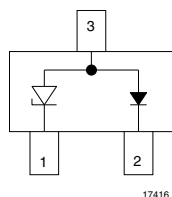
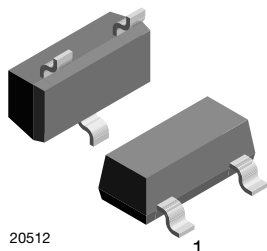


## Low Capacitance ESD Protection Diodes for High-Speed Data Interfaces



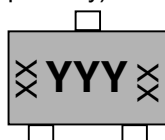
17416



20512

1

### MARKING (example only)



20357

Bar = cathode marking

YYY = type code (see table below)

XX = date code

### FEATURES

- IEC 61000-4-5 (lightning) see  $I_{PPM}$  below
- ESD-protection acc. IEC 61000-4-2  
± 8 kV contact discharge  
± 15 kV air discharge
- 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
- AEC-Q101 qualified
- e3 - Sn
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
**GREEN**  
(5-2008)  
Available

### ORDERING INFORMATION

| PART<br>NUMBER<br>(EXAMPLE) | ENVIRONMENTAL AND QUALITY CODE |                                                 |       |               | PACKAGING CODE                                  |                                                   | ORDERING CODE<br>(EXAMPLE) |
|-----------------------------|--------------------------------|-------------------------------------------------|-------|---------------|-------------------------------------------------|---------------------------------------------------|----------------------------|
|                             | AEC-Q101<br>QUALIFIED          | RoHS-COMPLIANT +<br>LEAD (Pb)-FREE TERMINATIONS |       | TIN<br>PLATED | 3K PER 7" REEL<br>(8 mm TAPE),<br>15K/BOX = MOQ | 10K PER 13" REEL<br>(8 mm TAPE),<br>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 | $^{\circ}C$ |

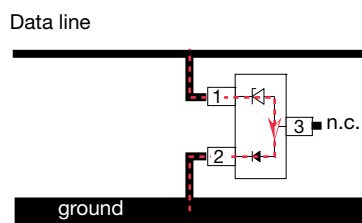
## ABSOLUTE MAXIMUM RATINGS GL24T

| 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 | $^{\circ}C$ |

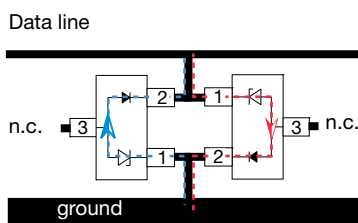
The GLxxT contains an avalanche diode (pin 3-1) and a switching diode (pin 3-2). With pin 1 connected to the signal or data line and pin 2 connected to ground both diodes are in series (pin 3 remains unconnected). The big and robust avalanche diode, driven in reverse direction, provides the working range  $V_{RWM}$  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.

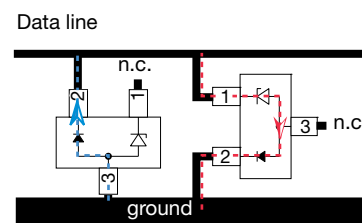
With the GLxxT a signal or data line can be protected against positive transients only. For negative transients another GLxxT can be used to provide a back path for the negative transients as well.



**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** ( $T_{amb} = 25^\circ\text{C}$  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 |                                              | $V_{RWM}$     | -    | -    | 5    | V             |
| Reverse voltage           | at $I_R = 20\ \mu\text{A}$                   | $V_R$         | 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** ( $T_{amb} = 25^\circ\text{C}$  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 |                                              | $V_{RWM}$     | -    | -    | 12   | V             |
| Reverse voltage           | at $I_R = 1\ \mu\text{A}$                    | $V_R$         | 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** ( $T_{amb} = 25^\circ\text{C}$  unless otherwise specified)

