APPROVAL SHEET

WA02H_V

±5%, ±1%

Thick Film
General purpose chip resistors array
Anti-Sulfur ASTM B-809 Compliant
Size 0201x4 Flat Type

RoHS 2 Compliant with exemption 7C-I
Halogen free

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. RoHS compliant with exemption 7C- I and Halogen free products
6. Anti-Sulfuration compliant against ASTM B-809 60’C 1000hrs

APPLICATION

- Consumer electrical equipment, PDA, Digital Cam-coder, …
- EDP, Computer application
- Mobile phone, 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 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) solder alloy.

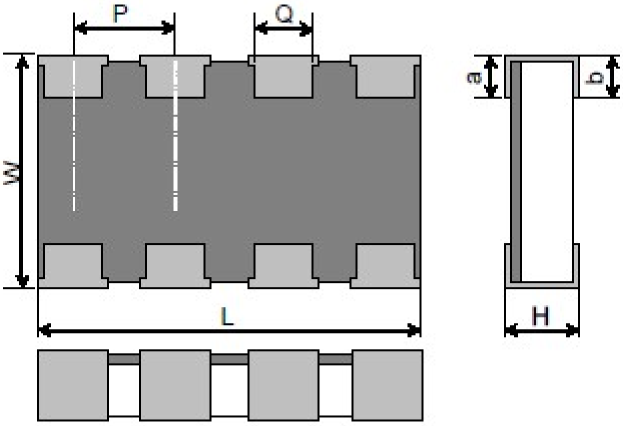


Fig 1. Outline of chip-R array WA02H

QUICK REFERENCE DATA

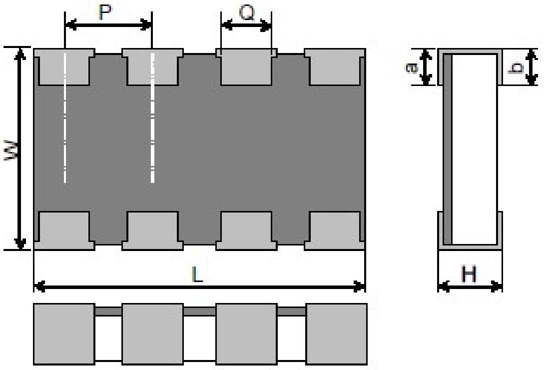
Item	General Specification	
Series No.	WA02H_V	
Size	0201x4 (0603x4)	
Termination construction	Flat type	
Resistance Tolerance	±5% (E24 series), jumper	±1% (E24 series)
Resistance Range	10Ω ~ 1MΩ	100Ω ~ 100KΩ
TCR (ppm/°C)	10Ω ~ 27Ω: ≤ ± 350 ppm/°C 30Ω ~ 1MΩ: ≤ ± 200 ppm/°C	
Rated element dissipation (W)	0.031W	
Max. Operation Voltage Limiting element Voltage (V)	12.5V	
Insulation Voltage(V)	50V	
Rated current for Jumper	1A	
Category temperature range('C)	-55 ~ +155'C	

Note :

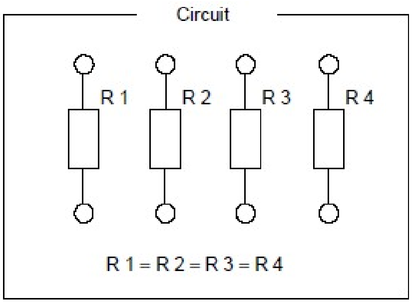
1. This is the maximum voltage that may be continuously supplied to the resistor element, see "IEC publication 60115-8"
2. Max. Operation Voltage : So called RCWV (Rated Continuous Working Voltage) is determined by

   $\mathrm{RCWV} = \sqrt{\mathrm{Rated\,Power} \times \mathrm{Resistance\,Value}}$ or Max. RCWV listed above, whichever is lower.
3. Jumper is defined as max. 50mΩ

DIMENSIONS(unit：mm)



Dimension (mm)	**WA02H**
L	1.40 ± 0.05
W	0.60 ± 0.05
H	0.23 ± 0.10
P	0.40 typical
Q	0.20 ± 0.10
a	0.20 ± 0.10
b	0.20 ± 0.10



MARKING

No marking for WA02H_V chip resistors array

FUNCTIONAL DESCRIPTION

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of ±5%, and ±1%.The values of the E24 series are in accordance with "IEC publication 60063"

Derating

The derated values of dissipation (or current rating in case of chip jumper) at temperature in excess of 70°C shall be as indicated by the following curve.

