

3-Pin Supply Voltage Supervisors

 Check for Samples: [TLV809J25](#), [TLV809L30](#), [TLV809K33](#), [TLV809I50](#)

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 MAX809
- Temperature Range: -40°C to $+85^{\circ}\text{C}$

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 TLV809 family of supervisory circuits provides circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

During power-on, $\overline{\text{RESET}}$ is asserted when the supply voltage (V_{DD}) becomes higher than 1.1 V. Thereafter, the supervisory circuit monitors V_{DD} and keeps $\overline{\text{RESET}}$ 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 (high) 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 (low) 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 TLV809 devices are characterized for operation over a temperature range of -40°C to $+85^{\circ}\text{C}$.

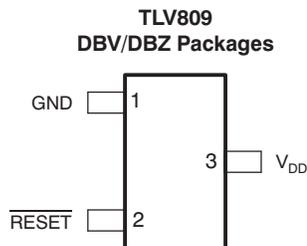
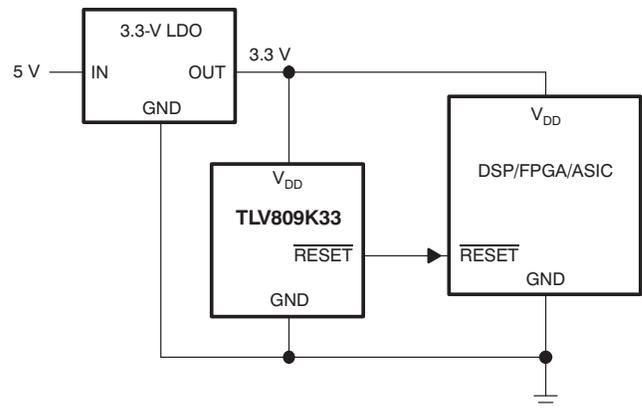


Figure 1. TYPICAL APPLICATION



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.

All trademarks are the property of their respective owners.



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
TLV809J25	2.25 V	SOT23-3	DBV	-40°C to +85°C	VTCI	TLV809J25DBVR	Tape and Reel, 3000
						TLV809J25DBVT	Tape and Reel, 250
			DBZ	-40°C to +85°C	BCMT	TLV809J25DBZR	Tape and Reel, 3000
						TLV809J25DBZT	Tape and Reel, 250
TLV809L30	2.64 V	SOT23-3	DBV	-40°C to +85°C	VTXI	TLV809L30DBVR	Tape and Reel, 3000
						TLV809L30DBVT	Tape and Reel, 250
			DBZ	-40°C to +85°C	BCMZ	TLV809L30DBZR	Tape and Reel, 3000
						TLV809L30DBZT	Tape and Reel, 250
TLV809K33	2.93 V	SOT23-3	DBV	-40°C to +85°C	VTRI	TLV809K33DBVR	Tape and Reel, 3000
						TLV809K33DBVT	Tape and Reel, 250
			DBZ	-40°C to +85°C	BCMXX	TLV809K33DBZR	Tape and Reel, 3000
						TLV809K33DBZT	Tape and Reel, 250
TLV809I50	4.55 V	SOT23-3	DBV	-40°C to +85°C	VTBI	TLV809I50DBVR	Tape and Reel, 3000
						TLV809I50DBVT	Tape and Reel, 250
			DBZ	-40°C to +85°C	BCMXX	TLV809I50DBZR	Tape and Reel, 3000
						TLV809I50DBZT	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 folder at www.ti.com.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

	VALUE	UNIT
V_{DD} Supply voltage ⁽²⁾	7	V
All other pins ⁽²⁾	-0.3 to 7	V
I_{OL} Maximum low output current	5	mA
I_{OH} Maximum high output current	-5	mA
I_{IK} Input clamp current ($V_I < 0$ or $V_I > V_{DD}$)	±20	mA
I_{OK} Output clamp current ($V_O < 0$ or $V_O > V_{DD}$)	±20	mA
T_A Operating free-air temperature range	-40 to +85	°C
T_{stg} Storage temperature range	-65 to +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⁾		TLV809	TLV809	UNITS
		DBV	DBZ	
		3 PINS	3 PINS	
θ_{JA}	Junction-to-ambient thermal resistance	242.1	286.9	°C/W
θ_{JCTop}	Junction-to-case (top) thermal resistance	213.0	105.6	
θ_{JB}	Junction-to-board thermal resistance	123.4	124.4	
ψ_{JT}	Junction-to-top characterization parameter	45.7	25.8	
ψ_{JB}	Junction-to-board characterization parameter	130.9	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](#).

