

# APPROVAL SHEET

## WR02X(W)

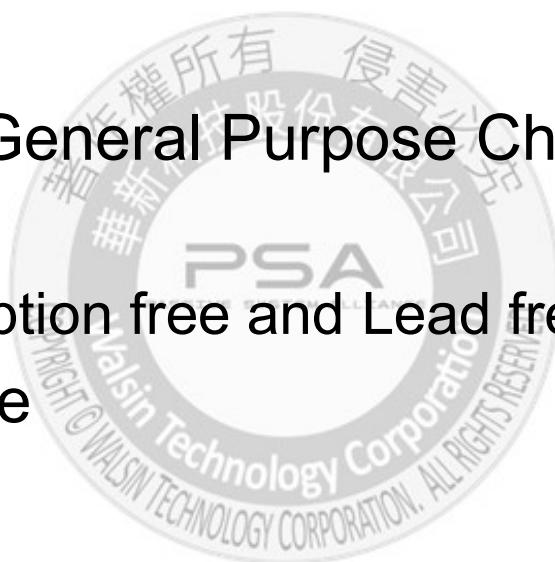
**±5%, ±1%**

**Thick Film General Purpose Chip Resistors**

**Size 0201**

**RoHS Exemption free and Lead free products**

**Halogen free**



\*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. RoHS exemption free and Lead free products

## APPLICATION

1. Mobile phone
2. PDA
3. Camcorders
4. Palmtop computers
5. Hybrid module

## DESCRIPTION

The **LEAD FREE** resistors are constructed in a high grade ceramic body (aluminum oxide). Internal metal electrodes are added at each end and connected by a **LEAD FREE** 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 **BLACK** protective coat. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a Tin ( **LEAD FREE** ) alloy.

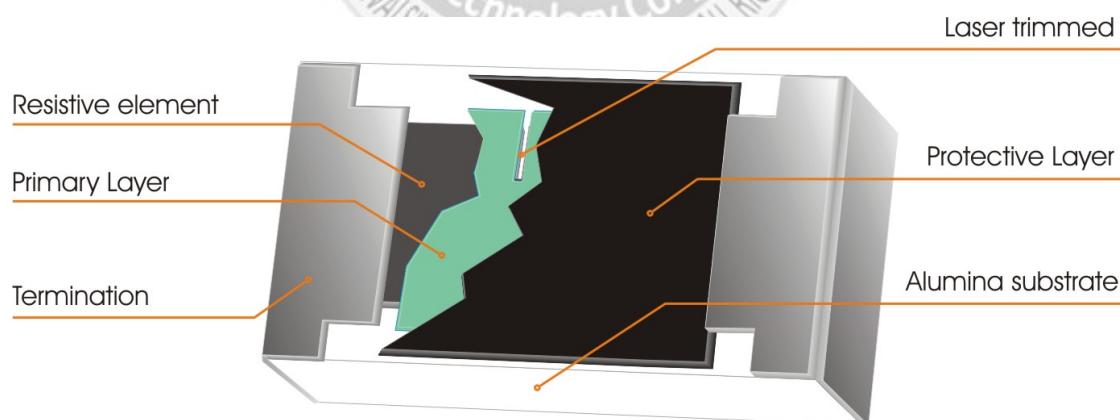


Fig 1. Construction of Chip-R WR02X

## QUICK REFERENCE DATA

Item	General Specification	
Series No.	WR02X(W)	
Size code	0201(0603)	
Resistance Range	1Ω~10MΩ ( ±5% tolerance ), Jumper 1Ω~1MΩ ( ±1% tolerance )	
Resistance Tolerance	±1% E96/E24	±5% E24
TCR (ppm/°C)	100Ω - 10MΩ, ±200 10Ω - 97.6Ω, +600 ~ 0 1 - 9.76Ω, +800~ -100	
Max. dissipation @ $T_{amb}=70^{\circ}\text{C}$	1/20 W	
Max. Operation Voltage (DC or RMS)	25V	
Max. Overload Voltage (DC or RMS)	50V	
Climatic category (IEC 60068)	55/125/56	

