ESD-Protection Diode in LLP1006-2L

Features

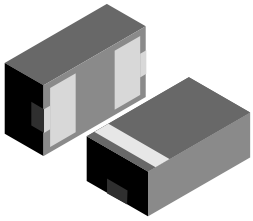
- Ultra compact LLP1006-2L package
- Low package height < 0.4 mm
- 1-line ESD-protection
- Low leakage current < 0.5 µA
- Low load capacitance C_D = 15 pF (V_R = 2.5 V; f = 1 MHz)
- ESD-protection acc. IEC 61000-4-2
  - ± 30 kV contact discharge
  - ± 30 kV air discharge
- High surge current acc. IEC61000-4-5 I_{PP} > 3.5 A
- Soldering can be checked by standard vision inspection. No X-ray necessary
- AEC Q101 qualified
- Lead (Pb)-free component
- Pin plating NiPdAu (e4) no whisker growth
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e4

RoHS COMPLIANT

GREEN (5-2008)**



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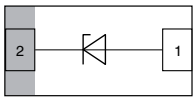

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Marking (example only)

21121

Bar = Cathode marking
X = Date code
Y = Type code (see table below)

Ordering Information

Device name	Ordering code	Taped units per reel (8 mm tape on 7" reel)	Minimum order quantity
VESD03A1B-HD1	VESD03A1B-HD1-GS08	8000	8000

Package Data

Device name	Package name	Marking code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
VESD03A1B-HD1	LLP1006-2L	J	0.72 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

Absolute Maximum Ratings

Rating	Test conditions	Symbol	Value	Unit
Peak pulse current	Acc. IEC 61000-4-5, t_P = 8/20 µs/single shot	I_{PPM}	3.5	A
Peak pulse power	Acc. IEC 61000-4-5, t_P = 8/20 µs/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	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

** Please see document “Vishay Green and Halogen-Free Definitions (5-2008)” http://www.vishay.com/doc?99902

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 **M**aximum **R**everse **W**orking **V**oltage (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 **C**lamping **V**oltage (V_C) is defined by the **BR**eakthrough **V**oltage (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 **F**orward **V**oltage (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 **Bi**directional and **As**ymmetrical (**BiAs**).

Electrical Characteristics

Ratings at 25 °C, ambient temperature, unless otherwise specified

VESD03A1B-HD1

BiAs mode (between pin 1 and pin 2)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 0.5 µA	V_{RWM}	3.3			V
Reverse current	at V_R = 3.3 V	I_R		0.04	0.5	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	5	6	6.6	V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		6.2	7.5	V
	at I_{PP} = I_{PPM} = 3.5 A	V_C		7.6	9	V
Forward clamping voltage	at I_{PP} = 0.2 A	V_F		0.9	1.2	V
	at I_{PP} = 1 A	V_F		1.25		V
	at I_{PP} = I_{PPM} = 3.5 A	V_F		1.8		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		25	28	pF
	at V_R = 2.5 V; f = 1 MHz	C_D		15		pF

