10	0.55 ±0.10	0.40 ±0.10	0.55 ±0.10	



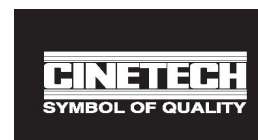
General Specifications

Style (Size)	Power rating at 70°C	Max working voltage	Max overload voltage	Operating Temp. Range	TCR ppm/°C	Resistance Range	
						±1%(F) (E24, E96)	±5%(J) (E24)
RMC-01 01005	1/32W	15V	30V	-55~+125°C	±300ppm	1Ω ~ 1MΩ	
RMC-02 0201	1/20W	25V	50V	-55~+125°C	-200/+400ppm	1Ω ~ 10Ω	
					±200ppm	10Ω ~ 10MΩ	
RMC-04 0402	1/16W	50V	100V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-06 0603	1/10W	75V	150V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-10 0805	1/8W	150V	300V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-18 1206	1/4W	200V	400V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-20 1210	1/2W 1/3W	200V	400V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-22 2010	3/4W	200V	400V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-24 2512	1W	200V	400V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02M~20MΩ	10Ω ~ 10MΩ
					±100ppm	10Ω ~ 10MΩ	
RMC-26 1812	3/4W	200V	400V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02MΩ ~ 20MΩ	
					±100ppm	10Ω ~ 10MΩ	
RMC-28 1218	1W	200V	400V	-55~+155°C	±400ppm	1Ω ~ 10Ω, 20.5MΩ ~ 100MΩ	
					±200ppm	1Ω ~ 9.76Ω, 1.02MΩ ~ 20MΩ	
					±100ppm	10Ω ~ 10MΩ	

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

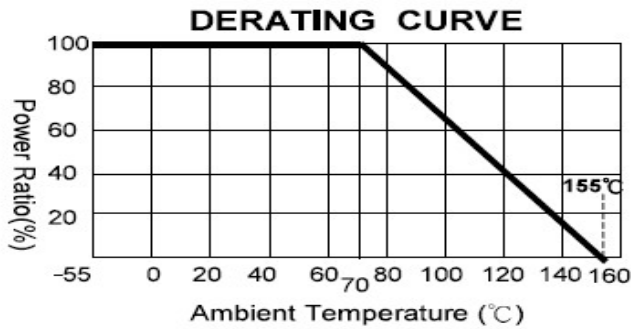
Type	01005	0402, 0603	0805, 1206	1210	2010	2512, 1812, 1218
Jumper Resistance value	50 mΩ Max.					
Jumper Rated Current	0.5A	1A	2A	2.5A	3.A	4A
Max. Over load Current < 1 second and 1 times	1A	3A		10A		



Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C / +155°C, 25°C is the reference temperature	As pec
Insulation Resistance	JIS- C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute	$\geq 10G \Omega$
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max Overload voltage whichever is less for 5 Sec	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.10\Omega)$
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds.	Individual leaching area $\leq 5\%$, Total leaching area $\leq 10\%$
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.05\Omega)$
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 5 cycles	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.10\Omega)$
Resistance to Solvent	JIS -C- 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25 °C for 60 secs. Then the resistor is left in the room for 48 hrs.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (0.5\% + 0.05\Omega)$
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm$ 2°C, 90~95% R.H RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.05\Omega)$ value $< 1\Omega : \pm (2.0\% + 0.05\Omega)$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm$ 2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (3.0\% + 0.10\Omega)$ value $< 1\Omega : \pm (3.0\% + 0.10\Omega)$
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 60 seconds D: 0201 ~ 0805= 3mm; 1206 , 1210= 3mm 2010 , 2512 =2mm	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.50\Omega)$

Derating Curve



Power Rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure or derating Curve.

* Rate voltage

Resistance range: $\geq 1\Omega$

Rated voltage: The resistor shall have a DC continuous working voltage or a RMS AC(ms) continuous working voltage at commercial - line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

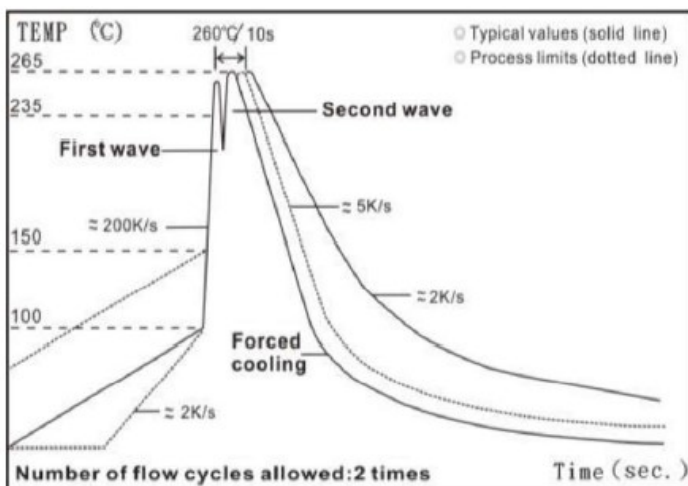
E=Rated voltage(V)

P=Power rating(W)

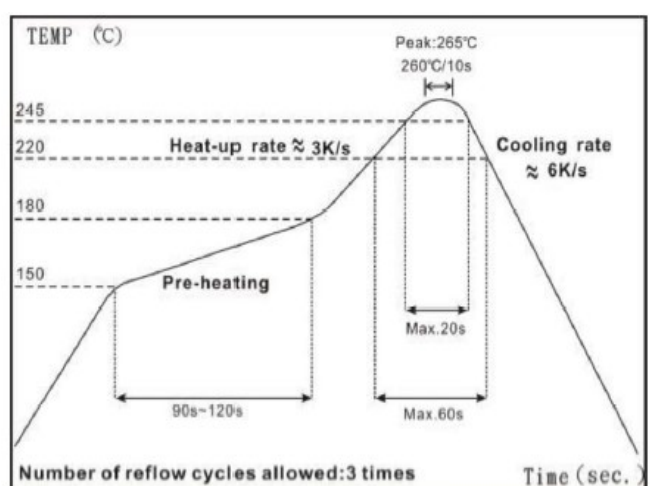
R=Nominal resistance(Ω)

Recommended Customer Soldering Parameters

* Wave solder Temperature Condition



* Solder reflow Temperature Condition



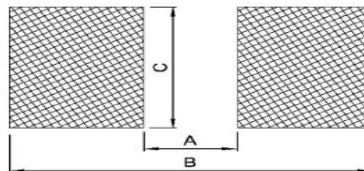
* Rework Temperature (hot air equipment: 350°C, 3~5 seconds)

* Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temp. exceed the recommended profile, devices may not meet the performance requirements.

* Recommend Land Pattern Design



Type	0201	0402	0603	0805	1206	1210	2010	2512
A	0.25	0.60	0.85	1.30	2.20	2.00	3.80	4.90
B	1.1	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.32	0.70	1.00	1.40	1.70	2.70	2.70	3.40



Marking



No marking

RMC-01(01005)
RMC-02(0201)
RMC-04(0402)



1% EIA 96 marking

RMC-06(0603)



1% : 4 digits code

RMC-10(0805) RMC-24(2512)
RMC-18(1206) RMC-26(1812)
RMC-20(1210) RMC-28(1218)



1% : 3 digits code

RMC-28(1218)



5% : 3 digits code

RMC-02(0201) RMC-20(1210)
RMC-04(0402) RMC-22(2010)
RMC-06(0603) RMC-24(2512)
RMC-10(0805) RMC-26(1812)
RMC-18(1206)

※5% tolerance: 3 digits

First two digits are significant figure,

Third digit is number of zeros, Letter R is decimal point.

- ⊙ 01005, 0201 and 0402 no marking
- ⊙ Standard packaging is 8mm tape reel per EIA481
- ⊙ Paper tape 7" reel : RMC-01/02/04:10,000PCS,
RMC-06/18/ 20: 5,000pcs

※1% tolerance: 4 digits

First three digits are significant figure,

Forth digit is number of zeros, Letter R is decimal point.

- ⊙ 0603% : EIA-96 marking
- ⊙ Plastic tape 7" reel: RMC-22/24/26/28:4K/reel

code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value
01	100	13	133	25	178	37	237	49	316	61	422	73	562	85	750
02	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768
03	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787
04	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806
05	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825
06	113	18	150	30	200	42	267	54	357	66	475	78	634	90	845
07	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866
08	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887
09	121	21	162	33	215	45	287	57	383	69	511	81	681	93	909
10	124	22	165	34	221	46	294	58	392	70	523	82	698	94	931
11	127	23	169	35	226	47	301	59	402	71	536	83	715	95	953
12	130	24	174	36	232	48	309	60	412	72	549	84	732	96	976

This table shows the first two digits for the three-digit EIA-96 part marking scheme. The third character is a letter multiplier:

⁻²Y=10 ⁻¹X=10 ⁰A=10 ¹B=10 ²C=10 ³D=10 ⁴E=10 ⁵F=10

Parts Number system

RMC -

Type

RMC Series-
Thick Film
General
Purpose Chip
Resistors

10 -

Size

04=0402
06=0603
10=0805
18=1206
20=1210
22=2010
24=2512

102

Resistance

3 Digits: for 5%
10K=103
100K=104
4 Digits: for 1%
10K=1002
100K=1003

J

Tolerance

J=± 5%
F=± 1%

R

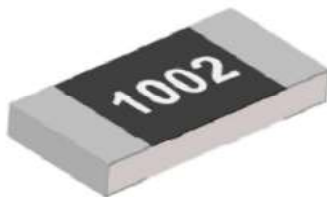
Standard Packing

R=Paper tape reel
10Kpcs/Reel:0402
5Kpcs/Reel
size: 0603~1206
K=Embossed
plastic tape reel
4Kpcs/Reel
size: 2010~2512



CURRENT SENSING THICK FILM CHIP RESISTORS

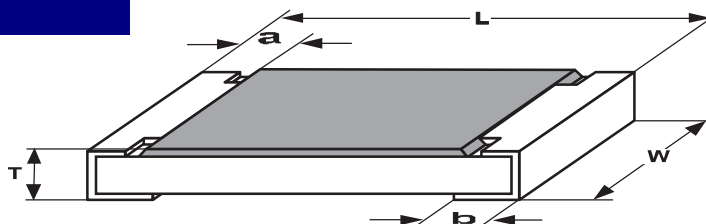
(RPC / RPL / RPCH SERIES)



Applications

- * Switching model power supply
- * Communication equipment
- * Consumer Electrical, Electronic device
- * Home Appliance: Air conditioner, Refrigerator
- * Computer & relative products: Main board

Dimension Specifications



Style				Dimension mm				
				L	W	T	a	b
RPC-04	RPL-04	RPCH-04	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10
RPC-06	RPL-06	RPCH-06	0603	1.60±0.10	0.80±0.10	0.45±0.15	0.30±0.20	0.30±0.20
RPC-10	RPL-10	RPCH-10	0805	2.00±0.10	1.25±0.10	0.50±0.15	0.35±0.20	0.40±0.20
RPC-18	RPL-18	RPCH-18	1206	3.10±0.10	1.60±0.10	0.55±0.15	0.50±0.20	0.50±0.20
RPC-20	RPL-20	RPCH-20	1210	3.10±0.10	2.50±0.15	0.55±0.15	0.50±0.20	0.50±0.20
RPC-22	RPL-22	RPCH-22	2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
RPC-24	RPL-24	RPCH-24	2512	6.30±0.20	3.20±0.15	0.55±0.10	0.60±0.25	0.60±0.25

RPC SERIES (High Power Electrical Specifications)

Style (Size)		Power rating at 70°C	Max working voltage	Max overload voltage	Resistance tolerance %	TCR ppm/°C	Resistance range	
							Min.	Max.
RPC-04	0402	1/10W	50V	100V	±1%F ±5%J	±400ppm	1Ω	10Ω
						±100ppm	10Ω	10MΩ
						* ±200ppm	10.1MΩ	30 MΩ
RPC-06	0603	1/8W	75V	150V		±400ppm	1Ω	10Ω
						±100ppm	10Ω	10MΩ
						* ±200ppm	10.1MΩ	30 MΩ
RPC-10	0805	1/4W	150V	300V		±400ppm	1Ω	10Ω
						±100ppm	10Ω	10MΩ
						* ±200ppm	10.1MΩ	30 MΩ
RPC-18	1206	1/2W	200V	400V	±1%F ±5%J	±400ppm	1Ω	10Ω
RPC-20	1210	2/3W				±100ppm	10Ω	10MΩ
RPC-22	2010	1W				±100ppm	10Ω	10MΩ
RPC-24	2512	2W				* ±200ppm	10.1MΩ	30 MΩ

* High Power High-Resistance : 10.1MΩ ~ 30MΩ; Tol. J 5% & F 1%; TCR: ±200 ppm



RPL SERIES (High Power Low Ohm Chip Resistors)

Style (Size)		Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	Resistance tolerance %	TCR ppm/°C	Resistance Range (mΩ)	
							Min.	Max.
RPL-04	0402	1/10W	0.32V	0.79 V	±1%F ±5%J	±800ppm	450mΩ	1000mΩ
						±500ppm	100mΩ	976mΩ
RPL-06	0603	1/8W	0.35V	0.88V		±1200ppm	20mΩ	47mΩ
						±800ppm	100mΩ	330mΩ
						±500ppm	100mΩ	976mΩ
RPL-10	0805	1/4W	0.50V	1.25V		±1500ppm	10mΩ	18mΩ
						±1200ppm	20mΩ	47mΩ
						±800ppm	50mΩ	100mΩ
						±500ppm	100mΩ	976mΩ
RPL-18	1206	1/2W	0.71V	1.77V	±1%F ±5%J	±800ppm	50mΩ	91mΩ
						±500ppm	100mΩ	976mΩ
RPL-20	1210	2/3W	0.81V	2.03V		±1500ppm	10mΩ	18mΩ
						±800ppm	50mΩ	100mΩ
						±500ppm	100mΩ	976mΩ
RPL-22	2010	1W	1.0V	2.5V		±800ppm	50mΩ	100mΩ
						±500ppm	100mΩ	976mΩ
RPL-24	2512	2W	1.41V	3.54V		±500ppm	100mΩ	976mΩ

* High Power Low-TCR ±100ppm available for resistance more than 100mΩ upon request.

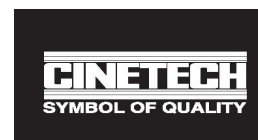
RPCH SERIES (Ultra High Power Chip Resistors)

Style (size)		Rated Power at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R ppm/°C	Resistance Range		
						±0.5%(D)	±1%(F), ±5%(J)	
							Min.	Max.
RPCH-04	0402	1/5W	50V	100V	±400ppm	--	1 Ω	10Ω
					±100ppm	10Ω~1MΩ	10Ω	10MΩ
RPCH-06	0603	1/3W	150V	200V	±400ppm	--	1 Ω	10Ω
					±100ppm	10Ω~1MΩ	10Ω	10MΩ
RPCH-10	0805	1/2W	200V	300V	±400ppm	--	1 Ω	10Ω
					±100ppm	10Ω~1MΩ	10Ω	10MΩ
RPCH-18	1206	3/4W	200V	400V	±400ppm	--	1 Ω	10Ω
					±100ppm	10Ω~1MΩ	10Ω	10MΩ
RPCH-20	1210	1W	200V	400V	±400ppm	--	1 Ω	10Ω
					±100ppm	10Ω~1MΩ	10Ω	10MΩ
RPCH-22	2010	1.5W	200V	400V	±400ppm	--	1 Ω	10Ω
					±150ppm	10Ω~1MΩ	10Ω	10MΩ
RPCH-24	2512	3W	250V	500V	±400ppm	--	1 Ω	10Ω
					±150ppm	10Ω~1MΩ	10Ω	10MΩ

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

Operating Temperature Range: -55°C ~ +155°C



RPC Series - Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C / +125°C, 25°C is the reference temperature	Refer to RPC type
Insulation Resistance	JIS- C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute	$\geq 10G \Omega$
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	High Power: 2.5 times RCWV or Max Overload voltage whichever is less for 2 Sec. Jumper: Over load current for 5 sec. 0402=4.5A; 0603=6.3A; 0805=8.8A; 1206=11A; 1210=13A; 1812=15A; 2512=20A	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.10\Omega)$ Jumper: Max. 0.02 Ω after test.
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds.	Individual leaching area $\leq 5\%$, Total leaching area $\leq 10\%$
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.05\Omega)$
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 5 cycles	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.10\Omega)$
Resistance to Solvent	JIS -C- 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25 °C for 60 secs. Then the resistor is left in the room for 48 hrs.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (0.5\% + 0.05\Omega)$ Jumper: Max. 0.02 Ω after test.
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm$ 2°C, 90~95% R.H RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.05\Omega)$ value < 1 Ω : $\pm (2.0\% + 0.05\Omega)$ Jumper: Max. 0.05 Ω after test.
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm$ 2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (3.0\% + 0.10\Omega)$ value < 1 Ω : $\pm (3.0\% + 0.10\Omega)$ Jumper: Max. 0.05 Ω after test.
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 60 seconds D: 0201 ~ 0805= 3mm; 1206, 1210= 3mm 2010, 2512 =2mm	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.50\Omega)$

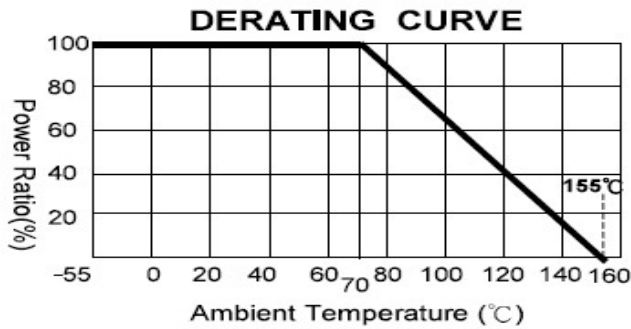
Type	0402	0603	0805	1206	1210	2010	2512
Jumper Resistance value	20 m Ω Max.						
Jumper Rated Current	2A	2.5A	3.5A	5A	6A	7A	10A
Max. Over load Current < 1 second and 1 times	6A	9A	13A	16A	19A	22A	30A



RPL / RPCH Series - Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C / +125°C, 25°C is the reference temperature	Refer to RPL / RPCH type
Insulation Resistance	JIS- C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute	$\geq 10G \Omega$
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	High power: RCWV*2.5 or Max. Overload voltage whichever is less for 2 Sec Ultra Power: 5 x Rated Power or Max Overload voltage whichever is less for 5 Sec.	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.10\Omega)$
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds.	Individual leaching area $\leq 5\%$, Total leaching area $\leq 10\%$
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.05\Omega)$
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 5 cycles	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.10\Omega)$
Resistance to Solvent	JIS -C- 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25 °C for 60 secs. Then the resistor is left in the room for 48 hrs.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (0.5\% + 0.05\Omega)$
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm$ 2°C, 90~95% R.H RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.05\Omega)$ value $< 1\Omega$: $\pm (2.0\% + 0.05\Omega)$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm$ 2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (3.0\% + 0.10\Omega)$ value $< 1\Omega$: $\pm (3.0\% + 0.10\Omega)$
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 60 seconds D: 0201 ~ 0805= 3mm; 1206, 1210= 3mm 2010、2512 =2mm	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.50\Omega)$

Derating Curve



The Operating Temperature Range:

-55°C ~ +155°C. Power Rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure or derating Curve.

* Rate voltage

Resistance range: $\geq 1\Omega$

Rated voltage: The resistor shall have a DC continuous working voltage or a RMS AC(ms) continuous working voltage at commercial - line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

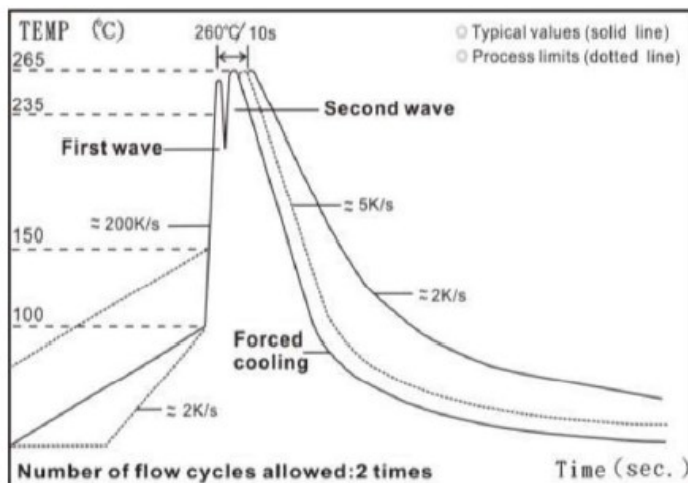
E=Rated voltage(V)

P=Power rating(W)

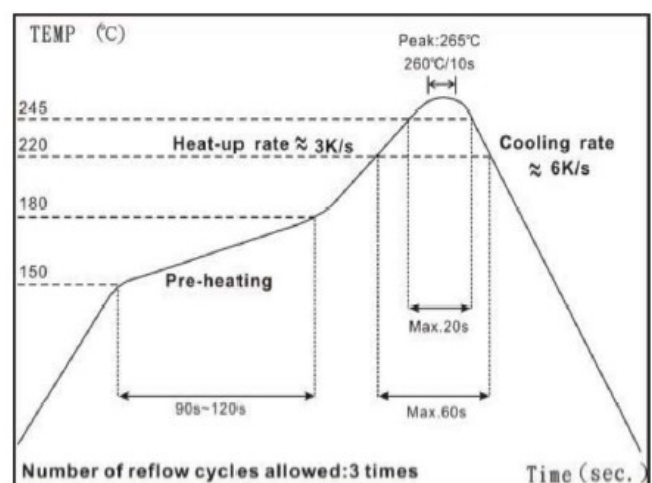
R=Nominal resistance(Ω)

Recommended Customer Soldering Parameters

* Wave solder Temperature Condition



* Solder reflow Temperature Condition



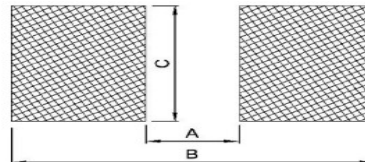
* Rework Temperature (hot air equipment: 350°C, 3~5 seconds)

* Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temp. exceed the recommended profile, devices may not meet the performance requirements.

* Recommend Land Pattern Design



Type	0402	0603	0805	1206	1210	2010	2512
A	0.60	0.85	1.30	2.20	2.00	3.80	4.90
B	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.70	1.00	1.40	1.70	2.70	2.70	3.40



Marking

* General Resistance Codes



0201, 0402 no marking



0603: 3 digits code



0805~2512 5%



0805~2512 1%

code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value
01	100	13	133	25	178	37	237	49	316	61	422	73	562	85	750
02	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768
03	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787
04	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806
05	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825
06	113	18	150	30	200	42	267	54	357	66	475	78	634	90	845
07	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866
08	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887
09	121	21	162	33	215	45	287	57	383	69	511	81	681	93	909
10	124	22	165	34	221	46	294	58	392	70	523	82	698	94	931
11	127	23	169	35	226	47	301	59	402	71	536	83	715	95	953
12	130	24	174	36	232	48	309	60	412	72	549	84	732	96	976

This table shows the first two digits for the three-digit EIA-96 part marking scheme. The third character is a letter multiplier:

$Y=10^{-2}$ $X=10^{-1}$ $A=10^0$ $B=10^1$ $C=10^2$ $D=10^3$ $E=10^4$ $F=10^5$

* m Ω Resistance Codes



0402 no marking

0603 ~ 2512 5%
3 digits code0805~2512 1%
4 digits code

E-24 value	Code		Example	
	5%	1%	5%	1%
10m Ω ~ 99m Ω	R01	0R01	R01=10m Ω	0R01=10m Ω
100m Ω ~ 990m Ω	R10	0R10	R10=100m Ω	0R10=100m Ω

Parts Number system

RPC -	10 -	102	J	R
Type RPC Series- Standard Resistances RPL Series- Low ohmic Chip Resistor RPCH Series- Ultra High Power Chip Resistor	Size 04=0402 06=0603 10=0805 18=1206 20=1210 22=2010 24=2512	Resistance 3 Digits: for 5% 10K=103 100K=104 R01=10m Ω R10=100m Ω 4 Digits: for 1% 10K=1002 100K=1003 0R01=10m Ω 0R10=100m Ω	Tolerance J=± 5% F=± 1%	Standard Packing R=Paper tape reel 10Kpcs/Reel size: 0402 5Kpcs/Reel size: 0603~1206 K=Embossed plastic tape reel 4Kpcs/Reel size: 2010~2512

THICK FILM AUTOMOTIVE CHIP RESISTORS

(RMF / RPF / RPFH SERIES)

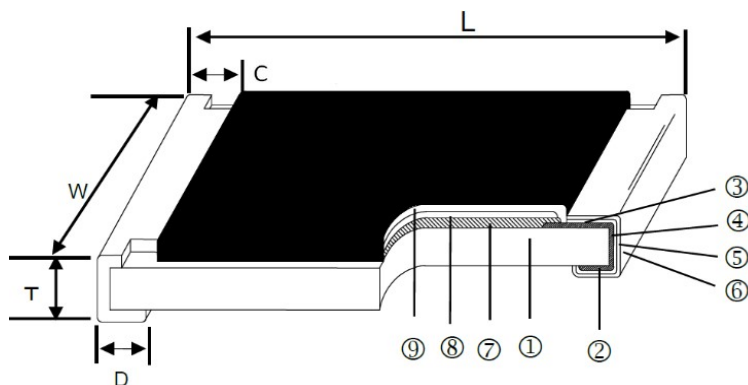
Applications:

- * Automotive Industry
- * Telecommunication Equipments
- * Navigation equipment, Air conditioning.
- * Computers, Instruments
- * Indoor Light, Central door locking, Wiper module

Features:

- * AEC-Q200 Compliance
- * Compatible with all soldering process
- * 100% CCD inspection
- * Highly reliable multilayer electrode construction

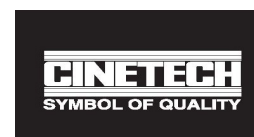
Contruction:



1	Alumina Substrate	6	External Electrode
2	Bottom Inner Electrode	7	Resistive Layer
3	Top Inner Electrode	8	Primary Overcoat
4	Edge Electrode	9	Secondary Overcoat
5	Barrier Layer		

Dimensional Specifications

Style				Dimensions				mm
				L	W	T	C	D
RMF-02	--	--	0201	0.60±0.03	0.30 ±0.03	0.23±0.03	0.15 ±0.05	0.15 ±0.05
RMF-04	RPF-04	RPFH-04 *	0402	1.00 ±0.05	0.50 ±0.05	0.35 ±0.05 * 0.30 ±0.05	0.20 ±0.10 * 0.15 ±0.10	0.20 ±0.10
RMF-06	RPF-06	RPFH-06 *	0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10 * 0.40 ±0.10	0.30 ±0.20	0.30 ±0.20
RMF-10	RPF-10	RPFH-10	0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.15	0.35 ±0.20	0.40 ±0.20
RMF-18	RPF-18	RPFH-18 *	1206	3.10 ±0.10	1.55±0.15	0.55 ±0.15	0.50 ±0.25 * 0.40 ±0.20	0.50 ±0.20
RMF-20	--	RPFH-20 *	1210	3.10 ±0.10	2.60 ±0.15 * 2.50 ±0.15	0.55 ±0.15	0.50 ±0.25	0.50 ±0.20
RMF-22	RPF-22	RPFH-22 *	2010	5.00 ±0.20	2.50 ±0.15	0.55 ±0.10	0.60 ±0.25 * 0.60 ±0.20	0.50 ±0.20 * 0.60 ±0.20
RMF-24	RPF-24	RPFH-24 *	2512	6.35 ±0.10	3.10 ±0.15 * 3.20 ±0.15	0.55 ±0.10 * 0.68 ±0.15	0.60 ±0.25 * 0.60 ±0.20	0.50 ±0.20 * 0.60 ±0.20



RMF SERIES (Standard Electrical Specification)

Type	Power Rating at 70 °C	Max. Working Voltage	Max. Overload Voltage	T.C.R (PPM/°C)	Resistance Range(Ω)		
					D (±0.5%) E-96 & E-24	F (±1%) E-96 & E-24	J (±5%) E-24
RMF-02 0201	1/20W	25V	50V	±200	---	1Ω - 10MΩ	
RMF-04 0402	1/16W	50V	100V	±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
				±100	10Ω ~ 1MΩ		
RMF-06 0603	1/10W	75V	150V	±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
				±100	10Ω ~ 1MΩ		
RMF-10 0805	1/8W	150V	300V	±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
				±100	10Ω ~ 1MΩ		
RMF-18 1206	1/4W	200V	400V	±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
RMF-20 1210	1/2W			±100	10Ω ~ 1MΩ		
				±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
				±100	---	10Ω ~ 1MΩ	
				±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
RMF-22 2010	3/4W			±100	10Ω ~ 1MΩ		
RMF-24 2512	1W	250V	500V	±200	---	1Ω - 9.76Ω, 1.02M~10MΩ	
				±100	10Ω ~ 1MΩ		

* Operating Temperature Range: -55°C ~ +155°C

Type	0201, 0402, 0603	0805, 1206	1210	2010	2512
Jumper Resistance Value	0Ω (< 50mΩ)				
Juice Rated Current	1A	2A	2.5A	3.5A	4A

RPF SERIES (High Power Rating Electrical Specification)

Type	Power Rating at 70 °C	Max. Working Voltage	Max. Overload Voltage	T.C.R (PPM/°C)	Resistance Range(Ω)		
					D (±0.5%) E-96 & E-24	F (±1%) E-96 & E-24	J (±5%) E-24
RPF-04 0402	1/8W	50V	100V	±200	---	1Ω - 9.76Ω	
				±100	10Ω ~ 1MΩ		
RPF-06 0603	1/4W	75V	150V	±200	---	1Ω - 9.76Ω	
				±100	10Ω ~ 1MΩ		
RPF-10 0805	1/3W	150V	300V	±200	---	1Ω - 9.76Ω	
				±100	10Ω ~ 1MΩ		
RPF-18 1206	1/2W	200V	400V	±200	---	1Ω - 9.76Ω	
				±100	10Ω ~ 1MΩ		
RPF-22 2010	1W			±200	---	1Ω - 9.76Ω	
				±100	10Ω ~ 1MΩ		
RPF-24 2512	2W	250V	500V	±200	---	1Ω - 9.76Ω	
				±100	10Ω ~ 1MΩ		

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB.

The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155 °C.

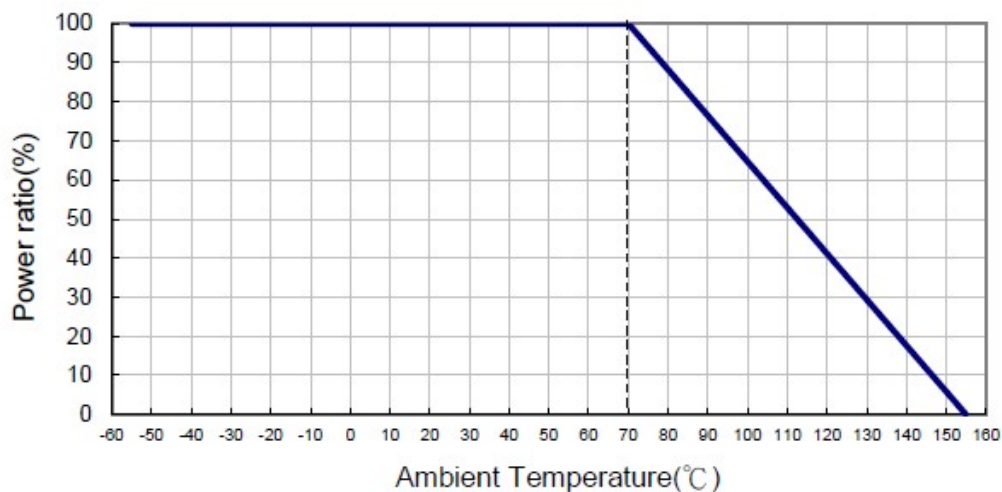


RPFH SERIES (Ultra High Power Rating Electrical Specification)

Type	Power Rating at 70 °C	Max. Working Voltage	Max. Overload Voltage	T.C.R (PPM/° C)	Resistance Range(Ω)		
					D (±0.5%) E-96 & E-24	F (±1%) E-96 & E-24	J (±5%) E-24
RPFH-04 0402	1/5W	50V	100V	±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	
RPFH-06 0603	1/3W	150V	200V	±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	
RPFH-10 0805	1/2W	200V	300V	±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	
RPFH-18 1206	3/4W	200V	400V	±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	
RPFH-20 1210	1W			±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	
RPFH-22 2010	1.5W			±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	
RPFH-24 2512	3W	250V	500V	±400	---	1Ω - 10Ω	
				±100	10Ω ~ 1MΩ	10 ~ 10MΩ	

* Operating Temperature Range: -55°C ~ +155°C

Derating Curve



Reliability test and Requirements

Test Item	Test Method	Condition of Test	Requirements	
			RMF, RPF Series	RPFH Series
Temperature Coefficient of Resistance	IEC 60115-1 4.8 JIS-C-5201-1 4.8	AT +25/-55°C and +25/+125°C 25°C is the reference temperature	As spec	
Short Time Overload	IEC 60115-1 4.13 JIS-C-5201-1 4.13	RCWV*2.5 or Max. Overload Voltage Ultra Power : Rated power or Max Overload Voltage whichever is lower for 5 seconds	±0.5%,1% : ±(1%+0.05Ω) ±5%:±(1.5%+0.10Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(2.0%+0.05Ω)
High Temperature Exposure	MIL-STD-202 Method 108	at +155°C for 1000 hrs	±0.5%,1% : ±(1%+0.05Ω) ±5%:±(1.5%+0.10Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(2.0%+0.05Ω)
Insulation Resistance	IEC 60115-1 4.6 JIS-C-5201-1 4.6	Max. Overload Voltage for 1 minute	≥10G	≥10G
Biased Humidity	MIL-STD-202 Method 103	1000 hrs 85°C/85%RH 10% of operating power	±0.5%,1% : ±(1%+0.05Ω) ±5%:±(2.0%+0.10Ω) 0Ω : < 100mΩ	±0.5%,1% : ±(1.0%+0.05Ω) ±5%:±(3.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.	±0.5%,1% : ±(1%+0.10Ω) ±5%:±(2.0%+0.10Ω) 0Ω : < 100mΩ	±0.5%,1% : ±(1.0%+0.05Ω) ±5%:±(3.0%+0.10Ω)
Voltage Proof	IEC 60115-1 4.7 JIS-C-5201-1 4.7	1.42 times Max.Operating Voltage for 1minute	No breakdown or flashover	-----
Leaching	IEC-60068-2-58 8.2.1 JIS-C-5201-1 4.18	260±5°C for 30 seconds	Individual leaching area ≤ 5% Total leaching area ≤ 10%	
Resistance to Solvents	MIL-STD-202 Method 215	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.	No visible damage on appearance and marking.	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(0.5%+0.05Ω)
Mechanical Shock	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock Pluse.Peak value is 100g's. Normal duration(D) is 6(ms)	±0.5%,1%:±(0.25%+0.05Ω) ±5%:±(1.0%+0.05Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(1.0%+0.05Ω) ±5%:±(2.0%+0.10Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000Hz.	±0.5%,1% : ±(1%+0.05Ω) ±5%:±(1.0%+0.05Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(1.0%+0.05Ω) ±5%:±(2.0%+0.10Ω)
Resistance to Soldering Heat	MIL-STD-202 Method 210 Ultra Power : JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10±1 seconds	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(1.0%+0.10Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(1.0%+0.05Ω)
Temperature Crycling	JESD22 Method JA-104	-55°C to +125°C, 1000 cycles	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(1.5%+0.05Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(0.5%+0.10Ω) ±5%:±(1.0%+0.05Ω)
ESD	AEC-Q200-002 or ISO/DIS 10605	Human body model 0201: 0.5KV 0402/0603: 1KV ; 0805 and above: 2KV	±(3% + 0.05Ω)	
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17 J-STD-002	245±5°C for 3 seconds	95% min. covered	±0.5%,1% : ±(0.5%+0.05Ω) ±5%:±(1.0%+0.05Ω)
Flammability	UL-94	V-0 or V-1 are acceptable. Electrical test not required.	No ignition of the tissue paper or scorching or the pinewood board	-----
Board Flex	AEC-Q200-005	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm	±0.5%,1% : ±(1%+0.05Ω) ±5%:±(1.0%+0.05Ω) 0Ω : < 50mΩ	±0.5%,1% : ±(1.0%+0.05Ω) ±5%:±(1.0%+0.05Ω)
Terminal Strength	AEC-Q200-006	Force of 1.8kg for 60 seconds Ultra Power : 0402/0603: 8N ; 0805 and above: 17.7N	No broken	
Sulfuration Test	EIA-977 (Condition A) Ultra Power:ASTM-B-809-95	60±2°C, no power rating for 500 hrs. Ultra Power :10±2°C, no rating power for	△R: ±1% 0Ω : < 50mΩ	△R: ±(2.0%+0.05Ω)

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

※ Ref. Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; ACE-Q200; MIL-STD-202; JESD22; UL-94; EIA-977

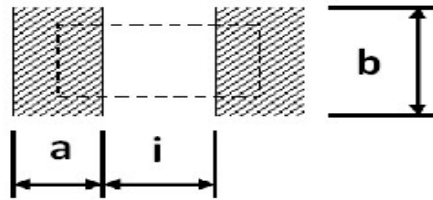
※ Storage Temperature: 15~28°C; Humidity < 80%RH

※ Shelf Life: 2 years from production date.



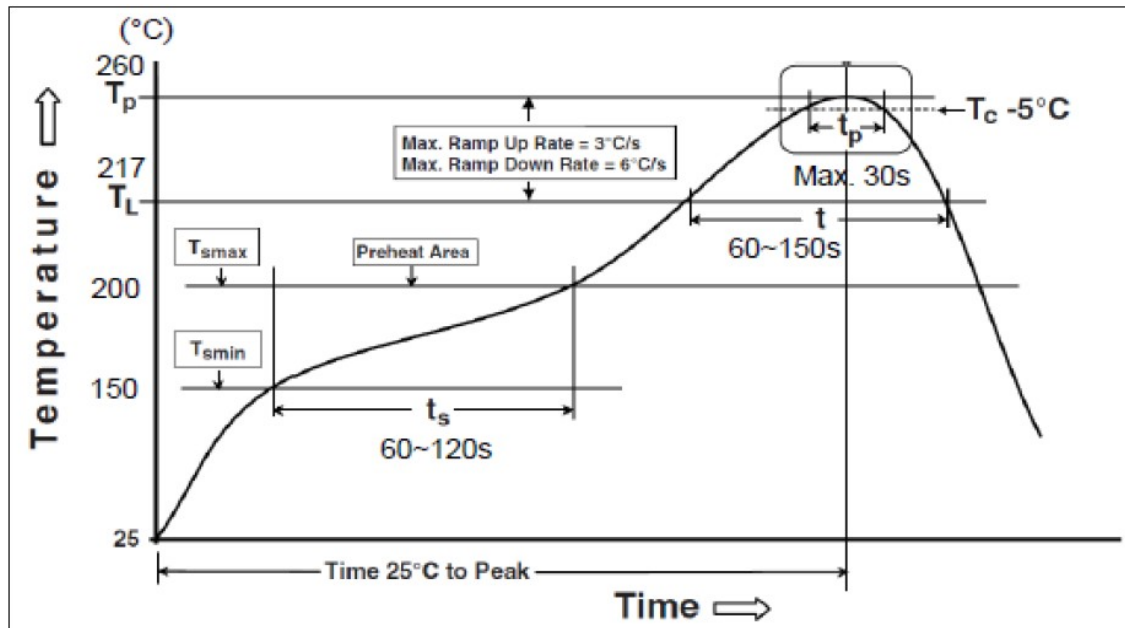
General information

* Recommend Land Pattern Design



Type	0201	0402	0603	0805	1206	1210	2010	2512
i	0.30	0.50	0.90	1.20	2.00	2.00	3.80	4.90
a	0.25	0.45	0.60	0.70	0.90	0.90	0.90	1.60
b	0.30	0.60	0.90	1.30	1.60	2.80	2.80	3.50

※ RMF/RPF Series : Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



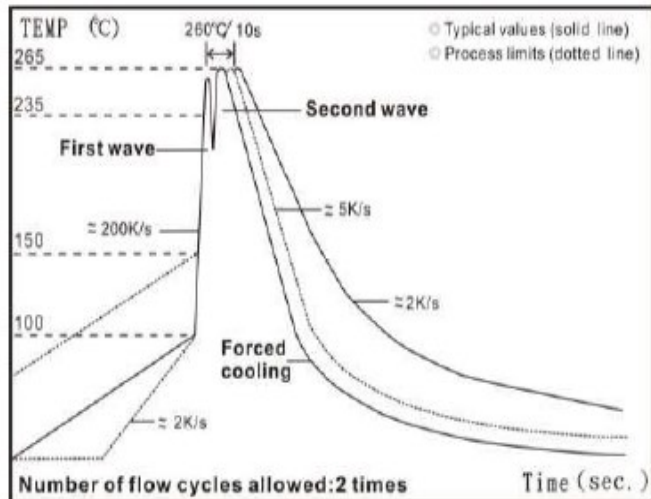
※ Reflow Profiles

Profile Feature	Pb-Free Assembly
Preheat	
Min. Temperature (T _{min})	150 °C
Max Temperature (T _{max})	200 °C
Preheating time (t _s) from (T _{min} to T _{max})	60-120 seconds
Ramp-up rate (T _L to T _p)	3 °C/second max.
Liquidous temperature (T _L)	217 °C
Time (t _L) maintained above T _L	60-150 seconds
Min. Peak temperature (T _p min)	235°C
Max. Peak temperature (T _p max)	260°C
Time (t _p) within 5 °C of the specified classification	30 seconds max.
Ramp-down rate (T _p to T _L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

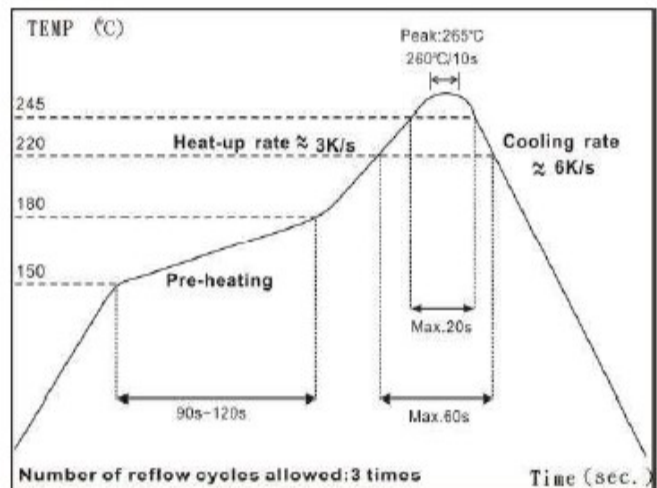
Recommended Customer Soldering Parameters

※ RPFH Series:

* Wave solder Temperature condition



* Solder reflow Temperature condition

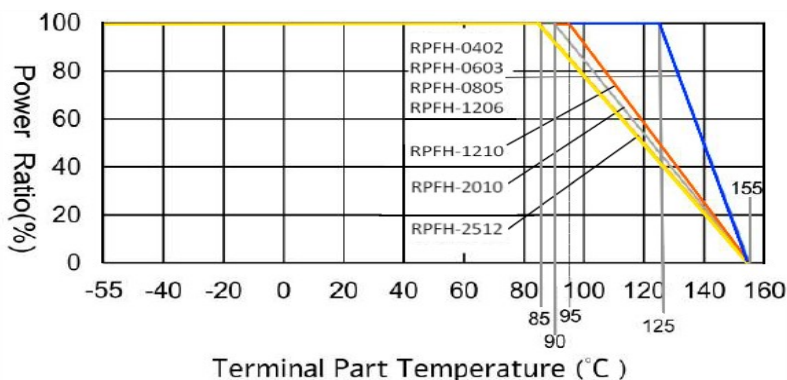


* Rework temperature (hot air equipment): 350°C, 3~5seconds

* Recommended reflow methods

- IR, vapor phase oven, hot air oven
- If reflow temperatures exceed the recommended profile, devices may not meet the performance

* Terminal part temperature



Parts Number System

RMF -

Type

Automotive
Gade Chip
Resistor
RME/RPF Type
High Power
RPFH type
Ultra High
Power

18 -

Size

02=0201
04=0402
06=0603
10=0805
18=1206
20=1210
22=2010
24=2512

1004

Resistance

0R = 0000
1R = 1R00
9R7 = 9R70
10R = 10R0
100R = 1000
1KR = 1001
1MR = 1004

F

Tolerance

D=0.5%
J = ±5%
F = ±1%

R

Standard Packing

R=Paper tape reel
10Kpcs/Reel
size: 0201-0402
5Kpcs/Reel
size: 0603-1210
K=Embossed
plastic tape reel
4Kpcs/Reel
size: 2010-2512



Marking

* 5%: marking code: 3 digits in E24 for 0603/0805/1206/1210/2010/2512

- First two digits are significant figure,
- Third digit is number of zeros.
- Letter R is decimal point.

EX: 120K, the marking code is 124 in E24



Value=10KΩ

* 1%: Marking code: 4 digits in E24 and E96 for 0805/1206/1210/2010/2512

- First three digits are significant figure,
- Forth digit is number of zeros.
- Letter R is decimal point.

EX: 120K, the marking code is 1203 in E24

121K, The marking code is 1213 in E96



Value=10KΩ

* 0201, 0402 no marking



* 0603 1%: E24 Marking.

3 digits marking in E24,

When the E24 and E96 are the same resistance, this marking in E96

EX : 01A= 100Ω 05C=11KΩ

* 0603 1%: E96 Marking.



EX : 13C=13K3Ω

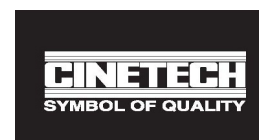
code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value	code	R Value
01	100	13	133	25	178	37	237	49	316	61	422	73	562	85	750
02	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768
03	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787
04	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806
05	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825
06	113	18	150	30	200	42	267	54	357	66	475	78	634	90	845
07	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866
08	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887
09	121	21	162	33	215	45	287	57	383	69	511	81	681	93	909
10	124	22	165	34	221	46	294	58	392	70	523	82	698	94	931
11	127	23	169	35	226	47	301	59	402	71	536	83	715	95	953
12	130	24	174	36	232	48	309	60	412	72	549	84	732	96	976

This table shows the first two digits for the three-digit EIA-96 part marking scheme. The third character is a letter multiplier:

⁻² Y=10 ⁻¹ X=10 ⁰ A=10 ¹ B=10 ² C=10 ³ D=10 ⁴ E=10 ⁵ F=10

* E24 & E96 data form

E24		E96							
10	33	100	178	316	562	133	237	422	750
11	36	102	182	324	576	137	243	432	768
12	39	105	187	332	590	140	249	442	787
13	43	107	191	340	604	143	255	453	806
15	47	110	196	348	619	147	261	464	825
16	51	113	200	357	634	150	267	475	845
18	56	115	205	365	649	154	274	487	866
20	62	118	210	374	665	158	280	499	887
22	68	121	215	383	681	162	287	511	909
24	75	124	221	392	698	165	294	523	931
27	82	127	226	402	715	169	301	536	953
30	91	130	232	412	732	174	309	549	976

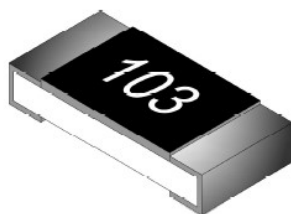


HIGH VOLTAGE SMD POWER RESISTORS

(RVC/RVCH SERIES)

Features

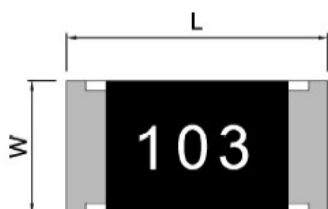
- * Special material and design for higher working voltage application



Applications

- * Power supply, Industrial control system
- * Backlight inverter
- * Measurement instrument
- * Medical, precision equipments

Dimensions (mm)



Style	L	W	H	l1	l2
RVC-04 0402	1.00±0.01	0.50±0.05	0.30±0.05	0.15±0.10	0.20±0.10
RVC-06 0603	1.60±0.20	0.80±0.15	0.40±0.10	0.30±0.20	0.30±0.10
RVC-10 0805	2.00±0.20	1.25±0.15	0.50±0.15	0.30±0.15	0.40±0.15
RVC-18 1206	3.05±0.10	1.60±0.20	0.55±0.15	0.40±0.20	0.50±0.20
RVC-20 1210	3.05±0.10	2.50±0.20	0.55±0.15	0.50±0.20	0.55±0.20
RVC-22 2010	5.00±0.20	2.50±0.20	0.55±0.10	0.60±0.20	0.60±0.20
RVC-24 2512	6.30±0.20	3.20±0.20	0.55±0.10	0.60±0.20	0.60±0.20

Style	L	W	H	l1	l2
RVCH-22 2010	5.00±0.20	2.50±0.20	0.55±0.10	0.40±0.20	0.60±0.20
RVCH-24 2512	6.30±0.20	3.20±0.20	0.55±0.10	0.40±0.20	0.60±0.20



Standard Electrical Specifications

Style	Power Rating at 70 °C	Max. Operating Voltage	Max. Overload Voltage	T.C.R. (ppm/°C)	Resistance Range		
					D: ±0.5%	J: ±5%	F: ±1%
RVC-04 0402	1/16W	100V	200V	±100	-	100Ω~10MΩ	
RVC-06 0603	1/10W	200V	400V	±100	-	47Ω~10MΩ	
				±200	-	10MΩ~30MΩ	
RVC-10 0805	1/8W	400V	800V	±100	100KΩ~1MΩ	47Ω~10MΩ	
				±200	-	10MΩ~30MΩ	
RVC-18 1206	1/4W	500V	1000V	±100	100KΩ~1MΩ	47Ω~10MΩ	
				±200	-	10MΩ~30MΩ	
RVC-20 1210	1/3W			±100	100KΩ~1MΩ	47Ω~10MΩ	
				±200	-	10MΩ~30MΩ	
RVC-22 2010	1/2W			±100	100KΩ~1MΩ	47Ω~10MΩ	
				±200	-	10MΩ~30MΩ	
RVC-24 2512	1W			±100	100KΩ~1MΩ	47Ω~10MΩ	
				±200	-	10MΩ~30MΩ	

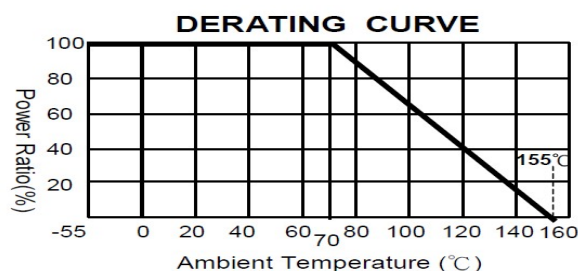
Style	Power Rating at 70 °C	Max. Operating Voltage	Max. Overload Voltage	T.C.R. (ppm/°C)	Resistance Range		
					D: ±0.5%	J: ±5%	F: ±1%
RVCH-22 2010	1/2W	2000V	3000V	±100	100KΩ~1MΩ	100KΩ~10MΩ	
RVCH-24 2512	1W	3000V	4000V	±100	43KΩ~1MΩ		

- For non-standard parts, please contact our sales dept.

- Operating temperature range: -55°C ~+115°C

Performance Characteristics

* Power Derating Curve



Power rating or current rating is the case based on continuous full-load at ambient temperatures of 70°C. For operating at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating curve.

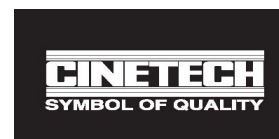
* Voltage Rating or Current Rating

Resistance Range: $\geq 1\Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)
 P=Power rating(W)
 R=Nominal resistance(Ω)



Reliability test and Requirement

Test Item	Test Method	Procedure	Requirements	
			RVC	RVCH
Temperature Coefficient of Resistance(TCR)	JIS -C -5201-1 4.8 IEC-60115-1 4.8	At 25/-55°C and 25°C /+155°C , 25°C is the reference temperature	As Spec	
Short time Overload	JIS -C- 5201-1 4.13 IEC -60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	1% and below : $\pm (1.0\% + 0.05\Omega)$ 5%: $\pm (2.0\% + 0.1\Omega)$	$\pm 2.0\%$
Leaching	JIS -C- 5201-1 4.18 IEC -60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds.	Individual leaching area $\leq$ 5% Total leaching area $\leq$ 10%	
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC -60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	1% and below: $\pm (0.5\% + 0.05\Omega)$ 5%: $\pm (1.0\% + 0.05\Omega)$	$\pm 1.0\%$
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC -60115-1 4.19	-55°C to+155°C, 5 cycles	1% and below: $\pm (0.5\% + 0.05\Omega)$ 5%: $\pm (1.0\% + 0.10\Omega)$	$\pm 1.0\%$
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs. Then the resistor is left in the room for 48 hrs.	1% and below: $\pm (0.5\% + 0.05\Omega)$ 5%: $\pm (0.5\% + 0.05\Omega)$	$\pm 1.0\%$
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC -60115-1 4.24	40 $\pm$ 2°C,90~95% R.H.RCWV or Max.working voltage whichever is less for 1000hrs with1.5hrs "ON" and 0.5hrs"OFF".	1% and below: $\pm (1.0\% + 0.05\Omega)$ 5%: $\pm (2.0\% + 0.05\Omega)$	$\pm 3.0\%$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC -60115-1 4.25.1	70 $\pm$ 2°C,RCWV or Max.working voltage whichever is less for 1000hrs with1.5hrs "ON" and 0.5hrs"OFF".	1% and below: $\pm (1.0\% + 0.05\Omega)$ 5%: $\pm (3.0\% + 0.10\Omega)$	$\pm 3.0\%$
Insulation Resistance	JIS -C- 5201-1 4.6 IEC -60115-1 4.6	Apply 100VDC for 1 minute.	$\geq 10G\Omega$	
Bending Strength	JIS -C- 5201-1 4.33 IEC -60115-1 4.33	Bending once for 5 seconds D: 0402·0603·0805= 5mm 1206·1210·1812= 3mm 1218·2010·2512·2030= 2mm	1% and below: $\pm (1.0\% + 0.05\Omega)$ 5%: $\pm (1.0\% + 0.05\Omega)$	$\pm 1.0\%$

Parts Number System

RVC -	10 -	1002	F	R
<u>Type</u>	<u>Size</u>	<u>Resistance</u>	<u>Tolerance</u>	<u>Standard Packing</u>
<u>RVC/RVCH-</u> High Voltage SMD Power Resistor	02=0201 04=0402 06=0603 10=0805 18=1206 20=1210 22=2010 24=2512	<u>3 Digits:</u> for 5% First 2 digits are significant figure third Digits is number of zero	D=±0.5% J=±5% F=±1%	R=Paper tape reel 10,000pcs/Reel Size:0201~0402 5,000pcs/Reel Size:0603~1206 K=Embossed plastic tape reel 4,000pcs/Reel Size: 2010~2512
		<u>4 Digits :</u> for 1%, 0.5% 10K=1002		

THICK FILM HIGH OHMIC CHIP RESISTORS

(RMH SERIES)

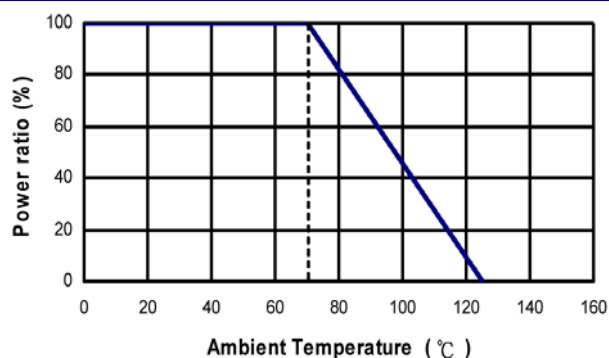
Features

- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment

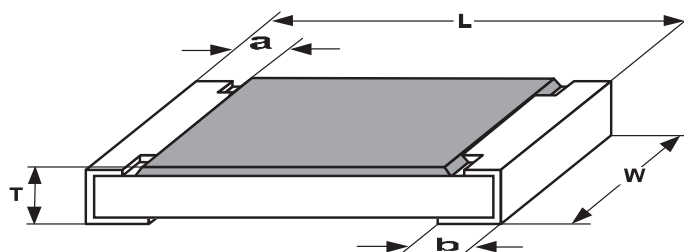
Applications

- Inverter
- Outdoor Equipments
- Converter
- Automotive Industry
- High Pulse Equipment

Derating Curve



Dimensions



unit mm

Style	L	W	T	a	b
RMH-10/0805	2.00±0.15	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20
RMH-18/1206	3.10±0.15	1.55±0.15	0.55±0.10	0.50±0.25	0.50±0.25

Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	TCR (PPM/°C)
						±5%	
RMH-10(0805)	1/8W		-55 ~ +125°C	150V	300V	110MΩ ~ 500MΩ	±500
						510MΩ ~ 1GΩ	±1000
RMH-18(1206)	1/4W			200V	400V	110MΩ ~ 500MΩ	±500
						510MΩ ~ 1GΩ	±1000

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. overload voltage listed above, whichever is lower.



Characteristics

Item	Rating	Test Method
	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(3.0%+0.10Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(3.0%+0.10Ω)	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±(1.5%+0.10Ω)	at +125°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	Bending once for 5 seconds 0805, 1206 sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(1.0%+0.05Ω)	-55°C to +125°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 25±3°C; Humidity < 80%RH

Parts Number System

RMH —	10	117	J	R
Type	Size and Wattages	Resistance	Tolerance	Standard Packing
High ohmic Chip Resistor	10: 0805 18: 1206	110M	J = ±5%	R=Paper tape reel K=Embossed plastic tape reel Please refer to packaging explanation



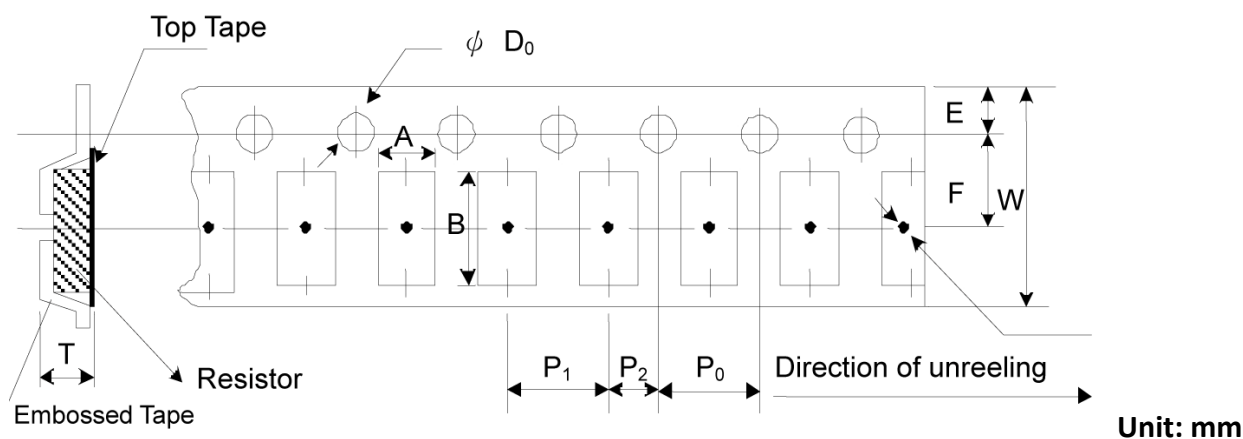
Marking

5% for 0805/1206: 3 digits marking in E24

Example: 127=120M Ω 108=1G Ω (1st and 2nd are E24 code and 3rd code is multiplier)

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
----------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Tape Dimensions

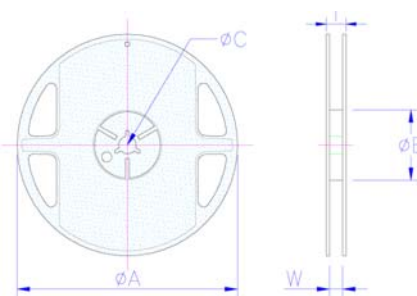


Type	A	B	W	E	F	P ₀	P ₁	P ₂	ϕD_0	T
RMH-10	1.60 $\pm$ 0.10	2.40 $\pm$ 0.20	8.0 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50+0.1,-0	0.85 $\pm$ 0.10
RMH-18	1.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.0 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50+0.1,-0	0.85 $\pm$ 0.10

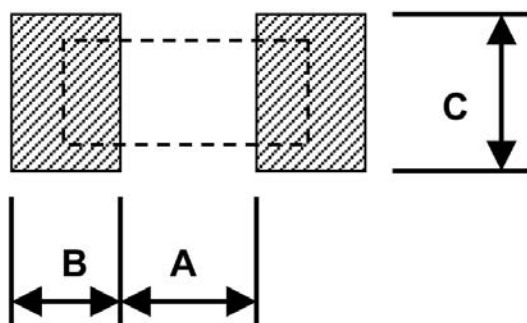
Packaging

Unit: mm

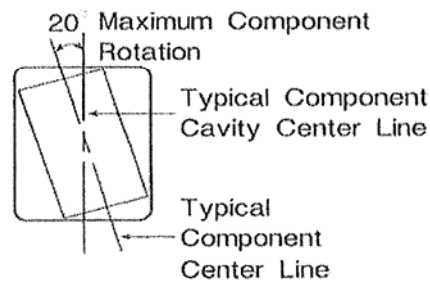
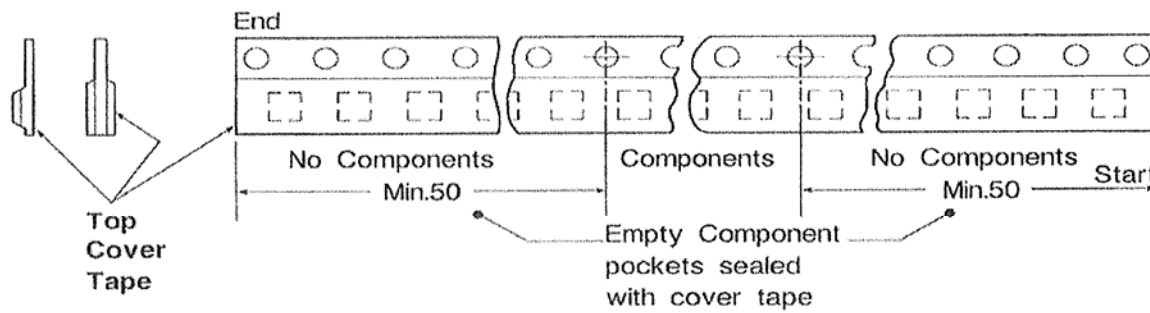
Type	Packaging Quantity	Tape Width	Reel Diameter	ϕA	ϕB	ϕC	W	T
RMH-10 RMH-18	Paper	5K	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5	12.5 $\pm$ 0.5
		10K	10 inch	254 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5	13.5 $\pm$ 0.5
		20K	13 inch	330 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5	13.5 $\pm$ 0.5



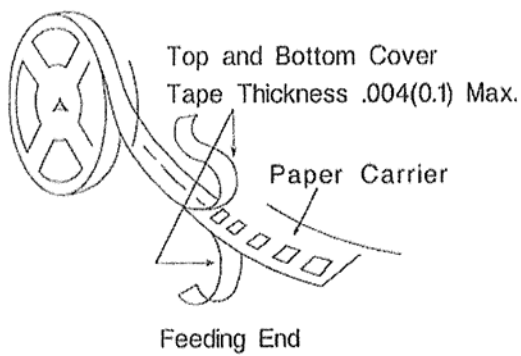
Recommend Land Pattern



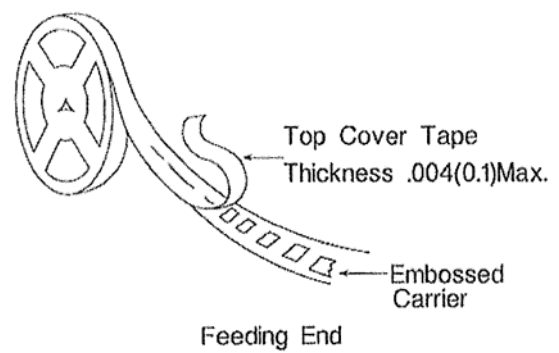
Type	A	B	C
RMH-10	1.2	0.7	1.3
RMH-18	2	0.9	1.6



Paper Carrier

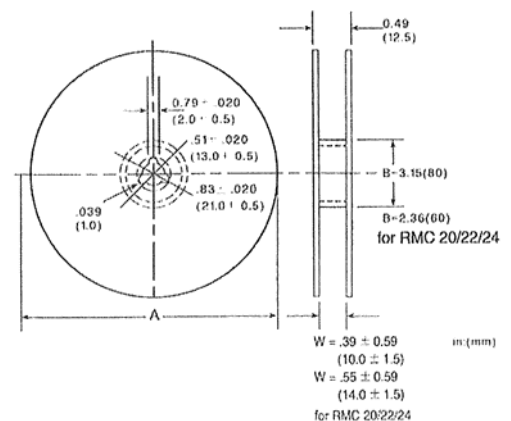


Embossed Plastic Carrier



Reel Dimensions

A (MAX.)	Component/Reel
	Paper RMH- 10/18
7"(178mm)	5.000
10"(254mm)	10.000
13"(330mm)	20.000



THICK FILM LOW OHMIC CHIP RESISTORS

(RML SERIES)

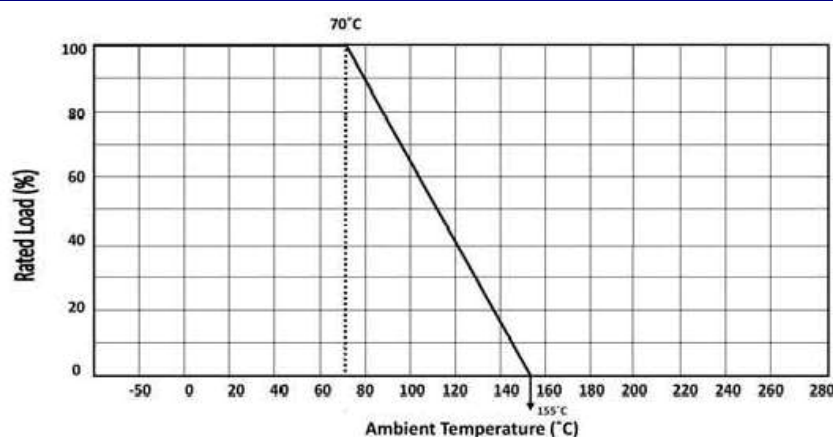
Features

- ⊙ Current sensing of Desktop & Notebook PC
- ⊙ Highly Reliable multilayer electrode construction

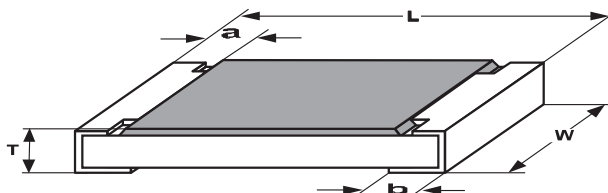
Applications

- ⊙ Automotive
- ⊙ Medical and military equipments
- ⊙ Audio and TV Tuners
- ⊙ Telecommunication Equipments
- ⊙ Video Cameras, watches, Calculators

Derating Curve



Dimensional Specifications



Style	Dimensions : mm				
	L	W	T	a	b
RML-02 0201	0.58 ±0.05	0.30 ±0.03	0.13 ±0.08	0.15 ±0.05	0.23 ±0.05
RML-04 0402	1.00 ±0.05	0.50 ±0.005	0.20 ±0.10	0.25 ±0.10	0.35 ±0.05
RML-06 0603	1.60 ±0.10	0.80 ±0.10	0.30 ±0.20	0.30 ±0.20	0.45 ±0.10
RML-10 0805	2.00 ±0.15	1.25 ±0.10	0.35 ±0.20	0.40 ±0.20	0.50 ±0.10
RML-18 1206	3.10 ±0.15	1.55±0.10	0.50 ±0.25	0.50±0.25	0.55 ±0.10
RML-20 1210	3.10 ±0.15	2.60 ±0.15	0.50 ±0.25	0.50±0.20	0.55 ±0.10
RML-22 2010	5.00 ±0.20	2.50 ±0.15	0.60 ±0.25	0.50±0.20	0.55 ±0.10
RML-24 2512	6.35 ±0.20	3.20 ±0.15	0.60 ±0.25	0.50±0.20	0.55 ±0.10
RML-37 3720	2.00 ±0.20	3.75 ±0.20	0.60 ±0.25	0.40±0.20	0.40 ±0.25
RML-75 7520	2.00 ±0.30	7.50 ±0.20	0.60 ±0.25	0.40±0.20	0.40 ±0.25
RML-50 1225	3.10 ±0.15	6.30 ±0.20	0.90 ±0.25	0.80 ±0.30	0.55 ±0.25
RML-62 0612	1.55±0.10	3.10 ±0.15	0.55 ±0.10	0.30 ±0.15	0.45 ±0.15

Electrical Characteristics

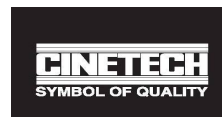
Style	RML-02	RML-04	RML-06	RML-10	RML-18	RML-20	RML-22	RML-24	RML-37	RML-75	RML-50	RML-62
	0201	0402	0603	0805	1206	1210	2010	2512	3720	7520	1225	612
Power rating at 70°C	1/20W	1/16W	1/10W	1/8W	1/4W	1/2W	3/4W	1W	1W	2W	3W	1W
operating temp.range	-55°C~ +155°C (+125°C FOR 0201)											
Derated to 0 Load at	+155°C~ (+125°C FOR 0201)											
Resistance range	0.01Ω~ 1Ω(0.003Ω~7.5Ω for 1225)											
Temperature Coefficient	Refer to chart attached											
Resistance Tolerance	±1%, ±2%, ±5%											

Characteristics

Performance	Test method	Rating
Temperature Coefficient	MIL-STD-202F,Method 304	Per Spec
Thermal shock	MIL-STD-202F,Method107G 100 cycles, -55°C to +155°C	± (0.5%+0.001Ω)
Low temperature Operation	JIS-C-5202-7.1 One hour at -65°C followed by 45 minutes RCWV	± (0.5%+0.001Ω)
Short Time Overload	MIL-R-55342D,Para4.7.5 2.5 times RCWV for 5 seconds	± (1%+0.05Ω)
Insulation Resistance	MIL-STD-202F,Method 302, 100VDC for 1 min.	>10000MΩ
Dielectric Voltage	MIL-STD-202F,Method 301, R.M.S. for 1 min.	by Type
Resistance to soldering Heat	MIL-STD-202F,Method 201 E, Soldered to test board at 260°C for 10 seconds	± (0.5%+0.05Ω)
Moisture Desistance	MIL-STD-202F,Method 103B 40 °C. 90-95% RH 42 cycles. Total 1000 hours	± (2%+0.05Ω)
Life	MIL-STD-202F,Method 108A 1000 hours at 70 °C RCWV intermittent	± (2%+0.05Ω)
Solderability	MIL-STD-202F,Method 208G,245 °C for 5 seconds	95% min. coverage

Parts Number System

RML-	O6	0R50	F	R	M
Type	Size and Wattages	Resistance	Tolerance	Standard Packing	TCR
Low ohmic chip Resistor		0R50=0.5 ohm 0R05=0.05 ohm	J = ±5% G = ±2% F = ±1%	R=Paper tape reel K=Embossed plastic tape reel Please refer to packaging explanation	Blank-per chart K ± 100ppm, L ± 200ppm M ± 300ppm, Q±800ppm N ± 400ppm, R±1200ppm O ± 500ppm, S±1500ppm P ± 600ppm



Standard TCR for LOW Ohmic Chip Resistors

Style	Resistance Range (mΩ)	TCR PPM/°C	
		Standard	Low TCR
RML-02/0201	50-147	±1000	
	150-500	±600	
	510-976	±300	
RML-04/0402	50-91	±800	±400
	100-976	±500	±300
RML-06/0603	20-47	±1200	±600
	50-91	±800	±400
	100-976	±500	±300
RML-10/0805	10-18	±1500	±600
	20-47	±1200	±600
	50-91	±800	±400
	100-976	±500	±300
RML-18/1206	10-18	±1500	±600
	20-47	±1200	±400
	50-91	±800	±300
	100-976	±500	±200
RML-20/1210	10-18	±1500	±600
	20-91	±800	±400
	100-976	±500	±200
RML-22/2010	10-18	±1500	±600
	20-91	±800	±400
	100-976	±500	±200
RML-24/2512	10-18	±1500	±600
	20-91	±800	±400
	100-976	±500	±200
RML-37/3720	10-18	±300	
	20-500	±150	
RML-75/7520	1-4	±300	
	5-10	±200	
	11-350	±150	
RML-50/1225	3-5	±300	
	6-20	±200	
	21-30	±150	
	33-7500	±100	
RML-62/0612	10-27	±600	
	30-91	±300	
	100-499	±200	
	500-1000	±100	

THICK FILM ANTI-SURGE CHIP RESISTORS

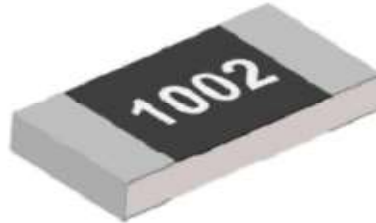
(RSC / RSP SERIES)

Features

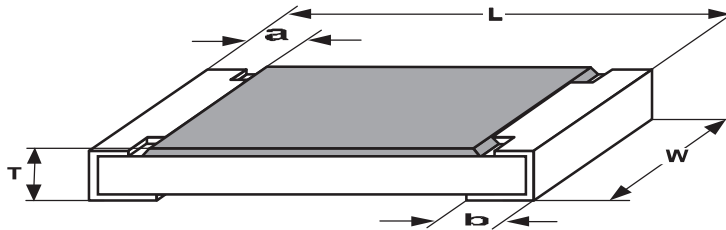
- * Suitable for withstanding circuit for surge voltage
- * Improved working voltage ratings
- * Highly stable in auto-placement surface mounting application.
- * RoHS Compliant & Halogen Free
- * AEC-Q200 Compliant

Applications

- * LCD video monitor
- * Medical Devices
- * Measurement instrument
- * Charger
- * Inverter
- * Automotive



Dimensions



Style			Dimensions					mm
			L	w	a	b	T	
RSC-04	RSP-04	0402	1.00 ±0.05	0.50 ±0.05	0.15 ±0.10	0.20 ±0.10	0.30 ±0.05	
RSC-06	RSP-06	0603	1.60 ±0.10	0.80 ±0.10	0.30 ±0.20	0.30 ±0.20	0.40 ±0.10	
RSC-10	RSP-10	0805	2.00 ±0.10	1.20 ±0.10	0.40 ±0.15	0.40 ±0.20	0.50 ±0.15	
RSC-18	RSP-18	1206	3.05 ±0.10	1.60±0.10	0.40 ±0.20	0.50±0.20	0.55 ±0.15	
RSC-20	RSP-20	1210	3.05 ±0.10	2.50±0.15	0.50 ±0.20	0.50±0.20	0.55 ±0.15	
RSC-22	RSP-22	2010	5.00 ±0.20	2.50 ±0.15	0.60 ±0.20	0.60 ±0.20	0.55 ±0.10	
RSC-24	RSP-24	2512	6.30 ±0.20	3.20 ±0.15	0.60 ±0.20	0.60±0.20	0.68 ±0.10	

General Specification

Standard Electrical Specification

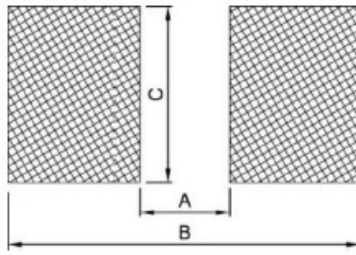
Type	Size	Power Rating at 70° C	Max Working Voltage	Max Overload Voltage	TCR ppm/°C	Resistance Range	
						±1%(F), ±2%(G)	±5%(J),±10%(K)
RSC-04	0402	1/10W	50V	100V	±400	---	1Ω ~ 10Ω
					±300	---	10Ω ~ 1KΩ
					±200	10Ω ~ 1MΩ	1KΩ ~ 10MΩ
RSC-06	0603	1/8W	50V	100V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSC-10	0805	1/4W	150V	300V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSC-18	1206	1/3W	200V	400V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSC-20	1210	1/2W	200V	400V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSC-22	2010	3/4W	400V	800V	±400	---	1Ω ~ 10Ω
					±150	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSC-24	2512	1.5W	500V	1000V	±400	---	1Ω ~ 10Ω
					±150	10Ω ~ 1MΩ	10Ω ~ 10MΩ

High Power Rating Electrical Specification

Type	Size	Power Rating at 70° C	Max Working Voltage	Max Overload Voltage	TCR ppm/°C	Resistance Range	
						±1%(F), ±2%(G)	±5%(J),±10%(K)
RSP-04	0402	1/8W	50V	100V	±400	---	1Ω ~ 10Ω
					±300	---	10Ω ~ 1KΩ
					±200	10Ω ~ 1MΩ	1KΩ ~ 10MΩ
RSP-06	0603	1/4W	150V	200V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSP-10	0805	2/5W	150V	300V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSP-18	1206	1/2W	200V	400V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSP-20	1210	3/4W	200V	400V	±400	---	1Ω ~ 10Ω
					±100	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSP-22	2010	1W	400V	800V	±400	---	1Ω ~ 10Ω
					±150	10Ω ~ 1MΩ	10Ω ~ 10MΩ
RSP-24	2512	2W	500V	1000V	±400	---	1Ω ~ 10Ω
					±150	10Ω ~ 1MΩ	10Ω ~ 10MΩ



Recommend Land Pattern Design

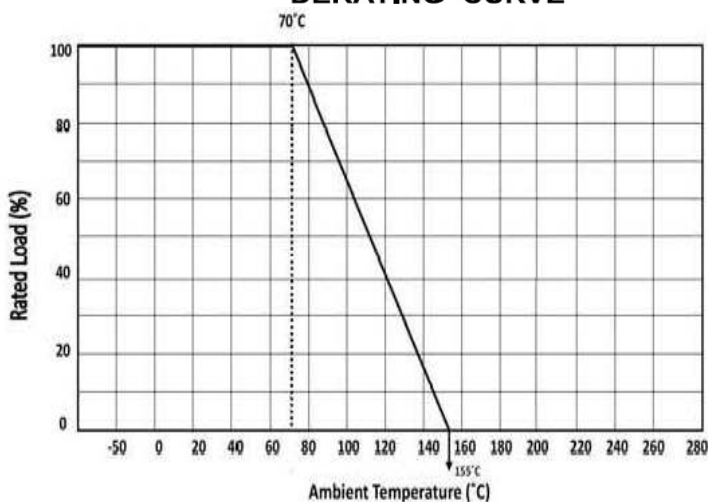


Unit: mm

Type	0402	0603	0805	1206	1210	2010	2512
A	0.60	0.80	1.30	2.20	2.00	3.80	4.90
B	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.70	1.00	1.40	1.70	2.70	2.70	3.40

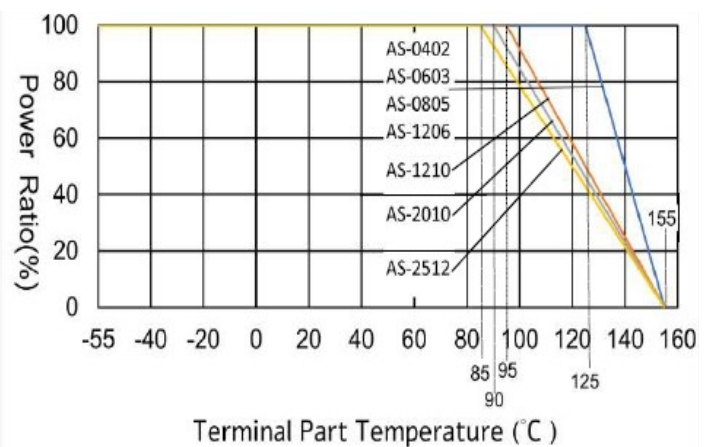
* Power Derating Curve

DERATING CURVE



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.

