

Dual Voltage Detector with Adjustable Hysteresis

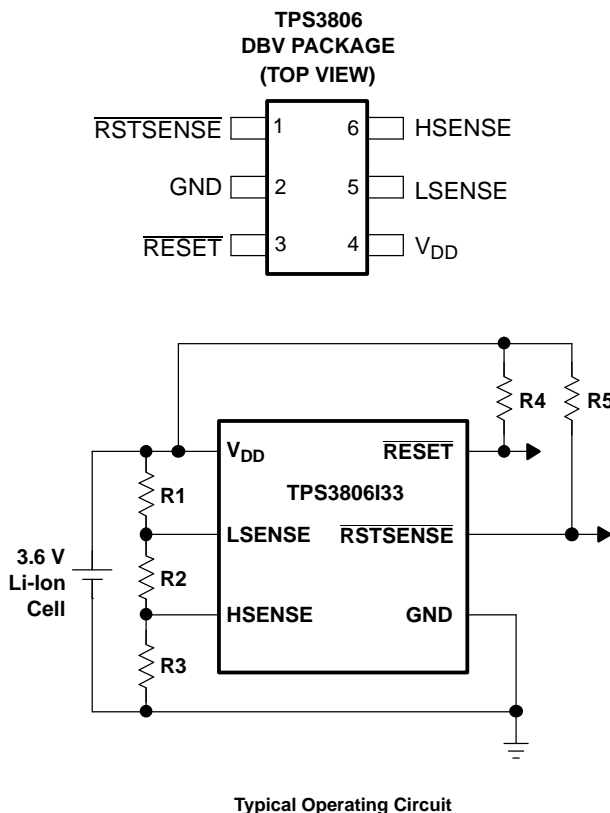
FEATURES

- Dual Voltage Detector With Adjustable Hysteresis 3.3-V/Adjustable and 2-V/Adjustable
- Assured Reset at $V_{DD} = 0.8\text{ V}$
- Supply Current: $3\text{ }\mu\text{A}$ Typical at $V_{DD} = 3.3\text{ V}$
- Independent Open-Drain Reset Outputs
- Temperature Range: -40°C to $+85^{\circ}\text{C}$
- 6-Pin SOT-23 Package

DESCRIPTION

The TPS3806 integrates two independent voltage detectors for battery voltage monitoring. During power-on, $\overline{\text{RESET}}$ and $\overline{\text{RSTSENSE}}$ are asserted when supply voltage V_{DD} or the voltage at LSENSE input become higher than 0.8 V . Thereafter, the supervisory circuit monitors V_{DD} and LSENSE, keeping $\overline{\text{RESET}}$ and $\overline{\text{RSTSENSE}}$ active as long as V_{DD} and LSENSE remain below the threshold voltage, V_{IT} . As soon as V_{DD} or LSENSE rise above the threshold voltage V_{IT} , $\overline{\text{RESET}}$ or $\overline{\text{RSTSENSE}}$ is deasserted, respectively. The TPS3806 device has a fixed-sense threshold voltage V_{IT} set by an internal voltage divider at V_{DD} and an adjustable second-LSENSE input. In addition, an upper voltage threshold can be set at HSENSE to allow a wide adjustable hysteresis window.

The devices are available in a 6-pin SOT-23 package. The TPS3806 device is characterized for operation over a temperature range of -40°C to $+85^{\circ}\text{C}$.



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.



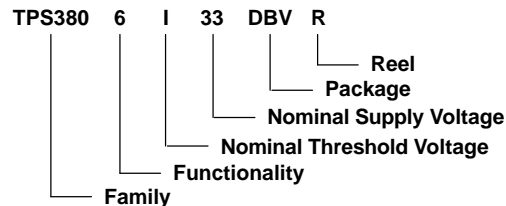
This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ORDERING INFORMATION⁽¹⁾

T _A	DEVICE NAME		THRESHOLD VOLTAGE		MARKING
			V _{DD}	SENSE	
-40°C to +85°C	TPS3806J20DBVR ⁽²⁾	TPS3806J20DBVT ⁽³⁾	1.8 V	1.207 V	PGQI
	TPS3806I33DBVR ⁽²⁾	TPS3806I33DBVT ⁽³⁾	3 V	1.207 V	PGPI

- (1) For the most current package and ordering information, see the Package Option Addendum located at the end of this data sheet or refer to our web site at www.ti.com.
 (2) The DBVR passive indicates tape and reel containing 3000 parts.
 (3) The DBVT passive indicates tape and reel containing 250 parts.



