

# APPROVAL SHEET

**WF06A 1 ~ 1Mohm**

**±5%, ±1%**

High Power Chip Resistors

Size 0603 1/4W

\*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. High power
5. RoHS compliant and Lead free products

## APPLICATION

- High accuracy dc-power supply
- Digital multi-meter
- Telecommunication
- Computer
- Automotive industry
- Medical and military equipment

## 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.

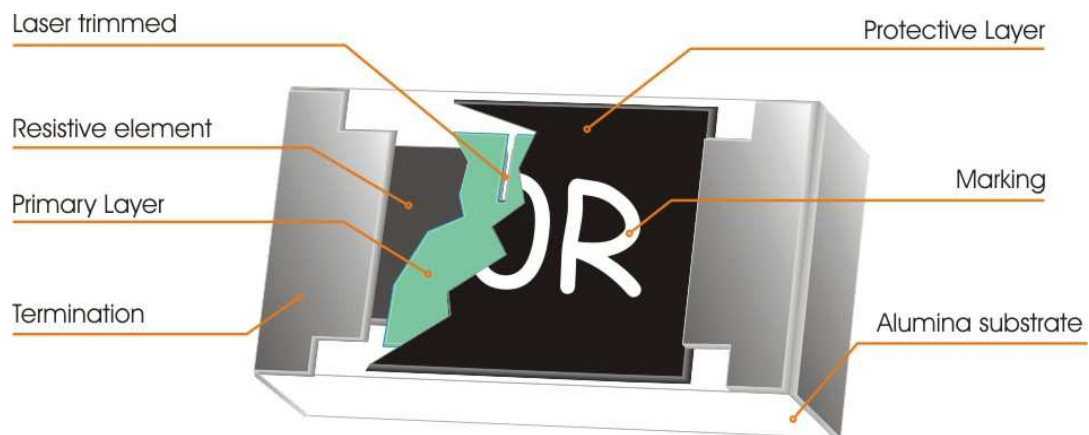


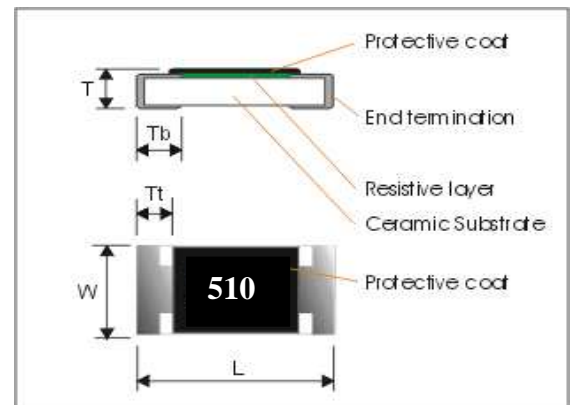
Fig 1. Construction of Chip-R

### QUICK REFERENCE DATA

Item	General Specification
Series No.	WF06A
Size code	0603(1608)
Resistance Tolerance	±5%, ±1%
Resistance Range	1 ~ 1MΩ (E96+E24 series)
TCR (ppm/°C)	51 ~ 1Mohm: ≤ ± 100 ppm/°C 1 ~ 49.9ohm: +500 ~ -200 ppm/°C
Max. dissipation at T <sub>amb</sub> =70°C	1/4W
Max. Operation Voltage)	150V
Max. Overload Voltage	300V
Climatic category (IEC 60068)	55/155/56

### DIMENSIONS(unit : mm)

Part No	WF06A
<b>L</b>	1.60 ± 0.10
<b>W</b>	0.80 + 0.15/ -0.05
<b>T</b>	0.45 ± 0.15
<b>Tb</b>	0.30 ± 0.10
<b>Tt</b>	0.30 ± 0.20



### MARKING

Each resistor is marked with a three-digit (E24) on the protective coating to designate the nominal resistance value. No marking in the E96 series!

Marking example	Contents	Application
123	$12 \times 10^3 [\Omega] \rightarrow 12 [\text{k}\Omega]$	E24
2R2	$2.2 [\Omega]$	E24
No marking	$102 \times 10^2 [\Omega] \rightarrow 10.2 [\text{k}\Omega]$	E96
No marking	$332 \times 10^{-1} [\Omega] \rightarrow 33.2 [\Omega]$	E96

## FUNCTIONAL DESCRIPTION

### Product characterization

Standard values of nominal resistance are taken from the E96&E24 series for resistors with a tolerance of  $\pm 1\%$ ,  $\pm 5\%$ . The values of the E96/E24 series are in accordance with "IEC publication 60063".

