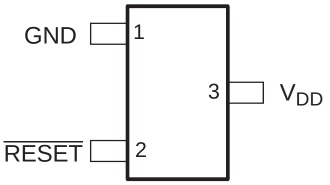
TPS3809L30-EP, TPS3809K33-EP, TPS3809I50-EP
3-PIN SUPPLY VOLTAGE SUPERVISORS

FEATURES

- **Controlled Baseline**
  - **One Assembly Site**
  - **One Test Site**
  - **One Fabrication Site**
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree** (1)
- **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**

DBV PACKAGE
(TOP VIEW)



(1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

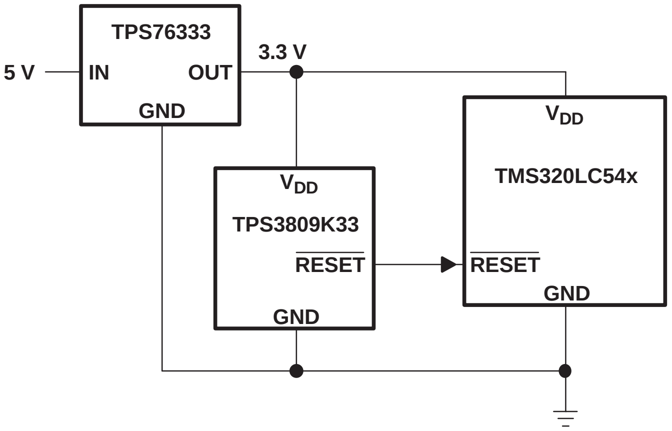
DESCRIPTION

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, $t_{d(typ)}$ = 200 ms, starts after V_{DD} has risen above the V_{IT}. When the supply voltage drops below the V_{IT}, the output becomes active (low) again. No external components are required. All the devices of this family have a fixed-sense 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 package. The TPS3809 devices are characterized for operation over a temperature range of –55°C to 125°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**

AVAILABLE OPTIONS

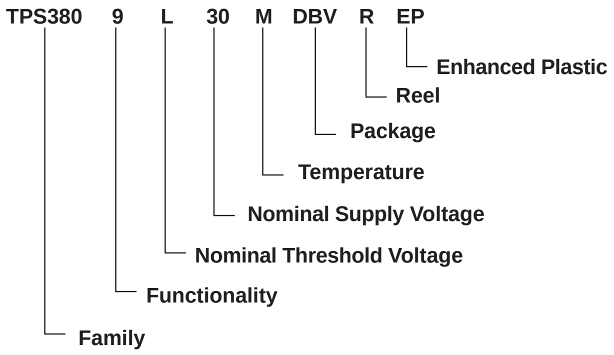
T_A	DEVICE NAME	THRESHOLD VOLTAGE	MARKING
–55°C to 125°C	TPS3809L30MDBVREP (1)	2.64 V	PLYM
	TPS3809K33MDBVREP (1)	2.93 V	PLZM
	TPS3809I50MDBVREP (1)	4.55 V	PMAM

(1) The DBVR passive indicates tape and reel of 3000 parts.

