

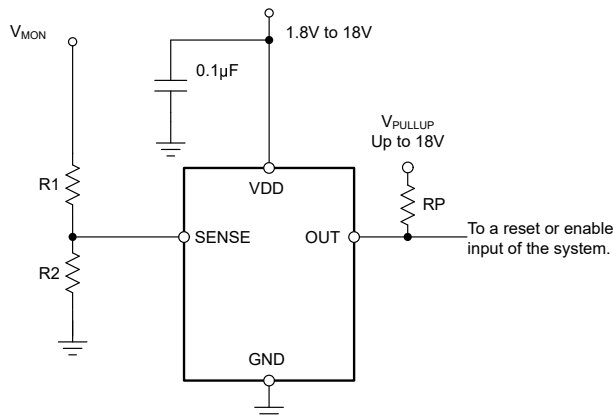
# TPS3710 Wide VIN Voltage Detector

## 1 Features

- Qualified for automotive applications
- AEC-Q100 qualified with the following results:
  - Device temperature grade 1:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  ambient operating temperature range
  - Device HBM ESD classification level 2
  - Device CDM ESD classification level C6
- Wide supply voltage range: 1.8V to 18V
- Adjustable threshold: down to 400mV
- High threshold accuracy:
  - 1.0% Overtemperature
  - 0.25% Typical
- Low quiescent current: 5.5 $\mu\text{A}$  (typical)
- Open-Drain output
- Internal hysteresis: 5.5mV (typical)
- Temperature range:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Packages:
  - SOT-6
  - 1.5mm  $\times$  1.5mm WSON-6

## 2 Applications

- [Industrial Control Systems](#)
- [Embedded Computing Modules](#)
- [DSP, Microcontroller, or Microprocessor Applications](#)
- [Notebook and Desktop Computers](#)
- [Portable- and Battery-Powered Products](#)
- [FPGA and ASIC Applications](#)



**Simplified Schematic**

## 3 Description

The TPS3710 wide supply voltage detector operates over a 1.8V to 18V range. The device has a high-accuracy comparator with an internal 400mV reference and an open-drain output rated to 18V for precision voltage detection. The monitored voltage can be set with the use of external resistors.

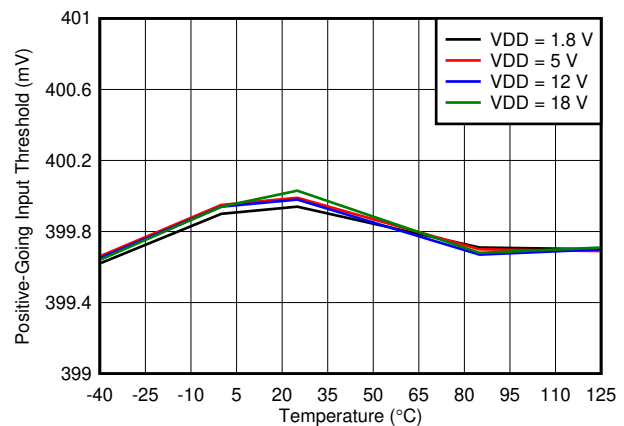
The OUT pin is driven low when the voltage at the SENSE pin drops below ( $V_{IT-}$ ), and goes high when the voltage returns above the respective threshold ( $V_{IT+}$ ). The comparator in the TPS3710 includes built-in hysteresis for filtering to reject brief glitches, which helps the device to operate without false triggering.

The TPS3710 is available in a 6-pin SOT package, and a 1.5mm  $\times$  1.5mm 6-pin WSON package, and is specified over the junction temperature range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

### Device Information

PART NUMBER	PACKAGE <sup>(1)</sup>	BODY SIZE (NOM) <sup>(2)</sup>
TPS3710	SOT (6)	2.90mm $\times$ 1.60mm
	WSON (6)	1.50mm $\times$ 1.50mm

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



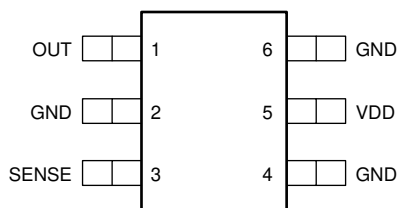
**Rising Input Threshold Voltage ( $V_{IT+}$ ) vs Temperature**



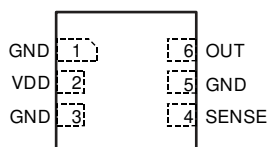
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## 4 Pin Configuration and Functions



**Figure 4-1. DDC Package  
6-Pin SOT  
Top View**



**Figure 4-2. DSE Package  
6-Pin WSON  
Top View**

**Table 4-1. Pin Functions**

PIN			I/O	DESCRIPTION
NAME	DDC	DSE		
GND	2, 4, 6	1, 3, 5	—	Connect all three pins to ground.
OUT	1	6	O	SENSE comparator open-drain output. OUT is driven low when the voltage at this comparator is below ( $V_{IT-}$ ). The output goes high when the sense voltage returns above the respective threshold ( $V_{IT+}$ ).
SENSE	3	4	I	This pin is connected to the voltage to be monitored with the use of an external resistor divider. When the voltage at this pin drops below the threshold voltage ( $V_{IT-}$ ), OUT is driven low.
VDD	5	2	I	Supply voltage input. Connect a 1.8V to 18V supply to VDD to power the device. Good analog design practice is to place a 0.1μF ceramic capacitor close to this pin.

## 5 Specifications

### 5.1 Absolute Maximum Ratings

over operating temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
Voltage <sup>(2)</sup>	VDD	−0.3	20	V
	OUT	−0.3	20	
	SENSE	−0.3	7	
Current	OUT (output sink current)		40	mA
Temperature	Operating junction, T <sub>J</sub>	−40	125	°C
	Storage, T <sub>stg</sub>	−65	150	

(1) Stresses beyond those 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) All voltages are with respect to network ground pin.

### 5.2 ESD Ratings

		VALUE	UNIT
V <sub>(ESD)</sub> Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>	±2500	V
	Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup>	±1000	

(1) JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

### 5.3 Recommended Operating Conditions

over operating temperature range (unless otherwise noted)

			MIN	NOM	MAX	UNIT
V <sub>DD</sub>	Supply voltage		1.8		18	V
V <sub>I</sub>	Input voltage	SENSE	0		6.5	V
V <sub>O</sub>	Output voltage	OUT	0		18	V

### 5.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		TPS3710		UNIT
		DDC (SOT)	DSE (WSON)	
		6 PINS	6 PINS	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	204.6	194.9	°C/W
R <sub>θJC(top)</sub>	Junction-to-case (top) thermal resistance	50.5	128.9	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	54.3	153.8	°C/W
ψ <sub>JT</sub>	Junction-to-top characterization parameter	0.8	11.9	°C/W
ψ <sub>JB</sub>	Junction-to-board characterization parameter	52.8	157.4	°C/W
R <sub>θJC(bot)</sub>	Junction-to-case (bottom) thermal resistance	N/A	N/A	°C/W

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

## 5.5 Electrical Characteristics

Over the operating temperature range of  $T_J = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ , and  $1.8\text{V} < V_{DD} < 18\text{V}$  (unless otherwise noted). Typical values are at  $T_J = 25^{\circ}\text{C}$  and  $V_{DD} = 5\text{V}$ .

