

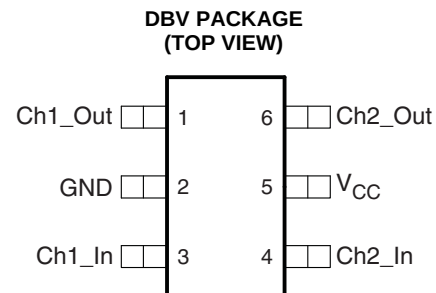
2-CHANNEL ULTRA-LOW CLAMP VOLTAGE ESD SOLUTION WITH SERIES-RESISTOR ISOLATION

FEATURES

- Ultra-Low Clamp Voltage Ensures the Protection of Ultra-Low Voltage Core Chipset During ESD Events
- Exceeds ESD Protection to IEC61000-4-2 (Level 4)
- Matching of Series Resistor ($R \approx 1 \Omega$) of $\pm 8 \text{ m}\Omega$ (Typical)
- Differential Channel Input Capacitance Matching of 0.02 pF (Typical)
- High-Speed Data Rate and EMI Filter Action at High Frequencies ($\sim 3 \text{ dB}$ Bandwidth, $\approx 3 \text{ GHz}$)
- Available in 6-Pin Small-Outline Transistor [SOT (DBV)] Package
- Flow-Through Single-In-Line Pin Mapping for the High-Speed Lines Ensures no Additional Board Layout Burden While Placing the ESD Protection Chip Near the Connector

APPLICATIONS

- Hi-Speed USB
- IEEE 1394 Interface
- Low-Voltage Differential Signaling (LVDS)
- Mobile Display Digital Interface (MDDI)/Mobile Industry Processor Interface (MIPI)
- HS Signal



DESCRIPTION/ORDERING INFORMATION

The TPD2S017 provides a robust system-level ESD solution for the high-speed lines interfacing low-voltage, ESD-sensitive core chipset. This device offers two stage ESD clamps in each line with $\approx 1\text{-}\Omega$ series resistor isolation. This architecture allows the device to generate very low clamp voltage during system level ESD strikes. Due to the series resistor component, the TPD2S017 provides a controlled filter roll-off for even greater spurious EMI suppression and signal integrity. This device offers a flow-through pin mapping for ease of board layout. The monolithic silicon technology allows matching component values, including clamp capacitance, series resistor matching, etc., between the differential signal pairs. Tight matching of the line capacitance and series resistors ensure that the differential signal distortion due to added ESD clamp remains minimal, and also allow the part to operate at high-speed differential data rate (in excess of 1.5 Gbps).

The TPD2S017 confirms the IEC61000-4-2 (Level 4) ESD protection and $\pm 15 \text{ kV}$ HBM ESD protection. This device is offered in space saving DBV packages.

The TPD2S017 is characterized for operation over ambient air temperature of -40°C to 85°C .

ORDERING INFORMATION

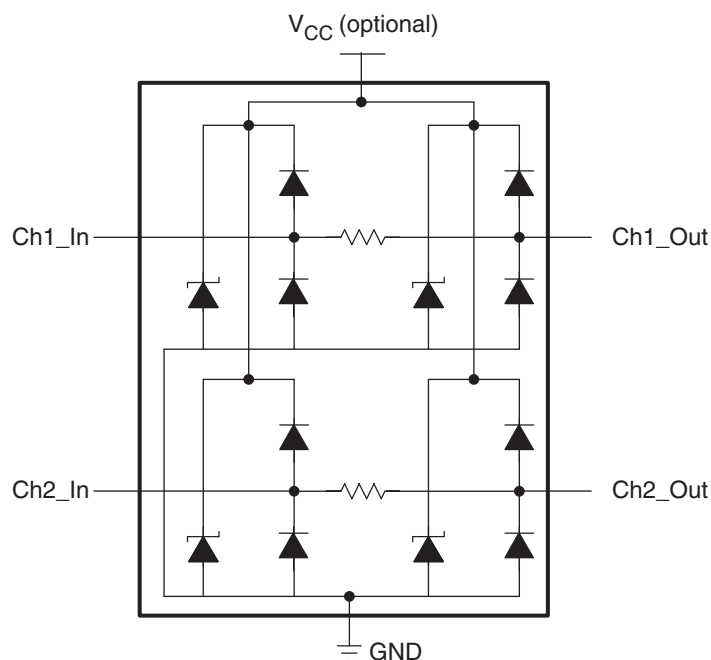
T_A	PACKAGE ⁽¹⁾⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SOT (SOT-23) – DBV	Reel of 3000	TPD2S017DBVR	NFTF

(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 website 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.

