

APPROVAL SHEET

WF06P

±5%

High power chip resistors

Size 0603, 1/8watt

Customer : _____

Approval No : _____

Issue Date : _____

Customer Approval :



FEATURE

1. High rated power 1/8 watt
2. High reliability and stability
3. Reduced size of final equipment
4. Lower assembly costs
5. Higher component and equipment reliability
6. Lead free termination upon customer requested

APPLICATION

- Consumer electrical equipment
- Automotive application
- EDP, Computer application
- Telecom application

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 within tolerance by laser cutting 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) solder alloy.

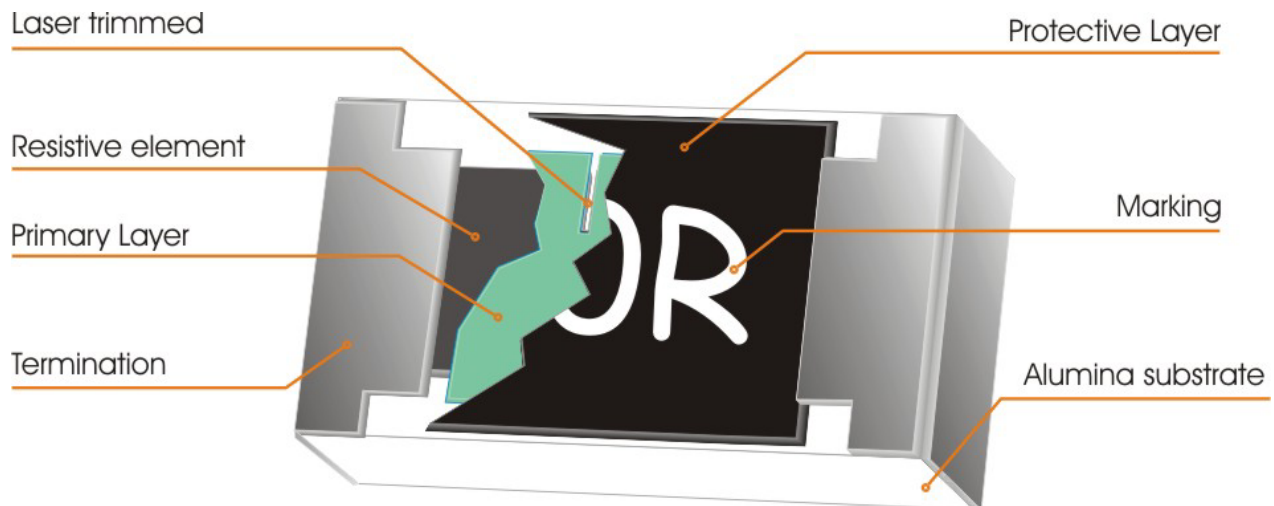


Fig 1. Construction of a Chip-R

QUICK REFERENCE DATA

Item	General Specification
Series No.	WF06P
Size code	0603 (1608)
Resistance Tolerance	±5% (E24 series)
Resistance Range	1Ω ~ 10MΩ (±5% tolerance)
TCR (ppm/°C) 10Ω ≤ R ≤ 1MΩ <10Ω, or > 1MΩ	≤ ± 200 ppm/°C -300~+500 ppm/°C
Max. dissipation at T _{amb} =70°C	1/8 W
Max. Operation Voltage (DC or RMS)	50V
Max. Overload Voltage (DC or RMS)	100V
Climatic category (IEC 60068)	55/125/56

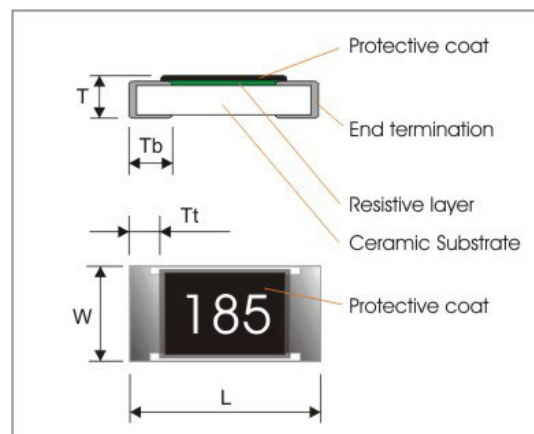
Note :

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

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

Dimensions

	WF06P
L	1.60 ± 0.10
W	0.80 ± 0.10
T	0.45 ± 0.15
Tb	0.30 ± 0.20
Tt	0.30 ± 0.10



MAARKING

3-digits marking

Each resistor is marked with a three digits code on the protective coating to designate the nominal resistance value.

