DUAL PROCESSOR SUPERVISORY CIRCUITS WITH POWER-FAIL

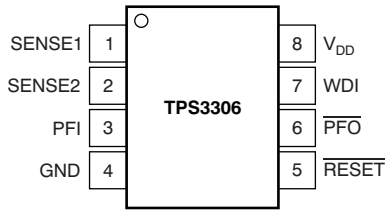
FEATURES

- **Dual Supervisory Circuits With Power-Fail for DSP and Processor-Based Systems**
- **Voltage Monitor for Power-Fail or Low-Battery Warning**
- **Watchdog Timer With 0.8 Second Time-Out**
- **Power-On Reset Generator With Integrated 100 ms Delay Time**
- **Open-Drain Reset and Power-Fail Output**
- **Supply Current of 15 μA (Typ.)**
- **Supply Voltage Range: 7 V to 6 V**
- **Defined $\overline{\text{RESET}}$ Output From $V_{DD} \geq$ 1.1 V**
- **MSOP-8 and SO-8 Packages**
- **Temperature Range: –40°C to +85°C**

APPLICATIONS

- **Multivoltage DSPs and Processors**
- **Portable Battery-Powered Equipment**
- **Embedded Control Systems**
- **Intelligent Instruments**
- **Automotive Systems**

D OR DGK PACKAGE
(TOP VIEW)

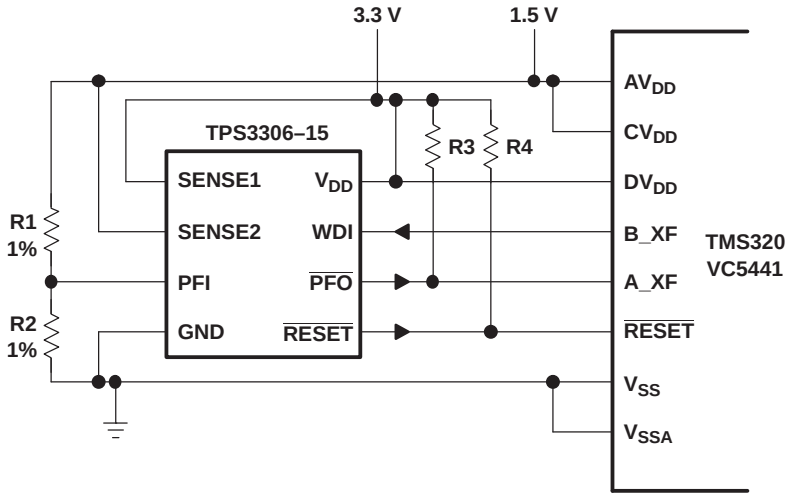


DESCRIPTION

The TPS3306 family is a series of supervisory circuits designed for circuit initialization which require two supply voltages, primarily in DSP and processor-based systems.

The product spectrum of the TPS3306-xx is designed for monitoring two independent supply voltages of 3.3 V/1.5 V, 3.3 V/1.8 V, 3.3 V/2 V, 3.3 V/2.5 V, or 3.3 V/5 V.

TYPICAL OPERATING CIRCUIT



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.

AVAILABLE OPTIONS

Table 1. SUPPLY VOLTAGE MONITORING

DEVICE	NOMINAL SUPERVISED VOLTAGE		THRESHOLD VOLTAGE (TYP)	
	SENSE1	SENSE2	SENSE1	SENSE2
TPS3306-15	3.3 V	1.5 V	2.93 V	1.4 V
TPS3306-18	3.3 V	1.8 V	2.93 V	1.68 V
TPS3306-20	3.3 V	2 V	2.93 V	1.85 V
TPS3306-25	3.3 V	2.5 V	2.93 V	2.25 V
TPS3306-33	5 V	3.3 V	4.55 V	2.93 V

For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

DESCRIPTION (CONTINUED)

The various supervisory circuits are designed to monitor the nominal supply voltage, as shown in the Supply Voltage Monitoring table.

During power-on, $\overline{\text{RESET}}$ is asserted when the supply voltage V_{DD} becomes higher than 1.1 V. Thereafter, the supervisory circuits monitor the SENSEn inputs and keep $\overline{\text{RESET}}$ active as long as SENSEn remains 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, $t_{d(typ)}$ = 100 ms, starts after SENSE1 and SENSE2 inputs have risen above the threshold voltage V_{IT}. When the voltage at SENSE1 or SENSE2 input drops below the threshold voltage V_{IT}, the output becomes active (low) again.

The integrated power-fail (PFI) comparator with separate open-drain ($\overline{\text{PFO}}$) output can be used for low-battery detection, power-fail warning, or for monitoring a power supply other than the main supply.

The TPS3306-xx devices integrate a watchdog timer that is periodically triggered by a positive or negative transition of WDI. When the supervising system fails to retrigger the watchdog circuit within the time-out interval, $t_{t(out)}$ = 0.50 s, $\overline{\text{RESET}}$ becomes active for the time period t_d. This event also reinitializes the watchdog timer. Leaving WDI unconnected disables the watchdog.

The TPS3306-xx devices are available in either 8-pin MSOP or standard 8-pin SO packages, and are characterized for operation over a temperature range of –40°C to +85°C.

