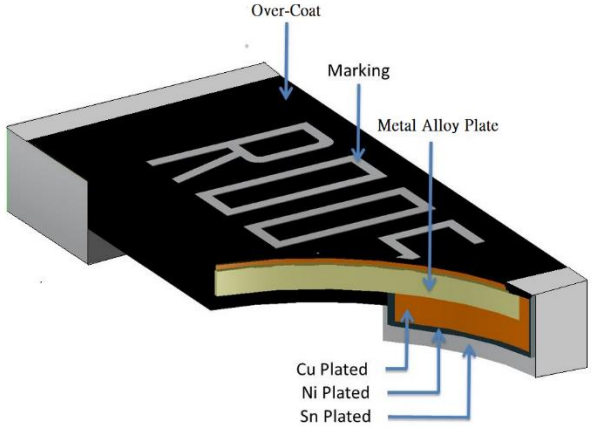
■ Metal Alloy Low Resistance Chip Resistor — MA Series



■ 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

■ Parts Number Explanation

■ Example:

MA	2512	20	F	R001	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	1206 2512 2725 2728 4527	05= 0.5W 07= 0.75 W 10= 1.00 W 15= 1.50 W 20= 2.00 W 30= 3.00 W 40= 4.00 W 50= 5.00 W	D : ±0.5 % F : ±1 % G : ±2 % J : ±5 %	0m20= 0.2 mR 2m50= 2.5 mR R000= 0 mR R005= 5.0 mR R100= 100 mR R500= 500 mR	S : MnCuSn M : MnCu F : FeCrAl C : Cu	Z : Default code

■ Standard Electrical Specifications

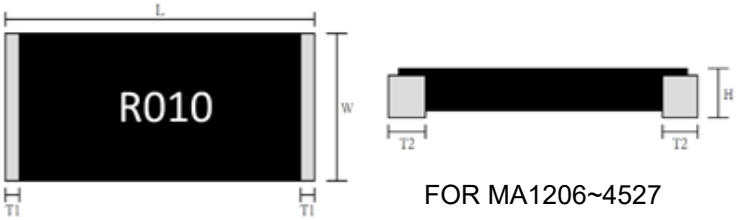
TYPE	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)		Material	Operating Temperature Range (℃)
					0.5% (D)	1.0% (F) 2.0% (G) 5.0% (J)		
MA1206	0.5W	≦±50	22.36	50.00	5~75	1~75	R001~R0015：MnCuSn R002~R007：MnCu R008~R075：FeCrAl	-55~+170°C
	0.75W		27.38	61.23				
	1W		31.62	70.71	5~50	1~50	R001~R0015：MnCuSn R002~R007：MnCu R008~R050：FeCrAl	
	1.5W		38.72	86.60	5~10	1~10	R001~R0015：MnCuSn R002~R007：MnCu R008~R010：FeCrAl	
MA2512	1W	≦±75	44.72	100.00	---	0.5~0.8	R0005~R0008：MnCuSn	
	1W	≦±50	31.62	70.71	1~450	1~500	R001~R006：MnCu R007~R500：FeCrAl	
	2W	≦±75	63.24	141.42	---	0.5~0.8	R0005~R0008：MnCuSn	
	2W	≦±50	44.72	100.00	1~450	1~450	R001~R006：MnCu R007~R450：FeCrAl	
	3W	≦±75	77.45	173.20	---	0.5~0.8	R0005~R0008：MnCuSn	
	3W	≦±50	54.77	122.47	1~100	1~100	R001~R006：MnCu R007~R100：FeCrAl	
MA2725	5W*NOTE	≦±50	141.42	282.84	---	0.25	R0002~R0004：MnCuSn R0005~R0025：MnCu R003：FeCrAl	
	4W	≦±100	141.42	282.84		0.2		
		≦±50	126.49	252.98		0.25~3		
MA2728	4W	≦±50	31.62	63.24	7~450	4~450	R004~R450：FeCrAl	
MA4527	2W	≦±75	63.24	141.42	---	0.5	R0005：MnCuSn	
	2W	≦±50	44.72	100.00	5~100	1~100	R001~R040：MnCu R041~R100：FeCrAl	
	3W	≦±75	77.45	173.20	---	0.5	R0005：MnCuSn	
	3W	≦±50	54.77	122.47	5~60	1~60	R001~R040：MnCu R041~R060：FeCrAl	
	5W	≦±75	100.00	173.20	---	0.5	R0005：MnCuSn	
	5W	≦±50	70.71	122.47	5~500	1~500	R001~R040：MnCu R041~R500：FeCrAl	

