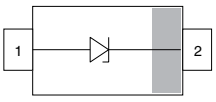
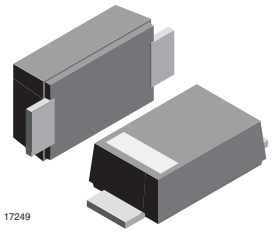
# Surface Mount ESD Protection Diodes




20278



17249

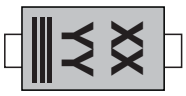
## FEATURES

- For surface mounted applications
- Low-profile package
- Optimized for LAN protection applications
- Ideal for ESD protection of data lines in accordance with IEC 61000-4-2 (IEC 801-2)
- Ideal for EFT protection of data lines in accordance with IEC 61000-4-4 (IEC 801-4)
- ESD-protection acc. IEC 61000-4-2
  ± 30 kV contact discharge
  ± 30 kV air discharge
- Low incremental surge resistance, excellent clamping capability
- 200 W peak pulse power capability with a 10/1000 µs waveform, repetition rate (duty cycle): 0.01 %
- Very fast response time
- High temperature soldering guaranteed: 260 °C/10 s at terminals
- e3 - Sn
- AEC-Q101 qualified
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definiton

RoHS COMPLIANT

HALOGEN FREE

## MARKING (example only)




22623

Bar = cathode marking
YY = type code (see table below)
XX = date code

## ORDERING INFORMATION

SMF5V0A-M-xx

- 08 = 3K per 7" reel (8 mm tape), 30K/box
- 18 = 10K per 13" reel (8 mm tape), 50K/box
- Environmental suffix -M- defines halogen-free
- Part number

| PACKAGE DATA | | | | | | |
|---|---|---|---|---|---|---|
| DEVICE NAME | PACKAGE NAME | TYPE CODE | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL | SOLDERING CONDITIONS |
| SMF5V0A-M | SMF | NE | 15 mg | UL 94 V-0 | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
| SMF6V5A-M | | NK | | | | |
| SMF7V0A-M | | NM | | | | |
| SMF7V5A-M | | NP | | | | |
| SMF8V0A-M | | NR | | | | |
| SMF8V5A-M | | NT | | | | |
| SMF9V0A-M | | NV | | | | |
| SMF10A-M | | NX | | | | |
| SMF11A-M | | NZ | | | | |
| SMF12A-M | | OE | | | | |
| SMF13A-M | | OG | | | | |
| SMF14A-M | | OK | | | | |
| SMF15A-M | | OM | | | | |
| SMF16A-M | | OP | | | | |
| SMF17A-M | | OR | | | | |
| SMF18A-M | | OT | | | | |
| SMF20A-M | | OV | | | | |
| SMF22A-M | | OX | | | | |
| SMF24A-M | | OZ | | | | |



For technical questions, contact: ESDprotection@vishay.com

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

| PACKAGE DATA | | | | | | |
|---|---|---|---|---|---|---|
| DEVICE NAME | PACKAGE NAME | TYPE CODE | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL | SOLDERING CONDITIONS |
| SMF26A-M | SMF | PE | 15 mg | UL 94 V-0 | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
| SMF28A-M | | PG | | | | |
| SMF30A-M | | PK | | | | |
| SMF33A-M | | PM | | | | |
| SMF36A-M | | PP | | | | |
| SMF40A-M | | PR | | | | |
| SMF43A-M | | PT | | | | |
| SMF45A-M | | PV | | | | |
| SMF48A-M | | PX | | | | |
| SMF51A-M | | PZ | | | | |

| ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| PARAMETER | TEST CONDITIONS | SYMBOL | VALUE | UNIT |
| Peak pulse current | $t_p$ = 10/1000 µs waveform acc. IEC 61000-4-5 | $I_{PPM}$ | see "Electrical Characteristics" | A |
| Peak pulse power | $t_p$ = 8/20 µs waveform acc. IEC 61000-4-5 | $P_{PP}$ | 1000 | W |
| | $t_p$ = 10/1000 µs waveform acc. IEC 61000-4-5 | | 200 | W |
| Peak forward surge current | 8.3 ms single half sine-wave | $I_{FSM}$ | 20 | A |
| ESD immunity | Contact discharge acc. IEC 61000-4-2; 10 pulses | $V_{ESD}$ | ± 30 | kV |
| | Air discharge acc. IEC 61000-4-2; 10 pulses | | ± 30 | kV |
| Thermal resistance | Mounted on epoxy glass PCB with 3 mm x 3 mm, Cu pads (≥ 40 µm thick) | $R_{thJA}$ | 180 | K/W |
| Forward clamping voltage | $I_F$ = 12 A | $V_F$ | 3.5 | V |
| Operating temperature | Junction temperature | $T_J$ | - 55 to + 150 | °C |
| Storage temperature | | $T_{STG}$ | - 55 to + 150 | °C |

| ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PART NUMBER | REVERSE BREAKDOWN VOLTAGE at $I_T$, $t_p \le 5$ ms | TEST CURRENT | REVERSE WORKING VOLTAGE | REVERSE CURRENT at $V_{RWM}$ | MAXIMUM PEAK PULSE CURRENT $t_p$ = 10/1000 µs | REVERSE CLAMPING VOLTAGE at $I_{PPM}$ | CAPACITANCE at $V_R$ = 0 V, f = 1 MHz | PROTECTION PATHS |
| | $V_{BR}$ MIN. (V) | $I_T$ (mA) | $V_{RWM}$ (V) | $I_R$ (µA) | $I_{PPM}$ (A) | $V_C$ (V) | $C_D$ TYP. (pF) | $N_{channel}$ |
| SMF5V0A-M | 6.40 | 10 | 5 | 400 | 21.7 | 9.2 | 1030 | 1 |
| SMF6V0A-M | 6.67 | 10 | 6 | 400 | 19.4 | 10.3 | 1010 | 1 |
| SMF6V5A-M | 7.22 | 10 | 6.5 | 250 | 17.9 | 11.2 | 850 | 1 |
| SMF7V0A-M | 7.78 | 10 | 7 | 100 | 16.7 | 12 | 750 | 1 |
| SMF7V5A-M | 8.33 | 1 | 7.5 | 50 | 15.5 | 12.9 | 730 | 1 |
| SMF8V0A-M | 8.89 | 1 | 8 | 25 | 14.7 | 13.6 | 670 | 1 |
| SMF8V5A-M | 9.44 | 1 | 8.5 | 10 | 13.9 | 14.4 | 660 | 1 |
| SMF9V0A-M | 10 | 1 | 9 | 5 | 13.5 | 15.4 | 620 | 1 |
| SMF10A-M | 11.1 | 1 | 10 | 2.5 | 11.8 | 17 | 570 | 1 |
| SMF11A-M | 12.2 | 1 | 11 | 2.5 | 11 | 18.2 | 460 | 1 |
| SMF12A-M | 13.3 | 1 | 12 | 2.5 | 10.1 | 19.9 | 440 | 1 |
| SMF13A-M | 14.4 | 1 | 13 | 1 | 9.3 | 21.5 | 420 | 1 |
| SMF14A-M | 15.6 | 1 | 14 | 1 | 8.6 | 23.2 | 370 | 1 |
| SMF15A-M | 16.7 | 1 | 15 | 1 | 8.2 | 24.4 | 350 | 1 |
| SMF16A-M | 17.8 | 1 | 16 | 1 | 7.7 | 26 | 340 | 1 |
| SMF17A-M | 18.9 | 1 | 17 | 1 | 7.2 | 27.6 | 310 | 1 |
| SMF18A-M | 20 | 1 | 18 | 1 | 5.8 | 29.2 | 305 | 1 |


