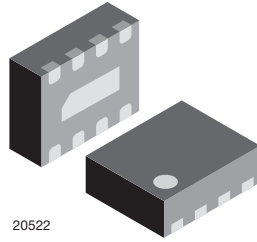
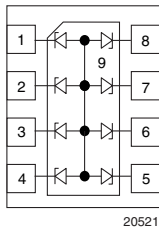


8-Line ESD Protection Diode Array in LLP1713-9L



FEATURES

- Ultra compact LLP1713-9L package
- Low package profile < 0.6 mm
- 8-line ESD protection
- Low leakage current $I_R < 0.5 \mu A$
- Low load capacitance $C_D = 20 \text{ pF}$
- ESD immunity acc. IEC 61000-4-2
± 17 kV contact discharge
± 17 kV air discharge
- Working voltage range $V_{RWM} = 5 \text{ V}$
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



MARKING (example only)



Dot = pin 1 marking
Y = type code (see table below)
XX = date code

DESIGN SUPPORT TOOLS

[click logo to get started](#)



ORDERING INFORMATION

| DEVICE NAME | ORDERING CODE | TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL) | MINIMUM ORDER QUANTITY |
|---------------|--------------------|--|------------------------|
| VESD05A8B-HNH | VESD05A8B-HNH-GS08 | 3000 | 15 000 |

PACKAGE DATA

| DEVICE NAME | PACKAGE NAME | TYPE CODE | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL | SOLDERING CONDITIONS |
|---------------|--------------|-----------|--------|---|--------------------------------------|------------------------------|
| VESD05A8B-HNH | LLP1713-9L | E | 3.7 mg | UL 94 V-0 | MSL level 1 (according J-STD-020) | Peak temperature max. 260 °C |

ABSOLUTE MAXIMUM RATINGS VESD05A8B-HNH

| RATING | TEST CONDITIONS | SYMBOL | VALUE | UNIT |
|-----------------------|---|-----------|-------------|------|
| Peak pulse current | BiAs-mode: each input (pin 1 to pin 8) to ground (pin 9); acc. IEC 61000-4-5; $t_p = 8/20 \mu s$; single shot | I_{PPM} | 4 | A |
| | BiSy-mode: each input (pin 1 to pin 8) to any other input pin. Pin 9 not connected. Acc. IEC 61000-4-5; $t_p = 8/20 \mu s$; single shot | I_{PPM} | 3 | A |
| Peak pulse power | BiAs-mode: each input (pin 1 to pin 8) to ground (pin 9); acc. IEC 61000-4-5; $t_p = 8/20 \mu s$; single shot | P_{PP} | 52 | W |
| | BiSy-mode: each input (pin 1 to pin 8) to any other input pin. Pin 9 not connected. Acc. IEC 61000-4-5; $t_p = 8/20 \mu s$; single shot | P_{PP} | 45 | W |
| ESD immunity | Contact discharge acc. IEC 61000-4-2; 10 pulses BiAs-mode: each input (pin 1 to pin 8) to ground (pin 9) | V_{ESD} | ± 17 | kV |
| | Air discharge acc. IEC 61000-4-2; 10 pulses BiSy-mode: each input (pin 1 to pin 8) to any other input pin. Pin 9 not connected | V_{ESD} | ± 10 | kV |
| Operating temperature | Junction temperature | T_J | -40 to +125 | °C |
| Storage temperature | | T_{STG} | -55 to +150 | °C |

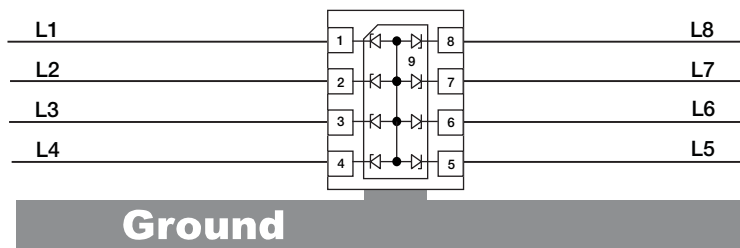
BiAs-MODE (8-line bidirectional asymmetrical protection mode)

With the VESD05A8B-HNH up to 8 signal- or data-lines (L1 to L8) can be protected against voltage transients. With pin 9 connected to ground and pin 1 up to pin 8 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 offer a high isolation to the ground line. The protection device behaves like an open switch.

