

APPROVAL SHEET

WW25J_J, WW25K_J

$\pm 1\%$, $\pm 5\%$

Metal Ultra low ohm power chip resistors

Size 2512, WW25K 2W, WW25J 1W

Metal Current Sensing Type

RoHS Exemption free and Lead free products

Halogen free

Low EMF

Automotive AEC Q200 Compliant

Anti-Sulfuration EIA-977 105°C 750hrs

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

FEATURE

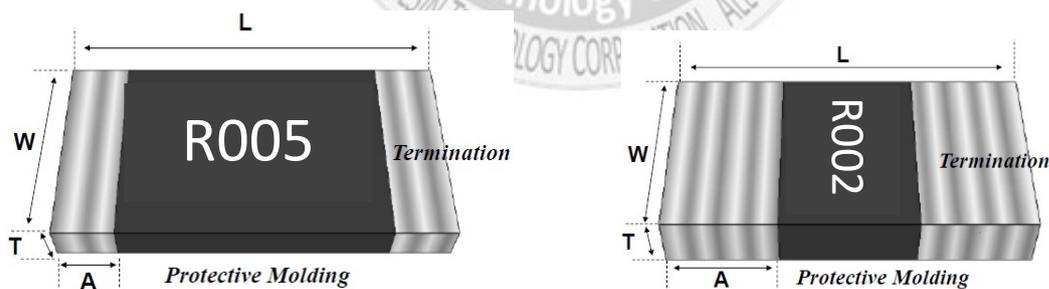
1. Ultra low and stable TCR performance
2. High power rating and low EMF $\leq 3\mu V/^{\circ}C$
3. High reliability and stability
4. Reduced size of final equipment
5. RoHS Exemption free and Lead free products
6. Inductance below 1Nh
7. Automotive grade AEC Q-200 compliant
8. EIA-977 Test B 105°C 750hrs compliant

APPLICATION

- Switching model power supply
- Computer
- Automotives
- Battery charger
- DC-DC power converter
- Test Instrument

DESCRIPTION

The resistors are constructed in a high grade low resistive metal body. The resistive layer is covered with a protective coat and printed a resistance marking code over it. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a lead-free solder.



Item	Protective Molding	Resistive Element	Internal Terminal	External Terminal
Material	Resin	Alloy Metal	Copper	Solder

Fig 1. Construction of Chip-R

QUICK REFERENCE DATA

Item	General Specification	General Specification
Series No.	WW25J	WW25K
Size code	2512 (6432)	2512 (6432)
Resistance Tolerance	±5%; ±1%	±5%; ±1%
Resistance Value	0.001Ω, 0.002Ω, 0.003Ω, 0.004Ω, 0.005Ω, 0.006Ω, 0.007Ω, 0.008Ω, 0.009Ω, 0.010Ω, 0.015Ω, 0.020Ω, 0.025Ω	0.001Ω, 0.002Ω, 0.003Ω, 0.004Ω, 0.005Ω, 0.006Ω, 0.007Ω, 0.008Ω, 0.009Ω, 0.010Ω, 0.015Ω, 0.020Ω, 0.025Ω
TCR (ppm/°C) **	±70	±70
Max. dissipation at T _{amb} =70°C	1W	2W
Max. Working Current (Voltage)*	31.6A (158mV)	44.7A (224mV)
Max. Overload Current (Voltage)*	70.7A (354mV)	100A (500mV)
Operation temperature	-55/+170°C	-55/+170°C

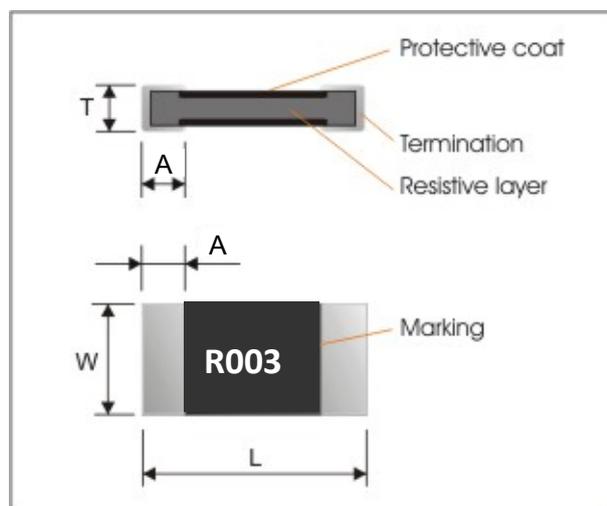
Note :

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

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

3. Please keep the surface temperature do not exceed 105°C when operating.
4. **: TCR Hot (+25~+155°C)
5. R-value might be variance depend on soldering conditions and please consider this influence before use milli-ohm resistors, and strongly suggest use the recommend solder pad to design your circuits
6. *Max. working & Max. overload current details please refer Annex. 1

MECHANICAL DATA



Symbol	R001~R002	R003 ~ R025
L	6.40±0.20	6.20±0.20
W	3.25±0.20	3.25±0.20
T	0.75±0.20	0.60±0.20
A	2.00±0.20	0.80±0.20

CATALOGUE NUMBERS

The resistors have a catalogue number starting with .

