ROYALOHM

SPECIFICATION FOR APPROVAL

TRELIK COMERCIAL IMPORTADORA LTD.

Description : Metal Film Fixed Resistors

Royalohm Part no.: MF006FFxxxxA50 (MF 0.6W-S +/- 1% 50ppm)

Approved by

Parts corresponding to RoHS Compliant: 2005-Apr.-1

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Approved	Checked	Prepared
Mr. Jack Lin	Ms. S. Sakultala	Ms. T. Suparuch

Issued Date: 2007/12/14

CHANGE NOTIFICATION HISTORY			
Version	**Date of Version**	**History**	**Remark**
1	2004/11/3	Resistance range: 10Ω----1MΩ	
2	2005/3/17	Change from JIS C 5202 to JIS C 5201-1	
3	2005/7/7	Lead wire diameter: 0.54 ± 0.05 (Unit: mm)	

Customer: TRELIK COMERCIAL IMPORTADORA LTD.	Part No.: MF006FFxxxxA50

1. Scope:

This specification for approval relates to Metal Film Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	MF	0.6W-S	F	1KΩ
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type	MF
Rated Power	0.6W at 70℃
Max. Working Voltage	250V
Max. Overload Voltage	500 V
Dielectric Withstanding Voltage	500 V
Rated Ambient Temp.	70 ℃
Operating Temp. Range	-55℃ --- +155℃
Resistance Tolerance	± 1%
Resistance Range	10Ω----1MΩ

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 ℃. For temperature in excess of 70 ℃ , the load shall be derated as shown in the figure 1.

3.2 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform curresponding to the power rating , as determined from the following formula :

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

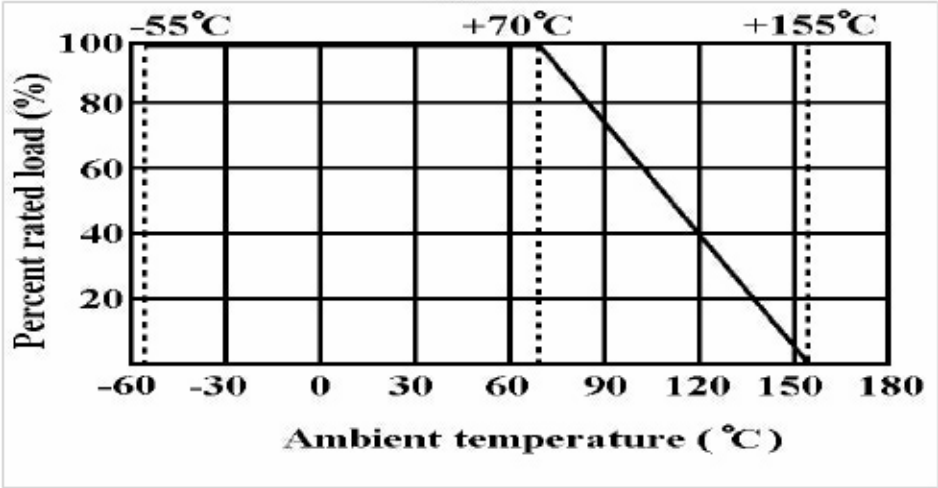
Were : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value

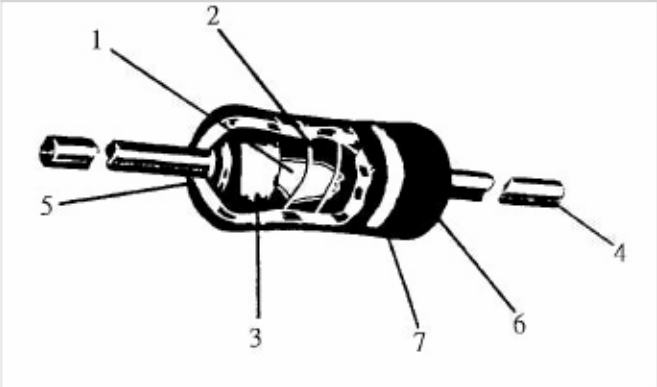
Figure 1.



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-96 series, and resistance tolerance shall be shown by table 1.