RECOMMENDED OPERATING CONDITIONS

At specified temperature range (unless otherwise noted).

		MIN	MAX	UNIT
V_{DD}	Supply voltage	2	6	V
T_A	Operating free-air temperature range	-40	+85	°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	$V_{DD} = 2.5\text{ V to }6\text{ V}, I_{OH} = -500\ \mu\text{A}$		$V_{DD} - 0.2$			V
		$V_{DD} = 3.3\text{ V}, I_{OH} = -2\text{ mA}$		$V_{DD} - 0.4$			
		$V_{DD} = 6\text{ V}, I_{OH} = -4\text{ mA}$		$V_{DD} - 0.4$			
V_{OL}	Low-level output voltage	$V_{DD} = 2\text{ V to }6\text{ V}, I_{OH} = 500\ \mu\text{A}$		0.2			V
		$V_{DD} = 3.3\text{ V}, I_{OH} = 2\text{ mA}$		0.4			
		$V_{DD} = 6\text{ V}, I_{OH} = 4\text{ mA}$		0.4			
Power-up reset voltage ⁽¹⁾		$V_{DD} \geq 1.1\text{ V}, I_{OL} = 50\ \mu\text{A}$		0.2			V
V_{IT-}	Negative-going input threshold voltage ⁽²⁾	TLV809J25	$T_A = -40^\circ\text{C to }85^\circ\text{C}$	2.20	2.25	2.30	V
		TLV809L30		2.58	2.64	2.70	
		TLV809K33		2.87	2.93	2.99	
		TLV809I50		4.45	4.55	4.65	
V_{hys}	Hysteresis	TLV809J25		30			mV
		TLV809L30		35			
		TLV809K33		40			
		TLV809I50		60			
I_{DD}	Supply current	$V_{DD} = 2\text{ V},$ Output unconnected		9	12	μA	
		$V_{DD} = 6\text{ V},$ Output unconnected		20	25		
C_i	Input capacitance	$V_i = 0\text{ V to }V_{DD}$		5			pF

(1) The lowest supply voltage at which $\overline{\text{RESET}}$ becomes active. $t_r, V_{DD} \geq 15\text{ ms/V}$.

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

TIMING REQUIREMENTS

At $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = +25^\circ\text{C}$.

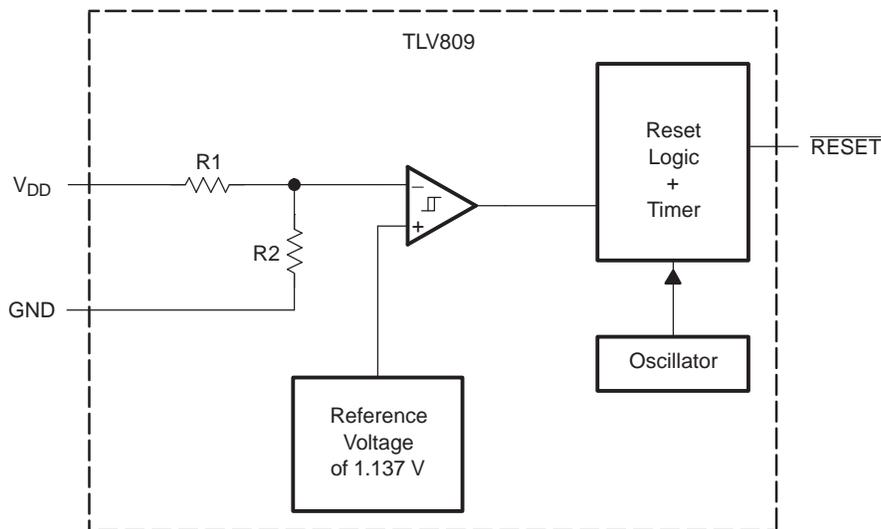
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w Pulse width at V_{DD}	$V_{DD} = V_{IT-} + 0.2\text{ V}$, $V_{DD} = V_{IT-} - 0.2\text{ V}$	3			μs