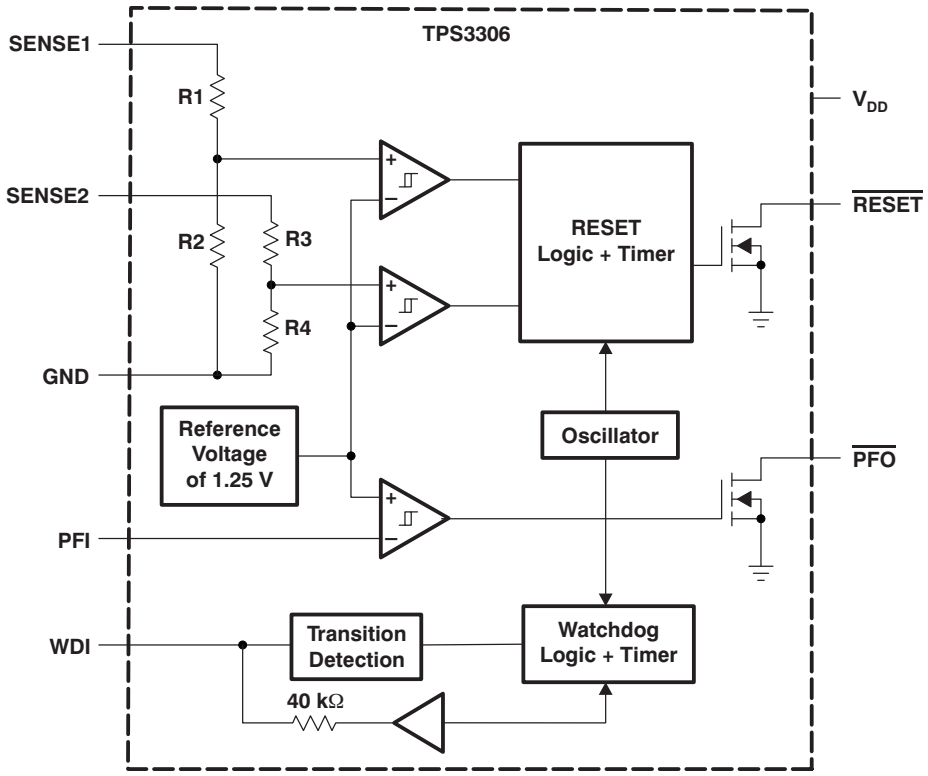
FUNCTION/TRUTH TABLES

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

FUNCTION/TRUTH TABLES

PFI > V_{IT}	$\overline{\text{PFO}}$
0	L
1	H

FUNCTIONAL BLOCK DIAGRAM



TIMING DIAGRAM

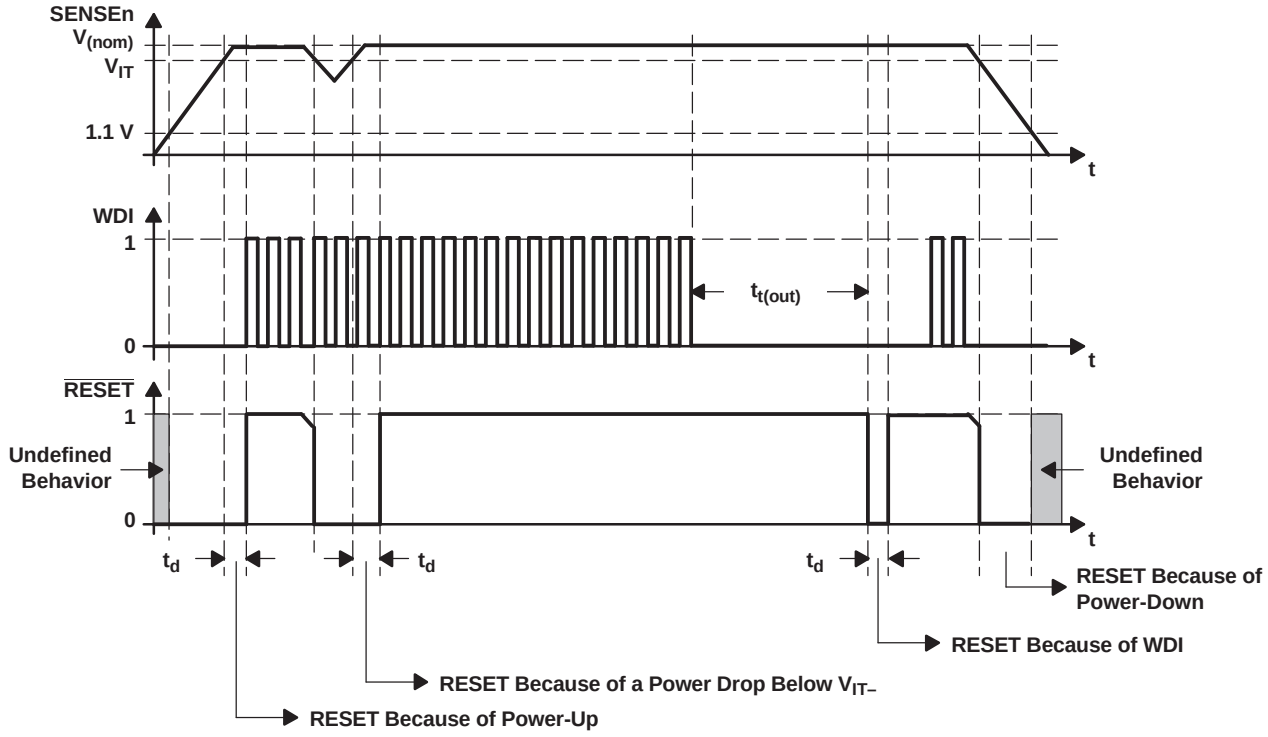


Table 4. Terminal Functions

TERMINAL NAME	TERMINAL NO.	I/O	DESCRIPTION
GND	4	I	Ground
PFI	3	I	Power-fail comparator input
$\overline{PFO}$	6	O	Power-fail comparator output, open-drain
$\overline{RESET}$	5	O	Active-low reset output, open-drain
SENSE1	1	I	Sense voltage input 1
SENSE2	2	I	Sense voltage input 2
WDI	7	I	Watchdog timer input
V_{DD}	8	I	Supply voltage

