

## TPS3809x 3 端子電源電圧監視 IC

### 1 特長

- 3 ピンの SOT-23 パッケージ
- 消費電流 9 $\mu$ A (標準値)
- 高精度の電源電圧モニタ  
2.5V、3V、3.3V、5V
- MAX 809 とピン互換
- 温度範囲: -40°C ~ +85°C

### 2 アプリケーション

- ファクトリ・オートメーション
- ワイヤレス・スピーカ
- モーター・ドライブ
- サーバー
- 家電製品
- 電気メーター
- ビル・オートメーション

### 3 概要

TPS3809 ファミリの監視回路は、主に DSP およびプロセッサ・ベースのシステムの回路の初期化とタイミングの監視を行います。新しい TLV809E デバイスは、同じピン、機能、電気的パラメータを持つ代替品です。

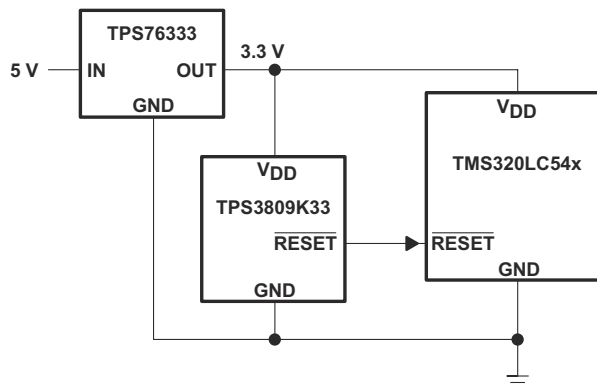
電源投入時には、電源電圧  $V_{DD}$  が 1.1V を上回ると  $\overline{\text{RESET}}$  ピンがアサートされます。その後、この電源電圧監視 IC が  $V_{DD}$  を監視し、 $V_{DD}$  がスレッショルド電圧  $V_{IT}$  を下回っている間は  $\overline{\text{RESET}}$  ピンをアクティブに維持します。内蔵のタイマは、システムを確実に正しくリセットさせるため、出力が非アクティブ状態 (HIGH) に戻るのを遅らせます。この遅延時間 ( $t_{d(\text{typ})} = 200 \text{ ms}$ ) は、 $V_{DD}$  がスレッショルド電圧  $V_{IT}$  を上回ったときにカウントを開始します。電源電圧がスレッショルド電圧  $V_{IT}$  を下回ると、出力は再びアクティブ (LOW) になります。外付け部品は不要です。このファミリのデバイスはすべて、内部分圧回路により検出スレッショルド電圧  $V_{IT}$  が固定値になっています。

この製品ファミリは、2.5V、3V、3.3V、5V の電源電圧用に設計されています。これらの回路は 3 ピンの SOT-23 パッケージで供給されます。TPS3809 デバイスは、-40°C ~ 85°C の温度範囲で動作が規定されています。

#### 製品情報

部品番号	パッケージ (1)	本体サイズ (公称)
TPS3809	SOT-23 (3) (DBV)	2.90mm × 1.60mm

- (1) 利用可能なパッケージについては、このデータシートの末尾にある注文情報を参照してください。



代表的なアプリケーション



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## 4 Revision History

Changes from Revision C (October 2013) to Revision D (January 2021)	Page
• 文書全体にわたって表、図、相互参照の採番方法を更新.....	1
• 「概要」セクションに新しい TLV809E に関する文を追加.....	1
• Added the pinout and pin function table.....	4
• Changed VDD from 7 to 6.5 in <i>Absolute Maximum Ratings</i> .....	5
• Changed V <sub>OL</sub> @ 500μA from 0.2 to 0.3V and corrected header of the table from TPS3800-xx, TPS3801-xx, TPS3802-xx to TPS3809xx in <i>Electrical Characteristics</i> .....	5
• Changed t <sub>w</sub> pulse duration from 3 to 10μs in <i>Timing Requirements</i> .....	6
• Changed t <sub>PHL</sub> from 1 to 10μs in <i>Switching Characteristics</i> .....	6
Changes from Revision B (July 2012) to Revision C (October 2013)	Page
• 現在の標準的なルック・アンド・フィールに合わせて、先頭ページとページのフローを変更.....	1
• Changed "Operating junction temperature range" to "Operating free-air temperature range" in Absolute Maximum Ratings (typo).....	5
Changes from Revision A (October 2010) to Revision B (July 2012)	Page
• Changed the Pull-up resistor value, RESET To: RESET current sink during startup in the Recommended Operating Conditions Table.....	5
Changes from Revision * (August 1999) to Revision A (October 2010)	Page
• Added Pull-up resistor value, RESET to the Recommended Operating Conditions Table.....	5

