

3-Pin Voltage Supervisors with Active-High, Push-Pull Reset

Check for Samples: [TLV810M](#), [TLV810R](#), [TLV810S](#), [TLV810Z](#)

FEATURES

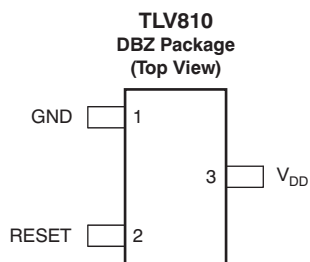
- 3-Pin SOT23 Package
- Supply Current: 9 μ A (Typical)
- Precision Supply Voltage Monitor:
2.5 V, 3 V, 3.3 V, 5 V
- Power-On Reset Generator with
Fixed Delay Time of 200 ms
- Pin-for-Pin Compatible with MAX810
- Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Push-Pull, RESET Output

APPLICATIONS

- DSPs, Microcontrollers, and Microprocessors
- Wireless Communication Systems
- Portable/Battery-Powered Equipment
- Programmable Controls
- Intelligent Instruments
- Industrial Equipment
- Notebook and Desktop Computers
- Automotive Systems

DEVICE FAMILY COMPARISON

DEVICE	FUNCTION
TLV803	Open-Drain, $\overline{\text{RESET}}$ Output
TLV809	Push-Pull, $\overline{\text{RESET}}$ Output
TLV810	Push-Pull, RESET Output



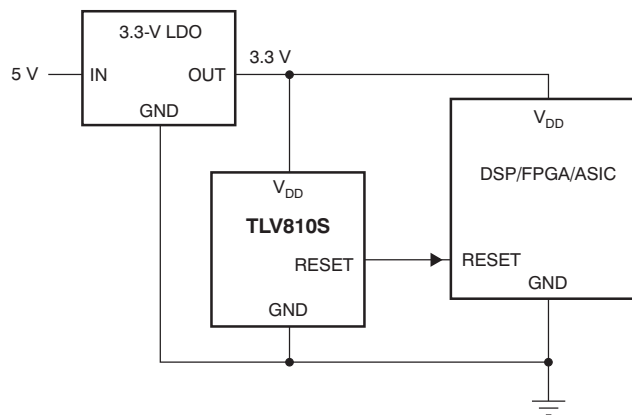
DESCRIPTION

The [TLV810](#) family of supervisory circuits provides circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

During power-on, RESET is asserted when the supply voltage (V_{DD}) becomes higher than 1.1 V. Thereafter, the supervisory circuit monitors V_{DD} and keeps RESET active as long as V_{DD} remains below the threshold voltage V_{IT} . An internal timer delays the return of the output to the inactive state (low) to ensure proper system reset. The delay time ($t_{\text{d(typ)}} = 200$ ms) starts after V_{DD} has risen above the threshold voltage, V_{IT} . When the supply voltage drops below the V_{IT} threshold voltage, the output becomes active (high) again. No external components are required. All the devices in this family have a fixed sense-threshold voltage (V_{IT}) set by an internal voltage divider.

The product spectrum is designed for supply voltages of 2.5 V, 3 V, 3.3 V, and 5 V. The circuits are available in a 3-pin SOT-23 package. The TLV810 devices are characterized for operation over a temperature range of -40°C to $+125^{\circ}\text{C}$.

TYPICAL APPLICATION



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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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/ORDERING INFORMATION⁽¹⁾

PRODUCT	THRESHOLD VOLTAGE	PACKAGE-LEAD	PACKAGE DESIGNATOR	SPECIFIED OPERATING TEMPERATURE	PACKAGE MARKING	ORDERING INFORMATION	TRANSPORT MEDIA, QUANTITY
TLV810Z	2.25 V	SOT23-3	DBZ	-40°C to +125°C	VOVQ	TLV810ZDBZR	Tape and Reel, 3000
						TLV810ZDBZT	Tape and Reel, 250
TLV810R	2.64 V	SOT23-3	DBZ	-40°C to +125°C	VOWQ	TLV810RDBZR	Tape and Reel, 3000
						TLV810RDBZT	Tape and Reel, 250
TLV810S	2.93 V	SOT23-3	DBZ	-40°C to +125°C	VOXQ	TLV810SDBZR	Tape and Reel, 3000
						TLV810SDBZT	Tape and Reel, 250
TLV810M	4.38 V	SOT23-3	DBZ	-40°C to +125°C	VOYQ	TLV810MDBZR	Tape and Reel, 3000
						TLV810MDBZT	Tape and Reel, 250

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this data sheet, or visit the [device product folders at www.ti.com](http://www.ti.com).

