ROHS compliance

APPROVAL SHEET

WF12T, WF08T, WF06T, WF04T

±0.5%, ±0.1%

TC50

High Precision Thin Film chip resistors

Size 1206, 0805, 0603, 0402

FEATURE

1. SMD metal film resistor
2. High reliability and stability of 0.1% and below per customer request
3. High performance of TCR: 50 ppm/K and below per customer request
4. Low current noise

APPLICATION

- Medical equipment
- Measuring instrument
- Communication device
- Computer
- Printer

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 layer that is applied to the top surface of the substrate. The composition of the resistive layer 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 environmental soldering issue, the outer layer of these end terminations is a Lead-free solder .

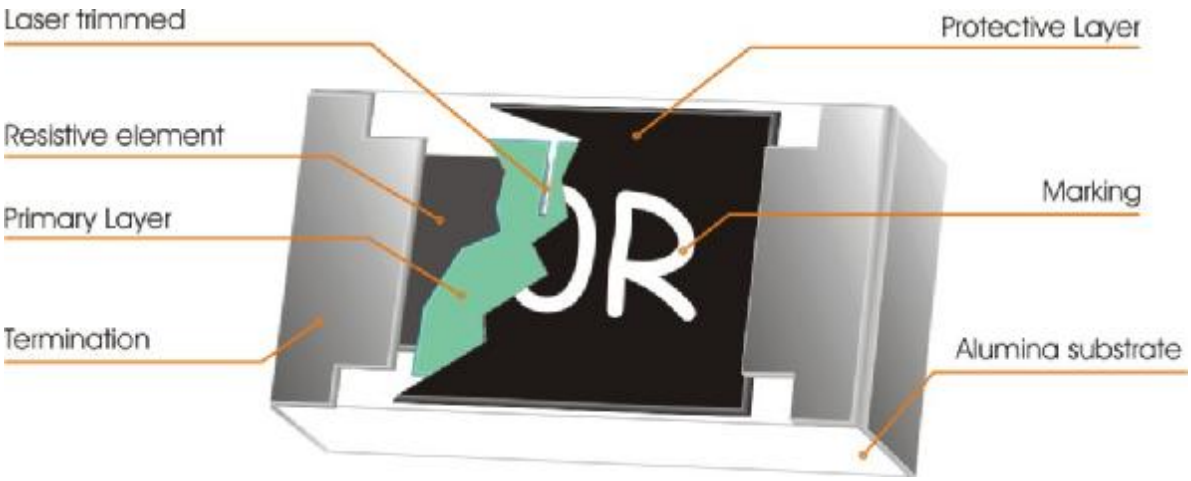


Fig 1. Consctruction of Chip-R WFxxT

QUICK REFERENCE DATA

Item	General Specification			
Series No.	WF12T	WF08T	WF06T	WF04T
Size code	1206 (3216)	0805 (2012)	0603 (1608)	0402 (1005)
Resistance Tolerance	±0.5%, ±0.1%			
Resistance Range	4.7Ω ~ 1MΩ (E24 +E96)	4.7Ω ~ 1MΩ (E24 +E96)	10Ω ~ 330KΩ (E24 +E96)	10Ω ~ 100KΩ (E24 +E96)
TCR (ppm/°C)	+50 ~ -50 ppm/°C			
Max. dissipation at T_{amb}=70°C	1/8W	1/10W	1/16W	1/16W
Max. Operation Voltage (DC or RMS)	150V	100V	50V	25V
Climatic category (IEC 60068)	55/125/56			

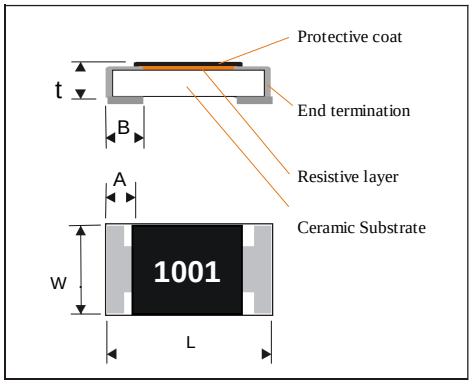
Note :

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

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

Dimensions:

