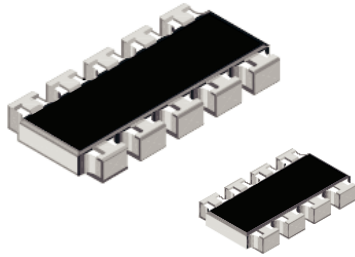


## Thick Film Chip Resistor Array



### FEATURES

- Convex terminal array available with either scalloped corners (E version) or square corners (S version)
- Wide ohmic range: 10R to 1M $\Omega$
- 8 or 10 terminal package with isolated resistors
- Pure tin solder contacts on Ni barrier layer, provides compatibility with lead (Pb)-free and lead containing soldering processes
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

| STANDARD ELECTRICAL SPECIFICATIONS  |            |   |  |   |                      |                                 |          |
|---|------------|---|--|---|----------------------|---------------------------------|----------|
| MODEL   | CIRCUIT    | POWER RATING<br>$P_{70^\circ\text{C}}$<br>W | LIMITING ELEMENT<br>VOLTAGE MAX.<br>$V_{\text{E}}$ | TEMPERATURE<br>COEFFICIENT<br>$\pm$ ppm/K | TOLERANCE<br>$\pm$ % | RESISTANCE<br>RANGE<br>$\Omega$ | SERIES   |
| CRA12E<br>CRA12S  | 01; 02; 20 | 0.100                                       | 50   | 100                                       | 1                    | 10 to 1M                        | E24; E96 |
|   | 03         | 0.125                                       |  | 200                                       | 2; 5                 | 10 to 1M                        | E24      |
| Zero-Ohm-Resistor: $R_{\text{max.}} = 50 \text{ m}\Omega$ , $I_{\text{max.}} = 1.5 \text{ A}$ |            |   |  |   |                      |                                 |          |

| TECHNICAL SPECIFICATIONS                            |                  |   |                                 |
|---|------------------|---|---------------------------------|
| PARAMETER   | UNIT             | CRA12E AND CRA12S<br>CIRCUIT 01; 02; 20 | CRA12E AND CRA12S<br>CIRCUIT 03 |
| Rated dissipation at $P_{70}^{(1)}$                 | W per element    | 0.1                                     | 0.125                           |
| Limiting element voltage<br>$U_{\text{max. AC/DC}}$ | V                | 50                                      |                                 |
| Insulation voltage $U_{\text{ins}}$ (1 min)         | V                | 100                                     |                                 |
| Insulation resistance                               | $\Omega$         | $> 10^9$                                |                                 |
| Category temperature range                          | $^\circ\text{C}$ | - 55 to + 155                           |                                 |

