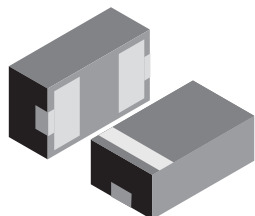
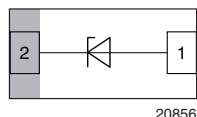


## ESD Protection Diode in LLP1006-2L



20855



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

### MARKING (example only)



Bar = cathode marking

X = date code

Y = type code (see table below)

### DESIGN SUPPORT TOOLS

[click logo to get started](#)

**3D**  
Models  
Available

### FEATURES

- Ultra compact LLP1006-2L package
- Low package height < 0.4 mm
- 1-line ESD protection
- Low leakage current < 0.01  $\mu$ A
- Low load capacitance  $C_D = 22.5$  pF ( $V_R = 6$  V;  $f = 1$  MHz)
- ESD immunity acc. IEC 61000-4-2  
 $\pm 30$  kV contact discharge  
 $\pm 30$  kV air discharge
- High surge current acc. IEC 61000-4-5  $I_{PP} > 8$  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)
- 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
VESD12A1A-HD1	VESD12A1A-HD1-GS08	8000	8000

### PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VESD12A1A-HD1	LLP1006-2L	K	0.72 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

### ABSOLUTE MAXIMUM RATINGS VESD12A1A-HD1

PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5; $t_P = 8/20$ $\mu$ s; single shot	$I_{PPM}$	8	A
Peak pulse power	Acc. IEC 61000-4-5; $t_P = 8/20$ $\mu$ s; single shot	$P_{PP}$	200	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	$V_{ESD}$	$\pm 30$	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		$\pm 30$	kV
Operating temperature	Junction temperature	$T_J$	-40 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.

**ELECTRICAL CHARACTERISTICS VESD12A1A-HD1**

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

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of line which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand-off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	12	V
Reverse voltage	At $I_R = 0.1\text{ }\mu\text{A}$	$V_R$	12	-	-	V
Reverse current	At $V_R = 12\text{ V}$	$I_R$	-	$< 0.01$	0.1	$\mu\text{A}$
Reverse breakdown voltage	At $I_R = 1\text{ mA}$	$V_{BR}$	13.5	14	16	V
Reverse clamping voltage	At $I_{PP} = 1\text{ A}$	$V_C$	-	14.8	17	V
	At $I_{PP} = I_{PPM} = 8\text{ A}$	$V_C$	-	21	24	V
Forward clamping voltage	At $I_{PP} = 0.2\text{ A}$	$V_F$	-	0.85	1.2	V
	At $I_{PP} = 1\text{ A}$	$V_F$	-	1.0	1.3	V
	At $I_{PP} = I_{PPM} = 8\text{ A}$	$V_F$	-	2.0	2.5	V
Capacitance	At $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	-	54	65	pF
	At $V_R = 6\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	-	22.5	-	pF

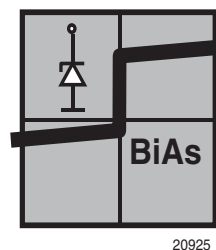
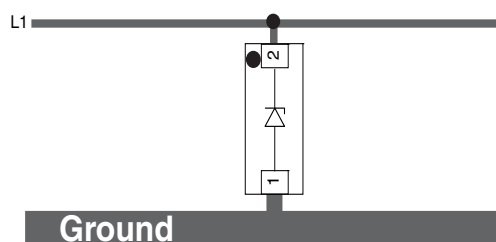
**BiAs-MODE** (bidirectional asymmetrical protection mode)

With the VESD12A1A-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 VESD12A1A-HD1 clamping behaviour is bidirectional and asymmetrical (BiAs).



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

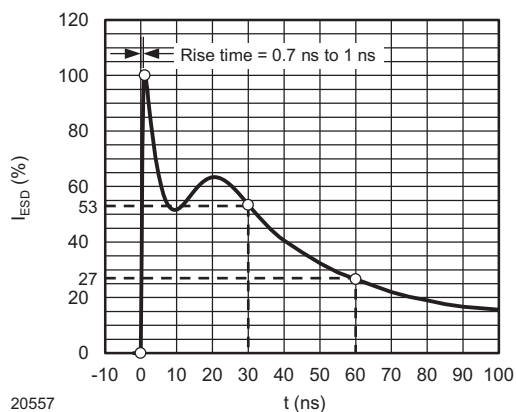


Fig. 1 - ESD Discharge Current Wave Form  
acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

