

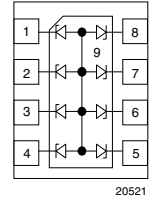
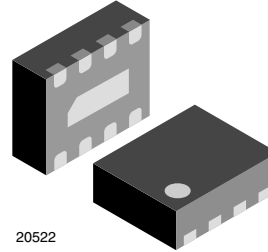
## 8-Line ESD-Protection Diode Array in LLP1713-9L

### Features

- Ultra compact LLP1713-9L package
- Low package profile < 0.6 mm
- **8-line** ESD-protection
- Low leakage current  $I_R < 1 \mu A$
- Low load capacitance  $C_D = 30 \text{ pF}$
- ESD-immunity acc. IEC 61000-4-2  
 $\pm 25 \text{ kV}$  contact discharge  
 $\pm 30 \text{ kV}$  air discharge
- Working voltage range  $V_{RWM} = 5 \text{ V}$
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and 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
VESD05A8A-HNH	VESD05A8A-HNH-GS08	3000	15 000

### Package Data

Device name	Package name	Marking code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
VESD05A8A-HNH	LLP1713-9L	B	3.7 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

\* Please see document "Vishay Green and Halogen-Free Definitions (5-2008)" <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	$I_{PPM}$	5	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	$I_{PPM}$	2.5	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	$P_{PP}$	65	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	$P_{PP}$	33	W
ESD-immunity	Acc. IEC61000-4-2; 10 pulses BiAs-mode: each input (pin 1 - pin 8) to ground (pin 9)	Contact discharge	$V_{ESD}$	$\pm 25$ kV
		Air discharge	$V_{ESD}$	$\pm 30$ 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	$V_{ESD}$	$\pm 12$ kV
		Air discharge	$V_{ESD}$	$\pm 12$ kV
Operating temperature	Junction temperature	$T_J$	- 40 to + 125	$^{\circ}C$
Storage temperature		$T_{STG}$	- 55 to + 150	$^{\circ}C$

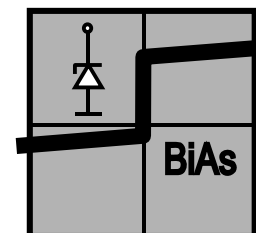
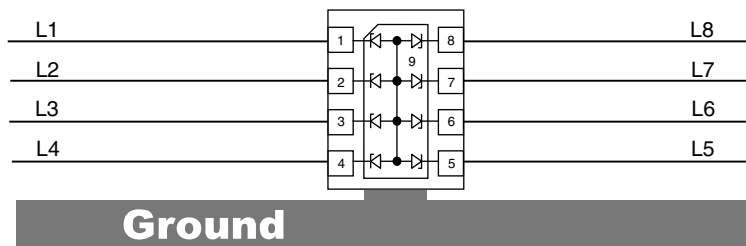
### BiAs-Mode (8-line Bidirectional Asymmetrical protection mode)

With the **VESD05A8A-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 **B**reakthrough 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 **F**orward Voltage ( $V_F$ ) clamps the negative transient close to the ground level.

Due to the different clamping levels in forward and reverse direction the **VESD05A8A-HNH** clamping behaviour is **B**idirectional and **A**symmetrical (**BiAs**).



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## Electrical Characteristics

Ratings at 25 °C, ambient temperature unless otherwise specified

### VESD05A8A-HNH

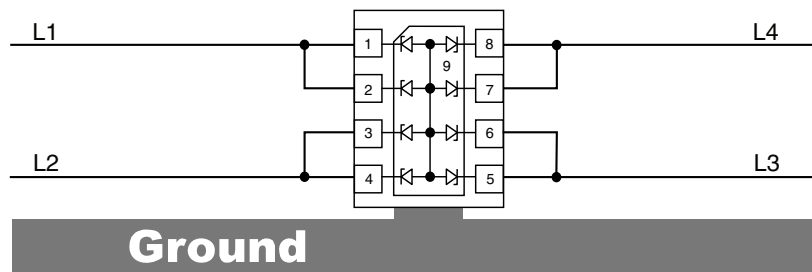
BiAs mode: each input (pin 1 - pin 8) to ground (pin 9)

