

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 μ 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。

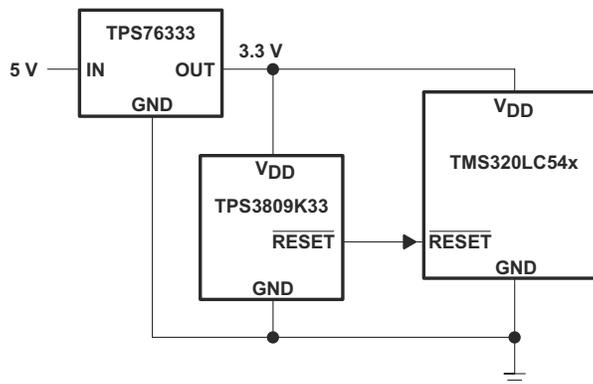
電源投入時には、電源電圧 V_{DD} が 1.1V を上回ると $\overline{\text{RESET}}$ ピンがアサートされます。その後、この電源電圧監視 IC が V_{DD} を監視し、 V_{DD} がスレッショルド電圧 V_{IT} を下回っている間は $\overline{\text{RESET}}$ ピンをアクティブに維持します。内蔵のタイマは、システムを確実に正しくリセットさせるため、出力が非アクティブ状態 (HIGH) に戻るのを遅らせます。この遅延時間 ($t_{d(\text{typ})} = 200 \text{ ms}$) は、 V_{DD} がスレッショルド電圧 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



Table of Contents

1 特長.....	1	7.3 Dissipation Ratings.....	5
2 アプリケーション.....	1	7.4 Electrical Characteristics.....	5
3 概要.....	1	7.5 Timing Requirements.....	6
4 Revision History.....	2	7.6 Switching Characteristics.....	6
5 Device Comparison.....	3	7.7 Timing Diagram.....	6
6 Pin Configuration and Functions.....	4	7.8 Typical Characteristics.....	7
7 Specifications.....	5	8 Detailed Description.....	9
7.1 Absolute Maximum Ratings (1) (2).....	5	9 静電気放電に関する注意事項.....	9
7.2 Recommended Operating Conditions.....	5		

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 _{OL} @ 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 _w pulse duration from 3 to 10μs in <i>Timing Requirements</i>	6
• Changed t _{PHL} 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

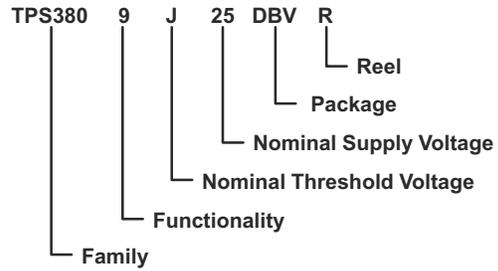
表 5-1. Device Comparison Table

T _A	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 _{DD} >V _{IT}	$\overline{\text{RESET}}$
0	L
1	H

ORDERING INFORMATION



6 Pin Configuration and Functions

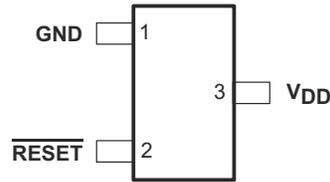


图 6-1. Pin configuration

表 6-1. Pin Functions

PIN		I/O ⁽¹⁾	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 _{DD} is below the threshold voltage. When V _{DD} rises above V _{IT} , there is a delay time (t _d) 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 ⁽¹⁾ ⁽²⁾

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 $V_I > V_{DD}$)	± 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 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	μ 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 $I_{OH} = -500$ μ 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, $I_{OL} = 500$ μ 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 ⁽¹⁾	$V_{DD} \geq 1.1$ V, $I_{OL} = 50$ μ A	0.2			V	
V_{IT-} Negative-going input threshold voltage ⁽²⁾	$T_A = -40^\circ\text{C}$ to 85°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 _{DD} Supply current	V _{DD} = 2 V, output unconnected		9	12	μA
	V _{DD} = 6 V, output unconnected		20	25	
C _i Input capacitance	V _I = 0 V to V _{DD}		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_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

