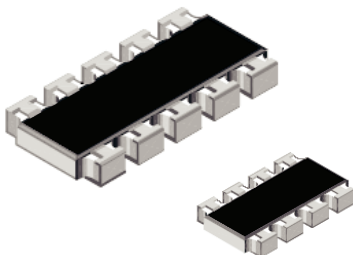


## Thick Film Chip Resistor Array



### 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>$V_{\cong}$ | 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

|                                |   |                |   |          |   |                                      |   |   |                                                                 |   |   |                                                       |   |           |   |                |  |
|--------------------------------|---|----------------|---|----------|---|--------------------------------------|---|---|-----------------------------------------------------------------|---|---|-------------------------------------------------------|---|-----------|---|----------------|--|
| Part Number: CR12-08-347K0JT-R |   |                |   |          |   |                                      |   |   |                                                                 |   |   |                                                       |   |           |   |                |  |
| C                              | R | A              | 1 | 2        | E | 0                                    | 8 | 3 | 4                                                               | 7 | K | 0                                                     | J | T         | R |                |  |
| MODEL                          |   | TERMINAL 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 Ω Jumper |   |   | F = ± 1 %<br>G = ± 2 %<br>J = ± 5 %<br>Z = 0 Ω 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

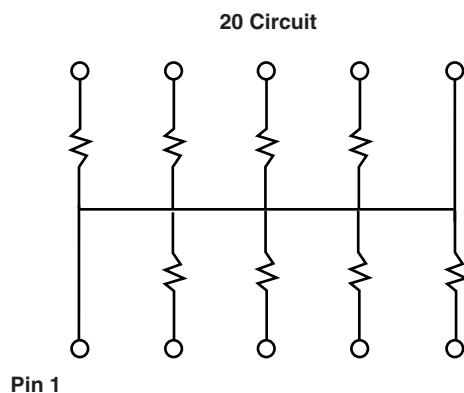
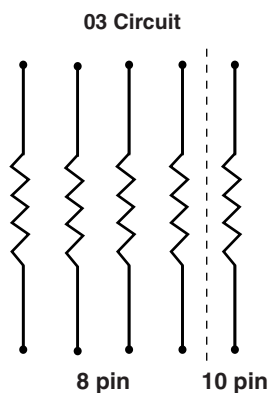
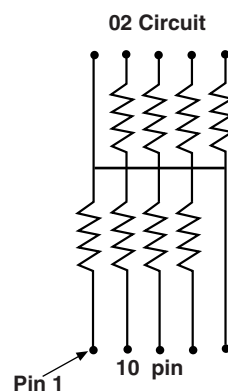
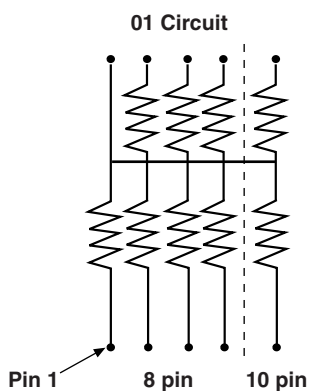
<sup>(2)</sup> Preferred way for ordering products is by use of the PART NUMBER.

