■ Features

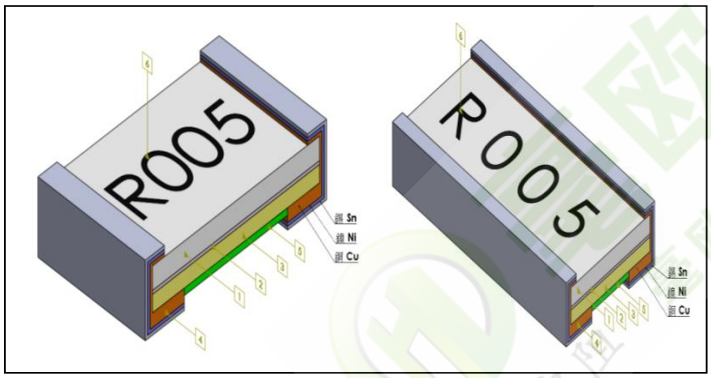
— Low Resistance / TCR / EMF (only for MnCu)/Inductance
— Excellent long term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.

■ Application

— Entertainment
— Power supply
— Measuring instrument
— Industrial
— Battery management system

■ Product structure:

(1) - Substrate : Alumina Ceramic
(2) - Adhesive : Epoxy
(3) - Resistive element : Cu – alloy
(4) - Terminal electrode : Sn、Ni、Cu
(5) - Protective coating : Flame-retardant epoxy, meets UL- 94-V0 requirements(green)
(6) - Marking coating : Flame-retardant epoxy, meets UL- 94-V0 requirements (black)



■ Parts Number Explanation

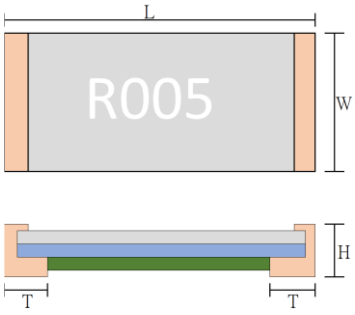
Example:

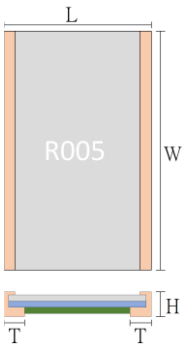
Ho	RFM	2512	2W	5mR	1%
制造商	产品系列	封装	额定功率	阻值	精度
毫欧电子	陶瓷合金	0603 0805 1206 2010 2512 3921 4527 0508 0612 0815 1225 2139	05=0.50W 07=0.75W 10=1.00W 15=1.50W 20=2.00W 30=3.00W 40=4.00W 50=5.00W	2.5mR=2M50 5.0mR=R005 20mR=R020 150mR=R150	D=±0.5% F=±1% G=±2%

■ 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)		
RFM0603	0.5W	±75	10A	15.81A	—	5~9	—	R005~R049：MnCu R050~R100：Cu Alloy	-55℃~155℃
		±50	7.07A	11.18A	10~100		—		
RFM0805	0.75W	±75	13.69A	21.65A	—	4~9	—	R004~R049：MnCu R050~R270：Cu Alloy	
		±50	8.66A	13.69A	10~270		—		
RFM1206	1W	±75	15.81A	25A	—	4~9	—	R004~R049：MnCu R050~R700：Cu Alloy	
		±50	10A	15.81A	10~700		—		
RFM2010	1.5W	±100	27.38A	43.30A	—	2~9	—	R002~R500：Cu Alloy	
		±50	12.24A	19.36A	10~500		—		
RFM2512	2W	±75	31.62A	50A	—	2~9	—	R002~R049：MnCu R050~R560：Cu Alloy	
		±50	14.14A	22.36A	10~560		—		
RFM3921	4W	—	—	—	—	—	—	R010~R050：Cu Alloy	
		±50	20A	31.62A	10~50		—		
RFM4527	5W	—	—	—	—	—	—	R010~R050：Cu Alloy	
		±50	22.36A	35.35A	10~50		—		
RFM0508	1W	±100	31.62A	50A	—	—	1	R001~R009：MnCu R010~R100：Cu Alloy	
		±100	22.36A	35.35A	—	2~9	—		
		±50	10A	15.81A	10~100		—		
RFM0612	1.5W	±100	38.72A	61.23A	—	—	1	R001~R009：MnCu R010~R100：Cu Alloy	
		±100	27.38A	43.30A	—	2~9	—		
		±50	12.24A	19.36A	10~100		—		
RFM0815	2W	±100	44.72A	70.71A	—	—	1	R001~R020：Cu Alloy	
		±100	31.62A	50A	—	2~9	—		
		±50	14.14A	22.36A	10~20		—		
RFM1225	3W	±100	54.77A	86.60A	—	1~9	—	R001~R020：MnCu R021~R100：Cu Alloy	
		±50	17.32A	27.38A	10~100		—		
RFM2139	5W	±100	70.71A	111.8A	—	1~9	—	R001~R020：MnCu R021~R100：Cu Alloy	
		±50	22.36A	35.35A	10~100		—		