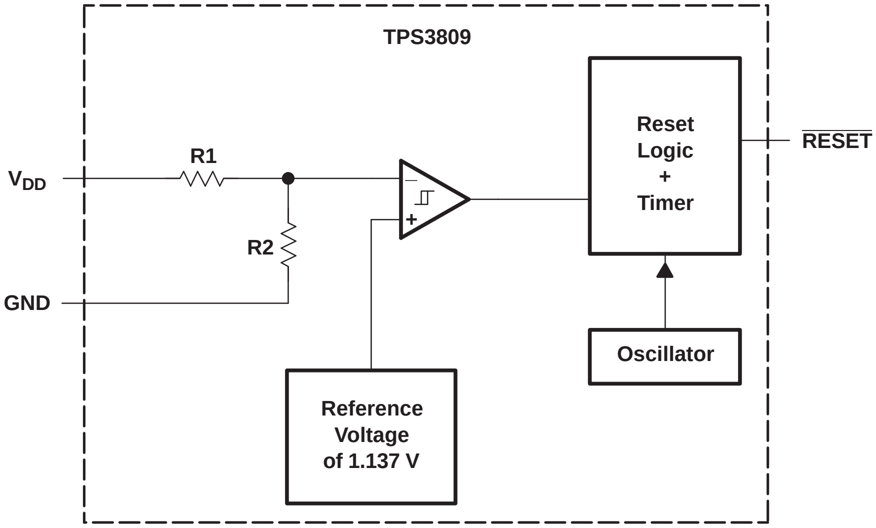
FUNCTION/TRUTH TABLE

$V_{DD} > V_{IT}$	$\overline{\text{RESET}}$
0	L
1	H

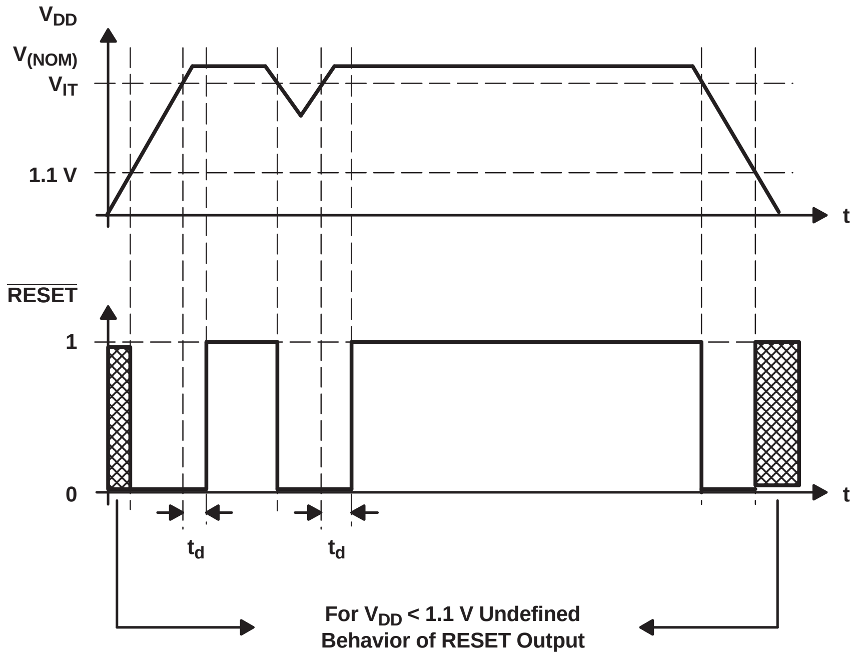
ORDERING INFORMATION



FUNCTIONAL BLOCK DIAGRAM



TIMING DIAGRAM



Absolute Maximum Ratings(1)

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

			MIN	MAX	UNIT
	Supply voltage(2)	V_{DD}		7	V
		All other pins	–0.3	7	
I_{OL}	Maximum low output current			5	mA
I_{OH}	Maximum high output current			–5	mA
I_{IK}	Input clamp current	$V_I < 0$ or $V_I > V_{DD}$		±20	mA
I_{OK}	Output clamp current	$V_O < 0$ or $V_O > V_{DD}$		±20	mA
	Continuous total power dissipation		See Dissipation Rating Table		
T_A	Operating free-air temperature range		–55	125	°C
T_{stg}	Storage temperature range		–65	150	°C
	Soldering temperature			260	°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 7 V for more than t = 1000h continuously.