#### Note

<sup>(1)</sup> Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

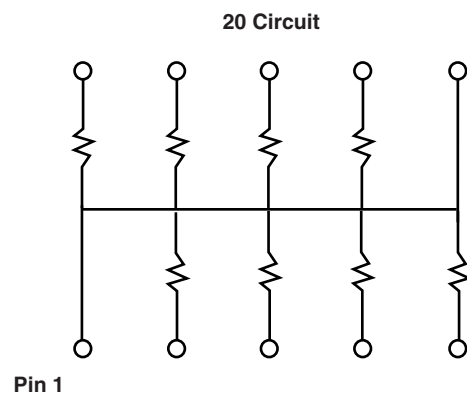
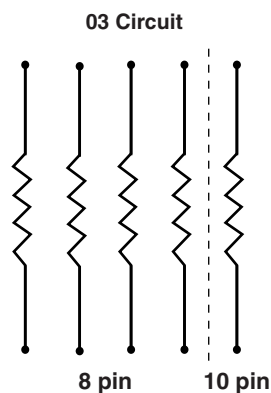
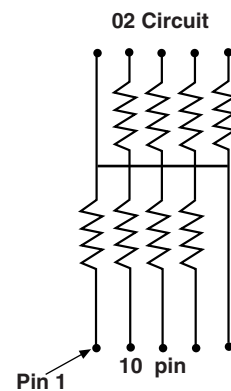
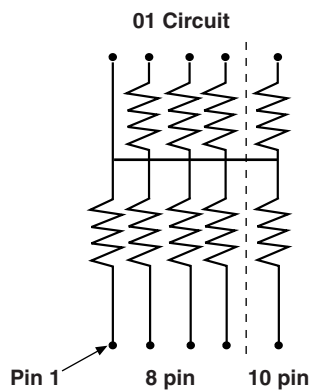
| PART NUMBER AND PRODUCT DESCRIPTION             |                   |                      |  |   |  |                                     |                |   |   |   |   |   |   |   |   |  |  |
|---|-------------------|----------------------|--|---|--|-------------------------------------|----------------|---|---|---|---|---|---|---|---|--|--|
| Part Number: CRA12E08347K0JTR <sup>(2)</sup>    |                   |                      |  |   |  |                                     |                |   |   |   |   |   |   |   |   |  |  |
| C   | R                 | A                    | 1  | 2   | E  | 0                                   | 8              | 3 | 4 | 7 | K | 0 | J | T | R |  |  |
| MODEL   | TERMINAL<br>STYLE | PIN                  | CIRCUIT  | VALUE   | TOLERANCE  | PACKAGING                           | SPECIAL        |   |   |   |   |   |   |   |   |  |  |
| CRA12   | S<br>E            | 08<br>10             | 1 = 01<br>2 = 02<br>3 = 03<br>8 = 20   | R = Decimal<br>K = Thousand<br>M = Million<br>0000 = 0 $\Omega$<br>Jumper | F = $\pm 1\%$<br>G = $\pm 2\%$<br>J = $\pm 5\%$<br>Z = 0 $\Omega$ Jumper | TR<br>TL                            | Up to 2 digits |   |   |   |   |   |   |   |   |  |  |
| Product Description: CRA12E 08 03 47K 5% RB8 e3 |                   |                      |  |   |  |                                     |                |   |   |   |   |   |   |   |   |  |  |
| CRA12E  | 08                | 03                   | 47K  | 5%  | RB8  | e3                                  |                |   |   |   |   |   |   |   |   |  |  |
| MODEL   | PIN               | CIRCUIT              | RESISTANCE<br>VALUE  | TOLERANCE   | PACKAGING  | LEAD (Pb)-FREE                      |                |   |   |   |   |   |   |   |   |  |  |
| CRA12E<br>CRA12S                                | 08<br>10          | 01<br>02<br>03<br>20 | 10R = 10 $\Omega$<br>47K = 47 k $\Omega$<br>1M = 1M $\Omega$<br>0R0 = Jumper | $\pm 1\%$<br>$\pm 2\%$<br>$\pm 5\%$                                       | RB8<br>RD7   | e3 = Pure tin<br>termination finish |                |   |   |   |   |   |   |   |   |  |  |