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

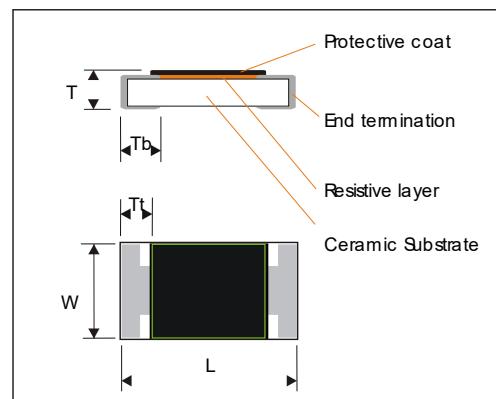
$$\text{RCWV} = \sqrt{\text{Rated Power} \times \text{Resistance Value or Max. RCWV listed above, whichever is lower.}}$$

### For Jumper (0Ω) :

Series No.	WR02X
Power Rating At $70^{\circ}\text{C}$	1/20W
Resistance	MAX.50mΩ
Rated Current	1A
Peak Current within 5 sec	2.5A
Operating Temperature	-55 ~ +125°C

### DIMENSION(unit : mm)

Type	WR02X(W)
L	0.60 ± 0.03
W	0.30 ± 0.03
T	0.23 ± 0.03
Tb	0.15 ± 0.05
Tt	0.10 ± 0.05



## CATALOGUE NUMBERS

The resistors have a catalogue number starting with :

WR02	X	472_	J	A	R
<b>Size code</b> WR02 : 0201	<b>Type code</b> X : Normal W : 1% For $<10\Omega$ and $>1M\Omega$	<b>Resistance code</b> 5%, E24: 2 significant digits followed by no. of zeros and a blank.  100 $\Omega$ = 101_ 10K $\Omega$ = 103_ (“_” means a blank)  1%, E24+E96: 3 significant digits followed by no. of zeros  100 $\Omega$ = 1000 37.4K $\Omega$ = 3742	<b>Tolerance</b> J : $\pm 5\%$ F : $\pm 1\%$ P : Jumper	<b>Packaging code</b> A : 7" Reeled taping (15Kpcs/Reel) T : 7" Reeled taping (10Kpcs/Reel) D : 7" Reeled taping (20Kpcs/Reel) G : 13" Reeled taping (70Kpcs/Reel)	<b>RoHS code</b> R = Lead free ( $< 100$ ppm )

**LEAD content:** below 100ppm with reference to IEC62321, determination of LEAD by ICP-AES

## 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

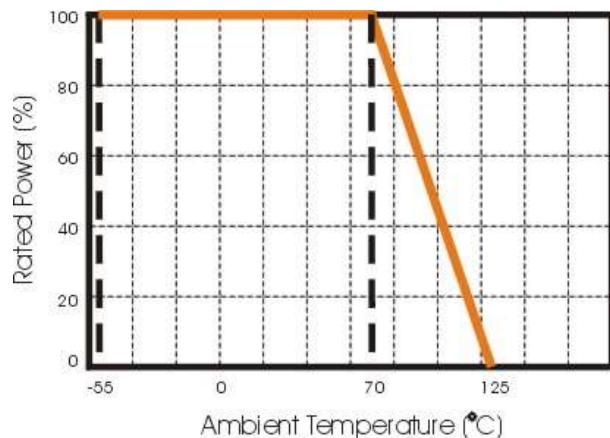


Figure 2. Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## 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.

## Storage and Handling Conditions:

1. Products are recommended to be used up within two years since operation date as ensured shelf life. Check solderability in case shelf life extension is needed.

2. To store products with following condition:

Temperature :5 to 40°C

Humidity :20 to 70% relative humidity

3. Caution:

a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid.

