



**THE DATASHEET OF
TLV810MDBZT**



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

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

FEATURES

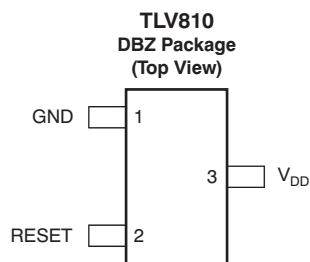
- 3-Pin SOT23 Package
- Supply Current: 9 μ A (Typical)
- Precision Supply Voltage Monitor: 2.5 V, 3 V, 3.3 V, 5 V
- Power-On Reset Generator with Fixed Delay Time of 200 ms
- Pin-for-Pin Compatible with MAX810
- Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Push-Pull, RESET Output

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 |



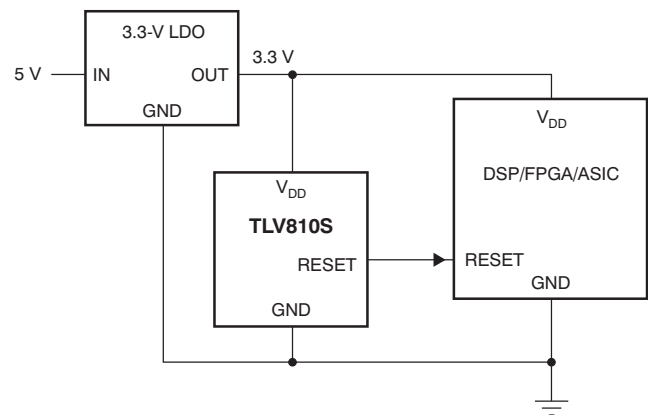
DESCRIPTION

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](http://www.ti.com) at 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 $t = 1000$ h 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 | $V_{DD} = 2.0\text{ V to }6\text{ V}, I_{OH} = -500\text{ }\mu\text{A}$ | $V_{DD} - 0.2$ | | | V |
| | | $V_{DD} = 3.3\text{ V}, I_{OH} = -2\text{ mA}$ | $V_{DD} - 0.4$ | | | |
| | | $V_{DD} = 6\text{ V}, I_{OH} = -4\text{ mA}, T_A = -40^\circ\text{C to }+85^\circ\text{C}$ | $V_{DD} - 0.4$ | | | |
| | | $V_{DD} = 6\text{ V}, I_{OH} = -4\text{ mA}, T_A = +85^\circ\text{C to }+125^\circ\text{C}$ | $V_{DD} - 0.5$ | | | |
| V_{OL} | Low-level output voltage | $V_{DD} = 2.5\text{ V to }6\text{ V}, I_{OL} = 500\text{ }\mu\text{A}$ | 0.2 | | | V |
| | | $V_{DD} = 3.3\text{ V}, I_{OL} = 2\text{ mA}$ | 0.4 | | | |
| | | $V_{DD} = 6\text{ V}, I_{OL} = 4\text{ mA}$ | 0.4 | | | |
| Power-up reset voltage ⁽¹⁾ | | $V_{OH} \geq V_{DD} - 0.2\text{ V}, I_{OH} = -50\text{ }\mu\text{A}$ | 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 | $I_{OH} = -50\text{ }\mu\text{A}, T_A = +25^\circ\text{C}$ | 30 | | | mV |
| | | | 35 | | | |
| | | | 40 | | | |
| | | | 60 | | | |
| I_{DD} | Supply current | $V_{DD} = 2\text{ V}, \text{output unconnected}$ | 9 | | | μA |
| | | $V_{DD} = 6\text{ V}, \text{output unconnected}$ | 20 | | | |

