

# APPROVAL SHEET

**WW12R, WW08R, WW06R**

**±1%, ±5%**

Metal Low Ohm Power Chip Resistors

Size 1206 (1W), 0805 (0.5W), 0603 (0.33W)

RoHS Exemption free and Lead free

Sensing Type

\*Contents in this sheet are subject to change without prior notice.

## FEATURE

1. Metal ultra low and stable TCR performance
2. High power rating and compact size
3. High reliability and stability
4. Reduced size of final equipment
5. RoHS exemption free & Halogen free & Lead free
6. Inductance below 1nH

## APPLICATION

- Power supply
- PDA
- Digital meter
- Computer
- Automotives
- Battery charger
- DC-DC power converter

## DESCRIPTION

The resistors are constructed in a high grade low resistive metal body. The resistive layer is covered with a protective coat and printed a resistance marking code over it. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a Lead free terminations.



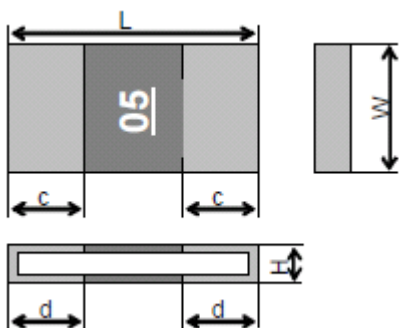
Fig 1. Construction of Chip-R

**QUICK REFERENCE DATA**

| Item                                 | General Specification |                              |              |
|--------------------------------------|-----------------------|------------------------------|--------------|
| Series No.                           | WW06R                 | WW08R                        | WW12R        |
| Size code                            | 0603 ( 1608 )         | 0805 ( 2012 )                | 1206 (3216)  |
| Resistance Tolerance                 | ±5% , ±1%             |                              |              |
| Resistance Range                     | 5, 10mΩ               | 2, 3, 4, 5, 6, 7, 8, 9 10mΩ, | 1 ~ 15 mΩ    |
| TCR (ppm/°C)                         | ±70 ppm/°C            |                              |              |
| Max. power at T <sub>amb</sub> =70°C | 1/3 W                 | 1/2 W                        | 1W           |
| Max. Operation Current (DC or RMS)   | 8.1A, 5.7A            | 7A ~ 15.8A                   | 31.6A ~ 8.2A |
| Operation temperature                | -55 ~ +155°C          |                              |              |

Note : Max. Operation Current : So called RCWC (Rated Continuous Working Current) is determined by

$$RCWC = \sqrt{\text{Rated Power} / \text{Resistance Value}} \text{ listed above.}$$

**MECHANICAL DATA**

Unit: mm

| Type  | Size (inch) | Resistance | L (mm)    | W (mm)    | H (mm)    | c (mm)    | d (mm)    |
|-------|-------------|------------|-----------|-----------|-----------|-----------|-----------|
| WW06R | 0603        | 5mΩ        | 1.60±0.10 | 0.80±0.10 | 0.33±0.10 | 0.20±0.10 | 0.50±0.10 |
|       |             | 10mΩ       |           |           | 0.30±0.10 | 0.20±0.10 | 0.30±0.10 |
| WW08R | 0805        | 2mΩ        | 2.0±0.15  | 1.25±0.15 | 0.22±0.10 | 0.35±0.10 | 0.55±0.20 |
|       |             | 3mΩ        |           |           | 0.45±0.10 | 0.35±0.10 | 0.75±0.20 |
|       |             | 4mΩ        |           |           | 0.35±0.10 | 0.35±0.10 | 0.75±0.20 |
|       |             | 5mΩ        |           |           | 0.35±0.10 | 0.35±0.10 | 0.60±0.20 |
|       |             | 6mΩ        |           |           | 0.35±0.10 | 0.35±0.10 | 0.47±0.20 |
|       |             | 7mΩ        |           |           | 0.22±0.10 | 0.35±0.10 | 0.75±0.20 |
|       |             | 8mΩ        |           |           | 0.22±0.10 | 0.35±0.10 | 0.60±0.20 |
|       |             | 9mΩ        |           |           | 0.22±0.10 | 0.35±0.10 | 0.52±0.20 |
|       |             | 10mΩ       |           |           | 0.22±0.10 | 0.30±0.10 | 0.47±0.20 |
| WW12R | 1206        | 1mΩ        | 3.2±0.15  | 1.60±0.15 | 0.32±0.10 | 1.10±0.25 |           |