CIRCUIT DIAGRAM**TERMINAL FUNCTIONS**

TERMINAL		I/O	DESCRIPTION
NAME	NO.		
Ch1_In Ch2_In	3 4	I	High-speed ESD clamp input
Ch1_Out Ch2_Out	1 6	O	High-speed ESD clamp output
GND	2	–	Ground
V _{CC}	5	–	Optional power

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

		MIN	MAX	UNIT
V _{IO}	IO voltage range	0	5	V
T _{stg}	Storage temperature range	–85	125	°C
T _A	Operating temperature	–40	85	°C

- (1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

ESD RATINGS

PARAMETER		MIN	MAX	UNIT
IEC 61000-4-2 Contact Discharge	Out pin		±11	kV
	In pin		±11	
Human Body Model	In and out pins		±15	kV

DISSIPATION RATINGS

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ⁽¹⁾ ABOVE $T_A \leq 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
DBV	463.18 mW	-4.63 mW/C	254.75 mW

(1) Derating factor is defined as the inverse of the traditional junction-to-ambient thermal resistance ($R_{\theta JA}$).

ELECTRICAL CHARACTERISTICS

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
R	Series resistor		1		Ω
I_{IO}	Current from I/O pins	$V_{IO} = 3\text{ V}$	0.01	0.1	μA
ΔRS	Channel-to-channel resistance match	$V_{IO} = 3\text{ V}$	± 8	± 15	$\text{m}\Omega$
V_D	Diode forward voltage for lower clamp	$I_D = 8\text{ mA}$	-0.6	-0.8	V
R_{DYN}	Dynamic resistance (for I/O clamp)	$I = 9\text{ A}$	0.8		Ω
C_{IO}	IO capacitance	$V_{IO} = 2.5\text{ V}$	1		pF
V_{BR}	Break-down voltage	$I_O = 1\text{ mA}$	11	12	V

TYPICAL CHARACTERISTICS

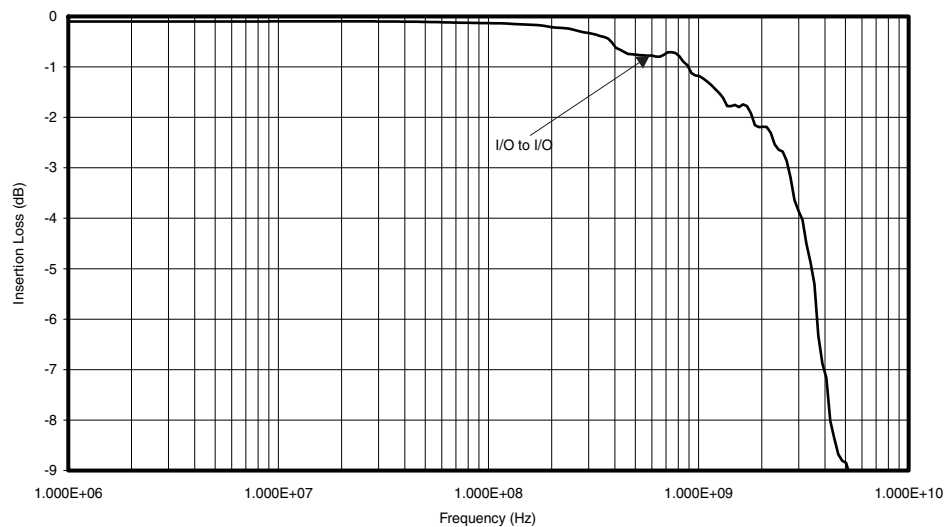


Figure 1. Insertion Loss Data (S21)

