



MFR Series Metal Foil Low-Resistance Resistor Product Specifications

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|---------------|---------------|
| Document No. | S-10-12-07-05 |
| Released Date | 2020/01/10 |
| Page No. | 1/9 |

Metal Foil Low Resistance Chip Resistor — MFR Series

Application

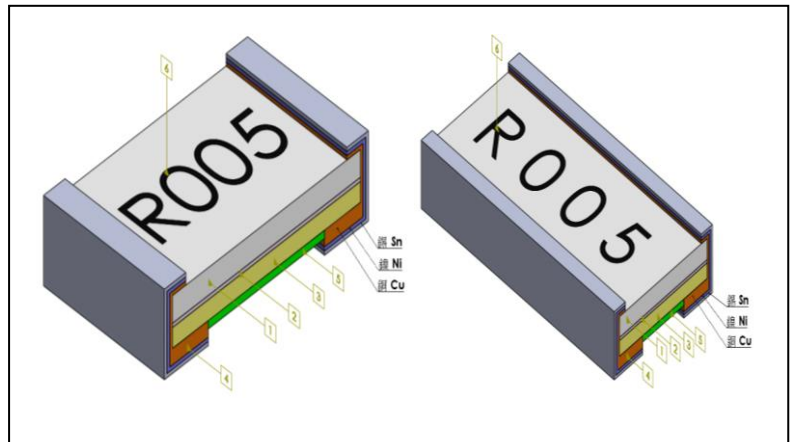
- Entertainment
- Power supply
- Measuring instrument
- Industrial
- Battery management system

Features

- Low Resistance / TCR / EMF (only for MnCu)/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 : Cu – alloy
- (4) - Terminal electrode : Sn, Ni, Cu
- (5) - Protective coating : Flame-retardant epoxy, meets UL- 94-V0 requirements(green)
- (6) - Marking coating : Flame-retardant epoxy, meets UL- 94-V0 requirements (black)



Parts Number Explanation

Example:

| | | | | | | |
|--------------|--|--|-------------------------------------|--|--------------------------|----------|
| MFR | 2512 | 20 | F | R005 | M | Z |
| Product Type | Size (Inch) | Rated Power | Tolerance | Resistance | Material | Optional |
| | 0603 0805 1206 2010 2512 3921 4527 0508 0612 0815 1225 2139 | 05=0.50W 07=0.75W 10=1.00W 15=1.50W 20=2.00W 30=3.00W 40=4.00W 50=5.00W | D : ±0.5% F : ±1.0% G : ±2.0% | 2M50=2.5mR R005=5.0mR R020=020mR R150=150mR | M : MnCu C : Cu Alloy | |



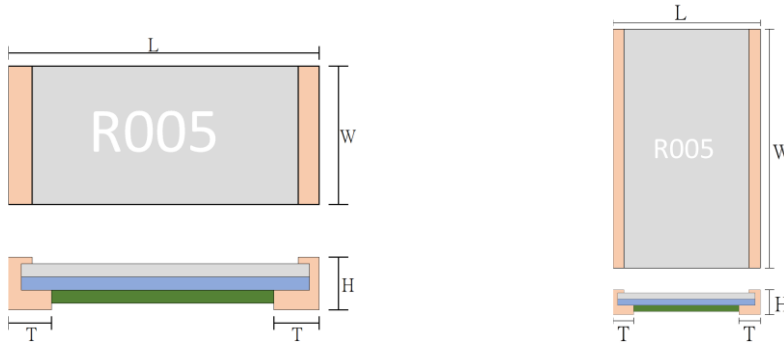
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| | |
|---------------|---------------|
| Document No. | S-10-12-07-05 |
| Released Date | 2020/01/10 |
| Page No. | 2/9 |