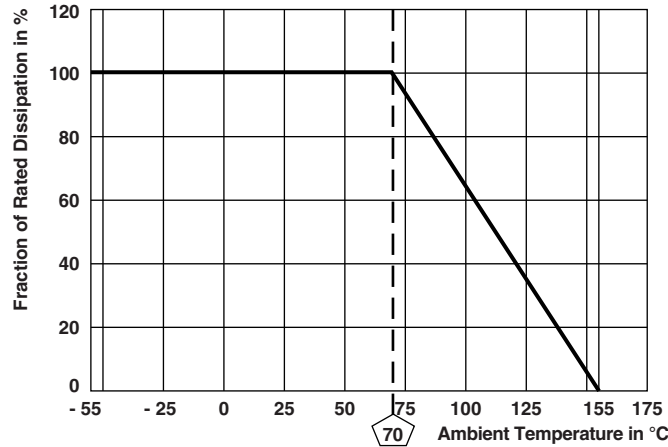
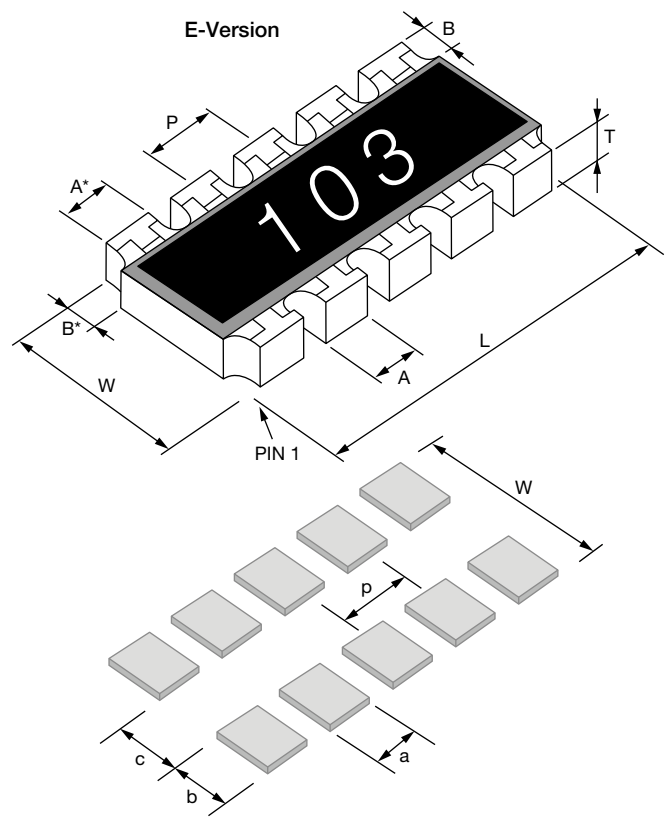
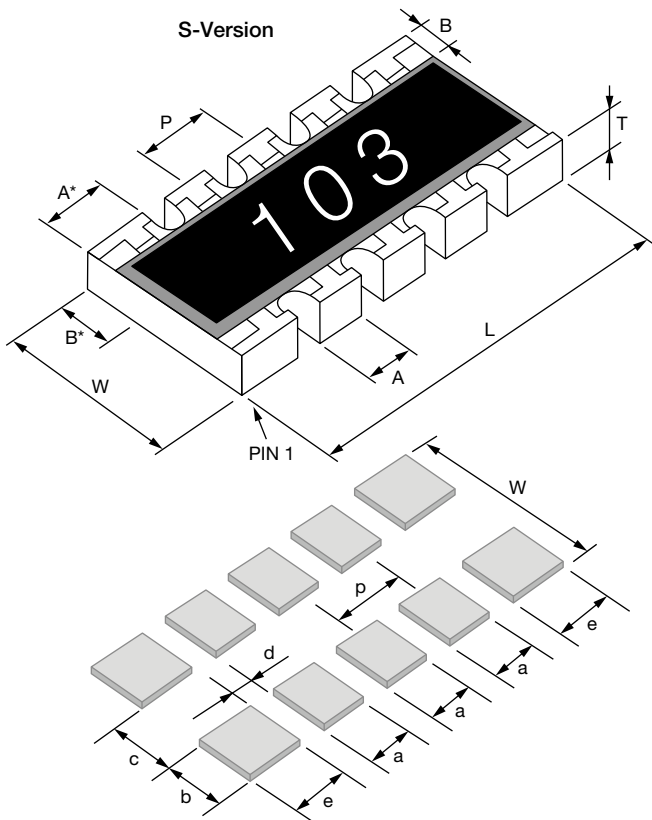
#### Note

<sup>(2)</sup> Preferred way for ordering products is by use of the PART NUMBER.

| AVAILABLE TYPES AND RANGES |                |                      |                            |                     |
|----------------------------|----------------|----------------------|----------------------------|---------------------|
| MODEL                      | TERMINAL COUNT | CIRCUIT              | TEMPERATURE COEFFICIENT    | TOLERANCE           |
| CRA12S                     | 10             | 01<br>02<br>03<br>20 | ± 100 ppm/K<br>± 200 ppm/K | ± 1 %; ± 2 %; ± 5 % |
| CRA12E                     | 08<br>10       | 01<br>02<br>03<br>20 |                            |                     |

| PACKAGING                           |            |                         |       |              |   |                     |
|-------------------------------------|------------|-------------------------|-------|--------------|---|---------------------|
| MODEL                               | TAPE WIDTH | DIAMETER                | PITCH | PIECES/REEL  | BLISTER TAPE<br>ACC. IEC 60286-3, TYPE II |                     |
|                                     |            |                         |       |              | PART NUMBER                               | PRODUCT DESCRIPTION |
| CRA12E 08<br>CRA12E 10<br>CRA12S 10 | 12 mm      | 180 mm/7"<br>330 mm/13" | 8 mm  | 2000<br>5000 | TR<br>TL                                  | RB8<br>RD7          |