### Derating

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

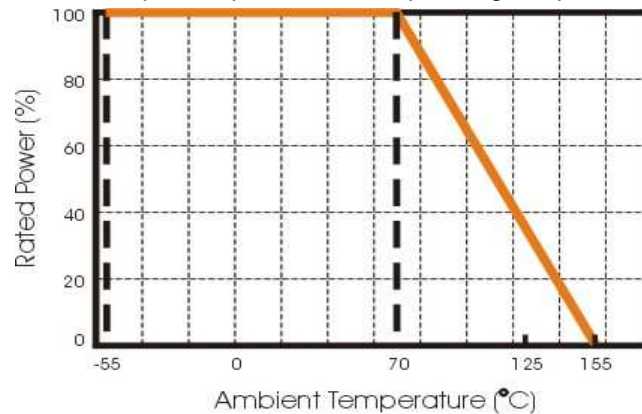


Fig.2 Maximum dissipation in percentage of rated power  
As a function of the ambient temperature

## 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 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.

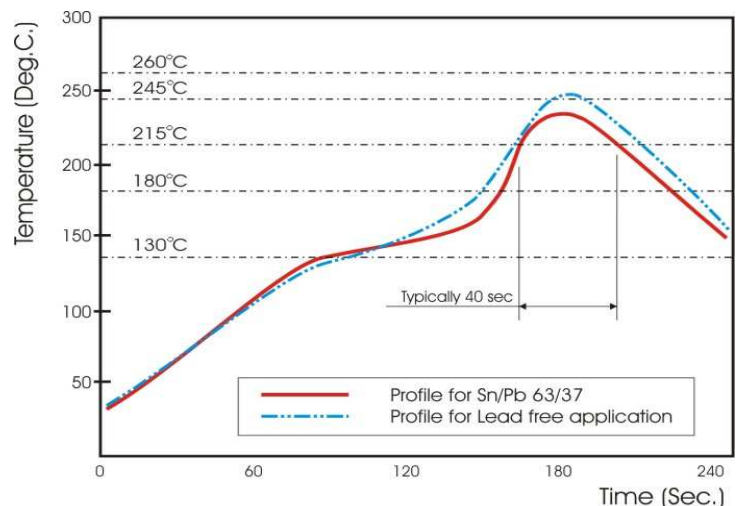


Fig 3. Infrared soldering profile for Chip Resistors

## CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WF06	A	510_	F	T	L
<b>Size code</b> WF06: 0603	<b>Type code</b> <b>A</b> :Power 0603 size= 1/4W	<b>Resistance code</b> 5% E24: 2 significant digits followed by No. of zeros e.g.: 3ohm        =3R0 10ohm       =100 56Kohm      =563  1% E24+E96: 3 significant digits followed by No. of zeros 100Ω         =1000 37.4KΩ       =3742	<b>Tolerance</b> J : ±5% F : ±1%	<b>Packaging code</b> T : 7" Reeled taping  paper taping 5Kpcs/reel.	<b>Termination code</b> L = Sn base (lead free)

- Reeled tape packaging : 8mm width paper taping 5000pcs per 7" reel.

