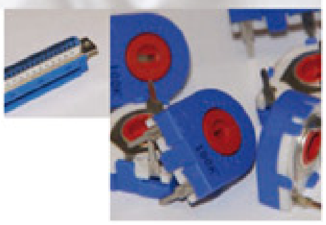
AX electronic



Distribution

Logistics

Services

www.ax-electronic.de

ISO/TS 16949:2009
ISO 9001:2008
ISO 14001:2004

Roy Hsieh - President
Roger Shih - CEO
Quanni Yuang - GM

QUALITY POLICY :

Reliability and Service creates the future of --- ROYALOHM

QUALITY OBJECTIVES :

1.) Know ones duties and responsibilities.
2.) Do things right at the first time and emphasize implementation.
3.) Product must conform to customer requirements.
4.) On time delivery.
5.) Speedy and efficient coordination.

Taiwan Factory : Royal Electronic Fty. Co., Ltd. (since 1978)

Address	: Hsinchu Industrial District 17 San Ming Rd., Hukuo Hsiang Hsinchu Hsien, Taiwan, R.O.C. 303
Telephone	: +886 3 598 1716 to 18
Fax Line	: +886 3 598 1955

Thailand Factory : Royal Electronic Factory (Thailand) Co., Ltd. (since 1988)

Address	: 20/1-2 Moo 2, Klong Na, Muang, Chachoengsao 24000, Thailand
Telephone	: +66 38 82 24 04 to 08
Export Direct Line	: +66 38 82 38 30; +66 38 98 11 92; +66 38 98 11 91
Export Fax Line	: +66 38 82 37 65 ; +66 38 98 11 90
Local Fax Line	: +66 38 82 38 39
E-mail	: Export Sales Department - export@royalohm.com
	: Local Sales Department - local@royalohm.com

Bank Reference

Bank Name1	: TMB Bank Public Co., Ltd. (Thanon Mahajakkapad Branch)
Address	: 219/10 Thanon Mahajackkapad, Muang, Chachoengsao 24000 Thailand
Beneficiary	: Royal Electronic Factory (Thailand) Co., Ltd.
Account No.	: 526-1-00783-4
Swift Code	: TMBKTHBK
Bank Name2	: Kasikorn Bank PLC., THAILAND (Chachoengsao Branch)
Address	: 103, Chompon Rd., Na-Muang, Muang, Chachoengsao
Beneficiary	: Royal Electronic Factory (Thailand) Co., Ltd.
Account No.	: 112-1-05089-3
Swift Code	: KASITHBK

China Factory : Ticrom Technology (Shenzhen) China (since 2004)

Address	: 4th Floor, Block 16th, Jiuwei Industrial Zone , Xixiang Town, Bao'An District , Shenzhen City, Guangdong Province, China
Telephone	: +86 755 2748 4580 / 2748 4798 / 2748 4698
	+86 755 6186 1797 / 6186 1798 Ext.103
Fax Line	: +86 755 2748 4308
E-mail	: info-sz@royalohm.com.cn

ROYALOHM

Index

RoHS Compliant

Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	0Ω1 ~ 0Ω99	±800PPM/°C	
	1Ω ~ 10Ω	±400PPM/°C	
	11Ω ~ 100Ω	±200PPM/°C	
	>100Ω	±100PPM/°C	(0201: >100Ω ≤ ±200PPM/°C)
Short Time Overload	±5%: ± (2.0% + 0.1Ω)Max		
	±1%: ± (1.0% + 0.1Ω)Max		
Insulation Resistance	Min. 1,000 Mega Ohm		
Dieiectric 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% : ±(1.0% + 0.05Ω)Max		
	±1% : ±(0.5% + 0.05Ω)Max		
Humidity (Steady State)	±5% : ±(3.0% + 0.1Ω)Max		
	±1% : ±(0.5% + 0.1 Ω)Max		
Load Life in Humidity	±5% : ±(3.0% + 0.1Ω)Max		
	±1% : ±(1.0% + 0.1 Ω)Max		
Load Life	±5% : ±(3.0% + 0.1Ω)Max		
	±1% : ±(1.0% + 0.1Ω)Max		

Ordering Procedure: Ex.: 1206, 1/4W-S, +/-5%, 10Ω T/R-5000

1 2 0 6 | S 4 | J | 0 1 0 0 | T | 5 | E

Resistor Size:
0201, 0402, 0603, 0805, 1206,
1210, 1812, 2010, 2512
Wide Terminals:
0508, 0612, 1020, 1218, 1225

Wattage:
Normal size: WH=1/32W, WM=1/20W, WG=1/16W, WA=1/10W, W8=1/8W, W4=1/4W, W2=1/2W, 1W=1W
Small size: SA=1/10W-S, S8=1/8W-S, S4=1/4W-S, S3=1/3W-S, 07=3/4W-S, U2=1/2W-SS
Applicable for Wide Terminal only: WJ=1.5W, 2W. 3W

Tolerance:
D = ±0.5%
F = ±1%
G = ±2%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~1Ω2, 226K ~ 2Ω26
- Jumper : use "0" for 1st to 4th digits

Packing Type:
T = Tape/Reel

Packing Qty:

1 = 1,000 pcs.	2 = 2,000 pcs.
4 = 4,000 pcs.	5 = 5,000 pcs.
A = 500 pcs.	C = 10,000 pcs.
D = 20,000 pcs.	E = 15,000 pcs.
F = 40,000 pcs.	G = 60,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

Note :
1.) Special resistance value, tolerance, T.C.R. requirement is available on a case-to-case basis.
2.) Standard reel size = 7"
3.) 4", 10", & 13" reels are available upon request

RoHS Compliant

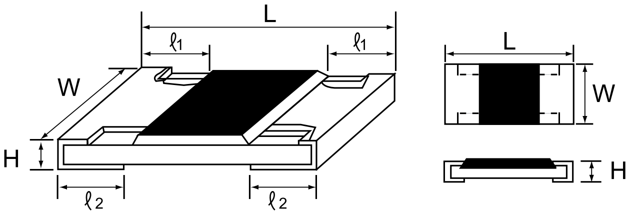
ROYALOHM

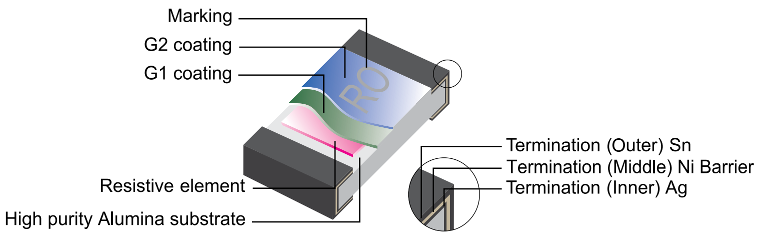
Thick Film Chip Resistors

Features

- Small size and light weight
- Suitable for both wave and reflow soldering
- Reduction of assembly costs

Dimension



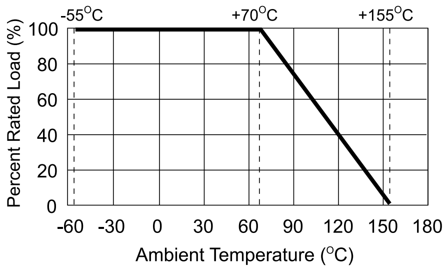


Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	Dimension (mm)				
							L	W	H	ℓ_1	ℓ_2
0201 (0603)	1/20W	0.5A	1A	-	Jumper	<50mΩ	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
		25V	50V	-	±1% ±2% ±5%	10Ω ~ 1MΩ 10Ω ~ 1MΩ 1Ω ~ 1MΩ					
0402 (1005)	1/16W	1A	2A		Jumper	<50mΩ	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
		50V	100V	100V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					
0603 (1608)	1/10W-S 1/16W	1A	2A		Jumper	<50mΩ	1.60±0.10	$0.80^{+0.15}_{-0.10}$	0.45±0.10	0.30±0.20	0.30±0.20
		75V	150V	300V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					
0805 (2012)	1/8W-S 1/10W	2A	5A		Jumper	<50mΩ	2.00±0.15	$1.25^{+0.15}_{-0.10}$	0.55±0.10	0.40±0.20	0.40±0.20
		150V	300V	500V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					
1206 (3216)	1/4W-S 1/8W	2A	10A		Jumper	<50mΩ	3.10±0.15	$1.55^{+0.15}_{-0.10}$	0.55±0.10	0.45±0.20	0.45±0.20
		200V	400V	500V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					
1210 (3225)	1/2W-SS 1/3W-S 1/4W	2A	10A		Jumper	<50mΩ	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20
		200V	500V	500V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					
1812	1/2W 3/4W-S	2A	10A		Jumper	<50m Ω	4.50±0.20	3.20±0.20	0.55±0.20	0.50±0.20	0.05±0.20
		200V	500V	500V	±1% ±5%	1Ω ~ 10MΩ					
2010 (5025)	3/4W-S 1/2W	2A	10A		Jumper	<50m Ω	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20
		200V	500V	500V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					
2512 (6432)	1W	2.5A	10A		Jumper	<50mΩ	6.35±0.10	3.20±0.15	0.55±0.10	0.60±0.25	0.50±0.20
		200V	500V	500V	±1% ±2% ±5%	10Ω ~ 1MΩ 1Ω ~ 10MΩ 1Ω ~ 10MΩ					

Note:

1.) Metric information inside parenthesis.
2.) Standard Operating Temp (°C): -55 ~ +155
3.) Standard: E-96 series: 0.5%, 1%
E-24 series: 2%, 5%
4.) Low resistance range (0.1Ω ~ 0.99Ω) is also available for 0402, 0603, 0805, 1206, 1210, 2010 and 2512

Derating Curve



RoHS Compliant

Anti-Surge Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	1Ω~10Ω ≤± 400PPM/°C* 11Ω~10MΩ ≤ ± 100PPM/°C	Humidity (Steady State) Load Life in Humidity	±(3.0% + 0.1Ω)Max ±(3.0% + 0.1Ω)Max
Short Time Overload	±(1.0% + 0.1Ω)Max	Load Life	±(3.0% + 0.1Ω)Max
Terminal Bending	±(1.0% + 0.05Ω)Max	Solderability	Min. 95% coverage.
Soldering Heat	±(1.0% + 0.05Ω)Max	Temperature Cycling	±(1.0% + 0.05Ω)Max
Single Pulse	±(1.0% + 0.1Ω)Max	Insulation Resistance	Min. 1,000 Mega Ohm
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.		

Ordering Procedure: Ex.: AS05, 1/3W, +/-5%, 1Ω T/R-5000

A S 0 5 W 3 J 0 1 0 J T 5 E

Resistor Size:
AS03 = 0603
AS05 = 0805
AS06 = 1206
AS07 = 1210

Wattage:
W5 = 1/5W
S4 = 1/4W-S
W3 = 1/3W
S2 = 1/2W-S
W2 = 1/2W
06 = 0.6W-S
07 = 3/4W-S

Tolerance:
J = ±5%
K = ±10%
M = ±20%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros

Packing Type:
T = Tape/Reel

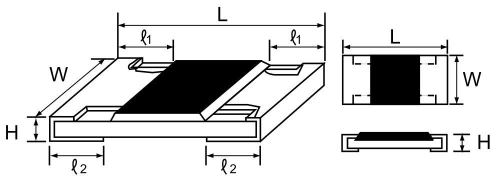
Packing Qty:
5 = 5,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/
RoHS compliant

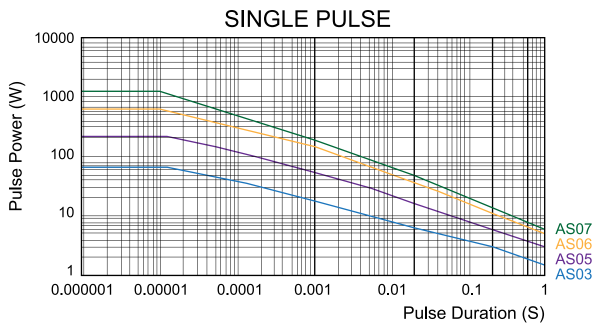
Features

- Small size and light weight
- Suitable for both wave and reflow soldering
- Can withstand high surge
- Reduction of assembly costs

Dimension



Note:
1.) Standard Operating Temp (°C) : -55 -+155
2.) Standard : E-24 series
3.) Construction : Same as thick film
* (1Ω~9.1Ω) ±200 PPM can be provided on a case to case basis



Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	Dimension (mm) L	W	H	ℓ1	ℓ2
AS03 (0603)	1/4W-S 1/5W	50V	100V	300V	±5% ±10% ±20%	1Ω~10MΩ	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
AS05 (0805)	1/2W-S 1/3W	150V	300V	500V		1Ω~10MΩ	2.00±0.15	1.25 +0.15 -0.10	0.55±0.10	0.40±0.20	0.40±0.20
AS06 (1206)	0.6W-S 1/2W	200V	400V	500V		1Ω~10MΩ	3.10±0.15	1.55 +0.15 -0.10	0.55±0.10	0.40±0.20	0.40±0.20
AS07 (1210)	3/4W-S 1/2W	200V	500V	500V		1Ω~10MΩ	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20

RoHS Compliant

High-Precision Anti-Surge Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	1Ω ~ 10Ω	±200PPM/°C
	11Ω ~ 10MΩ	±100PPM/°C
	PS07 : 1Ω ~ 10MΩ	±100PPM/°C
Short Time Overload	±5%: ±(2.0% + 0.1Ω)Max	
	±1%: ±(1.0% + 0.1Ω)Max	
Temperature Cycling	±5%: ±(3.0% + 0.1Ω)Max	
	±1%: ±(0.5% + 0.1Ω)Max	
Terminal Bending	±(1.0% + 0.05Ω)Max	
Single Pulse	±(1.0% + 0.1Ω)Max	
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.	

Humidity (Steady State)	±(3.0% + 0.1Ω)Max
Load Life in Humidity	±5%: ±(3.0% + 0.1Ω)Max
	±1%: ±(1.0% + 0.1Ω)Max
Load Life	±5%: ±(3.0% + 0.1Ω)Max
	±1%: ±(1.0% + 0.1Ω)Max
Solderability	Min. 95% coverage.
Soldering Heat	±(1.0% + 0.05Ω)Max
Insulation Resistance	Min. 1,000 Mega Ohm

Ordering Procedure: Ex.: PS05, 1/3W, +/-5%, 1Ω T/R-5000

P S 0 5 W 3 J 0 1 0 J T 5 E

Resistor Size:
PS03 = 0603
PS05 = 0805
PS06 = 1206
PS07 = 1210

Wattage:
W4 = 1/4W
W3 = 1/3W
W2 = 1/2W
07 = 3/4W-S

Tolerance:
F = ±1%
J = ± 5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

Packing Type:
T = Tape/Reel

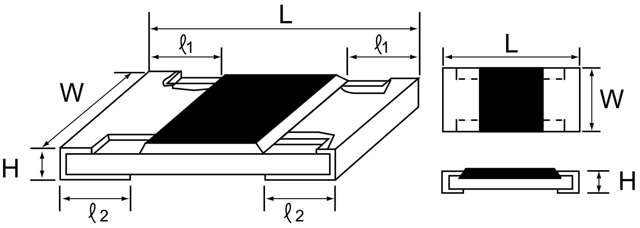
Packing Qty:
5 = 5,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

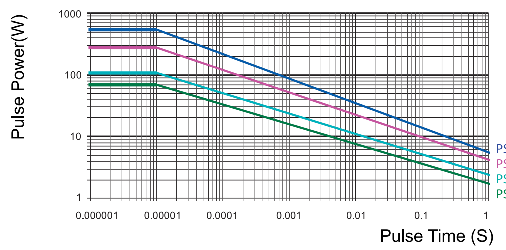
Features

- Small size and light weight
- Suitable for both wave and reflow soldering
- Can withstand one-pulse limiting electric power
- Reduction of assembly costs

Dimension



PS03 PS05 PS06 PS07 one-pulse limiting electric power



Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	Dimension (mm) L	W	H	ℓ1	ℓ2
PS03 (0603)	1/4W	50V	100V	300V	±1% ±5%	1Ω~10MΩ	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
PS05 (0805)	1/3W	150V	300V	500V		1Ω~10MΩ	2.00±0.15	$1.25^{+0.15}_{-0.10}$	0.55±0.10	0.40±0.20	0.40±0.20
PS06 (1206)	1/2W	200V	400V	500V		1Ω~10MΩ	3.10±0.15	$1.55^{+0.15}_{-0.10}$	0.55±0.10	0.45±0.20	0.45±0.20
PS07 (1210)	3/4W-S	200V	500V	500V		1Ω~10MΩ	3.10±0.10	2.60±0.20	0.55±0.10	0.55±0.25	0.50±0.20

Note:
1.) Standard Operating Temp (°C) : -55 -+155
2.) Standard : E-96 series : 1%
E-24 series : 5%
3.) Construction : Same as thick film

Anti-Electro Static Discharge Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	1Ω ~ 10Ω ±200PPM/°C 11Ω ~ 10MΩ ±100PPM/°C	Humidity (Steady State)	±5%: ±(3.0% + 0.1Ω)Max ±1%: ±(0.5% + 0.1Ω)Max
Short Time Overload	±5%: ±(2.0% + 0.1Ω)Max ±1%: ±(1.0% + 0.1Ω)Max	ESD	±(1.0% + 0.05Ω)Max
		Load Life	±5%: ±(3.0% + 0.1Ω)Max ±1%: ±(1.0% + 0.1Ω)Max
Temperature Cycling	±5%: ±(1.0% + 0.05Ω)Max ±1%: ±(0.5% + 0.05Ω)Max	Solderability	Min. 95% coverage.
Terminal Bending	±(1.0% + 0.05Ω)Max	Soldering Heat	±(1.0% + 0.05Ω)Max
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.		

Ordering Procedure: Ex.: ES06, 1/4W-S, +/-5%, 1.2Ω T/R-5000

E	S	0	6	S	4	J	0	1	2	J	T	5	E

Resistor Size:
ES02 = 0402
ES03 = 0603
ES05 = 0805
ES06 = 1206
ES07 = 1210

Wattage:
WG=1/16W, WA=1/10W, W8=1/8W,
W3=1/3W, SA=1/10W-S, S8=1/8W-S,
S4=1/4W-S, S2=1/2W-S

Tolerance:
F = ±1%
J = ± 5%

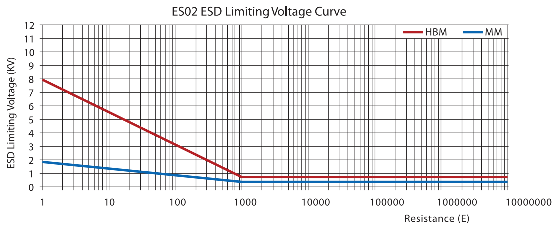
Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

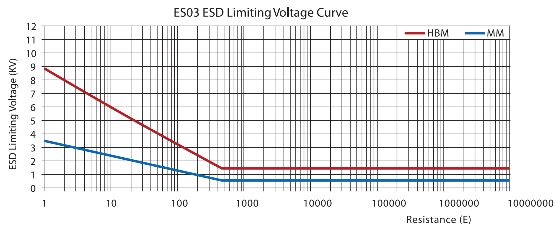
Packing Type:
T = Tape/Reel

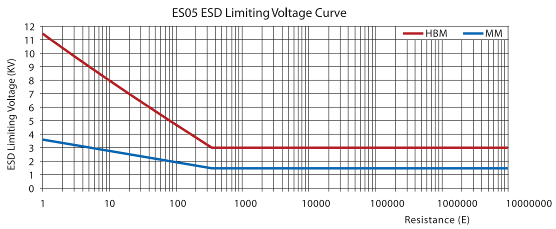
Packing Qty:
5 = 5,000 pcs.

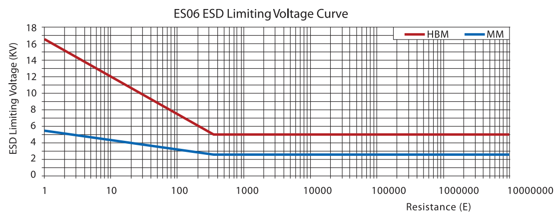
Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

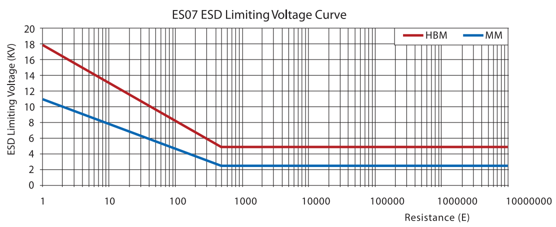
ESD Limiting Voltage Curve











Note: HBM:100PF 1K5 1Cycle, MM:200PF 0E 1Cycle

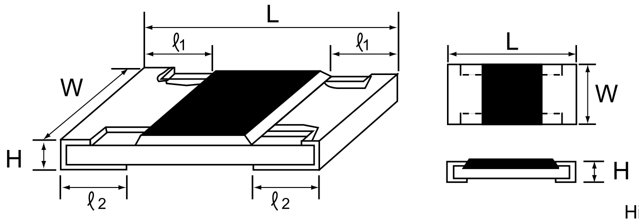
RoHS Compliant

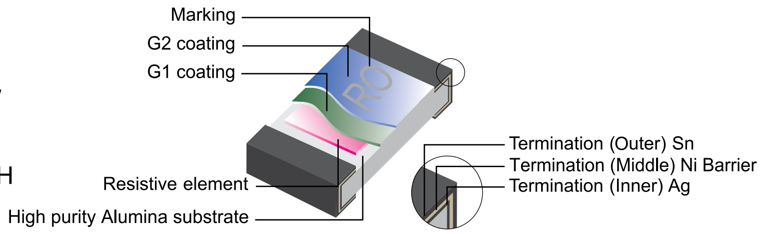
Anti-Electro Static Discharge Thick Film Chip Resistors

Features

- Anti-Electro Static Discharge
- High Voltage
- Suitable for reflow & wave soldering.
- Application Medical Devices, Industrial Controls, AV adapter, Flash lamp of camera, Automotive Industry, Outdoor Equipments

Dimension

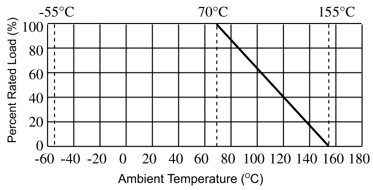




Type	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Operating Temperature
ES02	50V	100V	100V	-55 ~ +155°C
ES03	200V	400V	300V	
ES05	400V	800V	500V	
ES06	500V	1,000V	500V	
ES07	800V	1,500V	500V	

Type	Power (70°C)	L (mm)	W (mm)	H (mm)	ℓ1 (mm)	ℓ2 (mm)	Resistance Range 1%(E96), 5%(E24)
ES02	1/16W	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	1Ω ~ 10MΩ
ES03	1/16W 1/10W-S	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	
ES05	1/10W 1/8W-S	2.00±0.15	1.25 +0.15/-0.10	0.55±0.10	0.40±0.20	0.40±0.20	
ES06	1/8W 1/4W-S	3.10±0.15	1.55 +0.15/-0.10	0.55±0.10	0.45±0.20	0.45±0.20	
ES07	1/3W 1/2W-S	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20	

Derating Curve

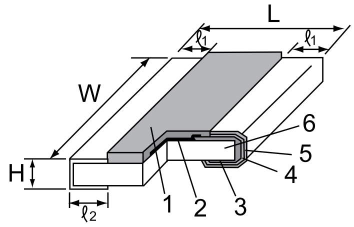


RoHS Compliant

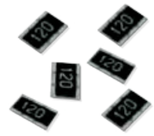
Wide Terminal Thick Film Chip Resistors

Features

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



1. Protective Layer
2. Resistive element
3. Termination (Inner) Ag
4. Termination (Middle) Ni
5. Termination (Outer) Sn
6. High Purity Alumina substrate



Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	Dimension (mm)				
							L	W	H	ℓ1	ℓ2
0508	1/3W	150V	300V	500V	±1% ±5%	10Ω ~ 1MΩ 10Ω ~ 1MΩ	1.20±0.10	2.00±0.10	0.55±0.10	0.20±0.10	0.30±0.20
0612	1/2W	200V	400V	500V	±1% ±5%	10Ω ~ 1MΩ 1Ω ~ 1MΩ	1.60±0.15	3.20±0.15	0.55±0.10	0.30±0.20	0.45±0.20
1020	1W	200V	400V	500V	±1% ±5%	10Ω ~ 1MΩ 1Ω ~ 1MΩ	2.50±0.15	5.00±0.15	0.55±0.10	0.40±0.20	0.60±0.20
1218	1W	200V	400V	500V	±1% ±5%	0Ω1 ~ 1MΩ 0Ω1 ~ 1MΩ	3.10±0.10	4.60±0.15	0.55±0.10	0.45±0.20	0.40±0.20
1225	1.5W	200V	400V	500V	±1% ±5%	1Ω ~ 1MΩ 1Ω ~ 1MΩ	3.10±0.15	6.25±0.15	0.55±0.10	0.45±0.20	0.65±0.20

Note: Wide Terminal Part No. System on Page 3.

Marking on the Resistor Body

- All case sizes except 0201 and 0402

±5% Tolerance: 10Ω ~ 10MΩ = 3 digit marking
1st & 2nd digits are significant figures of the resistance
3rd digit indicates number of zeros
1Ω ~ 9.9Ω = 3 digit marking, “R” represents decimal point
±1%, 5% Tolerance: <1Ω = 3 digit marking, “R” represents decimal point

±5%
10Ω ~ 10MΩ
154 =150000Ω =150KΩ

±5%
1Ω ~ 9.9Ω
4R7 = 4.7Ω

±1%, ±5%
0.1Ω ~ 0.99Ω
R360 = 0.36Ω

- All case sizes except 0201, 0402 and 0603

±1% Tolerance: 10Ω ~ 10MΩ = 4 digit marking
1st & 3rd digits are significant figures of the resistance
4th digit indicates number of zeros
1Ω ~ 9.9Ω = 3 digit marking, “R” represents decimal point

±1%
10Ω ~ 10MΩ
2432 =24300Ω =24K3Ω

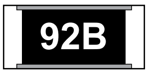
±1%
1Ω ~ 9.9Ω
3R30 = 3.30Ω

RoHS Compliant

Thick Film Chip Resistors

- 0603 ±1% E96 series has 3 digit marking. Use the Multiplier code & Standard E96 series Resistance Value Code. Resistance value not in the multiplier table use 0603 1% E24 series marking below.

8.87KΩ =887 x 10^{1}Ω = **92B**



13.3Ω =133 x 10^{-1}Ω = **13X**

Multiplier Code

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10^{0}	10^{1}	10^{2}	10^{3}	10^{4}	10^{5}	10^{6}	10^{7}	10^{-1}	10^{-2}	10^{-3}

0603 ±1% Standard E-96 Series Resistance Value Code

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

- 0603 ±1% E24 series has 3 digit marking
  - 1st & 2nd digits are significant figures of the resistance
  - 3rd digit indicates number of zeros
  - underline below the digits = ±1%

152 = 1500 = 1.5KΩ

390 = 39Ω

Note: Resistance value in both E96 and E24 series shall follow E96 marking.

RoHS Compliant

High Voltage Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	±200PPM/°C	Humidity (Steady State)	±(3.0% + 0.1Ω)Max
Short Time Overload	±(2.0% + 0.1Ω)Max	Load Life in Humidity	±(3.0% + 0.1Ω)Max
Terminal Bending	±(1.0% + 0.05Ω)Max	Load Life	±(3.0% + 0.1Ω)Max
Solderability	Min. 95% coverage.	Temperature Cycling	±5%: ±(1.0% + 0.05Ω)Max
Insulation Resistance	Min. 1,000 Mega Ohm		±1%: ±(0.5% + 0.05Ω)Max

Dielectric Withstanding Voltage: No evidence of flashover, mechanical damage, arcing or insulation breakdown.

Ordering Procedure: Ex.: HV06, 1/4W-S, +/-5%, 100KΩ T/R-5000

H V 0 6 | S 4 | J | 0 1 0 4 | T | 5 | E

Resistor Size:
HV03 = 0603 HV05 = 0805
HV06 = 1206 HV07 = 1210
HV10 = 2010 HV12 = 2512

Wattage:
Normal size: WG=1/16W, WA=1/10W, W8=1/8W, W2=1/2W, 1W=1W
Small Size: SA=1/10W-S, S8=1/8W-S, S4=1/4W-S, 07 = 3/4W-S, S3=1/3W-S
Extra Small Size: U2=1/2W-SS

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

Packing Type:
T = Tape/Reel

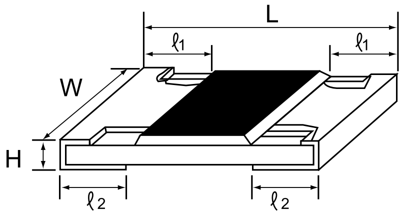
Packing Qty:
4 = 4,000 pcs. 5 = 5,000 pcs.

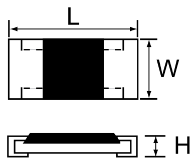
Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

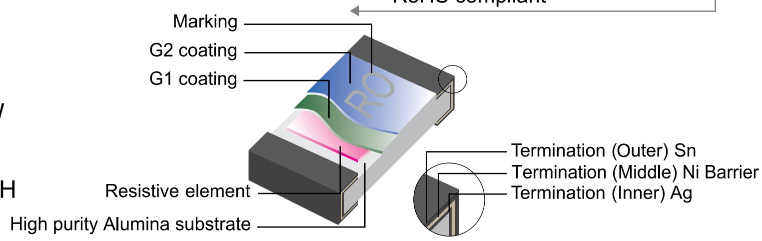
Features

- High maximum working voltage limits
- Suitable for both wave and reflow soldering
- Application: AV adapters, LCD back light, Camera strobe

Dimension







Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	Dimension (mm)				
							L	W	H	ℓ1	ℓ2
HV03 (0603)	1/16W, 1/10W-S	200V	400V	300V	±1% ±5%	36KΩ ~ 10MΩ 36KΩ ~ 10MΩ	1.60±0.10	0.80 +0.15/-0.10	0.45±0.10	0.30±0.20	0.30±0.20
HV05 (0805)	1/10W, 1/8W-S	400V	800V	500V	±1% ±5%	100KΩ ~ 10MΩ 100KΩ ~ 10MΩ	2.00±0.15	1.25 +0.15/-0.10	0.55±0.10	0.40±0.20	0.40±0.20
HV06 (1206)	1/8W, 1/4W-S	500V	1000V	500V	±1% ±5%	100KΩ ~ 10MΩ 100KΩ ~ 10MΩ	3.10±0.15	1.55 +0.15/-0.10	0.55±0.10	0.45±0.20	0.45±0.20
HV07 (1210)	1/3W-S, 1/2W-SS	800V	1500V	500V	±1% ±5%	50KΩ ~ 10MΩ 50KΩ ~ 10MΩ	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20
HV10 (2010)	1/2W, 3/4W-S	2000V	3000V	500V	±1% ±5%	50KΩ ~ 10MΩ 50KΩ ~ 10MΩ	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20
HV12 (2512)	1W	3000V	4000V	500V	±1% ±5%	39KΩ ~ 10MΩ 39KΩ ~ 10MΩ	6.35±0.10	3.20±0.15	0.55±0.10	0.60±0.25	0.50±0.20

Note:
1.) Standard Operating Temp (°C): -55 -+155
2.) Standard : E-96 series : 1%
E-24 series : 5%

RoHS Compliant

High Power Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	HP02 :	1Ω ~ 10Ω	±400PPM/°C
		11Ω ~ 100Ω	±200PPM/°C
		>100Ω	±100PPM/°C
	HP03 ~ HP12 :	1Ω ~ 10Ω	≤±200PPM/°C
		11Ω ~ 10MΩ	≤±100PPM/°C
Short Time Overload	±5%: ±(2.0% + 0.1Ω)Max		
	±1%: ±(1.0% + 0.1Ω)Max		
Terminal Bending	±(1.0% + 0.05Ω)Max		
Soldering Heat	±(1.0% + 0.05Ω)Max		
Solderability	Min. 95% coverage.		
Humidity (Steady State)	±5%: ±(3.0% + 0.1Ω)Max		
	±1%: ±(0.5% + 0.1Ω)Max		
Load Life in Humidity	±5%: ±(3.0% + 0.1Ω)Max		
	±1%: ±(1.0% + 0.1Ω)Max		
Load Life	±5%: ±(3.0% + 0.1Ω)Max		
	±1%: ±(1.0% + 0.1Ω)Max		
Temperature Cycling	±5%: ±(1.0% + 0.05Ω)Max		
	±1%: ±(0.5% + 0.05Ω)Max		
Insulation Resistance	Min. 1,000 Mega Ohm		
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.		

Ordering Procedure: Ex.: HP05, 1/3W, +/-5%, 1Ω T/R-5000

H P 0 5 W 3 J 0 1 0 J T 5 E

Resistor Size:
HP02 = 0402
HP03 = 0603
HP05 = 0805
HP06 = 1206
HP07 = 1210
HP10 = 2010
HP12 = 2512

Wattage:
WA = 1/10W
W5 = 1/5W
W3 = 1/3W
W2 = 1/2W
1W = 1W
WJ = 1.5W
2W = 2W
34 = 3/4W

Tolerance:
F = ±1%
J = ± 5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

Packing Type:
T = Tape/Reel

Packing Qty:
4 = 4,000 pcs. 5 = 5,000 pcs.
C = 10,000 pcs. E = 15,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

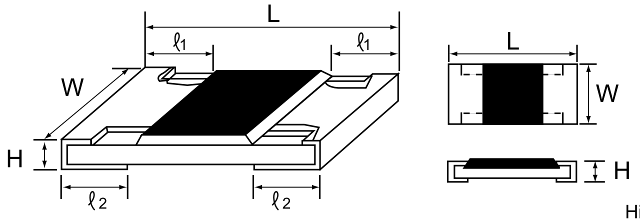
RoHS Compliant

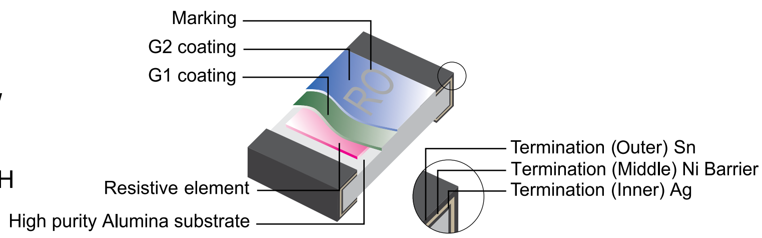
High Power Thick Film Chip Resistors

Features

- High power in standard size
- Suitable for both wave and reflow soldering
- Application: AV adapters, LCD back light, Camera strobe

Dimension





Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tol %	Resistance Range	Dimension (mm)				
							L	W	H	ℓ1	ℓ2
HP02 (0402)	1/10W	50V	100V	100V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
HP03 (0603)	1/5W	50V	100V	300V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	1.60±0.10	0.80 +0.15/-0.10	0.45±0.10	0.30±0.20	0.30±0.20
HP05 (0805)	1/3W	150V	300V	500V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	2.00±0.15	1.25 +0.15/-0.10	0.55±0.10	0.40±0.20	0.40±0.20
HP06 (1206)	1/2W	200V	400V	500V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	3.10±0.15	1.55 +0.15/-0.10	0.55±0.10	0.45±0.20	0.45±0.20
HP07 (1210)	3/4W	200V	500V	500V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	3.10±0.10	2.60 +0.15/-0.10	0.55±0.10	0.50±0.20	0.50±0.20
HP10 (2010)	1W	200V	500V	500V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20
HP12 (2512)	2W	250V	500V	500V	±1% ±5%	1Ω~10MΩ 1Ω~10MΩ	6.35±0.10	3.20±0.15	0.55±0.10	0.60±0.25	1.80±0.25

Note:
1.) Standard Operating Temp (°C): -55 -+155 2.) Standard : E-96 series : 1% & E-24 series : 5%
2.) HP12 1Ω ~ 10M Ω Low TCR available case by case on basis.
3.) HP low resistance range : 0.1Ω ~ 1Ω available,
TCR for HP03, HP05 at +/-200ppm°C, HP06 ~ HP12 at +/-100ppm°C,
Electrical performance same as above.

Trimmable Thick Film Chip Resistors

Performance Specification

Temperature Coefficient	TR03 : 1Ω ~ 10Ω	±400PPM/°C	TR05, TR06 : ±200PPM/°C
	11Ω ~ 1MΩ	±200PPM/°C	
Short Time Overload	±(2.0% + 0.1Ω)Max		
Terminal Bending	±(1.0% + 0.05Ω)Max		
Soldering Heat	±(1.0% + 0.05Ω)Max		
Insulation Resistance	Min. 1,000 Mega Ohm		
Solderability	Min. 95% coverage.		
Temperature Cycling	±(1.0% + 0.05Ω)Max		
Load Life in Humidity	±(3.0% + 0.1Ω)Max		
Load Life	±(3.0% + 0.1Ω)Max		
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.		

Ordering Procedure: Ex.: TR06, 1/8W, +/-20%, 150KΩ T/R-5000

T R 0 6 W 8 M 0 1 5 4 T 5 E

Resistor Size:
TR03 = 0603
TR05 = 0805
TR06 = 1206

Wattage:
W8 = 1/8W
WA = 1/10W
S8 = 1/8 W-S
S4 = 1/4W-S

Tolerance:
R = 0~30% Q = 0~20%
P = -30~0% N = -20~0%
K = ±10% M = ±20%
S = -10 0% T = 0~10%
J = ±5%

Resistance Value:
- E-12 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
  "J" ~0.1
  Ex. 012J ~1Ω2

Packing Type:
T = Tape/Reel

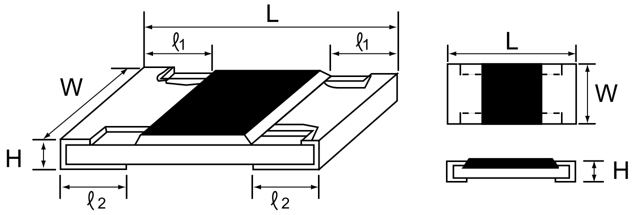
Packing Qty:
5 = 5,000 pcs.

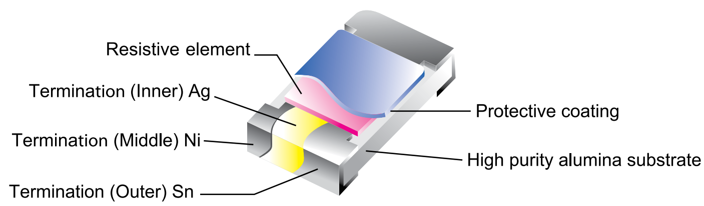
Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

Features

- Stable replacement of variable resistor for adjusting circuit (Laser trimming machine is required in client end)
- Superior heat & humidity withstanding performance

Dimension





Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Tolerance %	Resistance Range	Dimension (mm)				
						L	W	H	ℓ1	ℓ2
TR03 (0603)	1/16W, 1/10W-S	75V	150V	R : 0~30% Q : 0~20% T : 0~10% S : -10~0% N : -20~0% P : -30~0% J : ±5% K : ±10% M : ±20%	1Ω~1MΩ	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
TR05 (0805)	1/10W, 1/8W-S	150V	300V			2.00±0.15	1.25 +0.15 -0.10	0.55±0.10	0.40±0.20	0.40±0.20
TR06 (1206)	1/8W, 1/4W-S	200V	400V			3.10±0.15	1.55 +0.15 -0.10	0.55±0.10	0.45±0.20	0.45±0.20

Note:
1.) Standard Operating Temp (°C) : -55 -+155
2.) Standard : E-12 Series

Anti-Sulfurized Thick Film Chip Resistors

Performance Specification

Test Item	Test Methods	Determine Specifiction
Temperature Coefficient	Measure between: -55 °C ~ +125 °C	1Ω ≤ R ≤ 10Ω : ±400PPM/°C 10Ω < R ≤ 100Ω : ±200PPM/°C 100Ω < R ≤ 10MΩ : ±100PPM/°C
Short Time Overload	2.5 x rated voltage or Max. Overtoad Voltage whichever is lower for 5 seconds, then check the resistance.	±1%: ± (1.0% + 0.1Ω)Max ±5%: ± (2.0% + 0.1Ω)Max
Terminal Bending	Duration: 60s ± 5s, then check the resistance.	±(1.0% + 0.05Ω)Max
Solderability	245 ± 3 °C, 2 ~ 3s	95% coverage Min
Soldering Heat	260 ± 5 °C, 10 ± 1s	±(1.0% + 0.05Ω)Max
Moisture Resistance	25 °C ~ 65 °C, 90 ~ 100%RH, 2.5H, 65 °C 90 ~ 100%RH, 3H, 65 °C ~ 25 °C, 80 ~ 100%RH, 2.5H, 10 cycles, Measurement at 24 hours after test conclusion. MIL-STD-202 Method 106	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Biased Humidity	10% rated power, 85 °C/85%RH, 1000H, Measurement at 24 hours after test conclusion. MIL-STD-202 Method 103	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Dieiectric Withstanding Voltage	Resistor shall be clamped in the trough of 90 metallic V-block and shall be tested at AC potential respectively specified in the given list of each product type for 60 ~ 70s.	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Temperature Cycling	-55 ± 3 °C 30min ~ normal temperature 10min-15min ~ 155 ± 2 °C 30min ~ normaltemperature 10min-15min 100 cycles, Measurement at 24 hours after test conclusion. JESD22 Method JA-104	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(1.0% + 0.1Ω)Max
Load Life	125 °C, at RCWV or Max. Working Voltage whichever less, 1,000 hours(1.5 hours "ON", 0.5 hours "OFF") Measurement at 24 ± 2 hours after test conclusion. MIL-STD-202 Method 108	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Anti-Sulfurized test	H_2S 1000ppm, 60°C ± 2°C, 70% RH, 720H	±(0.5% + 0.1Ω)Max

Ordering Procedure: Ex.: NS06 1/8W, 5%,1.2Ω , T/R5000

N S 0 6 W 8 J 0 1 2 J T 5 E

Resistor Size:
NS03 = 0603
NS05 = 0805
NS06 = 1206
NS07 = 1210

Wattage:
WG=1/16W, WA=1/10W, W8=1/8W, W4=1/4W
SA=1/10W-S, S8=1/8W-S, S4=1/4W-S, S3=1/3W-S

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.

Packing Type:
T = Tape/Reel

Packing Qty:
5 = 5,000 pcs.

