

## Cemented Wirewound Resistors



### FEATURES

- All welded construction
- Ceramic core
- Non-flammable cement coating
- Tinned copper-clad iron leads (for axial parts)
- High power dissipation in small volume
- Ideal for pulse application
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL               | POWER RATING<br>$P_{40^{\circ}\text{C}}$<br>W | POWER RATING<br>$P_{70^{\circ}\text{C}}$<br>W | LIMITING VOLTAGE<br>$U_{\text{max.}}$ | RESISTANCE RANGE $\Omega$<br>TCR =<br>- 10 ppm/K to - 80 ppm/K | RESISTANCE RANGE $\Omega$<br>TCR =<br>100 ppm/K to 180 ppm/K | RESISTANCE RANGE $\Omega$<br>TCR= $\pm$ 100 ppm/K | TOLERANCE<br>$\pm$ % |
|---------------------|-----------------------------------------------|-----------------------------------------------|---------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------|----------------------|
| AC01                | 1                                             | 0.9                                           | $\sqrt{P \times R}$                   | 0.10 to 33                                                     | 36 to 2.4K                                                   | n/a                                               | 5                    |
| AC03 <sup>(2)</sup> | 3                                             | 2.5                                           | $\sqrt{P \times R}$                   | 0.10 to 390                                                    | 430 to 3.3K                                                  | 3.6K to 5.1K                                      | 5                    |
| AC04                | 4                                             | 3.5                                           | $\sqrt{P \times R}$                   | 0.10 to 620                                                    | 680 to 6.8K                                                  | n/a                                               | 5                    |
| AC05                | 5                                             | 4.7                                           | $\sqrt{P \times R}$                   | 0.10 to 910                                                    | 1K to 10K                                                    | n/a                                               | 5                    |
| AC07                | 7                                             | 5.8                                           | $\sqrt{P \times R}$                   | 0.10 to 1.5K                                                   | 1.6K to 15K                                                  | n/a                                               | 5                    |
| AC10                | 10                                            | 8.4                                           | $\sqrt{P \times R}$                   | 0.22 to 560                                                    | 620 to 27K                                                   | n/a                                               | 5                    |

#### Notes

- (1) Resistance value to be selected for  $\pm$  5 % from E24  
(2) AC03 WSZ:  $P_{40^{\circ}\text{C}}$  = 1.8 W;  $P_{70^{\circ}\text{C}}$  = 1.5 W

### PART NUMBER AND PRODUCT DESCRIPTION

Part Number: AC03000001509JAC00

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | C | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 9 | J | A | C | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| MODEL                                                                                                                                              | VARIANT                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TCR/MATERIAL        | VALUE                                                                                                                                                                                                                          | TOLERANCE CODE         | PACKAGING CODE        | SPECIAL                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AC01000</b> = AC01<br><b>AC03000</b> = AC03<br><b>AC04000</b> = AC04<br><b>AC05000</b> = AC05<br><b>AC07000</b> = AC07<br><b>AC10000</b> = AC10 | <b>0</b> = Neutral<br><b>1</b> = RT<br><b>2</b> = SWI =<br>Special winding <sup>(3)</sup><br><b>3</b> = DK SP 20 mm <sup>(4)</sup><br><b>4</b> = DK LP 33 mm <sup>(4)</sup><br><b>5</b> = DK LP 17.8 mm <sup>(4)</sup><br><b>6</b> = NI = Non inductive <sup>(7)</sup><br><b>7</b> = DK LP 25.4 mm <sup>(4)</sup><br><b>9</b> = WSZ 6720<br><b>8</b> = DK SP 25.4 mm<br><b>Z</b> = Value overflow<br>(Special)<br><b>C</b> = E/K 25.4 mm <sup>(4)</sup> | <b>0</b> = Standard | <b>3 digit value</b><br><b>1 digit multiplier</b><br><b>MULTIPLIER</b><br>7 = $\times 10^{-3}$<br>8 = $\times 10^{-2}$<br>9 = $\times 10^{-1}$<br>0 = $\times 10^0$<br>1 = $\times 10^1$<br>2 = $\times 10^2$<br>5 = $10^{-4}$ | <b>J</b> = $\pm$ 5.0 % | (See Packaging table) | The 5 digit BV number will be encoded using a 36 character code. This code contains numbers 0...9 and letters A...Z (36 characters total) and allows to encode at least 46 655 five digit BV numbers.<br><br><b>00</b> = Standard |

