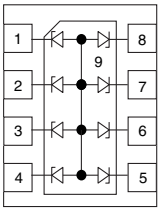
8-Line ESD-Protection Diode Array in LLP1713-9L



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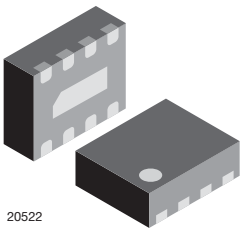
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FEATURES

- Ultra compact LLP1713-9L package
- Low package profile < 0.6 mm
- 8-line ESD-protection
- Low leakage current I_R < 1 µA
- Low load capacitance C_D = 30 pF
- ESD-immunity acc. IEC 61000-4-2
  ± 25 kV contact discharge
  ± 30 kV air discharge
- Working voltage range V_{RWM} = 5 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

Pb-free

e4

RoHS COMPLIANT

GREEN (5-2008)

MARKING (example only)

20719

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	TYPE 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

ABSOLUTE MAXIMUM RATINGS

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 µs; single shot	I_{PPM}	5	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 µs/single shot	I_{PPM}	2.5	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 µs; single shot	P_{PP}	65	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 µs/single shot	P_{PP}	33	W
ESD immunity	Contact discharge acc. IEC61000-4-2; 10 pulses BiAs-mode: each input (pin 1 to pin 8) to ground (pin 9)	V_{ESD}	± 25	kV
	Air discharge acc. IEC61000-4-2; 10 pulses BiAs-mode: each input (pin 1 to pin 8) to ground (pin 9)	V_{ESD}	± 30	kV
	Contact discharge acc. IEC61000-4-2; 10 pulses BiSy-mode: each input (pin 1 to pin 8) to any other input pin. Pin 9 not connected.	V_{ESD}	± 12	kV
	Air discharge acc. IEC61000-4-2; 10 pulses BiSy-mode: each input (pin 1 to pin 8) to any other input pin. Pin 9 not connected.	V_{ESD}	± 12	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

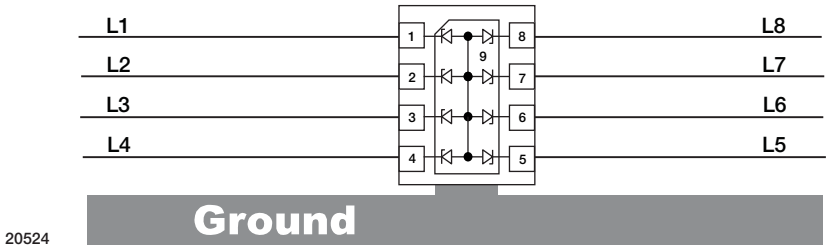
BiAs-MODE (8-line bidirectional asymmetrical protection mode)

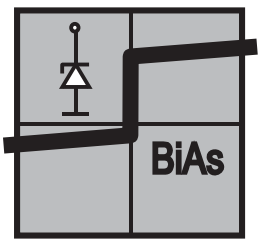
With the VESD05A8A-HNH up to 8 signal- or data-lines (L1 to L8) can be protected against voltage transients. With pin 9 connected to ground and pin 1 up to pin 8 connected to a signal- or data-line which has to be protected. As long as the voltage level on the data- or signal-line is between 0 V (ground 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 VESD05A8A-HNH clamping behaviour is bidirectional and ssymmetrical (BiAs).

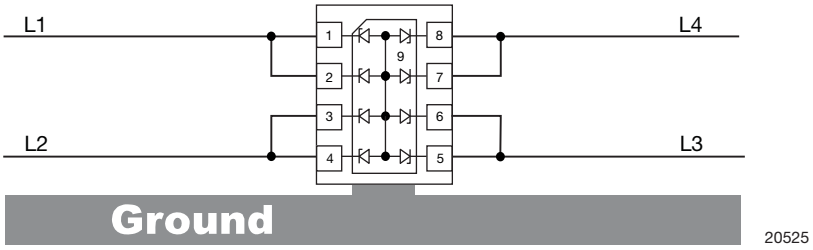




ELECTRICAL CHARACTERISTICS (Between pin 1 to 8 and pin 9) (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITIONS/REMARKS**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	8	lines
Reverse stand-off voltage	Max. reverse working voltage	V_{RWM}	-	-	5	V
Reverse voltage	at I_R = 1 µA	V_R	5	-	-	V
Reverse current	at $V_R = V_{RWM}$ = 5 V	I_R	-	< 0.1	1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	6		8	V
Reverse clamping voltage	at I_{PP} = 5 A acc. IEC 61000-4-5	V_C	-		13	V
Forward clamping voltage	at I_F = 5 A acc. IEC 61000-4-5	V_F	-		4.5	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	30	35	pF
	at V_R = 2.5 V; f = 1 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 x I_{PPM})
- half of the line inductance = reduced clamping voltage
- half of the line resistance = reduced clamping voltage
- double line capacitance (2 x C_D)
- double reverse leakage current (2 x I_R)