2725 5W*NOTE: The end electrode temperature needs to be controlled at 105°C. The temperature rise of the main body and the end electrode varies depending on the usage environment and the circuit board. The relevant test conditions follow our company's testing methods and environment. If you need related information, please check with our company before use.

■ Jumper Specifications

Type	Rating Power at 70℃	Max. Rating Current	Resistance (mΩ)	Material	Operating Temperature Range (℃)
MA1206	1W	70.7A	≦0.2	Jumper：Cu	-55~+170°C
MA2512	2W	100A			
	3W	122A			

■ Type Dimension



FOR MA1206~4527

■ Dimension

Unit: mm

Type	Power Rating	Resistance Range	L	W	H	T1	T2
MA1206	0.5W 0.75W	1mΩ	3.200±0.254	1.650±0.254	0.820±0.254	0.508±0.254	0.508±0.254
		1.5 mΩ			0.700±0.254		
		2mΩ					
		3mΩ			0.600±0.254		
		4~20mΩ			0.550±0.254		
		21~50mΩ			0.470±0.254		
		51~75mΩ			0.400±0.254		
	1W	1mΩ			0.820±0.254		
		1.5 mΩ			0.700±0.254		
		2mΩ					
		3mΩ			0.600±0.254		
		4~20mΩ			0.550±0.254		
		21~50mΩ			0.470±0.254		
	1.5W	1mΩ			0.820±0.254		
		1.5 mΩ			0.700±0.254		
		2mΩ					
		3mΩ			0.600±0.254		
		4~10mΩ			0.550±0.254		
2512	1W	451~500mΩ	6.350±0.254	3.050±0.254	0.350±0.254	0.750±0.254	0.850±0.254
	1W&2W	0.5mΩ		3.200±0.200	0.820±0.254	1.980±0.254	2.000±0.254
		0.6mΩ			0.700±0.254		2.100±0.254
		0.75mΩ		3.050±0.254		1.150±0.254	1.980±0.254
		0.8mΩ					1.860±0.254
		1mΩ			0.720±0.254		2.200±0.254
		1.1mΩ					1.900±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254

Type	Power Rating	Resistance Range	L	W	H	T1	T2
2512	1W&2W	6mΩ	6.350±0.254	3.050±0.254	0.550±0.254	1.150±0.254	1.100±0.254
		7~10mΩ			0.600±0.254		
		11~75mΩ			0.600±0.254	1.050±0.254	
		76~100mΩ			0.550±0.254	0.750±0.254	
		101~135mΩ			0.470±0.254		
		136~200mΩ			0.400±0.254		
		201~450mΩ					0.850±0.254
2512	3W	0.5mΩ	6.350±0.254	3.200±0.200	0.820±0.254	1.980±0.254	2.000±0.254
		0.6mΩ			0.700±0.254		2.100±0.254
		0.75mΩ		3.050±0.254		1.150±0.254	1.980±0.254
		0.8mΩ					1.860±0.254
		1mΩ			0.720±0.254		2.200±0.254
		1.1mΩ					1.900±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254
		6mΩ			0.550±0.254	0.75±0.254	1.100±0.254
		7~10mΩ			0.600±0.254	1.150±0.254	
		11~75mΩ				0.75±0.254	
		76~100mΩ			0.550±0.254		
MA2725	5W*	0.25mΩ	6.900±0.254	6.350±0.254	0.950±0.254	1.20±0.254	2.287±0.254
	4W	0.2mΩ			1.100±0.254		2.150±0.254
		0.25mΩ			0.950±0.254		2.287±0.254
		0.3mΩ					1.975±0.254
		0.35mΩ					1.710±0.254
		0.4mΩ					1.440±0.254
		0.5mΩ			0.850±0.254		2.080±0.254
		0.6mΩ					1.780±0.254
		0.8mΩ					1.300±0.254
		1mΩ	6.800±0.254		0.650±0.254	1.15±0.254	1.800±0.254
		1.5~1.6mΩ					1.500±0.254
		2~3mΩ			0.550±0.254		
MA2728	4W	4~450mΩ	6.600±0.254	6.700±0.254	0.580±0.254	0.400±0.254	1.050±0.254
MA4527	2W	0.5mΩ	11.300±0.500	6.600±0.500	0.770±0.254	0.900±0.254	3.000±0.254
		1mΩ			0.650±0.254		2.000±0.254
		1.5~20mΩ					
		21~100mΩ			0.550±0.254		
	3W	0.5mΩ			0.770±0.254	0.900±0.254	3.000±0.254
		1mΩ			0.650±0.254		2.000±0.254
		1.5~20mΩ					
		21~60mΩ			0.550±0.254		