* Terminal part temperature



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with derating curve.

* Voltage Rating or Current Rating

Resistance range: $\leq 1\Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Power rating(W)

R=Nominal resistance(Ω)

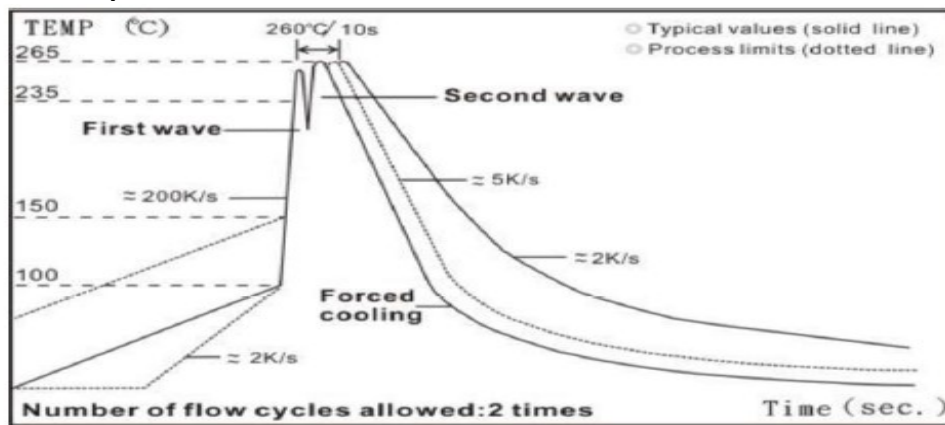


Reliability Test and Requirement

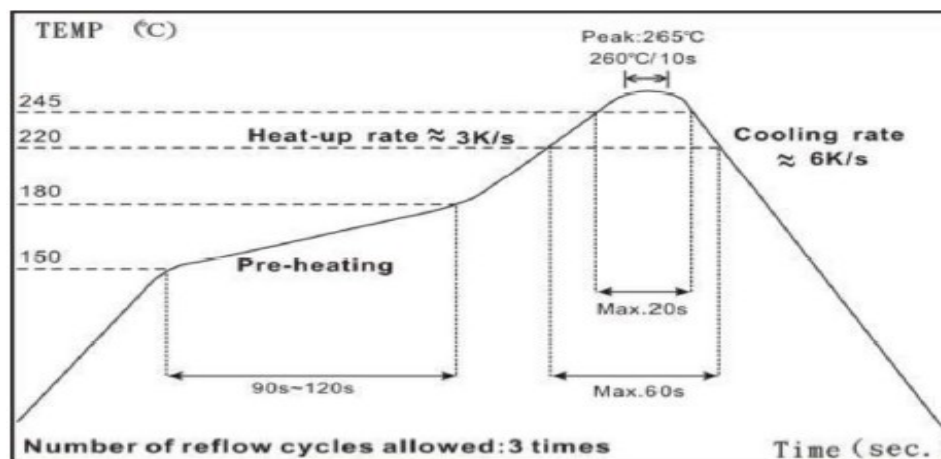
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS C 5201-1 4.8 IEC-60115-1 4.8	At 25 °C / - 55°C and 25°C / +155°C, 25°C is the reference temperature	Refer to Ratings
Short Time Overload	JIS C 5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. overload voltage, whichever is less for 5 seconds.	$\pm(1.0\%+0.05\Omega)$
Single pulse high voltage overload	IEC-60115	Severity No. 4: $U=10\sqrt{P_{70} \times R}$ or $U=2 \times U_{Max}$; Whichever is the less severe. One pulse per minute, 10 pulses 10/700μs.	$\pm(1.0\%+0.05\Omega)$
Insulation Resistance	JIS C 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute	$\geq 10G\Omega$
Resistance to Soldering Heat	JIS C 5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds.	$\pm(1.0\%+0.05\Omega)$
Leaching	JIS C 5201-1 4.18 IEC-60068-2-58 8.2.1	260±5°C for 30 seconds	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$
Rapid Change of Temperature	JIS C 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 5 cycles	$\pm(1.0\%+0.1\Omega)$
Resistance to Solvent	JIS C 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20-25°C for 60 secs. Then the resistor is left in the room for 48 hrs.	$\pm(0.5\%+0.05\Omega)$
Damp Heat with Load	JIS C 5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000hrs with 1.5hrs "ON" and 0.5hr "OFF"	$\pm(2.0\%+0.05\Omega)$
Load Life (Endurance)	JIS C 5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000hrs with 1.5hrs "ON" and 0.5hr "OFF"	$\pm(3.0\%+0.1\Omega)$
Terminal Bending Strength	JIS C 5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D: 0402, 0603、0805=5mm 1206、1210=3mm 1210、2512=2mm	$\pm(1.0\%+0.05\Omega)$

* Recommended Customer Soldering Parameters

Wave solder Temperature Condition



Solder reflow Temperature condition



* Rework temperature hot (air equipment): 350°C , 3~5seconds

Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requiremer

Parts Number System

RSC -

Type

RSC- Thick Film
Anti-Surge Chip
Resistor

RSP- High Power
Chip Resisor

10 -

Size

04=0402
06=0603
10=0805
18=1206
20=1210
22=2010
24=2512

102

Resistance

3 Digits: for 5%
First 2 digits are
significant
figure third
Digits is number
of aero
4 Digits:
for 1%, 0.5%
10K=1002

J

Tolerance

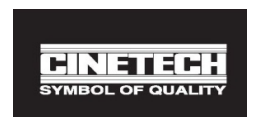
D=± 0.5%
J=± 5%
F=± 1%

R

Standard Packing

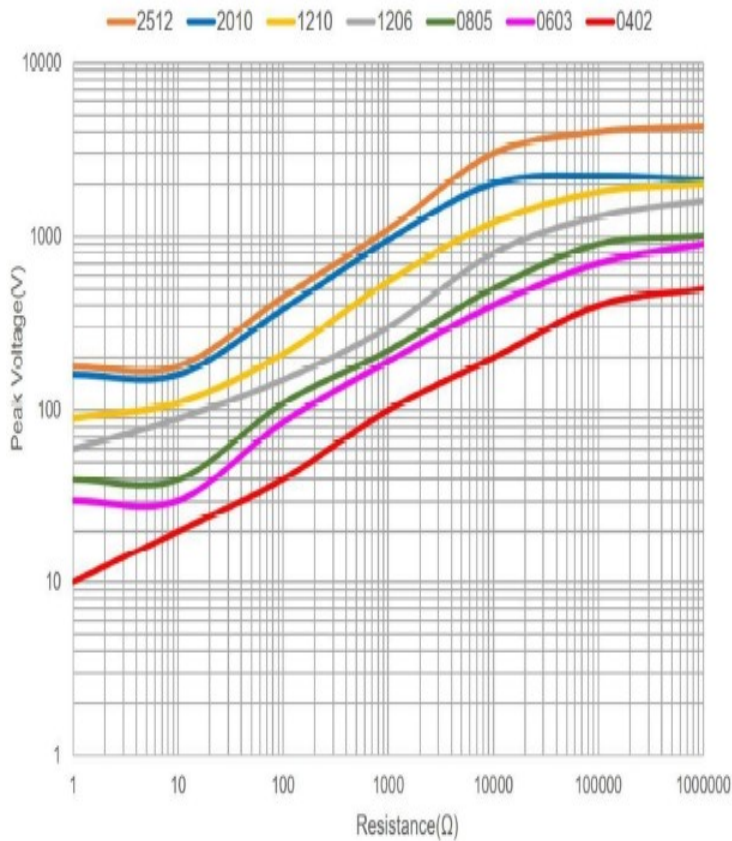
R=Paper tape
reel

K=Embossed
plastic tape
reel

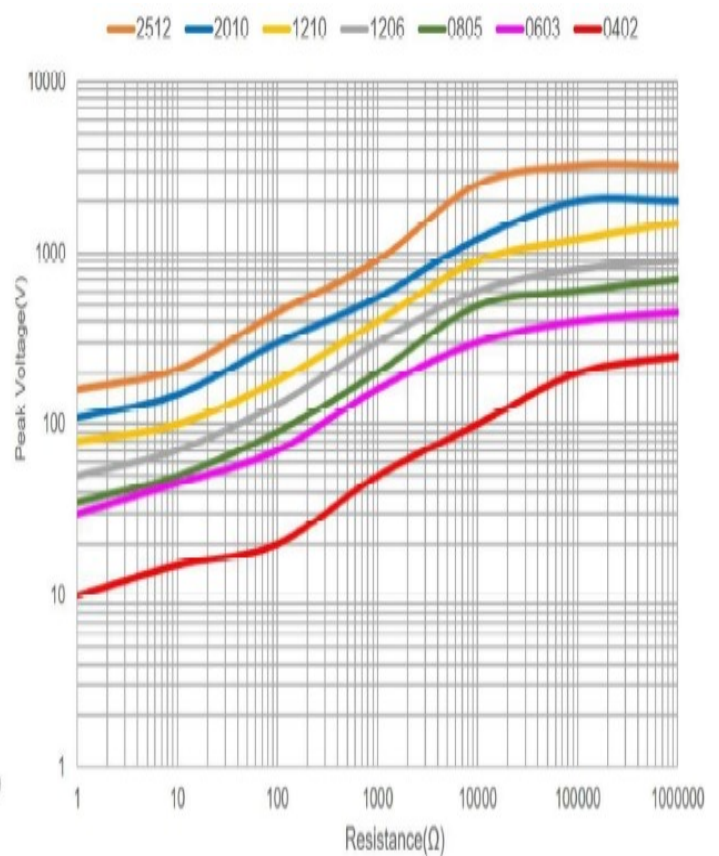


Lightning Surge

* 1.2/50us Lightning Surge

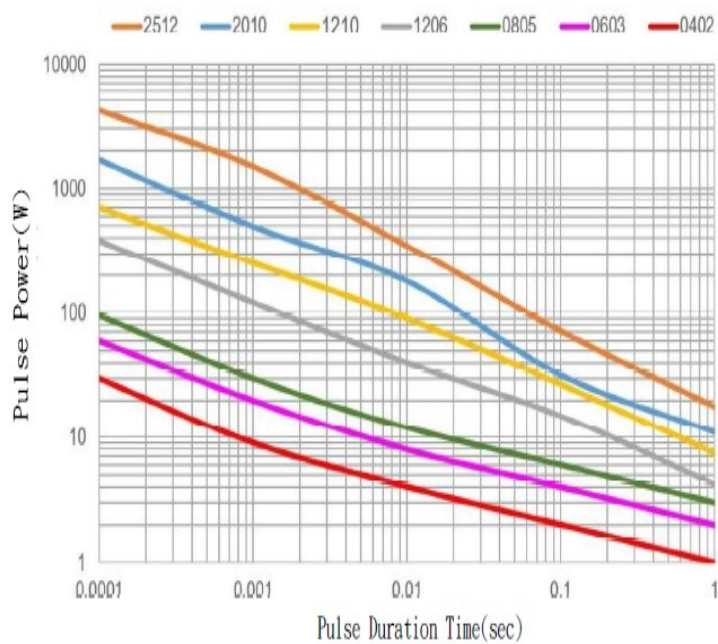


* 10/700us Lightning Surge



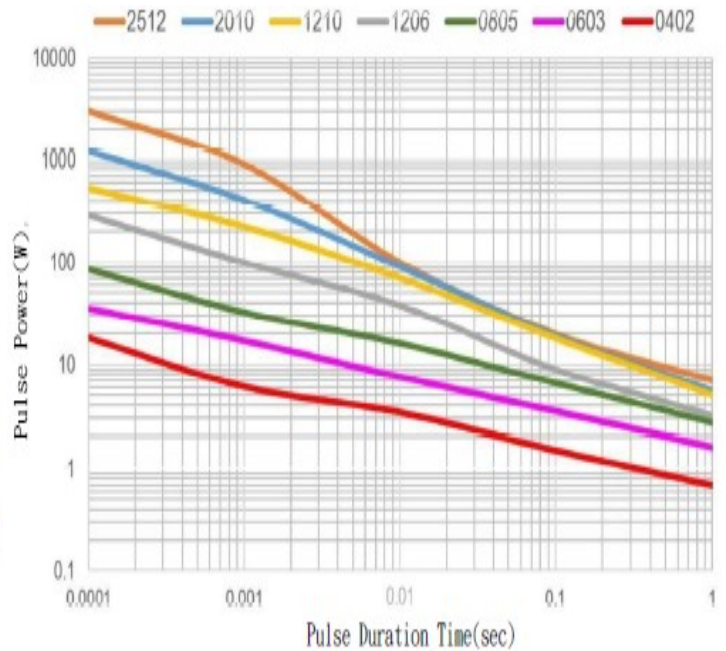
Single Pulse Power

* Single Pulse Power - 100 ohm



Continuous Pulse Power

* Continuous Pulse Power - 100 ohm



PULSE WITHSTANDING CHIP RESISTORS

(RPW & RPWH SERIES)

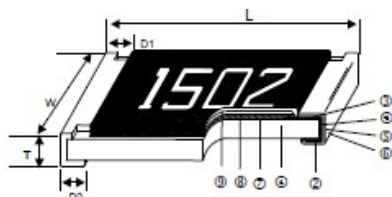
Features

- * Tolerance from $\pm 0.5\%$ ~5%
- * High power rating
- * Excellent pulse withstanding performance
- * improved working voltage ratings.
- * Standard package sizes of 0402~2512
- * AEC-Q200 Compliance

Applications

- * Metering(Testing/Measurement)
- * Diagnostic Equipment
- * Medical Devices
- * Industrial Controls
- * Plasma
- * LCD Video Monitors

Construction

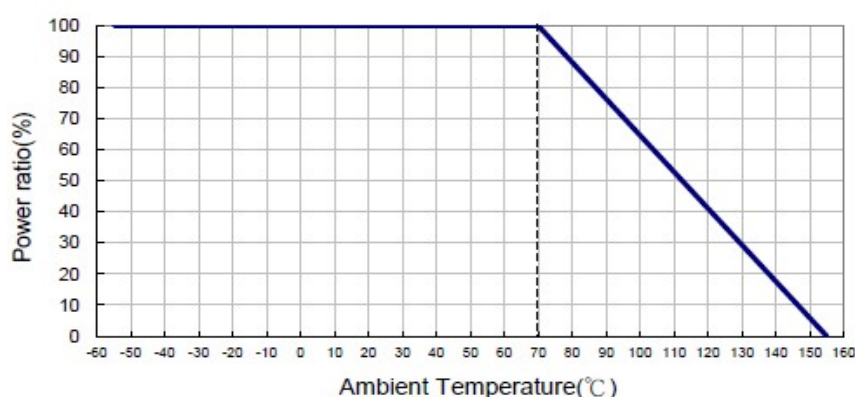


① Alumina Substrate	⑥ External Electrode
② Bottom Electrode	⑦ Resistor Layer
③ Top Electrode	⑧ Primary Overcoat
④ Edge Electrode	⑨ Secondary Overcoat
⑤ Barrier Layer	

Dimensions

Type		Dimensions (mm)				
		L	W	T	D1	D2
RPW-04	0402	1.00 ± 0.05	0.50 ± 0.05	0.35 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
RPW-06	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
RPWH-06						
RPW-10	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
RPWH-10						
RPWH-10U						
RPW-18	1206	3.10 ± 0.10	1.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20
RPWH-18						
RPWH-18U						
RPW-20	1210	3.10 ± 0.10	2.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20
RPWH-20						
RPW-22	2010	5.00 ± 0.10	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20
RPWH-22						
RPW-24	2512	6.35 ± 0.10	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20
RPWH-24U		6.35 ± 0.20	3.15 ± 0.15	0.60 ± 0.10	0.60 ± 0.25	0.60 ± 0.20

Derating Curve



General Specification

RPW Series (Standard Electrical Specification)

Type	Size	Power Rating at 70 °C	Operating Temp.Range	Max Operating Voltage	Max Overload Voltage	TCR ppm/°C	Resistance Range	
							±0.5%(D)	±1%(F),±5%(J)
RPW-04	0402	1/5W	-55~+155°C	50V	100V	±300	---	1Ω ~ 20Ω
						±100	100Ω ~ 1MΩ	20.5Ω ~ 1MΩ
RPW-06	0603	1/10W	-55~+155°C	50V	100V	±200	10Ω ~ 294Ω	1Ω ~ 294Ω
						±100	300Ω ~ 1MΩ	
RPW-10	0805	1/8W	-55~+155°C	150V	300V	±200	10Ω ~ 294Ω	1Ω ~ 294Ω
						±100	300Ω ~ 20MΩ	
RPW-18	1206	1/3W	-55~+155°C	200V	400V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 20MΩ	
RPW-20	1210	1/2W	-55~+155°C	200V	400V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 20MΩ	
RPW-22	2010	3/4W	-55~+155°C	400V	800V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 20MΩ	
RPW-24	2512	1.5W	-55~+155°C	500V	1000V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 20MΩ	

RPWH Series (High Power & Ultra High Power Rating Electrical Specification)

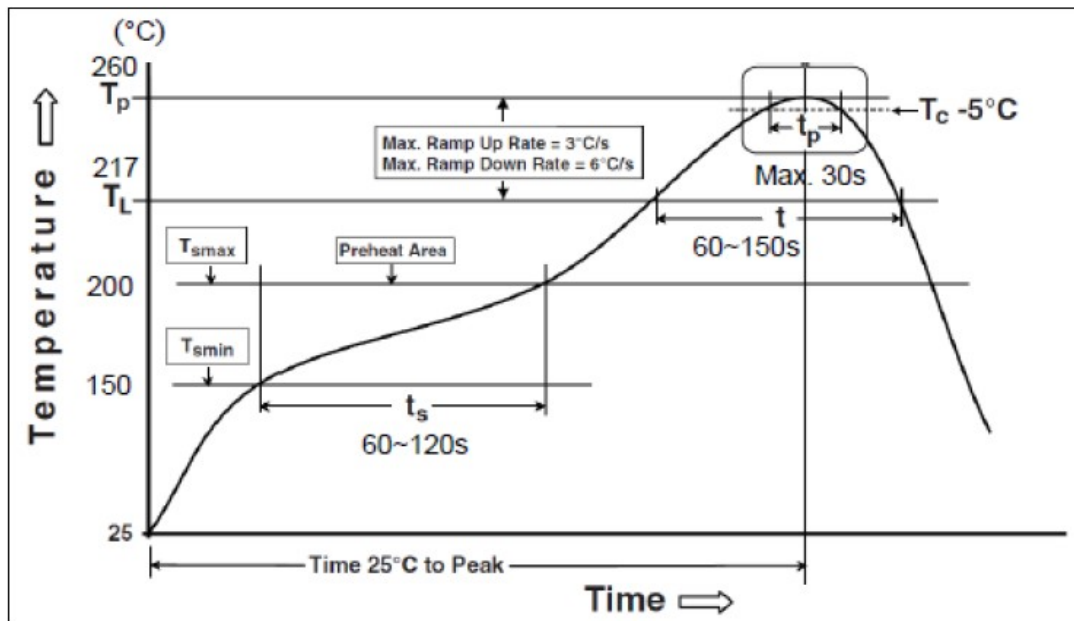
Type	Size	Power Rating at 70 °C	Operating Temp.Range	Max Operating Voltage	Max Overload Voltage	TCR ppm/°C	Resistance Range	
							±0.5%(D)	±1%(F),±5%(J)
RPWH-06	0603	1/4W	-55~+155℃	75V	150V	±200	10Ω ~ 294Ω	1Ω ~ 294Ω
		±100				300Ω ~ 1MΩ		
		Jumper:5A*				-		0Ω(≤8mΩ)
RPWH-10	0805	2/5W	-55~+155℃	150V	300V	±200	10Ω ~ 294Ω	1Ω ~ 294Ω
						±100	300Ω ~ 1MΩ	
RPWH-10U	0805	1/2W*	-55~+155℃	400V	600V	±200	10Ω ~ 294Ω	1Ω ~ 294Ω
		Jumper:6A*				±100	300Ω ~ 1MΩ	
		-					0Ω(≤5mΩ)	
RPWH-18	1206	1/2W	-55~+155℃	200V	400V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 1MΩ	
RPWH-18U	1206	3/4W*	-55~+155℃	500V	1000V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
		Jumper:10A*				±100	20.5Ω ~ 1MΩ	
		-					0Ω(≤5mΩ)	
RPWH-20	1210	3/4W	-55~+155℃	200V	400V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 1MΩ	
RPWH-22	2010	1W	-55~+155℃	400V	800V	±200	10Ω ~ 20Ω	1Ω ~ 20Ω
						±100	20.5Ω ~ 1MΩ	
RPWH-24U	2512	2W*	-55~+155℃	500V	1000V	±350	10Ω	1Ω ~ 10Ω
						±100	10.2Ω ~ 200K Ω	

*Ultra High Power:double side printed resistor element

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \times \sqrt{P \cdot R}$ or Max.Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155°C



Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat Min. Temperature (T_{smin}) Max Temperature (T_{smax}) Preheating time (t_s) from (T_{smin} to T_{smax})	150 °C 200 °C 60-120 seconds
Ramp-up rate (T_L to T_p)	3 °C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 60-150 seconds
Min. Peak temperature (T_p min)	235°C
Max. Peak temperature (T_p max)	260°C
Time (t_p) within 5 °C of the specified classification temperature (T_c)	30 seconds max.
Ramp-down rate (T_p to T_L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

Environmental Characteristics

Test Item	Requirement		Test Method
	±5% and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS C 5201-1 4.13 IEC-60115-1 4.13 RCWV 2.5 times or Max. overload voltage, whichever is lower for 5 seconds. Jumper: 2*1max for 5 seconds
Insulation Resistance	≥10G		JIS C 5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS C 5201-1 4.25 IEC-60115-1 4.25.1 70±2°C RCWV for 1000hrs with 1.5hrs"ON" and 0.5hr"OFF"
Damp Heat with Load	±(0.5%+0.05Ω) Ultra High Power* ±(1.0%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS C 5201-1 4.24 IEC-60115-1 4.24 40±2°C, 90~95% R.H. RCWV for 1000hrs with 1.5hrs "ON" and 0.5hr
Dry Heat	±(0.5%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS-C--5201-1 4.23 IEC-60115-1 4.23.2 at+155°C for 1000hrs
Bending Strength	±(1.0%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS-C--5201-1 4.33 IEC-60115-1 4.33 Bending once for 60 seconds 2010,2512 sizes:2mm other sizes:3mm
Solderability	95 % min. coverage		JIS-C--5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS-C--5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds.
Voltage Proof	No breakdown or flashover		JIS-C--5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute.
Leaching	Individual leaching area≤5% Total leaching area≤10%		JIS-C--5201-1 4.18 IEC-6068-2-58 8.2.1 260±5°C for 30 seconds.
Rapid Change of Temperature	±(0.5%+0.05Ω)	0603:≤8mΩ 0805:≤5mΩ 1206:≤5mΩ	JIS-C--5201-1 4.19 IEC-60115-1 4.19 -55°C to 155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

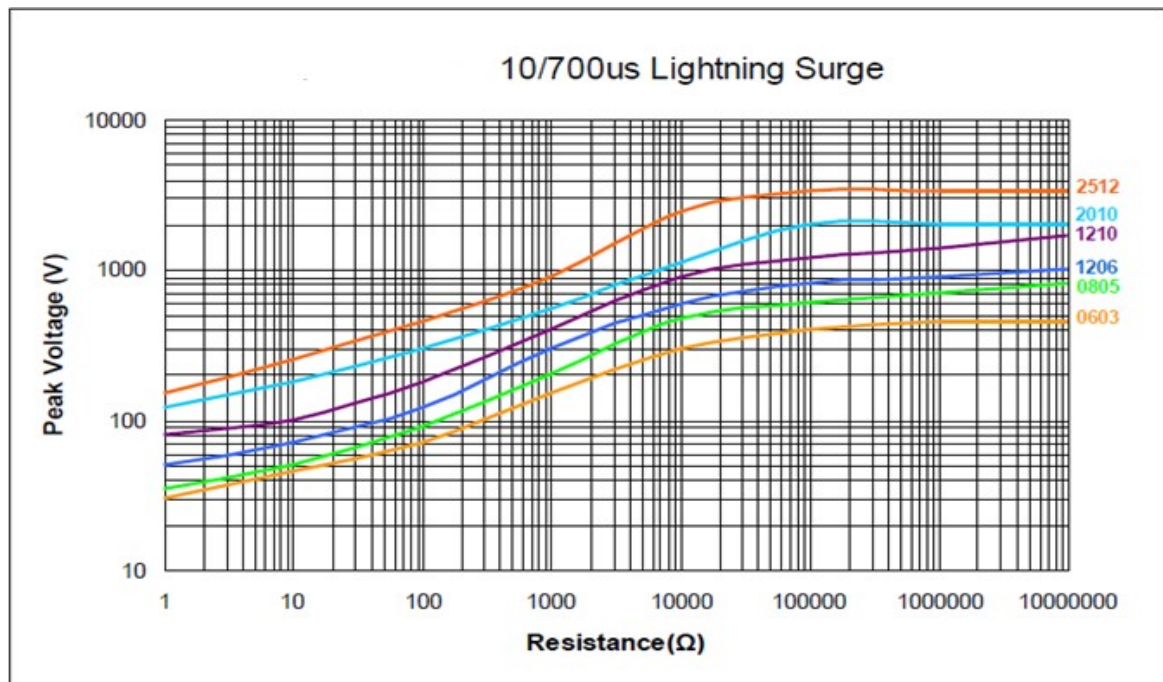
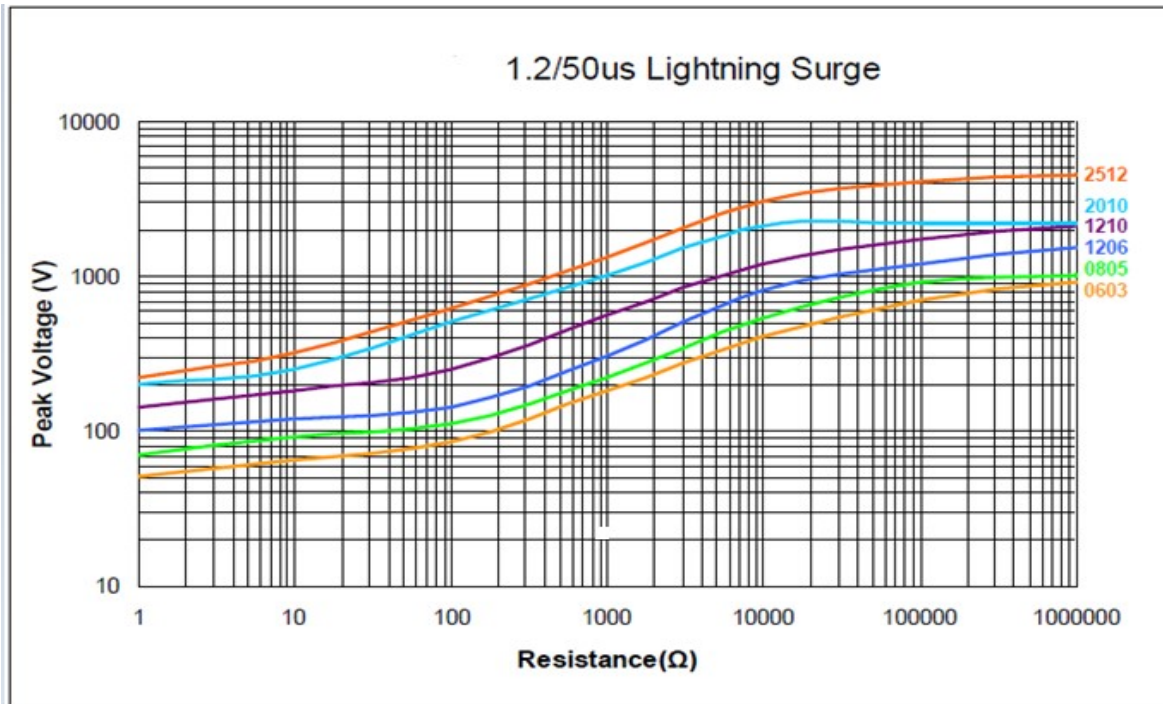
■ Storage Temperature: 15~28°C; Humidity<80% RH

■ Shelf Life: 2 years from production date.



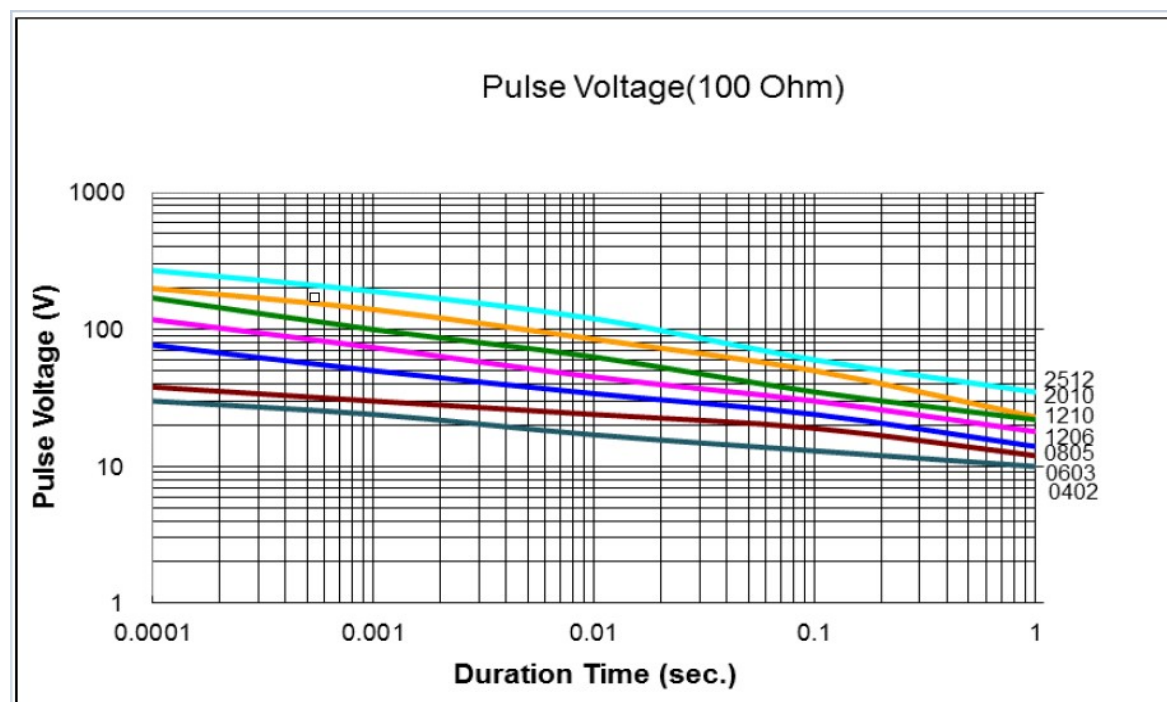
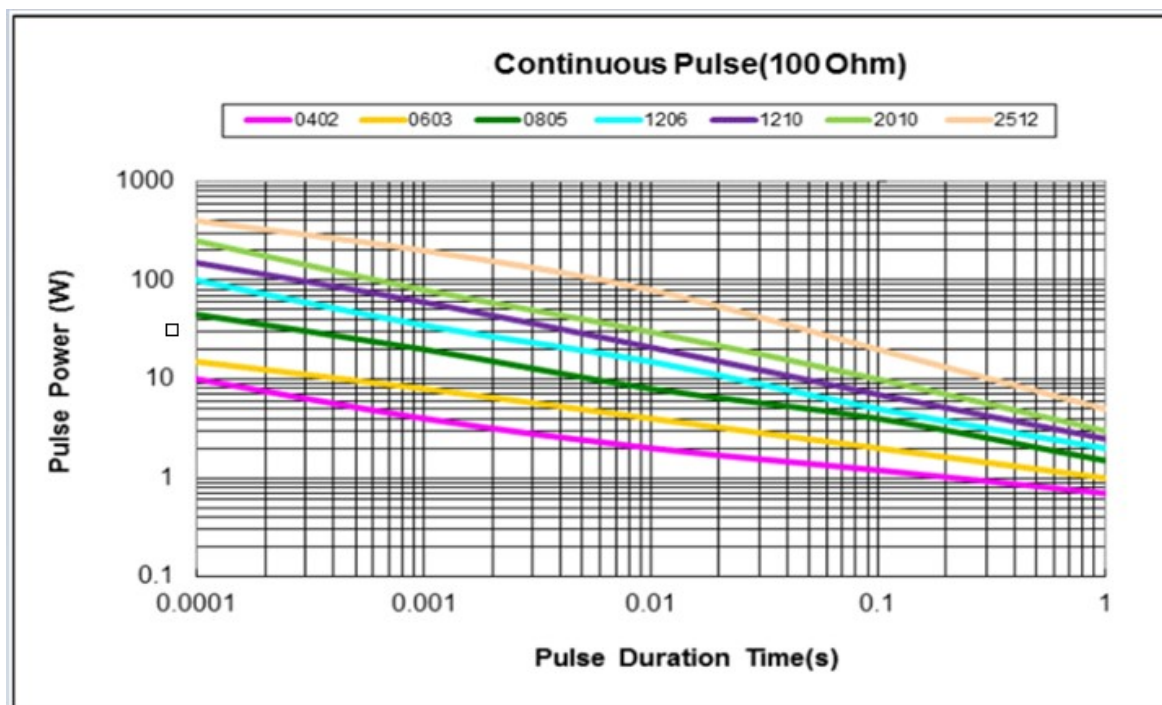
Lightning Surge

Resistors are tested in accordance with IEC 60115-1 using both 1.2/50us and 10/700 pulse shapes. The limit of acceptance is a shift in resistance of less than 1% from the initial value.



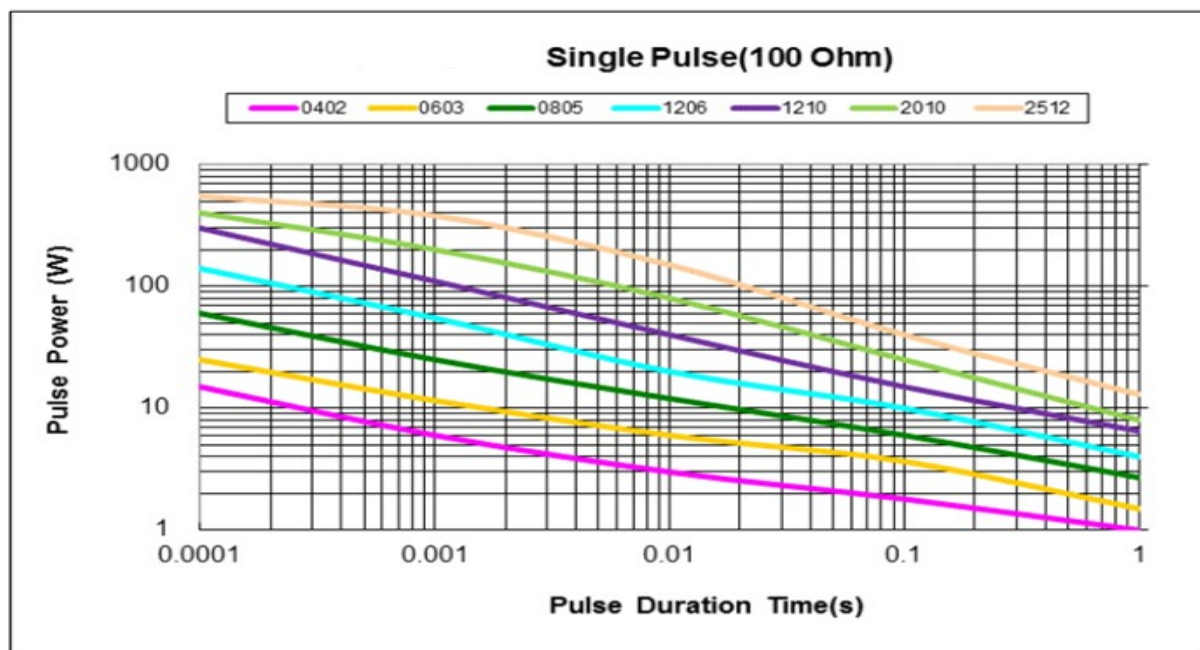
Continuous Pulse

The continuous load graph was obtained by applying repetitive rectangular pulses where the pulse period was adjusted so that the average power dissipated in the resistor was equal to its rated power at 70°C. Again the limit of acceptance was a shift in resistance of less than 1% from the initial value.



Pulse withstanding capacity

The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.



Parts Number System

RPW -	10 / (10U)	102	J	R
Type	Size	Resistance	Tolerance	Standard Packing
RPW Series Standard Power	04=0402, 06=0603 10=0805, 18=1206 20=1210, 22=2010 24=2512	3 Digits: for 5% First 2 digits are significant figure third Digits is number of zero	D=± 0.5% J=± 5% F=± 1%	R=Paper tape reel
RPWH Series High power and Ultra High power	Ultra High Power 10U=0805 18U=1206 24U=2512	4 Digits: for 1%, 0.5% 10K=1002		K=Embossed plastic tape reel

THICK FILM ANTI SULFURATED CHIP RESISTORS

(RAS / RASP SERIES)

Special construction to prevent sulfuration under a sulfur containing environment.



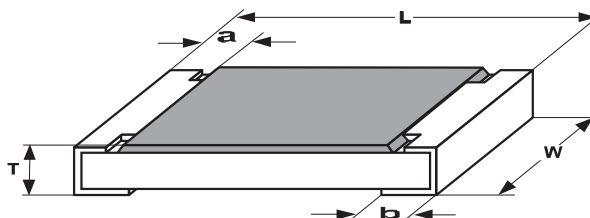
Features

- * Small size and light weight.
- * Excellent mechanical strength and electrical stability.
- * Reduce assembly costs.
- * 8mm tape carrier packaging available for automatic surface mounting.

Application

- * Industrial Control, System Sensor, Netcom Station
- * Navigation Equipment
- * Measuring Instrument.
- * Telecommunication Equipment, Railway Semaphore system.

Dimensional Specifications



Style			Dimensions				mm
			L	W	T	a	b
RAS-02	---	0201	0.60 ±0.03	0.30 ±0.03	0.23 ±0.03	0.10 ±0.10	0.20 ±0.10
RAS-04	RASP-04	0402	1.00 ±0.10	0.50 ±0.05	0.30 ±0.05	0.15 ±0.10	0.20 ±0.10
RAS-06	RASP-06	0603	1.60 ±0.20	0.80 ±0.15	0.40 ±0.10	0.30 ±0.20	0.30 ±0.10
RAS-10	RASP-10	0805	2.00 ±0.20	1.25 ±0.15	0.50 ±0.15	0.30 ±0.15	0.40 ±0.15
RAS-18	RASP-18	1206	3.05 ±0.10	1.60 ±0.20	0.55 ±0.15	0.40 ±0.20	0.50 ±0.20
RAS-20	RASP-20	1210	3.05 ±0.10	2.50 ±0.20	0.55 ±0.15	0.50 ±0.20	0.50 ±0.20
RAS-22	RASP-22	2010	5.00 ±0.20	2.50 ±0.20	0.55 ±0.10	0.60 ±0.20	0.60 ±0.20
RAS-24	RASP-24	2512	6.30 ±0.20	3.20 ±0.20	0.55 ±0.10	0.60 ±0.20	0.60 ±0.20
RAS-26	RASP-26	1812	4.50 ±0.10	3.10 ±0.20	0.55 ±0.05	0.55 ±0.20	0.70 ±0.20
RAS-28	RASP-28	1218	3.10 ±0.10	4.60 ±0.10	0.55 ±0.05	0.40 ±0.20	0.50 ±0.20

General Specification

RAS SERIES (Thick Film Anti-Sulfur Chip Resistors)

Size Style		Rate Power at 70°C	Max working Voltage	Max Overload voltage	T.C.R. (PPM/ °C)	Reistance Range	
						D(±0.5%)	F(±1%) , J(±5%)
RAS-02	0201	1/20W	25V	50V	±200	---	1Ω~10MΩ
RAS-04	0402	1/16W	50V	100V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RAS-06	0603	1/10W	75V	150V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	1Ω~9.9Ω
RAS-10	0805	1/8W	150V	300V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RAS-18	1206	1/4W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RAS-20	1210	1/2W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RAS-22	2010	3/4W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RAS-24	2512	1W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RAS-26	1812	3/4W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ

Type	0201 -0402	0603	0805 -1206	1210	1812	2010	2512
Jumper Resistance value	50 mΩ Max.						
Jumper Rated Current	1A		2A	2.5A		3.5A	



RASP SERIES (Thick Film Anti-Sulfur High Power Chip Resistors)

Size Style		Rate Power at 70℃	Max working Voltage	Max Overload voltage	T.C.R. (PPM/℃)	Resistance Range	
						D(±0.5%)	F(±1%) , J(±5%)
RASP-04	0402	1/10W	50V	100V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.76Ω, 10.1MΩ~30MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-06	0603	1/8W	75V	150V	±400	---	1Ω~9.9Ω
					±200	---	10.1MΩ~30MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-10	0805	1/4W	150V	300V	±400	---	1Ω~9.9Ω
					±200	---	10.1MΩ~30MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-18	1206	1/2W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.9Ω, 1.02MΩ~10MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-20	1210	2/3W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	10.1MΩ~30MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-22	2010	1W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	1Ω~9.76Ω, 10.1MΩ~30MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-24	2512	2W	200V	400V	±400	---	1Ω~9.9Ω
					±200	---	10.1MΩ~30MΩ
					±100	10Ω~1MΩ	10Ω~10MΩ
RASP-26	1812	1W	200V	400V	±400	---	1Ω~9.9Ω
					±100	10Ω~1MΩ	10Ω~10MΩ

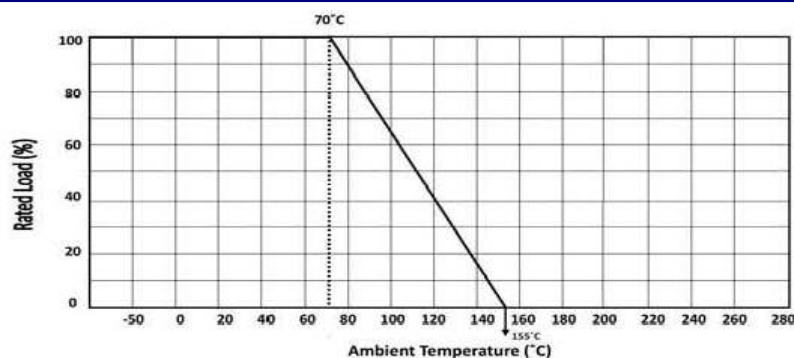
Type	0402	0603	0805	1206	1210	1812-2010	2512
Jumper Resistance value	20 mΩ Max.						
Jumper Rated Current	2A	2.5A	3.5A	5A	6A	7A	10A
Max. Over Load Current < 1 second and 1 times	6A	9A	13A	16A	19A	22A	30A



Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C / +125°C, 25°C is the reference temperature	As Spec
Insulation Resistance	JIS- C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute	$\geq 10G \Omega$
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max Overload voltage whichever is less for 5 Sec.	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.10\Omega)$
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds.	Individual leaching area $\leq 5\%$, Total leaching area $\leq 10\%$
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.05\Omega)$
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 5 cycles	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.10\Omega)$
Resistance to Solvent	JIS -C- 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25 °C for 60 secs. Then the resistor is left in the room for 48 hrs.	F 1% and below : $\pm (0.5\% + 0.05\Omega)$ J 5% : $\pm (0.5\% + 0.05\Omega)$
Damp Heat with Load	JIS -C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm$ 2°C, 90~95% R.H RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (2.0\% + 0.05\Omega)$ value $< 1\Omega$: $\pm (2.0\% + 0.05\Omega)$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm$ 2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (3.0\% + 0.10\Omega)$ value $< 1\Omega$: $\pm (3.0\% + 0.10\Omega)$
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 60 seconds D: 0201 ~ 0805 = 3mm; 1206, 1210 = 3mm 2010, 2512 = 2mm	F 1% and below : $\pm (1.0\% + 0.05\Omega)$ J 5% : $\pm (1.0\% + 0.50\Omega)$

Derating Curve



The Operating Temperature Range:

-55°C ~ +155°C. Power Rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure or derating Curve.

* Rate voltage

Resistance range: $\geq 1\Omega$

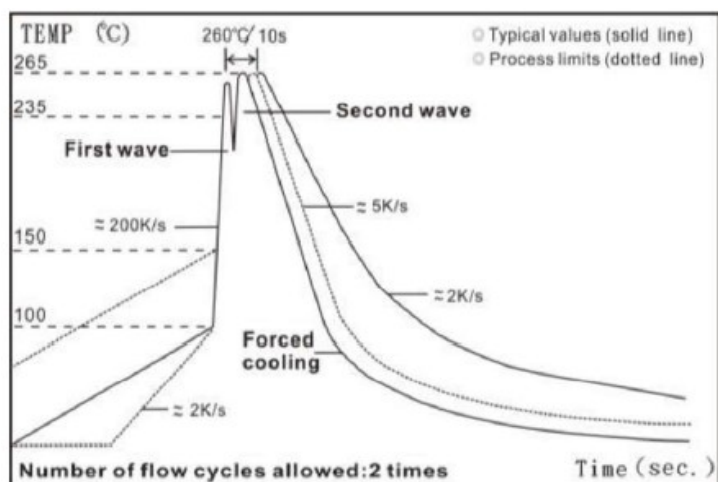
Rated voltage: The resistor shall have a DC continuous working voltage or a RMS AC(ms) continuous working voltage at commercial - line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

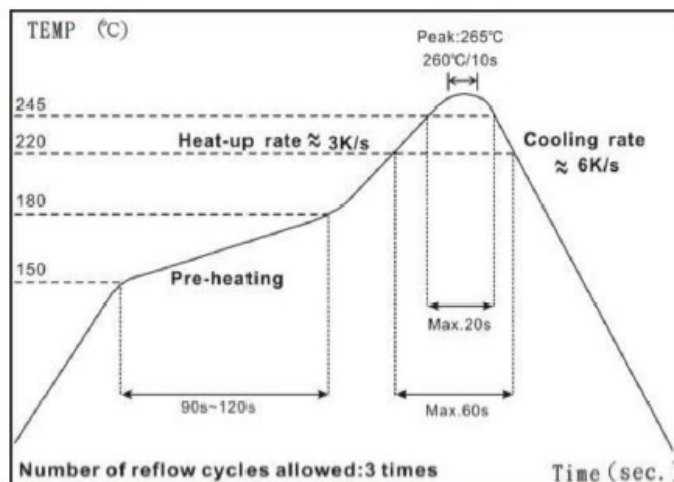
E=Rated voltage(V)
P=Power rating(W)
R=Nominal resistance(Ω)

Recommended Customer Soldering Parameters

* Wave solder Temperature Condition



* Solder reflow Temperature Condition



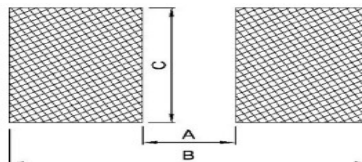
* Rework Temperature (hot air equipment: 350°C, 3~5 seconds)

* Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temp. exceed the recommended profile, devices may not meet the performance requirements.

* Recommend Land Pattern Design



Type	0402	0603	0805	1206	1210	1812	2010	2512
A	0.60	0.85	1.30	2.20	2.00	3.11	3.80	4.90
B	1.60	2.40	2.90	4.20	4.40	5.91	6.60	8.10
C	0.70	1.00	1.40	1.70	2.70	3.00	2.70	3.40

Marking

※ **5%: marking code: 3 digits, please refer to E24 data form as below:**

- First two digits are significant figure,
- Third digit is number of zeros.
- Letter R is decimal point.

EX: 120K, the marking code is 124 in E24



Value=10KΩ

RAS/RASP-06 (0603)
RAS/RASP-10 (0805)
RAS/RASP-18 (1206)
RAS/RASP-20 (1210)

RAS/RASP-26 (1812)
RAS/RASP-22 (2010)
RAS/RASP-24 (2512)

※ **1%: Marking code: 4 digits, Please refer to E96 and E24 data form as below:**

- First three digits are significant figure,
- Forth digit is number of zeros.
- Letter R is decimal point.

EX: 120K, the marking code is 1203 in E
121K, The marking code is 1213 in E96



Value=10KΩ

RAS/RASP-10 (0805)
RAS/RASP-18 (1206)
RAS/RASP-20 (1210)

RAS/RASP-26 (1812)
RAS/RASP-22 (2010)
RAS/RASP-24 (2512)

※ **0201, 0402 no marking**



RAS/RASP-02 (0201)
RAS/RASP-04 (0402)

※ **0603 1%: EIA-96 Marking. Please refer to data form as below:**



RAS/RASP-06 (0603)

1%marking --> Value=12.4KΩ

Parts Number System

RAS -	10 -	102	J	R
Type RAS Series- Thick Film Anti-Sulfur Chip Resistors RASP Series- Thick Film Anti-Sulfur High Power Chip Resistors	Size 02=0201 04=0402 06=0603 10=0805 18=1206 20=1210 22=2010 24=2512 26=1812 28=1218	Resistance 3 Digits: for 5% 10K=103 100K=104 4 Digits: for 0.5%, 1% 10K=1002 100K=1003	Tolerance D=± 0.5% J=± 5% F=± 1%	Standard Packing R=Paper tape reel 15Kpcs/Reel size: 0201 10Kpcs/Reel size: 0402 5Kpcs/Reel size: 0603~1206 K=Embossed plastic tape reel 4Kpcs/Reel size: 2010~2512

- **5% tolerance: 3 digits, first 2 digits are significant figure, Third digit is number of zeros, Letter R is decimal point.**
- **1% tolerance: 4 digits, first three digits are significant figure, Forth digit is number of zeros, Letter R is decimal point.**

AUTOMOTIVE WIDE TERMINAL CHIP RESISTOR

(RMW/RMWH/RMWL SERIES)

AUTOMOTIVE GRADE

Features

- * Small size and light weight
- * Reliability, high quality
- * CCD visual quality inspection
- * AEC-Q200 compliance
- * Excellent Resistance to Vulcanization
(ASTM-B-809-95& EIA-977 Specification)

Applications

- * Automotive electronics
- * Navigation equipment TPMS
- * Heating, Ventilating and Air conditioning
- * Indoor lighting, Central door locking,
Wiper module

Standard Electrical Specifications

Type	Rated Power	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range	
					F(±1%)	J(±5%)
RMW-0508	0.75W	200V	400V	±200	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMW-0612	0.75W			±200	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMW-1020	1W			±200	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMW-1218	1W			±200	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMW-1225	2W			±200	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	

- For non-standard parts, please contact our sales dept.
- Operating temperature Range: -55°C ~ + 155°C

High Power Electrical Specifications

Type	Rated Power	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range	
					F(±1%)	J(±5%)
RMWH-0508	1W	200V	400V	±150	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 1M\Omega$	
RMWH-0612	1.5W			±100	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMWH-1020	2W			±100	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMWH-1218	2W			±100	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	
RMWH-1225	3W			±100	$1\Omega \leq R < 10\Omega$	
				±100	$10\Omega \leq R \leq 10M\Omega$	

- For non-standard parts, please contact our sales dept.
- Operating temperature Range: -55°C ~ + 155°C



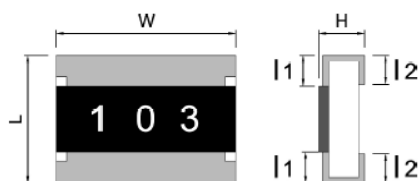
Low Ohm Chip Resistor Electrical specifications

Type	Rated Power	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/°C)	Resistance Range(mΩ)	
					F(±1%)	J(±5%)
RMWL-0612	0.75W	0.087~0.86V	2.154V	±1800	$10 \leq R < 50$	
				±800	$50 \leq R < 100$	
				±600	$100 \leq R \leq 1000$	
RMWL-1020	1W	0.10~0.99V	2.475V	±1800	$10 \leq R < 50$	
				±800	$50 \leq R < 100$	
				±600	$100 \leq R \leq 1000$	
RMWL-1218	1W	0.10~0.99V	2.475V	±1800	$10 \leq R < 50$	
				±800	$50 \leq R < 100$	
				±600	$100 \leq R \leq 1000$	
RMWL-1225	2W	0.14~1.41V	3.518V	±1800	$10 \leq R < 50$	
				±800	$50 \leq R < 100$	
				±600	$100 \leq R \leq 1000$	

- For non-standard parts, please contact our sales dept.

- Operating temperature Range: -55°C ~ +155°C

Type Dimension

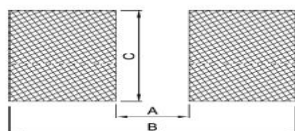


Unit: mm

TYPE	L	W	H	I1	I2
RMW-0508	1.25±0.10	2.00±0.10	0.55±0.10	0.25±0.20	0.50±0.20
RMW-0612	1.60±0.20	3.20±0.20	0.55±0.10	0.30±0.20	0.50±0.20
RMW-1020	2.50±0.20	5.00±0.20	0.55±0.10	0.40±0.20	0.75±0.20
RMW-1218	3.10±0.10	4.60±0.10	0.55±0.05	0.40±0.20	0.50±0.20
RMW-1225*Z	3.20±0.20	6.50±0.20	0.55±0.20	0.40±0.20	0.75±0.20
RMW-1225*H	3.20±0.20	6.50±0.20	0.65±0.20	0.40±0.20	0.75±0.20

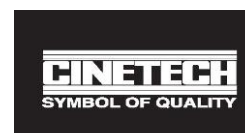
General Information

★ Recommend Land Pattern Design



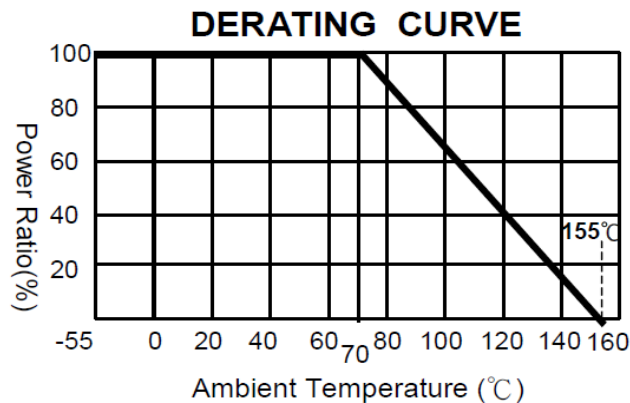
Unit: mm

	0508	0612	1020	1218	1225
A	0.4	0.60	0.75	2.04	0.85
B	1.8	2.90	3.40	4.24	3.70
C	2	3.20	5.00	4.80	6.40



Performance Characteristics

★ Power Derating Curve



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.

Voltage Rating or Current Rating

★ Rate voltage

Resistance range: $\geq 1\Omega$

Rated voltage: The resistor shall have a DC continuous working voltage of a RMS AC continuous working voltage at commercial - line frequency and wave form corresponding to the power rating, as determined formula as following:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)
 P=Power rating(W)
 R=Nominal resistance(Ω)

Standard Resistance Value in Decade

★ RMW/RMWH series marking

* RMW 0508 No Marking



1%: Marking code, Please refer to E96 and E24 dataas below:

EX: 120K, the marking code is 1203 in E24
 121K, The marking code is 1213 in E96



5%: marking code, please refer to E24 data as below:

EX: 120K, the marking code is 124 in E24

Note: Jumper zero ohm resistor marking code is one 「0」



E24		E96							
10	33	100	178	316	562	133	237	422	750
11	36	102	182	324	576	137	243	432	768
12	39	105	187	332	590	140	249	442	787
13	43	107	191	340	604	143	255	453	806
15	47	110	196	348	619	147	261	464	825
16	51	113	200	357	634	150	267	475	845
18	56	115	205	365	649	154	274	487	866
20	62	118	210	374	665	158	280	499	887
22	68	121	215	383	681	162	287	511	909
24	75	124	221	392	698	165	294	523	931
27	82	127	226	402	715	169	301	536	953
30	91	130	232	412	732	174	309	549	976

★ RMWL mΩ Resistance code 4 digi marking.

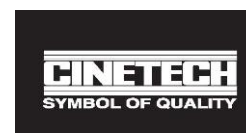


Resistance value: 10mΩ~990mΩ: Code: RXXX.

EX: R680 = 680mΩ

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ / +155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. H:5*Rated power or Max Overload voltage	±1%: ±(1.0%+0.05Ω) ±5%: ±(2.0%+0.1Ω) Value < 1Ω±(2.0%+0.1Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260 ± 5℃ for 30 seconds.	Individual leaching area ≤ 5% Total leaching area ≤ 10%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260 ± 5℃ for 10 seconds.	±1%: ±(0.5%+0.05Ω) ±5%: ±(1.0%+0.05Ω) Value < 1Ω±(1.0%+0.05Ω)
Insulation Resistance	JIS -C- 5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≥ 10 GΩ
Temperature Cycling	JESD22 Method JA-104	1000 cycles (-55℃ to + 125℃) Measurement at 24±4 hours after test conclusion. 30min max. dwell time at each temperature	±1%: ±(0.5%+0.05Ω) ±5%: ±(1.0%+0.10Ω)



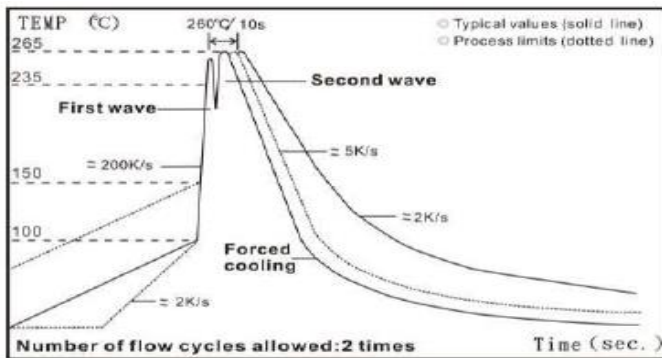
Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Resistance to Solvent	MIL-STD-202 Method 215	Add Aqueous wash chemical-OKEM Clean or equivalent	$\pm 1\%: \pm(0.5\%+0.05\Omega)$ $\pm 5\%: \pm(0.5\%+0.05\Omega)$
Biased Humidity	MIL-STD-202 Method 103	1,000 hrs; 85°C /85% RH, 10% of operating power Measurement at 24±4 hrs after test conclusion	$\pm 1\%: \pm(1.0\%+0.05\Omega)$ $\pm 5\%: \pm(3.0\%+0.05\Omega)$
High Temp. Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs.@T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion	$\pm 1\%: \pm(0.5\%+0.05\Omega)$ $\pm 5\%: \pm(2.0\%+0.05\Omega)$
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA= 125 °C at derated power Measurement at 24±4 hrs after test conclusion	$\pm 1\%: \pm(1.0\%+0.05\Omega)$ $\pm 5\%: \pm(3.0\%+0.10\Omega)$
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	--
Mechanical Shock	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's.Normal duration (D) is 6 (ms)	$\pm 1\%: \pm(1.0\%+0.05\Omega)$ $\pm 5\%: \pm(2.0\%+0.10\Omega)$
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 H	$\pm 1\%: \pm(1.0\%+0.05\Omega)$ $\pm 5\%: \pm(2.0\%+0.10\Omega)$
ESD	AEC-Q200-002 or ISO/DIS 10605	Human body model 0508· 0612: 1KV 1020 and above: 2KV	$\pm(3\%: \pm 0.05\Omega)$
Solderability	J-STD-002	(1) 4 hrs 155°C dry heat (2) 245±5°C 3 sec.	$\pm 1\%: \pm(0.5\%+0.05\Omega)$ $\pm 5\%: \pm(1.0\%+0.05\Omega)$
Terminal Strength (SMD)	AEC Q200-006	Pressurizing force for 60 seconds 0508/0612 : 8N 1020 and above :17.7 N	No broken
Board Flex	AEC Q200-005	Beading once for 60 seconds 0508/0612/1020/1218/1225: 3mm	$\pm 1\%: \pm(1.0\%+0.05\Omega)$ $\pm 5\%: \pm(1.0\%+0.05\Omega)$
Sulfur Test	ASTM-B-809-95 EIA-977	105±2°C, NO RATING POWER FOR 1000 HRS (NOT INCLUDE TYPE 0508)	$\triangle R: \pm(2.0\%+0.05\Omega)$

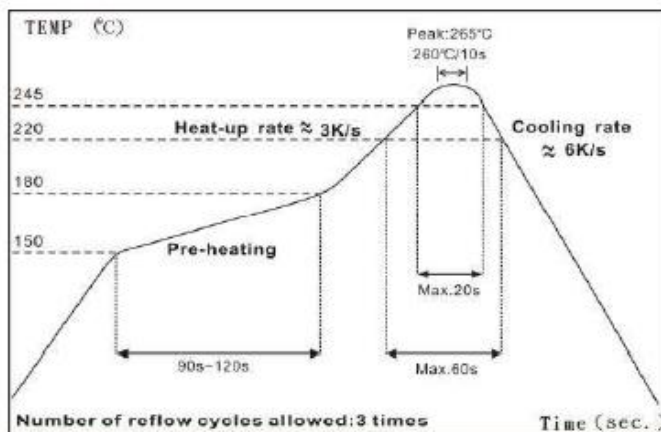


Recommended Customer Soldering Parameters

★ Wave solder Temperature condition



★ Solder reflow Temperature condition



★ Rework temperature (hot aire equipment): 350°C, 3~5seconds

★ Recommended reflow methods

- IR, vapor phase oven, hot air oven
- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.



Parts Number System

RMW -	0612 -	1002	F	R
Type RMW/RMWH/ RMWL = Automotive wide Terminal Chip Resistor	Size 0508 0612 1020 1218 1225	Resistance 10mR = R010 100mR = R100 1R = 1R00 10R = 10R0 100R = 1000 1K = 1001 1M = 1004	Tolerance F = $\pm 1\%$ J = $\pm 5\%$ On request	Standard Packing R=tape reel 0508/0612=5K pcs/R K=Embossed plastic tape reel 1020~1225 =4Kpcs/R



CARBON FILM FIXED RESISTORS

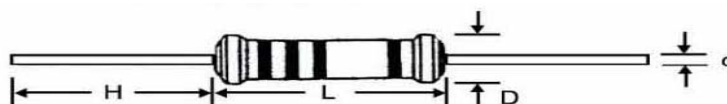
(CR SERIES)

The resistance temperature coefficient of carbon film resistors is relatively high. Their resistance value changes inversely with temperature. But as they are big in volume, causing quick dissipation of heat and low temperature rise, they are good enough in quality stability and reliability, and are therefore popularly used in consumer electronic appliances. In addition to the above general features, our CR series carbon film fixed resistors have the following features in particular:

- *Automated mass production, low prices.
- *Selected superior quality materials to ensure stability and reliability.
- *Variety of packaging-bulk, strip pack, ammo box tape box, tape reel, cut and formed, or radial Panasert/Avisert



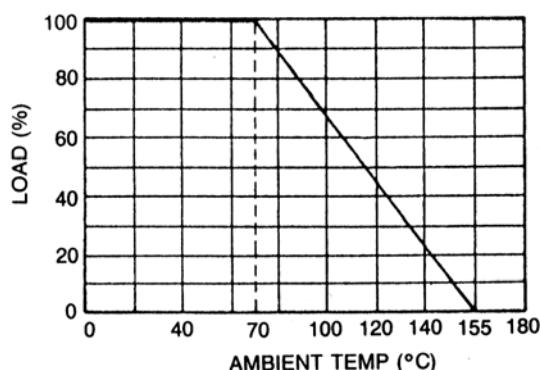
Dimensions



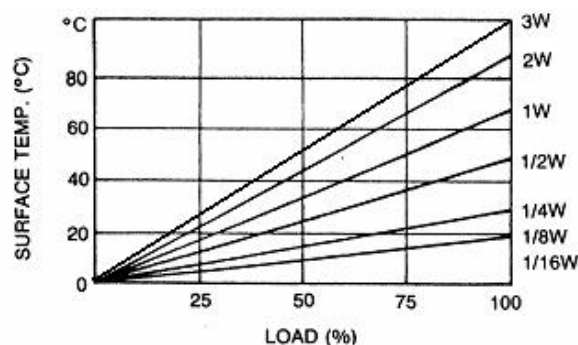
General Specification

MIL Style	Style	Power Rating	Dimensions				Max.		Resistance Range	
			L	D	d	H (MIN)	Working V.	Overload V.	±2% (G)	±5% (J)
RD-50	CR-012	1/8W (0.125W)	3.7 ± 0.4	1.7 ± 0.2	0.45 ± 0.05	25	200V	400V	10Ω~470K	1Ω~10M
	CR-016	1/6W (0.16W)	3.7 ± 0.4	1.7 ± 0.2	0.45 ± 0.05	25	200V	400V	10Ω~470K	1Ω~10M
RD-55	CR-025	1/4W (0.25W)	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	25	250V	500V	10Ω~10M	10Ω~10M
	CR-050S	1/2WS (0.5W)	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	25	300V	600V	10Ω~10M	10Ω~10M
	CR-033	1/2W Small Size	8.5 ± 0.5	2.8 ± 0.3	0.55 ± 0.05	25	300V	600V	10Ω~10M	10Ω~10M
RD-60	CR-050	1/2W (0.5W)	9 ± 1	3.3 ± 0.5	0.55 ± 0.05	25	350V	700V	10Ω~10M	10Ω~10M
	CR-100	1W	12 ± 1	4.5 ± 0.5	0.73 ± 0.05	25	500V	1000V	10Ω~10M	10Ω~10M
RD-65	CR-100S	1W Small Size	9 ± 1	3.3 ± 0.5	0.60 ± 0.05	25	400V	800V	10Ω~10M	10Ω~10M
RD-70	CR-200	2W	16 ± 1	5.0 ± 0.5	0.75 ± 0.05	25	500V	1000V	10Ω~10M	10Ω~10M
RD-75	CR-300S	3WS	18 ± 1	6.5 ± 0.5	0.75 ± 0.05	25	650V	1200V	10Ω~470K	1Ω~1M

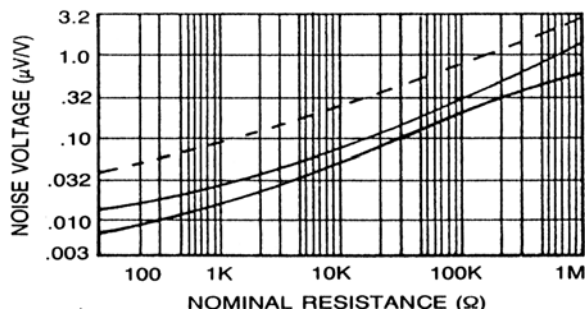
Derating Curve



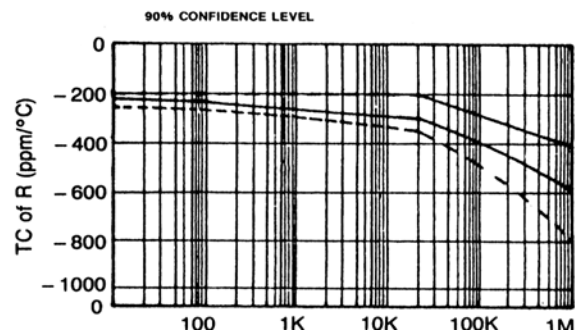
Surface Temp Rise



Current Noise



Temperature Coefficient



*For CR012 and CR025, tin plated copper clad steel lead wire also available
 0 ohm available for CR012 and CR025, only one black color ring at the body center.

Characteristics

REQUIREMENTS		PERFORMANCE				TEST METHOD	
						JIS C 5202	MIL-STD-202
Operating Temp. Range		-55°C~ + 155°C				—	—
Temp. Coefficient (ppm°C)	TCR TYPE	±450	-150 -700	-150 -1,000	-150 -1,300	5.2	METHOD304
	0.125W	under 1KΩ	1.1KΩ-47KΩ	51KΩ-510KΩ	560KΩ-1MΩ		
	0.25W	under 10KΩ	1.1KΩ-150KΩ	160KΩ-2.2MΩ	2.4MΩ-5.1MΩ		
	0.5W & over	under 22KΩ	24KΩ-470KΩ	510KΩ-2.2MΩ	2.4KΩ-10MΩ		
Noise (μV/V)	NOISE TYPE	0.1	0.3	0.6	1.0	5.9-11	METHOD308
	0.125W & 0.16W	—	under 10KΩ	11KΩ-100KΩ	over 110KΩ		
	0.25W& over	under100KΩ	110KΩ~510KΩ	560KΩ~2.2MΩ	over 2.4KΩ		
Dielectric Withstanding Voltage		No evidence of flashover or breakdown				5.7. - A	METHOD301
Resistance to solvents		Permanent Marking No physical or electrical damage or deterioration				—	METHOD215
Short Time Overload		△Rmax ≤ ±(1%+0.05Ω)				5.5- A	
Resistance to Soldering Heat		△Rmax ≤ ±(1%+0.05Ω)				6.4 350°C 3 sec	METHOD210
Temperature Cycling		△Rmax ≤ ±(1%+0.05Ω)				7.4-55°C/. 85°C	METHOD107
Vibration		△Rmax ≤ ±(0.5%+0.05Ω)				6.3.3-A	METHOD204
Moisture	R > 100KΩ	△Rmax ≤ ±5%				7.9.40°C 90-65% RH.	METHOD106
Resistance	R ≤ 100KΩ	△Rmax ≤ ±(3%+0.05Ω)				1000hrs	
Load Life	R > 100KΩ	△Rmax ≤ ±3%				7.10	METHOD108
	R ≤ 100KΩ	△Rmax ≤ ±(2%+0.05Ω)				70°C 1000hrs	

Parts Number system

CR	-	025	103	J	T
CR-Carbon film resistor FPC-Carbon film resistor with flameproof coating		Wattages	Resistance	Tolerance	Packing code
			3-digit code 103=10K ohm	J=5% G=2%	T= Ammo pack R= Tape/reel B= Bulk pack

Note: 26, 52, 63 and 73 mm taping are available for different wattages, consult with factory before ordering



CARBON FILM FIXED RESISTORS

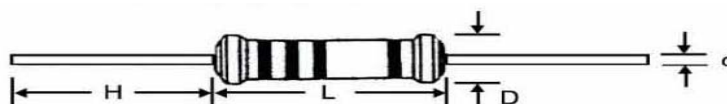
(CR SERIES)

The resistance temperature coefficient of carbon film resistors is relatively high. Their resistance value changes inversely with temperature. But as they are big in volume, causing quick dissipation of heat and low temperature rise, they are good enough in quality stability and reliability, and are therefore popularly used in consumer electronic appliances. In addition to the above general features, our CR series carbon film fixed resistors have the following features in particular:

- *Automated mass production, low prices.
- *Selected superior quality materials to ensure stability and reliability.
- *Variety of packaging-bulk, strip pack, ammo box tape box, tape reel, cut and formed, or radial Panasert/Avisert



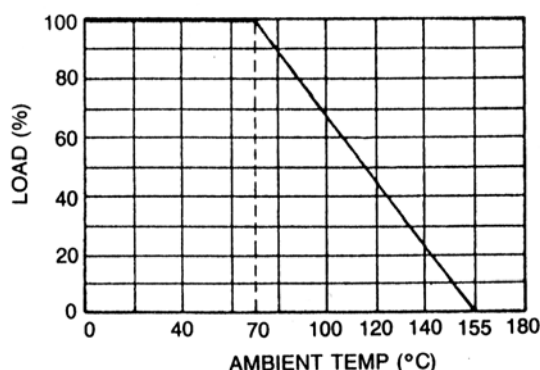
Dimensions



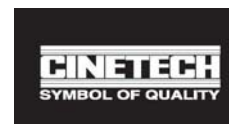
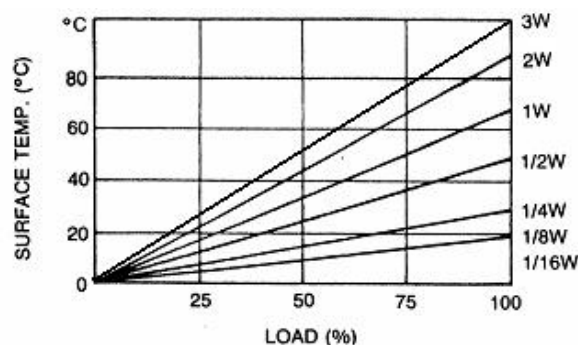
General Specification

MIL Style	Style	Power Rating	Dimensions				Max.		Resistance Range	
			L	D	d	H (MIN)	Working V.	Overload V.	±2% (G)	±5% (J)
RD-50	CR-012	1/8W (0.125W)	3.7 ± 0.4	1.7 ± 0.2	0.45 ± 0.05	25	200V	400V	10Ω~470K	1Ω~10M
	CR-016	1/6W (0.16W)	3.7 ± 0.4	1.7 ± 0.2	0.45 ± 0.05	25	200V	400V	10Ω~470K	1Ω~10M
RD-55	CR-025	1/4W (0.25W)	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	25	250V	500V	10Ω~10M	10Ω~10M
	CR-050S	1/2WS (0.5W)	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	25	300V	600V	10Ω~10M	10Ω~10M
	CR-033	1/2W Small Size	8.5 ± 0.5	2.8 ± 0.3	0.55 ± 0.05	25	300V	600V	10Ω~10M	10Ω~10M
RD-60	CR-050	1/2W (0.5W)	9 ± 1	3.3 ± 0.5	0.55 ± 0.05	25	350V	700V	10Ω~10M	10Ω~10M
	CR-100	1W	12 ± 1	4.5 ± 0.5	0.73 ± 0.05	25	500V	1000V	10Ω~10M	10Ω~10M
RD-65	CR-100S	1W Small Size	9 ± 1	3.3 ± 0.5	0.60 ± 0.05	25	400V	800V	10Ω~10M	10Ω~10M
RD-70	CR-200	2W	16 ± 1	5.0 ± 0.5	0.75 ± 0.05	25	500V	1000V	10Ω~10M	10Ω~10M
RD-75	CR-300S	3WS	18 ± 1	6.5 ± 0.5	0.75 ± 0.05	25	650V	1200V	10Ω~470K	1Ω~1M

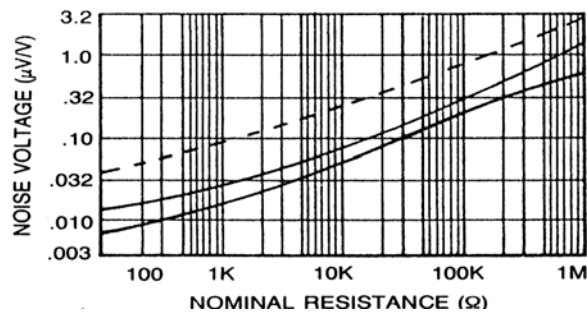
Derating Curve



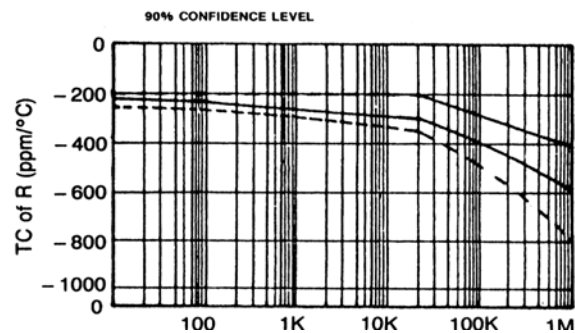
Surface Temp Rise



Current Noise



Temperature Coefficient



*For CR012 and CR025, tin plated copper clad steel lead wire also available
 0 ohm available for CR012 and CR025, only one black color ring at the body center.

