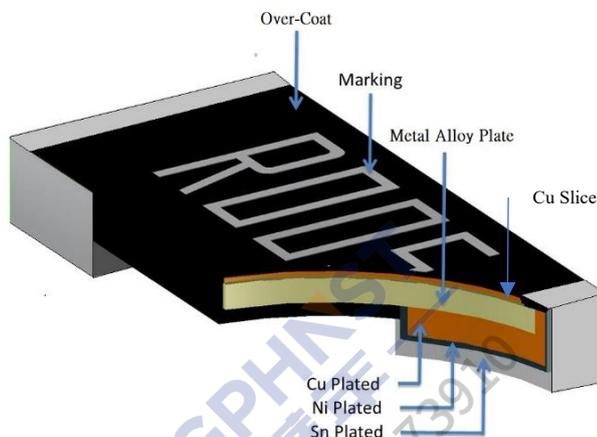


■ Metal Alloy High Power Low Resistance Chip Resistor — MAH Series



■ Application

- Entertainment product
- Power supply
- Measuring instrument
- Industrial product
- Battery management system

■ Features

- Low Resistance / Low TCR
- Excellent long term stability
- RoHs compliant and halogen free
- Lead free
- High precision current sensing and voltage division
- AEC-Q200 compliant.

■ Parts Number Explanation

■ Example:

MAH	2512	50	F	R001	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	2512	50= 5.00 W 40= 4.00 W	F : ±1 % G : ±2 % J : ±5 %	1m= 1 mR 1m50= 1.5 mR 10m=10mR	M : MnCu	Z : Default code



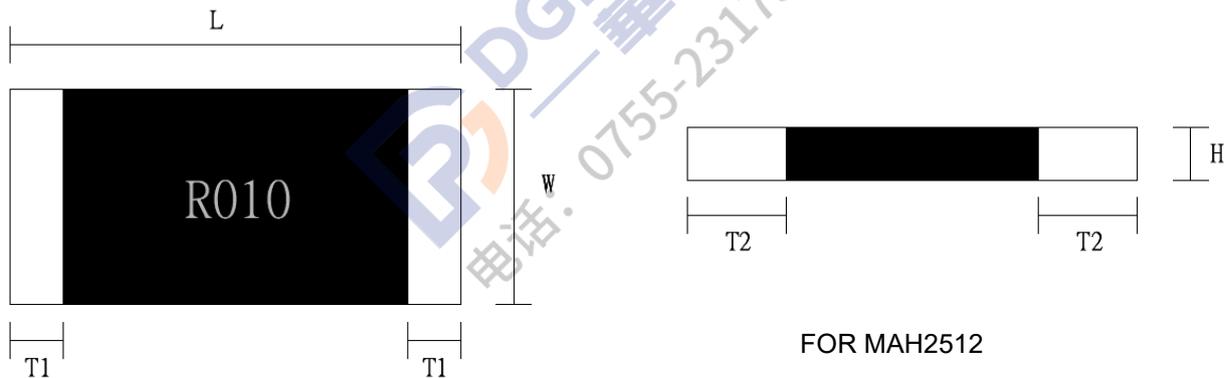
**MAH Series Metal Alloy High Power
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Standard Electrical Specifications

Type	Rating Power	Rated Terminal Part Temp	T.C.R. (ppm/°C)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)	Material	Operating Temperature Range (°C)
						1.0% (F) 2.0% (G) 5.0% (J)		
MAH2512	5W	105°C	≤±50	70.71	141.42	1~3	MnCu	-55~+170°C
	5W	85°C	≤±50	35.35	70.71	4~10	MnCu	

Type Dimension



Dimension

Unit: mm

Type	Power Rating	Resistance Range	L	W	H	T1	T2
MAH2512	5W	1mΩ	6.35±0.254	3.05±0.254	0.75±0.254	1.150±0.254	2.200±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254
		6~10mΩ					1.100±0.254



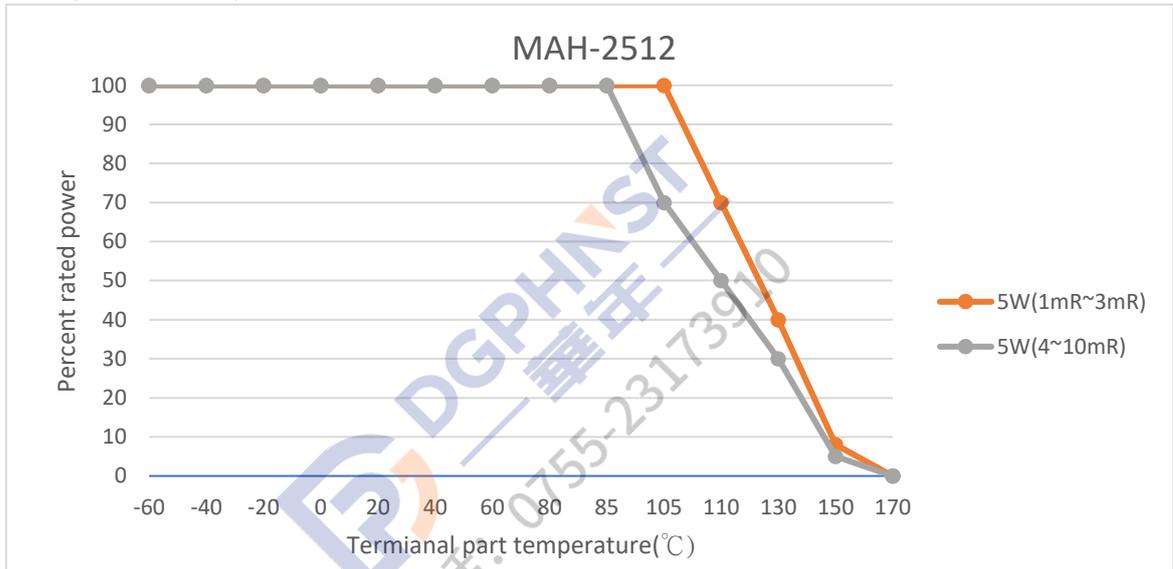
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■ Performance Characteristics