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) |
|---------|----------------------|-----------------|---------------------|-----------------------|-----------------------|----------|---------|--|----------------------------------|
| | | | | | 0.5% (D) | 1.0% (F) | 2.0%(G) | | |
| MFR0603 | 0.5W | ±75 | 10A | 15.81A | — | 5~9 | — | R005~R049 : MnCu R050~R100 : Cu Alloy | -55°C~155°C |
| | | ±50 | 7.07A | 11.18A | 10~100 | | | | |
| MFR0805 | 0.75W | ±75 | 13.69A | 21.65A | — | 4~9 | — | R004~R049 : MnCu R050~R270 : Cu Alloy | |
| | | ±50 | 8.66A | 13.69A | 10~270 | | | | |
| MFR1206 | 1W | ±75 | 15.81A | 25A | — | 4~9 | — | R004~R049 : MnCu R050~R700 : Cu Alloy | |
| | | ±50 | 10A | 15.81A | 10~700 | | | | |
| MFR2010 | 1.5W | ±100 | 27.38A | 43.30A | — | 2~9 | — | R002~R500 : Cu Alloy | |
| | | ±50 | 12.24A | 19.36A | 10~500 | | | | |
| MFR2512 | 2W | ±75 | 31.62A | 50A | — | 2~9 | — | R002~R049 : MnCu R050~R560 : Cu Alloy | |
| | | ±50 | 14.14A | 22.36A | 10~560 | | | | |
| MFR3921 | 4W | — | — | — | — | — | — | R010~R050 : Cu Alloy | |
| | | ±50 | 20A | 31.62A | 10~50 | | | | |
| MFR4527 | 5W | — | — | — | — | — | — | R010~R050 : Cu Alloy | |
| | | ±50 | 22.36A | 35.35A | 10~50 | | | | |
| MFR0508 | 1W | ±100 | 31.62A | 50A | — | — | 1 | R001~R009 : MnCu R010~R100 : Cu Alloy | |
| | | ±100 | 22.36A | 35.35A | — | 2~9 | — | | |
| | | ±50 | 10A | 15.81A | 10~100 | | | | |
| MFR0612 | 1.5W | ±100 | 38.72A | 61.23A | — | — | 1 | R001~R009 : MnCu R010~R100 : Cu Alloy | |
| | | ±100 | 27.38A | 43.30A | — | 2~9 | — | | |
| | | ±50 | 12.24A | 19.36A | 10~100 | | | | |
| MFR0815 | 2W | ±100 | 44.72A | 70.71A | — | — | 1 | R001~R020 : Cu Alloy | |
| | | ±100 | 31.62A | 50A | — | 2~9 | — | | |
| | | ±50 | 14.14A | 22.36A | 10~20 | | | | |
| MFR1225 | 3W | ±100 | 54.77A | 86.60A | — | 1~9 | — | R001~R020 : MnCu R021~R100 : Cu Alloy | |
| | | ±50 | 17.32A | 27.38A | 10~100 | | | | |
| MFR2139 | 5W | ±100 | 70.71A | 111.8A | — | 1~9 | — | R001~R020 : MnCu R021~R100 : Cu Alloy | |
| | | ±50 | 22.36A | 35.35A | 10~100 | | | | |

■ Type Dimension



■ Dimension

Unit : mm

| | Power Rating | Resistance Range | L | W | H | T |
|---------|--------------|------------------|------------|------------|-----------|-----------|
| MFR0603 | 0.5W | 5mΩ | 1.60±0.25 | 0.80±0.25 | 0.65±0.20 | 0.50±0.20 |
| | | 6~100mΩ | | | | 0.40±0.20 |
| MFR0805 | 0.75W | 4~270mΩ | 2.00±0.25 | 1.20±0.25 | 0.65±0.20 | 0.50±0.20 |
| MFR1206 | 1W | 4~700mΩ | 3.20±0.25 | 1.60±0.25 | 0.65±0.20 | 0.68±0.30 |
| MFR2010 | 1.5W | 2~3mΩ | 5.08±0.25 | 2.54±0.25 | 0.65±0.20 | 2.10±0.30 |
| | | 4~500mΩ | | | | 0.70±0.30 |
| MFR2512 | 2W | 2mΩ | 6.40±0.30 | 3.20±0.30 | 0.75±0.20 | 1.65±0.30 |
| | | 3mΩ | | | | 1.65±0.30 |
| | | 4~560mΩ | | | | 1.05±0.30 |
| MFR3921 | 4W | 10~50mΩ | 11.10±0.30 | 5.10±0.30 | 0.65±0.30 | 2.36±0.30 |
| MFR4527 | 5W | 10~50mΩ | 11.60±1.0 | 7.10±1.0 | 0.65±0.30 | 2.70±0.40 |
| MFR0508 | 1W | 1~100mΩ | 1.35±0.20 | 2.10±0.20 | 0.65±0.20 | 0.43±0.20 |
| MFR0612 | 1.5W | 1mΩ | 1.60±0.25 | 3.20±0.25 | 0.65±0.20 | 0.50±0.30 |
| | | 2~100mΩ | | | | 0.40±0.20 |
| MFR0815 | 2W | 1~20mΩ | 2.20±0.20 | 3.80±0.20 | 0.65±0.20 | 0.61±0.20 |
| MFR1225 | 3W | 1~100mΩ | 3.20±0.30 | 6.40±0.30 | 0.65±0.20 | 0.60±0.20 |
| MFR2139 | 5W | 1~100mΩ | 5.10±0.40 | 11.10±0.30 | 0.65±0.30 | 0.90±0.30 |



