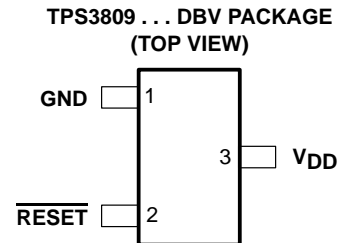


TPS3809J25-Q1, TPS3809L30-Q1, TPS3809K33-Q1, TPS3809I50-Q1 3-PIN SUPPLY VOLTAGE SUPERVISORS

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- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval†
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Using Human Body Model (C = 100 pF, R = 1500 Ω)
- 3-Pin SOT-23 Package
- Supply Current of 9 μA (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

† Contact factory for details. Q100 qualification data available on request.



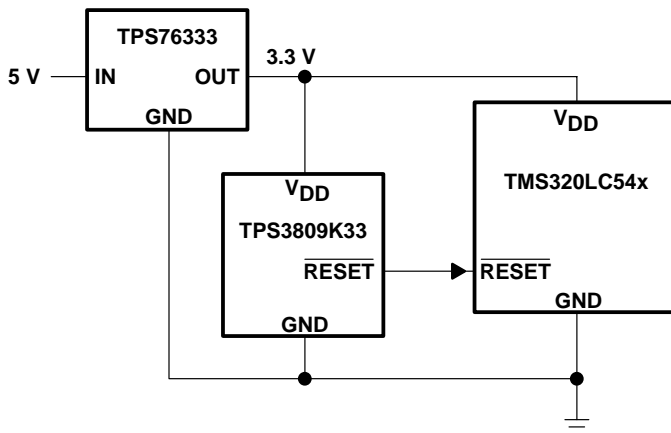
description

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_{DD} becomes higher than 1.1 V. Thereafter, the supervisory circuit monitors V_{DD} and keeps $\overline{\text{RESET}}$ active as long as V_{DD} remains below the threshold voltage V_{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_{DD} has risen above the threshold voltage V_{IT} . When the supply voltage drops below the threshold voltage V_{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_{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 TPS3809xxxQ-Q1 devices are characterized for operation over a temperature range of -40°C to 125°C , and are qualified in accordance with AEC-Q100 stress test qualification for integrated circuits.

typical applications



- Applications Using Automotive DSPs, Microcontrollers, or Microprocessors
- Wireless Communication Systems
- Battery-Powered Equipment
- Programmable Controls
- Intelligent Instruments
- Industrial Equipment
- 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**

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TPS3809J25-Q1, TPS3809L30-Q1, TPS3809K33-Q1, TPS3809I50-Q1 3-PIN SUPPLY VOLTAGE SUPERVISORS

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AVAILABLE OPTIONS

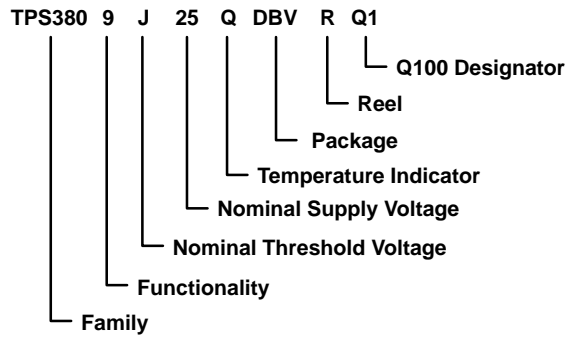
T _A	DEVICE NAME	THRESHOLD VOLTAGE	MARKING
-40°C to 125°C	TPS3809J25QDBVRQ1†	2.25 V	PCZQ
	TPS3809L30QDBVRQ1†	2.64 V	PDAQ
	TPS3809K33QDBVRQ1†	2.93 V	PDBQ
	TPS3809I50QDBVRQ1†	4.55 V	PDCQ

