

APPROVAL SHEET

WW25M_J

±5%, ±1%

Metal low ohm current sensing chip resistors

Size 2512 (6432) 1W

Automotive AEC Q200 Compliant

Anti-Sulfuration ASTM B-809 105°C 1000hrs

RoHS Exemption free and Lead free products

Halogen free

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

FEATURE

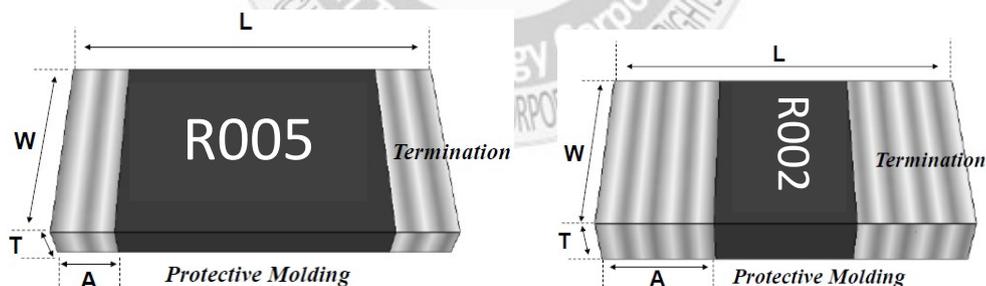
1. Metal low ohm and stable TCR performance
2. Automotive grade AEC Q-200 compliant
3. 100% CCD inspection
4. RoHS Exemption free and Lead free products
5. ASTM B-809 105°C 1000hrs compliant

APPLICATION

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

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 Tin (lead-free) solder alloy.



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

Fig 1. Construction of Chip-R

QUICK REFERENCE DATA

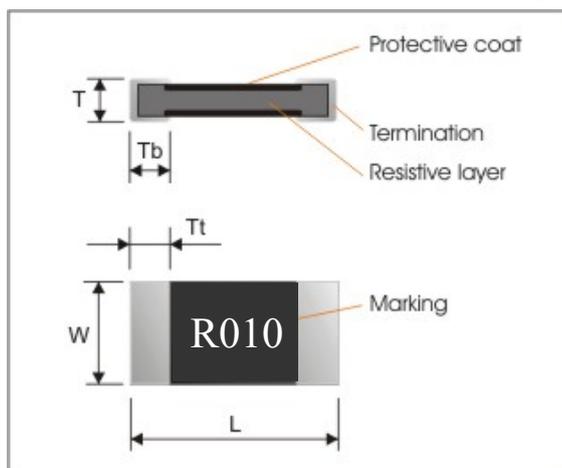
Item	General Specification	
Series No.	WW25M	
Size code	2512 (6432)	
Resistance Tolerance	±5%, ±1%	
Resistance Value	0.001Ω, 0.002Ω	0.003Ω, 0.004Ω, 0.005Ω, 0.006Ω, 0.007Ω, 0.008Ω, 0.009Ω, 0.010Ω, 0.012Ω, 0.015Ω, 0.020Ω, 0.022Ω, 0.025Ω, 0.030Ω, 0.033Ω, 0.035Ω, 0.040Ω, 0.050Ω, 0.060Ω, 0.070Ω, 0.075Ω, 0.080Ω, 0.100Ω,
TCR (ppm/°C)	≤ ±70 ppm/°C	≤ ±50 ppm/°C
Max. dissipation at T _{amb} =70°C	1W	
Max. Operation current (DC or RMS)	SQRT (Power / Resistance)	
Operation temperature	-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

$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value}}$$
 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 – R100
L	6.40±0.25	6.20±0.25
W	3.25±0.20	3.25±0.20
T	0.75±0.20	0.60±0.20
Tt	2.00±0.20	0.80±0.20
Tb	2.00±0.20	0.80±0.20

CATALOGUE NUMBERS

The resistors have a catalogue number starting with

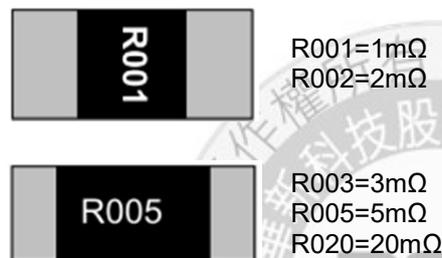
WW25	M	R025	J	T	L	J
Size code WW25 : 2512	Type code M : 1W Sensing type	Resistance code 0.025Ω = R025	Tolerance J : ±5% F : ±1%	Packaging code T : 7" reeled in tape	Termination code L = Sn base (lead free)	Special code J = Automotive grade AEC Q-200 compliant ASTM B-809 compliant

Reeled tape packaging : 12mm width plastic emboss taping 4,000pcs per reel.

