



## Specification for Approval

Customer : 深圳市立創電子商務有限公司

Product Name: Metal Strip Current Sensing Chip Resistors

Part Name : MS SERIES

Part No. : MS\*\*\*\*J\*\*\*\*T\*E、MS\*\*\*\*F\*\*\*\*T\*E

Building 8, Jiuwei Industrial Zone, Xixiang Town, Bao'An District ,Shenzhen, Guangdong, China

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## Uniroyal Electronics Global Co.,Ltd Shenzhen Branch



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001610656

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|                             |                |                      |                   |                   |                   |               |
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| <b>William Zhao</b>         | <b>Ted Hsu</b> | <b>Chengxia Tang</b> | <b>JLC-01-016</b> | <b>1</b>          | <b>2017/07/03</b> | <b>3 / 10</b> |

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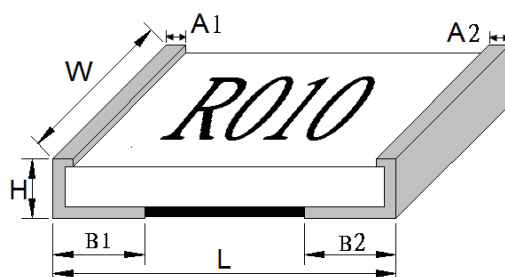


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### 1.0 Scope:

This file is specification of **Metal Strip Current Sensing Chip Resistors** manufactured by UNIOHM.

### 2.0 Ratings & dimension:



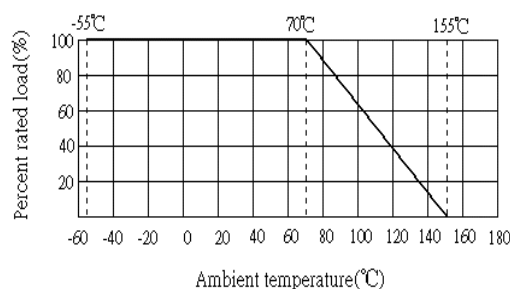
Dimension (mm)

| Type | Power<br>70°C | Dimension(mm) |           |           |       |                | Resistance Range |
|------|---------------|---------------|-----------|-----------|-------|----------------|------------------|
|      |               | L             | W         | H         | A1/A2 | B1/B2          | 1.0%&5%          |
| MS05 | 1/2W          | 2.00±0.30     | 1.20±0.30 | 0.60±0.20 | ≤1.0  | 0.50±0.25      | 5~30mΩ           |
| MS06 | 1W            | 3.10±0.20     | 1.60±0.30 | 0.70±0.20 | ≤1.0  | 0.50~1.00±0.25 | 3~51mΩ           |
| MS07 | 1.5W          | 3.10±0.20     | 2.50±0.25 | 0.70±0.20 | ≤1.0  | 0.65±0.25      | 3~150mΩ          |
| MS11 | 2W            | 4.40±0.20     | 3.20±0.25 | 0.70±0.20 | ≤1.0  | 0.80~1.50±0.30 | 2~100mΩ          |
| MS10 | 1.5W          | 5.00±0.20     | 2.50±0.25 | 0.70±0.20 | ≤1.0  | 0.70~1.40±0.30 | 2~150mΩ          |
| MS12 | 3W            | 6.35±0.20     | 3.20±0.25 | 1.00±0.20 | ≤1.0  | 1.80~2.50±0.30 | 1~2mΩ            |
|      | 3W            | 6.35±0.20     | 3.20±0.25 | 0.70±0.20 | ≤1.0  | 1.20~1.90±0.30 | 3~100mΩ          |
|      | 2W            | 6.35±0.20     | 3.20±0.25 | 0.70±0.20 | ≤1.0  | 1.20~1.90±0.30 | 101~250mΩ        |
| MS28 | 4W            | 6.70±0.20     | 7.20±0.25 | 0.70±0.20 | ≤1.0  | 0.80±0.30      | 5~100mΩ          |
| MS17 | 3W            | 7.10±0.20     | 4.20±0.20 | 0.70±0.20 | ≤1.0  | 1.10~1.50±0.30 | 3~150mΩ          |
| MS20 | 5W            | 11.00±0.30    | 5.00±0.25 | 0.65±0.20 | ≤1.0  | 2.50±0.30      | 10~20mΩ          |
|      | 3W            | 11.00±0.30    | 5.00±0.25 | 0.65±0.20 | ≤1.0  | 2.50±0.30      | 2~9mΩ 21~50mΩ    |
| MS27 | 5W            | 11.60±0.30    | 6.70±0.25 | 0.60±0.20 | ≤1.0  | 2.50±0.30      | 10~30mΩ          |
|      | 3W            | 11.60±0.30    | 6.70±0.25 | 0.60±0.20 | ≤1.0  | 2.50±0.30      | 2~9mΩ 31~100mΩ   |

