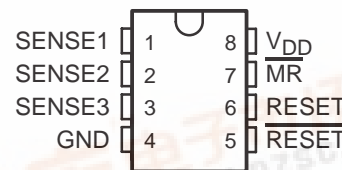


- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree†**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Triple Supervisory Circuits for DSP and Processor-Based Systems**
- **Power-On Reset Generator With Fixed Delay Time of 200 ms, No External Capacitor Needed**
- **Temperature-Compensated Voltage Reference**
- **Maximum Supply Current of 40 μ A**
- **Supply Voltage Range . . . 2 V to 6 V**
- **Defined $\overline{\text{RESET}}$ Output from $V_{\text{DD}} \geq 1.1 \text{ V}$**
- **SO-8 and MSOP-8 Packages**

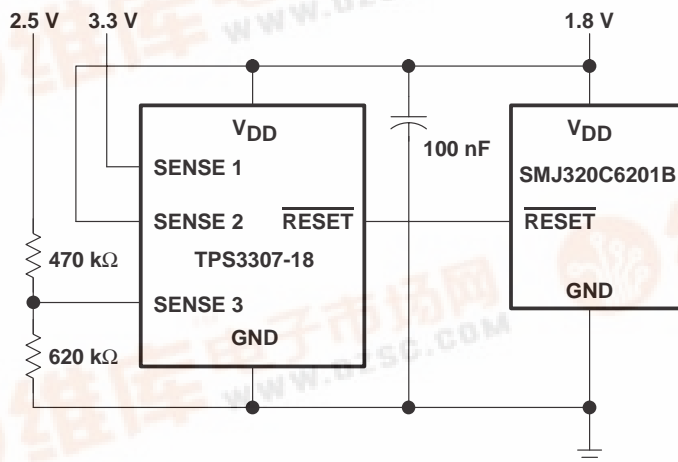
† Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

D or DGN PACKAGE
(TOP VIEW)



typical applications

Figure 1 lists some of the typical applications for the TPS3307 family, and a schematic diagram for a processor-based system application. This application uses Texas Instruments part numbers TPS3307-18 and SMJ320C6201B.



- **Military applications using DSPs, Microcontrollers or Microprocessors**
- **Industrial Equipment**
- **Programmable Controls**
- **Military Systems**

Figure 1. Applications Using the TPS3307-18

description

The TPS3307-xx family is a series of micropower supply voltage supervisors designed for circuit initialization primarily in DSP and processor-based systems which require more than one supply voltage.

The TPS3307-18 and TPS3307-33 are designed for monitoring three independent supply voltages: 3.3 V/1.8 V/adj and 5V/3.3V/adj, respectively. The adjustable SENSE input allows the monitoring of any supply voltage >1.25 V.



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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TPS3307-18-EP, TPS3307-33-EP TRIPLE PROCESSOR SUPERVISORS

SGLS3307-18-EP, TPS3307-33-EP 2008-12 REVISED BY JUST 2005

description (continued)

The various supply voltage supervisors are designed to monitor the nominal supply voltage as shown in the following supply voltage monitoring table.

SUPPLY VOLTAGE MONITORING

DEVICE	NOMINAL SUPERVISED VOLTAGE			THRESHOLD VOLTAGE (TYP)		
	SENSE1	SENSE2	SENSE3	SENSE1	SENSE2	SENSE3
TPS3307-18	3.3 V	1.8 V	User defined	2.93 V	1.68 V	1.25 V†
TPS3307-33	5 V	3.3 V	User defined	4.55 V	2.93 V	1.25 V†

† The actual sense voltage has to be adjusted by an external resistor divider according to the application requirements.

During power-on, $\overline{\text{RESET}}$ is asserted when the supply voltage V_{DD} becomes higher than 1.1 V. Thereafter, the supply voltage supervisor monitors the SENSEn inputs and keeps $\overline{\text{RESET}}$ active as long as SENSEn remain below the threshold voltage V_{IT+} .

An internal timer delays the return of the $\overline{\text{RESET}}$ output to the inactive state (high) to ensure proper system reset. The delay time, $t_{dtyp} = 200$ ms, starts after all SENSEn inputs have risen above the threshold voltage V_{IT+} . When the voltage at any SENSE input drops below the threshold voltage V_{IT-} , the $\overline{\text{RESET}}$ output becomes active (low) again.

The TPS3307-xx family of devices incorporates a manual reset input, $\overline{\text{MR}}$. A low level at $\overline{\text{MR}}$ causes $\overline{\text{RESET}}$ to become active. In addition to the active-low $\overline{\text{RESET}}$ output, the TPS3307-xx family includes an active-high RESET output.

The devices are available in either 8-pin MSOP or a standard 8-pin SO packages and are characterized for operation over a temperature range of -55°C to 125°C .

ORDERING INFORMATION

TA	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-55°C to 125°C	Small Outline (D)	Tape and Reel	TPS3307-18MDREP	30718E
	PowerPad μ -Small Outline (DGN)	Tape and Reel	TPS3307-33MDGNREP	BNP