Product Description: AC03 15R 5 % AC

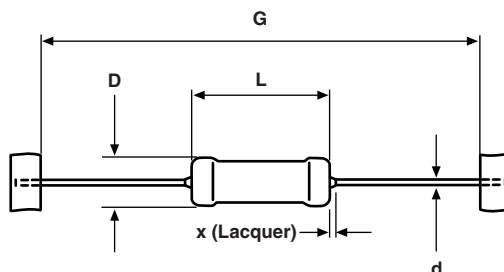
|                      |                      |                               |                                      |
|----------------------|----------------------|-------------------------------|--------------------------------------|
| <b>AC03</b>          | <b>15R</b>           | <b>5 %</b>                    | <b>AC</b>                            |
| MODEL <sup>(5)</sup> | VALUE <sup>(5)</sup> | TOLERANCE CODE <sup>(5)</sup> | PACKAGING DESCRIPTION <sup>(6)</sup> |

#### Notes

- (3) Special winding on request  
(4) Other dimensions and variants on request  
(5) See "Part Number and Product Description"  
(6) See "Packaging Table"  
(7) Resistance range on request

| PACKAGING TABLE |        |            |             |           |            |             |         |            |             |
|-----------------|--------|------------|-------------|-----------|------------|-------------|---------|------------|-------------|
| MODEL           | AMMO   |            |             | LOOSE     |            |             | BLISTER |            |             |
|                 | PIECES | PACK. CODE | PACK. DESC. | PIECES    | PACK. CODE | PACK. DESC. | PIECES  | PACK. CODE | PACK. DESC. |
| AC01            | 1000   | A1         | A1          | 500 LC LC |            |             |         |            |             |
| AC01 DK/EK      |        |            |             |           |            |             |         |            |             |
| AC01RT          | 2500   | AE         | AE          |           |            |             |         |            |             |
| AC03            | 500    | AC         | AC          | 500 LC LC |            |             |         |            |             |
| AC03 DK/EK      |        |            |             |           |            |             |         |            |             |
| AC03 WSZ        |        |            |             |           |            |             | 1250    | BM         | BM          |
| AC04            | 500    | AC         | AC          | 500 LC LC |            |             |         |            |             |
| AC04 DK/EK      |        |            |             |           |            |             |         |            |             |
| AC05            | 500    | AC         | AC          | 500 LC LC |            |             |         |            |             |
| AC05 DK/EK      |        |            |             |           |            |             |         |            |             |
| AC07            | 500    | AC         | AC          | 250 LB LB |            |             |         |            |             |
| AC07 DK/EK      |        |            |             |           |            |             |         |            |             |
| AC10            | 250    | AB         | AB          |           |            |             |         |            |             |

## DIMENSIONS



For packaging dimensions see: [www.vishay.com/doc?28721](http://www.vishay.com/doc?28721)

| DIMENSIONS - Resistor types, mass and relevant physical dimensions |                                    |                   |                               |                   |                        |                   |
|--------------------------------------------------------------------|------------------------------------|-------------------|-------------------------------|-------------------|------------------------|-------------------|
| MODEL                                                              | DIMENSIONS in millimeters [inches] |                   |                               |                   |                        |                   |
|                                                                    | D <sub>max.</sub>                  | L <sub>max.</sub> | d                             | x <sub>max.</sub> | G                      | WEIGHT g PER UNIT |
| AC01                                                               | 4.3 [0.169]                        | 11 [0.433]        | 0.8 ± 0.03<br>[0.031 ± 0.001] | 2                 | 63 ± 1 [2.480 ± 0.039] | 0.52              |
| AC03                                                               | 4.8 [0.189]                        | 13 [0.512]        |                               | 2                 | 63 ± 1 [2.480 ± 0.039] | 0.75              |
| AC04                                                               | 5.5 [0.217]                        | 16.5 [0.650]      |                               | 3                 | 63 ± 1 [2.480 ± 0.039] | 1.10              |
| AC05                                                               | 7.5 [0.295]                        | 18 [0.709]        |                               | 3                 | 63 ± 1 [2.480 ± 0.039] | 1.90              |
| AC07                                                               | 7.5 [0.295]                        | 26 [1.024]        |                               | 3                 | 73 ± 1 [2.874 ± 0.039] | 2.60              |
| AC10                                                               | 8.0 [0.315]                        | 44 [1.732]        |                               | 3                 | 88 ± 1 [3.465 ± 0.039] | 4.50              |