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### 3.0 Power Rating:

Resistor shall have a power rating based on continuous load operation at ambient temperature from -55°C to 155°C.



### 4.0 Voltage rating:

Resistor shall have one voltage specifications at direct-current (DC) continuous voltage or approximate single-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage. We can calculate the Voltage from the following formula:

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

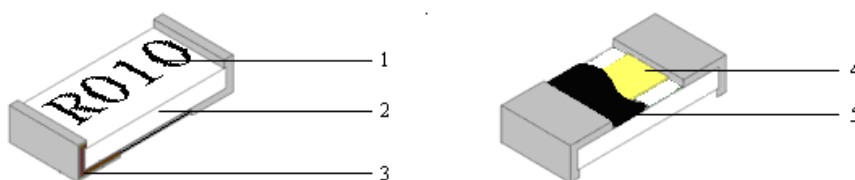
Remark:

RCWV: Rate Continuous Working Voltage. (Volt)

P: Power Rating (Watt.)

R: Nominal Resistance (Ohm)

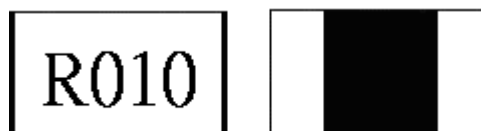
### 5.0 Structure:



|   |                      |   |                  |
|---|----------------------|---|------------------|
| 1 | Marking              | 4 | Resistance layer |
| 2 | Alumina Substrate    | 5 | Protective layer |
| 3 | Terminal (Cu/Ni/ Sn) |   |                  |

### 6.0 Marking:

First code should be "R" which meaning as decimal point.



R010→10mΩ

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### 7.0 Performance specification:

| Item                                           | Limits                                                                                                | Test Method (JIS-C-5201&5202)                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient                        | MS05 5~30mΩ : ±150ppm/°C                                                                              | Resistance value will change when temperature changes per centigrade.<br>$\frac{R_2 - R_1}{R_1 (T_1 - T_2)} \times 10^6 (PPM/°C)$ R <sub>1</sub> : Resistance value at room temp. (t <sub>1</sub> )<br>R <sub>2</sub> :Resistance value at room temp.+100°C (t <sub>2</sub> )<br>Test condition:<br>1 <sup>st</sup> condition: room temp. (t <sub>1</sub> ),<br>2 <sup>nd</sup> condition: room temp. +100°C(t <sub>2</sub> ) |
|                                                | MS06 3~25mΩ : ±100ppm/°C<br>26~51 mΩ : ±50ppm/°C                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS07 ±30ppm/°C                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS11 ±30ppm/°C                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS10 2~10mΩ : ±50ppm/°C<br>11~150mΩ : ±30ppm/°C                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS12 2W 101-250mΩ: ±30ppm/°C<br>3W 3-100mΩ: ±30ppm/°C<br>3W 1~2 mΩ: ±50ppm/°C                         |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS28 ±50ppm/°C                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS17 ±30ppm/°C                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS20 ±30ppm/°C                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                | MS27 ±30ppm/°C                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Item                                           | Limits                                                                                                | Test Method (JIS-C-5201&5202)                                                                                                                                                                                                                                                                                                                                                                                                 |
| Short-time overload                            | Resistance change rate must be in<br>1%: ±(1%+0.001Ω)<br>5%:±(2%+0.001Ω)<br>and no mechanical damage. | Permanent resistance change after the application of a potential of 5 times rated power for 5 seconds.                                                                                                                                                                                                                                                                                                                        |
| Low Temperature Storage                        | ±(1.0%+0.001Ω)ΔR                                                                                      | - 55 °C for 1000hrs                                                                                                                                                                                                                                                                                                                                                                                                           |
| High Temperature Exposure                      | ±(1.0%+0.001Ω)ΔR                                                                                      | 155°C for 1000hrs                                                                                                                                                                                                                                                                                                                                                                                                             |
| Solderability                                  | More than 95% coverage rate                                                                           | The surface of solder must be new, smooth, clean, shiny and continuous, and without concentrated pinholes. The solder's temperature must be within 245±3°C.Hold in hot solder 2~3seconds.                                                                                                                                                                                                                                     |
| Resistance rate of change after soldering heat | ±(0.5%+0.005Ω)ΔR                                                                                      | Dipped into solder at 260°Cfor 10 seconds.                                                                                                                                                                                                                                                                                                                                                                                    |
| Load life                                      | 1%:± (1%+0.001Ω)ΔR<br>5%:± (3%+0.001Ω)ΔR<br>Without mechanical damage                                 | Permanent resistance change after 1,000 hours operating at rated power at 70±2°C, 1.5hrs ON ,0.5hrs OFF.                                                                                                                                                                                                                                                                                                                      |
| Temperature cycling                            | ± (0.5%+0.005Ω)ΔR                                                                                     | -55°Cto+155°C, 5cycles,30min at each extreme test cycle                                                                                                                                                                                                                                                                                                                                                                       |
| Load life in humidity                          | 1%:± (1.0%+0.001Ω)ΔR<br>5%:± (3.0%+0.001Ω)ΔR                                                          | 40±2°C,1000hrs at rated power,90~95%RH , 1.5hrs ON,0.5hrs OFF.                                                                                                                                                                                                                                                                                                                                                                |

