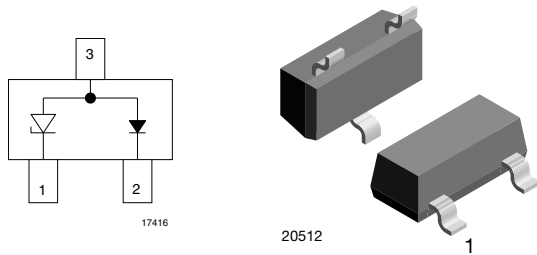
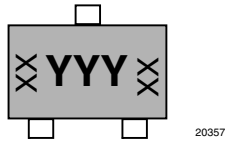


## Low Capacitance ESD Protection Diodes for High-Speed Data Interfaces


**MARKING** (example only)


Bar = cathode marking  
 YYY = type code (see table below)  
 XX = date code

**DESIGN SUPPORT TOOLS** click logo to get started

**FEATURES**

- IEC 61000-4-5 (lightning) see  $I_{PPM}$  below
- ESD immunity acc. IEC 61000-4-2  
 $\pm 8$  kV contact discharge  
 $\pm 15$  kV air discharge
- ESD capability according to AEC-Q101:  
 human body model: class H3B:  $> 8$  kV
- SOT-23 package
- High temperature soldering guaranteed:  
 $260$  °C/10 s at terminals
- Low capacitance for high speed data lines,  
 cellular handsets, USB port protection, LAN equipment,  
 peripherals
- e3 - Sn
- AEC-Q101 qualified available
- Material categorization: for definitions of compliance  
 please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



| ORDERING INFORMATION  |                                |                                 |       |            |   |   |                         |
|-----------------------|--------------------------------|---------------------------------|-------|------------|---|---|-------------------------|
| PART NUMBER (EXAMPLE) | ENVIRONMENTAL AND QUALITY CODE |                                 |       |            | PACKAGING CODE                            |   | ORDERING CODE (EXAMPLE) |
|                       | AEC-Q101 QUALIFIED             | RoHS-COMPLIANT + LEAD (Pb)-FREE |       | TIN PLATED | 3K PER 7" REEL (8 mm TAPE), 15K/BOX = MOQ | 10K PER 13" REEL (8 mm TAPE), 10K/BOX = MOQ |                         |
|                       |                                | STANDARD                        | GREEN |            |   |   |                         |
| GL05T-                |                                | E                               |       | 3          | -08                                       |   | GL05T-E3-08             |
| GL05T-                |                                |                                 | G     | 3          | -08                                       |   | GL05T-G3-08             |
| GL05T-                | H                              | E                               |       | 3          | -08                                       |   | GL05T-HE3-08            |
| GL05T-                | H                              |                                 | G     | 3          | -08                                       |   | GL05T-HG3-08            |
| GL05T-                |                                | E                               |       | 3          |   | -18   | GL05T-E3-18             |
| GL05T-                |                                |                                 | G     | 3          |   | -18   | GL05T-G3-18             |
| GL05T-                | H                              | E                               |       | 3          |   | -18   | GL05T-HE3-18            |
| GL05T-                | H                              |                                 | G     | 3          |   | -18   | GL05T-HG3-18            |

| PACKAGE DATA |              |           |                      |        |                                      |                                   |                          |
|--------------|--------------|-----------|----------------------|--------|--------------------------------------|-----------------------------------|--------------------------|
| DEVICE NAME  | PACKAGE NAME | TYPE CODE | ENVIRONMENTAL STATUS | WEIGHT | MOLDING COMPOUND FLAMMABILITY RATING | MOISTURE SENSITIVITY LEVEL        | SOLDERING CONDITIONS     |
| GL05T        | SOT-23       | L05       | Standard             | 8.8 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
|              |              | L06       | Green                | 8.1 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
| GL12T        | SOT-23       | L12       | Standard             | 8.8 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
|              |              | L13       | Green                | 8.1 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
| GL15T        | SOT-23       | L15       | Standard             | 8.8 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
|              |              | L16       | Green                | 8.1 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
| GL24T        | SOT-23       | L24       | Standard             | 8.8 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |
|              |              | L25       | Green                | 8.1 mg | UL 94 V-0                            | MSL level 1 (according J-STD-020) | 260 °C/10 s at terminals |



