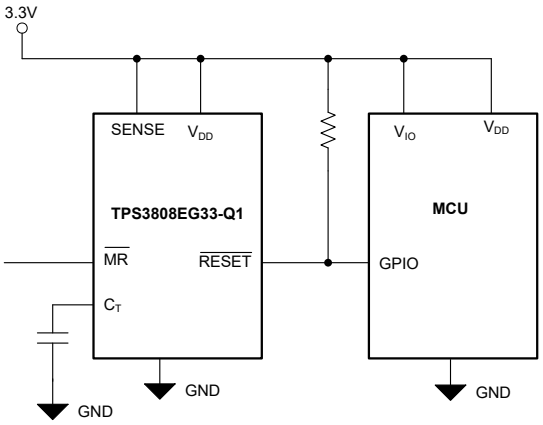
TPS3808E-Q1 Low-Quiescent-Current, Programmable-Delay Supervisory Circuit for Automotive

1 Features

- AEC-Q100 qualified with the following results:
  - Device temperature grade 1: –40°C to +125°C
- Undervoltage monitoring for power rails
  - Reliable monitoring with high threshold accuracy (1% typical)
  - Fixed voltage threshold options from 0.9V to 5V
  - Adjustable voltage option available (0.405V)
  - Separate Sense pin for monitoring and V_{DD} pin for power
- Miniature solution with ultra-low power consumption
  - 0.6µA typical quiescent current
  - Compact 6-pin SOT23 package (2.9mm x 1.6mm)
- Highly configurable reset time delay to prevent unsafe power on
  - Adjustable from 1.25ms to 150s
- Separate Manual Reset Input (MR) to assert RESET output on demand

2 Applications

- ADAS domain controller
- Automotive gateway
- Automotive head unit
- Digital cockpit processing unit
- Telematics control unit
- Driver monitoring



Typical Application

3 Description

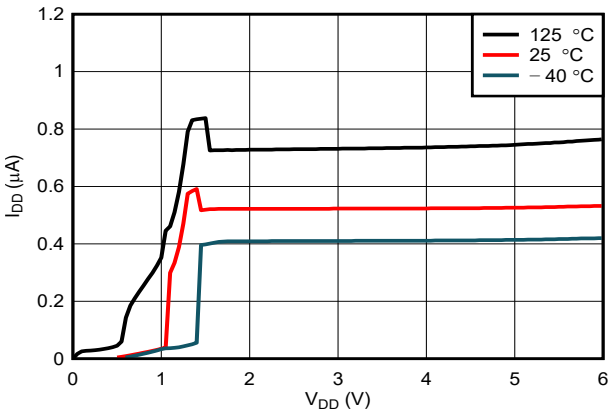
The TPS3808E-Q1 family of microprocessor supervisory circuits monitors system voltages from 0.4V to 5V, asserting an open-drain $\overline{\text{RESET}}$ signal when the SENSE voltage drops below a preset threshold or when the manual reset ($\overline{\text{MR}}$) pin drops to a logic low. The $\overline{\text{RESET}}$ output remains low for the user-adjustable delay time after the SENSE voltage and manual reset ($\overline{\text{MR}}$) return above the respective thresholds.

The TPS3808E-Q1 device uses a precision reference to achieve 0.5% threshold accuracy. The reset delay time can be set to 20ms by disconnecting the C_T pin, 300ms by connecting the C_T pin to V_{DD} using a resistor, or can be user-adjusted between 1.25ms and 150s by connecting the C_T pin to an external capacitor. The TPS3808E device has a very low typical quiescent current of 0.6µA, and is designed for battery-powered applications. The TPS3808E-Q1 is available in the SOT-23-6 , and is fully specified over a temperature range of –40°C to 125°C (T_J).

Device Information

PART NUMBER	PACKAGE (1)	BODY SIZE (NOM) (2)
TPS3808E	SOT-23 (6)	2.90mm x 1.60mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.



Supply Current vs Supply Voltage

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4 Device Voltage Thresholds

The following table shows the nominal rail to be monitored and the corresponding threshold voltage of the device.

PART NUMBER	NOMINAL SUPPLY VOLTAGE	THRESHOLD VOLTAGE (V_{IT})
TPS3808EG01	Adjustable	0.405V
TPS3808EG09	0.9V	0.84V
TPS3808EG12	1.2V	1.12V
TPS3808EG125	1.25V	1.16V
TPS3808EG15	1.5V	1.40V
TPS3808EG18	1.8V	1.67V
TPS3808EG19	1.9V	1.77V
TPS3808EG25	2.5V	2.33V
TPS3808EG30	3V	2.79V
TPS3808EG33	3.3V	3.07V
TPS3808EG50	5V	4.65V

5 Pin Configuration and Functions

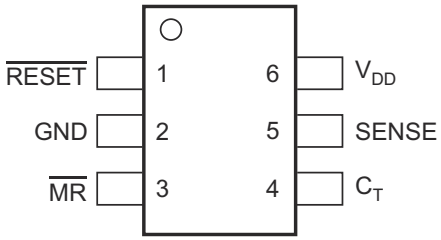


Figure 5-1. DBV Package
6-Pin SOT-23
Top View

Table 5-1. Pin Functions

PIN		I/O	DESCRIPTION
NAME	SOT-23		
C_T	4	I	Reset period programming pin. Connecting this pin to V_{DD} through a 40kΩ to 200kΩ resistor or leaving the pin open results in fixed delay times. Connecting this pin to a ground referenced capacitor ≥ 130pF gives a user-programmable delay time.
GND	2	—	Ground
$\overline{MR}$	3	I	Driving the manual reset pin ($\overline{MR}$) low asserts $\overline{RESET}$. $\overline{MR}$ is internally tied to V_{DD} by a 90kΩ pull-up resistor.
$\overline{RESET}$	1	O	$\overline{RESET}$ is an open-drain output that is driven to a low-impedance state when $\overline{RESET}$ is asserted (either the SENSE input is lower than the threshold voltage (V_{IT}) or the $\overline{MR}$ pin is set to a logic low). $\overline{RESET}$ remains low (asserted) for the reset period after both SENSE is above V_{IT} and $\overline{MR}$ is set to a logic high. A pull-up resistor from 10kΩ to 1MΩ must be used on this pin, this allows the reset pin to attain voltages higher than V_{DD}.
SENSE	5	I	This pin is connected to the voltage to be monitored. If the voltage at this terminal drops below the threshold voltage V_{IT}, then $\overline{RESET}$ is asserted.
V_{DD}	6	I	Supply voltage. For good analog design, place a 0.1µF ceramic capacitor close to this pin.

6 Specification

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Voltage	V_{DD}, V_{CT}, $V_{\overline{RESET}}$, $V_{\overline{MR}}$, V_{SENSE}	–0.3	6.5	V
Current	$I_{\overline{RESET}}$		±5	mA
Temperature (2)	Operating junction temperature, T_J	-40	150	°C
	Operating free-air temperature, T_A	-40	150	°C
	Storage temperature, T_{stg}	-65	150	°C

(1) Stresses beyond values listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) As a result of the low dissipated power in this device, it is assumed that $T_J = T_A$.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per AEC Q100-002(1)	±2000	V
		Charged device model (CDM), per AEC Q100-011	±1000	

(1) AEC Q100-002 indicates that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

6.3 Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
V_{DD}	Supply pin voltage	1.7		6	V
V_{SENSE}	Input pin voltage	0		6	V
V_{CT}	CT pin voltage			V_{DD}	V
$V_{\overline{MR}}$	$\overline{MR}$ pin Voltage	0		6	V
$V_{\overline{RESET}}$	Output pin voltage	0		6	V
$I_{\overline{RESET}}$	Output pin current	0		5	mA
T_J	Junction temperature (free-air temperature)	-40		125	℃

