Resistor Product Discontinuation & Update

We would like to take this opportunity to thank you for your patronage and the many years of support you have given to our resistive products. As you know we are de-emphasizing the product line and would like to inform you of our decision to re-alignment our product offering.

AVX will expand our focus on our 0408 and smaller resistor array products and discontinue to offer our larger case size resistor chip series along with the 1206 resistor arrays. This will be accomplished in several stages over the next twelve months. Please refer to each product series below and the effective dates we will cease to supply the products.

- **Chip Resistor Series (CR63, CR32, CR21, CR10)**
  Final Ship Date: February 1st, 2004

- **Chip Resistor Series (CR05)**
  Final Ship Date: August 1st, 2004

- **1206 Resistor Array Series (CRA3A4E, CRB3A4E, CRC3A4E)**
  Final Ship Date: August 1st, 2004

We would like to work closely with you during the discontinuation period and minimize any inconveniences that may arise. Should you have any questions or comments, please contact KDP Marketing.

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) CR03 and CR05
D = 10" Reel/Punched Paper Tape (10,000 pcs/reel) CR32, CR21, CR10

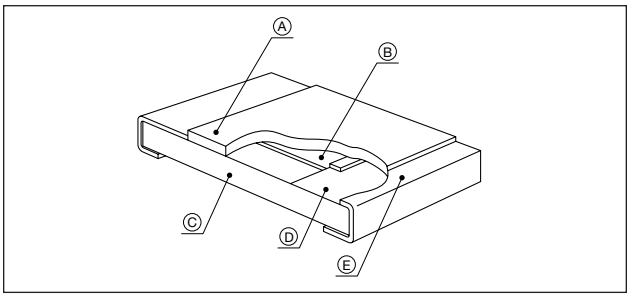
Resistance Tolerance
D = ±0.5% J = ±5%
F = ±1% Blank = Chip Jumper

Resistance Value (3 digits or 4 digits)
Example: 2 significant figures and 1 multiplier
R indicator decimal or values <10Ω
Chip Jumper = 000

Size (EIA)
03 = 0201 21 = 0805
05 = 0402 32 = 1206
10 = 0603

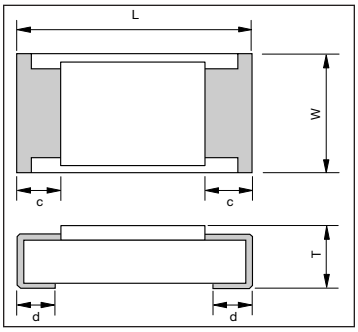
Series
CR = Resistor
CJ = Jumper

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)

	CR03, CJ03 (0201)	CR05, CJ05 (0402)	CR10, CJ10 (0603)	CR21, CJ21 (0805)	CR32, CJ32 (1206)
W	0.30±0.03 (0.012±0.001)	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	0.60±0.03 (0.024±0.001)	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	0.15±0.10 (0.006±0.004)	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	0.15±0.05 (0.006±0.002)	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	0.23±0.05 (0.009±0.002)	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	CR03 (0201)	CR05 (0402)	CR10 (0603)	CR21 (0805)	CR32 (1206)
Rated Power	0.050 (1/20) W	0.0625 (1/16) W	0.10 (1/10) W	0.125 (1/8) W	0.25 (1/4) W
Max. Working Voltage	15V	50V	50V	100V	200V
Resistance Tolerance	J = ±5%	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	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	-55 to +125°C

Thick Film Chip Resistors

CR, CJ Series

SPECIFICATIONS

CJ Series

Part Number	CJ03	CJ05, CJ10, CJ21 (0402, 0603, 0805 Type)	CJ32 (1206 Type)
Rated Current	0.5A (70°C)	1A (70°C)	2A (70°C)
Resistivity	50mΩ max.	50mΩ max.	50mΩ max.
Working Temperature	-55 to +125°C	-55 to +125°C	-55 to +125°C

HOW TO CALCULATE RATED VOLTAGE

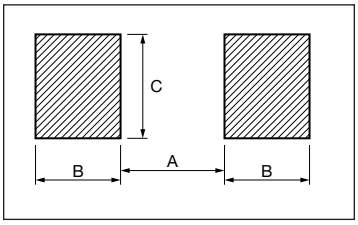
$E = \sqrt{P \bullet R}$

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

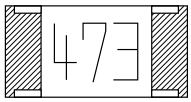
millimeters (inches)



