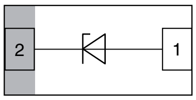
ESD-Protection Diode in LLP1006-2L



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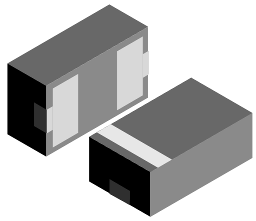

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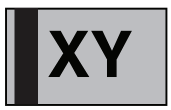
MARKING (example only)



21121

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 < 0.01 μA
- Low load capacitance C_D = 45 pF (V_R = 0 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} > 6 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

Pb-free
e4
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

ORDERING INFORMATION

DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (8 mm TAPE on 7" REEL)	MINIMUM ORDER QUANTITY
VESD15A1-HD1	VESD15A1-HD1-G4-08	8000	8000

PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VESD15A1-HD1	LLP1006-2L	W	0.72 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

ABSOLUTE MAXIMUM RATINGS RATINGS VESD15A1-HD1

PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5; t_P = 8/20 μs; single shot	I_{PPM}	6	A
Peak pulse power	Acc. IEC 61000-4-5; t_P = 8/20 μs; single shot	P_{PP}	150	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 VESD15A1-HD1 (T_{amb} = 25 °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}	-	-	15	V
Reverse voltage	at I_R = 0.1 µA	V_R	15	-	-	V
Reverse current	at V_R = 15 V	I_R	-	< 0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	15.5	16	17	V
Reverse clamping voltage	at I_{PP} = 1 A	V_C	-	18	20	V
	at I_{PP} = I_{PPM} = 6 A	V_C	-	24	27	V
Forward clamping voltage	at I_{PP} = 0.2 A	V_F	-	0.85	1.2	V
	at I_{PP} = 1 A	V_F	-	1.1	1.3	V
	at I_{PP} = I_{PPM} = 6 A	V_F	-	2.0	2.5	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	45	50	pF
	at V_R = 7.5 V; f = 1 MHz	C_D	-	18	-	pF
Clamping voltage	Transmission line pulse (TLP), t_p = 100 ns I_{TLP} = 8 A	$V_{C\text{-}TLP}$	-	19	-	V
	Transmission line pulse (TLP), t_p = 100 ns I_{TLP} = 16 A	$V_{C\text{-}TLP}$	-	20.5	-	V
Dynamic resistance	Transmission line pulse (TLP), t_p = 100 ns	R_{DYN}	-	0.27	-	Ω

BiAs-MODE (bidirectional asymmetrical protection mode)

With the VESD15A1-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 VESD15A1-HD1 clamping behavior is bidirectional and asymmetrical (BiAs).