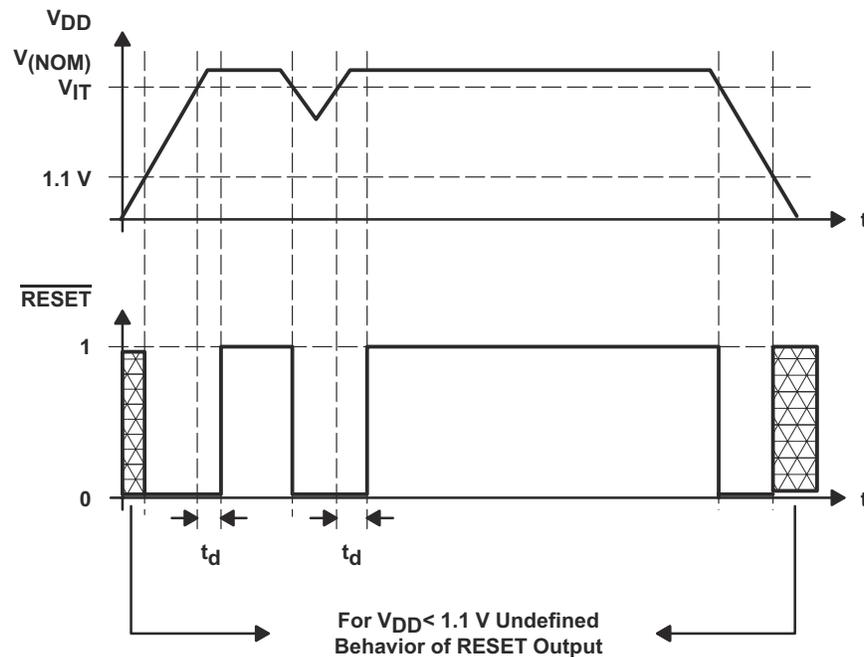
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _w Pulse width at V _{DD}	V _{DD} = V _{IT-} + 0.2 V, V _{DD} = V _{IT-} - 0.2 V	10			μs

7.6 Switching Characteristics

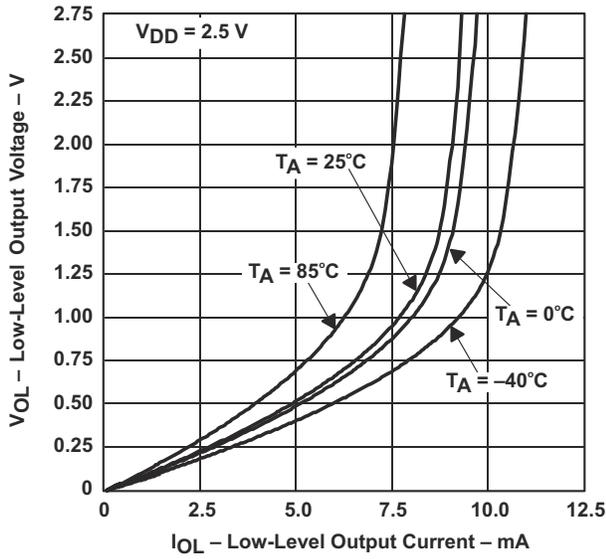
at R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