Special Feature:
E = Lead Free (standard)

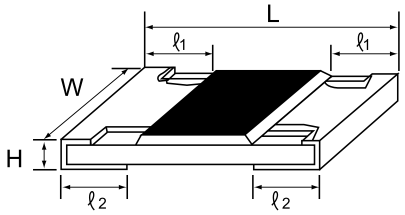
RoHS Compliant

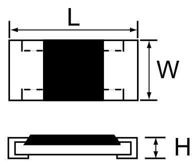
Anti-Sulfurized Thick Film Chip Resistors

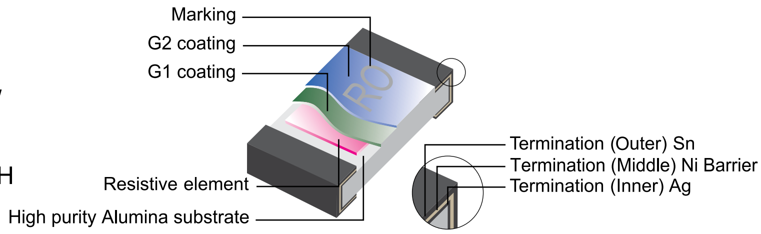
Features

- Anti-Sulfurized
- Suitable for reflow & wave soldering.
- Application, power
- The relevant provisions of the AEC-Q200.

Dimension



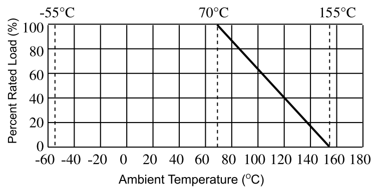


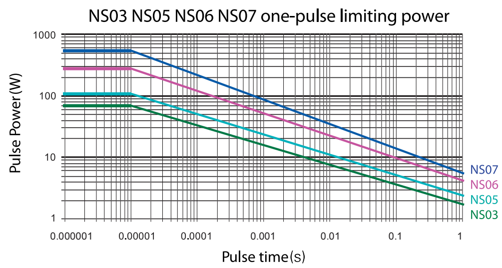


Type	Max Working Voltage	Max Overload Voltage	Dielectric	Resistance Value of Jumper	Rate Current of Jumper	Max Current of Jumper	Operating Temperature
NS03	75V	150V	300V	< 50mΩ	1A	2A	-55 ~ +155°C
NS05	150V	300V	500V	< 50mΩ	2A	5A	
NS06	200V	400V	500V	< 50mΩ	2A	10A	
NS07	200V	500V	500V	< 50mΩ	2A	10A	

Type	Power (70°C)	L (mm)	W (mm)	H (mm)	ℓ1 (mm)	ℓ2 (mm)	Resistance Range 1%(E96), 5%(E24)
NS03	1/16W (1/10W-S)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1%, 5%: 1Ω ~ 10M 0Ω
NS05	1/10W (1/8W-S)	2.00±0.15	1.25 +0.15 -0.10	0.55±0.10	0.40±0.20	0.40±0.20	
NS06	1/8W (1/4W-S)	3.10±0.15	1.55 +0.15 -0.10	0.55±0.10	0.45±0.20	0.45±0.20	
NS07	1/4W (1/3W-S)	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20	

Derating Curve





AEC-Q200 Version Chip Resistor

Performance Specification

Test Item	Test Methods	Determine Specifiction
Temperature Coefficient	Measure between: -55 °C~+125 °C	1Ω ≤ R ≤ 10Ω : ±400PPM/°C 11Ω < R ≤ 100Ω : ±200PPM/°C 100Ω < R ≤ 10MΩ : ±100PPM/°C
Short Time Overload	2.5 x rated voltage or Max. Overtoad Voltage whichever is lower for 5 seconds, then check the resistance.	±1%: ± (1.0% + 0.1Ω)Max ±5%: ± (2.0% + 0.1Ω)Max
Terminal Bending	Duration: 60s±5s, then check the resistance.	±(1.0% + 0.05Ω)Max
Solderability	245±3 °C, 2~3s	95% coverage Min
Soldering Heat	260±5 °C, 10±1s	±(1.0% + 0.05Ω)Max
Moisture Resistance	25 °C~ 65 °C, 90 ~ 100%RH, 2.5H, 65 °C 90 ~ 100%RH, 3H, 65 °C ~ 25 °C, 80 ~ 100%RH, 2.5H, 10 cycles, Measurement at 24 hours after test conclusion. MIL-STD-202 Method 106	±1% : ±(1.0% + 0.1Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Biased Humidity	10% rated power, 85 °C/85%RH, 1000H, Measurement at 24 hours after test conclusion. MIL-STD-202 Method 103	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Dieiectric Withstanding Voltage	Resistor shall be clamped in the trough of 90 metallic V-block and shall be tested at AC potential respectively specified in the given list of each product type for 60 ~ 70s.	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Temperature Cycling	-55 ± 3 °C 30min ~ normal temperature 10min-15min ~155±2 °C 30min ~ normaltemperature 10min-15min 100 cycles, Measurement at 24 hours after test conclusion. JESD22 Method JA-104	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(1.0% + 0.1Ω)Max
Load Life	125 °C, at RCWV or Max. Working Voltage whichever less, 1,000 hours(1.5 hours "ON", 0.5 hours "OFF") Measurement at 24± 2 hours after test conclusion. MIL-STD-202 Method 108	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Anti-Sulfurized test	H_2S 3~5ppm, 50°C±2°C,91%~93%RH, 1000H	±5% : ±(5.0% + 0.1Ω)Max ±1% : ±(1.0% + 0.1 Ω)Max

Ordering Procedure: Ex.: HQ06, 1/4W-S, 5%,1.2Ω , T/R5000

H Q 0 6 S 4 J 0 1 2 J T 5 E

Resistor Size:
HQ02 = 0402, HQ03 = 0603,
HQ05 = 0805, HQ06 = 1206,
HQ07 = 1210, HQ10 = 2012,
HQ12 = 2512

Wattage:
WG=1/16W, WA=1/10W, W8=1/8W,
W4=1/4W, W2=1/2W,
SA=1/10W-S, S8=1/8W-S, S4=1/4W-S,
S3=1/3W-S, 07=3/4W-S

Tolerance:
F = ±1%
G =±2%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.

Packing Type:
T = Tape/Reel

Packing Qty:
4 = 4,000 pcs. 5 = 5,000 pcs.
C = 10,000 pcs. E = 15,000 pcs.

Special Feature:
E = Lead Free (standard)

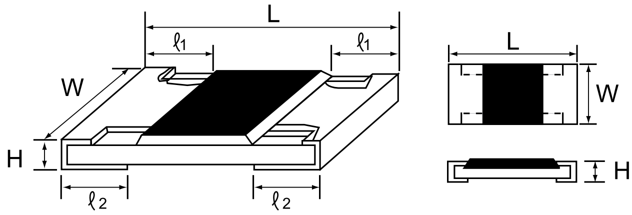
RoHS Compliant

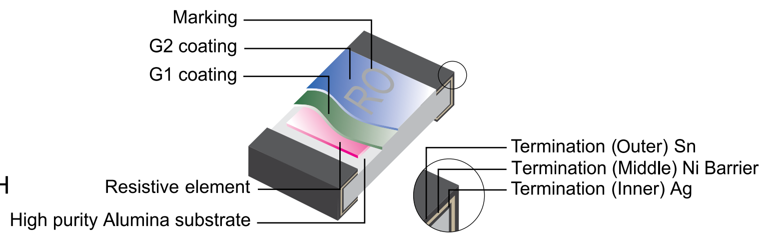
AEC-Q200 Version Chip Resistor

Features

- The relevant provisions of the AEC-Q200.
- Suitable for reflow & wave soldering.
- Application car.

Dimension

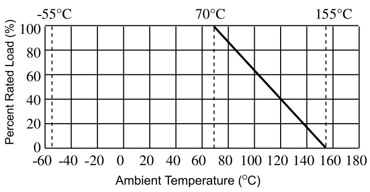




Type	Max Working Voltage	Max Overload Voltage	Dielectric	Resistance Value of Jumper	Rate Current of Jumper	Max Current of Jumper	Operating Temperature
HQ02	50V	100V	100V	< 50mΩ	1A	2A	-55 ~ +155°C
HQ03	50V	100V	100V	< 50mΩ	1A	2A	
HQ05	150V	300V	300V	< 50mΩ	2A	5A	
HQ06	200V	400V	400V	< 50mΩ	2A	10A	
HQ07	200V	500V	500V	< 50mΩ	2A	10A	
HQ10	200V	500V	500V	< 50mΩ	2A	10A	
HQ12	200V	500V	500V	< 50mΩ	2A	10A	

Type	Power (70°C)	L (mm)	W (mm)	H (mm)	ℓ1 (mm)	ℓ2 (mm)	Resistance Range 1%(E96), 5%(E24)
HQ02	1/16W	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	1Ω ~ 10M
HQ03	1/16W (1/10W-S)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	
HQ05	1/10W (1/8W-S)	2.00±0.15	$1.25^{+0.15}_{-0.10}$	0.55±0.10	0.40±0.20	0.40±0.20	
HQ06	1/8W (1/4W-S)	3.10±0.15	$1.55^{+0.15}_{-0.10}$	0.55±0.10	0.45±0.20	0.45±0.20	
HQ07	1/4W (1/3W-S)	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20	
HQ10	1/2W (3/4W-S)	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20	
HQ12	1W	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	1.80±0.20	

Derating Curve



RoHS Compliant

Common Quality Anti-Sulfurized Chip Resistor (AEC-Q200)

Performance Specification

Test Item	Test Methods	Determine Specifiction
Temperature Coefficient	Measure between: -55 °C ~ +125 °C	0.1Ω ~ 0.99Ω ±800PPM/°C 1Ω ~ 10Ω ±400PPM/°C 11Ω ~ 100Ω ±200PPM/°C >100Ω ±100PPM/°C
Short Time Overload	2.5 x rated voltage or Max. Overtoad Voltage whichever is lower for 5 seconds, then check the resistance.	±1%: ± (1.0% + 0.1Ω)Max ±5%: ± (2.0% + 0.1Ω)Max
Terminal Bending	Duration: 60s ± 5s, then check the resistance.	±(1.0% + 0.05Ω)Max
Solderability	245 ± 3 °C, 2 ~ 3s	95% coverage Min
Soldering Heat	260 ± 5 °C, 10 ± 1s	±(1.0% + 0.05Ω)Max
Moisture Resistance	25 °C ~ 65 °C, 90 ~ 100%RH, 2.5H, 65 °C 90 ~ 100%RH, 3H, 65 °C ~ 25 °C, 80 ~ 100%RH, 2.5H, 10 cycles, Measurement at 24 hours after test conclusion. MIL-STD-202 Method 106	±1% : ±(0.5% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Biased Humidity	10% rated power, 85 °C/85%RH, 1000H, Measurement at 24 hours after test conclusion. MIL-STD-202 Method 103	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Dieiectric Withstanding Voltage	Resistor shall be clamped in the trough of 90 metallic V-block and shall be tested at AC potential respectively specified in the given list of each product type for 60 ~ 70s.	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Temperature Cycling	-55 ± 3 °C 30min ~ normal temperature 10min-15min ~ 155 ± 2 °C 30min ~ normaltemperature 10min-15min 100 cycles, Measurement at 24 hours after test conclusion. JESD22 Method JA-104	±1% : ±(0.5% + 0.1 Ω)Max ±5% : ±(1.0% + 0.1Ω)Max
Load Life	125 °C, at 35% rated power, Measurement at 24± 2 hours after test conclusion. MIL-STD-202 Method 108	±1% : ±(1.0% + 0.1 Ω)Max ±5% : ±(3.0% + 0.1Ω)Max
Anti-Sulfurized test	H_2S 3 ~ 5ppm, 50°C ± 2°C,91% ~ 93%RH, 1000H	±5% : ±(5.0% + 0.1Ω)Max ±1% : ±(1.0% + 0.1 Ω)Max

Ordering Procedure: Ex.: CQ06, 1/4W-S, +/-5%,10Ω T/R5000

C Q 0 6 S 4 J 0 1 0 0 T 5 E

Resistor Size:
CQ02 = 0402, CQ03 = 0603,
CQ05 = 0805, CQ06 = 1206,
CQ07 = 1210, CQ10 = 2010,
CQ12 = 2512

Wattage:
Normal size: WH=1/32W, WM=1/20W, WG=1/16W, WA=1/10W, W8=1/8W, W4=1/4W, W2=1/2W, 1W=1W
Small size: SA=1/10W-S, S8=1/8W-S, S4=1/4W-S, S3=1/3W-S, 07=3/4W-S, U2=1/2W-SS
Applicable for Wide Terminal only: WJ=1.5W, 2W, 3W

Tolerance:
D = ±0.5%
F = ±1%
G = ±2%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
- Jumper : use "0" for 1st to 4th digits

Packing Type:
T = Tape/Reel

Packing Qty:
1 = 1,000 pcs. 2 = 2,000 pcs.
4 = 4,000 pcs. 5 = 5,000 pcs.
A = 500 pcs. C = 10,000 pcs.
D = 20,000 pcs. E = 15,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

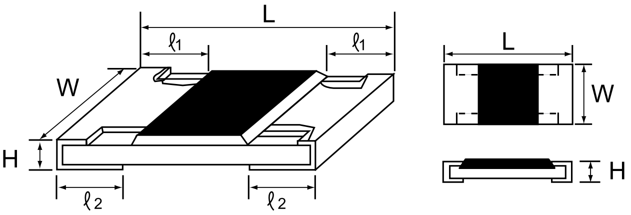
ROYALOHM

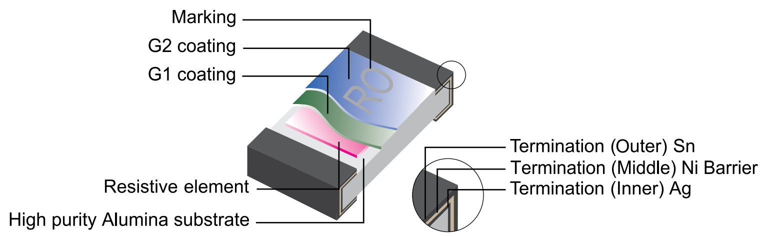
Common Quality Anti-Sulfurized Chip Resistor (AEC-Q200)

Features

- Small size and light weight
- Suitable for both wave and reflow soldering
- Reduction of assembly costs
- Automotive application with Anti Sulfurized Performance
- The relevant provisions of AEC-Q200

Dimension

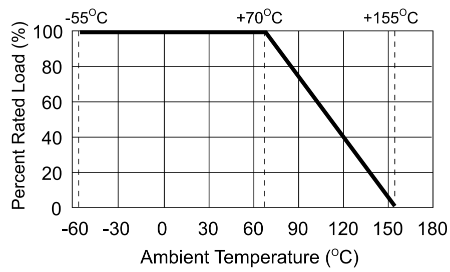




Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	Dimension (mm) L	W	H	ℓ1	ℓ2
CQ02 (0402)	1/16W	1A	2A		Jumper	<50mΩ	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
		50V	100V	100V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					
CQ03 (0603)	1/10W-S 1/16W	1A	2A		Jumper	<50mΩ	1.60±0.10	$0.80^{+0.15}_{-0.10}$	0.45±0.10	0.30±0.20	0.30±0.20
		50V	100V	100V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					
CQ05 (0805)	1/8W-S 1/10W	2A	5A		Jumper	<50mΩ	2.00±0.15	$1.25^{+0.15}_{-0.10}$	0.55±0.10	0.40±0.20	0.40±0.20
		150V	300V	300V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					
CQ06 (1206)	1/4W-S 1/8W	2A	10A		Jumper	<50mΩ	3.10±0.15	$1.55^{+0.15}_{-0.10}$	0.55±0.10	0.45±0.20	0.45±0.20
		200V	400V	400V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					
CQ07 (1210)	1/2W-SS 1/3W-S 1/4W	2A	10A		Jumper	<50mΩ	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
		200V	500V	500V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					
CQ10 (2010)	3/4W-S 1/2W	2A	10A		Jumper	<50mΩ	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
		200V	500V	500V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					
CQ12 (2512)	1W	2A	10A		Jumper	<50mΩ	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20
		200V	500V	500V	±1% ±2% ±5%	10Ω ~1MΩ 1Ω~10MΩ 1Ω~10MΩ					

Note:
1.) Metric information inside parenthesis.
2.) Standard Operating Temp (°C): -55 ~ +155
3.) Standard: E-96 series: 0.5%,1%
E-24 series: 2%, 5%
4.) Low resistance range (0.1Ω ~ 0.99Ω) is also available for CQ02, CQ03, CQ05, CQ06, CQ07, CQ10 and CQ12

Derating Curve



RoHS Compliant

Current Sensing Chip Resistors

Performance Specification

Short Time Overload	1%: ± (1.0% + 0.005Ω)Max
	5%: ± (2.0% + 0.005Ω)Max
Terminal Bending	±(1.0% + 0.005Ω)Max
Solderability	Min. 95% coverage.
Temperature Cycling	±(1.0% + 0.005Ω)Max
Soldering Heat	±(1.0% + 0.005Ω)Max
Load Life in Humidity	5% : ±(3.0% + 0.005Ω)Max
	1% : ±(1.0% + 0.005Ω)Max
Load Life	5% : ±(3.0% + 0.005Ω)Max
	1% : ±(1.0% + 0.005Ω)Max
Insulation Resistance	Min. 1,000 Mega Ohm
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.

Ordering Procedure: Ex.: CS03, 1/10W, +/-5%, 22mΩ T/R-5000

C S 0 3 W A J 0 2 2 L T 5 E

Resistor Size:
CS03 = 0603, CS05 = 0805,
CS06 = 1206, CS07 = 1210,
CS10 = 2010, CS12 = 2512

Wattage:
Normal size: WA=1/10W, W8=1/8W,W4=1/4W, W3=1/3W, W2=1/2W,07=3/4W, 1W=1W, WJ=1.5W
Small size: S4=1/4W-S, S3=1/3W-S, 07=3/4W-S, S5=1/5W-S, S2=1/2W-S

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~0.1, "K" ~ 0.01, "L" ~ 0.001, "M" ~0.0001
  Ex. 022J ~ 22mΩ, 200M ~ 20mΩ

Packing Type:
T = Tape/Reel

Packing Qty:
4 = 4,000 pcs. 5 = 5,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

T = Special T.C.R.

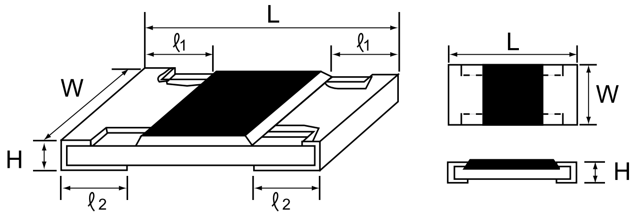
RoHS Compliant

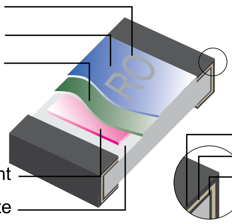
Current Sensing Chip Resistors

Features

- Ultra low Value
- Low Temperature Coefficient
- Suitable for wave and reflow soldering
- Application: Power supply
- High Power rating available upon request

Dimension





Type	Power Rating at 70°C	Dielectric Withstanding Voltage	Tolerance %	Resistance Range (mΩ)	T.C.R. (PPM/°C)	Dimension (mm)				
						L	W	H	ℓ1	ℓ2
CS03 (0603)	1/10W, 1/5W-S	300V	±1% ±5%	20mΩ ~ 29.9mΩ	±800	1.60±0.10	$0.80^{+0.15}_{-0.10}$	0.45±0.10	0.30±0.20	0.30±0.20
				30mΩ ~ 32.9mΩ	±600					
				33mΩ ~ 50mΩ	±500					
				50.1mΩ ~ 100mΩ	±400					
				101mΩ ~ 500mΩ	±300					
				501mΩ ~ 1Ω	±200					
CS05 (0805)	1/8W, 1/4W-S	500V	±1% ±5%	10mΩ ~ 15mΩ	±800	2.00±0.15	$1.25^{+0.15}_{-0.10}$	0.55±0.10	0.40±0.20	0.40±0.20
				15.1mΩ ~ 25mΩ	±600					
				25.1mΩ ~100mΩ	±400					
				101mΩ ~500mΩ	±300					
				501mΩ ~ 10Ω	±200					
CS06 (1206)	1/4W, 1/3W-S	500V	±1% ±5%	10mΩ ~50mΩ	±400	3.10±0.15	$1.55^{+0.15}_{-0.10}$	0.55±0.10	0.45±0.20	0.45±0.20
				50.1mΩ ~100mΩ	±300					
				101mΩ ~ 10Ω	±200					
CS07 (1210)	1/3W, 1/2W-S	500V	±1% ±5%	20mΩ ~ 50mΩ	±400	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20
				50.1mΩ ~ 10Ω	±200					
CS10 (2010)	1/2W, 3/4W-S	500V	±1% ±5%	20mΩ ~ 50mΩ	±400	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20
				50.1mΩ ~ 100mΩ	±200					
				101mΩ ~ 10Ω	±200					
CS12 (2512)	1W	500V	±1% ±5%	10mΩ ~ 19mΩ	±600	6.35±0.10	3.20±0.15	0.55±0.10	0.60±0.25	0.50±0.20
				20mΩ ~ 50mΩ	±400					
				501mΩ ~ 100mΩ	±200					
				101mΩ ~ 10Ω	±200					

Note:
1.) Standard Operating Temp (°C) : -55 -+155
2.) Standard : E-96 series : 1%
E-24 series : 5%
3.) High power available on case to case basis.
4.) CS07 size in 0.75W 100mΩ ~ 1Ω 100PPM/°C could be provided specially.
5.) CS12 size in 1W 50.1mΩ ~ 100mΩ 100PPM/°C could be provided specially.

RoHS Compliant

Thin Film Chip Resistors

Performance Specification

Short Time Overload	±0.5% Max
Insulation Resistance	Min. 1,000 Mega Ohm
Humidity (Steady State)	±0.3% Max
Load Life	±0.2%; >7KΩ ± 0.5% Max
Terminal Bending	±0.2% Max
Solderability	Min. 95% coverage
Resistance to Soldering Heat	±0.2% Max
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.

Ordering Procedure: Ex.: TC06, 1/8W, 25PPM, +/-0.25%, 10Ω T/R-5000

T C 0 6 2 5 C 1 0 0 J T 5 E

Resistor Size:
TC02 = 0402 TC03 = 0603
TC05 = 0805 TC06 = 1206
TC10 = 2010 TC12 = 2512
TC07 = 1210

Temperature Coefficient:
05 = 5PPM 25 = 25PPM
10 = 10PPM 50 = 50PPM
15 = 15PPM A0 = 100PPM

Tolerance:
T = ±0.01%
A = ±0.05%
B = ±0.10%
C = ±0.25%
D = ±0.5%
F = ±1%

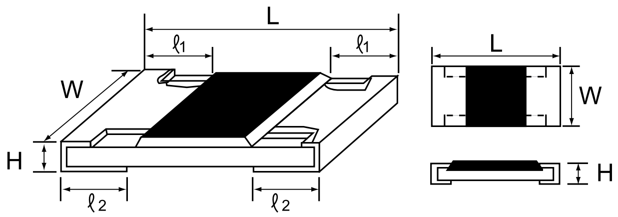
Resistance value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

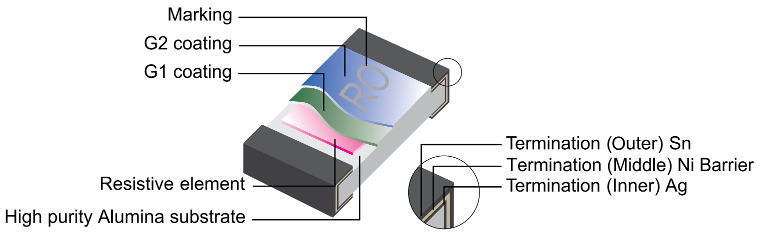
Packing Type:
T = Paper Tape/Reel
E = Plastic Tape/Reel

Packing Qty:
4 = 4,000 pcs 5 = 5,000 pcs. C = 10,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

Dimension





Type	Dimension (mm)				
	L	W	H	ℓ1	ℓ2
TC02 (0402)	1.00±0.10	0.50±0.05	0.32±0.08	0.20±0.10	0.23±0.13
TC03 (0603)	1.60±0.15	0.80±0.15	0.45±0.10	0.30±0.20	0.30±0.20
TC05 (0805)	2.00±0.15	1.25±0.15	0.55±0.10	0.35±0.25	0.40±0.25
TC06 (1206)	3.10±0.20	1.55±0.15	0.55±0.10	0.45±0.25	0.45±0.25
TC07 (1210)	3.10±0.15	2.50±0.25	0.55±0.10	0.50±0.30	0.55±0.25
TC10 (2010)	4.95±0.20	2.45±0.20	0.55±0.10	0.60±0.30	0.50±0.25
TC12 (2512)	6.35±0.20	3.15±0.20	0.55±0.10	0.60±0.30	0.50±0.25

Note:
1.) Standard Operating Temp (°C): -55 -+155
2.) Standard : All Tolerance use E-96 Series
Only 2% & 5% use E-24 Series

RoHS Compliant

Thin Film Chip Resistors

Features

- Thin Film NiCr resistance element
- Precision tolerance from ±0.01%, ±0.05%, ±0.10%, ±0.25%, ±0.50%, ±1%
- Extremely low TCR from ±5 ~ ±50 PPM/°C
- Special packaging 1,000 pcs. / 2,000 pcs. per reel available

Application

- Medical equipment
- Testing / Measuring equipment
- Communication device, cellphone. GPS, PDA
- Automatic equipment controller
- Printer equipment
- Converters

Standard

Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. PPM/°C	Tolerance %	Resistance Range (Special low)	Resistance Range	Resistance Range (Special high)
TC02 (0402)	1/16W	25V	50V	±25 ±50	±0.10% ±0.25% ±0.50% ±1.00%		10Ω ~ 332KΩ	
TC03 (0603)	1/16W	50V	100V	±25 ±50	±0.05%	4.7Ω ~ 9.76Ω	10Ω ~ 332KΩ	
					±0.10%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	
					±0.25% ±0.50% ±1.00%	1.5Ω ~ 9.76Ω	10Ω ~ 1MΩ	
TC05 (0805)	1/10W	100V	200V	±25 ±50	±0.05%	4.7Ω ~ 9.76Ω	10Ω ~ 511KΩ	
					±0.10%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 2MΩ
					±0.25% ±0.50% ±1.00%	1Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 2MΩ
TC06 (1206)	1/8W	150V	300V	±25 ±50	±0.05%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	
					±0.10%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 2.5MΩ
					±0.25% ±0.50% ±1.00%	1Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 2.5MΩ
TC07 (1210)	1/5W	150V	300V	±25 ±50	±0.05%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	
					±0.10%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 2.5MΩ
					±0.25% ±0.50% ±1.00%	1Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 2.5MΩ
TC10 (2010)	1/4W	150V	300V	±25 ±50	±0.05%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	
					±0.10%	4.7Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.1MΩ ~ 3MΩ
TC12 (2512)	1/2W				±0.25% ±0.50% ±1.00%	1Ω ~ 9.76Ω	10Ω ~ 1MΩ	1.10Ω ~ 3MΩ

RoHS Compliant

Thin Film Chip Resistors

Special Tolerance

Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. PPM/°C	Tolerance %	Resistance Range (Special low)	Resistance Range
TC02 (0402)	1/16W	25V	50V	±5	±0.01%		49.9Ω~5KΩ
					±0.05%		
					±0.10%		
				±10 ±15	±0.01%		49.9Ω~12KΩ
					±0.05%		
					±0.10%		49.9Ω~70KΩ
TC03 (0603)	1/16W	50V	100V	±5	±0.01%		25Ω~15KΩ
					±0.05%		
					±0.10%		
				±10 ±15	±0.01%		25Ω~100KΩ
					±0.05%		
					±0.10%	4.7Ω~9.76Ω	10Ω~332KΩ
TC05 (0805)	1/10W	100V	200V	±5	±0.01%		25Ω~30KΩ
					±0.05%		
					±0.10%		
				±10 ±15	±0.01%		25Ω~200KΩ
					±0.05%	4.7Ω~9.76Ω	10Ω~511KΩ
					±0.10%		
TC06 (1206)	1/8W	150V	300V	±5	±0.01%		25Ω~50KΩ
					±0.05%		
					±0.10%		
TC07 (1210)	1/5W			±10 ±15	±0.01%		25Ω~500KΩ
					±0.05%		
					±0.10%	4.7Ω~9.76Ω	10Ω~1MΩ
TC10 (2010)	1/4W	150V	300V	±5	±0.01%		25Ω~100KΩ
					±0.05%		
					±0.10%		
TC12 (2512)	1/2W			±10 ±15	±0.01%		25Ω~500KΩ
					±0.05%		
					±0.10%	4.7Ω~9.76Ω	10Ω~1MΩ

ROYALOHM

High Power Thin Film Chip Resistors

Performance Specification

Short Time Overload	±0.5% Max
Insulation Resistance	Min. 1,000 Mega Ohm
Humidity (Steady State)	±0.3% Max
Load Life	±0.2%; >7KΩ ± 0.5% Max
Terminal Bending	±0.2% Max
Solderability	Min. 95% coverage
Resistance to Soldering Heat	±0.2% Max
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.

Ordering Procedure: Ex.: TP06, 1/4W, 25PPM, +/-0.25%, 10Ω T/R-5000

T P 0 6 | 2 5 | C | 1 0 0 J | T | 5 | E

Resistor Size:
TP03 = 0603 TP05 = 0805
TP06 = 1206 TP07 = 1210

Temperature Coefficient:
05 = 5PPM 25 = 25PPM
10 = 10PPM 50 = 50PPM
15 = 15PPM A0 = 100PPM

Tolerance:
B = ±0.10%
C = ±0.25%
D = ±0.5%
F = ±1%

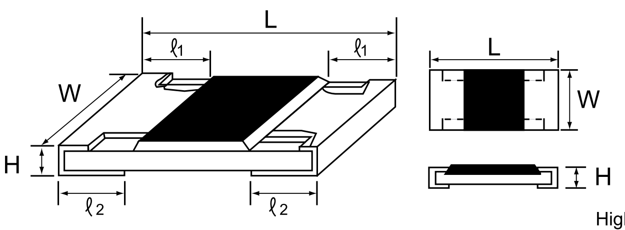
Resistance value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

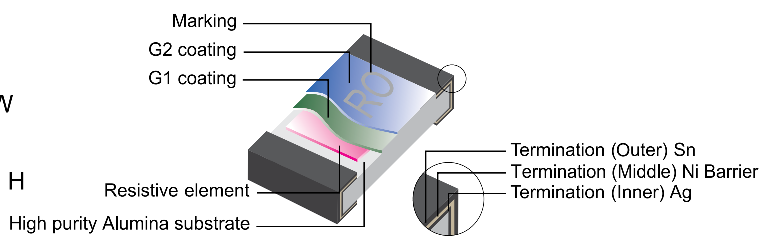
Packing Type:
T = Paper Tape/Reel
E = Plastic Tape/Reel

Packing Qty:
4 = 4,000 pcs 5 = 5,000 pcs. C = 10,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

Dimension





Type	Dimension (mm)				
	L	W	H	ℓ1	ℓ2
TP03 (0603)	1.60±0.15	0.80±0.15	0.45±0.10	0.30±0.20	0.30±0.20
TP05 (0805)	2.00±0.15	1.25±0.15	0.55±0.10	0.35±0.25	0.40±0.25
TP06 (1206)	3.10±0.20	1.55±0.15	0.55±0.10	0.45±0.25	0.45±0.25
TP07 (1210)	3.10±0.15	2.50±0.25	0.55±0.10	0.50±0.30	0.55±0.25

Note:
1.) Standard Operating Temp (°C): -55 -+155
2.) Standard : All Tolerance use E-96 Series
Only 2% & 5% use E-24 Series

RoHS Compliant

ROYALOHM

High Power Thin Film Chip Resistors

Features

- Thin Film NiCr resistance element
- Precision tolerance from ±0.10%, ±0.25%, ±0.50%, ±1%
- Extremely low TCR from ±25 PPM/°C, ±50 PPM/°C
- Special packaging 1,000 pcs. / 2,000 pcs. per reel available

Application

- Medical equipment
- Testing / Measuring equipment
- Communication device, cellphone. GPS, PDA
- Automatic equipment controller
- Printer equipment
- Converters

Standard

Type	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	T.C.R. PPM/°C	Tolerance %	Resistance Range
TP03 (0603)	1/6W-S 1/10W	75V	150V	±25 ±50	±0.10%	4.7Ω ~ 1MΩ
					±0.25%	1.5Ω ~ 1MΩ
					±0.50%	
					±1.00%	
				±10	±0.10%	10Ω ~ 10K
					±0.25%	
					±0.50%	
					±1.00%	
TP05 (0805)	1/4W-S 1/8W	150V	300V	±25 ±50	±0.10%	4.7Ω ~ 1MΩ
					±0.25%	
					±0.50%	
					±1.00%	
				±10	±0.10%	10Ω ~ 10K
					±0.25%	
					±0.50%	
					±1.00%	
TP06 (1206)	1/3W-S 1/4W	200V	400V	±25 ±50	±0.10%	4.7Ω ~ 1MΩ
					±0.25%	
					±0.50%	
					±1.00%	
				±10	±0.10%	10Ω ~ 10K
					±0.25%	
					±0.50%	
					±1.00%	
TP07 (1210)	1/3W	200V	400V	±25 ±50	±0.10%	4.7Ω ~ 10MΩ
					±0.25%	
					±0.50%	
					±1.00%	
TP10 (2010)	1/2W	200V	400V	±25 ±50	±0.10%	4.7Ω ~ 10MΩ
					±0.25%	
					±0.50%	
					±1.00%	

RoHS Compliant

Ultra Low Chip Resistors

Performance Specification

Short Time Overload	black coating: ±0.5% Max; green coating: ±1% Max
Thermal Shock	black coating: ±0.5% Max; green coating: ±1% Max
Load Life	±1% Max
Solderability	Min. 95% coverage.
Resistance to Soldering Heat	black coating: ±0.5% Max; green coating: ±1% Max

Ordering Procedure: Ex.: LR12, 100PPM, +/-1%, 5mΩ T/R-2000 1W

L R 1 2 A 0 F 5 0 0 N T 2 A

Resistor Size:
LR06 = 1206
LR10 = 2010
LR12 = 2512

Temparature Coefficient:
50 = 50ppm
75 = 75ppm
A0 = 100ppm
A5 = 150ppm
A7 = 275ppm

Tolerance:
F = ±1%
G = ±2%
J = ±5%

Resistance value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~ 0.1, "K"~0.01, "L"~0.001
  "M"~0.0001, "N"~0.00001
  Ex. 020L ~ 20mΩ, 500N ~ 5mΩ

Packing Type:
T = Tape/Reel

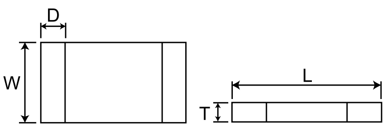
Packing Qty:
2 = 2,000 pcs.

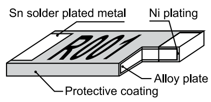
Wattage :
A=1W, B=1.5W, C=2W, D=2.5W, E=3W

Features

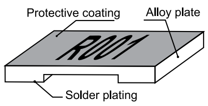
- High power rating up to 3 watts
- Low T.C.R.until ± 50PPM
- Low resistance values, from 0.5mΩ to 15mΩ
- Wide range package size 1206 / 2010 / 2512
- Tolerance : ±1%, ±2%, ±5%

Dimension



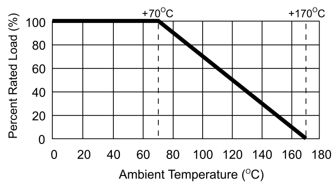


Black coating - Wave or IR reflow soldering



Green coating - IR reflow soldering only

Derating Curve



Type	Power Rating at 70°C	T.C.R. PPM/°C	Resistance Range (mΩ)	Dimension (mm) L	W	T	D	Color	Soldering
Standard									
LR06 (1206)	1W	±50	1,1.5,2,3,4, 5,6,7,8,9,10	3.20±0.254	1.60±0.104	0.60±0.20	0.980±0.380	No coating/ No Marking	IR reflow
LR12 (2512)	1W	±150	2.5,3,3.5	6.35±0.254	3.18±0.254	Depends on value	Depends on value	Black	Wave or IR reflow
		±100	4,4.5,5					Black	Wave or IR reflow
		±75	6,6.5,7					Black	Wave or IR reflow
		±50	0.5,0.75,1,1.5,2					Black	Wave or IR reflow
		±50	11,12,13,14,15					Green	IR reflow
High Power Rating									
LR10 (2010)	1.5W	±50	1,1.5,2,3,4, 5,6,7,8,9,10	5.08±0.254	2.54±0.15	0.60±0.20	1.665±0.625	No coating/ No Marking	IR reflow
LR12 (2512)	2.0W	±275	1,2	6.35±0.254	3.18±0.254	Depends on value	Depends on value	Black	Wave or IR reflow
		±100	3,5,10					Black	
		±50	0.5,0.75,1,1.5,2 3.5,6.5,7,8,9,10					Green	IR reflow
	2.5W	±50	4,4.5,5,6					Green	IR reflow
	3W	±100 ±50	0.5,0.75 1,2,3					Green	IR reflow

Note: LR12 2W special TCR available case by case on basis.
Standard Operating Temp (°C): -55~+170

RoHS Compliant

Thick Film Chip Resistor Arrays - Convex Terminal

Performance Specification

Short Time Overload	±(2.0% + 0.1Ω)Max
Terminal Bending	±(1.0% + 0.05Ω)Max
Soldering Heat	±(1.0% + 0.05Ω)Max
Insulation Resistance	Min. 1,000 Mega Ohm
Solderability	Min. 95% coverage.
Temperature Cycling	±(1.0% + 0.05Ω)Max
Load Life in Humidity	±(3.0% + 0.1Ω)Max
Load Life	±(3.0% + 0.1Ω)Max
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.

Ordering Procedure: Ex.: RMC 1/16W (2D02), +/-1%,10Ω, T/R5000

2 D 0 2 W G F 1 0 0 J T C E

Resistor Size:
2D02, 4D02, 4D03,
10P8, 16P8

Wattage:
WG = 1/16W
WH = 1/32W

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 2Ω26~ 266K, 266Ω~2260

Packing Type:
T = Tape/Reel

Packing Qty:
4 = 4,000 pcs.
5 = 5,000 pcs.
C = 10,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/
RoHS compliant

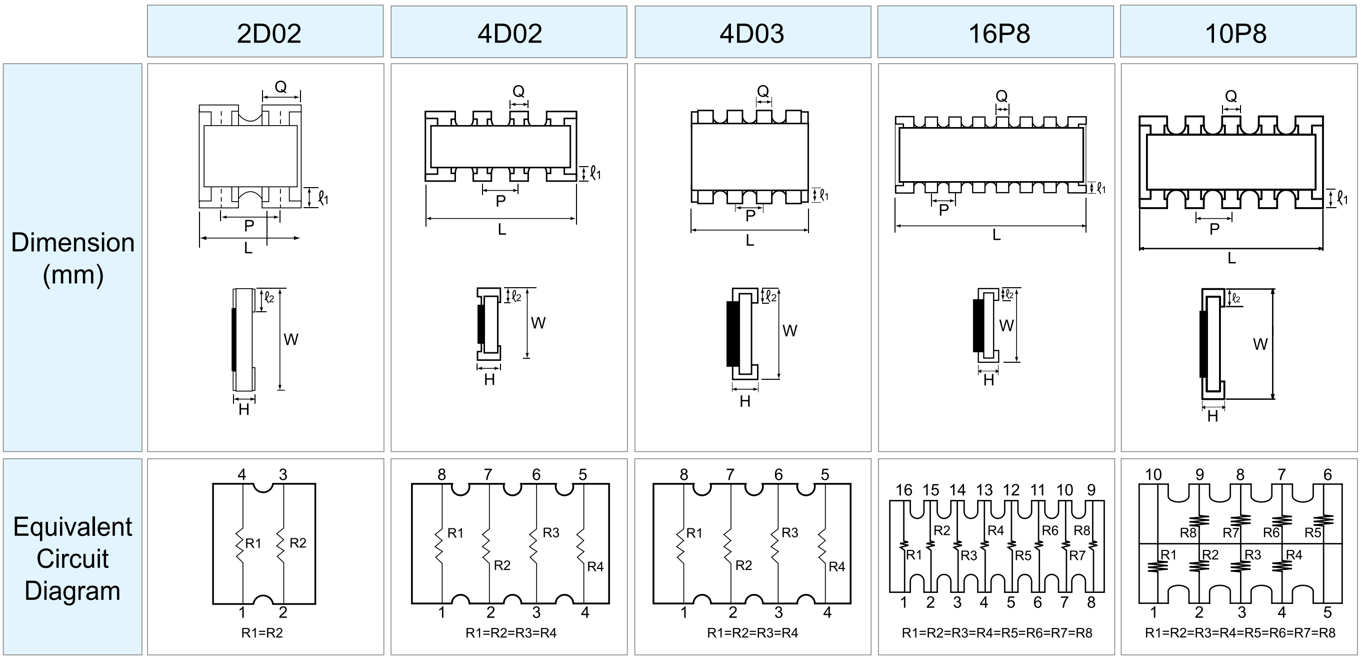
Thick Film Chip Resistor Arrays - Convex Terminal

Features

- High density 2,4,8 resistors in one small case (convex type)
- Improvement of placement efficiency
- Packaging is suitable for automatic placement machines
- Superior solderability
- Scalloped

Mechanical Specification

Standard : 2% ,5% ,10% -- E - 24 series
1% -- E - 96 series



Type	Style	L	W	H	ℓ1	ℓ2	P	Q
2D02 (0402x2)	2D02 (4Pin 2R)	1.00±0.10	1.00±0.10	0.35±0.10	0.17±0.10	0.25±0.10	0.65±0.05	0.33±0.10
4D02 (0402x4)	4D02 (8Pin 4R)	2.00±0.10	1.00±0.10	0.45±0.10	0.20±0.15	0.30±0.15	0.50±0.05	0.30±0.05
4D03 (0603x4)	4D03 (8Pin 4R)	3.20±0.20	1.60±0.20	0.50±0.10	0.30±0.15	0.40±0.15	0.80±0.10	0.50±0.15
16P8	16P8 (16Pin 8R)	4.00±0.20	1.60±0.15	0.45±0.10	0.30±0.15	0.40±0.10	0.50±0.05	0.30±0.05
10P8	10P8 (10Pin 8R)	3.20±0.20	1.60±0.15	0.55±0.10	0.40±0.10	0.30±0.10	0.64±0.05	0.35±0.05

Type	Style	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	T.C.R. PPM/°C	Resistance Range		Jumper Rated Current
							F(±1%)	J(±5%)	
2D02 (0402x2)	2D02 (4Pin 2R)	1/16W	50V	100V	100V	±200	10Ω~1MΩ	10Ω~1MΩ	1A
4D02 (0402x4)	4D02 (8Pin 4R)	1/16W	50V	100V	100V	±200	10Ω~1MΩ	10Ω~1MΩ	1A
4D03 (0603x4)	4D03 (8Pin 4R)	1/16W	50V	100V	300V	<10Ω : ±400 ≥10Ω : ±200	10Ω~1MΩ	1Ω~1MΩ	1A
16P8	16P8 (16Pin 8R)	1/16W	50V	100V	300V	<10Ω : ±400 ≥10Ω : ±200	1Ω~1MΩ	1Ω~1MΩ	1A
10P8	10P8 (10Pin 8R)	1/32W	25V	50V	50V	±200	10Ω~1MΩ	10Ω~1MΩ	0.5A

Standard Operating Temp (°C) : -55~+155

RoHS Compliant

Thick Film Chip Resistor Arrays - Concave Terminal

Performance Specification

Short Time Overload	±(2.0% + 0.1Ω)Max
Terminal Bending	±(1.0% + 0.05Ω)Max
Soldering Heat	±(1.0% + 0.05Ω)Max
Insulation Resistance	Min. 1,000 Mega Ohm
Solderability	Min. 95% coverage.
Temperature Cycling	±(1.0% + 0.05Ω)Max
Load Life in Humidity	±(3.0% + 0.1Ω)Max
Load Life	±(3.0% + 0.1Ω)Max
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.