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 $I_R = 1 \mu\text{A}$	$V_{RWM}$	5			V
Max. reverse current	at $V_R = V_{RWM} = 5 \text{ V}$	$I_R$		< 0.1	1	$\mu\text{A}$
Min. reverse breakdown voltage	at $I_R = 1 \text{ mA}$	$V_{BR}$	6		8	V
Max. clamping voltage	at $I_{PP} = 5 \text{ A}$ acc. IEC 61000-4-5	$V_C$			13	V
Max. forward clamping voltage	at $I_F = 5 \text{ A}$ acc. IEC 61000-4-5	$V_F$			4.5	V
Line capacitance	at $V_R = 0 \text{ V}$ ; $f = 1 \text{ MHz}$	$C_D$		30	35	pF
	at $V_R = 2.5 \text{ V}$ ; $f = 1 \text{ MHz}$	$C_D$		18	23	pF

If a higher surge current or **Peak Pulse current ( $I_{PP}$ )** is needed, some protection diodes in the **VESD05A8A-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** ( $2 \times I_R$ )



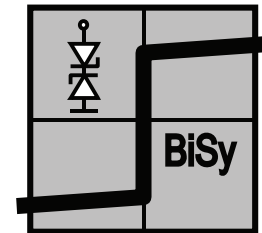
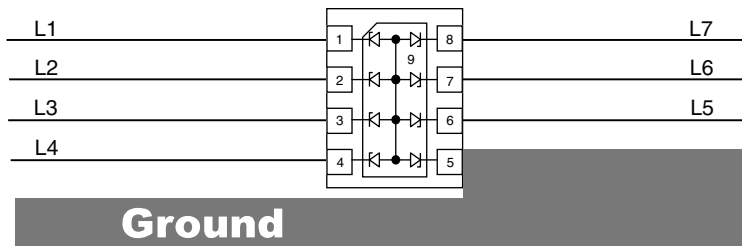
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## BiSy-mode (7-line Bidirectional Symmetrical protection mode)

If a bipolar symmetrical protection device is needed the **VESD05A8A-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 **VESD05A8A-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 **BR**eakthrough 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 **VESD05A8A-HNH** voltage clamping behaviour is also **Bidirectional** and **Symmetrical (BiSy)**.



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## Electrical Characteristics

Ratings at 25 °C, ambient temperature unless otherwise specified

### VESD05A8A-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 $I_R = 1 \mu A$	$V_{RWM}$	5.5			V
Max. reverse current	at $V_R = V_{RWM} = 5.5 V$	$I_R$		< 0.1	1	$\mu A$
Min. reverse breakdown voltage	at $I_R = 1 mA$	$V_{BR}$	6.5		8.7	V
Max. clamping voltage	at $I_{PP} = 2.5 A$ acc. IEC 61000-4-5	$V_C$			13	V
Line capacitance	at $V_R = 0 V$ ; $f = 1 MHz$	$C_D$		15	18	pF
	at $V_R = 2.5 V$ ; $f = 1 MHz$	$C_D$		13	15	pF

## Typical Characteristics

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

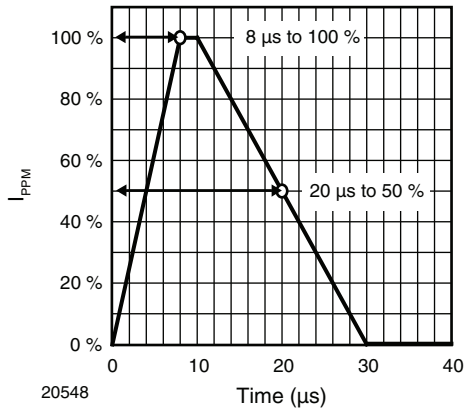


Figure 1. 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form acc. IEC 61000-4-5

