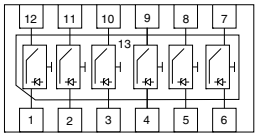
6-Channel EMI-Filter with ESD-Protection



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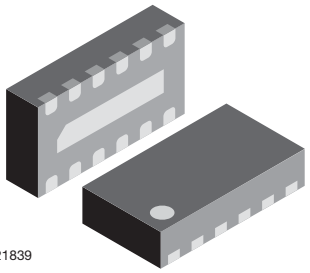

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FEATURES

- Ultra compact LLP2513-13L package
- Low package profile of 0.6 mm
- 6-channel EMI-filter
- Low leakage current
- Line resistance R_S = 100 Ω
- Typical cut off frequency f_{3dB} = 100 MHz
- ESD-protection acc. IEC 61000-4-2
  ± 30 kV contact discharge
  ± 30 kV air discharge
- 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

HALOGEN FREE

GREEN (5-2008)

DESIGN SUPPORT TOOLS

click logo to get started

3D Models Available

MARKING (example only)



20720

Dot = pin 1 marking
YY = 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
VEMI65AA-HCI	VEMI65AA-HCI-GS08	3000	15 000

PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VEMI65AA-HCI	LLP2513-13L	9P	5.5 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	All I/O pin to pin 13; acc. IEC 61000-4-5; t_p = 8/20 µs; single shot	I_{PPM}	4	A
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		± 30	
Operating temperature	Junction temperature	T_J	-40 to +125	°C
Storage temperature		T_{STG}	-55 to +150	°C

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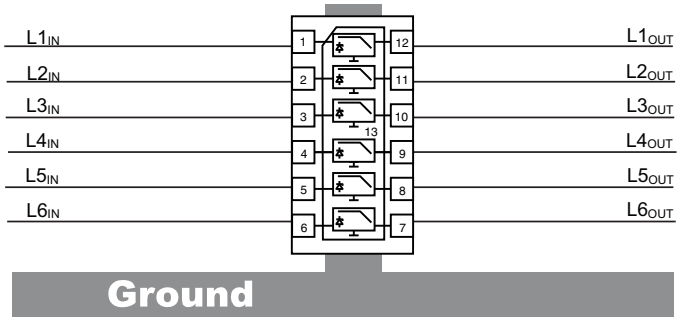
APPLICATION NOTE

With the VEMI65AA-HCI 6 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 behavior is Bidirectional and Asymmetric (BiAs).



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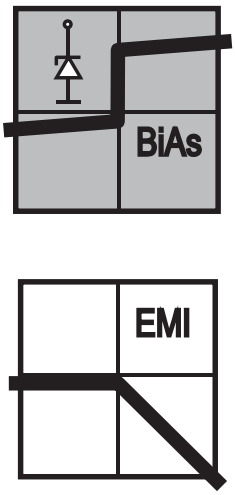
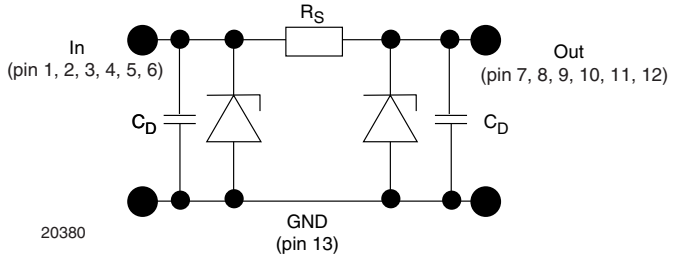


The 6 independent EMI-filter are placed between

pin 1 and pin 12,
pin 2 and pin 11,
pin 3 and pin 10,
pin 4 and pin 9,
pin 5 and pin 8 and
pin 6 and pin 7.

They all are connected to a common ground pin 13 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.



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

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ELECTRICAL CHARACTERISTICS All inputs (pin 1 to pin 6) to ground (pin 13) (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITIONS/REMARKS**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Protection paths	Number of channels which can be protected	$N_{channel}$	-	-	6	channel
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 $V_R = V_{RWM}$	I_R	-	-	1	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	6	-	-	V
Pos. clamping voltage	at I_{PP} = 1 A applied at the input, measured at the output; acc. IEC 61000-4-5	V_{C-out}	-	-	7	V
	at $I_{PP} = I_{PPM}$ = 4 A applied at the input, measured at the output; acc. IEC 61000-4-5	V_{C-out}	-	-	8	V
Neg. clamping voltage	at I_{PP} = -1 A applied at the input, measured at the output; acc. IEC 61000-4-5	V_{C-out}	-1	-	-	V
	at $I_{PP} = I_{PPM}$ = -4 A applied at the input, measured at the output; acc. IEC 61000-4-5	V_{C-out}	-1.2	-	-	V
Input capacitance	at V_R = 0 V; f = 1 MHz	C_{IN}	-	60	-	pF
	at V_R = 2.5 V; f = 1 MHz	C_{IN}	-	36	-	pF
ESD-clamping voltage	at ± 30 kV ESD-pulse acc. IEC 61000-4-2	V_{CESD}	-	7.5	-	V
Line resistance	Measured between input and output; I_S = 10 mA	R_S	90	100	110	Ω
Cut-off frequency	V_{IN} = 0 V; measured in a 50 Ω system	f_{3dB}	-	100	-	MHz