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		10		μs

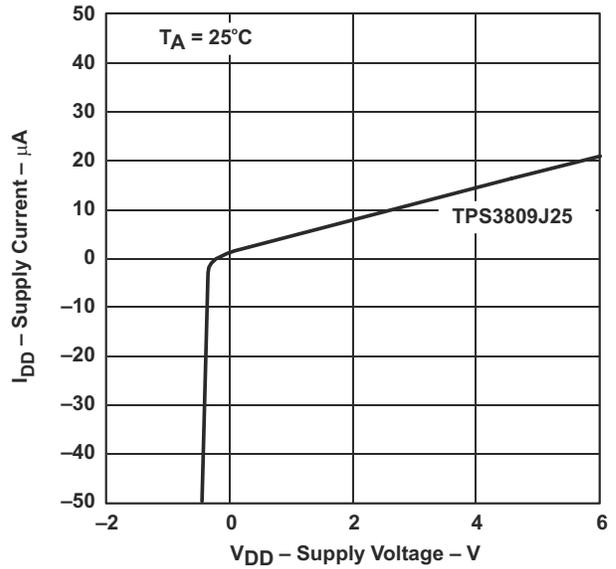
7.7 Timing Diagram



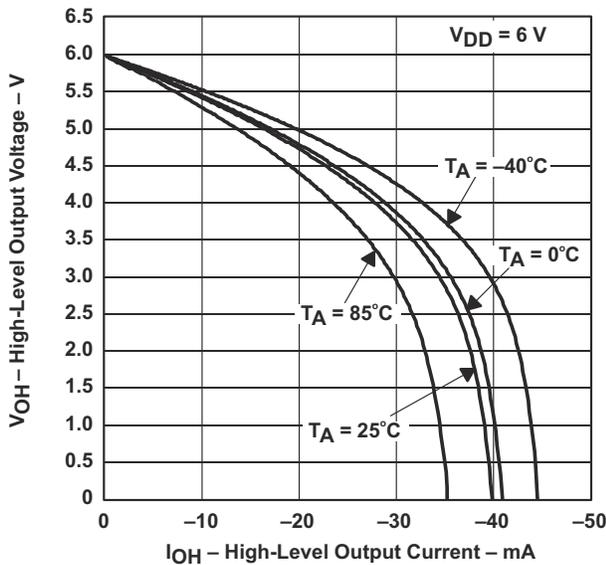
7.8 Typical Characteristics



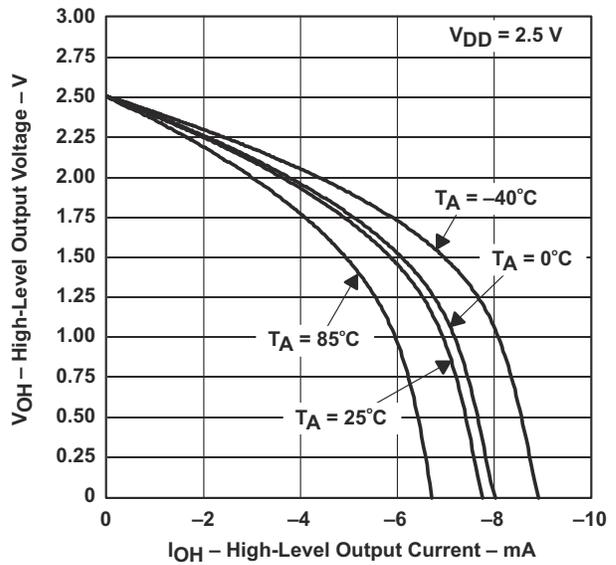

7-1. LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT




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)

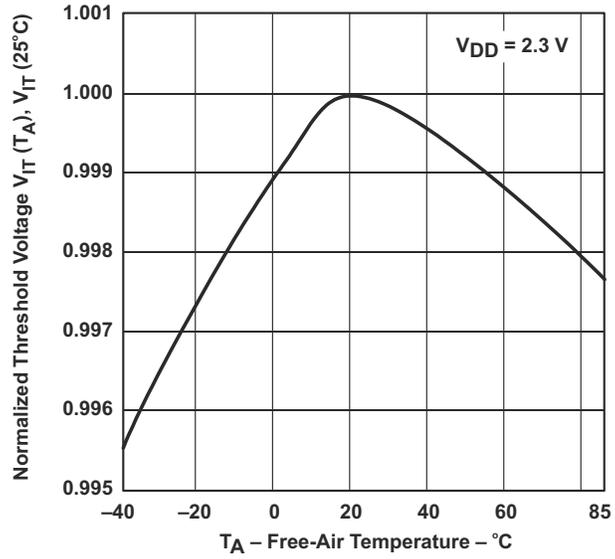
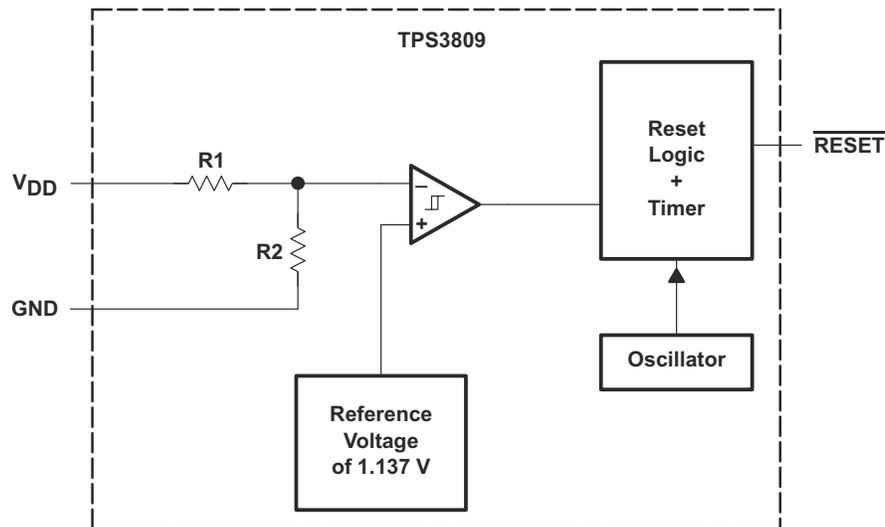