ABSOLUTE MAXIMUM RATINGS

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

	TPS3806J20, TPS3806I33	UNIT
Supply voltage, V _{DD} ⁽²⁾	7	V
All other pins ⁽²⁾	-0.3 to 7	V
Maximum low-output current, I _{OL}	5	mA
Maximum high-output current, I _{OH}	-5	mA
Input clamp current, I _{IK} (V _I < 0 or V _I > V _{DD})	±10	mA
Output clamp current, I _{OK} (V _O < 0 or V _O > V _{DD})	±10	mA
Continuous total power dissipation	See Dissipation Rating Table	
Operating free-air temperature range, T _A	-40 to +85	°C
Storage temperature range, T _{stg}	-65 to +150	°C
Soldering temperature	+260	°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.
 (2) All voltage values are with respect to GND. For reliable operation, the device must not be continuously operated at 7 V for more than t = 1000 h.

DISSIPATION RATING TABLE

PACKAGE	T _A < 25°C	DERATING FACTOR ABOVE T _A = 25°C	T _A = 70°C POWER RATING	T _A = 85°C POWER RATING
DBV	437 mW	3.5 mW/°C	280 mW	227 mW

RECOMMENDED OPERATING CONDITIONS

	MIN	MAX	UNIT
Supply voltage, V_{DD}	1.3	6	V
Input voltage, V_I	0	$V_{DD} + 0.3$	V
Operating free-air temperature range, T_A	-40	+85	°C

ELECTRICAL CHARACTERISTICS

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

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
V _{OL}	Low-level output voltage		V _{DD} = 1.5 V, I _{OL} = 1 mA			0.3	V
			V _{DD} = 3.3 V, I _{OL} = 2 mA				
			V _{DD} = 6 V, I _{OL} = 3 mA				
Power-up reset voltage ⁽¹⁾			V _{DD} ≥ 0.8 V, I _{OL} = 50 μA			0.2	V
V _{IT}	Negative-going input threshold voltage ⁽²⁾	LSENSE	T _A = +25°C	1.198	1.207	1.216	V
		TPS3806J20		1.787	1.8	1.813	
		TPS3806I33		2.978	3.0	3.022	
		LSENSE	T _A = 0°C to +70°C	1.188	1.207	1.226	V
		TPS3806J20		1.772	1.8	1.828	
		TPS3806I33		2.952	3.0	3.048	
		LSENSE	T _A = -40°C to +85°C	1.183	1.207	1.231	V
		TPS3806J20		1.764	1.8	1.836	
		TPS3806I33		2.94	3.0	3.06	
V _{hys}	Hysteresis		1.2 V < V _{IT} < 2.5 V		60	mV	
			2.5 V < V _{IT} < 3.5 V		90		
I _I	Input current	LSENSE, HSENSE	-25		25	nA	
I _{OH}	High-level output current		V _{DD} = V _{IT} + 0.2 V, V _{OH} = V _{DD}			300	nA
I _{DD}	Supply current		V _{DD} = 3.3 V, Output unconnected		3	5	μA
			V _{DD} = 6 V, Output unconnected		4	6	
C _i	Input capacitance		V _I = 0 V to V _{DD}		1		pF

(1) The lowest supply voltage at which RESET becomes active. $t_{r,VDD} \geq 15 \mu\text{s/V}$

(2) To ensure best stability of the threshold voltage, place a bypass capacitor (ceramic, 0.1 μF) near the supply terminals.

SWITCHING CHARACTERISTICS

at $R_L = 1 \text{ M}\Omega$, $C_L = 50 \text{ pF}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation (delay) time, high-to-low-level output	V_{DD} to RESET delay	$V_{IH} = 1.05 \times V_{IT}$, $V_{IL} = 0.95 \times V_{IT}$		5	100	μs
		LSENSE to $\overline{\text{RSTSENSE}}$ delay					
t_{PLH}	Propagation (delay) time, low-to-high-level output	V_{DD} to RESET delay			5	100	μs
		HSENSE to $\overline{\text{RSTSENSE}}$ delay					

TIMING REQUIREMENTS

at $R_L = 1 \text{ M}\Omega$, $C_L = 50 \text{ pF}$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w	Pulse width	At V_{DD}	$V_{IH} = 1.05 \times V_{IT}$, $V_{IL} = 0.95 \times V_{IT}$	5.5			μs
		At SENSE					

