



## DUAL PROCESSOR SUPERVISORS

### FEATURES

- Dual Supervisory Circuits for DSP- and Processor-Based Systems
- Power-On Reset Generator with Fixed Delay Time of 200ms; no External Capacitor Needed
- Watchdog Timer Retriggeres the  $\overline{\text{RESET}}$  Output at  $\text{SENSEn} \geq V_{IT+}$
- Temperature-Compensated Voltage Reference
- Maximum Supply Current of 40 $\mu\text{A}$
- Supply Voltage Range: 2.7V to 6V
- Defined  $\overline{\text{RESET}}$  Output From  $V_{DD} \geq 1.1\text{V}$
- MSOP-8 and SO-8 Packages
- Temperature Range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### APPLICATIONS

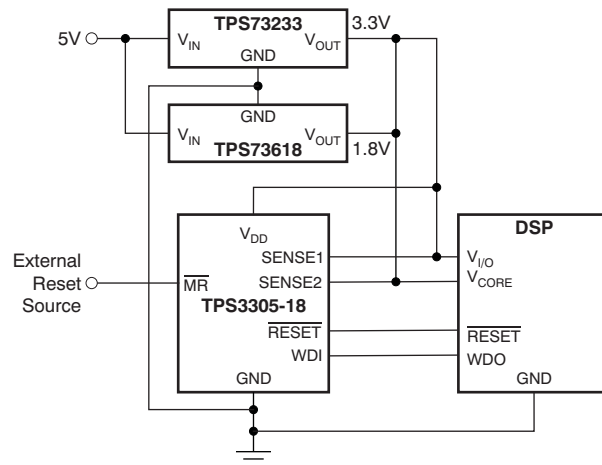
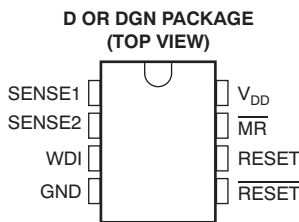
- Processor Supply Monitoring
- Industrial Equipment
- Automotive Systems
- Portable/Battery-Powered Equipment
- Wireless Communication Systems
- Notebook/Desktop Computers

### DESCRIPTION

The TPS3305 family is a series of micropower supply voltage supervisors designed for circuit initialization. Its dual monitor topology is well-suited to use in DSP and processor-based systems, which often require two supply voltages, core and I/O.

$\overline{\text{RESET}}$  is asserted when the voltage at either SENSEn pin falls below its threshold voltage,  $V_{IT}$ . When both SENSEn pins are again above their respective threshold voltages,  $\overline{\text{RESET}}$  is held low for the factory-programmed delay time (200ms typ).  $\overline{\text{RESET}}$  is also asserted if the watchdog input (WDI) is not toggled for more than 1.6s typ.

The TPS3305-xx devices are available in either 8-pin MSOP or SO packages, and are specified for operation over a temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .



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.

**ORDERING INFORMATION<sup>(1)</sup>**

DEVICE	NOMINAL SUPERVISED VOLTAGE		THRESHOLD VOLTAGE (TYP)	
	SENSE1	SENSE2	SENSE1	SENSE2
TPS3305-18	3.3 V	1.8 V	2.93 V	1.68 V
TPS3305-25	3.3 V	2.5 V	2.93 V	2.25 V
TPS3305-33	5.0 V	3.3 V	4.55 V	2.93 V

(1) For the most current specifications and package information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).

**ABSOLUTE MAXIMUM RATINGS<sup>(1)(2)</sup>**

Over operating junction temperature range (unless otherwise noted).

	UNIT
Supply voltage range, $V_{DD}$	-0.3V to +7V
$V_{MR}$ , $V_{WDI}$	-0.3V to $V_{DD} + 0.3V$
Input voltage at SENSE1 and SENSE2, $V_I$	$(V_{DD} + 0.3)V_{IT} / 1.25V$
$V_{RESET}$ , $V_{\overline{RESET}}$	-0.3V to +7V
Maximum low output current, $I_{OL}$	5mA
Maximum high output current, $I_{OH}$	-5mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{DD}$ )	$\pm 20mA$
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{DD}$ )	$\pm 20mA$
Continuous total power dissipation	See <a href="#">Dissipation Ratings Table</a>
Operating junction temperature range, $T_J$	-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.

