

General Purpose Thick Film Resistors (CR Series)



Features:

- RoHS Compliant (9/10) and Halogen Free
- TCR as low as $\pm 100\text{ppm}$
- Available Sizes 01005 to 2512
- Stable over temperature range
- Good power dissipation capabilities (Rated power is conservatively rated)
- 100% matte Tin over Nickel with wrap around termination for excellent solderability
- Some values available for conductive epoxy application (suitable for MRI applications)

Part Number Structure

CR Series	1206 Size	8W Power Rating	103 Resistance	J Tolerance	Termination	T Packaging	Optional Reel Identifier
01005	32W = 0.031W	3 DIGIT (J TOL.)	2R2=2.2 Ω	D = $\pm 0.5\%$	Leave blank for standard termination.	T = Tape & Reel	Leave blank if standard Reel size.
0201	20W = 0.05W		103=10K Ω	F = $\pm 1\%$			
0402	16W = 0.063W	4 DIGIT (D & F TOL.)	10R2=10.2 Ω	J = $\pm 5\%$	P = Palladium Silver Termination (PdAg)		Add "-13" if 13" Reel is required
0603	10W = 0.10W		1002=10K Ω	No tolerance specified for the zero ohm			
0805	8W = 0.125W	Jumper	3 zeros	Leave blank for zero ohm value			
1206	4W = 0.25W						
1210	2W = 0.50W						
2010	1W = 1W						
2512	2W = 2W						

Note: 1% E24 values may be marked with a 3 digit code.

Example P/N: CR1206-8W-103JT

Standard termination finish is 100% matte Tin (Sn) over Nickel.

Dimensions

Size	Unit: inches (mm)				
	L	W	T	C ₁	C ₂
01005	0.016 $\pm$ 0.0008 (0.4 $\pm$ 0.02)	0.008 $\pm$ 0.0008 (0.2 $\pm$ 0.02)	0.005 $\pm$ 0.0008 (0.13 $\pm$ 0.02)	0.003 $\pm$ 0.001 (0.08 $\pm$ 0.03)	0.003 $\pm$ 0.001 (0.08 $\pm$ 0.03)
0201	0.024 $\pm$ 0.002 (0.6 $\pm$ 0.05)	0.012 $\pm$ 0.001 (0.3 $\pm$ 0.02)	0.010 $\pm$ 0.002 (0.25 $\pm$ 0.05)	0.020 $\pm$ 0.008 (0.50 $\pm$ 0.20)	0.006 $\pm$ 0.002 (0.15 $\pm$ 0.05)
0402	0.040 $\pm$ 0.002 (1.0 $\pm$ 0.05)	0.020 $\pm$ 0.001 (0.5 $\pm$ 0.02)	0.014 $\pm$ 0.002 (0.35 $\pm$.05)	0.008 $\pm$ 0.004 (0.2 $\pm$ 0.1)	0.008 $\pm$ 0.004 (0.2 $\pm$ 0.1)
0603	0.063 $\pm$ 0.004 (1.6 $\pm$ 0.1)	0.031 $\pm$ 0.004 (0.8 $\pm$ 0.1)	0.018 $\pm$ 0.004 (0.45 $\pm$ 0.1)	0.012 $\pm$ 0.006 (0.30 $\pm$ 0.15)	0.012 $\pm$ 0.006 (0.30 $\pm$ 0.15)
0805	0.079 $\pm$ 0.006 (2.0 $\pm$ 0.15)	0.050 $\pm$ 0.006 (1.25 $\pm$ 0.15)	0.018 $\pm$ 0.006 (0.45 $\pm$ 0.15)	0.014 $\pm$ 0.006 (0.35 $\pm$ 0.15)	0.014 $\pm$ 0.006 (0.35 $\pm$ 0.15)
1206	0.126 $\pm$ 0.006 (3.2 $\pm$ 0.15)	0.063 $\pm$ 0.006 (1.6 $\pm$ 0.15)	0.022 $\pm$ 0.006 (0.56 $\pm$ 0.15)	0.020 $\pm$ 0.008 (0.50 $\pm$ 0.20)	0.020 $\pm$ 0.008 (0.50 $\pm$ 0.20)
1210	0.126 $\pm$ 0.006 (3.2 $\pm$ 0.15)	0.098 $\pm$ 0.006 (2.50 $\pm$ 0.15)	0.022 $\pm$ 0.006 (0.56 $\pm$ 0.15)	0.020 $\pm$ 0.008 (0.50 $\pm$ 0.20)	0.020 $\pm$ 0.008 (0.50 $\pm$ 0.20)
2010	0.197 $\pm$ 0.006 (5.0 $\pm$ 0.15)	0.098 $\pm$ 0.006 (2.50 $\pm$ 0.15)	0.022 $\pm$ 0.006 (0.56 $\pm$ 0.15)	0.026 $\pm$ 0.008 (0.65 $\pm$ 0.25)	0.024 $\pm$ 0.008 (0.60 $\pm$ 0.20)
2512 (1W)	0.248 $\pm$ 0.006 (6.3 $\pm$ 0.15)	0.126 $\pm$ 0.006 (3.2 $\pm$ 0.15)	0.022 $\pm$ 0.006 (0.56 $\pm$ 0.15)	0.026 $\pm$ 0.008 (0.65 $\pm$ 0.25)	0.024 $\pm$ 0.008 (0.60 $\pm$ 0.20)
2512 (2W)	0.248 $\pm$ 0.006 (6.3 $\pm$ 0.15)	0.126 $\pm$ 0.006 (3.2 $\pm$ 0.15)	0.024 $\pm$ 0.008 (0.60 $\pm$ 0.20)	0.024 $\pm$ 0.008 (0.60 $\pm$ 0.20)	0.020 $\pm$ 0.008 (0.50 $\pm$ 0.20)