6.4 Thermal Information

THERMAL METRIC(1)		TPS3808E-Q1 DBV (SOT23-6) 6 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	210.8	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	131.5	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	91.7	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	67.6	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	91.3	°C/W

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

6.5 Electrical Characteristics

At 1.7V ≤ V_{DD} ≤ 6V, CT = $\overline{MR}$ = Open, $\overline{RESET}$ Voltage ($V_{\overline{RESET}}$) = 100kΩ to V_{DD}, $\overline{RESET}$ load = 50pF, and over the operating free-air temperature range of -40°C to 125°C, unless otherwise noted. Typical values are at T_J = 25°C.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{DD}	Supply Voltage		1.7		6	V
V_{POR}	Power on reset voltage(2)	V_{OL}(max) = 0.25V, I_{OUT} = 15µA			1	V
$V_{IT-(UV)}$	Negative-going threshold accuracy	Adjustable V_{IT}	-2	±1	2	%
$V_{IT-(UV)}$	Negative-going threshold accuracy	Fixed V_{IT}	-1.5	±0.5	1.5	%
V_{HYS}	Hysteresis Voltage(1)	Fixed Vth		1	2.5	%
V_{HYS}	Hysteresis Voltage(1)	Adjustable Vth		1	2.5	%
I_{DD}	Supply current	VDD = 3.3V		0.6	1.5	µA
I_{DD}	Supply current	VDD = 6V		0.6	1.5	µA
I_{SENSE}	Input current, SENSE pin	V_{SENSE} = V_{IT}, TPS3808EG01	-25		25	nA
I_{SENSE}	Input current, SENSE pin	V_{SENSE} = 6V, Fixed Versions		0.75	1.25	µA
V_{OL}	Low level output voltage	1.7V ≤ V_{DD} < 6V, I_{OUT} = 1mA			400	mV
I_{LKG}	Open drain output leakage current	V_{DD} = $V_{\overline{RESET}}$ = 6V			300	nA
$V_{\overline{MR}\_L}$	$\overline{MR}$ logic low input				$0.3V_{DD}$	V
$V_{\overline{MR}\_H}$	$\overline{MR}$ logic high input		$0.7V_{DD}$			V
$R_{\overline{MR}}$	Manual reset Internal pullup resistance			90		KΩ

(1) Hysteresis is with respect of the tripoint $V_{IT-(UV)}$.
(2) V_{POR} is the minimum V_{DD} voltage level for a controlled output state.

6.6 Timing Requirements

At 1.7V ≤ V_{DD} ≤ 6V, CT = $\overline{MR}$ = Open, $\overline{RESET}$ Voltage ($V_{\overline{RESET}}$) = 100kΩ to V_{DD}, $\overline{RESET}$ load = 50pF, and over the operating free-air temperature range of -40°C to 125°C, unless otherwise noted. Typical values are at T_J = 25°C.

			MIN	NOM	MAX	UNIT
t_D	Reset time delay	CT = Open	12	20	28	ms
t_D	Reset time delay	CT = V_{DD}	180	300	420	ms
t_D	Reset time delay	CT = 130pF	0.75	1.25	1.75	ms
t_D	Reset time delay	CT = 150nF		0.83		s
t_{PD}	Propagation detect delay(1) (2)			30	50	µs
t_{SD}	Startup delay(3)			300		µs
$t_{GI\ (VIT-)}$	Glitch Immunity undervoltage $V_{IT-(UV)}$, 5% Overdrive(1)			5		µs
$t_{GI\ (\overline{MR})}$	Glitch Immunity $\overline{MR}$ pin			50		ns
$t_{PD\ (\overline{MR})}$	Propagation delay from $\overline{MR}$ low to assert $\overline{RESET}$			500		ns

(1) 5% Overdrive from threshold. Overdrive % = [V_{SENSE} - V_{IT}] / V_{IT}; Where V_{IT} stands for $V_{IT-(UV)}$
(2) t_{PD} measured from threshold trip point ($V_{IT-(UV)}$ or $V_{IT+(OV)}$) to $\overline{RESET}$ V_{OL} voltage
(3) During the power-on sequence, V_{DD} must be at or above $V_{DD\ (MIN)}$ for at least t_{SD} + t_D before the output is in the correct state.

6.7 Timing Diagram

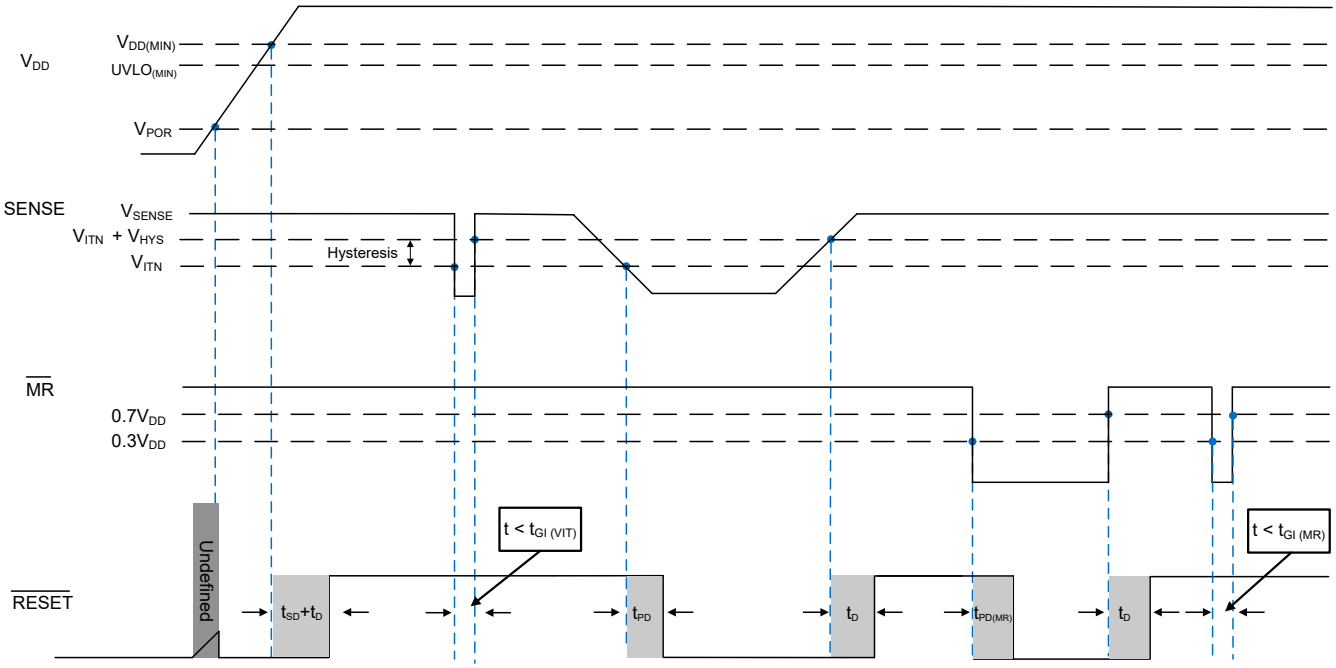


Figure 6-1. Timing Diagram

7 Typical Characteristics

At T_J = 25°C, V_{DD} = 3.3V, R_{LRESET} = 100kΩ, and C_{LRESET} = 50pF, unless otherwise noted.