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

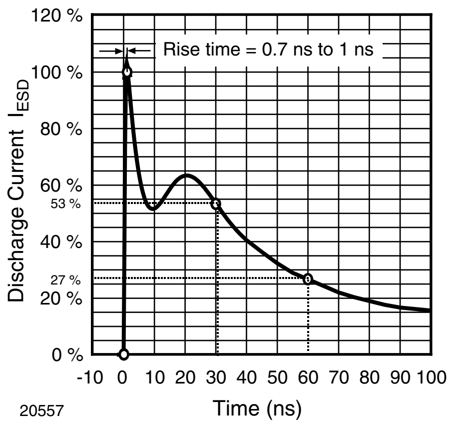


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

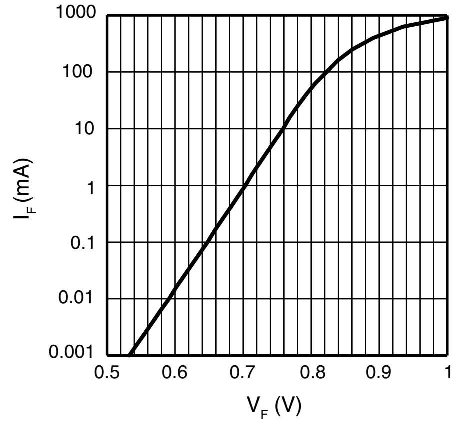


Fig. 4 - Typical Forward Current I_F vs. Forward Voltage V_F

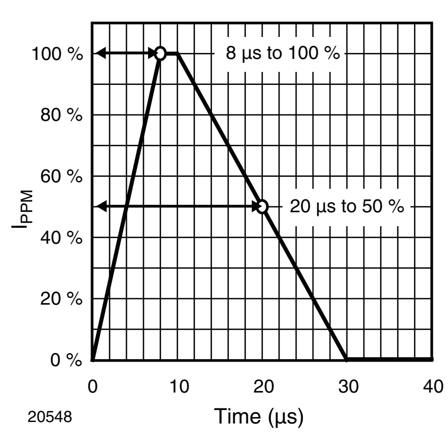


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

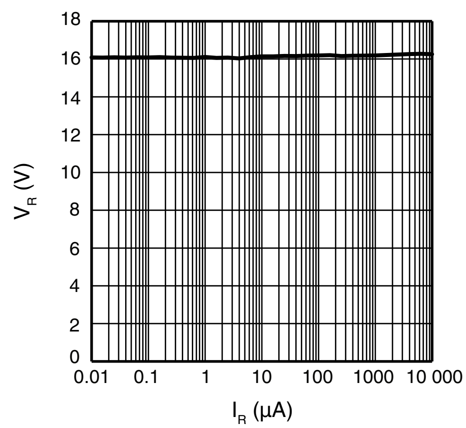


Fig. 5 - Typical Reverse Voltage V_R vs. Reverse Current I_R

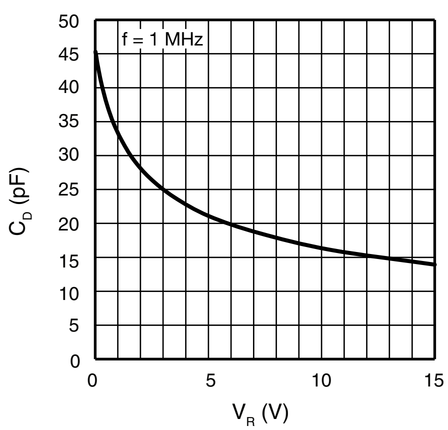


Fig. 3 - Typical Capacitance C_D vs. Reverse Voltage V_R

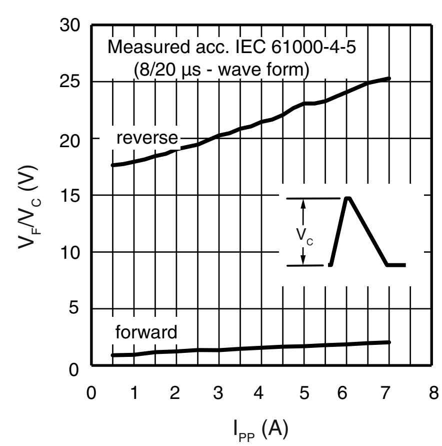


Fig. 6 - Typical Clamping Voltage vs. Peak Pulse Current I_{PP}

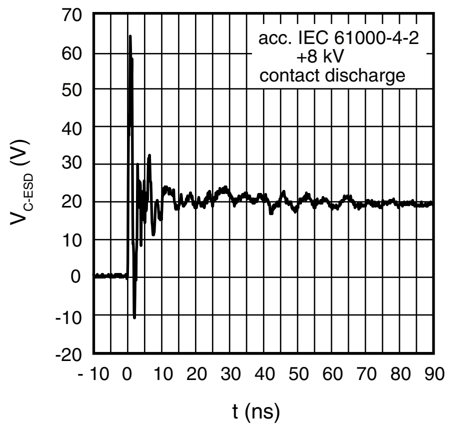


Fig. 7 - Typical Clamping Performance at +8 kV Contact Discharge (acc. IEC 61000-4-2)

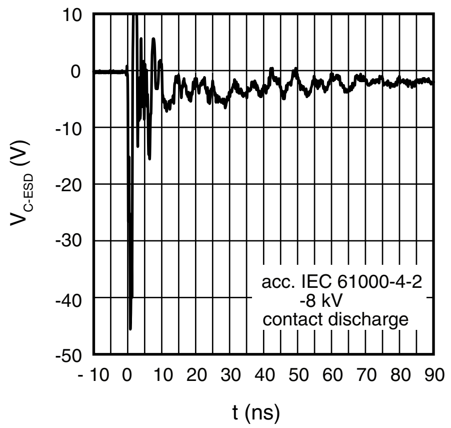


Fig. 8 - Typical Clamping Performance at -8 kV Contact Discharge (acc. IEC 61000-4-2)

