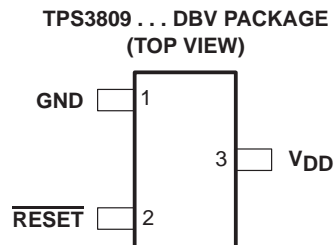


- 3-Pin SOT-23 Package
- Supply Current of 9  $\mu$ A (Typical)
- Precision Supply Voltage Monitor  
2.5 V, 3 V, 3.3 V, 5 V
- Power-On Reset Generator With Fixed  
Delay Time of 200 ms
- Pin-For-Pin Compatible With MAX 809
- Temperature Range . . .  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$



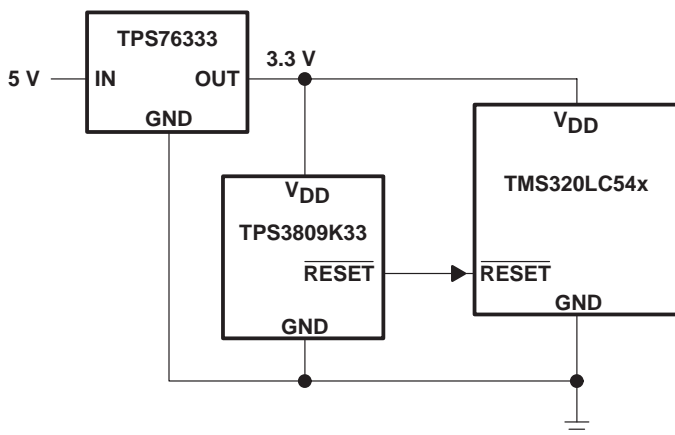
## description

The TPS3809 family of supervisory circuits provides circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

During power-on,  $\overline{\text{RESET}}$  is asserted when the supply voltage  $V_{\text{DD}}$  becomes higher than 1.1 V. Thereafter, the supervisory circuit monitors  $V_{\text{DD}}$  and keeps  $\overline{\text{RESET}}$  active as long as  $V_{\text{DD}}$  remains below the threshold voltage  $V_{\text{IT}}$ . An internal timer delays the return of the output to the inactive state (high) to ensure proper system reset. The delay time,  $t_{\text{d(typ)}} = 200$  ms, starts after  $V_{\text{DD}}$  has risen above the threshold voltage  $V_{\text{IT}}$ . When the supply voltage drops below the threshold voltage  $V_{\text{IT}}$ , the output becomes active (low) again. No external components are required. All the devices of this family have a fixed sense-threshold voltage  $V_{\text{IT}}$  set by an internal voltage divider.

The product spectrum is designed for supply voltages of 2.5 V, 3 V, 3.3 V, and 5 V. The circuits are available in a 3-pin SOT-23. The TPS3809 devices are characterized for operation over a temperature range of  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

## typical applications



- Applications Using DSPs, Microcontrollers, or Microprocessors
- Wireless Communication Systems
- Portable/Battery-Powered Equipment
- Programmable Controls
- Intelligent Instruments
- Industrial Equipment
- Notebook/Desktop Computers
- Automotive Systems



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1999, Texas Instruments Incorporated

# TPS3809J25, TPS3809L30, TPS3809K33, TPS3809I50 3-PIN SUPPLY VOLTAGE SUPERVISORS

SLVS228 – AUGUST 1999

### AVAILABLE OPTIONS

T <sub>A</sub>	DEVICE NAME		THRESHOLD VOLTAGE	MARKING
-40°C to 85°C	TPS3809J25DBVR†	TPS3809J25DBVT‡	2.25 V	PCZI
	TPS3809L30DBVR†	TPS3809L30DBVT‡	2.64 V	PDAI
	TPS3809K33DBVR†	TPS3809K33DBVT‡	2.93 V	PDBI
	TPS3809I50DBVR†	TPS3809I50DBVT‡	4.55 V	PDCI

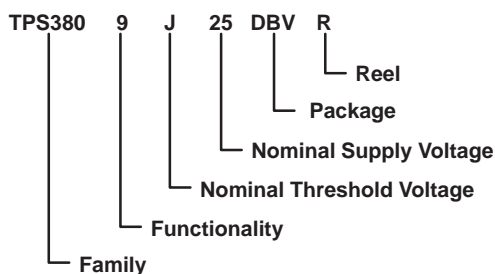
† The DBVR passive indicates tape and reel of 3000 parts.