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

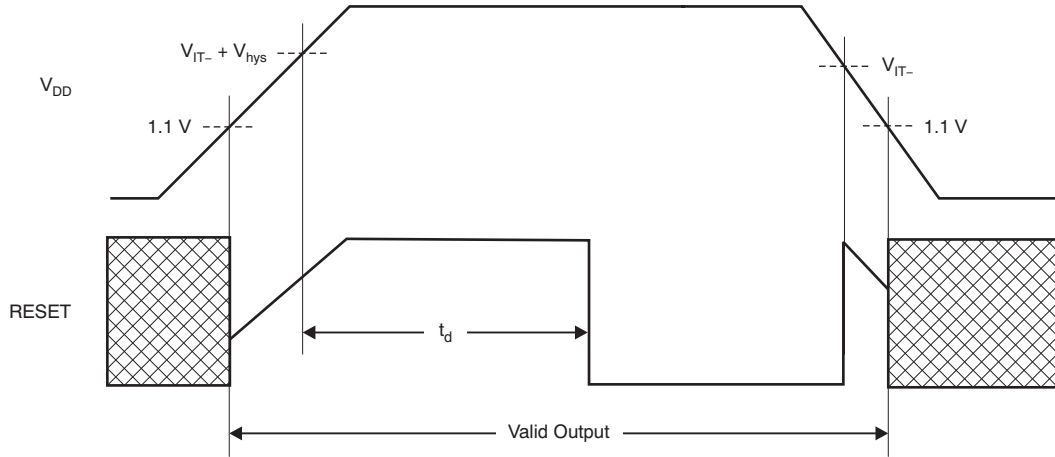
(2) To ensure best stability of the threshold voltage, a bypass capacitor (0.1- μF ceramic) should be placed near the supply terminals.

SWITCHING CHARACTERISTICS

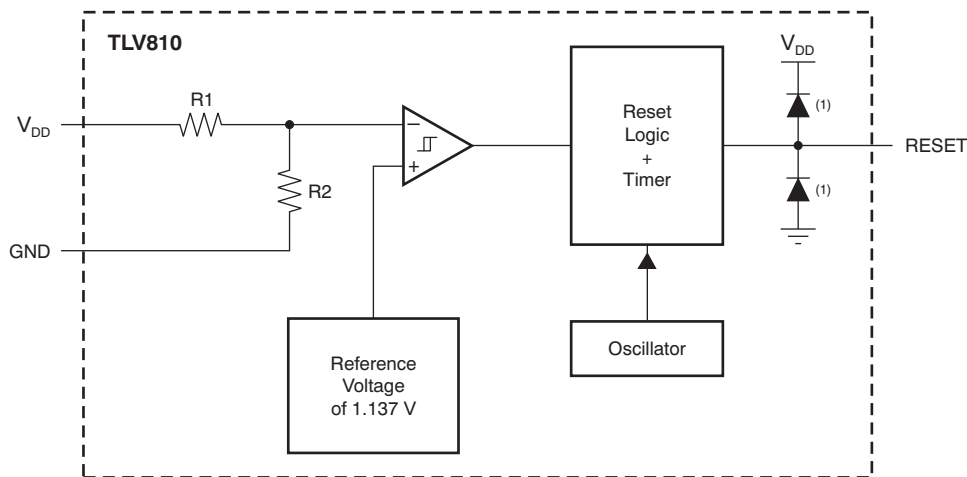
At $T_A = +25^\circ\text{C}$, unless otherwise noted.

| 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.

LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

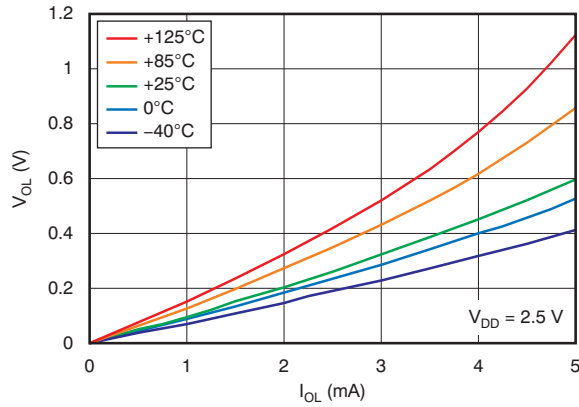


Figure 1.