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Document No. S-10-12-07-05

Released Date 2020/01/10

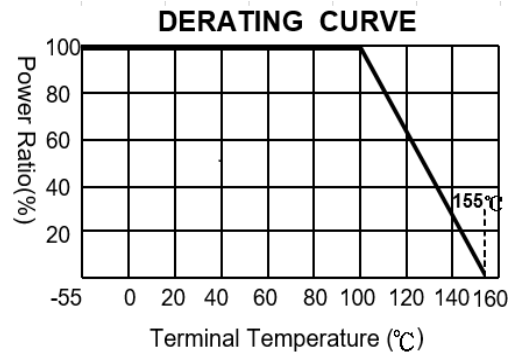
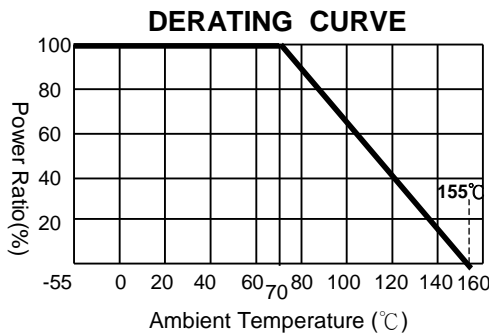
Page No. 4/9

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 (Terminal temperature derating from above 100°C)



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 IEC-60115-1 4.8 | At 25°C /+125°C, 25°C is the reference temperature | As Spec |
| Short Time Overload | JIS-C-5201-1 4.13 IEC-60115-1 4.13 | The number of rated power are as follows: 2.5 times of rated power for 5 seconds. | ±1.0%+0.5mΩ |
| High Temperature Exposure | JIS-C5201-1 4.25 IEC 60068-2-2 | At 155°C for 1000 hours. | ±1.0%+0.5mΩ |
| Low Temperature Storage | JIS-C-5201-1 4.23.4 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 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 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 IEC-60115-1 4.19 | -55°C to +155°C, 100 cycles | ±1.0%+0.5mΩ |



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| | |
|---------------|---------------|
| Document No. | S-10-12-07-05 |
| Released Date | 2020/01/10 |
| Page No. | 5/9 |

| | | | |
|-----------------------|---|--|-----------------------|
| Load Life (Endurance) | JIS-C-5201-1 4.25 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 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 IEC-60115-1 4.33 | Bending once 2mm for 10 seconds | ±1.0%+0.5mΩ |

■ Marking Format:

- 0603 type products marking are 2 or 3 digits
 - e.g. 2 digits
 - 10mΩ the product marking is 10.
 - 15mΩ the product marking is 15
 - e.g. 3 digits
 - "M" designates the decimal location in milli-ohms
 - 2.5mΩ the product marking is 2M5
- 0805 type products marking are 3 or 4 digits.
 - "R" designates the decimal location in ohms
 - e.g. 3 digits
 - 50mΩ the product marking is 050.
 - 500mΩ the product marking is 500.
 - e.g. 4 digits
 - 20mΩ the product marking is R020.
 - "M" designates the decimal location in milli-ohms
 - e.g. 5.5mΩ the product marking is 5M50.
- 1206 and above 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. 5.5mΩ the product marking is 5M50.
- The criteria to distinguishing the mark on the surface of products are that characters can be identified.

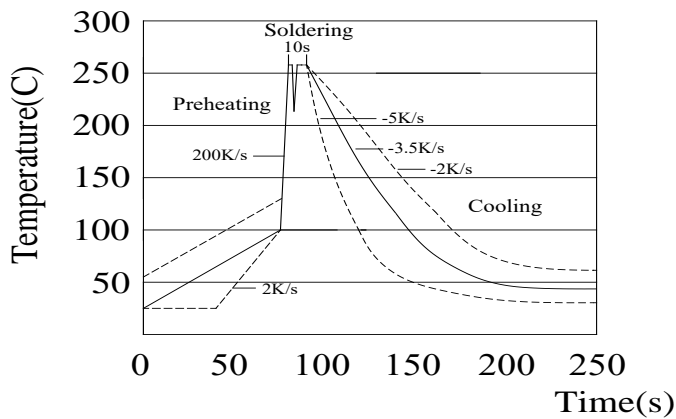
● Recommended Customer Soldering Parameters

