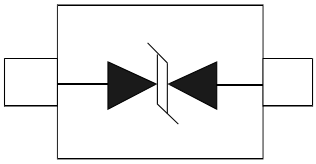
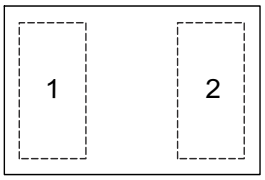
Description

The TPD1E10B06 is a single-channel ESD TVS diode in a small 0402 package convenient for space contrained applications and an industry standard SOD-523 package. This TVS protection product offers ±30 kV contact ESD, ±30 kV IEC air-gap protection, and has an ESD clamp circuit with a back-to-back TVS diode for bipolar or bidirectional signal support. The 12 pF line capacitance of this ESD protection diode is suitable for a wide range of applications supporting data rates up to 400 Mbps.

Typical applications of this ESD protection product are circuit protection for audio lines (microphone, earphone, and speakerphone), SD interfacing, keypad or other buttons, VBUS pin and ID pin of USB ports, and general-purpose I/O ports.This ESD clamp is good for the protection of end equipment like portable devices, wearables, set-top boxes, electronic point-of-sale equipment, appliances, and products for building automation.



SOD-523



X1SON

Applications

- End equipment:
  - Portable devices
  - Wearables
  - Set-top boxes
  - Electronic point of sale (EPOS)
  - Appliances
  - Building automation
- Interfaces:
  - Audio lines
  - Push-buttons
  - General-purpose input or output (GPIO)

Features

- Provides system-level ESD protection for low-voltage I/O interface
- IEC 61000-4-2 level 4 ESD protection
  - ±30 kV contact discharge
  - ±30 kV air-gap discharge
- IEC 61000-4-5 surge: 6 A (8/20 µs)
- I/O capacitance 12 pF (typical)
- R_{DYN} 0.4 Ω (typical)
- DC breakdown voltage ±6 V (minimum)
- Ultralow leakage current 100 nA (maximum)
- 10-V clamping voltage (maximum at I_{PP} = 1 A)
- Industrial temperature range: –40°C to 125°C
- Small 0402 footprint
  (1 mm × 0.6 mm × 0.5 mm)
- Industry standard SOD-523 package
  (0.8 mm × 1.2 mm)

Specifications

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Peak pulse	IEC 61000-4-5 power (t_p - 8/20 µs) at 25°C		90	W
	IEC 61000-4-5 current (t_p - 8/20 µs) at 25°C		6	A
T_A	Operating free-air temperature	-40	125	°C
T_{stg}	Storage temperature	–65	155	°C

(1)Stresses beyond those listed under *Absolute Maximum Rating* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Condition* . Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

ESD Ratings—JEDEC Specification

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge - DPY	Human body model (HBM), per ANSI/ESDA/ JEDEC JS-001	±2500	V
		Charged device model (CDM), per JEDEC specification JESD22-C101	±1000	V
$V_{(ESD)}$	Electrostatic discharge - DYA	Human body model (HBM), per ANSI/ESDA/ JEDEC JS-001	±2500	V
		Charged device model (CDM), per JEDEC specification JS-002	±1000	V

ESD Ratings—IEC Specification

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	IEC 61000-4-2 Contact Discharge, all pins	±30000	V
		IEC 61000-4-2 Air-gap Discharge, all pins	±30000	

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
Operating voltage	Pin 1 to 2 or Pin 2 to 1	–5.5		5.5	V
T_A	Operating free-air temperature	-40		125	°C

Thermal Information

THERMAL METRIC(1)		TPD1E10B06		UNIT
		DPY (X1SON)	DYA (SOD523)	
		2 PINS	2 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	615.5	730.8	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	404.8	413.4	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	493.3	497.7	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	127.7	129.7	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	493.3	491.8	°C/W

Thermal Information (continued)

THERMAL METRIC(1)		TPD1E10B06		UNIT
		DPY (X1SON)	DYA (SOD523)	
		2 PINS	2 PINS	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	162	-	°C/W

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.

Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
V_{RWM}	Reverse stand-off voltage	Pin 1 to 2 or Pin 2 to 1			5.5	V
I_{LEAK}	Leakage current	Pin 1 = 5 V, Pin 2 = 0 V			100	nA
$V_{Clamp1,2}$	Clamp voltage with surge strike on pin 1, pin 2 grounded.	I_{PP} = 1 A, t_p = 8/20 μs(2)			10	V
$V_{Clamp1,2}$	Clamp voltage with surge strike on pin 1, pin 2 grounded.	I_{PP} =5 A, t_p = 8/20 μs(2)			14	V
$V_{Clamp2,1}$	Clamp voltage with surge strike on pin 2, pin 1 grounded.	I_{PP} = 1 A, t_p = 8/20 μs(2)			8.5	V
		I_{PP} = 5 A, t_p = 8/20 μs(2)			14	
R_{DYN}	Dynamic resistance	Pin 1 to Pin 2(1)		0.32		Ω
		Pin 2 to Pin 1(1)		0.38		
C_{IO}	I/O capacitance	V_{IO} = 2.5 V; f = 1 MHz		12		pF
$V_{BR1,2}$	Break-down voltage, pin 1 to pin 2	I_{IO} = 1 mA	6			V
$V_{BR2,1}$	Break-down voltage, pin 2 to pin 1	I_{IO} = 1 mA	6			V

(1) Extraction of R_{DYN} using least squares fit of TLP characteristics between I_{PP} = 10 A and I_{PP} = 20 A.
(2) Nonrepetitive current pulse 8 to 20 μs exponentially decaying waveform according to IEC 61000-4-5

