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TPD1E10B06DPYR



TPD1E10B06 单通道 ESD 保护二极管

1 特性

- 可为低电压 I/O 接口提供系统级 ESD 保护
- IEC 61000-4-2 4 级 ESD 保护
 - $\pm 30\text{kV}$ 接触放电
 - $\pm 30\text{kV}$ 气隙放电
- IEC 61000-4-5 浪涌: 6A (8/20 μs)
- I/O 电容 12pF (典型值)
- $R_{\text{DYN}} 0.4\Omega$ (典型值)
- 直流击穿电压 $\pm 6\text{V}$ (最小值)
- 100nA 超低漏电流 (最大值)
- 10V 钳位电压 ($I_{\text{PP}} = 1\text{A}$ 时的最大值)
- 工业级温度范围: -40°C 至 125°C
- 小型 0402 封装尺寸 (1mm $\times$ 0.6mm $\times$ 0.5mm)
- 业界通用 SOD-523 封装 (0.8mm $\times$ 1.2mm)

2 应用

- 终端设备:
 - 便携式设备
 - 可穿戴设备
 - 机顶盒
 - 电子销售终端 (EPOS)
 - 电器
 - 楼宇自动化
- 接口:
 - 音频线路
 - 按钮
 - 通用输入或输出 (GPIO)

3 说明

TPD1E10B06 是一款单通道 ESD TVS 二极管, 提供适合空间受限应用的小型 0402 封装, 以及业界通用的 SOD-523 封装。这款 TVS 保护产品提供 $\pm 30\text{kV}$ 接触 ESD 和 $\pm 30\text{kV}$ IEC 气隙保护, 并具有一个带背靠背 TVS 二极管的 ESD 钳位电路, 用于支持双极或双向信号。该 ESD 保护二极管的 12pF 线路电容非常适合各种支持高达 400Mbps 数据速率的应用。

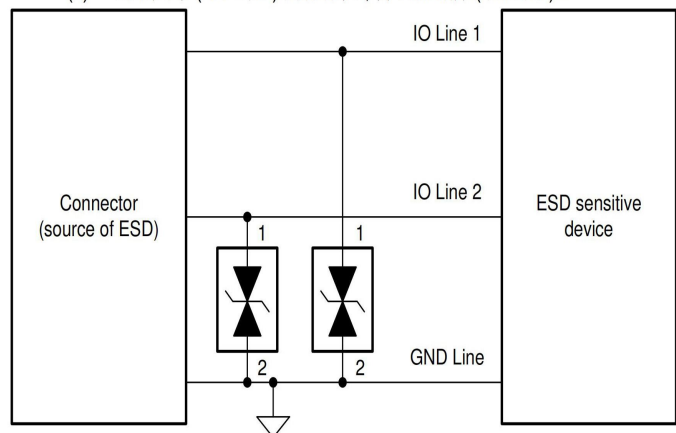
这款 ESD 保护产品的典型应用是为音频线路 (麦克风、耳机和扬声器)、SD 接口、键盘或其他按钮、USB 端口的 VBUS 引脚和 ID 引脚以及通用 I/O 端口等提供电路保护。该 ESD 钳位有利于为便携式设备、可穿戴设备、机顶盒、电子销售终端设备、电器以及楼宇自动化产品等终端设备提供保护。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾
TPD1E10B06	DPY (X1SON, 2)	1mm $\times$ 0.6mm
	DYA (SOT-5X3, 2)	1.6mm $\times$ 0.8mm

(1) 有关更多信息, 请参阅节 10。

(2) 封装尺寸 (长 $\times$ 宽) 为标称值, 并包括引脚 (如适用)。



应用原理图

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5.1 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 μ s) at 25°C		90	W
	IEC 61000-4-5 current (t_p - 8/20 μ s) 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.