EIA Size	0201	0402	0603	0805	1206
A	0.25 (0.010)	0.50 (0.020)	0.80 (0.031)	1.00 (0.039)	2.00 (0.079)
B	0.225 (0.009)	0.40 (0.016)	0.70 (0.028)	0.80 (0.031)	0.80 (0.031)
C	0.30 (0.012)	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



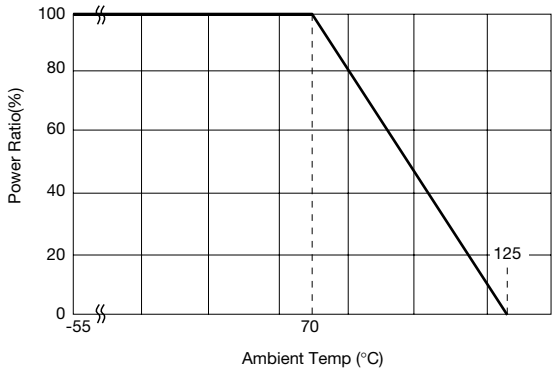
Series: CR03, CJ03, CR05 and CJ05 - No marking

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				

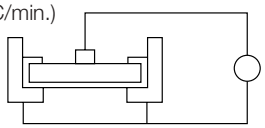
TEMPERATURE CHARACTERISTICS

Resistance (Ω)	TCR (ppm/°C)
D, F 10≤ R ≤1M	–100 to +100
J R <10 10≤ R ≤1M 1M< R	–100 to +600 –200 to +200 –500 to +300

Chip Resistor Arrays

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

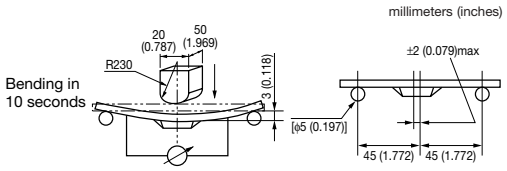
ELECTRICAL CHARACTERISTICS

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="2">Standard</th><th colspan="2">Test Conditions</th></tr>
<tr><th>Resistor</th><th>Jumper</th><th>Resistor</th><th>Jumper</th></tr>
<tr><td colspan="2">DC Resistance</td><td>Within Initial Tolerance</td><td>50mΩ max.</td><td colspan="2">Power Condition A
(20°C, 65% RH)</td></tr>
<tr><td colspan="2">Temperature Characteristics</td><td><table><tr><th>Resistance (Ω)</th><th>TCR (ppm/°C)</th></tr><tr><td>*D, F
10≤ R ≤1M</td><td>–100 to +100</td></tr><tr><td>J, CR05 = F
R <10
10≤ R ≤1M
1M< R</td><td>
–100 to +600
–250 to +250
–500 to +300</td></tr></table></td><td></td><td>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)</td><td></td></tr>
<tr><td rowspan="2">Short-time Overload</td><td>ΔR/R</td><td>±(2.0%+0.10Ω) max.
of the initial value</td><td>50mΩ max.</td><td rowspan="2">(1) Apply 2.0 x rated voltage for 5 sec. (2.5 x rated voltage for Arrays)
(2) Wait 30 minutes
(3) Measure resistance
CR03 = 30V max.
CR05 = 50V max
CR10 = 100V max.
CR21 = 200V max.
CR32 = 400V max.
CRA3A, CRB3A, CRC3A = 100V max.</td><td rowspan="2">(1) 2A for 5 sec. (CJ03 = 1A)
(2) Wait 30 minutes
(3) Measure resistance</td></tr>
<tr><td>Visual</td><td colspan="2">No evidence of mechanical damage
intermittent overload</td></tr>
<tr><td rowspan="2">Intermittent Overload</td><td>ΔR/R</td><td>±(5%+0.1Ω) max.
of the initial value</td><td>50mΩ max.</td><td rowspan="2">(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
CR03 = 30V max.
CR05 = 50V max.
CR10 = 150V max.
CR21 = 200V max.
CR32 = 400V max.
CRA, CRB, CRC = 100V max.</td><td rowspan="2">(1) Perform 10,000 current cycles as follows:
ON (2A) 1 sec.
OFF 25 sec.
(2) Wait 30 minutes
(3) Measure resistance
CJ03 = 1A max.</td></tr>
<tr><td>Visual</td><td colspan="2">No evidence of mechanical damage</td></tr>
<tr><td colspan="2">Dielectric Withstanding Voltage</td><td colspan="2">No evidence of mechanical damage</td><td colspan="2" rowspan="2">Apply 500 VAC for 1 min. (CR10 300 VAC)
(CR05, CRA3A, CRB3A, CRC3A 300 VAC/1 sec.
CR03 50 VAC/min.)
 
