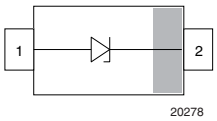
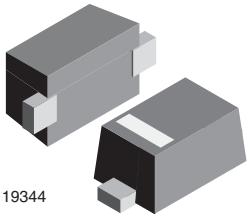
Single-Line ESD-Protection Diode in SOD-523



20278


19344

FEATURES

- Compact SOD-523 package
- Low package height < 0.7 mm
- 1-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

AUTOMOTIVE GRADE Available

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

MARKING (example only)

20279

Bar = cathode marking
X = date code
Y = type code (see table below)

DESIGN SUPPORT TOOLS click logo to get started

3D Models Available

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	
VESD05C1-02V	-	G	3	-08	VESD05C1-02V-G3-08
VESD05C1-02V	H	G	3	-08	VESD05C1-02VHG3-08

PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VESD01C1-02V	SOD-523	∀	1.32 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
VESD03C1-02V		B				
VESD05C1-02V		C				
VESD08C1-02V		D				
VESD012C1-02V		E				
VESD016C1-02V		G				
VESD026C1-02V		K				
VESD033C1-02V		A				

ABSOLUTE MAXIMUM RATINGS VESD01C1-02V (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITIONS**	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse current	Acc. IEC 61000-4-5, 8/20 µs/single shot	I_{PPM}	14.6	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 VESD03C1-02V (T_{amb} = 25 °C, 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 VESD05C1-02V (T_{amb} = 25 °C, 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 VESD08C1-02V (T_{amb} = 25 °C, 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 VESD12C1-02V (T_{amb} = 25 °C, 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 VESD16C1-02V (T_{amb} = 25 °C, 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 VESD26C1-02V (T_{amb} = 25 °C, 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 VESD33C1-02V (T_{amb} = 25 °C, 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 VESD01C1-02V
(T_{amb} = 25 °C, unless otherwise specified)

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}	-	-	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 $I_{PP} = I_{PPM}$ = 14.6 A, t_p = 8/20 µs	V_C	-	6.2	6.9	V
Forward clamping voltage	at I_{PP} = 1 A, t_p = 300 µs	V_F	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM}$ = 14.6 A, t_p = 8/20 µs	V_F	-	3	3.92	V
Dynamic resistance	t_p = 100 ns (TLP; pin 2-1)	r_{dyn}	-	0.13	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	153	192	230	pF

ELECTRICAL CHARACTERISTICS VESD03C1-02V
(T_{amb} = 25 °C, unless otherwise specified)

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	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; pin 2-1)	r_{dyn}	-	0.19	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	89	112	135	pF

ELECTRICAL CHARACTERISTICS VESD05C1-02V
(T_{amb} = 25 °C, unless otherwise specified)

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 = 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; pin 2-1)	r_{dyn}	-	0.2	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	53	67	81	pF

ELECTRICAL CHARACTERISTICS VESD08C1-02V
(T_{amb} = 25 °C, unless otherwise specified)

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 = 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; pin 2-1)	r_{dyn}	-	0.23	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	37	47	57	pF

ELECTRICAL CHARACTERISTICS VESD12C1-02V
(T_{amb} = 25 °C, unless otherwise specified)

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 = 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; pin 2-1)	r_{dyn}	-	0.4	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	26	33	40	pF

ELECTRICAL CHARACTERISTICS VESD16C1-02V
(T_{amb} = 25 °C, unless otherwise specified)

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}	-	-	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; pin 2-1)	r_{dyn}	-	0.53	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	21	27	33	pF

ELECTRICAL CHARACTERISTICS VESD26C1-02V (T_{amb} = 25 °C, unless otherwise specified)						
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}	-	-	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; pin 2-1)	r_{dyn}	-	1.9	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	14	17.5	21	pF