Characteristics

REQUIREMENTS		PERFORMANCE				TEST METHOD	
						JIS C 5202	MIL-STD-202
Operating Temp. Range		-55°C~ + 155°C				—	—
Temp. Coefficient (ppm°C)	TCR TYPE	±450	-150 -700	-150 -1,000	-150 -1,300	5.2	METHOD304
	0.125W	under 1KΩ	1.1KΩ-47KΩ	51KΩ-510KΩ	560KΩ-1MΩ		
	0.25W	under 10KΩ	1.1KΩ-150KΩ	160KΩ-2.2MΩ	2.4MΩ-5.1MΩ		
	0.5W & over	under 22KΩ	24KΩ-470KΩ	510KΩ-2.2MΩ	2.4KΩ-10MΩ		
Noise (μV/V)	NOISE TYPE	0.1	0.3	0.6	1.0	5.9-11	METHOD308
	0.125W & 0.16W	—	under 10KΩ	11KΩ-100KΩ	over 110KΩ		
	0.25W& over	under100KΩ	110KΩ~510KΩ	560KΩ~2.2MΩ	over 2.4KΩ		
Dielectric Withstanding Voltage		No evidence of flashover or breakdown				5.7. - A	METHOD301
Resistance to solvents		Permanent Marking No physical or electrical damage or deterioration				—	METHOD215
Short Time Overload		△Rmax ≤ ±(1%+0.05Ω)				5.5- A	
Resistance to Soldering Heat		△Rmax ≤ ±(1%+0.05Ω)				6.4 350°C 3 sec	METHOD210
Temperature Cycling		△Rmax ≤ ±(1%+0.05Ω)				7.4-55°C/. 85°C	METHOD107
Vibration		△Rmax ≤ ±(0.5%+0.05Ω)				6.3.3-A	METHOD204
Moisture	R > 100KΩ	△Rmax ≤ ±5%				7.9.40°C 90-65% RH.	METHOD106
Resistance	R ≤ 100KΩ	△Rmax ≤ ±(3%+0.05Ω)				1000hrs	
Load Life	R > 100KΩ	△Rmax ≤ ±3%				7.10	METHOD108
	R ≤ 100KΩ	△Rmax ≤ ±(2%+0.05Ω)				70°C 1000hrs	

Parts Number system

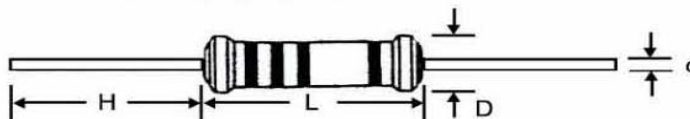
CR	-	025	103	J	T
CR-Carbon film resistor FPC-Carbon film resistor with flameproof coating		Wattages	Resistance	Tolerance	Packing code
			3-digit code 103=10K ohm	J=5% G=2%	T= Ammo pack R= Tape/reel B= Bulk pack

Note: 26, 52, 63 and 73 mm taping are available for different wattages, consult with factory before ordering



FLAME PROOF TYPE

(FPC SERIES)



Dimensions

FPC series are carbon film resistors with complete nonflame insulated coating, do not burn in outside flaming or inside overloading, thus ensure the safety of electronic appliances.

General Specification

Style	Power Rating	Dimensions				Max. Working V.	Max. Overload V.	Resistance Range	
		L	D	d	H (MIN)			±2% (G)	±5% (J)
FPC-012	1/8W (0.125W)	3.7 ± 0.3	1.7 ± 0.2	0.45 ± 0.05	25	200V	400V	10Ω~1M	10Ω~10M
FPC-025	1/4W (0.25W)	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	25	250V	500V	10Ω~1M	1Ω~10M
FPC-050	1/2W (0.5W)	9 ± 1	3.5 ± 0.5	0.55 ± 0.05	25	350V	700V	10Ω~1M	1Ω~10M
FPC-100	1W	12 ± 1	4.5 ± 0.5	0.73 ± 0.05	25	500V	1000V	10Ω~1M	1Ω~10M
FPC-200	2W	16 ± 1	5.0 ± 0.5	0.75 ± 0.05	25	500V	1000V	10Ω~1M	1Ω~10M
FPC-200S	2W	12 ± 1	4.5 ± 0.5	0.73 ± 0.05	25	500V	1000V	10Ω~1M	1Ω~10M

Characteristics

Requirements	Characteristics	Test Method
Non-Combustibility	Flame Resistance Not burns continuously for more than 5 seconds, Overload Burning Resistance Not fume under the overload of less than 5 times of rated power. The volume of fumes emitted under the overload of more than 5 times of rated power is less than of stilled fumes emitted by one cigarette. During the test the height of fumes does not over 3mm and the burning does not continue for more than 3 seconds.	MIL-STD-202 Method 111 JIS C 5202 7 . 12 EIAJ-RC 2658 5.1

METAL FILM FIXED RESISTORS

(MF SERIES)

MF series are a group of metal film-fixed resistors applying high Aluminum content base material vacuum sputtered by Ni-Cr alloy and excellent heat-and wet-proof special resin for protective coating. Those resistors are manufactured through integrated automatic production system and then have good stable and uniform property. Furthermore, they show excellent performance regardless open in air.

DIMENSIONS



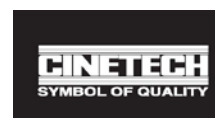
General Specification

MIL Style	Style	Power Rating (W)	Dimensions				Max Working Voltage	Max Overload Voltage
		70°C	L	D	d	H (MIN)	70°C	70°C
RN-50	MF-12	0.125W	3.7±0.4	1.7±0.2	0.45±0.05	25	150	300
RN-50	MF-25S	0.25W	3.7±0.4	1.7±0.2	0.45±0.05	25	200	400
RN-55	MF-25	0.25W	6.5±0.5	2.3±0.2	0.50±0.05	25	250	500
RN-60	MF-50	0.5W	9.0±1	3.5±0.5	0.55±0.05	25	350	500
RN-60	MF-100S	1WS	9.0±1	3.5±0.5	0.55±0.05	25	400	600
RN-65	MF-100	1W	12±1.0	4.5±0.5	0.73±0.05	25	500	700
RN-65	MF-200S	2WS	12±1.0	4.5±0.5	0.73±0.05	25	500	700
RN-70	MF-200	2W	16±1.0	5.5±0.5	0.75±0.05	25	500	1000

RESISTANCE RANGE

STYLE	MIL STYLE	TOLERANCE	TC ± 25PPM/°C	TC ± 100PPM/°C TC ± 50PPM/°C	TC ± 200PPM/°C
MF-12 MF-25S	RN-50	±1% ±0.5% ±0.25% ±0.1%	100Ω-100KΩ 100Ω-100KΩ 100Ω-100KΩ 100Ω-100KΩ	51.1Ω-511KΩ 51.1Ω-511KΩ 51.1Ω-511KΩ	5.11Ω-5.11M
MF-25	RN-55	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-511KΩ 51.1Ω-511KΩ 100Ω-330KΩ 100Ω-100KΩ	10Ω - 1M	5.11Ω-5.11M
MF-50 MF-100S	RN-60	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1MΩ 51.1Ω-1MΩ 100Ω-511KΩ 100Ω-330KΩ	10Ω - 1M	5.11Ω-5.11M
MF-100 MF-200S	RN-65	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1MΩ 51.1Ω-1MΩ 100Ω-511KΩ 100Ω-330KΩ	10Ω - 1M	5.11Ω-5.11M
MF-200	RN-70	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1MΩ 51.1Ω-1MΩ 100Ω-511KΩ 100Ω-330KΩ	10Ω - 1M	5.11Ω-5.11M

*chmic values beyond above range are available upon request



FLAME PROOF TYPE

(FPS & FPM SERIES)

FPM and FPS series are nonflammable high performance metal film fixed resistors. By applying selected flame-overload burning-resisting resin on our regular metal film fixed resistors, those resistors improve the safeness of various kinds of electronic devices and instruments and having excellent electrical performance.

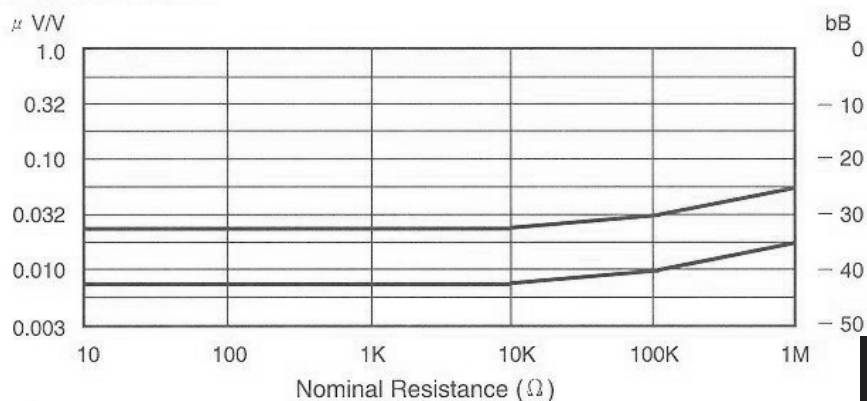
General Specification

Style		Dimensions				Max Working	Max Overload
FPS	FPM	L	D	d	H (MIN)	Voltage	Voltage
0.25W FPS-25	0.125W FPM-12	3.7±0.4	1.7±0.2	0.45±0.05	25	200	400
0.5W FPS-50	0.25W FPM-25	6.5±0.5	2.3±0.2	0.50±0.05	25	250	500
1.0W FPS-100	0.5W FPM-50	9±1	3.5±0.5	0.55±0.05	25	350	700
2.0W FPS-200	1.0W FPM-100	12.0±1	4.5±0.5	0.73±0.05	25	350	700
3.0W FPS-300	2.0W FPM-200	16.0±1	5.0±0.5	0.75±0.05	25	350	700

Characteristics

Requirements	Characteristics	Test Method
Non-Combustibility	Flame Resistance Not burns continuously for more than 5 seconds. Overload burning Resistance Not fume under the overload of less than 5 time of rated power. The volume of fumes emitted under the overload of more than 5 time of rated power is less than of stilled fumes emitted by one cigarette. During the test the height of fumes does not over 3mm and the burning does not continue for more than 3 seconds.	MIL-STD-02 Method 111 JIS C 5202 7.12 EIAJ-RC 2658 5.1

Current Noise



Characteristics	Specification	Test Method
		(All resistance measurements should be performed after stabilization or conditioning periods)
Dc Resistance	Within specified tolerance	MIL-STD-202 Method 303
Temperature Coefficient	As buyer requested $\pm 25\text{PPM}^{\circ}\text{C}$ $\pm 100\text{PPM}^{\circ}\text{C}$ $\pm 50\text{PPM}^{\circ}\text{C}$ $\pm 200\text{PPM}^{\circ}\text{C}$	MIL-STD-202 Method 304
Dielectric Strength	No flashover or damage	MIL-STD-202 Method 301 1/8W,1/6W 300V 1 minute 1/4W 500V 1 minute 1/2W 700V 1 minute 1,2W 750V 1 minute
Insulation Resistance	At least 1,000M Ω	MIL-STD-202 Method 302 100V 1 minute
Terminal Strength	lead is not break or loose	MIL-STD-202 Method211
Resistance to Soldering Heat	ΔR within $\pm(0.25\%+0.05\Omega)$	MIL-STD-202 Method210 350°C, 3 $\pm$ 0.05 sec.
Solderability	At least 95% coverage	MIL-STD-202 Method218 260°C, 5 sec.
Thermal Shock	ΔR within $\pm(0.5\%+0.05\Omega)$	MIL-STD-202 Method107 - 55°C, 3 + 155°C 5 cycles
Short Time Overload	ΔR within $\pm(0.5\%+0.05\Omega)$	MIL-R-10509 Para 4,6,6 2.5 times rated working voltage,5 seconds
Humidity	ΔR within $\pm(1\%+0.05\Omega)$ No mechanical damage	MIL-STD-202 Method103 40°C, RH95% 1000 hours
Low Temperature Operation	ΔR within $\pm(0.5\%+0.05\Omega)$	MIL-R-10509 Para 4,6,5 rated working voltage,at-65°C 45 minutes.

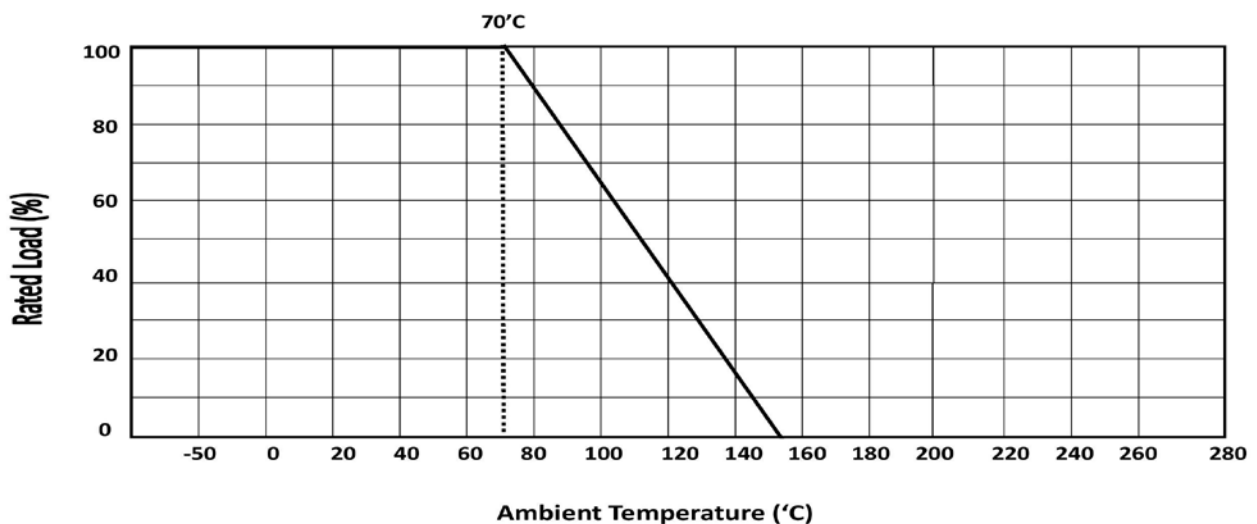


Load Life	ΔR within $\pm(1\%+0.05\Omega)$	MIL-STD-202 Method108 Rated working voltage 1 1/2hours on. 1/2 hours off for total 1000 hours
Resistance to Solvent	Color bands legible No mechanical damage	MIL-STD-202 Method215

Parts Number system

MF	—	25S	1002	F	T	E
	Wattages	Resistance	Tolerance	Packing Code	T.C.R	
MF-Metal film resistor FPM-Metal film resistor with flameproof coating FPS - Metal film resistor small size with flameproof coating	S=small size	4-digit codes for ≤ 1% 1002 = 10K ohm 3-digit codes for 2% and 5 % 103= 10K ohm	F=1% D=0.5% B=0.1%	T=AMMO tape/ box R=Tape reel B=Bulk pack	K= 100 ppm C= 50 ppm E= 25 ppm T= 10 ppm NO TCR marked on P/N for 5% tolerance	

Derating Curve

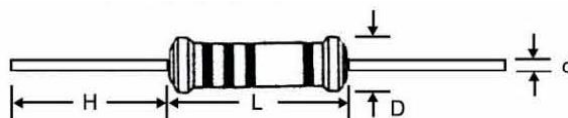


MINIATURE SIZE METAL FILM FIXED RESISTORS

(FM SERIES)

1. Miniature size for saving PCB assembly.
2. Manufactured by high vacuum sputtering deposit metal film on high aluminum content ceramic rods.
3. Superior electrical performance and cost comparable to conventional size.
4. Standard tolerance: $\pm 1\%$

Dimensions



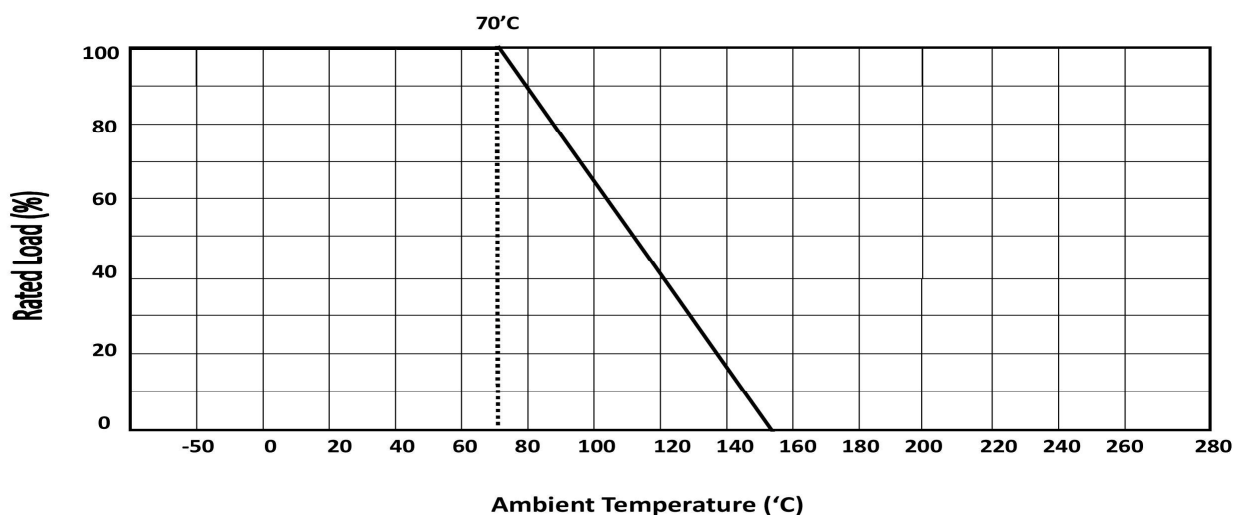
General Specification

Style	Power Rating(W)	Dimensions				Max Working V.*	Max Overload V.	*Resistance Range 1%
	70°C	L	D	d	H (MIN)			
FM-0204	0.4W	3.7 ± 0.4	1.7 ± 0.2	0.45 ± 0.05	27	200V	350V	10Ω~1MEG
FM-0207	0.6W	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	27	350V	500V	10Ω~1MEG
FM-01	1W	6.5 ± 0.5	2.3 ± 0.2	0.55 ± 0.05	27	350V	500V	10Ω~1MEG
FM-02	2W	10.5 ± 1	3.5 ± 1	0.75 ± 0.05	25	350V	700V	10Ω~1MEG
FM-03	3W	16.0 ± 1	5.5 ± 0.5	0.75 ± 0.05	25	350V	700V	10Ω~1MEG

*Max working voltage determined by $E = \sqrt{PR}$, E Should not exceed value listed in column above

*Ohmic values beyond 10Ω - 1M and closer tolerance up to 0.1% are available upon request.

Derating Curve



Characteristics

Requirements	Characteristics	
Temperature Coefficient	$\pm 25\text{PPM}$ $\pm 50\text{PPM}$ $\pm 100\text{PPM}$	$10^{-6} / ^\circ\text{C}$ MIL-STD-202 METHOD-304
Life Stability At 70 °C 1000 Hr Max. Resistance Change	0.5%	At Most Vmax. 1.5 hr on 0.5 hr off
Dielectric Withstanding Voltage	300 Vr.m.s.for FM-0204 500 Vr.m.s.for FM-0207,FM-01	
Insulation Resistance	>10 MΩ	100VDC
Damp Heat Steady State	±1%	56Days At 40°C and 95°C Relative humidity at a voltage of 0.1 times rated voltage. Max 16 Volts
Short time Overload	±0.5%	2.5 times rated voltage, at most 2 times limiting element voltage (U Max)
Moisture Resistance	±1.5%	40±2 °C , 95% RH, 1000hrs
Resistance to Soldering Heat	±0.5%	350±5 °C to 6mm distance from the resistance body in 3 sec.
Temperature Cycling	±0.5%	- 55 to +155 °C
Low Temperature Operation	±0.5%	- 65°C
Vibration	±0.5%	
Current Noise	Up to 1MΩ ≤ 0.5 $\frac{\mu\text{V}}{\text{V}}$	- 5dB
Solderability	>95% coverage	Dipping in 260°C Solder bath for 2.5 sec
Resistance to Solvents	No failure to top coating and color code	

Parts Number system

FM	0207	1002	F	T	E
FM Miniature size metal film resistor	Wattages	Resistance	Tolerance	packaging codes	T.C.R.
		4-digit code for ≤ 1% 1002= 10K ohm 3-digit code for 5% 103= 10K ohm	J= 5% F= 1% D= 0.5% B= 0.1%	T=AMMO tape / box R=Tape reel B=Bulk pack	K=100 ppm C=50 ppm E=25 ppm T=10 ppm No TCR marked on P/N for 5% tolerance

Note:

1. 26, 25, 63 and 73MM tapping are available for different wattages.
2. Flameproof coating for FM01, FM02 and FM03.
3. Resistance range 0.1% 10Ω~150k ohm.



METAL OXIDE FILM RESISTORS

(RSF & RSS SERIES)

RSF series are electric power type highly reliable fixed resistors with special metal oxide film thermochemically burned on the high heat conductive base material. They include those of flame-resisting coating type and nonflammable coating type and owing to their uniform quality produced through the most modern products able to use easily for various kinds of electronic devices and instruments.

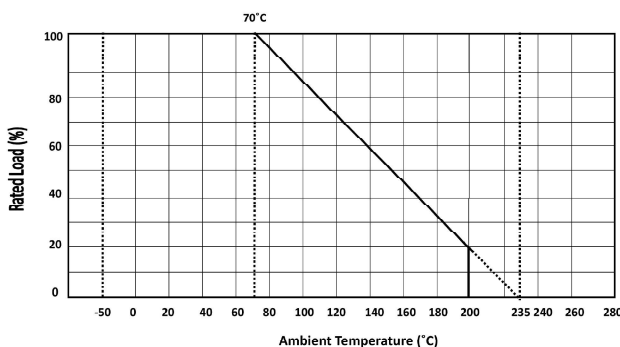
RSS are small-sized metal oxide film resistors, apply high aluminum content ceramic cores with performance for compact sizes.

Features

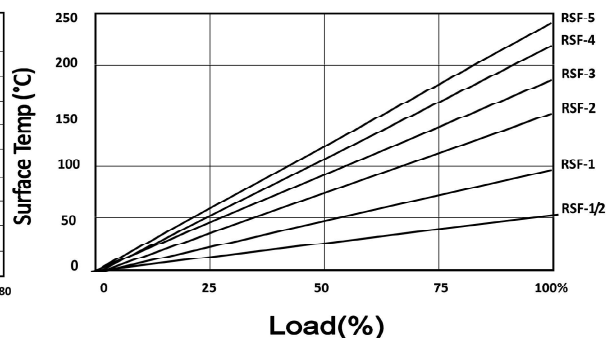
- 1.Small in size comparatively.
- 2.Electrical and mechanical stability and high reliability.
- 3.Best resistive to heat, humidity and noncombustible.
- 4.Annual shift is the lowest for the strengthen metal oxide film.
- 5.Low noise,with high resistance value which wire wound type can not be produced.

- * Coating and marking resist IPA or other cleaning solvents
- * Improved stability,dissipation,and low TCR available, Consult factory.
- * RSF 1/2-3W apply color code,RSF 4-7W apply graphic marking.

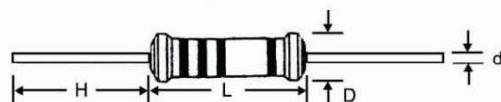
Derating Curve



Surface Temp Rise



Dimensions



General Specification

Style		Dimensions				Max. Working V.	Max. Overload V.	Resistance Range ± 5%(J)
RSS	RSF	L	D	d	H(MN)			
1/2W	1/4W	6.5±1	2.3±0.5	0.50±0.05	25	250 V	500V	0.1Ω~1M
1W	1/2W	9±1	3.5±0.5	0.55±0.05	25	300V	600V	0.1Ω~1M
2W	1W	11±1	4.5±1.0	0.73±0.05	27	350 V	700 V	0.1Ω~1M
3W	2W	15.5±1	5.0±1.0	0.75±0.05	27	350 V	700V	0.1Ω~1M
*5WS		18±1	6.5±1.0	0.75±0.05	27	500V	1000V	10Ω~150KΩ
5W	3W	24.5±1	8.5±1.0	0.75±0.05	27	500V	1000V	0.5Ω~1M
*6WS		24.5±1	8.5±1.0	0.75±0.05	27	500V	1000V	0.5Ω~1M
6W	4W	32±1	8.5±1.0	0.75±0.05	27	500V	1000V	10Ω~150KΩ
7W	5W	41±1	8.5±1.0	0.75±0.05	27	750 V	1000V	10Ω~150KΩ
10W	7W	53±1	8.5±1.0	0.75±0.05	27	750V	1000V	10Ω~150KΩ

Characteristics

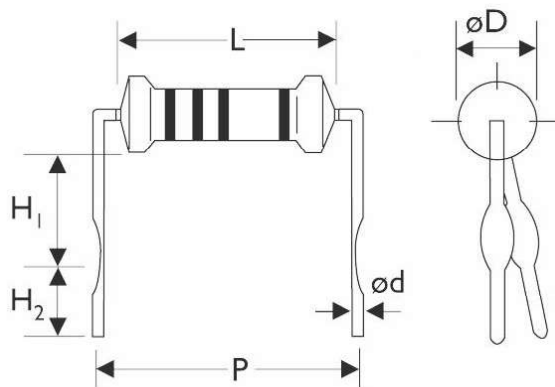
Requirements	Performance	Test Method	
		JIS-C-5202	MIL-STD202
Operating Temp. Range	-55°C~+155°C	—	—
Temp. Coefficient (ppm/°C)	±350	5.2	METHOD 304
Short Time Overload	$\Delta R_{max} \leq \pm(1\%+0.05\Omega)$	5.5-A	—
Resistance to Soldering Heat	$\Delta R_{max} \leq \pm(1\%+0.05\Omega)$	6.4. 350°C 3 Sec	METHOD210
Temp. Cycling	$\Delta R_{max} \leq \pm(1\%+0.05\Omega)$	7.4.-55°C/85°C, 5 cycle	METHOD107
Moisture Resistance	$\Delta R_{max} \leq \pm 5\%$	7.9 95%RH on-off 1.000 hr	METHOD 106
Load Life	$\Delta R_{max} \leq \pm 5\%$	7.10 70°C RH on-off 1.000 hr	METHOD 108
Dielectric Withstanding Voltage	$\Delta R_{max} \leq \pm(0.5\%+0.05\Omega)$	5.7 -A	METHOD 301
Insulation Resistance	10 ⁴ MΩ ~	5.6 -A	—
Non-Combustibility	The resistor shall withstand Overload test in accordance with Article UL 492.2.13 without producing a fire hazard.		

*Note: Lower TCR ± 200 ppm or ± 100ppm also available, consult to factory

*RSS5WS/6WS - the ceramic core is high alumina content which gives excellent heat dissipation and high power



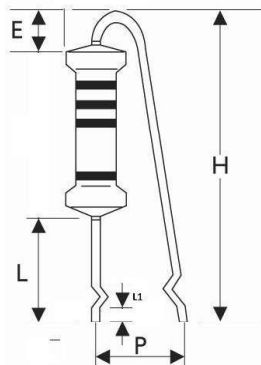
MF FORM



Unit: mm

RSS	RSF	$D \pm 0.5$	$L \pm 1$	P	H1	$H2 \pm 1$
2W	1W	4.5	11	15 ± 1.5	7 ± 1	4.5
3W	2W	5.5	15	20 ± 2	10 ± 2	4.5
5W	3W	8.5	24	30 ± 2	13 ± 2	4.5

FK FORM



*With/without leads kink or kink at only one lead can be done by customers' request

RSS	RSF	$D \pm 0.5$	$L \pm 1$	$H \pm 3$	$d \pm 0.05$	Pref	$L1 \pm 1$	E
2W	1W	4.5	10	25MAX	0.73	8	4	3.5MAX
3W	2W	5.5	10	30MAX	0.75	8	4	3.5MAX

Part Number system

RSF	200	103	J	T
	Wattages	Resistance	Tolerance	Packaging codes
RSF-Metal Oxide Film Resistor	025=1/4W			R=Tape reeled
RSS-Metal Oxide Film Resistor	050=1/2W		J=5%	T=AMMO Tape/box
Small Size	100=1W	3-digit code	F=1%	FK, MF-Formed &
RSF200=RSF2W	200=2W	103=10K ohm		Cut Leads
	300=3W			B=Bulk Pack,
	500=5W			Straight Leads

Note: 52, 63 and 73 MM taping are available for different Wattages

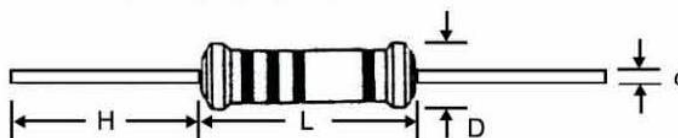
HIGH VOLTAGE METAL GLAZE RESISTORS

RV(RVS) SERIES

Features

- Excellent anti-surge characteristics
- Suitable for high voltage and high impedance applications
- Stable characteristics of moisture resistance
- Standard coating - epoxy, silicon, flameproof coating on request
- Operating temperature range $-55^{\circ}\text{C} - +175^{\circ}\text{C}$

Construction



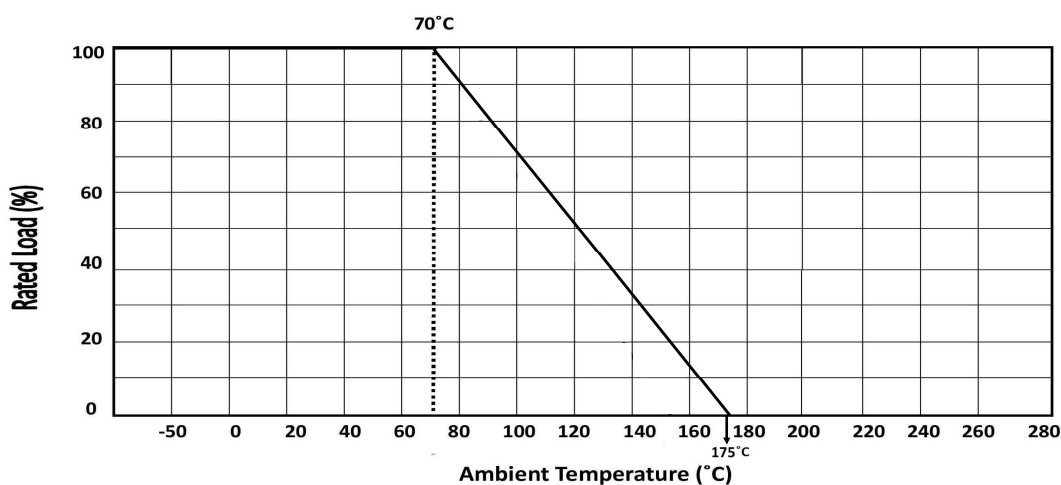
General Specification

Style		Dimensions				Max Permissible Voltage	Max Impulse Voltage	Standard Resistance Range
RVS	RV	L	D	d	H($\pm 2.0\text{mm}$)	V	V	
1/2W	1/4W	6.5 ± 0.5	2.3 ± 0.2	0.55 ± 0.05	28	1600	3000	1K ~ 1G
1W	1/2W	9.0 ± 1.0	3.2 ± 0.5	0.7 ± 0.05	26	3500	10000	1K ~ 1G
2W	1W	11.5 ± 1.0	4.5 ± 0.5	0.78 ± 0.03	35	5000	10000	1K ~ 1G
3W	2W	15.5 ± 1.0	5.5 ± 0.5	0.78 ± 0.03	32	7500	10000	1K ~ 1G
5W	3W	17.5 ± 1.0	6.0 ± 0.5	0.78 ± 0.03	35	12000	16000	1K ~ 1G

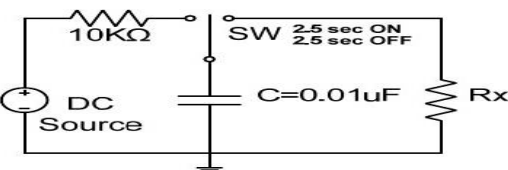
Standard Tolerance 5%, $\geq 1\text{G}$ 10%

*Special resistances and Up to 10G tolerances are available upon request

Derating Curve



Electrical Characteristics

Characteristics	Specification	Test Method
Temperature Coefficient	$< 1G \leq \pm 200 \times 10^{-6} / K$ $> 1G \leq \pm 500 \times 10^{-6} / K$	MIL-STD-202 Method 304
Dielectric withstanding voltage of the insulation for 1 min	1/4W upward 400V ~1000V	260 °C $\pm$ 5 °C, 2S $\pm$ 1S
Resistance to soldering heat	ΔR within $\pm 1\%$	MIL-STD-202 Method 201 350°C, 3 $\pm$ 0.5 sec.
Terminal Strength	Leads are not broken or loosened	MIL-STD-202 method 211
Solderability	At least 95% coverage	MIL-STD-202 method 218 235°C, 5 sec.
Short Time Overload	ΔR within $\pm 1\%$	MIL-R-10509 Para 4.6.6 2.5 times rated working voltage
Humidity	ΔR within $\pm 2\%$	MIL-STD-202 Method 103, 40 °C, 90% RH 1000Hours
Impulse Test	ΔR within $\pm 2\%$	MIL-R-10509 para 4.6.5
Load Life	ΔR within $\pm 3\%$	MIL-STD-202 Method 108, Rated Working Voltage 1 1/2 hours on, 1/2 hours off, 1000 hrs.
Resistance to Solvent	Color band legible no mechanical damage	MIL-STD-202 Method 215
Anti Surge Characteristics	Discharge Test: 0.01uF capacitors Discharge Pulse 10 times. (1 pulse/5 sec. Max) 	
	Type	RV 1/4W RVS 1/2W RV 1/2W RVS 1W RV 1W RVS 2W RV 3W RVS 5WS
	Voltage	3KV
		$1K \leq R < 10K ; 5KV$
$10K \leq R < 100K ; 7KV$		
	$100K \leq R : 10KV$	10KV 15KV

Parts Number System

RV(RVS)	—	1/4W	104	J	T
		Wattages	Resistance	Toleranc	Packaging Codes
High voltage Metal Glaze Resistor		1/4W 1/2W 1W 2W 3W	3 digit code for 5% 104= 100K 4 digit code for 1% 1003= 100K	F=1% J=5% K=10%	T - Ammo tape/box R - Tape/Reel B - Bulk pack



FLAMEPROOF FUSIBLE RESISTORS

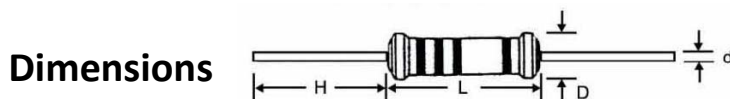
(FML, FMF, FKN & FSQ SERIES)

FMF,FML Series are low cost type resistors provide circuit protection for overload or component failure. The resistor will be opened quickly under continuous load, it prevents circuit board from damage and fire hazards.

Features

1. Suitable to apply in transistor protection circuit.
2. Small in sizes with low cost.
3. Noncombustible insulating coat, solvent proof and excellent application in high temperature.
4. Standard TCR $\pm 200\text{PPM}/^{\circ}\text{C}$
5. Uniform in fusing time.

FUSIBLE METAL FILM TYPE FMF, FML SERIES



General Specification

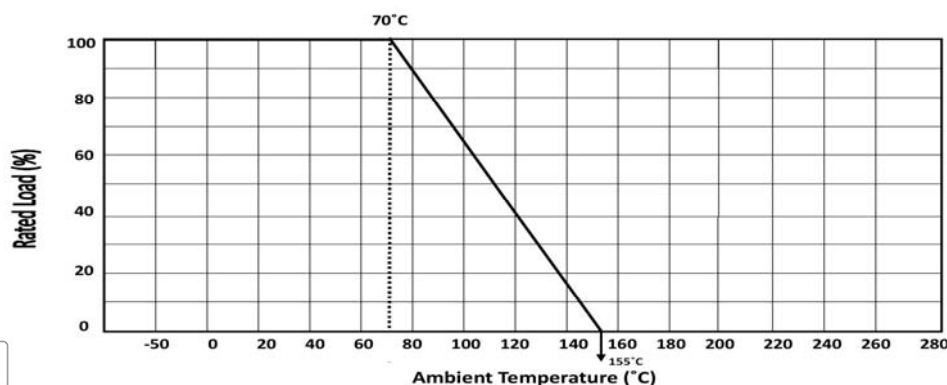
Style		Dimensions				Resistance Range	Max Working Voltage	Dielectric Withstanding Voltage
FML	FMF	L	D	d	H(MIN)			
1/4W	1/2W	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	25	$1\Omega \sim 10\text{K}\Omega$	250V	300V
1/2W	1W	9 ± 0.5	3.5 ± 0.5	0.55 ± 0.05	25	$1\Omega \sim 10\text{K}\Omega$	300V	500V
1W	2W	11 ± 0.5	4.5 ± 0.5	0.73 ± 0.05	25	$1\Omega \sim 10\text{K}\Omega$	350V	500V
2W	3W	15 ± 0.5	5.0 ± 0.5	0.75 ± 0.05	25	$1\Omega \sim 10\text{K}\Omega$	500V	500V

Note: 1. Max overload voltage is 2 times Max working voltage.

2. 0.1-0.9 Ω available upon request.

3. MF form available, pls ref to the forming spec of [Metal Oxide Film Resistors](#)

Derating Curve



Fusing Characteristics:

Resistance Range	Fusing Power	
	FML	FMF
0.22Ω~1Ω	32 X Rated power	16 X Rated power
1.1Ω~2Ω	25 X Rated power	16 X Rated power
2.1Ω~10Ω	16 X Rated power	16 X Rated power
12Ω~10KΩ	12 X Rated power	16 X Rated power
Fusing Time: within 60 sec		

Note:1. Same fusing chart for FML,FMF,FKN and FSQ series.

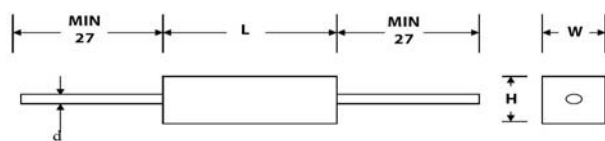
2. Special fusing time according to customers' spec is also available.

Characteristic

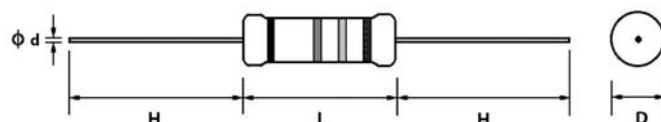
Characteristic	Condition	Spec.
Operating Temp.	- 40°C ~ + 240°C	
Resistance Temp. Coeff.	- 30°C ~ + 150°C	± 200 ppm/°C
Short Time Over Load	2 time of rated voltage for 5 sec.	± 2%
Insulation Resistance	500V megger	1,000M Ω
Temp Cycle	- 30°C ~ 85°C for 5 cycles	± 1%
Load Life	25°C on-off cycles 1,000 hrs.	± 5%
Moisture-Proof Load Life	40°C 95% RH on-off cycle 1,000 hrs.	± 5%
Solder Pot	270°C for 3 sec.	± 1%
Incombustibility	16 times of rated wattage for 5 min.	not flamed

*Total resistance change: ($\Delta R\% + 0.05 \Omega$)

FUSIBLE WIRE WOUND TYPE FKN, FSQ SERIES Dimensions



FSQ



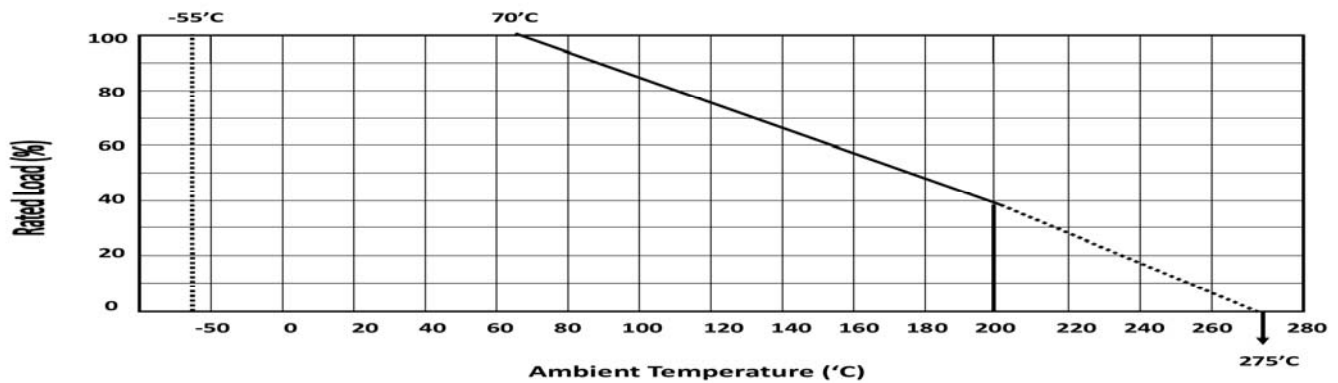
FKN

General Specification

Style	Power Rating	Dimensions						Resistance Range	Dielectric Withstanding Voltage
		L ± 1.5	D ± 1	h ± 0.5	W ± 0.5	d ± 0.05	H(MIN)		
FKN	1W	9	3			0.6	25	0.1Ω~10Ω	500V
	2W	11	4			0.73	27	0.1Ω~30Ω	500V
	3W	15	5.5			0.75	27	0.1Ω~50Ω	500V
	5W	17	6.5			0.75	27	0.3Ω~100Ω	500V
FSQ	2W	18		7	7	0.65	27	0.1Ω~22Ω	1000V
	3W	22		8	8	0.75	27	0.1Ω~50Ω	1000V
	5W	22		9	10	0.75	27	0.2Ω~50Ω	1000V
	7W	35		9	10	0.75	27	0.3Ω~100Ω	1000V
	10W	48		9	10	0.75	27	0.3Ω~150Ω	1000V



Derating Curve



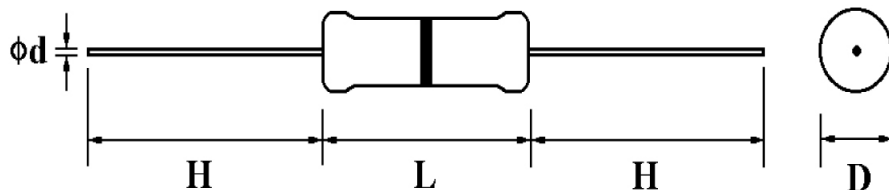
Characteristic

Test items	Condition	Spec.
Operating Temp.	- 55 °C ~ + 275 °C	
Resistance Temp. Coeff.	-30 °C ~ + 150 °C	± 200 ppm/ °C
Short Time Over Load	2.5 time of rated voltage for 5 sec.	± 2%
Insulation Resistance	500V megger	1,000M Ω
Temp Cycle	- 30 °C ~ + 85 °C for 5 cycles	± 1%
Load Life	70 °C on-off cycles 1,000 hrs.	± 5%
Moisture-Proof Load Life	40 °C 95% RH on-off cycle 1,000 hrs.	± 5%
Solder Pot	270 °C for 3 sec.	± 1%
Incombustibility	16 times of rated wattage for 5 min.	not flamed

Parts Number system

FMF	—	2W	101	J	B
FMF-Fusible Metal Film Resistor Small Size		Wattages	Resistance	Tolerance	Packing Code
FML-Fusible Metal Film Resistor Normal Size			3 Digit code for 5% tolerance 4 Digit code for 1% tolerance	J = ±5% F = ±1%	R=Tape/Reeled T=Tape/Box B=Bulk Pack
FKN,FSQ-Fusible Wire Wound Resistor					

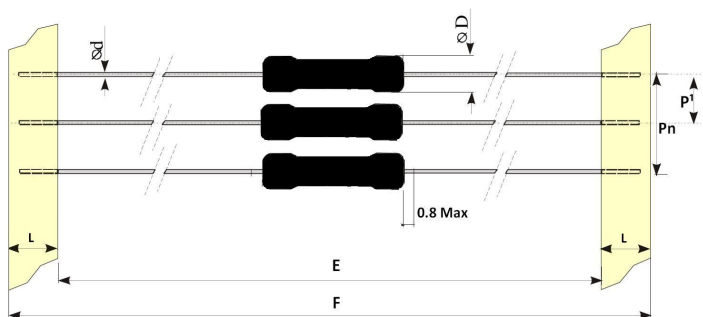
ZERO-OHM RESISTORS



Mechanical Dimensions

	DIMENSIONS (mm)		in	
	L	D	H	d
1/8W	3.7±0.4	1.5±0.2	27MM	0.45±0.03
1/4W	6.5±0.5	2.3±0.2	27MM	0.5±0.05

Packing: Resistors supplied on reels of 5,000 pieces per EIA RS-296-C.

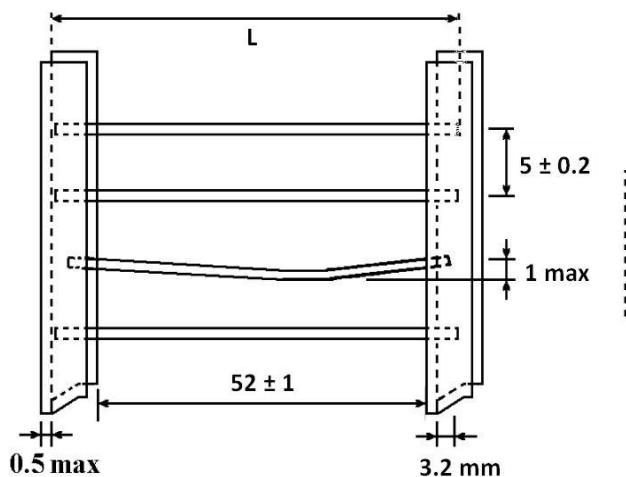
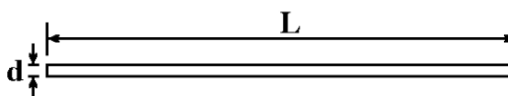


DIMENSIONS(mm)	in.
E 52±1.0.....	2.090 ± 0.20
F 6.6±0.5.....	2.600 ± 0.20
P ¹ 5.08±0.4.....	.200 ± 0.15
Pn 500±4.....	19.685 ± .157
n: 100 spacings	
L 6.35±0.25.....	.250 ± .010

JUMPER WIRES

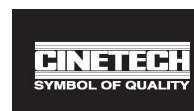
JT-52MM

JT-26MM



DIMENSION

Style	L±1	d±0.05
JW0.45	60	0.45
JW0.58	60	0.58
JW0.60	60	0.60
JW0.70	60	0.70
JW0.78	60	0.78
JW1.00	60	1.00

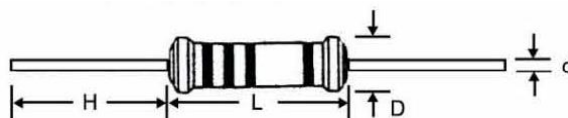


MINIATURE SIZE METAL FILM FIXED RESISTORS

(FM SERIES)

1. Miniature size for saving PCB assembly.
2. Manufactured by high vacuum sputtering deposit metal film on high aluminum content ceramic rods.
3. Superior electrical performance and cost comparable to conventional size.
4. Standard tolerance: $\pm 1\%$

Dimensions



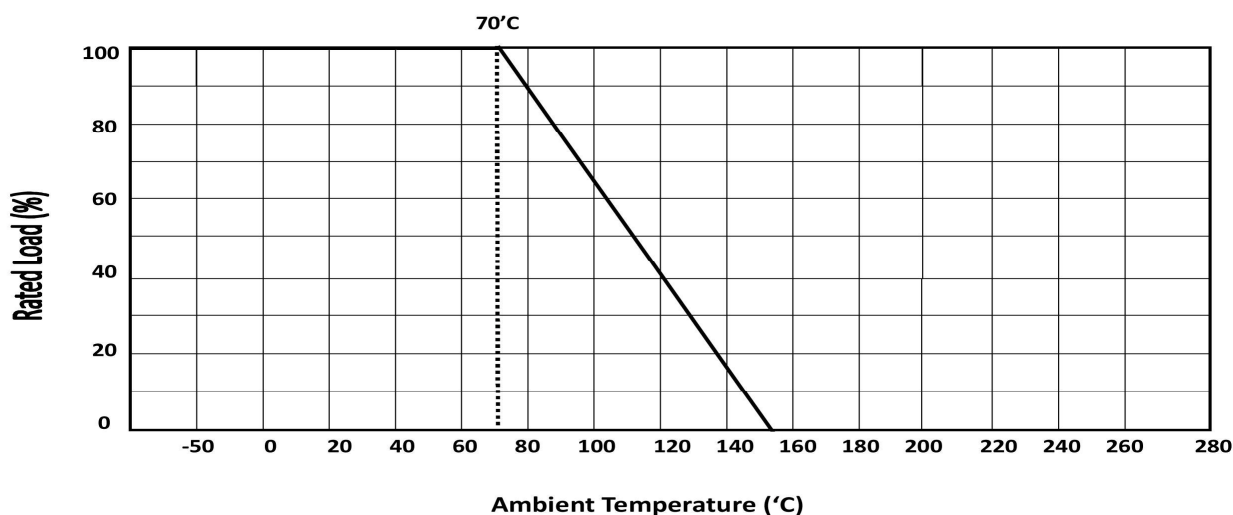
General Specification

Style	Power Rating(W)	Dimensions				Max Working V.*	Max Overload V.	*Resistance Range 1%
	70°C	L	D	d	H (MIN)			
FM-0204	0.4W	3.7 ± 0.4	1.7 ± 0.2	0.45 ± 0.05	27	200V	350V	10Ω~1MEG
FM-0207	0.6W	6.5 ± 0.5	2.3 ± 0.2	0.50 ± 0.05	27	350V	500V	10Ω~1MEG
FM-01	1W	6.5 ± 0.5	2.3 ± 0.2	0.55 ± 0.05	27	350V	500V	10Ω~1MEG
FM-02	2W	10.5 ± 1	3.5 ± 1	0.75 ± 0.05	25	350V	700V	10Ω~1MEG
FM-03	3W	16.0 ± 1	5.5 ± 0.5	0.75 ± 0.05	25	350V	700V	10Ω~1MEG

*Max working voltage determined by $E = \sqrt{PR}$, E Should not exceed value listed in column above

*Ohmic values beyond 10Ω - 1M and closer tolerance up to 0.1% are available upon request.

Derating Curve



Characteristics

Requirements	Characteristics	
Temperature Coefficient	$\pm 25\text{PPM}$ $\pm 50\text{PPM}$ $\pm 100\text{PPM}$	$10^{-6} / ^\circ\text{C}$ MIL-STD-202 METHOD-304
Life Stability At 70 °C 1000 Hr Max. Resistance Change	0.5%	At Most Vmax. 1.5 hr on 0.5 hr off
Dielectric Withstanding Voltage	300 Vr.m.s.for FM-0204 500 Vr.m.s.for FM-0207,FM-01	
Insulation Resistance	>10 MΩ	100VDC
Damp Heat Steady State	±1%	56Days At 40°C and 95°C Relative humidity at a voltage of 0.1 times rated voltage. Max 16 Volts
Short time Overload	±0.5%	2.5 times rated voltage, at most 2 times limiting element voltage (U Max)
Moisture Resistance	±1.5%	40±2 °C , 95% RH, 1000hrs
Resistance to Soldering Heat	±0.5%	350±5 °C to 6mm distance from the resistance body in 3 sec.
Temperature Cycling	±0.5%	- 55 to +155 °C
Low Temperature Operation	±0.5%	- 65°C
Vibration	±0.5%	
Current Noise	Up to 1MΩ ≤ 0.5 $\frac{\mu\text{V}}{\text{V}}$	- 5dB
Solderability	>95% coverage	Dipping in 260°C Solder bath for 2.5 sec
Resistance to Solvents	No failure to top coating and color code	

Parts Number system

FM	0207	1002	F	T	E
FM Miniature size metal film resistor	Wattages	Resistance	Tolerance	packaging codes	T.C.R.
		4-digit code for ≤ 1% 1002= 10K ohm 3-digit code for 5% 103= 10K ohm	J= 5% F= 1% D= 0.5% B= 0.1%	T=AMMO tape / box R=Tape reel B=Bulk pack	K=100 ppm C=50 ppm E=25 ppm T=10 ppm No TCR marked on P/N for 5% tolerance

Note:

1. 26, 25, 63 and 73MM tapping are available for different wattages.
2. Flameproof coating for FM01, FM02 and FM03.
3. Resistance range 0.1% 10Ω~150k ohm.



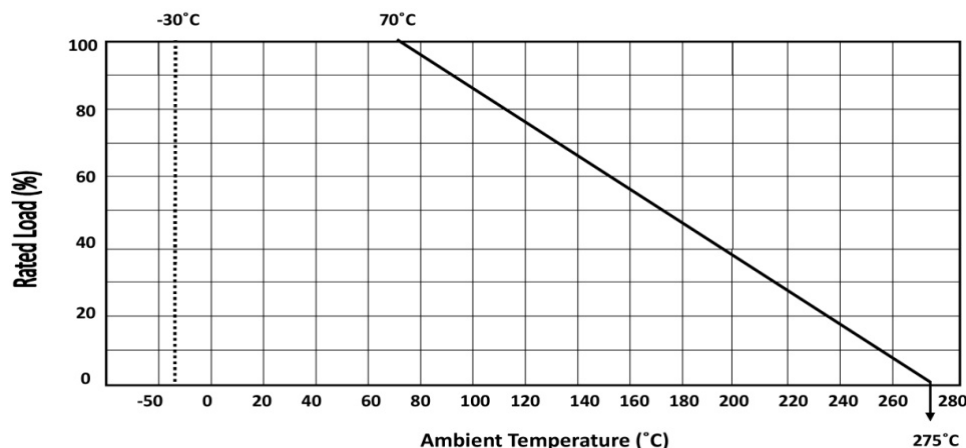
WIREWOUND RESISTORS

FLAME-PROOF COATING KNP(RW)TYPE

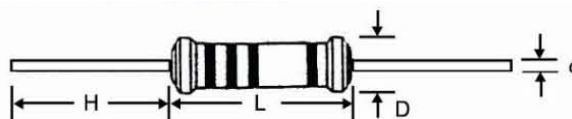
KNP(RW) type is to wind the resistance wire on a alkaliless ceramic core, coated with non-corrosive and high in-sulating heat proof material.

1. Super heat dissipation.
2. Small linear temperature coefficient.
3. Instant overload capability.
4. Low noise figure and without annual shift on resistance value

Derating Curve



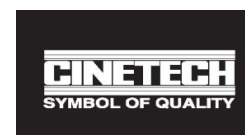
Dimensions



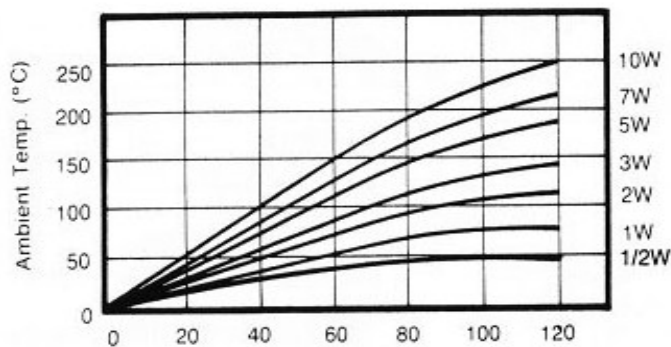
Type		Power Rating at temp.	Dimensions (mm)				Resistance Range (Ω) 1%, 5%
KNPS	KNP		D	L	H (MIN)	d ± 0.05mm	
1/2W	1/4W	70°C	2.3± 0.5	6.5± 1.0	25	0.55	0.1 ~ 47Ω
1WSS		70°C	2.3± 0.5	6.5± 1.0	25	0.55	0.1 ~ 47Ω
1W	1/2W	70°C	3.5± 0.5	9± 1.0	27	0.60	0.1 ~ 47Ω
2WSS		70°C	3.5± 0.5	9± 1.0	27	0.60	0.1 ~ 100Ω
2W	1W	70°C	4.0± 1.0	11± 1.0	27	0.75	0.1 ~ 150Ω
3WSS		70°C	4.0± 1.0	11± 1.0	27	0.75	0.1 ~ 150Ω
3W	2W	70°C	5.5± 1.0	15± 1.0	27	0.75	0.1 ~ 200Ω
5W	3W	40°C	6.5± 1.0	18± 1.5	27	0.75	0.1 ~ 400Ω
7W	5W	40°C	8.5± 1.0	25± 1.5	27	0.75	0.1 ~ 1K
8W	7W	40°C	8.5± 1.0	32± 1.5	27	0.75	0.1 ~ 1K
10W	8W	40°C	8.5± 1.0	42± 1.5	27	0.75	0.1 ~ 2K
	10W	40°C	8.5± 1.0	53± 1.5	27	0.75	0.1 ~ 4K7

Note: Resistance up to 27 Ω maximum for Non-inductive type

Lower or Higher resistance values other than the list are also available



Temperature Rise



Test Items	Condition	Spec.
Resistance Temp.Coeff.	-55°C~+155°C	* ± 300 ppm/°C standard
Short Time Over Load	5 times of rated wattage for 5 sec.	$\pm 2\%$
Rated Load	Rated wattage 30 min.	
Voltage Durability	500V AC 1 min.	not changed
Insulation Resistance	500V megger	500M Ω
Temp. Cycle	- 55°C ~ + 150°C for 5 cycles	$\pm 1\%$
Load Life	70°C on-off cycle 1,000 hrs.	$\pm 5\%$
Moisture-Proof Load Life	40°C 95% RH on-off cycle 500 hrs.	$\pm 3\%$
Incombustibility	16 times of rated wattage for 5 min	not flamed

Note: Special value is available on request.

* Lower TCR ± 25 , 50, 100ppm available upon request.

Parts Number System

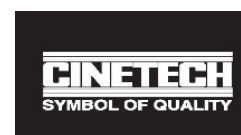
KNP	—	200S	101	J	B	C
Wire Wound Resistor With Flameproof Coating Axial Type		Wattages	Resistance	Tolerance	Packing Code	T.C.R
KNP - Wire Wound Resistor NKNP-Non-inductive W/W resistor		see below 2. & 3.	3 Digit code for 5% tolerance 4 Digit code for 1% tolerance	J = $\pm 5\%$ F = $\pm 1\%$	R= Tape/Reeled T=Ammo Tape/box B=Bulk Pack	No marking = 300ppm K = 100ppm C = 50ppm E = 25ppm

Note: 1. 52, 63, and 73mm taping are available for different Wattages.

2. Wattages: 1W = 100; 2W=200; 3W=300; 5W=500; 7W=700; 8W=800; 10W=10W

3. "S" - Small size wire wound Resistor

"SS" - ultra small size wire wound Resistor



METAL FILM FIXED RESISTORS

(MF SERIES)

MF series are a group of metal film-fixed resistors applying high Aluminum content base material vacuum sputtered by Ni-Cr alloy and excellent heat-and wet-proof special resin for protective coating. Those resistors are manufactured through integrated automatic production system and then have good stable and uniform property. Furthermore, they show excellent performance regardless open in air.

DIMENSIONS



General Specification

MIL Style	Style	Power Rating (W)	Dimensions				Max Working Voltage	Max Overload Voltage
		70°C	L	D	d	H (MIN)	70°C	70°C
RN-50	MF-12	0.125W	3.7±0.4	1.7±0.2	0.45±0.05	25	150	300
RN-50	MF-25S	0.25W	3.7±0.4	1.7±0.2	0.45±0.05	25	200	400
RN-55	MF-25	0.25W	6.5±0.5	2.3±0.2	0.50±0.05	25	250	500
RN-60	MF-50	0.5W	9.0±1	3.5±0.5	0.55±0.05	25	350	500
RN-60	MF-100S	1WS	9.0±1	3.5±0.5	0.55±0.05	25	400	600
RN-65	MF-100	1W	12±1.0	4.5±0.5	0.73±0.05	25	500	700
RN-65	MF-200S	2WS	12±1.0	4.5±0.5	0.73±0.05	25	500	700
RN-70	MF-200	2W	16±1.0	5.5±0.5	0.75±0.05	25	500	1000

RESISTANCE RANGE

STYLE	MIL STYLE	TOLERANCE	TC ± 25PPM/°C	TC ± 100PPM/°C TC ± 50PPM/°C	TC ± 200PPM/°C
MF-12 MF-25S	RN-50	±1% ±0.5% ±0.25% ±0.1%	100Ω-100KΩ 100Ω-100KΩ 100Ω-100KΩ 100Ω-100KΩ	51.1Ω-511KΩ 51.1Ω-511KΩ 51.1Ω-511KΩ	5.11Ω-5.11M
MF-25	RN-55	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-511KΩ 51.1Ω-511KΩ 100Ω-330KΩ 100Ω-100KΩ	10Ω - 1M	5.11Ω-5.11M
MF-50 MF-100S	RN-60	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1MΩ 51.1Ω-1MΩ 100Ω-511KΩ 100Ω-330KΩ	10Ω - 1M	5.11Ω-5.11M
MF-100 MF-200S	RN-65	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1MΩ 51.1Ω-1MΩ 100Ω-511KΩ 100Ω-330KΩ	10Ω - 1M	5.11Ω-5.11M
MF-200	RN-70	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1MΩ 51.1Ω-1MΩ 100Ω-511KΩ 100Ω-330KΩ	10Ω - 1M	5.11Ω-5.11M

*chmic values beyond above range are available upon request



FLAME PROOF TYPE

(FPS & FPM SERIES)

FPM and FPS series are nonflammable high performance metal film fixed resistors. By applying selected flame-overload burning-resisting resin on our regular metal film fixed resistors, those resistors improve the safeness of various kinds of electronic devices and instruments and having excellent electrical performance.

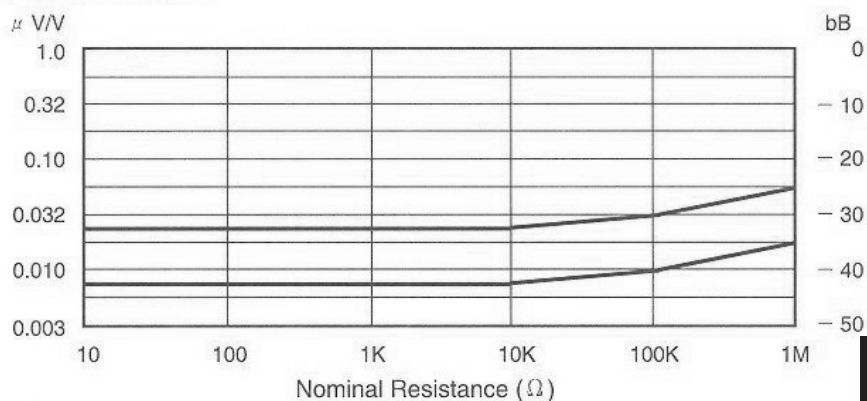
General Specification

Style		Dimensions				Max Working	Max Overload
FPS	FPM	L	D	d	H (MIN)	Voltage	Voltage
0.25W FPS-25	0.125W FPM-12	3.7±0.4	1.7±0.2	0.45±0.05	25	200	400
0.5W FPS-50	0.25W FPM-25	6.5±0.5	2.3±0.2	0.50±0.05	25	250	500
1.0W FPS-100	0.5W FPM-50	9±1	3.5±0.5	0.55±0.05	25	350	700
2.0W FPS-200	1.0W FPM-100	12.0±1	4.5±0.5	0.73±0.05	25	350	700
3.0W FPS-300	2.0W FPM-200	16.0±1	5.0±0.5	0.75±0.05	25	350	700

Characteristics

Requirements	Characteristics	Test Method
Non-Combustibility	Flame Resistance Not burns continuously for more than 5 seconds. Overload burning Resistance Not fume under the overload of less than 5 time of rated power. The volume of fumes emitted under the overload of more than 5 time of rated power is less than of stilled fumes emitted by one cigarette. During the test the height of fumes does not over 3mm and the burning does not continue for more than 3 seconds.	MIL-STD-02 Method 111 JIS C 5202 7.12 EIAJ-RC 2658 5.1

Current Noise



Characteristics	Specification	Test Method
		(All resistance measurements should be performed after stabilization or conditioning periods)
Dc Resistance	Within specified tolerance	MIL-STD-202 Method 303
Temperature Coefficient	As buyer requested $\pm 25\text{PPM}^{\circ}\text{C}$ $\pm 100\text{PPM}^{\circ}\text{C}$ $\pm 50\text{PPM}^{\circ}\text{C}$ $\pm 200\text{PPM}^{\circ}\text{C}$	MIL-STD-202 Method 304
Dielectric Strength	No flashover or damage	MIL-STD-202 Method 301 1/8W,1/6W 300V 1 minute 1/4W 500V 1 minute 1/2W 700V 1 minute 1,2W 750V 1 minute
Insulation Resistance	At least 1,000M Ω	MIL-STD-202 Method 302 100V 1 minute
Terminal Strength	lead is not break or loose	MIL-STD-202 Method211
Resistance to Soldering Heat	ΔR within $\pm(0.25\%+0.05\Omega)$	MIL-STD-202 Method210 350°C, 3 $\pm$ 0.05 sec.
Solderability	At least 95% coverage	MIL-STD-202 Method218 260°C, 5 sec.
Thermal Shock	ΔR within $\pm(0.5\%+0.05\Omega)$	MIL-STD-202 Method107 - 55°C, 3 + 155°C 5 cycles
Short Time Overload	ΔR within $\pm(0.5\%+0.05\Omega)$	MIL-R-10509 Para 4,6,6 2.5 times rated working voltage,5 seconds
Humidity	ΔR within $\pm(1\%+0.05\Omega)$ No mechanical damage	MIL-STD-202 Method103 40°C, RH95% 1000 hours
Low Temperature Operation	ΔR within $\pm(0.5\%+0.05\Omega)$	MIL-R-10509 Para 4,6,5 rated working voltage,at-65°C 45 minutes.

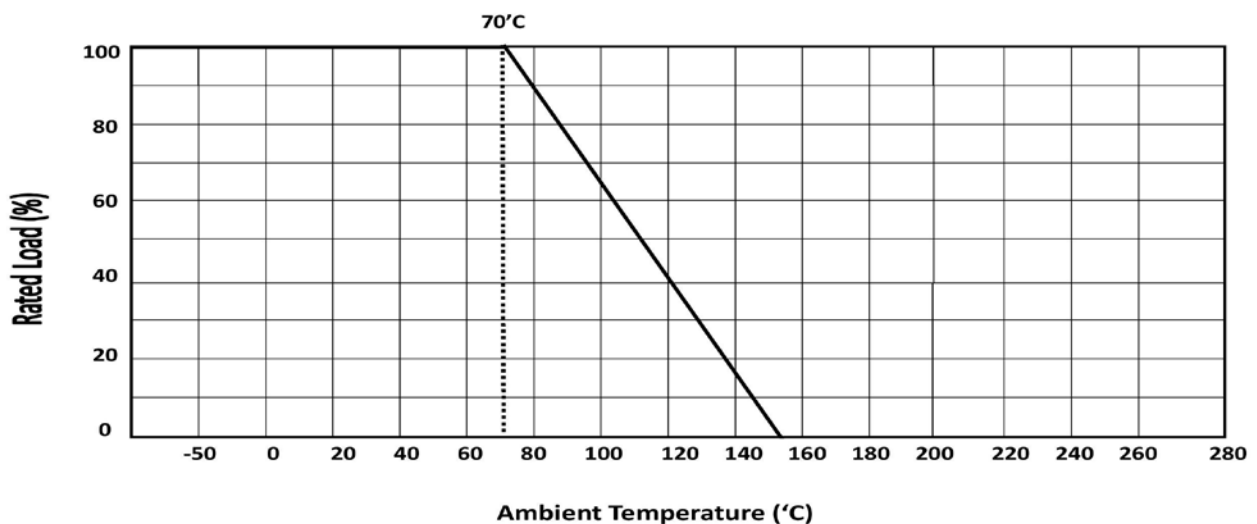


Load Life	ΔR within $\pm(1\%+0.05\Omega)$	MIL-STD-202 Method108 Rated working voltage 1 1/2hours on. 1/2 hours off for total 1000 hours
Resistance to Solvent	Color bands legible No mechanical damage	MIL-STD-202 Method215

Parts Number system

MF	—	25S	1002	F	T	E
	Wattages	Resistance	Tolerance	Packing Code	T.C.R	
MF-Metal film resistor FPM-Metal film resistor with flameproof coating FPS - Metal film resistor small size with flameproof coating	S=small size	4-digit codes for ≤ 1% 1002 = 10K ohm 3-digit codes for 2% and 5 % 103= 10K ohm	F=1% D=0.5% B=0.1%	T=AMMO tape/ box R=Tape reel B=Bulk pack	K= 100 ppm C= 50 ppm E= 25 ppm T= 10 ppm NO TCR marked on P/N for 5% tolerance	

Derating Curve



THICK FILM RESISTOR NETWORKS

RA(RB) SERIES

Thick Film resistor networks SIP type have metal glaze elements on the ceramic substrates with strong clip-construction terminals, and are coated with special epoxy resin. They are originally designed, as a style of single in line package, and are the most suitable to meet the density of circuit assembling.

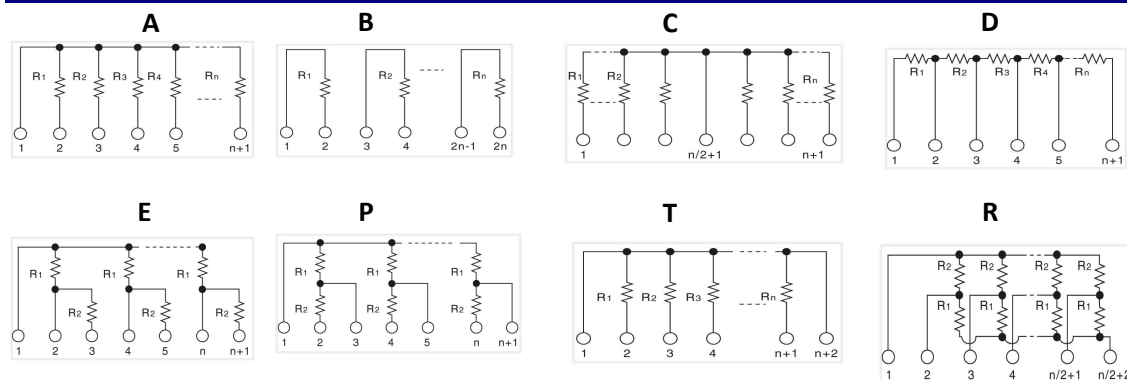
Features

- Small in size with high precision package. It is suitably used in printed circuit board.
- Automated machinery mass production and competitive prices accordingly.
- Extremely high stability, accuracy and reliability.

General Specification

Operating Temp. Range		- 55°C to ~ +125°C		Wattage/Element	RA		RB
T.C.R.	±100 ppm 50 ohm ~ 2.2 M ohm				B Circuits	Others	All Circuits
	±250 ppm < 50 ohm ~ > 2.2 M ohm				0.2W	0.125W	0.25W
Rating Ambient Temp.		+70°C		Max.Working Voltage	100V		200V
Resistance Range (E-12 Series)		R Circuit	Others	Resistance Tolerance	F = 1% G = ± 2%		
		100Ω-10K	10Ω-4.7MΩ				

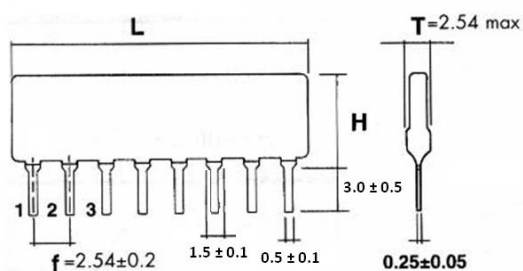
Internal Circuit



Dimensions (Standard Type)

Dual Terminators (R1/R2) (OHM)

DIMENSIONS



160/240

330/390

180/390

330/470

220/270

1.5K/3.3K

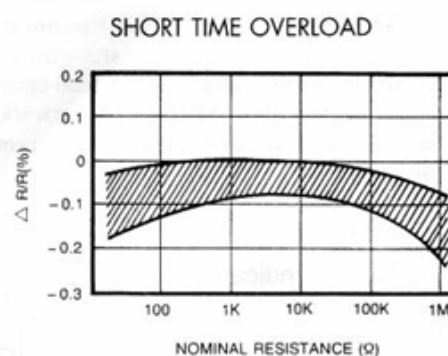
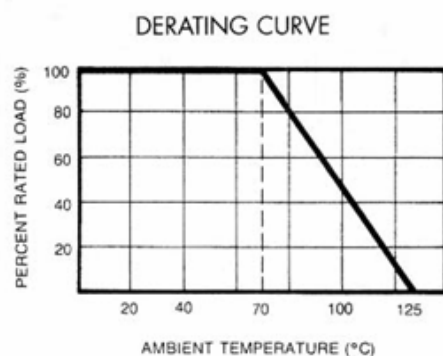
220/330

3.0K/6.2K

L											H MAX	
NO. PS											RA	RB
4	5	6	7	8	9	10	11	12	13	14	5.08	7.5
10.2 MM	12.7	15.3	17.8	20.4	22.1	25.4	28	30.5	33.1	35.6		

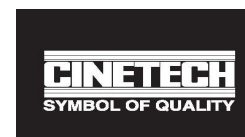
Derating Curve

Short Time Overload

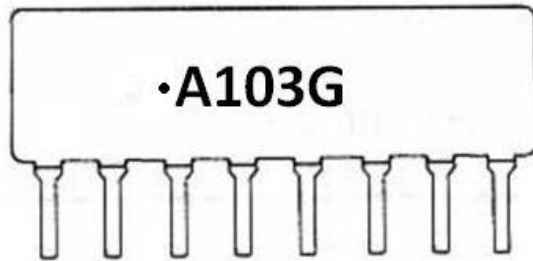


Characteristic Performance

Test Items	Specification
Insulation Resistance (200Vdc Applied)	$10^4 \text{ M}\Omega$ or Greater
Thermal Shock (-55°C to +125°C, 5 Cycles)	$\Delta R/R: \pm (0.5\% + 0.1 \Omega)$
Short Time Overload(2.5 X Rated Voltage, 5 Sec.)	$\Delta R/R: \pm (0.5\% + 0.1 \Omega)$
Resistance to Soldering Heat (+260°C $\pm$ 5°C, 10 sec)	$\Delta R/R: \pm (0.5\% + 0.1 \Omega)$
Head Shock (+25°C to +125°C, 5 Cycles)	$\Delta R/R: \pm (0.5\% + 0.1 \Omega)$
Moisture Resistance, Constant State (40°C, 95% R.H., 1000Hrs.)	$\Delta R/R: \pm (1\% + 0.1 \Omega)$
High Temperature Exposure (125°C, 100Hrs.)	$\Delta R/R: \pm (1\% + 0.1 \Omega)$
Moisture Load Life (1,000Hrs., 40°C, 95% R.H., - Rated Voltage Cycling)	$\Delta R/R: \pm (3\% + 0.1 \Omega)$
Load Life (1,000Hrs., Rated Voltage Cycling at 70°C)	$\Delta R/R: \pm (3\% + 0.1 \Omega)$
Load Pull Strength (1kg, 10Sec.)	$\Delta R/R: \pm (0.5\% + 0.1 \Omega)$
Temperature Coefficient (-55°C to 125°C)	$\pm 100 \text{ ppm}/^\circ\text{C}$, $\pm 250 \text{ ppm}/^\circ\text{C}$ for $<50 \Omega$ or > 2.2
Solderability (230°C for 5 Sec.)	95% min. coverage
Note: Test methods and conditions are in accordance with MIL-R-83401	



Marking



A : Type of Circuit
 103 : Resistance Value, 3-digit code
 G : Tolerance $\pm 2\%$

Parts Number System

RA	9	A	103	G	B
Single In-Line Resistor Network	No. of Pins	Circuit Type	Resistance Code	Resistance Tolerance	Packing Code
RA= Low profile RB= High profile	4 To 14	A, E B, P C, T D, R	3-digit Code 2%	F= $\pm 1\%$ G= $\pm 2\%$	B=Bulk pack 2000pcs/box



METAL OXIDE FILM RESISTORS

(RSF & RSS SERIES)

RSF series are electric power type highly reliable fixed resistors with special metal oxide film thermochemically burned on the high heat conductive base material. They include those of flame-resisting coating type and nonflammable coating type and owing to their uniform quality produced through the most modern products able to use easily for various kinds of electronic devices and instruments.

