

1.Description

The TPD1E10B06 is a single-channel ESD TVS diode in a small 0402 package convenient for space constrained 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.

3.Features

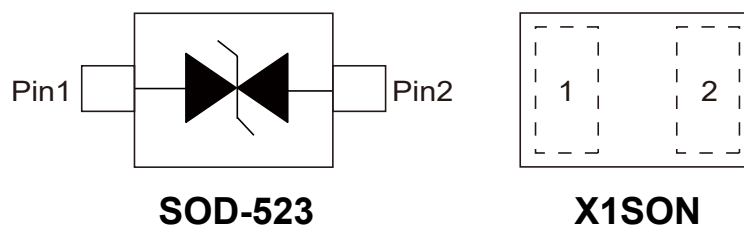
- Provides system-level ESD protection for low voltage I/O interface
- IEC 61000-4-2 level 4 ESD protection
 - ± 30 kV contact discharge
 - ± 30 kV air-gap discharge
- IEC 61000-4-5 surge: 6 A (8/20 μ s)
- I/O capacitance 12 pF (typical)
- R_{DYN} 0.4 Ω (typical)

2.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)

- DC breakdown voltage ± 6 V (minimum)
- Ultralow leakage current 100 nA (maximum)
- 10-V clamping voltage (maximum at $I_{PP}=1A$)
- Industrial temperature range: $-40^{\circ}C$ to $125^{\circ}C$
- Small 0402 footprint
(1 mm $\times$ 0.6 mm $\times$ 0.5 mm)
- Industry standard SOD-523 package
(0.8 mm $\times$ 1.2 mm)

4.Pinning information





5.Absolute Maximum Ratings

		Min	Max	Units
IEC 61000-4-5 power (t_p - 8/20 μ s) at 25°C	Peak pulse		90	W
IEC 61000-4-5 current (t_p - 8/20 μ s) at 25°C			6	A
Operating free-air temperature	T_A	-40	125	°C
Storage temperature	T_{STG}	-65	155	°C

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

(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



6.ESD Ratings - JEDEC Specification

			Value	Units
$V_{(ESD)}$	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

7.ESD Ratings—IEC Specification

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

8.Recommended Operating Conditions

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

		Min	Nom	Max	Units
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



9. Thermal Information

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

10. Thermal Information (continued)

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

Notes:

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



11. Electrical Characteristic ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

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

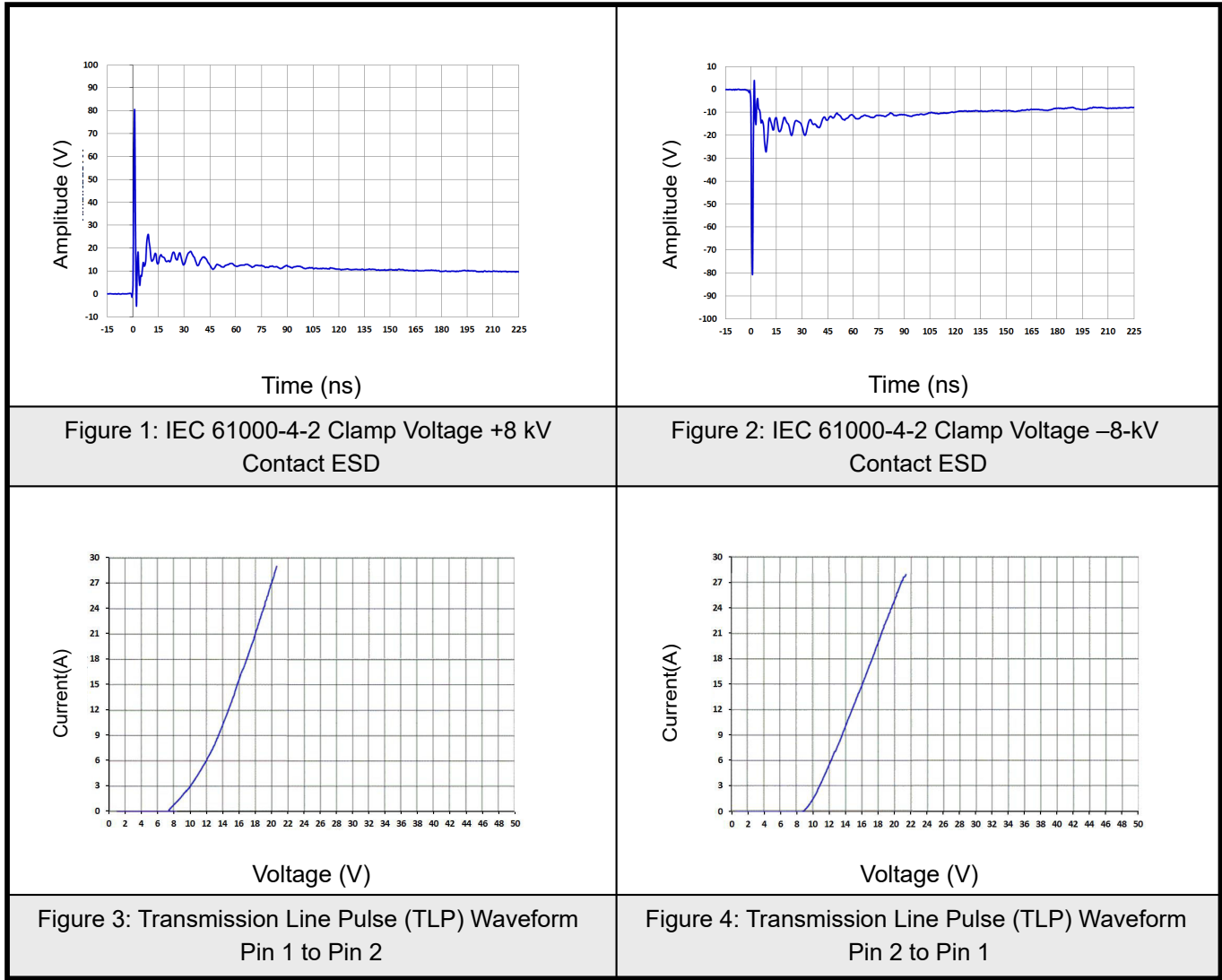
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse stand-off voltage	V_{RWM}	Pin 1 to 2 or Pin 2 to 1			5.5	V
Leakage current	I_{LEAK}	Pin 1=5 V, Pin 2=0V			100	nA
Clamp voltage with surge strike on pin 1, pin 2 grounded.	$V_{Clamp1,2}$	$I_{PP}=1\text{A}$, $t_p=8/20\mu\text{s}^{(2)}$			10	V
Clamp voltage with surge strike on pin 1, pin 2 grounded.	$V_{Clamp1,2}$	$I_{PP}=5\text{A}$, $t_p=8/20\mu\text{s}^{(2)}$			14	V
Clamp voltage with surge strike on pin 2, pin 1 grounded.	$V_{Clamp2,1}$	$I_{PP}=1\text{A}$, $t_p=8/20\mu\text{s}^{(2)}$			8.5	V
		$I_{PP}=5\text{A}$, $t_p=8/20\mu\text{s}^{(2)}$			14	V
Dynamic resistance	R_{DYN}	Pin 1 to Pin 2 ⁽¹⁾		0.32		Ω
		Pin 2 to Pin 1 ⁽¹⁾		0.38		Ω
I/O capacitance	C_{IO}	$V_{IO}=2.5\text{V}$; $f=1\text{MHz}$		12		pF
Break-down voltage, pin 1 to pin 2	$V_{BR1,2}$	$I_{IO}=1\text{mA}$	6			V
Break-down voltage, pin 2 to pin 1	$V_{BR2,1}$	$I_{IO}=1\text{mA}$	6			V

(1) Extraction of R_{DYN} using least squares fit of TLP characteristics between $I_{PP}=10\text{A}$ and $I_{PP}=20\text{A}$.

(2) Nonrepetitive current pulse 8 to 20 μs exponentially decaying waveform according to IEC 61000-4-5



