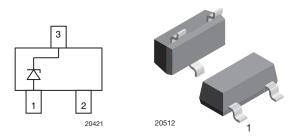
Single-Line ESD Protection in SOT-23



www.vishay.com

MARKING (example only)



20357

YYY = type code (see table below) XX = date code

DESIGN SUPPORT TOOLS AVAILABLE



Models

FEATURES

- Single-line ESD protection device
- ESD immunity acc. IEC 61000-4-2 ± 30 kV contact discharge ± 30 kV air discharge
- ESD capability according to AEC-Q101: human body model: class H3B: > 8 kV
- Space saving SOT-23 package
- e3 Sn
- AEC-Q101 qualified available
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>





ORDERIN	G INFORM	ATION					
	ENVIR	ONMENTAL AND QUALITY CODE			PACKAG	ING CODE	
PART NUMBER (EXAMPLE)	AEC-Q101	RoHS-COMPLIANT + LEAD (Pb)-FREE				ORDERING CODE (EXAMPLE)	
	QUALIFIED	STANDARD	GREEN	PLATED	15K/BOX = MOQ	10K/BOX = MOQ	
GSOT05-		E		3	-08		GSOT05-E3-08
GSOT05-			G	3	-08		GSOT05-G3-08
GSOT05-	Н	E		3	-08		GSOT05-HE3-08
GSOT05-	Н		G	3	-08		GSOT05-HG3-08
GSOT05-		E		3		-18	GSOT05-E3-18
GSOT05-			G	3		-18	GSOT05-G3-18
GSOT05-	Н	E		3		-18	GSOT05-HE3-18
GSOT05-	Н		G	3		-18	GSOT05-HG3-18

PACKA		1					
DEVICE NAME	PACKAGE NAME	TYPE CODE	ENVIRONMENTAL STATUS	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
GSOT03	SOT-23	03	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
466166	001 20	03G	Green	8.1 mg	020110	(according J-STD-020)	
GSOT04	SOT-23	04	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
466161		04G	Green	8.1 mg	020110	(according J-STD-020)	
GSOT05	SOT-23	05	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
000100	001 20	05G	Green	8.1 mg	020400	(according J-STD-020)	
GSOT08	SOT-23	08	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
000100	001 20	08G	Green	8.1 mg	02 04 0 0	(according J-STD-020)	r car temperature max. 200 0
GSOT12	SOT-23	12	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
030112	301-23	12G	Green	8.1 mg	01 94 0-0	(according J-STD-020)	Feak temperature max. 200 C
GSOT15	SOT-23	15	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
030113	301-23	15G	Green	8.1 mg	01 94 0-0	(according J-STD-020)	Feak temperature max. 200 C
GSOT24	SOT-23	24	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
630124	301-23	24G	Green	8.1 mg	UL 94 V-0	(according J-STD-020)	Feak temperature max. 200 C
GSOT36	SOT-23	36	Standard	8.8 mg	UL 94 V-0	MSL level 1	Peak temperature max. 260 °C
030130	301-23	36G	Green	8.1 mg	01 94 0-0	(according J-STD-020)	Fear temperature max. 200 C

Rev. 2.8, 17-Apr-2019

1 For technical questions, contact: <u>ESDprotection@vishay.com</u> Document Number: 85807

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ABSOLUTE MAXIMUM RATINGS GSOT03						
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT		
Peak pulse current	Pin 3 to 1 acc. IEC 61000-4-5, $t_p = 8/20 \ \mu s$; single shot	I _{PPM}	30	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, $t_p = 8/20 \ \mu s$; single shot	P _{PP}	369	W		
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	M	± 30	kV		
ESD minutity	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		

ABSOLUTE MAXIMUM RATINGS GSOT04						
PARAMETER	TEST CONDITIONS	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	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, t _p = 8/20 μs; single shot	P _{PP}	429	W		
	Contact discharge acc. IEC 61000-4-2; 10 pulses	M	± 30	kV		
ESD immunity	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		

ABSOLUTE MAXIMUM RATINGS GSOT05						
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT		
Peak pulse current	Pin 3 to 1 acc. IEC 61000-4-5, $t_p = 8/20 \ \mu s$; single shot	I _{PPM}	30	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, $t_p = 8/20 \ \mu s$; single shot	P _{PP}	480	W		
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V	± 30	kV		
ESD initiality	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		