Type	Power Rating	Resistance Range	L	W	H	T1	T2
MA4527	5W	0.5mΩ	11.300±0.500	6.600±0.500	0.800±0.254	0.650±0.254	3.000±0.254
		1mΩ			0.680±0.254		
		1.5~20mΩ					2.000±0.254
		21~500mΩ			0.580±0.254		

■ Jumper Dimension

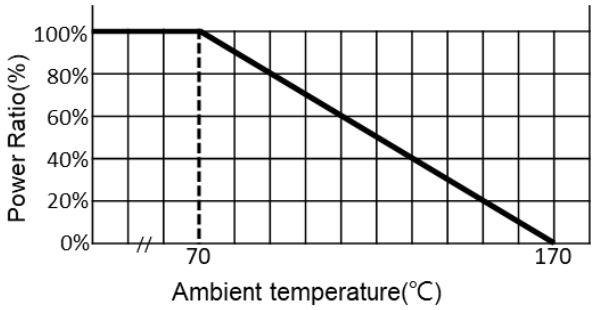
Type	Power Rating	Resistance Range	L	W	H	T1	T2
MA1206	1W	< 0.2mΩ	3.200±0.254	1.650±0.254	0.650±0.254	0.508±0.254	0.508±0.254
MA2512	2W / 3W	< 0.2mΩ	6.350±0.254	3.050±0.254	0.650±0.254	1.15±0.254	1.100±0.254

■ Performance Characteristics

Power Derating Curve

The Operating Temperature Range: -55°C ~+170°C.

For resistors operated in ambient temperatures above 70°C, power rating must be derating in accordance with the curve below.



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)

■ 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℃ /+150℃, 25℃ 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: ● MA1206-0.5W: 5 times of rated power ● MA1206-0.75W: 5 times of rated power ● MA1206-1W: 5 times of rated power ● MA1206-1.5W: 5 times of rated power ● MA2512-1W: 5 times of rated power ● MA2512-2W: 5 times of rated power ● MA2512-3W: 5 times of rated power*(Note) ● MA2725-5W: 4 times of rated power ● MA2725-4W: 4 times of rated power ● MA2728-4W: 4 times of rated power ● MA4527-2W: 5 times of rated power ● MA4527-3W: 5 times of rated power ● MA4527-5W: 3 times of rated power for 5 seconds.	● MA4527: ΔR/R1≦±2.0% ● The others: ΔR/R1≦±0.5%
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 170℃ for 1000 hours.	● MA4527: ΔR/R1≦±2.0% ● The others: ΔR/R1≦±1.0%
Resistance to Soldering Heat	MIS-STD-202 Method 210	SMD: Condition K, time above 217℃, 60s – 150s， Number of heat cycles:3	ΔR/R1≦± (0.5%+0.0005 Ω)
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.	ΔR/R1≦± 0.5%
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.	ΔR/R1≦± 0.5%
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	● MA4527: ΔR/R1≦±2.0% ● The others: ΔR/R1≦±1.0%
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ 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	ΔR/R1≦± 0.5% No broken
Moisture Resistance	MIL-STD 202 Method 106	T=24 hours / Cycle ,10 Cycles . Steps 7a& 7b not required. Unpowered . (Figure 1)	ΔR/R1≦± 0.5%

*Note: This test is a destructive experiment. The top protective layer is prone to damage and peculiar smell during, in the 50mR~100mR resistance test. The resistance change rate can meets the specifications.

