

APPROVAL SHEET

WW12L, WW20L, WW25L

±1%, ±5%

Thick Film Power Low Ohm Chip Resistor

Wide Termination

RoHS compliant and Halogen free

Size 0612, 1020, 1225

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

FEATURE

1. High power rating and compact size
2. High reliability and stability
3. Reduced size of final equipment
4. RoHS compliant and Halogen free products

APPLICATION

- Power supply
- PDA
- Digital meter
- Computer
- Automotives
- Battery charger
- DC-DC power converter

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 at longer sides. For ease of soldering the outer layer of these end terminations is Tin (lead free) alloy.

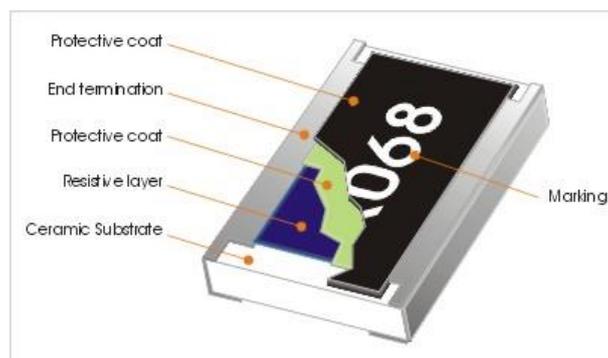


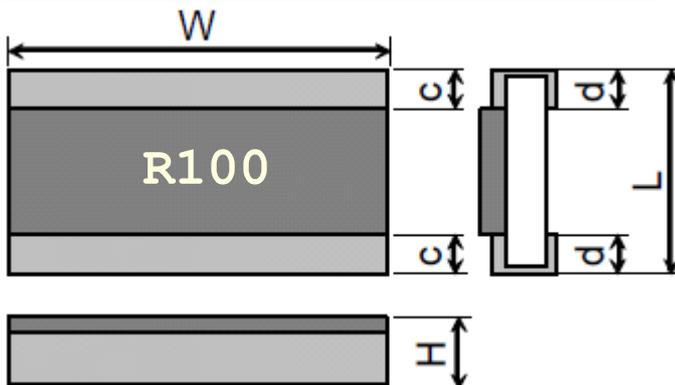
Fig 2. Construction of Chip-R

QUICK REFERENCE DATA

Item	General Specification		
	WW12L	WW20L	WW25L
Series No.	WW12L	WW20L	WW25L
Size code	0612(1632)	1020 (2550),	1225(3264)
Resistance Tolerance	±5%; ±1%		
Resistance Range	0.1Ω ~ 0.91Ω,		
TCR (ppm/°C) :	0.5 ~ 0.91Ω: 0~200 ppm/°C 0.2 ~ 0.47Ω: 0~ 250 ppm/°C 0.1 ~ 0.18Ω: 0~350 ppm/°C	0.2 ~ 0.91Ω: ± 200 ppm/°C 0.1 ~ 0.18Ω: ± 350 ppm/°C	
Max. dissipation at T _{amb} =70°C	1W	1 W	2W
Max. Operation Current	1.04A ~ 3.16A	1.04A ~ 3.16A	1.48A ~ 4.49A
Operation temperature	-55 ~ +155°C		

MECHANICAL DATA (unit : mm)

TYPE	WW12L	WW20L	WW25L
W	3.20±0.20	5.00±0.20	6.30±0.20
L	1.60±0.20	2.50±0.15	3.20±0.20
H	0.55±0.10	0.55±0.10	0.60±0.10
c	0.50±0.25	0.60±0.20	0.60±0.20
d	0.50±0.25	0.60±0.20	0.60±0.20



MARKING

Each resistor is marked with a four-digit code on the protective coating to designate the nominal resistance value.

Example:

$$R100 = 0.1\Omega$$

FUNCTIONAL DESCRIPTION

Derating curve

The power that the resistor can dissipate depends on the operating temperature; see Fig.3

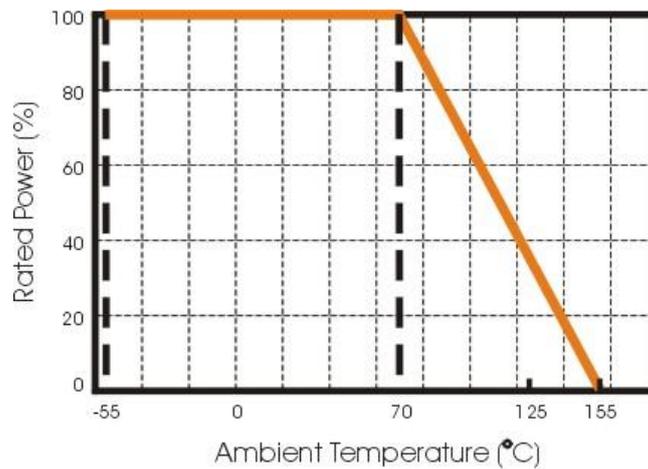


Figure 3. Maximum dissipation in percentage of rated power as a function of the ambient temperature.

