

Single Channel ESD Protection Device in 0201 Package

 Check for Samples: [TPD1E6B06](#)

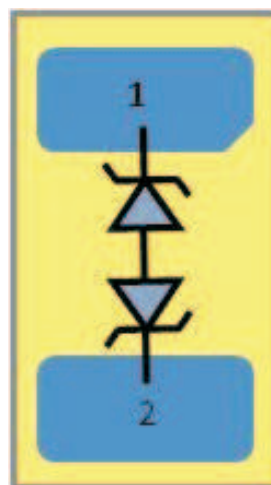
FEATURES

- Provides System Level ESD Protection for Low-voltage IO Interface
- IEC 61000-4-2 Level 4
 - ±15kV (Air Discharge),
 - ±15kV (Contact Discharge)
- IO Capacitance 6pF (Typ)
- R_{DYN} 0.55Ω (Typ)
- DC Breakdown Voltage ±6V (Min)
- Ultra Low Leakage Current 10nA (Typ)
- Low ESD Clamping Voltage
- Industrial Temperature Range: –40°C to 125°C
- IEC 61000-4-5 (Surge): 3.8A (8/20 μs Pulse)
- Space Saving 0201 Footprint (0.6mm x 0.3mm x 0.3mm)

APPLICATIONS

- Cell Phones
- eBook
- Portable Media Players
- Digital Camera

DEVICE CONFIGURATION

 0.6 mm × 0.3 mm × 0.3 mm
(0.35-mm pitch)


DESCRIPTION

The TPD1E6B06 is a single channel ESD protection device in a small 0201 package. The device offers ±15kV IEC air-gap, ±15kV contact ESD protection, and has an ESD clamp circuit with a back-to-back diode for bipolar or bidirectional signal support. The 6pF line capacitance is suitable for a wide range of applications supporting data rates up to 800Mbps. Typical application areas for the TPD1E6B06 are audio lines (microphone, earphone, and speakerphone), SD interfacing, keypad or other buttons, VBUS pin and ID pin of USB ports.

The 0201 package is industry standard and convenient for component placement in space saving applications. The TPD1E6B06 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	15000	Tape and reel	TPD1E6B06DPLR	H

(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.



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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		±15	kV
IEC 61000-4-2 air-gap ESD		±15	kV
I_{PP} Peak pulse current (tp = 8/20 µs)		3.8	A
P_{PP} Peak pulse power (tp = 8/20 µs)		50	W

ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
V_{RWM} Reverse stand-off voltage	$I_{LEAK} = 100 \text{ nA}$			±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.	$I_{PP} = 1 \text{ A}$, tp = 8/20 µs			10	V
	$I_{PP} = 5 \text{ A}$, tp = 8/20 µs			14	
$V_{Clamp2,1}$ Clamp voltage with ESD strike on pin 2, pin 1 grounded.	$I_{PP} = 1 \text{ A}$, tp = 8/20 µs			10	V
	$I_{PP} = 5 \text{ A}$, tp = 8/20 µs			14	
R_{DYN} Dynamic resistance	Pin 1 to Pin 2 ⁽¹⁾		0.55		Ω
	Pin 2 to Pin 1 ⁽¹⁾		0.55		
C_{IO} IO capacitance	$V_{IO} = 2.5 \text{ V}$		6		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 $I_{PP} = 20\text{A}$.

