

Single Channel ESD Protection Device in 0402 Package

 Check for Samples: [TPD1E10B06](#)

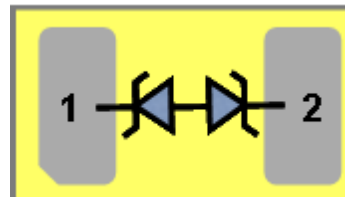
FEATURES

- Provides System Level ESD Protection for Low-voltage IO Interface
- IEC 61000-4-2 Level 4
 - > ±30kV (Air-Gap Discharge),
 - > ±30kV (Contact Discharge)
- IEC 61000-4-5 (Surge): 6A (8/20µs)
- IO Capacitance 12pF (Typ)
- R_{DYN} 0.4Ω (Typ)
- DC Breakdown Voltage ±6V (Min)
- Ultra Low Leakage Current 100nA (Max)
- 10V Clamping Voltage (Max at I_{PP} = 1A)
- Industrial Temperature Range: –40°C to 125°C
- Space Saving 0402 Footprint (1mm x 0.6mm x 0.5mm)

APPLICATIONS

- Cell Phones
- eBook
- Portable Media Players
- Digital Camera
- Set-top-box
- Printers
- Handheld Electronics

DEVICE CONFIGURATION



DESCRIPTION

The TPD1E10B06 is a single channel ESD protection device in a small 0402 package. The device offers over ±30KV IEC air-gap, over ±30KV contact ESD protection, and has an ESD clamp circuit with a back-to-back diode for bipolar or bidirectional signal support. The 10pF line capacitance is suitable for a wide range of applications supporting data rates up to 400Mbps. Typical application areas of the TPD1E10B06 include audio lines (microphone, earphone and speakerphone), SD interfacing, keypad or other buttons, and VBUS pins of USB ports (ID).

The 0402 package is industry standard and convenient for component placement in space saving applications. The TPD1E10B06 is characterized for operation over ambient air temperature of –40°C to 125°C.

ORDERING INFORMATION

T _A	PACKAGE ⁽¹⁾⁽²⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	10000 Tape and reel	TPD1E10B06DPYR	B_

(1) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

(2) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI Web site at www.ti.com.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ABSOLUTE MAXIMUM RATINGS

	MIN	MAX	UNIT
Operating temperature range	-40	125	°C
Storage temperature	-65	155	°C
IEC 61000-4-2 contact ESD		> ±30	kV
IEC 61000-4-2 air-gap ESD		> ±30	kV
I _{PP} Peak pulse current (tp = 8/20 μs)		6	A
P _{PP} Peak pulse power (tp = 8/20 μs)		90	W

ELECTRICAL CHARACTERISTICS

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 ESD strike on pin 1, pin 2 grounded.	I _{PP} = 1 A, tp = 8/20 μSec ⁽¹⁾			10	V
	I _{PP} = 5 A, tp = 8/20 μSec ⁽¹⁾			14	
V _{Clamp2,1} Clamp voltage with ESD strike on pin 2, pin 1 grounded.	I _{PP} = 1 A, tp = 8/20 μSec ⁽¹⁾			8.5	V
	I _{PP} = 5 A, tp = 8/20 μSec ⁽¹⁾			14	
R _{DYN} Dynamic resistance	Pin 1 to Pin 2 ⁽²⁾		0.32		Ω
	Pin 2 to Pin 1 ⁽²⁾		0.38		
C _{IO} IO capacitance	V _{IO} = 2.5 V		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) Non-repetitive current pulse 8/20 us exponentially decaying waveform according to IEC61000-4-5
- (2) Extraction of R_{DYNAMIC} using least squares fit of TLP characteristics between I_{PP} = 10A and I_{PP} = 20A.