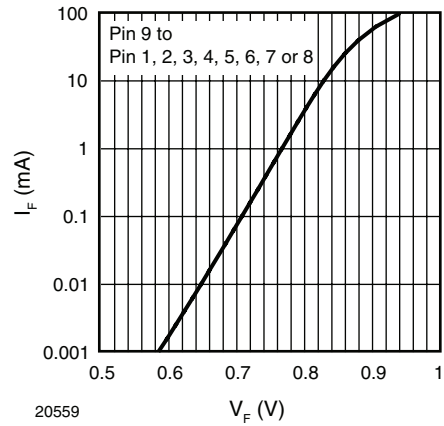


Figure 4. Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

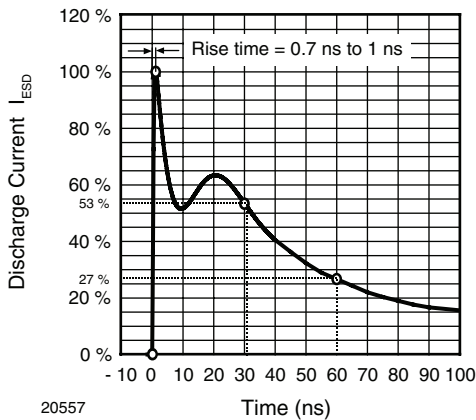


Figure 2. ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

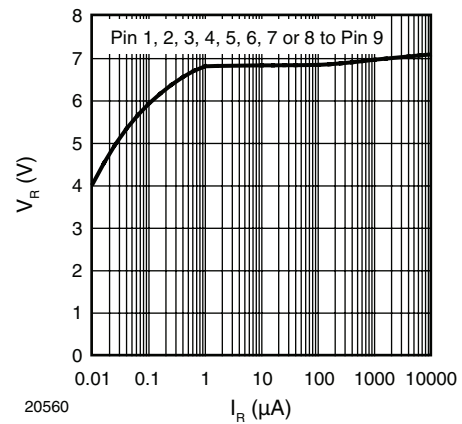


Figure 5. Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

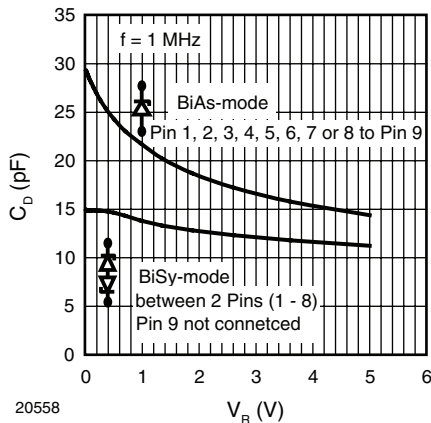


Figure 3. Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

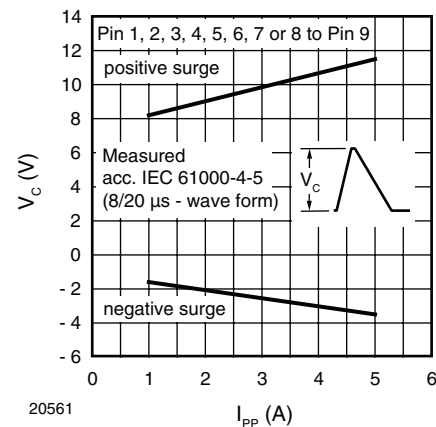


Figure 6. Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

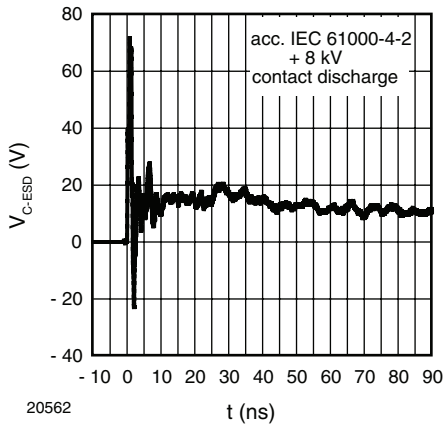


Figure 7. Typical Clamping Performance at + 8 kV Contact Discharge (Acc. IEC 61000-4-2)

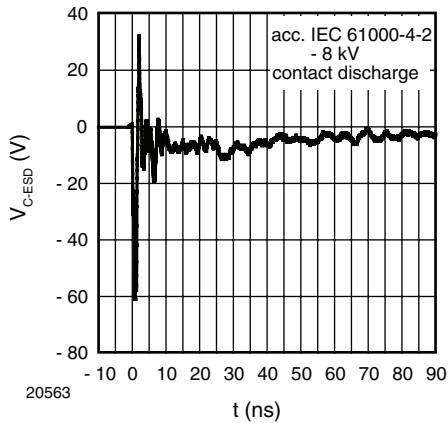


Figure 8. Typical Clamping Performance at - 8 kV Contact Discharge (acc. IEC 61000-4-2)