**DISSIPATION RATINGS TABLE**

PACKAGE	$T_A \leq +25^\circ C$ POWER RATING	DERATING FACTOR ABOVE $T_A = +25^\circ C$	$T_A = +70^\circ C$ POWER RATING	$T_A = +85^\circ C$ POWER RATING
DGN	2.14W	17.1mW/°C	1.37W	1.11W
D	725mW	5.8mW/°C	464mW	377mW

## ELECTRICAL CHARACTERISTICS

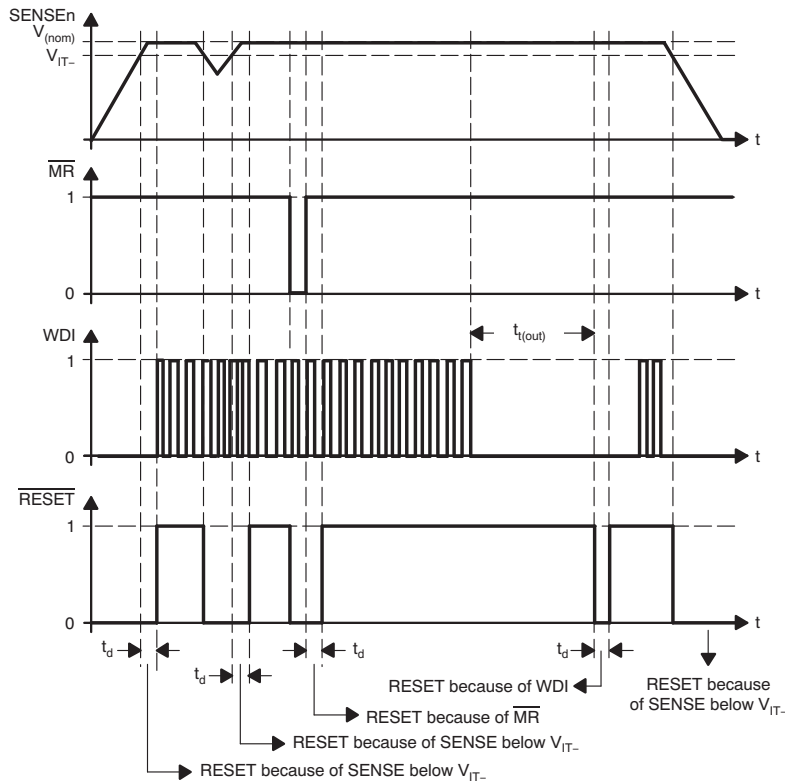
Over operating junction temperature range (unless otherwise noted).

PARAMETER		TEST CONDITIONS	TPS3305-xx			UNIT		
			MIN	TYP	MAX			
V <sub>DD</sub>	Input supply range		2.7		6.0	V		
T <sub>J</sub>	Operating junction temperature range		-40		+85	°C		
V <sub>OH</sub>	High-level output voltage	V <sub>DD</sub> = 2.7V to 6V, I <sub>OH</sub> = -20μA	V <sub>DD</sub> - 0.2V			V		
		V <sub>DD</sub> = 3.3V, I <sub>OH</sub> = -2mA	V <sub>DD</sub> - 0.4V			V		
		V <sub>DD</sub> = 6V, I <sub>OH</sub> = -3mA	V <sub>DD</sub> - 0.4V			V		
V <sub>OL</sub>	Low-level output voltage	V <sub>DD</sub> = 2.7V to 6V, I <sub>OL</sub> = 20μA				0.2		
		V <sub>DD</sub> = 3.3V, I <sub>OL</sub> = 2mA				0.4		
		V <sub>DD</sub> = 6V, I <sub>OL</sub> = 3mA				0.4		
Power-up reset voltage <sup>(1)</sup>		V <sub>DD</sub> ≥ 1.1V, I <sub>OL</sub> = 20μA				0.4		
V <sub>IT-</sub>	Negative-going input threshold voltage <sup>(2)</sup>	V <sub>DD</sub> = 2.7V to 6V, T <sub>A</sub> = 0°C to +85°C	VSENSE1, VSENSE2	1.64	1.68	1.72	V	
				2.20	2.25	2.30	V	
				2.86	2.93	3.0	V	
				4.46	4.55	4.64	V	
		VSENSE1, VSENSE2	V <sub>DD</sub> = 2.7V to 6V, T <sub>A</sub> = -40°C to +85°C		1.64	1.68	1.73	V
					2.20	2.25	2.32	V
					2.86	2.93	3.02	V
					4.46	4.55	4.67	V
V <sub>hys</sub>	Hysteresis at VSENSEn input	V <sub>IT-</sub> = 1.68V				15		
		V <sub>IT-</sub> = 2.25V				20		
		V <sub>IT-</sub> = 2.93V				30		
		V <sub>IT-</sub> = 4.55V				40		
I <sub>H(AV)</sub>	Average high-level input current	WDI	WDI = V <sub>DD</sub> = 6V Time average (dc = 88%)		100	150	μA	
I <sub>L(AV)</sub>	Average low-level input current	WDI	WDI = 0V, V <sub>DD</sub> = 6V Time average (dc = 12%)		-15	-20	μA	
V <sub>IH</sub>	High-level input voltage at $\overline{MR}$ and WDI		0.7 x V <sub>DD</sub>			V		
V <sub>IL</sub>	Low-level input voltage at $\overline{MR}$ and WDI		0.3 x V <sub>DD</sub>			V		
Δt / ΔV	Input transition rise and fall rate at $\overline{MR}$					50	ns/V	
I <sub>H</sub>	High-level input current	WDI	WDI = V <sub>DD</sub> = 6V		120	170	μA	
		$\overline{MR}$	$\overline{MR} = 0.7 \times V_{DD}$ , V <sub>DD</sub> = 6V		-130	-180	μA	
		SENSE1	VSENSE1 = V <sub>DD</sub> = 6V		5	8	μA	
		SENSE2	VSENSE2 = V <sub>DD</sub> = 6V		6	9	μA	
I <sub>L</sub>	Low-level input current	WDI	WDI = 0V, V <sub>DD</sub> = 6V		-120	-170	μA	
		$\overline{MR}$	$\overline{MR} = 0V$ , V <sub>DD</sub> = 6V		-430	-600	μA	
		SENSEn	VSENSE1,2 = 0V		-1	1	μA	
I <sub>DD</sub>	Supply current					40	μA	
C <sub>I</sub>	Input capacitance	V <sub>I</sub> = 0V to V <sub>DD</sub>				10	pF	

