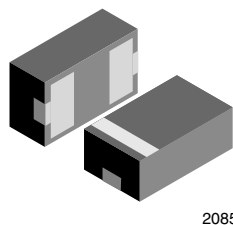
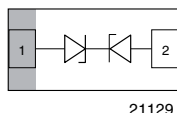


# Ultra Low Capacitance Bidirectional Symmetrical (BiSy) Single Line ESD Protection Diode in LLP1006-2M



## 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 < 0.01  $\mu$ A
- Ultra low load capacitance  $C_D = 0.36$  pF typ.
- ESD immunity acc. IEC 61000-4-2  
 $\pm 18$  kV contact discharge  
 $\pm 18$  kV air discharge
- Lead plating: Sn (e3); tin plated exposed side wall of leadframe; soldering can be checked by standard vision inspection; (AOI = Automated Outgoing Inspection); no X-ray necessary
- Lead material: Cu
- 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)



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

## MARKING (example only)



Bar = pin 1 marking

X = date code

Y = type code (see table below)

## DESIGN SUPPORT TOOLS click logo to get started



## ORDERING INFORMATION

DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL)	MINIMUM ORDER QUANTITY
VBUS05M1-DD1	VBUS05M1-DD1-G3-08	10 000	100 000

## PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	SOLDERING CONDITIONS
VBUS05M1-DD1	LLP1006-2M	5	0.72 mg	260 °C/10 s at terminals reflow soldering according JEDEC® STD-020

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 $\mu$ s/single shot	$I_{PPM}$	4.5	A
Peak pulse power	Pin 1 to pin 2 Acc. IEC 61000-4-5; $t_p = 8/20$ $\mu$ s; single shot	$P_{PP}$	95	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	$V_{ESD}$	$\pm 18$	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		$\pm 18$	
Operating temperature	Junction temperature	$T_J$	-55 to +125	°C
Storage temperature		$T_{stg}$	-55 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.

## ESD PROTECTION FOR HIGH-SPEED SIGNAL OR DATA LINES

The VBUS05M1-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 VBUS05M1-DD1 offers a high isolation (low leakage current, low capacitance) within the specified working range. Due to the short leads and small package size of the tiny LLP1006 package the line inductance is very low, so that fast transients like an ESD strike can be clamped with minimal over- or undershoots. Due to the very low capacitance the VBUS05M1-DD1 can be used for high speed data ports like HDMI, USB 3.0 or Thunderbolt.

ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	N <sub>channel</sub>	-	-	1	lines
Reverse stand-off voltage	Max. reverse working voltage	V <sub>RWM</sub>	-	-	5.5	V
Reverse voltage	at I <sub>R</sub> = 0.1 μA	V <sub>R</sub>	5.5	-	-	V
Reverse current	at V <sub>RWM</sub> = 5.5 V	I <sub>R</sub>	-	-	0.1	μA
Reverse breakdown voltage	at I <sub>R</sub> = 1 mA	V <sub>BR</sub>	6.0	8.5	10	V
Reverse clamping voltage	at I <sub>PP</sub> = 1 A	V <sub>C</sub>	-	11	13	V
	at I <sub>PP</sub> = I <sub>PPM</sub> = 4.5 A	V <sub>C</sub>	-	18	21	V
Capacitance	at V <sub>R</sub> = 0 V; f = 1 MHz	C <sub>D</sub>	-	0.36	0.4	pF
	at V <sub>R</sub> = 3.3 V; f = 1 MHz	C <sub>D</sub>	-	0.36	-	pF
Clamping voltage	Transmission Line Pulse (TLP); t <sub>p</sub> = 100 ns I <sub>TLP</sub> = 8 A	V <sub>C-TLP</sub>	-	21	-	V
	Transmission Line Pulse (TLP); t <sub>p</sub> = 100 ns I <sub>TLP</sub> = 16 A		-	31	-	
Dynamic resistance	Transmission Line Pulse (TLP); t <sub>p</sub> = 100 ns	R <sub>DYN</sub>	-	1.3	-	Ω

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

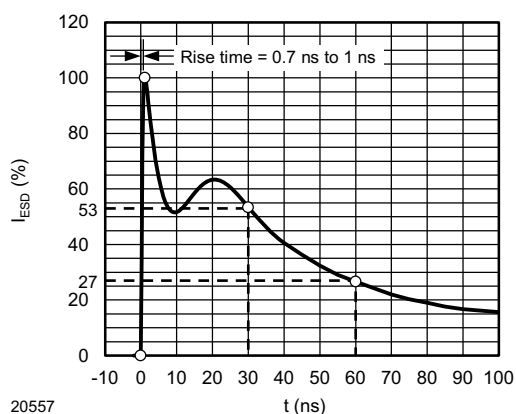


Fig. 1 - ESD Discharge Current Wave Form  
acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

