

Uniroyal Electronics Industry Co., Ltd.

21 Xiajia North Road, Economic & Technical Development Zone,  
Kunshan City, Jiangsu, CHINA 215334

Tel: +86 512 5763 45 95

Fax: +86 512 5763 45 99

globalsales@uniohm.com

www.uniohm.com

### Surface Mount Category - CHIP, CHIP ARRAY & CHIP NETWORK Resistors

Thick Film Chip Resistors	2	0201, 0402, 0603, 0805, 1206, 1210, 2010, 2512
High-Voltage Thick Film Chip Resistors	5	HV03, HV05, HV06, HV10, HV12
High-Power Thick Film Chip Resistors	6	HPO3, HPO5, HPO6
Wide-Terminal Thick Film Chip Resistors	7	0508, 0612, 1020, 1218, 1225
Trimmable Thick Film Chip Resistors	8	TR05, TR06
Current Sense Chip Resistors	9	CS03, CS05, CS06, CS10, CS12
High-Precision Thin Film Chip Resistors	10	TC02, TC03, TC05, TC06, TC10, TC12
Chip Resistor Array - Convex Terminal Type	12	2DO2, 4DO2, 4DO3, 16P8
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### RELATIVE INFORMATION

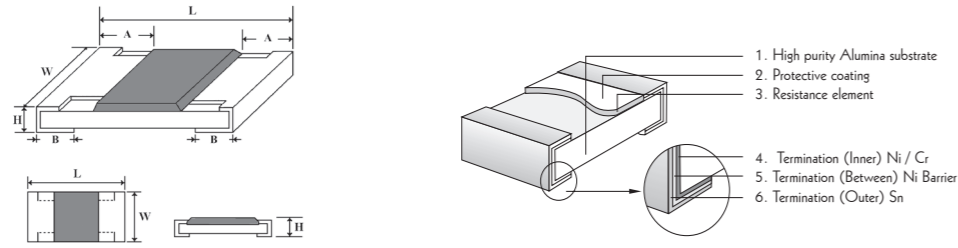
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Feature

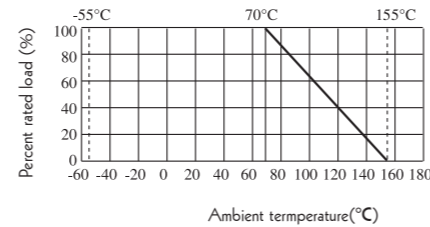
- Small size & light weight
- Reduction of assembly costs and matching with placement machine
- Suitable for both flow & re-flow soldering
- Applications: Navigator (GPS), Mobile Phone, Telecom, PDA, Setbox, Meter.



Figures



Derating Curve & Specification



Type	0201	0402	0603	0805	1206	1210	2010	2512
Max. Working Voltage	25V	50V	50V	150V	200V	200V	200V	200V
Max. Overload Voltage	50V	100V	100V	300V	400V	400V	400V	400V
Dielectric withstanding Voltage	-	100V	300V	500V	500V	500V	500V	500V
Operating Temperature	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C	-55~+155°C

Type	0201	0402	0603	0805	1206	1210	2010	2512	
Power Rating at 70°C	1/20W	1/16W	1/16W (1/10W-S)	1/10W (1/8W-S)	1/8W (1/4W-S)	1/4W (1/3W-S) *	1/2W (3/4W-S)	1W	
Dimension	L (mm)	0.60 ± 0.03	1.00 ± 0.10	1.60 ± 0.10	2.00 ± 0.15	3.10 ± 0.15	3.10 ± 0.10	5.00 ± 0.10	
	W (mm)	0.30 ± 0.03	0.50 ± 0.05	0.80 <sup>+0.15</sup> <sub>-0.10</sub>	1.25 <sup>+0.15</sup> <sub>-0.10</sub>	1.55 <sup>+0.15</sup> <sub>-0.10</sub>	2.60 <sup>+0.15</sup> <sub>-0.10</sub>	2.50 <sup>+0.15</sup> <sub>-0.10</sub>	3.20 <sup>+0.15</sup> <sub>-0.10</sub>
	H (mm)	0.23 ± 0.03	0.35 ± 0.05	0.45 ± 0.10	0.55 ± 0.10	0.55 ± 0.10	0.55 ± 0.10	0.55 ± 0.10	0.55 ± 0.10
	A (mm)	0.10 ± 0.05	0.20 ± 0.10	0.30 ± 0.20	0.40 ± 0.20	0.45 ± 0.20	0.50 ± 0.25	0.60 ± 0.25	0.60 ± 0.25
	B (mm)	0.15 ± 0.05	0.25 ± 0.10	0.30 ± 0.20	0.40 ± 0.20	0.45 ± 0.20	0.50 ± 0.20	0.50 ± 0.20	
Resistance Value of Jumper	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	
Rated Current of Jumper	0.5A	1A	1A	2A	2A	2A	2A	2A	
Max. Current of Jumper	1A	2A	2A	5A	10A	10A	10A	10A	
Resistance Range of 0.5% (E-96)	10Ω ~ 1MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	
Resistance Range of 1% (E-96)	10Ω ~ 1MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	
Resistance Range of 2% (E-24)	10Ω ~ 1MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	
Resistance Range of 5% (E-24)	1Ω ~ 1MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	1Ω ~ 10MΩ	

\* 1210 size in 1/2W could be provided specially (1210U2)

Marking on the Resistors Body

- For 0201 & 0402 size, no marking on the body due to the small size of the resistor.
- ±5% tolerance product: the marking is 3 digits, the first 2 digits are the significant of the resistance and the 3rd digit denotes number of zeros following.

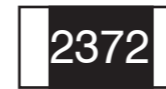


153 = 15000Ω = 15KΩ, 190 = 19Ω



Below 100Ω: 6R8 = 6.8Ω

- 0805, 1206, 1210, 2010, 2512 ≤±1%: the marking is 4 digits, the first 3 digits are the significant of the resistance and the 4th digit denotes number of zeros following.



2372 = 23700Ω = 23.7KΩ, 1430 = 143Ω



Below 100Ω: 3R24 = 3.24Ω

- Standard E-96 series values of 0603 ≤±1%: due to the small size of the resistor's body, 3 digits marking will be used to indicate the accurate resistance value by using the following Multiplier & Resistance Code.

Multiplier Code (for 0603 ≤±1% marking)

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>

Standard E-96 Series Resistance Value Code (for 0603 ≤±1% marking)

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

So the resistance value are marked as the following examples:



1.96KΩ = 196 × 10<sup>1</sup> Ω = 29B



12.4Ω = 124 × 10<sup>-1</sup> = 10X

- Standard E-24 and not belong to E-96 series values (≤±1%) of 0603 size: the marking is the same as 5% tolerance but marking as underline.



122 = 1200 = 1.2 KΩ



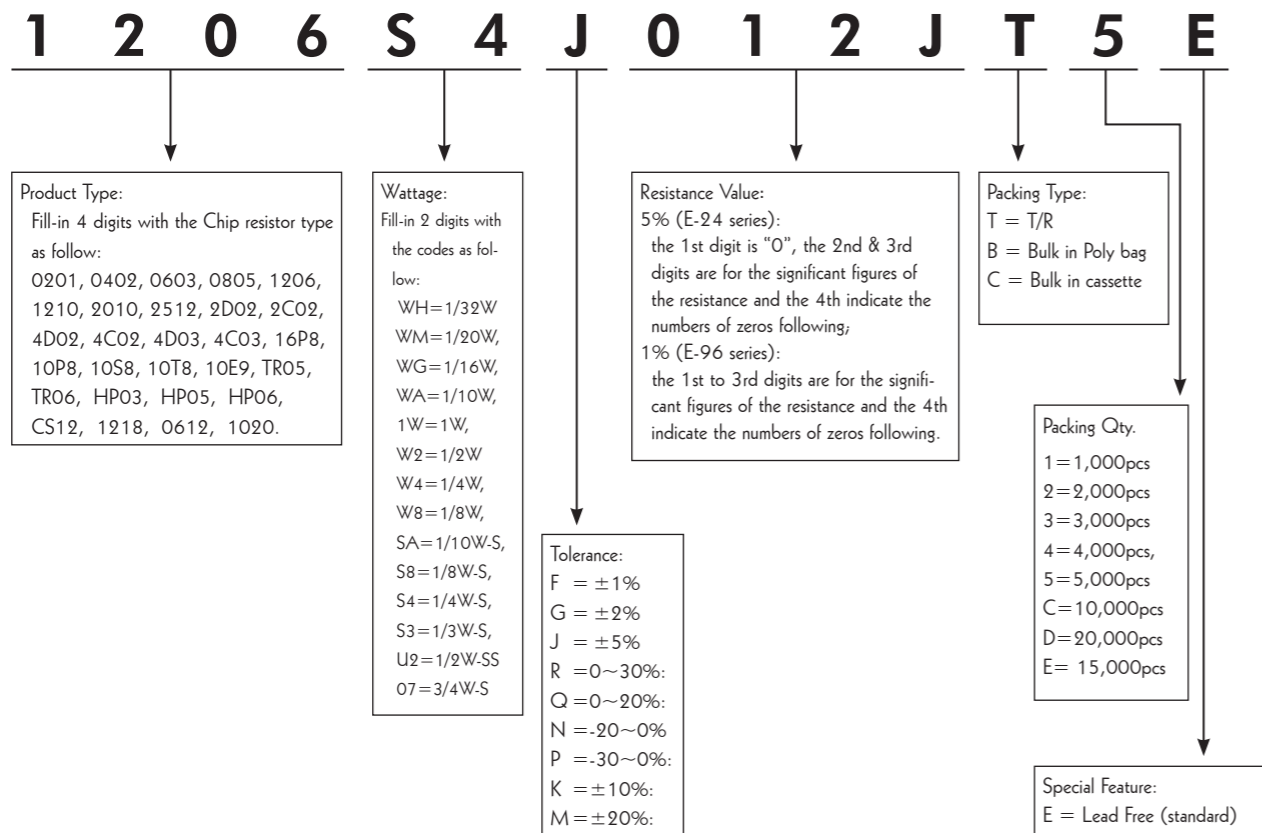
680 = 68Ω

Performance Specifications

Temperature coefficient	1Ω~10Ω ≤ ±400PPM/°C 11Ω~100Ω ≤ ±200PPM/°C >100Ω ±100PPM/°C (0201: >100Ω ±200PPM/°C)
Short-time overload	±5%, ±2%: ±(2.0% + 0.1Ω) Max. ±1%, ±0.5%: ±(1.0% + 0.1Ω) Max.
Insulation resistance	≥ 1,000 Mega Ohm
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal bending	±(1.0% + 0.05Ω) Max.
Soldering heat	±(1.0% + 0.05Ω) Max.
Solderability	Min. 95% coverage
Temperature cycling	±5%, ±2%: ±(1.0% + 0.05Ω) Max. ±1%, ±0.5%: ±(0.5% + 0.05Ω) Max.
Humidity (Steady State)	±5%, ±2%: ±(3.0% + 0.1Ω) Max. ±1%, ±0.5%: ±(0.5% + 0.1Ω) Max.
Load life in humidity	±5%, ±2%: ±(3.0% + 0.1Ω) Max. ±1%, ±0.5%: ±(1.0% + 0.1Ω) Max.
Load life	±5%, ±2%: ±(3.0% + 0.1Ω) Max. ±1%, ±0.5%: ±(1.0% + 0.1Ω) Max.

Ordering Procedure (Example: 1206 1/4W-S 5% 1.2 Ω T/R-5000)

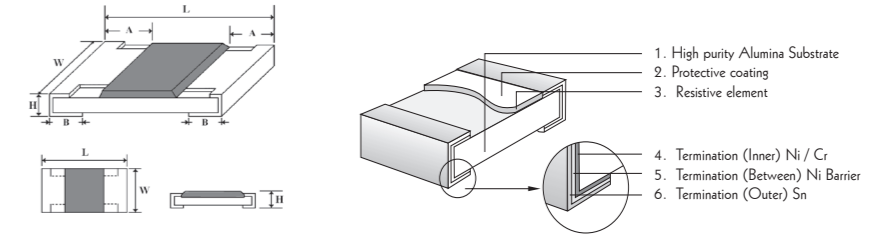
The values which are not of standard E-24 series (2% & 5%) and not of E-96 series (1%) could be offered on a case to case basis.



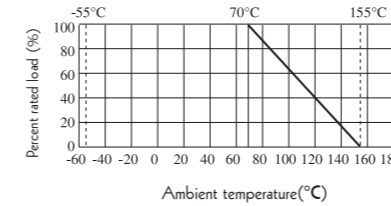
Feature

- Superior to Thick Film Chip Resistors in Max. Working Voltage
- Suitable for both flow & re-flow soldering
- Application: AV adapter, LCD Backlight, Flash Light of camera

Figures



Derating Curve & Specification



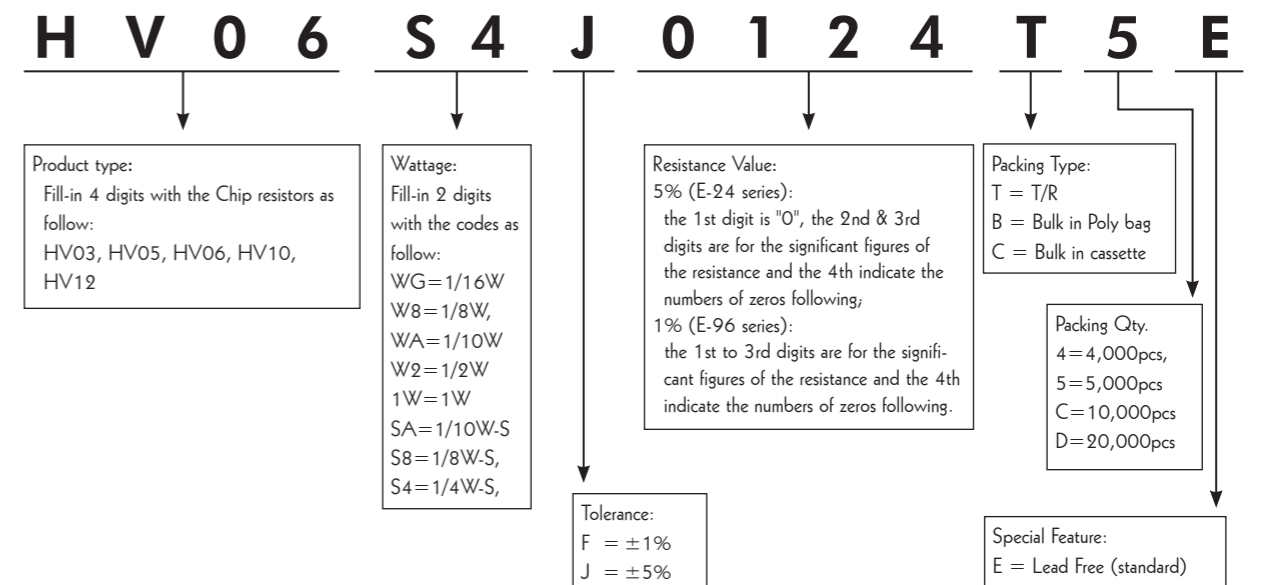
Type	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Operating Temperature
HV03	200V	400V	300V	-55°C~155°C
HV05	400V	800V	500V	-55°C~155°C
HV06	500V	1000V	500V	-55°C~155°C
HV10	2000V	3000V	500V	-55°C~155°C
HV12	800V	1600V	500V	-55°C~155°C

Type	Power Rating at 70°C	L(mm)	W(mm)	H(mm)	A(mm)	B(mm)	Resistance Range of 1% (E-96)	Resistance Range of 5% (E-24)
HV03	1/16W, 1/10W-S	1.60±0.10	0.80 <sup>+0.15</sup> <sub>-0.10</sub>	0.45±0.10	0.30±0.20	0.30±0.20	100KΩ~10M	100KΩ~10M
HV05	1/10W, 1/8W-S	2.00±0.15	1.25 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.40±0.20	0.40±0.20	100KΩ~10M	100KΩ~10M
HV06	1/8W, 1/4W-S	3.10±0.15	1.55 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.45±0.20	0.45±0.20	100KΩ~10M	100KΩ~10M
HV10	1/2W	5.00±0.10	2.50 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.60±0.25	0.50±0.20	50KΩ~10M	50KΩ~10M
HV12	1W	6.35±0.10	3.20 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.60±0.25	0.50±0.20	50KΩ~10M	50KΩ~10M

Performance Specifications

Temperature coefficient	±200PPM/°C	Temperature Cycling	5% : ±(1.0%+0.05Ω) Max. 1% : ±(0.5%+0.05Ω) Max.
Short-time overload	±(2.0%+0.1Ω) Max.	Humidity steady State	±(3.0%+0.1Ω) Max.
Terminal bending	±(1.0%+0.05Ω) Max.	Load life in humidity	±(3.0%+0.1Ω) Max.
Solderability	Min. 95% Coverage	Load life	±(3.0%+0.1Ω) Max.

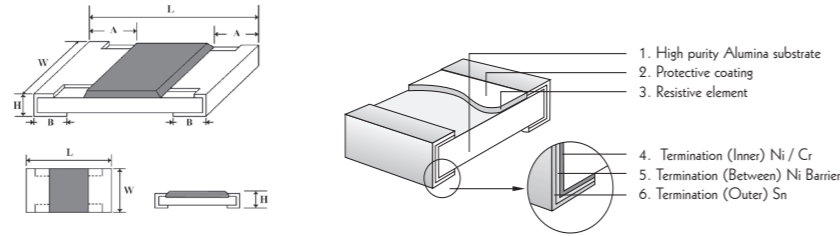
Ordering Procedure (Example: High Voltage 1206 1/4W-S 5% 120KΩ T/R-5000)



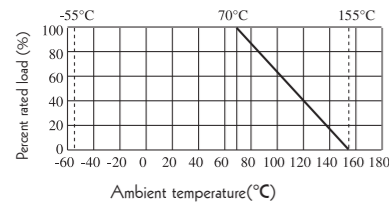
Feature

- High power in standard size
- Suitable for reflow & wave soldering
- Application: AV adapters, LCD back-light, camera strobe etc.

Figures



Derating Curve & Specification



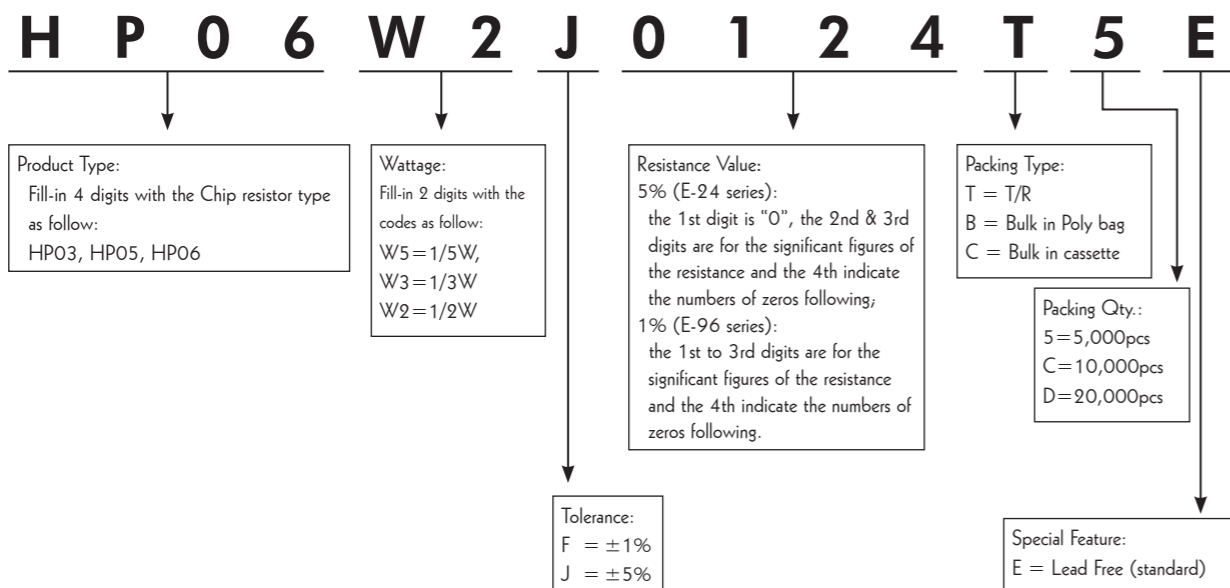
Type	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Operating Temperature
HP03	50V	100V	300V	-55°C~155°C
HP05	150V	300V	500V	-55°C~155°C
HP06	200V	400V	500V	-55°C~155°C

Type	Power Rating at 70°C	L(mm)	W(mm)	H(mm)	A(mm)	B(mm)	Resistance Range of 1% (E-96)	Resistance Range of 5% (E-24)
HP03	1/5W	1.60±0.10	0.80 <sup>+0.15</sup> <sub>-0.10</sub>	0.45±0.10	0.30±0.20	0.30±0.20	1Ω~10M	1Ω~10M
HP05	1/3W	2.00±0.15	1.25 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.40±0.20	0.40±0.20	1Ω~10M	1Ω~10M
HP06	1/2W	3.10±0.15	1.55 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.45±0.20	0.45±0.20	1Ω~10M	1Ω~10M

Performance Specifications

Temperature coefficient	1Ω~10Ω ≤ ±200PPM/°C 11Ω~10MΩ ≤ ±100PPM/°C	Temperature cycling	±5%: ±(1.0% + 0.05Ω) Max. ±1%: ±(0.5% + 0.05Ω) Max.
Short-time overload	±5%: ±(2.0% + 0.1Ω) Max. ±1%: ±(1.0% + 0.1Ω) Max.	Humidity (Steady state)	±5%: ±(3.0% + 0.1Ω) Max. ±1%: ±(0.5% + 0.1Ω) Max.
Dielectric withstanding voltage	No Evidence of flashover, mechanical damage, arcing or insulation breakdown	Load life in humidity	±5%: ±(3.0% + 0.1Ω) Max. ±1%: ±(1.0% + 0.1Ω) Max.
Terminal bending	±(1.0% + 0.05Ω) Max.	Load life	±5%: ±(3.0% + 0.1Ω) Max. ±1%: ±(1.0% + 0.1Ω) Max.
Soldering heat	±(1.0% + 0.05Ω) Max.		
Solderability	Min. 95% Coverage		

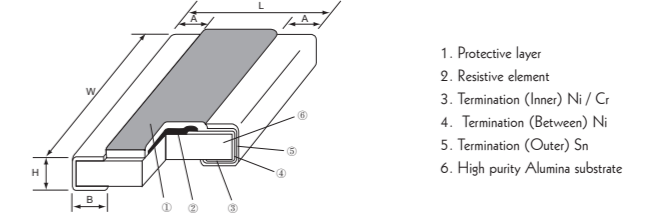
Ordering Procedure (Example: High Power HP06 1/2W 5% 120KΩ T/R-5000)



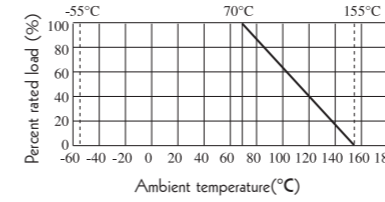
Feature

- High power in standard size
- Suitable for reflow & wave soldering
- Application: AV adapters, LCD back-light, camera strobe etc.

Figures



Derating Curve & Specification



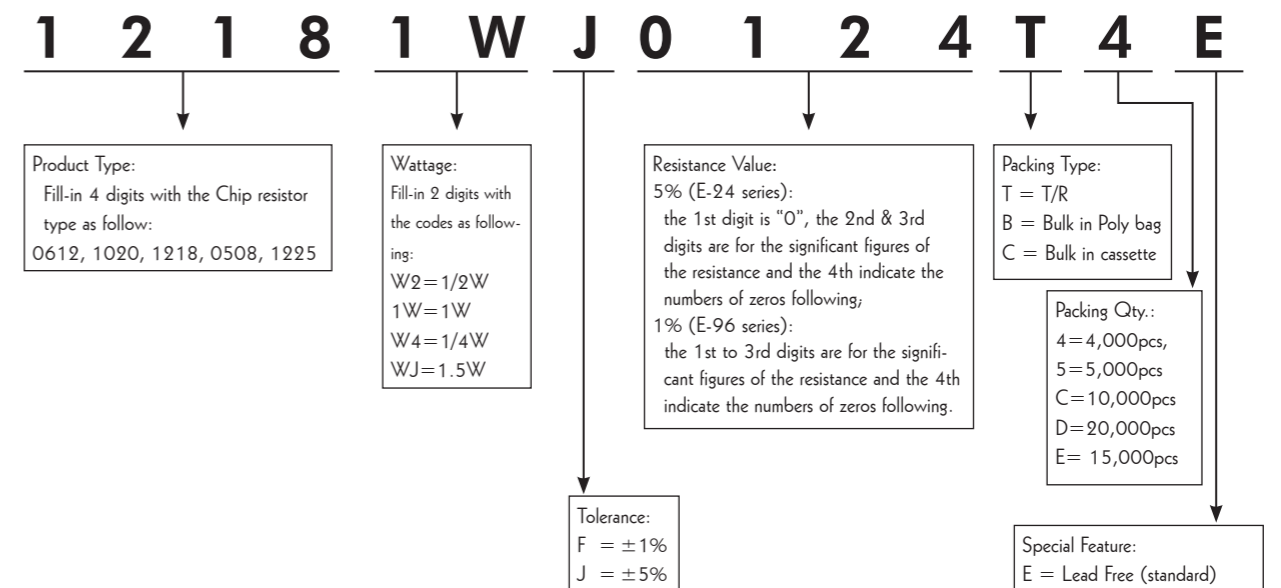
Type	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Operating Temperature
0508	150V	300V	500V	-55°C~155°C
0612	200V	400V	500V	-55°C~155°C
1020	200V	400V	500V	-55°C~155°C
1218	200V	400V	500V	-55°C~155°C
1225	200V	400V	500V	-55°C~155°C

Type	Rated Power at 70°C	L(mm)	W(mm)	H(mm)	A(mm)	B(mm)	Resistance Range of 1% (E-96)	Resistance Range of 5% (E-24)
0508	1/4W	1.20±0.10	2.00±0.10	0.55±0.10	0.20±0.10	0.30±0.20	10Ω~1M	10Ω~1M
0612	1/2W	1.60±0.15	3.20±0.15	0.55±0.10	0.45±0.20	0.30±0.20	10Ω~1M	1Ω~1M
1020	1W	2.50±0.15	5.00±0.15	0.55±0.10	0.60±0.20	0.40±0.20	10Ω~1M	1Ω~1M
1218	1W	3.10±0.10	4.60±0.15	0.55±0.10	0.45±0.20	0.40±0.20	1Ω~1M	1Ω~1M
1225	1.5W	3.10±0.15	6.25±0.15	0.55±0.10	0.45±0.20	0.40±0.20	10Ω~1M	10Ω~1M

Performance Specification

Temperature coefficient	1Ω~10Ω ≤ ±400PPM/°C 11Ω~100Ω ≤ ±200PPM/°C >100Ω ±100PPM/°C	Solderability	Min. 95% coverage
Short-time overload	±5%: ±(2.0% + 0.1Ω) Max. ±1%: ±(1.0% + 0.1Ω) Max.	Temperature cycling	±5%: ±(1.0% + 0.05Ω) Max. ±1%: ±(0.5% + 0.05Ω) Max.
Dielectric withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown	Humidity (Steady State)	±5%: ±(3.0% + 0.1Ω) Max. ±1%: ±(0.5% + 0.1Ω) Max.
Terminal bending	±(1.0% + 0.05Ω) Max.	Load life in humidity	±5%: ±(3.0% + 0.1Ω) Max. ±1%: ±(1.0% + 0.1Ω) Max.
Soldering heat	±(1.0% + 0.05Ω) Max.	Load life	±5%: ±(3.0% + 0.1Ω) Max. ±1%: ±(1.0% + 0.1Ω) Max.

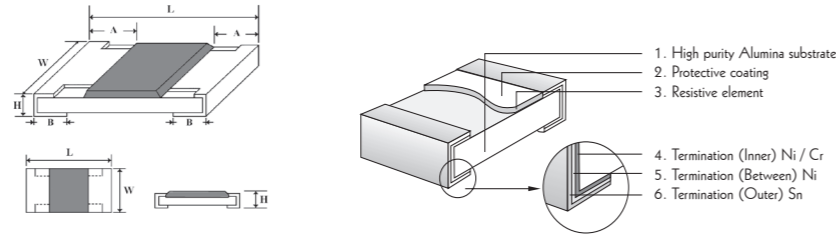
Ordering Procedure (Example: Wide Terminal 1218 1W 5% 120KΩ T/R-4000)



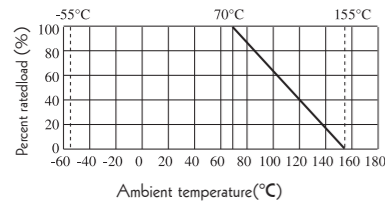
Feature

- Suitable for the circuit demanding stability as a replacement of variable resistor for adjusting circuit (Laser Trimming machine required in client end)
- Superior heat & humidity withstanding performance

Figures



Derating Curve & Specification



Type	Max. Working Voltage	Max. Overload Voltage	Operating Temperature
TR05	100V	200V	-55°C~155°C
TR06	200V	400V	-55°C~155°C

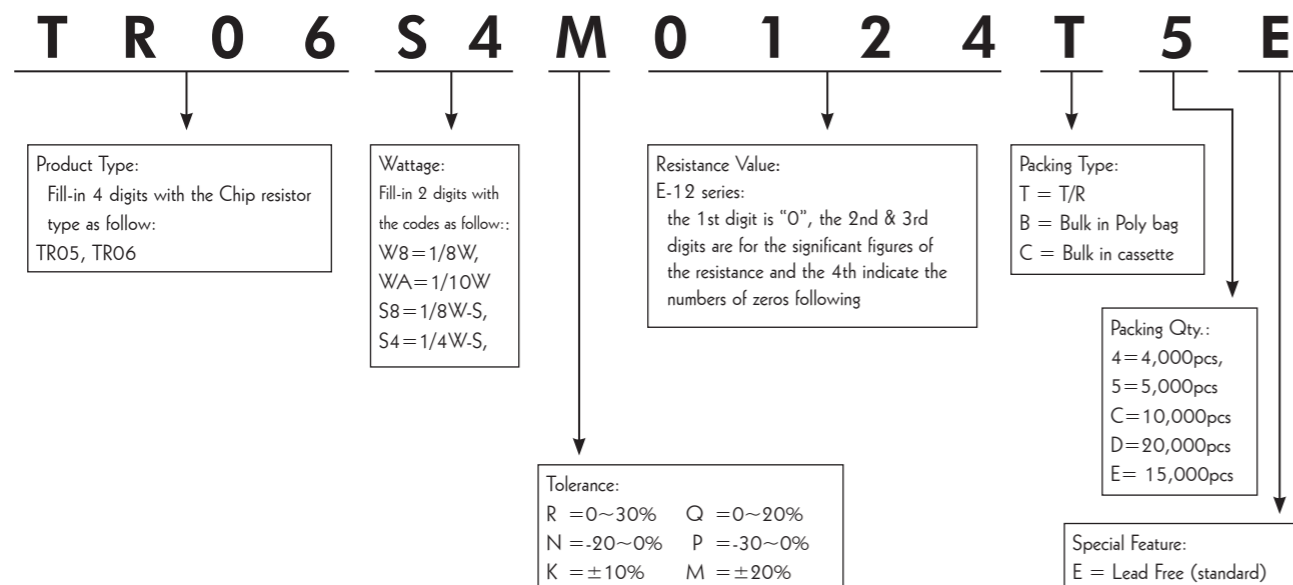
Type	Power Rating at 70°C	L(mm)	W(mm)	H(mm)	A(mm)	B(mm)	Tolerance	Resistance Range (E-12)
TR05	1/10W, 1/8W-S	2.00±0.15	1.25 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.40±0.20	0.40±0.20	R: 0~30%: Q: 0~20%: N: -20~0%: P: -30~0%: K: ±10%: M: ±20%:	10Ω~1M
TR06	1/8W, 1/4W-S	3.10±0.15	1.55 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.45±0.20	0.45±0.20		

Performance Specification

Temperature coefficient	±200PPM/°C	Soldering heat	±(1.0%+0.05Ω) Max.
Short-time overload	±(2.0%+0.1Ω) Max.	Temperature cycling	±(1.0%+0.05Ω) Max.
Terminal bending	±(1.0%+0.05Ω) Max.	Load life in humidity	±(3.0%+0.1Ω) Max.
Solderability	Min. 95% coverage	Load life	±(3.0%+0.1Ω) Max.

Ordering Procedure (Example: Trimable TR06 1/4W-S ±20% 120KΩ T/R-5000)

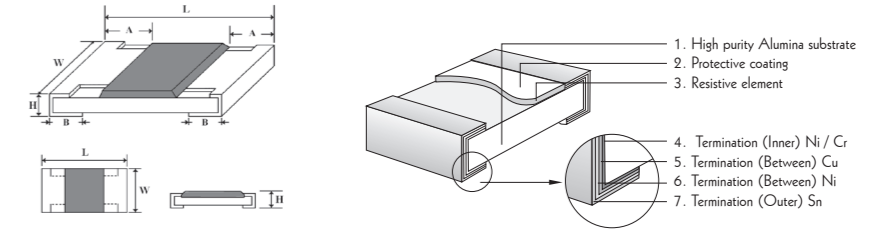
The values which are not of standard E-12 series could be offered on a case to case basis.



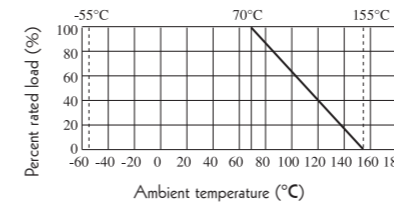
Feature

- Ultra-low Value
- Low Temperature Coefficient
- Suitable for reflow & wave soldering
- Application: Power supply

Figures



Derating Curve & Specification



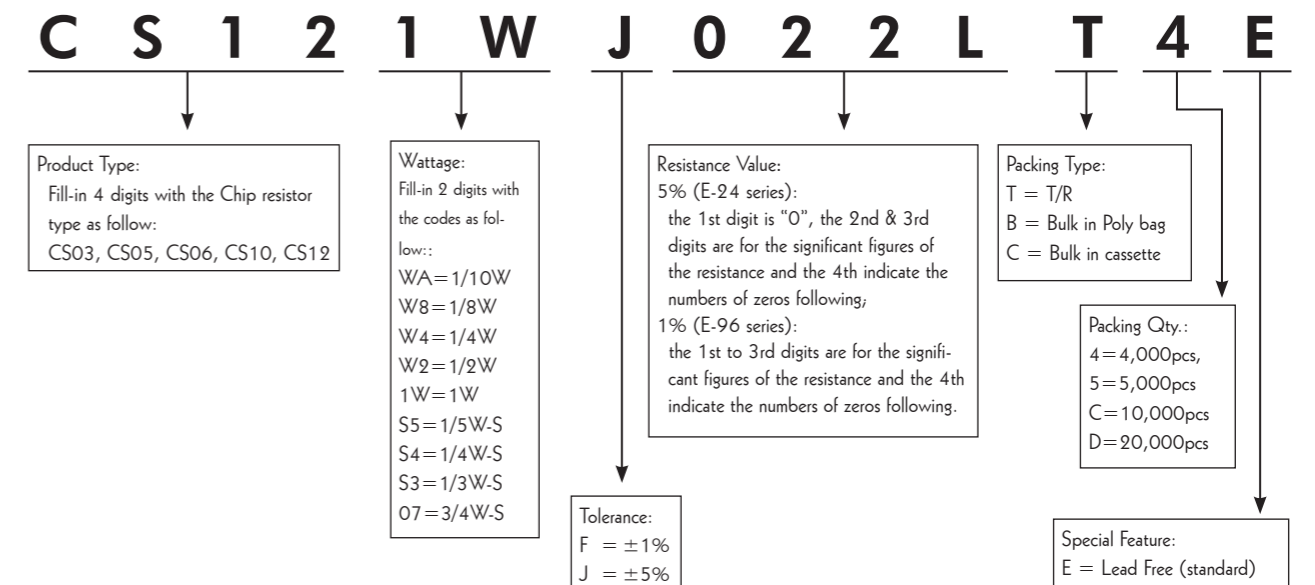
Type	Dielectric Withstanding Voltage	Operating Temperature
CS03	300V	-55°C~155°C
CS05	500V	-55°C~155°C
CS06	500V	-55°C~155°C
CS10	500V	-55°C~155°C
CS12	500V	-55°C~155°C

Type	Power Rating at 70°C	L(mm)	W(mm)	H(mm)	A(mm)	B(mm)	Resistance Range of 1% & 5%	T.C.R.
CS03	1/10W 1/5W-S	1.60±0.10	0.80 <sup>+0.15</sup> <sub>-0.10</sub>	0.45±0.10	0.30±0.20	0.30±0.20	33mΩ~100mΩ	33~50mΩ: ≤±400ppm/°C 50~100mΩ: ≤±400ppm/°C
CS05	1/8W 1/4W-S	2.00±0.15	1.25 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.40±0.20	0.40±0.20	25mΩ~100mΩ	≤±400ppm/°C
CS06	1/4W 1/3W-S	3.10±0.15	1.55 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.45±0.20	0.45±0.20	20mΩ~100mΩ 30mΩ~100mΩ	20~50mΩ: ≤±400ppm/°C 50~100mΩ: ≤±300ppm/°C
CS10	1/2W 3/4W-S	5.00±0.10	2.50 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.60±0.25	0.50±0.20	20mΩ~100mΩ	20~50mΩ: ≤±400ppm/°C 50~100mΩ: ≤±200ppm/°C
CS12	1W	6.35±0.10	3.20 <sup>+0.15</sup> <sub>-0.10</sub>	0.55±0.10	0.60±0.25	0.80±0.30		

Performance Specifications

Short-time overload	1%: ±(1.0%+0.005Ω) Max. 5%: ±(2.0%+0.005Ω) Max.	Temperature cycling	±(1.0%+0.005Ω) Max.
Terminal bending	±(1.0%+0.005Ω) Max.	Soldering heat	±(1.0%+0.005Ω) Max.
Solderability	Min. 95% coverage	Load life in humidity	1%: ±(1.0%+0.005Ω) Max. 5%: ±(3.0%+0.005Ω) Max.
Dielectric withstanding Voltage	No evidence of flashover, mechanical damages, arcing or insulation breakdown	Load life	1%: ±(1.0%+0.005Ω) Max. 5%: ±(3.0%+0.005Ω) Max.

