

■ General

- This specification is available for Anti-Sulfur Metal Film Resistors manufactured by ELLON Electro-Mechanics Co., Ltd.
- The resistor is manufactured by highly quality-controlled process and guaranteed high reliability,
- it meets RoHS & Halogen-Free requirement.
- Temperature $20 \pm 2^{\circ}\text{C}$, Humidity $65 \pm 5\%$. Being no doubt about the judgment, measurements can
- be made within the following Temperature $5 \sim 35^{\circ}\text{C}$, Humidity $45 \sim 85\%$.

■ Application

- Consumer electronics
- Computer & relative products
- Communication devices
- Measuring instrument
- Industrial/Power supply
- Battery management system

■ Features

- Standard Package Sizes (0402 0603 0805 1206 1210 2010 2512)
- High Power capability
- Low Resistance/TCR/inductance
- High precision current sensing
- Sulfur resistant
- RoHs Compliant

■ Part Number System

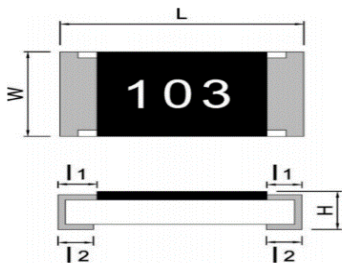
EAM	16	F	T	1R00	D	E	S
Product Type	Size (Inch)	Resistor Tolerance	Rated Power	Resistor Value	TCR (PPM/ $^{\circ}\text{C}$)	Quantity (Pcs)	Remarks
EAM	04=0402 06=0603 08=0805 16=1206 12=1210 20=2010 25=2512	D= $\pm 0.5\%$ F = $\pm 1\%$ G= $\pm 2\%$ J= $\pm 5\%$	Y=1/16W X= 1/10W W=1/8W P=1/5W V=1/4W O=1/3W G=2/5W U=1/2W Q=3/4W T=1W A=1.5W S=2W R=3W	R050=50m Ω R100=100m Ω 1R00=1 Ω 10R0=10 Ω	D= $\pm 50\text{PPM}$ E= $\pm 100\text{PPM}$	B=2000 D=4000 E=5000 C=10000	S=Standard

■ Standard Electrical Specifications

Type	EIA Size	Power Rating at 70° C	Max. Rated Current	Max. Overload Current	Resistance Tolerance (Code)	Temperature Coefficient (ppm/° C)	Resistance Range (Ω)
EAM04	0402	1/16W	1.12A	2.80A	± 0.5% (D), ± 1% (F) ± 2% (G), ± 5% (J)	± 100	50mΩ ≤ R < 100mΩ
		1/8W	1.58A	3.54A		± 50	100mΩ ≤ R ≤ 10RΩ
		1/4W	2.24A	5.00A		± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
						± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
EAM06	0603	1/10W	1.41A	3.54A		± 100	50mΩ ≤ R < 100mΩ
		1/5W	2.00A	4.47A		± 50	100mΩ ≤ R ≤ 10RΩ
		2/5W	2.83A	6.32A		± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
						± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
EAM08	0805	1/8W	1.58A	3.95A		± 100	50mΩ ≤ R < 100mΩ
		1/4W	2.24A	5.00A		± 50	100mΩ ≤ R ≤ 10RΩ
		1/2W	3.16A	7.07A		± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
						± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
EAM16	1206	1/4W	2.24A	5.59A		± 100	50mΩ ≤ R < 100mΩ
		1/2W	3.16A	7.07A		± 50	100mΩ ≤ R ≤ 10RΩ
		1W	4.47A	10.00A		± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
						± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
EAM12	1210	1/2W	3.16A	7.91A		± 100	50mΩ ≤ R < 100mΩ
		1W	4.47A	10.00A		± 50	100mΩ ≤ R ≤ 10RΩ
						± 100	50mΩ ≤ R < 100mΩ
						± 50	100mΩ ≤ R ≤ 10RΩ
EAM20	2010	3/4W	2.74A	6.85A		± 50	100mΩ ≤ R ≤ 10RΩ
		1.5W	3.87A	8.66A		± 50	100mΩ ≤ R ≤ 10RΩ
EAM25	2512	1W	3.16A	7.91A		± 50	100mΩ ≤ R ≤ 10RΩ
		2W	4.47A	10.00A		± 50	100mΩ ≤ R ≤ 10RΩ