SWITCHING CHARACTERISTICS

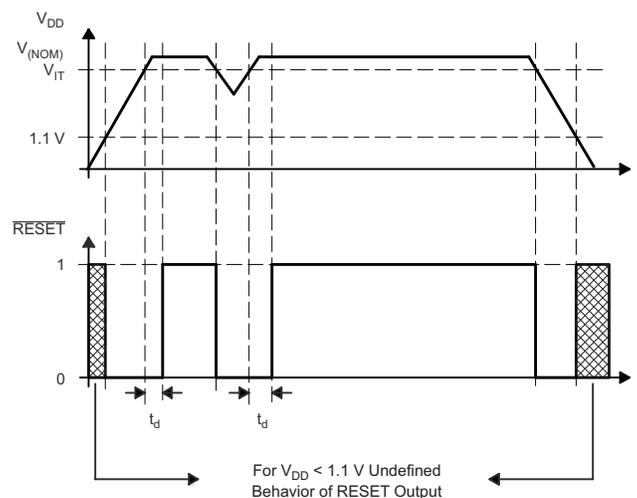
At $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = +25^\circ\text{C}$.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_d Delay time	$V_{DD} \geq V_{IT-} + 0.2\text{ V}$; see timing diagram	120	200	280	ms
t_{PHL} Propagation (delay) time, high-to-low-level output	V_{DD} to $\overline{\text{RESET}}$ delay $V_{IL} = V_{IT-} - 0.2\text{ V}$, $V_{IH} = V_{IT-} + 0.2\text{ V}$		1		μs

FUNCTIONAL BLOCK DIAGRAM



TIMING DIAGRAM



TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

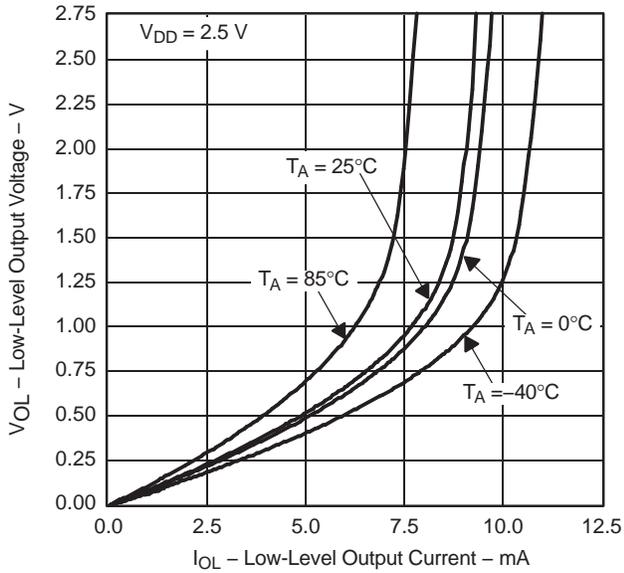


Figure 2.

SUPPLY CURRENT
vs
SUPPLY VOLTAGE

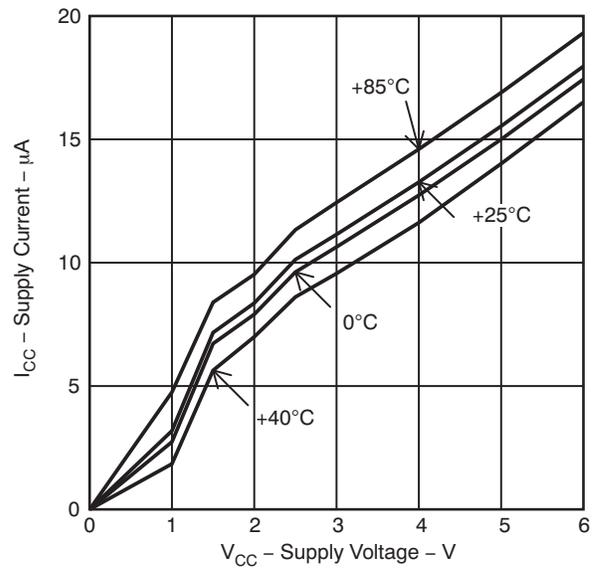


Figure 3.

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

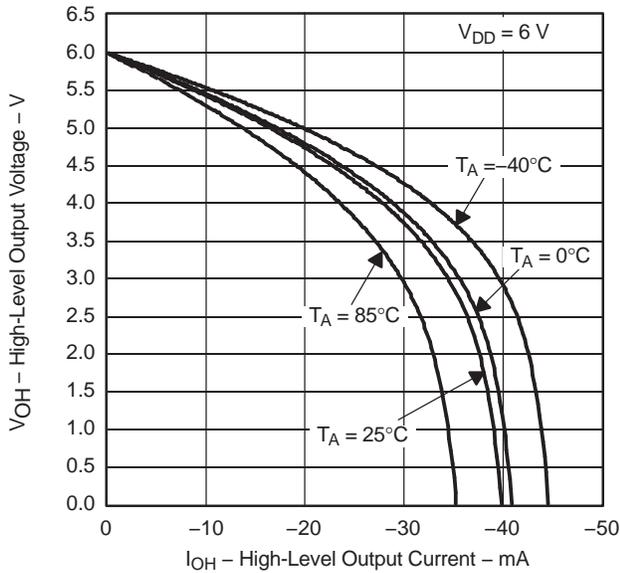


Figure 4.

