

### Features

- Thick film technology
- Power rating up to 2 watts at 70 °C
- High power surge withstanding
- Sulfur-resistant design (ASTM B-809)
- RoHS compliant\* and halogen free\*\*
- AEC-Q200 compliant

# **CRS-A Series High Power Anti-Surge Resistor**

#### **Electrical Characteristics**

| Characteristic  | Model             |              |             |          |          |          |  |  |  |  |  |
|---|-------------------|--------------|-------------|----------|----------|----------|--|--|--|--|--|
| Characteristic  | CRS0603A          | CRS0805A     | CRS1206A    | CRS1210A | CRS2010A | CRS2512A |  |  |  |  |  |
| Power Rating @ 70 °C  | 0.125 W           | 0.25 W       | 0.5 W       | 0.5 W    | 1 W      | 2 W      |  |  |  |  |  |
| Operating Temperature Range   | -55 °C to +155 °C |              |             |          |          |          |  |  |  |  |  |
| Derated to Zero Load at   |                   |              |             |          |          |          |  |  |  |  |  |
| Maximum Working Voltage   | 50 V              | 150 V        | 200 V       | 200 V    | 200 V    | 300 V    |  |  |  |  |  |
| Maximum Overload Voltage  | 100 V             | 300 V        | 400 V       | 400 V    | 400 V    | 600 V    |  |  |  |  |  |
| Resistance Tolerance  | ±1 %, ±5 %        |              |             |          |          |          |  |  |  |  |  |
| Temperature Coefficient<br>1 ohm to 9.76 ohms<br>(±1 %, E24 & E96 Series) | ±200 PPM/°C       | ±150 PPM/°C* | ±100 PPM/°C |          |          |          |  |  |  |  |  |
| 10 ohms to 1 megohm<br>(±1 %, E24 & E96 Series)                           | ±100 PPM/°C       | ±100 PPM/°C  | ±100 PPM/°C |          |          |          |  |  |  |  |  |
| 1 ohm to 1 megohm<br>(±5 %, E24 Series)                                   | ±200 PPM/°C       | ±200 PPM/°C  |             | ±200 F   | PM/°C    |          |  |  |  |  |  |

\* TCR code assigned as "X"; see How to Order.

For Standard Values Used in Capacitors, Inductors and Resistors, click here.

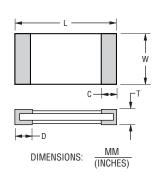
**Applications** 

Power supplies

Stepper motor drives

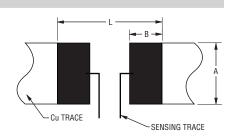
#### **Product Dimensions**

| Model    | L   | W   | С   | D   | т   |
|----------|---|---|---|---|---|
| CRS0603A | $\frac{1.60 \pm 0.10}{(0.063 \pm 0.004)}$ | $\frac{0.80 \pm 0.10}{(0.031 \pm 0.004)}$ | $\frac{0.30 \pm 0.20}{(0.012 \pm 0.008)}$ | $\frac{0.30 \pm 0.20}{(0.012 \pm 0.008)}$ | $\frac{0.45 \pm 0.10}{(0.018 \pm 0.04)}$  |
| CRS0805A | $\frac{2.00 \pm 0.10}{(0.079 \pm 0.004)}$ | $\frac{1.25 \pm 0.10}{(0.049 \pm 0.004)}$ | $\frac{0.40 \pm 0.20}{(0.016 \pm 0.008)}$ | $\frac{0.40 \pm 0.20}{(0.016 \pm 0.008)}$ | $\frac{0.50 \pm 0.10}{(0.020 \pm 0.04)}$  |
| CRS1206A | $\frac{3.10 \pm 0.10}{(0.122 \pm 0.004)}$ | $\frac{1.60 \pm 0.10}{(0.063 \pm 0.004)}$ | $\frac{0.50 \pm 0.25}{(0.020 \pm 0.010)}$ | $\frac{0.50 \pm 0.25}{(0.020 \pm 0.010)}$ | $\frac{0.55 \pm 0.10}{(0.022 \pm 0.004)}$ |
| CRS1210A | $\frac{3.10 \pm 0.10}{(0.122 \pm 0.004)}$ | $\frac{2.60 \pm 0.10}{(0.102 \pm 0.004)}$ | $\frac{0.50 \pm 0.25}{(0.020 \pm 0.010)}$ | $\frac{0.50 \pm 0.25}{(0.020 \pm 0.010)}$ | $\frac{0.55 \pm 0.10}{(0.022 \pm 0.004)}$ |
| CRS2010A | $\frac{5.00 \pm 0.20}{(0.197 \pm 0.008)}$ | $\frac{2.50 \pm 0.20}{(0.098 \pm 0.008)}$ | $\frac{0.65 \pm 0.25}{(0.026 \pm 0.010)}$ | $\frac{0.60 \pm 0.25}{(0.024 \pm 0.010)}$ | $\frac{0.60 \pm 0.10}{(0.024 \pm 0.004)}$ |
| CRS2512A | $\frac{6.40 \pm 0.20}{(0.252 \pm 0.008)}$ | $\frac{3.10 \pm 0.20}{(0.122 \pm 0.008)}$ | $\frac{0.60 \pm 0.25}{(0.024 \pm 0.010)}$ | $\frac{1.80 \pm 0.25}{(0.071 \pm 0.010)}$ | $\frac{0.60 \pm 0.15}{(0.024 \pm 0.006)}$ |