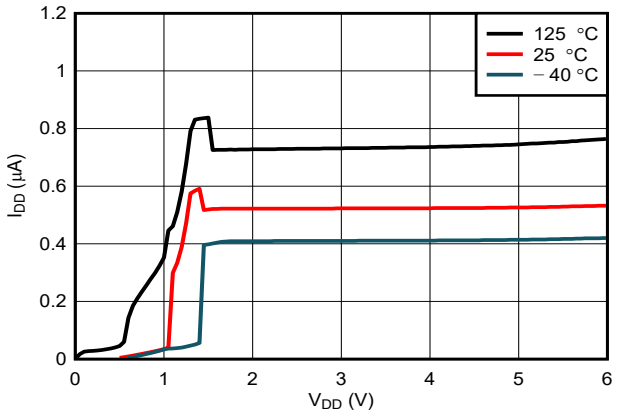


Figure 7-1. Supply Current vs Supply Voltage

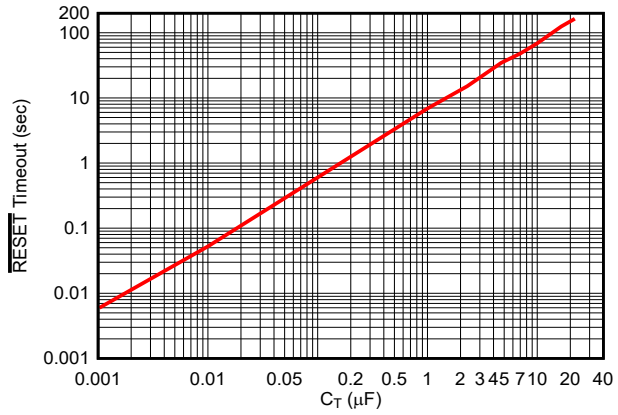


Figure 7-2. $\overline{\text{RESET}}$ Time-Out Period vs C_T

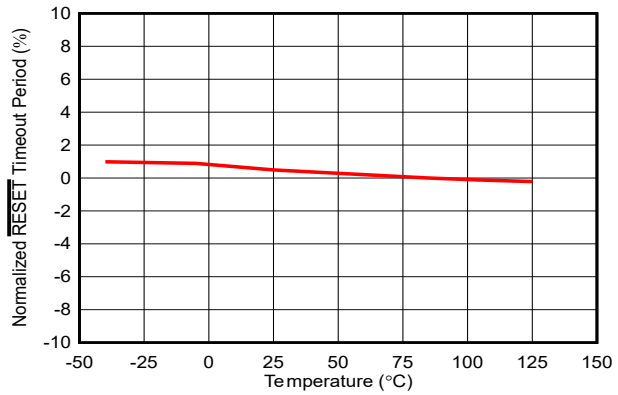


Figure 7-3. Normalized RESET Time-Out Period vs Temperature (CT = Open, CT = VDD, CT = Any)

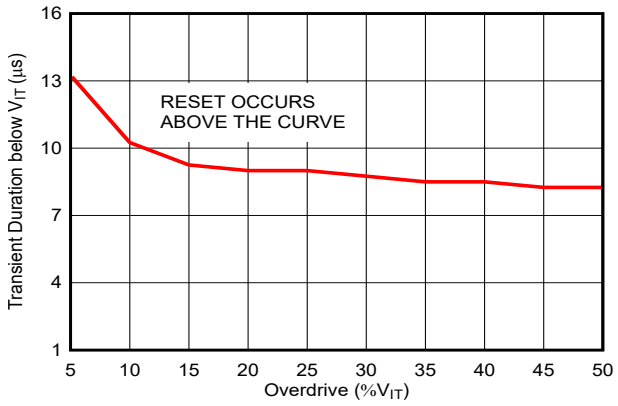


Figure 7-4. Maximum Transient Duration at Sense vs Sense Threshold Overdrive Voltage

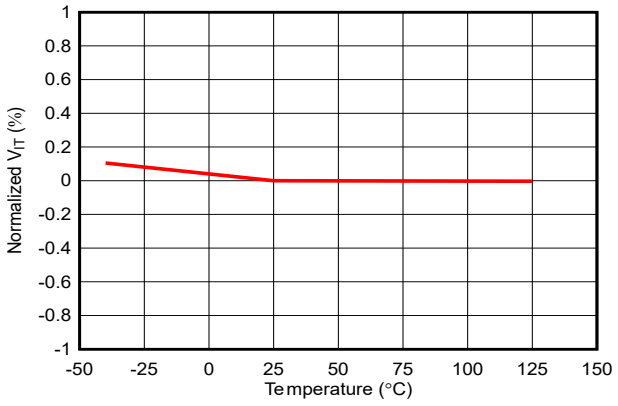


Figure 7-5. Normalized Sense Threshold Voltage (VIT) vs Temperature

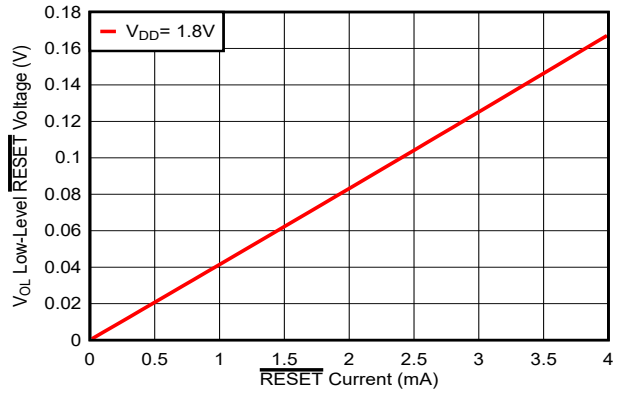


Figure 7-6. Low-Level RESET Voltage vs RESET Current

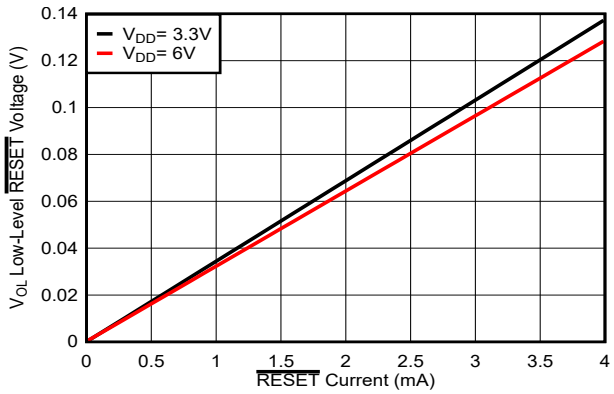


Figure 7-7. Low-Level RESET Voltage vs RESET Current

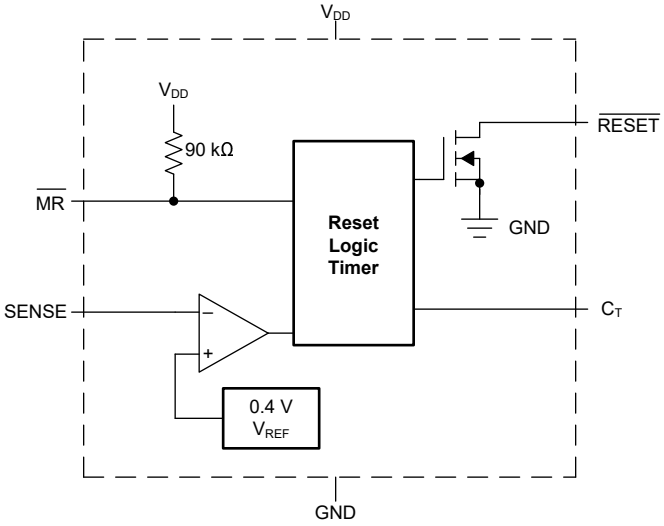
8 Detailed Description

8.1 Overview

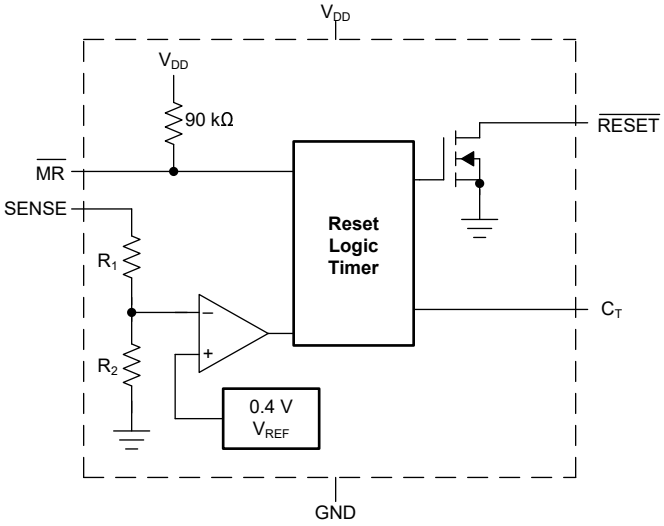
The TPS3808E microprocessor supervisory product family is a low quiescent current single channel supervisor which has programmable delay time and manual reset features. The TPS3808E-Q1 microprocessor supervisory product family is designed to assert a $\overline{\text{RESET}}$ signal when either the SENSE pin voltage drops below V_{IT} or the manual reset ($\overline{\text{MR}}$) is driven low. The $\overline{\text{RESET}}$ output remains asserted for a user-adjustable time after both the manual reset ($\overline{\text{MR}}$) and SENSE voltages return above their respective thresholds.