Ordering Procedure (Example: CS12 1W 5% 22mΩ T/R-4000)



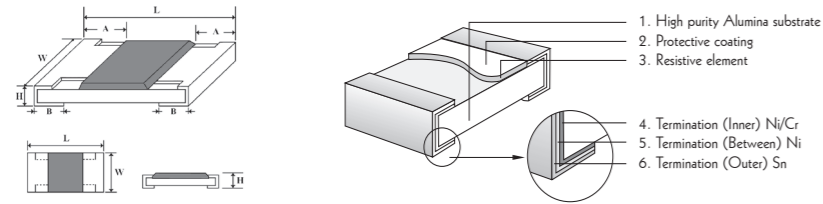
Feature

- Thin file NiCr Resistance element
- Very tight tolerance from  $\pm 0.10\%$ ,  $\pm 0.25\%$
- Extremely low TCR from  $\pm 5 \sim \pm 50$  PPM/ $^{\circ}\text{C}$

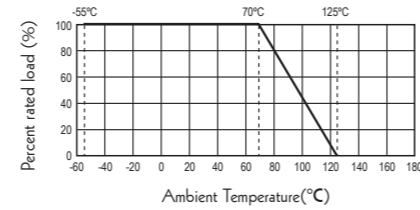
Application

- Medical Equipment
- Testing / Measurement Equipment
- Communication Device, Cell Phone, GPS, PDA
- Automatic equipment controller
- Printer Equipment
- Converters

Structure

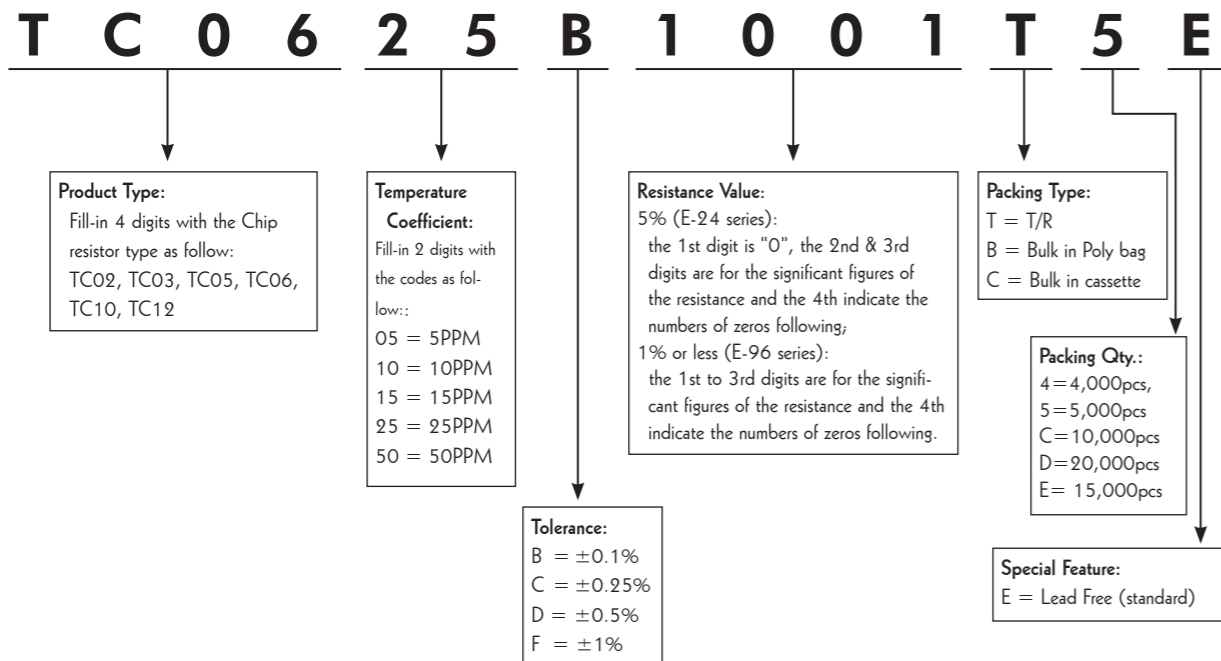


Derating Curve



Type	L	W	H	A	B
TC02	1.00±0.10	0.50 ±0.05	0.35±0.05	0.20±0.10	0.25±0.10
TC03	1.60±0.10	0.80 <sup>+0.15</sup> / <sub>-0.10</sub>	0.45±0.10	0.30±0.20	0.30±0.20
TC05	2.00±0.15	1.25 <sup>+0.15</sup> / <sub>-0.10</sub>	0.55±0.10	0.40±0.20	0.40±0.20
TC06	3.10±0.15	1.55 <sup>+0.15</sup> / <sub>-0.10</sub>	0.55±0.10	0.45±0.20	0.45±0.20
TC10	5.00±0.10	2.50 <sup>+0.15</sup> / <sub>-0.10</sub>	0.55±0.10	0.60±0.25	0.50±0.20
TC12	6.35±0.10	3.20 <sup>+0.15</sup> / <sub>-0.10</sub>	0.55±0.10	0.60±0.25	0.50±0.20

Ordering Procedure (Example: Thin Film 1206 1/8W 0.1% 25PPM 1KΩ T/R-5000)



Performance Specification

Short-time overload	$\pm 0.25\%$ , $\pm 0.10\%$ : $\Delta R \leq \pm 0.5\%$
Insulation Resistance	$> 1000\text{M}\Omega$
Load life	$\pm 0.25\%$ , $\pm 0.10\%$ : $\Delta R \leq \pm 0.2\%$ $> 7\text{K}\Omega$ $\Delta R \leq \pm 0.5\%$
Humidity (Steady State)	$\pm 0.25\%$ , $\pm 0.10\%$ : $\Delta R \leq \pm 0.3\%$
Bending strength	$\pm 0.25\%$ , $\pm 0.10\%$ : $\Delta R \leq \pm 0.2\%$
Solderability	$\geq 95\%$ coverage
Resistance to soldering heat	$\pm 0.25\%$ , $\pm 0.10\%$ : $\Delta R \leq \pm 0.2\%$

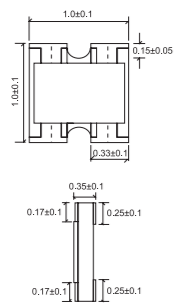
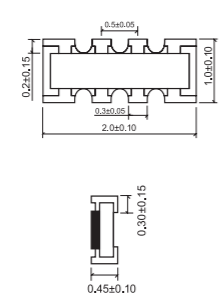
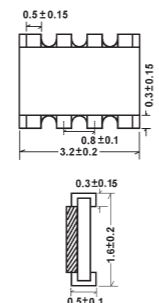
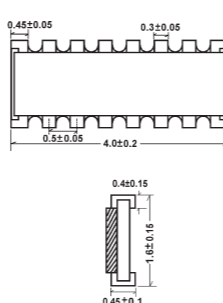
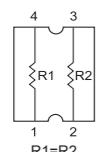
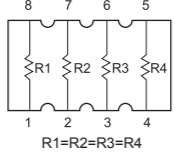
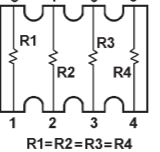
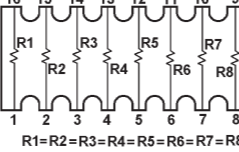
Characteristics

Type	Power Rating at 70°C	Operating Temperature	Max. Working Voltage	Max. Overload Voltage	Resistance Tolerance	Resistance Range	TCR (PPM/ $^{\circ}\text{C}$ )
TC02	1/16W	-55~+125°C	25V	50V	$\pm 0.10\%$ $\pm 0.25\%$	100Ω ~ 2KΩ	$\pm 5\text{ppm}$
						50Ω ~ 12KΩ	$\pm 10\text{ppm}$
						10Ω ~ 100KΩ	$\pm 25\text{ppm}$
						10Ω ~ 100KΩ	$\pm 50\text{ppm}$
TC03	1/16W	-55~+125°C	50V	100V	$\pm 0.10\%$ $\pm 0.25\%$	100Ω ~ 4KΩ	$\pm 5\text{ppm}$
						50Ω ~ 50KΩ	$\pm 10\text{ppm}$
						10Ω ~ 332KΩ	$\pm 25\text{ppm}$
TC05	1/10W	-55~+125°C	100V	200V	$\pm 0.10\%$ $\pm 0.25\%$	100Ω ~ 10KΩ	$\pm 5\text{ppm}$
						50Ω ~ 100KΩ	$\pm 10\text{ppm}$
						4.7Ω ~ 1MΩ	$\pm 25\text{ppm}$
TC06	1/8W	-55~+125°C	150V	300V	$\pm 0.10\%$ $\pm 0.25\%$	4.7Ω ~ 1MΩ	$\pm 50\text{ppm}$
						100Ω ~ 15KΩ	$\pm 5\text{ppm}$
						50Ω ~ 200KΩ	$\pm 10\text{ppm}$
TC10	1/4W	-55~+125°C	150V	300V	$\pm 0.10\%$ $\pm 0.25\%$	4.7Ω ~ 1MΩ	$\pm 25\text{ppm}$
						4.7Ω ~ 1MΩ	$\pm 50\text{ppm}$
						100Ω ~ 25KΩ	$\pm 5\text{ppm}$
TC12	1/2W	-55~+125°C	150V	300V	$\pm 0.10\%$ $\pm 0.25\%$	50Ω ~ 200KΩ	$\pm 10\text{ppm}$
						4.7Ω ~ 1MΩ	$\pm 25\text{ppm}$
						4.7Ω ~ 1MΩ	$\pm 50\text{ppm}$

Feature

- High density, more than 1 resistors in one small case
- Improvement of placement efficiency
- Tape/Reel packaging is suitable for automatic placement machine
- Superior solderability
- Application: Master board, CD & DVD Rom, Hard Disk, RAM



	2D02	4D02	4D03	16P8
Dimension (mm)				
Equivalent Circuit Diagram				

Type	2D02	4D02	4D03	16P8
Rated power at 70°C	1/16W	1/16W	1/16W	1/16W
Max. Working Voltage	50V	50V	50V	50V
Max. Overload Voltage	100V	100V	100V	100V
Dielectric Withstanding Voltage	100V	100V	300V	300V
Resistance Range	5% (E-24 ): 10Ω~1MΩ 1% (E-96 ): 10Ω~1MΩ	5% (E-24 ): 10Ω~1MΩ 1% (E-96 ): 10Ω~1MΩ	5% (E-24 ): 1Ω~1MΩ 1% (E-96 ): 1Ω~1MΩ	5% (E-24 ): 1Ω~1MΩ 1% (E-96 ): 1Ω~1MΩ
Temperature Coefficient	±200PPM/°C	±200PPM/°C	≥10Ω: ±200PPM/°C <10Ω: ±400PPM/°C	≥10Ω: ±200PPM/°C <10Ω: ±400PPM/°C
Operating Temperature	-55°C~+155 °C	-55°C~+155 °C	-55°C~+155 °C	-55°C~+155 °C
Resistance Value of Jumper	<50mΩ	<50mΩ	<50mΩ	<50mΩ
Rated Current of Jumper	1A	1A	1A	1A

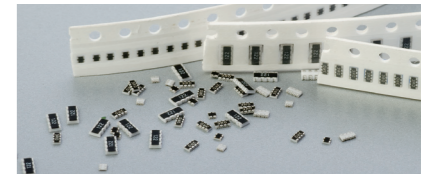
Performance Specification

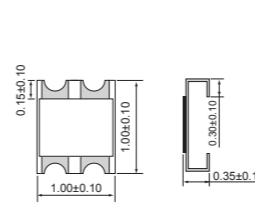
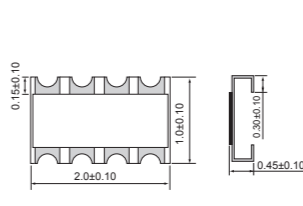
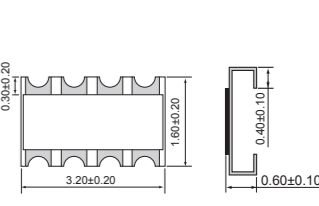
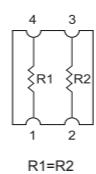
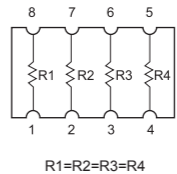
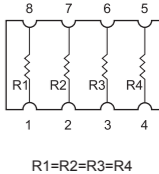
Short-time overload	±(2.0% ±0.1Ω) Max.
Insulation resistance	≥1,000 Mega Ohm.
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal bending	±(1.0% ±0.05Ω) Max.
Soldering heat	ΔR/R ≤ ±(1.0% ±0.05Ω)
Solderability	Min. 95% coverage
Temperature cycling	ΔR/R ≤ ±(1.0% ±0.05Ω)
Load lie in humidity	±(3.0% ±0.1Ω) Max.
Load life	±(3.0% ±0.1Ω) Max.

• Please refer to page 4 for the information of Ordering Procedure (Part No.)

Feature

- High density, more than 1 resistors in one small case
- The Concave design in terminal enlarge the Soldering plate area
- The Concave design to reduce the terminal breaking risk
- Improvement of placement efficiency
- Application: RAM, CD & DVD Rom, Hard Disk, Master board



	2C02	4C02	4C03
Dimension (mm)			
Equivalent Circuit Diagram			

Type	2C02	4C02	4C03
Rated power at 70°C	1/16W	1/16W	1/16W
Max. Working Voltage	25V	25V	50V
Max. Overload Voltage	50V	50V	100V
Dielectric withstanding Voltage	100V	100V	300V
Resistance Range	5% (E-24 ): 10Ω~1MΩ 1% (E-96 ): 10Ω~1MΩ	5% (E-24 ): 10Ω~1MΩ 1% (E-96 ): 10Ω~1MΩ	5%, 1%: 1Ω~1M
Temperature coefficient	±200PPM/°C	±200PPM/°C	≥10Ω: ±200PPM/°C <10Ω: ±400PPM/°C
Operating Temperature	-55°C~+155 °C	-55°C~+155 °C	-55°C~+155 °C
Resistance Value of Jumper	<50mΩ	<50mΩ	<50mΩ
Rated Current of Jumper	1A	1A	1A

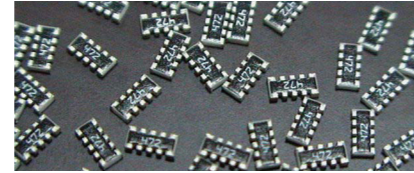
Performance Specification

Short-time overload	±(2.0% ±0.1Ω) Max.
Insulation resistance	≥1,000 Mega Ohm.
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal bending	±(1.0% ±0.05Ω) Max.
Soldering heat	ΔR/R ≤ ±(1.0% ±0.05Ω)
Solderability	Min. 95% coverage
Temperature cycling	ΔR/R ≤ ±(1.0% ±0.05Ω)
Load life in humidity	±(3.0% ±0.1Ω) Max.
Load life	±(3.0% ±0.1Ω) Max.

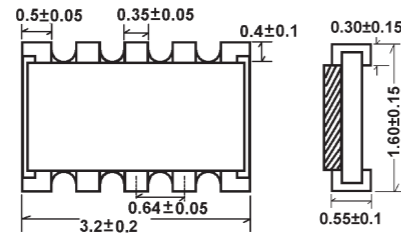
• Please refer to page 4 for the information of Ordering Procedure (Part No.)

Feature

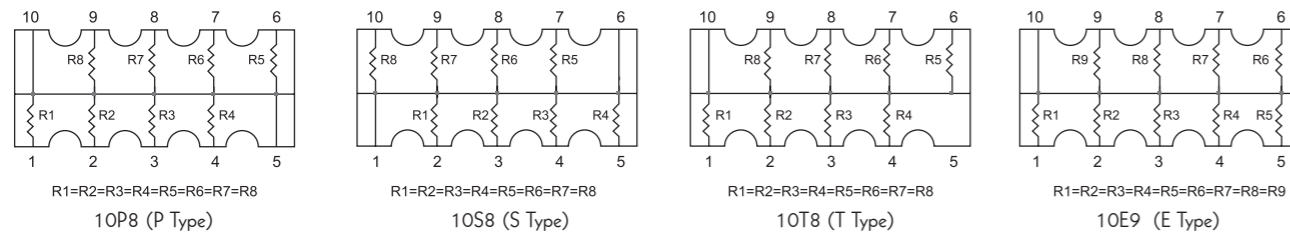
- High density, more than 1 resistors in one small case
- Improvement of placement efficiency
- Tape/Reel packaging is suitable for automatic placement machine
- Superior solderability



Dimension (mm)



Equivalent Circuit Diagram



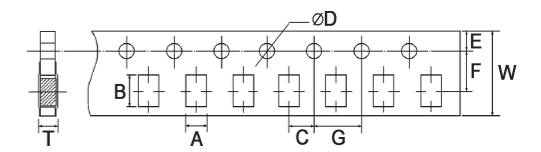
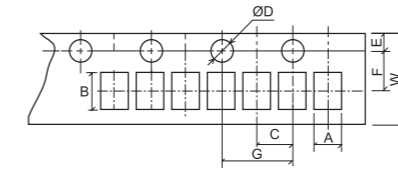
Performance Specification

Rated Power at 70°C	1/32W (special code "WH" in Part No.), 1/16W
Max. Working Voltage	25V
Max. Overload Voltage	50V
Dielectric withstanding Voltage	50V
Operating temperature	-55°C ~ +155 °C
Resistance Range	5% (E-24 series) & 1% (E-96 series): 10Ω~1MΩ
Resistance Value of Jumper	<50mΩ
Rated Current of Jumper	0.5A

Temperature Coefficient	±200PPM/°C
Short-time overload	±(2.0% ±0.05Ω) Max.
Insulation resistance	≥1,000 Mega Ohm.
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal bending	±(1.0% ±0.05Ω) Max.
Soldering heat	ΔR/R ≤ ±(1.0% ±0.05Ω)
Solderability	Min.95% coverage
Load life in humidity	±(3.0% ±0.1Ω) Max.
Load life	±(3.0% ±0.1Ω) Max.

• Please refer to page 4 for the information of Ordering Procedure (Part No.)

Dimension of Paper Taping (mm)

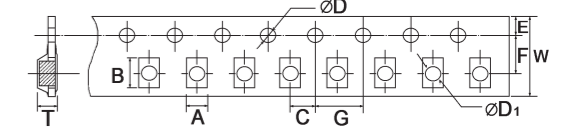


0201 0402 2C02 4C02 4D02 2D02

0603 0805 1206 1210 2010 4C03 4D03 0612 1020 HP03 HP05  
HP06 TR05 TR06 CS03 CS05 CS06 CS10 HV03 HV05 HV06 HV10 10P8 16P8

Type	A±0.2	B±0.2	C±0.05	Ø D <sup>+0.1</sup> <sub>-0</sub>	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
0201	0.40±0.05	0.70±0.05	2.0	1.5	1.75	3.5	4.0	8.0	0.42
0402 / TC02	0.65	1.15	2.0	1.5	1.75	3.5	4.0	8.0	0.45
0603 / TC03 / HV03 / HP03 / CS03	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
0805 / TC05 / HV05 / HP05 / TR05 / 0508 / CS05	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
1206 / TC06 / HV06 / HP06 / TR06 / 0612 / CS06	2.00	3.60	2.0	1.5	1.75	3.5	4.0	8.0	0.81
1210	2.80	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.75
2010 / 1020 / HV10 / CS10	2.80	5.40	2.0	1.5	1.75	5.5	4.0	12.0	0.75
2D02 / 2C02	1.20	1.20	2.0	1.5	1.75	3.5	4.0	8.0	0.45
4D02 / 4C02	1.20	2.20	2.0	1.5	1.75	3.5	4.0	8.0	0.70
4D03 / 4C03	2.00	3.60	2.0	1.5	1.75	3.5	4.0	8.0	0.83
10P8	2.00	3.60	2.0	1.5	1.75	3.5	4.0	8.0	0.85
16P8	1.80	4.30	2.0	1.5	1.75	5.5	4.0	12.0	0.75

Dimension of Embossed Taping (mm)

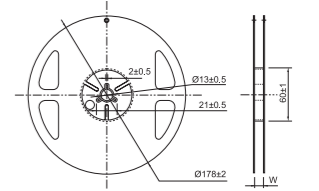


Type	A±0.2	B±0.2	C±0.05	Ø D <sup>+0.1</sup> <sub>-0</sub>	Ø D <sub>1</sub> <sup>+0.25</sup> <sub>-0</sub>	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
TC10	2.9	5.6	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0
1218	3.5	4.8	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0
2512 / TC12 / CS12 / HV12 / 1225	3.5	6.7	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0

Dimension of Reel (mm)

Type	Tape	Qty. / Reel	Tape Width	W±1
0201 / 0402* / TC02	Paper	10,000pcs *	8mm	10
0603 / TC03 / HV03 / HP03 / CS03	Paper	5,000pcs	8mm	10
0805 / TC05 / HV05 / HP05 / TR05 / 0508 / CS05	Paper	5,000pcs	8mm	10
1206 / TC06 / HV06 / HP06 / TR06 / 0612 / CS06	Paper	5,000pcs	8mm	10
1210	Paper	5,000pcs	8mm	10
2010 / 1020 / HV10 / CS10	Paper	4,000pcs	12mm	13.8
1218 / TC10	Embossed	4,000pcs	12mm	13.8
2512 / TC12 / HV12 / CS12 / 1225	Embossed	4,000pcs	12mm	13.8
2D02 / 2C02	Paper	10,000pcs	8mm	10
4D02 / 4C02	Paper	10,000pcs	8mm	10
4D03 / 4C03	Paper	5,000pcs	8mm	10
10P8	Paper	5,000pcs	8mm	10
16P8	Paper	4,000pcs	12mm	13.8

\*Remark: 15,000kpcs/reel package could be offered for 0402 size.



Dimension of Bulk Cassette (mm)

36(H)×12(W)×110(L)

Bulk Cassette packing available on a case to case basis



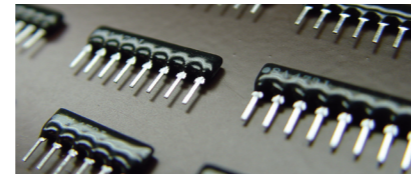


Feature

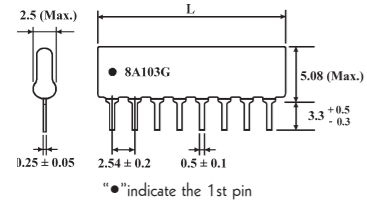
- Miniature, high density packaging
- High reliability R<sub>1</sub>O<sub>2</sub> paste

Application

- Control circuit V.C.R.
- Air-conditioner
- Computer, color TV
- Facsimile



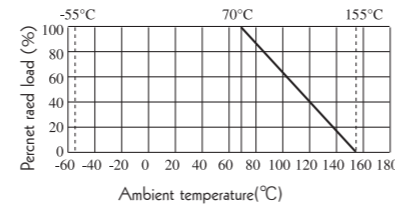
Dimension (mm)



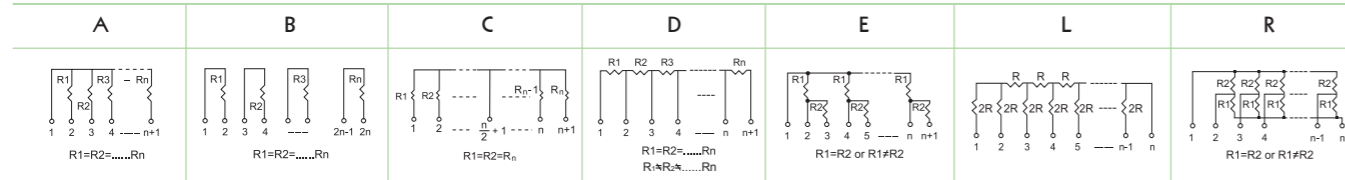
Dimension of L (Max.)

4 PIN : 10.2mm	9 PIN : 22.9mm
5 PIN : 12.7mm	10 PIN : 25.4mm
6 PIN : 15.3mm	11 PIN : 28.0mm
7 PIN : 17.8mm	12 PIN : 30.5mm
8 PIN : 20.4mm	13 PIN : 33.1mm
	14 PIN : 35.6mm

Derating Curve



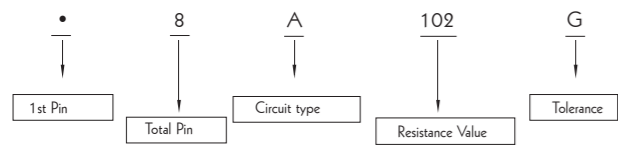
Circuit Structure



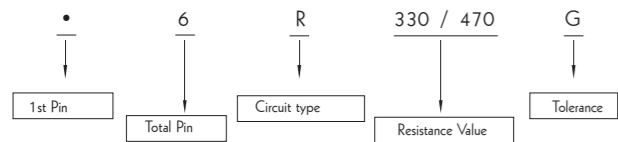
\* Custom Design Circuit could be available on a case to case basis.

Power Rating at 70°C	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	Tolerance	Operating Temperature
B type: 0.2W Others: 0.125W	100V	150V	200V	R Type: 100Ω~10KΩ Others: 10Ω~1M	±2% ±5%	-55°C~+155°C

Marking (Single Value):



Marking (Dual Value):



Dual Value (R1/R2) (Ohm)

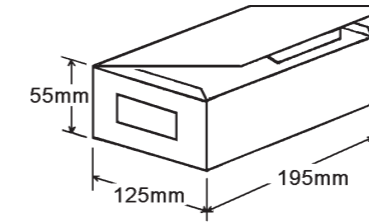
160 / 240	330 / 390
180 / 390	330 / 470
220 / 270	1.5K / 3.5K
220 / 330	3.0K / 6.2K

\* Special Value available on a case to case basis.

Performance Specifications

Temperature coefficient	50Ω ~ 1MΩ: ±200PPM/°C <50Ω & >1MΩ: ±250PPM/°C
Short-time overload	ΔR/R ≤ ±(0.5% + 0.1Ω)
Insulation resistance	Min. 10,000 Mega ohm.
Dielectric withstanding voltage	No Evidence of flashover, arcing or insulation breakdown
Terminal strength	ΔR/R ≤ ±(0.5% + 0.1Ω)
Soldering heat	ΔR/R ≤ ±(0.5% + 0.1Ω)
Solderability	Min. 95% coverage
Thermal shock	ΔR/R ≤ ±(0.5% + 0.1Ω)
Temperature cycling	ΔR/R ≤ ±(0.5% + 0.1Ω)
Load life in humidity	ΔR/R ≤ ±(3% + 0.1Ω)
Load life	ΔR/R ≤ ±(3% + 0.1Ω)

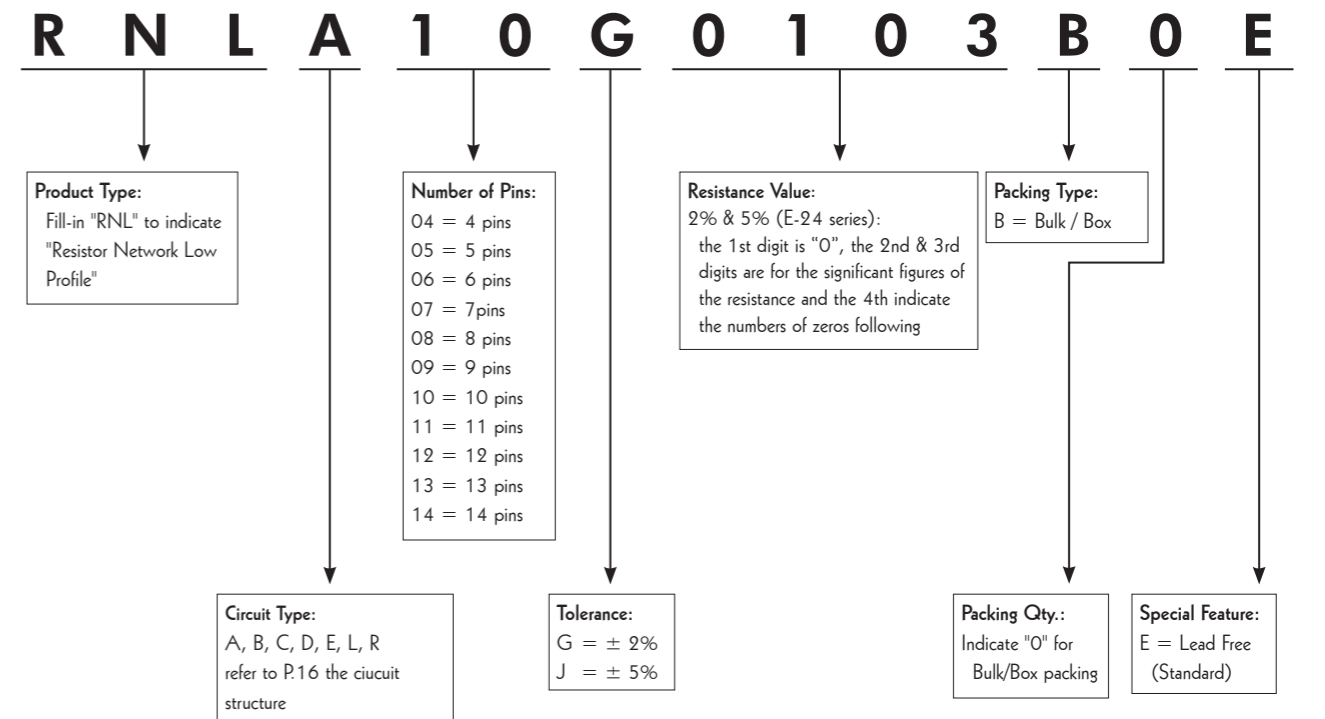
Standard Packing of Resistor Network



Pins	Weight of 1,000pcs	Qty. per Box	Qty. per Box	Qty. per Carton
4	210g	500	5,000	75,000
5	250g	400	4,000	60,000
6	320g	300	3,000	45,000
7	360g	200	2,000	30,000
8	430g	200	2,000	30,000
9	450g	200	2,000	30,000
10	530g	150	1,500	22,500
11	600g	100	1,000	15,000
12	650g	100	1,000	15,000
13	710g	100	1,000	15,000
14	770g	100	1,000	15,000

\* standard carton dimension (mm) : 395×367×195

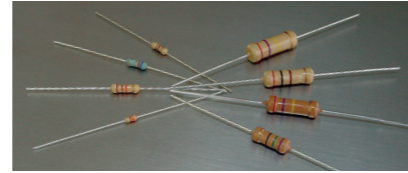
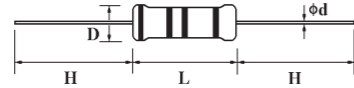
Ordering Procedure (Example: RNL A type 10 PIN 2% 10KΩ B/B)





Feature

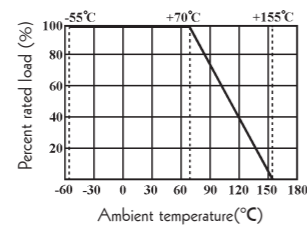
- High quality performance
- Great economy
- Flame retardant type available
- Automatically insertable



Part No.	Type	Power Rating at 70°C	Dimension (mm)				Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range
			D Max.	L Max.	d±0.05	H ± 3				
<b>Normal Size</b>										
CFROW8	CFR-12	1/8W	1.9	3.5	0.45	28	200V	400V	400V	1Ω ~ 1MΩ
CFROW4	CFR-25	1/4W	2.5	6.8	0.54	28	250V	500V	500V	1Ω ~ 10MΩ
CFROW2	CFR-50	1/2W	3.5	10	0.54	28	350V	700V	700V	1Ω ~ 10MΩ
CFR01W	CFR-100	1W	5.5	16	0.70	28	500V	1000V	1000V	1Ω ~ 10MΩ
CFR02W	CFR-200	2W	6.5	17.5	0.75	28	500V	1000V	1000V	1Ω ~ 10MΩ
<b>Small Size &amp; Extra Small Size</b>										
CFROS4	CFR-25-S	1/4W	1.9	3.5	0.45	28	200V	400V	400V	1Ω ~ 1MΩ
CFROU2	CFR-50-SS	1/2W	2.7	6.8	0.54	28	250V	500V	250V	1Ω ~ 10MΩ
CFROS2	CFR-50-S	1/2W	3	9	0.54	28	350V	700V	700V	1Ω ~ 10MΩ
CFR01S	CFR-100-S	1W	5	12	0.65	28	500V	1000V	1000V	1Ω ~ 10MΩ
CFR02S	CFR-200-S	2W	5.5	16	0.70	28	500V	1000V	1000V	1Ω ~ 10MΩ
CFR03S	CFR-300-S	3W	6.5	17.5	0.75	28	500V	1000V	1000V	1Ω ~ 10MΩ

- Standard E-24 series values in ±5% tolerance
- Standard Beige base color, Light Brown color for CFR01S, CFR02S & CFR03S
- Standard Grayish-green base color (Non-Flammable coating) for CFROU2 (CFR-50-SS)
- For any special inquiry such as too Low or too High ohmic values is available on a case to case basis

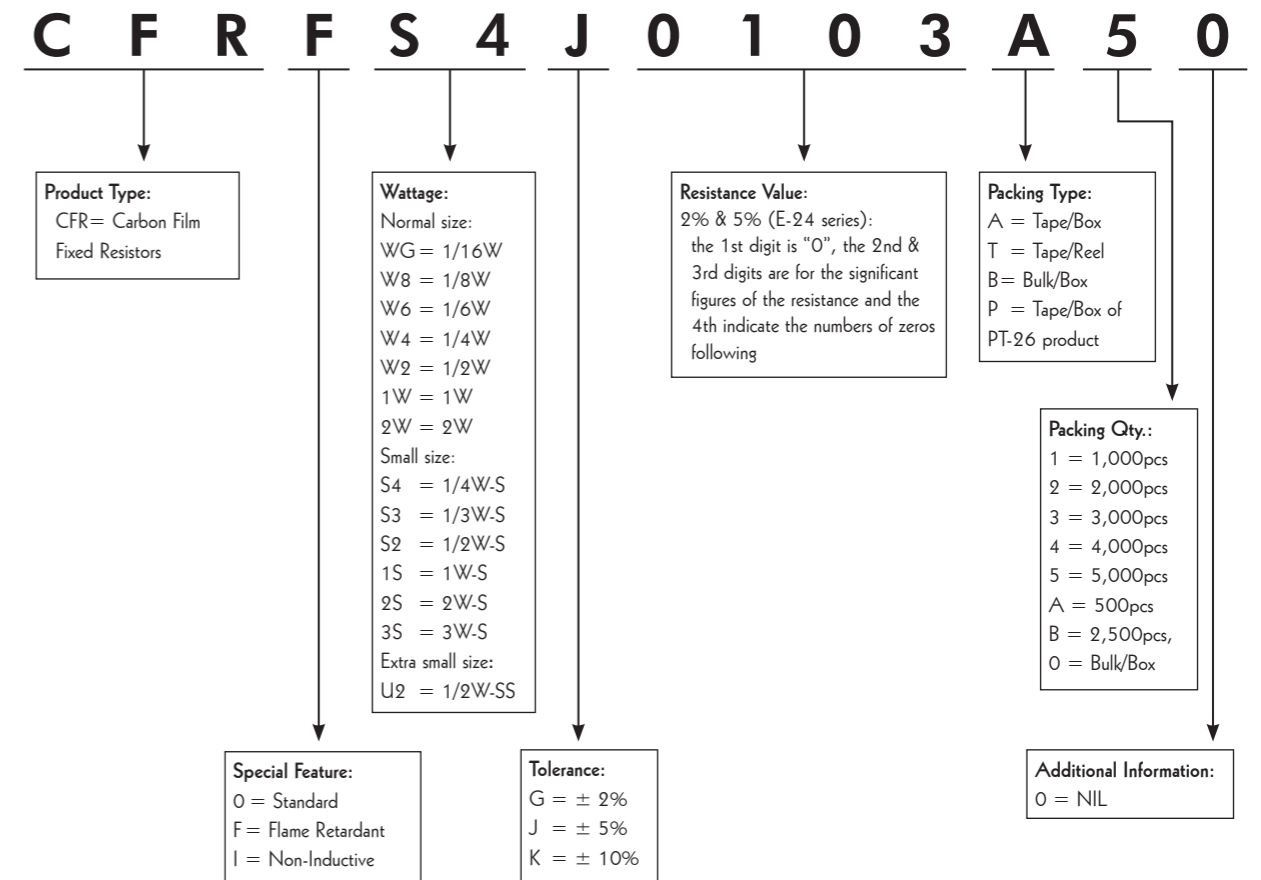
Derating Curve



Performance Specification

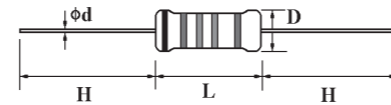
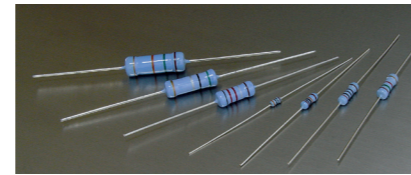
Temperature coefficient	±300PPM/°C for ≤10Ω; ±450PPM/°C for 11Ω ~ 99KΩ; 0 ~ -700PPM/°C for 100KΩ ~ 1MΩ; 0 ~ -1500PPM/°C for 1.1MΩ ~ 10MΩ.
Short-time overload	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Insulation resistance	Min. 10,000Mega Ohm.
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Resistance to solvent	No deterioration of protective coating and markings
Temperature cycling	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Load life in humidity	Normal type: ΔR/R ± 3% for <100KΩ, ±5% for ≥100KΩ; Flame retardant type: ΔR/R ± 5% for <100KΩ, ±10% for ≥100KΩ
Load life	Normal type: ΔR/R ±2% for <56KΩ, ±3% for ≥56KΩ; Flame retardant type: ΔR/R ±5% for <100KΩ, ±10% for ≥100KΩ

Ordering Procedure (Example: CFR 1/4W Small Size Flame Retardant type 5% 10KΩ T/B-5000)



Feature

- EIA standard color coding
- Flame retardant type available
- Low noise & voltage coefficient
- Low temperature coefficient range
- Multiple epoxy coating on vacuum-deposited metal film provides superior moisture protection
- Nichrome resistive element provides stable performance in various environments

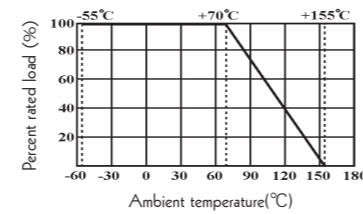


Part No.	Type	Power Rating at 70°C	Dimension (mm)			
			D Max.	L Max.	d ± 0.05	H ± 3
<b>Normal Size</b>						
MFR0W8	MF-12	1/8W	1.9	3.5	0.45	28
MFR0W4	MF-25	1/4W	2.5	6.8	0.54	28
MFR0W2	MF-50	1/2W	3.5	10	0.54	28
MFR01W	MF-100	1W	5	12	0.65	28
MFR02W	MF-200	2W	5.5	16	0.70	28
MFR03W	MF-300	3W	6.5	17.5	0.75	28
<b>Small Size &amp; Extra Small Size</b>						
MFR0S4	MF-25-S	1/4W	2	3.5	0.45	28
MFR004	MF-40-SS	0.4W	2	3.5	0.45	28
MFR0U2	MF-50-SS	1/2W	2.7	6.8	0.54	28
MFR0S2	MF-50-S	1/2W	3	9	0.54	28
MFR006	MF-60-S	0.6W	2.7	6.8	0.54	28

Standard Non-flammable coating for Small size type (except MF-50-S).