#### **Recommended Solder Pad Layout**

| Model    | Α       | В                    | L       | Model     | Α       | В       | L       |
|----------|---------|----------------------|---------|-----------|---------|---------|---------|
| CRS0603A | 0.90    | 1.00                 | 3.00    | CRS1210A  | 3.00    | 1.30    | 4.70    |
| CHOUGA   | (0.035) | (0.039)              | (0.118) | CHOIZIDA  | (0.118) | (0.051) | (0.185) |
| CRS0805A | 1.30    | 1.30 1.15 3.50 CD800 |         | CRS2010A  | 3.00    | 1.50    | 6.80    |
| CHOODA   | (0.051) | (0.045)              | (0.138) | CHSZOTOA  | (0.118) | (0.059) | (0.268) |
| CRS1206A | 1.80    | 1.30                 | 4.70    | CRS2512A  | 3.70    | 2.45    | 7.60    |
|          | (0.071) | (0.051)              | (0.185) | 01102012A | (0.032) | (0.096) | (0.299) |





#### WARNING Cancer and Reproductive Harm - www.P65Warnings.ca.gov

\* RoHS Directive 2015/863, Mar 31, 2015 and Annex. \*\*Bourns considers a product to be "halogen free" if (a) the Bromine (Br) content is 900 ppm or less; (b) the Chlorine (CI) content is 900 ppm or less; and (c) the total Bromine (Br) and Chlorine (CI) content is 1500 ppm or less.

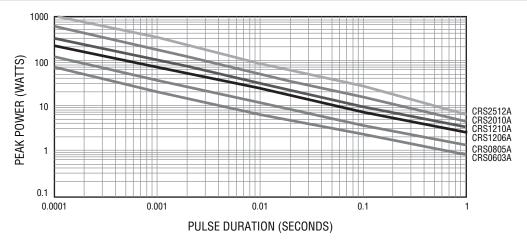
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### How to Order

|  | CRS 0603 A F X - 1002 E LF     |
|--|--------------------------------|
| Model  |                                |
| (CRS = High Power Anti-Surge Resistor)   |                                |
| Size   |                                |
| 0603 = 0603 Size   |                                |
| 0805 = 0805 Size   |                                |
| 1206 = 1206 Size   |                                |
| 1210 = 1210 Size   |                                |
| 2010 = 2010 Size   |                                |
| 2512 = 2512 Size   |                                |
| Feature  |                                |
| A = AEC-Q200 Compliant   |                                |
| Resistance Tolerance   |                                |
| $F = \pm 1 \%$   |                                |
| $J = \pm 5 \%$   |                                |
| TCR (See Electrical Characteristics chart)<br>• W = ±200 PPM/°C<br>• X = ±100 PPM/°C NOTE: CRS0805A 0.5%, 1 ohm to 9.76 ohms: 150 PPM/°C   |                                |
| Resistance Value   |                                |
| • 1 % Tolerance:   |                                |
| <100 ohms  |                                |
| ≥100 ohms  | N (example: 8252 = 82.5K ohms) |
| <10 ohms   |                                |
| ≥10 ohmsFirst two digits are significant, third digit represents number of zeros to follow (ex.  | ample: 474 = 470K ohms)        |
| Packaging  | . ,                            |
| <ul> <li>E = 5,000 pieces on 180 mm (7 inch) reel, paper tape - CRS0603A, CRS0805A, CRS1206A, CRS<br/>4,000 pieces on 180 mm (7 inch) reel, plastic tape - CRS2010A, CRS2512A</li> </ul> | 1210A                          |
| Termination  |                                |
| <ul> <li>LF = Tin-plated (RoHS Compliant)</li> </ul>   |                                |
|  |                                |