ELECTRICAL CHARACTERISTICS VESD33C1-02V (T_{amb} = 25 °C, unless otherwise specified)						
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}	-	-	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; pin 2-1)	r_{dyn}	-	3.6	-	Ω
Capacitance	at V_R = 0 V; f = 1 MHz	C_D	12	15	18	pF

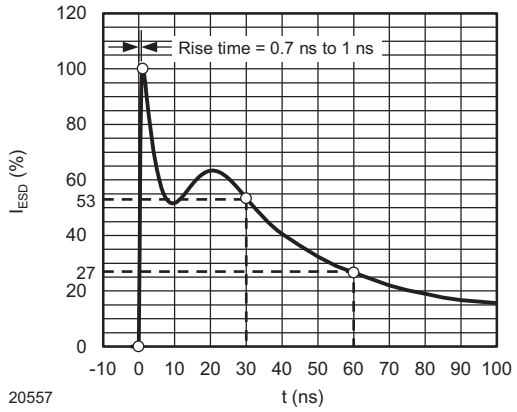


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω / 150 pF)

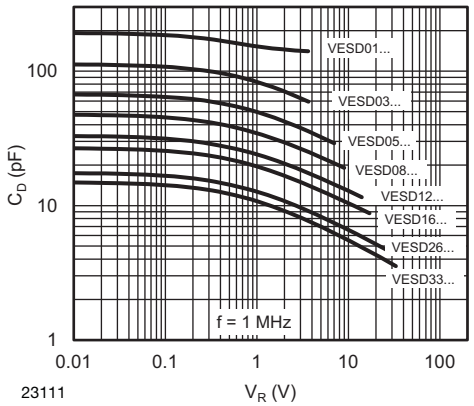


Fig. 4 - Typical Capacitance vs. Reverse Voltage

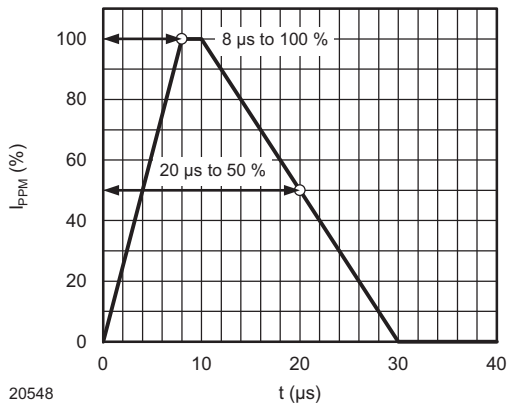


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

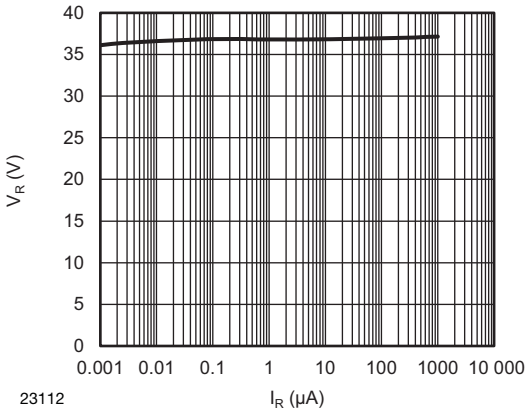


