

Metal Film Resistors

# MFR Series

## Normal & Miniature Style



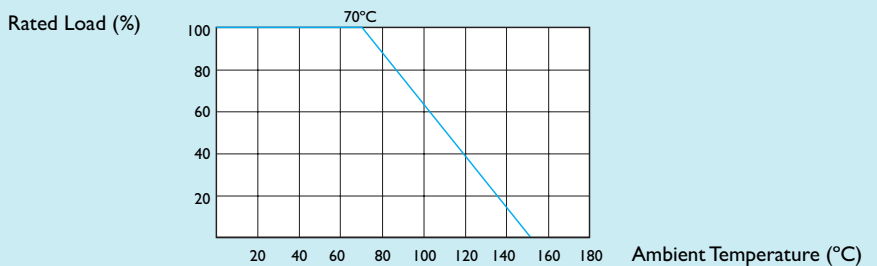
### INTRODUCTION

The MFR Series Metal Film Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals and passive materials onto a carefully treated high grade ceramic substrate, the resistors are coated with layers of blue lacquer.

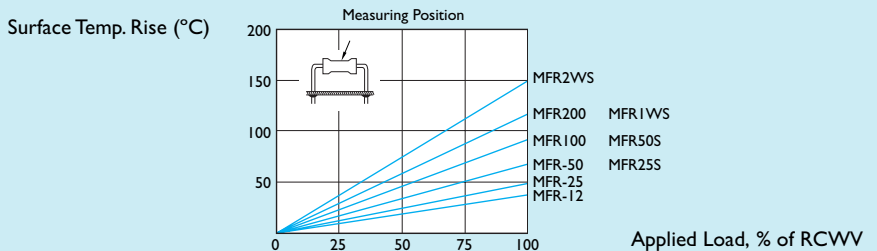
### FEATURES

Power Rating	1/6W, 1/4W, 1/2W, 1W, 2W
Resistance Tolerance	±0.1%, ±0.25%, ±0.5%, ±1%
T.C.R.	±15ppm/°C, ±25ppm/°C, ±50ppm/°C, ±100ppm/°C

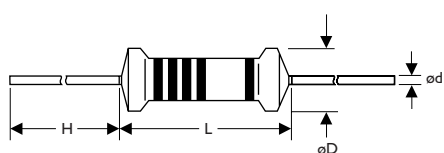
### DERATING CURVE



### HOT-SPOT TEMPERATURE



### DIMENSIONS



Unit : mm

STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
MFR-12	MFR25S	3.4±0.3	1.9±0.2	28±2.0	0.5±0.05
MFR-25	MFR50S	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05
MFR-50	MFR1WS	9.0±0.5	3.3±0.3	26±2.0	0.6±0.05
MFR100	MFR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
MFR200	-	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	MFR-12	MFR25S	MFR-25	MFR50S	MFR-50	MFR1WS	MFR100	MFR2WS	MFR200
Power Rating at 70°C	1/6W	1/4W		1/2W		1W		2W	
Operating Temp. Range	-55°C to +155°C								
Maximum Working Voltage	200V	200V	250V	300V	350V	400V	500V	500V	500V
Maximum Overload Voltage	400V	400V	500V	600V	700V	800V	1000V	1000V	1000V
Dielectric Withstanding Voltage	300V	400V	500V	500V	500V	700V	1000V	1000V	1000V
Value Range ±0.5%, ±1%	10Ω~1MΩ								
Value Rang ±0.1%, ±0.25%	100Ω~100KΩ								
Temperature Coefficient (by Type)	±15ppm/°C, ±25ppm/°C, ±50ppm/°C, ±100ppm/°C								

\* Resistance Range for standard resistance, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD	APPRAISE	
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(1%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(1.5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(0.75%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(0.25%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(0.25%+0.05Ω)

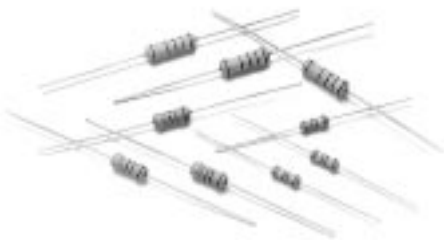
\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



## Metal Film Resistors

# FLAME-PROOF TYPE

## Normal & Miniature Style [ FMF Series ]



### INTRODUCTION

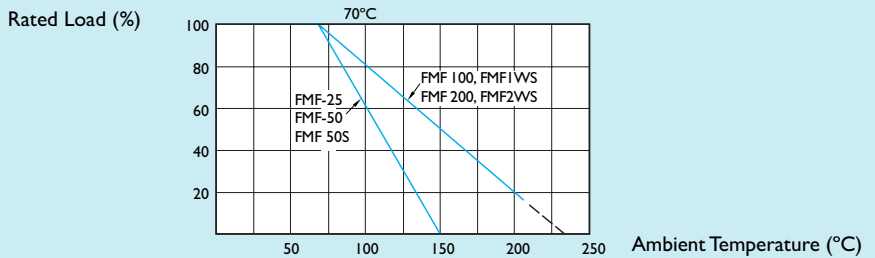
The FMF series flame-proof type Metal Film Resistors are manufactured by vacuum deposit metal film on high thermal conductivity ceramic rods, and are coated with layers of gray color flame-proof lacquer.

These FMF flame-proof metal film resistor is designed to replace the metal oxide resistors and low power wire wound resistors, where when flame-proof and small size is needed.

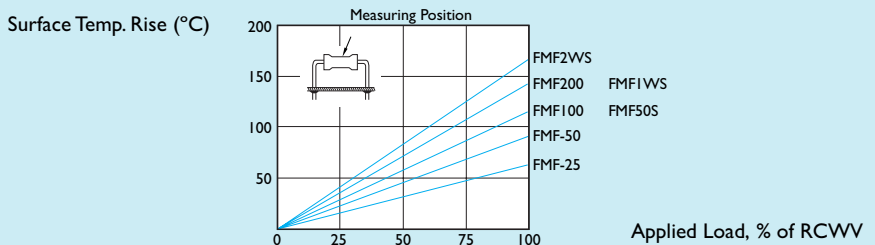
### FEATURES

Flame-Proof Coating	UL-1412
Power Rating	1/4W, 1/2W, 1W, 2W
Resistance Tolerance	±1%
T.C.R.	±50ppm/°C, ±100ppm/°C

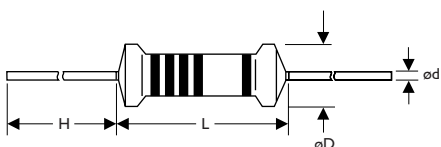
### DERATING CURVE



### HOT-SPOT TEMPERATURE



### DIMENSIONS



Unit : mm

STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
FMF-25	FMF50S	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05
FMF-50	FMF1WS	9.0±0.5	3.3±0.3	26±2.0	0.6±0.05
FMF100	FMF2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FMF200	-	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	FMF-25	FMF50S	FMF-50	FMF1WS	FMF100	FMF2WS	FMF200
Power Rating at 70°C	1/4W	1/2W		1W		2W	
Operating Temp. Range	-55°C to +155°C						
Maximum Working Voltage	250V	300V	350V	400V	500V	500V	500V
Maximum Overload Voltage	500V	600V	700V	800V	1000V	1000V	1000V
Dielectric Withstanding Voltage	400V	400V	500V	600V	750V	750V	750V
Value Range ±1%	10Ω~1MΩ						
Temperature Coefficient (by Type)	±50ppm/°C, ±100ppm/°C						

\* Standard resistance is 10Ω~1MΩ, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(1%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(1.5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(1.5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(0.75%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(0.25%+0.05Ω)

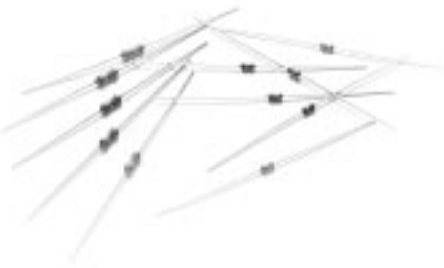
\* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



## Metal Film Resistors

# PROFESSIONAL TYPE

## Miniature Style [ MF0 Series ]



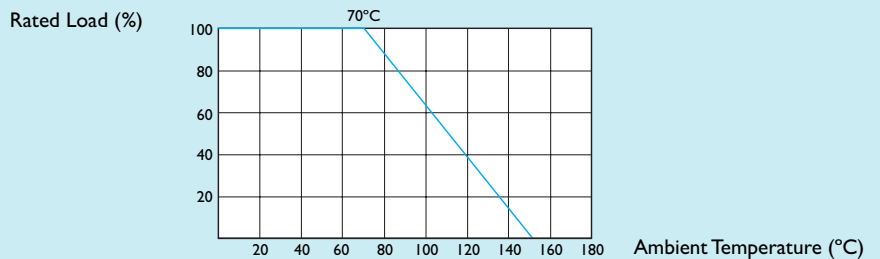
### INTRODUCTION

The MF0 Series are manufactured by high vacuum sputtering deposit metal film on high thermal conductivity and specific gravity ROSENTHAL ceramic or same grade rods. The resistors are coated with multilayers of blue color lacquer.

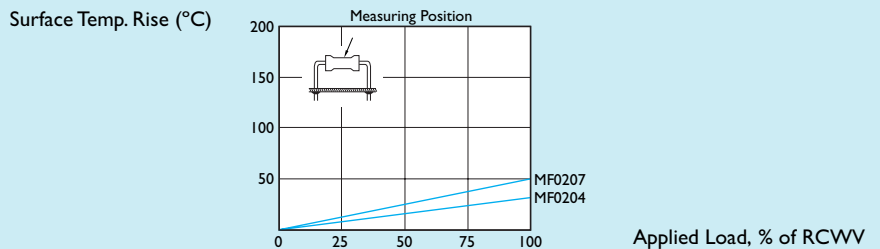
### FEATURES

DIN	44061, 45921 part 107
CECC	40101-039, 40101-017
MIL	10509F (Char. D & C )
Resistance Tolerance	± 1%
T.C.R.	± 50ppm/°C

### DERATING CURVE

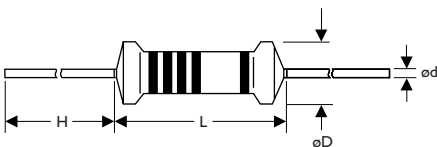


### HOT-SPOT TEMPERATURE



### DIMENSIONS

Unit : mm



STYLE	L	øD	H	ød
MF0204	3.4±0.3	1.9±0.2	28±2.0	0.5±0.05
MF0207	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	MF0204	MF0207
Power Rating at 70°C	0.4W	0.6W
Operating Temp. Range	-55°C to +155°C	
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Value Range ±1%	10Ω~1MΩ	
Temperature Coefficient	±50ppm/°C	

\* Standard resistance is 10Ω~1MΩ, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	±50ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>10000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(1%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(1.5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(1.5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(0.75%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(0.25%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



## Metal Film Resistors

# PROFESSIONAL & FLAME-PROOF TYPE

## Miniature Style [ FM0 Series ]



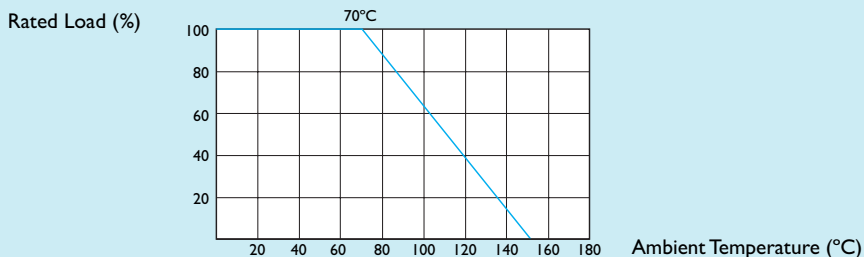
### INTRODUCTION

The FM0 Series are manufactured by high vacuum sputtering deposit metal film on high thermal conductivity and specific gravity ROSENTHAL ceramic or same grade rods. The FM0207 are coated with multilayers of light-green color flame-proof lacquer. The FM0207 meets severe overload test in accordance with UL specification # 1412 without fire hazard.