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{(POR)}$ Power-on reset voltage <sup>(1)</sup>	$V_{OLmax} = 0.2\text{V}$ , output sink current = $15\mu\text{A}$			0.8	V
$V_{IT+}$ Positive-going input threshold voltage	$V_{DD} = 1.8\text{V}$	396	400	404	mV
	$V_{DD} = 18\text{V}$	396	400	404	
$V_{IT-}$ Negative-going input threshold voltage	$V_{DD} = 1.8\text{V}$	387	394.5	400	mV
	$V_{DD} = 18\text{V}$	387	394.5	400	
$V_{hys}$ Hysteresis voltage ( $hys = V_{IT+} - V_{IT-}$ )			5.5	12	mV
$I_{(SENSE)}$ Input current (at the SENSE pin)	$V_{DD} = 1.8\text{V}$ and $18\text{V}$ , $V_I = 6.5\text{V}$	-25	1	25	nA
$V_{OL}$ Low-level output voltage	$V_{DD} = 1.3\text{V}$ , output sink current = $0.4\text{mA}$			250	mV
	$V_{DD} = 1.8\text{V}$ , output sink current = $3\text{mA}$			250	
	$V_{DD} = 5\text{V}$ , output sink current = $5\text{mA}$			250	
$I_{lk(OD)}$ Open-drain output leakage-current	$V_{DD} = 1.8\text{V}$ and $18\text{V}$ , $V_O = V_{DD}$			300	nA
	$V_{DD} = 1.8\text{V}$ , $V_O = 18\text{V}$			300	
$I_{DD}$ Supply current	$V_{DD} = 1.8\text{V}$ , no load		5.5	11	$\mu\text{A}$
	$V_{DD} = 5\text{V}$		6	13	
	$V_{DD} = 12\text{V}$		6	13	
	$V_{DD} = 18\text{V}$		7	13	
UVLO Undervoltage lockout <sup>(2)</sup>	$V_{DD}$ falling	1.3		1.7	V

(1) The lowest supply voltage ( $V_{DD}$ ) at which output is active;  $t_{r(VDD)} > 15\mu\text{s/V}$ . Below  $V_{(POR)}$ , the output cannot be determined.

(2) When  $V_{DD}$  falls below UVLO, OUT is driven low. The output cannot be determined below  $V_{(POR)}$ .

## 5.6 Timing Requirements

over operating temperature range (unless otherwise noted)

			MIN	NOM	MAX	UNIT
$t_{pd(HL)}$	High-to-low propagation delay <sup>(1)</sup>	$V_{DD} = 5V$ , 10mV input overdrive, $R_P = 10k\Omega$ , $V_{OH} = 0.9 \times V_{DD}$ , $V_{OL} = 400mV$ , see <a href="#">Figure 5-1</a>		18		$\mu s$
$t_{pd(LH)}$	Low-to-high propagation delay <sup>(1)</sup>	$V_{DD} = 5V$ , 10mV input overdrive, $R_P = 10k\Omega$ , $V_{OH} = 0.9 \times V_{DD}$ , $V_{OL} = 400mV$ , see <a href="#">Figure 5-1</a>		29		$\mu s$
$t_{d(start)}$	Start-up delay <sup>(2)</sup>			150		$\mu s$

(1) High-to-low and low-to-high refers to the transition at the input pin (SENSE).

(2) During power on,  $V_{DD}$  must exceed 1.8V for at least 150 $\mu s$  before the output is in a correct state.

## 5.7 Switching Characteristics

over operating temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_r$	Output rise time $V_{DD} = 5V$ , 10mV input overdrive, $R_P = 10k\Omega$ , $V_O = (0.1 \text{ to } 0.9) \times V_{DD}$		2.2		$\mu s$
$t_f$	Output fall time $V_{DD} = 5V$ , 10mV input overdrive, $R_P = 10k\Omega$ , $V_O = (0.1 \text{ to } 0.9) \times V_{DD}$		0.22		$\mu s$

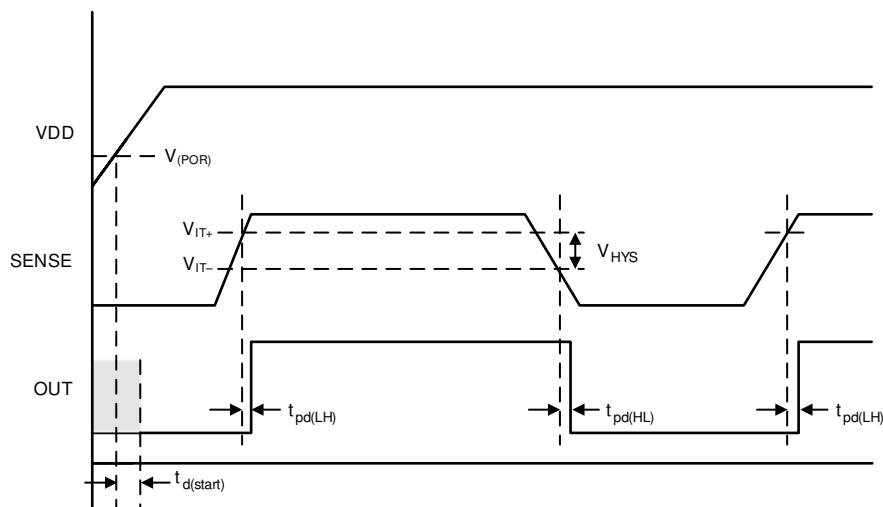


Figure 5-1. Timing Diagram

## 5.8 Typical Characteristics

at  $T_J = 25^\circ\text{C}$  and  $V_{DD} = 5\text{V}$  (unless otherwise noted)

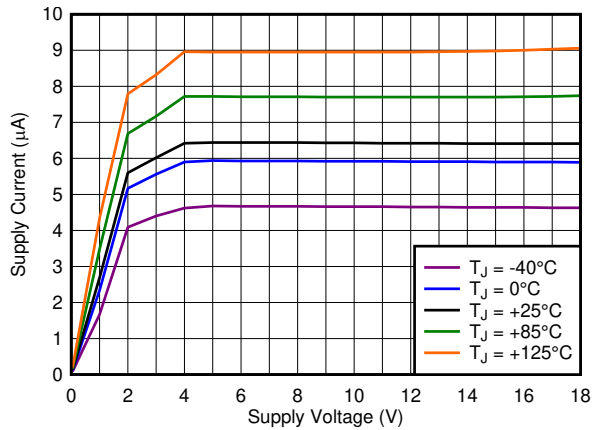


Figure 5-2. Supply Current ( $I_{DD}$ ) vs Supply Voltage ( $V_{DD}$ )