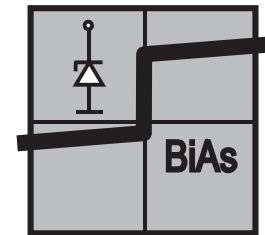
As soon as any positive transient voltage signal exceeds the break through voltage level of the protection diode, the diode becomes conductive and shorts the transient current to ground. Now the protection device behaves like a closed switch. The clamping voltage (V_C) is defined by the breakthrough 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 VESD05A8B-HNH clamping behaviour is bidirectional and asymmetrical (BiAs).



20524

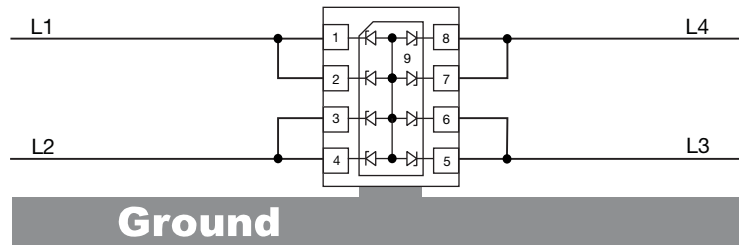

ELECTRICAL CHARACTERISTICS VESD05A8B-HNH (Between pin 1 to 8, and pin 9)

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

| PARAMETER | TEST CONDITIONS/REMARKS | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---------------------------|--|---------------|------|------|------|---------------|
| Protection paths | Number of lines which can be protected | $N_{channel}$ | - | - | 8 | lines |
| Reverse stand-off voltage | Max. reverse working voltage | V_{RWM} | - | - | 5 | V |
| Reverse voltage | at $I_R = 0.5\text{ }\mu\text{A}$ | V_R | 5 | - | - | V |
| Reverse current | at $V_R = V_{RWM} = 5\text{ V}$ | I_R | - | - | 0.5 | μA |
| Reverse breakdown voltage | at $I_R = 1\text{ mA}$ | V_{BR} | 6 | - | 8 | V |
| Reverse clamping voltage | at $I_{PP} = 4\text{ A}$ acc. IEC 61000-4-5 | V_C | - | - | 13 | V |
| Forward clamping voltage | at $I_F = 4\text{ A}$ acc. IEC 61000-4-5 | V_F | - | - | 4.5 | V |
| Capacitance | at $V_R = 0\text{ V}$; $f = 1\text{ MHz}$ | C_D | - | 20 | 23 | pF |
| | at $V_R = 2.5\text{ V}$; $f = 1\text{ MHz}$ | C_D | - | 12 | 14 | pF |

If a higher surge current or peak pulse current (I_{PP}) is needed, some protection diodes in the VESD05A8B-HNH can also be used in parallel in order to "multiply" the performance. If two diodes are switched in parallel you get

- double surge power = double peak pulse current ($2 \times I_{PPM}$)
- half of the line inductance = reduced clamping voltage
- half of the line resistance = reduced clamping voltage
- double line capacitance ($2 \times C_D$)
- double reverse leakage current ($2 \times I_R$)



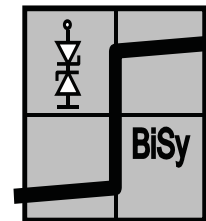
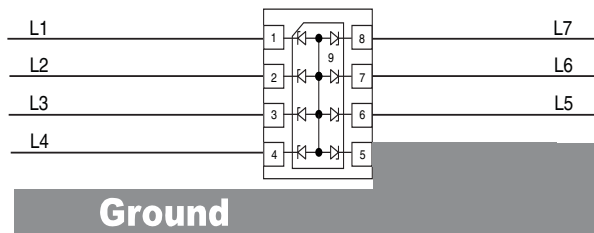
20525

BiSy-MODE (7-line bidirectional symmetrical protection mode)

If a bipolar symmetrical protection device is needed the VESD05A8B-HNH can also be used as a seven-line protection device. Therefore seven pins (example: pin 1, 2, 3, 4, 6, 7 and 8) has to be connected to the signal or data-line (L1 to L7) and pin 5 to ground. Pin 9 must not be connected!

