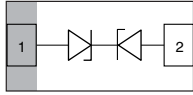
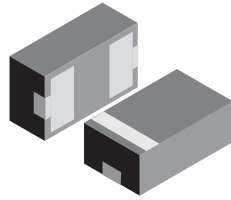




# Bidirectional Symmetrical (BiSy) Low Capacitance, Single-Line ESD Protection Diode in LLP1006-2M



21129



20855

### MARKING (example only)



21121

Bar = pin 1 marking  
X = date code  
Y = type code (see table below)

### DESIGN SUPPORT TOOLS

[click logo to get started](#)



### FEATURES

- Ultra compact LLP1006-2M package
- Low package height < 0.4 mm
- 1-line ESD protection
- Working range  $\pm 5.5$  V
- Low leakage current  $I_R < 0.1 \mu A$
- Very low load capacitance  $C_D = 0.3$  pF
- ESD immunity acc. IEC 61000-4-2  
 $\pm 15$  kV contact discharge  
 $\pm 16$  kV air discharge
- Soldering can be checked by standard vision inspection; no X-ray necessary
- Pin plating NiPdAu (e4) no whisker growth
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- PATENT(S): [www.vishay.com/patents](http://www.vishay.com/patents)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



| ORDERING INFORMATION |                   |   |                        |
|----------------------|-------------------|---|------------------------|
| DEVICE NAME          | ORDERING CODE     | TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL) | MINIMUM ORDER QUANTITY |
| VBUS05L1-DD1         | VBUS05L1-DD1-G-08 | 8000  | 8000                   |

| PACKAGE DATA |              |           |         |                                      |                                   |                              |
|--------------|--------------|-----------|---------|--------------------------------------|-----------------------------------|------------------------------|
| DEVICE NAME  | PACKAGE NAME | TYPE CODE | WEIGHT  | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL        | SOLDERING CONDITIONS         |
| VBUS05L1-DD1 | LLP1006-2M   | R         | 0.72 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | Peak temperature max. 260 °C |

| ABSOLUTE MAXIMUM RATINGS VBUS05L1-DD1 |  |  |           |             |      |
|---------------------------------------|--|--|-----------|-------------|------|
| PARAMETER                             | TEST CONDITIONS  |  | SYMBOL    | VALUE       | UNIT |
| Peak pulse current                    | Acc. IEC 61000-4-5; $t_p = 8/20 \mu s$ ; single shot                 |  | $I_{PPM}$ | 2           | A    |
| Peak pulse power                      | Pin 1 to pin 2, acc. IEC 61000-4-5; $t_p = 8/20 \mu s$ ; single shot |  | $P_{PP}$  | 34          | W    |
| ESD immunity                          | Contact discharge acc. IEC 61000-4-2; 10 pulses                      |  | $V_{ESD}$ | $\pm 15$    | kV   |
|                                       | Air discharge acc. IEC 61000-4-2; 10 pulses                          |  |           | $\pm 16$    | kV   |
| Operating temperature                 | Junction temperature   |  | $T_J$     | -40 to +125 | °C   |
| Storage temperature                   |  |  | $T_{STG}$ | -40 to +150 | °C   |

PATENT(S): [www.vishay.com/patents](http://www.vishay.com/patents)

This Vishay product is protected by one or more United States and international patents.



| <b>ELECTRICAL CHARACTERISTICS VBUS05L1-DD1</b><br>( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |               |      |      |      |               |
|--|--|---------------|------|------|------|---------------|
| PARAMETER  | TEST CONDITIONS/REMARKS                      | SYMBOL        | MIN. | TYP. | MAX. | UNIT          |
| Protection paths   | Number of lines which can be protected       | $N_{channel}$ | -    | -    | 1    | lines         |
| Reverse stand-off voltage  | Max. reverse working voltage                 | $V_{RWM}$     | -    | -    | 5.5  | V             |
| Reverse voltage  | at $I_R = 0.05\text{ }\mu\text{A}$           | $V_R$         | 5.5  | -    | -    | V             |
| Reverse current  | at $V_{RWM} = 5.5\text{ V}$                  | $I_R$         | -    | -    | 0.05 | $\mu\text{A}$ |
| Reverse breakdown voltage  | at $I_R = 1\text{ mA}$                       | $V_{BR}$      | 7    | 8.4  | 9.5  | V             |
| Reverse clamping voltage   | at $I_{PP} = 1\text{ A}$                     | $V_C$         | -    | 11.5 | 14   | V             |
|  | at $I_{PP} = I_{PPM} = 2\text{ A}$           | $V_C$         | -    | 14   | 17   | V             |
| Capacitance  | at $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$   | $C_D$         | -    | 0.33 | 0.4  | pF            |
|  | at $V_R = 2.5\text{ V}$ , $f = 1\text{ MHz}$ | $C_D$         | -    | 0.34 | -    | pF            |

**VBUS05L1-DD1: ESD PROTECTION WITH LOWEST LOAD CAPACITANCE**

The VBUS05L1-DD1 is a bidirectional and symmetrical (BiSy) ESD protection device which clamps positive and negative overvoltage transients to ground. Connected between the signal or data line and the ground the VBUS05L1-DD1 offers a high isolation (low leakage current, lowest capacitance) within the specified working range. Due to the short leads and small package size of the tiny LLP1006-2M package the line inductance is very low, so that fast transients like an ESD strike can be clamped with minimal over- or undershoots.