Ordering Procedure: Ex.: RMC 1/16W (2C02), +/-1%,10Ω, T/R5000

2 C 0 2 | W G | F | 1 0 0 J | T | C | E

Resistor Size:
2C02, 4C02, 4C03

Wattage:
Normal size:
WG = 1/16W
Special:
SA = 1/10W-S

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
- E-96 series:
  1st to 3rd digits are significant figures of the resistance
  4th digit indicates the number of zeros.
  "J" ~0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 2Ω26~ 266K, 266Ω~2260

Packing Type:
T = Tape/Reel

Packing Qty:
4 = 4,000 pcs.
5 = 5,000 pcs.
C = 10,000 pcs.

Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

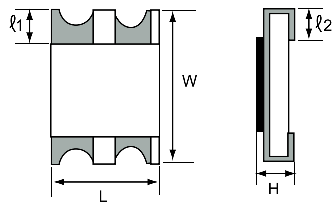
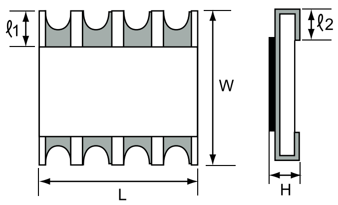
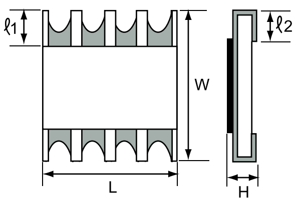
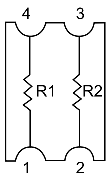
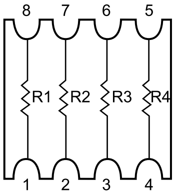
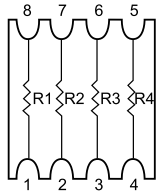
RoHS Compliant

Thick Film Chip Resistor Arrays - Concave Terminal

Features

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

Standard : 2% ,5% ,10% -- E-24 series
1% -- E-96 series

	2C02	4C02	4C03
Dimension (mm)			
Equivalent Circuit Diagram	 R1=R2	 R1=R2=R3=R4	 R1=R2=R3=R4

Type	Style	L	W	H	ℓ1	ℓ2
2C02	2C02 (4Pin 2R)	1.00±0.10	1.00±0.10	0.35±0.10	0.15±0.10	0.30±0.10
4C02	4C02 (8Pin 4R)	2.00±0.10	1.00±0.10	0.45±0.10	0.15±0.10	0.30±0.10
4C03	4C03 (8Pin 4R)	3.20±0.20	1.60±0.20	0.60±0.10	0.30±0.20	0.40±0.10

Type	Style	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	T.C.R. PPM/°C	Resistance Range		Jumper Rated Current
							F(±1%)	J(±5%)	
2C02	2C02 (4Pin 2R)	1/16W	50V	100V	100V	±200	10Ω ~ 1MΩ	10Ω ~ 1MΩ	1A
4C02	4C02 (8Pin 4R)	1/16W	50V	100V	100V	±200	10Ω ~ 1MΩ	10Ω ~ 1MΩ	1A
4C03	4C03 (8Pin 4R)	1/16W 1/10W-S	50V	100V	300V	<10Ω: ±400 ≥10Ω: ±200	1Ω ~ 1MΩ	1Ω ~ 1MΩ	1A

Standard Operating Temp (°C): -55~+155

RoHS Compliant

Kit Resistors

Chip Kit

Coated Kit

Ordering Procedure: Ex: 0603, 1/16W, +/-1%, E-6 series, Chip Kit Resistors

0	6	0	3	W	G	F	E	0	0	6	K	I	T

Resistor Size:
- Chip type:
  0402, 0603, 0805, 1206, 2512
- Coated type:
  Carbon Film Fixed Resistors
  (see page 25 for boxes no.1st - 7th)
  Metal Film Fixed Resistors
  (see page 28 for boxes no.1st - 7th)

Wattage:
Normal:
WG = 1/16W
WA = 1/10W
W8 = 1/8W
W4 = 1/4W
W2 = 1/2W
1W = 1W
Small size:
SA = 1/10WS
S8 = 1/8WS
S4 = 1/4WS
S2 = 1/2WS

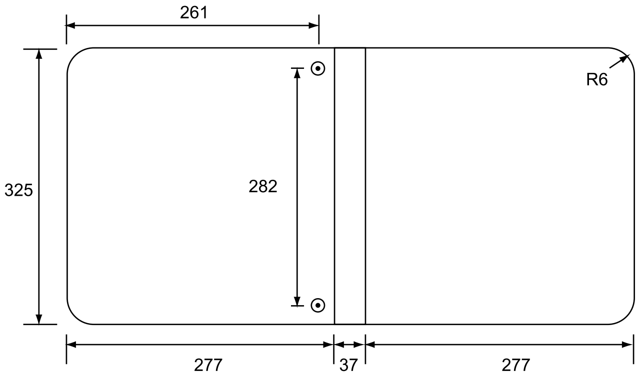
Tolerance:
F = ±1%
J = ±5%

Resistance value:
For Kit Resistors
E006 = E-6 Series
E012 = E-12 Series
E024 = E-24 Series

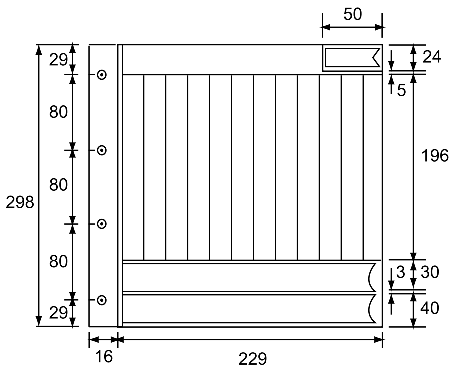
Special Feature:
- KIT = Kit resistors (with mslstors)
- KON = Album only (no resistors)
- KIL = Index only (no resistors)
- KIN = Insert only (no resistors)
- KIC = Insert and Album, Cover lid,
  (No resistors)

Chip Type

Album Kit Dimension

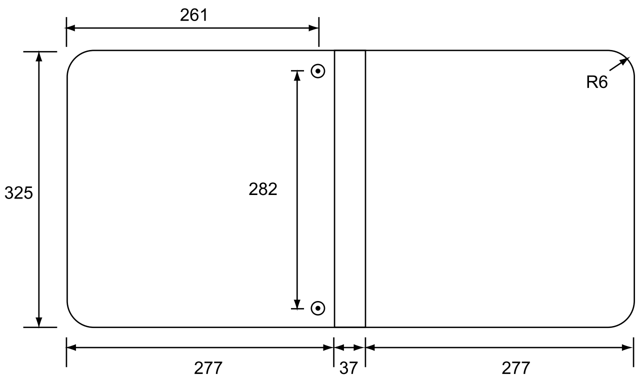


Inserts for Chip Kit

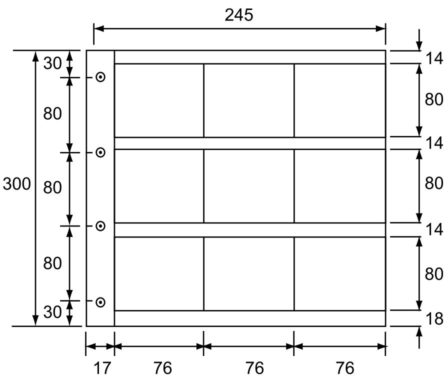


Coated Type

Album Kit Dimension



Inserts for Coated Kit



Sample:
1.) SMD Kit 1/16W (0603) 1% E-6 Serles-0603WGFE006KIT
2.) Album only Kit 1/16W (0603) 1% E-6 Series-0603WGFE006KON (no chip reslstors)
3.) Chip Kit Standard : E-6 : 32 values
E-12 : 62 values
E-24 : 121 values

RoHS Compliant

Resistor Networks

Performance Specification

Temperature Coefficient	50Ω ~ 1MΩ :	±200PPM/°C
	<50Ω & >1MΩ :	±250PPM/°C
Short Time Overload	±(0.5% + 0.1Ω)Max	
Insulation Resistance	Min. 10,000 Mega Ohm	
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.	
Terminal Strength	±(0.5% + 0.1Ω)Max	
Resistance to Soldering Heat	±(0.5% + 0.1Ω)Max	
Solderability	Min. 95% coverage.	
Thermal Shock	±(0.5% + 0.1Ω)Max	
Temperature Cycling	±(0.5% + 0.1Ω)Max	
Load Life in Humidity	±(3.0% + 0.1Ω)Max	
Load Life	±(3.0% + 0.1Ω)Max	

Ordering Procedure: Ex.: RNL A-type, 10 Pins, +/-2%, 10KΩ, B/B

R	N	L	A	1	0	G	0	1	0	3	B	0	E

Resistor Size:
RNL = Resistors Network Low Profile

Circuit Type:
A = Single Common
B = Isolated

Wattage:
04 = 4 pins
05 = 5 pins
06 = 6 pins
07 = 7 pins
08 = 8 pins
09 = 9 pins
10 = 10 pins
11 = 11 pins
12 = 12 pins
13 = 13 pins
14 = 14 pins

Tolerance:
G = ±2%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are significant figures of the resistance
  4th indicates the number of zeros
  "J" ~ 0.1, "K" ~ 0.01, "L" ~ 0.001
  Ex. 012J ~ 1Ω2, 226K ~ 2Ω26

Packing Type:
B = Bulk/Box

Packing Qty:
0 = NIL

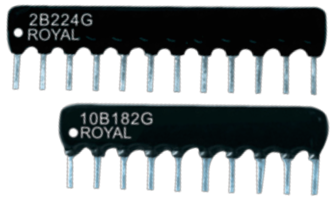
Special Feature:
E = Lead (Pb) Free Plating Type/ RoHS compliant

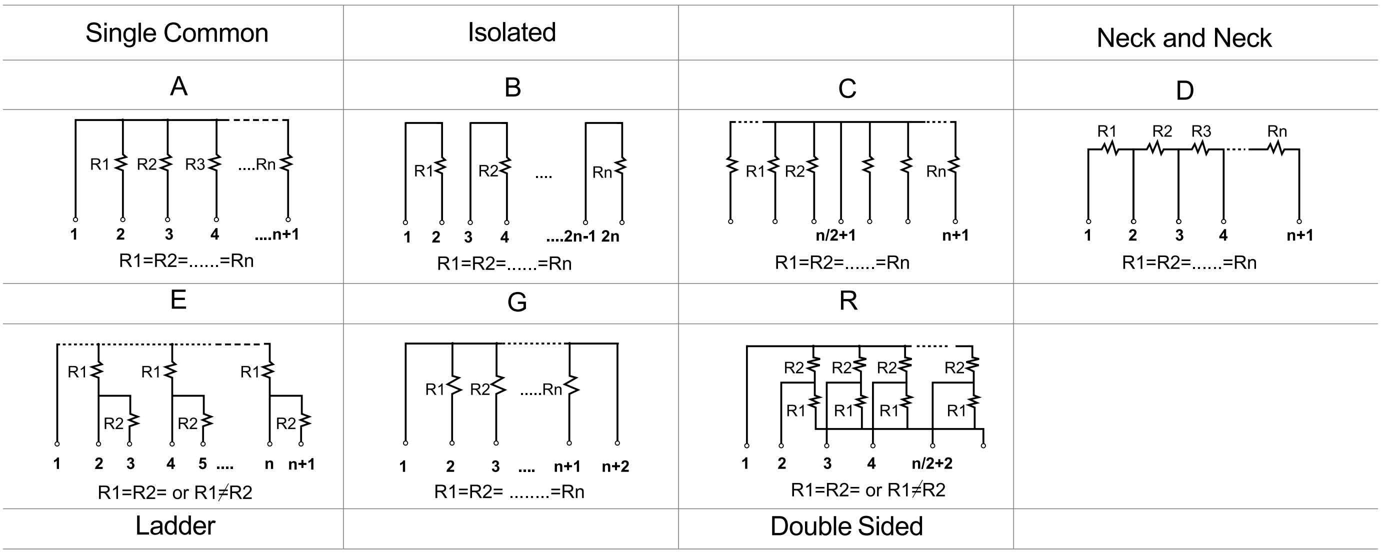
RoHS Compliant

Resistor Networks

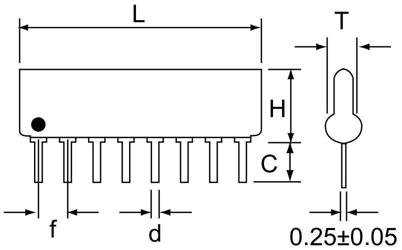
Features

- High reliability with RUO2 paste
- Miniature, high density packaging
- Combination of different ohmic values are available

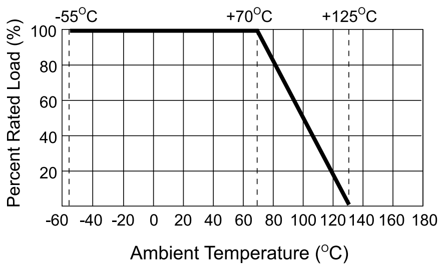




Dimension (mm)



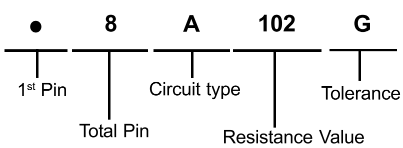
Derating Curve



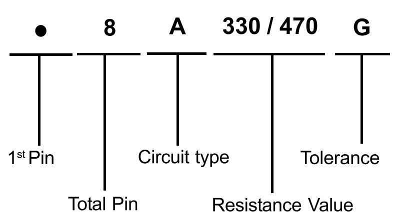
Dual Value (R1/R2)(Ohm)	
160 / 240	330 / 390
180 / 390	330 / 470
220 / 270	1.5K / 3.3K
220 / 330	3.0K / 6.2K

Type	L (Max.)	H (Max.)	T (Max.)	$C^{+0.5}_{-0.3}$	d±0.1	f±0.2
4 pins	10.2	5.08	2.5	3.3	0.5	2.54
5 pins	12.7					
6 pins	15.3					
7 pins	17.8					
8 pins	20.4					
9 pins	22.9					
10 pins	25.4					
11 pins	28.2					
12 pins	30.5					
13 pins	31.1					
14 pins	35.6					

Marking (Single Value)



Marking (Dual Value)



Note: Type A & B are commonly ordered. Other types can be provided on a case to case basis

Type	Power Rating at 70°C	Operating Temp. Range	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range
B Type	0.2W	-55°C ~ +125°C	100V	150V	200V	±2% ±5%	R-Type 100Ω ~ 10KΩ
Other	0.125W	-55°C ~ +125°C	100V	150V	200V		Others: 10Ω ~ 1MΩ

RoHS Compliant

Carbon Film Fixed Resistors

Performance Specification

Temperature Coefficient	≤ 10Ω : ±350PPM/ °C 11Ω ~ 99KΩ : 0 ~ -450PPM/ °C 100KΩ ~ 1MΩ : 0 ~ -700PPM/ °C 1.1MΩ ~ 10MΩ : 0 ~ -1500PPM/°C
Short Time Overload	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Insulation Resistance	Min. 10,000 Mega 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	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and markings.
Temperature Cycling	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	Normal type: <100KΩ: ±(3.0% + 0.05Ω)Max ≥100KΩ: ±(5.0% + 0.05Ω)Max Non-Flame type: <100KΩ: ±(5.0% + 0.05Ω)Max ≥100KΩ: ±(10.0% + 0.05Ω)Max
Load Life	Normal type: <56KΩ: ±(2.0% + 0.05Ω)Max ≥56KΩ: ±(3.0% + 0.05Ω)Max Non-Flame type: <100KΩ: ±(5.0% + 0.05Ω)Max ≥100KΩ: ±(10.0% + 0.05Ω)Max

Ordering Procedure: Ex.: CFR 1/4W, +/-5%, 10KΩ, T/B-5000

C F R 0 W 4 J 0 1 0 3 A 5 0

Type:
CFR = Carbon Film

Feature:
0 = Standard
F = Non-Flame
I = Non-Inductive

Wattage:

Normal size
WG = 1/16W
W8 = 1/8W
W4 = 1/4W
W2 = 1/2W
1W = 1W
2W = 2W

Small size
S4 = 1/4W-S
S3 = 1/3W-S
S2 = 1/2W-S
1S = 1W-S
2S = 2W-S
3S = 3W-S

Extra small size
U2 = 1/2W-SS
1U = 1W-SS

Tolerance:
F = ±1%
G = ±2%
J = ±5%
K = ±10%

Resistance Value:

- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33KΩ = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26mm

Packing Qty:
1 = 1,000 pcs. 2 = 2,000 pcs.
4 = 4,000 pcs. 5 = 5,000 pcs.
A = 500 pcs. B = 2,500 pcs.
0 = Bulk/Box

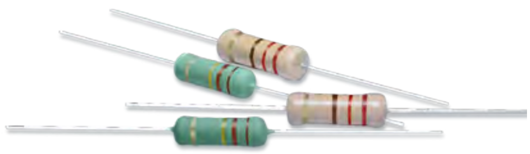
Additional Information:
P = Panasert type
1 = Avisert type
2 = Avisert type 2
3 = Avisert type 3
0 = PT-52mm, PT-26mm, Standard lead wire for Bulk/Box
8 = PT-58mm
9 = PT-64mm
7 = Lead wire (H) 38mm
C = PT-73mm

RoHS Compliant

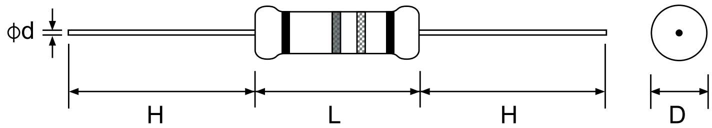
Carbon Film Fixed Resistors

Features

- Automatically insertable
- High quality performance
- Non-Flame type available
- Cost effective and commonly used
- Too low or too high values can be supplied on case to case basis



Standard : 2% ,5% ,10% -- E-24 series
1% -- E-96 series

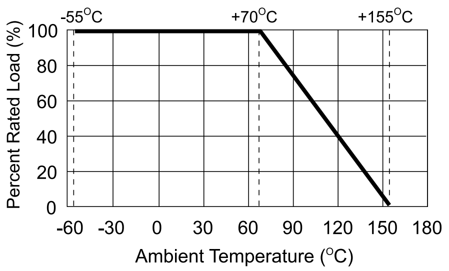


Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Std Packing Qty
			D Max	L Max	H±3	d±0.05	PT					
Normal size												
CFR0W8	CFR 12	1/8W (0.125W)	1.85	3.5	28	0.45	52	1Ω ~ 1MΩ	200	400	400	5,000
CFR0W4	CFR 25	1/4W (0.25W)	2.5	6.8	28	0.54(1)	52	1Ω ~ 10MΩ	250	500	500	5,000
CFR0W2	CFR 50	1/2W (0.50W)	3.5	10.0	28	0.54	52	1Ω ~ 10MΩ	350	700	700	1,000
CFR01W	CFR 100	1W	5.5	16.0	28	0.70	64	1Ω ~ 10MΩ	500	1,000	1,000	1,000
CFR02W	CFR 200	2W	6.5	17.5	28	0.75	64	1Ω ~ 10MΩ	500	1,000	1,000	500
Small size												
CFR0S4	CFR 25-S	1/4W (0.25W)	1.85	3.5	28	0.45	52	1Ω ~ 1MΩ	200	400	400	5,000
CFRFU2	CFR 50-SS	1/2W (0.50W)	2.5	6.8	28	0.54(1)	52	1Ω ~ 10MΩ	250	500	250	5,000
CFR0S2	CFR 50-S	1/2W (0.50W)	3.0	9.0	28	0.54	52	1Ω ~ 10MΩ	350	700	700	4,000
CFRF1U	CFR 100-SS	1W	3.5	10.0	28	0.54	52	1Ω ~ 10MΩ	350	700	350	1,000
CFR01S	CFR 100-S	1W	5.0	12.0	25	0.70	52	1Ω ~ 10MΩ	500	1,000	1,000	1,000
CFR02S	CFR 200-S	2W	5.5	16.0	28	0.70	64	1Ω ~ 10MΩ	500	1,000	1,000	1,000
CFR03S	CFR 300-S	3W	6.5	17.5	28	0.75	64	1Ω ~ 10MΩ	500	1,000	1,000	500

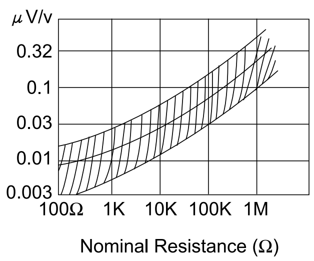
Note:

- Standard beige base color
- Standard grayish-green base color (Non-flammable coating) for CFRFU2 (CFR-50-SS) and CFRF1U (CFR-100-SS)
- (1) Lead diameter of CFR0W4 & CFRFU2 can be provided in 0.50mm, 0.54mm & 0.60mm
- Ohmic values outside the standard range available on a case to case basis

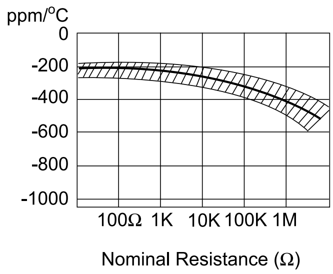
Derating Curve



Current Noise



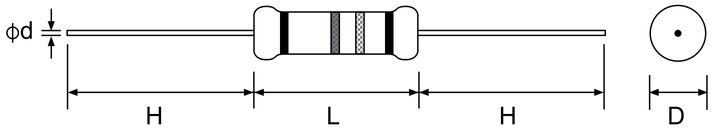
Temp. Coefficient



RoHS Compliant

Carbon Film Fixed Resistors

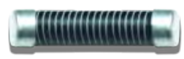
1) Copper Plated Steel Lead Wire Type
Copper Plated Wire (CP)
Tin Plated Copper Steel Lead Wire (CT)

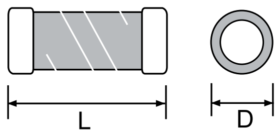


Part No.	Style	Power Rating at 70°C	Dimension (mm)					Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	Std Packing Qty
			D Max	L Max	H±3	d±0.02	PT					
CPxxW8 / CTxxW8	CP/ CT 12	1/8W (0.125W)	1.85	3.5	28	0.50	52	200V	400V	400V	1Ω ~ 1MΩ	5,000
CPxxW4 / CTxxW4	CP/ CT 25	1/4W (0.25W)	2.5	6.8	28/38	0.50	52	250V	500V	500V	1Ω ~ 10MΩ	5,000
CPxxS3 / CTxxS3	CP/ CT 33-S	1/3W (0.33W)	2.5	6.8	28/38	0.50	52	300V	600V	500V	1Ω ~ 10MΩ	5,000
CPxxW3 / CTxxW3	CP/ CT 33	1/3W (0.33W)	3.0	9.0	28	0.50	52	300V	600V	700V	1Ω ~ 10MΩ	2,000
CPxxS2 / CTxxS2	CP/ CT 50-S	1/2W (0.5W)	3.0	9.0	28	0.50	52	350V	700V	700V	1Ω ~ 10MΩ	2,000

2) Cutting (CO) Type

Part No.	Style	Power Rating at 70°C	Dimension (mm)		Resistance Range
			D	L	
CO...W8	CO 12	1/8W (0.125W)	1.6 +0.10 / -0.00	3.2±0.1	1Ω ~ 10MΩ
CO...W4	CO 25	1/4W (0.25W)	2.1 +0.09 / -0.00	5.6 +0.10 / -0.20	1Ω ~ 10MΩ
CO...W4-A	CO 25-A	1/4W (0.25W)	2.1 +0.09 / -0.00	5.9 +0.10 / -0.15	1Ω ~ 10MΩ
CO...W4-B	CO 25-B	1/4W (0.25W)	2.1 +0.09 / -0.00	6.4 +0.10 / -0.15	1Ω ~ 10MΩ





Cutting type resistors are produced without lead wire and without coating
*Cap plated : Tin plated (ROYALOHM std.)

Ordering Procedure: Ex.: CPO 1/4W, +/-5%, 10Ω, T/B-5000

C P O 0 W 4 J 0 1 0 0 A 5 0

Type:
CPO =
Copper plated lead wire (H=28mm)
CPL =
Copper plated lead wire (H=38mm)
CTO =
Tin plated copper steel lead wire (H=28mm)
CTL =
Tin plated copper steel lead wire (H=38mm)
COT=
Cutting Type (Tin-Plated Cap)

Feature:
0 = Standard
F = Non-Flame
I = Non-Inductive

Wattage:
Normal
W8 = 1/8W
W4 = 1/4W
W3 = 1/3W

Small
S2 = 1/2W-S
S3 = 1/3W-S

Tolerance:
G = ± 2%
J = ± 5%
K = ± 10%

Resistance Value:
- E-24 series:
  1st digit is “0”
  2nd & 3rd digits are the significant figures of the resistance
  4th digit indicates the number of zeros: “J” ~ 0.1, “K” ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box

Packing Qty:
1 = 1,000 pcs. 2 = 2,000 pcs. 4 = 4,000 pcs.
5 = 5,000 pcs. A = 500 pcs. B = 2,500 pcs.
0 = Bulk/Box

Additional Information:
0 = CP/CT Type
A = Cutting type (CO-25-A)
B = Cutting type (CO-25-B)

RoHS Compliant

Precision Metal Film Fixed Resistors

Performance Specification

Temperature Coefficient	Within the maximum temperature coefficient specified.
Short Time Overload	±(0.5% + 0.05Ω)Max, with no evidence of mechanical damage.
Insulation Resistance	Min. 10,000 Mega Ohm
Dielectric Withstanding Voltage	No evidence of flashover,mechanical damage, arcing or insulation breakdown.
Pulse Overload	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and markings.
Temperature Cycling	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady state)	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	Normal type: ±(1.5% + 0.05Ω)Max Non-Flame type: ±(5.0% + 0.05Ω)Max
Load Life	Normal type: ±(1.5% + 0.05Ω)Max Non-Flame type: ±(5.0% + 0.05Ω)Max

Ordering Procedure: Ex.: MFR 1/2W, +/-5%, 200PPM, 10Ω, T/B-1000

M F 0 W 2 J J 0 1 0 0 A 1 0

Type:
- MF = Metal Film
- MT = Metal Film Tin plated copper steel lead wire

Feature:
- 0 = Standard
- F = Non-Flame
- I = Non-Inductive

Wattage:

Normal size
- W8 = 1/8W
- W4 = 1/4W
- W2 = 1/2W
- 1W = 1W
- 2W = 2W
- 3W = 3W

Small size
- S4 = 1/4W-S
- S2 = 1/2W-S
- 06 = 0.6W-S
- M7 = 0.75W-S
- 1S = 1W-S
- 2S = 2W-S
- 3S = 3W-S

Extra small size
- U2 = 1/2W-SS
- 04 = 0.4W-SS

Tolerance:
- B = ±0.1%
- C = ±0.25%
- D = ±0.5%
- F = ±1%
- G = ±2%
- J = ±5%

PPM requirement:
- B = 15ppm
- C = 25ppm
- F = 50ppm
- G = 100ppm
- J = 200ppm

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33KΩ = 1331

Packing Type:
- A = Tape/Box
- T = Tape/Reel
- B = Bulk/Box
- P = Tape/Box of PT-26mm

Packing Qty:
- 1 = 1,000 pcs.
- 2 = 2,000 pcs.
- 4 = 4,000 pcs.
- 5 = 5,000 pcs.
- A = 500 pcs.
- B = 2,500 pcs.
- 0 = Bulk/Box

Additional Information:
- P = Panasert type
- 1 = Avisert type
- 2 = Avisert type 2
- 3 = Avisert type 3
- 0 = PT-52mm, PT-26mm, Standard lead wire for Bulk/Box
- 8 = PT-58mm
- 9 = PT-64mm
- 7 = Lead wire (H) 38mm

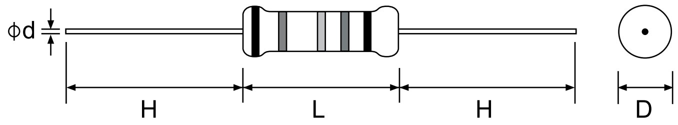
RoHS Compliant

Precision Metal Film Fixed Resistors

Features

- EIA standard color coding
- Non-Flame type available
- Low noise & voltage coefficient
- Low temperature coefficient range
- Wide precision range in small package
- Too low or too high ohmic value can be supplied on a case to case basis
- Nichrome resistor element provides stable performance in various environment
- Multiple epoxy coating on vacuum deposited metal film provides superior moisture protection

Standard : 2% ,5% ,10% -- E-24 series
1% -- E-96 series



Part No.	Style	Power Rating at 70°C	Dimension (mm)					Std Packing Qty
			D Max	L Max	H±3	d±0.05	PT	
Normal Size								
MF0W8	MF 12	1/8W (0.125W)	1.85	3.5	28	0.45	52	5,000
MF0W4	MF 25	1/4W (0.25W)	2.5	6.8	28	0.54[1]	52	5,000
MF0W2	MF 50	1/2W (0.50W)	3.5	10.0	28	0.54	52	1,000
MF01W	MF 100	1W	5.0	12.0	25	0.70	52	1,000
MF02W	MF 200	2W	5.5	16.0	28	0.70	64	1,000
MF03W	MF 300	3W	6.5	17.5	28	0.75	64	500
Small Size								
MF0S4	MF 25-S	1/4W (0.25W)	1.85	3.5	28	0.45	52	5,000
MFF04	MF 40-SS	0.4W	1.9	3.7	28	0.45	52	5,000
MFFU2	MF 50-SS	1/2W (0.50W)	2.5	6.8	28	0.54[1]	52	5,000
MF0S2	MF 50-S	1/2W (0.50W)	3.0	9.0	28	0.54	52	4,000
MF006	MF 60-S	0.6W	2.5	6.8	28	0.54[1]	52	5,000
MF0M7	MF 75-S	0.75W	3.5	10.0	28	0.54	52	1,000
MF01S	MF 100-S	1W	3.5	10.0	28	0.54	52	1,000
MF02S	MF 200-S	2W	5.0	12.0	25	0.70	52	1,000
MF03S	MF 300-S	3W	5.5	16.0	28	0.70	64	1,000

Note:

- Extra small size types (-SS) are Non flame coating (Dark Green color).
- [1] Lead diameter of MF0W4, MF006 & MFFU2 can be provided in 0.50mm, 0.54mm & 0.60mm

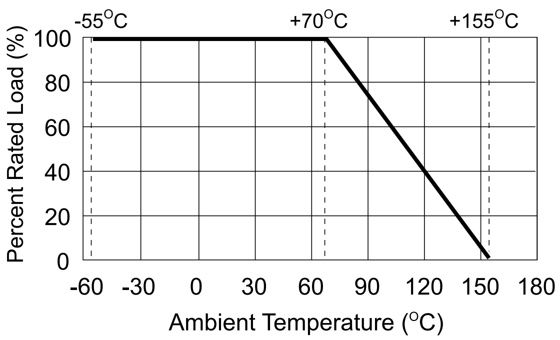
RoHS Compliant

Precision Metal Film Fixed Resistors

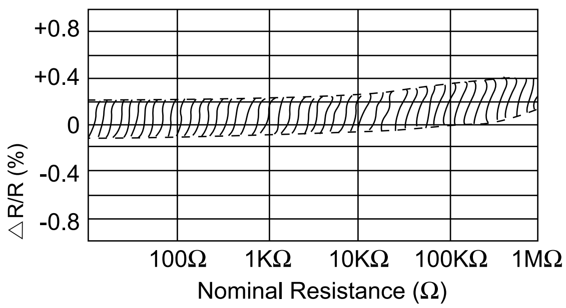
Part No.	Style	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance %	Resistance Range	T.C.R.	Special Order		
								Tolerance %	Resistance Range	T.C.R.
MF0W8 MF0S4	MF 12 MF 25-S	200V	400V	400V	±1% ±2% ±5%	10Ω ~ 1MΩ 10Ω ~ 1MΩ 1Ω ~ 1MΩ	± 50PPM/°C ±100PPM/°C ±200PPM/°C	±0.25%	51.1Ω ~ 200KΩ	±15PPM/°C ±25PPM/°C ±50PPM/°C
MFF04	MF 40-SS	200V	400V	200V				±0.5%	51.1Ω ~ 511KΩ	
MF0W4 MF006	MF 25 MF 60-S	250V	500V	500V	±1% ±2% ±5%	10Ω ~ 1MΩ 10Ω ~ 1MΩ 1Ω ~ 1MΩ	± 50PPM/°C ±100PPM/°C ±200PPM/°C	±0.1% ±0.25%	100Ω ~ 100KΩ 51.1Ω ~ 330KΩ	±15PPM/°C ±25PPM/°C ±50PPM/°C
MFFU2	MF 50-SS	250V	500V	250V				±0.5%	10Ω ~ 1MΩ	
MF0W2 MF0S2 MF0M7 MF01S	MF 50 MF 50-S MF 75-S MF 100-S	350V	700V	700V	±1% ±2% ±5%	10Ω ~ 1MΩ 10Ω ~ 1MΩ 1Ω ~ 1MΩ	±50PPM/°C ±100PPM/°C ±200PPM/°C	±0.1% ±0.25% ±0.5%	100Ω ~ 330KΩ 51.1Ω ~ 511KΩ 10Ω ~ 1MΩ	±15PPM/°C ±25PPM/°C ±50PPM/°C
MF02S MF03S MF01W MF02W MF03W	MF 200-S MF 300-S MF 100 MF 200 MF 300	500V	1,000V	1,000V	±1% ±2% ±5%	51.1Ω ~ 1MΩ 51.1Ω ~ 1MΩ 10Ω ~ 1MΩ	±50PPM/°C ±100PPM/°C ±200PPM/°C	±0.1% ±0.25% ±0.5%	100Ω ~ 330KΩ 51.1Ω ~ 511KΩ 51.1Ω ~ 1MΩ	±15PPM/°C ±25PPM/°C ±50PPM/°C

Note: MFFU2 (MF50-SS) Dielectric Withstanding Voltage Non flame 250V
Epoxy 500V

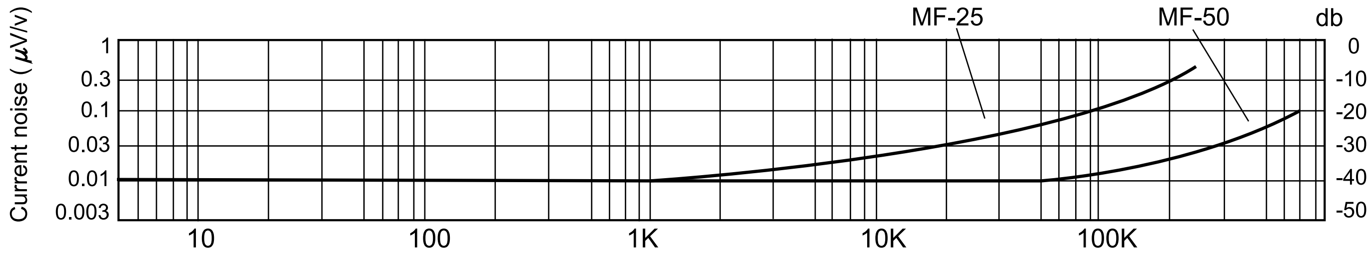
Derating Curve



Load Life



Current Noise Level



* Only for your reference

RoHS Compliant

Metal Oxide Film Fixed Resistors

Performance Specification

Temperature Coefficient	±350PPM/°C
Short Time Overload	Normal size: ±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
	Small size: ±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Pulse Overload	Normal size: ±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
	Small size: ±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and markings.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady state)	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	<100KΩ : ±(5.0% + 0.05Ω)Max
	≥100KΩ : ±(10.0% + 0.05Ω)Max
Load Life	<100KΩ : ±(5.0% + 0.05Ω)Max
	≥100KΩ : ±(10.0% + 0.05Ω)Max
Non-Flame	No evidence of flaming or arcing.

Ordering Procedure: Ex.: MOR 1/2W, +/-5%, 100Ω, T/B-1000

M	O	R	0	W	2	J	0	1	0	1	A	1	0

Type:
MOR = Metal Oxide Film

Feature:
0 = Standard
I = Non-Inductive

Wattage:
Normal size
W4 = 1/4W
W2 = 1/2W
1W = 1W
2W = 2W
3W = 3W
5W = 5W
7W = 7W
8W = 8W
9W = 9W

Small size
S2 = 1/2W-S
1S = 1W-S
2S = 2W-S
3S = 3W-S
4S = 4W-S
5S = 5W-S

Extra small size
5U = 5W-SS

Tolerance:
G = ±2%
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω, ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33 KΩ = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26mm

Packing Qty:
1 = 1,000 pcs. 2 = 2,000 pcs.
5 = 5,000 pcs. A = 500 pcs.
B = 2,500 pcs. 0 = Bulk/Box

Additional Information:
0 = PT-52mm, PT-26mm, Standard lead wire for Bulk/Box
8 = PT-58mm
9 = PT-64mm
7 = Lead wire (H=38mm)
A = PT-83mm
C = PT-73mm
D = PT-71mm

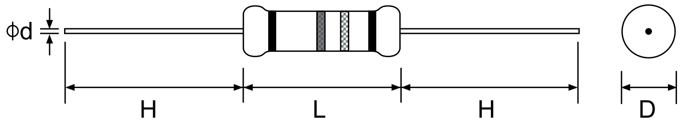
RoHS Compliant

Metal Oxide Film Fixed Resistors

Features

- High safety standard, high purity ceramic core
- Excellent non-flame coating, non-inductive type available
- Stable performance in diverse environment, meet EIAJ-RC2655A requirements
- Too low or too high ohmic value can be supplied on a case to case basis

Standard : 2% ,5% ,10% -- E - 24 series

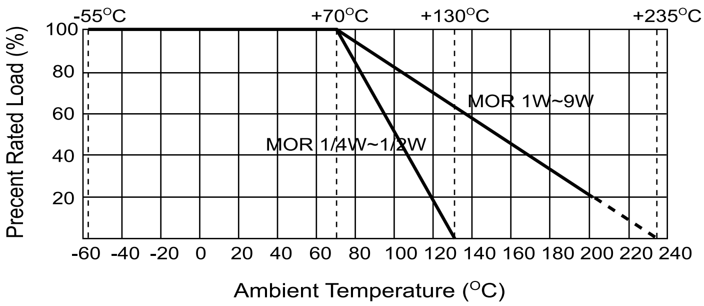


Part No.	Style	Power Rating at 70°C	Dimension (mm)					Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	Std Packing Qty
			D Max	L Max	H±3	d±0.05	PT					
Normal Size												
MOR0W4	MOR 25	1/4W(0.25W)	2.5	7.5	28	0.54	52	250V	400V	250V	0.3Ω ~ 50KΩ	5,000
MOR0W2	MOR 50	1/2W(0.50W)	3.5	10.0	28	0.54	52	250V	400V	250V	0.3Ω ~ 50KΩ	1,000
MOR01W	MOR 100	1W	5.0	12.0	25	0.70	52	350V	600V	350V	0.3Ω ~ 50KΩ	1,000
MOR02W	MOR 200	2W	5.5	16.0	28	0.70	64	350V	600V	350V	0.3Ω ~ 50KΩ	1,000
MOR03W	MOR 300	3W	6.5	17.5	28	0.75	64	500V	800V	500V	5Ω ~ 100KΩ	500
MOR05W	MOR 500	5W	8.5	26.0	38	0.75	B/B	750V	1,000V	750V	5Ω ~ 150KΩ	1,000
MOR07W	MOR 700	7W	8.5	32.0	38	0.75	B/B	750V	1,000V	750V	20Ω ~ 150KΩ	1,600
MOR08W	MOR 800	8W	8.5	41.0	38	0.75	B/B	750V	1,000V	750V	30Ω ~ 200KΩ	1,600
MOR09W	MOR 900	9W	8.5	54.0	38	0.75	B/B	750V	1,000V	750V	50Ω ~ 200KΩ	1,800
Small Size												
MOR0S2	MOR 50-S	1/2W(0.50W)	2.5	7.5	28	0.54	52	250V	400V	250V	0.3Ω ~ 50KΩ	5,000
MOR01S	MOR 100-S	1W	3.5	10.0	28	0.54	52	350V	600V	350V	0.3Ω ~ 50KΩ	1,000
MOR02S	MOR 200-S	2W	5.0	12.0	25	0.70	52	350V	600V	350V	0.3Ω ~ 50KΩ	1,000
MOR03S	MOR 300-S	3W	5.5	16.0	28	0.70	64	350V	600V	350V	0.3Ω ~ 50KΩ	1,000
MOR04S	MOR 400-S	4W	6.5	17.5	28	0.75	64	500V	800V	500V	5Ω ~ 100KΩ	500
MOR05S	MOR 500-S	5W	8.0	25.0	38	0.75	B/B	500V	800V	500V	5Ω ~ 150KΩ	1,000
Extra Small Size												
MOR05U	MOR 500-SS	5W	6.5	17.5	28	0.75	64	500V	800V	500V	5Ω ~ 100KΩ	500

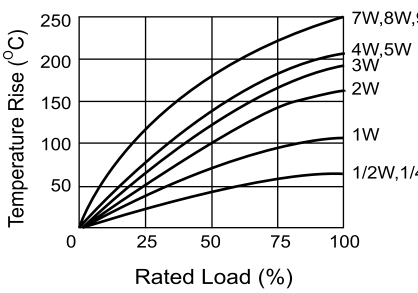
Note:

- Standard gray base color for normal size product, sea blue color for small size and extra small size product
- Standard Non-flammable coating
- Non-Inductive type available on a case to case basis

Derating Curve



Heat Rise Chart



RoHS Compliant

Fusible Fixed Resistors

Performance Specification

Temperature Coefficient	±350PPM/°C
Short Time Overload	±(2.0% + 0.05Ω)Max, 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	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and markings.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady state)	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Non-Flame	Do not have any specimens which burn with flaming combustion after each application.