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

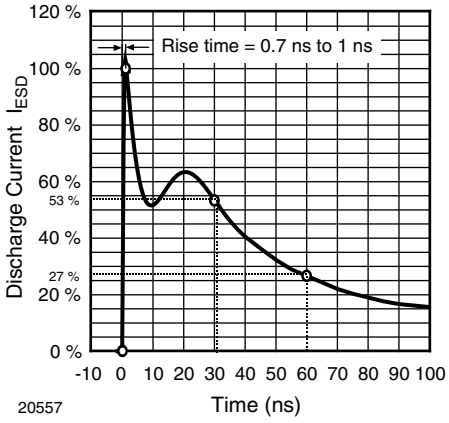

Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

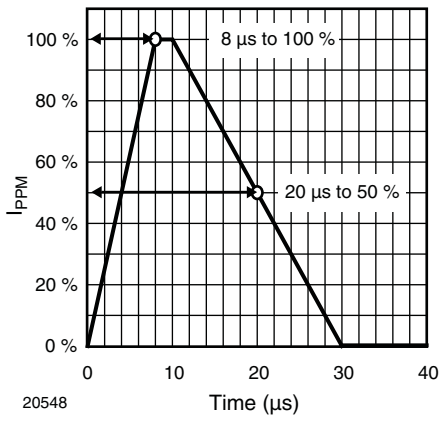

Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

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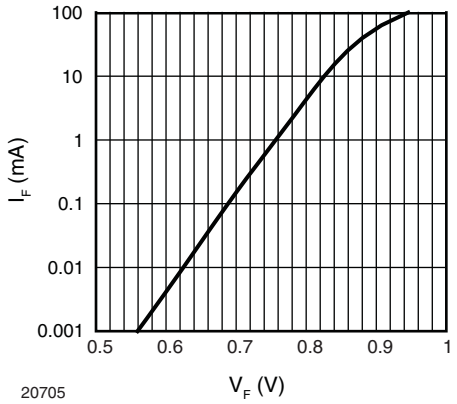