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

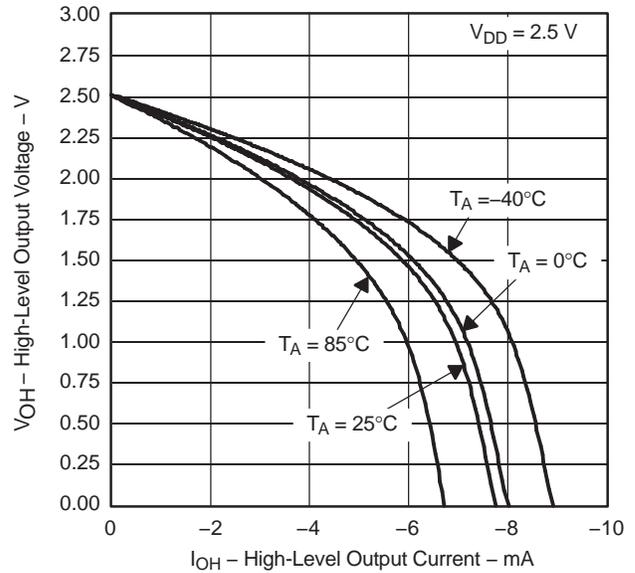


Figure 5.

TYPICAL CHARACTERISTICS (continued)

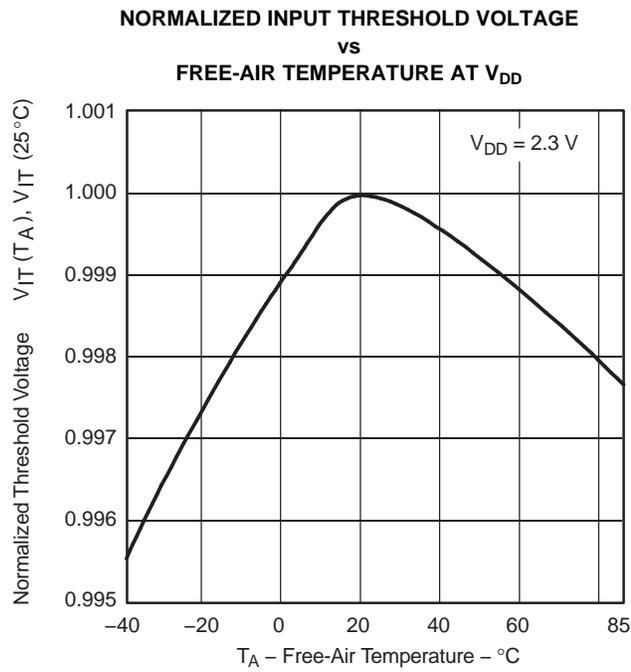


Figure 6.

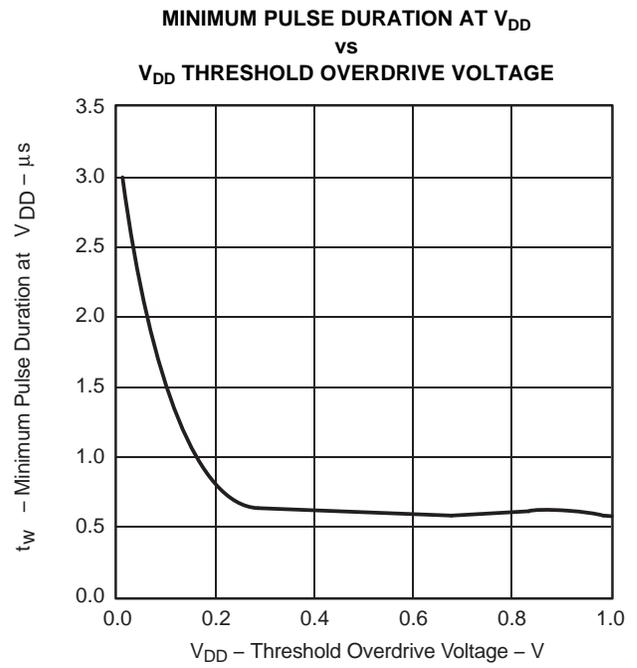


Figure 7.