Ordering Procedure: Ex.: FRN 1W, +/-5%, 10Ω, T/B-1000

F R N 0 1 W J 0 1 0 0 A 1 0

Type:
FRN = Fusible Film

Feature:
0= Standard

Wattage:
W4 = 1/4W
W2 = 1/2W
1W = 1W
2W = 2W
3W = 3W
S2 = 1/2W-S
N4 = 0.4W
75 = 3/4W
15 = 1.5W

Tolerance:
G = ±2%
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ~ 472

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26mm

Packing Qty:
1 = 1,000 pcs.
A = 500 pcs.
0 = Bulk/Box
5 = 5,000 pcs.
B = 2,500 pcs.

Additional Information:
0 = PT-52mm, PT-26mm,
Standard lead wire for Bulk/Box
8 = PT-58mm
9 = PT-64mm

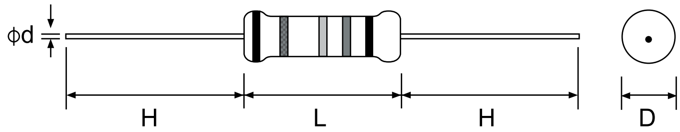
RoHS Compliant

Fusible Fixed Resistors

Features

- Nickle or Metal film deposits in cylinder ceramic rods
- Non-flame coating
- 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
- Spacial UL approved items available (UL 1412)

Standard : 2% ,5% ,10% -- E - 24 series

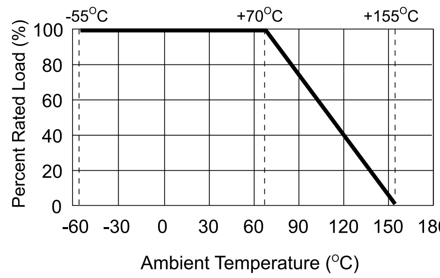


Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	Dielectric Withstanding Voltage	Std Packing Qty
			D Max	L Max	H±3	d±0.05	PT			
FRN0W4	FRN 25	1/4W(0.25W)	2.5	6.8	28	0.54	52	0.22Ω ~10KΩ	300V	5,000
FRN0S2	FRN 50-S	1/2W (0.50W)	2.5	6.8	28	0.54	52	0.22Ω ~10KΩ	300V	5,000
FRN0N4	FRN 40	0.40W	2.5	6.8	28	0.54	52	0.22Ω ~10KΩ	300V	5,000
FRN0W2	FRN 50	1/2W (0.50W)	3.0	9.0	28	0.54	52	0.22Ω ~10KΩ	350V	1,000
FRN075	FRN 75	3/4W (0.75W)	3.5	10.0	28	0.54	52	0.22Ω ~10KΩ	350V	1,000
FRN01W	FRN 100	1W	3.5	10.0	28	0.54	52	0.22Ω ~10KΩ	350V	1,000
FRN015	FRN 150	1.5W	5.0	12.0	25	0.70	52	0.22Ω ~10KΩ	600V	1,000
FRN02W	FRN 200	2W	5.0	12.0	25	0.70	52	0.22Ω ~10KΩ	600V	1,000
FRN03W	FRN 300	3W	5.5	16.0	28	0.70	64	0.22Ω ~10KΩ	600V	1,000

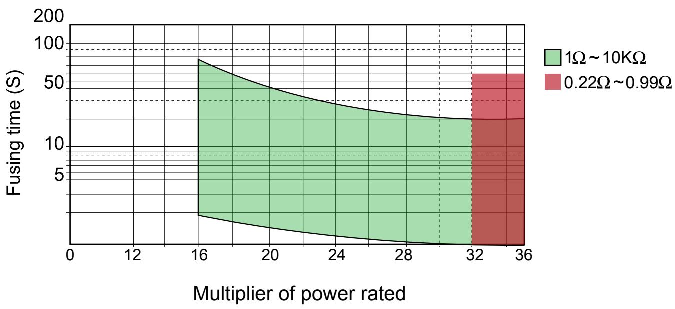
Fusing Characteristics

Resistance Range	Magnification of Power Rating	Fusing Time (Maximum time)
0.22Ω~0.99Ω	32 (Test by current)	60 sec
1Ω ~ 10KΩ	16 (1E 3E Test by current)	60 sec
	20	40 sec
	24	30 sec
	28	20 sec
	32	15 sec

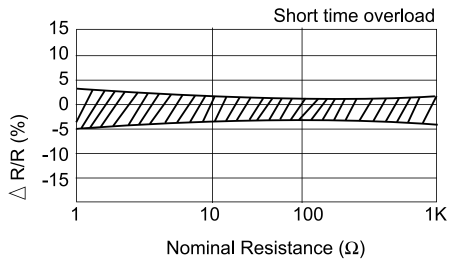
Derating Curve



Fusing Characteristics Chart



Overload Curve



RoHS Compliant

Metal Glaze Film Fixed Resistors

Performance Specification

Temperature Coefficient	≤ ±200PPM/°C
Short Time Overload	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Insulation Resistance	Min. 10,000 Mega Ohm
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdwown.
Pulse Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and markings.
Temperature Cycling	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady State)	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Surge Withstanding Voltage	±(20.0% + 0.05Ω)Max, with no evidence of mechanical damage.

Ordering Procedure: Ex.: MGR 1W, +/-5%, 470KΩ, T/B-1000, Non-Flame

M G R	F	1 W	J	0 4 7 4	A	1	0

Type:
MGR = Metal Glaze Film

Feature:
0 = UL epoxy for 1/4W only
F = UL Non-Flame for 1/2W, 1W, 2W

Wattage:
Normal:
W4 = 1/4W (UL Epoxy Paint) Only
W2 = 1/2W (UL Non-Flame Paint)
1W = 1W (UL Non-Flame Paint)
2W = 2W (UL Non-Flame Paint)

Small:
S2 = 1/2WS
1S = 1WS
2S = 2WS
3S = 3WS

Extra small:
U2 = 1/2WSS
1U = 1WSS
2U = 2WSS
3U = 3WSS

Tolerance:
F = ±1%
G = ± 2%
J = ± 5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33KΩ = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26mm

Packing Qty:
1 = 1,000 pcs.
4 = 4,000 pcs.
5 = 5,000 pcs.
A = 500 pcs.
B = 2,500 pcs.
0 = Bulk/Box

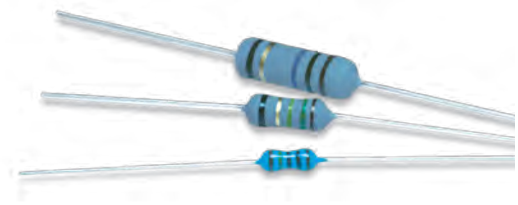
Additional Information:
0 = PT-52mm, Standard lead wire for Bulk/Box
8 = PT-58mm
9 = PT-64mm

RoHS Compliant

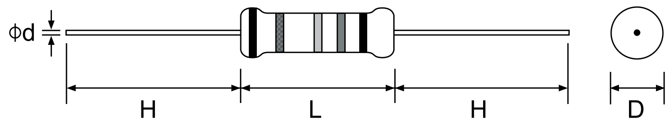
Metal Glaze Film Fixed Resistors

Features

- Small in dimension and broad range in high resistance
- Metal glaze resistor elements provide high stable performance against environmental conditions and overload
- Excellent in absorption of electric shock (Pulse, Surge Voltage)
- Approved to IEC 60065 safety requirements (VDE) (For 1/2W: 1M ~ 100M, 1W and 2W: 100K ~ 100M)
- Recognized by UL 1676 for 1/2W, 1W and 2W normal size resistance value 960K ~12M



Standard : 2% ,5% ,10% -- E-24 series
1% -- E-96 series



Part No.	Style	Power Rating at 70°C	Dimension (mm)					Std Packing Qty
			D Max	L Max	d±0.05	H±3	PT	
Normal Size								
MGR0W4	MGR 25	1/4W (0.25W)	2.7	7.0	0.60	28	52	4,000
MGRFW2	MGR 50	1/2W (0.50W)	3.8	10.0	0.60	28	52	1,000
MGRF1W	MGR 100	1W	5.2	13.0	0.75	25	52	1,000
MGRF2W	MGR 200	2W	6.0	17.0	0.75	28	64	500
Small Size / Ultra Small Size								
MGR0U2	MGR-50-SS	1/2W	2.7	7.0	0.60	28	52	4,000
MGRFS2	MGR-50-S	1/2W	3.3	9.5	0.60	28	52	1,000
MGRF1U	MGR-100-SS	1W	4.0	10.0	0.60	28	52	1,000
MGRF1S	MGR-100-S	1W	4.7	11.0	0.70	28	52	1,000
MGRF2U	MGR-200-SS	2W	4.7	13.0	0.75	28	52	1,000
MGRF2S	MGR-200-S	2W	5.2	13.0	0.75	28	52	1,000
MGRF3U	MGR-300-SS	3W	5.2	13.0	0.75	28	52	1,000
MGRF3S	MGR-300-S	3W	6.0	17.0	0.75	28	64	500

Metal Glaze Film Fixed Resistors

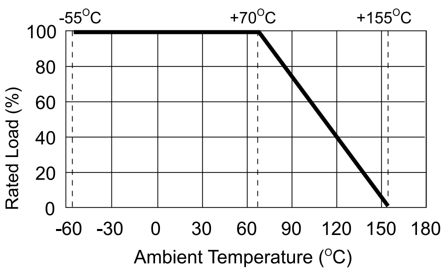
Surge Characteristics

Part No.	Style	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Surge Withstanding Voltage	Resistance Range
Normal Size						
MGR0W4	MGR 25	1,600V	2,000V	700V	100KΩ~100MΩ: 3,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 100MΩ
MGRFW2	MGR 50	3,500V	4,000V	700V	100KΩ~360KΩ: 5,000V 361KΩ~1MΩ: 7,000V 1.1MΩ~100MΩ: 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~100MΩ
MGRF1W	MGR 100	3,500V	4,000V	1,000V	100KΩ~ 100MΩ : 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 100MΩ
MGRF2W	MGR 200	3,500V	4,000V	1,000V	100KΩ~ 100MΩ : 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 100MΩ
Small Size / Ultra Small Size						
MGR0U2	MGR-50-SS	500V	700V	500V	100KΩ~1MΩ: 3,000V 1.1MΩ~6.2MΩ: 4,000V ≥~6.8MΩ: 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRFS2	MGR-50-S	500V	700V	500V		±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRF1U	MGR-100-SS	700V	1,000V	700V	100KΩ~1MΩ: 4,000V 1.1MΩ~6.2MΩ: 5,000V ≥~6.8MΩ: 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRF1S	MGR-100-S	700V	1,000V	700V		±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRF2U	MGR-200-SS	1,000V	1,400V	700V	100KΩ~1MΩ: 5,000V 1.1MΩ~6.2MΩ: 6,000V ≥~6.8MΩ: 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRF2S	MGR-200-S	1,000V	1,400V	700V		±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRF3U	MGR-300-SS	1,000V	1,400V	700V	100KΩ~1MΩ: 5,000V 1.1MΩ~6.2MΩ: 6,000V ≥~6.8MΩ: 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ
MGRF3S	MGR-300-S	1,000V	1,400V	700V	100KΩ~1MΩ: 8,000V 1.1MΩ~6.2MΩ: 9,000V ≥~6.8MΩ: 10,000V	±1%: 100KΩ ~ 1MΩ ±5%: 1KΩ ~ 33MΩ ±10%: 1KΩ ~ 33MΩ

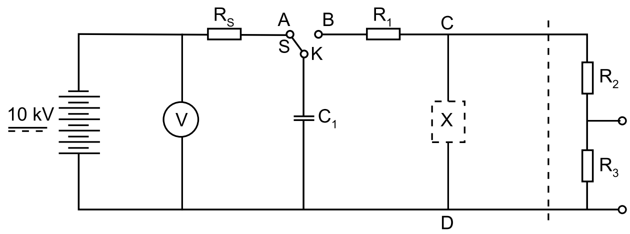
Surge Withstanding Voltage: IEC 60065

1. Discharge test: 3KV ~ <10KV, 0.01µF capacitor discharge pulse, 10 times (1 pulse: 2.5 sec "ON", 2.5 sec "OFF")
2. Discharge test: ≥10KV, 0.001µF (1nF) capacitor discharge pulse, 50 times (1 pulse: 2.5 sec "ON", 2.5 sec "OFF")

Derating Curve



Surge Test - Test Circuit



Note: $C1 = 0.01\mu F$ <10,000V $C1 = 0.001\mu F$ (1nF) ≥10,000V

$R_1 = 1K\Omega$ $R_2 = 100M\Omega$ $R_3 = 0.1M\Omega$ $R_3 = 15M\Omega$

RoHS Compliant

Power Metal Fixed Resistors

Performance Specification

Short Time Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Pulse Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and markings.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady state)	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life In Humidity	<100KΩ: ±(5.0% + 0.05Ω)Max ≥100KΩ: ±(10.0% + 0.05Ω)Max
Load Life	<100KΩ: ±(5.0% + 0.05Ω)Max ≥100KΩ: ±(10.0% + 0.05Ω)Max

Ordering Procedure: Ex.: PMR 1W-SSS +/-5% 100Ω, T/B-1000

P	M	R	0	1	T	J	0	1	0	1	A	5	0

Type:
PMR=Power Metal

Feature:
0 = Standard

Wattage:
1T = 1W-SSS
2S = 2W-S
3S = 3W-S

Tolerance:
G = ±2%
J = ±5%
K = ±10%

Resistance Value:

- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω, ~47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33 KΩ = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26mm

Packing Qty:
1 = 1,000 pcs. 2 = 2,000 pcs.
5 = 5,000 pcs. A = 500 pcs.
B = 2,500 pcs. 0 = Bulk/Box

Additional Information:
0 = PT-52mm, PT-26mm, Standard lead wire for Bulk/Box
7 = Lead wire (H=38mm)
8 = PT-58mm
9 = PT-64mm
A = PT-83mm
C = PT-73mm
D = PT-71mm

RoHS Compliant

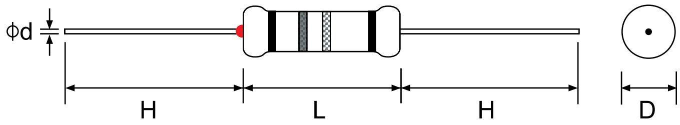
ROYALOHM

Power Metal Fixed Resistors

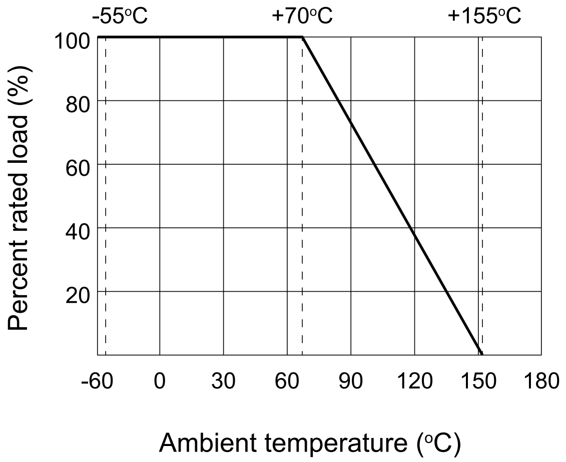
Features

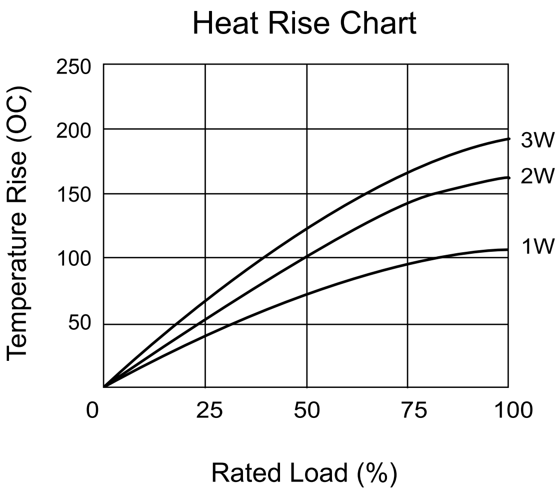
- High Power, small in dimension
- Stable performance against environment conditions
- Define interruption behavior
- Application: All general purpose power application

Standard : 2% ,5% ,10% -- E - 24 series



Part No.	Style	Power Rating at 70°C	Dimension (mm)					Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	TCR (PPM/C)	Std Packing Qty
			D Max	L Max	H±3	d±0.05	PT						
PMR01T	PMR 1W -SSS	R<1Ω(0.6W)	2.5	6.5	25	0.54	52	350V	400V	350V	0.56Ω~100KΩ	±350	5,000
		R≥1Ω(1W)									101KΩ~470KΩ	±400	
											471KΩ~1MΩ	±800	
PMR02S	PMR 2W-S	2W	4.0	11.0	25	0.75	52	500V	600V	350V	3.9Ω~100KΩ	±350	1,000
											101KΩ~680KΩ	±400	
PMR03S	PMR 3W-S	3W	5.5	16.0	25	0.75	64	750V	800V	350V	12Ω~100KΩ	±350	1,000
											101KΩ~180KΩ	±400	





RoHS Compliant

Wire-Wound Fixed Resistors

Performance Specification

Temperature Coefficient	<20Ω: ±400PPM/°C; ≥20Ω: ±300PPM/°C
Short Time Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Pulse Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Non-Flame	No evidence of flaming or arcing.
Surge Immunity (IEC 61000-4-5)	±(5.0% + 0.05Ω)Max,

Ordering Procedure: Ex.: KNP 1W,+/-5%, 100Ω, T/B-1000

K N P 0 1 W J 0 1 0 1 A 1 0

Type:
KNP = KNP
KNS = KNS
KNH = KNH

Feature:
0 = Standard
I = Non-Inductive
U = UL Approved
S = Special / Customized
(For KNP Type only)

Wattage:
Normal
W2 = 1/2W
1W = 1W
.. ..
9W = 9W
AW = 10W
.. ..
A0 = 100W

Small
1S = 1W-S
.. ..
9S = 9W-S
AS = 10W-S

Extra Small
1U = 1W-SS
2U = 2W-SS
3U = 3W-SS
4U = 4W-SS
AU = 10W-SS

Tolerance:
F = ±1%
G = ±2%
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex. 1.33K =1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box

Packing Qty:
1 = 1,000 pcs.
2 = 2,000 pcs.
A = 500 pcs.
B = 2,500 pcs.(for T/R)
0 = Bulk/Box

Additional Information:
(for KNP,KNS,KNH,KNHA Type B/B pack only)
0 = NIL

(for KNP Type only)
0 = PT-52mm, PT-26mm
8 = PT-58mm
9 = PT-64mm
C= PT-73mm

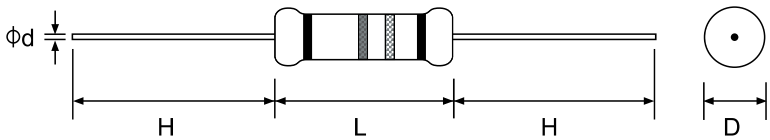
RoHS Compliant

Wire-Wound Fixed Resistors

Features

- Color coating is “Green”
- Non-inductive type available
- Excellent flame resistance
- Too low or too high ohmic value can be supplied on a case to case basis
- Special Fusing Wire-Wound Resistors can be supplied on a case to case basis
- Special UL approved items available (UL1412)

Standard : 2% ,5% ,10% -- E-24 series
1% -- E-96 series



Part No.	Style	Power Rating at 70°c	Dimension (mm)					Low Resistance Range	Standard Resistance Range	High Resistance Range
			D±1	L±1	H±3	d±0.05	PT			
Normal Size										
KNP0W2	KNP 50	1/2W (0.50W)	3.5	10.0	28	0.54	52	0.06Ω~9.9Ω	10Ω~39Ω	40Ω~560Ω
KNP01W	KNP 100	1W	5.0	12.0	25	0.70	52	0.10Ω~9.9Ω	10Ω~50Ω	51Ω~1KΩ
KNP02W	KNP 200	2W	5.5	16.0	28	0.70	64	0.15Ω~9.9Ω	10Ω~120Ω	121Ω~2KΩ
KNP03W	KNP 300	3W	6.5	17.5	28	0.75	64	0.25Ω~9.9Ω	10Ω~200Ω	201Ω~3KΩ
KNP05W	KNP 500	5W	8.5	25	38	0.75	B/B	0.50Ω~9.9Ω	10Ω~470Ω	471Ω~5KΩ
KNP07W	KNP 700	7W	8.5	30	38	0.75	B/B	0.65Ω~9.9Ω	10Ω~470Ω	471Ω~6KΩ
KNP08W	KNP 800	8W	8.5	40	38	0.75	B/B	1.0Ω~9.9Ω	10Ω~1.5KΩ	1.6KΩ~10KΩ
KNP09W	KNP 900	9W	8.5	53	38	0.75	B/B	1.0Ω~9.9Ω	10Ω~1.5KΩ	1.6KΩ~15KΩ
Small Size										
KNP01S	KNP 100-S	1W	3.5	10.0	28	0.54	52	0.06Ω~9.9Ω	10Ω~39Ω	40Ω~560Ω
KNP02S	KNP 200-S	2W	5.0	12.0	25	0.70	52	0.10Ω~9.9Ω	10Ω~50Ω	51Ω~1KΩ
KNP03S	KNP 300-S	3W	5.5	16.0	28	0.70	64	0.15Ω~9.9Ω	10Ω~120Ω	121Ω~2KΩ
KNP05S	KNP 500-S	5W	6.5	17.5	28	0.75	64	0.25Ω~9.9Ω	10Ω~200Ω	201Ω~3KΩ
KNP07S	KNP 700-S	7W	8.5	25	38	0.75	B/B	0.50Ω~9.9Ω	10Ω~470Ω	471Ω~5KΩ
KNP08S	KNP 800-S	8W	8.5	30	38	0.75	B/B	0.65Ω~9.9Ω	10Ω~470Ω	471Ω~6KΩ
KNP09S	KNP 900-S	9W	8.5	40	38	0.75	B/B	1.0Ω~9.9Ω	10Ω~1.5KΩ	1.6KΩ~10KΩ
KNP0AS	KNP 1000-S	10W	8.5	53	38	0.75	B/B	1.0Ω~9.9Ω	10Ω~1.5KΩ	1.6KΩ~15KΩ
Extra Size										
KNP01U	KNP 100-SS	1W	3.0	9.0	28	0.54	52	0.10Ω~9.9Ω	10Ω~39Ω	40Ω~180Ω
KNP02U	KNP 200-SS	2W	3.5	10.0	28	0.54	52	0.10Ω~9.9Ω	10Ω~39Ω	40Ω~220Ω
KNP03U	KNP 300-SS	3W	5.5	13.5	28	0.70	64	0.20Ω~9.9Ω	10Ω~50Ω	51Ω~620Ω
KNP04U	KNP 400-SS	4W	5.5	16.0	28	0.70	64	0.20Ω~9.9Ω	10Ω~120Ω	121Ω~750Ω
KNP0AU	KNP 1000-SS	10W	8.5	40	38	0.75	B/B	1.0Ω~9.9Ω	10Ω~1.5KΩ	1.6KΩ~5KΩ

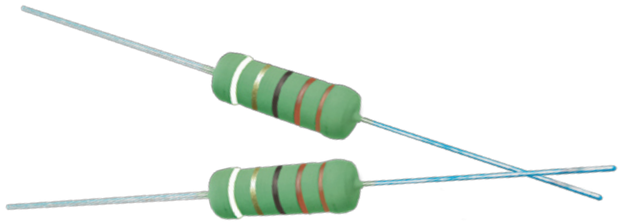
Note: For KNP Series Max. Working Voltage: 500V
Max. Overload Voltage: 1,000V
Dielectric Withstanding Voltage : Dimension ≤ 3.5 x 10 : 350V
> 3.5 x 10 : 500V

RoHS Compliant

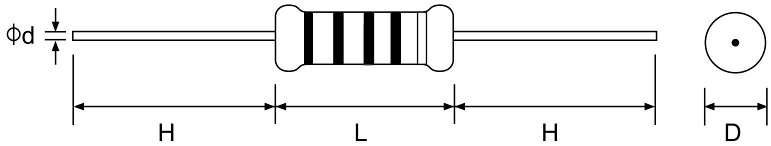
Wire-Wound Fixed Resistors

Features

- Color coating Is "Green"
- Non-inductive type avaliable
- Excellent flame resistance
- Too low or too high ohmic value can be supplied on a case to case basis
- Special Fusing Wire-Wound Resistors can be supplied on a case to case basis
- Special UL approved items available (UL1412)



Standard : 2% ,5% ,10% -- E - 24 series
1% -- E - 96 series

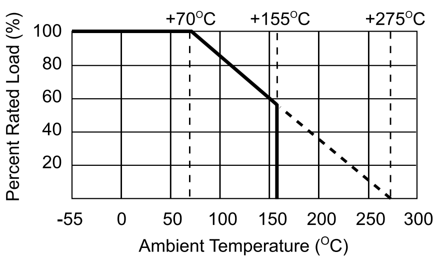


Part No.	Style	Power Rating at 70°C	Dimension (mm)					Standard Resistance Range
			D(Max)	L(Max)	H±3	d±0.05	PT	
Normal Size								
KNPU1W	KNPU100	1W	5.0	12.0	28	0.70	52	0.47Ω ~ 240Ω
KNPU2W	KNPU200	2W	5.5	16.0	28	0.70	64	0.47Ω ~ 240Ω
KNPU3W	KNPU300	3W	6.5	17.5	28	0.75	64	0.47Ω ~ 240Ω
KNPU5W	KNPU500	5W	8.0	20.0	38	0.75	B/B	0.47Ω ~ 240Ω
KNPU7W	KNPU700	7W	8.5	25.0	38	0.75	B/B	0.47Ω ~ 47Ω

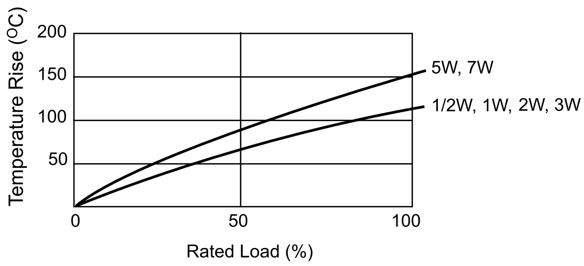
Note: Surge spec available on a case to case basls.

Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	Standard Packing Qty	Max Surge Voltage
			D(Max)	L(Max)	H±3	d±0.05	PT			
Small Size										
KNPU1U	KNPU1W-SS	1W	3.0	8.5	28.0	0.54	52	10Ω	1,000	1.2KV
KNPU1S	KNPU1W-S	1W	4.0	9.0	28.0	0.60	52	4.7Ω ~ 47Ω	1,000	Depends on Value
KNPU1S	KNPU1W-S	1W	4.0	10.0	28.0	0.75	52	4.7Ω ~ 47Ω	1,000	Depends on Value
KNPU2S	KNPU2W-S	2W	5.0	12.0	28.0	0.70	52	0.47Ω ~ 240Ω	1,000	Depends on Value
KNPU3S	KNPU3W-S	3W	5.5	16.0	28.0	0.70	64	0.47Ω ~ 240Ω	1,000	Depends on Value

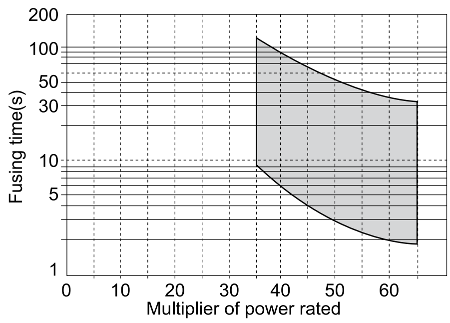
Derating Curve



Heat Rise Chart



Fusing Graph For UL Approved

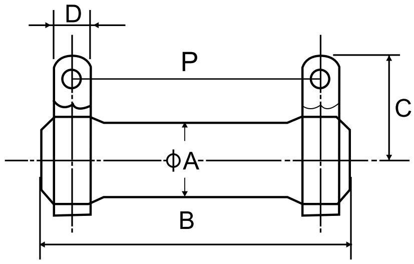


Note: For KNPU Series Dieletric Withstanding Voltage : 1,000VAC.

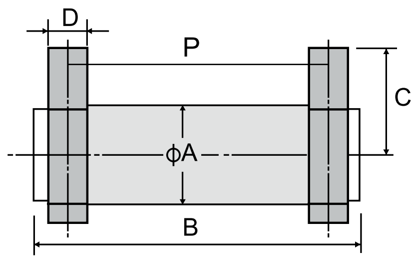
Wire-Wound Fixed Resistors

KNH, KNHA Type

KNH Type

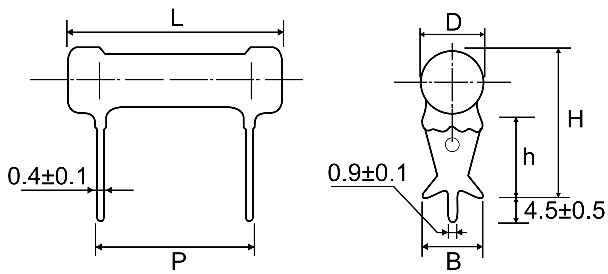


KNHA Type



Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range
			A±1.5	B±1.5	C±3	D±0.5	P±5	
KNH020	KNH 20W	20W	19	50	19	4.5	40	0.4Ω ~ 10KΩ
KNH030	KNH 30W	30W	19	75	19	4.5	65	0.5Ω ~ 15KΩ
KNH040	KNH 40W	40W	19	90	19	4.5	80	0.6Ω ~ 20KΩ
KNH050	KNH 50W	50W	28	75	31	8	65	3Ω ~ 25KΩ
KNH060	KNH 60W	60W	28	90	31	8	80	3Ω ~ 30KΩ
KNH080	KNH 80W	80W	28	115	31	8	100	3Ω ~ 40KΩ
KNH100	KNH 100W	100W	28	140	31	8	130	3Ω ~ 50KΩ
KNHA25	KNHA 25W	25W	21	41	24	5	30	0.4Ω ~ 10KΩ
KNHA30	KNHA 30W	30W	21	42	24	5	30	0.4Ω ~ 10KΩ

KNS Type



Part No.	Style	Power Rating at 70°C	Dimension (mm)						Resistance Range
			D Max	L±1.5	P±0.5	H±1	h±1	B±0.5	
KNS02W	KNS 200	2W	8	19	8	19	12	4.5	0.1Ω ~ 50Ω
KNS03W	KNS 300	3W	8	21	10	19	13	4.5	0.5Ω ~ 50Ω
KNS05W	KNS 500	5W	10	26	15	21.5	13	6.5	0.5Ω ~ 100Ω
KNS07W	KNS 700	7W	10	31	20	21.5	13	6.5	1Ω ~ 1KΩ
KNS08W	KNS 800	8W	10	41	30	21.5	13	6.5	1Ω ~ 1.5KΩ
KNS0AW	KNS 1000	10W	10	54	43	21.5	13	6.5	1Ω ~ 2KΩ

RoHS Compliant

Anti-Surge Wire-Wound Fixed Resistors

Performance Specification

Temperature Coefficient	<20Ω: ±400PPM/°C; ≥20Ω: ±300PPM/°C
Short Time Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Pulse Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life In Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Non-Flame	No evidence of flaming or arcing
Surge Immunity (IEC 61000-4-5)	±(5.0% + 0.05Ω)Max.

Ordering Procedure: Ex.: KNPA 1W, +/-5% 100Ω, T/B-1000, AntiSurge

K	N	P	A	1	W	J	0	1	0	1	A	1	0

Type:
KNP = KNP

Feature:
A = Anti-Surge

Wattage:
Normal
W2 = 1/2W
1W = 1W
.. ..
9W = 9W
AW = 10W
.. ..
A0 = 100W

Small
1S = 1W-S
.. ..
9S = 9W-S
AS = 10W-S

Tolerance:
F = ±1%
G = ±2%
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros:
  Ex. 1.33K = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box

Packing Qty:
1 = 1,000 pcs.
A = 500 pcs.
B = 2,500 pcs.(for T/R)
0 = Bulk/Box

Additional Information:
0 = PT-52mm, PT-26mm, Standard lead wire for Bulk/Box
8 = PT-58mm
9 = PT-64mm

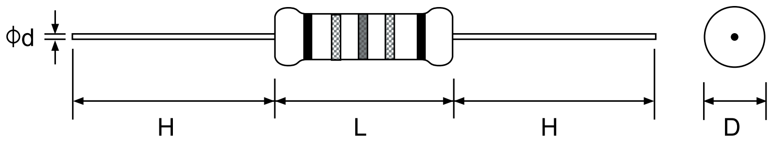
RoHS Compliant

Anti-Surge Wire-Wound Fixed Resistors

Features

- Color coating is "Green"
- Excellent flame resistance
- Too low or too high ohmic value can be supplied on a case to case basis
- Special Fusing Wire-Wound Resistors can be supplied on a case to case basis
- Special Anti-Surge function items available (per IEC 61000-4-5)

Standard : 2% ,5% ,10% -- E - 24 series
1% -- E - 96 series

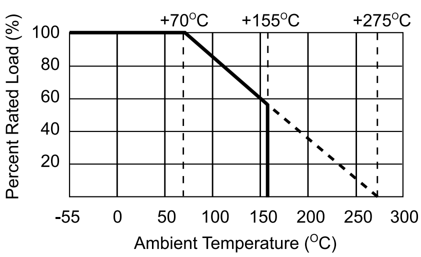


Type	Style	Power Rating at 70°C	Dimension (mm)					Standard Resistance Range	High Resistance Range	Surge Voltage Range
			D±1	L±1	d±0.05	H±3	PT			
Normal Size										
KNPAW2	KNPA50	1/2W(0.5W)	3.5	10.0	0.54	28	52	10Ω~39Ω	40Ω~560Ω	1KV-4KV
KNPA1W	KNPA100	1W	5.0	12.0	0.70	25	52	10Ω~50Ω	51Ω~1KΩ	2KV-5KV
KNPA2W	KNPA200	2W	5.5	16.0	0.70	28	64	10Ω~120Ω	121Ω~2KΩ	3KV-6KV
KNPA3W	KNPA300	3W	6.5	17.5	0.75	28	64	10Ω~200Ω	201Ω~3KΩ	4KV-7KV
KNPA5W	KNPA500	5W	8.5	25.0	0.75	38	B/B	10Ω~470Ω	471Ω~5KΩ	5KV-8KV
KNPA7W	KNPA700	7W	8.5	30.0	0.75	38	B/B	10Ω~470Ω	471Ω~6KΩ	6KV-10KV
KNPA8W	KNPA800	8W	8.5	40.0	0.75	38	B/B	10Ω~1.5KΩ	1.6KΩ~10KΩ	7KV-10KV
KNPA9W	KNPA900	9W	8.5	53.0	0.75	38	B/B	10Ω~1.5KΩ	1.6KΩ~15KΩ	8KV-10KV
Small Size										
KNPA1S	KNPA-100-S	1W	3.5	10.0	0.54	28	52	10Ω~39Ω	40Ω~560Ω	1KV-4KV
KNPA2S	KNPA-200-S	2W	5.0	12.0	0.70	25	52	10Ω~50Ω	51Ω~1KΩ	2KV-5KV
KNPA3S	KNPA-300-S	3W	5.5	16.0	0.70	28	52	10Ω~120Ω	121Ω~2KΩ	3KV-6KV
KNPA5S	KNPA-500-S	5W	6.5	17.5	0.75	28	64	10Ω~200Ω	201Ω~3KΩ	4KV-7KV
KNPA7S	KNPA-700-S	7W	8.5	25.0	0.75	38	B/B	10Ω~470Ω	471Ω~5KΩ	5KV-8KV
KNPA8S	KNPA-800-S	8W	8.5	30.0	0.75	38	B/B	10Ω~470Ω	471Ω~6KΩ	6KV-10KV
KNPA9S	KNPA-900-S	9W	8.5	40.0	0.75	38	B/B	10Ω~1.5KΩ	1.6KΩ~10KΩ	7KV-10KV
KNPAAS	KNPA-1000-S	10W	8.5	53.0	0.75	38	B/B	10Ω~1.5KΩ	1.6KΩ~15KΩ	8KV-10KV

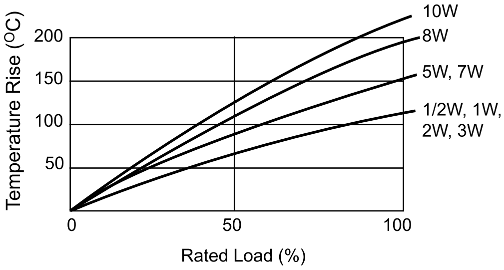
Note: For KNPA Series Max. Working Voltage: 500V
Max. Overload Voltage: 1,000V
Dieletric Withstanding Voltage : Dimension ≤ 3.5 x 10 : 350V
> 3.5 x 10 : 500V

The following are available on case to case basis:
- Low and high resistance
- Small size
- Higher surge voltage

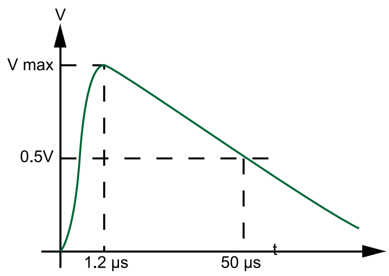
Derating Curve



Heat Rise Chart



Surge Waveform (1.2/50μs)



RoHS Compliant

Thermal Fusing Wire-Wound Fixed Resistors

Performance Specification

Temperature Coefficient	±400PPM/°C Max.
Short Time Overload	±(2.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Insulation Resistance	20MΩ Max. with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Humidity (Steady State)	±(3.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω) Max, with no evidence of mechanical damage.