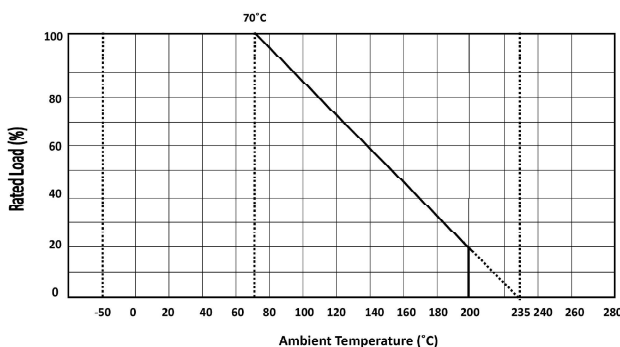
RSS are small-sized metal oxide film resistors, apply high aluminum content ceramic cores with performance for compact sizes.

Features

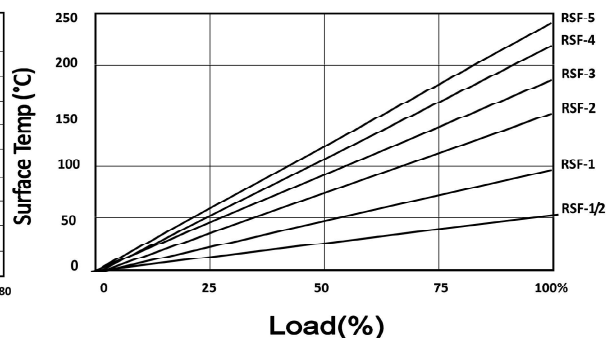
- 1.Small in size comparatively.
- 2.Electrical and mechanical stability and high reliability.
- 3.Best resistive to heat, humidity and noncombustible.
- 4.Annual shift is the lowest for the strengthen metal oxide film.
- 5.Low noise,with high resistance value which wire wound type can not be produced.

- * Coating and marking resist IPA or other cleaning solvents
- * Improved stability,dissipation,and low TCR available, Consult factory.
- * RSF 1/2-3W apply color code,RSF 4-7W apply graphic marking.

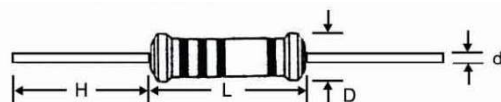
Derating Curve



Surface Temp Rise



Dimensions



General Specification

Style		Dimensions				Max. Working V.	Max. Overload V.	Resistance Range ± 5%(J)
RSS	RSF	L	D	d	H(MN)			
1/2W	1/4W	6.5±1	2.3±0.5	0.50±0.05	25	250 V	500V	0.1Ω~1M
1W	1/2W	9±1	3.5±0.5	0.55±0.05	25	300V	600V	0.1Ω~1M
2W	1W	11±1	4.5±1.0	0.73±0.05	27	350 V	700 V	0.1Ω~1M
3W	2W	15.5±1	5.0±1.0	0.75±0.05	27	350 V	700V	0.1Ω~1M
*5WS		18±1	6.5±1.0	0.75±0.05	27	500V	1000V	10Ω~150KΩ
5W	3W	24.5±1	8.5±1.0	0.75±0.05	27	500V	1000V	0.5Ω~1M
*6WS		24.5±1	8.5±1.0	0.75±0.05	27	500V	1000V	0.5Ω~1M
6W	4W	32±1	8.5±1.0	0.75±0.05	27	500V	1000V	10Ω~150KΩ
7W	5W	41±1	8.5±1.0	0.75±0.05	27	750 V	1000V	10Ω~150KΩ
10W	7W	53±1	8.5±1.0	0.75±0.05	27	750V	1000V	10Ω~150KΩ

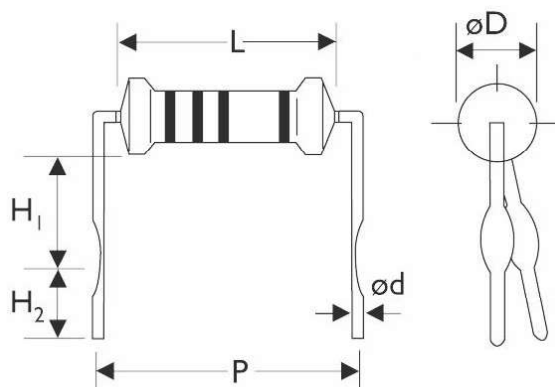
Characteristics

Requirements	Performance	Test Method	
		JIS-C-5202	MIL-STD202
Operating Temp. Range	-55°C~+155°C	—	—
Temp. Coefficient (ppm/°C)	±350	5.2	METHOD 304
Short Time Overload	$\Delta R_{max} \leq \pm(1\%+0.05\Omega)$	5.5-A	—
Resistance to Soldering Heat	$\Delta R_{max} \leq \pm(1\%+0.05\Omega)$	6.4. 350°C 3 Sec	METHOD210
Temp. Cycling	$\Delta R_{max} \leq \pm(1\%+0.05\Omega)$	7.4.-55°C/85°C, 5 cycle	METHOD107
Moisture Resistance	$\Delta R_{max} \leq \pm 5\%$	7.9 95%RH on-off 1.000 hr	METHOD 106
Load Life	$\Delta R_{max} \leq \pm 5\%$	7.10 70°C RH on-off 1.000 hr	METHOD 108
Dielectric Withstanding Voltage	$\Delta R_{max} \leq \pm(0.5\%+0.05\Omega)$	5.7 -A	METHOD 301
Insulation Resistance	10 ⁴ MΩ ~	5.6 -A	—
Non-Combustibility	The resistor shall withstand Overload test in accordance with Article UL 492.2.13 without producing a fire hazard.		

*Note: Lower TCR ± 200 ppm or ± 100ppm also available, consult to factory

*RSS5WS/6WS - the ceramic core is high alumina content which gives excellent heat dissipation and high power

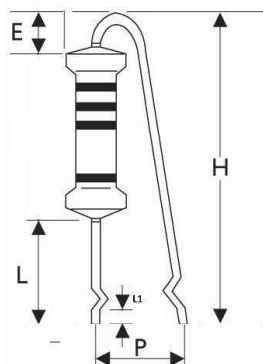
MF FORM



Unit: mm

RSS	RSF	$D \pm 0.5$	$L \pm 1$	P	H1	$H2 \pm 1$
2W	1W	4.5	11	15 ± 1.5	7 ± 1	4.5
3W	2W	5.5	15	20 ± 2	10 ± 2	4.5
5W	3W	8.5	24	30 ± 2	13 ± 2	4.5

FK FORM



*With/without leads kink or kink at only one lead can be done by customers' request

RSS	RSF	$D \pm 0.5$	$L \pm 1$	$H \pm 3$	$d \pm 0.05$	Pref	$L1 \pm 1$	E
2W	1W	4.5	10	25MAX	0.73	8	4	3.5MAX
3W	2W	5.5	10	30MAX	0.75	8	4	3.5MAX

Part Number system

RSF	200	103	J	T
	Wattages	Resistance	Tolerance	Packaging codes
RSF-Metal Oxide Film Resistor	025=1/4W	3-digit code 103=10K ohm	J=5% F=1%	R=Tape reeled
RSS-Metal Oxide Film Resistor	050=1/2W			T=AMMO Tape/box
Small Size	100=1W			FK, MF-Formed &
RSF200=RSF2W	200=2W			Cut Leads
	300=3W			B=Bulk Pack,
	500=5W			Straight Leads

Note: 52, 63 and 73 MM taping are available for different Wattages

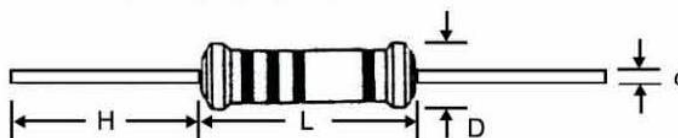
HIGH VOLTAGE METAL GLAZE RESISTORS

RV(RVS) SERIES

Features

- Excellent anti-surge characteristics
- Suitable for high voltage and high impedance applications
- Stable characteristics of moisture resistance
- Standard coating - epoxy, silicon, flameproof coating on request
- Operating temperature range $-55^{\circ}\text{C} - +175^{\circ}\text{C}$

Construction



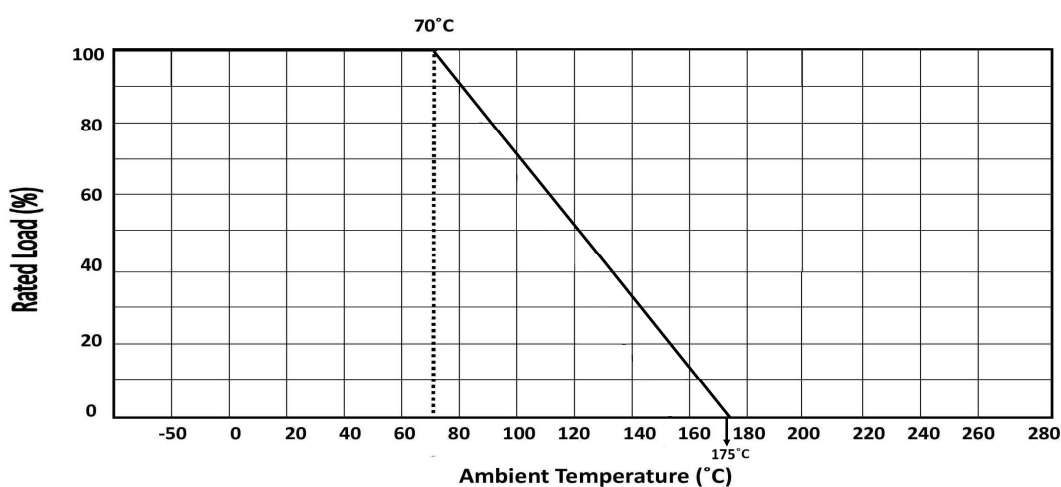
General Specification

Style		Dimensions				Max Permissible Voltage	Max Impulse Voltage	Standard Resistance Range
RVS	RV	L	D	d	H($\pm 2.0\text{mm}$)	V	V	
1/2W	1/4W	6.5 ± 0.5	2.3 ± 0.2	0.55 ± 0.05	28	1600	3000	1K ~ 1G
1W	1/2W	9.0 ± 1.0	3.2 ± 0.5	0.7 ± 0.05	26	3500	10000	1K ~ 1G
2W	1W	11.5 ± 1.0	4.5 ± 0.5	0.78 ± 0.03	35	5000	10000	1K ~ 1G
3W	2W	15.5 ± 1.0	5.5 ± 0.5	0.78 ± 0.03	32	7500	10000	1K ~ 1G
5W	3W	17.5 ± 1.0	6.0 ± 0.5	0.78 ± 0.03	35	12000	16000	1K ~ 1G

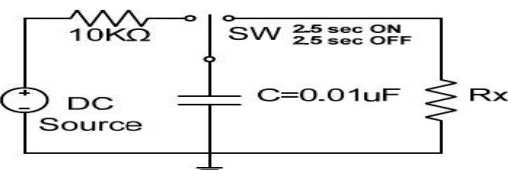
Standard Tolerance 5%, $\geq 1\text{G}$ 10%

*Special resistances and Up to 10G tolerances are available upon request

Derating Curve



Electrical Characteristics

Characteristics	Specification	Test Method					
Temperature Coefficient	$< 1G \leq \pm 200 \times 10^{-6} / K$ $> 1G \leq \pm 500 \times 10^{-6} / K$	MIL-STD-202 Method 304					
Dielectric withstanding voltage of the insulation for 1 min	1/4W upward 400V ~1000V	260 °C ± 5 °C, 2S ±1S					
Resistance to soldering heat	△ R within ± 1%	MIL-STD-202 Method 201 350°C, 3±0.5 sec.					
Terminal Strength	Leads are not broken or loosened	MIL-STD-202 method 211					
Solderability	At least 95% coverage	MIL-STD-202 method 218 235°C, 5 sec.					
Short Time Overload	△ R within ± 1%	MIL-R-10509 Para 4.6.6 2.5 times rated working voltage					
Humidity	△ R within ± 2%	MIL-STD-202 Method 103, 40 °C, 90% RH 1000Hours					
Impulse Test	△ R within ± 2%	MIL-R-10509 para 4.6.5					
Load Life	△ R within ± 3%	MIL-STD-202 Method 108, Rated Working Voltage 1 1/2 hours on, 1/2 hours off, 1000 hrs.					
Resistance to Solvent	Color band legible no mechanical damage	MIL-STD-202 Method 215					
Anti Surge Characteristics	Discharge Test: 0.01uF capacitors Discharge Pulse 10 times. (1 pulse/5 sec. Max) 		± (10%+0.05Ω)				
	Type	RV 1/4W RVS 1/2W RV 1/2W RVS 1W RV 1W RVS 2W RV 3W RVS 5WS					
	Voltage	3KV	1K ≤ R < 10K ; 5KV		10KV	15KV	
			10K ≤ R < 100K ; 7KV				
100K ≤ R: 10KV							

Parts Number System

RV(RVS)	—	1/4W	104	J	T
		Wattages	Resistance	Toleranc	Packaging Codes
High voltage Metal Glaze Resistor		1/4W 1/2W 1W 2W 3W	3 digit code for 5% 104= 100K 4 digit code for 1% 1003= 100K	F=1% J=5% K=10%	T - Ammo tape/box R - Tape/Reel B - Bulk pack

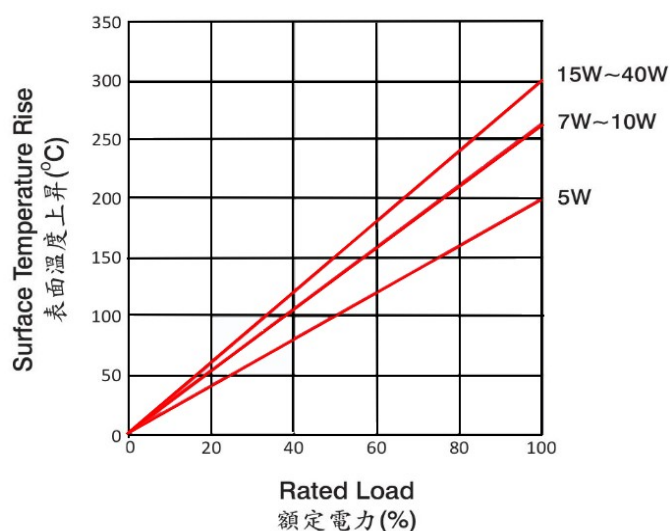


WIREWOUND RESISTORS RECTANGULAR TYPE

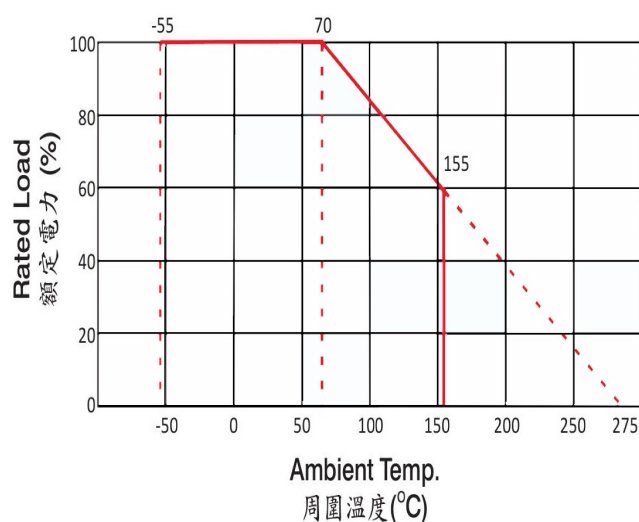
1. As applying non-flammable materials, even if over current flows, there will be no self-ignition occurred.
2. Completely insulated character suitable for Printed circuit board mounting
3. Precise resistance value with long life proof.
4. Super heat dissipation; small linear temperature coefficient
5. Instant overload capability; low noise figure and without annual shift on resistance value.
6. For higher resistance value, the winding core is replaced by Metal Oxide Film cutting core (MO)



Temperature Rise



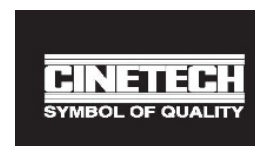
Derating Curve



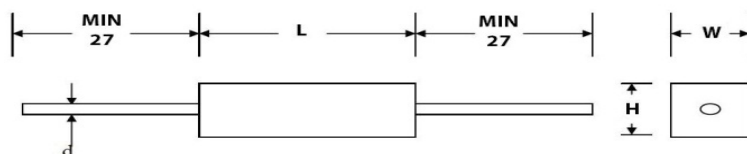
Test Items	Condition	Spec.
Resistance Temp.Coeff.	-55°C~+155°C	* $\pm 300 \text{ ppm/}^\circ\text{C}$
Short Time Over Load	* 5 times of rated wattage for 5 sec.	$\pm 2\%$
Rated Load	Rated wattage 30 min.	$\pm 1\%$
Voltage Durability	1,000V AC 1 min.	not changed
Insulation Resistance	500V megger	500M Ω
Temp. Cycle	- 30°C ~ + 85°C for 5 cycles	$\pm 1\%$
Load Life	70°C on-off cycle 1,000 hrs.	$\pm 5\%$
Moisture-Proof Load Life	40°C 95% RH on-off cycle 1000 hrs.	$\pm 3\%$
Incombustibility	16 times of rated wattage for 5 min.	not flamed

*Lower TCR available upon request.

*Applicable for wirewound elements only.



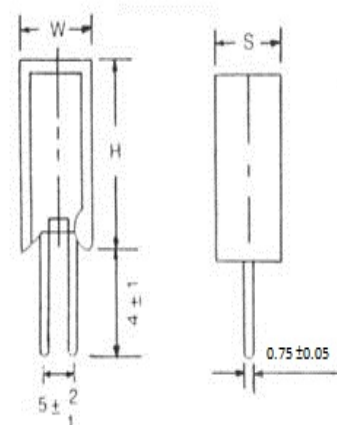
SQP TYPE



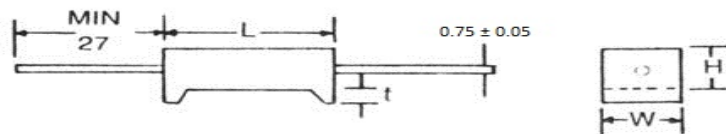
SQP	Dimension(mm)				Resistance Range(Ω)		Max Working Voltage
	L ± 1.5	W ± 1.0	H ± 1.0	d ± 0.05	Wire Wound	MO	
2W	18.0	7.0	7.0	0.75	0.1~50 Ω	51~200K Ω	150V
3W	22.0	8.0	8.0	0.75	0.1~50 Ω	51~500K Ω	350V
5W	22.0	9.5	9.0	0.75	0.1~50 Ω	51~500K Ω	350V
7W	35.0	9.5	9.0	0.75	0.1~500 Ω	501~100K Ω	500V
10W	48.0	9.5	9.0	0.75	0.1~500 Ω	501~100K Ω	500V
15W	48.0	12.5	12.0	0.75	0.1~1K Ω	1k1~100K Ω	500V
20W	60.0	14.0	13.5	0.75	0.1~1K Ω	1k1~100K Ω	500V
25W	60.0	14.0	13.5	0.75	0.1~1K Ω	1k1~100K Ω	1000V
30W	77.0	18.0	17.0	0.75	0.1~1K Ω		1000V
40W	90.0	19.0	18.0	0.75	0.1~1K Ω		1000V
50W	90.0	19.0	18.0	0.75	0.1~1K Ω		1000V

SQM TYPE

Type	Dimension(mm)			Resistance Range(Ω)	
SQM	H ± 1.5	W ± 1	S ± 1	Wire Wound	MO
2W	20	11	7.5	0.1~50 Ω	51~500 Ω
3W	25	12	9	0.1~50 Ω	51- 47K Ω
5W	25	13	9	0.1~50 Ω	51- 47K Ω
7W	39	13	9	0.1~500 Ω	501- 47K Ω
10W	51	13	9	0.1~500 Ω	501- 47K Ω
10WS	35	16	12	0.1~500 Ω	501- 47K Ω



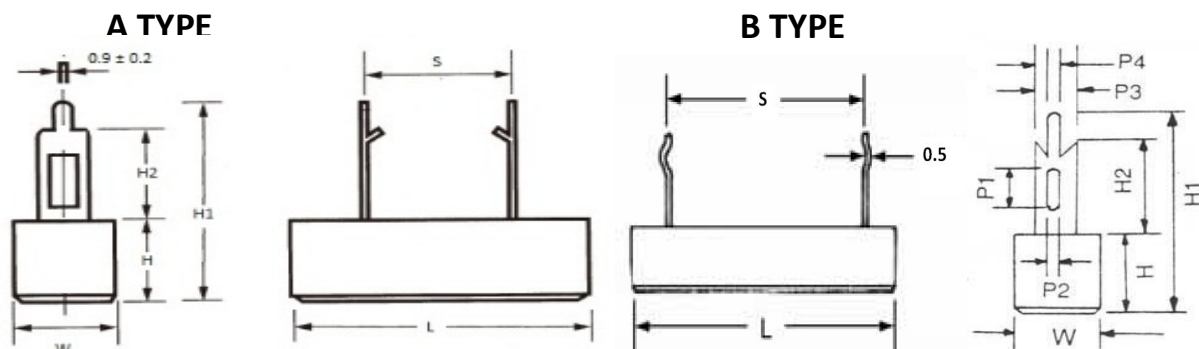
SQT TYPE



Type	Dimension(mm)				Resistance	Range(Ω)
SQT	W ± 1	H ± 1	L ± 1.5	t ± 1.5	Wire Wound	MO
5W	10	9	22	1.5	0.1~50 Ω	51 Ω ~47K Ω
7W	10	9	35	3	0.1~500 Ω	501~47K Ω
10W	10	9	48	3	0.1~500 Ω	501~47K Ω
15W	12.5	12.5	48	3	0.1~500 Ω	501~47K Ω
20W	13	14	60	5	0.1~500 Ω	501~47K Ω

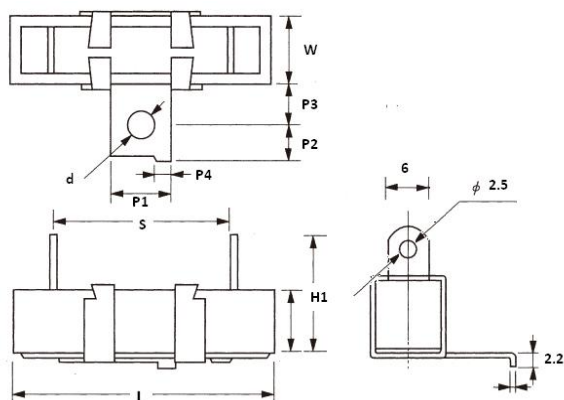


SQZ TYPE

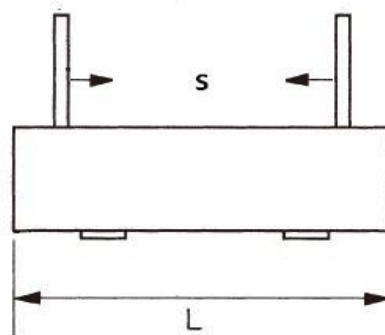


Type A+B	Power Rating (W)	Resistance Range(Ω)		Dimension(mm)									
		Wire Wound	MO	L ± 2	H ± 1	W ± 1	S ± 1.5	H1 ± 1	H2 ± 1	P1	P2	P3	P4
SQZ-5	5	0.1Ω~200Ω	201Ω50KΩ	27.0	9.5	9.5	15.0	24(30)(40)	9.5(15)(25)	4.0	2.0	7.5	1.5
SQZ-7	7	0.1Ω~200Ω	201Ω100KΩ	35.0	9.5	9.5	22	24(30)(40)	9.5(15)(25)	4.0	2.0	7.5	1.5
SQZ-10	10	0.2Ω~500Ω	501Ω100KΩ	48.0	9.5	9.5	33	24(30)(40)	9.5(15)(25)	4.0	2.0	7.5	1.5
SQZ-15	15	0.5Ω~600Ω	601Ω100KΩ	48.0	12.5	12.5	33	34.5	15.0	7.0	6.0	10.0	2.7
SQZ-20	20	0.5Ω~1KΩ	1.1KΩ100KΩ	63.5	12.5	12.5	42	34.5	15.0	7.0	6.0	10.0	2.7
SQZ-3S	3	0.1Ω~50Ω	—	22.0	9.5	9.5	10.0	23.0	12.0	4.0	2.0	7.5	1.5
SQZ-5S	5	0.1Ω~50Ω	—	25.0	9.5	9.5	10.0	24.0	12.0	4.0	2.0	7.5	1.5

SQHG TYPE

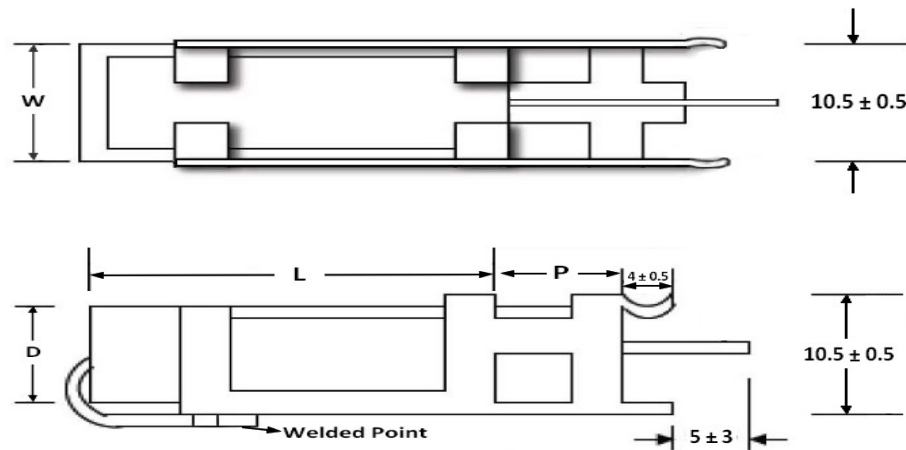


SQH TYPE



Type A+B	Power Rating (W)	Resistance Range(Ω)		Dimension(mm)									
		Wire Wound	MO	L ± 2	H ± 1	W ± 1	S ± 1	H1 ± 1	P1 ± 1	P2 ± 1	P3 ± 1	P4 ± 1	d
SQH-10	10	0.5Ω~500Ω	501Ω - 50KΩ	48.0	10.0	10.0	33	21	12	6	8.0	3.0	4
SQH-15	15	0.5Ω~600Ω	601Ω - 150KΩ	48.0	12.0	12.0	33	21	12	6	8.0	3.0	4
SQH-20	20	0.5Ω~1KΩ	1.1KΩ-150KΩ	63.7	12.0	12.0	42	24	12	6	8.0	3.0	4
SQH-30	30	0.1Ω~2KΩ	—	75.0	19.0	18.0	56	30	17	8	10.0	3.0	4
SQH-40	40	0.1Ω~2KΩ	—	90.0	19.0	18.0	68	30	17	8	10.0	3.0	4

SPS TYPE



Type	Dimension(mm)			Resistance Range		
	W ± 1	D ± 1	L ± 1	P ± 1	Wire Wound	MO
SPS-5	10	9	22	5	0.1 Ω ~50 Ω	51 Ω ~50K Ω
SPS-7	10	9	35	10	0.1 Ω ~500 Ω	501 Ω ~50K Ω
SPS-10	10	9	48	10	0.1 Ω ~500 Ω	501 Ω ~50K Ω
SPS-15	10	13	48	10	0.1 Ω ~1K Ω	1K1 Ω ~150K Ω
SPS-20	10	13	60	10	0.1 Ω ~1K Ω	1K1 Ω ~150K Ω

Parts Number System

SQP	—	5W	101	J	B
Type of Cement Resistor	Wattages	Resistance	Tolerance	Packing Code	
		3 Digit code for 5% tolerance 101=100Ω R10=0.1Ω 4R7=4.7Ω 4 Digit code for 1% tolerance	J = ±5% F= ±1%	B=Bulk Pack	



NCA12-T, NCA36-S/T

10 PIN/ 8R

CHIP RESISTOR

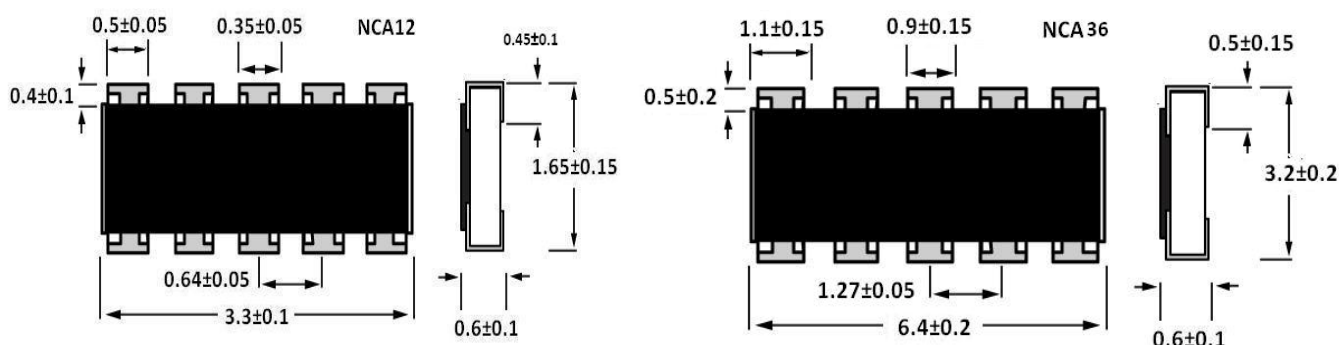
NETWORKS

Applications

Telecommunication Equipment

Lap-Top and Note-Book Computer

Dimensions

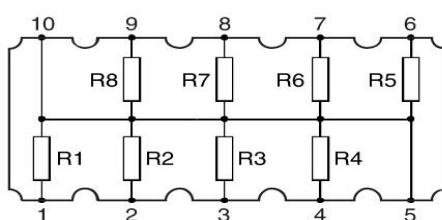


Internal Circuit

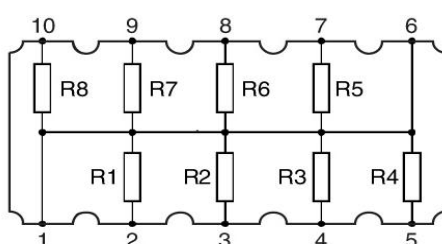
TYPE

Circuit Diagram

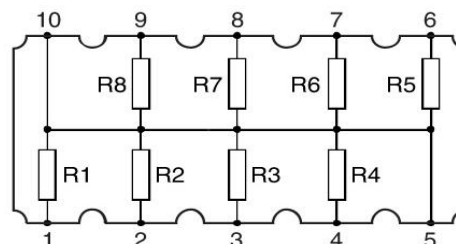
NCA12 T



NCA36 S



T



Characteristics

Item	NCA12	NCA36
Power Rating	1/32W	1/16W
Max Working Voltage	25V	50V
Resistance Tolerance	± 5%(J)	
Resistance Range	E-24 series (33 ohm~100K ohm)	
T.C.R.	±200 ppm	
Number of Resistors	8	
Operating Temp Range	-55°C ~ + 155°C	



Specifications

Requirements	Characteristics	Test Method
Short time Over-load	$\pm (2\% + 0.05\Omega)$	Rated Voltage x 2.5, 5 seconds
Soldering Heat	$\pm (1\% + 0.05\Omega)$	$260 \pm 5^\circ\text{C}$, 10 ± 1 seconds
Temperature Cycling	$\pm (1\% + 0.05\Omega)$	$-55^\circ\text{C}(30\text{min})/ +125^\circ\text{C}(30\text{min})$ 5 Cycles
Moisture Load-life	$\pm (2\% + 0.05\Omega)$	Rated Voltage, $40^\circ \pm 2^\circ\text{C}$, 90~95%RH, 1000_{-0}^{+48} Hrs.
Load-life	$\pm (3\% + 0.1\Omega)$	Rated Voltage, $70^\circ \pm 3^\circ\text{C}$, 1000_{-0}^{+48} Hrs.

Packing

	NCA12	NCA36
Tape & Reel	Paper 5,000	Plastic 4,000
Tape Width	8.0 ± 0.1 m/m	12.0 ± 0.1 m/m
Bulk Pack	1,000	1,000

Parts Number System

NCA36	—	S	103	J	K
Type		Circuit	Resistance	Tolerance	Packaging codes
			3-digit Code 103=10K OHM	J=5%	R=Paper tape reel K=Embossed plastic tape reel



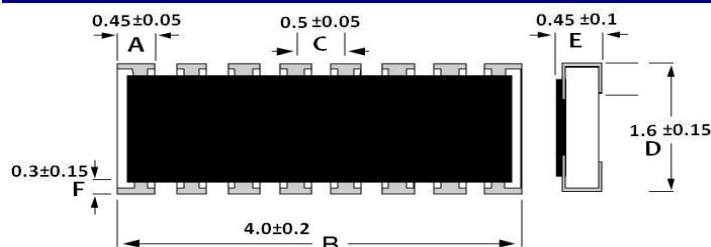


NCA24-8 THICK FILM CHIP RESISTOR Network (CONVEX TYPE)

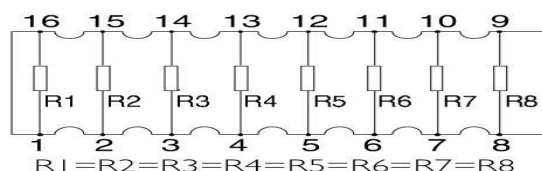
Applications:

Telecommunication Equipment
Lap-Top and Note-book computer

Dimensions



Internal Circuit



Type	Number of Resistors	A ± 0.05	B ± 0.2	C ± 0.05	D ± 0.15	E ± 0.1	F ± 0.15
NCA24	8	0.45	4	0.5	1.6	0.45	0.3

Characteristics

Style	NCA24-8
Power Rating	1/16W
Max Working Voltage	50V
Max Overload Voltage	100V
Resistance Tolerance	± 5% (J), ± 1% (F)
Resistance Range	5%(E-24) 10Ω - 1MΩ 1%(E-24/E-96) 10Ω- 1MΩ
Temperature Coefficient	± 200 ppm/°C

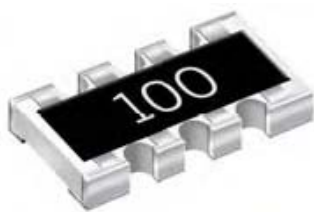
Specifications

Requirements	Characteristics	Test Method
Short time Over-load	± (2% +0.05Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	± (1% +0.05Ω)	260±5°C, 10 ± 1 seconds
Temperature Cycling	± (1% +0.05Ω)	-55°C(30min)/+125°C(30min) 5 Cycles
Moisture Load-life	± (2% +0.05Ω)	Rated Voltage, 40° ±2°C, 90~95%RH, 1000 ⁺⁴⁸ ₀ Hrs.
Load-life	± (3% +0.1Ω)	Rated Voltage, 70° ±3°C, 1000 ⁺⁴⁸ ₀ Hrs.

Parts Number System

NCA24	—	8	103	J	R
Type	No. of Resistor	Resistance	Tolerance	Packaging codes	
		3-digit Code 103=10K ohm	J=5%	R=Paper tape reel 5,000pcs/reel	





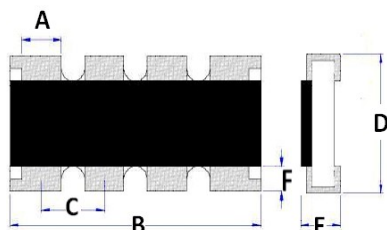
NCA 16-4, 16-2, 32-4 CHIP RESISTOR ARRAY (CONVEX TYPE)

Applications

Telecommunication Equipment

Lap-Top and Note-Book Computer

Dimensions

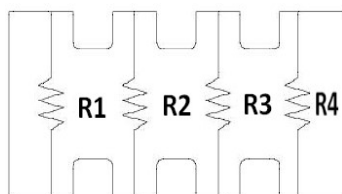


Type	Number of Resistors	A ±0.15	B ±0.2	C ±0.1	D ±0.15	E ±0.1	F ±0.15
NCA-16	4	0.5	3.2	0.8	1.6	0.6	0.3
	2	0.6	1.6	1	1.6	0.6	0.3
NCA-32	4	0.9	5	1.27	3.2	0.6	0.5

Internal Circuit

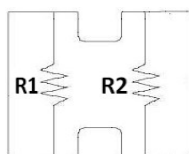
Characteristics

NCA16-4 R1=R2=R3=R4



NCA16-2

R1=R2



Item	NCA16	NCA32
Power Rating	1/16W	1/8W
Max Working Voltage	50V	200V
Resistance Tolerance	± 5%(J), ± 1%(F)	
Resistance Range	E-24 series (10 ohm~1M ohm)	
T.C.R.	±200 ppm/°C	
Number of Resistors	2,4	
Operating Temp. Range	-55°C~ + 155°C	

Specifications

Requirements	Characteristics	Test Method
Short time Over-load	± (2% +0.05Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	± (1% +0.05Ω)	260±5°C, 10 ± 1 seconds
Temperature Cycling	± (1% +0.05Ω)	-55°C(30min)/+125°C(30min) 5 Cycles
Moisture Load-life	± (2% +0.05Ω)	Rated Voltage, 40° ±2°C, 90~95%RH, 1000 ⁺⁴⁸ ₀ Hrs.
Load-life	± (3% +0.1Ω)	Rated Voltage, 70° ±3°C, 1000 ⁺⁴⁸ ₀ Hrs.

Parts Number System

NCA16	—	4	103	J	R
Type	No. of Resistors	Resistance	Tolerance	Packaging codes	
		3-digit Code 103=10K OHM 4-digit Code 1002=10K OHM	J= 5% F= 1%	R-Paper tape reel 5000 pcs/reel	





NCA 04-4, 04-2

NCB 04-4, 04-2

THICK FILM CHIP RESISTOR ARRAY
(CONVEX AND / CONCAVE TYPE)

Applications

Telecommunication Equipment

Lap-Top and Note-Book Computer

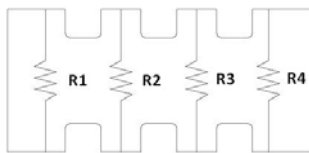
Dimensions

Type	Number of Resistors	A	B	C	D	E	F
		±0.1	±0.2	±0.1	±0.15	±0.1	±0.1
NCA-04	4	0.3	2.0	0.5	1.0	0.45	0.2
NCA-04 (Convex)	2	0.22	1.0	0.67	1.0	0.33	0.15
NCB-04	4	0.3	2.0	0.5	1.0	0.45	0.2
NCB-04 (Concave)	2	0.22	1.0	0.67	1.0	0.33	0.15

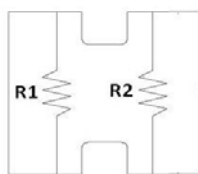
(Unit:PCS)

Internal Circuit

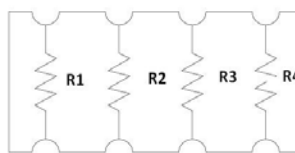
NCA04-4



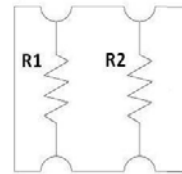
NCA04-2



NCB04-4



NCB04-2



R1=R2=R3=R4

Characteristics

Item	NCA04-4	NCA04-2	NCB04-4	NCB04-2
Power Rating	1/16W		1/16W	
Max Working Voltage	25V		25V	
Resistance Tolerance	±5%(J), ±1%(F)		±5%(J), ±1%(F)	
Resistance Range	E-24 series (10 ohm~1M ohm)		E-24 series (10 ohm~1M ohm)	
T.C.R.	±200ppm/°C		±200ppm/°C	
Number of Resistors	4	2	4	2
Operating Temp. Range	-55°C~+125°C			
Rating Temperature	+70°C		+70°C	

Specifications

Requirements	Characteristics	Test Method
Short time Over-load	± (2% +0.05Ω)	50V or 2.5√PxR whichever is lower
Soldering Heat	± (1% +0.05Ω)	260±5°C, 10 ± 1 seconds
Temperature Cycling	± (1% +0.05Ω)	-55°C(30min)/+125°C(30min) 5 Cycles
Moisture Load-life	± (2% +0.05Ω)	Rated Voltage, 40° ±2°C, 90~95%RH, 1000 ⁺⁴⁸ ₀ Hrs.
Load-life	± (3% +0.1Ω)	Rated Voltage, 70° ±3°C, 1000 ⁺⁴⁸ ₀ Hrs.

Parts Number System

NCA04	—	2	103	J	R
Type	No. of Resistor	Resistance	Tolerance	Packaging codes	
		3-digit Code 103=10K OHM		R-Paper tape reel 10000 pcs/reel	

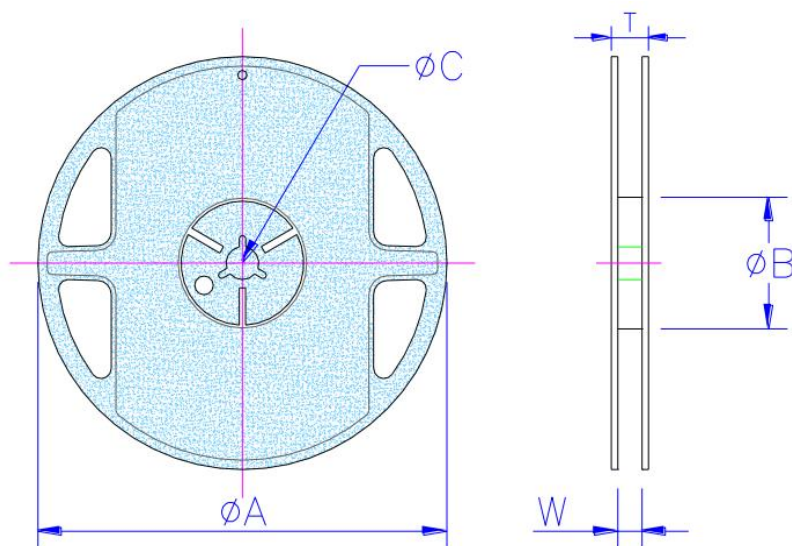


Packaging

Reel Specifications & Package Quantity

Unit: mm

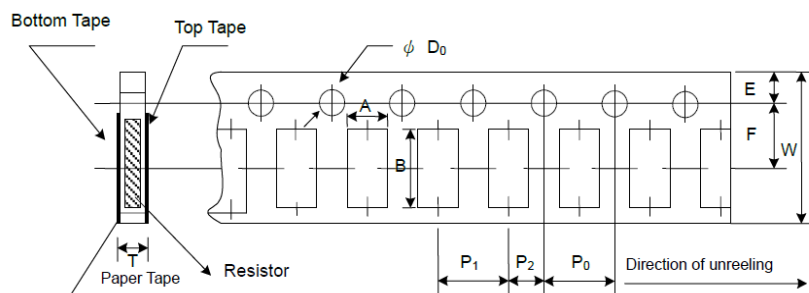
Type	Packaging quantity		Tape width	Reel Diameter	ΦA	ΦC	ΦC	W	T
NCA-04-4	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
NCA-04-2		20K	8mm	10 inch	254±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5
NCB-04-4		40K	8mm	13 inch	330±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5
NCB-04-2									
NCA16-4 NCB16-4	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		50K	8mm	10 inch	254±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5



Paper Tape Specifications

Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
NCA-04	1.20 ± 0.10	2.2 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.70 ± 0.10
NCB-04	1.20 ± 0.10	2.2 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.70 ± 0.10
NCA16-4	1.95 ± 0.10	3.5 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	4.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.85 ± 0.10
NCB16-4	1.95 ± 0.10	3.5 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	4.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.85 ± 0.10





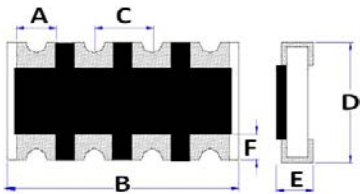
NCB 16-4, 16-2 CHIP RESISTOR ARRAY (CONCAVE TYPE)

Applications

Telecommunication Equipment
Lap-Top and Note-Book Computer

Dimensions

(Unit: PCS)

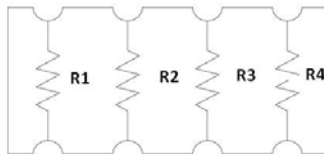


Type	Number of Resistors	A ±0.15	B ±0.2	C ±0.1	D ±0.0.2	E ±0.15	F ±0.15
NCB-16	4	0.5	3.20	0.8	1.6	0.6	0.3
NCB-16	2	0.25	1.6	0.8	1.6	0.6	0.3

Internal Circuit

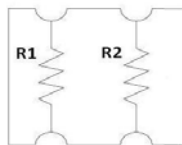
Characteristics

NCB16-4



$$R1=R2=R3=R4$$

NCB16-2



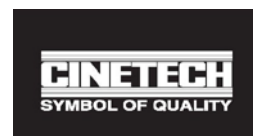
Item	NCB16	
Power Rating	1/16W	
Max Working Voltage	50V	
Resistance Tolerance	±5%(J), ±1%(F)	
Resistance Range	E-24 series (10 ohm~1M ohm)	
T.C.R.	±200ppm/°C	
Number of Resistors	4	2
Operating Temp. Range	-55°C~+125°C	
Rating Temperature	+70°C	

Specifications

Requirements	Characteristics	Test Method
Short time Over-load	± (2% +0.05Ω)	Rated Voltage x 2.5, 5 seconds
Soldering Heat	± (1% +0.05Ω)	260±5°C, 10 ± 1 seconds
Temperature Cycling	± (1% +0.05Ω)	-55°C(30min)/+125°C(30min) 5 Cycles
Moisture Load-life	± (2% +0.05Ω)	Rated Voltage, 40° ±2°C, 90~95%RH, 1000 ⁺⁴⁸ ₀ Hrs.
Load-life	± (3% +0.1Ω)	Rated Voltage, 70° ±3°C, 1000 ⁺⁴⁸ ₀ Hrs.

Parts Number System

NCB16	—	4	103	J	R
Type	No. of Resistor	Resistance	Tolerance	Packaging codes	
		3-digit Code 103=10K OHM		R-Paper tape reel 5000 pcs/reel	

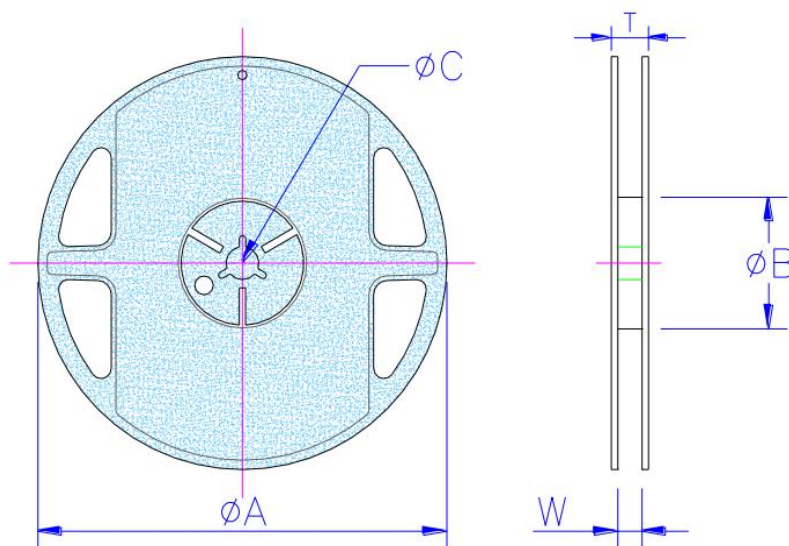


Packaging

Reel Specifications & Package Quantity

Unit: mm

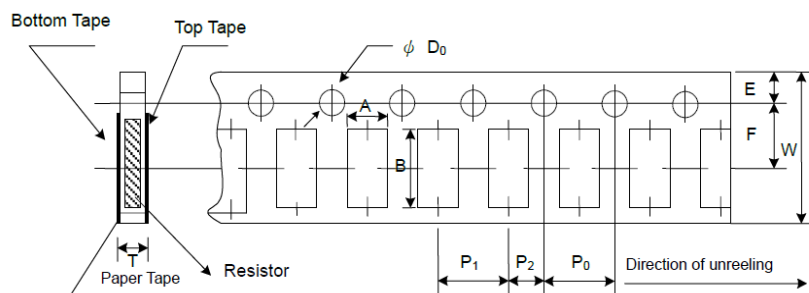
Type	Packaging quantity		Tape width	Reel Diameter	ΦA	ΦC	ΦC	W	T
NCA-04-4	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
NCA-04-2		20K	8mm	10 inch	254±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5
NCB-04-4		40K	8mm	13 inch	330±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5
NCB-04-2									
NCA16-4 NCB16-4	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		50K	8mm	10 inch	254±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100 ^{+1/-0}	13.0±0.2	9.5±0.5	13.5±0.5



Paper Tape Specifications

Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
NCA-04	1.20 ± 0.10	2.2 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.70 ± 0.10
NCB-04	1.20 ± 0.10	2.2 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.70 ± 0.10
NCA16-4	1.95 ± 0.10	3.5 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	4.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.85 ± 0.10
NCB16-4	1.95 ± 0.10	3.5 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	4.0 ± 0.05	2.0 ± 0.050	$1.50 \pm 0.1, -0$	0.85 ± 0.10



THICK FILM RESISTOR NETWORKS

RA(RB) SERIES

Thick Film resistor networks SIP type have metal glaze elements on the ceramic substrates with strong clip-construction terminals, and are coated with special epoxy resin. They are originally designed, as a style of single in line package, and are the most suitable to meet the density of circuit assembling.

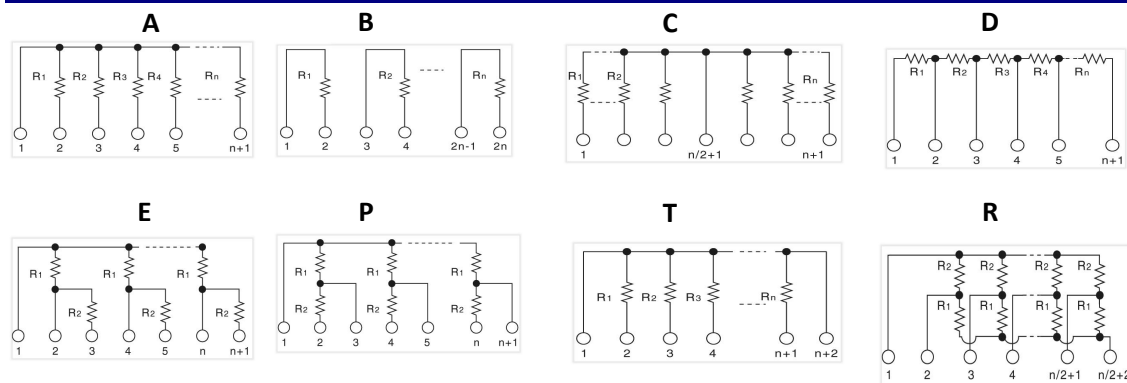
Features

- Small in size with high precision package. It is suitably used in printed circuit board.
- Automated machinery mass production and competitive prices accordingly.
- Extremely high stability, accuracy and reliability.

General Specification

Operating Temp. Range		- 55°C to ~ +125°C		Wattage/Element	RA		RB
T.C.R.	±100 ppm 50 ohm ~ 2.2 M ohm				B Circuits	Others	All Circuits
	±250 ppm < 50 ohm ~ > 2.2 M ohm				0.2W	0.125W	0.25W
Rating Ambient Temp.		+70°C		Max.Working Voltage	100V		200V
Resistance Range (E-12 Series)		R Circuit	Others	Resistance Tolerance	F = 1% G = ± 2%		
		100Ω-10K	10Ω-4.7MΩ				

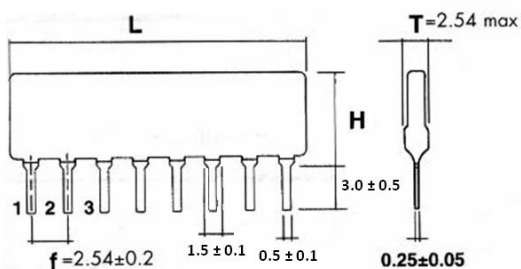
Internal Circuit



Dimensions (Standard Type)

Dual Terminators (R1/R2) (OHM)

DIMENSIONS



160/240

330/390

180/390

330/470

220/270

1.5K/3.3K

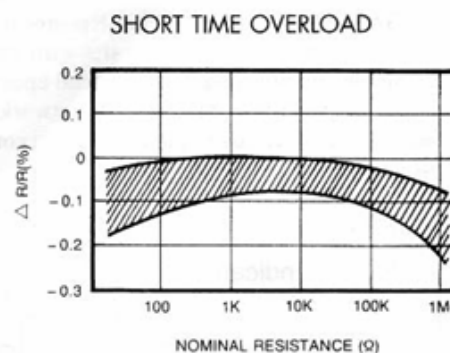
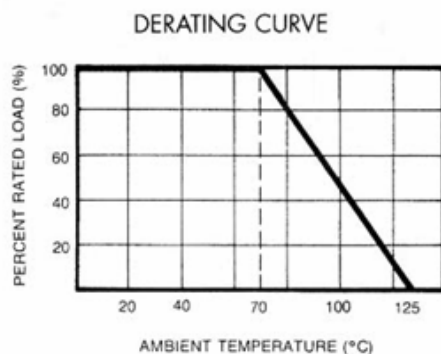
220/330

3.0K/6.2K

L											H MAX	
NO. PS											RA	RB
4	5	6	7	8	9	10	11	12	13	14	5.08	7.5
10.2 MM	12.7	15.3	17.8	20.4	22.1	25.4	28	30.5	33.1	35.6		

Derating Curve

Short Time Overload

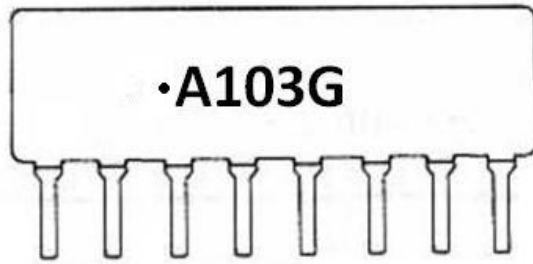


Characteristic Performance

Test Items	Specification
Insulation Resistance (200Vdc Applied)	10 ⁴ MΩ or Greater
Thermal Shock (-55°C to + 125°C, 5 Cycles)	Δ R/R: ± (0.5% + 0.1 Ω)
Short Time Overload(2.5 X Rated Voltage, 5 Sec.)	Δ R/R: ± (0.5% + 0.1 Ω)
Resistance to Soldering Heat (+260°C ± 5°C, 10 sec)	Δ R/R: ± (0.5% + 0.1 Ω)
Head Shock (+25°C to + 125°C, 5 Cycles)	Δ R/R: ± (0.5% + 0.1 Ω)
Moisture Resistance, Constant State (40°C, 95% R.H., 1000Hrs.)	Δ R/R: ± (1% + 0.1 Ω)
High Temperature Exposure (125°C, 100Hrs.)	Δ R/R: ± (1% + 0.1 Ω)
Moisture Load Life (1,000Hrs., 40°C, 95% R.H., - Rated Voltage Cycling)	Δ R/R: ± (3% + 0.1 Ω)
Load Life (1,000Hrs., Rated Voltage Cycling at 70°C)	Δ R/R: ± (3% + 0.1 Ω)
Load Pull Strength (1kg, 10Sec.)	Δ R/R: ± (0.5% + 0.1 Ω)
Temperature Coefficient (-55°C to 125°C)	± 100ppm/°C, ± 250ppm/°C for <50 Ω or > 2.2
Solderability (230°C for 5 Sec.)	95% min. coverage
Note: Test methods and conditions are in accordance with MIL-R-83401	



Marking



A : Type of Circuit
 103 : Resistance Value, 3-digit code
 G : Tolerance $\pm 2\%$

Parts Number System

RA	9	A	103	G	B
Single In-Line Resistor Network	No. of Pins	Circuit Type	Resistance Code	Resistance Tolerance	Packing Code
RA= Low profile RB= High profile	4 To 14	A, E B, P C, T D, R	3-digit Code 2%	F= $\pm 1\%$ G= $\pm 2\%$	B=Bulk pack 2000pcs/box



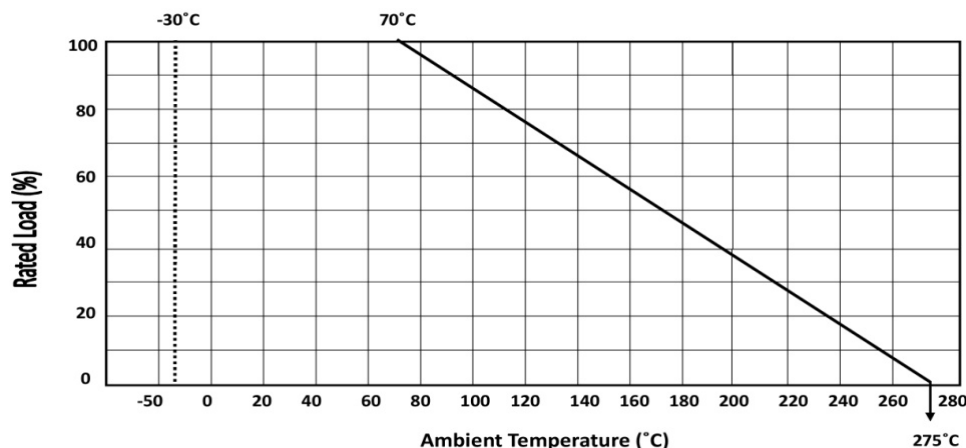
WIREWOUND RESISTORS

FLAME-PROOF COATING KNP(RW)TYPE

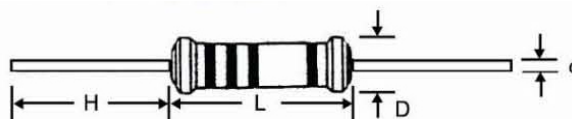
KNP(RW) type is to wind the resistance wire on a alkaliless ceramic core, coated with non-corrosive and high in-sulating heat proof material.

1. Super heat dissipation.
2. Small linear temperature coefficient.
3. Instant overload capability.
4. Low noise figure and without annual shift on resistance value

Derating Curve



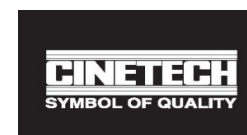
Dimensions



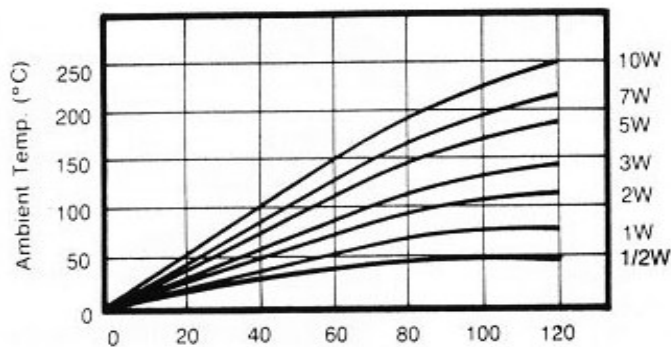
Type		Power Rating at temp.	Dimensions (mm)				Resistance Range (Ω) 1%, 5%
KNPS	KNP		D	L	H (MIN)	d ± 0.05mm	
1/2W	1/4W	70°C	2.3± 0.5	6.5± 1.0	25	0.55	0.1 ~ 47Ω
1WSS		70°C	2.3± 0.5	6.5± 1.0	25	0.55	0.1 ~ 47Ω
1W	1/2W	70°C	3.5± 0.5	9± 1.0	27	0.60	0.1 ~ 47Ω
2WSS		70°C	3.5± 0.5	9± 1.0	27	0.60	0.1 ~ 100Ω
2W	1W	70°C	4.0± 1.0	11± 1.0	27	0.75	0.1 ~ 150Ω
3WSS		70°C	4.0± 1.0	11± 1.0	27	0.75	0.1 ~ 150Ω
3W	2W	70°C	5.5± 1.0	15± 1.0	27	0.75	0.1 ~ 200Ω
5W	3W	40°C	6.5± 1.0	18± 1.5	27	0.75	0.1 ~ 400Ω
7W	5W	40°C	8.5± 1.0	25± 1.5	27	0.75	0.1 ~ 1K
8W	7W	40°C	8.5± 1.0	32± 1.5	27	0.75	0.1 ~ 1K
10W	8W	40°C	8.5± 1.0	42± 1.5	27	0.75	0.1 ~ 2K
	10W	40°C	8.5± 1.0	53± 1.5	27	0.75	0.1 ~ 4K7

Note: Resistance up to 27 Ω maximum for Non-inductive type

Lower or Higher resistance values other than the list are also available



Temperature Rise



Test Items	Condition	Spec.
Resistance Temp.Coeff.	-55°C~+155°C	* ± 300 ppm/°C standard
Short Time Over Load	5 times of rated wattage for 5 sec.	$\pm 2\%$
Rated Load	Rated wattage 30 min.	
Voltage Durability	500V AC 1 min.	not changed
Insulation Resistance	500V megger	500M Ω
Temp. Cycle	- 55°C ~ + 150°C for 5 cycles	$\pm 1\%$
Load Life	70°C on-off cycle 1,000 hrs.	$\pm 5\%$
Moisture-Proof Load Life	40°C 95% RH on-off cycle 500 hrs.	$\pm 3\%$
Incombustibility	16 times of rated wattage for 5 min	not flamed

Note: Special value is available on request.

* Lower TCR ± 25 , 50, 100ppm available upon request.

Parts Number System

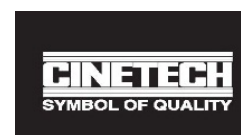
KNP	—	200S	101	J	B	C
Wire Wound Resistor With Flameproof Coating Axial Type		Wattages	Resistance	Tolerance	Packing Code	T.C.R
KNP - Wire Wound Resistor NKNP-Non-inductive W/W resistor		see below 2. & 3.	3 Digit code for 5% tolerance 4 Digit code for 1% tolerance	J = $\pm 5\%$ F = $\pm 1\%$	R= Tape/Reeled T=Ammo Tape/box B=Bulk Pack	No marking = 300ppm K = 100ppm C = 50ppm E = 25ppm

Note: 1. 52, 63, and 73mm taping are available for different Wattages.

2. Wattages: 1W = 100; 2W=200; 3W=300; 5W=500; 7W=700; 8W=800; 10W=10W

3. "S" - Small size wire wound Resistor

"SS" - ultra small size wire wound Resistor

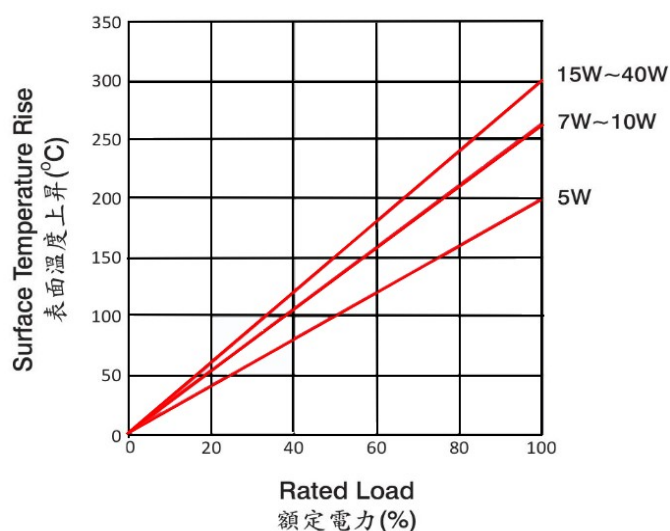


WIREWOUND RESISTORS RECTANGULAR TYPE

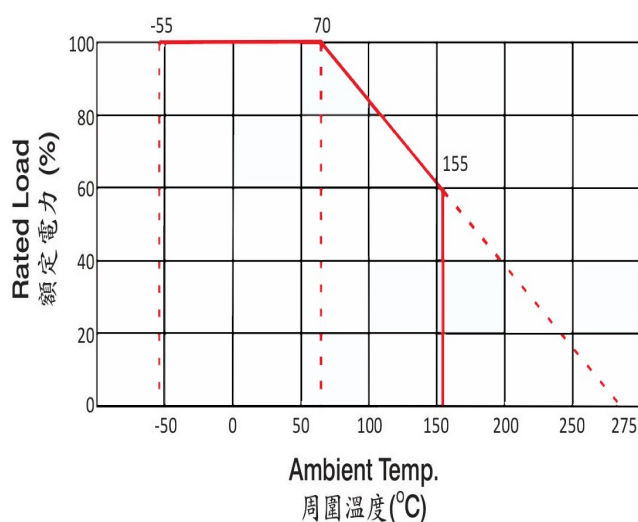
1. As applying non-flammable materials, even if over current flows, there will be no self-ignition occurred.
2. Completely insulated character suitable for Printed circuit board mounting
3. Precise resistance value with long life proof.
4. Super heat dissipation; small linear temperature coefficient
5. Instant overload capability; low noise figure and without annual shift on resistance value.
6. For higher resistance value, the winding core is replaced by Metal Oxide Film cutting core (MO)



Temperature Rise



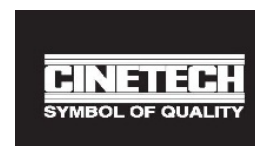
Derating Curve



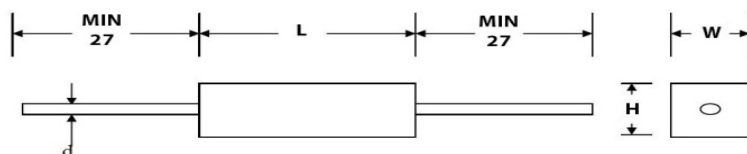
Test Items	Condition	Spec.
Resistance Temp.Coeff.	-55°C~+155°C	* ± 300 ppm/°C
Short Time Over Load	* 5 times of rated wattage for 5 sec.	$\pm 2\%$
Rated Load	Rated wattage 30 min.	$\pm 1\%$
Voltage Durability	1,000V AC 1 min.	not changed
Insulation Resistance	500V megger	500M Ω
Temp. Cycle	- 30°C ~ + 85°C for 5 cycles	$\pm 1\%$
Load Life	70°C on-off cycle 1,000 hrs.	$\pm 5\%$
Moisture-Proof Load Life	40°C 95% RH on-off cycle 1000 hrs.	$\pm 3\%$
Incombustibility	16 times of rated wattage for 5 min.	not flamed

*Lower TCR available upon request.

*Applicable for wirewound elements only.



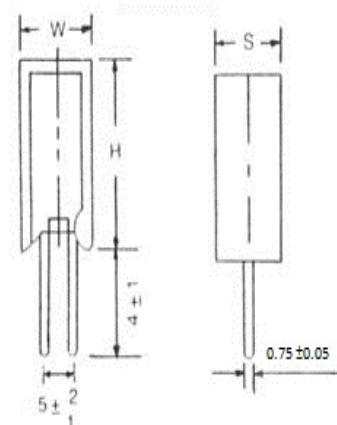
SQP TYPE



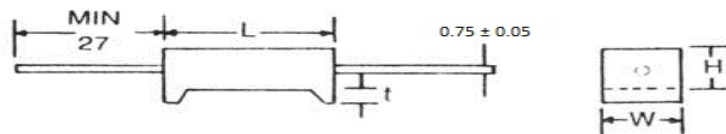
SQP	Dimension(mm)				Resistance Range(Ω)		Max Working Voltage
	L ± 1.5	W ± 1.0	H ± 1.0	d ± 0.05	Wire Wound	MO	
2W	18.0	7.0	7.0	0.75	0.1~50 Ω	51~200K Ω	150V
3W	22.0	8.0	8.0	0.75	0.1~50 Ω	51~500K Ω	350V
5W	22.0	9.5	9.0	0.75	0.1~50 Ω	51~500K Ω	350V
7W	35.0	9.5	9.0	0.75	0.1~500 Ω	501~100K Ω	500V
10W	48.0	9.5	9.0	0.75	0.1~500 Ω	501~100K Ω	500V
15W	48.0	12.5	12.0	0.75	0.1~1K Ω	1k1~100K Ω	500V
20W	60.0	14.0	13.5	0.75	0.1~1K Ω	1k1~100K Ω	500V
25W	60.0	14.0	13.5	0.75	0.1~1K Ω	1k1~100K Ω	1000V
30W	77.0	18.0	17.0	0.75	0.1~1K Ω		1000V
40W	90.0	19.0	18.0	0.75	0.1~1K Ω		1000V
50W	90.0	19.0	18.0	0.75	0.1~1K Ω		1000V

SQM TYPE

Type	Dimension(mm)			Resistance Range(Ω)	
SQM	H ± 1.5	W ± 1	S ± 1	Wire Wound	MO
2W	20	11	7.5	0.1~50 Ω	51~500 Ω
3W	25	12	9	0.1~50 Ω	51- 47K Ω
5W	25	13	9	0.1~50 Ω	51- 47K Ω
7W	39	13	9	0.1~500 Ω	501- 47K Ω
10W	51	13	9	0.1~500 Ω	501- 47K Ω
10WS	35	16	12	0.1~500 Ω	501- 47K Ω



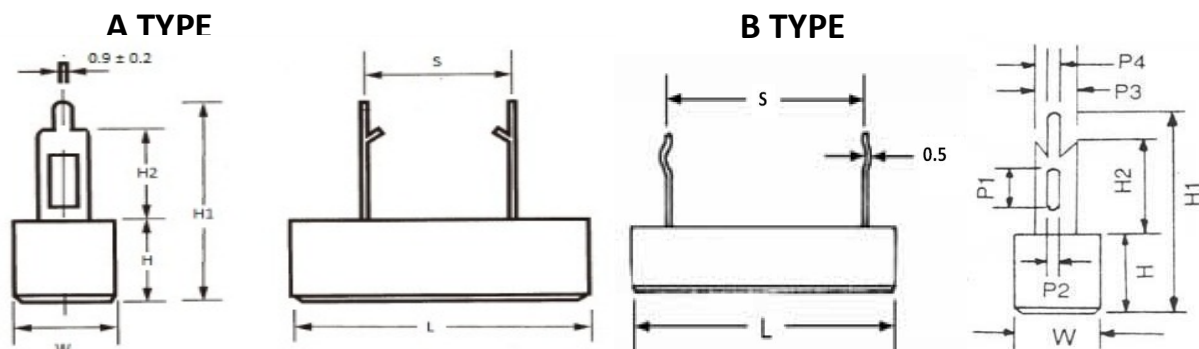
SQT TYPE



Type	Dimension(mm)				Resistance	Range(Ω)
SQT	W ± 1	H ± 1	L ± 1.5	t ± 1.5	Wire Wound	MO
5W	10	9	22	1.5	0.1~50 Ω	51 Ω ~47K Ω
7W	10	9	35	3	0.1~500 Ω	501~47K Ω
10W	10	9	48	3	0.1~500 Ω	501~47K Ω
15W	12.5	12.5	48	3	0.1~500 Ω	501~47K Ω
20W	13	14	60	5	0.1~500 Ω	501~47K Ω

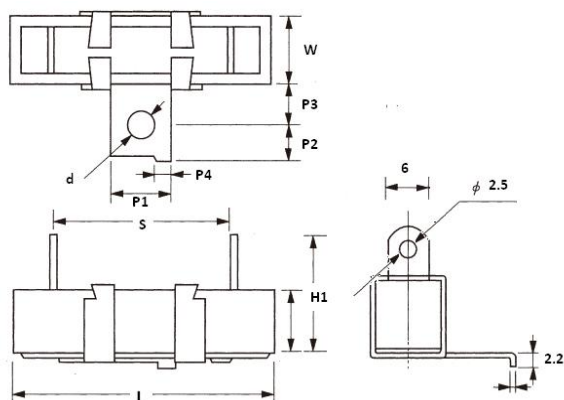


SQZ TYPE

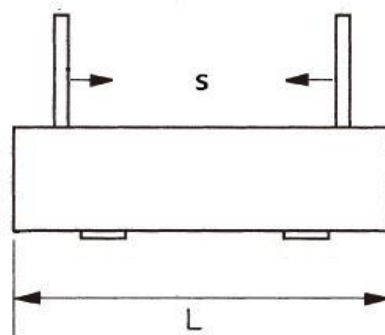


Type A+B	Power Rating (W)	Resistance Range(Ω)		Dimension(mm)									
		Wire Wound	MO	L ± 2	H ± 1	W ± 1	S ± 1.5	H1 ± 1	H2 ± 1	P1	P2	P3	P4
SQZ-5	5	0.1Ω~200Ω	201Ω50KΩ	27.0	9.5	9.5	15.0	24(30)(40)	9.5(15)(25)	4.0	2.0	7.5	1.5
SQZ-7	7	0.1Ω~200Ω	201Ω100KΩ	35.0	9.5	9.5	22	24(30)(40)	9.5(15)(25)	4.0	2.0	7.5	1.5
SQZ-10	10	0.2Ω~500Ω	501Ω100KΩ	48.0	9.5	9.5	33	24(30)(40)	9.5(15)(25)	4.0	2.0	7.5	1.5
SQZ-15	15	0.5Ω~600Ω	601Ω100KΩ	48.0	12.5	12.5	33	34.5	15.0	7.0	6.0	10.0	2.7
SQZ-20	20	0.5Ω~1KΩ	1.1KΩ100KΩ	63.5	12.5	12.5	42	34.5	15.0	7.0	6.0	10.0	2.7
SQZ-3S	3	0.1Ω~50Ω	—	22.0	9.5	9.5	10.0	23.0	12.0	4.0	2.0	7.5	1.5
SQZ-5S	5	0.1Ω~50Ω	—	25.0	9.5	9.5	10.0	24.0	12.0	4.0	2.0	7.5	1.5

SQHG TYPE

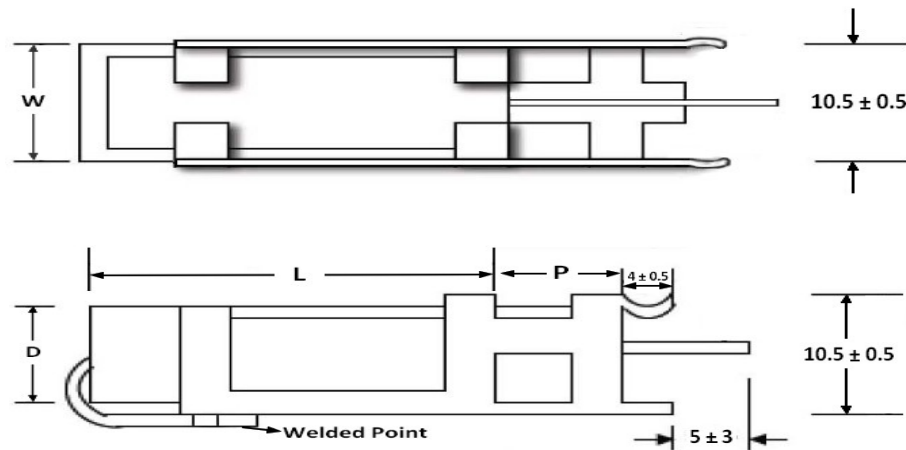


SQH TYPE



Type A+B	Power Rating (W)	Resistance Range(Ω)		Dimension(mm)									
		Wire Wound	MO	L ± 2	H ± 1	W ± 1	S ± 1	H1 ± 1	P1 ± 1	P2 ± 1	P3 ± 1	P4 ± 1	d
SQH-10	10	0.5Ω~500Ω	501Ω - 50KΩ	48.0	10.0	10.0	33	21	12	6	8.0	3.0	4
SQH-15	15	0.5Ω~600Ω	601Ω - 150KΩ	48.0	12.0	12.0	33	21	12	6	8.0	3.0	4
SQH-20	20	0.5Ω~1KΩ	1.1KΩ-150KΩ	63.7	12.0	12.0	42	24	12	6	8.0	3.0	4
SQH-30	30	0.1Ω~2KΩ	—	75.0	19.0	18.0	56	30	17	8	10.0	3.0	4
SQH-40	40	0.1Ω~2KΩ	—	90.0	19.0	18.0	68	30	17	8	10.0	3.0	4

SPS TYPE



Type	Dimension(mm)			Resistance Range		
	W ±1	D ±1	L ±1	P ±1	Wire Wound	MO
SPS-5	10	9	22	5	0.1Ω~50Ω	51Ω~50KΩ
SPS-7	10	9	35	10	0.1Ω~500Ω	501Ω~50KΩ
SPS-10	10	9	48	10	0.1Ω~500Ω	501Ω~50KΩ
SPS-15	10	13	48	10	0.1Ω~1KΩ	1K1Ω~150KΩ
SPS-20	10	13	60	10	0.1Ω~1KΩ	1K1Ω~150KΩ

Parts Number System

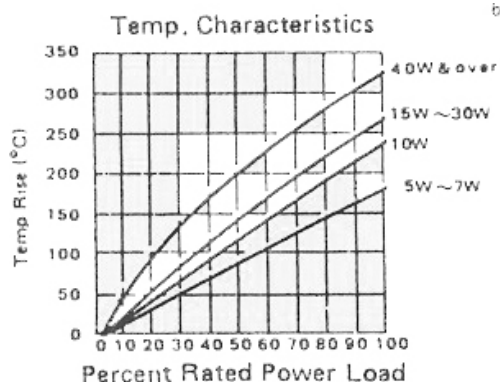
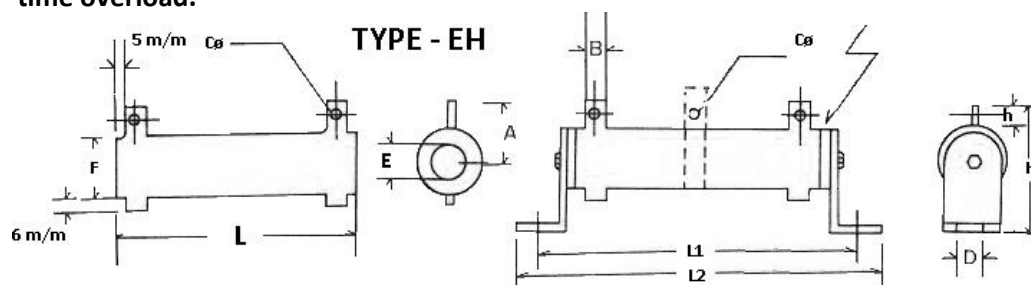
SQP	—	5W	101	J	B
Type of Cement Resistor	Wattages	Resistance		Tolerance	Packing Code
		3 Digit code for 5% tolerance 101=100Ω R10=0.1Ω 4R7=4.7Ω 4 Digit code for 1% tolerance		J = ±5% F = ±1%	B=Bulk Pack

POWER TYPE WIRE WOUND RESISTORS

EH/EZG SERIES

Introduction

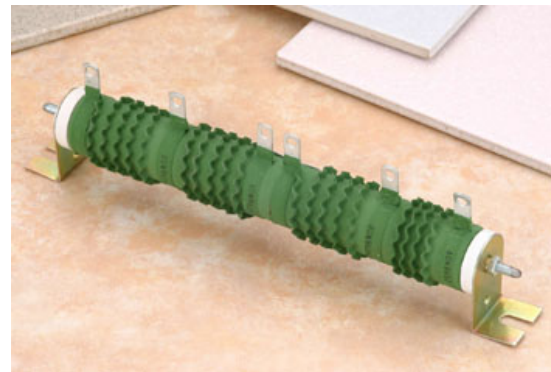
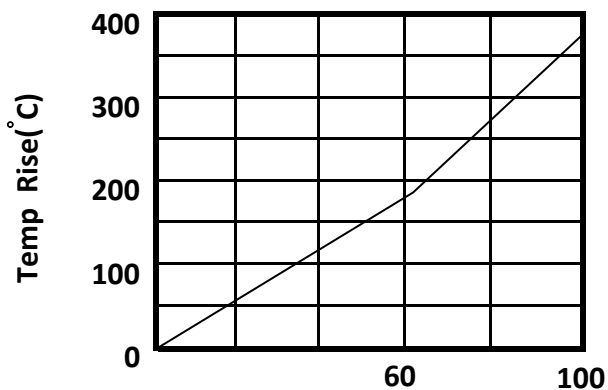
1. High resistivity to heat, small resistance temp coefficient and the change in resistance with temperature being linear.
2. Resistance value unchanged after long use, good resistivity to short time overload.
3. Multi-terminal types and adjustable types available.
4. Insulation: $\geq 500V$, 20M OHM
5. Load: 1000V 1 min.