12.1Typical characteristic





12.2 Typical characteristic

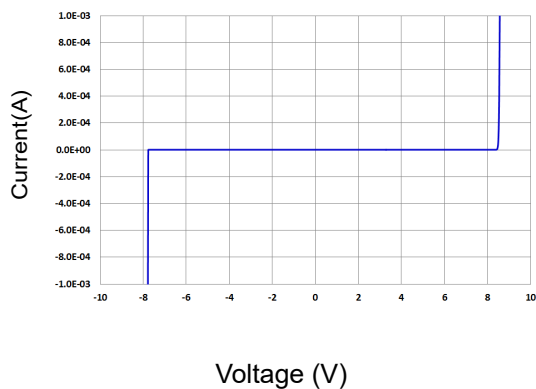


Figure 5: Source-Drain Diode Forward Voltage

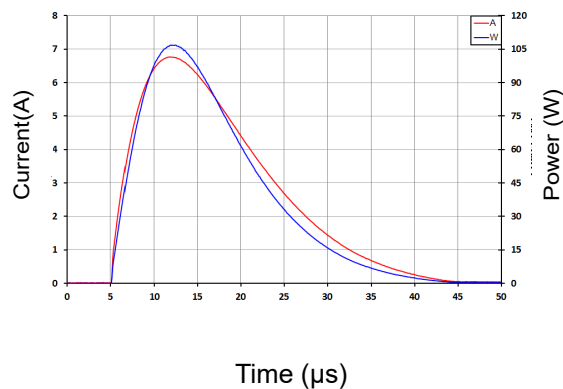
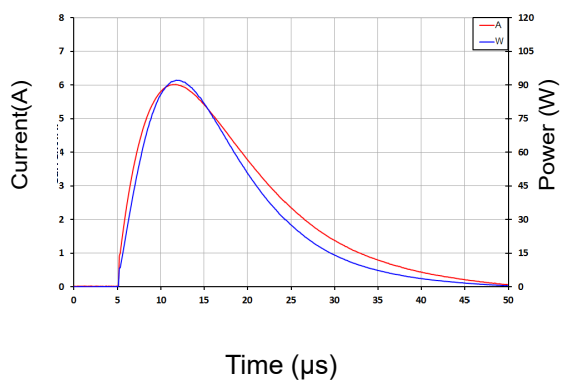
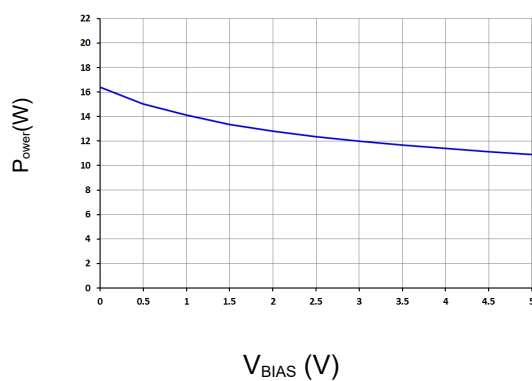
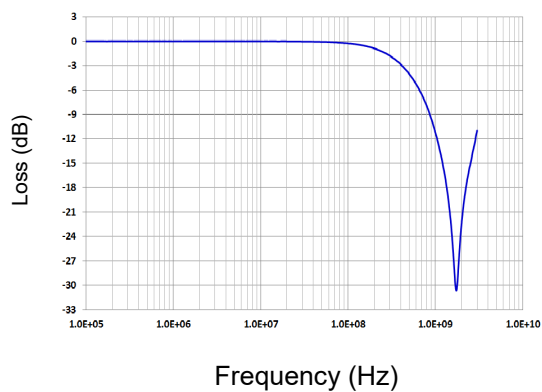
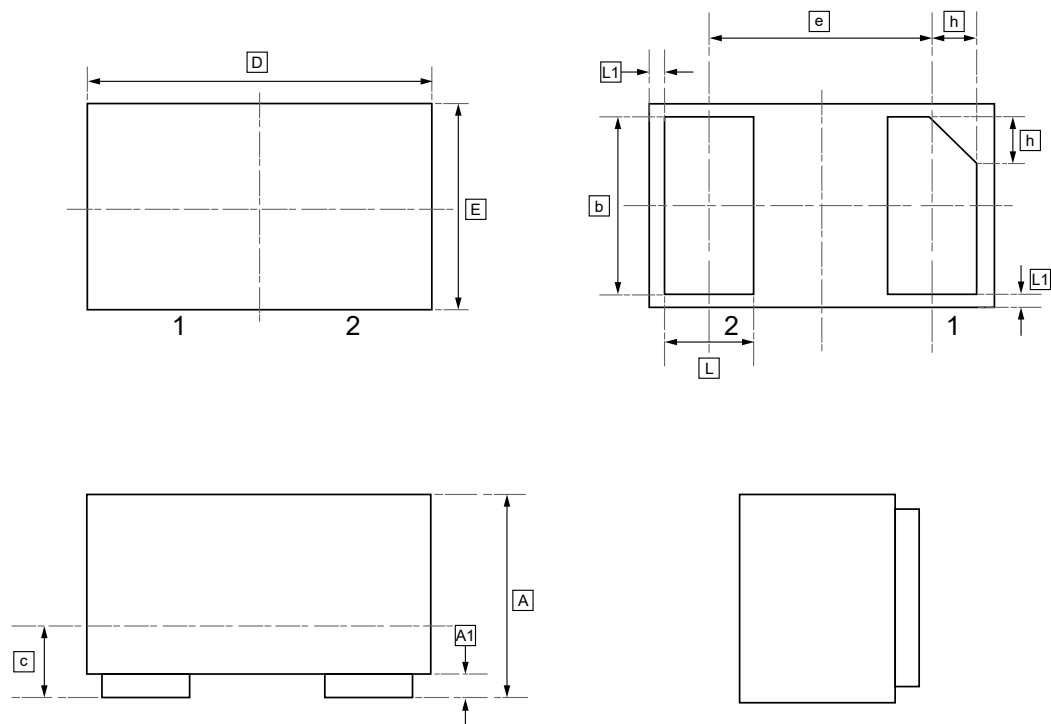
Figure 6: Positive Surge Waveform 8 to 20 μ sFigure 7: Negative Surge Waveform 8 to 20 μ sFigure 8: Pin Capacitance Across V_{BIAS} 