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

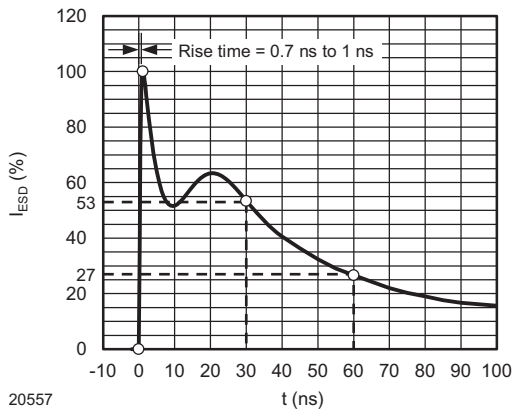


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

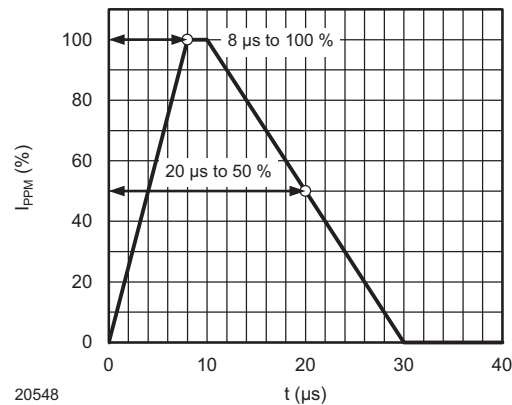


Fig. 2 - 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form acc. IEC 61000-4-5

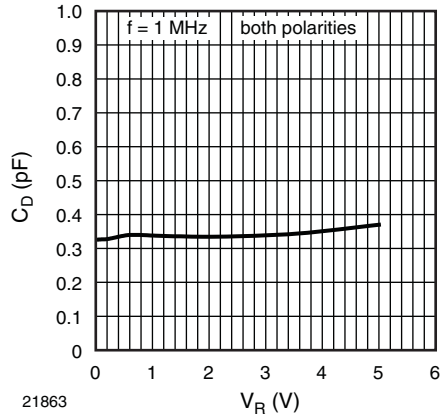


Fig. 3 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

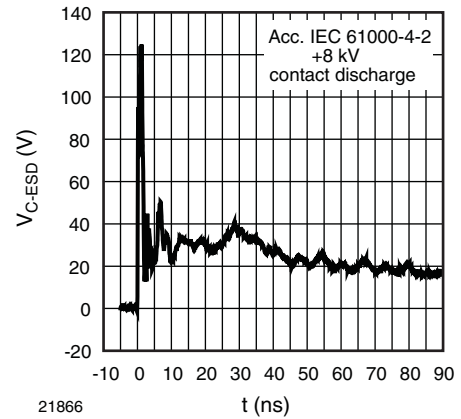


Fig. 6 - Typical Clamping Performance at + 8 kV Contact Discharge (acc. IEC 61000-4-2)

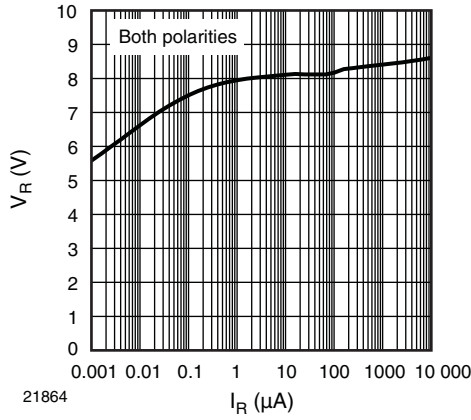


Fig. 4 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

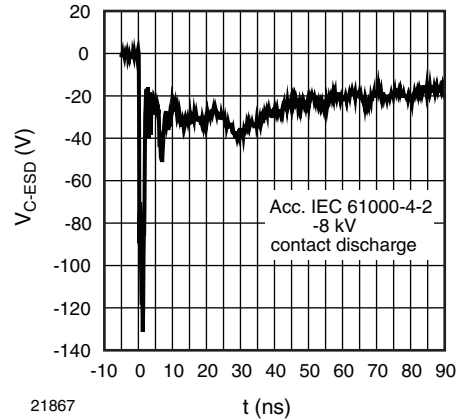


Fig. 7 - Typical Clamping Performance at - 8 kV Contact Discharge (acc. IEC 61000-4-2)

