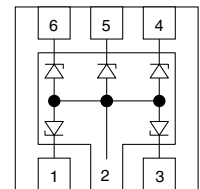
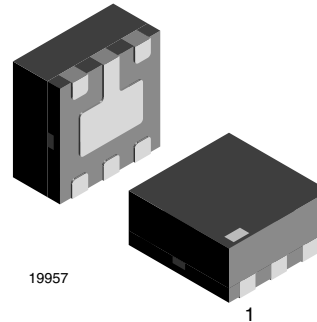


## 5-Line ESD-Protection Diode Array in LLP75-6A

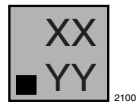
### Features

- Ultra compact LLP75-6A package
- 5-line ESD-protection
- Low leakage current  $I_R < 0.1 \mu A$
- Low load capacitance of typ. 43 pF at  $V_R = 0 V$
- ESD-immunity acc. IEC 61000-4-2  $\pm 30 kV$  contact discharge  $\pm 30 kV$  air discharge
- Working voltage range  $V_{RWM} = 5 V$
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



19956

### Marking (example only)



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
GMF05LC-HS3	GMF05LC-HS3-GS08	3000	15000

### Package Data

Device name	Package name	Type code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
GMF05LC-HS3	LLP75-6A	F6	5.1 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

### Absolute Maximum Ratings

Rating	Test condition	Symbol	Value	Unit	
Peak pulse current	BiAs-mode: each input (pin 1; 3 - pin 6) to ground (pin 2); acc. IEC 61000-4-5; $t_p = 8/20 \mu s$ ; single shot	$I_{PPM}$	5	A	
Peak pulse power	BiAs-mode: each input (pin 1; 3 - pin 6) to ground (pin 2); acc. IEC 61000-4-5; $t_p = 8/20 \mu s$ ; single shot	$P_{PP}$	70	W	
ESD-immunity	acc. IEC61000-4-2; 10 pulses BiAs-mode: each input (pin 1; 3 - pin 6) to ground (pin 2)	contact discharge	$V_{ESD}$	$\pm 30$	kV
		air discharge	$V_{ESD}$	$\pm 30$	kV
Operating temperature	Junction temperature	$T_J$	- 55 to + 125	°C	
Storage temperature		$T_{STG}$	- 55 to + 150	°C	

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

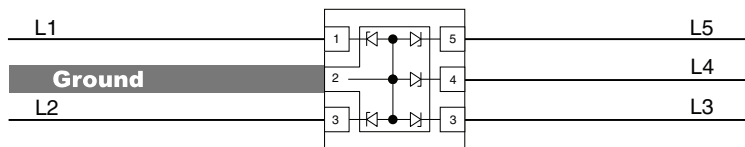
## BiAs-Mode (5-line Bidirectional Asymmetrical protection mode)

With the **GMF05LC-HS3** up to 5 signal- or data-lines (L1 - L5) can be protected against voltage transients. With pin 2 connected to ground and pin 1; 3 up to pin 6 connected to a signal- or data-line which has to be protected. As long as the voltage level on the data- or signal-line is between 0 V (ground level) and the specified **Maximum Reverse Working Voltage ( $V_{RWM}$ )** the protection diode between data line and ground offer a high isolation to the ground line. The protection device behaves like an open switch.

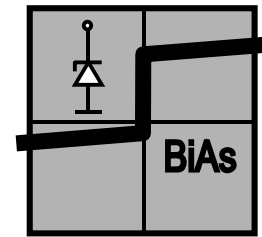
As soon as any positive transient voltage signal exceeds the break through voltage level of the protection diode, the diode becomes conductive and shorts the transient current to ground. Now the protection device behaves like a closed switch. The **Clamping Voltage ( $V_C$ )** is defined by the **Breakthrough Voltage ( $V_{BR}$ )** level plus the voltage drop at the series impedance (resistance and inductance) of the protection device.

Any negative transient signal will be clamped accordingly. The negative transient current is flowing in the forward direction of the protection diode. The low **Forward Voltage ( $V_F$ )** clamps the negative transient close to the ground level.

Due to the different clamping levels in forward and reverse direction the **GMF05LC-HS3** clamping behaviour is **Bidirectional** and **Asymmetrical (BiAs)**.



