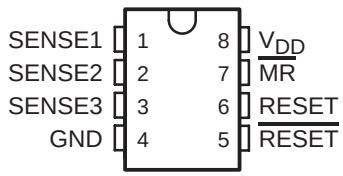
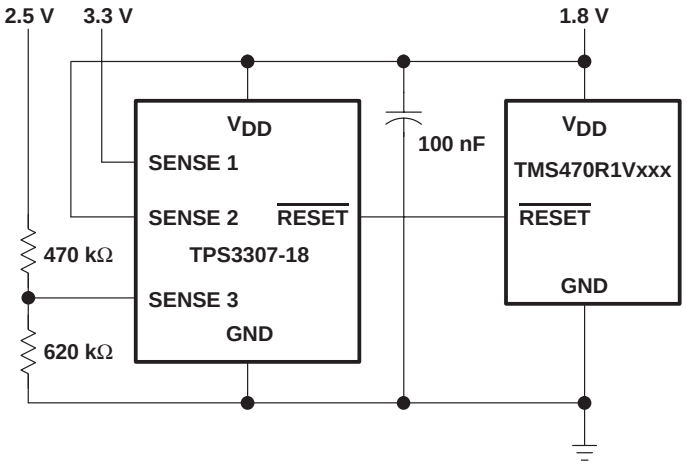
- **Qualified for Automotive Applications**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Triple Supervisory Circuits for DSP and Processor-Based Systems**
- **Power-On Reset Generator with Fixed Delay Time of 200 ms, No External Capacitor Needed**
- **Temperature-Compensated Voltage Reference**
- **Maximum Supply Current of 40 μA**
- **Supply Voltage Range . . . 2 V to 6 V**
- **Defined $\overline{\text{RESET}}$ Output from $V_{DD} \geq 1.1$ V**
- **SO-8 Package**
- **Temperature Range . . . −40°C to 125°C**

D 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 TI part numbers TPS3307−18 and TMS470R1Vxxx.



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

Figure 1. Applications Using the TPS3307-18

description

The TPS3307-18 is a micropower supply voltage supervisor designed for circuit initialization primarily in automotive DSP and processor-based systems, which require more than one supply voltage.

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

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

description (continued)

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†

† 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, $t_{d\,typ}$ = 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 TPS3307-18 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 TPS3307-18 includes an active-high RESET output.

The device is available in a standard 8-pin SO package, and is characterized for operation over a temperature range of −40°C to 125°C.

ORDERING INFORMATION†

T_A	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
−40°C to 125°C	Small Outline (D)	Tape and Reel	TPS3307-18QDRQ1	30718Q

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at http://www.ti.com.

‡ Package drawings, thermal data, and symbolization are available at http://www.ti.com/packaging.