SUPPLY CURRENT vs SUPPLY VOLTAGE

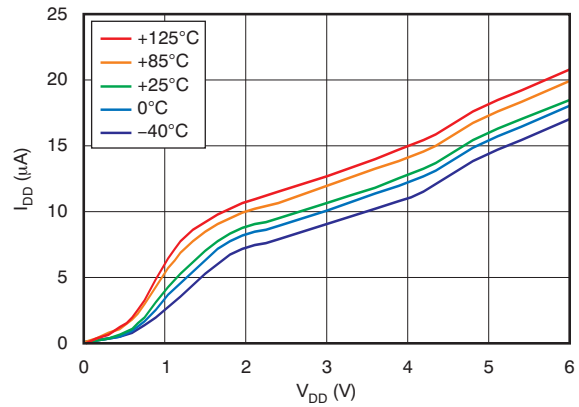


Figure 2.

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

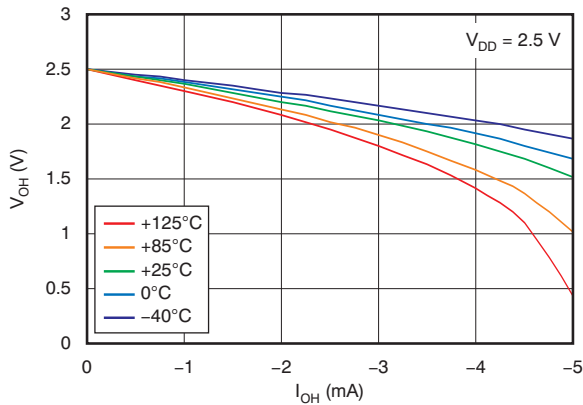


Figure 3.

NORMALIZED INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE AT V_DD

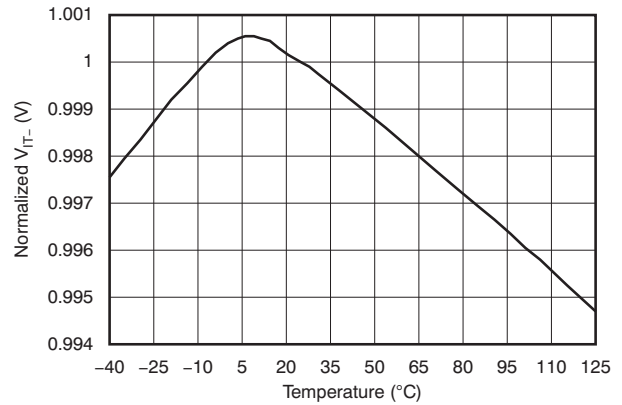


Figure 4.

MINIMUM PULSE DURATION AT V_DD vs V_DD THRESHOLD OVERDRIVE VOLTAGE (TLV810M)

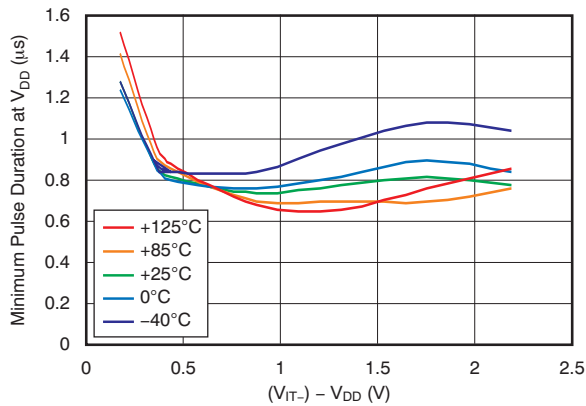


Figure 5.

DELAY TIME vs TEMPERATURE

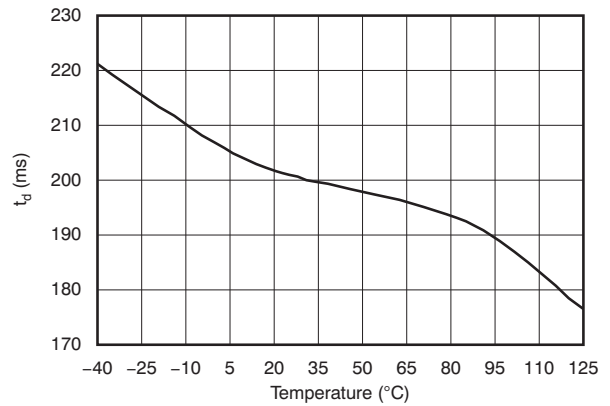


Figure 6.

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.