Fig. 3 - Typical Forward Current I_F vs. Forward Voltage V_F

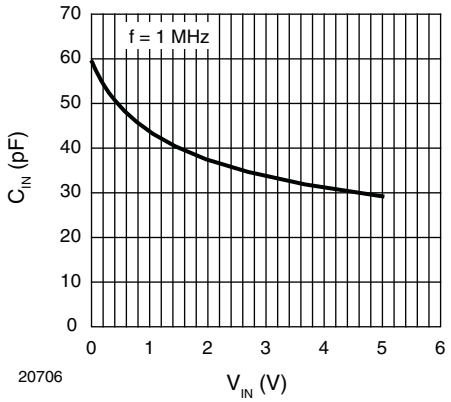

Fig. 6 - Typical Input Capacitance C_{IN} vs. Input Voltage V_{IN}

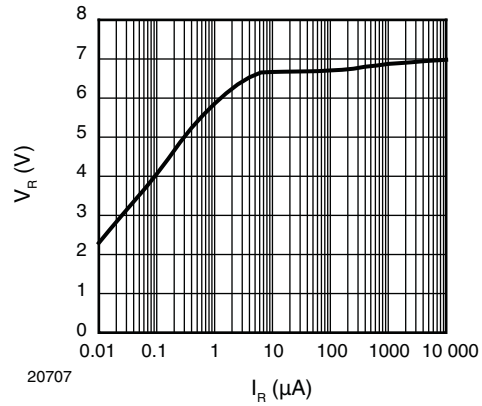

Fig. 4 - Typical Reverse Voltage V_R vs. Reverse Current I_R

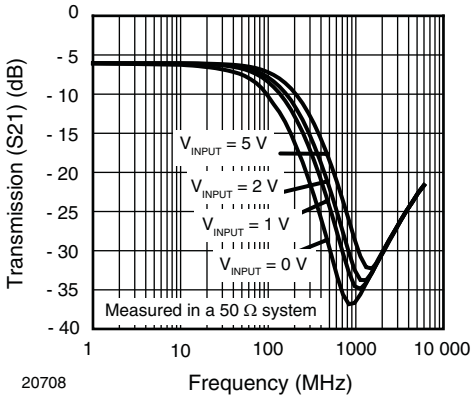

Fig. 7 - Typical Small Signal Transmission (S21) at Z_O = 50 Ω

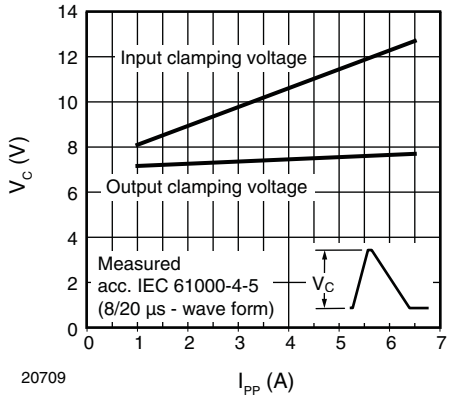

Fig. 5 - Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

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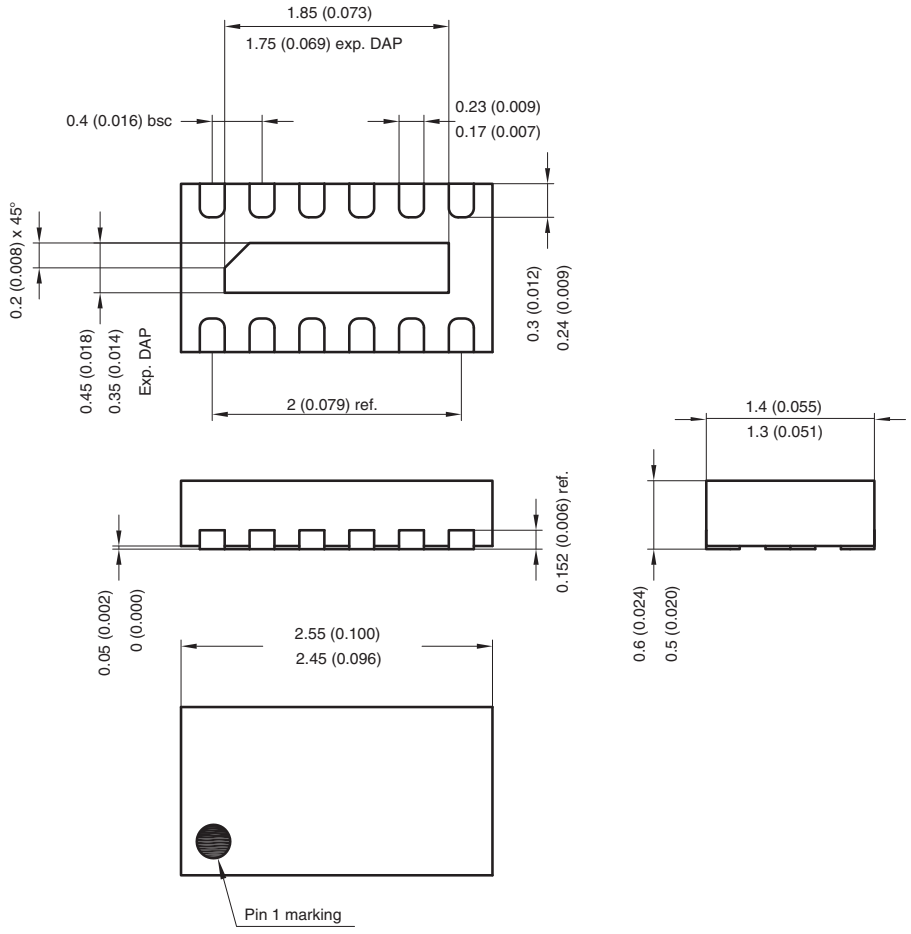
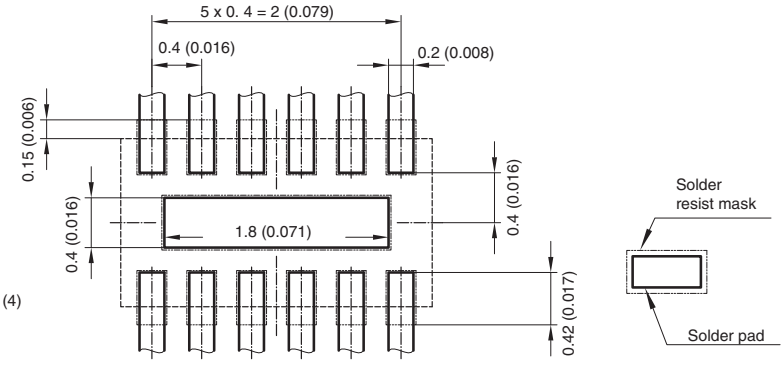
PACKAGE DIMENSIONS in millimeters (inches): **LLP2513-13L**



Foot print recommendation:



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