**CIRCUIT**


**DERATING**

**DIMENSIONS**


| MODEL  | PIN NO #    | DIMENSIONS in millimeters |        |        |        |       |       |        |        |
|--------|-------------|---------------------------|--------|--------|--------|-------|-------|--------|--------|
|        |             | L                         | A      | A*     | B      | B*    | P     | T      | W      |
| CRA12E | 8           | 5.08                      | 0.79   | -      | 0.51   | 0.38  | 1.27  | 0.55   | 3.05   |
| CRA12E | 10          | 6.40                      | 0.79   | -      | 0.51   | 0.38  | 1.27  | 0.55   | 3.05   |
| CRA12S | 10          | 6.40                      | 0.79   | 0.89   | 0.51   | 0.38  | 1.27  | 0.55   | 3.05   |
|        | <b>TOL.</b> | ± 0.15                    | ± 0.15 | ± 0.15 | ± 0.25 | ± 0.2 | ± 0.1 | ± 0.15 | ± 0.15 |

| SOLDER PAD DIMENSIONS in millimeters |     |     |      |      |      |      |      |
|--------------------------------------|-----|-----|------|------|------|------|------|
|                                      | c   | w   | d    | p    | a    | b    | e    |
| <b>WAVE</b>                          | 2.2 | 4.3 | 0.57 | 1.27 | 0.71 | 1.05 | 1.09 |
| <b>REFLOW</b>                        | 2.2 | 3.9 | 0.57 | 1.27 | 0.71 | 0.86 | 1.09 |