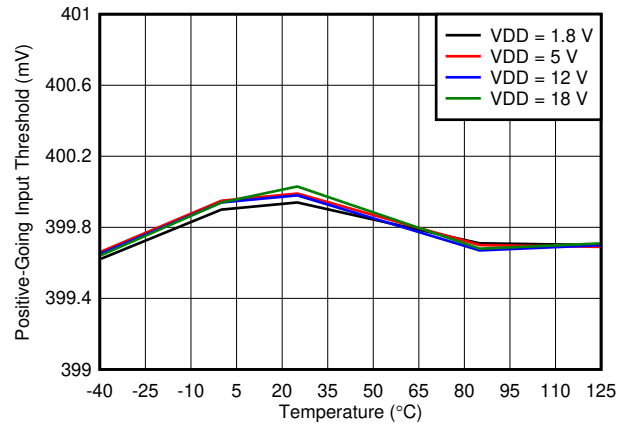


Figure 5-3. Rising Input Threshold Voltage ( $V_{IT+}$ ) vs Temperature

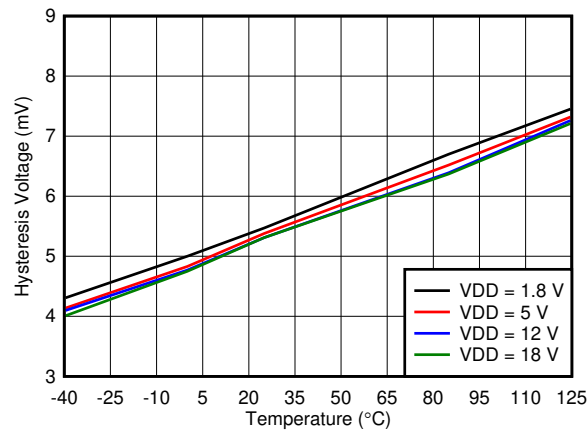


Figure 5-4. Hysteresis ( $V_{hys}$ ) vs Temperature

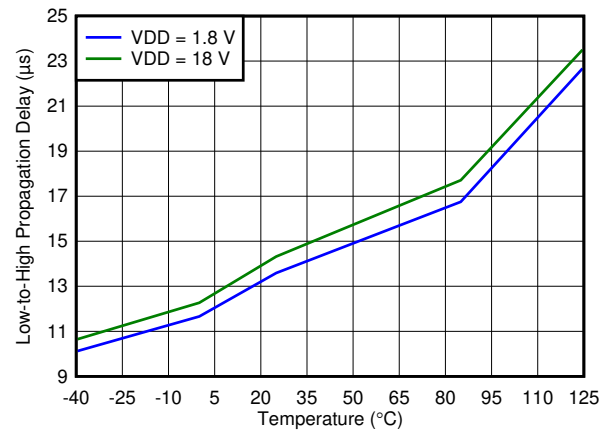


Figure 5-5. Propagation Delay vs Temperature (High-to-Low Transition at Sense)

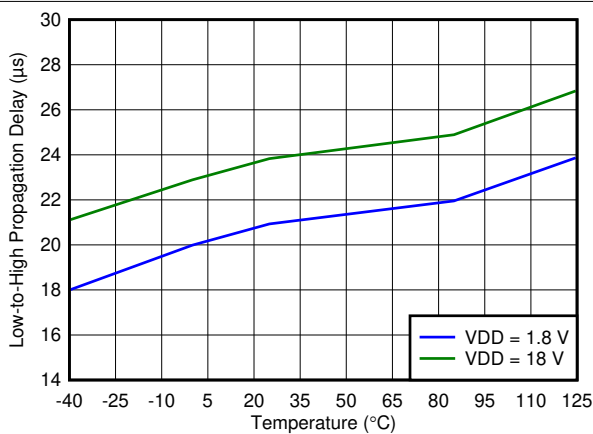


Figure 5-6. Propagation Delay vs Temperature (Low-to-High Transition at Sense)

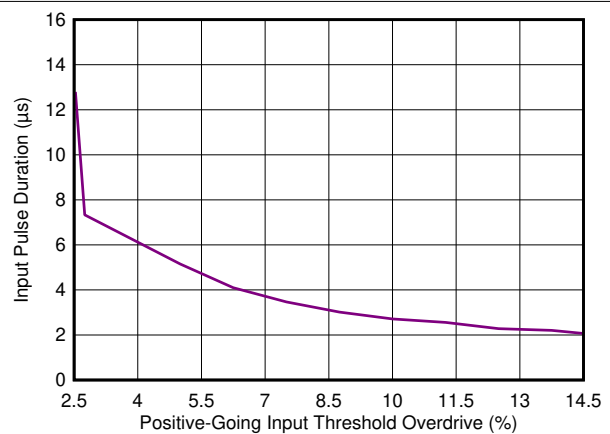


Figure 5-7. Minimum Pulse Width vs Threshold Overdrive Voltage

## 5.8 Typical Characteristics (continued)

at  $T_J = 25^\circ\text{C}$  and  $V_{DD} = 5\text{V}$  (unless otherwise noted)

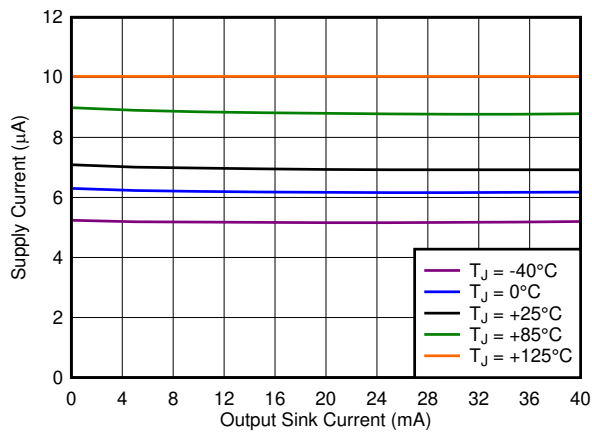


Figure 5-8. Supply Current ( $I_{DD}$ ) vs Output Sink Current

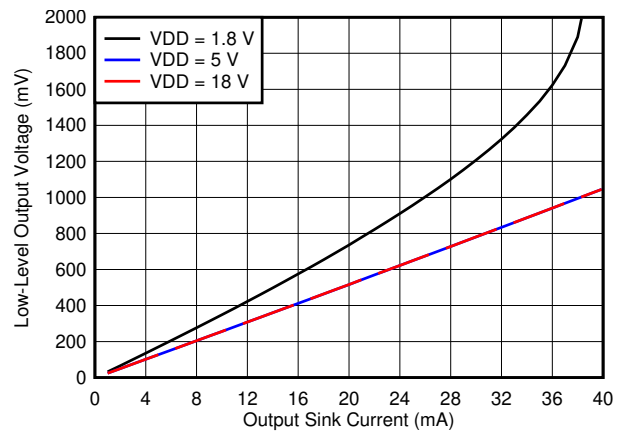


Figure 5-9. Output Voltage Low ( $V_{OL}$ ) vs Output Sink Current ( $-40^\circ\text{C}$ )

