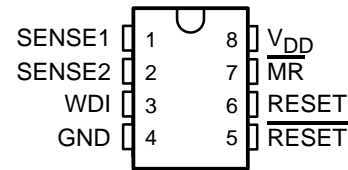


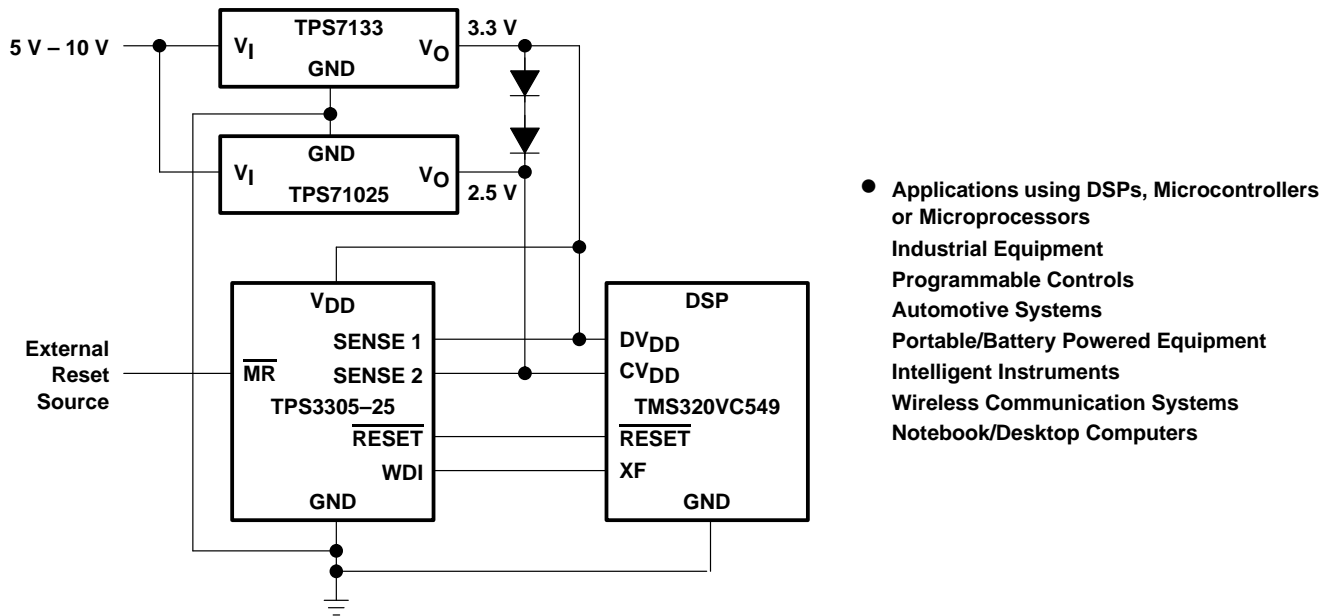
- Dual Supervisory Circuits for DSP and Processor-Based Systems
- Power-On Reset Generator With Fixed Delay Time of 200 ms, no External Capacitor Needed
- Watchdog Timer Retriggeres the $\overline{\text{RESET}}$ Output at $\text{SENSE}_n \geq V_{IT+}$
- Temperature-Compensated Voltage Reference
- Maximum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

D OR DGN PACKAGE
(TOP VIEW)



typical applications

Figure 1 lists some of the typical applications for the TPS3305 family, and a schematic diagram for a TI DSP-based system application. This application uses TI part numbers TPS3305–25, TPS7133, TPS71025, and TMS320VC549.



- Applications using DSPs, Microcontrollers or Microprocessors
- Industrial Equipment
- Programmable Controls
- Automotive Systems
- Portable/Battery Powered Equipment
- Intelligent Instruments
- Wireless Communication Systems
- Notebook/Desktop Computers

Figure 1. Applications Using the TPS3305 Family

description

The TPS3305 family is a series of micropower supply voltage supervisors designed for circuit initialization, primarily in DSP and processor-based systems, which require two supply voltages.



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.

TMS320 DSP family is a trademark of Texas Instruments.

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TPS3305-18, TPS3305-25, TPS3305-33 DUAL PROCESSOR SUPERVISORS

SLVS198A – DECEMBER 1998 – REVISED DECEMBER 2002

description (continued)

The product spectrum of the TPS3305 is designed for monitoring two independent supply voltages of 3.3 V/1.8 V, 3.3 V/2.5 V or 3.3 V/5 V.

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	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 V	3.3 V	4.55 V	2.93 V

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 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, $t_{d\text{typ}} = 200$ 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 $\overline{\text{RESET}}$ output becomes active (low) again.