4. Construction :



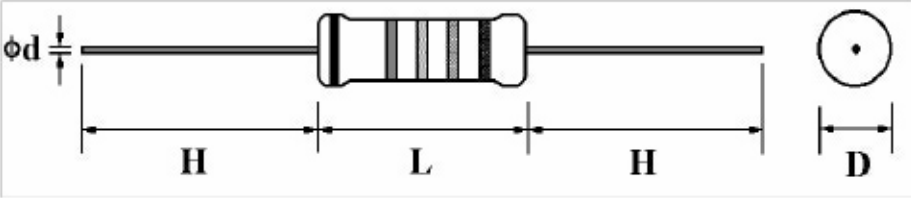
No.	Name	Material
1	Basic Body	Rod Type Ceramics
2	Resistance Film	Metal Film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By Welding
6	Coating	Insulated resin (Color : Apple Green)
7	Color Code	Epoxy Resin

Metal Film Fixed Resistors		
5. Characteristics :		
Characteristics	Limits	Test Methods (JIS C 5201-1)
DC. Resistance	Must be within the specified tolerance	5.1 The limit of error of measuring apparatus shall not exceed allowable range or 1% of resistance tolerance
Temperature coefficient	Within the temperature coefficient specified below : ± 50PPM/℃ Max.	5.2 Natural resistance change per temp. degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance value at room temperature (t1) R_2: Resistance value at room temp. plus 100 ℃ (t_2)
Short time overload	Resistance change rate is ± (0.5% + 0.05Ω) Max. with no evidence of mechanical damage	5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds
Dielectric withstanding voltage	No evidence of flashover me-chanical damage, arcing or insulation break down	5.7 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at AC potential respectively specified in the table 1.
Pulse overload	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage	5.8 Resistance change after 10,000 cycles (1 sec. "on" , 25 secs. "off") at 4 times RCWV
Terminal strength	No evidence of mechanical damage	6.1 **Direct load** : Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads **Twist test :** Terminal leads shall be bent through 90 ° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations
Resistance to soldering heat	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage	6.4 Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in 350℃ ± 10 ℃ solder for 3 ± 0.5 seconds

Metal Film Fixed Resistors

<table>
<tr><th>Characteristics</th><th>Limits</th><th>Test Methods
(JIS C 5201-1)</th></tr>
<tr><td>Solderability</td><td>95 % coverage Min.</td><td>6.5 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes.
Test temp. of solder : 245℃ ± 3℃
Dwell time in solder : 2 ~ 3 seconds</td></tr>
<tr><td>Resistance to solvent</td><td>No deterioration of protective coatings and markings</td><td>6.9 Specimens shall be immersed in bath of trichroethane completely for 3 mins. with ultrasonic</td></tr>
<tr><td>Temperature cycling</td><td>Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage</td><td>7.4 Resistance change after continuous 5 cycles for duty shown below:
<table>
<tr><th>Step</th><th>Temperature</th><th>Time</th></tr>
<tr><td>1</td><td>-55℃ ± 3℃</td><td>30 mins</td></tr>
<tr><td>2</td><td>Room temp.</td><td>10～15 mins</td></tr>
<tr><td>3</td><td>+155℃ ± 2℃</td><td>30 mins</td></tr>
<tr><td>4</td><td>Room temp.</td><td>10～15 mins</td></tr>
</table></td></tr>
<tr><td>Load life in humidity</td><td><table>
<tr><th>Resistance value</th><th>△ R/R</th></tr>
<tr><td>Normal type</td><td>± 1.5 %</td></tr>
</table></td><td>7.9 Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity test chamber controlled at 40 ℃ ± 2 ℃ and 90 to 95 % relative humidity</td></tr>
<tr><td>Load life</td><td><table>
<tr><th>Resistance value</th><th>△ R/R</th></tr>
<tr><td>Normal type</td><td>± 1.5 %</td></tr>
</table></td><td>7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70℃ ± 2℃ ambient</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

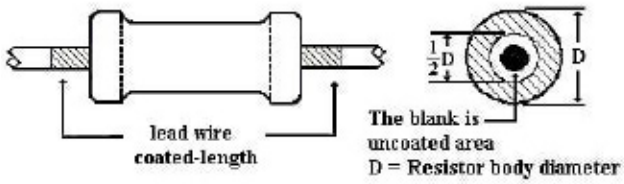
6. Dimension : Unit :mm



Type	Power Rating	D (Max.)	L (Max.)	d ± 0.05	H ± 3
MF	0.6W-S	2.5 mm	6.8 mm	0.54 mm	28 mm

Painting method:

Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the are angle.

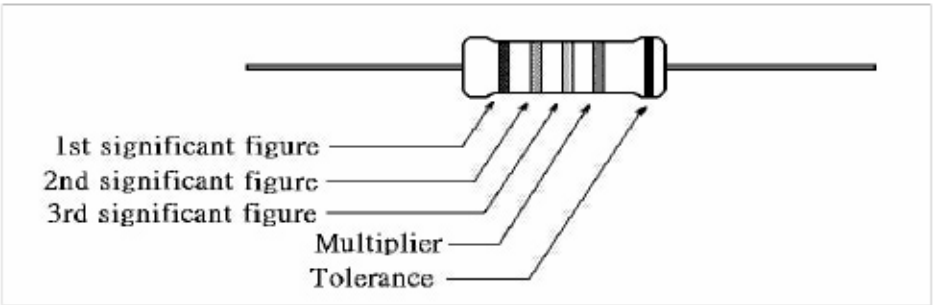


7. Marking :

7.1 Resistor :

Resistors shall be marked with color coding

colors shall be in accordance with JIS C 0802



7.2 Label :

Label shall be marked with following items:

(1) Type and style
(2) Nominal resistance
(3) Resistance tolerance
(4) Quantity
(5) Lot number
(6) PPM

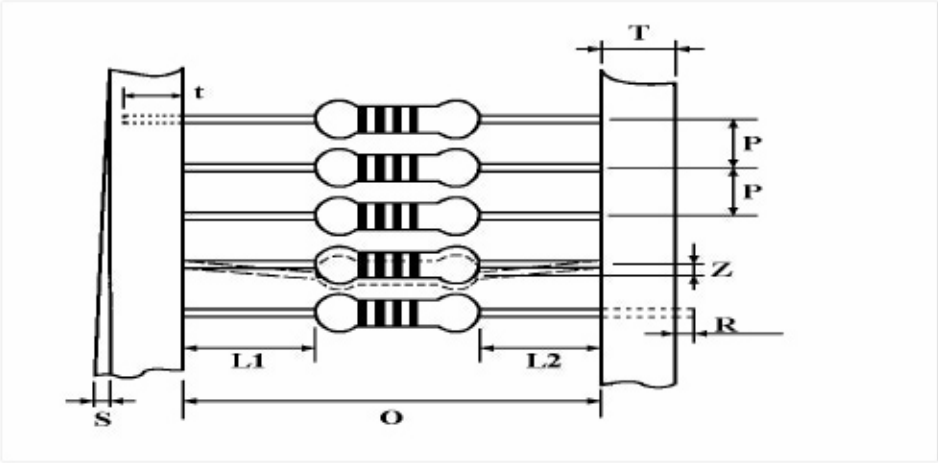
Example :

Metal Film Fixed Resistors

Watt :	0.6W-S	Val :	1K
Q'TY :	5,000	Tol :	1%
Lot :	319022	PPM :	50
	ROYALOHM		Pb Free

8. Packing specification :

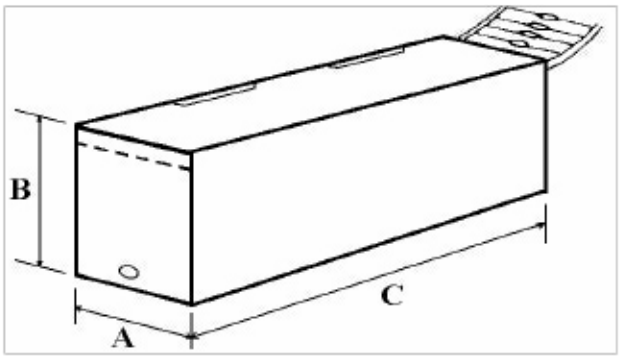
8.1 Taping dimension :



Dimensions (mm)

Type	Style	O	P	L1-L2	T	Z	R	t	S
MF-60s	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.

8.2 Tape in box packing :



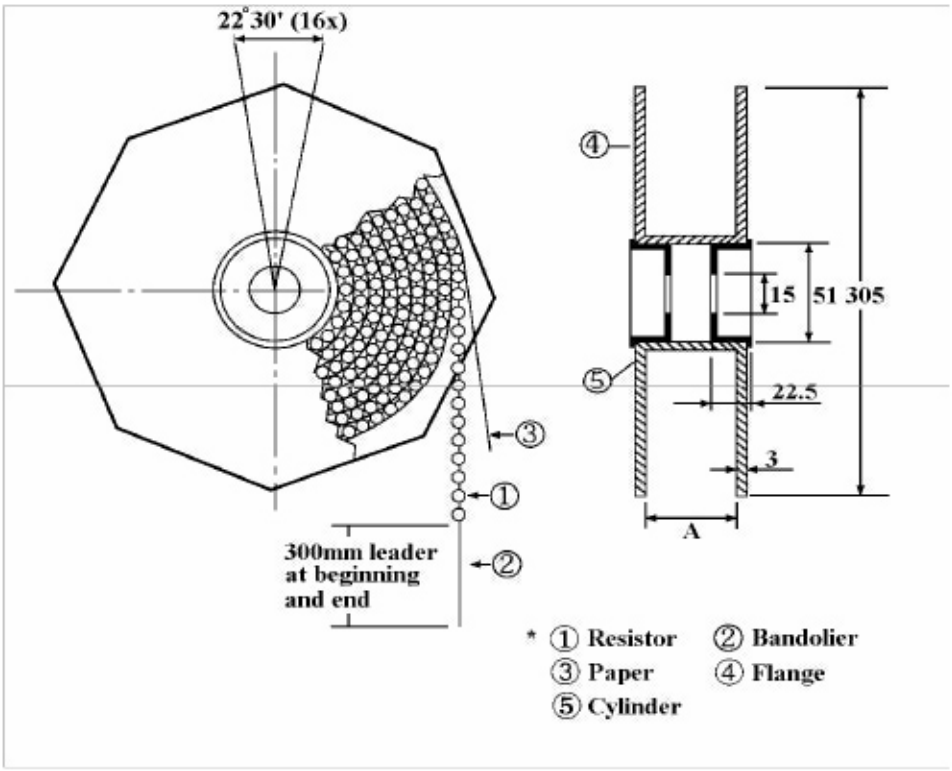
Bandoliers may also be contained in a cardboard box ("Ammopack")

