

APPROVAL SHEET

WR20X

±1%, ±5%

Power chip resistors

Size 2010

Customer : _____
Approval No : _____
Issue Date : _____

Customer Approval :

FEATURE

1. High power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. Lead free product is available.

APPLICATION

- Power supply
- PDA
- Digital meter
- Computer
- Automotives
- 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 Lead-tin or Tin (lead free) alloy.

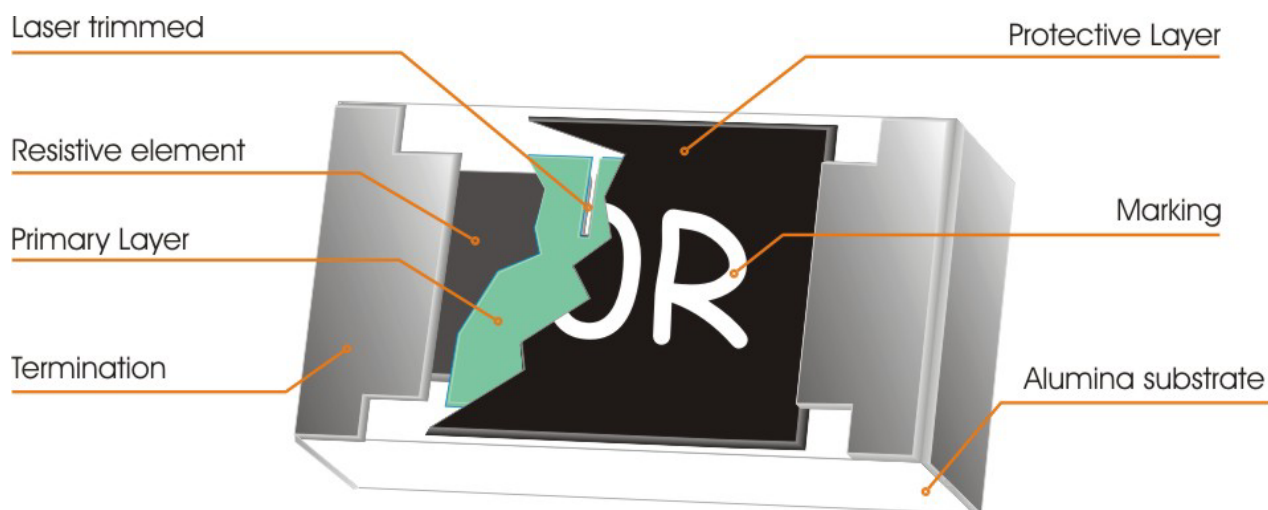


Fig 1. Construction of Chip-R

QUICK REFERENCE DATA

Item	General Specification	
Series No.	WR20X	
Size code	2010 (5025)	
Resistance Tolerance	±5% (E24); ±1% (E24+E96)	
Resistance Range	1Ω ~ 10MΩ, Jumper (0Ω)	
TCR (ppm/°C)	1Ω ≤ Rn < 9.76Ω	± 300 ppm/°C
	10Ω ≤ Rn < 1MΩ	± 200 ppm/°C
	1MΩ ≤ Rn < 10MΩ	± 300 ppm/°C
Max. dissipation at T _{amb} =70°C	0.5 W	
Max. Operation Voltage (DC or RMS)	200V	
Max. Overload Voltage (DC or RMS)	400V	
Climatic category (IEC 60068)	55/155/56	

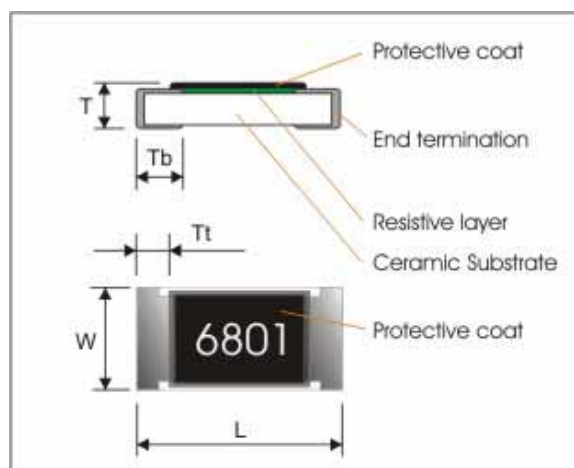
Note :

- 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.
- The resistance of Jumper is defined <0.05Ω, I_{max.} = 0.8A.

