



# 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
- 6. 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.

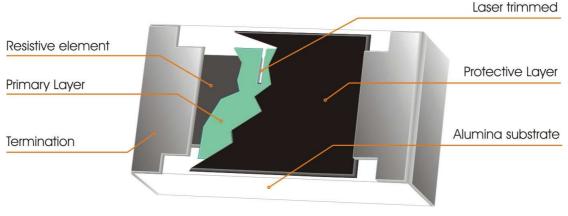


Fig 1. Construction of Chip-R WR02X



#### QUICK REFERENCE DATA

Item	General Specification		
Series No.	WR02X(W)		
Size code	0.	201(0603)	
Resistance Range	1Ω~10MΩ ( $\pm$ 5% tolerance ), Jumper		
	1Ω~ 10MΩ	$\Omega$ ( ±1% tolerance )	
Resistance Tolerance	±1%	±5%	
	E96/E24	E24	
TCR (ppm/°C)	10Ω - 10MΩ, ≤±200		
	1 - 9.76Ω, <b>+</b> 600~-200		
Max. dissipation @ T <sub>amb</sub> =70°C	1/20 W		
Max. Operation Voltage (DC or RMS)	25V		
Max. Overload Voltage (DC or RMS)	50V		
Operation temperature	-55 ~ +125'C		

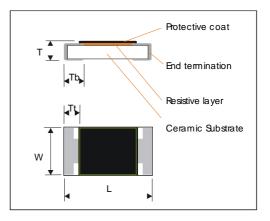
Note :

- 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

 $RCWV = \sqrt{RatedPower \times ResistanceValue}$  or Max. RCWV listed above, whichever is lower.

#### **DIMENSION**(unit : mm)

	WR02X(W)	
L	$0.60\pm0.03$	
w	$0.30\pm0.03$	
т	$0.23\pm0.03$	
Tb	$0.15\pm0.05$	
Tt	$0.10\pm0.05$	



#### 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

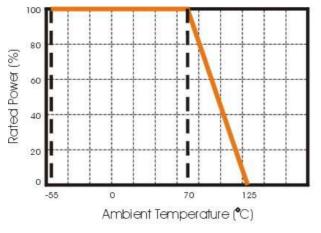


Figure 2. Maximum dissipation in percentage of rated power As a function of the ambient temperature

#### 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.

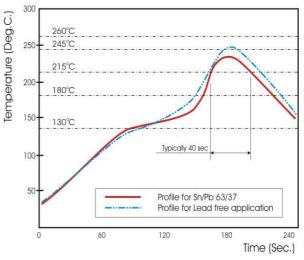


Fig 3. Infrared soldering profile for Chip Resistors WR02X(W)



#### **CATALOGUE NUMBERS**

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	<ul> <li>A : 7" Reeled taping (15Kpcs/Reel)</li> <li>T : 7" Reeled taping (10Kpcs/Reel)</li> <li>D : 7" Reeled taping (20Kpcs/Reel)</li> <li>H : 13" Reeled taping (50Kpcs/Reel)</li> <li>G : 13" Reeled taping (70Kpcs/Reel)</li> </ul>	L = Sn base (lead free)

## TEST CONDITION FOR JUMPER (0 $\Omega)$

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

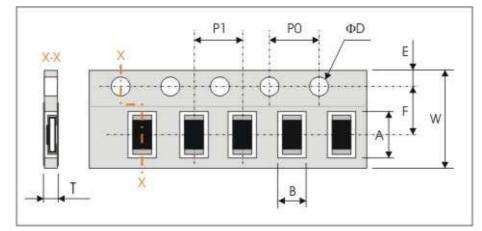


## TEST AND REQUIREMENTS (JIS C 5201-1 : 1998)

TEOT		REQUIREMENT		
TEST	PROCEDURE / TEST METHOD	Resistor	0Ω	
Electrical Characteristics	<ul> <li>DC resistance values measurement</li> <li>Temperature Coefficient of Resistance (T.C.R)</li> </ul>	Within the specified tolerance Refer to "QUICK		
JISC5201-1: 1998 Clause 4.8	Natural resistance change per change in degree centigrade.	REFERENCE DATA"	50 0	
	$\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}  t_1 : 20^{\circ} \text{C} + 5^{\circ} \text{C} - 1^{\circ} \text{C}$		<50mΩ	
	$R_1$ : Resistance at reference temperature (20°C+5°C/-1°C)			
	$R_2$ : Resistance at test temperature (-55°C or +125°C)			
Short time overload (S.T.O.L)	Permanent resistance change after a 5second application of a voltage 2.5 times RCWV or the maximum	ΔR/R max. ±(2%+0.10Ω)	<50mΩ	
Clause 4.13	overload voltage specified in the above list, whichever is less.			
Resistance to soldering heat(R.S.H)	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at $260^{\circ}C \pm 5 \circ C$	$\Delta$ R/R max. ±(1%+0.05 $\Omega$ ) no visible damage	<50mΩ	
Clause 4.18		<b>.</b>		
Solderability Clause 4.17	Un-mounted chips completely immersed for 2±0.8second in a SAC solder bath at 235 $^{\circ}C$ ±5 $^{\circ}C$	95% coverage min., good tinning and no visible damage		
		5		
Temperature cycling Clause 4.19	30 minutes at -55°C±3°C, 2~3 minutes at 20℃+5℃-1℃, 30 minutes at +125°C±3°C, 2~3 minutes at 20℃+5℃- 1℃, total 5 continuous cycles	∆R/R max. ±(1%+0.05Ω)	< 50mΩ	
Damp Heat	1000 +48/-0 hours, loaded with RCWV or Vmax in	10Ω≤R<1MΩ :		
(Load life in humidity)	humidity chamber controller at 40°C±2°C and 90~95%	∆R/R max. ±(3%+0.10Ω)	< 50mΩ	
Clause 4.24	relative humidity, 1.5hours on and 0.5 hours off	R<10Ω, R≥1MΩ : ΔR/R max. ±(5%+0.10Ω)		
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	Ditto.		
Bending strength	Resistors mounted on a 90mm glass epoxy resin	No visual damaged,	< 50mΩ	
Clause 4.33	PCB(FR4), bending once 5mm for 10sec.	$\Delta$ R/R max. ±(1%+0.05 $\Omega$ )	< 2011/22	
Adhesion	Pressurizing force: 3N, Test time: 10±1sec.	No remarkable damage or remo	oval of the	
Clause 4.32		terminations		

#### PACKAGING

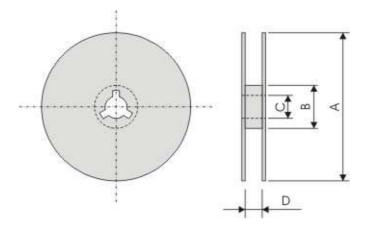
Paper Tape specifications (unit :mm)



Series No.	А	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	$\Phi 1.50^{+0.1}_{-0.0}$	0.45±0.05

#### **Reel dimensions**



Symbol	А	В	С	D
7" Reel	Φ178.0±0.2	Φ60.0±1.0	13.0±0.2	9.0±0.5
10" Reel	Φ254.0±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.

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