WW25	K	R010	F	T	L	J
Size code WW25 : 2512	Type code K : 2512 2W J : 2512 1W Metal strip Low EMF	Resistance code R is first digit followed by 3 significant digits. 0.010Ω = R010	Tolerance J : ±5% F : ±1%	Packaging code T : 7" reeled taping 4K pcs	Termination code L = Sn base (lead free)	Special code J = Automotive grade AEC Q-200 compliant Anti-sulfuration

MARKING

TOP : Marking. (4 Digits marking to identify the resistance value.)



R005=5mΩ , R020=20mΩ



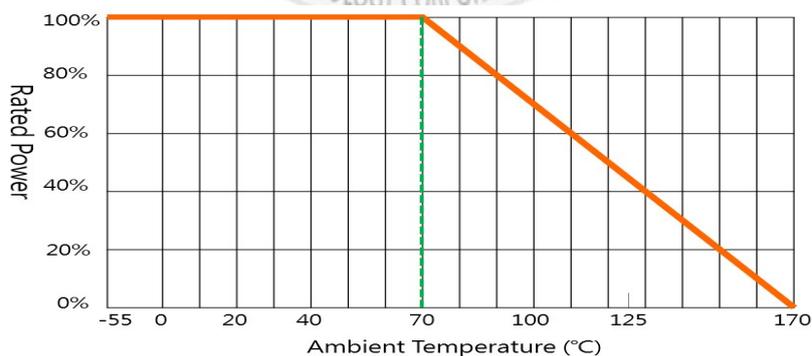
R001=1mΩ ; R002=2mΩ

FUNCTIONAL DESCRIPTION

Derating curve

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

Operating Temperature Range: -55 to +170°C



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.

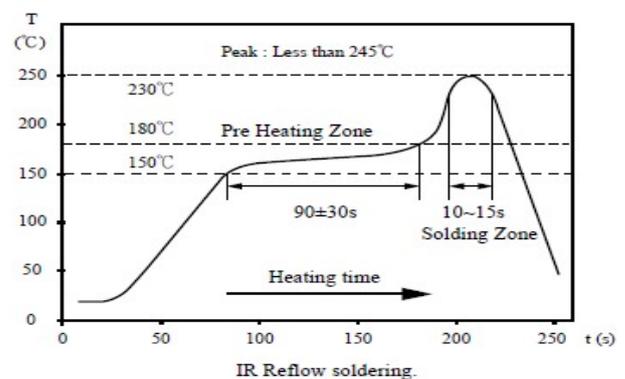
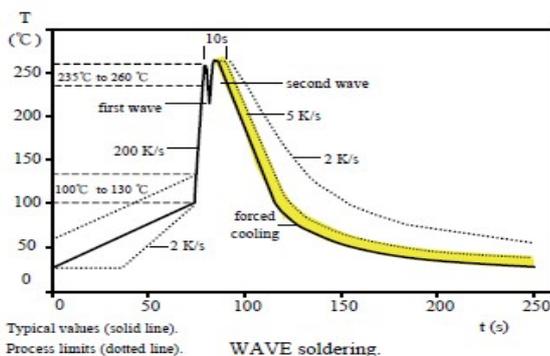
Storage and Handling Conditions:

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 235°C during 3 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.



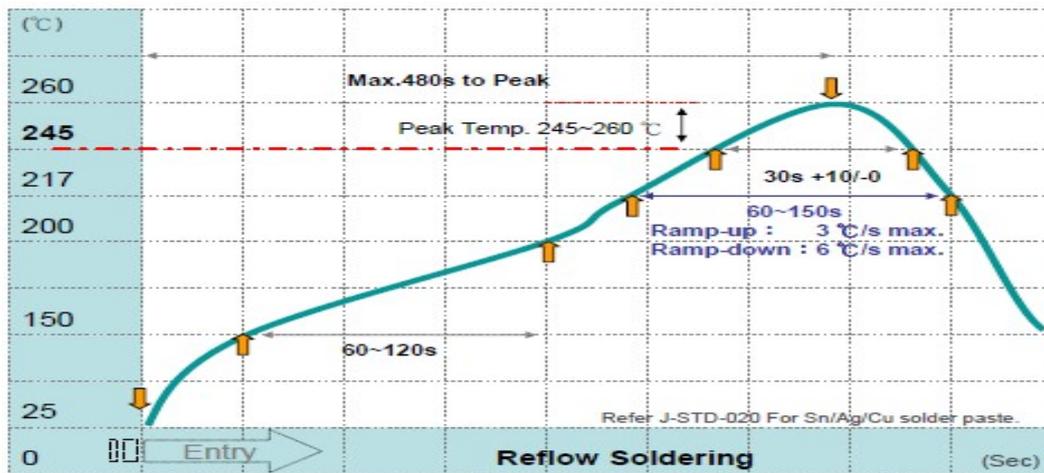


Fig 3. Infrared soldering profile for Chip Resistors WW25

Recommend Solder Pad Dimensions :