DETAILED DESCRIPTION

Watchdog

In a microprocessor- or DSP-based system, it is not only important to supervise the supply voltage, it is also important to ensure correct program execution. The task of a watchdog is to ensure that the program is not stalled in an indefinite loop. The microprocessor, microcontroller, or DSP typically has to toggle the watchdog input within 0.8 s to avoid a time-out occurring. Either a low-to-high or a high-to-low transition resets the internal watchdog timer. If the input is unconnected or tied with a high impedance driver, the watchdog is disabled and will be retriggered internally.

DETAILED DESCRIPTION (continued)

Saving Current While Using the Watchdog

The watchdog input is internally driven low during the first 7/8 of the watchdog time-out period, then momentarily pulses high, resetting the watchdog counter. For minimum watchdog input current (minimum overall power consumption), leave WDI low for the majority of the watchdog time-out period, pulsing it low-high-low once within 7/8 of the watchdog time-out period to reset the watchdog timer. If instead WDI is externally driven high for the majority of the time-out period, a current of 5 V/40 kΩ = 125 µA can flow into WDI.

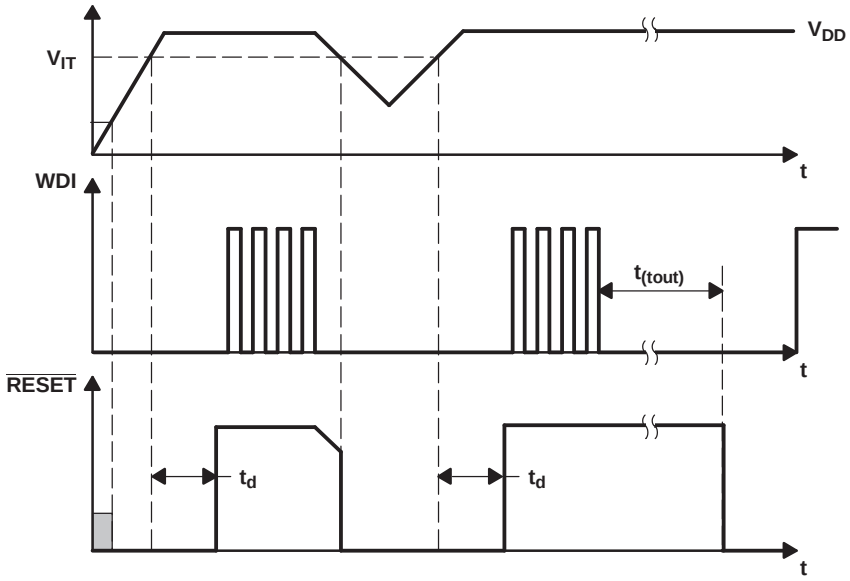
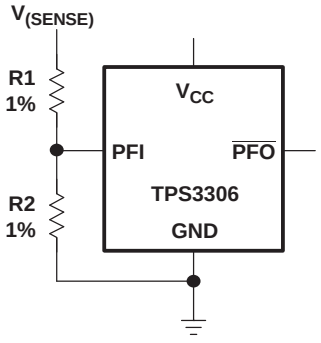


Figure 1. Watchdog Timing

Power-Fail Comparator (PFI and $\overline{PFO}$)

An additional comparator is provided to monitor voltages other than the nominal supply voltage. The power-fail-input (PFI) will be compared with an internal voltage reference of 1.25 V. If the input voltage falls below the power-fail threshold (V_{PFI}) of typ. 1.25 V, the power-fail output ($\overline{PFO}$) goes low. If it goes above 1.25 V plus about 10 mV hysteresis, the output returns to high. By connecting two external resistors, it is possible to supervise any voltages above 1.25 V. The sum of both resistors should be about 1 MΩ, to minimize power consumption and also to assure that the current in the PFI pin can be neglected compared with the current through the resistor network. The tolerance of the external resistors should be not more than 1% to ensure minimal variation of sensed voltage. If the power-fail comparator is unused, connect PFI to ground and leave $\overline{PFO}$ unconnected.



$$V_{PFI,trip} = 1.25\ V \times \frac{R_1 + R_2}{R_2}$$

ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range (unless otherwise noted).(1)

	UNIT
Supply voltage, V_{DD} (see (2))	7 V
PFI pin	–0.3 V to V_{DD} + 0.3 V
All other pins (see (2))	–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 +85°C
Storage temperature range, T_{stg}	–65°C 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 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
DGK	424 mW	3.4 mW/°C	271 mW	220 mW
D	725 mW	5.8 mW/°C	464 mW	377 mW

RECOMMENDED OPERATING CONDITIONS

At specified temperature range.