MARKING

Each resistor is marked with a four-digit code on the protection coat to define resistance value.

Example:

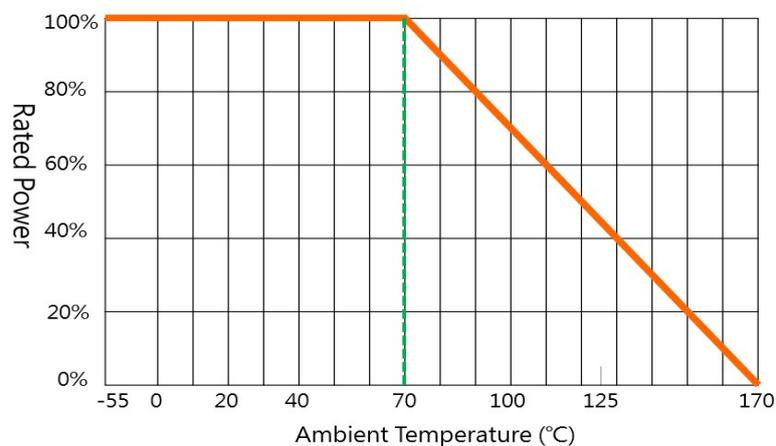


FUNCTIONAL DESCRIPTION

Derating curve

The power that the resistor can dissipate depends on the operating temperature.

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.

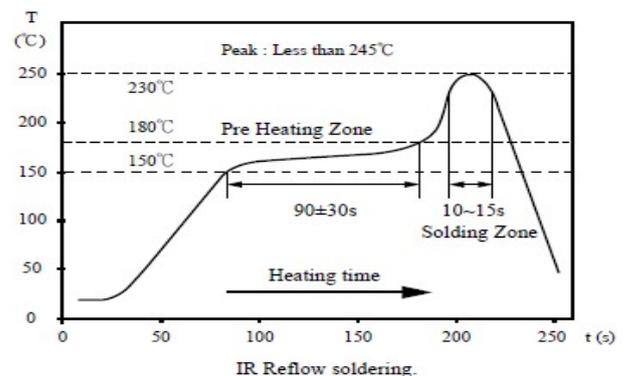
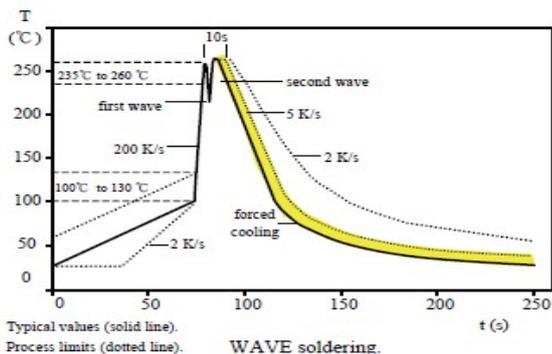
Storage and Handling Conditions:

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 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.



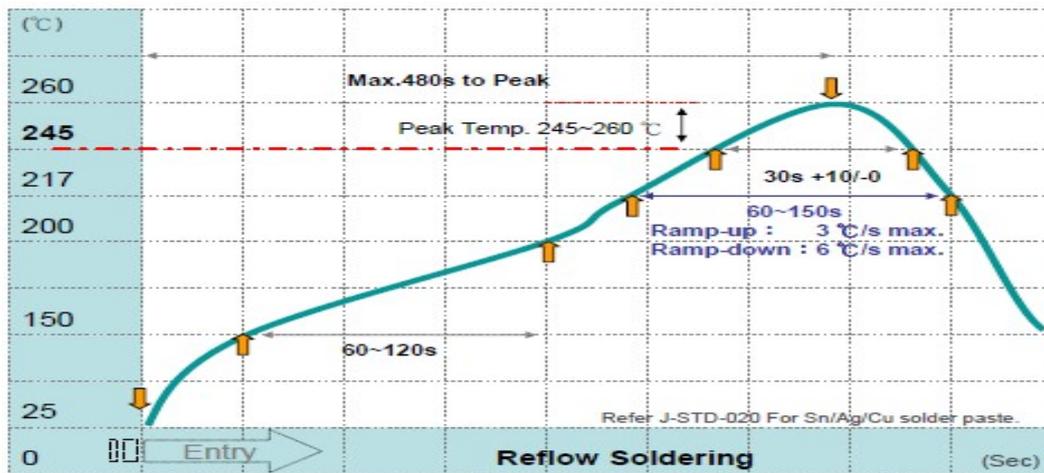
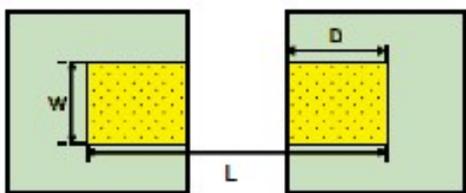


