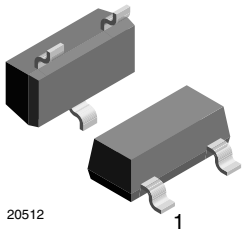
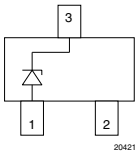
Single-Line ESD-Protection in SOT23

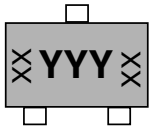
Features

- Single-line ESD-protection device
- ESD-immunity acc. IEC 61000-4-2
  - ± 30 kV contact discharge
  - ± 30 kV air discharge
- Space saving SOT23 package
- Lead (Pb)-free component
- Lead finish = "e3" = matte tin (Sn)
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC





Marking (example only)



YYY = Type code (see table below)
XX = Date code

Ordering Information

Device name	Ordering code	Taped units per reel (8 mm tape on 7" reel)	Minimum order quantity
GSOT03	GSOT03-GS08	3000	15000
GSOT04	GSOT04-GS08	3000	15000
GSOT05	GSOT05-GS08	3000	15000
GSOT08	GSOT08-GS08	3000	15000
GSOT12	GSOT12-GS08	3000	15000
GSOT15	GSOT15-GS08	3000	15000
GSOT24	GSOT24-GS08	3000	15000
GSOT36	GSOT36-GS08	3000	15000

Package Data

Device name	Package name	Marking code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
GSOT03	SOT23	03	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT04	SOT23	04	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT05	SOT23	05	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT08	SOT23	08	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT12	SOT23	12	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT15	SOT23	15	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT24	SOT23	24	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals
GSOT36	SOT23	36	8.8 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

Absolute Maximum Ratings

GSOT03

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	30	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	369	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT04

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	30	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	429	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT05

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	30	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	480	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT08

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	18	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	345	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT12

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	12	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	312	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT15

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	8	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	230	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT24

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	5	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	235	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

GSOT36

Rating	Test condition	Symbol	Value	Unit
Peak pulse current	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	I_{PPM}	3.5	A
Peak pulse power	Pin 3 to 1 Acc. IEC 61000-4-5, t_P = 8/20 µs; single shot	P_{PP}	248	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 55 to + 150	°C

BiAs-Mode (1-line Bidirectional Asymmetrical protection mode)

With the **GSOTxx** one signal- or data-lines (L1) can be protected against voltage transients. With pin 1 connected to ground and pin 3 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 **M**aximum **R**everse **W**orking **V**oltage (V_{RWM}) the protection diode between pin 2 and pin 3 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 **C**lamping **V**oltage (V_C) is defined by the **BR**eakthrough **V**oltage (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 **F**orward **V**oltage (V_F) clamps the negative transient close to the ground level.

Due to the different clamping levels in forward and reverse direction the **GSOTxx** clamping behaviour is **Bi**directional and **As**ymmetrical (**BiAs**).

Electrical Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified

GSOT03

BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 100 µA	V_{RWM}	3.3			V
Reverse current	at V_R = 3.3 V	I_R			100	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	4	4.6		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		5.7	7.5	V
	at I_{PP} = I_{PPM} = 30 A	V_C		10	12.3	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at I_{PP} = I_{PPM} = 30 A	V_F		4.5		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		420	600	pF
	at V_R = 1.6 V; f = 1 MHz	C_D		260		pF

GSOT04

BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 20 µA	V_{RWM}	4			V
Reverse current	at V_R = 4 V	I_R			20	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	5	6.1		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		7.5	9	V
	at $I_{PP} = I_{PPM}$ = 30 A	V_C		11.2	14.3	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at $I_{PP} = I_{PPM}$ = 30 A	V_F		4.5		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		310	450	pF
	at V_R = 2 V; f = 1 MHz	C_D		200		pF

GSOT05

BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 10 µA	V_{RWM}	5			V
Reverse current	at V_R = 5 V	I_R			10	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	6	6.8		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		7	8.7	V
	at $I_{PP} = I_{PPM}$ = 30 A	V_C		12	16	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at $I_{PP} = I_{PPM}$ = 30 A	V_F		4.5		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		260	350	pF
	at V_R = 2.5 V; f = 1 MHz	C_D		150		pF

GSOT08

BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 5 µA	V_{RWM}	8			V
Reverse current	at V_R = 8 V	I_R			5	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	9	10		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		10.7	13	V
	at $I_{PP} = I_{PPM}$ = 18 A	V_C		15.2	19.2	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at $I_{PP} = I_{PPM}$ = 18 A	V_F		3		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		160	250	pF
	at V_R = 4 V; f = 1 MHz	C_D		80		pF