TYPICAL CHARACTERISTICS

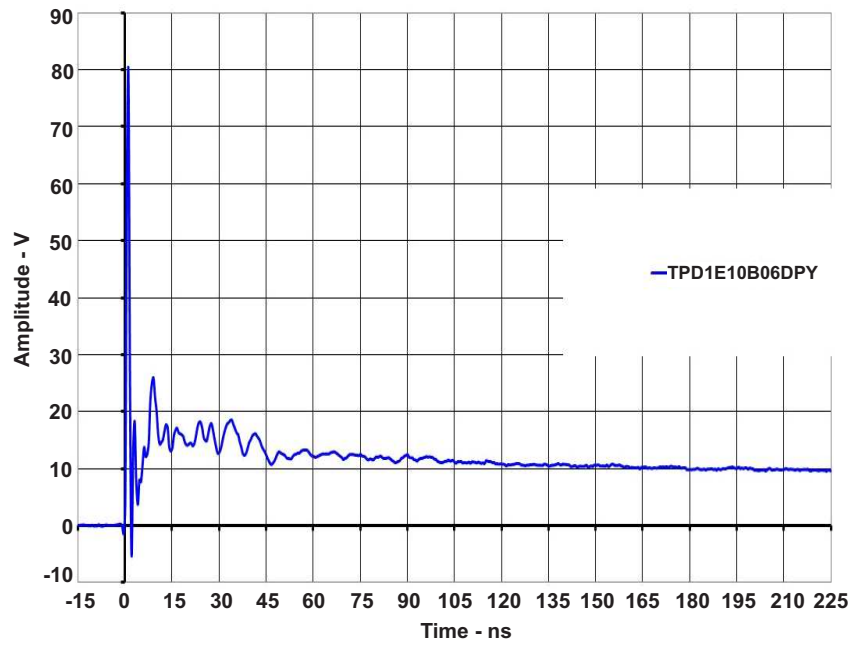


Figure 1. IEC61000-4-2 Clamp Voltage +8KV Contact ESD

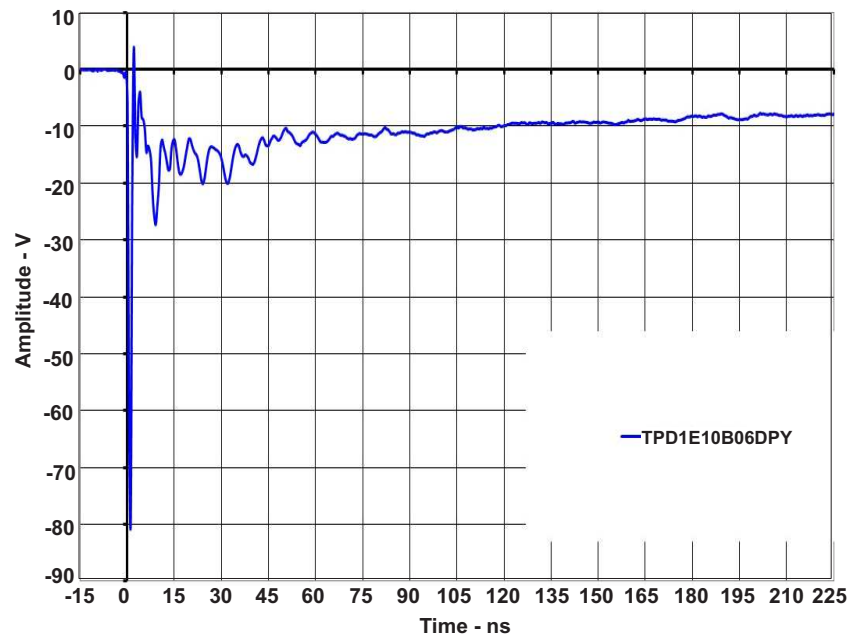


Figure 2. IEC61000-4-2 Clamp Voltage -8KV Contact ESD

TYPICAL CHARACTERISTICS (continued)

