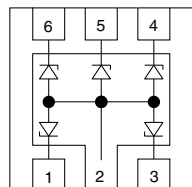
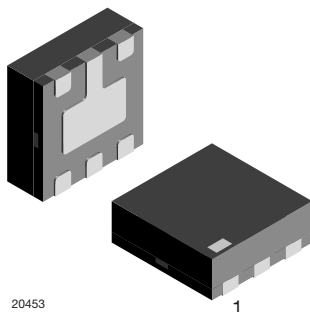


## 5-Line ESD Protection Diode Array in LLP75-6L



19956



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1

### MARKING (example only)



Dot = pin 1 marking

YY = type code (see table below)

XX = date code

### FEATURES

- Ultra compact LLP75-6L package
- Low package profile < 0.6 mm
- 5-line ESD-protection
- Surge immunity acc. IEC 61000-4-5  $I_{PPM} > 12$  A
- Low leakage current  $I_R < 1$   $\mu$ A
- ESD-protection acc. IEC 61000-4-2  
± 30 kV contact discharge  
± 30 kV air discharge
- Working voltage range  $V_{RWM} = 5$  V
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC


**RoHS**  
COMPLIANT

**GREEN**  
[5-2008]\*\*

### ORDERING INFORMATION

| DEVICE NAME | ORDERING CODE   | TAPED UNITS PER REEL<br>(8 mm TAPE ON 7" REEL) | MINIMUM ORDER QUANTITY |
|-------------|-----------------|------------------------------------------------|------------------------|
| GMF05C-HSF  | GMF05C-HSF-GS08 | 3000                                           | 15 000                 |

### PACKAGE DATA

| DEVICE NAME | PACKAGE NAME | TYPE CODE | WEIGHT | MOLDING COMPOUND<br>FLAMMABILITY RATING | MOISTURE<br>SENSITIVITY LEVEL        | SOLDERING<br>CONDITIONS  |
|-------------|--------------|-----------|--------|-----------------------------------------|--------------------------------------|--------------------------|
| GMF05C-HSF  | LLP75-6L     | 1A        | 4.2 mg | UL 94 V-0                               | MSL level 1<br>(according J-STD-020) | 260 °C/10 s at terminals |

### ABSOLUTE MAXIMUM RATINGS GMF05C-HSF

| PARAMETER             | TEST CONDITIONS                                                                                                      | SYMBOL               | VALUE         | UNIT |
|-----------------------|----------------------------------------------------------------------------------------------------------------------|----------------------|---------------|------|
| Peak pulse current    | BiAs-mode: each input (pin 1; 3 - pin 6) to ground (pin 2);<br>acc. IEC 61000-4-5; $t_p = 8/20$ $\mu$ s; single shot | $I_{PPM}$            | 12            | A    |
| Peak pulse power      | BiAs-mode: each input (pin 1; 3 - pin 6) to ground (pin 2);<br>acc. IEC 61000-4-5; $t_p = 8/20$ $\mu$ s; single shot | $P_{PP}$             | 200           | W    |
| ESD immunity          | BiAs-mode: each input (pin 1; 3 - pin 6) to<br>ground (pin 2);<br>acc. IEC 61000-4-2; 10 pulses                      | contact<br>discharge | ± 30          | kV   |
|                       |                                                                                                                      | air<br>discharge     | ± 30          | kV   |
| Operating temperature | Junction temperature                                                                                                 | $T_J$                | - 55 to + 125 | °C   |
| Storage temperature   |                                                                                                                      | $T_{STG}$            | - 55 to + 150 | °C   |

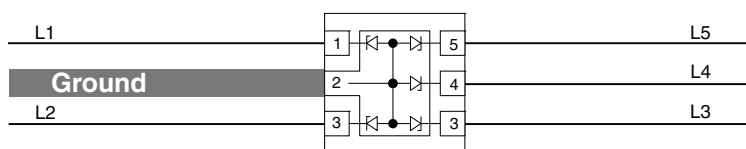
\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

### BiAs-MODE (5-line bidirectional asymmetrical protection mode)

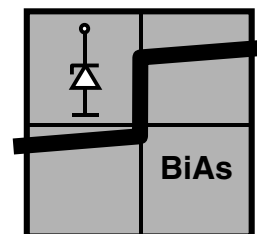
With the GMF05C-HSF up to 5 signal- or data-lines (L1 to L5) can be protected against voltage transients. With pin 2 connected to ground and pin 1; 3 up to pin 6 connected to a signal- or data-line which has to be protected. As long as the voltage level on the data- or signal-line is between 0 V (ground 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 GMF05C-HSF clamping behaviour is bidirectional and asymmetrical (BiAs).