■Dimension （Unit:mm）





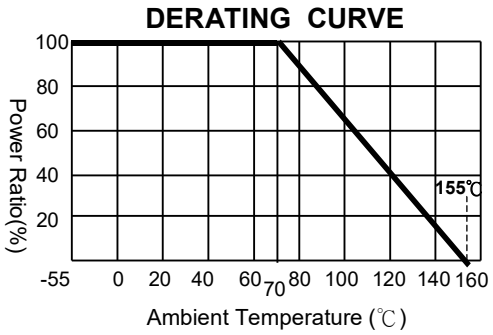
Type	Power Rating	Resistance Range	L	W	H	T
RFM0603	0.5W	5mΩ	1.60±0.25	0.80±0.25	0.65±0.20	0.50±0.20
		6~100mΩ				0.40±0.20
RFM0805	0.75W	4~270mΩ	2.00±0.25	1.20±0.25	0.65±0.20	0.50±0.20
RFM1206	1W	4~700mΩ	3.20±0.25	1.60±0.25	0.65±0.20	0.68±0.30
RFM2010	1.5W	2~3mΩ	5.08±0.25	2.54±0.25	0.65±0.20	2.10±0.30
		4~500mΩ				0.70±0.30
RFM2512	2W	2mΩ	6.40±0.30	3.20±0.30	0.75±0.20	1.65±0.30
		3mΩ			0.75±0.20	1.65±0.30
		4~560mΩ			0.65±0.20	1.05±0.30
RFM3921	4W	10~50mΩ	11.10±0.30	5.10±0.30	0.65±0.30	2.36±0.30
RFM4527	5W	10~50mΩ	11.60±1.0	7.10±1.0	0.65±0.30	2.70±0.40
RFM0508	1W	1~100mΩ	1.35±0.20	2.10±0.20	0.65±0.20	0.43±0.20
RFM0612	1.5W	1mΩ	1.60±0.25	3.20±0.25	0.65±0.20	0.50±0.30
		2~100mΩ				0.40±0.20
RFM0815	2W	1~20mΩ	2.20±0.20	3.80±0.20	0.65±0.20	0.61±0.20
RFM1225	3W	1~100mΩ	3.20±0.30	6.40±0.30	0.65±0.20	0.60±0.20
RFM2139	5W	1~100mΩ	5.10±0.40	11.10±0.30	0.65±0.30	0.90±0.30

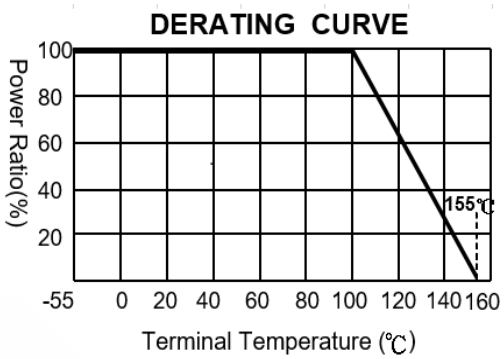
■ Performance Characteristics

Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C.

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below (Terminal temperature derating from above 100℃)





■ 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 (paragraph 5), 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℃ /+125℃, 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: 2.5 times of rated power for 5 seconds.	±1.0%+0.5mΩ
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155℃ for 1000 hours.	±1.0%+0.5mΩ
Low Temperature Storage	JIS-C-5201-1 4.23.4 IEC60115-1 4.23.4	At -55℃ for 1000 hours	±1.0%+0.5mΩ
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±1.0%+0.5mΩ
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	±2.0%+0.5mΩ
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,100 cycles	±1.0%+0.5mΩ

■ Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
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〞.	±2.0%+0.5mΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	The covered area >95%
Mechanical Shock	JIS C 5202 6.7	a =50G , t =11ms, 5 times shock	±1.0%+0.5mΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once 2mm for 10 seconds	±1.0%+0.5mΩ

■ Marking Format:

● 0603 type products marking are 2 or 3 digits

e.g. 2 digits

10mΩ the product marking is 10.

