# MICROPOWER SUPPLY VOLTAGE SUPERVISORS

**Check for Samples: TLC7701-EP, TLC7705-EP, TLC7733-EP**

## FEATURES

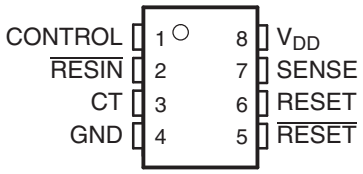
- **Power-On Reset Generator**
- **Automatic Reset Generation After Voltage Drop**
- **Precision Voltage Sensor**
- **Temperature-Compensated Voltage Reference**
- **Programmable Delay Time by External Capacitor**
- **Supply Voltage Range . . . 2 V to 6 V**
- **Defined RESET Output from $V_{DD} \geq 1$ V**
- **Power-Down Control Support for Static RAM With Battery Backup**
- **Maximum Supply Current of 16 mA**
- **Power Saving Totem-Pole Outputs**

## SUPPORTS DEFENSE, AEROSPACE, AND MEDICAL APPLICATIONS

- **Controlled Baseline**
- **One Assembly/Test Site**
- **One Fabrication Site**
- **Available in Extended (–40°C/125°C and –55°C/125°C), Temperature Ranges**(1)
- **Extended Product Life Cycle**
- **Extended Product-Change Notification**
- **Product Traceability**

(1) Additional temperature ranges available - contact factory

**D OR PW PACKAGE**
**(TOP VIEW)**




## DESCRIPTION

The TLC77xx family of micropower supply voltage supervisors provide reset control, primarily in microcomputer and microprocessor systems.

During power-on, RESET is asserted when $V_{DD}$ reaches 1 V. After minimum $V_{DD}$ (≥ 2 V) is established, the circuit monitors SENSE voltage and keeps the reset outputs active as long as SENSE voltage ($V_{I(SENSE)}$) remains below the threshold voltage. An internal timer delays return of the output to the inactive state to ensure proper system reset. The delay time ($t_d$) is determined by an external capacitor:

$$t_d = 2.1 \times 10^4 \times C_T \quad (1)$$

Where

$C_T$ is in farads

$t_d$ is in seconds

Except for the TLC7701, which can be customized with two external resistors, each supervisor has a fixed sense threshold voltage set by an internal voltage divider. When SENSE voltage drops below the threshold voltage, the outputs become active and stay in that state until SENSE voltage returns above threshold voltage and the delay time ($t_d$) has expired.

In addition to the power-on reset and undervoltage-supervisor function, the TLC77xx adds power-down control support for static RAM. When CONTROL is tied to GND, RESET will act as active high. The voltage monitor contains additional logic intended for control of static memories with battery backup during power failure. By driving the chip select ($\overline{CS}$) of the memory circuit with the RESET output of the TLC77xx and with the CONTROL driven by the memory bank select signal ($\overline{CSH1}$) of the microprocessor (see Figure 11), the memory circuit is automatically disabled during a power loss. (In this application the TLC77xx power has to be supplied by the battery.)

## ORDERING INFORMATION

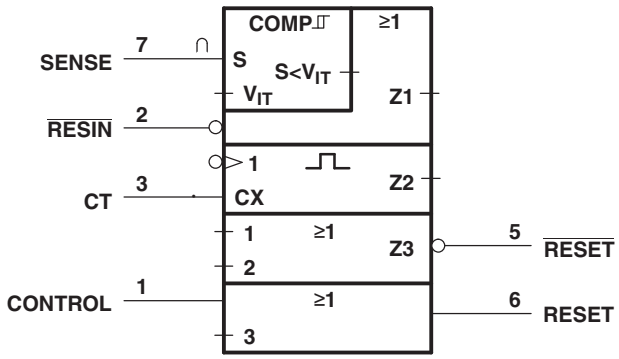
| $T_A$ | PACKAGE(1) | | ORDERABLE PART NUMBER | TOP-SIDE MARKING | VID NUMBER |
|---|---|---|---|---|---|
| -40°C to 125°C | TSSOP - PW | Tape and reel | TLC7701QPWREP | 7701QE | V62/04604 - 01XE |
| | | | TLC7705QPWREP | 7705QE | V62/04604 - 02XE |
| | | | TLC7733QPWREP | 7733QE | V62/04604 - 03XE |
| -55°C to 125°C | TSSOP - PW | Tape and reel | TLC7701MPWREP | 7701ME | V62/04604 - 04XE |
| | | | TLC7733MPWREP | 7733ME | V62/04604 - 06XE |
| | SOIC - D | Tape and reel | TLC7701MDREP | 7701ME | V62/04604 - 04YE |

(1) The PW package is only available left-end taped and reeled (indicated by the R suffix on the device type; e.g., TLC7701QPWREP).

## Table 1. FUNCTION TABLE

| CONTROL | RESIN | $V_{I(SENSE)} > V_{IT+}$ | RESET | $\overline{RESET}$ |
|---|---|---|---|---|
| L | L | False | H | L |
| L | L | True | H | L |
| L | H | False | H | L |
| L | H | True | L(1) | H(1) |
| H | L | False | H | L |
| H | L | True | H | L |
| H | H | False | H | L |
| H | H | True | H | H(1) |

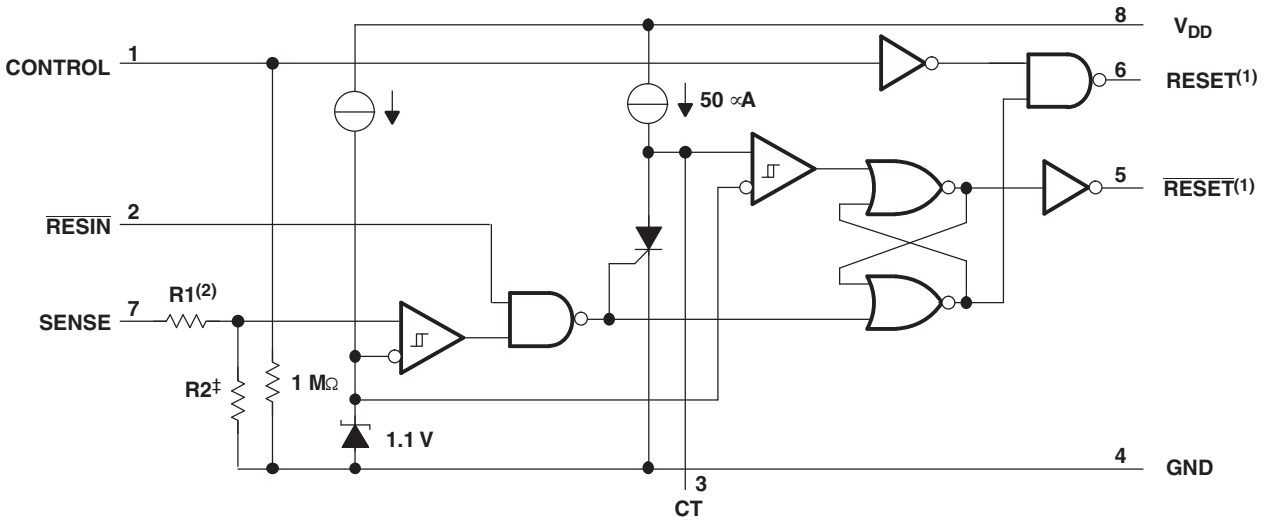
(1) RESET and $\overline{RESET}$ states shown are valid for $t > t_d$.