The TPS3305-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, $t_{t(\text{out})} = 1.6$ 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 TPS3305-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 TPS3305-xx family includes an active-high RESET output.

The TPS3305-xx devices are available in either 8-pin MSOP or standard 8-pin SO packages.

The TPS3305-xx family is characterized for operation over a temperature range of -40°C to 85°C .

AVAILABLE OPTIONS

T _A	PACKAGED DEVICES		MARKING DGN PACKAGE	CHIP FORM (Y)
	SMALL OUTLINE (D)	PowerPAD™ μ-SMALL OUTLINE (DGN)		
-40°C to 85°C	TPS3305-18D	TPS3305-18DGN	TIAAM	TPS3305-18Y
	TPS3305-25D	TPS3305-25DGN	TIAAN	TPS3305-25Y
	TPS3305-33D	TPS3305-33DGN	TIAAO	TPS3305-33Y

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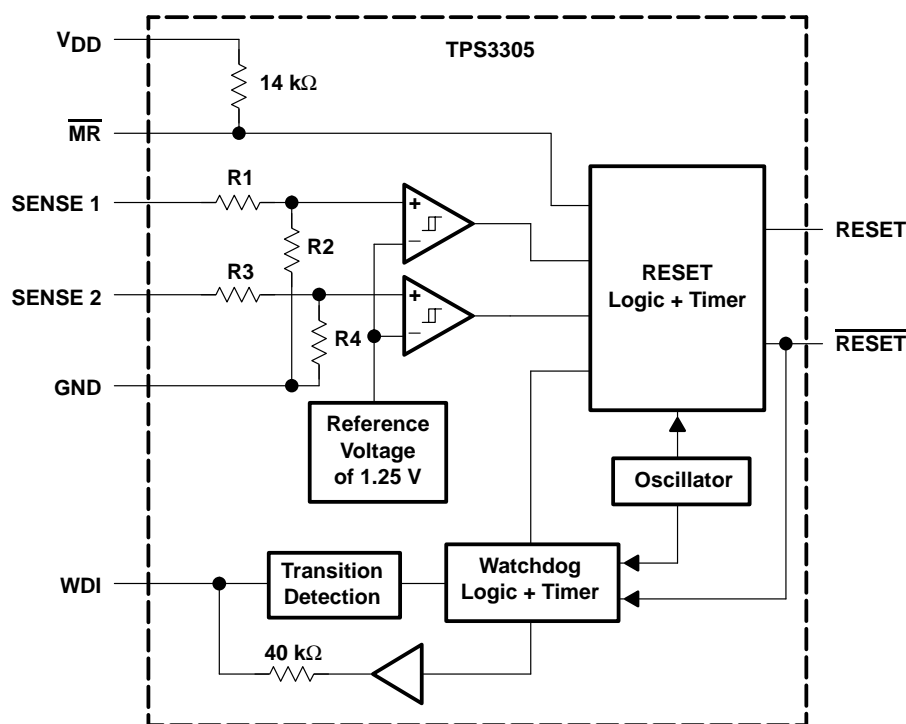
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FUNCTION/TRUTH TABLES