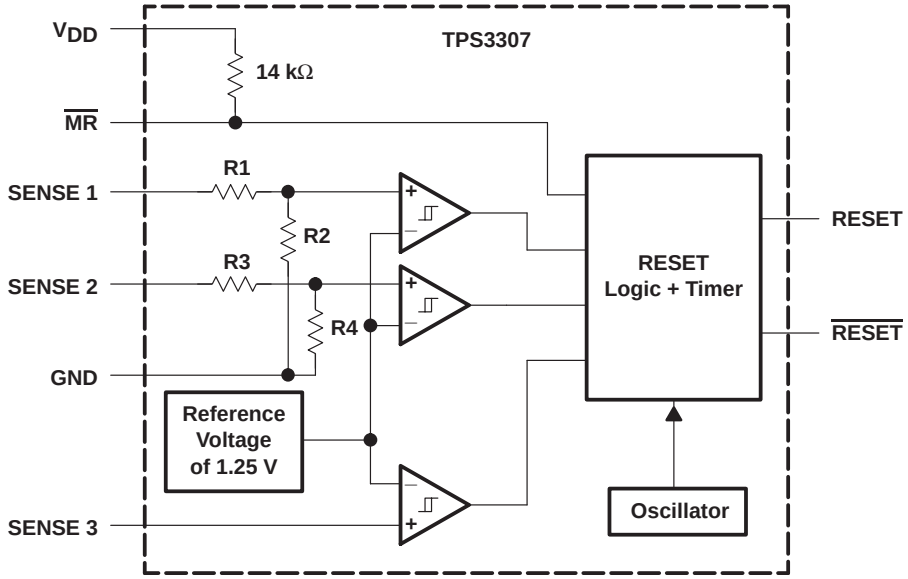
FUNCTION/TRUTH TABLES

$\overline{\text{MR}}$	SENSE1>V_{IT1}	SENSE2>V_{IT2}	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

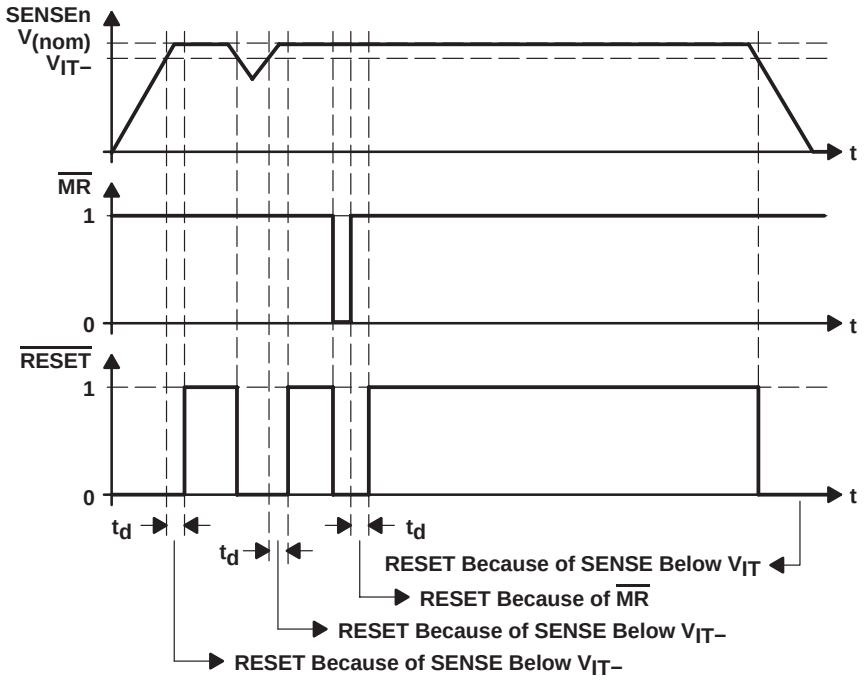
X = Don't care

PowerPAD is a trademark of Texas Instruments Incorporated.

functional block diagram



timing diagram



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

Supply voltage, V_{DD} (see Note1) . . . . . 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
Continuous total power dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . . . −40°C to 125°C
Storage temperature range, T_{stg} . . . . . −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.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW

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}/1.25V	V
High-level input voltage at $\overline{MR}$, V_{IH}	0.7xV_{DD}		V
Low-level input voltage at $\overline{MR}$, V_{IL}		0.3×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	−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 V to 6 V, I_{OH} = −20 µA	V_{DD} − 0.2V			V
			V_{DD} = 3.3 V, I_{OH} = −2 mA	V_{DD} − 0.4V			
			V_{DD} = 6 V, I_{OH} = −3 mA	V_{DD} − 0.4V			
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 2)		$V_{DD} \geq$ 1.1 V, I_{OL} = 20 µA			0.4	V
V_{IT-}	Negative-going input threshold voltage (see Note 3)	VSENSE3	V_{DD} = 2 V to 6 V, T_A = −40°C to 125°C	1.2	1.25	1.29	V
		VSENSE2		1.6	1.68	1.73	V
		VSENSE1		2.8	2.93	3.02	
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	
I_H	High-level input current	$\overline{MR}$	$\overline{MR}$ = 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	$\overline{MR}$	$\overline{MR}$ = 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: 2. The lowest supply voltage at which $\overline{RESET}$ becomes active. t_r, $V_{DD} \geq$ 15 µs/V
3. To ensure best stability of the threshold voltage, a bypass capacitor (ceramic 0.1 µF) should be placed close to the supply terminals.