Part No.	Type	Dielectric Withstanding Voltage	Max. Working Voltage	Max. Overload Voltage	Standard Order			Special Order		
					Tolerance	TCR	Value Range	Tolerance	TCR	Value Range
MFR0W8	MF-12	400V	200V	400V	±1%	± 50	10Ω-1MΩ	± 0.25%	± 15	51.1Ω ~ 200KΩ
MFR0S4	MF-25-S	200V	200V	400V	±2%	± 100	10Ω-1MΩ	± 0.5%	± 25	51.1Ω ~ 511KΩ
MFR004	MF-40-SS				±5%	± 200	1Ω-1MΩ	± 0.5%	± 50	51.1Ω ~ 511KΩ
MFR0W4	MF-25	500V	250V	500V	±1%	± 50	10Ω-1MΩ	± 0.1%	± 15	10Ω ~ 1MΩ
MFR0U2	MF-50-SS	250V	250V	500V	±2%	± 100	1Ω-1MΩ	± 0.25%	± 25	10Ω ~ 1MΩ
MFR006	MF-60-S				±5%	± 200	1Ω-1MΩ	± 0.5%	± 50	10Ω ~ 1MΩ
MFR0S2	MF-50-S	700V	350V	700V	±1%	± 50	10Ω-1MΩ	± 0.1%	± 15	100Ω ~ 330KΩ
MFR0W2	MF-50				±2%	± 100	10Ω-1MΩ	± 0.25%	± 25	51.1Ω ~ 511KΩ
					±5%	± 200	1Ω-1MΩ	± 0.5%	± 50	10Ω ~ 1MΩ
MFR01W	MF-100	1000V	500V	1000V	±1%	± 50	51.1Ω-1MΩ	± 0.1%	± 15	100Ω ~ 330KΩ
MFR02W	MF-200				±2%	± 100	51.1Ω-1MΩ	± 0.25%	± 25	51.1Ω ~ 511KΩ
MFR03W	MF-300				±5%	± 200	1Ω-1MΩ	± 0.5%	± 50	51.1Ω ~ 1MΩ

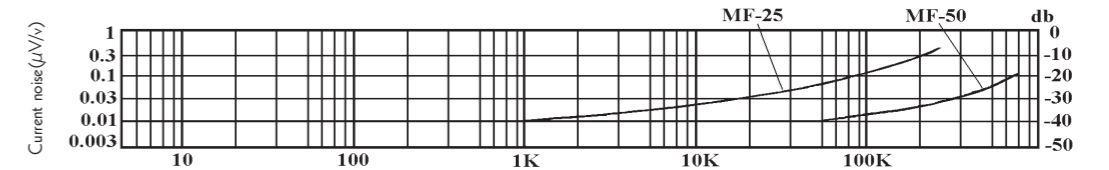
Derating Curve



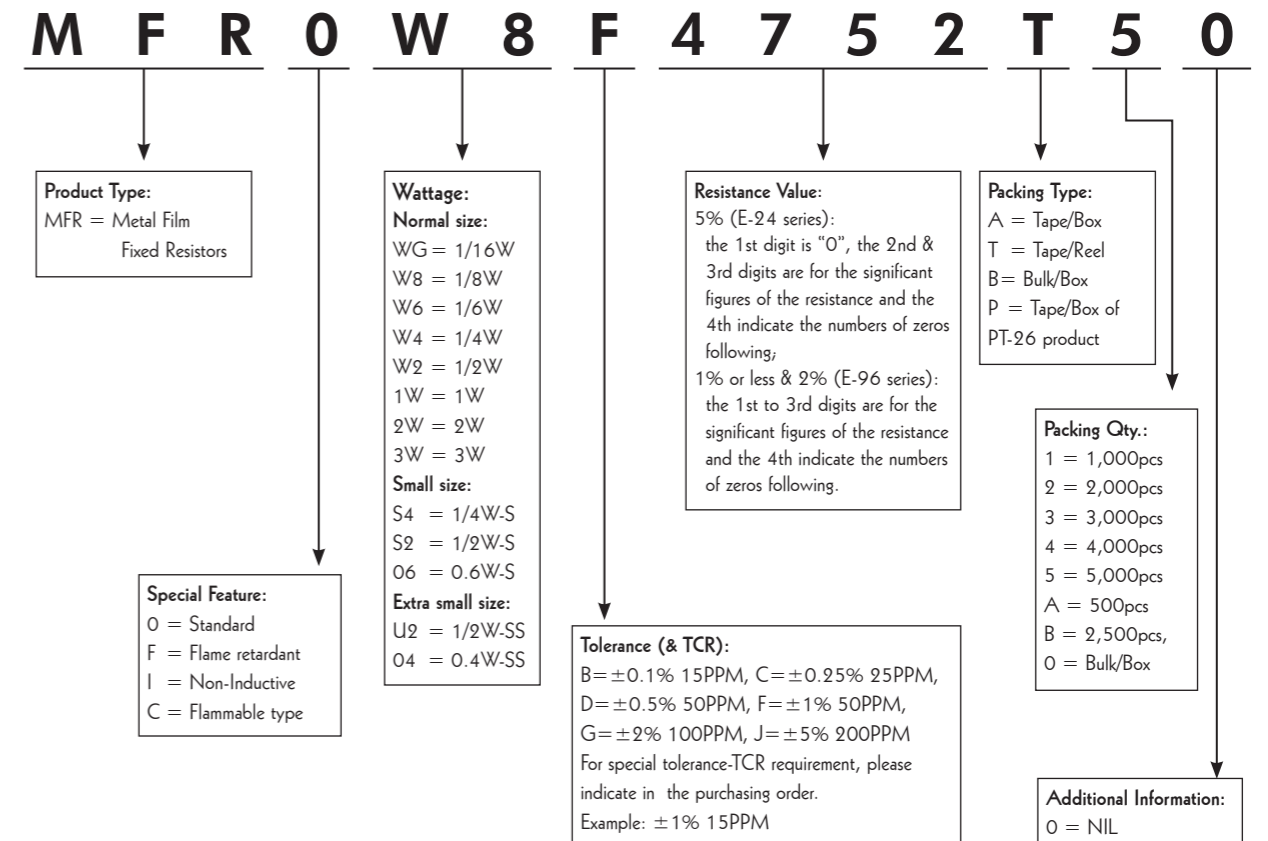
Performance Specification

Temperature coefficient	refer to P.20
Short-time overload	$\Delta R/R \leq \pm(0.5\%+0.05\Omega)$ , with no evidence of mechanical damage
Dielectric withstanding voltage	With no evidence of flashover, mechanical damage, arcing or insulation breakdown
Pulse overload	$\Delta R/R \leq \pm(1\%+0.05\Omega)$ , with no evidence of mechanical damage
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	$\Delta R/R \leq \pm(1\%+0.05\Omega)$ , with no evidence of mechanical damage
Solderability	Min. 95% coverage
Resistance to solvent	No deterioration of protective coating and marking
Temperature cycling	$\Delta R/R \leq \pm(1\%+0.05\Omega)$ , with no evidence of mechanical damage
Load life in humidity	Normal type: $\Delta R/R \leq \pm 1.5\%$ ; Flame retardant type: $\Delta R/R \leq \pm 5\%$ .
Load life	Normal type: $\Delta R/R \leq \pm 1.5\%$ ; Flame retardant type: $\Delta R/R \leq \pm 5\%$ .

Current Noise Level

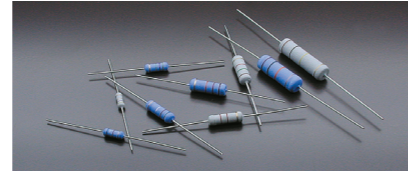


Ordering Procedure (Example: MFR 1/8W 1% 50PPM 47.5KΩ T/R-5000)

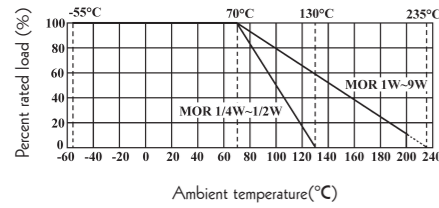


Feature

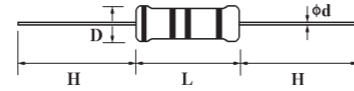
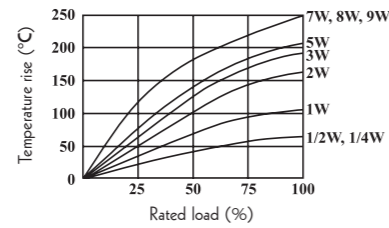
- Excellent flame retardant coating
- Stable performance in diverse environments
- High purity ceramic core
- Meet EIA-RC2655A requirements
- High safety standard



Derating Curve



Heat Rise Chart



Specification

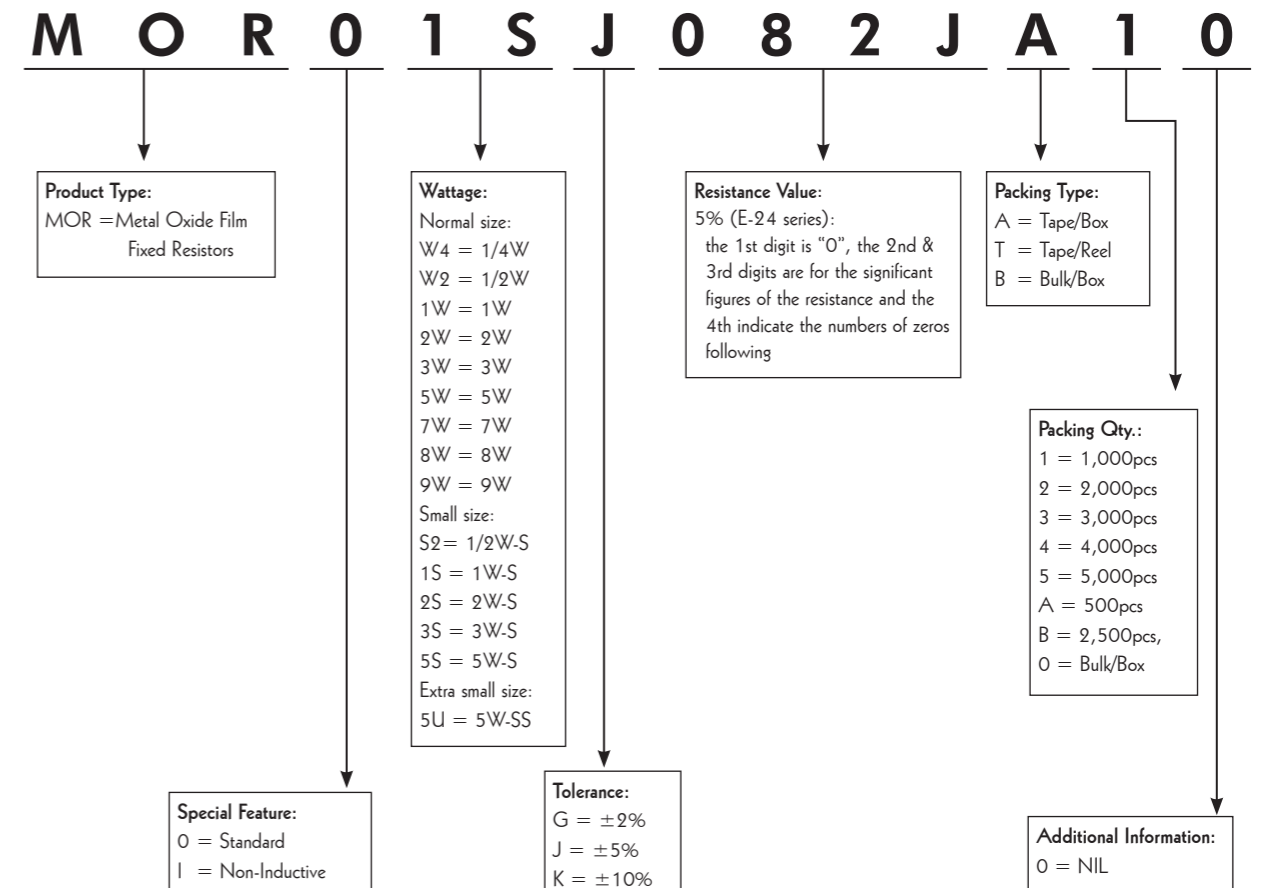
Part No.	Type	Power Rating at 70°C	Dimension (mm)				Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Value Range
			D Max.	L Max.	d±0.05	H±3				
<b>Normal Size</b>										
MOR0W4	MOR-25	1/4W	2.7	7.5	0.54	28	250V	400V	250V	0.1Ω ~ 100KΩ
MOR0W2	MOR-50	1/2W	4.5	10	0.54	28	250V	400V	250V	0.1Ω ~ 120KΩ
MOR01W	MOR-100	1W	5.0	12	0.65	28	350V	600V	350V	0.1Ω ~ 150KΩ
MOR02W	MOR-200	2W	5.5	16	0.70	28	350V	600V	350V	0.1Ω ~ 150KΩ
MOR03W	MOR-300	3W	6.5	17.5	0.75	28	500V	800V	500V	0.1Ω ~ 150KΩ
MOR05W	MOR-500	5W	8.5	26	0.75	38	750V	1000V	750V	0.1Ω ~ 180KΩ
MOR07W	MOR-700	7W	8.5	32	0.75	38	750V	1000V	750V	20Ω ~ 150KΩ
MOR08W	MOR-800	8W	8.5	41	0.75	38	750V	1000V	750V	30Ω ~ 200KΩ
MOR09W	MOR-900	9W	8.5	54	0.75	38	750V	1000V	750V	50Ω ~ 200KΩ
<b>Small Size &amp; Extra Small Size</b>										
MOR0S2	MOR-50-S	1/2W	2.7	7.5	0.54	28	250V	400V	250V	0.1Ω ~ 100KΩ
MOR01S	MOR-100-S	1W	4.5	10	0.65	28	350V	600V	350V	0.1Ω ~ 120KΩ
MOR02S	MOR-200-S	2W	5.0	12	0.65	28	350V	600V	350V	0.1Ω ~ 150KΩ
MOR03S	MOR-300-S	3W	5.5	16	0.70	28	350V	600V	350V	0.1Ω ~ 150KΩ
MOR05U	MOR-500-SS	5W	6.5	17.5	0.75	28	500V	800V	500V	0.1Ω ~ 150KΩ
MOR05S	MOR-500-S	5W	8.0	25	0.75	38	500V	800V	500V	0.1Ω ~ 180KΩ

- Standard E-24 series value in ± 5% tolerance
- Standard Gray base color for Normal Size product, Blue color for Small Size product
- Standard Non-Flammable coating
- Non-Inductive type available on a case to case basis

Performance Specification

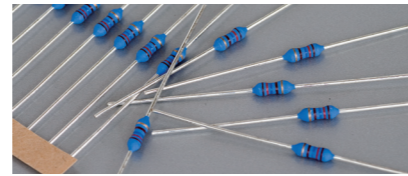
Temperature coefficient	± 350PPM /°C
Short-time overload	Normal size, ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
	Small size, ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Pulse overload	Normal size, ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
	Small size, ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Resistance to solvent	No deterioration of protective coating and marking
Temperature cycling	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Load life in humidity	ΔR/R: ≤ ±5% for <100KΩ; ±10% for ≥100KΩ.
	Load life ΔR/R: ≤ ±5% for <100KΩ; ±10% for ≥100KΩ.
Flame retardant	Resistor insulation is self-extinguishing within 10 seconds after externally applied flame is removed

Ordering Procedure (Example: MOR 1W-S 5% 8.2Ω T/B-1000)

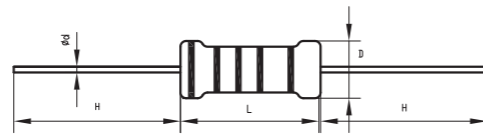
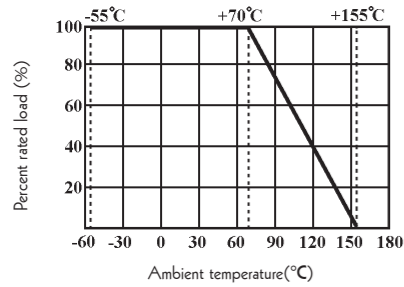


Feature

- High power in small body size
- Excellent flame Retardant coating
- High stability even in bad environment
- Match the Safety requirement



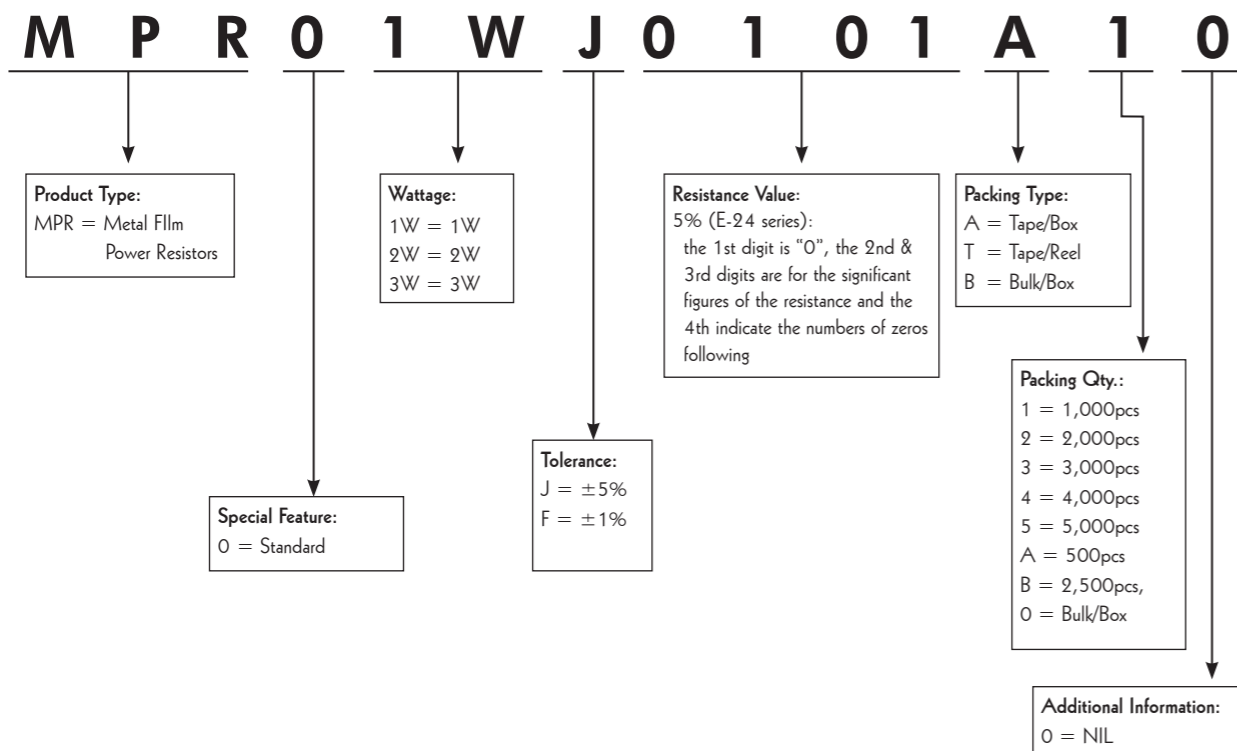
Derating Curve



Specification

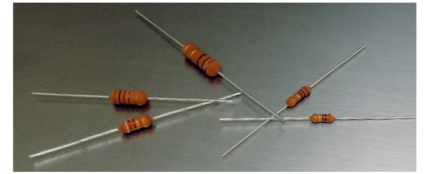
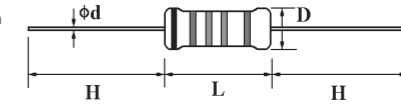
Part No.	Type	Power rating at 70°C	Dimension (mm)				Max. Working Voltage	Dielectric Withstanding Voltage	Resistance Value
			D Max.	L Max.	d±0.05	H±3			
MPR01W	MPR-100	1W	2.7	7.5	0.75	28	350V	250V	10Ω ~ 1M
MPR02W	MPR-200	2W	4	10	0.75	28	500V	350V	10Ω ~ 1M
MPR03W	MPR-300	3W	5.5	16	0.75	28	750V	500V	10Ω ~ 1M

Ordering Procedure (Example: MPR 1W 5% 100Ω T/B-5000)



Feature

- Ideal circuit opening controller, disconnecting units from overload rating specified
- Too low or too high ohmic value can be supplied on a case to case basis



Fusing Characteristics

Resistance Value	Test Wattage	Fusing Time
≤ 2.2Ω	32 X Power Rating	≤ 60 seconds
> 2.2Ω	16 X Power Rating	≤ 60 seconds

The fusing test current or voltage should be stable, change within 5%.

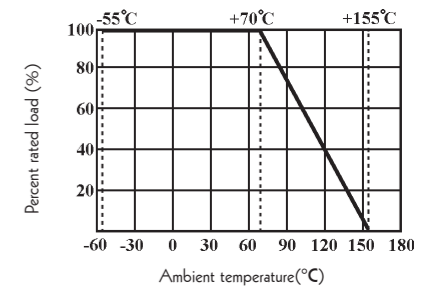
Specification

Part No.	Type	Power Rating at 70°C	Dimension (mm)				Dielectric Withstanding Voltage	Resistance Range
			D Max.	L Max.	d±0.05	H±3		
FRNOW4	FRN-25	1/4W	2.7	6.8	0.54	28	300V	0.22Ω ~ 10KΩ
FRNOW2	FRN-50	1/2W	3.0	9.0	0.54	28	350V	0.22Ω ~ 10KΩ
FRN01W	FRN-100	1W	4.5	10	0.65	28	350V	0.22Ω ~ 10KΩ
FRN02W	FRN-200	2W	5.0	12	0.65	28	600V	0.22Ω ~ 10KΩ
FRN03W	FRN-300	3W	5.5	16	0.70	28	600V	0.22Ω ~ 10KΩ

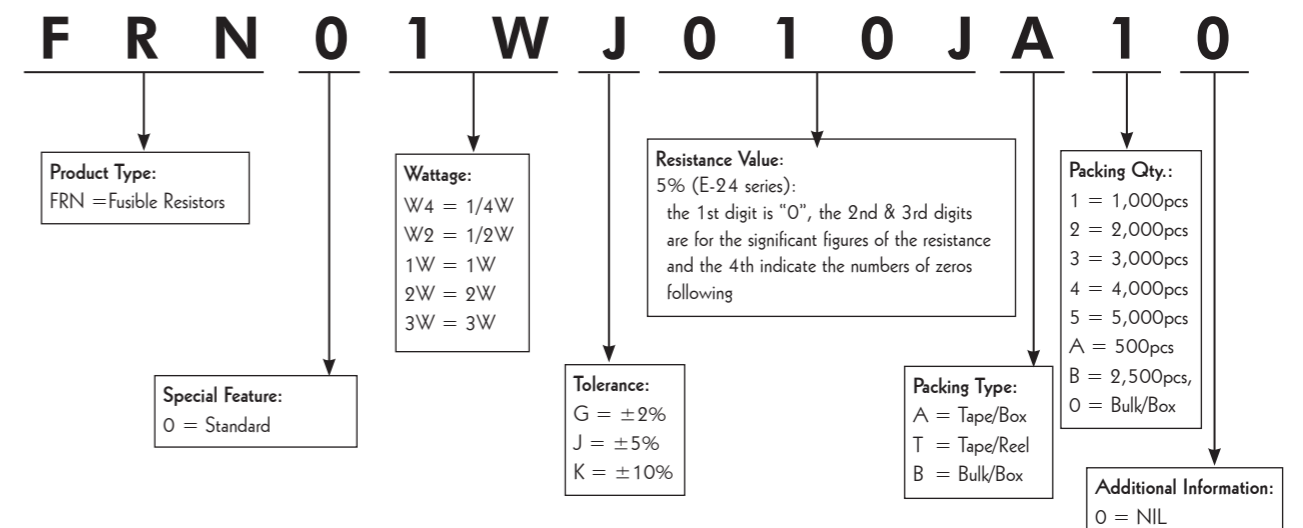
Performance Specification

Temperature coefficient	± 350PPM / °C
Short-time overload	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Temperature cycling	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Load life in humidity	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Flame retardant	Not have any specimens which burn with flaming combustion after each application of the test flame

Derating Curve

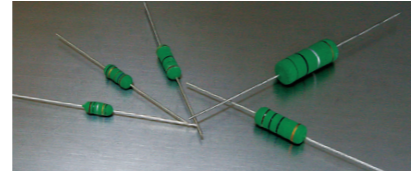


Ordering Procedure (Example: FRN 1W 5% 1Ω T/B-1000)



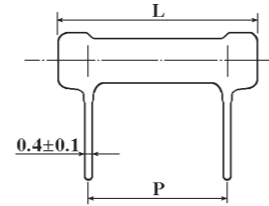
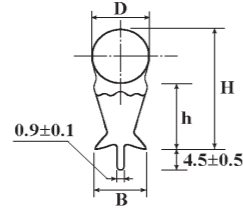
Feature

- Excellent flame retardant coating
- Too low or too high ohmic value can be supplied on a case to case basis
- Non-Inductive type available



KNP Type

KNS Type



Part No.	Type	Power Rating at 70°C	Dimension (mm)					Resistance Value Range	
			D Max.	L ± 1.5	P ± 1	H ± 1	h ± 1		B ± 0.5
KNS02W	KNS-200	2W	8	19	8	19	12	4.5	0.05Ω ~ 430Ω
KNS03W	KNS-300	3W	8	21	10	19	13	4.5	0.068Ω ~ 510Ω
KNS05W	KNS-500	5W	10	26	15	21.5	13	6.5	0.01Ω ~ 750Ω
KNS07W	KNS-700	7W	10	31	20	21.5	13	6.5	0.1Ω ~ 1.1KΩ
KNS08W	KNS-800	8W	10	41	30	21.5	13	6.5	0.2Ω ~ 2.2KΩ
KNS0AW	KNS-1000	10W	10	54	43	21.5	13	6.5	0.3Ω ~ 3.3KΩ

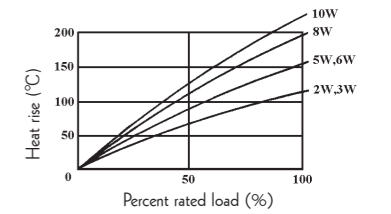
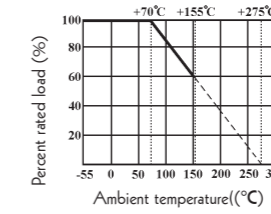
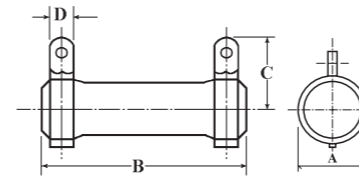
Part No.	Type	Power Rating at 70°C	Dimension (mm)				Resistance Value Range
			D ± 1	L Max.	d ± 0.05	H ± 3	
KNP0W2	KNP-50	1/2W	4.5	10	0.54	28	0.01Ω ~ 510Ω
KNP01W	KNP-100	1W	5	12	0.65	28	0.01Ω ~ 910Ω
KNP02W	KNP-200	2W	5.5	16	0.65	28	0.01Ω ~ 1.8KΩ
KNP03W	KNP-300	3W	6.5	17.5	0.75	28	0.039Ω ~ 2.4KΩ
KNP05W	KNP-500	5W	8.5	26	0.75	38	0.082Ω ~ 5.1KΩ
KNP07W	KNP-700	7W	8.5	32	0.75	38	0.1Ω ~ 6.8KΩ
KNP08W	KNP-800	8W	8.5	41	0.75	38	0.15Ω ~ 10KΩ
KNP09W	KNP-900	9W	8.5	54	0.75	38	0.22Ω ~ 13KΩ

Small Size							
Part No.	Type	Power Rating at 70°C	D ± 1	L Max.	d ± 0.05	H ± 3	Resistance Value Range
KNP01S	KNP-100-S	1W	4.5	10	0.54	28	0.01Ω ~ 470Ω
KNP02S	KNP-200-S	2W	5	12	0.65	28	0.01Ω ~ 750Ω
KNP03S	KNP-300-S	3W	5.5	16	0.65	28	0.01Ω ~ 1.5KΩ
KNP05S	KNP-500-S	5W	6.5	17.5	0.75	28	0.039Ω ~ 2KΩ
KNP07S	KNP-700-S	7W	8.5	26	0.75	38	0.082Ω ~ 4.3KΩ
KNP08S	KNP-800-S	8W	8.5	32	0.75	38	0.1Ω ~ 5.6KΩ
KNP09S	KNP-900-S	9W	8.5	41	0.75	38	0.15Ω ~ 8.2KΩ
KNP0AS	KNP-1000-S	10W	8.5	54	0.75	38	0.22Ω ~ 11KΩ

KNH Type

Derating Curve

Heat Rise Chart

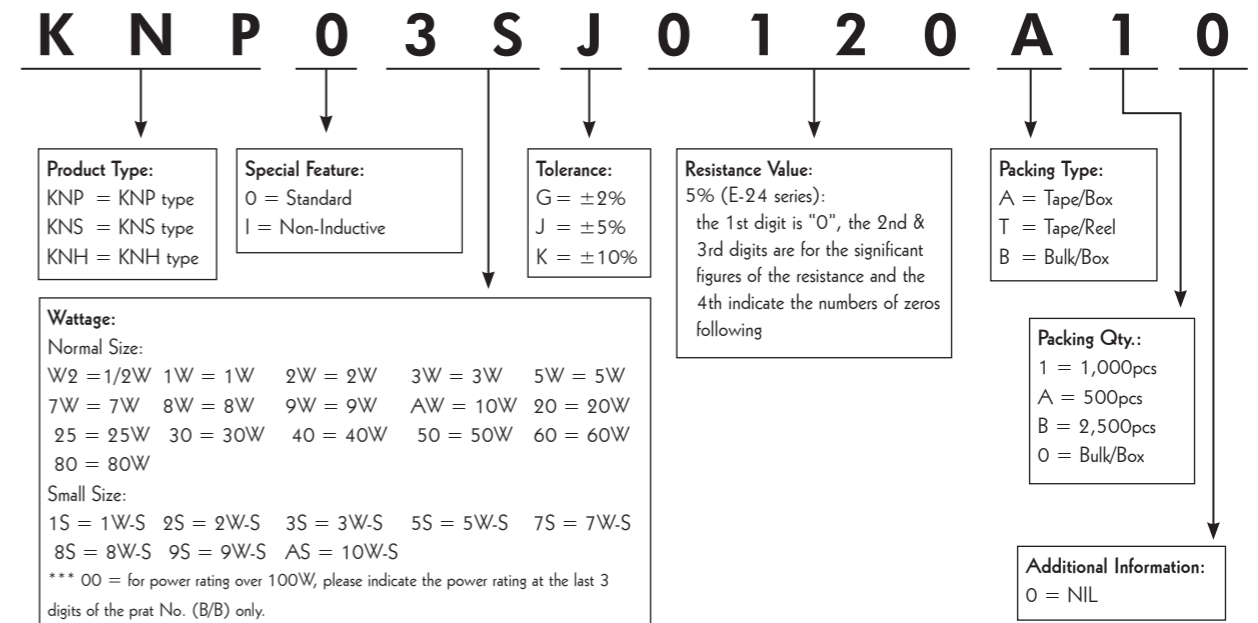


Part No.	Type	Power Rating at 70°C	Dimension (mm)				Resistance Value Range
			A ± 1.5	B ± 1.5	C ± 3	D ± 1	
KNH020	KNH-20W	20W	19	50	19	5	0.4Ω ~ 1KΩ
KNH025	KNH-25W	25W	19	60	19	5	0.4Ω ~ 1KΩ
KNH030	KNH-30W	30W	19	75	19	5	0.5Ω ~ 3KΩ
KNH040	KNH-40W	40W	19	90	19	5	0.6Ω ~ 5KΩ
KNH050	KNH-50W	50W	31	75	31	8	3Ω ~ 10KΩ
KNH060	KNH-60W	60W	31	90	31	8	3Ω ~ 15KΩ
KNH080	KNH-80W	80W	31	115	31	8	3Ω ~ 20KΩ
KNH ..... 100	KNH-100W	100W	31	140	31	8	3Ω ~ 30KΩ

Performance Specification

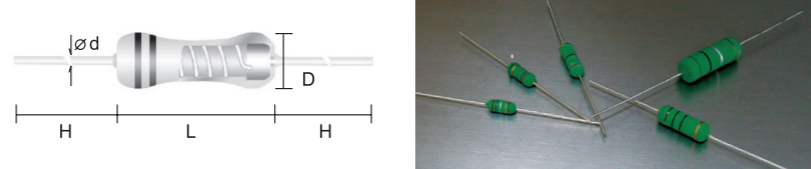
- Temperature coefficient:  $\geq 20\Omega$ :  $\pm 300\text{PPM}/^\circ\text{C}$ ,  $< 20\Omega$ :  $\pm 400\text{PPM}/^\circ\text{C}$
- Short-time overload:  $\Delta R/R \leq \pm(2\% + 0.05\Omega)$ , with no evidence of mechanical damage
- Terminal strength: No evidence of mechanical damage
- Resistance to soldering heat:  $\Delta R/R \leq \pm(1\% + 0.05\Omega)$ , with no evidence of mechanical damage
- Solderability: Min. 95% coverage
- Load life in humidity:  $\Delta R/R \leq \pm(5\% + 0.05\Omega)$ , with no evidence of mechanical damage
- Load life:  $\Delta R/R \leq \pm(5\% + 0.05\Omega)$ , with no evidence of mechanical damage

Ordering Procedure (Example: KNP 3W-S 5% 12Ω T/B-1000)



Feature

1. Suitable for all kinds of protection circuit
2. Non-flammable coating, could withstand High Temperature
3. Common resistor with additional safety function, no flame or smoke, no explosion or coating crack when fusing



Specification

Part No.	Type	Power Rating at 70°C	Dimension (mm)				Tolerance	Resistance Value Range
			D±1	L Max.	d±0.05	H±3		
KFR01W	KFR-100	1W	5	10	0.65	28	±5%	0.1Ω~68Ω
KFR02W	KFR-200	2W	5	12	0.65	28		
KFR03W	KFR-300	3W	5.5	16	0.75	28		

too low or too high ohmic value could be provided on a case to case basis

Fusing Characteristics

Fusing time could be designed according to customer's circuit Spec.