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

† X = Don't care

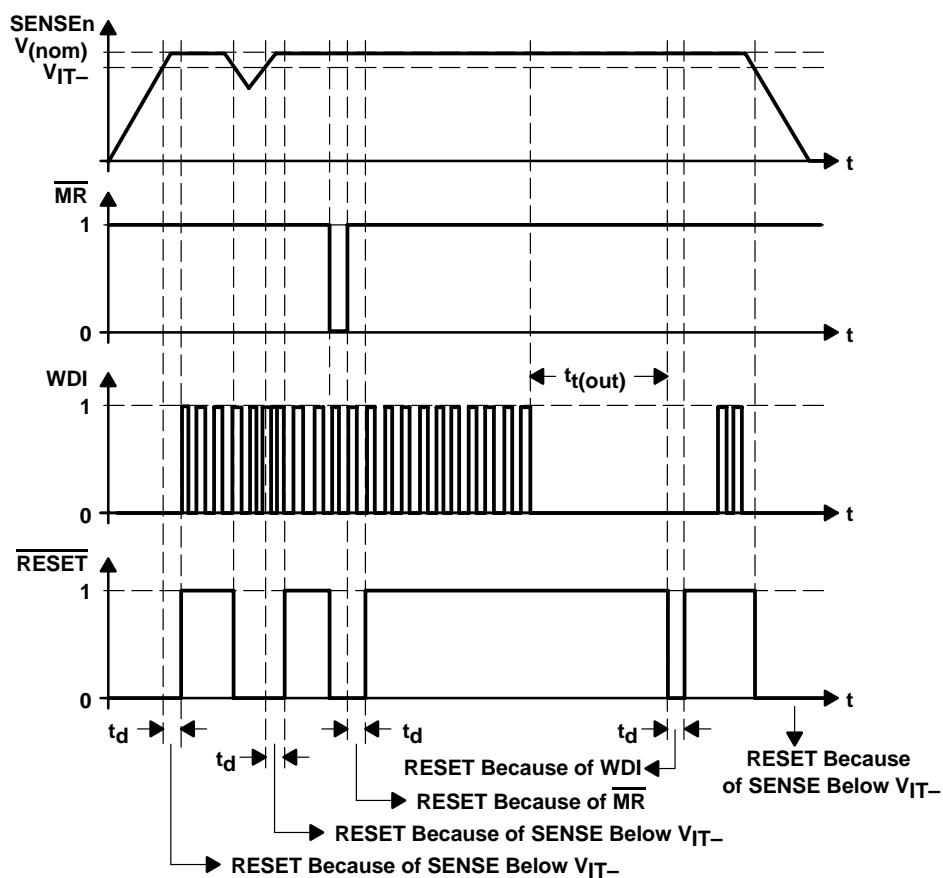
functional block diagram



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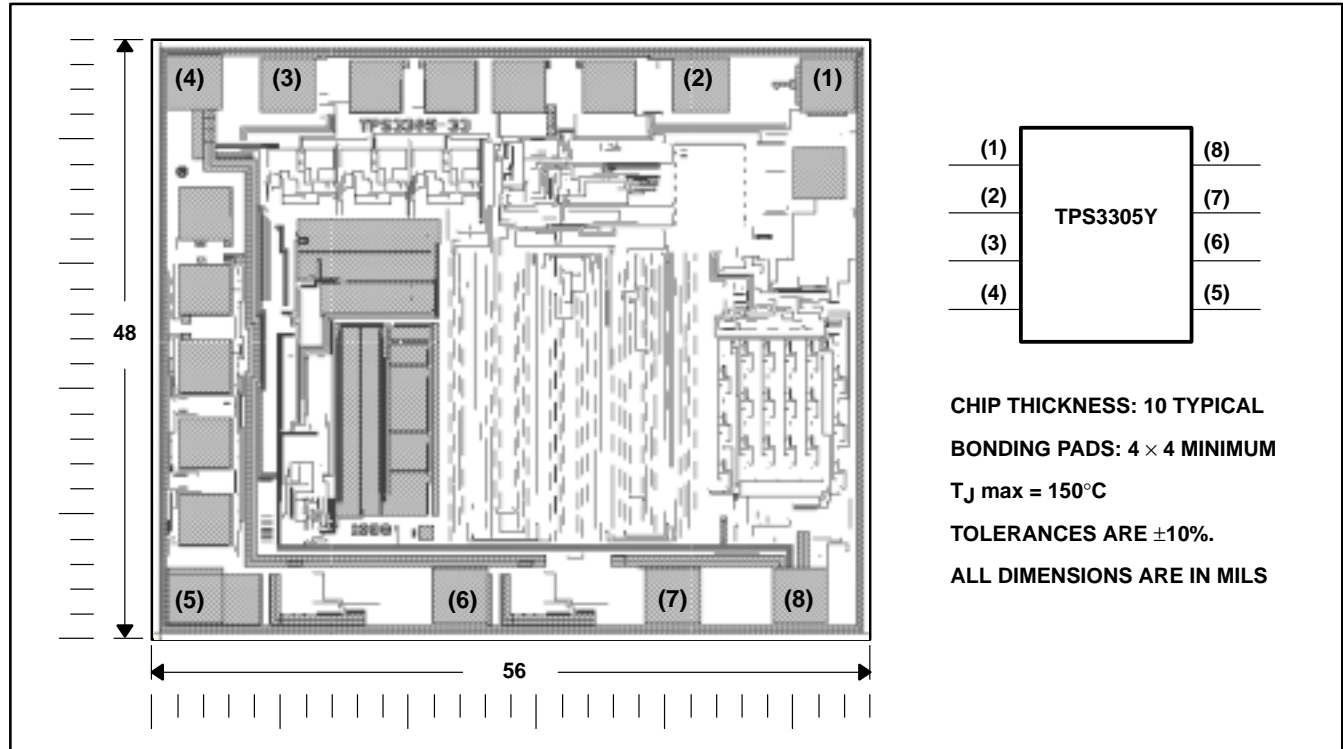
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timing diagram



TPS3305Y chip information

These chips, when properly assembled, display characteristics similar to those of the TPS3305. Thermal compression or ultrasonic bonding may take place on the doped aluminium bonding pads. The chips may be mounted with conductive epoxy or a gold-silicon preform.