timing requirements at V_{DD} = 2 V to 6 V, R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w	Pulse width	SENSEn	$V_{SENSEnL} = V_{IT-} - 0.2$ V, $V_{SENSEnH} = V_{IT+} + 0.2$ V	6	10		µs
		$\overline{MR}$	$V_{IH} = 0.7 \times V_{DD}$, $V_{IL} = 0.3 \times V_{DD}$	100	150		ns

switching characteristics at V_{DD} = 2 V to 6 V, R_L = 1 MΩ, C_L = 50 pF, T_A = 25°C

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

TYPICAL CHARACTERISTICS

NORMALIZED SENSE THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE AT V_{DD}

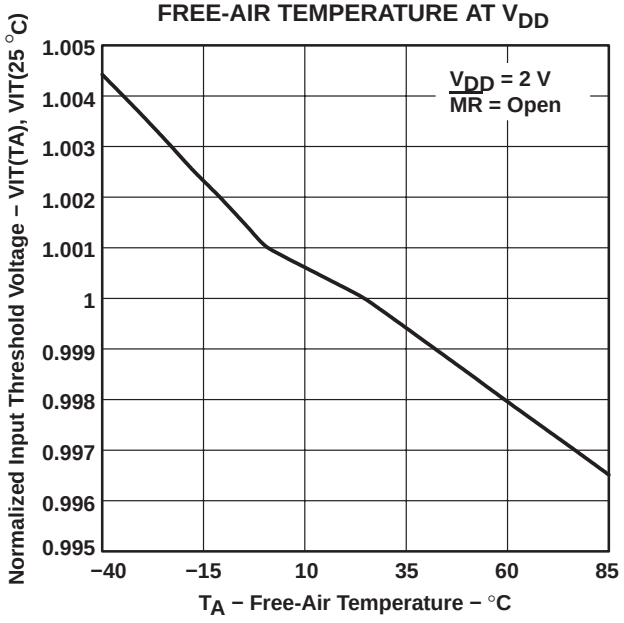


Figure 2