■ For Jumper

Test Item	Test Method	Procedure	Requirements
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	4 times of rated power for 5 seconds.	≦0.2mΩ
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.	≦0.2mΩ
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 170℃ for 1000 hours.	≦0.2mΩ
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.	≦0.2mΩ
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	≦0.2mΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% coverage

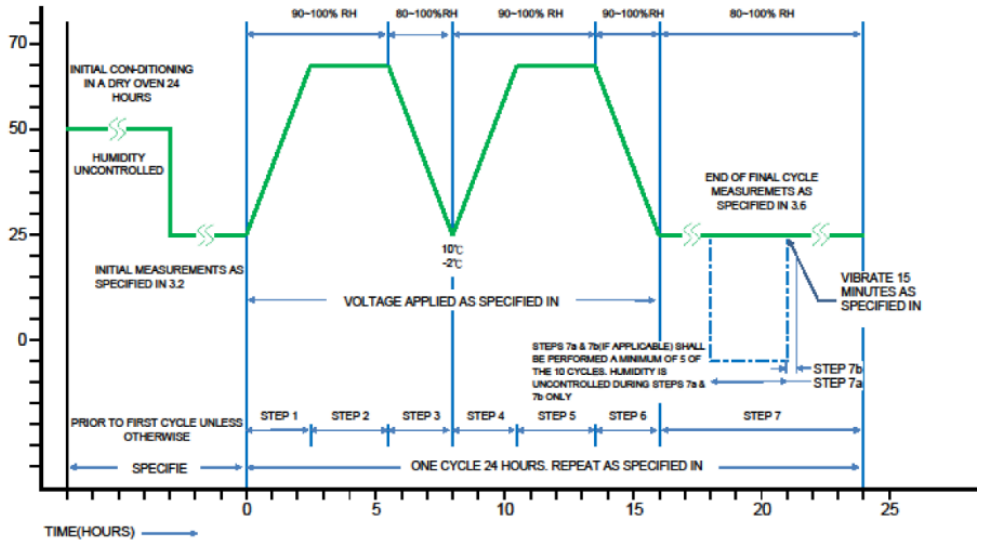
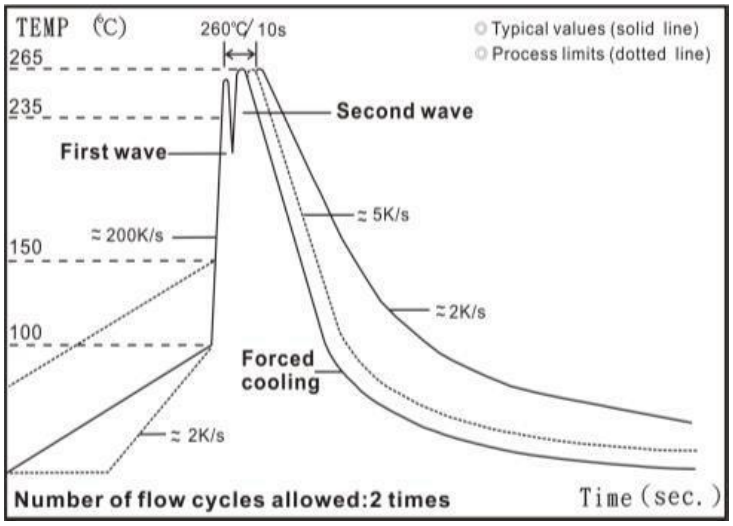


