Ultralow Power, Supply Voltage Supervisor

Check for Samples: TPS3831, TPS3839

FEATURES

- **Ultralow Supply Current: 150 nA (typ)**
- **Operating Supply Voltage: 0.6 V to 6.5 V**
- **Valid Reset for V_{DD} > 0.6 V**
- **Push-Pull $\overline{\text{RESET}}$ Output**
- **Factory-Trimmed Reset Threshold Voltages**
- **Temperature Range: –40°C to +85°C**
- **Packages: 1-mm × 1-mm X2SON or 3-Pin SOT23**

APPLICATIONS

- **Portable and Battery-Powered Equipment**
- **Industrial Equipment**
- **Cell Phones**
- **Glucose Monitors**
- **Metering**
- **Televisions**

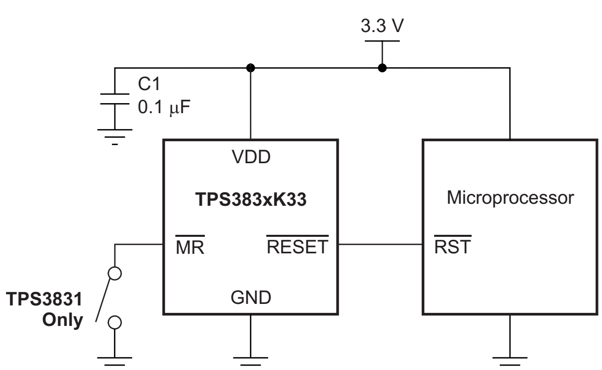
DESCRIPTION

The TPS3831 and TPS3839 (both referred to as the TPS383x) are ultralow current (150 nA, typical), voltage supervisory circuit that monitor a single voltage. Both devices assert an active-low reset signal whenever the V_{DD} supply voltage drops below the factory-trimmed reset threshold voltage. The reset output remains asserted for 200 ms (typical) after the V_{DD} voltage rises above the threshold voltage. These devices are designed to ignore fast transients on the V_{DD} pin. Note that the TPS3831 includes a manual reset input.

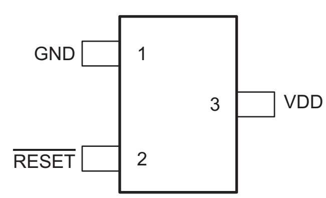
The ultralow current consumption of 150 nA makes these voltage supervisors ideal for use in low-power and portable applications. The TPS383x are specified to have the correct output logic state for supply voltages down to 0.6 V.

The TPS383x feature precision factory-trimmed threshold voltages and extremely low-power operation. The TPS3831 is available is a 4-pin 1-mm × 1-mm (DQN) X2SON package. The TPS3839 is available in a 3-pin SOT23 (DBZ) package or a 4-pin 1-mm × 1-mm (DQN) X2SON package.

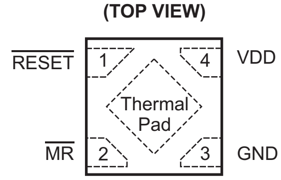
TYPICAL APPLICATION



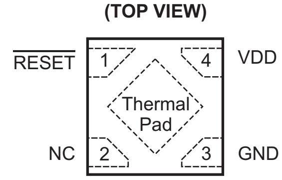
**DBZ PACKAGE
SOT23-3
(TOP VIEW)**



**TPS3831
DQN PACKAGE
1-mm × 1-mm X2SON
(TOP VIEW)**



**TPS3839
DQN PACKAGE
1-mm × 1-mm X2SON
(TOP VIEW)**



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

PACKAGE INFORMATION(1)

PRODUCT	THRESHOLD VOLTAGE (V)	PACKAGE-LEAD	PACKAGE DESIGNATOR
TPS3831A09	0.900	X2SON-4	DQN
TPS3831G12	1.100	X2SON-4	DQN
TPS3831E16	1.520	X2SON-4	DQN
TPS3831G18	1.670	X2SON-4	DQN
TPS3831L30	2.630	X2SON-4	DQN
TPS3831K33	2.930	X2SON-4	DQN
TPS3831G33	3.080	X2SON-4	DQN
TPS3831K50	4.380	X2SON-4	DQN
TPS3839A09	0.900	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839G12	1.100	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839E16	1.520	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839G18	1.670	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839L30	2.630	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839K33	2.930	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839G33	3.080	SOT23-3	DBZ
		X2SON-4	DQN
TPS3839K50	4.380	SOT23-3	DBZ
		X2SON-4	DQN

(1) For the most current package and ordering information see the Package Option Addendum at the end of this document, or visit the device product folder at www.ti.com.

ABSOLUTE MAXIMUM RATINGS(1)

Over operating free-air temperature range, unless otherwise noted.

		VALUE		UNIT
		MIN	MAX	
Voltage	VDD	–0.3	7	V
	On $\overline{\text{RESET}}$	–0.3	7	V
Current	RESET pin		10	mA
Temperature(2)	Operating ambient, T_A	–40	+85	°C
	Storage, T_{stg}	–65	+150	°C
Electrostatic discharge (ESD) rating:	Human body model (HBM)		2	kV
	Charge device model (CDM)		500	V

(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 my affect device reliability.
(2) As a result of the low dissipated power in this device, it is assumed that the junction temperature is equal to the ambient temperature.

THERMAL INFORMATION

THERMAL METRIC(1)		TPS3839 DBZ (SOT23-3) 3 PINS	TPS3831 TPS3839 DQN (X2SON) 4 PINS	UNITS
θ_{JA}	Junction-to-ambient thermal resistance	286.9	249.9	°C/W
θ_{JCtop}	Junction-to-case (top) thermal resistance	105.6	N/A	
θ_{JB}	Junction-to-board thermal resistance	123.4	N/A	
ψ_{JT}	Junction-to-top characterization parameter	25.8	6.0	
ψ_{JB}	Junction-to-board characterization parameter	107.9	N/A	
θ_{JCbot}	Junction-to-case (bottom) thermal resistance	N/A	N/A	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, SPRA953.

ELECTRICAL CHARACTERISTICS

At T_A = –40°C to +85°C, 0.9 V < V_{DD} < 6.5 V, and C1 = 0.1 µF, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{DD}	Input supply voltage range		0.9		6.5	V
$V_{(VO)}$	Minimum V_{DD} voltage for valid output	I_{OL} = 1 µA			0.6	V
I_{DD}	Supply current (into VDD pin)	Output not connected		150	500	nA
V_{OL}	Low-level output voltage ($\overline{RESET}$ pin)	V_{DD} = 0.9 V to 1.2 V, I_{OL} = 120 µA			0.4	V
		V_{DD} = 1.2 V to 2.8 V, I_{OL} = 0.5 mA			0.4	V
		V_{DD} = 2.8 V to 6.5 V, I_{OL} = 2 mA			0.4	V
V_{OH}	High-level output voltage ($\overline{RESET}$ pin)	V_{DD} = 0.9 V to 1.2 V, I_{OH} = –50 µA	V_{DD} – 0.4			V
		V_{DD} = 1.2 V to 3.3 V, I_{OH} = –0.5 mA	V_{DD} – 0.4			V
		V_{DD} = 3.3 V to 6.5 V, I_{OH} = –2 mA	V_{DD} – 0.4			V
V_{IL}	Low-level input voltage ($\overline{MR}$ pin)		$0.3V_{DD}$			V
V_{IH}	High-level input voltage ($\overline{MR}$ pin)				$0.7V_{DD}$	V
R_{MR}	MR pin pull-up resistance		10	20	30	kΩ
	Negative-going input threshold accuracy	T_A = +25°C		±1.0%		
V_{IT-}	Negative-going threshold voltage	TPS3839A09	0.874	0.900	0.914	V
		TPS3839G12	1.073	1.100	1.117	V
		TPS3839E16	1.482	1.520	1.543	V
		TPS3839G18	1.628	1.670	1.695	V
		TPS3839L30	2.564	2.630	2.669	V
		TPS3839K33	2.857	2.930	2.974	V
		TPS3839G33	3.003	3.080	3.126	V
		TPS3839K50	4.271	4.380	4.446	V
V_{hys}	Hysteresis voltage	TPS3839A09		54		mV
		TPS3839G12		11		mV
		TPS3839E16		15		mV
		TPS3839G18		17		mV
		TPS3839L30		26		mV
		TPS3839K33		29		mV
		TPS3839G33		31		mV
		TPS3839K50		44		mV