TPS3808E product family comes with fixed threshold options, which eliminates the need of external resistor divider and can monitor the standard voltage rails from 0.9V to 5V, and adjustable threshold option, which can monitor down to 0.4V with both high threshold accuracy. By connecting an external resistor divider, the adjustable version also can also monitor standard voltage rails.

8.2 Functional Block Diagram



Adjustable-Voltage Version



Fixed-Voltage Version

8.3 Feature Description

A broad range of voltage threshold and reset delay time adjustments are available for the TPS3808E-Q1 device, allowing these devices to be used in a wide array of applications. Reset threshold voltages can be factory-set from 0.82V to 3.3V or from 4.4V to 5V, while the adjustable variant can be set to any voltage above 0.405V using an external resistor divider. Two preset delay times are also user-selectable: connecting the C_T pin to V_{DD} results in a 300ms reset delay, whereas leaving the C_T pin open yields a 20ms reset delay. In addition, connecting a capacitor between C_T and GND allows the designer to select any reset delay period from 1.25ms to 150s.

8.3.1 SENSE Input

The SENSE input provides a pin at which any system voltage can be monitored. If the voltage on this pin drops below V_{IT}, then $\overline{\text{RESET}}$ is asserted. The comparator has a built-in hysteresis to make sure there are smooth $\overline{\text{RESET}}$ assertions and de-assertions. It is good analog design practice to put a 1nF to 10nF bypass capacitor on the SENSE input to reduce sensitivity to transients and layout parasitics.

The TPS3808E-Q1 device is relatively immune to short negative transients on the SENSE pin. Sensitivity to transients is dependent on threshold overdrive.

The adjustable variant can be used to monitor any voltage rail down to 0.405V using the circuit shown in Figure 8-1.

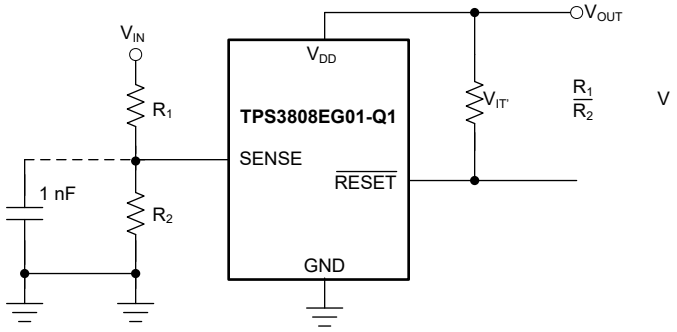


Figure 8-1. Using the TPS3808EG01-Q1 to Monitor a User-Defined Threshold Voltage

8.3.2 Selecting the RESET Delay Time

The TPS3808E-Q1 has three options for setting the $\overline{\text{RESET}}$ delay time as shown in Figure 8-2. Figure 8-2 (a) shows the configuration for a fixed 300ms typical delay time by tying C_T to V_{DD}; a resistor from 40kΩ to 200kΩ must be used. Supply current is not affected by the choice of resistor. Figure 8-2 (b) shows a fixed 20ms delay time by leaving the C_T pin open. Figure 8-2 (c) shows a ground referenced capacitor connected to C_T for a user-defined program time between 1.25ms and 150s.

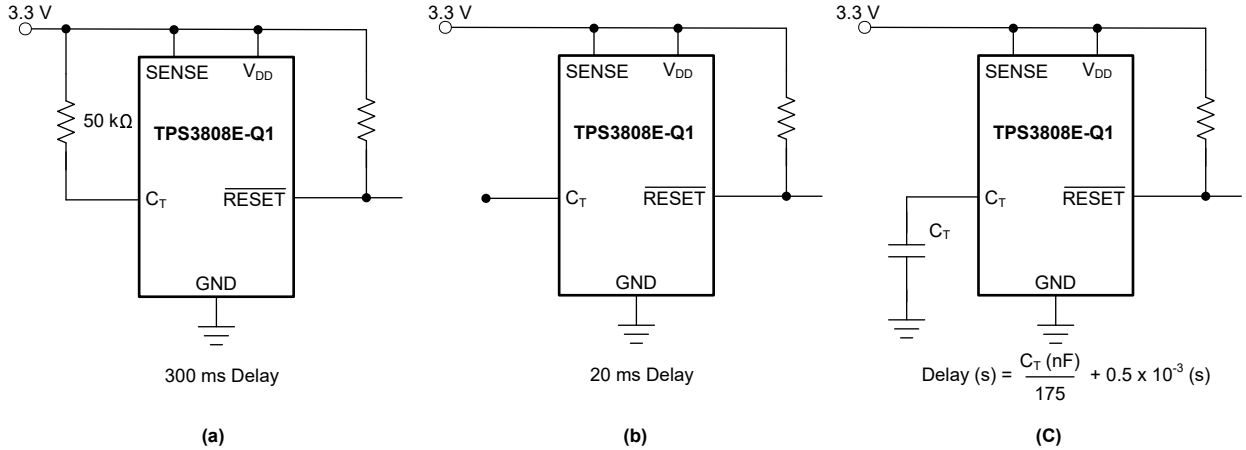


Figure 8-2. Configuration Used to Set the $\overline{\text{RESET}}$ Delay Time

The capacitor C_T should be ≥ 100pF nominal value for the TPS3808Exxx to recognize that the capacitor is present. The capacitor value for a given delay time can be calculated using Equation 1.

$$C_T\,(nF) = \left[t_D\,(s) - 0.5 \times 10^{-3}\,(s)\right] \times 175 \quad (1)$$

The reset delay time is determined by the time it takes an on-chip precision 220nA current source to charge the external capacitor to the internal threshold. When a $\overline{\text{RESET}}$ is asserted, the capacitor is discharged. When the $\overline{\text{RESET}}$ conditions are cleared, the internal current source is enabled and begins to charge the external capacitor. When the voltage on this capacitor reaches higher than the internal threshold, $\overline{\text{RESET}}$ is deasserted. Note that a low-leakage type capacitor such as a ceramic can be used, and that stray capacitance around this pin may cause errors in the reset delay time.

When a voltage fault occurs, the previously charged up capacitor discharges and if the monitored voltage returns from the fault condition before the delay capacitor discharges completely, the delay is shorter than expected. The capacitor begins charging from a voltage above zero and results a in shorter than expected time delay. A larger delay capacitor can be used so long as the capacitor has enough time to fully discharge during the duration of the voltage fault.

8.3.3 Manual RESET ($\overline{\text{MR}}$) Input

The manual reset ($\overline{\text{MR}}$) input allows a processor or other logic circuits to initiate a reset. 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 SENSE is above the reset threshold, $\overline{\text{RESET}}$ is de-asserted after the user-defined reset delay expires. Note that $\overline{\text{MR}}$ is internally tied to V_{DD} using a 90kΩ resistor, so this pin can be left unconnected if $\overline{\text{MR}}$ is not used.