	MIN	MAX	UNIT
Supply voltage, V_{DD}	2.7	6	V
Input voltage at WDI and PFI, 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 WDI, V_{IH}	0.7 x V_{DD}		V
Low-level input voltage at WDI, V_{IL}		0.3 × V_{DD}	V
Operating free-air temperature range, T_A	–40	+85	°C

ELECTRICAL CHARACTERISTICS

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

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OL}	Low-level output voltage	$\overline{RESET}$, $\overline{PFO}$	V_{DD} = 2.7 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 (1))		$V_{DD} \geq$ 1.1 V, I_{OL} = 20 µA			0.4	V
V_{IT}	Negative-going input threshold voltage (see (2))	V_{SENSE1}, V_{SENSE2}	V_{DD} = 2.7 V to 6 V T_A = 0°C to +85°C	1.37	1.40	1.43	V
				1.64	1.68	1.72	
				1.81	1.85	1.89	
				2.20	2.25	2.30	
				2.86	2.93	3	
				4.46	4.55	4.64	
		PFI		1.22	1.25	1.28	
		V_{SENSE1}, V_{SENSE2}	V_{DD} = 2.7 V to 6 V T_A = –40°C to +85°C	1.37	1.40	1.44	V
				1.64	1.68	1.73	
				1.81	1.85	1.90	
				2.20	2.25	2.32	
				2.86	2.93	3.02	
				4.46	4.55	4.67	
		PFI		1.22	1.25	1.29	
V_{hys}	Hysteresis	PFI	V_{IT} = 1.25 V		10		mV
		V_{SENSEn}	V_{IT} = 1.40 V		15		
			V_{IT} = 1.68 V		15		
			V_{IT} = 1.86 V		20		
			V_{IT} = 2.25 V		20		
			V_{IT} = 2.93 V		30		
			V_{IT} = 4.55 V		40		
$I_{H(AV)}$	Average high-level input current	WDI	WDI = V_{DD} = 6 V, Time average (dc = 88%)		100	150	µA
$I_{L(AV)}$	Average low-level input current		WDI = 0 V, V_{DD} = 6 V, Time average (dc = 12%)		–15	–20	
I_H	High-level input current	WDI	WDI = V_{DD} = 6 V		120	170	µA
		SENSE1	V_{SENSE1} = V_{DD} = 6 V		5	8	
		SENSE2	V_{SENSE2} = V_{DD} = 6 V		6	9	
I_L	Low-level input current	WDI	WDI = 0 V, $V_{DD,}$ = 6 V		–120	–170	µA
I_I	Input current	PFI	V_{DD} = 6 V, 0 V ≤ V_I ≤ V_{DD}	–25		25	nA
I_{DD}	Supply current				15	40	µA
C_i	Input capacitance		V_I = 0 V to V_{DD}		10		pF

(1) The lowest supply voltage at which $\overline{RESET}$ becomes active. t_r, $V_{DD} \geq$ 15 µs/V.
(2) 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} = 2.7 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			µs
		WDI	V_{IH} = 0.7 × V_{DD}, V_{IL}= 0.3 × V_{DD}	100			ns

SWITCHING CHARACTERISTICS

at V_{DD} = 2.7 V to 6 V, R_L= 1 MΩ, C_L = 50 pF, T_A= 25°C

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{t(out)}$	Watchdog time-out		$V_{I(SENSEn)} \geq V_{IT}$ + 0.2 V, See Timing Diagram	0.5	0.8	1.2	s
t_d	Delay time		$V_{I(SENSEn)} \geq V_{IT}$ + 0.2 V, See Timing Diagram	70	100	140	ms
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		1	5	µs
t_{PHL}	Propagation (delay) time, high-to-low level output	PFI to $\overline{PFO}$			0.5	1	µs
t_{PLH}	Propagation (delay) time, low-to-high level output						

TYPICAL CHARACTERISTICS

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

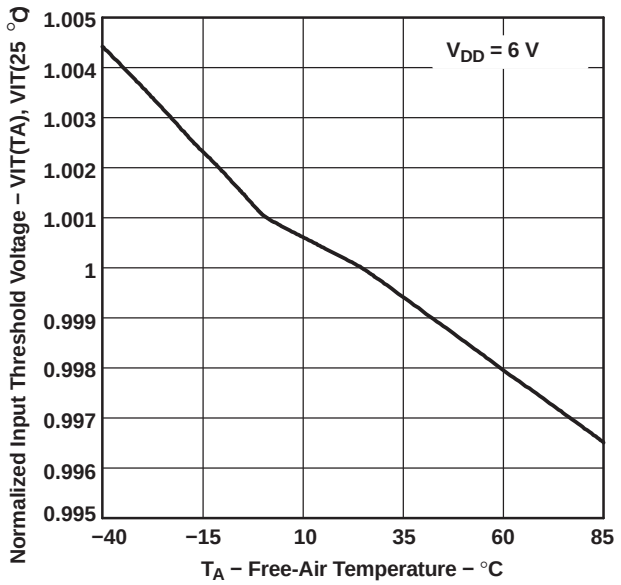


Figure 2.