TIMING REQUIREMENTS

PARAMETER		MIN	TYP	MAX	UNIT
t_d	$\overline{\text{RESET}}$ delay time (power-up delay)	120	200	350	ms
t_{pd_vdd}	Propagation delay, V_{DD} falling (power-down delay)		20		µs
t_{pd_mr}	Propagation delay from $\overline{\text{MR}}$ low to $\overline{\text{RESET}}$ low		46		ns

TIMING DIAGRAM

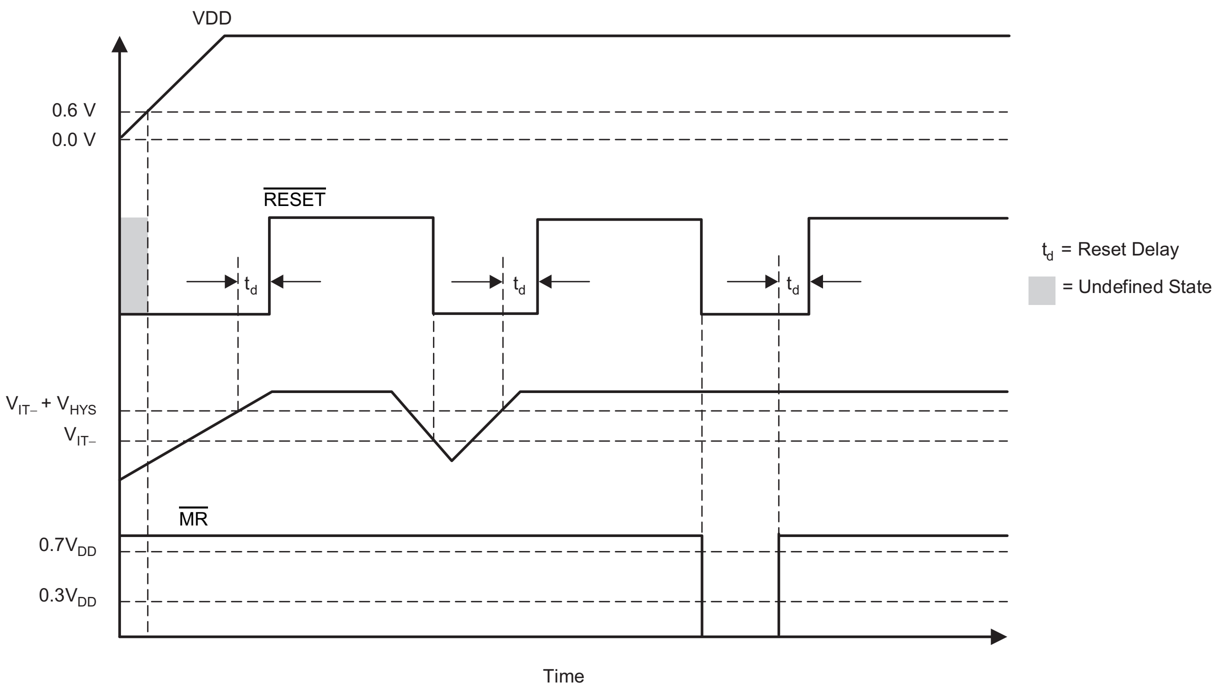
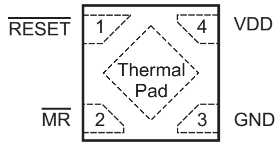


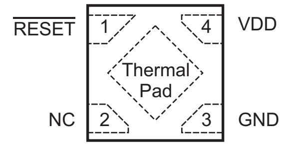
Figure 1. $\overline{\text{MR}}$ and V_{DD} Reset Timing

PIN CONFIGURATIONS

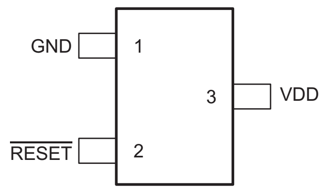
TPS3831 DQN PACKAGE
1-mm × 1-mm X2SON
(TOP VIEW)



TPS3839 DQN PACKAGE
1-mm × 1-mm X2SON
(TOP VIEW)



TPS3839 DBZ PACKAGE
SOT23-3
(TOP VIEW)



PIN ASSIGNMENTS

NAME	PIN NUMBER			DESCRIPTION
	TPS3839DBZ	TPS3839DQN	TPS3831DQN	
GND	1	3	3	Ground
$\overline{\text{MR}}$	N/A	N/A	2	Manual reset. Pull this pin to a logic low to assert the $\overline{\text{RESET}}$ output. After the $\overline{\text{MR}}$ pin is deasserted, the $\overline{\text{RESET}}$ output deasserts after the reset delay (t_d) elapses.
NC	N/A	2	N/A	No internal connection.
$\overline{\text{RESET}}$	2	1	1	Active-low reset output. $\overline{\text{RESET}}$ has a push-pull output drive and is capable of directly driving input pins. $\overline{\text{RESET}}$ is low as long as V_{DD} remains below the factory threshold voltage, and until the delay time (t_D) elapses after V_{DD} rises above the threshold voltage.
Thermal pad	N/A	Available	Available	Connect to ground or floating copper plane for mechanical stability.
VDD	3	4	4	Supply voltage