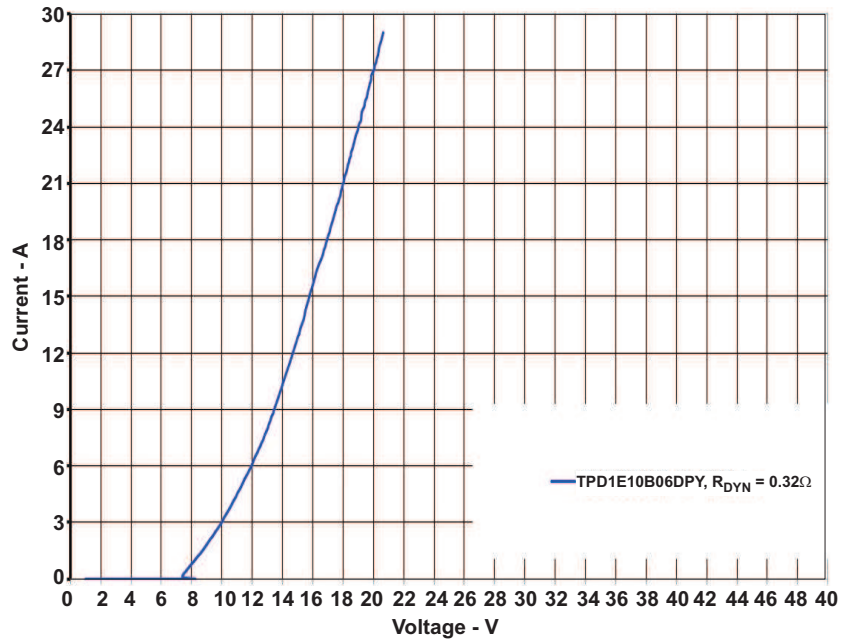


Figure 3. Transmission Line Pulse (TLP) Waveform Pin1 to Pin2

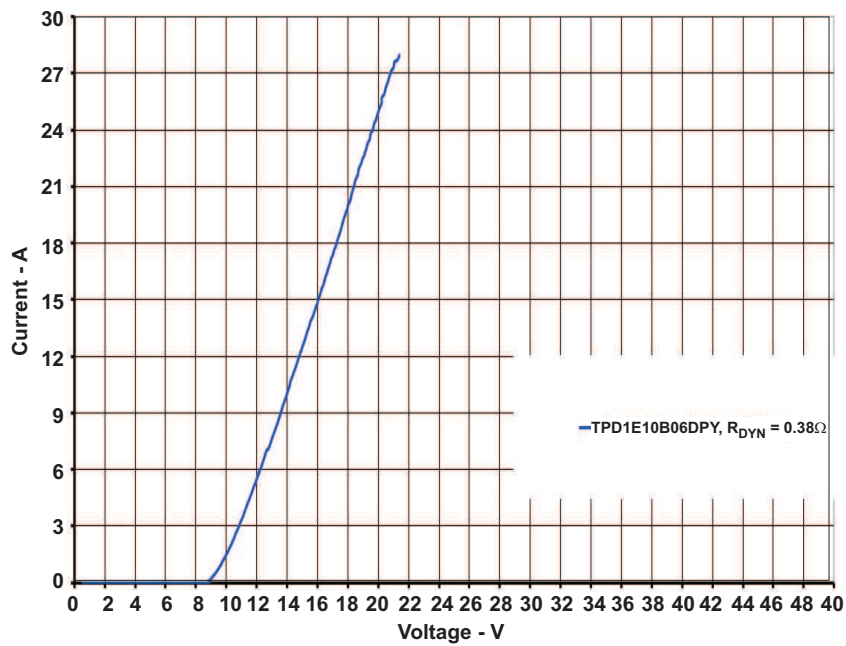


Figure 4. Transmission Line Pulse (TLP) Waveform Pin2 to Pin1

TYPICAL CHARACTERISTICS (continued)