TYPICAL CHARACTERISTICS (continued)

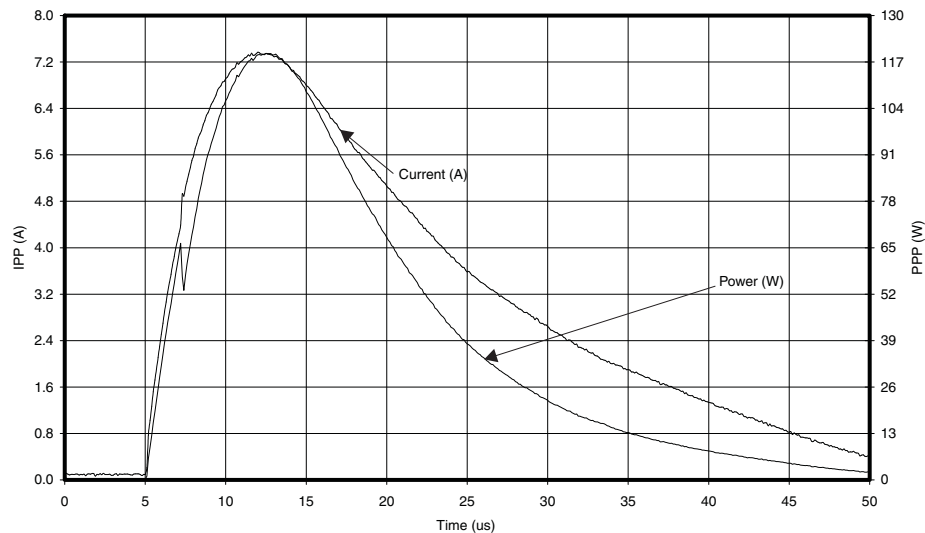


Figure 2. Peak Pulse Waveforms
Ch1_Out, PUT wrt GND, $V_{CC} = 5.0$ V

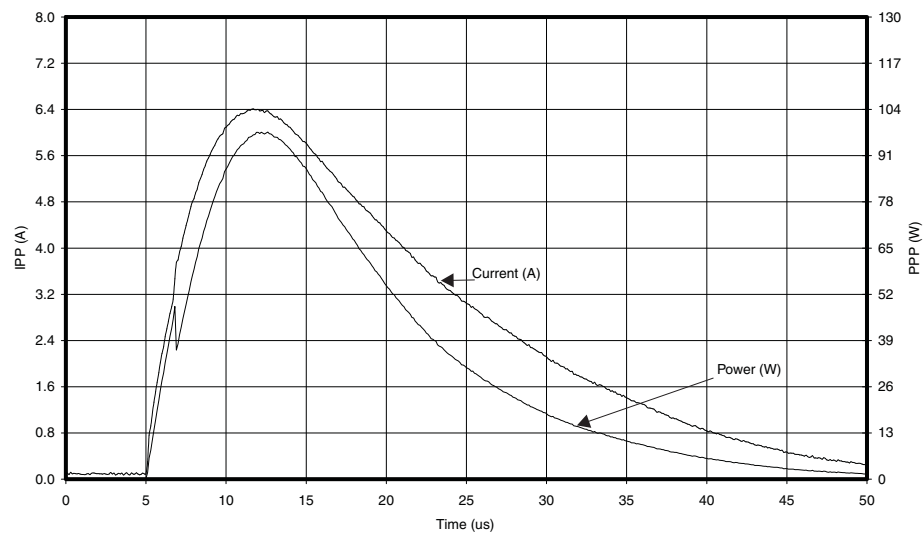
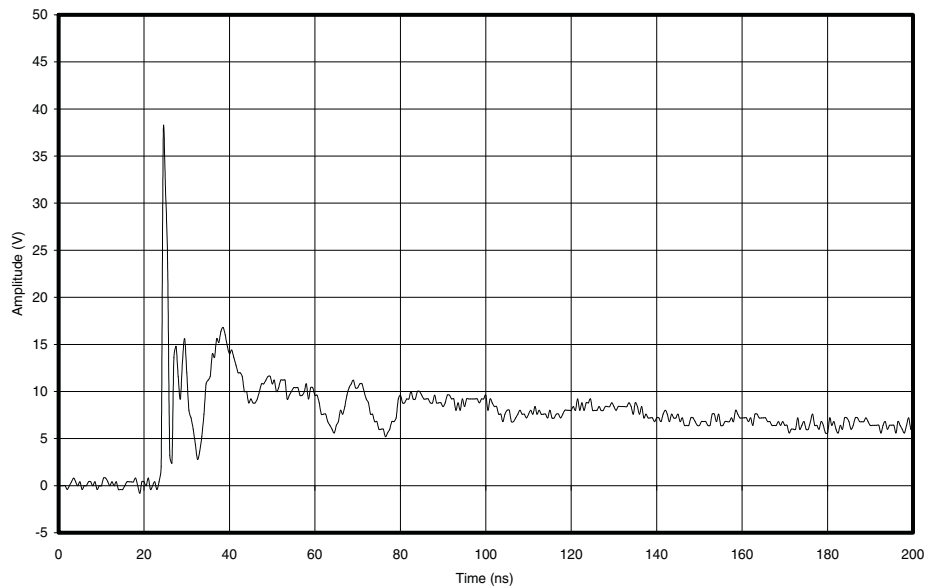
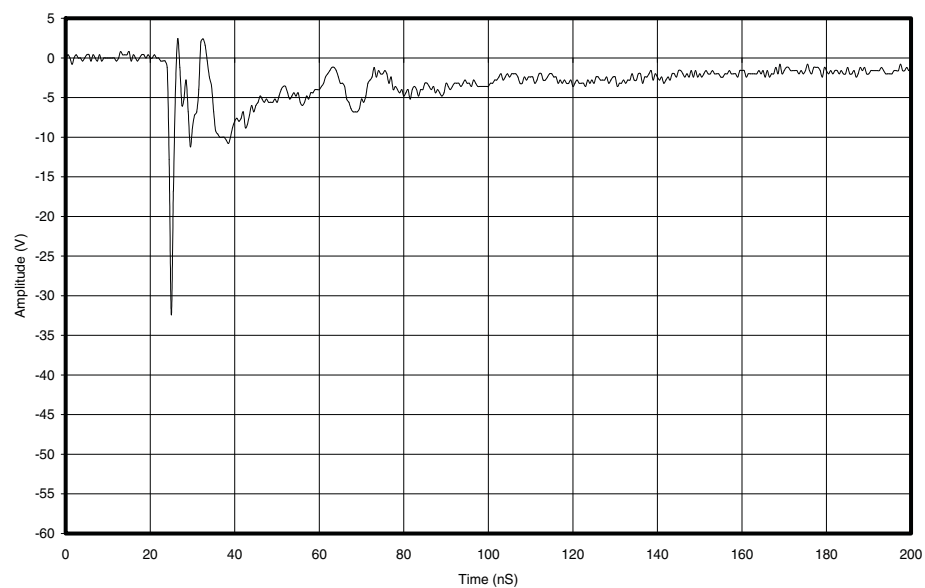


Figure 3. Peak Pulse Waveforms
Ch2_In, PUT wrt GND, $V_{CC} = 5.0$ V

TYPICAL CHARACTERISTICS (continued)



**Figure 4. IEC Clamping Waveforms
8 kV Contact, 1 GHz Bandwidth**



**Figure 5. IEC Clamping Waveforms
-8 kV Contact, 1 GHz Bandwidth**

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TPD2S017DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