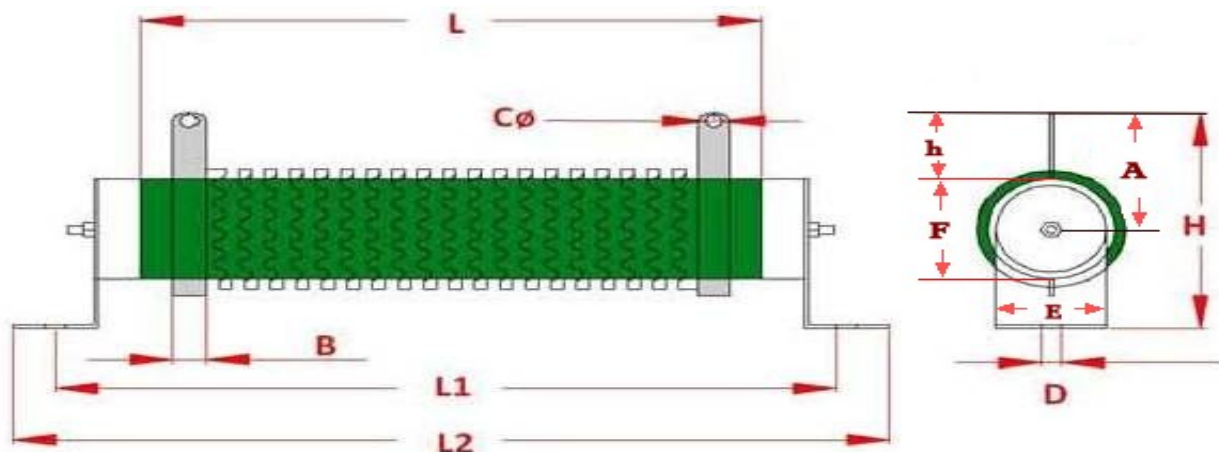
RATED WATTS	D TYPE DIMENSIONS (m/m)										
	L	F	E	A	B	L1	Cø	h	D	L2	H
10W	45	12	6	15	4		2	9	3		
20W	60	17	8	20	5	73	2.5	12	3	92	37
30W	80	17	8	20	5	93	2.5	12	3	112	37
40W	110	17	8	20	5	123	2.5	12	3	142	37
50W	110	25	16	30	8	140	4	18	5	164	58
60W	90	28	18	32	8	120	4	18	5	144	60
80W	110	28	18	32	8	140	4	18	5	164	60
100W	140	28	18	32	8	170	4	18	5	194	60
120W	160	28	18	32	8	190	4	18	5	214	60
150W	195	28	18	32	8	225	4	18	5	249	60
160W	185	35	24	36	8	220	4	18	9	254	75
200W	210	35	24	36	8	245	4	18	9	274	75
250W	210	40	25	38	10	250	5	22	9	277	77
300W	260	40	25	38	10	300	5	22	9	327	77
400W	330	40	25	38	10	370	5	22	9	400	77
500W	330	50	35	50	15	370	6	22	9	400	105
600W	400	50	35	50	15	440	6	22	9	470	105
800W	460	60	40	60	15	505	6	30	9	535	112
1000W	540	60	40	60	15	585	6	30	9	615	112
1200W	650	65	42	62	15	690	6	30	9	720	115



RIBBON TYPE - EZG



percent Rated Power Load

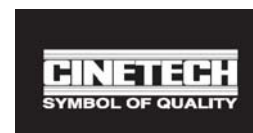


RATED WATTS	D TYPE DIMENSIONS (m/m)											備註
	L	F	E	A	B	L1	Cφ	h	D	L2	H	
75W	110	25	16	30	8	140	4	18	5	164	58	
90W	90	28	18	32	8	120	4	18	5	144	60	
120W	110	28	18	32	8	140	4	18	5	164	60	
150W	140	28	18	32	8	17	4	18	5	194	60	
180W	160	28	18	32	8	190	4	18	5	214	60	
225W	195	28	18	32	8	225	4	18	5	249	60	
240W	185	35	24	36	8	220	4	18	9	254	75	
300W	210	35	24	36	8	245	4	18	9	274	75	
375W	210	40	25	38	10	50	5	22	9	277	77	
450W	260	40	25	38	10	300	5	22	9	327	77	
600W	330	40	25	38	10	370	5	22	9	400	77	
750W	330	50	35	50	15	370	6	22	9	400	105	
900W	400	50	35	50	15	440	6	22	9	470	105	
1000W	460	50	35	50	15	505	6	22	9	535	105	
1200W	460	60	40	60	15	505	6	30	9	535	112	
1500W	540	60	40	60	15	585	6	30	9	615	112	
2000W	650	62	42	62	15	690	6	30	9	720	115	

Characters: Excellent in heat dissipation, small size with large current.

Applying temperature: Max.400 °C, can be used in high temperature continuously.

Larger wattages are available.



Parts Number System

EH	— 120W	100	J	F
Type	wattages	Resistance	Tolerance	
EH- Power Type Wire wound Resistors EZG - Ribbon Power Type Wire wound resistors		3 digit code for 5% 4 digit code for 1%	J = $\pm 5\%$ F = $\pm 1\%$	F - Fixed A - adjustable



METAL-CLAD WIRE WOUND RESISTORS

GMR SERIES

Dimensions - 5W, 10W, 25W, 50W, 80W, 100W, 100WS, 150WS, 250W and 300W

Type A

Dimensions

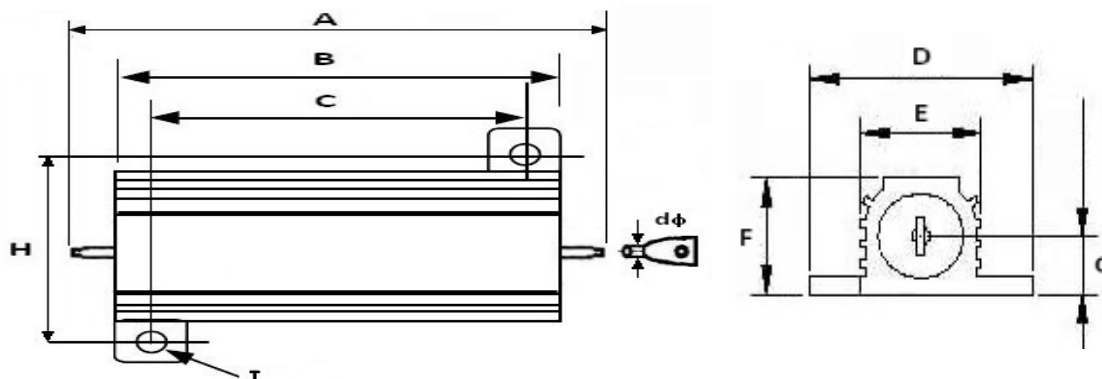
GMR-5W

GMR-10W

GMR-25W

GMR-50W

GMR-80W



Power Rating (W)	Dimension										Resistance Range
	A ref.	B ± 1	C ± 1	D ± 1	E ± 1	F ± 0.5	G ± 0.3	H ± 1	ϕ I ± 0.2	d ± 0.2	
GMR-5W	25	15	10	16.5	8.5	8	4	12.5	2	2	0.1 Ω ~50K
GMR-10W	32	19	14	20	10.5	10	5	15.5	2	2	0.1 Ω ~50K
GMR-25W	47	27	18	27	15	15.5	7	21	3.5	2.5	0.1 Ω ~100K
GMR-50W	70	50	39	29	15	15.5	7	21	3.5	2.5	0.1 Ω ~100K
GMR-80W	96	75	39	29	15	15.5	7	21	3.5	2.5	0.1 Ω ~3K

Option: 1. Straight Leads on each End 0.8 or 1.0mm Diameter

2. Screws Mounting With Nuts And Washers On each end

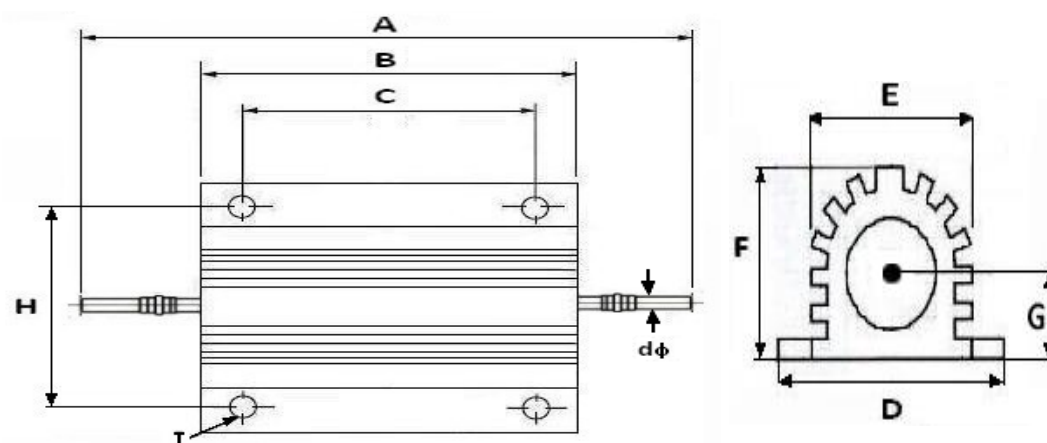
80W also available with screw mounting, refer to Type B

Type B

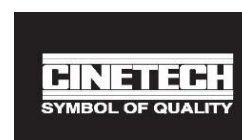
Dimensions

GMR-80W

GMR-100WS

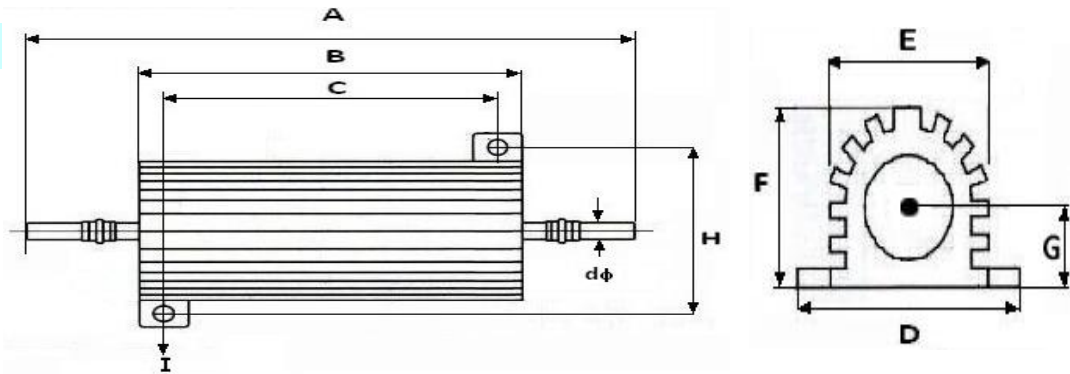


Power Rating (W)	Dimension										Resistance Range
	A ref.	B ± 1	C ± 1	D ± 1	E ± 1	F ± 0.5	G ± 0.3	H ± 1	ϕ I ± 0.2	d ± 0.2	
GMR-80W	102	66	35	47	28	25	12	37	4.5	M5	0.1 Ω ~3K
GMR-100WS	102	66	35	47	28	25	12	37	4.5	M5	0.1 Ω ~3K



Type C

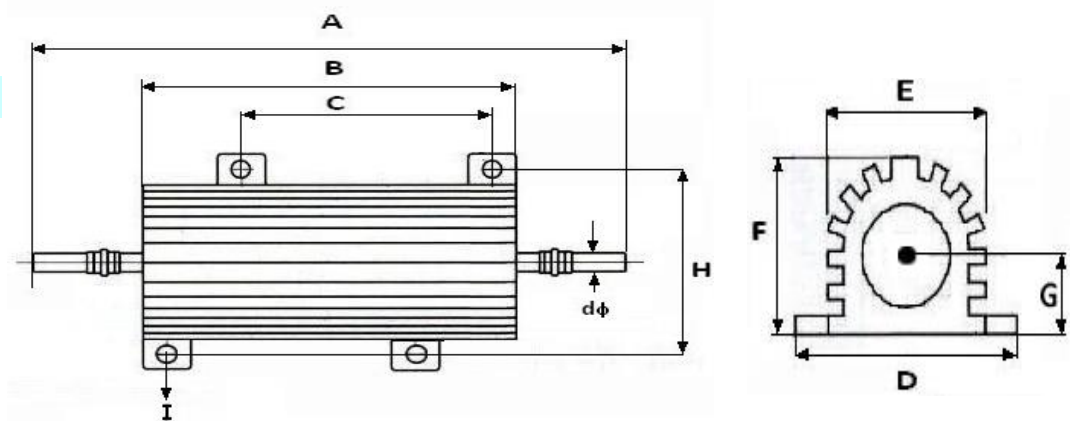
Dimensions
GMR-100W



Power Rating (W)	Dimension										Resistance Range
	A Ref.	B±1	C±1	D±1	E±1	F±0.5	G±0.3	H±1	φ I±0.2	d±0.2	
GMR-100W	135	89	69	70	46	44.5	19.5	58	5	M5	0.1Ω~3K

Type D

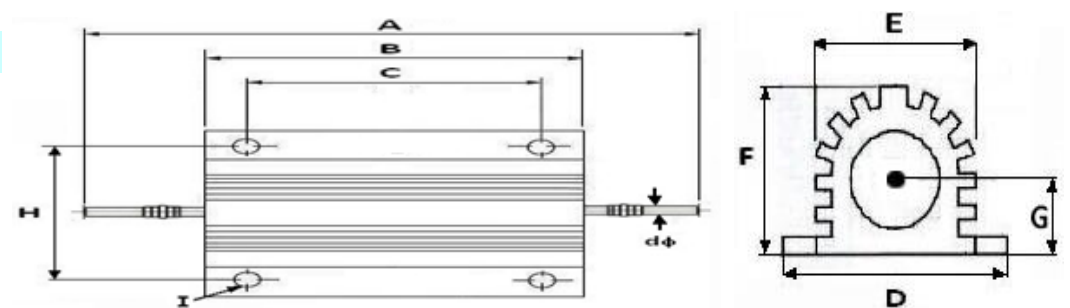
Dimensions
GMR-250W
GMR-300W



Power Rating (W)	Dimension										Resistance Range
	A ref.	B±1	C±1	D±1	E±1	F±0.5	G±0.3	H±1	φ I±0.2	d±0.2	
GMR-250W	175	114	77	77	53	55.5	25	64	5	M6	0.1Ω~3K
GMR-300W	175	114	77	77	53	55.5	25	64	5	M6	0.1Ω~3K

Type E

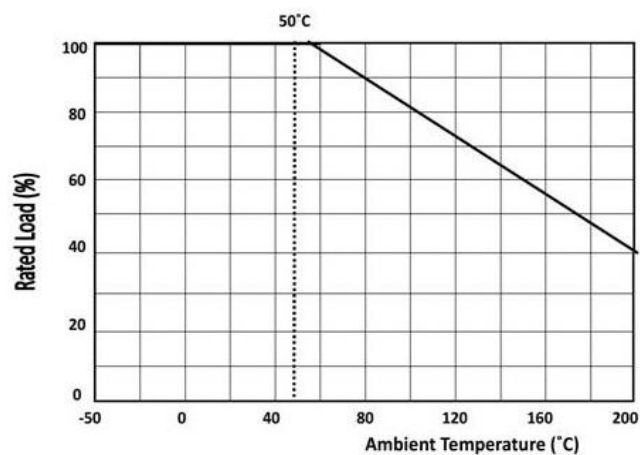
Dimensions
GMR-150WS
GMR-300W



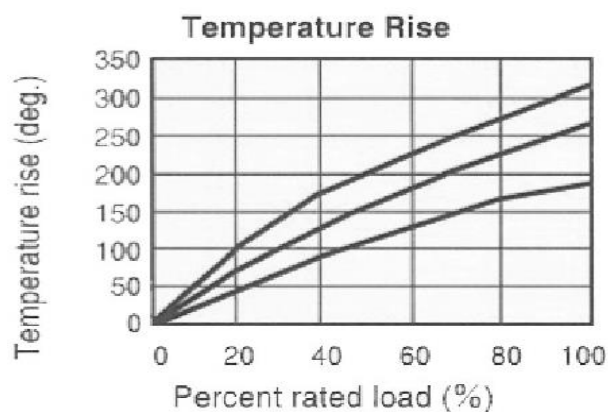
Power Rating (W)	Dimension										Resistance Range
	A ref.	B±2	C±2	D±2	E±1.5	F±1	G±1.5	H±1.5	φ I±0.5	d±0.2	
GMR-150WS	136	98	70	49	27	26	11.5	37	4.4	M5	0.1Ω~5K
GMR-300W	170	130	102	73	46.5	45	21	58	5.5	M6	0.1Ω~5K



Power Derating Curve



Temperature Rise

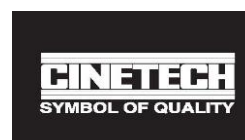


Electrical Specification

Characteristics	Limits	Test methods
Resistance tolerance	±1% (F) ±5% (J) ±10% (K)	JIS-C-5202 5-1
Temperature Coefficient	±200ppm/°C max.	JIS-C-5202 5-2b
Power rating load	$\Delta R/R \leq \pm (1\% + 0.05 \Omega)$ surface temp. rise 350 °C max	JIS-C-5202 5-4
Short-time overload	$\Delta R/R \leq \pm (2\% + 0.05 \Omega)$ 100% rated power 5 seconds	JIS-C-5202 5-5
Insulation resistance	DC500V 1000 M Ω min.	JIS-C-5202 5-6
Dielectric withstanding voltage	Standard 2KV, for power higher than 100W, 3KV available upon request	JIS-C-5202 5-7

Parts Number System

GMR —	A	50W	100	J
Series	Type	Wattages	Resistance	Tolerance
Golden Color Metal Clad Wire Wound Resistors	A B C D E		3 digit code for 5% 4 digit code for 1%	F = ±1% J = ±5% K = ±10%



LARGE POWER METAL-CLAD WIRE WOUND RESISTORS

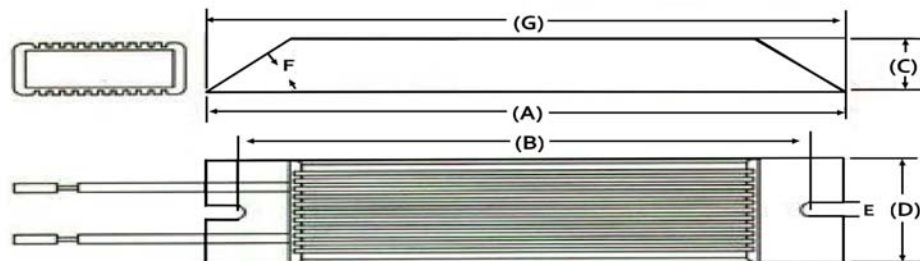
SMRH SERIES

SMRH series

◆ Power Type

◆ Higher Power

* A Type



* B Type



GENERAL SPECIFICATION

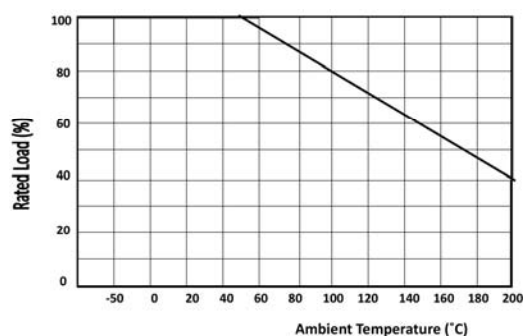
Power Rating (W)	Dimensions (mm)							Type	Resistance Range
	A ± 2	B ± 2	C ± 1	D ± 1	E ± 1	F ± 1	G ± 2		
SMRH-60W	115	100	20	40	5.2	45°	75	A	0.1~10K
SMRH-80W	140	125	20	40	5.2	45°	100	A	0.1~10K
SMRH-100W	165	150	20	40	5.2	45°	125	A	0.1~10K
SMRH-120W	190	175	20	40	5.2	45°	150	A	0.15~15K
SMRH-150W	215	200	20	40	5.2	45°	175	A	0.15~15K
SMRH-200W	165	150	30	60	5.2	60°	125	A	0.3~20K
SMRH-300W	215	200	30	60	5.2	60°	175	A	0.5~30K
SMRH-400W	265	250	30	60	5.2	60°	225	A	0.5~30K
SMRH-500W	335	320	30	60	5.2	60°	300	A	0.5~30K
SMRH-600W	335	320	30	60	5.2	60°	300	A	1~50K
SMRH-800W	400	385	40	80	5.2	60°	355	A, B	1~50K
SMRH-1000W	400	385	50	100	5.2	60°	345	A, B	1~50K

Electrical specification

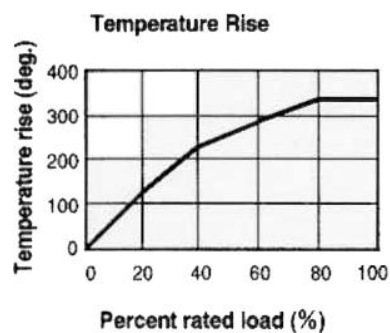
Characteristics	Limits
Resistance tolerance	Resistance $1\Omega > R$ Resistance tolerance $\pm 10\%(K)$
Temperature coefficient	$\pm 400\text{ppm}/^\circ\text{C}$ max.
Power Rating Load	$\Delta R/R \leq \pm 1\%$ Surface temp. rise 375°C max.
Short-time overload	$\Delta R/R \leq \pm 2\%$ 300% rated power 5 seconds
Insulation resistance	DC500V 100M Ω min
Dielectric withstanding voltage	AC3000V 60 Sec.



Power Derating Curve



Temperature Rise



Short-time Overload Rating

(Second) Load Time	5	10	30	60	180	300	600	900	1800
(%) Max. Load Amps Rated	400	350	250	200	140	120	110	105	100

NEMA standard/ON-OFF Cycling

Cycling time (Second)	5 sec ON 75sec OFF	10 sec ON 70 sec OFF	15sec ON 75sec OFF	15sec ON 45sec OFF	15sec ON 30sec OFF	15sec ON 15sec OFF
Max. Amps Rated Load (%)	290	215	185	160	150	125

Parts Number System

SMRHA	— 120W	100	J
Type	Wattages	Resistance	Tolerance
SMRH - A, B Type Large Power Metal-Clad Wire Wound Resistors		3 digit code for 5% 4 digit code for 1%	J = $\pm 5\%$ F = $\pm 1\%$

Ceramic Disc Capacitors

Temperature Compensating Series (Class I 50V ~ 1KV)

• Features

- ◎ Linear temperature coefficient of capacitance.
- ◎ High stability of capacitance.
- ◎ Low loss at wide range of frequency.



• Specifications

Operating Temperature Range 操作溫度範圍	Class I : -25°C ~ +85°C
Rated Working Voltage (DC) 工作電壓	50V, 63V, 100V, 500V, 1KV
Capacitance 電容器	Measured at 25°C, 1MHz, 1Vms.max.
Capacitance Tolerance 電容誤差值	1p F ~ 9 p F: ± 0.25 p F (C) or ± 0.5 p F (D) 10 p F and above: $\pm 5\%$ (J) or $\pm 10\%$ (K)
Insulation Resistance 絕緣電阻值	10,000M Ω min. at working voltage, 60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25°C, 1MHz, 1V ms, max. Q=1000min, if C ≥ 30 p F Q $\geq 400+20C$, if C < 30p F (where C= capacitance)
Voltage Proof (Flash Test) 電壓防護	With stand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85°C for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS I), JIS C-6422 (TYPE I)

• How to order

T (1)	CH (2)	1H (3)	101 (4)	J (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
CLASS I T series	DIELECTRIC CH=NPO LH=N80 PH=N150 RH=N220 UJ=N750 SL=SL	RATED VOLTAGE 1H=50V 1J=63V 2A=100V 2H=500V 3A=1KV	CAPACITANCE 1PF =1R0 1.5PF = 1R5 2.2PF =2R2 100PF=101 120PF=121 10nF=103 100nF= 104	TOLERANCE C= ± 0.25 PF D= ± 0.5 PF F= $\pm 1\%$ J= $\pm 5\%$ K= $\pm 10\%$ M= $\pm 20\%$ Z=+80 ~ -20%	LEAD SHAPE K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	LEAD SPACING 2=2.5 ± 0.8 5=5.0 ± 0.8 6=6.3 ± 0.8 7=7.5 ± 0.8 0=10 ± 0.8	LEAD LENGTH 3=3.5 ± 1.0 5=5.0 ± 0.8 6=6.3 ± 0.8 0=10 ± 0.8 1= 25mm	LEAD WIRE 5=16V~500V ($\Phi 0.48 \pm 0.05$) 6=1KV ($\Phi 0.5 \pm 0.05$) 8=2KV ($\Phi 0.45 \pm 0.6$) 9=3KV ($\Phi 0.6 \pm 0.05$)	GRADE Y=-25°C ~+85°C

Ceramic Disc Capacitors

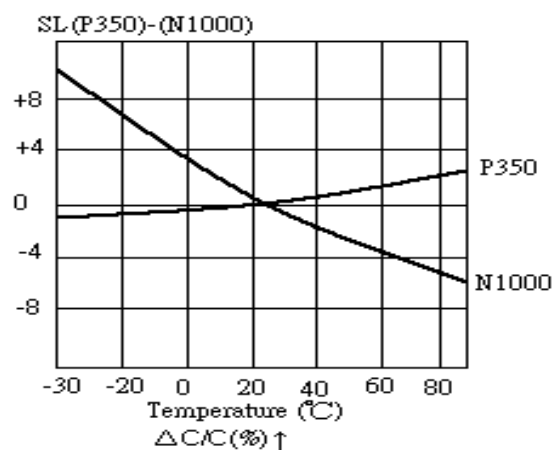
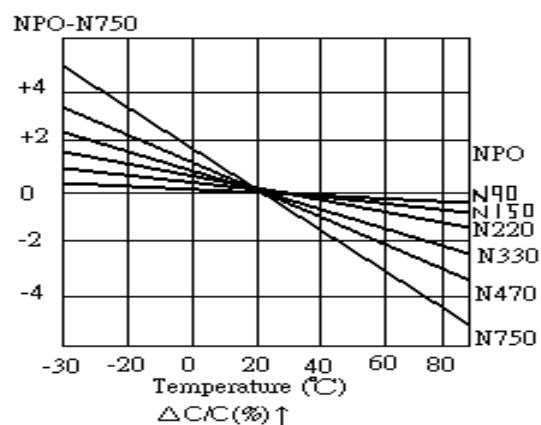
Temperature Compensating Series (Class I 50V ~ 1KV)

• Dimensions & Capacitance range

Dimensions(mm) 尺寸		Capacitance range (p F) of each Temperature 各溫度係數之電容值範圍					
D	F	NPO	N80	N150	N220	N750	SL
5	2.5or5.0	1-50	1-24	1-39	1-24	22-50	1-180
6	5.0	51-82	25-39	47-56	25-39	56-82	200-220
7	5.0	100-120	47-56	82-100	47-56	100-120	270-330
8	5.0	150-180	68	120-150	68	150-180	390-470
9	5.0	220	82	180-220	82	220	560-680
10	5.0	270~330	100	-	100	270	820-1000

Dimensions(mm) 尺寸		Capacitance range (p F) of each Temperature 各溫度係數之電容值範圍		
(D)	(F) ◎	500V	500V	1 KV
Dia. Max.	Lead Spacing	NPO	SL	SL
6.0	5.0±0.8	1 ~ 39	1 ~ 82	47 ~ 68
7.0	5.0±0.8	47 ~ 56	90 ~ 161	82 ~ 101
8.0	5.0±0.8	65 ~ 82		150 ~ 221
9.0	5.0±0.8	90 ~ 101	181 ~ 301	
10.0	5.0±0.8			271
11.0	5.0±0.8			331
12.0	5.0±0.8 or 7.5±0.8			391 ~ 471
14.0	5.0±0.8 or 7.5±0.8			561 ~ 681

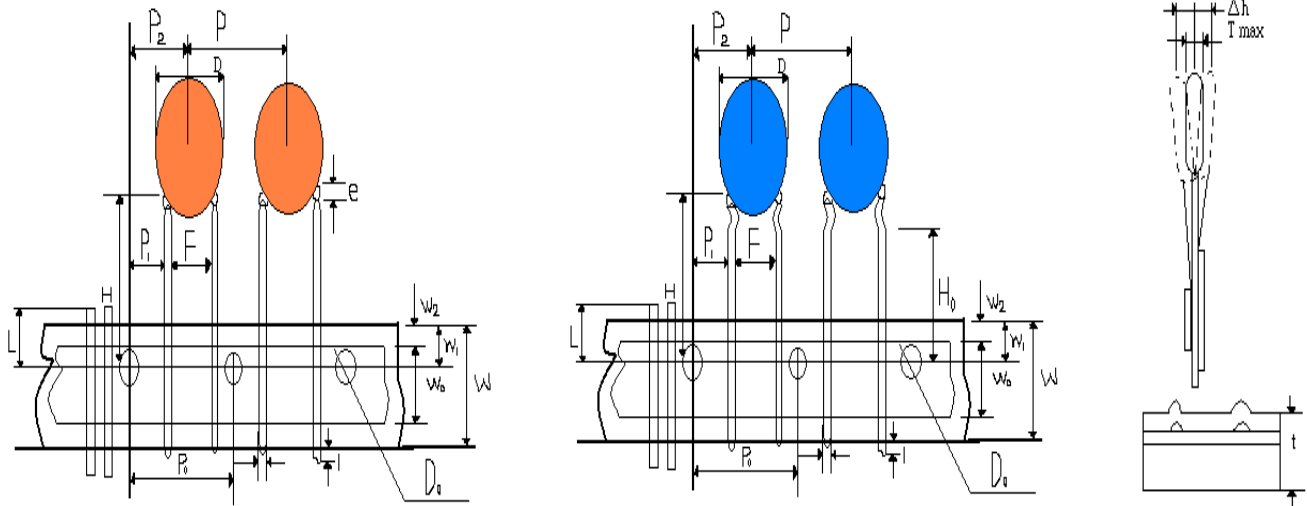
• Temperature characteristic curves



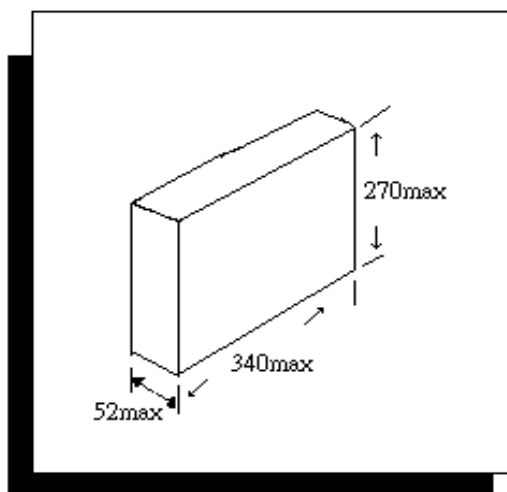
Ceramic Disc Capacitors

Temperature Compensating Series (Class I 50V ~ 1KV)

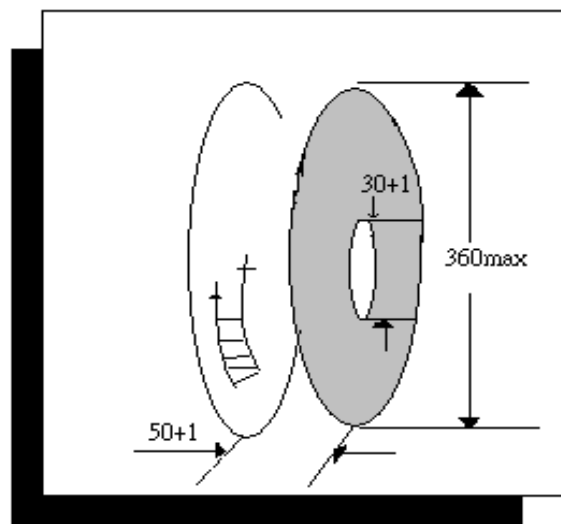
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

Temperature Compensating Series (Class I 50V ~ 1KV)

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度 : 0.5 ±0.1mm
Length of snapped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)



• Features

- ◎ Non linear temperature coefficient of capacitance.
- ◎ Large capacitance in small size.

• Specifications

Operating Temperature Range 操作溫度範圍	Y5E,Y5P:-30℃~+85℃; Z5U,Z5V:+10℃~+85℃
Rated Working Voltage (DC) 工作電壓	50V, 63V, 100V, 500V, 1KV
Capacitance 電容器	Measured at 25℃, 1KHz, 1Vms.max.
Capacitance Tolerance 電容誤差值	±10% (K), ±20%(M), +50%-10%(R),+80%-20%(Z)
Insulation Resistance 絕緣電阻值	10,000MΩ min. at working voltage,60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25℃, 1KHz, 1V ms, max. Y5E, Y5P, Z5U: 2.5% max. Z5V: 5.0% max.
Voltage Proof (Flash Test) 電壓防護	Withstand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85℃ for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS II), JIS C-6422 (TYPE II)

• How to order

H (1)	B (2)	1H (3)	101 (4)	K (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
CLASS II H series	DIELECTRIC B=Y5P/Y5E E=Z5U F-Z5V	RATED VOLTAGE 1H=50V 1J=63V 2A=100V 2H=500V 3A=1KV	CAPACITANCE 1PF = 1R0 1.5PF = 1R5 2.2PF =2R2 100PF=101 120PF=121 10nF=103 100nF= 104	TOLERANCE K=±10% M=±20% Z=+80 ~ -20%	LEAD SHAPE K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	LEAD SPACING 2=2.5±0.8 5=5.0±0.8 6=6.3±0.8 7=7.5±0.8 0=10 ±0.8	LEAD LENGTH 3=3.5±1.0 5=5.0±0.8 6=6.3±0.8 0=10 ±0.8 1= 25mm	LEAD WIRE 5=16V~500V (Φ0.48±0.05) 6=1KV (Φ0.5±0.05) 8=2KV (Φ0.45±0.6) 9=3KV (Φ0.6±0.05)	GRADE Y= -25℃ ~+85℃ Z= -10℃ ~+70℃

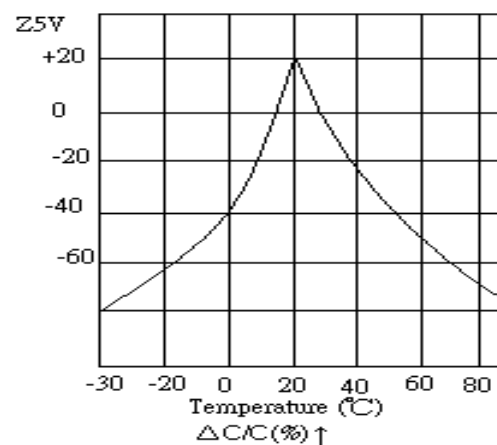
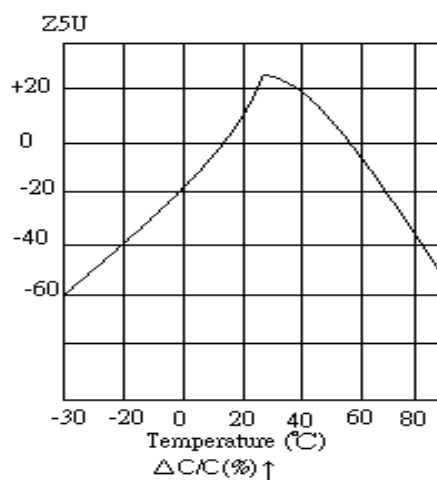
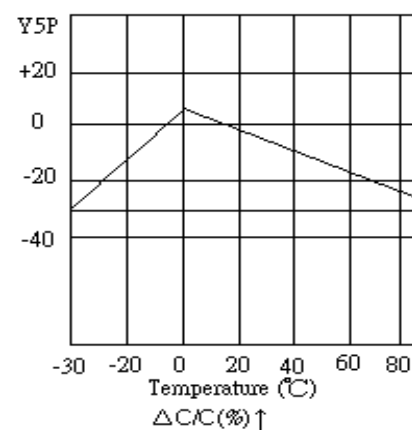
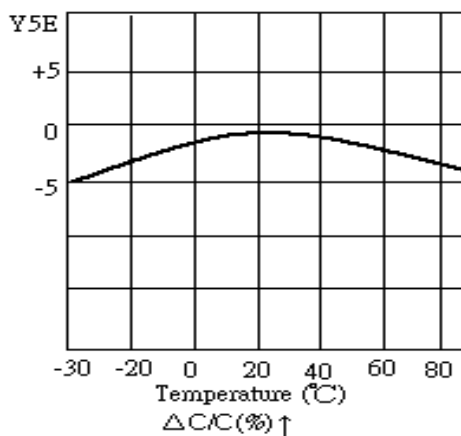
Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)

• Dimensions & Capacitance range

W.V. 電壓	Dimensons 尺寸			Capacitance range (pF) of each Temperature Coefficient 各溫度係數之電容值		
(DC)	D	T	dφ	Y5P/Y5E	Z5U	Z5V
50.63.100	5	3	0.5	100-2200	1000-4700	1000-10000
	6	3	0.5	2700~3300	5600~10000	15000~22000
	7	3	0.5	4700~5000	-	-
	8	3	0.5	5600~6800	15000	-
	9	3	0.5	-	-	40000~47000
	10	3	0.5	10000	-	-

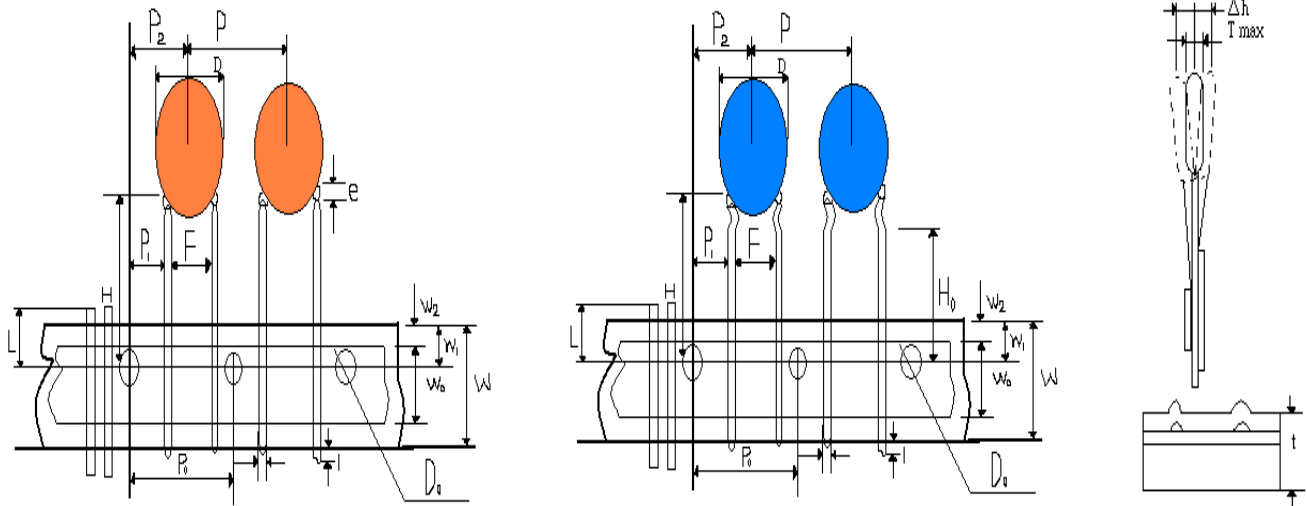
• Temperature characteristic curves



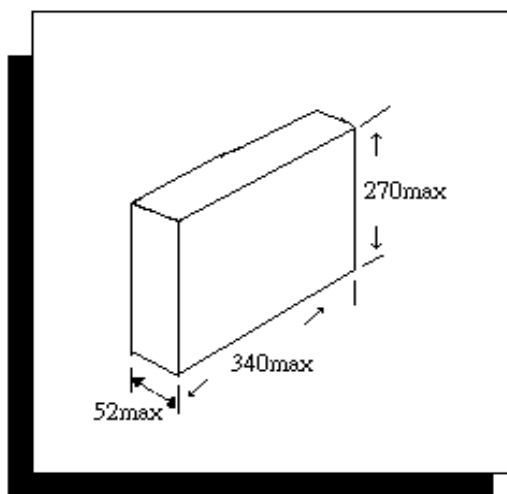
Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)

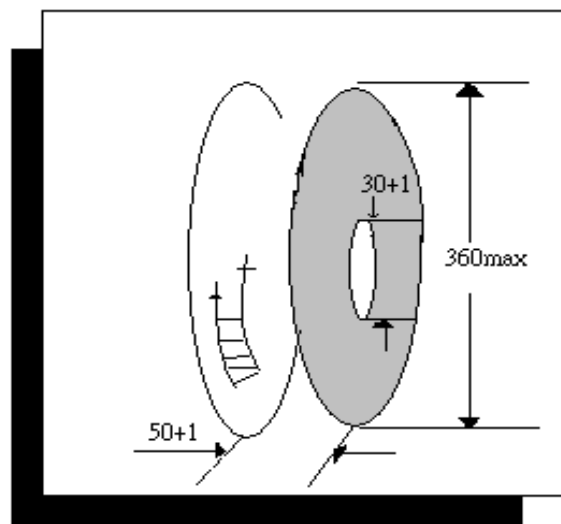
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引 線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度 : 0.5 ±0.1mm
Length of snipped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

• Specifications

Operating Temperature Range 操作溫度範圍	Y5E,Y5P:-30°C~+85°C; Z5U,Z5V:+10°C~+85°C
Rated Working Voltage (DC) 工作電壓	50V.63V.100V
Capacitance 電容器	Measured at 25°C, 1KHz, 1Vms.max.
Capacitance Tolerance 電容誤差值	±10% (K), ±20%(M), +50%-10%(R),+80%-20%(Z)
Insulation Resistance 絕緣電阻值	10,000MΩ min. at working voltage,60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25°C, 1KHz, 1V ms, max. Y5E, Y5P, Z5U: 2.5% max. Z5V: 5.0% max.
Voltage Proof (Flash Test) 電壓防護	Withstand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85°C for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS II), JIS C-6422 (TYPE II)

• How to order

S (1)	B (2)	1H (3)	103 (4)	K (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
CLASS I S series	DIELECTRIC B=Y5P E=Y5U F=Y5V	RATED VOLTAGE 1C=16V 1E=25V 1H=50V	CAPACITANCE 10nF=103 22nF=223 47nF=473 100nF= 104	TOLERANCE K=±10% M=±20% Z=+80 ~ -20%	LEAD SHAPE K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	LEAD SPACING 2=2.5±0.8 5=5.0±0.8 6=6.3±0.8 7=7.5±0.8 0=10 ±0.8	LEAD LENGTH 3=3.5±1.0 5=5.0±0.8 6=6.3±0.8 0=10 ±0.8 1= 25mm	LEAD WIRE 5=16V~500V (Φ0.48±0.05) 6=1KV (Φ0.5±0.05) 8=2KV (Φ0.45±0.6) 9=3KV (Φ0.6±0.05)	GRADE Y=-25°C ~+85°C

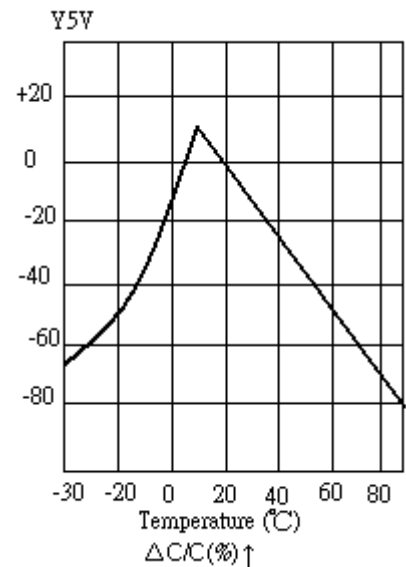
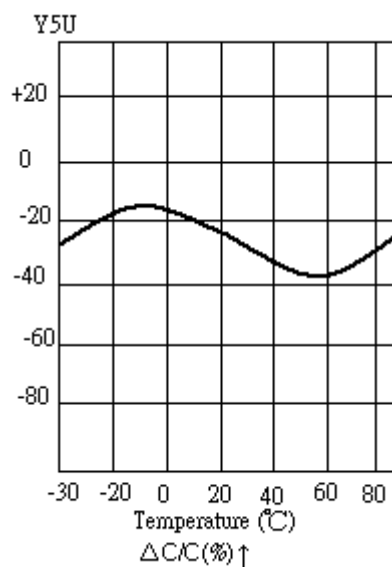
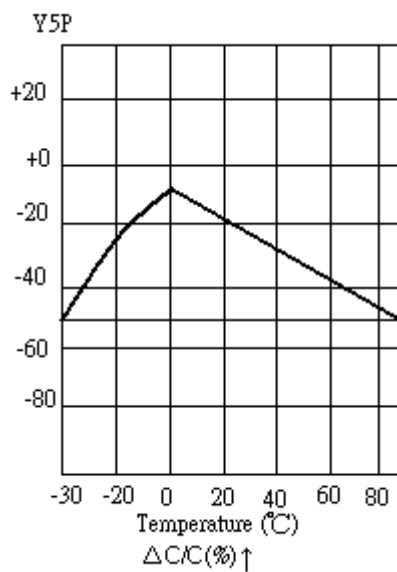
Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

• Dimensions & Capacitance rang

CAP.(μ F) 電容値	DIMENSIONS(D ϕ in mm) 尺寸								
T.C. 溫度係數	Y5P			Y5U			Y5V		
W.V.(DC) 電壓	16V	25V	50V	16V	25V	50V	16V	25V	50V
0.01 μ F	5	5	5	5	5	5	5	5	5
0.022 μ F	6	6	8	5	5	5	5	5	5
0.033 μ F	7	8	8	5	5	5	5	5	5
0.047 μ F	8	9	9	5	5	5	5	5	5
0.1 μ F	11	11	11	6	7	8	6	6	7
0.22 μ F	-	-	-	9	9	9	8	8	9

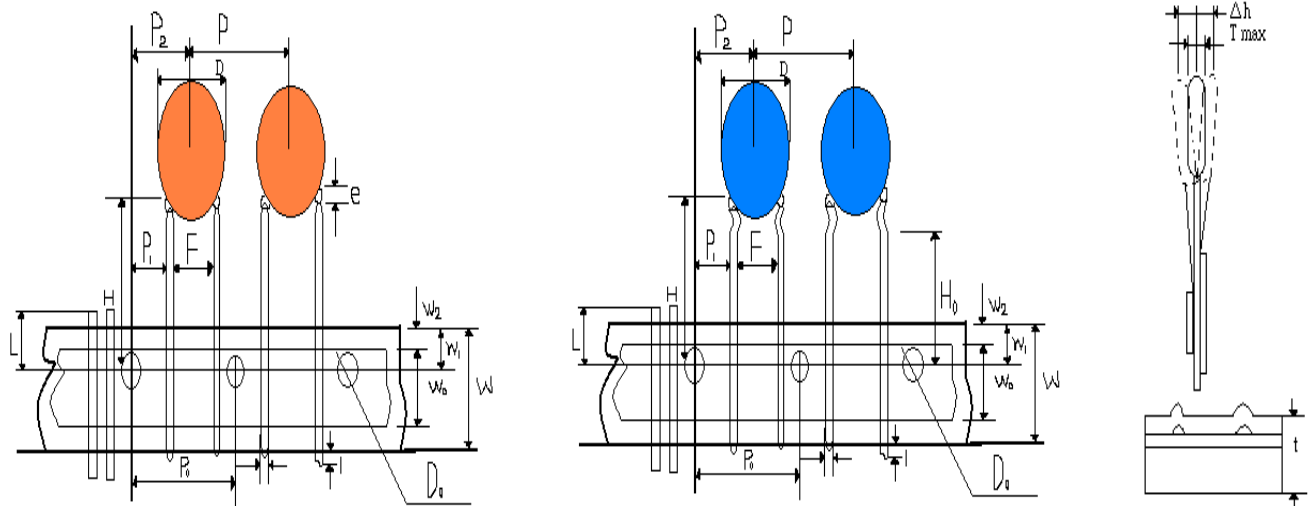
• Temperature Characteristic Curves



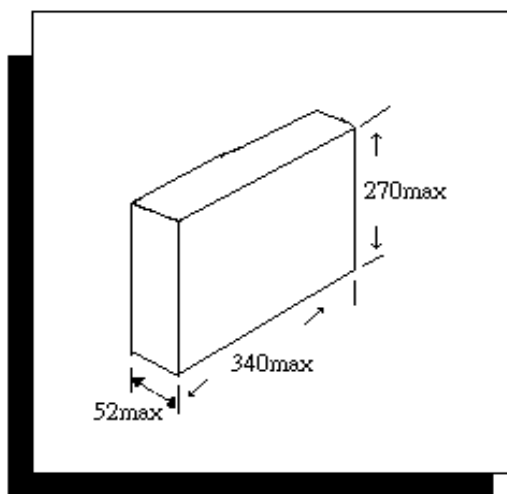
Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

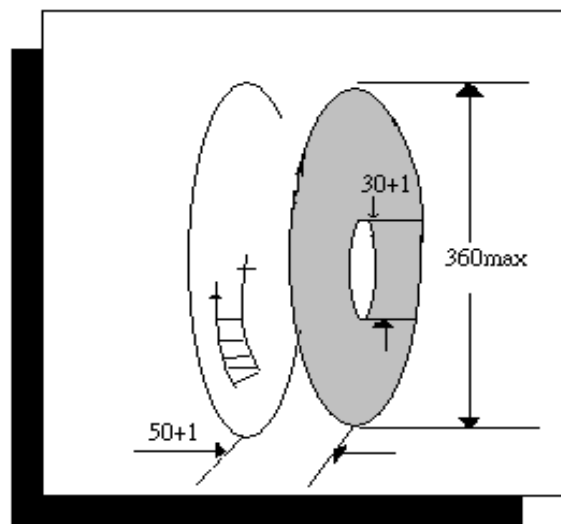
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引 線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度 : 0.5 ±0.1mm
Length of snipped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series



• Specifications

Operating Temperature Range 操作溫度範圍	Class I : -25°C~+85°C	Class II : Y5E,Y5P:-30°C~+85°C; Z5U,Z5V:+10°C~+85°C
Rated Working Voltage (DC) 工作電壓	2KV~3KV; are available.	2KV~3KV; are available.
Capacitance 電容器	Measured at 25°C, 1MHz,1Vms.max.	Measured at 25°C, 1KHz,1Vms.max.
Capacitance Tolerance 電容誤差值	1p F ~9 p F: ± 0.25 p F (C) or ± 0.5 p F (D), 10 p F and above: $\pm 5\%$ (J) or $\pm 10\%$ (K)	$\pm 10\%$ (K), $\pm 20\%$ (M), $+50\%-10\%$ (R), $+80\%-20\%$ (Z)
Insulation Resistance 絕緣電阻值	10,000M Ω min. at working voltage,60 sec.	10,000M Ω min. at working voltage,60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25°C, 1MHz, 1V ms, max. Q=1000min, if $C \geq 30$ p F Q $\geq 400+20C$, if $C < 30$ p F (where C= capacitance)	Measured at 25°C, 1KHz, 1V ms, max. Y5E, Y5P, Z5U: 2.5% max. Z5V: 5.0% max.
Voltage Proof (Flash Test) 電壓防護	Withstand 250% of rated working voltage with 50mA current, 1.5sec.	Withstand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85°C for 500 hours.	200% of rated voltage at 85°C for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS I), JIS C-6422 (TYPE I)	EIA RS-198 (CLASS II), JIS C-6422 (TYPE II)

• Dimensions & Capacitance range

Dimensions 尺寸		Capacitance range (pF) of each Temperature Coefficient 各溫度係數之電容值		
Dia. Max. (D)	Lead Spacing (F)	2 KV	3 KV	3 KV
		SL	NPO	SL
6.0	5.0 $\pm$ 0.8	10 ~ 56		5 ~ 47
7.0	5.0 $\pm$ 0.8	68 ~ 82	10 ~ 22	56 ~ 68
8.0	5.0 $\pm$ 0.8		25 ~ 33	82 ~ 101
9.0	5.0 $\pm$ 0.8		47 ~ 56	
10.0	5.0 $\pm$ 0.8		68 ~ 101	

Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

• Dimensions & Capacitance range

W.V. 電壓	Dimensions 尺寸			Capacitance range (pF) of each Temperature Coefficient 各溫度係數之電容值		
(DC)	D	T	dφ	Y5P/Y5E	Z5U	Z5V
2KV	7	6	0.6	100-470	100-1000	100-1500
	8	6	0.6	560-680	1500	2200
	9	6	0.6	1000	2200	3300
	10	6	0.6	1500	3300	47000 (0.01UF-Y5V)
	12	6	0.6	2200	4700	100000-
	14	6	0.6	3300	10000	
	16	6	0.6	-		-
	18	6	0.6	4700	-	-
3KV	8	7	0.6	100-470	100-1000	-
	9	7	0.6	680	1500	-
	10	7	0.6	820	-	-
	12	7	0.6	1000	2200	-
	14	7	0.6	2200	3300	-
	16	7	0.6	-	4700	-
	18	7	0.6	3300	-	-
	20	7	0.6	4700	10000	-

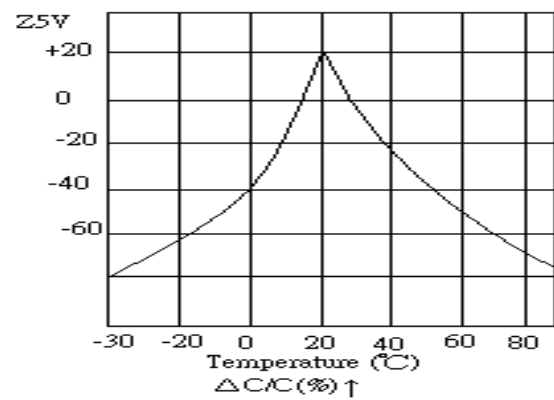
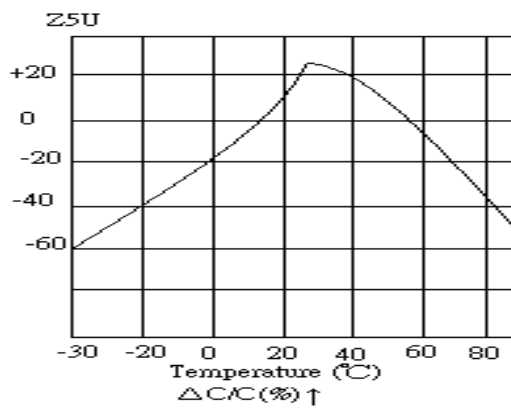
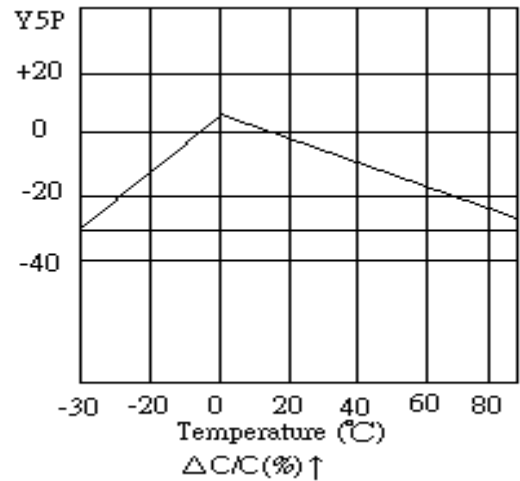
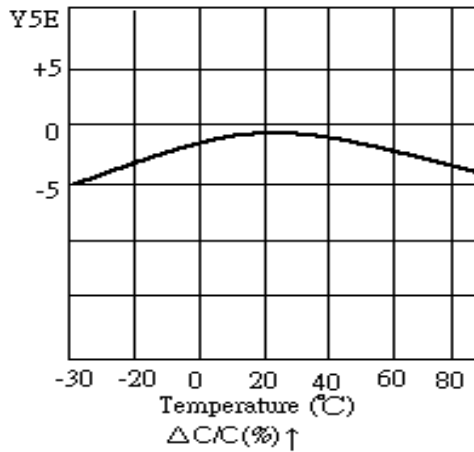
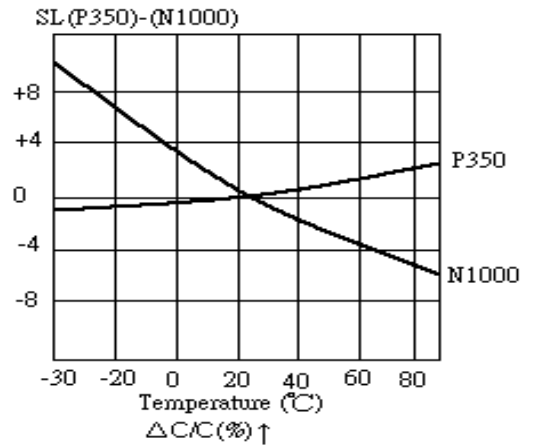
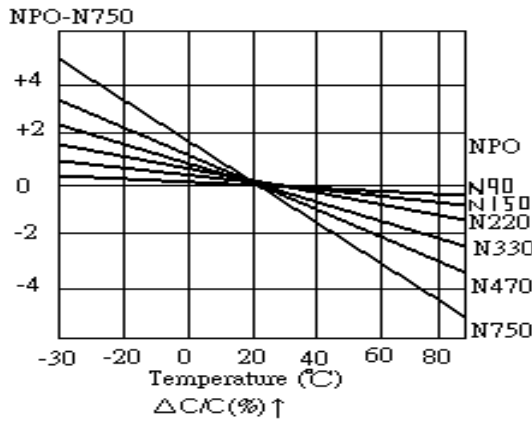
• How to order

K (1)	B (2)	1H (3)	101 (4)	K (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
<u>CLASS I/II</u> K series	<u>DIELECTRIC</u> B=Y5P/Y5E CH=NPO E=Z5U F=Z5V SL=SL	<u>RATED VOLTAGE</u> 3D=2KV 3F=3KV	<u>CAPACITANCE</u> 10nF=103 22nF=223 27nF=273 33nF=333 47nF=473 100nF= 104	<u>TOLERANCE</u> J=±5% K=±10% M=±20% Z=+80 ~ -20%	<u>LEAD SHAPE</u> K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	<u>LEAD SPACING</u> 5=5.0±0.8 6=6.3±0.8 7=7.5±0.8 0=10 ±0.8	<u>LEAD LENGTH</u> 3=3.5±1.0 5=5.0±0.8 6=6.3±0.8 0=10 ±0.8 1= 25mm	<u>LEAD WIRE</u> 8=2KV (Φ0.45±0.6) 9=3KV (Φ0.6±0.05)	<u>GRADE</u> Y= -25℃ ~+85℃ Z= -10℃ ~+70℃

Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

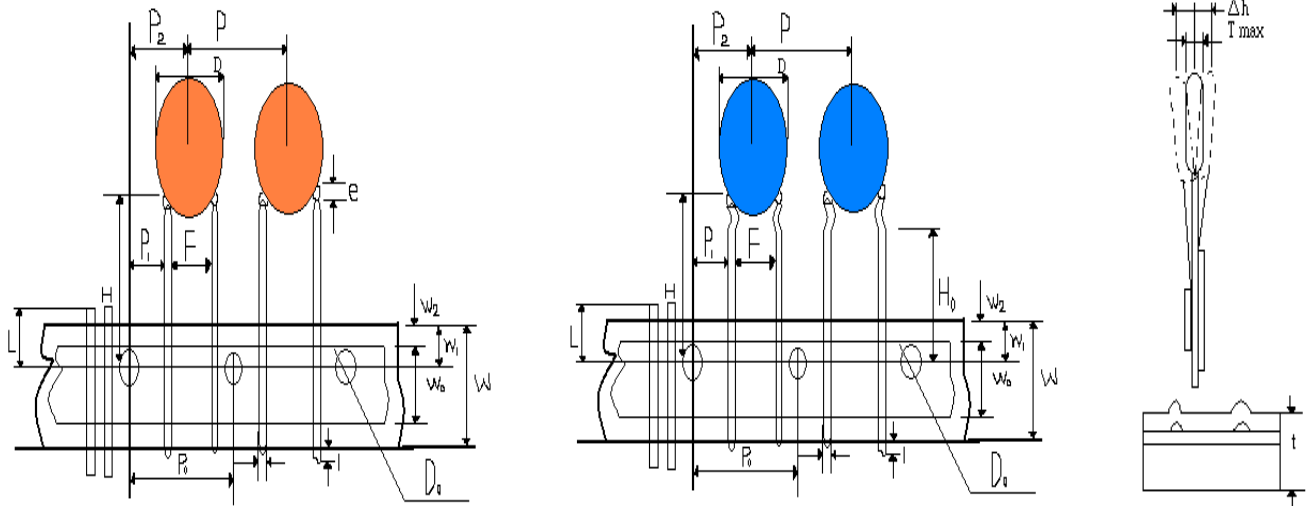
• Temperature characteristic curves



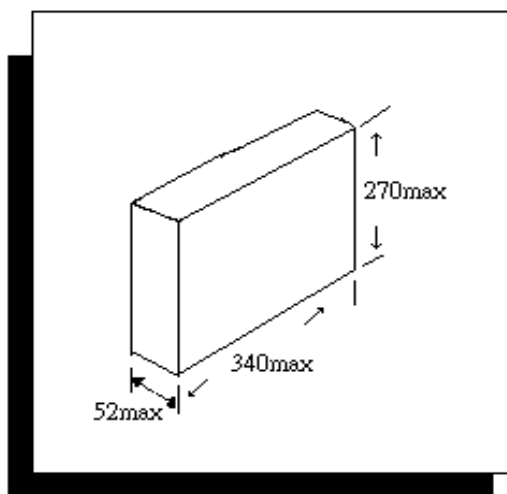
Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

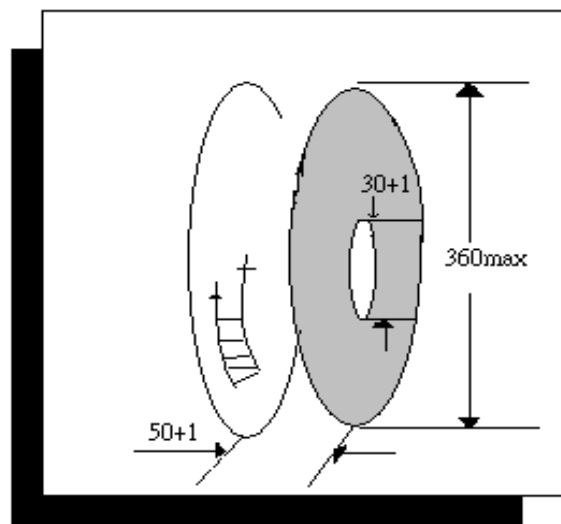
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引 線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度： 0.5 ±0.1mm
Length of snipped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Application

Dielectric Material	NPO	X7R	Z5U	Y5V
Electrical Properties	With negligible dependence of electrical properties on temperature, voltage, frequency and time.	With predictable change of properties with temperature, voltage, frequency and time, this dielectric is ferroelectric and offers higher capacitance ranges than class I .	With higher dielectric constant and greater variation of properties with temperature and test conditions, very high capacitance per unit volume and suited for by-pass and coupling application as well as filtering, transient suppression blocking, and charge storage application.	
Application	Used in radio-frequency oscillators, precision timing circuits, ultrastable amplifiers, etc.	Used as blocking, decoupling in radio, television receivers, audio tone and coupling, By-passing and frequency discriminating elements.	General type for by-pass and filtering applications.	
Operating Temperature	-55℃ ~ +125℃	-55℃ ~ +125℃	+10℃ ~85℃	-30℃ ~ +85℃
Temperature Coefficient	0 ± 30 ppm/℃	± 15%	+22%~-56%	+22%~-82%

How to order

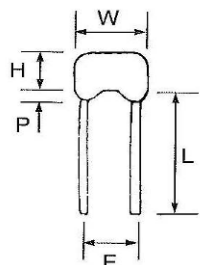
RD15	Z	104	M	1H	A	5	R
SIZE	T.C.	CAPACITANCE	TOLERANCE	VOLTAGE	LEAD SHAPE	LEAD SPACE	PACKAGE
RD15	N=NPO	1PF = 1R0	J=±5%	1H=50V	L=STRAIGHT	2=2.54±0.8	R=TAPE/REEL
RD20	B=X7R	1.5PF = 1R5	K=±10%	2A=100V	A=SLOPE 45° LEAD	5=5.08±0.8	B=TAPE/BOX
RD30	Z=Z5U	2.2PF =2R2	M=±20%	2A=100V	Y=INSIDE CRIMP		K=BULK
	Y=Y5V	100PF=101	Z=+80 ~ -20%	2H=500V	H=HIGHT SEATED 90°		L=25.4mm
		120PF=121		2J=630V	K=OUTWARD KINK		
		10nF=103		3A=1KV			
		100nF= 104		3D=2KV			
				3F=3KV			

MULTILAYER CERAMIC DISC CAPACITORS

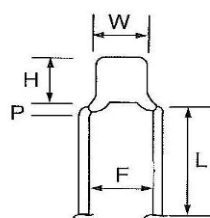
Epoxy Coated Radial Type

SPECIFICATION

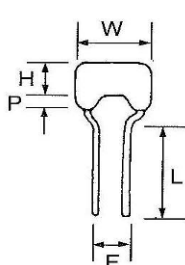
Lead shape



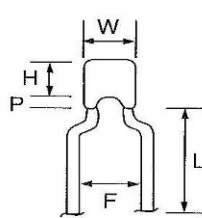
STYLE L
STRAIGHT LEAD



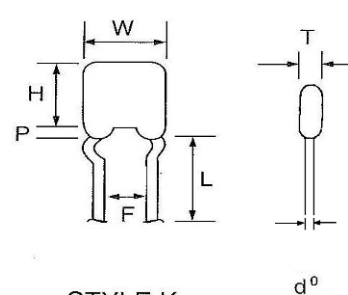
STYLE A
SLOPE SEATED



STYLE Y
INSIDE CRIMP



STYLE H
HIGH SEATED



STYLE K
OUTWARD KINK

Size Code and Dimensions

(mm)

Size Code	H (Max.)	W (Max.)	T (Max.)	$d \pm 0.05$	F	Lead Length	Lead Shape
RD15	3.81	3.81	4	0.5	2.54 ± 0.25	$6 \pm 1 \sim 25 \text{mm}$	L
	3.81	3.81	4		5.08 ± 0.5		A, H
RD20	5.8	5.8	4		2.54 ± 0.25		L, Y
	5.8	5.8	4		5.08 ± 0.5		H
RD30	6.8	6.8	5.5		5.08 ± 0.5		L

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Capacitance Range

T.C.	NPO																			
Size	RD15					RD20							RD30							
Cap (pF)	50V	100V	250V	500V	630V	50V	100V	250V	500V	630V	1KV	2KV	50V	100V	250V	500V	630V	1KV	2KV	3KV
0.5																				
0.6 0R6																				
0.7 0R7																				
0.8 0R8																				
0.9 0R9																				
1.0 1R0																				
1.2 1R2																				
1.5 1R5																				
1.8 1R8																				
2.2 2R2																				
2.7 2R7																				
3.3 3R3																				
3.9 3R9																				
4.7 4R7																				
5.6 5R6																				
6.8 6R8																				
8.2 8R2																				
10 100																				
12 120																				
15 150																				
18 180																				
22 220																				
27 270																				
33 330																				
39 390																				
47 470																				
56 560																				
68 680																				
82 820																				
100 101																				
120 121																				
150 151																				
180 181																				
220 221																				
270 271																				
330 331																				
390 391																				
470 471																				
560 561																				
680 681																				
820 821																				
1000 102																				
1200 122																				
1500 152																				
1800 182																				
2200 222																				
2700 272																				
3300 332																				
3900 392																				
4700 472																				
5600 562																				
6800 682																				
8200 822																				
10000 103																				
12000 123																				
15000 153																				
18000 183																				
22000 223																				
27000 273																				
33000 333																				
39000 393																				
47000 473																				
56000 563																				
68000 683																				
82000 823																				
(uF) 0.1 104																				

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

T.C.		X7R																					
Size		RD15					RD20							RD30									
Cap (pF)		50V	100V	250V	500V	630V	50V	100V	250V	500V	630V	1KV	2KV	250V	500V	630V	1KV	2KV	3KV				
100	101																						
120	121																						
150	151																						
180	181																						
220	221																						
270	271																						
330	331																						
390	391																						
470	471																						
560	561																						
680	681																						
820	821																						
1000	102																						
1200	122																						
1500	152																						
1800	182																						
2200	222																						
2700	272																						
3300	332																						
3900	392																						
4700	472																						
5600	562																						
6800	682																						
8200	822																						
10000	103																						
12000	123																						
15000	153																						
18000	183																						
22000	223																						
27000	273																						
33000	333																						
39000	393																						
47000	473																						
56000	563																						
68000	683																						
82000	823																						
(uF) 0.1	104																						
0.12	124																						
0.15	154																						
0.18	184																						
0.22	224																						
0.27	274																						
0.33	334																						
0.39	394																						
0.47	474																						
0.56	564																						
0.68	684																						
0.82	824																						
1	105																						
1.5	155																						
2.2	225																						
3.3	335																						
4.7	475																						

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

T.C.		Y5V			Z5U		
Size		RD15	RD20	RD30	RD15	RD20	RD30
Cap (pF)		50V	50V	50V	50V	50V	50V
10000	103						
12000	123						
15000	153						
18000	183						
22000	223						
27000	273						
33000	333						
39000	393						
47000	473						
56000	563						
68000	683						
82000	823						
(uF) 0.1	104						
0.12	124						
0.15	154						
0.18	184						
0.22	224						
0.33	334						
0.39	394						
0.47	474						
0.68	684						
1	105						
1.5	155						
2.2	225						
3.3	335						
4.7	475						

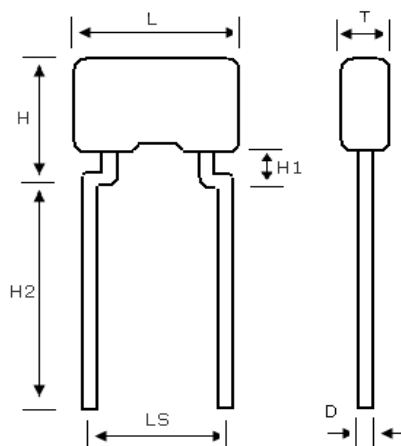
MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

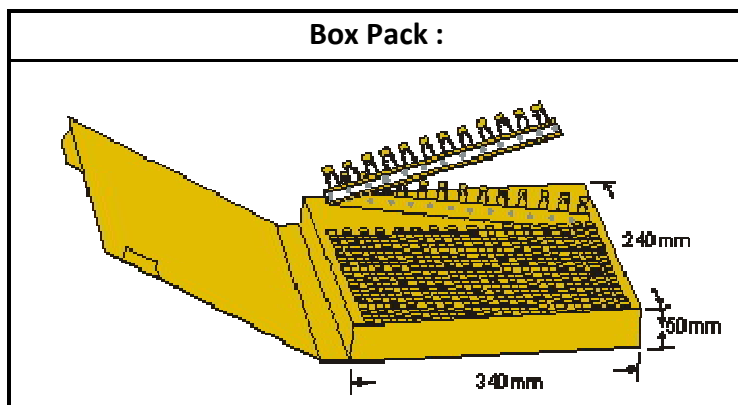
Marking

Color	Black	
Capacitance	Tolerance	Marking
100	J	10
220	J	22
470	J	47
101	J	101
471	J/K	471
102	J/K	102
103	J/K/M	103
104	K/M/Z	104
105	K/M/Z	105