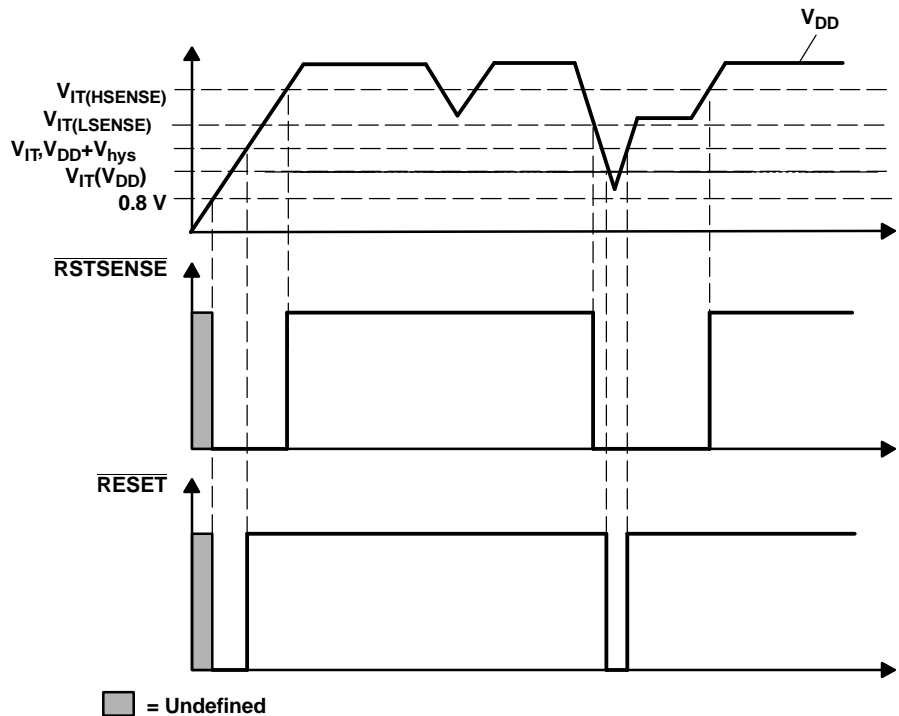


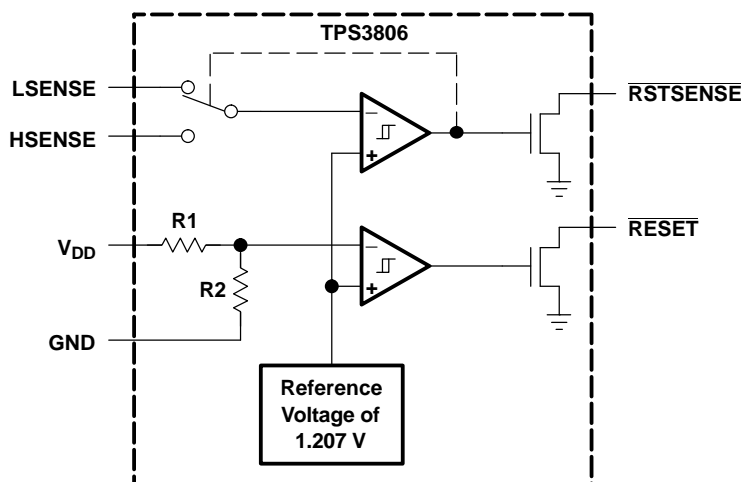
Table 1. TERMINAL FUNCTIONS

TERMINAL		I/O	DESCRIPTION
NAME	NO.		
GND	2	I	Ground
HSENSE	6	I	Adjustable hysteresis input
LSENSE	5	I	Adjustable sense input
\overline{RESET}	3	O	Active-low open drain reset output (from V_{DD})
$\overline{RSTSENSE}$	1	O	Active-low open-drain reset output (from LSENSE)
V_{DD}	4	I	Input supply voltage and fixed sense input

FUNCTION/TRUTH TABLE

TPS3806			
$V_{DD} > V_{IT}$	\overline{RESET}	$LSENSE > V_{IT}$	$\overline{RSTSENSE}$
0	L	0	L
1	H	1	H