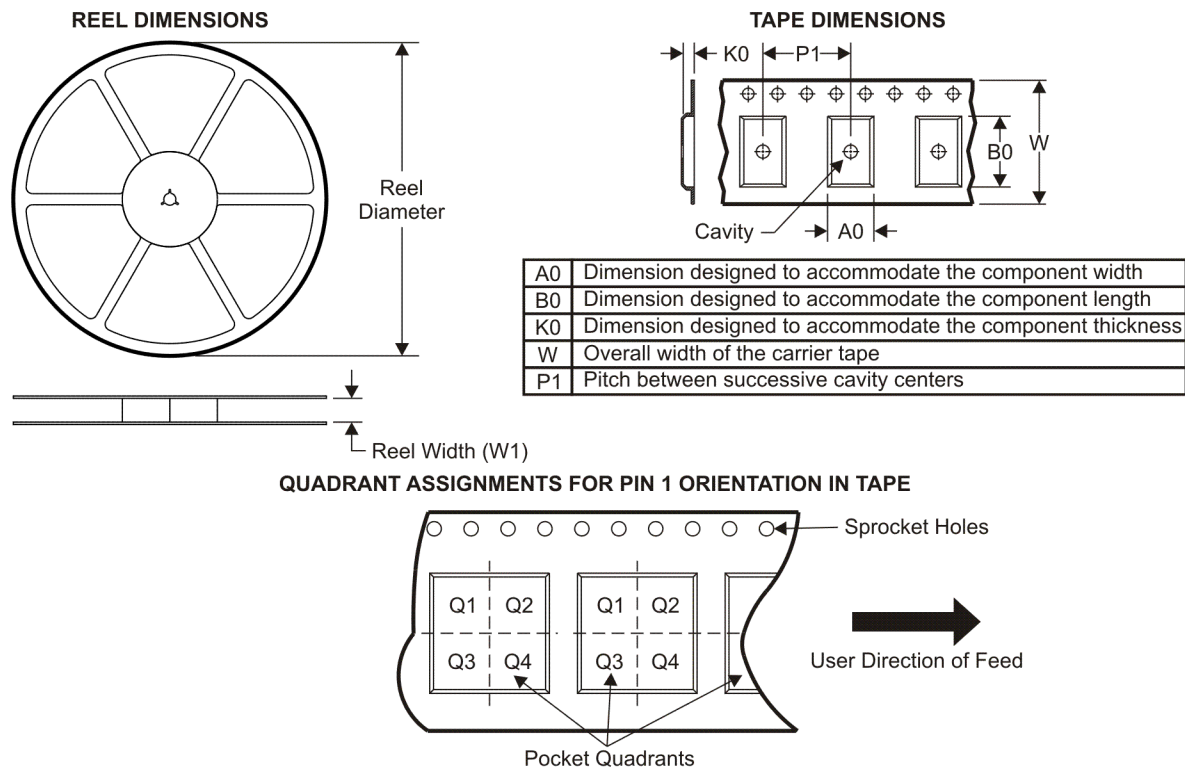
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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.

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.

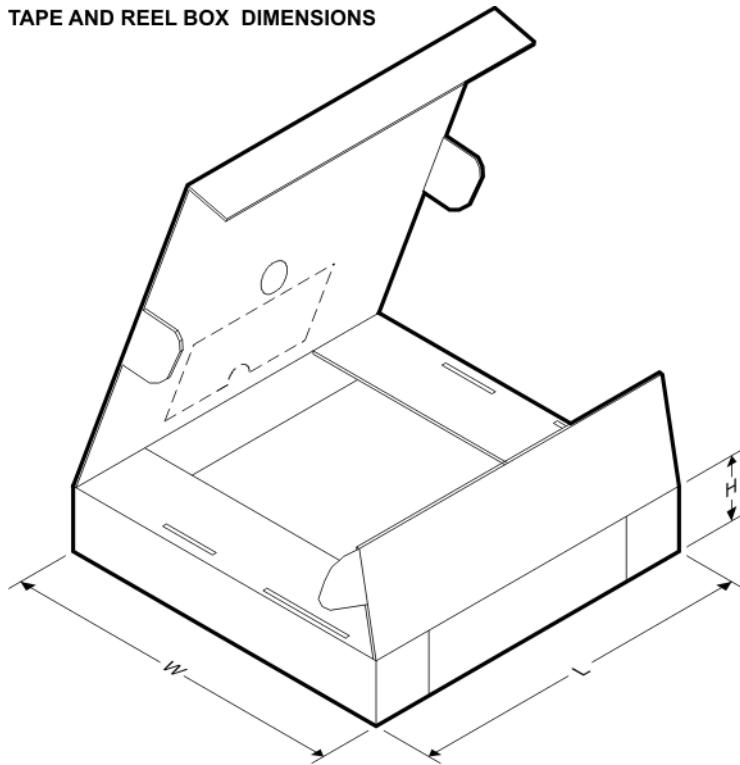
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION


*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
TPD2S017DBVR	SOT-23	DBV	6	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS

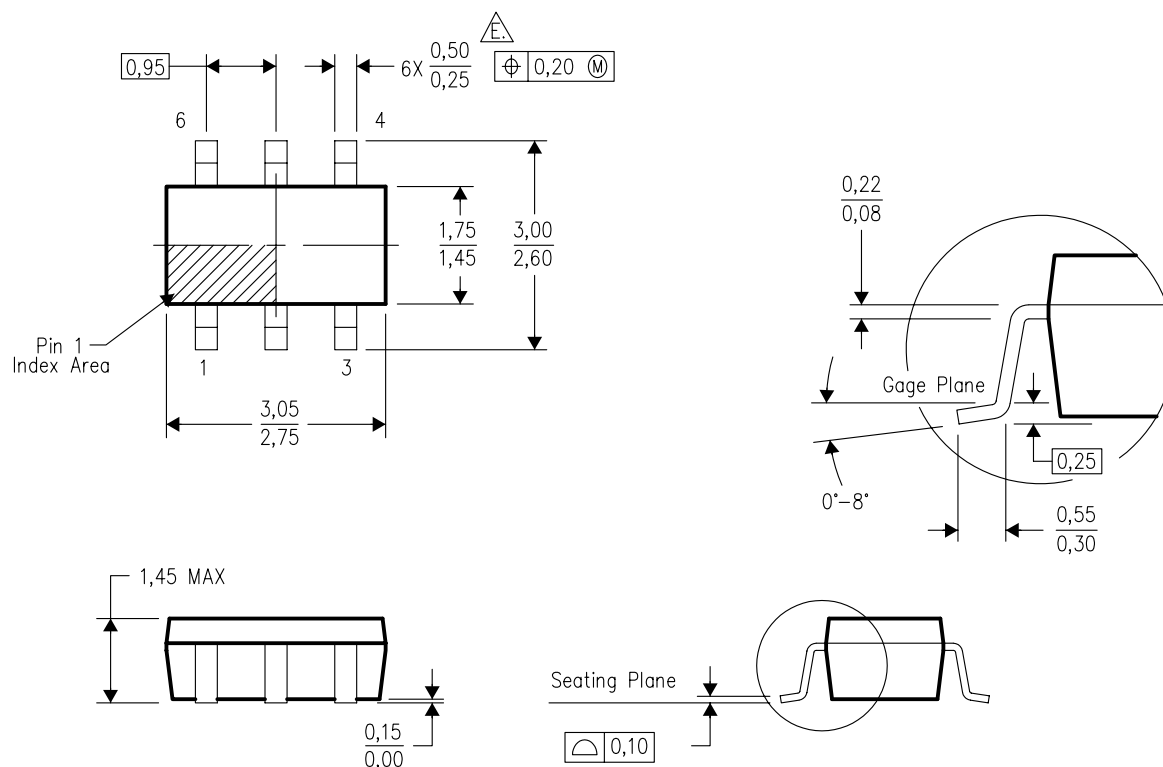


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPD2S017DBVR	SOT-23	DBV	6	3000	180.0	180.0	18.0

DBV (R-PDSO-G6)

