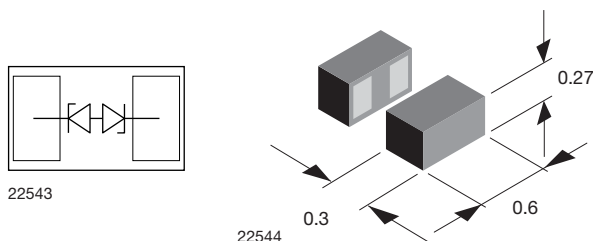


# Ultra Low Capacitance Bidirectional Symmetrical (BiSy) Single Line ESD Protection Diode in Silicon Package



## MARKING (example only)



1 = year code

Open circle = month code and pin 1

XY = type code

## FEATURES

- Ultra compact CLP0603 package
- Low package height < 0.3 mm
- 1-line ESD protection
- Working range  $\pm 3.3$  V
- Low leakage current < 0.05  $\mu$ A
- Ultra low load capacitance  $C_D = 0.29$  pF typ.
- ESD immunity acc. IEC 61000-4-2  
 $\pm 16$  kV contact discharge  
 $\pm 16$  kV air discharge
- Lead plating: Au (e4)
- Lead material: Ni
- Backside coating
- 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)

## DESIGN SUPPORT TOOLS AVAILABLE



ORDERING INFORMATION				
PART NUMBER (EXAMPLE)	ENVIRONMENTAL AND QUALITY CODE		PACKAGING CODE	ORDERING CODE (EXAMPLE)
	RoHS-COMPLIANT + LEAD (Pb)-FREE TERMINATIONS	GOLD PLATED	15K PER 7" REEL (8 mm TAPE) 15K/BOX = MOQ	
	GREEN			
VBUS03B1-SD0-	G	4	-08	VBUS03B1-SD0-G4-08

PACKAGE DATA				
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	SOLDERING CONDITIONS
VBUS03B1-SD0	CLP0603-2L	3B	0.12 mg	Peak temperature max. 260 °C 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	$I_{PPM}$	2.5	A
Peak pulse power	Pin 1 to pin 2 acc. IEC 61000-4-5; $t_p = 8/20$ $\mu$ s; single shot	$P_{PP}$	45	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	$V_{ESD}$	$\pm 16$	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		$\pm 16$	
Operating temperature	Junction temperature	$T_J$	-55 to +150	°C
Storage temperature		$T_{stg}$	-55 to +150	°C

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

The VBUS03B1-SD0 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 VBUS03B1-SD0 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 CLP0603 package the line inductance is very low, so that fast transients like and ESD strike can be clamped with minimal over- or undershoots. Due to the very low capacitance the VBUS03B1-SD0 can be used for high speed data ports like HDMI, USB 3.0 or Thunderbolt.

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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	$V_{RWM}$	-	-	3.3	V
Reverse voltage	at $I_R = 0.05\text{ }\mu\text{A}$	$V_R$	3.3	-	-	V
Reverse current	at $V_{RWM} = 3.3\text{ V}$	$I_R$	-	$< 0.0009^{(1)}$	0.05	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	6.0	8.5	10	V
Reverse clamping voltage	at $I_{PP} = 1\text{ A}$	$V_C$	-	12	14	V
	at $I_{PP} = I_{PPM} = 2.5\text{ A}$	$V_C$	-	15	18	V
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	-	0.29	0.4	pF
	at $V_R = 3.3\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	-	0.29	-	pF
Clamping voltage	Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$ $I_{TLP} = 8\text{ A}$	$V_{C-TLP}$	-	20	-	V
	Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$ $I_{TLP} = 16\text{ A}$		-	29	-	
Dynamic resistance	Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$	$R_{DYN}$	-	1.14	-	$\Omega$

**Note**

<sup>(1)</sup> Defined by design. Such a low leakage current is too low for a 100 % final test verification

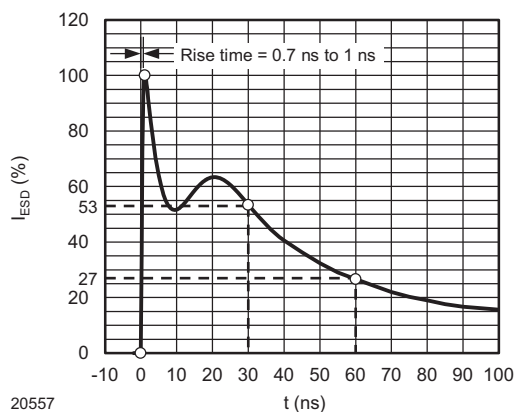
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