Ordering Procedure: Ex.: TFR 1W,+/-5% 4.7Ω B/B

T F R 0 1 W J W 4 7 J B 0 0

Type:
TFR0 = TFR

Wattage:
1W = 1W

Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit denotes product type
  W= Wire-wound type
  P= Power Film type
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472

Packing Type:
B = Bulk/Box

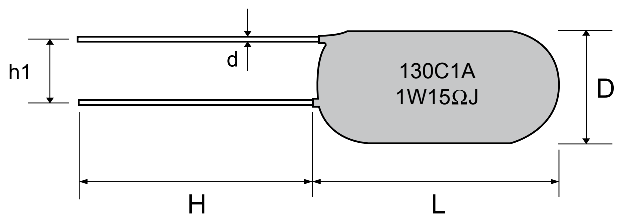
Packing Qty:
0 = Bulk/Box

Additional Information:
0 = Standard

TFR Type

Features

- Low resistance value with higher power dissipation
- Wire-wound resistor with thermal fuse protection
- Used in Electronic ballast, other Lighting applications



Type	Power Rating at70°C	D	L	H (Min)	h1 (Min)	d ±0.02	Current Rating	Resistance Range	TF (°C)	TH / TC (°C)	TM (°C)	Ir (A)	Ur (V)
TFR	1W	5.5±0.5	14±1	12	3.5	0.53	2A	4.7Ω	130	102	180	2	250
TFR	1W	$5.5^{+1}_{-0.5}$	11(Max.)	12	3.5	0.53	1A	4.7Ω	130	102	180	2	250

Note: 1.) TH / TC (°C) = Holding Temperature
2.) TM (°C) = Max. Temperature Limit
3.) TF (°C) = Rated Functioning Temperature
4.) Ir (A) = Rated Current
5.) Ur (V) = Rated Voltage

RoHS Compliant

Terminal Type of Metal Oxide Film Fixed Resistors

Performance Specification

Temperature Coefficient	<20Ω: ±400PPM/°C; ≥20Ω: ±350PPM/ °C
Short Time Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damge, arcing or insulation breakdown.
Pulse Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Resistance to Solvent	No deterioration of protective coating and marking.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady State)	±(2.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω) Max
Load Life	±(5.0% + 0.05Ω) Max
Non-Flame	No evidence of flaming or arcing

Ordering Procedure: Ex.: TMOV 5W, +/-5%, 1KΩ, B/B

T M O V 5 W J 0 1 0 2 B 0 0

Type:
TMOV = Vertical Terminal
TMOR = Radial Terminal

Wattage:
3W = 3W
5W = 5W
7W = 7W

Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472

Packing Type:
B = Bulk/Box

Packing Qty:
0 = Bulk/Box

Additional Information:
0 = NIL, TMOV
0 = TMOR, H = 29mm
L = TMOR, H = 39mm

RoHS Compliant

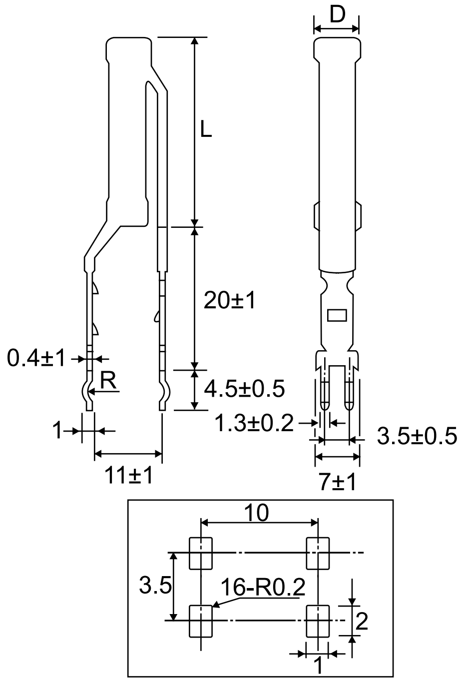
Terminal Type of Metal Oxide Film Fixed Resistors

Features

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

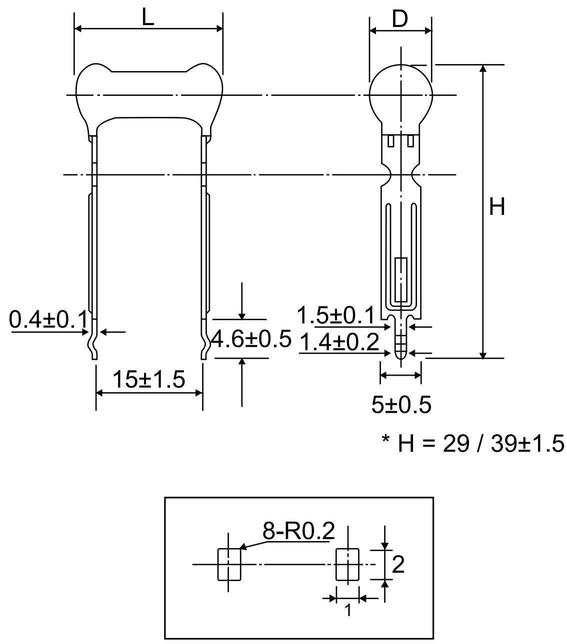
Standard : 5% ,10% -- E - 24 series

Vertical Type



*Mounting hole dimensions on P.C.B (Reference)

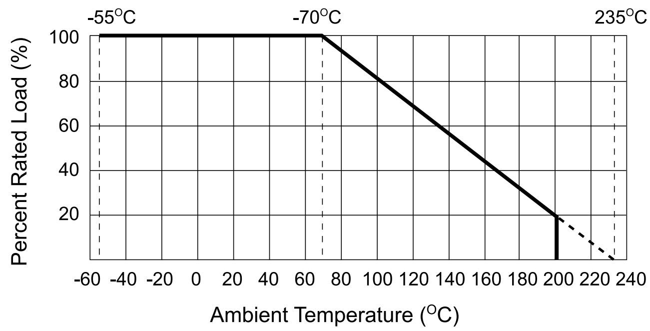
Radial Type



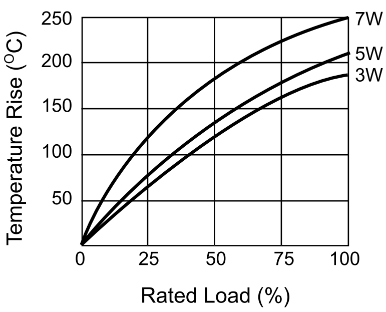
*Mounting hole dimensions on P.C.B (Reference)

Part No.	Style	Power Rating at 70°C	Dimension (mm)		Max Working Voltage	Max Overload Voltage	Max Pulse Overload Voltage	Resistance Range	Tolerance %
			D±1	L±1					
TMOV5W	TMOV 500	5W	7	20	500V	800V	1,500V	≤10Ω	±10%
								10Ω ~ 10KΩ	±5%
TMOV7W	TMOV 700	7W	7	30	500V	800V	1,500V	≤10Ω	± 10%
								10Ω ~ 10KΩ	±5%
TMOR3W	TMOR 300	3W	6	16	350V	600V	1,000V	≤10Ω	± 10%
								10Ω ~ 43KΩ	±5%
TMOR5W	TMOR 500	5W	7	18	500V	800V	1,500V	≤10Ω	± 10%
								10Ω ~ 43KΩ	±5%

Derating Curve



Heat Rise Chart



Cement Fixed Resistors

Performance Specification

Temperature Coefficient	<20Ω: ±400PPM/℃; ≥20Ω: ±350PPM/°C	
Short Time Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Dielectric Withstanding Voltage	No evidence of flashover, mechanical damge, arcing or insulation breakdown.	
Terminal Strength	No evidence of mechanical damge.	
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Solderability	Min. 95% coverage	
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Humidity (Steady State)	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Load Life in Humidity	Wire-wound	±(5.0% + 0.05Ω)Max
	Power Film	<100KΩ: ±(5.0% + 0.05Ω)Max
		≥100KΩ: ±(10.0% + 0.05Ω)Max
Load Life	Wire-wound	±(5.0% + 0.05Ω)Max
	Power Film	<100KΩ: ±(5.0% + 0.05Ω)Max
		≥100KΩ:±(10.0% + 0.05Ω)Max

Ordering Procedure: Ex.: PRW 5W, +/- 5%, 100Ω, B/B

P R W 0 5 W J P 1 0 1 B 0 0

Type:
PRW0 = PRW
PRWA = PRWA
PRWC = PRWC
PRC1 = PRWC-1
PRM0 = PRM
PRMA = PRMA
PRMB = PRMB
PRS0 = PRS
PRVA = PRVA
PRVB = PRVB
PZ1A = PRZA-1
PZ2A = PRZA-2
PZ3A = PRZA-3
PRZC = PRZC
PRZD = PRZD
PRT0 = PRT
PRU0 = PRU
PRWI = PRWI
TFRC = TFRC

Wattage:
1W = 1W
2W = 2W
3W = 3W
4W = 4W
5W = 5W
6W = 6W
7W = 7W
AW = 10W
BW = 11W
HW = 17W
FW = 15W
20 = 20W
25 = 25W
30 = 30W
40 = 40W

Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit denotes product type
  W = Wire-wound type
  P = Power Film type
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4Ω7 ~ 47J, 4.7KΩ ~ 472

Packing Type:
B = Bulk/Box

Packing Qty:
0 = Bulk/Box

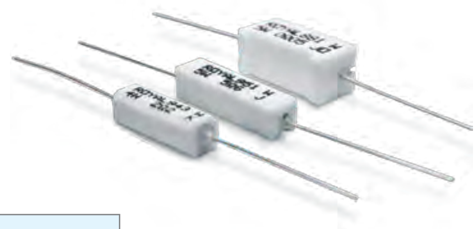
Additional Information:
0 = Standard
I = Non-inductive

RoHS Compliant

Cement Fixed Resistors

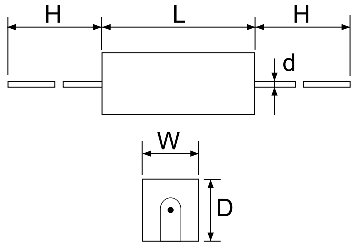
Features

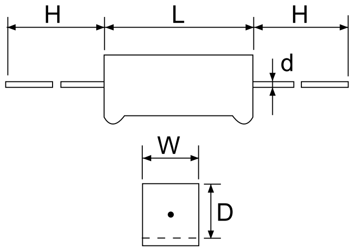
- Self extinguishing
- Excellent flame and moisture resistance
- Extremely small sturdy and mechanically safe
- Non-inductive types available for all ROYALOHM Cement Resistors
- Too low or too high ohmic values on Wire-wound & Power Film type can be supplied on a case to case basis

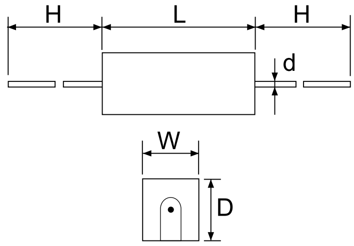


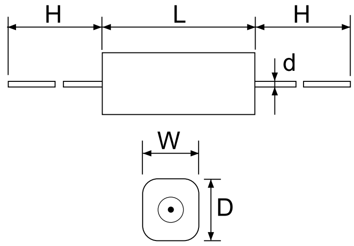
Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	
			W±1	D±1	L±1	d±0.05	H±5	Wire-wound	Power Film
PRW Type									
PRW01W	PRW 1W	1W	6	6	14	0.70	25	1Ω ~ 27Ω	28Ω ~ 33KΩ
PRW02W	PRW 2W	2W	7	7	18	0.75	28	0.1Ω ~ 27Ω	28Ω ~ 33KΩ
PRW03W	PRW 3W	3W	8	8	22	0.75	32	0.1Ω ~ 39Ω	40Ω ~ 56KΩ
PRW05W	PRW 5W	5W	10	9	22	0.75	35	0.1Ω ~ 47Ω	48Ω ~ 100KΩ
PRW07W	PRW 7W	7W	10	9	35	0.75	35	0.1Ω ~ 680Ω	681Ω ~ 200KΩ
PRW0AW	PRW 10W	10W	10	9	49	0.75	35	0.1Ω ~ 910Ω	911Ω ~ 200KΩ
PRW0FW	PRW 15W	15W	12.5	11.5	49	0.75	35	1Ω ~ 1KΩ	
PRW020	PRW 20W	20W	14.5	13.5	60	0.75	35	2Ω ~ 1.2KΩ	
PRW025	PRW 25W	25W	14.5	13.5	64	0.75	35	2Ω ~ 1.2KΩ	
PRWA Type									
PRWA5W	PRWA 5W	5W	10	9	22	0.75	35	0.1Ω ~ 47Ω	48Ω ~ 100KΩ
PRWAAW	PRWA 10W	10W	10	9	49	0.75	35	0.1Ω ~ 910Ω	911Ω ~ 200KΩ
PRWC Type									
PRWC1W	PRWC 1W	1W	5.5	5.5	12	0.70	25	1Ω ~ 27Ω	28Ω ~ 33KΩ
PRWC2W	PRWC 2W	2W	6	6	18	0.75	28	1Ω ~ 27Ω	28Ω ~ 33KΩ
PRWC3W	PRWC 3W	3W	6	6	20	0.75	28	1Ω ~ 27Ω	28Ω ~ 33KΩ
PRWC5W	PRWC 5W	5W	6	6	25	0.75	35	1Ω ~ 200Ω	201Ω ~ 100KΩ
PRWC7W	PRWC 7W	7W	9	9	25	0.75	35	1Ω ~ 200Ω	201Ω ~ 100KΩ
PRWC-1 Type									
PRC14W	PRWC-1 4W	4W	6.4	6.4	20	0.70	28	1Ω ~ 200Ω	201Ω ~ 100KΩ
PRC15W	PRWC-1 5W	5W	6.4	6.4	25	0.70	28	1Ω ~ 200Ω	201Ω ~ 100KΩ
PRC16W	PRWC-1 6W	6W	6.4	6.4	38	0.75	35	1Ω ~ 200Ω	201Ω ~ 100KΩ

Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

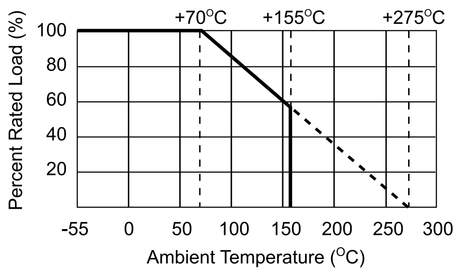




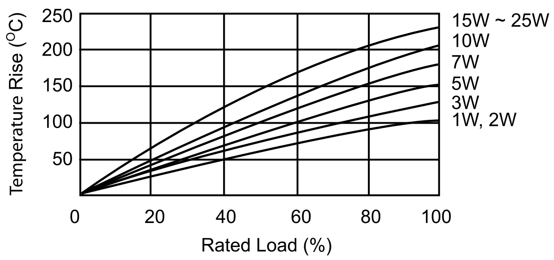




Derating Curve



Heat Rise Chart

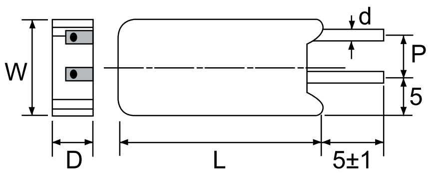


RoHS Compliant

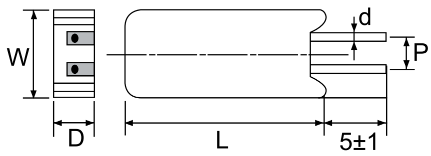
ROYALOHM

Cement Fixed Resistors

PRM Type



***PRM 7W, 10W : Lead not centered

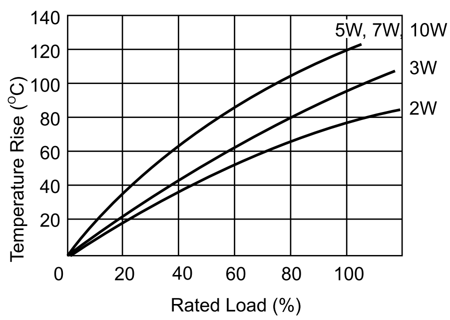


*** PRM 2W, 3W, 5W, PRMA 5W, 10W, PRMB 7W } Lead centered

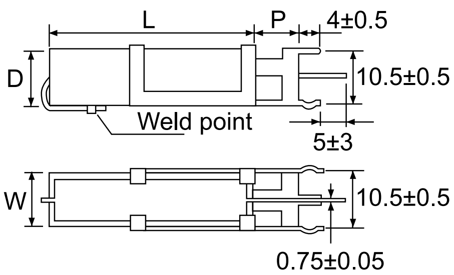
Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	
			W±1	D±1	L±1	d±0.05	P±1	Wire-wound	Power Film
PRM02W	PRM 2W	2W	11.5	7.5	20	0.75	5	0.1Ω ~ 27Ω	28Ω ~ 33KΩ
PRM03W	PRM 3W	3W	12.5	8.5	25	0.75	5	0.1Ω ~ 39Ω	40Ω ~ 56KΩ
PRM05W	PRM 5W	5W	13	9	25	0.75	5	0.1Ω ~ 47Ω	48Ω ~ 100KΩ
PRM07W	PRM 7W	7W	13	9	39	0.75	5	0.1Ω ~ 680Ω	681Ω ~ 200KΩ
PRM0AW	PRM 10W	10W	13	9	50	0.75	5	0.1Ω ~ 910Ω	911Ω ~ 200KΩ
PRMA5W	PRMA 5W	5W	13	9	25	0.75	7.5	0.1Ω ~ 47Ω	48Ω ~ 100KΩ
PRMAAW	PRMA 10W	10W	16	12	35	0.75	7.5	0.1Ω ~ 560Ω	561Ω ~ 100KΩ
PRMB7W	PRMB 7W	7W	13	9	39	0.75	5	0.1Ω ~ 680Ω	681Ω ~ 200KΩ

Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

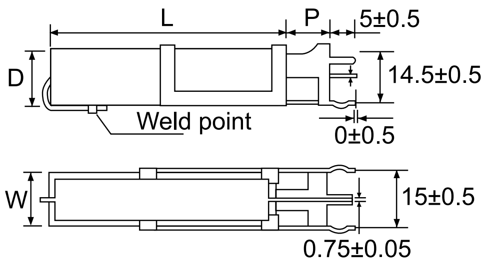
Heat Rise Chart (PRM)



PRS Type



5W, 7W, 10W, 15W



20W, 25W

Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	
			W ± 1	D ± 1	L ± 1	d ± 0.05	P ± 1	Wire-wound	Power Film
PRS05W	PRS 5W	5W	10	9	22	0.75	5	0.1Ω ~ 47Ω	48Ω ~ 100KΩ
PRS07W	PRS 7W	7W	10	9	35	0.75	10	0.1Ω ~ 680Ω	681Ω ~ 200KΩ
PRS0AW	PRS 10W	10W	10	9	49	0.75	10	01 Ω ~ 910Ω	911Ω ~ 200KΩ
PRS0FW	PRS 15W	15W	12.5	11.5	49	0.75	11	1Ω ~ 1KΩ	
PRS020	PRS 20W	20W	14.5	13.5	60	0.75	10	1Ω ~ 3.4KΩ	
PRS025	PRS 25W	25W	14.5	13.5	64	0.75	10	1Ω ~ 3.4KΩ	

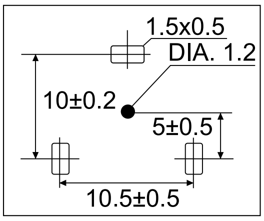
Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

RoHS Compliant

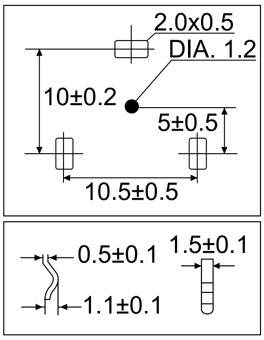
Cement Fixed Resistors

PRS Recommended Hole

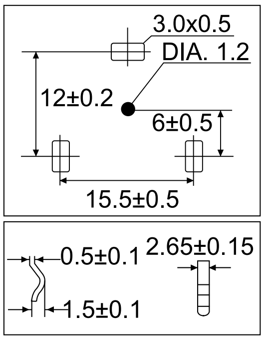
PRS 5W



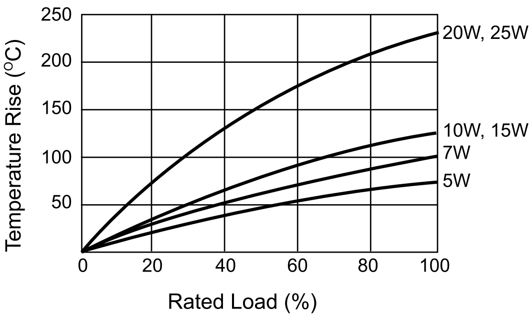
PRS 7W, 10W, 15W



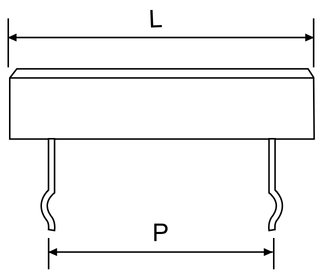
PRS 20W, 25W

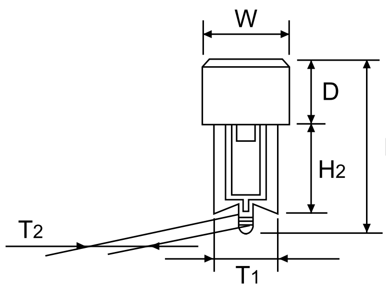


Heat Rise Chart (PRS)

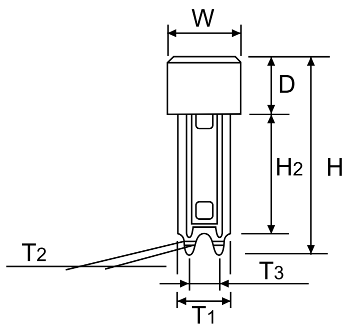


PRZA-1, PRZA-2, PRZA-3, PRZC, PRZD Type



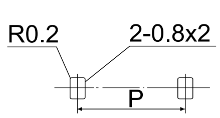
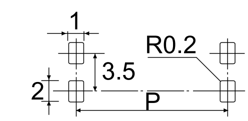
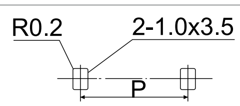
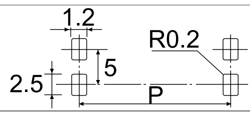


PRZA-1, PRZA-2, PRZA-3



PRZC, PRZD

Recommended Hole

Power Rating at 70°C	Dimension (mm)		
	PRZA-1, PRZA-2, PRZA-3	PRZC, PRZD	P
5W			9.5 / 15
7W			22
10W			32 / 35
15W			32
20W			45

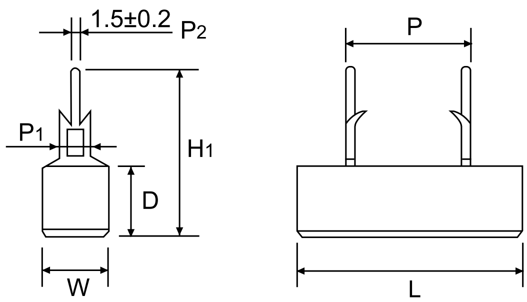
RoHS Compliant

Cement Fixed Resistors

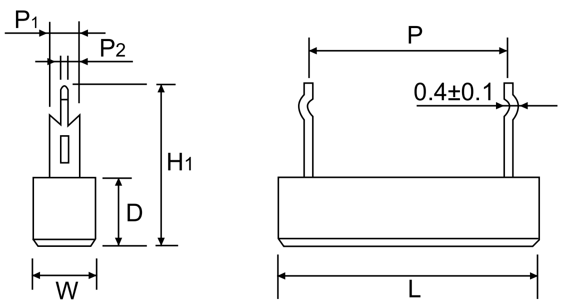
Part No.	Style	Power Rating at 70°C	Dimension (mm)									Resistance Range	
			W ± 1	D ± 1	L	P ±1.5	T_1 ± 1	T_2 ± 0.2	T_3 ± 0.5	H_1 + 2 - 1	H_2 + 2 - 1	Wire-wound	Power Film
PZ1A5W	PRZA-1	5W	10	9	25 ± 1	9.5	7	1.6		24	10	0.1Ω ~ 120Ω	121Ω ~ 56KΩ
					27 ± 1	15							
PZ2A5W	PRZA-2		10	9	27 ± 1	15	7	1.6		39	25		
PZ3A5W	PRZA-3		10	9	27 ± 1	15	7	1.3		39	25		
PRZC5W	PRZC		10	9	27 ± 1	*15	7	1.5	3.5	36	22		
PRZD5W	PRZD		10	9	27 ± 1	15	7	1.5	3.5	24	10		
PZ1A7W	PRZA-1	7W	10	9	35 ± 1	22	7	1.6		24	10	0.1Ω ~ 560Ω	561Ω ~ 100KΩ
PZ2A7W	PRZA-2		10	9	35 ± 1	22	7	1.6		39	25		
PRZC7W	PRZC		10	9	35 ± 1	*22	7	1.5	3.5	36	22		
PRZD7W	PRZD		10	9	35 ± 1	22	7	1.5	3.5	24	10		
PZ1AAW	PRZA-1	10W	10	9	48 ± 1.5	32 / 35	7	1.6		24	10	1Ω ~ 820Ω	821Ω ~ 100KΩ
PZ2AAW	PRZA-2		10	9	48 ± 1.5	32 / 35	7	1.6		39	25		
PRZCAW	PRZC		10	9	48 ± 1.5	*32 / *35	7	1.5	3.5	36	22		
PRZDAW	PRZD		10	9	48 ± 1.5	32 / 35	7	1.5	3.5	24	10		
PZ1AFW	PRZA-1	15W	12.5	11.5	48 ± 1.5	32	10	3		35	15	1Ω ~ 1KΩ	
PZ2AFW	PRZA-2		12.5	11.5	48 ± 1.5	32	10	3		47	30		
PRZCFW	PRZC		12.5	11.5	48 ± 1.5	*32	10	2	5	47	30		
PZ1A20	PRZA-1	20W	12.5	13.5	63 ± 1.5	45	10	3		35	15	2Ω ~ 1.2KΩ	
PZ2A20	PRZA-2		12.5	13.5	63 ± 1.5	45	10	3		47	30		
PRZC20	PRZC		12.5	13.5	63 ± 1.5	*45	10	2	5	47	30		

* PRZC Type Pitch Tolerance = +2 ~ +6   Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

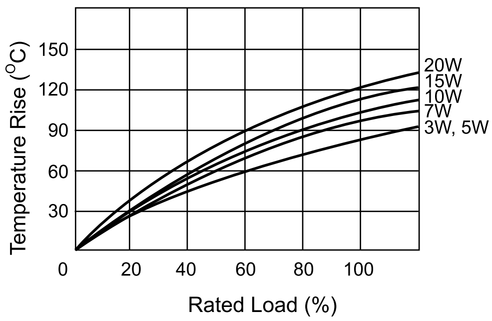
PRVA Type



PRVB Type



Heat Rise Chart (PRVA/PRVB)



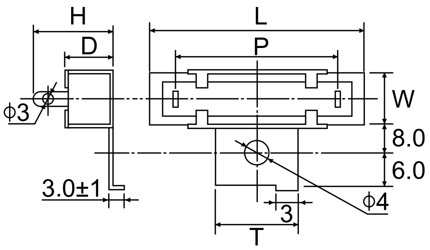
RoHS Compliant

Cement Fixed Resistors

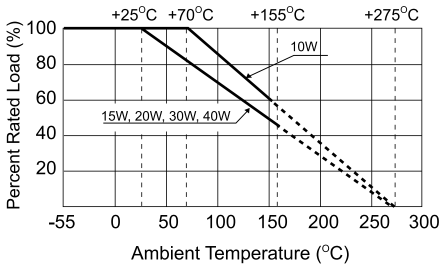
Part No.	Power Rating at 70°C	Dimension (mm)							Resistance Range	
		W±1	D±1	L±1	P±1	P_1±1	H_1±1	*P_2±0.2	Wire-wound	Power Film
PRVA3W / PRVB3W	3W	10	9	22	9.5	5	25	1.5/1.3	0.1Ω ~ 47Ω	48Ω ~ 33KΩ
PRVA5W / PRVB5W	5W	10	9	27 / 25	15 / 9.5	5	25	1.5/1.3	0.1Ω ~ 120Ω	121Ω ~ 56KΩ
PRVA7W / PRVB7W	7W	10	9	35	22	5	25	1.5/1.3	0.1Ω ~ 560Ω	561Ω ~ 100KΩ
PRVAAW / PRVBAW	10W	10	9	48	32	5	25	1.5/1.3	1Ω ~ 820Ω	821Ω ~ 100KΩ
PRVAFW / PRVBFW	15W	12.5	11.5	48	32	5	24	1.5	1Ω ~ 1KΩ	
PRVA20 / PRVB20	20W	12.5	13.5	63	45	5	26	1.5	1Ω ~ 1.2KΩ	

Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

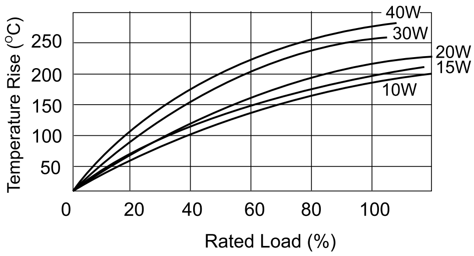
PRT Type



Derating Curve



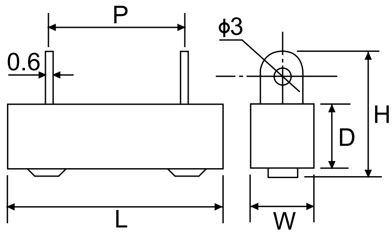
Heat Rise Chart (PRT)



Part No.	Style	Power Rating at 70°C	Dimension (mm)						Resistance Range	
			W±1	D±1	L±1	P±1	H±1	T±1	Wire-wound	Power Film
PRT0AW	PRT 10W	10W	10	9	48	32	18	12	1Ω ~ 820Ω	821Ω ~ 100KΩ
PRT0FW	PRT 15W	15W	12.5	11.5	48	32	21	12	1Ω ~ 1KΩ	
PRT020	PRT 20W	20W	12.5	13.5	63	45	21	12	2Ω ~ 1.2KΩ	
PRT030	PRT 30W	30W	19	19	75	56	32 Max	18	3Ω ~ 1.5KΩ	
PRT040	PRT 40W	40W	19	19	90	70	32 Max	18	6Ω ~ 1.5KΩ	

Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

PRU Type



Part No.	Style	Power Rating at 70°C	Dimension (mm)					Resistance Range	
			W±1	D±1	L±1	P±1	H±1	Wire-wound	Power Film
PRU0AW	PRU 10W	10W	10	9	48	32	18	1Ω ~ 820Ω	821Ω ~ 100KΩ
PRU0FW	PRU 15W	15W	12.5	11.5	48	32	21	1Ω ~ 1KΩ	
PRU020	PRU 20W	20W	12.5	13.5	63	45	21	2Ω ~ 1.2KΩ	
PRU030	PRU 30W	30W	19	19	75	56	32 Max	3Ω ~ 1.5KΩ	
PRU040	PRU 40W	40W	19	19	90	70	32 Max	6Ω ~ 1.5KΩ	

Remark: Max Working Voltage: 500V
Max Overload Voltage: 1,000V

RoHS Compliant

Cement Fixed Resistors

Performance Specification

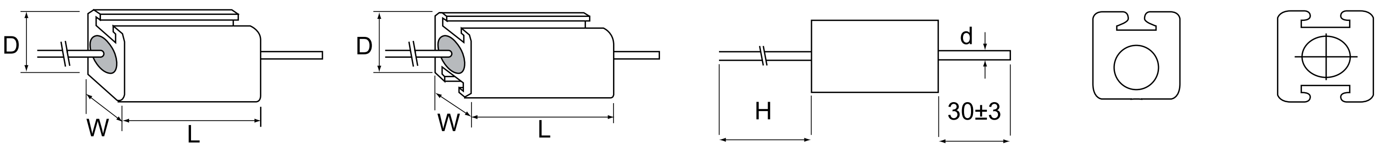
Temperature Coefficient	<20Ω: ±400PPM/°C; ≥20Ω: ±350PPM/°C
Short Time Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dieiectric Withstanding Voltage	No evidence of flashover, mechanical damage, arcing or insulation breakdown.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady State)	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.

Features

- Vertical or Axial type
- Rated power: 4W - 17W
- Tolerance: 5%, 10%
- Wire-wound technology
- Withstand high overload current
- Non - flammable
- Extremely small, sturdy and mechanically safe
- Special solvent resistance

PRWI Type

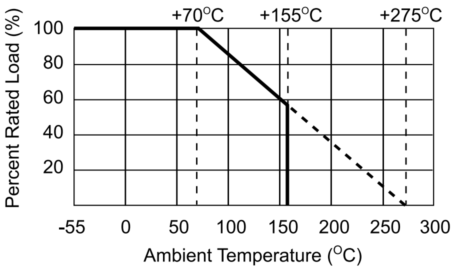
4W, 5W, 7W | 11W, 17W | 4W, 5W, 7W, 11W, 17W | 4W, 5W, 7W | 11W, 17W



Part No.	Style	Power Rating at 70°C	Dimension (mm)					Low Resistance Range	Standard Resistance Range	High Resistance Range
			W±1	D±1	L±1	H±1	d±0.05			
PRWI4W	PRWI4W	4W	7	8	20	56	0.75	0.1Ω ~ 0.9Ω	1Ω ~ 1KΩ	1.1Ω ~ 6.8KΩ
PRWI5W	PRWI5W	5W	7.5	8.5	25	60	0.75	0.1Ω ~ 0.9Ω	1Ω ~ 1KΩ	1.1Ω ~ 6.8KΩ
PRWI7W	PRWI7W	7W	7	8	38	70	0.75	0.33Ω ~ 0.9Ω	1Ω ~ 10KΩ	10.1Ω ~ 22KΩ
PRWIBW	PRWI11W	11W	9	10	50	85	0.75	0.56Ω ~ 0.9Ω	1Ω ~ 10KΩ	10.1Ω ~ 23KΩ
PRWIHW	PRWI17W	17W	9	10±1.5	75	110	0.75	0.1Ω ~ 0.9Ω	1Ω ~ 10KΩ	10.1Ω ~ 39KΩ

Remarks: Max Worldrg Voltage: 500V
Max Overload Voltage: 1,000V
Dielectric withstanding voltage: 2,000V

Derating Curve



Cement Thermal Fusible Resistors

Performance Specification

Temperature Coefficient	<20Ω: ±400PPM/°C; ≥20Ω: ±350PPM/°C	
Short Time Overload	±(5.0% + 0.05Ω)Max, 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	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Solderability	Min. 95% coverage.	
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Humidity (Steady State)	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.	
Load Life in Humidity	Wire-wound:	±(5.0% + 0.05Ω)Max
	Power Film:	<100KΩ: ±(5.0% + 0.05Ω)Max
		≥100KΩ: ±(10.0% + 0.05Ω)Max
Load life	Wire-wound:	±(5.0% + 0.05Ω)Max
	Power Film:	<100KΩ: ±(5.0% + 0.05Ω)Max
		≥100KΩ: ±(10.0% + 0.05Ω)Max

Ordering Procedure: Ex.: FTR-5G 2.8W, +/-5%, 1.5Ω, 2A, B/B

P F 5 G 2 8 J W 1 5 J B 0 2

Type:
PF2 = FTR2
PF3 = FTR3
PF5 = FTR5
PF7 = FTR7
PFA= FTR10

Fusing Temp:
A = 98°C
B = 104°C
C = 117°C
D = 125°C
E = 128°C(10A) / 130°C(2A)
F = 144°C
G= 150°C
H = 152°C
I = 167°C
J = 184°C
K = 227°C
L = 229°C

Wattage:
14 = 1.4W
15 = 1.5W
16 = 1.6W
17 = 1.7W
18 = 1.8W
19 = 1.9W
20 = 2.0W
21= 2.1W
22 = 2.2W
23 = 2.3W
24 = 2.4W
25 = 2.5W
26 = 2.6W
27 = 2.7W
28 = 2.8W
30 = 3.0W
31 = 3.1W
32 = 3.2W
33 = 3.3W
34 = 3.4W
36 = 3.6W
38 = 3.8W
40 = 4.0W
44 = 4.4W
46 = 4.6W
52 = 5.2W

Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit denotes product type
  W = Wire-wound type
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472

Packing Type:
B = Bulk/Box

Packing Qty:
0 = Bulk/Box

Current Rating:
2 = 2A
5 = 5A
A = 10A

Cement Thermal Fusible Resistors

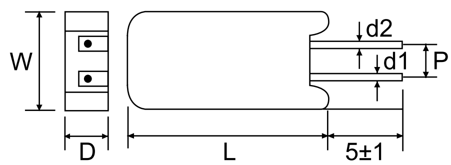
Features

- Self extinguishing
- Excellent flame and moisture resistance
- Extremely small and mechanically safe
- Provides outstanding feature against surges
- Too low or too high ohmic values on Wire-wound & Power Film type can be supplied on a case to case basis
- Tolerance: 5%, 10%

FTR Type

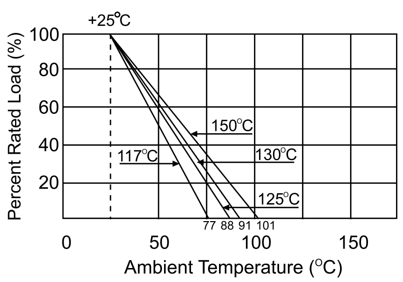
Part No.	Type	Dimension (mm)						Current Rating	Voltage Rating	Rated Functioning Temp.				Resistance Range (E-24 series) ±5%, ±10%
		W ± 1	D ± 1	L ± 1	P ± 1	d1	d2 ± 0.05			C 117°C	D 125°C	E 130°C	G 150°C	
PF2	FTR2	12	7	21	5	0.6	0.75	2A	250V	1.6W	1.9W	2.0W	2.0W	0.22Ω ~ 270Ω
PF3	FTR3	12	8	26	5	0.6	0.75			1.7W	2.0W	2.1W	2.3W	0.27Ω ~ 680Ω
PF5	FTR5	13	9	26	5	0.6	0.75			1.9W	2.3W	2.4W	2.8W	0.27Ω ~ 680Ω
PF7	FTR7	13	9	38.5	5	0.6	0.75			2.2W	2.7W	2.8W	3.2W	0.68Ω ~ 1.2KΩ
PFA	FTR10	16	13	35	7.5	0.6	0.75			2.6W	3.2W	3.3W	3.8W	1Ω ~ 1.8KΩ

Part No.	Type	Dimension (mm)						Current Rating	Voltage Rating
		W ± 1	D ± 1	L ± 1	P ± 1	d1 ± 0.05	d2 ± 0.05		
PF2	FTR2	12	7	21	5	1.0	0.75	10A	250V
PF3	FTR3	12	8	26	5	1.0	0.75		
PF5	FTR5	13	9	26	5	1.0	0.75		
PF7	FTR7	13	9	38.5	5	1.0	0.75		
PFA	FTR10	16	13	35	7.5	1.0	0.75		

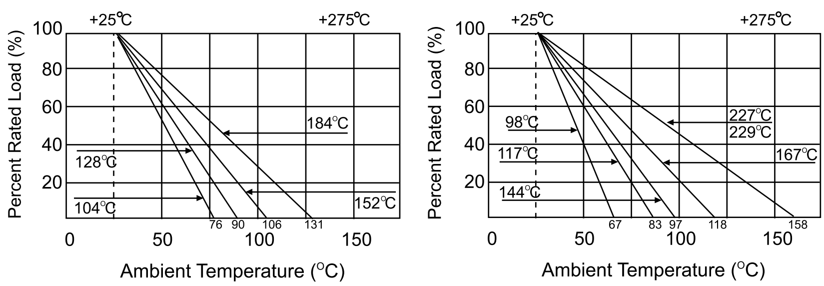


Part No.	Type	Fusing Temperature Code										Resistance Range (E-24 series) ±5%, ±10%
		A 98°C	B 104°C	C 117°C	E 128°C	F 144°C	H 152°C	I 167°C	J 184°C	K 227°C	L 229°C	
PF2	FTR2	1.4W	1.6W	1.8W	2.0W	2.0W	2.0W	2.0W	2.0W	2.0W	2.0W	0.22Ω ~ 270Ω
PF3	FTR3	1.5W	1.7W	1.9W	2.1W	2.2W	2.5W	2.8W	3.0W	3.0W	3.0W	0.27Ω ~ 680Ω
PF5	FTR5	1.7W	1.9W	2.2W	2.4W	2.6W	3.1W	3.3W	3.8W	3.8W	3.8W	0.27Ω ~ 680Ω
PF7	FTR7	2.0W	2.2W	2.5W	2.8W	3.0W	3.4W	3.8W	4.4W	4.4W	4.4W	0.68Ω ~ 1.2KΩ
PFA	FTR10	2.4W	2.6W	3.0W	3.3W	3.6W	4.0W	4.6W	5.2W	5.2W	5.2W	1Ω ~ 1.8KΩ

Derating Curve (current rating 2A)



Derating Curve (current rating 10A)



RoHS Compliant

Power Flat Alloy Resistors

Performance Specification

Temperature Coefficient	±350PPM/°C
Short Time Overload	±(2.0% + 0.05Ω)Max , with no evidence of mechanical damage.
Dielectric Withstanding Voltage	2,000V
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max , with no evidence of mechanical damage.
Solderability	Min. 95% coverage
Temperature Cycling	±(5% + 0.05Ω)Max , with no evidence of mechanical damage.
Humidity (Steady State)	±(5% + 0.05Ω)Max , with no evidence of mechanical damage.
Load Life in Humidity	±(5% + 0.05Ω)Max , with no evidence of mechanical damage.
Load Life	±(5% + 0.05Ω)Max , with no evidence of mechanical damage.

Ordering Procedure: Ex.: PFAS 5W,+/-5%, 0.68Ω, B/B

P F A S 5 W J 0 6 8 K B 0 0

Type:
PFAS = PFA Single
PFAT = PFA Twin

Wattage:
2W = 2W
3W = 3W
5W = 5W
7W = 7W
AW = 10W

Tolerance:
J = ±5%
K = ±10%
M = ±20%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J

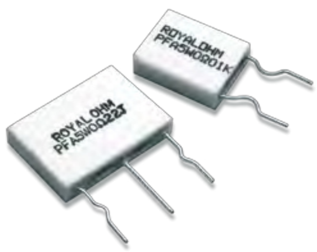
Packing Type:
B = Bulk/Box

Packing Qty:
0 = Bulk/Box

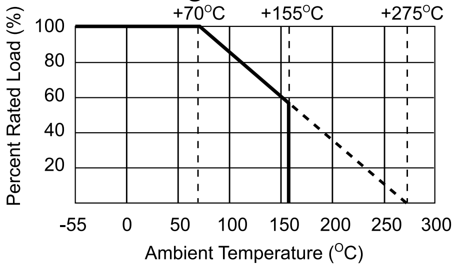
Additional Information:
0 = Standard

Features

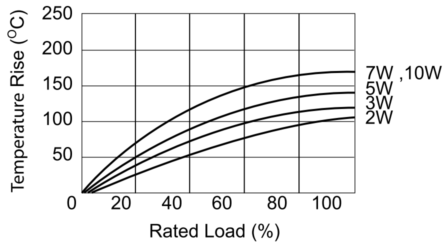
- Low Inductance
- Safety flameproof construction
- Thin & lightweight save PCB space
- Automatically insertable
- Application: TV, Microwave, Audio, Air condition



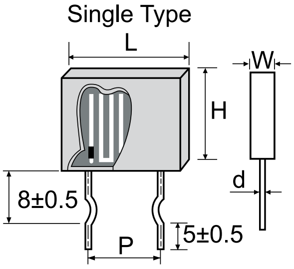
Derating Curve



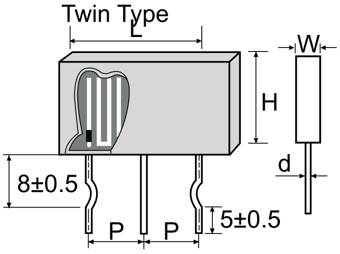
Heat Rise Chart



Single Type



Twin Type



Part No.	Style	Power Rating at70°C	Dimension (mm) W +0 -0.5	H±1	L±1	d±0.05	P±1	Resistance Range (±5% & ±10%)
PFAS Type (Single Circuit)								
PFAS2W	PFAS 2W	2W	5.5	9	14	0.75	10	0.1Ω ~ 0.68Ω
PFAS3W	PFAS 3W	3W	5.5	13	14	0.75	10	0.1Ω ~ 0.68Ω
PFAS5W	PFAS 5W	5W	5.5	18	14	0.75	10	0.1Ω ~ 1Ω
PFASAW	PFAS 10W	10W	5.5	18	26	0.75	20	0.22Ω ~ 3.3Ω
PFAT Type (Twin Circuit)								
PFAT2W	PFAT 2W + 2W	2W	5.5	9	26	0.75	10	0.1Ω ~ 0.68Ω
PFAT3W	PFAT 3W + 3W	3W	5.5	13	26	0.75	10	0.1Ω ~ 0.68Ω
PFAT5W	PFAT 5W + 5W	5W	5.5	18	26	0.75	10	0.1Ω ~ 1Ω
PFAT7W	PFAT 7W + 7W	7W	5.5	20	26	0.75	10	0.1Ω ~ 1Ω

RoHS Compliant

Shunt Resistors

Performance Specification

Temperature Coefficient	±400PPM/°C depends on resistance value.
Short Time Overload	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Resistance to Soldering Heat	±(1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min.95% coverage

Ordering Procedure: Ex.: CSRA, ϕ08mm, +/- 5%, 25mΩ, B/B

C S R A 0 8 J 2 5 L 0 B 0 0

Type:
- CSRA = Type A
- CSRB = Type B
- CSRC = Type C
- CSRD = Type D
- CSRE = Type E

Wire diameter:
- 08 = Ø0.8
- 10 = Ø1.0
- 12 = Ø1.2
- 14 = Ø1.4
- 16 = Ø1.6
- 20 = Ø2.0

Tolerance:
- G = ±2%
- J = ±5%
- K = ±10%

Resistance Value:
- "L" decimal point

Ex.: 5L00 = 5mΩ
5L50 = 5.5mΩ
25L5 = 25.5mΩ
255L = 255mΩ

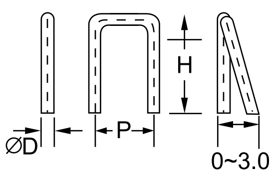
Packing Type:
B = Bulk/Box

Packing Qty:
0 = Bulk/Box

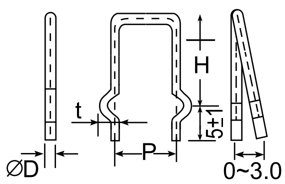
Additional Information:
0 = NIL

Features

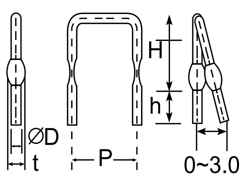
- The resistive element: CuNi or MnCu alloys (depends on resistance value)
- Customized product
- Low inductance type
- For current sensing application
- Easy to insert and solder
- Resistance tolerance: ±2%, ±5%, ±10%
- Power rating is in the form of maximum current (amp)



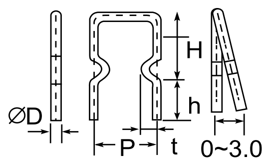
Shunt A



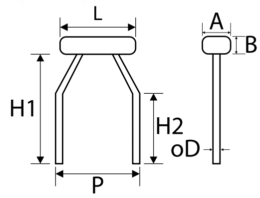
Shunt B



Shunt C



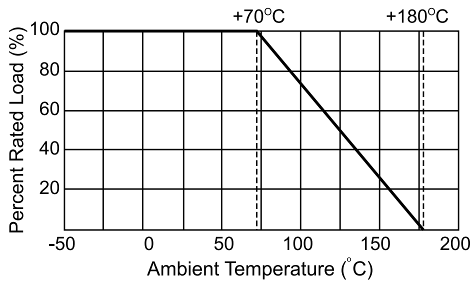
Shunt D



Shunt E

Type	Wire diameter (mm)	Rated Current (A)	Resistance range	Remark
CSRA CSRB CSRC CSRD	0.8	4.5	5mΩ ~ 50mΩ	Info needed: a.) Ohmic value b.) Rated current (amp) Optional: a.) Pitch b.) Lead wire diameter
	1.0	5.5	3mΩ ~ 30mΩ	
	1.2	7.0	3mΩ ~ 20mΩ	
	1.4	8.0	3mΩ ~ 20mΩ	
	1.6	9.5	3mΩ ~ 15mΩ	
	2.0	12	3mΩ ~ 10mΩ	
CSRE	1.0	50	1mΩ	

Derating Curve



RoHS Compliant

Coil Resistors

Performance Specification

Temperature Coefficient	±200PPM/°C depends on resistance value.
Short Time Overload	±(5%+0.05Ω) Max, with no evidence of mechanical damage.
Resistance to Soldering Heat	±(1%+0.05Ω) Max, with no evidence of mechanical damage.
Load Life	±(5%+0.05Ω) Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5%+0.05Ω) Max, with no evidence of mechanical damage.

