



## MFF Series Metal Foil Four Terminal Low-Resistance Resistor Product Specifications

|               |               |
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### ■ Metal Foil Four Terminal Low Resistance Chip Resistor — MFF Series

#### ■ Application

- Entertainment
- Power supply
- Measuring instrument
- Industrial
- Battery management system

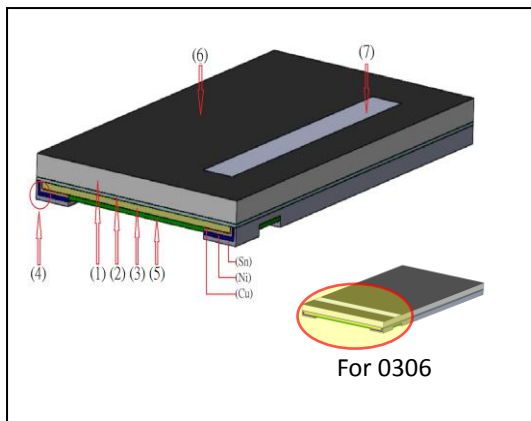
#### ■ Features

- Low Resistance / TCR / EMF/Inductance
- Excellent long term stability
- RoHs compliant and halogen free.
- Lead free.
- High precision current sensing and voltage division.

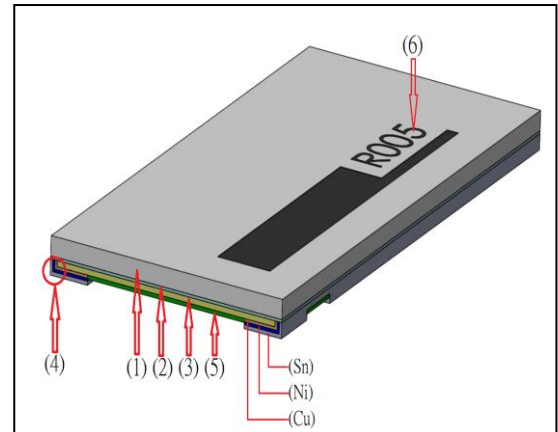
#### ■ Product structure:

- (1) - Substrate : Alumina Ceramic
- (2) - Adhesive : Epoxy
- (3) - Resistive element : MnCu – alloy
- (4) - Terminal electrode : Cu、Ni、Sn
- (5) - Protective coating : Flame-retardant epoxy, meets UL- 94-V0 requirements(green)
- (6) - Marking coating : Flame-retardant epoxy, meets UL- 94-V0 requirements (black)
- (7) - Marking coating : Flame-retardant epoxy, meets UL- 94-V0 requirements (white)

