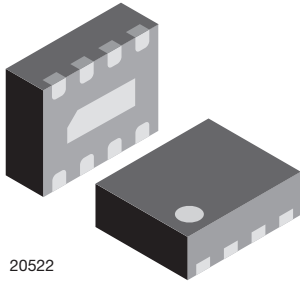
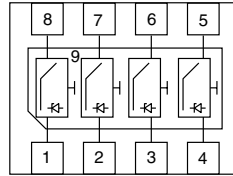


4-Channel EMI-Filter with ESD-Protection



20522



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MARKING (example only)



20719

Dot = pin 1 marking

Y = type code (see table below)

XX = date code

FEATURES

- Ultra compact LLP1713-9L package
- Low package profile of 0.6 mm
- 4-channel EMI-filter
- Low leakage current
- Line inductance $L_S = 10$ nH
- Low line resistance $R_S = 12$ Ω
- Typical cut off frequency $f_{3dB} = 150$ MHz
- ESD-protection acc. IEC 61000-4-2
 ± 25 kV contact discharge
 ± 25 kV air discharge
- 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]**

ORDERING INFORMATION

DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL)	MINIMUM ORDER QUANTITY
VEMI45LA-HNH	VEMI45LA-HNH-GS08	3000	15 000

PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VEMI45LA-HNH	LLP1713-9L	H	3.7 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

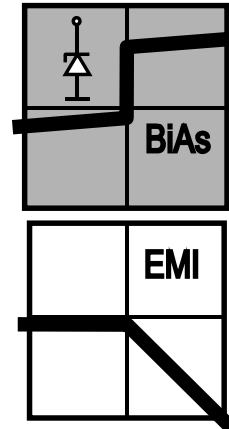
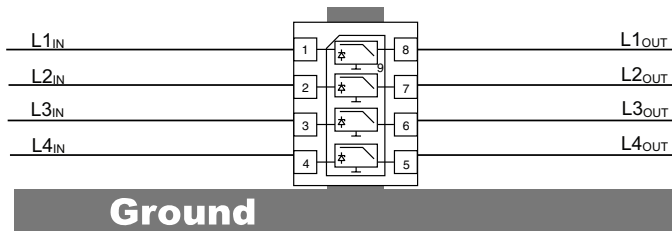
ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	All I/O pin to pin 9; acc. IEC 61000-4-5; $t_p = 8/20$ μ s; single shot	I_{PPM}	4	A
ESD immunity	Contact discharge acc. IEC61000-4-2; 10 pulses	V_{ESD}	± 25	kV
	Air discharge acc. IEC61000-4-2; 10 pulses		± 25	
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

 ** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

APPLICATION NOTE

With the VEMI45LA-HNH 4 different signal or data lines can be filtered and clamped to ground. Due to the different clamping levels in forward and reverse direction the clamping behaviour is Bidirectional and Asymmetric (BiAs).



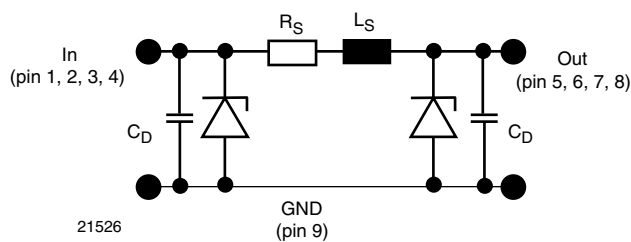
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The 4 independent EMI-filter are placed between

- pin 1 and pin 8,
- pin 2 and pin 7,
- pin 3 and pin 6 and
- pin 4 and pin 5.

They all are connected to a common ground pin 9 on the backside of the package.

The circuit diagram of one EMI-filter-channel shows two identical Z-diodes at the input to ground and the output to ground. These Z-diodes are characterized by the breakthrough voltage level (V_{BR}) and the diode capacitance (C_D). Below the breakthrough voltage level the Z-diodes can be considered as capacitors. Together with these capacitors and the line resistance R_S between input and output the device works as a low pass filter. Low frequency signals ($f < f_{3dB}$) pass the filter while high frequency signals ($f > f_{3dB}$) will be shorted to ground through the diode capacitances C_D .

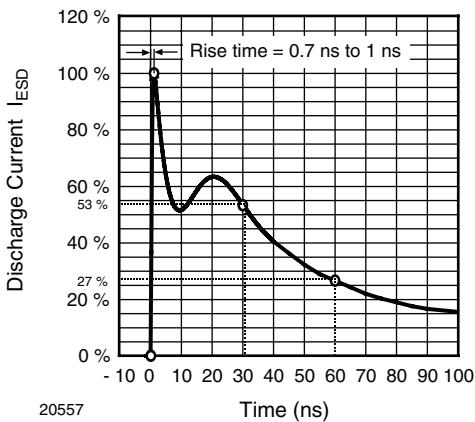
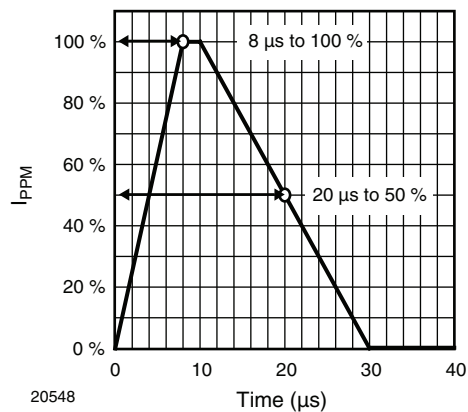


Each filter is symmetrical so that both ports can be used as input or output.