| TEST PROCEDURES AND REQUIREMENTS |                         |  |  |   |  |
|----------------------------------|-------------------------|--|--|---|--|
| EN 60115-1 CLAUSE                | IEC 60068-2 TEST METHOD | TEST   | PROCEDURE  | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ ) <sup>(1)</sup>                             |  |
|                                  |                         |  |  | STABILITY CLASS 1 OR BETTER   | STABILITY CLASS 2 OR BETTER                                    |
|                                  |                         |  | Stability for product type:<br><b>CRA12E/CRA12S</b>  | 10 $\Omega$ to 1 M $\Omega$   |  |
| 4.5                              | -                       | Resistance   | -  | $\pm 1 \%$  | $\pm 2 \%, \pm 5 \%$   |
| 4.7                              | -                       | Voltage proof  | $U = 1.4 \times U_{ins}$ ; 60 s  | No flashover or breakdown   |  |
| 4.13                             | -                       | Short time overload  | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$ ;<br>Duration according to style                          | $\pm (0.25 \% R + 0.05 \Omega)$   | $\pm (0.5 \% R + 0.05 \Omega)$                                 |
| 4.17.2                           | 58 (Td)                 | Solderability  | Solder bath method; Sn60Pb40;<br>non-activated flux;<br>(235 $\pm$ 5) $^{\circ}$ C; (2 $\pm$ 0.2) s                      | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage                                 |  |
|                                  |                         |  | Solder bath method; Sn96.5Ag3Cu0.5;<br>non-activated flux;<br>(245 $\pm$ 5) $^{\circ}$ C; (3 $\pm$ 0.3) s                | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage                                 |  |
| 4.8.4.2                          | -                       | Temperature coefficient                                    | (20/- 55/20) $^{\circ}$ C and (20/125/20) $^{\circ}$ C   | $\pm 100$ ppm/K   | $\pm 200$ ppm/K  |
| 4.32                             | 21 (U <sub>J3</sub> )   | Shear (adhesion)   | 45 N   | No visible damage   |  |
| 4.33                             | 21 (U <sub>U1</sub> )   | Substrate bending  | Depth 2 mm; 3 times  | No visible damage,<br>no open circuit in bent position<br>$\pm (0.25 \% R + 0.05 \Omega)$ |  |
| 4.19                             | 14 (Na)                 | Rapid change of temperature                                | 30 min. at - 55 $^{\circ}$ C; 30 min at 125 $^{\circ}$ C<br>5 cycles<br>1000 cycles                                      | $\pm (0.25 \% R + 0.05 \Omega)$<br>$\pm (1 \% R + 0.05 \Omega)$                           | $\pm (0.5 \% R + 0.05 \Omega)$<br>$\pm (1 \% R + 0.05 \Omega)$ |
| 4.23                             | -                       | Dry heat   | -  | $\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.1 \Omega)$                                  |  |
| 4.23.2                           | 2 (Ba)                  | Damp heat, cyclic  | 125 $^{\circ}$ C; 16 h   |   |  |
| 4.23.3                           | 30 (Db)                 | Cold   | 55 $^{\circ}$ C; $\geq 90 \%$ RH; 24 h; 1 cycle  |   |  |
| 4.23.4                           | 1 (Aa)                  | Low air pressure   | - 55 $^{\circ}$ C; 2 h   |   |  |
| 4.23.5                           | 13 (M)                  | -  | 1 kPa; (25 $\pm$ 10) $^{\circ}$ C; 1 h   |   |  |
| 4.23.6                           | 30 (Db)                 | Damp heat, cyclic  | 55 $^{\circ}$ C; $\geq 90 \%$ RH; 24 h; 5 cycle  |   |  |
| 4.23.7                           | -                       | DC load  | $U = \sqrt{P_{70} \times R}$   |   |  |
| 4.25.1                           | -                       | Endurance at 70 $^{\circ}$ C                               | $U = \sqrt{P_{70} \times R} \leq U_{max.}$<br>1.5 h on; 0.5 h off;<br>70 $^{\circ}$ C; 1000 h<br>70 $^{\circ}$ C; 8000 h | $\pm (1 \% R + 0.05 \Omega)$<br>$\pm (2 \% R + 0.1 \Omega)$                               | $\pm (2 \% R + 0.1 \Omega)$<br>$\pm (4 \% R + 0.1 \Omega)$     |
| 4.18.2                           | 58 (Td)                 | Resistance to soldering heat                               | Solder bath method;<br>(260 $\pm$ 5) $^{\circ}$ C; (10 $\pm$ 1) s  | $\pm (0.25 \% R + 0.05 \Omega)$   | $\pm (0.5 \% R + 0.05 \Omega)$                                 |
| 4.35                             | -                       | Flammability, needle flame test                            | IEC 60695-11-5; 10 s   | No burning after 30 s   |  |
| 4.24                             | 78 (Cab)                | Damp heat, steady state                                    | (40 $\pm$ 2) $^{\circ}$ C; (93 $\pm$ 3) % RH; 56 days  | $\pm (1 \% R + 0.05 \Omega)$  |  |
| 4.25.3                           | -                       | Endurance at upper category temperature                    | 155 $^{\circ}$ C; 1000 h   | $\pm (1 \% R + 0.05 \Omega)$  | $\pm (2 \% R + 0.1 \Omega)$                                    |
| 4.40                             | -                       | Electrostatic discharge (human body model)                 | IEC 61340-3-1;<br>3 positive and 3 negative discharges;<br>ESD voltage: 500 V  | $\pm (1 \% R + 0.05 \Omega)$  |  |
| 4.29                             | 45 (XA)                 | Component solvent resistance                               | Isopropyl alcohol; 50 $^{\circ}$ C; method 2   | No visible damage   |  |
| 4.30                             | 45 (XA)                 | Solvent resistance of marking                              | Isopropyl alcohol; 50 $^{\circ}$ C; method 1;<br>toothbrush  | Marking legible,<br>no visible damage   |  |
| 4.22                             | 6 (Fc)                  | Vibration, endurance by sweeping                           | f = 10 Hz to 2000 Hz; x, y, z $\leq$ 1.5 mm;<br>A $\leq$ 200 m/s <sup>2</sup> ; 10 sweeps per axis                       | $\pm (0.25 \% R + 0.05 \Omega)$   | $\pm (0.5 \% R + 0.05 \Omega)$                                 |
| 4.37                             | -                       | Periodic electric overload                                 | $U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{max.}$<br>0.1 s on; 2.5 s off; 1000 cycles                        | $\pm (1 \% R + 0.05 \Omega)$  |  |
| 4.27                             | -                       | Single pulse high voltage overload, 10 $\mu$ s/700 $\mu$ s | $\dot{U} = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$<br>10 pulses   | $\pm (1 \% R + 0.05 \Omega)$  |  |

**Note**

<sup>(1)</sup> Figures are given for a single element.

All tests are carried out in accordance with the following specifications:

- EN 60115-1, generic specification
- EN 140400, sectional specification
- EN 140401-802, detail specification
- IEC 60068-2 environmental test procedures

Packaging of components is done in paper or blister tapes according to IEC 60286-3



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