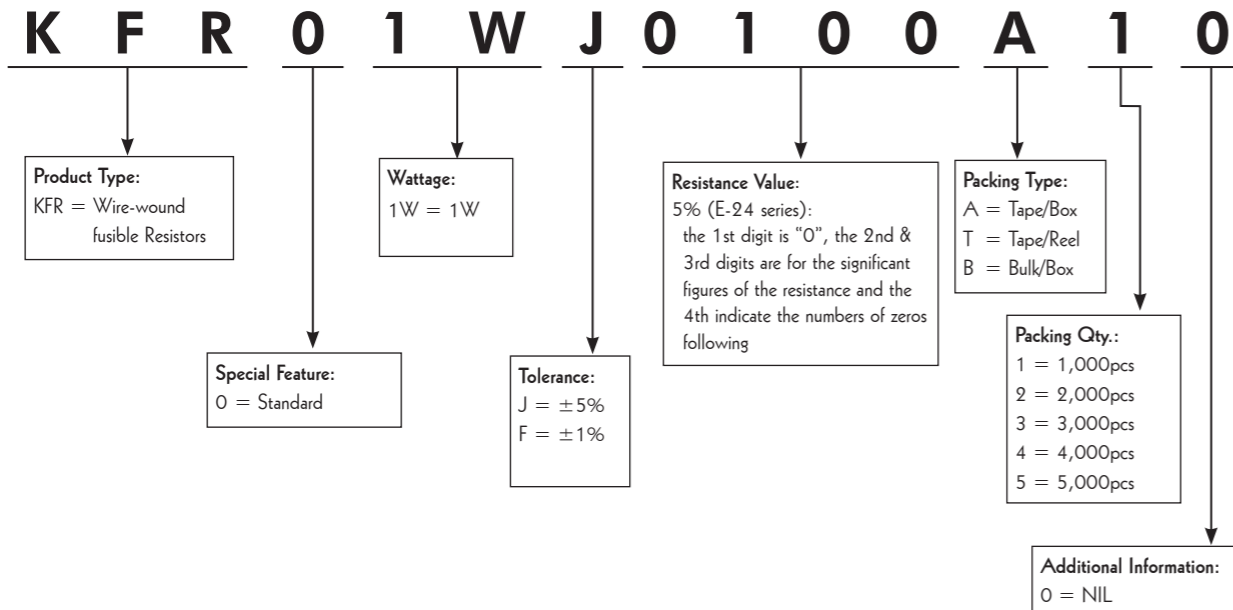
The following are necessary information must be provided for any Fusing time Spec. request:

1. Working ambient temperature & Working voltage
2. The Rated Power or Current
3. Requested Fusing Power or Current
4. Resistance Value & Tolerance
5. The requirement of the Resistor Body Size
6. The Wave of Voltage & the Frequency
7. Other general condition in circuit

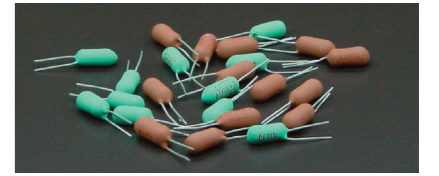
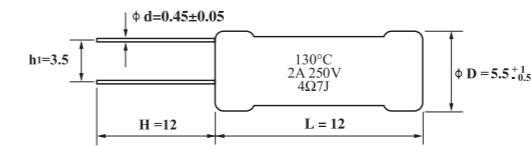
Performance Specification

Temperature coefficient	±300PPM/°C
Short-time overload	$\Delta R/R \leq \pm(2\% \pm 0.05\Omega)$ , with no evidence of mechanical damage
Dielectric withstanding voltage	500V
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	$\Delta R/R \leq \pm(1\% \pm 0.05\Omega)$ , with no evidence of mechanical damage
Solderability	Min. 95% coverage
Load life in humidity	$\Delta R/R \leq \pm(5\% \pm 0.05\Omega)$ , with no evidence of mechanical damage
Load life	$\Delta R/R \leq \pm(5\% \pm 0.05\Omega)$ , with no evidence of mechanical damage

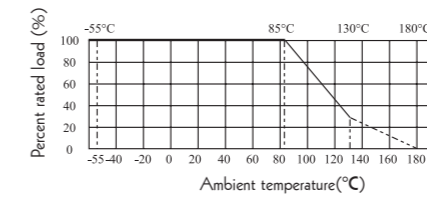
Ordering Procedure (Example: KFR 1W 5% 10Ω T/B-1000)



Specification



Derating Curve



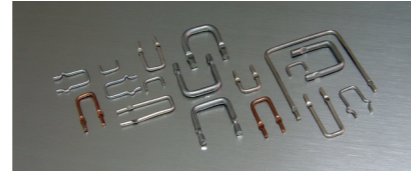
Type	Power Rating at 70°C	Tolerance	Resistance Value	Fusing Temperature T <sub>F</sub> (°C)	Holding Temperature T <sub>H</sub> /T <sub>C</sub> (°C)	Max. Temperature T <sub>M</sub> (°C)	Rated Current I <sub>r</sub> (A)	Rated Voltage U <sub>r</sub> (V)
TFR	1W	±5%	4Ω7	130	102	180	2	250

Performance Specification

Temperatur coefficient	±400 PPM/°C
Short-time overload	$\Delta R/R \leq \pm(2\% + 0.05\Omega)$ , with no evidence of mechanical damage
Insulation resistance	≥ 20MΩ, with no evidence of mechanical damage
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal strength	No evidence of mechanical damage
Humidity (Steady State)	$\Delta R/R \leq \pm(3\% + 0.05\Omega)$ , with no evidence of mechanical damage
Load life in humidity	$\Delta R/R \leq \pm(5\% + 0.05\Omega)$ , with no evidence of mechanical damage
Load life	$\Delta R/R \leq \pm(5\% + 0.05\Omega)$ , with no evidence of mechanical damage

Feature

- Made by Cu/Ni or Mn/Cu Alloy resistance wire materials
- Excellent Solderability
- Suitable for all kinds of Current sense application
- Application: Power Supply

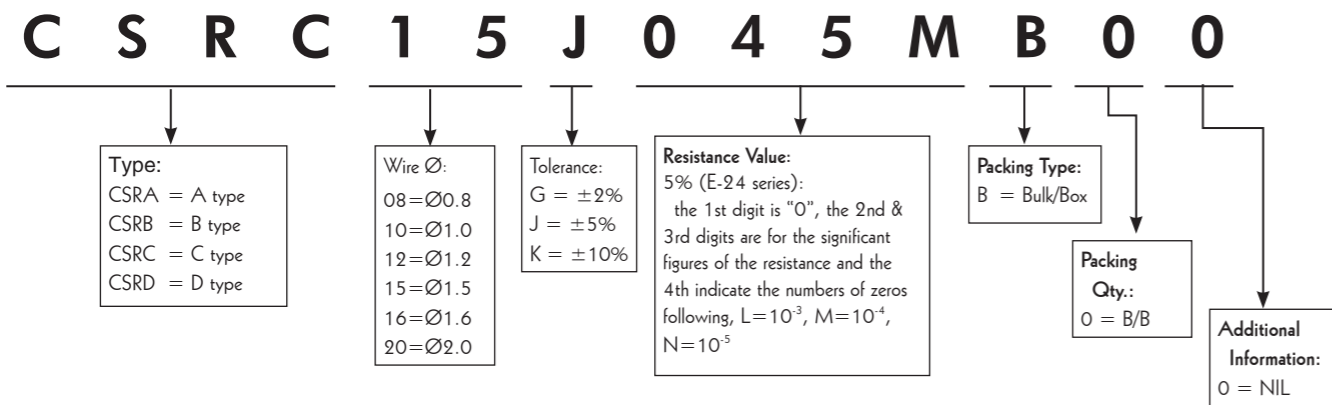


Type	Ød mm	Rated Current	TCR	Resistance Range ± 1%, ± 5%	Remark
CSRA CSRB CSRC	0.4	2.0A	±100PPM	80mΩ-200mΩ	Diameter according to this table listed, P & H could be design by customer's requirement
	0.5	2.5A		60mΩ-150mΩ	
	0.6	3.0A		60mΩ-100mΩ	
	0.7	4.0A		35mΩ-60mΩ	
	0.8	4.5A		5mΩ-50mΩ	
	0.9	5.0A		5mΩ-40mΩ	
	1.0	5.5A		3mΩ-30mΩ	
	1.1	6.0A		3mΩ-20mΩ	
	1.2	7.0A		3mΩ - 20mΩ	
	1.3	7.5A		3mΩ - 20mΩ	
	1.4	8.0A		3mΩ - 20mΩ	
	1.5	9.0A		3mΩ - 20mΩ	
	1.6	9.5A		3mΩ - 15mΩ	
	1.8	11A		3mΩ - 10mΩ	
2.0	12A	3mΩ - 10mΩ			
2.3	14A	3mΩ - 7mΩ			

CSRD (Flat Wire Type)

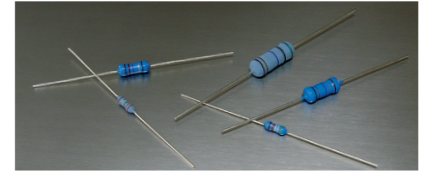
Type	Rated Power	H max (mm)	P max (mm)	TCR	Resistance Range ± 1%, ± 5%
CSRD	1W	11	5	±20PPM	5mΩ - 10mΩ
	3W	25	15		5mΩ - 10mΩ
	5W	25	20		5mΩ - 10mΩ

Ordering Procedure(Example: CSRC15J045M B00)



Feature

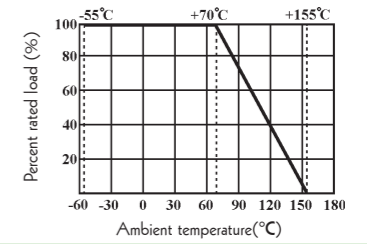
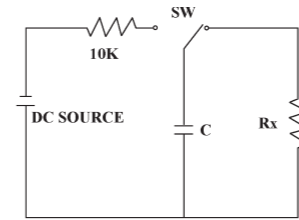
- Provide high stable performance against environment conditions & overload voltage
- Can withstand High Surge Voltage
- Width resistance range & low TCR



- 5 band color code for ±5% tolerance, and last band Black color for identification
- Standard 5 band color code for ±1% tolerance

Surge Withstanding Voltage

Derating Curve



Normal Size: the discharge cycle is repeated in above circuit: 2.5 seconds "ON", 2.5 seconds "OFF", 50 cycles, C=0.001uf  
 Small Size: the discharge cycle is repeated in above circuit: 2.5 seconds "ON", 2.5 seconds "OFF", 10 cycles, C=0.01uf  
 The applied DC source voltage is shown as below table

Specification

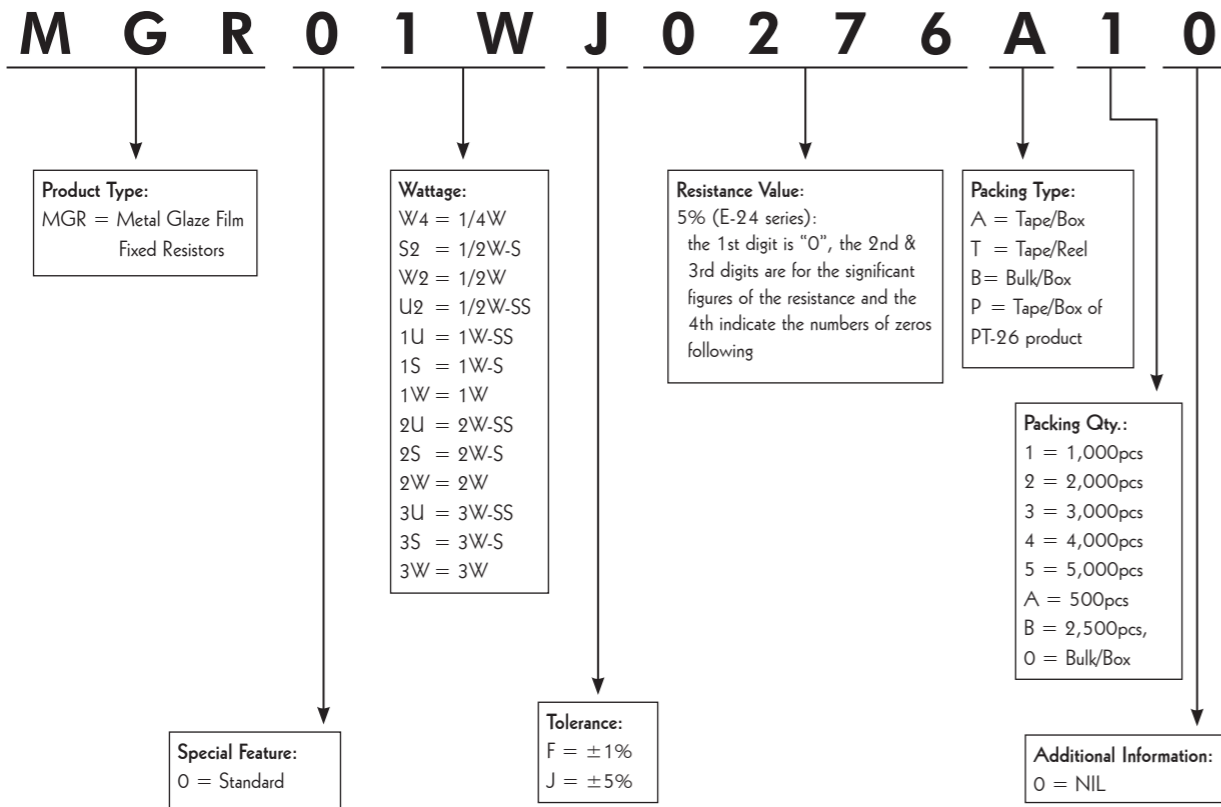
Part No.	Type	Power Rating at 70°C	Dimension (mm)				Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Surge Withstanding Voltage	Resistance Range
			D Max.	L Max.	d±0.05	H±3					
<b>Normal Size</b>											
MGR 0W4	MGR 25	1/4W	2.7	7	0.54	28	500V	700V	500V	100K-100M: 10,000V	1K-100M (±5%,±10%)
MGR 0W2	MGR 50	1/2W	4.0	10	0.54	28	700V	1,000V	700V		
MGR 01W	MGR-100	1W	4.7	13	0.65	28	1,000V	1,400V	700V		
MGR 02W	MGR-200	2W	6	17	0.75	28	1,000V	1,400V	700V		
MGR 03W	MGR-300	3W	7	19	0.75	28	1,000V	1,400V	700V		100K-1M(±1%)
<b>Small Size &amp; Ultra Small Size</b>											
MGR0U2	MGR-50-SS	1/2W	2.7	7	0.54	28	500V	700V	500V	100K-1M:3,000V 1M1-6M2:4,000V ≥6M8: 6,000V	1K-33M (±5%,±10%)
MGR0S2	MGR-50-S	1/2W	3.3	9.5	0.54	28	500V	700V	500V	100K-1M:3,000V 1M1-6M2:4,000V ≥6M8: 6,000V	100K-1M (±1%)
MGR01U	MGR-100-SS	1W	4.0	10	0.54	28	700V	1,000V	700V	100K-1M:4,000V 1M1-6M2:5,000V ≥6M8: 8,000V	
MGR01S	MGR-100-S	1W	4.7	11	0.54	28	700V	1,000V	700V		
MGR02U	MGR-200-SS	2W	4.7	13	0.65	28	1,000V	1,400V	700V	100K-1M:5,000V 1M1-6M2:6,000V ≥6M8: 9,000V	1K-33M (±5%,±10%)
MGR02S	MGR-200-S	2W	5.2	13	0.65	28	1,000V	1,400V	700V		
MGR03U	MGR-300-SS	3W	5.2	13	0.75	28	1,000V	1,400V	700V	100K-1M:5,000V 1M1-6M2:6,000V ≥6M8: 9,000V	100K-1M (±1%)
MGR03S	MGR-300-S	3W	6	17	0.75	28	1,000V	1,400V	700V	100K-1M:8,000V 1M1-6M2:9,000V ≥6M8:10,000V	



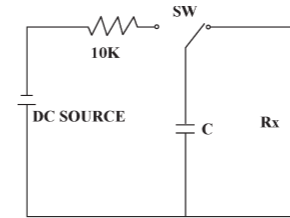
Performance Specification

Temperature coefficient	$\leq \pm 200\text{PPM}/^\circ\text{C}$
Short-time overload	$\Delta R/R \leq \pm(1\%+0.05\Omega)$ , with no evidence of mechanical damage
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Pulse overload	$\Delta R/R \leq \pm(2\%+0.05\Omega)$ , with no evidence of mechanical damage
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	$\Delta R/R \leq \pm(1\%+0.05\Omega)$ , with no evidence of mechanical damage
Solderability	Min. 95% coverage
Resistance to solvent	No deterioration of protective coating and marking
Temperature cycling	$\Delta R/R \leq \pm(1\%+0.05\Omega)$ , with no evidence of mechanical damage
Load life in humidity	$\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage
Load life	$\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage

Ordering Procedure (Example: MGR 1W 5% 27MΩ T/B-1000)

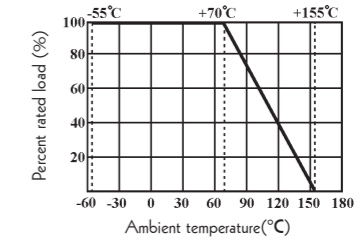


Surge Withstanding Voltage



Discharge cycle: 2.5 seconds "ON", 2.5 seconds "OFF", 50 cycles, C=0.001uF  
The applied DC source voltage is shown as below table

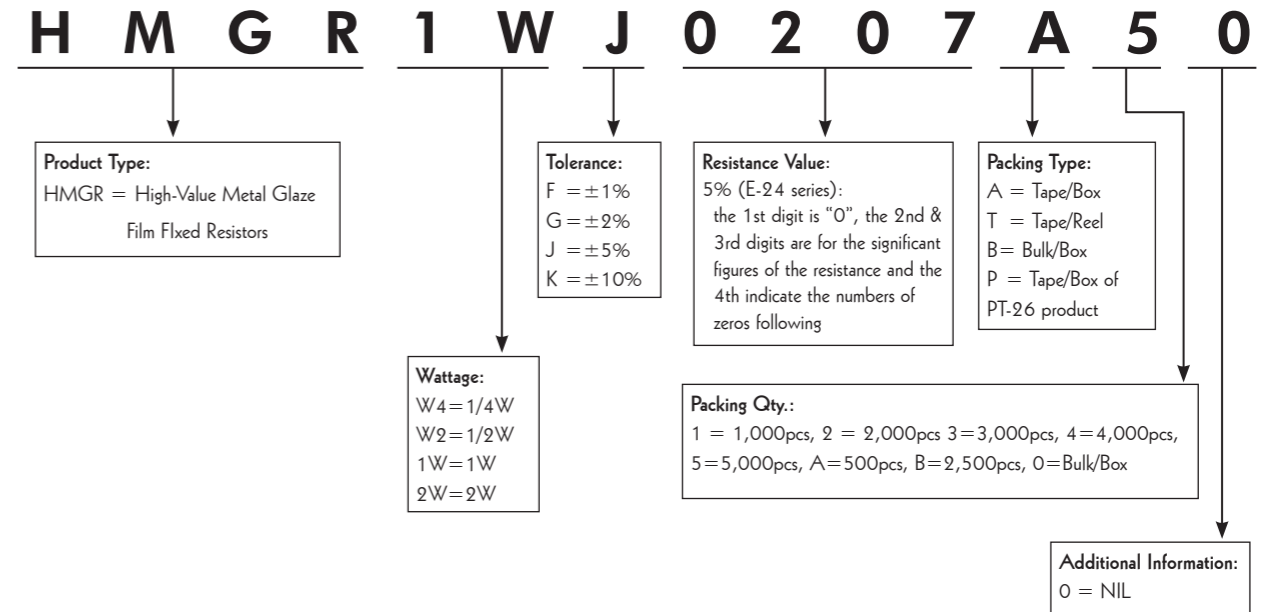
Derating Curve



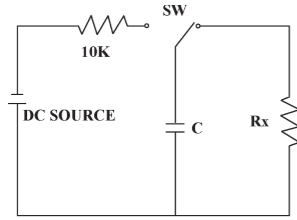
Specification

Part No.	Type	Power Rating at 70°C	Dimension(mm)				Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Surge Withstanding Voltage	Resistance Range
			D Max.	L Max.	d±0.05	H±3					
HMGR 0W4	HMGR-25	1/4W	2.7	7.0	0.6	28	500	1,000V	700V	10 KV	500K-510MΩ (1% 2% 5% 10%)
HMGR 0W2	HMGR-50	1/2W	4	10	0.6	28	1,000V	2,000V	700V		
HMGR 01W	HMGR -100	1W	4.7	13	0.7	28	2,000V	3,000V	1,000V	10 KV	500K-1GΩ (1% 2% 5% 10%)
HMGR 02W	HMGR -200	2W	6	17	0.8	28	3,000V	4,000V	1,000V		

Ordering Procedure (Example: HMGR 1W 5% 200MΩ T/B -1000)

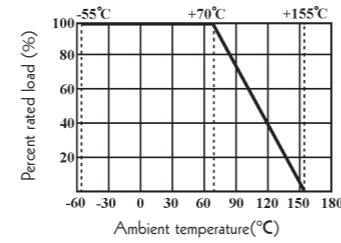


Surge Withstanding Voltage



Discharge cycle: 2.5 seconds "ON", 2.5 seconds "OFF", 50 cycles, C=0.001uF  
The applied DC source voltage is shown as below table

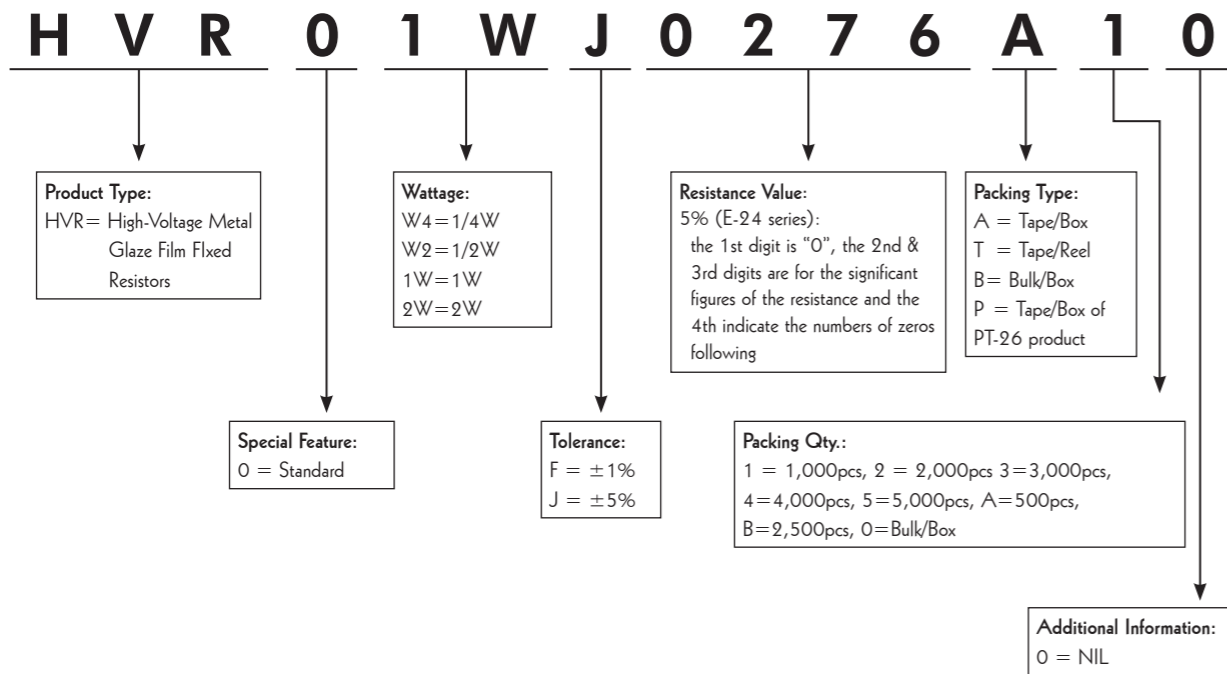
Derating Curve



Specification

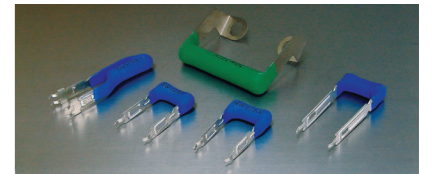
Part No.	Type	Power Rating at 70°C	Dimension (mm)				Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Surge Withstanding Voltage	Resistance Range
			D Max.	L Max.	d±0.05	H±3					
HVROW4	HVR-25	1/4W	2.7	7.0	0.6	28	1,600V	2,000V	700V	10,000V 1K-100M (±5%, ±10%) 100K-1M (±1%)	
HVROW2	HVR-50	1/2W	4	10	0.6	28	3,500V	4,000V	700V		
HVRO1W	HVR-100	1W	4.7	13	0.7	28	3,500V	4,000V	700V		
HVRO2W	HVR-200	2W	6	17	0.8	28	3,500V	4,000V	700V		

Ordering Procedure (Example: HVR 1W 5% 27MΩ T/B -1000)

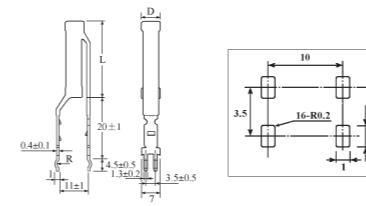


Feature

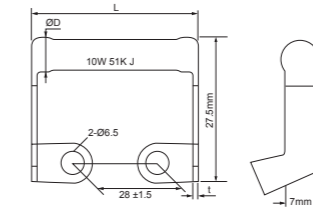
- Excellent flame retardant coating
- Stable performance in diverse environments
- High purity ceramic core
- High safety standard
- Meet EIAJ-RC2655A requirements
- Too low or too high ohmic value can be provided on a case to case basis



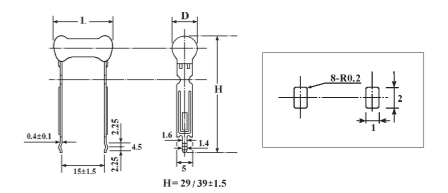
Vertical type - TMOV



"L" type terminal - TMOL



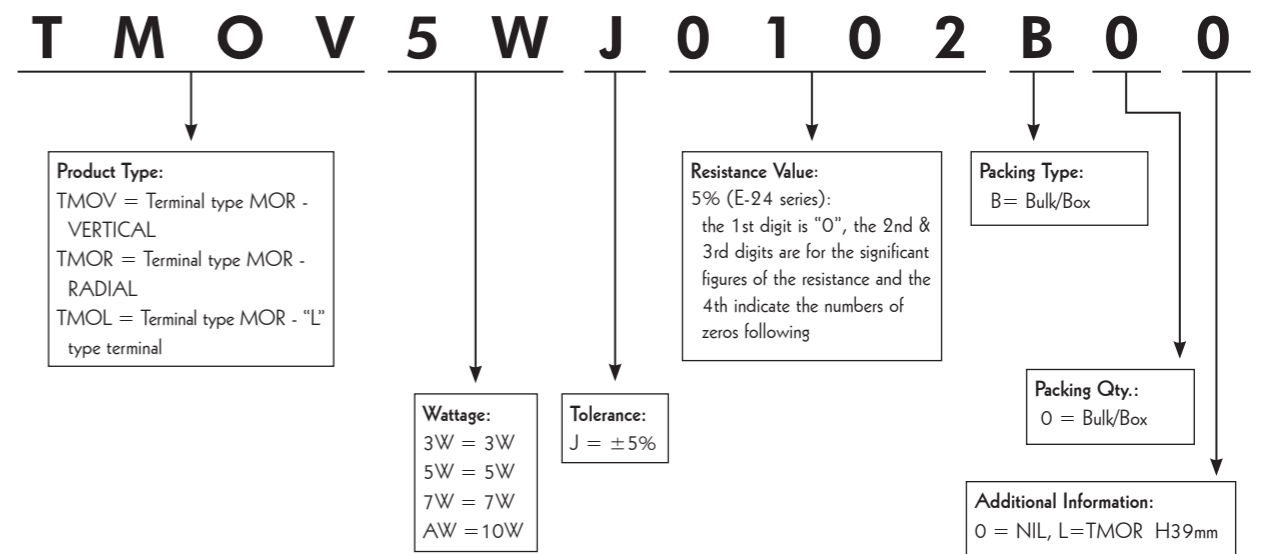
Radial type - TMOR



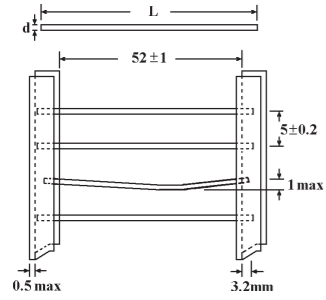
Specification

Part No.	Type	Power Rating at 70°C	Dimension (mm)		Max. Working Voltage	Max. Overload Voltage	Max. Pulse Overload Voltage	Resistance Range (5%)
			L ± I	D ± I				
TMOV5W	TMOV-500	5W	20	7	500V	800V	1,500V	10Ω ~ 10KΩ
TMOV7W	TMOV-700	7W	30	7	500V	800V	1,500V	10Ω ~ 10KΩ
TMOLAW	TMOL-10W	10W	46	10 Max.	500V	800V	1,500V	100Ω ~ 82KΩ
TMOR3W	TMOR-300	3W	16	6	350V	600V	1,000V	10Ω ~ 10KΩ
TMOR5W	TMOR-500	5W	18	7	500V	800V	1,500V	10Ω ~ 10KΩ

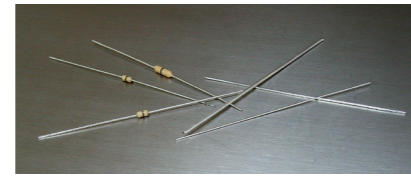
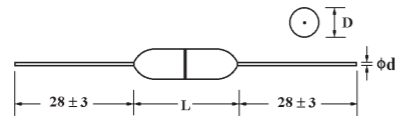
Ordering Procedure (Example: TMOV 5W 5% 1KΩ B/B)



ZW Type



ZO Type



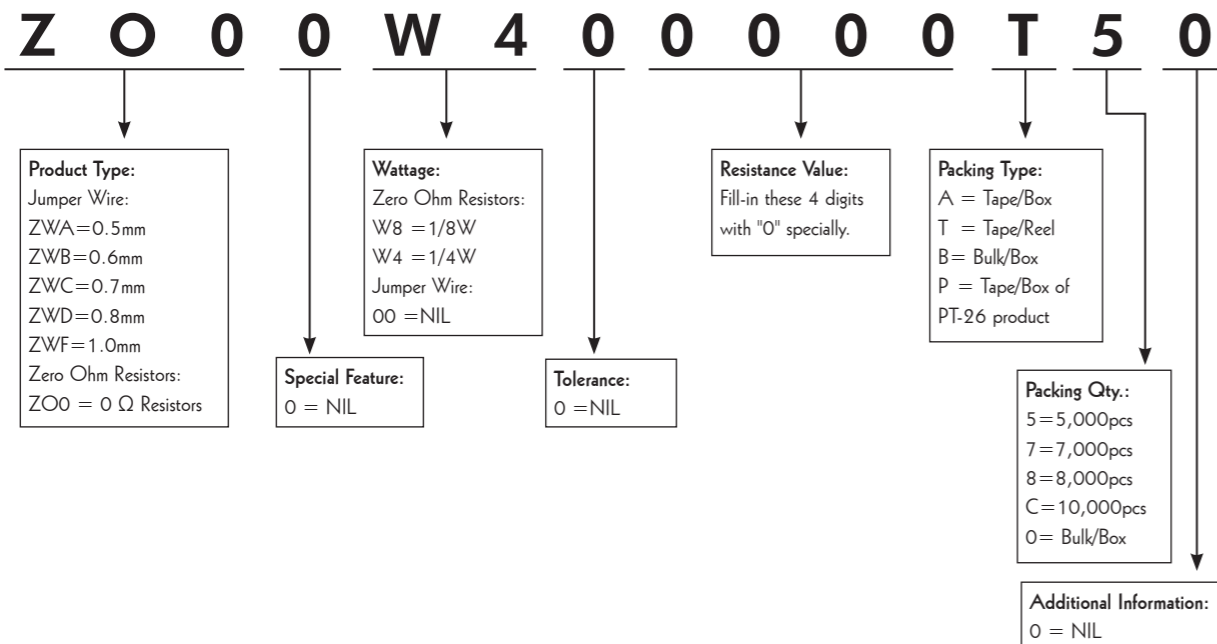
Part No.	Type	Dimension (mm)	
		L ± 3	d ± 0.05
ZWA0	ZW-A	60	0.45
ZWB0	ZW-B	60	0.54
ZWC0	ZW-C	60	0.65
ZWD0	ZW-D	60	0.75
ZWF0	ZW-F	60	1.00

Part No.	Type	Power Rating at 70°C	Dimension (mm)		
			D Max.	L Max.	d ± 0.05
ZO00W8	ZO-12	1/8W	1.85	3.5	0.45
ZO00W4	ZO-25	1/4W	2.5	6.8	0.54

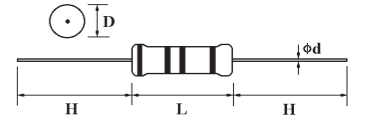
Performance Specification

Maximum resistance value	< 50mΩ
Lead material	Tin-plated cooper
Body material(ZO Type)	Electrical grade, high performance molding compound
Insulation resistance	Dry - 10,000 MΩ; Wet - 100MΩ
Dielectric withstanding voltage	Atmospheric - 500V RMS ; Reduced - 325V RMS
Flame retardant	Resistor insulation is self-extinguishing within 10 seconds after externally applied flame is removed
Rated current	25 AMPS at 25°C, derating to 0 AMPS at 150°C

Ordering Procedure (Example: ZO 1/4W T/R-5,000)



Cooper Plated Wire Type (CP)



Part No.	Type	Power Rating at 70°C	Dimension (mm)				Max. Working Voltage	Max. Overload Voltage	Resistance Range
			D Max.	L Max.	d±0.02	H±3			
CP00W4	CP-25	1/4W	2.5	6.8	0.5	28/38	250V	500V	1Ω ~ 10MΩ
CP00S3	CP-33-S	1/3W	2.5	6.8	0.5	28/38	300V	600V	1Ω ~ 10MΩ
CP00W3	CP-33	1/3W	3	9	0.5	28	300V	600V	1Ω ~ 10MΩ
CP00S2	CP-50-S	1/2W	3	9	0.5	28	350V	700V	1Ω ~ 10MΩ

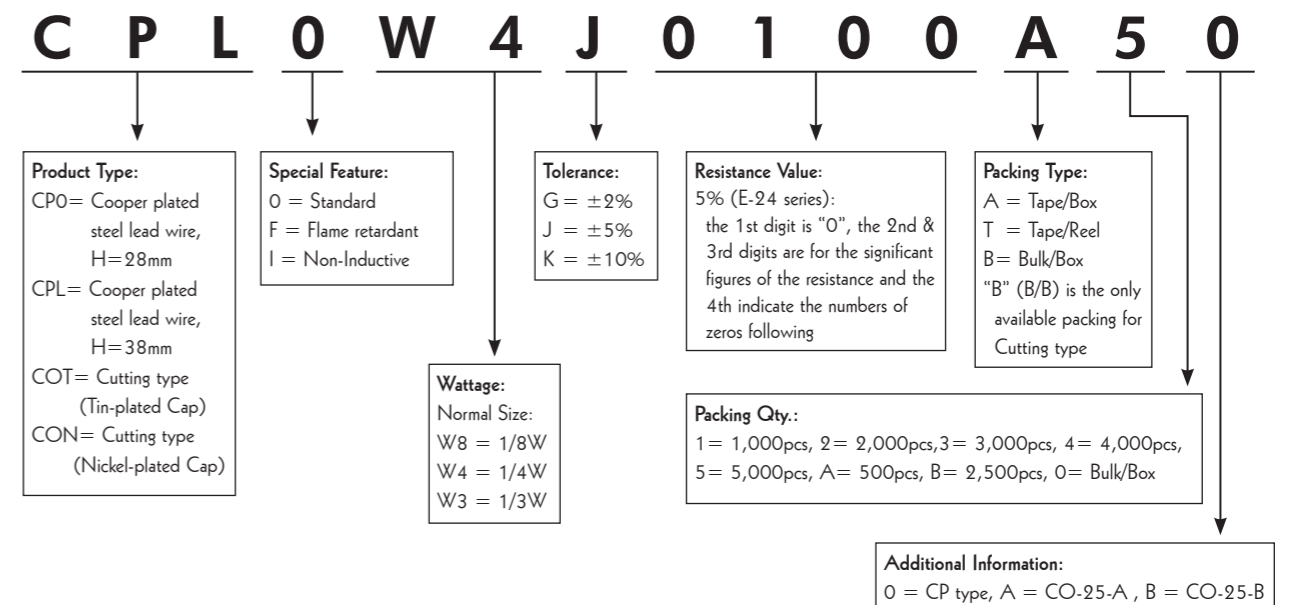
Cutting Type (CO)



Part No.	Type	Power Rating at 70°C	Dimension (mm)		Resistance Range
			D	L	
CO...W8	CO-12	1/8W	1.6 <sup>+0.10</sup> <sub>-0.00</sub>	3.2 ±0.1	1Ω ~ 10MΩ
CO...W4	CO-25	1/4W	2.1 <sup>+0.09</sup> <sub>-0.00</sub>	5.6 <sup>+0.10</sup> <sub>-0.20</sub>	1Ω ~ 10MΩ
CO...W4...A	CO-25-A	1/4W	2.1 <sup>+0.09</sup> <sub>-0.00</sub>	5.9 <sup>+0.10</sup> <sub>-0.15</sub>	1Ω ~ 10MΩ
CO...W4...B	CO-25-B	1/4W	2.1 <sup>+0.09</sup> <sub>-0.01</sub>	6.4 <sup>+0.10</sup> <sub>-0.15</sub>	1Ω ~ 10MΩ

• Cutting type resistors are produced without lead-wire and without coating • Cap plated option: 1. Tin-plated 2. Nickel-Plated

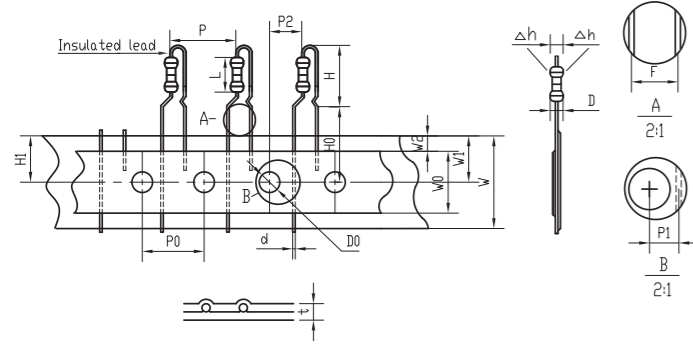
Ordering Procedure (Example: CP 1/4W 5% H=38mm 10Ω T/B-5000)



Feature

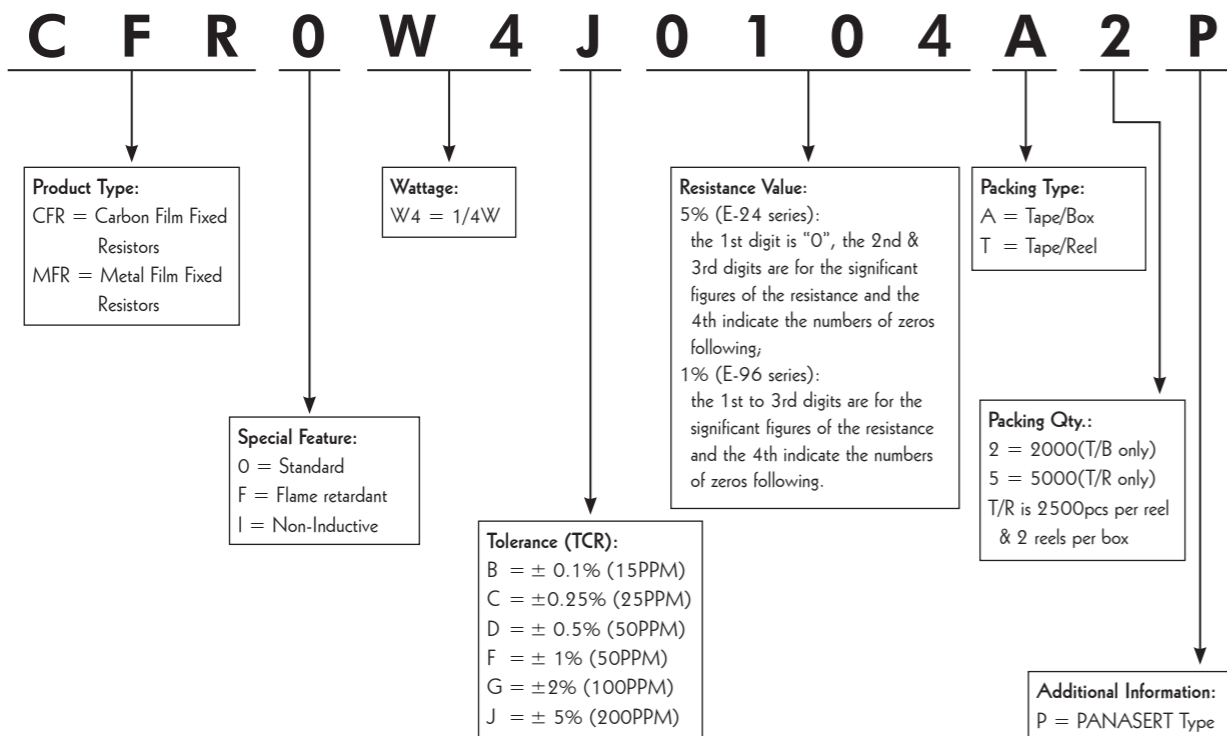
- This specification is applicable for CFR 1/4W & MFR 1/4W product only; other product (size), please consult factory for the available specification and drawing.