ABSOLUTE MAXIMUM RATINGS GSOT08						
PARAMETER	TEST CONDITIONS	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	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, t _p = 8/20 μs; single shot	P _{PP}	345	W		
	Contact discharge acc. IEC 61000-4-2; 10 pulses	M	± 30	kV		
ESD immunity	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		



ABSOLUTE MAXIMUM RATINGS GSOT12						
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT		
Peak pulse current	Pin 3 to 1 acc. IEC 61000-4-5, $t_p = 8/20 \ \mu s$; single shot	I _{PPM}	12	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, $t_p = 8/20 \ \mu s$; single shot	P _{PP}	312	W		
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V	± 30	kV		
	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		

ABSOLUTE MAXIMUM RATINGS GSOT15						
PARAMETER	TEST CONDITIONS	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	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, t _p = 8/20 μs; single shot	P _{PP}	230	W		
	Contact discharge acc. IEC 61000-4-2; 10 pulses	N/	± 30	kV		
ESD immunity	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		

ABSOLUTE MAXIMUM RATINGS GSOT24						
PARAMETER	TEST CONDITIONS	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	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, t _p = 8/20 μs; single shot	P _{PP}	235	W		
	Contact discharge acc. IEC 61000-4-2; 10 pulses	M	± 30	kV		
ESD immunity	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-40 to +125	°C		
Storage temperature		T _{STG}	-55 to +150	°C		

ABSOLUTE MAXIMUM RATINGS GSOT36						
PARAMETER	TEST CONDITIONS	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	А		
Peak pulse power	Pin 3 to 1 acc. IEC 61000-4-5, t _p = 8/20 μs; single shot	P _{PP}	248	W		
	Contact discharge acc. IEC 61000-4-2; 10 pulses	N/	± 30	kV		
ESD immunity	Air discharge acc. IEC 61000-4-2; 10 pulses	V _{ESD}	± 30	kV		
Operating temperature	Junction temperature	TJ	-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 maximum reverse working voltage (V_{RWM}) the protection diode between pin 1 and pin 3 offers 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 breakdown 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 breakdown voltage (V_{BR}) level plus the voltage drop at the series impedance (resistance and inductance) of the protection diode.

Any negative transient signal will be clamped accordingly. The negative transient current is flowing in the forward direction through 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 GSOTxx clamping behavior is Bidirectional and Asymmetrical (BiAs).



²⁰⁴²²

ELECTRICAL CHARACTERISTICS GSOT03 ($T_{amb} = 25 \degree C$ unless otherwise specified) between pin 3 and pin 1							
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}	-	-	3.3	V	
Reverse voltage	at I _R = 100 μA	V _R	3.3	-	-	V	
Reverse current	at V _R = 3.3 V	I _R	-	-	100	μA	
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	4	4.6	5.5	V	
Deverse elemening veltage	at I _{PP} = 1 A	V	-	5.7	7.5	V	
Reverse clamping voltage	at I _{PP} = I _{PPM} = 30 A	V _C	-	10	12.3	V	
Forward elemping valtage	at I _{PP} = 1 A	V	-	1	1.2	V	
Forward clamping voltage	at $I_{PP} = I_{PPM} = 30 \text{ A}$	V _F	-	4.5	-	V	
Canacitanas	at $V_R = 0 V$; f = 1 MHz	0	-	420	600	pF	
Capacitance	at V _R = 1.6 V; f = 1 MHz	C _D	-	260	-	pF	

ELECTRICAL CHARACTERISTICS GSOT04 ($T_{amb} = 25$ °C unless otherwise specified) between pin 3 and pin 1							
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}	-	-	4	V	
Reverse voltage	at I _R = 20 μA	V _R	4	-	-	V	
Reverse current	at V _R = 4 V	I _R	-	-	20	μA	
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	5	6.1	7	V	
Deverse elempine veltage	at I _{PP} = 1 A	V	-	7.5	9	V	
Reverse clamping voltage	at I _{PP} = I _{PPM} = 30 A	V _C	-	11.2	14.3	V	
	at I _{PP} = 1 A	N	-	1	1.2	V	
Forward clamping voltage	at I _{PP} = I _{PPM} = 30 A	V _F	-	4.5	-	V	
<u>O</u>	at $V_R = 0 V$; f = 1 MHz	0	-	310	450	pF	
Capacitance	at V _R = 2 V; f = 1 MHz	C _D	-	200	-	pF	

