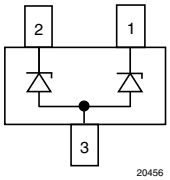
Dual-Line ESD-Protection Diode Array in SOT-323



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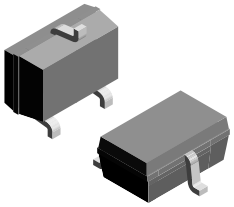


22743 SOT-323

FEATURES

- Compact SOT-323 package
- 2-line unidirectional ESD-protection
- AEC-Q101 qualified available
- Working range 1 V to 33 V
- ESD immunity acc. IEC 61000-4-2
  ±15 kV to ±30 kV contact discharge
  ±15 kV to ±30 kV air discharge
- Lead plating: Sn (e3)
  - soldering can be checked by standard vision inspection
  - AOI = Automated Optical Inspection
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

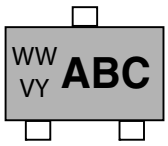
Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

MARKING (example only)



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ABC = type code (see table below)
WW = date code working week
VY = date code year

LINKS TO ADDITIONAL RESOURCES

3D Models

ORDERING INFORMATION

PART NUMBER (EXAMPLE)	AEC-Q101 QUALIFIED	ENVIRONMENTAL AND QUALITY CODE			ORDERING CODE (EXAMPLE)
		RoHS COMPLIANT + LEAD (Pb)-FREE TERMINATIONS	TIN PLATED	8K PER 7" REEL (8 mm TAPE)	
		GREEN		MOQ = 8K/BOX	
VESD05A2-03G	-	G	3	-08	VESD05A2-03G-G3-08
VESD05A2-03G	H	G	3	-08	VESD05A2-03GHG3-08

PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VESD01A2-03G-G3	SOT-323	D01	5.2 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
VESD03A2-03G-G3	SOT-323	D03				
VESD05A2-03G-G3	SOT-323	D05				
VESD08A2-03G-G3	SOT-323	D08				
VESD12A2-03G-G3	SOT-323	D12				
VESD16A2-03G-G3	SOT-323	D16				
VESD26A2-03G-G3	SOT-323	D26				
VESD33A2-03G-G3	SOT-323	D33				

ABSOLUTE MAXIMUM RATINGS VESD01A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	11	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	70	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		30	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD03A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	11.6	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	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		30	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD05A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	8.7	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	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		30	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD08A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	6.60	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	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		30	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD12A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	4.4	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	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		30	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD16A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	3.6	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	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		30	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD26A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	2.1	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	20	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		20	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ABSOLUTE MAXIMUM RATINGS VESD33A2-03G (T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	1.6	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 µs/single shot	P_{PP}	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	15	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		15	kV
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS VESD01A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	1	V
Reverse voltage	at I_R = 100 µA	V_R	1	1.2	-	V
Reverse current	at V_R = 1 V	I_R	-	20	100	µA
Reverse breakdown voltage	at I_R = 20 mA	V_{BR}	2.5	2.65	2.8	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 11 A, t_p = 8/20 µs	V_C	-	5.6	6.4	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 11 A, t_p = 8/20 µs	V_F	-	2.5	3.2	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	0.13	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	153	192	230	pF

ELECTRICAL CHARACTERISTICS VESD03A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	3	V
Reverse voltage	at I_R = 20 µA	V_R	3	-	-	V
Reverse current	at V_R = 3 V	I_R	-	8	20	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	4.4	4.65	4.9	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 11.6 A, t_p = 8/20 µs	V_C	-	7.8	8.70	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 11.6 A, t_p = 8/20 µs	V_F	-	2.6	3.32	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	0.19	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	89	112	135	pF

ELECTRICAL CHARACTERISTICS VESD05A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	5	V
Reverse voltage	at I_R = 1 µA	V_R	5	-	-	V
Reverse current	at V_R = 5 V	I_R	-	0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	6.85	7.26	7.65	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 8.7 A, t_p = 8/20 µs	V_C	-	10.3	11.5	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 8.7 A, t_p = 8/20 µs	V_F	-	2.2	2.74	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	0.2	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	53	67	81	pF

ELECTRICAL CHARACTERISTICS VESD08A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	8	V
Reverse voltage	at I_R = 0.1 µA	V_R	8	-	-	V
Reverse current	at V_R = 8 V	I_R	-	0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	9.5	10	10.5	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 6.6 A, t_p = 8/20 µs	V_C	-	13.7	15.3	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 6.6 A, t_p = 8/20 µs	V_F	-	1.9	2.32	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	0.23	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	37	47	57	pF