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Over operating free-air temperature range (unless otherwise noted).

		VALUE		UNIT
		MIN	MAX	
Voltage	$V_{DD}^{(2)}$	0	7	V
	All other pins ⁽²⁾	-0.3	7	V
Current	Maximum low output current, I_{OL}		5	mA
	Maximum high output current, I_{OH}		-5	mA
	Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{DD}$)		±20	mA
	Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{DD}$)		±20	mA
Temperature	Operating free-air temperature range, T_A	-40	+125	°C
	Storage temperature range, T_{stg}	-65	+150	°C
	Soldering temperature		+260	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltage values are with respect to GND. For reliable operation the device should not be operated at 7 V for more than $t = 1000h$ continuously.

THERMAL INFORMATION

THERMAL METRIC ⁽¹⁾		TLV810	UNITS
		DBZ	
		3 PINS	
θ_{JA}	Junction-to-ambient thermal resistance	286.9	°C/W
θ_{JCTop}	Junction-to-case (top) thermal resistance	105.6	
θ_{JB}	Junction-to-board thermal resistance	124.4	
ψ_{JT}	Junction-to-top characterization parameter	25.8	
ψ_{JB}	Junction-to-board characterization parameter	107.9	
θ_{JCbott}	Junction-to-case (bottom) thermal resistance	—	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](http://www.ti.com).

RECOMMENDED OPERATING CONDITIONS

At specified temperature range (unless otherwise noted).

		MIN	MAX	UNIT
V _{DD}	Supply voltage	1.1	6	V
T _A	Operating free-air temperature range	–40	+125	°C

ELECTRICAL CHARACTERISTICS

Over recommended operating free-air temperature range (unless otherwise noted).

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V _{OH}	High-level output voltage	V _{DD} = 2.0 V to 6 V, I _{OH} = −500 μA	V _{DD} − 0.2			V
		V _{DD} = 3.3 V, I _{OH} = −2 mA	V _{DD} − 0.4			
		V _{DD} = 6 V, I _{OH} = −4 mA, T _A = −40°C to +85°C	V _{DD} − 0.4			
		V _{DD} = 6 V, I _{OH} = −4 mA, T _A = +85°C to +125°C	V _{DD} − 0.5			
V _{OL}	Low-level output voltage	V _{DD} = 2.5 V to 6 V, I _{OL} = 500 μA			0.2	V
		V _{DD} = 3.3 V, I _{OL} = 2 mA			0.4	
		V _{DD} = 6 V, I _{OL} = 4 mA			0.4	
Power-up reset voltage ⁽¹⁾		V _{OH} ≥ V _{DD} − 0.2 V, I _{OH} = −50 μA	1.1			V
V _{IT−}	Negative-going input threshold voltage ⁽²⁾	TLV810Z	2.20	2.25	2.30	V
		TLV810R	2.58	2.64	2.70	
		TLV810S	2.87	2.93	2.99	
		TLV810M	4.28	4.38	4.48	
V _{hys}	Hysteresis	TLV810Z	I _{OH} = −50 μA, T _A = +25°C	30		mV
		TLV810R		35		
		TLV810S		40		
		TLV810M		60		
I _{DD}	Supply current	V _{DD} = 2 V, output unconnected		9	15	μA
		V _{DD} = 6 V, output unconnected		20	30	

(1) The lowest supply voltage at which RESET becomes valid. t_r, V_{DD} ≤ 66.7 ms/V.