## 5 Device Comparison

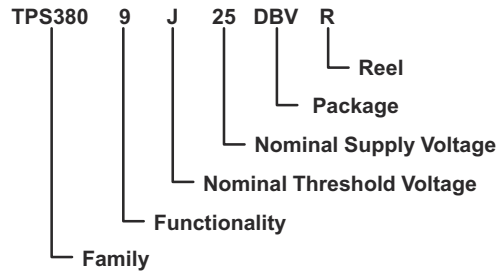
**表 5-1. Device Comparison Table**

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

**FUNCTION/TRUTH TABLE, TPS3809**

V <sub>DD</sub> >V <sub>IT</sub>	$\overline{\text{RESET}}$
0	L
1	H

**ORDERING INFORMATION**



## 6 Pin Configuration and Functions

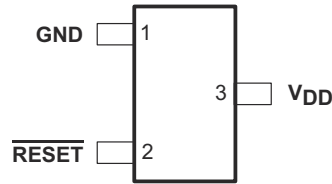


图 6-1. Pin configuration

表 6-1. Pin Functions

PIN		I/O <sup>(1)</sup>	DESCRIPTION
NAME	NO.		
GND	1	-	This pin should be connected to ground with a low-impedance connection.
RESET	2	O	RESET is an active low signal, asserting when V <sub>DD</sub> is below the threshold voltage. When V <sub>DD</sub> rises above V <sub>IT</sub> , there is a delay time (t <sub>d</sub> ) until RESET deasserts. RESET is a push-pull output stage.
VDD	3	-	Supply voltage pin. A 0.1-μF ceramic capacitor from this pin to ground is recommended to improve stability of the threshold voltage

## 7 Specifications

### 7.1 Absolute Maximum Ratings <sup>(1)</sup> <sup>(2)</sup>

Over operating free-air temperature range (unless otherwise noted).

	UNIT
Supply voltage, $V_{DD}$	6.5 V
All other pins	-0.3 V to 6.5 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

- (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 should not be operated at 6.5 V for more than  $t = 1000$ h continuously.

### 7.2 Recommended Operating Conditions

	MIN	MAX	UNIT
Supply voltage, $V_{DD}$	2	6	V
RESET current sink during startup		50	$\mu$ A
Operating free-air temperature range, $T_A$	-40	+85	°C

### 7.3 Dissipation Ratings

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

### 7.4 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	TPS3809xx			UNIT	
		MIN	TYP	MAX		
$V_{OH}$ High-level output voltage	$V_{DD} = 2.5$ V to 6 V $I_{OH} = -500$ $\mu$ A	$V_{DD} - 0.2$			V	
	$V_{DD} = 3.3$ V $I_{OH} = -2$ mA	$V_{DD} - 0.4$				
	$V_{DD} = 6$ V $I_{OH} = -4$ mA	$V_{DD} - 0.4$				
$V_{OL}$ Low-level output voltage	$V_{DD} = 2$ V to 6 V, $I_{OL} = 500$ $\mu$ A	0.3			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 <sup>(1)</sup>	$V_{DD} \geq 1.1$ V, $I_{OL} = 50$ $\mu$ A	0.2			V	
$V_{IT-}$ Negative-going input threshold voltage <sup>(2)</sup>	$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$	TPS3809J25	2.2	2.25	2.3	V
		TPS3809L30	2.58	2.64	2.7	
		TPS3809K33	2.87	2.93	2.99	
		TPS3809I50	4.45	4.55	4.65	
$V_{hys}$ Threshold hysteresis		TPS3809J25	30			mV
		TPS3809L30	35			
		TPS3809K33	40			
		TPS3809I50	60			

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

PARAMETER	TEST CONDITIONS	TPS3809xx			UNIT
		MIN	TYP	MAX	
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

