Precision Metal Film Resistors

Materials and Features:

- EIA standard color coding
- Flame retardant type available
- Low noise & Voltage coefficient
- Low temperature coefficient
- Wide precision range in small package
- Very low or very high ohmic values available upon request
- Nichrome resistor element provides stable performance in various environments
- Multiple epoxy coating on vacuum-deposited metal film provides superior moisture protection

Explanation of Part Numbers:

MF	25	C	1001	F	T	XX
1	2	3	4	5	6	7

1 Style:

MF - Metal Film

2 Wattage:

08 = 1/8 watt 25 = 1/4 watt 40 = .4 watt 50 = 1/2 watt
60 = .6 watt 100 = 1 watt 200 = 2 watt

3 Temperature Coefficient:

T = ± 15 ppm *C = ± 50 ppm (Std)
E = ± 25 ppm D = ± 100 ppm
* Standard TC provided unless otherwise specified in part number.

4 Nominal Resistance Value:

E24 Series (5% Tolerance)
The first two digits are significant figures of resistance and the third digit denotes the number of zeros (decimal point is expressed by the letter “R”).
i.e. 102 = 1k Ω
1R2 = 1.2 Ω

E96 Series (1% Tolerance)
The first three digits are significant figures of resistance and the fourth digit denotes the number of zeros.
i.e. 1001 = 1kΩ
10R0 = 10Ω

5 Tolerance:

A = ± .05% B = ± .1% C = ± .25%
D = ± .5% F = ± 1% G = ± 2% J = ± 5%

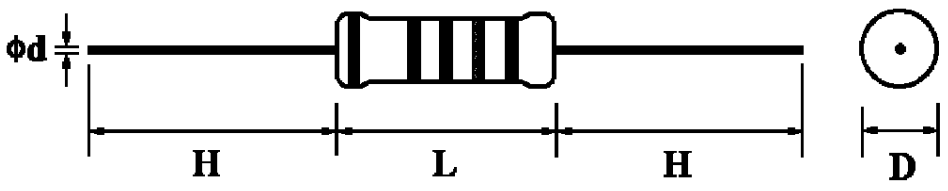
6 Packaging:

T = Tape & Reel B = Bulk
TB = Tape & Box A = Ammo

7 Lead Forming:

PN = Panasert Type PA1 = Avisert Type 1
PA2 = Avisert Type 2 PA3 = Avisert Type 3
* For all other requests, please consult factory.

Dimension:



Normal Size					
Style	Power Rating at 70°C	Dimension (mm)			
		D Max.	L Max.	$d^{+0.02}_{-0.05}$	H±3
MF08	1/8W (0.125W)	1.85	3.5	0.5	28
MF25	1/4W (0.25W)	2.5	6.8	0.6	28
MF50	1/2W (0.5W)	3.5	10.0	0.6	28
MF100	1W	5.0	12.0	0.7	28
MF200	2W	5.5	16.0	0.8	28

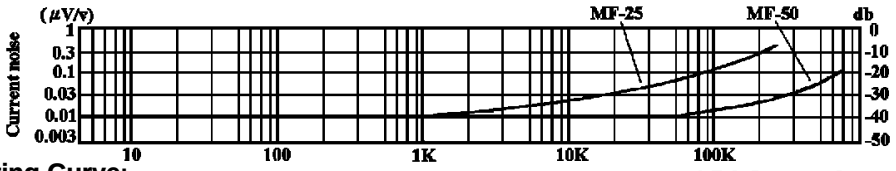
Small Size					
Style	Power Rating at 70°C	Dimension (mm)			
		D Max.	L Max.	$d^{+0.02}_{-0.05}$	H±3
MF25S	1/4W (0.25W)	1.85	3.5	0.5	28
MF40SS	0.4W	1.9	3.7	0.5	28
MF50S	1/2W (0.5W)	3.0	9.0	0.6	28
MF50SS	1/2W (0.5W)	2.5	6.8	0.6	28
MF60S	0.6W	2.5	6.8	0.6	28

General Specification

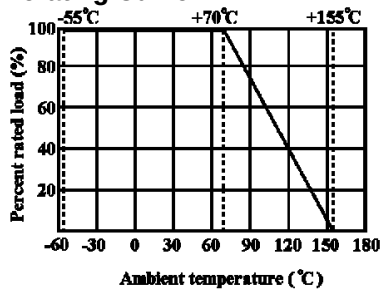
Style	Dielectric Withstanding Voltage	Max. Working Voltage	Max. Overload Voltage	Resistance Tolerance	T.C.R.	Resistance Range	Special Order	
							Resistance Tolerance	T.C.R.
MF08	400V	200V	400V	±5%	±200PPM/°C	1Ω ~ 22.1MΩ	±0.25%	±15PPM/°C
MF25S				±2%	±100PPM/°C	1Ω ~ 22.1MΩ	±0.5%	±25PPM/°C
MF40SS	200V			±1%	±50PPM/°C	1Ω ~ 22.1MΩ		±50PPM/°C
MF25	500V	250V	500V	±5%	±200PPM/°C	1Ω ~ 22.1MΩ	±0.1%	±15PPM/°C
MF60S				±2%	±100PPM/°C	1Ω ~ 22.1MΩ	±0.25%	±25PPM/°C
MF50SS	250V			±1%	±50PPM/°C	1Ω ~ 22.1MΩ	±0.5%	±50PPM/°C
MF50	700V	350V	700V	±5%	±200PPM/°C	1Ω ~ 22.1MΩ	±0.1%	±15PPM/°C
MF50S				±2%	±100PPM/°C	1Ω ~ 22.1MΩ	±0.25%	±25PPM/°C
				±1%	±50PPM/°C	1Ω ~ 22.1MΩ	±0.5%	±50PPM/°C
MF100	1000V	500V	1000V	±5%	±200PPM/°C	1Ω ~ 10MΩ	±0.1%	±15PPM/°C
MF200				±2%	±100PPM/°C	1Ω ~ 10MΩ	±0.25%	±25PPM/°C
				±1%	±50PPM/°C	1Ω ~ 10MΩ	±0.5%	±50PPM/°C

Note: MF – xx – SS is Non-Flame coating.
* MF200 Series is only available up to 1M Ω

Current Noise Level:

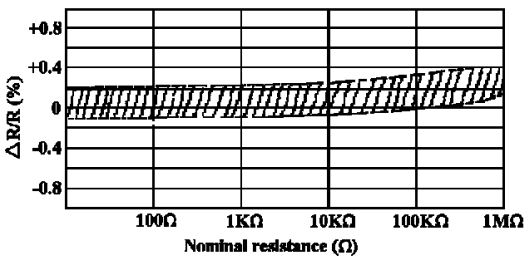


Derating Curve:



Load Life:

* Only for your reference



Performance Specifications

<table>
<tr><th>Characteristics</th><th>Test Methods</th><th>Limits</th></tr>
<tr><td>Temperature coefficient
JIS - C - 5202 5.2</td><td>Natural resistance change per temp. degree centigrade.
$\frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6$ (PPM / °C)
R_1 : Resistance value at room temperature (t_1)
R_2 : Resistance value at room temp. plus 100 °C (t_2)</td><td>± 350 PPM / °C</td></tr>
<tr><td>Dielectric withstanding voltage
JIS - C - 5202 5.7</td><td>Resistors shall be clamped in the trough of a 90° metallic V- block and shall be tested at AC potential respectively specified in the above list for 60+ 10 / -0 seconds.</td><td>No evidence of flashover, mechanical damage, arcing or insulation break down.</td></tr>
<tr><td>Temperature cycling
JIS - C - 5202 7.4</td><td>Resistance change after continuous five cycles for duty cycle specified below:
<table>
<tr><th>Step</th><th>Temperature</th><th>Time</th></tr>
<tr><td>1</td><td>-55°C ± 3°C</td><td>30 minutes</td></tr>
<tr><td>2</td><td>Room temp</td><td>10~15 minutes</td></tr>
<tr><td>3</td><td>+ 155°C ± 3°C</td><td>30 minutes</td></tr>
<tr><td>4</td><td>Room temp</td><td>10~15 minutes</td></tr>
</table></td><td>Resistance change rate is
± 2% + 0.05Ω).
No evidence of mechanical damage</td></tr>
<tr><td>Short - time overload
JIS - C - 5202 5.5</td><td>Permanent resistance change after the application of a potential of 2.5 times RCWV or the max. overload voltage respectively specified in the above list, whichever less for 5 seconds.</td><td>Resistance change rate is
N: ± (1% + 0.05Ω)
S: ± (2% + 0.05Ω)
No evidence of mechanical damage</td></tr>
<tr><td>Pulse overload
JIS - C - 5202 5.8</td><td>Resistance change after 10,000 cycles (1 second “on”, 25 seconds “off”) at 4 times RCWV or the max. pulse overload voltage.</td><td>Resistance change rate is
N: ± (2% + 0.05Ω)
S: ± (5% + 0.05Ω)
No evidence of mechanical damage</td></tr>
<tr><td>Load life in humidity
JIS - C - 5202 7.9</td><td>Resistance change after 1,000 hours (1.5 hours “on” 0.5 hour “off”) at RCWV in a humidity chamber controlled at 40°C ± 2°C and 90 to 95% relative humidity.</td><td><table>
<tr><th>Resistance value</th><th>▲R/R</th></tr>
<tr><td>Less than 100KΩ</td><td>± 5%</td></tr>
<tr><td>100KΩ or more</td><td>± 10%</td></tr>
</table></td></tr>
<tr><td>Load life
JIS - C - 5202 7.10</td><td>Permanent resistance change after 1,000 hours operating at RCWV, with duty cycle of 1.5 hours “on”, 0.5 hour “off” at 70°C ± 2°C ambient.</td><td><table>
<tr><th>Resistance value</th><th>▲R/R</th></tr>
<tr><td>Less than 100KΩ</td><td>± 5%</td></tr>
<tr><td>100KΩ or more</td><td>± 10%</td></tr>
</table></td></tr>
<tr><td>Terminal strength
JIS - C - 5202 6.1</td><td>Direct load : Resistance to a 2.5 kgs direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads.
Twist test : Terminal leads shall be bent through 90 at point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations.</td><td>No evidence of mechanical damage</td></tr>
<tr><td>Resistance to soldering heat
JIS - C - 5202 6.4</td><td>Permanent resistance change when leads immersed to 3.2 mm to 4.8 mm from the body in 350°C ± 10°C solder for 3 ± 0.5 seconds</td><td>Resistance change rate is ± (1% + 0.05W).
No evidence of mechanical damage</td></tr>
<tr><td>Solderability
JIS - C - 5202 6.5</td><td>The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes.
Test temp. of solder : 235°C ± 5°C
Dwell time in solder : 3 + 0.5 / - 0 seconds</td><td>95% coverage Min.</td></tr>
<tr><td>Resistance to solvent
JIS - C - 5202 6.9</td><td>Specimens shall be immersed in a bath of trichloroethane completely for 3 minutes with ultrasonic.</td><td>No deterioration of protective coatings and markings</td></tr>
<tr><td>Flame retardant
JIS - C - 5202 7.12</td><td>Resistors shall resist flaming or arcing when overloaded up to 16 times RCWV.</td><td>No evidence of flaming or arcing</td></tr>
</table>

*RCWV = Rated Continuous Working Voltage = $\sqrt{\text{Rated Power x Resistance Value}}$