15mΩ the product marking is 15

e.g. 3 digits

“M” designates the decimal location in milli-ohms

2.5mΩ the product marking is 2M5

● 0805 type products marking are 3 or 4 digits.

“R” designates the decimal location in ohms

e.g. 3 digits

50mΩ the product marking is 050.

500mΩ the product marking is 500.

e.g. 4 digits

20mΩ the product marking is R020.

“M” designates the decimal location in milli-ohms

e.g. 5.5mΩ the product marking is 5M50.

● 1206 and above type products marking are 4 digits.

“R” designates the decimal location in ohms

e.g. 1mΩ the product marking is R001.

20mΩ the product marking is R020.

“M” designates the decimal location in milli-ohms

e.g. 5.5mΩ the product marking is 5M50.

● The criteria to distinguishing the mark on the surface of products are that characters can be identified.

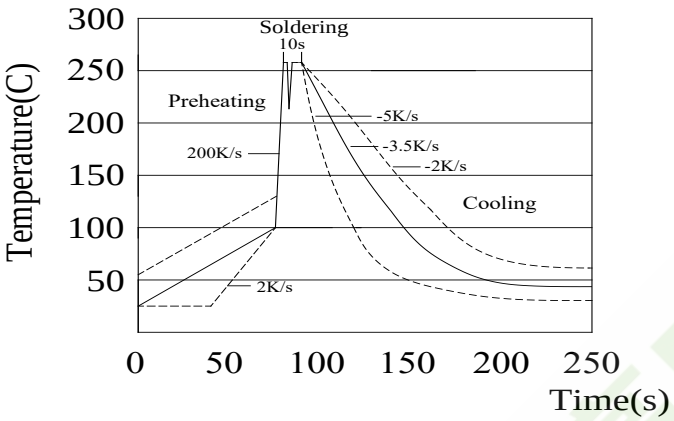
● Recommended Customer Soldering Parameters

■ Wave solder Temperature condition

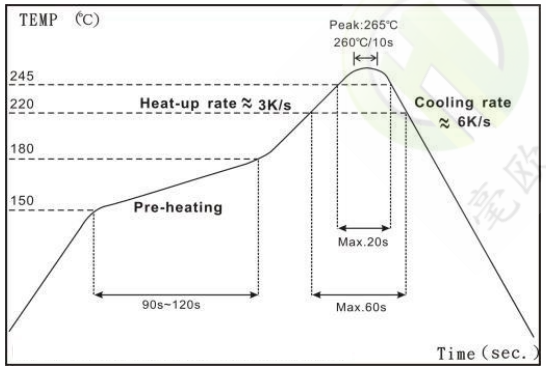
Preheating : 100℃~130℃, max.100 sec.

Soldering: 250℃~265℃ max. 10 sec.

Maximum temperature : 260±5℃, max. 10sec.



■ Solder reflow Temperature condition



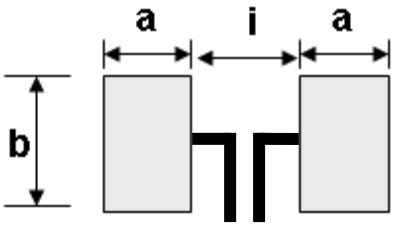
■ Rework temperature（hot air equipment）: 350℃, 3~5seconds

■ Recommended 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
RFM0603 – 0.5W	5mΩ	1.35	0.92	0.50
	6mΩ~100mΩ	1.30	0.92	0.60
RFM0805 – 0.75W	4mΩ~270mΩ	1.40	1.44	0.80
RFM1206 – 1W	4mΩ~700mΩ	1.80	1.84	1.20
RFM2010– 1.5W	2~3mΩ	3.65	2.88	0.70
	4mΩ~500mΩ	2.65	2.88	2.70
RFM2512 – 2W	2~3mΩ	3.85	3.57	1.6
	4~560mΩ	3.10	3.57	3.10
RFM3921 – 4W	10mΩ~50mΩ	4.50	5.75	5.00
RFM4527 – 5W	10mΩ~50mΩ	4.65	8.05	5.20