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION/TRUTH TABLES

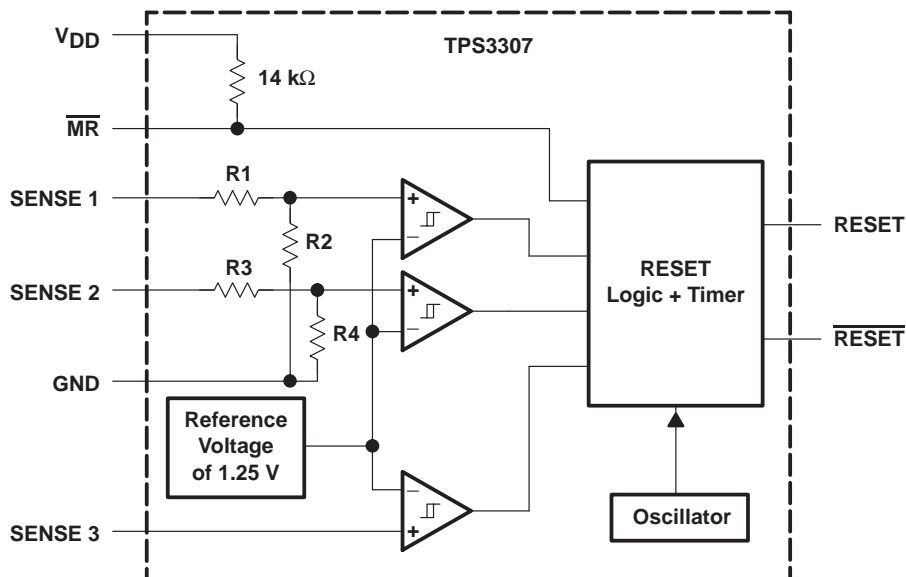
$\overline{\text{MR}}$	$\text{SENSE1} > V_{IT1}$	$\text{SENSE2} > V_{IT2}$	$\text{SENSE3} > V_{IT3}$	$\overline{\text{RESET}}$	RESET
L	X	X	X	L	H
H	0	0	0	L	H
H	0	0	1	L	H
H	0	1	0	L	H
H	0	1	1	L	H
H	1	0	0	L	H
H	1	0	1	L	H
H	1	1	0	L	H
H	1	1	1	H	L

X = Don't care

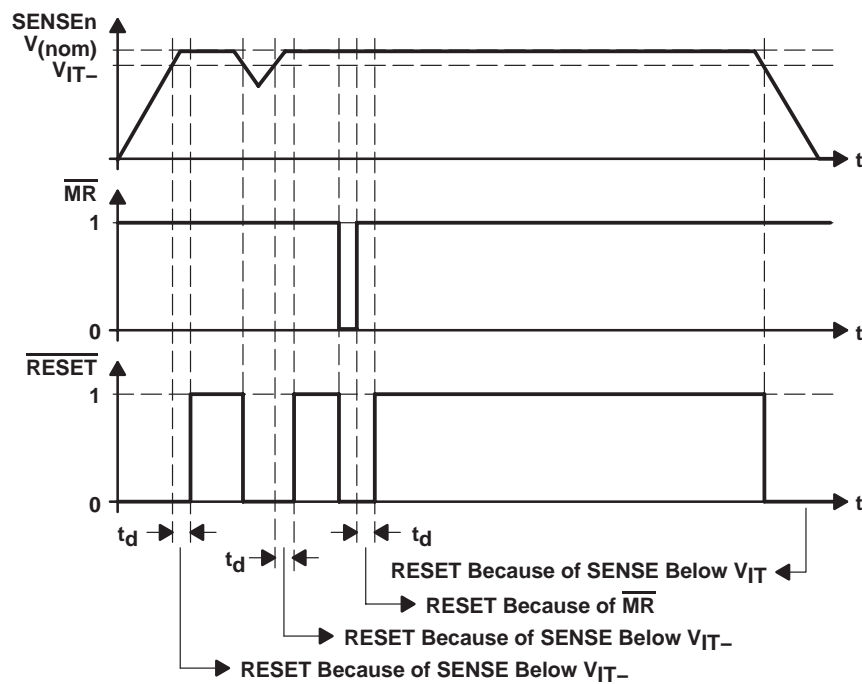


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functional block diagram



timing diagram



TPS3307-18-EP, TPS3307-33-EP TRIPLE PROCESSOR SUPERVISORS

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage, V_{DD} (see Note 1)	7 V
All other pins (see Note 1)	-0.3 V to 7 V
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
Maximum junction temperature, T_J	150°C
Package thermal impedance, θ_{JA} (see Note 2)	D package 126°C/W DGN package 58.4°C/W
Operating free-air temperature range, T_A	-55°C to 125°C
Storage temperature range, T_{stg} (see Note 3)	-65°C to 150°C
Soldering temperature	260°C

[†] 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.

NOTE 1: All voltage values are with respect to GND. For reliable operation the device must not be operated at 7 V for more than $t = 1000$ h continuously.

NOTE 2: The thermal impedance, θ_{JA} , for the D package is determined for JEDEC high-K PCB (JESD51-7). The thermal impedance value for the DGN package is determined for Texas Instruments recommended assembly for PowerPAD packages. See Texas Instruments technical briefs SLMA002 and SLMA004 for more information about utilizing the PowerPAD thermally enhanced package. Thermal impedance, θ_{JA} , values for the D and DGN packages using JEDEC low-K PCB (JESD51-3) are 215°C/W and 296°C/W, respectively.

NOTE 3: Long-term, high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See <http://www.ti.com/sc/ep> for more information.

recommended operating conditions at specified temperature range

	MIN	MAX	UNIT
Supply voltage, V_{DD}	2	6	V
Input voltage at \overline{MR} and SENSE3, V_I	0	$V_{DD}+0.3$	V
Input voltage at SENSE1 and SENSE2, V_I	0	$(V_{DD}+0.3)V_{IT}/1.25$ V	V
High-level input voltage at \overline{MR} , V_{IH}	$0.7 \times V_{DD}$		V
Low-level input voltage at \overline{MR} , V_{IL}		$0.3 \times V_{DD}$	V
Input transition rise and fall rate at \overline{MR} , $\Delta t/\Delta V$		50	ns/V
Operating free-air temperature range, T_A	-55	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 V to 6 V, I _{OH} = –20 μA		V _{DD} – 0.2 V			V	
		V _{DD} = 3.3 V, I _{OH} = –2 mA		V _{DD} – 0.4 V				
		V _{DD} = 6 V, I _{OH} = –3 mA		V _{DD} – 0.4 V				
V _{OL}	Low-level output voltage	V _{DD} = 2 V to 6 V, I _{OL} = 20 μA		0.2			V	
		V _{DD} = 3.3 V, I _{OL} = 2 mA		0.4				
		V _{DD} = 6 V, I _{OL} = 3 mA		0.4				
Power-up reset voltage (see Note 4)		V _{DD} ≥ 1.1 V, I _{OL} = 20 μA		0.4			V	
V _{IT–}	Negative-going input threshold voltage (see Note 5)	SENSE3	V _{DD} = 2 V to 6 V		1.2	1.25	1.29	V
		SENSE1, SENSE2		VSENSE = 1.8 V	1.6	1.68	1.73	
				VSENSE = 3.3 V	2.8	2.93	3.02	
					VSENSE = 5 V	4.4	4.55	
V _{hys}	Hysteresis at VSENSEn input	V _{IT–} = 1.25 V		2	10	30	mV	
		V _{IT–} = 1.68 V		2	15	40		
		V _{IT–} = 2.93 V		3	30	60		
		V _{IT–} = 4.55 V		3	40	80		
I _H	High-level input current	$\overline{\text{MR}}$	$\overline{\text{MR}}$ = 0.7 × V _{DD} , V _{DD} = 6 V	–130 –180			μA	
		SENSE1	VSENSE1 = V _{DD} = 6 V	5 8				
		SENSE2	VSENSE2 = V _{DD} = 6 V	6 9				
		SENSE3	VSENSE3 = V _{DD}	–1 1				
I _L	Low-level input current	$\overline{\text{MR}}$	$\overline{\text{MR}}$ = 0 V, V _{DD} = 6 V	–430 –600			μA	
		SENSEn	VSENSE1,2,3 = 0 V	–1 1				
I _{DD}	Supply current			40			μA	
C _i	Input capacitance	V _I = 0 V to V _{DD}		10			pF	