Ordering Procedure: Ex.: Coil Type A, ϕ1.6mm,+/-5%, 230mΩ, B/B

C S C A 1 6 J 2 3 0 L B 0 0

Type:
CSCA = Coil Type A (Normal)
CSCB = Coil Type B (Kink)
CSCC = Coil Type C (Alignment)

Wire diameter:
08 = Ø0.8
10 = Ø1.0
16 = Ø1.6
20 = Ø2.0

Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- "L" decimal point

Ex.: 5L00 = 5mΩ
5L50 = 5.5mΩ
25L5 = 25.5mΩ
255L = 255mΩ

Packing Type:
B = Bulk/Box

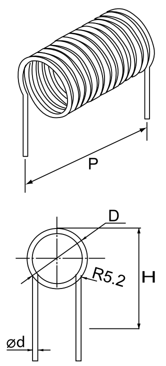
Packing Qty:
0 = Bulk/Box

Additional Information:
0 = NIL

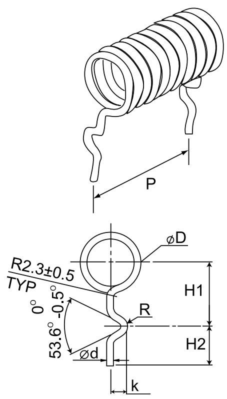
Features

- Low resistance value that withstand high current
- Compatible with automotive part
- Customized product
- Stable performance and perfect reliability

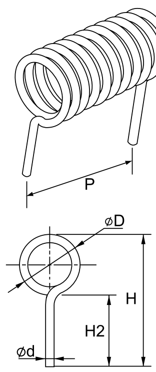
Coil A



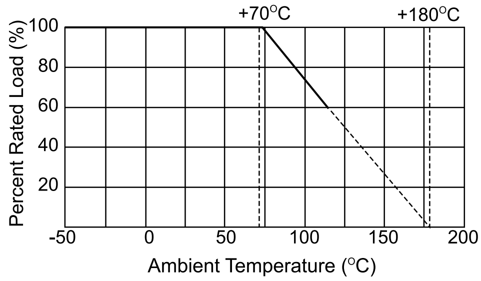
Coil B



Coil C



Derating Curve



Type	Wire diameter (mm)	Rated Current (A)	Resistance Range	Operating Temperature	Remark
Coil A Coil B Coil C	0.8	4.5	5mΩ ~ 50mΩ	-55°C ~ +180°C	Info needed: a.) Ohmic value b.) Rated current (amp) Optional: a.) Pitch b.) Lead wire diameter
	1.0	5.5	3mΩ ~ 30mΩ		
	1.6	9.5	3mΩ ~ 15mΩ		
	2.0	12	3mΩ ~ 10mΩ		

RoHS Compliant

Power Dissipation Mount Fixed Resistors

Performance Specification

Temperature Coefficient	<20Ω ±400PPM/°C; ≥20Ω ±350PPM/°C.
Short Time Overload	± (5.0% + 0.05Ω) Max, 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	± (1.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Temperature Cycling	± (5.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Humidity (Steady State)	±(3.0% + 0.05Ω) Max, with no evidence of mechanical damage.
Load Life in Humidity	For Wire-wound range, ±(5.0% + 0.05Ω)Max
Load Life	For Wire-wound range, ±(5.0% + 0.05Ω)Max

Ordering Procedure: Ex.: PDM 25W,+/-5%, 100Ω, B/B

P D M 0 2 5 J W 1 0 1 B 0 0

Type:
PDM = Power Dissipation Mount Fixed Resistors

0 = Standard
1 = Cement Filling
S = Special

Wattage:
5W = 5W
AW = 10W
25 = 25W
35 = 35W
50 = 50W
75 = 75W
85 = 85W
A0 = 100W

Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "W" = Wire-wound
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472

Packing Type:
B = Bulk/Box

Packing Qty:
0 = Bulk/Box

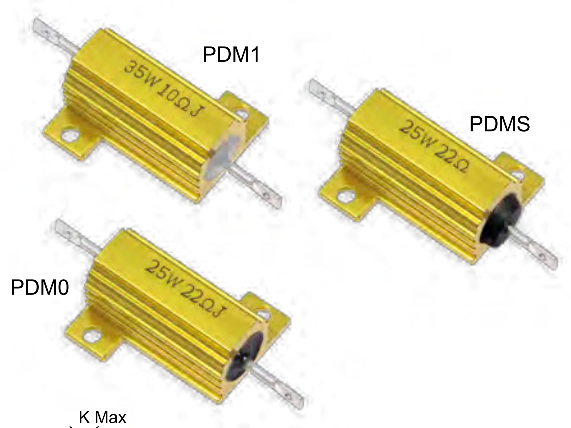
Additional Information:
0 = Standard

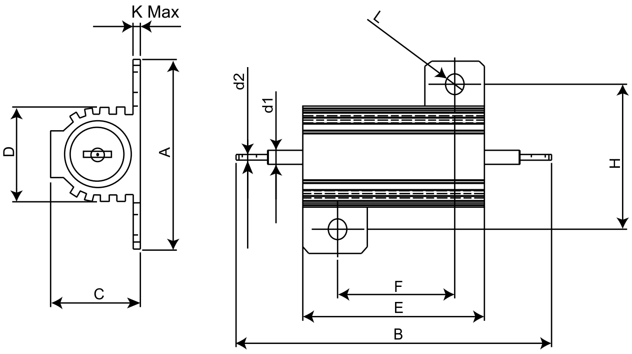
RoHS Compliant

Power Dissipation Mount Fixed Resistors

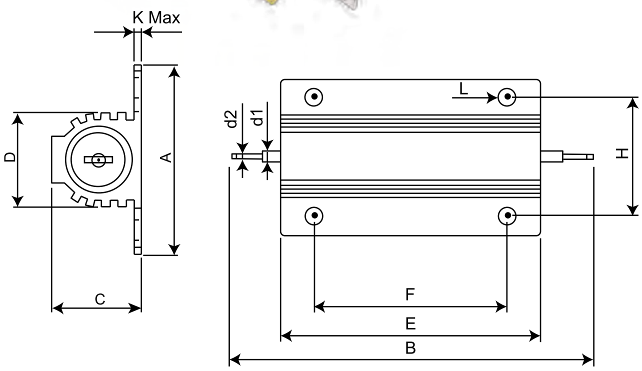
Features

- Low inductance
- Safety flameproof construction
- Lightweight body with high power rating
- Application: Power supply, Adapter,
  Industrial application, Inverter





5W-50W, 85W

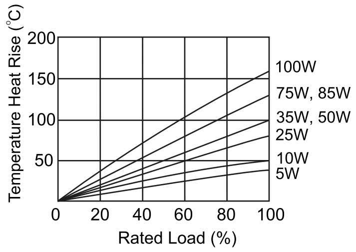


75W, 100W

Style	A±1	B±2	C±1	D±1	E±1	F±1	H±1	K Max	L±0.5	d_1±0.2	d_2±0.2
PDM1 5W	16.5	34	8	8.5	15	10	12.5	2.5	2	0.8	-
PDM1 10W	22.5	33.5	10.5	10.5	20	13	15.5	3.2	3	2	0.8
PDM1 25W PDMS 25W	27	49	14	13.5	28	18	19	3.2	4	2	0.8
PDM1 35W	29	60	15.5	15.5	33	23	23.5	3.2	3.5	2	0.8
PDM1 50W PDMS 50W	30	75	16	15.5	50	40	21.5	3.2	3.5	2	0.8
PDM1 75W	47.5	88	26	27	66	36	37	3.7	4.5	2.3	1.1
PDM1 85W	29	100	15.5	15.5	75.5	40	20.5	3.2	3.5	2	0.8
PDM1 100W	48	120	26	27	98	72	37	3.7	4.5	2	0.8

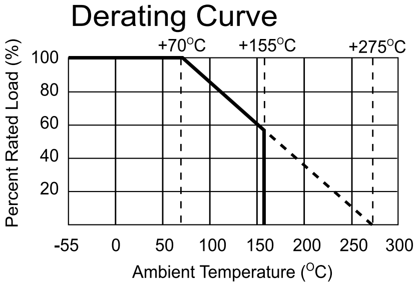
Style	A±0.5	B±1	C±0.5	D±2	E±0.5	F±0.2	H±0.2	K Max	L±0.5	d_1±0.05	d_2±0.2
PDM0 5W	16	32.5	8	8	15.5	11	12	2.5	2	1	0.3
PDM0 10W	22.3	40.5	12.2	11	20.5	15.2	17.2	3.2	2.5	2	0.8
PDM0 25W	30.3	45.5	16.3	14	27.5	18.2	20.2	3.2	3	2	0.8
PDM0 35W	30.3	56.5	16.3	16.3	34.5	24.2	20.2	3.2	3	2	0.8
PDM0 50W	30.3	78.5	15.7	16.5	50.5	40.2	20.2	3.2	3	2	0.8

Heat Rise Chart



Style	Power Rating at 70°C	Max Working Voltage	Lowest Ohmic Value	Standard Resistance Range	Highest Ohmic Value
PDM 5W	5W	200V	0.01Ω	5.1Ω ~1KΩ	1.8KΩ
PDM 10W	10W	265V	0.05Ω	5.1Ω ~1.5KΩ	5KΩ
PDM 25W	25W	550V	0.05Ω	5.1Ω ~8.2KΩ	12KΩ
PDM 35W	35W	950V	0.05Ω	5.1Ω ~8.2KΩ	15KΩ
PDM 50W	50W	1250V	0.05Ω	5.1Ω ~20KΩ	35KΩ
PDM 75W	75W	1400V	0.05Ω	0.1Ω ~20KΩ	35KΩ
PDM 85W	85W	1400V	0.05Ω	0.1Ω ~20KΩ	35KΩ
PDM 100W	100W	1900V	0.05Ω	1Ω ~3KΩ	-

Derating Curve



Note : Part no PDMS special 25W, 50W only.
Above 100W available on case to case basis.

RoHS Compliant

Power (Ribbon) Wire-Wound Resistors

Performance Specification

Temperature Coefficient	<20Ω±400PPM/°C; ≥20Ω ±300PPM/°C.
Short Time Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Terminal Strength	No evidence of mechanical damage.
Resistance to Soldering Heat	± (1.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Solderability	Min. 95% coverage.
Load Life in Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.

Ordering Procedure: Ex.: QRZG 225W,+/- 5%, 1.8Ω, B/B

Q R Z G 0 0 J 0 1 8 J 2 2 5

Q R Z G — Type:
Power Wire-wound
QH00= QH
QL00= QL

Power(Ribbon)Wire-wound
QR00= QR
QRZG= QRZG

0 0 — Wattage:
20 = 20W
25 = 25W
30 = 30W
40 = 40W
50 = 50W
60 = 60W
80 = 80W
00 = ≥100W indicate power rating at the last 3 digits of the part no.

J — Tolerance:
J =±5%
K=±10%

0 1 8 J — Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros.
  "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4Ω7 ~ 47J, 4.7KΩ ~ 472

2 — Packing Type:
0 = Bulk/Box

2 — Packing Qty:
0 = Bulk/Box

5 — Additional Information:
0 = NIL

Note: Power Rating ≥ 100 Watt, please indicate the power rating in the last 3 digits as follows.

100 = 100W	300 = 300W	120 = 120W	450 = 450W
225 = 225W	600 = 600W	A00 = 1,000W	

RoHS Compliant

ROYALOHM

Power (Ribbon) Wire-Wound Resistors

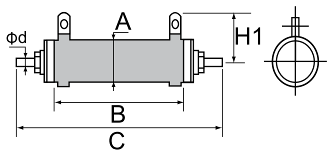
Features

- Multi-terminal types and variable types available
- Capable of carrying high power load
- Resistance value unchanged after long use
- Good resistivity to short time overload
- High resistance to heat & low temperature coefficient, Resistance and temperature change is linear
- Too low or too high ohmic value can be supplied on a case to case basis

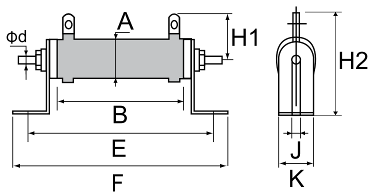
QL / QH Type

Part no.	Style	Power Rating at 70°C	Dimention (mm)										Resistance Range
			A±1	B	C±1	E±1	F±1	H1±1	H2±1	J±1	K±1	Φd±0.5	
QH / QL0020	QH / QL 20W	20W	22	50±1	75	81	102	27	50	7	19	4	1Ω~10KΩ
QH / QL0025	QH / QL 25W	25W	22	60±1	84	87	110	27	50	7	19	4	2Ω~12KΩ
QH / QL0030	QH / QL 30W	30W	22	75±1	100	105	117	27	50	7	19	4	2Ω~15KΩ
QH / QL0040	QH / QL 40W	40W	22	90±1	113	126	140	27	50	7	19	4	2Ω~20KΩ
QH / QL0050	QH / QL 50W	50W	31	75±1	108	118	131	32	64	8	27	5	3Ω~25KΩ
QH / QL0060	QH / QL 60W	60W	31	90±1	123	124	146	32	64	8	27	5	3Ω~30KΩ
QH / QL0080	QH / QL 80W	80W	31	115±2	148	148	171	32	64	8	27	5	3Ω~40KΩ
QH / QL00...100	QH / QL 100W	100W	31	140±2	175	173	195	32	64	8	27	5	3Ω~50KΩ
QH / QL00...120	QH / QL 120W	120W	31	165±2	197	198	224	32	64	8	27	5	4Ω~60KΩ
QH / QL00...150	QH / QL 150W	150W	31	195±2	230	228	253	32	64	8	27	5	4Ω~70KΩ
QH / QL00...200	QH / QL 200W	200W	31	254±2	288	288	312	32	64	8	39	5	5Ω~100KΩ
QH / QL00...300	QH / QL 300W	300W	43	254±2	293	384	334	45	87	8	39	5	8Ω~150KΩ
QH / QL00...400	QH / QL 400W	400W	43	330±3	347	371	410	45	87	8	39	5	10Ω~200KΩ
QH / QL00...600	QH / QL 600W	600W	43	420±3	462	462	502	45	87	8	39	5	10Ω~200KΩ

QH TYPE



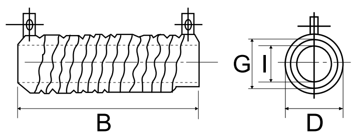
QL TYPE



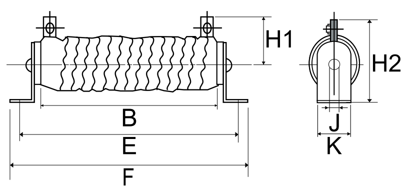
QR / QRZG Type

Part No.	Max Watt	Dimension (mm)										Resistance Range
		B	D±1	E±1	F±1	G±1	H1±1	H2±1	I±1	J±1	K±1	
QR00....120 QRZG...120	120W	115±2	33	148	171	28	32	64	16	8	27	0.2Ω~4Ω
QR00....150 QRZG...150	150W	140±2	33	173	195	28	32	64	16	8	27	0.3Ω~5Ω
QR00....180 QRZG...180	180W	165±2	33	198	224	28	32	64	16	8	27	0.3Ω~6Ω
QR00....225 QRZG...225	225W	195±2	33	228	253	28	32	64	16	8	27	0.4Ω~8Ω
QR00....300 QRZG...300	300W	254±2	33	288	312	28	32	64	16	8	27	0.5Ω~10Ω
QR00....450 QRZG...450	450W	254±2	48	384	334	40	45	87	25	8	40	0.8Ω~15Ω
QR00....600 QRZG ..600	600W	330±3	48	371	410	40	45	87	25	8	40	1Ω~20Ω
QR00....750 QRZG...750	750W	300±3	55	338	382	50	57	100	30	8	50	1Ω~75Ω
QR00....1000 QRZG...1000	1000W	390±3	55	427	473	50	57	100	30	8	50	1Ω~100Ω

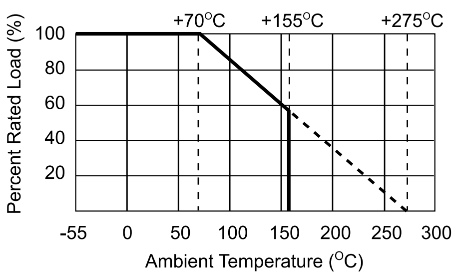
QR TYPE



QRZG TYPE



Derating Curve



RoHS Compliant

Aluminum Case High Power Wire-Wound Resistors

Performance Specification

Temperature Coefficient	±350PPM/^{o}C
Short Time Overload	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Dieiectric Withstanding Voltage	No evidence of mechanical damage.
Temperature Cycling	±(2.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Humidity (Steady state)	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.
Load Life	±(5.0% + 0.05Ω)Max, with no evidence of mechanical damage.

Ordering Procedure: Ex.: HEWR, 200W,+/-5%, 180Ω

H E W R B 0 J 0 1 8 1 2 0 0

Type:
HEWR = HEWR
HBWR = HBWR

Connector style:
A0 = Terminal type
B0 = Cable type

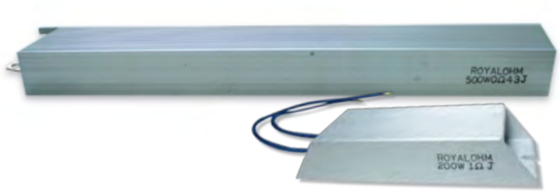
Tolerance:
J = ±5%
K = ±10%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros
  "J" ~0.1, "K" ~ 0.01
  Ex. 4.7Ω ~ 47J, 4.7KΩ ~ 472

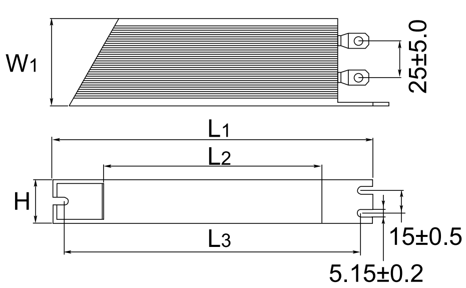
Wattage:
060 = 60W
080 = 80W
100 = 100W
200 = 200W
300 = 300W
400 = 400W
500 = 500W
600 = 600W
A00 = 1000W

Features

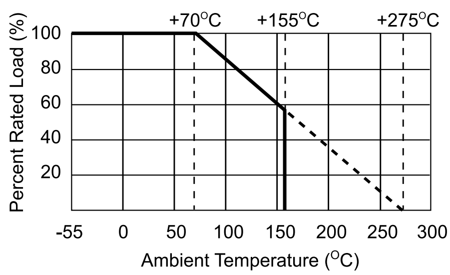
- High Power and Excellent Load Life stability
- Good resistance to moisture solvent and insulation
- High Surge resistance item available
- Application: Breaking resistor, Elevator



HBWR



Derating Curve



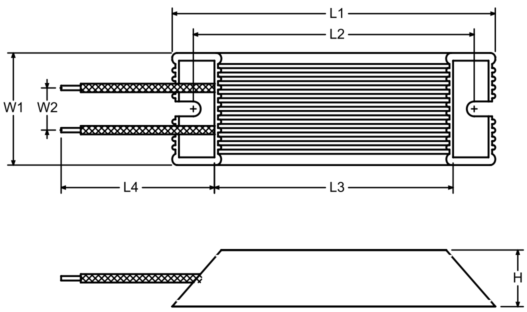
Power	L1±2	L2±2	L3±2	W1±2	H±2	Resistance Range
200W	190	160	165	30	60	1Ω ~ 7KΩ
300W	240	210	215	30	60	1Ω ~ 8KΩ
400W	290	260	265	30	60	0.5Ω~10KΩ
500W	360	330	335	30	60	0.5Ω~12KΩ
600W	360	330	335	30	60	0.5Ω~12KΩ

RoHS Compliant

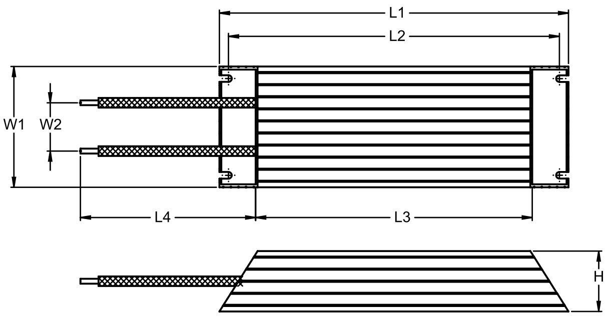
Aluminum Case High Power Wire-Wound Resistors

Features

HEWR



60W - 600W



1000W

Power	L1±2	L2±2	L3±2	L4±10	W1±2	W2±5	H±2
60W	115	100	80	190	40	15	20
80W	140	125	105	200	40	15	20
100W	140	125	100	240	60	25	30
100W-S	165	150	125	240	40	15	20
120W	190	175	150	240	40	15	20
150W	215	200	175	240	40	15	20
200W	165	150	125	255	60	25	30
300W	215	200	175	255	60	25	30
400W	265	250	225	255	60	25	30
500W	335	320	295	255	60	25	30
600W	335	320	295	255	60	25	30
1000W	400	385	340	255	100	25	50

Note: Cable and Terminal Type are available for Both HEWR and HBWR

Thermal Fuse Wire-Wound Resistors

Performance Specification

Temperature Coefficient	±350PPM/°C
Short Time Overload	±(5%+0.05Ω) Max, with no evidence of mechanical damage.
Temperature Cycling	±(5%+0.05Ω) Max, with no evidence of mechanical damage.
Thermal Shock	±(2%+0.05Ω) Max, with no evidence of mechanical damage.
Load Life	±(5%+0.05Ω) Max, with no evidence of mechanical damage.
Load Life in Humidity	±(5%+0.05Ω) Max, with no evidence of mechanical damage.

Ordering Procedure: Ex.: ASSY, 12V, 216°C, 10A, +/- 10%, 0.5Ω+0.5Ω

A S S Y 1 D K 2 B 0 0 B 0 A

Type:
ASSY = ASSY

Voltage:
1 = 12V

Cut off temp:
A = 92°C
B = 167°C
C = 184°C
D = 216°C
E = 227°C
F = 240°C

Tolerance:
K = ±10%

Schematic style and resistance:
2A00 = 2 resistors circuit A
2B00 = 2 resistors circuit B
3A00 = 3 resistors circuit A
3B00 = 3 resistors circuit B
3C00 = 3 resistors circuit C

Packing Type:
B = Bulk/Box

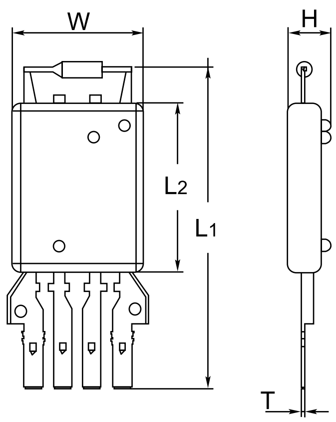
Packing Qty:
0 = Bulk/Box

Current rating:
A = 10A
B = 2A

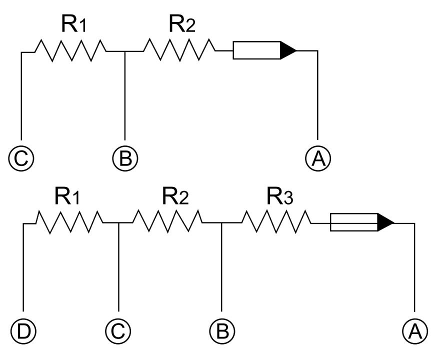
Features

- Quality Non-Flame coating
- Too Low or too high value can be supplied
- Self extinguishing
- Other type of schematic can be supplied

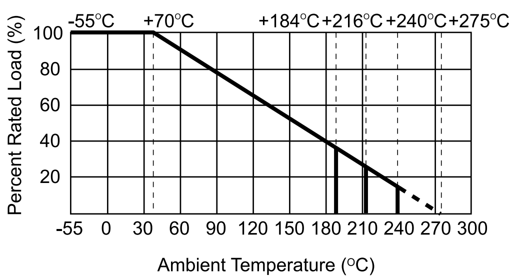
Dimension (MM)



Circuit



Derating Curve



Type	L1±3	L2±3	W±3	H (Max)	T±0.2	Resistance Range
ASSY 4 Terminal	74	43	39	13	0.8	0.1Ω ~10Ω
ASSY 5 Terminal	80	43	34	13	0.8	0.1Ω ~10Ω

Carbon Film Leadless Fixed Resistors

Performance Specification

Temperature Coefficient	≥1/4W: ≤10KΩ = 0~350PPM/°C 11KΩ ~ 150KΩ = 0-600PPM/°C 160KΩ ~ 2.2MΩ = 0-1000PPM/°C	1/8W: ≤1KΩ = 0-350PPM/°C 1.1KΩ ~ 47KΩ = 0-600PPM/°C 51KΩ ~ 470KΩ = 0-1000PPM/°C 51KΩ ~ 1MΩ = 0-1500PPM/°C
Short Time Overload	±(1%+0.05Ω) Max, with no evidence of mechanical damage.	
Resistance to Soldering	±(1%+0.05Ω) Max, with no evidence of mechanical damage.	
Pulse Overload	±(1%+0.05Ω) Max, with no evidence of mechanical damage.	
Load Life	±(3%+0.05Ω) Max, with no evidence of mechanical damage.	
Load Life in Humidity	±(5%+0.05Ω) Max, with no evidence of mechanical damage.	
Solderability	95% Coverage Min.	

Ordering Procedure: Ex.: MELF Carbon Film type 0204 1/4W-S +/- 5% 75Ω Tape/Reel 3000

M C 2 4 S 4 J 0 7 5 0 T 3 0

Type:
MC24 = Carbon Film 0204
MC27 = Carbon Film 0207
MC39 = Carbon Film 0309

Wattage:
Normal size:
W8 = 1/8W
W4 = 1/4W
W2 = 1/2W
Small size:
S4 = 1/4W-S
S2 = 1/2W-S
1S = 1W-S
Extra Small size:
1U = 1W-SS
2U = 2W-SS

Tolerance:
G = ±2%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472

Packing Type:
T = Tape/Reel

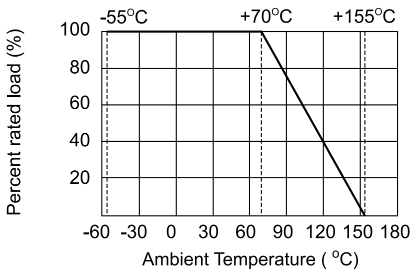
Packing Qty:
2 = 2,000 pcs.
3 = 3,000 pcs.
B = 2,500 pcs.

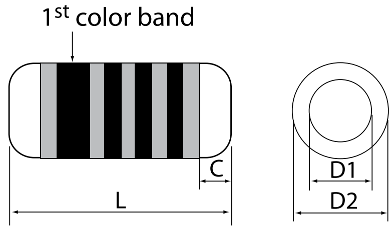
Additional Information:
0 = NIL

Features

- SMD carbon resistor
- High terminal strength
- Excellent solderability
- Suitable for Flow, Reflow and hand soldering

Derating Curve





Part No.	Power Rating at 70°C	Dimension (mm)				Resistance Range	Max. Working Voltage	Max. Overload Voltage	Std Packing (Reel)
		D1	D2(Max)	L±0.2	C(Min)				
Normal size									
MC24W8	1/8W (0.125W)	1.4 ± 0.15	1.55	3.5	0.5	1Ω ~ 1MΩ	200V	400V	3,000
MC27W4	1/4W (0.25W)	2.2±0.2	2.4	5.9	0.5	1Ω ~ 1MΩ	300V	600V	2,000
MC39W2	1/2W (0.50W)	3.2±0.2	3.4	8.5	0.5	1Ω ~ 1MΩ	350V	700V	2,500
Small size									
MC24S4	1/4W (0.25W)	1.4 ± 0.15	1.55	3.5	0.5	1Ω ~ 1MΩ	250V	500V	3,000
MC27S2	1/2W (0.50W)	2.2 ± 0.2	2.4	5.9	0.5	1Ω ~ 1MΩ	300V	600V	2,000
MC271U	1W	2.2 ± 0.2	2.4	5.9	0.5	1Ω ~ 1MΩ	350V	700V	2,000
MC391S	1W	3.2 ± 0.2	3.4	8.5	0.5	1Ω ~ 1MΩ	350V	700V	2,500
MC392U	2W	3.2 ± 0.2	3.4	8.5	0.5	1Ω ~ 1MΩ	350V	700V	2,500

RoHS Compliant

Metal Film Leadless Fixed Resistors

Performance Specification

Temperature Coefficient	±10, ±15, ±25, ±50, ±100, ±200 PPM/°C
Short Time Overload	± (0.5%+0.05Ω) Max, with no evidence of mechanical damage.
Resistance to Soldering	± (0.5%+0.05Ω) Max, with no evidence of mechanical damage.
Pulse Overload	± (1%+0.05Ω) Max, with no evidence of mechanical damage.
Load Life	± (2%+0.05Ω) Max, with no evidence of mechanical damage.
Load Life in Humidity	± (2%+0.05Ω) Max, with no evidence of mechanical damage.
Solderability	95% Coverage Min.

Ordering Procedure: Ex.: MELF Metal Film type 0204 1/4W-S ,+/- 0.1% 15PPM 100Ω Tape/Reel 3000

M 2 4 S 4 B B 1 0 0 0 T 3 0

Type:
M24 = Metal Film 0204
M27 = Metal Film 0207
M39 = Metal Film 0309

Wattage:
Normal size:
W8 = 1/8W
W4 = 1/4W
W2 = 1/2W
Small size:
S4 = 1/4W-S
S2 = 1/2W-S
1S = 1W-S
Extra Small size:
1U = 1W-SS
2U = 2W-SS

Tolerance:
B = ±0.1%
C = ±0.25%
D = ±0.5%
F = ±1%
G = ±2%
J = ±5%

A = 10PPM
B = 15PPM
C = 25PPM
F = 50PPM
G = 100PPM
J = 200PPM

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33KΩ = 1331

Packing Type:
T = Tape/Reel

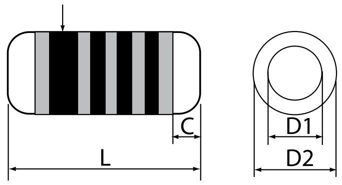
Packing Qty:
2 = 2,000 pcs.
3 = 3,000 pcs.
B = 2,500 pcs.

Additional Information:
0 = NIL

Features

- SMD metal film resistor
- High terminal strength
- High stability and Low temperature coefficient
- Excellent solderability
- Suitable for Flow, Reflow and hand soldering

Part No.	Power Rating at 70°C	Dimension (mm)			
		D1	D2(Max)	L±0.2	C(Min)
Normal size					
M24W8	1/8W (0.125W)	1.4 ± 0.15	1.55	3.5	0.5
M27W4	1/4W (0.25W)	2.2 ± 0.2	2.4	5.9	0.5
M39W2	1/2W (0.50W)	3.2 ± 0.2	3.4	8.5	0.5
Small size					
M24S4	1/4W (0.25W)	1.4 ± 0.15	1.55	3.5	0.5
M27S2	1/2W (0.50W)	2.2 ± 0.2	2.4	5.9	0.5
M271U	1W	2.2 ± 0.2	2.4	5.9	0.5
M391S	1W	3.2 ± 0.2	3.4	8.5	0.5
M392U	2W	3.2 ± 0.2	3.4	8.5	0.5

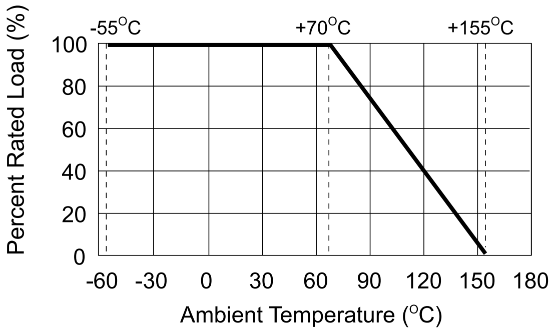


Metal Film Leadless Fixed Resistors

General Specification

Part No.	Power Rating at 70°C	Tolerance %	T.C.R.	Resistance Range	Max. Working Voltage	Max. Overload Voltage	Std Packing (Reel)
Normal size							
M24W8	1/8W (0.125W)	±5%	±200PPM/°C	10Ω ~ 1MΩ	150	300	3,000
		±2%	±100PPM/°C	10Ω ~ 1MΩ			
		±1%	± 50PPM/°C	10Ω ~ 1MΩ			
M27W4	1/4W (0.25W)	±5%	±200PPM/°C	1Ω ~ 1MΩ	250	500	2,000
		±2%	±100PPM/°C	2.2Ω ~ 1MΩ			
		±1%	± 50PPM/°C	10Ω ~ 1MΩ			
M39W2	1/2W (0.50W)	±5%	±200PPM/°C	1Ω ~ 1MΩ	350	700	2,500
		±2%	±100PPM/°C	2.2Ω ~ 1MΩ			
		±1%	± 50PPM/°C	51.1Ω ~ 1MΩ			
Small size							
M24S4	1/4W (0.25W)	±5%	±100PPM/°C	10Ω ~ 5.1MΩ	200	400	3,000
		±5%	±200PPM/°C	10Ω ~ 5.1MΩ			
		±2%	±100PPM/°C	10Ω ~ 1MΩ			
		±1%	± 50PPM/°C	10Ω ~ 1MΩ			
M27S2	1/2W (0.50W)	±5%	±200PPM/°C	1Ω ~ 1MΩ	250	500	2,000
		±2%	±100PPM/°C	2.2Ω ~ 1MΩ			
		±1%	± 50PPM/°C	10Ω ~ 1MΩ			
M271U	1W	±5%	±200PPM/°C	1Ω ~ 1MΩ	350	700	2,000
		±2%	±100PPM/°C	2.2Ω ~ 1MΩ			
		±1%	± 50PPM/°C	10Ω ~ 1MΩ			
M391S	1W	±5%	±200PPM/°C	1Ω ~ 1MΩ	350	700	2,500
		±2%	±100PPM/°C	2.2Ω ~ 1MΩ			
		±1%	± 50PPM/°C	51.1Ω ~ 1MΩ			
M392U	2W	±5%	±200PPM/°C	1Ω ~ 1MΩ	350	700	2,500
		±2%	±100PPM/°C	2.2Ω ~ 1MΩ			
		±1%	± 50PPM/°C	10Ω ~ 1MΩ			

Derating Curve



RoHS Compliant

Metal Film Leadless Fixed Resistors

Special Tolerance & T.C.R

Part No.	Power Rating at 70°C	Tolerance %	T.C.R.	Resistance Range	Max. Working Voltage	Max. Overload Voltage	Std Packing (Reel)
Normal size							
M24W8	1/8W (0.125W)	±0.1%	±10PPM/°C	100Ω ~ 20KΩ	150	300	3,000
		±0.1%	±15PPM/°C	100Ω ~ 100KΩ			
		±0.25%	±25PPM/°C	51.1Ω ~330KΩ			
		±0.5%	±50PPM/°C	10Ω ~ 1MΩ			
M27W4	1/4W (0.25W)	±0.1%	±10PPM/°C	100Ω ~ 20KΩ	250	500	2,000
		±0.1%	±15PPM/°C	100Ω ~ 100KΩ			
		±0.25%	±25PPM/°C	51.1Ω ~330KΩ			
		±0.5%	±50PPM/°C	10Ω ~ 1MΩ			
M39W2	1/2W (0.50W)	±0.1%	±15PPM/°C	100Ω ~ 100KΩ	350	700	2,500
		±0.25%	±25PPM/°C	51.1Ω ~ 511KΩ			
		±0.5%	±50PPM/°C	10Ω ~ 1MΩ			
Small size							
M24S4	1/4W (0.25W)	±0.1%	±10PPM/°C	100Ω ~ 20KΩ	200	400	3,000
		±0.1%	±15PPM/°C	100Ω ~ 100KΩ			
		±0.25%	±25PPM/°C	51.1Ω ~330KΩ			
		±0.5%	±50PPM/°C	10Ω ~ 1MΩ			
M27S2	1/2W (0.50W)	±0.1%	±10PPM/°C	100Ω ~ 20KΩ	250	500	2,000
		±0.1%	±15PPM/°C	100Ω ~ 100KΩ			
		±0.25%	±25PPM/°C	51.1Ω ~330KΩ			
		±0.5%	±50PPM/°C	10Ω ~ 1MΩ			
M271U	1W	±0.1%	±10PPM/°C	100Ω ~ 20KΩ	350	700	2,000
		±0.1%	±15PPM/°C	100Ω ~ 100KΩ			
		±0.25%	±25PPM/°C	51.1Ω ~330KΩ			
		±0.5%	±50PPM °C	10Ω ~ 1MΩ			

RoHS Compliant

ROYALOHM

Jumper Wire and Zero Ohm Fixed Resistors

Performance Specification

Maximum Resistance	Jumper wire: 0.05Ω Max. Zero Ohm: Ceramic rod : 0.05Ω Max and Steel core: 0.01Ω Max.
Lead Material	Tin - Plated copper
Body Material (ZO-type)	Electrical grade, high performance molding compound
Insulation Resistance	Dry - 10,000MΩ, Wet - 100MΩ
Dielectric Withstanding Voltage	Atmospheric - 500V RMS, Reduced - 325V RMS
Insulation Flammability	Resistor Insulation is self extinguishing within 10 seconds after extemally applied flame is removed.
Current Rating	Z0T 25 Amps at 25°C Derating to 0 Amps at 150°C Z0C 16 Amps at 25°C Derating to 0 Amps at 150°C

Ordering Procedure: Ex.: ZO 1/4W, T/B-5000

Z O C 0 W 4 0 0 0 0 0 A 5 0

Type:
Jumper Wire:
ZWA = 0.45mm lead wire
ZWB = 0.54mm lead wire
ZWC = 0.70mm lead wire
ZWD = 0.75mm lead wire
ZWE = 1.0mm lead wire
ZWF = 0.60mm lead wire
Zero Ohm Resistors:
ZOC = Ceramic core
ZOT = Steel core

Special Feature:
0 = NIL

Wattage:
Zero Ohm resistors:
W8 = 1/8W
W4 = 1/4W
Jumper wire:
00 = NIL

Tolerance:
0 = NIL

Resistance Value:
Fill in these 4 digit with "0" to denote no ohmic value.