SUPPLY CURRENT
vs
SUPPLY VOLTAGE

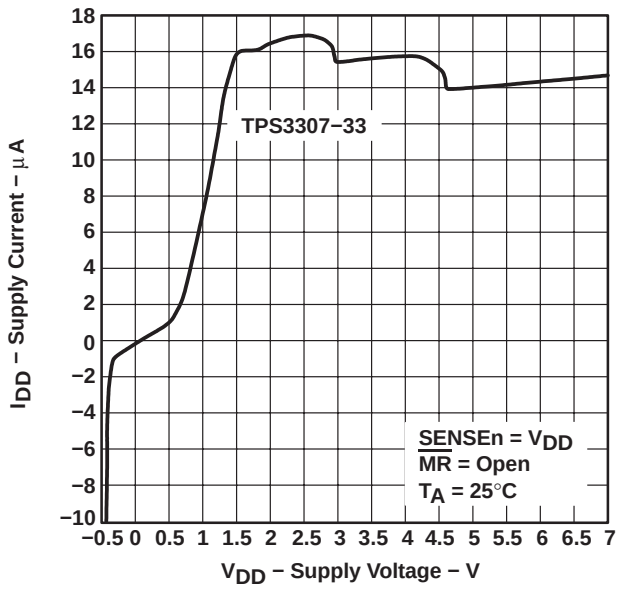


Figure 3

INPUT CURRENT
vs
INPUT VOLTAGE AT $\overline{MR}$

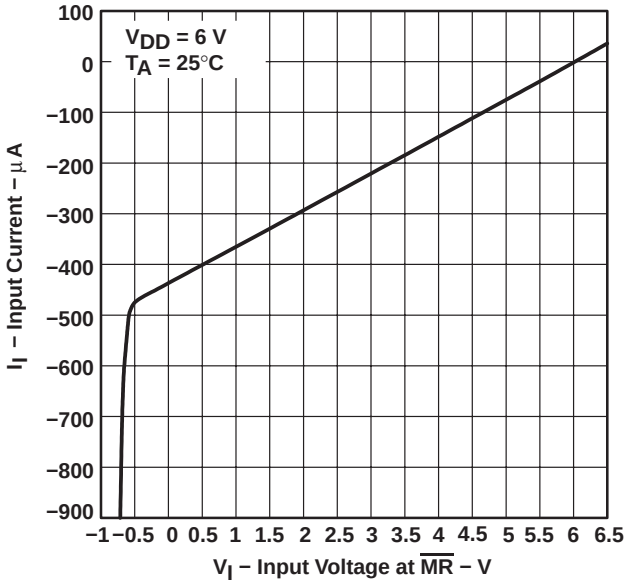


Figure 4

MINIMUM PULSE DURATION AT SENSE
vs
THRESHOLD OVERDRIVE

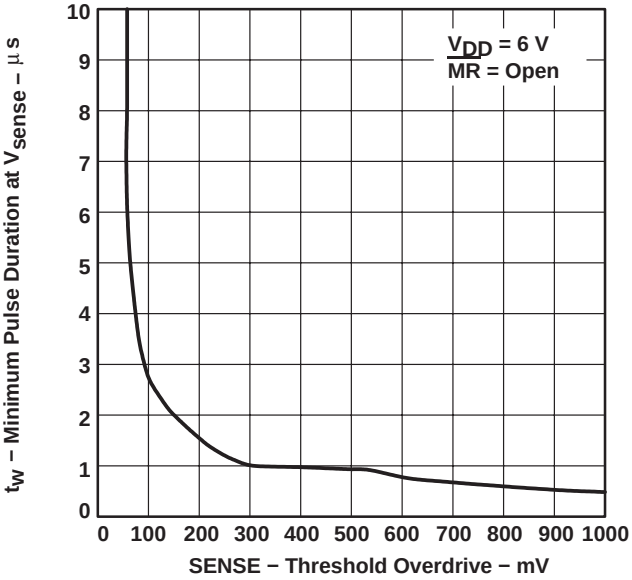


Figure 5

TYPICAL CHARACTERISTICS

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

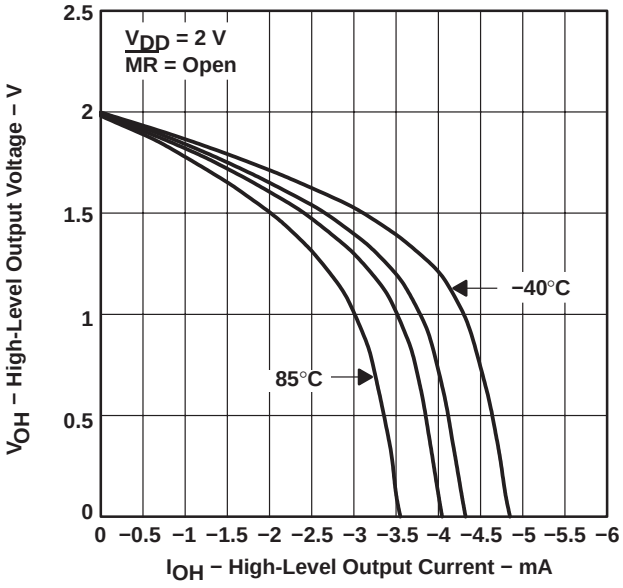


Figure 6

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

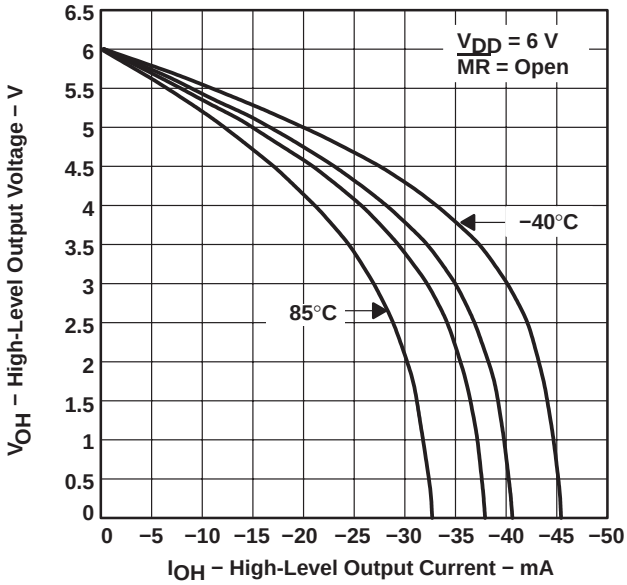


Figure 7

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