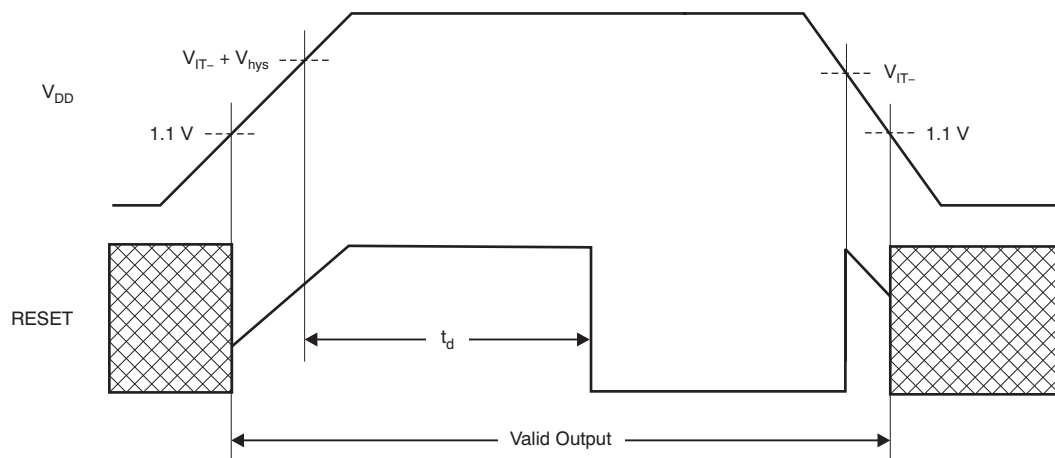
(2) To ensure best stability of the threshold voltage, a bypass capacitor (0.1-µF ceramic) should be placed near the supply terminals.

SWITCHING CHARACTERISTICS

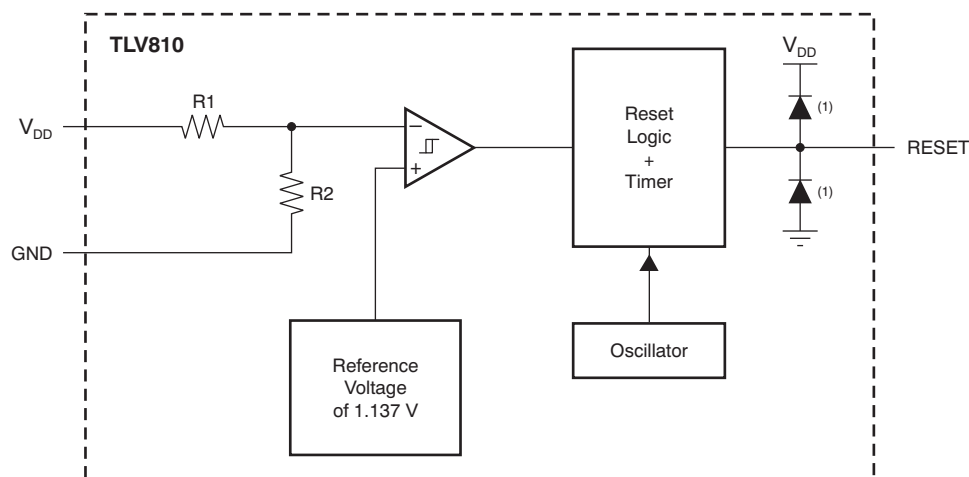
At $T_A = +25^\circ\text{C}$, unless otherwise noted.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w Pulse width at V_{DD}	$V_{DD} = 1.08 V_{IT-}$ to $0.92 V_{IT-}$		1		μs
t_d Delay time	$V_{DD} \geq V_{IT-} + 0.2 \text{ V}$; see Timing Diagram	120	200	280	ms

TIMING DIAGRAM



FUNCTIONAL BLOCK DIAGRAM



(1) Parasitic diode.

TYPICAL CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_{IT-} = 4.38\text{ V}$, and $V_{DD} = 5.0\text{ V}$, unless otherwise noted.

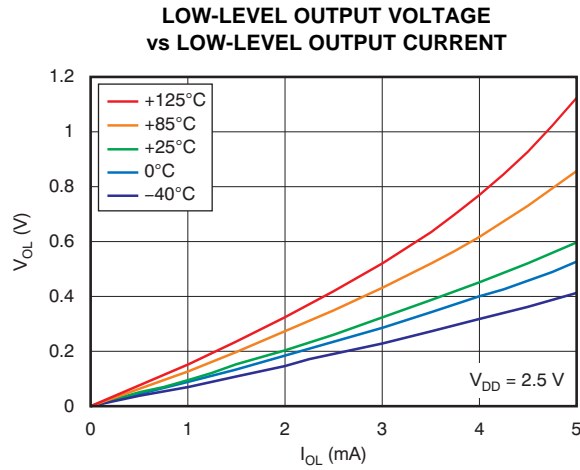


Figure 1.

