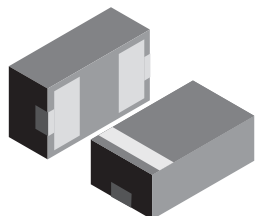
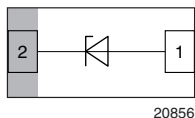




## ESD-Protection Diode in LLP1006-2L



20855



## MARKING (example only)



Bar = cathode marking

X = date code

Y = type code (see table below)

## FEATURES

- Ultra compact LLP1006-2L package
- Low package height < 0.4 mm
- 1-line ESD-protection
- Low leakage current < 0.5  $\mu$ A
- Low load capacitance  $C_D = 15$  pF ( $V_R = 2.5$  V;  $f = 1$  MHz)
- ESD-protection acc. IEC 61000-4-2  
± 30 kV contact discharge  
± 30 kV air discharge
- High surge current acc. IEC61000-4-5  $I_{PP} > 3.5$  A
- 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)
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## ORDERING INFORMATION

| DEVICE NAME   | ORDERING CODE      | TAPED UNITS PER REEL<br>(8 mm TAPE on 7" REEL) | MINIMUM ORDER QUANTITY |
|---------------|--------------------|------------------------------------------------|------------------------|
| VESD03A1B-HD1 | VESD03A1B-HD1-GS08 | 8000                                           | 8000                   |

## PACKAGE DATA

| DEVICE NAME   | PACKAGE NAME | TYPE CODE | WEIGHT  | MOLDING COMPOUND<br>FLAMMABILITY RATING | MOISTURE<br>SENSITIVITY LEVEL        | SOLDERING<br>CONDITIONS  |
|---------------|--------------|-----------|---------|-----------------------------------------|--------------------------------------|--------------------------|
| VESD03A1B-HD1 | LLP1006-2L   | J         | 0.72 mg | UL 94 V-0                               | MSL level 1<br>(according J-STD-020) | 260 °C/10 s at terminals |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER             | TEST CONDITIONS                                       | SYMBOL    | VALUE         | UNIT |
|-----------------------|-------------------------------------------------------|-----------|---------------|------|
| Peak pulse current    | Acc. IEC 61000-4-5; $t_P = 8/20$ $\mu$ s; single shot | $I_{PPM}$ | 3.5           | A    |
| Peak pulse power      | Acc. IEC 61000-4-5; $t_P = 8/20$ $\mu$ s; single shot | $P_{PP}$  | 31            | W    |
| 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   |
| Operating temperature | Junction temperature                                  | $T_J$     | - 40 to + 125 | °C   |
| Storage temperature   |                                                       | $T_{stg}$ | - 55 to + 150 | °C   |

**ELECTRICAL CHARACTERISTICS**

( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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 $I_R = 0.5\text{ }\mu\text{A}$            | $V_R$         | 3.3  | -    | -    | V             |
| Reverse current           | at $V_R = 3.5\text{ V}$                      | $I_R$         | -    | 0.04 | 0.5  | $\mu\text{A}$ |
| Reverse breakdown voltage | at $I_R = 1\text{ mA}$                       | $V_{BR}$      | 5    | 6    | 6.6  | V             |
| Reverse clamping voltage  | at $I_{PP} = 1\text{ A}$                     | $V_C$         | -    | 6.2  | 7.5  | V             |
|                           | at $I_{PP} = I_{PPM} = 3.5\text{ A}$         | $V_C$         | -    | 7.6  | 9    | V             |
| Forward clamping voltage  | at $I_{PP} = 0.2\text{ A}$                   | $V_F$         | -    | 0.9  | 1.2  | V             |
|                           | at $I_{PP} = 1\text{ A}$                     | $V_F$         | -    | 1.25 | -    | V             |
|                           | at $I_{PP} = I_{PPM} = 3.5\text{ A}$         | $V_F$         | -    | 1.8  | -    | V             |
| Capacitance               | at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$   | $C_D$         | -    | 25   | 28   | pF            |
|                           | at $V_R = 2.5\text{ V}$ ; $f = 1\text{ MHz}$ | $C_D$         | -    | 15   | -    | pF            |

