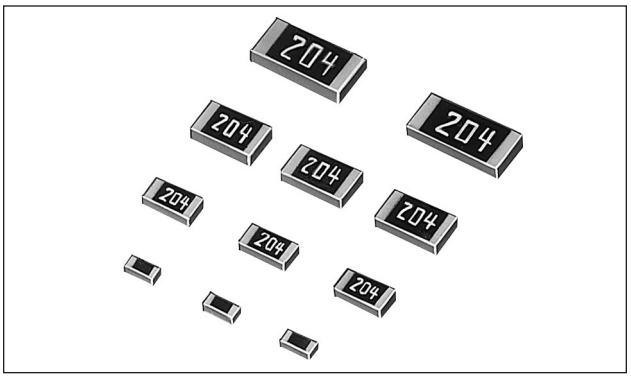
Thick Film Chip Resistors

CR, CJ Series



FEATURES

- Low Noise
- Nickel Barrier Terminations

APPLICATION

- General Purpose

HOW TO ORDER

CR 05 - 472 J - H

Packaging
T = 7" Reel/Punched Paper Tape (5,000 pcs/reel) except CR05
H = 7" Reel/Punched Paper Tape (10,000 pcs/reel, 2mm pitch taping) CR05 and CR10
D = 10" Reel/Punched Paper Tape (10,000 pcs/reel) CR32, CR21, CR10
K = 13" Reel/Punched Paper Tape (20,000 pcs/reel) except CR05 (optional)

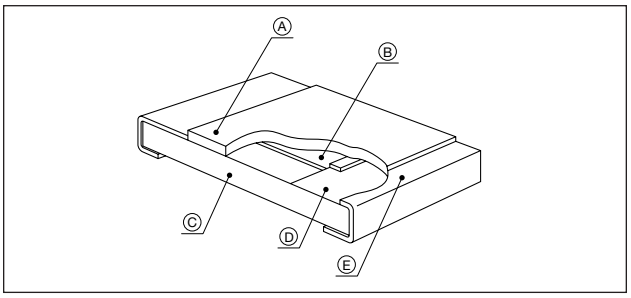
Resistance Tolerance
D = ±0.5% J = ±5%
F = ±1% Blank = Jumper Chips

Resistance Value (3 digits or 4 digits)
Example: 562 = $56x10^2 = 5600\Omega$
4021 = $402x10^1 = 4020\Omega$
Chip Jumper = 000

Size (EIA)
05 = 0402 21 = 0805
10 = 0603 32 = 1206

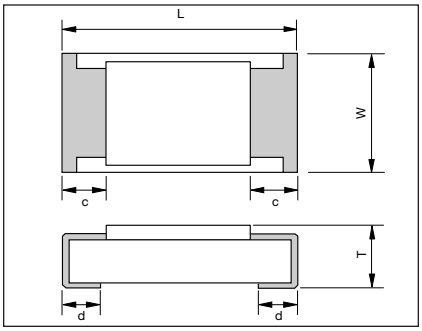
Series
CR = Resistor CJ = Jumper

STRUCTURE AND MATERIAL



Code	Structure	Material
A	Coating	Glass or Epoxy
B	Resistor	RuO_2 Resistor (The same material of Termination for chip jumper)
C	Substrate	96% Alumina
D	Termination	Silver
E	Plating	(Ni, Sn-Pb) Plating

DIMENSIONS



millimeters (inches)

	CR05, CJ05 (0402)	CR10, CJ10 (0603)	CR21, CJ21 (0805)	CR32, CJ32 (1206)
W	0.50±0.05 (0.020±0.002)	$0.80^{+0.15}_{-0.10}$ ($0.031^{+0.006}_{-0.004}$)	$1.25^{+0.15}_{-0.10}$ ($0.050^{+0.006}_{-0.004}$)	$1.55^{+0.15}_{-0.10}$ ($0.061^{+0.006}_{-0.004}$)
L	1.00±0.05 (0.039±0.002)	1.60±0.10 (0.063±0.004)	2.00±0.10 (0.080±0.004)	3.10±0.10 (0.122±0.004)
C	0.20±0.15 (0.008±0.006)	0.25±0.20 (0.010±0.008)	0.35±0.20 (0.014±0.008)	0.45±0.20 (0.018±0.008)
d	0.20±0.10 (0.008±0.004)	$0.20^{+0.20}_{-0.15}$ ($0.008^{+0.008}_{-0.006}$)	0.40±0.20 (0.016±0.008)	0.45±0.20 (0.018±0.008)
T	0.35±0.05 (0.014±0.002)	0.50±0.10 (0.020±0.004)	0.55±0.10 (0.022±0.004)	$0.55^{+0.10}_{-0.05}$ ($0.022^{+0.004}_{-0.002}$)

