## ALTERNATION HISTORY RECORDS变更记录

| Date | Version | Mark | Page | Description | Drafter | Approver |
|---|---|---|---|---|---|---|
| 2025-12-20 | B | / | / | Revised edition release | Doris Chang | / |

## 1. Features:

Excellent overall stability.

Advanced thin film technology.

The World`s Most Reliable and

Predictable, High-Performing Film Resistors

Tight tolerance down to ±0.1%.

Extremely low TCR down to ±15 PPM/°C

High power rating up to 2 Watts.

The resistors are suitable for processing on automatic SMD assembly systems.

## 2. Applicable Scope:

Telecommunication.

Medical equipment.

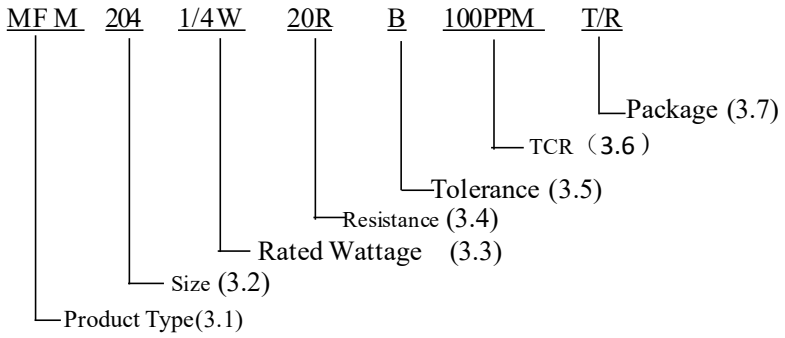
Measurement/Testing Equipment.

Automotive.

Industrial.

## 3. Part Number System:

It is composed by Type, Rated Wattage, Nominal Resistance, Tolerance, Safety Version and Package. e.g.




3.1 Product Type

| Code | MFM |
|---|---|
| Product Type | Metal Film Precision Resistor |

3.2 Size code

| Code | 102 | 204 | 207 | 309 |
|---|---|---|---|---|
| Size(L x φ D)mm | 2.2 x1.1 | 3.5x1.4 | 5.9x2.2 | 8.5x3.2 |

3.3 Rated Wattage

| Code | 1/4W | 2/5W | 1W |
|---|---|---|---|
| Wattage (W) | Rated Power:1/4W | Rated Power:2/5W | Rated Power:1W |

3.4 Resistance

| Code | 22R | 10K | 100K |
|---|---|---|---|
| Resistance | 22Ω | 10KΩ | 100KΩ |

Remark:Ω is its unit which be in accordance with JIS-C6409 article 6 (EIARS-196A) series.

3.5 Resistance tolerance

| Code | B | C | D | F | J | Z |
|---|---|---|---|---|---|---|
| Tolerance Range | ±0.1% | ±0.25% | ±0.50% | ±1% | ±5% | Jumper |