ELECTRICAL CHARACTERISTICS VEMI45LA-HNH						
PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of channels which can be protected	N_{channel}	-	-	4	channel
Reverse stand off voltage	at $I_R = 1 \mu\text{A}$	V_{RWM}	5	-	-	V
Reverse current	at $V_R = V_{\text{RWM}}$	I_R	-	-	1	μA
Reverse break down voltage	at $I_R = 1 \text{ mA}$	V_{BR}	6	-	-	V
Pos. clamping voltage	at $I_{\text{PP}} = 1 \text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{\text{C-out}}$	-	7.7	8.5	V
	at $I_{\text{PP}} = I_{\text{PPM}} = 4 \text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{\text{C-out}}$	-	8.3	9.5	V
Neg. clamping voltage	at $I_{\text{PP}} = -1 \text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{\text{C-out}}$	-1	-	-	V
	at $I_{\text{PP}} = I_{\text{PPM}} = -4 \text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{\text{C-out}}$	-1.2	-	-	V
Input capacitance	at $V_R = 0 \text{ V}$; $f = 1 \text{ MHz}$	C_{IN}	-	47	53	pF
	at $V_R = 2.5 \text{ V}$; $f = 1 \text{ MHz}$	C_{IN}	-	28	31	pF
Line inductance	Measured between input and output	L_S	-	10	-	V
Line resistance	Measured between input and output; $I_S = 10 \text{ mA}$	R_S	-	12	-	Ω
Cut-off frequency	$V_{\text{IN}} = 0 \text{ V}$; measured in a 50Ω system	$f_{3\text{dB}}$	-	150	-	MHz

Note

- Ratings at 25 °C, ambient temperature unless otherwise specified. All inputs (pin 1, 2, 3 and 4) to ground (pin 9)

TYPICAL CHARACTERISTICS ($T_{\text{amb}} = 25 \text{ °C}$, 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