Type	W	D	L
3~25 mOhm	3.70	1.60	7.60
1-2 mOhm	4.00	3.00	7.30

TEST AND REQUIREMENTS

Test Item	Specification	Test Method (AEC-Q200. IEC 60115)
DC Resistance	J : $\pm 5\%$ F : $\pm 1\%$	AEC-Q200 TABLE 7.1 IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value.
High Temperature Exposure (Storage)	J : $\Delta R \leq \pm 3\%$ F : $\Delta R \leq \pm 1\%$	AEC-Q200 TABLE 7.3 1000 hrs. @ T=170°C. Unpowered. Measurement at 24 ± 2 hours after test conclusion.
Temperature Cycling	J : $\Delta R \leq \pm 1\%$ F : $\Delta R \leq \pm 0.5\%$ No mechanical damage.	AEC-Q200 TABLE 7.4 1000 Cycles (-55°C to +125°C). Measurement at 24 ± 2 hours after test conclusion.
Moisture Resistance	J : $\Delta R \leq \pm 1\%$ F : $\Delta R \leq \pm 0.5\%$	AEC-Q200 TABLE 7.6 Test 65°C/80~100%RH/10Cycles. Measurement at 24 ± 2 hours after test conclusion. (t=24hrs/cycle).
Biased Humidity	J : $\Delta R \leq \pm 3\%$ F : $\Delta R \leq \pm 1\%$	AEC-Q200 TABLE 7.7 1000 hours 85°C/85%RH. 10% of operating power. Measurement at 24 ± 2 hours after test conclusion.
Operational Life	J : $\Delta R \leq \pm 3\%$ F : $\Delta R \leq \pm 1\%$	AEC-Q200 TABLE 7.8 Test 1000hr @ T=125°C at specified rated power. Measurement at 24 ± 2 hours after test conclusion.
External Visual	No visual damage and refer the marking code.	AEC-Q200 TABLE 7.9 Inspect device construction, marking and workmanship.
Physical Dimension	Within the spec.	AEC-Q200 TABLE 7.10 Verify physical dimensions to the applicable device detail specification.
Mechanical Shock	Within product specification tolerance and no visible damage.	AEC-Q200 TABLE 7.13 Test Peak value: 100g's, Wave: Half-sine, Duration: 6ms, Velocity:12.3ft/sec.
Vibration	No mechanical damage.	AEC-Q200 TABLE 7.14 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz.

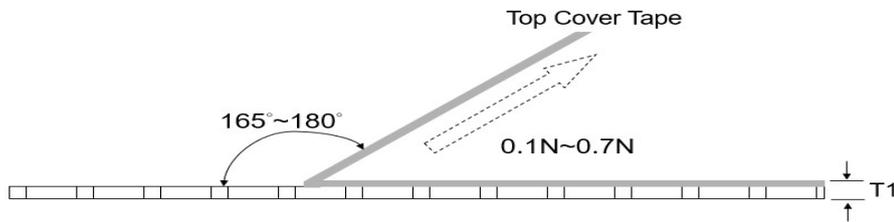
Test Item	Specification	Test Method (AEC-Q200. IEC 60115)
Resistance to Solder Heat	J : $\Delta R \leq \pm 1\%$ F : $\Delta R \leq \pm 0.5\%$ No mechanical damage.	AEC-Q200 TABLE 7.15 Solder dipping @ 260°C±5°C for 10sec.±1sec.
Thermal Shock	J : $\Delta R \leq \pm 1\%$ F : $\Delta R \leq \pm 0.5\%$ No mechanical damage.	AEC-Q200 TABLE 7.16 -55 to 155°C / dwell time 15min/ Max transfer time 20sec/ 300cycles.
ESD	$\Delta R \leq \pm 1\%$ No mechanical damage.	AEC-Q200-002 Test contact min. 1KV.
Solder Ability	Over 95% of termination must be covered with solder.	AEC-Q200 TABLE 7.18 a)Baking 155°C 4H, dipping 235°C 5s b)Steam 8H, dipping 215°C 5s c)Steam 8H, dipping 260°C 7s
Flammability	Refer UL-94.	AEC-Q200 TABLE 7.20 UL-94 V-0 or V-1 are acceptable
Board Flex	J : $\Delta R \leq \pm 1\%$ F : $\Delta R \leq \pm 0.5\%$ No mechanical damage.	AEC-Q200 TABLE 7.21 Bending 2mm 2512
Terminal Strength	No mechanical damage	AEC-Q200 TABLE 7.22 Force 1.8 Kg for 60 seconds.
Anti-Sulfur	$\Delta R \leq \pm 1\%$	EIA-977(Test B) Sulfur 750 hours, 105±2°C
Short time overload (S.T.O.L)	5×Rated power for 5 seconds.	no visible damage $\Delta R/R$ max.±1%