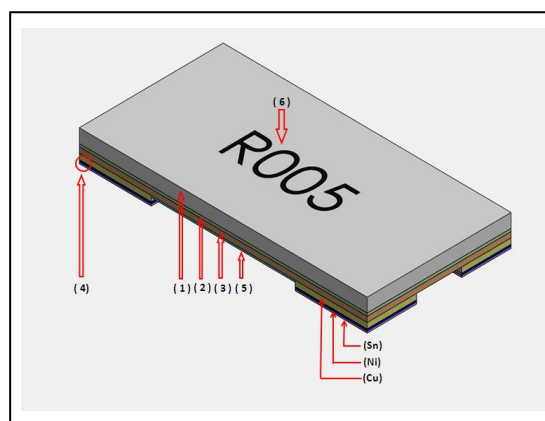
#### For 0306/0612 Type



#### For 1225/2139 Type



#### For 1206 Type



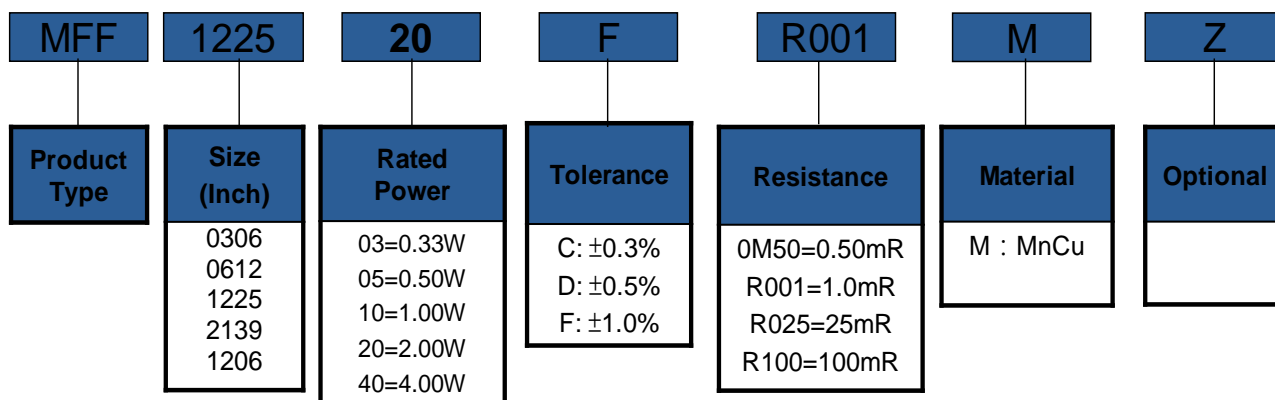


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### Parts Number Explanation

Example:



### Standard Electrical Specifications

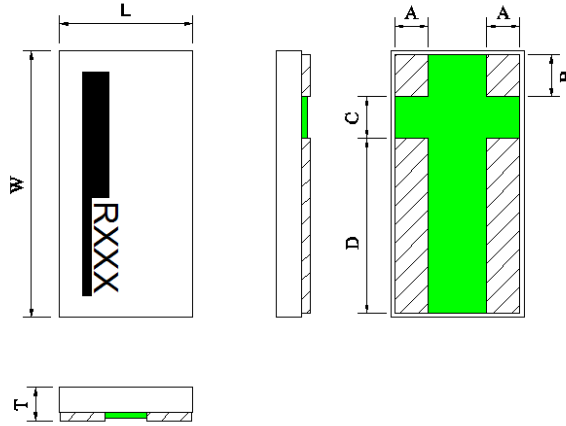
| Type    | Rating Power at 70°C | T.C.R. (ppm/°C) | Max. Rating Current | Max. Overload Current | Resistance Range (mΩ) |          |          | Material | Operating Temperature Range (°C) |
|---------|----------------------|-----------------|---------------------|-----------------------|-----------------------|----------|----------|----------|----------------------------------|
|         |                      |                 |                     |                       | 0.3% (C)              | 0.5% (D) | 1.0% (F) |          |                                  |
| MFF0306 | 0.33W                | ±100            | 18.16A              | 28.72A                | —                     |          | 1~4      | MnCu     | -55°C~155°C                      |
|         |                      | ±50             | 8.12A               | 12.84A                | —                     |          | 5~25     |          |                                  |
| MFF0612 | 1W                   | ±150            | 44.72A              | 70.71A                | —                     |          | 0.5~0.75 |          |                                  |
|         |                      | ±100            | 31.62A              | 50A                   | —                     |          | 1~4      |          |                                  |
| MFF1225 | 2W                   | ±50             | 14.14A              | 22.36A                | —                     | 5~25     |          |          |                                  |
|         |                      | ±100            | 44.72A              | 70.71A                | —                     |          | 1~4      |          |                                  |
| MFF2139 | 4W                   | ±50             | 20A                 | 31.62A                | —                     | 5~25     |          |          |                                  |
|         |                      | ±100            | 63.24A              | 100A                  | —                     |          | 1~4      |          |                                  |
| MFF1206 | 0.5W                 | ±100            | 31.62A              | 50A                   | —                     |          | 0.5      |          |                                  |
|         |                      | ±75             | 22.36A              | 35.35A                | —                     | 1~5      |          |          |                                  |
|         |                      | ±50             | 9.12A               | 14.43A                | —                     | 6~9      |          |          |                                  |
|         |                      | ±30             | 7.07A               | 11.18A                | 10~100                |          | —        |          |                                  |



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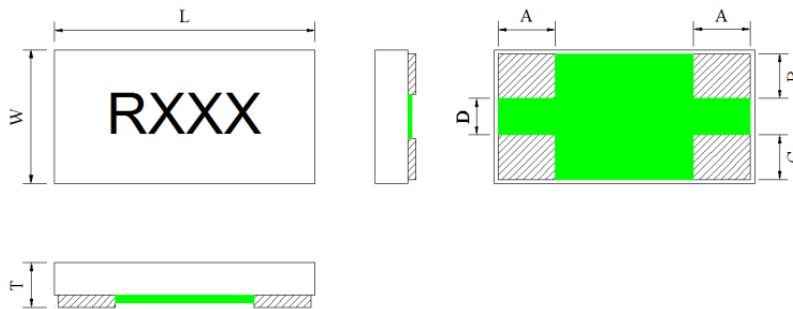
### ■ Type Dimension