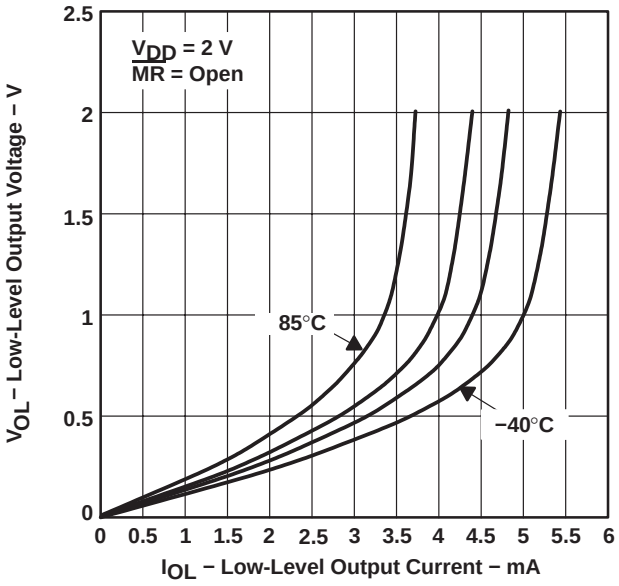


Figure 8

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

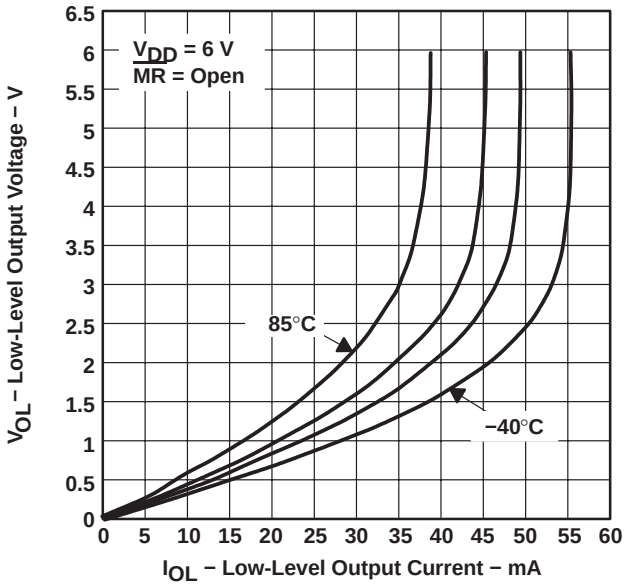


Figure 9

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS3307-18QDRG4Q1	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	30718Q	Samples
TPS3307-18QDRQ1	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	30718Q	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 <=1000ppm 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 finish/Ball material - Orderable Devices 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.