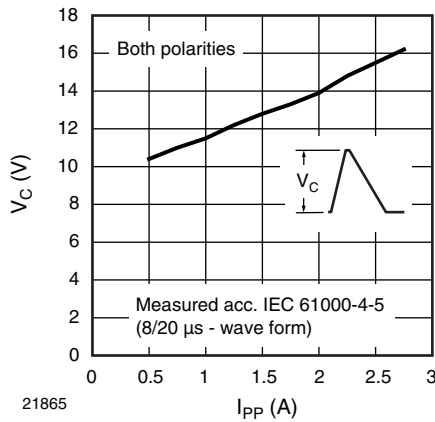


Fig. 5 - Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

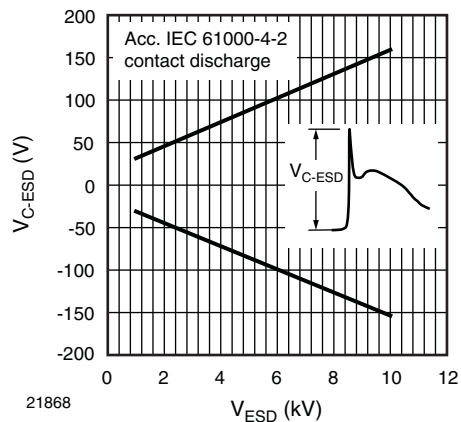
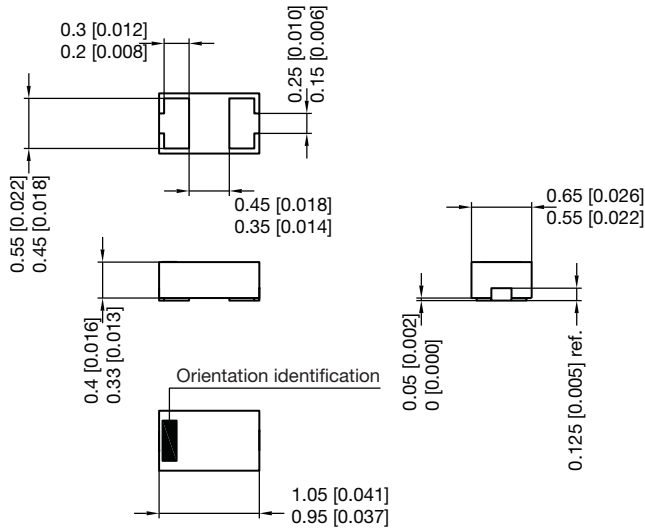


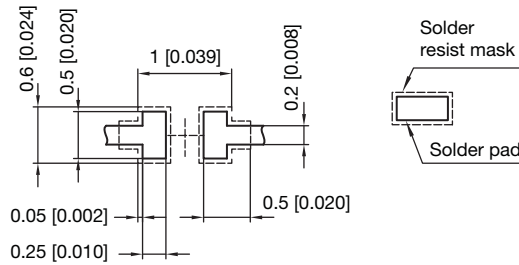
Fig. 8 - Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)



PACKAGE DIMENSIONS in millimeters (inches): **LLP1006-2M**

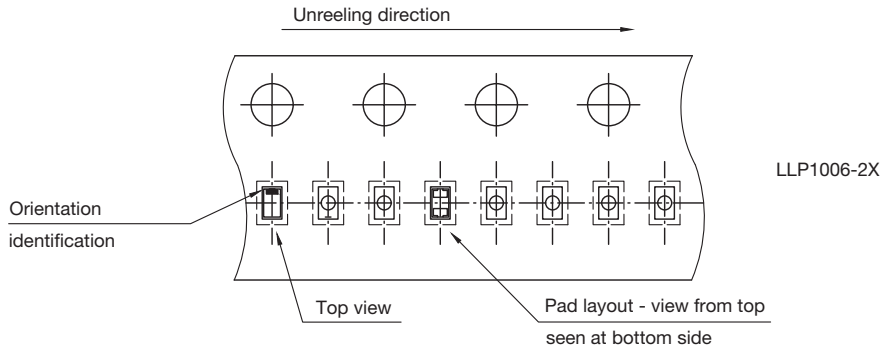


Foot print recommendation:



Pad Design Patented:  
(©) US 9.018.537 B2

Document no.: S8-V-3906.04-005 (4)  
Rev. 7 - Date: 11.May 2016  
20812



S8-V-3906.04-017 (4)  
02.05.2017  
22965



## **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.