It may cause oxidation of electrode, which easily be resulted in poor soldering.

b. To store products on the shelf and avoid exposure to moisture.

c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

## 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.

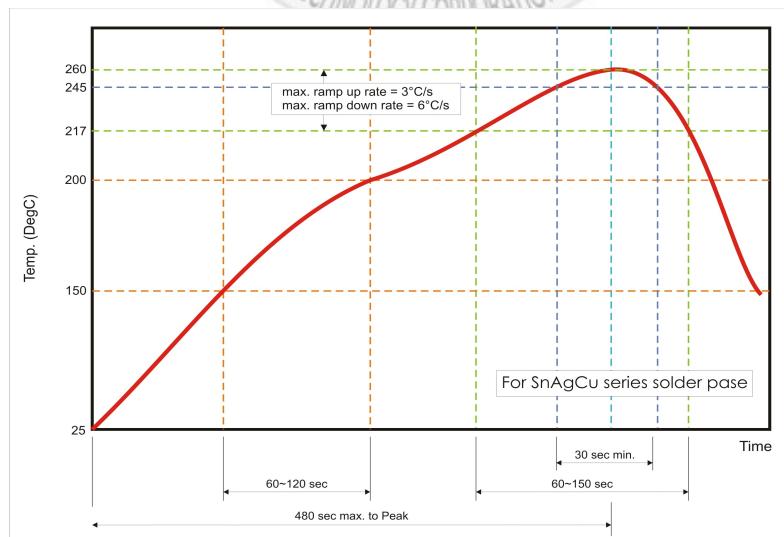


Fig 3. Infrared soldering profile for Chip Resistors WR02X  
SMT process with SnAgCu series solder paste

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

Essentially all tests are carried out according to the schedule of **IEC publication 115-8**, category **LCT/UCT/56**(rated temperature range : Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days). **The testing also meets the requirements specified by EIA, EIAJ and JIS.**

The tests are carried out in accordance with IEC publication 68, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions according to IEC 60068-1, subclause 5.3. Unless otherwise specified, the following value supplied :

Temperature: 15°C to 35°C.

Relative humidity: 45% to 75%.

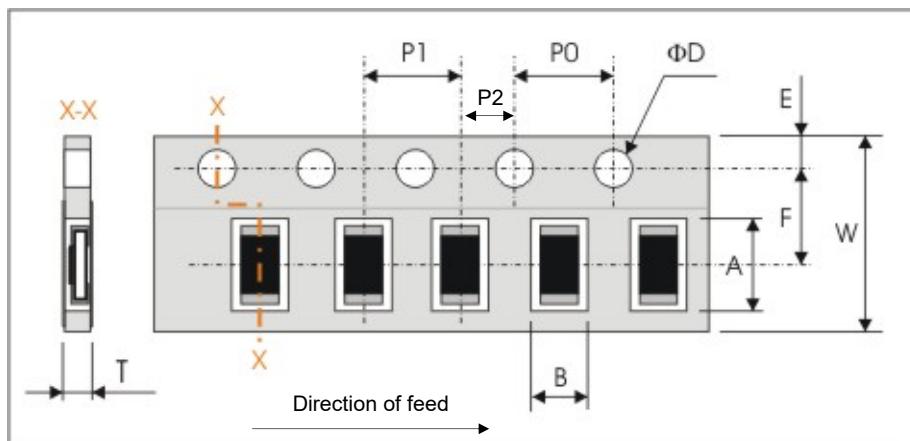
Air pressure: 86kPa to 106 kPa (860 mbar to 1060 mbar).

All soldering tests are performed with mildly activated flux.