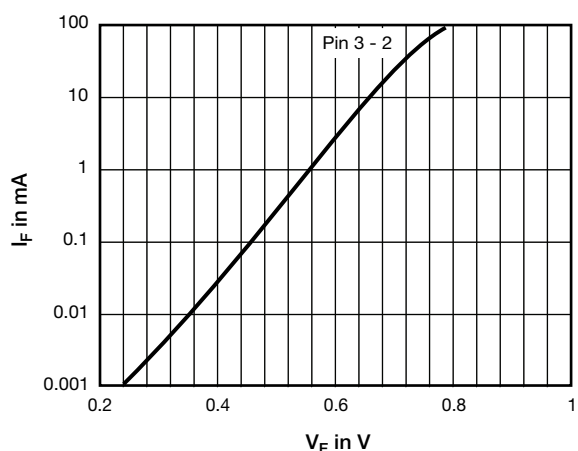
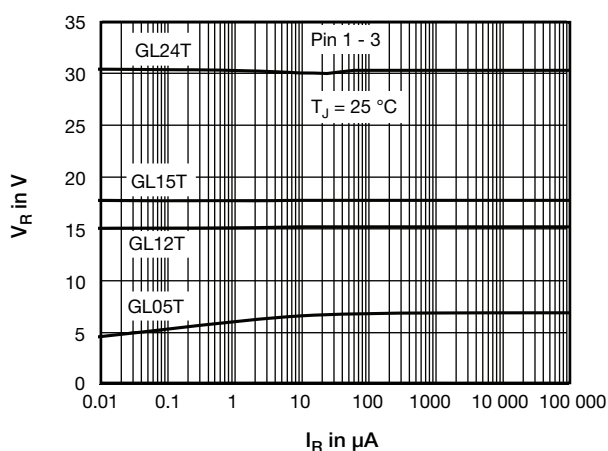
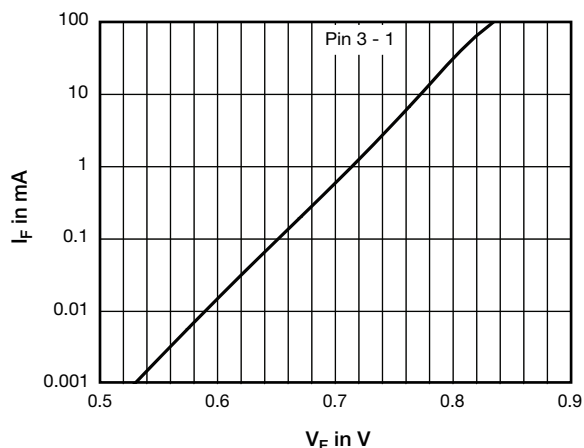
pin 1 to pin 2; pin 3 not connected

| 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 |                                              | $V_{RWM}$     | -    | -    | 15   | V             |
| Reverse voltage           | at $I_R = 1\ \mu\text{A}$                    | $V_R$         | 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            |


**ELECTRICAL CHARACTERISTICS GL24T** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

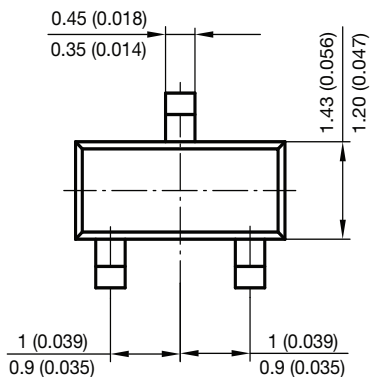
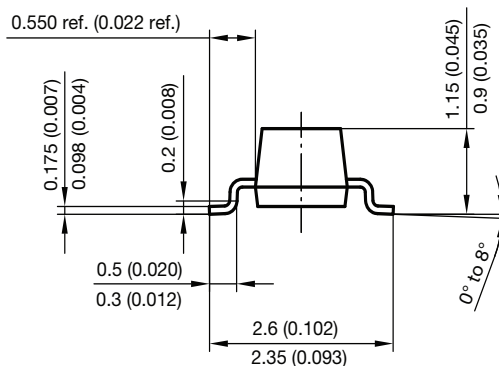
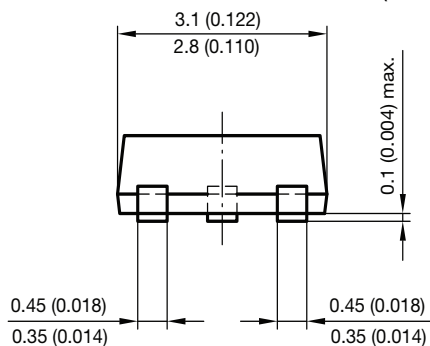
pin 1 to pin 2; pin 3 not connected

| 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 |                                            | $V_{RWM}$     | -    | -    | 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            |

