3-Pin Voltage Supervisors
with Active-High, Push-Pull Reset
Check for Samples: TLV810M, TLV810R, TLV810S, TLV810Z

FEATURES

- **3-Pin SOT23 Package**
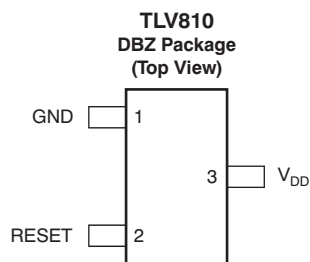- **Supply Current: 9 μA (Typical)**
- **Precision Supply Voltage Monitor:**
  2.5 V, 3 V, 3.3 V, 5 V
- **Power-On Reset Generator with**
  Fixed Delay Time of 200 ms
- **Pin-for-Pin Compatible with MAX810**
- **Temperature Range: −40°C to +125°C**
- **Push-Pull, RESET Output**

APPLICATIONS

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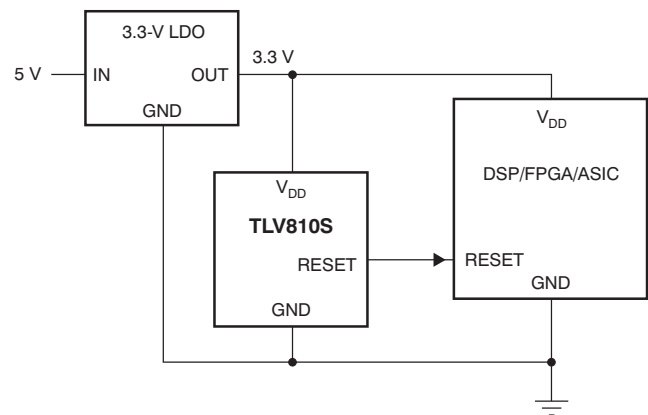- **Notebook and Desktop Computers**
- **Automotive Systems**

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 ($t_{d(typ)}$ = 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°C.

DEVICE FAMILY COMPARISON

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

TLV810
DBZ Package
(Top View)

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.

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 DBZ 3 PINS	UNITS
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_{JCbot}	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.

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]	$V_{OH} \geq V_{DD}$ – 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. $t_{r,\ VDD} \leq$ 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.

TLV810M, TLV810R
TLV810S, TLV810Z

SWITCHING CHARACTERISTICS

At T_A = +25°C, unless otherwise noted.

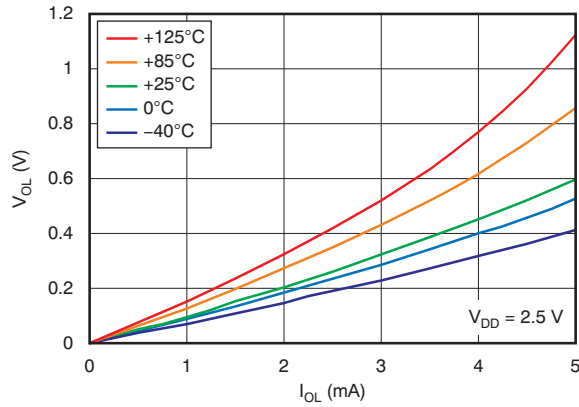| PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w	Pulse width at V_{DD}	V_{DD} = 1.08 V_{IT-} to 0.92 V_{IT-}			1	µs
t_d	Delay time	$V_{DD} \geq V_{IT-}$ + 0.2 V; see Timing Diagram	120	200	280	ms