(1) This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

**Figure 1. Logic Symbol**

## FUNCTIONAL BLOCK DIAGRAM

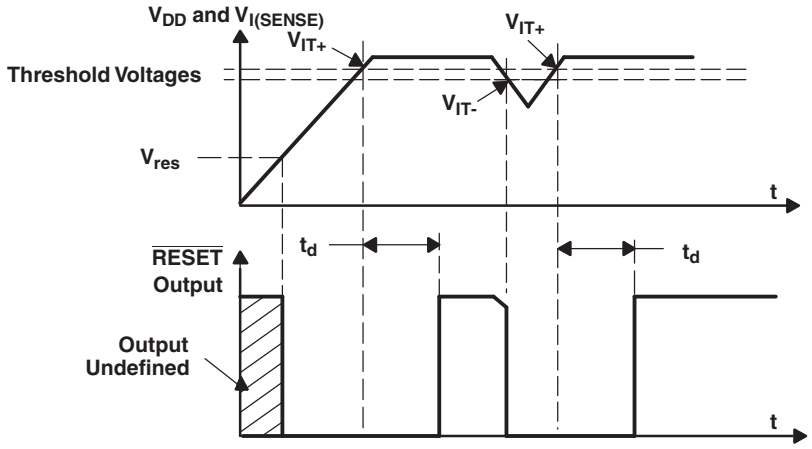



(1) Outputs are totem-pole configuration. External pullup or pulldown resistors are not required.

(2) Nominal values:

| | R1 (Typ) | R2 (Typ) |
|---|---|---|
| TLC7701 | 0 | ∞ |
| TLC7705 | 910 kΩ | 290 kΩ |
| TLC7733 | 750 kΩ | 450 kΩ |

## TIMING DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

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

| | | | VALUE | UNIT |
|---|---|---|---|---|
| $V_{DD}$ | Supply voltage(2) | | 7 | V |
| | Input voltage range, CONTROL, RESIN, SENSE (2) | | -0.3 to 7 | V |
| $I_{OL}$ | Maximum low output current | | 10 | mA |
| $I_{OH}$ | Maximum high output current | | 10 | mA |
| $I_{IK}$ | Input clamp current, ($V_I$ < 0 or $V_I$ > $V_{DD}$) | | ±10 | mA |
| $I_{OK}$ | Output clamp current, ($V_O$ < 0 or $V_O$ > $V_{DD}$) | | ±10 | mA |
| $T_A$ | Operating free-air temperature range | TL77xxQ | -40 to 125 | °C |
| | | TL77xxM | -55 to 125 | |
| $T_{stg}$ | Storage temperature range | | -65 to 150 | °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.

## THERMAL INFORMATION

| THERMAL METRIC(1) | | TLC77xx-EP D 8 PINS | TLC77xx-EP PW 8 PINS | UNITS |
|---|---|---|---|---|
| $\theta_{JA}$ | Junction-to-ambient thermal resistance | 97.1 | 168 | °C/W |
| $\theta_{JC}$ | Junction-to-case thermal resistance | 39.4 | 38.9 | |
| $\theta_{JB}$ | Junction-to-board thermal resistance | - | 96.6 | |
| $\psi_{JT}$ | Junction-to-top characterization parameter | - | 1.5 | |
| $\psi_{JB}$ | Junction-to-board characterization parameter | - | 94.7 | |

(1) For more information about traditional and new thermal metrics, see the IC Package Thermal Metrics application report, SPRA953.

## RECOMMENDED OPERATING CONDITIONS(1)

over operating free-air temperature range (unless otherwise noted)

| | | | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{DD}$ | Supply voltage | | 2 | | 6 | V |
| $V_I$ | Input voltage | | 0 | | $V_{DD}$ | V |
| $V_{IH}$ | High-level input voltage at $\overline{\text{RESIN}}$ and CONTROL(2) | | 0.7×$V_{DD}$ | | | V |
| $V_{IL}$ | Low-level input voltage at $\overline{\text{RESIN}}$ and CONTROL | | | | 0.2×$V_{DD}$ | V |
| $I_{OH}$ | High-level output current, $V_{DD}$ ≥ 2.7 V | | | | -2 | mA |
| $I_{OL}$ | Low-level output current, $V_{DD}$ ≥ 2.7 V | | | | 2 | mA |
| Δt/ΔV | Input transition rise and fall rate at $\overline{\text{RESIN}}$ and CONTROL | | | | 100 | ns/V |
| $T_A$ | Operating free-air temperature range | Q temperature range | -40 | | 125 | °C |
| | | M temperature range | -55 | | 125 | |

(1) Long-term high-temperature storage and/or extended use at maximum recommended operating conditions may result in a reduction of overall device life. See http://www.ti.com/ep_quality for additional information on enhanced plastic packaging.
(2) To ensure a low supply current, $V_{IL}$ should be kept <0.3 V and $V_{IH}$ > -0.3 V.

## ELECTRICAL CHARACTERISTICS

over recommended operating conditions(1) (unless otherwise noted)