**BENDING FORMS**
**KINK TYPE S = EK**


| TYPE        | Ø d | Ø D <sub>max.</sub> | L   | h ± 1 | P ± 1 | S <sub>max.</sub> |
|-------------|-----|---------------------|-----|-------|-------|-------------------|
| AC01        | 0.8 | (1)                 | (1) | 8     | 17.8  | 2                 |
| AC03 - AC05 |     |                     |     |       | 25.4  |                   |
| AC07        |     |                     |     |       | 33.0  |                   |

**DOUBLE KINK SP = DK SP**

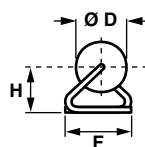
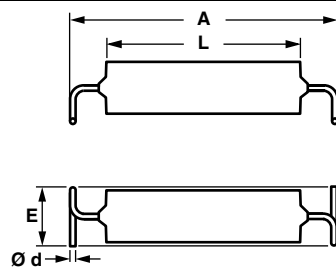

| TYPE        | Ø d | Ø D <sub>max.</sub> | L   | h ± 1 | P <sub>1</sub> ± 1 | P <sub>2</sub> ± 3 | S <sub>max.</sub> | Ø B       | c       |
|-------------|-----|---------------------|-----|-------|--------------------|--------------------|-------------------|-----------|---------|
| AC01        | 0.8 | (1)                 | (1) | 8     | 19.8               | 17.8               | 2                 | 1.0 ± 0.1 | 4.5 ± 1 |
| AC03 - AC05 |     |                     |     |       | 22.0               | 20.0               |                   |           |         |
|             |     |                     |     |       | 27.4               | 25.4               |                   |           |         |
| AC07        |     |                     |     |       | 35.0               | 33.0               |                   |           |         |

**DOUBLE KINK LP = DK LP**


| TYPE        | Ø d | Ø D <sub>max.</sub> | L   | h ± 1 | P <sub>1</sub> ± 1 | P <sub>2</sub> ± 3 | S <sub>max.</sub> | Ø B       | c       |
|-------------|-----|---------------------|-----|-------|--------------------|--------------------|-------------------|-----------|---------|
| AC01 - AC03 | 0.8 | (1)                 | (1) | 8     | 17.8               | 17.8               | 2                 | 1.0 ± 0.1 | 4.5 ± 1 |
| AC03 - AC05 |     |                     |     |       | 25.4               | 25.4               |                   |           |         |
| AC07        |     |                     |     |       | 33.0               | 33.0               |                   |           |         |

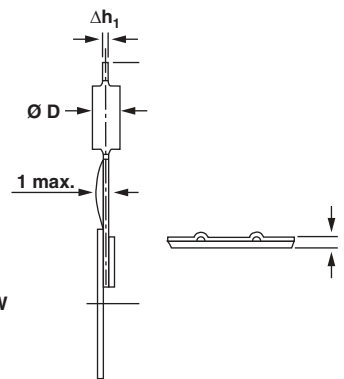
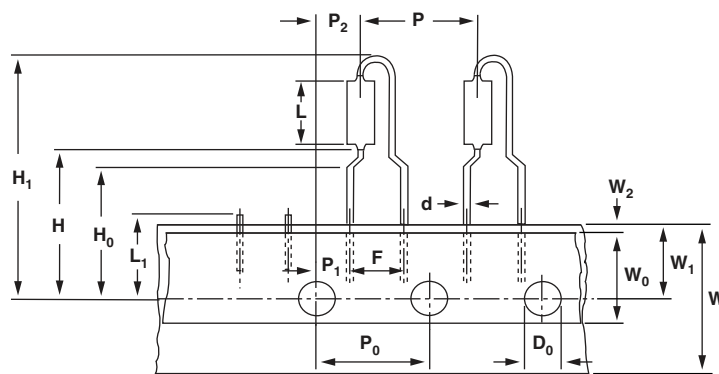
**Note**