OTHER QUALIFIED VERSIONS OF TPS3307-18-Q1 :

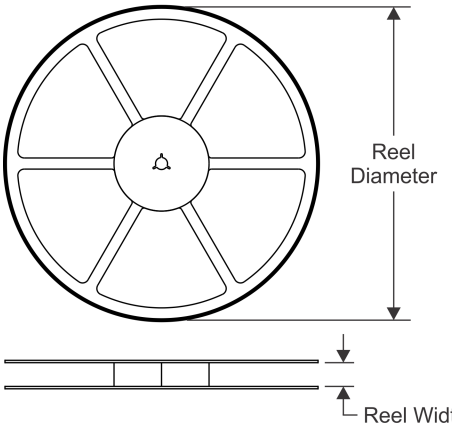
- Enhanced Product: TPS3307-EP
- Military: TPS3307-18M

NOTE: Qualified Version Definitions:

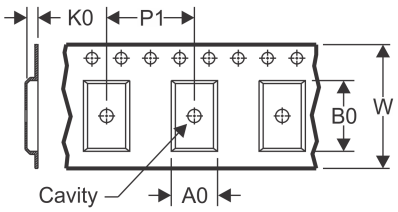
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

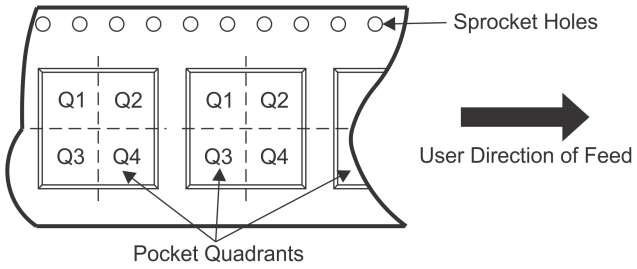


TAPE DIMENSIONS



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

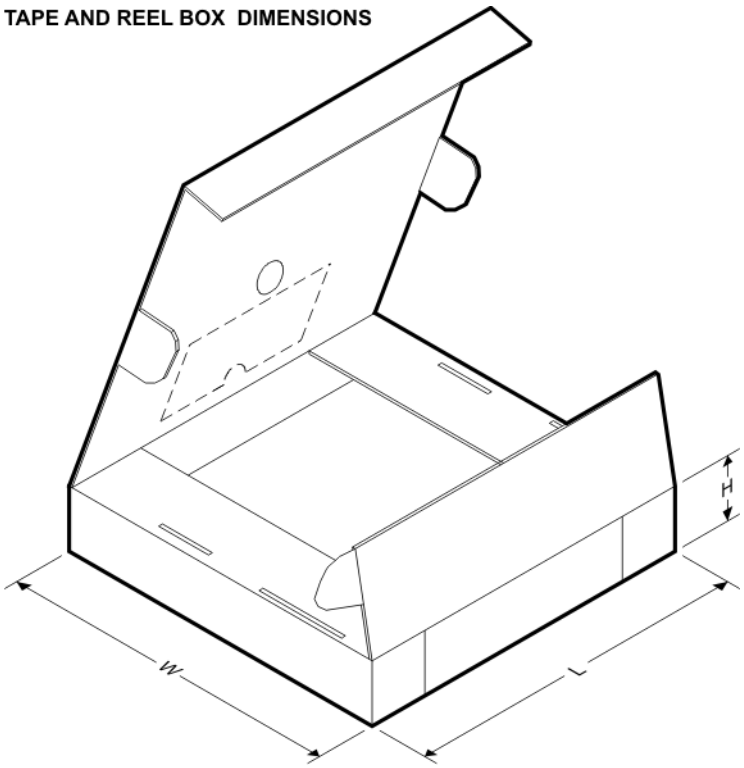
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TPS3307-18QDRG4Q1	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3307-18QDRQ1	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