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

## 7.5 Timing Requirements

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

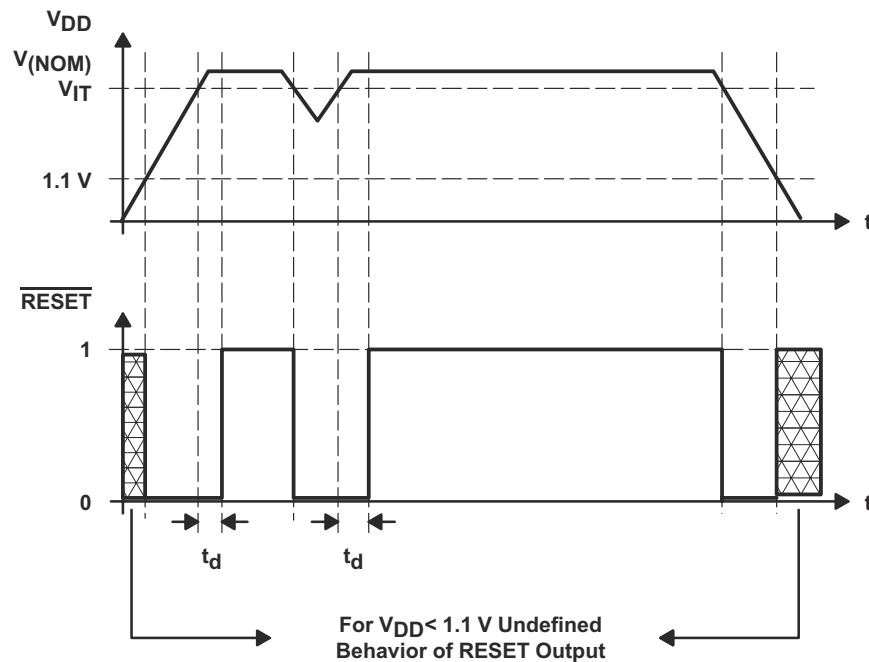
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>w</sub> Pulse width at V <sub>DD</sub>	V <sub>DD</sub> = V <sub>IT-</sub> + 0.2 V, V <sub>DD</sub> = V <sub>IT-</sub> - 0.2 V	10			μs

## 7.6 Switching Characteristics

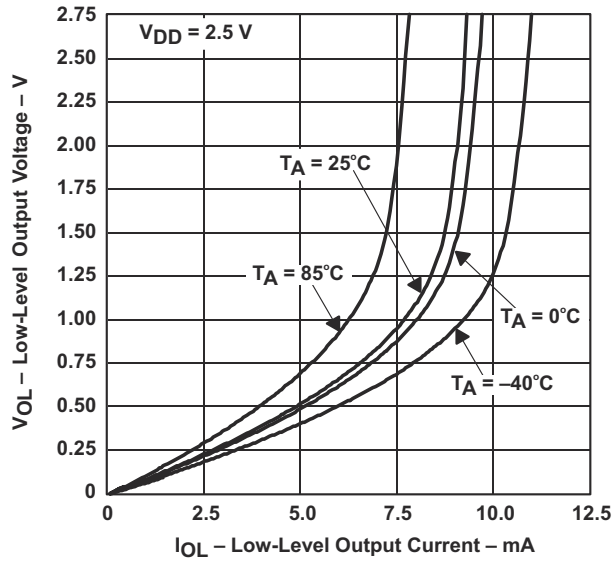
at R<sub>L</sub> = 1 MΩ, C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C

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 <a href="#">timing diagram</a>	120	200	280	ms
t <sub>PHL</sub> Propagation (delay) time, high-to-low-level output	V <sub>DD</sub> to <b>RESET</b> delay V <sub>IL</sub> = V <sub>IT-</sub> - 0.2 V, V <sub>IH</sub> = V <sub>IT-</sub> + 0.2 V		10		μs