Fig. 5 - Typical Reverse Voltage vs. Reverse Current

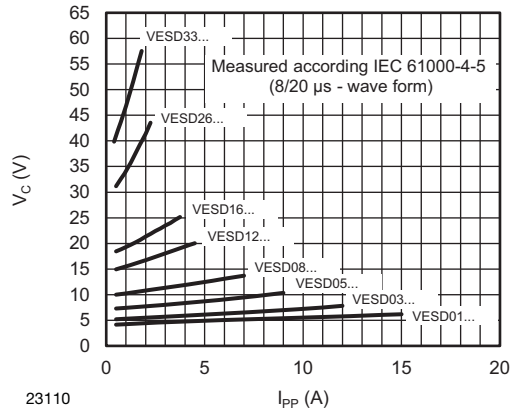


Fig. 3 - Typical Peak Clamping Voltage vs. Peak Pulse Current

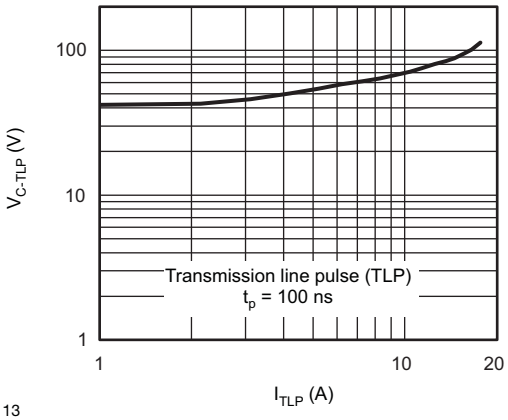


Fig. 6 - Typical Clamping Voltage vs. Peak Pulse Current

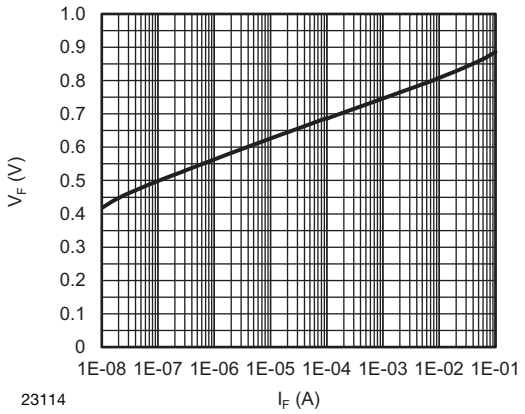


Fig. 7 - Typical Forward Voltage vs. Forward Current

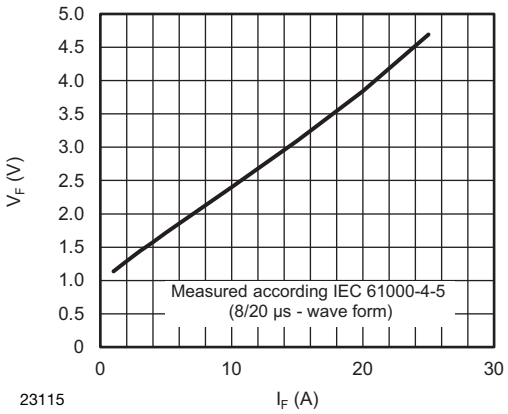
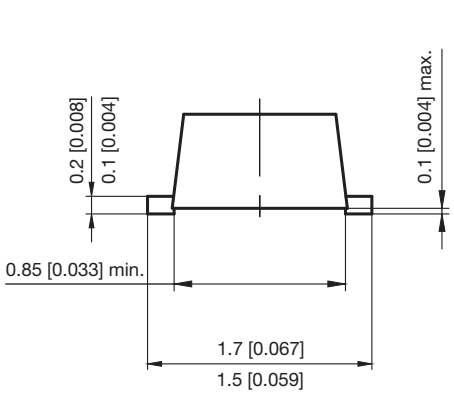
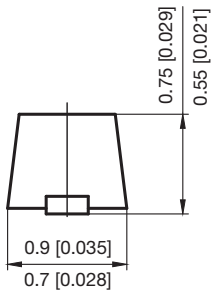
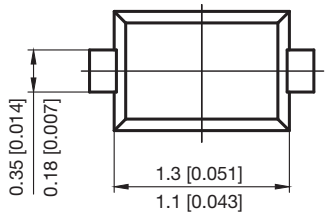


Fig. 8 - Typical Forward Voltage vs. Forward Current

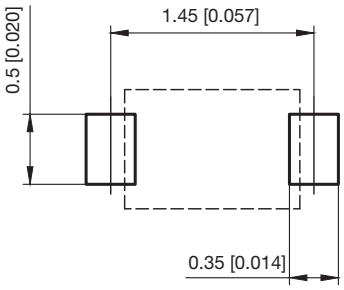
PACKAGE DIMENSIONS in millimeters (Inches): **SOD-523**