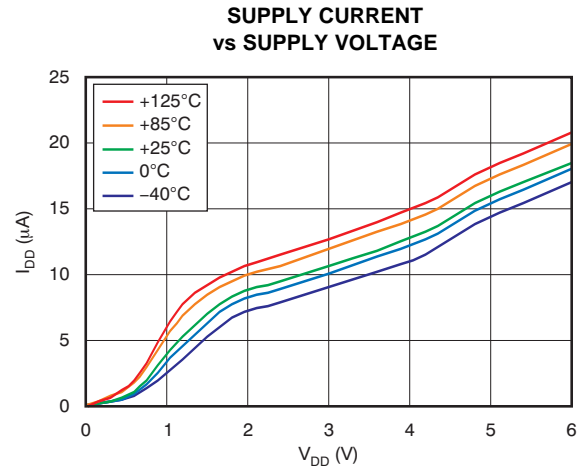


Figure 2.

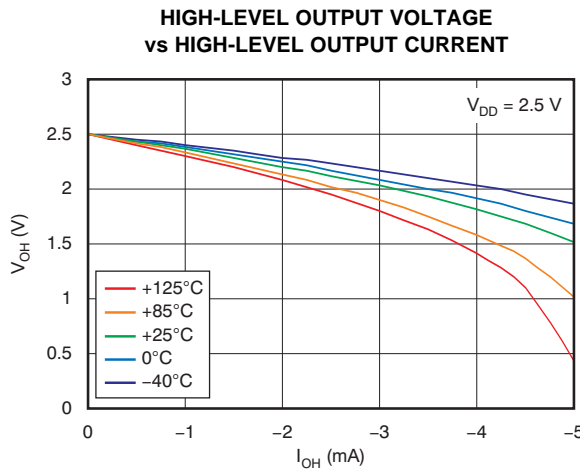


Figure 3.

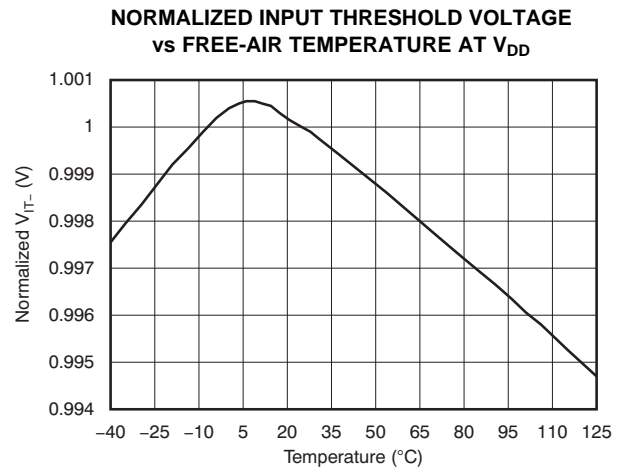


Figure 4.

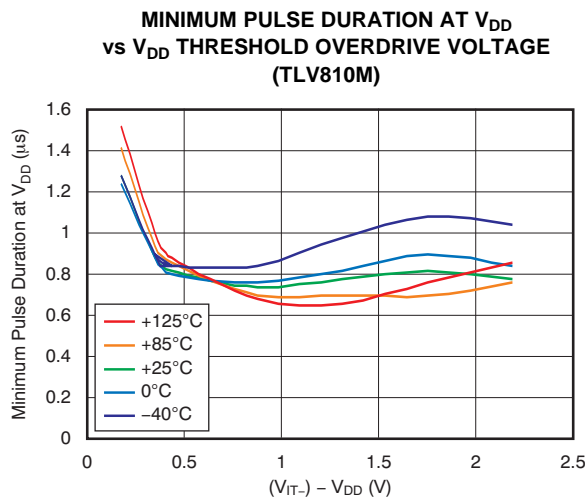


Figure 5.

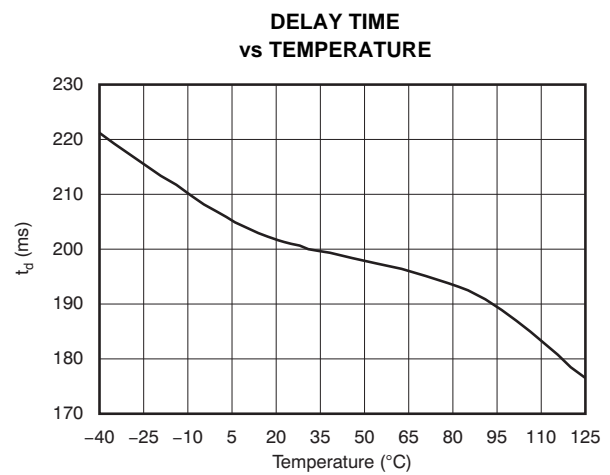


Figure 6.