Positive and negative voltage transients will be clamped in the same way. The clamping current from one data line through the VESD05A8B-HNH to the ground passes one diode in forward direction and the other one in reverse direction. The clamping voltage (V_C) is defined by the breakthrough voltage (V_{BR}) level of one diode plus the forward voltage of the other diode plus the voltage drop at the series impedances (resistances and inductances) of the protection device.

Due to the same clamping levels in positive and negative direction the VESD05A8B-HNH voltage clamping behaviour is also bidirectional and symmetrical (BiSy).



20526_1

| ELECTRICAL CHARACTERISTICS (One input pin 1 to 8 to any other input pin. Pin 9 not connected.) ($T_{amb} = 25\text{ }^\circ\text{C}$, unless otherwise specified) | | | | | | |
|---|--|---------------|------|------|------|---------------|
| PARAMETER | TEST CONDITIONS/REMARKS | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Protection paths | Number of lines which can be protected | $N_{channel}$ | - | - | 7 | lines |
| Reverse working voltage | Max. reverse working voltage | V_{RWM} | - | - | 5.5 | V |
| Reverse voltage | at $I_R = 0.5\text{ }\mu\text{A}$ | V_R | 5.5 | - | - | V |
| Reverse current | at $V_R = V_{RWM} = 5.5\text{ V}$ | I_R | - | - | 0.5 | μA |
| Reverse breakdown voltage | at $I_R = 1\text{ mA}$ | V_{BR} | 6.5 | - | 8.7 | V |
| Reverse clamping voltage | at $I_{PP} = 3\text{ A acc. IEC 61000-4-5}$ | V_C | - | - | 15 | V |
| Capacitance | at $V_R = 0\text{ V}$; $f = 1\text{ MHz}$ | C_D | - | 10 | 13 | pF |
| | at $V_R = 2.5\text{ V}$; $f = 1\text{ MHz}$ | C_D | - | 8 | 10 | pF |