Dissipation Ratings

PACKAGE	$T_A < 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING
DBV	437 mW	3.5 mW/°C	280 mW	227 mW

Recommended Operating Conditions

		MIN	MAX	UNIT
V_{DD}	Supply voltage	2	6	V
T_A	Operating free-air temperature	–55	125	°C

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	V_{DD} – 0.4			
			V_{DD} = 6 V, I_{OH} = –4 mA, 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(1)		$V_{DD} \geq$ 1.1 V, I_{OL} = 50 µA			0.2	V
V_{IT-}	Negative-going input threshold voltage(2)	TPS3809L30		2.58	2.64	2.7	V
		TPS3809K33		2.87	2.93	2.99	
		TPS3809I50		4.45	4.55	4.65	
V_{hys}	Hysteresis	TPS3809L30			35		mV
		TPS3809K33			40		
		TPS3809I50			60		
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 $\overline{\text{RESET}}$ becomes active. t_r, $V_{DD} \geq$ 15 µs/V.
(2) To ensure best stability of the threshold voltage, a bypass capacitor (0.1-µF ceramic) should be placed near the supply terminals.

Timing Requirements

R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	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

R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_d	Delay time		$V_{DD} \geq V_{IT-} + 0.2$ V, See timing diagram	120	200	280	ms
t_{PHL}	Propagation (delay) time, high- to low-level output	V_{DD} to $\overline{\text{RESET}}$ delay	$V_{IL} = V_{IT-} - 0.2$ V, $V_{IH} = V_{IT-} + 0.2$ V		1		ms

TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

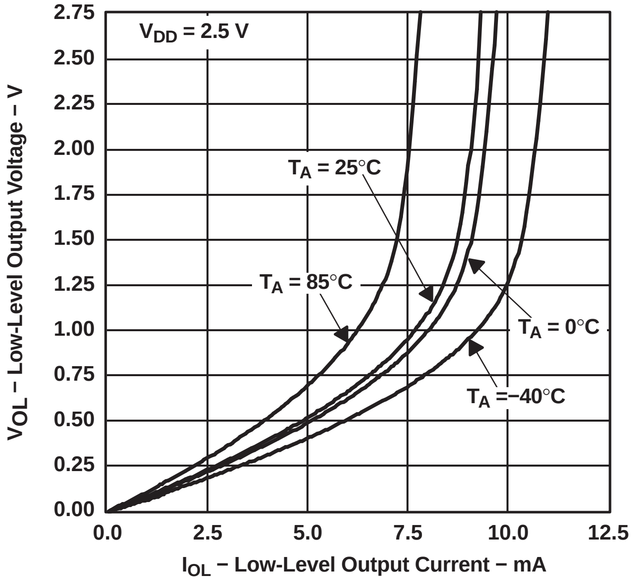


Figure 1.

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

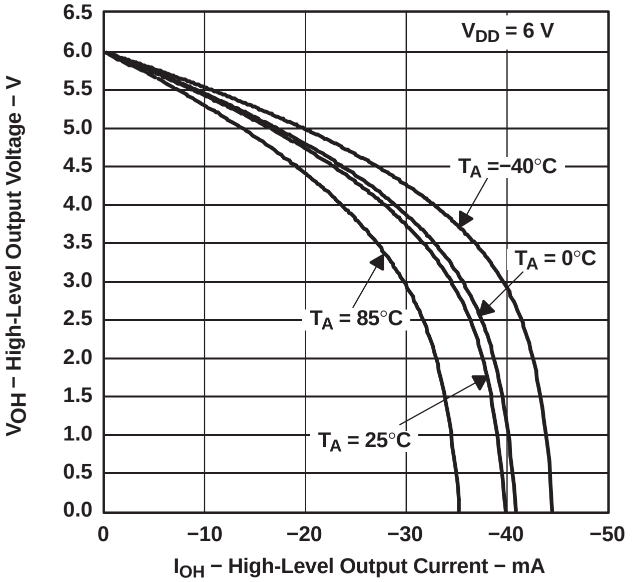


Figure 2.

