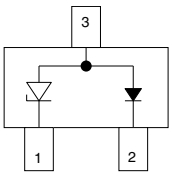
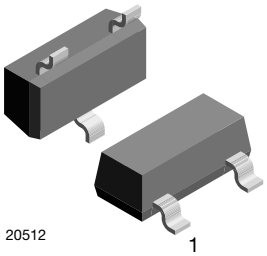
Low Capacitance ESD Protection Diodes for High-Speed Data Interfaces





FEATURES

- IEC 61000-4-5 (lightning) see I_{PPM} below
- ESD immunity acc. IEC 61000-4-2
  ± 8 kV contact discharge
  ± 15 kV air discharge
- ESD capability according to AEC-Q101: human body model: class H3B: > 8 kV
- SOT-23 package
- 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

Pb-free

e3

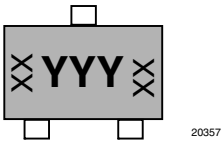
RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

MARKING

(example only)



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

LINKS TO ADDITIONAL RESOURCES

3D Models

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)	Peak temperature max. 260 °C
		L06	Green	8.1 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
GL12T	SOT-23	L12	Standard	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
		L13	Green	8.1 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
GL15T	SOT-23	L15	Standard	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
		L16	Green	8.1 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
GL24T	SOT-23	L24	Standard	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
		L25	Green	8.1 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

For technical questions, contact: ESDprotection@vishay.com

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

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

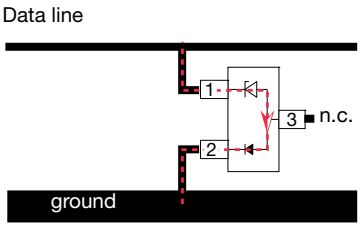
ABSOLUTE MAXIMUM RATINGS GL15T					
PARAMETER	**TEST CONDITIONS**		**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	8/20 µs	Pin 1-2 (pin 3 n.c.)	I_{PPM}	10	A
Peak pulse power	8/20 µs waveform		P_{PP}	300	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses		V_{ESD}	± 8	kV
	Air discharge acc.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

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

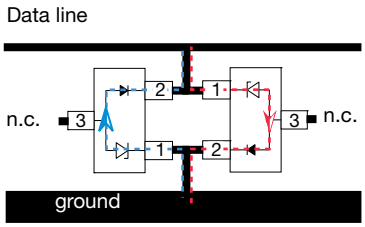
The GLxxT contains an avalanche diode (pin 3-1) and a switching diode (pin 3-2). With pin 1 connected to the signal or data line and pin 2 connected to ground both diodes are in series (pin 3 remains unconnected). The big and robust avalanche diode, driven in reverse direction, provides the working range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

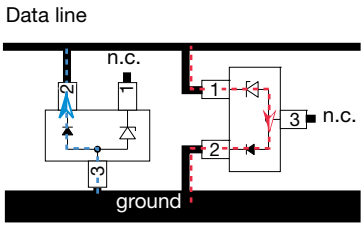
With the GLxxT a signal or data line can be protected against positive transients only. For negative transients another GLxxT can be used to provide a back path for the negative transients as well.



Uni
Unidirectional clamping performance for positive transients only.



BiSy
Bidirectional and **Sy**mmetrical clamping performance for positive and negative transients.



BiAs
Bidirectional and **As**ymmetrical clamping performance for positive and negative transients.

ELECTRICAL CHARACTERISTICS GL05T (T_{amb} = 25 °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 µA	V_R	5	-	-	V
Reverse current	at V_R = 5 V	I_R	-	-	20	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	6.9	7.5	8.0	V
Reverse clamping voltage	at I_{PP} = 1 A	V_C	-	-	9.8	V
	at I_{PP} = 5 A		-	-	11	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	2.5	5	pF

ELECTRICAL CHARACTERISTICS GL12T (T_{amb} = 25 °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 µA	V_R	12	-	-	V
Reverse current	at V_R = 12 V	I_R	-	-	1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	13.3	14.3	17.2	V
Reverse clamping voltage	at I_{PP} = 1 A	V_C	-	-	19	V
	at I_{PP} = 5 A		-	-	24	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	2.5	5	pF

ELECTRICAL CHARACTERISTICS GL15T (T_{amb} = 25 °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 µA	V_R	15	-	-	V
Reverse current	at V_R = 15 V	I_R	-	-	1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	16.7	17.7	22	V
Reverse clamping voltage	at I_{PP} = 1 A	V_C	-	-	24	V
	at I_{PP} = 5 A		-	-	33	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	2.5	5	pF

ELECTRICAL CHARACTERISTICS GL24T (T_{amb} = 25 °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}	-	-	24	V
Reverse voltage	at I_R = 1 µA	V_R	24	-	-	V
Reverse current	at V_R = 24 V	I_R	-	-	1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	26.7	28.2	33	V
Reverse clamping voltage	at I_{PP} = 1 A	V_C	-	-	43	V
	at I_{PP} = 5 A		-	-	55	V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	-	2.5	5	pF