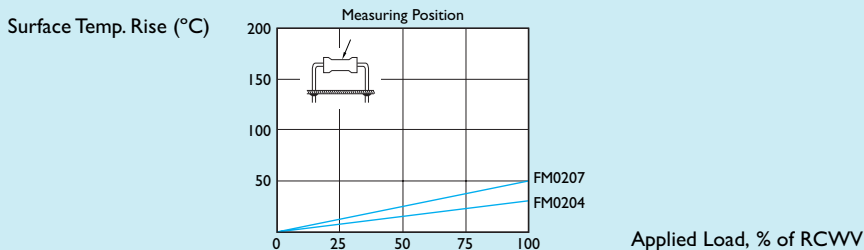
### FEATURES

DIN	44061, 45921 part 107
CECC	40101-039, 40101-017
Flameproof Coating	UL-1412
Resistance Tolerance	± 1%
T.C.R.	± 50ppm/°C

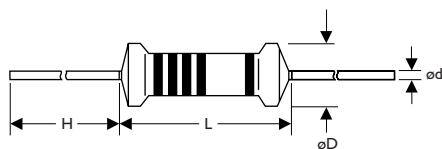
### DERATING CURVE



### HOTSPOT TEMPERATURE



### DIMENSIONS



STYLE	L	øD	H	ød
FM0204	3.4±0.3	1.9±0.2	28±2.0	0.5±0.05
FM0207	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05

Unit : mm

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	FM0204	FM0207
Power Rating at 70°C	0.4W	0.6W
Operating Temp. Range	-55°C to +155°C	
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Value Range ±1%	10Ω~1MΩ	
Temperature Coefficient	±50ppm/°C	

\* Standard resistance is 10Ω~1MΩ, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.25%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	±50ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(1%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(1.5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(1.5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(0.75%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(0.25%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



# Metal Oxide Film Resistors

# FLAME-PROOF TYPE

## Normal & Miniature Style [ RSF Series ]



### INTRODUCTION

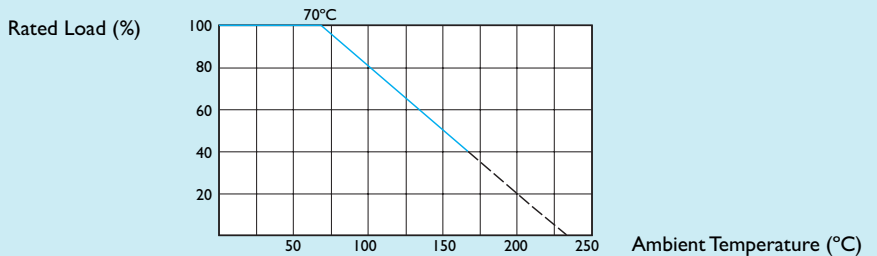
These Metal Oxide Resistors offer excellent performance in applications where stability and uniformity of characteristics are desired. They provide lower cost alternatives to Carbon Composition Resistors and General Purpose Metal Films. Metal Oxides also can replace many low power General Purpose wirewound applications, saving both money and time, with shorter delivery cycles.

The normal style & the miniature style of RSF series are coated with layers of gray and pink colors flame-proof lacquer respectively.

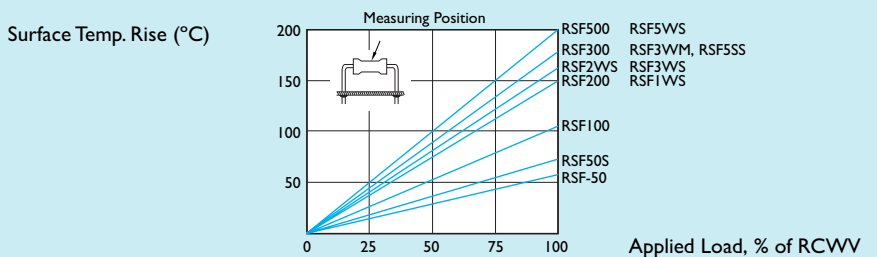
### FEATURES

- Low Cost, Prompt Delivery
- High Power-to-Size Ratio for Significant Space Savings
- Complete Flameproof Construction-UL 1412
- High Surge/Overload Capability
- Non-Inductive Design
- Wide Resistance Range:  $1\Omega$  ~  $1M\Omega$
- Resistance ToLerance:  $\pm 5\%$

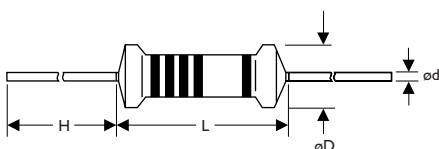
### DERATING CURVE



### HOT-SPOT TEMPERATURE



### DIMENSIONS



STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
RSF-25	RSF50S	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05
RSF-50	RSF1WS	9.0±0.5	3.3±0.3	26±2.0	0.6±0.05
RSF100	RSF2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
RSF200	RSF3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
RSF5SS	RSF3WVM	17.5±1.0	6.5±1.0	32±2.0	0.8±0.05
RSF300	RSF5WS	24.5±1.0	8.5±1.0	38±2.0	0.8±0.05
RSF500	-	24.5±1.0	8.5±1.0	38±2.0	0.8±0.05

\* RSF1WS ( MB Type ) ød 0.8±0.05

Unit : mm

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	RSF-25	RSF50S	RSF-50	RSF1WS	RSF100	RSF2WS	RSF200	RSF3WS/ RSF3WM	RSF300	RSF5SS/ RSF5WS	RSF500
Power Rating at 70°C	1/4W	1/2W		1W		2W		3W		5W	
Operating Temp. Range	-55°C to +155°C										
Maximum Working Voltage	200V	250V	250V	300V	350V	350V	350V	350V/450V	500V	500V/500V	750V
Maximum Overload Voltage	300V	400V	400V	500V	600V	600V	600V	600V/700V	800V	800V/800V	1000V
Dielectric Withstanding Voltage	250V	350V	350V	400V	500V	500V	500V	500V/600V	700V	700V/750V	750V
Value Range ±5%	1Ω~510KΩ										
Temperature Coefficient	±300ppm/°C										

\* Standard resistance is 1Ω~510KΩ, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD	APPRAISE	
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(1%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	±200ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(2%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(1%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(1%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV)= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

# Carbon Film Resistors

# CFR Series

## Normal & Miniature Style



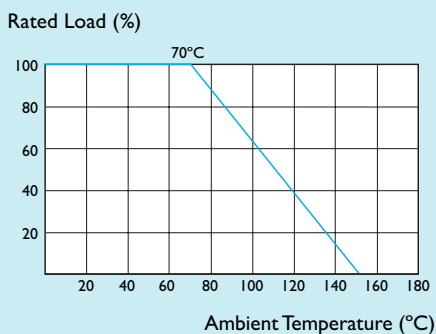
### INTRODUCTION

Billions of products are already in use worldwide in all types of applications—from process control instrumentation to telephone receivers and FM radio to color television. The secret is in a proprietary production system and baking by a uniquely designed and automated production technique. Years of experience in making raw materials and production machinery prove the unique quality and high reliability of these products. The meet-or far exceed—such specifications as EIA RS196A, JIS-C-6402 and IEC-115. The resistors are coated with layers of tan color lacquer.

### FEATURES

- Industry's Lowest Cost
- Delivery From Stock in Bulk, Taped and Strip Pack
- Exceptional Long-Term Stability
- Exceeds Carbon Comp MIL-R-11 Performance
- Resistance Tolerance:  $\pm 2\%$ ,  $\pm 5\%$
- Variety of Packaging—Bulk, Strip Pack, 26mm and 52mm Tape and Reel, Cut and Formed, or Radial Panaset/Avisert

### DERATING CURVE



### HOT-SPOT TEMPERATURE

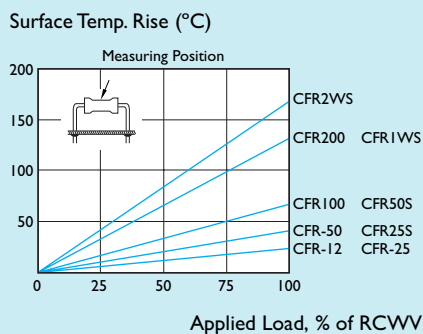
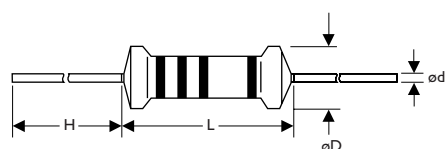


FIG. 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100K $\Omega$	100K $\Omega$ ~ 1M $\Omega$	1M $\Omega$ ~ 10M $\Omega$
CFR100, CFR200, CFR2WS	$\pm 350$	-500	-1500
CFR-12, CFR-25, CFR-50, CFR25S, CFR50S, CFR1WS	+350	-700	-1500

### DIMENSIONS



Unit : mm

STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
CFR-12	CFR25S	3.4 $\pm$ 0.3	1.9 $\pm$ 0.2	28 $\pm$ 2.0	0.5 $\pm$ 0.05
CFR-25	CFR50S	6.3 $\pm$ 0.5	2.4 $\pm$ 0.2	28 $\pm$ 2.0	0.6 $\pm$ 0.05
CFR-50	CFR1WS	9.0 $\pm$ 0.5	3.3 $\pm$ 0.3	26 $\pm$ 2.0	0.6 $\pm$ 0.05
CFR100	CFR2WS	11.5 $\pm$ 1.0	4.5 $\pm$ 0.5	35 $\pm$ 2.0	0.8 $\pm$ 0.05
CFR200	-	15.5 $\pm$ 1.0	5.0 $\pm$ 0.5	32 $\pm$ 2.0	0.8 $\pm$ 0.05