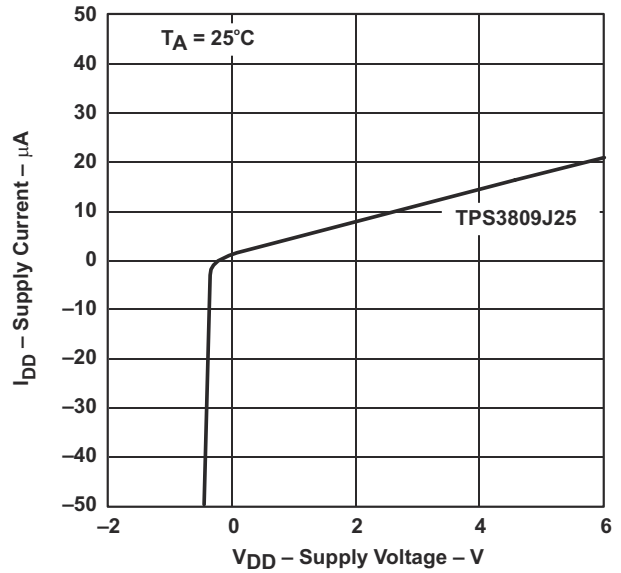
## 7.7 Timing Diagram



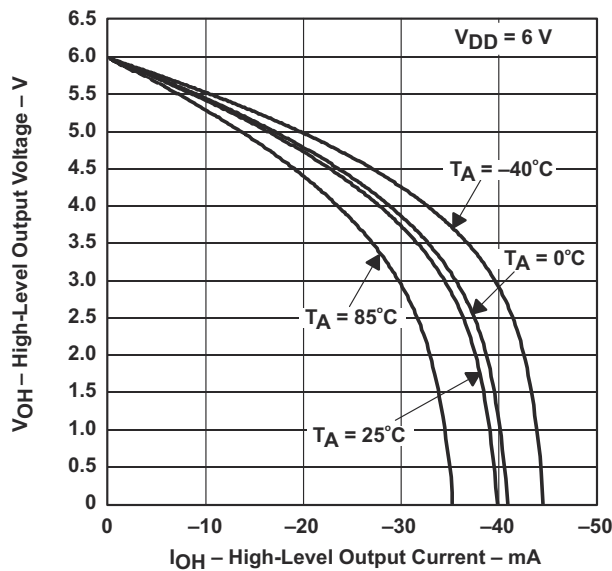
## 7.8 Typical Characteristics



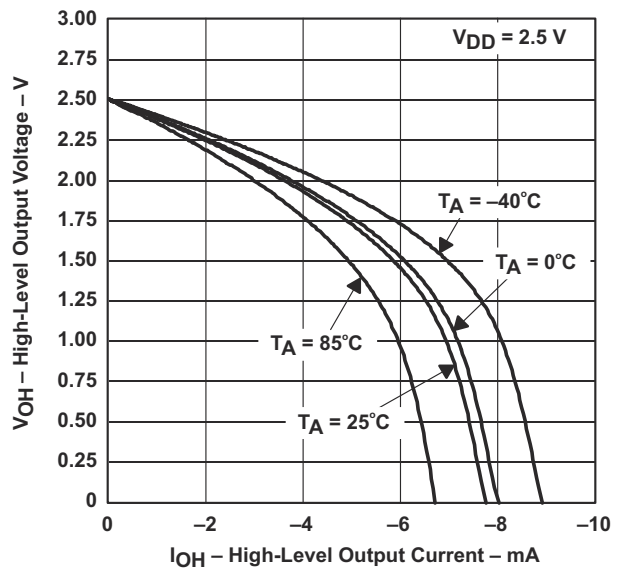

**7-1. LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT**




**7-2. SUPPLY CURRENT vs SUPPLY VOLTAGE**




**7-3. HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT at  $V_{DD}=6V$**




**7-4. HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT at  $V_{DD}=2.5V$**

## 7.8 Typical Characteristics (continued)

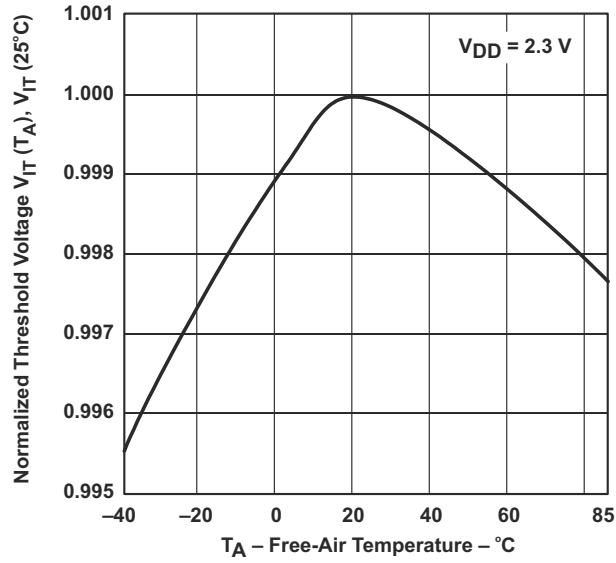
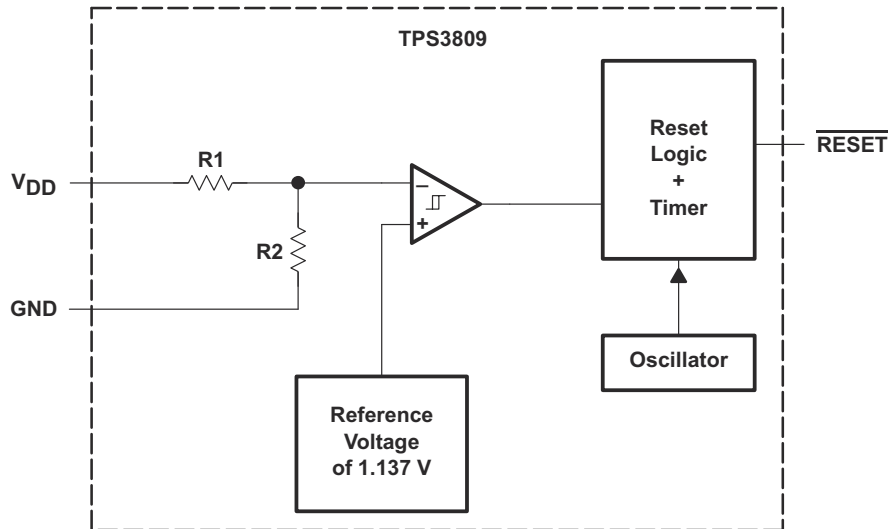


FIG 7-5. NORMALIZED INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE AT  $V_{DD}=2.3\text{V}$



## 8 Detailed Description



## 9 静電気放電に関する注意事項



この IC は、ESD によって破損する可能性があります。テキサス・インスツルメンツは、IC を取り扱う際には常に適切な注意を払うことを推奨します。正しい ESD 対策をとらないと、デバイスを破損するおそれがあります。

ESD による破損は、わずかな性能低下からデバイスの完全な故障まで多岐にわたります。精密な IC の場合、パラメータがわずかに変化するだけで公表されている仕様から外れる可能性があるため、破損が発生しやすくなっています。

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS3809I50DBVR	ACTIVE	SOT-23	DBV	3	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI	<a href="#">Samples</a>