PACKAGING

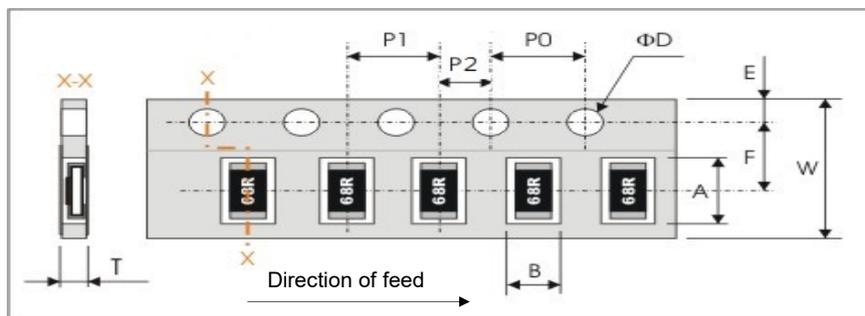
Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall between 0.1 to 0.7N



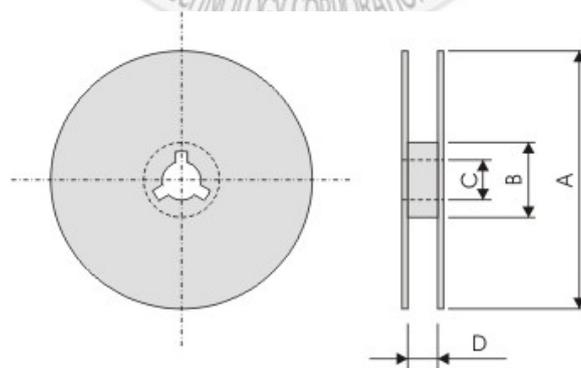
Plastic Tape specifications (unit :mm)



Series No.	A	B	W	F	E
WW25J/ WW25K	6.75±0.20	3.50±0.20	12.00±0.30	5.50±0.10	1.75±0.10

Series No.	P1	P0	P2	ΦD	T
WW25J/ WW25K	4.00±0.10	4.00±0.10	2.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	1.20±0.20

Reel dimensions



Size	A	B	C	D
2512	Φ178.0±2.0	Φ60.0±1.0	13.0±0.5	13.8±1.5

Taping Qty: WW25J/ WW25K: 4,000pcs per reel

Annex. 1 Max. working &. Max. overload current

2512 Rating Power 1.0W			2512 Rating Power 2.0W		
R_Value (mΩ)	Max. Working (A)	Max. Overload (A)	R_Value (mΩ)	Max. Working (A)	Max. Overload (A)
1	31.6	70.7	1	44.7	100.0
2	22.4	50.0	2	31.6	70.7
2.5	20.0	44.7	2.5	28.3	63.2
3	18.3	40.8	3	25.8	57.7
4	15.8	35.4	4	22.4	50.0
5	14.1	31.6	5	20.0	44.7
6	12.9	28.9	6	18.3	40.8
7	12.0	26.7	7	16.9	37.8
8	11.2	25.0	8	15.8	35.4
9	10.5	23.6	9	14.9	33.3
10	10.0	22.4	10	14.1	31.6
12	9.1	20.4	12	12.9	28.9
15	8.2	18.3	15	11.5	25.8
18	7.5	16.7	18	10.5	23.6
20	7.1	15.8	20	10.0	22.4
22	6.7	15.1	22	9.5	21.3
25	6.3	14.1	25	8.9	20.0
30	5.8	12.9	30	8.2	18.3
33	5.5	12.3	33	7.8	17.4
35	5.3	12.0	35	7.6	16.9
40	5.0	11.2	40	7.1	15.8
50	4.5	10.0	50	6.3	14.1
60	4.1	9.1	60	5.8	12.9
70	3.8	8.5	70	5.3	12.0
75	3.7	8.2	75	5.2	11.5
80	3.5	7.9	80	5.0	11.2
100	3.2	7.1	100	4.5	10.0
			150	3.7	8.2