Terminal Functions

TERMINAL NAME	NO.	I/O	DESCRIPTION
GND	4		Ground
$\overline{\text{MR}}$	7	I	Manual reset
$\overline{\text{RESET}}$	5	O	Active-low reset output
RESET	6	O	Active-high reset output
SENSE1	1	I	Sense voltage input 1
SENSE2	2	I	Sense voltage input 2
WDI	3	I	Watchdog timer input
V _{DD}	8		Supply voltage

TPS3305-18, TPS3305-25, TPS3305-33 DUAL PROCESSOR SUPERVISORS

SLVS198A – DECEMBER 1998 – REVISED DECEMBER 2002

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 85°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	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
DGN	2.14 W	17.1 mW/°C	1.37 W	1.11 W
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 \overline{MR} and WDI, 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} and WDI, V_{IH}	$0.7 \times V_{DD}$		V
Low-level input voltage at \overline{MR} and WDI, 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	–40	85	°C

TPS3305-18, TPS3305-25, TPS3305-33 DUAL PROCESSOR SUPERVISORS

SLVS198A – DECEMBER 1998 – REVISED DECEMBER 2002

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} = 2.7 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} = 2.7 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 Note 2)		V _{DD} ≥ 1.1 V, I _{OL} = 20 μA		0.4			V
V _{IT−}	Negative-going input threshold voltage (see Note 3)	V _{SENSE1} , V _{SENSE2}	V _{DD} = 2.7 V to 6 V, T _A = 0°C to 85°C	1.64	1.68	1.72	V
				2.20	2.25	2.30	
				2.86	2.93	3	
				4.46	4.55	4.64	
	V _{SENSE1} , V _{SENSE2}	V _{DD} = 2.7 V to 6 V, T _A = −40°C to 85°C	1.64	1.68	1.73	V	
			2.20	2.25	2.32		
			2.86	2.93	3.02		
			4.46	4.55	4.67		
V _{hys}	Hysteresis at V _{SENSEn} input	V _{IT−} = 1.68 V		15			mV
		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
		$\overline{\text{MR}}$	$\overline{\text{MR}}$ = 0.7 × V _{DD} , V _{DD} = 6 V		−130	−180	
		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
		$\overline{\text{MR}}$	$\overline{\text{MR}}$ = 0V, V _{DD} = 6 V		−430	−600	
		SENSEn	V _{SENSE1,2} = 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 RESET becomes active. $t_r, V_{DD} \geq 15\text{ }\mu\text{s/V}$.
3. To ensure best stability of the threshold voltage, a bypass capacitor (ceramic 0.1 μF) should be placed close to the supply terminals.



TPS3305-18, TPS3305-25, TPS3305-33 DUAL PROCESSOR SUPERVISORS

SLVS198A – DECEMBER 1998 – REVISED DECEMBER 2002

timing requirements at $V_{DD} = 2.7\text{ V to }6\text{ V}$, $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

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
	WDI		100			ns

switching characteristics at $V_{DD} = 2.7\text{ V to }6\text{ V}$, $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

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



TYPICAL CHARACTERISTICS

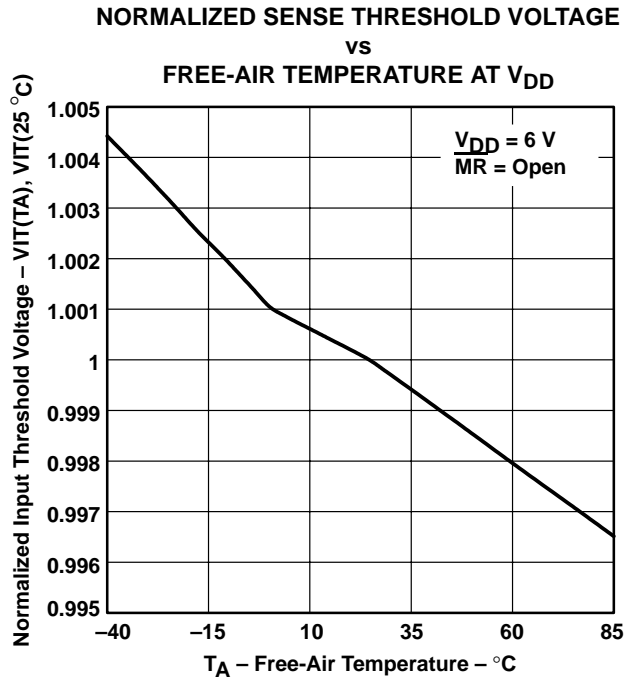


Figure 2

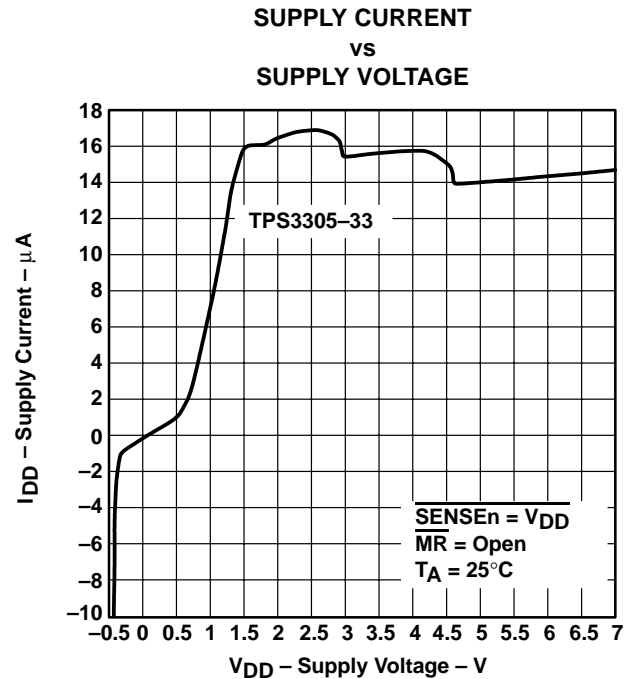


Figure 3

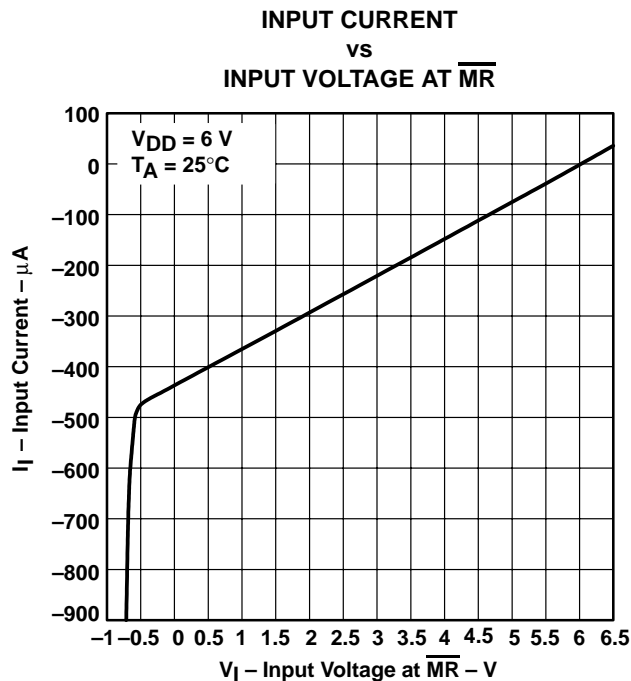


Figure 4

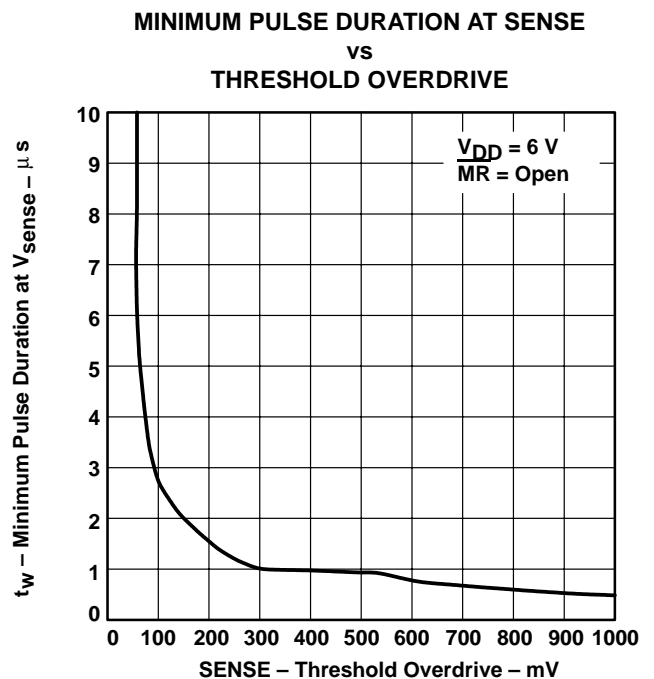


Figure 5

TPS3305-18, TPS3305-25, TPS3305-33 DUAL PROCESSOR SUPERVISORS

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TYPICAL CHARACTERISTICS

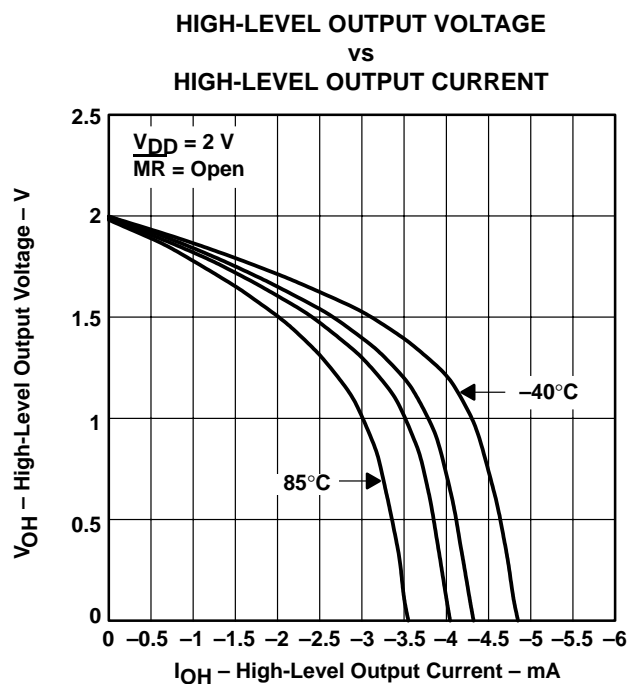


Figure 6

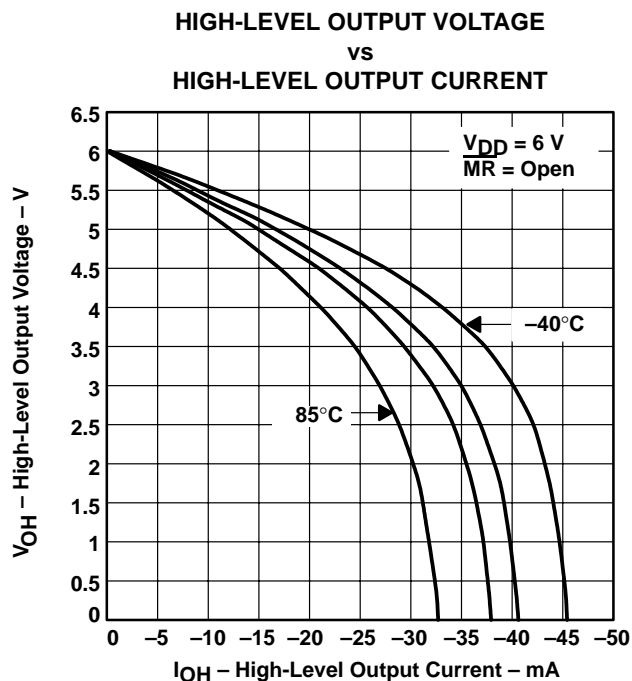


Figure 7

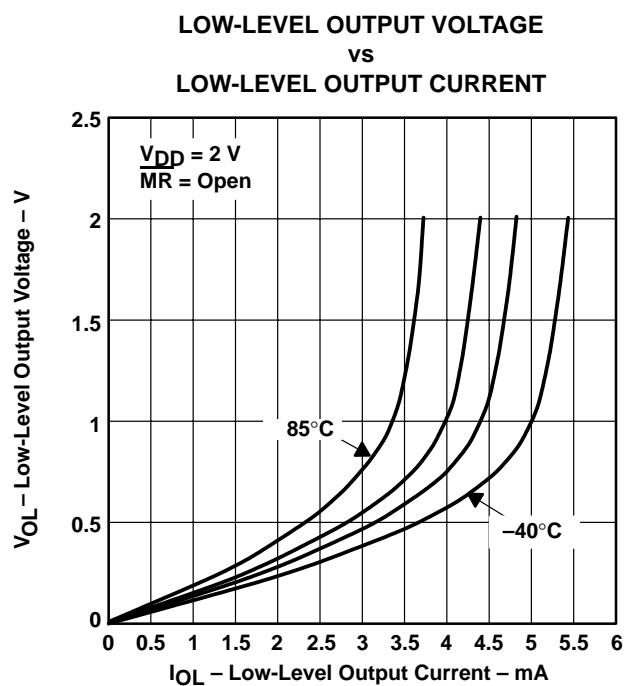


Figure 8

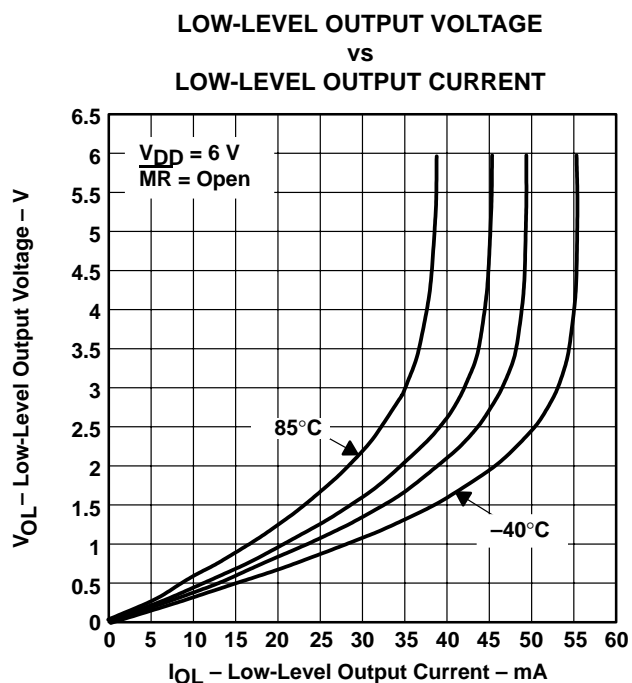


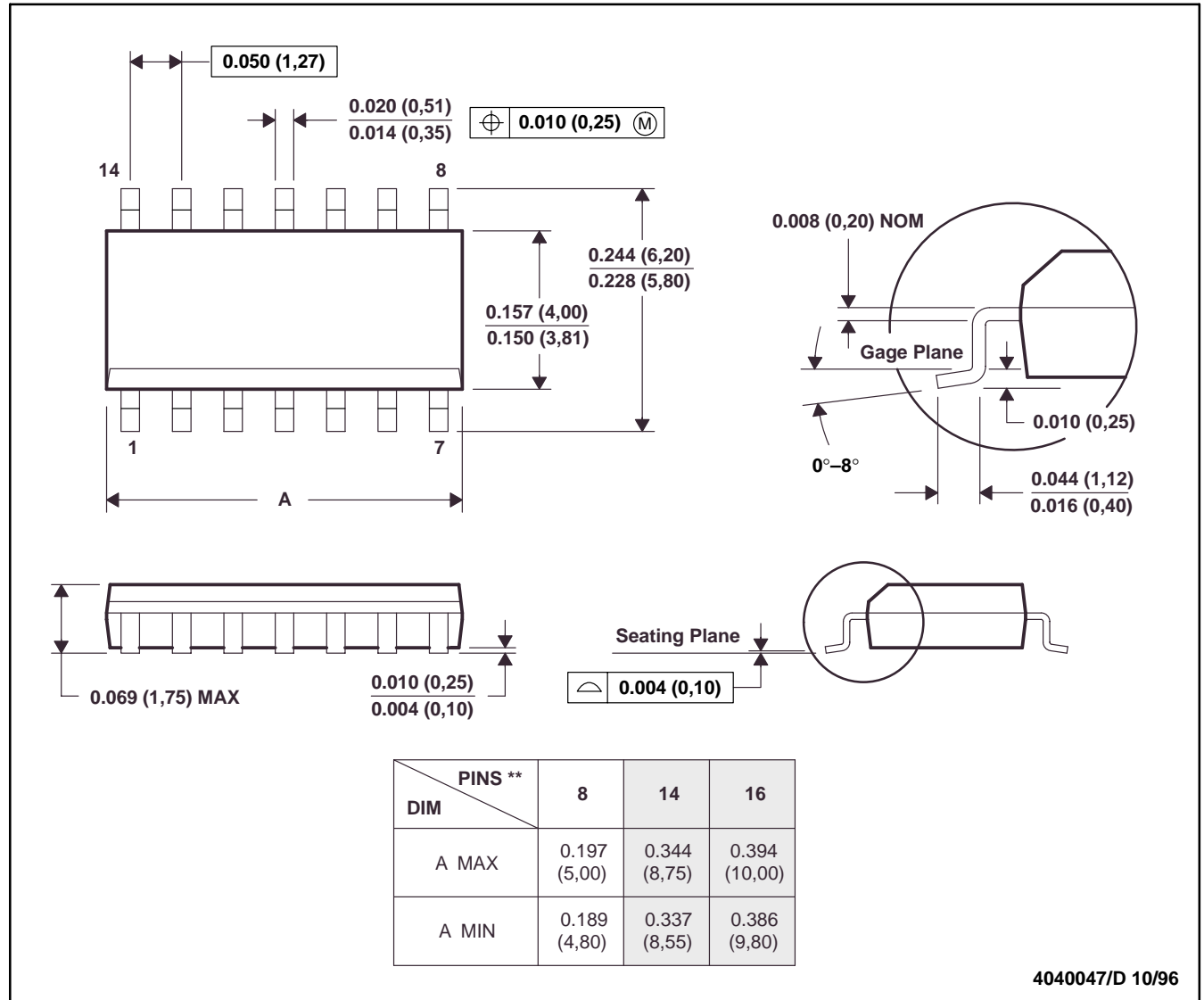
Figure 9

MECHANICAL DATA

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
D. Falls within JEDEC MS-012

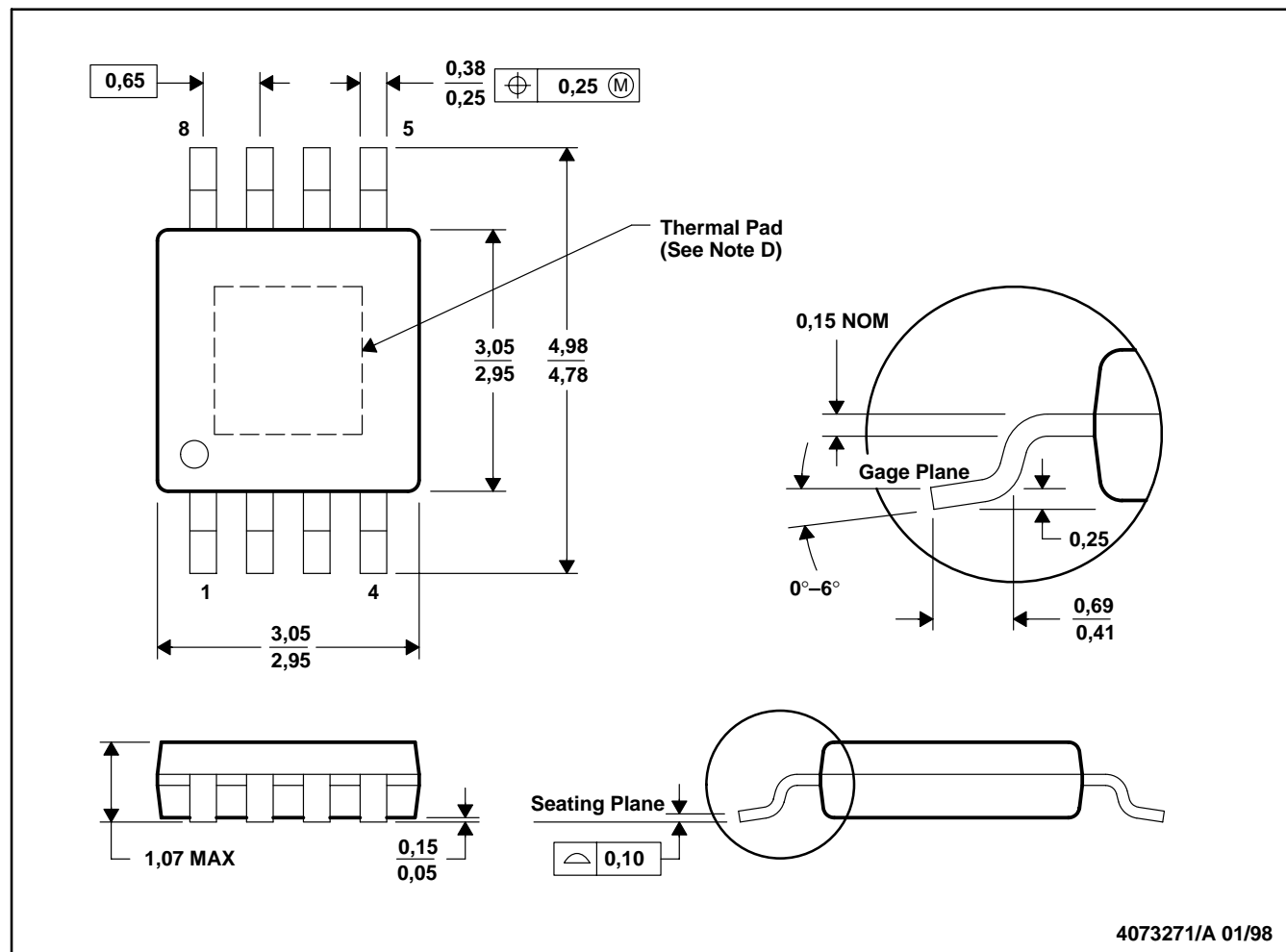
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MECHANICAL DATA

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 include mold flash or protrusions.
 - D. The package thermal performance may be enhanced by attaching an external heat sink to the thermal pad. This pad is electrically and thermally connected to the backside of the die and possibly selected leads.
 - E. Falls within JEDEC MO-187

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