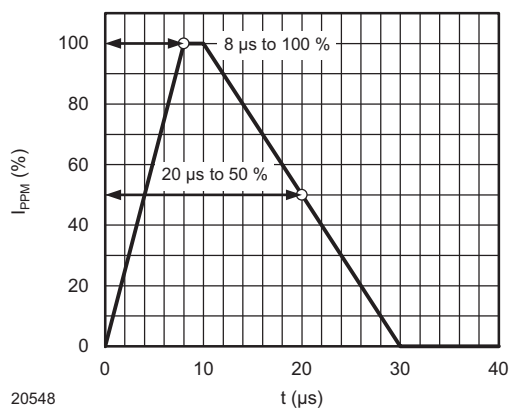


Fig. 2 - 8/20  $\mu$ s Peak Pulse Current Wave Form  
acc. IEC 61000-4-5

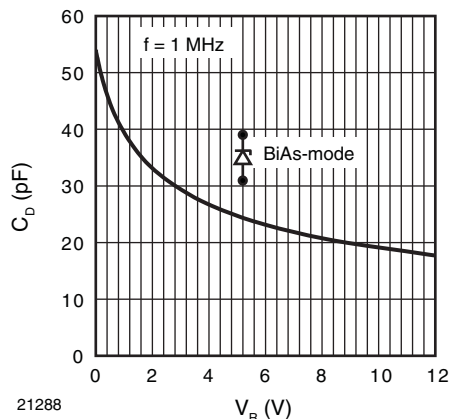


Fig. 3 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

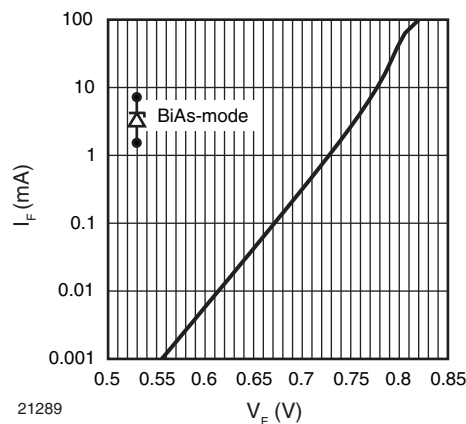


Fig. 4 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

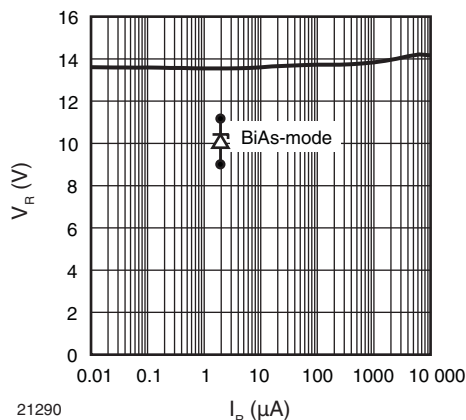


Fig. 5 - Typical Reverse Voltage  $V_R$  vs.  
Reverse Current  $I_R$

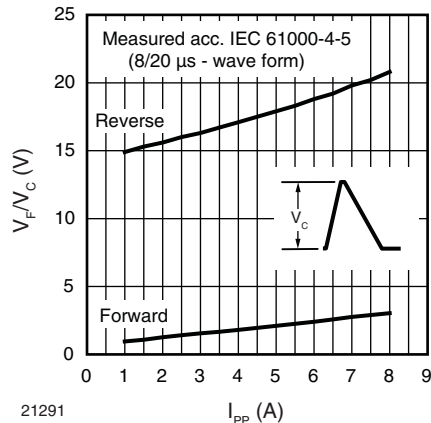


Fig. 6 - Typical Clamping Voltage vs.  
Peak Pulse Current  $I_{PP}$

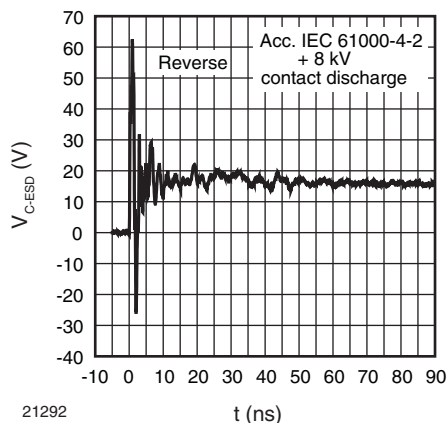


Fig. 7 - Typical Clamping Performance at + 8 kV Contact Discharge (acc. IEC 61000-4-2)