See Figure 8-3 for how $\overline{\text{MR}}$ can be used to monitor multiple system voltages. Note that if the logic signal driving $\overline{\text{MR}}$ does not go fully to V_{DD}, there is some additional current draw into V_{DD} as a result of the internal pullup resistor on $\overline{\text{MR}}$. To minimize current draw, a logic-level FET can be used as illustrated in Figure 8-4.

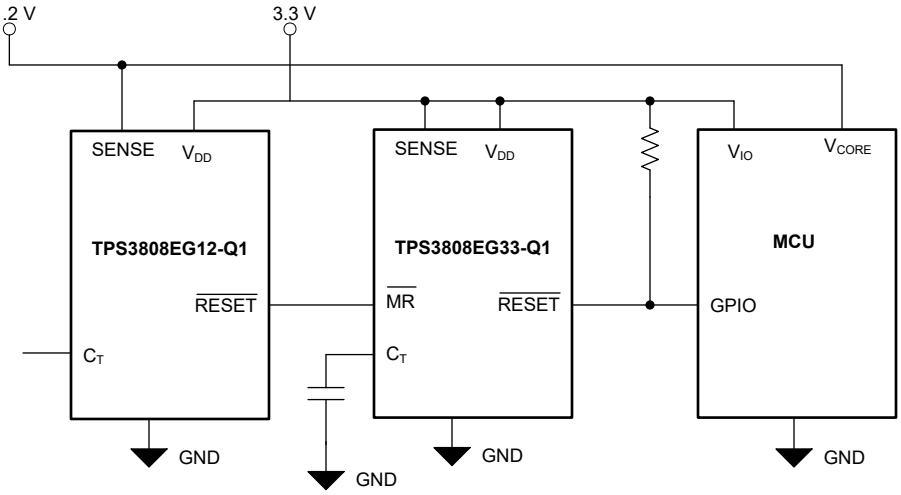


Figure 8-3. Using $\overline{\text{MR}}$ to Monitor Multiple System Voltages

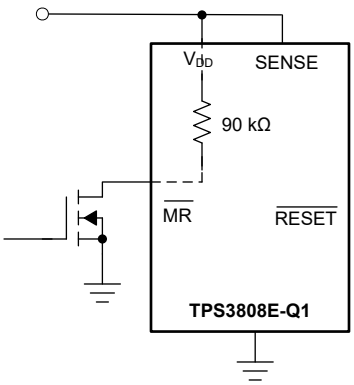


Figure 8-4. Using an External MOSFET to Minimize I_{DD} When $\overline{MR}$ Signal Does Not Go to V_{DD}

8.3.4 RESET Output

$\overline{RESET}$ remains high (unasserted) as long as SENSE is above its threshold (V_{IT}) and the manual reset ($\overline{MR}$) is logic high. If either SENSE falls below V_{IT} or $\overline{MR}$ is driven low, $\overline{RESET}$ is asserted, driving the $\overline{RESET}$ pin to a low impedance.

Once $\overline{MR}$ is again logic high and SENSE is above V_{IT} + V_{HYS} (the threshold hysteresis), a delay circuit is enabled that holds $\overline{RESET}$ low for a specified reset delay period. Once the reset delay has expired, the $\overline{RESET}$ pin goes to a high impedance state. The pullup resistor from the open-drain $\overline{RESET}$ to the supply line can be used to allow the reset signal for the microprocessor to have a voltage higher than V_{DD} (up to 6V). The pullup resistor should be no smaller than 10kΩ as a result of the finite impedance of the $\overline{RESET}$ line.

8.4 Device Functional Modes

Table 8-1. Truth Table

$\overline{MR}$	SENSE > V_{IT}	$\overline{RESET}$
L	0	L
L	1	L
H	0	L
H	1	H

8.4.1 Normal Operation (V_{DD} > $V_{DD(min)}$)

When V_{DD} is greater than $V_{DD(min)}$, the $\overline{RESET}$ signal is determined by the voltage on the SENSE pin and the logic state of $\overline{MR}$.

- $\overline{MR}$ high: When the voltage on V_{DD} is greater than 1.7V for a time of the selected t_D, the $\overline{RESET}$ signal corresponds to the voltage on SENSE relative to V_{IT}.
- $\overline{MR}$ low: in this mode, $\overline{RESET}$ is held low regardless of the value of the SENSE pin.

8.4.2 Above Power-On Reset but Less Than $V_{DD(min)}$ (V_{POR} < V_{DD} < $V_{DD(min)}$)

When the voltage on V_{DD} is less than the device $V_{DD(min)}$ voltage, and greater than the power-on reset voltage (V_{POR}), the $\overline{RESET}$ signal is asserted and low impedance, respectively, regardless of the voltage on the SENSE pin.

8.4.3 Below Power-On Reset (V_{DD} < V_{POR})

When the voltage on V_{DD} is lower than the required voltage (V_{POR}) needed to internally pull the asserted output to GND, $\overline{RESET}$ is undefined and can not be relied upon for proper device function.

9 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

9.1 Application Information

The following sections describe in detail how to properly use this device, depending on the requirements of the final application.

9.2 Typical Application

A typical application of the TPS3808E-Q1 used with a 3.3V processor is shown in Figure 9-1. The open-drain $\overline{\text{RESET}}$ output is typically connected to the $\overline{\text{RESET}}$ input of a microprocessor. A pullup resistor must be used to hold this line high when $\overline{\text{RESET}}$ is not asserted. The $\overline{\text{RESET}}$ output is undefined for voltage below 0.8V, but this characteristic is normally not a problem because most microprocessors do not function below this voltage.

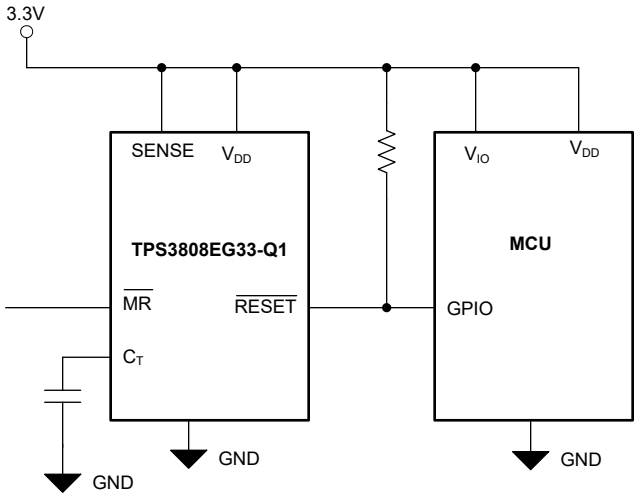


Figure 9-1. Typical Application of the TPS3808E-Q1 With a C2000 Processor

9.2.1 Design Requirements

The TPS3808E-Q1 is intended to drive the $\overline{\text{RESET}}$ input of a microprocessor. The $\overline{\text{RESET}}$ pin is pulled high with a 100kΩ resistor and the reset delay time is controlled by C_T depending on the reset requirement times of the microprocessor. In this case, C_T is left open for a typical reset delay time of 20ms.

9.2.2 Detailed Design Procedure

The primary constraint for this application is the reset delay time. In this case, because C_T is open, and is set to 20ms. A 0.1µF decoupling capacitor is connected to the V_{DD} pin and a 100kΩ resistor is used to pull up the $\overline{\text{RESET}}$ pin high. The $\overline{\text{MR}}$ pin can be connected to an external signal if desired.