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

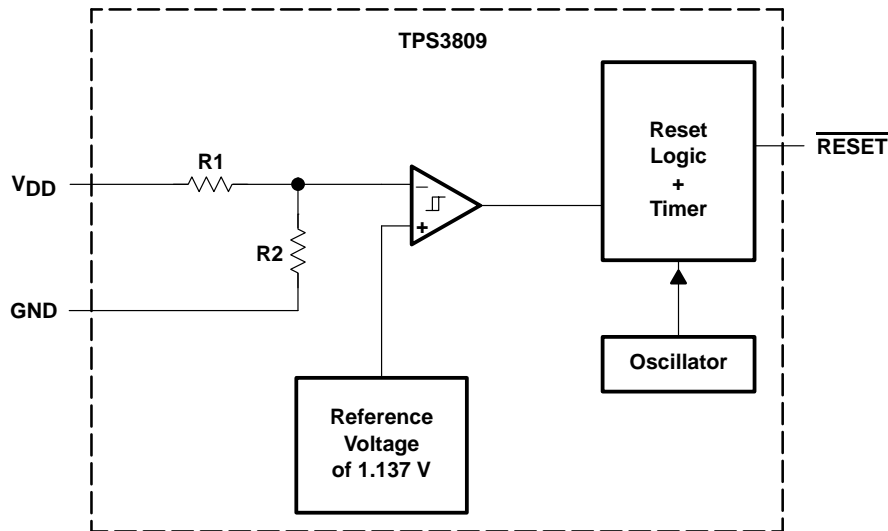
FUNCTION/TRUTH TABLE, TPS3809

V _{DD} >V _{IT}	RESET
0	L
1	H

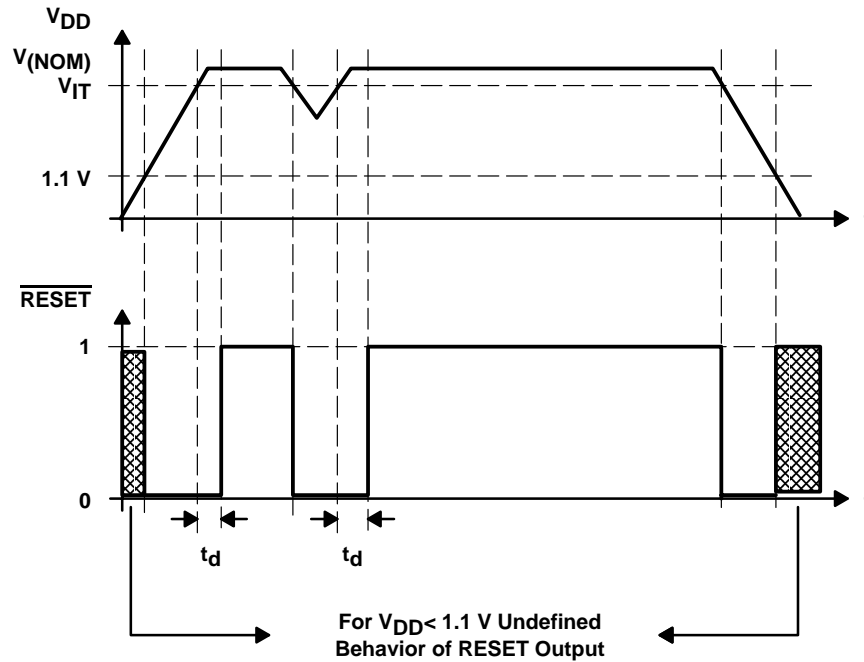
ORDERING INFORMATION



functional block diagram



timing diagram



absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

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 $V_I > V_{DD}$)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{DD}$)	± 20 mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	-40°C to 125°C
Storage temperature range, T_{stg}	-65°C to 150°C
Soldering temperature	260°C

† 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 $t=1000h$ 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	$T_A = 125^\circ\text{C}$ POWER RATING
DBV	437 mW	3.5 mW/°C	280 mW	227 mW	87 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	125	°C

TPS3809J25-Q1, TPS3809L30-Q1, TPS3809K33-Q1, TPS3809I50-Q1 3-PIN SUPPLY VOLTAGE SUPERVISORS

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V _{OH}	High-level output voltage	V _{DD} = 2.5 V to 6 V, I _{OH} = -500 μA	V _{DD} -0.2			V	
		V _{DD} = 3.3 V, I _{OH} = -2 mA	V _{DD} -0.4				
		V _{DD} = 6 V, I _{OH} = -4 mA	T _A = -40°C to 25°C	V _{DD} -0.4			
			T _A = 125°C	V _{DD} -0.5			
V _{OL}	Low-level output voltage	V _{DD} = 2 V to 6 V, I _{OL} = 500 μA			0.2	V	
		V _{DD} = 3.3 V, I _{OL} = 2 mA			0.4		
		V _{DD} = 6 V, I _{OL} = 4 mA			0.4		
Power-up reset voltage (see Note 2)		V _{DD} ≥ 1.1 V, I _{OL} = 50 μA			0.2	V	
V _{IT-}	Negative-going input threshold voltage (see Note 3)	TPS3809J25	T _A = -40°C to 125°C	2.20	2.25	2.30	V
		TPS3809L30		2.58	2.64	2.70	
		TPS3809K33		2.87	2.93	2.99	
		TPS3809I50		T _A = -40°C to 85°C	4.45	4.55	
T _A = -40°C to 125°C	4.4		4.55	4.65			
V _{hys}	Hysteresis	TPS3809J25			30	mV	
		TPS3809L30			35		
		TPS3809K33			40		
		TPS3809I50			60		
I _{DD}	Supply current	V _{DD} = 2 V, Output unconnected		9	15	μA	
		V _{DD} = 6 V, Output unconnected		20	30		
C _i	Input capacitance	V _I = 0 V to V _{DD}		5		pF	

NOTES: 2. The lowest supply voltage at which RESET becomes active. t_r, V_{DD} ≥ 15 μs/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_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _w	Pulse width	at V _{DD} V _{DD} = V _{IT-} + 0.2 V, V _{DD} = V _{IT-} - 0.2 V	3			μs

switching characteristics at R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _d	Delay time	V _{DD} ≥ V _{IT-} + 0.2 V, See timing diagram	120	200	280	ms
t _{PHL}	Propagation (delay) time, high-to-low-level output	V _{DD} to RESET delay V _{IL} = V _{IT-} - 0.2 V, V _{IH} = V _{IT-} + 0.2 V		1		μs



TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

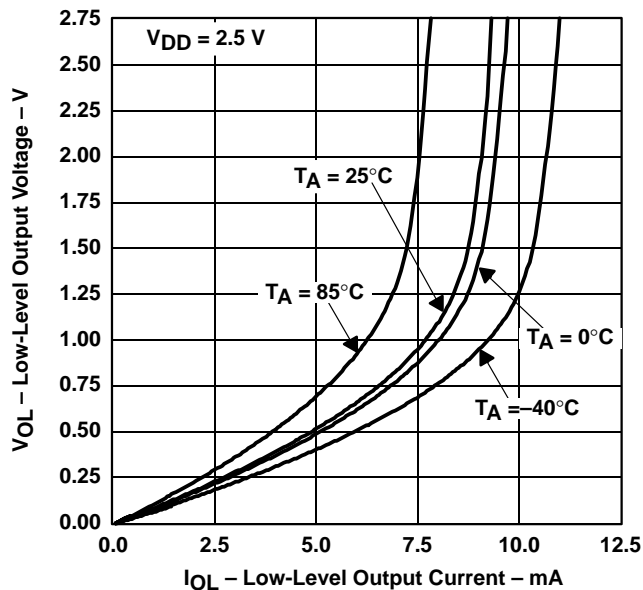


Figure 1

SUPPLY CURRENT
vs
SUPPLY VOLTAGE

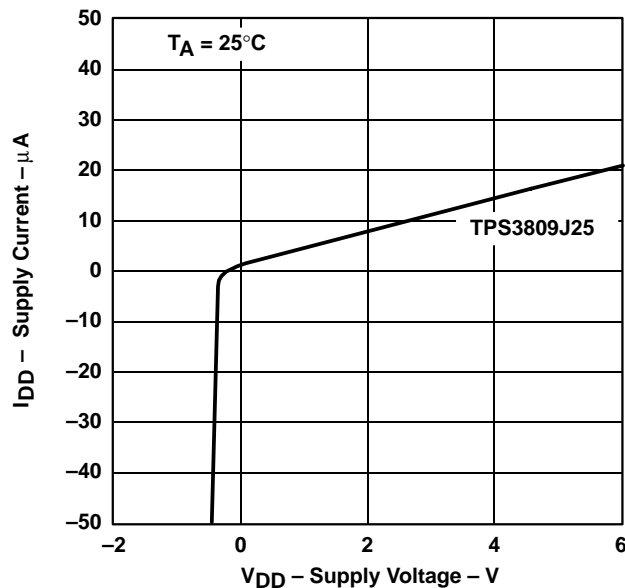


Figure 2

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

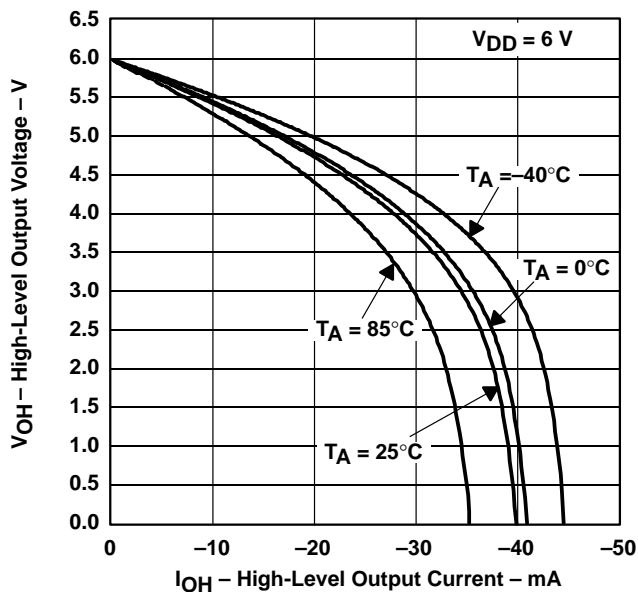


Figure 3

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

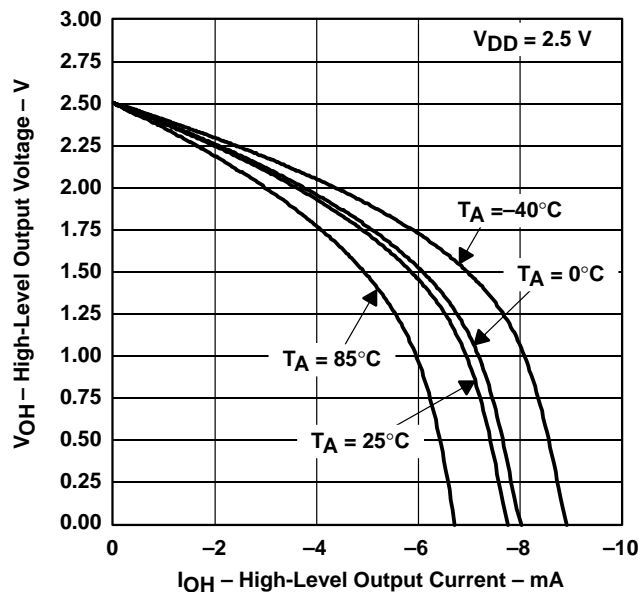


Figure 4

TPS3809J25-Q1, TPS3809L30-Q1, TPS3809K33-Q1, TPS3809I50-Q1
3-PIN SUPPLY VOLTAGE SUPERVISORS

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TYPICAL CHARACTERISTICS

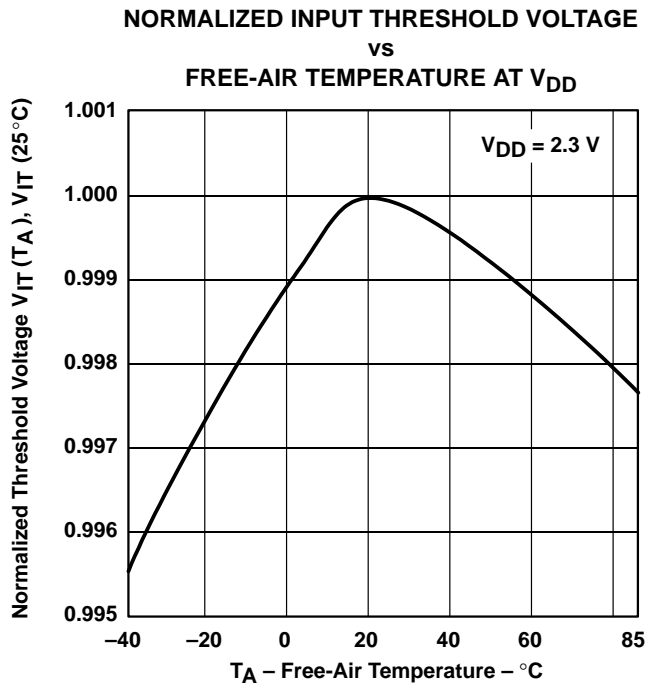


Figure 5

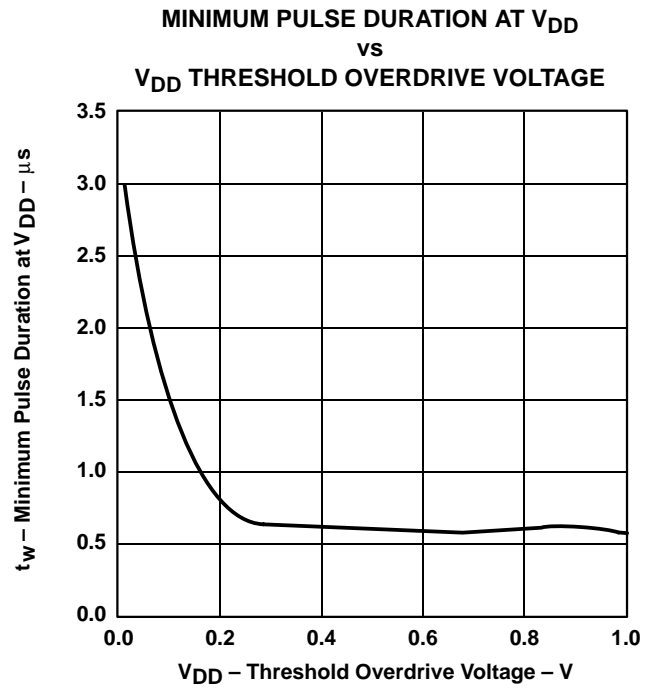
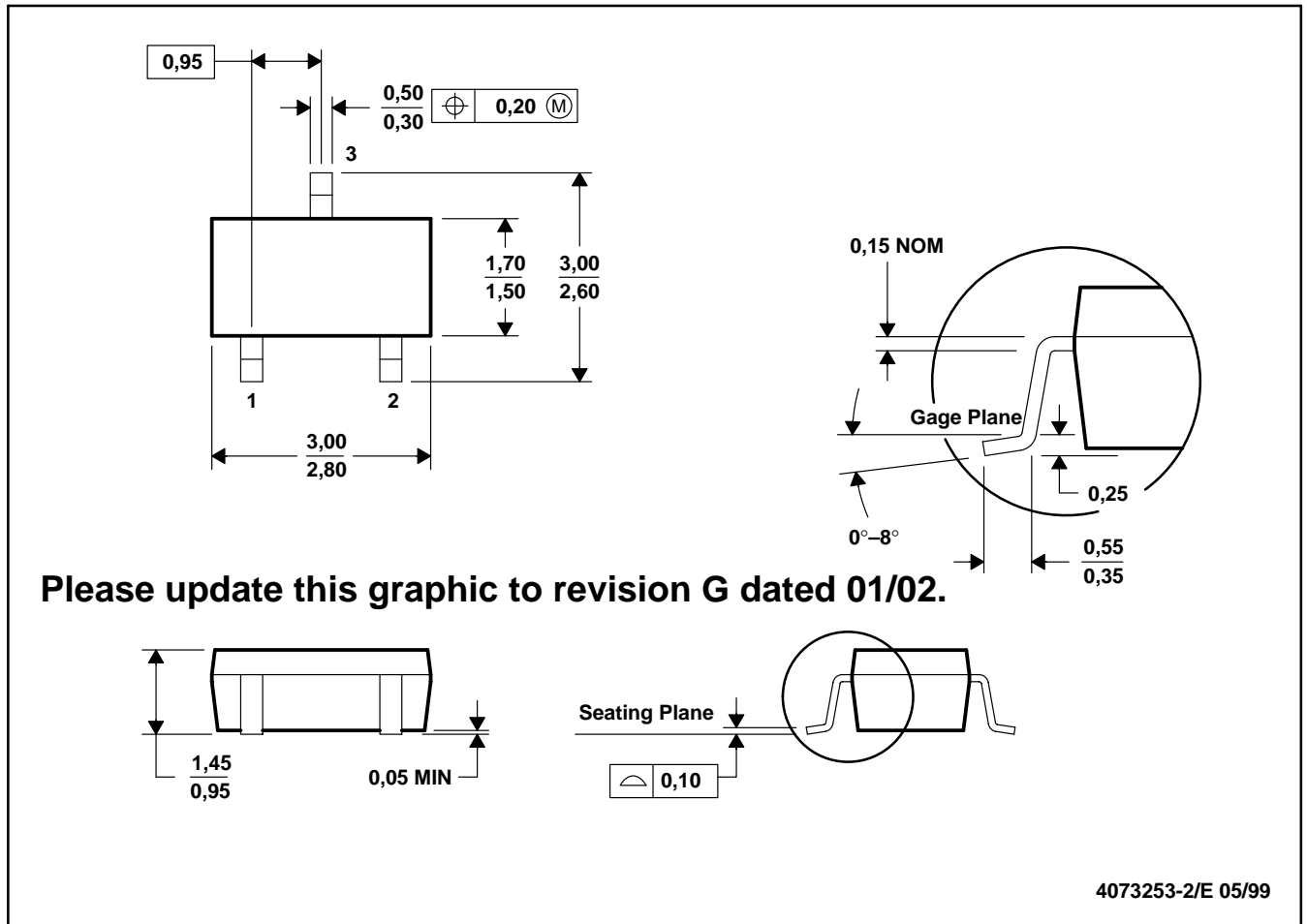


Figure 6

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 ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TPS3809I50QDBVRQ1	ACTIVE	SOT-23	DBV	3	3000	None	Call TI	Level-1-220C-UNLIM
TPS3809J25QDBVRQ1	ACTIVE	SOT-23	DBV	3	3000	None	Call TI	Level-1-220C-UNLIM
TPS3809K33QDBVRQ1	ACTIVE	SOT-23	DBV	3	3000	None	Call TI	Level-1-220C-UNLIM
TPS3809L30QDBVRQ1	ACTIVE	SOT-23	DBV	3	3000	None	Call TI	Level-1-220C-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 - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

None: Not yet available Lead (Pb-Free).

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.

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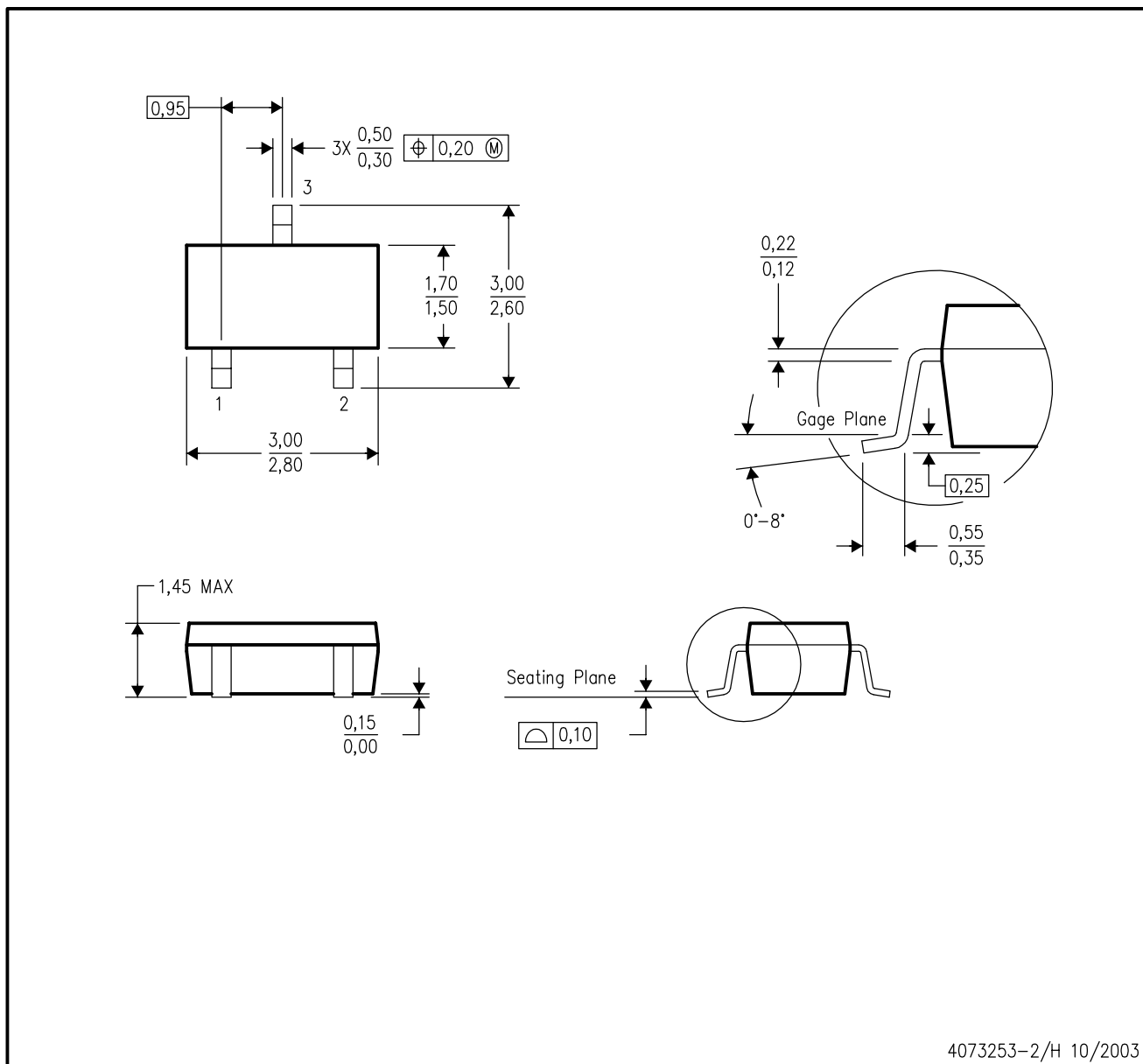
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DBV (R-PDSO-G3)

PLASTIC SMALL-OUTLINE PACKAGE



4073253-2/H 10/2003

- 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.

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