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

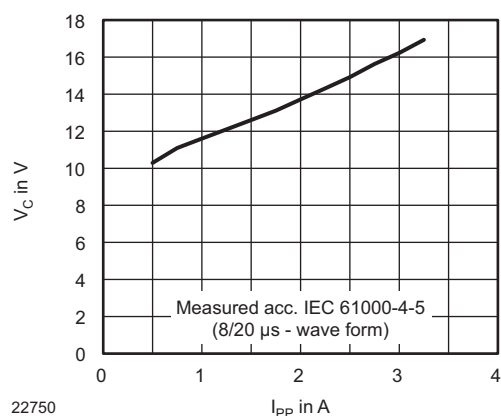


Fig. 4 - Typical Peak Clamping Voltage  $V_C$  vs.  
Peak Pulse Current  $I_{PP}$

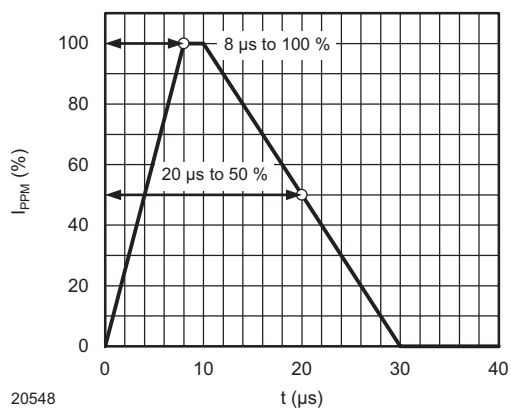


Fig. 2 - 8/20  $\mu$ s Peak Pulse Current Wave Form  
acc. IEC 61000-4-5

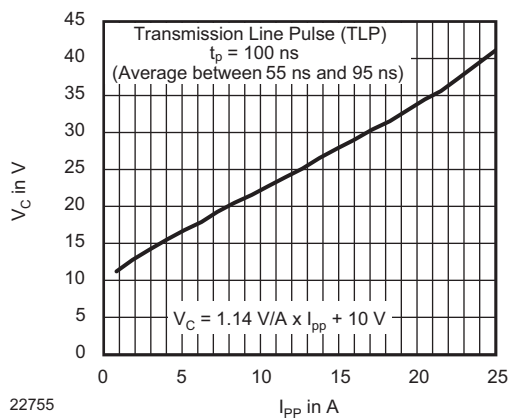


Fig. 5 - Typical Peak Clamping Voltage  $V_C$  vs.  
Peak Pulse Current  $I_{PP}$

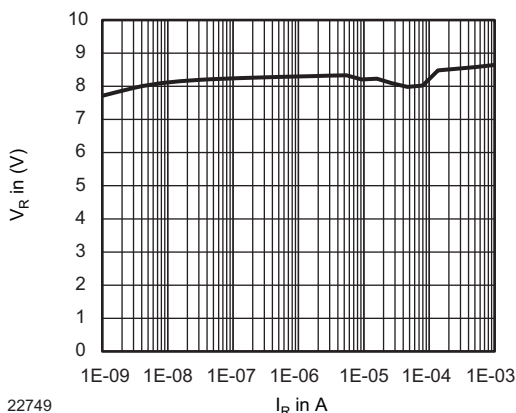


Fig. 3 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

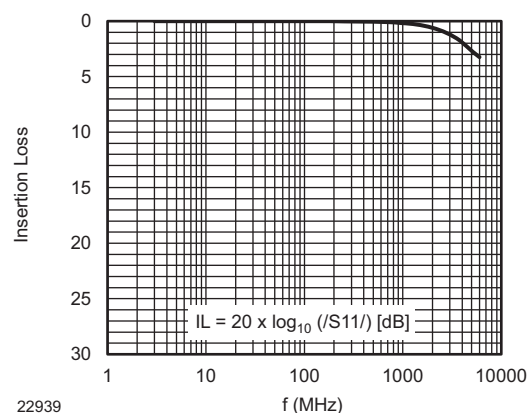
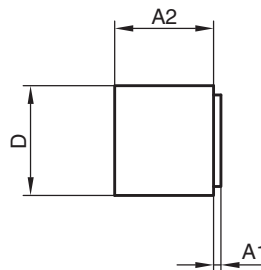
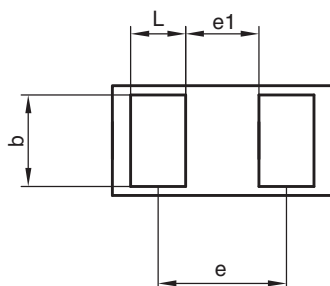