REVISION HISTORY

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

Changes from Revision B (September 2010) to Revision C	Page
• Changed TLV809L30 DBZ ordering information column in Package/Ordering Information table	2
• Changed TLV809K33 DBZ ordering information column in Package/Ordering Information table	2
• Changed first TLV809I50 DBZ ordering information entry in Package/Ordering Information table	2

Changes from Revision A (July 2010) to Revision B	Page
• Updated document format to current standards	1
• Added DBZ package to pinout figure	1
• Added DBZ package to <i>Package/Ordering Information</i> table	2
• Added <i>Thermal Information</i> table	2
• Changed Figure 3	5

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)
TLV809I50DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809I50DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809I50DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809I50DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809J25DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809J25DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809J25DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809J25DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809K33DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809K33DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809K33DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809K33DBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809L30DBVR	ACTIVE	SOT-23	DBV	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809L30DBVT	ACTIVE	SOT-23	DBV	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809L30DBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
TLV809L30DBZT	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.

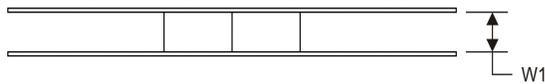
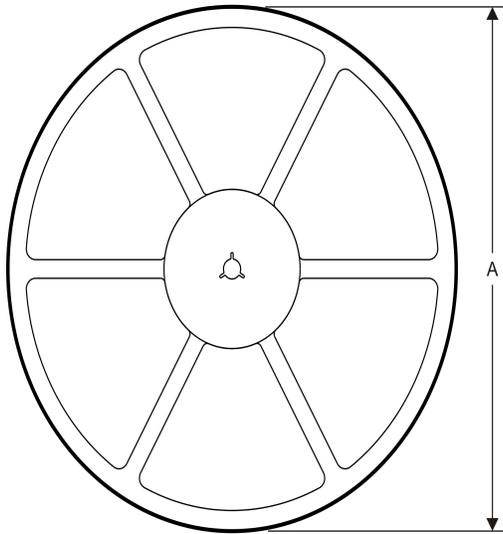
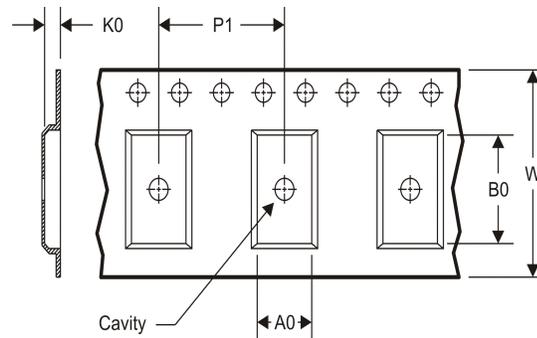
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

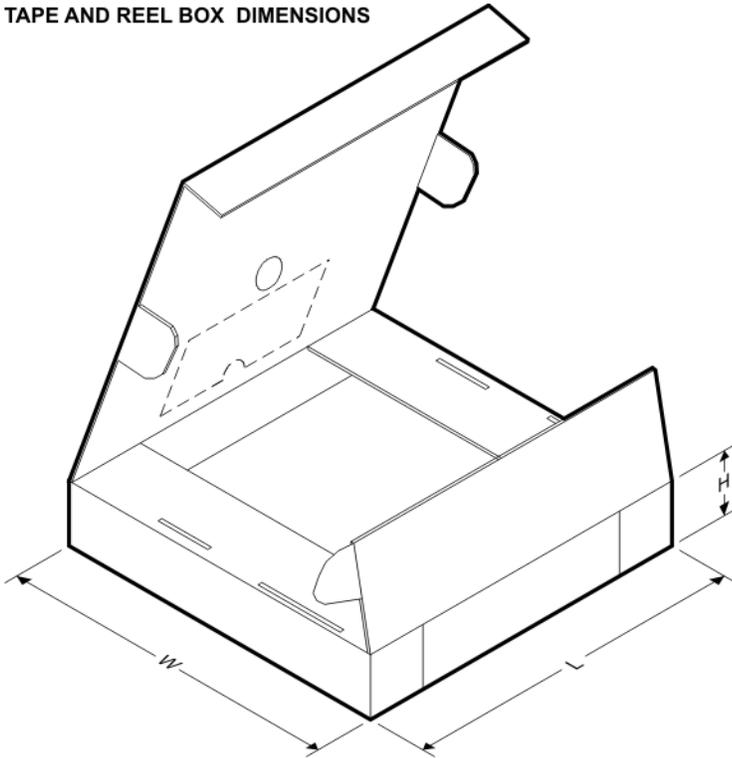
TAPE AND REEL INFORMATION
REEL DIMENSIONS

