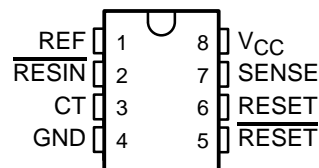


# TL7702A, TL7705A, TL7709A, TL7712A, TL7715A SUPPLY-VOLTAGE SUPERVISORS

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- Power-On Reset Generator
- Automatic Reset Generation After Voltage Drop
- Wide Supply-Voltage Range
- Precision Voltage Sensor
- Temperature-Compensated Voltage Reference
- True and Complement Reset Outputs
- Externally Adjustable Pulse Duration

TL7702A, TL7709A, TL7712A, TL7715A . . . D OR P PACKAGE  
TL7705A . . . D, P, OR PS PACKAGE,  
(TOP VIEW)



## description/ordering information

### ORDERING INFORMATION

| TA            | PACKAGE†     |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|--------------|--------------|-----------------------|------------------|
| 0°C to 70°C   | PDIP (P)     | Tube of 50   | TL7702ACP             | TL7702ACP        |
|               | SOIC (D)     | Tube of 75   | TL7702ACD             | 7702AC           |
|               |              | Reel of 2500 | TL7702ACDR            |                  |
|               | PDIP (P)     | Tube of 50   | TL7705ACP             | TL7705ACP        |
|               | SOIC (D)     | Tube of 75   | TL7705ACD             | 7705AC           |
|               |              | Reel of 2500 | TL7705ACDR            |                  |
|               | SOP (PS)     | Reel of 2000 | TL7705ACPSR           | T7705A           |
|               | PDIP (P)     | Tube of 50   | TL7709ACP             | TL7709ACP        |
|               | SOIC (D)     | Tube of 75   | TL7709ACD             | 7709AC           |
|               |              | Reel of 2500 | TL7709ACDR            |                  |
|               | PDIP (P)     | Tube of 50   | TL7712ACP             | TL7709ACP        |
|               | SOIC (D)     | Tube of 75   | TL7712ACD             | 7712AC           |
| Reel of 2500  |              | TL7712ACDR   |                       |                  |
| PDIP (P)      | Tube of 50   | TL7715ACP    | TL7715ACP             |                  |
| SOIC (D)      | Tube of 75   | TL7715ACD    | 7715AC                |                  |
| -40°C to 85°C | PDIP (P)     | Tube of 50   | TL7702AIP             | TL7702AIP        |
|               | SOIC (D)     | Tube of 75   | TL7702AID             | 7702AI           |
|               |              | Reel of 2500 | TL7702AIDR            |                  |
|               | PDIP (P)     | Tube of 50   | TL7705AIP             | TL7705AIP        |
| SOIC (D)      | Tube of 75   | TL7705AID    | 7705AI                |                  |
|               | Reel of 2500 | TL7705AIDR   |                       |                  |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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 **TEXAS  
INSTRUMENTS**

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# TL7702A, TL7705A, TL7709A, TL7712A, TL7715A SUPPLY-VOLTAGE SUPERVISORS

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## description/ordering information (continued)

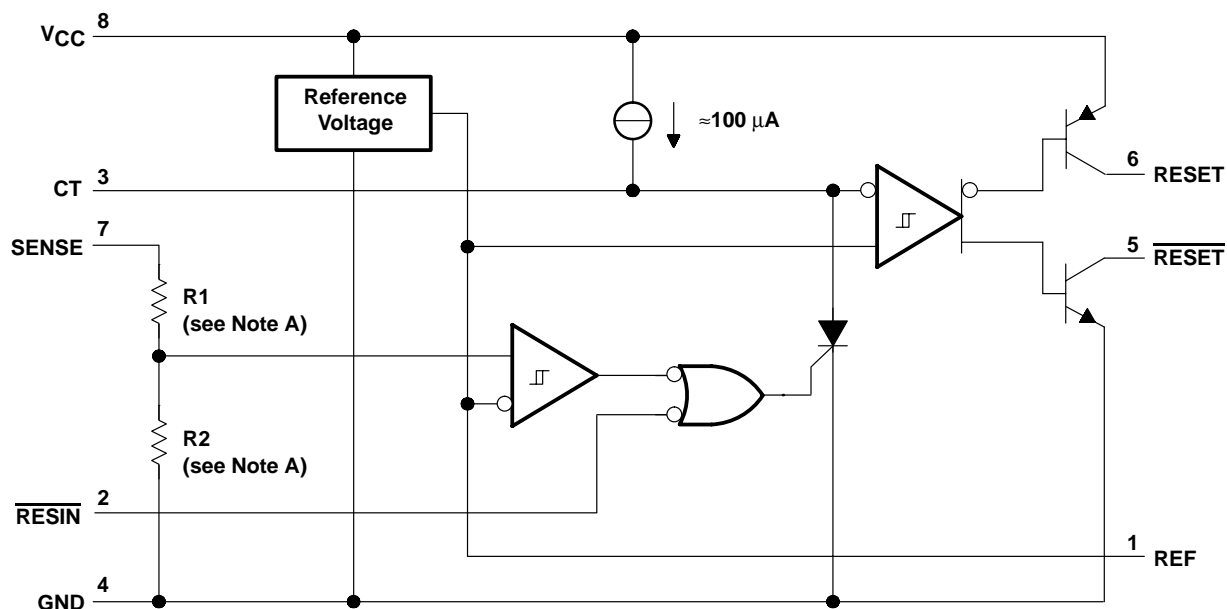
The TL77xxA family of integrated-circuit supply-voltage supervisors is designed specifically for use as reset controllers in microcomputer and microprocessor systems. The supply-voltage supervisor monitors the supply for undervoltage conditions at the SENSE input. During power up, the  $\overline{\text{RESET}}$  output becomes active (low) when  $V_{CC}$  attains a value approaching 3.6 V. At this point (assuming that SENSE is above  $V_{IT+}$ ), the delay timer function activates a time delay, after which outputs  $\overline{\text{RESET}}$  and RESET go inactive (high and low, respectively). When an undervoltage condition occurs during normal operation,  $\overline{\text{RESET}}$  and RESET go active. To ensure that a complete reset occurs, the reset outputs remain active for a time delay after the voltage at the SENSE input exceeds the positive-going threshold value. The time delay is determined by the value of the external capacitor  $C_T$ :  $t_d = 1.3 \times 10^4 \times C_T$ , where  $C_T$  is in farads (F) and  $t_d$  is in seconds (s).

