

APPROVAL SHEET

WA04F

±5%, ±1% Half Reverse Type

General purpose chip resistors array

Size 0402x4

Customer : _____

Approval No : _____

Issue Date : _____

Customer Approval :

FEATURE

1. Small size and light weight
2. Reduced size of final equipment
3. Lower surface mounted assembly costs
4. Higher component and equipment reliability
5. Strong body and terminations
6. Excellence performance in surface mounting assembly.
7. RoHS compliant and Lead free

APPLICATION

- Consumer electrical equipment
- EDP, Computer application
- Telecom
- Ram Module

DESCRIPTION

The resistors array is 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 **BLACK** color protective coat. The top side is **WITHOUT** protective coat. Finally, the external end terminations are added. For ease of soldering the outer layer of these end terminations is a Tin (lead free) solder alloy.

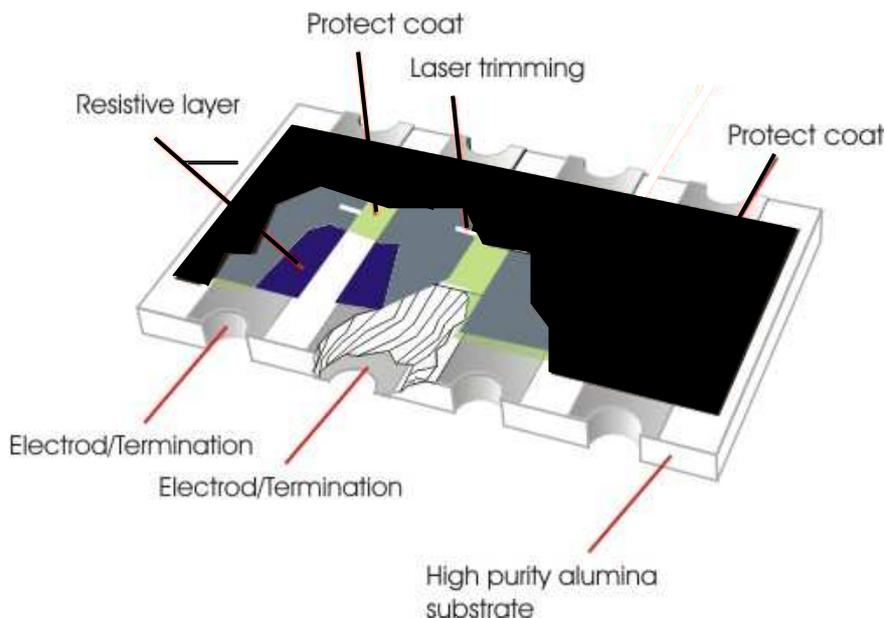


Fig 1. Construction of a Chip-R array WA04F

QUICK REFERENCE DATA

Item	General Specification
Series No.	WA04F
Size	0402x4 (1005x4)
Termination construction	Concave half reverse type
Resistance Tolerance	±5%, ±1% (E24 series)
Resistance Range	10Ω ~ 1MΩ, Jumper (0Ω)
TCR (ppm/°C)	≤ ± 300 ppm/°C
Max. dissipation at T _{amb} =70°C	1/16 W
Max. Operation Voltage (DC or RMS)	25V
Max. overload voltage	50V
Climatic category (IEC 60068)	55/155/56

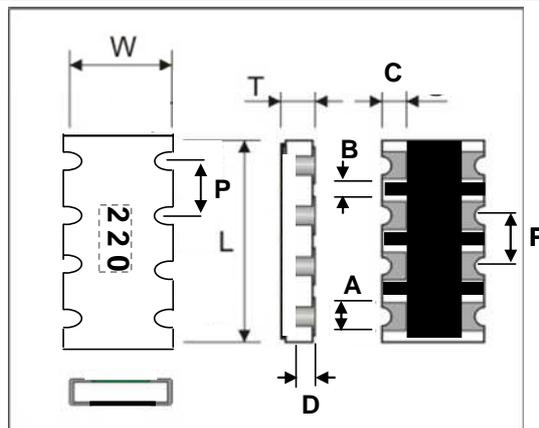
Note :