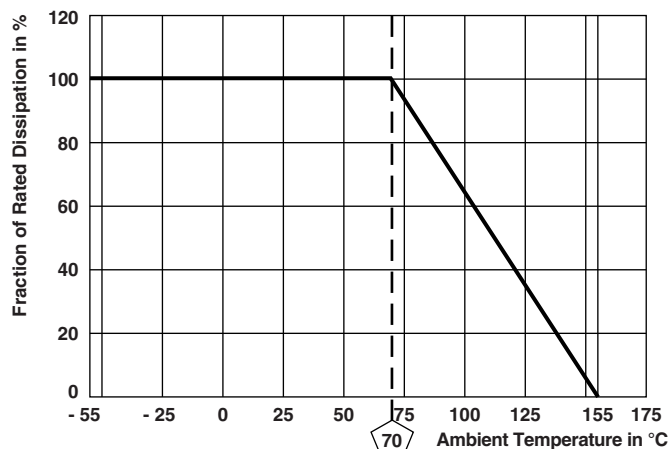
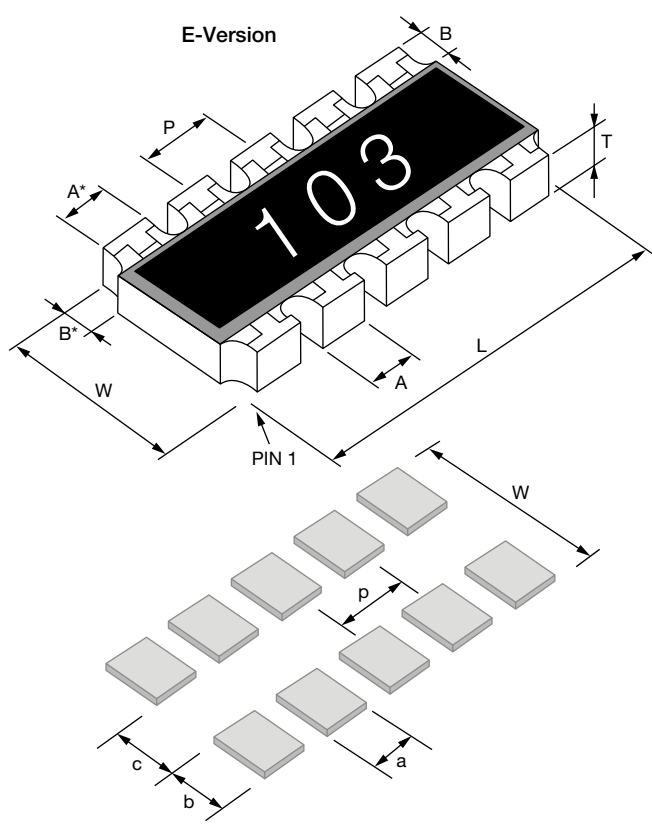
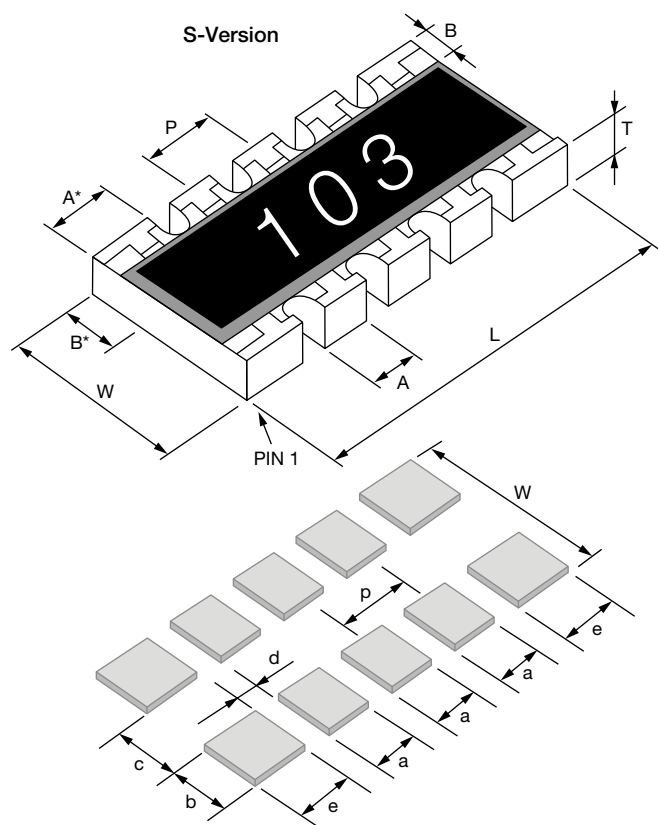
**AVAILABLE TYPES AND RANGES**

| MODEL  | TERMINAL COUNT | CIRCUIT              | TEMPERATURE COEFFICIENT            | TOLERANCE                         |
|--------|----------------|----------------------|------------------------------------|-----------------------------------|
| CRA12S | 10             | 01<br>02<br>03<br>20 | $\pm 100$ ppm/K<br>$\pm 200$ ppm/K | $\pm 1\%$ ; $\pm 2\%$ ; $\pm 5\%$ |
| 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   |
|        | TOL.     | ± 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    |
| WAVE                                 | 2.2 | 4.3 | 0.57 | 1.27 | 0.71 | 1.05 | 1.09 |
| REFLOW                               | 2.2 | 3.9 | 0.57 | 1.27 | 0.71 | 0.86 | 1.09 |