TYPICAL CHARACTERISTICS

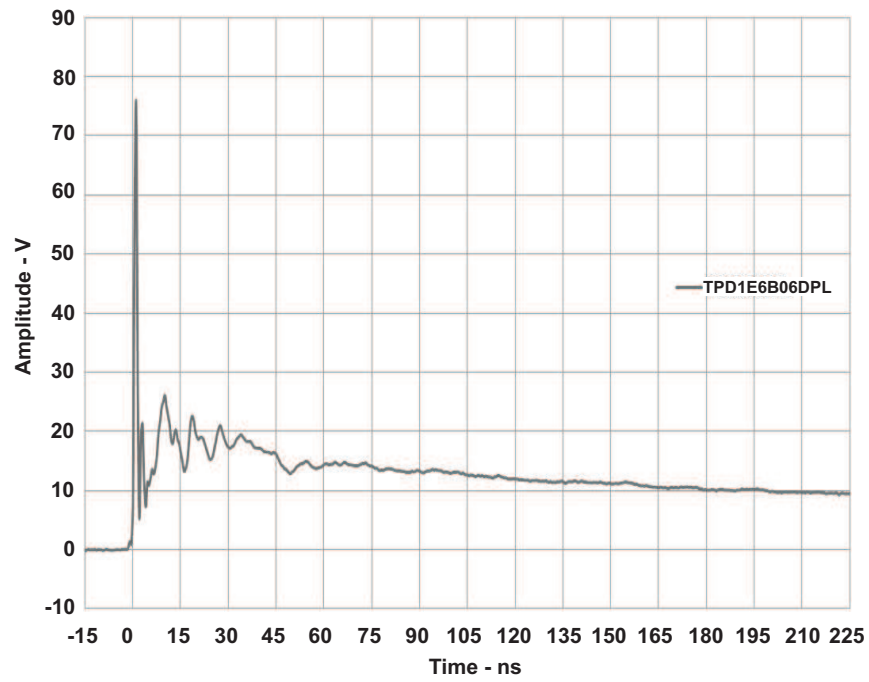


Figure 1. ESD Clamp Voltage +8kV Contact ESD

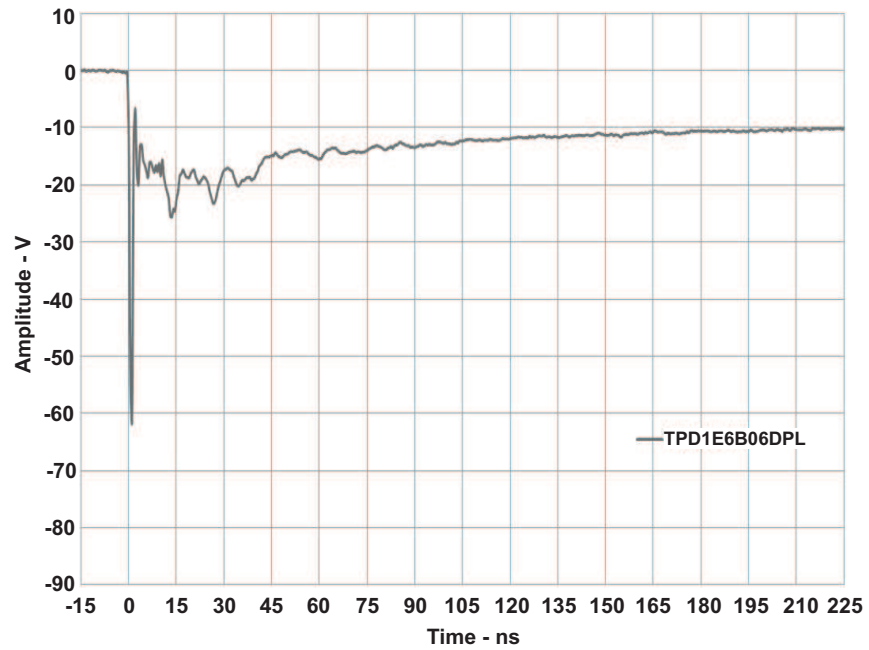


Figure 2. ESD Clamp Voltage -8kV Contact ESD

TYPICAL CHARACTERISTICS (continued)