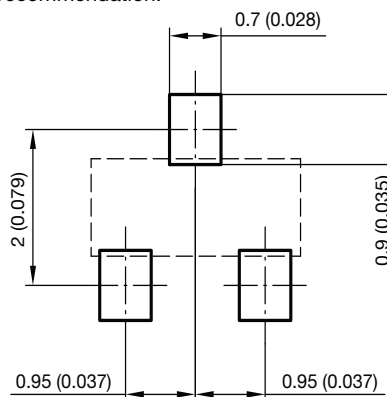
Fig. 1 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$ Fig. 3 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$ Fig. 2 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$



**PACKAGE DIMENSIONS** in millimeters (inches): **SOT-23**

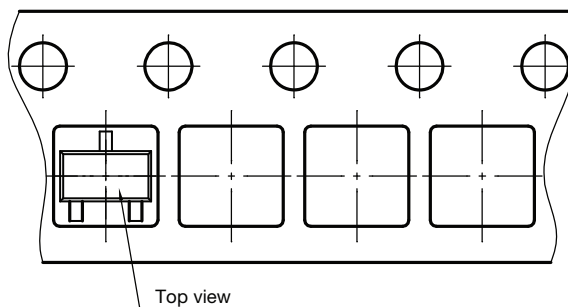


Foot print recommendation:



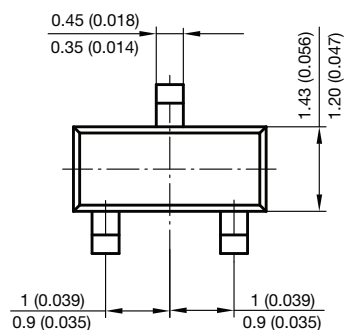
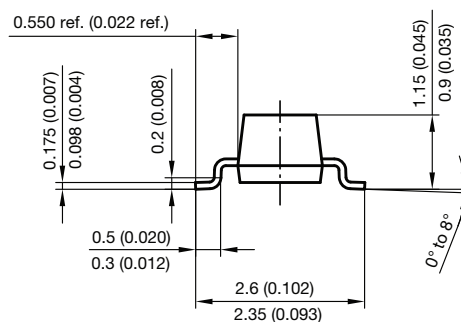
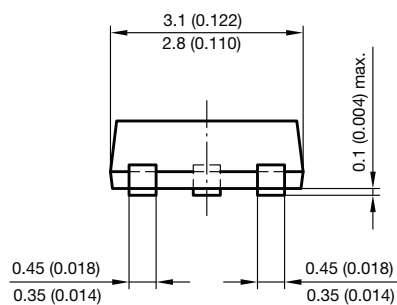
Document no.: 6.541-5014.01-4  
Rev. 8 - Date: 23.Sept.2009  
17418

Unreeling direction

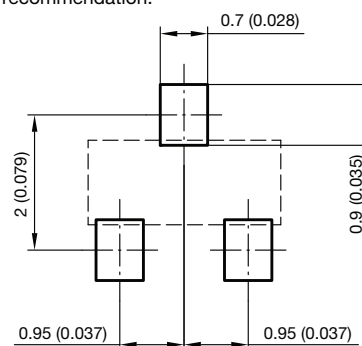


SOT-23

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

**PACKAGE DIMENSIONS** in millimeters (inches)

Foot print recommendation:



Document no.: 6.541-5014.01-4

Rev. 8 - Date: 23.Sept.2009

17418



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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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