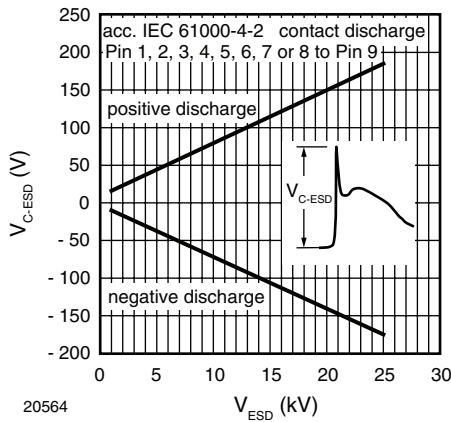
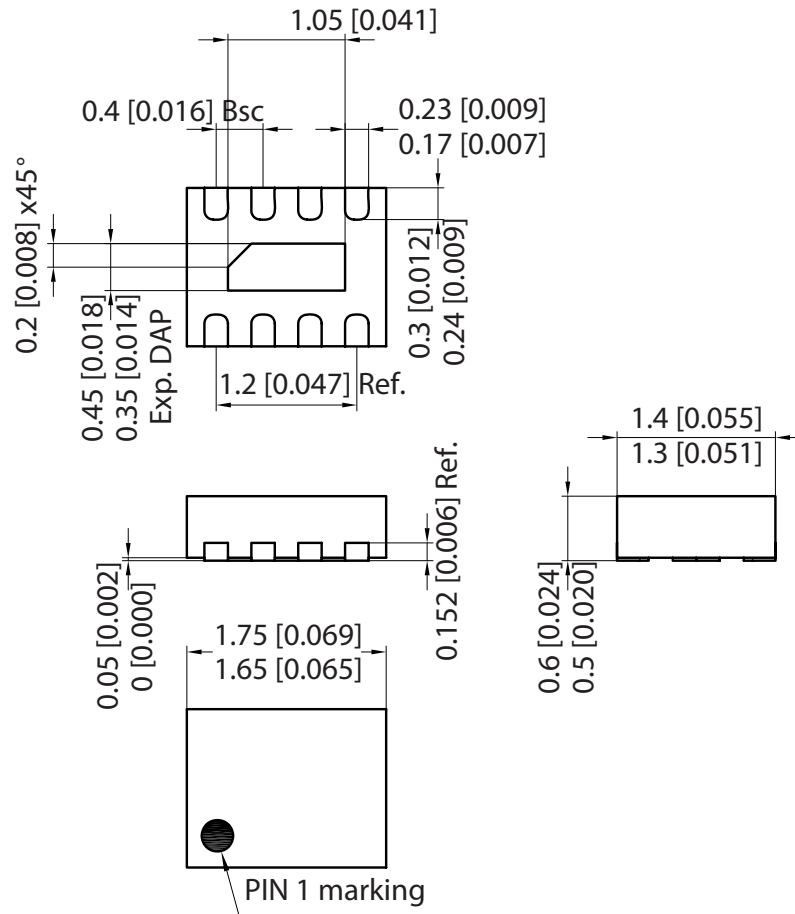
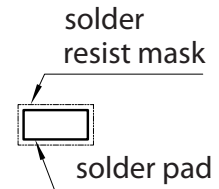
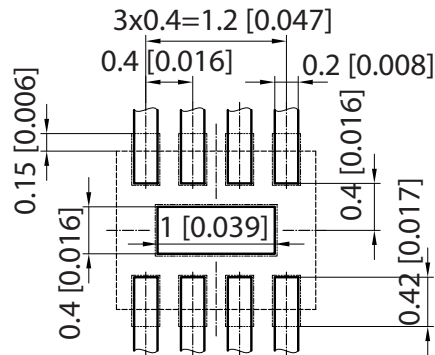


Figure 9. Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)

**Package Dimensions** in millimeters (inches): **LLP1713-9L**



foot print recommendation:



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Created - Date: 28. August 2006  
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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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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