

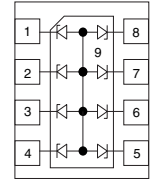
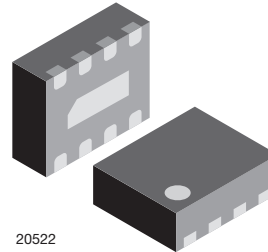
## 8-Line ESD-Protection Diode Array in LLP1713-9L

### 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  
 $\pm 17 \text{ kV}$  contact discharge  
 $\pm 17 \text{ kV}$  air discharge
- Working voltage range  $V_{RWM} = 5 \text{ V}$
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT  
**GREEN**  
[5-2008]\*\*



### Marking (example only)



Dot = Pin 1 marking  
 Y = Type code (see table below)  
 XX = Date code

### 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	Marking 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)	260 °C/10 s at terminals

\*\* Please see document "Vishay Material Category Policy" [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

## Absolute Maximum Ratings

Rating	Test conditions	Symbol	Value	Unit
Peak pulse current	BiAs-mode: each input (pin 1 - 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 - 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 - 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 - 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	Acc. IEC61000-4-2; 10 pulses BiAs-mode: each input (pin 1 - pin 8) to ground (pin 9)	Contact discharge	$V_{ESD}$	$\pm 17$ kV
		Air discharge	$V_{ESD}$	$\pm 17$ kV
	Acc. IEC 61000-4-2 ; 10 pulses BiSy-mode: each input (pin 1 - pin 8) to any other input pin. Pin 9 not connected	Contact discharge	$V_{ESD}$	$\pm 10$ kV
		Air discharge	$V_{ESD}$	$\pm 10$ kV
Operating temperature	Junction temperature	$T_J$	- 40 to + 125	$^{\circ}C$
Storage temperature		$T_{STG}$	- 55 to + 150	$^{\circ}C$

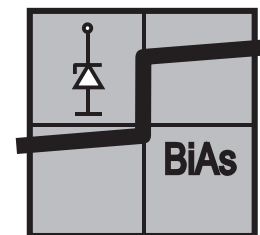
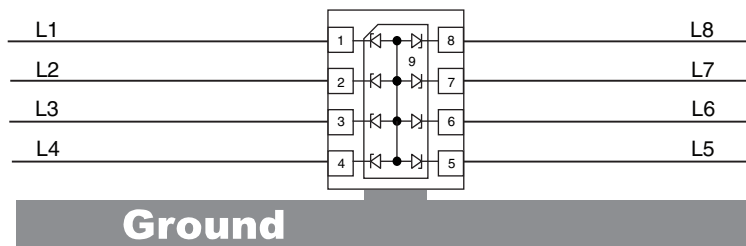
## BiAs-Mode (8-line Bidirectional Asymmetrical protection mode)

With the **VESD05A8B-HNH** up to 8 signal- or data-lines (L1 - 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

Ratings at 25 °C, ambient temperature unless otherwise specified

### VESD05A8B-HNH

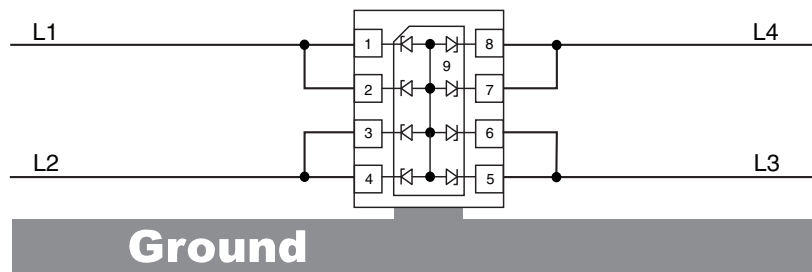
BiAs mode: each input (pin 1 - pin 8) to ground (pin 9)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of line which can be protected	N lines			8	lines
Reverse current	at $I_R = 0.5 \mu\text{A}$	$V_{RWM}$	5			V
Max. reverse current	at $V_R = V_{RWM} = 5 \text{ V}$	$I_R$			0.5	$\mu\text{A}$
Min. reverse breakdown voltage	at $I_R = 1 \text{ mA}$	$V_{BR}$	6		8	V
Max. clamping voltage	at $I_{PP} = 4 \text{ A}$ acc. IEC 61000-4-5	$V_C$			13	V
Max. forward clamping voltage	at $I_F = 4 \text{ A}$ acc. IEC 61000-4-5	$V_F$			4.5	V
Line 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** ( $2 \times I_R$ )