5.2 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

5.3 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	

5.4 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

5.5 Thermal Information

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

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5.6 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.	$I_{PP} = 1\text{ A}$, $t_p = 8/20\text{ }\mu\text{s}$ ⁽²⁾			10	V
$V_{Clamp1,2}$	Clamp voltage with surge strike on pin 1, pin 2 grounded.	$I_{PP} = 5\text{ A}$, $t_p = 8/20\text{ }\mu\text{s}$ ⁽²⁾			14	V
$V_{Clamp2,1}$	Clamp voltage with surge strike on pin 2, pin 1 grounded.	$I_{PP} = 1\text{ A}$, $t_p = 8/20\text{ }\mu\text{s}$ ⁽²⁾			8.5	V
		$I_{PP} = 5\text{ A}$, $t_p = 8/20\text{ }\mu\text{s}$ ⁽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	$V_{IO} = 2.5\text{ V}$; $f = 1\text{ MHz}$		12		pF
$V_{BR1,2}$	Break-down voltage, pin 1 to pin 2	$I_{IO} = 1\text{ mA}$	6			V
$V_{BR2,1}$	Break-down voltage, pin 2 to pin 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

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5.7 Typical Characteristics

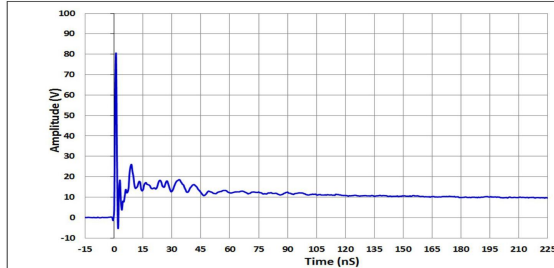


图 5-1. IEC 61000-4-2 Clamp Voltage +8 kV Contact ESD

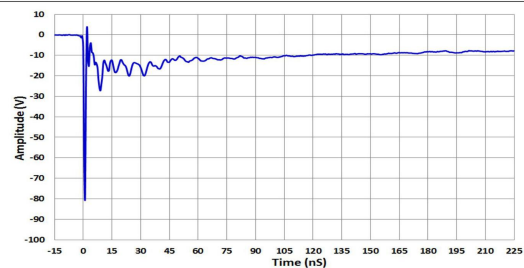


图 5-2. IEC 61000-4-2 Clamp Voltage -8 kV Contact ESD