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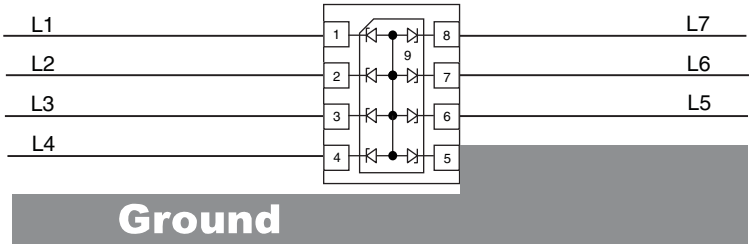
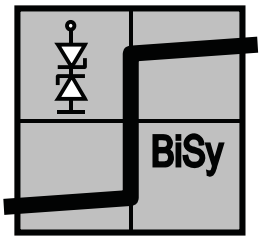
BiSy-MODE (7-line bidirectional symmetrical protection mode)

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 signalor 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 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 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 VESD05A8A-HNH voltage clamping behaviour is also bidirectional and symmetrical (BiSy).





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ELECTRICAL CHARACTERISTICS (Between any of the pins 1 to 8; pin 9 not connected) (T_{amb} = 25 °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 stand-off voltage	Max. reverse working voltage	V_{RWM}	-	-	5.5	V
Reverse voltage	at I_R = 1 µA	V_R	5.5	-	-	V
Reverse current	at V_R = V_{RWM} = 5.5 V	I_R	-	< 0.1	1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	6.5		8.7	V
Reverse clamping voltage	at I_{PP} = 2.5 A acc. IEC 61000-4-5	V_C	-		13	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	30	35	pF
	at V_R = 2.5 V; f = 1 MHz	C_D	-	18	23	pF

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

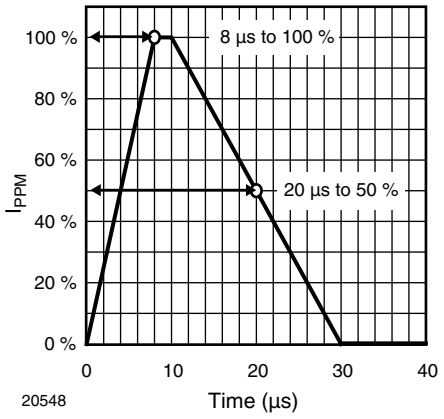


Fig. 1 - ESD Discharge Current Wave Form
acc. IEC 61000-4-2 (330 Ω/150 pF)