FUNCTIONAL BLOCK DIAGRAM



Detailed Description

Operation

The TPS3806 is used for monitoring battery voltage and asserting $\overline{\text{RESET}}$ when a battery gets discharged below a certain threshold voltage. The battery voltage is monitored by a comparator via an external resistor divider. When the voltage at the LSENSE input drops below the internal reference voltage the $\overline{\text{RSTSENSE}}$ output pulls low. The output remains low until the battery is replaced, or recharged above a second higher trip-point, set at HSENSE. A second voltage can be monitored at V_{DD} . The independent $\overline{\text{RESET}}$ output pulls low when the voltage at V_{DD} drops below the fixed threshold voltage. Because the TPS3806 outputs are open-drain MOSFETs, most applications may require a pull-up resistor.

Programming the Threshold Voltage Levels

The low-voltage threshold at LSENSE is calculated according to Equation 1:

$$V_{(\text{LSENSE})} = V_{\text{ref}} \left(\frac{R1 + R2 + R3}{R2 + R3} \right) \quad (1)$$

where $V_{\text{ref}} = 1.207 \text{ V}$

The high-voltage threshold at HSENSE is calculated as shown in Equation 2:

$$V_{(\text{HSENSE})} = V_{\text{ref}} \left(\frac{R1 + R2 + R3}{R3} \right) \quad (2)$$

where $V_{\text{ref}} = 1.207 \text{ V}$

To minimize battery current draw it is recommended to use $1\text{-M}\Omega$ as the total resistor value $R_{(\text{tot})}$, with $R_{(\text{tot})} = R1 + R2 + R3$.

TYPICAL CHARACTERISTICS

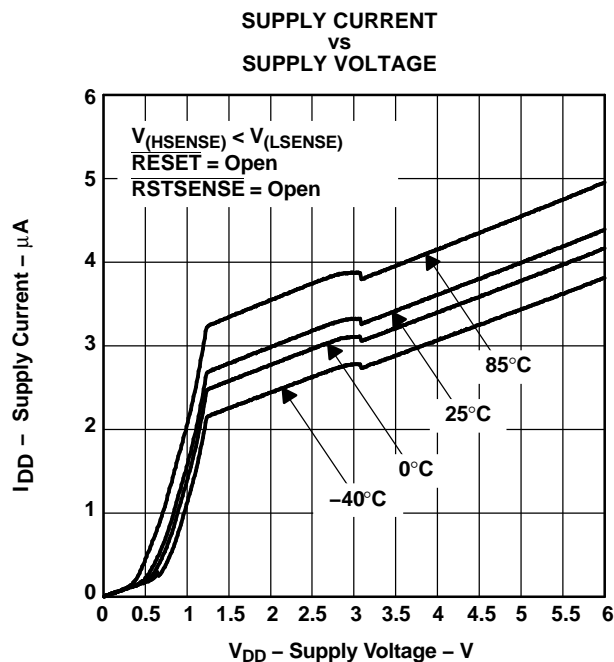


Figure 1.

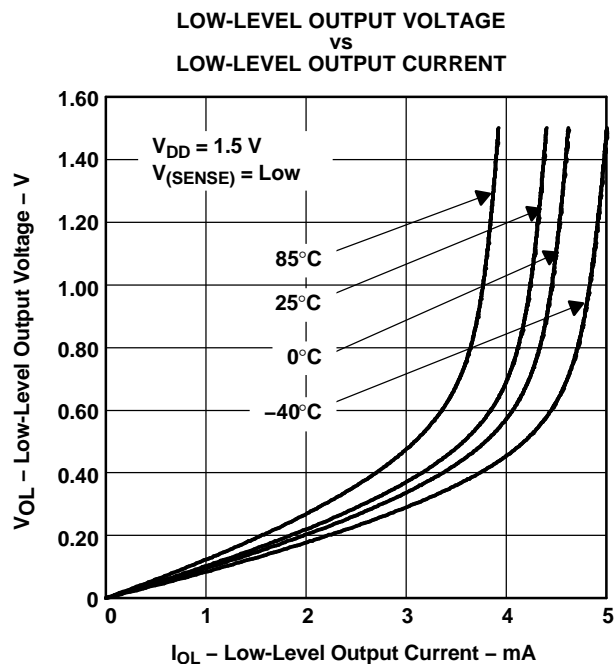


Figure 2.