Typical Characteristics

T_{amb} = 25 °C, unless otherwise specified

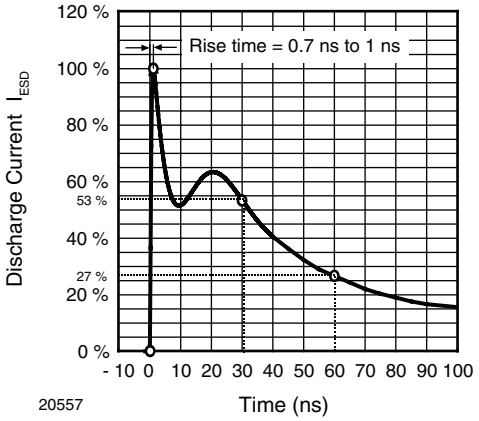


Figure 1. ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

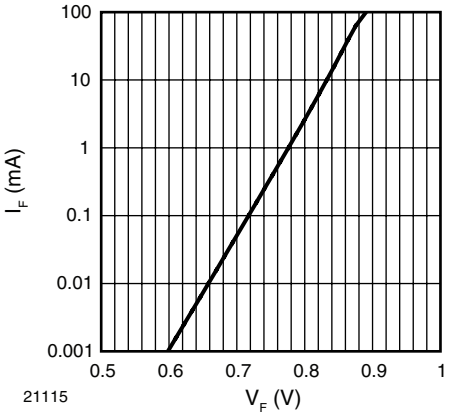


Figure 4. Typical Forward Current I_F vs. Forward Voltage V_F

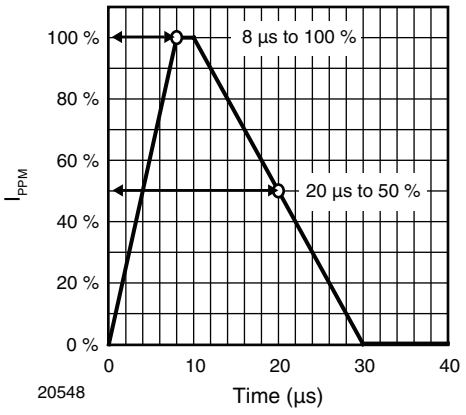


Figure 2. 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

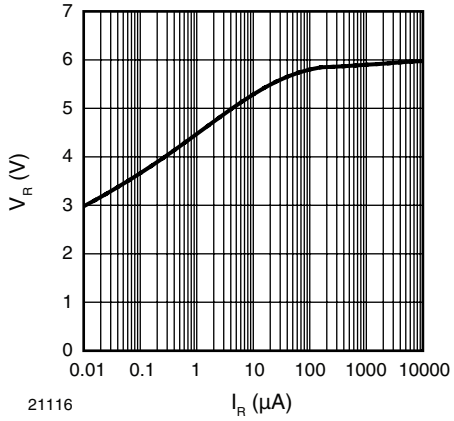


Figure 5. Typical Reverse Voltage V_R vs. Reverse Current I_R

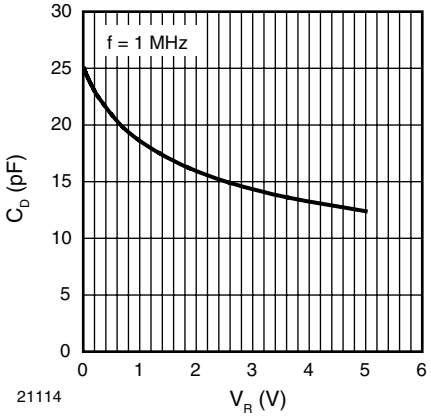


Figure 3. Typical Capacitance C_D vs. Reverse Voltage V_R

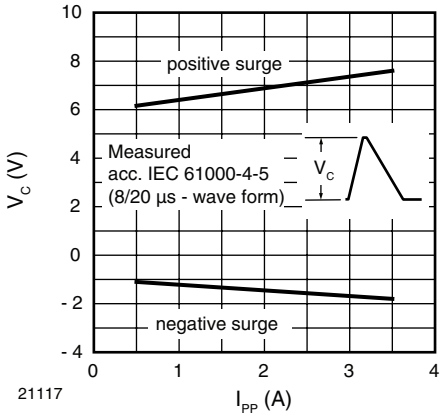


Figure 6. Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

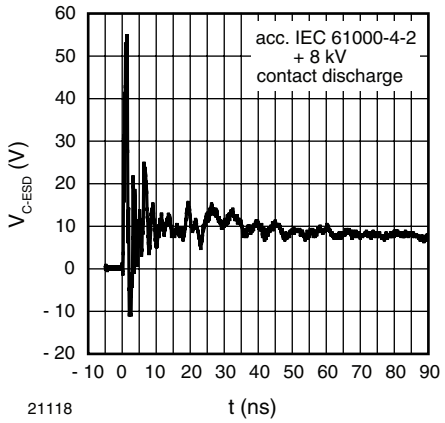


Figure 7. Typical Clamping Performance at + 8 kV
Contact Discharge (acc. IEC 61000-4-2)

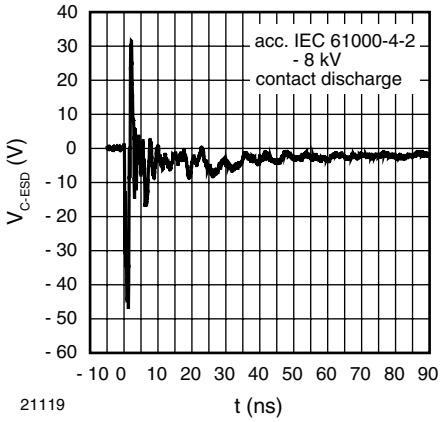


Figure 8. Typical Clamping Performance at - 8 kV
Contact Discharge (acc. IEC 61000-4-2)