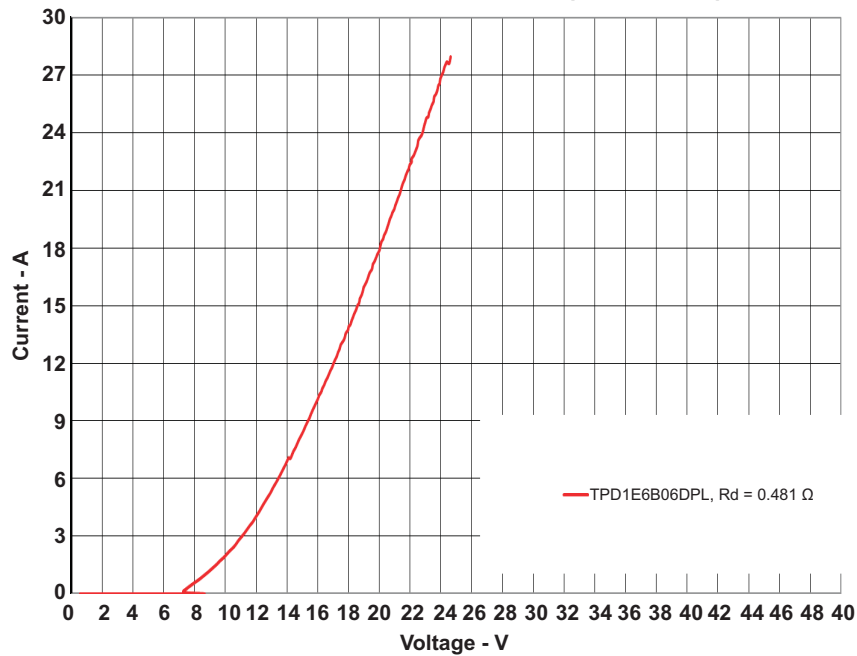


Figure 3. Clamping Voltage $V_{TLP} = F(I_{TLP})$, PIN1 to PIN2

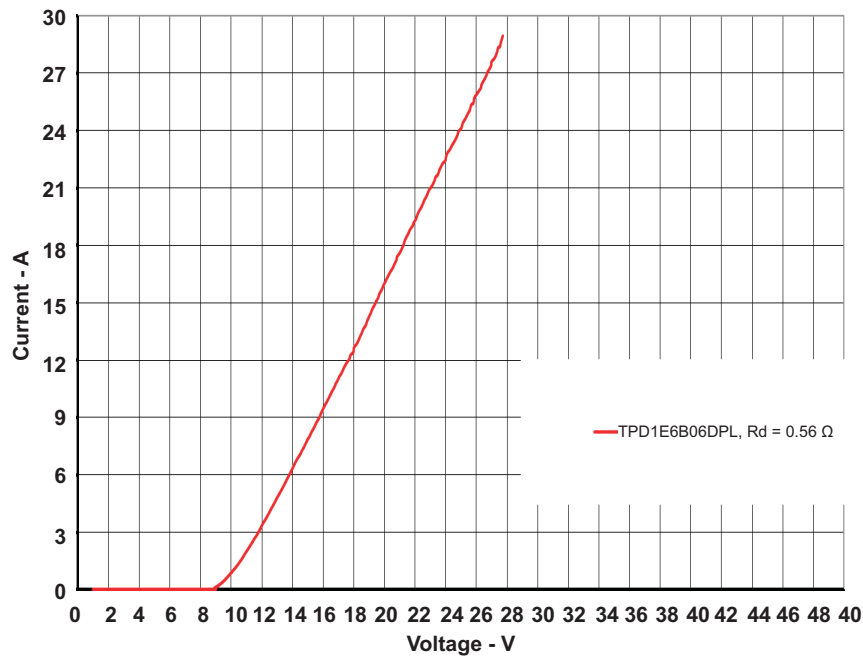


Figure 4. Clamping Voltage $V_{TLP} = F(I_{TLP})$, PIN2 to PIN1

TYPICAL CHARACTERISTICS (continued)