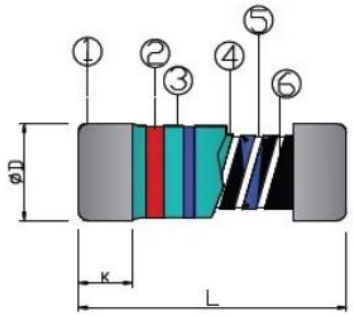
3.6 TCR

| Code | 15PPM | 25PPM | 50PPM | 100PPM |
|---|---|---|---|---|
| TCR(PPM/°C) | ±15PPM | ±25PPM | ±50PPM | ±100PPM |

3.7 Package

| Code | T/R | RR |
|---|---|---|
| Inner Code | Taping Reel | Bulk |

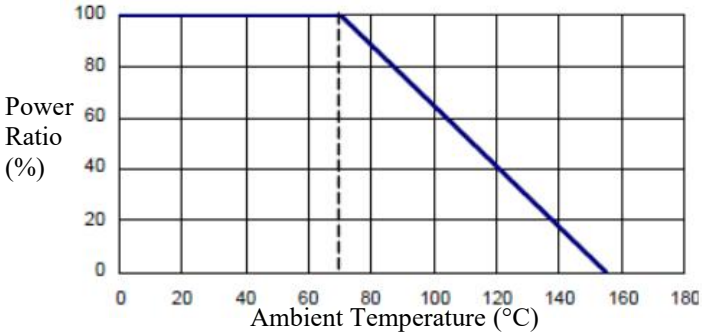
## 4. Construction & Dimension




| | | | |
|---|---|---|---|
| ① | Steel Termination Cap | ④ | Metal Film Resistive Layer |
| ② | Color Code Rings | ⑤ | Trimming Line |
| ③ | Insulation Coating | ⑥ | Alumina Ceramic Rod |

| Type | L mm | ϕ D mm | K min. | Weight (g) (1000pcs) | Packaging |
|---|---|---|---|---|---|
| 102 | 2.2±0.1 | 1.1±0.1 | 0.45 | 7.7 | 3000 pcs |
| 204 | 3.5±0.2 | 1.4±0.15 | 0.70 | 18.7 | 3000 pcs |
| 207 | 5.9±0.2 | 2.2±0.20 | 0.80 | 77.5 | 2000 pcs |
| 309 | 8.5±0.3 | 3.2±0.30 | 1.40 | 233.0 | 2500 pcs |

## 5.Derating Curve:




## 6. Standard Electrical Specifications

| Item / Type | Power at 70°C | Temperature range | Maximum Working Voltage | Maximum Overload Voltage | Resistance range | | T.C.R. PPM /°C |
|---|---|---|---|---|---|---|---|
| | | | | | ±0.1%、±0.25% | ±0.5%、±1% | |
| 102 | 1/8W | -55~155 | 150V | 300V | / | 8.2~470KΩ | ±50 |
| 204 | 1/4W | -55~155 | 200V | 400V | 33Ω-100KΩ(±15PPM)、33Ω-510KΩ(±25PPM) | | ±15、±25 |
| | | | | | 1Ω-1MΩ | | ±50 |
| | | | | | 1Ω-10MΩ | | ±100 |
| | Jumper: 2A | | | | 0Ω<25mΩ | | - |
| 207 | 1/2W | -55~155 | 300V | 700V | 33Ω-100KΩ(±15PPM)、33Ω-510KΩ(±25PPM) | | ±15、±25 |
| | | | | | 1Ω-1MΩ | | ±50 |
| | | | | | 1Ω-10MΩ | | ±100 |
| | Jumper: 2A | | | | 0Ω<25mΩ | | - |
| 309 | 1 W | -55~155 | 500V | 800V | 1Ω-1MΩ | | ±50 |
| | | | | | 1Ω-10MΩ | | ±100 |

## 7. High Power Rating Electrical Specifications

| Item / Type | Power at 70°C | Temperature range | Maximum Working Voltage | Maximum Overload Voltage | Resistance range | | T.C.R. PPM /°C |
|---|---|---|---|---|---|---|---|
| | | | | | ±0.1%、±0.25% | ±0.5%、±1% | |
| 204 | 2/5W | -55~155 | 200V | 400V | 33Ω-510KΩ | 1Ω-510KΩ | ±25 |
| | | | | | 1Ω-1MΩ | | ±50 |
| | | | | | 1Ω-10MΩ | | ±100 |
| 207 | 1W | -55~155 | 350V | 700V | 33Ω-510KΩ | 1Ω-510KΩ | ±25 |
| | | | | | 1Ω-1MΩ | | ±50 |
| | | | | | 1Ω-10MΩ | | ±100 |
| 309 | 2 W | -55~155 | 500V | 800V | 1Ω-1MΩ | | ±50 |
| | | | | | 1Ω-10MΩ | | ±100 |