| ABSOLUTE MAXIMUM RATINGS GL05T |   |                      |           |             |             |
|--------------------------------|---|----------------------|-----------|-------------|-------------|
| PARAMETER                      | TEST CONDITIONS                                 |                      | SYMBOL    | VALUE       | UNIT        |
| Peak pulse current             | 8/20 $\mu$ s                                    | Pin 1-2 (pin 3 n.c.) | $I_{PPM}$ | 25          | A           |
| Peak pulse power               | 8/20 $\mu$ s waveform                           |                      | $P_{PP}$  | 300         | W           |
| ESD immunity                   | Contact discharge acc. IEC 61000-4-2; 10 pulses |                      | $V_{ESD}$ | $\pm 8$     | kV          |
|                                | Air discharge acc. IEC 61000-4-2; 10 pulses     |                      |           | $\pm 15$    | kV          |
| Blocking voltage               | $I_B = 1 \mu A$                                 | Pin 2-1 or pin 2-3   | $V_B$     | 70          | V           |
| Operating temperature          | Junction temperature                            |                      | $T_J$     | -55 to +150 | $^{\circ}C$ |
| Storage temperature            |   |                      | $T_{STG}$ | -55 to +150 | $^{\circ}C$ |

| ABSOLUTE MAXIMUM RATINGS GL12T |   |                      |           |             |             |
|--------------------------------|---|----------------------|-----------|-------------|-------------|
| PARAMETER                      | TEST CONDITIONS                                 |                      | SYMBOL    | VALUE       | UNIT        |
| Peak pulse current             | 8/20 $\mu$ s                                    | Pin 1-2 (pin 3 n.c.) | $I_{PPM}$ | 12          | A           |
| Peak pulse power               | 8/20 $\mu$ s waveform                           |                      | $P_{PP}$  | 300         | W           |
| ESD immunity                   | Contact discharge acc. IEC 61000-4-2; 10 pulses |                      | $V_{ESD}$ | $\pm 8$     | kV          |
|                                | Air discharge acc. IEC 61000-4-2; 10 pulses     |                      |           | $\pm 15$    | kV          |
| Blocking voltage               | $I_B = 1 \mu A$                                 | Pin 2-1 or pin 2-3   | $V_B$     | 70          | V           |
| Operating temperature          | Junction temperature                            |                      | $T_J$     | -55 to +150 | $^{\circ}C$ |
| Storage temperature            |   |                      | $T_{STG}$ | -55 to +150 | $^{\circ}C$ |

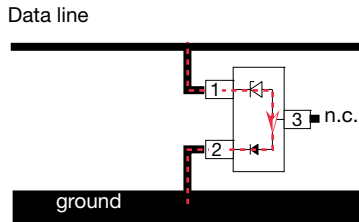
| ABSOLUTE MAXIMUM RATINGS GL15T |   |                      |           |             |             |
|--------------------------------|---|----------------------|-----------|-------------|-------------|
| PARAMETER                      | TEST CONDITIONS                                 |                      | SYMBOL    | VALUE       | UNIT        |
| Peak pulse current             | 8/20 $\mu$ s                                    | Pin 1-2 (pin 3 n.c.) | $I_{PPM}$ | 10          | A           |
| Peak pulse power               | 8/20 $\mu$ s waveform                           |                      | $P_{PP}$  | 300         | W           |
| ESD immunity                   | Contact discharge acc. IEC 61000-4-2; 10 pulses |                      | $V_{ESD}$ | $\pm 8$     | kV          |
|                                | Air discharge acc. IEC 61000-4-2; 10 pulses     |                      |           | $\pm 15$    | kV          |
| Blocking voltage               | $I_B = 1 \mu A$                                 | Pin 2-1 or pin 2-3   | $V_B$     | 70          | V           |
| Operating temperature          | Junction temperature                            |                      | $T_J$     | -55 to +150 | $^{\circ}C$ |
| Storage temperature            |   |                      | $T_{STG}$ | -55 to +150 | $^{\circ}C$ |

| ABSOLUTE MAXIMUM RATINGS GL24T |   |                      |           |             |             |
|--------------------------------|---|----------------------|-----------|-------------|-------------|
| PARAMETER                      | TEST CONDITIONS                                 |                      | SYMBOL    | VALUE       | UNIT        |
| Peak pulse current             | 8/20 $\mu$ s                                    | Pin 1-2 (pin 3 n.c.) | $I_{PPM}$ | 5           | A           |
| Peak pulse power               | 8/20 $\mu$ s waveform                           |                      | $P_{PP}$  | 300         | W           |
| ESD immunity                   | Contact discharge acc. IEC 61000-4-2; 10 pulses |                      | $V_{ESD}$ | $\pm 8$     | kV          |
|                                | Air discharge acc. IEC 61000-4-2; 10 pulses     |                      |           | $\pm 15$    | kV          |
| Blocking voltage               | $I_B = 1 \mu A$                                 | Pin 2-1 or pin 2-3   | $V_B$     | 70          | V           |
| Operating temperature          | Junction temperature                            |                      | $T_J$     | -55 to +150 | $^{\circ}C$ |
| Storage temperature            |   |                      | $T_{STG}$ | -55 to +150 | $^{\circ}C$ |