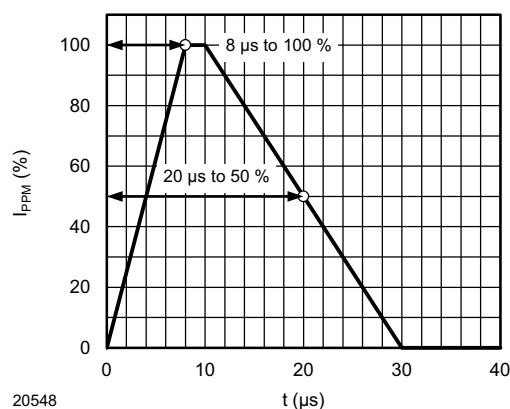


Fig. 2 - 8/20  $\mu$ s Peak Pulse Current Wave Form  
acc. IEC 61000-4-5

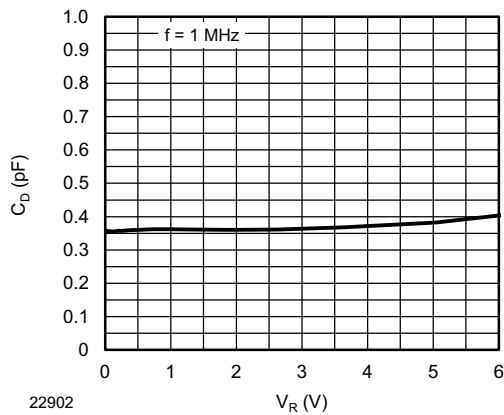


Fig. 3 - Typical Capacitance vs. Reverse Voltage

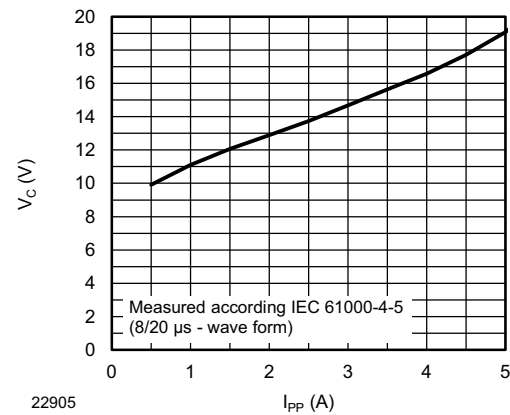


Fig. 6 - Typical Peak Clamping Voltage vs. Peak Pulse Current

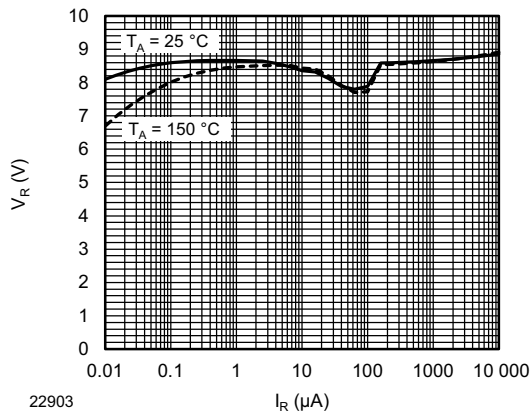


Fig. 4 - Typical Reverse Voltage vs. Reverse Current

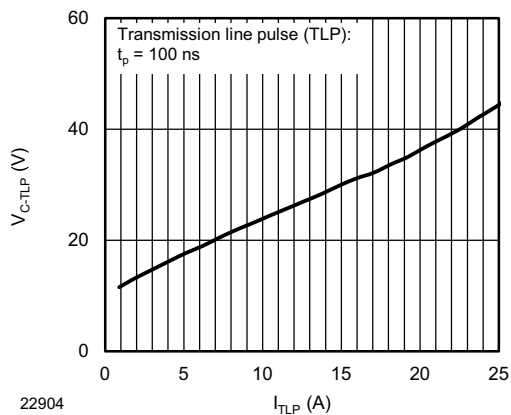
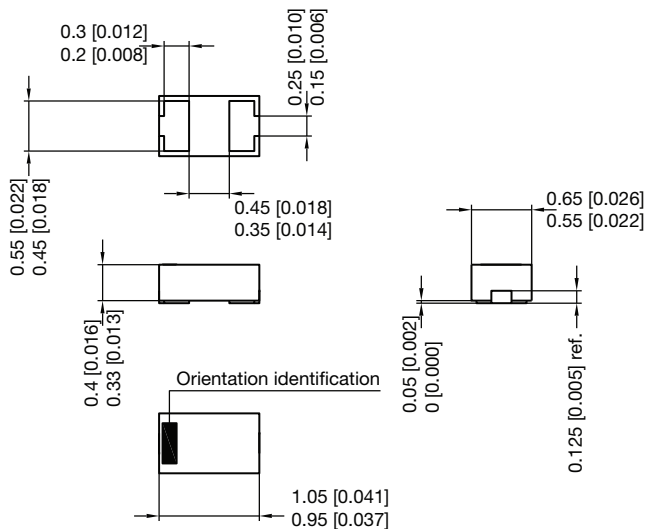
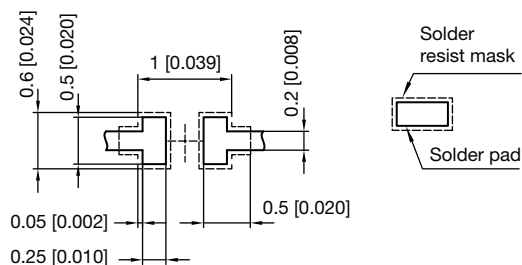


Fig. 5 - Typical Clamping Voltage vs. Peak Pulse Current

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

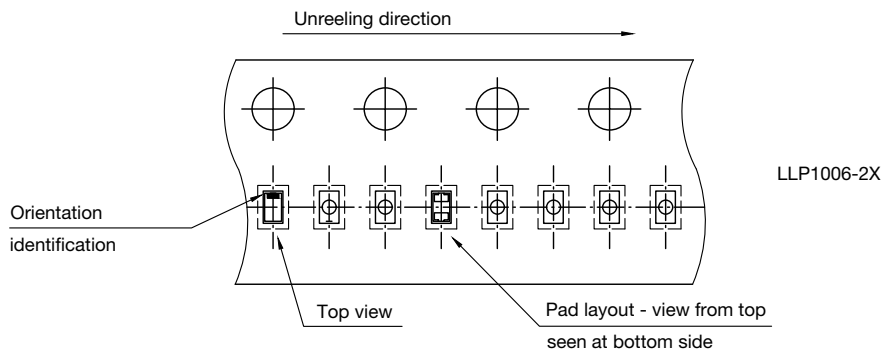


### Foot print recommendation:



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.