| PARAMETER | | | TEST CONDITIONS | $T_A$ = -40°C to 125°C | | | $T_A$ = -55°C to 125°C | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP(2) | MAX | MIN | TYP(2) | MAX | |
| $V_{OH}$ | High-level output voltage | $I_{OH}$ = - 20 µA | $V_{DD}$ = 2 V | 1.8 | | | 1.8 | | | V |
| | | | $V_{DD}$ = 2.7 V | 2.5 | | | 2.5 | | | |
| | | | $V_{DD}$ = 4.5 V | 4.3 | | | 4.3 | | | |
| | | $I_{OH}$ = - 20 mA | $V_{DD}$ = 4.5 V | 3.7 | | | 3.7 | | | |
| $V_{OL}$ | Low-level output voltage | $I_{OH}$ = - 20 µA | $V_{DD}$ = 2 V | | | 0.2 | | | 0.2 | V |
| | | | $V_{DD}$ = 2.7 V | | | 0.2 | | | 0.2 | |
| | | | $V_{DD}$ = 4.5 V | | | 0.2 | | | 0.2 | |
| | | $I_{OH}$ = - 20 mA | $V_{DD}$ = 4.5 V | | | 0.5 | | | 0.5 | |
| $V_{IT-}$ | Negative-going input threshold voltage, SENSE(3) | TLC7701 | $V_{DD}$ = 2 V to 6 V | 1.04 | 1.1 | 1.16 | | | | V |
| | | TLC7705 | | 4.43 | 4.5 | 4.63 | | | | |
| | | TLC7733 | | 2.855 | 2.93 | 3.03 | 2.8 | 2.93 | 3.03 | |
| $V_{hys}$ | Hysteresis voltage, SENSE | TLC7701 | $V_{DD}$ = 2 V to 6 V | | 30 | | | | | mV |
| | | TLC7705 | | | 70 | | | | | |
| | | TLC7733 | | | 70 | | | 70 | | |
| $V_{res}$ | Power-up reset voltage(4) | | $I_{OL}$ = 20 µA | | | 1 | | | 1 | V |
| $I_I$ | Input current | $\overline{RESIN}$ | $V_I$ = 0 V to $V_{DD}$ | | | 2 | | | 2 | µA |
| | | CONTROL | $V_I$ = $V_{DD}$ | | 7 | 15 | | 7 | 15 | |
| | | SENSE | $V_I$ = 5 V | | 5 | 10 | | 5 | 10 | |
| | | SENSE, TLC7701 only | $V_I$ = 5 V | | | 2 | | | | |
| $I_{DD}$ | Supply current | | $\overline{RESIN}$ = $V_{DD}$, SENSE = $V_{DD}$ ≥ $V_{ITmax}$ + 0.2 V CONTROL = 0 V, Outputs open | | 9 | 16 | | 9 | 18 | µA |
| $I_{DD(d)}$ | Supply current during $t_d$ | | $V_{DD}$ = 5 V, $V_{CT}$ = 0 , $\overline{RESIN}$ = $V_{DD}$, SENSE = $V_{DD}$ CONTROL = 0 V, Outputs open | | 120 | 150 | | 120 | 150 | µA |
| $C_I$ | Input capacitance, SENSE | | $V_I$ = 0 V to $V_{DD}$ | | 50 | | | 50 | | pF |

(1) All characteristics are measured with $C_T$ = 0.1 µF.
(2) Typical values apply at $T_A$ = 25°C.
(3) To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1 µF) should be connected near the supply terminals.
(4) The lowest supply voltage at which $\overline{RESET}$ becomes active. The symbol $V_{res}$ is not currently listed within EIA or JEDEC standards for semiconductor symbology. Rise time of VDD ≥ 15 ms/V.

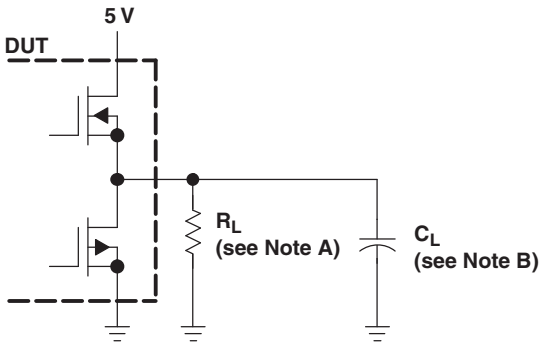
## SWITCHING CHARACTERISTICS

over operating free-air temperature range (unless otherwise noted)

| PARAMETER | | MEASURED | | TEST CONDITIONS | $T_A$ = -40°C to 125°C | | | $T_A$ = -55°C to 125°C | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FROM (INPUT) | TO (OUTPUT) | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $t_d$ | Delay time | | | $\overline{RESIN}$ = 0.7 × $V_{DD}$, CONTROL = 0.2 × $V_{DD,CT}$ = 100 nF, $T_A$ = Full range, See timing diagram | 1.1 | 2.1 | 4.2 | | 2.1 | | ms |
| $t_{PLH}$ | Propagation delay time, low-to-high level output | SENSE | $\overline{RESET}$ | $V_{IH}$ = $V_{IT+max}$ + 0.2 V, $V_{IL}$ = $V_{IT-min}$ - 0.2 V, $\overline{RESIN}$ = 0.7 × $V_{DD,CONTROL}$ = 0.2 × $V_{DD}$, $C_T$ = NC(1) | | | 20 | | | 20 | µs |
| $t_{PLH}$ | Propagation delay time, high-to-low level output | | | | | | 5 | | | 5 | |
| $t_{PLH}$ | Propagation delay time, low-to-high level output | | RESET | | | | 5 | | | 5 | |
| $t_{PLH}$ | Propagation delay time, high-to-low level output | | | | | | 20 | | | 20 | |
| $t_{PLH}$ | Propagation delay time, low-to-high level output | $\overline{RESIN}$ | $\overline{RESET}$ | $V_{IH}$ = 0.7 × $V_{DD}$, $V_{IL}$ = 0.2 × $V_{DD,SENSE}$ = $V_{IT+max}$ + 0.2 V, CONTROL = 0.2 × $V_{DD}$, $C_T$ = NC(1) | | | 20 | | | 20 | µs |
| $t_{PLH}$ | Propagation delay time, high-to-low level output | | | | | | 60 | | | 60 | ns |
| $t_{PLH}$ | Propagation delay time, low-to-high level output | | RESET | | | | 65 | | | 65 | |
| $t_{PLH}$ | Propagation delay time, high-to-low level output | | | | | | 20 | | | 20 | µs |
| $t_{PLH}$ | Propagation delay time, low-to-high level output | CONTROL | RESET | $V_{IH}$ = 0.7 × $V_{DD}$, $V_{IL}$ = 0.2 × $V_{DD,SENSE}$ = $V_{IT+max}$ + 0.2 V, $\overline{RESIN}$ = 0.7 × $V_{DD}$, $C_T$ = NC(1) | | | 58 | | | 58 | ns |
| $t_{PLH}$ | Propagation delay time, high-to-low level output | | | | | | 58 | | | 58 | ns |
| | Low-level minimum pulse duration to switch RESET and $\overline{RESET}$ | SENSE | | $V_{IH}$ = $V_{IT+max}$ + 0.2 V, $V_{IL}$ = $V_{IT-min}$ - 0.2 V | 3 | | | 4 | | | µs |
| | | $\overline{RESIN}$ | | $V_{IL}$ = 0.2 × $V_{DD}$, $V_{IH}$ = 0.7 × $V_{DD}$ | 1 | | | 1 | | | |
| $t_r$ | Rise time | | RESET and $\overline{RESET}$ | 10% to 90% | | 8 | | | 8 | | ns/V |
| $t_f$ | Fall time | | | 90% to 10% | | 4 | | | 4 | | |

(1) NC = No capacitor, and includes up to 100-pF probe and jig capacitance.