TEST	PROCEDURE / TEST METHOD	REQUIREMENT	
		Resistor	0Ω
<b>DC resistance</b> <b>Clause 4.5</b>	DC resistance values measured at the test voltages specified below : <10Ω@0.1V, <100Ω@0.3V, <1KΩ@1.0V, <10KΩ@3V, <100KΩ@10V, <1MΩ@25V, <10MΩ@30V	Within the specified tolerance	<50mΩ
<b>Temperature Coefficient of Resistance(T.C.R)</b> <b>Clause 4.8</b>	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ $t_1 : 20^\circ\text{C} + 5^\circ\text{C} - 1^\circ\text{C}$ $R_1 : \text{Resistance at reference temperature}$ $R_2 : \text{Resistance at test temperature}$	Refer to "QUICK REFERENCE DATA"	N/a
<b>Short time overload</b> (S.T.O.L) <b>Clause 4.13</b>	Permanent resistance change after a 2second application of a voltage 2.5 times RCWV or the maximum overload voltage specified in the above list, whichever is less.	ΔR/R max. ±(1%+0.05Ω)	<50mΩ
<b>Resistance to soldering heat(R.S.H)</b> <b>Clause 4.18</b>	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C±5°C	ΔR/R max. ±(1%+0.05Ω) no visible damage	<50mΩ
<b>Solderability</b> <b>Clause 4.17</b>	Un-mounted chips completely immersed for 2±0.8second in a SAC solder bath at 235°C±5°C	95% coverage min., good tinning and no visible damage	
<b>Temperature cycling</b> <b>Clause 4.19</b>	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	ΔR/R max. ±(1%+0.05Ω)	< 50mΩ
<b>Damp Heat</b> (Load life in humidity) <b>Clause 4.24</b>	1000 +48/-0 hours, loaded with RCWV or V <sub>max</sub> in humidity chamber controller at 40°C±2°C and 90~95% relative humidity,	ΔR/R max. ±(5%+0.10Ω)	< 50mΩ
<b>Load Life (Endurance)</b> <b>Clause 4.25</b>	1000+48/-0 hours; loaded with RCWV or V <sub>max</sub> in chamber controller 70±2°C, 1.5 hours on and 0.5 hours off	ΔR/R max. ±(5%+0.10Ω)	< 50mΩ
<b>High temperature</b> <b>Clause 4.25</b>	125°C x 1000hrs, no load	ΔR/R max. ±(5%+0.10Ω)	< 50mΩ
<b>Bending strength</b> <b>Clause 4.33</b>	Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 3mm for 10sec.	No visual damaged, ΔR/R max. ±(1%+0.05Ω)	< 50mΩ
<b>Adhesion</b> <b>Clause 4.32</b>	Pressurizing force: 3N, Test time: 10±1sec.	No remarkable damage or removal of the terminations	

## PACKAGING

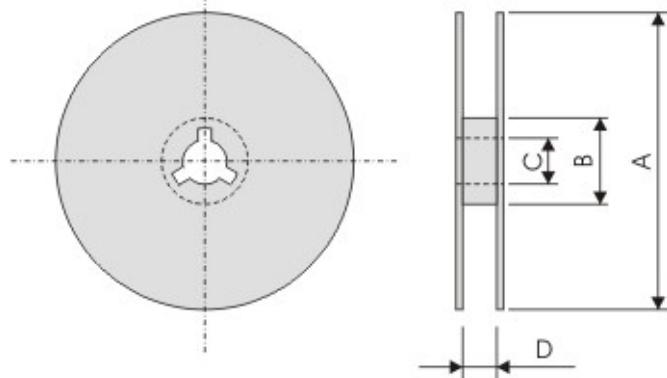
### Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WR02	$0.67 \pm 0.05$	$0.37 \pm 0.05$	$8.00 \pm 0.20$	$3.50 \pm 0.05$	$1.75 \pm 0.10$

Series No.	$P_1$	$P_0$	$P_2$	$\Phi D$	$T$
WR02	$2.00 \pm 0.05$	$4.00 \pm 0.05$	$2.00 \pm 0.05$	$\Phi 1.50^{+0.1}_{-0.0}$	$0.45 \pm 0.05$

### Reel dimensions



Symbol	A	B	C	D
7" Reel	$\Phi 178.0 \pm 0.2$	$\Phi 60.0 \pm 1.0$	$13.0 \pm 0.2$	$9.0 \pm 0.5$
13" Reel	$\Phi 330.0 \pm 2.0$	$\Phi 100.0 \pm 1.0$	$13.0 \pm 0.2$	$9.0 \pm 0.5$

### Standard Taping quantity and Tape material

- Chip resistors 15,000 pcs/reel, Paper tape.