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### 8.0 Part No. System:

Part No. System has 14 codes.

8.1 1<sup>st</sup> ~4<sup>th</sup> codes: Product name. E.g.:MS05, MS06, MS07,MS10, MS11,MS12, MS17, MS20, MS27

8.2 5<sup>th</sup> ~6<sup>th</sup> codes: Power rating.

E.g.: W=Normal Size; "1"~"G"to denotes"1"~"16"as Hexadecimal:1W~16W ( $\geq 1W$ )

|         |     |     |     |     |     |     |     |      |      |
|---------|-----|-----|-----|-----|-----|-----|-----|------|------|
| Wattage | 1   | 2   | 3   | 5   | 7   | 8   | 9   | 10   | 15   |
| code    | 1W  | 2W  | 3W  | 5W  | 7W  | 8W  | 9W  | AW   | FW   |
| Wattage | 1/2 | 1/3 | 1/4 | 1/5 | 1/7 | 1/8 | 1/9 | 1/10 | 1/15 |
| code    | W2  | W3  | W4  | W5  | W7  | W8  | W9  | WA   | WF   |

8.3 7<sup>th</sup> code: Resistors' tolerance. E.g.: F= $\pm 1\%$  J= $\pm 5\%$

8.4 8<sup>th</sup> ~ 11<sup>th</sup> codes: Resistance value.

8.4.1 If the value belongs to E-96 series, 8<sup>th</sup>~10<sup>th</sup> digits means the significant figures of the resistance and the 11<sup>th</sup> digit are the power of ten.

8.4.2 We use the power of ten in 11<sup>th</sup> digit.

0= $10^0$  1= $10^1$  2= $10^2$  3= $10^3$  4= $10^4$  5= $10^5$  6= $10^6$  J= $10^{-1}$  K= $10^{-2}$  L= $10^{-3}$  M= $10^{-4}$

