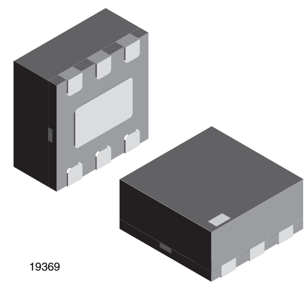
3-Channel EMI-Filter with ESD-Protection

Features

- Ultra compact LLP75-7A package
- 3-channel EMI-filter and ESD-protection
- Low leakage current
- Line resistance of 30 Ω
- Typical cut-off frequency f_{3dB} = 100 MHz
- ESD-protection acc. IEC 61000-4-2
  - ± 30 kV contact discharge
  - ± 30 kV air discharge
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb
Pb-free
e3
RoHS
COMPLIANT
GREEN
(5-2008)*



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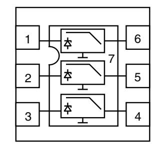

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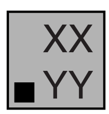
Marking (example only)



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Dot = Pin 1 marking
XX = Date code
YY = Type code (see table below)

Ordering Information

Device name	Ordering code	Taped units per reel (8 mm tape on 7" reel)	Minimum order quantity
VEMI353A-HA3	VEMI353A-HA3-GS08	3000	15 000

Package Data

Device name	Package name	Marking code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
VEMI353A-HA3	LLP75-7A	9A	5 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

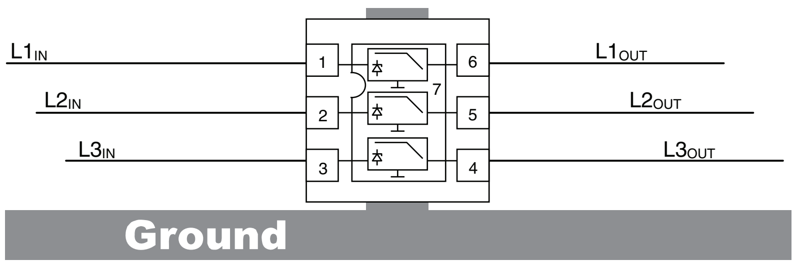
Absolute Maximum Ratings

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 µs; single shot	I_{PPM}	4	A
ESD immunity	Contact discharge acc. IEC61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC61000-4-2; 10 pulses		± 30	
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature	T_{STG}	T_{STG}	- 55 to + 150	°C

* Please see document “Vishay Green and Halogen-Free Definitions (5-2008)” http://www.vishay.com/doc?99902

Application Note:

- With the **VEMI353A-HA3** 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 **Bi**directional and **As**ymmetric **(BiAs)**.



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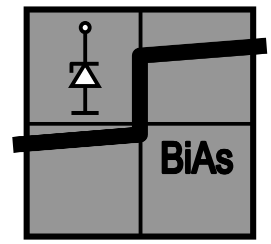

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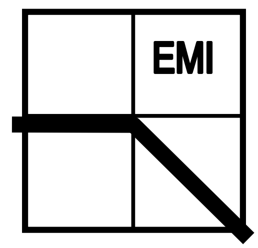
The 3 independent EMI-filter are placed between

pin 1 and pin 6,
pin 2 and pin 5, and
pin 3 and pin 4



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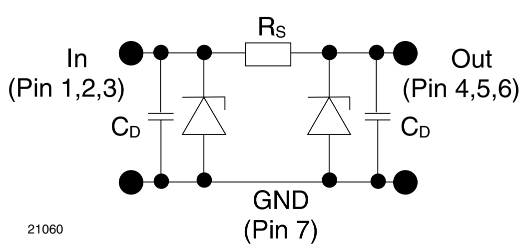
They all are connected to a common ground pin 7 on the backside of the package.
Each filter is symmetrical so that all ports (pin 1 to 6) can be used as input or output.

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.