MECHANICAL DATA

Symbol	Dimensions (mm)
L	5.00±0.20
W	2.50±0.20
T	0.55±0.10
Tt	0.65±0.25
Tb	0.60±0.25



MASS (per 100pcs) : 2.50 gram

MARKING

Each resistor is marked with a four-digit code on the protective coating to designate the nominal resistance value.

Example:

1R00 = 1Ω
 1001 = 1000Ω

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

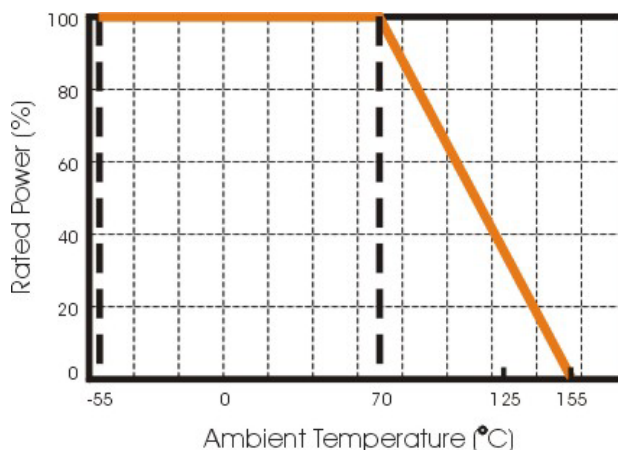


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

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 one minute. 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 230°C during 2 seconds. The test condition for no leaching is 260°C for 60 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in Fig 3.

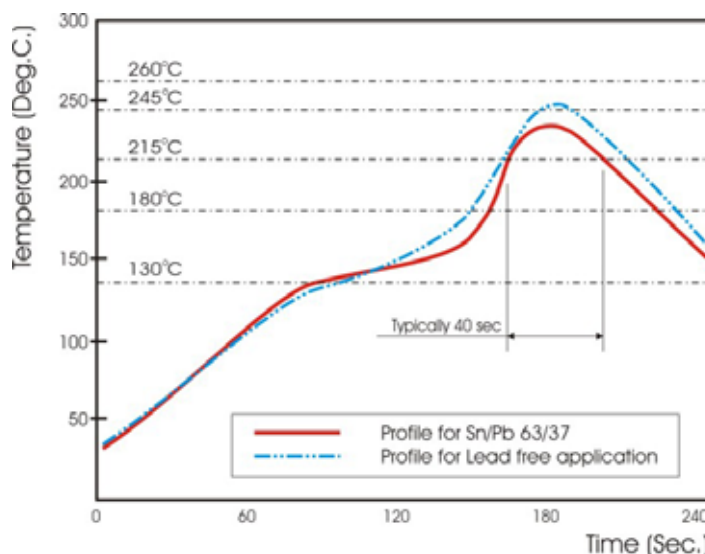


Fig 3. Infrared soldering profile for Chip Resistors WR20X

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WR20	X	472_	J	T	_
Size code WR25 : 2512 WR20 : 2010	Type code X : Normal	Resistance code E24 : 2 significant digits followed by no. of zeros and a blank 4.7Ω =4R7_ 10Ω =100_ 220Ω =221_ Jumper =000_ ("_" means a blank) E96 : 3 significant digits followed by no. of zeros 102Ω =1020 37.4KΩ =3742	Tolerance J : ±5% F : ±1% P : Jumper	Packaging code T : 7" Reel taping	Termination code _ = SnPb base ("_" means a blank) L = Sn base (lead free)

TEST AND REQUIREMENTS

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).

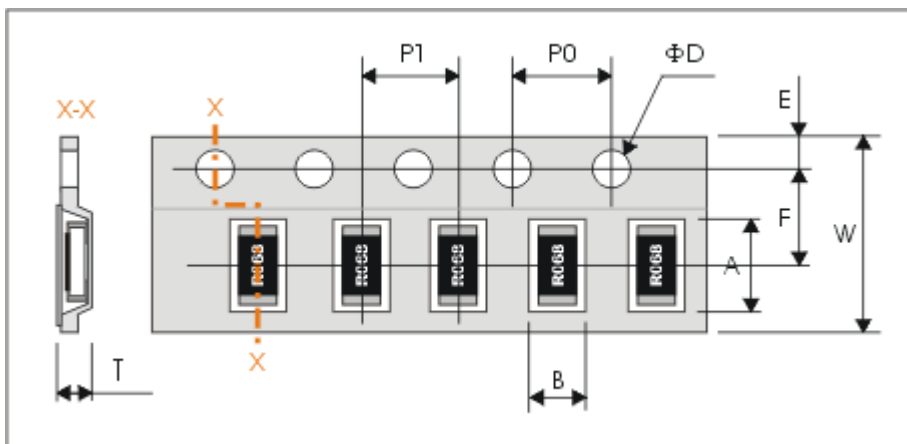
All soldering tests are performed with mildly activated flux.