Packing specification

Bulk	Tape
STYLE H HIGH SEATED	



Item	Radial Leaded Type
Tape & Reel	4000 pcs/Reel
Tape & Box	2000 pcs/Box
Bulk Pack	1000 pcs/Bag(STD)

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Inspection

Item	Inspection			
	NPO/COG	X7R	Z5U	Y5V
Capacitance	Test Frequency : $\leq 1000\text{PF}=1\text{Mhz}$ $> 1000\text{PF}=1\text{Khz}$	Test Frequency : 1Khz	Test Frequency : 1Khz 1Khz	
	Test Voltage: $1 \pm 0.2 \text{ Vrms}$	Test Voltage: $1 \pm 0.2 \text{ Vrms}$	Test Voltage: $0.5 \pm 0.1 \text{ Vrms}$ $1 \pm 0.2 \text{ Vrms}$	
	In the tolerance : $C=\pm 0.25\text{pf}$ $D=\pm 0.50\text{pf}$ $J=\pm 5\%$	In the tolerance : $J=\pm 5\text{pF}$ $K=\pm 10\%$ $M=\pm 20\%$	In the tolerance : $M=\pm 20\%$ $M=\pm 20\%$ $Z=+80\%/-20\%$ $Z=+80\%/-20\%$	
(DF) Dissipation Factor	Test Frequency : $\leq 1000\text{PF}=1\text{Mhz}$ $> 1000\text{PF}=1\text{Khz}$ Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 0.1 \%$	Test Frequency : 1Khz Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 2.5\%-100/50\text{V}$ $< 3.5\%-25/16\text{V}$	Test Frequency : 1Khz 1Khz Test Voltage: $0.5 \pm 0.1 \text{ Vrms}$ $1 \pm 0.2 \text{ Vrms}$ $< 4.0 \%$ $< 5.0\%-100/50\text{V}$ $< 7.0\%-25/16\text{V}$	
(IR) Insulation Resistance $500\Omega=C*R$ $500\Omega=0.47\text{UF}$ $1064\text{M}\Omega$	Test Voltage : Rated Voltage Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	Test Voltage : Rated Voltage Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	Test Voltage : Rated Voltage Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	
50V	2 x rated Voltage	2 x rated Voltage	2 x rated Voltage	

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Reliability

(Item)	(Test Methods)	(Test Specifications)																																													
Solder ability	The lead wire of a capacitor shall be dipped into a rosin and then into molten solder of 235±5 ℃ for 5 seconds , in both cases the depth of dipping is up to about 2.5 to 3.0 mm from the root of lead wires.	Lead wire shall be soldered with uniformly coated on the Axial or Radial direction over 75% of the circumferential direction.																																													
Resistance to Soldering heat	The lead wire shall be immersed into the melted solder of 265±5 ℃ , up to about 2.5 to 3.0 mm from the main body and the specified items shall be measured after leaving for 24±2 hours.	1.外觀：無損傷 Appearance：No marked defect 2.電容值變化(△C/C)： Capacitance change： <table><tr><td></td><td>COG</td><td>X7R</td><td>Z5U</td><td>Y5V</td></tr><tr><td>△C/C</td><td>≤±0.5%, or ±0.5pf</td><td>≤±7.5%</td><td>≤±20%</td><td>≤±20%</td></tr></table>		COG	X7R	Z5U	Y5V	△C/C	≤±0.5%, or ±0.5pf	≤±7.5%	≤±20%	≤±20%																																			
	COG	X7R	Z5U	Y5V																																											
△C/C	≤±0.5%, or ±0.5pf	≤±7.5%	≤±20%	≤±20%																																											
Life Test	<table><tr><td>條件 Condition</td><td>NPO</td><td>X7R</td><td>Z5U</td><td>Y5V</td></tr><tr><td>溫度 Temperature</td><td colspan="2">+125 ℃</td><td colspan="2">+85 ℃</td></tr><tr><td>時間 Time</td><td colspan="4">1000 小時(hours)</td></tr><tr><td>電壓 Voltage</td><td colspan="4">1.5×額定電壓 (rated voltage applied)</td></tr><tr><td>恢復時間 Recovery time</td><td colspan="4">24±2 小時(hours)</td></tr></table>	條件 Condition	NPO	X7R	Z5U	Y5V	溫度 Temperature	+125 ℃		+85 ℃		時間 Time	1000 小時(hours)				電壓 Voltage	1.5×額定電壓 (rated voltage applied)				恢復時間 Recovery time	24±2 小時(hours)				1.外觀：無損傷 Appearance：No marked defect 2.變化值 (Change value)： <table><tr><td></td><td>COG</td><td>X7R</td><td>Z5U</td><td>Y5V</td></tr><tr><td>△C/C</td><td>≤±2%, or ±2pf</td><td>≤±10%</td><td>≤±20%</td><td>≤±30%</td></tr><tr><td>DF</td><td colspan="4">≤1.5 × initial requirement</td></tr><tr><td>IR</td><td colspan="4">≥0.25 × initial requirement</td></tr></table>		COG	X7R	Z5U	Y5V	△C/C	≤±2%, or ±2pf	≤±10%	≤±20%	≤±30%	DF	≤1.5 × initial requirement				IR	≥0.25 × initial requirement			
條件 Condition	NPO	X7R	Z5U	Y5V																																											
溫度 Temperature	+125 ℃		+85 ℃																																												
時間 Time	1000 小時(hours)																																														
電壓 Voltage	1.5×額定電壓 (rated voltage applied)																																														
恢復時間 Recovery time	24±2 小時(hours)																																														
	COG	X7R	Z5U	Y5V																																											
△C/C	≤±2%, or ±2pf	≤±10%	≤±20%	≤±30%																																											
DF	≤1.5 × initial requirement																																														
IR	≥0.25 × initial requirement																																														
Strength of lead	Fix the body of capacitor, apply a tensile weight gradually to each lead.	Pull：Axial：> 4 kg Radial：> 1 kg																																													

MULTILAYER CERAMIC DISC CAPACITORS

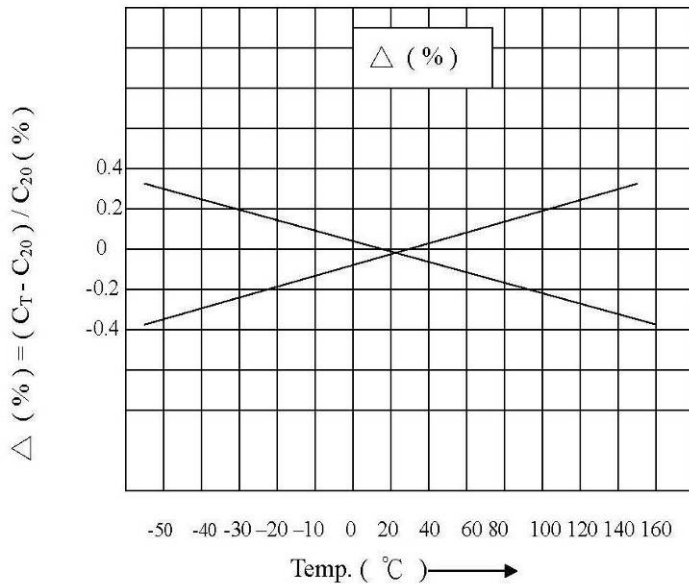
Epoxy Coated Radial Type

SPECIFICATION

Temperature Characteristics

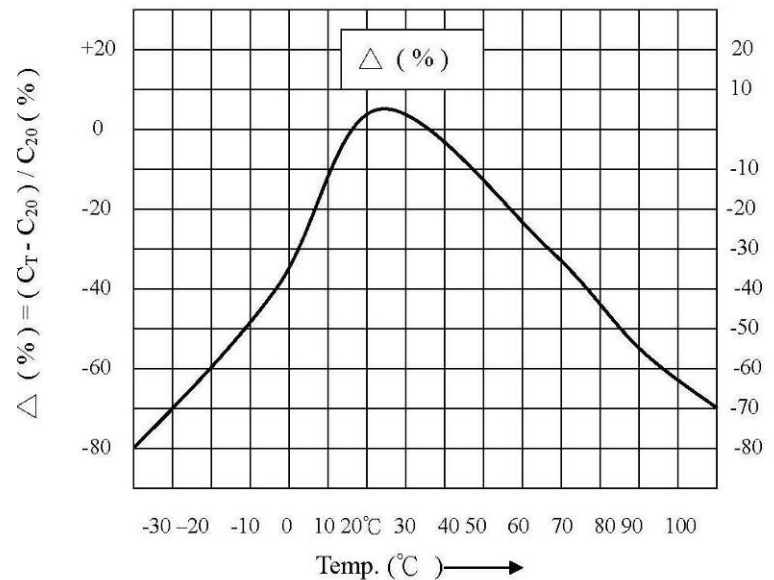
NPO

-30 -20 -10 0 10 20°C 30 40 50 60 70 80 90 100



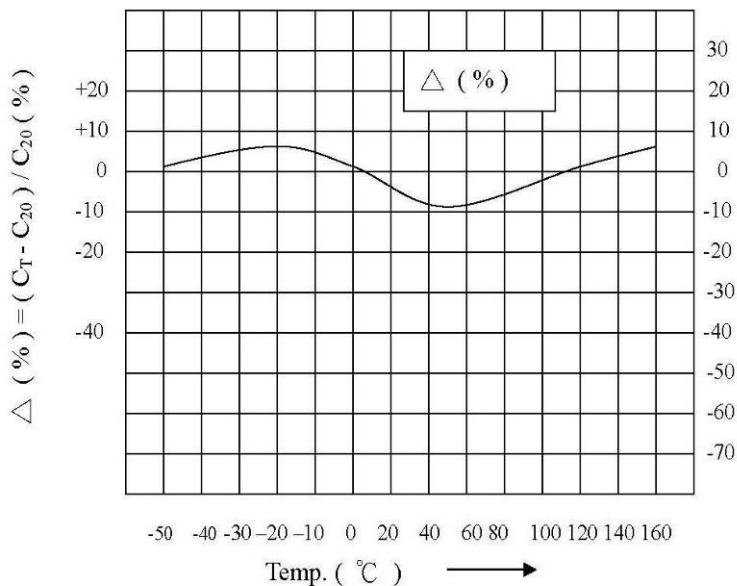
Z5U

-30 -20 -10 0 10 20°C 30 40 50 60 70 80 90 100



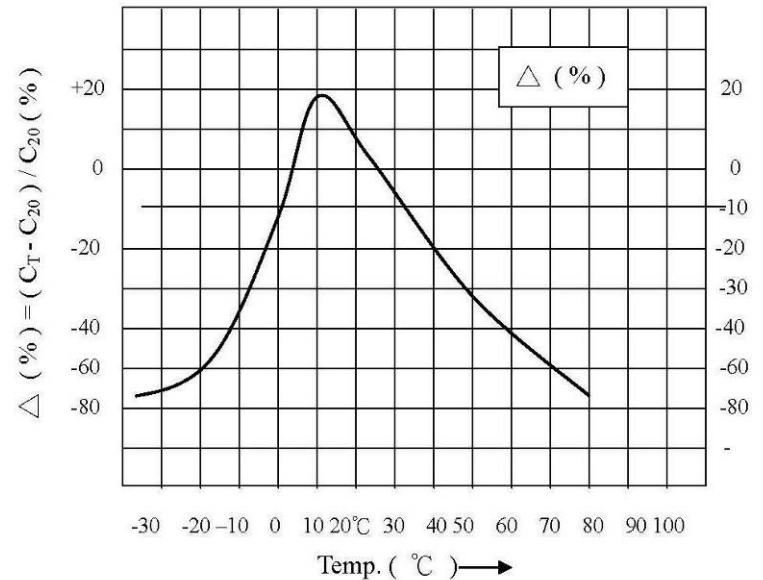
X7R

-50 -40 -30 -20 -10 0 20 40 60 80 100 120 140 160



Y5V

-30 -20 -10 0 10 20°C 30 40 50 60 70 80 90 100



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

1. Application

電介質材料 Dielectric Material	NPO COG	X7R	Z5U	Y5V
電介質種類 Dielectric Type	I 類電介質 Stable Class I	II 類電介質 Stable Class II Dielectric		
電氣性能 Electrical Properties	電氣性能最穩定,基本上不隨溫度、電壓和時間的改變而改變。 With negligible dependence of electrical properties on temperature, voltage, frequency and time.	電氣性能較穩定,在溫度、電壓與時間改變時性能的變化不明顯,由於X7R是一種強電介質,因而能造出容量比NPO電介質更大的電容器。 With predictable change of properties with temperature, voltage, frequency and time, this dielectric is ferroelectric and offers higher capacitance ranges than class I .	具有較高的介電常數,常用於生產比容較大、標稱容量較高的大容量電容器產品,但其容量穩定性能較X7R差,容量損耗對溫度、電壓等測試條件敏感。 With higher dielectric constant and greater variation of properties with temperature and test conditions, very high capacitance per unit volume and suited for bypass and coupling application as well as filtering, transient suppression blocking, and charge storage application.	
應用 Application	適用於穩定性要求高的高頻電路,如溫度補償電路、震盪電路等。 Used in circuit requiring stable performance, such as temperature compensation circuits and smite circuits.	適用於隔直、耦合、旁路與對電容穩定性要求不太高的鑒頻電路。 Used as blocking, coupling, By-passing and frequency discriminating elements.	適用於要求容量較大的電路,如儲能、記憶電路等。 Suited for By-passing and coupling application such as store power and memory circuit.	
使用溫度 Operating	-55℃ ~+125℃	-55℃ ~+125℃	+10℃ ~85℃	-30℃ ~+85℃
溫度係數 Temperature	0 ± 30 ppm/℃	± 15%	+22%~-56%	+22%~-82%

CINETECH
SYMBOL OF QUALITY

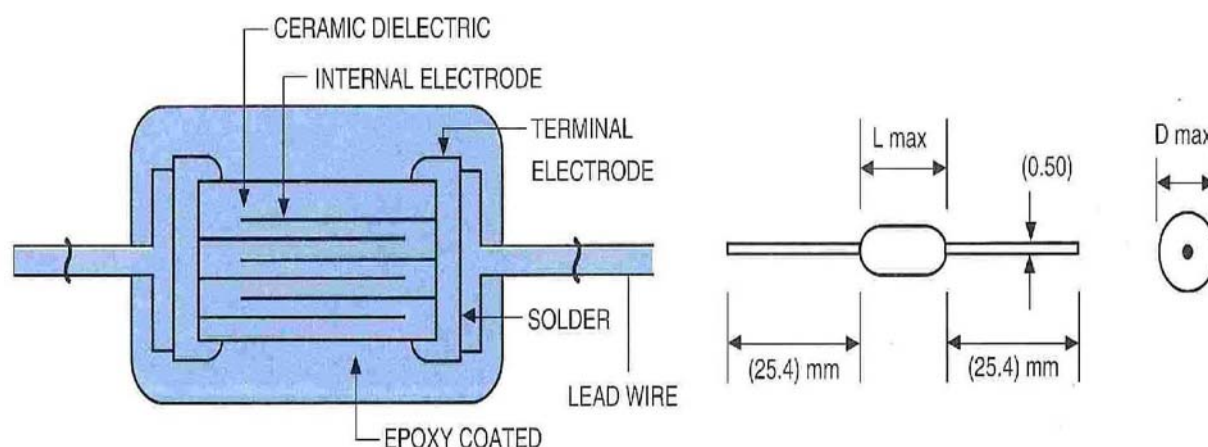
MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

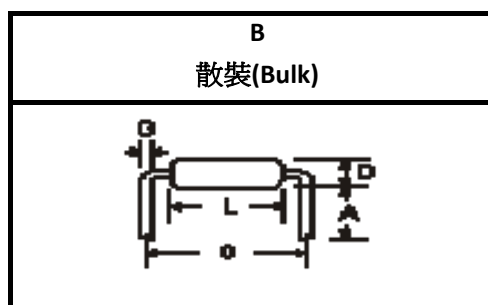
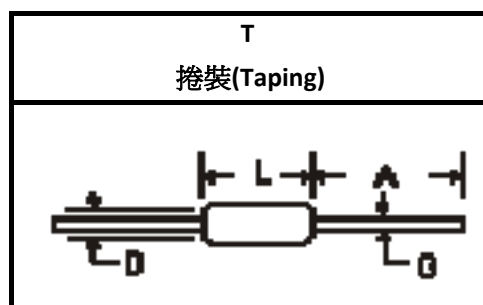
2. How to order

AD15	Z	104	M	1H	1	R
SIZE	T.C.	CAPACITANCE	TOLERANCE	VOLTAGE	PACKAGE & QTY	PACKAGE
AD15	N=NPO	1PF = 1R0	J=±5%	1E=25V	1=10000 PCS/REEL	R= TAPE / REEL
AD20	B=X7R	1.5PF = 1R5	K=±10%	1H=50V	7=7500 PCS/REEL	B TAPE / BOX
	Z=Z5U	2.2PF = 2R2	M=±20%	2A=100V	5=5000 PCS/BOX	(mm)
	Y=Y5V	100PF=101	Z=+80 ~ -20%	2D=200V	0=5000 PCS/REEL	
	X=X5R	120PF=121		2H=500V		
		10nF=103		2J=630V		
		100nF= 104		3A=1KV		
				3D=2KV		
				3F=3KV		

3. Construction



4. Size Code Dimension



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

6. Marking

項目 Item	尺寸大小 Size Code	晶片大小 Chip Size	L Max.	D Max.	A Min.	G	S
T	A15	603	3.5	2.54	25.4	0.5±0.05	--
	A15	805	3.5	2.54	25.4	0.5±0.05	--
	A20	1206	5	3	25.4	0.5±0.05	--
B	A15	603	3.5	2.54	7±0.8	0.5±0.05	5±0.5
	A15	805	3.5	2.54	7±0.8	0.5±0.05	5±0.5
	A20	1206	5	3	7±0.8	0.5±0.05	7.5±0.5

6. Marking

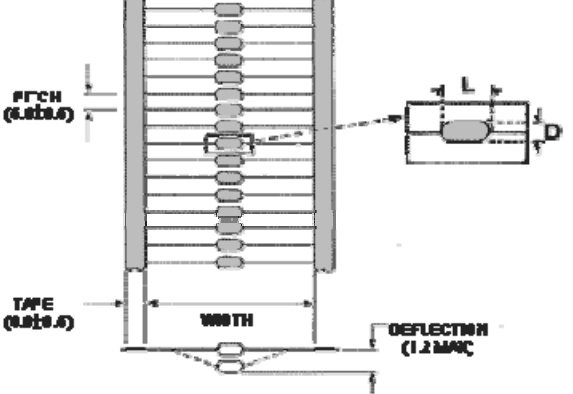
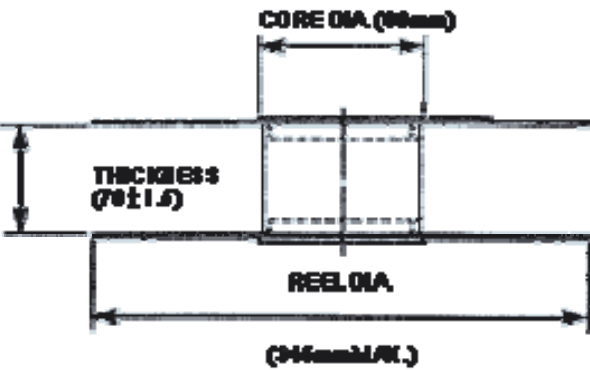
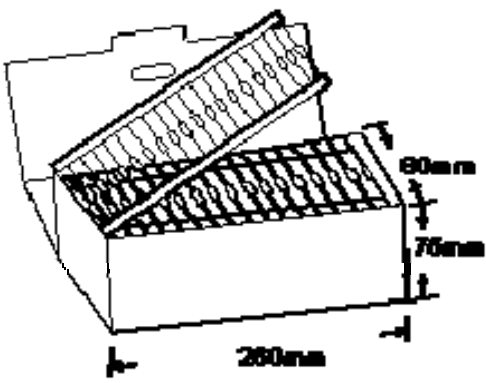
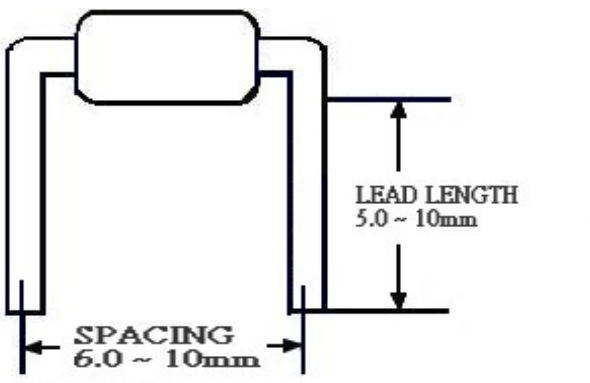
顏色 Color	黑色 Black	
電容量 Capacitance	公差 Tolerance	印字 Marking
100	J	10 J
220	J	22 J
470	J	47 J
101	J	101
471	J/K	471
102	J/K	102
103	K/M	103
104	M/M/Z	104
105	K/M/Z	105



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

7. Packing Specification

Tape :	Reel :
	
Box Pack :	Bulk :
	

8. Packing Quantity

項目 Item	立式電容器 Radial Leaded	臥式電容器 Axial Leaded Type
編帶/捲裝 Tape & Reel	4000 pcs/捲 4000 pcs/Reel	7500 pcs/捲 7500 pcs/Reel
編帶/盒裝 Tape & Box	2000 pcs/盒 2000 pcs/Box	5000 pcs/盒 5000 pcs/Box
散裝 Bulk Pack	1000 pcs/包 1000 pcs/bag	1000 pcs/包 1000 pcs/bag



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

9. Inspection Norm

檢驗項目 Item	檢驗標準Inspection Norm			
	NPO/COG	X7R	Z5U	Y5V
電容量 Capacitance	測試頻率： Test Frequency： $\leq 1000\text{PF}=1\text{Mhz}$ $> 1000\text{PF}=1\text{Khz}$	測試頻率： Test Frequency： 1Khz	測試頻率： Test 1Khz	測試頻率： Test Frequency： 1Khz
	測試電壓： Test Voltage: $1 \pm 0.2 \text{ Vrms}$	測試電壓： Test Voltage: $1 \pm 0.2 \text{ Vrms}$	測試電壓： Test Voltage: $0.5 \pm 0.1 \text{ Vrms}$	測試電壓： Test Voltage: $1 \pm 0.2 \text{ Vrms}$
	在允差範圍內： In the tolerance： $C=\pm 0.25\text{pf}$ $D=\pm 0.50\text{pf}$ $J=\pm 5\%$	在允差範圍內： In the tolerance： $J=\pm 5\%\text{pF}$ $K=\pm 10\%$ $M=\pm 20\%$	在允差範圍內： In the tolerance： $M=\pm 20\%$ $Z=+80\%/-20\%$	在允差範圍內： In the tolerance： $M=\pm 20\%$ $Z=+80\%/-20\%$
消散係數(DF) Dissipation Factor	測試頻率： Test Frequency： $\leq 1000\text{PF}=1\text{Mhz}$ $> 1000\text{PF}=1\text{Khz}$	測試頻率： Test Frequency： 1Khz	測試頻率： Test Frequency： 1Khz	測試頻率： Test Frequency： 1Khz
	測試電壓： Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 0.1 \%$	測試電壓： Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 2.5\%-100/50\text{V}$ $< 3.5\%-25/16\text{V}$	測試電壓： Test Voltage: $0.5 \pm 0.1 \text{ Vrms}$ $< 4.0 \%$	測試電壓： Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 5.0\%-100/50\text{V}$ $< 7.0\%-25/16\text{V}$
絕緣組抗(IR) Insulation Resistance $500\Omega=C*R$ 500 $\Omega=0.47\text{UF}$ 1064M Ω	測試電壓：Test Voltage 額定電壓：Rated	測試電壓：Test Voltage 額定電壓：Rated Voltage	測試電壓Test Voltage 額定電壓：Rated Voltage	測試電壓：Test Voltage 額定電壓：Rated Voltage
	兩個中的最小值： Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	兩個中的最小值： Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	兩個中的最小值： Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	兩個中的最小值： Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$
耐電壓(TV) Voltage	2.5倍額定電壓 2.5 x rated Voltage	2.5倍額定電壓 2.5 x rated Voltage	2.5倍額定電壓 2.5 x rated	2.5倍額定電壓 2.5 x rated Voltage



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

10. Reliability

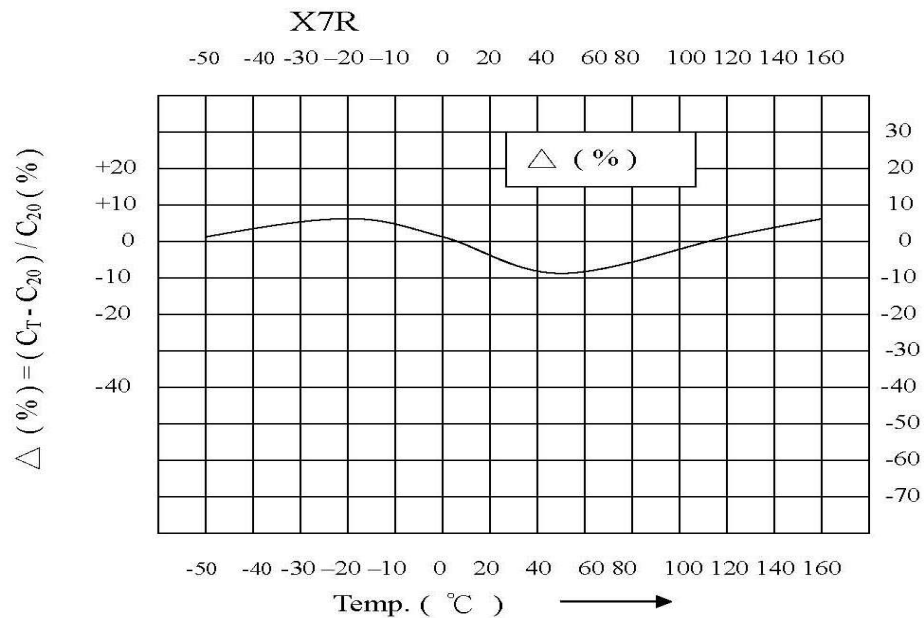
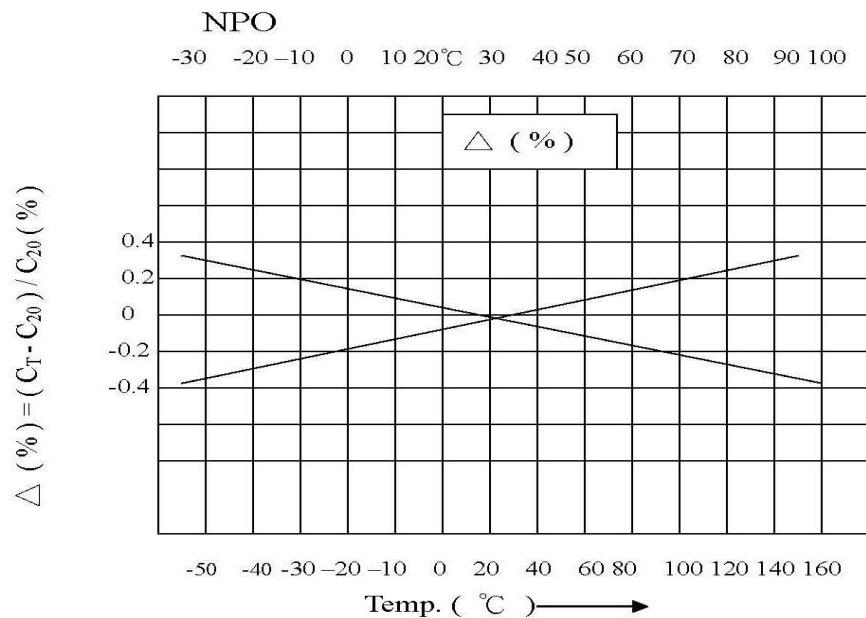
項目 (Item)	檢驗方法 (Test Methods)	檢驗標準 (Test Specifications)																																													
焊錫性 Solderability	將電容器導線浸入松香溶液後浸入焊錫槽溫度為235±5℃的焊錫中5秒,浸入深度距離電容本體 2.5~3mm. The lead wire of a capacitor shall be dipped into a rosin and then into molten solder of 235±5℃ for 5 seconds , in both cases the depth of dipping is up to about 2.5 to 3.0 mm from the root of lead wires.	導線表面均勻沾錫,上錫面積不小於總面積的75%. Lead wire shall be soldered with uniformly coated on the Axial or Radial direction over 75% of the circumferential direction.																																													
耐焊性 Resistance to Soldering heat	焊錫溫度265±5℃,時間5±0.5秒,插入深度距離電容本體2.5~3mm,試驗後24±2小時測量. The lead wire shall be immersed into the melted solder of 265±5℃, up to about 2.5 to 3.0 mm from the main body and the specified items shall be measured after leaving for 24±2 hours.	1.外觀：無損傷 Appearance：No marked defect 2.電容值變化(△C/C)： Capacitance change： <table><tr><td></td><td>COG</td><td>X7R</td><td>Z5U</td><td>Y5V</td></tr><tr><td>△C/C</td><td>≤±0.5%, or ±0.5pf</td><td>≤±7.5%</td><td>≤±20%</td><td>≤±20%</td></tr></table>		COG	X7R	Z5U	Y5V	△C/C	≤±0.5%, or ±0.5pf	≤±7.5%	≤±20%	≤±20%																																			
	COG	X7R	Z5U	Y5V																																											
△C/C	≤±0.5%, or ±0.5pf	≤±7.5%	≤±20%	≤±20%																																											
壽命實驗 Life Test	<table><tr><td>條件 Condition</td><td>NPO</td><td>X7R</td><td>Z5U</td><td>Y5V</td></tr><tr><td>溫度 Temperature</td><td colspan="2">+125℃</td><td colspan="2">+85℃</td></tr><tr><td>時間 Time</td><td colspan="4">1000 小時(hours)</td></tr><tr><td>電壓 Voltage</td><td colspan="4">1.5×額定電壓 (rated voltage applied)</td></tr><tr><td>恢復時間 Recovery time</td><td colspan="4">24±2 小時(hours)</td></tr></table>	條件 Condition	NPO	X7R	Z5U	Y5V	溫度 Temperature	+125℃		+85℃		時間 Time	1000 小時(hours)				電壓 Voltage	1.5×額定電壓 (rated voltage applied)				恢復時間 Recovery time	24±2 小時(hours)				1.外觀：無損傷 Appearance：No marked defect 2.變化值 (Change value)： <table><tr><td></td><td>COG</td><td>X7R</td><td>Z5U</td><td>Y5V</td></tr><tr><td>△C/C</td><td>≤±2%, or ±2pf</td><td>≤±10%</td><td>≤±20%</td><td>≤±30%</td></tr><tr><td>DF</td><td colspan="4">≤1.5 × initial requirement</td></tr><tr><td>IR</td><td colspan="4">≥0.25 × initial requirement</td></tr></table>		COG	X7R	Z5U	Y5V	△C/C	≤±2%, or ±2pf	≤±10%	≤±20%	≤±30%	DF	≤1.5 × initial requirement				IR	≥0.25 × initial requirement			
條件 Condition	NPO	X7R	Z5U	Y5V																																											
溫度 Temperature	+125℃		+85℃																																												
時間 Time	1000 小時(hours)																																														
電壓 Voltage	1.5×額定電壓 (rated voltage applied)																																														
恢復時間 Recovery time	24±2 小時(hours)																																														
	COG	X7R	Z5U	Y5V																																											
△C/C	≤±2%, or ±2pf	≤±10%	≤±20%	≤±30%																																											
DF	≤1.5 × initial requirement																																														
IR	≥0.25 × initial requirement																																														
引出端強度 Strength of lead	固定電容器並在兩端導線加力. Fix the body of capacitor, apply a tensile weight gradually to each lead.	拉力：臥式電容器：>4kg 立式電容器：>1 kg Pull：Axial：>4 kg Radial：>1 kg																																													



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

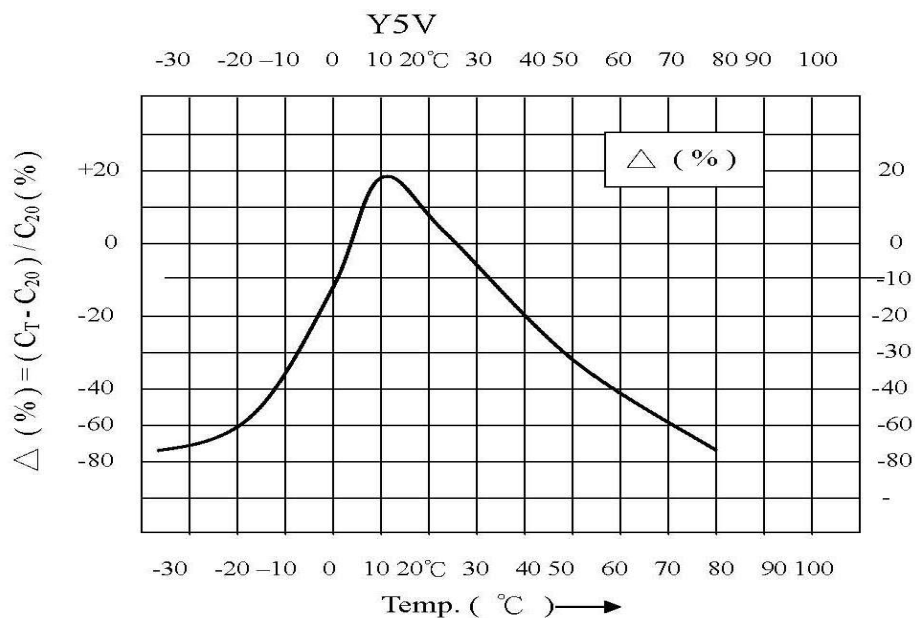
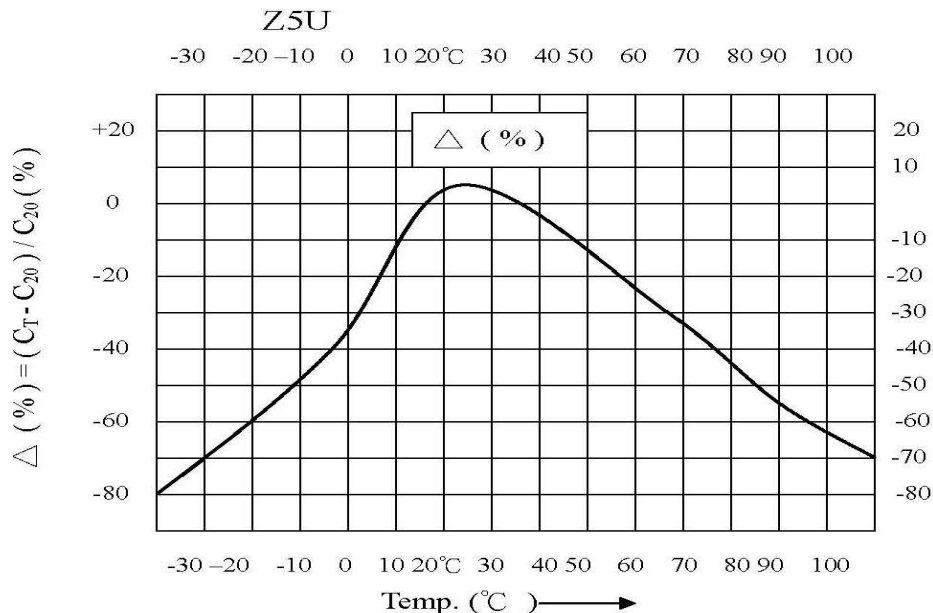
11. Temperature Characteristics



MULTILAYER CERAMIC CAPACITORS

EPOXY COATED AXIAL TYPE

11. Temperature Characteristics



Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series



• Specifications

Operating Temperature Range 操作溫度範圍	Class I : -25°C~+85°C	Class II : Y5E,Y5P:-30°C~+85°C; Z5U,Z5V:+10°C~+85°C
Rated Working Voltage (DC) 工作電壓	2KV~3KV; are available.	2KV~3KV; are available.
Capacitance 電容器	Measured at 25°C, 1MHz,1Vms.max.	Measured at 25°C, 1KHz,1Vms.max.
Capacitance Tolerance 電容誤差值	1p F ~9 p F: ± 0.25 p F (C) or ± 0.5 p F (D), 10 p F and above: $\pm 5\%$ (J) or $\pm 10\%$ (K)	$\pm 10\%$ (K), $\pm 20\%$ (M), $+50\%-10\%$ (R), $+80\%-20\%$ (Z)
Insulation Resistance 絕緣電阻值	10,000M Ω min. at working voltage,60 sec.	10,000M Ω min. at working voltage,60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25°C, 1MHz, 1V ms, max. Q=1000min, if $C \geq 30$ p F Q $\geq 400+20C$, if $C < 30$ p F (where C= capacitance)	Measured at 25°C, 1KHz, 1V ms, max. Y5E, Y5P, Z5U: 2.5% max. Z5V: 5.0% max.
Voltage Proof (Flash Test) 電壓防護	Withstand 250% of rated working voltage with 50mA current, 1.5sec.	Withstand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85°C for 500 hours.	200% of rated voltage at 85°C for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS I), JIS C-6422 (TYPE I)	EIA RS-198 (CLASS II), JIS C-6422 (TYPE II)

• Dimensions & Capacitance range

Dimensions 尺寸		Capacitance range (pF) of each Temperature Coefficient 各溫度係數之電容值		
Dia. Max. (D)	Lead Spacing (F)	2 KV	3 KV	3 KV
		SL	NPO	SL
6.0	5.0 $\pm$ 0.8	10 ~ 56		5 ~ 47
7.0	5.0 $\pm$ 0.8	68 ~ 82	10 ~ 22	56 ~ 68
8.0	5.0 $\pm$ 0.8		25 ~ 33	82 ~ 101
9.0	5.0 $\pm$ 0.8		47 ~ 56	
10.0	5.0 $\pm$ 0.8		68 ~ 101	

Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

• Dimensions & Capacitance range

W.V. 電壓	Dimensions 尺寸			Capacitance range (pF) of each Temperature Coefficient 各溫度係數之電容值		
(DC)	D	T	dφ	Y5P/Y5E	Z5U	Z5V
2KV	7	6	0.6	100-470	100-1000	100-1500
	8	6	0.6	560-680	1500	2200
	9	6	0.6	1000	2200	3300
	10	6	0.6	1500	3300	47000 (0.01UF-Y5V)
	12	6	0.6	2200	4700	100000-
	14	6	0.6	3300	10000	
	16	6	0.6	-		-
	18	6	0.6	4700	-	-
3KV	8	7	0.6	100-470	100-1000	-
	9	7	0.6	680	1500	-
	10	7	0.6	820	-	-
	12	7	0.6	1000	2200	-
	14	7	0.6	2200	3300	-
	16	7	0.6	-	4700	-
	18	7	0.6	3300	-	-
	20	7	0.6	4700	10000	-

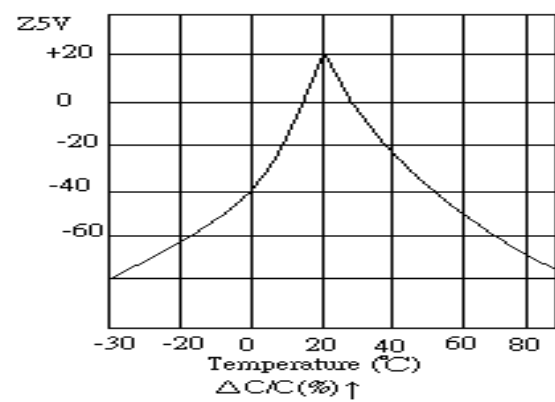
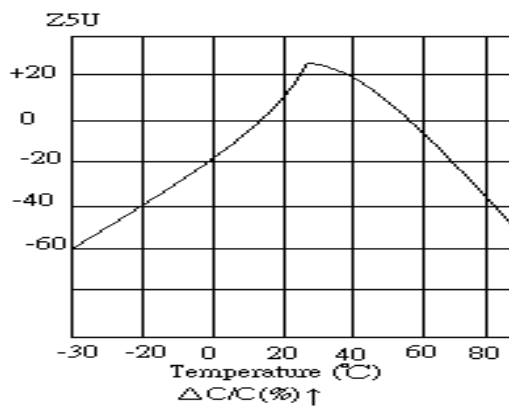
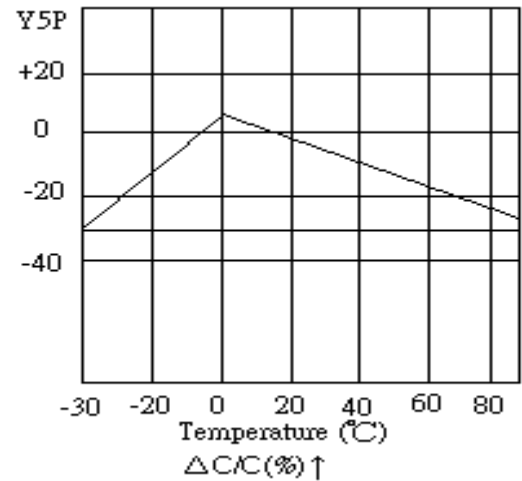
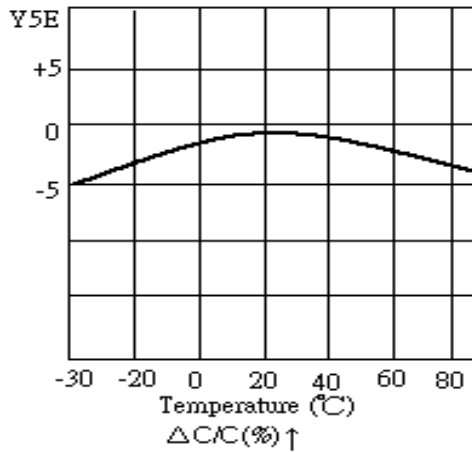
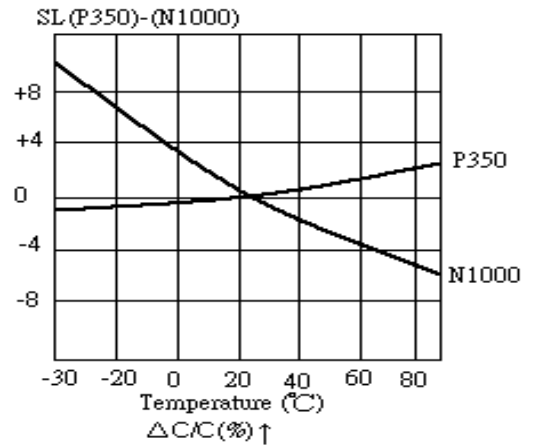
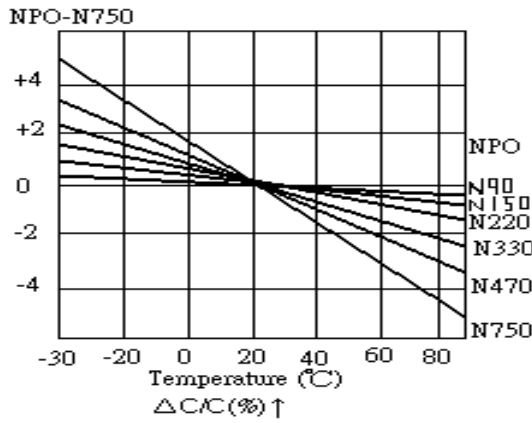
• How to order

K (1)	B (2)	1H (3)	101 (4)	K (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
<u>CLASS I/II</u> K series	<u>DIELECTRIC</u> B=Y5P/Y5E CH=NPO E=Z5U F=Z5V SL=SL	<u>RATED VOLTAGE</u> 3D=2KV 3F=3KV	<u>CAPACITANCE</u> 10nF=103 22nF=223 27nF=273 33nF=333 47nF=473 100nF= 104	<u>TOLERANCE</u> J=±5% K=±10% M=±20% Z=+80 ~ -20%	<u>LEAD SHAPE</u> K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	<u>LEAD SPACING</u> 5=5.0±0.8 6=6.3±0.8 7=7.5±0.8 0=10 ±0.8	<u>LEAD LENGTH</u> 3=3.5±1.0 5=5.0±0.8 6=6.3±0.8 0=10 ±0.8 1= 25mm	<u>LEAD WIRE</u> 8=2KV (Φ0.45±0.6) 9=3KV (Φ0.6±0.05)	<u>GRADE</u> Y= -25℃ ~+85℃ Z= -10℃ ~+70℃

Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

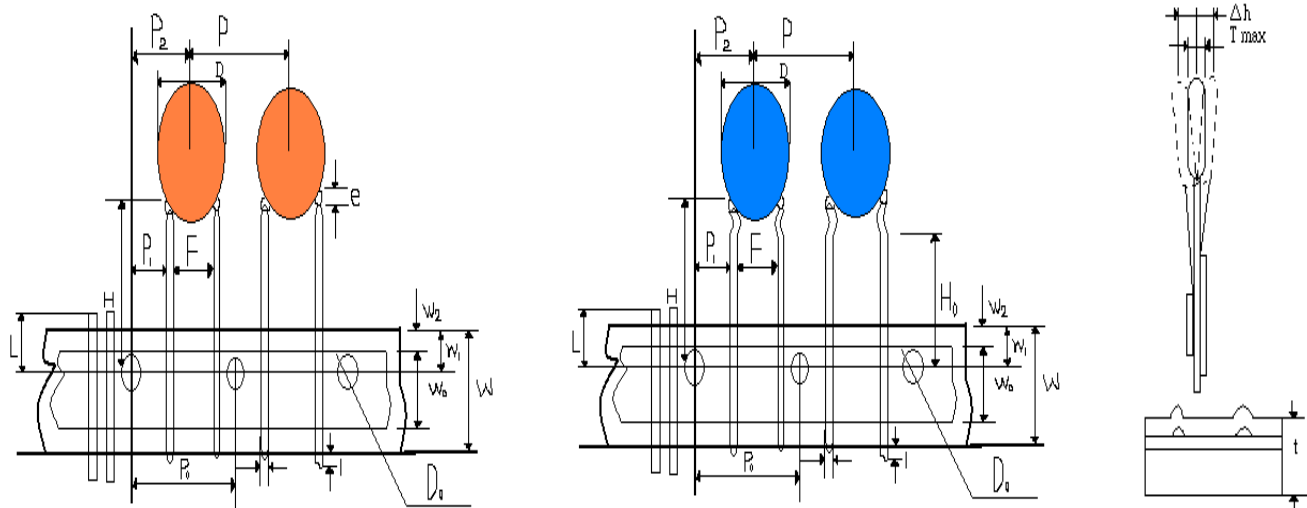
• Temperature characteristic curves



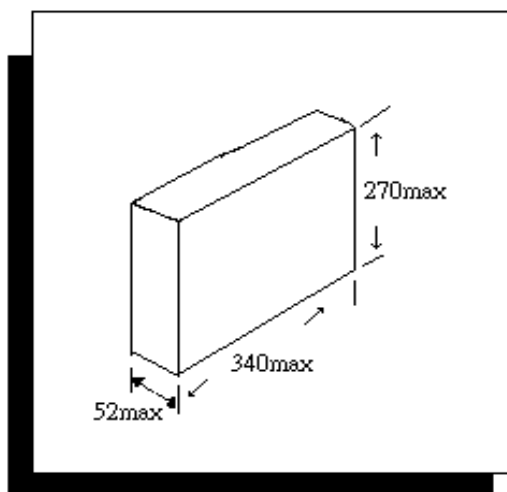
Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

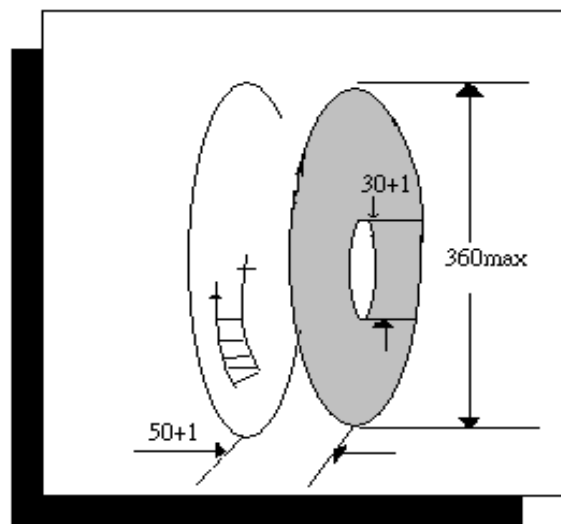
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

High Permittivity 2KV ~ 3KV Series

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引 線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度： 0.5 ±0.1mm
Length of snipped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

• Specifications

Operating Temperature Range 操作溫度範圍	Y5E,Y5P:-30°C~+85°C; Z5U,Z5V:+10°C~+85°C
Rated Working Voltage (DC) 工作電壓	50V.63V.100V
Capacitance 電容器	Measured at 25°C, 1KHz, 1Vms.max.
Capacitance Tolerance 電容誤差值	±10% (K), ±20%(M), +50%-10%(R), +80%-20%(Z)
Insulation Resistance 絕緣電阻值	10,000MΩ min. at working voltage, 60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25°C, 1KHz, 1V ms, max. Y5E, Y5P, Z5U: 2.5% max. Z5V: 5.0% max.
Voltage Proof (Flash Test) 電壓防護	Withstand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85°C for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS II), JIS C-6422 (TYPE II)

• How to order

S (1)	B (2)	1H (3)	103 (4)	K (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
<u>CLASS I</u> S series	<u>DIELECTRIC</u> B=Y5P E=Y5U F=Y5V	<u>RATED VOLTAGE</u> 1C=16V 1E=25V 1H=50V	<u>CAPACITANCE</u> 10nF=103 22nF=223 47nF=473 100nF= 104	<u>TOLERANCE</u> K=±10% M=±20% Z=+80 ~ -20%	<u>LEAD SHAPE</u> K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	<u>LEAD SPACING</u> 2=2.5±0.8 5=5.0±0.8 6=6.3±0.8 7=7.5±0.8 0=10 ±0.8	<u>LEAD LENGTH</u> 3=3.5±1.0 5=5.0±0.8 6=6.3±0.8 0=10 ±0.8 1= 25mm	<u>LEAD WIRE</u> 5=16V~500V (Φ0.48±0.05) 6=1KV (Φ0.5±0.05) 8=2KV (Φ0.45±0.6) 9=3KV (Φ0.6±0.05)	<u>GRADE</u> Y=-25°C ~+85°C

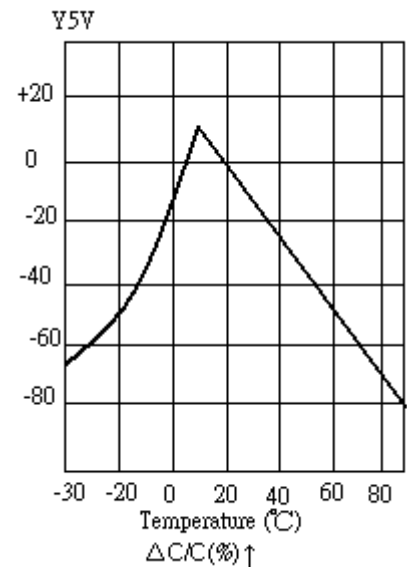
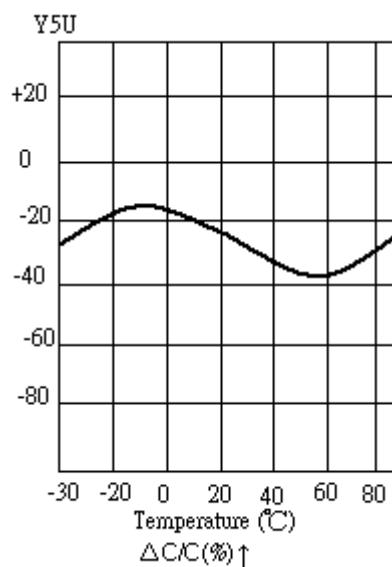
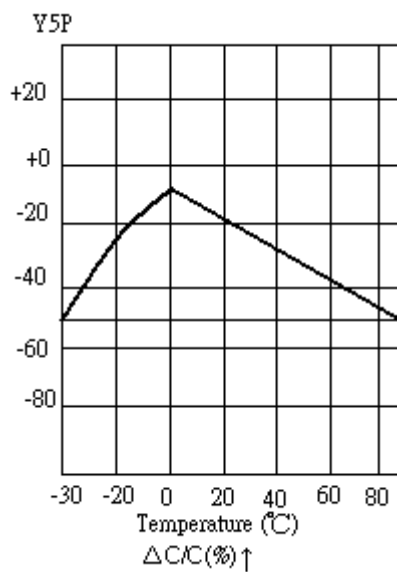
Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

• Dimensions & Capacitance rang

CAP.(μ F) 電容値	DIMENSIONS(D ϕ in mm) 尺寸								
T.C. 溫度係數	Y5P			Y5U			Y5V		
W.V.(DC) 電壓	16V	25V	50V	16V	25V	50V	16V	25V	50V
0.01 μ F	5	5	5	5	5	5	5	5	5
0.022 μ F	6	6	8	5	5	5	5	5	5
0.033 μ F	7	8	8	5	5	5	5	5	5
0.047 μ F	8	9	9	5	5	5	5	5	5
0.1 μ F	11	11	11	6	7	8	6	6	7
0.22 μ F	-	-	-	9	9	9	8	8	9

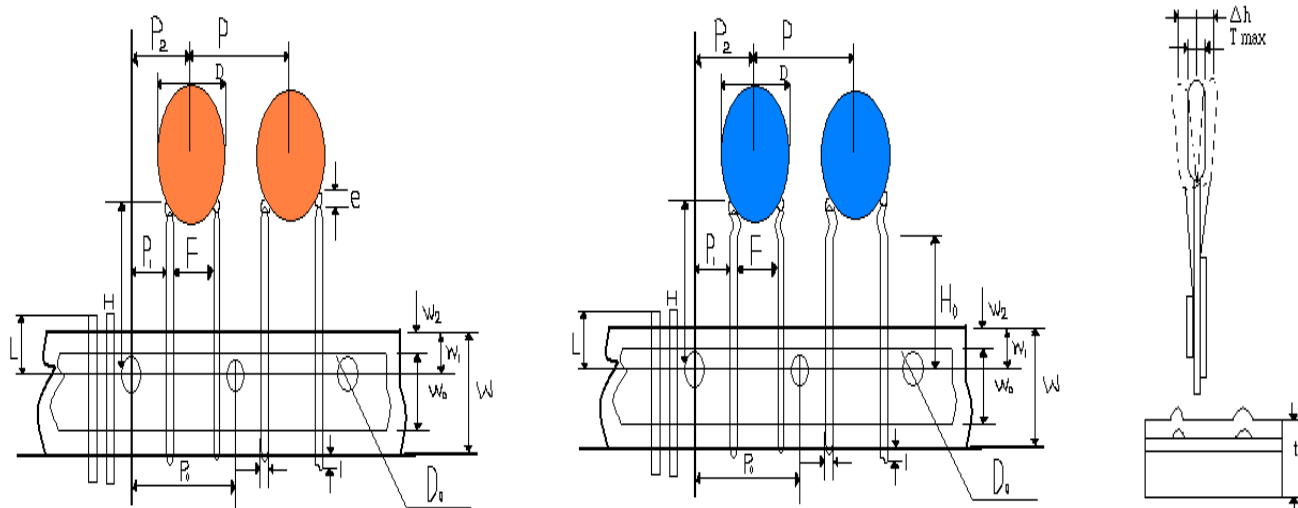
• Temperature Characteristic Curves



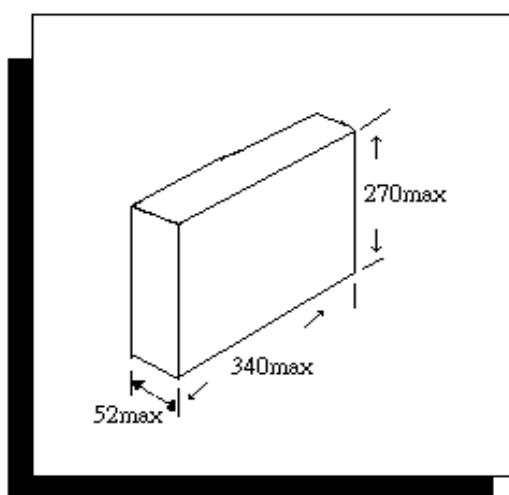
Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

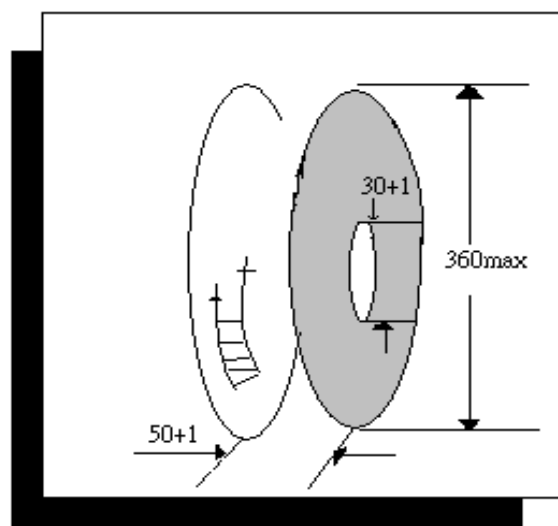
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

Semi - Conductive Series (Class III 16V ~ 50V)

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引 線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度 : 0.5 ±0.1mm
Length of snapped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

Ceramic Disc Capacitors

Temperature Compensating Series (Class I 50V ~ 1KV)

• Features

- ◎ Linear temperature coefficient of capacitance.
- ◎ High stability of capacitance.
- ◎ Low loss at wide range of frequency.



• Specifications

Operating Temperature Range 操作溫度範圍	Class I : -25°C ~ +85°C
Rated Working Voltage (DC) 工作電壓	50V, 63V, 100V, 500V, 1KV
Capacitance 電容器	Measured at 25°C, 1MHz, 1Vms.max.
Capacitance Tolerance 電容誤差值	1p F ~ 9 p F: ± 0.25 p F (C) or ± 0.5 p F (D) 10 p F and above: $\pm 5\%$ (J) or $\pm 10\%$ (K)
Insulation Resistance 絕緣電阻值	10,000M Ω min. at working voltage, 60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25°C, 1MHz, 1V ms, max. Q=1000min, if C ≥ 30 p F Q $\geq 400+20C$, if C < 30p F (where C= capacitance)
Voltage Proof (Flash Test) 電壓防護	With stand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85°C for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS I), JIS C-6422 (TYPE I)

• How to order

T (1)	CH (2)	1H (3)	101 (4)	J (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
CLASS I T series	DIELECTRIC CH=NPO LH=N80 PH=N150 RH=N220 UJ=N750 SL=SL	RATED VOLTAGE 1H=50V 1J=63V 2A=100V 2H=500V 3A=1KV	CAPACITANCE 1PF =1R0 1.5PF = 1R5 2.2PF =2R2 100PF=101 120PF=121 10nF=103 100nF= 104	TOLERANCE C= ± 0.25 PF D= ± 0.5 PF F= $\pm 1\%$ J= $\pm 5\%$ K= $\pm 10\%$ M= $\pm 20\%$ Z=+80 ~ -20%	LEAD SHAPE K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	LEAD SPACING 2=2.5 ± 0.8 5=5.0 ± 0.8 6=6.3 ± 0.8 7=7.5 ± 0.8 0=10 ± 0.8	LEAD LENGTH 3=3.5 ± 1.0 5=5.0 ± 0.8 6=6.3 ± 0.8 0=10 ± 0.8 1= 25mm	LEAD WIRE 5=16V~500V ($\Phi 0.48 \pm 0.05$) 6=1KV ($\Phi 0.5 \pm 0.05$) 8=2KV ($\Phi 0.45 \pm 0.6$) 9=3KV ($\Phi 0.6 \pm 0.05$)	GRADE Y=-25°C ~+85°C

Ceramic Disc Capacitors

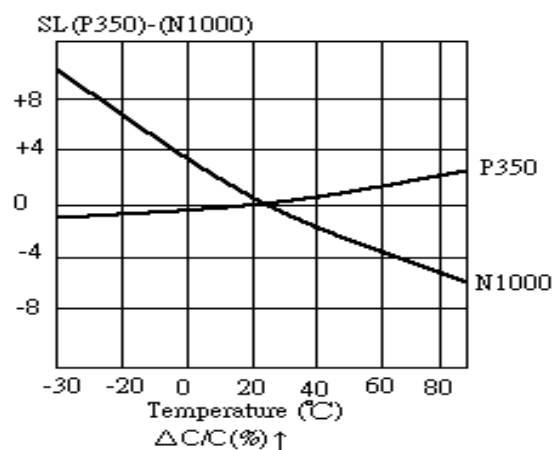
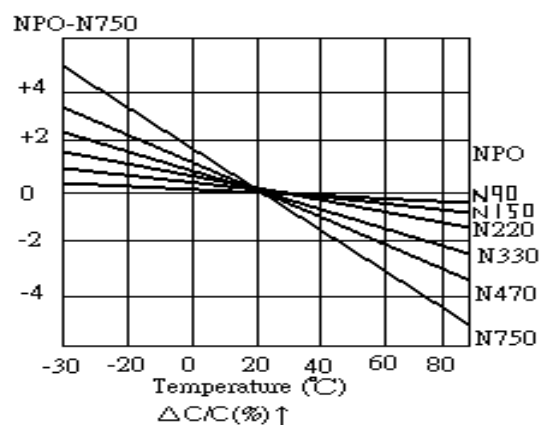
Temperature Compensating Series (Class I 50V ~ 1KV)

• Dimensions & Capacitance range

Dimensions(mm) 尺寸		Capacitance range (p F) of each Temperature 各溫度係數之電容值範圍					
D	F	NPO	N80	N150	N220	N750	SL
5	2.5or5.0	1-50	1-24	1-39	1-24	22-50	1-180
6	5.0	51-82	25-39	47-56	25-39	56-82	200-220
7	5.0	100-120	47-56	82-100	47-56	100-120	270-330
8	5.0	150-180	68	120-150	68	150-180	390-470
9	5.0	220	82	180-220	82	220	560-680
10	5.0	270~330	100	-	100	270	820-1000

Dimensions(mm) 尺寸		Capacitance range (p F) of each Temperature 各溫度係數之電容值範圍		
(D)	(F) ◎	500V	500V	1 KV
Dia. Max.	Lead Spacing	NPO	SL	SL
6.0	5.0±0.8	1 ~ 39	1 ~ 82	47 ~ 68
7.0	5.0±0.8	47 ~ 56	90 ~ 161	82 ~ 101
8.0	5.0±0.8	65 ~ 82		150 ~ 221
9.0	5.0±0.8	90 ~ 101	181 ~ 301	
10.0	5.0±0.8			271
11.0	5.0±0.8			331
12.0	5.0±0.8 or 7.5±0.8			391 ~ 471
14.0	5.0±0.8 or 7.5±0.8			561 ~ 681

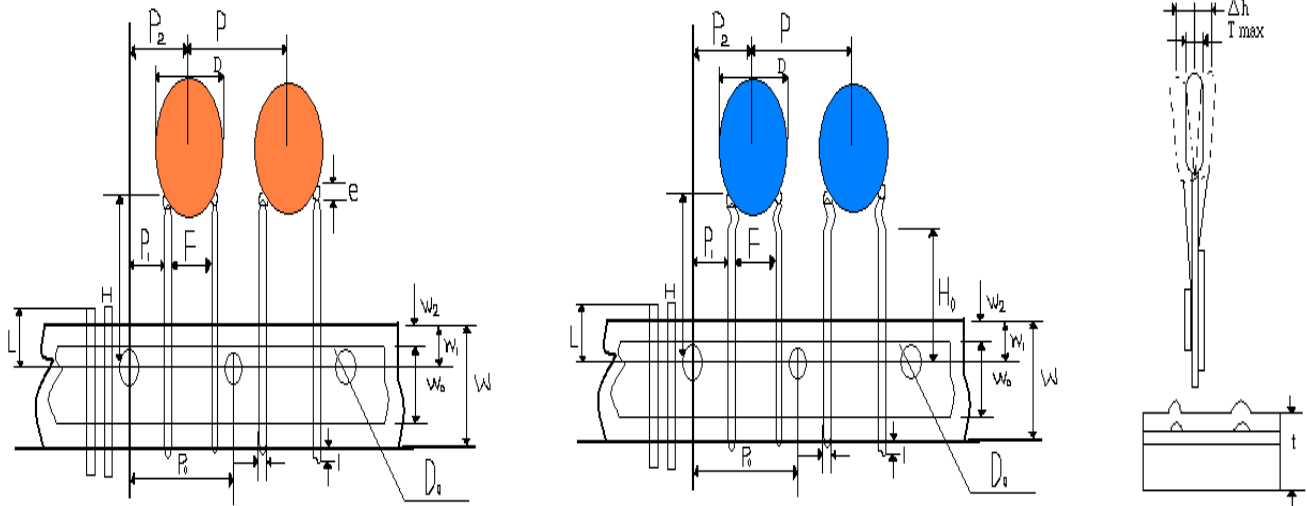
• Temperature characteristic curves



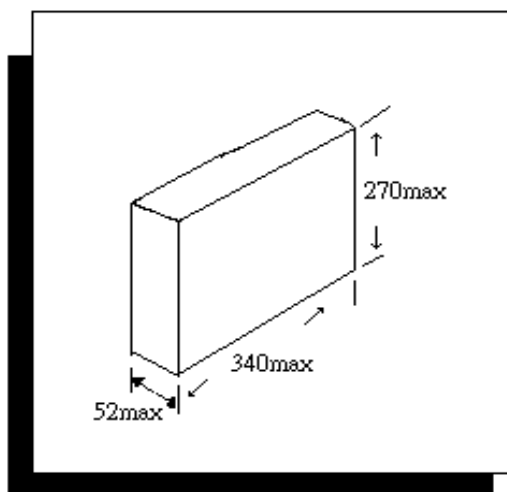
Ceramic Disc Capacitors

Temperature Compensating Series (Class I 50V ~ 1KV)

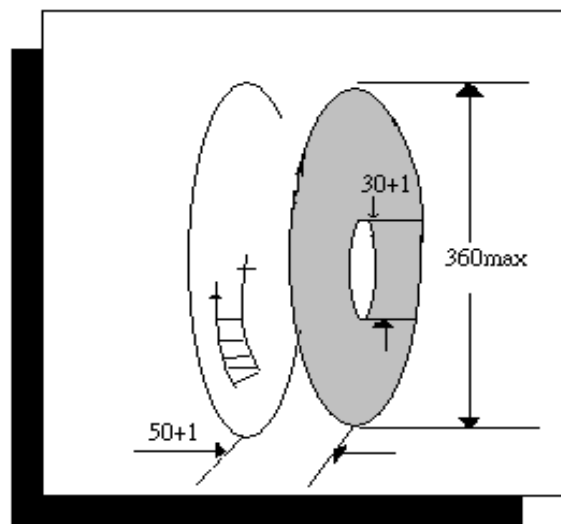
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

Temperature Compensating Series (Class I 50V ~ 1KV)

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度 : 0.5 ±0.1mm
Length of snapped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)



• Features

- ◎ Non linear temperature coefficient of capacitance.
- ◎ Large capacitance in small size.

• Specifications

Operating Temperature Range 操作溫度範圍	Y5E,Y5P:-30℃~+85℃; Z5U,Z5V:+10℃~+85℃
Rated Working Voltage (DC) 工作電壓	50V, 63V, 100V, 500V, 1KV
Capacitance 電容器	Measured at 25℃, 1KHz, 1Vrms.max.
Capacitance Tolerance 電容誤差值	±10% (K), ±20%(M), +50%-10%(R),+80%-20%(Z)
Insulation Resistance 絕緣電阻值	10,000MΩ min. at working voltage,60 sec.
Dissipation Factor (D.F.) 散逸因子	Measured at 25℃, 1KHz, 1V ms, max. Y5E, Y5P, Z5U: 2.5% max. Z5V: 5.0% max.
Voltage Proof (Flash Test) 電壓防護	Withstand 250% of rated working voltage with 50mA current, 1.5sec.
Life Test 壽命測試	200% of rated voltage at 85℃ for 500 hours.
Applicable Standards 適用標準	EIA RS-198 (CLASS II), JIS C-6422 (TYPE II)

• How to order

H (1)	B (2)	1H (3)	101 (4)	K (5)	L (6)	5 (7)	1 (8)	5 (9)	Y (10)
CLASS II H series	DIELECTRIC B=Y5P/Y5E E=Z5U F-Z5V	RATED VOLTAGE 1H=50V 1J=63V 2A=100V 2H=500V 3A=1KV	CAPACITANCE 1PF = 1R0 1.5PF = 1R5 2.2PF =2R2 100PF=101 120PF=121 10nF=103 100nF= 104	TOLERANCE K=±10% M=±20% Z=+80 ~ -20%	LEAD SHAPE K=Short kink (Bulk) S=Short Straight (Bulk) L=Long Straight (Bulk) A=Tape/Reel (Long Straight) B=Tape/Box (Long Straight) C=Tape/reel (Long kink) D=Tape/Box (Long kink)	LEAD SPACING 2=2.5±0.8 5=5.0±0.8 6=6.3±0.8 7=7.5±0.8 0=10 ±0.8	LEAD LENGTH 3=3.5±1.0 5=5.0±0.8 6=6.3±0.8 0=10 ±0.8 1= 25mm	LEAD WIRE 5=16V~500V (Φ0.48±0.05) 6=1KV (Φ0.5±0.05) 8=2KV (Φ0.45±0.6) 9=3KV (Φ0.6±0.05)	GRADE Y= -25℃ ~+85℃ Z= -10℃ ~+70℃

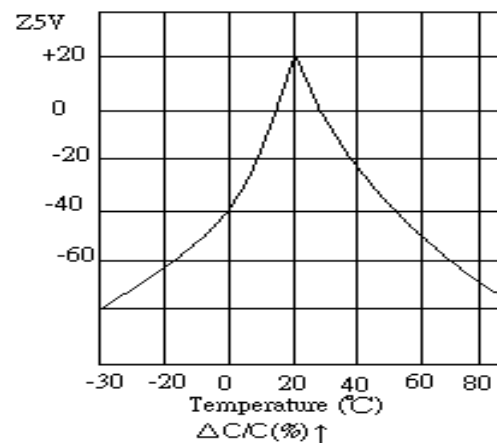
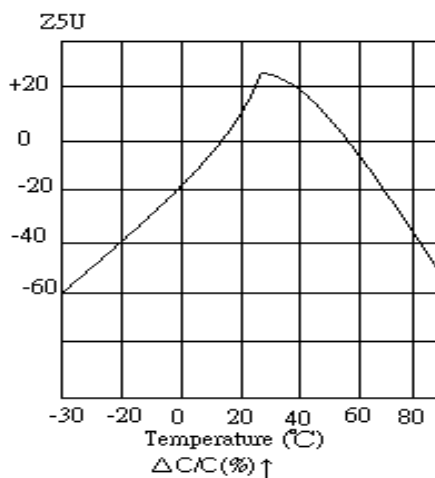
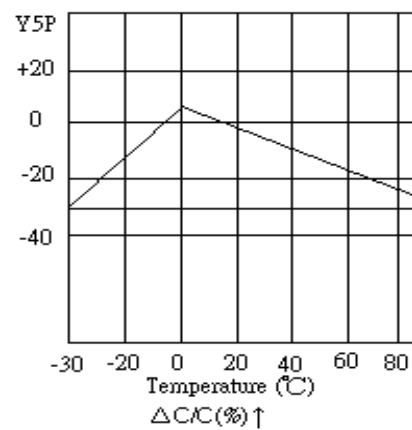
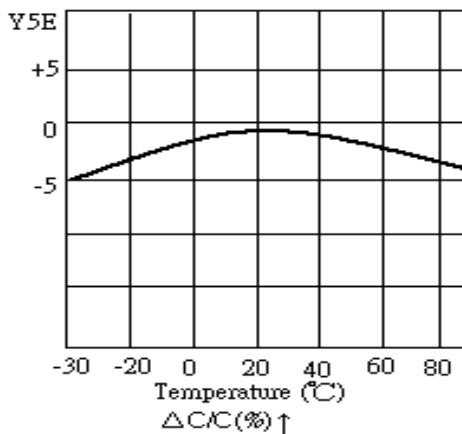
Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)

• Dimensions & Capacitance range

W.V. 電壓	Dimensons 尺寸			Capacitance range (pF) of each Temperature Coefficient 各溫度係數之電容值		
(DC)	D	T	dφ	Y5P/Y5E	Z5U	Z5V
50.63.100	5	3	0.5	100-2200	1000-4700	1000-10000
	6	3	0.5	2700~3300	5600~10000	15000~22000
	7	3	0.5	4700~5000	-	-
	8	3	0.5	5600~6800	15000	-
	9	3	0.5	-	-	40000~47000
	10	3	0.5	10000	-	-

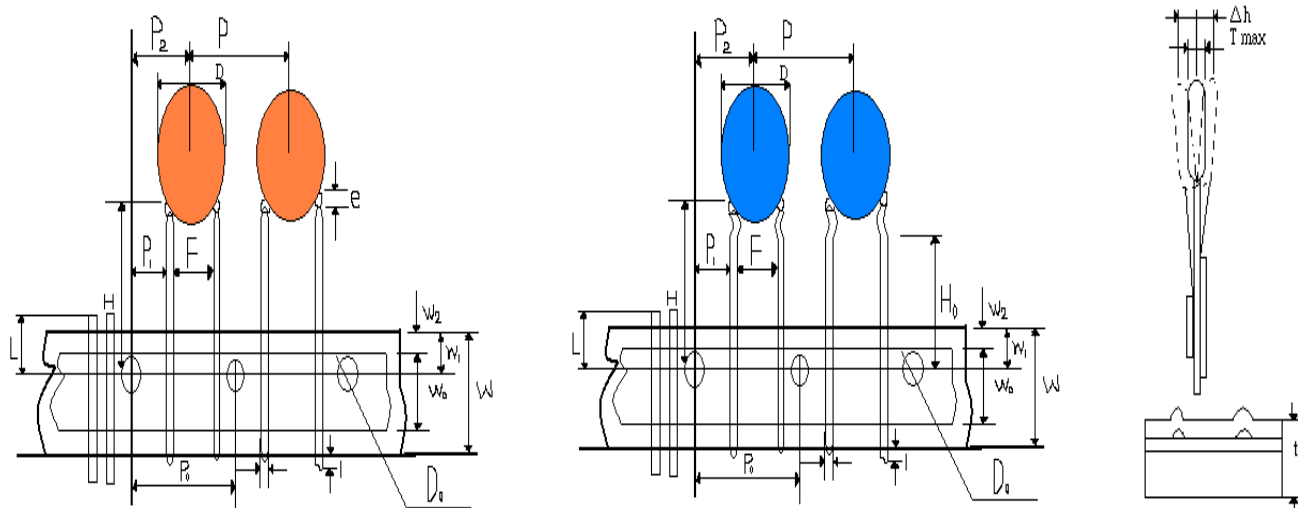
• Temperature characteristic curves



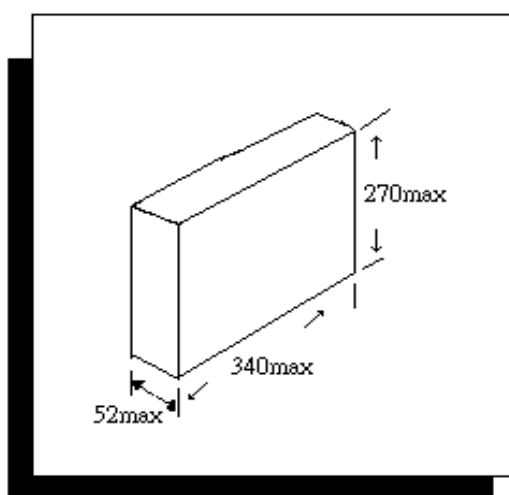
Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)

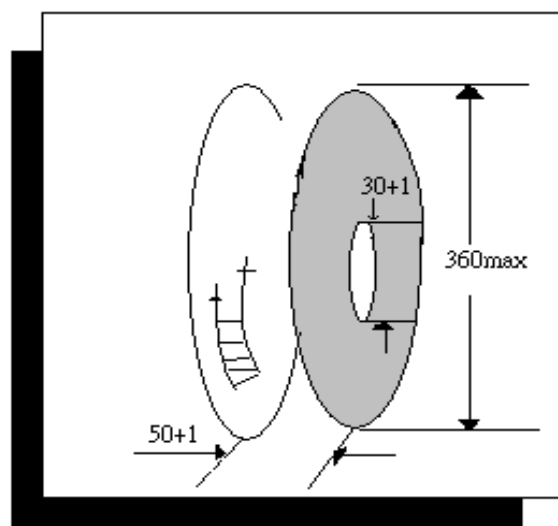
• Taping Specifications



AMMOPACK 編帶盒裝 2000pcs per Box



REEL 編帶捲裝 2000 or 2500 pcs Reel Unit mm



Ceramic Disc Capacitors

High Permittivity Series (Class II 50V ~ 1KV)

• Taping Specifications

Item 項目	Symbol 符號	Specifications 規格		Remarks 備註
		Value 尺寸	Tolerance 誤差	
Body Width 本體直徑	D	11.0	Max.	
Body Thickness 本體厚度	T	3.5	Max.	
Lead-wire diameter 引線直徑	d	0.55	+0.06-0.05	
Pitch of component 部品間寬距	P	12.7	±1.0	
Feed hole pitch 進料孔寬距	P0	12.7	±0.3	Cumulative pitch error. 1.0 mm /20 pitch 累積誤差
Feed hole center to lead 進料孔到引線寬	P1	3.85	±0.7	To be measured at bottom 在底部量測
Hole to component center 進料孔到部品寬	P2	6.35	±1.3	
Component alignment 部品排列偏度	h	0	±0.2	
Tape width 紙帶寬度	W	18.0	+1.0-0.5	
Hold-down tape width 膠帶寬度	W0	11.0	Min.	
Hole position 進料孔位置	W1	9.0	+0.75-0.5	
Hole-down tape position 膠帶位置	W2	3.0	Max.	
Height of component from Tape center 部品與紙帶中心高度	H	20.0	+1.0-0.5	For Straight Lead Type 直引線型
	H0	16.0	±0.5	For Kinked Lead Type 彎引線型
Lead-to-lead distance 引 線寬度	F	5.0	±0.8	
Lead-wire protrusion 引線凸出量	l	2.0	Max.	
Feed hole diameter 進料孔直徑	D0	4.0	±0.3	
Total tape thickness 總紙帶厚度	t	0.7	±0.2	Ground paper 底部厚度： 0.5 ±0.1mm
Length of snipped lead 裁切引線長度	L	11.0	Max.	
Coating rundown on leads 引線漆長	e	1.5	Max.	