(1) The lowest supply voltage at which **RESET** becomes active. t<sub>r</sub>, V<sub>DD</sub> ≥ 15 μs/V.

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

**TIMING DIAGRAM**



**TIMING REQUIREMENTS**

At  $V_{DD} = 2.7V$  to  $6V$ ,  $R_L = 1M\Omega$ ,  $C_L = 50pF$ , and  $T_J = +25^\circ C$ .

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

**SWITCHING CHARACTERISTICS**

At  $V_{DD} = 2.7V$  to  $6V$ ,  $R_L = 1M\Omega$ ,  $C_L = 50pF$ , and  $T_J = +25^\circ C$ .

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{t(out)}$	Watchdog time-out	$V_{I(SENSEn)} \geq V_{IT+} + 0.2V$ , $\overline{MR} \geq 0.7 \times V_{DD}$ See <a href="#">Timing Diagram</a>	1.1	1.6	2.3	s
$t_d$	Delay time	$V_{I(SENSEn)} \geq V_{IT+} + 0.2V$ , $\overline{MR} \geq 0.7 \times V_{DD}$ See <a href="#">Timing Diagram</a>	140	200	280	ms
$t_{PHL}$	Propagation (delay) time, high-to-low level output	$\overline{MR}$ to $\overline{RESET}$ , $\overline{MR}$ to RESET $V_{I(SENSEn)} \geq V_{IT+} + 0.2V$ , $V_{IH} = 0.7 \times V_{DD}$ , $V_{IL} = 0.3 \times V_{DD}$		200	500	ns
$t_{PLH}$	Propagation (delay) time, low-to-high level output	$\overline{MR}$ to $\overline{RESET}$ , $\overline{MR}$ to RESET $V_{I(SENSEn)} \geq V_{IT+} + 0.2V$ , $V_{IH} = 0.7 \times V_{DD}$ , $V_{IL} = 0.3 \times V_{DD}$		200	500	ns
$t_{PHL}$	Propagation (delay) time, high-to-low level output	$\overline{SENSEn}$ to $\overline{RESET}$ , $\overline{SENSEn}$ to RESET $V_{IH} = V_{IT+} + 0.2V$ , $V_{IL} = V_{IT-} - 0.2V$ , $\overline{MR} \geq 0.7 \times V_{DD}$		1	5	$\mu s$
$t_{PLH}$	Propagation (delay) time, low-to-high level output	$\overline{SENSEn}$ to $\overline{RESET}$ , $\overline{SENSEn}$ to RESET $V_{IH} = V_{IT+} + 0.2V$ , $V_{IL} = V_{IT-} - 0.2V$ , $\overline{MR} \geq 0.7 \times V_{DD}$		1	5	$\mu s$