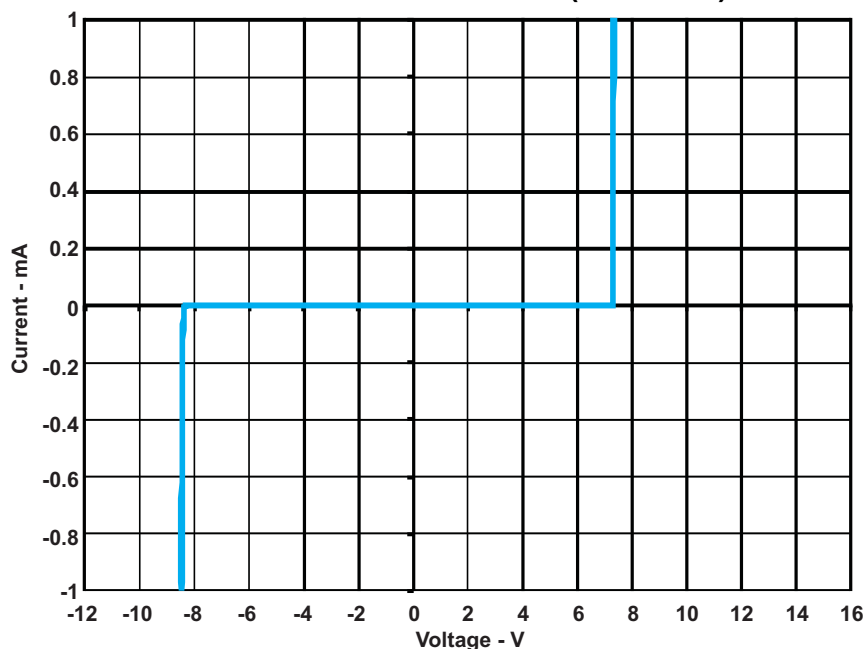


Figure 5. IV Curve

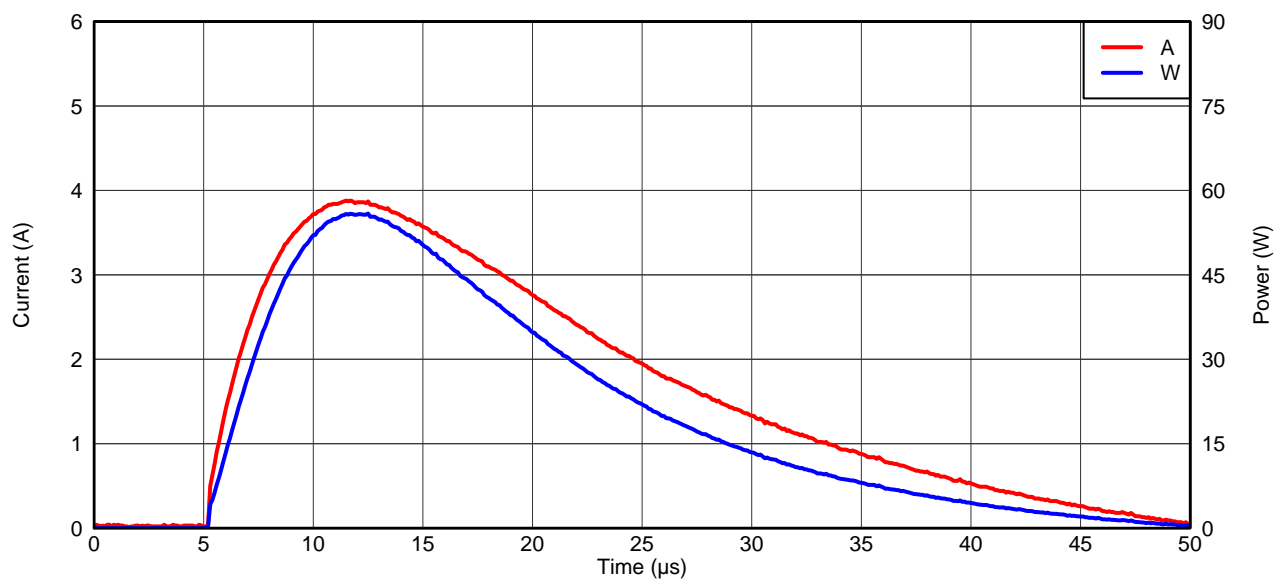


Figure 6. Surge Graph, Pin 1 to Pin 2

G001

TYPICAL CHARACTERISTICS (continued)