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

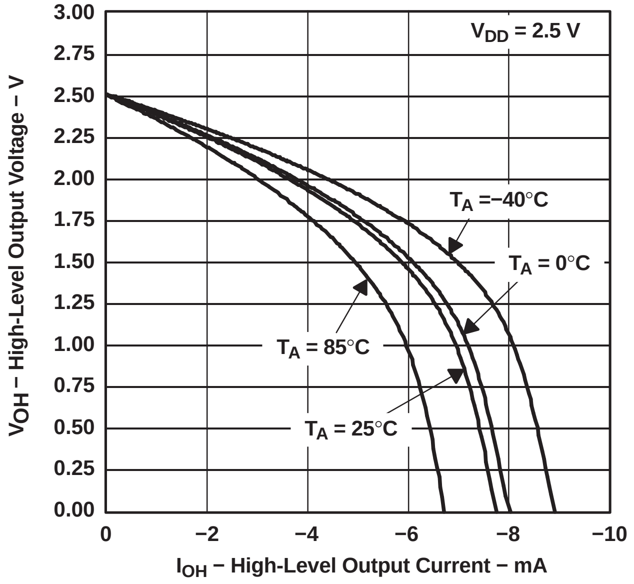


Figure 3.

NORMALIZED INPUT THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE AT V_{DD}

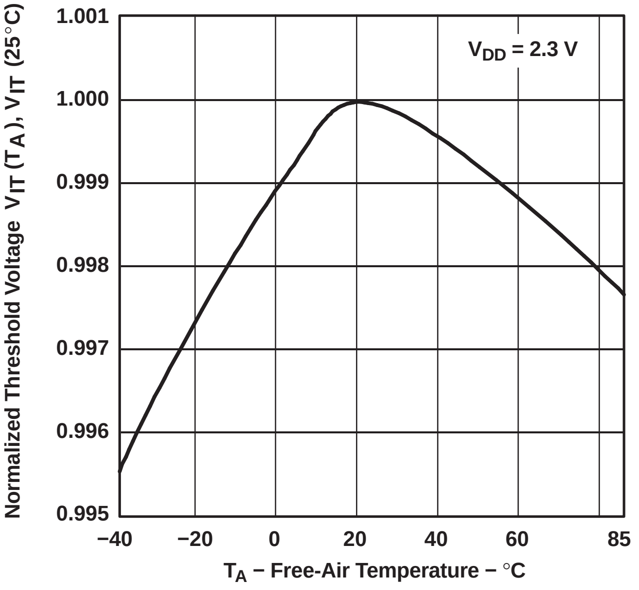


Figure 4.

TYPICAL CHARACTERISTICS (continued)

MINIMUM PULSE DURATION AT V_{DD}
vs
V_{DD} THRESHOLD OVERDRIVE VOLTAGE

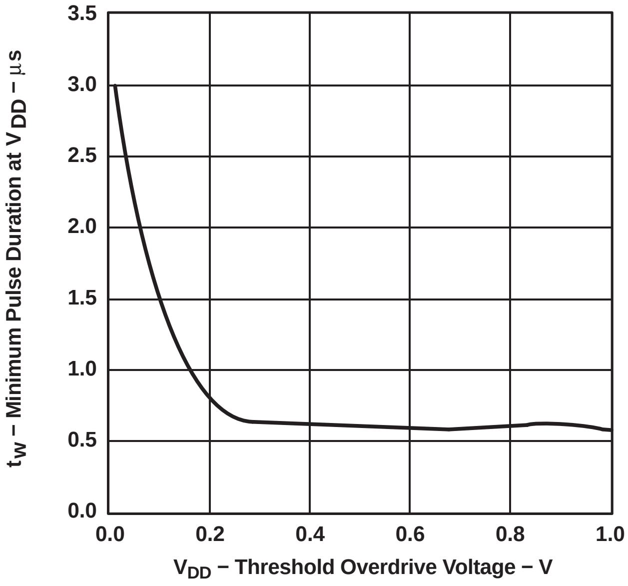


Figure 5.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS3809I50MDBVREP	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	PMAM	Samples
TPS3809K33MDBVREP	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	PLZM	Samples
TPS3809L30MDBVREP	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	PLYM	Samples
V62/06636-01XE	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	PLYM	Samples
V62/06636-02XE	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	PLZM	Samples
V62/06636-03XE	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	PMAM	Samples