### Surge Performance



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#### **Typical Part Marking**

CRS0603A, CRS0805A, CRS1206A, CRS1210A, CRS2010A, CRS2512A

E96 ±5 % 3 digits identify the resistance value



 $301 = 30 \times 10^1 = 300 \text{ ohms}$ 

CRS0805A, CRS1206A, CRS1210A, CRS2010A, CRS2512A

E24 / E96 ±1 % 4 digits identify the resistance value



 $1542 = 154 \times 10^2 = 15.4 \text{K ohms}$ 

CRS0603A E24 ±1 % 3 digits identify the resistance value



 $222 = 22 \times 10^2 = 2.2$ K ohms

CRS0603A

E96 ±1 % 3 digits identify the resistance value



01B = 1K ohms(Refer to Marking Table below)

#### E96 Marking for CRS0603A, 1 %

| Code | R Value |
|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|
| 01   | 100     | 13   | 133     | 25   | 178     | 37   | 237     | 49   | 316     | 61   | 422     | 73   | 562     | 85   | 750     |
| 02   | 102     | 14   | 137     | 26   | 182     | 38   | 243     | 50   | 324     | 62   | 432     | 74   | 576     | 86   | 768     |
| 03   | 105     | 15   | 140     | 27   | 187     | 39   | 249     | 51   | 332     | 63   | 442     | 75   | 590     | 87   | 787     |
| 04   | 107     | 16   | 143     | 28   | 191     | 40   | 255     | 52   | 340     | 64   | 453     | 76   | 604     | 88   | 806     |
| 05   | 110     | 17   | 147     | 29   | 196     | 41   | 261     | 53   | 348     | 65   | 464     | 77   | 619     | 89   | 825     |
| 06   | 113     | 18   | 150     | 30   | 200     | 42   | 267     | 54   | 357     | 66   | 475     | 78   | 634     | 90   | 845     |
| 07   | 115     | 19   | 154     | 31   | 205     | 43   | 274     | 55   | 365     | 67   | 487     | 79   | 649     | 91   | 866     |
| 08   | 118     | 20   | 158     | 32   | 210     | 44   | 280     | 56   | 374     | 68   | 499     | 80   | 665     | 92   | 887     |
| 09   | 121     | 21   | 162     | 33   | 215     | 45   | 287     | 57   | 383     | 69   | 511     | 81   | 681     | 93   | 909     |
| 10   | 124     | 22   | 165     | 34   | 221     | 46   | 294     | 58   | 392     | 70   | 523     | 82   | 698     | 94   | 931     |
| 11   | 127     | 23   | 169     | 35   | 226     | 47   | 301     | 59   | 402     | 71   | 536     | 83   | 715     | 95   | 953     |
| 12   | 130     | 24   | 174     | 36   | 232     | 48   | 309     | 60   | 412     | 72   | 549     | 84   | 732     | 96   | 976     |

This table shows the first two digits for the three-digit E96 part marking scheme. The third character is a letter multiplier:  $A=10^{\circ}$   $B=10^{1}$   $C=10^{2}$   $D=10^{3}$   $E=10^{4}$   $F=10^{5}$   $G=10^{-6}$   $H=10^{-7}$   $X=10^{-1}$   $Y=10^{-2}$   $Z=10^{-3}$ 

