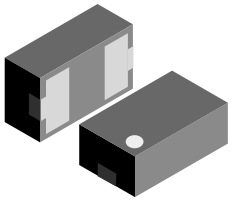
Low Capacitance, Single-Line ESD-Protection Diode

Features

- Ultra compact LLP1006-2L package
- Low package height < 0.4 mm
- 1-line ESD-protection
- Low leakage current < 0.1 µA
- Low load capacitance C_D = 1.3 pF
- ESD-protection to IEC 61000-4-2
  ± 15 kV contact discharge
  ± 15 kV air discharge
- High surge current acc. IEC61000-4-5 I_{PP} > 3 A
- Soldering can be checked by standard vision inspection. No X-ray necessary
- Lead (Pb)-free component
- Pin plating NiPdAu (e4) no whisker growth
- "Green" molding compound
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC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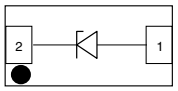

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Marking (example only)

21121

dot = 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
VBUS051BD-HD1	VBUS051BD-HD1-GS08	8000	8000

Package Data

Device name	Package name	Type code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
VBUS051BD-HD1	LLP1006-2L	A	0.72 mg	UL 94 V-0	MSL level 1 (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 µs; single shot	I_{PPM}	3	A
Peak pulse power	Acc. IEC 61000-4-5; t_P = 8/20 µs; single shot	P_{PP}	45	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 15	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 15	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 40 to + 150	°C

Electrical Characteristics

Ratings at 25 °C, ambient temperature unless otherwise specified

VBUS051BD-HD1

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of line which can be protected	N lines			1	lines
Reverse working voltage	at I_R = 0.1 µA; pin 2 to pin 1	V_{RWM}	5			V
Max. reverse current	at $V_R = V_{RWM}$ = 5 V; pin 2 to pin 1	I_R		< 0.01	0.1	µA
Min. reverse breakdown voltage	at I_R = 1 mA pin 2 to pin 1	V_{BR}	6.9	7.9	8.7	V
Max. clamping voltage	at I_{PP} = 3 A; acc. IEC 61000-4-5; pin 2 to pin 1	V_C			16	V
Max. forward clamping voltage	at I_F = 3 A; acc. IEC 61000-4-5; pin 1 to pin 2	V_F		1.9	2.5	V
Line capacitance	at V_R = 0 V; f = 1 MHz; pin 2 to pin 1	C_D		1.3	1.8	pF

Application Note

The **VBUS051BD-HD1** is an ESD-protection device with the characteristic of a Z-Diode with a high ESD-immunity and a very low capacitance which makes it usable for high frequency applications like USB2.0 or HDMI

With the **VBUS051BD-HD1** one high speed data line can be protected against transient voltage signals like ESD (Electro Static Discharge). Connected to the data line (pin 2) and to ground (pin 1) negative transients will be clamped close below the ground level while positive transients will be clamped close above the 5 V working range. The clamping behaviour of the **VBUS051BD-HD1** is bidirectional but asymmetrical (**BiAs**) and so it offers the best protection for applications running up to 5 V.