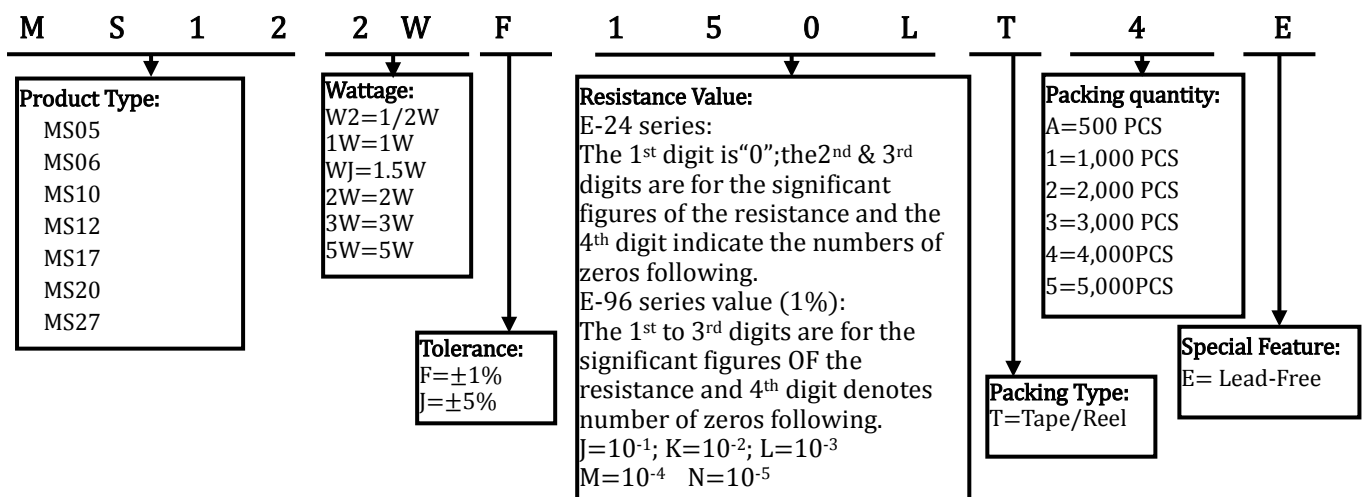
8.5 12<sup>th</sup> code: Packaging Type. E.g.: T: Tape/Reel

13<sup>th</sup> code: Standard Packing Quantity.

E.g.: 1=1,000PCS 2=2,000PCS 3=3,000PCS 4=4,000 PCS 5=5,000PCS

8.6 14<sup>th</sup> code: Special features information. E.g.: E=For "Environmental Protection, Lead Free type"

### 9.0 Ordering Procedure:( Example: MS12 2W $\pm 1\%$ 0.15 $\Omega$ T/R-4000)



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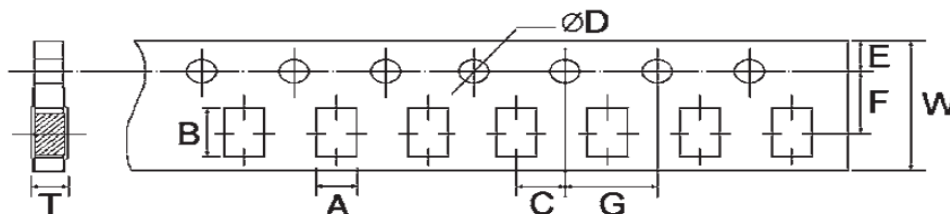
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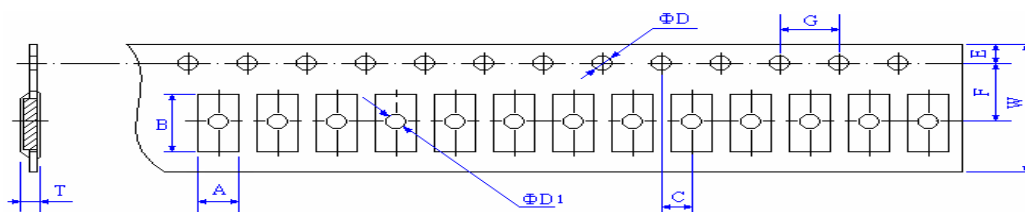
### 10.0 Packaging:

#### 10.1 Tapping dimension:



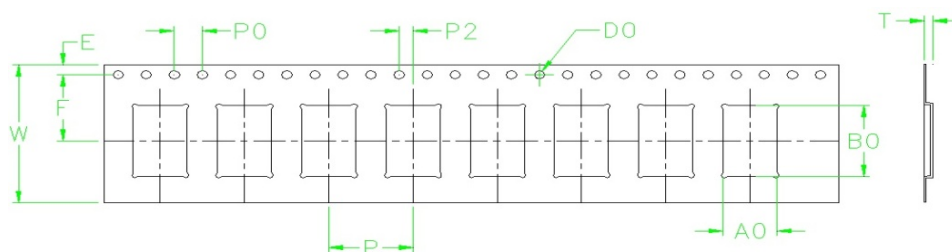
Unit: mm

| TYPE | A ± 0.2 | B ± 0.2 | C ± 0.05 | φD ± 0.1 | E ± 0.1 | F ± 0.05 | W ± 0.2 | T ± 0.10 | G ± 0.1 |
|------|---------|---------|----------|----------|---------|----------|---------|----------|---------|
| MS05 | 2.00    | 3.6     | 2.00     | 1.50     | 1.75    | 3.50     | 8.00    | 0.81     | 4.00    |
| MS06 | 2.00    | 3.60    | 2.00     | 1.50     | 1.75    | 3.50     | 8.00    | 0.81     | 4.00    |
| MS07 | 2.80    | 3.50    | 2.00     | 1.50     | 1.75    | 3.50     | 8.00    | 0.75     | 4.00    |



Unit: mm

| TYPE | A ± 0.2 | B ± 0.2 | C ± 0.05 | φD ± 0.1 | φD1 ± 0.25 | E ± 0.1 | F ± 0.05 | W ± 0.2 | T ± 0.10 | G ± 0.1 |
|------|---------|---------|----------|----------|------------|---------|----------|---------|----------|---------|
| MS10 | 2.80    | 5.40    | 2.00     | 1.50     | 1.50       | 1.75    | 5.50     | 12.00   | 0.75     | 4.00    |
| MS11 | 3.50    | 4.80    | 2.00     | 1.50     | 1.50       | 1.75    | 5.50     | 12.00   | 1.00     | 4.00    |
| MS12 | 3.50    | 6.70    | 2.00     | 1.50     | 1.50       | 1.75    | 5.50     | 12.00   | 1.00     | 4.00    |



Unit: mm

| TYPE | W ± 0.3 | A0 ± 0.1 | B0 ± 0.1 | P ± 0.1 | F ± 0.1 | E ± 0.1 | D0 ± 0.1 | P0 ± 0.1 | P2 ± 0.1 | T ± 0.05 |
|------|---------|----------|----------|---------|---------|---------|----------|----------|----------|----------|
| MS17 | 16.0    | 4.50     | 7.40     | 8.00    | 7.50    | 1.75    | 1.5      | 4.0      | 2.0      | 0.30     |

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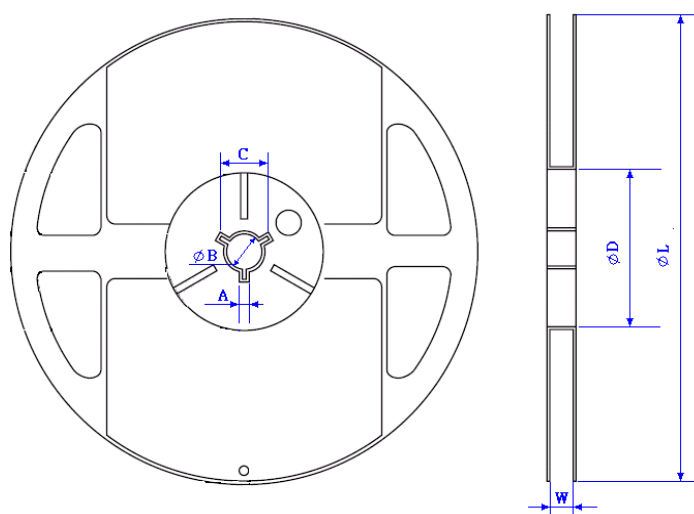
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| TYPE | W±0.3 | A0±0.1 | B0±0.1 | P±0.1 | F±0.1 | E±0.1 | D0±0.1 | P0±0.1 | P2±0.1 | T±0.05 |
|------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|
| MS20 | 24.0  | 5.40   | 11.5   | 8.0   | 11.5  | 1.75  | 1.5    | 4.0    | 2.0    | 0.3    |