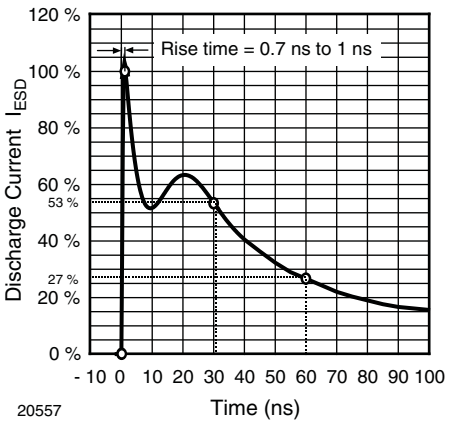


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form
acc. IEC 61000-4-5

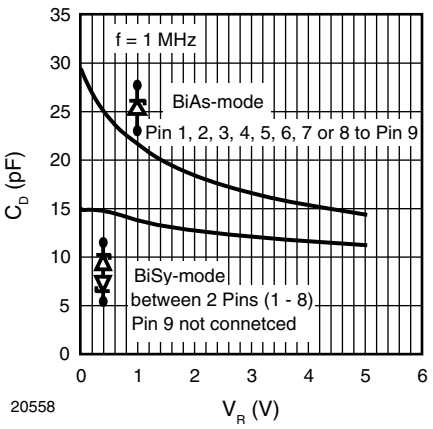


Fig. 3 - Typical Capacitance C_D vs. Reverse Voltage V_R

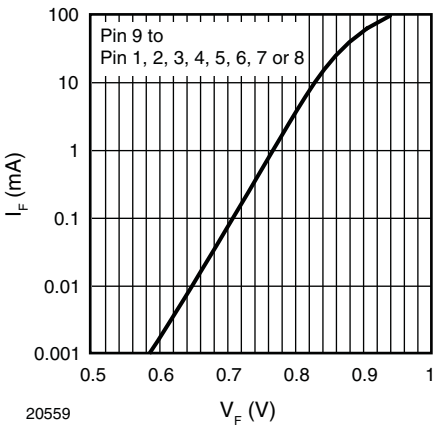


Fig. 4 - Typical Forward Current I_F vs. Forward Voltage V_F

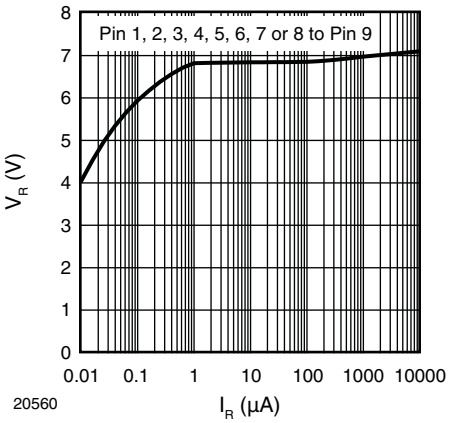


Fig. 5 - Typical Reverse Voltage V_R vs. Reverse Current I_R

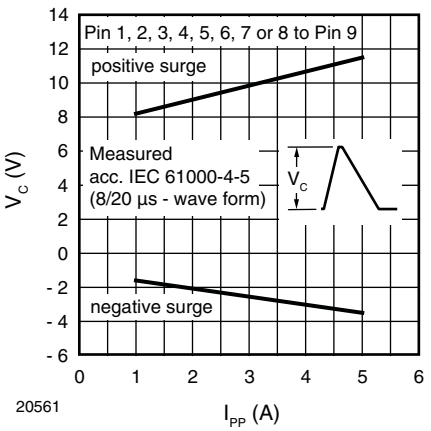


Fig. 6 - Typical Peak Clamping Voltage V_C vs.
Peak Pulse Current I_{PP}

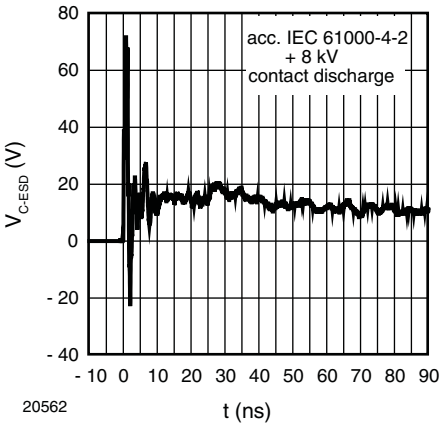


Fig. 7 - Typical Clamping Performance at + 8 kV
Contact Discharge (acc. IEC 61000-4-2)

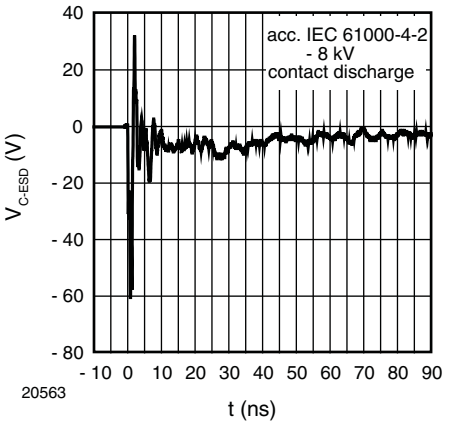


Fig. 8 - Typical Clamping Performance at - 8 kV
Contact Discharge (acc. IEC 61000-4-2)