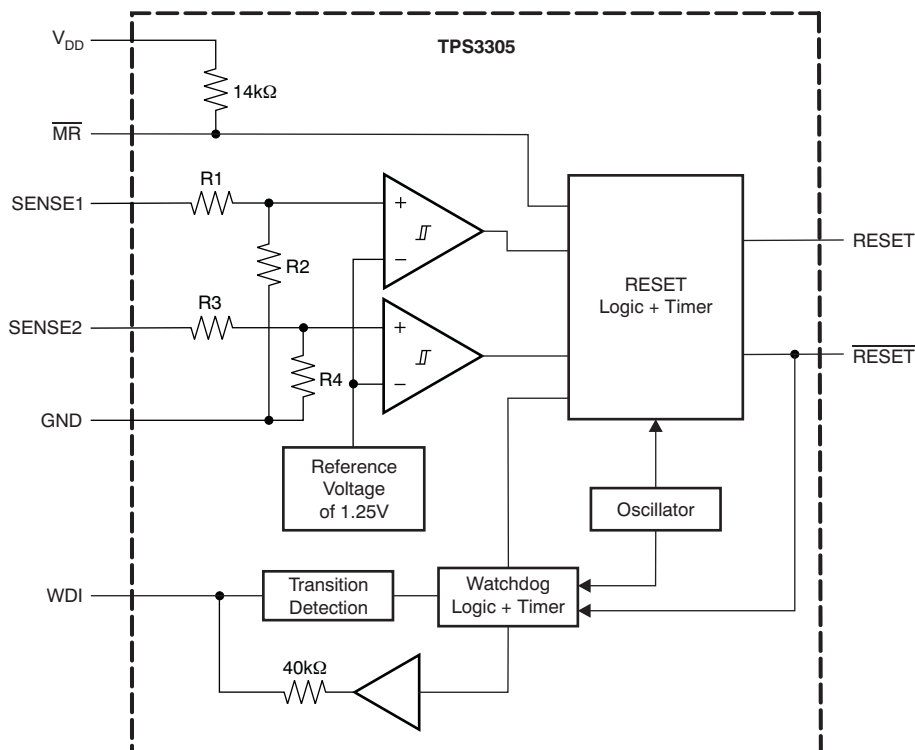
**DEVICE INFORMATION**

**FUNCTION/TRUTH TABLE<sup>(1)</sup>**

MR	SENSE1 > V <sub>IT1</sub>	SENSE2 > V <sub>IT2</sub>	RESET	RESET
L	X	X	L	H
H	0	0	L	H
H	0	1	L	H
H	1	0	L	H
H	1	1	H	L

(1) X = Don't care

**FUNCTIONAL BLOCK DIAGRAM**



**TERMINAL FUNCTIONS**

TERMINAL		DESCRIPTION
NAME	NO.	
GND	4	Ground
MR	7	Manual reset
RESET	5	Active-low reset output
RESET	6	Active-high reset output
SENSE1	1	Sense voltage input 1
SENSE2	2	Sense voltage input 2
WDI	3	Watchdog timer input
V <sub>DD</sub>	8	Supply voltage

TYPICAL CHARACTERISTICS

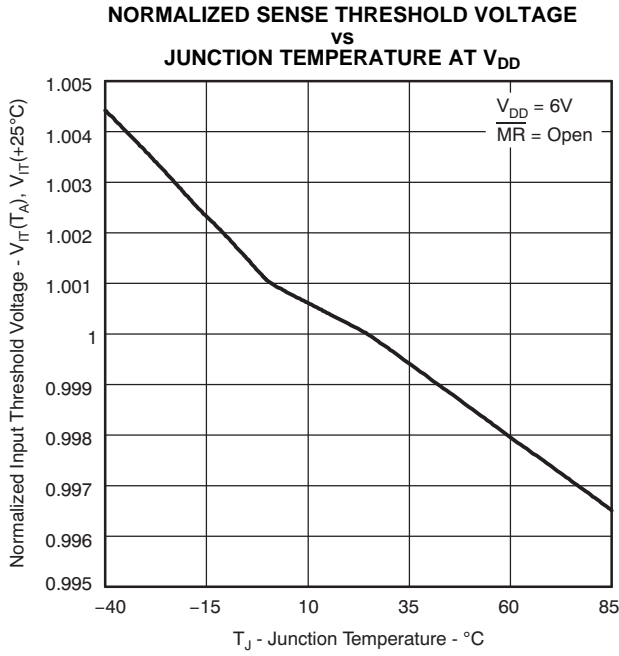


Figure 1.