Dimension (mm)

Type	Style	L (C) ± 5	W (A) ± 5	H (B) ± 5	Quantity Per Box (pcs.)
MF-60s	PT-52	250	75	96	5,000

"Ammopack" is an abbreviation of "ammunition pack"

8.3 Tape on reel packing :



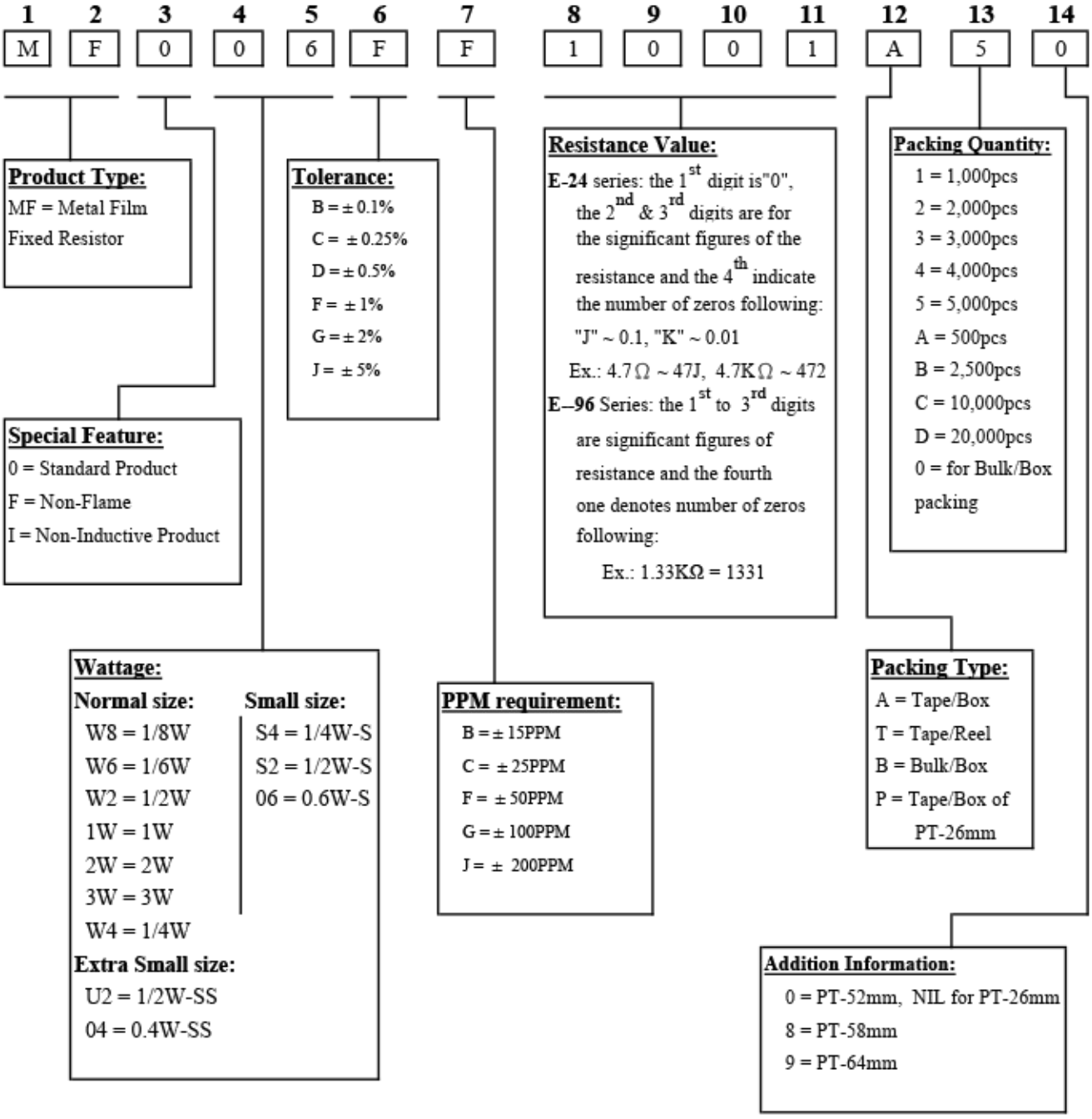
Dimension (mm) :

Type	Style	Across Flange (A)	Quantity Per Reel
MF-60s	PT-52	73 ± 2	5,000 pcs.