NOTES: 4. The lowest supply voltage at which $\overline{\text{RESET}}$ becomes active. t_r , V_{DD} ≥ 15 µs/V
5. To ensure best stability of the threshold voltage, a bypass capacitor (ceramic 0.1 µF) should be placed close to the supply terminals.

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timing requirements at $V_{DD} = 2\text{ V to }6\text{ V}$, $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w Pulse width	SENSEn	$V_{SENSEnL} = V_{IT-} - 0.2\text{ V}$, $V_{SENSEnH} = V_{IT+} + 0.2\text{ V}$	6			μs
	$\overline{\text{MR}}$	$V_{IH} = 0.7 \times V_{DD}$, $V_{IL} = 0.3 \times V_{DD}$	100			ns

switching characteristics at $V_{DD} = 2\text{ V to }6\text{ V}$, $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_d Delay time		$V_I(\text{SENSEn}) \geq V_{IT+} + 0.2\text{ V}$, $\overline{\text{MR}} \geq 0.7 \times V_{DD}$, See timing diagram	140	200	280	ms
t_{PHL} Propagation (delay) time, high-to-low level output	$\overline{\text{MR}}$ to $\overline{\text{RESET}}$	$V_I(\text{SENSEn}) \geq V_{IT+} + 0.2\text{ V}$, $V_{IH} = 0.7 \times V_{DD}$, $V_{IL} = 0.3 \times V_{DD}$		200	600	ns
t_{PLH} Propagation (delay) time, low-to-high level output	$\overline{\text{MR}}$ to RESET					
t_{PHL} Propagation (delay) time, high-to-low level output	SENSEn to $\overline{\text{RESET}}$	$V_{IH} \geq V_{IT+} + 0.2\text{ V}$, $V_{IL} \leq V_{IT-} - 0.2\text{ V}$, $\overline{\text{MR}} \geq 0.7 \times V_{DD}$		1	5	μs
t_{PLH} Propagation (delay) time, low-to-high level output	SENSEn to RESET					