DEVICE INFORMATION

FUNCTIONAL BLOCK DIAGRAM

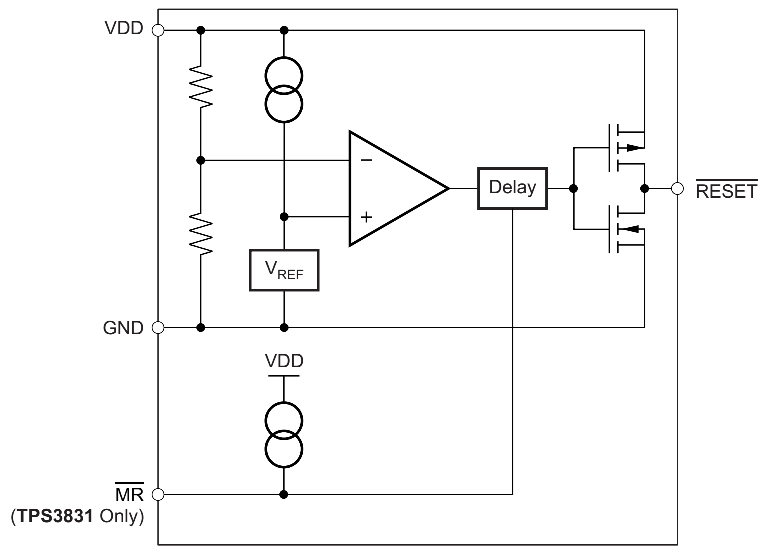


Figure 2. TPS383x Block Diagram

APPLICATION CIRCUIT

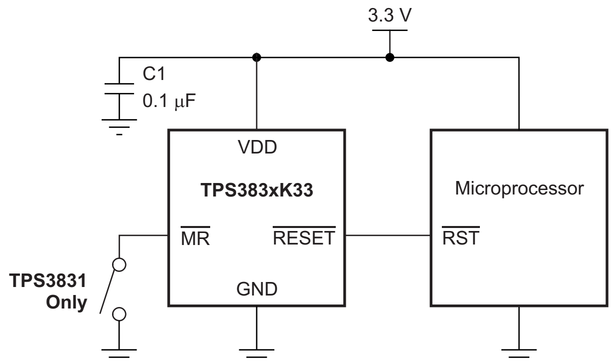


Figure 3. Typical Application Circuit

TYPICAL CHARACTERISTICS

At T_A = +25°C and C_1 = 0.1 µF, unless otherwise noted.

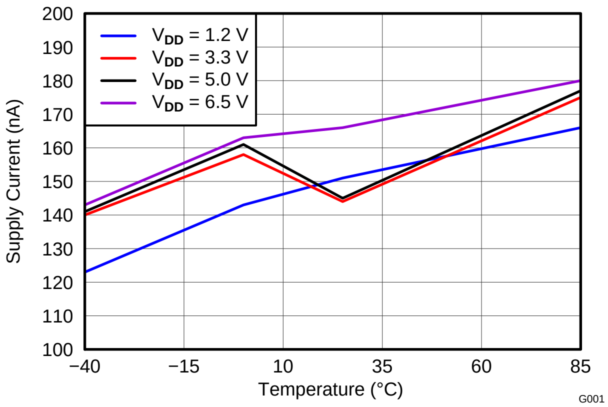


Figure 4. SUPPLY CURRENT vs INPUT VOLTAGE AND TEMPERATURE

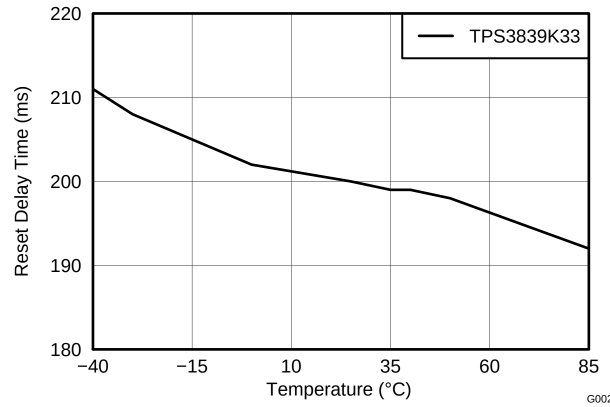


Figure 5. RESET DELAY vs TEMPERATURE

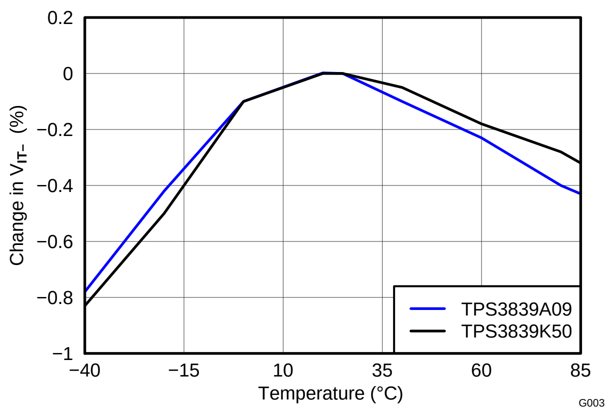


Figure 6. PERCENTAGE CHANGE IN THRESHOLD VOLTAGE vs TEMPERATURE

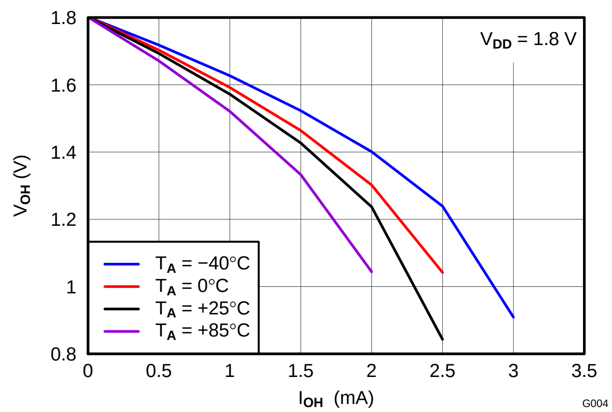


Figure 7. V_{OH} vs I_{OH} AND TEMPERATURE FOR V_{DD} = 1.8 V

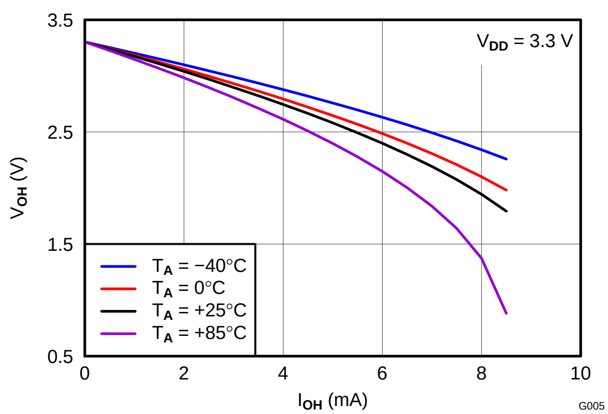


Figure 8. V_{OH} vs I_{OH} AND TEMPERATURE FOR V_{DD} = 3.3 V

vs

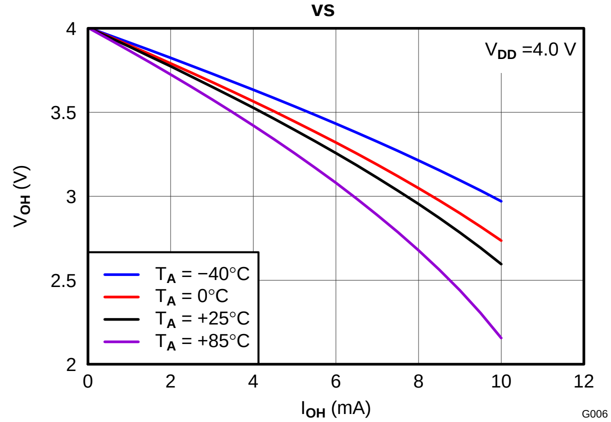


Figure 9. V_{OH} vs I_{OH} AND TEMPERATURE FOR V_{DD} = 4.0 V

TYPICAL CHARACTERISTICS (continued)

At T_A = +25°C and C_1 = 0.1 µF, unless otherwise noted.