|  |      |  |           |                       |
|--|------|--|-----------|-----------------------|
|  | 2mΩ  |  | 0.32±0.10 | 0.50±0.25             |
|  | 3mΩ  |  | 0.35±0.10 | 0.70±0.25   1.30±0.25 |
|  | 4mΩ  |  | 0.35±0.10 | 1.10±0.25             |
|  | 5mΩ  |  | 0.35±0.10 | 1.00±0.25             |
|  | 6mΩ  |  | 0.35±0.1  | 0.80±0.25             |
|  | 7mΩ  |  | 0.35±0.1  | 0.70±0.25             |
|  | 8mΩ  |  | 0.35±0.1  | 0.50±0.25             |
|  | 9mΩ  |  | 0.28±0.1  | 0.55±0.25             |
|  | 10mΩ |  | 0.28±0.1  | 0.50±0.25             |
|  | 11mΩ |  | 0.22±0.1  | 0.80±0.25             |
|  | 12mΩ |  | 0.22±0.1  | 0.70±0.25             |
|  | 13mΩ |  | 0.22±0.1  | 0.60±0.25             |
|  | 14mΩ |  | 0.22±0.1  | 0.55±0.25             |
|  | 15mΩ |  | 0.22±0.1  | 0.50±0.25             |

## MARKING

WW12R/WW08R each resistor is marked with a 2-digit code with underline on the protective coating to designate the nominal resistance value. WW06R has no marking!

Example:

$$\underline{05} = 0.005\Omega$$

$$\underline{10} = 0.010\Omega$$

## FUNCTIONAL DESCRIPTION

### Derating curve

The power that the resistor can dissipate depends on the operating temperature; see Fig.2

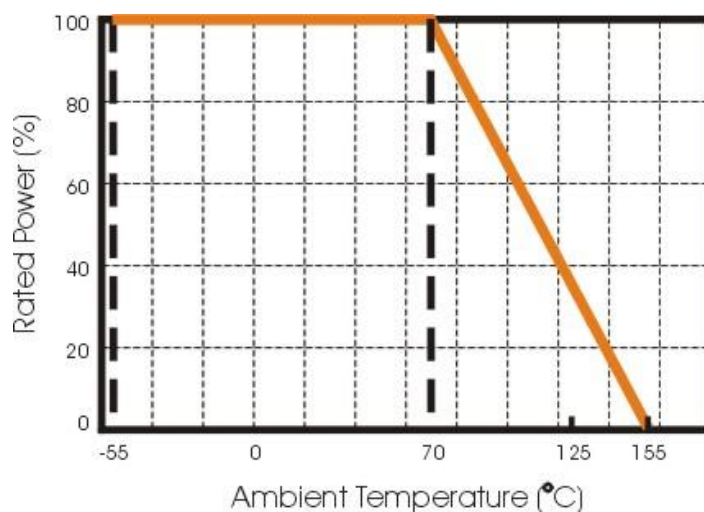


Fig.2 Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## SOLDERING CONDITIONS

The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260°C for 10 seconds. Therefore, it is possible to mount Surface Mount Resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs).

Surface Mount Resistors are tested for solderability at 245°C during 3 seconds within lead-free solder bath. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in Fig