■ Wave solder Temperature condition

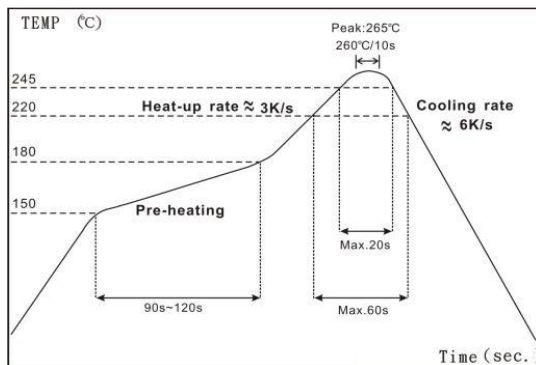
Preheating : 100°C~130°C, max.100 sec.

Soldering: 250°C~265°C max. 10 sec.

Maximum temperature : 260±5°C, max. 10sec.



■ Solder reflow Temperature condition



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

■ Recommended reflow methods

IR, vapor phase oven, hot air oven

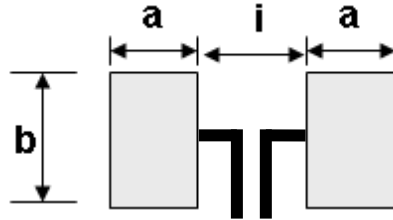
If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.



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| | |
|---------------|---------------|
| Document No. | S-10-12-07-05 |
| Released Date | 2020/01/10 |
| Page No. | 7/9 |

Recommend Land Pattern Design



Dimension

Unit: mm

| TYPE | Resistance Range | a | b | i |
|-----------------|------------------|------|------|------|
| MFR0603 – 0.5W | 5mΩ | 1.35 | 0.92 | 0.50 |
| | 6mΩ~100mΩ | 1.30 | 0.92 | 0.60 |
| MFR0805 – 0.75W | 4mΩ~270mΩ | 1.40 | 1.44 | 0.80 |
| MFR1206 – 1W | 4mΩ~700mΩ | 1.80 | 1.84 | 1.20 |
| MFR2010– 1.5W | 2~3mΩ | 3.65 | 2.88 | 0.70 |
| | 4mΩ~500mΩ | 2.65 | 2.88 | 2.70 |
| MFR2512 – 2W | 2~3mΩ | 3.85 | 3.57 | 1.6 |
| | 4~560mΩ | 3.10 | 3.57 | 3.10 |
| MFR3921 – 4W | 10mΩ~50mΩ | 4.50 | 5.75 | 5.00 |
| MFR4527 – 5W | 10mΩ~50mΩ | 4.65 | 8.05 | 5.20 |

Dimension

Unit: mm

| TYPE | Resistance Range | a | b | i |
|----------------|------------------|------|-------|------|
| MFR0508– 1W | 1~100mΩ | 1.10 | 2.30 | 0.60 |
| MFR0612 – 1.5W | 1mΩ | 1.35 | 3.68 | 0.50 |
| | 2~100mΩ | 1.30 | 3.68 | 0.60 |
| MFR0815 – 2W | 1~20mΩ | 2.40 | 4.26 | 0.70 |
| MFR1225 – 3W | 1~100mΩ | 2.35 | 7.25 | 1.40 |
| MFR2139 – 5W | 1~100mΩ | 2.80 | 12.65 | 2.40 |

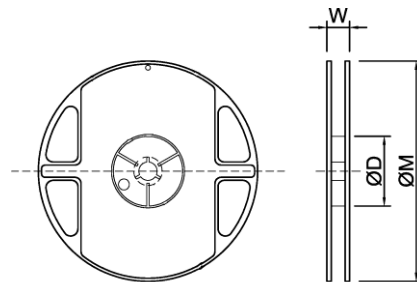
■ Packing Quantity

| TYPE | PCS /Reel |
|-------------------|-----------|
| MFR0603 | 5000 |
| MFR0805 / MFR0508 | 5000 |
| MFR1206 / MFR0612 | 5000 |
| MFR2010 | 4000 |
| MFR2512 / MFR1225 | 4000 |
| MFR0815 | 4000 |
| MFR3921/ MFR2139 | 2000 |
| MFR4527 | 1000 |