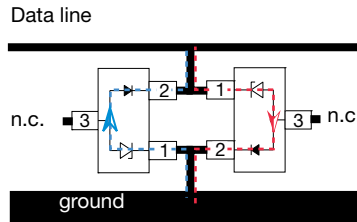
The GLxxT contains an avalanche diode (pin 3-1) and a switching diode (pin 3-2). With pin 1 connected to the signal or data line and pin 2 connected to ground both diodes are in series (pin 3 remains unconnected). The big and robust avalanche diode, driven in reverse direction, provides the working range  $V_{RWM}$  of 5 V, 12 V, 15 V or 24 V. Due to its size the capacitance of the avalanche diode is in the range of typ. 260 pF (GL05T) and 65 pF (GL24T). The small switching diode in series has a low capacitance of just 2.5 pF (typ.). As both diodes are in series (with pin 3 not connected) the total capacitance of both diodes measured between pin 1 and 2 is as low as the capacitance of the switching diode.

Before the GLxxT can provide this low capacitance the big capacitance of the avalanche diode has to be charged up with the first signal or data pulses. This is usually no problem for digital signals like USB or other data ports.

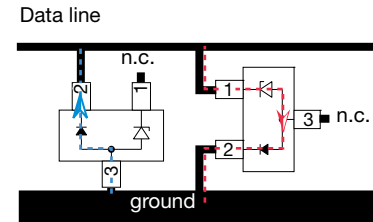
With the GLxxT a signal or data line can be protected against positive transients only. For negative transients another GLxxT can be used to provide a back path for the negative transients as well.



**Uni**  
Unidirectional clamping performance for **positive** transients only.



**BiSy**  
Bidirectional and **Symmetrical** clamping performance for **positive** and **negative** transients.



**BiAs**  
Bidirectional and **Asymmetrical** clamping performance for **positive** and **negative** transients.

**ELECTRICAL CHARACTERISTICS GL05T** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

pin 1 to pin 2; pin 3 not connected

| PARAMETER                 | TEST CONDITIONS/REMARKS                    | SYMBOL        | MIN. | TYP. | MAX. | UNIT          |
|---------------------------|--|---------------|------|------|------|---------------|
| Protection paths          | Number of lines which can be protected     | $N_{channel}$ | -    | -    | 1    | lines         |
| Reverse stand-off voltage | Max. reverse working voltage               | $V_{RWM}$     | -    | -    | 5    | V             |
| Reverse voltage           | at $I_R = 20\text{ }\mu\text{A}$           | $V_R$         | 5    | -    | -    | V             |
| Reverse current           | at $V_R = 5\text{ V}$                      | $I_R$         | -    | -    | 20   | $\mu\text{A}$ |
| Reverse breakdown voltage | at $I_R = 1\text{ mA}$                     | $V_{BR}$      | 6.9  | 7.5  | 8.0  | V             |
| Reverse clamping voltage  | at $I_{PP} = 1\text{ A}$                   | $V_C$         | -    | -    | 9.8  | V             |
|                           | at $I_{PP} = 5\text{ A}$                   |               | -    | -    | 11   | V             |
| Capacitance               | at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$ | $C_D$         | -    | 2.5  | 5    | pF            |

**ELECTRICAL CHARACTERISTICS GL12T** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

pin 1 to pin 2; pin 3 not connected

| PARAMETER                 | TEST CONDITIONS/REMARKS                    | SYMBOL        | MIN. | TYP. | MAX. | UNIT          |
|---------------------------|--|---------------|------|------|------|---------------|
| Protection paths          | Number of lines which can be protected     | $N_{channel}$ | -    | -    | 1    | lines         |
| Reverse stand-off voltage | Max. reverse working voltage               | $V_{RWM}$     | -    | -    | 12   | V             |
| Reverse voltage           | at $I_R = 1\text{ }\mu\text{A}$            | $V_R$         | 12   | -    | -    | V             |
| Reverse current           | at $V_R = 12\text{ V}$                     | $I_R$         | -    | -    | 1    | $\mu\text{A}$ |
| Reverse breakdown voltage | at $I_R = 1\text{ mA}$                     | $V_{BR}$      | 13.3 | 14.3 | 17.2 | V             |
| Reverse clamping voltage  | at $I_{PP} = 1\text{ A}$                   | $V_C$         | -    | -    | 19   | V             |
|                           | at $I_{PP} = 5\text{ A}$                   |               | -    | -    | 24   | V             |
| Capacitance               | at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$ | $C_D$         | -    | 2.5  | 5    | pF            |