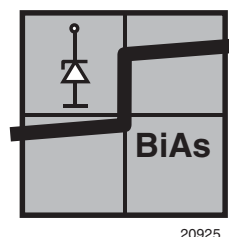
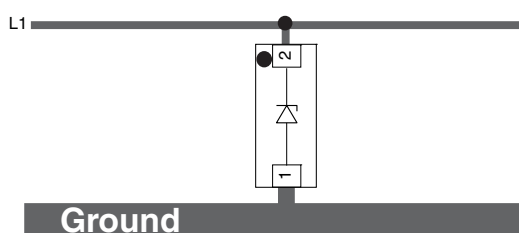
**BiAs-MODE** (bidirectional asymmetrical protection mode)

With the VESD03A1B-HD1 one signal- or data-lines (L1) can be protected against voltage transients. With pin 1 connected to ground and pin 2 connected to a signal- or data-line which has to be protected. As long as the voltage level on the data- or signal-line is between 0 V (ground level) and the specified maximum reverse working voltage ( $V_{RWM}$ ) the protection diode between data line and ground offers a high isolation to the ground line. The protection device behaves like an open switch.

As soon as any positive transient voltage signal exceeds the break through voltage level of the protection diode, the diode becomes conductive and shorts the transient current to ground. Now the protection device behaves like a closed switch. The clamping voltage ( $V_C$ ) is defined by the breakthrough voltage ( $V_{BR}$ ) level plus the voltage drop at the series impedance (resistance and inductance) of the protection device.

Any negative transient signal will be clamped accordingly. The negative transient current is flowing in the forward direction of the protection diode. The low forward voltage ( $V_F$ ) clamps the negative transient close to the ground level.

Due to the different clamping levels in forward and reverse direction the VESD03A1B-HD1 clamping behaviour is bidirectional and asymmetrical (BiAs).



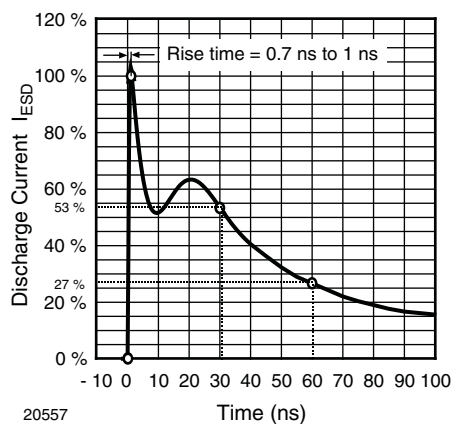
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