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## Electrical Characteristics

Ratings at 25 °C ambient temperature, unless otherwise specified

### GMF05LC-HS3

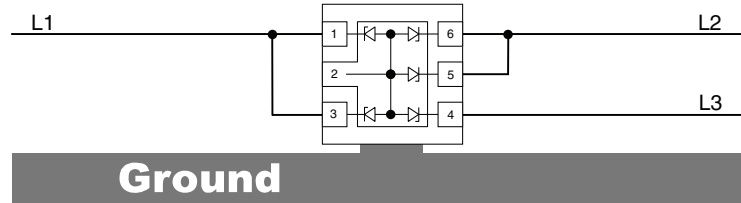
BiAs mode: each input (pin 1, 3, 4, 5, 6) to ground (pin 2)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	number of line which can be protected	N lines			5	lines
Reverse stand-off voltage	at $I_R = 1 \mu\text{A}$	$V_{RWM}$	5			V
Reverse current	at $V_R = V_{RWM} = 5 \text{ V}$	$I_R$		0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1 \text{ mA}$	$V_{BR}$	6		8	V
Reverse clamping voltage	at $I_{PP} = 1 \text{ A}$ ; acc. IEC 61000-4-5	$V_C$		8	9.5	V
	at $I_{PP} = I_{PPM} = 5 \text{ A}$ ; acc. IEC 61000-4-5	$V_C$		11.5	12.5	V
Forward clamping voltage	at $I_F = 1 \text{ A}$ ; acc. IEC 61000-4-5	$V_F$		1.5	2	V
	at $I_{PP} = I_{PPM} = 5 \text{ A}$ ; acc. IEC 61000-4-5	$V_F$		3.1	4	V
Line capacitance	at $V_R = 0 \text{ V}$ ; $f = 1 \text{ MHz}$	$C_D$		43	50	pF
	at $V_R = 2.5 \text{ V}$ ; $f = 1 \text{ MHz}$	$C_D$		25		pF

If a higher surge current or **Peak Pulse current ( $I_{PP}$ )** is needed, some protection diodes in the **GMF05LC-HS3** can also be used in parallel in order to "multiply" the performance.

If two diodes are switched in parallel you get

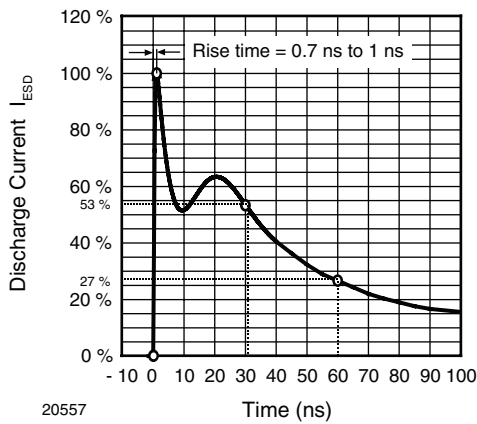
- double surge power = double peak pulse current ( $2 \times I_{PPM}$ )
- half of the line inductance = reduced clamping voltage
- half of the line resistance = reduced clamping voltage
- double line Capacitance ( $2 \times C_D$ )
- double **Reverse leakage current** ( $2 \times I_R$ )



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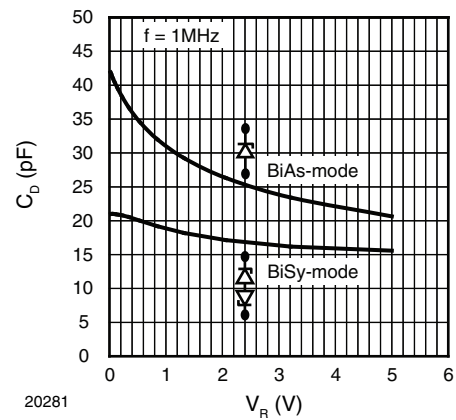
## Typical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified



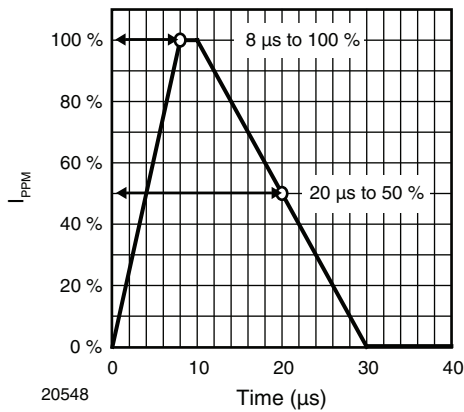
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Figure 1. ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)



