

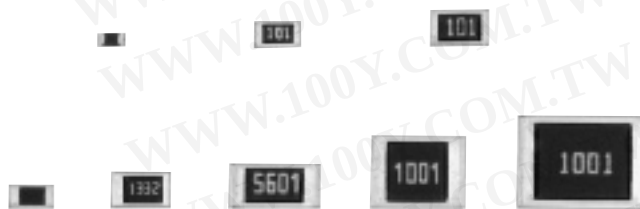
Precision Thick Film Chip Resistors

ERJ R: 0402, 0603, 0805

ERJ E: 0603, 0805, 1206,
1210, 1812

Type: ERJ 2R, 3R, 6R

ERJ 3E, 6E, 8E, 14, 12



■ Features

- Small size and lightweight
- High reliability
Metal glaze thick film resistive element and three layered electrodes.
- Compatible with placement machines
Bulk, taping and magazine packaging available
- Suitable for both reflow soldering and flow soldering

● Marking

Four digit marking of resistance value on resistive element side (except 2R, 3R, 6R, 3E Type)

- The power rating for one-K size larger is available for 3E, 6E, 8E type

● Low Resistance Tolerance

ERJ2R, 3E, 6E, 8E, 14, 12 Series ... $\pm 1\%$

ERJ2R, 3R, 6R Series $\pm 0.5\%$

- Approved under the ISO 9001 system

Approved under the QS-9000 system

- Reference Standards

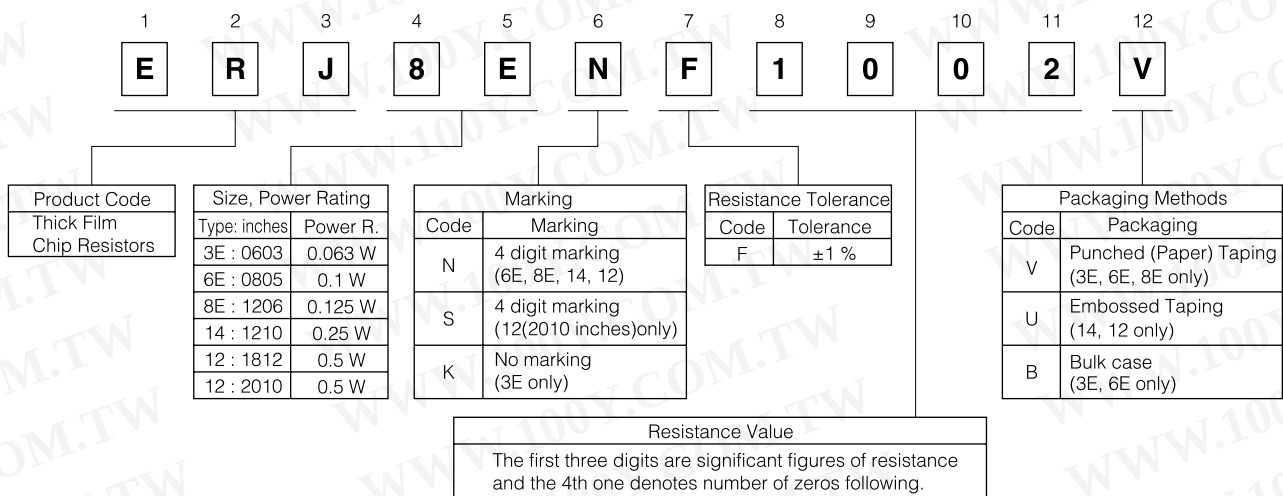
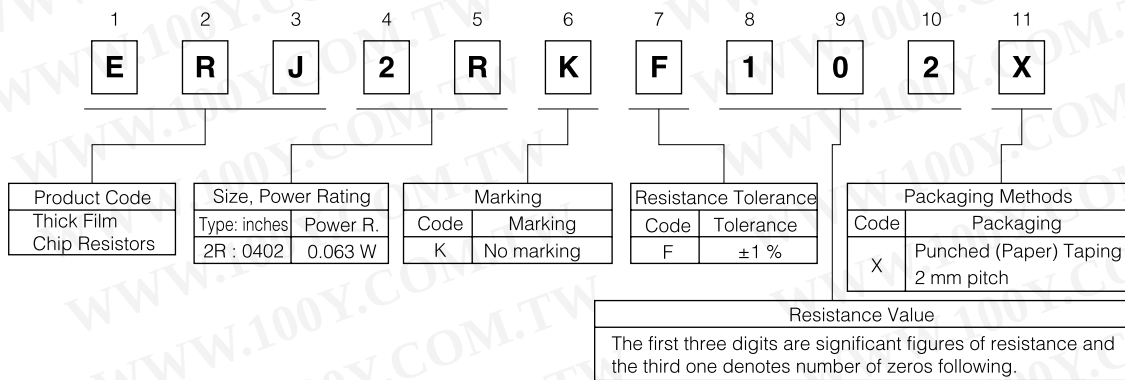
IEC 60115-8, JIS C 5201-8