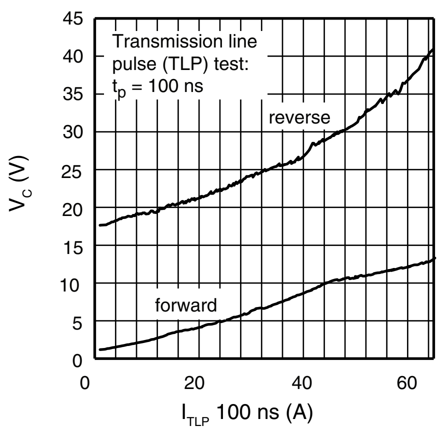
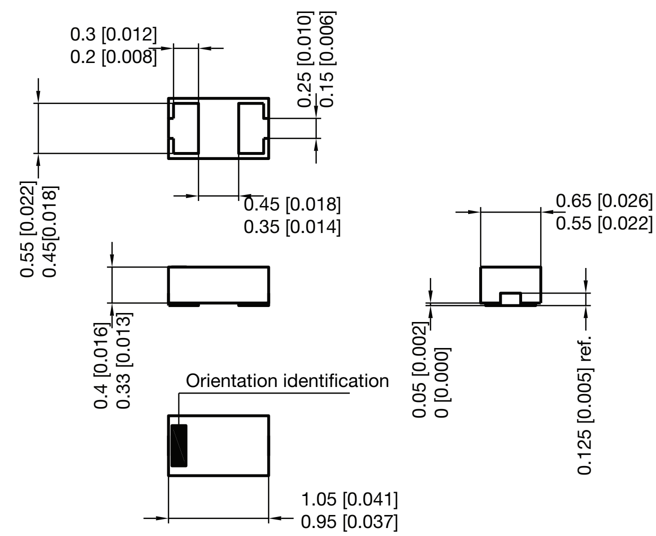
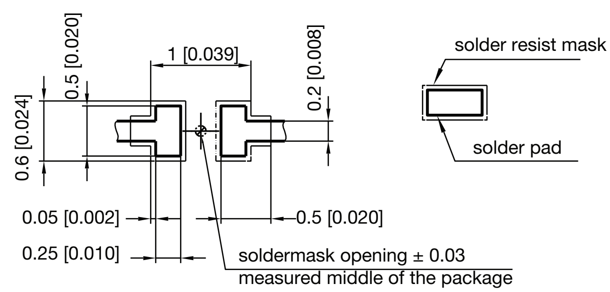


Fig. 9 - Typical Peak Clamping Voltage vs. TLP current (TLP = transmission line pulse; t_p = 100 ns)

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



Foot print recommendation:



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Rev. 6 - Date: 15.July 2015
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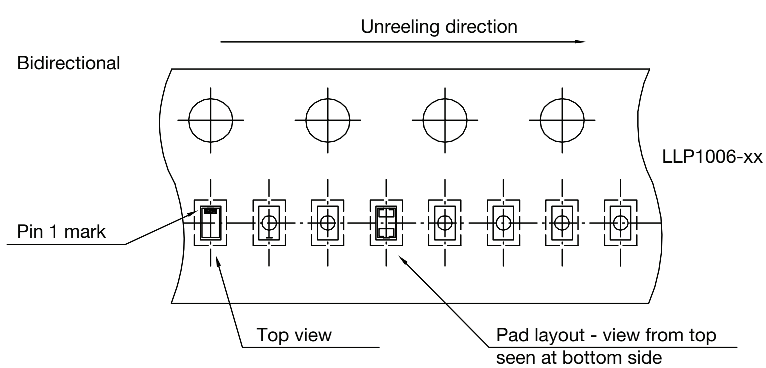
Pad design patented:
(® US 9,018,537 B2)



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