Part Number System

Explanation of Part Number System

(Metal Film Fixed Resistors)



Sample: MF 0.6W-S +/- 1% 50ppm 1KΩ T/B 5,000 → MF006FF1001A50

ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

TRELIK

Description : Metal Film Fixed Resistors

Royalohm Part no.:

MF006FFxxxxA50 (MF 0.6W-S +/-1% T/B-5,000 50PPM)

Approved by

Parts corresponding to RoHS Compliant: 2005-Apr.-1

Royal Electronic Factory (Thailand) Co., Ltd.
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Approved	Checked	Prepared
Mr. Jack Lin	Mr. S. Polthanasan	Ms. P. Supatta

Issue Date: 2014/12/10

CHANGE NOTIFICATION HISTORY			
Version	**Date of Version**	**History**	**Remark**
1	2014/12/10	1. Resistance Range : 1.1MΩ ~ 10MΩ	
		2. Finished size: 2.5mm x 6.8mm	
		3. Lead wire diameter: 0.54 ± 0.05 (Unit: mm)	
		4. Pitch of Tape(PT): 52mm	

Customer: TRELIK	Part No.: MF006FFxxxxA50

1. Scope:

This specification for approval relates to Metal Film Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	MF	0.6W-S	F	10MΩ
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type	MF
Rated Power	0.6W at 70℃
Max. Working Voltage	250 V
Max. Overload Voltage	500 V
Dielectric Withstanding Voltage	500 V
Rated Ambient Temp.	70 ℃
Operating Temp. Range	-55℃ --- +155℃
Resistance Tolerance	± 1%
Resistance Range	1.1MΩ ~ 10MΩ

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 ℃. For temperature in excess of 70 ℃ , the load shall be derated as shown in the figure 1.

3.2 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform curresponding to the power rating , as determined from the following formula :

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

Were : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

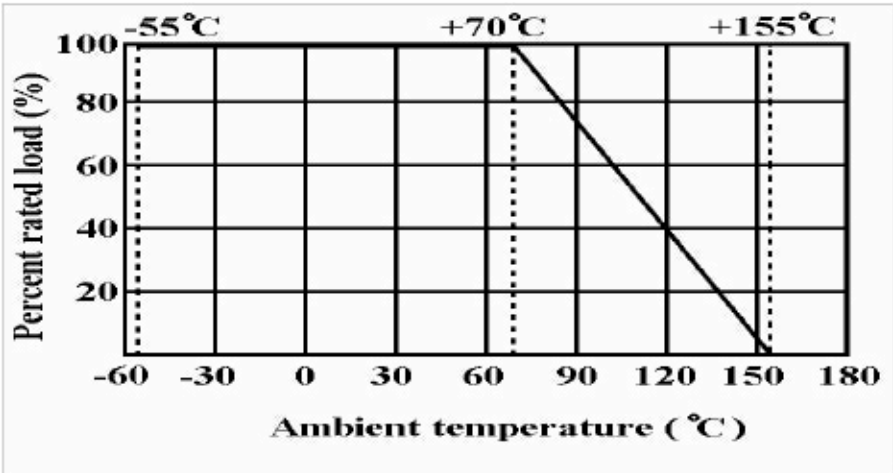
P = Power Rating (watt)

R = Nominal Resistance (ohm)

Metal Film Fixed Resistors

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value

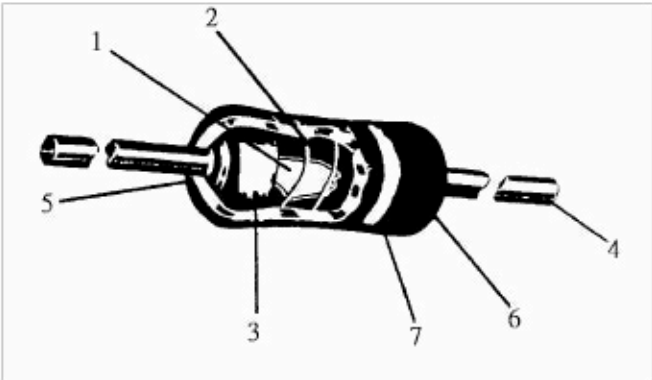
Figure 1.



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-96 series, and resistance tolerance shall be shown by table 1.