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

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
TLV809I50DBVR	SOT-23	DBV	3	3000	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809I50DBVT	SOT-23	DBV	3	250	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809I50DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809I50DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809J25DBVR	SOT-23	DBV	3	3000	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809J25DBVT	SOT-23	DBV	3	250	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809J25DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809J25DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809K33DBVR	SOT-23	DBV	3	3000	178.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809K33DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809K33DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809L30DBVR	SOT-23	DBV	3	3000	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809L30DBVT	SOT-23	DBV	3	250	180.0	9.0	3.3	3.2	1.47	4.0	8.0	Q3
TLV809L30DBZR	SOT-23	DBZ	3	3000	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3
TLV809L30DBZT	SOT-23	DBZ	3	250	179.0	8.4	3.15	2.95	1.22	4.0	8.0	Q3

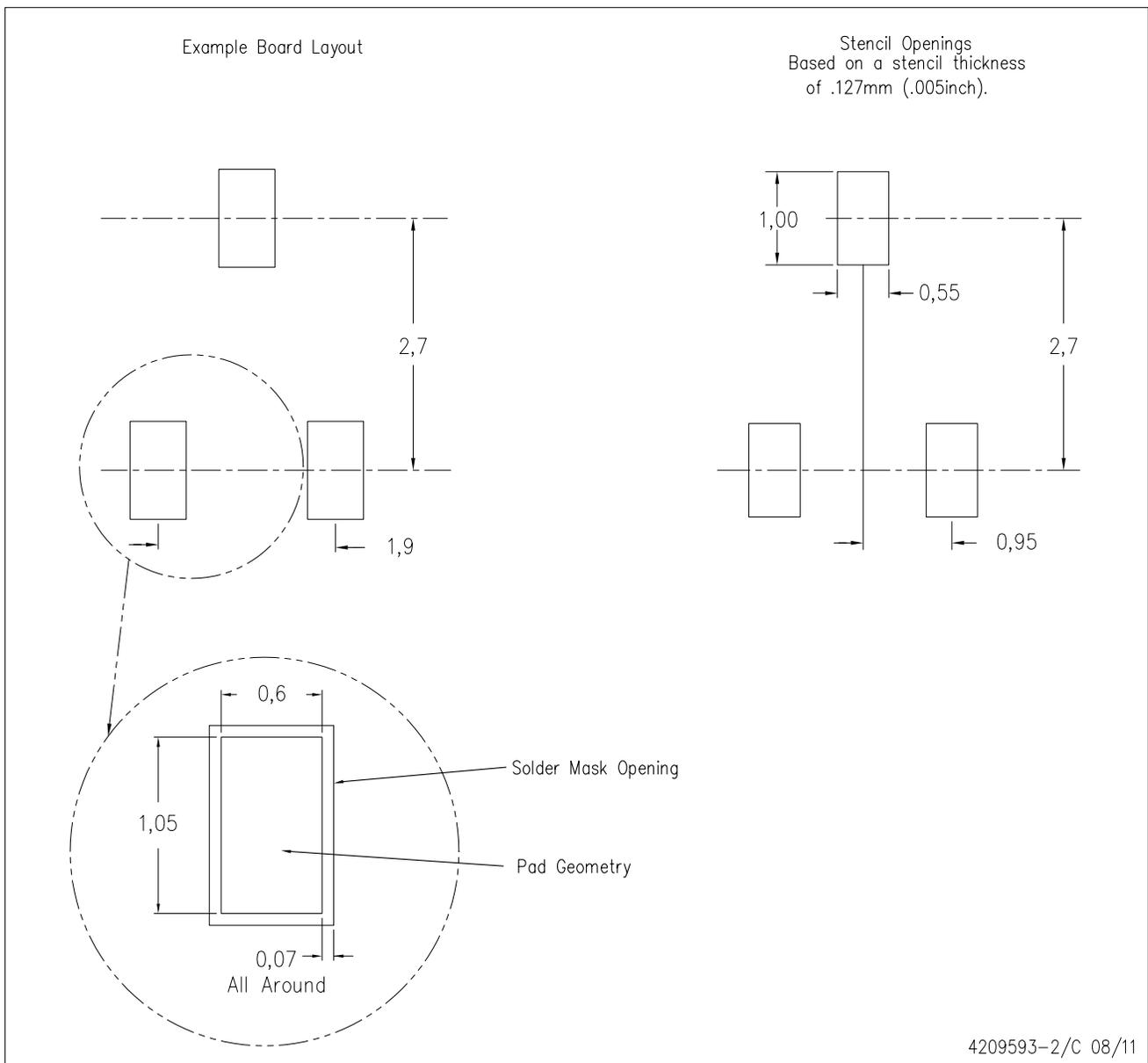
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV809I50DBVR	SOT-23	DBV	3	3000	182.0	182.0	20.0
TLV809I50DBVT	SOT-23	DBV	3	250	182.0	182.0	20.0
TLV809I50DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TLV809I50DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TLV809J25DBVR	SOT-23	DBV	3	3000	182.0	182.0	20.0
TLV809J25DBVT	SOT-23	DBV	3	250	182.0	182.0	20.0
TLV809J25DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TLV809J25DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TLV809K33DBVR	SOT-23	DBV	3	3000	180.0	180.0	18.0
TLV809K33DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TLV809K33DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0
TLV809L30DBVR	SOT-23	DBV	3	3000	182.0	182.0	20.0
TLV809L30DBVT	SOT-23	DBV	3	250	182.0	182.0	20.0
TLV809L30DBZR	SOT-23	DBZ	3	3000	203.0	203.0	35.0
TLV809L30DBZT	SOT-23	DBZ	3	250	203.0	203.0	35.0