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

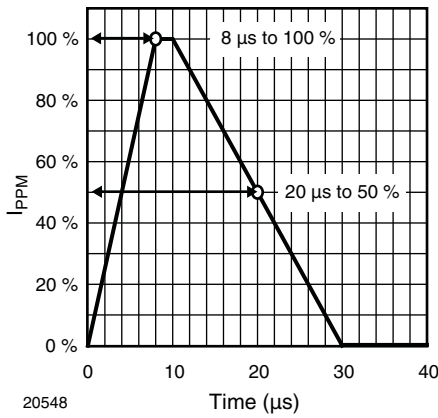


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

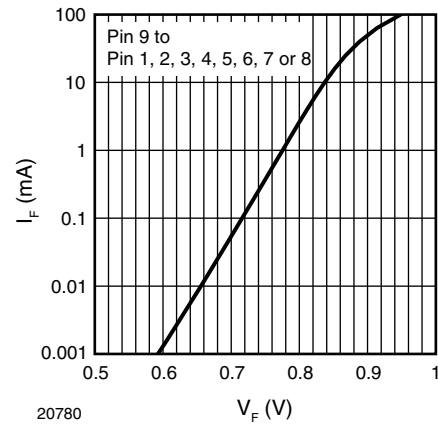


Fig. 4 - Typical Forward Current I_F vs. Forward Voltage V_F

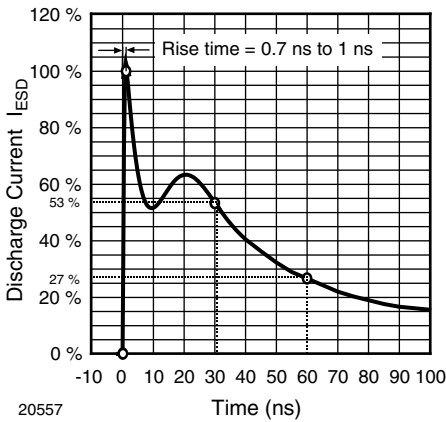


Fig. 2 - 8/20 μs Peak Pulse Current Wave Form acc. IEC 61000-4-5

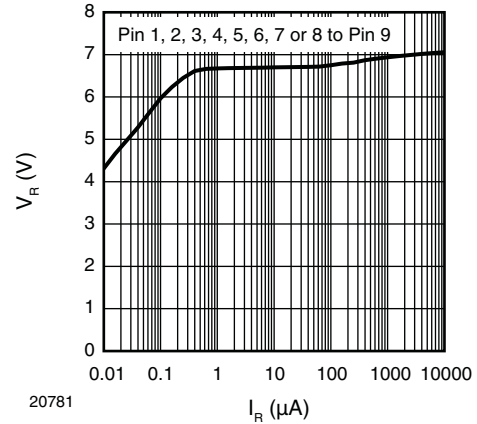


Fig. 5 - Typical Reverse Voltage V_R vs. Reverse Current I_R

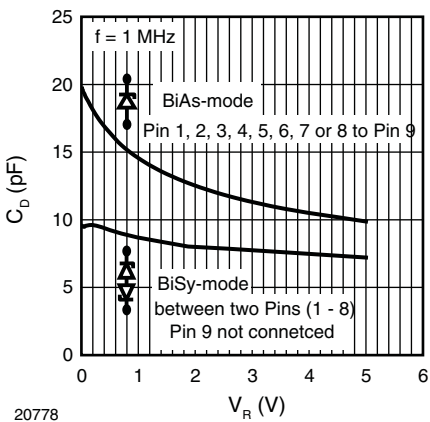


Fig. 3 - Typical Capacitance C_D vs. Reverse Voltage V_R

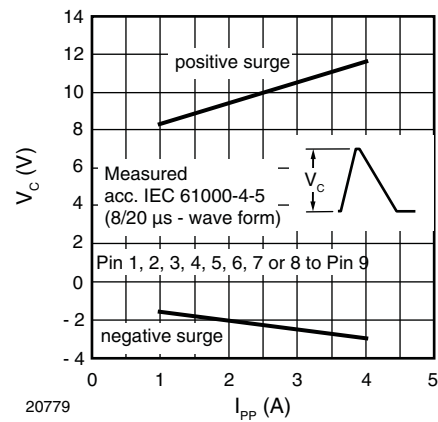
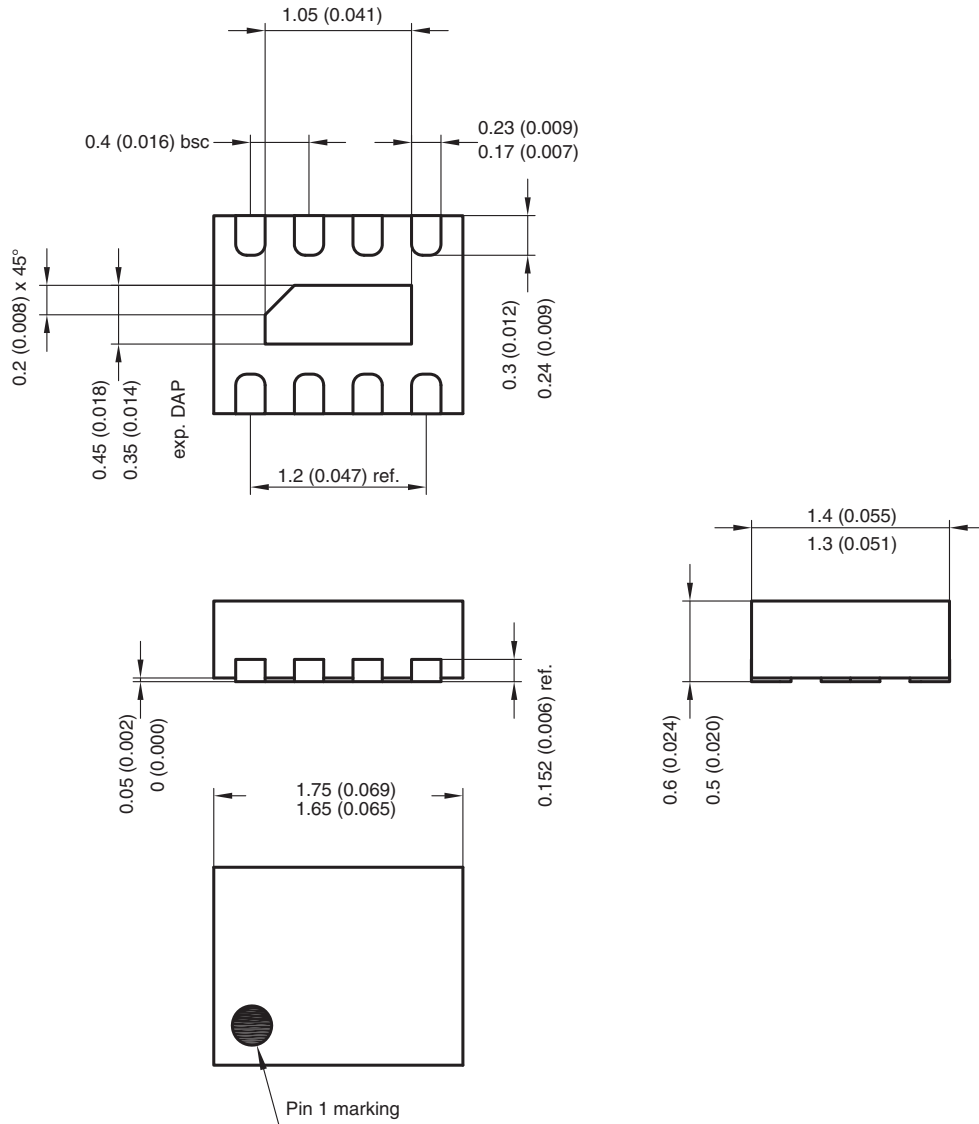