Figure 9: Insertion Loss



13.1X1SON Package Outline Dimensions

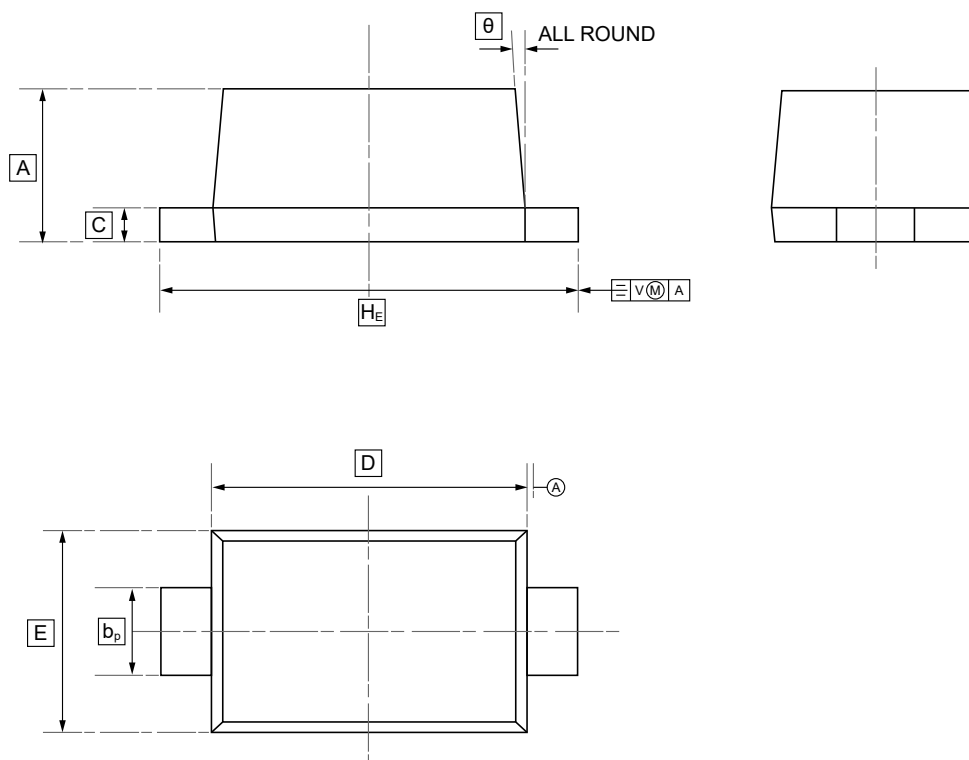


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	b	c	D	e	E	L	L1	h
Min	0.45	0.00	0.45	0.12	0.95	0.65	0.55	0.20	0.05	0.07
Max	0.55	0.05	0.55	0.18	1.05	BSC	0.65	0.30	REF	0.17



13.2SOD-523 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	b _p	C	D	E	H _E	θ
Min	0.58	0.3	0.100	1.15	0.75	1.5	5°
Max	0.68	0.4	0.135	1.25	0.85	1.7	



14.Ordering information



X1SON



yww: Batch Code

SOD-523

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TPD1E10B06DPYR	B2	X1SON	10000	Tape and reel
UMW TPD1E10B06DPAR	1KF	SOD-523	3000	Tape and reel



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