TEST	PROCEDURE	REQUIREMENT
DC resistance	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
Temperature Coefficient of Resistance (TCR)	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ R ₁ : Resistance at reference temperature R ₂ : Resistance at test temperature t ₁ : 25°C	Test temperature -55 ~ +155°C 1Ω ≤ Rn < 9.76Ω, ± 300 ppm/°C 10Ω ≤ Rn < 1MΩ, ± 200 ppm/°C 1MΩ ≤ Rn < 10MΩ, ± 300 ppm/°C

TEST	PROCEDURE	REQUIREMENT
Short time overload (STOL)	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.	$\Delta R/R$ max. $\pm(2\%+0.1\Omega)$
Resistance to soldering heat	Unmounted chips 10 ± 1 seconds, $270\pm 5^{\circ}\text{C}$	no visible damage $\Delta R/R$ max. $\pm(1\%+0.05\Omega)$
Solderability	Termination SnPb base : Unmounted chips completely immersed for 2 ± 0.5 sec. in a solder bath at $230\pm 5^{\circ}\text{C}$ Termination Sn base (lead free) : Unmounted chip completely immersed in a lead free solder bath, $245^{\circ}\text{C}\pm 5^{\circ}\text{C}$, 3 ± 1 sec	good tinning (>95% covered) no visible damage
Temperature cycling	1. 30 minutes at $-55^{\circ}\text{C}\pm 3^{\circ}\text{C}$, 2. 2~3 minutes at room temperature, 3. 30 minutes at $+155^{\circ}\pm 3^{\circ}\text{C}$, 4. 2~3 minutes at room temperature, Total 5 continuous cycles	no visible damage $\Delta R/R$ max. $\pm(1\%+0.05\Omega)$
Load life (endurance)	$70\pm 2^{\circ}\text{C}$, 1000 hours, loaded with RCWV or V_{max} , 1.5 hours on and 0.5 hours off	$\Delta R/R$ max. $\pm(3\%+0.1\Omega)$
Load life in Humidity	1000 hours, at rated continuous working voltage in humidity chamber controller at $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and 90~95% relative humidity, 1.5hours on and 0.5 hours off	$\Delta R/R$ max. $\pm(3\%+0.1\Omega)$
Bending and Termination strength	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 2 mm, once for 10 seconds Pulling test : 500grams	$\Delta R/R$ max. $\pm(1\%+0.05\Omega)$

PACKAGING

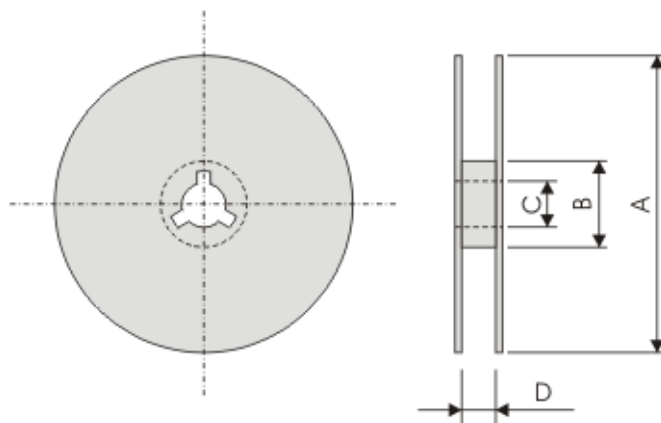
Plastic Tape specifications (unit :mm)



Symbol	A	B	W	F	E
Dimensions	5.50±0.20	2.80±0.20	12.00±0.30	5.50±0.1	1.75±0.10

Symbol	P1	P0	ΦD	T
Dimensions	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max. 1.2

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	14.0±0.2

Taping quantity

- Chip resistors 4,000 pcs per reel.