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Application

Dielectric Material	NPO	X7R	Y5V	
Electrical Properties	With negligible dependence of electrical properties on temperature, voltage, frequency and time.	With predictable change of properties with temperature, voltage, frequency and time, this dielectric is ferroelectric and offers higher capacitance ranges than class I .	With higher dielectric constant and greater variation of properties with temperature and test conditions, very high capacitance per unit volume and suited for by-pass and coupling application as well as filtering, transient suppression blocking, and charge storage application.	
Application	Used in radio-frequency oscillators, precision timing circuits, ultrastable amplifiers, etc.	Used as blocking, decoupling in radio, television receivers, audio tone and coupling, By-passing and frequency discriminating elements.	General type for by-pass and filtering applications.	
Operating Temperature	-55°C ~ +125 °C	-55 °C ~ +125 °C	+10°C ~85°C	-30 °C ~ +85 °C
Temperature Coefficient	0 ± 30 ppm/°C	± 15%	+22%~-56%	+22%~-82%

How to order

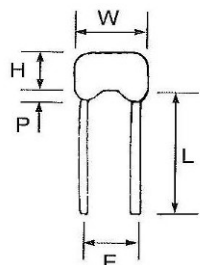
RD15	B	104	M	1H	A	5	R
SIZE	T.C.	CAPACITANCE	TOLERANCE	VOLTAGE	LEAD SHAPE	LEAD SPACE	PACKAGE
RD15	N=NPO	1PF = 1R0	J=±5%	1H=50V	L=STRAIGHT	2=2.54±0.8	R=TAPE/REEL
RD20	B=X7R	1.5PF = 1R5	K=±10%	2A=100V	A=SLOPE 45° LEAD	5=5.08±0.8	B=TAPE/BOX
RD30	Y=Y5V	2.2PF =2R2	M=±20%	2A=100V	Y=INSIDE CRIMP		K=BULK
		100PF=101	Z=+80 ~ -20%	2H=500V	H=HIGHT SEATED 90°		L=25.4mm
		120PF=121		2J=630V	K=OUTWARD KINK		
		10nF=103		3A=1KV			
		100nF= 104		3D=2KV			
				3F=3KV			

MULTILAYER CERAMIC DISC CAPACITORS

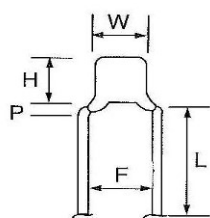
Epoxy Coated Radial Type

SPECIFICATION

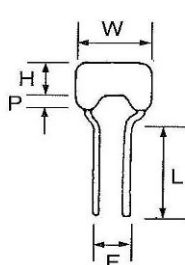
Lead shape



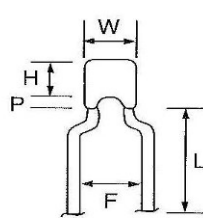
STYLE L
STRAIGHT LEAD



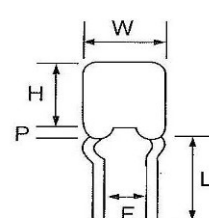
STYLE A
SLOPE SEATED



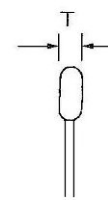
STYLE Y
INSIDE CRIMP



STYLE H
HIGH SEATED



STYLE K
OUTWARD KINK



d^0

Size Code and Dimensions

(mm)

Size Code	H (Max.)	W (Max.)	T (Max.)	$d \pm 0.05$	F	Lead Length	Lead Shape
RD15	3.81	3.81	4	0.5	2.54 ± 0.25	$6 \pm 1 \sim 25 \text{mm}$	L
	3.81	3.81	4		5.08 ± 0.5		A, H
RD20	5.8	5.8	4		2.54 ± 0.25		L, Y
	5.8	5.8	4		5.08 ± 0.5		H
RD30	6.8	6.8	5.5		5.08 ± 0.5		L

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Capacitance Range

T.C.		NPO																			
Size		RD15					RD20							RD30							
Cap (pF)		50V	100V	250V	500V	630V	50V	100V	250V	500V	630V	1KV	2KV	50V	100V	250V	500V	630V	1KV	2KV	3KV
0.5																					
0.6	0R6																				
0.7	0R7																				
0.8	0R8																				
0.9	0R9																				
1.0	1R0																				
1.2	1R2																				
1.5	1R5																				
1.8	1R8																				
2.2	2R2																				
2.7	2R7																				
3.3	3R3																				
3.9	3R9																				
4.7	4R7																				
5.6	5R6																				
6.8	6R8																				
8.2	8R2																				
10	100																				
12	120																				
15	150																				
18	180																				
22	220																				
27	270																				
33	330																				
39	390																				
47	470																				
56	560																				
68	680																				
82	820																				
100	101																				
120	121																				
150	151																				
180	181																				
220	221																				
270	271																				
330	331																				
390	391																				
470	471																				
560	561																				
680	681																				
820	821																				
1000	102																				
1200	122																				
1500	152																				
1800	182																				
2200	222																				
2700	272																				
3300	332																				
3900	392																				
4700	472																				
5600	562																				
6800	682																				
8200	822																				
10000	103																				
12000	123																				
15000	153																				
18000	183																				
22000	223																				
27000	273																				
33000	333																				
39000	393																				
47000	473																				
56000	563																				
68000	683																				
82000	823																				
[uF] 0.1	104																				

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

T.C.		X7R																					
Size		RD15					RD20							RD30									
Cap (pF)		50V	100V	250V	500V	630V	50V	100V	250V	500V	630V	1KV	2KV	250V	500V	630V	1KV	2KV	3KV				
100	101																						
120	121																						
150	151																						
180	181																						
220	221																						
270	271																						
330	331																						
390	391																						
470	471																						
560	561																						
680	681																						
820	821																						
1000	102																						
1200	122																						
1500	152																						
1800	182																						
2200	222																						
2700	272																						
3300	332																						
3900	392																						
4700	472																						
5600	562																						
6800	682																						
8200	822																						
10000	103																						
12000	123																						
15000	153																						
18000	183																						
22000	223																						
27000	273																						
33000	333																						
39000	393																						
47000	473																						
56000	563																						
68000	683																						
82000	823																						
(uF) 0.1	104																						
0.12	124																						
0.15	154																						
0.18	184																						
0.22	224																						
0.27	274																						
0.33	334																						
0.39	394																						
0.47	474																						
0.56	564																						
0.68	684																						
0.82	824																						
1	105																						
1.5	155																						
2.2	225																						
3.3	335																						
4.7	475																						

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

T.C.		Y5V		
Size		RD15	RD20	RD30
Cap (pF)		50V	50V	50V
10000	103			
12000	123			
15000	153			
18000	183			
22000	223			
27000	273			
33000	333			
39000	393			
47000	473			
56000	563			
68000	683			
82000	823			
(uF) 0.1	104			
0.12	124			
0.15	154			
0.18	184			
0.22	224			
0.33	334			
0.39	394			
0.47	474			
0.68	684			
1	105			
1.5	155			
2.2	225			
3.3	335			
4.7	475			

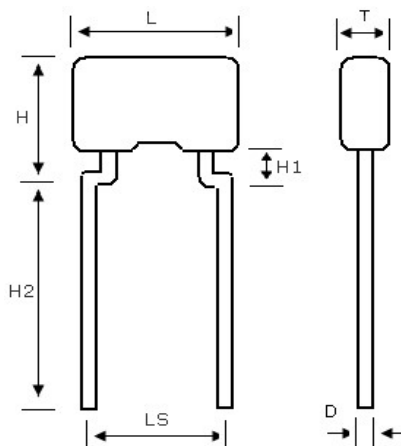
MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

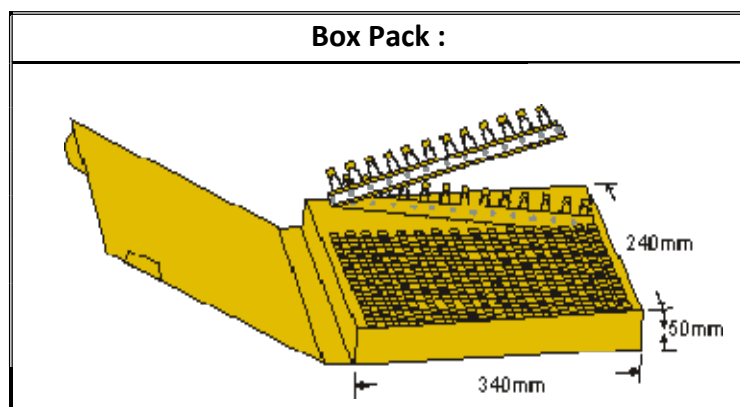
Marking

Color	Black	
Capacitance	Tolerance	Marking
100	J	10
220	J	22
470	J	47
101	J	101
471	J/K	471
102	J/K	102
103	J/K/M	103
104	K/M/Z	104
105	K/M/Z	105



Packing specification

Bulk	Tape
STYLE H HIGH SEATED	



Item	Radial Leaded Type
Tape & Reel	4000 pcs/Reel
Tape & Box	2000 pcs/Box
Bulk Pack	1000 pcs/Bag(STD)

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Inspection

Item	Inspection		
	NPO/COG	X7R	Y5V
Capacitance	Test Frequency : $\leq 1000\text{PF}=1\text{Mhz}$ $> 1000\text{PF}=1\text{Khz}$	Test Frequency : 1Khz	Test Frequency : 1Khz
	Test Voltage: $1 \pm 0.2 \text{ Vrms}$	Test Voltage: $1 \pm 0.2 \text{ Vrms}$	Test Voltage: $1 \pm 0.2 \text{ Vrms}$
	In the tolerance : $C=\pm 0.25\text{pf}$ $D=\pm 0.50\text{pf}$ $J=\pm 5\%$	In the tolerance : $J=\pm 5\%\text{pF}$ $K=\pm 10\%$ $M=\pm 20\%$	In the tolerance : $M=\pm 20\%$ $Z=+80\%/-20\%$
(DF) Dissipation Factor	Test Frequency : $\leq 1000\text{PF}=1\text{Mhz}$ $> 1000\text{PF}=1\text{Khz}$ Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 0.1 \%$	Test Frequency : 1Khz Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 2.5\%-100/50\text{V}$ $< 3.5\%-25/16\text{V}$	Test Frequency : 1Khz Test Voltage: $1 \pm 0.2 \text{ Vrms}$ $< 5.0\%-100/50\text{V}$ $< 7.0\%-25/16\text{V}$
(IR) Insulation Resistance $500\Omega=C \cdot R$ $500\Omega=0.47\text{UF}$ $1064\text{M}\Omega$	Test Voltage : Rated Voltage Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	Test Voltage : Rated Voltage Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$	Test Voltage : Rated Voltage Whichever is less $\geq 10 \text{ Gohmas}$ or $\geq 1000 \text{ M}\Omega$
50V	2 x rated Voltage	2 x rated Voltage	2 x rated Voltage

MULTILAYER CERAMIC DISC CAPACITORS

Epoxy Coated Radial Type

SPECIFICATION

Reliability

(Item)	(Test Methods)	(Test Specifications)																																				
Solder ability	The lead wire of a capacitor shall be dipped into a rosin and then into molten solder of 235±5 °C for 5 seconds , in both cases the depth of dipping is up to about 2.5 to 3.0 mm from the root of lead wires.	Lead wire shall be soldered with uniformly coated on the Axial or Radial direction over 75% of the circumferential direction.																																				
Resistance to Soldering heat	The lead wire shall be immersed into the melted solder of 265±5 °C, up to about 2.5 to 3.0 mm from the main body and the specified items shall be measured after leaving for 24±2 hours.	1.外觀：無損傷 Appearance：No marked defect 2.電容值變化(△C/C)： Capacitance change： <table><tr><td></td><td>COG</td><td>X7R</td><td>Y5V</td></tr><tr><td>△C/C</td><td>≤±0.5%, or ±0.5pf</td><td>≤±7.5%</td><td>≤±20%</td></tr></table>		COG	X7R	Y5V	△C/C	≤±0.5%, or ±0.5pf	≤±7.5%	≤±20%																												
	COG	X7R	Y5V																																			
△C/C	≤±0.5%, or ±0.5pf	≤±7.5%	≤±20%																																			
Life Test	<table><tr><td>條件 Condition</td><td>NPO</td><td>X7R</td><td>Y5V</td></tr><tr><td>溫度 Temperature</td><td colspan="2">+125 °C</td><td>+85 °C</td></tr><tr><td>時間 Time</td><td colspan="3">1000 小時(hours)</td></tr><tr><td>電壓 Voltage</td><td colspan="3">1.5×額定電壓 (rated voltage applied)</td></tr><tr><td>恢復時間 Recovery time</td><td colspan="3">24±2 小時(hours)</td></tr></table>	條件 Condition	NPO	X7R	Y5V	溫度 Temperature	+125 °C		+85 °C	時間 Time	1000 小時(hours)			電壓 Voltage	1.5×額定電壓 (rated voltage applied)			恢復時間 Recovery time	24±2 小時(hours)			1.外觀：無損傷 Appearance：No marked defect 2.變化值 (Change value)： <table><tr><td></td><td>COG</td><td>X7R</td><td>Y5V</td></tr><tr><td>△C/C</td><td>≤±2%, or ±2pf</td><td>≤±10%</td><td>≤±30%</td></tr><tr><td>DF</td><td colspan="3">≤1.5 × initial requirement</td></tr><tr><td>IR</td><td colspan="3">≥0.25 × initial requirement</td></tr></table>		COG	X7R	Y5V	△C/C	≤±2%, or ±2pf	≤±10%	≤±30%	DF	≤1.5 × initial requirement			IR	≥0.25 × initial requirement		
條件 Condition	NPO	X7R	Y5V																																			
溫度 Temperature	+125 °C		+85 °C																																			
時間 Time	1000 小時(hours)																																					
電壓 Voltage	1.5×額定電壓 (rated voltage applied)																																					
恢復時間 Recovery time	24±2 小時(hours)																																					
	COG	X7R	Y5V																																			
△C/C	≤±2%, or ±2pf	≤±10%	≤±30%																																			
DF	≤1.5 × initial requirement																																					
IR	≥0.25 × initial requirement																																					
Strength of lead	Fix the body of capacitor, apply a tensile weight gradually to each lead.	Pull：Axial：>4 kg Radial：>1 kg																																				

MULTILAYER CERAMIC DISC CAPACITORS

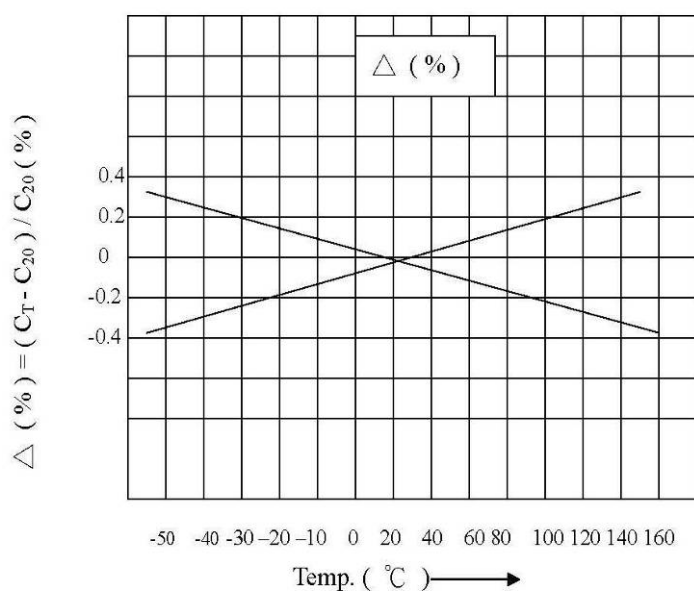
Epoxy Coated Radial Type

SPECIFICATION

Temperature Characteristics

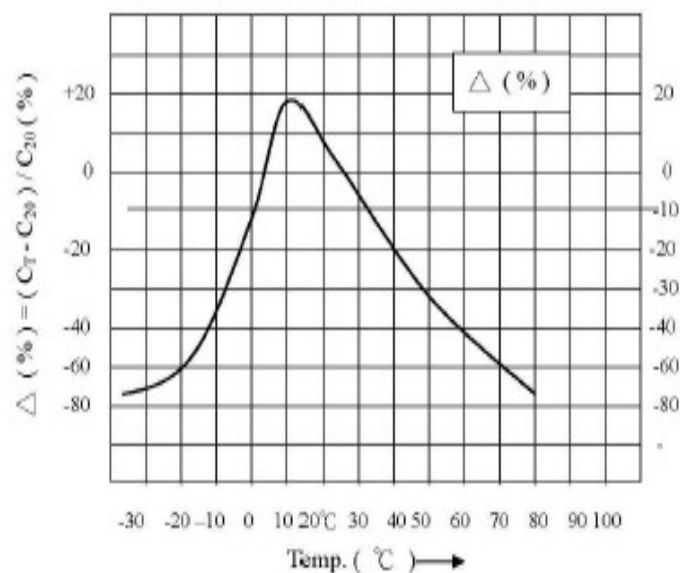
NPO

-30 -20 -10 0 10 20°C 30 40 50 60 70 80 90 100



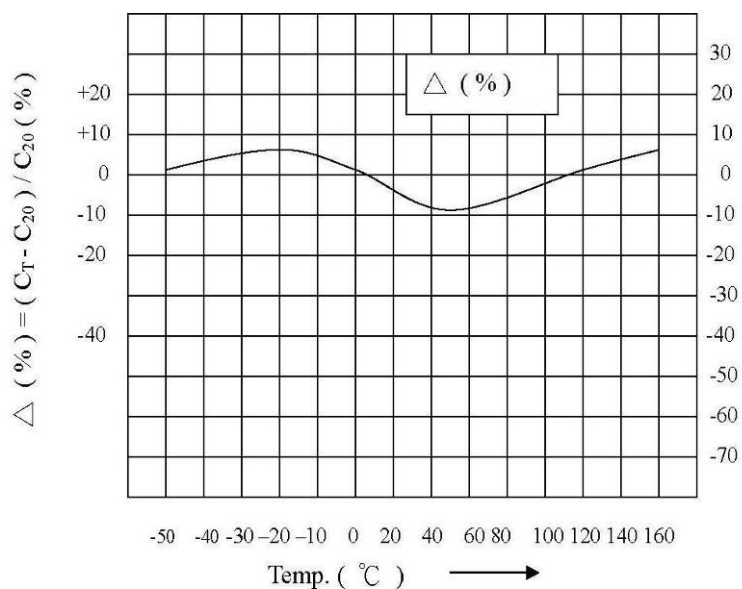
Y5V

-30 -20 -10 0 10 20°C 30 40 50 60 70 80 90 100



X7R

-50 -40 -30 -20 -10 0 20 40 60 80 100 120 140 160



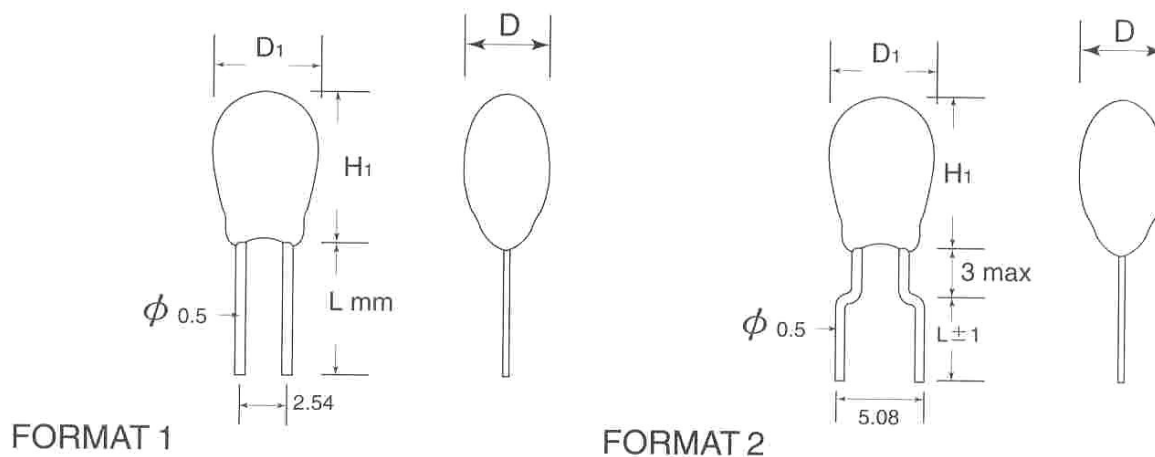
Dipped Tantalum Capacitors

-55 to +85°C, from 6.3 to 50V



Specifications

Item	Performance																	
Operating Temperature Range	-55 to+85℃at rated voltage																	
Rated Working Voltage Range	6.3 – 50VDC																	
Nominal Capacitance Range	0.1 – 330μ F																	
Capacitance Tolerance	± 10% or 20% (at+20℃ ,120Hz)																	
Leakage Current	Not more than 0.008CV (μ A) or 0.5μ A, whichever is greater.																	
Dissipation Factor (tan δ) (120Hz\+20℃)	0.04 max. for ≤ 1.0μ F, 0.06 max. for 1.5 to 68μ F, 0.08 max. for 10 to 68μ F, 0.1 max. for ≥ 100μ F.																	
Characteristics at High and Low Temperature	<table><tr><td>-55℃</td><td>Capacitance change</td><td>±12% of initial measured value at +20℃</td></tr><tr><td rowspan="2">+105℃</td><td>Leakage current</td><td>≤ 10% of initial measured value</td></tr><tr><td>Capacitance change</td><td>±12% of initial measured value at +20℃</td></tr></table>			-55℃	Capacitance change	±12% of initial measured value at +20℃	+105℃	Leakage current	≤ 10% of initial measured value	Capacitance change	±12% of initial measured value at +20℃							
-55℃	Capacitance change	±12% of initial measured value at +20℃																
+105℃	Leakage current	≤ 10% of initial measured value																
	Capacitance change	±12% of initial measured value at +20℃																
Moisture Resistance	Test conditions : Relative humidity : 90 to 95% without load Ambient Temperature : +40℃. Duration : 500 hrs Post test requirements at +20℃ : Leakage current & Tan δ : ≤0.012CV or 0.75μ F, whichever is greater. Capacitance change : ±10% of initial measured value Tan δ: ≤150% of initial specified value																	
Endurance	<table><tr><td></td><td>Derating (10 to 15V only)</td><td>Rating</td></tr><tr><td>Duration</td><td>1000 hrs</td><td>1000 hrs</td></tr><tr><td>Ambient Temperature</td><td>+105℃</td><td>+85℃</td></tr><tr><td>Applied voltage</td><td>Derated working votlage</td><td>Rated working voltage</td></tr><tr><td>Source impedance</td><td>1Ω / V</td><td>1Ω / V</td></tr></table>				Derating (10 to 15V only)	Rating	Duration	1000 hrs	1000 hrs	Ambient Temperature	+105℃	+85℃	Applied voltage	Derated working votlage	Rated working voltage	Source impedance	1Ω / V	1Ω / V
	Derating (10 to 15V only)	Rating																
Duration	1000 hrs	1000 hrs																
Ambient Temperature	+105℃	+85℃																
Applied voltage	Derated working votlage	Rated working voltage																
Source impedance	1Ω / V	1Ω / V																
Shelf Life	Test conditions : Duration : 1000hrs., Ambient Temperature : +85℃. Applied voltage : none. Post test requirements at +20℃, same limits for “ Endurance”.																	

Dipped Tantalum Capacitors**-55 to +85°C, from 6.3 to 50V****CINETECH**
SYMBOL OF QUALITY**Outline****Dimension mm**

Case Size	A	B	C	D	E	F
Formats 1,2 H1 MAX.	7.0	8.0	9.5	11.0	13.0	16.5
D1 MAX.	4.5	5.0	5.5	6.5	8.5	9.5
D MAX.	4.2	4.7	5.5	6.5	8.5	9.5

Wire Length (L)	5.7±1	12, 14±1	18, 20±1
Code	A	B	C

Standard pitch size :

2.54 ±0.5mm or 5.08 ±0.5mm

Dipped Tantalum Capacitors**-55 to +85°C, from 6.3 to 50V****CINETECH**
SYMBOL OF QUALITY**Rated voltage, Capacitance, and Case Size**

Voltage	6.3V	10V	16V	25V	35V	50V
0.1 UF					A	A
0.15 UF					A	A
0.22 UF					A	A
0.33 UF					A	A
0.47 UF					A	A
0.68 UF					A	A
1.0 UF				A	A	B
1.5 UF			A	A	A	C
2.2 UF		A	A	A	B	C
3.3 UF	A	A	A	B	B	D
4.7 UF	A	A	A	B	C	D
6.8 UF	A	B	B	C	D	E
10 UF	B	B	B	C	D	E
15 UF	B	C	C	D	E	F
22 UF	C	C	C	D	E	F
33 UF	C	D	D	E	F	
47 UF	D	D	D	E	F	
68 UF	D	D	E	F		
100 UF	E	E	E	F		
150 UF	E	E	F			
220 UF	E	F				
330 UF	F					

Dipped Tantalum Capacitors

-55 to +85°C, from 6.3 to 50V

CINETECH
SYMBOL OF QUALITY

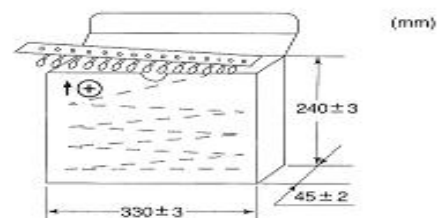
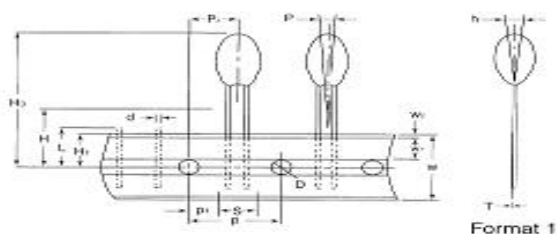
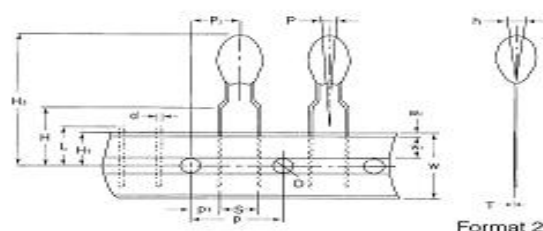
Part Number System :

T (1)	10 (2)	M (3)	10 (4)	R (5)
SERIES Dipped Tantalum Capacitor	CAPACITANCE 0U47 = 0.47UF 1 = 1UF 10 = 10UF 100=100UF	TOLERANCE K=±10% M=±20%	RATED VOLTAGE 6.3=6.3V 10=10V 25=25V 50=50V	PACKING R=Tape/Reel A=Tape/Box B=Bulk

Carrier Tape packaging specifications (mm)

Item	Code	Dimension (mm)
Carrier tape width	W	18.0 +1.0/-0.5
Hold down tape width	W1	6.0 ±0.5
Hold down tape position	W2	1.0 max.
Feed hole diameter	D	4.0±0.2
Feed hole pitch	P	12.7±0.2
Hole center to lead	P1	Format 1: 5.05±0.7 Format 2: 3.85±0.7
Hole center to component center	P	6.35±1.0
Lead wire clench height	H	16±0.5
Hole position	H1	9.0±0.5
Base of component height	H2	0.8 min
Component height	H3	32.2 Max.
Component sligment	$\Delta P / \Delta h$	0±1.3 / 0±2.0
Lead spacing	S	"S" : 2.5+0.6/-0.1 "B" : 5.0+0.6/-0.5
Lead diameter	d	0.5±0.05
Length of snapped lead	L	11.0 max.
Carrier tape thickness	T	0.5±0.1

Taping package :



Case code	A - B	C - D	E - F
Q'TY PCS/BOX	2,500	2,000	1,000

SMD Tantalum Capacitors

-55 to +85°C, from 4 to 50V, S to E cases



Specifications

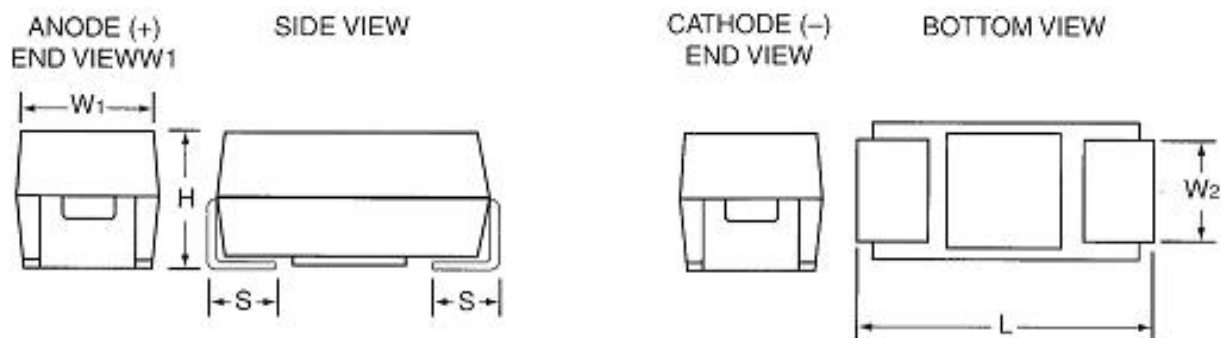
Item	Performance		
Operating Temperature Range	-55 to+85℃ at rated voltage		
Rated Working Voltage Range	4 – 50VDC		
Nominal Capacitance Range	0.1 – 470μ F		
Capacitance Tolerance	± 10% or 20% (at+20℃ ,120Hz)		
Leakage Current	Not more than 0.01CV (μ A) or 0.5μ A, whichever is greater.		
Dissipation Factor (tan δ) (120Hz\+20℃)	0.04 max. for ≤ 1.0μ F, 0.06 max. for 1.5 to 68μ F, 0.08 max. for 100 to 470μ F.		
Characteristics at High and Low Temperature	-55℃	Capacitance change	±12% of initial measured value at +20℃
	+105℃	Leakage current	≤ 12.5% of initial measured value
		Capacitance change	±12% of initial measured value at +20℃
Moisture Resistance	Test conditions : Relative humidity : 90 to 95% without load, Ambient Temperature : +40℃. Duration : 500 hrs Post test requirements at +20℃ : : Leakage current & Tanδ : ≤ initial specified value Capacitance change : ±10% of initial measured value		
Endurance			
		Derating	Rating
	Duration	1000 hrs	1000 hrs
	Ambient Temperature	+105 ℃	+85℃
	Applied voltage	Derated working votlage	Rated working voltage
	Source impedance	1Ω / V	1Ω / V
Shelf Life	Test conditions : Duration : 1000hrs., Ambient Temperature : +125℃. Applied voltage : none. Post test requirements at +20℃, same limits for “ Endurance”. Solder Heat Resistance :Withstand dipping into solder bath for 5±1 sec. at 260±5℃.		

SMD Tantalum Capacitors

-55 to +85°C, from 4 to 50V, S to E cases

CINETECH
SYMBOL OF QUALITY

Case outline



Dimension mm (inch)

Case Size	$L \pm 0.2$ (0.008)	$W_1 \pm 0.2$ (0.008)	$H \pm 0.2$ (0.008)	$S \pm 0.2$ (0.008)	$W_2 \pm 0.2$ (0.008)
S	2.0 (0.079)	1.2 (0.047)	1.2 (0.047)	0.5 (0.020)	1.2 (0.047)
A	3.2 (0.126)	1.6 (0.063)	1.6 (0.063)	0.8 (0.031)	1.2 (0.047)
B	3.5 (0.137)	2.8 (0.110)	1.9 (0.075)	0.8 (0.031)	2.2 (0.087)
C	6.0 (0.236)	3.2 (0.126)	2.5 (0.098)	1.3 (0.051)	2.2 (0.087)
D	7.3 (0.287)	4.3 (0.169)	2.8 (0.110)	1.3 (0.051)	2.4 (0.094)
E	7.3 (0.287)	4.3 (0.169)	4.0 (0.157)	1.3 (0.051)	2.4 (0.094)

SMD Tantalum Capacitors**-55 to +85°C, from 4 to 50V, S to E cases****CINETECH**
SYMBOL OF QUALITY**Rated voltage, Capacitance, and Case Size**

Voltage	4V	6.3V	10V	16V	20V	25V	35V	50V
0.1 UF					S		A	A
0.15 UF					S		A	A / B
0.22 UF					S		A	B
0.33 UF					S		A	B
0.47 UF				S	S	A	A / B	C
0.68 UF			S	S	S / A	A	A / B	C
1.0 UF		S / A	S / A	S / A	A	A / B	A / B	C
1.5 UF	S	S / A	S / A	S / A	A / B	B	B / C	C / D
2.2 UF	S	S / A	S / A	A / B	A / B	B	B / C	D
3.3 UF	S / A	S / A	S / A	A / B	A / B / C	B / C	B / C / D	D
4.7 UF	S / A	S / A	S / A / B	A / B	A / B / C	B / C	C / D	D / E
6.8 UF	S / A	S / A / B	A / B	A / B / C	B / C / D	C / D	C / D	D
10 UF	A / B	A / B	A / B	A / B / C	C / D	C / D	C / D	E
15 UF	A / B	A / B	B / C	B / C	C / D	C / D	E	
22 UF	A / B	A / B	B / C	B / C / D	C / D	D	E	
33 UF	B / C	B / C	C / D	C / D	D	D / E		
47 UF	B / C	B / C	C / D	C / D	D / E	E		
68 UF	B / C / D	C / D	D	D	D / E			
100 UF	B / C / D	C / D	C / D	D	E			
150 UF	C / D	D	E	E				
220 UF	D	D / E	D / E	E				
330 UF	E	D / E	E					
470 UF	E							

SMD Tantalum Capacitors

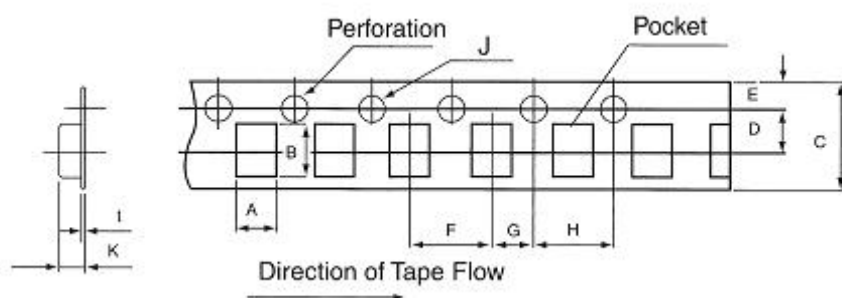
-55 to +85°C, from 4 to 50V, S to E cases

CINETECH
 SYMBOL OF QUALITY

Part Number System :

TA (1)	10 (2)	M (3)	10 (4)	R (5)
CASE SIZE	CAPACITANCE	TOLERANCE	RATED VOLTAGE	PACKING
TS ---S case	0U1 = 0.1UF	K=±10%	6.3=6.3V	R=Tape/Reel
TA --- A case	0U47 = 0.47UF	M=±20%	10=10V	
TB --- B case	1 = 1UF		16=16V	
TC --- C case	10 = 10UF		25=25V	
TD ---D case	100=100UF		50=50V	
TE --- E case				

Carrier Tape packaging specifications (mm)



Case Size	A±0.1	B±0.1	C±0.3	D±0.1	E±0.1	F±0.1	G±0.1	H±0.1	J±0.1	K max	t	Q'ty/reel
S	1.6	2.4	8.0	3.5	1.75	4.0	2.0	4.0	1.5	2.5	0.2	2,500
A	1.9	3.5	8.0	3.5	1.75	4.0	2.0	4.0	1.5	2.5	0.2	2,000
B	3.1	3.8	8.0	3.5	1.75	4.0	2.0	4.0	1.5	2.5	0.2	2,000
C	3.6	6.4	12.0	5.5	1.75	8.0	2.0	4.0	1.5	3.0	0.3	500
D	4.7	7.7	12.0	5.5	1.75	8.0	2.0	4.0	1.5	3.4	0.3	500
E	4.6	7.6	12.0	5.5	1.75	8.0	2.0	4.0	1.5	4.6	0.3	500

Safety Standard	Standard NO.	Recognized NO.
CSA (Canada)	CSA-22.2 No.1-94	E187963
UL (USA)	UL1414	
VDE (Germany)	EN 132 400 / IEC 60384 -14 (VDE 0565 Teil 1-1)	123326
SEMKO (Sweden)	EN 132 400 / IEC 60384 -14	312302
SEV (Switzerland)	EN 132 400 / IEC 60384 -14	03.1245
FIMKO (Finland)	EN 132 400 / IEC 60384 -14	FI 153165 A1
NEMKO (Norway)	EN 132 400 / IEC 60384 -14	P03201239
DEMKO (Denmark)	EN 132 400 / IEC 60384 -14	135948-01/A1
VDE CB	IEC 60384-14 Table II 2nd (1993)	DE 1-07488-A1

RECOGNITION LIST

Part Number	Safety standard	UL	CSA	VDE VDC/CB	SEMKO	SEV	FIMKO	NEMKO	DEMKO
	Sub-Class	———	———	X1,Y2	X1,Y2	X1,Y2	X1,Y2	X1,Y2	X1,Y2
	Rated Vol.	250	250	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300
JY10KY5P Y2		○	○	○	○	○	○	○	○
JY12KY5P Y2		○	○	○	○	○	○	○	○
JY15KY5P Y2		○	○	○	○	○	○	○	○
JY18KY5P Y2		○	○	○	○	○	○	○	○
JY20KY5P Y2		○	○	○	○	○	○	○	○
JY22KY5P Y2		○	○	○	○	○	○	○	○
JY25KY5P Y2		○	○	○	○	○	○	○	○
JY27KY5P Y2		○	○	○	○	○	○	○	○
JY30KY5P Y2		○	○	○	○	○	○	○	○
JY33KY5P Y2		○	○	○	○	○	○	○	○
JY36KY5P Y2		○	○	○	○	○	○	○	○
JY39KY5P Y2		○	○	○	○	○	○	○	○
JY47KY5P Y2		○	○	○	○	○	○	○	○
JY50KY5P Y2		○	○	○	○	○	○	○	○
JY56KY5P Y2		○	○	○	○	○	○	○	○
JY62KY5P Y2		○	○	○	○	○	○	○	○
JY68KY5P Y2		○	○	○	○	○	○	○	○
JY75KY5P Y2		○	○	○	○	○	○	○	○
JY82KY5P Y2		○	○	○	○	○	○	○	○

Safety Standard	Standard NO.	Recognized NO.
CSA (Canada)	CSA-22.2 No.1-94	LR 111243-1
UL (USA)	UL1414	E187963
VDE (Germany)	EN 132 400 / IEC 60384 -14 (VDE 0565 Teil 1-1)	123326
SEMKO (Sweden)	EN 132 400 / IEC 60384 -14	312302
SEV (Switzerland)	EN 132 400 / IEC 60384 -14	03.1245
FIMKO (Finland)	EN 132 400 / IEC 60384 -14	FI 153165 A1
NEMKO (Norway)	EN 132 400 / IEC 60384 -14	P03201239
DEMKO (Denmark)	EN 132 400 / IEC 60384 -14	309805-01
VDE CB	IEC 60384-14 Table II 2nd (1993)	DE 1-07488-A1

RECOGNITION LIST

Part Number	Safety standard	UL	CSA	VDE VDC/CB	SEMKO	SEV	FIMKO	NEMKO	DEMKO
	Sub-Class	———	———	X1,Y2	X1,Y2	X1,Y2	X1,Y2	X1,Y2	X1,Y2
	Rated Vol.	250	250	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300	X1:400 Y2:300
JY101KY5P Y2		○	○	○	○	○	○	○	○
JY151KY5P Y2		○	○	○	○	○	○	○	○
JY221KY5P Y2		○	○	○	○	○	○	○	○
JY271KY5P Y2		○	○	○	○	○	○	○	○
JY331KY5P Y2		○	○	○	○	○	○	○	○
JY471KY5P Y2		○	○	○	○	○	○	○	○
JY561KY5P Y2		○	○	○	○	○	○	○	○
JY681KY5P Y2		○	○	○	○	○	○	○	○
JY102KY5P Y2		○	○	○	○	○	○	○	○
JY102MY5V Y2		○	○	○	○	○	○	○	○
JY152MY5V Y2		○	○	○	○	○	○	○	○
JY222MY5V Y2		○	○	○	○	○	○	○	○
JY332MY5V Y2		○	○	○	○	○	○	○	○
JY392MY5V Y2		○	○	○	○	○	○	○	○
JY472MY5V Y2		○	○	○	○	○	○	○	○
JY682MY5V Y2		○	○	○	○	○	○	○	○
JY822MY5V Y2		○	○	○	○	○	○	○	○
JY103MY5V Y2		○	○	○	○	○	○	○	○

Safety Standard	Standard NO.	Recognized NO.
CSA (Canada)	CSA-22.2 No.1-94	E187963
UL (USA)	UL1414	
VDE (Germany)	EN 132 400 / IEC 60384 -14 (VDE 0565 Teil 1-1)	137027
SEMKO (Sweden)	EN 132 400 / IEC 60384 -14	312302
SEV (Switzerland)	EN 132 400 / IEC 60384 -14	03.1244
FIMKO (Finland)	EN 132 400 / IEC 60384 -14	FI 17334 A1
NEMKO (Norway)	EN 132 400 / IEC 60384 -14	P03201238
DEMKO (Denmark)	EN 132 400 / IEC 60384 -14	136122-01
VDE CB	IEC 60384-14 Table II 2nd (1993)	DE 1-30022

RECOGNITION LIST

Part Number	Safety standard	UL	CSA	VDE VDC/CB	SEMKO	SEV	FIMKO	NEMKO	DEMKO
	Sub-Class	———	———	X1,Y1	X1,Y1	X1,Y1	X1,Y1	X1,Y1	X1,Y1
	Rated Vol.	250	250	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400
JD10KY5P Y1		○	○	○	○	○	○	○	○
JD12KY5P Y1		○	○	○	○	○	○	○	○
JD15KY5P Y1		○	○	○	○	○	○	○	○
JD18KY5P Y1		○	○	○	○	○	○	○	○
JD20KY5P Y1		○	○	○	○	○	○	○	○
JD22KY5P Y1		○	○	○	○	○	○	○	○
JD25KY5P Y1		○	○	○	○	○	○	○	○
JD27KY5P Y1		○	○	○	○	○	○	○	○
JD30KY5P Y1		○	○	○	○	○	○	○	○
JD33KY5P Y1		○	○	○	○	○	○	○	○
JD36KY5P Y1		○	○	○	○	○	○	○	○
JD39KY5P Y1		○	○	○	○	○	○	○	○
JD47KY5P Y1		○	○	○	○	○	○	○	○
JD50KY5P Y1		○	○	○	○	○	○	○	○
JD56KY5P Y1		○	○	○	○	○	○	○	○
JD62KY5P Y1		○	○	○	○	○	○	○	○
JD68KY5P Y1		○	○	○	○	○	○	○	○
JD75KY5P Y1		○	○	○	○	○	○	○	○
JD82KY5P Y1		○	○	○	○	○	○	○	○

Safety Standard	Standard NO.	Recognized NO.
CSA (Canada)	CSA-22.2 No.1-98	E187963
UL (USA)	UL1414	
VDE (Germany)	EN 132 400 / IEC 60384 -14 (VDE 0565 Teil 1-1)	137027
SEMKO (Sweden)	EN 132 400 / IEC 60384 -14	312302
SEV (Switzerland)	EN 132 400 / IEC 60384 -14	03.1244
FIMKO (Finland)	EN 132 400 / IEC 60384 -14	FI 17334 A1
NEMKO (Norway)	EN 132 400 / IEC 60384 -14	P03201238
DEMKO (Denmark)	EN 132 400 / IEC 60384 -14	136122-01
VDE CB	IEC 60384-14 Table II 2nd (1993)	DE 1-30022

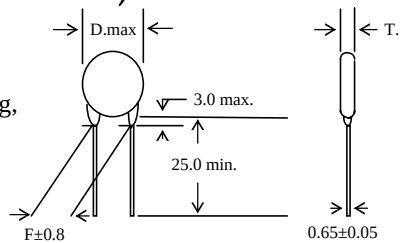
RECOGNITION LIST

Part Number	Safety standard	UL	CSA	VDE	SEMKO	SEV	FIMKO	NEMKO NEMKO/CB	DEMKO
	Sub-Class	———	———	X1,Y1	X1,Y1	X1,Y1	X1,Y1	X1,Y1	X1,Y1
	Rated Vol.	250	250	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400	X1:400 Y1:400
JD101KY5P Y1		○	○	○	○	○	○	○	○
JD151KY5P Y1		○	○	○	○	○	○	○	○
JD221KY5P Y1		○	○	○	○	○	○	○	○
JD331KY5P Y1		○	○	○	○	○	○	○	○
JD471KY5P Y1		○	○	○	○	○	○	○	○
JD561KY5P Y1		○	○	○	○	○	○	○	○
JD681KY5P Y1		○	○	○	○	○	○	○	○
JD102KY5P Y1		○	○	○	○	○	○	○	○
JD102MY5U Y1		○	○	○	○	○	○	○	○
JD152MY5U Y1		○	○	○	○	○	○	○	○
JD222MY5U Y1		○	○	○	○	○	○	○	○
JD332MY5U Y1		○	○	○	○	○	○	○	○
JD392MY5U Y1		○	○	○	○	○	○	○	○
JD472MY5U Y1		○	○	○	○	○	○	○	○

■ AC. CAPACITORS (Y2:250VAC AND 400VAC)

Applications:

- For use in circuit where alternating, pulsating, intermittent and steady high voltage exist.



Approved/Recognized Type

Related Standard		Certificate NO.	Approved Monogram
CSA (Canada)	CSA-22.2 No.1-94	LR 111243-1	
UL (USA)	UL1414	E187963	
VDE (Germany)	EN 132 400 / IEC 60384 -14 (VDE 0565 Teil 1-1)	123326	
SEMKO (Sweden)	EN 132 400 / IEC 60384 -14	312302	
SEV (Switzerland)	EN 132 400 / IEC 60384 -14	03.1245	
FIMKO (Finland)	EN 132 400 / IEC 60384 -14	FI 153165 A1	
NEMKO (Norway)	EN 132 400 / IEC 60384 -14	P03201239	
DEMKO (Denmark)	EN 132 400 / IEC 60384 -14	135948-01/A1 309805-01	
VDE CB	IEC 60384-14 Table II 2nd (1993)	DE 1-07488-A1	CB

Part Number Configuration :

JY 102 K Y5P Y2

(1) (2) (3) (4) (5)

(1) AC capacitors, safety

(2) Rated capacitance

(3) Tolerance on rated capacitance

(4) Type code: Y5P, Y5V

(5) Class Y2

Specifications:

Operating Temp. Rang	− 2 5 °C t o + 8 5 °C		
			X1
	CSA,UL		Y2
	SEMKO, SEV, FIMKO, NEMKO, DEMKO, VDE (0565 Teil 1-1)		250 VAC
Dielectric Withstanding Voltage	Rated Voltage	400 VAC	
	250 VAC	300 VAC	
	400 VAC		
Dissipation Factor (D.F)	Y5P	TAN δ ≤ 2.5%, measured at 1KHz±10%, 1.0 — 5.0 Vrms, 25°C	
	Y5V	TAN δ ≤ 5.0%, measured at 1KHz±10%, 1.0 — 5.0 Vrms, 25°C	
	Y5V		
Capacitance (C)	Range	10 pF to 10000 pF. measured at 1KHz±10%, 1.0 — 5.0 Vrms, 25°C	
	Tolerance	±10%	Y5P
		±20%	Y5V
Insulation Resistance (I R)	10000 MΩ min, 500 VDC		
Temperature Characteristics	Type Code	Cap. Change	Temp. Range
	Y5P	±10%, max.	− 2 5 °C t o + 8 5 °C
	Y5V	+30%, −80% max.	− 2 5 °C t o + 8 5 °C
	The reference temperature: 25°C		

Y2 SERIES

文件編號：P004

版 本：Q

制訂日期：2003/12/01

INTRODUCTION

These Ceramic Disc Capacitors are specifically designed for AC applications and meet the safety requirements of various safety standards agencies. These capacitors are ideal for across the line and line by-pass applications

FEATURES:

- ⊙ Ideal for across the line applications
- ⊙ Compact size
- ⊙ Cost effective product
- ⊙ Safety standards recognized for AC application:

GENERAL SPECIFICATIONS

Operating temperature range:	- 25 to 85℃
Capacitance range:	10 pF to 10000 pF
Capacitance tolerance:	K=±10%, M=±20%
Rated voltage:	125, 250 and 400 VAC. Please refer to table for approval file number.
Temperature coefficient	±10% for B (Y5P), +30 to -80% for F (Y5V)
Dissipation factor (tan δ):	Y5P: 2.5% max. at 25℃ and 1KHz, 1±0.2 Vrms. Y5V: 5.0% max. at 25℃ and 1KHz, 1±0.2 Vrms.
Insulation resistance at 25℃:	10000MΩ at 500VDC for 1 minute.
Dielectric strength:	1500 VAC for 60 seconds - AC125V, AC250V 2600 VAC for 60 seconds - AC400V

CAPACITANCE AND DIMENSIONS:

When ordering safety standard recognized ceramic capacitors please use the part number as noted above

Rated Y2, X1: AC250V AND AC400V

Dielectric strength: 1500Vac/2600Vac

PART NUMBER	T.C.	CAP.	TOL.	DIMENSION(mm)		
				D max	F	T max
JY10KY5P Y2	±10% (Y5P)	10PF	K ±10%	6.5	7.5±0.8	5
to		to		6.5	7.5±0.8	5
JY82KY5P Y2		82PF		6.5	7.5±0.8	5
JY101KY5P Y2		100PF		6.5	7.5±0.8	5
JY151KY5P Y2		150PF		6.5	7.5±0.8	5
JY221KY5P Y2		220PF		6.5	7.5±0.8	5
JY331KY5P Y2		330PF		6.5	7.5±0.8	5
JY471KY5P Y2		470PF		6.5	7.5±0.8	5
JY561KY5P Y2		560PF		7.5	7.5±0.8	5
JY681KY5P Y2		680PF		7.5	7.5±0.8	5
JY102KY5P Y2		1000PF		8.5	7.5±0.8	5
JY102MY5V Y2	+30 ~ -80% (Y5V)	1000PF	M ±20%	6.5	7.5±0.8	5
JY152MY5V Y2		1500PF		7.5	7.5±0.8	5
JY222MY5V Y2		2200PF		7.5	7.5±0.8	5
JY332MY5V Y2		3300PF		9.5	7.5±0.8	5
JY392MY5V Y2		3900PF		9.5	7.5±0.8	5
JY472MY5V Y2		4700PF		10.5	7.5±0.8	5
JY682MY5V Y2		6800PF		11.5	9.5±0.8	5
JY822MY5V Y2		8200PF		13.5	9.5±0.8	5
JY103MY5V Y2		10000PF		15	9.5±0.8	5
JY103MY5V075 Y2		10000PF		15	7.5±0.8	5

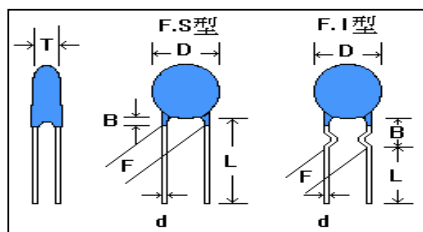
Dimensions and Tolerance

B = 3.0 mm max for AA

d = 0.65 mm ±0.05 mm

F = 7.5 or 9.5 ±0.8 mm

L = 5 ~ 25 mm.



⊙ According as customer's request and size.

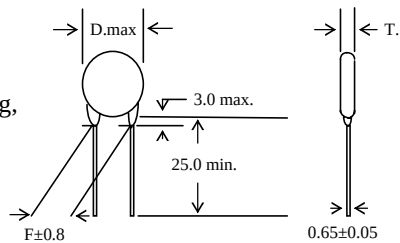


Y2, X1 AC250V, AC400V

■ AC. CAPACITORS (Y1:400VAC)

Applications:

- For use in circuit where alternating, pulsating, intermittent and steady high voltage exist.



Approved/Recognized Type

Related Standard		Certificate NO.	Approved Monogram
CSA (Canada)	CSA-22.2 No.1-98	E187963	
UL (USA)	UL1414		
VDE (Germany)	EN 132 400 / IEC 60384 -14 (VDE 0565 Teil 1-1)	137027	
SEMKO (Sweden)	EN 132 400 / IEC 60384 -14	312302	
SEV (Switzerland)	EN 132 400 / IEC 60384 -14	03.1244	
FIMKO (Finland)	EN 132 400 / IEC 60384 -14	FI 17334 A1	
NEMKO (Norway)	EN 132 400 / IEC 60384 -14	P03201238	
DEMKO (Denmark)	EN 132 400 / IEC 60384 -14	136122-01	
VDE CB	IEC 60384-14 Table II 2nd (1993)	DE 1-30022	CB

Part Number Configuration :

JD 102 K Y5P Y1

(1) (2) (3) (4) (5)

(1) AC capacitors, safety

(2) Rated capacitance

(3) Tolerance on rated capacitance

(4) Type code: Y5P, Y5U

(5) Class Y1

Specifications:

Operating Temp. Rang	- 2 5 °C t o + 8 5 °C		
			X1
	CSA,UL		Y1
	250 VAC		
Dielectric Withstanding Voltage	SEMKO, SEV, FIMKO, NEMKO, DEMKO, VDE (0565 Teil 1-1)		400 VAC
	Rated Voltage		400 VAC
	400 VAC		400 VAC
Test Voltage			4000 VAC for 1 min.
Dissipation Factor (D.F)	Y5P	TAN $\delta \leq 2.5\%$, measured at 1KHz $\pm 10\%$, 1.0 — 5.0 Vrms, 25°C	
	Y5U	TAN $\delta \leq 2.5\%$, measured at 1KHz $\pm 10\%$, 1.0 — 5.0 Vrms, 25°C	
Capacitance	Range	10 pF to 4700 pF. measured at 1KHz $\pm 10\%$, 1.0 — 5.0 Vrms, 25°C	
(C)	Tolerance	$\pm 10\%$	Y5P
		$\pm 20\%$	Y5U
Insulation Resistance (I R)	10000 M Ω min, 500 VDC		
Temperature Characteristics	Type Code	Cap. Change	Temp. Range
	Y5P	$\pm 10\%$, max.	- 2 5 °C t o + 8 5 °C
	Y5U	+ 20%, - 55% max.	- 2 5 °C t o + 8 5 °C
	The reference temperature: 25°C		

Y1 SERIES

INTRODUCTION

These Ceramic Disc Capacitors are specifically designed for AC applications and meet the safety requirements of various safety standards agencies. These capacitors are ideal for across the line and line by-pass application:

FEATURES:

- ⊙ Ideal for across the line application
- ⊙ Compact size
- ⊙ Cost effective product
- ⊙ Safety standards recognized for AC application

GENERAL SPECIFICATIONS

Operating temperature range:	- 25 to 85°C
Capacitance range:	10 pF to 4700 pF
Capacitance tolerance:	K=±10%, M=±20%
Rated voltage:	400 VAC. Please refer to table for approval file number
Temperature coefficient	±10% for B (Y5P), +20 to -55% for F (Y5U)
Dissipation factor (tan δ):	Y5P: 2.5% max. at 25°C and 1KHz, 1± 0.2 Vrms. Y5U: 2.5% max. at 25°C and 1KHz, 1± 0.2 Vrms.
Insulation resistance at 25°C:	10000MΩ at 500VDC for 1 minute.
Dielectric strength:	4000 VAC for 60 seconds - AC400V

CAPACITANCE AND DIMENSIONS:

When ordering safety standard recognized ceramic capacitors please use the part number as noted above

Rated : Y1, X1:AC400V Dielectric strength: 4000Vac

PART NUMBER	T.C.	CAP.	TOL.	DIMENSION(mm)		
				D max	F	T max
JD10KY5P Y1	±10% (Y5P)	10PF	K ±10%	6.5	9.5±0.8	6
to		to		6.5	9.5±0.8	6
JD82KY5P Y1		82PF		6.5	9.5±0.8	6
JD101KY5P Y1		100PF		7.5	9.5±0.8	6
JD151KY5P Y1		150PF		7.5	9.5±0.8	6
JD221KY5P Y1		220PF		7.5	9.5±0.8	6
JD331KY5P Y1		330PF		7.5	9.5±0.8	6
JD471KY5P Y1		470PF		8.5	9.5±0.8	6
JD561KY5P Y1		560PF		9.5	9.5±0.8	6
JD681KY5P Y1		680PF		10.5	9.5±0.8	6
JD102KY5P Y1		1000PF		11.5	9.5±0.8	6
JD102MY5U Y1	+20 ~ -55% (Y5U)	1000PF	M ±20%	7.5	9.5±0.8	6
JD152MY5U Y1		1500PF		8.5	9.5±0.8	6
JD222MY5U Y1		2200PF		9.5	9.5±0.8	6
JD332MY5U Y1		3300PF		11.5	9.5±0.8	6
JD392MY5U Y1		3900PF		13.5	9.5±0.8	6
JD472MY5U Y1		4700PF		13.5	9.5±0.8	6

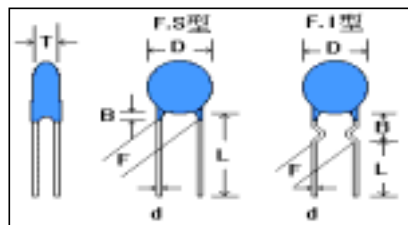
Dimensions and Tolerance

B= 3.0 mm max for AA

d=0.65 mm ±0.05 mm

F= 9.5 ±0.8 mm

L= 5 ~ 25 mm.



© According as customer's request and size

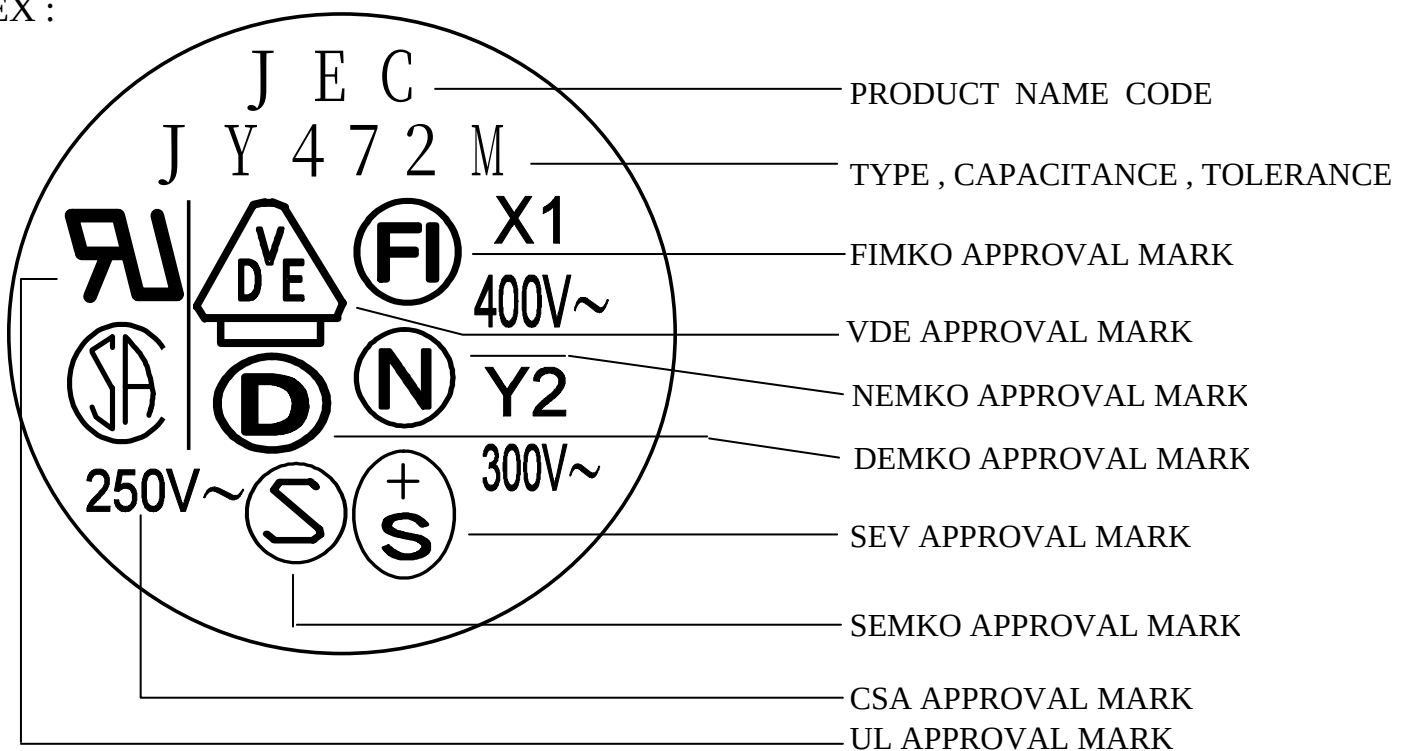


Y1, X1 AC400V

MARKING

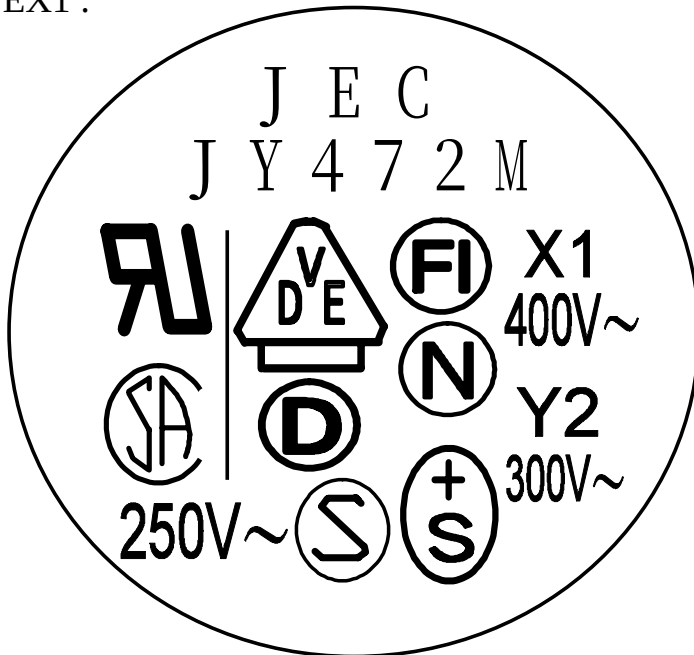
VDE APPROVAL MARK		SEMKO APPROVAL MARK	
UL APPROVAL MARK		NEMKO APPROVAL MARK	
FIMKO APPROVAL MARK		DEMKO APPROVAL MARK	
SEV APPROVAL MARK		CSA APPROVAL MARK	
The People's Republic of China APPROVAL MARK		UL AND CSA APPROVAL MARK	
COMPANY NAME CODE	JEC	TYPE DESIGNATION	JY (for Y2) or JD (for Y1)
NOMINAL CAPACITANCE	3 - DIGIT - SYSTEM : 472 = 4700 PF : 103 = 10000 PF		
CAPACITANCE TOLERANCE	CODE : K = ±10% , M = ±20%		

EX :

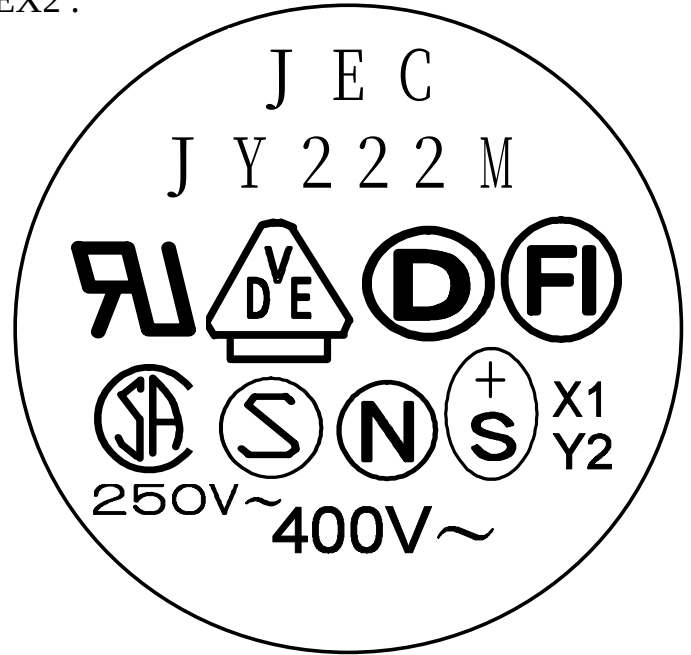


MARKING : (FOR Y2)

EX1 :

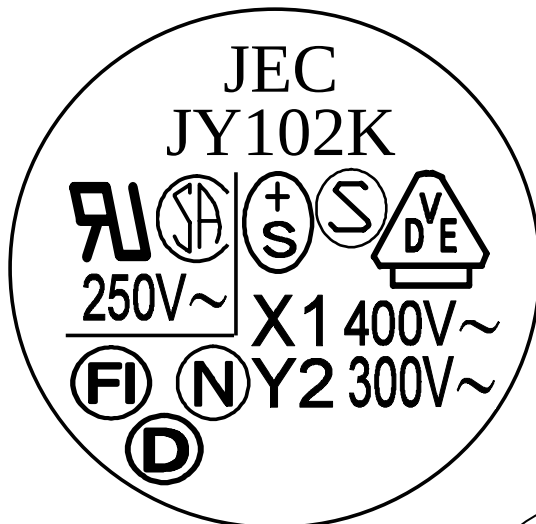


EX2 :

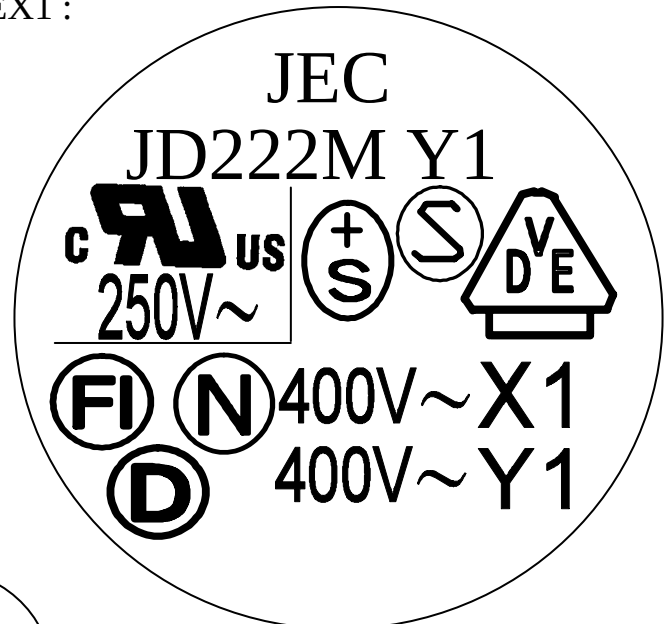


MARKING : (FOR Y1)

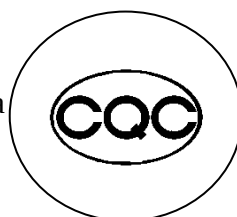
EX3 :



EX1 :



EX5 : Made In
The People's Republic of China
back marking



性能與試驗

編號	項 目		性 能	試 驗 方 法	
1	外觀及 尺寸		參考第 5、8 與 11 頁 之圖表	1~1 1~2	生產線必須做全數外觀檢驗並分別剔除不良品。 尺寸利用微測儀或卡尺測量。
2	記號標示		必須乾淨及清晰。	2~1	標示需能承受異丙醇擦拭。
3	耐 電 壓 (I)	端子間	無異常。	3~1	額定電壓：250Vac for Y2 試驗電壓 1500 VAC，時間一分鐘 額定電壓：400Vac for Y2 試驗電壓 2600 VAC，時間一分鐘 額定電壓：400Vac for Y1 試驗電壓 4000 VAC，時間一分鐘
		端子、封裝間	無異常。	3~2	額定電壓：250Vac 或 400Vac for Y2 試驗電壓 2000 VAC，時間一分鐘 額定電壓：400Vac for Y1 試驗電壓 4000 VAC，時間一分鐘
4	耐電壓(III) (適用於安全 性能符號A2)		(1)紗布須不引燃。 (2)電容器須不冒煙。	4~1	依CNS 3432，11節規定
5	耐電壓(IV) (適用於安全 性能號B2)		(3)元件與封裝須不散飛。 (4)端子不能移動離開安裝 位置3mm以上。	5~1	依CNS3432, 12節規定
6	絕 緣 電 阻	端子間	10000MΩ以上。	6~1	測定電壓為500±50V，在一分鐘內要在規定值 內。
		端子、封裝間	10000MΩ以上。		
7	靜電容量		必須符合要求之容許差規 格內。	7~1 7~2 7~3	測定溫度25±2℃ 測定電壓：1~5Vrms以下 測定頻率：1KHz±10%
8	Q值		Q(CCS)值： 特性SL 1000以上。 特性YN 500以上。	8~1	與第7項同。
	或散逸因數		散逸因數(CKS)： 特性：B, E 2.5%以下。 特性：F 5.0%以下。		

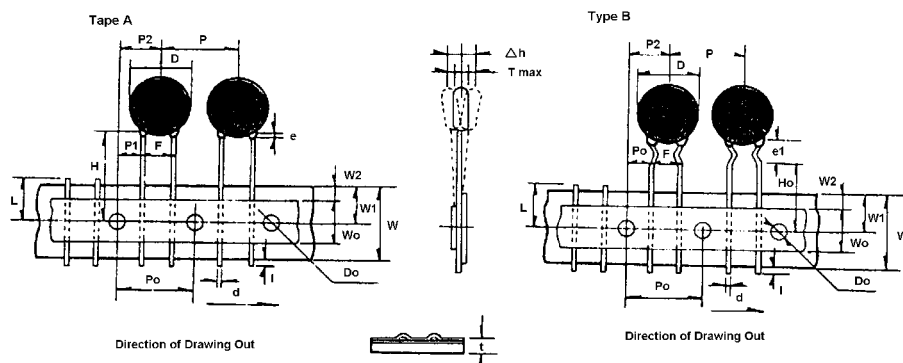
編號	項目	性能		試驗方法				
9	靜電容量 溫度特性	溫度係數(CCS)：		9~1	溫度係數：(CCS) PPM/°C = C _{t2} － C _{t1} /C _{t1} *(t2－t1) C _{t2} ：在t2時之容量值 C _{t1} ：在t1時之容量值 t2：85°C±3°C t1：20°C±2°C			
		溫特性 度範圍	SL				YN	
		20~85°C	+ 350~ － 1000 ppm／°C				－ 800~ － 5800 ppm／°C	
		使用溫度特性(CKS)： 範圍內之靜電容量變化率： 特性B 變化率 ±10%以內 特性E 變化率 +20% －55%以內 特性F 變化率 +30% －80%以內		9~2	溫度階段 1、20±2°C→2、－25±2°C →3、20±2°C→4、85±2°C →5、20±2°C 9~3 容量變化率：(CKS) C.C(%)=(C _{tx} －C _{t20})/C _{t20} *100 C _{tx} ：溫度階段1、3、5除外，2 到4之間任何溫度時之容量 值。 C _{t20} ：溫度階段3時之容量值。			
10	端子強度	抗拉強度	導線不斷裂，電容器不破損	10~1	線徑(mm)	負荷重kgs	時間(秒)	
					0.5Φ	0.5	10	
					0.6Φ~0.8Φ	1	10	
		彎曲強度	導線不致被折斷，電容器不破損。	10~2	製品固定，負荷施力方向為端子引出之方向。			
					10~3	線徑(mm)	負荷重kgs	彎曲角度為 90° 兩回以上。
						0.5Φ	0.25	
11	耐振性	外觀	無顯著之異常	11~1	振動頻率10→55→10HZ一分鐘內完全成覆振動全振幅1.5mm.。			
		容量變化	在規格範圍內					
		Q或散逸 因數	在初期規格內					
12	焊 錫 耐 熱 性	外觀	無顯著異常	12~1	焊錫溫度350±10°C			
		耐電壓(I) (端子間)	合於編號3之性能	12~2	浸漬時間3.5±0.5秒			
		靜電容量 變化率	CCS： 特性SL ±2.5%以內 特性YN ±10%以內	12~3	在常溫常濕中放置4~24小時後測定之。			
			CKS： 特性B ±10%以內 特性E ±15%以內 特性F ±20%以內					

編號	項目	性能	試驗方法
13	焊錫之付著性	導線之橫截面積上須有圓周之3/4以上之面積為焊錫所付著。	13~1 13~2 焊錫溫度為 $235\pm 5^{\circ}\text{C}$ 浸漬時間為 2 ± 0.5 秒。
14	耐濕性 (穩定狀態)	外觀 耐電壓(I)(端子間) 絕緣電阻 端子間 端子、封裝間 靜電容量變化率 Q值或散逸因數	無顯著異常 合於編號3之規定。 編號6所規定值之1/2以上。 CCS： 特性SL $\pm 5\%$ 以內。 特性YN $\pm 10\%$ 以內。 CKS： 特性B $\pm 15\%$ 以內。 特性E $\pm 20\%$ 以內。 特性F $\pm 30\%$ 以內。 Q(CCS)值： 特性SL、YN 250以上 散逸因數(CKS)： 特性B、E 5%以下。 特性F 7.5%以下。
15	耐濕負荷	外觀 耐電壓(I)(端子間) 絕緣電阻 端子間 端子、封裝間 靜電容量變化率 Q質或散逸因數	15~1 15~2 15~3 15~4 15~5 15~6 溫度： $40\pm 2^{\circ}\text{C}$ 濕度：90~95%RH 時間： 500 ± 12 小時 電壓：依交流180Vrms印加之。 電流：50mA以下。 取出置常溫下1~2小時後測定之

編號	項	目	性	能	試	驗	方	法
16	高溫負荷 (連續)	外觀	無顯著異常		16~1	溫度：85±3℃		
		耐電壓(I)(端子間)	合於編號3之規定		16~2	時間：1000±12小時		
		絕緣電阻	端子間	編號6所規定值1/2以上	16~3	電壓：依額定電壓印加之。		
			端子、封裝間		16~4	電流：50mA以下。		
		靜電容量變化率		CCS： 特性SL ±5%以內。 特性YN ±10%以內。 CKS： 特性B ±15%以內。 特性E ±20%以內。 特性F ±30%以內。	16~5	取出置常溫下1~2小時後測定之		
17	耐燃性	Q值或散逸因數		Q(CCS)值： 特性SL、YN 250以上。 散逸因數(CKS)： 特性B、E 5%以下。 特性F 7.5%以下。		試驗開始後，在第1次及第2次移開試驗火焰後，不得燃燒15秒以上或不爆炸。而且在第3次後，繼續燃燒1分鐘而不爆炸。		
18	耐溶劑性 (本体)	將樣本完全浸漬於異丙醇溶劑中5±0.5分後取出，觀察本體有無溶解，而後放置於常溫中48小時後，量測其電氣特性。				試驗后其電性能須符合標準		
19	耐溶劑性 (標志)					使用棉紗沾溶劑異丙醇，以每1平方公分5±0.5N之力，1秒鐘來回兩次擦拭本體上的標示，往返5次。標志應清晰可辨		

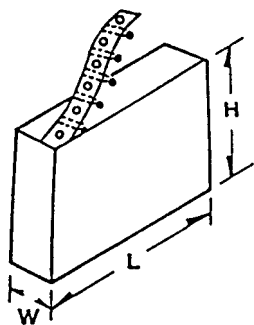
TAPING SPECIFICATIONS

Taping (Radial)-- Lead Spacing $F=5.0\pm0.8$



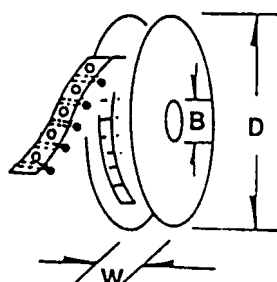
Item		Code	Dimensions (mm)	Item		Code	Dimensions (mm)
Taping Pitch		P	12.7 ± 1.0	Lead Protrusion		l	$+0.5\sim1.0$
Guide Pitch		Po	12.7 ± 1.0	Diameter of Feed Hole		Do	4.0 ± 0.3
Lead Spacing		F	5.0 ± 0.8	Diameter of Lead		d	$0.6^{+0.06}_{-0.05}$
Feed Hole Position Capacitor Body		P2	6.35 ± 1.3	Total Thickness of Tape		t	0.7 ± 0.2
Feed Hole Position Capacitor Lead		P1	3.85 ± 0.7	Thickness of Capacitor Body		T	Differ in each product
Diameter Of Disco		D	See table of each series	Alignment to FR. Direction		Δ h	0 ± 2.0
				Length of Snipped Lead		L	$11.0^{+0}_{-1.0}$
Width Of Base Tape		W	18.0 ± 0.5	Width of Hold-down Tape		W0	12.5
Feed Hole Vertical Position		W1	$9.0^{+0.75}_{-0.05}$	Hold-down Tape Position		W2	1.5 ± 1.5
Taping Height	For Straight	Ho	16.0 ± 0.5	Coating Extension		e	3.0以下
	For Crimp	H	$20^{+1.5}_{-1.0}$			e1	up to center of crimp

AMMO PACK



$$\begin{aligned} H &= 241\pm5 \text{ mm} \\ L &= 332\pm5 \text{ mm} \\ W &= 42 \pm 3 \text{ mm} \end{aligned}$$

REEL



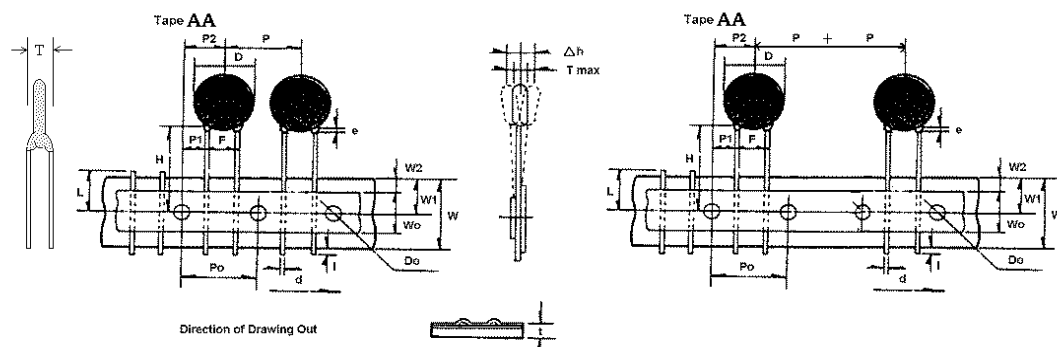
$$\begin{aligned} D &\leq 354(13.93) \\ B &\geq 21(.83') \text{ but} \\ &\leq 30(1.18") \\ W &\leq 55(2.16) \end{aligned}$$

Acceptable to standard radial type cartridge.