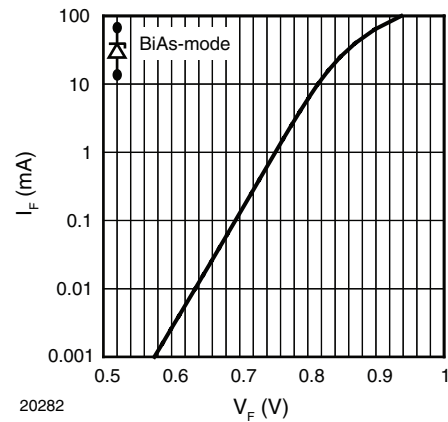
20281

Figure 3. Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$



20548

Figure 2. 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form acc. IEC 61000-4-5



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Figure 4. Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

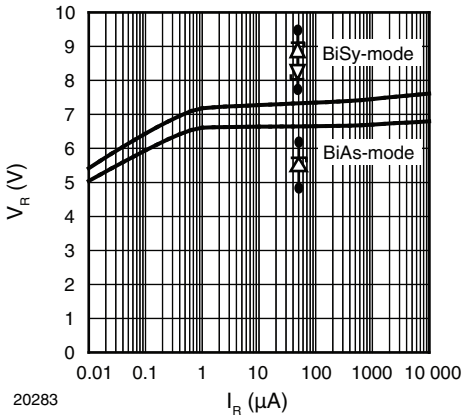


Figure 5. Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

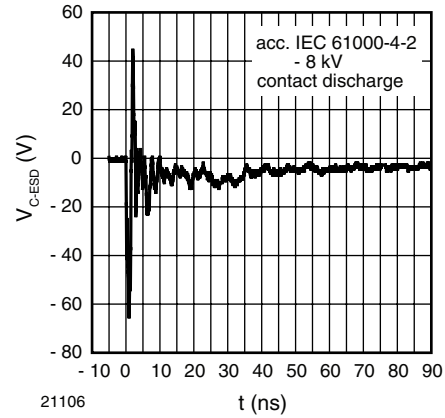


Figure 8. Typical Clamping performance at -8 kV Contact Discharge (acc. IEC 61000-4-2)

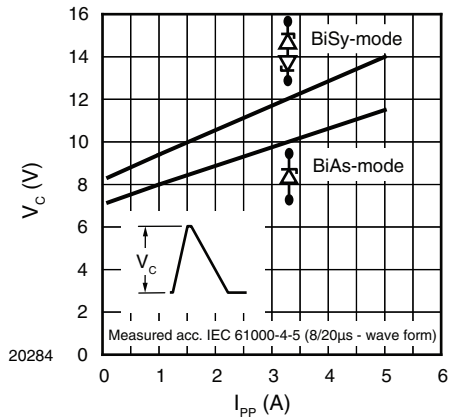


Figure 6. Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

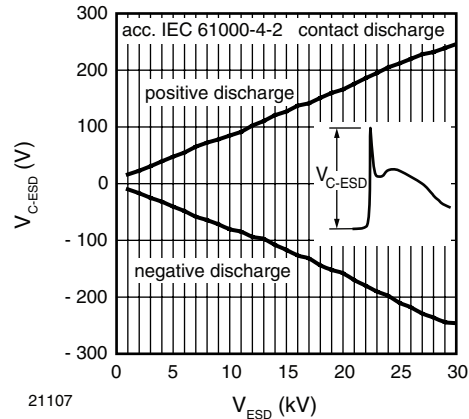


Figure 9. Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)