	1/4W	1WS	2WS
Body diameter (D)	2.5 Max.	3.5±0.5	4±0.5
Body length (L)	6.8 Max.	9±1.0	12±1.0
Body height (H)	12 Max.	19 Max.	21 Max.
Lead-wire diameter (d)	0.54±0.05	0.65±0.05	0.65±0.05
Pitch of component (P)	12.7±1	12.7±1	12.7±1
Feed hole pitch (P <sub>0</sub> )	12.7±0.3	12.7±0.3	12.7±0.3
Hole center to lead (P <sub>1</sub> )	3.85±0.7	3.85±0.7	3.85±0.7
Hole center to body (P <sub>2</sub> )	6.35±1.3	6.35±1.3	6.35±1.3
Lead to lead distance (F)	5±1	5±1	5±1
Component alignment (Δh)	0±1	0±2	0±2
Tape width (W)	18±1	18+1.0/-1.5	18+1.0/-1.5
Hole position (W <sub>1</sub> )	9±0.5	9+0.75/-0.5	9+0.75/-0.5
Lead-wire clinch height (H <sub>0</sub> )	16.5 Max.	16±0.5	16±0.5
Feed hole diameter (D <sub>0</sub> )	4±0.3	4±0.3	4±0.3
Total tape thickness (t)	0.5±0.2	0.5±0.2	0.5±0.2
Sticky tape width (W <sub>0</sub> )	12.5 Max.	12.5 Min.	12.5 Min.
Paper tape width (W <sub>2</sub> )	3.0 Max.	1.5 Max.	1.5 Max.



P<sub>0</sub> cumulative pitch error 1 mm / 20 pitch

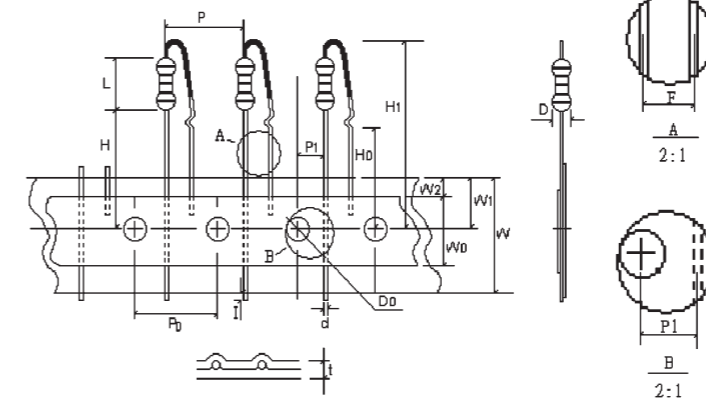
Ordering Procedure (Example: CFR 1/4W 5% 100K Ω T/B-2000 PANASERT)



Avisert (1) Type

- This specification is applicable for CFR 1/4W & MFR 1/4W product only; other product (size), please consult factory for the available specification and drawing.

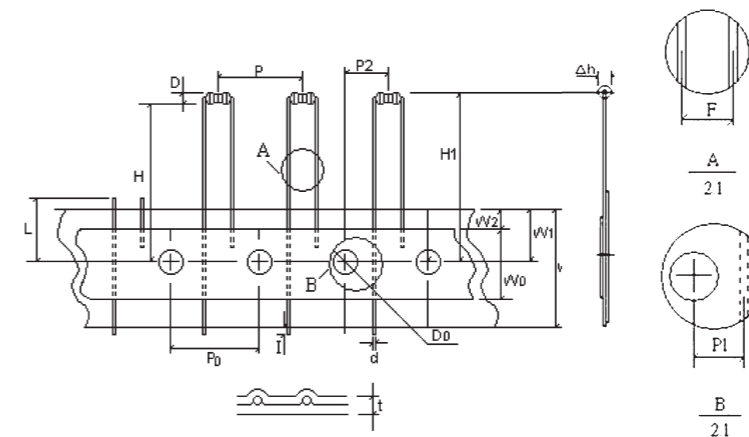
	1/4W	1WS	2WS
Body diameter (D)	2.5 Max.	3.5±0.5	4±0.5
Body length (L)	6.8 Max.	9±1.0	12±1.0
Lead wire diameter (d)	0.54 ± 0.05	0.65 ± 0.05	0.65 ± 0.05
Pitch of component (P)	12.7 ± 1	12.7 ± 1	12.7 ± 1
Feed hole pitch (P <sub>0</sub> )	12.7 ± 0.3	12.7 ± 0.3	12.7 ± 0.3
Hole center to lead (P <sub>1</sub> )	3.85 ± 0.7	3.85 ± 0.7	3.85 ± 0.7
Lead to lead distance (F)	5 ± 1	5 ± 1	5 ± 1
Paper tape width (W)	18 ± 1	18 ± 1	18 ± 1
Hole position (W <sub>1</sub> )	9.0 ± 0.5	9.0 ± 0.5	9.0 ± 0.5
Lead wire clinch height (H <sub>0</sub> )	16 ± 0.5	16 ± 0.5	16 ± 0.5
Component height (H <sub>1</sub> )	32.25 Max.	32.25 Max.	32.25 Max.
Lead wire protrusion (l)	1.0 Max.	1.0 Max.	1.0 Max.
Feed hole diameter (D <sub>0</sub> )	4 ± 0.3	4 ± 0.3	4 ± 0.3
Total paper tape thickness (t)	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2
Adhesive tapge width (W <sub>0</sub> )	12.5 Min.	12.5 Min.	12.5 Min.
Uncovered paper tape width (W <sub>2</sub> )	3.0 Max.	3.0 Max.	3.0 Max.
Height of component from tape center (H)	17.3 ± 0.5	17.3 ± 0.5	17.3 ± 0.5



Avisert (2) Type

- This specification is applicable for CFR 1/8W & MFR 1/8W product only; other product (size), please consult factory for the available specification and drawing.

	1/8W	1WS	2WS
Body diameter (D)	2.0 Max.	3.5±0.5	4±0.5
Lead wire diameter (d)	0.45 ± 0.05	0.65 ± 0.05	0.65 ± 0.05
Pitch of component (P)	12.7 ± 1	12.7 ± 1	12.7 ± 1
Feed hole pitch (P <sub>0</sub> )	12.7 ± 0.3	12.7 ± 0.3	12.7 ± 0.3
Hole center to lead (P <sub>1</sub> )	3.85 ± 0.7	3.85 ± 0.7	3.85 ± 0.7
Lead to lead distance (F)	5 ± 1	5 ± 1	5 ± 1
Component alignment (Δh)	0 ± 1	0 ± 2	0 ± 2
Paper tape width (W)	18 ± 1	18 ± 1	18 ± 1
Hole position (W <sub>1</sub> )	9 ± 0.5	9 ± 0.5	9 ± 0.5
Lead wire clinch height (H)	21.0 Max.	16 ± 0.5	16 ± 0.5
Component height (H <sub>1</sub> )	32.25 Max.	32.25 Max.	32.25 Max.
Lead wire protrusion (l)	1.0 Max.	1.0 Max.	1.0 Max.
Feed hole diameter (D <sub>0</sub> )	4 ± 0.2	4 ± 0.3	4 ± 0.3
Total paper tape thickness (t)	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2
Adhesive tape width (W <sub>0</sub> )	12.5 Min.	12.5 Min.	12.5 Min.
Uncovered paper tape width (W <sub>2</sub> )	3.0 Max.	3.0 Max.	3.0 Max.
Legth of snapped lead (L)	11.0 Max.	12.5 Min.	12.5 Min.
Hole center to component center (P <sub>2</sub> )	6.35 ± 1.3	6.35 ± 1.3	6.35 ± 1.3



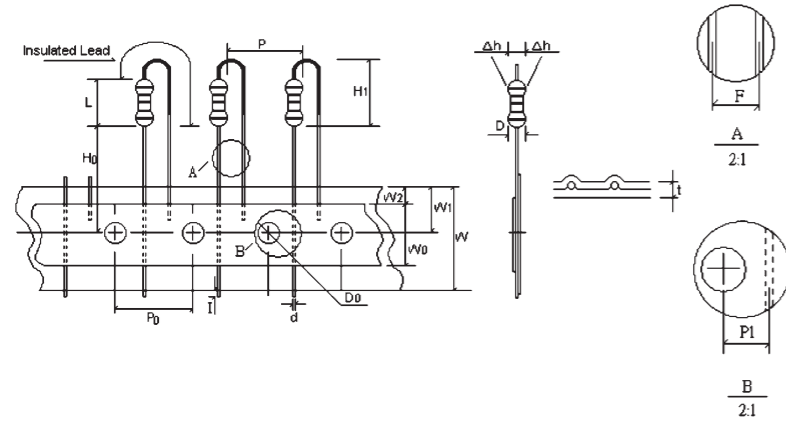
Remark: P<sub>0</sub> cumulative pitch error 1.0mm/20pitch

P<sub>1</sub> to be measured at bottom of clinch

t: ground paper 0.5 ± 0.1 mm

**Avisert (3) Type**

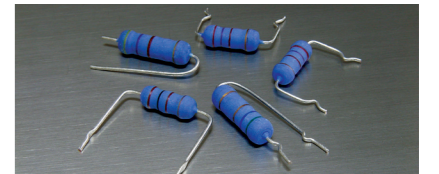
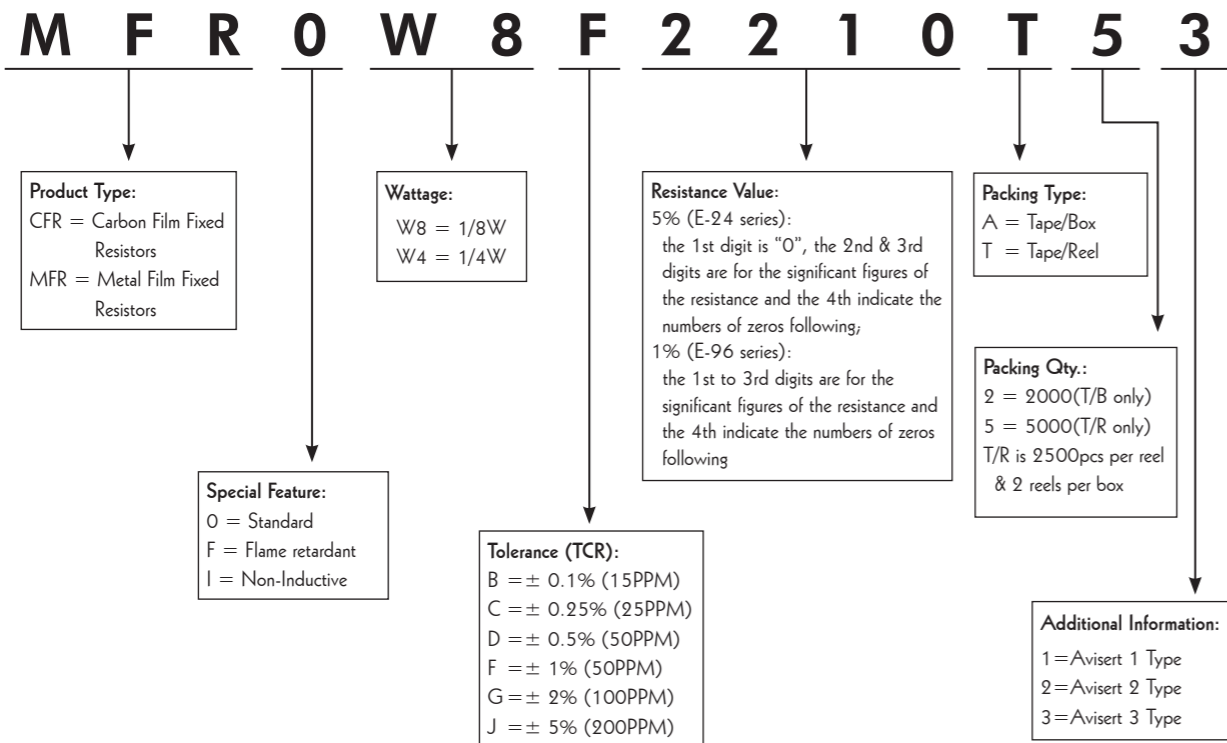
- This specification is applicable for CFR 1/8W, 1/4W & MFR 1/8W, 1/4W product only; other product (size), please consult factory for the available specification and drawing.



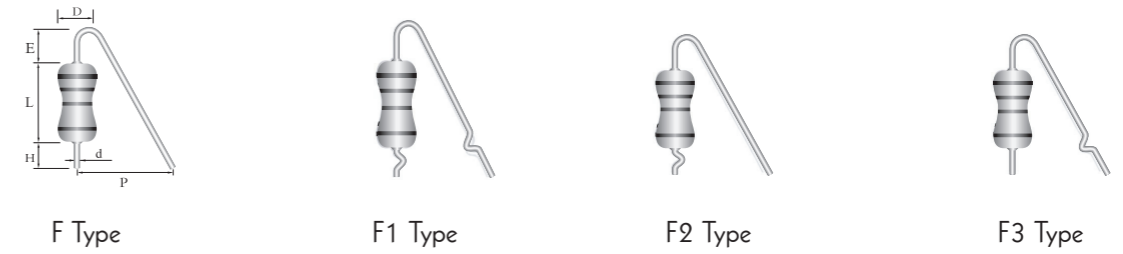
Body diameter (D)	1/8W: 2.0 Max. 1/4W: 2.5 Max.
Body length (L)	1/8W: 4.2 Max. 1/4W: 6.8 Max.
Body height (H)	1/8W: 7.0 Max. 1/4W: 10.0 Max.
Lead wire diameter (d)	1/8W: 0.45 ± 0.05 1/4W: 0.54 ± 0.05
Pitch of component (P)	12.7 ± 1
Lead to lead distance (F)	1/8W: 5 ± 1 1/4W: 5 ± 1
Feed hole pitch (P <sub>0</sub> )	12.7 ± 0.3
Hole center to lead (P <sub>1</sub> )	3.84 ± 0.7
Component alignment (Δh)	0 ± 0.1
Paper tape width (W)	18 ± 1
Hold down tape width (W <sub>0</sub> )	12.5 Min
Hole position (W <sub>1</sub> )	9 ± 0.5
Hold down tape position (W <sub>2</sub> )	3 Max.
Lead wire clinch height (H <sub>0</sub> )	16.5 Max.
Length of snipped lead (H <sub>1</sub> )	11.0 Max.
Lead wire protrusion (I)	1.0 Max.
Feed hole diameter (d <sub>0</sub> )	4 ± 0.3
Total paper tape thickness (t)	0.5 ± 0.2

Remark: P<sub>0</sub> cumulative pitch error 1.0mm/20pitch

**Ordering Procedure (Example: MFR 1/8W 1% 50PPM 221Ω T/R-5000 Avisert 3 Type)**



**F Forming Type**

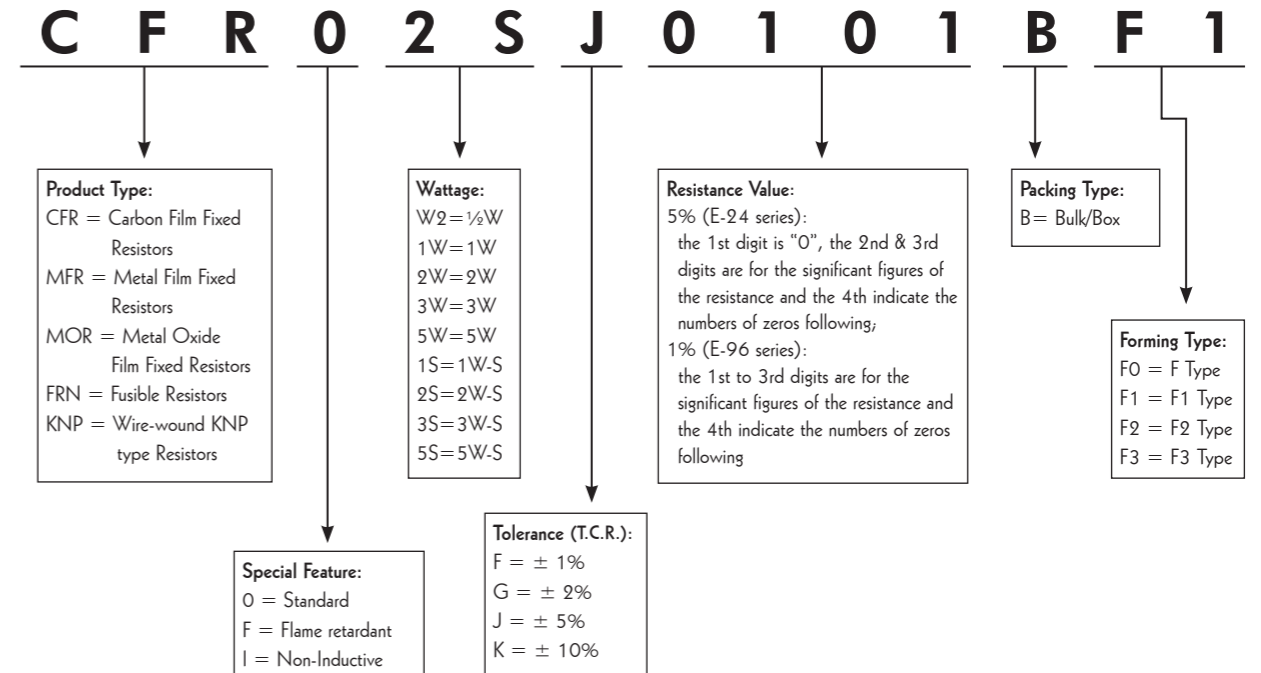


**Dimension**

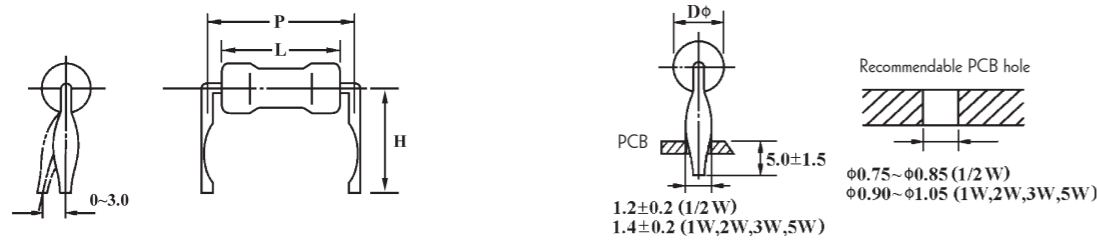
Power Rating	L Max.	D Max.	d ± 0.05	P <sup>+1</sup> / <sub>-3</sub>	H ± I	E ± 0.5
1 W (2W-S)	12	5.0	0.65	8	6	2.5
2 W (3W-S)	16	5.5	0.70	8	6	2.5

• Above specification given for recommendation only, please consult factory for special required specification

**Ordering Procedure (Example: CFR 2W-S 5% 100Ω B/B F1 Type)**



M Forming Type



Normal Size

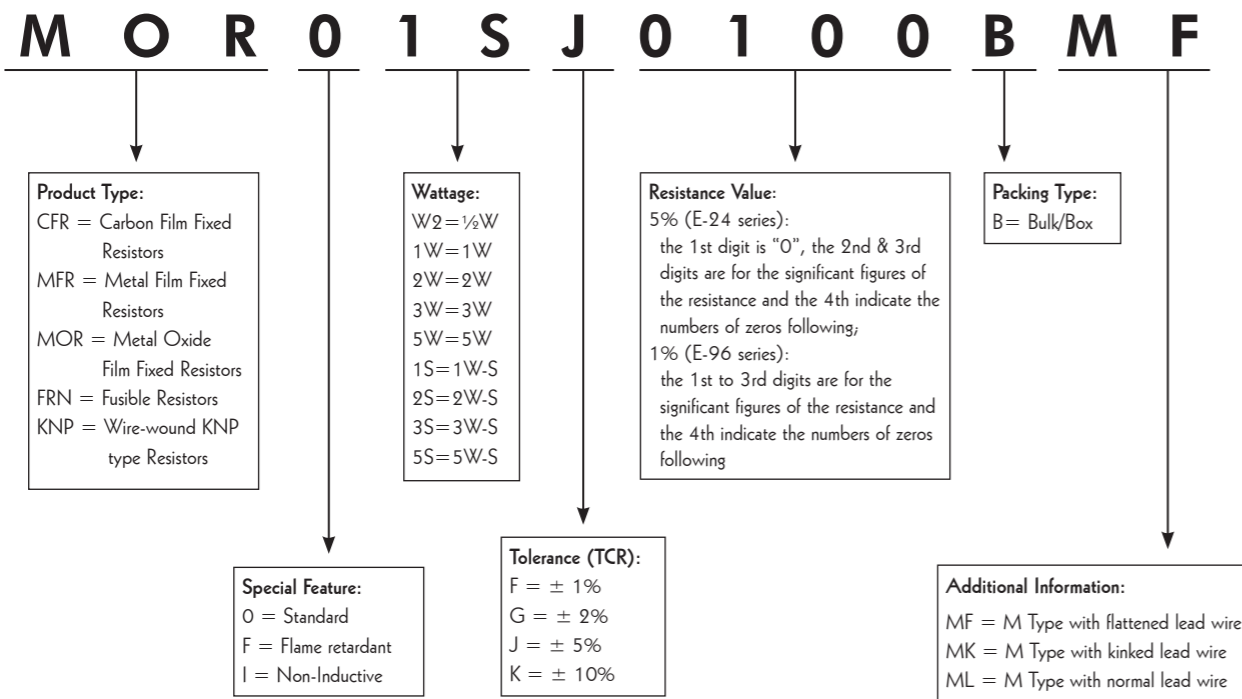
Power Rating at 70°C	Dimension (mm)				
	D Max.	L Max.	H±2	P±1.5	d±0.05
1/2W	4	10	14	13	0.54
1W	5	12	14	15	0.65
2W	5.5	16	18	20	0.70
3W	6.5	17.5	20	25	0.75
5W	8.5	26	20	31	0.75

Small Size

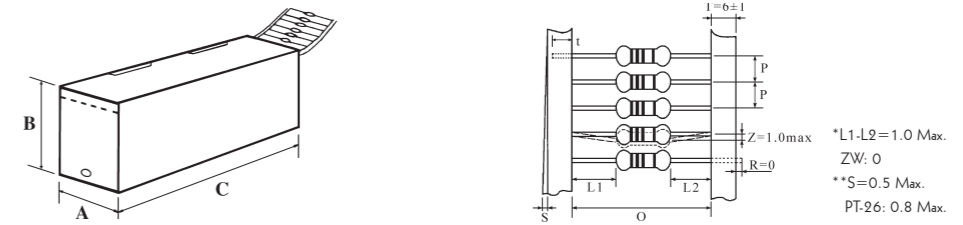
Power Rating at 70°C	Dimension (mm)				
	D Max.	L Max.	H±2	P±1.5	d±0.05
1W	4	10	14	13	0.65
2W	5	12	14	15	0.65
3W	5.5	16	18	20	0.75
5W	8	25	22	31	0.75

Above specification given are recommended for MOR product only, please consult factory for the specification of other products

Ordering Procedure (Example: MOR 1W-S 5% 10Ω B/B M Type with flattened lead wire)



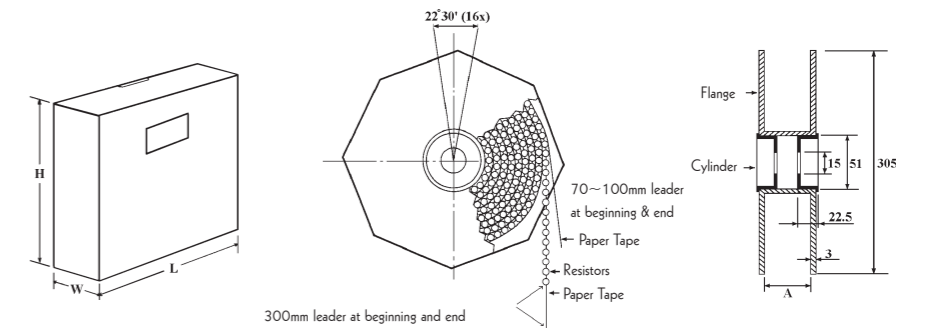
Tape in Box Packing (Ammo Pack)



Part No.	Type	Dimension of T/B (mm)					Qty./Box
		0	P	A±5	B±5	C±5	
<b>Carbon Film Fixed Resistors</b>							
CFROW8	CFR-12	52±1	5±0.3	75	65	255	5,000
CFROS4	CFR-25-S	52±1	5±0.3	75	65	255	5,000
CFROW4	CFR-25	52±1	5±0.3	75	100	250	5,000
CFROU2	CFR-50-SS	52±1	5±0.3	70	115	250	5,000
CFROS2	CFR-50-S	52±1	5±0.3	75	65	255	2,000
CFROW2	CFR-50	52±1	5±0.3	75	45	250	1,000
CFRO1S	CFR-100-S	58±1	5±0.3	75	80	255	1,000
CFRO1W	CFR-100	65±5	10±0.5	85	85	255	1,000
CFRO2S	CFR-200-S	65±5	10±0.5	85	85	255	1,000
CFRO2W	CFR-200	65±5	10±0.5	85	65	255	500
CFRO3S	CFR-300-S	65±5	10±0.5	85	65	255	500
<b>Metal Film Fixed Resistors</b>							
MFROW8	MF-12	52±1	5±0.3	75	65	255	5,000
MFR0S4	MF-25-S	52±1	5±0.3	75	65	255	5,000
MFROW4	MF-25	52±1	5±0.3	75	100	250	5,000
MFR004	MF-40-SS	52±1	5±0.3	75	65	255	5,000
MFR0U2	MF-50-SS	52±1	5±0.3	70	115	250	5,000
MFR0S2	MF-50-S	52±1	5±0.3	75	65	255	2,000
MFROW2	MF-50	52±1	5±0.3	75	45	250	1,000
MFR006	MF-60-S	52±1	5±0.3	70	115	250	5,000
MFR01W	MF-100	58±1	5±0.3	75	80	255	1,000
MFR02W	MF-200	65±5	10±0.5	85	85	255	1,000
MFR03W	MF-300	65±5	10±0.5	85	65	255	500
<b>Metal Oxide Film Fixed Resistors</b>							
MOR0W4	MOR-25	52±1	5±0.3	70	115	250	5,000
MOR0S2	MOR-50-S	52±1	5±0.3	70	115	250	5,000
MOR0W2	MOR-50	52±1	5±0.3	75	45	250	1,000
MOR01S	MOR-100-S	58±1	5±0.3	75	65	255	1,000
MOR01W	MOR-100	58±1	5±0.3	75	80	255	1,000
MOR02S	MOR-200-S	58±1	5±0.3	75	80	255	1,000
MOR02W	MOR-200	65±1	10±0.5	85	105	255	1,000
MOR03S	MOR-300-S	65±1	10±0.5	85	105	255	1,000
MOR03W	MOR-300	65±5	10±0.5	85	75	255	500
MOR05U	MOR-500-SS	65±5	10±0.5	85	75	255	500
MOR05S	MOR-500-S	90±5	10±0.5	115	125	500	500
<b>Fusible Resistors</b>							
FRN0W4	FRN-25	52±1	5±0.3	70	115	250	5,000
FRN0W2	FRN-50	52±1	5±0.3	75	65	255	2,000
FRN01W	FRN-100	58±1	5±0.3	75	65	255	1,000
FRN02W	FRN-200	58±1	5±0.3	75	80	255	1,000
FRN03W	FRN-300	65±5	10±0.5	85	105	255	1,000

Part No.	Type	Dimension of T/B (mm)					Qty./Box
		O	P	A±5	B±5	C±5	
<b>Wire-wound Fixed Resistors</b>							
KNP0W2	KNP-50	58±1	5±0.3	75	45	250	1,000
KNP01S	KNP-100-S	58±1	5±0.3	75	65	255	1,000
KNP01W	KNP-100	58±1	5±0.5	75	80	255	1,000
KNP02S	KNP-200-S	58±1	5±0.5	75	80	255	1,000
KNP02W	KNP-200	65±5	10±0.5	85	105	255	1,000
KNP03S	KNP-300-S	65±5	10±0.5	85	105	255	1,000
KNP03W	KNP-300	65±5	10±0.5	85	75	255	500
KNP05S	KNP-500-S	65±5	10±0.5	85	75	255	500
<b>Jumper Wires &amp; Zero Ohm Resistors</b>							
ZWA0	ZW-A	52±1	5±0.3	75	110	250	10,000
ZWB0	ZW-B	52±1	5±0.3	70	100	250	10,000
ZWC0	ZW-C	52±1	5±0.3	70	115	250	8,000
ZWD0	ZW-D	52±1	5±0.3	70	115	250	8,000
ZWF0	ZW-F	52±1	5±0.3	70	115	250	7,000
ZO00W8	ZO-12	52±1	5±0.3	75	65	255	5,000
ZO00W4	ZO-25	52±1	5±0.3	75	100	250	5,000
<b>PT-26 Type</b>							
CFROW8	CFR-12	26 <sup>+1.5</sup> <sub>-1</sub>	5±0.5	45	65	255	5,000
CFROS4	CFR-25-S	26 <sup>+1.5</sup> <sub>-1</sub>	5±0.5	45	65	255	5,000
CFROW4	CFR-25	26 <sup>+1.5</sup> <sub>-0</sub>	5±0.5	45	100	250	5,000
CFROU2	CFR-50-SS	26 <sup>+1.5</sup> <sub>-0</sub>	5±0.5	45	100	250	4,000
MFR0W8	MF-12	26 <sup>+1.5</sup> <sub>-1</sub>	5±0.5	45	65	255	5,000
MFR0S4	MF-25-S	26 <sup>+1.5</sup> <sub>-1</sub>	5±0.5	45	65	255	5,000
MFR0W4	MF-25	26 <sup>+1.5</sup> <sub>-0</sub>	5±0.5	45	100	250	5,000
MFR0U2	MF-50-SS	26 <sup>+1.5</sup> <sub>-0</sub>	5±0.5	45	100	250	4,000
MFR006	MF-60-S	26 <sup>+1.5</sup> <sub>-0</sub>	5±0.5	45	100	250	4,000
<b>Metal Glazed Film Fixed Resistors</b>							
MGR0W4	MGR25	52±1	5±0.3	71	116	255	5000
MGR0W2	MGR-50	52±1	5±0.3	75	70	255	1000
MGR01W	MGR-100	58±5	5±0.3	84	88	255	1000
MGR02W	MGR-200	65±5	10±0.5	84	119	255	1000
MGR03W	MGR-300	65±5	10±0.5	84	88	255	500
MGR0U2	MGR-50-SS	52±1	5±0.3	71	116	255	5000
MGR0S2	MGR-50-S	52±1	5±0.3	73	45	255	1000
MGR01U	MGR-100-SS	52±1	5±0.3	75	70	255	1000
MGR01S	MGR-100-S	58±1	5±0.3	75	82	255	1000
MGR02U	MGR-200-SS	58±1	5±0.3	75	82	255	1000
MGR02S	MGR-200-S	58±1	5±0.3	84	88	255	1000
MGR03U	MGR-300-SS	58±1	5±0.3	84	88	255	1000
MGR03S	MGR-300-S	65±1	10±0.5	84	119	255	1000

Tape in Reel

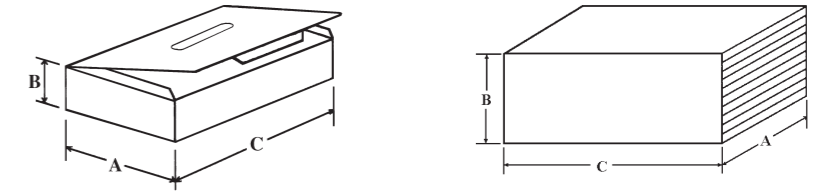


Part No.	Type	Dimension of T/R (mm)				Qty./Box
		A	W±5	H±5	L±5	
<b>Carbon Film Fixed Resistors</b>						
CFROW8	CFR-12	73±2	85	295	290	5,000
CFROS4	CFR-25-S	73±2	85	295	290	5,000
CFROW4	CFR-25	73±2	85	295	290	5,000
CFROU2	CFR-50-SS	73±2	85	295	290	5,000
CFROS2	CFR-50-S	73±2	85	295	290	4,000
CFROW2	CFR-50	73±2	85	295	290	4,000
CFR01S	CFR-100-S	73±2	85	295	290	2,500
CFR0IW	CFR-100	80±5	95	295	290	1,000
CFR02S	CFR-200-S	80±5	95	295	290	1,000
CFR02W	CFR-200	80±5	95	295	290	1,000
CFR03S	CFR-300-S	80±5	95	295	290	1,000
<b>Metal Film Fixed Resistors</b>						
MFR0W8	MF-12	73±2	85	295	290	5,000
MFR0S4	MF-25-S	73±2	85	295	290	5,000
MFR0W4	MF-25	73±2	85	295	290	5,000
MFR004	MF-40-SS	73±2	85	295	290	5,000
MFR0U2	MF-50-SS	73±2	85	295	290	5,000
MFR0S2	MF-50-S	73±2	85	295	290	4,000
MFR0W2	MF-50	73±2	85	295	290	4,000
MFR006	MF-60-S	73±2	85	295	290	5,000
MFR0IW	MF-100	73±2	85	295	290	2,500
MFR02W	MF-200	80±5	95	295	290	1,000
MFR03W	MF-300	80±5	95	295	290	1,000
<b>Metal Oxide Film Fixed Resistors</b>						
MOR0W4	MOR-25	73±2	85	295	290	5,000
MOR0S2	MOR-50-S	73±2	85	295	290	5,000
MOR0W2	MOR-50	73±2	85	295	290	3,500
MOR01S	MOR-100-S	73±2	85	295	290	2,500
MOR0IW	MOR-100	73±2	85	295	290	2,500
MOR02S	MOR-200-S	73±2	85	295	290	2,500
MOR02W	MOR-200	80±5	95	295	290	1,000
MOR03S	MOR-300-S	80±5	95	295	290	1,000
MOR03W	MOR-300	80±5	95	295	290	1,000
MOR05U	MOR-500-SS	80±5	95	295	290	1,000