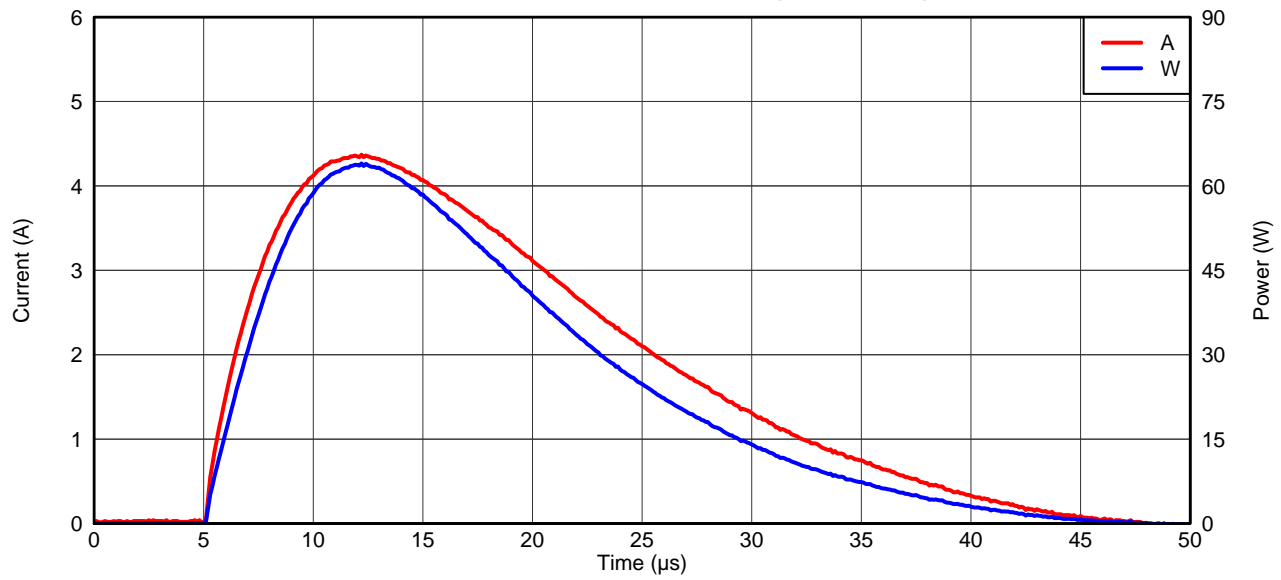


Figure 7. Surge Graph, Pin 2 to Pin 1

G001

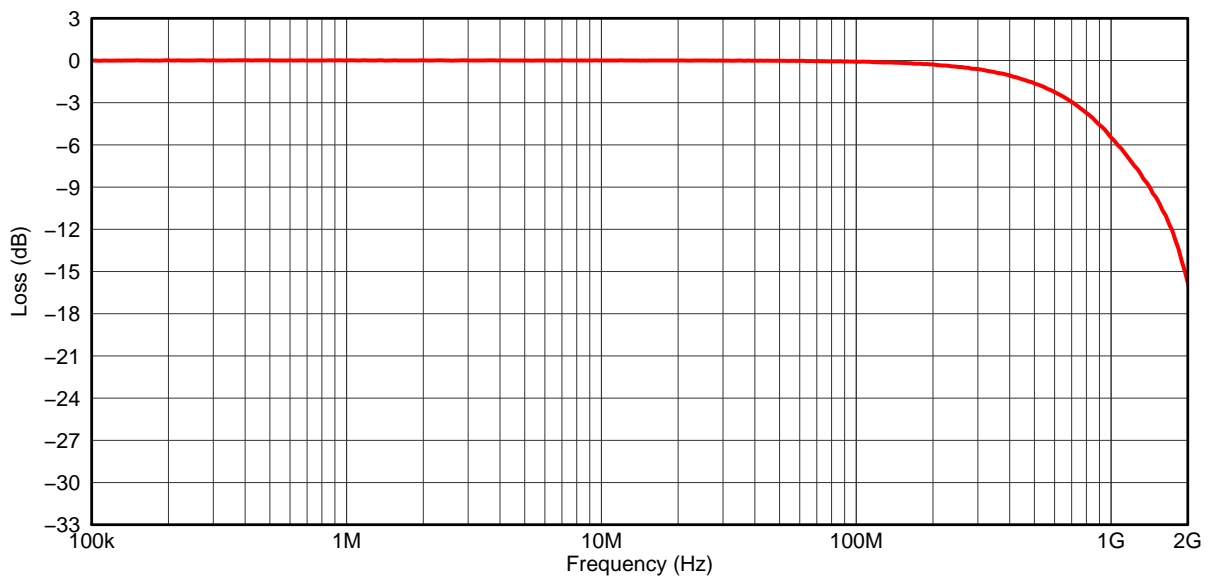


Figure 8. Insertion Loss, Pin 1 to Pin 2

G001

TYPICAL CHARACTERISTICS (continued)