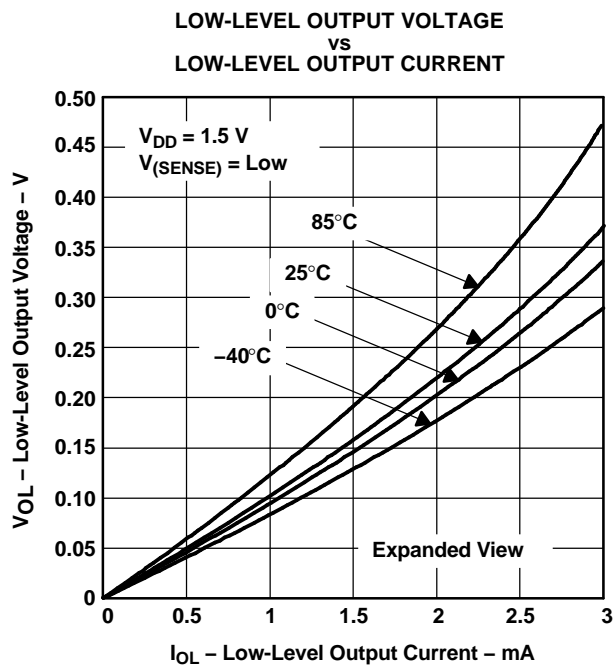


Figure 3.

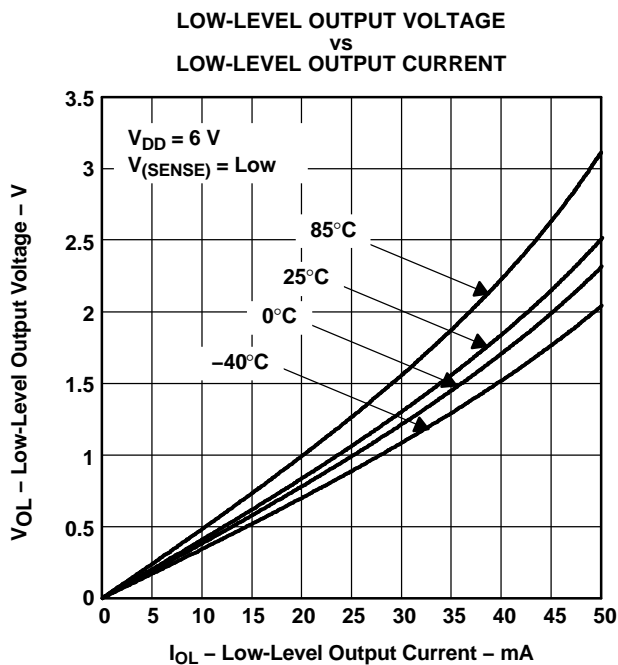


Figure 4.

TYPICAL CHARACTERISTICS (continued)

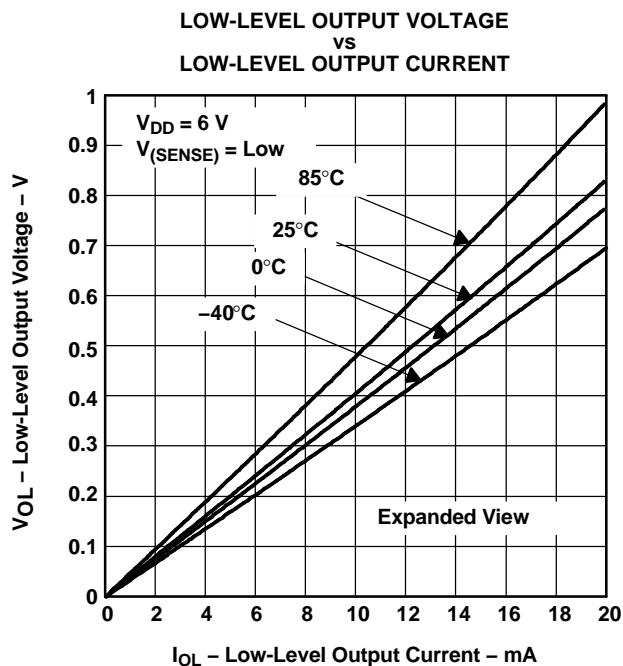


Figure 5.