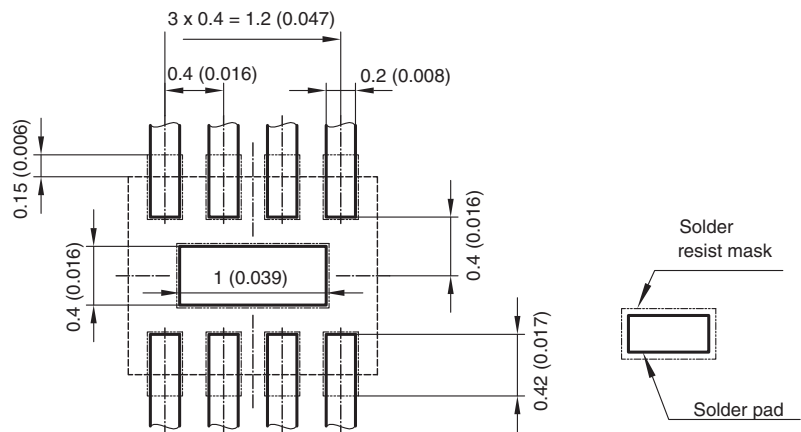
Fig. 6 - Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}



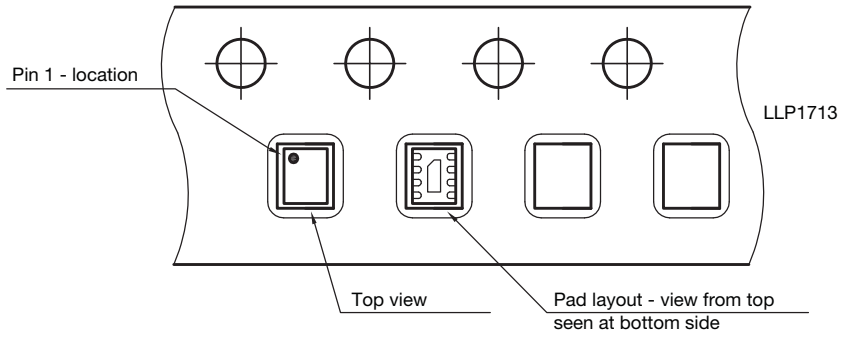
PACKAGE DIMENSIONS in millimeters (Inches): **LLP1713-9L**



Foot print recommendation:



Document no.:S8-V-3906.04-001 (4)
Created - Date: 28. August 2006
Rev. 1 - Date: 27. May 2008
20386





Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.