



# APPROVAL SHEET

**WW04P**

**±1%, ±5%**

Low ohm power chip resistors

Size 0402(1005)

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



## FEATURE

1. High power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. Lead free product is upon customer requested.
5. Current sensing resistor

## APPLICATION

- PDA
- Cable Modem
- Battery charger
- DC-DC power converter

## 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 Tin (lead free) alloy.

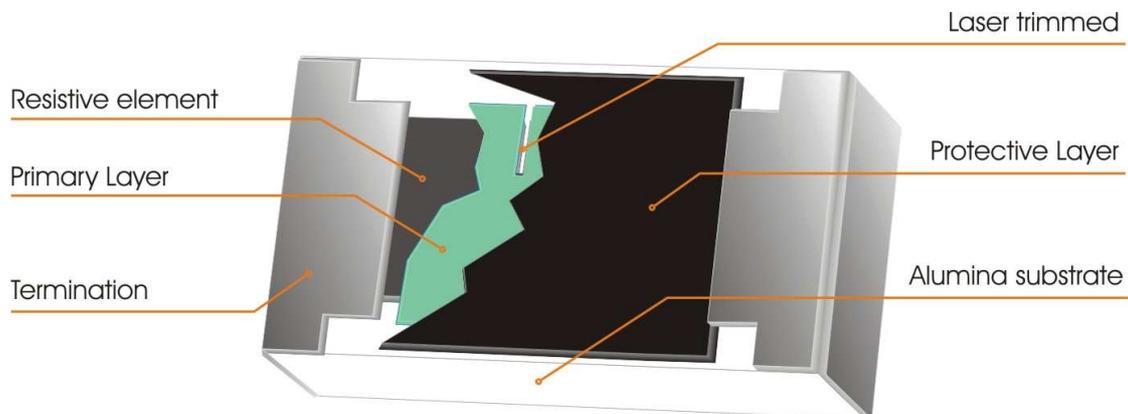


Fig 1. Construction of Chip-R



## QUICK REFERENCE DATA

Item	General Specification
Series No.	WW04P
Size code	0402 ( 1005 )
Resistance Tolerance	±1%, ±5%
Resistance Range	0.1Ω ~ 0.91Ω
TCR (ppm/°C)	
0.47 ~ 0.976 ohm	0 ~ +200 ppm/°C
0.1 ~ 0.43 ohm	0 ~ +300 ppm/°C
Max. dissipation at T <sub>amb</sub> =70°C	1/8 W
Max. Operation current (DC or RMS)	1.11 amper
Climatic category (IEC 60068)	55/125/56

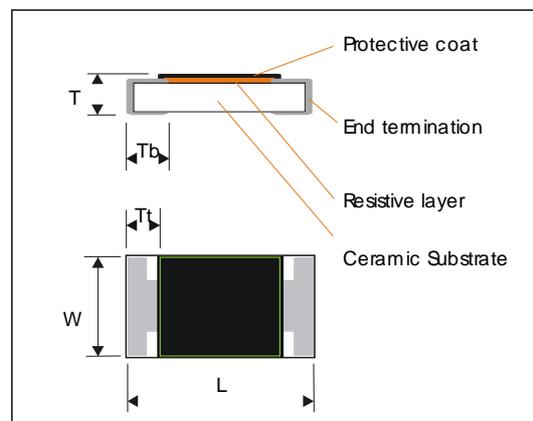
Note :

- This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
- Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by  

$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$$
 or Max. RCWV listed above, whichever is lower.
- Lead free product is upon customer requested.

## MECHANICAL DATA

Unit : mm	WW04P
<b>L</b>	1.00 ± 0.05
<b>W</b>	0.50 ± 0.05
<b>T</b>	0.35 ± 0.05
<b>Tt</b>	0.20 ± 0.10
<b>Tb</b>	0.25 +0.05/- 0.10



## MARKING

WW04P series has no marking on the product overcoat for both 5% & 1%.



## FUNCTIONAL DESCRIPTION

### Product characterization

Standard values of nominal resistance are taken from the E96 & E24 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 curve

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

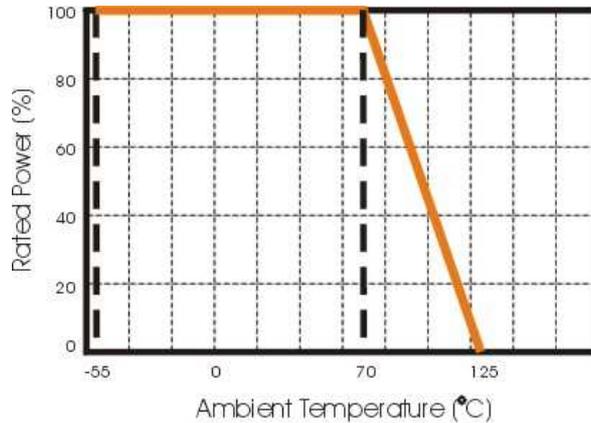


Figure 2. Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## 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.