During power down and when SENSE is below  $V_{IT-}$ , the outputs remain active until  $V_{CC}$  falls below 2 V. After this, the outputs are undefined.

An external capacitor (typically 0.1  $\mu\text{F}$ ) must be connected to REF to reduce the influence of fast transients in the supply voltage.

## functional block diagram

The functional block diagram is shown for illustrative purposes only; the actual circuit includes a trimming network to adjust the reference voltage and sense-comparator trip point.



- NOTES: A. TL7702A: R1 = 0  $\Omega$ , R2 = open  
 TL7705A: R1 = 7.8 k $\Omega$ , R2 = 10 k $\Omega$   
 TL7709A: R1 = 19.7 k $\Omega$ , R2 = 10 k $\Omega$   
 TL7712A: R1 = 32.7 k $\Omega$ , R2 = 10 k $\Omega$   
 TL7715A: R1 = 43.4 k $\Omega$ , R2 = 10 k $\Omega$   
 B. Resistor values shown are nominal.



# TL7702A, TL7705A, TL7709A, TL7712A, TL7715A SUPPLY-VOLTAGE SUPERVISORS

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## recommended operating conditions

|                 |   | MIN      | MAX | UNIT       |    |
|-----------------|---|----------|-----|------------|----|
| V <sub>CC</sub> | Supply voltage  | 3.5      | 18  | V          |    |
| V <sub>IH</sub> | High-level input voltage at $\overline{\text{RESIN}}$ | 2        |     | V          |    |
| V <sub>IL</sub> | Low-level input voltage at $\overline{\text{RESIN}}$  |          | 0.6 | V          |    |
| V <sub>I</sub>  | Input voltage, SENSE                                  | TL7702A  | 0   | See Note 2 | V  |
|                 |   | TL7705A  | 0   | 10         |    |
|                 |   | TL7709A  | 0   | 15         |    |
|                 |   | TL7712A  | 0   | 20         |    |
|                 |   | TL7715A  | 0   | 20         |    |
| I <sub>OH</sub> | High-level output current, $\overline{\text{RESET}}$  |          | -16 | mA         |    |
| I <sub>OL</sub> | Low-level output current, $\overline{\text{RESET}}$   |          | 16  | mA         |    |
| T <sub>A</sub>  | Operating free-air temperature range                  | TL77xxAC | 0   | 70         | °C |
|                 |   | TL77xxAI | -40 | 85         |    |

NOTE 2: For proper operation of the TL7702A, the voltage applied to the SENSE terminal should not exceed V<sub>CC</sub> - 1 V or 6 V, whichever is less.

## electrical characteristics over recommended operating conditions (unless otherwise noted)

| PARAMETER        |  | TEST CONDITION <sup>†</sup>               | TL77xxAC<br>TL77xxAI  |      |      | UNIT  |   |
|------------------|--|---|---|------|------|-------|---|
|                  |  |   | MIN   | TYP  | MAX  |       |   |
| V <sub>OH</sub>  | High-level output voltage, $\overline{\text{RESET}}$     | I <sub>OH</sub> = -16 mA                  | V <sub>CC</sub> -1.5  |      |      | V     |   |
| V <sub>OL</sub>  | Low-level output voltage, $\overline{\text{RESET}}$      | I <sub>OL</sub> = 16 mA                   | 0.4   |      |      | V     |   |
| V <sub>ref</sub> | Reference voltage  | T <sub>A</sub> = 25°C                     | 2.48  | 2.53 | 2.58 | V     |   |
| V <sub>IT-</sub> | Negative-going input threshold voltage, SENSE            | T <sub>A</sub> = 25°C                     | TL7702A   | 2.48 | 2.53 | 2.58  | V |
|                  |  |   | TL7705A   | 4.5  | 4.55 | 4.6   |   |
|                  |  |   | TL7709A   | 7.5  | 7.6  | 7.7   |   |
|                  |  |   | TL7712A   | 10.6 | 10.8 | 11    |   |
|                  |  |   | TL7715A   | 13.2 | 13.5 | 13.8  |   |
| V <sub>hys</sub> | Hysteresis, SENSE (V <sub>IT+</sub> - V <sub>IT-</sub> ) | T <sub>A</sub> = 25°C                     | TL7702A   | 10   |      | mV    |   |
|                  |  |   | TL7705A   | 15   |      |       |   |
|                  |  |   | TL7709A   | 20   |      |       |   |
|                  |  |   | TL7712A   | 35   |      |       |   |
|                  |  |   | TL7715A   | 45   |      |       |   |
| I <sub>I</sub>   | RESIN  | V <sub>I</sub> = 2.4 V to V <sub>CC</sub> | 20  |      |      | μA    |   |
|                  |  | V <sub>I</sub> = 0.4 V                    | -100  |      |      |       |   |
|                  | SENSE  | TL7702A                                   | V <sub>ref</sub> < V <sub>I</sub> < V <sub>CC</sub> - 1.5 V |      |      | 0.5 2 |   |
| I <sub>OH</sub>  | High-level output current, $\overline{\text{RESET}}$     | V <sub>O</sub> = 18 V                     | 50  |      |      | μA    |   |
| I <sub>OL</sub>  | Low-level output current, $\overline{\text{RESET}}$      | V <sub>O</sub> = 0                        | -50   |      |      | μA    |   |
| I <sub>CC</sub>  | Supply current   | All inputs and outputs open               | 1.8   | 3    |      | mA    |   |

<sup>†</sup> All electrical characteristics are measured with 0.1-μF capacitors connected at REF, CT, and V<sub>CC</sub> to GND.



switching characteristics over recommended operating conditions (unless otherwise noted)

| PARAMETER   | TEST CONDITIONS†   | TL77xxAC<br>TL77xxAI    |            |     | UNIT          |
|---|--|-------------------------|------------|-----|---------------|
|   |  | MIN                     | TYP        | MAX |               |
| Output pulse duration   | $C_T = 0.1 \mu\text{F}$  | 0.65                    | 1.2        | 2.6 | msec          |
| Input pulse duration at $\overline{\text{RESIN}}$                                       |  | 0.4                     |            |     | $\mu\text{s}$ |
| $t_w(\text{S})$ Pulse duration at SENSE input to switch outputs                         | $V_{IH} = V_{IT-} + 200 \text{ mV}, V_{IL} = V_{IT-} - 200 \text{ mV}$ | 2                       |            |     | $\mu\text{s}$ |
| $t_{pd}$ Propagation delay time, $\overline{\text{RESIN}}$ to $\overline{\text{RESET}}$ | $V_{CC} = 5 \text{ V}$   |                         |            | 1   | $\mu\text{s}$ |
| $t_r$ Rise time   | $\overline{\text{RESET}}$  | $V_{CC} = 5 \text{ V},$ | See Note 5 | 0.2 | $\mu\text{s}$ |
|   | $\overline{\text{RESET}}$  |                         |            | 3.5 |               |
| $t_f$ Fall time   | $\overline{\text{RESET}}$  | $V_{CC} = 5 \text{ V},$ | See Note 5 | 3.5 | $\mu\text{s}$ |
|   | $\overline{\text{RESET}}$  |                         |            | 0.2 |               |

† All switching characteristics are measured with 0.1- $\mu\text{F}$  capacitors connected at REF and  $V_{CC}$  to GND.

NOTE 5: The rise and fall times are measured with a 4.7-k $\Omega$  load resistor at RESET and  $\overline{\text{RESET}}$ .

PARAMETER MEASUREMENT INFORMATION

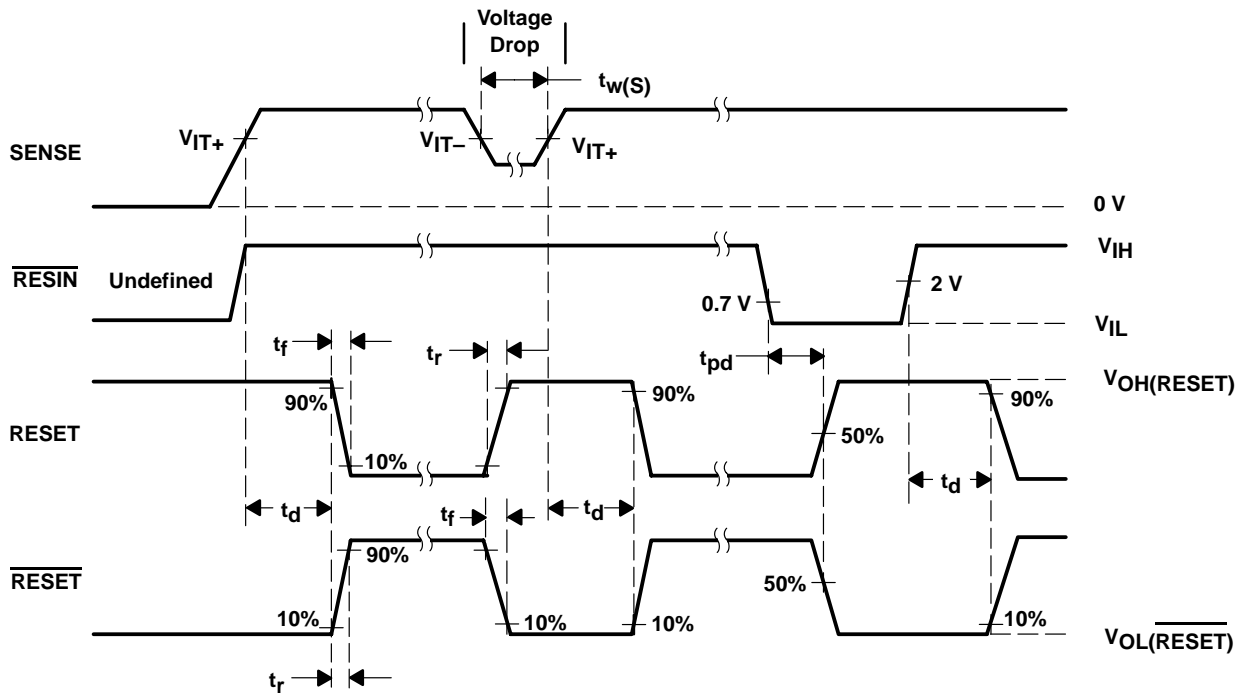


Figure 1. Voltage Waveforms

# TL7702A, TL7705A, TL7709A, TL7712A, TL7715A SUPPLY-VOLTAGE SUPERVISORS

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## TYPICAL CHARACTERISTICS†

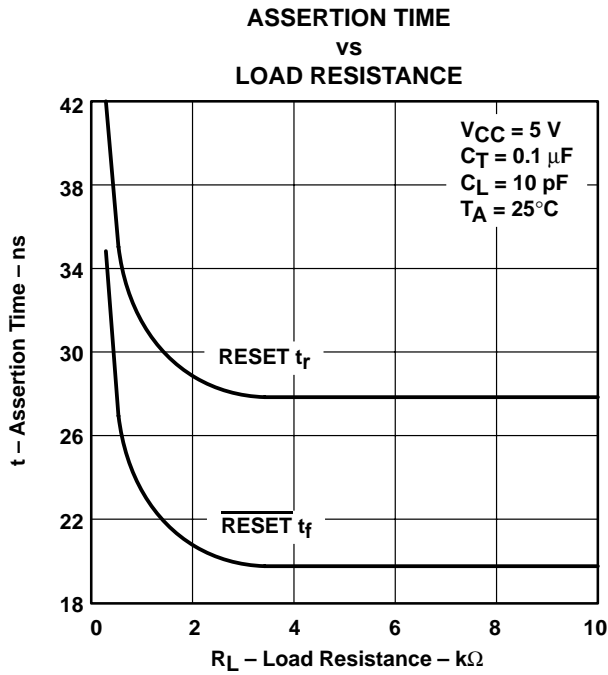


Figure 2

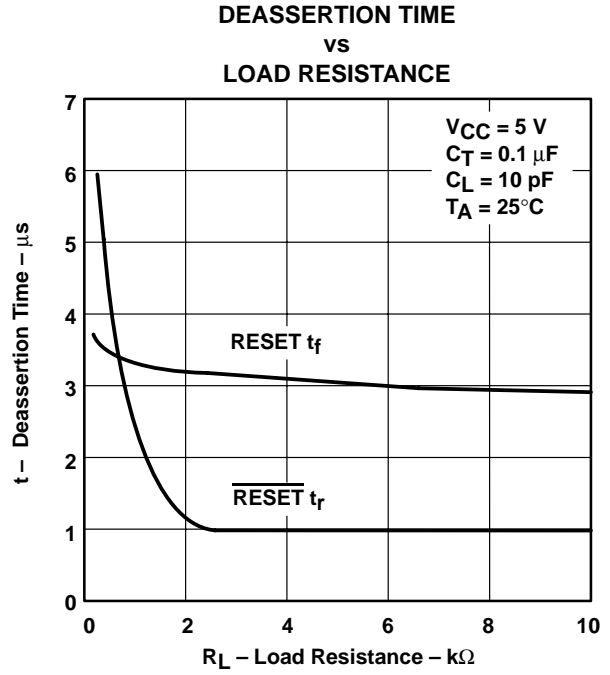


Figure 3

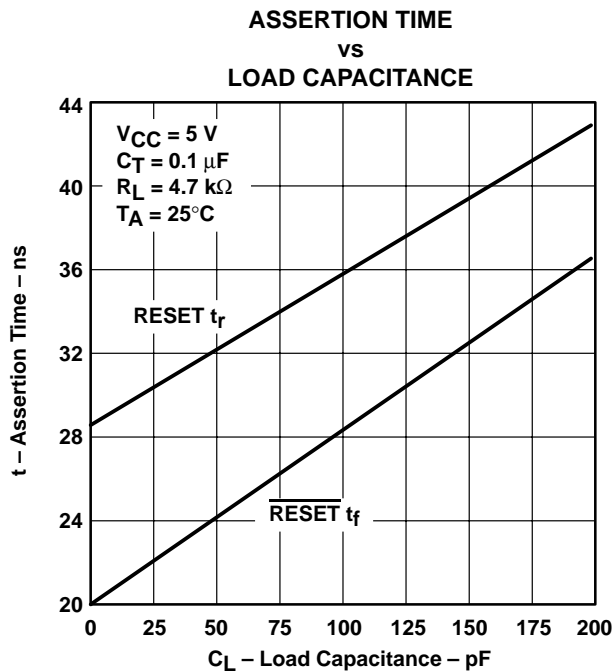


Figure 4

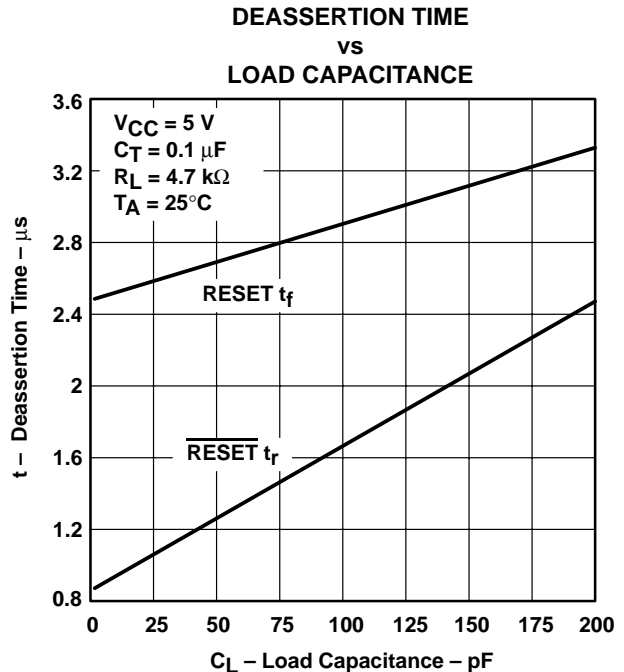


Figure 5

† For proper operation, both RESET and  $\overline{\text{RESET}}$  should be terminated with resistors of similar value. Failure to do so may cause unwanted plateauing in either output waveform during switching.

APPLICATION INFORMATION

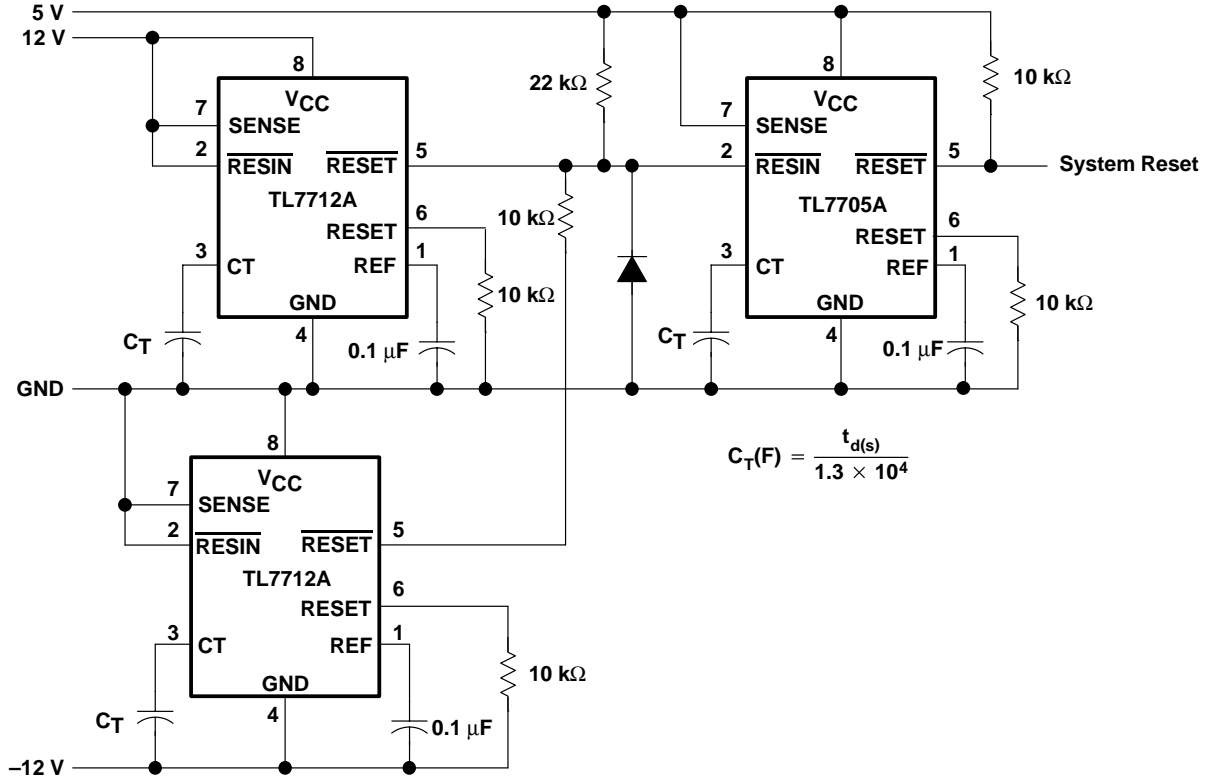


Figure 6. Multiple Power-Supply System Reset Generation

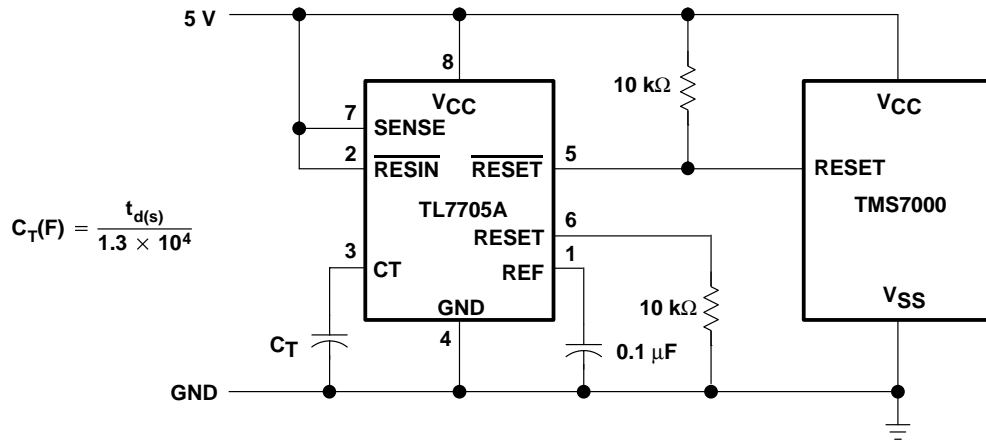


Figure 7. Reset Controller for TMS7000 System

# TL7702A, TL7705A, TL7709A, TL7712A, TL7715A SUPPLY-VOLTAGE SUPERVISORS

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## APPLICATION INFORMATION

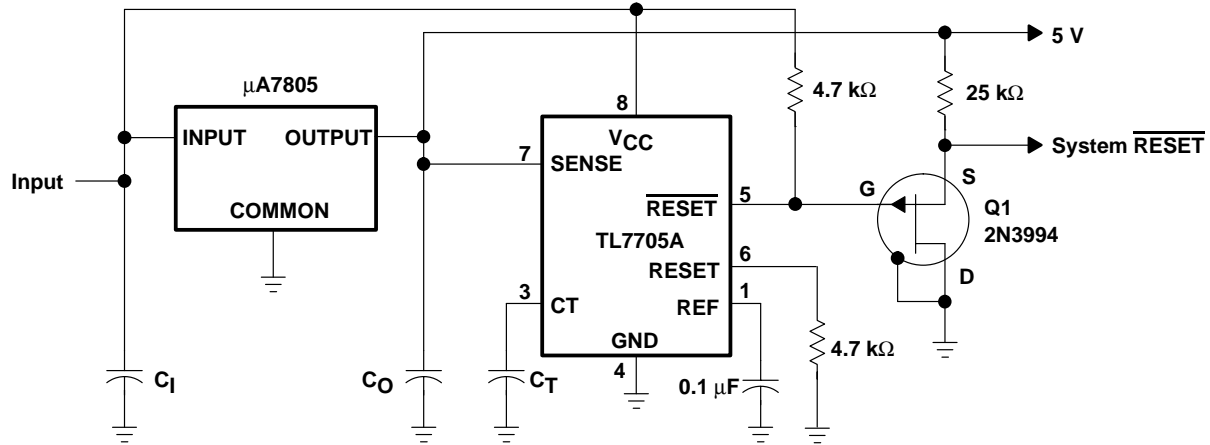


Figure 8. Eliminating Undefined States Using a P-Channel JFET

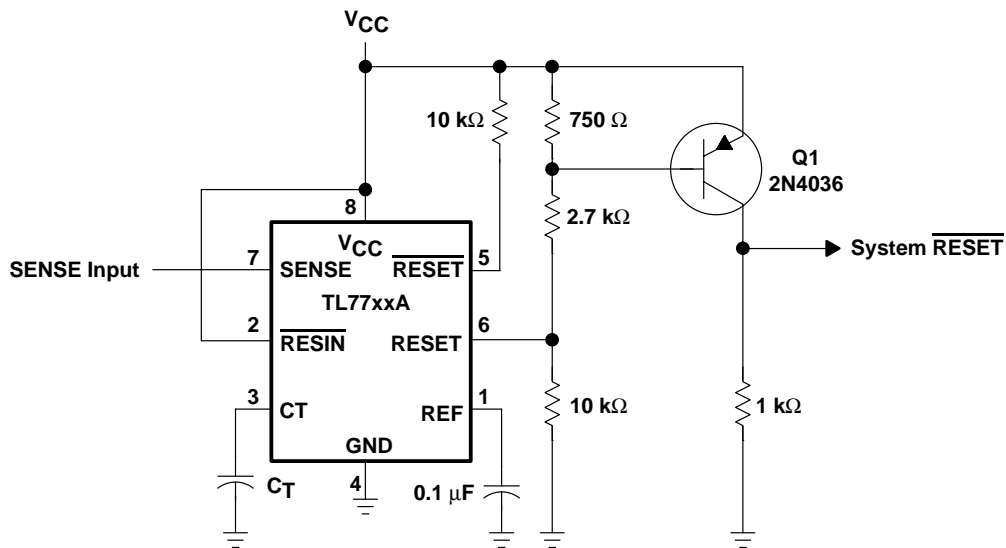


Figure 9. Eliminating Undefined States Using a pnp Transistor



**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--|
| 5962-88685012A   | OBSOLETE              | LCCC         | FK              | 20   |             | TBD                     | Call TI          | Call TI                                    |
| TL7702ACD        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7702ACDE4      | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7702ACDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR                         |
| TL7702ACDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7702ACDRE4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7702ACDRG4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR                         |
| TL7702ACP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| TL7702ACPE4      | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| TL7702AID        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7702AIDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR                         |
| TL7702AIDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7702AIDRG4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR                         |
| TL7702AIP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| TL7702AMFKB      | OBSOLETE              | LCCC         | FK              | 20   |             | TBD                     | Call TI          | Call TI                                    |
| TL7702AMJG       | OBSOLETE              | CDIP         | JG              | 8    |             | TBD                     | Call TI          | Call TI                                    |
| TL7702AMJGB      | OBSOLETE              | CDIP         | JG              | 8    |             | TBD                     | Call TI          | Call TI                                    |
| TL7705ACD        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7705ACDE4      | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7705ACDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR                         |
| TL7705ACDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7705ACDRE4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR                        |
| TL7705ACDRG4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR                         |
| TL7705ACP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| TL7705ACPSLE     | OBSOLETE              | SO           | PS              | 8    |             | TBD                     | Call TI          | Call TI                                    |
| TL7705ACPSR      | ACTIVE                | SO           | PS              | 8    | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| TL7705ACPSRE4    | ACTIVE                | SO           | PS              | 8    | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TL7705AID        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7705AIDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| TL7705AIDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7705AIDRG4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| TL7705AIP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| TL7705AIPe4      | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| TL7705AMFKB      | OBSOLETE              | LCCC         | FK              | 20   |             | TBD                     | Call TI          | Call TI                      |
| TL7705AMJG       | OBSOLETE              | CDIP         | JG              | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7705AMJGB      | OBSOLETE              | CDIP         | JG              | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7709ACD        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7709ACDE4      | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7709ACDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7709ACDRE4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7709ACP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| TL7709AID        | OBSOLETE              | SOIC         | D               | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7709AIP        | OBSOLETE              | PDIP         | P               | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7712ACD        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7712ACDE4      | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7712ACDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7712ACDRE4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7712ACP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| TL7712ACPE4      | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| TL7712AID        | OBSOLETE              | SOIC         | D               | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7712AIP        | OBSOLETE              | PDIP         | P               | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7715ACD        | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7715ACDE4      | ACTIVE                | SOIC         | D               | 8    | 75          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR          |
| TL7715ACP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| TL7715AID        | OBSOLETE              | SOIC         | D               | 8    |             | TBD                     | Call TI          | Call TI                      |
| TL7715AIP        | OBSOLETE              | PDIP         | P               | 8    |             | TBD                     | Call TI          | Call TI                      |

---

(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) 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.

**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.

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JG (R-GDIP-T8)

CERAMIC DUAL-IN-LINE



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification.  
 E. Falls within MIL STD 1835 GDIP1-T8

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



4040140/D 10/96

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a metal lid.
  - D. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE



4040082/D 05/98

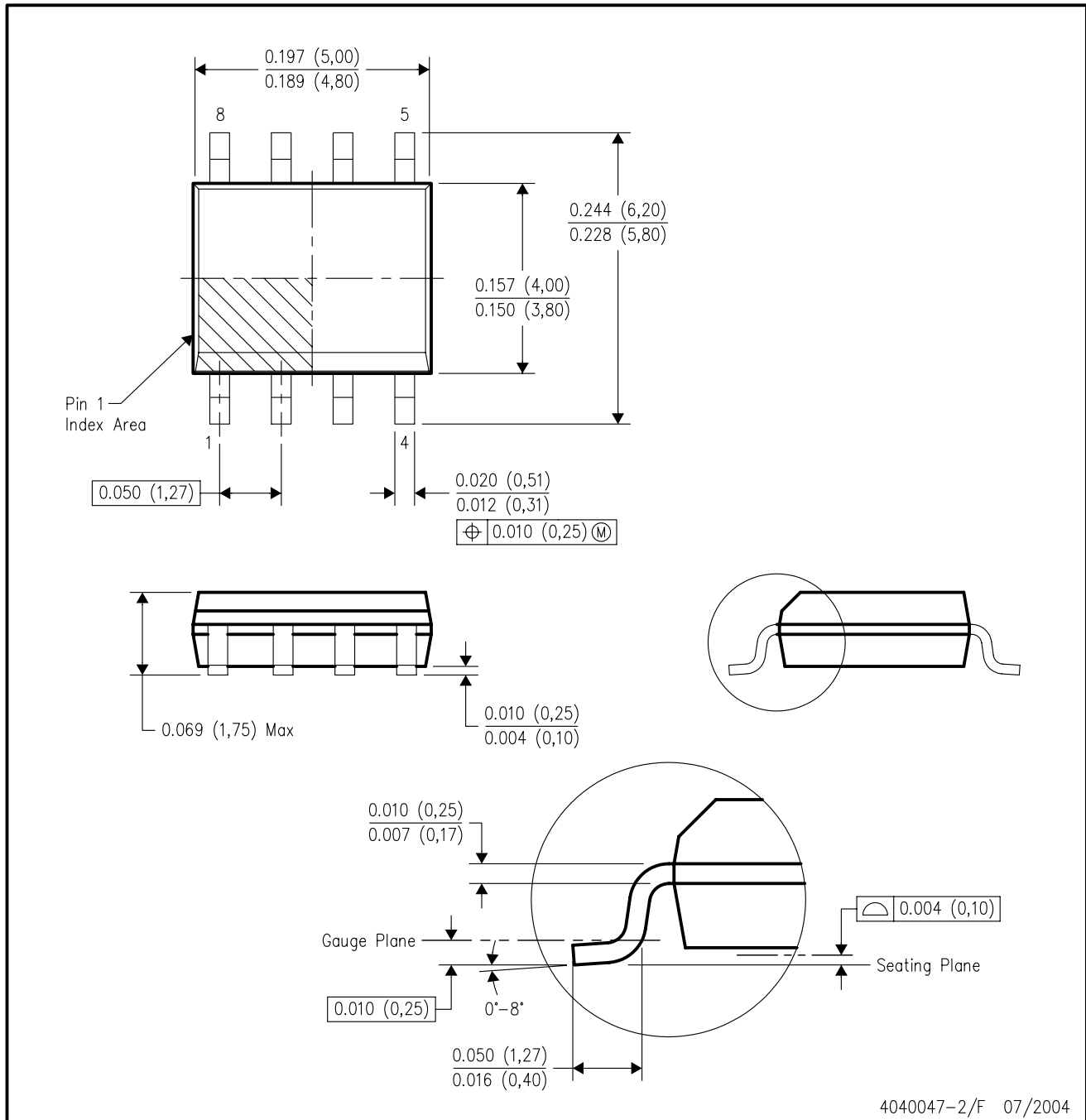
- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-001

For the latest package information, go to [http://www.ti.com/sc/docs/package/pkg\\_info.htm](http://www.ti.com/sc/docs/package/pkg_info.htm)



D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

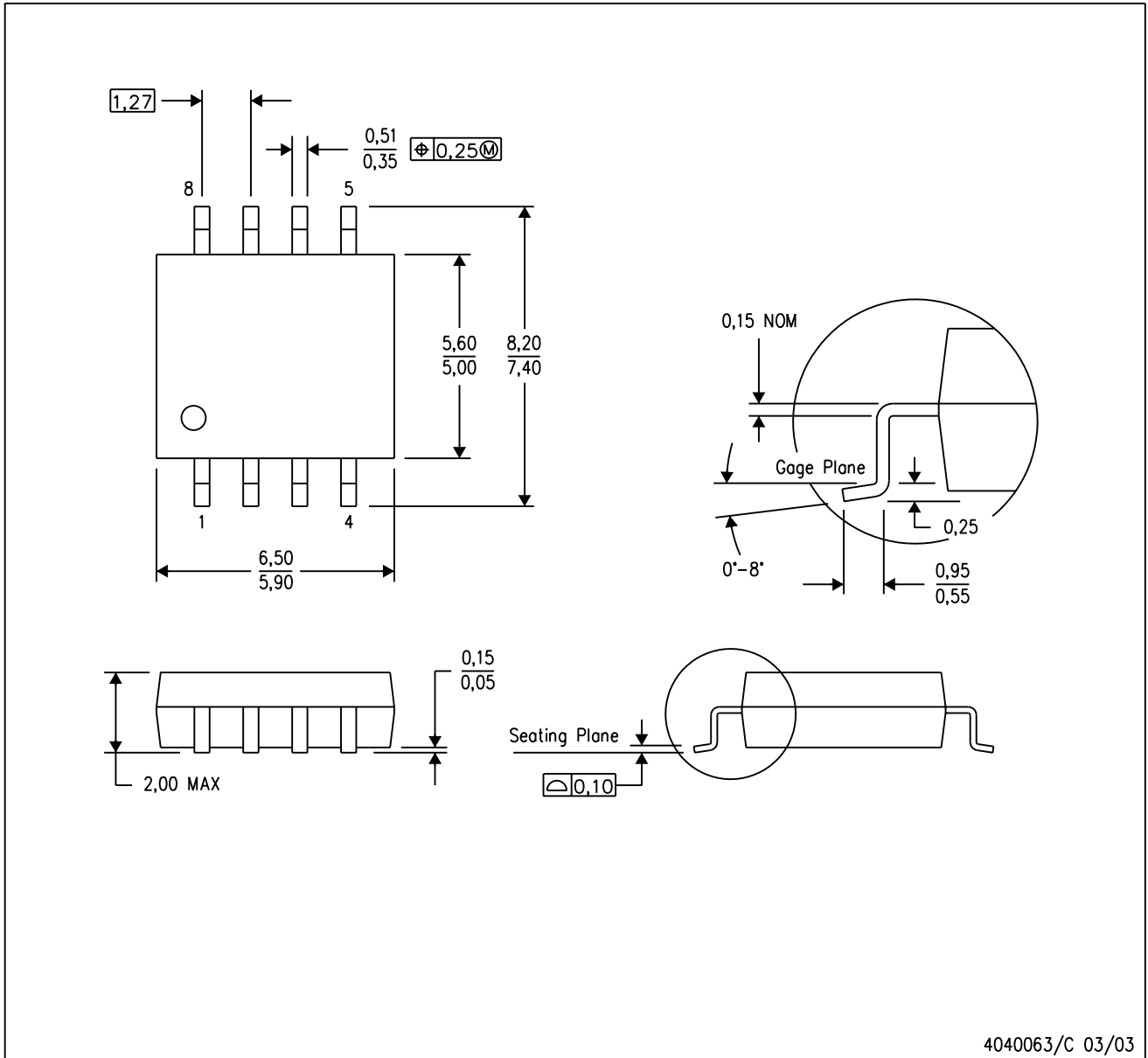


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-012 variation AA.

## MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



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