SUPPLY CURRENT vs SUPPLY VOLTAGE

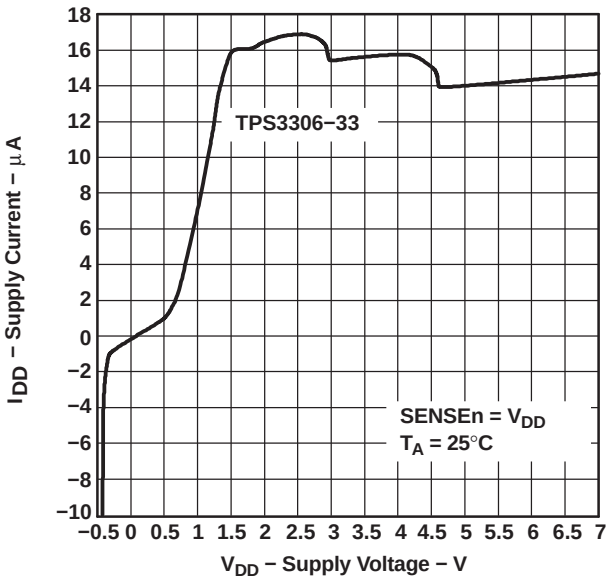


Figure 3.

TYPICAL CHARACTERISTICS (continued)

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

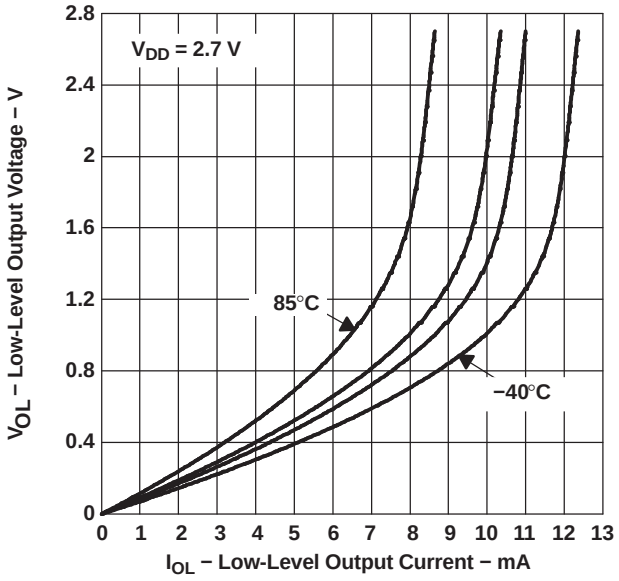


Figure 4.

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

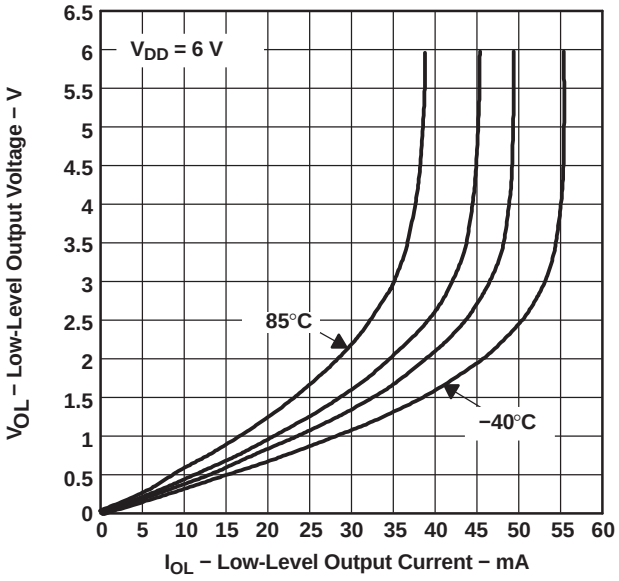


Figure 5.

MINIMUM PULSE DURATION AT SENSE
vs
THRESHOLD OVERDRIVE

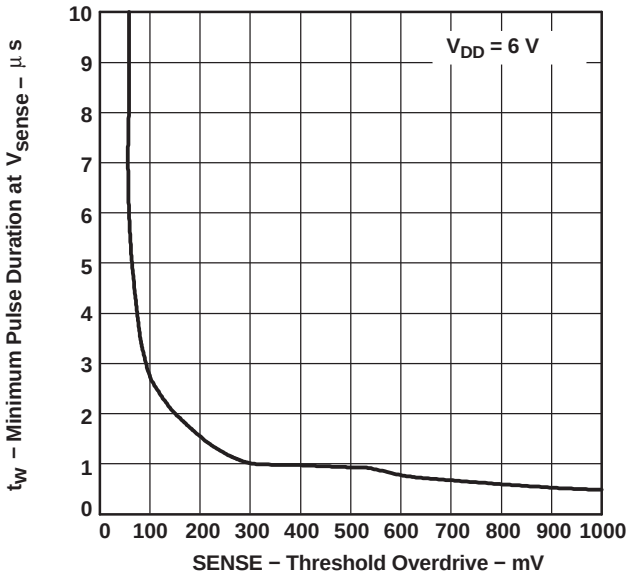


Figure 6.