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 4.

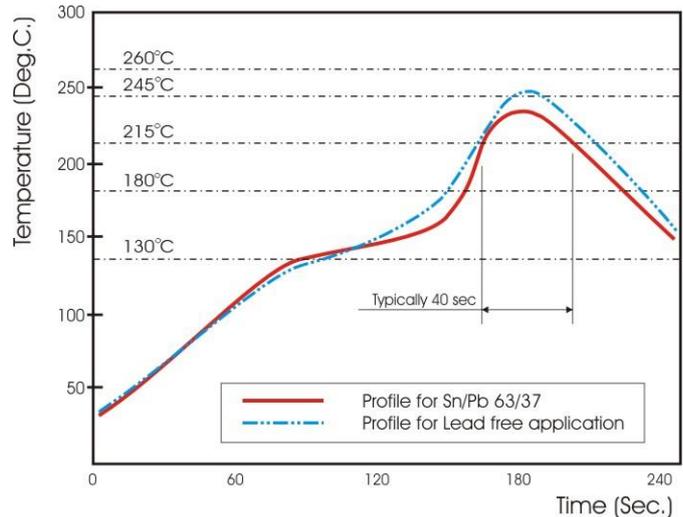


Fig 4. Infrared soldering profile for Chip Resistors

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW12	L	R100	F	T	L
Size code WW25 : 1225 WW20 : 1020 WW12: 0612	Type code L : wide termination	Resistance code 3 significant digits followed by no. of zeros 0.1Ω = R100 0.91Ω = R910	Tolerance J : ±5% F : ±1%	Packaging code T : 7" Reel taping	Termination code L = Sn base (lead free)

Rated resistance

The rated resistance shall be in accordance with Table-2

Table-2

Rated resistance		Rated resistance	
Rated resistance [mΩ]	Symbol	Rated resistance [mΩ]	Symbol
100	R100	400	R400
110	R110	430	R430
120	R120	470	R470
130	R130	500	R500
150	R150	510	R510
160	R160	560	R560
180	R180	600	R600
200	R200	620	R620
220	R220	650	R650
240	R240	680	R680
250	R250	700	R700
270	R270	750	R750
300	R300	800	R800
330	R330	820	R820
360	R360	900	R900
390	R390	910	R910

TEST AND REQUIREMENTS (JIS C 5201-1: 2011)

Table- 5(1)

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 Table-4 of this specification. 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 ≥ 1 GΩ
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: 245 °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

Table-5(2)

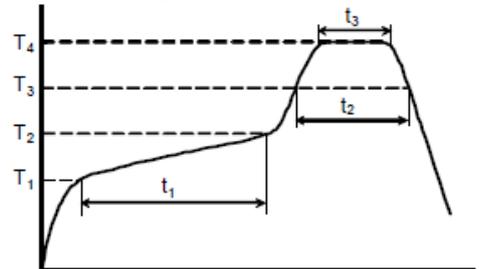
No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
6	Mounting Bound strength of the end face plating Final measurements	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.33 Bent value: 0612: 3mm 1020/1225: 1mm Resistance Sub-clause 4.33.6 Visual examination	$\Delta R \leq \pm 1\%$ No visible damage
7	Resistance to soldering heat Component resistance solvent	Sub-clause 4.18 (JEITA RC-2144 2.3.2) T ₁ :Pre-heat minimum temp.:150±5 °C T ₂ :Pre-heat maximum temp.:180±5 °C T ₃ :Soldering temp.:220 °C T ₄ :Peak temp.:250 °C t ₁ :Pre-heat duration:120±5 s t ₂ :Soldering duration:60 to 90 s t ₃ :Peak duration(T ₄ -5°C):20 to 40 s Pre-reflow soldering: 1 time (Initial measurements) Reflow soldering: 3 times  Visual examination Resistance Sub-clause 4.29 Solvent: 2-propanol Solvent temperature: 23 °C±5 °C Method 2 Recovery: 48 h Visual examination Resistance	No visible damage $\Delta R \leq \pm 1\%$ No visible damage $\Delta R \leq \pm 1\%$