Power Derating Curve

When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown below, the power shall be derated according to the derating curve.



■ Rating Current

The following equation may be used to determine the DC (Direct Current) or AC (Alternating Current) (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards, the highest normal rated power is to be used.

$$I = \sqrt{P/R}$$

I = Rating current (A)
P = Rating Power (W)
R = Resistance(Ω)

■ Marking Format

- All the other products marking are 4 digits.
- "R" designates the decimal location in ohms
e.g. 1mΩ the product marking is R001.
10mΩ the product marking is R010.
- "m" designates the decimal location in milli-ohms
e.g. 1.5mΩ the product marking is 1m50.
- The criteria to distinguishing the mark on the surface of products are that characters can be identified.



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Reliability test and requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+150°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: ● MAH2512-5W: 4 times of rated power for 5 seconds.	● $\Delta R/R1 \leq \pm 1\%$
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155°C for 1000 hours At 170°C for 1000 hours.	$\Delta R/R1 \leq \pm 1\%$ $\Delta R/R1 \leq \pm 2\%$
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds.	$\Delta R/R1 \leq \pm 0.5\%$
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	$\Delta R/R1 \leq \pm 1\%$
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	$\Delta R/R1 \leq \pm 1.0\%$
Endurance of Rated Terminal Part Temperature	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	105°C ± 2°C(5W.1mR~3mR) ^{*(Note)*} 85°C ± 2°C(5W.4~10mR) ^{*(Note)*} whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	$\Delta R/R1 \leq \pm 1.0\%$
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% coverage
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	Applied 500VAC for 1 minute.	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force : 5N , 10 seconds	No broken
Terminal Strength (SMD)	AEC Q200-006	Pressurizing force 17.7N for 60 seconds	No broken
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once 2mm for 10 seconds	$\Delta R/R1 \leq \pm 0.5\%$ No broken
Moisture Resistance	MIL-STD 202 Method 106	T=24 hours / Cycle ,10Cycles . Steps 7a& 7b not required. Unpowered . (Figure 1)	$\Delta R/R1 \leq \pm 0.5\%$

Note: All reliability test should follow de-rating curve shown on page 3.

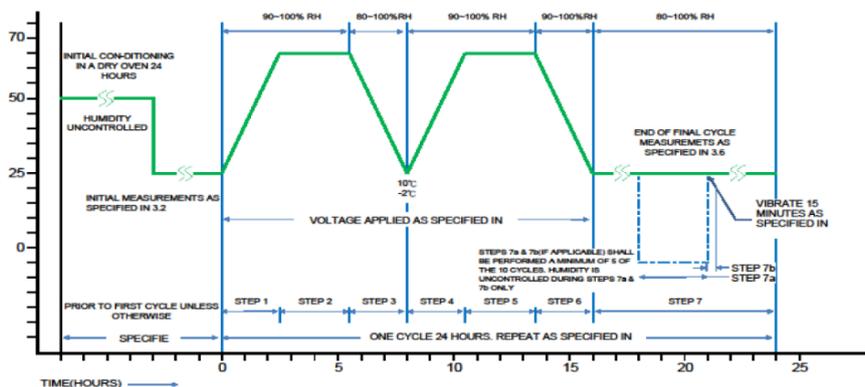
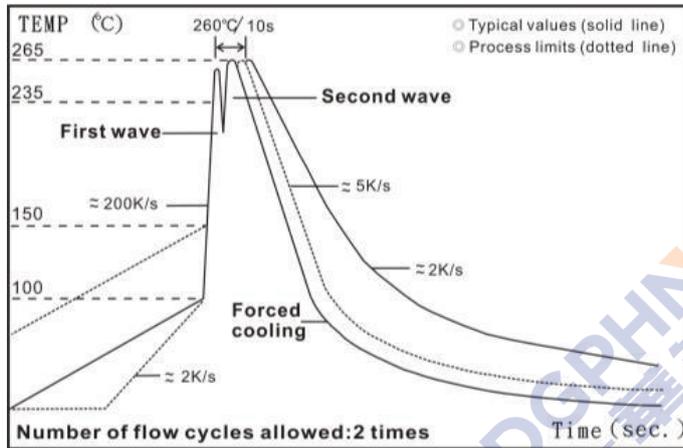