Note :

## ELECTRICAL CHARACTERISTICS

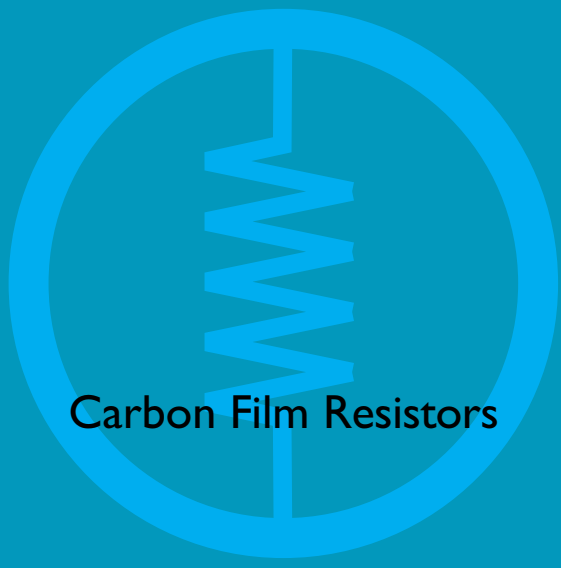
STYLE	CFR-12	CFR25S	CFR-25	CFR50S	CFR-50	CFR1WS	CFR100	CFR2WS	CFR200
Power Rating at 70°C	1/6W	1/4W		1/2W		1W		2W	
Operating Temp. Range	-55°C to +155°C								
Maximum Working Voltage	150V	200V	250V	300V	350V	400V	500V	500V	500V
Maximum Overload Voltage	300V	400V	500V	600V	700V	800V	1000V	1000V	1000V
Dielectric Withstanding Voltage	300V	400V	500V	500V	500V	700V	1000V	1000V	1000V
Value Range $\pm 2\%$ , $\pm 5\%$	1 $\Omega$ ~10M $\Omega$								
Temperature Coefficient (by Type)	see FIG. 1								

\* Standard resistance is 1 $\Omega$ ~10M $\Omega$ , below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	$\pm (0.75\%+0.05\Omega)$
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000M $\Omega$
Solderability	JIS-C-5202 6.5	235°C for 5 $\pm$ 0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		$\geq 2.5\text{kg}$ (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	$\pm (1\%+0.05\Omega)$
Load Life in Humidity	JIS-C-5202 7.9	40 $\pm$ 2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	$\pm (3\%+0.05\Omega)$
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	$\pm (3\%+0.05\Omega)$
Temperature Cycling	JIS-C-5202 7.4	-55°C $\rightarrow$ Room Temp. $\rightarrow$ +155°C $\rightarrow$ Room Temp. for 5 Cycles	$\pm (1\%+0.05\Omega)$
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C $\pm$ 10°C for 3 $\pm$ 0.5 Seconds	$\pm (1\%+0.05\Omega)$

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



# Carbon Film Resistors

# FLAME-PROOF TYPE

## Normal & Miniature Style [ FCR Series ]



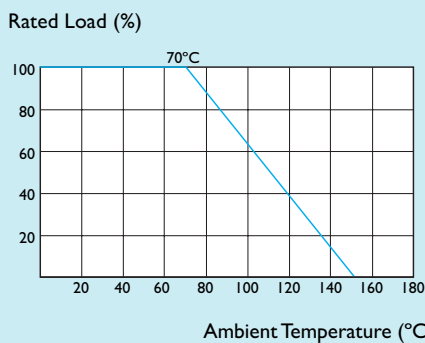
### INTRODUCTION

The FCR series flame-proof Carbon Film Resistors are manufactured by Coating a homogeneous film of pure carbon on high grade ceramic rods, resistance less than 10Ω have an electroless deposited nickel film, and are coated with layers of gray color flame-proof lacquer. These resistors meet overload tests in accordance with UL specification #1412 without producing a fire hazard.

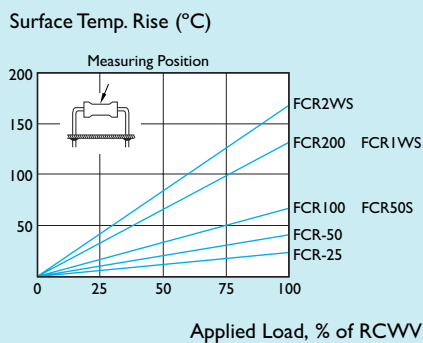
### FEATURES

- Low Cost. Prompt Delivery
- High Power-to-Size Ratio for Significant Space Savings
- Complete Flameproof Construction-UL 1412
- Excellent Long-Term Stability
- Wide Resistance Range: 1Ω~10MΩ
- Resistance Tolerance: ±5%
- Coating and Marking Resist Trichlorethylene, Freon, and Other Cleaning Agents

### DERATING CURVE



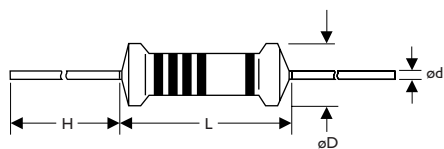
### HOT-SPOT TEMPERATURE



### FIG. 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100KΩ	100KΩ ~ 1MΩ	1MΩ ~ 10MΩ
FCR100, FCR200, FCR2WS	± 350	-500	-1500
FCR-25, FCR-50,	+350	-700	-1500
FCR50S, FCR1WS	-500		

### DIMENSIONS



\*The 5th is black color band for FCR series

STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
FCR-25	FCR50S	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05
FCR-50	FCR1WS	9.0±0.5	3.3±0.3	26±2.0	0.6±0.05
FCR100	FCR2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FCR200	-	15.5±1.0	5.0±0.5	32±2.0	0.8±0.05

Unit : mm

Note :

## ELECTRICAL CHARACTERISTICS

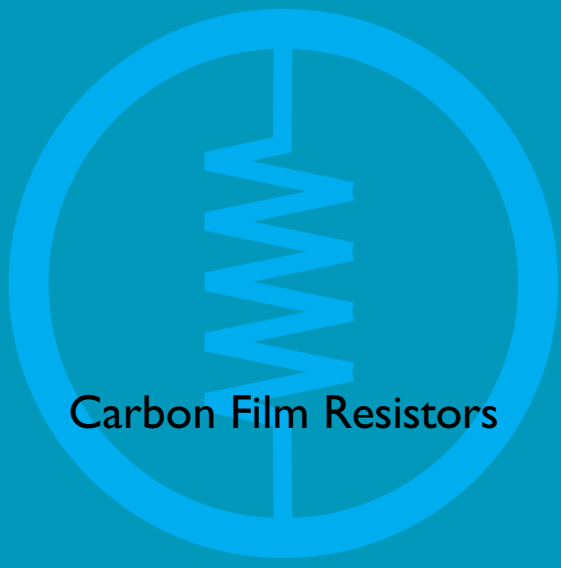
STYLE	FCR-25	FCR50S	FCR-50	FCR1WS	FCR100	FCR2WS	FCR200
Power Rating at 70°C	1/4W	1/2W		1W		2W	
Operating Temp. Range	-55°C to +155°C						
Maximum Working Voltage	250V	300V	350V	400V	500V	500V	500V
Maximum Overload Voltage	500V	600V	700V	800V	1000V	1000V	1000V
Dielectric Withstanding Voltage	400V	400V	500V	600V	750V	750V	750V
Value Range $\pm 2\%$ , $\pm 5\%$	1 $\Omega$ – 10M $\Omega$						
Temperature Coefficient (by Type)	see FIG.1						

\* Standard resistance is 1 $\Omega$  – 10M $\Omega$ , below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	$\pm (0.75\% + 0.05\Omega)$
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	> 1000M $\Omega$
Solderability	JIS-C-5202 6.5	235°C for 5 $\pm$ 0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct load for 10 Sec. in The Direction of The Terminal Leads		$\geq 2.5\text{kg}$ (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	$\pm (1\% + 0.05\Omega)$
Load Life in Humidity	JIS-C-5202 7.9	40 $\pm$ 2°C, 90 – 95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	$\pm (3\% + 0.05\Omega)$
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	$\pm (3\% + 0.05\Omega)$
Temperature Cycling	JIS-C-5202 7.4	-55°C $\rightarrow$ Room Temp. $\rightarrow$ +155°C $\rightarrow$ Room Temp. for 5 Cycles	$\pm (1\% + 0.05\Omega)$
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C $\pm$ 10°C for 3 $\pm$ 0.5 Seconds	$\pm (1\% + 0.05\Omega)$

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



# Carbon Film Resistors

# PROFESSIONAL TYPE

## Miniature Style [ CF0 Series ]



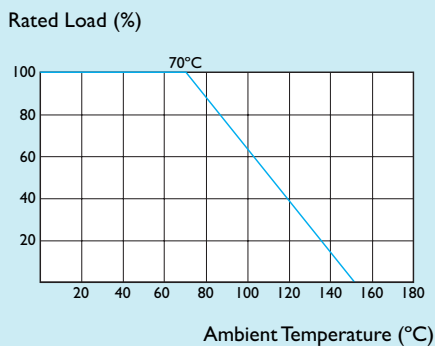
### INTRODUCTION

The CF0 series are manufactured by Coating a homogeneous film of pure carbon on high grade ceramic rods, resistance less than  $10\Omega$  have an electroless-deposited nickel film. The resistors are coated with layers of tan color lacquer.