Typical Characteristics

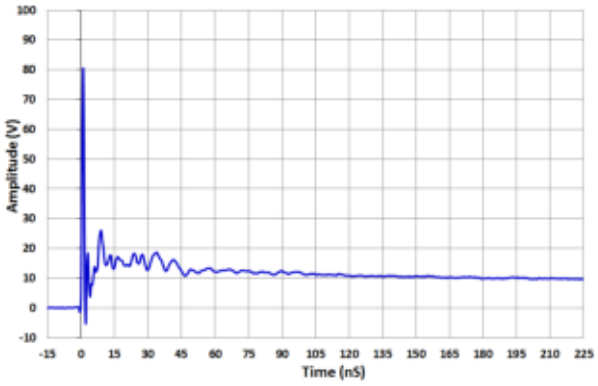


Figure 6-1. IEC 61000-4-2 Clamp Voltage +8 kV Contact ESD

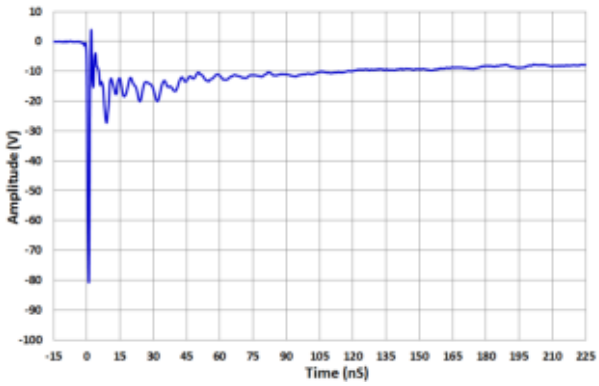


Figure 6-2. IEC 61000-4-2 Clamp Voltage –8-kV Contact ESD

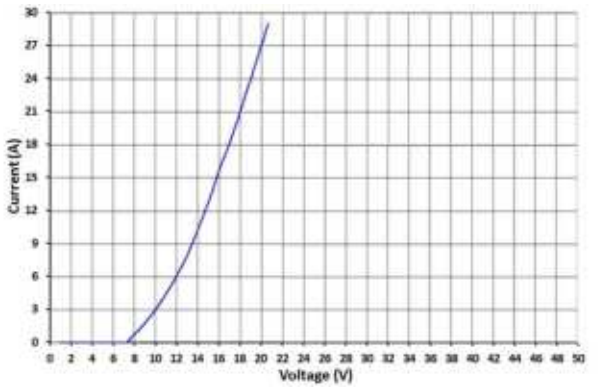


Figure 6-3. Transmission Line Pulse (TLP) Waveform Pin 1 to Pin 2

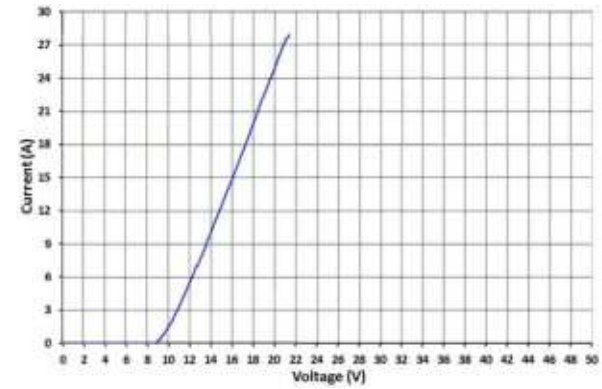


Figure 6-4. Transmission Line Pulse (TLP) Waveform Pin 2 to Pin 1

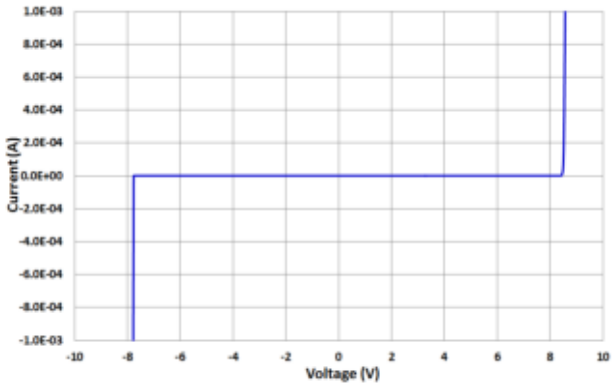


Figure 6-5. IV Curve

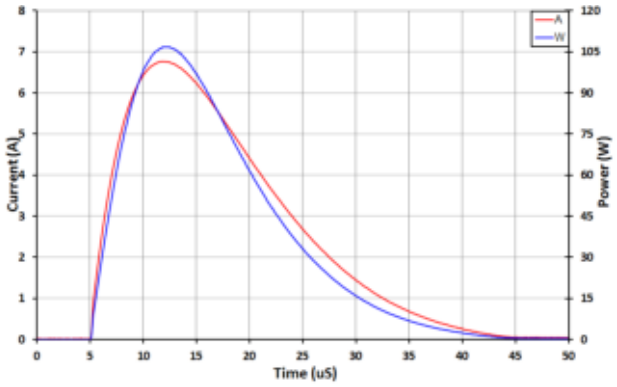


Figure 6-6. Positive Surge Waveform 8 to 20 µs

Typical Characteristics (continued)

