

◆ FEATURES

- Surface mount 1206/2512/2725/2728/2817/4527 case sizes
- Resistance values up to 500mΩ
- High precision current sensing and voltage division
- Resistance tolerance ($\pm 0.1\%$)
- Reflow compatible
- Low resistance / Low TCR

◆ APPLICATION

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

◆ Part number system

EMA	25	F	3W0	R001	M	D	G
EMA	12=1206 25=2512 27=2725 28=2728 87=2817 45=4527	B = $\pm 0.1\%$ C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1\%$ J = $\pm 5\%$	2W0=2.0Watt 3W0=3.0Watt 5W0=5.0Watt --- 15W=15Watt	0M30=0.3mΩ R001=1mΩ --- R005=5mΩ	F: FeCrAl M: MnCu K: Karma S: MnCuSn	B=2000 D=4000 E=5000 M=500 N=1500 J=1000	RoHS

(1) EMA Series

(2): Size Code: 12=1206, 25=2512, 27=2725, 28=2728, 87=2817, 45=4527

(3): Tolerance Code: B = $\pm 0.1\%$, C = $\pm 0.25\%$, D = $\pm 0.5\%$, F = $\pm 1\%$

(4): Power Rating: Ex. 2W0=2.0Watt ; 3W0=3.0Watt; 5W0=5.0Watt 12W=12.0Watt;

(5): Resistance Code: 0M30=0.3mΩ 1M50=1.5mΩ R005=5mΩ R010=10mΩ.

(6): Materials: F=FeCrAl; M:MnCu; K:Karma

(7): Optional piece reel quantity:

A=1000; B=2000; C=3000; D=4000; E=5000; F=10000; G=15000; H=50000; J=20000; K=700; M=500; N=1500; J=1000

(8): RoHS compliant

◆ SPECIFICATIONS

Type	EIA SIZE	Rating Power at 70℃	Material	Resistance Range (Ω)		T.C.R. (ppm/℃)	Operating Temperature Range (℃)	
				0.1% (B) 0.5%(D)	1.0%(F) 2.0% (G) 5.0% (J)			
EMA12	1206	0.75W	FeCrAl	R051-R100	R051~R100	≒ ±50		
		1W	R001:MnCuSn R002-R007:MnCu R008-R100 :FeCrAl R008-R100 :Karma	R007~R050	R001~R100			
			R001: MnCu	R001	R001			≒ ±150
			R002-R020: MnCu	R002-R020	R002-R020			≒ ±75
			R006-R025: Karma	R006-R025	R006-R025			≒ ±75
2W	R006-R025: FeCrAl	R006-R025	R006-R025	≒ ±50				
	EMA25	2512	1W	0M50-0M75:MnCuSn R001-R006:MnCu R003-R500:FeCrAl	R077-R500	0M50~0M75	≒ ±75	
				R001-R500		≒ ±50		
	2W	0M25-0M75:MnCuSn R001-R200:MnCu R005-R500:FeCrAl R003-R500: Karma	R077-R450	0M25~0M75	≒ ±75			
R001-R500				≒ ±50				
R005-R050				≒ ±25				
3W	0M25-0M75:MnCuSn R001-R200:MnCu R007-R300:FeCrAl R003-R500: Karma	R077-R100	0M25~0M75	≒ ±75				
			R001-R500	≒ ±50				
EMA27	2725	4W	0M25-0M30:MnCuSn 0M50-0M25:MnCu R003:FeCrAl	--	0M25~0M30	≒ ±75		
					0M50-R003	≒ ±50		
EMA28	2728	4W	R004-R450:FeCrAl	R007-R450	R004-R450	≒ ±50		
		5W	R003-R050:FeCrAl	--	R003-R050	≒ ±50		
EMA87	2817	5W	R001-R003 MnCu	--	R001-R003	≒ ±75		
			R004-R050 Karma	--	R004-R050	≒ ±50		
EMA45	4527	2W	0M50:MnCuSn	--	0M50	≒ ±75		
			R001-R006:MnCu R007-R100:FeCrAl	R007-R100	R001-R100	≒ ±50		
		3W	0M50:MnCuSn	--	0M50	≒ ±75		
			R001-R005:MnCu R006-R60:FeCrAl	R007-R060	R001-R060	≒ ±50		
		5W	0M50:MnCuSn	--	0M50	≒ ±75		
			R001-R005:MnCu R006-R500:FeCrAl R006-R500:Karma	R007~R500	R001~R500	≒ ±50		