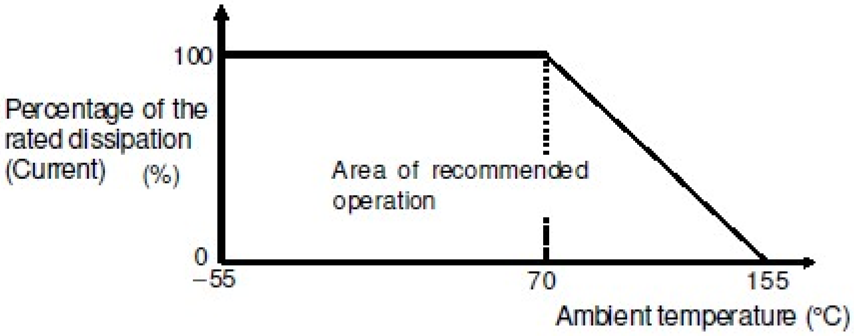


Figure 2. Maximum dissipation in percentage of rated power

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 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.

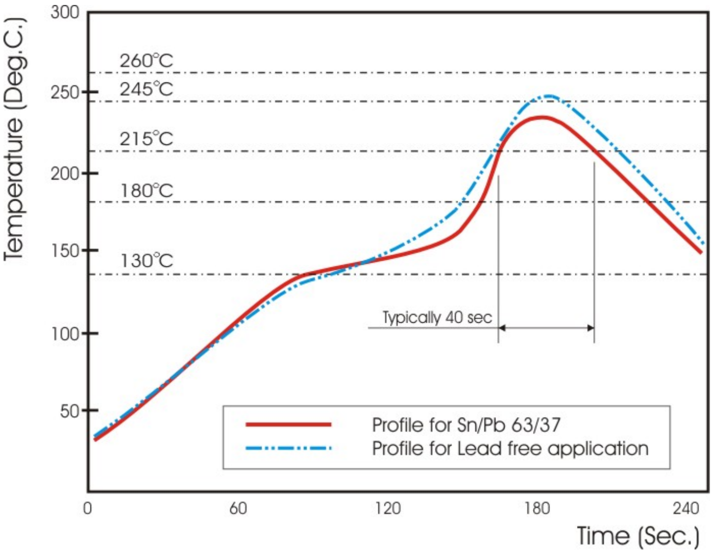


Fig 3. Infrared soldering profile for Chip Resistors array

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WA02	H	472_	J	T	L	V
Size code WA02: 0201	**Type code** H: x4, Flat Array	**Resistance code** 5% E24 : 2 significant digits followed by no. of zeros and a blank 10Ω =100_ 220Ω =221_ Jumper =000_ ("_" means a blank) 1%, E24: 3 significant digits followed by no. of zeros 100Ω =1000 220Ω =2200	**Tolerance** J : ±5% F : ±1% P : Jumper	**Packaging code** T : 7" 10kpcs Reel taping	**Termination code** L **=** Sn base (lead free)	**Special code** **V** = Anti-sulfuration ASTM B-809 60'C 1000hrs

Reeled tape packaging : 8mm width paper taping 7" reel 10,000pcs per reel,

TEST AND REQUIREMENTS

The standard condition for tests shall be in accordance with Sub-clause 4.2, JIS C 5201-1:2011.

The performance shall be satisfied in follows.