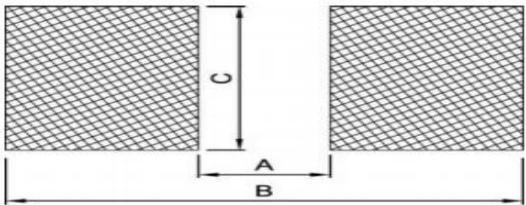
- If there are other TCR or Power requirements, please contact our sales department.

Type Dimension



TYPE	EIA Size	L	W	H	l1	l2
EAM04	0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
EAM06	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.30±0.15
EAM08	0805	2.00±0.10	1.25±0.10	0.55±0.15	0.35±0.20	0.40±0.20
EAM16	1206	3.10±0.10	1.60±0.10	0.55±0.15	0.40±0.20	0.50±0.20
EAM12	1210	3.10±0.10	2.50±0.15	0.55±0.15	0.50±0.20	0.50±0.20
EAM20	2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
EAM25	2512	6.30±0.20	3.20±0.15	0.55±0.10	0.65±0.25	0.65±0.25

Recommend Land Pattern Design



Dimension (unit:mm)

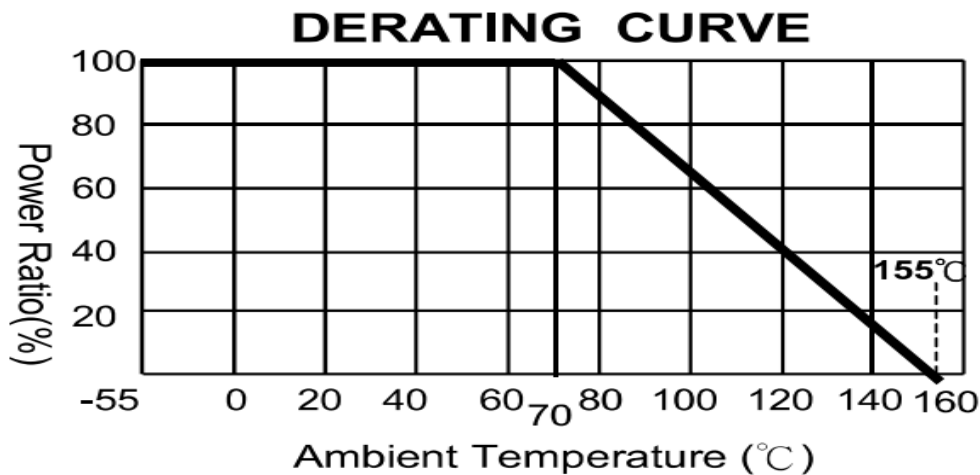
TYPE	EIA Size	A	B	C
EAM04	0402	0.60	1.60	0.70
EAM06	0603	0.80	2.40	1.00
EAM08	0805	1.30	2.90	1.44
EAM16	1206	2.20	4.20	1.80
EAM12	1210	2.00	4.40	2.70
EAM20	2010	3.80	6.60	2.70
EAM25	2512	4.90	8.10	3.40

■ Performance Characteristics

● Power Derating Curve

The operating Temperature Range: $-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$

Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C . For operation at ambient temperature in excess of 70°C , the load should be derated in accordance with figure of derating Curve.