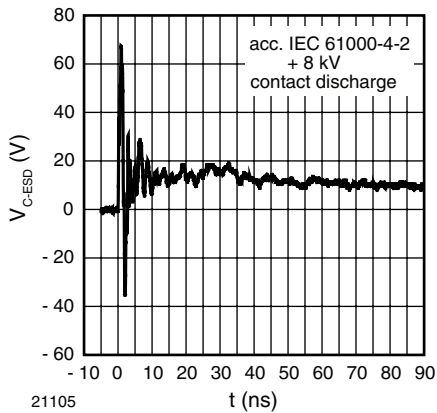
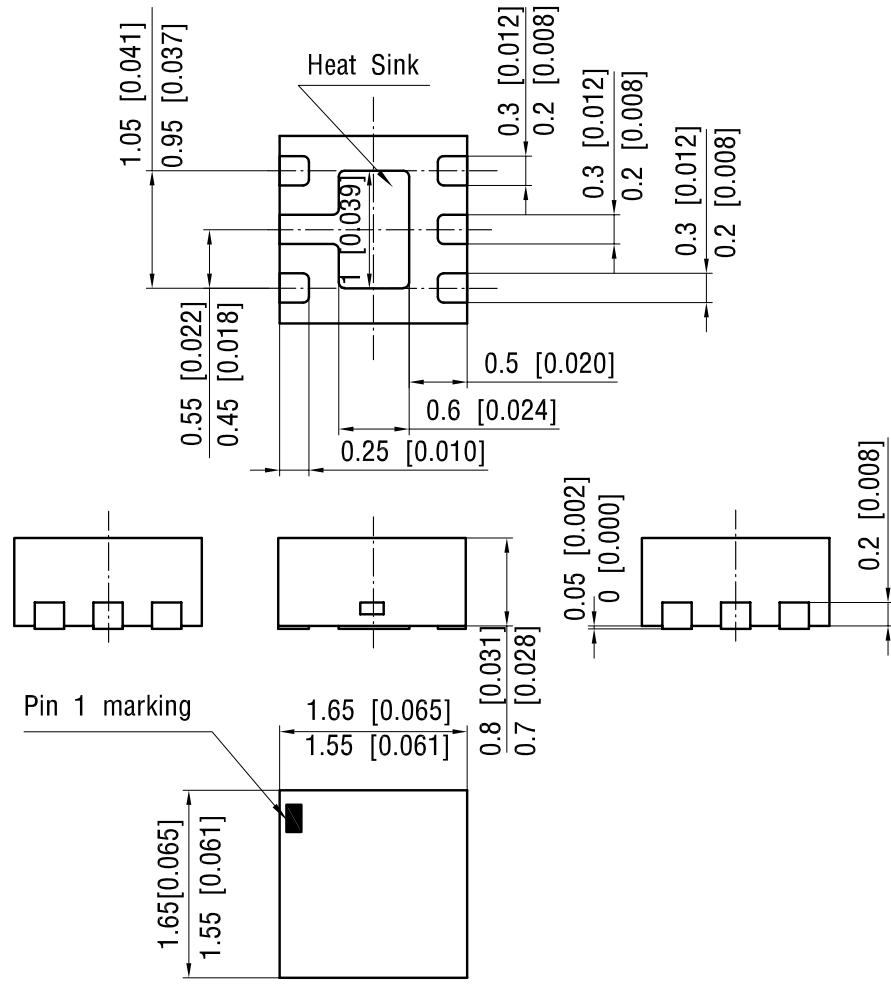
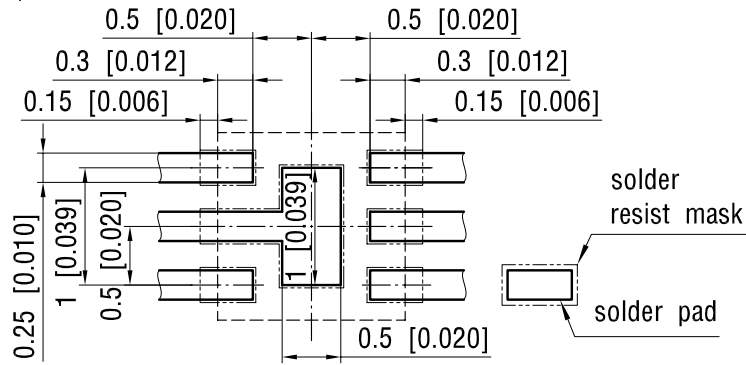


Figure 7. Typical Clamping Performance at +8 kV Contact Discharge (acc. IEC 61000-4-2)

**Package Dimensions** in millimeters (inches): **LLP75-6A**



foot print recommendation:



Document no.: S8-V-3906.02-001 (4)  
 Created - Date: 20.December 2004  
 Rev. b - Date: 12.January 2006  
 18058

### 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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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