

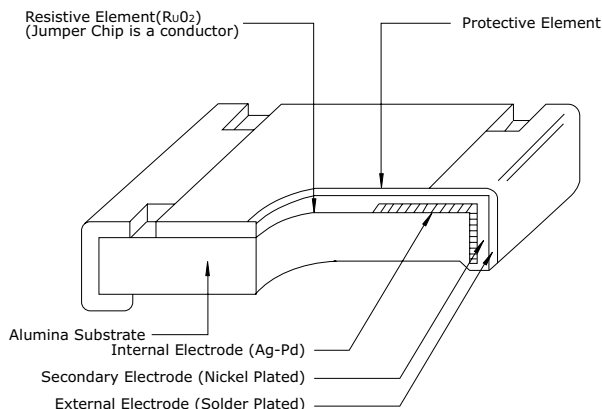
INTRODUCTION

The CR series resistors are manufactured with sophisticated process technology using up-to-date automated production facilities that enable production of small-size, light weight and thin component. They are used in surface mount applications where high density of components with high performance and reliability are needed.

FEATURES

- Highly reliable multi-layer electrode construction.
- Compatible with wave and reflow soldering process.
- Small size with high power ratings.
- Lead free terminals also available.

CONSTRUCTION

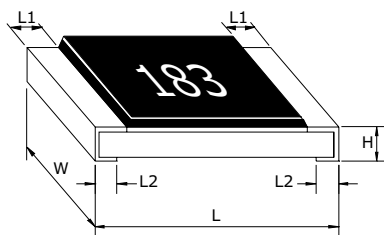


RATINGS

Type	CR 10 0402(1005)		CR 16 0603(1608)		CR 21 0805(2012)		CR 32 1206(3216)	
Rated Power at 70°C	1/16W		1/10W		1/8W		1/4W	
Operating Temp Range	-55°C to 155°C		-55°C to +155°C					
Derating to 0 load at	+155°C		155°C					
Maximum Working Voltage	50V		50V		150V		200V	
Maximum Overload Voltage	100V		100V		300V		400V	
Resistance Range								
D(± 0.5%) E-96	-	-	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω
F(± 1%) E-96,E-24	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 1MΩ	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω
G(± 2%) E-24	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 1MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ
J(± 5%) E-24	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 3.3MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ
Jumper Rated Current	1A		1A		2A		2A	
Jumper Resistance Value	<0.05Ω		<0.05Ω		<0.05Ω		<0.05Ω	
RTC (ppm/°C)	+500	± 200	± 100	± 200	± 100	± 200	± 100	± 200
-200								
Type	CR 40 1210(3225)		CR 46 1218(3246)		CR 50 2010(5025)		CR 63 2512(6432)	
Rated Power at 70°C	1/3W		1W		3/4W		1W	
Operating Temp Range	-55°C to +155°C							
Derating to 0 load at	+155°C							
Maximum Working Voltage	200V		200V		200V		200V	
Maximum Overload Voltage	400V		400V		400V		400V	
Resistance Range								
D(± 0.5%) E-96	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω	10Ω ≤ R ≤ 10MΩ	1Ω ≤ R < 10Ω
F(± 1%) E-96,E-24	10Ω ≤ R < 10MΩ	1Ω ≤ R ≤ 10Ω	10Ω ≤ R < 10MΩ	1Ω ≤ R ≤ 10Ω	10Ω ≤ R < 10MΩ	1Ω ≤ R ≤ 10Ω	10Ω ≤ R < 10MΩ	1Ω ≤ R ≤ 10Ω
G(± 2%) E-24	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ
J(± 5%) E-24	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ	-	1Ω ≤ R ≤ 10MΩ
Jumper Rated Current	2A		2A		2A		3A	
Jumper Resistance Value	<0.05Ω		<0.05Ω		<0.05Ω		<0.05Ω	
RTC (ppm/°C)	± 100	± 200	± 100	± 200	± 100	± 200	± 100	± 200