‡ The DBVT passive indicates tape and reel of 250 parts.

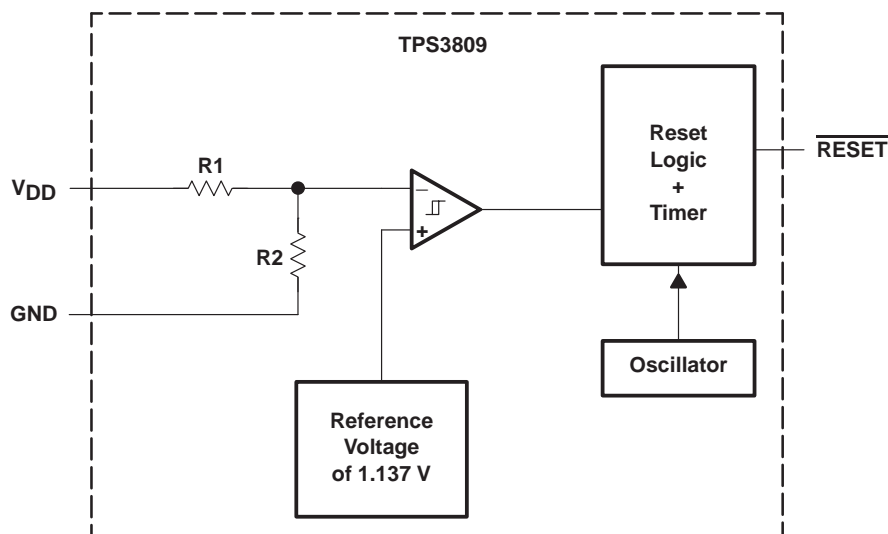
### FUNCTION/TRUTH TABLE, TPS3809

V <sub>DD</sub> >V <sub>IT</sub>	RESET
0	L
1	H

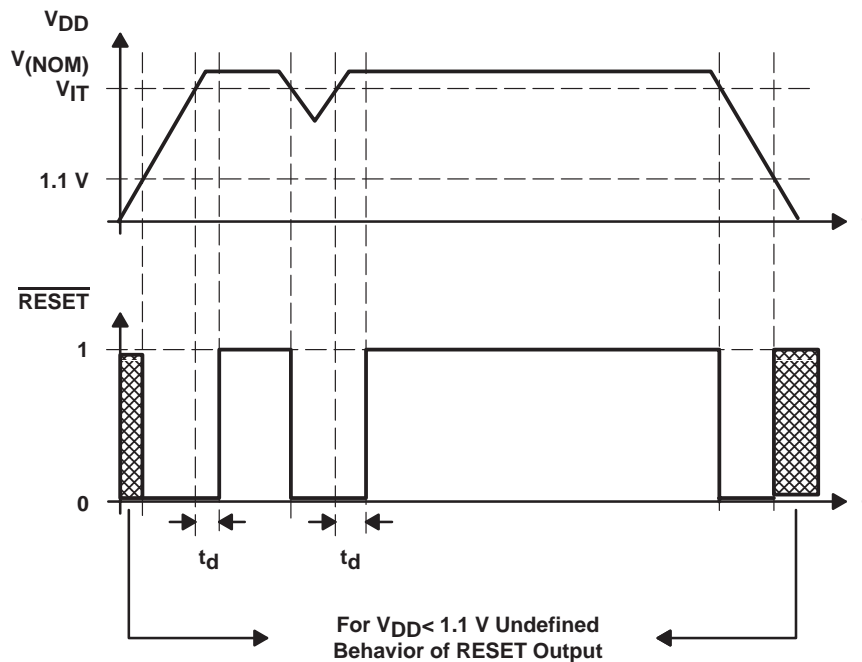
### ORDERING INFORMATION



### functional block diagram



timing diagram



absolute maximum ratings over operating free-air temperature (unless otherwise noted)<sup>†</sup>

Supply voltage, $V_{DD}$ (see Note 1)	7 V
All other pins (see Note 1)	-0.3 V 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 $V_I > V_{DD}$ )	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{DD}$ )	$\pm 20$ mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, $T_A$	-40°C to 85°C
Storage temperature range, $T_{stg}$	-65°C to 150°C
Soldering temperature	260°C

<sup>†</sup> 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.