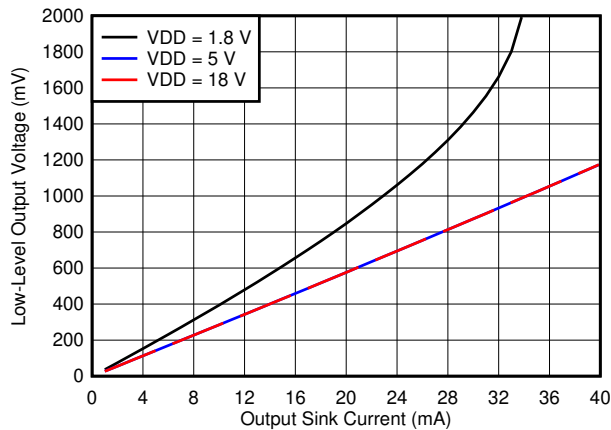


Figure 5-10. Output Voltage Low ( $V_{OL}$ ) vs Output Sink Current ( $0^\circ\text{C}$ )

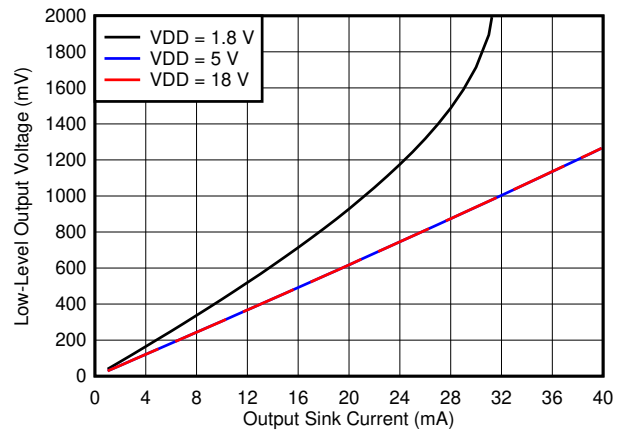


Figure 5-11. Output Voltage Low ( $V_{OL}$ ) vs Output Sink Current ( $25^\circ\text{C}$ )

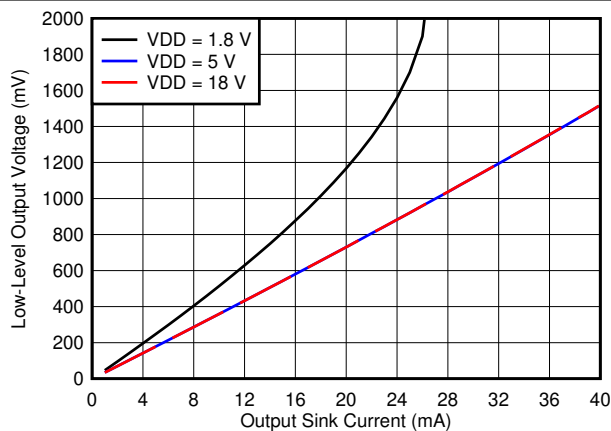


Figure 5-12. Output Voltage Low ( $V_{OL}$ ) vs Output Sink Current ( $85^\circ\text{C}$ )

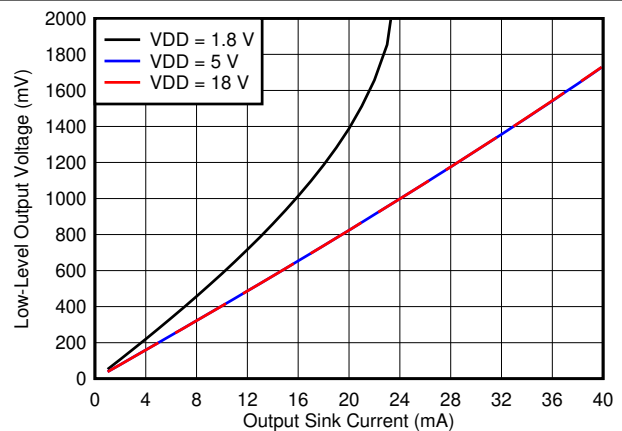


Figure 5-13. Output Voltage Low ( $V_{OL}$ ) vs Output Sink Current ( $125^\circ\text{C}$ )



## 6 Detailed Description

### 6.1 Overview

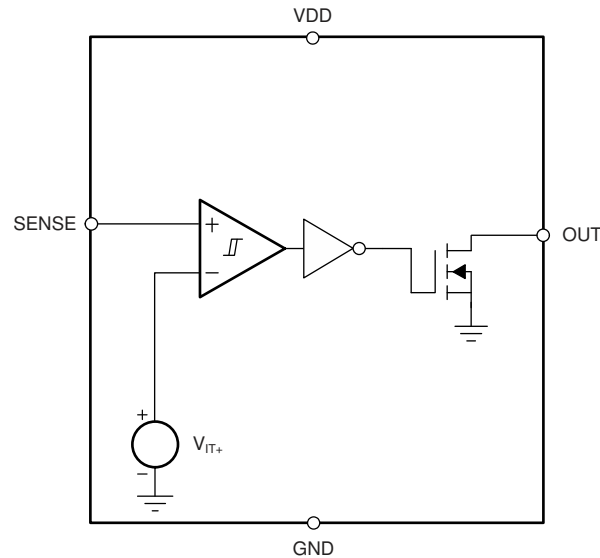
The TPS3710 provides precision voltage detection. The TPS3710 is a wide-supply voltage range (1.8V to 18V) device with a high-accuracy rising input threshold of 400mV (1% over temperature) and built-in hysteresis. The output is also rated to 18V, and can sink up to 40mA.

The TPS3710 asserts the output signal, as shown in [Table 6-1](#). To monitor any voltage above 0.4V, set the input using an external resistor divider network. Broad voltage thresholds are supported that enable the device for use in a wide array of applications.

**Table 6-1. TPS3710 Truth Table**

CONDITION	OUTPUT	STATUS
$\text{SENSE} > V_{IT+}$	OUT high	Output not asserted
$\text{SENSE} < V_{IT-}$	OUT low	Output asserted

### 6.2 Functional Block Diagram



## 6.3 Feature Description

### 6.3.1 Input (SENSE)

The TPS3710 comparator has two inputs: one external input, and one input connected to the internal reference. The comparator rising threshold is trimmed to be equal to the reference voltage (400mV). The comparator also has a built-in falling hysteresis that makes the device less sensitive to supply-rail noise and provides stable operation.

The comparator input (SENSE) is able to swing from ground to 6.5V, regardless of the device supply voltage. Although not required in most cases, to reduce sensitivity to transients and layout parasitics for extremely noisy applications, place a 1nF to 10nF bypass capacitor at the comparator input.

OUT is driven to logic low when the input SENSE voltage drops below ( $V_{IT-}$ ). When the voltage exceeds  $V_{IT+}$ , the output (OUT) goes to a high-impedance state; see [Figure 5-1](#).

### 6.3.2 Output (OUT)

In a typical TPS3710 application, the output is connected to a reset or enable input of the processor (such as a digital signal processor [DSP], central processing unit [CPU], field-programmable gate array [FPGA], or application-specific integrated circuit [ASIC]) or the output is connected to the enable input of a voltage regulator (such as a dc-dc converter or low-dropout regulator [LDO]).

