

APPROVAL SHEET

WW04E

±5%, ±1%

Thick film low ohm chip resistors

Size 0402

RoHS 2 Compliant with exemption 7C-I

Halogen free



*Contents in this sheet are subject to change without prior notice.

FEATURES

1. High power rating and low range
2. High reliability and stability
3. Suitable for current sensing of small mobile devices
4. RoHS 2 compliant with exemption 7C-I and Halogen free products
5. Low cost benefit

APPLICATIONS

- Game equipment
- Mobile phone
- Battery pack
- Power supply
- DSC
- HDD

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.

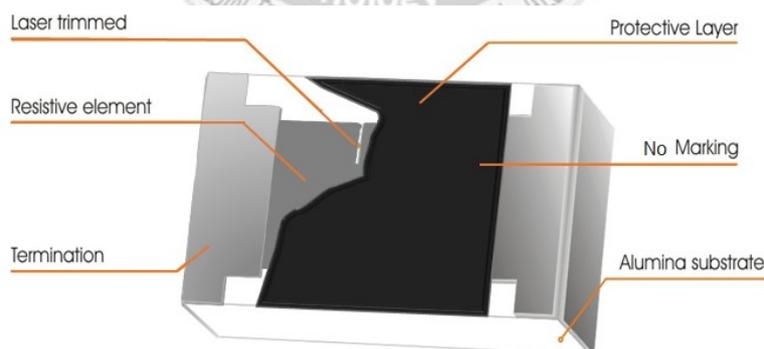


Fig.1 Construction of WW04E

QUICK REFERENCE DATA

Item	General Specification
Series No.	WW04E
Size code	0402(1005)
Resistance Tolerance	±5%, ±1%
Resistance Range	0.050Ω ~ 0.910Ω
TCR (ppm/°C)	
0.51Ω~0.91Ω	±300ppm
0.39Ω~0.50Ω	±800ppm
0.10Ω~0.36Ω	±800ppm
0.05Ω~0.091Ω	±1500ppm
Max. dissipation at T _{amb} =70°C	0.063 W
Max. Operation Current	0.26 ~ 1.12 A
Operation temperature	-55 ~ +155°C

Series No.	Limiting element voltage (V)	Insulation voltage (V)	Category temperature range (°C)
WW04E	0.23	100	-55 ~ +155°C

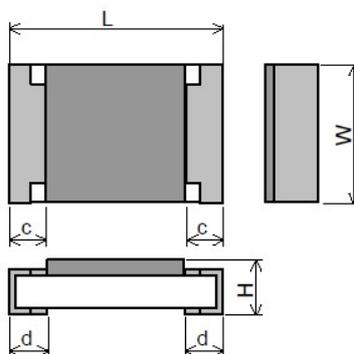
1. Max. Operation current : So called RCWC (Rated Continuous Working Current) is determined by

$$RCWC = \sqrt{\text{Rated Power} / \text{Resistance Value}}$$

2. Resistance range shall be in accordance with Table-1

MECHANICAL DATA (unit: mm)

Symbol	WW04E
L	1.0 ± 0.05
W	0.50 ± 0.05
H	0.35 ± 0.05
c	0.20 ± 0.10
d	0.25 +0.05/-0.10



RESISTANCE RANGE

Resistance range shall be in accordance with Table-1

Table-1

Rated resistance (mΩ)	PN Symbol	Rated resistance (mΩ)	PN Symbol
50	R050	250	R250
51	R051	270	R270
56	R056	300	R300
60	R060	330	R330
62	R062	360	R360
65	R065	390	R390
68	R068	400	R400
70	R070	430	R430
75	R075	470	R470
80	R080	500	R500
82	R082	510	R510
90	R090	560	R560
91	R091	600	R600
100	R100	620	R620
110	R110	650	R650
120	R120	680	R680
130	R130	700	R700
150	R150	750	R750
160	R160	800	R800
180	R180	820	R820
200	R200	900	R900
220	R220	910	R910
240	R240		

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW04	E	R050	F	T	L
Size code WW04 : 0402	Type code E : Low ohm	Resistance code R is first digit followed by 3 significant digits. 0.050Ω = R050 0.100Ω = R100 0.910Ω = R910	Tolerance J : ±5% F : ±1%	Packaging code T : 7" Reel taping	Termination code L = Sn base (lead free)

- Reeled tape packaging
0402: 8mm width paper taping 2mm pitch, 10,000pcs per reel

MARKING

0402 size should not be marked.