Fig 3. Infrared soldering profile for Chip Resistors WW25M

FOOT PRINT

Unit: mm	W	D	L
WW25N3 ~	3.70	1.60	7.60
WW25N 1 ~ 2m	4.00	3.00	7.30



TEST AND REQUIREMENTS (AEC Q-200)

TEST	PROCEDURE / TEST METHOD	REQUIREMENT
		Resistor
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	- DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) Natural resistance change per change in degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)} \quad t_1 : 20^\circ\text{C}+5^\circ\text{C}-1^\circ\text{C}$ R_1 : Resistance at reference temperature R_2 : Resistance at test temperature	Within the specified tolerance Refer to "QUICK REFERENCE DATA"
Resistance to soldering heat (R.S.H) MIL-STD-202 method 210	Un-mounted chips completely immersed for 10±1second in a SAC solder bath at 270°C ±5°C	ΔR/R max. ±(0.5%+0.5mΩ) no visible damage
Solderability J-STD-002	a) Bake the sample for 155°C dwell time 4hrs/ solder dipping 235°C / 5sec. b) Steam the sample dwell time 8 hour/ solder dipping 215°C / 5sec. c) Steam the sample dwell time 8 hour/ solder dipping 260°C / 7sec.	95% coverage min., good tinning and no visible damage
Temperature cycling JESD22 Method JA-104	1000 cycles, -55°C ~ +125°C, dwell time 30min maximum.	ΔR/R max. ±(0.5%+1mΩ) No visible damage
Moisture Resistance MIL-STD-202 method 106	65±2°C, 80~100% RH, 10 cycles, 24 hours/ cycle	ΔR/R max. ±(0.5%+0.5mΩ) No visible damage
Bias Humidity MIL-STD-202 method 103	1000+48/-0 hours; 85°C, 85% RH, 10% of operation power	ΔR/R max. ±(1%+0.5mΩ) No visible damage
Operational Life MIL-STD-202 method 108	1000+48/-0 hours; 35% of operation power, 125±2°C	ΔR/R max. ±(1%+0.5mΩ) No visible damage
High Temperature Exposure MIL-STD-202 Method 108	Test 1000 hrs./ @T=170°C / Un-powered. Measurement at 24±2 hours after test conclusion.	ΔR/R max. ±(1%+0.5mΩ) No visible damage
Board Flex AEC-Q200-005	Resistors mounted on a 90mm glass epoxy resin PCB(FR4),bending once 2mm for 60sec.	ΔR/R max. ±(0.5%+0.5mΩ) No visible damage
Terminal strength AEC-Q200-006	Pressurizing force: 1.8Kg, Test time: 60±1sec.	No remarkable damage or removal of the terminations
Thermal shock MIL-STD-202 method 107	Test -55 to 155°C / dwell time 15min/ Max transfer time 20sec 300cycles	ΔR/R max. ±(0.5%+0.5mΩ) No visible damage
ESD AEC-Q200-002	Test contact 1KV (Min)	ΔR/R max. ±(1%+0.5mΩ) No visible damage