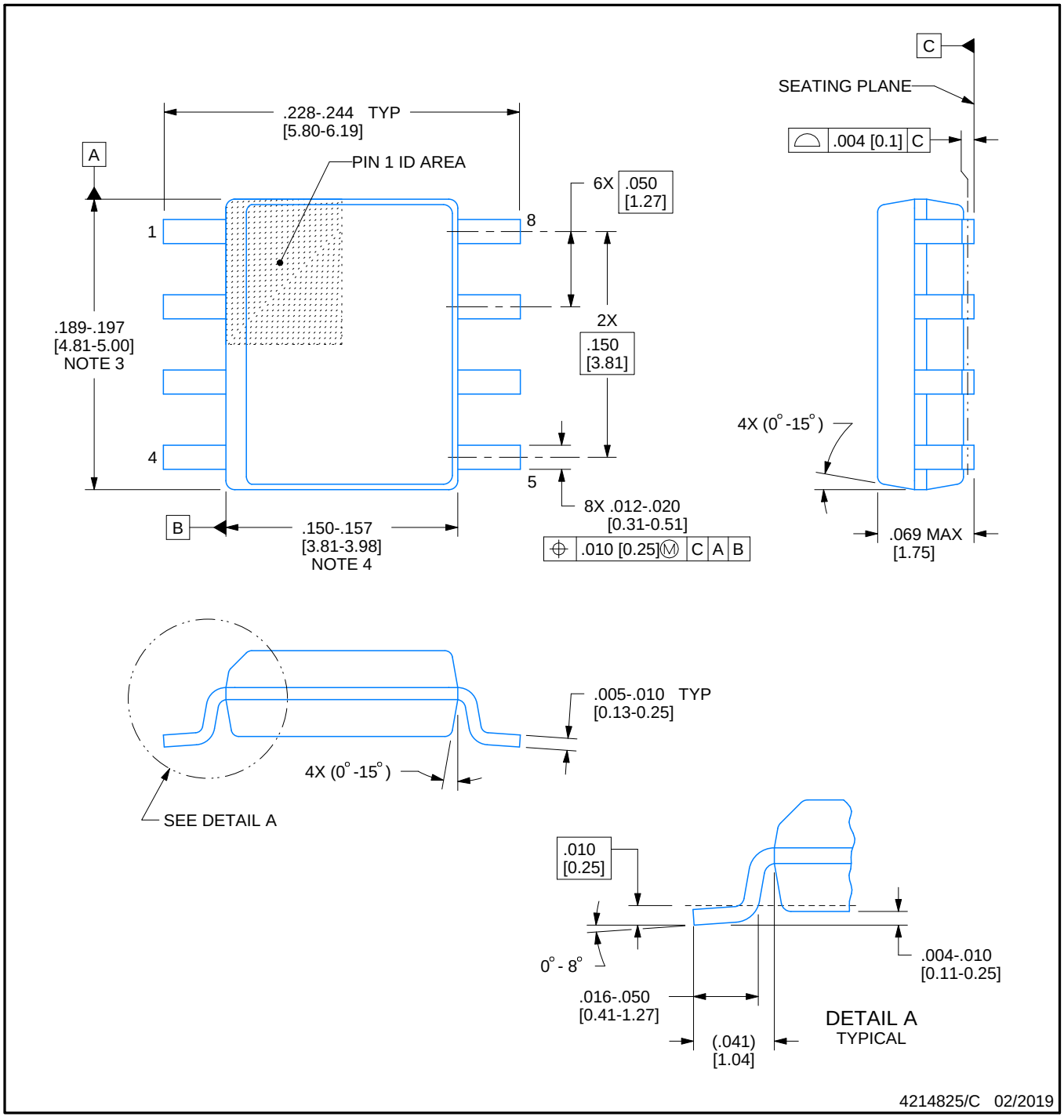
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3307-18QDRG4Q1	SOIC	D	8	2500	350.0	350.0	43.0
TPS3307-18QDRQ1	SOIC	D	8	2500	350.0	350.0	43.0