9.2.2.1 Immunity to SENSE Pin Voltage Transients

The TPS3808E-Q1 is relatively immune to short negative transients on the SENSE pin. Sensitivity to transients depends on threshold overdrive. Threshold overdrive is defined by how much the V_{SENSE} exceeds the specified threshold, and is important to know because the smaller the overdrive, the slower the $\overline{RESET}$ response. Threshold overdrive is calculated as a percent of the threshold in question, as shown in Equation 2:

$$\text{Overdrive} = | (V_{SENSE} / V_{IT} - 1) \times 100\% | \quad (2)$$

where:

- V_{IT} is the threshold voltage.

9.2.3 Application Curve

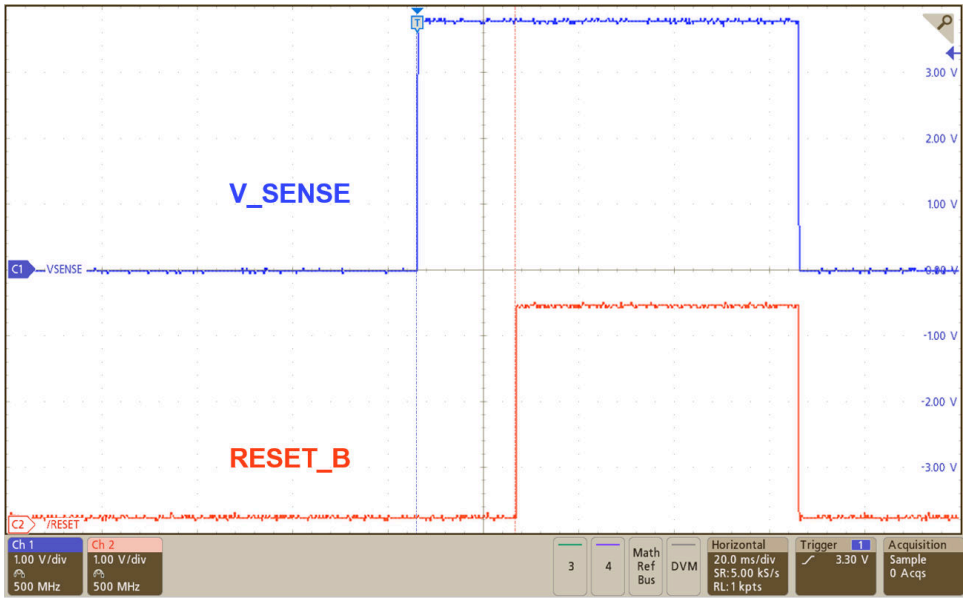


Figure 9-2. Reset Time Delay

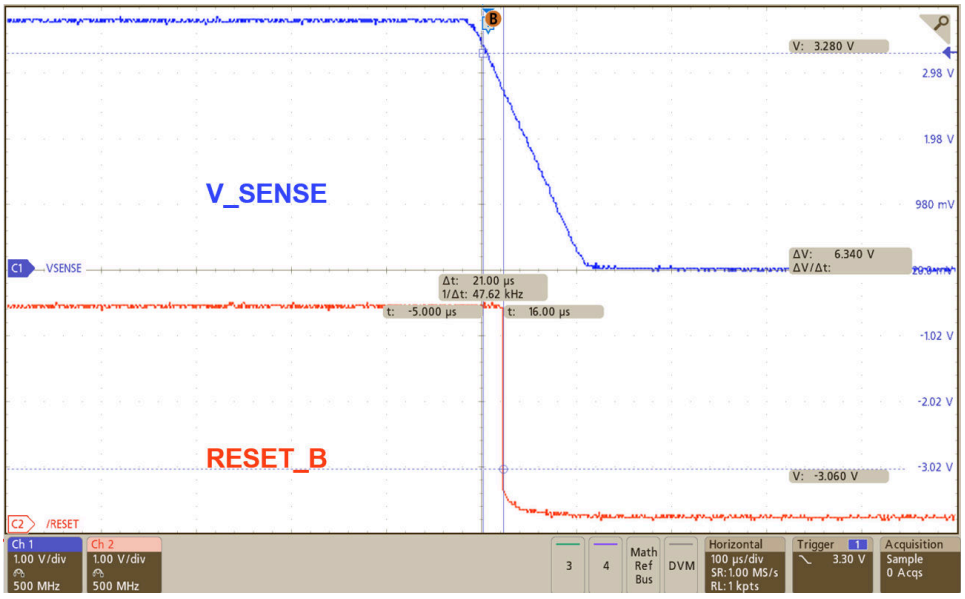


Figure 9-3. Propogation Detect Delay

9.3 Power Supply Recommendations

These devices are designed to operate from an input supply with a voltage range between 1.7V and 6. V. Use a low-impedance power supply to eliminate inaccuracies caused by current changes during the voltage reference refresh.

9.4 Layout

9.4.1 Layout Guidelines

Make sure the connection to the V_{DD} pin is low impedance. Place a 0.1µF ceramic capacitor near the V_{DD} pin. If no capacitor is connected to the C_T pin, parasitic capacitance on this pin should be minimized so the $\overline{\text{RESET}}$ delay time is not adversely affected.

9.4.2 Layout Example

The layout example in Layout Example for a 20ms Delay shows how the TPS3808E-Q1 is laid out on a printed circuit board (PCB) for a 20ms delay.