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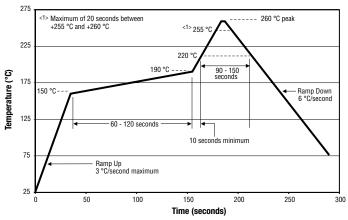
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#### Test Method Procedure Test Limits AR **High Temperature** 1 % tolerance: ≤±1 % AEC-Q200 Table 7.3 1,000 hours @ +125 °C; no power loading Exposure Storage 5 % tolerance: ≤±3 % 1 % tolerance: ≤±0.5 % Temperature Cycling AEC-Q200 Table 7.4 -55 °C to +125 °C, 1,000 cycles 5 % tolerance: ≤±1 % 1 % tolerance: ≤±0.5 % Moisture Resistance AEC-Q200 Table 7.6 +65 °C / 80~100 % RH / 10 cycles 5 % tolerance: ≤±1 % 1,000 hours @ +85 °C / 85 % RH, 1 % tolerance: <+1 % **Biased Humidity** AEC-Q200 Table 7.7 10 % operating power 5 % tolerance: ≤±3 % 1 % tolerance: ≤±1 % **Operational Life** AEC-Q200 Table 7.8 1,000 hours @ +125 °C, at specified rated power 5 % tolerance: ≤±3 % Within product specification Mechanical Shock AEC-Q200 Table 7.13 100 g, half-sine, 6 ms, velocity: 12.3 ft./sec. tolerance; no visible damage 5 g for 20 minutes, 12 cycles each of 3 durations; 1 % tolerance: $\leq \pm 0.5$ % Vibration AEC-Q200 Table 7.14 10~200 Hz 5 % tolerance: ≤±1 % 1 % tolerance: ≤±0.5 % Resistance to Solder Heat AEC-Q200 Table 7.15 +270 °C ±5 °C, 10 ±1 seconds 5 % tolerance: ≤±1 % -55 °C to +155 °C, dwell time 15 minutes, max. transfer 1 % tolerance: ≤±0.5 % Thermal Shock AEC-Q200 Table 7.16 time 20 seconds/300 cycles 5 % tolerance: ≤±1 % ESD AEC-Q200-002 1 kV min. ≤±1 % a) Backing +155 °C, 4 hours, dipping +235 °C, 5 seconds Over 95 % of the termination Solderability AEC-Q200 Table 7.18 b) Steam 8 hours, dipping +215 °C, 5 seconds must be covered with solder c) Steam 8 hours, dipping +260 °C, 7 seconds Flammability AEC-Q200 Table 7.20 UL 94 V-0 or V-1 are acceptable Refer to UL 94 Bending 2 mm (CRS1206A, 1210A, 2010A, 2512A) 1 % tolerance: ≤±0.5 % Board Flex AEC-Q200 Table 7.21 Bending 3 mm (CRS0603A, 0805A) 5 % tolerance: ≤±1 % Terminal Strength AEC-Q200 Table 7.22 No mechanical damage Force 1.8 Kg for 60 seconds Sulfur-resistant (Applies only when ASTM B-809 +50 °C ±2 °C, 1,000 hours ≤±1 % $R \ge 1$ ohm)

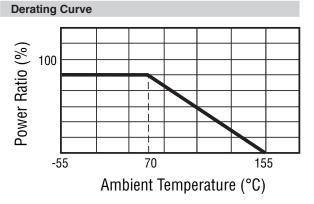
#### Performance Characteristics (AEC-Q200)

### Soldering Profile



#### Environmental Characteristics





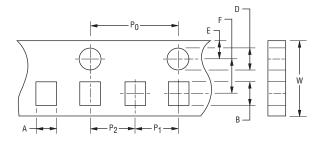
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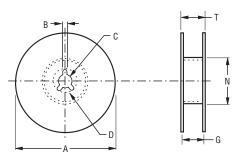
#### Packaging Dimensions (Conforms to EIA RS-481A)



 $\frac{40 \pm 0.2}{(1.575 \pm .008)}$ Accumulated dimensional tolerance

> MM (INCHES) DIMENSIONS:

| Model    | Таре Туре | Α             | В             | W             | F             | E             | P <sub>1</sub> | P <sub>2</sub>  | Po            | D               |
|----------|-----------|---------------|---------------|---------------|---------------|---------------|----------------|-----------------|---------------|-----------------|
| CRS0603A | Dapar     | 1.10 ± 0.20   | 1.90 ± 0.20   | 8.00 ± 0.30   | 3.50 ± 0.05   | 1.75 ± 0.10   | 4.00 ± 0.10    | $2.00 \pm 0.05$ | 4.00 ± 0.10   | 1.50 +0.10/-0   |
| UN30003A | Paper     | (.043 ± .008) | (.075 ± .008) | (.315 ± .012) | (.138 ± .002) | (.069 ± .004) | (.158 ± .004)  | (.079 ± .002)   | (.158 ± .004) | (.006 +.004/-0) |
| CRS0805A | Danar     | 1.65 ± 0.20   | 2.40 ± 0.20   | 8.00 ± 0.30   | 3.50 ± 0.05   | 1.75 ± 0.10   | 4.00 ± 0.10    | $2.00 \pm 0.05$ | 4.00 ± 0.10   | 1.50 +0.10/-0   |
| 0H30003A | Paper     | (.065 ± .008) | (.094 ± .008) | (.315 ± .012) | (.138 ± .002) | (.069 ± .004) | (.158 ± .004)  | (.079 ± .002)   | (.158 ± .004) | (.006 +.004/-0) |
| CRS1206A | Danar     | 2.00 ± 0.20   | 3.60 ± 0.20   | 8.00 ± 0.30   | 3.50 ± 0.05   | 1.75 ± 0.10   | 4.00 ± 0.10    | 2.00 ± 0.05     | 4.00 ± 0.10   | 1.50 +0.10/-0   |
| UNS1200A | Paper     | (.079 ± .008) | (.142 ± .008) | (.315 ± .012) | (.138 ± .002) | (.069 ± .004) | (.158 ± .004)  | (.079 ± .002)   | (.158 ± .004) | (.006 +.004/-0) |
| CRS1210A | Danar     | 3.00 ± 0.20   | 3.60 ± 0.20   | 8.00 ± 0.30   | 3.50 ± 0.05   | 1.75 ± 0.10   | 4.00 ± 0.10    | 2.00 ± 0.05     | 4.00 ± 0.10   | 1.50 +0.10/-0   |
| UNSIZIUA | Paper     | (.118 ± .008) | (.142 ± .008) | (.315 ± .012) | (.138 ± .002) | (.069 ± .004) | (.158 ± .004)  | (.079 ± .002)   | (.158 ± .004) | (.006 +.004/-0) |
| CRS2010A | Plastic   | 2.80 ± 0.20   | 5.50 ± 0.20   | 12.00 ± 0.30  | 3.50 ± 0.05   | 1.75 ± 0.10   | 4.00 ± 0.10    | $2.00 \pm 0.05$ | 4.00 ± 0.10   | 1.50 +0.10/-0   |
| 0R32010A | Plastic   | (.110 ± .008) | (.217 ± .008) | (.472 ± .012) | (.138 ± .002) | (.069 ± .004) | (.158 ± .004)  | (.079 ± .002)   | (.158 ± .004) | (.006 +.004/-0) |
| CRS2512A | Plastic   | 3.50 ± 0.20   | 6.70 ± 0.20   | 12.00 ± 0.30  | 3.50 ± 0.05   | 1.75 ± 0.10   | 4.00 ± 0.10    | $2.00 \pm 0.05$ | 4.00 ± 0.10   | 1.50 +0.10/-0   |
| UN32012A | FIASLIC   | (.138 ± .008) | (.264 ± .008) | (.472 ± .012) | (.138 ± .002) | (.069 ± .004) | (.158 ± .004)  | (.079 ± .002)   | (.158 ± .004) | (.006 +.004/-0) |



MM (INCHES) DIMENSIONS:

| Model    | Packaging<br>Quantity | А             | N              | C             | D Min.  | В             | G             | T Max. |
|----------|-----------------------|---------------|----------------|---------------|---------|---------------|---------------|--------|
| CRS0603A |                       |               |                |               |         |               |               |        |
| CRS0805A | 5,000 pcs. per        |               |                |               |         |               | 10.00 ± 1.50  | 14.9   |
| CRS1206A | reel                  | 1.78 ± 2.00   | 60 ± 0.50      | 13.0 ± 0.50   | 20.0    | 2.00 ± 0.50   | (.394 ± .006) | (.587) |
| CRS1210A |                       | (.070 ± .079) | (2.362 ± .020) | (.512 ± .020) | (8.661) | (.079 ± .020) |               |        |
| CRS2010A | 4,000 pcs. per        |               |                |               |         |               | 13.80 ± 1.50  | 16.7   |
| CRS2512A | reel                  |               |                |               |         |               | (.543 ± .006) | (.657) |

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 CR-12JP4--680R
 CRCW06036K80FKEE
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