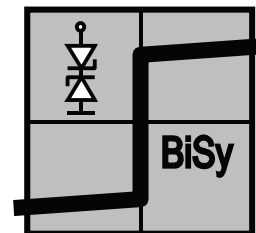
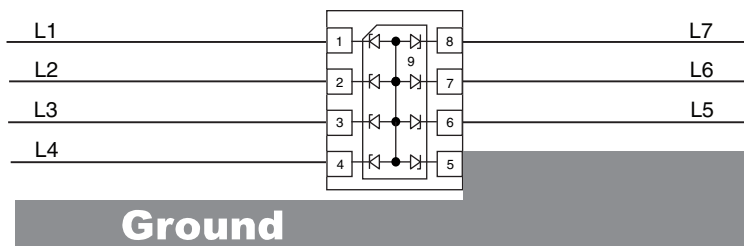
20525

## 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 - 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

Ratings at 25 °C, ambient temperature unless otherwise specified

### VESD05A8B-HNH

BiSy mode: each input (pin 1 - pin 8) to any other input pin connected to ground; pin 9 not connected

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of line which can be protected	$N_{lines}$			7	lines
Reverse current	at $I_R = 0.5 \mu A$	$V_{RWM}$	5.5			V
Max. reverse current	at $V_R = V_{RWM} = 5.5 V$	$I_R$			0.5	$\mu A$
Min. reverse breakdown voltage	at $I_R = 1 mA$	$V_{BR}$	6.5		8.7	V
Max. clamping voltage	at $I_{PP} = 3 A$ acc. IEC 61000-4-5	$V_C$			15	V
Line capacitance	at $V_R = 0 V$ ; $f = 1 MHz$	$C_D$		10	13	pF
	at $V_R = 2.5 V$ ; $f = 1 MHz$	$C_D$		8	10	pF

## Typical Characteristics

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

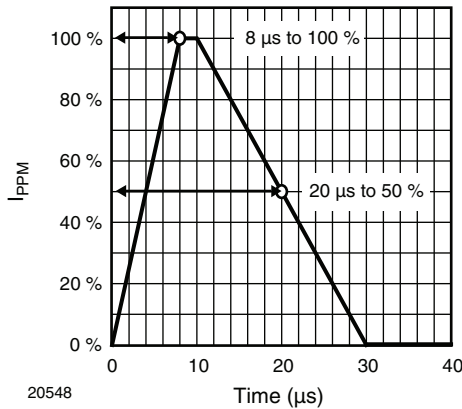


Figure 1. 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form acc. IEC 61000-4-5