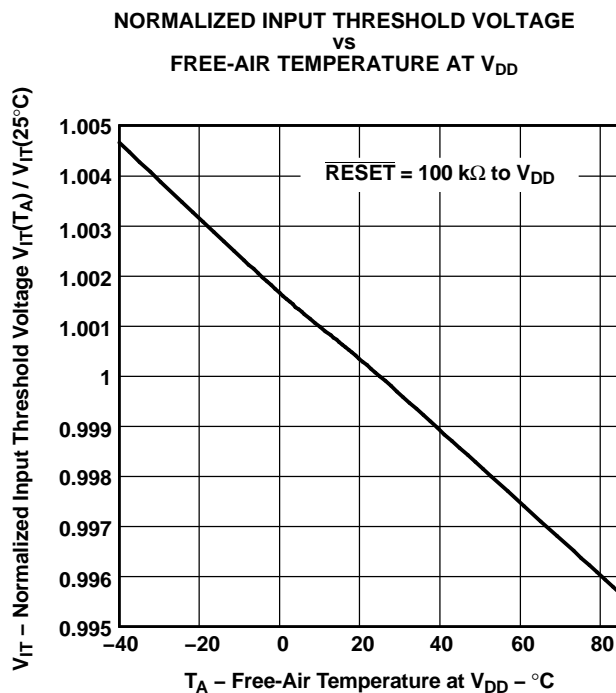


Figure 6.

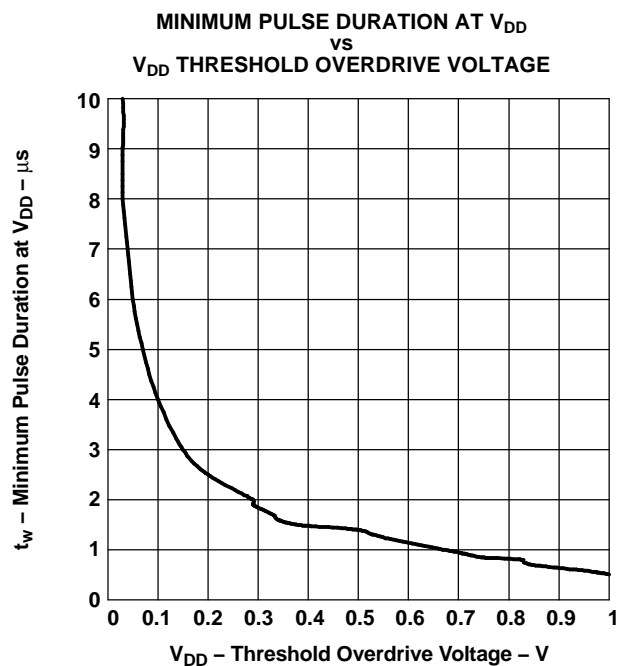


Figure 7.

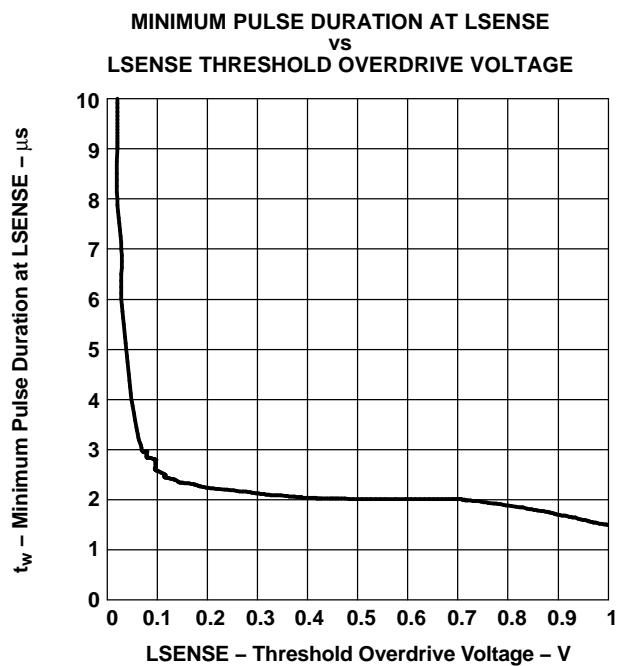


Figure 8.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TPS3806I33DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806I33DBVRG4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806I33DBVT	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806I33DBVTG4	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806J20DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806J20DBVRG4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806J20DBVT	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3806J20DBVTG4	ACTIVE	SOT-23	DBV	6	250	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.