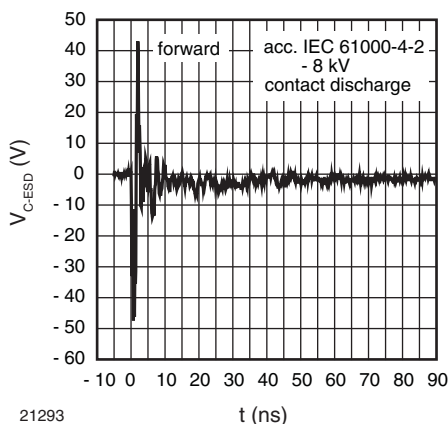


Fig. 8 - Typical Clamping Performance at - 8 kV Contact Discharge (acc. IEC 61000-4-2)

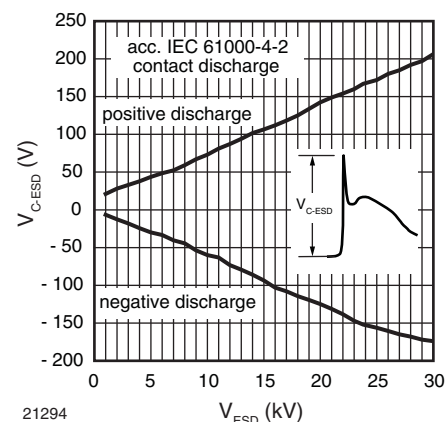
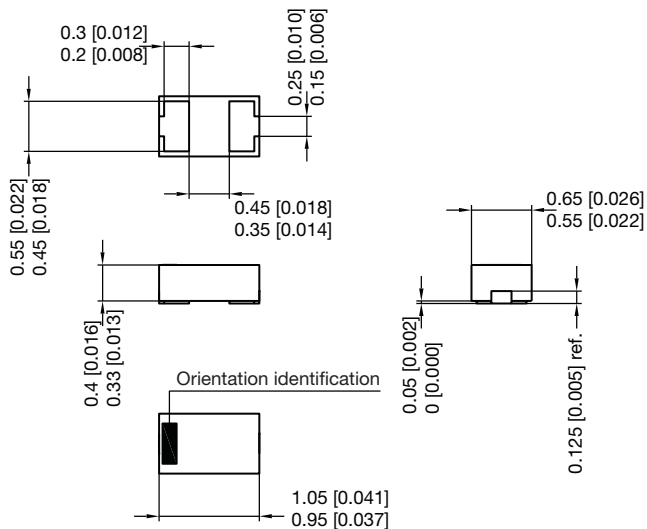


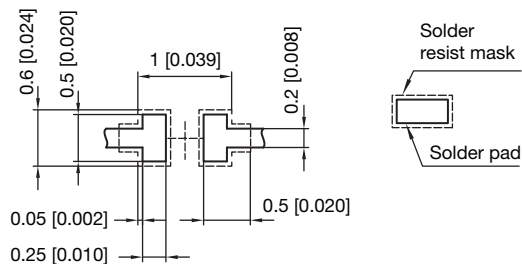
Fig. 9 - Typical Clamping Voltage at ± ESD Contact Discharge (acc. IEC 61000-4-2)



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

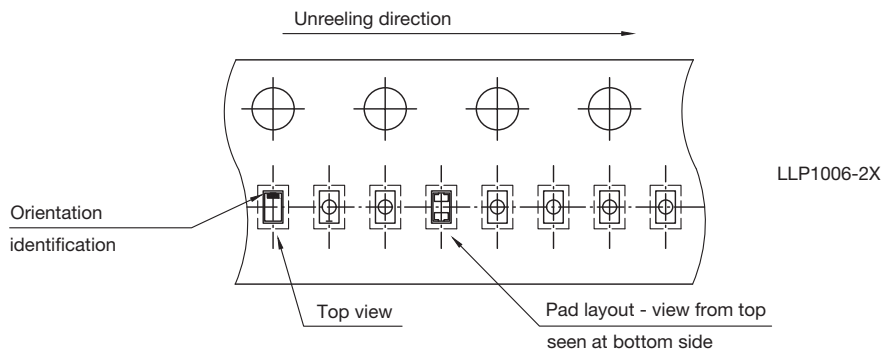


**Foot print recommendation:**



Pad Design Patented:  
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Document no.: S8-V-3906.04-005 (4)  
Rev. 7 - Date: 11.May 2016  
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S8-V-3906.04-017 (4)  
02.05.2017  
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