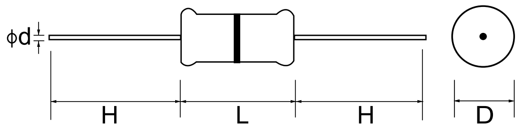
Packing Type:
A = Tape/Box
T = Tape/Reel
B = Bulk/Box
P = Tape/Box of PT-26mm

Packing Qty:
1 = 1,000pcs. 2 = 2,000pcs.
5 = 5,000pcs. 7 = 7,000pcs.
8 = 8,000pcs. C = 10,000pcs.
0 = Bulk/Box

Additional Info.:
0 = NIL
M = M-Type

Features

- One black band color-coding for easy identification
- Ideal straight - through between point on PC Boards

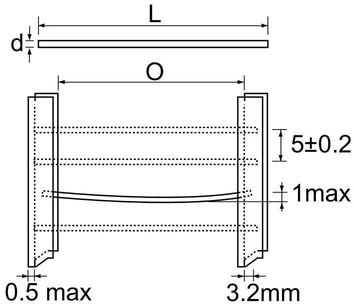


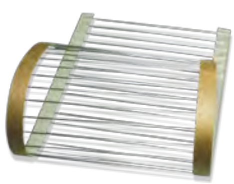
ZO Type

Part No.	Style	Power Rating at 70°C	Dimension (mm)				Std Packing Qty
			D Max	L Max	d±0.05	H±3	
ZOT0W8 / ZOC0W8	ZO - 12	1/8W (0.125W)	1.85	3.5	0.45	28	5,000
ZOT0W4 / ZOC0W4	ZO - 25	1/4W (0.25W)	2.5	6.8	0.54	28	5,000

ZW Type

Part No.	Style	L±3	d±0.05	O ± 1	
ZWA	ZW-A	60/34	0.45	52	26
ZWB	ZW-B	60/34	0.54	52	26
ZWC	ZW-C	60/34	0.70	52	26
ZWD	ZW-D	60/34	0.75	52	26
ZWE	ZW-E	60/34	1.00	52	26
ZWF	ZW-F	60/34	0.60	52	26





RoHS Compliant

Panasert Type

Ordering Procedure: Ex.: CFR 1/4W, +/- 5% , 100KΩ, T/B 2000 Panasert Type 1

C	F	R	0	W	4	J	0	1	0	4	A	2	P

Type:
CFR = Carbon Film
MF = Metal Film
MOR = Metal Oxide Film
FRN = Fusible Film

Special Feature:
0 = Standard product
F = Non-Flame

Wattage:
W4 = 1/4W
S2 = 1/2W-S
1S = 1W-S
2S = 2W-S

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros: "J" ~ 0.1, "K" ~ 0.01
  Ex.: 4.7Ω ~ 47J, 4.7KΩ ~ 472
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.
  Ex.: 1.33KΩ = 1331

Packing Type:
A = Tape/Box
T = Tape/Reel

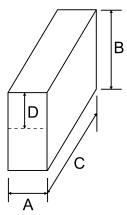
Packing Qty:
1 = 1,000 pcs. (T/B only)
2 = 2,000 pcs. (T/B only); 5 = 5,000 pcs. (T/R)
T/R is 2,500 pcs. per reel & 2 reels per box

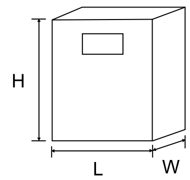
Additional Info.:
P = Panasert Type 1
Q = Panasert Type 2

Note : For Metal Film Fixed Resistors, Part No. System on Page 28.

- More explanation of part no. please see details on page 95-96.

Packing of Panasert and Avisert type

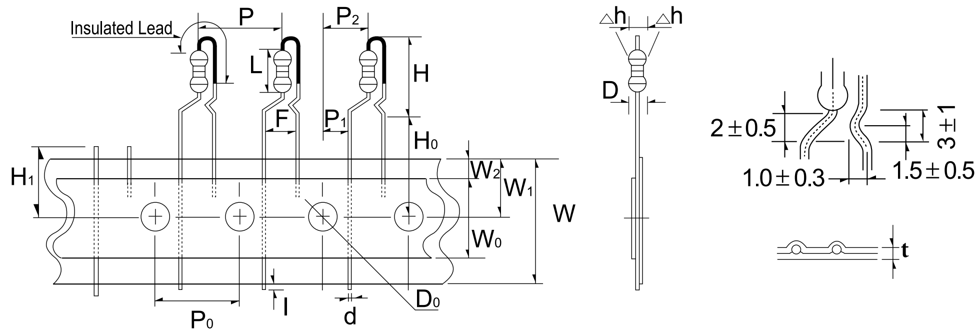
Dimension (mm)			Ammo Packing
A	45	55	
B	125	105	
C	325	320	
D	-	20	
Quantity	2,000 pcs. for 1/4W	1,000 pcs. for 1/2W-S, 1W-S, 2W-S	

Dimension (mm)		Reel Packing
L	325	
H	330	
W	105	
Quantity	2,500 pcs./Reel 2 Reels/Box	

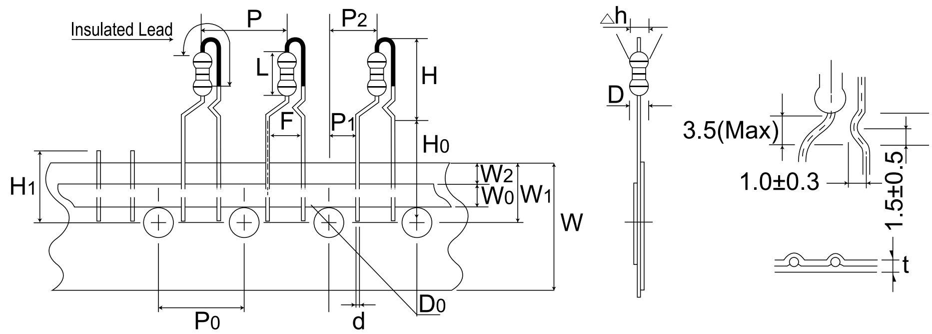
RoHS Compliant

Panasert Type

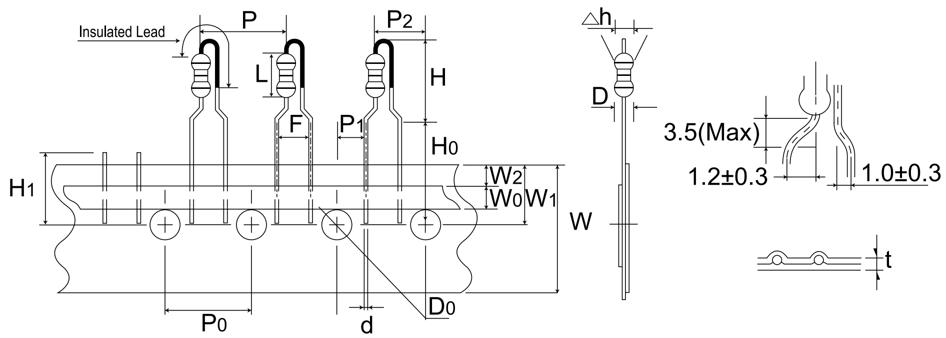
Panasert Type 1 :



Panasert Type 1 :



Panasert Type 2 :



Items	Symbol	Dimension (mm)				Items	Symbol	Dimension (mm)			
		1/4W	1/2W-S	1W-S	2W-S			1/4W	1/2W-S	1W-S	2W-S
Body diameter	D	2.5 Max.	3 ± 0.5	3.5 ± 0.5	4 ± 0.5	Paper width	W	18 ± 1	$18^{+1}_{-1.5}$	$18^{+1}_{-1.5}$	$18^{+1}_{-1.5}$
Body length	L	6.8 Max.	9 ± 1	9 ± 1	12 ± 1	Tape width	W_0	6 Min.	6 ± 0.2	6 ± 0.2	6 ± 0.2
Body height	H	12 Max.	17 Max.	19 Max.	21 Max.	Hole position	W_1	9 ± 0.5	$9^{+0.75}_{-0.5}$	$9^{+0.75}_{-0.5}$	$9^{+0.75}_{-0.5}$
Lead wire diameter	d	0.54±0.05	0.54±0.05	0.65±0.05	0.65±0.05	Paper and Tape distance	W_2	1.5 Max.	1.5 Max.	1.5 Max.	1.5 Max.
Pitch of component	P	12.7 ± 1	12.7 ± 1	12.7 ± 1	12.7 ± 1	Lead Wire clinch height	H_0	16.5 Max.	16 ± 0.5	16 ± 0.5	16 ± 0.5
Feed hole pitch	P_0	12.7 ± 0.3	12.7 ± 0.3	12.7 ± 0.3	12.7 ± 0.3	Length of snipped lead	H_1	11 Max.	11 Max.	11 Max.	11 Max.
Hole center to lead	P_1	3.85 ± 0.7	3.85 ± 0.7	3.85 ± 0.7	3.85 ± 0.7	Feed hole diameter	D_0	4 ± 0.3	4 ± 0.3	4 ± 0.3	4 ± 0.3
Hole center to body	P_2	6.35 ± 1.3	6.35 ± 1.3	6.35 ± 1.3	6.35 ± 1.3	Total tape thickness	t	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2
Lead to lead distance	F	5 ± 1	5 ± 1	5 ± 1	5 ± 1	Lead wire protrusion	l	1 Max.	-	-	-
Component alignment	Δ h	0 ± 1	0 ± 1	0 ± 1	0 ± 1	Length of lead cut	$H_1 - W_1$	2 ± 0.5	2 ± 0.5	2 ± 0.5	2 ± 0.5

Remark: P_0 cumulative pitch error 1mm / 20 pitch. Packing in this type have Ammo packing and Reel packing.

Avisert Type

Ordering Procedure: Ex.: CFR 1/8W, +/- 5%, 22Ω, T/R 5000 Avisert Type 3

C	F	R	0	W	8	J	0	2	2	0	T	5	3

Type:
CFR = Carbon Film
MF = Metal Film
MOR = Metal Oxide Film
FRN = Fusible Film

Special Feature:
0 = Standard product
F = Non-Flame

Wattage:

Avisert Type 1
W4 = 1/4W
U2 = 1/2W-SS
06 = 0.6W-S
S2 = 1/2W-S
(S2 for MOR & FRN)

Avisert Type 2
W8 = 1/8W
S4 = 1/4W-S

Avisert Type 3
W8 = 1/8W
S4 = 1/4W-S
W4 = 1/4W
U2 = 1/2W-SS
06 = 0.6W-S
S2 = 1/2W-S
(S2 for MOR & FRN)

Tolerance:
F = ±1%
J = ±5%

Resistance Value:
- E-24 series:
  1st digit is "0"
  2nd & 3rd digits are the significant figures of the resistance
  4th indicates the number of zeros:
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.

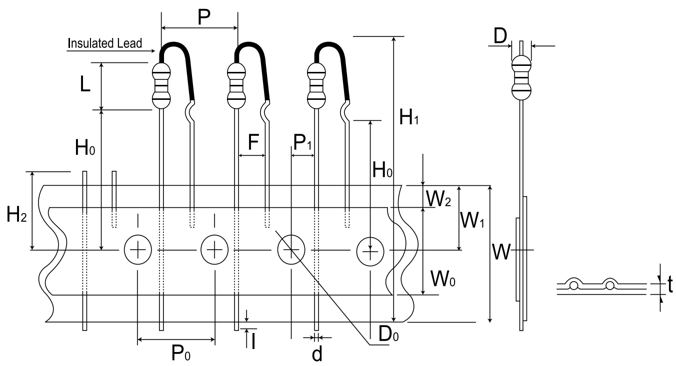
Packing Type:
A = Tape/Box
T = Tape/Reel

Packing Qty:
2 = 2,000 pcs. (T/B only); 5 = 5,000 pcs. (T/R)
T/R is 2,500 pcs. per reel & 2 reels per box

Additional Info.:
1 = Avisert Type 1
2 = Avisert Type 2
3 = Avisert Type 3

Note:
1.) For Metal Film Fixed Resistors, please follow Part No. system on page 28

Avisert Type 1



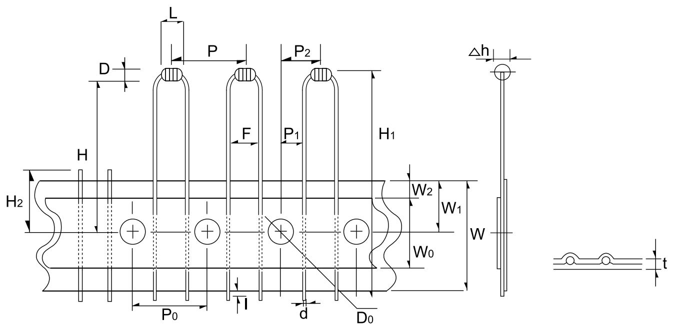
•This specification is applicable to: CFR 1/4W, 1/2W-SS, MFR 1/4W, 1/2W-SS, 0.6W-S
MOR 1/4W, 1/2W-S, FRN 1/4W, 1/2W-S

Items	Symbol	Dimension (mm)		Items	Symbol	Dimension (mm)
Body diameter	D	2.5 Max.		Hole position	W_1	9.5 ± 0.5
Body length	L	6.8 Max.		Paper and tape distance	W_2	3.0 Max.
Lead wire diameter	d	0.54±0.05		Height of Component from tape center	H	17 ±0.5
Pitch of component	P	12.7 ± 1		Lead wire clinch height	H_0	16 ± 0.5
Feed hole pitch	P_0	12.7 ± 0.3		Component height	H_1	34.50 Max.
Feed hole center to lead	P_1	3.85 ± 0.7		Length of snipped lead	H_2	11 Max.
Lead to lead distance	F	5 ± 1		Lead wire protrusion	l	1 Max.
Paper width	W	18 ± 1		Feed hole diameter	D_0	4 ± 0.3
Tape width	W_0	6 Min.		Total tape thickness	t	0.5 ± 0.2
Remark: P_0 cumulative pitch error 1mm / 20 pitch. Packing in this type have Ammo packing and Reel packing.						

RoHS Compliant

Avisert Type

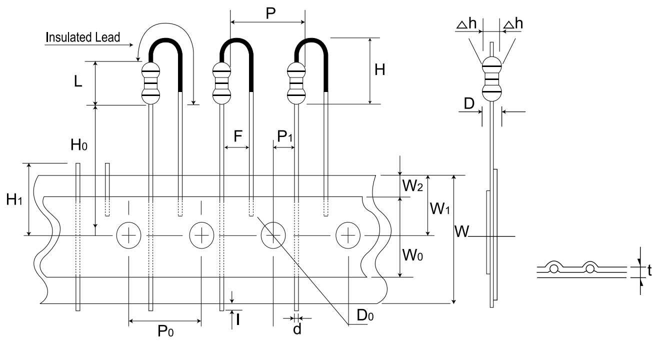
Avisert Type 2



•This specification is applicable to: CFR 1/8W, 1/4W-S, MFR 1/8W, 1/4W-S This type is ideal for automatic insertion.

Items	Symbol	Dimension (mm)		Items	Symbol	Dimension (mm)
Body diameter	D	1.85 Max.		Tape width	W_0	6 Min.
Body length	L	3.5 Max.		Hole position	W_1	9 ± 0.5
Lead wire diameter	d	0.45±0.05		Paper and tape distance	W_2	3 Max.
Pitch of component	P	12.7 ± 1		Lead wire clinch height	H	21.25 Max.
Feed hole pitch	P_0	12.7 ± 0.3		Component height	H_1	32.25 Max.
Hole center to lead	P_1	3.85 ± 0.7		Length of snipped lead	H_2	11 Max.
Hold center to component center	P_2	6.35 ± 1.3		Lead wire protrusion	l	1 Max.
Lead to lead distance	F	5 ± 1		Feed hole diameter	D_0	4 ± 0.3
Component alignment	Δh	0 ± 1		Total tape thickness	t	0.5 ± 0.2
Paper width	W	18 ± 1				
Remark: P_0 cumulative pitch error 1mm / 20 pitch. Packing in this type have Ammo packing and Reel packing.						

Avisert Type 3



•This specification is applicable to: CFR 1/8W, 1/4W-S, 1/4W, 1/2W-SS, MFR 1/8W, 1/4W-S, 1/4W, 1/2W-SS, 0.6W-S
MOR 1/4W, 1/2W-S FRN 1/4W, 1/2W-S

Items	Symbol	Dimension (mm)			Items	Symbol	Dimension (mm)
		1/8W	1/4W				1/8W, 1/4W
Body diameter	D	2.0 Max.	2.5 Max.		Paper width	W	18 ± 1
Body length	L	4.2 Max.	6.8 Max.		Tape width	W_0	6 Min.
Lead wire diameter	d	0.45±0.05	0.54±0.05		Hole position	W_1	9 ± 0.5
Body height	H	7.0 Max.	10.0 Max.		Paper and tape distance	W_2	3.0 Max.
Lead wire clinch height	H_0	20.0 Max.	16.0 Max.		Length of snipped lead	H_1	11 Max.
Lead to lead spacing	F	2.5 ± 1	5 ± 1		Lead wire protrusion	l	1 Max.
Pitch of component	P	12.7 ± 1	12.7 ± 1		Feed hole diameter	D_0	4 ± 0.3
Feed hole pitch	P_0	12.7 ± 0.3	12.7 ± 0.3		Total tape thickness	t	0.5 ± 0.2
Hole center to lead	P_1	3.85 ± 0.7	3.85 ± 0.7		Component alignment	Δh	0 ± 1
Remark: P_0 cumulative pitch error 1mm / 20 pitch. Packing in this type have Ammo packing and Reel packing.							

Formed Type

Ordering Procedure: Ex.: CFR 2W-S, +/-5%, 100Ω, B/B, F1 Type

C	F	R	0	2	S	J	0	1	0	1	B	F	1

Resistor Type:
- CFR = Carbon Film
- MF = Metal Film
- MOR = Metal Oxide Film
- FRN = Fusible Film
- KNP = Wire-Wound

Special Feature
- 0 = Standard Product
- F = Non-Flame
- I = Non-Inductive

Wattage:

Normal size:
- W2 = 1/2W
- 1W = 1W
- 2W = 2W
- 3W = 3W
- 5W = 5W

Small size
- 1S = 1W-S
- 2S = 2W-S
- 3S = 3W-S
- 5S = 5W-S

Tolerance:
- F = ±1%
- G = ±2%
- J = ±5%
- K = ±10%

Resistance Value:
- E-24 series:
  1st digit is “0”
  2nd & 3rd digits are the significant figures of the resistance
  4th digit indicates the number of zeros.
- E-96 series:
  1st to 3rd digits are the significant figures of the resistance and the 4th digit indicates the number of zeros.

Packing Type:
- B = Bulk/Box

Forming type:
- F0 = F Type
- F1 = F1 Type
- F2 = F2 Type
- F3 = F3 Type

- MF = M Type with flattened lead wire
- MK = M Type with kinked lead wire
- ML = M Type with normal lead wire

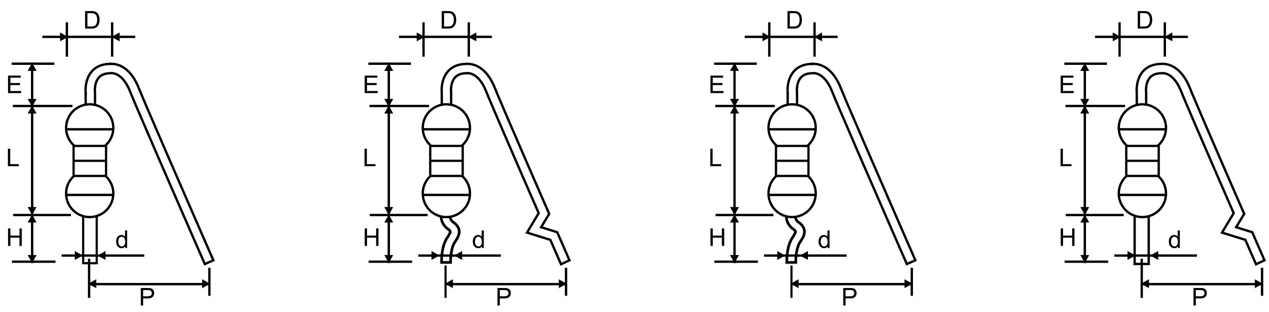
- T0 = T Type

Note:

1) For Metal Film Fixed Resistors, please follow Part No. system on page 28

2) More explanation of part no. please see details on pages 95-96

F-Type Series Forming Dimension (mm)



F Type F1 Type F2 Type F3 Type

Power Rating at 70°C	Dimension (mm)					
	D Max	L Max	d±0.05	P + 1 - 3	H±1	E±0.5
1W (2W-S)	5.0	12	0.70	8	6	2.5
2W (3W-S)	5.5	16	0.70	8	6	2.5

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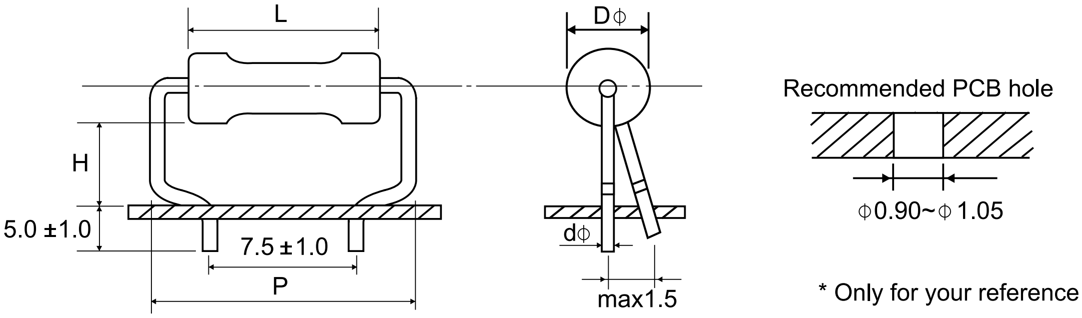
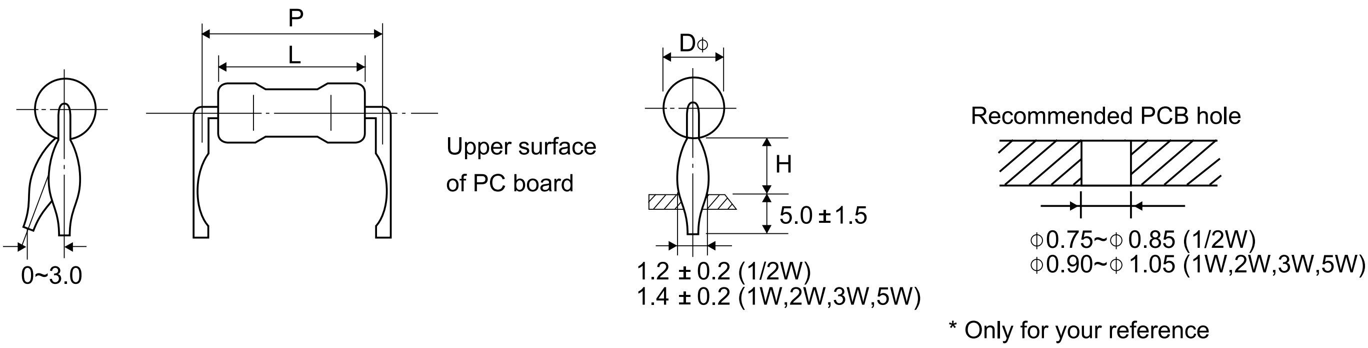
Formed Type

T-Type Series Forming Dimension (mm)



Power Rating at 70^{o}C	Dimension (mm)				
	D Max	L Max	d±0.05	P Max	H +1 -0
1W-S	3.5	10	0.70	12.5	8
1W (2W-S)	5.0	12	0.70	15	8
2W (3W-S)	5.5	16	0.70	20	9

M-Type Series Forming Dimension (mm)



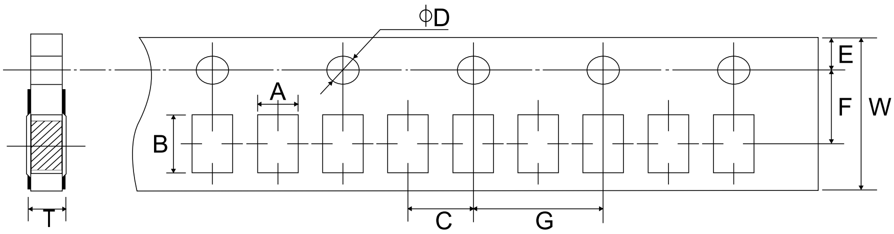
Power Rating at 70^{o}C	Dimension (mm)				
	D Max	L Max	H±2	P	d±0.05
Normal Size					
1/2W	3.5	10.0	7.0	12.5 ±1.5	0.70
1W	5.0	12.0	7.0	15.0 ±1.5	0.70
2W	5.5	16.0	10.0	20.0 ±2.0	0.70
3W	6.5	17.5	12.0	25.0 ±2.0	0.75
5W	8.5	26.0	12.0	31.0 ±2.0	0.75
Small Size					
1W-S	3.5	10.0	7.0	12.5 ±1.5	0.70
2W-S	5.0	12.0	7.0	15.0 ±1.5	0.70
3W-S	5.5	16.0	10.0	20.0 ±2.0	0.70
5W-S	8.0	25.0	12.0	31.0 ±2.0	0.75

RoHS Compliant

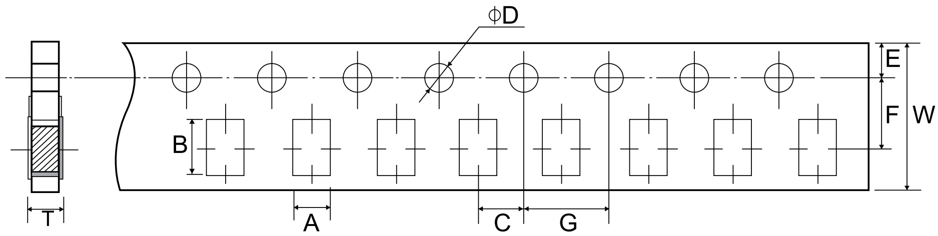
Packing of Chip, Chip Array & Resistor Network

(1) Taping Dimension (mm)

a.) Paper Taping

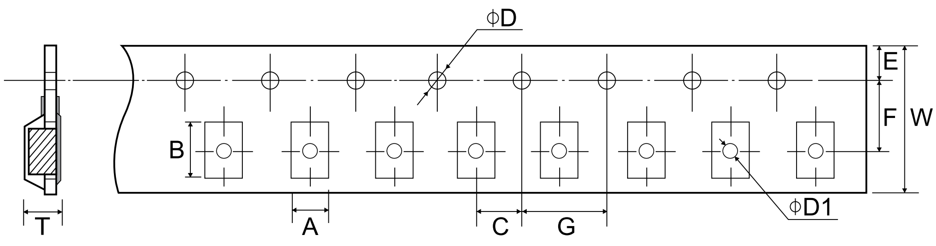


Type	A±0.2	B±0.2	C±0.05	D+0.1 -0	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
0201	0.40±0.05	0.70±0.05	2.0	1.5	1.75	3.5	4.0	8.0	0.42
0402	0.65	1.15	2.0	1.5	1.75	3.5	4.0	8.0	0.45
2D02 / 2C02	1.20	1.20	2.0	1.5	1.75	3.5	4.0	8.0	0.45
4D02 / 4C02	1.20	2.20	2.0	1.5	1.75	3.5	4.0	8.0	0.70



Type	A±0.2	B±0.2	C±0.05	D+0.1 - 0	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
0805	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
1206	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
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	0.75

b.) Embossed Taping

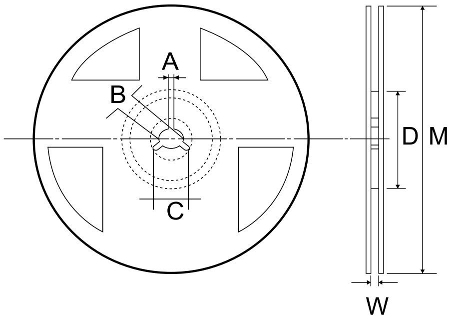


Type	A±0.2	B±0.2	C±0.05	D+0.1 -0	D_1 +0.1 - 0	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
1812	3.5	4.8	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0
2010	2.9	5.6	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0
2512	3.5	6.7	2.0	1.5	1.5	1.75	5.5	4.0	12	1.0

RoHS Compliant

Packing of Chip, Chip Array & Resistor Network

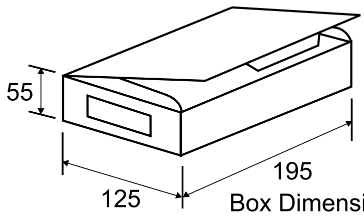
(2) Reel Dimension (mm)



Type	Packaging	Quantity/ Reel	Tape Width	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
0201 / 0402* / ES02 / HP02 / HQ02 / CQ02 / TC02	Paper	10,000 pcs.*	8	2	13	21	60	178	10
0603 / AS03 / PS03 / ES03 / HV03 / HP03 / TR03 / NS03 / HQ03 / CQ03 / CS03 / TC03 / TP03	Paper	5,000 pcs.	8	2	13	21	60	178	10
0805 / AS05 / PS05 / ES05 / HV05 / HP05 / TR05 / NS05 / HQ05 / CQ05 / CS05 / TC05 / TP05 / 0508	Paper	5,000 pcs.	8	2	13	21	60	178	10
1206 / AS06 / PS06 / ES06 / HV06 / HP06 / TR06 / NS06 / HQ06 / CQ06 / CS06 / TC06 / TP06 / 0612	Paper	5,000 pcs.	8	2	13	21	60	178	10
1210 / AS07 / PS07 / ES07 / HV07 / HP07 / NS07 / HQ07 / CQ07 / CS07 / TC07 / TP07	Paper	5,000 pcs.	8	2	13	21	60	178	10
2010 / HV10 / HP10 / HQ10 / CQ10 / CS10 / TC10 / 1020 / 1812 (Special) / 1218	Embossed	4,000 pcs.	12	2	13	21	60	178	13.8
2512 / HV12 / HP12 / HQ12 / CQ12 / CS12 / TC12 / 1225	Embossed	4,000 pcs.	12	2	13	21	60	178	13.8
2D02 / 2C02	Paper	10,000 pcs.	8	2	13	21	60	178	10
4D02 / 4C02	Paper	10,000 pcs.	8	2	13	21	60	178	10
4D03 / 4C03	Paper	5,000 pcs.	8	2	13	21	60	178	10
16P8	Paper	4,000 pcs.	12	2	13	21	60	178	13.8
10P8	Paper	5,000 pcs.	8	2	13	21	60	178	10

*Remark: 15,000pcs. / Reel package could be offered for 0402 size

Network Packing Specifications



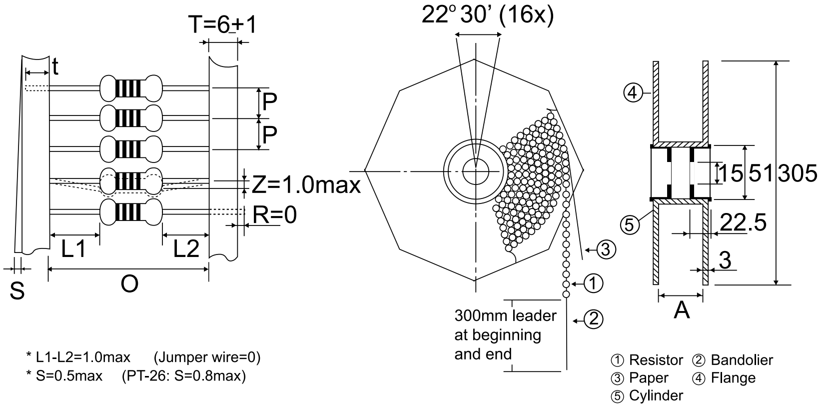
Box Dimension (mm)

Bag in Box Packing (B/B)				
Pin	Quantity / Bag (pcs)	Quantity / Box (pcs)	Quantity / Carton (pcs)	Gross Wt. ±2kgs
4	200	1,000	30,000	6.75
5	200	1,000	30,000	8.55
6	200	1,000	30,000	9.45
7	200	1,000	30,000	10.95
8	200	1,000	30,000	12.45
9	200	1,000	30,000	13.65
10	200	1,000	30,000	16.65
11	100	500	15,000	9.45
12	100	500	15,000	10.95
13	100	500	15,000	11.10
14	100	500	15,000	12.45

RoHS Compliant

Standard Packing of Coated Type Resistors

Dimension (mm)



* L1-L2=1.0max (Jumper wire=0)
* S=0.5max (PT-26: S=0.8max)

① Resistor ② Bandolier
③ Paper ④ Flange
⑤ Cylinder

Part No.	Style	Taping Dimension (mm)			Tape On Reel Packing (T/R)				
		O ± 1	P ± 0.3	t ± 1	Across Flange (A)	Quantity/ Reel (pcs)	Quantity/ Carton (pcs)	Carton Code***	Gross Wt. ± 2kgs.
CFR0W8 CFR0S4 MF0W8 MF0S4 MFF04	CFR-12 CFR-25-S MF-12 MF-25-S MF-40-SS	52	5	4	73 ± 2	5,000	50,000	A20	10.34
ZOC0W8 ZOT0W8	ZO-12	52	5	4	73 ± 2	5,000	50,000	A20	12.50
CFR0W4 CFRFU2 MF0W4 MFFU2 MF006 FRN0W4 FRN0S2 FRN0N4 MOR0W4 MOR0S2 MGR0W4 MGRU2 PMR01T	CFR-25 CFR-50-SS MF-25 MF-50-SS MF-60-S FRN-25 FRN-50-S FRN-40 MOR-25 MOR-50-S MGR-25 MGR-50-SS PMR-100-SSS	52	5	4	73 ± 2	5,000	50,000	A20	15.00
ZOC0W4 ZOT0W4	ZO-25	52	5	4	73 ± 2	5,000	50,000	A20	18.00
CFR0S2 MF0S2	CFR-50-S MF-50-S	52	5	4	73 ± 2	5,000	50,000	A21	18.50
CFR0W2 CFRF1U MF0W2 MF0M7 MF01S FRN0W2 MOR0W2 MGRFW2 MGRFS2	CFR-50 CFR-100-SS MF-50 MF-75-S MF-100-S FRN-50 MOR-50 MGR-50 MGR-50-S	52	5	4	73 ± 2	2,500	25,000	A20	13.00
MOR01S FRN075 FRN01W KNP0W2 KNP01S KNPAW2 KNPA1WS MGRF1U MGRF1S	MOR-100-S FRN-75 FRN-100 KNP-50 KNP-100-S KNPA-50 KNPA-100-S MGR-100-SS MGR-100-S	52	5	4	73 ± 2	2,500	25,000	A20	16.50

*** Carton Dimension :
- A21 - 650 x 445 x 340
- A20 - 600 x 445 x 320

RoHS Compliant

Standard Packing of Coated Type Resistors

Part No.	Style	Taping Dimension (mm)			Tape On Reel Packing (T/R)				
		O ± 1	P ± 0.3	t ± 1	Across Flange (A)	Quantity / Reel (pcs)	Quantity / Carton (pcs)	Carton Code***	Gross Wt. ± 2kgs.
CFR01S	CFR-100-S	52	5 ± 0.3	4	73 ± 2	2,500	25,000	A20	22.50
MF01W	MF-100								20.50
MF02S	MF-200-S								20.50
MOR01W	MOR-100								20.60
MOR02S	MOR-200-S								20.60
FRN015	FRN-150								21.50
FRN02W	FRN-200								21.50
KNP01W	KNP-100								21.50
KNP02S	KNP-200-S								21.50
KNPU2S	KNPU-200-S								
KNPA1W	KNPA-100								
KNPA2WS	KNPA-200-S								
PMR02S	PMR-200-S								20.60
MGRF1W	MGR-100					1,000	8,000		11.50
KNPU1W	KNPU100								
KNPU1S	KNPU1W-S								
KNPU1SS	KNPU1W-SS								
MGRF2U	MGR-200-SS								
MGRF2S	MGR-200-S								
MGRF3U	MGR-300-SS								
CFR01W	CFR-100	64	10 ± 0.5	5	81 ± 5	1,000	8,000	A20	12.00
CFR02S	CFR-200-S								12.00
MF02W	MF-200								12.00
MF03S	MF-300-S								12.50
MOR02W	MOR-200								12.50
MOR03S	MOR-300-S								12.50
FRN03W	FRN-300								12.50
KNP02W	KNP-200								12.50
KNP03U	KNP-300-SS								12.50
KNPU2W	KNPU200								
KNP03S	KNP-300-S								12.50
KNPU3S	KNPU-300-S								
KNPA2W	KNPA-200								
KNPA3WS	KNPA-300-S								
PMR03S	PMR-300-S								12.50
MGRF2W	MGR-200					500	4,000		9.00
MGRF3S	MGR-300-S								
CFR02W	CFR-200	64	10 ± 0.5	6	81 ± 5	500	4,000	A20	10.00
CFR03S	CFR-300-S								10.00
MF03W	MF-300								10.00
MOR03W	MOR-300								10.50
MOR04S	MOR-400-S								10.50
MOR05U	MOR-500-SS								10.50
KNP03W	KNP-300								10.50
KNPU3W	KNPU300								
KNP05S	KNP-500-S								10.50
KNPA3W	KNPA-300								
KNPA5WS	KNPA-500-S								
JUMPER WIRES									
ZWA0	ZW-A (0.45mm)	52	5 ± 0.3	4	73 ± 2	10,000	100,000	A20	16.50
ZWB0	ZW-B (0.54mm)	52	5 ± 0.3	4	73 ± 2	10,000	100,000	A20	17.00
ZWC0	ZW-C (0.70mm)	52	5 ± 0.3	4	73 ± 2	10,000	100,000	A20	23.60
ZWD0	ZW-D (0.75mm)	52	5 ± 0.3	4	73 ± 2	10,000	100,000	A20	26.50
ZWE0	ZW-E (1.0mm)	52	5 ± 0.3	4	73 ± 2	7,000	70,000	A20	34.45

PT - 26mm Dimension (mm)				
Part No.	Style	Taping Dimension		
		$0^{+1.5}_{-0}$	P ± 0.5	t ± 1
CFR0W8 CFR0S4 MF0W8 MF0S4 MFF04	CFR-12 CFR-25-S MF-12 MF-25-S MF-40-SS	26	5	5

PT - 26mm Dimension (mm)				
Part No.	Style	Taping Dimension		
		$0^{+1.5}_{-0}$	P ± 0.5	t ± 1
CFR0W4 CFRFU2 MF0W4 MFFU2 MF006	CFR-25 CFR-50-SS MF-25 MF-50-SS MF-60-S	26	5	5

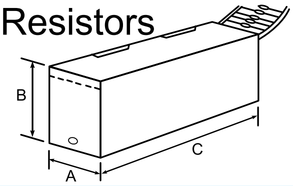
Note: Bandoliers can be reeled, dimension "A" differs per type. Reel packing for PT-26 is not available.