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
TPS3806I33DBVR	SOT-23	DBV	6	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3806I33DBVR	SOT-23	DBV	6	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3806I33DBVT	SOT-23	DBV	6	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3806I33DBVT	SOT-23	DBV	6	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3806J20DBVR	SOT-23	DBV	6	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TPS3806J20DBVT	SOT-23	DBV	6	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS

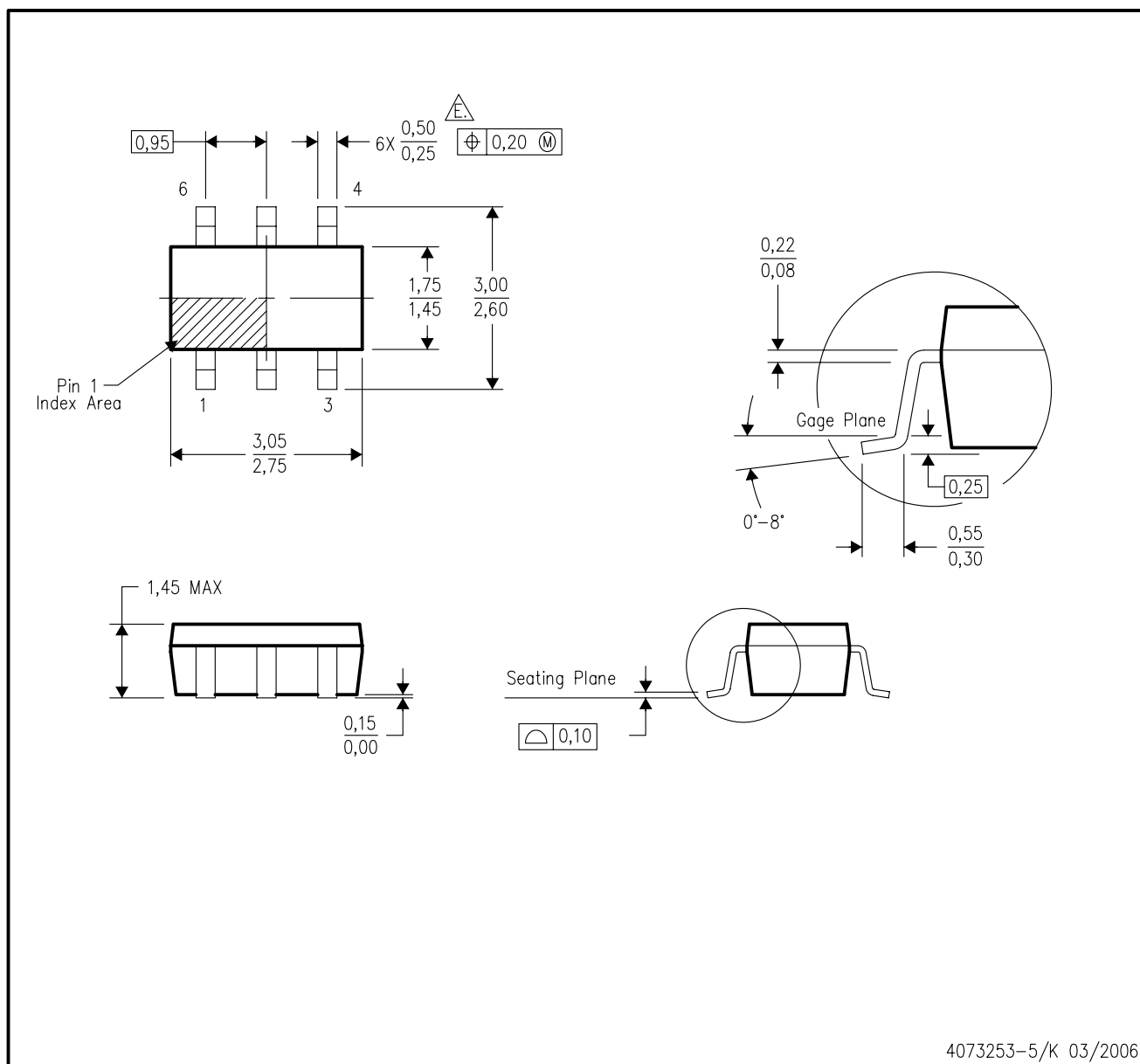


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3806I33DBVR	SOT-23	DBV	6	3000	203.0	203.0	35.0
TPS3806I33DBVR	SOT-23	DBV	6	3000	180.0	180.0	18.0
TPS3806I33DBVT	SOT-23	DBV	6	250	180.0	180.0	18.0
TPS3806I33DBVT	SOT-23	DBV	6	250	203.0	203.0	35.0
TPS3806J20DBVR	SOT-23	DBV	6	3000	180.0	180.0	18.0
TPS3806J20DBVT	SOT-23	DBV	6	250	180.0	180.0	18.0