## PARAMETER MEASUREMENT INFORMATION




A. For switching characteristics, $R_L$ = 2 kΩ

B. $C_L$ = 50 pF includes jig and probe capacitance

**Figure 2. RESET AND $\overline{\text{RESET}}$ Output Configurations**

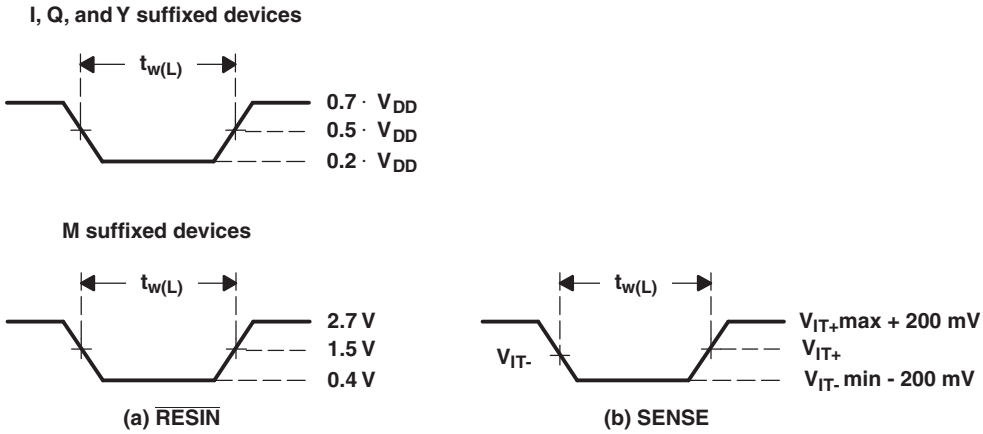



**Figure 3. Input Pulse Definition Waveforms**

## TYPICAL CHARACTERISTICS

**NORMALIZED INPUT THRESHOLD VOLTAGE vs TEMPERATURE**

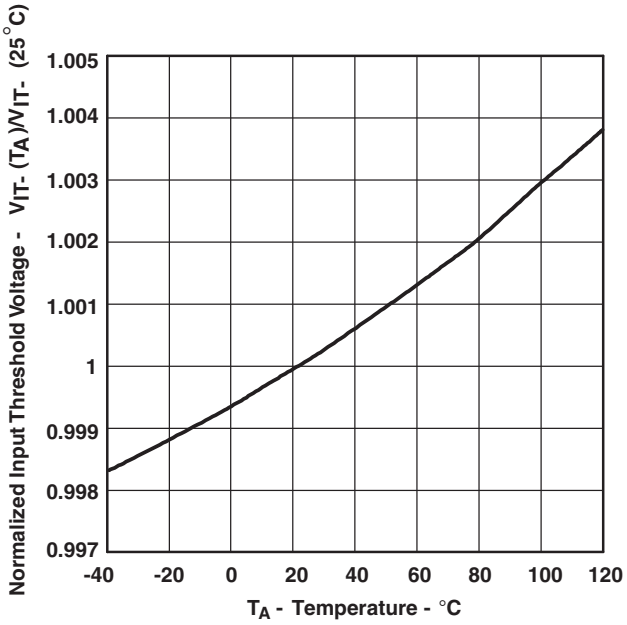



Figure 4.

**SUPPLY CURRENT vs SUPPLY VOLTAGE**

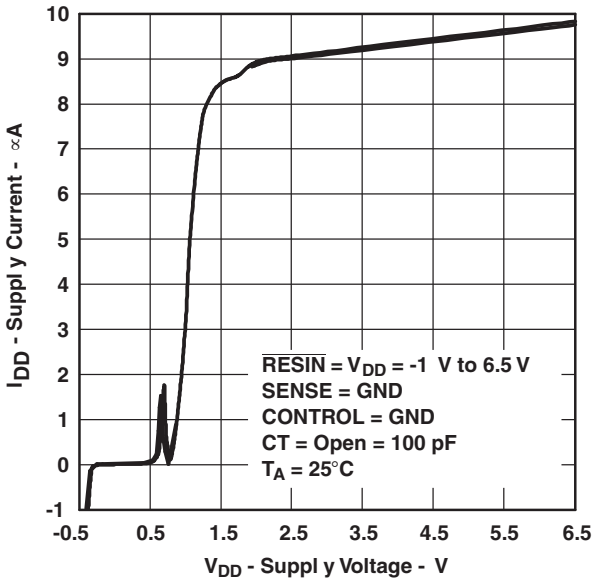



Figure 5.

**HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT**

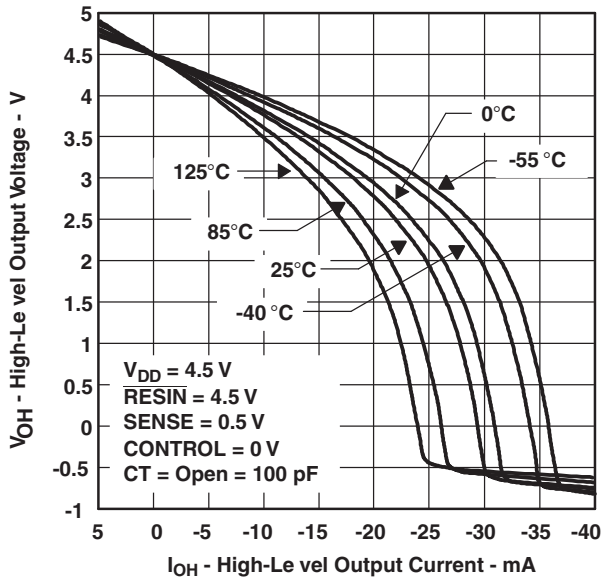



Figure 6.

**LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT**

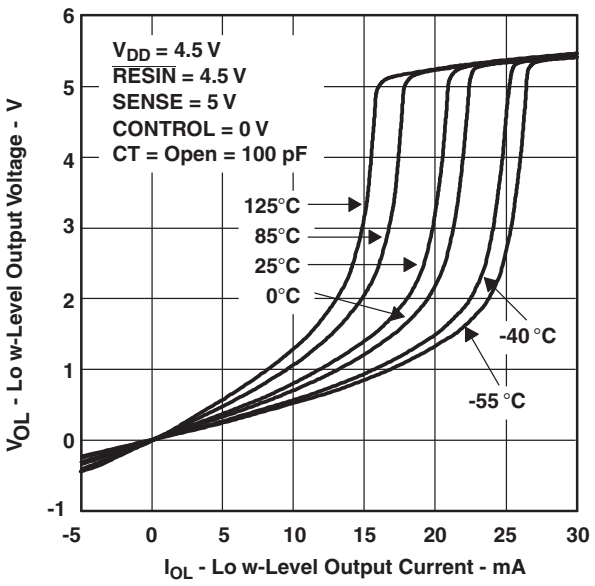



Figure 7.