The TPS3710 device provides an open-drain output (OUT). Use a pullup resistor to hold this line high when the output goes to high impedance (not asserted). To connect the output to another device at the correct interface-voltage level, connect a pullup resistor to the proper voltage rail. The TPS3710 output can be pulled up to 18V, independent of the device supply voltage.

[Table 6-1](#) and the [Section 6.3.1](#) section describe how the output is asserted or deasserted. See [Figure 5-1](#) for a timing diagram that describes the relationship between threshold voltage and the respective output.

### 6.3.3 Immunity to Input-Pin Voltage Transients

The TPS3710 is relatively immune to short voltage transient spikes on the sense pin. Sensitivity to transients depends on both transient duration and amplitude; see [Figure 5-7](#), *Minimum Pulse Width vs Threshold Overdrive Voltage*.

## 6.4 Device Functional Modes

### 6.4.1 Normal Operation ( $V_{DD} > UVLO$ )

When the voltage on  $V_{DD}$  is greater than 1.8V for at least 150 $\mu$ s, the OUT signal correspond to the voltage on SENSE as listed in [Table 6-1](#).

### 6.4.2 Undervoltage Lockout ( $V_{POR} < V_{DD} < UVLO$ )

When the voltage on  $V_{DD}$  is less than the device UVLO voltage, and greater than the power-on reset voltage,  $V_{POR}$ , the OUT signal is asserted regardless of the voltage on SENSE.

### 6.4.3 Power-On Reset ( $V_{DD} < V_{POR}$ )

When the voltage on  $V_{DD}$  is lower than the required voltage to internally pull the asserted output to GND ( $V_{POR}$ ), SENSE is in a high-impedance state and the OUT signal is undefined.

## 7 Application and Implementation

### Note

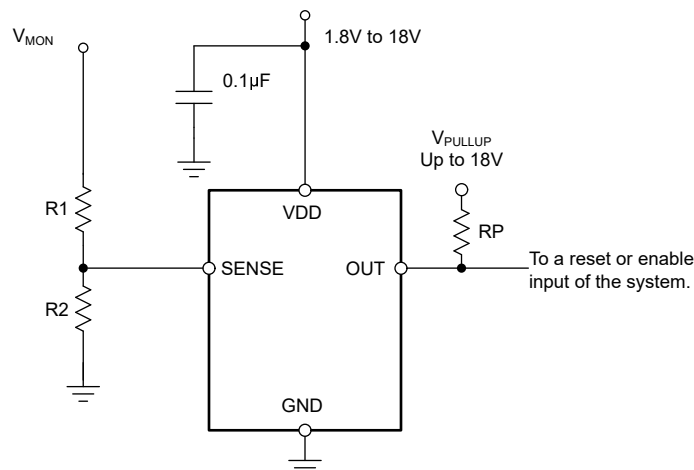
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation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

### 7.1 Application Information

The TPS3710 device is a wide-supply voltage comparator that operates over a  $V_{DD}$  range of 1.8V to 18V. The device has a high-accuracy comparator with an internal 400mV reference and an open-drain output rated to 18V for precision voltage detection. The device can be used as a voltage monitor. The monitored voltage are set with the use of external resistors.

#### 7.1.1 $V_{PULLUP}$ to a Voltage Other Than $V_{DD}$

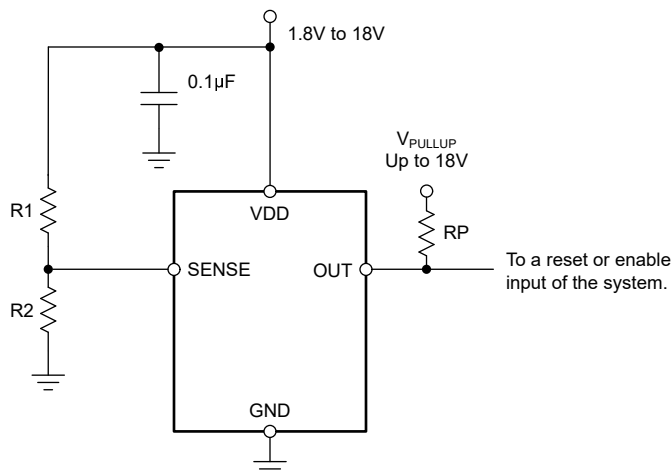
The output is often tied to  $V_{DD}$  through a resistor. However, some applications may require the output to be pulled up to a higher or lower voltage than  $V_{DD}$  to correctly interface with the reset and enable pins of other devices.



**Figure 7-1. Interfacing to a Voltage Other Than  $V_{DD}$**

### 7.1.2 Monitoring $V_{DD}$

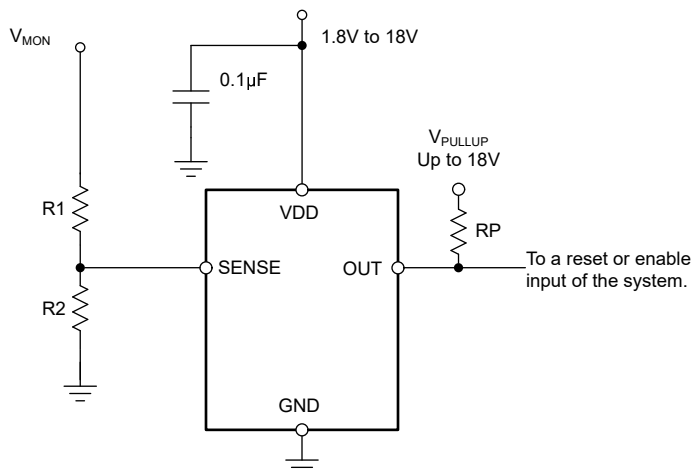
Many applications monitor the same rail that is powering  $V_{DD}$ . In these applications the resistor divider is simply connected to the  $V_{DD}$  rail.



**Figure 7-2. Monitoring the Same Voltage as  $V_{DD}$**

### 7.1.3 Monitoring a Voltage Other Than $V_{DD}$

Some applications monitor rails other than the one that is powering  $V_{DD}$ . In these types of applications the resistor divider used to set the desired threshold is connected to the rail that is being monitored.

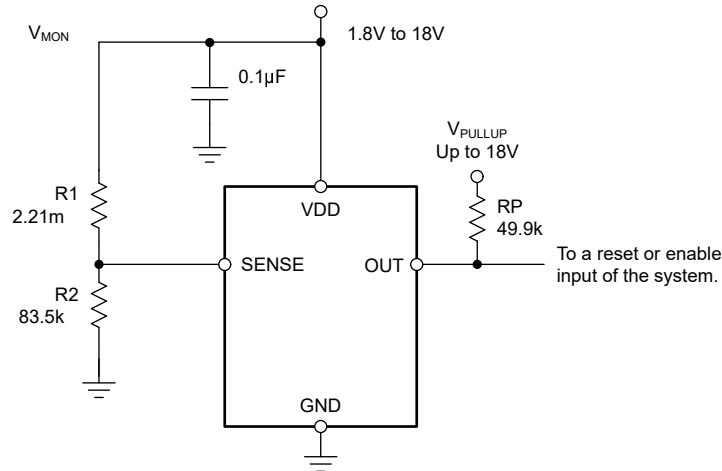


NOTE: The input can monitor a voltage greater than maximum  $V_{DD}$  with the use of an external resistor divider network.