Apply 500V DC
(CR05, CRA3A, CRB3A, CRC3A 100V DC
CR03 50 VDC)</td></tr>
<tr><td colspan="2">Insulation Resistance</td><td colspan="2">• CR03, CJ03 = 10^8Ω min.
• CR05, CJ05 = 10^8Ω min.
• CR10, CJ10 = 10^9Ω min.
• CR21, CJ21 = 10^{10}Ω min.
• CR32, CJ32 = 10^{12}Ω min.
• CRA3A, CRB3A, CRC3A = 10^9Ω min.</td></tr>
</table>

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			

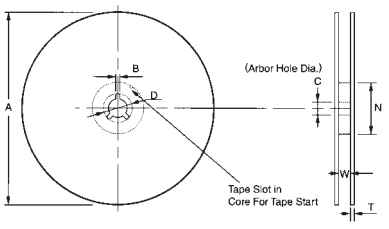
Packaging of Chip Component

Automatic Insertion Packaging

TAPE AND REEL

REEL DIMENSIONS

millimeters (inches)



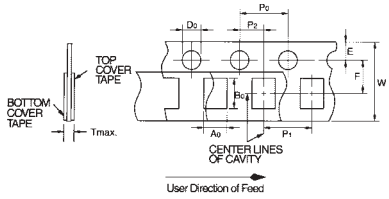
Tape Size	A Max.	B Min.	C	D Min.	N Min.	W	T Max.
8mm	178 (7)	1.50 (0.059)	13.0±0.50 (0.512±0.020)	20.2 (0.795)	50 (1.969)	10.0±1.50 (0.394±0.059)	2.50 (0.098)
	260 (10)						

Metric dimensions will govern.
English measurements rounded and for reference only.

millimeters (inches)

PUNCHED TAPE CONFIGURATION 8MM TAPE ONLY

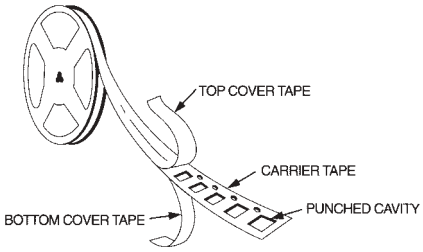
Tape Size	D_0	E	P_0	P_2	W	F
8mm	1.50 $^{+0.10}_{-0.00}$ (0.059 $^{+0.004}_{-0.000}$)	1.75±0.10 (0.069±0.004)	4.0±0.10 (0.157±0.004)	2.00±0.05 (0.079±0.002)	8.00±0.20 (0.135±0.008)	3.50±0.05 (0.138±0.002)



VARIABLE DIMENSIONS

Style	P_1	A_0	B_0	T max.
CR/CJ03 CR/CJ05	2.00±0.10 (0.079±0.004)	0.65±0.10 (0.026±0.004)	1.15±0.10 (0.045±0.004)	0.60 (0.024)
CR/CJ/FR10	4.00±0.10 (0.157±0.004) or 2.00±0.10 (0.079±0.004)	1.10±0.20 (0.043±0.008)	1.90±0.20 (0.075±0.008)	1.10 (0.043)
CR/CJ/FR21	4.00±0.10 (0.157±0.004)	1.65±0.20 (0.065±0.008)	2.40±0.20 (0.094±0.008)	
CR/CJ/FR32		2.00±0.20 (0.079±0.008)	3.60±0.20 (0.142±0.008)	
CRB1A		1.90±0.20 (0.075±0.008)	1.90±0.20 (0.075±0.008)	
CRA3A CRB3A CRC3A		2.00±0.20 (0.079±0.008)	3.60±0.20 (0.142±0.008)	
CRB2A	2.00±0.10 (0.079±0.004)	1.25±0.20 (0.049±0.008)	2.50±0.20 (0.098±0.008)	

PUNCHED CARRIER

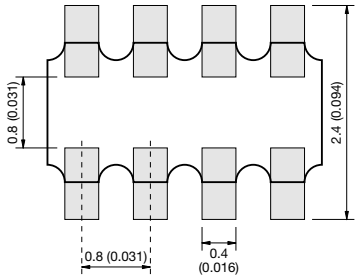


Recommended Land Patterns

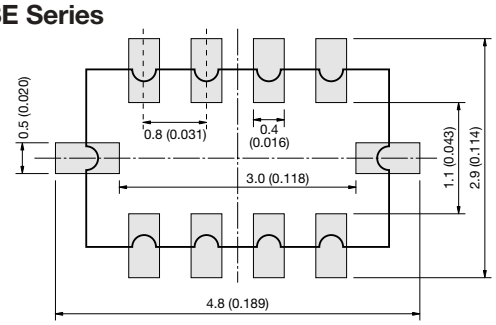
RECOMMENDED LAND PATTERNS IS REFERRED THE FOLLOWING FOR EXAMPLE

millimeters (inches)