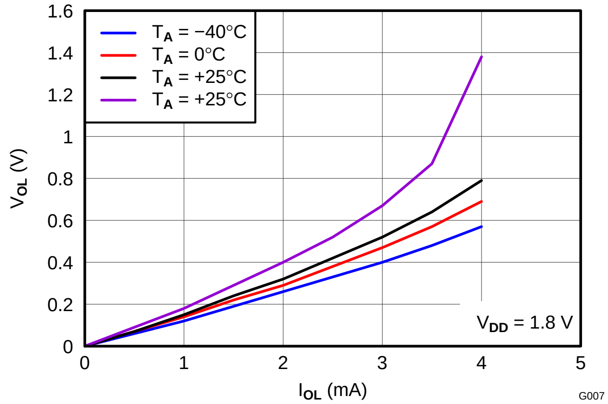


Figure 10. V_{OL} vs I_{OL} AND TEMPERATURE FOR V_{DD} = 1.8 V

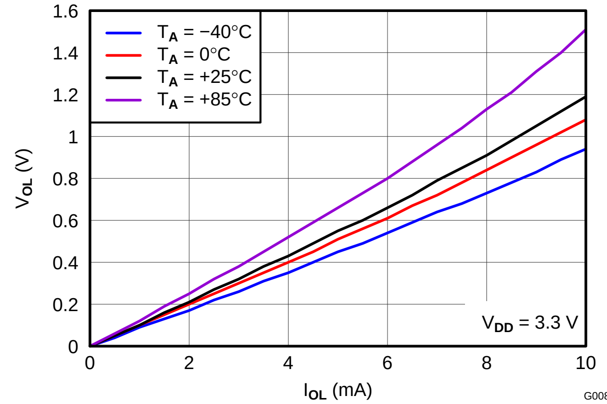


Figure 11. V_{OL} vs I_{OL} AND TEMPERATURE FOR V_{DD} = 3.3 V

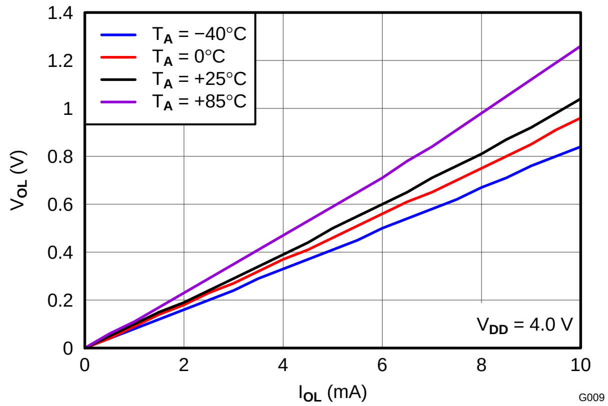


Figure 12. V_{OL} vs I_{OL} AND TEMPERATURE FOR V_{DD} = 4.0 V

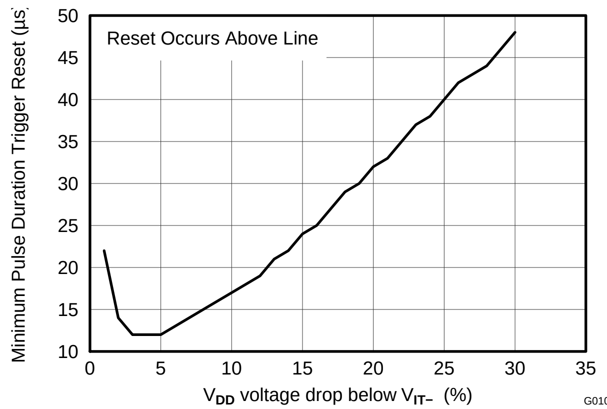


Figure 13. MAXIMUM PULSE DURATION vs PERCENT OF THRESHOLD OVERDRIVE

APPLICATION INFORMATION

VDD TRANSIENT REJECTION

The TPS383x (TPS3831 and TPS3839) has built-in rejection of fast transients on the VDD pin. Transient rejection depends on both the duration and amplitude of the transient. Transient amplitude is measured from the bottom of the transient to the negative threshold voltage ($V_{IT–}$) of the device, as shown in Figure 14.

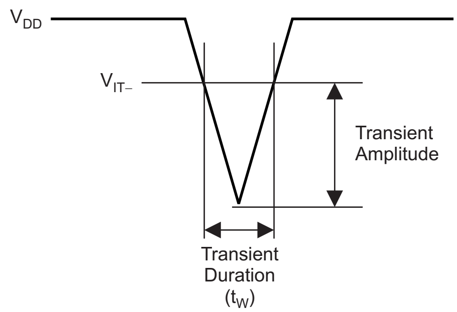


Figure 14. Voltage Transient Measurement

Figure 15 shows the relationship between the transient amplitude and duration required to trigger a reset. Any combination of duration and amplitude greater than that shown in Figure 15 generates a reset signal.

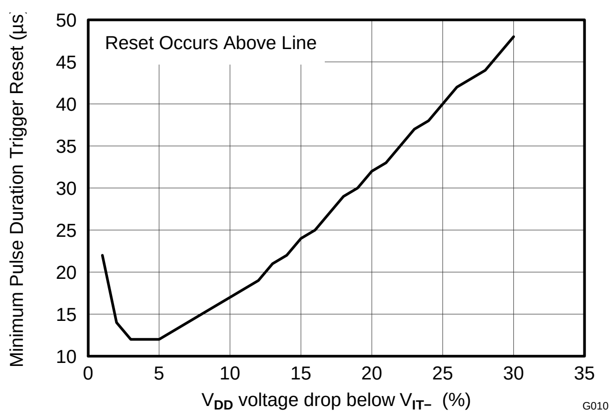


Figure 15. TPS3839 Transient Rejection

INPUT CAPACITOR

The TPS383x uses a unique sampling scheme to maintain an extremely low average quiescent current of 150 nA. The TPS383x typically consumes only about 100 nA of dc current. However, this current rises to approximately 15 µA for around 200 µs while the TPS383x samples the input voltage. If the source impedance back to the supply voltage is high, then the additional current during sampling may trigger a false reset as a result of the apparent voltage drop at VDD. For high VDD source or trace impedance applications, it is recommended to add a small 0.1-µF bypass capacitor near the TPS3839 VDD pin. This bypass capacitor effectively keeps the average current at 150 nA and reduces the effects of a high-impedance voltage source.

MANUAL RESET ($\overline{\text{MR}}$) INPUT (TPS3831 Only)

The manual reset ($\overline{\text{MR}}$) input allows a processor, or other logic devices, to initiate a reset (TPS3831 only). A logic low (0.3 V_{DD}) on $\overline{\text{MR}}$ causes $\overline{\text{RESET}}$ to assert. After $\overline{\text{MR}}$ returns to a logic high and V_{DD} is greater than the threshold voltage, $\overline{\text{RESET}}$ is deasserted after the reset delay time, t_d, elapses. Note that $\overline{\text{MR}}$ is internally tied to VDD with a 20-kΩ resistor; therefore, this pin can be left unconnected if $\overline{\text{MR}}$ is not used. If a logic signal driving $\overline{\text{MR}}$ does not go fully to VDD, there will be some additional current draw into VDD as a result of the internal pull-up resistor on $\overline{\text{MR}}$. To minimize current draw, a logic-level FET can be used, as illustrated in Figure 16.