### ■ Dimension

Unit : mm

|         | Power Rating | Resistance Range | W         | L         | A         | B         | C         | D         | T         |
|---------|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| MFF0306 | 0.33W        | 1~25mΩ           | 1.60±0.20 | 0.80±0.15 | 0.18±0.10 | 0.23±0.10 | 0.40±0.10 | 0.93±0.20 | 0.55±0.10 |
| MFF0612 | 1W           | 0.5~25mΩ         | 3.20±0.20 | 1.60±0.20 | 0.41±0.20 | 0.46±0.20 | 0.50±0.20 | 2.16±0.20 | 0.50±0.20 |
| MFF1225 | 2W           | 1~25mΩ           | 6.40±0.20 | 3.20±0.20 | 0.50±0.20 | 0.62±0.20 | 0.50±0.20 | 5.12±0.20 | 0.60±0.20 |
| MFF2139 | 4W           | 1~25mΩ           | 11.0±0.30 | 5.00±0.30 | 0.70±0.20 | 1.40±0.20 | 1.05±0.20 | 8.50±0.30 | 0.60±0.20 |



### ■ Dimension

Unit : mm

|         | Power Rating | Resistance Range | W         | L         | A         | B         | C         | D         | T         |
|---------|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| MFF1206 | 0.5W         | 0.5~100mΩ        | 1.60±0.20 | 3.20±0.20 | 0.60±0.20 | 0.55±0.20 | 0.55±0.20 | 0.50±0.20 | 0.60±0.20 |



## MFF Series Metal Foil Four Terminal Low-Resistance Resistor Product Specifications

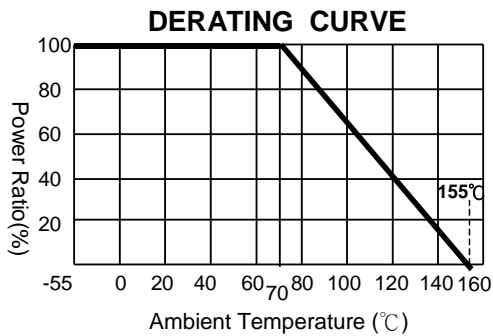
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### Performance Characteristics

#### Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C.

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below



#### Rating Current

The following equation may be used to determine the DC (Direct Current) or AC (Alternating Current) (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards (paragraph 5), the highest normal rated power is to be used

$$I = \sqrt{P/R}$$

I = Rating current (A)  
 P= Rating Power (W)  
 R= Resistance(Ω)

#### Reliability Test and Requirement

| Test Item                                     | Test Method                              | Procedure  | Requirements     |
|---|--|--|------------------|
| Temperature Coefficient of Resistance (T.C.R) | JIS-C-5201-1 4.8<br>IEC-60115-1 4.8      | At 25°C /+125°C, 25°C is the reference temperature   | Refer to Ratings |
| Short Time Overload                           | JIS-C-5201-1 4.13<br>IEC-60115-1 4.13    | The number of rated power are as follows:<br>2.5 times of rated power for 5 seconds.                                 | ±1.0%+0.5mΩ      |
| High Temperature Exposure                     | JIS-C5201-1 4.25<br>IEC 60068-2-2        | At 155°C for 1000 hours.   | ±1.0%+0.5mΩ      |
| Low Temperature Storage                       | JIS-C-5201-1 4.23.4<br>IEC60115-1 4.23.4 | At -55°C for 1000 hours  | ±1.0%+0.5mΩ      |
| Resistance to Soldering Heat                  | JIS-C-5201-1 4.18<br>IEC-60115-1 4.18    | 260±5°C for 10 seconds.  | ±1.0%+0.5mΩ      |
| Damp Heat with Load                           | JIS-C-5201-1 4.24<br>IEC-60115-1 4.24    | 40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" . | ±2.0%+0.5mΩ      |
| Rapid Change of Temperature                   | JIS-C-5201-1 4.19<br>IEC-60115-1 4.19    | -55°C to +155°C, 100 cycles  | ±1.0%+0.5mΩ      |