For technical questions, contact: ESDprotection@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

| **ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PART NUMBER** | **REVERSE BREAKDOWN VOLTAGE at $I_T$, $t_p \leq 5$ ms** | **TEST CURRENT** | **REVERSE WORKING VOLTAGE** | **REVERSE CURRENT at $V_{RWM}$** | **MAXIMUM PEAK PULSE CURRENT $t_p$ = 10/1000 µs** | **REVERSE CLAMPING VOLTAGE at $I_{PPM}$** | **CAPACITANCE at $V_R$ = 0 V, f = 1 MHz** | **PROTECTION PATHS** |
| | **$V_{BR}$ MIN. (V)** | **$I_T$ (mA)** | **$V_{RWM}$ (V)** | **$I_R$ (µA)** | **$I_{PPM}$ (A)** | **$V_C$ (V)** | **$C_D$ TYP. (pF)** | **$N_{channel}$** |
| SMF20A-M | 22.2 | 1 | 20 | 1 | 6.2 | 32.4 | 207 | 1 |
| SMF22A-M | 24.4 | 1 | 22 | 1 | 5.6 | 35.5 | 265 | 1 |
| SMF24A-M | 26.7 | 1 | 24 | 1 | 5.1 | 38.9 | 240 | 1 |
| SMF26A-M | 28.9 | 1 | 26 | 1 | 4.8 | 42.1 | 225 | 1 |
| SMF28A-M | 31.1 | 1 | 28 | 1 | 4.4 | 45.4 | 210 | 1 |
| SMF30A-M | 33.3 | 1 | 30 | 1 | 4.1 | 48.4 | 205 | 1 |
| SMF33A-M | 36.7 | 1 | 33 | 1 | 3.8 | 53.3 | 190 | 1 |
| SMF36A-M | 40 | 1 | 36 | 1 | 3.4 | 58.1 | 180 | 1 |
| SMF40A-M | 44.4 | 1 | 40 | 1 | 3.1 | 64.5 | 165 | 1 |
| SMF43A-M | 47.8 | 1 | 43 | 1 | 2.9 | 69.4 | 160 | 1 |
| SMF45A-M | 50 | 1 | 45 | 1 | 2.8 | 72.7 | 155 | 1 |
| SMF48A-M | 53.3 | 1 | 48 | 1 | 2.6 | 77.4 | 150 | 1 |
| SMF51A-M | 56.7 | 1 | 51 | 1 | 2.4 | 82.4 | 145 | 1 |

## TYPICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)

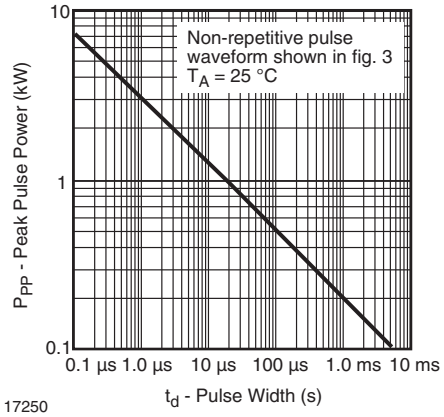



Fig. 1 - Peak Pulse Power Rating

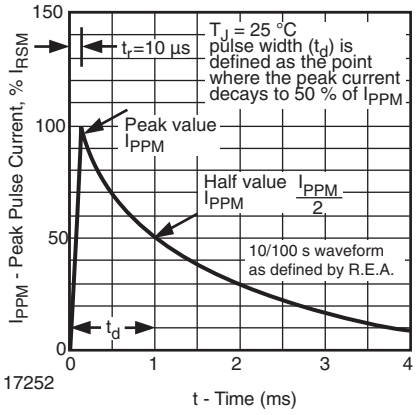



Fig. 3 - Pulse Waveform

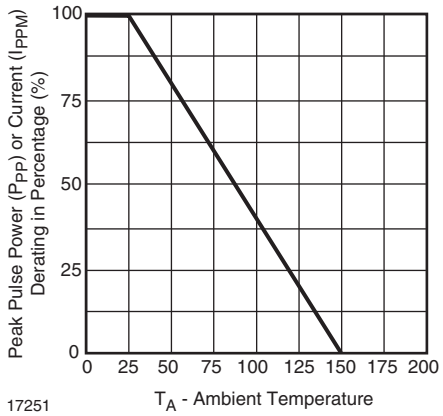


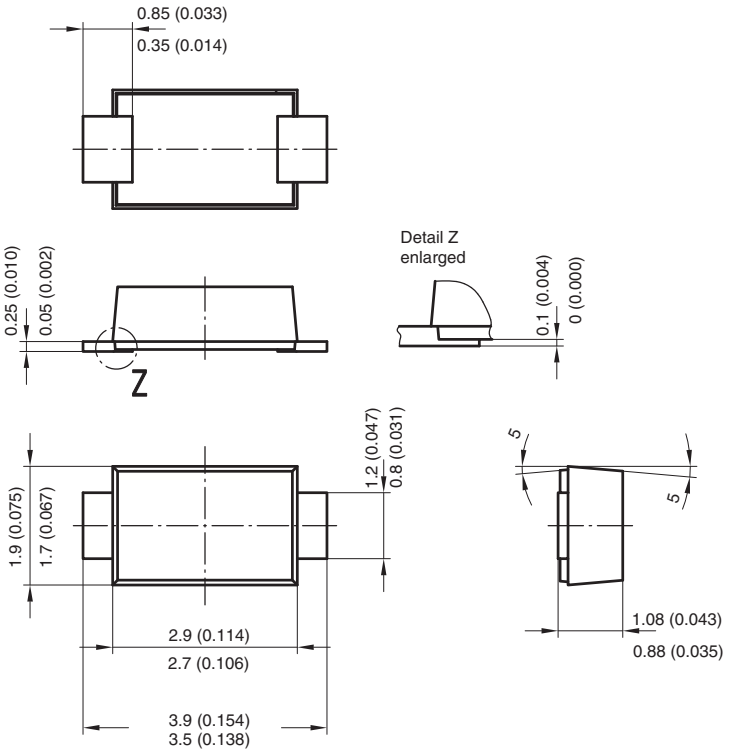

Fig. 2 - Pulse Derating Curve



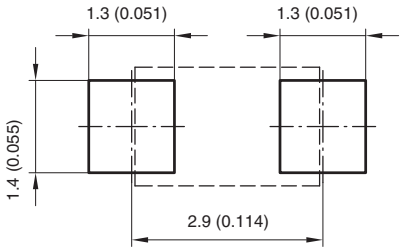
For technical questions, contact: ESDprotection@vishay.com