ELECTRICAL CHARACTERISTICS VESD12A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	12	V
Reverse voltage	at I_R = 0.1 µA	V_R	12	-	-	V
Reverse current	at V_R = 12 V	I_R	-	0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	13.9	14.7	15.5	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 4.4 A, t_p = 8/20 µs	V_C	-	20.5	22.7	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 4.4 A, t_p = 8/20 µs	V_F	-	1.6	1.88	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	0.4	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	26	33	40	pF

ELECTRICAL CHARACTERISTICS VESD16A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	16	V
Reverse voltage	at I_R = 0.1 µA	V_R	16	-	-	V
Reverse current	at V_R = 16 V	I_R	-	0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	17	17.9	18.8	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 3.6 A, t_p = 8/20 µs	V_C	-	25.3	28	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 3.6 A, t_p = 8/20 µs	V_F	-	1.5	1.72	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	0.53	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	21	27	33	pF

ELECTRICAL CHARACTERISTICS VESD26A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	26	V
Reverse voltage	at I_R = 0.1 µA	V_R	26	-	-	V
Reverse current	at V_R = 26 V	I_R	-	< 0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	27.6	29.1	30.6	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 2.1 A, t_p = 8/20 µs	V_C	-	43	48	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 2.1 A, t_p = 8/20 µs	V_F	-	1.3	1.42	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	1.9	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	14	17.5	21	pF

ELECTRICAL CHARACTERISTICS VESD33A2-03G
(T_{amb} = 25 °C, between pin 1 - 3 or 2 - 3, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	lines
Reverse stand off voltage	Max. reverse working voltage	V_{RWM}	-	-	33	V
Reverse voltage	at I_R = 0.1 µA	V_R	33	-	-	V
Reverse current	at V_R = 33 V	I_R	-	< 0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	35.5	37.4	39.3	V
Reverse clamping voltage	at $I_{PP} = I_{PPM}$ = 1.6 A, t_p = 8/20 µs	V_C	-	56	62.5	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 1.6 A, t_p = 8/20 µs	V_F	-	1.22	1.32	V
Dynamic resistance	t_p = 100 ns (TLP; reverse direction)	r_{dyn}	-	3.6	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	12	15	18	pF

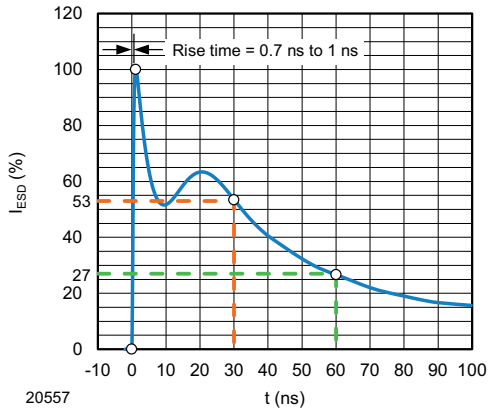


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω / 150 pF)