(1) See table DIMENSIONS

**BENDING FORMS**
**WSZ**


Solder pad dimensions

| TYPE     | Ø d | Ø D <sub>max.</sub> | A        | L       | F         | H         | E         | a   | b   | l    |
|----------|-----|---------------------|----------|---------|-----------|-----------|-----------|-----|-----|------|
| AC03 WSZ | 0.8 | (1)                 | 17 ± 0.5 | 11 - 12 | 4.8 ± 0.5 | 3.6 ± 0.5 | 5.0 ± 0.5 | 2.5 | 5.5 | 14.5 |

**RADIAL TAPED = RT**


Direction of Unreeling →

**TYPE AC01**

|                                                  |                 |                  |
|--------------------------------------------------|-----------------|------------------|
| Lead Ø                                           | Ø d             | 0.8              |
| Diameter                                         | Ø D             | (1)              |
| Length                                           | L               | (1)              |
| Pitch of components                              | P               | 12.7 ± 1.0       |
| Pitch of spocket holes (2)                       | P <sub>0</sub>  | 12.7 ± 0.3       |
| Distance between hole center and resistor center | P <sub>1</sub>  | 3.85 ± 0.7       |
| Distance between hole center and lead center     | P <sub>2</sub>  | 6.35 ± 1.0       |
| Lead spacing                                     | F               | 5.0 + 0.6, - 0.1 |
| Angle of insertion                               | Δh <sub>1</sub> | 2 max.           |
| Width of carrier tape                            | W               | 18.0 ± 0.5       |
| Width of adhesive tape                           | W <sub>0</sub>  | 12.0 ± 0.5       |
| Position of holes                                | W <sub>1</sub>  | 9.0 ± 0.5        |
| Position of adhesive tape                        | W <sub>2</sub>  | 0.5 max.         |
| Body to hole center                              | H               | 19.5 ± 1.0       |
| Lead crimp to hole center (3)                    | H <sub>0</sub>  | 16.0 ± 0.5       |
| Hole Ø                                           | D <sub>0</sub>  | 4.0 ± 0.2        |
| Thickness of tape (4)                            | t               | 0.9 max.         |
| Height for cutting                               | L <sub>1</sub>  | 11 max.          |
| Height for insertion                             | H <sub>1</sub>  | 32 max.          |

**Notes**

(1) See table DIMENSIONS

(2) Test over 10 holes - 9 intervals P<sub>0</sub> 12.7 x 9 = 114.3 ± 0.5

(3) Parallelism, &lt; 0.5 mm

(4) Thickness of carrier tape: 0.55 mm ± 0.1



## PULSE DIAGRAMS



**AC01** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC03** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC04** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC05** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC07** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



**AC10** Pulse on a regular basis; maximum permissible peak pulse power ( $\hat{P}_{max.}$ ) as a function of pulse duration ( $t_i$ )



PULSE DIAGRAMS



AC01 Pulse capability; E (Ws) as a function of R (Ω)



AC03 Pulse capability; E (Ws) as a function of R (Ω)



AC04 Pulse capability; E (Ws) as a function of R (Ω)



AC05 Pulse capability; E (Ws) as a function of R (Ω)



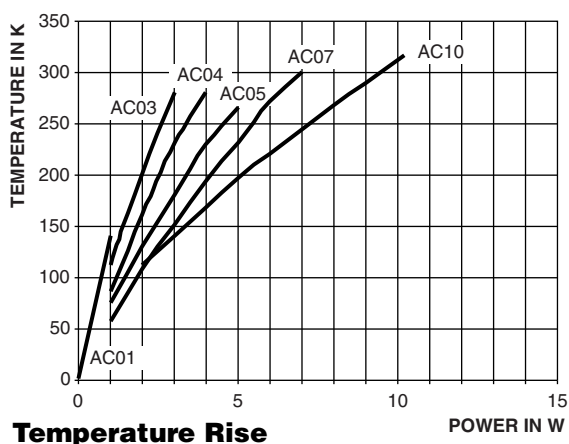
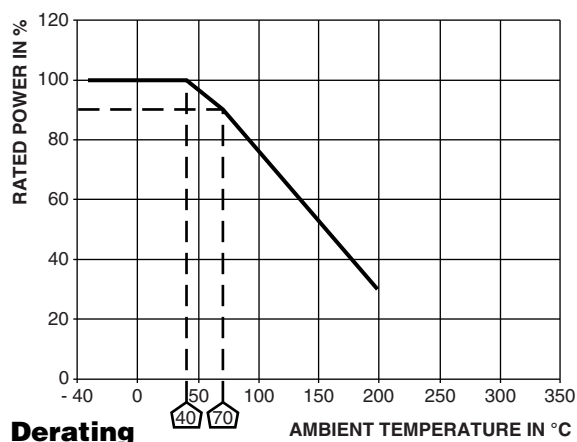
AC07 Pulse capability; E (Ws) as a function of R (Ω)