■ Rated Current

Resistance Range: $< 1\Omega$

Rated Current: The resistor shall have a DC continuous working current or a AC(RMS) continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

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

I = Rated current(A)

P = Rated Power(W)

R = Resistance(Ω)

■ Rated Voltage

Resistance Range: $\geq 1\Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$V = \sqrt{p \times R}$$

V = Rated voltage(V)

P = Rated power(W)

R = Nominal resistance(Ω)

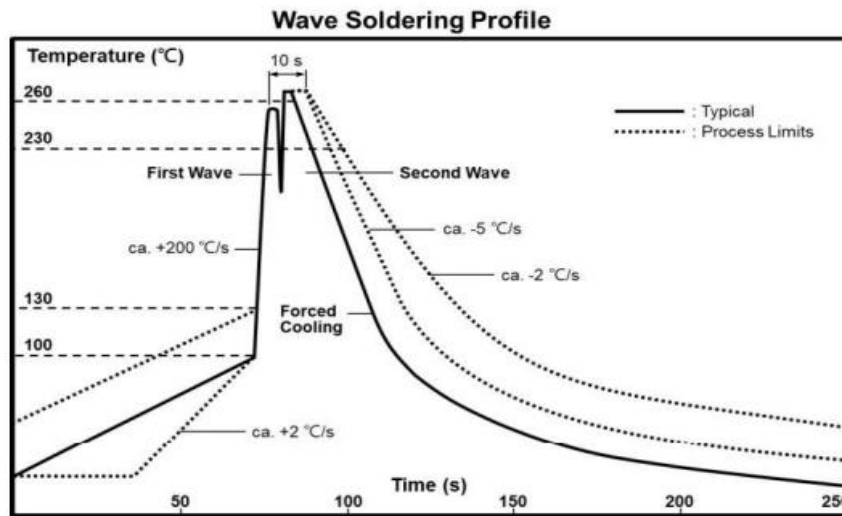
■ Reliability Tests and Requirements

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℃ is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	Standard power: 6.25 times rated power whichever is less for 5 seconds.	±(1.0%+0.001Ω)
		High power (2x/4x):5 times rated power whichever is less for 5 seconds.	
Insulation Resistance	JIS-C-5201-1 4.8 IEC-60115-1 4.8	Apply 100VDC for minute.	≥10GΩ
Dielectric withstanding voltage	JIS-C5201-1 4.7	0805 1206 1210 2010 2512 applied 500VAC for 1 minute. 0402 0603 applied 300VAC FOR 1 minute	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force:10N, 10 seconds.	No broken
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% Coverage No Visual damage
Resistance to Soldering Heat	JIS-C-5201-1 4.8 IEC-60115-1 4.8	260±5℃ for 10 seconds.	±(1.0%+0.001Ω) No Visual damage
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃to+155℃,300 cycles	±(1.0%+0.001Ω) No Visual damage
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 current whichever is less for 1000 Hours with 1.5 Hours “ON” and 0.5 Hour “OFF”	±(1.0%+0.001Ω)
Biased Humidity	MIL-STD-202 Method 103	1000 Hours; 85℃/85% RH, 10% of operating power ,Measurement at 24±4 Hours after test conclusion.	±(0.5%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	72±2℃,Rated power, or Max. working current whichever is less for 1000 hours with 1.5 hours “ON” and 0.5 Hour “OFF”	±(1.0%+0.001Ω)
High Temperature Exposure	JIS-C-5201-1 4.25 IEC-60068-2-2	At 155±5℃ for 1000 Hours.	±(1.0%+0.001Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for t0 secs. Then the resistor is left in the room for 48 hours	±(1.0%+0.001Ω) No Visual damage
Terminal Strength	JIS-C-5201-1 4.33 AEC-Q200-006	Pressurizing force for 10 seconds 0402/0603:8N 0805 and above:17.7N	NO broken
Bending STRENGTH	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D:0402 0603 0805 =5 mm 1206 1210=3mm 2010 2512=2mm	±(1.0%+0.001Ω) No Visual damage
Sulfur Test (Fos)	ASTM B809-95 ANSI/EIA-977	105±2℃,no power rating for 1000 hours.	±(2.0%+0.001Ω)

