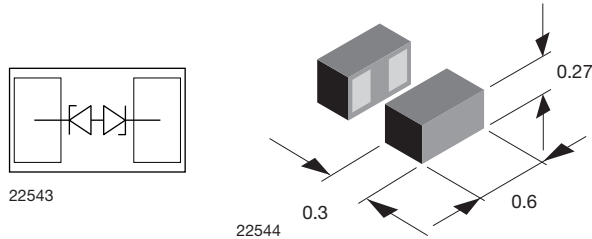


# Ultra Low Capacitance Bidirectional Symmetrical (BiSy) Single Line ESD Protection Diode in Silicon Package


**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  $\pm 5.5$  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)


**DESIGN SUPPORT TOOLS AVAILABLE**


| ORDERING INFORMATION     |   |             |   |                            |
|--------------------------|---|-------------|---|----------------------------|
| PART NUMBER<br>(EXAMPLE) | ENVIRONMENTAL AND QUALITY CODE                  |             | PACKAGING CODE                                  | ORDERING CODE<br>(EXAMPLE) |
|                          | RoHS-COMPLIANT +<br>LEAD (Pb)-FREE TERMINATIONS | GOLD PLATED | 15K PER 7" REEL<br>(8 mm TAPE)<br>15K/BOX = MOQ |                            |
|                          | GREEN   |             |   |                            |
| VBUS05B1-SD0-            | G   | 4           | -08   | VBUS05B1-SD0-G4-08         |

| PACKAGE DATA |              |           |         |   |
|--------------|--------------|-----------|---------|---|
| DEVICE NAME  | PACKAGE NAME | TYPE CODE | WEIGHT  | SOLDERING CONDITIONS  |
| VBUS05B1-SD0 | CLP0603-2L   | 5A        | 0.12 mg | Peak temperature max. 260 °C<br>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<br>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 VBUS05B1-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 VBUS05B1-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 VBUS05B1-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  | $V_{RWM}$     | -    | -                | 5.5  | V             |
| Reverse voltage  | at $I_R = 0.05\text{ }\mu\text{A}$  | $V_R$         | 5.5  | -                | -    | V             |
| Reverse current  | at $V_{RWM} = 5.5\text{ V}$   | $I_R$         | -    | $< 0.0009^{(1)}$ | 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); $t_p = 100\text{ ns}$<br>$I_{TLP} = 8\text{ A}$  | $V_{C-TLP}$   | -    | 20               | -    | V             |
|  | Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$<br>$I_{TLP} = 16\text{ A}$ |               | -    | 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)

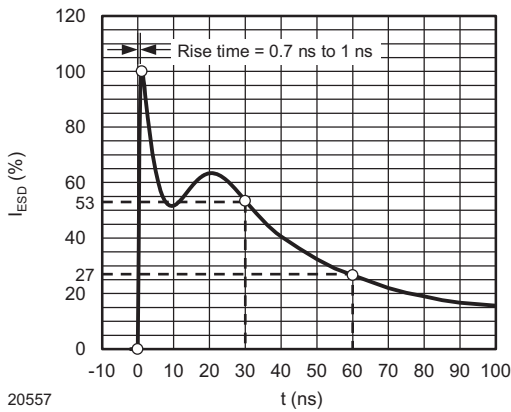


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

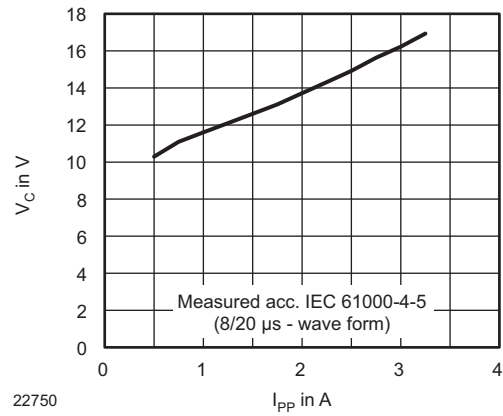


Fig. 4 - Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

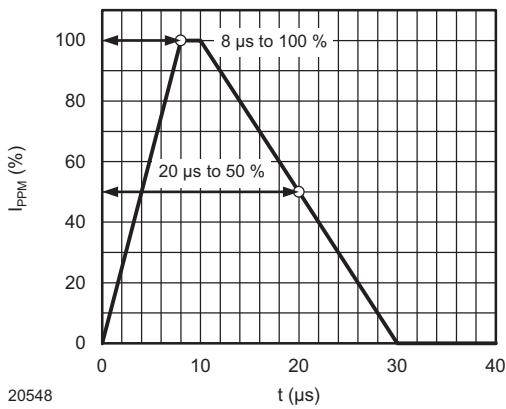


Fig. 2 - 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form acc. IEC 61000-4-5