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

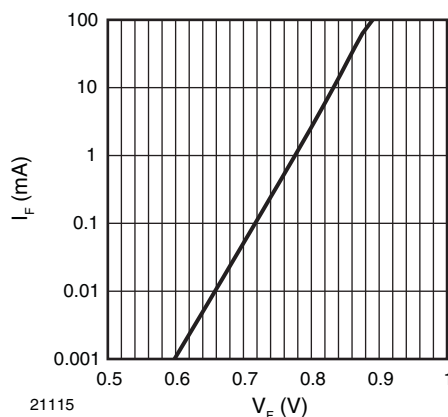


Fig. 4 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

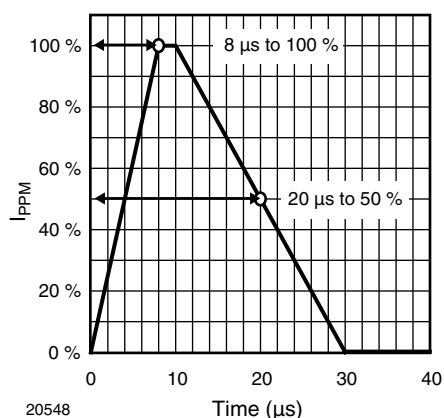


Fig. 2 - 8/20  $\mu$ s Peak Pulse Current Wave Form  
acc. IEC 61000-4-5

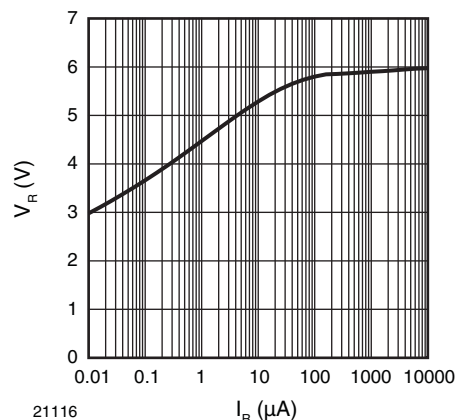


Fig. 5 - Typical Reverse Voltage  $V_R$  vs.  
Reverse Current  $I_R$

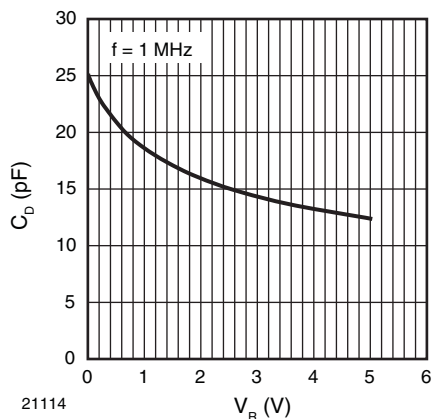


Fig. 3 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

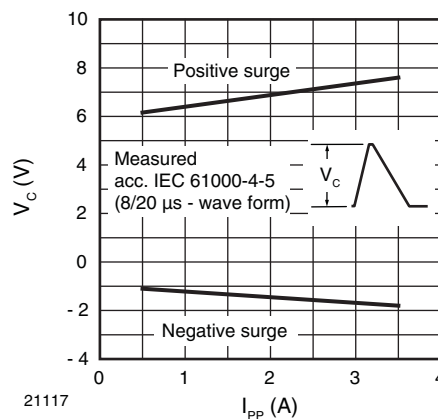


Fig. 6 - Typical Peak Clamping Voltage  $V_C$  vs.  
Peak Pulse Current  $I_{PP}$

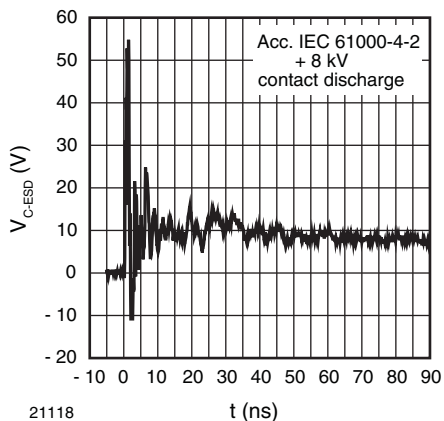


Fig. 7 - Typical Clamping Performance at + 8 kV Contact Discharge (acc. IEC 61000-4-2)

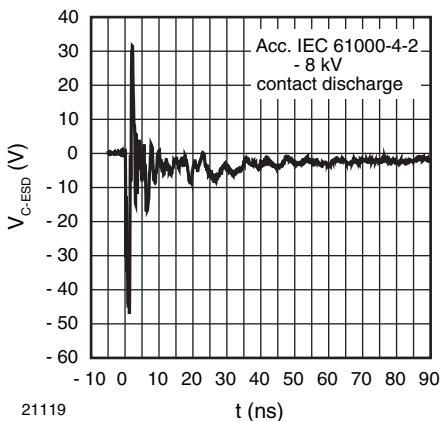


Fig. 8 - Typical Clamping Performance at - 8 kV Contact Discharge (acc. IEC 61000-4-2)

