

# APPROVAL SHEET

**WR01X**

**±5%, ±1%**

Thick Film General Purpose chip resistors  
Size 01005

RoHS 2 Compliant with exemption 7C-I  
Halogen free

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

## FEATURES

1. Ultra small and high precision 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 2 compliant with exemption 7C-I and Halogen free products

## APPLICATIONS

- Mobile phone
- PDA, MP3, Ipod, iPhone
- DSC, DVs
- Palmtop computers
- Mini 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.

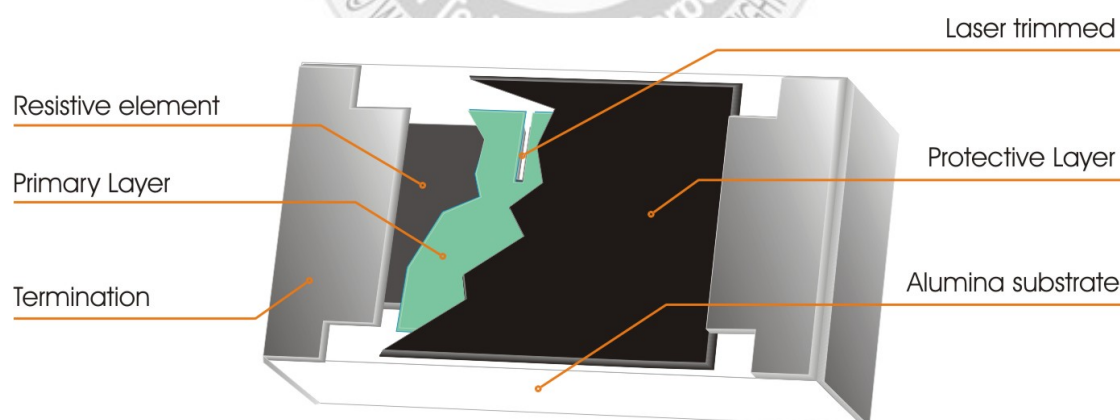


Fig 1. Construction of Chip-R WR01X

## QUICK REFERENCE DATA

Item	General Specification	
Series No.	WR01X	
Size code	01005 (0402mm)	
Resistance Range	1Ω ~ 1MΩ (±5%, ±1%), Jumper	
Resistance Tolerance	±1%: 4.7Ω ~ 1MΩ E96/E24	±5%: 1Ω ~ 1MΩ E24
TCR (ppm/°C)	100Ω - 1MΩ, ≤ ±200 ppm 10Ω - 91Ω, ≤ ±300 ppm 1 - 9.1Ω, +600~ -200 ppm	
Max. dissipation @ T <sub>amb</sub> =70°C	1/32 W	
Max. Operation Voltage (DC or RMS)	15V	
Max. Overload Voltage (DC or RMS)	30V	
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

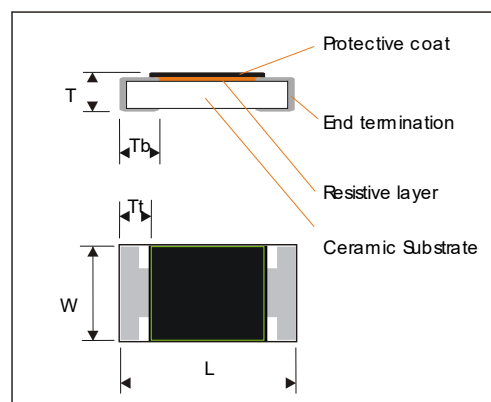
$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}} \text{ or Max. RCWV listed above, whichever is lower}$$

## For Jumper (0Ω) :

Item	General Specification
Series No.	WR01X
Size code	01005 (0402mm)
Resistance	MAX.50mΩ
Power Rating At 70°C	1/32W
Rated Current	0.8A
Peak Current within 5 sec	2A
Operating Temperature	-55 ~ +125°C

## DIMENSION (unit : mm)

Series No.	WR01
L	0.40 ± 0.02
W	0.20 ± 0.02
T	0.13 ± 0.02
Tb	0.10 ± 0.03
Tt	0.08 ± 0.03



## CATALOGUE NUMBERS

The resistors have a catalogue number starting with :