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
TPS3306-15D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30615	Samples
TPS3306-15DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30615	Samples
TPS3306-15DGK	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIC	Samples
TPS3306-15DGKG4	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIC	Samples
TPS3306-15DGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIC	Samples
TPS3306-15DGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIC	Samples
TPS3306-15DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30615	Samples
TPS3306-15DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30615	Samples
TPS3306-18D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30618	Samples
TPS3306-18DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30618	Samples
TPS3306-18DGK	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AID	Samples
TPS3306-18DGKG4	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AID	Samples
TPS3306-18DGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AID	Samples
TPS3306-18DGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AID	Samples
TPS3306-18DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30618	Samples
TPS3306-18DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30618	Samples
TPS3306-20D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30620	Samples

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
TPS3306-25D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30625	Samples
TPS3306-25DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30625	Samples
TPS3306-25DGK	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIF	Samples
TPS3306-25DGKG4	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIF	Samples
TPS3306-25DGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIF	Samples
TPS3306-25DGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIF	Samples
TPS3306-25DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30625	Samples
TPS3306-33D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30633	Samples
TPS3306-33DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30633	Samples
TPS3306-33DGK	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIG	Samples
TPS3306-33DGKG4	ACTIVE	VSSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIG	Samples
TPS3306-33DGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIG	Samples
TPS3306-33DGKRG4	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AIG	Samples
TPS3306-33DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30633	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) 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.

(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.

OTHER QUALIFIED VERSIONS OF TPS3306 :

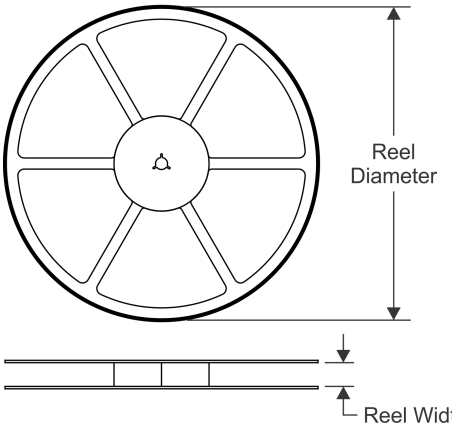
- Automotive: TPS3306-Q1

NOTE: Qualified Version Definitions:

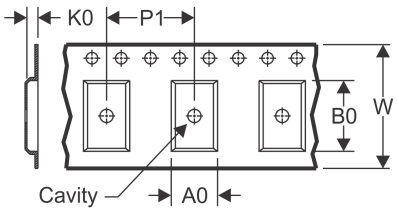
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

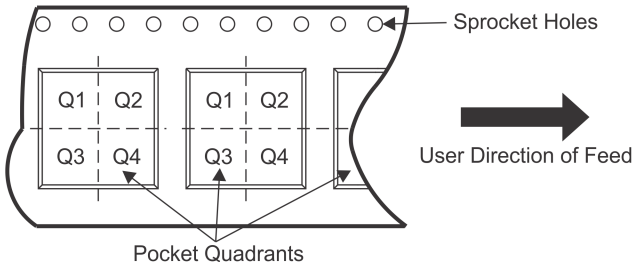


TAPE DIMENSIONS



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

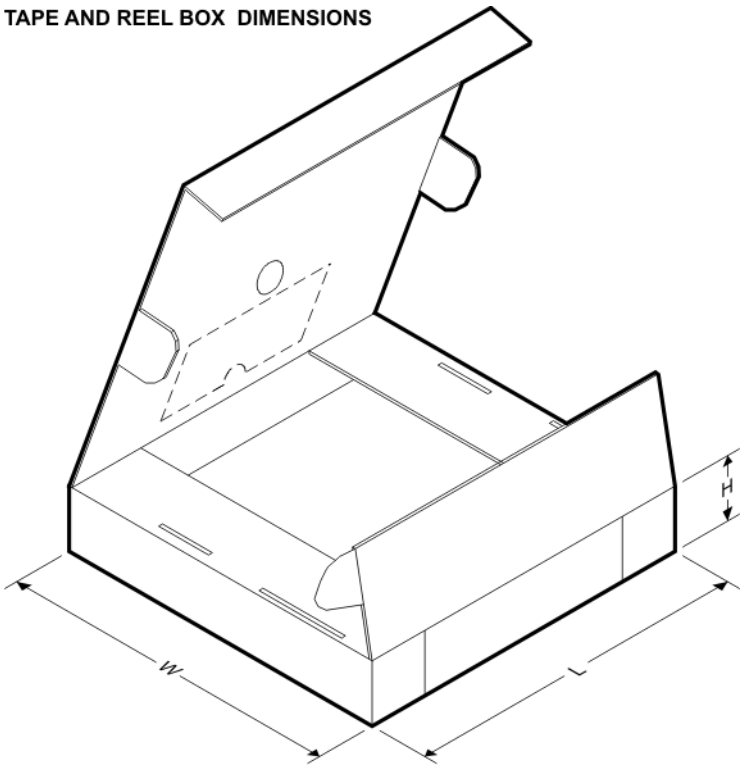
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TPS3306-15DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3306-15DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3306-18DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3306-18DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3306-25DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3306-25DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3306-33DGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3306-33DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