■ Appendix For SMD Chip Resistor

● Packaging Information

■ Reel Dimensions



■ Dimension

Unit: mm

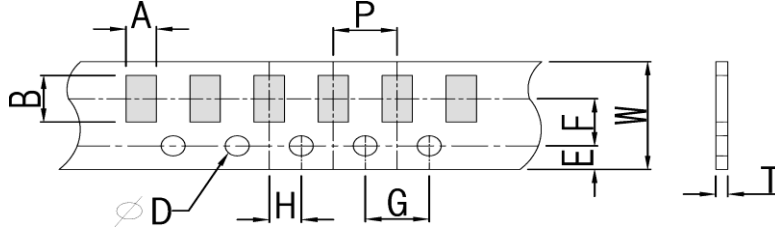
| TYPE | ϕD | W | ϕM |
|---|----------|--------|----------|
| MFR0603 / MFR0805 / MFR1206 / MFR0508 / MFR0612 | 60±2 | 9.0±1 | 178±5 |
| MFR2010 / MFR2512 / MFR0815 / MFR1225 | | 13±1 | |
| MFR3921 / MFR4527 / MFR2139 | | 24.5±1 | |



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Document No. S-10-12-07-05
 Released Date 2020/01/10
 Page No. 9/9

Carrier Dimensions

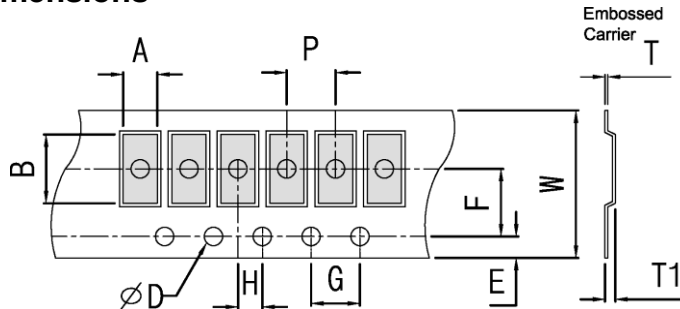


Dimension

Unit: mm

| Item | W | P | E | F | ϕD | G | H | A | Bo | T |
|---------|----------|----------|-----------|----------|------------------------------------|----------|----------|-----------|-----------|-----------|
| MFR0603 | 8.0±0.30 | 4.0±0.10 | 1.75±0.10 | 3.5±0.10 | 1.50 ^{+0.1} ₋₀ | 4.0±0.10 | 2.0±0.10 | 1.18±0.20 | 1.98±0.20 | 0.75±0.20 |
| MFR0805 | | | | | | | | 1.68±0.20 | 2.38±0.20 | 0.87±0.20 |
| MFR0508 | | | | | | | | 2.05±0.20 | 3.65±0.20 | 0.87±0.10 |
| MFR1206 | | | | | | | | | | |
| MFR0612 | | | | | | | | | | |

Embossed Dimensions



Dimension

Unit: mm

| Item | W | P | E | F | ϕD | G | H | A | B | T1 | T |
|---------|-----------|----------|-----------|-----------|------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| MFR1508 | 12.0±0.40 | 4.0±0.10 | 1.75±0.10 | 5.5±0.10 | 1.50 ^{+0.1} ₋₀ | 4.0±0.10 | 2.0±0.10 | 2.40±0.20 | 4.10±0.20 | 0.75±0.20 | 0.25±0.10 |
| MFR2010 | 12.0±0.30 | 4.0±0.10 | 1.75±0.10 | 5.5±0.10 | | 4.0±0.10 | 2.0±0.10 | 2.85±0.20 | 5.45±0.20 | 0.80±0.20 | 0.25±0.10 |
| MFR2512 | 12.0±0.30 | 4.0±0.10 | 1.75±0.10 | 5.5±0.10 | | 4.0±0.10 | 2.0±0.10 | 3.40±0.20 | 6.75±0.20 | 1.00±0.20 | 0.25±0.10 |
| MFR1225 | | | | | | | | | | | |
| MFR3921 | 24.0±0.30 | 8.0±0.10 | 1.75±0.10 | 11.5±0.10 | | 4.0±0.10 | 2.0±0.10 | 5.50±0.20 | 11.5±0.20 | 0.90±0.20 | 0.30±0.10 |
| MFR2139 | | | | | | | | | | | |
| MFR4527 | | | | | | 24.0±0.30 | 12.0±0.10 | 1.75±0.10 | 11.5±0.10 | 4.0±0.10 | 2.0±0.10 |

Peeling Strength of Seal Tape

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

Storage Temperature

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

单击下面可查看定价，库存，交付和生命周期等信息

[>>天二](#)