TYPICAL CHARACTERISTICS

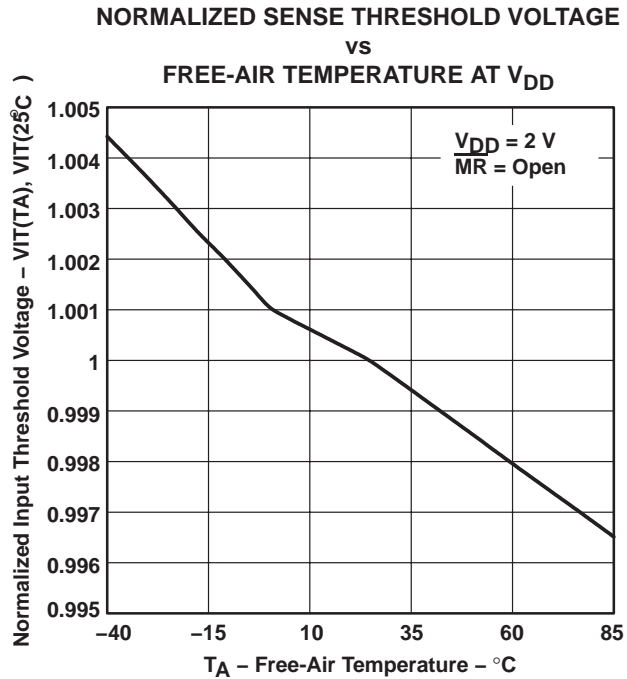


Figure 2

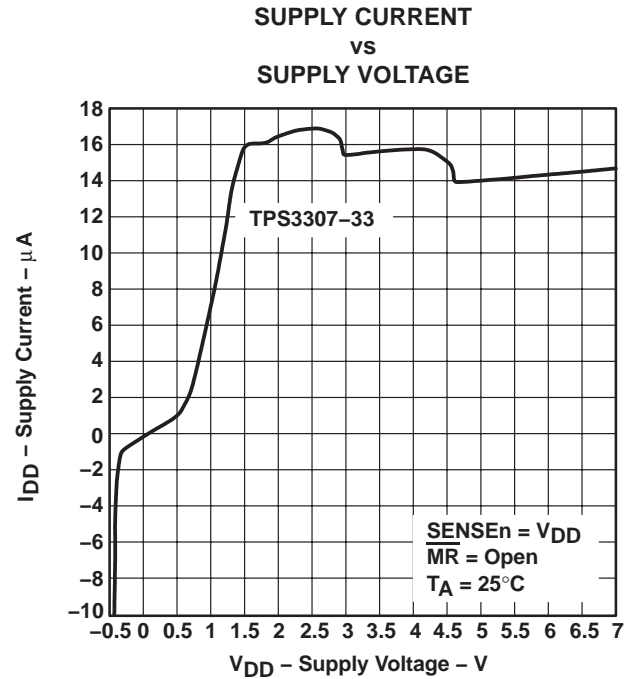


Figure 3

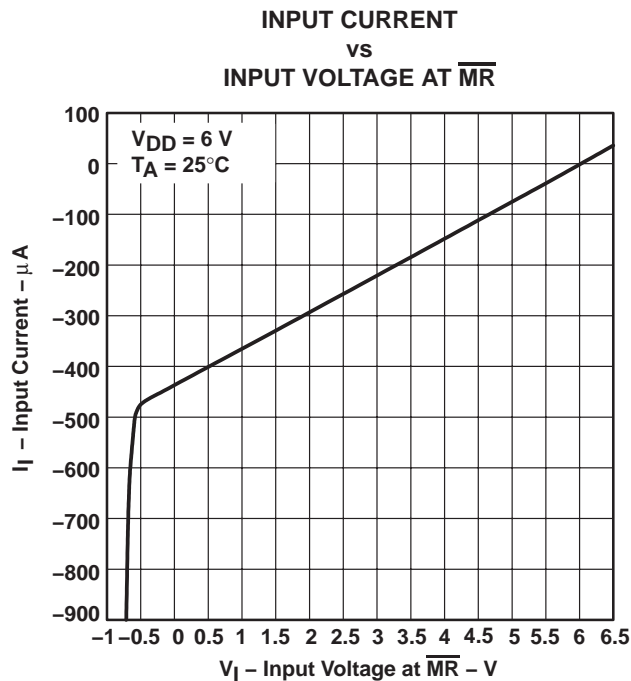


Figure 4

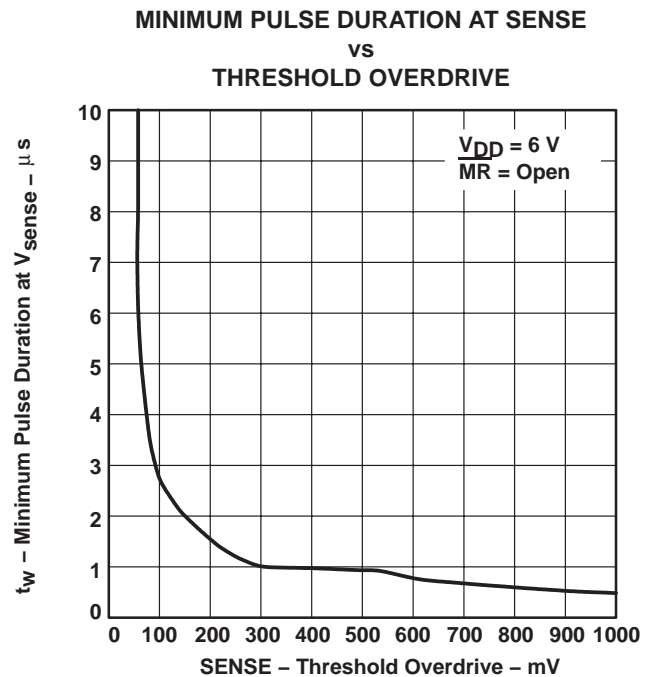


Figure 5

TPS3307-18-EP, TPS3307-33-EP TRIPLE PROCESSOR SUPERVISORS

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TYPICAL CHARACTERISTICS

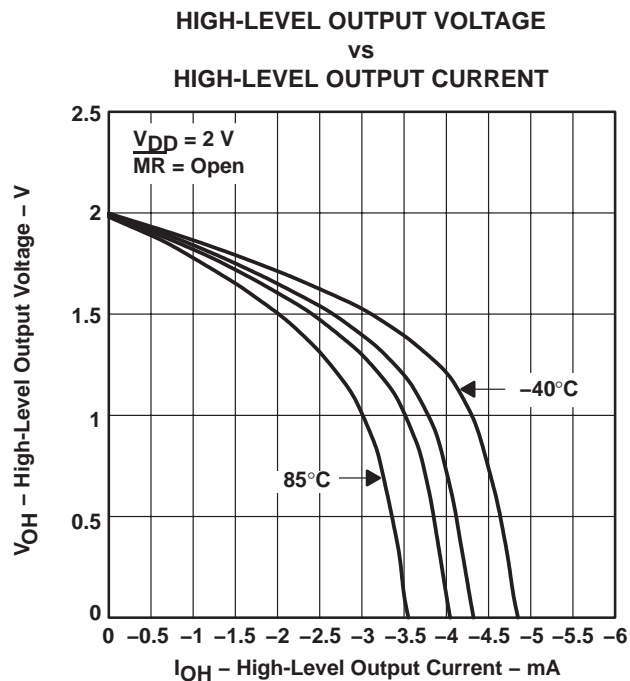


Figure 6

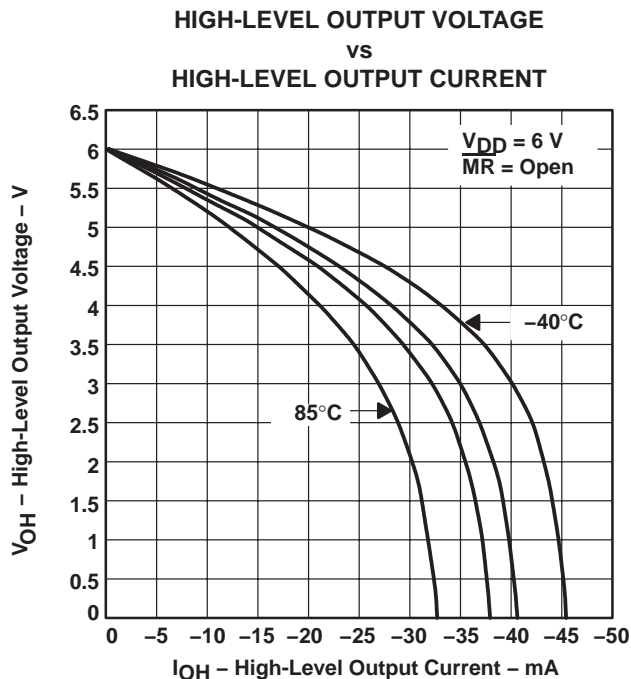


Figure 7

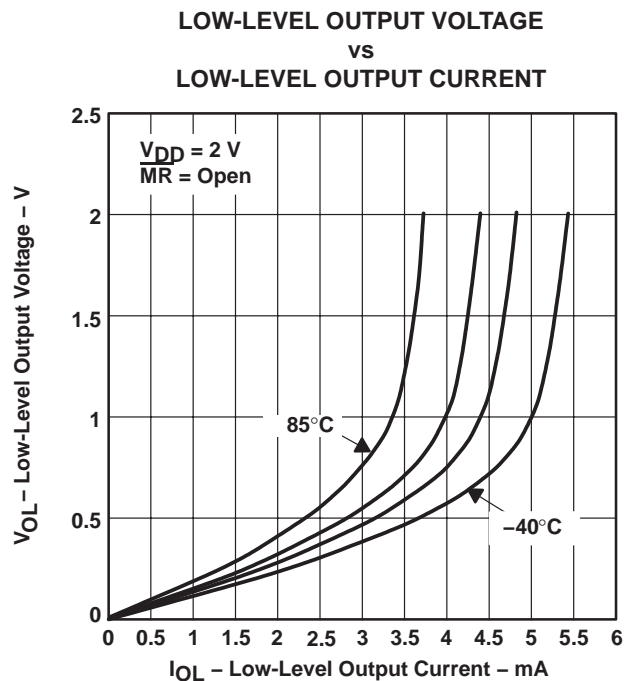


Figure 8

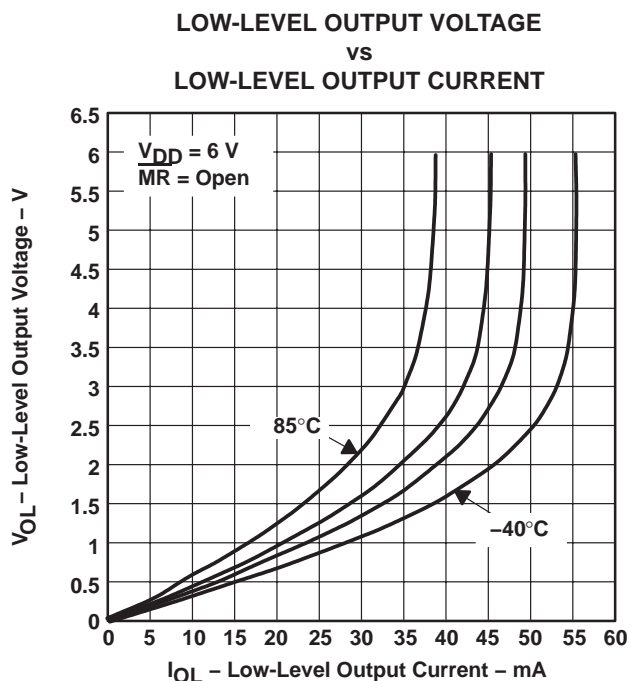


Figure 9