TIMING DIAGRAM
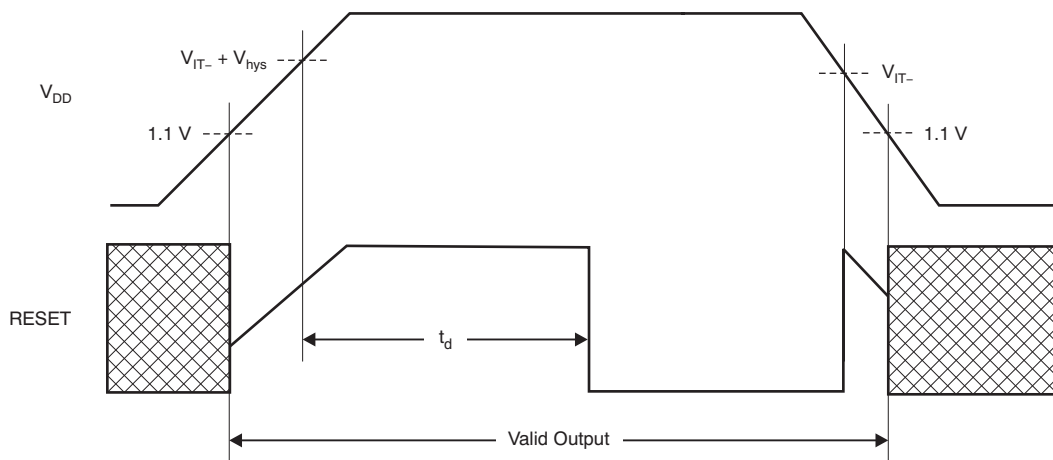
FUNCTIONAL BLOCK DIAGRAM
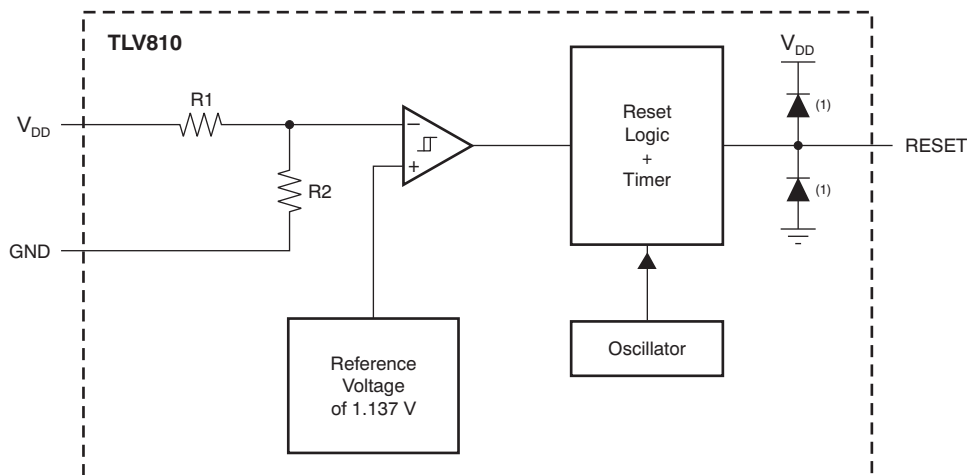
(1) Parasitic diode.

TYPICAL CHARACTERISTICS

At T_A = +25°C, $V_{IT−}$ = 4.38 V, and V_{DD} = 5.0 V, unless otherwise noted.

**LOW-LEVEL OUTPUT VOLTAGE
vs LOW-LEVEL OUTPUT CURRENT**

Figure 1.

**SUPPLY CURRENT
vs SUPPLY VOLTAGE**
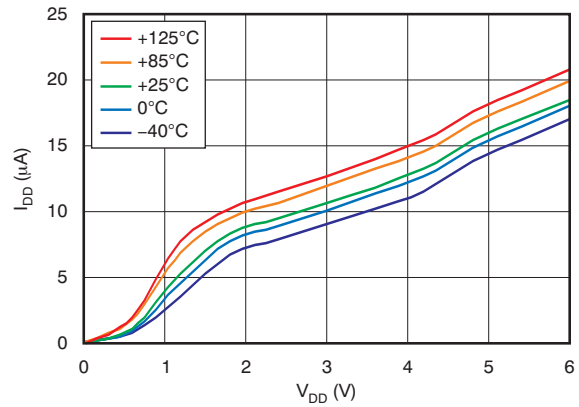
Figure 2.

**HIGH-LEVEL OUTPUT VOLTAGE
vs HIGH-LEVEL OUTPUT CURRENT**
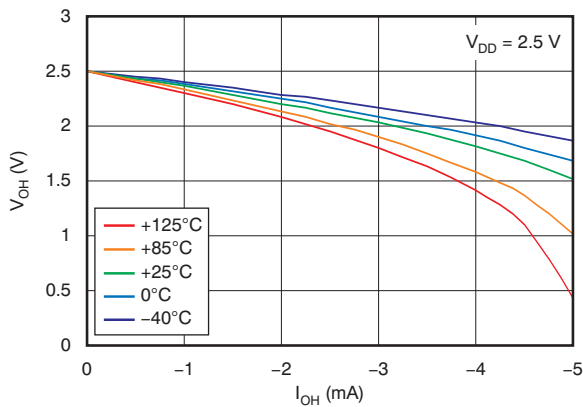
Figure 3.

**NORMALIZED INPUT THRESHOLD VOLTAGE
vs FREE-AIR TEMPERATURE AT V_{DD}**
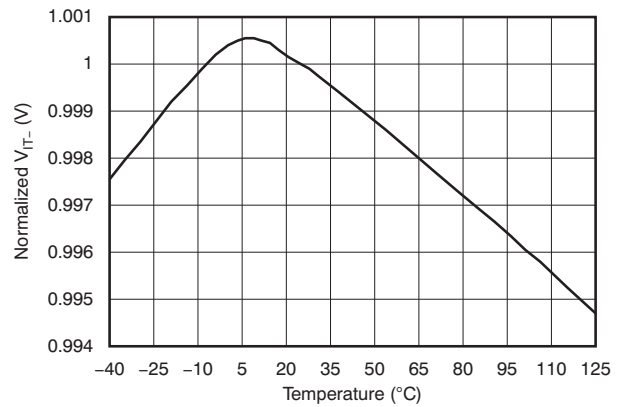
Figure 4.