4. Construction :



No.	Name	Material
1	Basic Body	Rod Type Ceramics
2	Resistance Film	Metal Film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By Welding
6	Coating	Insulated epoxy resin (Color : Sky blue)
7	Color Code	Epoxy Resin

Metal Film Fixed Resistors

5. Characteristics :

Characteristics	Limits	Test Methods (JIS C 5201-1)
DC. Resistance	Must be within the specified tolerance	5.1 The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance
Temperature coefficient	± 50 PPM/℃	5.2 Natural resistance change per temp. degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance value at room temperature (t1) R_2: Resistance value at room temp. plus 100 ℃ (t2)
Short time overload	Resistance change rate is ± (0.5% + 0.05Ω) Max. with no evidence of mechanical damage	5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down	5.7 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at AC potential respectively specified in the table 1. for 60 + 10/ -0 seconds
Pulse overload	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage	5.8 Resistance change after 10,000 cycles (1 sec. "on" , 25 secs. "off") at 4 times RCWV
Terminal strength	No evidence of mechanical damage	6.1 **Direct load** : Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads **Twist test :** Terminal leads shall be bent through 90 ° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations
Resistance to soldering heat	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage	6.4 Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in 350℃ ± 10 ℃ solder for 3 ± 0.5 seconds

Metal Film Fixed Resistors

<table>
<tr><th>Characteristics</th><th>Limits</th><th>Test Methods
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<tr><td>Solderability</td><td>95 % coverage Min.</td><td>6.5 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes.
Test temp. of solder : 245℃ ± 3℃
Dwell time in solder : 2 ~ 3 seconds</td></tr>
<tr><td>Resistance to solvent</td><td>No deterioration of protective coatings and markings</td><td>6.9 Specimens shall be immersed in bath of trichroethane completely for 3 mins. with ultrasonic</td></tr>
<tr><td>Temperature cycling</td><td>Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage</td><td>7.4 Resistance change after continuous 5 cycles for duty shown below:
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<tr><td>4</td><td>Room temp.</td><td>10～15 mins</td></tr>
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<tr><td>Load life in humidity</td><td><table>
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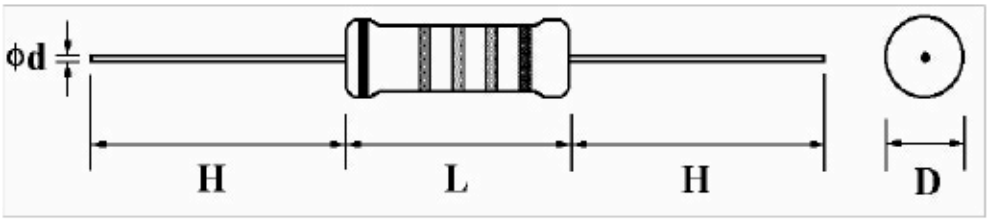
<tr><td>Load life</td><td><table>
<tr><th>Resistance value</th><th>△ R/R</th></tr>
<tr><td>Normal type</td><td>± 1.5 %</td></tr>
</table></td><td>7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70℃ ± 2℃ ambient</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Metal Film Fixed Resistors

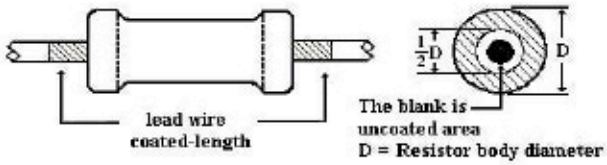
6. Dimension : Unit :mm



Type	Power Rating	D (Max.)	L (Max.)	d ± 0.05	H ± 3
MF	0.6W-S	2.5 mm	6.8 mm	0.54 mm	28 mm

Painting method:

Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the are angle.

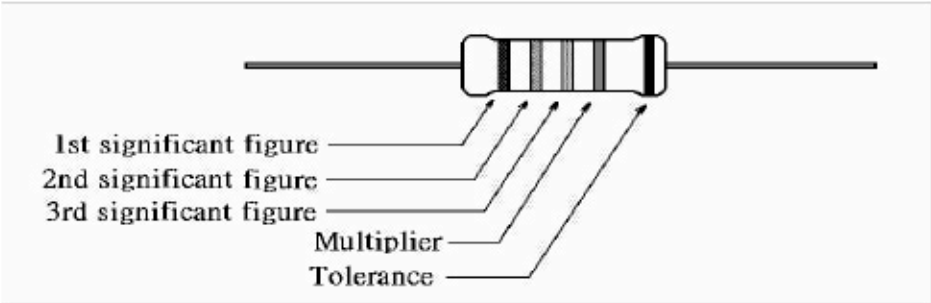


7. Marking :

7.1 Resistor :

Resistors shall be marked with color coding

colors shall be in accordance with JIS C 0802



7.2 Label :

Label shall be marked with following items:

(1) Type and style
(2) Nominal resistance
(3) Resistance tolerance
(4) Quantity
(5) Lot number
(6) PPM