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TPS3307-18MDREP	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3307-18MDREPG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TPS3307-33MDGNREP	ACTIVE	MSOP-Power PAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/03629-01XE	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/03629-02YE	ACTIVE	MSOP-Power PAD	DGN	8	2500	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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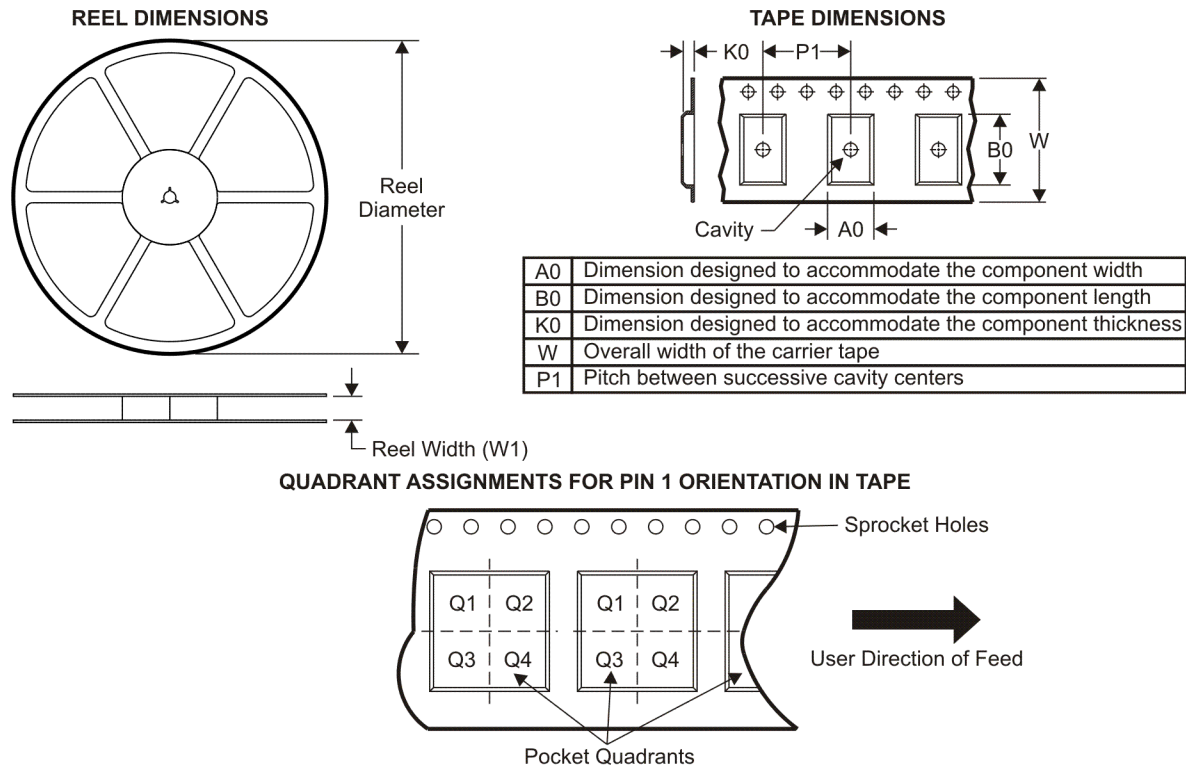
OTHER QUALIFIED VERSIONS OF TPS3307-18-EP, TPS3307-33-EP :