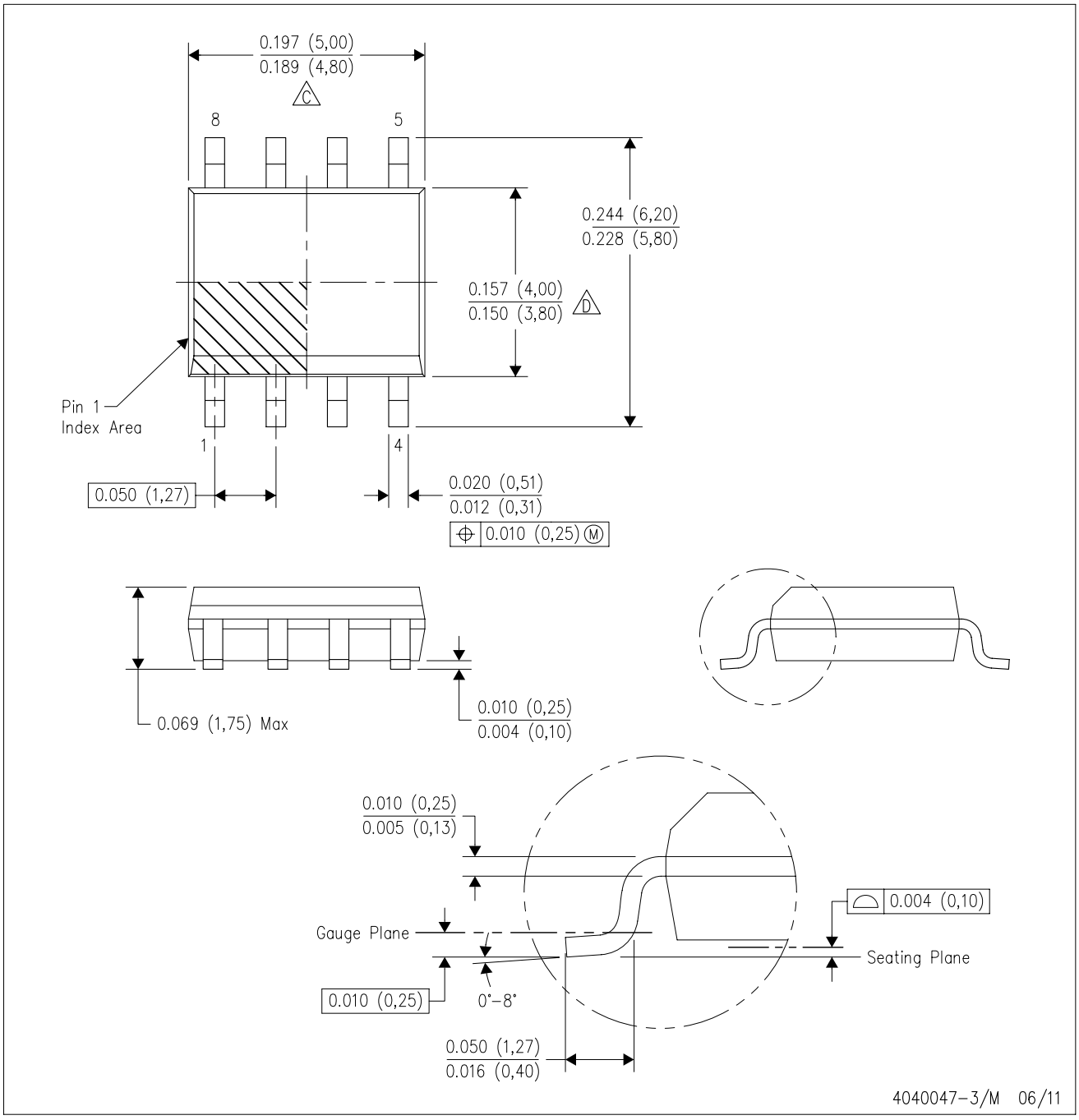
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

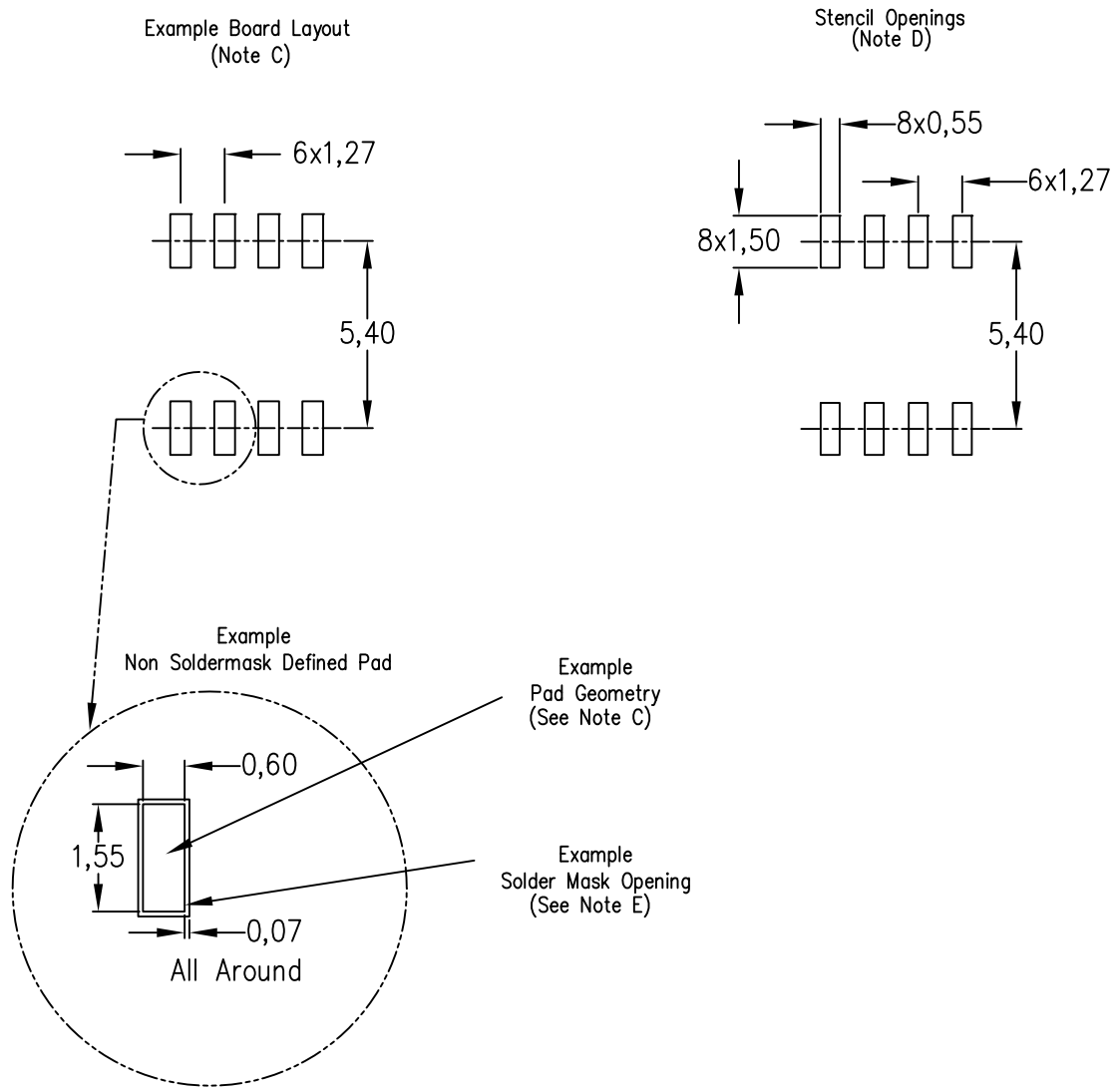
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS3306-15DGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0
TPS3306-15DR	SOIC	D	8	2500	367.0	367.0	38.0
TPS3306-18DGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0
TPS3306-18DR	SOIC	D	8	2500	367.0	367.0	38.0
TPS3306-25DGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0
TPS3306-25DR	SOIC	D	8	2500	367.0	367.0	38.0
TPS3306-33DGKR	VSSOP	DGK	8	2500	358.0	335.0	35.0
TPS3306-33DR	SOIC	D	8	2500	367.0	367.0	38.0