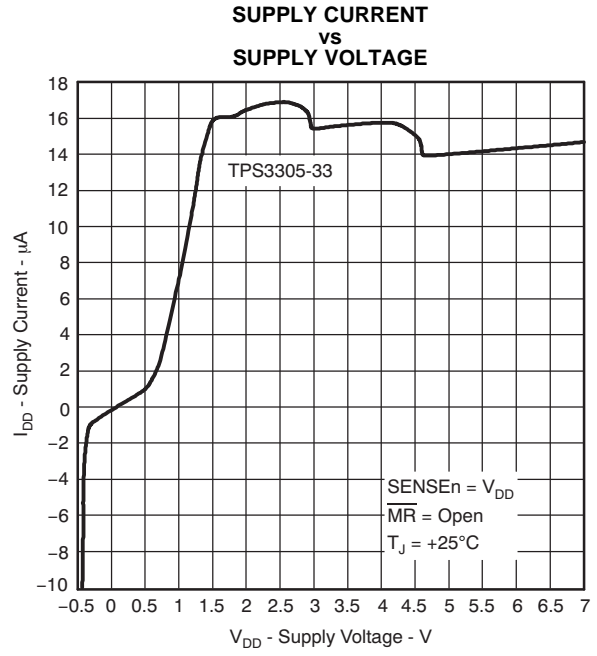


Figure 2.

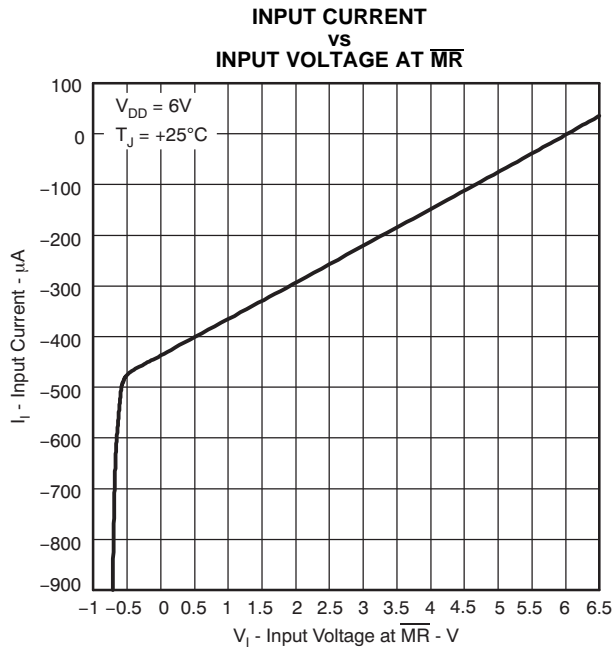


Figure 3.