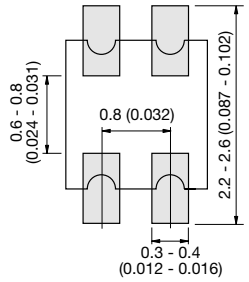
CRA3A4E Series



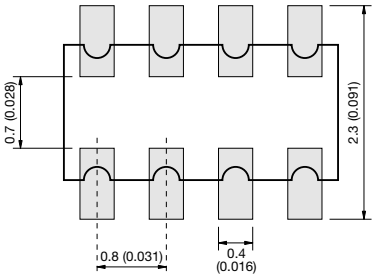
RNA4A8E Series



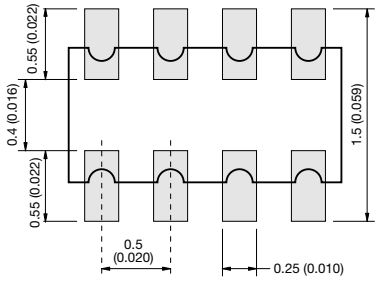
CRB1A2E Series



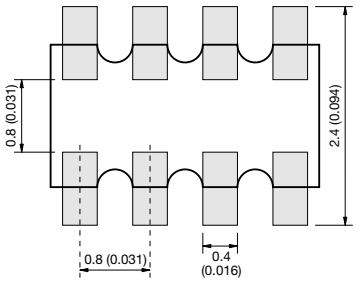
CRB3A4E Series



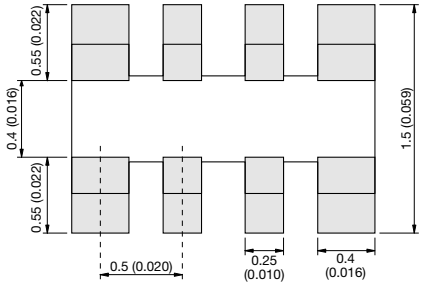
CRB2A4E Series



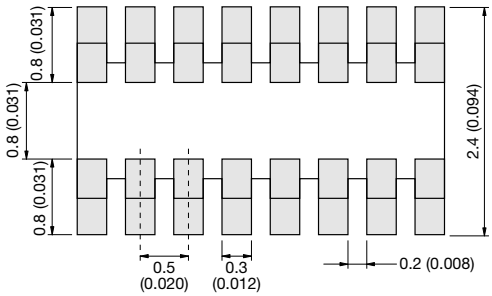
CRC3A4E Series



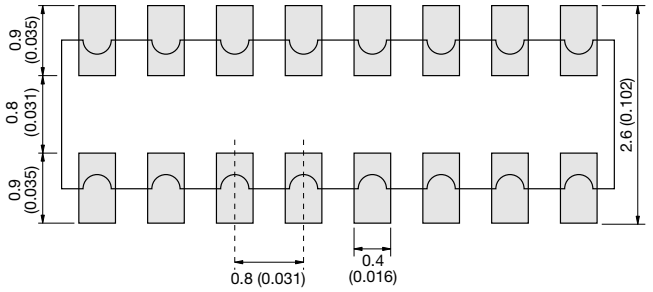
CRC2A4E Series



CRC4A8E Series



CRB6A8E Series



Chip Resistor and Array Kits

SAMPLE KIT PART NUMBERS

Part Number	Description
CRJ-E6-Kit	Combination 0603, 0805, 1206, 5% parts 21 values per case size 100 pcs. per value (approx.)
CR05-E12-Kit	0402, 5% parts 63 values 100 pcs. per value
CR10J-E12-Kit	0603, 5% parts 63 values 100 pcs. per value (approx.)
CR21J-E12-Kit	0805, 5% parts 63 values 100 pcs. per value (approx.)
CR32J-E12-Kit	1206, 5% parts 63 values 100 pcs. per value (approx.)
CR05F-E24-Kit	0402, 1% parts 63 values 100 pcs. per value
CR10F-E24-Kit	0603, 1% parts 63 values 100 pcs. per value
CR-ARRAY-E6-Kit	Arrays, Various styles, CRA, CRB, CRC, RNA, 5% 13 values per style (approx.) 20 pcs. per value