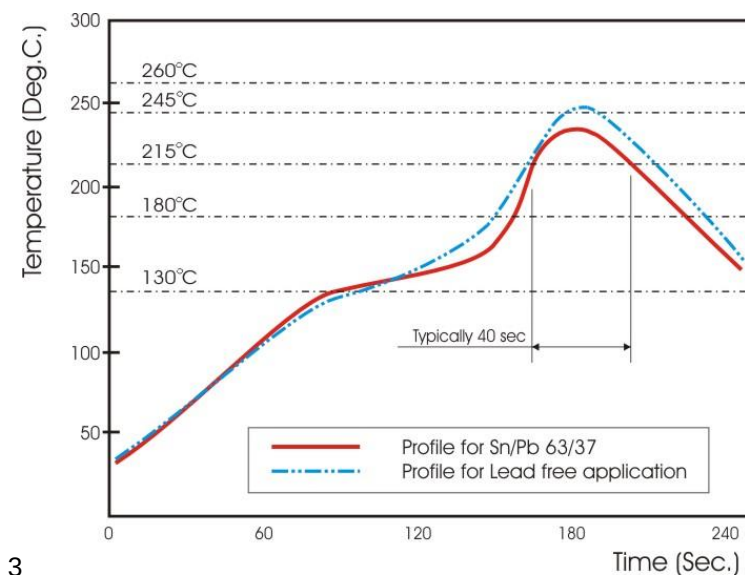


Fig 3. Infrared soldering profile for Chip Resistors WWxxR

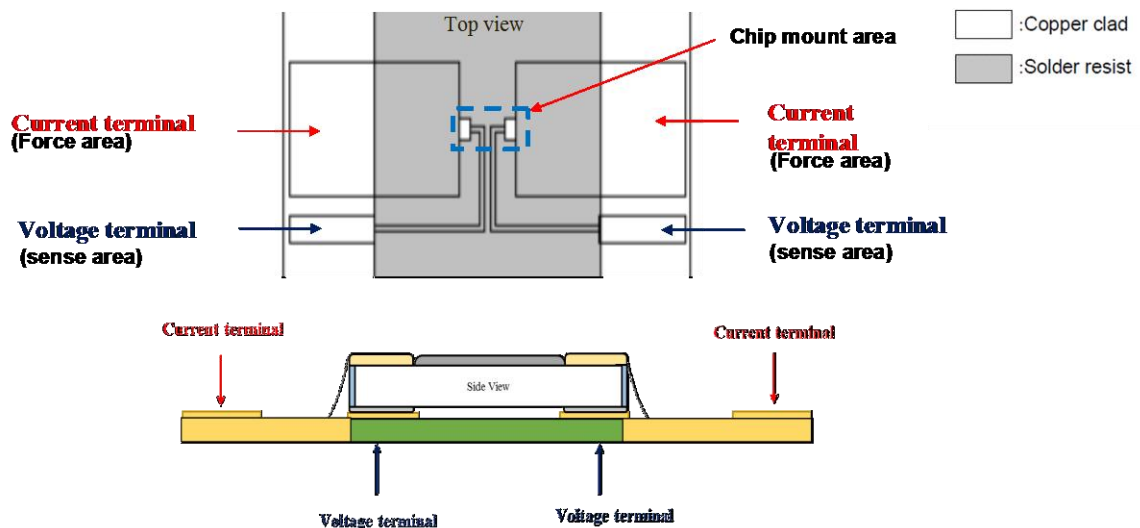
## CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

| WW06        | R              | R005                                               | J             | T              | L                       |
|-------------|----------------|----------------------------------------------------|---------------|----------------|-------------------------|
| Size code   | Type code      | Resistance code                                    | Tolerance     | Packaging code | Termination code        |
| WW06 : 0603 | R : 1/3W, 0603 | R is first digit followed by 3 significant digits. | J : $\pm 5\%$ | T : 7" reel    | L = Sn base (lead free) |
| WW08 : 0805 | 1/2W, 0805     | 0.010 $\Omega$ = R010                              | F : $\pm 1\%$ | Q : 10" reel   |                         |
| WW12 : 1206 | 1W, 1206       | 0.005 $\Omega$ = R005                              |               |                |                         |

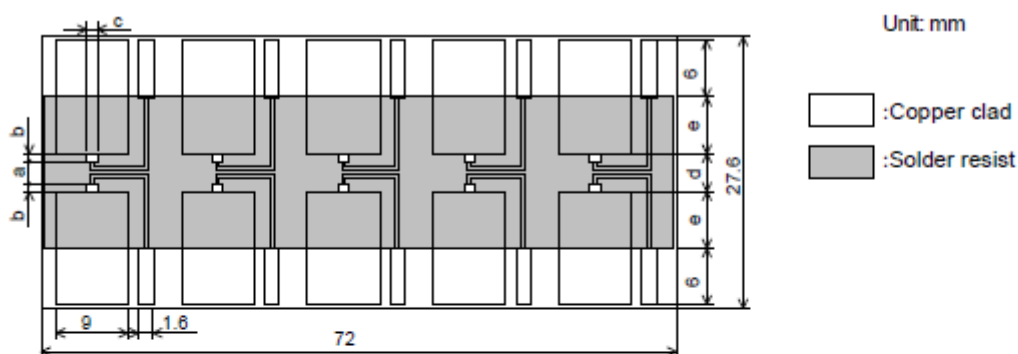
Reeled tape packaging : 8mm width paper taping 5,000pcs per 7" reel. 10,000pcs per 10" reel.

## RESISTANCE MEASUREMENT SCHEMATIC DIAGRAM



The resistance measured is based on mounted on PCB to match with customer field application.