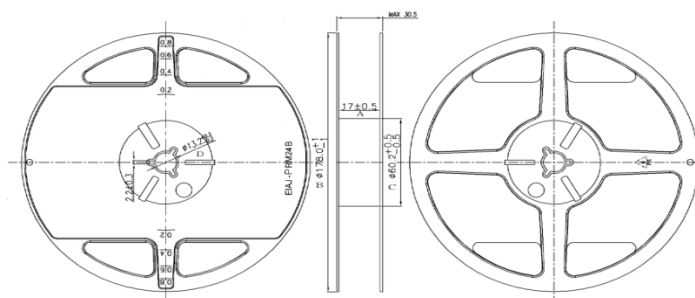
| TYPE | W±0.5 | A0±0.2 | B0±0.2 | P±0.2 | F±0.3 | E±0.2 | D0±0.2 | P0±0.2 | P2±0.3 | T±0.2 |
|------|-------|--------|--------|-------|-------|-------|--------|--------|--------|-------|
| MS27 | 24.0  | 7.2    | 11.9   | 12.0  | 11.5  | 1.75  | 1.5    | 4.0    | 2.0    | 1.3   |

### 10.2 Reel dimension:



UNIT: mm

| TYPE | TAPING              | Qty/Reel | A±0.5 | B±0.5 | C±0.5 | ΦD±1 | ΦL±2  | W±1  |
|------|---------------------|----------|-------|-------|-------|------|-------|------|
| MS05 | Emboss Plastic Tape | 5,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| MS06 | Emboss Plastic Tape | 5,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| MS07 | Emboss Plastic Tape | 5,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| MS10 | Emboss Plastic Tape | 4,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 13.8 |
| MS11 | Emboss Plastic Tape | 4,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 13.8 |
| MS12 | Emboss Plastic Tape | 4,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 13.8 |



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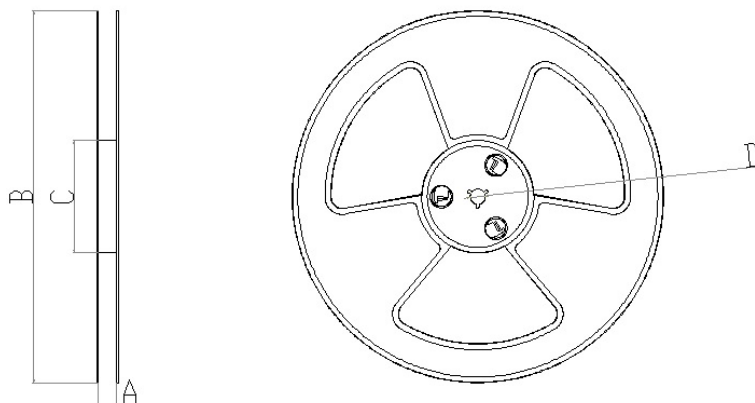
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UNIT: mm

| TYPE | TAPING   | Qty/Reel | A±0.5 | B±1.0 | C±0.5 | D <sup>+0.3</sup> <sub>-0.2</sub> |
|------|----------|----------|-------|-------|-------|-----------------------------------|
| MS17 | Embossed | 1,000pcs | 17.0  | 178.0 | 60.2  | 13.2                              |



UNIT: mm

| TYPE | TAPING   | Qty/Reel | A±1.0 | B±2.0 | C±1.0 | D±0.2 |
|------|----------|----------|-------|-------|-------|-------|
| MS20 | Embossed | 1,000pcs | 25.4  | 330.0 | 100.0 | 13.0  |

| TYPE | TAPING   | Qty/Reel | A±0.5 | B±1.5 | C±1.5 | D±0.5 |
|------|----------|----------|-------|-------|-------|-------|
| MS27 | Embossed | 1,000pcs | 24.5  | 330.0 | 100.0 | 13.0  |

### 11.0 Note:

11.1 UNIOHM recommends the storage condition as below:

11.1.1 Temperature: 15°C~35°C.

11.1.2 Humidity: 25%~75%.

Even under recommended condition, products' solderability will degrade day by day.

11.2 Please hold the cartons in correct direction signed on cartons' side during storage and delivery.

11.3 Resistor performance and solderability will fail if stored in the following condition:

11.3.1 High electrostatic environment.

11.3.2 Direct sunlight, rain, snow and so on.

11.3.3 In sea wind or corrosive gases long time, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>.

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