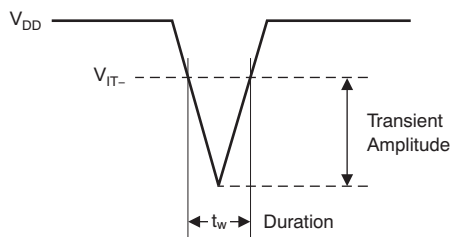


Figure 7. Voltage Transient Measurement

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.

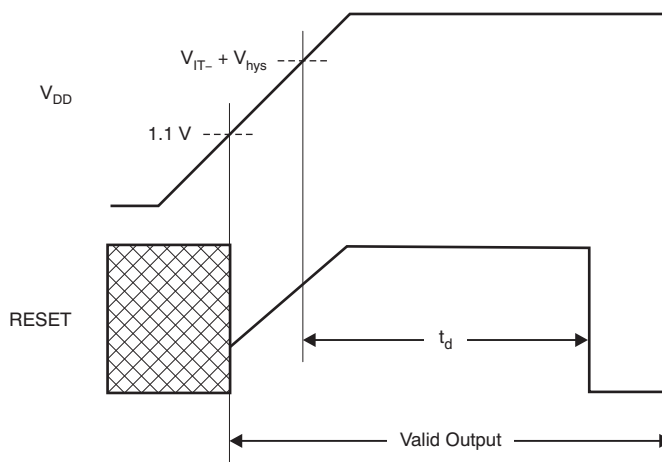


Figure 8. Power-Up Response

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.

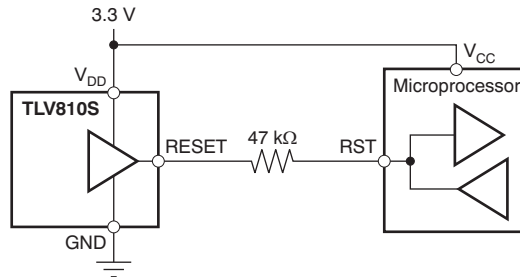


Figure 9. Connection to Bidirectional Reset Pin

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TLV810MDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOYQ | Samples |
| TLV810MDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOYQ | Samples |
| TLV810RDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOWQ | Samples |
| TLV810RDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOWQ | Samples |
| TLV810SDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOXQ | Samples |
| TLV810SDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOXQ | Samples |
| TLV810ZDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOVQ | Samples |
| TLV810ZDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAUAG | Level-1-260C-UNLIM | -40 to 125 | VOVQ | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=100ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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TAPE AND REEL INFORMATION

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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 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 |
| TLV810SDBZR | SOT-23 | DBZ | 3 | 3000 | 179.0 | 8.4 | 3.15 | 2.95 | 1.22 | 4.0 | 8.0 | Q3 |
| TLV810SDBZT | 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 |
| TLV810ZDBZT | SOT-23 | DBZ | 3 | 250 | 179.0 | 8.4 | 3.15 | 2.95 | 1.22 | 4.0 | 8.0 | Q3 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

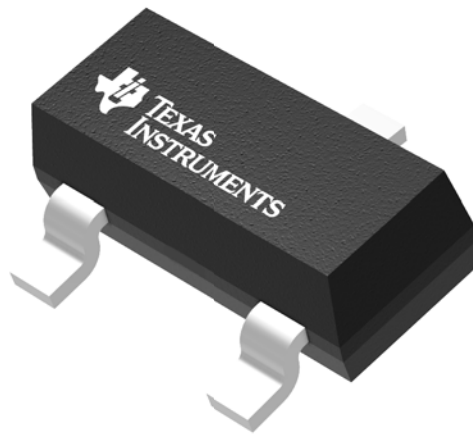
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TLV810MDBZR | SOT-23 | DBZ | 3 | 3000 | 203.0 | 203.0 | 35.0 |
| TLV810MDBZT | SOT-23 | DBZ | 3 | 250 | 203.0 | 203.0 | 35.0 |
| TLV810RDBZR | SOT-23 | DBZ | 3 | 3000 | 203.0 | 203.0 | 35.0 |
| TLV810RDBZT | SOT-23 | DBZ | 3 | 250 | 203.0 | 203.0 | 35.0 |
| TLV810SDBZR | SOT-23 | DBZ | 3 | 3000 | 203.0 | 203.0 | 35.0 |
| TLV810SDBZT | SOT-23 | DBZ | 3 | 250 | 203.0 | 203.0 | 35.0 |
| TLV810ZDBZR | SOT-23 | DBZ | 3 | 3000 | 203.0 | 203.0 | 35.0 |
| TLV810ZDBZT | SOT-23 | DBZ | 3 | 250 | 203.0 | 203.0 | 35.0 |