DBV (R-PDSO-G3)

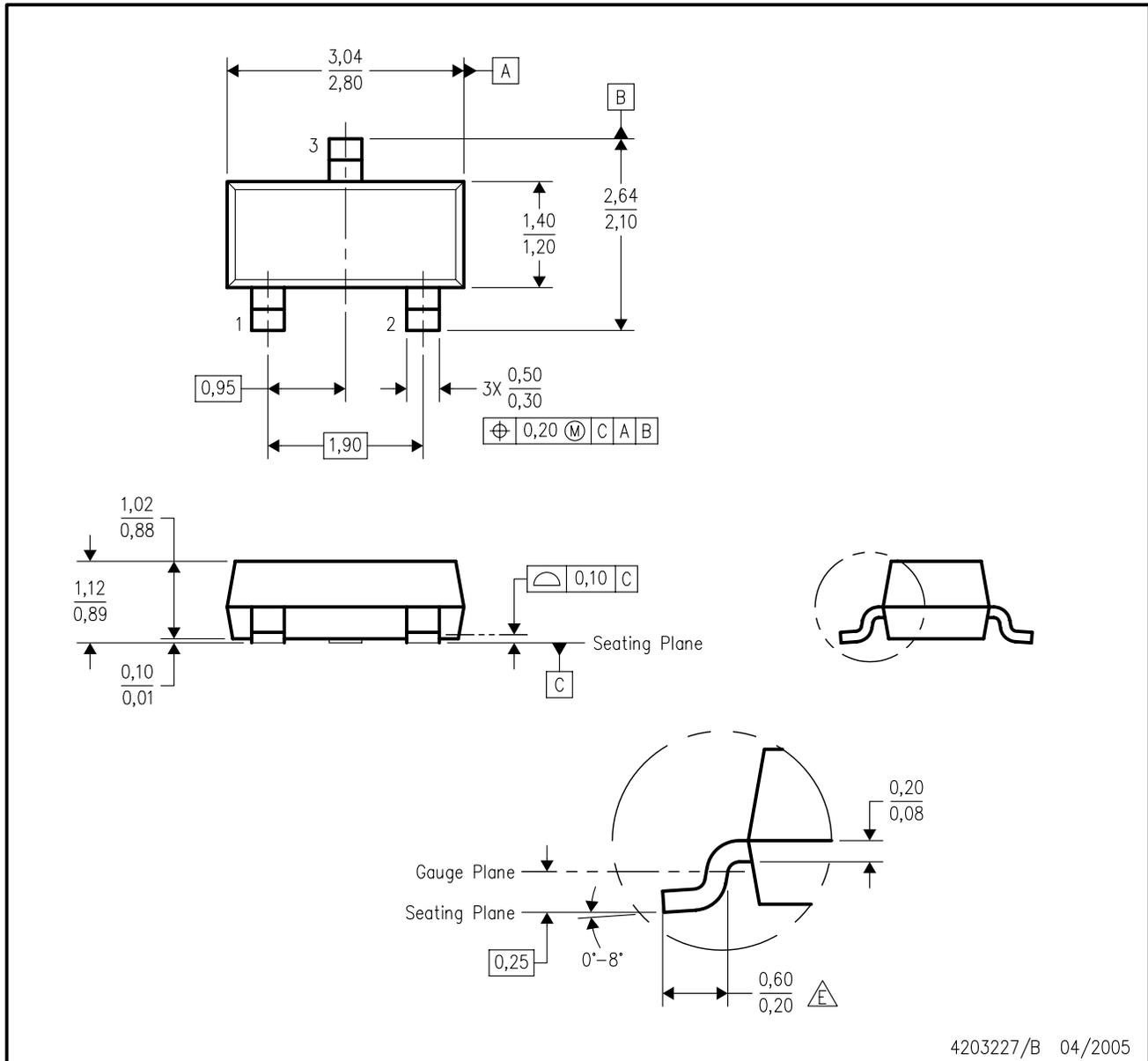
PLASTIC SMALL OUTLINE



- 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.