FUNCTIONAL DESCRIPTION

Derating Curve

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

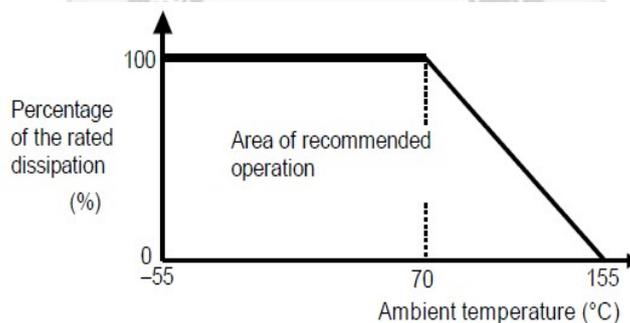


Fig.2 Maximum dissipation in percentage of rated power
As a function of the ambient temperature

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.

STORAGE AND HANDLING CONDITIONS

1. Products are recommended to be used up within two years since operation date as ensured shelf life. Check solderability in case shelf life extension is needed.
2. To store products with following condition:
 - Temperature :5 to 40°C
 - Humidity :20 to 70% relative humidity
3. Caution:
 - a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid.
It may cause oxidation of electrode, which easily be resulted in poor soldering.
 - b. To store products on the shelf and avoid exposure to moisture.
 - c. Don't expose products to excessive shock, vibration, direct sunlight and so on

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.

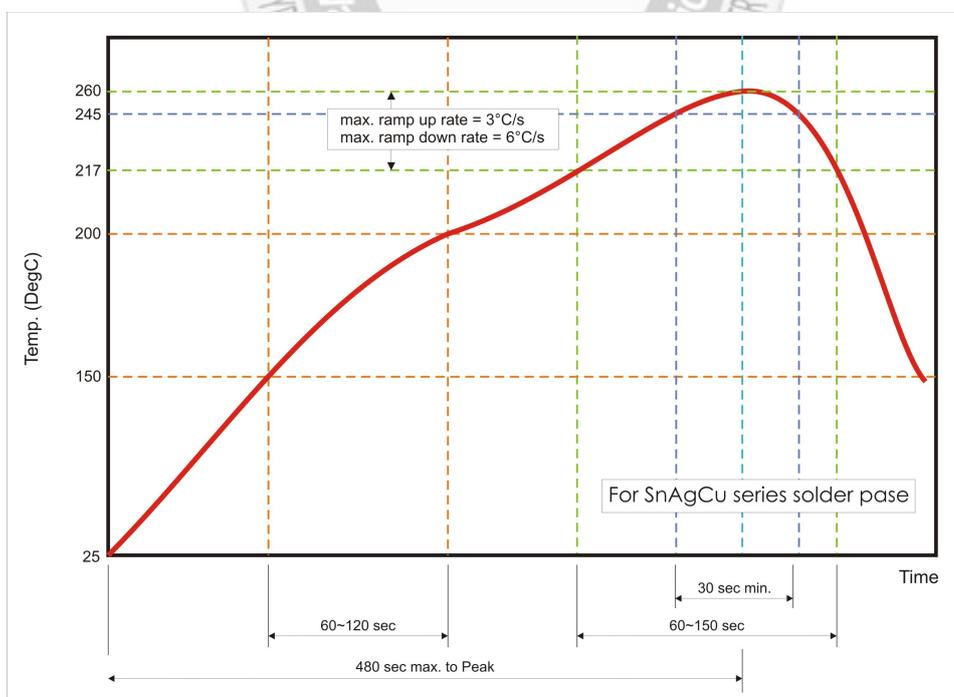


Fig 3. Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste

TEST AND REQUIREMENTS

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

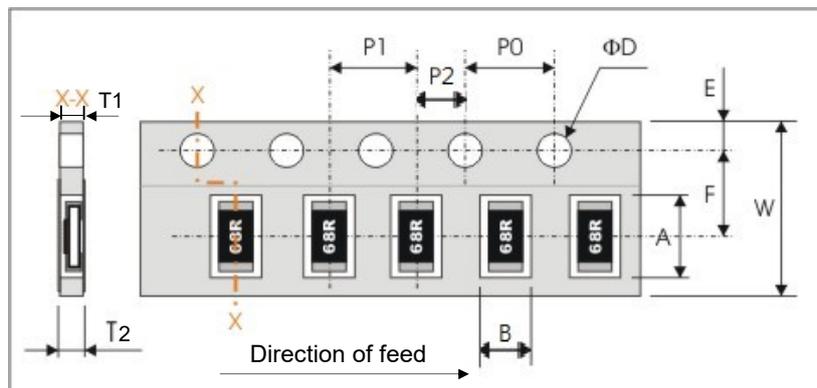
The performance shall be satisfied in follows

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 Resistance	Sub-clause 4.4.2 Sub-clause 4.5 Measurement current: 10(mA) Note: The measuring apparatus corresponding to Digital multimeter of TR6878 for Advantest Corp.	As specified in MECHANICAL DATA. As in 4.5.2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance
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: 60 s±5 s Insulation resistance Test voltage: Insulation voltage Duration: 1 min.	No breakdown or flash over R≥1GΩ
4	Solderability	Sub-clause 4.17 Without aging Flux: The resistors shall be immersed in a non-activated soldering flux for 2 s Bath temperature: 235°C±5°C Immersion time: 2 s±0.5 s	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 the current corresponding to. Duration: 2 s 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% Legible marking
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	ΔR≤±1% No visible damage