GENERIC PACKAGE VIEW

DBZ 3

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

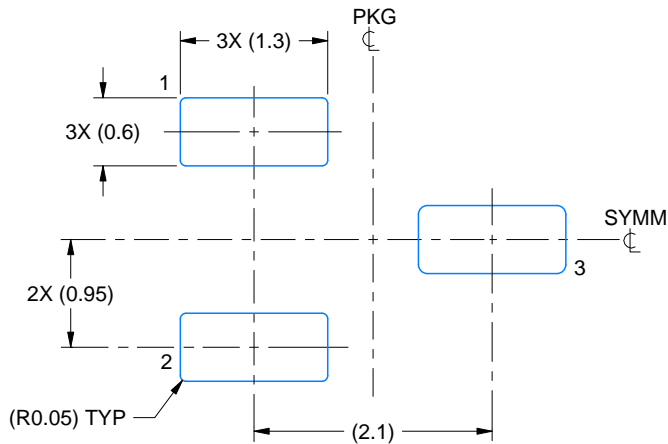
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EXAMPLE BOARD LAYOUT

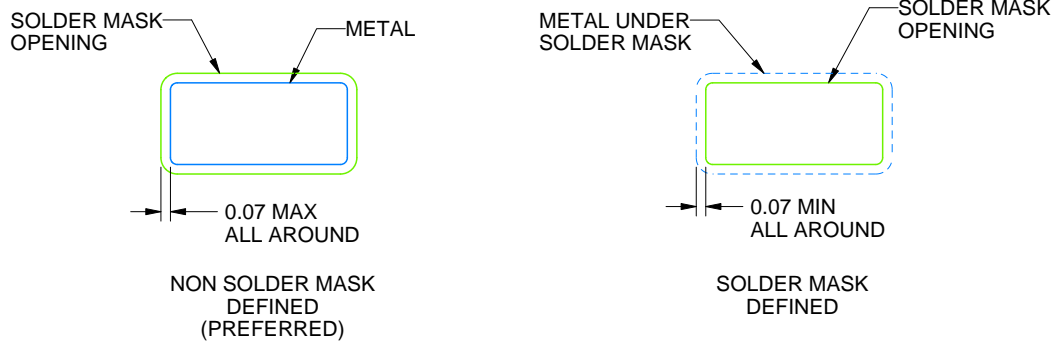
DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
SCALE:15X



SOLDER MASK DETAILS

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NOTES: (continued)

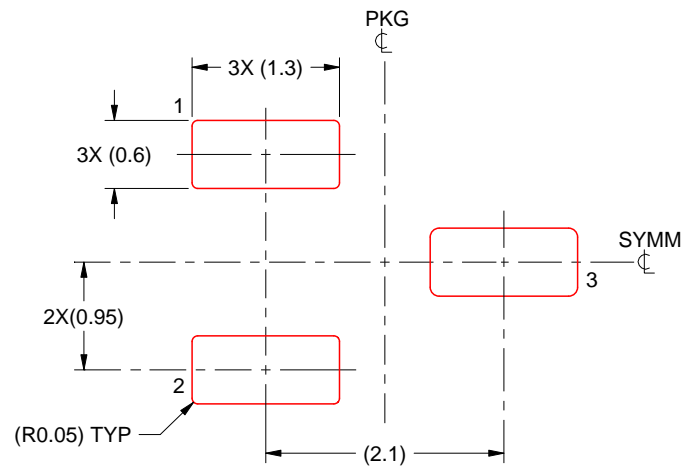
4. Publication IPC-7351 may have alternate designs.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

4214838/C 04/2017

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.

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-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management