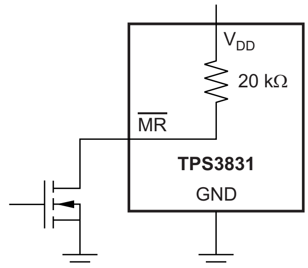


Figure 16. Using Logic-Level FET to Minimize Current Draw

BIDIRECTIONAL RESET PINS

Some microcontrollers have bidirectional reset pins that act both as an input and an output. A series resistor should be placed between the TPS383x output and the microcontroller reset pin to protect against excessive current flow when both the TPS383x and the microcontroller attempt to drive the reset line. Figure 17 shows the connection of the TPS3839K33 with a microcontroller using a series resistor to drive a bidirectional reset line.

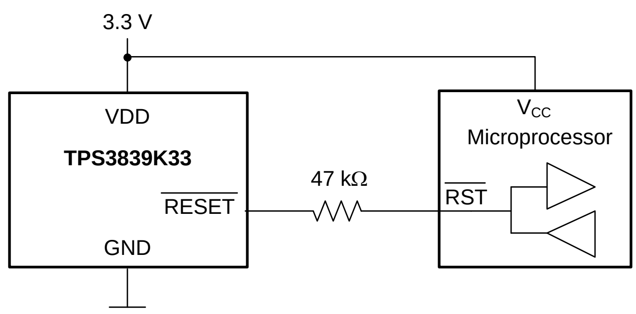


Figure 17. Connection to Bidirectional Reset Pin

APPLICATION EXAMPLE: SINGLE ALKALINE CELL MONITORING

Low operating voltage and threshold options make the TPS383x well-suited for monitoring single-cell, alkaline-battery applications. Figure 18 shows the TPS3839A09 used to disable a boost converter when the cell voltage reaches 0.9 V, which is the end of the discharge voltage for a single alkaline battery cell. When the cell voltage reaches 0.9 V, the TPS61261 enable pin is driven low. This setting disables the TPS61261 and places it in a low-current shutdown state. The combination of the TPS3839 and TPS61261 consumes only 250 nA (typical) from the discharged battery.

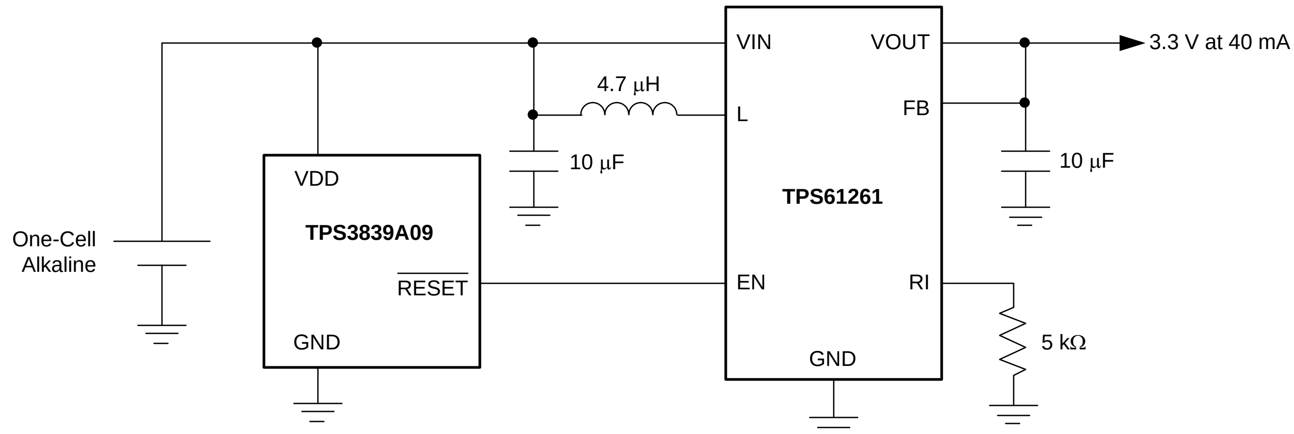


Figure 18. Disabled Boost Converter

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current verison.

Changes from Revision A (September 2012) to Revision B — Page

- Changed V_{DD} test conditions for high-level output voltage parameter 3

Changes from Original (June 2012) to Revision A — Page

- Changed data sheet status from product preview to production data 1

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
TPS3831A09DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A3	Samples
TPS3831A09DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A3	Samples
TPS3831E16DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A5	Samples
TPS3831E16DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A5	Samples
TPS3831G12DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A4	Samples
TPS3831G12DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A4	Samples
TPS3831G18DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A6	Samples
TPS3831G18DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A6	Samples
TPS3831G33DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A7	Samples
TPS3831G33DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A7	Samples
TPS3831K33DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A8	Samples
TPS3831K33DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A8	Samples
TPS3831K50DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A9	Samples
TPS3831K50DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	A9	Samples
TPS3831L30DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	BA	Samples
TPS3831L30DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	BA	Samples
TPS3839A09DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZDI	Samples

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
TPS3839A09DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZDI	Samples
TPS3839A09DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZJ	Samples
TPS3839A09DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZJ	Samples
TPS3839E16DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZCI	Samples
TPS3839E16DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZCI	Samples
TPS3839E16DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZK	Samples
TPS3839E16DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZK	Samples
TPS3839G12DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZBI	Samples
TPS3839G12DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZBI	Samples
TPS3839G12DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZE	Samples
TPS3839G12DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZE	Samples
TPS3839G18DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZAI	Samples
TPS3839G18DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PZAI	Samples
TPS3839G18DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZL	Samples
TPS3839G18DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZL	Samples
TPS3839G33DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYZI	Samples
TPS3839G33DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYZI	Samples
TPS3839G33DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZG	Samples

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
TPS3839G33DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZG	Samples
TPS3839J25DBZR	PREVIEW	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 85		
TPS3839J25DBZT	PREVIEW	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 85		
TPS3839K33DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYYI	Samples
TPS3839K33DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYYI	Samples
TPS3839K33DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZF	Samples
TPS3839K33DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZF	Samples
TPS3839K50DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYXI	Samples
TPS3839K50DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYXI	Samples
TPS3839K50DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZH	Samples
TPS3839K50DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZH	Samples
TPS3839L30DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYWI	Samples
TPS3839L30DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	PYWI	Samples
TPS3839L30DQNR	ACTIVE	X2SON	DQN	4	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZI	Samples
TPS3839L30DQNT	ACTIVE	X2SON	DQN	4	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ZI	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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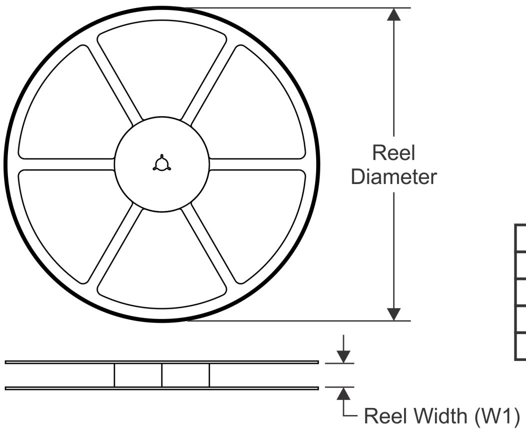
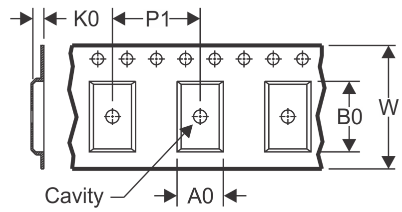
TAPE AND REEL INFORMATION