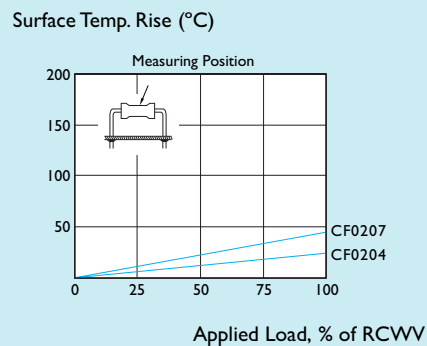
### FEATURES

- Excellent Long-Term Stability
- Miniature in Size
- Coating and Marking Resist Trichlorethylene, Freon, and Other Cleaning Agents
- Resistance Tolerance:  $\pm 5\%$
- Resistance Range:  $1\Omega - 10M\Omega$

### DERATING CURVE



### HOT-SPOT TEMPERATURE

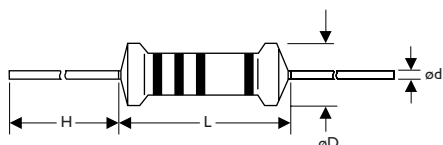


### FIG. 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under $100K\Omega$	$100K\Omega - 1M\Omega$	$1M\Omega - 10M\Omega$
CF0204, CF0207	+350 -500	-700	-1500

### DIMENSIONS

Unit : mm



STYLE	L	øD	H	ød
CF0204	$3.4 \pm 0.3$	$1.9 \pm 0.2$	$28 \pm 2.0$	$0.5 \pm 0.05$
CF0207	$6.3 \pm 0.5$	$2.4 \pm 0.2$	$28 \pm 2.0$	$0.6 \pm 0.05$

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	CF0204	CF0207
Power Rating at 70°C	0.4W	0.6W
Operating Temp. Range	-55°C to +155°C	
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Value Range ±5%	1Ω~10MΩ	
Temp. Coefficient (by Type)	see FIG. 1	

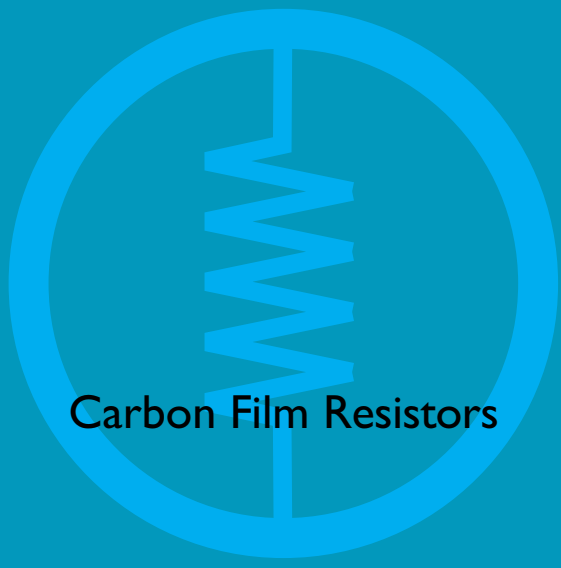
\* Standard resistance is 1Ω~10MΩ, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(1%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(3%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(3%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(1%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(1%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

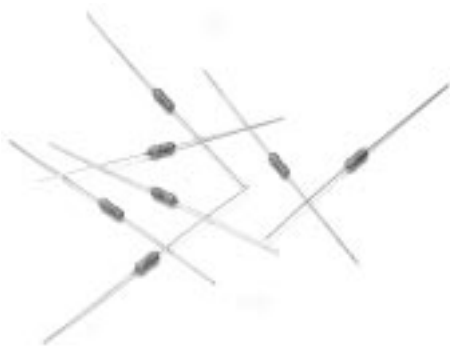




# Carbon Film Resistors

# PROFESSIONAL & FLAME-PROOF TYPE

## Miniature Style [ FC0 Series ]



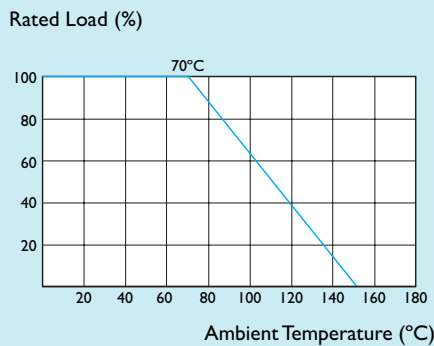
### INTRODUCTION

The FC0 series are manufactured by Coating a homogeneous film of pure carbon on high grade ceramic rods, resistance less than 10Ω have an electroless-deposited nickel film. The FC0207 are coated with layers of green color flame-proof lacquer. The FC0207 resistors meet overload test in accordance with UL specification #1412 without producing a fire hazard.

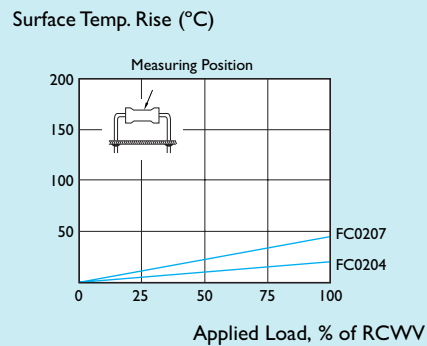
### FEATURES

- Excellent Long-Term Stability
- Miniature in Size
- Coating and Marking Resist Trichlorethylene, Freon, and Other Cleaning Agents
- Resistance Tolerance: ±5%
- Resistance Range: 1Ω~10MΩ

### DERATING CURVE



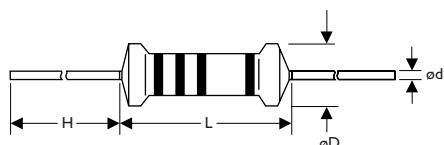
### HOT-SPOT TEMPERATURE



### FIG. 1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/°C		
	under 100KΩ	100KΩ ~ 1MΩ	1MΩ ~ 10MΩ
FC0204, FC0207	+350 -500	-700	-1500

### DIMENSIONS



Unit : mm

STYLE	L	øD	H	ød
FC0204	3.4±0.3	1.9±0.2	28±2.0	0.5±0.05
FC0207	6.3±0.5	2.4±0.2	28±2.0	0.6±0.05

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	FC0204	FC0207
Power Rating at 70°C	0.4W	0.6W
Operating Temp. Range	-55°C to +155°C	
Maximum Working Voltage	200V	300V
Maximum Overload Voltage	400V	600V
Dielectric Withstanding Voltage	300V	500V
Value Range ±5%	1Ω~10MΩ	
Temperature Coefficient (by Type)	see FIG. 1	

\* Standard resistance is 1Ω~10MΩ, below or over this resistance on request.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(0.75%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	by Type
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>1000MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(1%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(3%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(3%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(1%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(1%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



## Zerohm Resistors

# ZOR Series

## INTRODUCTION

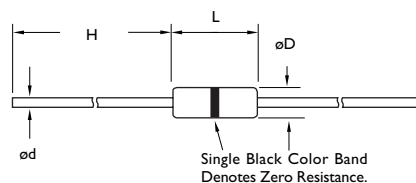
- Similar to a 1/4W resistor (1/6W size also available, typical resistance 0.004Ω)
- Ideal for automatic insertion or Cut and Form
- Available in Tape/Reel, Tape/Box and Bulk
- Film type Zerohm also available in 1/4W (ZOR-25) and 1/6W (ZOR-12) size

## SPECIFICATIONS

Maximum Resistance	0.005Ω
Min. Insulation Resistance	
Dry	10,000MΩ
Wet	100MΩ
Min. Dielectric Withstanding Voltage	
Atmospheric	500V RMS
Reduced	325V RMS
Insulation Flammability	Resistor Insulation is Self Extinguishing within 10 Seconds After Externally Applied Flame is Removed
Current Rating	15 AMPS at 70°C for 1/4W 10 AMPS at 70°C for 1/6W

## DIMENSIONS

Unit : mm



STYLE	L	øD	H	ød
ZOR-12	3.3±0.4	1.8±0.3	28±2.0	0.5±0.05
ZOR-25	6.3±0.5	2.3±0.3	28±2.0	0.6±0.05

# JPW Series



## Jumper Wires

### SPECIFICATIONS

Material of Jumper Wire	Soft Copper Wire with Tin Plating
Conductor Resistance	0.54mΩ/cm
Wire Diameter	0.5±0.05, 0.6±0.05, 0.7±0.05, 0.8±0.05, 1.0±0.05
Tension Strength	CNS 656 24kgs ± 4kg/mm <sup>2</sup>
Extension Rate	CNS 656 28% ±2%
Conductivity	Minimum 96%
Twisting Strength	CNS360°, 2 cycles
Solderability	JIS-5012-C5033 235°±5°C ,3 Sec. Coverage 95%
Element of Plating	Tin 99–100% Lead 0-1% (or Depend on Customer Requirement)
Thickness of Plating	5μ±2μ
Current Rating	6 AMPS at 70°C for ø0.5mm 7.5 AMPS at 70°C for ø0.6mm 8.5 AMPS at 70°C for ø0.7mm 10 AMPS at 70°C for ø0.8mm
Appearance	Smooth and Shining

### DIMENSIONS



### INTRODUCTION

Jumper wires or crossovers, as they are sometimes called, are basically interconnection devices between points on a P.C.Board. Generally they are used for the following reasons:

- Inability to connect two points on a P.C. Board due to other circuit paths which must be crossed over.
  - An After-the-Fact design change that requires new point connections.
  - Circuit tuning by changing point connections.
- Jumper wires offers a quick simple solution to these problems. They are especially suited for automatic machine insertion on lead tape or available in all packaging styles including pre-cut and formed leads for manual insertion.

Unit : mm

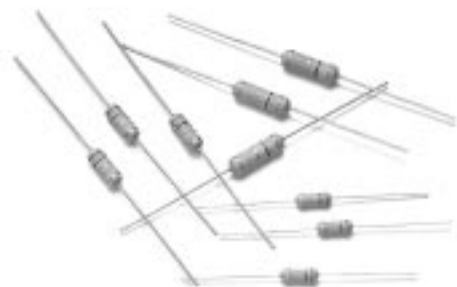
STYLE	L	ød
JPW-05	52.4±1	0.5±0.05
JPW-06	52.4±1	0.6±0.05
JPW-07	52.4±1	0.7±0.05
JPW-08	52.4±1	0.8±0.05
JPW-10	52.4±1	1.0±0.05



# Wirewound Resistors

# FLAME-PROOF TYPE

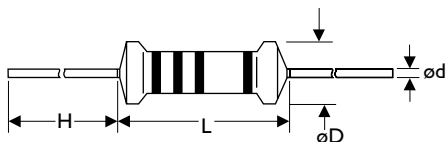
Normal & Miniature Style [ KNP Series NKN Series ]



## INTRODUCTION

- The resistor is fabricated using a suitable fiberglass or ceramic core with the resistance wire securely crimped to the terminals
- Small in size comparatively than other kind resistor
- Electrical and Mechanical stability and high reliability
- The KNP/NKN series are coated with layers of green color flame-proof lacquer. The resistors meet overload tests in accordance with UL specification #1412 without producing a fire hazard

## DIMENSIONS

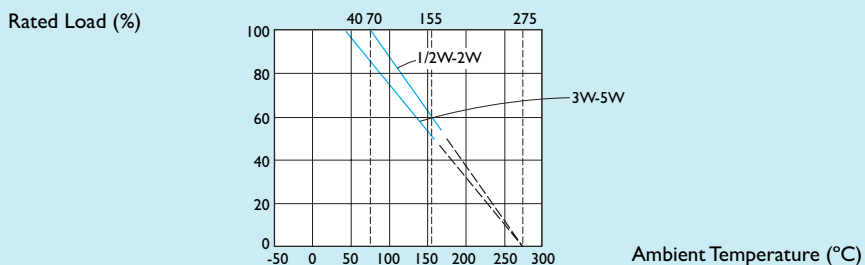


NKN has 5 color bands, the 5th black band.