TPS3809I50DBVRG4	ACTIVE	SOT-23	DBV	3	3000	TBD	Call TI	Call TI	-40 to 85		<a href="#">Samples</a>
TPS3809I50DBVT	ACTIVE	SOT-23	DBV	3	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI	<a href="#">Samples</a>
TPS3809J25DBVR	ACTIVE	SOT-23	DBV	3	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI	<a href="#">Samples</a>
TPS3809J25DBVT	ACTIVE	SOT-23	DBV	3	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI	<a href="#">Samples</a>
TPS3809K33DBVR	ACTIVE	SOT-23	DBV	3	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI	<a href="#">Samples</a>
TPS3809K33DBVRG4	ACTIVE	SOT-23	DBV	3	3000	TBD	Call TI	Call TI	-40 to 85		<a href="#">Samples</a>
TPS3809K33DBVT	ACTIVE	SOT-23	DBV	3	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI	<a href="#">Samples</a>
TPS3809L30DBVR	ACTIVE	SOT-23	DBV	3	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI	<a href="#">Samples</a>
TPS3809L30DBVRG4	ACTIVE	SOT-23	DBV	3	3000	TBD	Call TI	Call TI	-40 to 85		<a href="#">Samples</a>
TPS3809L30DBVT	ACTIVE	SOT-23	DBV	3	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI	<a href="#">Samples</a>