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

**PACKAGE DIMENSIONS** in millimeters (inches): **SMF**



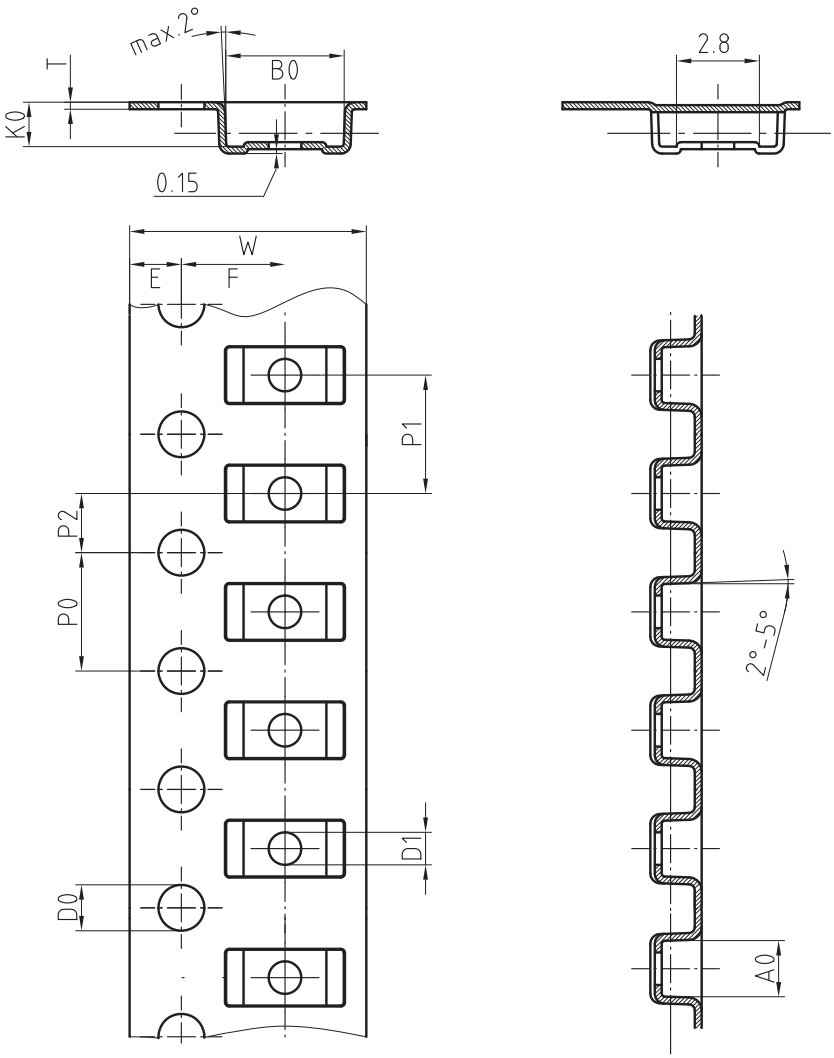

Foot print recommendation:




Created - Date: 15. February 2005
Rev. 3 - Date: 13. March 2007
Document no.:S8-V-3915.01-001 (4)
17247


For technical questions, contact: ESDprotection@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

**BLISTERTAPE DIMENSIONS** in millimeters (inches)




| Mat: | A0 | B0 | K0 | W | T | P0 | P2 | P1 | D0 | D1 | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS | 1.9 | 4.0 | 1.5 | 8.0 | 0.235 | 4.0 | 2.0 | 4.0 | 1.5 | 1 | 1.75 | 3.5 |

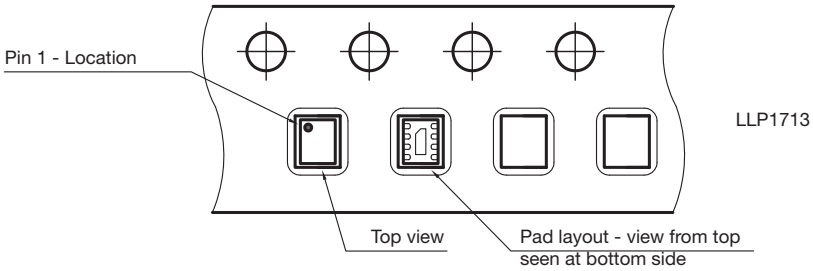
Document-No.: S8-V-3717.02-001 (3)

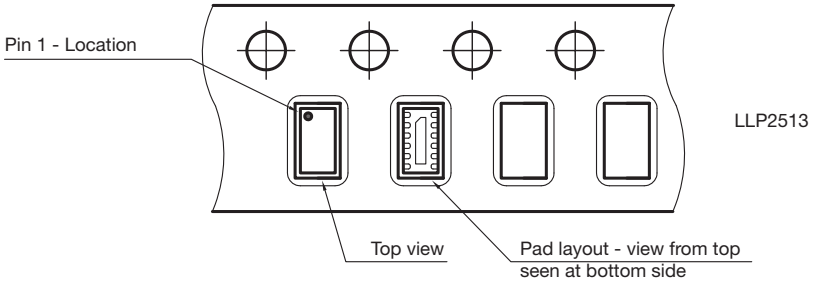
18513

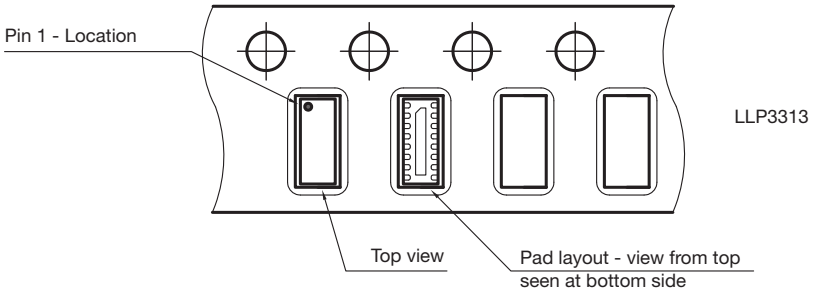


For technical questions, contact: ESDprotection@vishay.com

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000





For technical questions, contact: ESDprotection@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

# 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.**