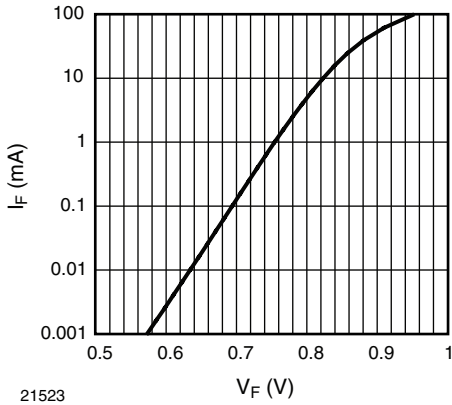


Fig. 3 - Typical Forward Current I_F vs. Forward Voltage V_F

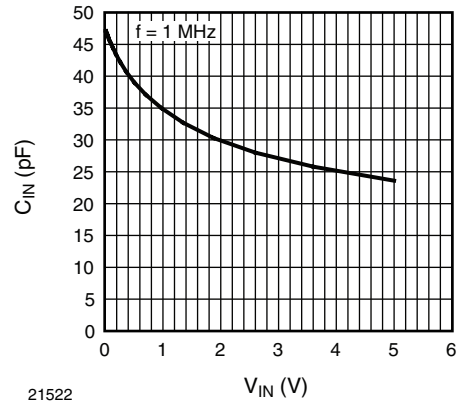


Fig. 6 - Typical Input Capacitance C_{IN} vs. Input Voltage V_{IN}

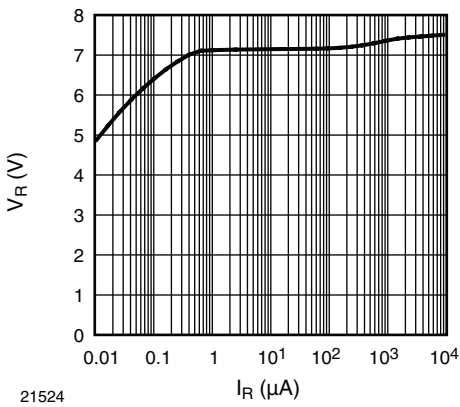


Fig. 4 - Typical Reverse Voltage V_R vs. Reverse Current I_R

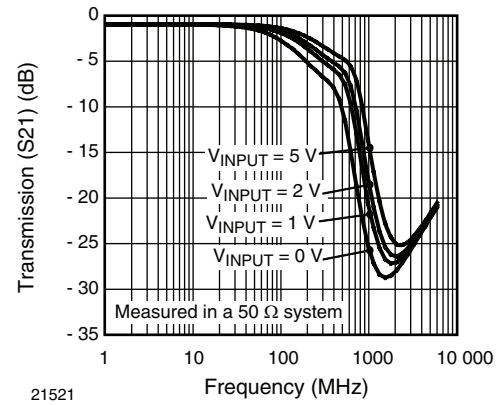


Fig. 7 - Typical Small Signal Transmission (S_{21}) at $Z_O = 50 \Omega$

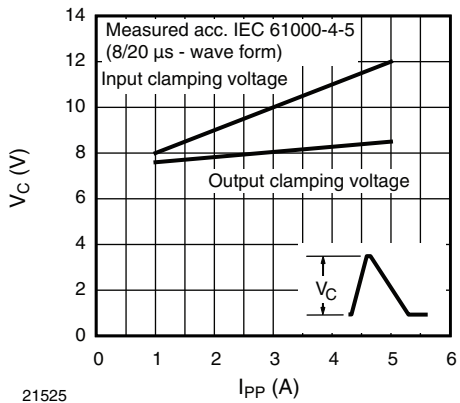
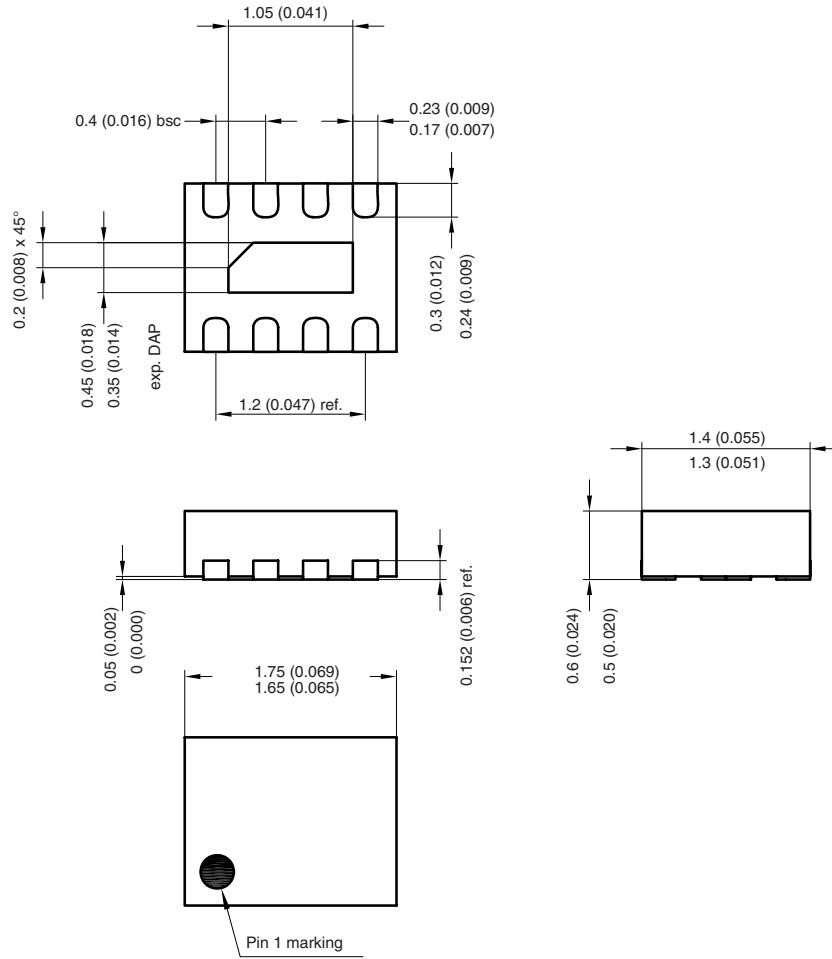
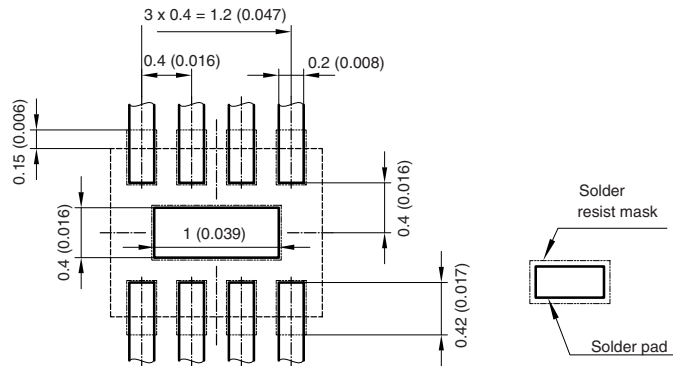


Fig. 5 - Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

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



Foot print recommendation:



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Created - Date: 28. August 2006
Rev. 1 - Date: 27. May 2008
20386



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