**Figure 7-3. Monitoring a Voltage Other Than  $V_{DD}$**

## 7.2 Typical Application

The TPS3710 device is a wide-supply voltage comparator that operates over a  $V_{DD}$  range of 1.8 to 18V. The monitored voltage is set with the use of external resistors, so the device can be used either as a precision voltage monitor.



**Figure 7-4. Wide VIN Voltage Monitor**

### 7.2.1 Design Requirements

For this design example, use the values summarized in [Table 7-1](#) as the input parameters.

**Table 7-1. Design Parameters**

PARAMETER	DESIGN REQUIREMENT	DESIGN RESULT
Monitored voltage	12V nominal rail with maximum falling threshold of 10%	$V_{MON(UV)} = 10.99V$ (8.33%)

### 7.2.2 Detailed Design Procedure

#### 7.2.2.1 Resistor Divider Selection

The resistor divider values and target threshold voltage can be calculated by using [Equation 1](#) to determine  $V_{MON(UV)}$ .

$$V_{MON(UV)} = \left(1 + \frac{R1}{R2}\right) \times V_{IT-} \quad (1)$$

where

- R1 and R2 are the resistor values for the resistor divider on the SENSEx pins
- $V_{MON(UV)}$  is the target voltage at which an undervoltage condition is detected

Choose  $R_{TOTAL}$  ( = R1 + R2) so that the current through the divider is approximately 100 times higher than the input current at the SENSE pin. The resistors can have high values to minimize current consumption as a result of low input bias current without adding significant error to the resistive divider. For details on sizing input resistors, refer to application report [SLVA450, Optimizing Resistor Dividers at a Comparator Input](#), available for download from [www.ti.com](#).

### 7.2.2.2 Pullup Resistor Selection

To make ensure the proper voltage level, the pullup resistor value is selected by ensuring that the pullup voltage divided by the resistor does not exceed the sink-current capability of the device. This confirmation is calculated by verifying that the pullup voltage minus the output-leakage current ( $I_{lk(OD)}$ ) multiplied by the resistor is greater than the desired logic-high voltage. These values are specified in the [Section 5.5](#).

Use [Equation 2](#) to calculate the value of the pullup resistor.

$$\frac{(V_{HI} - V_{PU})}{I_{lk(OD)}} \geq R_{PU} \geq \frac{V_{PU}}{I_O} \quad (2)$$

### 7.2.2.3 Input Supply Capacitor

Although an input capacitor is not required for stability, for good analog design practice, connect a 0.1µF low equivalent series resistance (ESR) capacitor across the VDD and GND pins. A higher value capacitor can be necessary if large, fast rise-time load transients are anticipated, or if the device is not located close to the power source.

### 7.2.2.4 Sense Capacitor

Although not required in most cases, for extremely noisy applications, place a 1nF to 10nF bypass capacitor from the comparator input (SENSE) to the GND pin for good analog design practice. This capacitor placement reduces device sensitivity to transients.

### 7.2.3 Application Curve

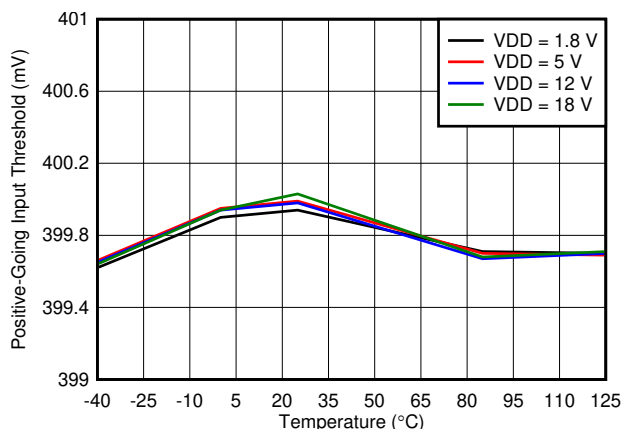


Figure 7-5. Rising Input Threshold Voltage ( $V_{IT+}$ ) vs Temperature

## 7.3 Do's and Don'ts

Do connect a 0.1µF decoupling capacitor from  $V_{DD}$  to GND for best system performance.

If the monitored rail is noisy, do connect a decoupling capacitor from the comparator input (sense) to GND.

Don't use resistors for the voltage divider that cause the current through them to be less than 100 times the input current of the comparator without also accounting for the effect to the accuracy.

Don't use a pullup resistor that is too small, because the larger current sunk by the output then exceeds the desired low-level output voltage ( $V_{OL}$ ).

## 7.4 Power-Supply Recommendations

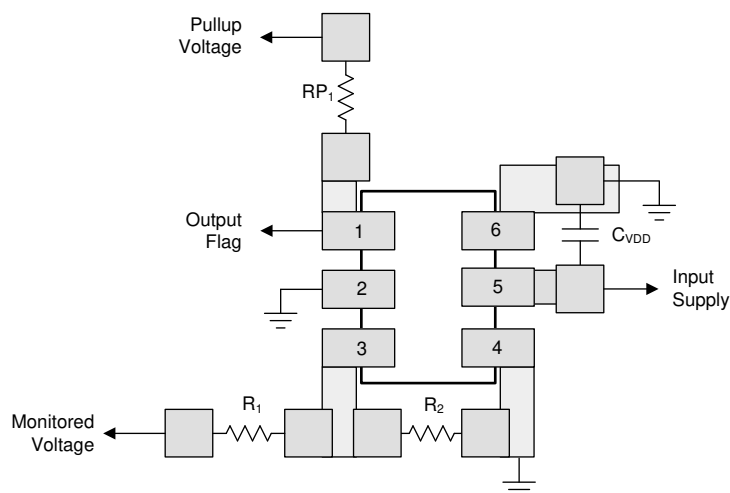
This device operates from an input voltage supply range between 1.8V and 18V.

## 7.5 Layout

### 7.5.1 Layout Guidelines

Placing a 0.1 $\mu$ F capacitor close to the VDD pin to reduce the input impedance to the device is good analog design practice.