Structure

		1	Alumina Substrate	6	Tin Plating
		2	Backside Electrode	7	Primary Coating
		3	Topside Electrode	8	Secondary Layer
		4	Edge Electrode	9	Resistive layer
		5	Nickel Plating	10	Marking

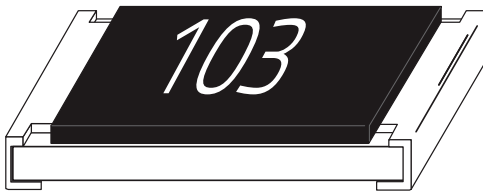
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Electrical Specifications and Range

	Size	01005	0201	0402		0603		0805		1206		1210		2010		2512	
	Power Rating at 70°C (W)	0.03W (1/32W)	0.05W (1/20W)	0.063W (1/16W)	0.10W (1/10W)	0.063W (1/16W)	0.10W (1/10W)	0.10W (1/10W)	0.125W (1/8W)	0.125W (1/8W)	0.25W (1/4W)	0.50W (1/2W)	0.50W (1/2W)	1.0W	1.0W	2.0W	
	Max. Working Voltage	√PR or 15V whichever is less	√PR or 25V whichever is less	√PR or 50V whichever is less		√PR or 75V whichever is less		√PR or 150V whichever is less		√PR or 200V whichever is less		√PR or 200V whichever is less		√PR or 200V whichever is less		√PR or 200V whichever is less	
	*Max. Overload Voltage	30V	50V	100V		150V		300V		400V		400V		400V		500V	
	Operating Temp. Range	-55°C to +125°C	-55°C to +125°C	-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C	
Zero Ohm (Jumper)	Current Rating	0.5A	0.5A	1A		1A		2A		2A		2.5A		3.5A		4A	
Zero Ohm (Jumper)	Resistance	50 mΩ (max)	50 mΩ (max)	50 mΩ (max)		50 mΩ (max)		50 mΩ (max)		50 mΩ (max)		50 mΩ (max)		50 mΩ (max)		50 mΩ (max)	
Tolerance	TCR	Resistance Range	Resistance Range	Resistance Range		Resistance Range		Resistance Range		Resistance Range		Resistance Range		Resistance Range		Resistance Range	
±0.5% (D)	±100ppm	-	-	10Ω - 1MΩ	-	10Ω - 1MΩ		10Ω - 1MΩ		10Ω - 1MΩ		-		-		-	
	±200ppm	-	-	1.02MΩ - 10MΩ	-	1.02MΩ - 10MΩ		1.02MΩ - 10MΩ		1.02MΩ - 10MΩ		-		-		-	
±1% (F)	±100ppm	-	-	10Ω - 10MΩ	10Ω - 1MΩ	10Ω - 10MΩ		10Ω - 10MΩ		10Ω - 10MΩ		10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ
	±200ppm	-	10Ω - 10MΩ	1Ω - 9.76Ω; 10.2MΩ - 20MΩ	1Ω - 9.76Ω; 1.02MΩ - 10MΩ	1Ω - 9.76Ω; 10.2MΩ - 21.5MΩ		1Ω - 9.76Ω; 10.2MΩ - 21.5MΩ		1Ω - 9.76Ω; 10.2MΩ - 21.5MΩ		1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω
	±250ppm	100Ω - 1MΩ	-	-	-	-		-		-		-		-		-	
	±300ppm	10Ω - 99Ω	-	-	-	-	-		-		20.5MΩ - 21.5MΩ		-	20.5MΩ - 21.5MΩ	-	-	
±5% (J)	±100ppm	-	-	-	-	-		-		-		10Ω - 1MΩ		10Ω - 1MΩ		10Ω - 1MΩ	
	±200ppm	-	1Ω - 10MΩ	1Ω - 10MΩ	1Ω - 10MΩ	1Ω - 10MΩ		1Ω - 10MΩ		1Ω - 10MΩ		1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.02MΩ - 20MΩ	1Ω - 9.76Ω	1Ω - 9.76Ω; 1.1MΩ - 20MΩ	1Ω - 9.76Ω
	±250ppm	100Ω - 1MΩ	-	-	-	-		-		-		-		-		-	
	±300ppm	10Ω - 99Ω	-	-	-	-		-		-		20.5MΩ - 21.5MΩ	-	20.5MΩ - 21.5MΩ	-	-	
	±350ppm	-	-	-	-	10MΩ - 22MΩ		10MΩ - 22MΩ		10MΩ - 22MΩ		-		-		-	