Part No.	Type	Dimension of T/R (mm)				Qty./Box
		A	W±5	H±5	L±5	
<b>Fusible Resistors</b>						
FRN0W4	FRN-25	73±2	85	295	290	5,000
FRN0W2	FRN-50	73±2	85	295	290	4,000
FRN01W	FRN-100	73±2	85	295	290	2,500
FRN02W	FRN-200	73±2	85	295	290	2,500
FRN03W	FRN-300	80±5	95	295	290	1,000
<b>Wire-wound Fixed Resistors</b>						
KNP0W2	KNP-50	73±2	85	295	290	2,500
KNP01S	KNP-100-S	73±2	85	295	290	2,500
KNP01W	KNP-100	73±2	85	295	290	2,500
KNP02S	KNP-200-S	73±2	85	295	290	2,500
KNP02W	KNP-200	80±5	95	295	290	1,000
KNP03S	KNP-300-S	80±5	95	295	290	1,000
KNP03W	KNP-300	80±5	95	295	290	1,000
KNP05S	KNP-500-S	80±5	95	295	290	1,000
<b>Jumper Wires &amp; Zero-Ohm Resistors</b>						
ZWA0	ZW-A	73±2	85	295	290	10,000
ZWB0	ZW-B	73±2	85	295	290	10,000
ZO00W8	ZO-12	73±2	85	295	290	5,000
ZO00W4	ZO-25	73±2	85	295	290	5,000

• Taping dimension are same as Tape/Box packing

Bulk in Box Packing



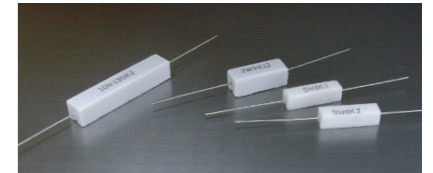
Part No.	Type	Dimension of Bulk/Box (mm)			Qty. of Bag/Box
		A±5	B±5	C±5	
<b>Carbon Film Fixed Resistors</b>					
CFROW8	CFR-12	140	80	240	1,000 / 20,000
CFROS4	CFR-25-S	140	80	240	1,000 / 20,000
CFROW4	CFR-25	140	80	240	500 / 10,000
CFROU2	CFR-50-SS	140	80	240	250 / 10,000
CFROS2	CFR-50-S	140	80	240	500 / 8,000
CFROW2	CFR-50	140	80	240	250 / 5,000
CFR01S	CFR-100-S	140	80	240	100 / 2,500
CFR0IW	CFR-100	140	80	240	100 / 1,500
CFR02S	CFR-200-S	140	80	240	100 / 1,500
CFR02W	CFR-200	140	80	240	100 / 1,000
CFR03S	CFR-300-S	140	80	240	100 / 1,000
<b>Metal Film Fixed Resistors</b>					
MFLOW8	MF-12	140	80	240	1,000 / 20,000
MFROS4	MF-25-S	140	80	240	1,000 / 20,000
MFLOW4	MF-25	140	80	240	500 / 10,000
MFR004	MF-40-SS	140	80	240	1,000 / 20,000
MFR0U2	MF-50-SS	140	80	240	500 / 10,000
MFROS2	MF-50-S	140	80	240	500 / 8,000
MFLOW2	MF-50	140	80	240	250 / 2,000
MFR006	MF-60-S	140	80	240	500 / 10,000
MFR01W	MF-100	140	80	240	100 / 2,500
MFR02W	MF-200	140	80	240	100 / 1,500
MFR03W	MF-300	140	80	240	100 / 1,500
<b>Metal Oxide Film Fixed Resistors</b>					
MOR0W4	MOR-25	140	80	240	250 / 10,000
MOR0S2	MOR-50-S	140	80	240	250 / 10,000
MOR0W2	MOR-50	140	80	240	200 / 4,000
MOR01S	MOR-100-S	140	80	240	200 / 4,000
MOR01W	MOR-100	140	80	240	100 / 2,500
MOR02S	MOR-200-S	140	80	240	100 / 2,500
MOR02W	MOR-200	140	80	240	100 / 1,500
MOR03S	MOR-300-S	140	80	240	100 / 1,500
MOR03W	MOR-300	140	80	240	100 / 1,000
MOR05U	MOR-500-SS	140	80	240	100 / 1,000
MOR05S	MOR-500-S	140(185)	80(100)	240(365)	25/400 (100/1,000)
MOR05W	MOR-500	140(185)	80(100)	240(365)	25/400 (100/1,000)
MOR07W	MOR-700	140	80	240	25 / 300



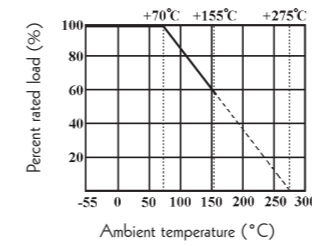
Part No.	Type	Dimension of Bulk/Box (mm)			Qty. per Bag/Box
		A±5	B±5	C±5	
<b>Fusible Resistors</b>					
FRN0W4	FRN-25	140	80	240	250 / 10,000
FRN0W2	FRN-50	140	80	240	250 / 8,000
FRN01W	FRN-100	140	80	240	200 / 4,000
FRN02W	FRN-200	140	80	240	100 / 2,500
FRN03W	FRN-300	140	80	240	100 / 1,500
<b>Wire-wound Fixed Resistors</b>					
KNP0W2	KNP-50	140	80	240	250 / 5,000
KNP01S	KNP-100-S	140	80	240	200 / 4,000
KNP01W	KNP-100	140	80	240	100 / 2,500
KNP02S	KNP-200-S	140	80	240	100 / 2,500
KNP02W	KNP-200	140	80	240	100 / 1,500
KNP03S	KNP-300-S	140	80	240	100 / 1,500
KNP03W	KNP-300	140	80	240	100 / 1,000
KNP05S	KNP-500-S	140 (185)	80 (100)	240 (365)	25 / 400 (100 / 1,000)
KNP05W	KNP-500	140 (185)	80 (100)	240 (365)	25 / 400 (100 / 1,000)
<b>Zero-Ohm Resistors</b>					
ZO0W8	ZO-12	140	80	240	1,000 / 20,000
ZO0W4	ZO-25	140	80	240	500 / 10,000

Feature

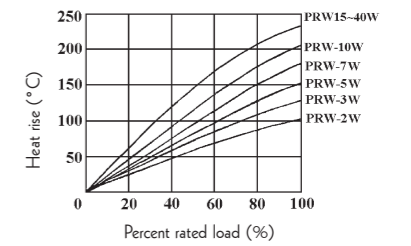
- Self-extinguishing
- Extremely small & sturdy mechanically safe
- Non-Inductive type available
- Excellent flame & moisture resistance
- Too low or too high values on Wire-wound & Power-film type can be supplied on a case to case basis



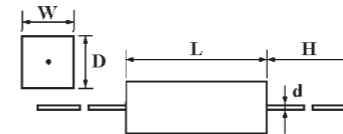
Derating Curve



Heat Rise Chart

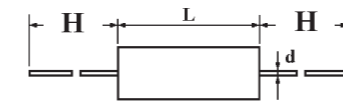


Axial Leaded Type - PRW Series



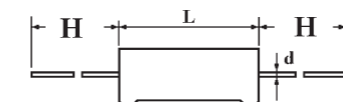
Part No.	Type	Dimension (mm)					Resistance Range	
		W ± 1	D ± 1	L ± 1	H	d ± 0.05	Wire-wound	Power Film
PRW02W	PRW-2W	7	7	18	28±5	0.70	0.1Ω~27Ω	28Ω~33KΩ
PRW03W	PRW-3W	8	8	22	32±5	0.70	0.1Ω~39Ω	40Ω~56KΩ
PRW05W	PRW-5W	10	9	22	35±5	0.75	0.1Ω~47Ω	48Ω~100KΩ
PRW07W	PRW-7W	10	9	35	35±5	0.75	0.1Ω~680Ω	681Ω~200KΩ
PRW0AW	PRW-10W	10	9	49	35±5	0.75	0.1Ω~910Ω	911Ω~200KΩ
PRW0FW	PRW-15W	12.5	11.5	49	35±5	0.75	1Ω ~ 1KΩ	1.1KΩ~200KΩ
PRW020	PRW-20W	14.5	13.5	60	35±5	0.75	2Ω ~ 1.2KΩ	1.3KΩ~200KΩ
PRW025	PRW-25W	14.5	13.5	64	35±5	0.75	2Ω ~ 1.2KΩ	

Axial Leaded Type - PRWC Series



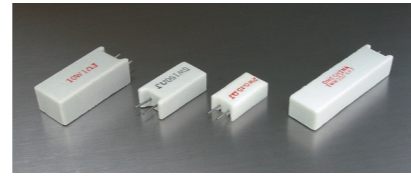
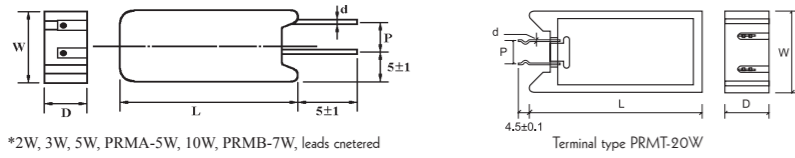
Part No.	Type	Dimension (mm)					Resistance Range	
		W ± 1	D ± 1	L ± 1	H	d ± 0.05	Wire-wound	Power Film
PRWC3W	PRWC-3W	6	6	20	28 ± 5	0.70	1Ω~27Ω	28Ω~33KΩ
PRWC5W	PRWC-5W	6	6	25	35 ± 5	0.75	1Ω~100Ω	101Ω~100KΩ
PRWC7W	PRWC-7W	9	9	25	35 ± 5	0.75	1Ω~100Ω	101Ω~100KΩ

Axial Leaded Type - PRWA Series



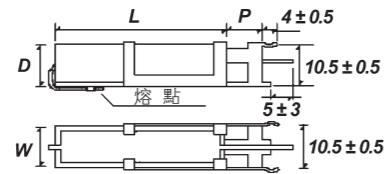
Part No.	Type	Dimension (mm)					Resistance Range	
		W ± 1	D ± 1	L ± 1	H	d ± 0.05	Wire-wound	Power Film
PRWA2W	PRWA-2W	7	7	18	28 ± 5	0.70	0.1Ω~27Ω	28Ω~33KΩ
PRWA5W	PRWA-5W	10	9	22	35 ± 5	0.75	0.1Ω~47Ω	48Ω~100KΩ
PRWA7W	PRWA-7W	10	9	35	35 ± 5	0.75	0.1Ω~680Ω	681Ω~200KΩ
PRWAAW	PRWA-10W	10	9	49	35 ± 5	0.75	0.1Ω~910Ω	911Ω~200KΩ

Radial Leaded Type - PRM Series



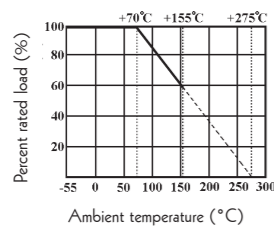
Part No.	Type	Dimension (mm)					Resistance Range	
		W ± 1	D ± 1	L ± 1	P ± 1	d ± 0.05	Wire-wound	Power Film
PRM02W	PRM-2W	11.5	7.5	20	5	0.70	0.1Ω~27Ω	28Ω~33KΩ
PRM03W	PRM-3W	12.5	8.5	25	5	0.70	0.1Ω~39Ω	40Ω~56KΩ
PRM05W	PRM-5W	12.5	9	25	5	0.75	0.1Ω~47Ω	48Ω~100KΩ
PRM07W	PRM-7W	12.5	9	38	5	0.75	0.1Ω~680Ω	681Ω~200KΩ
PRM0AW	PRM-10W	12.5	9	50	5	0.75	0.1Ω~910Ω	911Ω~200KΩ
PRMA5W	PRMA-5W	12.5	9	25	7.5	0.80	0.1Ω~47Ω	48Ω~100KΩ
PRMAAW	PRMA-10W	16	12	35	7.5	0.80	0.1Ω~560Ω	561Ω~100KΩ
PRMB7W	PRMB-7W	12.5	9	38	5	0.80	0.1Ω~680Ω	681Ω~200KΩ
PRMT20	PRMT-20W	20	13±0.5	45	7.5	0.4±0.1	100Ω~560Ω	

Radial Leaded Type - PRS Series

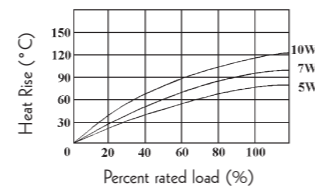


Part No.	Type	Dimension (mm)				Resistance Range	
		W ± 1	D ± 1	L ± 1	P ± 1	Wire-wound	Power Film
PRS05W	PRS-5W	10	9	22	5	0.1Ω~47Ω	48Ω~100KΩ
PRS07W	PRS-7W	10	9	35	10	0.1Ω~680Ω	681Ω~200KΩ
PRS0AW	PRS-10W	10	9	49	10	0.1Ω~910Ω	911Ω~200KΩ
PRS0FW	PRS-15W	12.5	11.5	49	11	1Ω~1KΩ	1.1KΩ~200KΩ

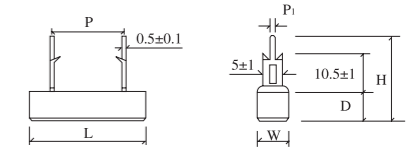
Derating Curve



Heat Rise Chart (PRS)

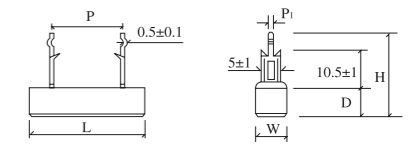


Radial Terminal Type - PRVA Series



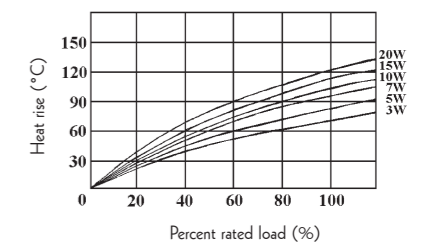
Part No.	Type	Dimension (mm)						Resistance Range	
		W ± 1	D ± 1	L ± 1	P ± 1	P <sub>1</sub> ± 0.2	H ± 1	Wire-wound	Power Film
PRVA3W	PRVA-3W	10	9	22	9.5	1.3	25	0.1Ω~47Ω	48Ω~33KΩ
PRVA5W	PRVA-5W	10	9	27 / 25	15/9.5	1.3	25	0.1Ω~120Ω	121Ω~56KΩ
PRVA7W	PRVA-7W	10	9	35	22	1.3	25	0.1Ω~560Ω	561Ω~100KΩ
PRVAAW	PRVA-10W	10	9	48	35 / 32	1.3	25	1Ω~820Ω	821Ω~100KΩ
PRVAFW	PRVA-15W	12.5	11.5	48	32	1.5	24	1Ω~1KΩ	1.1KΩ~200KΩ
PRVA20	PRVA-20W	12.5	13.5	63	42	1.5	26	1Ω~1.2KΩ	1.3KΩ~200KΩ

Radial Terminal Type - PRVB Series

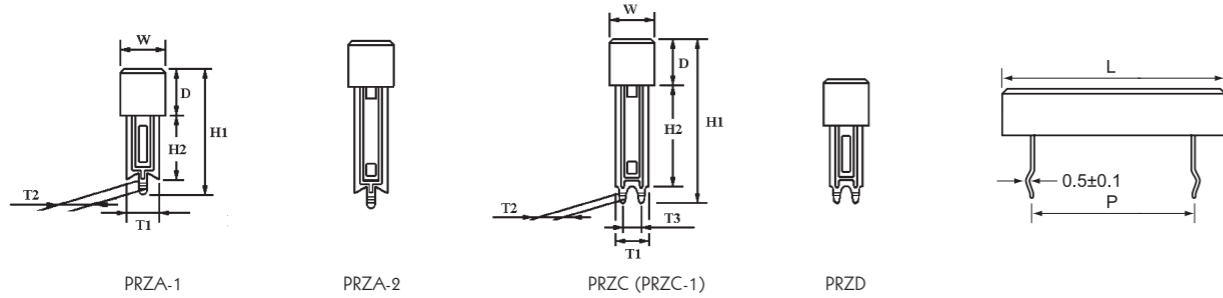
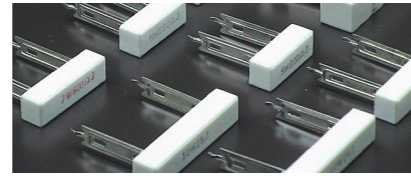


Part No.	Type	Dimension (mm)						Resistance Rang	
		W ± 1	D ± 1	L ± 1	P ± 1	P <sub>1</sub> ± 0.2	H ± 1	Wire-wound	Power Film
PRVB3W	PRVB-3W	10	9	22	9.5	1.3	25	0.1Ω~47Ω	48Ω~33KΩ
PRVB5W	PRVB-5W	10	9	27 / 25	15/9.5	1.3	25	0.1Ω~120Ω	121Ω~56KΩ
PRVB7W	PRVB-7W	10	9	35	22	1.3	25	0.1Ω~560Ω	561Ω~100KΩ
PRVBAW	PRVB-10W	10	9	48	35 / 32	1.3	25	1Ω~820Ω	821Ω~100KΩ
PRVBFW	PRVB-15W	12.5	11.5	48	32	1.5	27.5	1Ω~1KΩ	1.1KΩ~200KΩ
PRVB20	PRVB-20W	12.5	13.5	63	42	1.5	29.5	1Ω~1.2KΩ	1.3KΩ~200KΩ

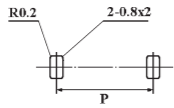
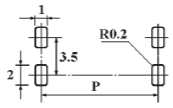
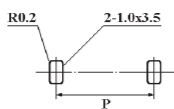
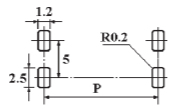
Heat Rise Chart of PRVA & PRVB



Radial Terminal Type - PRZ Series

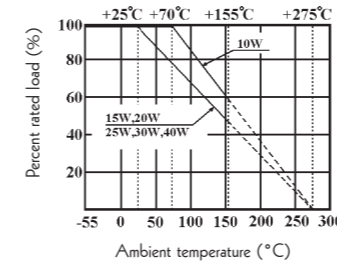


Dimension of Recommended Hole(mm)

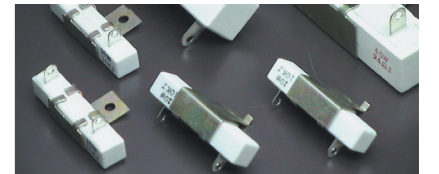
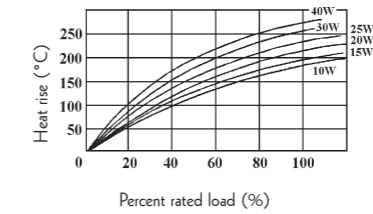
Power Rating	PRZA-1, PRZA-2	PRZC, PRZD	P
3W			9.5
5W			15
7W			22
10W			35
15W			32
20W			45

Power Rating	Part No.	Type	Dimension (mm)									Resistance Range				
			W±1	D±1	L	P±1.5	T <sub>1</sub> ±1	T <sub>2</sub> ±0.2	T <sub>3</sub> ±0.5	H <sub>1</sub> <sup>+2</sup> <sub>-1</sub>	H <sub>2</sub> <sup>+2</sup> <sub>-1</sub>	Wire-wound	Power Film			
3W	PZ1A3W	PRZA-1														
	PZ2A3W	PRZA-2	10	9	22±1	9.5	7			1.6					0.1Ω~47Ω	48Ω~33KΩ
	PRZC3W	PRZC								1.5	3.5	36	22			
	PRZD3W	PRZD								1.3		24	10			
5W	PZ1A5W	PRZA-1			25/27±1	9.5/15				1.6		24	10			
	PZ2A5W	PRZA-2									39	25				
	PRZC5W	PRZC	10	9	27±1	15	7			1.5		36	22	0.1Ω~120Ω	121Ω~56KΩ	
	PRZD5W	PRZD								1.3	3.5	39	24			
7W	PZ1A7W	PRZA-1								1.6		24	10			
	PZ2A7W	PRZA-2									39	25				
	PRZC7W	PRZC	10	9	35±1	22	7			1.5		36	22	0.1Ω~560Ω	561Ω~100KΩ	
	PRZD7W	PRZD								1.3	3.5	39	24			
10W	PZ1AAW	PRZA-1								1.6		24	10			
	PZ2AAW	PRZA-2									39	25				
	PRZCAW	PRZC	10	9	48±1.5	32/35	7			1.5		36	22	1Ω~820Ω	821Ω~100KΩ	
	PRZDAW	PRZD								1.3	3.5	24	10			
15W	PZ1AFW	PRZA-1									35	15				
	PZ2AFW	PRZA-2	12.5	11.5	48±1.5	32	10			3		47	30	1Ω~1KΩ	1.1KΩ~200KΩ	
	PRZCFW	PRZC								2	5	47	30			
20W	PZ1A20	PRZA-1									35	15				
	PZ2A20	PRZA-2	12.5	13.5	63±1.5	42	10			3		47	30	2Ω~1.2KΩ	1.3KΩ~200KΩ	
	PRZC20	PRZC								2	5	47	30			

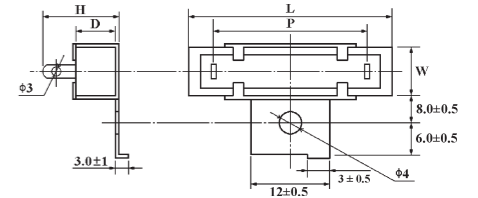
Derating Curve



Heat Rise Chart

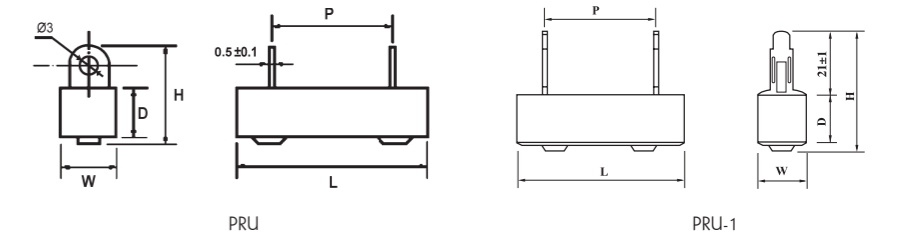


Radial Terminal Type - PRT Series



Part No.	Type	Dimension (mm)					Resistance Range	
		W±1	D±1	L±1	P±1	H±1	Wire-wound	Power Film
PRT0AW	PRT 10W	10	9	48	32	18	1Ω~820Ω	821Ω~100KΩ
PRT0FW	PRT 15W	12.5	11.5	48	32	21	1Ω~1KΩ	1.1KΩ~200KΩ
PRT020	PRT 20W	12.5	13.5	63	42	21	2Ω~1.2KΩ	1.3KΩ~200KΩ
PRT030	PRT 30W	19	19	75	54	30	3Ω~1.5KΩ	-
PRT040	PRT 40W	19	19	90	68	30	6Ω~1.5KΩ	-

Radial Terminal Type - PRU Series

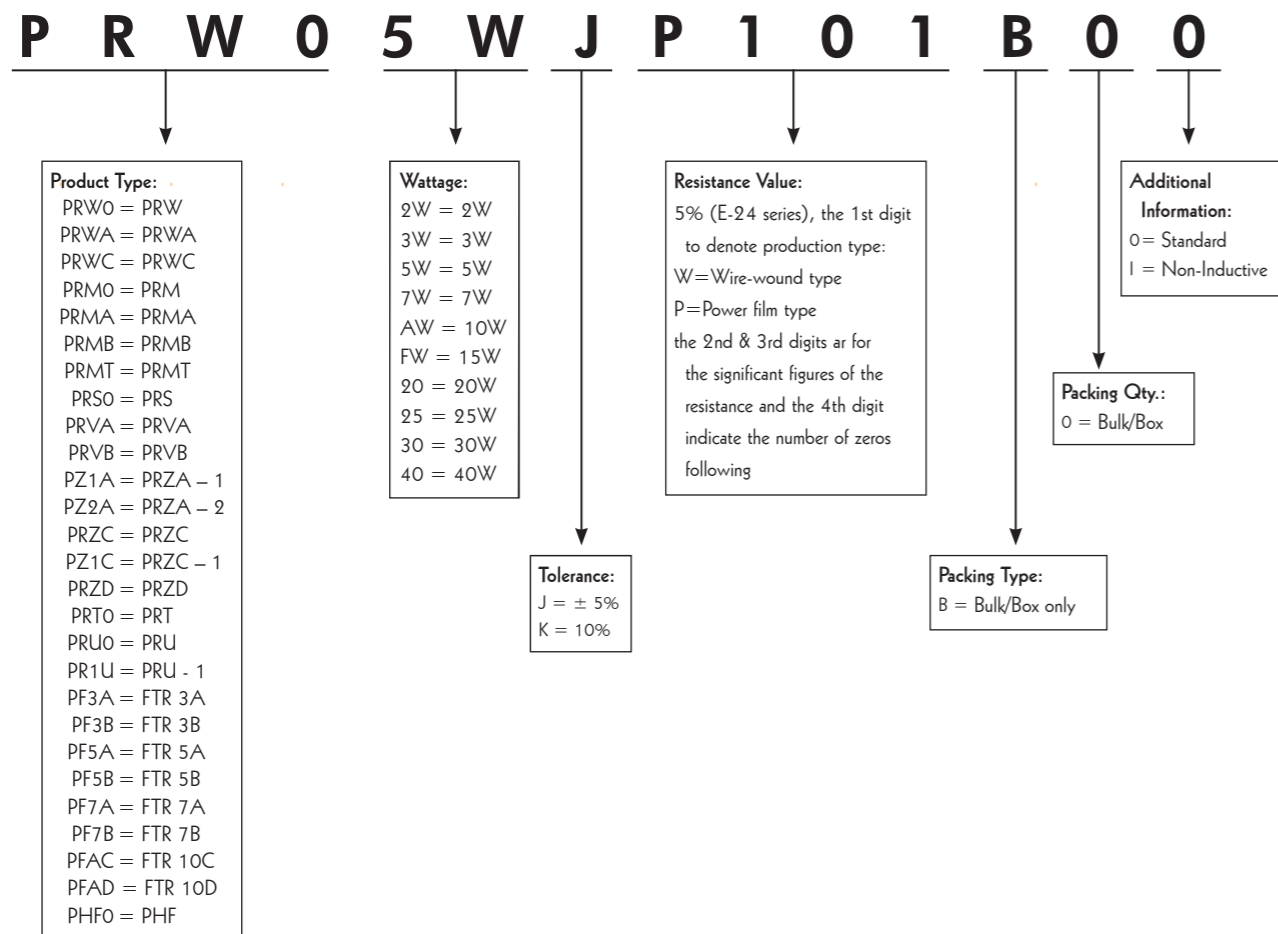


Part No.	Type	Dimension (mm)					Resistance Range	
		W±1	D±1	L±1	P±1	H±1	Wire-wound	Power Film
PRU0AW	PRU 10W	10	9	48	32	18	1Ω~820Ω	821Ω~100KΩ
PRU0FW	PRU 15W	12.5	11.5	48	32	21	1Ω~1KΩ	1.1KΩ~200KΩ
PRU020	PRU 20W	12.5	13.5	63	42	21	2Ω~1.2KΩ	1.3KΩ~200KΩ
PRU030	PRU 30W	19	19	75	54	30	3Ω~1.5KΩ	-
PR1U30	PRU-1 30W	19	19	75	54	41	3Ω~1.5KΩ	-
PRU040	PRU 40W	19	19	90	68	30	6Ω~1.5KΩ	-
PR1U40	PRU-1 40W	19	19	90	68	41	6Ω~1.5KΩ	-

Performance Specification

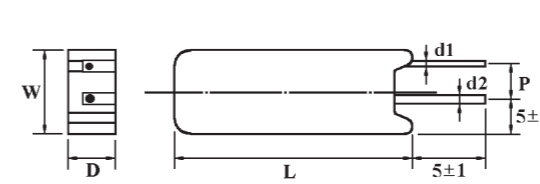
Temperature coefficient	< 20Ω: ± 400PPM/°C, ≥ 20Ω: ± 350PPM/°C
Short-time overload	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Temperature cycling	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Load life in humidity	Wire-wound type: ≤ R/R = ±5%;
	Power Film type < 100KΩ: ΔR/R = ±5%;
Load life	Wire-wound type: ΔR/R = ±5%;
	Power Film type ≥ 100KΩ: ΔR/R = ±10%.

Ordering Procedure (Example: PRW 5W 5% 100Ω, B/B)

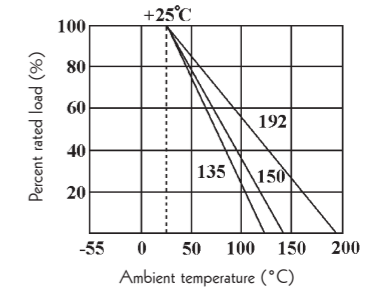


Leaded Type Cement Thermal Fusing Resistors - FTR

Derating Curve



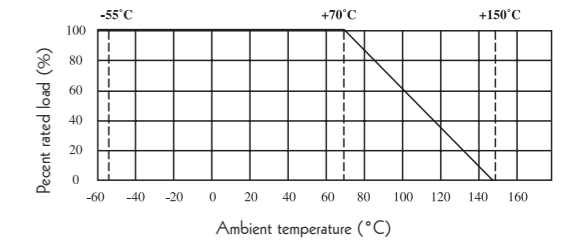
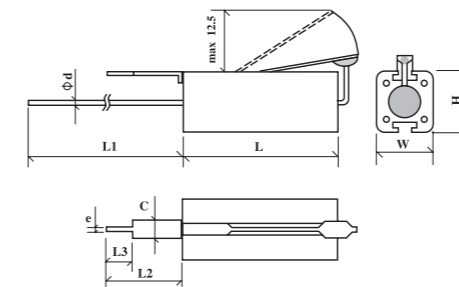
\*FTR3A, FTR3B, FTR5A, FTR5B, FTR10C: leads centered



Part No.	Type	Power Rating	Dimension (mm)						Cut-Off Temperature	Rated Current	Rated Voltage	Tolerance	Resistance Range
			D±1	L±1	d <sub>1</sub> <sup>+0.02/-0.05</sup>	d <sub>2</sub> ±0.05	P±1	W±1					
PF3A00	FTR3A	1.5W	8.5	25	0.5	0.70	5	12.5	130±4°C				
PF3B00	FTR3B	2W							145±4°C				
PF5A00	FTR5A	1.6W	9	25	0.5	0.75	5	12.5	130±4°C	2A	250V	±5% & ±10%	1Ω~100Ω
PF5B00	FTR5B	2.1W							145±4°C				
PF7A00	FTR7A	2.2W	9	38	0.5	0.75	5	12.5	130±4°C				
PF7B00	FTR7B	2.7W							145±4°C				
PFAC00	FTR10C	3.5W	12	35	1	0.75	5	16	188+3/-1°C	10A	250V		1Ω~200Ω
PFADAW	FTR-10D	10W	12	35	1	1.00	7.5	16	235±3°C	10A	250V	±10%	1Ω~200Ω

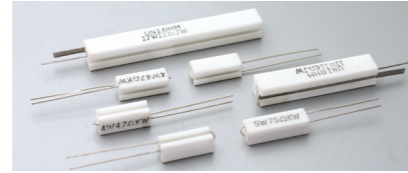
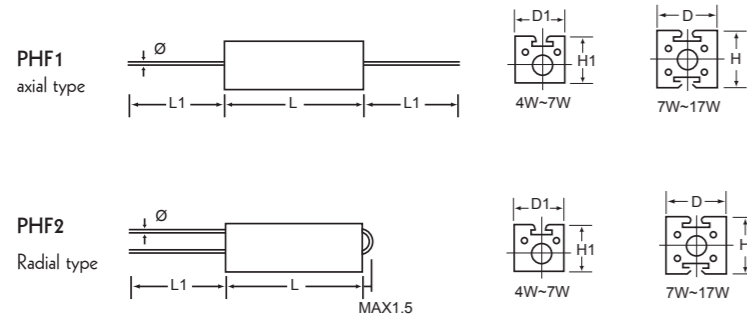
Leaded Type Cement Thermal Fusing Resistors - PHF

Derating Curve



Part No.	Type	Dimension (mm)									Resistance Range (Wire-wound)	Cut-Off Temperature
		L±1.0	W±1.0	H±1.0	L1±3.0	L2±1.0	L3±0.5	C±0.1	e±0.1	Ød±0.05		
PHF02W	PHF-2W	25	9	10	38	13	4.5	3.0	0.9	0.75	1Ω~470Ω	150±20°C

PHF1 & PHF2 Series

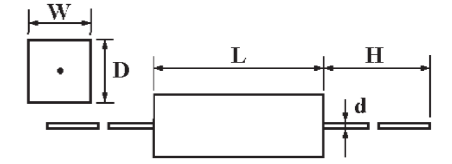


Dimension (mm)

Part No.	Wattage	H±0.5	H1±0.5	D±0.5	D1±0.5	L±1	L1±3	Ø±0.05	Remark
PHF1 4W	4W	/	8	/	7	20	30	0.8	the leads could be specially designed according to customer's requirement
PHF2 4W									
PHF1 5W	5W	/	8	/	7	25	30	0.8	
PHF2 5W									
PHF1 7W	7W	10	8	9	7	25	30	0.8	
PHF2 7W									
PHF1 9W	9W	10	/	9	/	38	30	0.8	
PHF2 9W									
PHF1 11W	11W	10	/	9	/	50	30	0.8	
PHF2 11W									
PHF1 17W	17W	10	/	9	/	75	30	0.8	
PHF2 17W									

Performance Specification

Rated Power	4W~17W
Resistance Range	1Ω~56KΩ
Tolerance	J(±5%) K(±10%)
Temperature coefficient	±350ppm/°C
Short-time overload	ΔR/R ≤ ±(3%+0.05Ω), with no evidence of mechanical damage
Dielectric withstanding voltage	>2,000V
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R < ±(1%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±5%, with no evidence of mechanical damage



Dimension (mm)

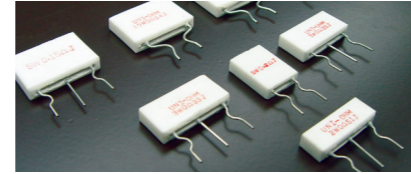
Part No.	Type	W±1	D±1	L±1	H±5	Ød±0.05	Rated Current	Resistance Range
PRWUAW	PRW/U 10W	10.0	9.0	49.0	35.0	0.80	30A	0.01Ω~0.02Ω
PRWU15	PRW/U 15W	12.5	11.5	49.0	35.0	1.00	40A	0.01Ω~0.039Ω
PRWU20	PRW/U 20W	14.5	13.5	60.0	35.0	1.00	40A	0.01Ω~0.039Ω
PRWU25	PRW/U 25W	14.5	13.5	64.0	35.0	1.00	40A	0.01Ω~0.051Ω

Performance Specification

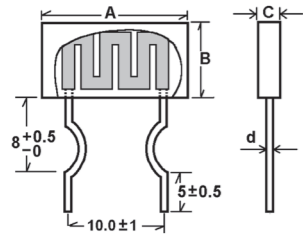
Temperature coefficient	±300PPM/°C
Load life in humidity	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Temperature cycling	ΔR/R ≤ ±(2.0%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage

Feature

- Low inductance
- Safety flameproof construction
- Thin & lightweight body save the PCB space considerably
- Automatically insertable

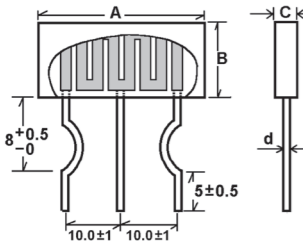


PFAS (Single Circuit) Dimension (mm)



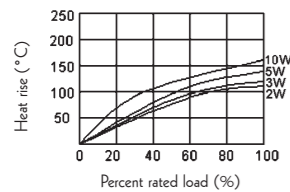
Part No.	Type	Power Rating at 70°C	Dimension (mm)				Resistance Range (5% & 10%)
			A±0.5	B±0.5	C±0.5	d±0.05	
PFAS2W	PFAS 2W	2W	13.0	8.5	5.0	0.75	0.01Ω~1Ω
PFAS3W	PFAS 3W	3W	13.0	13.5	5.0	0.75	0.01Ω~1Ω
PFAS5W	PFAS 5W	5W	14.0	18.0	5.0	0.75	0.01Ω~1Ω
PFASAW	PFAS 10W	10W	26.0	18.0	5.0	1.00	0.01Ω~3.3Ω

PFAT (Twin Circuit) Dimension (mm)

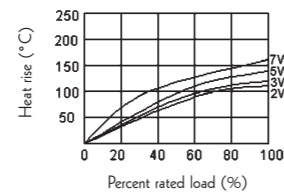


Part No.	Type	Power Rating at 70°C	Dimension (mm)				Resistance Range (5% & 10%)
			A±0.5	B±0.5	C±0.5	d±0.05	
PFAT2W	PFAT 2W+2W	2W	26.0	9.0	5.0	0.75	0.05Ω~1Ω
PFAT3W	PFAT 3W+3W	3W	26.0	13.0	5.0	0.75	0.05Ω~1Ω
PFAT5W	PFAT 5W+5W	5W	26.0	18.0	5.0	0.75	0.05Ω~1Ω
PFAT7W	PFAT 7W+7W	7W	26.0	20.0	5.0	1.00	0.1Ω~1Ω

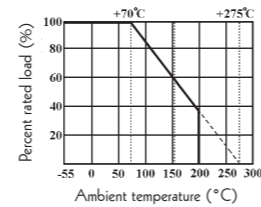
Heat Rise Chart (PFAS)



Heat Rise Chart (PFAT)



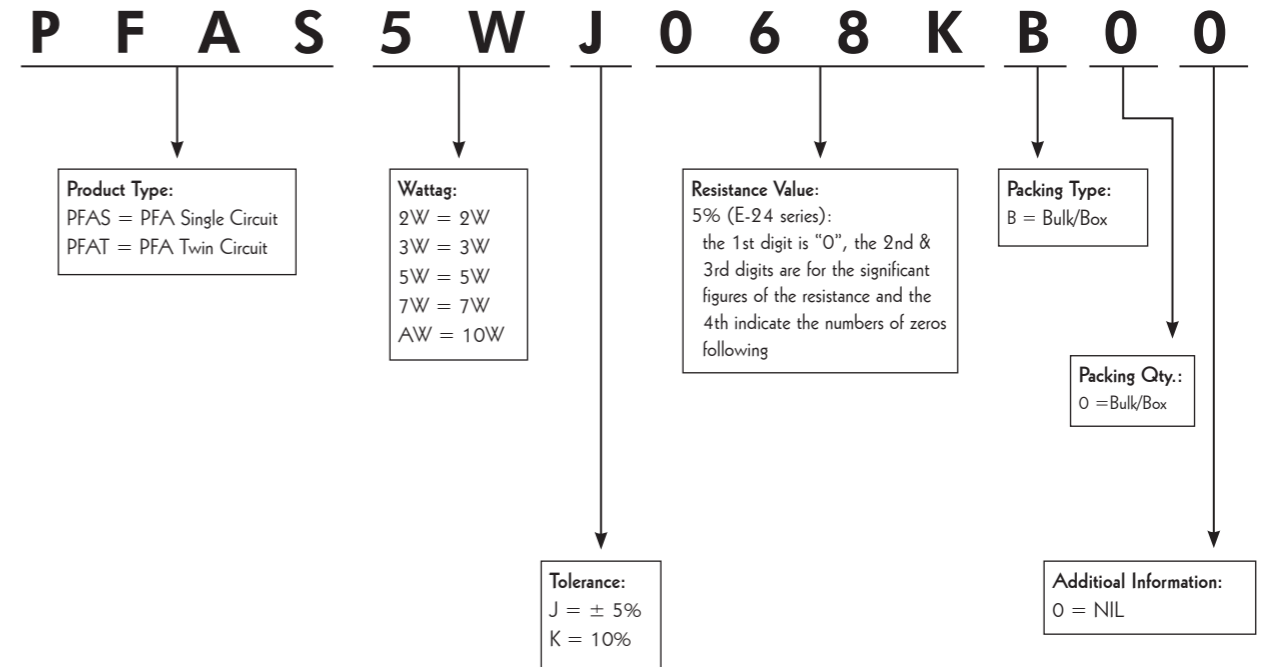
Derating Curve



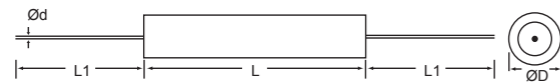
Performance Specification

Temperature coefficient	≤ ± 350PPM°C
Short-time overload	ΔR/R ≤ ±2%, with no evidence of mechanical damage
Dielectric withstanding voltage	2,000V
Operating temperature	-55°C ~ +200°C
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±1%, with no evidence of mechanical damage
Solderability	Min. 95% coverage
Resistance to solvent	ΔR/R ≤ ±1%
Temperature cycling	ΔR/R ≤ ±5%, with no evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±5%, with no evidence of mechanical damage
Load life in humidity	ΔR/R ≤ ±5%, with no evidence of mechanical damage
Load life	ΔR/R ≤ ±5%, with no evidence of mechanical damage

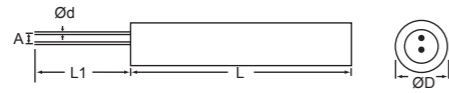
Ordering Procedure (Example: PFAS 5W 5% 0.68Ω, B/B)



QHO-1



QHO-2



Dimension (mm)

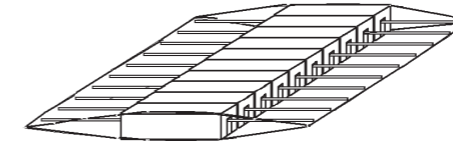
Type	L±1	L1±1	ØD±1	Ød±0.05	Remark
QHO4W	40	30	8	0.8	
QHO5W	45	30	8	0.8	
QHO7W	50	30	9	0.8	the leads can be specially designed according to customer's requirement
QHO9W	60	30	9	0.8	
QHO11W	65	30	9	0.8	
QHO17W	75	30	9	0.8	

The resistor of same Wattage QHO-1 & QHO-2 are same, only the lead type is different.

