

APPROVAL SHEET

WR02X(W)

±5%, ±1%

Thick Film General purpose chip resistors

Size 0201

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



FEATURE

- 1. Small size and light weight
- 2. High reliability and stability
- 3. Reduced size of final equipment
- 4. Suitable for high density print circuit board assembly
- 5. Higher component and equipment reliability
- Lead free product

APPLICATION

- Mobile phone
- PDA
- Camcorders
- Palmtop computers
- Hybrid module

DESCRIPTION

The resistors are constructed in a high grade ceramic body (aluminum oxide). Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the substrate. The composition of the paste is adjusted to give the approximate resistance required and the value is trimmed to nominated value within tolerance which controlled by laser trimming of this resistive layer.

The resistive layer is covered with a protective coat. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a pure Tin.

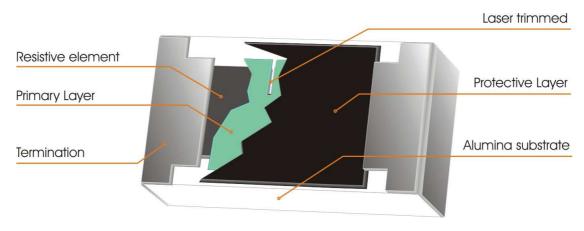


Fig 1. Construction of Chip-R WR02X



QUICK REFERENCE DATA

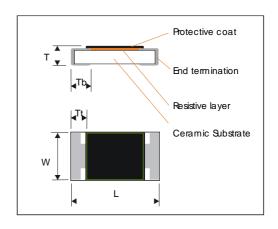
| Item | General Specification | | |
|---|---|-----------|--|
| Series No. | WR02X(W) | | |
| Size code | 02 | 201(0603) | |
| Resistance Range | 1Ω~10MΩ ($\pm 5\%$ tolerance), Jumper | | |
| | 1Ω~ 10MΩ (\pm 1% tolerance) | | |
| Resistance Tolerance | ±1% | ±5% | |
| | E96/E24 | E24 | |
| TCR (ppm/°C) | 10Ω - 10MΩ, ≤±200 | | |
| | 1 - 9.76Ω, +600~-200 | | |
| Max. dissipation @ T _{amb} =70°C | 1/20 W | | |
| Max. Operation Voltage (DC or RMS) | 25V | | |
| Max. Overload Voltage (DC or RMS) | 50V | | |
| Operation temperature | -55 ~ +125'C | | |

Note:

- 1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
- 2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by $RCWV = \sqrt{RatedPower \times Resistance Value} \text{ or Max. RCWV listed above, whichever is lower.}$

DIMENSION(unit:mm)

| | WR02X(W) | |
|----|-----------------|--|
| L | 0.60 ± 0.03 | |
| W | 0.30 ± 0.03 | |
| Т | 0.23 ± 0.03 | |
| Tb | 0.15 ± 0.05 | |
| Tt | 0.10 ± 0.05 | |



MARKING

WR02X(W) has no marking.



FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24/E96 series for resistors with a tolerance of $\pm 5\%$ & $\pm 1\%$. The values of the E24/E96 series are in accordance with "IEC publication 60063"

Derating

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

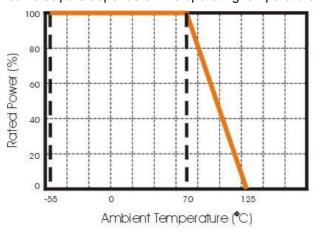


Figure 2. Maximum dissipation in percentage of rated power

As a function of the ambient temperature

MOUNTING

Due to their rectangular shapes and small tolerances, Surface Mountable Resistors are suitable for handling by automatic placement systems.

Chip placement can be on ceramic substrates and printed-circuit boards (PCBs).

Electrical connection to the circuit is by individual soldering condition.

The end terminations guarantee a reliable contact.

SOLDERING CONDITION

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 235°C during 2 seconds. 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 3.

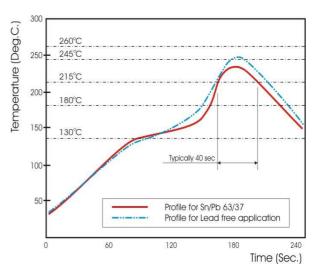


Fig 3. Infrared soldering profile for Chip Resistors WR02X(W)



CATALOGUE NUMBERS

The resistors have a catalogue number starting with:

| WR02 | X | 472_ | J | Α | L |
|-------------|------------------------------------|---|----------------------|---|-------------------------|
| Size code | Type code | Resistance code | Tolerance | Packaging code | Termination code |
| WR02 : 0201 | X : Normal W: 1% For <10Ω and >1MΩ | 5% , E24: 2 significant digits followed by no. of zeros and a blank $4.7\Omega = 4R7$ $100\Omega = 101$ $10K\Omega = 103$ 1% , E24+E96: 3 significant digits followed by no. of zeros $100\Omega = 1000$ $37.4K\Omega = 3742$ | J:±5% F:±1% P:Jumper | A: 7" Reeled taping (15Kpcs/Reel) T: 7" Reeled taping (10Kpcs/Reel) D: 7" Reeled taping (20Kpcs/Reel) H: 13" Reeled taping (50Kpcs/Reel) G: 13" Reeled taping (70Kpcs/Reel) | L = Sn base (lead free) |