NOTE 1: All voltage values are with respect to GND. For reliable operation the device should not be operated at 7 V for more than  $t=1000\text{h}$  continuously.

DISSIPATION RATING TABLE

PACKAGE	$T_A < 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
DBV	437 mW	3.5 mW/°C	280 mW	227 mW

recommended operating conditions at specified temperature range

	MIN	MAX	UNIT
Supply voltage, $V_{DD}$	2	6	V
Operating free-air temperature range, $T_A$	-40	85	°C

# TPS3809J25, TPS3809L30, TPS3809K33, TPS3809I50

## 3-PIN SUPPLY VOLTAGE SUPERVISORS

SLVS228 – AUGUST 1999

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V <sub>OH</sub>	High-level output voltage	V <sub>DD</sub> = 2.5 V to 6 V, I <sub>OH</sub> = -500 μA	V <sub>DD</sub> - 0.2			V	
		V <sub>DD</sub> = 3.3 V, I <sub>OH</sub> = -2 mA	V <sub>DD</sub> - 0.4				
		V <sub>DD</sub> = 6 V, I <sub>OH</sub> = -4 mA	V <sub>DD</sub> - 0.4				
V <sub>OL</sub>	Low-level output voltage	V <sub>DD</sub> = 2 V to 6 V, I <sub>OL</sub> = 500 μA	0.2			V	
		V <sub>DD</sub> = 3.3 V, I <sub>OL</sub> = 2 mA	0.4				
		V <sub>DD</sub> = 6 V, I <sub>OL</sub> = 4 mA	0.4				
Power-up reset voltage (see Note 2)		V <sub>DD</sub> ≥ 1.1 V, I <sub>OL</sub> = 50 μA	0.2			V	
V <sub>IT-</sub>	Negative-going input threshold voltage (see Note 3)	T <sub>A</sub> = 40°C to 85°C	TPS3809J25	2.20	2.25	2.30	V
			TPS3809L30	2.58	2.64	2.70	
			TPS3809K33	2.87	2.93	2.99	
			TPS3809I50	4.45	4.55	4.65	
V <sub>hys</sub>	Hysteresis		TPS3809J25	30		mV	
			TPS3809L30	35			
			TPS3809K33	40			
			TPS3809I50	60			
I <sub>DD</sub>	Supply current	V <sub>DD</sub> = 2 V, Output unconnected	9		12	μA	
		V <sub>DD</sub> = 6 V, Output unconnected	20		25		
C <sub>i</sub>	Input capacitance	V <sub>I</sub> = 0 V to V <sub>DD</sub>	5			pF	

NOTES: 2. The lowest supply voltage at which  $\overline{\text{RESET}}$  becomes active.  $t_r, V_{DD} \geq 15 \mu\text{s/V}$ .  
 3. To ensure best stability of the threshold voltage, a bypass capacitor (0.1 μF ceramic) should be placed near the supply terminals.

### timing requirements at R<sub>L</sub> = 1 MΩ, C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>w</sub>	Pulse width	at V <sub>DD</sub> , V <sub>DD</sub> = V <sub>IT-</sub> + 0.2 V, V <sub>DD</sub> = V <sub>IT-</sub> - 0.2 V	3			μs

### switching characteristics at R<sub>L</sub> = 1 MΩ, C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>d</sub>	Delay time	V <sub>DD</sub> ≥ V <sub>IT-</sub> + 0.2 V, See timing diagram	120	200	280	ms
t <sub>PHL</sub>	Propagation (delay) time, high-to-low-level output	V <sub>DD</sub> to $\overline{\text{RESET}}$ delay, V <sub>IL</sub> = V <sub>IT-</sub> - 0.2 V, V <sub>IH</sub> = V <sub>IT-</sub> + 0.2 V	1			μs



TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE  
vs  
LOW-LEVEL OUTPUT CURRENT