Typical Characteristics

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

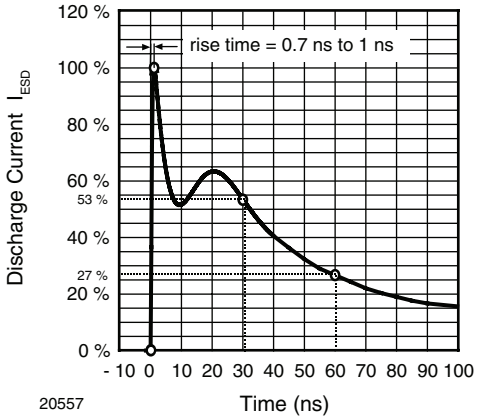


Figure 1. ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

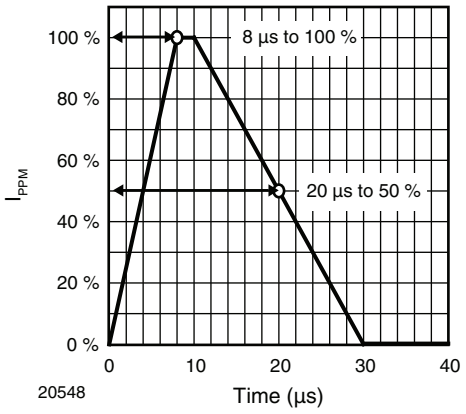


Figure 2. 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

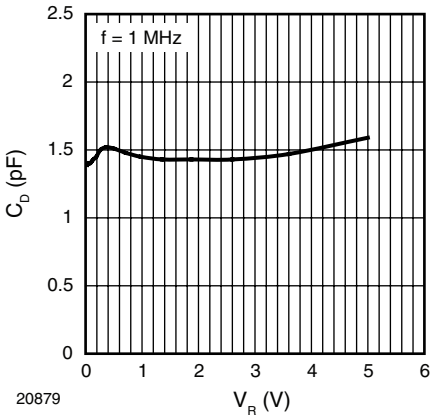


Figure 3. Typical Capacitance C_D vs. Reverse Voltage V_R

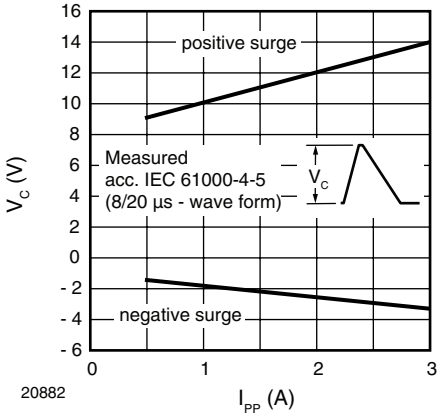


Figure 6. Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

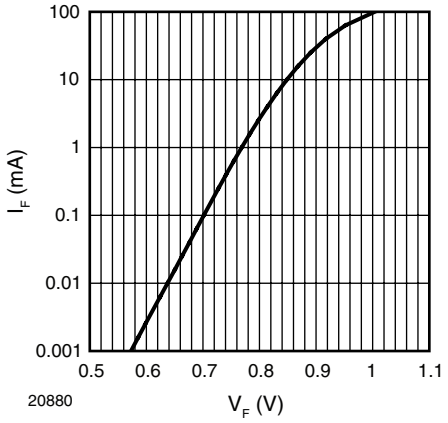


Figure 4. Typical Forward Current I_F vs. Forward Voltage V_F

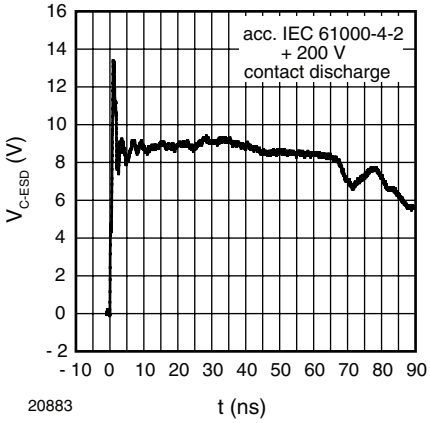


Figure 7. Typical Clamping Performance at + 200 V Contact Discharge (acc. IEC 61000-4-2)

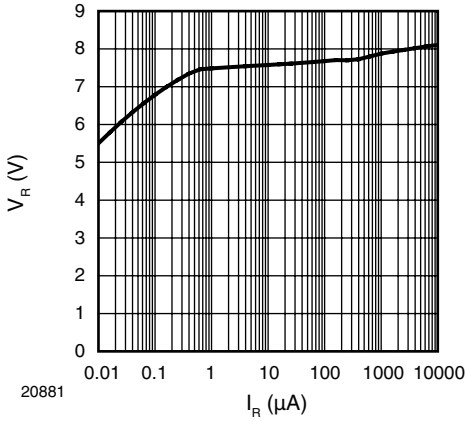


Figure 5. Typical Reverse Voltage V_R vs. Reverse Current I_R

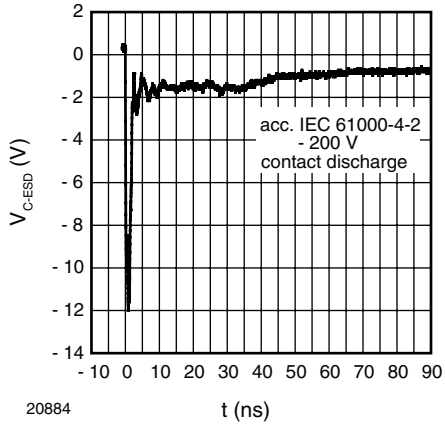


Figure 8. Typical Clamping Performance at - 200 V Contact Discharge (acc. IEC 61000-4-2)