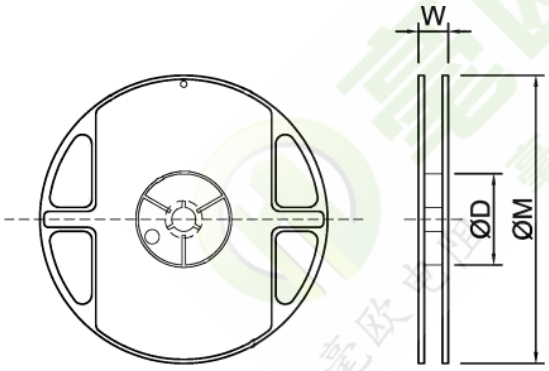
TYPE	Resistance Range	a	b	l
RFM0508– 1W	1~100mΩ	1.10	2.30	0.60
RFM0612 – 1.5W	1mΩ	1.35	3.68	0.50
	2~100mΩ	1.30	3.68	0.60
RFM0815 – 2W	1~20mΩ	2.40	4.26	0.70
RFM1225 – 3W	1~100mΩ	2.35	7.25	1.40
RFM2139 – 5W	1~100mΩ	2.80	12.65	2.40

■ Packing Quantity

TYPE	PCS /Reel
RFM0603	5000
RFM0805 / RFM0508	5000
RFM1206 / RFM0612	5000
RFM2010	4000
RFM2512 /RFM1225	4000
RFM0815	4000
RFM3921/ RFM2139	2000
RFM4527	1000

● Packaging Information

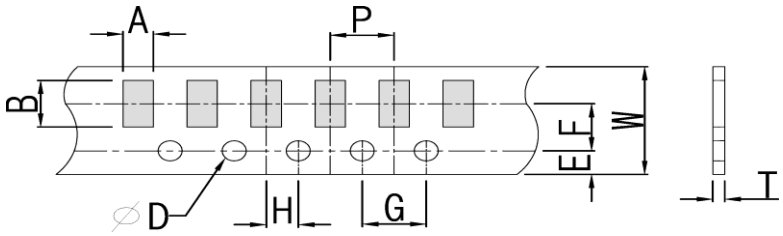
■ Reel Dimensions



■ Dimension （Unit: mm）

TYPE	ϕD	W	ϕM
RFM0603 / RFM0805 / RFM1206 /RFM0508 / RFM0612	60±2	9.0±1	178±5
RFM2010 / RFM2512 RFM0815 / RFM1225		13±1	
RFM3921 / RFM4527 / RFM2139		24.5±1	

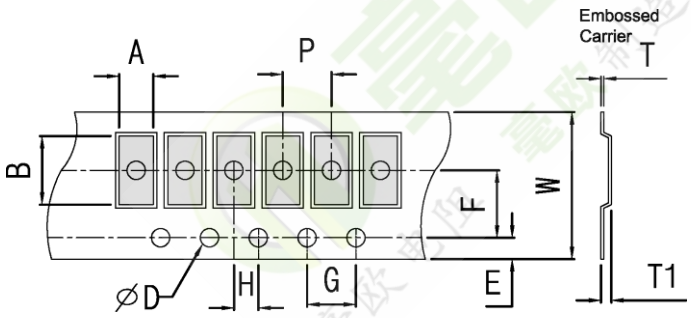
Carrier Dimensions



Dimension（Unit: mm）

Item	W	P	E	F	φD	G	H	A	Bo	T
RFM0603	8.0±0.30	4.0±0.10	1.75±0.10	3.5±0.10	$1.50^{+0.1}_{0}$	4.0±0.10	2.0±0.10	1.18±0.20	1.98±0.20	0.75±0.20
RFM0805								1.68±0.20	2.38±0.20	0.87±0.20
RFM0508										
RFM1206								2.05±0.20	3.65±0.20	0.87±0.10
RFM0612										

Embossed Dimensions



Dimension（Unit: mm）

Item	W	P	E	F	φD	G	H	A	B	T1	T
RFM1508	12.0±0.40	4.0±0.10	1.75±0.10	5.5±0.10	$1.50^{+0.1}_{0}$	4.0±0.10	2.0±0.10	2.40±0.20	4.10±0.20	0.75±0.20	0.25±0.10
RFM2010	12.0±0.30	4.0±0.10	1.75±0.10	5.5±0.10		4.0±0.10	2.0±0.10	2.85±0.20	5.45±0.20	0.80±0.20	0.25±0.10
RFM2512	12.0±0.30	4.0±0.10	1.75±0.10	5.5±0.10		4.0±0.10	2.0±0.10	3.40±0.20	6.75±0.20	1.00±0.20	0.25±0.10
RFM1225											
RFM3921	24.0±0.30	8.0±0.10	1.75±0.10	11.5±0.10		4.0±0.10	2.0±0.10	5.50±0.20	11.5±0.20	0.90±0.20	0.30±0.10
RFM2139											
RFM4527	24.0±0.30	12.0±0.10	1.75±0.10	11.5±0.10		4.0±0.10	2.0±0.10	7.50±0.20	12.0±0.20	0.90±0.20	0.30±0.10

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