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ELECTRICAL CHARACTERISTICS GSOT05 ($T_{amb} = 25$ °C unless otherwise specified) between pin 3 and pin 1							
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 = 10 µA	V _R	5	-	-	V	
Reverse current	at V _R = 5 V	I _R	-	-	10	μA	
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	6	6.8	8	V	
Reverse clamping voltage	at I _{PP} = 1 A	V _C	-	7	8.7	V	
	at I _{PP} = I _{PPM} = 30 A		-	12	16	V	
	at I _{PP} = 1 A	VF	-	1	1.2	V	
Forward clamping voltage	at I _{PP} = I _{PPM} = 30 A		-	4.5	-	V	
Capacitance	at $V_R = 0$ V; f = 1 MHz	CD	-	260	350	pF	
	at V _R = 2.5 V; f = 1 MHz		-	150	-	pF	

ELECTRICAL CHARACTERISTICS GSOT08 (T_{amb} = 25 °C unless otherwise specified) between pin 3 and pin 1

between pin 3 and pin 1						
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}	-	-	8	V
Reverse voltage	at I _R = 5 µA	V _R	8	-	-	V
Reverse current	at V _R = 8 V	I _R	-	-	5	μA
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	9	10	11	V
Reverse clamping voltage	at I _{PP} = 1 A	- V _C	-	10.7	13	V
	at I _{PP} = I _{PPM} = 18 A		-	15.2	19.2	V
Forward elemping valtage	at I _{PP} = 1 A		-	1	1.2	V
Forward clamping voltage	at I _{PP} = I _{PPM} = 18 A		-	3	-	V
Capacitance	at $V_R = 0 V$; f = 1 MHz	- C _D	-	160	250	pF
	at V _R = 4 V; f = 1 MHz		-	80	-	pF

ELECTRICAL CHARAC between pin 3 and pin 1	TERISTICS GSOT12 (T _{amb} = 25 °C	C unless ot	herwise s	pecified)		
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}	13.5	15	16.5	V
Reverse clamping voltage	at I _{PP} = 1 A	V _C	-	15.4	18.7	V
	at I _{PP} = I _{PPM} = 12 A		-	21.2	26	V
Forward clamping voltage	at I _{PP} = 1 A		-	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	CD	-	115	150	pF
	at V _R = 6 V; f = 1 MHz		-	50	-	pF

GSOT03 to GSOT36



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ELECTRICAL CHARACE between pin 3 and pin 1	TERISTICS GSOT15 (T _{amb} = 25 °C	C unless ot	herwise s	pecified)		
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}	16.5	18	20	V
Reverse clamping voltage	at I _{PP} = 1 A	V _C	-	19.4	23.5	V
	at I _{PP} = I _{PPM} = 8 A		-	24.8	28.8	V
Forward elemening voltage	at I _{PP} = 1 A		-	1	1.2	V
Forward clamping voltage	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		-	35	-	pF

ELECTRICAL CHARACTERISTICS GSOT24 ($T_{amb} = 25 \text{ °C}$ unless otherwise specified) between pin 3 and pin 1

between pin 5 and pin 1						
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}	27	30	33	V
Reverse clamping voltage	at I _{PP} = 1 A	V _C	-	34	41	V
	at $I_{PP} = I_{PPM} = 5 A$		-	41	47	V
Forward alamping valtage	at I _{PP} = 1 A	– V _F	-	1	1.2	V
Forward clamping voltage	at $I_{PP} = I_{PPM} = 5 A$		-	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		-	20	-	pF

ELECTRICAL CHARAC between pin 3 and pin 1	TERISTICS GSOT36 (T _{amb} = 25 °C	C unless ot	herwise s	pecified)		
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}	-	-	36	V
Reverse voltage	at I _R = 1 μA	V _R	36	-	-	V
Reverse current	at V _R = 36 V	I _R	-	-	1	μA
Reverse breakdown voltage	at I _R = 1 mA	V _{BR}	39	43	47	V
Reverse clamping voltage	at I _{PP} = 1 A	V _C	-	49	60	V
	at I _{PP} = I _{PPM} = 3.5 A		-	59	71	V
Forward clamping voltage	at I _{PP} = 1 A	N	-	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 $V_{\rm R} = 18$ V: f = 1 MHz		_	12	_	pF