## 8.Environmental Characteristics:

| Item | Requirement | Test Method |
|---|---|---|
| Temperature Coefficient | As Spec. | -55℃~+125℃, 25℃ is the reference temperature. |
| Short Time Overload | ±(0.5%+0.05Ω) | RCWV×2.5 or Max. Overload voltage for 5 seconds. |
| Damp Heat with Load | ±(2.0%+0.05Ω) | 40±2℃, 90~95% R.H. RCWV or Max. Operating voltage for 1,000 hrs. with 1.5 hrs. ON and 0.5 hrs. OFF. |
| Endurance | ±(2.0%+0.05Ω) | 70±2℃, RCWV or Max. Operating voltage for 1,000 hrs. (with 1.5 hrs. ON and 0.5 hrs. OFF). |
| Bending Strength | ±(0.5%+0.05Ω) | Bending once for 5 seconds with 2mm. |
| Solder ability | 95% min. Coverage | 245±5℃ for 3 seconds. |
| Resistance to Soldering Heat | (±0.5%+0.05Ω) | 260±5°C for 10 seconds. |
| Voltage Proof | No breakdown or flashover | 204:AC 300V, 207、309:AC 500V for 1 minute. |
| Insulation Resistance | >1000MΩ | DC 500V Megger. 、 |
| Temperature Cycle | (±0.5%+0.05Ω) | -55℃(30 min.) > Room Temp.(3min.) > +155℃(30 min.) > Room Temp. (3min.) / (5 cycle). |

Remark:

- RCWV (Rated Continuous Working Voltage)

RCWW=$\sqrt{\text{Power Rating x Resistance Values Max.}}$ RCWV listed above.

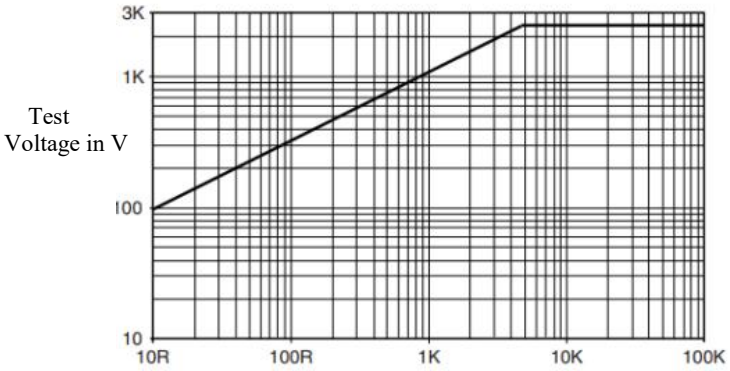
-Short time Overload(STOL) test should be determined form

STOL=2.5 x $\sqrt{\text{Power Rating x Resistance Values}}$ or maximum overload voltage listed above whichever is lower

-Reference Standards: IEC 60115-1；JIS-C 5201-1.

-Storage Temperature: 25±3°C; Humidity < 80% RH.

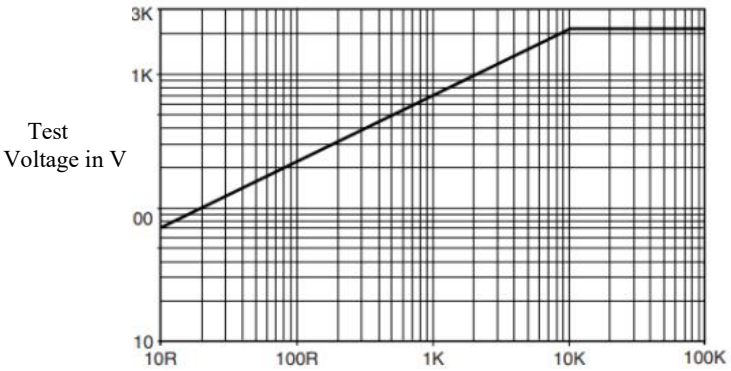
## 9.Anti-pulse curve:




Resistance Value in Ω

Remark:

Pulse load ratings match
IEC60115-1,4.27;1.2/50u;
Load a pulse
Apply only in 207 、309