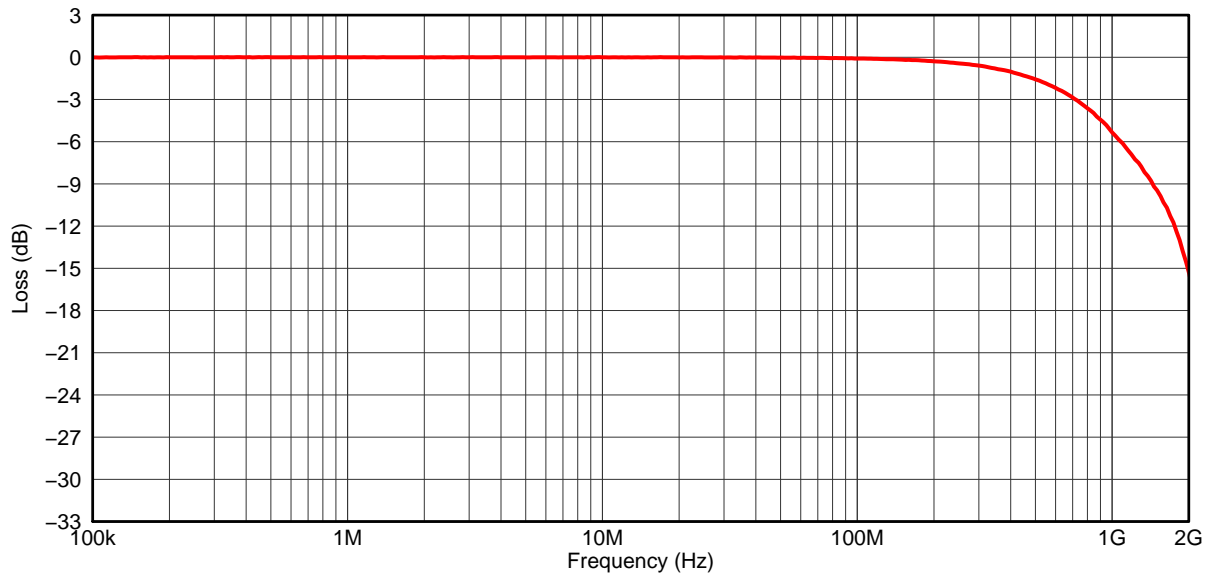


Figure 9. Insertion Loss, Pin 2 to Pin 1

G002

REVISION HISTORY

Changes from Original (February 2012) to Revision A	Page
• Changed 0402 Package to 0201 Package in title.	1
• Added R _{DYN} to FEATURES.	1
• Changed supporting data rates from 150Mbps to 800Mbps in the DESCRIPTION section..	1
• Added I _{LEAK} parameter to the ELECTRICAL CHARACTERISTICS table.	2

Changes from Revision A (April 2012) to Revision B	Page
• Updated R _{DYN} value in FEATURES.	1
• Updated IEC 61000-4-5 (Surge) value in FEATURES.	1
• Updated ABSOLUTE MAXIMUM RATINGS.	2
• Updated TYPICAL CHARACTERISTICS section.	3

Changes from Revision B (August 2012) to Revision C	Page
• Updated TOP-SIDE MARKING in the ORDERING INFORMATION table.	1

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
TPD1E6B06DPLR	ACTIVE	X2SON	DPL	2	15000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	H	Samples
TPD1E6B06DPLT	ACTIVE	X2SON	DPL	2	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	H	Samples

(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.

OBSOLETE: 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.