### 7.5.2 Layout Example



**Figure 7-6. Layout Example**

## 8 Device and Documentation Support

### 8.1 Device Support

#### 8.1.1 Device Nomenclature

**Table 8-1. Device Nomenclature**

PRODUCT	DESCRIPTION
TPS3710yyyz	yyy is package designator z is package quantity

### 8.2 Documentation Support

#### 8.2.1 Related Documentation

For related documentation, see the following:

[Optimizing Resistor Dividers at a Comparator Input](#)

### 8.3 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://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.

### 8.4 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](#).

### 8.5 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 8.6 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.

### 8.7 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 9 Revision History

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

Changes from Revision * (October 2015) to Revision A (February 2024)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document .....	1
• Updated images with capacitor value that changed from 0.01uF to 0.1uF at VDD pin throughout document...	1

## 10 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 revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.



## 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)
<a href="#">TPS3710DDCR</a>	Active	Production	SOT-23-THIN (DDC)   6	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	11AO
TPS3710DDCR.A	Active	Production	SOT-23-THIN (DDC)   6	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	11AO
<a href="#">TPS3710DDCRG4</a>	Active	Production	SOT-23-THIN (DDC)   6	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	11AO
TPS3710DDCRG4.A	Active	Production	SOT-23-THIN (DDC)   6	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	11AO
<a href="#">TPS3710DDCT</a>	Active	Production	SOT-23-THIN (DDC)   6	250   SMALL T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	11AO
TPS3710DDCT.A	Active	Production	SOT-23-THIN (DDC)   6	250   SMALL T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	11AO
<a href="#">TPS3710DSER</a>	Active	Production	WSON (DSE)   6	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1A
TPS3710DSER.A	Active	Production	WSON (DSE)   6	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1A
TPS3710DSERG4	Active	Production	WSON (DSE)   6	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1A
TPS3710DSERG4.A	Active	Production	WSON (DSE)   6	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1A
<a href="#">TPS3710DSET</a>	Active	Production	WSON (DSE)   6	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1A
TPS3710DSET.A	Active	Production	WSON (DSE)   6	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1A

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

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

**(6) Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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

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**OTHER QUALIFIED VERSIONS OF TPS3710 :**

- Automotive : [TPS3710-Q1](#)

NOTE: Qualified Version Definitions:

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

## TAPE AND REEL INFORMATION



\*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
TPS3710DDCR	SOT-23-THIN	DDC	6	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3710DDCRG4	SOT-23-THIN	DDC	6	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3710DDCT	SOT-23-THIN	DDC	6	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS3710DSERG4	WSO	DSE	6	3000	179.0	8.4	1.8	1.8	1.0	4.0	8.0	Q2
TPS3710DSET	WSO	DSE	6	250	179.0	8.4	1.8	1.8	1.0	4.0	8.0	Q2

## TAPE AND REEL BOX DIMENSIONS



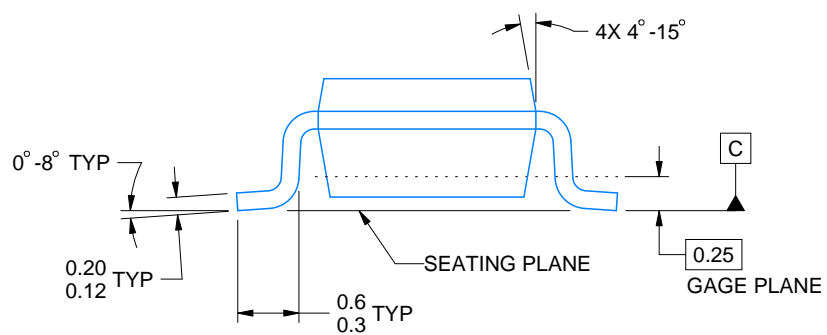
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3710DDCR	SOT-23-THIN	DDC	6	3000	213.0	191.0	35.0
TPS3710DDCRG4	SOT-23-THIN	DDC	6	3000	213.0	191.0	35.0
TPS3710DDCT	SOT-23-THIN	DDC	6	250	213.0	191.0	35.0
TPS3710DSERG4	WSON	DSE	6	3000	200.0	183.0	25.0
TPS3710DSET	WSON	DSE	6	250	200.0	183.0	25.0



## SOT-23 - 1.1 max height

## SMALL OUTLINE TRANSISTOR



4214841/E 08/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-193.

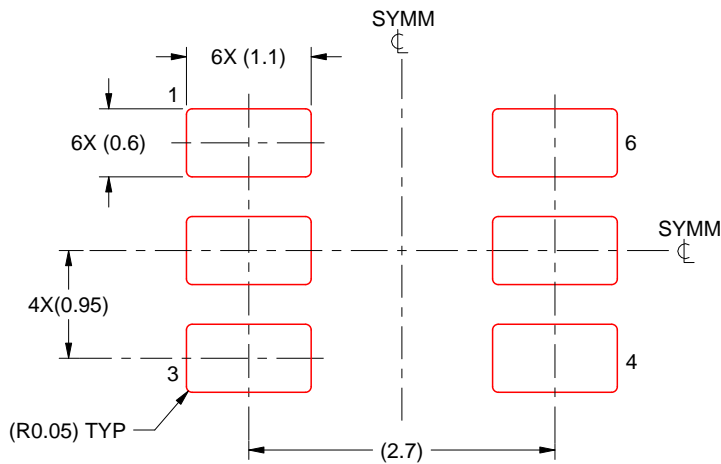


# EXAMPLE STENCIL DESIGN

DDC0006A

SOT-23 - 1.1 max height

SMALL OUTLINE TRANSISTOR



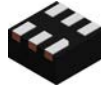
SOLDER PASTE EXAMPLE  
BASED ON 0.125 THICK STENCIL  
SCALE:15X

4214841/E 08/2024

NOTES: (continued)