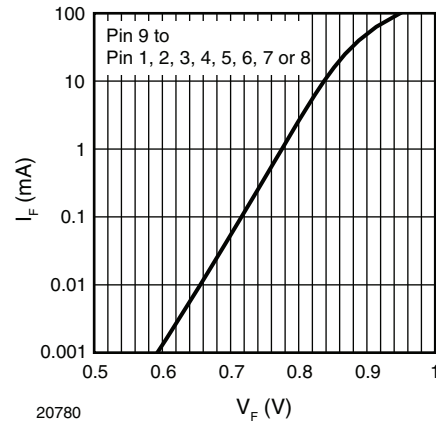


Figure 4. Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

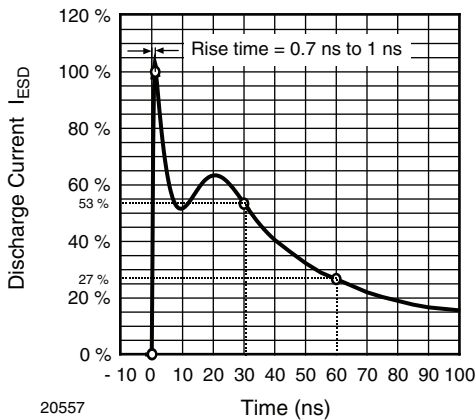


Figure 2. ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

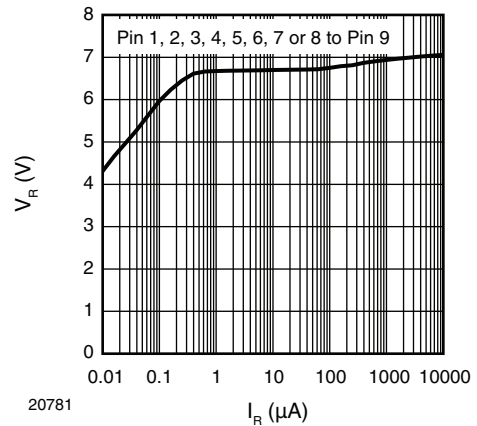


Figure 5. Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

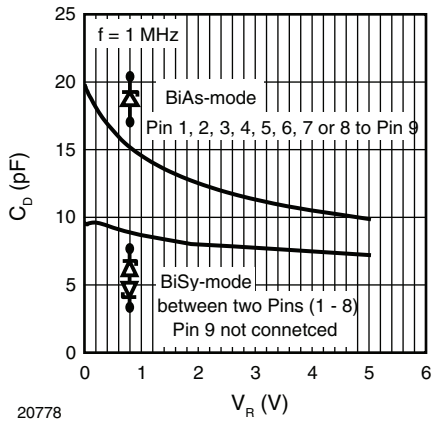


Figure 3. Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

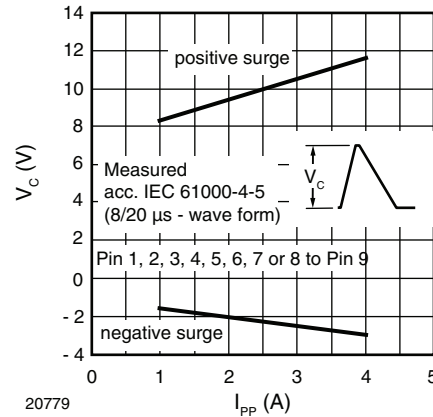
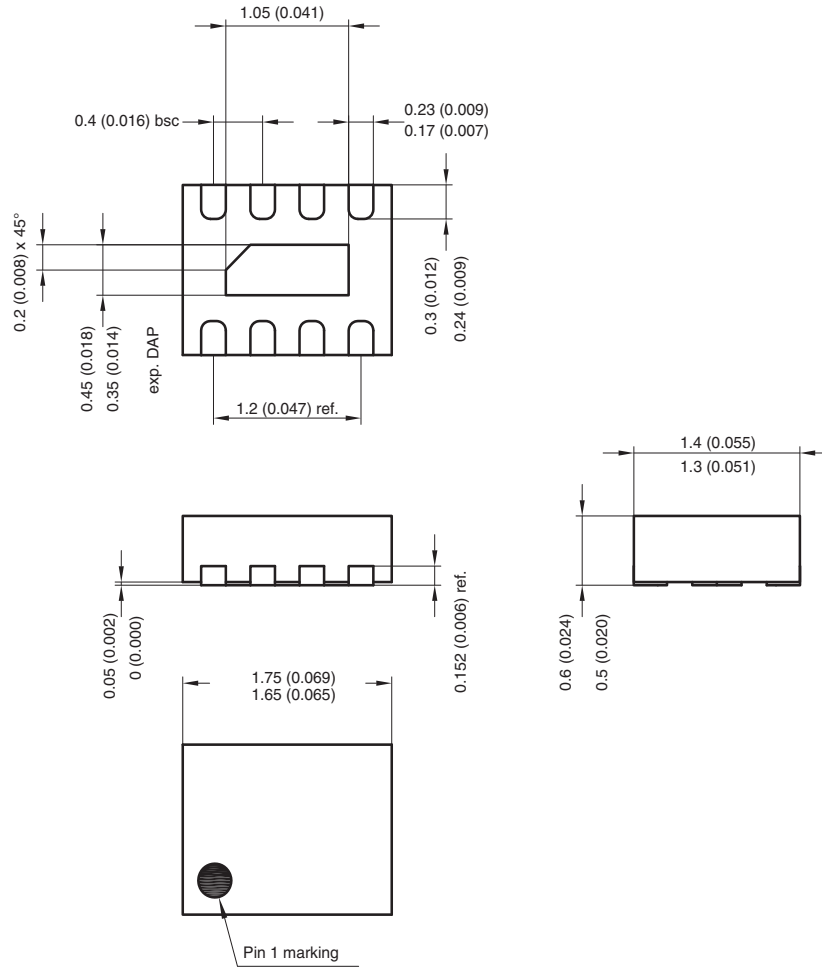
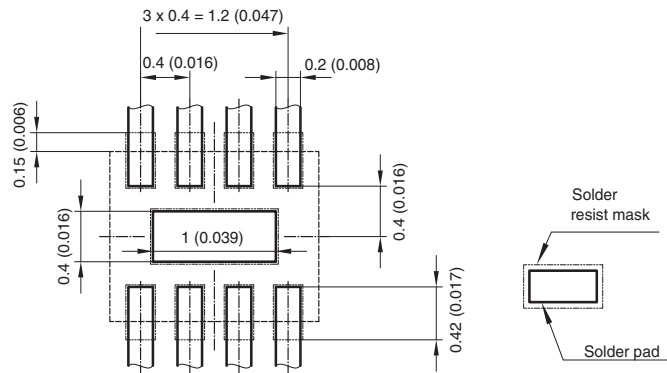


Figure 6. Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

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 specifications and data are subject to change without notice.

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 herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

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.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.