WR01	X	472_	J	D	L
Size code	Type code	Resistance code	Tolerance	Packaging code	Termination code
WR01 : 01005	<b>X:</b> Jumper $\pm 5\%$ , $1\Omega \sim 10M\Omega$ $\pm 1\%$ , $10\Omega \sim 1M\Omega$ <b>W :</b> $\pm 1\%$ , $< 10\Omega$ ; $> 1M\Omega$	5% E24 : 2 significant digits followed by no. of zeros and a blank $4.7\Omega = 4R7\_$ $10\Omega = 100\_$ $220\Omega = 221\_$ Jumper = $000\_$ ("_" means a blank) 1%, E24+E96: 3 significant digits followed by no. of zeros $100\Omega = 1000$ $37.4K\Omega = 3742$	J : $\pm 5\%$ F : $\pm 1\%$ P : Jumper	<b>D</b> : 7" Reeled paper taping (20Kpcs/Reel)	L = Sn base (lead free)

## MARKING

WR01 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

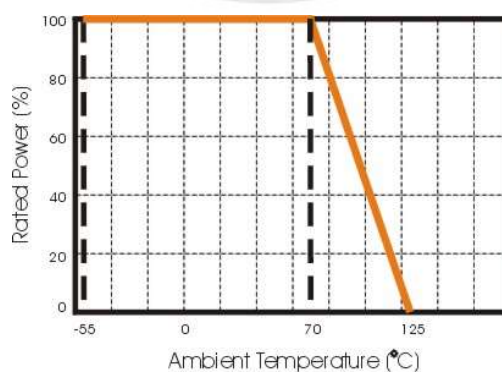
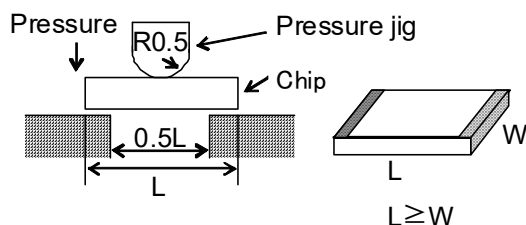


Figure 2. Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## MOUNTING

Due to its rectangular shape and ultra small size, Surface Mountable Resistors 01005 should be carefully handling by automatic placement systems. 01005 chip can withstand pressure force min. 1.9N by applying  $\phi 0.18$  pressure jig as shown drawing below. For mounting application, please contact Walsin group for details.



## 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 245°C during 3 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.