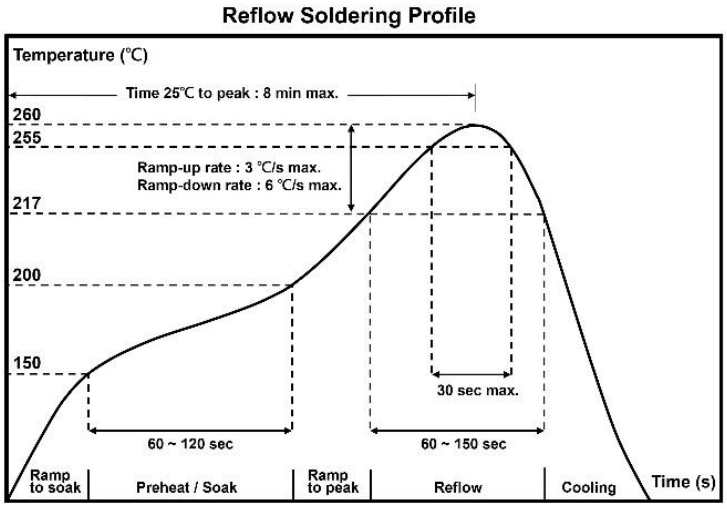
Figure 1

■ Recommended Customer Soldering Parameters

■ Wave solder Temperature condition



■ Solder reflow Temperature condition



The peak temperature of soldering heat is 260 for 10S

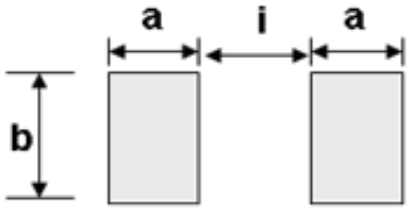
■ Soldering Iron: temperature 350℃±10℃ , dwell time shall be less than 3 sec

■ Recommend reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements

■ Recommend Land Pattern Design



■ Dimension

Unit: mm

Type	Resistance Range	a	b	i
MA1206 – 0.5W/0.75W/1W/1.5W	Jumper：≦0.2mΩ	1.46	2.15	1.68
	1mΩ~75mΩ	1.46	2.15	1.68
MA2512 -1W, 2W, 3W	Jumper：≦0.2mΩ	2.30	3.68	3.15
	0.5mΩ~1mΩ	3.24	3.68	1.27
	1.1mΩ/1.5mΩ	3.20	3.68	1.35
	2~5mΩ	2.60	3.68	2.55
	6mΩ~200mΩ	2.30	3.68	3.15
	201mΩ~500mΩ	2.05	3.68	3.65
MA2725 - 4W, 5W	0.2~0.35mΩ	2.90	6.7	1.28
	0.4~0.8mΩ	3.25	6.85	1.70
	1~3mΩ	2.75	6.85	2.70
MA2728 - 4W	4mΩ~450mΩ	2.05	7.20	3.90
MA4527 – 2W,3W,5W	0.5mΩ~1.5mΩ	4.50	8.74	4.50
	2.0mΩ~100mΩ	3.50	8.74	6.50
	101mΩ~500mΩ	3.50	8.74	6.50

■ Packing Quantity

Type	PCS /Reel	Parts Number Explanation
MA1206	5000	Z: 5000PCS
MA1206 R001	4000	Z: 4000PCS
MA2512	4000	Z: 4000PCS
MA2725(R≧1)	2000	Z: 2000PCS 1: 1000PCS
MA2725 (0.8≧R≧0.2)	1000	Z: 1000PCS
MA2728	2000 / 1000	Z: 2000PCS 1: 1000PCS
MA4527	1000 / 500	Z: 1000PCS 0: 500PCS