- Catalog: [TPS3307-18](#), [TPS3307-33](#)
- Automotive: [TPS3307-18-Q1](#)
- Military: [TPS3307-18M](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

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
TPS3307-18MDREP	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3307-33MDGNREP	MSOP-Power PAD	DGN	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1

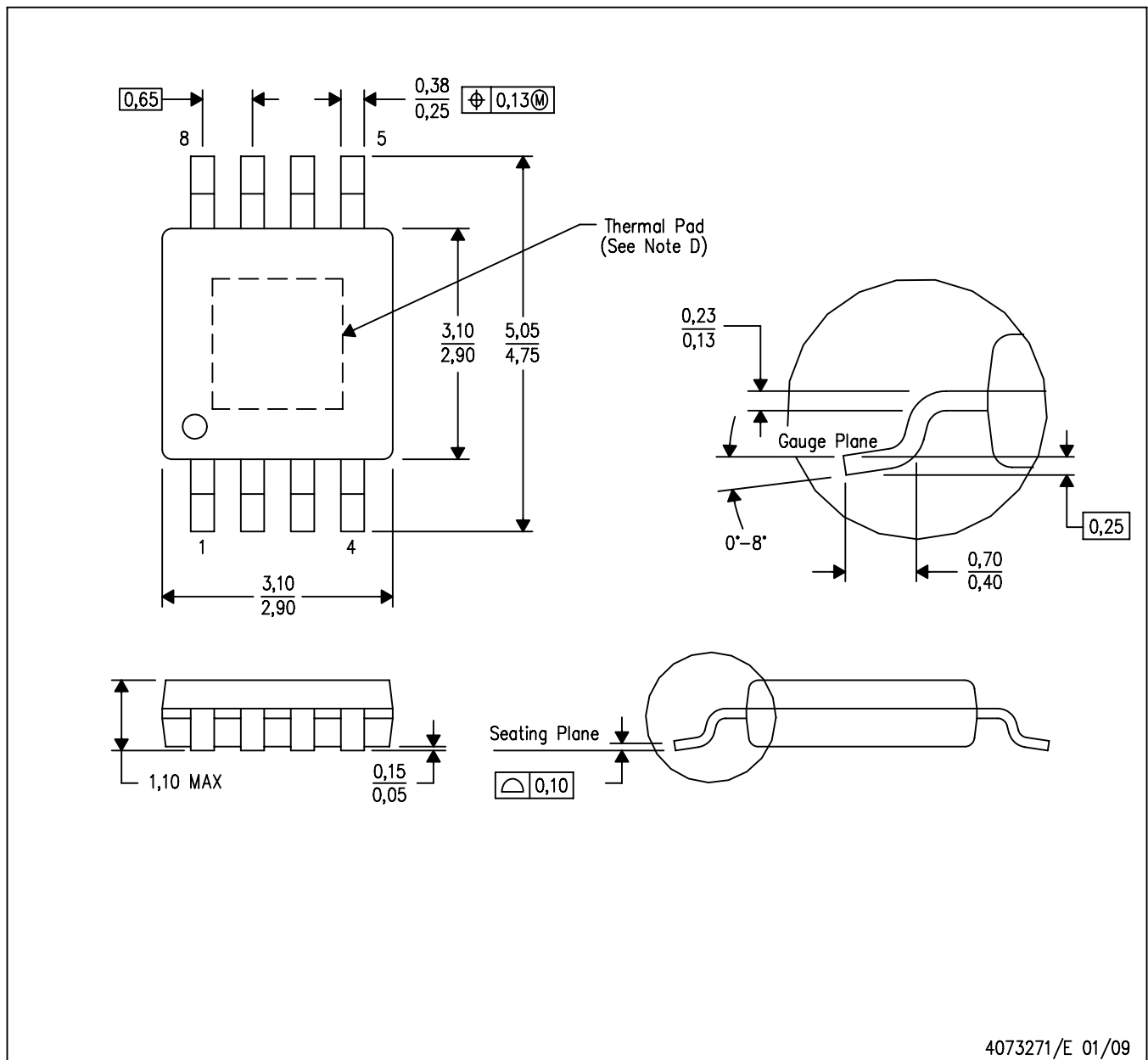
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3307-18MDREP	SOIC	D	8	2500	346.0	346.0	29.0
TPS3307-33MDGNREP	MSOP-PowerPAD	DGN	8	2500	358.0	335.0	35.0

DGN (S-PDSO-G8) PowerPAD™ PLASTIC SMALL-OUTLINE PACKAGE



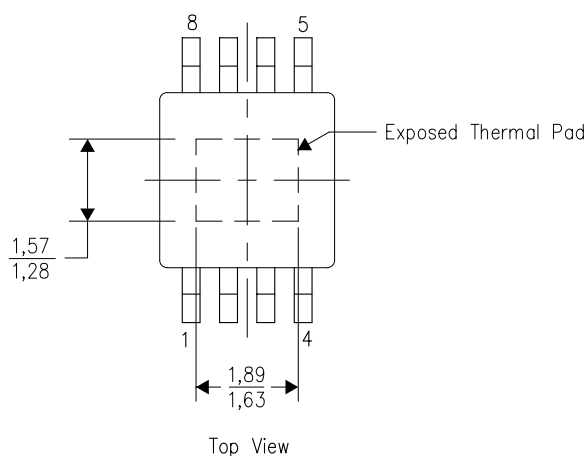
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion.
 - D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPAD Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 for information regarding recommended board layout. This document is available at www.ti.com <<http://www.ti.com>>.
 - E. Falls within JEDEC MO-187 variation AA-T

THERMAL INFORMATION

This PowerPAD™ package incorporates an exposed thermal pad that is designed to be attached to a printed circuit board (PCB). The thermal pad must be soldered directly to the PCB. After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