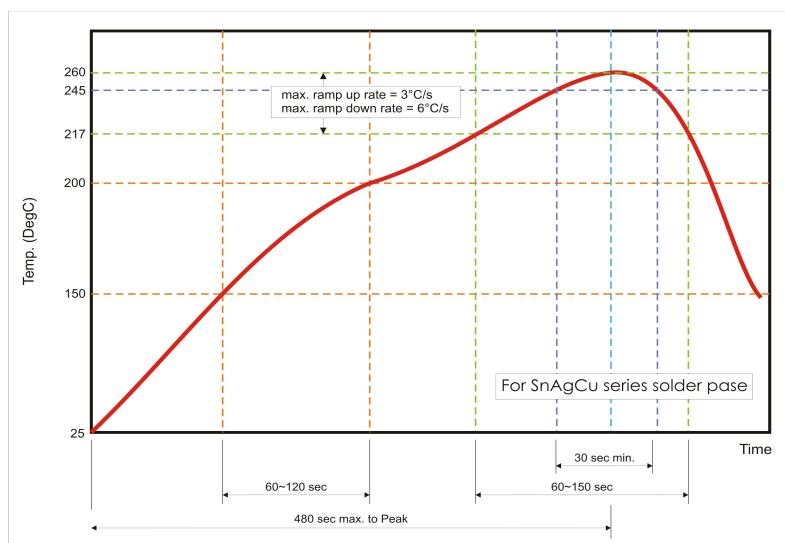


Fig 3. Infrared soldering profile for Chip Resistors WR01X

## TESTS AND REQUIREMENTS

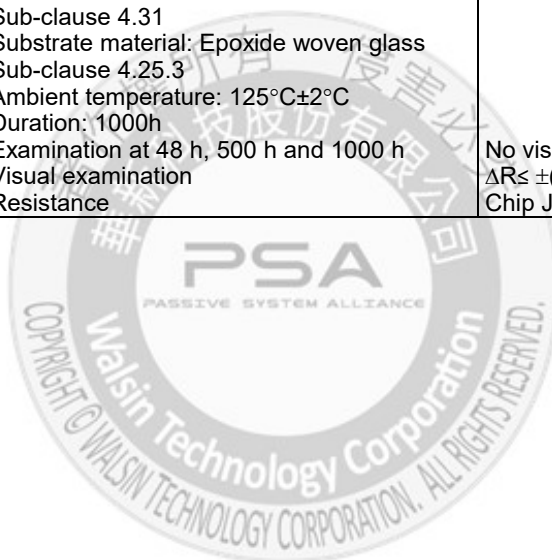
The standard condition for tests shall be in accordance with Sub-clause 4.2, JIS C 5201-1:2011.

The performance shall be satisfied in follows.

No.	TEST	PROCEDURE / TEST METHOD	REQUIREMENT
1	Visual examination	Sub-clause 4.4.1 Checked by visual examination	As in 4.4.1 The marking shall be as specified.
2	Dimension Resistance	Sub-clause 4.4.2 Sub-clause 4.5	As in DIMENSION specification. As in 4.5.2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance. Chip Jumper: 50mΩ Max.
3	Voltage proof	Sub-clause 4.7 Method: 4.6.1.4 Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage Duration: 60s±5s Insulation resistance Test voltage: Insulation voltage Duration: 1min.	No breakdown or flash over  R≥1GΩ
4	Solderability	Sub-clause 4.17 Without ageing Flux: The resistors shall be immersed in a non-activated soldering flux for 2s Bath temperature: 235°C±5°C Immersion time: 2s±0.5s	As in 4.17.4.5 The terminations shall be covered with a smooth and bright solder coating
5	Mounting Overload (in the mounted state)	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.13 The applied voltage shall be 2.5 times the rated voltage or twice the limiting element voltage, whichever is the less severe. Duration: 2s Visual examination Resistance	No visible damage $\Delta R \leq \pm(1\%+0.05\Omega)$ Chip Jumper: 50mΩ Max.
6	Mounting Bound strength of the end face plating Final measurements	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.33 Bent value: 3mm Resistance Sub-clause 4.33.6 Visual examination	$\Delta R \leq \pm(0.5\%+0.05\Omega)$ Chip Jumper: 50mΩ Max. No visible damage
7	Resistance to soldering heat  Component solvent resistance	Sub-clause 4.18 Solder temperature: 260°C±5°C Immersion time: 10s±0.5s Visual examination Resistance Sub-clause 4.29 Solvent: 2-propanol Solvent temperature: 23°C±5°C Method 2 Recovery: 48h Visual examination Resistance	As in 4.18.3.4 No sign of damage such as cracks $\Delta R \leq \pm(1\%+0.05\Omega)$ Chip Jumper: 50mΩ Max.  No visible damage $\Delta R \leq \pm(1\%+0.05\Omega)$ Chip Jumper: 50mΩ Max.