(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 - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), 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.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
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)

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

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OTHER QUALIFIED VERSIONS OF TPS3809-EP, TPS3809I50-EP, TPS3809K33-EP, TPS3809L30-EP :

- Catalog: TPS3809I50, TPS3809K33, TPS3809L30

- Automotive: TPS3809-Q1, TPS3809I50-Q1, TPS3809K33-Q1, TPS3809L30-Q1

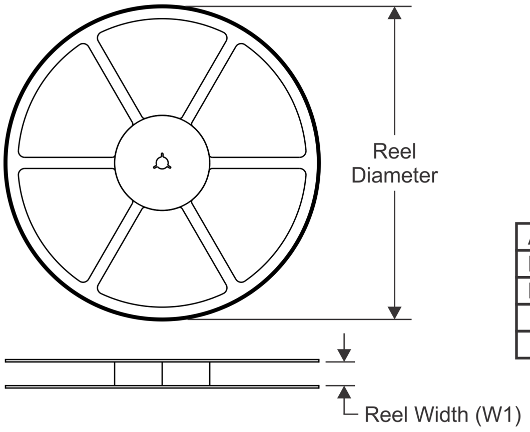
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

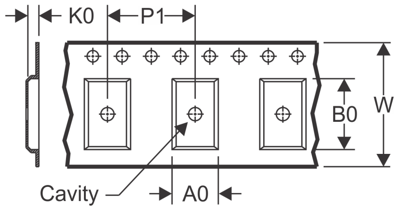
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

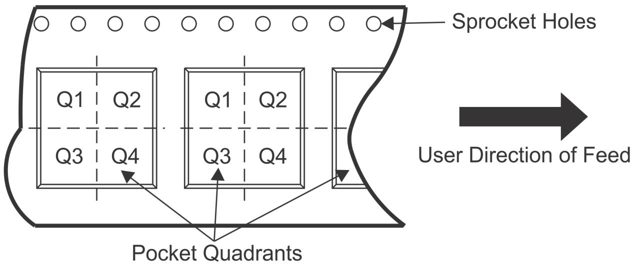


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

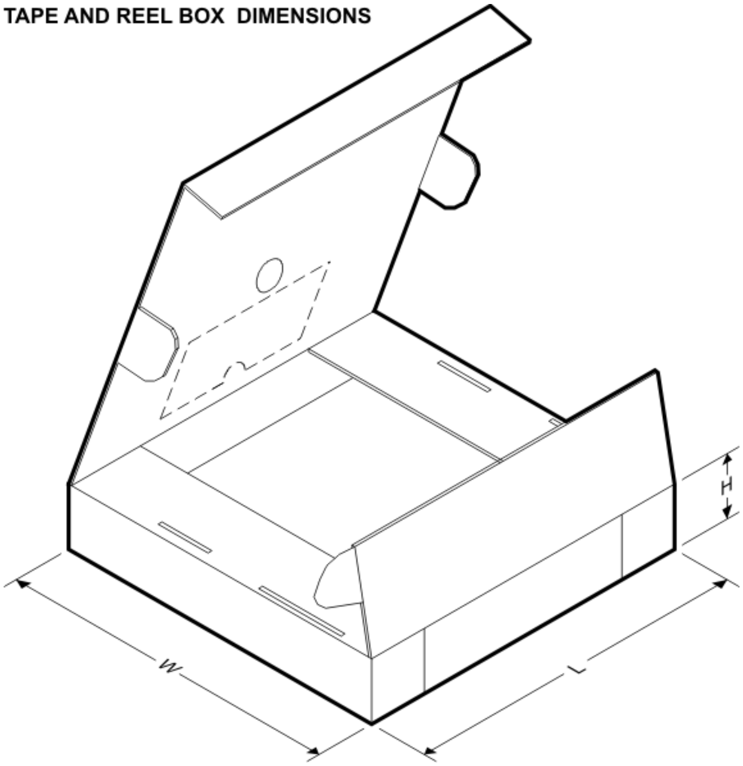
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TPS3809I50MDBVREP	SOT-23	DBV	3	3000	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TPS3809K33MDBVREP	SOT-23	DBV	3	3000	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TPS3809L30MDBVREP	SOT-23	DBV	3	3000	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3