■ Explanation of Part Numbers (ERJ2R, 3R, 6R Series, $\pm 0.5\%$ type)

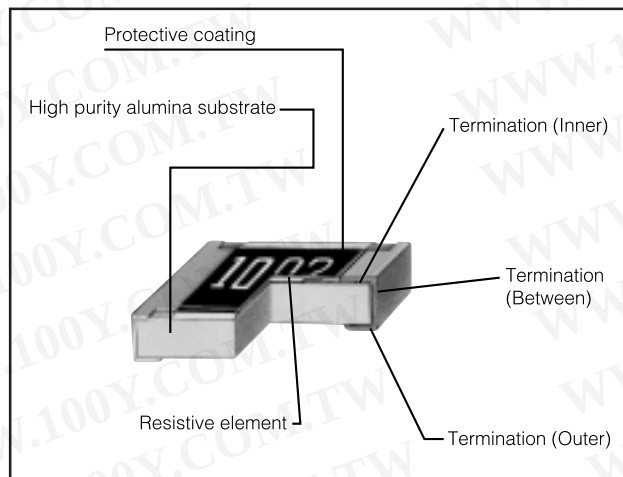
1		2		3		4		5		6		7		8		9		10		11	
E		R		J		3		R		B		D		1		0		2		V	
Product Code		Size, Power Rating				T.C.R. Marking						Resistance Tolerance		Packaging Methods							
Thick Film Chip Resistors		Type: inches	Power R.			Code		T.C.R. Marking				Code		Tolerance		Code		Packaging			
		2R : 0402	0.063 W			H		$\pm 50 \times 10^{-6}/^{\circ}\text{C}(\text{ppm}/^{\circ}\text{C})$ No marking (2R)				D		$\pm 0.5\%$		V		Punched (Paper) Taping (3R, 6R)			
		3R : 0603	0.063 W			B		$\pm 50 \times 10^{-6}/^{\circ}\text{C}(\text{ppm}/^{\circ}\text{C})$ Marking (3R, 6R)								X		Punched (Paper) Taping 2 mm pitch (2R)			
		6R : 0805	0.1 W			K		$\pm 100 \times 10^{-6}/^{\circ}\text{C}(\text{ppm}/^{\circ}\text{C})$ No marking (2R)													
						E		$\pm 100 \times 10^{-6}/^{\circ}\text{C}(\text{ppm}/^{\circ}\text{C})$ Marking (3R, 6R)													
Resistance Value																					
The first two digits are significant figures of resistance and the third one denotes number of zeros following.																					

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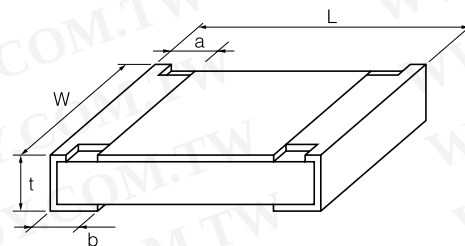
■ Explanation of Part Numbers (ERJ2R, 3E, 6E, 8E, 14, 12 Series, $\pm 1\%$ type)



■ Construction



■ Dimensions in mm (not to scale)