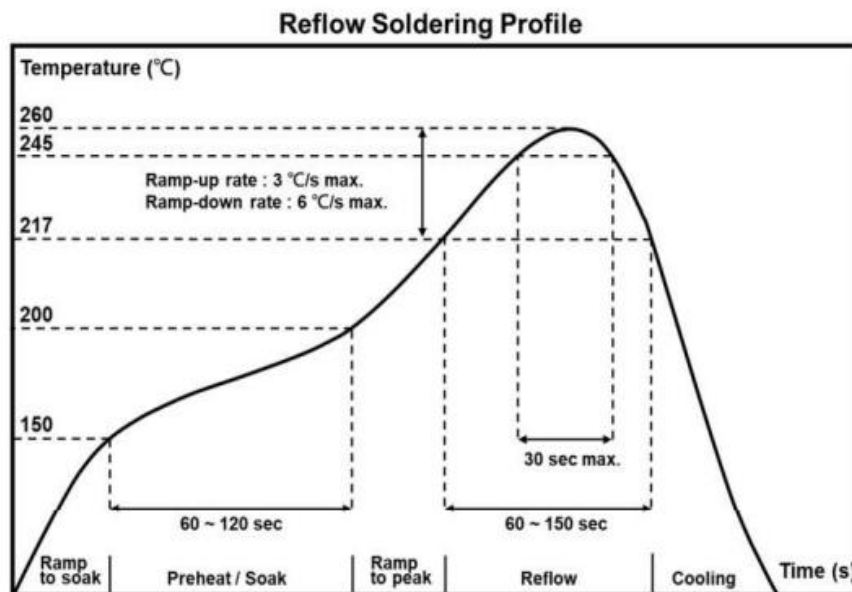
- Temperature Coefficient of Resistance test to -55℃ is available on request
- We can also provide AEC-Q200 test reports if required by customers.

■ Recommended Customer Soldering Parameters

● Wave solder Temperature condition



● Solder reflow Temperature condition



■ Rework temperature (hot air equipment): 350°C, 3-5 seconds

■ Recommended reflow methods

IR, Vapor phase oven, hot air oven

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

Part Marking

1. No marking on 0402 case size.
2. Marking for 0603 case size:

E-24 values and E-96 values: $\pm 1\%$ (F), $\pm 0.5\%$ (D), $\pm 0.25\%$ (C), $\pm 0.1\%$ (B) tolerances E-192 values: $\pm 0.1\%$ (B) tolerance (No Marking)

CODING FORMULA



Example: $10.2k\Omega = \frac{102}{02} \times 10^3 \Omega = 02C$
 $33.2 \Omega = \frac{332}{51} \times 10^{-1} = 51X$

Marking Examples

$10\Omega = 01X$
 $7.5k \Omega = 85B$
 $150k \Omega = 18D$
 $1 \text{ Meg}\Omega = 01E$

3. Marking for 0805, 1206, 2010 and 2512 case sizes:

E-24 and E-96 values - $\pm 1\%$ (F), $\pm 0.5\%$ (D), $\pm 0.25\%$ (C), $\pm 0.1\%$ (B) tolerances E-192 values: $\pm 0.1\%$ (B) tolerance (No Marking)