DBZ (R-PDSO-G3)

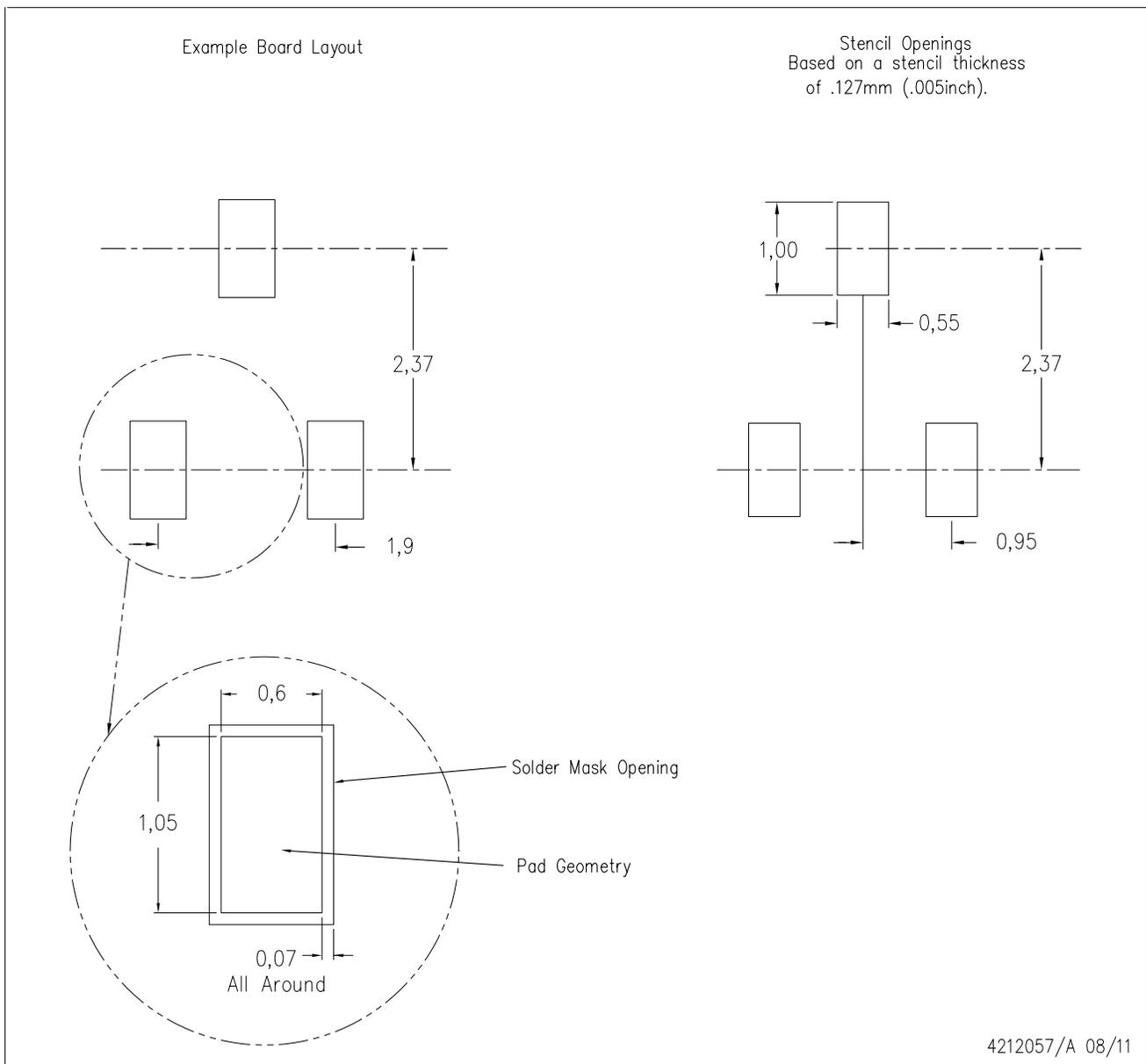
PLASTIC SMALL-OUTLINE



- 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.
 - $\triangle E$ Falls within JEDEC TO-236 variation AB, except minimum foot length.

DBZ (R-PDSO-G3)

PLASTIC SMALL OUTLINE



- 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

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Mobile Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2012, Texas Instruments Incorporated