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| ELECTRICAL CHARACTERISTICS GMF05C-HSF |                                        |               |      |       |      |         |
|---------------------------------------|----------------------------------------|---------------|------|-------|------|---------|
| PARAMETER                             | TEST CONDITIONS/REMARKS                | SYMBOL        | MIN. | TYP.  | MAX. | UNIT    |
| Protection paths                      | Number of lines which can be protected | $N_{channel}$ | -    | -     | 5    | lines   |
| Reverse working voltage               | at $I_R = 1 \mu A$                     | $V_{RWM}$     | 5    | -     | -    | V       |
| Reverse current                       | at $V_R = V_{RWM} = 5 V$               | $I_R$         | -    | < 0.1 | 1    | $\mu A$ |
| Reverse breakdown voltage             | at $I_R = 1 mA$                        | $V_{BR}$      | 6    | -     | 8    | V       |
| Reverse clamping voltage              | at $I_{PP} = 12 A$ acc. IEC 61000-4-5  | $V_C$         | -    | -     | 12.5 | V       |
|                                       | at $I_{PP} = 1 A$ acc. IEC 61000-4-5   |               | -    | 7.8   | 9.5  | V       |
| Forward clamping voltage              | at $I_F = 12 A$ acc. IEC 61000-4-5     | $V_F$         | -    | -     | 5.5  | V       |
|                                       | at $I_{PP} = 1 A$ acc. IEC 61000-4-5   |               | -    | 1.5   | -    | V       |
| Capacitance                           | at $V_R = 0 V$ ; $f = 1 MHz$           | $C_D$         | -    | 126   | 150  | pF      |
|                                       | at $V_R = 2.5 V$ ; $f = 1 MHz$         |               | -    | 76    | -    | pF      |

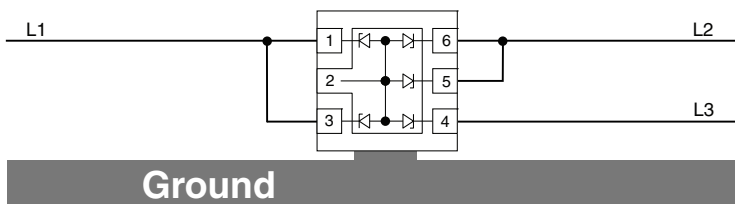
#### Note

- Ratings at 25 °C, ambient temperature unless otherwise specified. BiAs mode: each input (pin 1; 3 - pin 6) to ground (pin 2).

If a higher surge current or peak pulse current ( $I_{PP}$ ) is needed, some protection diodes in the GMF05C-HSF 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

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

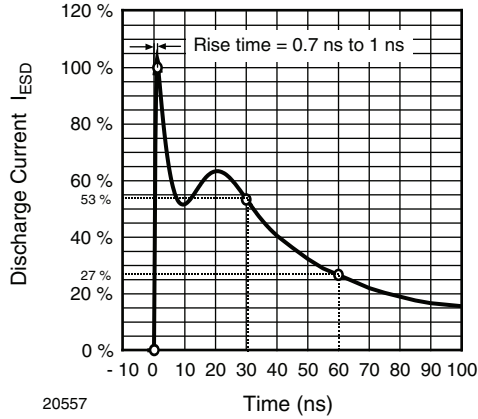


Fig. 1 - ESD Discharge Current Wave Form  
acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

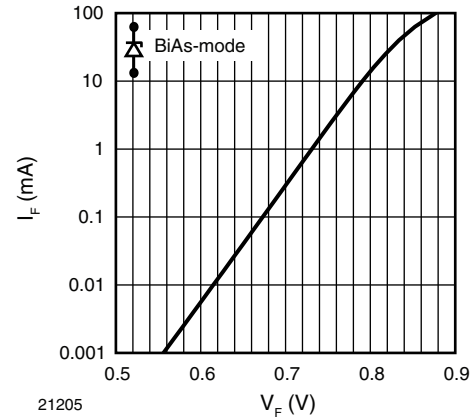


Fig. 4 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

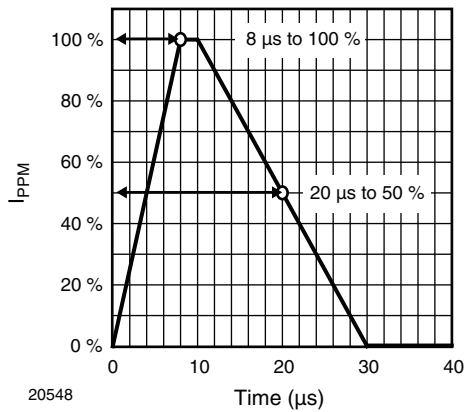


Fig. 2 - 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form  
acc. IEC 61000-4-5