DIMENSIONS



4

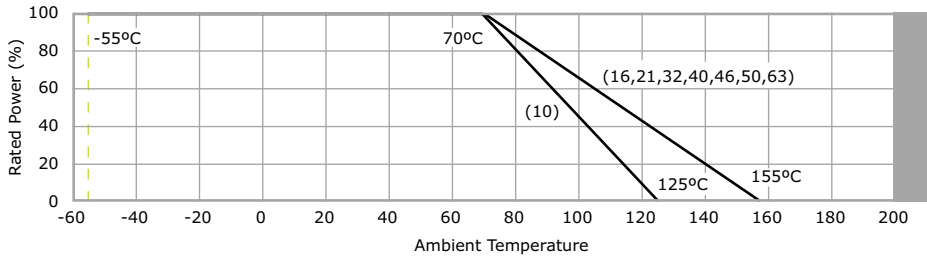
Type	DIMENSIONS Inches (Millimeters)				
	L	W	H	L1	L2
CR 10 (0402/1005)	0.040±0.004 (1.00±0.10)	0.020±0.002 (0.50±0.05)	0.014±0.002 (0.35±0.05)	0.008±0.004 (0.20±0.10)	0.010±0.004 (0.25±0.10) ⁰⁰
CR 16 (0603/1608)	0.063±0.004 (1.60±0.10)	0.031±0.004 (0.80±0.10)	0.018±0.004 (0.45±0.10)	0.012±0.008 (0.30±0.20)	0.012±0.008 (0.30±0.20)
CR 21 (0805/2012)	0.079±0.006 (2.00±0.15)	0.049±0.004 (1.25±0.10)	0.020±0.004 (0.50±0.10)	0.016±0.008 (0.40±0.20)	0.016±0.008 (0.40±0.20)
CR 32 (1206/3216)	0.122±0.004 (3.10±0.10)	0.063±0.006 (1.60±0.15)	0.022±0.002 (0.55±0.05)	0.020±0.010 (0.50±0.25)	0.020±0.010 (0.50±0.25)
CR 40 (1210/3225)	0.122±0.004 (3.10±0.10)	0.098±0.006 (2.50±0.15)	0.022±0.002 (0.55±0.05)	0.020±0.010 (0.50±0.25)	0.016±0.008 (0.40±0.20)
CR 46 ⁰⁰ (1218/3246)	0.122±0.004 (3.10±0.10)	0.181±0.006 (4.60±0.15)	0.022±0.002 (0.55±0.05)	0.020±0.010 (0.50±0.25)	0.016±0.008 (0.40±0.20)
CR 50 (2010/5025)	0.200±0.006 (5.00±0.15)	0.098±0.006 (2.50±0.15)	0.022±0.002 (0.55±0.05)	0.024±0.010 (0.60±0.25)	0.016±0.008 (0.40±0.20)
CR 63 (2512/6432)	0.250±0.006 (6.30±0.15)	0.126±0.006 (3.20±0.15)	0.022±0.002 (0.55±0.05)	0.024±0.010 (0.60±0.25)	0.016±0.008 (0.40±0.20)

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PERFORMANCE CHARACTERISTICS

Performance Test	Test Method	Specification
DC Resistance	JIS C 5202 5.1	0.5% (For 1206 only) & 1% tol
Voltage Coefficient	JIS C 5202 5.3 Method II	≤ 100 ppm/V
Shortage Time Overload	JIS C 5202 5.5	± (0.5%+0.05 ohm)
Insulation Resistance	JIS C 5202 5.6	>10G ohm
Dielectric Withstanding Voltage	JIS C 5202 5.7	± (1%+0.05 ohm)
Intermittent Overload	JIS C 5202 5.8	± (5%+0.10 ohm)
Noise	JIS C 5202 5.9	1-9 ohm : <-10dB (0.32μv/v) 10-99 ohm : <-5dB (0.52μv/v) 100-999 ohm : <0dB (1.0μv/v) 1K-9.9K ohm : <10dB (3.2μv/v) 10K-99.9K ohm : <18dB (5.6μv/v) 100K-999.9K ohm : <20dB (10μv/v) >1M ohm : <30dB (32μv/v)
Terminal Strength	JIS C 5202 6.1	
A) Bend Test (applicable for chip size ≤ 1210)	JIS C 5202 6.1.4(1) Method 2	± (0.5%+0.05 ohm)
B) Pull Test (applicable for chip size ≥ 0805)	JIS C 5202 6.1	± (1%+0.05 ohm)
C) Push Test (applicable for chip size >0402)	JIS C 5202 6.1.4(3)	± (1%+0.05 ohm)
Resistance to Soldering Heat	JIS C 5202 6.10	± (0.5%+0.05 ohm)
Solderability	JIS C 5202 6.11	≥ 95% coverage
Resistance to Solvent	JIS C 5202 6.9	± (1%+0.05 ohm)
Low Temperature	JIS C 5202 7.1	± (0.5%+0.05 ohm)
Low Temperature with Load	JIS C 5202 7.1	± (0.5%+0.05 ohm)
High Temperature	JIS C 5202 7.2	± (1%+0.05 ohm)
Terminal Shock (Temperature Cycling)	JIS C 5202 7.4	± (0.5%+0.05 ohm)
Resistance to Damp Heat (Humidity)	JIS C 5202 7.5	± (1%+0.10 ohm)
Loadlife	JIS C 5202 7.10	± (1%+0.05 ohm)
Salt Spray	JIS C 5202 7.7	± (3%+0.10 ohm)