TEST CONDITION FOR JUMPER (0 Ω)

| | • • |
|---------------------------|--------------|
| Item | WR02 |
| Power Rating At 70°C | 1/20W |
| Resistance | MAX.50m $Ω$ |
| Rated Current | 1A |
| Peak Current within 5 sec | 2.5A |
| Operating Temperature | -55 ~ +125°C |



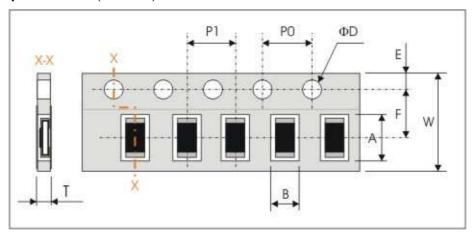
TEST AND REQUIREMENTS (JIS C 5201-1: 1998)

| TEST | DDOCEDURE / TEST METHOD | REQUIREMENT | | |
|---|---|--|-------------|--|
| TEST | PROCEDURE / TEST METHOD | Resistor | 0Ω | |
| Electrical Characteristics | - DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) | Within the specified tolerance Refer to "QUICK | | |
| JISC5201-1: 1998 Clause 4.8 | Natural resistance change per change in degree centigrade. | REFERENCE DATA" | | |
| | $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)} t_1 : 20\text{°C} + 5\text{°C} - 1\text{°C}$ | | <50mΩ | |
| | R_1 : Resistance at reference temperature (20°C+5°C/-1°C) | | | |
| | R₂: Resistance at test temperature (-55℃ or +125℃) | | | |
| Short time overload (S.T.O.L) Clause 4.13 | Permanent resistance change after a 5second application of a voltage 2.5 times RCWV or the maximum overload voltage specified in the above list, whichever is less. | Δ R/R max. ±(2%+0.10 Ω) | <50mΩ | |
| Resistance to soldering heat(R.S.H) | Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C±5°C | Δ R/R max. \pm (1%+0.05 Ω) no visible damage | <50mΩ | |
| Clause 4.18 | | · · | | |
| Solderability Clause 4.17 | Un-mounted chips completely immersed for 2±0.8second in a SAC solder bath at 235°C ±5°C | 95% coverage min., good tinnii visible damage | ng and no | |
| Temperature cycling Clause 4.19 | 30 minutes at -55°C±3°C, 2~3 minutes at 20°C+5°C-1°C, 30 minutes at +125°C±3°C, 2~3 minutes at 20°C+5°C-1°C, total 5 continuous cycles | Δ R/R max. ±(1%+0.05 Ω) | < 50mΩ | |
| Damp Heat | 1000 +48/-0 hours, loaded with RCWV or Vmax in | 10Ω≤R<1MΩ : | | |
| (Load life in humidity) Clause 4.24 | humidity chamber controller at 40°C±2°C and 90~95% relative humidity, 1.5hours on and 0.5 hours off | Δ R/R max. ±(3%+0.10Ω) R<10Ω, R≥1MΩ : Δ R/R max. ±(5%+0.10Ω) | < 50mΩ | |
| Load Life (Endurance) | 1000+48/-0 hours; loaded with RCWV or V _{max} in chamber | Ditto. | | |
| Clause 4.25 | controller 70±2°C, 1.5 hours on and 0.5 hours off | | r | |
| Bending strength | Resistors mounted on a 90mm glass epoxy resin | No visual damaged, | < 50mΩ | |
| Clause 4.33 | PCB(FR4), bending once 5mm for 10sec. | Δ R/R max. \pm (1%+0.05 Ω) | ~ JUIII22 | |
| Adhesion | Pressurizing force: 3N, Test time: 10±1sec. | No remarkable damage or remo | oval of the | |
| Clause 4.32 | | terminations | | |



PACKAGING

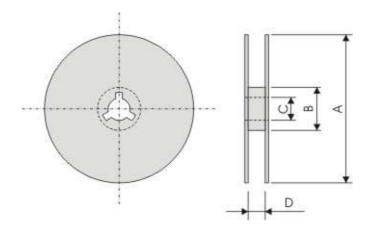
Paper Tape specifications (unit :mm)



| Series No. | Α | В | W | F | E |
|------------|-----------|-----------|-----------|-----------|-----------|
| WR02X | 0.67±0.05 | 0.37±0.05 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |

| Series No. | P1 | P0 | ΦD | Т |
|------------|-----------|-----------|------------------------------|-----------|
| WR02X | 2.00±0.05 | 4.00±0.05 | Φ 1.50 $^{+0.1}_{-0.0}$ | 0.45±0.05 |

Reel dimensions



| Symbol | Α | В | С | D |
|----------|------------|------------|----------|---------|
| 7" Reel | Φ178.0±0.2 | Φ60.0±1.0 | 13.0±0.2 | 9.0±0.5 |
| 10" Reel | Ф254.0±2.0 | Φ100.0±1.0 | 13.0±0.2 | 9.0±0.5 |
| 13" Reel | Ф330.0±2.0 | Φ100.0±1.0 | 13.0±0.2 | 9.0±0.5 |

Taping quantity and Tape material

- Chip resistors 10,000 / 15,000 / 20,000 pcs 7" Reel, Paper tape.
- Chip resistors 50,000 / 70,000 pcs 13" Reel, Paper tape.