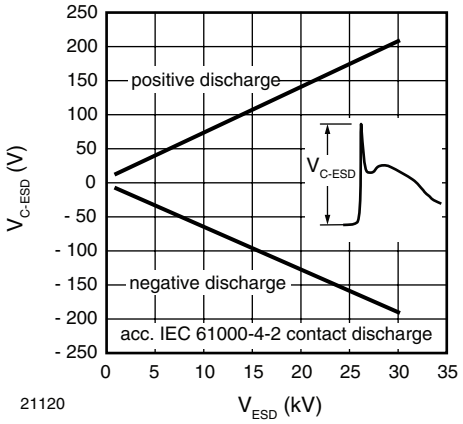
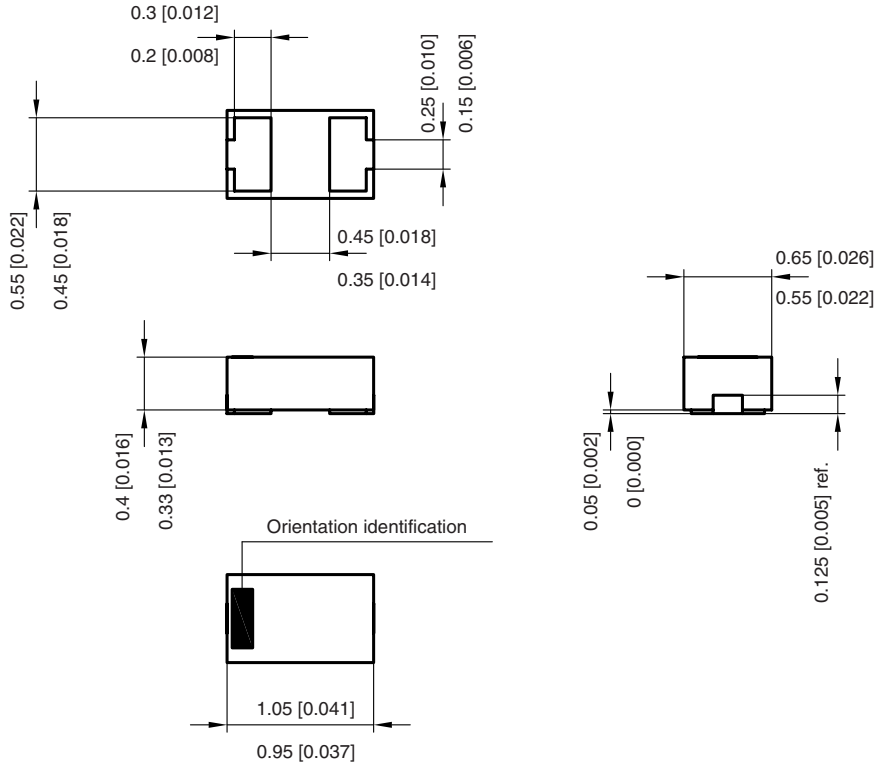
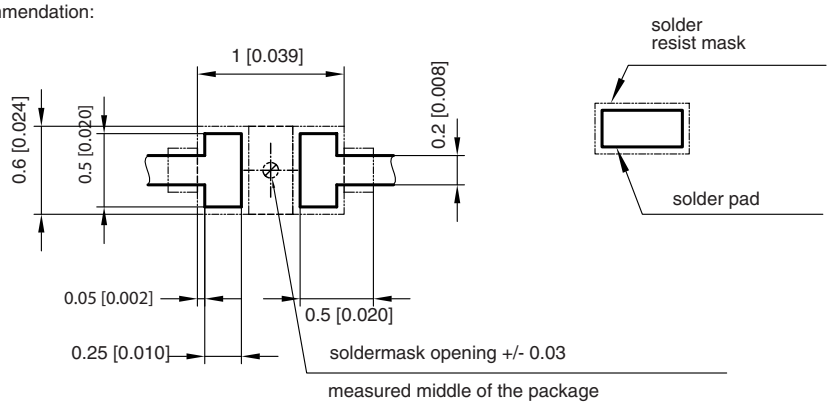


Figure 9. Typical Peak Clamping Voltage at ESD
Contact Discharge (acc. IEC 61000-4-2)

Package Dimensions in millimeters (inches): **LLP1006-2L**



foot print recommendation:



Created - Date: 13.July.2007
Rev. 4 - Date: 12.Sept.2008
Document no.:S8-V-3906.04-005 (4)
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Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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