SPECIFICATIONS

Series	CR05 (0402)	CR10 (0603)	CR21 (0805)	CR32 (1206)
Rated Power	0.0625 (1/16) W	0.10 (1/10) W	0.125 (1/8) W	0.25 (1/4) W
Max. Working Voltage	50V	50V	100V	200V
Resistance Tolerance	F = ±1% J = ±5%	D = ±0.5% F = ±1% J = ±5%	D = ±0.5% F = ±1% J = ±5%	D = ±0.5% F = ±1% J = ±5%
Resistance Value Range	10Ω to 1MΩ : F 1.0Ω to 10MΩ : J	10Ω to 1MΩ : D 10Ω to 1MΩ : F 1.0Ω to 10MΩ : J	10Ω to 1MΩ : D 10Ω to 1MΩ : F 1.0Ω to 10MΩ : J	10Ω to 1MΩ : D 10Ω to 1MΩ : F 1.0Ω to 10MΩ : J
Working Temperature	-55 to +125°C	-55 to +125°C	-55 to +125°C	-55 to +125°C

Thick Film Chip Resistors

CR, CJ Series

SPECIFICATIONS

CJ Series

Part Number	CJ05, CJ10, CJ21 (0402, 0603, 0805 Type)	CJ32 (1206 Type)
Rated Current	1A (70°C)	2A (70°C)
Resistivity	50mΩ max.	50mΩ max.
Working Temperature	-55 to +125°C	-55 to +125°C

HOW TO CALCULATE RATED VOLTAGE

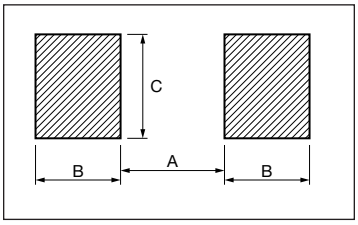
$E = \sqrt{P \bullet R}$

E = Rated Voltage (V)
P = Rated Power (W)
R = Standard Resistance Value (Ω)

Rated voltage should be lower than max. working voltage.

RECOMMENDED LAND PATTERN

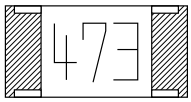
millimeters (inches)



EIA Size	0402	0603	0805	1206
A	0.50 (0.020)	0.80 (0.031)	1.00 (0.039)	2.00 (0.079)
B	0.40 (0.016)	0.70 (0.028)	0.80 (0.031)	0.80 (0.031)
C	0.50 (0.020)	0.80 (0.031)	1.20 (0.047)	1.50 (0.059)

MARKING

Marking available as follows:
Series: CR32, CJ32, CR21, CJ21, CR10, CJ10
3 digit indication
Example: 473=47x10^3 = 47000 Ω = 47 kΩ
0 = 0 Ω (Jumper)
100 = 10 Ω
102 = 1 kΩ
105 = 1 MΩ



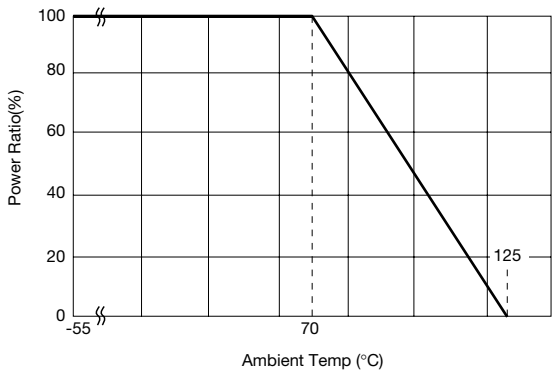
Series: CR05 and CJ05 - No marking

Note: On CR32 4 digit marking is standard for ±1% and ±0.5% tolerances.

DERATING CURVE

Rated power should be reduced as below when temperature become higher.