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
9	<p>Climatic sequence</p> <p>-Dry heat</p> <p>-Damp heat, cycle (12+12hour cycle) First cycle</p> <p>-Cold</p> <p>-Damp heat, cycle (12+12hour cycle) Remaining cycle</p> <p>-D.C. load</p>	<p>Sub-clause 4.23</p> <p>Sub-clause 4.23.2</p> <p>Test temperature:+155°C</p> <p>Duration: 16 h</p> <p>Sub-clause 4.23.3</p> <p>Test method: 2</p> <p>Test temperature: 55°C</p> <p>[Severity(2)]</p> <p>Sub-clause 4.23.4</p> <p>Test temperature: -55°C</p> <p>Duration:2h</p> <p>Sub-clause 4.23.6</p> <p>Test method : 2</p> <p>Test temperature: 55°C</p> <p>[Severity(2)]</p> <p>Number of cycles: 5 cycles</p> <p>Sub-clause 4.23.7</p> <p>The applied voltage shall be the rated current</p> <p>Duration: 1 min.</p> <p>Visual examination</p> <p>Resistance</p>	<p>No visible damage</p> <p>$\Delta R \leq \pm 1\%$</p>
10	<p>Mounting</p> <p>Endurance at 70°C</p>	<p>Sub-clause 4.31</p> <p>Substrate material : Epoxide woven glass</p> <p>Sub-clause 4.25.1</p> <p>Ambient temperature: 70°C±2°C</p> <p>Duration: 1000h</p> <p>The current shall be applied in cycles of 1.5 h on and 0.5 h off.</p> <p>The applied current shall be the rated current.</p> <p>Examination at 48h, 500h and 1000h:</p> <p>Visual examination</p> <p>Resistance</p>	<p>No visible damage</p> <p>$\Delta R \leq \pm 5\%$</p>
11	<p>Mounting</p> <p>Variation of resistance with temperature</p>	<p>Sub-clause 4.31</p> <p>Substrate material : Epoxide woven glass</p> <p>Sub-clause 4.8</p> <p>+20°C/+155°C</p>	<p>As in "QUICK REFERENCE DATA"</p>
12	<p>Mounting</p> <p>Damp heat, steady state</p>	<p>Sub-clause 4.31</p> <p>Substrate material: Epoxide woven glass</p> <p>Sub-clause 4.24</p> <p>Ambient temperature: 40°C±2°C</p> <p>Relative humidity: 93+2 /-3 %</p> <p>Without current applied</p> <p>Visual examination</p> <p>Resistance</p>	<p>No visible damage</p> <p>Legible marking</p> <p>$\Delta R \leq \pm 5\%$</p>
13	<p>Dimensions(detail)</p> <p>Mounting</p> <p>Endurance at upper category temperature</p>	<p>Sub-clause 4.4.3</p> <p>Sub-clause 4.31</p> <p>Substrate material : Epoxide woven glass</p> <p>Sub-clause 4.25.3</p> <p>Ambient temperature: 155°C±2°C</p> <p>Duration: 1000 h</p> <p>Examination at 48h, 500h and 1000h:</p> <p>Visual examination</p> <p>Resistance</p>	<p>As specified in MECHANICAL DATA</p> <p>No visible damage</p> <p>$\Delta R \leq \pm 5\%$</p>

PACKAGING

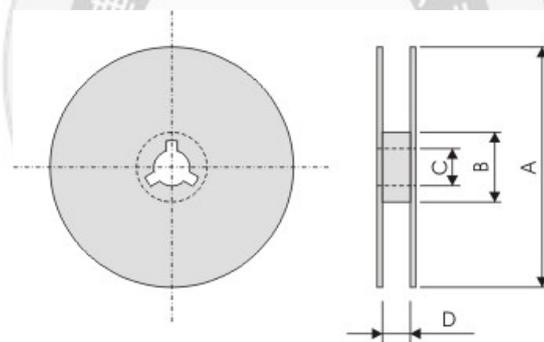
Paper Tape specifications (unit: mm)



Series No.	A	B	W	F	E
WW04E	1.15+0.05/-0.10	0.65+0.05/-0.10	8.00±0.20	3.50±0.05	1.75±0.10

Series No.	P1	P0	P2	ΦD	T1	T2
WW04E	2.00±0.10	4.00±0.10	2.00±0.05	Φ1.50 ^{+0.1} _{-0.0}	0.40±0.05	Max. 0.5

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ180 +0/ -1.5	Φ60+1.0/-0	13.0±0.2	9.0+1.0