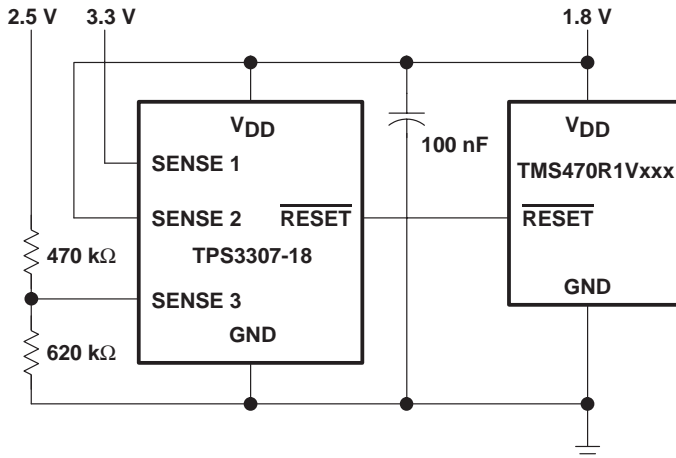
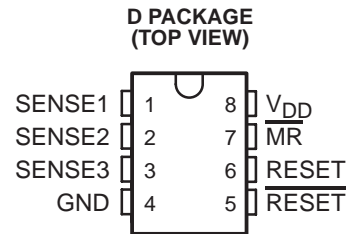


- Qualified for Automotive Applications
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Triple Supervisory Circuits for DSP and Processor-Based Systems
- Power-On Reset Generator with Fixed Delay Time of 200 ms, No External Capacitor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

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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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

**TEXAS
INSTRUMENTS**

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TPS3307-18-Q1 TRIPLE PROCESSOR SUPERVISORS

SGLS136A – NOVEMBER 2002 – REVISED APRIL 2008

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 $V_{\text{IT}+}$.

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, $t_{\text{dtyp}} = 200$ ms, starts after all SENSEn inputs have risen above the threshold voltage $V_{\text{IT}+}$. When the voltage at any SENSE input drops below the threshold voltage $V_{\text{IT}-}$, 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†

| TA | 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 > $V_{\text{IT}1}$ | SENSE2 > $V_{\text{IT}2}$ | SENSE3 > $V_{\text{IT}3}$ | $\overline{\text{RESET}}$ | 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 |

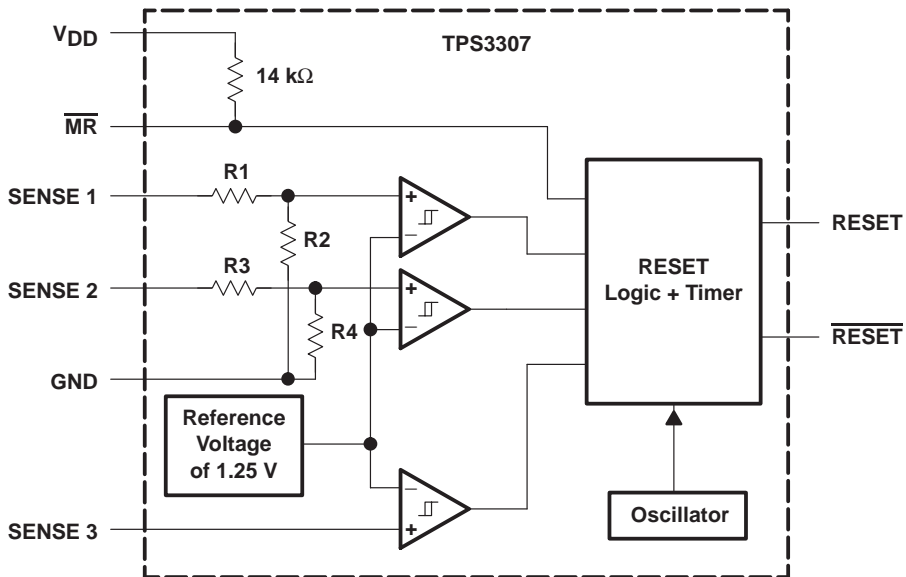
X = Don't care

PowerPAD is a trademark of Texas Instruments Incorporated.

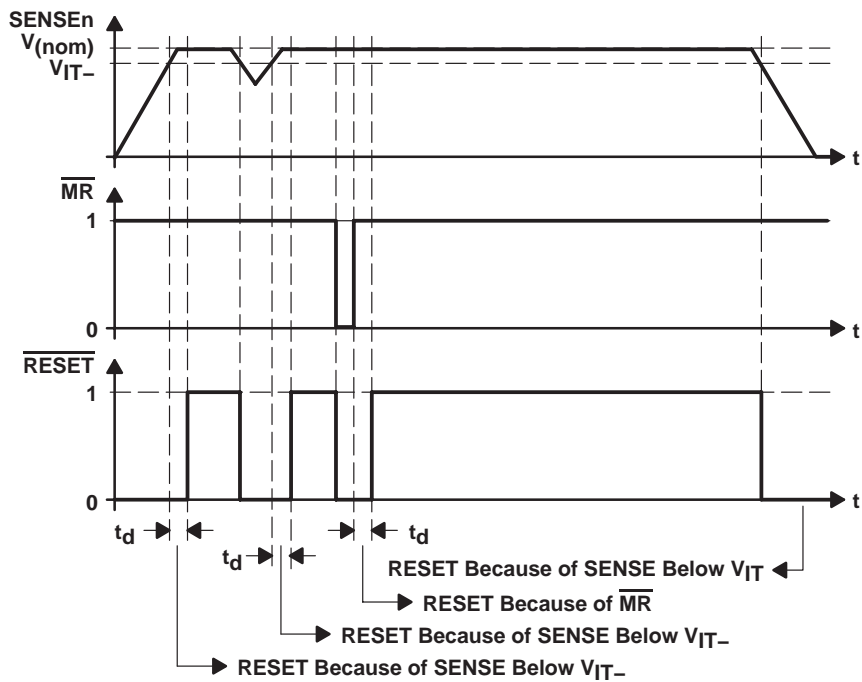


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functional block diagram



timing diagram



TPS3307-18-Q1

TRIPLE PROCESSOR SUPERVISORS

SGLS136A – NOVEMBER 2002 – REVISED APRIL 2008

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 | $T_A \leq 25^\circ\text{C}$ 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 | $T_A = 125^\circ\text{C}$ 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} | $0.7 \times V_{DD}$ | | V |
| Low-level input voltage at \overline{MR} , V_{IL} | $0.3 \times V_{DD}$ | | V |
| Input transition rise and fall rate at \overline{MR} , $\Delta t/\Delta V$ | 50 | | ns/V |
| Operating free-air temperature range, T_A | -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} ≥ 1.1 V, I _{OL} = 20 μA | 0.4 | | | V | |
| V _{IT-} | Negative-going input threshold voltage (see Note 3) | V _{DD} = 2 V to 6 V, T _A = -40°C to 125°C | VSENSE3 | 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 | $\overline{\text{MR}}$ | MR = 0.7 × V _{DD} , V _{DD} = 6 V | | -130 | -180 | μA |
| | | SENSE1 | VSENSE1 = V _{DD} = 6 V | | 5 | 8 | |
| | | SENSE2 | VSENSE2 = V _{DD} = 6 V | | 6 | 9 | |
| | | SENSE3 | VSENSE3 = V _{DD} | | -1 | 1 | |
| I _L | Low-level input current | $\overline{\text{MR}}$ | 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 RESET becomes active. t_r, V_{DD} ≥ 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.

TPS3307-18-Q1

TRIPLE PROCESSOR SUPERVISORS

SGLS136A – NOVEMBER 2002 – REVISED APRIL 2008

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

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

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

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



TYPICAL CHARACTERISTICS

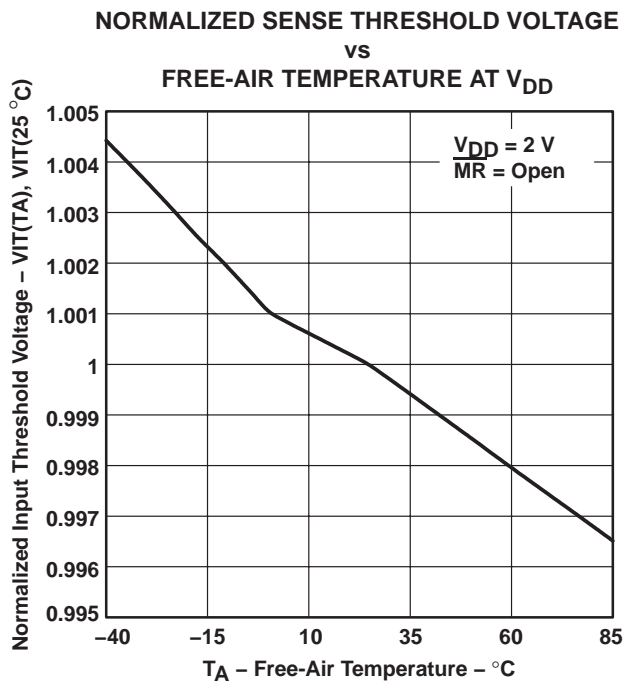


Figure 2

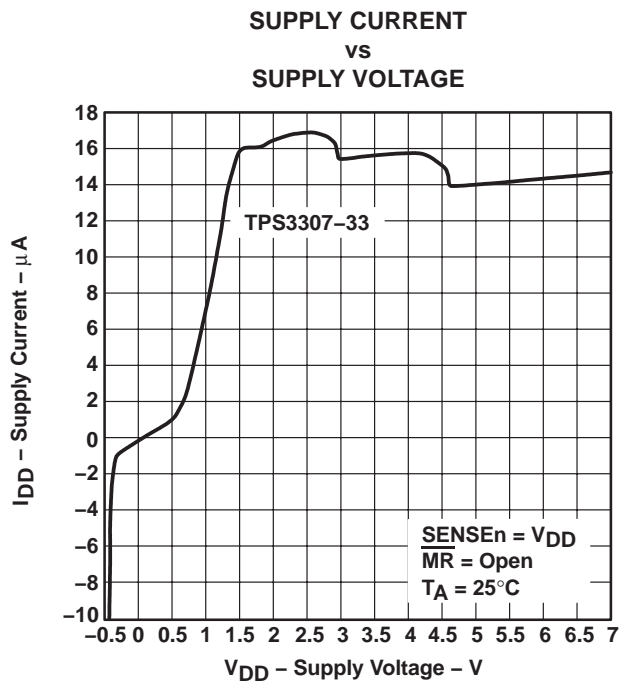


Figure 3

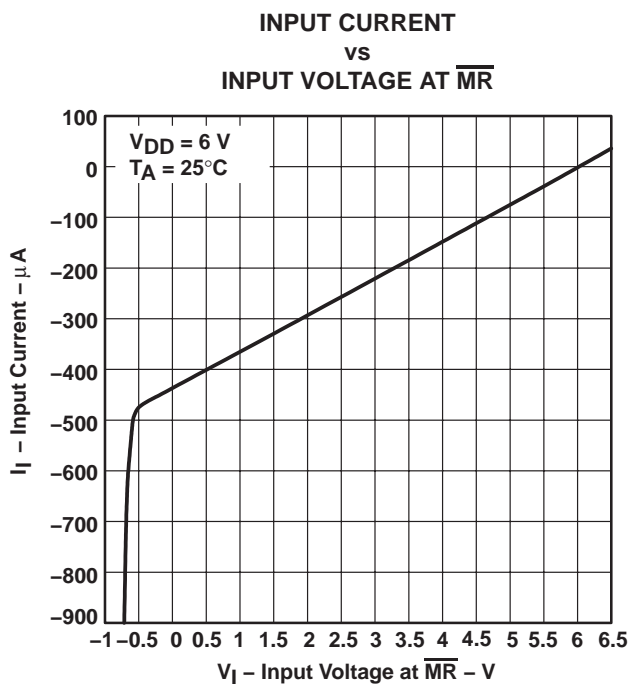


Figure 4

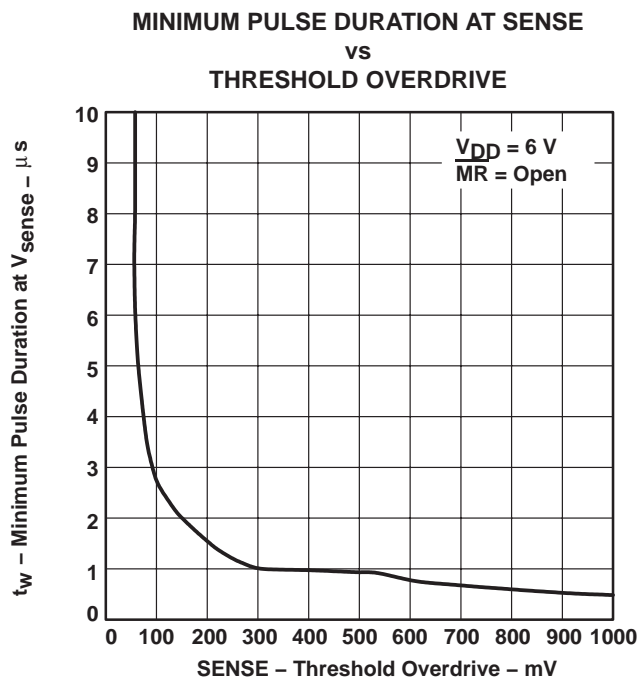


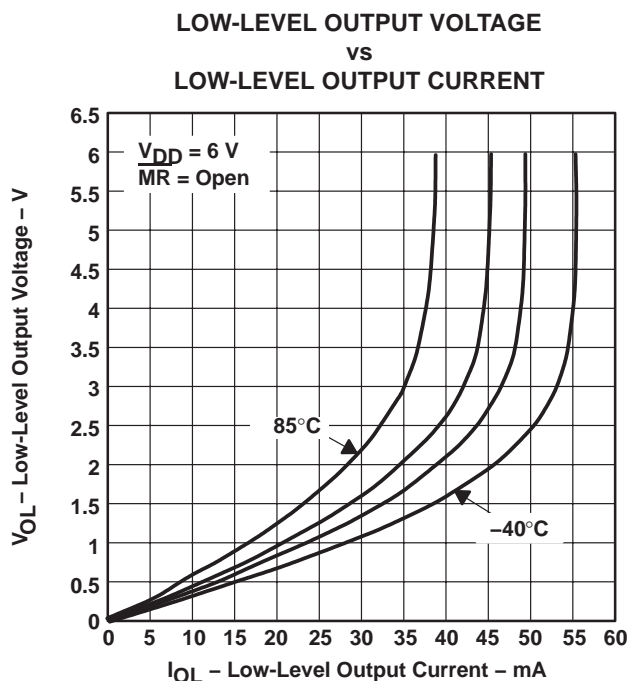
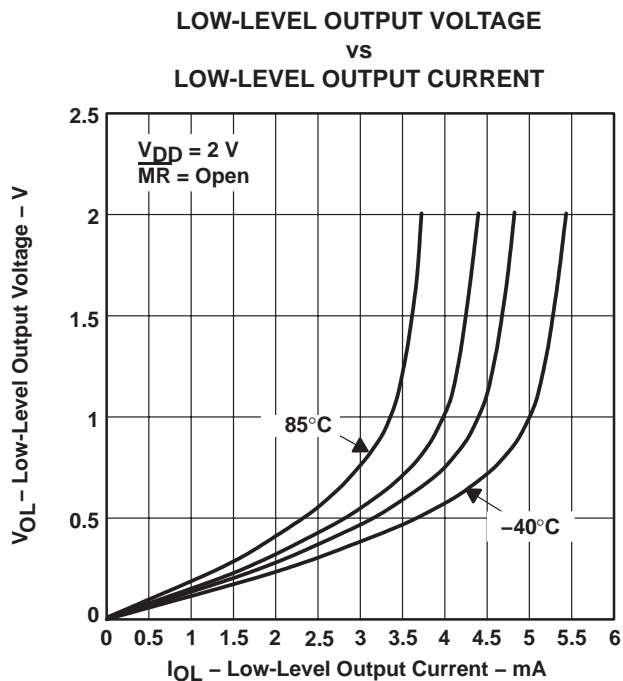
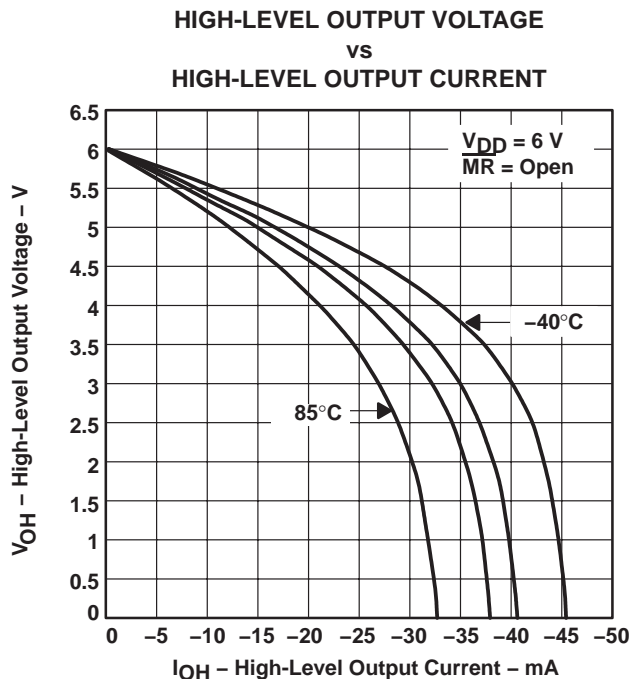
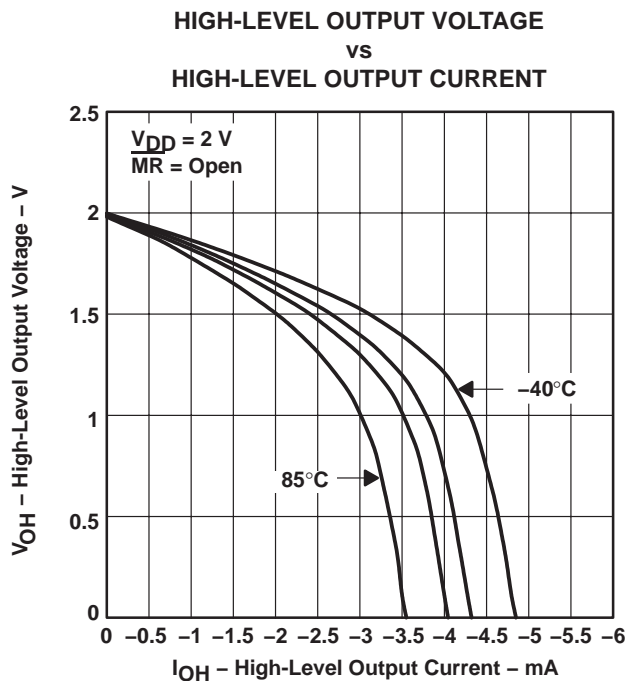
Figure 5

TPS3307-18-Q1

TRIPLE PROCESSOR SUPERVISORS

SGLS136A – NOVEMBER 2002 – REVISED APRIL 2008

TYPICAL CHARACTERISTICS



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 |
|-------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TPS3307-18QDRG4Q1 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 30718Q | Samples |
| TPS3307-18QDRQ1 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | 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/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.

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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



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 |



D0008A

PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

NOTES:

- 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.
- This drawing is subject to change without notice.
- 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.
- This dimension does not include interlead flash.
- Reference JEDEC registration MS-012, variation AA.

EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



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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