Table-5(3)

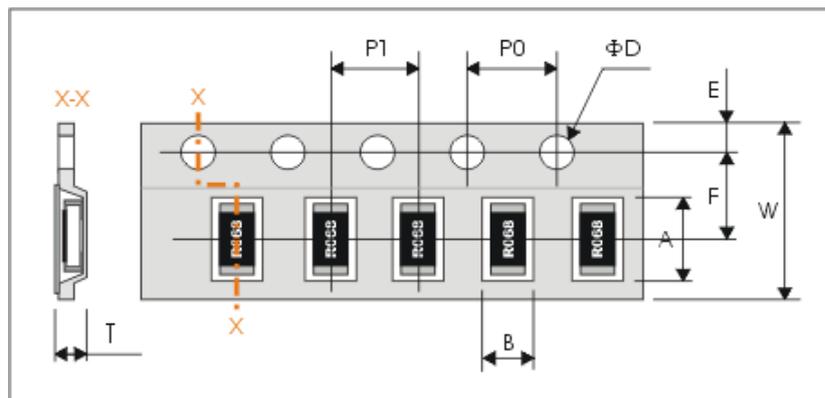
No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
8	Mounting Adhesion Rapid change temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.32 Force: 5 N Duration: 10 s±1 s Visual examination Sub-clause 4.19 Lower category temperature: -55 °C Upper category 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 $\Delta R \leq \pm 1\%$
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 current shall be the rated current. Duration: 1 min. Visual examination Resistance	No visible damage $\Delta R \leq \pm 5\%$
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: 1000 h The current shall be applied in cycles of 1.5 h on and 0.5 h. The applied current shall be the rated current Examination at 48 h, 500 h and 1000 h: Visual examination Resistance	No visible damage $\Delta R \leq \pm 5\%$

Table-5(4)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
11	Mounting Variation of resistance with temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Sub-clause 4.8 +20 °C / +155 °C	As in Table-1
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 \pm ₃ % Without current applied. Visual examination Resistance	No visible damage Legible marking $\Delta R \leq \pm 5\%$
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 48 h, 500 h and 1000 h: Visual examination Resistance	As in Table-4 No visible damage $\Delta R \leq \pm 5\%$

PACKAGING

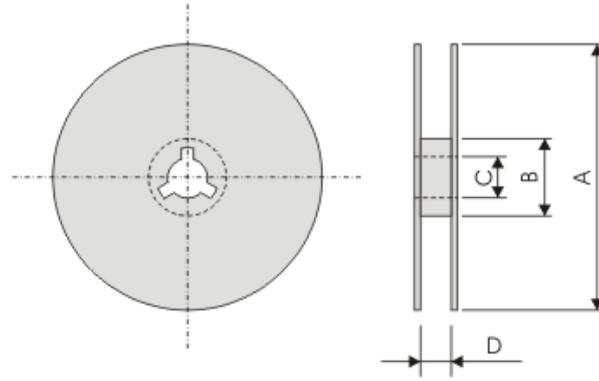
Tape specifications (unit :mm)



Type	A	B	W	F	E
WW12L	3.60±0.20	2.00±0.15	8.00±0.30	3.50±0.10	1.75±0.10
WW20L	5.50±0.20	3.10±0.20	12.00±0.30	5.50±0.10	
WW25L	6.90±0.20	3.60±0.20	12.00±0.30	5.50±0.10	

Type	P1	P0	ΦD	T
WW12L	4.00±0.10	4.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	Max 1.0
WW20L				1.10±0.15
WW25L				1.10±0.15

Reel dimensions



(unit : mm)

Symbol	A	B	C	D
7" Reel	$\Phi 178.0 \pm 2.0$	$\Phi 60.0 \pm 1.0$	13.0 ± 0.2	$12.4.0 \pm 1.00$
10" Reel	$\Phi 254.0 \pm 2.0$	$\Phi 100.0 \pm 1.0$	13.0 ± 0.2	14.0 ± 0.20
13" Reel	$\Phi 330.0 \pm 2.0$	$\Phi 100.0 \pm 1.0$	13.0 ± 0.2	14.0 ± 0.20

Taping quantity

WW20L, WW25L by plastic tape taping 4,000 pcs per reel!

WW12L by paper tape taping 5,000 pcs per reel!