| TEST PROCEDURES AND REQUIREMENTS |                                  |                                                                         |                                                                                                                                               |                                                                                           |                                                                |
|----------------------------------|----------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| EN<br>60115-1<br>CLAUSE          | IEC<br>60068-2<br>TEST<br>METHOD | TEST                                                                    | PROCEDURE                                                                                                                                     | REQUIREMENTS PERMISSIBLE<br>CHANGE ( $\Delta R$ ) <sup>(1)</sup>                          |                                                                |
|                                  |                                  |                                                                         |                                                                                                                                               | STABILITY CLASS 1<br>OR BETTER                                                            | STABILITY CLASS 2<br>OR BETTER                                 |
|                                  |                                  |                                                                         | Stability for product type:                                                                                                                   | 10 $\Omega$ to 1 M $\Omega$                                                               |                                                                |
|                                  |                                  |                                                                         | CRA12E/CRA12S                                                                                                                                 |                                                                                           |                                                                |
| 4.5                              | -                                | Resistance                                                              | -                                                                                                                                             | $\pm 1 \%$                                                                                | $\pm 2 \%, \pm 5 \%$                                           |
| 4.7                              | -                                | Voltage proof                                                           | $U = 1.4 \times U_{\text{ins}}$ ; 60 s                                                                                                        | No flashover or breakdown                                                                 |                                                                |
| 4.13                             | -                                | Short time overload                                                     | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\text{max.}}$ ;<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) $^{\circ}\text{C}$ ; (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) $^{\circ}\text{C}$ ; (3 $\pm$ 0.3) s                              | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage                                 |                                                                |
| 4.8.4.2                          | -                                | Temperature coefficient                                                 | (20/- 55/20) $^{\circ}\text{C}$ and (20/125/20) $^{\circ}\text{C}$                                                                            | $\pm 100 \text{ ppm/K}$                                                                   | $\pm 200 \text{ ppm/K}$                                        |
| 4.32                             | 21 ( $U_{U3}$ )                  | Shear (adhesion)                                                        | 45 N                                                                                                                                          | No visible damage                                                                         |                                                                |
| 4.33                             | 21 ( $U_{U1}$ )                  | 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 $^{\circ}\text{C}$ ; 30 min at 125 $^{\circ}\text{C}$<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 $^{\circ}\text{C}$ ; 16 h                                                                                                                 |                                                                                           |                                                                |
| 4.23.3                           | 30 (Db)                          | Cold                                                                    | 55 $^{\circ}\text{C}$ ; $\geq 90 \%$ RH; 24 h; 1 cycle                                                                                        |                                                                                           |                                                                |
| 4.23.4                           | 1 (Aa)                           | Low air pressure                                                        | - 55 $^{\circ}\text{C}$ ; 2 h                                                                                                                 |                                                                                           |                                                                |
| 4.23.5                           | 13 (M)                           | -                                                                       | 1 kPa; (25 $\pm$ 10) $^{\circ}\text{C}$ ; 1 h                                                                                                 |                                                                                           |                                                                |
| 4.23.6                           | 30 (Db)                          | Damp heat, cyclic                                                       | 55 $^{\circ}\text{C}$ ; $\geq 90 \%$ RH; 24 h; 5 cycle                                                                                        |                                                                                           |                                                                |
| 4.23.7                           | -                                | DC load                                                                 | $U = \sqrt{P_{70} \times R}$                                                                                                                  |                                                                                           |                                                                |
| 4.25.1                           | -                                | Endurance at 70 $^{\circ}\text{C}$                                      | $U = \sqrt{P_{70} \times R} \leq U_{\text{max.}}$<br>1.5 h on; 0.5 h off;<br>70 $^{\circ}\text{C}$ ; 1000 h<br>70 $^{\circ}\text{C}$ ; 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) $^{\circ}\text{C}$ ; (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) $^{\circ}\text{C}$ ; (93 $\pm$ 3) % RH; 56 days                                                                                  | $\pm (1 \% R + 0.05 \Omega)$                                                              |                                                                |
| 4.25.3                           | -                                | Endurance at upper category temperature                                 | 155 $^{\circ}\text{C}$ ; 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 $^{\circ}\text{C}$ ; method 2                                                                                           | No visible damage                                                                         |                                                                |
| 4.30                             | 45 (XA)                          | Solvent resistance of marking                                           | Isopropyl alcohol; 50 $^{\circ}\text{C}$ ; 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                                              | $U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{\text{max.}}$<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 $\mu\text{s}$ /700 $\mu\text{s}$ | $\dot{U} = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\text{max.}}$<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



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.