## 8-Channel EMI-Filter with ESD-Protection

**FEATURES** 

8-channel EMI-filter Low leakage current

• Line resistance  $R_S = 100 \Omega$ 

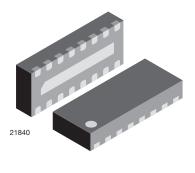
± 30 kV contact discharge

± 30 kV air discharge

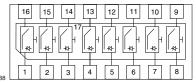
Ultra compact LLP3313-17L package
Low package profile of 0.6 mm

Typical cut off frequency f<sub>3dB</sub> = 100 MHz

• ESD-protection acc. IEC 61000-4-2



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### MARKING (example only)



Dot = pin 1 marking Y = type code (see table below) XX = date code

#### **DESIGN SUPPORT TOOLS**



ORDERING INFORMATION					
DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL)	MINIMUM ORDER QUANTITY		
VEMI85AA-HGK	VEMI85AA-HGK-GS08	3000	15 000		

click logo to get started

PACKAGE DATA						
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VEMI85AA-HGK	LLP3313-17L	9R	7.4 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 17; acc. IEC 61000-4-5; $t_p = 8/20 \ \mu s$ ; single shot	I <sub>PPM</sub>	4	A		
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	± 30	kV		
	Air discharge acc. IEC 61000-4-2; 10 pulses	VESD	± 30	κv		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T <sub>STG</sub>	-55 to +150	°C		

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1 For technical questions, contact: <u>EMIFilter@vishay.com</u> Document Number: 81386



RoHS COMPLIANT HALOGEN FREE GREEN (5-2008)

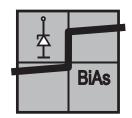
- e4 precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

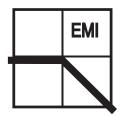


### **APPLICATION NOTE**

With the VEMI85AA-HGK 8 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 <u>Bi</u>directional and <u>Asymmetric</u> (BiAs).

L1 <sub>IN</sub>		L1 <sub>OUT</sub>
L2 <sub>IN</sub>		L2 <sub>OUT</sub>
L3 <sub>IN</sub>		L3 <sub>OUT</sub>
L4 <sub>IN</sub>		L4 <sub>OUT</sub>
L5 <sub>IN</sub>		L5 <sub>OUT</sub>
L6 <sub>IN</sub>		L6 <sub>OUT</sub>
L7 <sub>IN</sub>		L7 <sub>OUT</sub>
L8 <sub>IN</sub>	;↓₽;	L8 <sub>OUT</sub>
Ground		





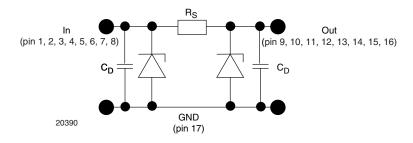
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The 8 independent EMI-filter are placed between

pin 1 and pin 16, pin 2 and pin 15, pin 3 and pin 14, pin 4 and pin 13, pin 5 and pin 12, pin 6 and pin 11, pin 7 and pin 10 and pin 8 and pin 9.

They all are connected to a common ground pin 17 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.

# VEMI85AA-HGK

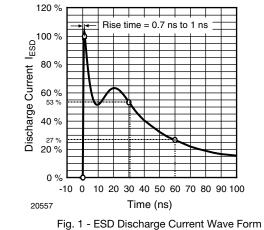


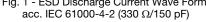
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### **Vishay Semiconductors**