## RECOMMENDED PCB LAND PATTERN



| Style | Rated resistance (mΩ) | a   | b    | c    | d   | e    |
|-------|-----------------------|-----|------|------|-----|------|
| WW06R | 5                     | 0.6 | 0.9  | 0.9  | 2.2 | 6.2  |
|       | 10                    | 1.0 | 0.6  |      |     |      |
| WW08R | 2,3                   | 0.5 | 1.1  | 1.36 | 2.7 | 5.95 |
|       | 4 to 10               | 0.8 | 0.95 |      |     |      |
| WW12R | 1                     | 1.0 | 1.45 | 1.7  | 3.9 | 5.35 |
|       | 2                     | 2.1 | 0.9  |      |     |      |
|       | 3                     | 0.8 | 1.55 |      |     |      |
|       | 4                     | 1.0 | 1.45 |      |     |      |
|       | 5 and 6               | 1.4 | 1.25 |      |     |      |
|       | 7 to 15               | 2.1 | 0.9  |      |     |      |

Remark: Material: Epoxy resin based as glass fabric(Specified in JIS C 6484).

Thickness: 1.6mm Thickness of copper clad: 0.035mm

**TEST & REQUIREMENTS**

Table- 4(1)

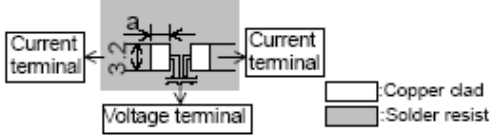
| No. | Test items                                                                                  | Condition of test (JIS C 5201-1)                                                                                                                                                                                                                                                                                                                                                                                                                    | Performance requirements                                                                                                                                                      |
|-----|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Visual examination                                                                          | Sub-clause 4.4.1<br>Checked by visual examination.                                                                                                                                                                                                                                                                                                                                                                                                  | As in 4.4.1<br>The marking shall be legible, as checked by visual examination.                                                                                                |
| 2   | Dimension<br><br>Resistance                                                                 | Sub-clause 4.4.2<br><br>Resistance value shall be measured by mounting the substrate of the following condition.<br><br>a: 2.9mm (2mΩ, 3mΩ, 4mΩ),<br>1.8mm (5mΩ)<br>Thickness of copper clad: 0.035mm<br>4-Terminal method<br>Measurement current: 1(A)<br>Note: The measuring apparatus corresponding to DC Low-ohm Meter (1A) of AX-1152D for ADEX CORPORATION. | As specified in Table-3 of this specification.<br>As in 4.5.2<br>The resistance value shall correspond with the rated resistance taking into account the specified tolerance. |
| 3   | Voltage proof                                                                               | Sub-clause 4.7<br>Method: 4.6.1.4(See Figure-5)<br>Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage.<br>Duration: 60 ±5 s<br>Insulation resistance<br>Test voltage: Insulation voltage<br>Duration: 1 min.                                                                                                                                                                                                  | No breakdown or flash over<br><br><br>$R \geq 1 \text{ G}\Omega$                                                                                                              |
| 4   | Solderability                                                                               | Sub-clause 4.17<br>Without aging<br>Flux: The resistors shall be immersed in a non-activated soldering flux for 2 s.<br>Bath temperature: 235 °C±5 °C<br>Immersion time: 2 s±0.5 s                                                                                                                                                                                                                                                                  | As in 4.17.4.5<br>The terminations shall be covered with a smooth and bright solder coating.                                                                                  |
| 5   | Mounting<br><br>Overload<br>(in the mounted state)<br><br>Solvent resistance of the marking | Sub-clause 4.31<br>Substrate material: Epoxide woven glass<br>Test substrate: Figure-3<br>Sub-clause 4.13<br>The applied voltage shall be 2.5 times the rated voltage or the current corresponding to.<br>Duration: 2 s<br>Visual examination<br>Resistance<br>Sub-clause 4.30<br>Solvent: 2-propanol<br>Solvent temperature: 23 °C±5 °C<br>Method 1<br>Rubbing material: cotton wool<br>Without recovery                                           | No visible damage<br>$\Delta R \leq \pm 1\%$<br>Legible marking                                                                                                               |