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

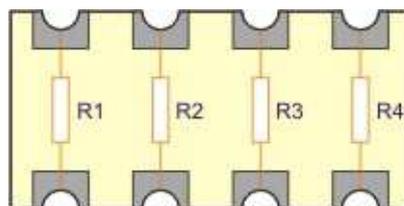
$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}} \text{ or Max. RCWV listed above, whichever is lower.}$$

Dimensions

L	W	T	A	B	C	D	P
2.00 ± 0.10	1.00 ± 0.10	0.45 ± 0.10	0.30 ± 0.10	0.15 ± 0.10	0.25 ± 0.15	> 0.6T	0.50 ± 0.10



CONSTRUCTION



$$R1 = R2 = R3 = R4$$

Marking

3D marking for E24 series!

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of $\pm 5\%$, $\pm 1\%$. 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

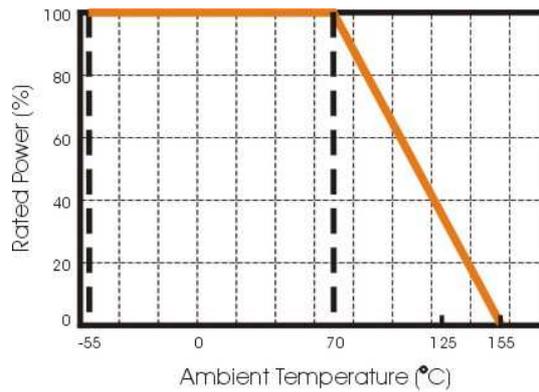


Figure 2. Maximum dissipation in percentage of rated power
As a function of the ambient temperature

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WA04	F	XXX_	J	T	L
Size code WA04 : 0402 per element	Type code F : x4, Half reverse type	Resistance code E24 : 2 significant digits followed by no. of zeros and a blank 15Ω =150_ 36Ω =360_ 22Ω =220_ (“_” means a blank)	Tolerance J : $\pm 5\%$ F : $\pm 1\%$ P : jumper	Packaging code T : 7" Reel taping B : Bulk	Termination code L = Sn base

1. Reeled tape packaging : 8mm width paper taping 10,000pcs per reel.

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

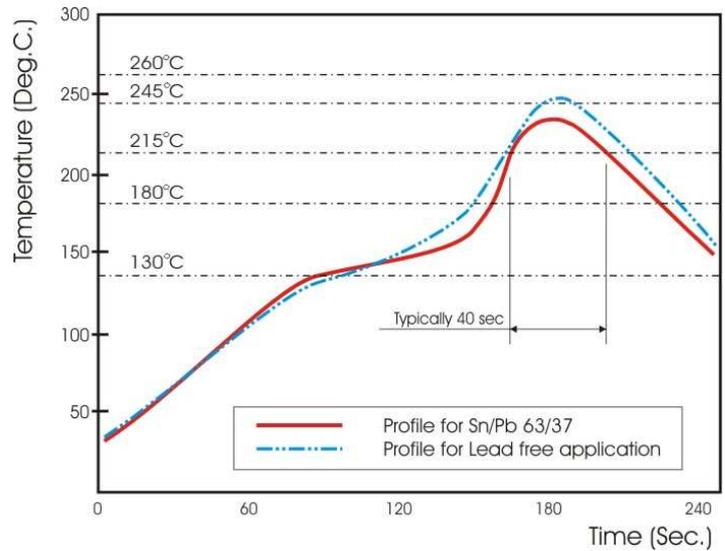


Fig 3. Infrared soldering profile for Chip Resistors array

TEST CONDITION FOR JUMPER (0Ω)