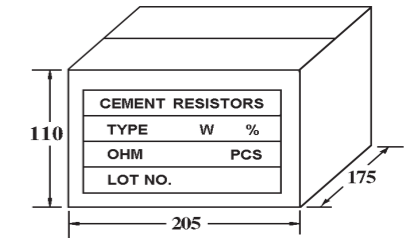
Performance Specification

Resistance Range	1Ω~56KΩ
Tolerance	J(±5%) K(±10%)
Temperature coefficient	<20Ω: ±400ppm/°C; ≥20Ω: ±350ppm/°C
Short-time overload	R/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	R/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Temperature cycling	R/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Humidity (Steady State)	R/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Load life	R/R ≤ ±5%, with no evidence of mechanical damage

Plastic Bag Packing



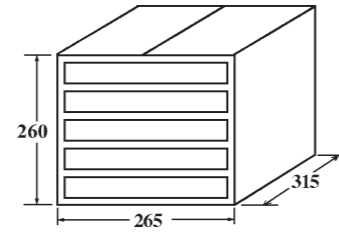
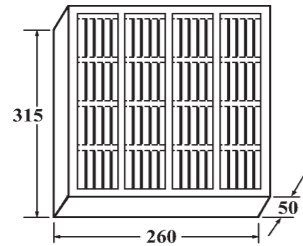
Inner Box of Plastic Bag Packing



Part NO.	Type	Qty. Per Bag/Box	Qty. per Carton	Carbon Dimension (±5mm)	GW (±2kg)	
<b>PRW Series</b>						
PRW02W	PRW 2W	10 / 600	3,600	540 x 215 x 245	12.5	
PRW03W	PRW 3W	10 / 500	3,000		14	
PRW05W	PRW 5W	10 / 400	2,400		14.5	
PRW07W	PRW 7W	10 / 300	1,800		17	
PRW0AW	PRW 10W	10 / 250	1,500		18	
PRW0FW	PRW 15W	10 / 140	840		16.5	
PRW020	PRW 20W	10 / 120	720		21	
PRWA2W	PRWA 2W	10 / 600	3,600		12.5	
PRWA5W	PRWA 5W	10 / 400	2,400		14.5	
PRWA7W	PRWA 7W	10 / 300	1 800		17	
PRWAAW	PRWA 10W	10 / 250	1 500		18	
PRWC3W	PRWC 3W	10 / 600	3,600		12.5	
PRWC5W	PRWC 5W	10 / 600	3,600		14	
PRWC7W	PRWC 7W	10 / 400	2,400		16	
<b>PRS Series</b>						
PRS05W	PRS 5W	10 / 400	2,400		540 x 215 x 245	18
PRS07W	PRS 7W	10 / 300	1,800	17		
PRS0AW	PRS 10W	10 / 250	1,500	22		
<b>PRT Series</b>						
PRT0AW	PRT 10W	10 / 200	1,200	540 x 215 x 245	20	
PRT0FW	PRT 15W	10 / 120	720		18	
PRT020	PRT 20W	10 / 90	540		17.5	
PRT030	PRT 30W	5 / 45	270		22	
PRT040	PRT 40W	5 / 25	150		14.2	
<b>PRU Series</b>						
PRU0AW	PRU 10W	10 / 200	1,200	540 x 215 x 245	14	
PRU0FW	PRU 15W	10 / 120	720		14	
PRU020	PRU 20W	10 / 90	540		15	
PRU030	PRU 30W	10 / 60	360		24	
PRU040	PRU 40W	10 / 50	300		24.5	

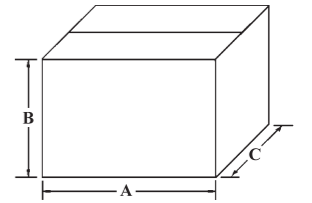
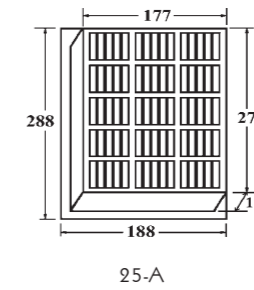
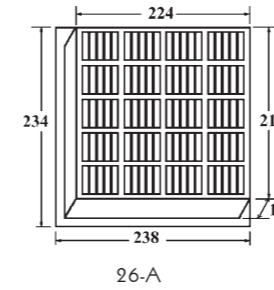
Poly-Foam Packing

Inner Box of Poly-Foam Packing



Part No.	Type	Qty. per Box	Qty. per Carton	Carton Dimension (± 5mm)	GW (± 2kg)
<b>PRV Series</b>					
PRVA3W	PRVA 3W	160 / 800	1,600	540 x 325 x 275	13
PRVA5W (6W)	PRVA 5W (6W)	200	2,000	425 x 185 x 292	17.5
PRVA7W	PRVA 7W	100	1,200	373 x 219 x 219	16.5
PRVAAW	PRVA 10W	100	1,200	429 x 219 x 261	20
PRVAFW	PRVA 15W	100	1,000	509 x 198 x 281	20
PRVA20	PRVA 20W	100	700	533 x 285 x 336	18.5
PRVB3W	PRVB 3W	200	2,000	423 x 185 x 239	16.3
PRVB5W (6W)	PRVB 5W (6W)	200	2,000	425 x 185 x 292	17.5
PRVB7W	PRVB 7W	100	1,200	373 x 219 x 219	16.5
PRVBAW	PRVB 10W	100	1,200	429 x 219 x 261	20
PRVBFW	PRVB 15W	64 / 320	640	540 x 325 x 275	12.5
PRVB20	PRVB 20W	64 / 320	640		17
<b>PRZ Series</b>					
PZ1A5W	PRZA-1 5W	200	2,000	425 x 185 x 292	17.5
PZ2A5W	PRZA-2 5W	200 / 1,000	2,000	540 x 325 x 275	14
PRZC5W	PRZC 5W	200 / 1,000	2,000	542 x 287 x 327	17.5
PZ1C5W	PRZC-1 5W	200	1,600	425 x 207 x 292	14
PRZD5W	PRZD 5W	200	2,000	425 x 185 x 292	17.5
PZ1A7W	PRZA-1 7W	100	1,000	373 x 219 x 219	16.5
PZ2A7W	PRZA-2 7W	125 / 750	1,500	540 x 325 x 275	11
PRZC7W	PRZC 7W				
PZ1C7W	PRZC-1 7W	100	1,000	373 x 219 x 219	16.5
PRZD7W	PRZD 7W				
PZ1AAW	PRZA-1 10W	100	1,200	429 x 219 x 261	20
PZ2AAW	PRZA-2 10W	100	1,000	429 x 255 x 261	16.3
PRZCAW	PRZC 10W	100	1,000	429 x 240 x 261	16.3
PRZDAW	PRZD 10W	100	1,200	429 x 219 x 261	20
PZ1AFW	PRZA-1 15W	100	800	509 x 191 x 281	16
PZ2AFW	PRZA-2 15W	100	800	509 x 239 x 281	16
PRZCFW	PRZC 15W	64 / 320	640	540 x 325 x 275	12.5
PZ1A20	PRZA-1 20W	100	600	533 x 279 x 336	18.6
PZ2A20	PRZA-2 20W	64 / 320	640	540 x 325 x 275	17
PRZC20	PRZC 20W	100	600	533 x 351 x 336	16

Plastic Case Packing



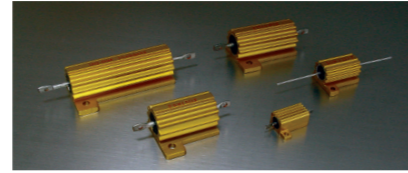
Inner Box of Plastic Case Packing

Part No.	Type	Case Type	Box Dimension (± 5mm)			Qty. per Box	Qty. per Carton	Carton Dimension (± 5mm)	GW (± 2kg)
			A	B	C				
<b>PRM Series</b>									
PRM02W	PRM 2W	66-A	145	30	115	200	4,200	370 x 267 x 162	17.5
PRM03W	PRM 3W	67-A	171	33	127	200	3,000	406 x 210 x 188	20.5
PRM05W	PRM 5W	68-A	185	35	127	200	2,400	406 x 179 x 202	16.8
PRMA5W	PRMA 5W	69-A	191	35	130	200	2,400	415 x 179 x 208	16.8
PRMB5W	PRMB 5W								
PRM07W	PRM 7W	70-A	195	47	133	200	1,800	415 x 179 x 208	20.5
PRMB7W	PRMB 7W								
PRM0AW	PRM 10W	71-A	195	58	127	200	1,200	424 x 174 x 212	17.5
PRMAAW	PRMA 10W	73-A	257	45	165	100	900	520 x 168 x 274	15
PRMBAW	PRMB 10W	72-A	190	59	133	200	1,200	424 x 145 x 207	17.5

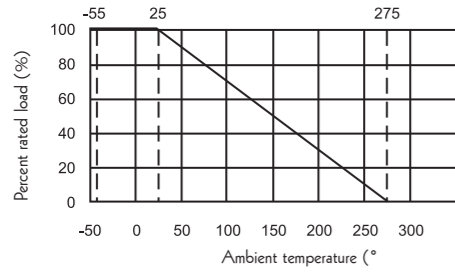


Feature

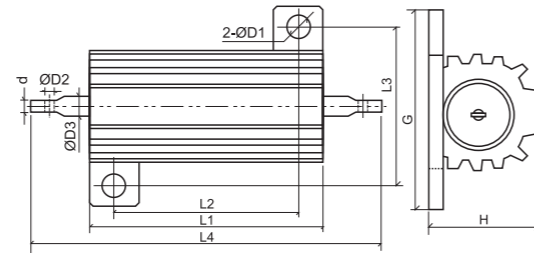
- With Metal Shell for a good heat dissipation, suitable for board mount
- Thin & lightweight body with big power rating
- Low inductance
- Application: Power Supply, Adapter, Machine



Derating Curve



Dimension

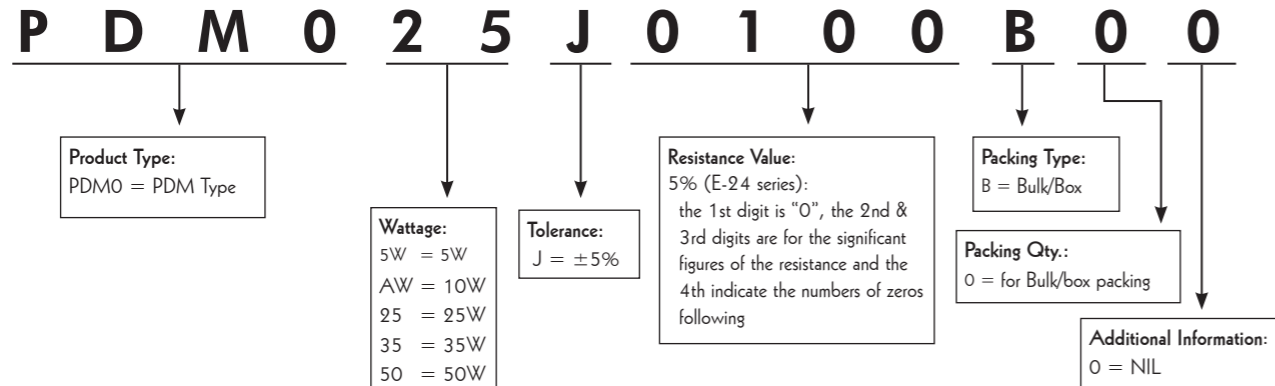


Part No.	Type	L1±0.5	L2±0.5	L3±0.5	L4±1.0	H±0.5	G±0.5	ØD1±0.5	ØD2±0.2	ØD3±0.05	d±0.2	Tolerance	Resistance Range
PDM05W	PDM 5W	15.5	11.0	12.0	32.5	8.0	16	2	1.3	1.5	0.3		0.01Ω~1.8KΩ
PDM0AW	PDM 10W	20.5	15.2	17.2	40.5	12.2	22.3	2.5	2.0	2.0	0.8		0.05Ω~5KΩ
PDM025	PDM 25W	27.5	18.2	20.2	45.5	16.3	30.3	3.0	2.0	2.0	0.8	±5%	0.05Ω~12KΩ
PDM035	PDM 35W	34.5	24.2	20.2	56.5	16.3	30.3	3.0	2.0	2.0	0.8		0.05Ω~15KΩ
PDM050	PDM 50W	50.5	40.2	20.2	78.5	16.3	30.3	3.0	2.0	2.0	0.8		0.05Ω~35KΩ

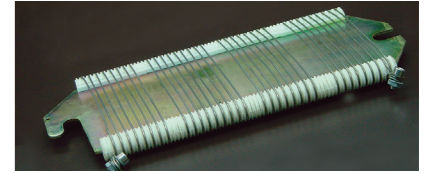
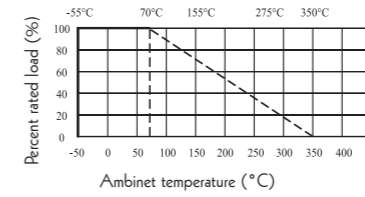
Performance Specification

Temperature coefficient	< 20Ω: ±400PPM/°C; ≥ 20Ω: ±350PPM/°C
Short-time overload	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Dielectric withstanding voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% coverage
Temperature cycling	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±(5%+0.05Ω)

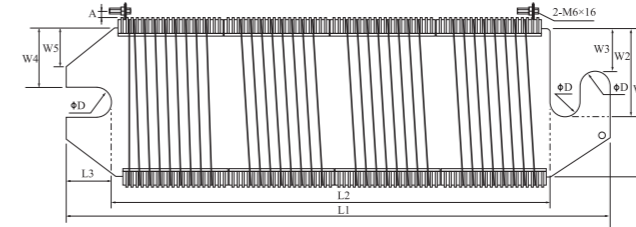
Ordering Procedure (Example: PDM 25W 5% 10Ω B/B)



Derating Curve



Dimension (mm)



Part No.	Type	L1±1.5	L2±1.0	L3±2.0	W1±1.0	W2±0.5	W3±0.3	W4±0.5	W5±0.3	D±0.2	A±1.0
BTR0.....350	BTR 350W	305	255	21	108	61	40	47	35	14	12

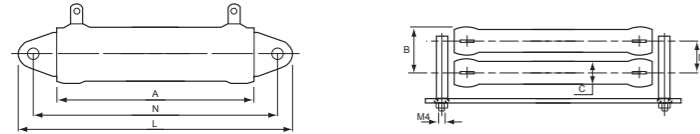
Power rating at 70°C	350W
Resistance range	1.0Ω ~ 10.0Ω
Tolerance	± 20%
Operating temperature	-55°C ~ +350°C
Temperature coefficient	± 350 PPM/°C
Short-time overload	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Temperature cycling	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Load life in humidity	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage

Feature

- All materials are inorganic and inherently non-burning
- The vitreous coating and marking are resistant to all accepted industrial cleaning fluids
- Low temperature coefficient
- Could endure high voltage's impulse in short time
- Could use in single or in-piles
- Application: Mechanical device, Industry equipment.



Dimension (mm)



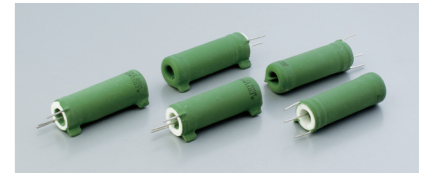
Type	A± 2	B± 1	C±0.5	D± 1	L± 1.5	N± 2
KNHB21W	32	19	12	14	68	51
KNHB31W	51	19	12	14	87	70
KNHB53W	90	19	12	14	126	109
KNHB68W	120	19	12	14	156	139
KNHB91W	153	19	12	14	189	172

Performance Specification

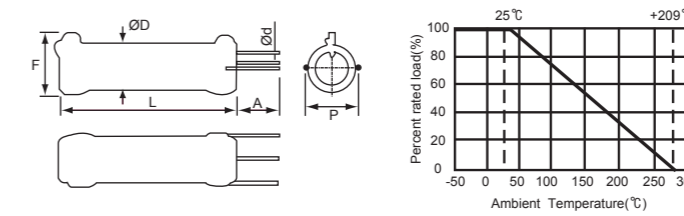
Resistance range	1Ω~1KΩ
Tolerance	J(±5%) K(±10%)
Short-time overload	R/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Max. working voltage	21W:350V 31W:700V 53W:1000V 68W & 91W:1500V
Dielectric withstanding voltage	1000V
Temperature coefficient	±100ppm / °C
Insulation resistance	100MΩ
Terminal strength	No evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±(5%+0.05Ω), with no evidence of mechanical damage

Feature

- All materials are inorganic and inherently non-burning
- Industrial grade Wire-wound resistors
- Super heat dissipation & High stability
- Special design of Multi-lead wire easy to assembled on PCB
- Application: charge resistor or step-down resistor in Electric device



Dimension (mm)



Type	L±1	A± 1	F± 1	P± 1	ØD± 1	Ød±0.05	Remark
KNHW10W	45	10	15	12	11.5	1.0	the leads could be specially designed according to customer's requirement
KNHW25W	50	12	18	15	14.5	1.0	
KNHW40W	65	12	20	17	16.5	1.6	

Performance Specification

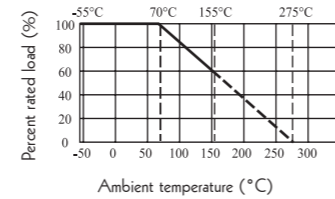
Temperature coefficient	±100ppm/°C
Short-time overload	ΔR/R ≤ ±(2%+0.05Ω), with no evidence of mechanical damage
Terminal strength	No evidence of mechanical damage
Resistance to soldering heat	ΔR/R ≤ ±(1%+0.05Ω), with no evidence of mechanical damage
Solderability	Min. 95% Coverage
Load life in humidity	ΔR/R ≤ ±5%, with no evidence of mechanical damage
Load life	ΔR/R ≤ ±5%, with no evidence of mechanical damage

Feature

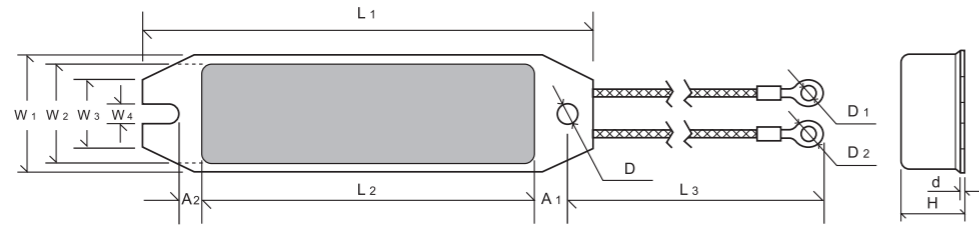
- Anti-vibration, high stability.
- Easy to assembled on PCB
- Application: Electric device



Derating Curve



Dimension (mm)



Part No.	Type	Dimension (mm)										Tolerance	Resistance Range
		L1	L2	L3	A1	A2	W1	W2	W3	W4	D		
HAWR60	HAWR 60W	100	80	300	5	5	30	28	14	4.5	4.5	±10%	1Ω~2KΩ
HAWR80	HAWR 80W	150	123	300	8.0	6.0	34	30	16	4.5	4.5	±10%	1Ω~3KΩ
HAWR...100	HAWR 100W	150	127	300	6.5	6.5	34	32	16	4.5	4.5	±10%	1Ω~3KΩ
HAWR...120	HAWR 120W	182	166	300	6.0	6.0	42	40	20	4.5	4.5	±10%	1Ω~13KΩ
HAWR...220	HAWR 220W	230	191	400	14.5	14.5	64	56	47	4.5	4.5	±10%	1Ω~20KΩ

- Operating temperature -55°C ~ +155°C
- Temperature coefficient ±350 PPM/°C
- Short-time overload  $\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage
- Dielectric withstanding voltage No evidence of flashover, mechanical damage, arcing or insulation breakdown
- Temperature cycling  $\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage
- Humidity (Steady State)  $\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage
- Load life in humidity  $\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage
- Load life  $\Delta R/R \leq \pm(5\%+0.05\Omega)$ , with no evidence of mechanical damage

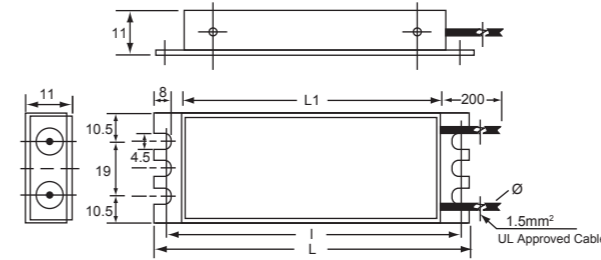
The length "L3" can be designed according to customer's requirement

Feature

- Flat resistor inside a zinc plated metallic case, composed by two coupled shells
- High insulative & heat-resistant performance
- Can withstand high overload current in short time
- Easy assembled on PCB or dissipator
- Application: Charge resistor or step-down resistor in Electric device & Elevator, Inverter



Dimension (mm)



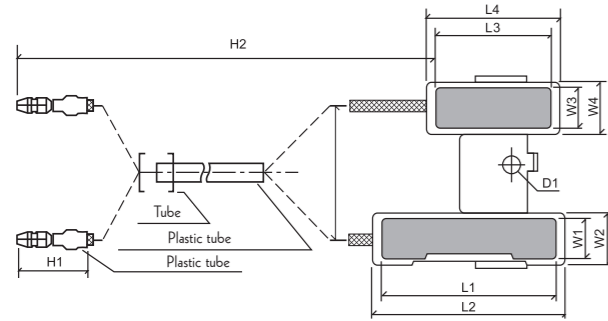
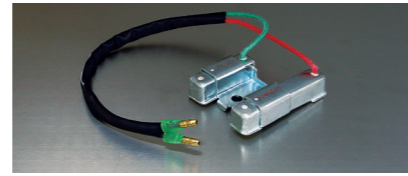
Type	L±1	L±1	L1±1	Ø±0.05	Remark
HAWF100W	89	100	70	2.5	
HAWF150W	134	145	115	2.5	the cable can be specially designed according to customer's requirement
HAWF200W	184	195	165	2.5	

Specification

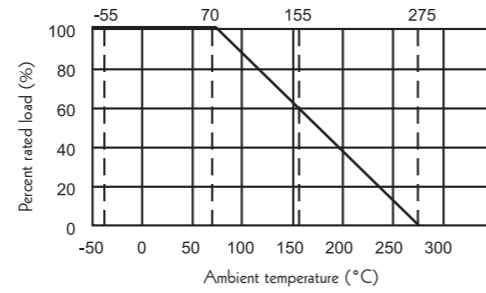
Type	HAWF100W	HAWF150W	HAWF200W
Nominal Power Rating	50W	75W	100W
Power Rating for Mounted on the deck	100W	150W	200W
Resistance Range	0.5Ω~2.5KΩ	0.5Ω~5KΩ	0.5Ω~7.5KΩ
Tolerance	±5%	±5%	±5%
Dielectric Withstanding Voltage (50Hz, 1 min)	3000V	3000V	3000V
Insulation Resistance	1000MΩ	1000MΩ	1000MΩ
Time Constant	≈8'	≈8'	≈8'
Energy absorbed in 5 seconds	5.0KJ	7.5KJ	10KJ
Surface Temperature	300°C	300°C	300°C

Feature

- Small size & sturdy mechanically safe
- High safety standard
- Application: Motor cycle



Derating Curve



Dimension (mm)

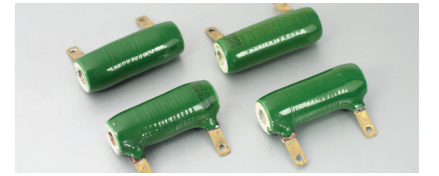
Type	L <sub>1</sub> +0.5	L <sub>2</sub> ±1	L <sub>3</sub> ±0.5	L <sub>4</sub> ±1	W <sub>1</sub> ±0.5	W <sub>2</sub> ±1	W <sub>3</sub> +0.5	W <sub>4</sub> +1	H <sub>1</sub> Max.	H <sub>2</sub> <sup>+10</sup> / <sub>-0</sub>	D <sub>1</sub> <sup>+0.5</sup> / <sub>-0</sub>	Resistance Range
BCR 20W+5W	64	66	42	44	13	15	13	15	30	250	6.5	0.5Ω - 100Ω

Performance Specification

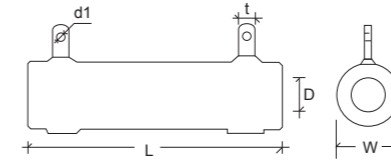
Temperature coefficient	±400PPM/°C
Short-tive overload	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage
Dielectric withstanding voltage	No flashover, mechanical damage, arcing or insulation breakdown
Temperature cycling	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage
Humidity (Steady State)	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage
Load life in humidity	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage
Load life	ΔR/R ≤ ±(5.0%+0.05Ω), with no evidence of mechanical damage

Feature

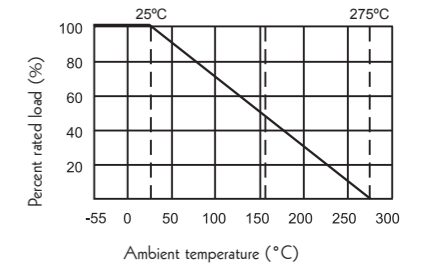
- High stable performance & power rating
- Safety flameproof construction, excellent moisture resistance
- Application: applied to DC & AC low frequency circuit as step-down voltage, shunt or overload resistor in electrical equipment & instrument



Dimension (mm)



Derating Curve

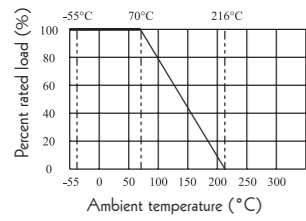


Type	L	W	D	d1	t	Resistance Range (±5% ±10%)
URX10W	41±1.5	15±1	5.5±0.4	2.0±0.1	4.5±0.1	5Ω-200Ω
URX 15W	45±1.5	17±2	8±0.5	2.0±0.1	4.5±0.1	0.2Ω-15KΩ
URX 20W	51±2	17±2	8±0.6	2.0±0.1	4.5±0.1	5Ω-430Ω
URX 25W	51±2	21±2.5	12±0.8	2.0±0.1	4.5±0.1	10Ω-510Ω
URX 30W	71±2.2	21±2.5	12±0.8	2.0±0.1	4.5±0.1	10Ω-1KΩ
URX 40W	87±2.2	21±2.5	12±0.8	2.0±0.1	4.5±0.1	0.2Ω-20KΩ
URX 50W	91±2.4	29±3	20±1	2.5±0.1	6.0±0.1	20Ω-1.5KΩ
URX 75W	140±3.2	29±3	20±1	2.5±0.1	6.0±0.1	24Ω-2KΩ
URX 100W	170±3.5	29±3	20±1	2.5±0.1	6.0±0.1	24Ω-2.7KΩ
URX 150W	215±3.5	29±3	20±1	2.5±0.1	6.0±0.1	24Ω-2.7KΩ

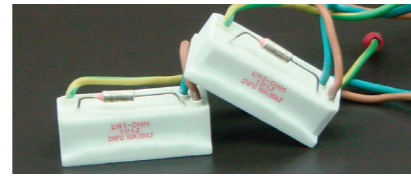
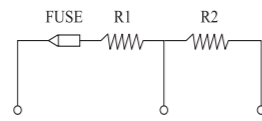
Performance Specification

Short-time overload	10 times rated power rating, 5 seconds	ΔR ≤ ±(1%R+0.05Ω)
Shock	acceleration 390m/s <sup>2</sup> , 11ms, 18 times	ΔR ≤ (1%R+0.05Ω)
Temperature quick change	-55°C~+200°C, 5times cycling	ΔR ≤ (1%R+0.05Ω)
Crash	acceleration 390m/s <sup>2</sup> , 4000 times	ΔR ≤ (1%R+0.05Ω)
Terminal strength	≤ 4.3W 10N ; ≥ 6W 20N	ΔR ≤ (1%R+0.05Ω)
Vibration	Frenquency 10-500HZ, acceleration 98m/s <sup>2</sup> 2.6h	ΔR ≤ (1%R+0.05Ω)
Humidity (Steady State)	Temperature 40±2°C, humidity 95—92% place 56 days	ΔR ≤ (5%R+0.05Ω)
Load life	Rated power rating, 1000h, room temperature	ΔR ≤ (5%R+0.05Ω)
Solderability	245°C±5°C	Min. 95% coverage
Temperature rise	Rated power rating	<245°C

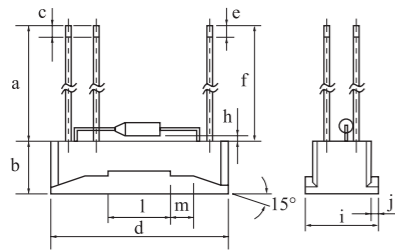
Derating Curve



Circuit Structure

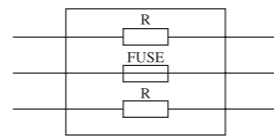
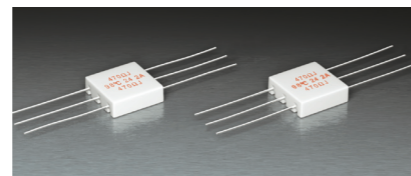
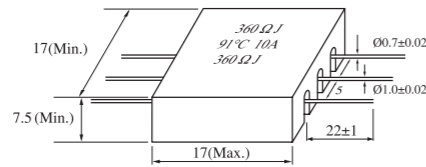
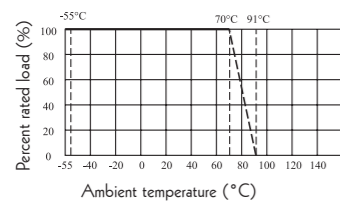


Dimension (mm)



Type	TFO 20W	c±1	5
Power rating at 70°C	20W	d±1	50
Resistance	1.1 +2.4Ω	e±1	5
Temperature coefficient	±350 PPM/°C	f±5	130
Fusing temperature TF	216°C	h±1	4
Rated current I <sub>r</sub>	10A	i±1	24
Rated voltage V <sub>r</sub>	250V	j±1	2.5
a±5	125	l±1	15
b±1	16	m±1	5

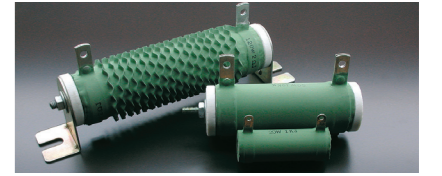
Derating Curve



Type	Power Rating at (70°C)	Resistance Range	Tolerance	Temperature Coefficient (PPM/°C)	Cut-off Temperature (°C)	Rated Current I <sub>r</sub> (A)	Rated Voltage U <sub>r</sub> (V)
TFRC 2W	2W	360+360Ω	± 5%	±350	91	10	250

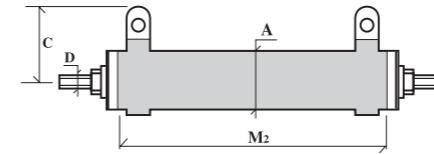
Feature

- Multi-terminal types & variable types available
- Small in size but capable of carrying high power load
- Resistance value unchanged after long use, good resistivity to short time overload
- High resistivity to heat, small resistance temperature coefficient and the change in resistance with temperature being linear
- Too low or high ohmic value can be supplied on a case to case basis
- Adjustable & Multi-Resistor type is available
- Non-Inductive type is available