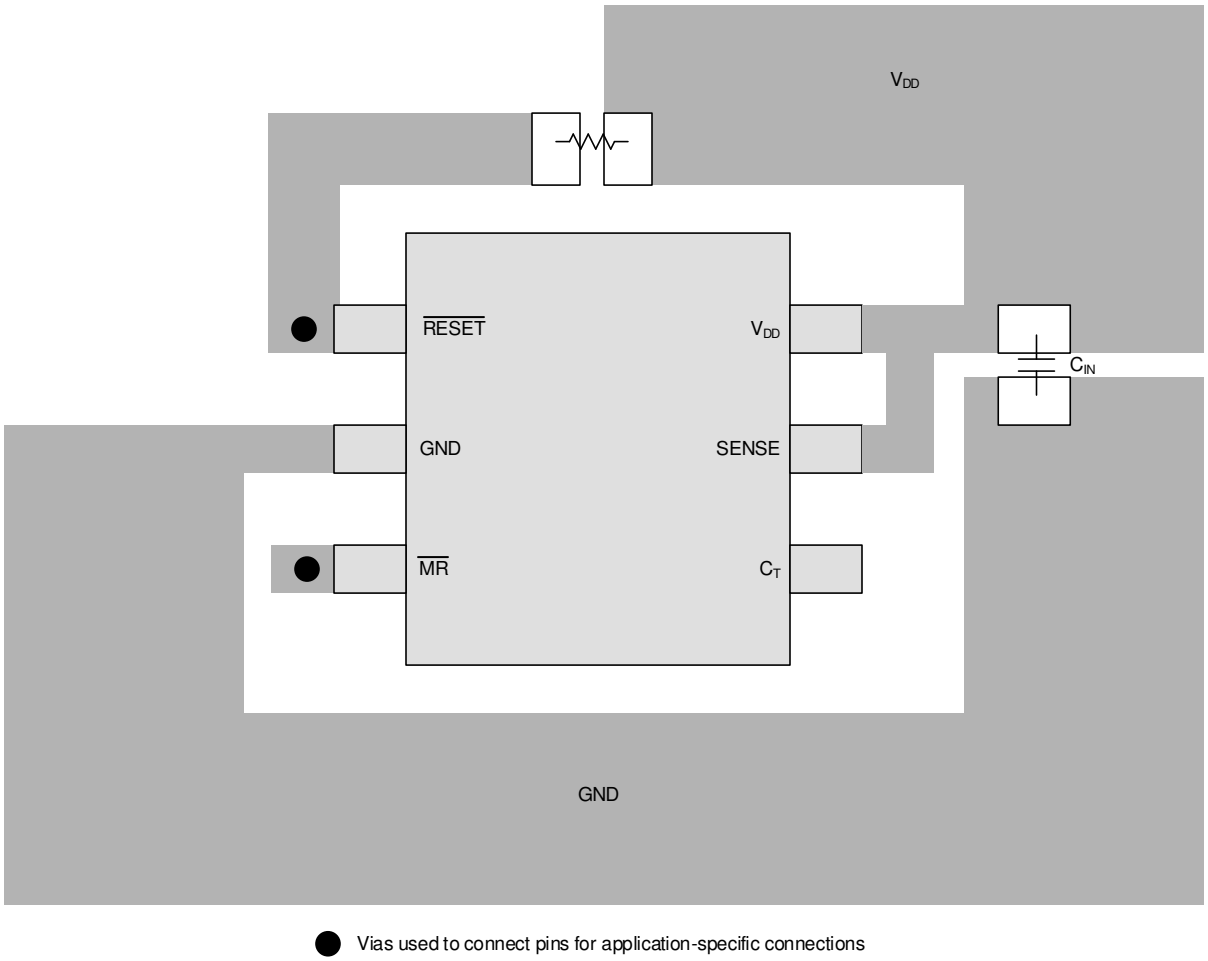


Figure 9-4. Layout Example for a 20ms Delay

10 Device and Documentation Support

10.1 Device Support

10.1.1 Development Support

10.1.1.1 Evaluation Modules

An evaluation module (EVM) is available to assist in the initial circuit performance evaluation using the TPS3808E-Q1. The TPS3808EG01DBVEVM evaluation module can be requested at the Texas Instruments website through the product folders or purchased directly from the TI eStore and is compatible with the TPS3808E-Q1. TPS3808E-Q1 sampled should be ordered and used to replace the existing TPS3808 device for testing.

10.2 Documentation Support

10.2.1 Related Documentation

The following related documents are available for download at www.ti.com:

- Application note. *Optimizing Resistor Dividers at a Comparator Input*. Literature number SLVA450.
- Application note. *Sensitivity Analysis for Power Supply Design*. Literature number SLVA481.
- TPS3808EG01DBVEVM Evaluation Module User Guide. Literature number SBVU015.

10.3 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

10.4 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

10.5 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

10.6 Electrostatic Discharge Caution

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.

10.7 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

11 Revision History

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

Changes from Revision B (December 2023) to Revision C (August 2025)	Page
• Updated adjustable reset timing max	1
• Updated Figure 7-2 to include a wider time-out period	8
• Added disclaimer about capacitor charging and discharging	11

Changes from Revision A (November 2023) to Revision B (December 2023)	Page
• Remove TBD from EC table	5
• Removed Min and Max values for RMR	6

Changes from Revision * (April 2023) to Revision A (November 2023)	Page
• Production Data Release	1

12 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most-current data available for the designated devices. This data is subject to change without notice and without revision of this document. For browser-based versions of this data sheet, see the left-hand navigation pane.

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)
TPS3808EG01DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ01
TPS3808EG01DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ01
TPS3808EG09DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ09
TPS3808EG09DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ09
TPS3808EG125DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	Q125
TPS3808EG125DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	Q125
TPS3808EG12DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ12
TPS3808EG12DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ12
TPS3808EG15DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ15
TPS3808EG15DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ15
TPS3808EG18DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	(EG18, EQ18)
TPS3808EG18DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(EG18, EQ18)
TPS3808EG19DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ19
TPS3808EG19DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ19
TPS3808EG25DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ25
TPS3808EG25DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ25
TPS3808EG30DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ30
TPS3808EG30DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ30
TPS3808EG33DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ33
TPS3808EG33DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ33
TPS3808EG50DBVRQ1	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	EQ50
TPS3808EG50DBVRQ1.A	Active	Production	SOT-23 (DBV) | 6	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	EQ50

(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.

OTHER QUALIFIED VERSIONS OF TPS3808E-Q1 :

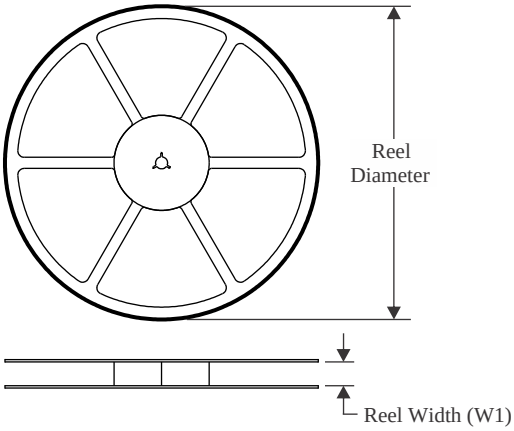
- Catalog : TPS3808E

NOTE: Qualified Version Definitions:

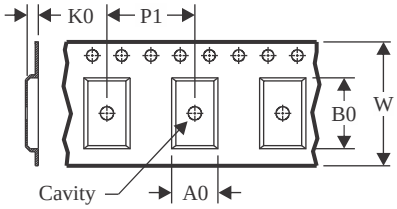
- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION

REEL DIMENSIONS

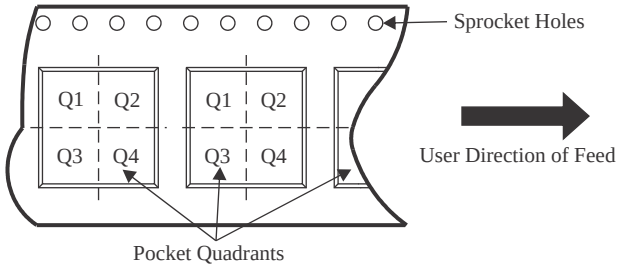


TAPE DIMENSIONS



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

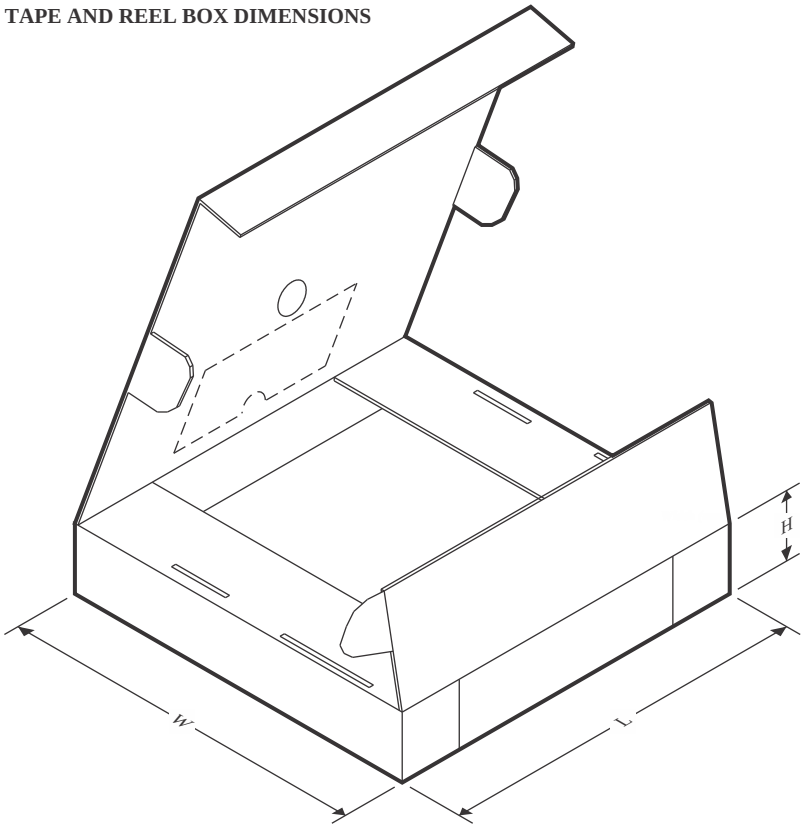


*All dimensions are nominal

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
TPS3808EG01DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG09DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG09DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG125DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG125DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG12DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG12DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG15DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG15DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG18DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG19DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG19DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG25DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG25DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG30DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG30DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	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
TPS3808EG33DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG33DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG50DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3808EG50DBVRQ1	SOT-23	DBV	6	3000	180.0	8.4	3.2	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)
TPS3808EG01DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG09DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG09DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG125DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG125DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG12DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG12DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG15DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG15DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG18DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG19DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG19DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG25DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG25DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG30DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG30DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG33DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG33DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0