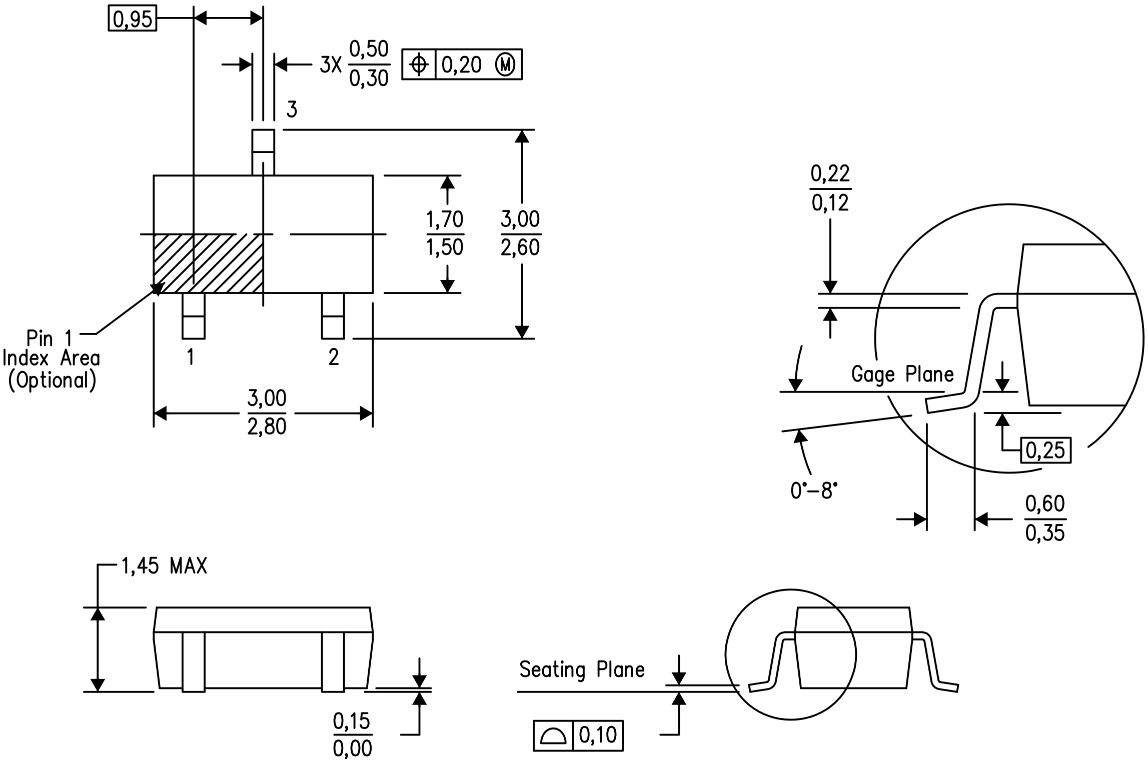
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3809I50MDBVREP	SOT-23	DBV	3	3000	182.0	182.0	20.0
TPS3809K33MDBVREP	SOT-23	DBV	3	3000	182.0	182.0	20.0
TPS3809L30MDBVREP	SOT-23	DBV	3	3000	182.0	182.0	20.0