**ELECTRICAL CHARACTERISTICS GL15T** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

pin 1 to pin 2; pin 3 not connected

| PARAMETER                 | TEST CONDITIONS/REMARKS                    | SYMBOL        | MIN. | TYP. | MAX. | UNIT          |
|---------------------------|--|---------------|------|------|------|---------------|
| Protection paths          | Number of lines which can be protected     | $N_{channel}$ | -    | -    | 1    | lines         |
| Reverse stand-off voltage | Max. reverse working voltage               | $V_{RWM}$     | -    | -    | 15   | V             |
| Reverse voltage           | at $I_R = 1\text{ }\mu\text{A}$            | $V_R$         | 15   | -    | -    | V             |
| Reverse current           | at $V_R = 15\text{ V}$                     | $I_R$         | -    | -    | 1    | $\mu\text{A}$ |
| Reverse breakdown voltage | at $I_R = 1\text{ mA}$                     | $V_{BR}$      | 16.7 | 17.7 | 22   | V             |
| Reverse clamping voltage  | at $I_{PP} = 1\text{ A}$                   | $V_C$         | -    | -    | 24   | V             |
|                           | at $I_{PP} = 5\text{ A}$                   |               | -    | -    | 33   | V             |
| Capacitance               | at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$ | $C_D$         | -    | 2.5  | 5    | pF            |



| <b>ELECTRICAL CHARACTERISTICS GL24T</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)<br>pin 1 to pin 2; pin 3 not connected |  |               |      |      |      |               |
|---|--|---------------|------|------|------|---------------|
| PARAMETER   | TEST CONDITIONS/REMARKS                    | SYMBOL        | MIN. | TYP. | MAX. | UNIT          |
| Protection paths  | Number of lines which can be protected     | $N_{channel}$ | -    | -    | 1    | lines         |
| Reverse stand-off voltage   | Max. reverse working voltage               | $V_{RWM}$     | -    | -    | 24   | V             |
| Reverse voltage   | at $I_R = 1\text{ }\mu\text{A}$            | $V_R$         | 24   | -    | -    | V             |
| Reverse current   | at $V_R = 24\text{ V}$                     | $I_R$         | -    | -    | 1    | $\mu\text{A}$ |
| Reverse breakdown voltage   | at $I_R = 1\text{ mA}$                     | $V_{BR}$      | 26.7 | 28.2 | 33   | V             |
| Reverse clamping voltage  | at $I_{PP} = 1\text{ A}$                   | $V_C$         | -    | -    | 43   | V             |
|   | at $I_{PP} = 5\text{ A}$                   |               | -    | -    | 55   | V             |
| Capacitance   | at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$ | $C_D$         | -    | 2.5  | 5    | pF            |