-55 ~ + 170

◆ Component Dimensions



Case Size	Rating Power	Resistance Range (Ω)	L	W	H	T1	T2
EMA12	0.75W	R051~R075	3.200±0.254	1.650±0.254	0.420±0.254	0.40±0.25	0.508±0.25
		R076-R100	3.200±0.254	1.650±0.254	0.370±0.254	0.40±0.25	0.508±0.25
	1W	R001	3.200±0.254	1.650±0.254	0.790±0.254	0.40±0.25	0.508±0.25
		R002	3.200±0.254	1.650±0.254	0.670±0.254	0.40±0.25	0.508±0.25
		R003-R020	3.200±0.254	1.650±0.254	0.570±0.254	0.40±0.25	0.508±0.25
		R021-R100	3.200±0.254	1.650±0.254	0.490±0.254	0.40±0.25	0.508±0.25
	2W	R001	3.200±0.254	1.650±0.254	0.80±0.154	0.70±0.25	0.70±0.25
		R002-R005	3.200±0.254	1.650±0.254	0.80±0.154	0.60±0.25	0.60±0.25
		R006-R025	3.200±0.254	1.650±0.254	0.80±0.154	0.60±0.25	0.60±0.25
		R006-R025	3.200±0.254	1.650±0.254	0.80±0.154	0.60±0.25	0.60±0.25
EMA25	1W 2W	0M25-0M75	6.350±0.254	3.050±0.254	0.790±0.254	1.05±0.25	2.200±0.25
		R001	6.350±0.254	3.050±0.254	0.670±0.254	1.05±0.25	2.200±0.25
		R0015	6.350±0.254	3.050±0.254	0.570±0.254	1.05±0.25	2.000±0.25
		R002	6.350±0.254	3.050±0.254	0.570±0.254	1.05±0.25	1.4±0.25
		R0025-R006	6.350±0.254	3.050±0.254	0.570±0.254	1.05±0.25	1.1±0.25
		R007-RR075	6.350±0.254	3.050±0.254	0.620±0.254	1.05±0.25	1.1±0.25
		R076-R100	6.350±0.254	3.050±0.254	0.570±0.254	0.75±0.25	1.1±0.25
		R101-R135	6.350±0.254	3.050±0.254	0.490±0.254	0.75±0.25	1.1±0.25
		R136-R200	6.350±0.254	3.050±0.254	0.420±0.254	0.75±0.25	1.1±0.25
	R201-R500	6.350±0.254	3.050±0.254	0.420±0.254	0.75±0.25	0.80±0.255	
	1W	R450-R500	6.350±0.254	3.050±0.254	0.370±0.254	0.75±0.25	0.80±0.255
	3W	0M25-0M75	6.350±0.254	3.050±0.254	0.790±0.254	1.05±0.25	2.200±0.25
		R001	6.350±0.254	3.050±0.254	0.670±0.254	1.05±0.25	2.200±0.25
		R0015	6.350±0.254	3.050±0.254	0.570±0.254	0.75±0.25	2.000±0.25
		R002	6.350±0.254	3.050±0.254	0.570±0.254	0.75±0.25	1.4±0.25
		R0025-R006	6.350±0.254	3.050±0.254	0.570±0.254	0.75±0.25	1.1±0.25
R007-RR075		6.350±0.254	3.050±0.254	0.620±0.254	0.75±0.25	1.1±0.25	
R076-R500		6.350±0.254	3.050±0.254	0.570±0.254	0.75±0.25	1.1±0.25	
EMA27	4W	0M25	6.800±0.254	6.350±0.254	0.790±0.254	1.15±0.25	2.300±0.25
		0M30	6.800±0.254	6.350±0.254	0.790±0.254	1.15±0.25	1.800±0.25
		0M50	6.800±0.254	6.350±0.254	0.670±0.254	1.15±0.25	2.300±0.25
		R001	6.800±0.254	6.350±0.254	0.670±0.254	1.15±0.25	1.800±0.25
		R0015	6.800±0.254	6.350±0.254	0.670±0.254	1.15±0.25	1.500±0.25