For values up to 910Ω the R is used as a decimal point. For values of $1K\Omega$ or greater the first 3 digits apply to the resistance value and fourth indicate the number of zeros to follow.

Example

RESISTANCE	10Ω	12Ω	100Ω	6800Ω	47000Ω
3-digits marking	100	120	101	682	473

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of $\pm 5\%$. The values of the 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

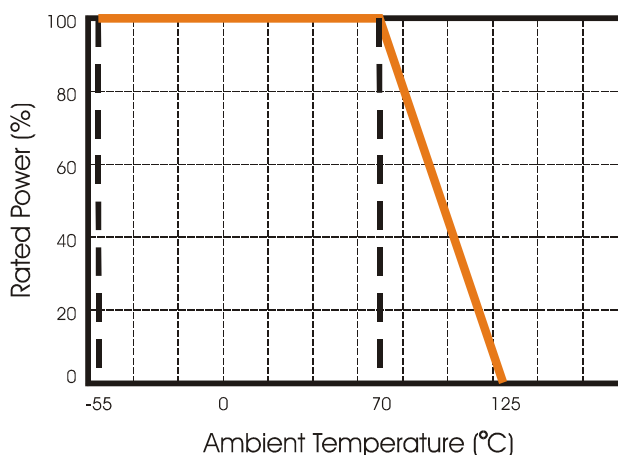


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

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 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.

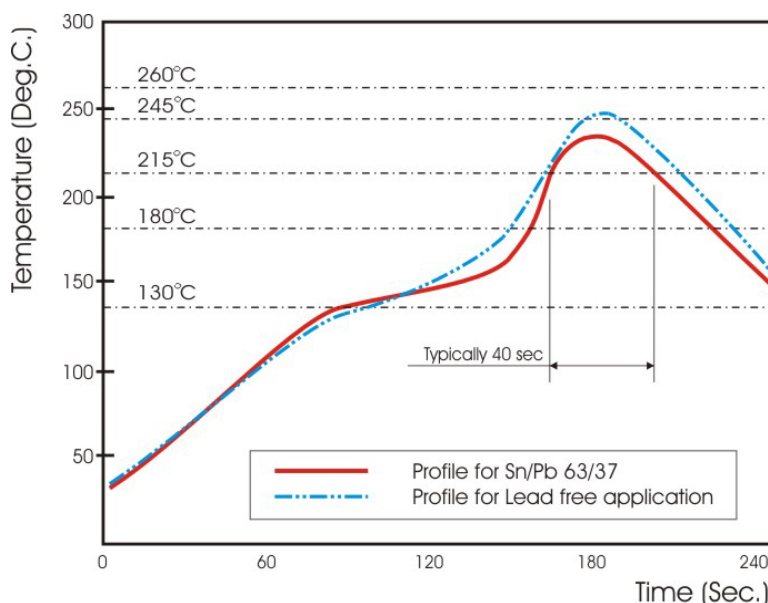


Fig 3. Infrared soldering profile for Chip Resistors

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WF06	P	472_	J	T	_
Size code WF06 : 0603	Type code P : High power type (1/8watt for 0603)	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)	Tolerance J : ±5%	Packaging code T : 7” Reeled taping	Termination code _ = SnPb base (“_” means a blank) L = Sn base (lead free)

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

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.