Type (inches)	Dimensions (mm)					Weight (1000 pcs.)
	L	W	a	b	t	
ERJ2R (0402)	1.00 ± 0.05	0.50 ± 0.05	0.20 ± 0.10	0.25 ± 0.05	0.35 ± 0.05	0.8 g
ERJ3R (0603)	1.60 ± 0.15	0.80 ± 0.15 -0.05	0.30 ± 0.20	0.30 ± 0.15	0.45 ± 0.10	2 g
ERJ6R (0805)	2.00 ± 0.20	1.25 ± 0.10	0.40 ± 0.20	0.40 ± 0.20	0.60 ± 0.10	4 g
ERJ3EK (0603)	1.60 ± 0.15	0.80 ± 0.15 -0.05	0.30 ± 0.20	0.30 ± 0.15	0.45 ± 0.10	2 g
ERJ6EN (0805)	2.00 ± 0.20	1.25 ± 0.10	0.40 ± 0.20	0.40 ± 0.20	0.60 ± 0.10	4 g
ERJ8EN (1206)	3.20 ± 0.05 -0.20	1.60 ± 0.05 -0.15	0.50 ± 0.20	0.50 ± 0.20	0.60 ± 0.10	10 g
ERJ14N (1210)	3.20 ± 0.20	2.50 ± 0.20	0.50 ± 0.20	0.50 ± 0.20	0.60 ± 0.10	16 g
ERJ12N (1812)	4.50 ± 0.20	3.20 ± 0.20	0.50 ± 0.20	0.50 ± 0.20	0.60 ± 0.10	27 g
ERJ12S (2010)	5.00 ± 0.20	2.50 ± 0.20	0.60 ± 0.20	0.60 ± 0.20	0.60 ± 0.10	27 g

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■ Ratings

Type (inches)	Power Rating at 70 °C (W)	Limiting Element Voltage (Maximum RCWV) ⁽¹⁾ (V)	Maximum Overload Voltage ⁽²⁾ (V)	Resistance Tolerance (%)	Resistance Ranges (Ω)		T.C.R. ×10 ⁻⁶ /°C (ppm/°C)	Standard Resistance Values
					min.	max.		
ERJ2R (0402)	0.063	50	100	±0.5	10	91	±100	E24
					100	100 K	±50	
					110 K	1 M	±100	
ERJ3R (0603)	0.063	50	100	±0.5	10	91	±100	E24
					100	100 K	±50	
					110 K	1 M	±100	
ERJ6R (0805)	0.1	150	200	±0.5	10	91	±100	E24
					100	100 K	±50	
					110 K	1 M	±100	
ERJ2RK (0402)	0.063	50	100	±1	10	1 M	±100	E24
ERJ3EK (0603)	0.063 (0.1)*	50	100	±1	10	1 M	±100	E24,E96
ERJ6EN (0805)	0.1 (0.125)*	150	200	±1	10	2.2 M	±100	E24,E96
ERJ8EN (1206)	0.125 (0.25)*	200	400	±1	10	2.2 M	±100	E24,E96
ERJ14N (1210)	0.25	200	400	±1	10	1 M	±100	E24,E96
ERJ12N, 12S (1812), (2010)	0.5	200	400	±1	10	1 M	±100	E24,E96

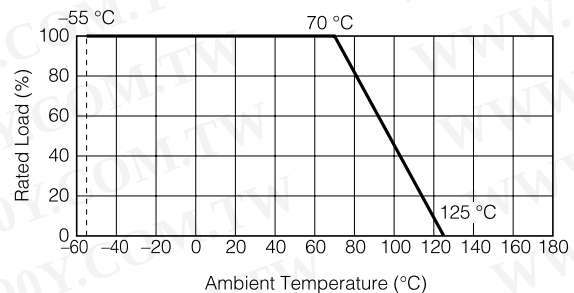
(1) Rated Continuous Working Voltage (RCWV) should be determined from $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$, or Limiting Element Voltage (max. RCWV) listed above, whichever is less.

(2) Overload (Short-time Overload) Test Voltage (SOTV) should be determined from $SOTV = 2.5 \times \text{Power Rating}$ or max. Overload Voltage listed above whichever is less.

* Please contact us when resistors guaranteed for high power are needed.

Power Derating Curve

For resistors operating in ambient temperature above 70 °C, power rating should be derated in accordance with the figure to the right.



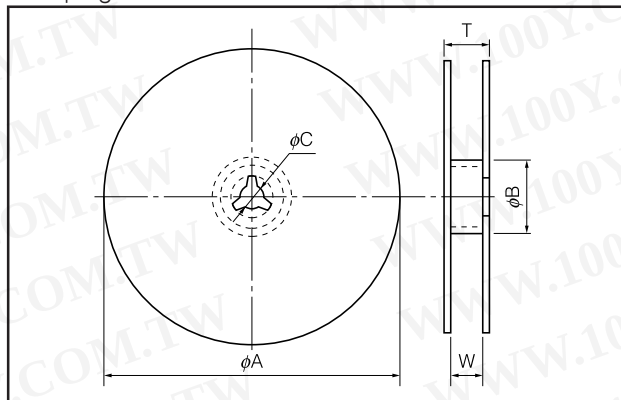
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■ Packaging Specifications