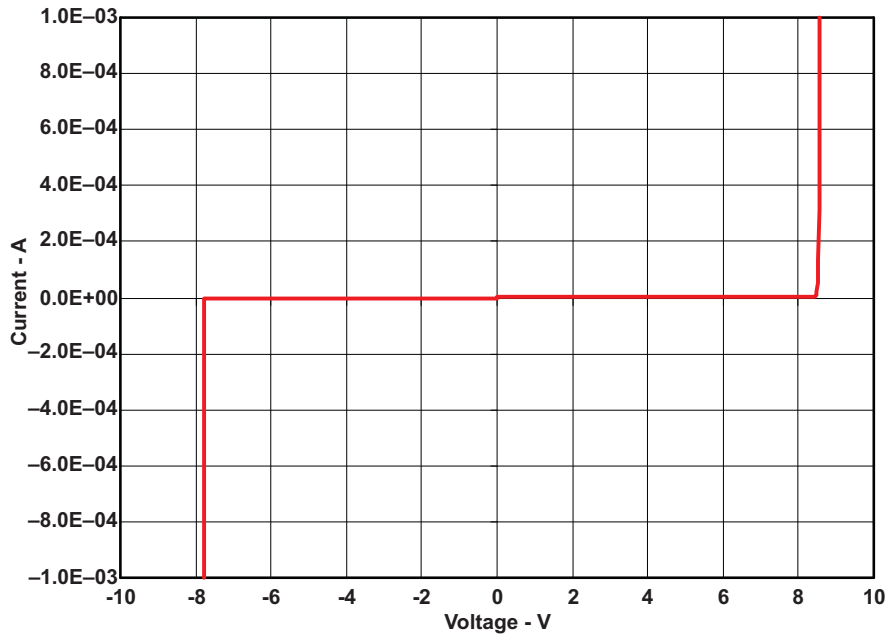


Figure 5. IV Curve

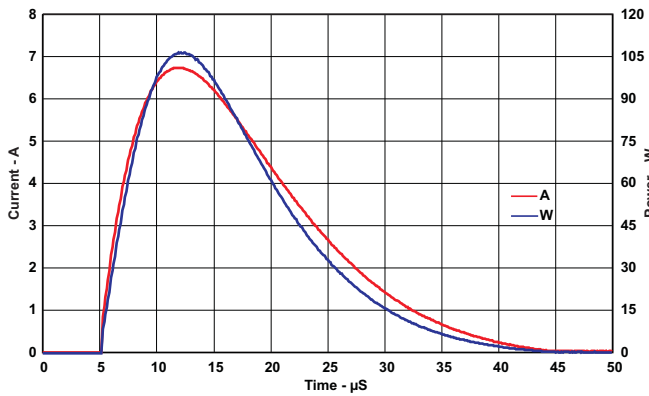


Figure 6. Positive Surge Waveform 8/20 μ s

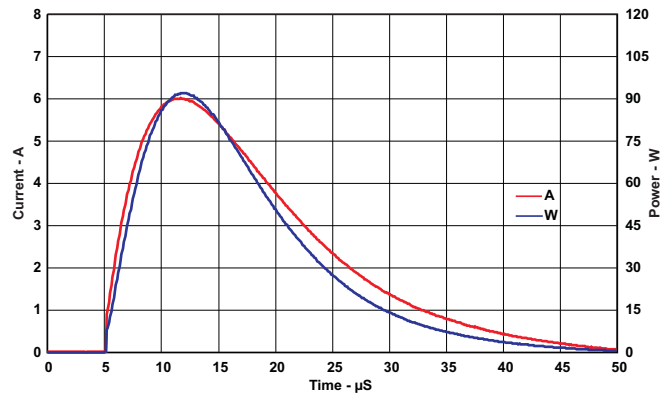


Figure 7. Negative Surge Waveform 8/20 μ s

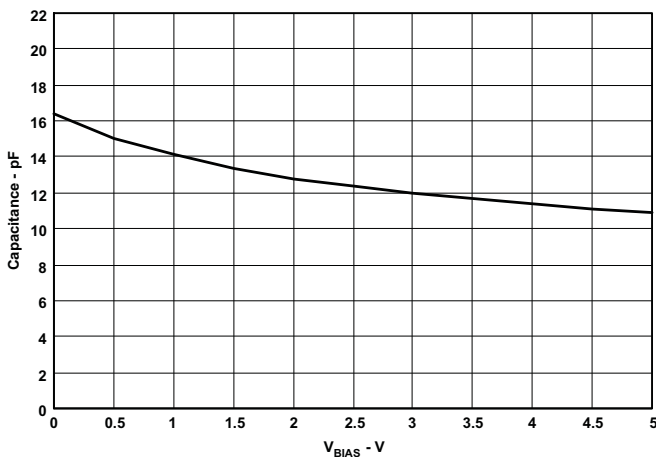


Figure 8. Pin Capacitance Across V_{BIAS}

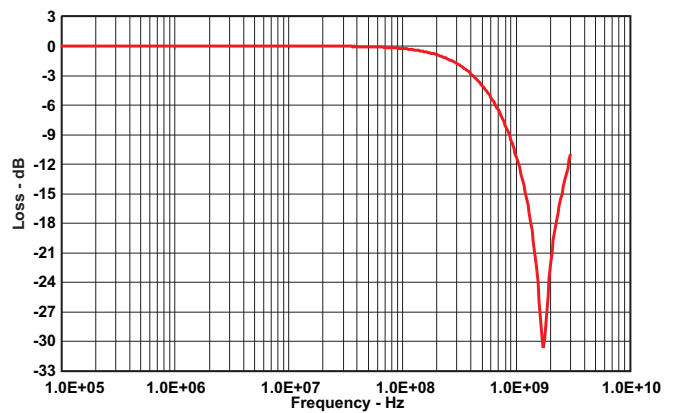


Figure 9. Insertion Loss

APPLICATION INFORMATION

The TPD1E10B06 is a single channel back-to-back diode that protects a single bi-directional signal line from Electro static discharge and surge pulses. Since its bi-directional, it protects signals that have positive or negative polarity. During normal operation, the diode behaves as a 12 pF capacitance to ground. Board layout is critical for optimal performance of any diode.