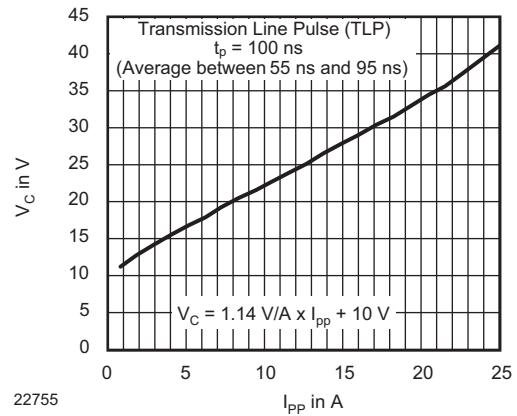


Fig. 5 - Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

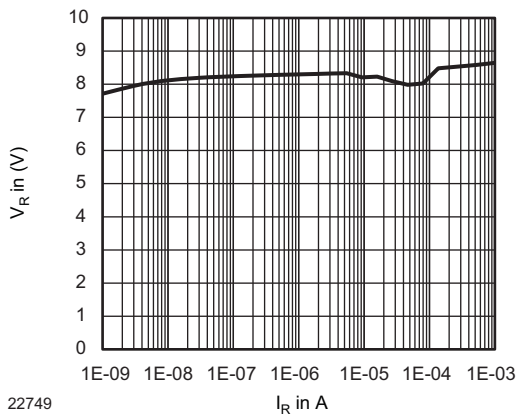


Fig. 3 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

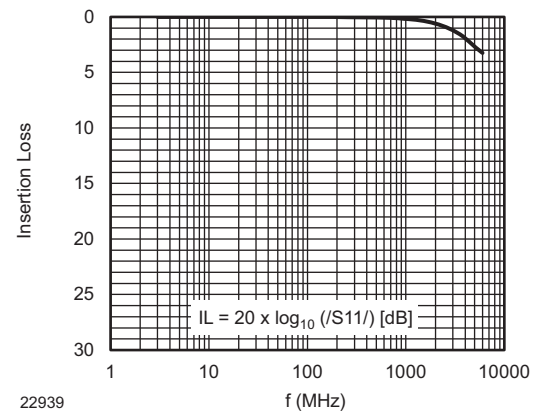
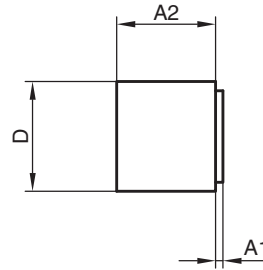
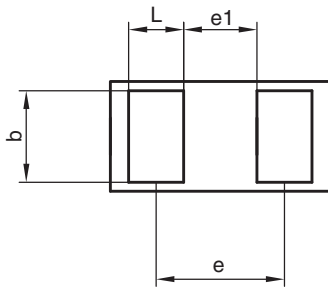


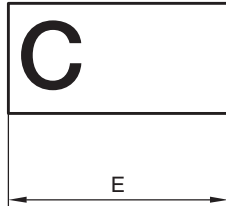
Fig. 6 - Typical Insertion Loss (IL) vs. Frequency



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

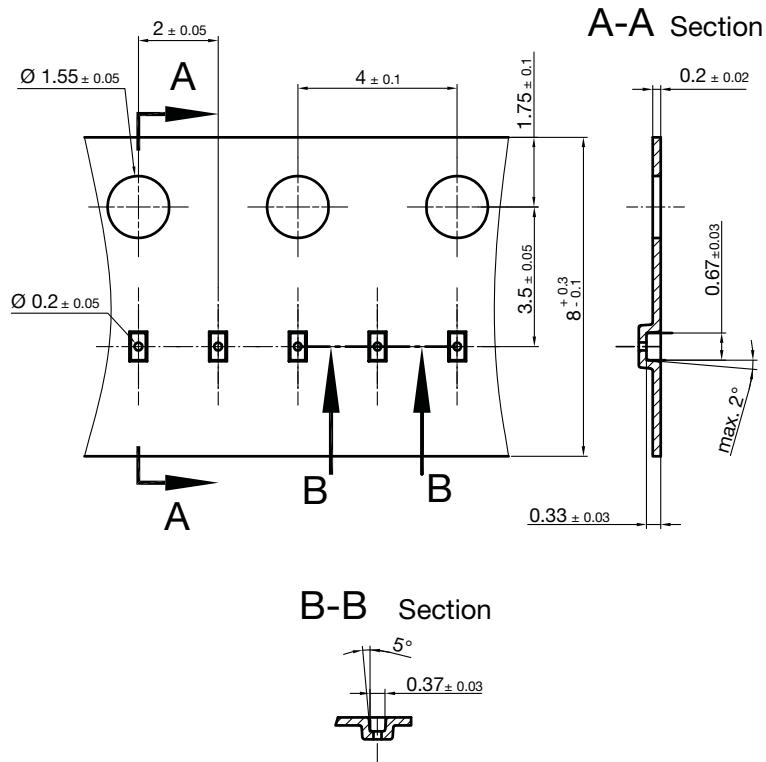
2 terminal leadless package (CLP)  
Document no.: S8-V-3906.04-023 (4)  
Created - Date: 22. Nov. 2010  
Rev.8 - Date: 11. Nov. 2016

Footprint and soldering recommendation:

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



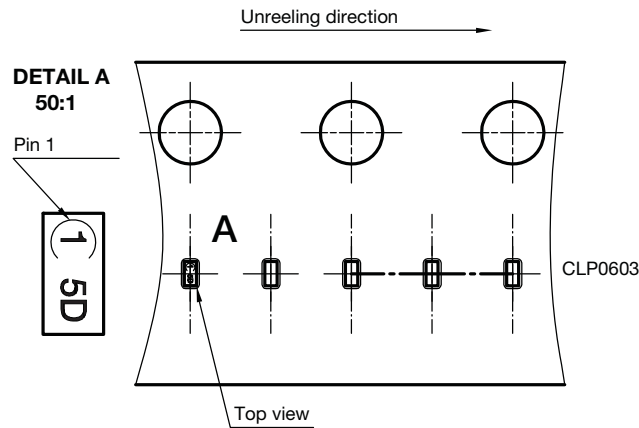
CARRIER TAPE in millimeters: CLP0603-2L



Cummulative tolerances of 10 sprocket holes is +/-0.2mm

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



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