PACKAGE OUTLINE

D0008A

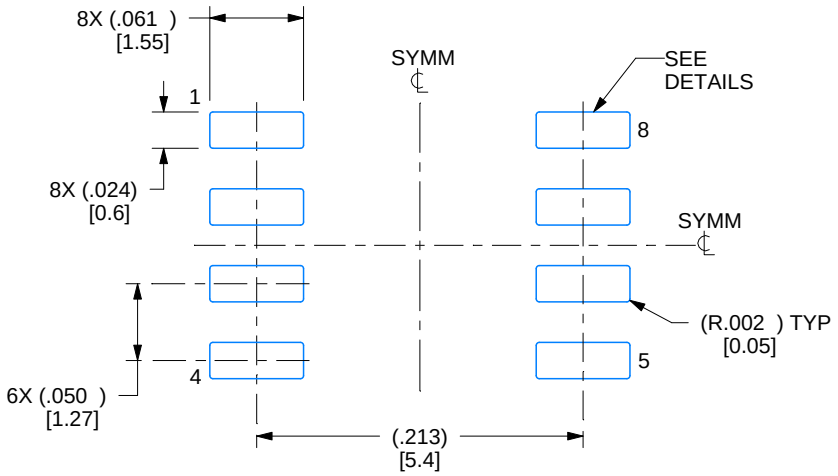
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

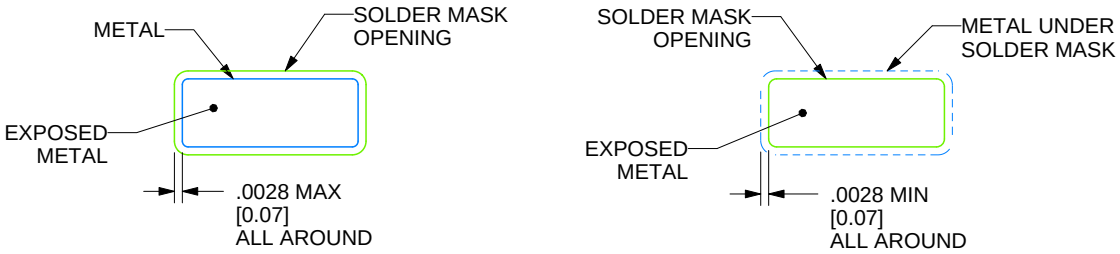


NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

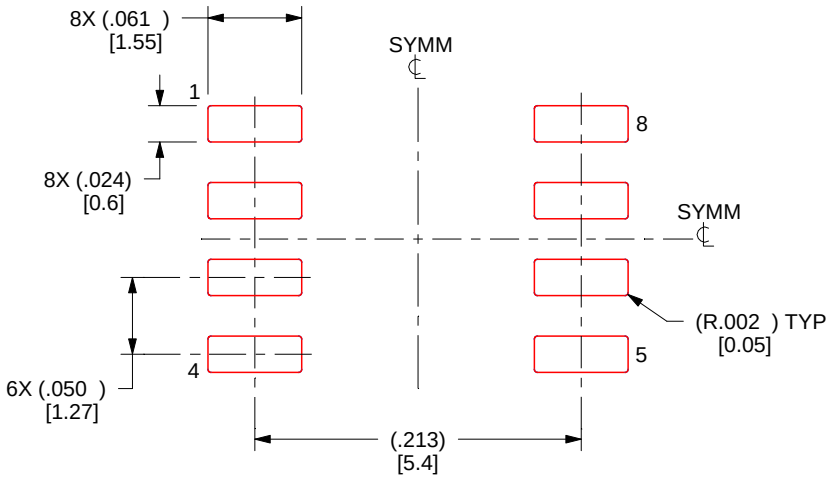
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

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

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