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of channels which can be protected	N <sub>channel</sub>	-	-	8	channel
Reverse stand off voltage	Max. reverse working voltage	V <sub>RWM</sub>	-	-	5	V
Reverse voltage	at I <sub>R</sub> = 1 μA	V <sub>R</sub>	5	-	-	V
Reverse current	at $V_R = V_{RWM}$	I <sub>R</sub>	-	-	1	μA
Reverse break down voltage	at I <sub>R</sub> = 1 mA	V <sub>BR</sub>	6	-	-	V
Pos. clamping voltage	at $I_{PP}$ = 1 A applied at the input, measured at the output; acc. IEC 61000-4-5	V <sub>C-out</sub>	-	-	7	V
	at $I_{PP} = I_{PPM} = 4 A$ applied at the input, measured at the output; acc. IEC 61000-4-5	V <sub>C-out</sub>	-	-	8	V
Neg. clamping voltage	at I <sub>PP</sub> = -1 A applied at the input, measured at the output; acc. IEC 61000-4-5	V <sub>C-out</sub>	- 1	-	-	V
	at $I_{PP} = I_{PPM} = -4$ A applied at the input, measured at the output; acc. IEC 61000-4-5	V <sub>C-out</sub>	-1.2	-	-	V
Input capacitance	at $V_R = 0 V$ ; f = 1 MHz	C <sub>IN</sub>	-	60	-	pF
	at $V_R = 2.5 V$ ; f = 1 MHz	C <sub>IN</sub>	-	36	-	pF
ESD-clamping voltage	at $\pm$ 30 kV ESD-pulse acc. IEC 61000-4-2	V <sub>CESD</sub>	-	7.5	-	V
Line resistance	Measured between input and output; $I_S = 10 \text{ mA}$	R <sub>S</sub>	90	100	110	Ω
Cut-off frequency	$V_{IN}$ = 0 V; measured in a 50 $\Omega$ system	f <sub>3dB</sub>	-	100	-	MHz

TYPICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)





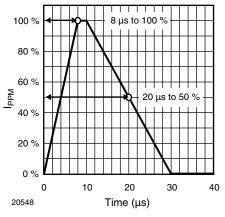


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5





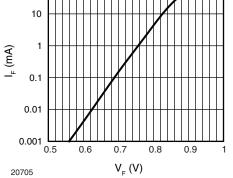


Fig. 3 - Typical Forward Current I<sub>F</sub> vs. Forward Voltage V<sub>F</sub>

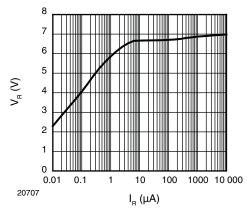


Fig. 4 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$ 

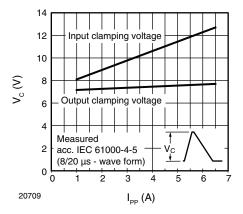


Fig. 5 - Typical Peak Clamping Voltage V\_C vs. Peak Pulse Current  $I_{PP}$ 

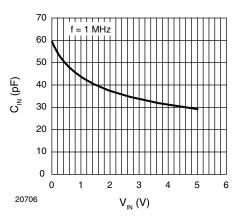
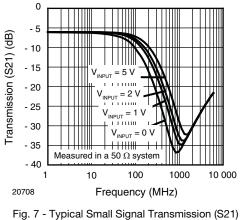


Fig. 6 - Typical Input Capacitance CIN vs. Input Voltage VIN

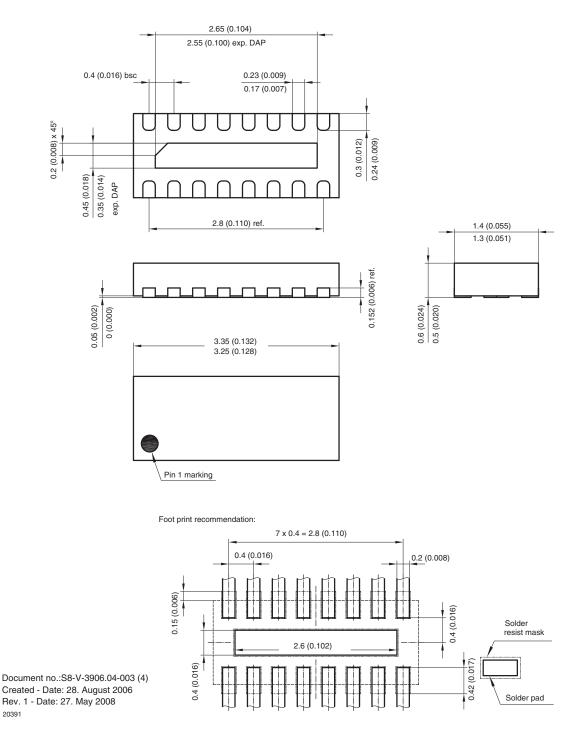


ig. 7 - Typical Small Signal Transmission (S21 at  $~Z_{O}$  = 50  $\Omega$ 

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### PACKAGE DIMENSIONS in millimeters (inches): LLP3313-17L



5 For technical questions, contact: <u>EMIFilter@vishav.com</u>

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