REEL DIMENSIONS

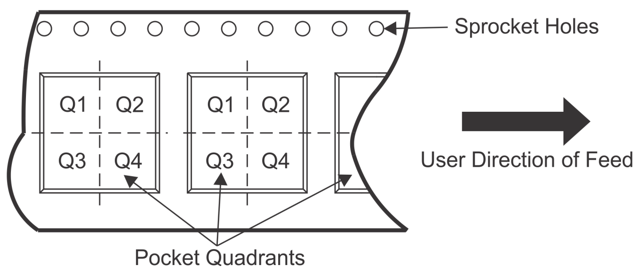


TAPE DIMENSIONS



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

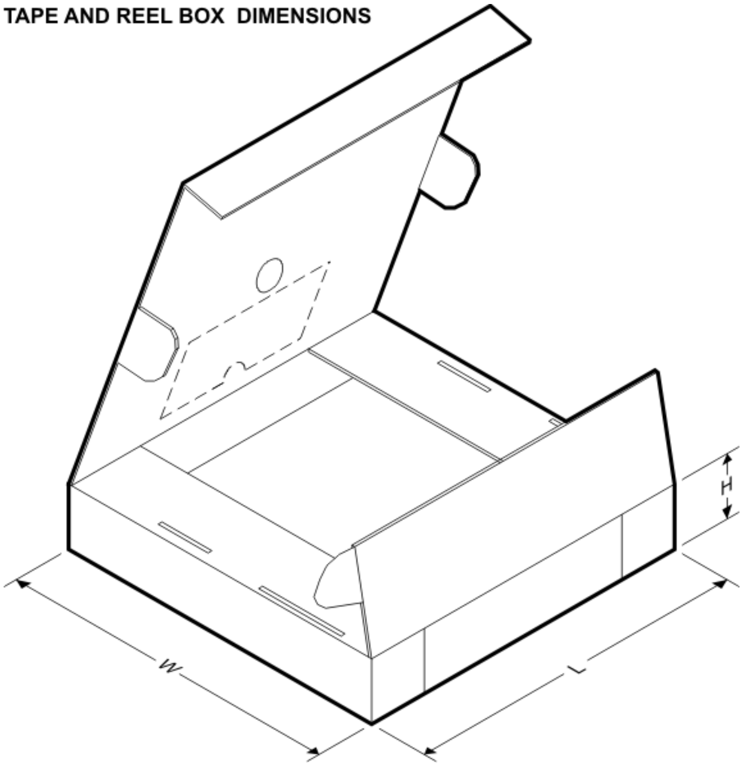


*All dimensions are nominal

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
TPS3831A09DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831A09DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831E16DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831E16DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831G12DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831G12DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831G18DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831G18DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831G33DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831G33DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831K33DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831K33DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831K50DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831K50DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831L30DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3831L30DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839A09DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839A09DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3

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
TPS3839A09DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839A09DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839E16DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839E16DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839E16DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839E16DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839G12DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839G12DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839G12DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839G12DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839G18DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839G18DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839G18DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839G18DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839G33DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839G33DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839G33DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839G33DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839K33DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839K33DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839K33DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839K33DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839K50DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839K50DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839K50DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839K50DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839L30DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839L30DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TPS3839L30DQNR	X2SON	DQN	4	3000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2
TPS3839L30DQNT	X2SON	DQN	4	250	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2

TAPE AND REEL BOX DIMENSIONS

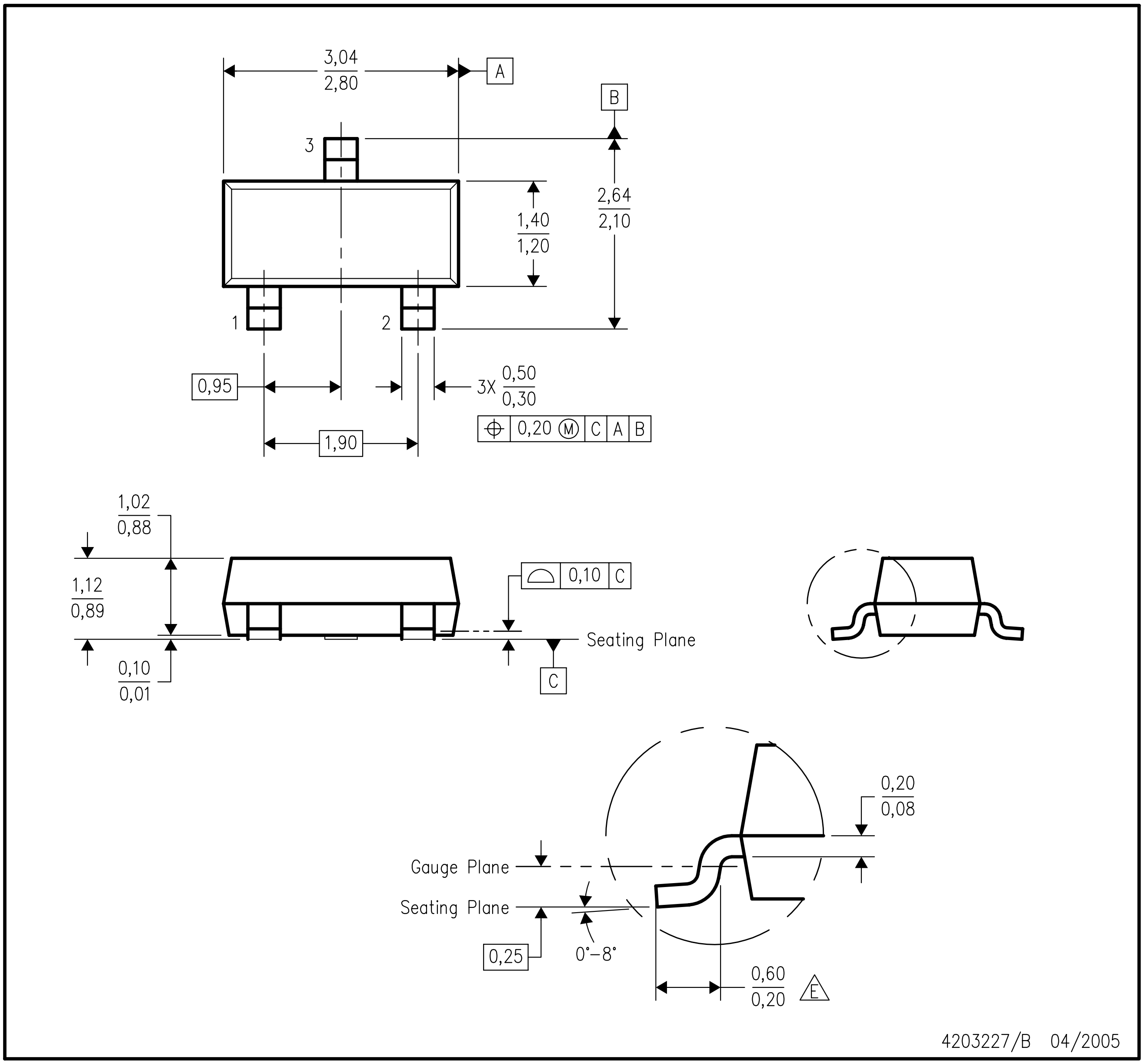


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3831A09DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831A09DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831E16DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831E16DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831G12DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831G12DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831G18DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831G18DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831G33DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831G33DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831K33DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831K33DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831K50DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831K50DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3831L30DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3831L30DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839A09DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839A09DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839A09DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839A09DQNT	X2SON	DQN	4	250	184.0	184.0	19.0