*** Carton Dimension : • A21 - 650 x 445 x 340
• A20 - 600 x 445 x 320

RoHS Compliant

Standard Packing of Coated Type Resistors

Dimension (mm)



Part No.	Style	Tape in Box Packing (T/B) -Ammo Packing						
		L (C) ± 5	W(A) ± 5	H(B) ±5	Quantity/ Box (pcs)	Quantity/ Carton (pcs)	Carton Code ***	Gross Wt. ± 2kgs.
CFR0W8 CFR0S4 MF0W8 MF0S4 MFF04	CFR-12 CFR-25-S MF-12 MF-25-S MF-40-SS	250	75	66	5,000	100,000	A105	12.80
ZOC0W8 ZOT0W8	ZO-12	250	75	66	5,000	100,000	A105	16.00
CFR0W4 CFRFU2 MF0W4 MFFU2 MF006 MOR0W4 MOR0S2 FRN0W4 FRN0S2 FRN0N4 PMR01T	CFR-25 CFR-50-SS MF-25 MF-50-SS MF-60-S MOR-25 MOR-50-S FRN-25 FRN-50-S FRN-40 PMR-100-SSS	250	75	96	5,000	50,000	A98	10.42
MGR0W4 MGR0U2	MGR-25 MGR-50-SS	255	75	103	4,000	40,000	A29	9.60
ZOC0W4 ZOT0W4	ZO-25	250	75	96	5,000	50,000	A29	13.00
CFR0S2 MF0S2	CFR-50-S MF-50-S	250	75	96	4,000	40,000	A29	13.00
FRN0W2 CFRF1U	FRN-50 CFR-100-SS	260	75	31	1,000	60,000	A120	17.30
CFR0W2 MF0W2 MF0M7 MF01S	CFR-50 MF-50 MF-75-S MF-100-S	255	75	43	1,000	48,000	A3	18.00
MOR0W2	MOR-50	260	85	70	1,000	36,000	A3	15.00
MGRFW2 MGR0S2	MGR-50 MGR-50-SS	260	75	56	1,000	36,000	A3	16.00
MOR01S	MOR-100-S	260	85	70	1,000	36,000	A3	16.33
FRN075 FRN01W KNP0W2 KNP01S KNPAW2 KNPA1WS MGRF1U MGRF1S	FRN-75 FRN-100 KNP-50 KNP-100-S KNPA-50 KNPA-100-S MGR-100-SS MGR-100-S	260	85	70	1,000	36,000	A3	15.00
CFR01S MF01W MF02S	CFR-100-S MF-100 MF-200-S	255	79	73	1,000	20,000	A110	14.80
MOR01W MOR02S FRN015 FRN02W KNP01W KNP02S KNPU2S KNPA1W KNPA2WS PMR02S	MOR-100 MOR-200-S FRN-150 FRN-200 KNP-100 KNP-200-S KNPU-200-S KNPA-100 KNPA-200-S PMR-200-S	262	86	80	1,000	20,000	A110	14.80
MGRF1W KNPU1W KNPU1S MGRF2U MGRF2S MGRF3U	MGR-100 KNPU100 KNPU1W-S MGR-200-S MGR-200-SS MGR-300-S	262	92	106	1,000	15,000	A119	16.33
CFR01W CFR02S MF02W MF03S	CFR-100 CFR-200-S MF-200 MF-300-S	260	94	87	1,000	20,000	A3	21.30

Standard Packing of Coated Type Resistors

Part No.	Style	Tape in Box Packing (T/B) - Ammo Packing						
		L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity/ Box (pcs)	Quantity/ Carton (pcs)	Carton Code ***	Gross Wt. ± 2kgs.
MOR02W MOR03S FRN03W KNP02W KNP03U KNP03S KNPA2W KNPA3WS KNPU3WS KNPU2W PMR03S	MOR-200 MOR-300-S FRN-300 KNP-200 KNP-300-SS KNP-300-S KNPA-200 KNPA-300-S KNPU-300-S KNPU200 PMR-300-S	262	92	108	1,000	15,000	A119	17.70
MGRF2W MGRF3S	MGR-200 MGR-300-SS	255	85	77	500	10,000	A115	14.70
CFR02W CFR03S MF03W	CFR-200 CFR-300-S MF-300	262	96	69	500	10,000	A3	18.00
MOR03W MOR04S MOR05U	MOR-300 MOR-400-S MOR-500-SS	256	92	80	500	10,000	A3	18.13
KNP03W KNPU3W KNP05S KNPA3W KNPA5WS	KNP-300 KNPU300 KNP-500-S KNPA-300 KNPA-500-S	256	92	80	500	10,000	A3	18.60

*** Carton Dimension :

- A3 - 490 x 270 x 375
- A29 - 410 x 270 x 235
- A98 - 400 x 250 x 205
- A110 - 430 x 270 x 335
- A105 - 400 x 275 x 275
- A115 - 505 x 275 x 315
- A119 - 495 x 270 x 355
- A120 - 505 x 270 x 355

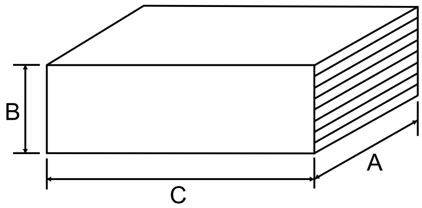
Part No.	Style	Tape in Box Packing (T/B) - Ammo Packing						
		L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity / Box (pcs)	Quantity / Carton (pcs)	Carton Code ***	Gross Wt ± 2kgs.
Jumper Wires								
ZWA0	ZW-A (0.45mm)	250	75	96	10,000	100,000	A29	12.00
ZWB0	ZW-B (0.54mm)	250	75	96	10,000	100,000	A29	12.62
ZWC0	ZW-C (0.70mm)	250	75	96	7,000	70,000	A29	16.00
ZWD0	ZW-D (0.75mm)	250	75	96	8,000	80,000	A29	20.80
ZWE0	ZW-E (1.0mm)	250	75	96	7,000	70,000	A29	32.50
PT-26mm								
CFR0W8 CFR0S4 MF0W8 MF0S4 MFF04	CFR-12 CFR-25-S MF-12 MF-25-S MF-40-SS	257	50	68	5,000	225,000	A3	20.44
CFR0W4 CFRFU2 MF0W4 MFFU2 MF006 MOR0S2 FRN0W4	CFR-25 CFR-50-SS MF-25 MF-50-SS MF-60-S MOR-50-S FRN-25	257	50	95	5,000	135,000	A3	22.00

*** Carton Dimension :
- A3 - 490 x 270 x 375
- A29 - 410 x 270 x 235

RoHS Compliant

Standard Packing of Coated Type Resistors

Box of Plastic Case

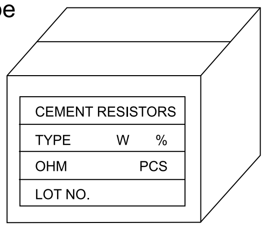


Part No.	Style	Bulk in Box Packing (In Plastic Case) (B/B)						
		L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity /Plastic Case/ Box (pcs)	Quantity / Carton (pcs)	Carton Code ***	Gross Wt. ±2kgs.
MOR05S MOR05W KNP05W KNP07S KNPA5W KNPU5W KNPA7WS	MOR-500-S MOR-500 KNP-500 KNP-700-S KNPA-500 KNPU-500 KNPA-700-S	155	95	53	100 / 200 (M-TYPE)	4,800	A104	18.20
		36	20	8	100 / 1,000	4,800	A51	16.50

*** Carton Dimension : • A51- 405 x 370 x 205

*** F-Type & T-Type packing standard same as M-Type

Inner Box



Inner box

Part No.	Type	Bulk in Box Packing (Inner Box)			
		Qty/Inner Box (pcs)	Qty/Carton (pcs)	Carton size L x W x H (±5)	Gross Wt. ±2kgs.
KNS02W	KNS-200	1,400	2,800	520 x 220 x 250	8.50
KNS03W	KNS-300	1,280	2,560		8.60
KNS05W	KNS-500	2,000	2,000		12.10
KNS07W	KNS-700	180	1,080		10.52
KNS0AW	KNS-1000	180	1,080		13.34
TMOR3W TMOR5W	TMOR-300 TMOR-500	500	3,000	520 x 220 x 250	10.17 11.20

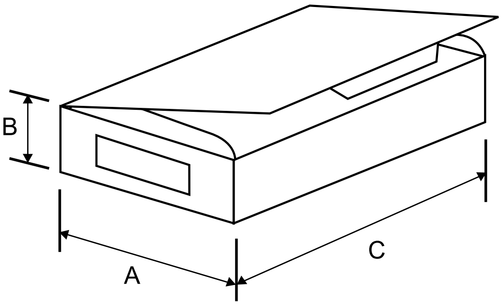
Plastic Bag

Part No.	Type	Bulk in Box Packing (In Plastic Bag) B/B				
		Qty/Plastic Bag (pcs)	Qty/Inner Box (pcs)	Qty/Carton (pcs)	Carton size L x W x H (±5)	Gross Wt. ±2kgs.
TMOV5W	TMOV-5W	10	400	2,400	520 x 220 x 250	9.40
TMOV7W	TMOV-7W	5	300	1,800	485 x 190 x 200	9.39
MOR07W MOR08W KNP07W KNP08S KNP08W KNP09S KNP0AU KNPA7W KNPU7W KNPA8WS KNPA8W KNPA9WS	MOR-7W MOR-8W KNP-7W KNP-8W-S KNP-8W KNP-9W-S KNP-10W-SS KNPA-700 KNPU-700 KNPA-800-S KNPA-800 KNPA-900-S	8	32	1,600	560 x 305 x 310	9.50
MOR09W KNP09W KNP0AS KNPA9W KNPA0AS	MOR-9W KNP-9W KNP-10W-S KNPA-900 KNPA-10W-S	10	300	1,800	520 x 220 x 250	15.05

RoHS Compliant

Standard Packing of Coated Type Resistors

Dimension (mm)



Part No.	Style	Bulk in Box Packing (In Plastic Bag) (B/B)						
		L(C) ±5	W(A) ±5	H(B) ± 5	Quantity/Plastic Bag/Box (pcs)	Quantity/ Carton (pcs)	Carton Code***	Gross Wt. ±2kgs.
CFR0W8 CFR0S4 MF0W8 MF0S4 MFF04	CFR-12 CFR-25-S MF-12 MF-25-S MF-40-SS	150	77	33	500 / 1,000	84,000	A3	13.00
ZOC0W8 ZOT0W8	ZO-12	150	77	33	500 / 1,000	84,000	A3	14.00
CFR0W4 CFRFU2 MF0W4 MFFU2 MF006 MOR0W4 MOR0S2 FRN0W4 FRN0S2 FRN0N4 MGR0W4	CFR-25 CFR-50-SS MF-25 MF-50-SS MF-60-S MOR-25 MOR-50-S FRN-25 FRN-50-S FRN-40 MGR-25	150	77	33	500 / 1,000	84,000	A3	20.80
ZOC0W4 ZOT0W4	ZO-25	150	77	33	500 / 1,000	84,000	A3	22.50
CFR0S2 MF0S2	CFR-50-S MF-50-S	150	75	67	100 / 1,000	36,000	A3	13.00 10.50
FRN0W2 CFRF1U	FRN-50 CFR-100-SS	150	75	67	100 / 1,000	36,000	A3	16.00
CFR0W2 MF0M7 MFR0W2 MF01S	CFR-50 MF-75-S MF-50 MF-100-S	150	75	67	100 / 1,000	36,000	A3	14.00
MOR0W2 MOR01S MGRFW2	MOR-500 MOR-100-S MGR-500	155	95	53	500 / 1,000 (M-TYPE)	24,000	A104	11.50
					100 / 1,000	24,000	A104	13.70
						36,000	A3	16.00
FRN075 FRN01W KNP0W2 KNP01S KNPAW2 KNPA1WS	FRN-75 FRN-100 KNP-500 KNP-100-S KNPA-50 KNPA-100-S	155	95	53	500 / 1,000 (M-TYPE)	24,000	A104	14.00
					100 / 1,000	24,000	A104	11.00
						36,000	A3	23.00
CFR01S MF01W MF02S	CFR-100-S MF-100 MF-200-S	155	95	53	100 / 500	12,000	A104	10.50
						18,000	A3	14.50
MOR01W MOR02S FRN015 FRN02W KNP01W KNP02S KNPA1W KNPA2WS MGRF1W	MOR-100 MOR-200-S FRN-150 FRN-200 KNP-100 KNP-200-S KNPA-100 KNPA-200-S MGR-100	155	95	53	500 / 1,000 (M-TYPE)	24,000	A104	16.00
					100 / 500	18,000	A3	10.80
						12,000	A104	7.10

RoHS Compliant

Standard Packing of Coated Type Resistors

Part No.	Style	Bulk in Box Packing (In Plastic Bag B/B)						
		L(C) ±5	W(A) ±5	H(B) ±5	Quantity/Plastic Bag/Box (pcs)	Quantity/ Carton (pcs)	Carton Code ***	Gross Wt. ±2kgs.
CFR01W CFR02S MF02W MF03S	CFR-100 CFR-200-S MF-200 MF-300-S	155	95	53	100 / 500	12,000	A104	13.00
						18,000	A3	23.00
					500 / 1,000 (M-TYPE)	24,000	A104	24.70
MOR02W MOR03S FRN03W KNP02W KNP03U KNP03S MGRF2W KNPA2W KNPA3WS	MOR-200 MOR-300-S FRN-300 KNP-200 KNP-300-SS KNP-300-S MGR-200 KNPA-200 KNPA-300-S	155	95	53	250 / 500 (M-TYPE)	12,000	A104	13.00
					100 / 500	18,000	A3	20.70
						12,000	A104	13.00
CFR02W CFR03S MF03W	CFR-200 CFR-300-S MF-300	155	95	53	100 / 400	9,600	A104	18.00
						14,400	A3	23.00
MOR03W MOR04S MOR05U	MOR-300 MOR-400-S MOR-500-SS	155	95	53	100 / 400	9,600	A104	18.00
						14,400	A3	30.00
					150 / 300 (M-TYPE)	7,200	A104	13.20
KNP03W KNP05S KNPA3W KNPA5WS	KNP-300 KNP-500-S KNPA-300 KNPA-500-S	155	95	53	100 / 400	9,600	A104	18.00
						14,400	A3	28.50

*** Carton Dimension : • A3 - 490 x 270 x 375, A104 - 400 x 325 x 225

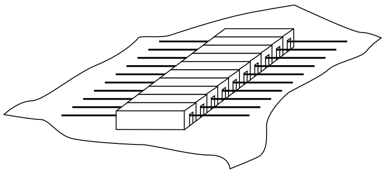
*** F-Type & T-Type packing same as M-Type

RoHS Compliant

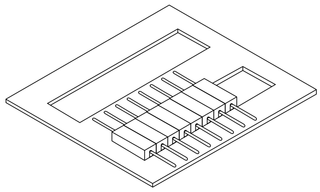
Standard Packing of Cement Type Resistors

Dimension (mm)

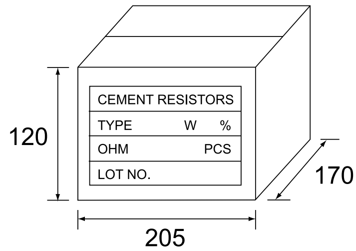
(1) Type A Packing



Type-A1 plastic bag



Type-A2 paper tray



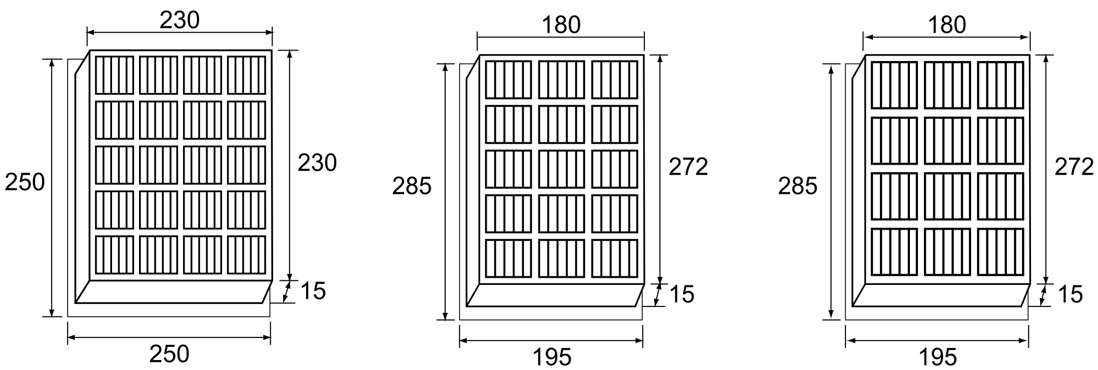
Inner box

Part No.	Type	Qty/Plastic Bag (pcs)	Qty/Inner Box (pcs)	Qty/Carton (pcs)	Carton size L x W x H (±5)	Gross Wt. ±2kgs.	Packing Type
	PRW series						
PRW01W	1 W	10	500	3,000	485 x 190 x 200	10.00	Type A1
PRW02W	2 W	10	400	2,400	485 x 190 x 200	8.00	Type A1
PRW03W	3 W	10	500	3,000	520 x 220 x 250	12.20	Type A1
PRW05W	5 W	10	400	2,400	520 x 220 x 250	12.73	Type A1
PRW07W	7 W	10	300	1,800	520 x 220 x 250	15.46	Type A1
PRW0AW	10 W	10	250	1,500	520 x 220 x 250	18.39	Type A1
PRW0FW	15 W	70	70	420	510 x 200 x 250	8.20	Type A1
PRW020	20 W	60	60	360	510 x 200 x 250	10.75	Type A1
PRW025	25 W	60	60	360	510 x 200 x 250	11.22	Type A1
	PRWA series						
PRWA5W	5 W	10	400	2,400	520 x 220 x 250	15.00	Type A1
PRWA7W	7 W	10	240	1,440	520 x 220 x 250	14.20	Type A1
PRWAAW	10 W	10	220	1,320	520 x 220 x 250	16.30	Type A1
	PRWC series						
PRWC3W	3 W	10	400	2,400	485 x 190 x 200	7.30	Type A1
PRWC5W	5 W	10	400	2,400	485 x 190 x 200	9.40	Type A1
PRWC7W	7 W	10	400	2,400	520 x 220 x 250	14.00	Type A1
	PRS series						
PRS05W	5 W	10	400	2,400	520 x 220 x 250	17.67	Type A1
PRS07W	7 W	10	250	1,500	520 x 220 x 250	16.78	Type A1
PRS0AW	10 W	10	150	900	485 x 190 x 200	13.00	Type A1
PRS025	25 W	10	80	480	520 x 220 x 250	17.85	Type A1
	PRT series						
PRT0AW	10 W	10	200	1,200	520 x 220 x 250	19.50	Type A1
PRT0FW	15 W	10	150	900	520 x 220 x 250	22.00	Type A1
PRT020	20 W	10	95	570	520 x 220 x 250	18.50	Type A1
PRT030	30 W	5	45	270	520 x 220 x 250	21.40	Type A1
PRT040	40 W	5	25	150	520 x 220 x 250	14.20	Type A1
	PRWC series						
PRC14W	4W	50	500	3,000	485 x 190 x 200	9.05	Type A2
PRC15W	5W	10	600	3,600	485 x 190 x 200	13.45	Type A1
PRC16W	6W	40	400	2,400	485 x 190 x 200	13.71	Type A2

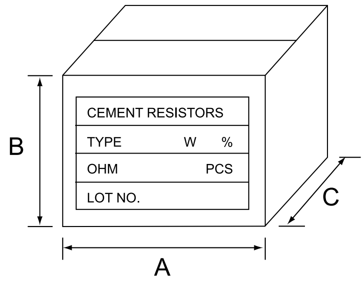
Part No.	Type	Qty/Plastic Bag (pcs)	Qty/Inner Box (pcs)	Qty/Carton (pcs)	Carton size L x W x H (±5)	Gross Wt. ±2kgs.	Packing Type
	PRM / FTR						
PRM02W / PF2	2 W	10 (in Bag)	700	4,200	520 x 220 x 250	18.50	Type A1
PRM03W / PF3	3 W	100	500	2,000	535 x 270 x 220	14.20	Type B1
PRM05W / PF5	5 W	100	500	2,000	535 x 270 x 220	14.20	Type B1
PRM07W / PF7	7 W	75	375	1,500	435 x 305 x 215	16.50	Type B2
PRM0AW	10 W	60	300	1,200	435 x 305 x 215	17.50	Type B3
PFA	10 W	10 (in Bag)	150	900	520 x 220 x 250	14.74	Type A1
	PRMA series						
PRMA5W	5 W	100	500	2,000	535 x 270 x 220	14.00	Type B1
PRMAAW	10 W	10 (in bag)	150	900	520 x 220 x 250	14.50	Type A1
	PFA series						
PFAS2W	2 W	20 (in bag)	600	3,600	485 x 190 x 200	7.10	Type A1
PFAS5W	3 W	20 (in bag)	500	3,000	485 x 190 x 200	9.72	Type A1
PFAS7W	5 W	20 (in bag)	500	3,000	485 x 190 x 200	11.70	Type A1
PFASAW	10 W	10 (in bag)	500	3,000	520 x 220 x 250	22.40	Type A1
PFAT5W	5 W	10 (in bag)	300	1,800	485 x 190 x 200	13.20	Type A1
PFAT7W	7 W	10 (in bag)	250	1,500	485 x 190 x 200	11.50	Type A1

Standard Packing of Cement Type Resistors

(2) Type B Packing (Plastic Case)
Dimension (mm)

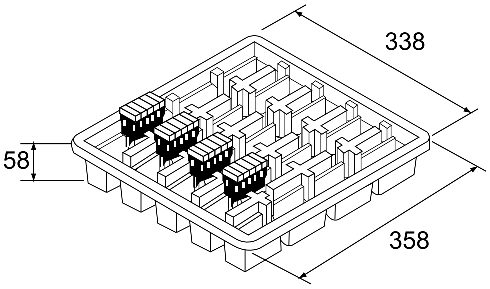


Dimension of Plastic Case (mm)			
Type	A	B	C
Type - B1	260	105	260
Type - B2	300	100	210
Type - B3	300	100	210

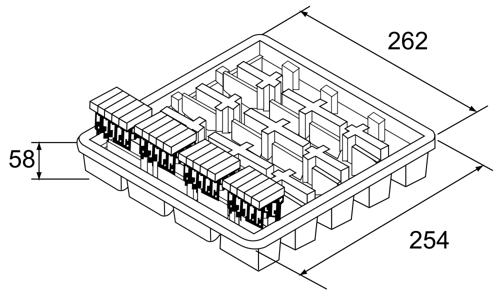


Inner Box of Plastic Case

(3) Type C Packing (Pulp Case)
Dimension (mm)

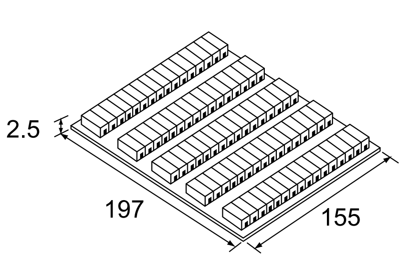


Type-C1 (5W)

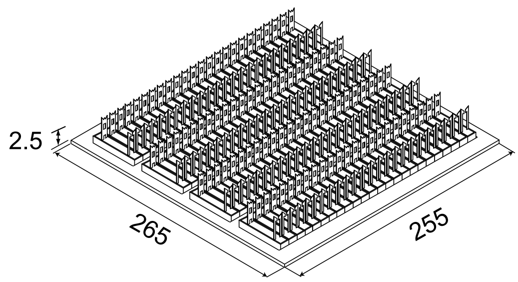


Type-C2 (7W)

(4) Type D Packing (Paper Sheet)
Dimension (mm)



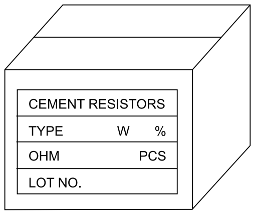
Type-D (5W) Axial M-Type



Type-D (10W,15W, 20W) Terminal Type

Standard Packing of Cement Type Resistors

Inner Box



Inner box

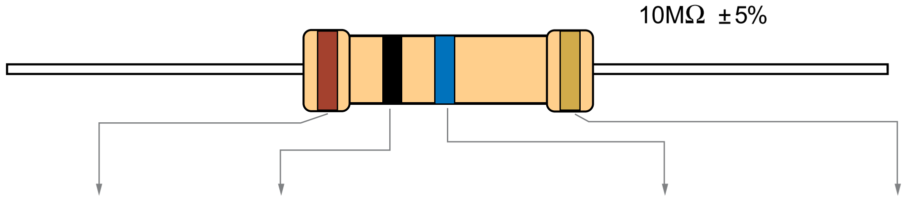
Part No.	Type	Qty/ Plastic Bag / Plastic Case/ Paper Sheet (pcs)	Qty/ Inner Box (pcs)	Qty/ Carton (pcs)	Carton size L x W x H (±5)	Gross Wt. ± 2kgs.	Packing Type
	PRVA / PRVB						
PRVA3W / PRVB3W	3 W	200	1,000	2,000	765 x 365 x 295	12.60	Type - C1
PRVA5W / PRVB5W	5 W	200	1,000	2,000	765 x 365 x 295	14.80	Type - C1
PRVA7W / PRVB7W	7 W	100	500	1,000	550 x 285 x 250	11.00	Type - C2
PRVAAW / PRVBAW	10 W	80	400	800	560 x 305 x 310	10.20	Type - D
PRVAFW / PRVBFW	15 W	80	80	800	560 x 305 x 310	17.33	Type - D
PRVA20 / PRVB20	20 W	60	60	600	560 x 305 x 310	17.85	Type - D
	PRZ series						
PZ1A5W / PZ2A5W / PRZC5W / PRZD5W	5 W	200	1,000	2,000	765 x 365 x 295	18.04	Type - C1
PZ1A7W / PZ2A7W / PRZC7W / PRZD7W	7 W	100	500	1,000	550 x 285 x 250	10.30	Type - C2
PZ1AAW / PZ2AAW / PRZCAW / PRZDAW	10 W	100	100	1,000	560 x 305 x 310	14.50	Type - D
PZ1AFW / PZ2AFW / PRZCFW	15 W	100	500	500	560 x 305 x 310	10.00	Type - D
PZ1A20 / PZ2A20 / PRZC20	20 W	100	500	500	560 x 305 x 310	11.80	Type - D
	PRU series						
PRUAW	10 W	100	100	1,000	560 x 305 x 310	12.50	Type - D
PRUFW	15 W	80	80	800	560 x 305 x 310	17.33	Type - D
PRU20	20 W	60	60	600	560 x 305 x 310	17.85	Type - D
PRU30	30 W	60	60	240	435 x 305 x 215	16.37	Type - D
PRU40	40 W	60	60	240	435 x 305 x 215	16.37	Type - D
	PRWI series						
PRWI4W	4 W	10	400	2,400	520 x 220 x 250	9.48	Type A1
PRWI7W	7 W	10	300	1,800	520 x 220 x 250	11.75	Type A1
PRWIBW	11 W	10	200	800	535 x 270 x 200	7.04	Type A1
PRWIHW	17 W	10	200	800	535 x 270 x 200	9.54	Type A1
PRW05W	**M-TYPE 5W**	600	600	3,600	520 x 220 x 250	11.00	Type - D
	QL series						
QL0030	30W	-	5	30	485 x190 x 200	8.13	-
QL0040	40W	-	10	60	520 x 220 x 250	7.80	-
QL0050	50W	-	10	60	520 x 220 x 250	11.05	-
QL0080	80W	-	7	42	520 x 220 x 250	7.70	-
QL00..100	100W	-	7	42	435 x 305 x 215	12.34	-
QL00..150	150W	-	5	20	435 x 305 x 215	8.30	-
QL00..200	200W	-	5	20	435 x 305 x 215	8.33	-
QL00..300	300W	-	1	8	435 x 305 x 215	6.42	-
QL00..400	400W		1	15	435 x 305 x 215	13.10	
	KNH/KNHA						
KNH020	20W	-	20	120	520 x 220 x 250	4.92	-
KNHA25	25W	-	60	360	520 x 220 x 250	12.00	-
KNH030, KNHA30	30W	-	60	360	520 x 220 x 250	12.00	-
KNH040	40W	-	20	120	520 x 220 x 250	7.32	-
KNH050	50W	-	20	120	520 x 220 x 250	13.37	-
KNH060	60W	-	12	72	520 x 220 x 250	9.18	-
KNH080	80W	-	10	60	520 x 220 x 250	9.00	-
KNH100	100W	-	10	60	520 x 220 x 250	10.00	-

Note: PRZ series included PRZA-1, PRZA-2, PRZA-3, PRZC and PRZD

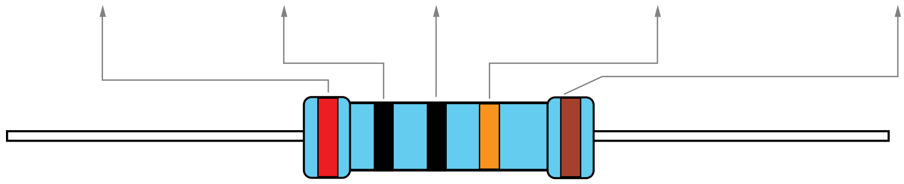
RoHS Compliant

Color Code

4 Band code: 2%, 5%, 10%
10MΩ ±5%



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE	
BLACK	0	0	0	1		
BROWN	1	1	1	10	±1%	(F)
RED	2	2	2	100	±2%	(G)
ORANGE	3	3	3	1K		
YELLOW	4	4	4	10K		
GREEN	5	5	5	100K	±0.5%	(D)
BLUE	6	6	6	1M	±0.25%	(C)
VIOLET	7	7	7	10M	±0.10%	(B)
GREY	8	8	8	100M	±0.05%	(A)
WHITE	9	9	9	1G		
GOLD				0.1	±5%	(J)
SILVER				0.01	±10%	(K)



5 Band code: 0.1%, 0.25%, 0.50%, 1%
200KΩ ± 1%

±2%	E6	1.0				1.5				2.2				3.3				4.7				6.8			
±5%	E12	1.0		1.2		1.5		1.8		2.2		2.7		3.3		3.9		4.7		5.6		6.8		8.2	
±10%	E24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
±1%	E96	1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.37	1.40	1.43	1.47	1.50	1.54	1.58	1.62	1.65	1.69	1.74
		1.78	1.82	1.87	1.91	1.96	2.00	2.05	2.10	2.15	2.21	2.26	2.32	2.37	2.43	2.49	2.55	2.61	2.67	2.74	2.80	2.87	2.94	3.01	3.09
		3.16	3.24	3.32	3.40	3.48	3.57	3.65	3.74	3.83	3.92	4.02	4.12	4.22	4.32	4.42	4.53	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.49
		5.62	5.76	5.90	6.04	6.19	6.34	6.49	6.65	6.81	6.98	7.15	7.32	7.50	7.68	7.87	8.06	8.25	8.45	8.66	8.87	9.09	9.31	9.53	9.76

RoHS Compliant

Test Methods of JIS C 5201 - 1

Temperature Coefficient : (JIS C 5201-1 4.8)	Natural Resistance change per temperature degree centigrade: $\frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6$ (PPM/^{O}C) R_1 : Resistance value at room temperature (t_1) R_2 : Resistance value at room temperature plus 100^{O}C (t_2) Test Pattern: Room temperature (t1), Room temperature + 100^{O}C (t_2)
Short Time Overload (Overload) : (JIS C 5201-1 4.13)	Permanent resistance change after application of a potential of 2.5 times RCWV or max overload whichever is lesser for 5 sec
Insulation resistance : (JIS C 5201-1 4.6)	Apply 500VDC between protective coating and termination for 1 min., then measure. (100V DC specially for Resistor Network)
Dielectric Withstanding Voltage : (Voltage proof) (JIS C 5201-1 4.7)	Resistor shall be clamped in the foil. Wrap metal foil around the body of the resistor. Test at AC potential respectively specified in the given list of each product type for 60 +10/-0 sec. For Cement Fixed Resistors, the testing voltage is 1,000 Volts. For Chip resistors, testing voltage is 500 Volts.
Pulse Overload : (JIS C 5202 5.8)	Resistance change after 10,000 cycles (1 sec “ON”, 25 sec “OFF”) at 4 times of RCWV or maximum overload.
Terminal Strength : (JIS C 5201-1 4.16)	**Direct Load:** Resistance to a 2.5kgs. Direct load for 10 sec In a direction of the longitudinal axis of the terminal leads. **Twist Test:** Terminal leads shall be bent through 90^{O} at a point of about 6mm from the body of the resistor and shall be rotated through 360^{O} about the original axis of the bent terminal in alternating direction for a total of 3 rotations.
Terminal Strength : (JIS C 5201-1 4.16)	(Applicable for Resistor Network) Tensile: 1Kg., 30sec, Bending: 500g, 2 times
Terminal Bending : (JIS C 5201-1 4.33)	(Applicable for Chip Resistors) Twist of the Test Board: Y/X = 3/90mm for 10 sec
Vibration : (JIS C 5201-1 4.22)	X, Y, Z each direction 2 hours, 10 ~ 55 ~ 10Hz / min. All amplitude 1.5mm
Soldering Heat : (JIS C 5201-1 4.18)	(Applicable for Chip Resistors) Dip the resistor into a solder bath having a temp. of 260±5^{O}C and hold it for 10±1 sec **Lead (Pb) free temp.:** 260 ± 3^{O}C, 5 + 1/-0 sec
Resistance to Soldering Heat : (JIS C 5201-1 4.18)	Permanent Resistance change when leads immersed to a point 2.0 ~ 2.5mm from the body in 350 ± 10^{o}C solder bath for 3 ~ 4 sec **Lead (Pb) free temp.:** 260 ± 3^{O}C, 5 + 1/-0 sec
Solderability : (JIS C 5201-1 4.17)	The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Test temperature of solder: 235 ± 5^{O}C; Dwell time in solder: 3 ~ 3.5 sec **Lead (Pb) free temp.:** 245 ± 3^{O}C; Dwell time in solder: 2 ~ 3 sec
Leaching : (JIS C 5201-1 4.18)	(Applicable for chip Resistors) Dip the resistors into a solder bath having a temp. of 260±5^{O}C and hold it for 30 sec.
Resistance to Solvent : (JIS C 5201-1 4.29, 4.30)	Specimens shall be immersed in a bath of alcohol completely for 3 min. using ultrasonic test equipment.
Thermal Shock : (JIS C 5201-1 4.21)	(Applicable for Resistor Network) Load V, room temperature, 30 min. Unload, -55^{O}C, 15min. Over 2 hours in room temperature before measuring.
Rapid Change Temperature : (JIS C 5201-1 4.19)	Resistance change after continuous 5 cycles for duty cycle specified below : Step 1: 30 min. at -55± 3^{O}C Step 2: 10 ~ 15 min. at room temperature Step 3: 30 min. at 155 ±2^{O}C Step 4: 10 ~ 15 min. at room temperature
Humidity (Steady State) : (JIS C 5201-1 4.24)	Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40 ±2^{O}C and 90 ~ 95% relative humidity.
Load Life in Humidity : (JIS C 5202 7.9)	Resistance change after 1,000hr (1.5 hours “ON”, 0.5 hour “OFF”) at RCWV or max.Working voltage whichever is lesser in a humidity test chamber controlled at 40 ± 2^{O}C and 90 ~ 95% relative humidity.
Load Life : (JIS C 5201-1 4.25.1)	Permanent Resistance change after 1,000 hours operating at RCWV or max. Working voltage whichever is lesser, with duty cycles of 1.5 hours “ON”, 0.5 hour “OFF” at 70 ± 2^{O}C ambient.
Flame Retardant : (JIS C 5202 7.12)	Resistor shall resist flaming or arcing when overloaded up to 16 times RCWV or max.Working voltage whichever is lesser. Lit burner and adjust to produce a blue flame 38mm in height & a max. of 127mm flame from the burner tube. Resistor is supported from its lead at 45^{O}C from the horizontal so that the lower end of resistor is on the top of blue flame. The resistor is placed on this test flame for 15 sec. Keep cool for 15 sec. Repeat this procedure for 5 times.

** RCWV = (**R**ated **C**ontinuous **W**orking **V**oltage) = $\sqrt{\text{Rated Power x Resistance Value}}$

RoHS Compliant

Test Methods of JIS C 5201-1

JIS C 5202	JIS C 5201-1
Maximum overload voltage	(Not applicable)
Intermittent overload	(Not applicable)
Endurance (under damp and load)	(Not applicable)
Flame resistance- Flame resistance test	(Not applicable)
Flame resistance-over-load burning / Resistance test	(Not applicable)
Highest ambient temperature	2.2.10 Upper category temperature
Lowest ambient temperature	2.2.11 Lower category temperature
Rated Power	2.2.13 Rated dissipation
Rated Voltage	2.2.15 Rated voltage
	2.2.17 Isolation Voltage
Temperature coefficient of resistance	2.2.20.2 Temperature coefficient of resistance
Ratio to rated dissipation	2.2.24 Percentage of the rated dissipation
Nominal resistance value	2.2.7 Rated resistance
Critical resistance value	2.2.8 Critical resistance
Working Temperature range	2.2.9 Category temperature range
Nominal resistance range	2.5 Rated resistance range
Tolerance of resistance value	2.6 Tolerance on rated resistance
Stability class	2.8 Stability class
Voltage coefficient	4.11 Voltage coefficient of resistance
Short-time overload	4.13 Overload
Temperature rise	4.14 Temperature rise
Robustness of resistor body	4.15 Robustness of the resistors body
Robustness of terminations bending strength of lead / wire termination	4.16 Robustness of terminations (Bending, Tensile, Torsion)
Solderability	4.17 Solderability
Resistance to soldering heat / Leaching	4.18 Resistance to soldering heat / Leaching
Change of temperature	4.19 Rapid change of temperature
Shock	4.21 Shock
Resistance to vibration	4.22 Vibration
Climatic sequence	4.23 Climatic sequence
Resistance to dry heat	4.23.1 Dry heat
Resistance to cold	4.23.4 Cold
Resistance to damp heat (steady state)	4.24 Damp test, steady state
D.C load	4.24.2.2 D.C Load
Endurance (rated load)	4.25 Endurance at 70°C
Resistance to solvent / Resistance to solvent of body	4.29 Component solvent resistance
Resistance to solvent / Resistance to solvent of marking	4.30 Solvent resistance of marking
Adhesiveness	4.32 Adhesion
Resistance to base material bending	4.33 Bond strength of the face plating
Resistance	4.5 Resistance
Insulation resistance	4.6 Insulation resistance
Dielectric withstanding voltage (voltage proof)	4.7 Voltage proof
Temperature characteristic of resistance	4.8 Variation of resistance with temperature characteristic of resistance
Derating curve	Derating curve
Resistance to dry heat	Dry heat
Maximum working voltage	Limiting element voltage

Explanation of Part No. System

1	2	3	4	5	6	7	8	9	10	11	12	13	14

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

1. 1^{st} ~ 4^{th} digit:
   a) This is indicating the Chip Resistor size. Example: 1206, 0805 or 0603;
   b) For Resistor Network & Coated type, the 1^{st} to 3^{rd} digit indicates the product type and the 4^{th} 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 Resistors Non-Inductive type
   c) For Metal Film Fixed Resistors, the 1^{st} to the 2^{nd} digit indicates the product type, and the 3^{rd} digit is the special feature.
   d) For Cement Fixed Resistors, these 4 digits indicates the product type but if the product type has only 3 digits, the 4^{th} digit will be "0". Example: PRW0 = PRW type; PRWC = PRWC type.
   e) For FTR series 1^{st} to 3^{rd} indicates to the type and the 4^{th} indicates fusing temperature.
2. Metal Film Fixed Resistors 4^{th} ~ 5^{th} digit, other types 5^{th} ~ 6^{th} digit:
   a) This is for indicating the wattage or power rating. To distinguish the sizes and the numbers, the following codes are used (please refer to the following chart for details):

W = Normal Size; S = Small Size; U = Extra Small Size; "1" ~ "G" 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
Extra 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
Extra Small Size	1U	2U	3U	4U	5U	6U	7U	8U	9U	AU	BU	CU	DU	EU	FU	GU

   b) For power rating less than 1 watt, the 5^{th} digit will be the letters W, S or U to represent the size required & the 6^{th} digit will be a number or a letter code. Example: WA = 1/10W; U2= 1/2W-SS.
   c) For power rating of 1 watt to 16 watt, the 5^{th} digit will be a number or a letter code and the 6^{th} digit will be the letters W, S or U. Example: AW = 10W ; 3S = 3W-S.
   d) For power rating between 20 watt to 99 watt, the 5^{th} and the 6^{th} digit will show the whole numbers of the power rating itself. Example: 20 = 20W; 75 = 75W.
   e) For power rating of 100W and over the 5^{th} and the 6^{th} digit will be indicated with "00" and the actual wattage will be indicated at the last 3 digits (12^{th} ~ 14^{th}) of the part number (please see sample on 5.d).
   f) For special power ratings, the following codes are used :
   1) WH = 1/32W 3) 04 = 0.4W-SS (0.4 watt Extra Small Size) 5) 2A = 2.5W
   2) 07 = 3/4W-S (CHIP 2010) 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^{th} and the 6^{th} digit indicate the number of pins required. Example: 09 = 9pins; 12 = 12pins.
   h) For Jumper Wire Resistors, the 5^{th} and the 6^{th} digit will be indicated with "00".
   i) For FTR series, the 5^{th} and the 6^{th} digit will use the following code:

Wattage	1.4W	1.5W	1.6W	1.7W	1.8W	1.9W	2.0W	2.1W	2.2W	2.3W	2.4W	2.5W	2.6W	2.7W	2.8W	2.9W	3.0W
Code	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Wattage	3.1W	3.2W	3.3W	3.4W	3.6W	3.8W	4.0W	4.4W	4.6W	5.2W							
Code	31	32	33	34	36	38	40	44	46	52							

3. The 7^{th} digit indicates the Resistance Tolerance. The following letter code is used for indicating the Standard Resistance Tolerance.
   * For Metal Film Fixed Resistors, the 6^{th} digit indicates the resistance tolerance, and the 7^{th} digit indicates the required PPM.

TOLERANCE	PPM REQUIREMENT
T = ±0.01%	B = 15PPM
A = ±0.05%	C = 25PPM
B = ±0.1%	F = 50PPM
C = ±0.25%	G = 100PPM
D = ±0.5%	J = 200PPM
F = ± 1%	
G = ± 2%	
J = ± 5%	
K = ± 10%	

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Explanation of Part No. System

1	2	3	4	5	6	7	8	9	10	11	12	13	14

4. The 8th ~ 11th digit indicate the Resistance Value.
   a) For the standard resistance values of E-24 series, the 8th digit is "0", the 9th & 10th indicate the significant figures of the resistance and the 11th digit is the number of zeros.
   b) For the standard resistance values of E-96 series, the 8th ~ 10th digit indicates the significant figures of the resistance and the 11th digit is the number of zeros.
   Note: in case E-24 standard values are required in 1%, 8th and 10th digit will be read the same as E-96 series as explained in 4b.
   c) The following number and letter codes indicate the number of zeros in the 11th digit :

$0 = 10^0$	$1 = 10^1$	$2 = 10^2$	$3 = 10^3$	$4 = 10^4$
$5 = 10^5$	$6 = 10^6$	$J = 10^{-1}$	$K = 10^{-2}$	$L = 10^{-3}$

   d) For Cement Fixed Resistors, the 8th digit will be coded "W" or "P" to indicate Wire-Wound or Power Film type respectively. The 9th ~ 11th digit, please refer to point 4a.
   Examples:

E-24 series	E-96 series	Cement Fixed Resistors
0120 = 12 ohm	1210 = 121 ohm	W120 = 12 ohm Wire-Wound
0123 = 12K ohm	1302 = 13K ohm	W12J = 1.2 ohm Wire-Wound
012J = 1.2 ohm	196J = 19.6 ohm	P273 = 27K ohm Power Film

5. The 12th, 13th & 14th digit.
   a) The 12th digit indicates the Packing Type with the following codes:

A = Tape / Box (Ammo Pack)	T = Tape / Reel
B = Bulk / Box	P = Tape / Box of PT-26 products

   b) The 13th digit normally indicates the Packing Quantity of Tape / Box & Tape / Reel packing types. Except for Chip products BULK packing , this digit should be filled with "0" for other products with "Bulk/Box" packing requirements. The following letter codes are used for available packing quantities :

A = 500 pcs	B = 2,500 pcs	C = 10,000 pcs
D = 20,000 pcs	G = 25,000 pcs	H = 50,000 pcs

   Examples:

Chip Products	Other Products
BD = B/B-20,000	A5 = T/B-5,000
TC = T/R-10,000	B0 = B/B (standard packing quantity available)
TB = T/R-2,500	

   c) For the FORMED type products, the 13th & 14th digit indicate the required forming types using the following codes:

MF = M-type with flattened lead wire	F0 = F-type	F3 = F3 type
MK = M-type with kinked lead wire	F1 = F1 type	T0 = T-type
ML = M-type with normal lead wire	F2 = F2 type	

   d) For power rating over 100 watt, the 12th ~ 14th digit indicates the actual wattage of the products :
   Example:

100 = 100 watt	150 = 150 watt	225 = 225 watt

   e) For some items, the 14th digit alone can indicate special features or additional information using the following codes:
      P = Panasert type
      1 = Avisert type 1
      2 = Avisert type 2
      3 = Avisert type 3
      A = Cutting type CO 1/4W - A type, Axial type PT 83 mm
      B = Cutting type CO 1/4W - B type
      C = PT 73mm
      D = PT 71mm
      E = For "Environmental Protection, Lead Free type" of Chip, Chip Array or Chip Network Resistors.
      0 = PT-52mm, NIL for PT-26
      8 = PT-58mm
      9 = PT-64mm
      7 = B/B Lead wire H = 38mm
   f) For FTR item, the 14th digit denotes the current rating using the following codes:
      2 = 2A
      5 = 5A
      A = 10A
   g) For Kit Album, the 12th ~ the 14th digit indicates special features with the following codes:
      KIT = Kit resistor
      KON = Album Kit only no resistor
      KIL = Lead Free

Storage method

To maintain proper quality of the resistors, the following conditions are required for storage.
1. Do not store in places that are exposed to direct sunlight.
2. Store in places within the temperature range of $25^{O}C \pm 10^{O}C$ and humidity range of 60 ± 10 %RH.

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