FIG 7-5. NORMALIZED INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE AT $V_{DD}=2.3V$

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 part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TPS3809I50DBVR	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI
TPS3809I50DBVR.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI
TPS3809I50DBVR1G4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI
TPS3809I50DBVR1G4.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI
TPS3809I50DBVRG4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	-	Call TI	Call TI	-40 to 85	
TPS3809I50DBVT	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI
TPS3809I50DBVT.A	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDCI
TPS3809J25DBVR	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI
TPS3809J25DBVR.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI
TPS3809J25DBVRG4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI
TPS3809J25DBVRG4.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI
TPS3809J25DBVT	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI
TPS3809J25DBVT.A	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PCZI
TPS3809K33DBVR	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI
TPS3809K33DBVR.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI
TPS3809K33DBVR1G4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI
TPS3809K33DBVR1G4.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI
TPS3809K33DBVRG4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	-	Call TI	Call TI	-40 to 85	
TPS3809K33DBVT	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI
TPS3809K33DBVT.A	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDBI
TPS3809L30DBVR	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI
TPS3809L30DBVR.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI
TPS3809L30DBVR1G4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI
TPS3809L30DBVR1G4.A	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI
TPS3809L30DBVRG4	Active	Production	SOT-23 (DBV) 3	3000 LARGE T&R	-	Call TI	Call TI	-40 to 85	
TPS3809L30DBVT	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI
TPS3809L30DBVT.A	Active	Production	SOT-23 (DBV) 3	250 SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	PDAI

(1) **Status:** For more details on status, see our [product life cycle](#).

- (2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
- (3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.
- (4) **Lead finish/Ball material:** Parts 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.
- (5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
- (6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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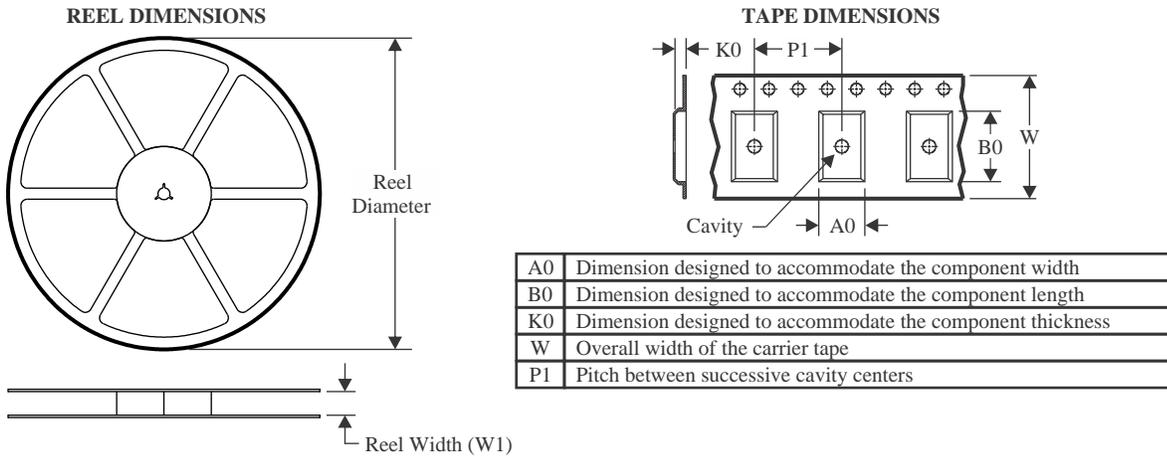
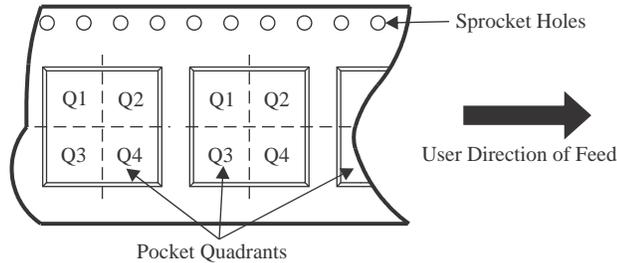
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OTHER QUALIFIED VERSIONS OF TPS3809 :