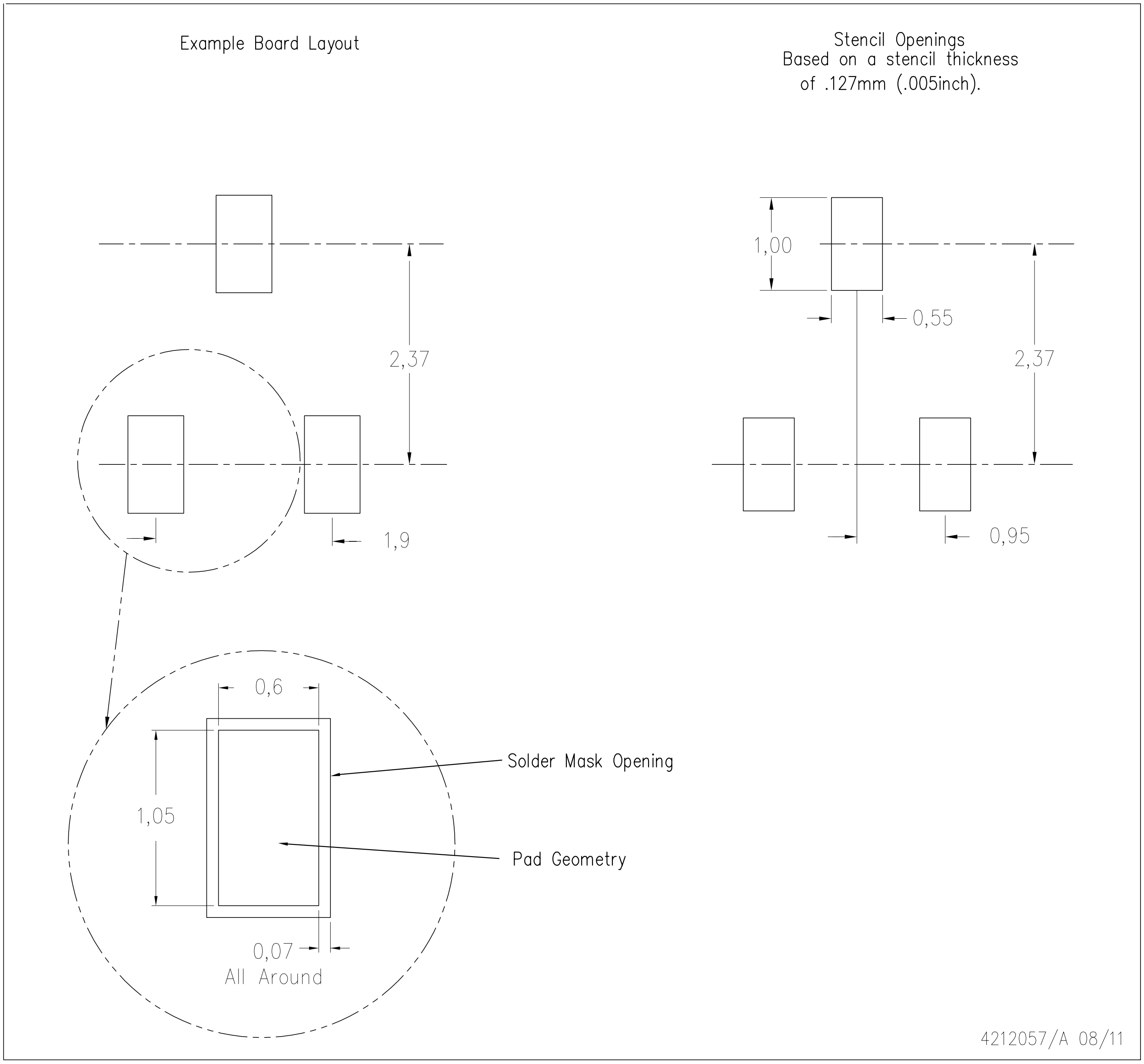
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3839E16DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839E16DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839E16DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839E16DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839G12DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839G12DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839G12DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839G12DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839G18DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839G18DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839G18DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839G18DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839G33DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839G33DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839G33DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839G33DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839K33DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839K33DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839K33DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839K33DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839K50DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839K50DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839K50DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839K50DQNT	X2SON	DQN	4	250	184.0	184.0	19.0
TPS3839L30DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TPS3839L30DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TPS3839L30DQNR	X2SON	DQN	4	3000	184.0	184.0	19.0
TPS3839L30DQNT	X2SON	DQN	4	250	184.0	184.0	19.0

DBZ (R-PDSO-G3) PLASTIC SMALL-OUTLINE



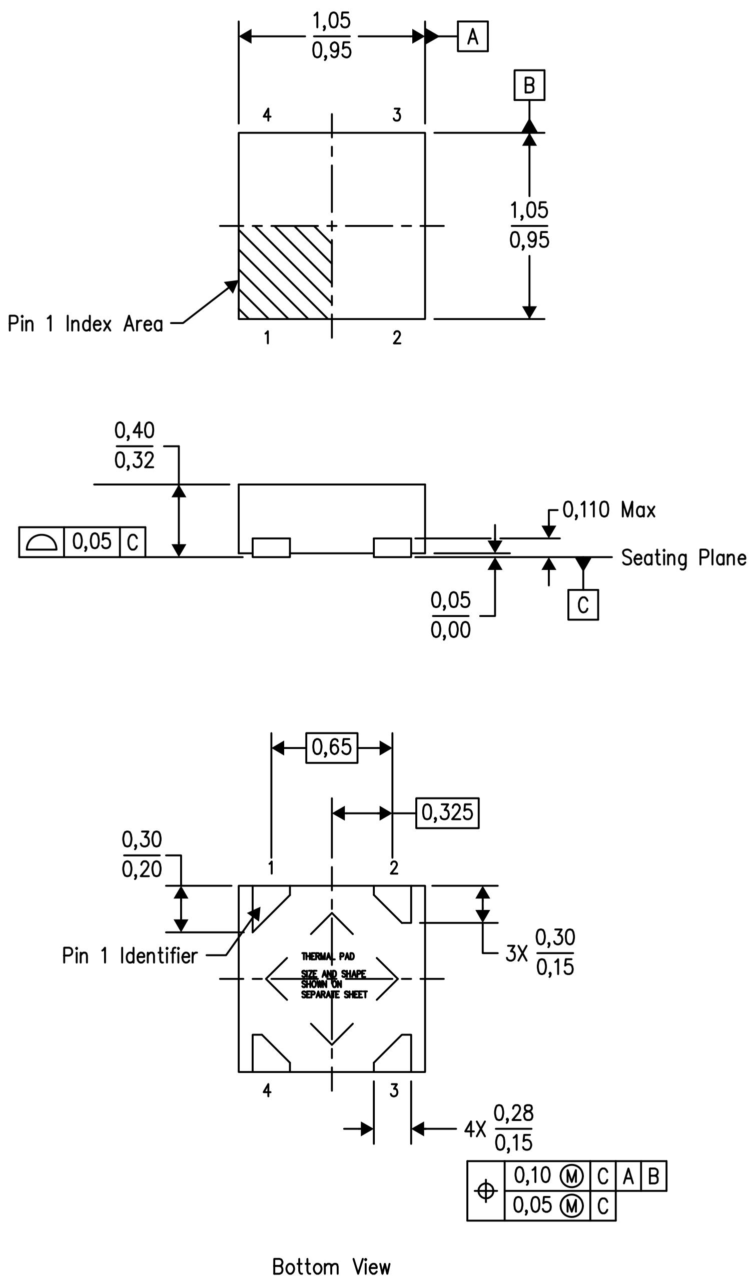
NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Lead dimensions are inclusive of plating.
D. Body dimensions are exclusive of mold flash and protrusion. Mold flash and protrusion not to exceed 0.25 per side.
E. Falls within JEDEC TO–236 variation AB, except minimum foot length.