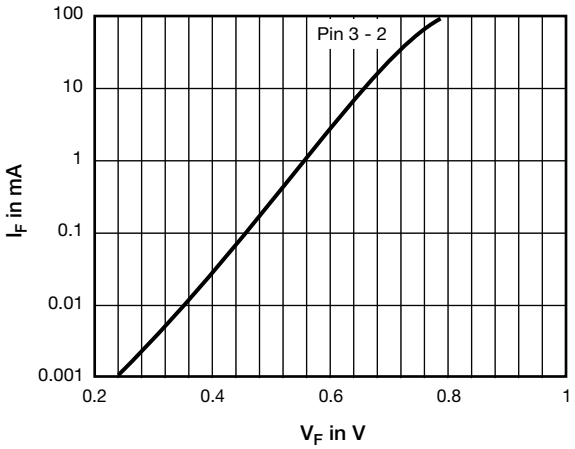


Fig. 1 - Typical Forward Current I_F vs. Forward Voltage V_F

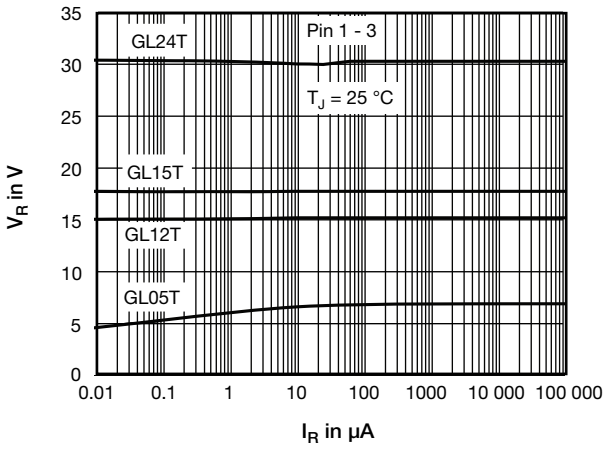


Fig. 3 - Typical Reverse Voltage V_R vs. Reverse Current I_R

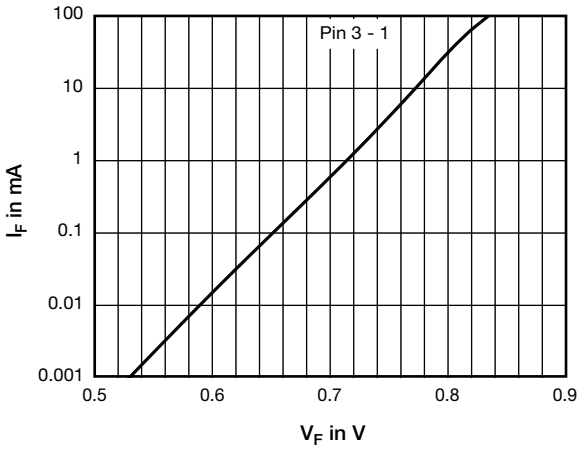
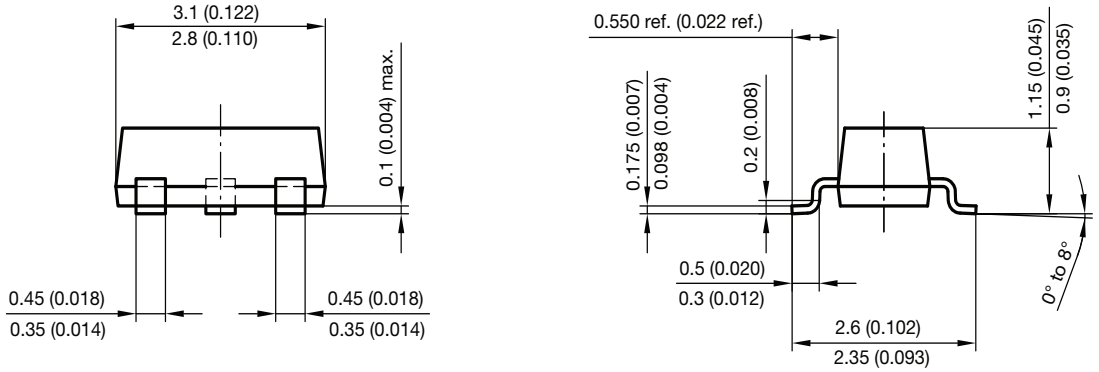
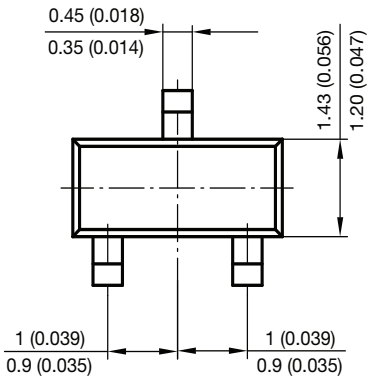


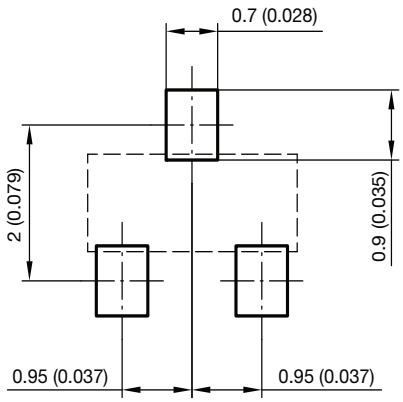
Fig. 2 - Typical Forward Current I_F vs. Forward Voltage V_F

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





Foot print recommendation:



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Rev. 8 - Date: 23. Sep. 2009
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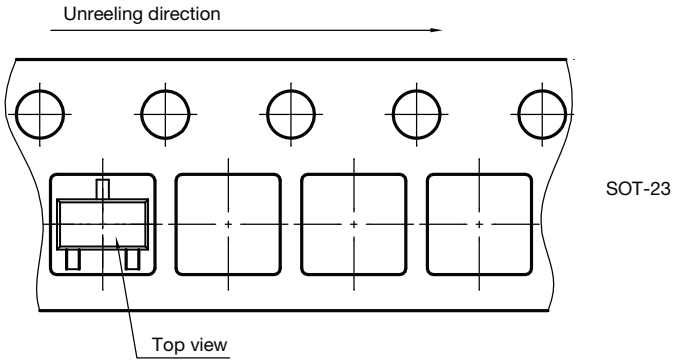

SOT-23

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

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