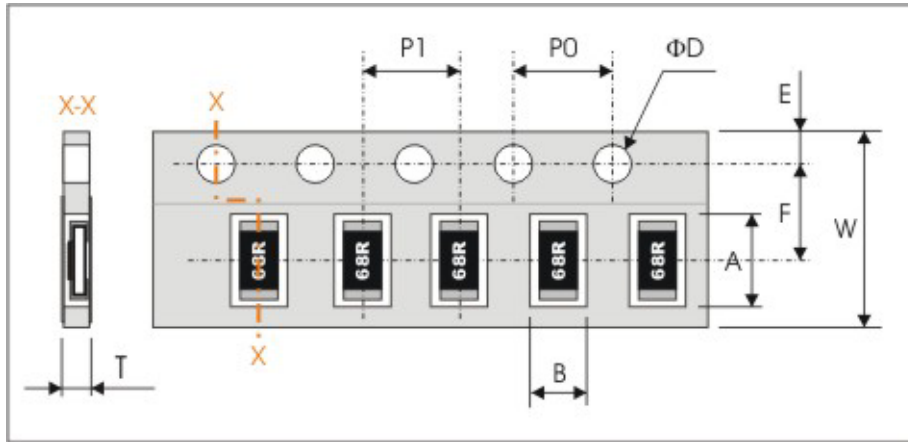


TEST	PROCEDURE / TEST METHOD	REQUIREMENT	
		Resistor	0Ω
DC resistance	JIS C 5202 5.1 / IEC 60115-1 4.5 DC resistance values measured at the test voltages specified below : <10Ω@0.1V, <100Ω@0.3V, <1KΩ@1.0V, <10KΩ@3V, <100KΩ@10V, <1MΩ@25V, <10MΩ@30V	Within the specified tolerance	< 50mΩ
Temperature Coefficient of Resistance	JIS C 5202 5.2 / IEC 60115-1 4.8.4.2 $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ R ₁ : Resistance at reference temperature R ₂ : Resistance at test temperature t ₁ : room temperature; t ₂ : LCT or UCT	Within the specified TCR	N/a
Short Time Overload	JIS C 5202 5.5 / IEC 60115-1 4.13 Permanent resistance change after a 5sec application of a voltage 2.5xU _R or max. overload voltage, whichever is less.	ΔR/R max. ±(2%+0.10Ω)	< 50mΩ
Resistance to Solder Heat	JIS C 5202 6.4 / IEC 60115-1 4.18 Unmounted chip with a solder bath, 260°C±5°C, 10±1 sec	ΔR/R max. ±(1%+0.05Ω)	< 50mΩ
Solderability	JIS C 5202 6.5 / IEC 60115-1 4.17 Termination SnPb base : Unmounted chips completely immersed for 2±0.5 sec. in a solder bath at 230±5°C Termination Sn base (lead free) : Unmounted chip completely immersed in a lead free solder bath, 245°C±5°C, 3±1 sec	95% coverage min., good tinning and no visible damage	
Leaching Test	JIS C 5202 6.4 / IEC 60115-1 4.18 Unmounted chip with a solder bath, 260°C±5°C, 60±1 sec	Ditto	
Temperature Cycling	JIS C 5202 7.4 / IEC 60115-1 4.19 30min at LCT, 30min at UCT, 5 cycles	ΔR/R max. ±(1%+0.05Ω)	< 50mΩ
Damp Heat (Load life in humidity)	JIS C 5202 7.9 1000+48/-0 hours; 1.5hours ON, 0.5hours OFF at RCWV in a humidity chamber controlled 40±2°C, 90~95% RH	10Ω≤R<1MΩ : ΔR/R max. ±(3%+0.10Ω) R<10Ω, R≥1MΩ : ΔR/R max. ±(5%+0.10Ω)	< 50mΩ
Load Life (Endurance)	JIS C 5202 7.10 / IEC 60115-1 4.25.1 1000+48/-0 hours; loaded with P _n or V _{max} ; 1.5 hours ON, 0.5 hours OFF	Ditto	
Bending and Terminal Strength	JIS C 5202 6.1.4 / IEC 60115-1 4.33 Resistors mounted on a 90mm glass epoxy resin PCB(FR4), bending once 3mm for 10sec Pulling test : >500 grams	No visual damaged, ΔR/R max. ±(1%+0.05Ω)	< 50mΩ



PACKAGING

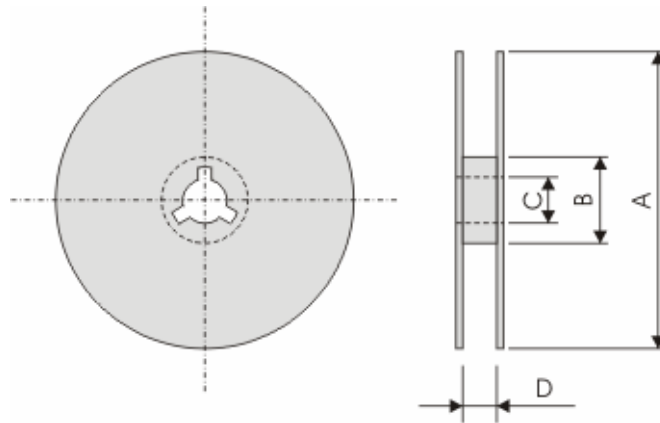
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WF06P	1.90±0.20	1.10±0.20	8.00±0.30	3.50±0.20	1.75±0.10

Series No.	P1	P0	ΦD	T
WF06P	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	0.65±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