Placement: The diode should be placed very close to the external connector for optimal performance. Ideally, the diode should be placed on the line that it is protecting.

Layout: The diode pin 1 should be right over the signal line that it protects. There should a thick and short trace from pin 2 to ground. An example is shown below.

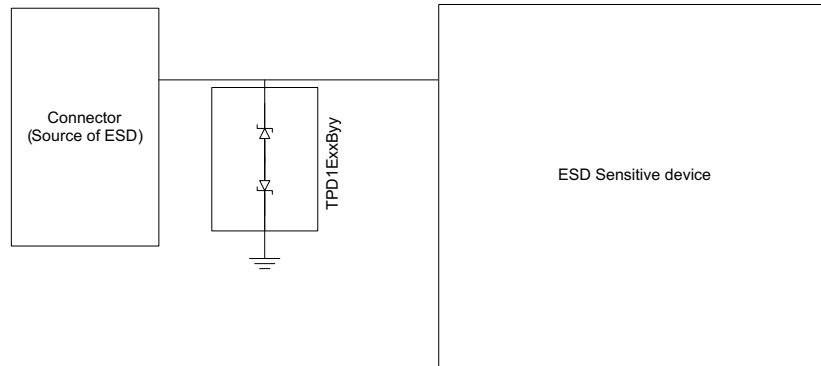


Figure 10. Application Schematic

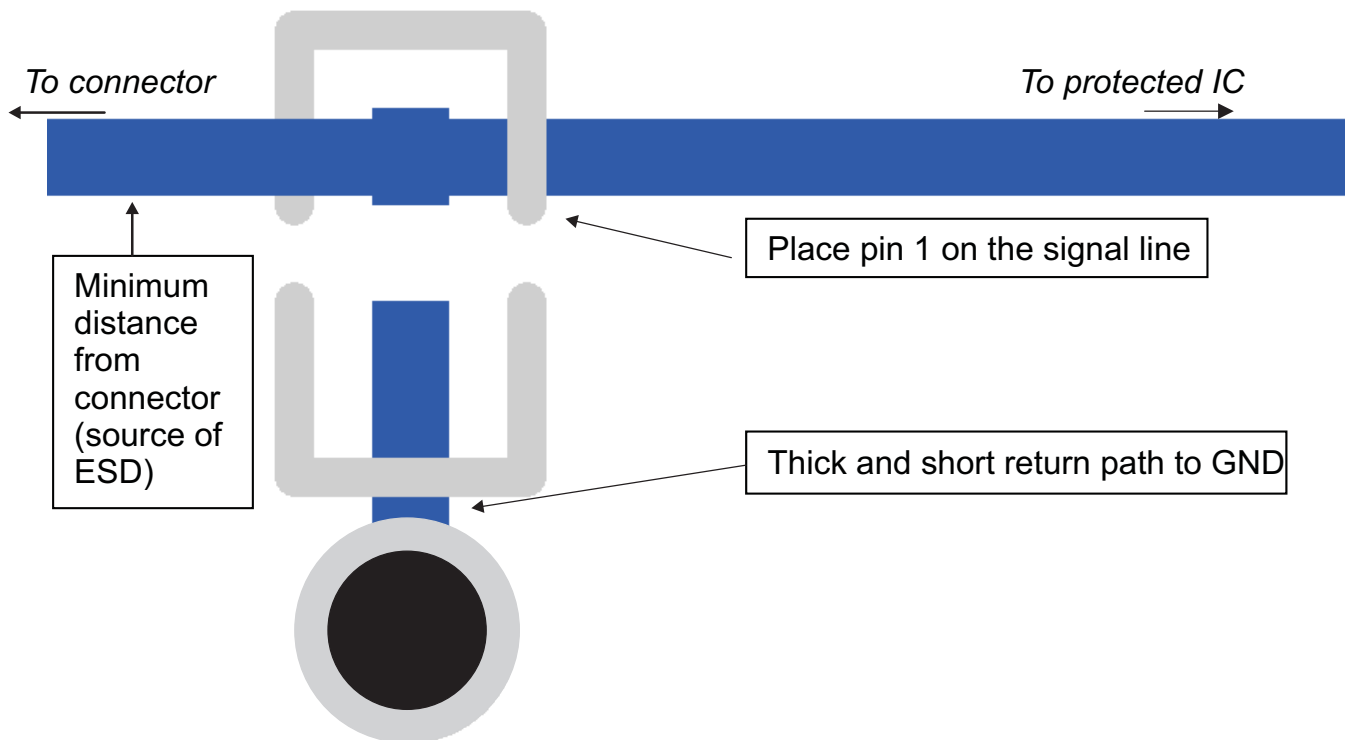


Figure 11. Layout Example

REVISION HISTORY

Changes from Original (February 2011) to Revision A	Page
• Updated FEATURES.	1
• Added graphs to TYPICAL CHARACTERISTICS section.	4
• Added APPLICATION INFORMATION section.	6