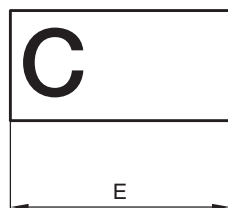
Fig. 6 - Typical Insertion Loss (IL) vs. Frequency



**PACKAGE DIMENSIONS** in millimeters (mils): **CLP0603-2L**



Package = chip dimensions in mm [mils]



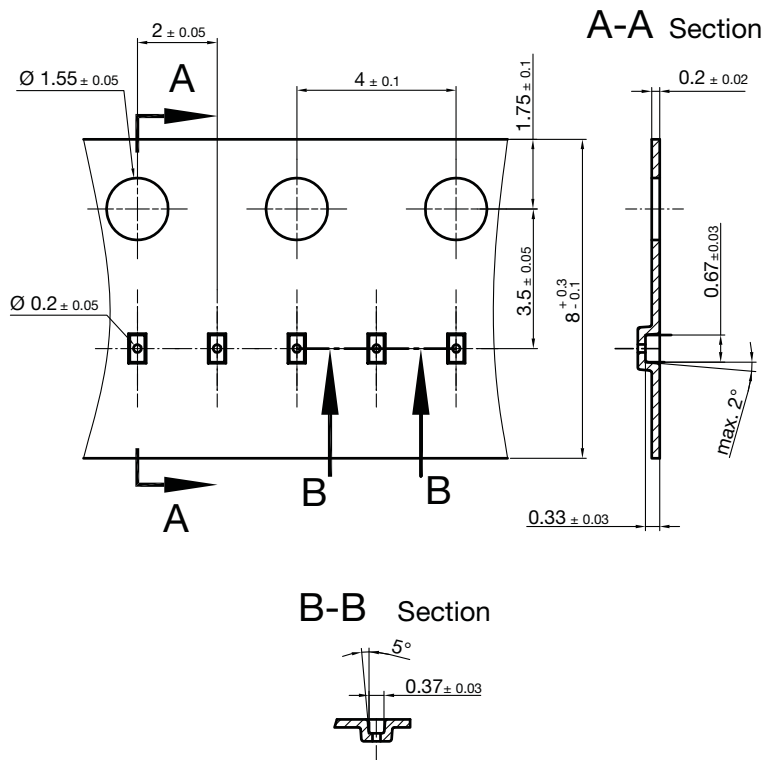
	Millimeters			mils		
	min.	nom.	max.	min.	nom.	max.
A	0.25	0.28	0.30	9.84	11.02	11.81
A1	0.01	0.01	0.02	0.39	0.39	0.79
A2	0.24	0.27	0.28	9.45	10.63	11.02
b	0.22	0.25	0.28	8.66	9.84	11.02
D	0.27	0.30	0.33	10.62	11.81	12.99
E	0.57	0.60	0.63	22.44	23.62	24.80
e		0.40			15.75	
e1		0.25			9.84	
L	0.12	0.15	0.18	4.72	5.91	7.09

22941

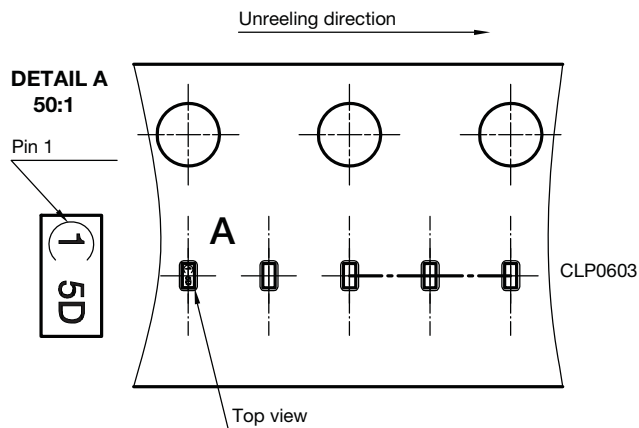
2 terminal leadless package (CLP)  
Document no.: S8-V-3906.04-023 (4)  
Created - Date: 22. Nov. 2010  
Rev.8 - Date: 11. Nov. 2016

**Footprint and soldering recommendation:**

please see Application Note: [www.vishay.com/doc?85917](http://www.vishay.com/doc?85917)

**CARRIER TAPE** in millimeters: **CLP0603-2L**

Cumulative tolerances of 10 sprocket holes is  $\pm 0.2\text{mm}$ 

22591  
Document no. S8-V-3906.04-0025 (4)  
Created - Date: 22. Nov. 2010

**ORIENTATION IN CARRIER CLP0603-2L**


22607

Orientation in Carrier Tape (CLP0603)  
S8-V-3906.04-026 (4)  
22.10.2010



## 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.