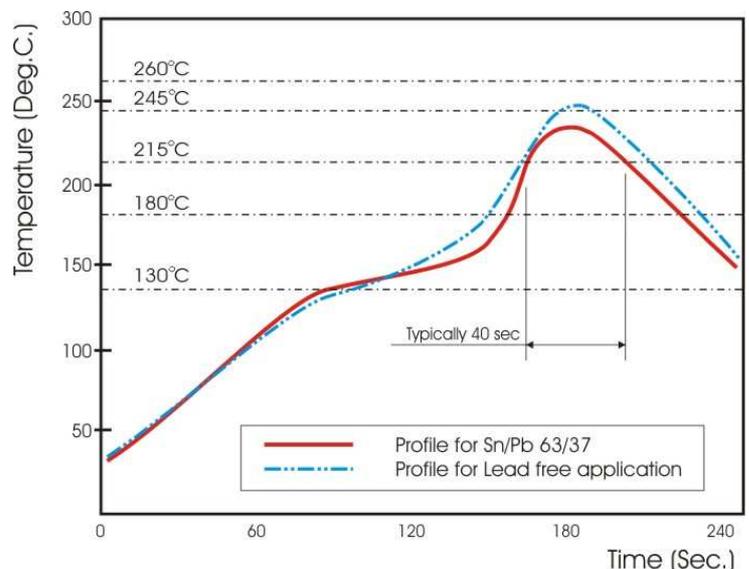


Fig 3. Infrared soldering profile



## CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW04	P	R100	J	T	L
<b>Size code</b> WW04 : 0402	<b>Type code</b> P : 1/8 W	<b>Resistance code</b> E96 + E24: R is first digit followed by 3 significant digits.  0.100Ω = R100 0.510Ω = R510	<b>Tolerance</b> J : ±5% F : ±1%	<b>Packaging code</b> T : 7" Reel taping	<b>Termination code</b> L = Sn base (lead free)

■ Reeled tape packaging : 8mm width paper taping 1000pcs per reel.

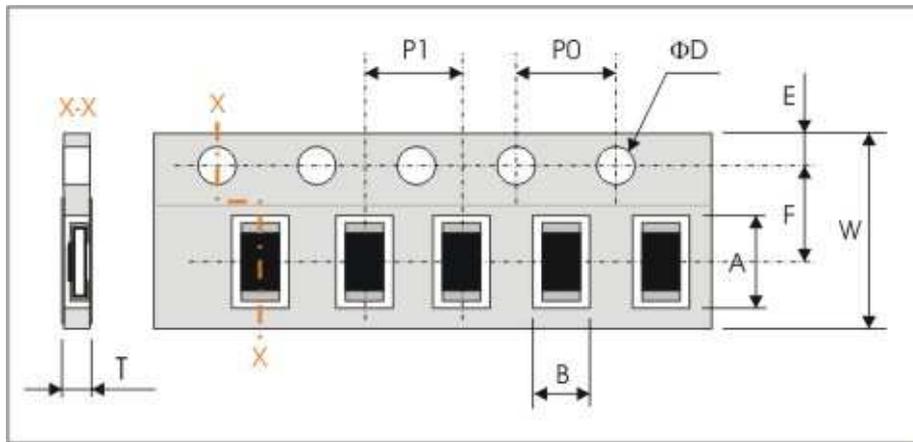
## TEST AND REQUIREMENTS

TEST	PROCEDURE	REQUIREMENT
Temperature Coefficient of Resistance ( TCR )	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ R <sub>1</sub> : Resistance at reference temperature R <sub>2</sub> : Resistance at test temperature t <sub>1</sub> : 25°C	Test temperature -55 ~ +125°C Refer to quick reference
Short time overload ( STOL )	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%
Resistance to soldering heat	Unmounted chips 5±1 seconds, 260±5°C	no visible damage Δ R/R max. ±1%
Solderability	Unmounted chip completely immersed in a lead free solder bath, 235°C±5°C, 2±1 sec	good tinning (>95% covered) no visible damage
Temperature cycling	1. 30 minutes at -55°C±3°C, 2. 2~3 minutes at room temperature, 3. 30 minutes at +125°C±3°C, 4. 2~3 minutes at room temperature, Total 5 continuous cycles	no visible damage ΔR/R max. ±1%
Load life (endurance)	70±2°C, 1000 hours, loaded with RCWV or Vmax,1.5 hours on and 0.5 hours off	ΔR/R max. ±5%
Damp heat steady state	40°C±2°C and 90~95% relative humidity, without current applied, 1000hours	ΔR/R max. ±5%
Bending and Adhesion	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 3 mm, once for 10 seconds Pressurizing force 5N, test time 10±1sec	ΔR/R max. ±1%



**PACKAGING**

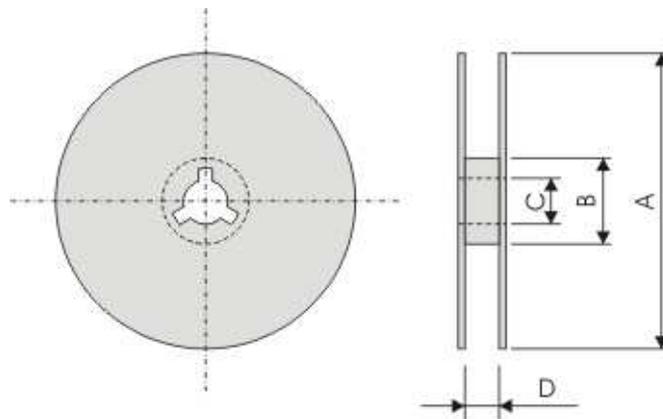
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WW04P	1.15+0.05/-0.10	0.65+0.05/-0.10	8.00±0.20	3.50±0.05	1.75±0.10

Series No.	P1	P0	ΦD	T
WW04P	2.00±0.05	4.00±0.10	Φ1.50 <sup>+0.1</sup> <sub>-0.0</sub>	Max. 0.50

**Reel dimensions**



Symbol	A	B	C	D
(unit : mm)	Φ180 +0/-1.5	Φ60.0±1.0	13 +1.0/-0	9 +1.0/-0