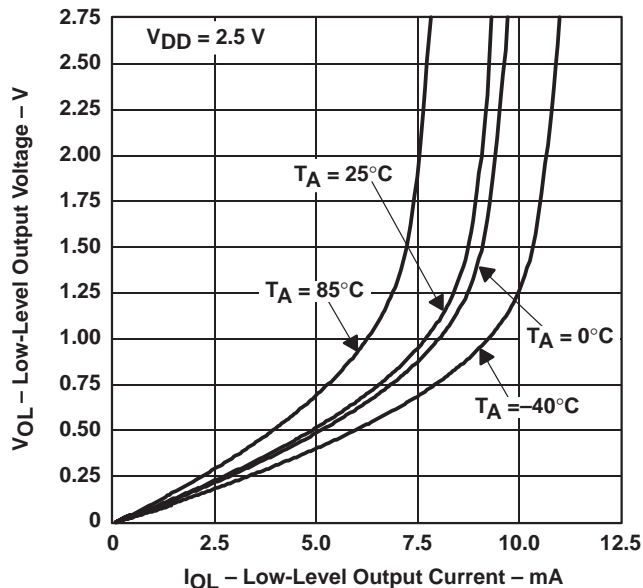


Figure 1

SUPPLY CURRENT  
vs  
SUPPLY VOLTAGE

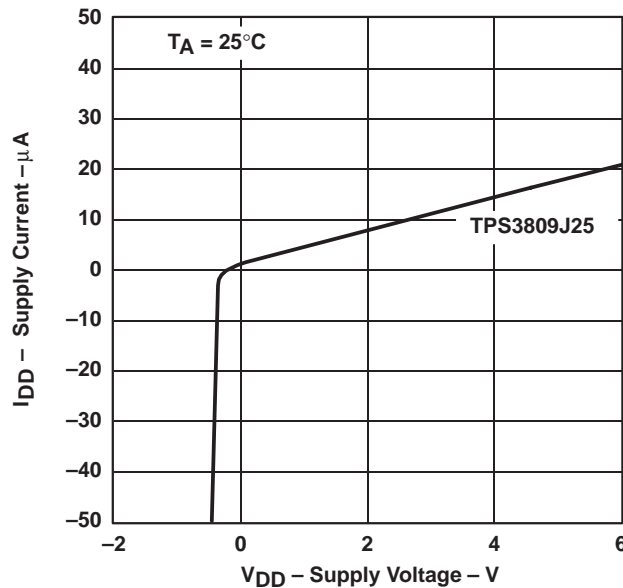


Figure 2

HIGH-LEVEL OUTPUT VOLTAGE  
vs  
HIGH-LEVEL OUTPUT CURRENT

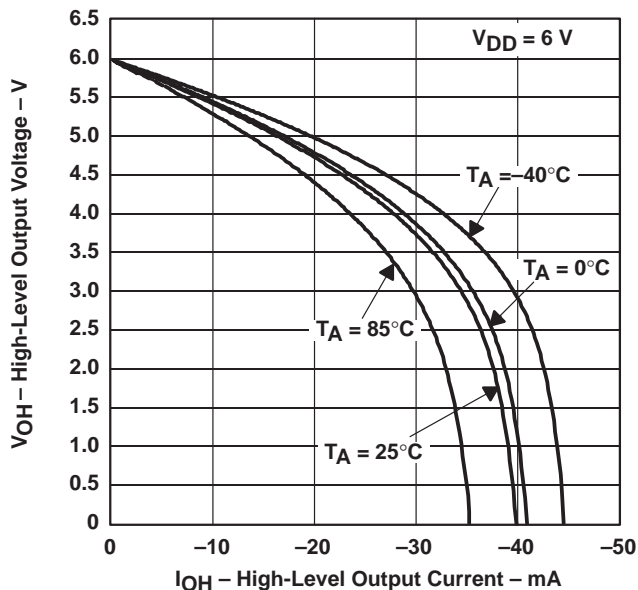


Figure 3

HIGH-LEVEL OUTPUT VOLTAGE  
vs  
HIGH-LEVEL OUTPUT CURRENT

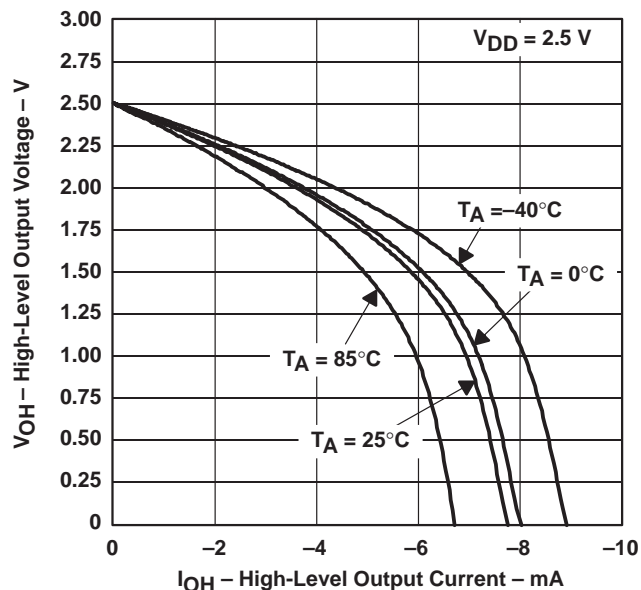


Figure 4

TYPICAL CHARACTERISTICS

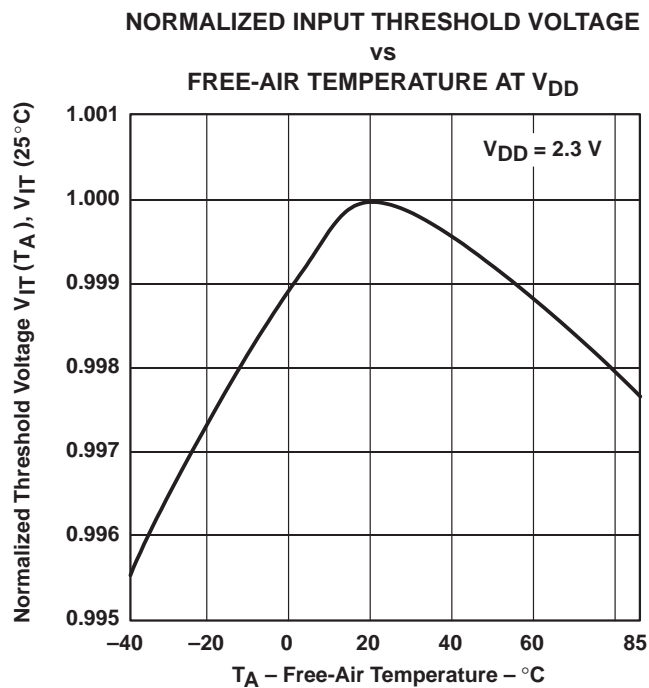


Figure 5

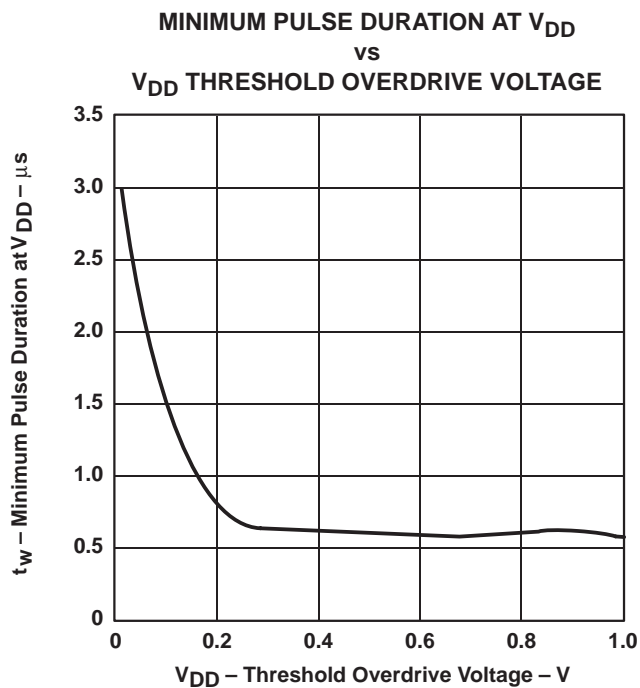
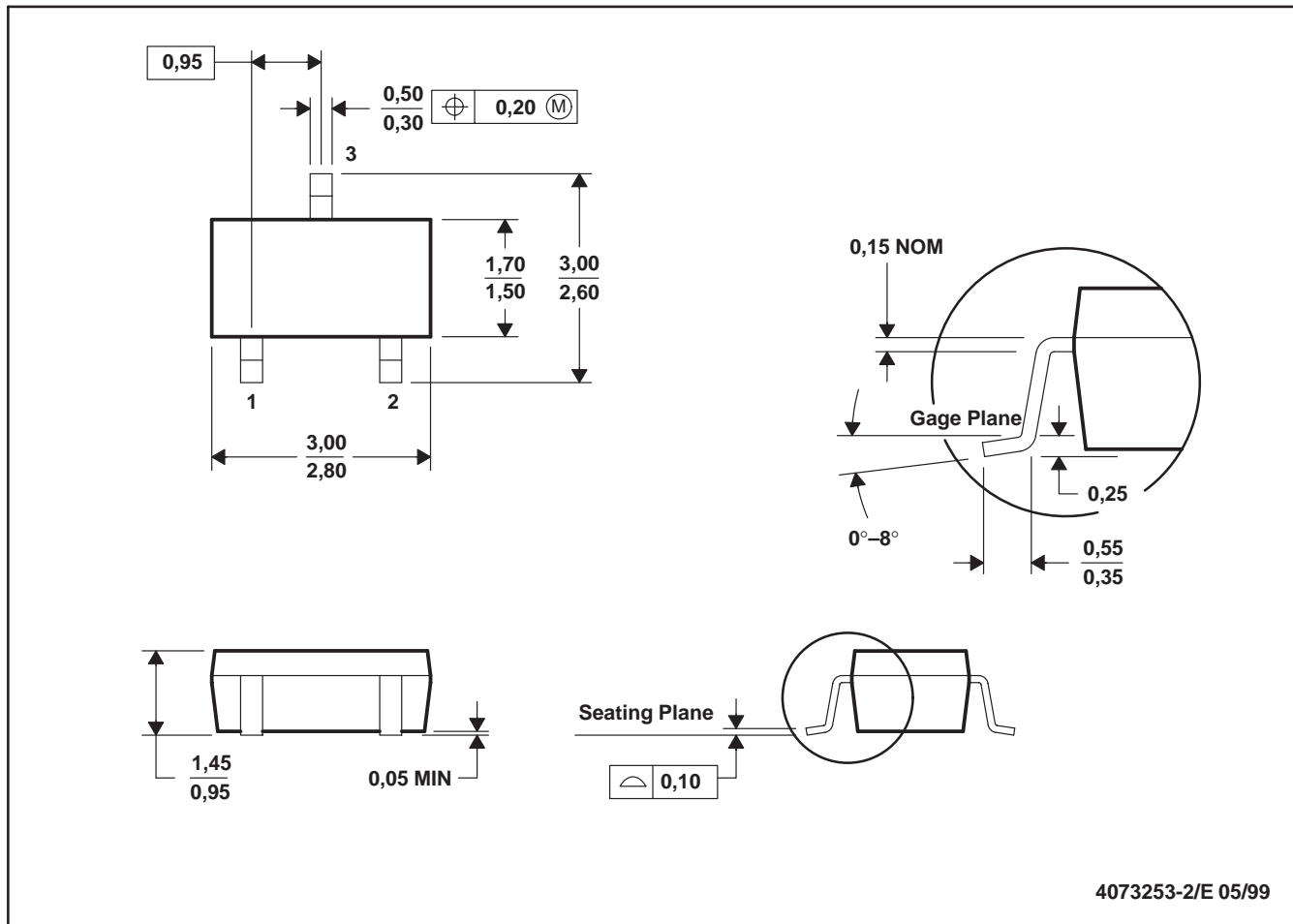


Figure 6

MECHANICAL DATA

DBV (R-PDSO-G3)

PLASTIC SMALL-OUTLINE



- 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.

PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TPS3809I50DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809I50DBVRG4	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809I50DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809I50DBVTG4	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809J25DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809J25DBVRG4	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809J25DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809K33DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809K33DBVRG4	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809K33DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809K33DBVTG4	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809L30DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809L30DBVRG4	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809L30DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3809L30DBVTG4	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

**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)

<sup>(3)</sup> 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.

## 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 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.

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.

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

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
		Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
		Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265