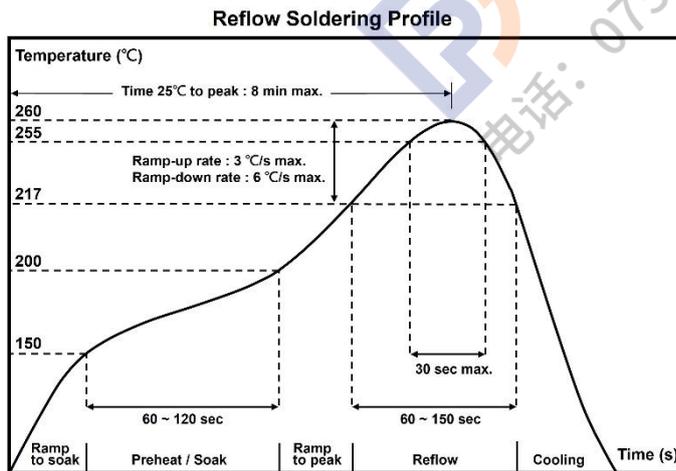
Figure 1

■ Recommended Customer Soldering Parameters

■ Wave solder Temperature condition

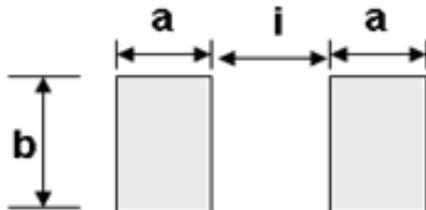


■ Solder reflow Temperature condition



■ Soldering Iron: temperature $350^{\circ}\text{C} \pm 10^{\circ}\text{C}$, dwell time shall be less than 3 sec

■ Recommend Land Pattern Design



■ Dimension

Unit: mm

Type	Resistance Range	a	b	i
MAH2512 - 5W	1mΩ / 1.5mΩ	3.225	3.68	1.30
	2~10mΩ	2.60	3.68	2.55



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■ Packing Quantity

Type	PCS / Reel	Parts Number Explanation
MAH 2512	4000	Z: 4000PCS

■ Plating Thickness

Ni: $\geq 2 \mu\text{m}$

Sn(Tin): $\geq 3 \mu\text{m}$

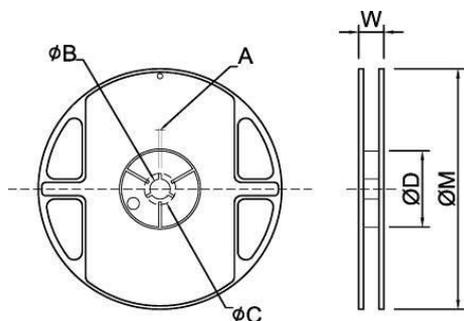
■ Label



■ Appendix For SMD Chip Resistor

● Packaging Information

■ Reel Dimensions



■ Dimension

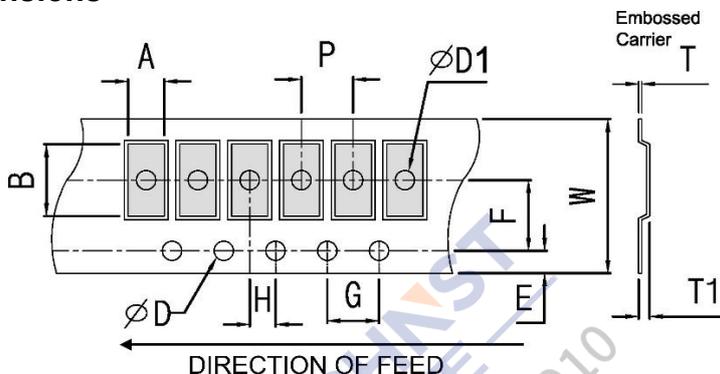
Reel Type / Tape	A	ϕB	ϕC	ϕD	W	ϕM
7" reel for 12 mm embossed	2.5 \pm 0.5	13.5 \pm 0.5	17.7 \pm 0.5	60.0 \pm 0.5	16.2 \pm 0.5	178 \pm 1.0



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■ Embossed Dimensions



■ Dimension

Unit: mm

Item	Resistance Range (mΩ)	W	P	E	F	φD	φD1	G	H	A	B	T1	T
MAH2512	1~5 mΩ	12.0±0.30	4.0±0.10	1.75±0.10	5.5±0.10	1.50 ^{+0.10} ₀	1.55±0.10	4.0±0.10	2.0±0.10	3.50±0.10	6.75±0.10	1.10±0.10	0.20±0.05
MAH2512	6~10 mΩ	12.0±0.30	4.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	3.50±0.10	6.75±0.10	0.90±0.10	0.20±0.05

■ Storage Temperature

Storage time at the environment temp: 25±5°C & humidity: 60±20% is valid for one year from the date of delivery