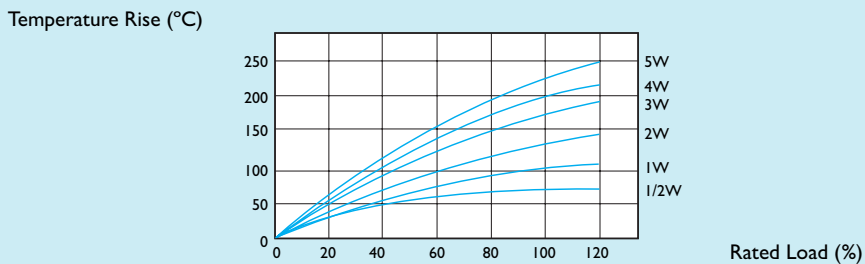
## FEATURES

- Industry's Lowest Cost
- Delivery From Stock in Bulk Taped, and Strip Pack
- Exceptional Long-Term Stability
- Exceeds Carbon Comp MIL-R-11 Performance
- Resistance Tolerance:  $\pm 5\%$
- Variety of Packaging—Bulk, Strip Pack, 52mm Tape and Reel, Cut and Formed, or Radial Panaset/Avi-ser t

## DERATING CURVE



## TEMPERATURE RISE



Unit : mm

STYLE		DIMENSION			
Normal	Miniature	L	øD	H	ød
KNP-50	KNP1WS	9.0±1.0	3.5±0.5	26±2.0	0.6±0.05
KNP100	KNP2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
KNP200	KNP3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05
KNP300	-	17.5±1.0	6.0±0.5	32±2.0	0.8±0.05
KNP400	KNP5WS	17.5±1.0	6.0±0.5	32±2.0	0.8±0.05
KNP500	-	24.5±1.0	8.0±0.5	38±2.0	0.8±0.05



Note :

## ELECTRICAL CHARACTERISTICS

STYLE	KNP-50	KNP1WS	KNP100	KNP2WS	KNP200	KNP3WS	KNP300	KNP400	KNP5WS	KNP500
Power Rating	1/2W	1W		2W		3W		4W	5W	
Operating Temp. Range	-55°C to +155°C									
Dielectric Withstanding Voltage	300V	300V	400V	400V	400V	400V	400V	400V	400V	400V
Value Range $\pm 5\%$	0.1 $\Omega$ ~47 $\Omega$		0.1 $\Omega$ ~100 $\Omega$		0.1 $\Omega$ ~330 $\Omega$		0.1 $\Omega$ ~560 $\Omega$		0.1 $\Omega$ ~1K $\Omega$	
Temperature Coefficient	$\pm 400$ ppm/°C									

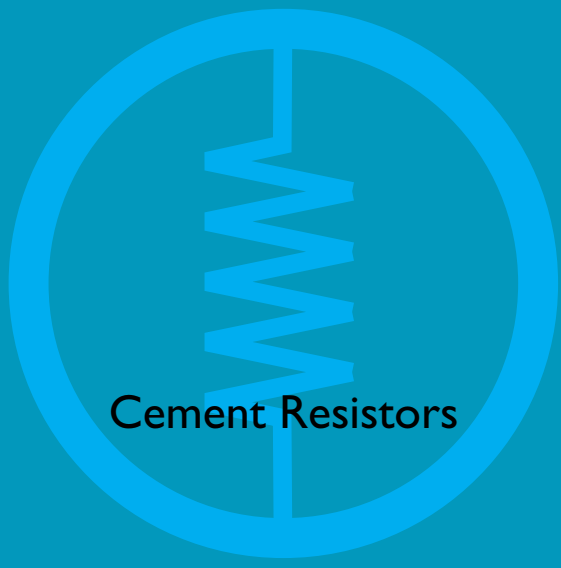
\* 1. Standard resistance is as the above list, below or over this resistance on request.

\* 2. Non-Inductive type up to 50 $\Omega$  only.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD	APPRAISE	
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	$\pm (2\%+0.05\Omega)$
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	$\pm 400$ ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100M $\Omega$
Solderability	JIS-C-5202 6.5	235°C for 5 $\pm$ 0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		$\geq 2.5$ kg (24.5N)
Load Life in Humidity	JIS-C-5202 7.9	40 $\pm$ 2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	$\pm (3\%+0.05\Omega)$
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	$\pm (3\%+0.05\Omega)$

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



# AXIAL LEAD TYPE

Standard Type[SQP Series], Non-Inductive Type[NSP Series]



## INTRODUCTION

- The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test
- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors

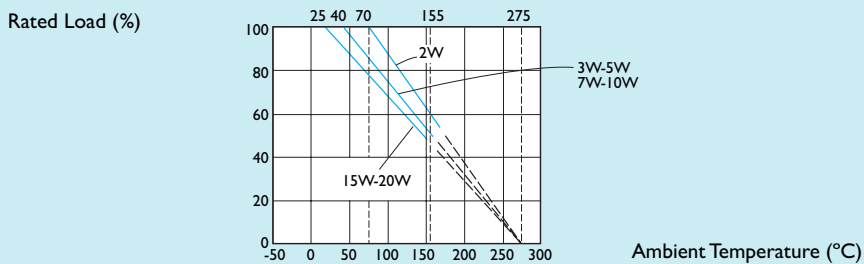
## FEATURES

Exceptionally Small and Sturdy; Mechanically Safe. Excellent Electrical Characteristics

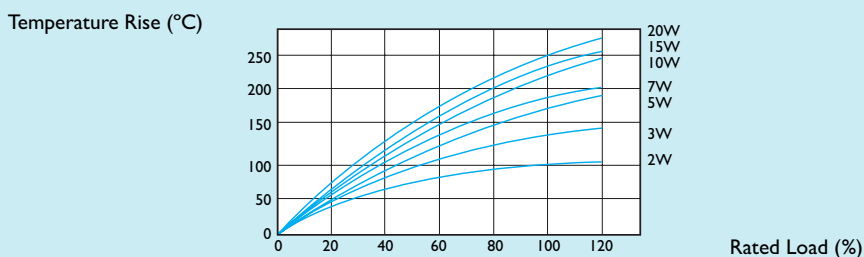
Resistance Tolerance:  $\pm 5\%$

Applicable Specifications: EIA RS-344 and EIA RC-649

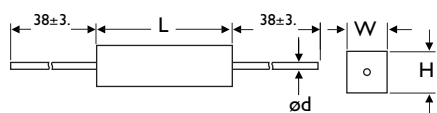
## DERATING CURVE



## TEMPERATURE RISE



## DIMENSIONS



Unit : mm

STYLE	L	W	H	ød
SQP200	18 $\pm$ 1.0	6.5 $\pm$ 1.0	6.5 $\pm$ 1.0	0.8 $\pm$ 0.05
SQP300	22 $\pm$ 1.5	8.0 $\pm$ 1.0	8.0 $\pm$ 1.0	0.8 $\pm$ 0.05
SQP500	22 $\pm$ 1.5	9.5 $\pm$ 1.0	9.0 $\pm$ 1.0	0.8 $\pm$ 0.05
SQP700	35 $\pm$ 1.5	9.5 $\pm$ 1.0	9.0 $\pm$ 1.0	0.8 $\pm$ 0.05
SQP10A	48 $\pm$ 1.5	9.5 $\pm$ 1.0	9.0 $\pm$ 1.0	0.8 $\pm$ 0.05
SQP15A	48 $\pm$ 1.5	12.5 $\pm$ 1.5	12.5 $\pm$ 1.5	1.0 $\pm$ 0.05
SQP20A	60 $\pm$ 2.0	12.5 $\pm$ 1.5	12.5 $\pm$ 1.5	1.0 $\pm$ 0.05

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	SQP200	SQP300	SQP500	SQP700	SQP10A	SQP15A	SQP20A
Power Rating	2W	3W	5W	7W	10W	15W	20W
Operating Temp. Range	-55°C to +155°C						
Maximum Working Voltage	250V	350V	350V	500V	500V	500V	500V
Maximum Overload Voltage	500V	700V	700V	1000V	1000V	1000V	1000V
Dielectric Withstanding Voltage	500V	700V	700V	1000V	1000V	1000V	1000V
Value Range ±5% (Wirewound)	0.15Ω~100Ω	0.3Ω~120Ω	0.3Ω~180Ω	0.5Ω~220Ω	1Ω~270Ω		
Value Range ±5% (Metal Oxide Film)	110Ω~10KΩ	130Ω~22KΩ	200Ω~33KΩ	240Ω~10KΩ	300Ω~10KΩ		
Temperature Coefficient	±300ppm/°C						

\* 1. Standard resistance is as the above list, below or over this resistance on request.

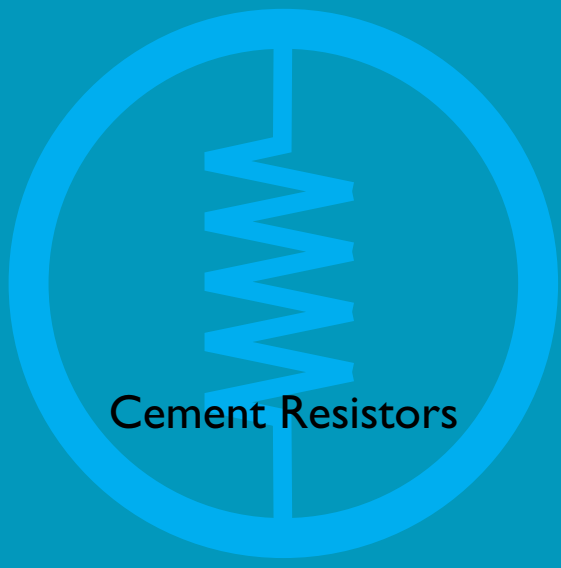
\* 2. Non-Inductive type up to 50Ω only.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	±300ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(2%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(2%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(1%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$





Cement Resistors

# VERTICAL LEAD TYPE

Standard Type[SQM Series], Non-Inductive Type[NSM Series]



## INTRODUCTION

- The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test
- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors

## FEATURES

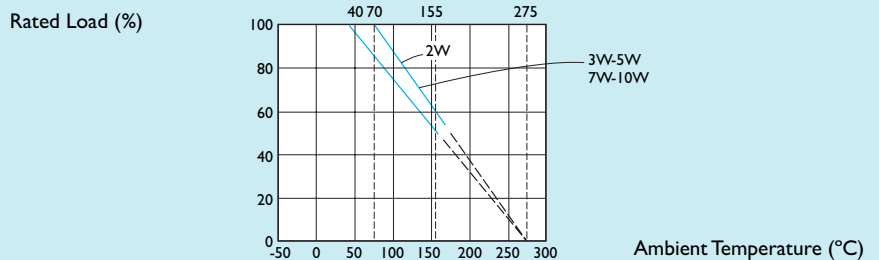
Space Saving Stand-Off Type

Small Size, High Power Capacity

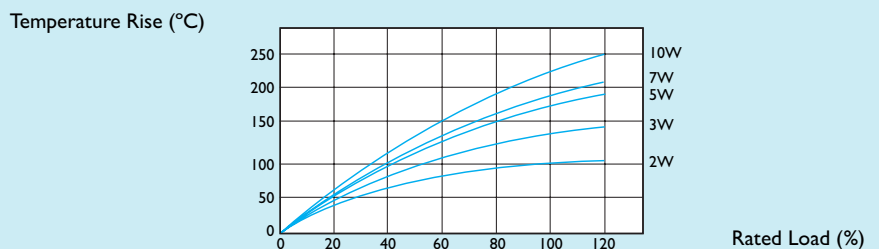
Resistance Tolerance:  $\pm 5\%$

Completely Unflamable

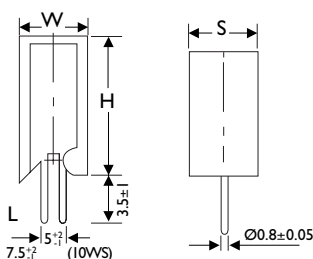
## DERATING CURVE



## TEMPERATURE RISE



## DIMENSIONS



STYLE	H	W	S
SQM200	20±1.5	11.0±1.0	7.0±1.0
SQM300	25±1.5	12.0±1.0	8.0±1.0
SQM500	25±1.5	13.0±1.0	9.0±1.0
SQM700	39±1.5	13.0±1.0	9.0±1.0
SQM10A	35±1.5	16.0±1.0	12.0±1.0

Unit : mm

Note :

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### ELECTRICAL CHARACTERISTICS

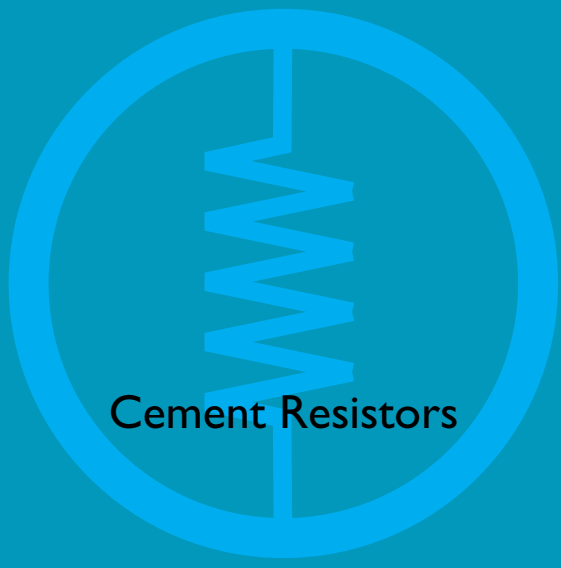
STYLE	SQM200	SQM300	SQM500	SQM700	SQM10A
Power Rating	2W	3W	5W	7W	10W
Operating Temp. Range	-55°C to +155°C				
Maximum Working Voltage	250V	350V	350V	500V	500V
Maximum Overload Voltage	500V	700V	700V	1000V	1000V
Dielectric Withstanding Voltage	500V	700V	700V	1000V	1000V
Value Range ±5% (Ceramic Core)	0.15Ω~100Ω	0.24Ω~120Ω	0.3Ω~180Ω	0.51Ω~220Ω	1Ω~270Ω
Value Range ±5% (Metal Oxide Film)	110Ω~10KΩ	130Ω~22KΩ	200Ω~33KΩ	240Ω~10KΩ	300Ω~10KΩ
Temperature Coefficient	±300ppm/°C				

\* 1. Standard resistance is as the above list, below or over this resistance on request.  
 \* 2. Non-Inductive type up to 50Ω only.

### ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	±300ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(2%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(2%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(1%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



# RADIAL TERMINALS TYPE

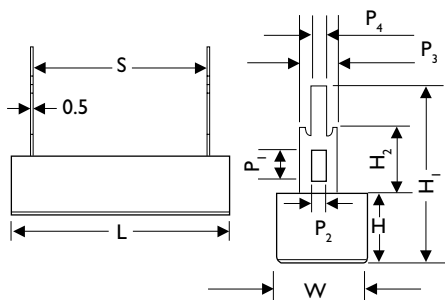
Standard Type[SQZ Series], Non-Inductive Type[NSZ Series]



## INTRODUCTION

- The materials used and the construction techniques ensure excellent flame resistance arc resistance and moisture resistances as well as self-extinguishing capabilities. They will withstand the most rigorous loading test
- As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors

## DIMENSIONS



## FEATURES

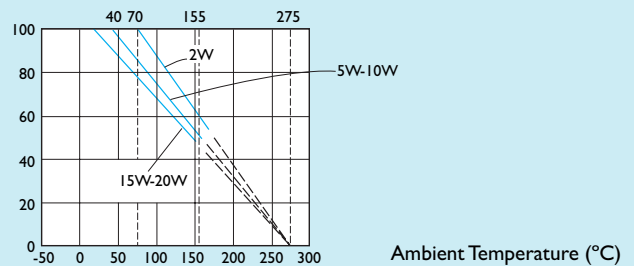
Space Saving Stand-Off Type

Resistance Tolerance:  $\pm 5\%$

Completely Unflamable

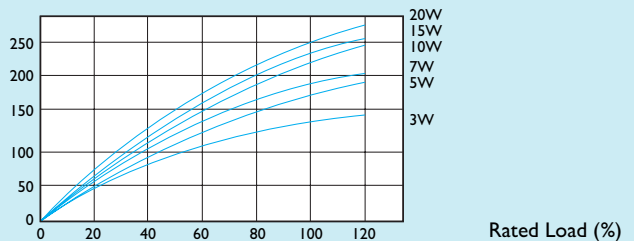
## DERATING CURVE

Rated Load (%)



## TEMPERATURE RISE

Temperature Rise (°C)



Unit : mm

STYLE	L	H	W	S	H <sub>1</sub>	H <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
SQZ300	24.0±1.5	9.0±1	9.0±1	12.5±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ500	27.0±1.5	9.5±1	9.5±1	15.0±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ700	35.0±1.5	9.5±1	9.5±1	22.5±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ10A	48.0±1.5	9.5±1	9.5±1	32.5±1	24.0±1	9.5±1.0	4.0±0.2	2.0±0.2	5.0±0.2	1.4±0.1
SQZ15A	48.0±1.5	12.5±1	12.5±1	35.0±1	34.5±1	15.0±1.5	7.0±0.2	6.0±0.2	10.0±0.2	2.7±0.1
SQZ20A	63.5±2.0	12.5±1	12.5±1	50.0±1	34.5±1	15.0±0.15	7.0±0.2	6.0±0.2	10.0±0.2	2.7±0.1

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	SQZ300	SQZ500	SQZ700	SQZ10A	SQZ15A	SQZ20A
Power Rating	3W	5W	7W	10W	15W	20W
Operating Temp. Range	-55°C to +155°C					
Maximum Working Voltage	250V	350V	500V	500V	500V	500V
Maximum Overload Voltage	500V	700V	1000V	1000V	1000V	1000V
Dielectric Withstanding Voltage	500V	700V	1000V	1000V	1000V	1000V
Value Range $\pm 5\%$ (Ceramic Core)	0.22 $\Omega$ ~120 $\Omega$	0.47 $\Omega$ ~180 $\Omega$	0.68 $\Omega$ ~220 $\Omega$	1 $\Omega$ ~270 $\Omega$		
Value Range $\pm 5\%$ (Metal Oxide Film)	130 $\Omega$ ~22K $\Omega$	200 $\Omega$ ~33K $\Omega$	240 $\Omega$ ~10K $\Omega$	300 $\Omega$ ~10K $\Omega$		
Temperature Coefficient	$\pm 300$ ppm/°C					

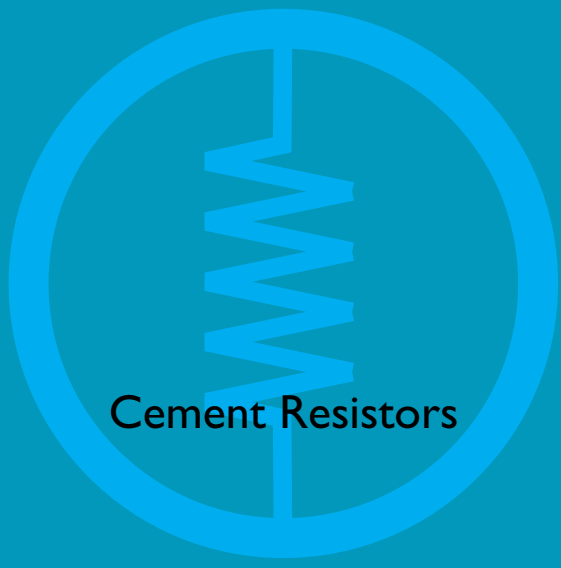
\* 1. Standard resistance is as the above list, below or over this resistance on request.

\* 2. Non-Inductive type up to 50 $\Omega$  only.

## ENVIRONMENTAL CHARACTERISTICS

PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	$\pm (2\%+0.05\Omega)$
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	$\pm 300$ ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100M $\Omega$
Solderability	JIS-C-5202 6.5	235°C for 5 $\pm$ 0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		$\geq 2.5$ kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	$\pm (2\%+0.05\Omega)$
Load Life in Humidity	JIS-C-5202 7.9	40 $\pm$ 2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	$\pm (5\%+0.05\Omega)$
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	$\pm (5\%+0.05\Omega)$
Temperature Cycling	JIS-C-5202 7.4	-55°C $\rightarrow$ Room Temp. $\rightarrow$ +155°C $\rightarrow$ Room Temp. for 5 Cycles	$\pm (2\%+0.05\Omega)$
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C $\pm$ 10°C for 3 $\pm$ 0.5 Seconds	$\pm (1\%+0.05\Omega)$

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



# CLAMP MOUNTING TYPE

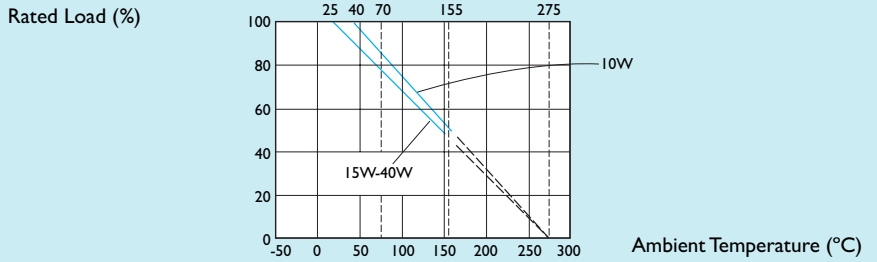
Standard Type[SQH Series], Non-Inductive Type[NSH Series]



## FEATURES

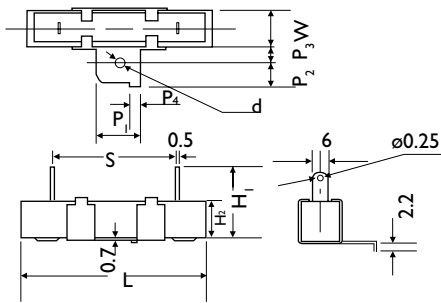
- Low Cost
- Small Size, High Power Capacity
- Resistance Tolerance:  $\pm 5\%$ ,  $\pm 10\%$
- Completely Unflamable

## DERATING CURVE

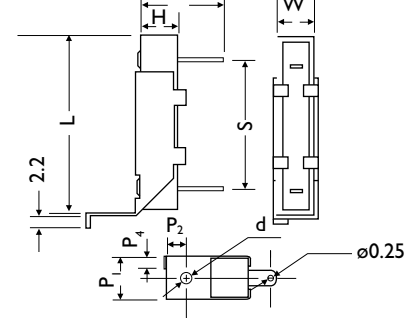


## DIMENSIONS

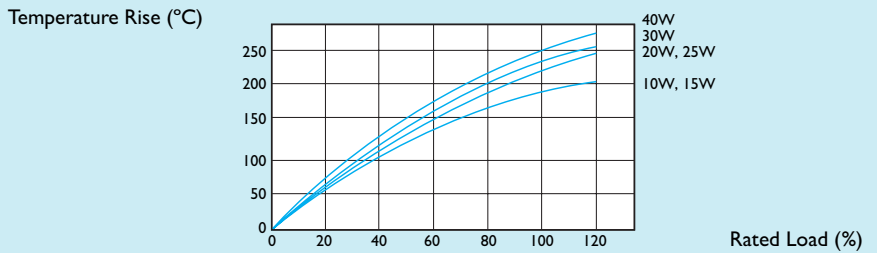
SQH<sub>1</sub> Type



SQH<sub>2</sub> Type



## TEMPERATURE RISE



Unit : mm

STYLE	L	H	W	S	H <sub>1</sub>	H <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
SQH10A	48.0±1.5	10.5±1.0	10.5±1	33.0±2	19.5±1.0	4.0	11.0±0.2	6.0	8.0	3.0
SQH15A	48.0±1.5	12.5±1.0	12.0±1	33.0±2	20.5±1.0	4.0	11.0±0.2	6.0	8.0	3.0
SQH20A	63.5±2.0	12.5±1.0	12.5±1	48.0±2	20.5±1.0	4.0	11.0±0.2	6.0	8.0	3.0
SQH25A	63.5±2.0	16.0±1.0	16.0±1	46.0±2	28.0±1.5	4.2	11.0±0.2	6.0	10.0	3.0
SQH30A	70.0±2.0	19.0±1.5	18.0±1	56.0±2	28.0±1.5	4.2	18.0±0.2	8.0	10.0	3.0
SQH40A	90.0±2.5	19.0±1.5	18.0±1	71.0±2	28.0±1.5	4.2	18.0±0.2	8.0	10.0	3.0

Note :

## ELECTRICAL CHARACTERISTICS

STYLE	SQH10A	SQH15A	SQH20A	SQH25A	SQH30A	SQH40A
Power Rating	10W	15W	20W	25W	30W	40W
Operating Temp. Range	-55°C to +155°C					
Maximum Working Voltage	250V	350V	500V	500V	500V	500V
Maximum Overload Voltage	500V	700V	1000V	1000V	1000V	1000V
Dielectric Withstanding Voltage	1000V	1000V	1000V	1000V	1000V	1000V
Value Range ±5% (Ceramic Core)	0.39Ω~270Ω	0.39Ω~300Ω	0.51Ω~300Ω	0.51Ω~1KΩ	0.62Ω~1KΩ	0.62Ω~1KΩ
Value Range ±5% (Metal Oxide Film)	300Ω~10KΩ	330Ω~10KΩ				
Temperature Coefficient	±300ppm/°C					

\* 1. Standard resistance is as the above list, below or over this resistance on request.

\* 2. Non-Inductive type up to 50Ω only.

## ENVIRONMENTAL CHARACTERISTICS

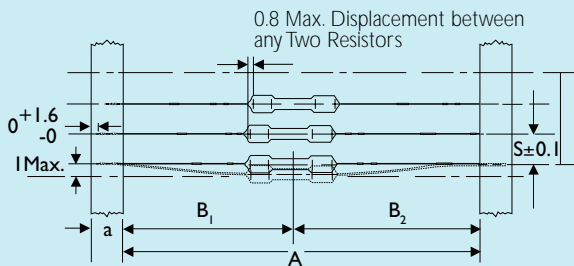
PERFORMANCE TEST	TEST METHOD		APPRAISE
Short Time Overload	JIS-C-5202 5.5	2.5 Times RCWV for 5 Seconds	±(2%+0.05Ω)
Dielectric Withstanding Voltage	JIS-C-5202 5.7	in V-Block for 60 Seconds	by Type
Temperature Coefficient of Resistance	JIS-C-5202 5.2	-55°C to +155°C	±300ppm/°C
Insulation Resistance	JIS-C-5202 5.6	in V-Block	>100MΩ
Solderability	JIS-C-5202 6.5	235°C for 5±0.5 Seconds	95% Min. Coverage
Resistance to Solvent	JIS-C-5202 6.9	Trichroethane for 1 Min. with Ultrasonic	No Deterioration of Coatings and Markings
Terminal Strength	Direct Load for 10 Sec. in The Direction of The Terminal Leads		≥2.5kg (24.5N)
Pulse Overload	JIS-C-5202 5.8	4 Times RCWV 10000 Cycles (1 Sec. on , 25 Sec. off)	±(2%+0.05Ω)
Load Life in Humidity	JIS-C-5202 7.9	40±2°C, 90~95% RH at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off )	±(5%+0.05Ω)
Load Life	JIS-C-5202 7.10	70°C at RCWV for 1000 Hrs. (1.5 Hrs. on , 0.5 Hrs. off)	±(5%+0.05Ω)
Temperature Cycling	JIS-C-5202 7.4	-55°C → Room Temp. → +155°C → Room Temp. for 5 Cycles	±(2%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5202 6.4	350°C±10°C for 3±0.5 Seconds	±(1%+0.05Ω)

\* Rated Continuous Working Voltage (RCWV) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$



Note :

## PACKING METHODS

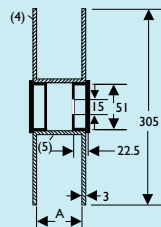
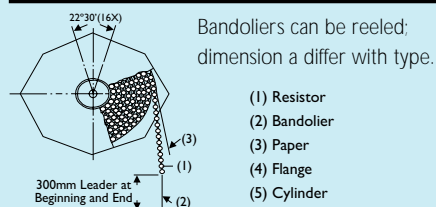


Bandolier for Axial Leads

The resistors are supplied on bandolier; either 1000 resistors in ammpack or 5000 resistors on reel.

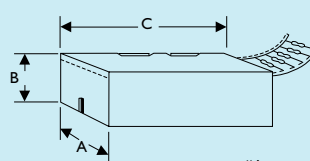
STYLE		DIMENSIONS					Unit : mm
Normal	Miniature	a	A	B1-B2	S (Spacing)	T (Max. Deviation of Spacing)	
TYPE-12	TYPE25S	6±0.5	52.4±1.0 26.0±1.0	1.2	5		
TYPE-25	TYPE50S	6±0.5	52.4±1.0 26.0±1.0	1.2 1.0	5		
TYPE-50	TYPE1WS	6±0.5	52.4±1.0	1.2	5	1mm Per 10 Spacings, 0.5mm Per 5 Spacings	
TYPE100	TYPE2WS	6±0.5	73.0±1.5 52.4±1.0	1.5	5		
TYPE200	TYPE3WS	6±0.5	73.0±1.5 52.4±1.0	1.5	10		
TYPE300/500	TYPE5WS	6±0.5	91.0±1.5 73.0±1.5	1.5	10		

## TAPE ON REEL PACKING



STYLE		TAPE ON REEL		Unit : mm/pcs
Normal	Miniature	Across Flange (A)	QTY Per Reel	
TYPE-12	TYPE25S	72	5,000	
TYPE-25	TYPE50S	48/72	5,000	
TYPE-50	TYPE1WS	72	2,500	
TYPE100	TYPE2WS	95	2,000	
TYPE200	TYPE3WS	95	1,000	
TYPE300/500	TYPE5WS	95	250	

## TAPE ON BOX PACKING



Bandoliers may also be supplied in a cardboard box ("ammpack").

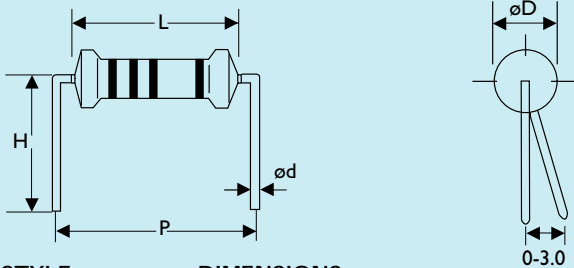
"Ammpack" is an abbreviation of "ammunition packing". The dimensions of A-B-C vary with type and quantity.