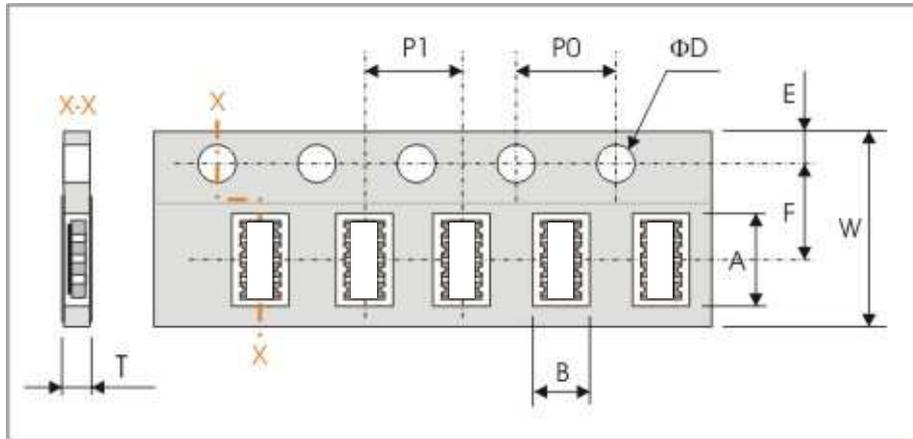
Item	WA04F
Power Rating At 70°C	1/16W
Resistance	MAX.50mΩ
Rated Current	1A
Peak Current	1.5A
Operating Temperature	-55~155°C

TEST AND REQUIREMENTS

TEST	PROCEDURE	REQUIREMENT	
		Resistor	Jumper
DC resistance (JIS C 5202 5.1 / IEC60115-1 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
TCR (JIS C5202 5.2 / IEC60115-1 4.8.4.2)	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 ₁ : Resistance at reference temperature R ₂ : Resistance at test temperature t ₁ : 25°C	Test temperature -55~+155°C ≤±300ppm/°C	N/a
Short time overload (JIS C 5202 5.5 / IEC60115-1 4.13)	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. ±(2%+0.10Ω)	< 50mΩ
Resistance to soldering heat IEC 60068-2-58:2004	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 255°C±5°C	no visible damage Δ R/R max. ±(1.0%+0.05Ω)	no visible damage, < 50mΩ
Solderability IEC 60068-2-58:2004	Un-mounted chips completely immersed for 3±0.3 second in a SAC solder bath at 245°C±5°C	good tinning (>95% covered) no visible damage	
Temperature cycling (JIS C 5202 7.4 / IEC60115-1 4.19)	1. 30 minutes at -55°C±3°C, 2. 10~15minutes at room temperature, 3. 30 minutes at +155°±3°C, 4. 10~15minutes at room temperature, 5 continuous cycles	no visible damage ΔR/R max. ±(1%+0.05Ω)	no visible damage, < 50mΩ
Load life (endurance) (JIS C 5202 7.10/ IEC60115-1 4.25.1)	70±2°C, 1000 hours, loaded with RCWV or Vmax, 1.5 hours on and 0.5 hours off	10Ω~1MΩ ±(3%+0.1Ω) <10Ω or ≥1MΩ ±(5%+0.1Ω)	< 50mΩ
Load life in Humidity (JIS C 5202 7.9 / IEC60115-1 4.24.2)	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	10Ω~1MΩ ±(3%+0.1Ω) <10Ω or ≥1MΩ ±(5%+0.1Ω)	< 50mΩ

PACKAGING

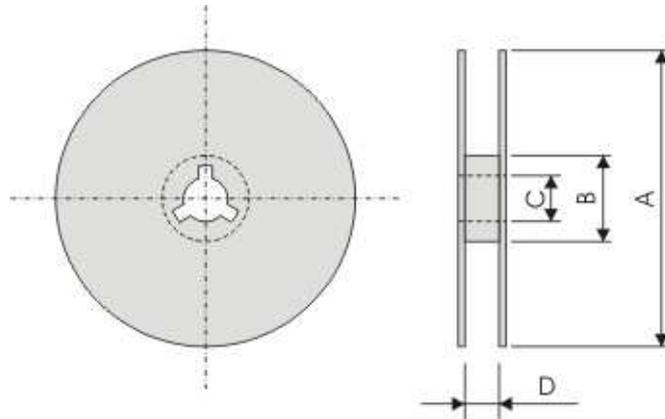
Paper Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WA04F	2.20±0.10	1.20±0.10	8.00±0.10	3.50±0.05	1.75±0.10

Series No.	P1	P0	ΦD	T
WA04F	2.00±0.05	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max. 0.6

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