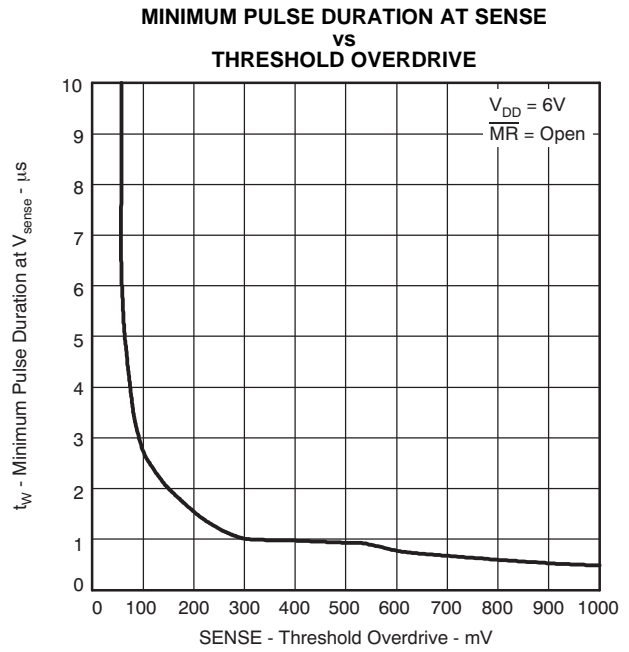
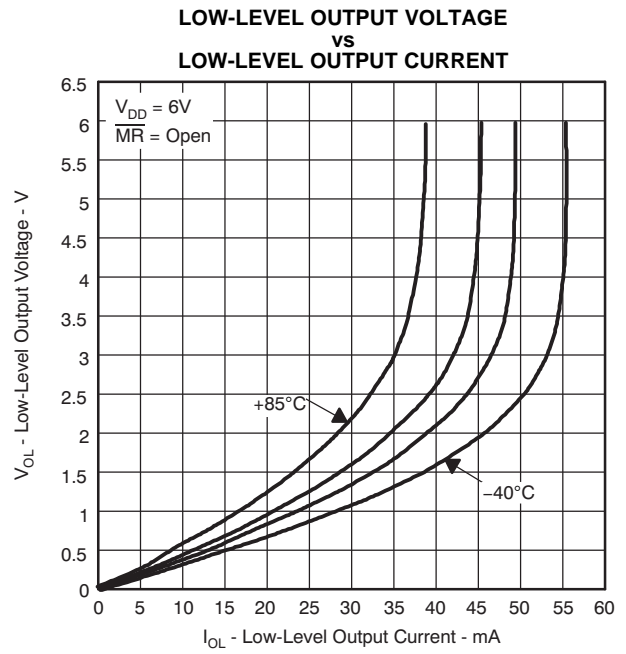
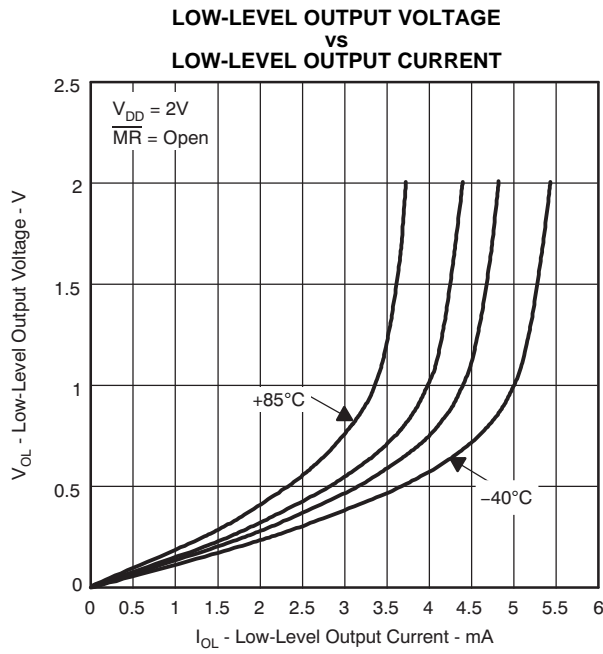
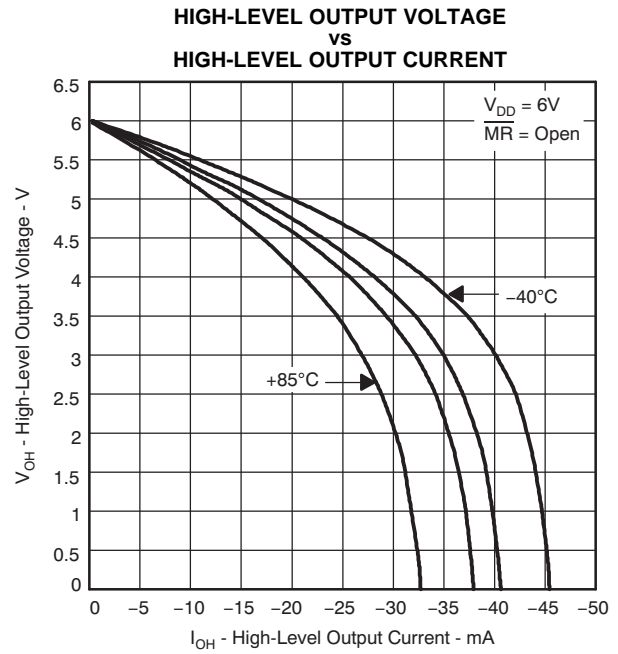
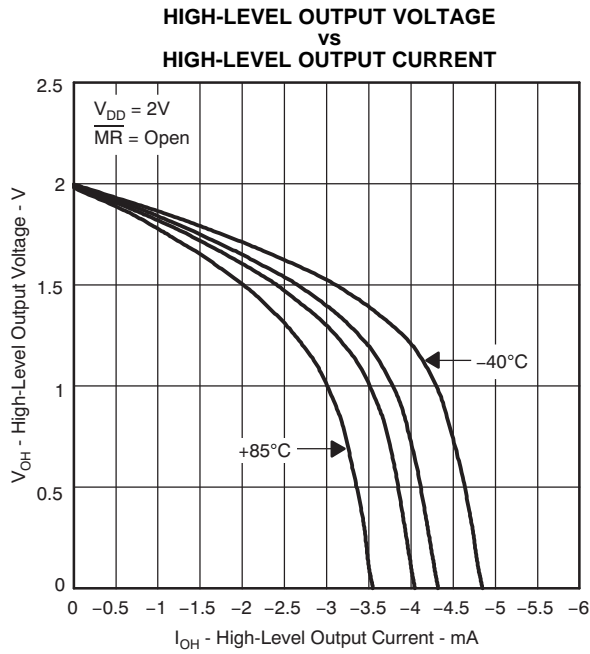


Figure 4.