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

Electrical Characteristics

Ratings at 25 °C, ambient temperature unless otherwise specified

VEMI353A-HA3

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Filter channels	Number of channels which can be protected	$N_{channel}$			3	channel
Reverse stand off voltage	at I_R = 1 µA each input to pin 2	V_{RWM}	5			V
Reverse current	at V_R = 5 V each input to pin 2	I_R			1	µA
Reverse break down voltage	Each input to pin 2 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	$V_{C\text{-}out}$			7.8	V
	at I_{PP} = I_{PPM} = 4 A applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C\text{-}out}$			8	V
Neg. clamping voltage	at I_{PP} = - 1 A applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C\text{-}out}$	- 1			V
	at I_{PP} = I_{PPM} = - 4 A applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C\text{-}out}$	- 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}		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_S = 10 mA	R_S	27	30	35	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

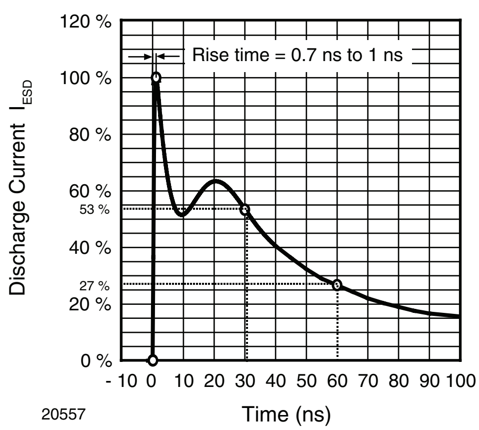