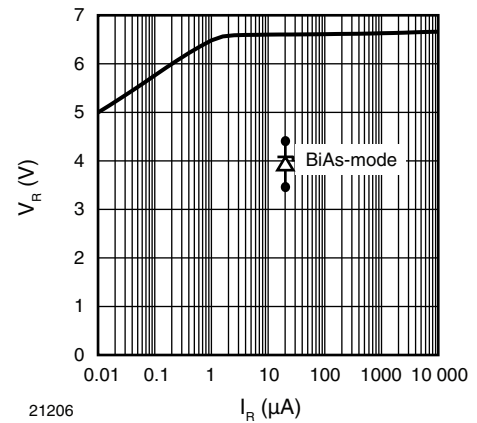


Fig. 5 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

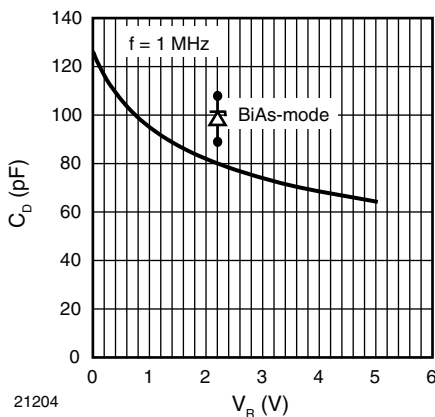


Fig. 3 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

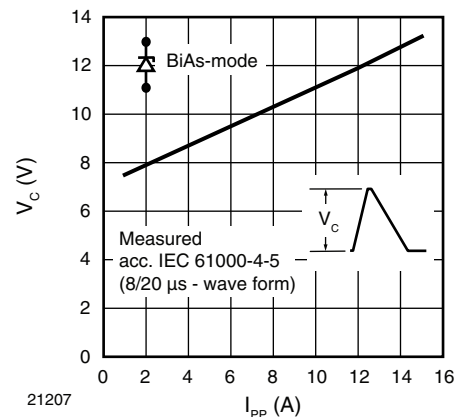


Fig. 6 - Typical Peak Clamping Voltage  $V_C$  vs.

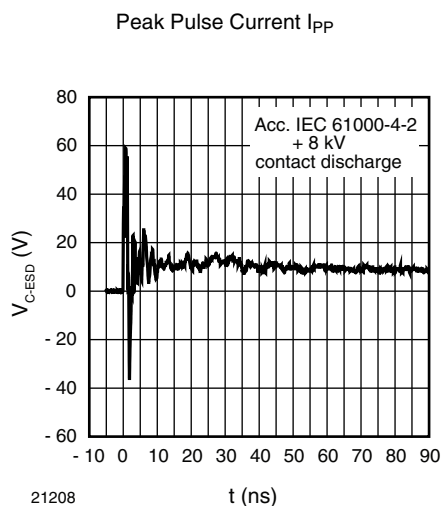


Fig. 7 - Typical Clamping Performance at + 8 kV Contact Discharge (acc. IEC 61000-4-2)

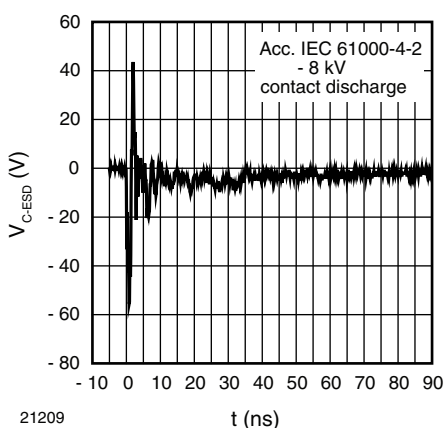


Fig. 8 - Typical Clamping Performance at - 8 kV Contact Discharge (acc. IEC 61000-4-2)