APPLICATION INFORMATION

V_{DD} TRANSIENT REJECTION

The TLV810 has built-in rejection of fast transients on the V_{DD} pin. The rejection of transients depends on both the duration and the amplitude of the transient. The amplitude of the transient is measured from the bottom of the transient to the negative threshold voltage of the TLV810, as shown in Figure 7.

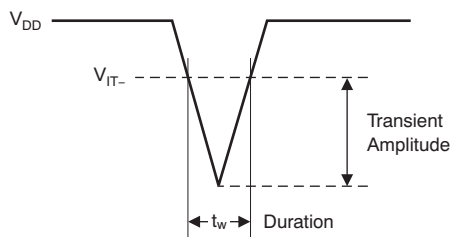


Figure 7. Voltage Transient Measurement

The TLV810 does not respond to transients that are fast duration/low amplitude or long duration/small amplitude. Figure 5 shows the relationship between the transient amplitude and the duration needed to trigger a reset. Any combination of duration and amplitude above the curve generates a reset signal.

RESET DURING POWER UP/DOWN

The TLV810 output is valid when V_{DD} is greater than 1.1 V. When V_{DD} is less than 1.1 V, the output is undefined. Figure 8 shows a typical waveform for the power-up sequence.

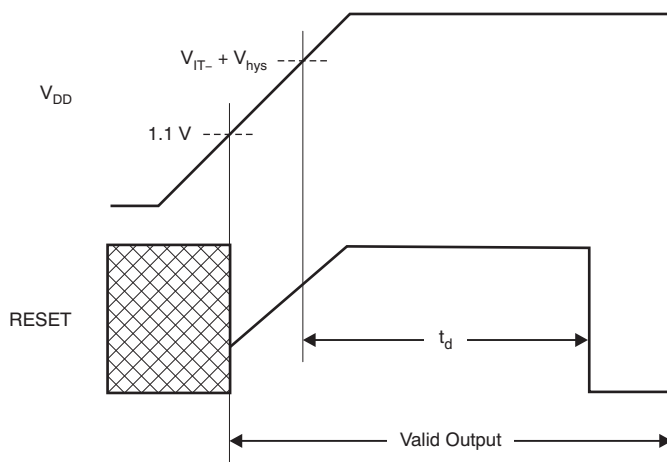


Figure 8. Power-Up Response

BIDIRECTIONAL RESET PINS

Some microcontrollers have bidirectional reset pins that act as both inputs and outputs. In a situation where both the TLV810 and the microcontroller are attempting to drive the RESET line, a series resistor should be placed between the output of the TLV810 and the RESET pin of the microcontroller to protect against excessive current flow. [Figure 9](#) shows the connection of the TLV810 to a microcontroller using a series resistor to drive a bidirectional RESET line.

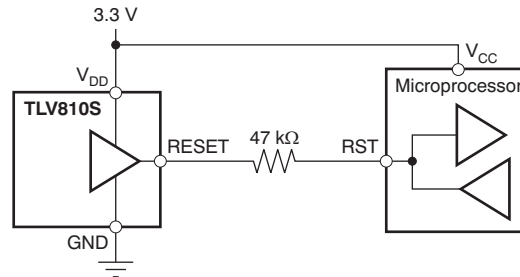


Figure 9. Connection to Bidirectional Reset Pin

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)
TLV810MDBZR	Active	Production	SOT-23 (DBZ) 3	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	VOYQ
TLV810MDBZT	Active	Production	SOT-23 (DBZ) 3	250 SMALL T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	VOYQ
TLV810RDBZR	Active	Production	SOT-23 (DBZ) 3	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	VOWQ
TLV810RDBZT	Active	Production	SOT-23 (DBZ) 3	250 SMALL T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	VOWQ
TLV810ZDBZR	Active	Production	SOT-23 (DBZ) 3	3000 LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	VOVQ

⁽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.