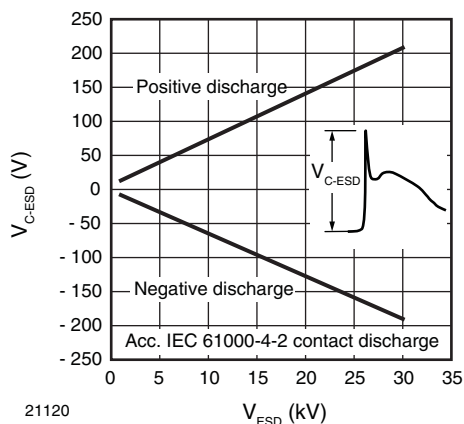
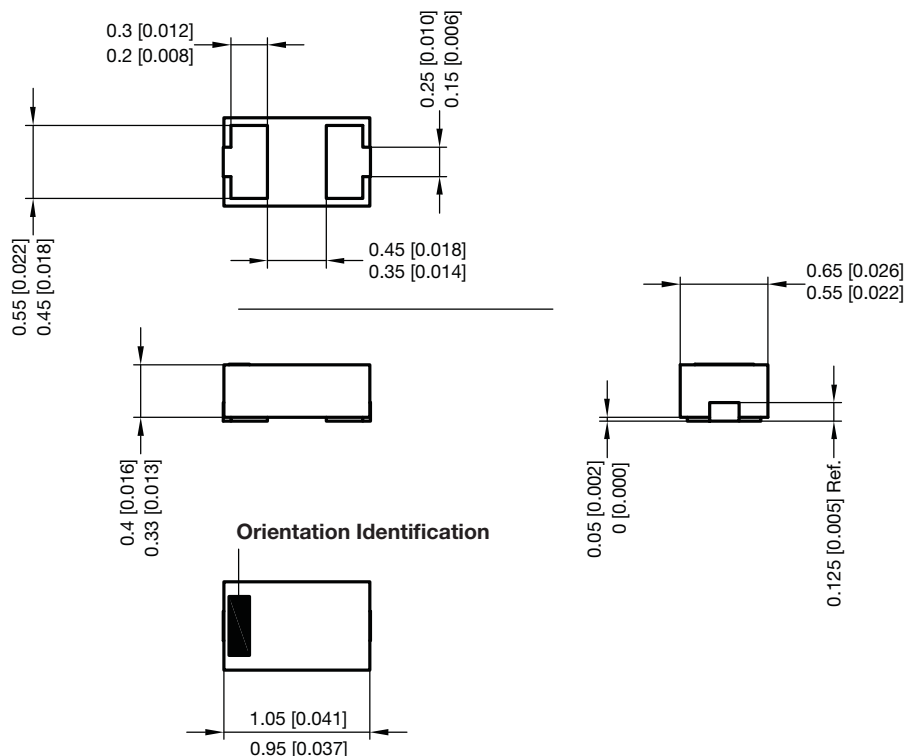
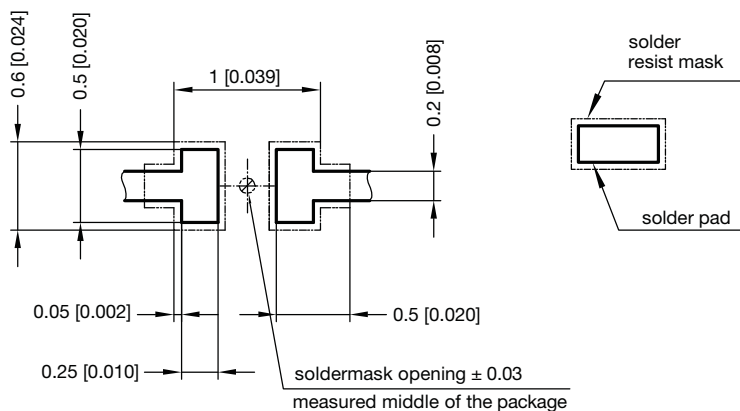


Fig. 9 - Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)

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



### Foot print recommendation:



Created - Date: 13. July. 2007  
 Rev. 5 - Date: 21 April 2010  
 Document no.: S8-V-3906.04-005 (4)  
 20812



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