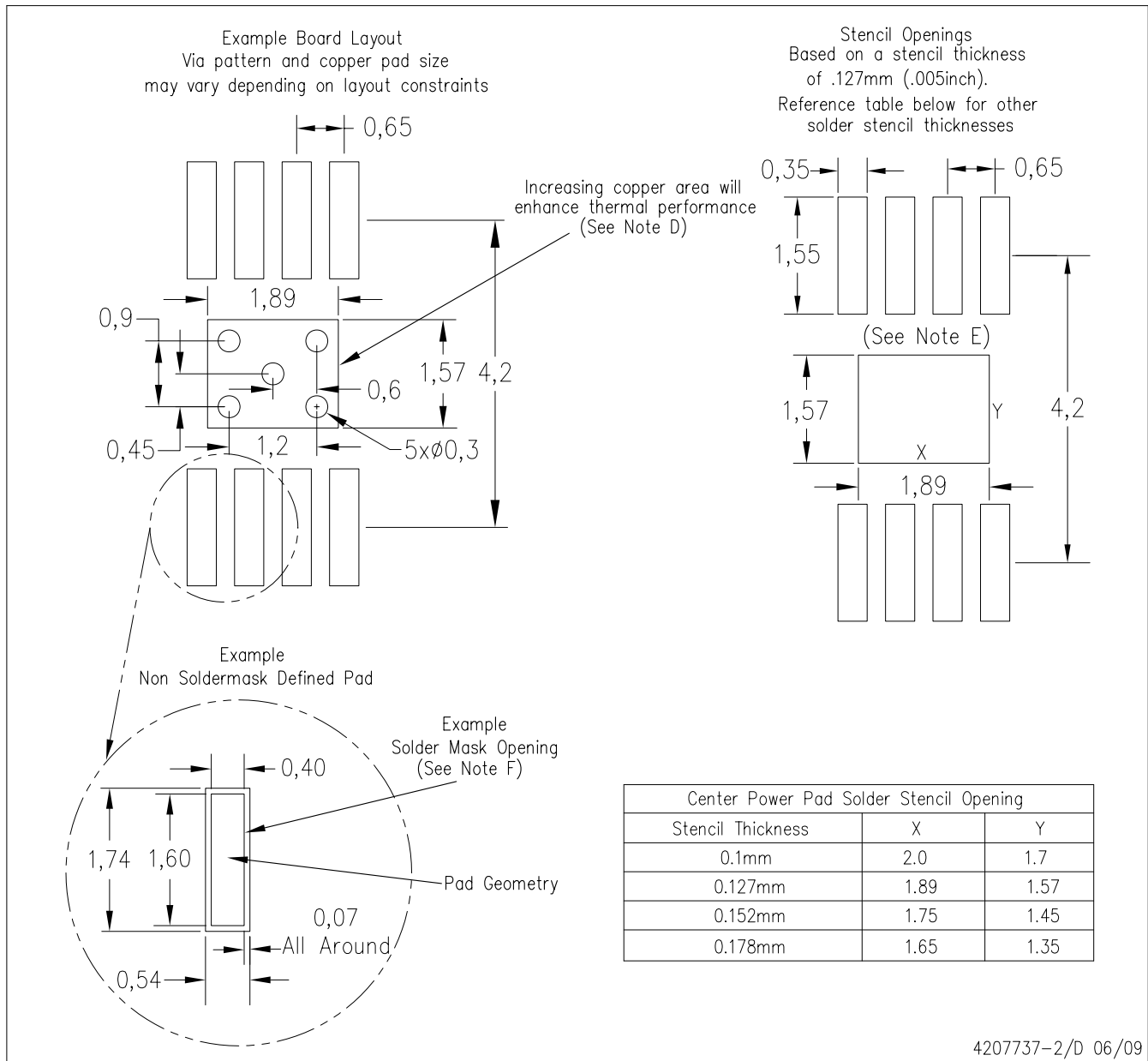
For additional information on the PowerPAD package and how to take advantage of its heat dissipating abilities, refer to Technical Brief, PowerPAD Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 and Application Brief, PowerPAD Made Easy, Texas Instruments Literature No. SLMA004. Both documents are available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