DERATING CURVE



ORDERING CODE

CR XX - XXXX X X

TYPE	SIZE	NOMINAL RESISTANCE	RESISTANCE TOLERANCE	Packaging								
Thick Film Chip Resistors	10 (0402/1005) 16 (0603/1608) 21 (0805/2012) 32 (1206/3216) 40 (1210/3225) 46 (1218/3246) 50 (2010/5025) 63 (2512/6432)	<table border="1"> <tr> <td rowspan="2">Resistors</td> <td>3-Digit</td> <td>E24 Series 2.2Ω=2R2 100Ω=101</td> </tr> <tr> <td>4-Digit</td> <td>E96 Series 10.2Ω=10R2 10KΩ=1002</td> </tr> <tr> <td>Jumper</td> <td></td> <td>000</td> </tr> </table>	Resistors	3-Digit	E24 Series 2.2Ω=2R2 100Ω=101	4-Digit	E96 Series 10.2Ω=10R2 10KΩ=1002	Jumper		000	D = ±0.5% F = ±1% G = ±2% J = ±5% Z = Zero ohm	Q = 4000 pcs F = 5000 pcs T = 10000 pcs W = 20000 pcs C = Bulk Cassette E = 4000 pcs Lead Free L = 5000 pcs Lead Free K = 10000 pcs Lead Free
Resistors	3-Digit	E24 Series 2.2Ω=2R2 100Ω=101										
	4-Digit	E96 Series 10.2Ω=10R2 10KΩ=1002										
Jumper		000										

MARKING DIAGRAMS

 5% marking Value = 10KΩ	 1% marking Value = 10KΩ	 1% marking Value = 10KΩ	 no marking
CR 16 (0603/1608) CR 21 (0805/2012) CR 32 (1206/3216) CR 40 (1210/3225) CR 46 [∞] (1218/3246) CR 50 (2010/5025) CR 63 (2512/6432)	CR 21 (0805/2012) CR 32 (1206/3216) CR 40 (1210/3225) CR 46 [∞] (1218/3246) CR 50 (2010/5025) CR 63 (2512/6432)	CR 16 (0603/1608) E-96 marking	CR 10 (0402/1005)

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Marking Explanation

- 2%, 5% tolerance : 3 digits (First two digits are significant figures, third digit is number of zeros).
Letter R is decimal point
- 1% tolerance : 4 digits (First three digits are significant figures, fourth digit is number of zeros).
Letter R is decimal point
- 0603 1% : E-96 marking (see page 38)
- 0402 : No marking
- Chip jumper resistor : Marking shall be 0

Packing Explanation (Refer to Page 31 - 34)

- Paper carrier tape per 7" reel
CR 10 : 10000 pcs
CR 16/21/32/40 : 5000 pcs
- Embossed plastic carrier tape per 7" reel
CR 46 : 4000 pcs
CR 50 : 4000 pcs
CR 63 : 4000 pcs
- Bulk cassette (see page 34)(EIA JET-7201)
- Standard packaging is 8mm tape reel per EIA-481 (JIS C 0806)
- 10" and 13" reel (Refer to Page 31 - 34)