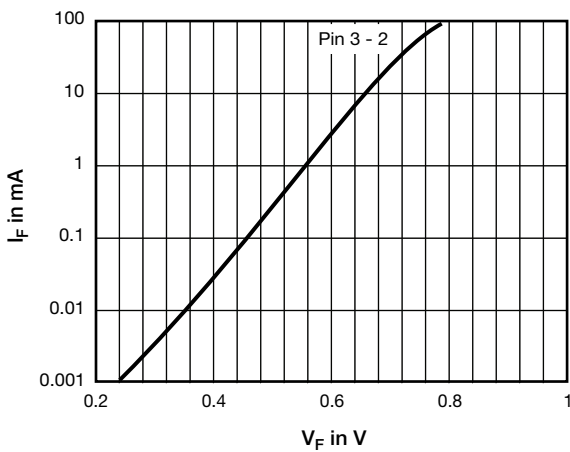


Fig. 1 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

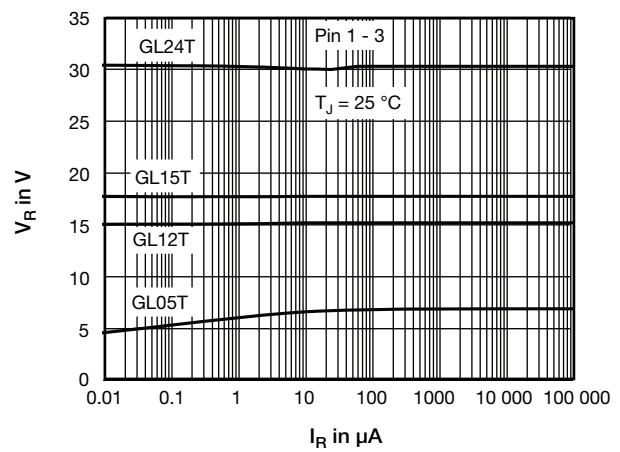


Fig. 3 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

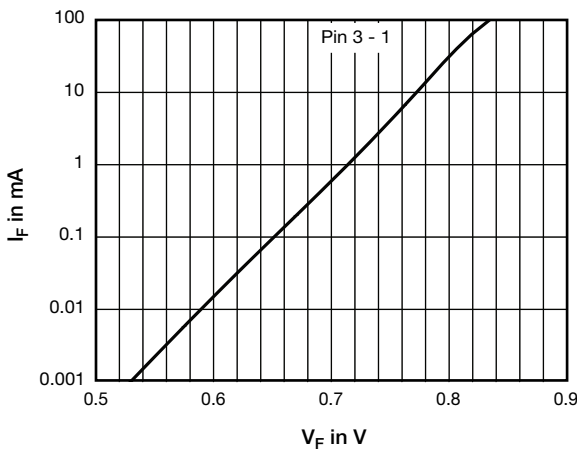
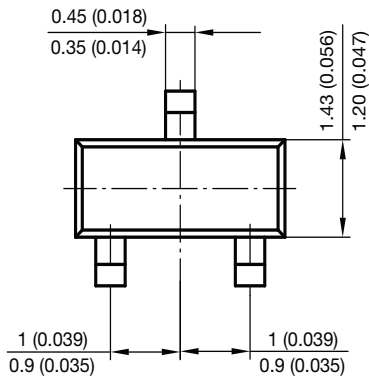
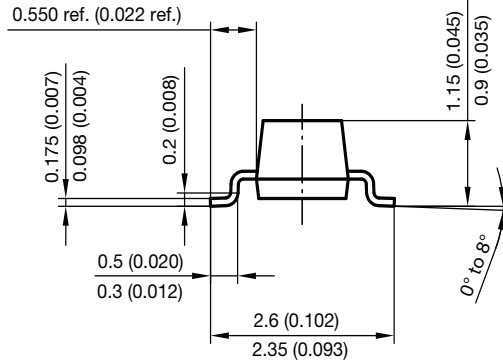
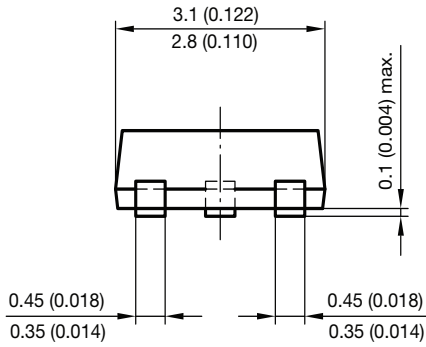


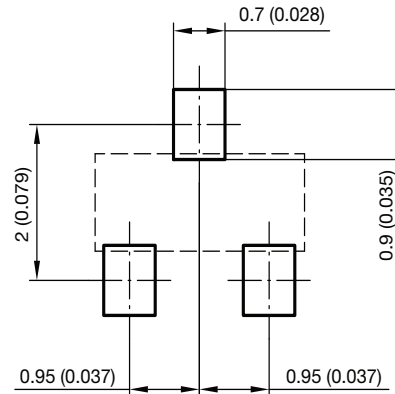
Fig. 2 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$



PACKAGE DIMENSIONS in millimeters (inches): SOT-23

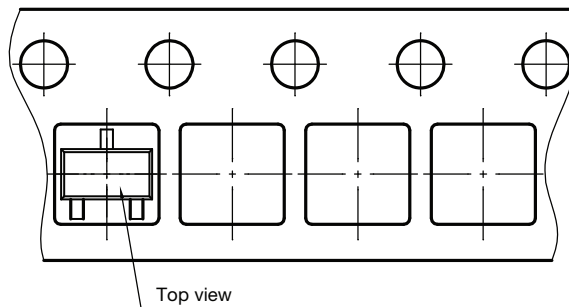


Foot print recommendation:



Document no.: 6.541-5014.01-4  
Rev. 8 - Date: 23.Sept.2009  
17418

Unreeling direction →



SOT-23

Orientation in carrier tape  
SOT-23  
S8-V-3929.01-006 (4)  
04.02.2010  
22607



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