- 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
TPS3809I50DBVR1G4	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
TPS3809J25DBVRG4	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
TPS3809K33DBVR1G4	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
TPS3809L30DBVR1G4	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
TPS3809I50DBVR1G4	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
TPS3809J25DBVRG4	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
TPS3809K33DBVR1G4	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
TPS3809L30DBVR1G4	SOT-23	DBV	3	3000	180.0	180.0	18.0
TPS3809L30DBVT	SOT-23	DBV	3	250	180.0	180.0	18.0

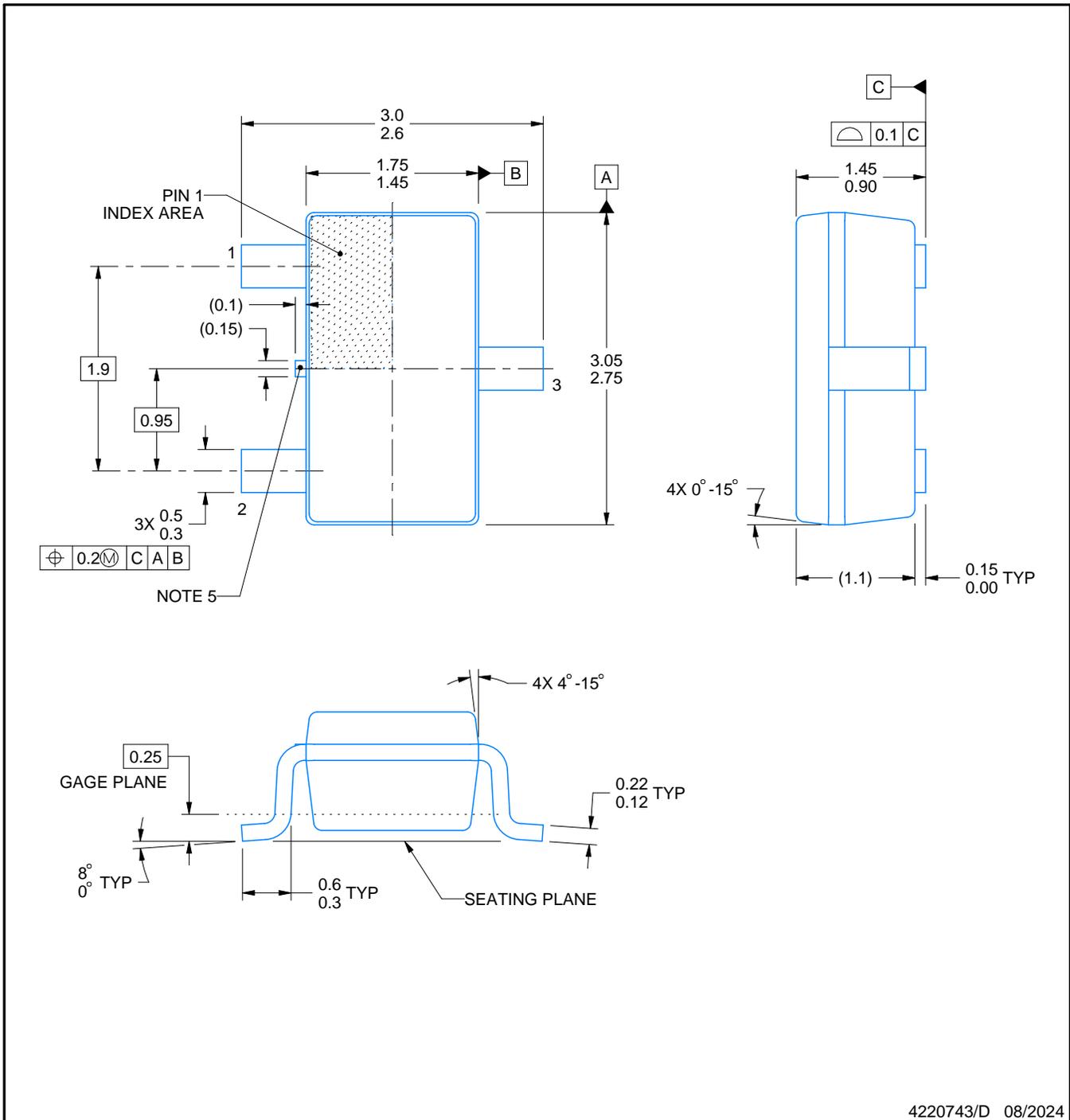
DBV0003A



PACKAGE OUTLINE

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



4220743/D 08/2024

NOTES:

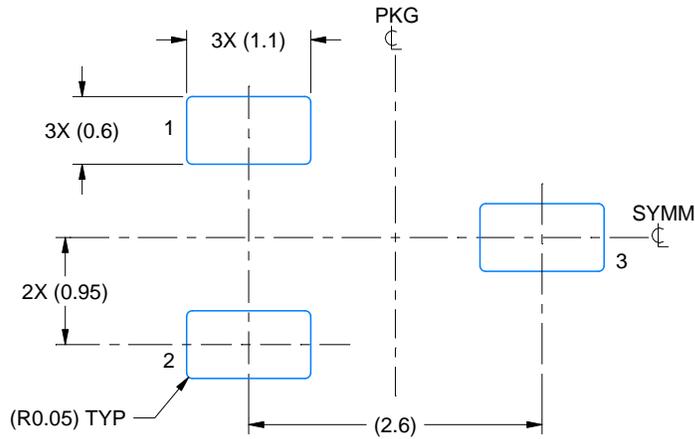
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold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

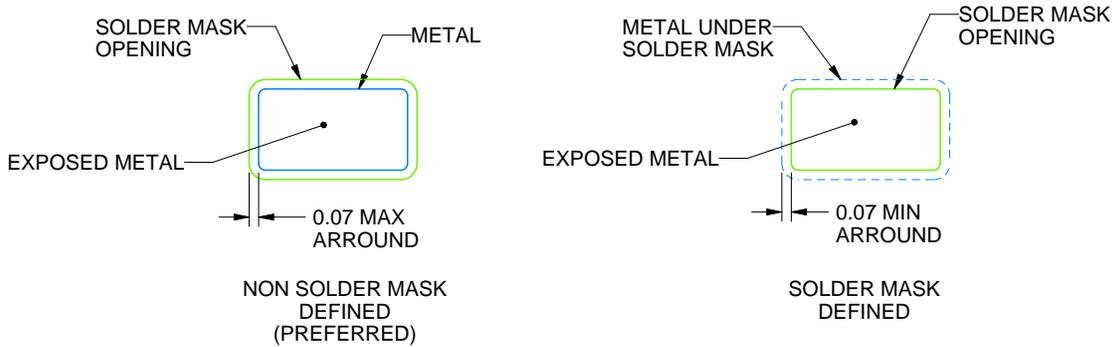
DBV0003A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4220743/D 08/2024

NOTES: (continued)

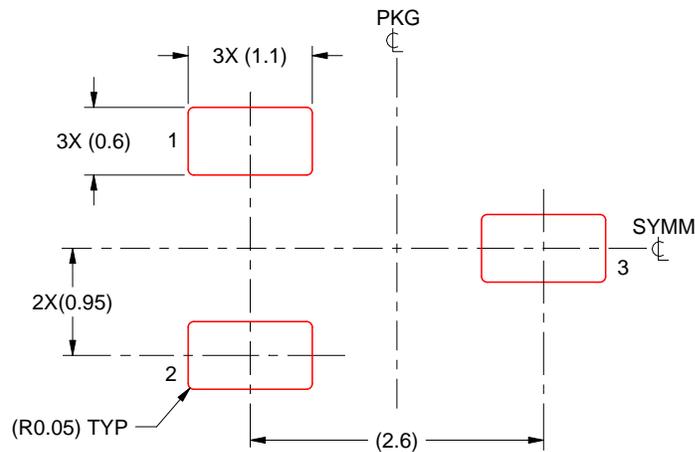
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

4220743/D 08/2024

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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最終更新日：2025 年 10 月