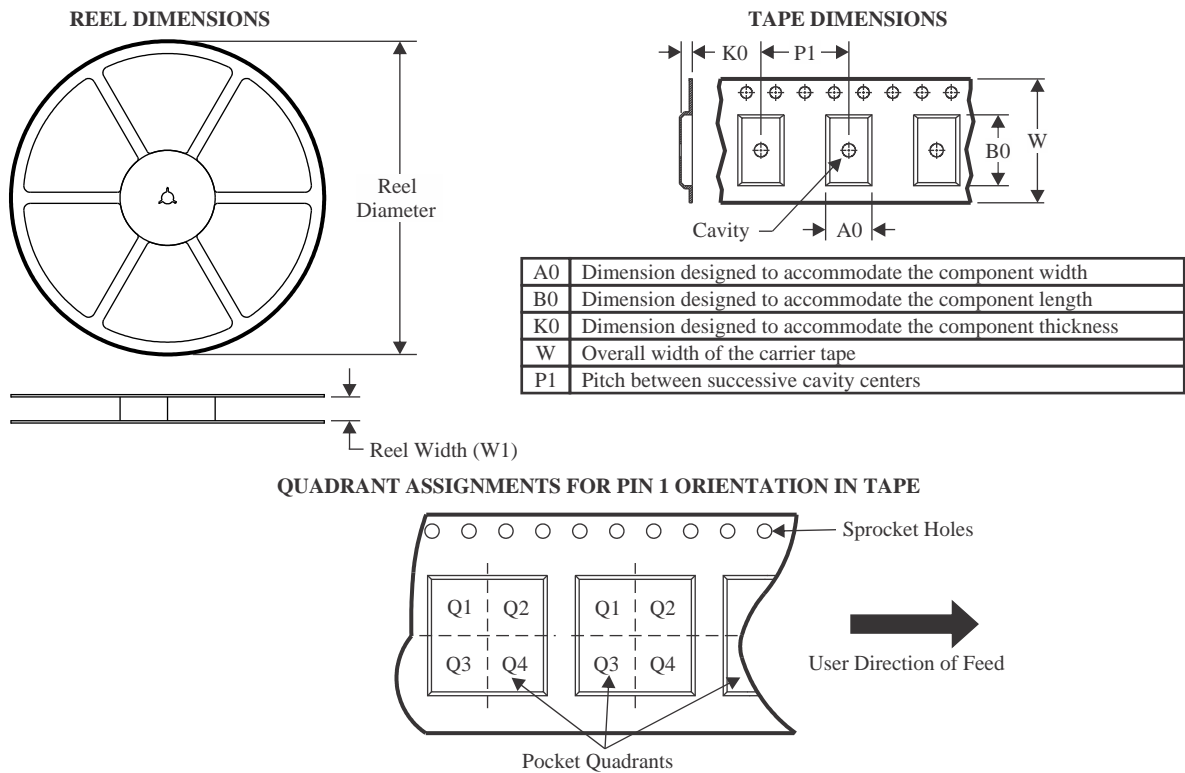
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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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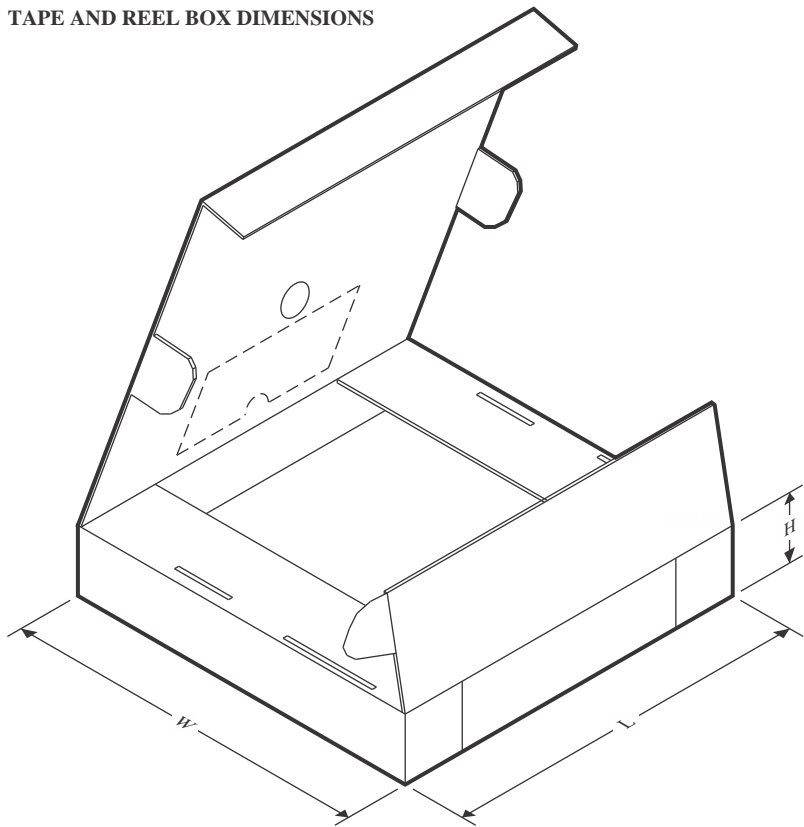
TAPE AND REEL INFORMATION