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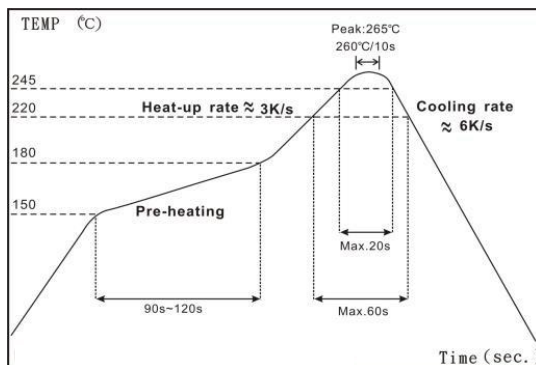
|                       |   |  |                       |
|-----------------------|---|--|-----------------------|
| Load Life (Endurance) | JIS-C-5201-1 4.25<br>IEC-60115-1 4.25.1 | 70±2 °C , RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" . | ±2.0%+0.5mΩ           |
| Solderability         | JIS-C-5201-1 4.17<br>IEC-60115-1 4.17   | 245±5°C for 3 seconds.   | The covered area >95% |
| Mechanical Shock      | JIS C 5202 6.7                          | a =50G , t =11ms, 5 times shock  | ±1.0%+0.5mΩ           |
| Bending Strength      | JIS-C-5201-1 4.33<br>IEC-60115-1 4.33   | Bending once 2mm for 10 seconds  | ±1.0%+0.5mΩ           |

### ■ Marking Format:

- 0306/0612 type products no marking.  
Other requirements can be contact with the business staff
- 1225/2139/1206 type products marking are 4 digits.  
"R" designates the decimal location in ohms  
e.g. 1mΩ the product marking is R001.  
20mΩ the product marking is R020.  
"M" designates the decimal location in milli-ohms  
e.g. 0.5mΩ the product marking is 0M50.
- The criteria to distinguishing the mark on the surface of products are that characters can be identified.

### ● Recommended Customer Soldering Parameters

#### ■ Solder reflow Temperature condition



■ Rework temperature ( hot air equipment ) : 350°C , 3~5seconds

#### ■ Recommended reflow methods

IR, vapor phase oven, hot air oven

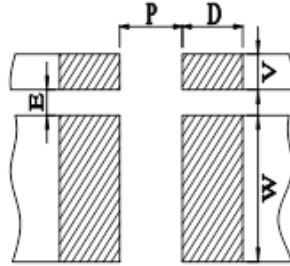
If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.



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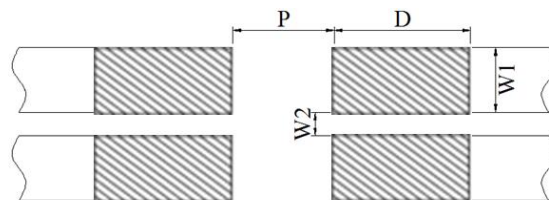
### Recommend Land Pattern Design



### Dimension

Unit: mm

| TYPE            | Resistance Range | P     | W    | D     | V     | E     |
|-----------------|------------------|-------|------|-------|-------|-------|
| MFF0306 – 0.33W | 1mΩ~25mΩ         | 0.35  | 1.30 | 0.40  | 0.40  | 0.20  |
| MFF0612 – 1W    | 0.5mΩ~25mΩ       | 0.762 | 2.29 | 1.014 | 0.762 | 0.381 |
| MFF1225 – 2W    | 1mΩ~25mΩ         | 2.00  | 5.10 | 1.00  | 0.70  | 0.50  |
| MFF2139– 4W     | 1mΩ~25mΩ         | 3.30  | 8.90 | 1.50  | 1.70  | 0.80  |



### Dimension

Unit: mm

| TYPE           | Resistance Range | P    | D    | W1   | W2   |
|----------------|------------------|------|------|------|------|
| MFF1206 – 0.5W | 0.5mΩ~100mΩ      | 1.20 | 1.80 | 1.10 | 0.30 |

### Packing Quantity

| TYPE              | PCS /Reel |
|-------------------|-----------|
| MFF0306           | 5000      |
| MFF0612 / MFF1206 | 5000      |
| MFF1225           | 4000      |
| MFF2139           | 2000      |