Figure 1. ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

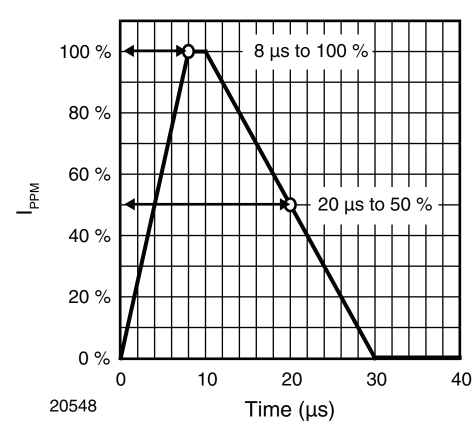


Figure 2. 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

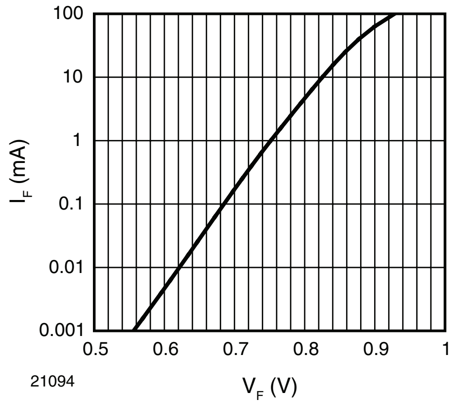


Figure 3. Typical Forward Current I_F vs. Forward Voltage V_F

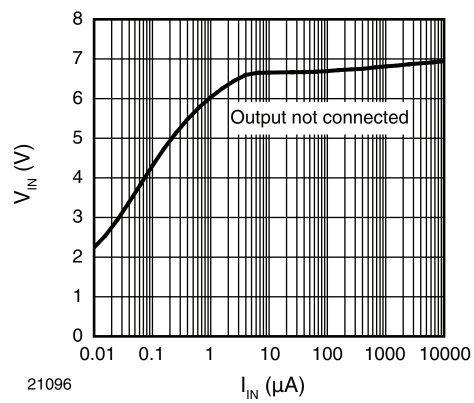


Figure 4. Typical Input Voltage V_{IN} vs. Input Current I_{IN}

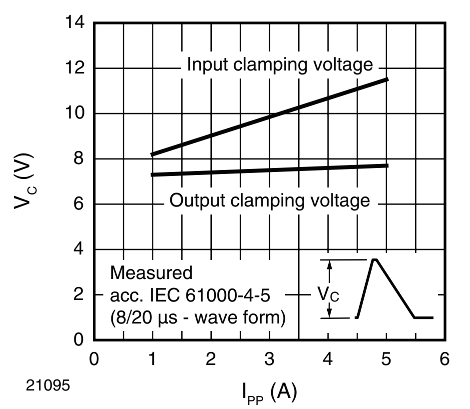


Figure 5. Typical Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

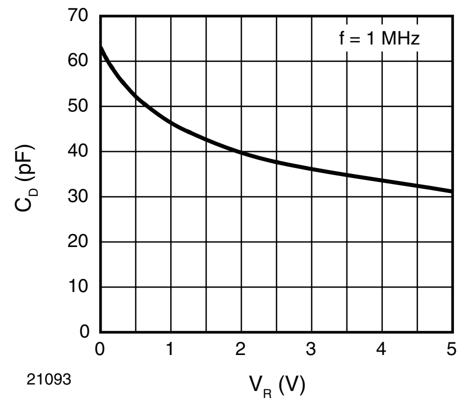


Figure 6. Typical Capacitance C_D vs. Reverse Voltage V_R

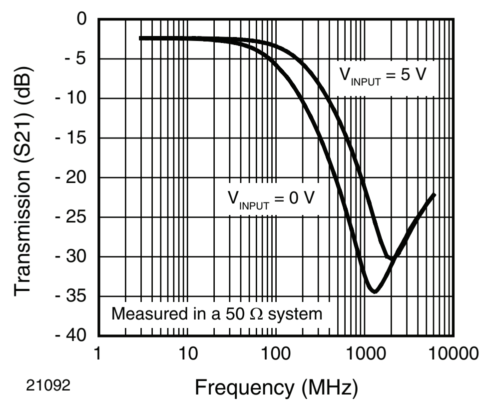
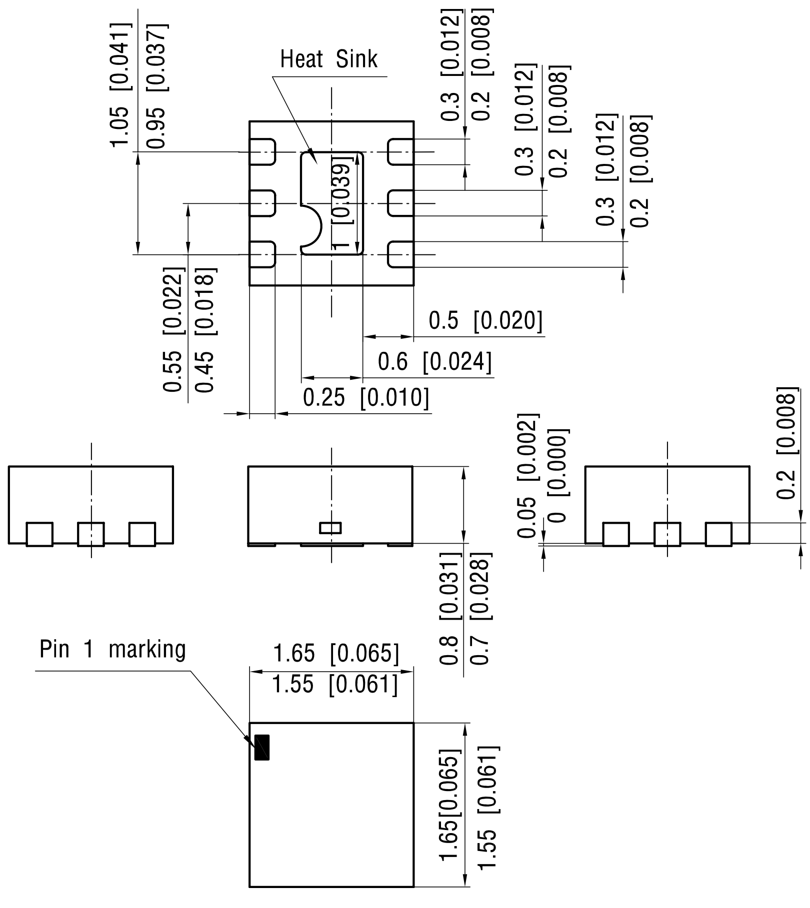
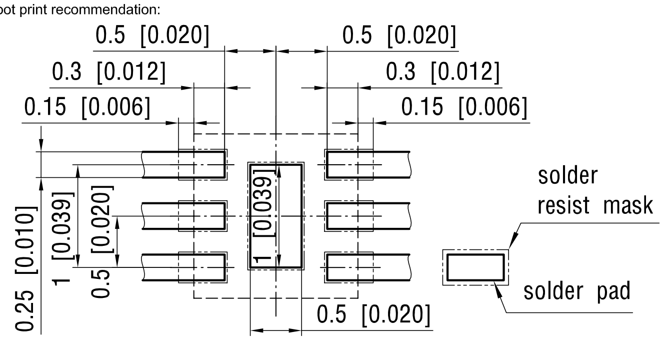


Figure 7. Typical Small Signal Transmission (S21) at $Z_O = 50\ \Omega$

Package Dimensions in millimeters (inches): LLP75-7A



foot print recommendation:



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Rev. 3 - Date: 21.March.2006

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Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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