AC10 Pulse capability; E (Ws) as a function of R (Ω)



## FUNCTIONAL PERFORMANCE



| PERFORMANCE                                                                       |                                           |
|-----------------------------------------------------------------------------------|-------------------------------------------|
| TEST                                                                              | PERMISSIBLE CHANGE                        |
| Climatic Category (LCT/UCT/Days)                                                  | 40/200/56                                 |
| Climatic Sequence, IEC 60115-1, 4.23                                              | $\Delta R = \pm (1 \% R + 0.05 \Omega)$   |
| Damp Heat, Steady State, IEC 60115-1, 4.24<br>(40 ± 2) °C, 56 days, (93 ± 3) % RH | $\Delta R = \pm (5 \% R + 0.1 \Omega)$    |
| Endurance at room temperature (116 % P70), 1000 h, IEC 60115-1, 4.25.2            | $\Delta R = \pm (5 \% R + 0.1 \Omega)$    |
| Endurance at UCT, 200 °C (30 % P70), 1000 h, IEC 60115-1, 4.25.3                  | $\Delta R = \pm (5 \% R + 0.1 \Omega)$    |
| Resistance to Soldering Heat, IEC 60115-1, 4.18<br>(260 ± 5) °C, (10 ± 1) s       | $\Delta R = \pm (0.5 \% R + 0.05 \Omega)$ |
| Robustness of Termination, IEC 60115-1, 4.16<br>10N                               | $\Delta R = \pm (0.5 \% R + 0.05 \Omega)$ |
| Short Time Overload, IEC 60115-1, 4.13<br>10 x Rated Power for 5 s                | $\Delta R = \pm (2 \% R + 0.1 \Omega)$    |



## HISTORICAL 12NC INFORMATION

- The resistors had a 12-digit ordering code starting with 23.
- The subsequent 7 digits indicated the resistor type, specification and packaging.
- The remaining 3 digits indicated the resistance value:
  - The first 2 digits indicated the resistance value.
  - The last digit indicated the resistance decade in accordance with resistance decade table.

### Resistance Decade

| RESISTANCE DECADE              | LAST DIGIT |
|--------------------------------|------------|
| 0.1 $\Omega$ to 0.91 $\Omega$  | 7          |
| 1 $\Omega$ to 9.1 $\Omega$     | 8          |
| 10 $\Omega$ to 91 $\Omega$     | 9          |
| 100 $\Omega$ to 910 $\Omega$   | 1          |
| 1 k $\Omega$ to 9.1 k $\Omega$ | 2          |
| 10 k $\Omega$ to 56 k $\Omega$ | 3          |

### 12NC Example

The 12NC code of an AC01 resistor, value 47  $\Omega$  supplied in ammpack of 1000 units was: 2306 328 33479.

## HISTORICAL 12NC - Resistor type and packaging

| TYPE                | 23.. ... ..                 |                |              |              |
|---------------------|-----------------------------|----------------|--------------|--------------|
|                     | BANDOLIER IN AMMOPACK       |                |              |              |
|                     | RADIAL                      | STRAIGHT LEADS |              |              |
|                     | 2500 units                  | 250 units      | 500 units    | 1000 units   |
| AC01                | 06 328 90... <sup>(2)</sup> | -              | -            | 06 328 33... |
| AC03 <sup>(1)</sup> | -                           | -              | 22 329 03... | -            |
| AC04 <sup>(1)</sup> | -                           | -              | 22 329 04... | -            |
| AC05 <sup>(1)</sup> | -                           | -              | 22 329 05... | -            |
| AC07 <sup>(1)</sup> | -                           | -              | 22 329 07... | -            |
| AC10                | -                           | -              | -            | -            |

### Notes

- <sup>(1)</sup> Products with bent leads and bulk packaging (100 pieces) are available on request  
<sup>(2)</sup> Radial parts with tin plated copper leads



## 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.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**