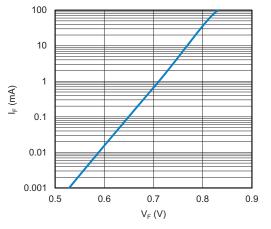


Fig. 1 - Typical Forward Current I_F vs. Forward Voltage V_F

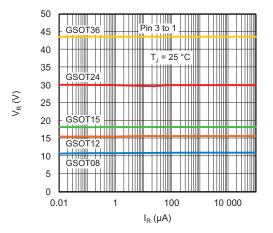


Fig. 2 - Typical Reverse Voltage V_R vs. Reverse Current I_R

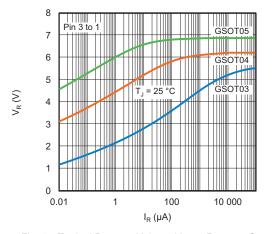


Fig. 3 - Typical Reverse Voltage V_{R} vs. Reverse Current I_{R}

GSOT03 to GSOT36

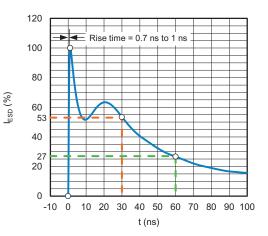


Fig. 4 - ESD Discharge Current Waveform According to IEC 61000-4-2 (330 Ω / 150 pF)

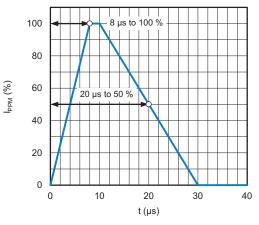


Fig. 5 - 8/20 µs Peak Pulse Current Waveform According to IEC 61000-4-5

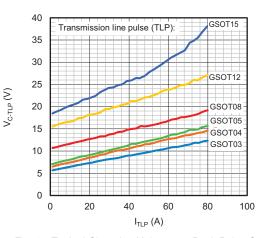


Fig. 6 - Typical Clamping Voltage vs. Peak Pulse Current

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7 For technical questions, contact: <u>ESDprotection@vishay.com</u> Document Number: 85807

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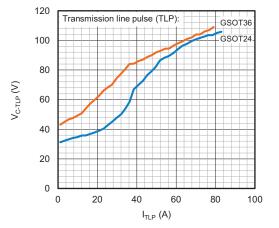


Fig. 7 - Typical Clamping Voltage vs. Peak Pulse Current

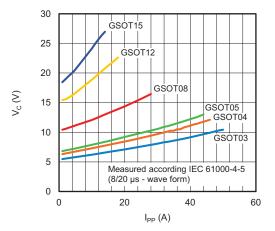


Fig. 8 - Typical Peak Clamping Voltage vs. Peak Pulse Current



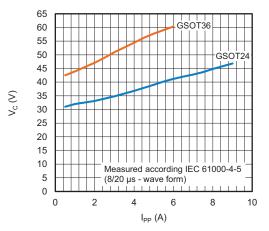


Fig. 9 - Typical Peak Clamping Voltage vs. Peak Pulse Current

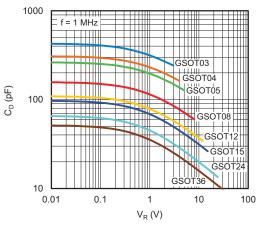
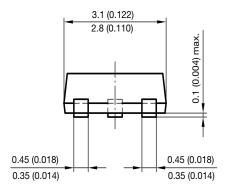


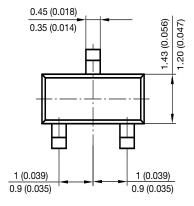
Fig. 10 - Typical Capacitance vs. Reverse Voltage

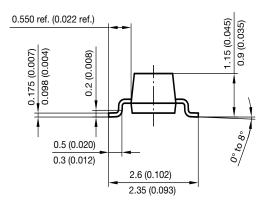
8



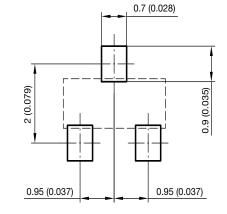
PACKAGE DIMENSIONS in millimeters (inches): SOT-23



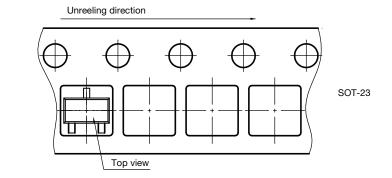




Foot print recommendation:



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



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



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