● Standard Quantity

Type (inches)	Thickness (mm)	Punched (Paper) Taping (4 mm pitch)	Embossed Taping (4 mm pitch)	Bulk Case
ERJ2R (0402)	0.35	10000 pcs./reel(2 mm pitch)		
ERJ3R (0603)	0.45	5000 pcs./reel		
ERJ6R (0805)	0.6	5000 pcs./reel		
ERJ2RK (0402)	0.35	10000 pcs./reel(2 mm pitch)		
ERJ3EK (0603)	0.45	5000 pcs./reel		25000 pcs./case
ERJ6EN (0805)	0.6	5000 pcs./reel		10000 pcs./case
ERJ8EN (1206)	0.6	5000 pcs./reel		
ERJ14N (1210)	0.6		5000 pcs./reel	
ERJ12N,12S (1812), (2010)	0.6		5000 pcs./reel	

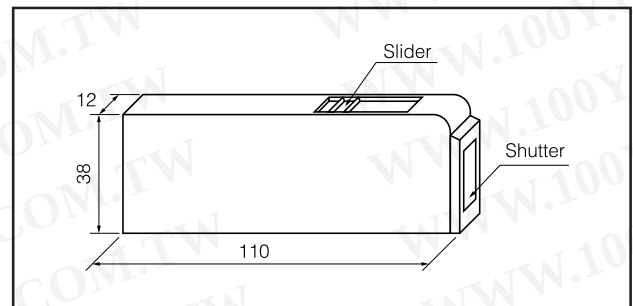
● Taping Reel



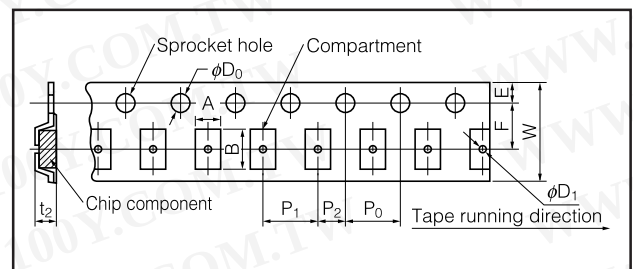
Dimensions (mm)	Type	φA	φB	φC	W	T
	2R,3R,6R 3EK,6EN, 8EN,14N	180.0 ⁺⁰ ₋₃₀	60 min.	13.0 ^{+1.0}	9.0 ^{+1.0}	11.4 ^{+2.0}
	12N, 12S				13.0 ^{+1.0}	15.4 ^{+2.0}

● Bulk Case

(mm)



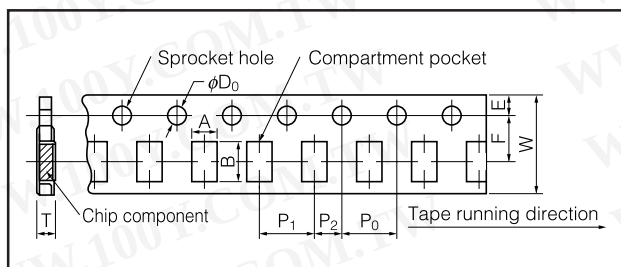
● Embossed Taping



	Type	A	B	W	F	E	P ₁
Dimensions (mm)	14N	2.80 ^{+0.20}	3.50 ^{+0.20}	8.00 ^{+0.30}	3.50 ^{+0.05}	1.75 ^{+0.10}	4.00 ^{+0.10}
	12N	3.50 ^{+0.20}	4.80 ^{+0.20}	12.00 ^{+0.30}	5.50 ^{+0.05}		
	12S	2.80 ^{+0.20}	5.30 ^{+0.20}				

Dimensions (mm)	Type	P ₂	P ₀	φD ₀	t ₂	φD ₁
	14N	2.00 ^{+0.05}	4.00 ^{+0.10}	1.50 ^{+0.10}	1.00 ^{+0.10}	1 min.
	12N					1.5 min.
	12S					