Under high temperature, power derated as follows:



STANDARD RESISTANCE VALUE

E24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2
	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1
	5.6	6.2	6.8	7.5	8.2	9.1			

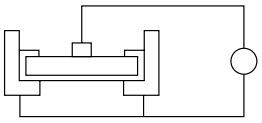
For ±1% and ±.5% Tolerance

E96	10.0	10.2	10.5	10.7	11.0	11.3	11.5	11.8	12.1	12.4
	12.7	13.0	13.3	13.7	14.0	14.3	14.7	15.0	15.4	15.8
	16.2	16.5	16.9	17.4	17.8	18.2	18.7	19.1	19.6	20.0
	20.5	21.0	21.5	22.1	22.6	23.2	23.7	24.3	24.9	25.5
	26.1	26.7	27.4	28.0	28.7	29.4	30.1	30.9	31.6	32.4
	33.2	34.0	34.8	35.7	36.5	37.4	38.3	39.2	40.2	41.2
	42.2	43.2	44.2	45.3	46.4	47.5	48.7	49.9	51.1	52.3
	53.6	54.9	56.2	57.6	59.0	60.4	61.9	63.4	64.9	66.5
	68.1	69.8	71.5	73.2	75.0	76.8	78.7	80.6	82.5	84.5
	86.6	88.7	90.9	93.1	95.3	97.6				

Chip Resistor Arrays

CR, CJ, CRA, CRB, CRC Series - Test Conditions

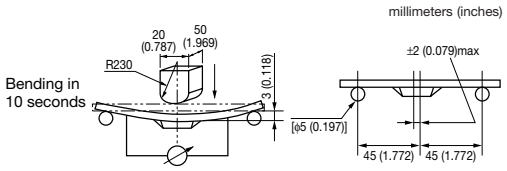
ELECTRICAL CHARACTERISTICS

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
DC Resistance		Within Initial Tolerance	50mΩ max.	Power Condition A (20°C, 65% RH)	
Temperature Characteristics		Resistance (Ω) / TCR (ppm/°C): D, F — 10≤ R ≤1M: −100 to +100; J — R <10: −100 to +600; 10≤ R ≤1M: −200 to +200; 1M< R: −500 to +300		Test Temperature: 25, 125(°C) $\Delta R/R=R_2-R_1/R_1x1/T_2-T_1x10^6$ ΔR/R = Temp. Coefficient (ppm/°C) T_1 = 25(°C) T_2 = 125(°C) R_1 = T_1 Resistance at (Ω) R_2 = T_2 Resistance at (Ω)	
Short-time Overload	**ΔR/R**	±(2.0%+0.10Ω) max. of the initial value	50mΩ max.	(1) Apply 2.0 x rated voltage for 5 sec. (2.5 x rated voltage for Arrays) (2) Wait 30 minutes (3) Measure resistance CR05 = 50V max. CR10 = 100V max. CR21 = 200V max. CR32 = 400V max. CRA, CRB, CRC = 100V max.	(1) 2A for 5 sec. (2) Wait 30 minutes (3) Measure resistance
	Visual	No evidence of mechanical damage intermittent overload			
Intermittent Overload	**ΔR/R**	±(5%+0.1Ω) max. of the initial value	50mΩ max.	(1) Perform 10,000 voltage cycles as follows: ON (2.0 x rated voltage, 2.5 x for Arrays) 1 sec. OFF 25 sec. (2) Stabilization time 30 min. without loading (3) Measure resistance CR05 = 50V max. CR10 = 150V max. CR21 = 200V max. CR32 = 400V max. CRA, CRB, CRC = 100V max.	(1) Perform 10,000 current cycles as follows: ON (2A) 1 sec. OFF 25 sec. (2) Wait 30 minutes (3) Measure resistance
	Visual	No evidence of mechanical damage			
Dielectric Withstanding Voltage		No evidence of mechanical damage		Apply 500 VAC for 1 min. (CR10 300 VAC) (CR05, CRA, CRB, CRC 300 VAC/1 sec.)	
Insulation Resistance		• CR05, CJ05 = 10^8Ω min. • CR10, CJ10 = 10^9Ω min. • CR21, CJ21 = 10^{10}Ω min. • CR32, CJ32 = 10^{12}Ω min. • CRA, CRB, CRC = 10^9Ω min.		 Apply 500V DC (CR05, CRA, CRB, CRC 100V DC)	