Acceptable to standard radial type cartridge with a few extra accessories. Reeled axials are also acceptable to standard axial type cartridge with a few accessories.

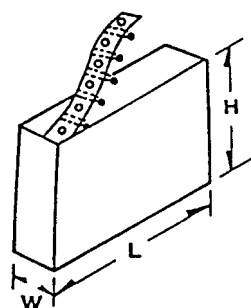
TAPING SPECIFICATIONS

Taping (Radial) -- Lead Spacing $F = 5.0 \pm 0.8$ or 7.5 ± 0.8 or 9.5 ± 0.8



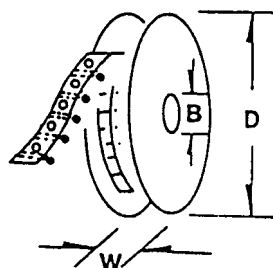
Item	Code	Dimensions (mm)	Item	Code	Dimensions (mm)
Taping Pitch	P	12.7 ± 1.0	Lead Protrusion	l	$+0.5 \sim 1.0$
Guide Pitch	Po	12.7 ± 1.0	Diameter of Feed Hole	Do	4.0 ± 0.3
Lead Spacing	F	5.0 ± 0.8 7.5 ± 0.8 9.5 ± 0.8	Diameter of Lead	d	$0.65^{+0.06}_{-0.05}$
Feed Hole Position Capacitor Body	P2	6.35 ± 1.3	Total Thickness of Tape	t	0.7 ± 0.2
Feed Hole Position Capacitor Lead	P1	3.85 ± 0.7	Thickness of Capacitor Body	T	Differ in each product
Diameter Of Diso	D	See table of each series	Alignment to FR. Direction	Δh	0 ± 2.0
Width Of Base Tape	W	18.0 ± 0.5	Length of Snipped Lead	L	$11.0^{+0}_{-1.0}$
Feed Hole Vertical Position	W1	$9.0^{+0.75}_{-0.05}$	Width of Hold-down Tape	W0	12.5
Taping Height	For Straight	Ho	Hold-down Tape Position	W2	1.5 ± 1.5
	For Crimp	H	Coating Extention	e	3.0以下
		$20^{+1.5}_{-1.0}$		e1	up to center of crimp

AMMO PACK



$$\begin{aligned} H &= 241 \pm 5 \text{ mm} \\ L &= 332 \pm 5 \text{ mm} \\ W &= 42 \pm 3 \text{ mm} \end{aligned}$$

REEL



$$\begin{aligned} D &\leq 354(13.93) \\ B &\geq 21(.83') \text{ but} \\ &\leq 30(1.18'') \\ W &\leq 55(2.16) \end{aligned}$$

Acceptable to standard radial type cartridge.

Acceptable to standard radial type cartridge with a few extra accessories. Reeled axials are also acceptable to standard axial type cartridge with a few accessories.

QUARTZ CRYSTAL RESONATOR

CS1B Series (SMD TYPE) 1.6x1.0mm

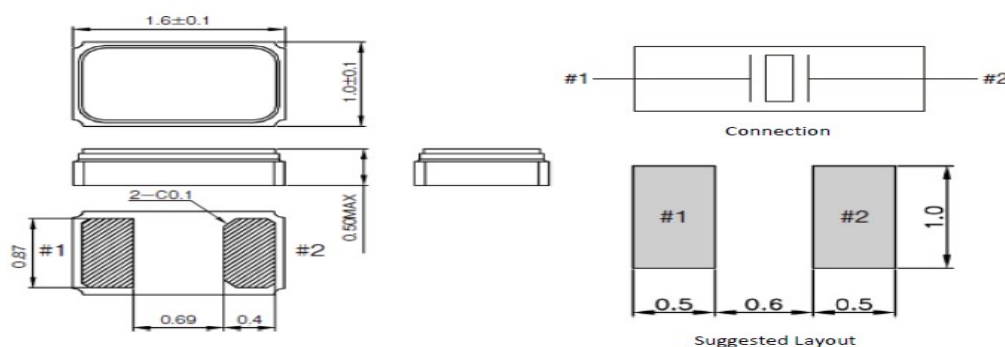
Features

- * Ultra small size 1.6x1.0x0.5mm
- * High reliability environmental performance
- * High frequency stability and high precision
- * Designed for automatic mounting and reflow solder
- * RoHS Compliant / Pb Free



Item	Specifications	
Frequency Range	32.768Khz	Need to specify
Load Capacitance	6pF, 7pF, 9pF, 12,5pF	Need to specify
Frequency Tolerance	±20ppm	at 25°C, need specify
Operating Temperature Range	-40°C to +85°C	Please specify
Frequency Temperature Curve	$(-0.036 \pm 10\%) \times 10^{-6}/^{\circ}\text{C}^2$	
Turnover Temperature	25± 5°C	
Equivalent Series Resistance (ESR) Max.	90K Ω	
Driver Level (Typical)	0.1 μW	
Driver Level (Max)	0.5 μW	
Shunt Capacitance	1.3pF Max.	
Insulator Resistance	500 MΩ, DC100V±15V	
Storage Temperature Range	-55°C to +125°C	
Aging	±3ppm/year	

Dimensions (mm)



How to order

CS1B	32.768 K	3	12	R
Series	Frequency	Operating Temp.	Load capacitance	Package
CS1B size: 1.6x1.0x0.5mm	32.768Khz	1= -10°C~+60°C 2= -20°C~+70°C 3= -40°C~+85°C	10=10pF 20=20pF 30=30pF 32=32pF or specify	R = Tape Reel

MSC

Reliability Specifications

Item	Conditions	Result
Low Temp. Storage	After storage under -40 °C for 1000 hours, measure at room temperature. (* 1 * 3)	$\Delta f/f_0 = \pm 20\text{ppm}$
High Temp. Storage	After storage under 125 °C for 1000 hours, measure at room temperature. (* 1 * 3)	$\Delta f/f_0 = \pm 20\text{ppm}$
High Temp & Humidity	After storage under +85±2°C ,85 % RH for 1000h, measure at room temperature. (* 1 * 3)	$\Delta f/f_0 = \pm 20\text{ppm}$
Thermal Shock	Measure at room temperature after 100 cycles. -55°C ⇔ +125°C for 30 minutes. (* 1 * 3)	$\Delta f/f_0 = \pm 20\text{ppm}$
IR Reflow	Measure after 2 time reflow under reflow profile specified (* 1)	$\Delta f/f_0 = \pm 20\text{ppm}$
Mechanical shock	Measure after 100g-dummy (SII Standard) drop from 1500mm height on the concrete 3 directions 10times. (* 2)	$\Delta f/f_0 = \pm 20\text{ppm}$
Vibration Test	Amplitude 1.5mm and 10~60Hz with cycle time 2~3 minutes in 3 direction (X,Y,and Z axis) each for 2 h. (* 2)	$\Delta f/f_0 = \pm 20\text{ppm}$
Shear strength	Pressuring force 10N×10±1sec. according to IEC60068-2-21, Measure after 2 hours left at room temperature. (* 2)	No peeling-off
Peel strength	Pressuring force 10N×10±1sec. according to IEC60068-2-21 (* 2)	No peeling-off
Bending test	ending: 3mm×5±1sec. Thickness of the testing board: 1mm. (* 2)	No peeling-off

1. Each test shall be done independently. (not in series tests)

*1: Measure after 24 hours left at room temperature.

*2: Measure after 2 hours left at room temperature.

*3: Pre conditions

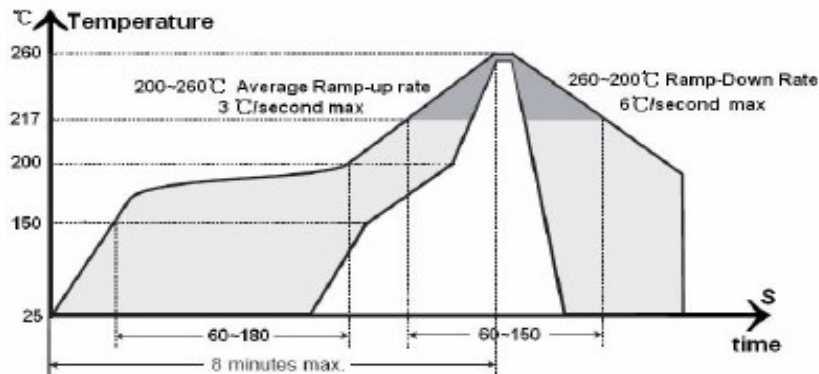
2 IR Reflow : 2 times

3 Initial values shall be measured after 24 hours at room temperature.

4 Shift in series resistance after the above tests shall be less than ±20% or less than ±20kΩ. In case of resistance to IR reflow and high temperature storage(±125°C for 1000 hours) , shift in series resistance after the above tests shall be less than ±30% or ±30kΩ.

Reflow Profile

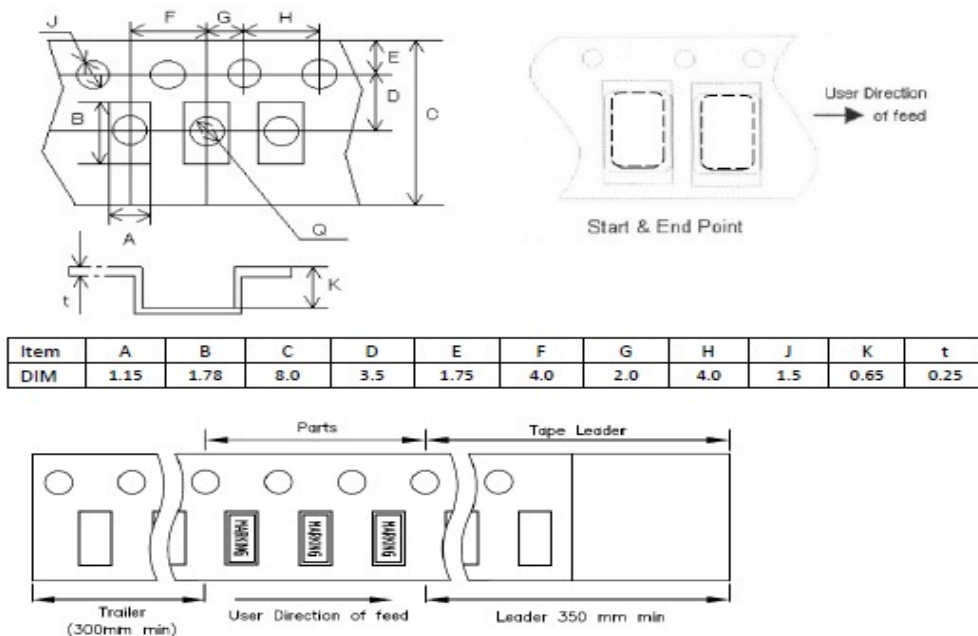
Tape Specification



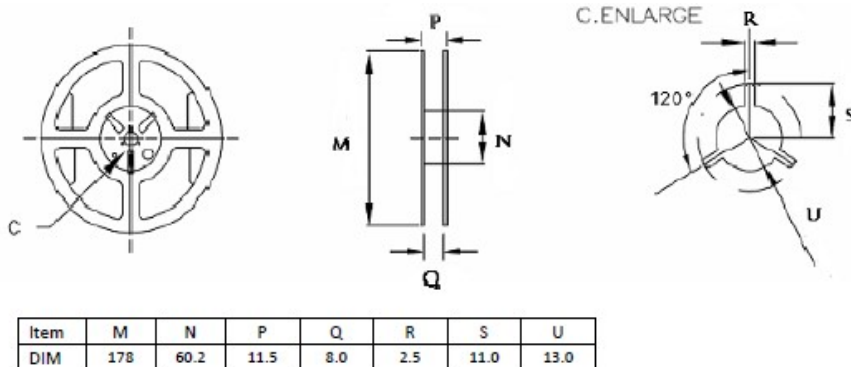
Peak temperature, 260°C $\pm$ 5 °C (10sec. max.) Reflow is permitted 2 times

Packing Specifications (Unit: mm)

Tape Specification



Outline Dimension



Reel Q'ty: 3000pcs/Reel

MSC

Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

QUARTZ CRYSTAL

CS2B Series (SMD TYPE) 3.2x1.5mm

Features

- Suited for portable devices with low current consumption
- Small size, Tape Reel and reflow available
- RoHS Compliant / Pb Free

Specifications

Frequency Range	F_o	32.768Khz
Frequency Tolerance (at 25°C)	$\Delta f/f_o$	±5ppm, ±10ppm, ±15ppm, ±20ppm,
Frequency Temperature Curve	$\Delta f/f_o$	-0.034±0.006 ppm/(°C) ²
Turnover temperature	T_m	25±5°C
Operating Temperature Range	T_{OPR}	-40°C to 85°C
Storage Temperature Range	T_{STG}	-55°C to 125°C
ESR		70K ohm Max
Series resistance	R_1	50 KΩ, REF TO 25°C
Shunt Capacitance	C_o	1.3PF TYP
Motional Capacitance	C_1	0.0030TYP
Load Capacitance	C_L	6pF, 7pF, 9pF, 12.5pF
Insulator Resistance	IR	500 MΩ, DC100V±15V
Drive Level	DL	1μW Max
Capacitance ratio	r	450TYP
Aging	$\Delta f/f_o$	±3PPM at 25°C ±3°C
Sealing		1×10 ⁻² uPa·m ³ /s MAX
Shock resistance		±5PPM MAX Drop test of 3 times on hard board from 75cm height or shock test of 3000G×0.3ms×1/2 sin wave ×3 directions

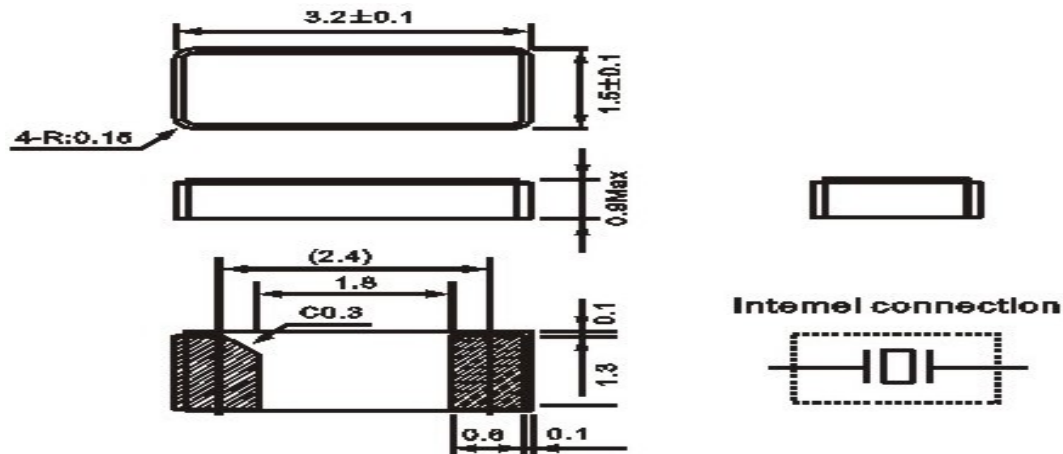
How to order

CS2B	32.768 K	3	12	R
Series	Frequency	Operating Temp.	Load capacitance	Package
CS2B = size:3.2x1.5 mm	32.768Khz	1= -10°C~+60°C 2= -20°C~+70°C 3= -40°C~+85°C	6 = 6pF 7 = 7pF 9 = 9pF 12 = 12.5pF or specify	R = Tape Reel

QUARTZ CRYSTAL

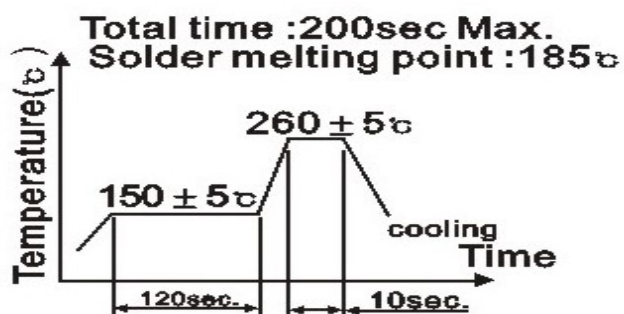
CS2B Series (SMD TYPE) 3.2x1.5mm

Dimensions (mm)

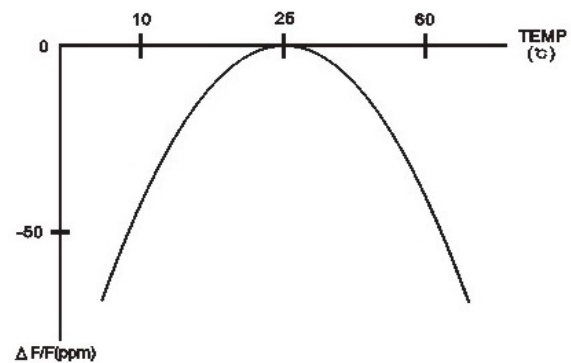


© Notice: Don't connect #2 and #3 to external device.

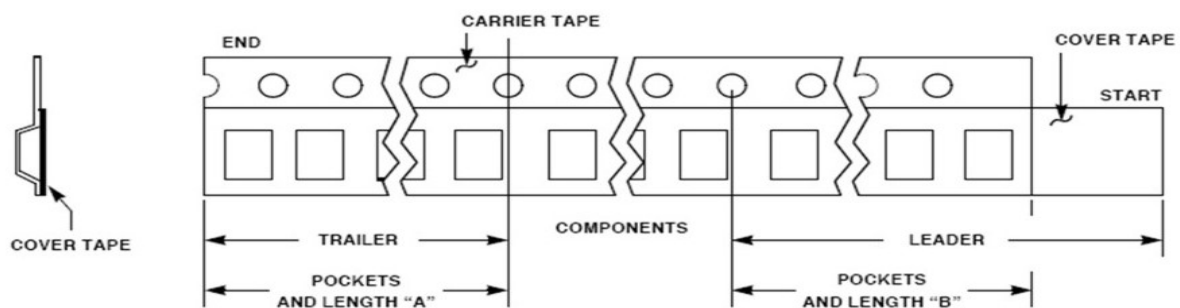
Reflow Condition



Frequency vs. Temperature Curve



Taping Specification (mm)



MSC

Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

QUARTZ CRYSTAL

CS4B Series (SMD TYPE) 12.4x4.8mm

Features

- Suited for portable devices with low current consumption
- Frequency Range : 3.579~27Mhz
- RoHS Compliant / Pb Free



Specifications			Conditions
Frequency Range	F_O	3.579~27.0 Mhz (Fund.)	Need to specify
Frequency Tolerance	$\Delta f/f_o$	$\pm 15\text{PPM}$, $\pm 30\text{PPM}$, $\pm 50\text{PPM}$	at 25°C, need specify
Frequency Tol. Over temp.		$\pm 30\text{PPM}$ or $\pm 50\text{PPM}$	Please specify
Operating Temperature Range	T_{OPR}	-10°C to 60°C, -20°C to 70°C	Please specify
Storage Temperature Range	T_{STG}	-40°C to 85°C or -55°C to 125°C	
Series resistance	R_1	Refer to the table as below:	at 25°C
Load Capacitance	C_L	10PF ~ 32pF	Need to specify
Shunt Capacitance	C_O	5.0PF Max.	
Drive Level	DL	10~100μW	
Aging	$\Delta f/f_o$	$\pm 5\text{PPM}$ at 25°C $\pm 3^\circ\text{C}$	
Insulator Resistance	IR	500 MΩ, DC100V $\pm$ 15V	

Remark: specifications subject to change without prior notice. Please confirm with our sales engineer.

Series Resistance

Freq. Rang	3.579~4.499Mhz	4.5~4.999Mhz	5.0~6.999Mhz	7.0~9.999Mhz	10~11.999Mhz	12~13.999Mhz	14~15.999Mhz	16~27Mhz
Mode	Fund.	Fund.	Fund.	Fund.	Fund.	Fund.	Fund.	Fund.
Series Resistance	150 ohm Max.	130 ohm Max.	120 ohm Max.	100 ohm Max.	80 ohm Max.	70 ohm Max.	50 ohm Max.	35 ohm Max.

Frequency Stability over temperature

Temp. Range	Frequency Stability			
	$\pm 10\text{PPM}$	$\pm 20\text{PPM}$	$\pm 30\text{PPM}$	$\pm 50\text{PPM}$
-10°C ~ +60°C	V	V	V	V
-20°C ~ +70°C		V	V	V
-40°C ~ +85°C				V

How to order

CS4B	27.0M	1	20	R
Series	Frequency	Operating Temp.	Load capacitance	Package
CS4B	3.579~ 27.0Mhz	1= -10°C ~ +60°C 2= -20°C ~ +70°C 3= -40°C ~ +85°C	10=10pF 20=20pF 30=30pF 32=32pF or specify	R = Tape Reel

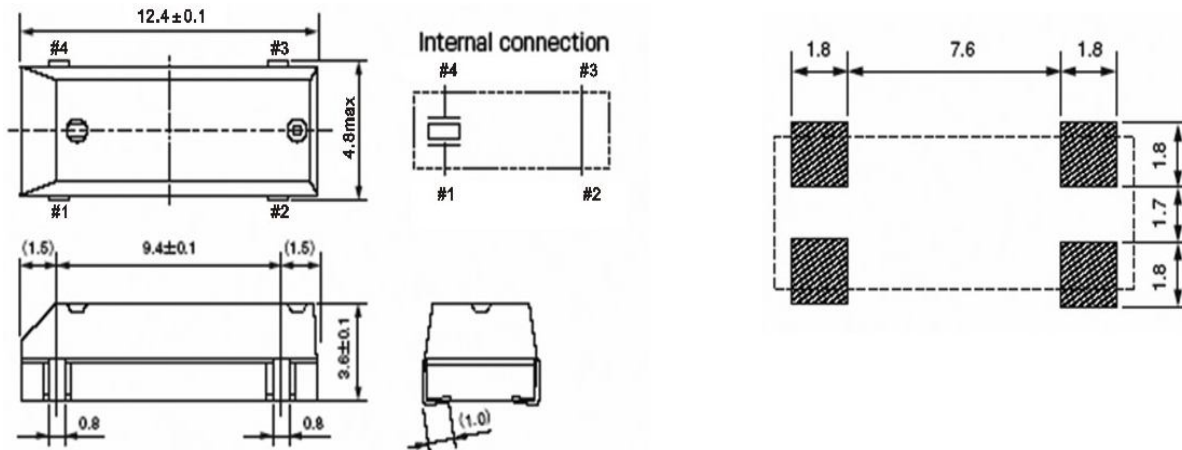
MSC

Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

QUARTZ CRYSTAL

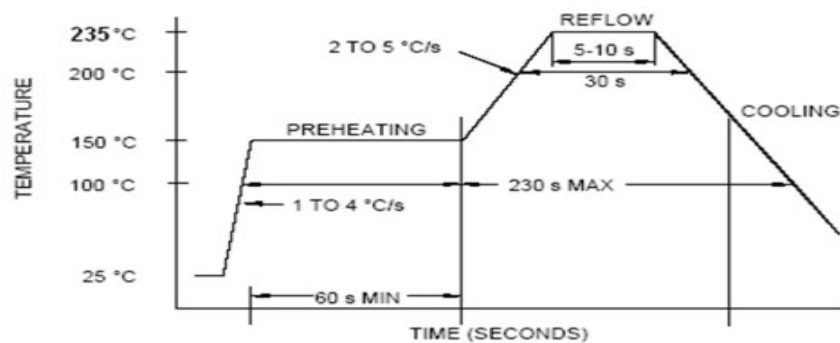
CS4B Series (SMD TYPE) 12.4x4.8mm

Dimensions (mm)

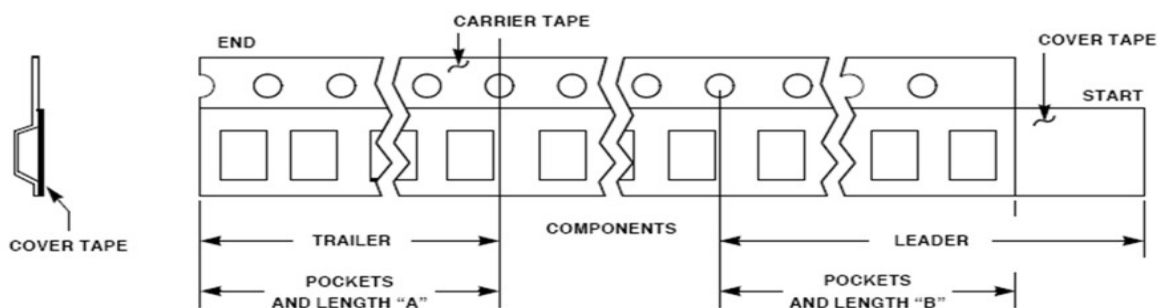


© Notice: Don't connect #2 and #3 to external device.

Reflow Condition



Taping Specification (mm)



MSC

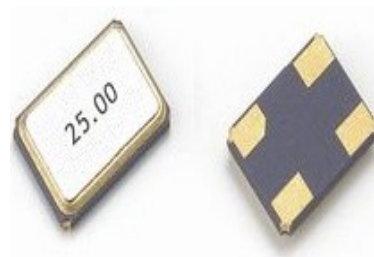
Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

QUARTZ CRYSTAL

SMD Crystal - C2025 Series

Features

- High precision characteristic covering up to high frequency range
- Designed for automatic mounting and reflow soldering
- Dthe best choice of Bluetooth wireless communication sets, DSN, PDA and mobile phone



Specifications

Holder Type	SMD 2.0x2.5
Frequency Range	20.000Mhz ~ 50.000Mhz
Operating Temperature Range	-10°C to +60°C to -40°C to +85°C
Storage Temperature Range	- 40°C to +85°C typical
Drive Level	100μW typical
Load Capacitance	8pF ~ 32pF or Series
Frequency Tolerance	±30ppm or custom-designed
Frequency Stability	±30ppm or custom-designed
Shunt Capacitance	7.0pF Max.
Insulation Resistance	500MΩ Min. at DC 100V
Aging (at 25°C)	±5ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

Frequency Range	ESR(Ω)	Mode	Frequency Range	ESR(Ω)	Mode
20.000 ~ 29.999	80 Max.	Fundamental	40.000 ~ 50.000	40 Max.	Fundamental
30.000 ~ 39.999	60 Max.	Fundamental			

How to order

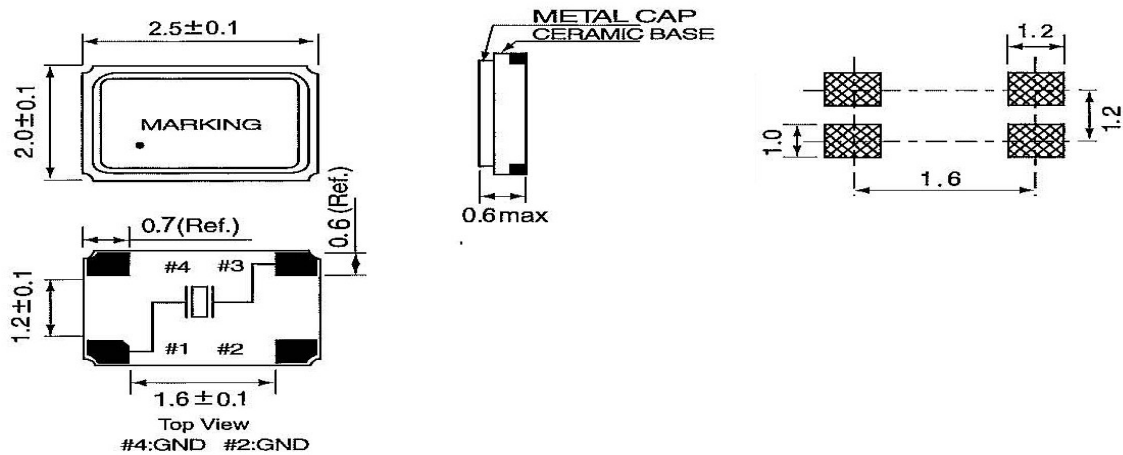
C2025	27.12M	20	2	1	R
Series	Frequency	Load capacitance	Frequency Tol.	Frequency Tol.	Package
C2025=2.0x2.5mm	20= 20Mhz	10=10pF	2 = 20ppm	1= -10°C~+60°C	R = Tape Reel
C3225=3.2x2.5mm	25= 25Mhz	20=20pF	3 = 30ppm	2= -20°C~+70°C	
C4025=4.0x2.5mm	30= 30Mhz	30=30pF	4 = 40ppm	3= -40°C~+85°C	
C5032=5.0x3.2mm	40= 40Mhz	or specify	5 = 50ppm		
C6035=6.0x3.5mm					
C7050=7.0x5.0mm					

MSC

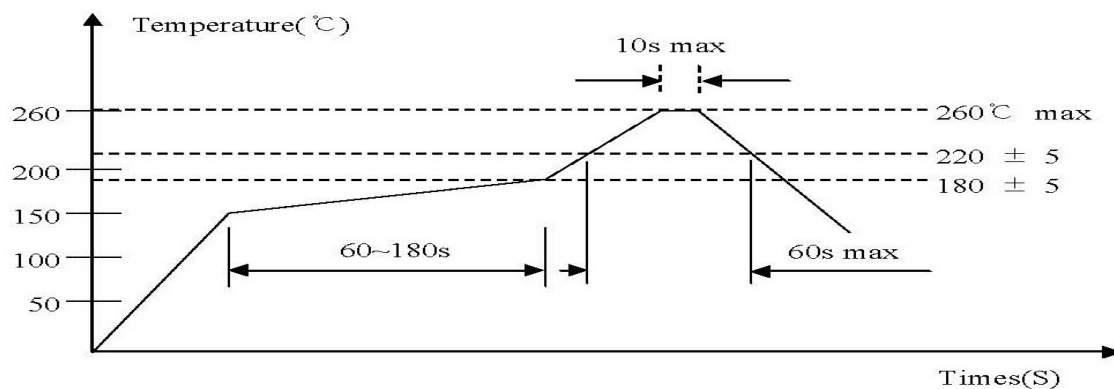
QUARTZ CRYSTAL

SMD Crystal - C2025 Series

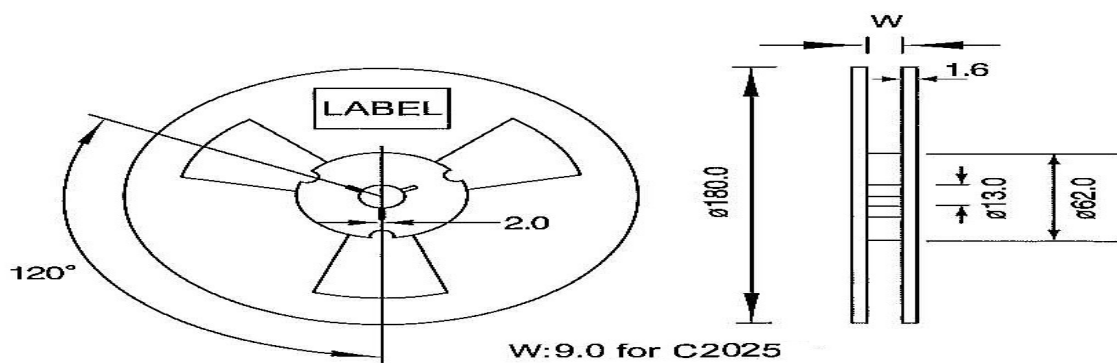
Dimensions (mm)



Reflow Condition



Reel Packing (mm)



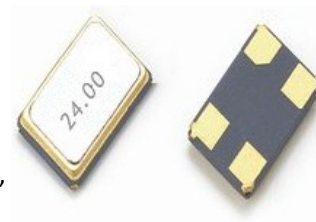
MSC

QUARTZ CRYSTAL

SMD Crystal - C3225 Series

Features

- High precision characteristic covering up to high frequency range
- Designed for automatic mounting and reflow soldering
- the best choice of Bluetooth wireless communication sets,



Specifications

Holder Type	SMD 3.2x2.5 thickness 0.7mm
Frequency Range	8 Mhz ~ 104Mhz
Operating Temperature Range	-20°C to +70°C or specify
Storage Temperature Range	- 55°C to +125°C typical
Drive Level	1~100μW (50 μW typical)
Load Capacitance	8pF, 9pF, 10pF, 12pF, 18pF, 20pF or specify
Frequency Tolerance	±30ppm or custom-designed
Frequency Stability	±30ppm or custom-designed
Shunt Capacitance	5.0pF Max.
Insulation Resistance	500MΩ Min. at DC 100V
Aging (at 25°C)	±3ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

Frequency Range	ESR(Ω)	Mode
8 ~ 10 Mhz	200 Max.	AT/Fundamental
10 ~ 24 Mhz	80 Max.	AT/Fundamental
24 ~ 104 Mhz	60 Max.	AT/Fundamental

How to order

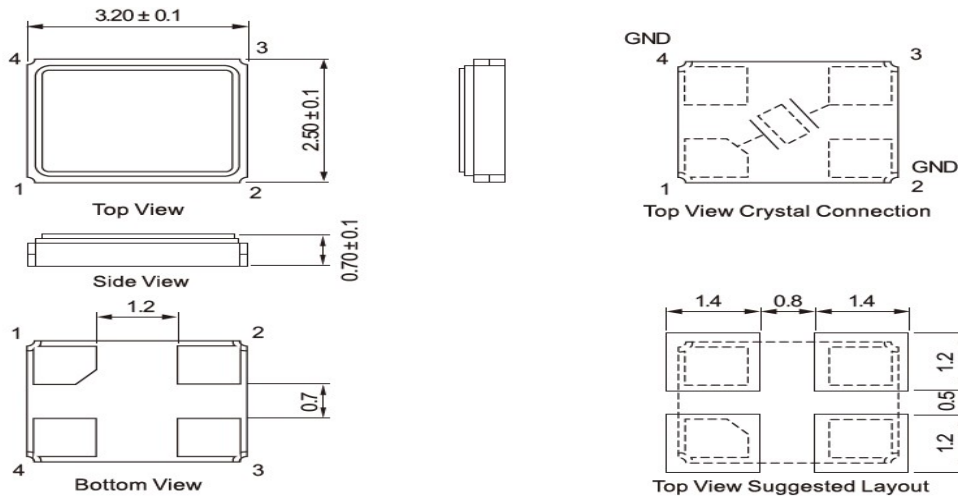
C3225	27.12M	20	2	3	R
Series	Frequency	Load capacitance	Frequency Tol.	Frequency Tol.	Package
C3225=3.2x2.5mm	20= 20Mhz 25= 25Mhz 30= 30Mhz 40= 40Mhz	10=10pF 20=20pF 30=30pF or specify	2 = 20ppm 3 = 30ppm 4 = 40ppm 5 = 50ppm	1= -10°C~+60°C 2= -20°C~+70°C 3= -40°C~+85°C	R = Tape Reel

MSC

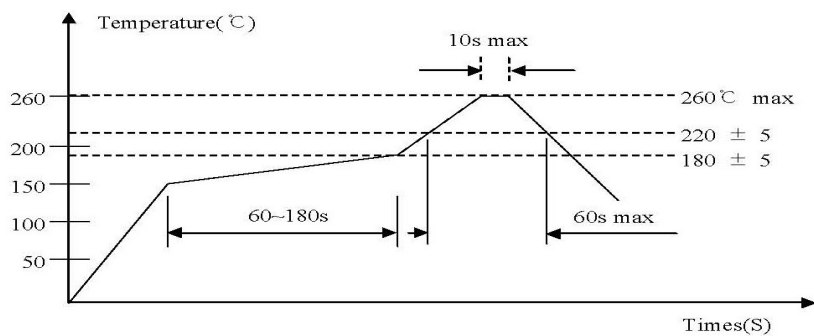
QUARTZ CRYSTAL

SMD Crystal - C3225 / C4025 Series

Dimensions (mm)



Reflow Condition



MSC

QUARTZ CRYSTAL

SMD Crystal - C5032 Series

Features

- High precision characteristic covering up to high frequency range
- Designed for automatic mounting and reflow soldering
- Dthe best choice of Bluetooth wireless communication set



Specifications

Holder Type	SMD 5.0x3.2, thickness 0.9mm
Frequency Range	8 Mhz ~ 100 Mhz
Operating Temperature Range	-20°C to +70°C or specify
Storage Temperature Range	- 55°C to +125°C typical
Drive Level	1~ 100μW (10 μW typical)
Load Capacitance	8pF , 16pF, 20pF, 30pF or specify
Frequency Tolerance	±10ppm ~ ±50ppm or custom-designed
Frequency Stability	±10ppm ~ ±50ppm or custom-designed
Shunt Capacitance	5.0pF Max.
Insulation Resistance	500MΩ Min. at DC 100V
Aging (at 25°C)	±3ppm / year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

Frequency Range	ESR(Ω)	Mode
8 ~ 12 Mhz	60 Max.	AT/Fundamental
12 ~ 48 Mhz	45 Max.	AT/Fundamental
40 ~ 60 Mhz	120 Max.	AT/3RD
60 ~ 100 Mhz	80 Max.	AT/3RD

How to order

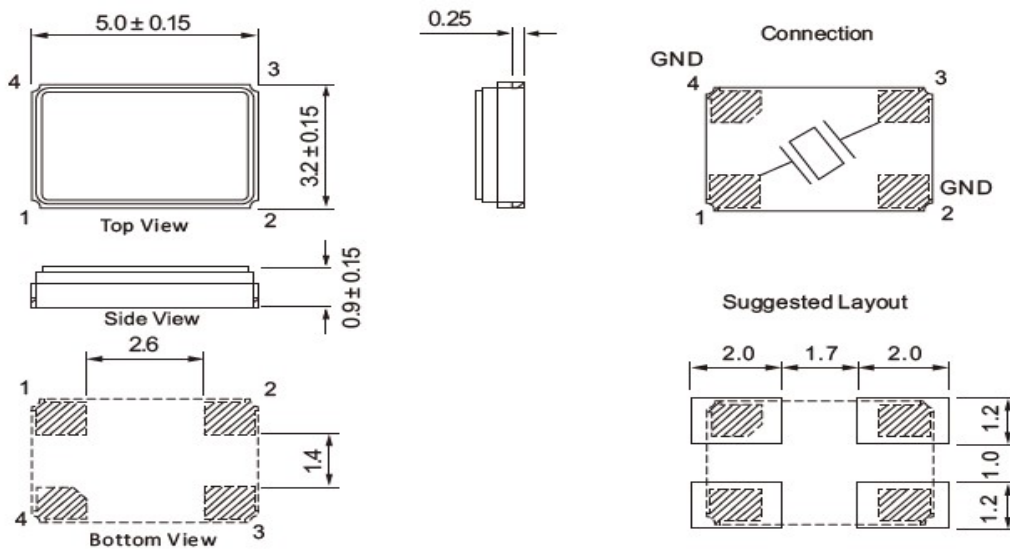
C5032	27.12M	20	2	2	R
Series	Frequency	Load capacitance	Frequency Tol.	Frequency Tol.	Package
C5032=5.0x3.2mm	20= 20Mhz 25= 25Mhz 30= 30Mhz 40= 40Mhz	10=10pF 20=20pF 30=30pF or specify	2 = 20ppm 3 = 30ppm 4 = 40ppm 5 = 50ppm	1= -10°C ~+60°C 2= -20°C ~+70°C 3= -40°C ~+85°C	R = Tape Reel

MSC

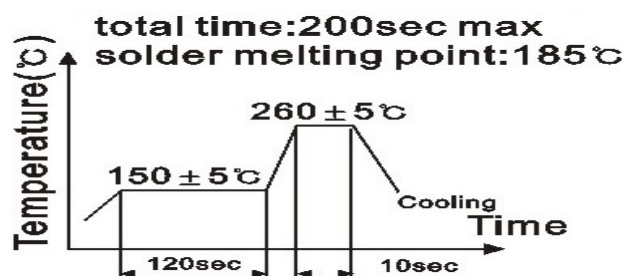
QUARTZ CRYSTAL

SMD Crystal - C5032 Series

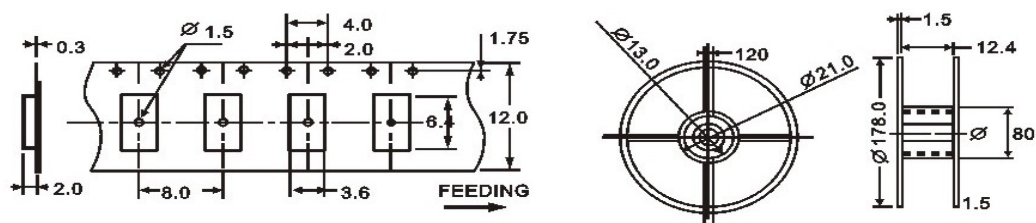
Dimensions (mm)



Reflow Condition



Reel Packing (mm)



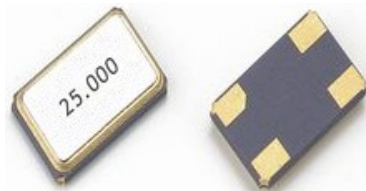
MSC

QUARTZ CRYSTAL

SMD Crystal - C6035 Series

Features

- High precision characteristic covering up to high frequency range
- Designed for automatic mounting and reflow soldering
- Dthe best choice of Bluetooth wireless communication sets, DSN, PDA and mobile phone



Specifications

Holder Type	SMD 6.0x3.5 (4 pad & 2pad)
Frequency Range	8.000Mhz ~ 150.000Mhz
Operating Temperature Range	-10°C to +60°C to -40°C to +85°C
Storage Temperature Range	- 40°C to +85°C typical
Drive Level	100μW typical
Load Capacitance	8pF ~ 32pF or Series
Frequency Tolerance	±30ppm or custom-designed
Frequency Stability	±30ppm or custom-designed
Shunt Capacitance	7.0pF Max.
Insulation Resistance	500MΩ Min. at DC 100V
Aging (at 25°C)	±5ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

Frequency Range	ESR(Ω)	Mode	Frequency Range	ESR(Ω)	Mode
8.0000 ~ 10.000	60 Max.	Fundamental	20.000 ~ 40.000	30/40 Max.	Fundamental
10.000 ~ 13.999	50 Max.	Fundamental	35.000 ~ 48.000	100 Max.	3rd Overtone
14.000 ~ 19.999	40 Max.	Fundamental	48.000 ~ 150.00	80 Max.	3rd Overtone

How to order

C6035	27.12M	20	2	3	R
Series	Frequency	Load capacitance	Frequency Tol.	Frequency Tol.	Package
C2025=2.0x2.5mm	20= 20Mhz	10=10pF	2 = 20ppm	1= -10°C ~+60°C	R = Tape Reel
C3225=3.2x2.5mm	25= 25Mhz	20=20pF	3 = 30ppm	2= -20°C ~+70°C	
C4025=4.0x2.5mm	30= 30Mhz	30=30pF	4 = 40ppm	3= -40°C ~+85°C	
C5032=5.0x3.2mm	40= 40Mhz	or specify	5 = 50ppm		
C6035=6.0x3.5mm					
C7050=7.0x5.0mm					

MSC

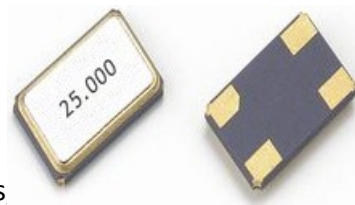
Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

QUARTZ CRYSTAL

SMD Crystal - C7050 Series

Features

- High precision characteristic covering up to high frequency range
- Designed for automatic mounting and reflow soldering
- Dthe best choice of Bluetooth wireless communication sets DSN, PDA and mobile phone



Specifications

Holder Type	SMD 7.0x5.0
Frequency Range	6.000Mhz ~ 150.000Mhz
Operating Temperature Range	-10°C to +60°C to -40°C to +85°C
Storage Temperature Range	- 40°C to +85°C typical
Drive Level	100μW typical
Load Capacitance	8pF ~ 32pF or Series
Frequency Tolerance	±30ppm or custom-designed
Frequency Stability	±30ppm or custom-designed
Shunt Capacitance	7.0pF Max.
Insulation Resistance	500MΩ Min. at DC 100V
Aging (at 25°C)	±5ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

Frequency Range	ESR(Ω)	Mode	Frequency Range	ESR(Ω)	Mode
6.000 ~ 7.3728 Mhz	100 Max.	Fundamental	20.000 ~ 40.000	30/40 Max.	Fundamental
7.3728 ~ 9.999 Mhz	60 Max.	Fundamental	24.000 ~ 34.999	100 Max.	3rd Overstone
10.000 ~ 13.999	50 Max.	Fundamental	35.000 ~ 150.000	80 Max.	3rd Overstone
14.000 ~ 19.999	40 Max.	Fundamental			

How to order

C7050	27.12M	20	2	1	R
Series	Frequency	Load capacitance	Frequency Tol.	Frequency Tol.	Package
C2025=2.0x2.5mm	20= 20Mhz	10=10pF	2 = 20ppm	1= -10°C~+60°C	R = Tape Reel
C3225=3.2x2.5mm	25= 25Mhz	20=20pF	3 = 30ppm	2= -20°C~+70°C	
C4025=4.0x2.5mm	30= 30Mhz	30=30pF	4 = 40ppm	3= -40°C~+85°C	
C5032=5.0x3.2mm	40= 40Mhz	or specify	5 = 50ppm		
C6035=6.0x3.5mm					
C7050=7.0x5.0mm					

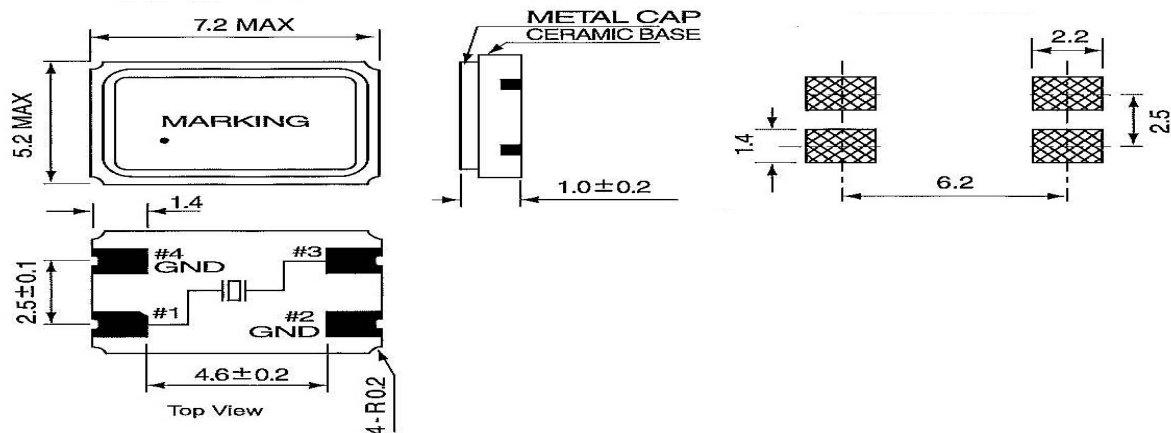
MSC

Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

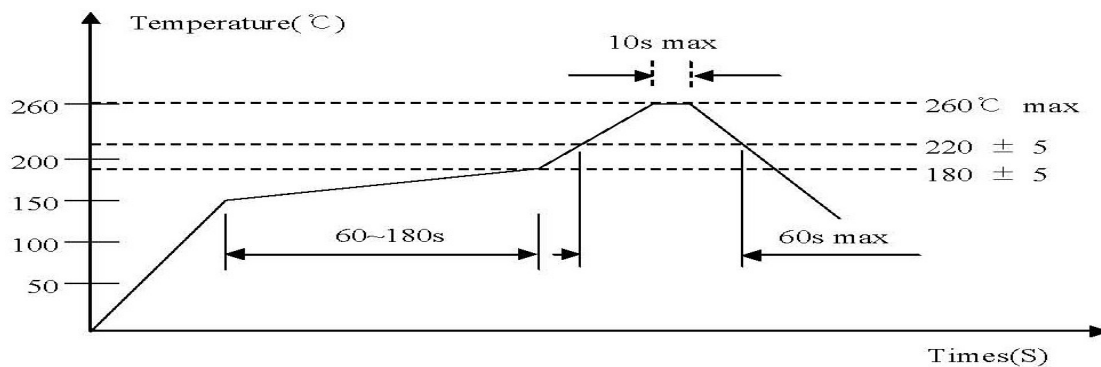
QUARTZ CRYSTAL

SMD Crystal - C7050 Series

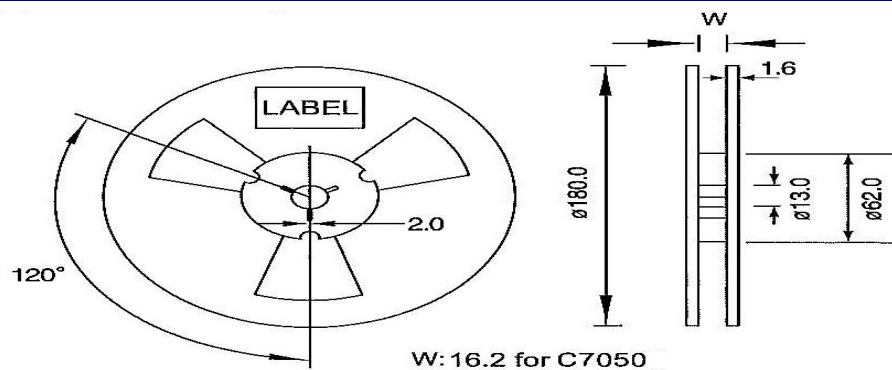
Dimensions (mm)



Reflow Condition



Reel Packing (mm)



MSC

QUARTZ CRYSTAL

HC-49SMD Series

Features

- A resistance weld completely sealed type
- High frequency stability and reliability
- Excellent aging stability
- RoHS Compliant / Pb Free



Specifications

Holder Type	HC-49SMD
Frequency Range	3.200Mhz to 90.000Mhz
Operating Temperature Range	-10°C to +60°C typical or custom-designed
Storage Temperature Range	- 40°C to +85°C typical
Frequency Tolerance (at 25°C)	±30ppm, or specify
Frequency Stability over	±50ppm, or specify
Load Capacitance	8pF ~ 32pF or Series
Drive Level	1 ~ 1000μW (100μW typical)
Shunt Capacitance	7pF Max.
Insulation Resistance	500 MΩ Mini. at DC 100V
Aging (at 25°C)	±5ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

Frequency Range	ESR(Ω)	Mode	Frequency Range	ESR(Ω)	Mode
3.200 ~ 3.579 Mhz	250 Max.	Fundamental	8.001 ~ 9.999 Mhz	60 Max.	Fundamental
3.580 ~ 4.000 Mhz	150 Max.	Fundamental	10.00 ~ 13.999 Mhz	50 Max.	Fundamental
4.001 ~ 5.000 Mhz	120 Max.	Fundamental	14.00 ~ 35.328 Mhz	40 Max.	Fundamental
5.001 ~ 6.000 Mhz	100 Max.	Fundamental	24.00 ~ 34.999 Mhz	100 Max.	3 rd Overtone
6.001 ~ 7.000 Mhz	80 Max.	Fundamental	35.00 ~ 90.000 Mhz	80 Max.	3 rd Overtone
7.001 ~ 8.000 Mhz	60 Max.	Fundamental			

How to order

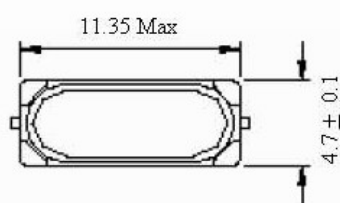
HC49SMD	4.000M	1	20	D	R
Series	Frequency	Operating Temp.	Load capacitance	Frequency Tol.	Package
HC49U series	2.0Mhz	1= -10°C~+60°C	16=16pF	A = ± 10ppm	R = Tape Reel
HC49US series	3.0Mhz	2= -20°C~+70°C	20=20pF	B = ± 15ppm	
HC49SMD series	4.000Mhz	3= -40°C~+85°C	30=30pF	C = ± 20ppm	
			32=32pF	D = ± 30ppm	
			or specify	E = ± 50ppm	

MSC

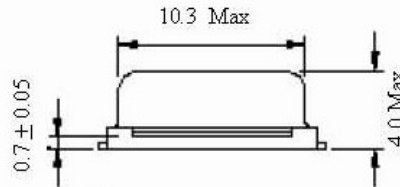
QUARTZ CRYSTAL

HC-49SMD Series

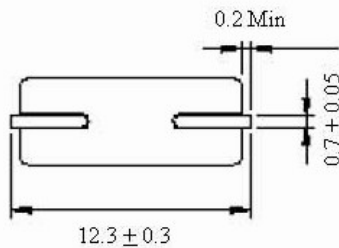
Dimensions (mm)



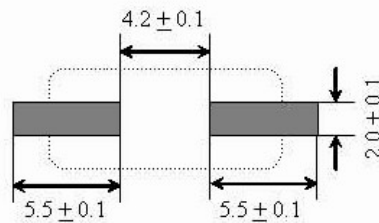
Top view



Side view



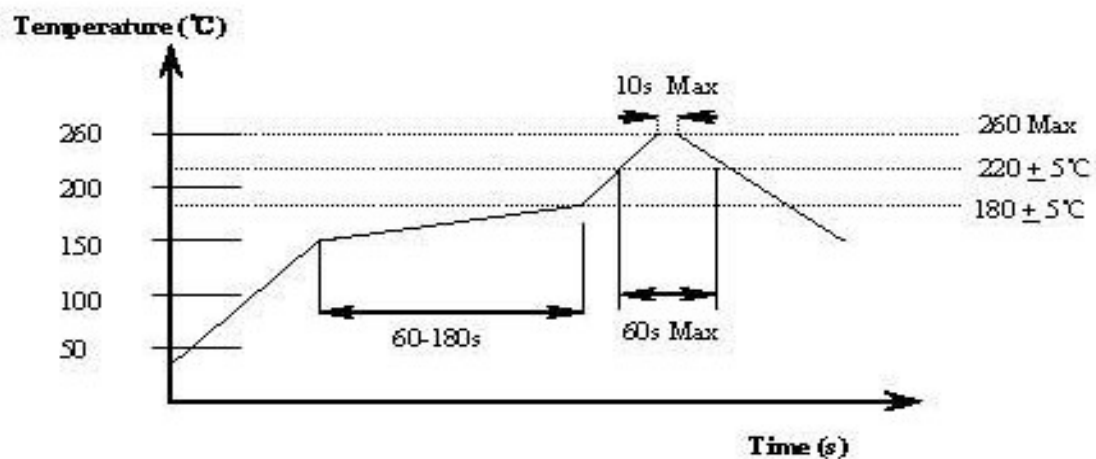
Bottom view



Pad layout

in mm

Reflow Soldering Profile


MSC

Remark: Specifications subject to change without prior notice. Please confirm with our sales engineer.

QUARTZ CRYSTAL

HC-49U

Features

- A resistance weld completely sealed type
- High frequency stability and reliability
- Excellent aging stability
- RoHS Compliant / Pb Free



Specifications

Holder Type	HC-49U
Frequency Range	1.8432Mhz to 200.000Mhz
Operating Temperature Range	-10°C to +60°C typical or custom-designed
Storage Temperature Range	- 40°C to +85°C typical
Frequency Tolerance (at 25°C)	±30ppm, or specify
Frequency	±50ppm, or specify
Load Capacitance	8pF ~ 32pF or Series
Drive Level	1 ~ 1000 μ W (100 μ W typical)
Shunt Capacitance	7pF Max.
Insulation Resistance	500 M Ω Mini. at DC 100V
Aging (at 25°C)	±5ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

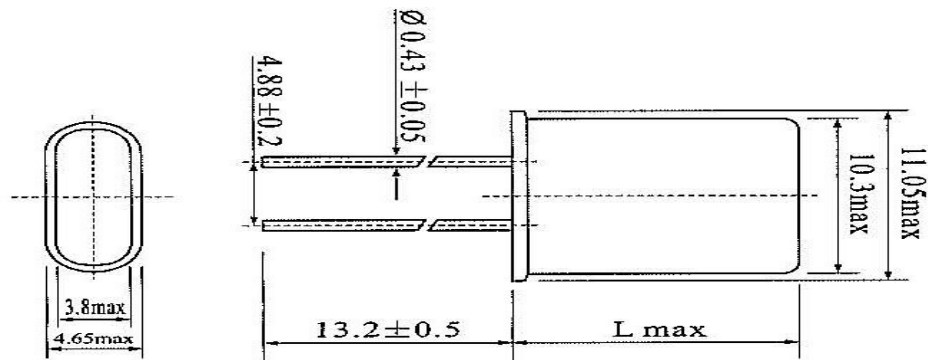
Frequency Range	ESR(Ω)	Mode	Frequency Range	ESR(Ω)	Mode
1.8432 ~ 2.300 Mhz	500 Max.	Fundamental	8.0001 ~ 40.000 Mhz	300 Max.	Fundamental
2.3001 ~ 3.000 Mhz	400 Max.	Fundamental	24.000 ~ 80.000 Mhz	50 Max.	3 rd Overtone
3.0001 ~ 5.000 Mhz	90 Max.	Fundamental	80.000 ~ 150.00 Mhz	150 Max.	5 th Overtone
5.0001 ~ 8.000 Mhz	60 Max.	Fundamental			

How to order

HC49US	4.000M	1	20	D	B
Series	Frequency	Operating Temp.	Load capacitance	Frequency Tol.	Package
HC49U series	4Mhz	1= -10°C ~+60°C	10 = 10ppm	A=±5ppm	B = Bulk
HC49US series	12Mhz	2= -20°C ~+70°C	15 = 15ppm	B=±10ppm	
	20Mhz	3= -40°C ~+85°C	20 = 20ppm	C=±15ppm	
		4= -40°C ~+105°C	30 = 30ppm	D=±20ppm	
		5= -30°C ~+85°C	Or specify	E=±30ppm	

MSC

Dimensions (mm)



QUARTZ CRYSTAL

HC-49US SERIES

Features

- A resistance weld completely sealed type
- High frequency stability and reliability
- Excellent aging stability
- RoHS Compliant / Pb Free



Specifications

Holder Type	HC-49US
Frequency Range	3.200Mhz to 90.000Mhz
Operating Temperature Range	-10°C to +60°C typical or custom-designed
Storage Temperature Range	- 40°C to +85°C typical
Frequency Tolerance (at 25°C)	±30ppm, or specify
Frequency Stability over	±50ppm, or specify
Load Capacitance	8pF ~ 32pF or Series
Drive Level	1 ~ 1000μW (100μW typical)
Shunt Capacitance	7pF Max.
Insulation Resistance	500 MΩ Mini. at DC 100V
Aging (at 25°C)	±5ppm/ year Max.

Equivalent Series Resistance (ESR) and Mode of Operation

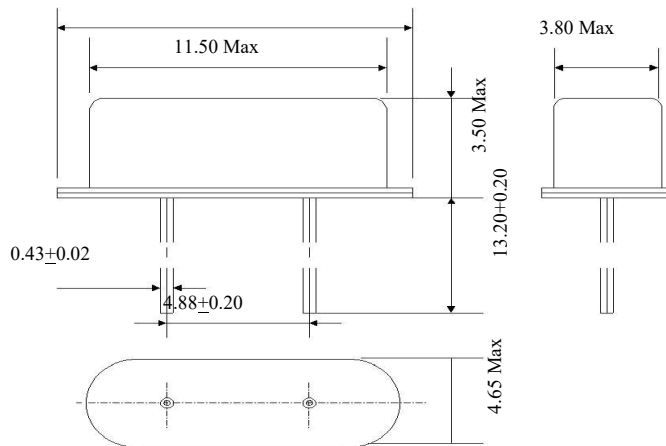
Frequency Range	ESR(Ω)	Mode	Frequency Range	ESR(Ω)	Mode
3.200 ~ 3.579 Mhz	250 Max.	Fundamental	8.001 ~ 9.999 Mhz	60 Max.	Fundamental
3.580 ~ 4.000 Mhz	150 Max.	Fundamental	10.00 ~ 13.999 Mhz	50 Max.	Fundamental
4.001 ~ 5.000 Mhz	120 Max.	Fundamental	14.00 ~ 35.328 Mhz	40 Max.	Fundamental
5.001 ~ 6.000 Mhz	100 Max.	Fundamental	24.00 ~ 34.999 Mhz	100 Max.	3 rd Overtone
6.001 ~ 7.000 Mhz	80 Max.	Fundamental	35.00 ~ 90.000 Mhz	80 Max.	3 rd Overtone
7.001 ~ 8.000 Mhz	60 Max.	Fundamental			

How to order

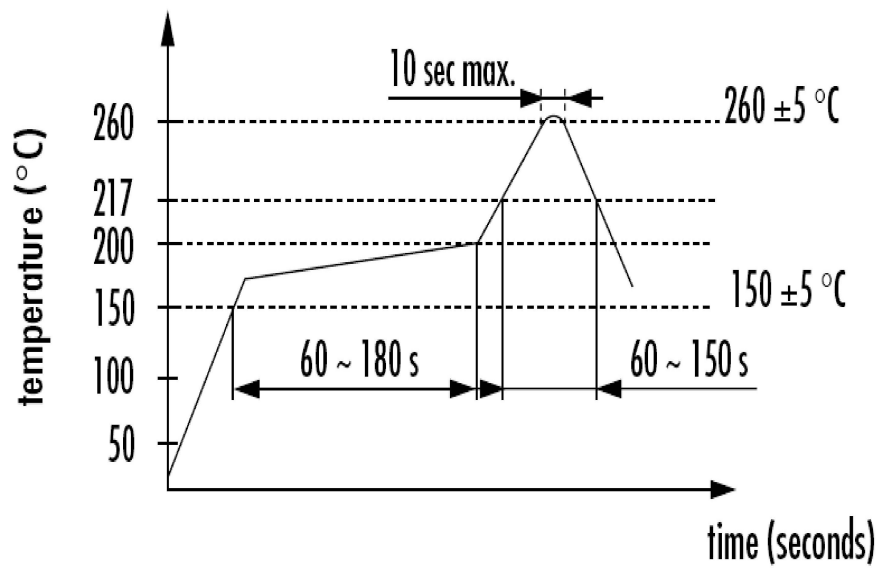
HC49US	4.000M	1	20	D	B
Series	Frequency	Operating Temp	Load capacitance	Frequency Tol.	Package
HC49U series	4Mhz	1= -10°C ~+60°C	10 = 10pF	A=±5ppm	B = Bulk
HC49US series	12Mhz	2= -20°C ~+70°C	15 = 15pF	B=±10ppm	R = Tape Reel
	20Mhz	3= -40°C ~+85°C	20 = 20pF	C=±15ppm	
		4= -40°C ~+105°C	30 = 30pF	D=±20ppm	
		5= -30°C ~+85°C	Or specify	E=±30ppm	

MSC

Dimensions (mm)



Reflow Condition



SMD CRYSTAL OSCILLATOR

OSC3225 Series

Features

- Wide frequency range
- Tri-State Function
- TTL/HCMOS
- RoHS Compliant / Pb Free



Specifications

Holder Type	SMD 3.2x2.5
Frequency	1.000Mhz ~ 150.000Mhz
Operating Temperature Range	-10°C to +60°C typical or custom-designed
Storage Temperature Range	-40°C to +85°C typical
Frequency	±10ppm ~ ±50ppm
Supply Voltage	5.0V or 3.3V ±10%
Current Consumption	5.0V 3.3V 25mA (1.000 ~ 35.999Mhz) 20mA (1.000 ~ 35.999Mhz) 60mA (36.00 ~ 69.999Mhz) 40mA (36.00 ~ 69.999Mhz) 80mA (70.00 ~ 150.00Mhz) 60mA (70.00 ~ 150.00Mhz)
Output Waveform	TTL/HCMOS
Output Load	10TTL or 15pF HCMOS
Symmetry	40/60% or 45/55%
Rise/Fall Time	10nS
Output Voltage "1" VoH	TTL: 2.4V Min. HCMOS: 90%V Min.
"0" VoL	TTL: 0.4V Max. HCMOS: 10%V Max.
Start-Up Time	10mS Max.
Pin 1 Tri-State Function	T: Enable / N: Disable
Aging (at 25°C)	±5ppm/ year Max.

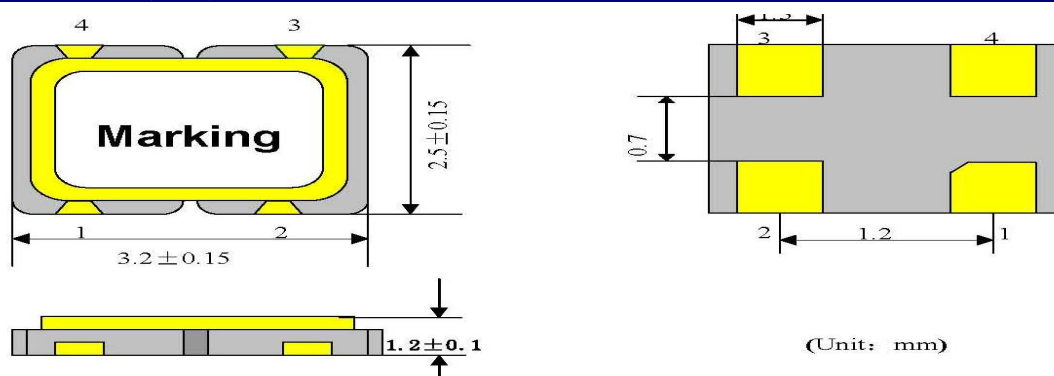
How to order

OSC3225	27.12M	2	1	R
Series	Frequency	Frequency Tol.	Operating Temperature	Package
OSC3225=3x2.5mm	20= 20Mhz	2 = 20ppm	1= -10°C~+60°C	R= Tape Reel
OSC5032=5x3.2mm	25= 25Mhz	3 = 30ppm	2= -20°C~+70°C	
OSC7050=7x5.0mm	30= 30Mhz	5= 50ppm	3= -40°C~+85°C	
	40= 40Mhz			

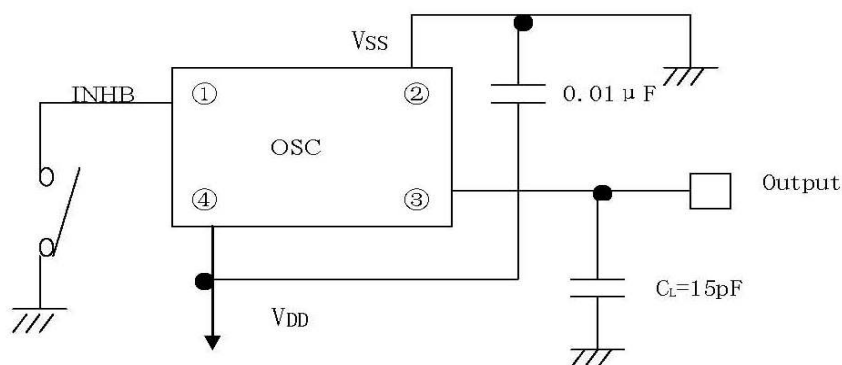
SMD CRYSTAL OSCILLATOR

OSC3225 Series

Dimensions (mm)



Circuit diagram and the pin configuration function



Pin configuration function

Pin Configuration	1	2	3	4
Function	INHB	Vss	QOUT	VDD

Output control terminal INHB	“Output Voltage ”H” VoL OPEN	Output Voltage ”L” VoL (三态)
Output QOUT	Oscillator Normal Output	High impedance

NOTED: The output state control carries INHB (three states of matter end) not to be able to ground wire, otherwise the oscillator assumes the high impedance

SMD CRYSTAL OSCILLATOR

OSC5032 Series

Features

- Wide frequency range
- Tri-State Function
- TTL/HCMOS
- RoHS Compliant / Pb Free



Specifications

Holder Type	SMD 5.0x3.2
Frequency Range	1.000Mhz ~ 150.000Mhz
Operating Temperature Range	-10°C to +60°C typical or custom-designed
Storage Temperature Range	- 40°C to +85°C typical
Frequency	±10ppm ~ ±50ppm
Supply Voltage	5.0V or 3.3V ±10%
Current Consumption	5.0V3.3V 25mA (1.000 ~ 35.999Mhz) 20mA (1.000 ~ 35.999Mhz) 60mA (36.00 ~ 69.999Mhz) 40mA (36.00 ~ 69.999Mhz) 80mA (70.00 ~ 150.00Mhz) 60mA (70.00 ~ 150.00Mhz)
Output Waveform	TTL/HCMOS
Output Load	10TTL or 15pF HCMOS
Symmetry	40/60% or 45/55%
Rise/Fall Time	10nS
Output Voltage "1" VoH	TTL: 2.4V Min. HCMOS: 90%V Min.
"0" VoL	TTL: 0.4V Max. HCMOS: 10%V Max.
Start-Up Time	10mS Max.
Pin 1 Tri-State Function	T: Enable / N: Disable
Aging (at 25°C)	±5ppm/ year Max.

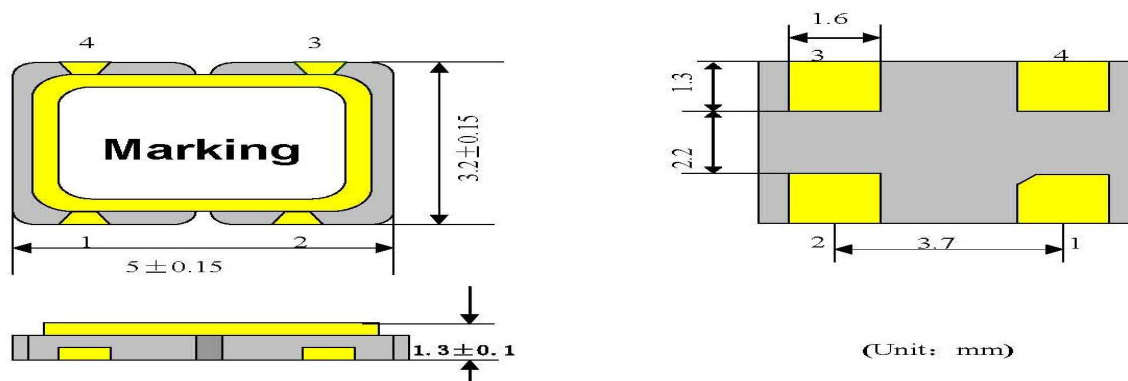
How to order

OSC5032	27.12M	2	1	R	
Series	Frequency	Frequency Tol.	Operating Temperature	Package	
OSC3225=3x2.5mm	20= 20Mhz	2 = 20ppm	1= -10°C ~+60°C	R= Tape Reel	
OSC5032=5x3.2mm	25= 25Mhz	3 = 30ppm	2= -20°C ~+70°C		
OSC7050=7x5.0mm	30= 30Mhz	5= 50ppm	3= -40°C ~+85°C		
	40= 40Mhz				

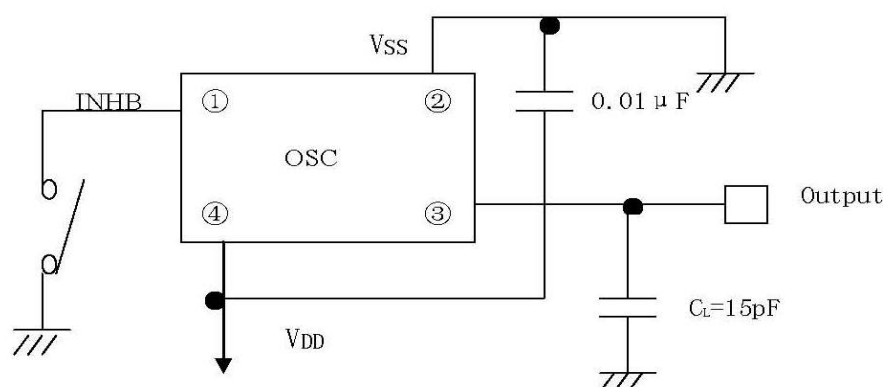
SMD CRYSTAL OSCILLATOR

OSC5032 Series

Dimensions (mm)



Circuit diagram and the pin configuration function



Pin configuration function

Pin Configuration	1	2	3	4
Function	INHB	VSS	QOUT	VDD

Output control terminal INHB	“Output Voltage ”H” VoL OPEN	Output Voltage ”L” VoL (三态)
Output QOUT	Oscillator Normal Output	High impedance

NOTED: The output state control carries INHB (three states of matter end) not to be able to ground wire, otherwise the oscillator assumes the high impedance