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF TPS3809 :**

- Automotive : [TPS3809-Q1](#)
- Enhanced Product : [TPS3809-EP](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*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
TPS3809I50DBVR	SOT-23	DBV	3	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809I50DBVT	SOT-23	DBV	3	250	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809J25DBVR	SOT-23	DBV	3	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809J25DBVT	SOT-23	DBV	3	250	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809K33DBVR	SOT-23	DBV	3	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809K33DBVT	SOT-23	DBV	3	250	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809L30DBVR	SOT-23	DBV	3	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TPS3809L30DBVT	SOT-23	DBV	3	250	178.0	9.0	3.3	3.2	1.4	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)
TPS3809I50DBVR	SOT-23	DBV	3	3000	180.0	180.0	18.0
TPS3809I50DBVT	SOT-23	DBV	3	250	180.0	180.0	18.0
TPS3809J25DBVR	SOT-23	DBV	3	3000	180.0	180.0	18.0
TPS3809J25DBVT	SOT-23	DBV	3	250	180.0	180.0	18.0
TPS3809K33DBVR	SOT-23	DBV	3	3000	180.0	180.0	18.0
TPS3809K33DBVT	SOT-23	DBV	3	250	180.0	180.0	18.0
TPS3809L30DBVR	SOT-23	DBV	3	3000	180.0	180.0	18.0
TPS3809L30DBVT	SOT-23	DBV	3	250	180.0	180.0	18.0