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
1	Visual examination	Sub-clause 4.4.1 Checked by visual examination	As in 4.4.1 The Marking shall be legible, as checked by visual examination
2	Dimension	Sub-clause 4.4.2	As specified in sub clause 5 of this specification.
	Resistance	Sub-clause 4.5	As in 4.5.2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance. Chip Jumper: 50mΩ max.
3	Voltage proof	Sub-clause 4.7 Method 4.6.1.4 Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage. Duration: 60s±5s Insulation resistance Test voltage: Insulation voltage. Duration: 1 min.	No breakdown or flash over R≥1GΩ
4	Solderability	Sub-clause 4.17 Without ageing Flux: The resistors shall be immersed in a non-activated soldering flux for 2s Bath temperature: 235°C±5°C Immersion time: 2s±0.5s	As in 4.17.4.5 The terminations shall be covered with a smooth and bright solder coating.
5	Mounting Overload (in the mounted state) Solvent resistance of the marking	Sub-clause 4.31 Substrate material : Epoxide woven glass Sub-clause 4.13 The applied voltage shall be 2.5 times the rated voltage or twice the limiting element voltage, whichever is less severe. Duration: 2s Visual examination Resistance Sub-clause 4.30 Solvent:2-propanol Solvent temperature: 23°C±5°C Method 1 Rubbing material : cotton wool Without recovery	No visible damage ΔR≤±(1%+0.05Ω) Chip Jumper: 50mΩ max. Legible marking

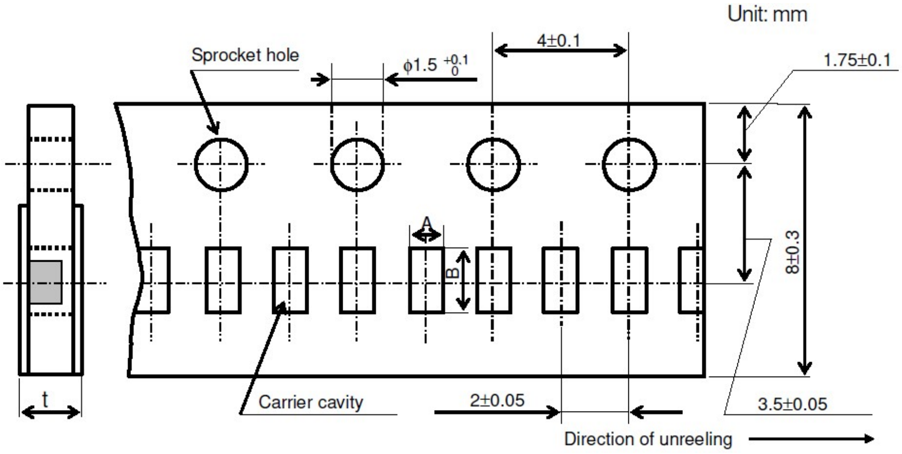
No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
6	Mounting Bound strength of the end face plating Final measurements	Sub-clause 4.31 Substrate material : Epoxide woven glass Sub-clause 4.33 Bent value: 3mm Resistance Sub-clause 4.33.6 Visual examination	∆R≤±(1%+0.05Ω) Chip Jumper: 50mΩ max No visible damage
7	Resistance to soldering heat Component solvent resistance	Sub-clause 4.18 Solder temperature: 260°C±5°C Immersion time: 10s±0.5s Visual examination Resistance Sub-clause 4.29 Solvent:2-propanol Solvent temperature: 23°C±5°C Method 2 Recovery:48h Visual examination Resistance	As in 4.18.3.4 No sign of damage such as cracks. ∆R≤±(1%+0.05Ω) Chip Jumper: 50mΩ max No visible damage ∆R≤±(1%+0.05Ω) Chip Jumper: 50mΩ max
8	Mounting Adhesion Rapid change temperature	Sub-clause 4.31 Substrate material : Epoxide woven glass Sub-clause 4.32 Force: 3N Duration: 10s±1s Visual examination Sub-clause 4.19 Lower category temperature:-55°C Upper category temperature:+155°C Duration of exposure at each temperature: 30 min. Number of cycles: 5 cycles Visual examination Resistance	No visible damage No visible damage ∆R≤±(1%+0.05Ω) Chip Jumper: 50mΩ max