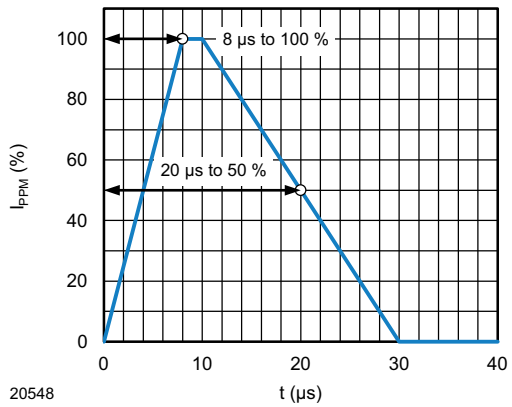


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

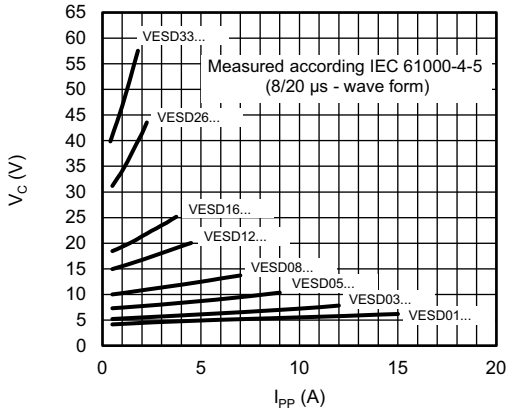


Fig. 3 - Typical Peak Clamping Voltage vs. Peak Pulse Current

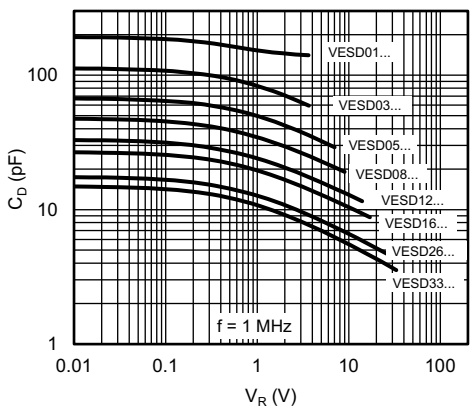


Fig. 4 - Typical Capacitance vs. Reverse Voltage

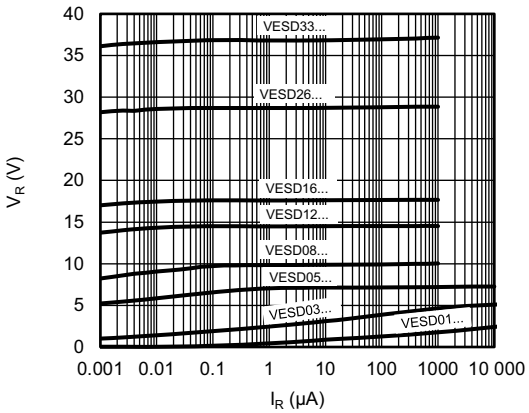


Fig. 5 - Typical Reverse Voltage vs. Reverse Current

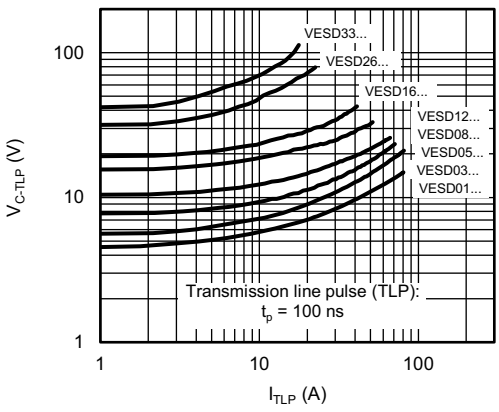


Fig. 6 - Typical Clamping Voltage vs. Peak Pulse Current

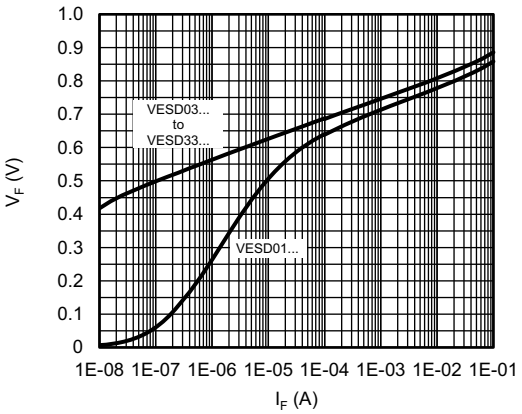


Fig. 7 - Typical Forward Voltage vs. Forward Current

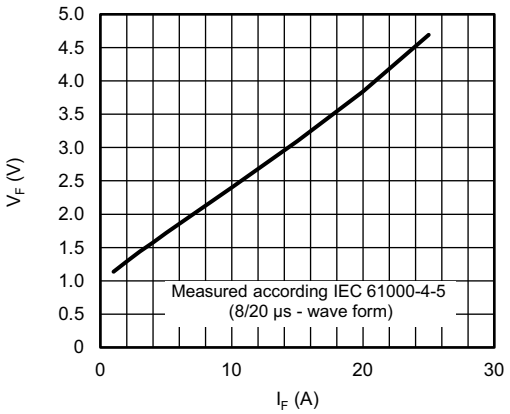