*All dimensions are nominal

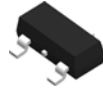
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLV810MDBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV810MDBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV810RDBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV810RDBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV810ZDBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS

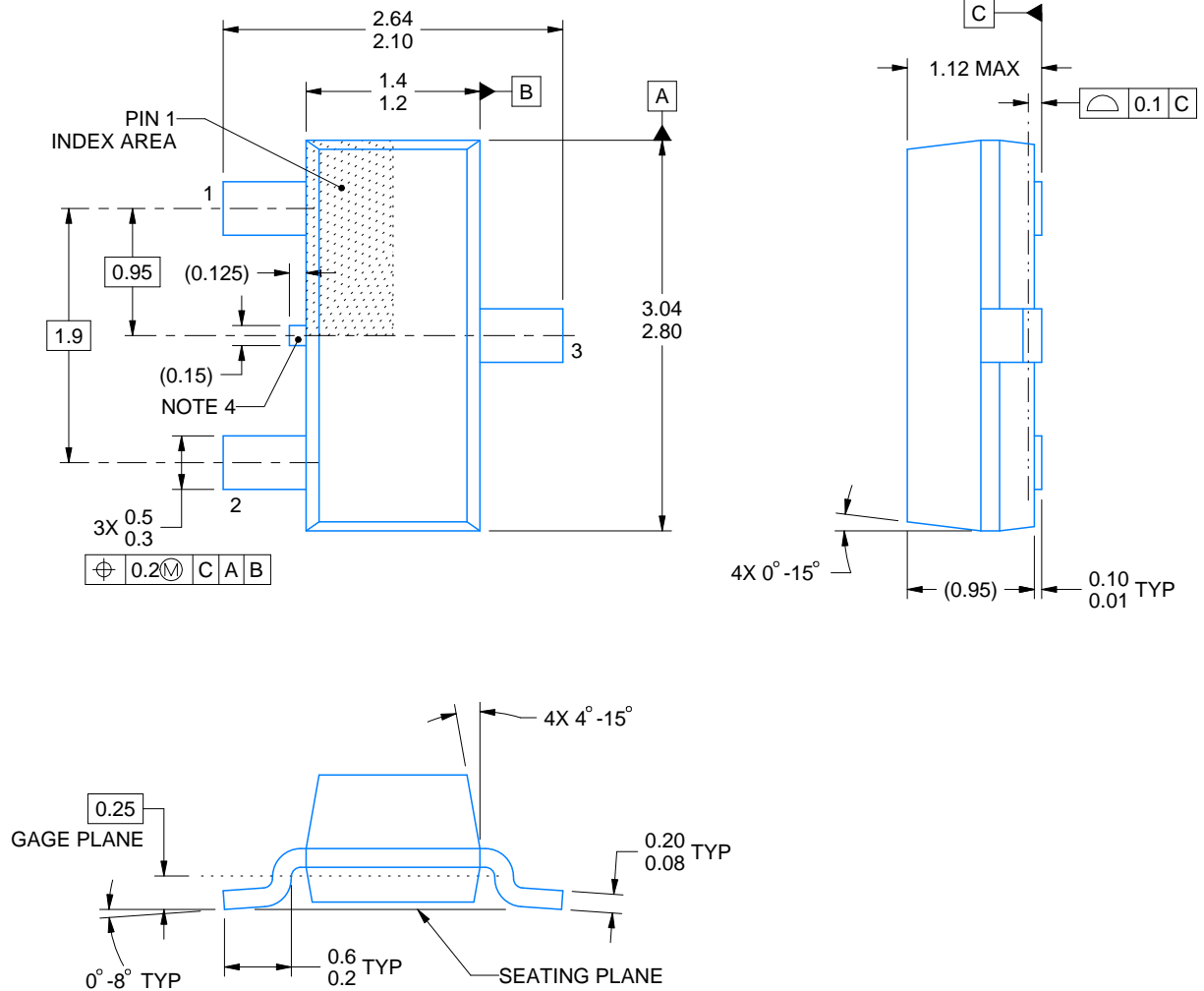


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV810MDBZR	SOT-23	DBZ	3	3000	200.0	183.0	25.0
TLV810MDBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TLV810RDBZR	SOT-23	DBZ	3	3000	200.0	183.0	25.0
TLV810RDBZT	SOT-23	DBZ	3	250	200.0	183.0	25.0
TLV810ZDBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0

DBZ0003A**PACKAGE OUTLINE****SOT-23 - 1.12 mm max height**