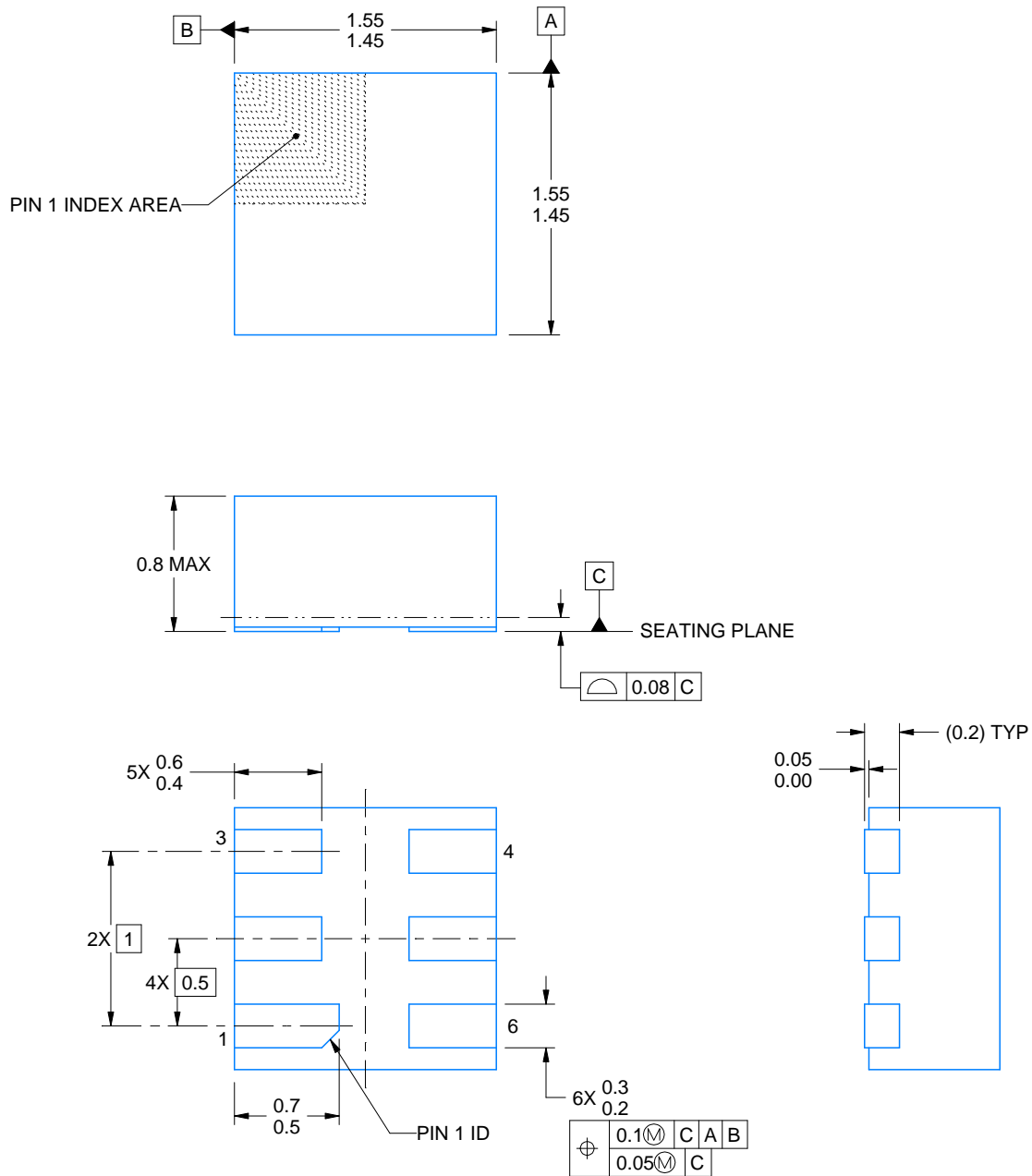
6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
7. Board assembly site may have different recommendations for stencil design.

DSE0006A



**PACKAGE OUTLINE**  
**WSO - 0.8 mm max height**

PLASTIC SMALL OUTLINE - NO LEAD



4220552/B 01/2024

**NOTES:**

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

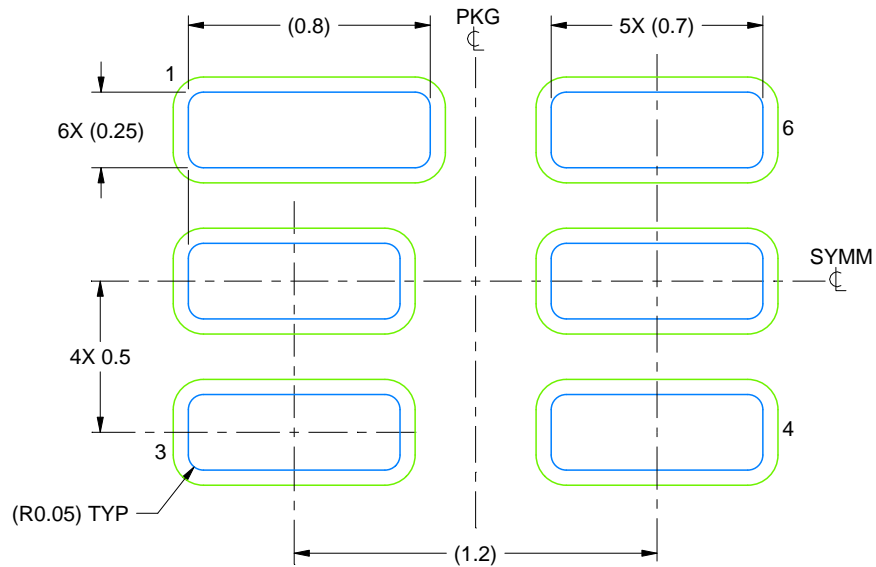


# EXAMPLE BOARD LAYOUT

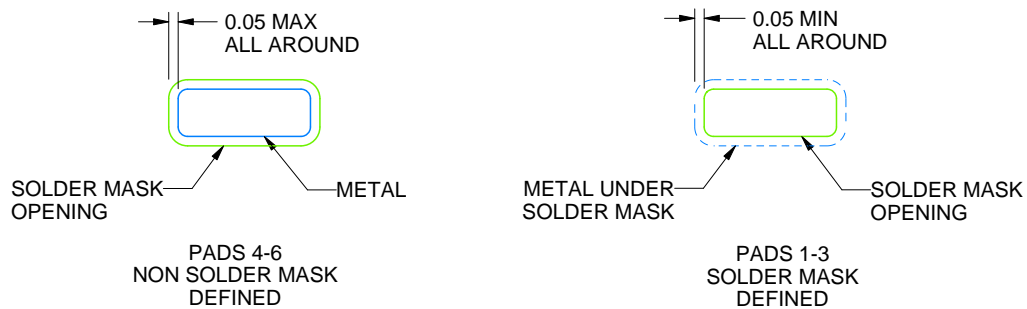
DSE0006A

WSN - 0.8 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
SCALE:40X



SOLDER MASK DETAILS

4220552/B 01/2024

NOTES: (continued)

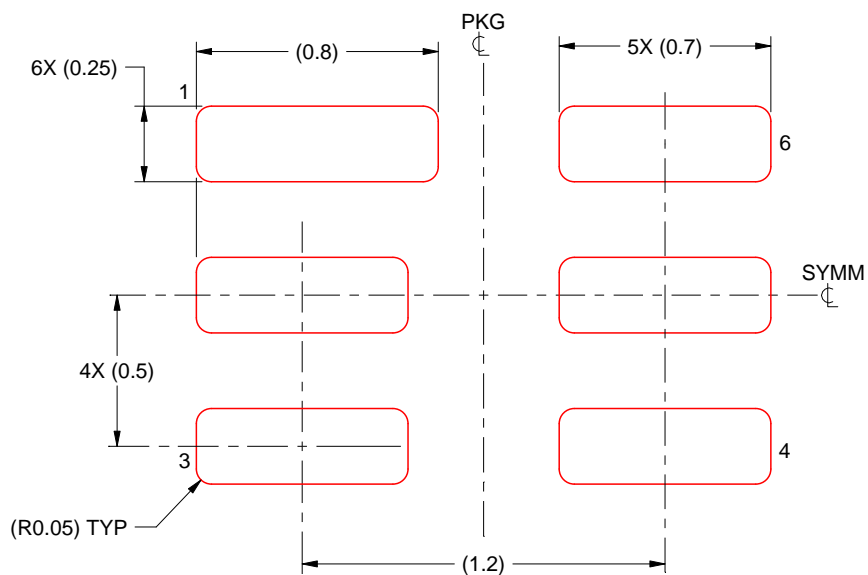
3. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).

## EXAMPLE STENCIL DESIGN

DSE0006A

WSN - 0.8 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:40X

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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