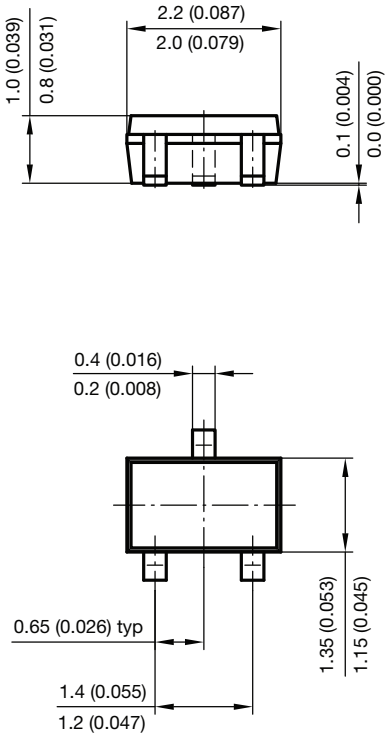
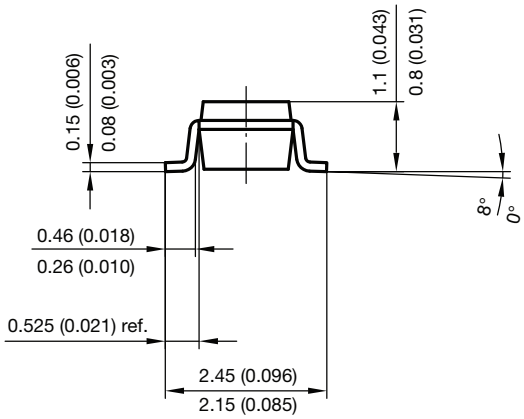


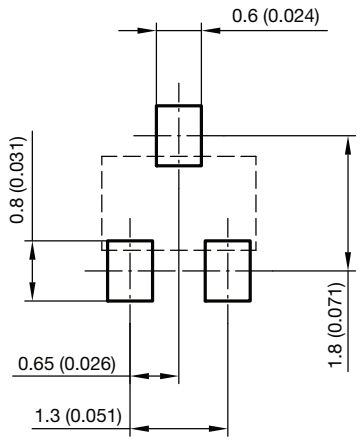
Fig. 8 - Typical Forward Voltage vs. Forward Current

PACKAGE DIMENSIONS in millimeters (inches): **SOT-323**





foot print recommendation:



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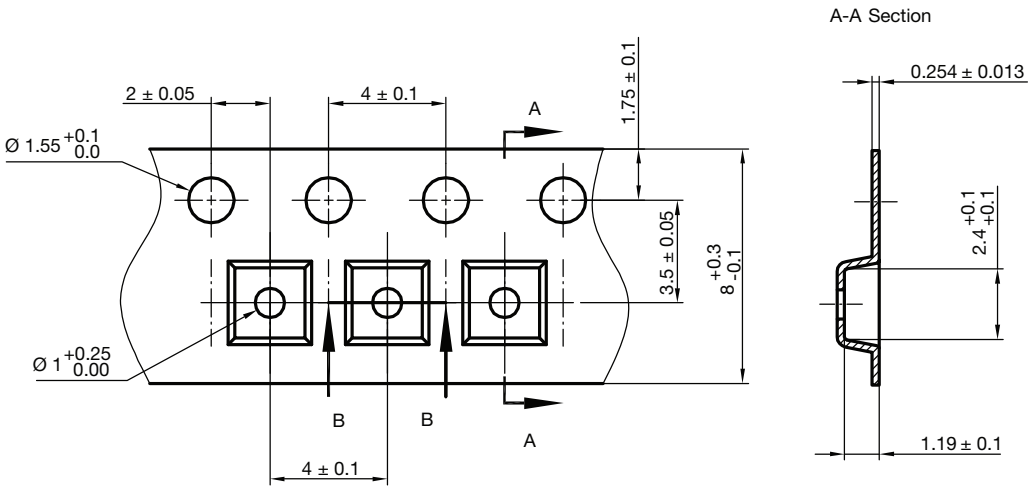
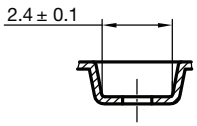
CARRIER TAPE SOT-323



B-B Section



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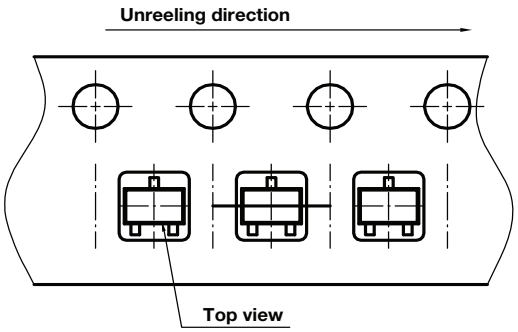
ORIENTATION IN CARRIER TAPE SOT-323



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