D (R–PDSO–G8) PLASTIC SMALL OUTLINE



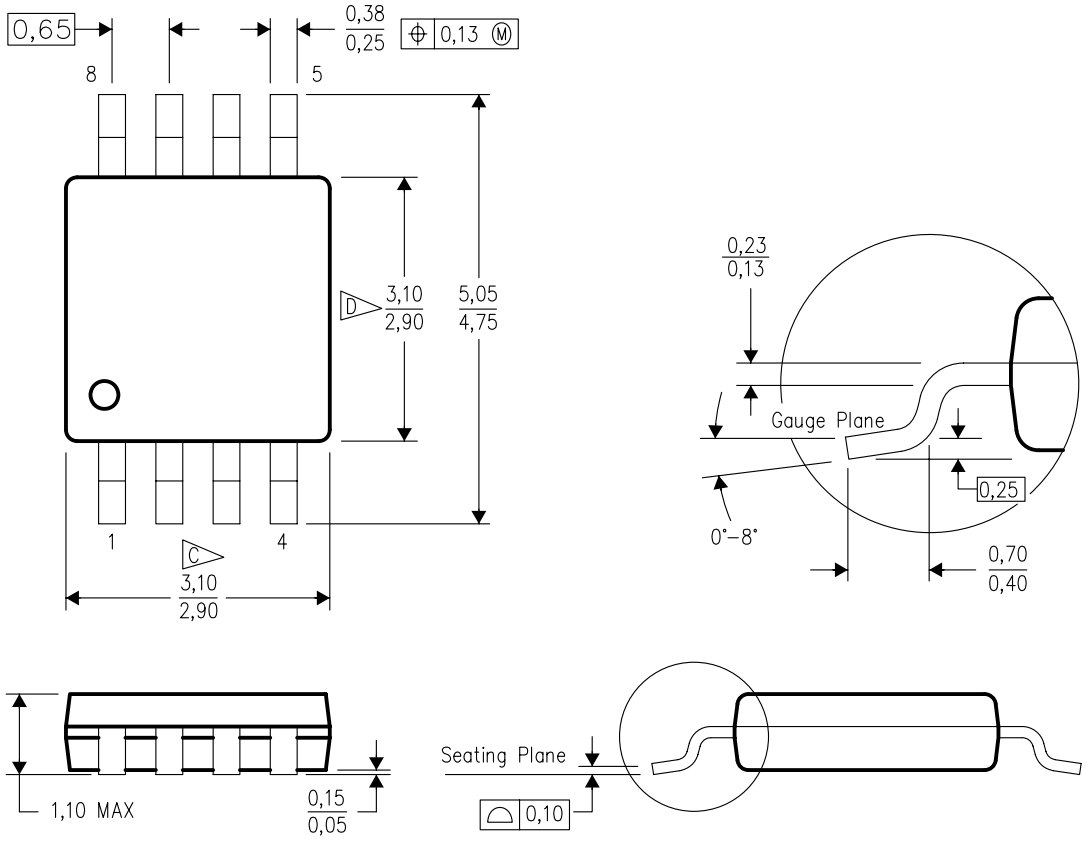
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each 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.

DGK (S–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE



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NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
E. Falls within JEDEC MO–187 variation AA, except interlead flash.

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