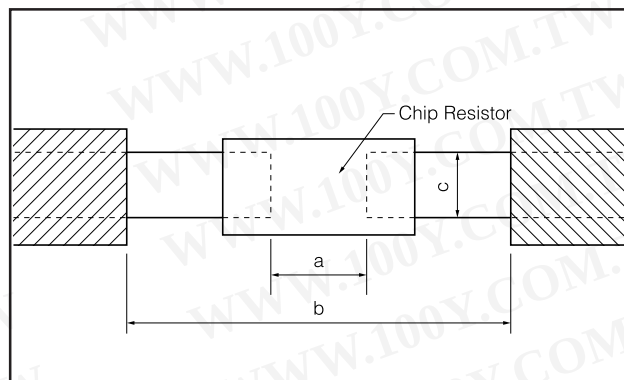
● Punched (Paper) Taping



Dimensions (mm)	Type	A	B	W	F	E	P ₁	P ₂	P ₀	φD ₀	T
	2R	0.70 ^{+0.05}	1.20 ^{+0.05}	8.00 ^{+0.20}	3.50 ^{+0.05}	1.75 ^{+0.10}	2.00 ^{+0.10}	2.00 ^{+0.05}	4.00 ^{+0.10}	1.50 ^{+0.10}	0.52 ^{+0.05}
	3R,3EK	1.10 ^{+0.10}	1.90 ^{+0.10}								0.70 ^{+0.05}
	6R,6EN	1.65 ^{+0.15}	2.50 ^{+0.20}								0.84 ^{+0.05}
	8EN	2.00 ^{+0.15}	3.60 ^{+0.20}								

■ Recommended Land Pattern

In case of flow soldering, the land width must be smaller than the Chip Resistor width to control the solder amount properly. Generally, the land width should be 0.7 to 0.8 times (W) of the width of chip resistor. In case of reflow soldering, solder amount can be adjusted, therefore the land width should be set to 1.0 to 1.3 times chip resistor width (W).



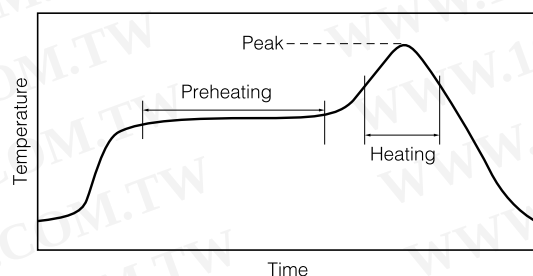
Type (inches)	Dimensions (mm)		
	a	b	c
ERJ2R (0402)	0.5 to 0.6	1.4 to 1.6	0.4 to 0.6
ERJ3R, 3EK (0603)	0.7 to 0.9	2 to 2.2	0.8 to 1
ERJ6R, 6EN (0805)	1 to 1.4	3.2 to 3.8	0.9 to 1.4
ERJ8EN (1206)	2 to 2.4	4.4 to 5	1.2 to 1.8
ERJ14N (1210)	2 to 2.4	4.4 to 5	1.8 to 2.8
ERJ12N (1812)	3.3 to 3.7	5.7 to 6.5	2.3 to 3.5
ERJ12S (2010)	3.6 to 4	6.2 to 7	1.8 to 2.8

■ Recommended Soldering Conditions

Recommendations and precautions are described below.

● Recommended soldering conditions for reflow

- Reflow soldering shall be two times maximum.
- Please contact us for additional information when used in conditions other than those specified.
- Please measure temperature of terminations and study solderability for every kind of solder and board, before actual use.



For soldering (Example : Sn/Pb)

	Temperature	Time
Preheating	140 °C to 160 °C	60 s to 120 s
Main heating	Above 200 °C	30 s to 40 s
Peak	235 ± 5 °C	max. 10 s

For lead-free soldering (Example : Sn/Ag/Cu)

	Temperature	Time
Preheating	150 °C to 180 °C	60 s to 120 s
Main heating	Above 230 °C	30 s to 40 s
Peak	max. 260 °C	max. 10 s

● Recommended soldering conditions for flow

	For soldering		For lead-free soldering	
	Temperature	Time	Temperature	Time
Preheating	140 °C to 160 °C	60 s to 120 s	150 °C to 180 °C	60 s to 120 s
Soldering	245±5 °C	20 s to 30 s	max. 260 °C	max. 10 s

⚠ Safety Precautions

1. If transient load (heavy load in a short time) like pulse is to be applied, carry out an evaluation and confirmation test with the resistors actually mounted on the board.
When a load of more than the rated power is applied under load condition at steady state, it could impair performance and/or reliability of the resistor.
Never exceed the specified rated power.
2. Chlorine type or other highly-reactive flux is not recommended. Residue could affect performance or reliability of the resistors.
3. When using a soldering iron, never let the tip of the soldering iron touch the body of the chip resistor. When using a soldering iron with a tip at a high temperature, solder for as short time as possible (no more than three seconds and up to 350 °C).
4. Avoid physical shock to the resistor and nipping of the resistor with hard tool (pliers or tweezers) as it may damage protective coating or the body of the resistor and may affect its performance.