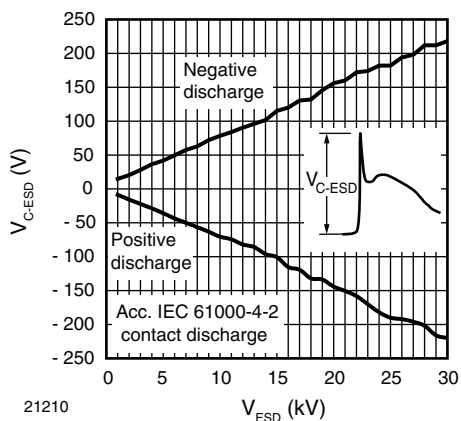
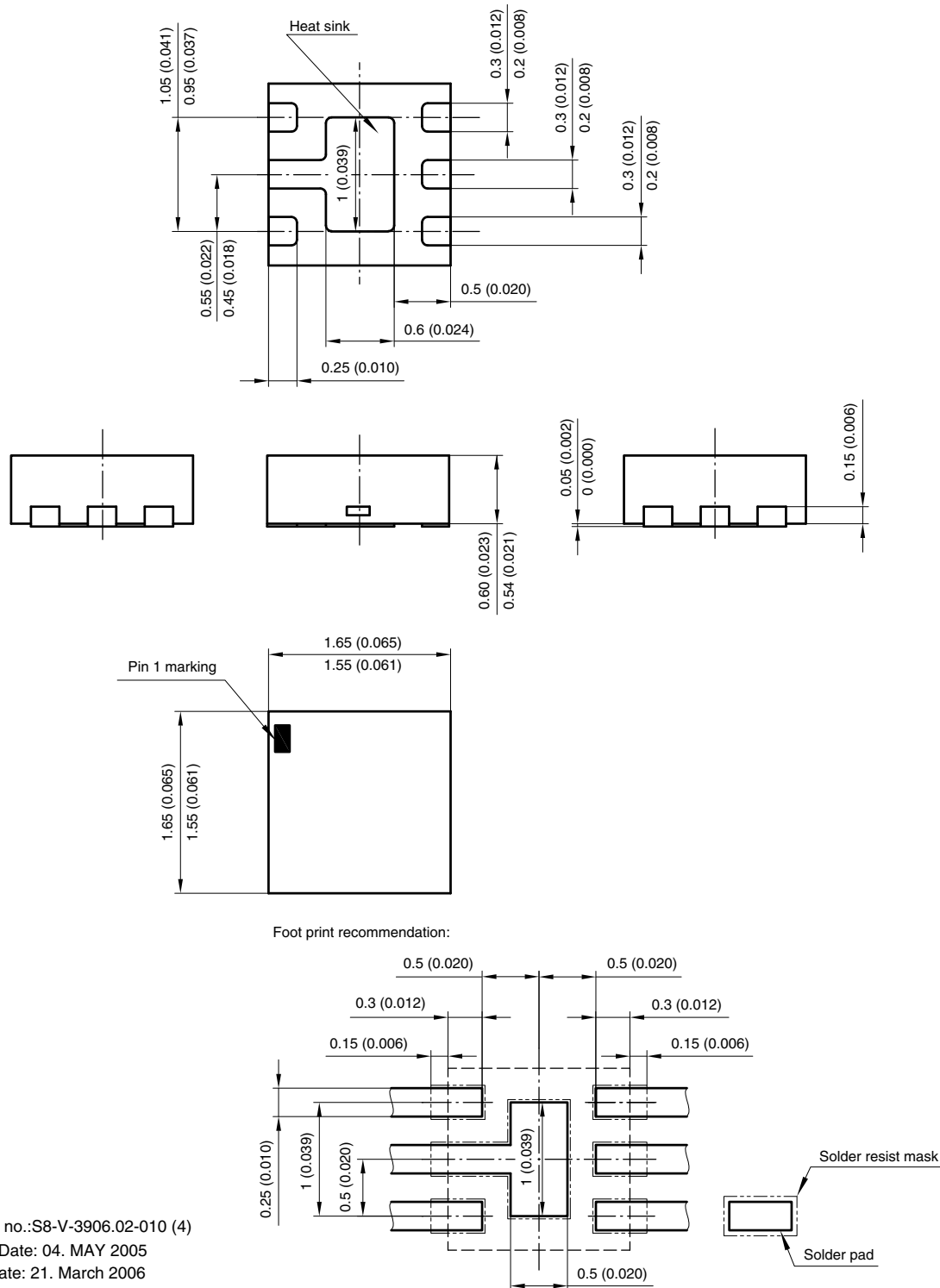


Fig. 9 - Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)

**PACKAGE DIMENSIONS** in millimeters (inches): **LLP75-6L**


Document no.:S8-V-3906.02-010 (4)  
Created - Date: 04. MAY 2005  
Rev. 4 - Date: 21. March 2006  
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