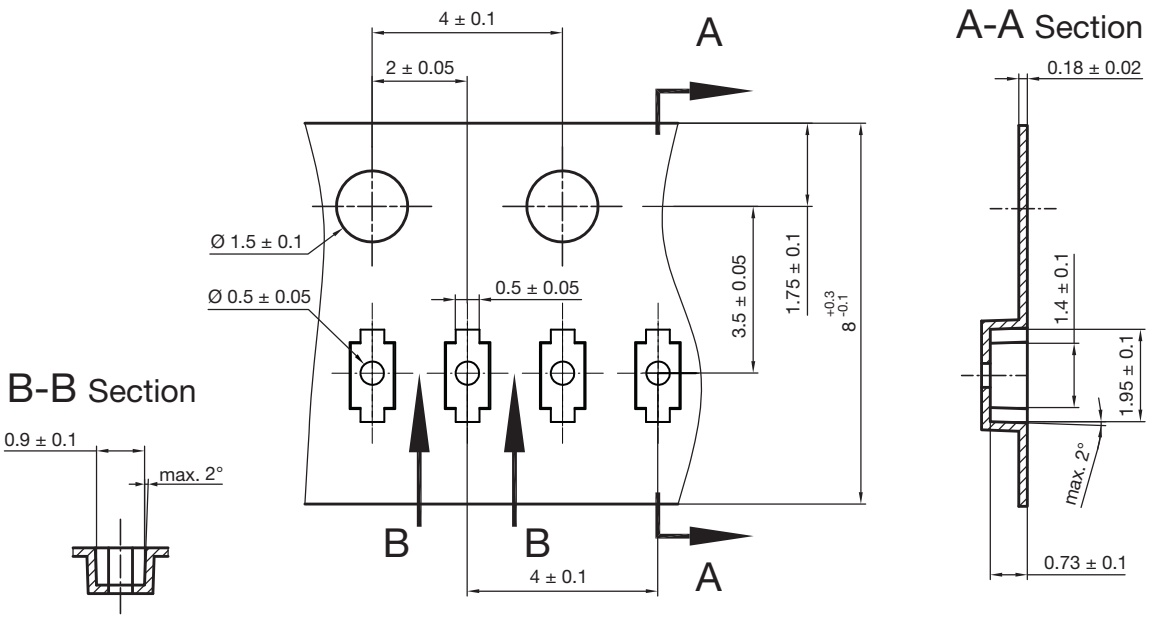


foot print recommendation:



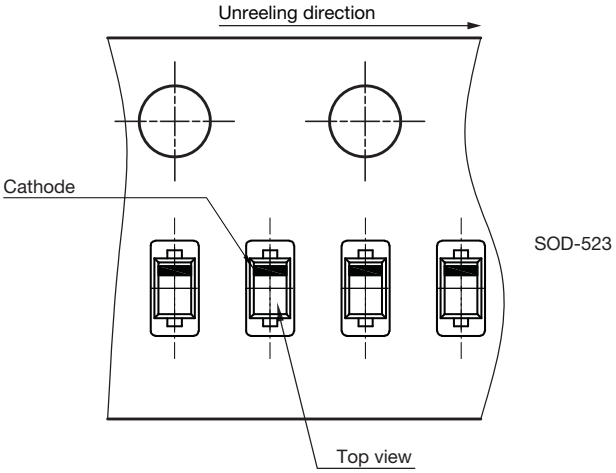
Document no.: S8-V-3880.02-003 (4)
Rev.2 - Date: 18. Aug. 2017
23093

CARRIER TAPE SOD-523



S8-V-3717.03-005 (4)
05.07.2018
22959

ORIENTATION IN CARRIER TAPE SOD-523



S8-V-3717.03-006 (4)
05.07.2018
22958

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А