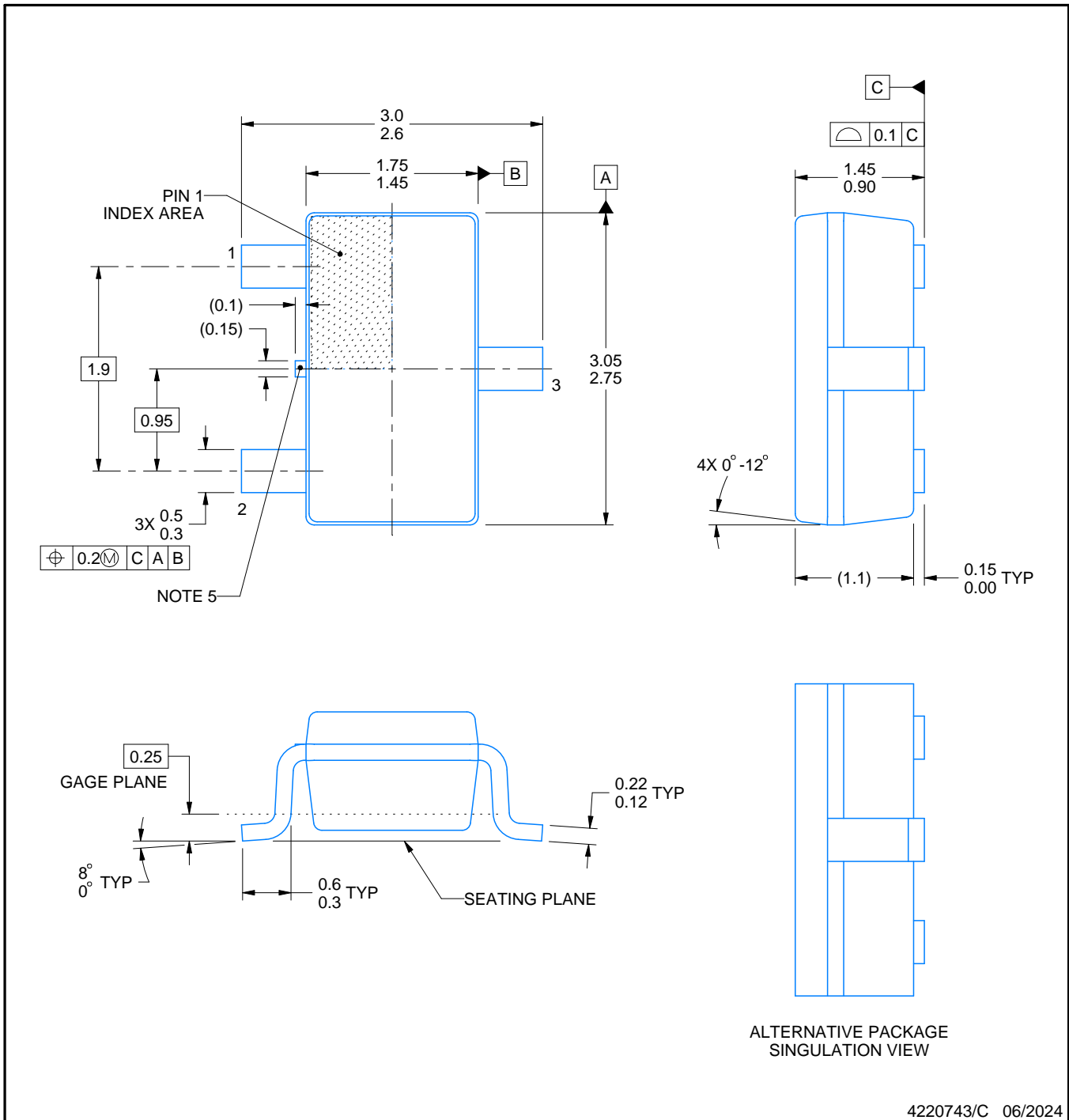
# DBV0003A



# PACKAGE OUTLINE

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



4220743/C 06/2024

## NOTES:

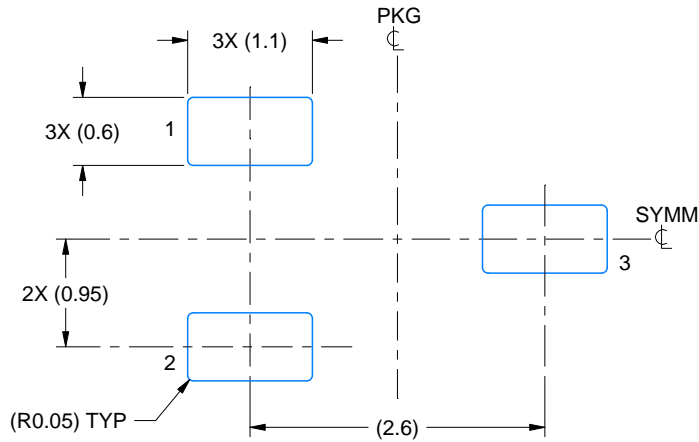
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.

# EXAMPLE BOARD LAYOUT

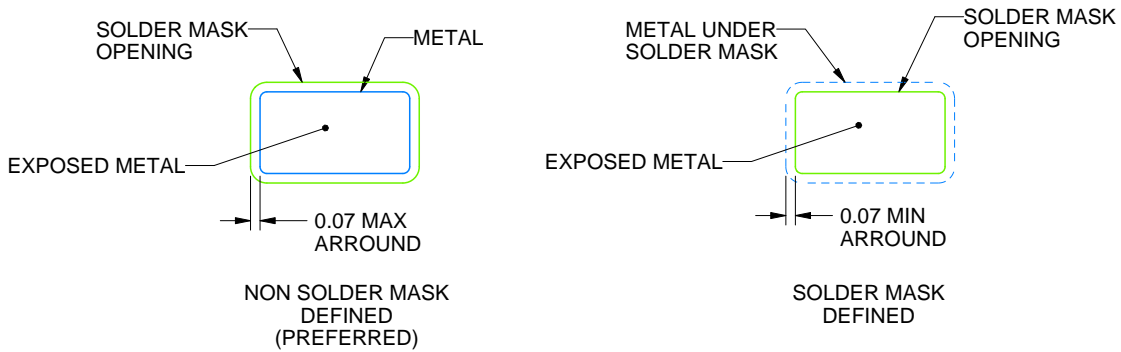
DBV0003A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:15X



SOLDER MASK DETAILS

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NOTES: (continued)

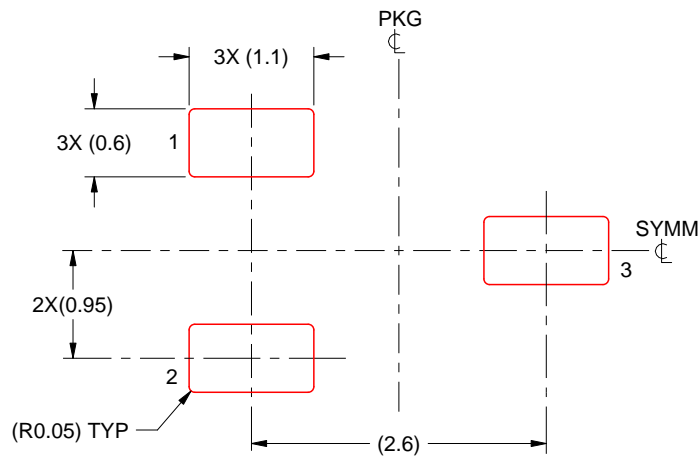
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DBV0003A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:15X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.



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