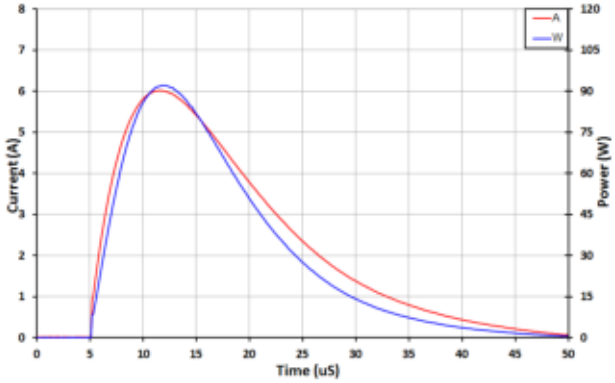


Figure 6-7. Negative Surge Waveform 8 to 20 µs

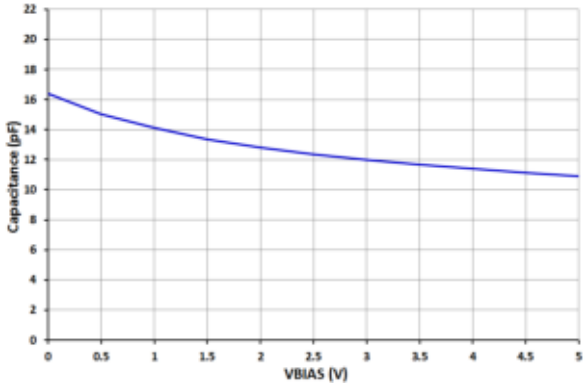


Figure 6-8. Pin Capacitance Across V_{BIAS}

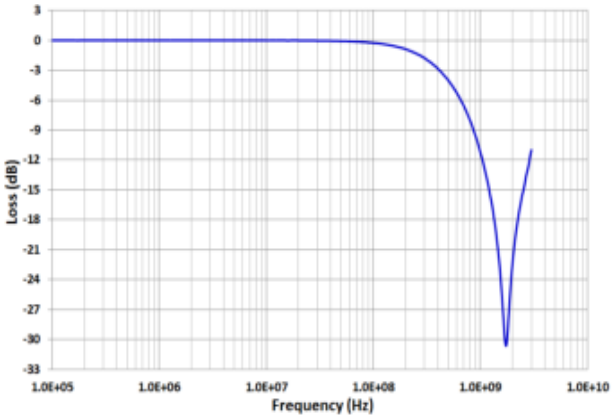
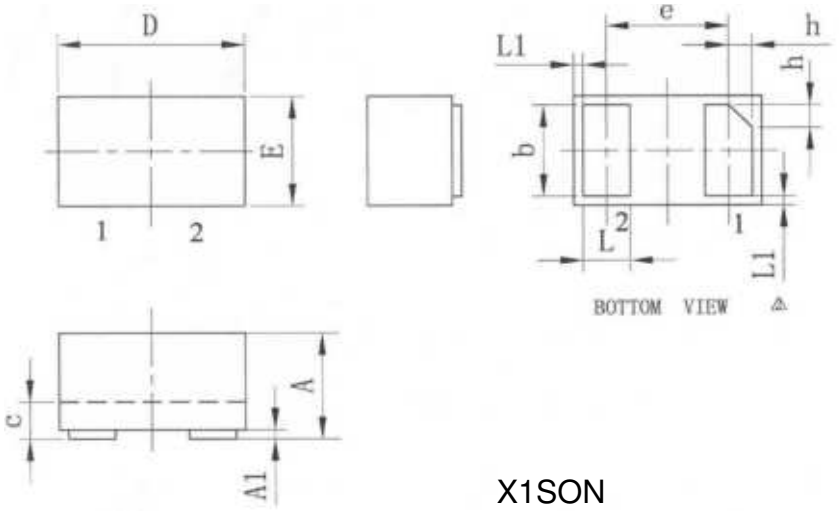


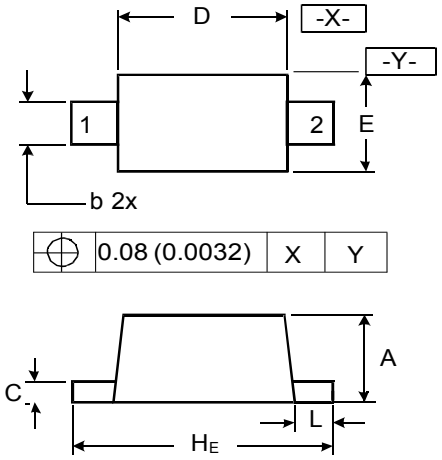
Figure 6-9. Insertion Loss

Outline Drawing – X1SON/SOD-523



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0	0.02	0.05
b	0.45	0.50	0.55
c	0.12	0.15	0.18
D	0.95	1.00	1.05
e	0.65BSC		
E	0.55	0.60	0.65
L	0.20	0.25	0.30
L1	0.05REF		
h	0.07	0.12	0.17
	20*20		

X1SON

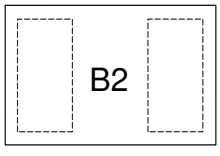


DIMENSIONS

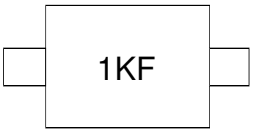
SYMBOL	MILLIMETER		INCHES	
	MIN	MAX	MIN	MAX
A	0.50	0.70	0.020	0.028
b	0.25	0.35	0.010	0.014
C	0.07	0.20	0.0028	0.0079
D	1.10	1.30	0.043	0.051
E	0.70	0.90	0.028	0.035
H_E	1.50	1.70	0.059	0.067
L	0.15	0.25	0.006	0.010

SOD-523

Marking



X1SON



SOD-523

Ordering information

Order code	Marking codes	Package	Baseqty	Deliverymode
UMW TPD1E0B06DPYR	B2	X1SON	10000	Tape and reel
UMW TPD1E0B06DPAR	1KF	SOD-523	3000	Tape and reel