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
9	Climatic sequence -Dry heat -Damp heat , cycle (12+12hour cycle) First cycle -Cold -Damp heat , cycle (12+12hour cycle) Remaining cycle -D.C. load	Sub-clause 4.23 Sub-clause 4.23.2 Test temperature:+155°C Duration:16 h Sub-clause 4.23.3 Test method : 2 Test temperature: 55°C [Severity(2)] Sub-clause 4.23.4 Test temperature: -55°C Duration:2h Sub-clause 4.23.6 Test method : 2 Test temperature: 55°C [Severity(2)] Number of cycles: 5 cycles Sub-clause 4.23.7 The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller. Duration: 1 min. Visual examination Resistance	No visible damage ΔR≤±(5%+0.1Ω) Chip Jumper: 50mΩ max
10	Mounting Endurance at 70°C	Sub-clause 4.31 Substrate material : Epoxide woven glass Sub-clause 4.25.1 Ambient temperature: 70°C±2°C Duration: 1000h The voltage shall be aplied in cycles of 1.5 h on and 0.5 h off. The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller. Examination at 48h, 500h and 1000h: Visual examination Resistance	No visible damage ΔR≤±(5%+0.1Ω) Chip Jumper: 50mΩ max
11	Mounting Variation of resistance with temperature	Sub-clause 4.31 Substrate material : Epoxide woven glass Sub-clause 4.8 -55°C/+20°C +20°C/+155°C	As in “QUICK REFERENCE DATA”

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
12	Mounting Damp heat, steady state	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.24 Ambient temperature: 40°C±2°C Relative humidity: 93+2 /-3 % a)1st group: without voltage applied b) 2nd group: The d.c.voltage shall be applied continously. The voltage shall be accordance with Sub-clause 4.24.2.1 b). without polarizing voltage[4.24.2.1,c)] Visual examination Resistance	No visible damage Legible marking ΔR≤±(5%+0.1Ω) Chip Jumper: 50mΩ max
13	Dimensions(detail) Mounting Endurance at upper category temperature	Sub-clause 4.4.3 Sub-clause 4.31 Substrate material : Epoxide woven glass Sub-clause 4.25.3 Ambient temperature: 155°C±2°C Duration: 1000 h Examination at 48h, 500h and 1000h: Visual examination Resistance	As in Sub-clause 5 of this specification No visible damage ΔR≤±(5%+0.1Ω) Chip Jumper: 50mΩ max
14	Humid Sulfur vapor test (FOS)	ASTM B809 Reagent: Sulfur(Saturated vapor) Test temp.:60°C Relative humidity: 95%RH Test period: 1000 h Resistance	ΔR≤±(1%+0.05Ω) Chip Jumper: 50mΩ max

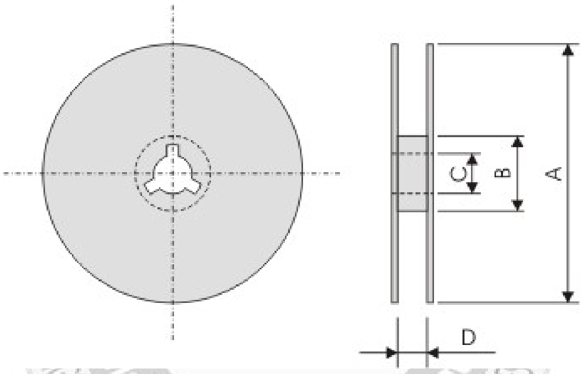
PACKAGING

Paper Tape Specifications (unit: mm)



Dimension(mm)	
A	0.7 ± 0.1
B	1.5 ± 0.1
t	0.6max.

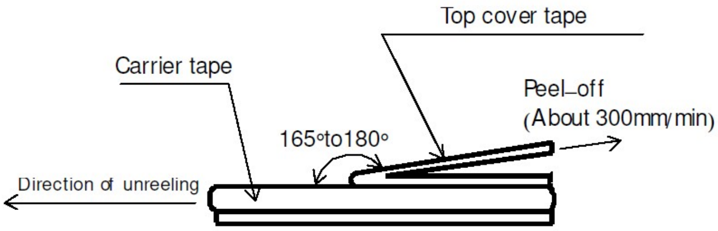
Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ178.0 ± 2.0	Φ60.0 ± 1.0	13.0 ± 0.2	9.0 ± 0.3

Peeling force of top cover tape

The peel strength of the top cover tape shall be with in 0.1N to 0.5N on the test method as shown in the followings.



Taping Qty

10,000pieces per 7” reel