4 DIGIT MARKING SYSTEM - First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point

STANDARD E-24, E-96 AND E-192 VALUES AND 0603 RESISTANCE CODES

E-24	E-96								E-192*					
Value	Value	Code	Value	Code	Value	Code	Value	Code	Value	Value	Value	Value	Value	Value
100	100	01	102	02	105	03	107	04	100	147	215	316	464	681
110	110	05	113	06	115	07	118	08	101	149	218	320	470	690
120	121	09	124	10	127	11	130	12	102	150	221	324	475	698
130	133	13	137	14	140	15	143	16	104	152	223	328	481	706
150	147	17	150	18	154	19	158	20	105	154	226	332	487	715
160	162	21	165	22	169	23	174	24	106	156	229	336	493	723
180	178	25	182	26	187	27	191	28	107	158	232	340	499	732
200	196	29	200	30	205	31	210	32	109	160	234	344	505	741
220	215	33	221	34	226	35	232	36	110	162	237	348	511	750
240	237	37	243	38	249	39	255	40	111	164	240	352	517	759
270	261	41	267	42	274	43	280	44	113	165	243	357	523	768
300	287	45	294	46	301	47	309	48	114	167	246	361	530	777
330	316	49	324	50	332	51	340	52	115	169	249	365	536	787
360	348	53	357	54	365	55	374	56	117	172	252	370	542	796
390	383	57	392	58	402	59	412	60	118	174	255	374	549	806
430	422	61	432	62	442	63	453	64	120	176	258	379	556	816
470	464	65	475	66	487	67	499	68	121	178	261	383	562	825
510	511	69	523	70	536	71	549	72	123	180	264	388	569	835
560	562	73	576	74	590	75	604	76	124	182	267	392	576	845
620	619	77	634	78	649	79	665	80	126	184	271	397	583	856
680	681	81	698	82	715	83	732	84	127	187	274	402	590	866
750	750	85	768	86	787	87	806	88	129	189	270	407	597	876
820	825	89	845	90	866	91	887	92	130	191	280	412	604	887
910	* Special E192 resistance values are supported on all case sizes of NTR series. Please review your E192 value requirements with NIC, as special terms apply, and E192 values are supplied without component resistance value marking.								132	193	284	417	612	898
133									196	287	422	619	909	
135									198	291	427	626	920	
137									200	294	432	634	931	
138									203	298	437	642	942	
140									205	301	442	649	953	
142									208	305	448	657	965	
143									210	309	453	665	976	

Multiplier code

Code	A	B, b	C	D, d	E	F	G	H	X	Y	Z
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

Paper Tape Dimensions (mm)

FIG. A

Type	EIA Size	A	B	D	E	F	P0	P1	P2	W	T
EAM02	0201	0.40 ± 0.05	0.70 ± 0.05	1.55 ±0.05	1.75 ±0.05	3.50 ±0.05	4.0 ±0.10	2.0 ± 0.05	2.0 ±0.05	8.0 ±0.1	0.42 ± 0.02
EAM04	0402	0.70 ± 0.05	1.16 ± 0.05					0.40 ± 0.03			
EAM06	0603	1.10 ± 0.05	1.90 ± 0.05					4.0 ±0.05			0.60 ± 0.03
EAM08	0805	1.60 ± 0.05	2.37 ± 0.05								0.75 ± 0.05
EAM16	1206	2.00 ± 0.05	3.55 ± 0.05								
EAM12	1210	2.75 ± 0.05	3.40 ± 0.05	1.60 ± 0.10							