PLASTIC SMALL-OUTLINE PACKAGE

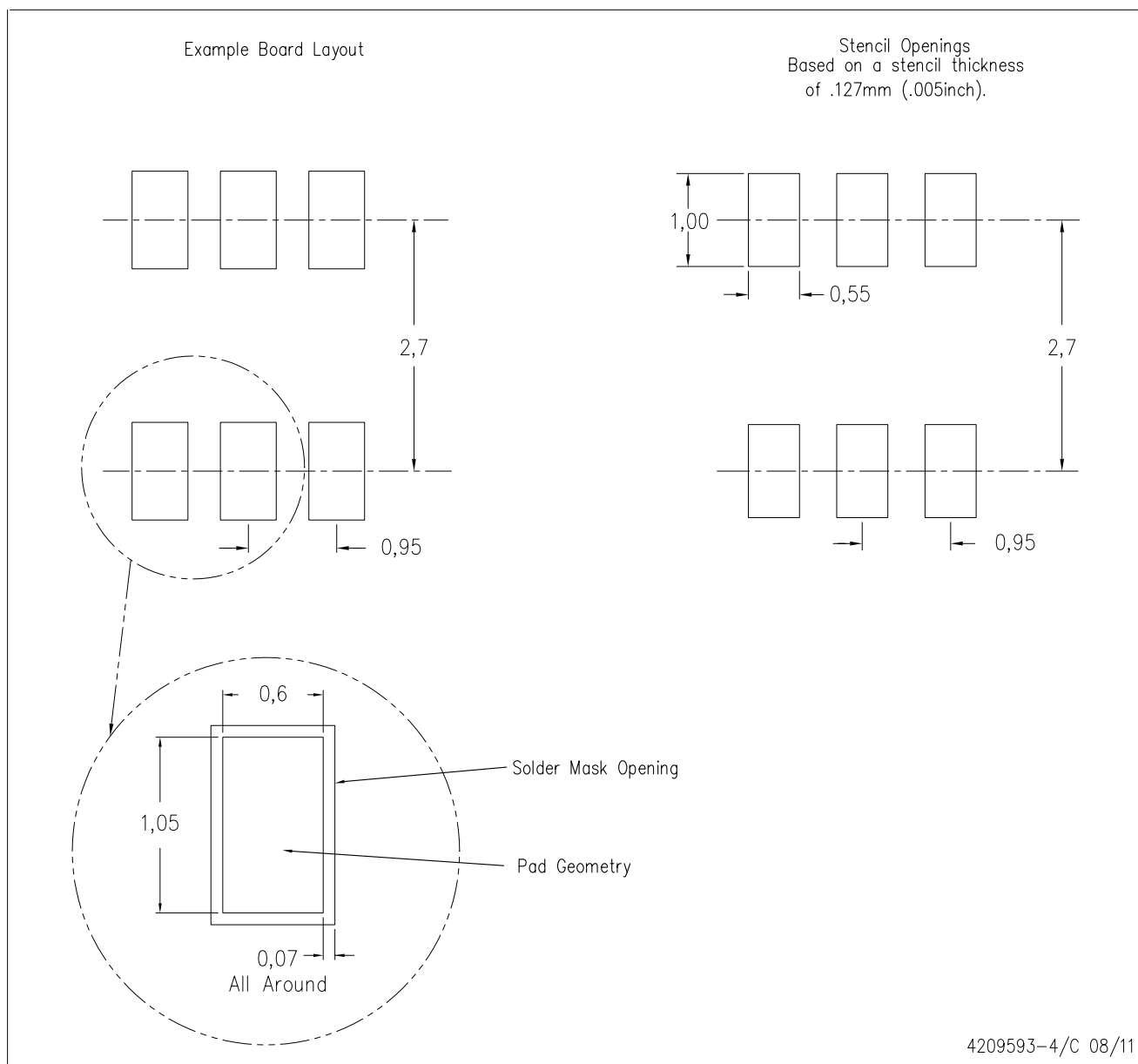


4073253-5/K 03/2006

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
-  Falls within JEDEC MO-178 Variation AB, except minimum lead width.

DBV (R-PDSO-G6)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

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
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

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
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video
Wireless	www.ti.com/wireless-apps

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.