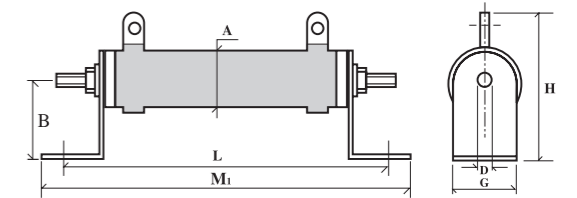


Power Wire-wound Resistors - QH & QL Type

QH Type

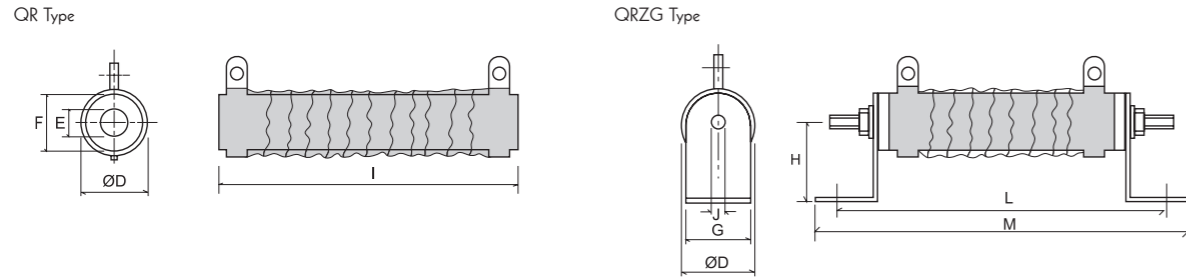


QL Type



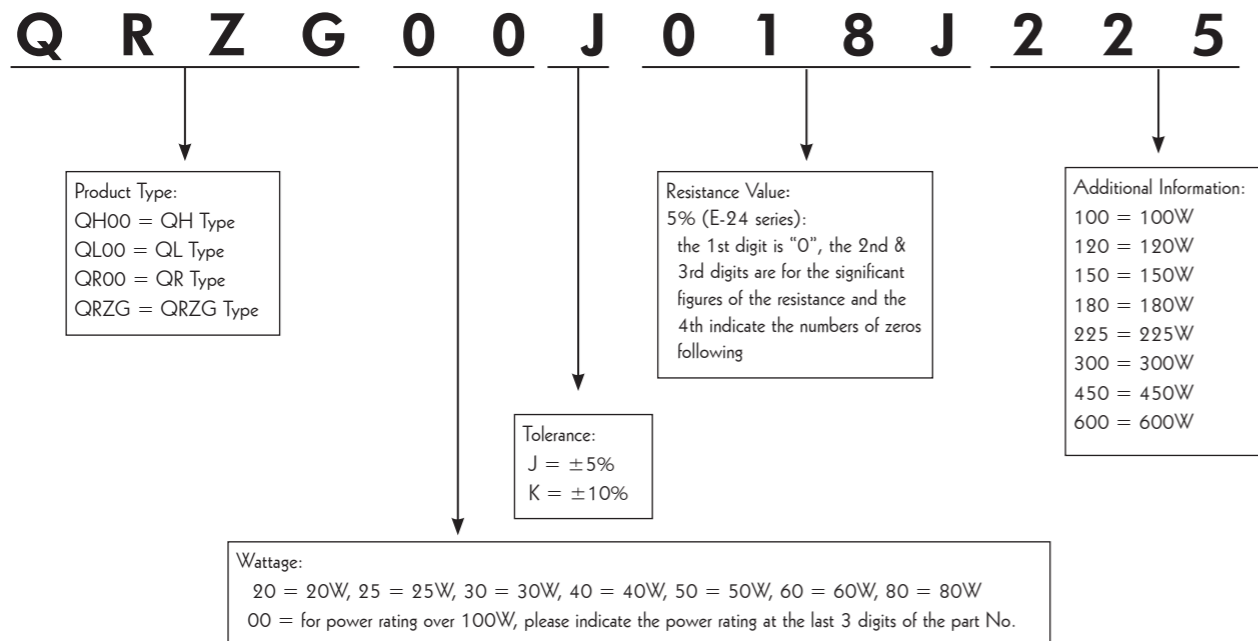
Part No.	Wattage	Dimension (mm)									Resistance Range
		A±1.5	B±1	C±1	D±1	G±1	L±2	M <sub>1</sub> ±2	M <sub>2</sub> ±2	H±1	
QH / QL0020	20W	18	19	19	4.5	18	81	91	50	29	1Ω~KΩ
QH / QL0025	25W	18	19	19	4.5	18	91	101	60	29	2Ω~2KΩ
QH / QL0030	30W	18	19	19	4.5	18	106	116	75	29	2Ω~3KΩ
QH / QL0040	40W	18	19	19	4.5	18	121	131	90	29	2Ω~5KΩ
QH / QL0050	50W	30	27	31	4.5	26	106	126	75	58	3Ω~10KΩ
QH / QL0060	60W	30	27	31	4.5	26	121	141	90	58	3Ω~15KΩ
QH / QL0080	80W	30	27	31	4.5	26	146	166	115	58	3Ω~20KΩ
QH / QL00.....100	100W	30	27	31	4.5	26	171	191	140	58	3Ω~30KΩ
QH / QL00.....120	120W	30	27	31	4.5	26	196	216	165	58	4Ω~40KΩ
QH / QL00.....150	150W	30	27	31	4.5	26	226	246	195	58	4Ω~50KΩ
QH / QL00.....200	200W	30	27	31	4.5	26	286	306	254	58	5Ω~60KΩ
QH / QL00.....300	300W	42	38	38	5.5	40	290	324	254	79	8Ω~80KΩ
QH / QL00.....400	400W	42	38	38	5.5	40	365	400	330	79	10Ω~100KΩ
QH / QL00.....600	600W	42	38	38	5.5	40	456	490	420	79	10Ω~200KΩ

Power Ribbon Wire-wound Resistors - QR & QRZG Type



Part No.	Wattage	Dimension (mm)									Resistance Range
		D±2	E±1	F±	G±1	H±1	J±1	I±1	L±2	M±2	
QR00.....120	120W	33	16	28	26	31	4.5	115	146	166	0.2Ω~4Ω
QRZG.....120											
QR00.....150	150W	33	16	28	26	31	4.5	140	171	191	0.3Ω~5Ω
QRZG.....150											
QR00.....180	180W	33	16	28	26	31	4.5	165	196	216	0.3Ω~6Ω
QRZG.....180											
QR00.....225	225W	33	16	28	26	31	4.5	195	226	246	0.4Ω~8Ω
QRZG.....225											
QR00.....300	300W	33	16	28	26	31	4.5	254	285	305	0.5Ω~10Ω
QRZG.....300											
QR00.....450	450W	48	25	40	40	38	5.5	254	290	324	0.8Ω~15Ω
QRZG.....450											
QR00.....600	600W	48	25	40	40	38	5.5	330	366	400	1Ω~20Ω
QRZG.....600											

Ordering Procedure (Example: QRZG 225W 5% 1.8Ω B/B)



Temperature coefficient: (JIS-C-5201 4.8)	Natural resistance change per temperature degree centigrade: $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM / °C) R <sub>1</sub> : Resistance value at room temperature (t <sub>1</sub> ); R <sub>2</sub> : Resistance value at room temperature +100°C (t <sub>2</sub> ). Test pattern: Room temperature (t <sub>1</sub> ), Room temperature +100°C (t <sub>2</sub> ).
Short-time overload: (JIS-C-5201.4.13)	Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds.
Insulation resistance: (JIS-C-5201 4.6)	1. Chip Resistor: the measuring voltage shall be „measured with a direct voltage of (100±15)V or a voltage equal to the dielectric withstanding voltage, and apply for 1 min. 2. TH Resistor: The measuring voltage shall be either(100±15) V DC for resistors with an insulation voltage <500V or (500±50)V DC,for resistors with an isolation voltage≥500V.
Dielectric withstanding voltage: (JIS-C-5201 4.7)	Resistor shall be clamped in the trough of 90°C metallic V - block and shall be tested at AC potential respectively specified in the given list of each product type for 60-70 seconds. For Cement Fixed Resistors, the testing voltage is 1,000V.
Pulse overload: (JIS-C-5201 4.28)	Resistance change after 10,000 cycles (1 second "ON", 25 seconds "OFF") at 4 times of RCWV or Max. RCWV whichever less.
Terminal strength: (JIS-C-5201 4.16)	Direct Load: Resistance at a 2.5kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads. Twist Test: Terminal leads shall be bent through 90° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations.
Terminal strength: (JIS-C-5201 4.16)	(Applicable for Resistor Network) Tensile: 1KG, 30 seconds / Bending: 500g, 2 times
Terminal bending: (JIS-C-5201 4.33)	(Applicable for CHIP Resistors) Twist of Test Board: Y / X = 3/90mm 60 seconds.
Soldering heat: (JIS-C-5201 4.18)	(Applicable for CHIP Resistors) Dip the resistor into a solder bath having a temperature of 260±5°C and hold it for a 10±1 seconds.
Resistance to soldering heat (JIS-C-5201 4.18)	(Applicable for TH Resistors) Permanent resistor change when leads immersed to a point 2.0~2.5mm from the body in 260±5°C solder 10±1 seconds.
Solderability: (JIS-C-5201 4.17)	The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Temperature of solder: 245±3°C, Dwell time in solder: 2-3 seconds.
Resistance to solvent: (JIS-C-5201 4.29)	Specimens shall be immersed in a bath of alcohol completely for a 3 minutes using ultrasonic test equipment.
Thermal shock: (JIS-C-5201 4.21)	(Applicable for Resistor Network) Load V, Room temperature, 30 minutes. Unload, -55°C, 15 minutes. Over 2 hours in room temperature before measuring.
Temperature cycling: (JIS-C-5201 4.19)	Resistance change after continuous 5 cycles for duty cycle specified below Step 1: 30 minutes at -55±3°C Step 2: 10~15 minutes at Room temperature Step 3: 30 minutes at 155±2°C Step 4: 10~15 minutes at Room temperature
Humidity (Steady State): (JIS-C-5201 4.24)	Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C and 90-95% RH.
Load life in humidity: (JIS-C 5202 7.9)	Resistance change after 1,000 hours (1.5 hours "ON", 0.5 hours "OFF") at RCWV or Max. Working Voltage whichever less in a humidity test chamber controlled at 40±2°C and 90~95% RH.
Load life: (JIS-C-5201 4.25.1)	Permanent resistance change after 1,000 hours operating at RCWV or Max. Working Voltage whichever less with duty cycle of 1.5 hours "ON", 0.5 hour "OFF" at 70±2°C ambient
Flame retardant: (JIS-C-5201 4.26)	Resistors shall resist flaming or arcing when overload up to 16 times RCWV or Max. Working Voltage whichever less.
Flame retardant (JIS-C-5201 4.26)	(Applicable for Flame retardant Resistors) The burner is placed remote from resistor ignited and adjusted to produce a blue flame 38mm in height and a top of flame 127mm above the top of burner tube. Resistor is supported from its lead at 45° from the horizontal so that the lower end of resistor is the top of blue flame. The test flame is placed to remain for 15 seconds and removed for 15 seconds. The operation is to be repeated until resistor has been subjected to 5 application of test flame.

\*\* RCWV = Rated Continuous Working Voltage =  $\sqrt{\text{Rated Power} \times \text{Resistance Value}}$ , the calculated value or the Max. Working Voltage whichever less.

The below chart shows the nominal resistance value for each series. The values in the chart have been in this order using the approximate values that are based on the common ratios given in the following table:

Series	Common Ratio	Remarks
E-6	$\sqrt[6]{10}$ (1.46)	Rounded off to a 2-digit figure
E-12	$\sqrt[12]{10}$ (1.21)	Rounded off to a 2-digit figure
E-24	$\sqrt[24]{10}$ (1.10)	Rounded off to a 2-digit figure
E-96	$\sqrt[96]{10}$ (1.02)	Rounded off to a 3-digit figure

E-6	E-12	E-24	E-96	E-6	E-12	E-24	E-96	E-6	E-12	E-24	E-96										
1.0	1.0	1.0	1.00	2.2	2.2	2.2	2.15	4.7	4.7	4.7	4.64										
			1.02				2.21				4.75										
			1.05				2.26				4.87										
			1.07				2.32				4.99										
		1.1	1.10				2.37				5.11										
			1.13				2.43				5.23										
			1.15				2.49				5.36										
	1.2	1.2	1.2			1.18	2.7			2.7	2.7	2.55	5.6	5.6	5.6	5.49					
						1.21						2.61				5.62					
						1.24						2.67				5.76					
			1.27			2.74						5.90									
		1.3	1.3			1.3					1.30	3.0			3.0	3.0	2.80	6.2	6.2	6.2	6.04
											1.33						2.87				6.19
											1.37						2.94				6.34
1.5	1.5	1.5	1.40	3.3	3.3	3.3	3.01	6.8	6.8	6.8	6.49										
			1.43				3.09				6.65										
			1.47				3.16				6.81										
			1.50				3.24				6.98										
		1.6	1.6				1.6				1.54	3.6	3.6	3.6	3.40	7.5	7.5	7.5	7.32		
											1.58				3.48				7.50		
											1.62				3.57				7.68		
	1.8	1.8	1.8			1.65	3.9			3.9	3.9	3.74	8.2	8.2	8.2	8.06					
						1.69						3.83				8.25					
						1.74						3.92				8.45					
			1.78			4.02						8.66									
		2.0	2.0			2.0					1.82	4.3			4.3	4.3	4.12	9.1	9.1	9.1	8.87
											1.87						4.22				9.09
											1.91						4.32				9.31
			2.00				4.42				9.53										
			2.05				4.53				9.76										
			2.10																		

E-24 series standard resistance value & the codes to be used in the part No. system 5% & 10% tolerance (4 digits, start with "0"):

Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code
1.0Ω	010J	10Ω	0100	100Ω	0101	1.0KΩ	0102	10KΩ	0103	100KΩ	0104	1.0MΩ	0105
1.1Ω	011J	11Ω	0110	110Ω	0111	1.1KΩ	0112	11KΩ	0113	110KΩ	0114	1.1MΩ	0115
1.2Ω	012J	12Ω	0120	120Ω	0121	1.2KΩ	0122	12KΩ	0123	120KΩ	0124	1.2MΩ	0125
1.3Ω	013J	13Ω	0130	130Ω	0131	1.3KΩ	0132	13KΩ	0133	130KΩ	0134	1.3MΩ	0135
1.5Ω	015J	15Ω	0150	150Ω	0151	1.5KΩ	0152	15KΩ	0153	150KΩ	0154	1.5MΩ	0155
1.6Ω	016J	16Ω	0160	160Ω	0161	1.6KΩ	0162	16KΩ	0163	160KΩ	0164	1.6MΩ	0165
1.8Ω	018J	18Ω	0180	180Ω	0181	1.8KΩ	0182	18KΩ	0183	180KΩ	0184	1.8MΩ	0185
2.0Ω	020J	20Ω	0200	200Ω	0201	2.0KΩ	0202	20KΩ	0203	200KΩ	0204	2.0MΩ	0205
2.2Ω	022J	22Ω	0220	220Ω	0221	2.2KΩ	0222	22KΩ	0223	220KΩ	0224	2.2MΩ	0225
2.4Ω	024J	24Ω	0240	240Ω	0241	2.4KΩ	0242	24KΩ	0243	240KΩ	0244	2.4MΩ	0245
2.7Ω	027J	27Ω	0270	270Ω	0271	2.7KΩ	0272	27KΩ	0273	270KΩ	0274	2.7MΩ	0275
3.0Ω	030J	30Ω	0300	300Ω	0301	3.0KΩ	0302	30KΩ	0303	300KΩ	0304	3.0MΩ	0305
3.3Ω	033J	33Ω	0330	330Ω	0331	3.3KΩ	0332	33KΩ	0333	330KΩ	0334	3.3MΩ	0335
3.6Ω	036J	36Ω	0360	360Ω	0361	3.6KΩ	0362	36KΩ	0363	360KΩ	0364	3.6MΩ	0365
3.9Ω	039J	39Ω	0390	390Ω	0391	3.9KΩ	0392	39KΩ	0393	390KΩ	0394	3.9MΩ	0395
4.3Ω	043J	43Ω	0430	430Ω	0431	4.3KΩ	0432	43KΩ	0433	430KΩ	0434	4.3MΩ	0435
4.7Ω	047J	47Ω	0470	470Ω	0471	4.7KΩ	0472	47KΩ	0473	470KΩ	0474	4.7MΩ	0475
5.1Ω	051J	51Ω	0510	510Ω	0511	5.1KΩ	0512	51KΩ	0513	510KΩ	0514	5.1MΩ	0515
5.6Ω	056J	56Ω	0560	560Ω	0561	5.6KΩ	0562	56KΩ	0563	560KΩ	0564	5.6MΩ	0565
6.2Ω	062J	62Ω	0620	620Ω	0621	6.2KΩ	0622	62KΩ	0623	620KΩ	0624	6.2MΩ	0625
6.8Ω	068J	68Ω	0680	680Ω	0681	6.8KΩ	0682	68KΩ	0683	680KΩ	0684	6.8MΩ	0685
7.5Ω	075J	75Ω	0750	750Ω	0751	7.5KΩ	0752	75KΩ	0753	750KΩ	0754	7.5MΩ	0755
8.2Ω	082J	82Ω	0820	820Ω	0821	8.2KΩ	0822	82KΩ	0823	820KΩ	0824	8.2MΩ	0825
9.1Ω	091J	91Ω	0910	910Ω	0911	9.1KΩ	0912	91KΩ	0913	910KΩ	0914	9.1MΩ	0915
												10MΩ	0106

E-96 series standard resistance value & the codes to be used in the part No. system 1%(or less) & 2% tolerance (4 digits):

Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code
10.0Ω	100J	17.8Ω	178J	31.6Ω	316J	56.2Ω	562J	100Ω	1000	178Ω	1780	316Ω	3160	562Ω	5620
10.2Ω	102J	18.2Ω	182J	32.4Ω	324J	57.6Ω	576J	102Ω	1020	182Ω	1820	324Ω	3240	576Ω	5760
10.5Ω	105J	18.7Ω	187J	33.2Ω	332J	59.0Ω	590J	105Ω	1050	187Ω	1870	332Ω	3320	590Ω	5900
10.7Ω	107J	19.1Ω	191J	34.0Ω	340J	60.4Ω	604J	107Ω	1070	191Ω	1910	340Ω	3400	604Ω	6040
11.0Ω	110J	19.6Ω	196J	34.8Ω	348J	61.9Ω	619J	110Ω	1100	196Ω	1960	348Ω	3480	619Ω	6190
11.3Ω	113J	20.0Ω	200J	35.7Ω	357J	63.4Ω	634J	113Ω	1130	200Ω	2000	357Ω	3570	634Ω	6340
11.5Ω	115J	20.5Ω	205J	36.5Ω	365J	64.9Ω	649J	115Ω	1150	205Ω	2050	365Ω	3650	649Ω	6490
11.8Ω	118J	21.0Ω	210J	37.4Ω	374J	66.5Ω	665J	118Ω	1180	210Ω	2100	374Ω	3740	665Ω	6650
12.1Ω	121J	21.5Ω	215J	38.3Ω	383J	68.1Ω	681J	121Ω	1210	215Ω	2150	383Ω	3830	681Ω	6810
12.4Ω	124J	22.1Ω	221J	39.2Ω	392J	69.8Ω	698J	124Ω	1240	221Ω	2210	392Ω	3920	698Ω	6980
12.7Ω	127J	22.6Ω	226J	40.2Ω	402J	71.5Ω	715J	127Ω	1270	226Ω	2260	402Ω	4020	715Ω	7150
13.0Ω	130J	23.2Ω	232J	41.2Ω	412J	73.2Ω	732J	130Ω	1300	232Ω	2320	412Ω	4120	732Ω	7320
13.3Ω	133J	23.7Ω	237J	42.2Ω	422J	75.0Ω	750J	133Ω	1330	237Ω	2370	422Ω	4220	750Ω	7500
13.7Ω	137J	24.3Ω	243J	43.2Ω	432J	76.8Ω	768J	137Ω	1370	243Ω	2430	432Ω	4320	768Ω	7680
14.0Ω	140J	24.9Ω	249J	44.2Ω	442J	78.7Ω	787J	140Ω	1400	249Ω	2490	442Ω	4420	787Ω	7870
14.3Ω	143J	25.5Ω	255J	45.3Ω	453J	80.6Ω	806J	143Ω	1430	255Ω	2550	453Ω	4530	806Ω	8060
14.7Ω	147J	26.1Ω	261J	46.4Ω	464J	82.5Ω	825J	147Ω	1470	261Ω	2610	464Ω	4640	825Ω	8250
15.0Ω	150J	26.7Ω	267J	47.5Ω	475J	84.5Ω	845J	150Ω	1500	267Ω	2670	475Ω	4750	845Ω	8450
15.4Ω	154J	27.4Ω	274J	48.7Ω	487J	86.6Ω	866J	154Ω	1540	274Ω	2740	487Ω	4870	866Ω	8660
15.8Ω	158J	28.0Ω	280J	49.9Ω	499J	88.7Ω	887J	158Ω	1580	280Ω	2800	499Ω	4990	887Ω	8870
16.2Ω	162J	28.7Ω	287J	51.1Ω	511J	90.9Ω	909J	162Ω	1620	287Ω	2870	511Ω	5110	909Ω	9090
16.5Ω	165J	29.4Ω	294J	52.3Ω	523J	93.1Ω	931J	165Ω	1650	294Ω	2940	523Ω	5230	931Ω	9310
16.9Ω	169J	30.1Ω	301J	53.6Ω	536J	95.3Ω	953J	169Ω	1690	301Ω	3010	536Ω	5360	953Ω	9530
17.4Ω	174J	30.9Ω	309J	54.9Ω	549J	97.6Ω	976J	174Ω	1740	309Ω	3090	549Ω	5490	976Ω	9760

Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code
1.00K	1001	2.37K	2371	5.62K	5621	13.3K	1332	31.6K	3162	75.0K	7502	178K	1783	422K	4223
1.02K	1021	2.43K	2431	5.76K	5761	13.7K	1372	32.4K	3242	76.8K	7682	182K	1823	432K	4323
1.05K	1051	2.49K	2491	5.90K	5901	14.0K	1402	33.2K	3322	78.7K	7872	187K	1873	442K	4423
1.07K	1071	2.55K	2551	6.04K	6041	14.3K	1432	34.0K	3402	80.6K	8062	191K	1913	453K	4533
1.10K	1101	2.61K	2611	6.19K	6191	14.7K	1472	34.8K	3482	82.5K	8252	196K	1963	464K	4643
1.13K	1131	2.67K	2671	6.34K	6341	15.0K	1502	35.7K	3572	84.5K	8452	200K	2003	475K	4753
1.15K	1151	2.74K	2741	6.49K	6491	15.4K	1542	36.5K	3652	86.6K	8662	205K	2053	487K	4873
1.18K	1181	2.80K	2801	6.65K	6651	15.8K	1582	37.4K	3742	88.7K	8872	210K	2103	499K	4993
1.21K	1211	2.87K	2871	6.81K	6811	16.2K	1622	38.3K	3832	90.9K	9092	215K	2153	511K	5113
1.24K	1241	2.94K	2941	6.98K	6981	16.5K	1652	39.2K	3922	93.1K	9312	221K	2213	523K	5233
1.27K	1271	3.01K	3011	7.15K	7151	16.9K	1692	40.2K	4022	95.3K	9532	226K	2263	536K	5363
1.30K	1301	3.09K	3091	7.32K	7321	17.4K	1742	41.2K	4122	97.6K	9762	232K	2323	549K	5493
1.33K	1331	3.16K	3161	7.50K	7501	17.8K	1782	42.2K	4222	100K	1003	237K	2373	562K	5623
1.37K	1371	3.24K	3241	7.68K	7681	18.2K	1822	43.2K	4322	102K	1023	243K	2433	576K	5763
1.40K	1401	3.32K	3321	7.87K	7871	18.7K	1872	44.2K	4422	105K	1053	249K	2493	590K	5903
1.43K	1431	3.40K	3401	8.06K	8061	19.1K	1912	45.3K	4532	107K	1073	255K	2553	604K	6043
1.47K	1471	3.48K	3481	8.25K	8251	19.6K	1962	46.4K	4642	110K	1103	261K	2613	619K	6193
1.50K	1501	3.57K	3571	8.45K	8451	20.0K	2002	47.5K	4752	113K	1133	267K	2673	634K	6343
1.54K	1541	3.65K	3651	8.66K	8661	20.5K	2052	48.7K	4872	115K	1153	274K	2743	649K	6493
1.58K	1581	3.74K	3741	8.87K	8871	21.0K	2102	49.9K	4992	118K	1183	280K	2803	665K	6653
1.62K	1621	3.83K	3831	9.09K	9091	21.5K	2152	51.1K	5112	121K	1213	287K	2873	681K	6813
1.65K	1651	3.92K	3921	9.31K	9311	22.1K	2212	52.3K	5232	124K	1243	294K	2943	698K	6983
1.69K	1691	4.02K	4021	9.53K	9531	22.6K	2262	53.6K	5362	127K	1273	301K	3013	715K	7153
1.74K	1741	4.12K	4121	9.76K	9761	23.2K	2322	54.9K	5492	130K	1303	309K	3093	732K	7323
1.78K	1781	4.22K	4221	10.0K	1002	23.7K	2372	56.2K	5622	133K	1333	316K	3163	750K	7503
1.82K	1821	4.32K	4321	10.2K	1022	24.3K	2432	57.6K	5762	137K	1373	324K	3243	768K	7683
1.87K	1871	4.42K	4421	10.5K	1052	24.9K	2492	59.0K	5902	140K	1403	332K	3323	787K	7873
1.91K	1911	4.53K	4531	10.7K	1072	25.5K	2552	60.4K	6042	143K	1433	340K	3403	806K	8063
1.96K	1961	4.64K	4641	11.0K	1102	26.1K	2612	61.9K	6192	147K	1473	348K	3483	825K	8253
2.00K	2001	4.75K	4751	11.3K	1132	26.7K	2672	63.4K	6342	150K	1503	357K	3573	845K	8453
2.05K	2051	4.87K	4871	11.5K	1152	27.4K	2742	64.9K	6492	154K	1543	365K	3653	866K	8663
2.10K	2101	4.99K	4991	11.8K	1182	28.0K	2802	66.5K	6652	158K	1583	374K	3743	887K	8873
2.15K	2151	5.11K	5111	12.1K	1212	28.7K	2872	68.1K	6812	162K	1623	383K	3833	909K	9093
2.21K	2211	5.23K	5231	12.4K	1242	29.4K	2942	69.8K	6982	165K	1653	392K	3923	931K	9313
2.26K	2261	5.36K	5361	12.7K	1272	30.1K	3012	71.5K	7152	169K	1693	402K	4023	953K	9533
2.32K	2321	5.49K	5491	13.0K	1302	30.9K	3092	73.2K	7322	174K	1743	412K	4123	976K	9763
												1M			1004

\*\* All values shown above are standard resistance values, other values could also be provided on a case to case basis (MOQ requested)

Explanation of Part No. System



The standard Part No. includes 14 digits with the following explanation:

1. 1<sup>st</sup>~4<sup>th</sup> digits:
  - a) This is to indicate the SMD Resistor size. Example: 1206, TC05 or HV03,
  - b) For Resistor Network & Coated type, the 1<sup>st</sup>~3<sup>rd</sup> digits are to indicate the product type and the 4<sup>th</sup> digit is the special feature. Example: RNLA = Resistor Network Circuit A type; CFRF = Carbon Film Fixed Resistors Non-Flame type; MORI = Metal Oxide Film Fixed Resistor Non-Inductive type.
  - c) For Cement Fixed Resistors, these 4 digits are to indicate the product type but if the product type has only 3 digits, the 4<sup>th</sup> digit will be "0". Example: PRWO=PRW type; PRWC=PRWC type.
2. 5<sup>th</sup>~6<sup>th</sup> digits:
  - a) This is to indicate the wattage or power rating. To distinguish the sizes and the umbers, the following codes are used, and please refer to the following chart for details: W = Normal Size, S = Small Size, U = Ultra Small Size, "1" ~ "G" to denotes "1" ~ "16" as Hexadecimal:

1/16W ~ 1/2W (<1W)

Wattage	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16
Normal Size	W2	W3	W4	W5	W6	W7	W8	W9	WA	WB	WC	WD	WE	WF	WG
Small Size	S2	S3	S4	S5	S6	S7	S8	S9	SA	SB	SC	SD	SE	SF	SG
Ultra Small Size	U2	U3	U4	U5	U6	U7	U8	U9	UA	UB	UC	UD	UE	UF	UG

1W ~ 16W (≥1W)

Wattage	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Normal Size	1W	2W	3W	4W	5W	6W	7W	8W	9W	AW	BW	CW	DW	EW	FW	GW
Small Size	1S	2S	3S	4S	5S	6S	7S	8S	9S	AS	BS	CS	DS	ES	FS	GS
Ultra Small Size	1U	2U	3U	4U	5U	6U	7U	8U	9U	AU	BU	CU	DU	EU	FU	GU

- b) For power rating less than 1W, the 5<sup>th</sup> digit will be the letters W, S or U to represent the size required & the 6<sup>th</sup> digit will be a number or a letter code. Example: WA = 1/10W; U2 = 1/2W-SS.
- c) For power rating of 1W to 16W, the 5<sup>th</sup> digit will be a number or a letter code and the 6<sup>th</sup> digit will be the letters of W, S or U. Example: AW = 10W; 3S = 3W-S.
- d) For power rating between 20W to 99W, the 5<sup>th</sup> & 6<sup>th</sup> digits will show the whole numbers of the power rating itself. Example: 20 = 20W; 75 = 75W.
- e) For power rating of 100W & over, the 5<sup>th</sup> & 6<sup>th</sup> digits will be indicated with "00" and the actual wattage being indicated at the last 3 digits (12<sup>th</sup>~14<sup>th</sup>) of the Part No.
- f) For special power ratings, the following codes ar bo be used:
 

1). WH = 1/32W (10P8 Chip Network)	3). 04 = 0.4W-SS (0.4 watt Ultra Small size)	5). 2A = 2.5W
2). 07 = 3/4-S (Chip 2010 size)	4). 06 = 0.6W-S (0.6 watt Small size)	6). 6A = 6.5W
- g) For Resistor Network, since the power rating is fixed as 1/8W for A circuit & 1/5W for B circuit, the 5<sup>th</sup> & 6<sup>th</sup> digit is to be used to denote the number of pins required. Example: 09 = 9pins; 12 = 12pins.
- h) For Jumper Wires the 5<sup>th</sup> & 6<sup>th</sup> digits will be indicated with "00".
- i) For Thin Film Chip Resistors, these 2 digits will be used to indicated the requested Temperature coefficient:
 

1). 05 = 5PPM	2). 10 = 10PPM	3). 15 = 15PPM	4). 25 = 25PPM	5). 50 = 50PPM
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3. The 7<sup>th</sup> digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resisance Tolerance. As for Metal Film Fixed Resistor products, it is also to denote the standard PPM as follows:

B = ±0.1% (15PPM)	G = ±2% (100PPM)
C = ±0.25% (25PPM)	J = ±5% (200PPM)
D = ±0.5% (50PPM)	K = ±10%
F = ±1% (50PPM)	

Remark: if it is not one of the above standard "tolerance-TCR", the requirement should be clearly stated when placing order. Example: ±1% (25PPM), the 7<sup>th</sup> digit still shows "F" but separately note the requirement of "25PPM"



4. The 8<sup>th</sup> to 11<sup>th</sup> digits is to denote the Resistance Value:

- a) For the standard resistance values of E-24 series in 5% & 10% tolerance, the 9<sup>th</sup> digit is "0", the 9<sup>th</sup> & 10<sup>th</sup> digits are to denote the significant figures of the resistance and the 11<sup>th</sup> digit is the number of zeros following.
- b) For the standard resistance values of E-96 series in 1% (or less) & 2% tolerance, the 8<sup>th</sup> digit to the 10<sup>th</sup> digits are to denote the significant figures of the resistance and the 11<sup>th</sup> digit is the number of zeros following.
- c) For the code of the significant figures of E-24 & E-96 series, please refer to page 77 & 78 of the standard Resistance Value list.
- d) The following numbers and the letter codes is to be used to indicate the number of zeros in the 11<sup>th</sup> digit:  
 0 = 10<sup>0</sup>      1 = 10<sup>1</sup>      2 = 10<sup>2</sup>      3 = 10<sup>3</sup>      4 = 10<sup>4</sup>      5 = 10<sup>5</sup>  
 6 = 10<sup>6</sup>      J = 10<sup>-1</sup>      K = 10<sup>-2</sup>      L = 10<sup>-3</sup>      M = 10<sup>-4</sup>      N = 10<sup>-5</sup>
- e) For Cement Resistors the 8<sup>th</sup> digit will be coded with "W" or "P" to denote Wire-wound type or Power Film type respectively of the Cement Fixed Resistor product. The 9<sup>th</sup> to 11<sup>th</sup> please refer to point 4.a

Example:

<u>E-24 series</u>	<u>E-96 series</u>	<u>Cement Resistors</u>
0120 = 12 ohm	1210 = 121 ohm	W120 = 12 ohm Wire-wound type
0123 = 12K ohm	1302 = 13K ohm	W12J = 1.2 ohm Wire-wound type
012J = 1.2 ohm	196J = 19.6 ohm	P273 = 27 kohm Powe Film type

5. The 12<sup>th</sup>, 13<sup>th</sup> & 14<sup>th</sup> digits:

- a) The 12<sup>th</sup> digit is to denote the Packaging type with the following codes:  
 A = Tape / Box (Ammo Pack)      C = Bulk in Cassette (for Chip product)  
 B = Bulk / Box      T = Tape / Reel      P = Tape / Box of PT-26 product
- b) The 13<sup>th</sup> digit is normally to indicate the Packing Quantity of Tape/Box or Tape/Reel packaging types. Except for Chip products Bulk packing, this digit should be filled "0" or other products with "Bulk/Box packaging requirement. The following letter codes is to be used for some packaging quantities.  
 A = 500pcs      B = 2,500pcs      C = 10,000pcs      D = 15,000pcs  
 D = 20,000pcs      G = 25,000pcs      H = 50,000pcs

Example:

<u>CHIP product</u>	<u>Other products</u>
TD = T/R-20,000	A5 = T/B-5,000
TE = T/R-15,000	TB = T/R-2,500
T4 = T/R-4,000	BO = B/B

c) For the Foring type products, the 13<sup>th</sup> & 14<sup>th</sup> digits are used to denote the forming types of the product with the following letter codes:

MF = M type with Flattened lead wire	FO = F type
MK = M type with Kinked lead wire	F1 = F1 type
ML = M type with normal lead wire	F2 = F2 type
	F3 = F3 type

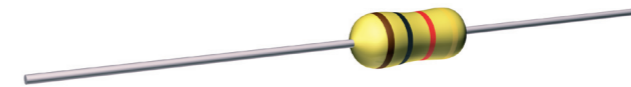
d) For power rating over 100watt, the 12<sup>th</sup> to the 14<sup>th</sup> digits are to denote the actual wattage of the products:

Example: 100 = 100watt      150 = 150watt      225 = 225watt

e) For some products, the 14<sup>th</sup> digit alone can use to denote special features or additional information with the following codes:

- P = Panasert type
- 1 = Avisert 1 type
- 2 = Avisert 2 type
- 3 = Avisert 3 type
- A = CO 1/4W - A type
- B = CO 1/4W - B type
- E = used to denote the "Environment Protection, lead Free type" of SMD category resistors (now, this became the Standard type of SMD)

4 Band Color Code (available for CFR, MOR, KNP & 2% or 5% of MFR products)



1 2 3 4

<b>1st Band</b>	<b>2nd Band</b>	<b>3rd Band</b>
Black = 0	Black = 0	Black = Multiply by 1 (10 <sup>0</sup> )
Brown = 1	Brown = 1	Brown = Multiply by 10 (10 <sup>1</sup> )
Red = 2	Red = 2	Red = Multiply by 100 (10 <sup>2</sup> )
Orange = 3	Orange = 3	Orange = Multiply by 1,000 (10 <sup>3</sup> )
Yellow = 4	Yellow = 4	Yellow = Multiply by 10,000 (10 <sup>4</sup> )
Green = 5	Green = 5	Green = Multiply by 100,000 (10 <sup>5</sup> )
Blue = 6	Blue = 6	Blue = Multiply by 1,000,000 (10 <sup>6</sup> )
Violet = 7	Violet = 7	Violet = Multiply by 10,000,000 (10 <sup>7</sup> )
Gray = 8	Gray = 8	Gold = Multiply by 0.1 (10 <sup>-1</sup> )
White = 9	White = 9	Silver = Multiply by 0.01 (10 <sup>-2</sup> )

<b>4th Band</b>	
Red	= ±2%
Gold	= ±5%
Silver	= ±10%

5 Band Color Code (available for MFR 1% & FRN Products)



1 2 3 4 5

<b>1st Band</b>	<b>2nd Band</b>	<b>3rd Band</b>	<b>4th Band</b>
Black = 0	Black = 0	Black = 0	Black = Multiply by 1 (10 <sup>0</sup> )
Brown = 1	Brown = 1	Brown = 1	Brown = Multiply by 10 (10 <sup>1</sup> )
Red = 2	Red = 2	Red = 2	Red = Multiply by 100 (10 <sup>2</sup> )
Orange = 3	Orange = 3	Orange = 3	Orange = Multiply by 1,000 (10 <sup>3</sup> )
Yellow = 4	Yellow = 4	Yellow = 4	Yellow = Multiply by 10,000 (10 <sup>4</sup> )
Green = 5	Green = 5	Green = 5	Green = Multiply by 100,000 (10 <sup>5</sup> )
Blue = 6	Blue = 6	Blue = 6	Blue = Multiply by 1,000,000 (10 <sup>6</sup> )
Violet = 7	Violet = 7	Violet = 7	Violet = Multiply by 10,000,000 (10 <sup>7</sup> )
Gray = 8	Gray = 8	Gray = 8	Gold = Multiply by 0.1 (10 <sup>-1</sup> )
White = 9	White = 9	White = 9	Silver = Multiply by 0.01 (10 <sup>-2</sup> )

<b>5th Band</b>	
Violet	= ±0.1%
Blue	= ±0.25%
Green	= ±0.5%
Brown	= ±1%