Type	WF12T	WF08T	WF06T	WF04T
L	**3.10 ± 0.10**	**2.00 ± 0.10**	**1.60 ± 0.10**	**1.00 ± 0.05**
W	**1.60 ± 0.10**	**1.25 ± 0.10**	**0.80 ± 0.10**	**0.50 ± 0.05**
A	**0.60 ± 0.15**	**0.50 ± 0.15**	**0.45 ± 0.15**	**0.35 ± 0.05**
B	**0.45 ± 0.20**	**0.40 ± 0.20**	**0.30 ± 0.20**	**0.25 ± 0.10**
t	**0.50 ± 0.20**	**0.40 ± 0.20**	**0.30 ± 0.20**	**0.20 ± 0.10**



Marking

Each resistor is marked with a three digits code on the protective coating to designate the nominal resistance value. WF04T has no marking!

Example: E24 serious 1% 39R0 => 390 820R =>821

E96 serious 1% 17R8 =>25X , 178R => 25A

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E96 & E24 series for resistors with a tolerance of ±0.5%, ±0.1%. 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

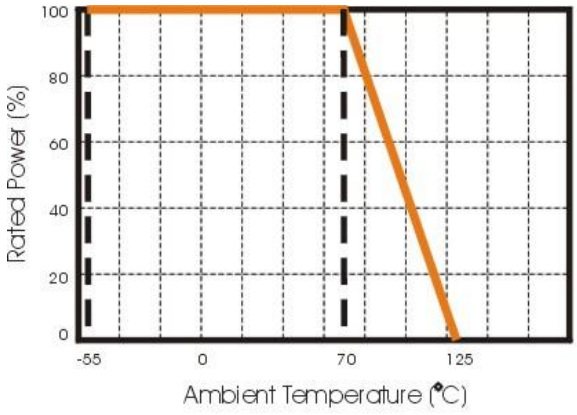


Figure 2. Maximum dissipation in percentage of rated power

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).

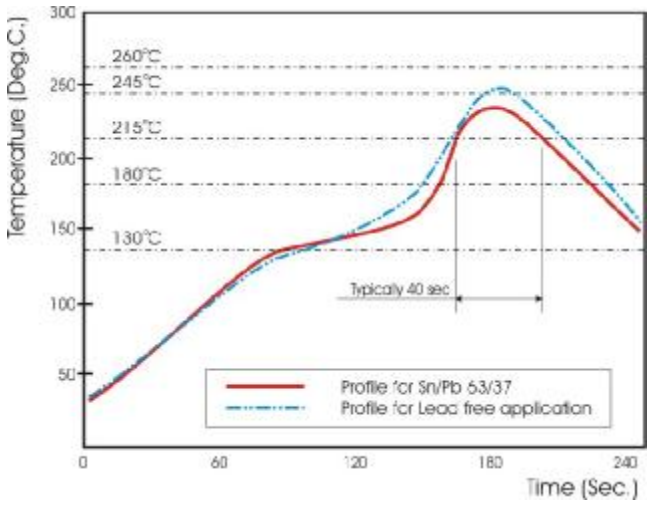
Electrical connection to the circuit is by individual soldering condition.

The end terminations guarantee a reliable contact.

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 245°C during 3 seconds within lead-free solder bath. 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.



Catalogue numbers

The resistors have a catalogue number starting with .

WF06	T	xxxx	B	T	_
Size code WF12 : 1206 WF08 : 0805 WF06 : 0603 WF04 : 0402	**Type code** **T** :TCR 50ppm	**Resistance code** E96 +E24: 4 significant digits. E24: 39R0=>39R0 820R =>8200 E96: 17R8 =>17R8 178R =>1780	**Tolerance** B : ±0.1% D : ±0.5%	**Packaging code** T : 7" Reeled taping B : Bulk	**Termination code** _ = SnPb base ("_" means a blank) L = Sn base (lead free)