GSOT12

BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 1 µA	V_{RWM}	12			V
Reverse current	at V_R = 12 V	I_R			1	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	13.5	15		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		15.4	18.7	V
	at $I_{PP} = I_{PPM}$ = 12 A	V_C		21.2	26	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at $I_{PP} = I_{PPM}$ = 12 A	V_F		2.2		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		115	150	pF
	at V_R = 6 V; f = 1 MHz	C_D		50		pF

GSOT15

BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 1 µA	V_{RWM}	15			V
Reverse current	at V_R = 15 V	I_R			1	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	16.5	18		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		19.4	23.5	V
	at $I_{PP} = I_{PPM}$ = 8 A	V_C		24.8	28.8	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at $I_{PP} = I_{PPM}$ = 8 A	V_F		1.8		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		90	120	pF
	at V_R = 7.5 V; f = 1 MHz	C_D		35		pF

GSOT24

BiAs mode (between pin 3 to 1)

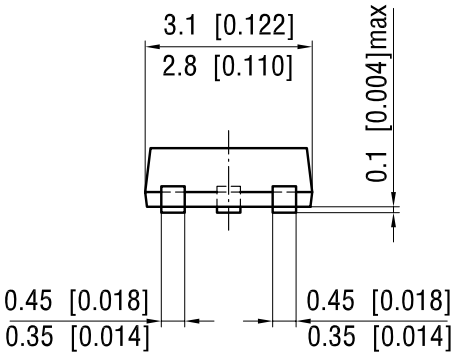
Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 1 µA	V_{RWM}	24			V
Reverse current	at V_R = 24 V	I_R			1	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	27	30		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		34	41	V
	at $I_{PP} = I_{PPM}$ = 5 A	V_C		41	47	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at $I_{PP} = I_{PPM}$ = 5 A	V_F		1.4		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		65	80	pF
	at V_R = 12 V; f = 1 MHz	C_D		20		pF

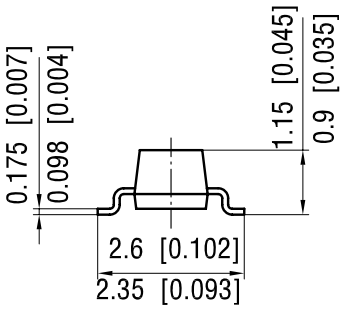
GSOT36

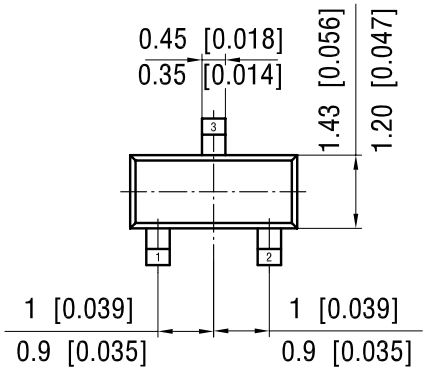
BiAs mode (between pin 3 to 1)

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of lines which can be protected	N_{lines}			1	lines
Reverse stand off voltage	at I_R = 1 µA	V_{RWM}	36			V
Reverse current	at V_R = 36 V	I_R			1	µA
Reverse break down voltage	at I_R = 1 mA	V_{BR}	39	43		V
Reverse clamping voltage	at I_{PP} = 1 A	V_C		49	60	V
	at I_{PP} = I_{PPM} = 3.5 A	V_C		59	71	V
Forward clamping voltage	at I_{PP} = 1 A	V_F		1	1.2	V
	at I_{PP} = I_{PPM} = 3.5 A	V_F		1.3		V
Capacitance	at V_R = 0 V; f = 1 MHz	C_D		52	65	pF
	at V_R = 18 V; f = 1 MHz	C_D		12		pF

Package Dimensions in millimeters (inches): SOT23







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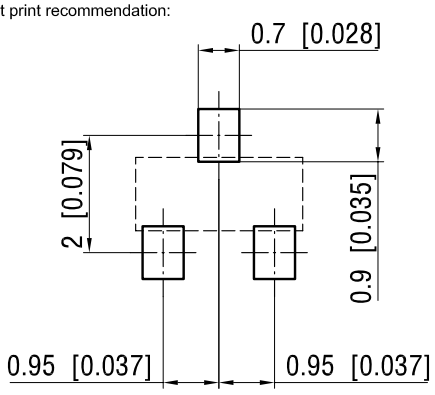

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Ozone Depleting Substances Policy Statement

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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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