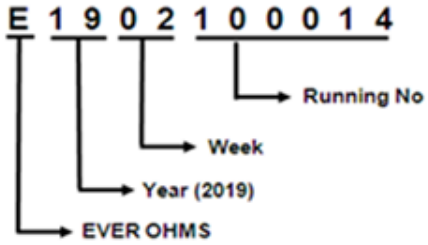
■ Plating Thickness

Ni:≧ 2 μm

Sn(Tin):≧ 3 μm

■ Label

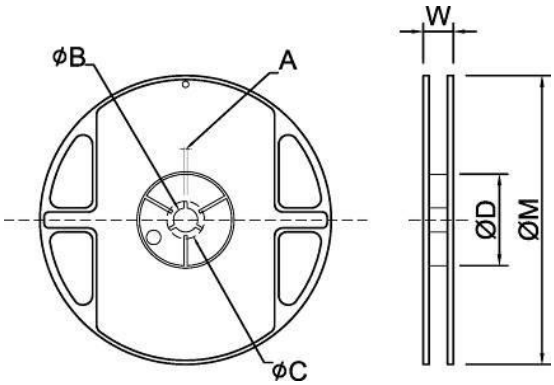




■ Appendix For SMD Chip Resistor

● Packaging Information

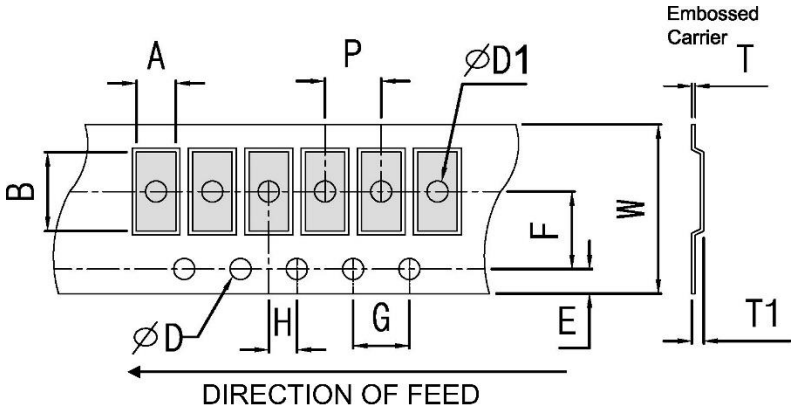
■ Reel Dimensions



■ Dimension

Reel Type / Tape	A	ϕB	ϕC	ϕD	W	ϕM
7” reel for 8 mm embossed (for MA1206)	2.0±0.5	13.2±0.5	17.7±0.5	60.0±0.5	12.0±0.5	178±1.0
7” reel for 12 mm embossed	2.5±0.5	13.5±0.5	17.7±0.5	60.0±0.5	16.2±0.5	178±1.0
7” reel for 24 mm embossed	2.0±0.5	13.2±0.5	17.7±0.5	60.0±0.5	24.4±2.0	178±1.0

■ Embossed Dimensions



■ Dimension

Unit: mm

Item	Resistance Range (mΩ)	W	P	E	F	ΦD	ΦD1	G	H	A	B	T1	T
MA1206	1mΩ	8.0±0.30	4.0±0.10	1.75±0.10	3.5±0.10	$1.50^{+0.1}_{-0}$	1.0±0.10	4.0±0.10	2.0±0.10	2.03±0.10	3.55±0.10	1.10±0.10	0.20±0.05
MA1206	0R/1.5~75mΩ	8.0±0.30	4.0±0.10	1.75±0.10	3.5±0.10		1.0±0.10	4.0±0.10	2.0±0.10	2.03±0.10	3.55±0.10	0.85±0.10	0.20±0.05
MA2512	0.5mΩ/1mΩ	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	1.10±0.10	0.20±0.05
MA2512	0R/0.6~0.8mΩ 1.1~500mΩ	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
MA2725	0.2~0.8mΩ	12.0±0.30	8.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	6.81±0.10	7.16±0.10	1.30±0.10	0.25±0.05
MA2725	1~3mΩ	12.0±0.30	8.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	6.81±0.10	7.16±0.10	1.05±0.10	0.25±0.05
MA2728	4~450mΩ	12.0±0.30	8.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	7.10±0.10	7.05±0.10	0.95±0.10	0.20±0.05
MA4527	0.5~500mΩ	24.0±0.30	12.0±0.10	1.75±0.10	11.5±0.10		1.50±0.10	4.0±0.10	2.0±0.10	7.38±0.10	12.0±0.10	1.05±0.10	0.30±0.10

■ Storage Temperature

Storage time at the environment temp: 25±5℃& humidity: 60±20% is valid for two years.