## TYPICAL CHARACTERISTICS (continued)

**INPUT CURRENT vs INPUT VOLTAGE AT SENSE**

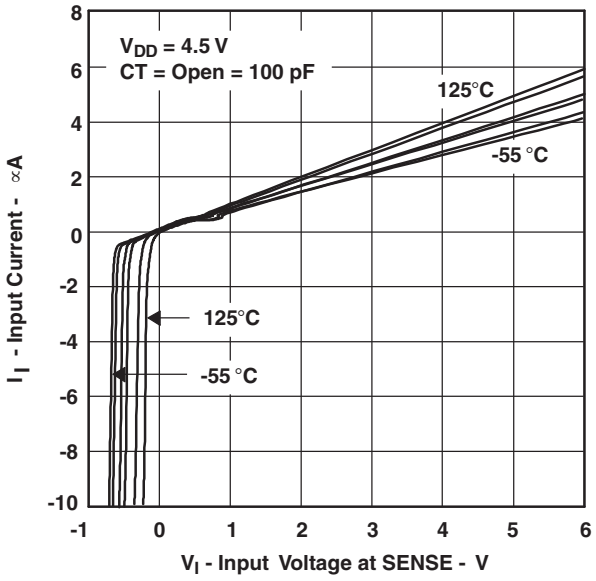



**Figure 8.**

**MINIMUM PULSE DURATION AT SENSE vs SENSE THRESHOLD OVERDRIVE**

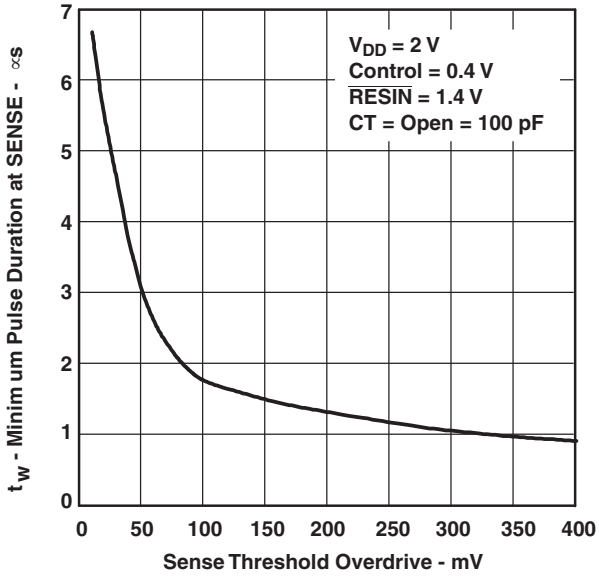



**Figure 9.**

## APPLICATION INFORMATION

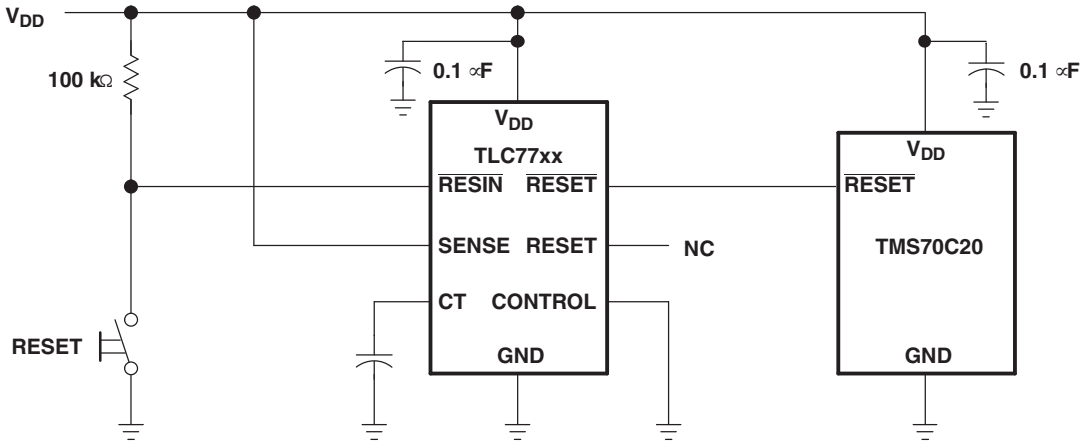



**Figure 10. Reset Controller in a Microcomputer System**

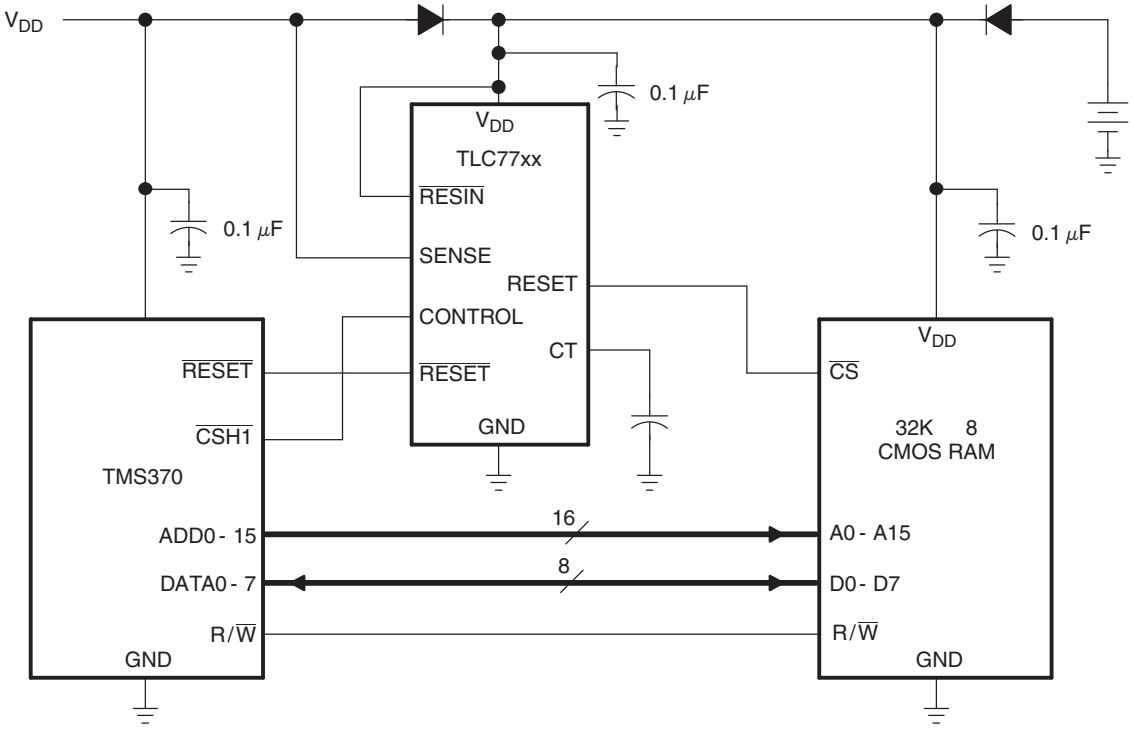



**Figure 11. Data Retention During Power Down Using Static CMOS RAMs**

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TLC7701MDREP | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7701ME | Samples |
| TLC7701MPWREP | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7701ME | Samples |
| TLC7701MPWREPG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7701ME | Samples |
| TLC7701QPWREP | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 7701QE | Samples |
| TLC7705QPWREP | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 7705QE | Samples |
| TLC7733MPWREP | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7733ME | Samples |
| TLC7733QPWREP | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 7733QE | Samples |
| V62/04604-01XE | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 7701QE | Samples |
| V62/04604-02XE | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 7705QE | Samples |
| V62/04604-03XE | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 7733QE | Samples |
| V62/04604-04XE | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7701ME | Samples |
| V62/04604-04YE | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7701ME | Samples |