DBZ (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.

DQN (S-PX2SON-N4) PLASTIC SMALL OUTLINE NO-LEAD



4210367/D 09/2012

NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
- B. This drawing is subject to change without notice.
- C. SON (Small Outline No-Lead) package configuration.
- D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
- E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.

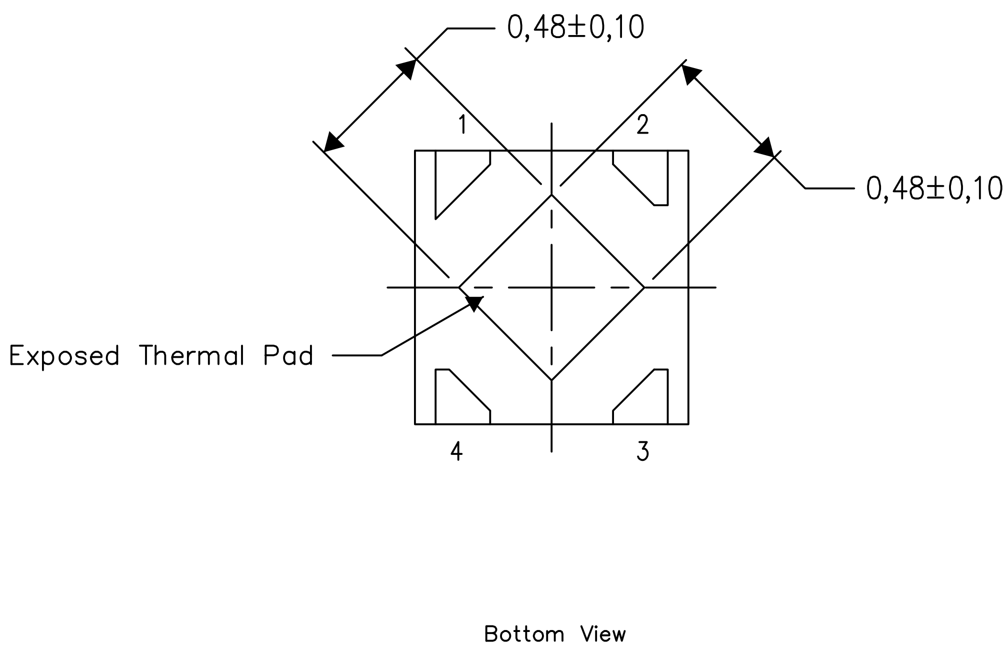
DQN (S-PX2SON-N4) PLASTIC SMALL OUTLINE NO-LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.

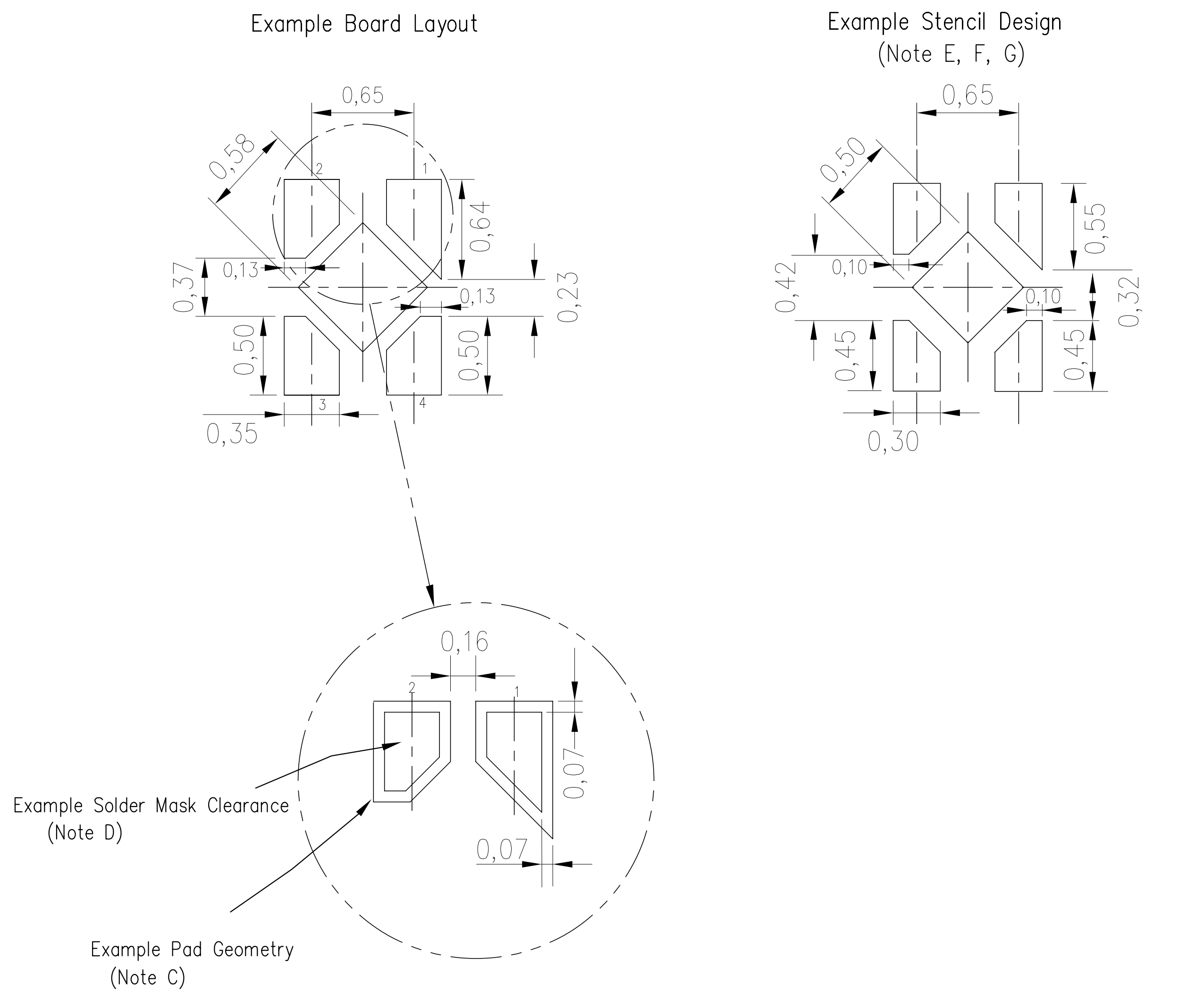


Exposed Thermal Pad Dimensions

4210393-3/E 04/12

NOTE: All linear dimensions are in millimeters

DQN (S-PX2SON-N4) PLASTIC SMALL OUTLINE NO-LEAD



4211303/B 06/11

NOTES:
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
- E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
- F. 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. Refer to IPC 7525 for stencil design considerations.
- G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

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