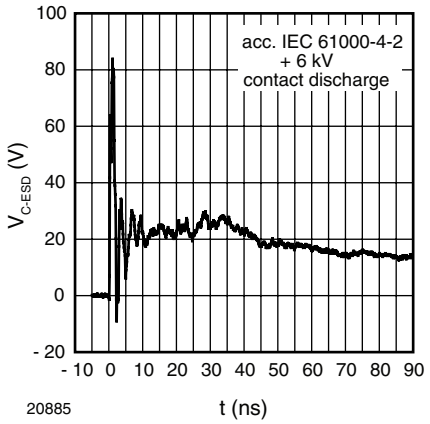


Figure 9. Typical Clamping Performance at + 6 kV Contact Discharge (acc. IEC 61000-4-2)

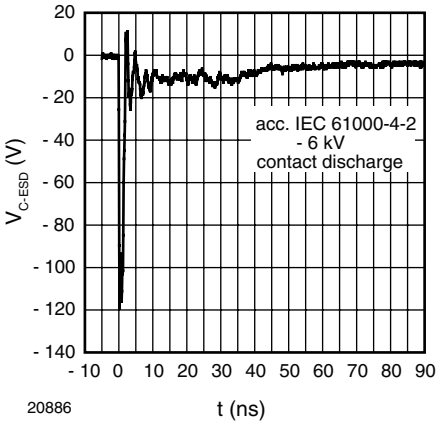
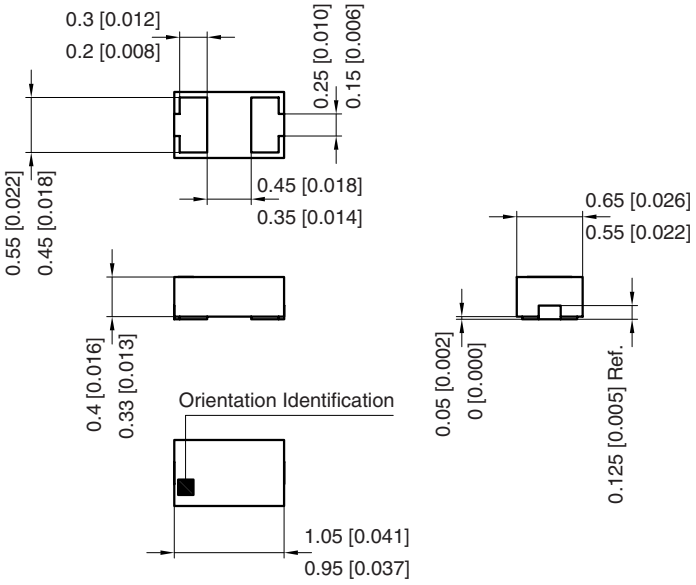
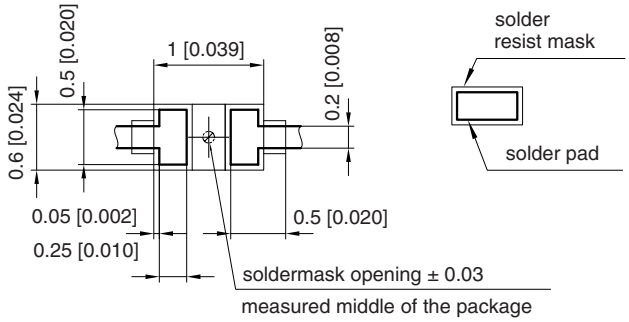


Figure 10. Typical Clamping Performance at - 6 kV Contact Discharge (acc. IEC 61000-4-2)

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



foot print recommendation:



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Rev. 2 - Date: 22.October.2007
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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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