DBV (R-PDSO-G6)

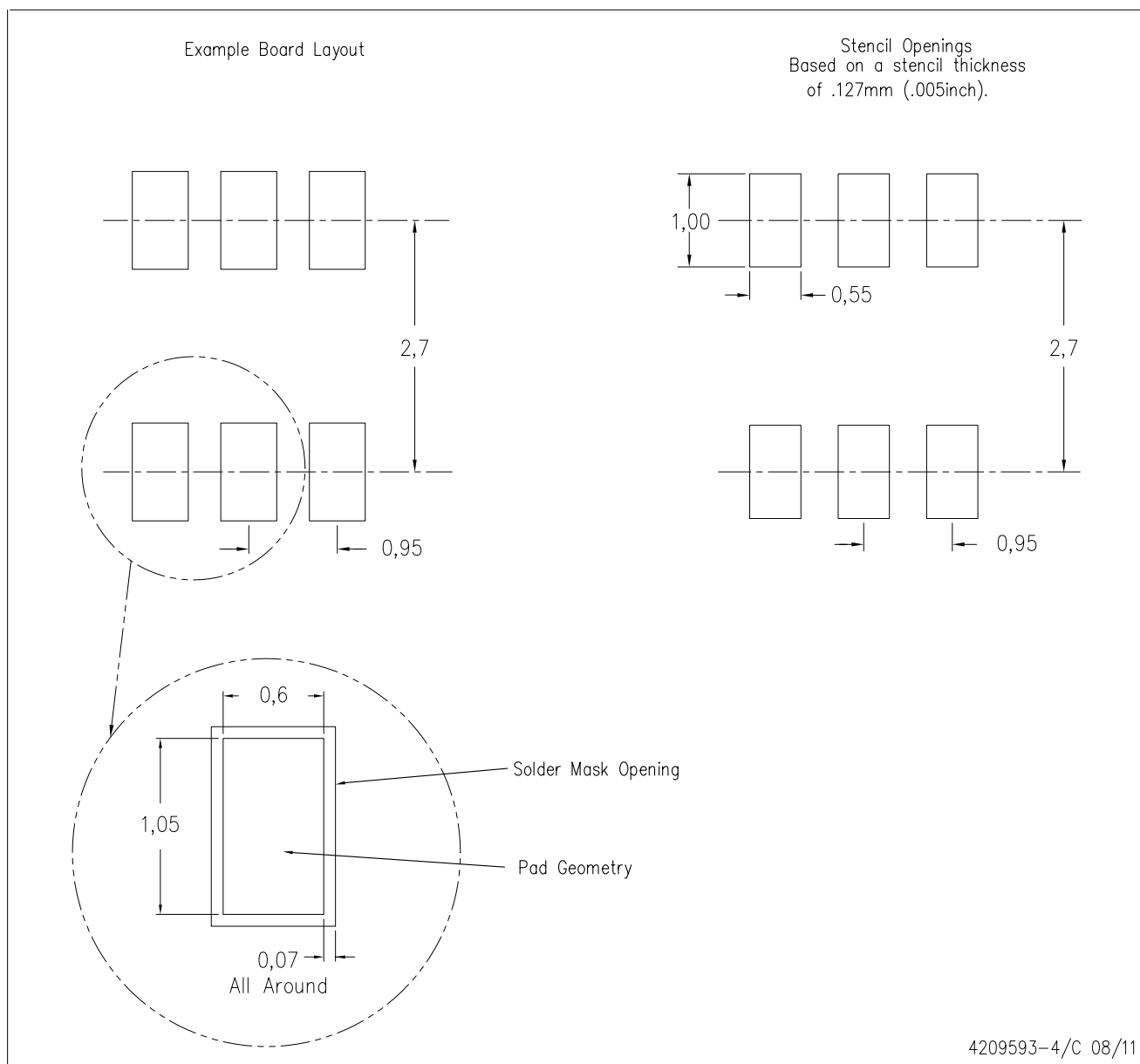
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
- \triangle 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
OMAP Mobile Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

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

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.