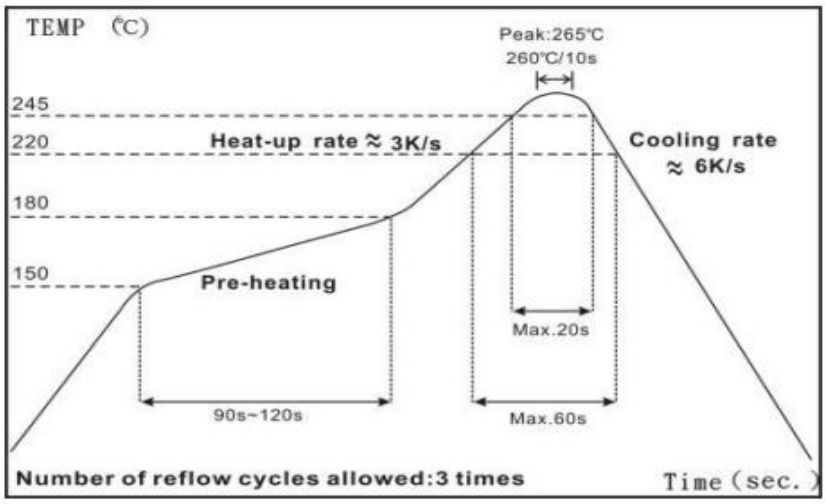

Resistance Value in Ω

Remark:

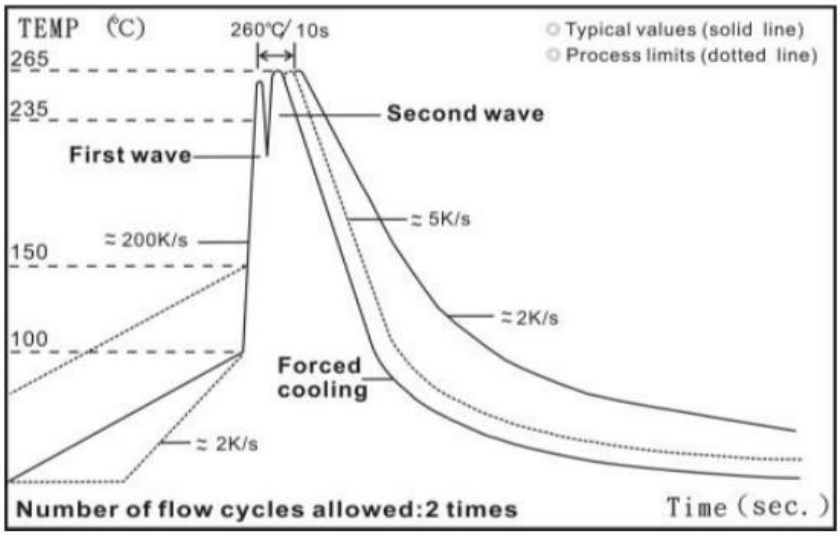
Pulse load ratings match
IEC60115-1,4.27;10/700u;
Load a pulse
Apply only in 207 、309

## 10.Soldering Condition:

IR Reflow Soldering




Wave Soldering (For R>10Ω)



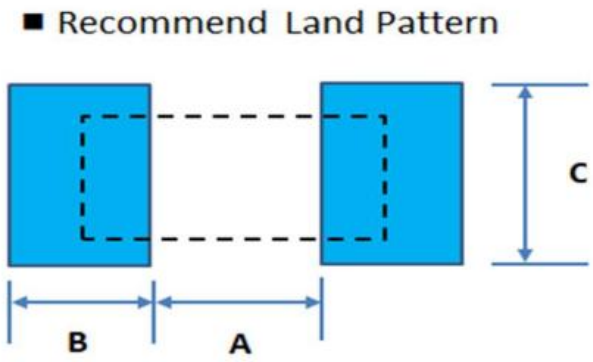

Remark:

1)Time of IR reflow soldering at maximum temperature point 260℃：10s

2)Time of wave soldering at maximum temperature point 260℃：10s

3)Time of soldering iron at maximum temperature point 410℃：5s

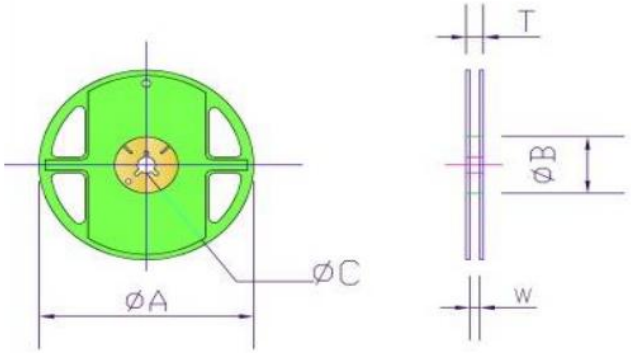
## 11. Recommend Land Pattern




| Type | A(mm) | B(mm) | C(mm) |
|---|---|---|---|
| 102 | 1.0 | 0.8 | 1.5 |
| 204 | 1.6 | 2.0 | 2.2 |
| 207 | 3.2 | 3.0 | 3.5 |
| 309 | 5.6 | 4.0 | 4.0 |

## 12. Packaging

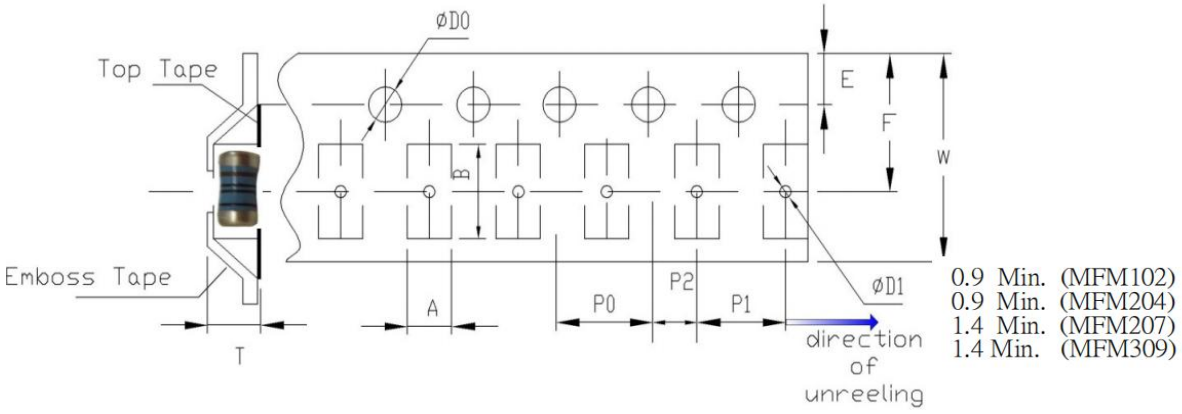
Packaging Quantity & Reel Specifications




Unit: mm

| Type | ∮ A(mm) | ∮ B(mm) | ∮ C(mm) | W | T | Emboss Plastic Tape (pcs) |
|---|---|---|---|---|---|---|
| 102 | 178.5±1.5 | 60.0±1.0 | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 | 3000(7.0”) |
| 204 | 178.5±1.5 | 60.0±1.0 | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 | 3000(7.0”) |
| 207 | 178.5±1.5 | 60.0±1.0 | 13.0±0.5 | 13.0±0.5 | 15.5±0.5 | 2000(7.0”) |
| 309 | 330±1.5 | 100.0±1.0 | 13.0±0.5 | 17.0±0.5 | 19.0±0.5 | 2500(7.0”) |

Emboss Plastic Tape Specifications




Unit: mm

| Type | A | B | W | E | F |
|---|---|---|---|---|---|
| 102 | 1.30±0.10 | 2.40±0.10 | 8.00±0.10 | 1.75±0.10 | 3.50±0.05 |
| 204 | 1.60±0.10 | 3.70±0.10 | 8.00±0.10 | 1.75±0.10 | 3.50±0.05 |
| 207 | 2.40±0.10 | 6.30±0.10 | 12.0±0.10 | 1.75±0.10 | 5.50±0.05 |
| 309 | 3.30±0.10 | 9.00±0.10 | 16.0±0.30 | 1.75±0.10 | 7.50±0.05 |

| Type | P0 | P1 | P2 | ΦD0 | T |
|---|---|---|---|---|---|
| 102 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 1.45±0.10 |
| 204 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 1.45±0.10 |
| 207 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 2.50±0.10 |
| 309 | 4.00±0.10 | 8.00±0.10 | 2.00±0.05 | 1.50±0.10 | 3.30±0.10 |