**MINIMUM PULSE DURATION AT V_{DD}
vs V_{DD} THRESHOLD OVERDRIVE VOLTAGE
(TLV810M)**
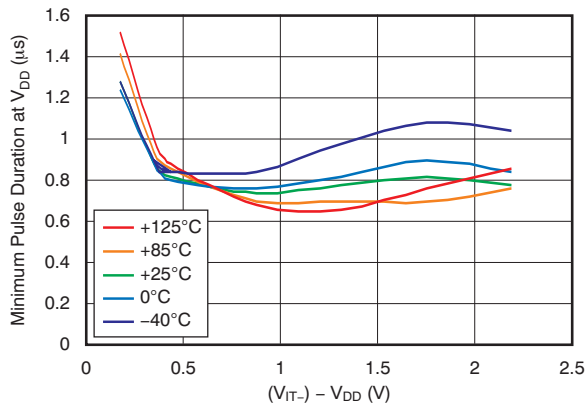
Figure 5.

**DELAY TIME
vs TEMPERATURE**
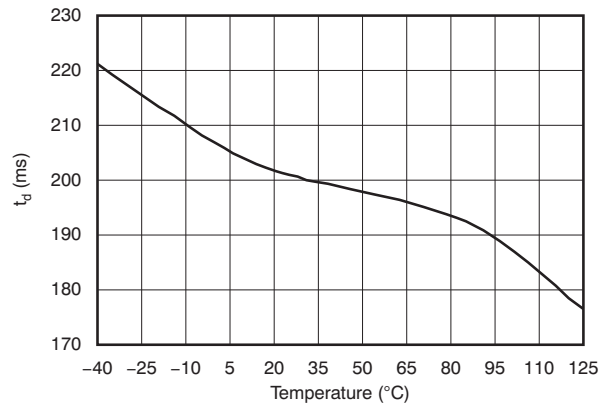
Figure 6.

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.
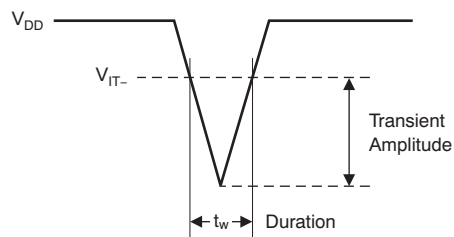
Figure 7. Voltage Transient Measurement

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.
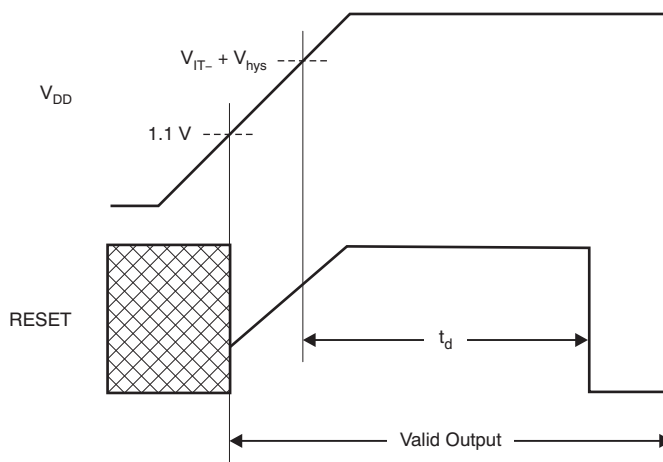
Figure 8. Power-Up Response

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.
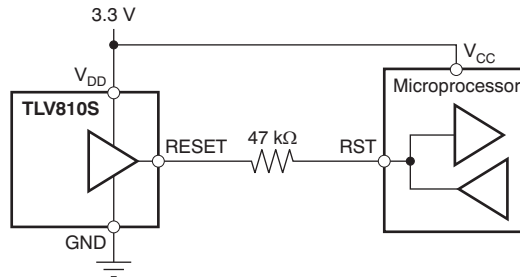
Figure 9. Connection to Bidirectional Reset Pin

PACKAGE OPTION ADDENDUM

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
TLV810MDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810MDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810RDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810RDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810SDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810SDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810ZDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV810ZDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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PACKAGE MATERIALS INFORMATION

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
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

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

4203227/B   04/2005

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

DBZ (R–PDSO–G3)   PLASTIC SMALL OUTLINE

Example Board Layout

Stencil Openings
Based on a stencil thickness
of .127mm (.005inch).