Table-4(2)

| No | Test items                                                                      | Condition of test (JIS C 5201-1)                                                                                                                                                                                                                                                                                                                                                                                                                     | Performance requirements                                                                                                           |
|----|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 6  | Mounting<br><br>Bond strength of the end face plating<br><br>Final measurements | Sub-clause 4.31<br>Substrate material: Epoxide woven glass<br>Test substrate: Figure-4<br>Sub-clause 4.33<br>Bent value: 1 mm<br>Resistance<br>Sub-clause 4.33.6<br>Visual examination                                                                                                                                                                                                                                                               | $\Delta R \leq \pm 1\%$<br><br>No visible damage                                                                                   |
| 7  | Resistance to soldering heat<br><br><br>Component resistance      solvent       | Sub-clause 4.18<br>Solder temperature: $260\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$<br>Immersion time: $10 \pm 0.5\text{ s}$<br>Visual examination<br><br>Resistance<br>Sub-clause 4.29<br>Solvent: 2-propanol<br>Solvent temperature: $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$<br>Method 2<br>Recovery: 48 h<br>Visual examination<br>Resistance                                                                   | As in 4.18.3.4<br>No sign of damage such as cracks.<br>$\Delta R \leq \pm 1\%$<br><br>No visible damage<br>$\Delta R \leq \pm 1\%$ |
| 8  | Mounting<br><br>Adhesion<br><br>Rapid change temperature                        | Sub-clause 4.31<br>Substrate material: Epoxide woven glass<br>Test substrate: Figure-3<br>Sub-clause 4.32<br>Force: 5 N<br>Duration: $10 \pm 1\text{ s}$<br>Visual examination<br>Sub-clause 4.19<br>Lower category temperature: $-55\text{ }^{\circ}\text{C}$<br>Upper category temperature: $+155\text{ }^{\circ}\text{C}$<br>Duration of exposure at each temperature: 30 min.<br>Number of cycles: 5 cycles.<br>Visual examination<br>Resistance | No visible damage<br><br><br><br><br><br><br>No visible damage<br>$\Delta R \leq \pm 1\%$                                          |



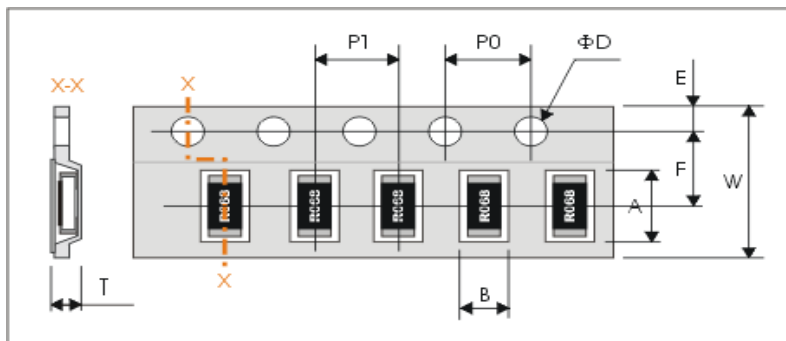
| No | Test items                                                                                                                                                                                                 | Condition of test (JIS C 5201-1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Performance requirements                                                             |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 9  | <p>Climatic sequence</p> <p>–Dry heat</p> <p>–Damp heat, cycle<br/>(12+12hour cycle)<br/>First cycle</p> <p>–Cold</p> <p>–Damp heat, cycle<br/>(12+12hour cycle)<br/>Remaining cycle</p> <p>–D.C. load</p> | <p>Sub-clause 4.23</p> <p>Sub-clause 4.23.2</p> <p>Test temperature: +155 °C</p> <p>Duration: 16 h</p> <p>Sub-clause 4.23.3</p> <p>Test method: 2</p> <p>Test temperature: 55 °C</p> <p>[Severity(2)]</p> <p>Sub-clause 4.23.4</p> <p>Test temperature –55 °C</p> <p>Duration: 2h</p> <p>Sub-clause 4.23.6</p> <p>Test method: 2</p> <p>Test temperature: 55 °C</p> <p>[Severity (2)]</p> <p>Number of cycles: 5 cycles</p> <p>Sub-clause 4.23.7</p> <p>The applied current shall be the rated current.</p> <p>Duration: 1 min.</p> <p>Visual examination</p> <p>Resistance</p> | <p>No visible damage</p> <p><math>\Delta R \leq \pm(1\%+0.0005\text{ohm})</math></p> |
| 10 | <p>Mounting</p> <p>Endurance at 70 °C</p>                                                                                                                                                                  | <p>Sub-clause 4.31</p> <p>Substrate material: Epoxide woven glass</p> <p>Test substrate: Figure-3</p> <p>Sub-clause 4.25.1</p> <p>Ambient temperature: 70 °C±2 °C</p> <p>Duration: 1000 h</p> <p>The current shall be applied in cycles of 1.5 h on and 0.5 h.</p> <p>The applied current shall be the rated current</p> <p>Examination at 48 h, 500 h and 1000 h:</p> <p>Visual examination</p> <p>Resistance</p>                                                                                                                                                              | <p>No visible damage</p> <p><math>\Delta R \leq (1\%+0.0005\text{ohm})</math></p>    |