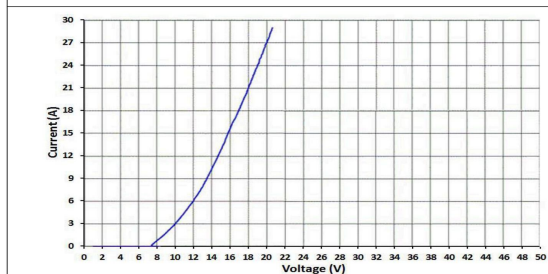


图 5-3. Transmission Line Pulse (TLP) Waveform Pin 1 to Pin 2

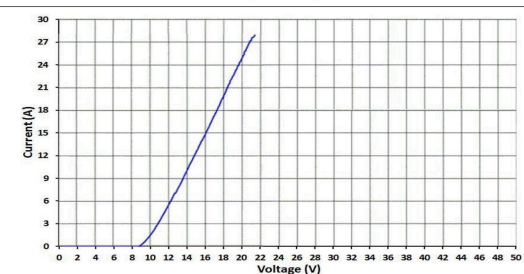


图 5-4. Transmission Line Pulse (TLP) Waveform Pin 2 to Pin 1

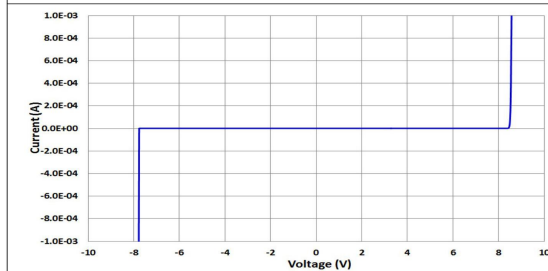


图 5-5. IV Curve

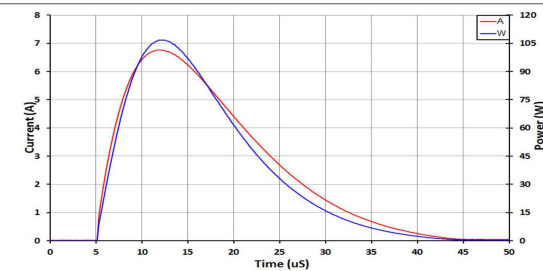


图 5-6. Positive Surge Waveform 8 to 20 μ s

5.7 Typical Characteristics (continued)

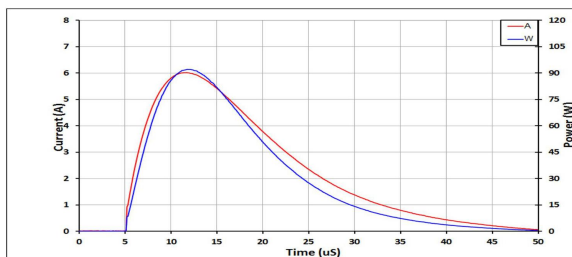


图 5-7. Negative Surge Waveform 8 to 20 μ s

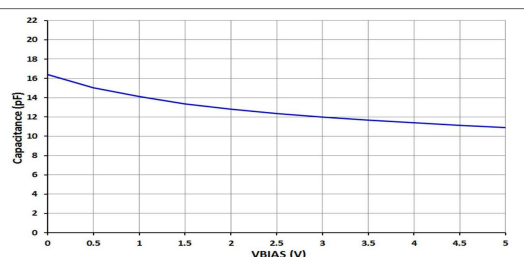


图 5-8. Pin Capacitance Across V_{BIAS}

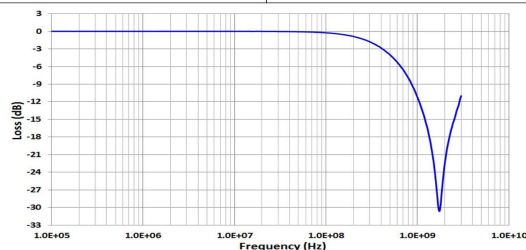


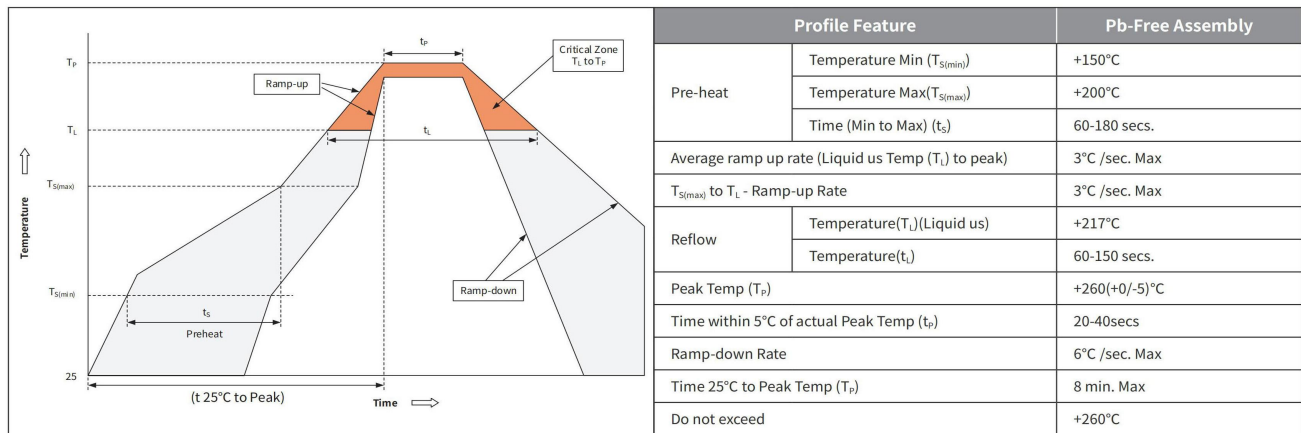
图 5-9. Insertion Loss

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Ordering Information

PREFERRED P/N	PACKAGE	SIZE(mm)	DELIVERY MODE	MPQ(PCS)
	DFN1006-2L	1.00×0.60×0.37	7" REEL	10,000

Recommended Soldering Conditions



Package Outline Dimensions (DFN1006-2L)

Symbol	Dimensions			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.950	1.050	0.037	0.041
B	0.550	0.650	0.022	0.026
C	0.350	0.450	0.014	0.018
D	0.550	0.650	0.022	0.026
D ₁	0.280	0.380	0.011	0.015
E	0.450	0.550	0.018	0.022
L	0.000	0.100	0.000	0.004

Suggested Pad Layout

Symbol	Dimensions			
	Millimeters		Inches	
	Min	Max	Min	Max
J	0.50	0.60	0.020	0.024
K	0.25	0.35	0.010	0.014
M	0.55	0.65	0.022	0.026