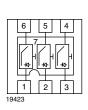
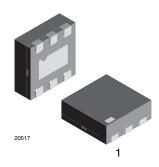


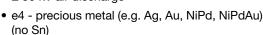
## 3-Channel EMI-Filter with ESD-Protection





#### **FEATURES**

- Ultra compact LLP75-7L package
- 3-channel EMI-filter and ESD-protection
- · Low leakage current
- Line resistance  $R_S = 50 \Omega$
- Typical cut off frequency f<sub>3dB</sub> = 100 MHz
- ESD-protection acc. IEC 61000-4-2
  ± 30 kV contact discharge
  ± 30 kV air discharge



 Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>







FREE GREEN (5-2008)

MARKING (example only)

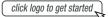


Dot = pin 1 marking

YY = 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		
VEMI355A-HAF	VEMI355A-HAF-G-08	3000	15 000		

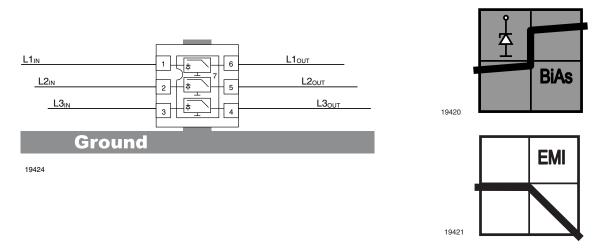
PACKAGE DATA						
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VEMI355A-HAF	LLP75-7L	9E	4.2 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT		
Peak pulse current	All I/O pin to pin 7; acc. IEC 61000-4-5; t <sub>p</sub> = 8/20 µs; single shot	I <sub>PPM</sub>	4	А		
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V	± 30	kV		
	Air discharge acc. IEC 61000-4-2; 10 pulses	$V_{ESD}$	± 30			
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T <sub>STG</sub>	-55 to +150	°C		



### **APPLICATION NOTE**

With the VEMI355A-HAF 3 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 <u>Bi</u>directional and <u>Asymmetric</u> (BiAs).



The 3 independent EMI-filter are placed between

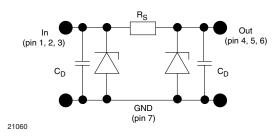
pin 1 and pin 6

pin 2 and pin 5, and

pin 3 and pin 4.

They all are connected to a common ground pin 7 on the backside of the package. Each filter is symmetrical so that all ports (pin 1 to 6) can be used as input or output.

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.

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of channels which can be protected	N <sub>channel</sub>	-	-	3	channel
Reverse stand off voltage	Max. reverse working voltage	V <sub>RWM</sub>	-	-	5	٧
Reverse voltage	at I <sub>R</sub> = 1 μA	$V_R$	5	-	-	V
Reverse current	at V <sub>R</sub> = 5 V	I <sub>R</sub>	-	-	1	μA
Reverse break down voltage	I <sub>R</sub> = 1 mA	$V_{BR}$	6	-	-	V
Pos. clamping voltage	at I <sub>PP</sub> = 1 A applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C-out}$	-	-	7.8	V
	at I <sub>PP</sub> = I <sub>PPM</sub> = 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 <sub>PP</sub> = I <sub>PPM</sub> = -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 <sub>R</sub> = 0 V; f = 1 MHz	C <sub>IN</sub>	-	60	-	pF
	at V <sub>R</sub> = 2.5 V; f = 1 MHz	C <sub>IN</sub>	-	37	-	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 <sub>S</sub> = 10 mA	$R_S$	45	50	55	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)

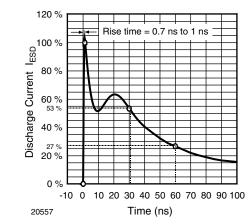


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

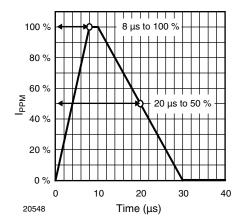


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5





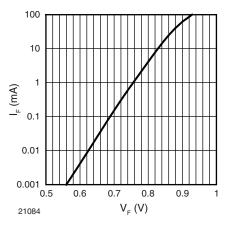


Fig. 3 - Typical Forward Current I<sub>F</sub> vs. Forward Voltage V<sub>F</sub>

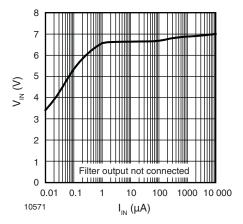


Fig. 4 - Typical Input Voltage  $V_{\text{IN}}$  vs. Input Current  $I_{\text{IN}}$ 

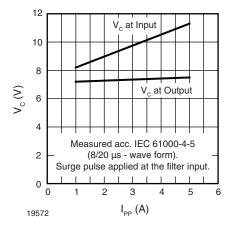


Fig. 5 - Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$ 

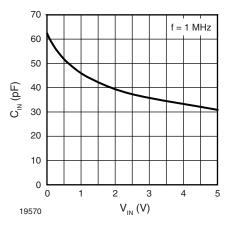


Fig. 6 - Typical Capacitance C<sub>D</sub> vs. Reverse Voltage V<sub>R</sub>

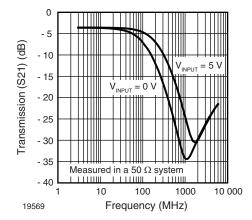
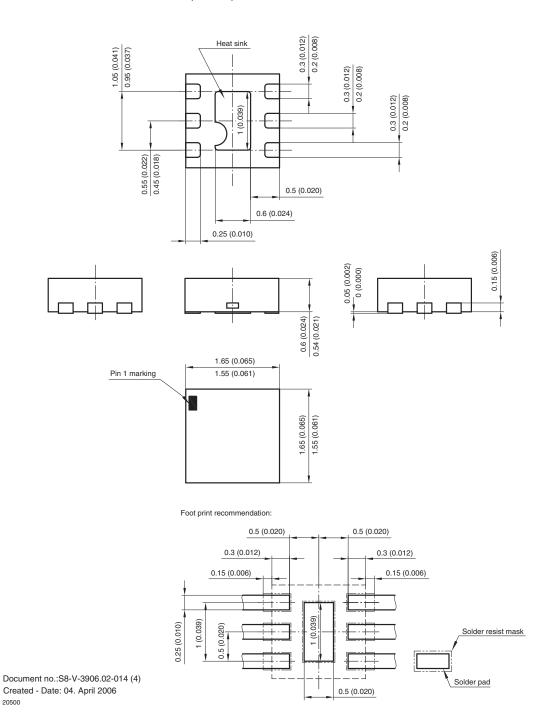


Fig. 7 - Typical Small Signal Transmission (S21) at  $\,$  Z $_{O}$  = 50  $\,$   $\Omega$ 

### PACKAGE DIMENSIONS in millimeters (inches): LLP75-7L





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