Table-4(4)

| No | Test items                                                                         | Condition of test (JIS C 5201-1)                                                                                                                                                                                                                                              | Performance requirements                                                                                            |
|----|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 11 | Mounting<br><br>Variation of resistance with temperature                           | Sub-clause 4.31<br>Substrate material: Epoxide woven glass<br>Test substrate: Figure-3<br><br>Sub-clause 4.8<br>+20 °C / +155 °C                                                                                                                                              | As in Table-1                                                                                                       |
| 12 | Mounting<br><br>Damp heat, steady state                                            | Sub-clause 4.31<br>Substrate material: Epoxide woven glass<br>Test substrate: Figure-3<br><br>Sub-clause 4.24<br>Ambient temperature: 40 °C±2 °C<br>Relative humidity: 93 <sup>+2</sup> <sub>-3</sub> %<br>Without current applied.<br>Visual examination<br><br>Resistance   | No visible damage<br>Legible marking<br>$\Delta R \leq \pm(1\%+0.0005\text{ohm})$                                   |
| 13 | Dimensions (detail)<br><br>Mounting<br><br>Endurance at upper category temperature | Sub-clause 4.4.3<br><br>Sub-clause 4.31<br>Substrate material: Epoxide woven glass<br>Test substrate: Figure-3<br><br>Sub-clause 4.25.3<br>Ambient temperature: 155 °C±2 °C<br>Duration: 1000 h<br>Examination at 48 h, 500 h and 1000 h:<br>Visual examination<br>Resistance | As in Table-4<br><br><br><br><br><br><br><br><br><br>No visible damage<br>$\Delta R \leq \pm(1\%+0.0005\text{ohm})$ |

## PACKAGING

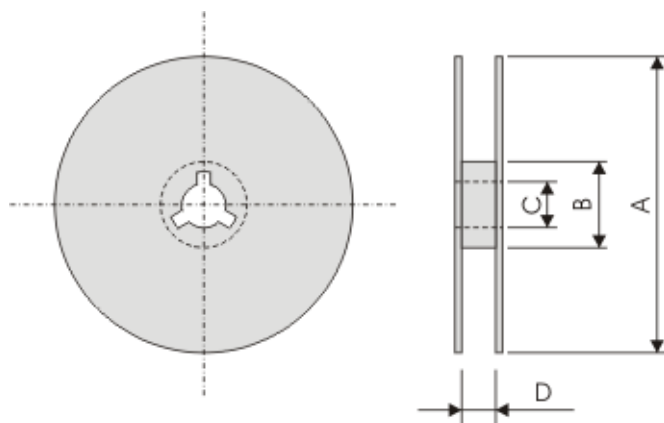
Paper Tape specifications (unit :mm)



| Symbol | A         | B         | W         | F         | E         |
|--------|-----------|-----------|-----------|-----------|-----------|
| WW06R  | 1.90±0.20 | 1.15±0.15 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| WW08R  | 2.50±0.20 | 1.65±0.15 |           |           |           |
| WW12R  | 3.60±0.20 | 2.00±0.15 |           |           |           |

| Symbol | P1        | P0        | ΦD                        | T        |
|--------|-----------|-----------|---------------------------|----------|
| WW06R  | 4.00±0.10 | 4.00±0.10 | $\Phi 1.50^{+0.1}_{-0.0}$ | 0.8 max. |
| WW08R  |           |           |                           | 1.0 max. |
| WW12R  |           |           |                           | 1.0 max. |

## Reel dimensions



| Symbol | A                    | B                    | C        | D        |
|--------|----------------------|----------------------|----------|----------|
| 7"     | $\Phi 180.0 \pm 1.5$ | $\Phi 60.0 \pm 1.0$  | 13.0±0.2 | 9.0 +1.0 |
| 10"    | $\Phi 254.0 \pm 2.0$ | $\Phi 100.0 \pm 1.0$ | 13.0±0.2 | 9.0 +1.0 |

## Taping quantity

- Chip resistors 5,000 pcs per 7" reel; 10,000pcs per 10" reel.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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