RoHS

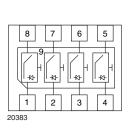
HALOGEN **FREE**

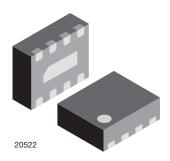
GREEN



Vishay Semiconductors

4-Channel EMI-Filter with ESD-Protection





MARKING (example only)

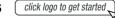


Dot = pin 1 marking Y = type code (see table below) XX = date code

DESIGN SUPPORT TOOLS

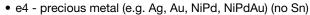
Models Available





FEATURES

- Ultra compact LLP1713-9L package
- Low package profile of 0.6 mm
- 4-channel EMI-filter
- · Low leakage current
- Line resistance $R_S = 100 \Omega$
- Typical cut off frequency f_{3dB} = 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 www.vishav.com/doc?99912

| ORDERING INFORMATION | | | | | |
|---------------------------|-------------------|--|------------------------|--|--|
| DEVICE NAME ORDERING CODE | | TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL) | MINIMUM ORDER QUANTITY | | |
| VEMI45AA-HNH | VEMI45AA-HNH-GS08 | 3000 | 15 000 | | |

| PACKAGE DATA | | | | | | | |
|--------------|-----------------|--------------|--------|--------------------------------------|-----------------------------------|------------------------------|--|
| DEVICE NAME | PACKAGE NAME | TYPE CODE | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL | SOLDERING CONDITIONS | |
| VEMI45AA-HNH | LLP1713-9L | Α | 3.7 mg | UL 94 V-0 | MSL level 1 (according J-STD-020) | Peak temperature max. 260 °C | |

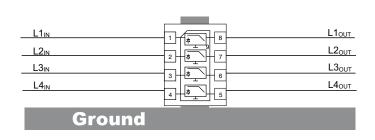
| ABSOLUTE MAXIMUM RATINGS | | | | | | | |
|--------------------------|--|------------------|-------------|------|--|--|--|
| PARAMETER | TEST CONDITIONS | SYMBOL | VALUE | UNIT | | | |
| Peak pulse current | All I/O pin to pin 9; acc. IEC 61000-4-5; t _p = 8/20 µs; single shot | I _{PPM} | 4 | А | | | |
| ESD immunity | Contact discharge acc. IEC 61000-4-2; 10 pulses | V _{ESD} | ± 30 | kV | | | |
| | Air discharge acc. IEC 61000-4-2; 10 pulses | VESD | ± 30 | | | | |
| Operating temperature | Junction temperature | TJ | -40 to +125 | °C | | | |
| Storage temperature | | T _{STG} | -55 to +150 | °C | | | |

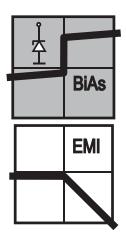


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APPLICATION NOTE

With the VEMI45AA-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 <u>Bi</u>directional and <u>Asymmetric</u> (BiAs).





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The 4 independent EMI-filter are placed between

pin 1 and pin 8,

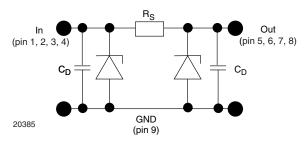
pin 2 and pin 7,

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.

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| 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 | Max. reverse working voltage | V _{RWM} | - | - | 5 | V |
| Reverse voltage | at I _R = 1 μA | | | | - | V |
| Reverse current | at V _R = V _{RWM} | I _R | - | - | 1 | μΑ |
| 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 | $V_{IN} = 0 \text{ V}$; measured in a 50 Ω system | f _{3dB} | - | 100 | - | MHz |

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

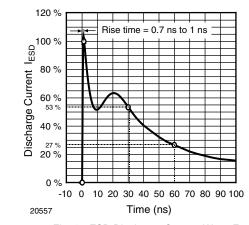


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 $\Omega/150$ pF)

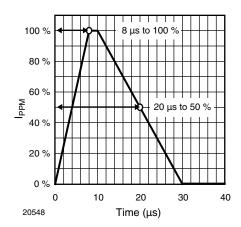


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5





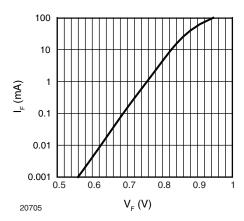


Fig. 3 - Typical Forward Current I_F vs. Forward Voltage V_F

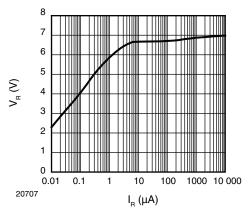


Fig. 4 - Typical Reverse Voltage V_R vs. Reverse Current I_R

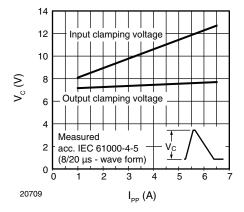


Fig. 5 - Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

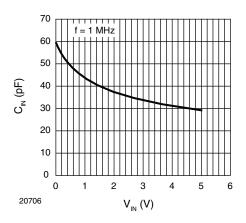


Fig. 6 - Typical Input Capacitance C_{IN} vs. Input Voltage V_{IN}

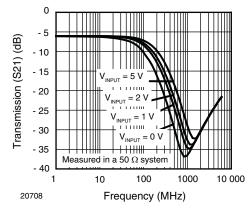
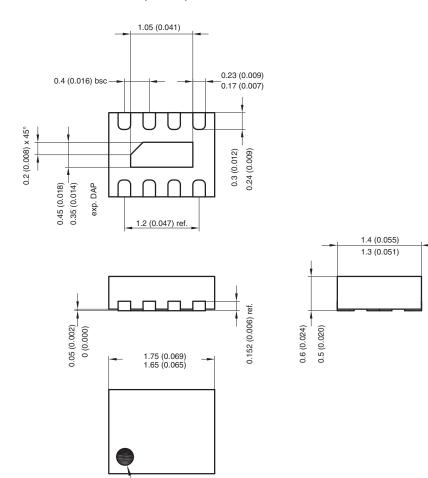


Fig. 7 - Typical Small Signal Transmission (S21) at $\,$ Z $_{O}$ = 50 $\,$ Ω

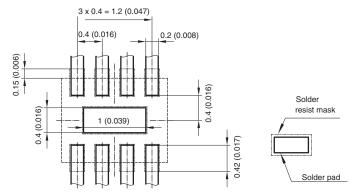
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PACKAGE DIMENSIONS in millimeters (inches): LLP1713-9L



Foot print recommendation:

Pin 1 marking



Document no.:S8-V-3906.04-001 (4) Created - Date: 28. August 2006 Rev. 1 - Date: 27. May 2008

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