NOTE: All linear dimensions are in millimeters

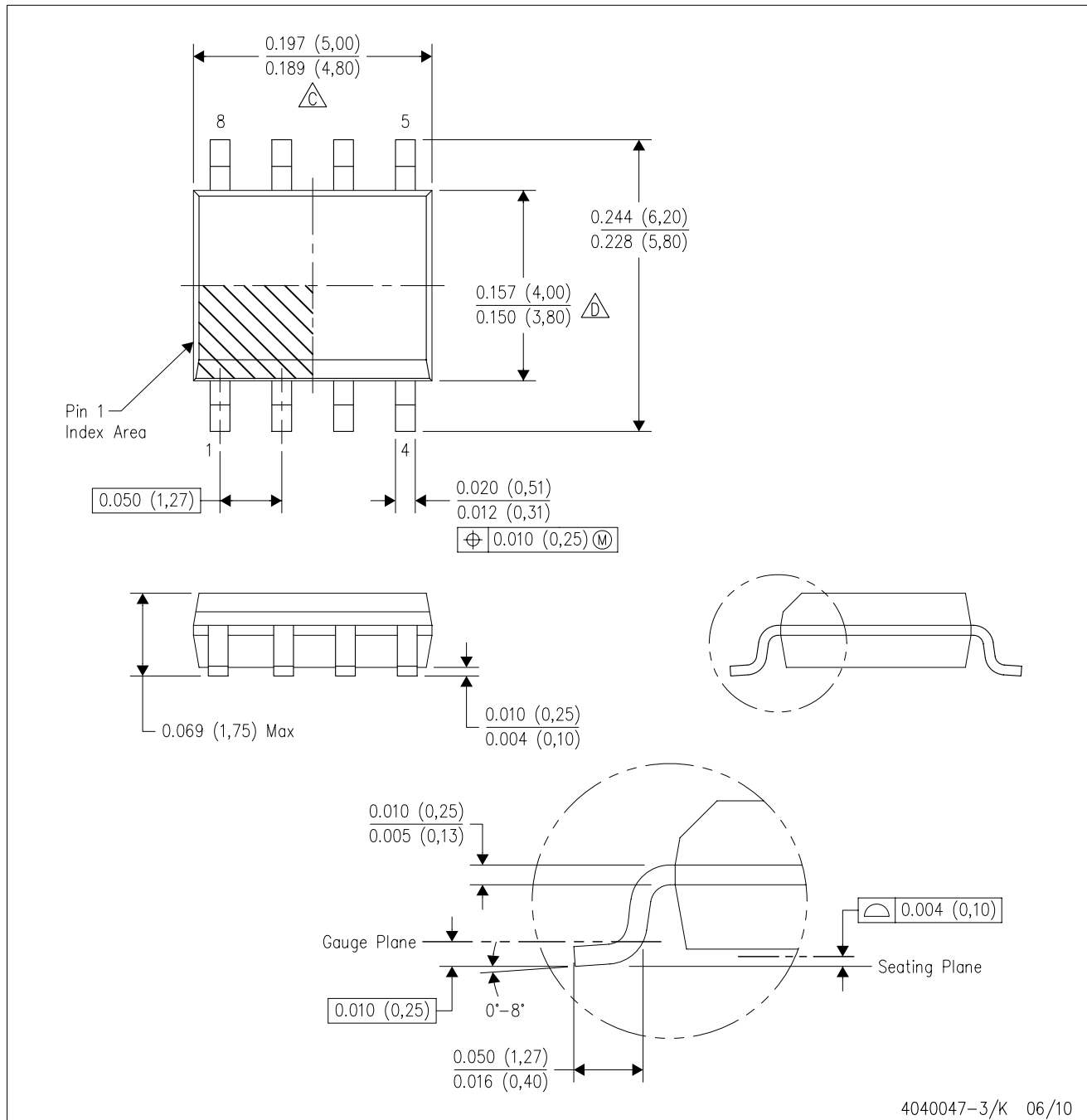
Exposed Thermal Pad Dimensions



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002, SLMA004, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>. Publication IPC-7351 is recommended for alternate designs.
 - 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.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

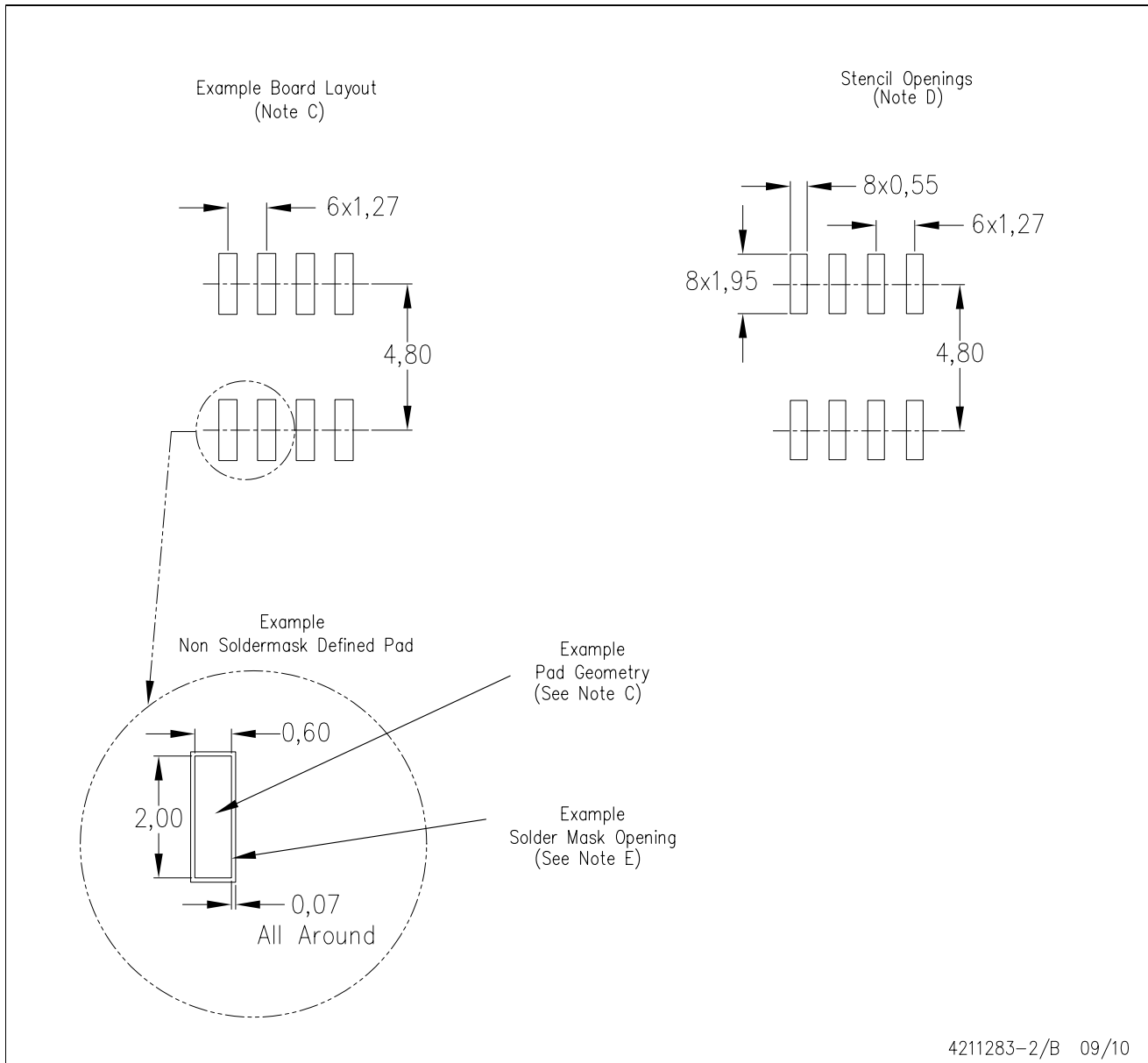


NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AA.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. 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. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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