SMALL OUTLINE TRANSISTOR



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NOTES:

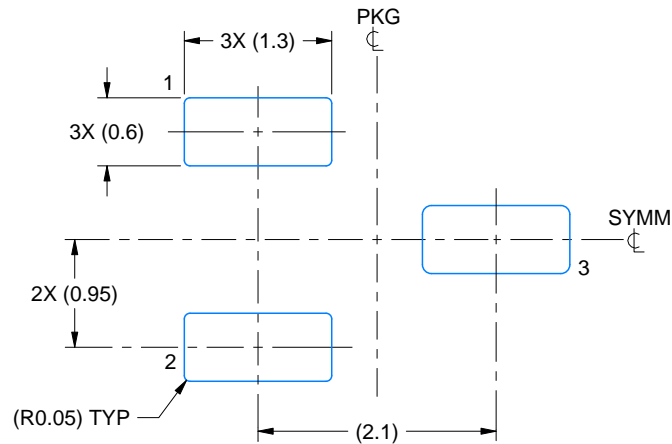
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.
4. Support pin may differ or may not be present.
5. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side

EXAMPLE BOARD LAYOUT

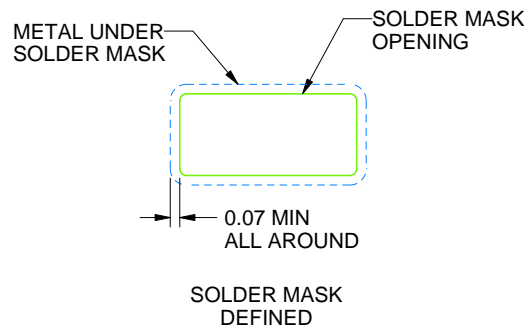
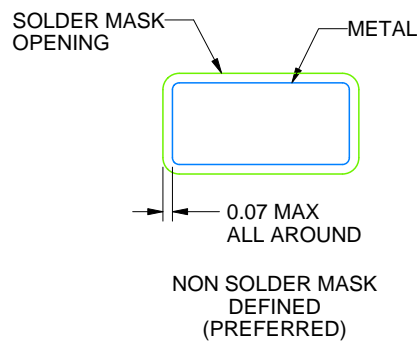
DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
SCALE:15X



SOLDER MASK DETAILS

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NOTES: (continued)

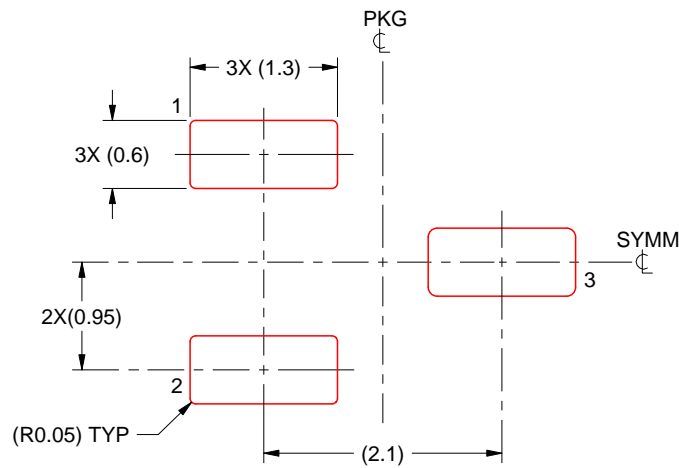
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



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

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NOTES: (continued)

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