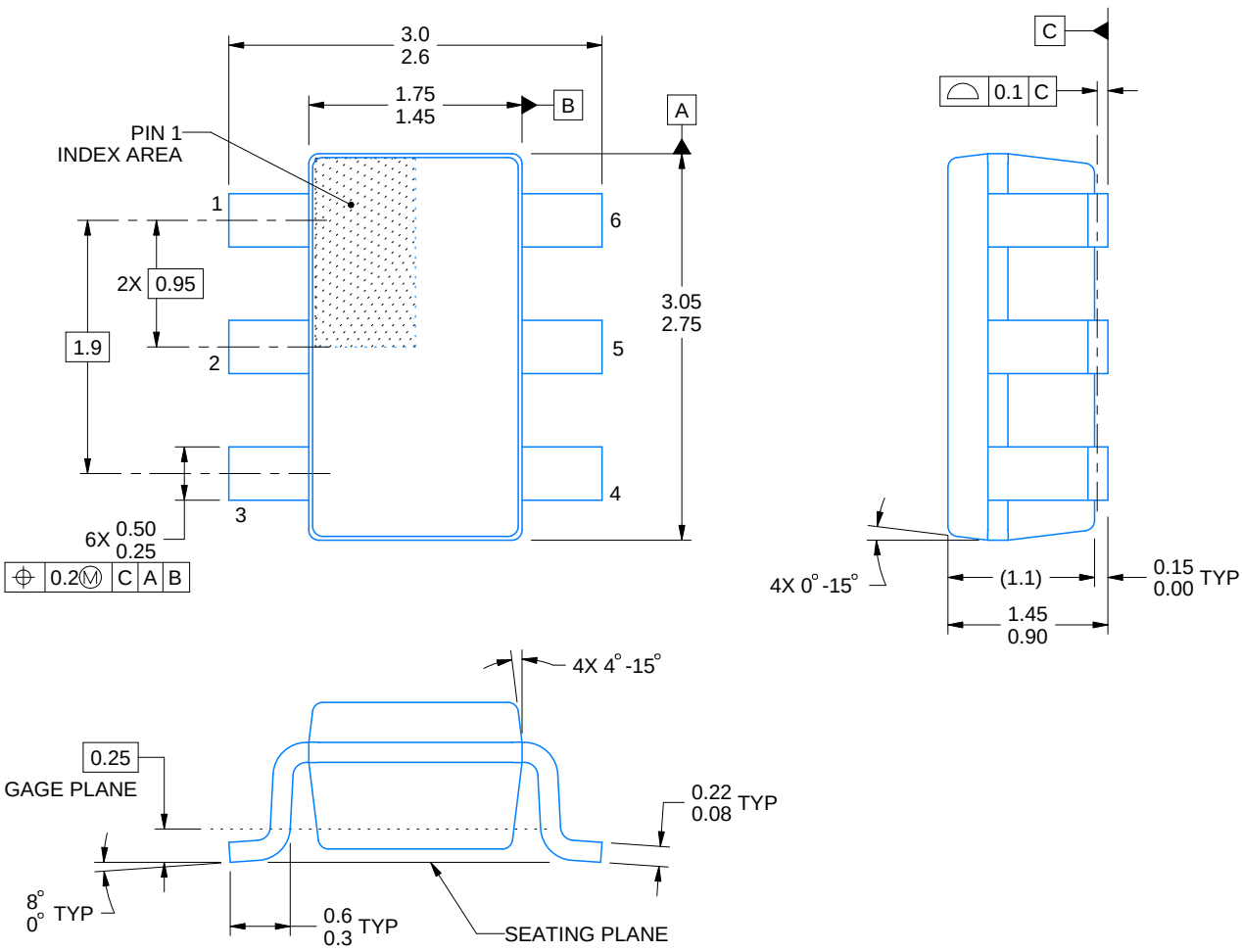
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3808EG50DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS3808EG50DBVRQ1	SOT-23	DBV	6	3000	210.0	185.0	35.0

PACKAGE OUTLINE

DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



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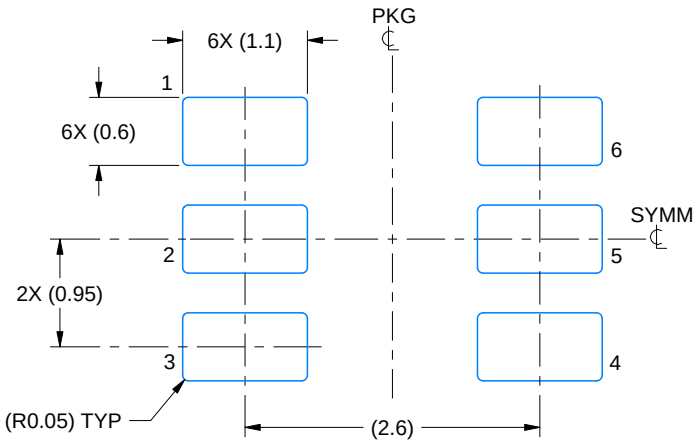
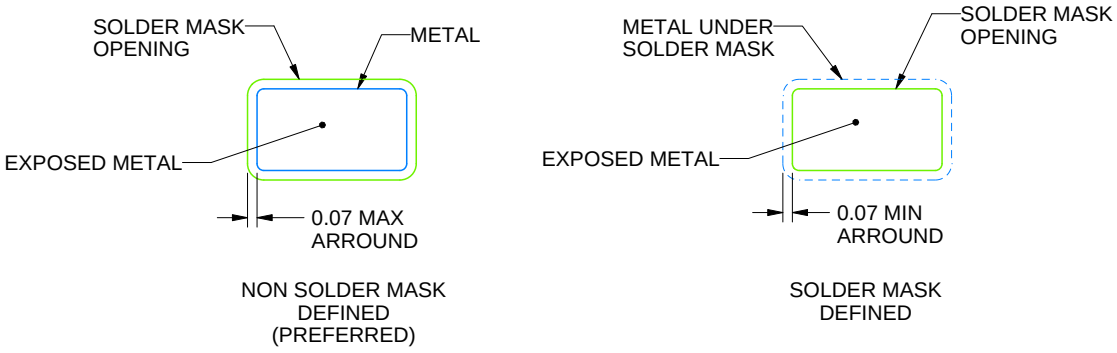
NOTES:

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. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.25 per side.
4. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
5. Refernce JEDEC MO-178.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

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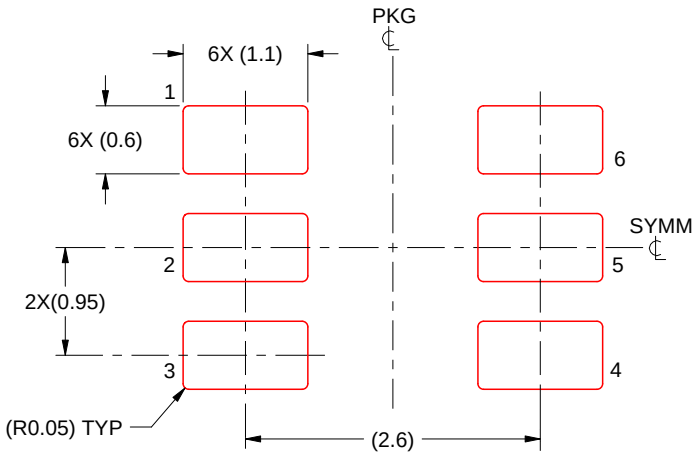
NOTES: (continued)

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



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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