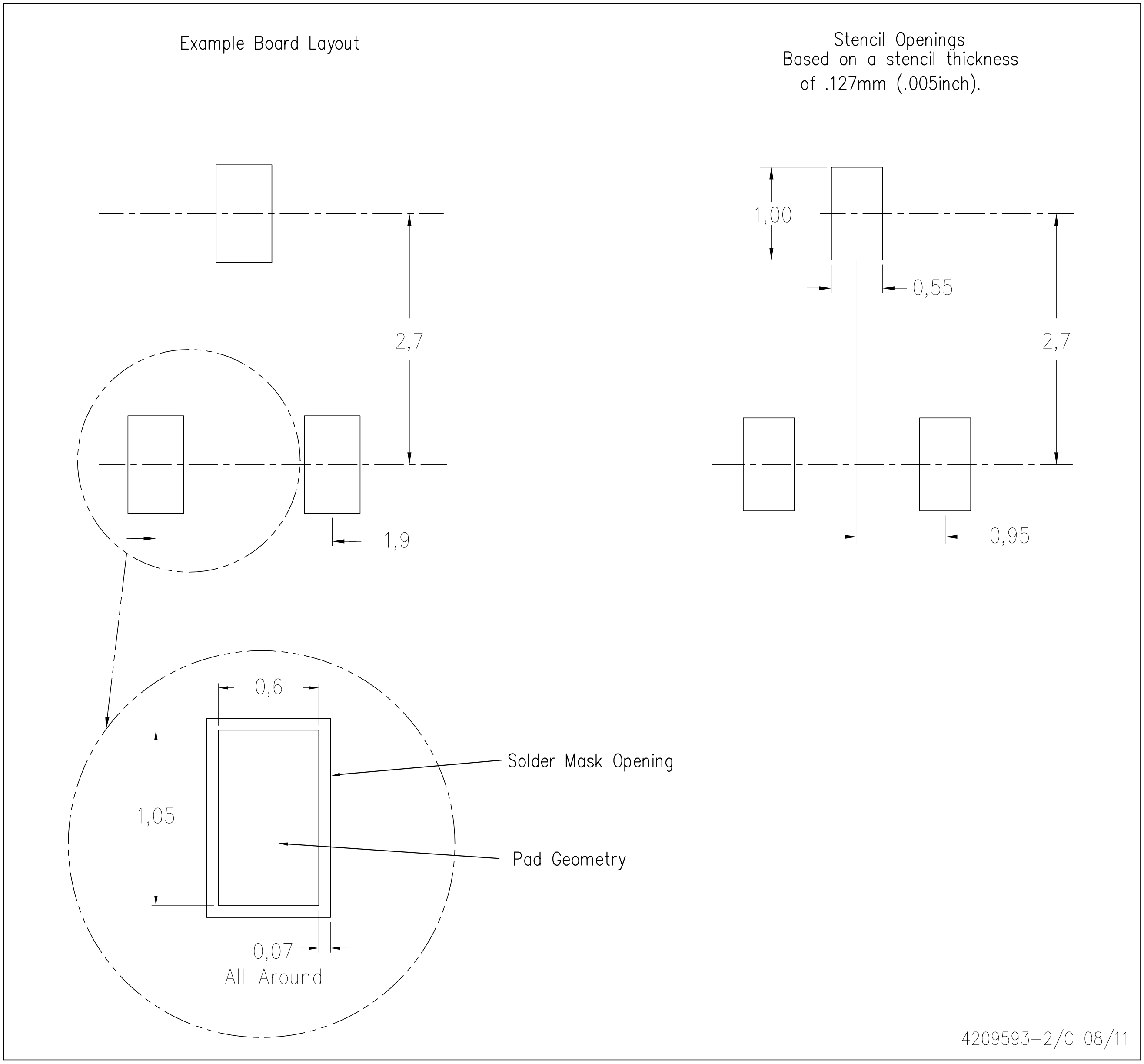
DBV (R–PDSO–G3) PLASTIC SMALL–OUTLINE PACKAGE



4073253–2/N 12/14

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. Mold flash and protrusion shall not exceed 0.15 per side.

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. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- D. Publication IPC–7351 is recommended for alternate designs.
- E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC–7525 for other stencil recommendations.

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