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

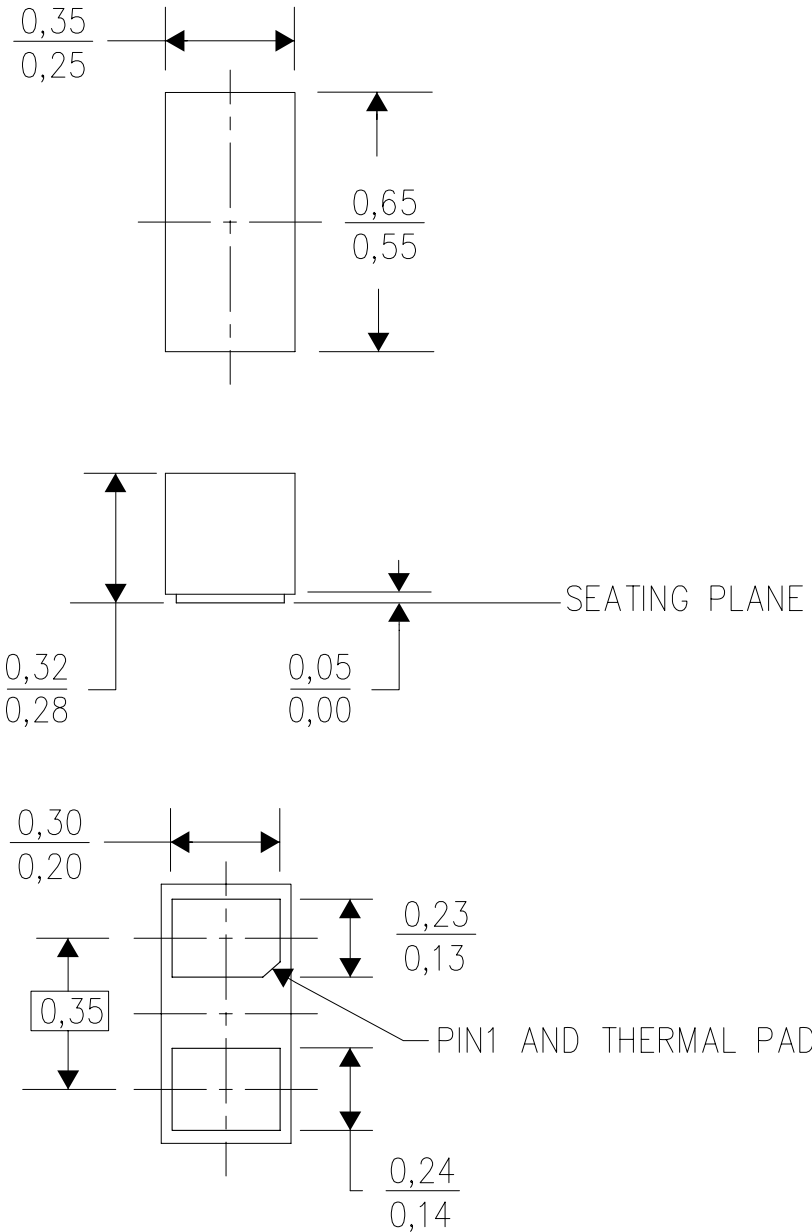
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MECHANICAL DATA

DPL (R-PX2SON-N2)

PLASTIC SMALL OUTLINE NO-LEAD

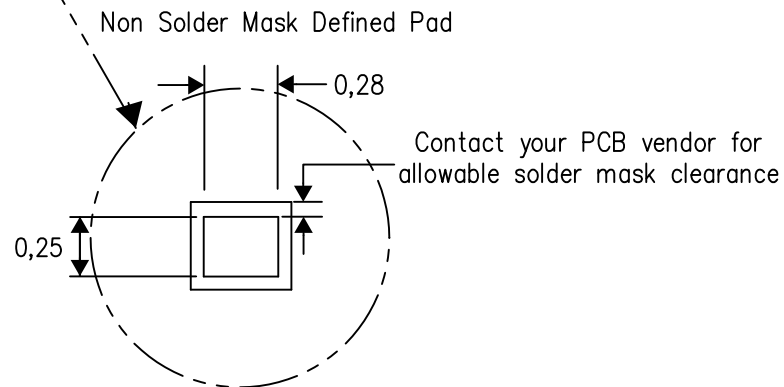
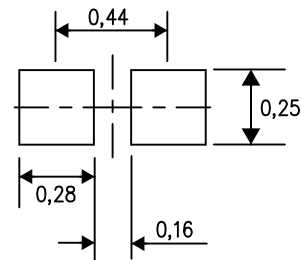
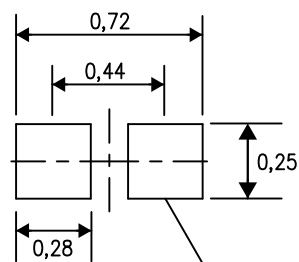


4212149/B 10/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Small Outline No-Lead (SON) package configuration.
 - D. The package thermal pad must be soldered to the board for thermal and mechanical performance.

Example Board Layout

Example Stencil Design
(Note E)



4217903/A 08/12

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
 - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
 - F. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

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➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype [ameyasales1](#) [ameyasales2](#)

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com