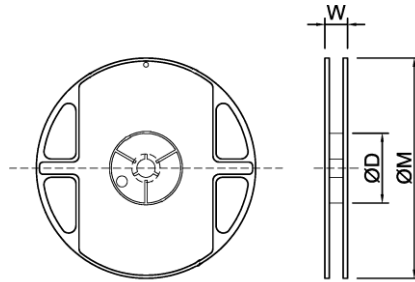
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### Appendix For SMD Chip Resistor

#### ● Packaging Information

##### ■ Reel Dimensions

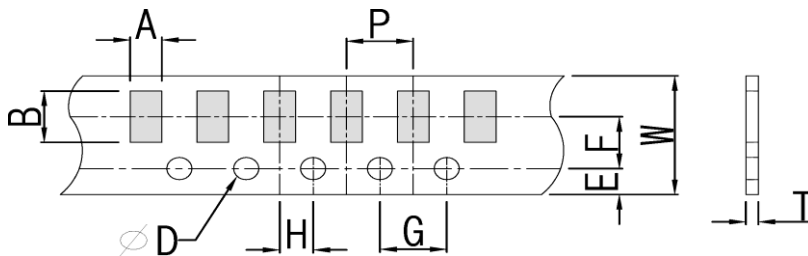


##### ■ Dimension

Unit: mm

| TYPE              | $\phi D$ | W      | $\phi M$ |
|-------------------|----------|--------|----------|
| MFF0306           | 60±2     | 9.0±1  | 178±5    |
| MFF0612 / MFF1206 |          | 9.0±1  |          |
| MFF1225           |          | 13.0±1 |          |
| MFF2139           |          | 24.5±1 |          |

##### ■ Paper tape Dimensions



##### ■ Dimension

Unit: mm

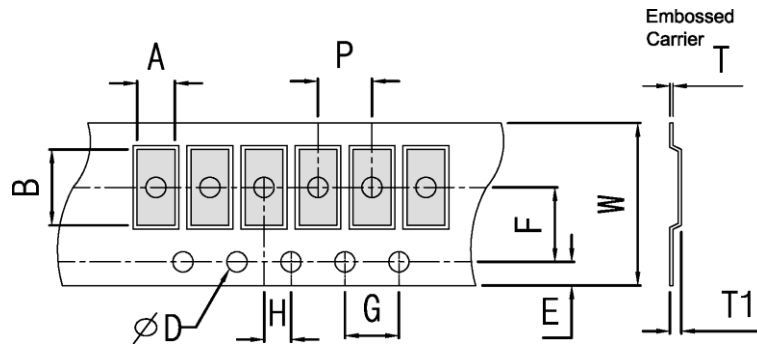
| Item    | W        | P        | E         | F        | $\phi D$                          | G        | H        | A         | B         | T         |
|---------|----------|----------|-----------|----------|-----------------------------------|----------|----------|-----------|-----------|-----------|
| MFF0306 | 8.0±0.30 | 4.0±0.10 | 1.75±0.10 | 3.5±0.10 | 1.50 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.10 | 2.0±0.10 | 1.18±0.20 | 1.98±0.20 | 0.75±0.20 |



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### ■ Embossed Dimensions



### ■ Dimension

Unit: mm

| Item              | W         | P        | E         | F          | $\phi D$                          | G        | H        | A         | B          | T1        | T         |
|-------------------|-----------|----------|-----------|------------|-----------------------------------|----------|----------|-----------|------------|-----------|-----------|
| MFF0612 / MFF1206 | 8.0±0.30  | 4.0±0.10 | 1.75±0.10 | 3.50±0.10  | 1.50 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.10 | 2.0±0.10 | 2.05±0.20 | 3.65±0.20  | 0.85±0.20 | 0.20±0.10 |
| MFF1225           | 12.0±0.30 | 4.0±0.10 |           | 5.5±0.10   |                                   |          |          | 3.40±0.20 | 6.75±0.20  | 1.00±0.20 | 0.25±0.10 |
| MFF2139           | 24.0±0.30 | 8.0±0.10 |           | 11.50±0.10 |                                   |          |          | 5.50±0.20 | 11.50±0.20 | 0.90±0.20 | 0.30±0.10 |

### ■ Peeling Strength of Seal Tape

Peeling Strength: 0.1 – 1.0N (10 - 100gf)

### ■ Storage Temperature

Temperature : 25±5°C, Humidity : 60±20%