| V62/04604-06XE | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | 7733ME | 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.



**OTHER QUALIFIED VERSIONS OF TLC77-EP :**

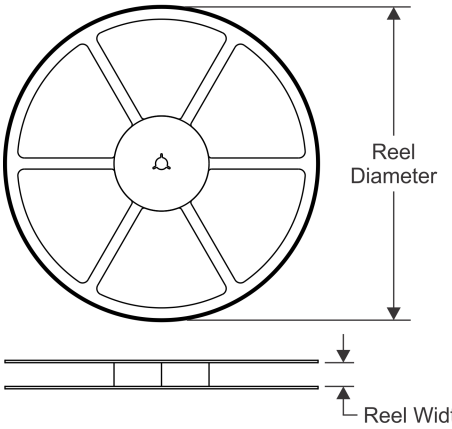
- Catalog: TLC77
- Automotive: TLC77-Q1

NOTE: Qualified Version Definitions:

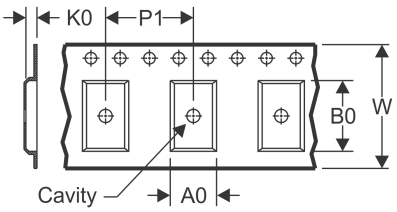
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

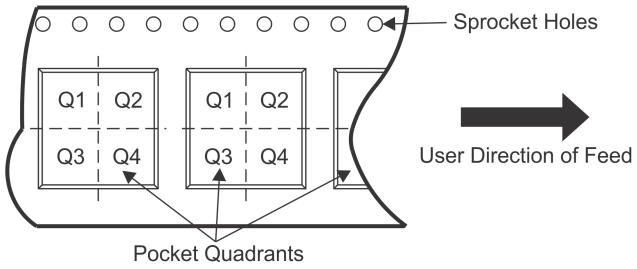



**TAPE DIMENSIONS**




| | |
|---|---|
| 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 |

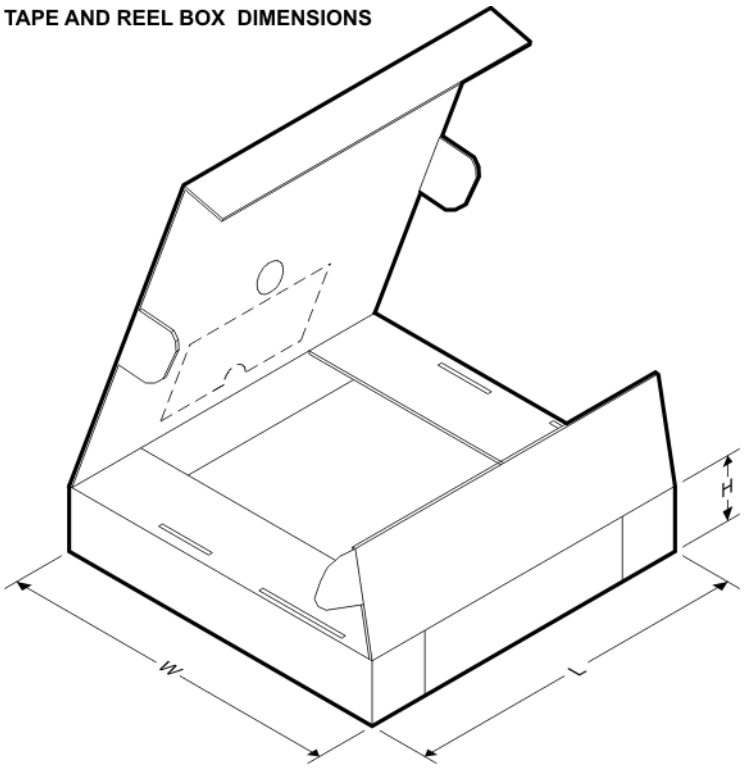
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*All dimensions are nominal

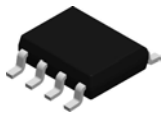
| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TLC7701MDREP | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLC7701MPWREP | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| TLC7701QPWREP | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| TLC7705QPWREP | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| TLC7733MPWREP | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| TLC7733QPWREP | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 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) |
|---|---|---|---|---|---|---|---|
| TLC7701MDREP | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| TLC7701MPWREP | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |
| TLC7701QPWREP | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |
| TLC7705QPWREP | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |
| TLC7733MPWREP | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |
| TLC7733QPWREP | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |

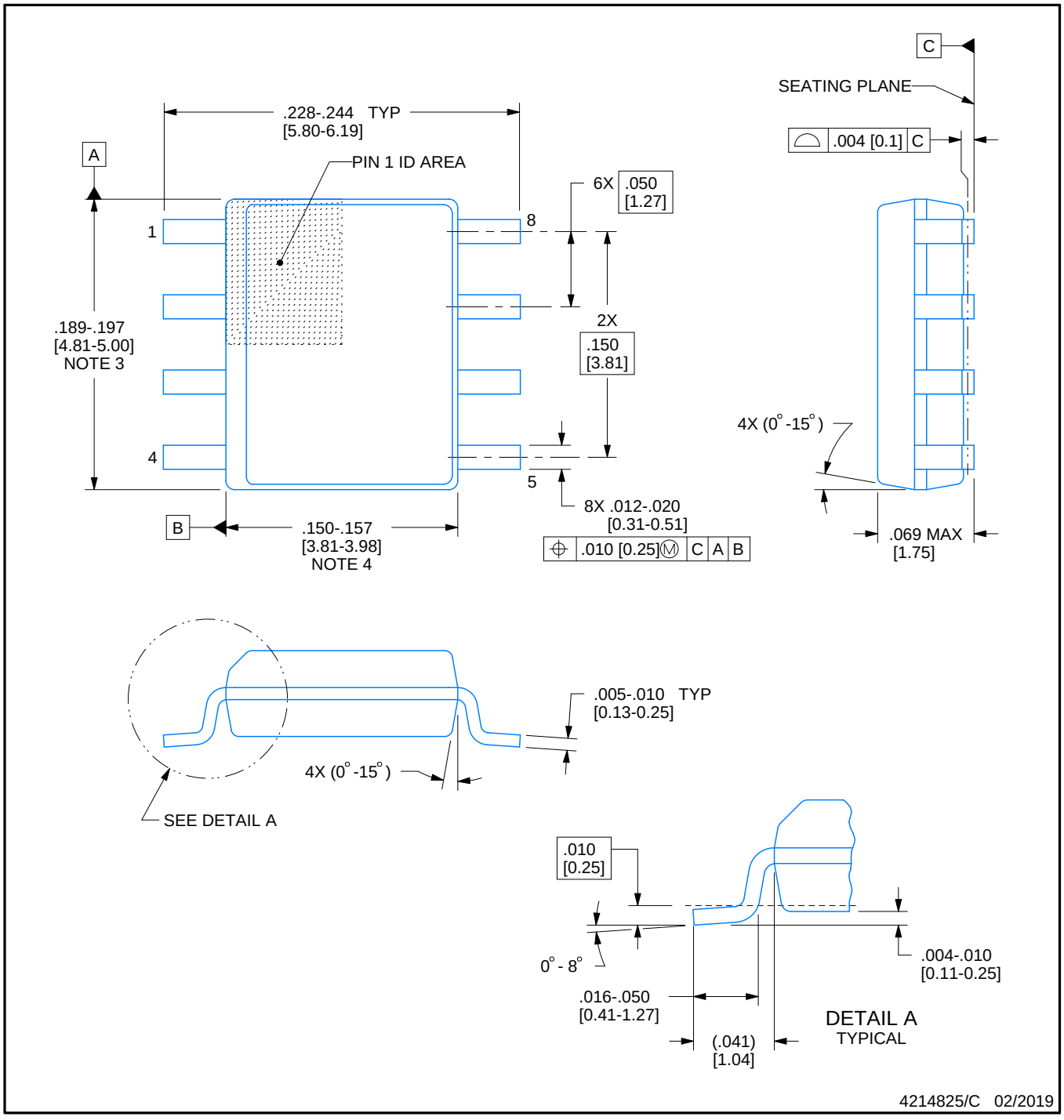


# PACKAGE OUTLINE

## D0008A

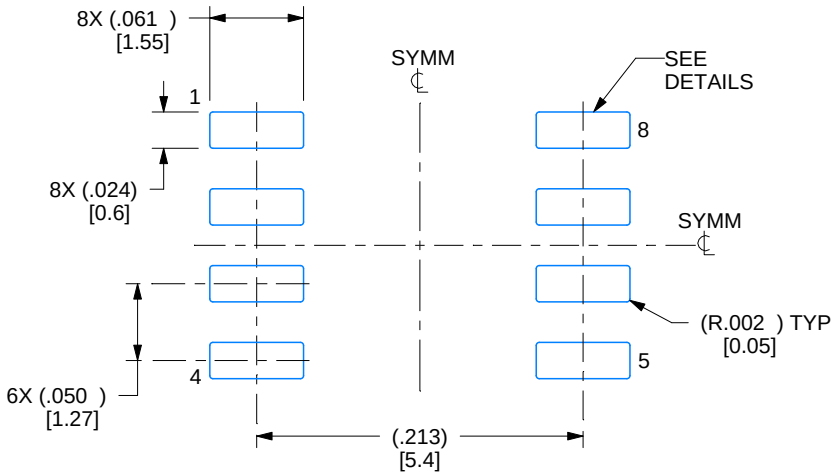
## SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

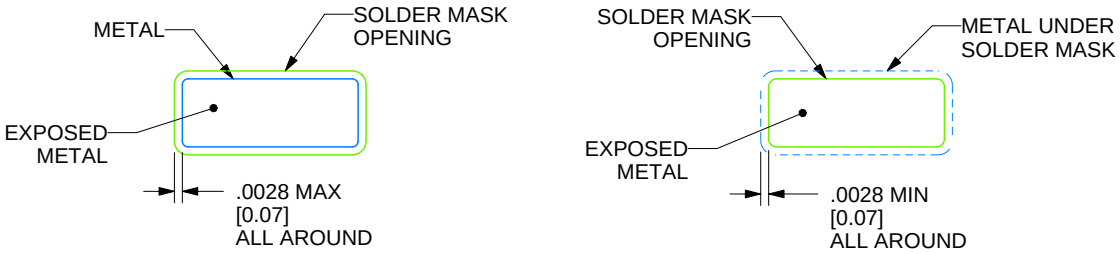



NOTES:

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




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X




SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

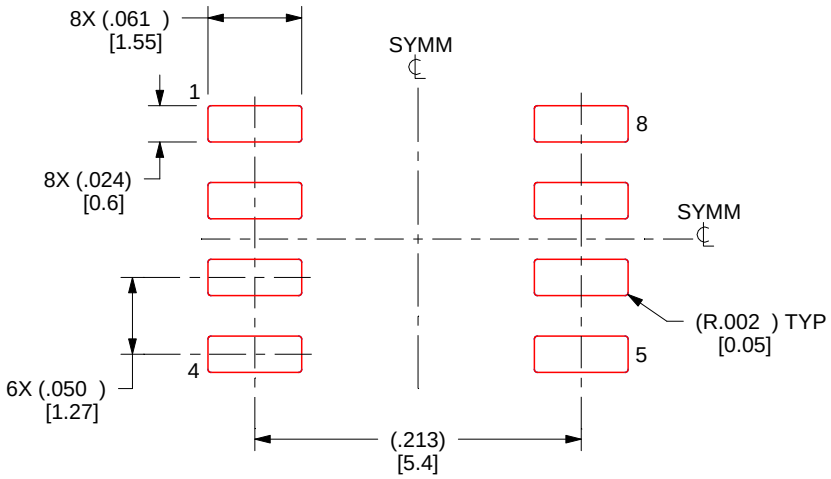
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

## D0008A

## SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT




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

4214825/C 02/2019

NOTES: (continued)

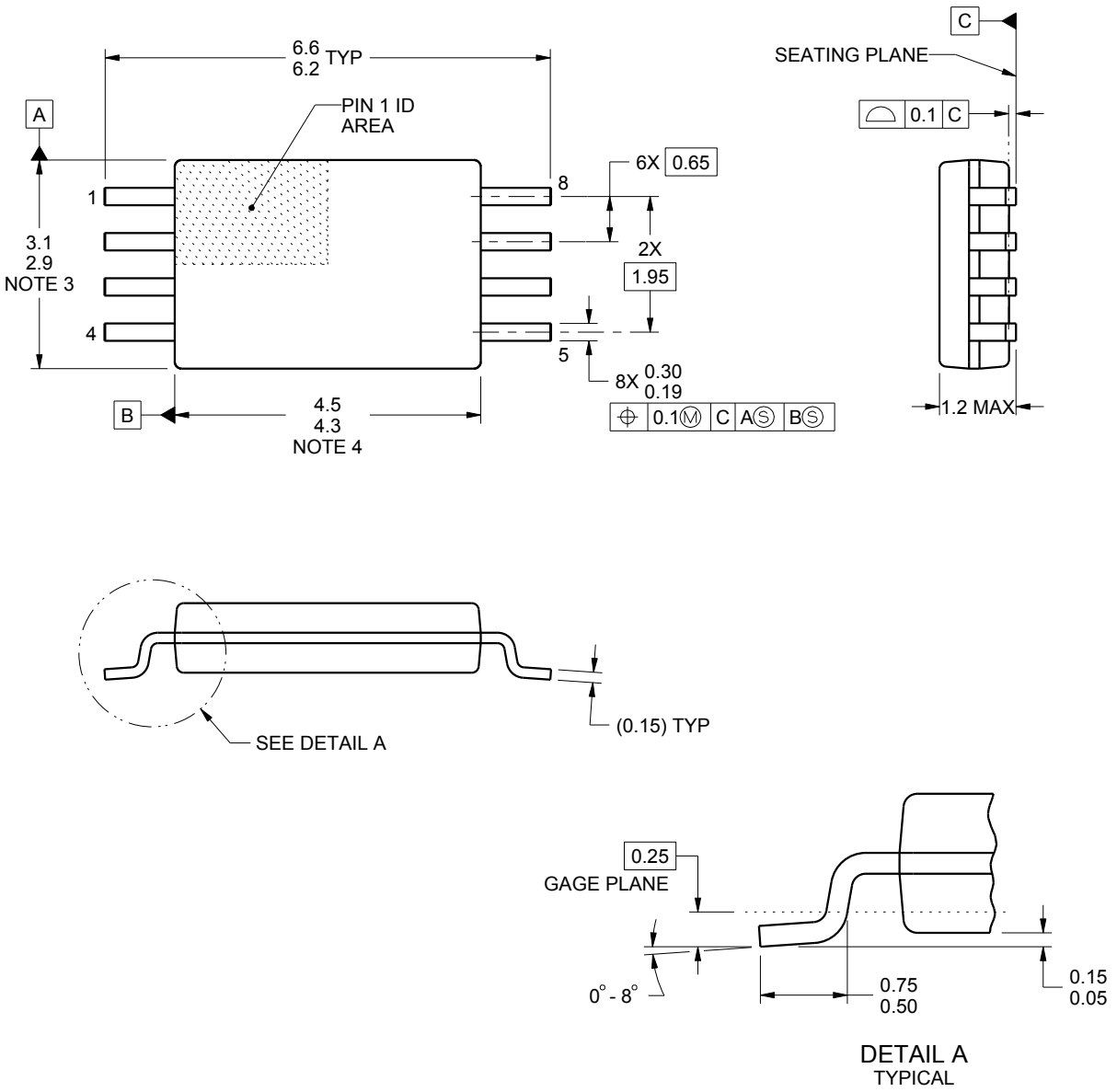
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

# PACKAGE OUTLINE

## PW0008A

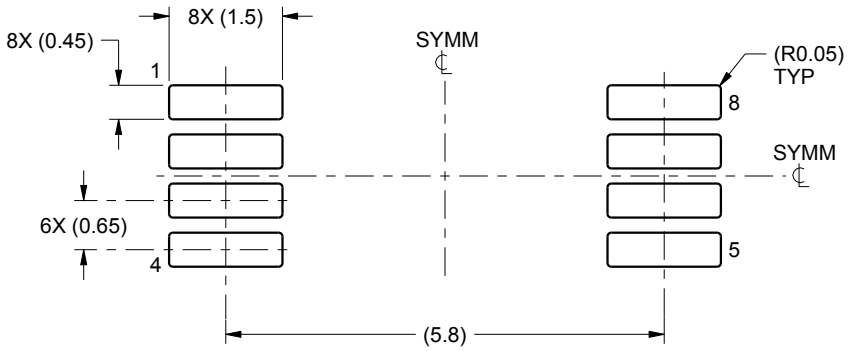
## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

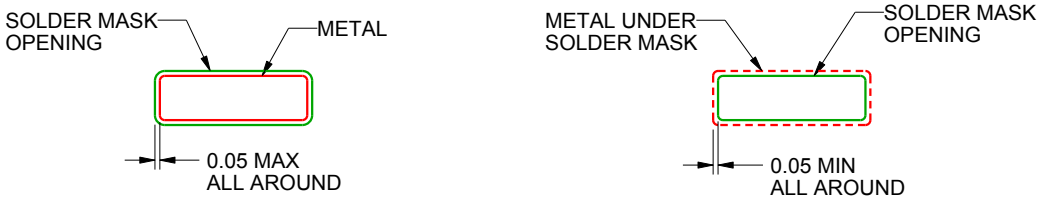



NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153, variation AA.




LAND PATTERN EXAMPLE
SCALE:10X

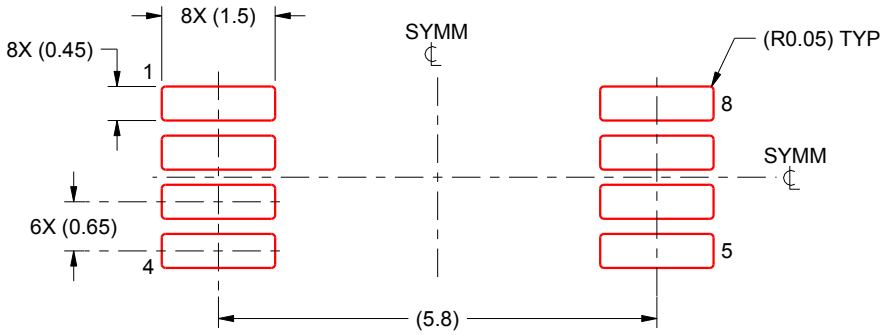



SOLDER MASK DETAILS
NOT TO SCALE

4221848/A 02/2015

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.




SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:10X

4221848/A 02/2015

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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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265