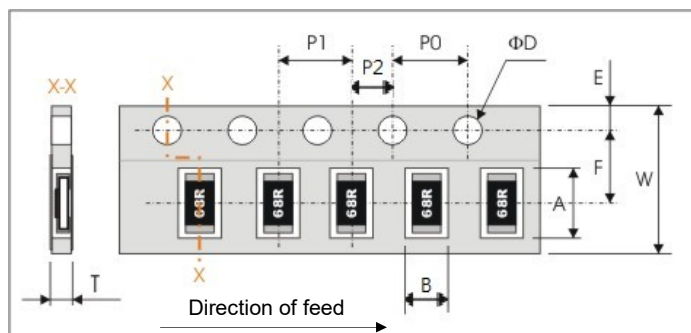
No.	TEST	PROCEDURE / TEST METHOD	REQUIREMENT
8	Mounting  Adhesion  Rapid change temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.32 Force: 2N Duration: 10s±1s Visual examination Sub-clause 4.19 Lower category temperature: -55°C Upper category temperature: +125°C Duration of exposure at each temperature: 30 min Number of cycle: 5 cycles Visual examination Resistance	No visible damage   No visible damage $\Delta R \leq \pm(1\%+0.05\Omega)$ Chip Jumper: 50m $\Omega$ Max.
9	Climatic sequence -Dry heat  -Damp heat, cycle (12+12hour cycle) First cycle  -Cold  Damp heat, cycle (12+12hour cycle) Remaining cycle  -D.C. load	Sub-clause 4.23 Sub-clause 4.23.2 Temperature: +125°C Duration: 16h Sub-clause 4.23.3 Test method 2 Temperature: 55°C [Severity(2)] Sub-clause 4.23.4 Temperature: -55°C Duration: 2h Sub-clause 4.23.6 Test method 2 Temperature: 55°C [Severity(2)] Number of cycles : 5 cycles Sub-clause 4.23.7 The applied voltage shall be the rated voltage or the limiting element voltage whichever the smaller Duration: 1min Visual examination Resistance	No visible damage $\Delta R \leq \pm(3\%+0.1\Omega)$ Chip Jumper: 50m $\Omega$ Max.
10	Mounting  Endurance at 70°C	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.25.1 Ambient temperature: 70°C±2°C Duration: 1000 h The voltage shall be applied in cycle of 1.5h on and 0.5h off The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller Examination at 48 h, 500 h and 1000 h Visual examination Resistance	No visible damage $\Delta R \leq \pm(3\%+0.1\Omega)$ Chip Jumper: 50m $\Omega$ Max.

No.	TEST	PROCEDURE / TEST METHOD	REQUIREMENT
11	Mounting  Variation of resistance with temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.8 -55°C/+20°C +20°C/+125°C	Refer to "QUICK REFERENCE DATA"
12	Mounting  Damp heat, steady state	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.24 Ambient temperature: 40°C±2°C Relative humidity: 93+2/-3% a) 1st group: without voltage applied b) 2nd group: The d.c. voltage shall be applied continuously The voltage shall be accordance with Sub-clause 4.24.2.1 b). without polarizing voltage [4.24.2.1,c)] Visual examination Resistance	No visible damage $\Delta R \leq \pm(3\%+0.1\Omega)$ Chip Jumper: 50mΩ Max.
13	Dimensions  Mounting  Endurance at upper category temperature	Sub-clause 4.4.3 Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.25.3 Ambient temperature: 125°C±2°C Duration: 1000h Examination at 48 h, 500 h and 1000 h Visual examination Resistance	As in DIMENSION specification    No visible damage $\Delta R \leq \pm(3\%+0.1\Omega)$ Chip Jumper: 50mΩ Max.



## PACKAGING

### Paper Tape specifications (unit :mm)

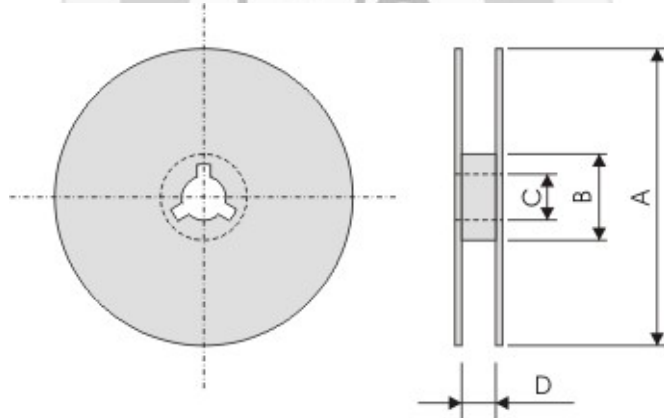


Series No.	A	B	W	F	E
WR01	0.45±0.03	0.24±0.03	8.00±0.20	3.50±0.05	1.75±0.10

Series No.	P1	P0	P2	ΦD	*t2	*t1	T
WR01	2.00±0.05	4.00±0.05	2.00±0.05	Φ1.50 <sup>+0.1</sup> <sub>-0.0</sub>	0.155±0.02	0.31±0.03	0.36±0.03

t2: cavity depth, t1: paper thickness

### Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ180.0+0/-1.5	Φ60.0+1/-0	13.0±0.2	9.0+1/-0

### Taping quantity and Tape material

- Chip resistors 20,000 pcs/reel, Paper tape.