Chip Resistor Arrays

CR, CJ, CRA, CRB, CRC Series - Test Conditions

MECHANICAL CHARACTERISTICS

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
Terminal Strength	ΔR/R	±(1%+0.05Ω) max. of the initial value	50mΩ max.	Apply the load as shown: Measure resistance during load application  PC Board = Glass epoxy t = 1.60 (0.063)	
	Visual	No evidence of mechanical damage after loading			
Soldering Heat Resistance	ΔR/R	±(1%+0.05Ω) max. of the initial value	50mΩ max.	Immerse into molten solder at 260±5°C for 10±1 sec. Stabilize component at room temperature for 1 hr. Measure resistance.	
	Visual	No evidence of leaching			
Solderability		Coverage ≥95% each termination end		Immerse in Rogin Flux for 2±0.5 sec. and in SN62 solder at 235±5°C for 2±0.5 sec.	
Anti-Vibration Test	ΔR/R	±(1%+0.1Ω) max. of the initial value	50mΩ max.	2 hrs. each in X, Y and Z axis. (TTL 6 hrs.) 10 to 55 Hz sweep in 1 min. at 1.5mm amplitude.	
	Visual	No evidence of mechanical damage			
Solvent Resistance	ΔR/R	±(0.5%+0.05Ω) max. of the initial value	50mΩ max.	Immerse in static state butyl acetate at 20°C to 25°C for 30±5 sec. Stabilize component at room temperature for 30 min. then measure value.	
	Visual	No evidence of mechanical damage			

ENVIRONMENTAL CHARACTERISTICS

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
Temperature Cycle	ΔR/R	±(1%+0.05Ω) max. of the initial value	50mΩ max.	(1) Run 5 cycles as follows: -55±3°C for 30 min. 125±3°C for 30 min. Room temp. for 10-15 min. (2) Stabilize component at room temperature for 1 hr. then measure value.	
	Visual	No evidence of mechanical damage			
Low Temperature Storage	ΔR/R	±(2%+0.1Ω) max. of the initial value	50mΩ max.	(1) Dwell in -55°C chamber without loading for 1000 $^{+48}_{-0}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.	
	Visual	No evidence of mechanical damage			
High Temperature Storage	ΔR/R	±(3%+0.1Ω) max. of the initial value	50mΩ max.	(1) Dwell in 125°C chamber without loading for 1000 $^{+48}_{-0}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.	
	Visual	No evidence of mechanical damage			
Moisture Resistance	ΔR/R	±(3%+0.1Ω) max. of the initial value	50mΩ max.	(1) Dwell in temp.: 65°C RH90 to 95% RH chamber without loading for 1000 $^{+48}_{-0}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.	
	Visual	No evidence of mechanical damage			
Life Test	ΔR/R	±(3%+0.1Ω) max. of the initial value	50mΩ max.	(1) Temp.: 70±3°C Voltage: (rated voltage) on 90 min. off 30 min. Duration: 1000 $^{+48}_{-0}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.	
	Visual	No evidence of mechanical damage			
Loading Life in Moisture	ΔR/R	±(3%+0.1Ω) max. of the initial value	50mΩ max.	(1) Temp.: 40±2°C RH: 90-95% Voltage Cycle: on 90 min. (rated voltage) off 30 min. Duration: 1000 $^{+48}_{-0}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.	
	Visual	No evidence of mechanical damage			

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CR21-1000F-T CR21-10R0F-T CR21-102J-T CR10-472J-T CR051871FT CR21-472J-T CR054322FT CR051692FT CR10-1872F-T CR10-750J-T CR10-5232F-D CR051001FT CR10-240J-T CR10-331J-T CR054872FT CR21-3300F-T CR10-75R0F-T CR21-470J-T CR10-1401F-T CR21-1781F-T CR32-10R0F-T CR21-220J-T CJ10-000-T CJ21-000-T CR05-103J-H CR10-2R0J-T CR21-2212F-T CR21-390J-S CR054752FT CR10-511J-T CR10-511J-D CR10-152J-D CR21-5110F-D CR10-3R9J-T CR21-103J-T CR21-153J-T CR21-331J-T CR10-220J-T CR10-1001F-T CR21-4702F-T CR10-6652F-T CR10-1000F-T