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
TPD1E10B06DPYR	ACTIVE	X2SON	DPY	2	10000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TPD1E10B06DPYT	PREVIEW	X2SON	DPY	2	250	TBD	Call TI	Call TI	

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

TAPE AND REEL INFORMATION

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TPD1E10B06DPYR	X2SON	DPY	2	10000	180.0	9.5	0.66	1.15	0.66	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS

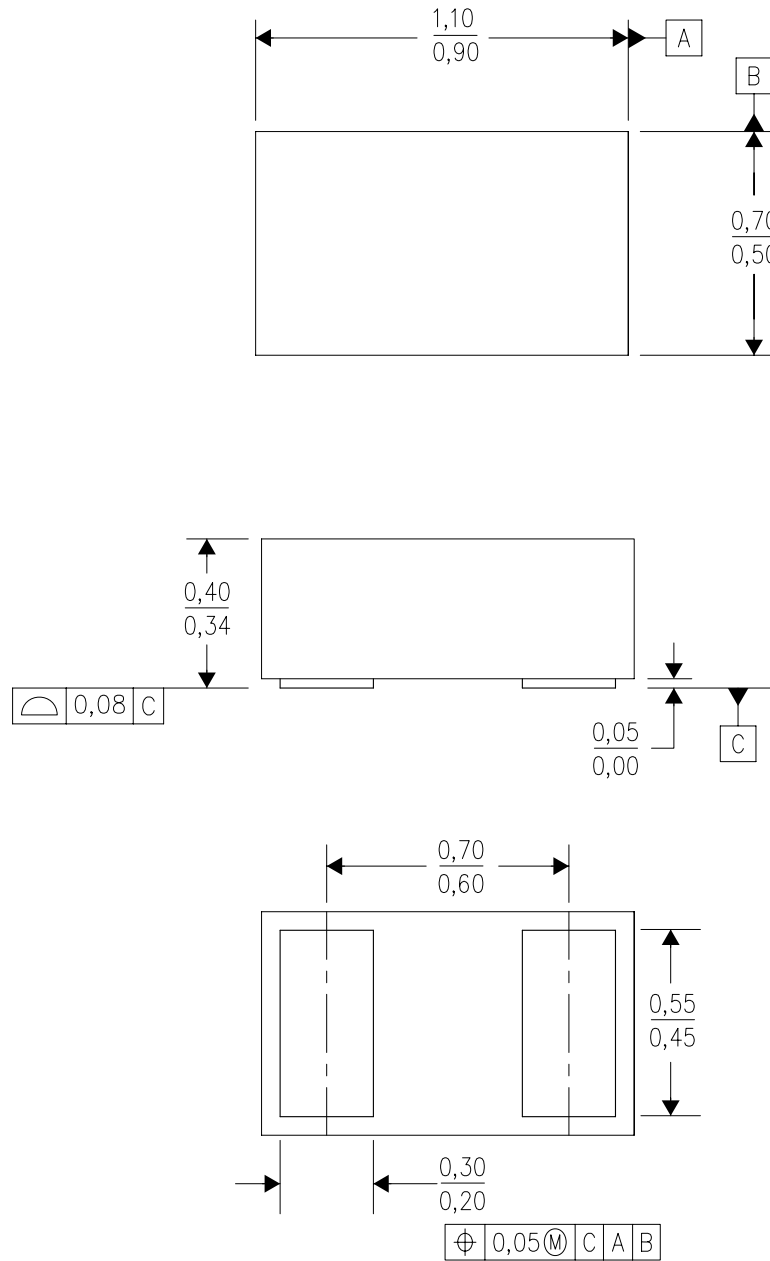


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPD1E10B06DPYR	X2SON	DPY	2	10000	180.0	180.0	30.0

DPY (R-PX2SON-N2)

PLASTIC SMALL OUTLINE NO-LEAD



4211012/A 04/10

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Mobile Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2012, Texas Instruments Incorporated