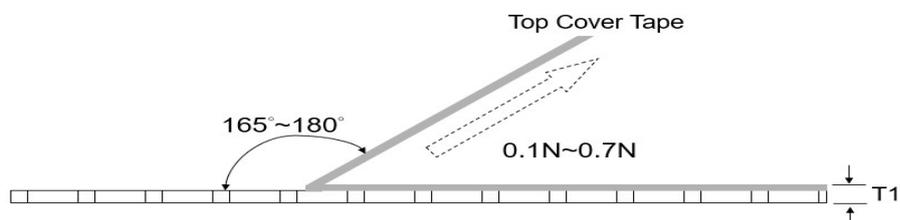
TEST	PROCEDURE / TEST METHOD	REQUIREMENT
		Resistor
Mechanical Shock MIL-STD-202 method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. Three shocks in each direction, total 18 shocks.	Within product specification tolerance and no visible damage.
Vibration MIL-STD-202 method 204	Test 5g's for 20 min., 12 cycles each of 3 orientations.	$\Delta R/R$ max. $\pm(0.5\%+0.5m\Omega)$ no visible damage.
Resistance to Solvents : MIL-STD-202 Method 215	Solvent is Isopropyl alcohol, immersion 3mins at 25°C and brush 10 strokes with a toothbrush with a handle made of a non-reactive material (wet bristle), immersion and brush 3 times and then air blow dry.	No superficial defect on marking, encapsulation, coating, appearance. Electrical characteristics within products specification and tolerance. Inspect at 3X max. for marking, inspect at 10X for part damage.
External Visual MIL-STD-883 method 2009	Electrical test not required. Inspect device construction, marking and workmanship	No visual damage and refer WTC marking code.
Physical Dimension JESD22 method JB-100	Verify physical dimensions(L, W, T, Tb, Tt)	Within the specified tolerance for WTC.
Sulfuration test ASTM B-809-95	ASTM B-809-95 105°C 1000hrs	$\Delta R/R$ max. $\pm(2\%+0.5m\Omega)$ no visible damage.
Short time overload (S.T.O.L) Clause 4.13	5×Rated power for 5 seconds.	no visible damage $\Delta R/R$ max. $\pm 1\%$

PACKAGING

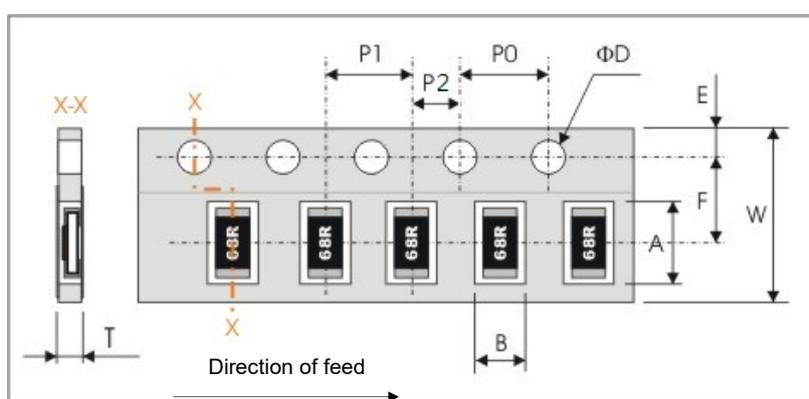
Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

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



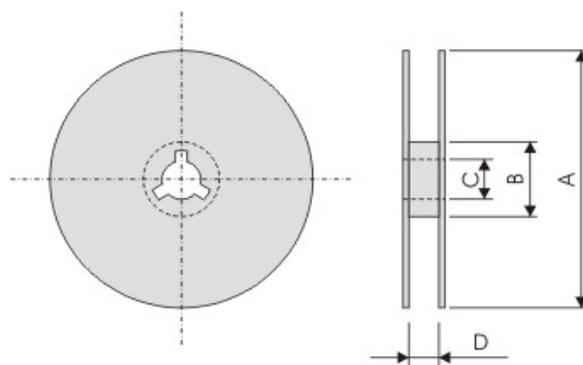
Plastic Tape specifications (unit :mm)



Symbol	A	B	W	F	E
Dimensions	6.75±0.20	3.50±0.20	12.00±0.30	5.50±0.1	1.75±0.10

Symbol	P1	P0	P2	ΦD	T
Dimensions	4.00±0.10	4.00±0.10	2.00±0.10	Φ1.50 ^{+0.1} _{-0.0}	1.0±0.2

Reel dimensions



Symbol	A	B	C	D
(unit : mm)	Φ178.0±2.0	Φ60.0±1.0	13.0±0.2	14.0±0.2

Taping quantity

- Chip resistors 4,000 pcs 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