**TYPICAL CHARACTERISTICS (continued)**



**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
TPS3305-18D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30518	<a href="#">Samples</a>
TPS3305-18DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30518	<a href="#">Samples</a>
TPS3305-18DGN	ACTIVE	MSOP- PowerPAD	DGN	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAM	<a href="#">Samples</a>
TPS3305-18DGNG4	ACTIVE	MSOP- PowerPAD	DGN	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAM	<a href="#">Samples</a>
TPS3305-18DGNR	ACTIVE	MSOP- PowerPAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAM	<a href="#">Samples</a>
TPS3305-18DGNRG4	ACTIVE	MSOP- PowerPAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAM	<a href="#">Samples</a>
TPS3305-18DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30518	<a href="#">Samples</a>
TPS3305-18DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30518	<a href="#">Samples</a>
TPS3305-25D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30525	<a href="#">Samples</a>
TPS3305-25DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30525	<a href="#">Samples</a>
TPS3305-25DGN	ACTIVE	MSOP- PowerPAD	DGN	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAN	<a href="#">Samples</a>
TPS3305-25DGNG4	ACTIVE	MSOP- PowerPAD	DGN	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAN	<a href="#">Samples</a>
TPS3305-25DGNR	ACTIVE	MSOP- PowerPAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAN	<a href="#">Samples</a>
TPS3305-25DGNRG4	ACTIVE	MSOP- PowerPAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAN	<a href="#">Samples</a>
TPS3305-25DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30525	<a href="#">Samples</a>
TPS3305-25DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30525	<a href="#">Samples</a>
TPS3305-33D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30533	<a href="#">Samples</a>



Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
TPS3305-33DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30533	<a href="#">Samples</a>
TPS3305-33DGN	ACTIVE	MSOP-PowerPAD	DGN	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAO	<a href="#">Samples</a>
TPS3305-33DGNG4	ACTIVE	MSOP-PowerPAD	DGN	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAO	<a href="#">Samples</a>
TPS3305-33DGNR	ACTIVE	MSOP-PowerPAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAO	<a href="#">Samples</a>
TPS3305-33DGNRG4	ACTIVE	MSOP-PowerPAD	DGN	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AAO	<a href="#">Samples</a>
TPS3305-33DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30533	<a href="#">Samples</a>
TPS3305-33DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	30533	<a href="#">Samples</a>

(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) Only one of markings shown within the brackets will appear on the physical device.

**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
TPS3305-18DGNR	MSOP-Power PAD	DGN	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3305-18DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3305-25DGNR	MSOP-Power PAD	DGN	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3305-25DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TPS3305-33DGNR	MSOP-Power PAD	DGN	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TPS3305-33DR	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)
TPS3305-18DGNR	MSOP-PowerPAD	DGN	8	2500	358.0	335.0	35.0
TPS3305-18DR	SOIC	D	8	2500	367.0	367.0	35.0
TPS3305-25DGNR	MSOP-PowerPAD	DGN	8	2500	358.0	335.0	35.0
TPS3305-25DR	SOIC	D	8	2500	367.0	367.0	35.0
TPS3305-33DGNR	MSOP-PowerPAD	DGN	8	2500	358.0	335.0	35.0
TPS3305-33DR	SOIC	D	8	2500	367.0	367.0	35.0

DGN (S-PDSO-G8)

PowerPAD™ PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion.
  - 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) <<http://www.ti.com>>.
  - See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
  - Falls within JEDEC MO-187 variation AA-T

PowerPAD is a trademark of Texas Instruments.

DGN (S-PDSO-G8)