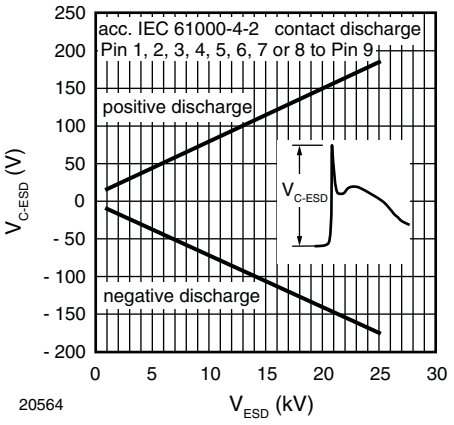
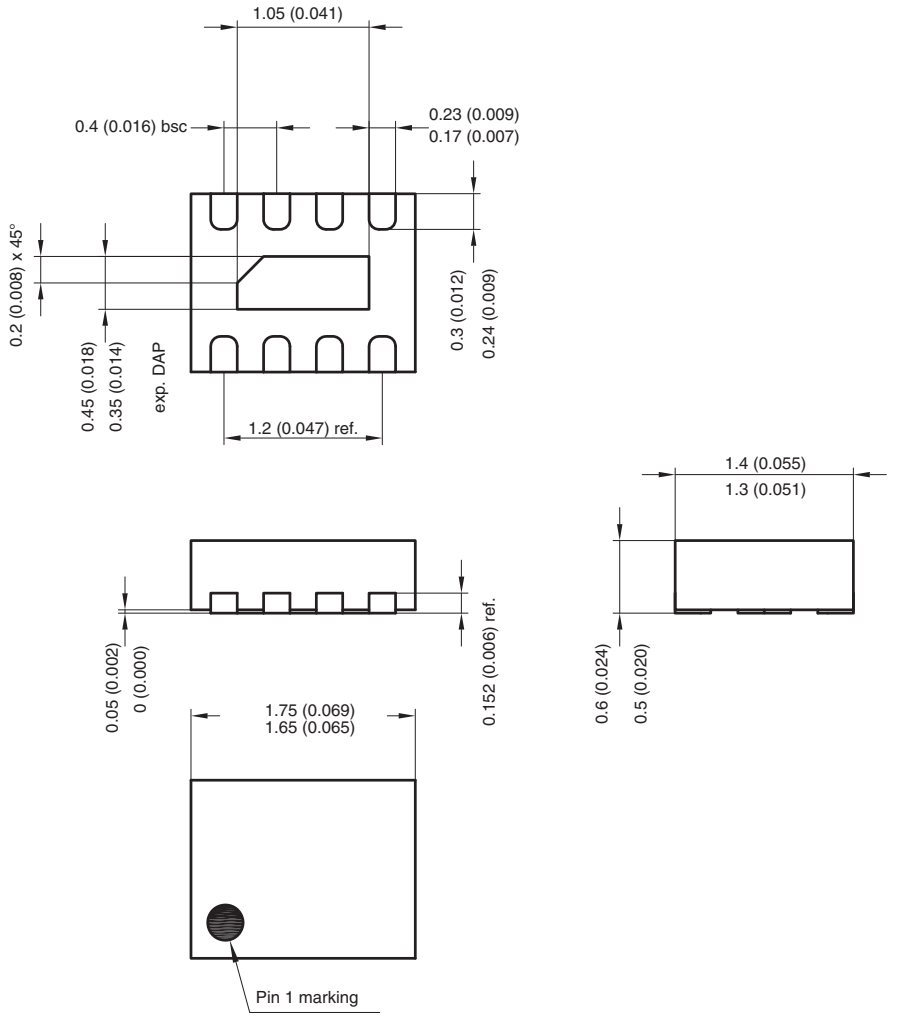
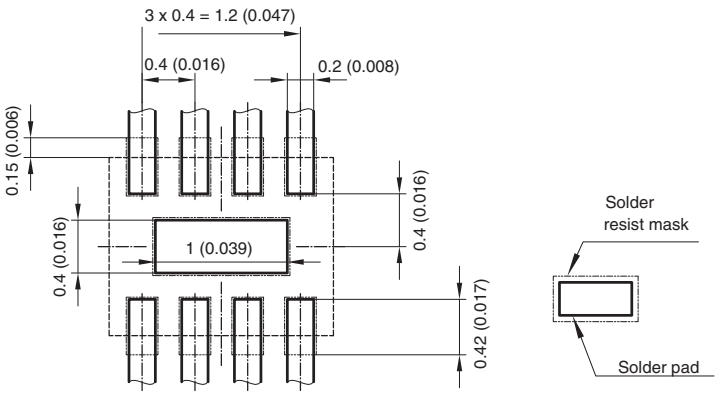


Fig. 9 - Typical Peak Clamping Voltage at ± ESD Contact Discharge
(acc. IEC 61000-4-2)

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
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