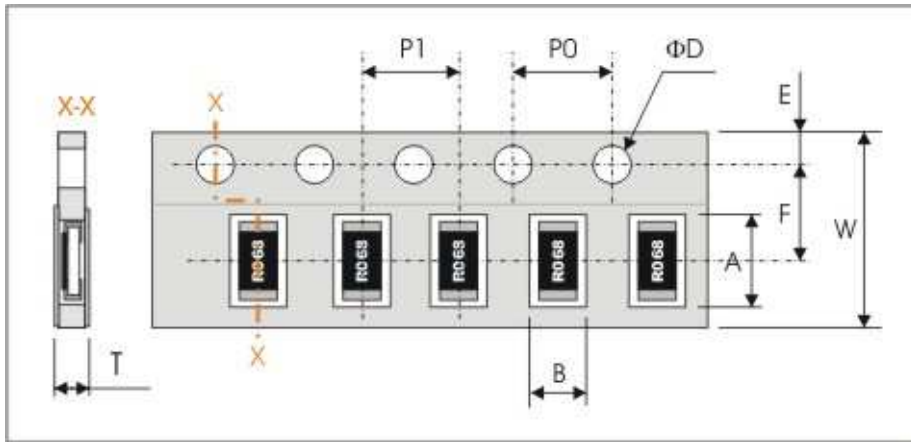
## TEST AND REQUIREMENTS

Basic specification : JIS C 5201-1 : 1998

TEST	PROCEDURE	REQUIREMENT
<b>Clause 4.8</b> 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> : 20°C+5°C-1°C.	Refer to quick reference data for T.C.R specification
<b>Clause 4.13</b> Short time overload	2.5 x Rated voltage or Max. Overload Voltage for 2 sec. Measure resistance after 30 minutes.	ΔR/R max.: ≤ ±(1%+0.05Ω)
<b>Clause 4.18</b> Resistance to soldering heat(R.S.H)	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 260°C±5°C.	No visible damage ΔR/R max. : ≤ ±(1%+0.05Ω)
<b>Clause 4.17</b> Solderability	Un-mounted chips completely immersed for 2±0.5 second in a SAC solder bath at 235°C±5°C.	Good tinning (>95% covered) No visible damage
<b>Clause 4.19</b> Temperature cycling	1. 30 minutes at -55°C±3°C, 2. 2~3 minutes at 20°C+5°C-1°C, 3. 30 minutes at +155°±3°C, 4. 2~3 minutes at 20°C+5°C-1°C, Total 5 continuous cycles.	No visible damage ΔR/R max. ≤ ±(1%+0.05Ω)
<b>Clause 4.25</b> Load life (endurance)	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 70±2°C, 1.5 hours on and 0.5 hours off.	No visible damage ΔR/R max. ≤ ±(5%+0.1Ω)
<b>Clause 4.24</b> Load life in Humidity	1000 +48/-0 hours, loaded with RCWV or Vmax in humidity chamber controller at 40°C±2°C and 90~95% relative humidity, continuous on.	No visible damage ΔR/R max. ≤ ±(5%+0.1Ω)
<b>Clause 4.33</b> Bending strength	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 3 mm, once for 10 seconds.	No visible damage ΔR/R max. ≤ ±(1%+0.05Ω)
<b>Clause 4.32</b> Adhesion	Pressurizing force: 5N, Test time: 10±1sec.	No remarkable damage or removal of the terminations
<b>Clause 4.6</b> Insulation Resistance	Apply the insulation voltage 150Vdc for 1minute.	R ≥ 1GΩ
<b>Clause 4.7</b> Dielectric Withstand Voltage	Apply 1.42 times the insulation voltage for 1 minute.	No breakdown or flashover

**PACKAGING**

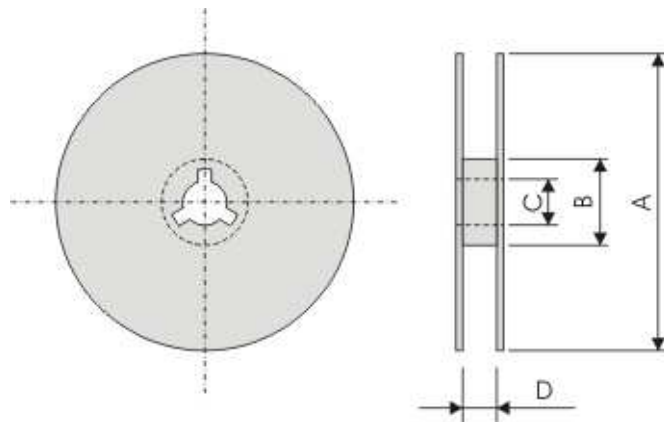
**Paper Tape specifications (unit :mm)**



Series No.	A	B	W	F	E
WF06A	1.90±0.20	1.15±0.15	8.00±0.30	3.50±0.20	1.75±0.10

Series No.	P1	P0	ΦD	T
WF06A	4.00±0.10	4.00±0.10	Φ1.50 <sup>+0.1</sup> <sub>-0.0</sub>	Max. 0.80

**Reel dimensions**



Symbol	A	B	C	D
(unit : mm)	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	9.0+1/-0