1,00

0,55

2,37

0,95

2,37

1,9

0,6

Solder Mask Opening

1,05

Pad Geometry

0,07
All Around

4212057/A 08/11
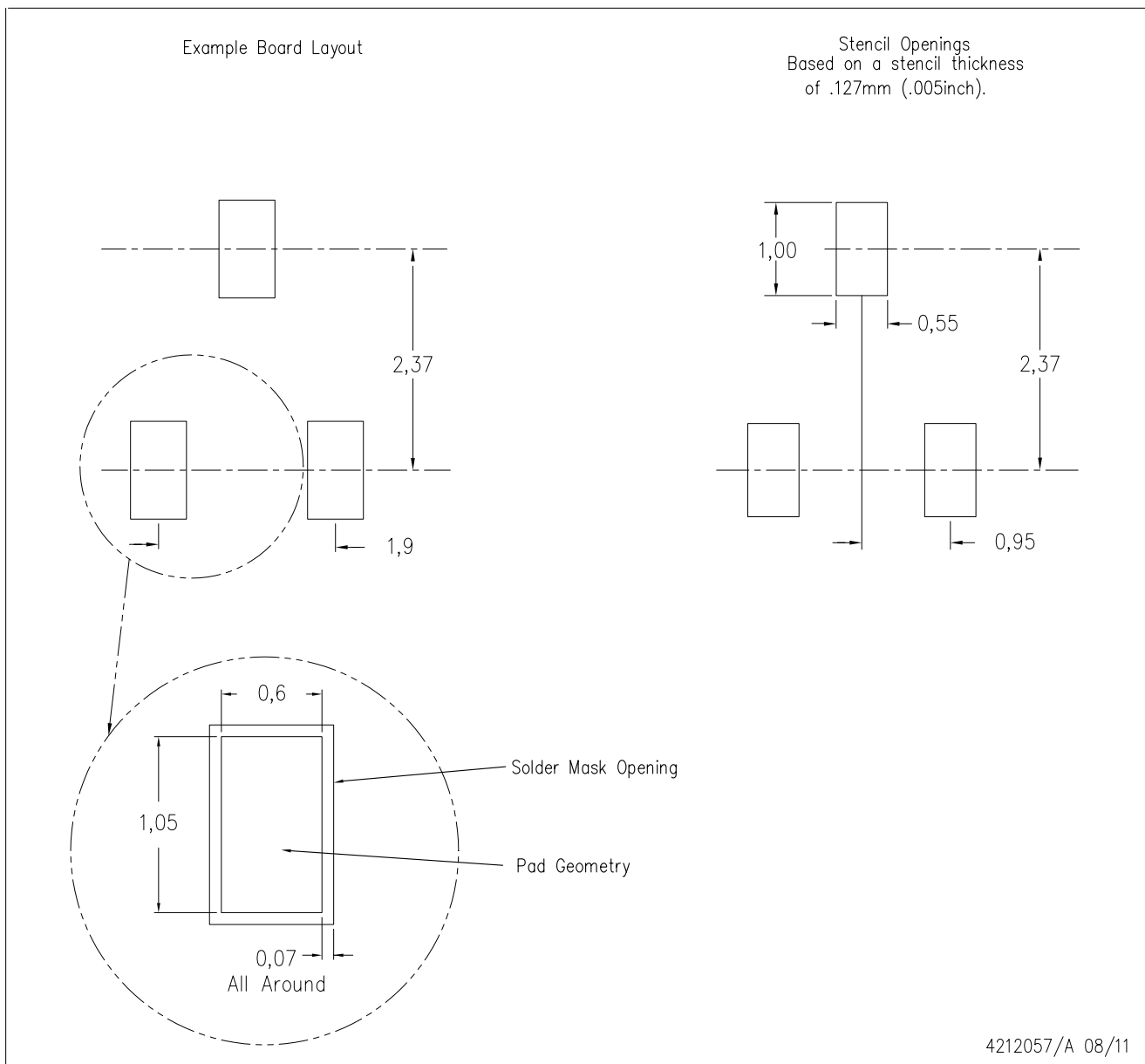
NOTES: A.   All linear dimensions are in millimeters.
         B.   This drawing is subject to change without notice.
         C.   Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
         D.   Publication IPC–7351 is recommended for alternate designs.
         E.   Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should
              contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric
              metal load solder paste. Refer to IPC–7525 for other stencil recommendations.

IMPORTANT NOTICE

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