FIG. A

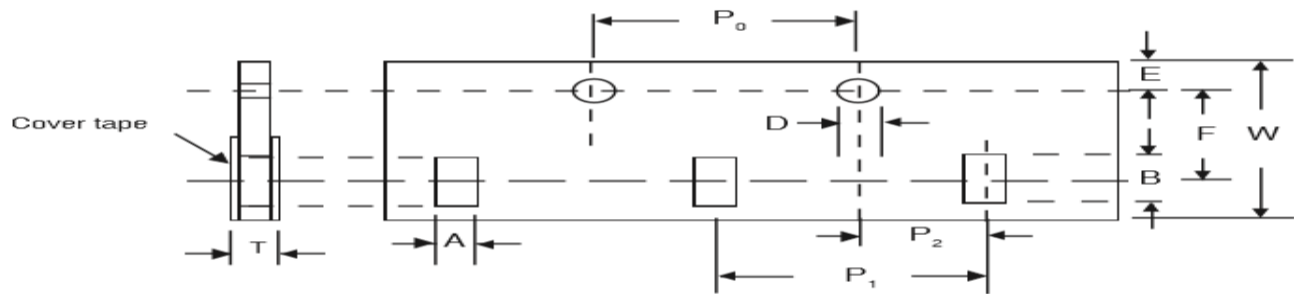
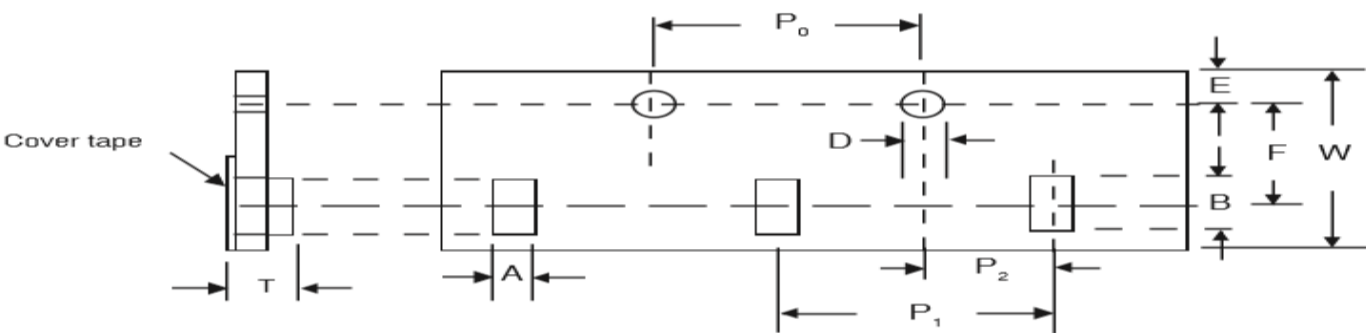


FIG. B

Type	EIA Size	A	B	D	E	F	P0	P1	P2	W	T
EAM20	2010	2.85 ± 0.10	5.45 ± 0.10	1.50 ± 0.10	1.75 ± 0.10	5.50 ± 0.05	4.0 ± 0.10	4.0 ± 0.05	2.0 ± 0.05	12.0 ± 0.1	1.0 ± 0.20
EAM25	2512	3.40 ± 0.10	6.65 ± 0.10								

FIG. B

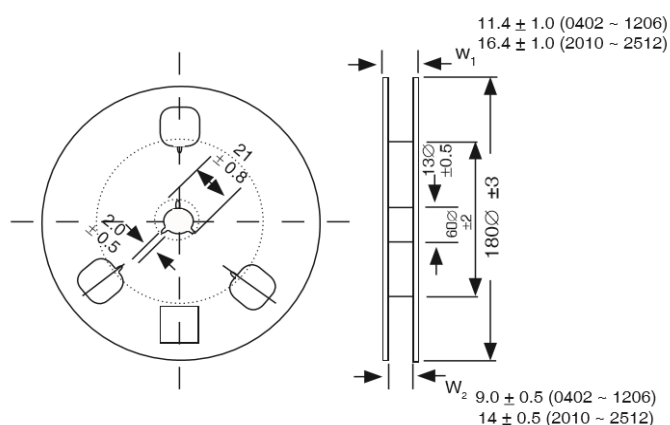


■ Taping specifications

Availability

Type	EIA Size	Carrier Tape			Qty per Reel (pcs)
		Fig.	Material	Width (mm)	Standard
EAM02	0201	A	Paper	8	10000
EAM04	0402	A			10000
EAM06	0603	A			5000
EAM08	0805	A			
EAM16	1206	A			
EAM12	1210	A			
EAM20	2010	B	Plastic	12	4000
EAM25	2512	B			

■ Reel Dimensions (mm)



■ Land pattern dimensions (mm)

Type	EIA Size	A	B	C
EAM02	0201	0.25	0.30	0.40 ± 0.2
EAM04	0402	0.50	0.50	0.60 ± 0.2
EAM06	0603	0.80	1.00	0.90 ± 0.2
EAM08	0805	1.00	1.00	1.35 ± 0.2
EAM16	1206	2.00	1.15	1.70 ± 0.2
EAM12	1210	2.00	1.15	2.50 ± 0.2
EAM20	2010	3.60	1.40	2.50 ± 0.2
EAM25	2512	4.90	1.60	3.10 ± 0.2