		R002-R003	6.800±0.254	6.350±0.254	0.570±0.254	1.15±0.25	1.500±0.25
EMA28	4W	R004-R450	6.600±0.254	6.700±0.254	0.600±0.254	0.40±0.25	1.050±0.25
	5W	R003-R050	7.200±0.254	6.800±0.254	1.050±0.254	0.40±0.25	1.050±0.254
EMA87	5W	R001-R003	7.100±0.254	4.300±0.254	1.000±0.155	1.20±0.25	1.20±0.25
		R004-R050	7.100±0.254	4.300±0.254	1.000±0.155	1.20±0.25	1.20±0.25
EMA45	2W	R0005	11.30±0.500	6.600±0.500	0.790±0.254	0.90±0.25	3.000±0.25
		R001	11.30±0.500	6.600±0.500	0.670±0.254	0.90±0.25	3.000±0.25
		0M15-R005	11.30±0.500	6.600±0.500	0.670±0.254	0.90±0.25	2.000±0.25
		R006-R100	11.30±0.500	6.600±0.500	0.570±0.254	0.90±0.25	2.000±0.25
	3W	R0005	11.30±0.500	6.600±0.500	0.790±0.254	0.90±0.25	3.000±0.25
		R001	11.30±0.500	6.600±0.500	0.670±0.254	0.90±0.25	3.000±0.25
		R0015-R005	11.30±0.500	6.600±0.500	0.670±0.254	0.90±0.25	2.000±0.25
		R006-R060	11.30±0.500	6.600±0.500	0.570±0.254	0.90±0.25	2.000±0.25
	5W	R0005	11.30±0.500	6.600±0.500	0.820±0.254	0.65±0.25	3.000±0.25
		R001	11.30±0.500	6.600±0.500	0.700±0.254	0.65±0.25	3.000±0.25
		R0015-R005	11.30±0.500	6.600±0.500	0.700±0.254	0.65±0.25	2.000±0.25
		R006-R500	11.30±0.500	6.600±0.500	0.600±0.254	0.65±0.25	2.000±0.25

◆ Environmental characteristics

Item	Specification	Test Method	Reference Standard
Temperature Coefficient of Resistance	Within specified value	+25°C ~ +125°C	IEC60115-1 4.8 JIS-C5201 4.8
Load Life	<±1% (<±2% 0508 & 0612)	1,000 hours at rated power, +70°C, 1.5 hours ON, 0.5 hours OFF	IEC60115-1 4.25.1 JIS-C5201 4.25.1
Short Time Overload	<±1%	5 x rated power for 5 seconds	IEC60115-1 4.13 JIS-C5201 4.13
Moisture Resistance (no load)	<±1% (<±2% 0508 & 0612)	+85°C, 85% RH, 1000 hours	IEC60115-1 4.24.2 1a JIS-C5201 4.24.2
Temperature Cycling	<±1%	-55°C & +125°C, 300 cycles, 15 minutes at each temperature	IEC60115-1 4.19 JIS-C5201 4.19
Resistance to Soldering Heat	<±0.5% (<±1% 0508 & 0612)	+260°C ± 5°C for 10 sec. ±1 sec., Two cycles	IEC60115-1 4.18 JIS-C5201 4.18
Solderability	At least 95% coverage of electrode surface	+245°C ± 5°C, 2 sec. ± 0.5sec.	IEC60115-1 4.17 JIS-C5201 4.17
High Temperature Exposure	<±1% (<±2% 0508 & 0612)	+155°C for 1,000 hours	IEC60115-1 4.23.2 JIS-C5201 4.23.2
Low Temperature Storage	<±1% (<±2% 0508 & 0612)	-55°C for 1,000 hours	IEC60115-1 4.23.4 JIS-C5201 4.23.4
Substrate Bending	<±0.5% (<±1% 0508 & 0612)	Bending within 2mm	IEC60115-1 4.33 JIS-C5201 4.33
Insulation Resistance	>100MW	100VDC for 1 minute	IEC60115-1 4.6 JIS-C5201 4.6

Voltage and Current Ratings: Voltage and current ratings can be calculated for each part number by using the formulas below:

Current Rating Formula: $I = \sqrt{P/R}$

Example: EMA12F0R006TR5F

P=1W

R=0.006Ω(6milli-ohm)

$$I = \sqrt{P/R} = \sqrt{1.0/0.006} = 12.909A$$

Voltage Rating Formula: $V = \sqrt{P * R}$

Example: EMA12F0R006TR5F

P=1W

R=0.006Ω(6milli-ohm)

$$V = \sqrt{P * R} = \sqrt{1.0 * 0.006} = 0.07745V$$

Thermal EMF Characteristics:

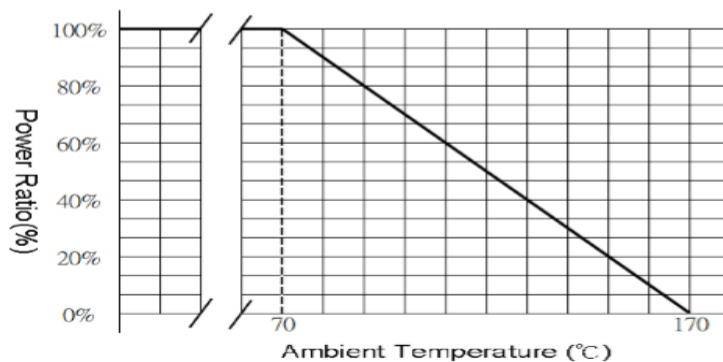
Thermal EMF=-1μV/°C

◆ Performance characteristics

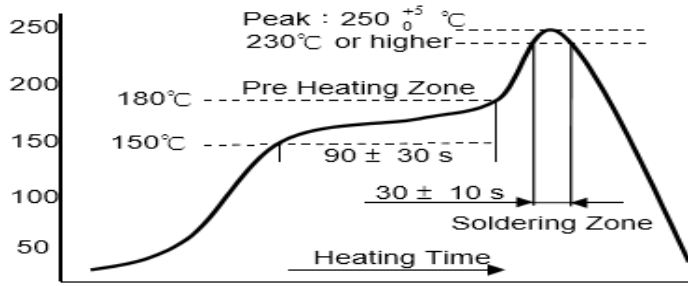
Power Derating Curve

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

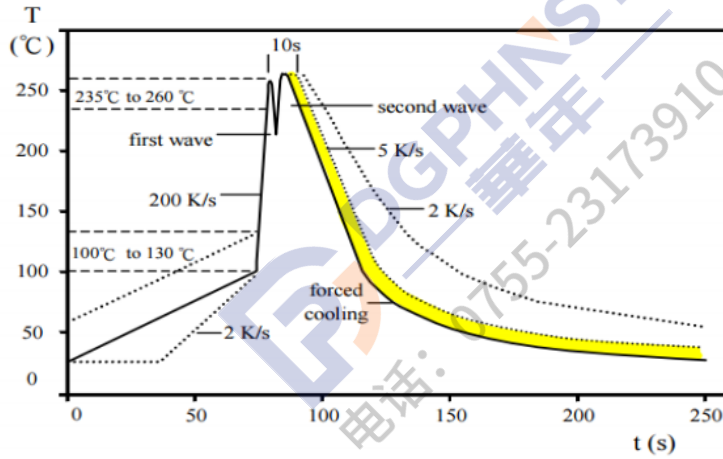
For resistors operated in ambient temperatures above 70°C, power rating must be derating in accordance with the curve below



◆ Soldering Profile



Reflow Soldering

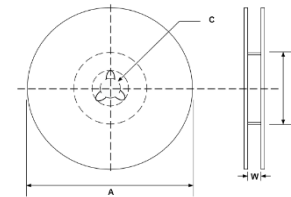


WAVE soldering.

◆ Packaging information

REEL DIMENSIONS (mm) AND QUANTITY

Type	A	B	C	W	Quantity
EMA12	178 ±2.0	60 ±1.0	13 ±1.0	9.0 ±1.0	5000/4000/3000
EMA25				13.0 ±1.0	2000/1000/500
EMA27					
EMA28					
EMA45					
EMA87				12.3 ±1.0	1000/500



◆ Storage Temperature

Temperature 20~30°C, Humidity 40~80%