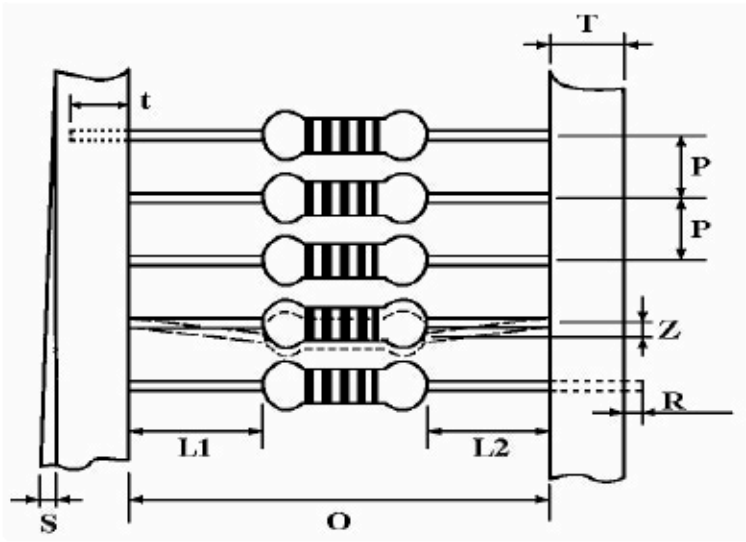
Ex.

Metal Film Fixed Resistors					
Watt	:	0.6W-S	Val	:	10M
Q'TY	:	5,000	Tol	:	1%
Lot	:	813478	PPM	:	50
		ROYALOHM			Pb Free

Metal Film Fixed Resistors

8. Packing specification :

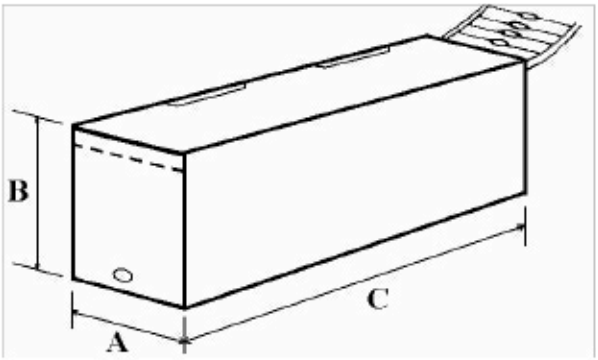
8.1 Taping dimension :



Dimensions (mm)

Type	Style	O	P	L1-L2	T	Z	R	t	S
MF-60-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.

8.2 Tape in box packing :



Bandoliers may also be contained in a cardboard box ("Ammopack")

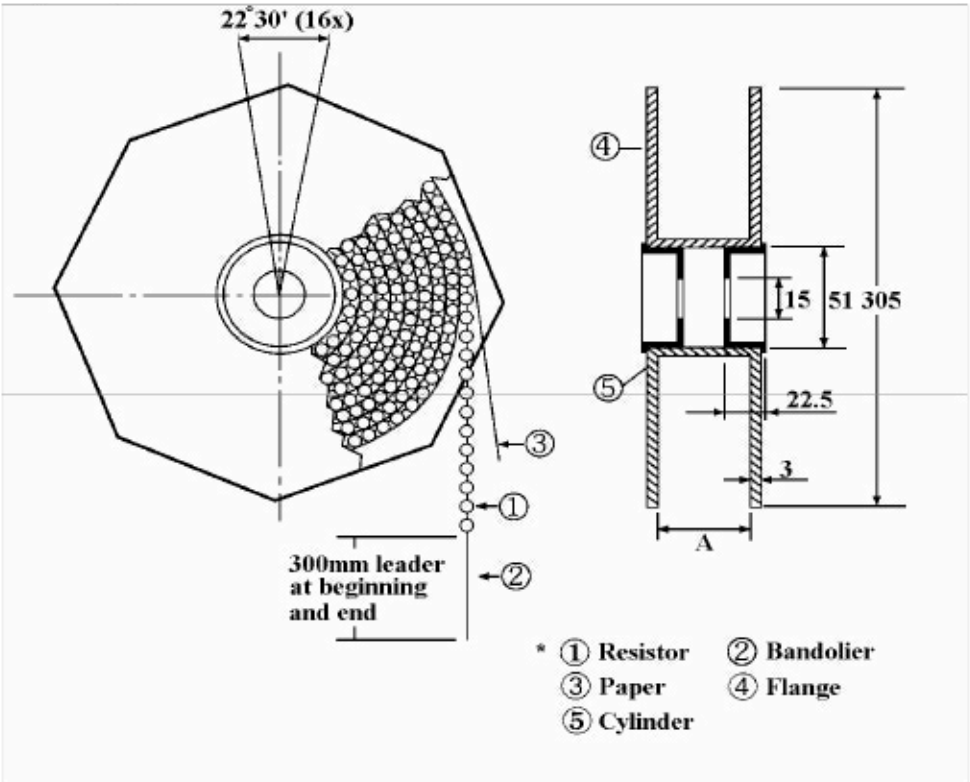
Dimension (mm)