STYLE		TAPE ON BOX				Unit : mm/pcs
Normal	Miniature	W(A)	H(B)	L(C)	QTY Per Box	
TYPE-12	TYPE25S	78/81	24/70	260	2,000/5,000	
TYPE-25	TYPE50S	78/81	24/104	260	1,000/5,000	
TYPE-50	TYPE1WS	73	45	258	1,000	
TYPE100	TYPE2WS	103	78	262	1,000	
TYPE200	TYPE3WS	103	94	262	1,000	
TYPE300/500	TYPE5WS	116	79	255	250	

Note :

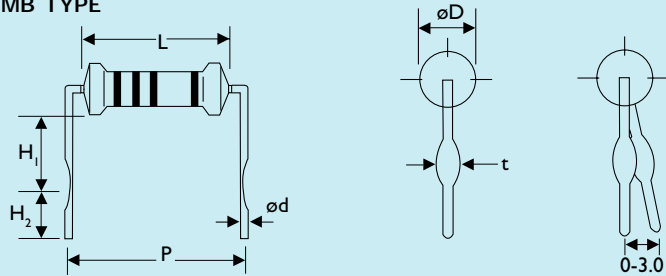
**SPECIAL TYPE (FORMING DIMENSIONS)**

**M TYPE**



STYLE		DIMENSIONS					Unit : mm
Normal	Miniature	L	P	øD	ød	H	
TYPE-25	TYPE50S	6.3±0.5	10.0±1	2.3±0.5	0.6±0.05	10.0±1	
TYPE-50	TYPE1WS	9.0±0.5	12.5±1	3.2±0.5	0.6±0.05	10.0±1	
TYPE100	TYPE2WS	11.5±1.0	15.0±1	4.5±0.5	0.8±0.05	12.5±1	
TYPE200	TYPE3WS	15.5±1.0	20.0±1	5.0±0.5	0.8±0.05	15.0±1	

**MB TYPE**



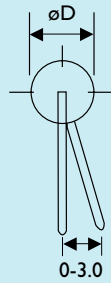
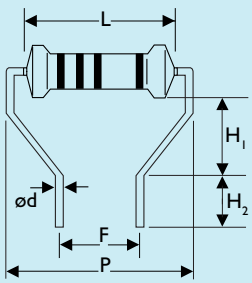
STYLE		DIMENSIONS							Unit : mm
Normal	Miniature	L	P	øD	ød	H <sub>1</sub>	H <sub>2</sub>	t	
TYPE-25	TYPE50S	6.3±0.5	10.0±1	2.3±0.5	0.6±0.05	6.0±1	5.0±1	1.2±0.2	
TYPE-50	-	9.0±0.5	12.5±1	3.2±0.5	0.6±0.05	6.0±1	5.0±1	1.2±0.2	
-	TYPE1WS	9.0±0.5	12.5±1	3.2±0.5	0.8±0.05	6.0±1	5.0±1	1.4±0.2	
TYPE100	TYPE2WS	11.5±1.0	15.0±1	4.5±0.5	0.8±0.05	6.0±1	5.0±1	1.4±0.2	
TYPE200	TYPE3WS	15.5±1.0	20.0±1	5.0±0.5	0.8±0.05	10.0±1	5.0±1	1.4±0.2	
TYPE300	TYPE5WS	24.5±1.0	30.0±1	8.0±0.5	0.8±0.05	15.0±1	5.0±1	1.4±0.2	
TYPE500	-	24.5±1.0	30.0±1	8.0±0.5	0.8±0.05	15.0±1	5.0±1	1.4±0.2	





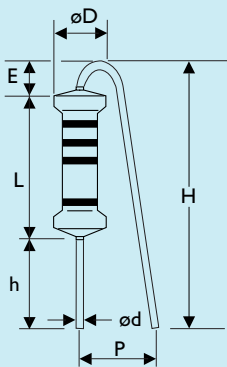
Note :

## MR TYPE



STYLE	DIMENSIONS								Unit : mm
Normal	Miniature	L	P	F	øD	ød	H <sub>1</sub>	H <sub>2</sub>	
TYPE-50	TYPE1WS	9.0±0.5	14.5±1	7.0±0.5	3.2±0.5	0.6±0.05	7.0±1	5.0±1	
TYPE100	TYPE2WS	11.5±1.0	17.5±1	7.0±0.5	4.5±0.5	0.8±0.05	8.0±1	5.0±1	
TYPE200	TYPE3WS	15.5±1.0	21.5±1	7.0±0.5	5.0±0.5	0.8±0.05	9.0±1	5.0±1	

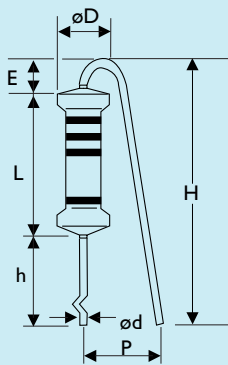
## F TYPE



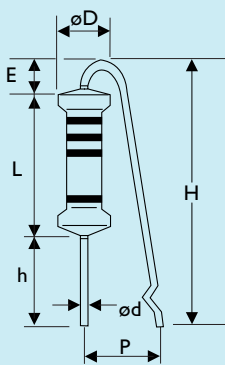
STYLE	DIMENSIONS								Unit : mm
Normal	Miniature	L	P	øD	ød	h	H Max.	E Max.	
TYPE100	TYPE2WS	11.5±1.0	6±1	4.5±0.5	0.8±0.05	5.0±1	20	3.5	
TYPE200	TYPE3WS	15.5±1.0	6±1	5.0±0.5	0.8±0.05	5.0±1	25	3.5	

Note :

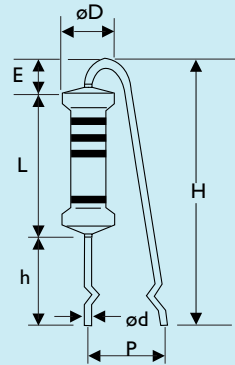
**FK TYPE**



**FFK TYPE**



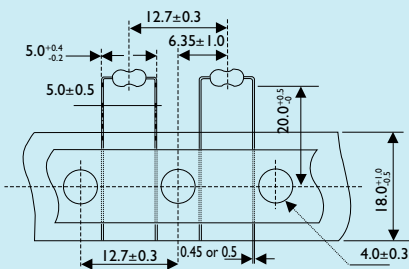
**FKK TYPE**



STYLE	DIMENSIONS		Unit : mm					
Normal	Miniature	L	P	øD	ød	h	H Max.	E Max.
TYPE100	TYPE2WS	11.5±1	6±1	4.5±0.5	0.8±0.05	10.0±1	25	3.5
TYPE200	TYPE3WS	15.5±1	6±1	5.0±0.5	0.8±0.05	10.0±1	30	3.5

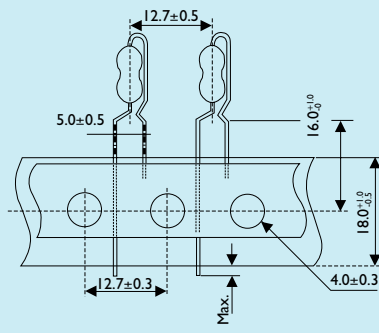
**MT Type Forming for Taping**

Rated Watts 1/6W Size Only  
 (Body Dimension : L = 3.3±0.4mm ;  
 øD = 1.8±0.3mm)



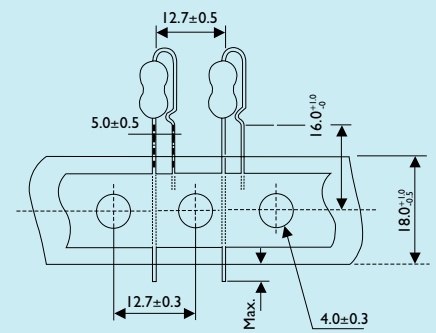
**PN Type Forming for Taping**

Rated Watts 1/4W Size Only  
 (Body Dimension : L = 6.3±0.5mm ;  
 øD = 2.3±0.3mm)



**AV Type Forming for Taping**

Rated Watts 1/4W Size Only  
 (Body Dimension : L = 6.3±0.5mm ;  
 øD = 2.3±0.3mm)





Note :

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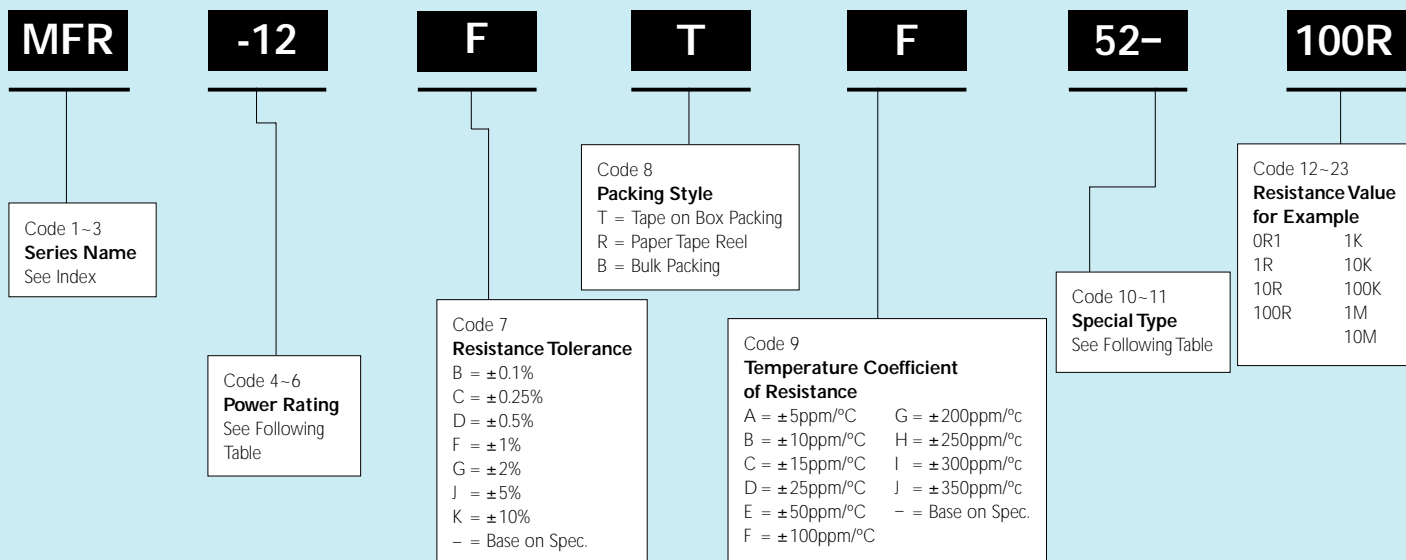


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## EXPLANATIONS OF ORDERING CODE

For Traditional Resistor (MFR, FMF, MF0, RSF, CFR, FCR, CF0, FC0, ZOR, JPW, KNP/NKN, SQP/NSP, SQM/NSM, SQZ/NSZ, SQH/NSH Series)

### Explanations of Ordering Code



CODE 4~6

Power Rating		
-12=1/6W	3WM=3WM	900=9W
-25=1/4W	400=4W	10A=10W
25S=1/4WS	4WS=4WS	10S=10WS
-50=1/2W	500=5W	15A=15W
50S=1/2WS	5WS=5WS	20A=20W
100=1W	5SS=5SS	30A=30W
1WS=1WS	600=6W	40A=40W
200=2W	6WS=6WS	50A=50W
2WS=2WS	700=7W	60A=60W
300=3W	7WS=7WS	70A=70W
3WS=3WS	800=8W	80A=80W

CODE 10~11

Special Type
26- =26mm
52- =52.4mm
73- =73mm
81- =81mm
91- =91mm
M=M-Type Forming
MB=MB-Type Forming
MR=MR-Type Forming
F=F-Type Forming
FK=FK-Type Forming
FFK=FFK-Type Forming

FKK=FKK-Type Forming  
PN=PANAsert  
AV=AVIsert  
MT=MT-Type Forming