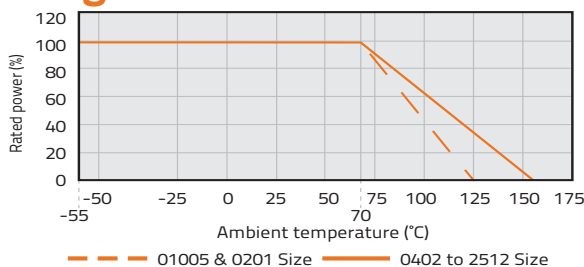
* Note: Max OverLoad Voltage = $2.5 \times (P \times R)^{1/2}$ or Max. overload voltage listed above, whichever is lower.

Marking Code



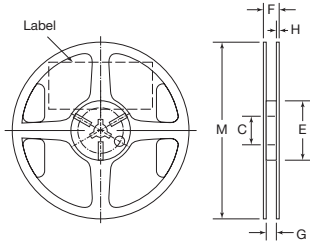
- 1% E-24 values for 0603 size and larger are typically marked with the standard 3 digit marking code.
- 1% E-96 values for 0805 size and larger may or may not be marked with the standard 4 digit marking code.
- 5% E-24 values for 0603 size and larger, will be marked with standard 3 digit marking code.
- 0603 -1% E-96 values will be marked with a standard 3 digit alpha numeric code (Please see page 61 for alpha numeric codes).
- 01005, 0201 and 0402 cannot be marked.
- 5% E-24 values for 1210-2512, may be marked with 4 digit marking code.
- E-192 values will not typically be marked.

Derating Curve



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Reel Specifications

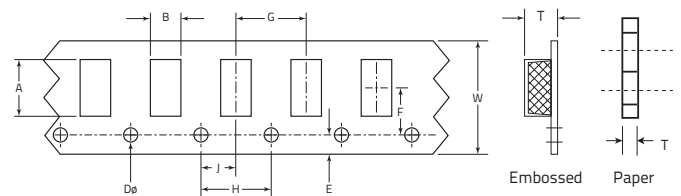


Unit: mm (inch)

C	E	F	G	H	M
13.0 ± 0.2 (0.51 ± 0.008)	60.0 ± 1.0 (2.36 ± 0.03)	11.4 ± 1.0 (0.45 ± 0.04)	9.0 ± .3 (0.35 ± 0.012)	1.5 ± .3 (0.06 ± 0.012)	180 ± 2.0 (7.09 ± 0.08)

Minimum of 30 empty pockets at the beginning of reel, 65 minimum empty pockets at the end.

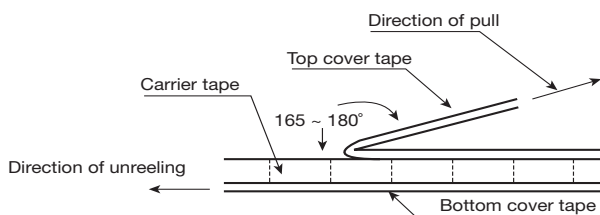
Tape Specifications



All dimensions in mm.

Tape	Size (inches)	A	B	W	E	F	T	G	H	J	Dø
Paper	01005	0.45 ± 0.03	0.25 ± 0.03	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.40 ± 0.10	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0201	0.7 ± 0.08	0.4 ± 0.08	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.42 ± 0.20	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0402	1.15 ± 0.1	0.65 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.45 ± 0.10	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0603	1.9 ± 0.1	1.1 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.70 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	0805	2.4 ± 0.1	1.65 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.85 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	1206	3.5 ± 0.1	1.9 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.85 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	1210	3.5 ± 0.1	2.8 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	0.85 ± 0.10	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
Embossed	2010	5.4 ± 0.2	2.9 ± 0.2	12.0 ± 0.1	1.75 ± 0.1	5.5 ± 0.5	1.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0
	2512	6.9 ± 0.2	3.6 ± 0.2	12.0 ± 0.1	1.75 ± 0.1	5.5 ± 0.5	1.2	8.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 + 0.1-0

Peel Back Force and Direction Diagram



Peel back force and direction of peel back angle should follow EIA481-1-A. Peel back force should be between 0.1N – 1.3N and peel back angle of 165° – 180°.

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Environmental Test Criteria

ITEM	REQUIREMENT			TEST METHOD
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C~+12°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70±2°C, RCWV for 1000 hrs with 1.5 hrs 'ON' and 0.5 hr 'OFF'
Damp Heat with Load	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs 'ON' and 0.5 hr 'OFF'
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +125/+155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%			JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +125/+155°C, 5 cycles
RCWV(Rated Continuous Working Voltage)=V(P*R) or Max. Operating Voltage whichever is lower.				
■ Storage Temperature: 15~28°C; Humidity < 80%RH				