Type	Style	L (C) ± 5	W (A) ± 5	H (B) ± 5	Quantity Per Box (pcs.)
MF-60-S	PT-52	250	75	96	5,000

"Ammopack" is an abbreviation of "ammunition pack"

Metal Film Fixed Resistors

8.3 Tape on reel packing :



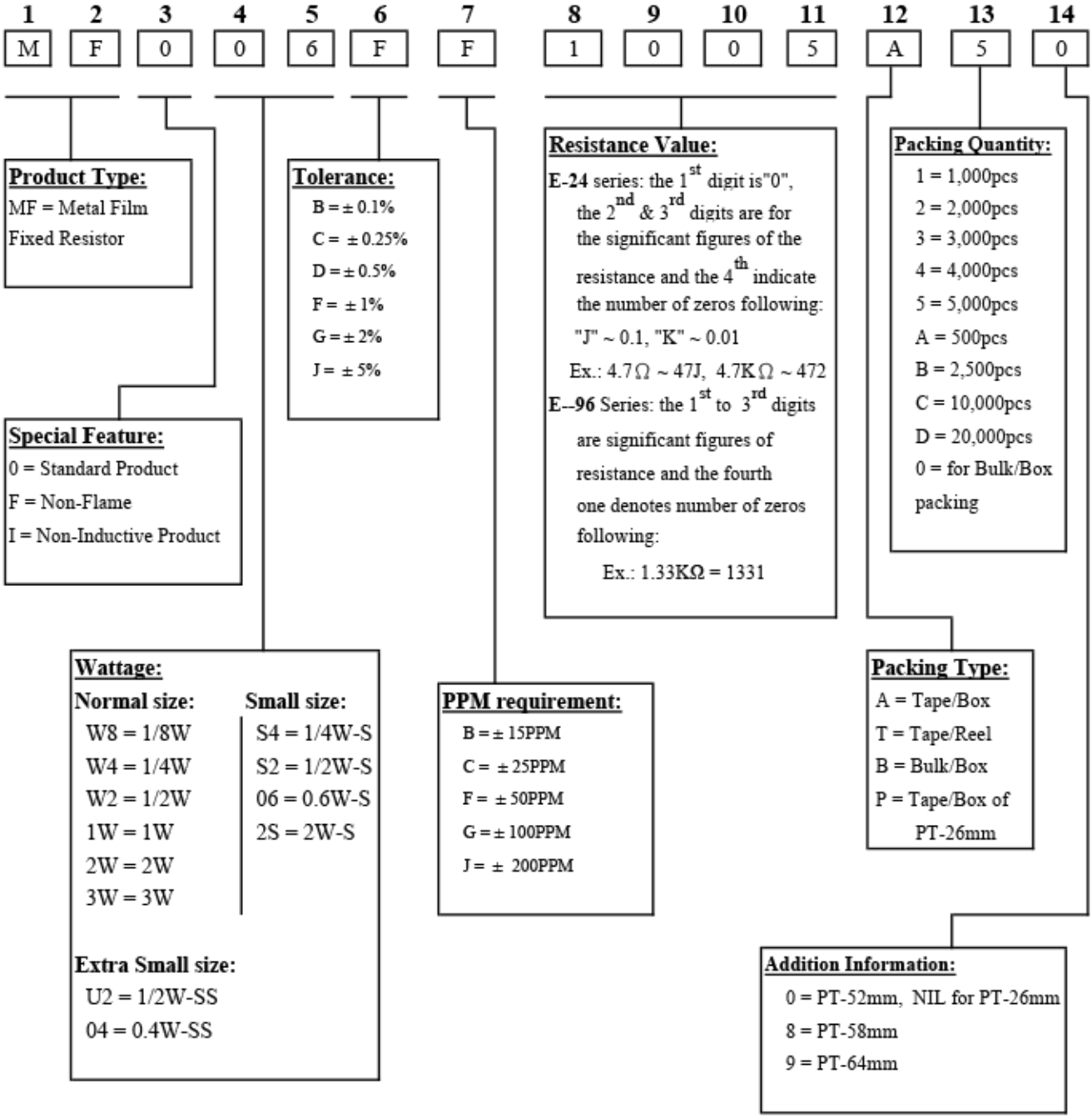
Dimension (mm) :

Type	Style	Across Flange (A)	Quantity Per Reel
MF-60-S	PT-52	73 ± 2	5,000 pcs.

Part Number System

Explanation of Part Number System

(Metal Film Fixed Resistors)



Sample: MF 0.6W-S +/- 1% 50ppm 10MΩ T/B 5,000 → MF006FF1005A50

Metal Film Fixed Resistors

Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.
This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

Storage Condition

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 25°C ± 5°C and a relative humidity of 60%RH ± 10%RH

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight