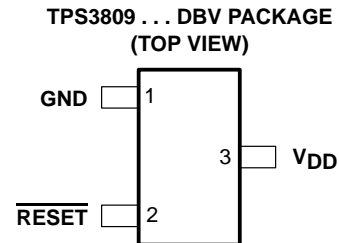


# TPS3809J25-Q1, TPS3809L30-Q1, TPS3809K33-Q1, TPS3809I50-Q1 3-PIN SUPPLY VOLTAGE SUPERVISORS

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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.



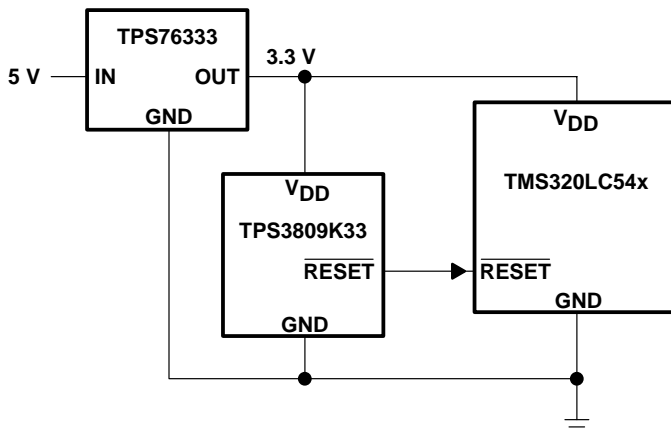
## description

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  $V_{\text{DD}}$  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 TPS3809xxxQ-Q1 devices are characterized for operation over a temperature range of  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ , 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

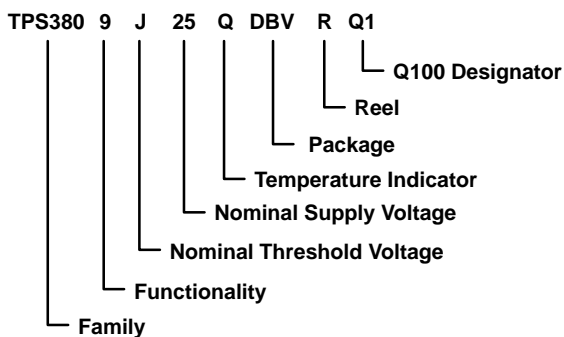
T <sub>A</sub>	DEVICE NAME	THRESHOLD VOLTAGE	MARKING
-40°C to 125°C	TPS3809J25QDBVRQ1†	2.25 V	PCZQ
	TPS3809L30QDBVRQ1†	2.64 V	PDAQ
	TPS3809K33QDBVRQ1†	2.93 V	PDBQ
	TPS3809I50QDBVRQ1†	4.55 V	PDCQ

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

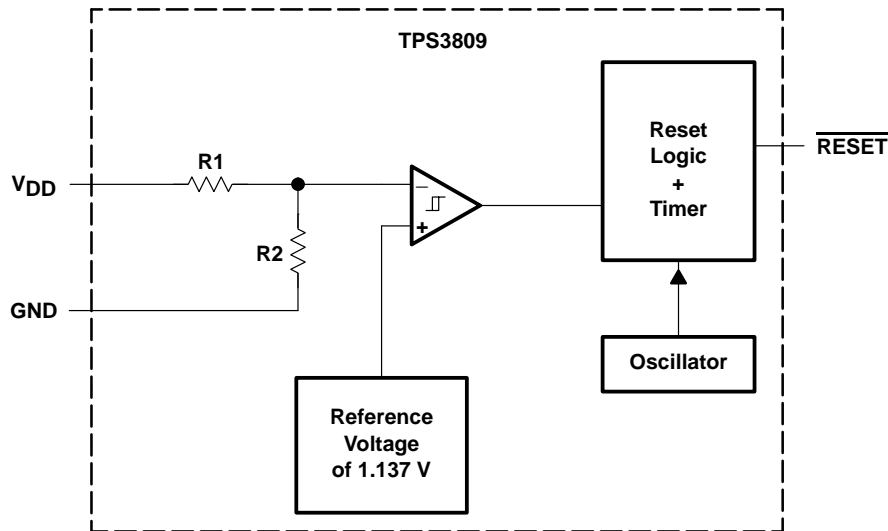
### FUNCTION/TRUTH TABLE, TPS3809

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

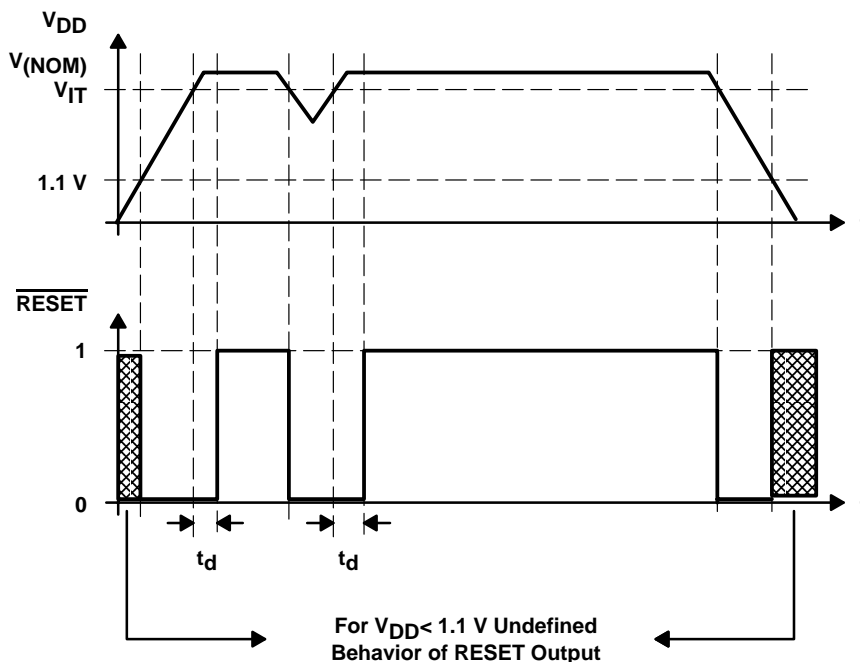
### ORDERING INFORMATION



### functional block diagram



timing diagram



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

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 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

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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	T <sub>A</sub> = -40°C to 25°C	V <sub>DD</sub> -0.4			
			T <sub>A</sub> = 125°C	V <sub>DD</sub> -0.5			
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)	TPS3809J25	T <sub>A</sub> = -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 <sub>A</sub> = -40°C to 85°C	4.45	4.55	
T <sub>A</sub> = -40°C to 125°C	4.4		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	15	μA	
		V <sub>DD</sub> = 6 V, Output unconnected		20	30		
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 RESET becomes active. t<sub>r</sub>, V<sub>DD</sub> ≥ 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<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 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

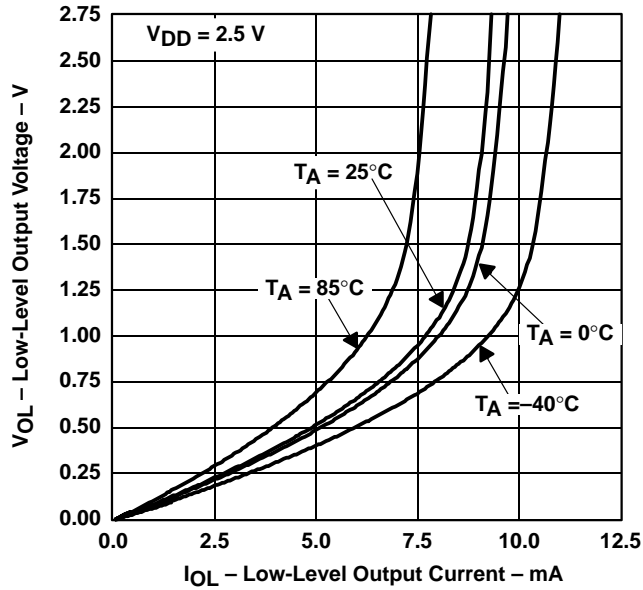


Figure 1

SUPPLY CURRENT  
vs  
SUPPLY VOLTAGE

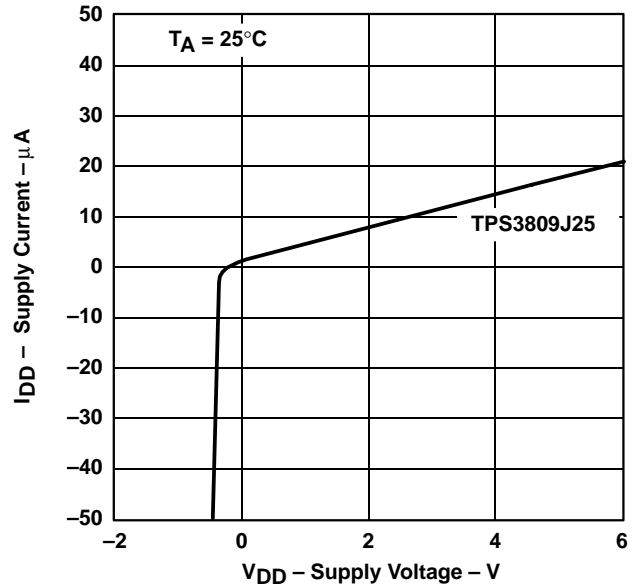


Figure 2

HIGH-LEVEL OUTPUT VOLTAGE  
vs  
HIGH-LEVEL OUTPUT CURRENT

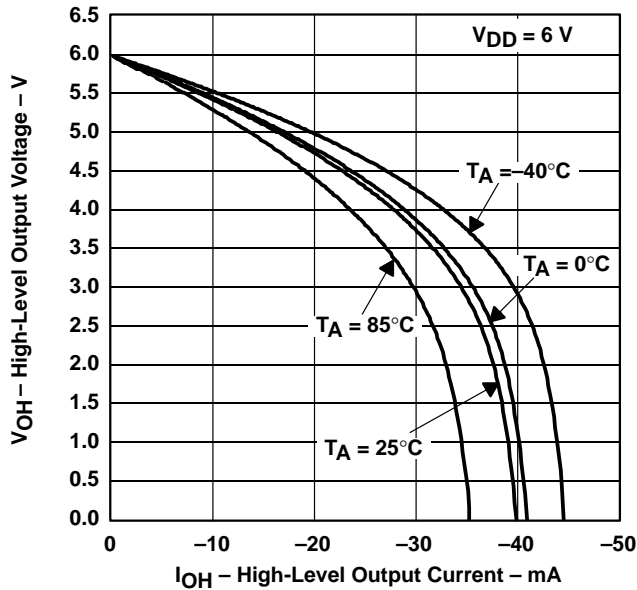


Figure 3

HIGH-LEVEL OUTPUT VOLTAGE  
vs  
HIGH-LEVEL OUTPUT CURRENT

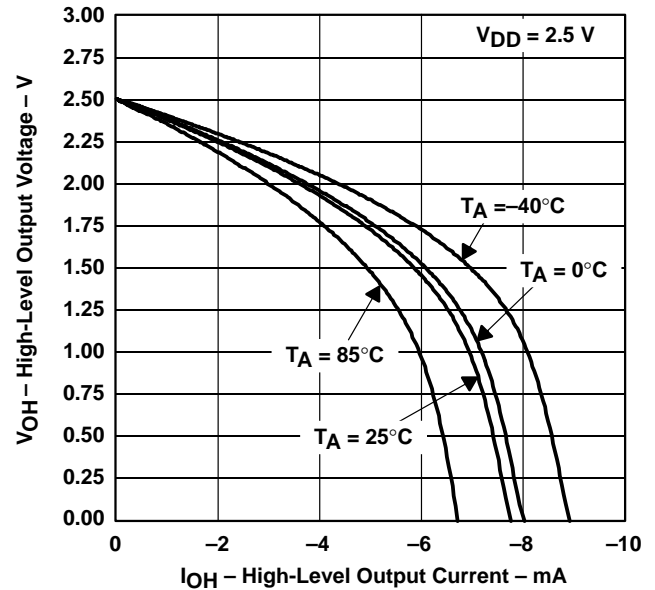
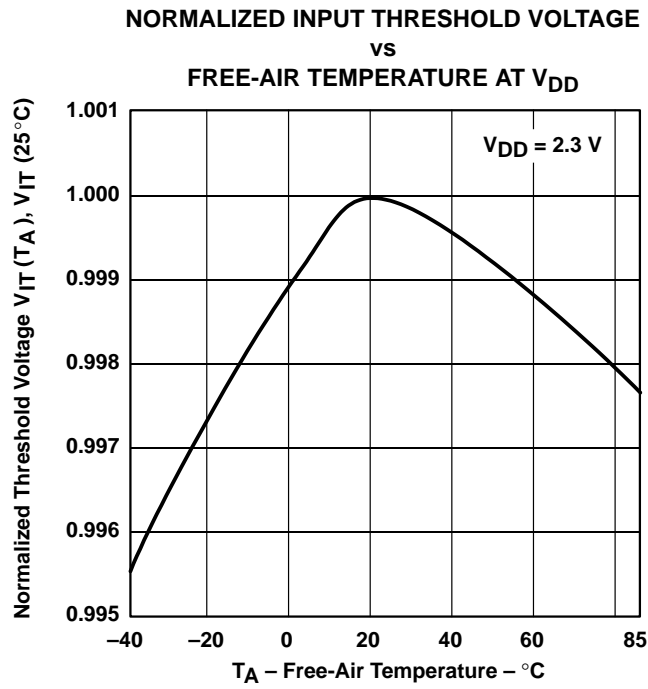


Figure 4

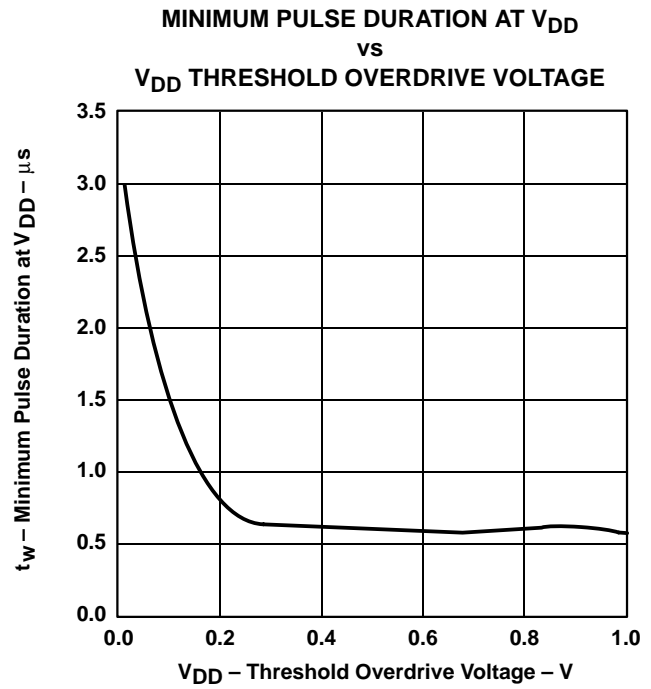
**TPS3809J25-Q1, TPS3809L30-Q1, TPS3809K33-Q1, TPS3809I50-Q1  
3-PIN SUPPLY VOLTAGE SUPERVISORS**

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**TYPICAL CHARACTERISTICS**



**Figure 5**

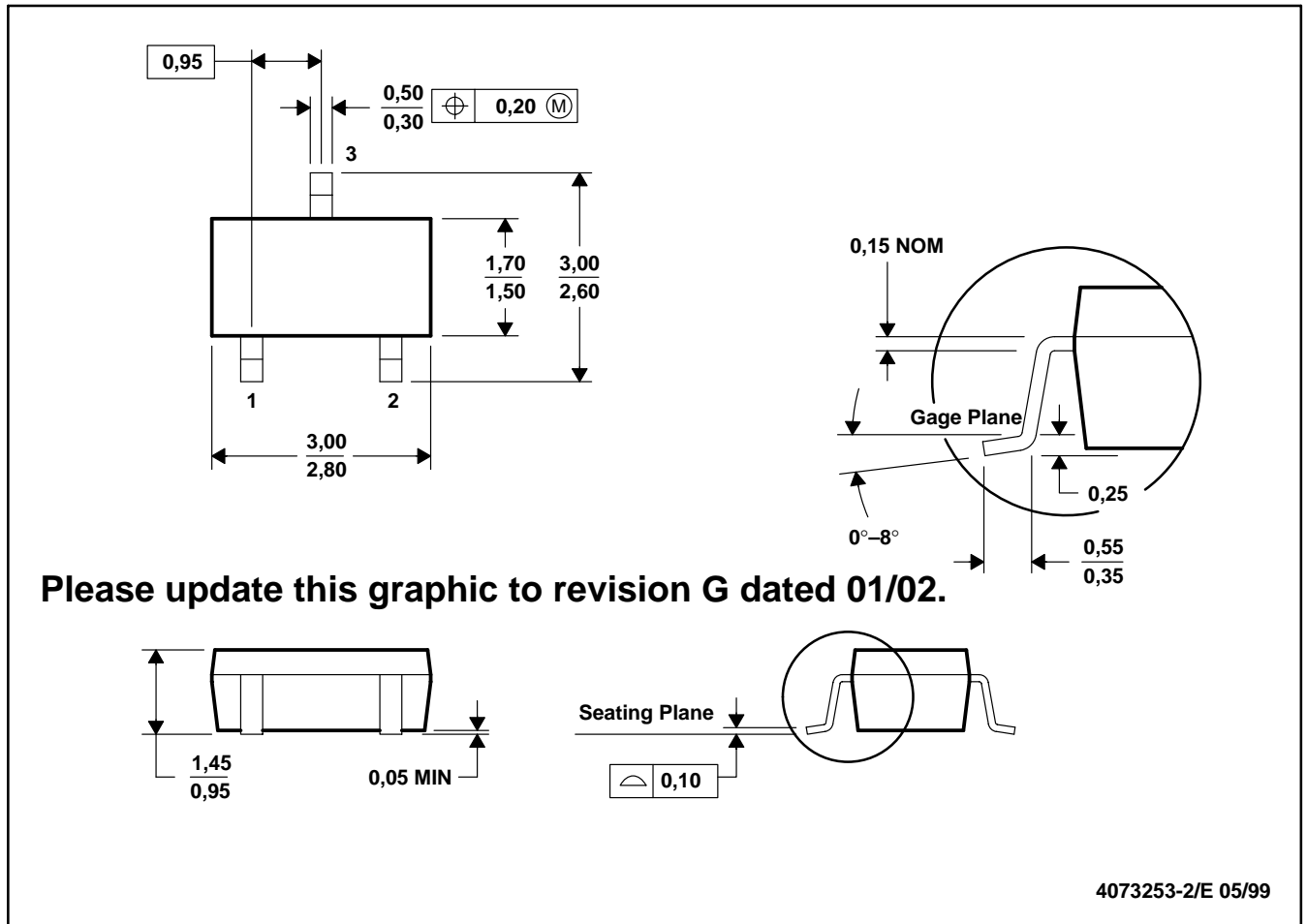


**Figure 6**

MECHANICAL DATA

DBV (R-PDSO-G3)

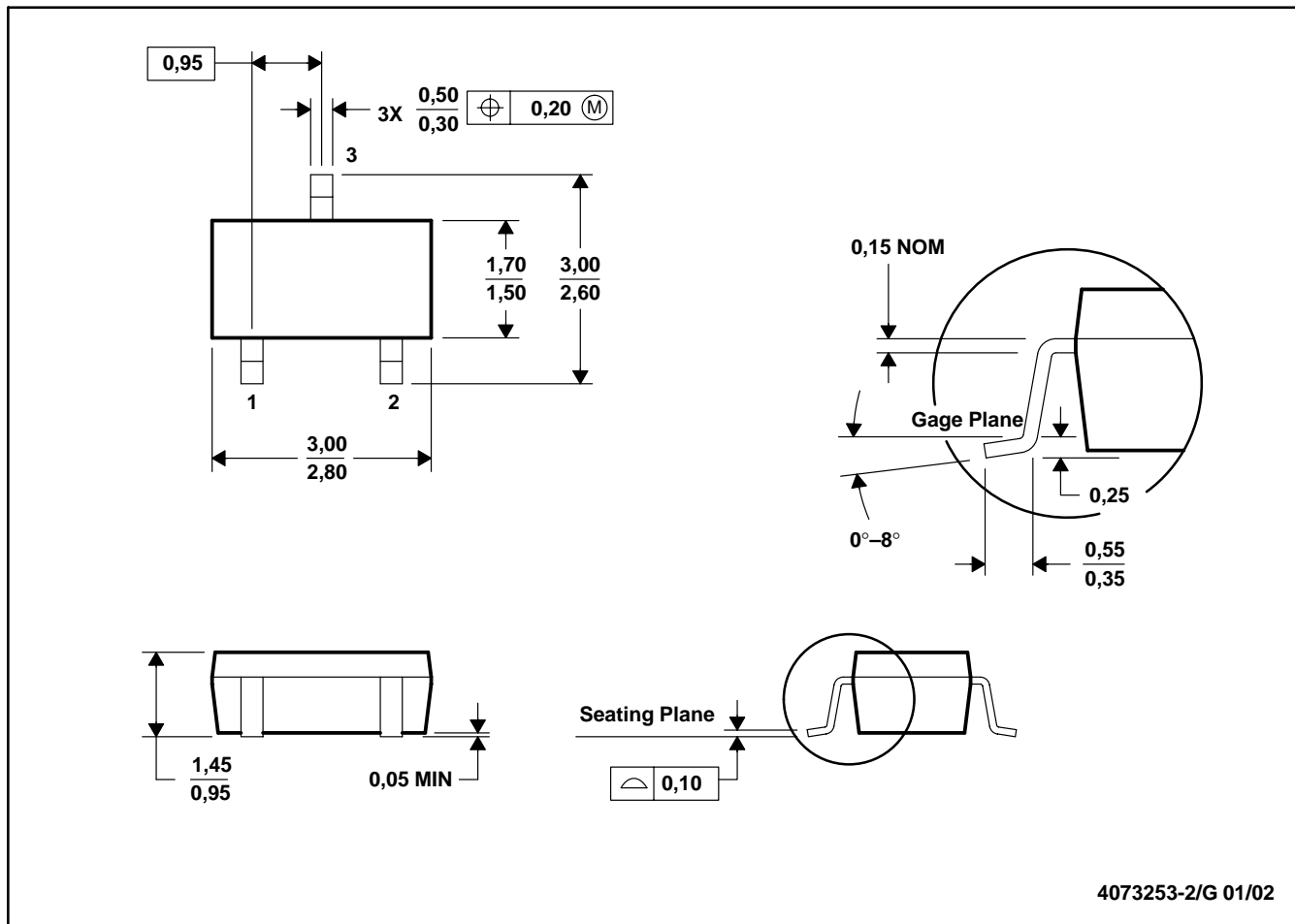
PLASTIC SMALL-OUTLINE



- 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.

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.



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