1. Reeled tape packaging: 8mm width paper taping.

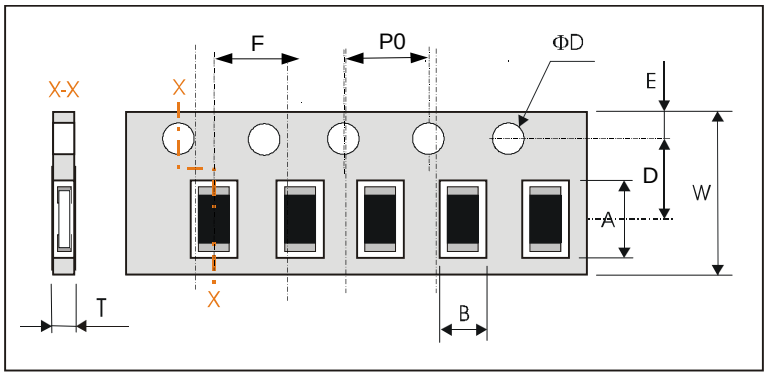
   5,000pcs/reel for WF12T, WF08T, WF06T; 10,000pcs/reel for WF04T.

TEST AND REQUIREMENTS

TEST	PROCEDURE	REQUIREMENT
		Resistor
DC resistance	DC resistance values measured at the test voltages specified below :	Within the specified tolerance ±0.5% & ±0.1%
	Resistance <100Ω / <1KΩ / <10KΩ Test voltage 0.3V / 1.0V / 3.0V	
	Resistance <100KΩ / <1MΩ / <10MΩ Test voltage 10V / 25V / 50V	
Temperature Coefficient of Resistance (TCR)	Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/°C) R_1 : Resistance at reference temperature R_2 : Resistance at test temperature t_1 : 25°C	Test temperature –55°C ~ +125°C TCR: ≦±50 ppm/°C
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.	ΔR/R max. ±(0.1%+0.05Ω)
Resistance to soldering heat	Unmounted chips 10±1 seconds, 260±5°C	no visible damage Δ R/R max. ±(0.1%+0.05Ω)
Solderability	Unmounted chips completely immersed for 3±1sec. in a lead-free solder bath at 245±5°C	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 +155°±3°C, 4. 2~3 minutes at room temperature, Total 5 continuous cycles	no visible damage ΔR/R max. ±(0.1%+0.05Ω)
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. ±(0.5%+0.05Ω)
Load life in Humidity	1000 hours, at rated continuous working voltage in humidity chamber controller at 40°C±2°C and 90~95% relative humidity, 1.5hours on and 0.5 hours off	ΔR/R max. ±(0.5%+0.05Ω)
Bending and Termination strength	Resistors mounted on a 90mm glass epoxy resin PCB(FR4); bending : 3 mm, once for 10 seconds Pulling test : 500grams	ΔR/R max. ±(0.1%+0.05Ω)

PACKAGING

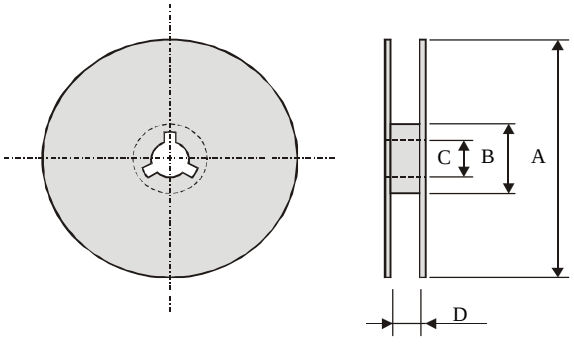
Paper Tape specifications (unit :mm)



Series No.	A	B	W	D	E
WF12	3.60±0.20	2.00±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WF08	2.40±0.20	1.65±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WF06	1.90±0.20	1.10±0.20	8.00±0.30	3.50±0.20	1.75±0.10
WF04	1.20±0.10	0.7±0.10	8.00±0.20	3.50±0.05	1.75±0.10

Series No.	F	P0	ΦD	T
WF12	4.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.0
WF08	4.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	Max. 1.0
WF06	4.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	0.65±0.05
WF04	2.00±0.10	4.00±0.10	$\Phi 1.50^{+0.1}_{-0.0}$	0.40±0.05

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	9.0±0.5

Taping quantity

- Chip resistors 5,000 pcs per reel (WF12T, WF08T, WF06T)
- Chip resistors 10,000 pcs per reel (WF04T)