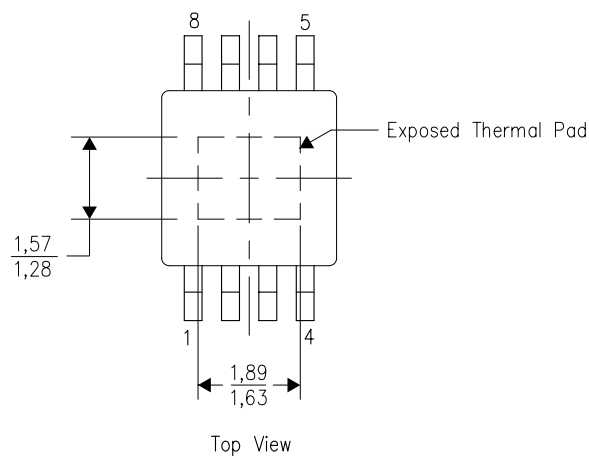
PowerPAD™ PLASTIC SMALL OUTLINE

## 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](http://www.ti.com).

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

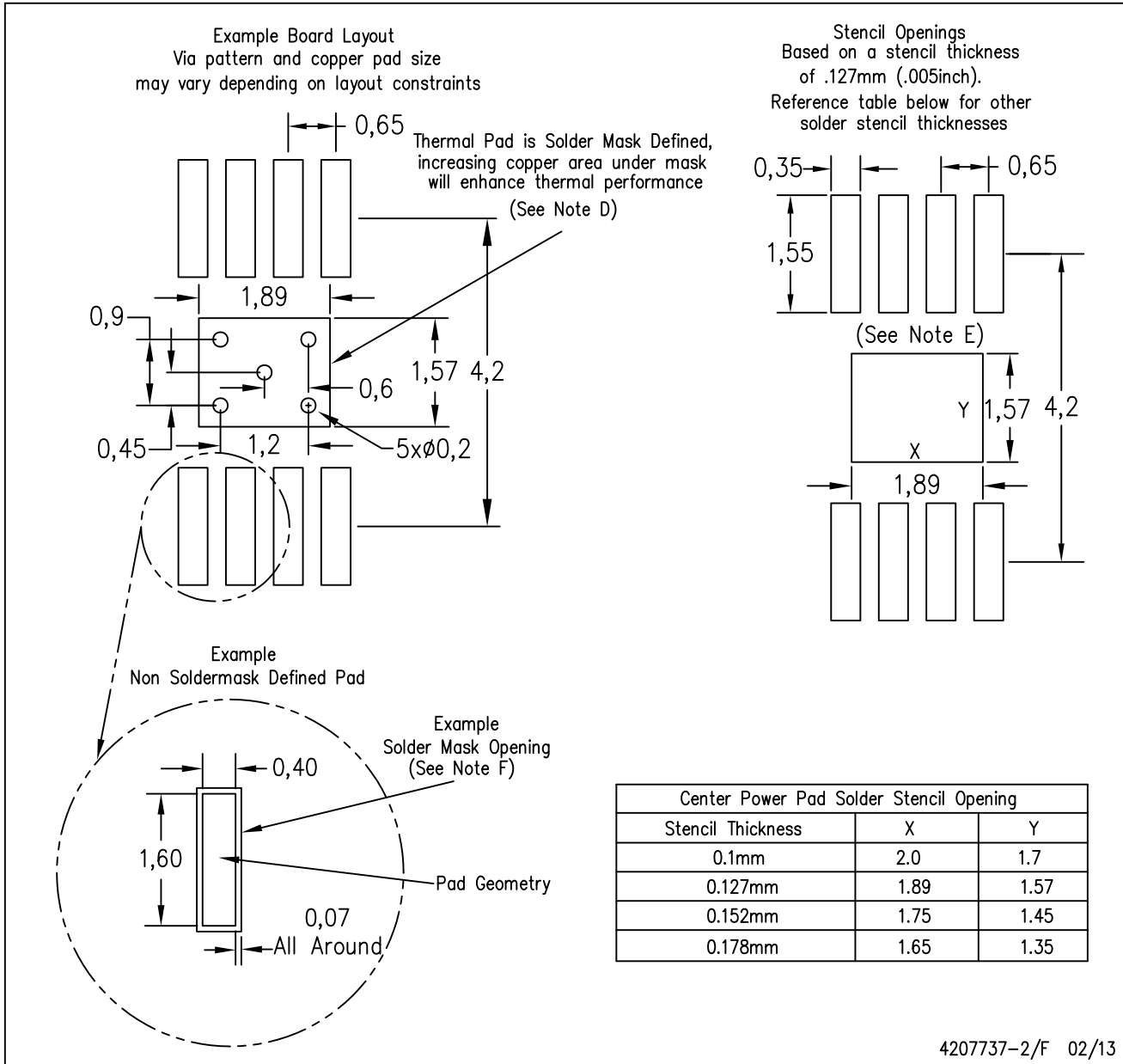


Exposed Thermal Pad Dimensions

4206323-2/1 12/11

NOTE: All linear dimensions are in millimeters

PowerPAD is a trademark of Texas Instruments



4207737-2/F 02/13

- 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. 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) <<http://www.ti.com>>.
  - 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.
  - F. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PowerPAD is a trademark of Texas Instruments

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:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - 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. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

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

### Applications

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

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)