

## SUPPLY VOLTAGE SUPERVISORS

- POWER-ON RESET GENERATOR
- AUTOMATIC RESET GENERATION AFTER VOLTAGE DROP
- WIDE SUPPLY VOLTAGE RANGE ... 3 V TO 18 V
- PRECISION VOLTAGE SENSOR
- TEMPERATURE-COMPENSATED VOLTAGE REFERENCE
- TRUE AND COMPLEMENT RESET OUTPUTS
- EXTERNALLY ADJUSTABLE PULSE WIDTH

### DESCRIPTION

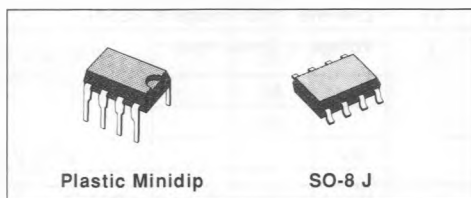
The TL7700A series are monolithic integrated circuit supply voltage supervisors specifically designed for use as reset controllers in microcomputer and microprocessor systems. During power-up the device tests the supply voltage and keeps the RESET and RESET outputs active (high and low, respectively) as long as the supply voltage has not reached its nominal voltage value. Taking RESIN low has the same effect. To ensure that the microcomputer system has reset, the TL7700A then initiates an internal time delay that delays the return of the reset outputs to their inactive states. Since the time delay for most microcomputers and microproces-

sors is in the order of several machine cycles, the device internal time delay is determined by an external time delay is determined by an external capacitor connected to the  $C_T$  input (pin 3).

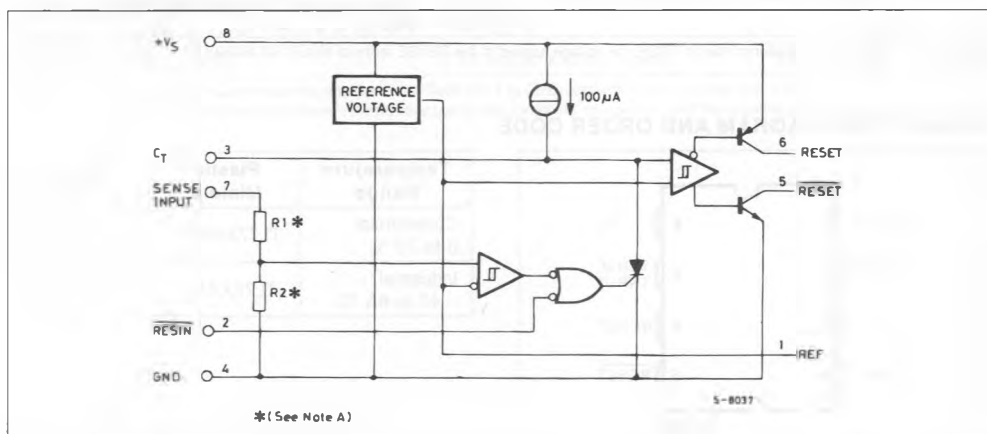
$$t_d = 1.3 \times 10^4 \times C_T$$

Where :  $C_T$  is in farads (F) and  $t_d$  in seconds (s). In addition, when the supply voltage drops below the nominal value, the outputs will be active until the supply voltage returns to the nominal value. An external capacitor (typically 0.1  $\mu$ F) must be connected to the REF output (pin 1) to reduce the influence of fast transients in the supply voltage.

The TL7700AI series is characterized for operation from  $-25^\circ\text{C}$  to  $85^\circ\text{C}$ ; the TL7700AC series is characterized from  $0^\circ\text{C}$  to  $70^\circ\text{C}$ .



### BLOCK DIAGRAM



\* 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 $\Omega$ .

ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter                                                   | Value       | Unit |
|------------------|-------------------------------------------------------------|-------------|------|
| V <sub>S</sub>   | Supply Voltage, V <sub>CC</sub> (see note 1)                | 20          | V    |
| V <sub>i</sub>   | Input Voltage Range at RESIN                                | − 0.3 to 20 | V    |
| V <sub>i</sub>   | Input Voltage at SENSE : TL7702A (see note 2)               | − 0.3 to 6  | V    |
|                  | TL7705A                                                     | − 0.3 to 10 | V    |
|                  | TL7709A                                                     | − 0.3 to 15 | V    |
|                  | TL7712A                                                     | − 0.3 to 20 | V    |
|                  | TL7715A                                                     | − 0.3 to 20 | V    |
| I <sub>OH</sub>  | High-level Output Current at RESET                          | − 30        | mA   |
| I <sub>OL</sub>  | Low-level Output Current at RESET                           | 30          | mA   |
| T <sub>amb</sub> | Operating Free-air Temperature Range : TL77XXAI<br>TL77XXAC | − 25 to 85  | °C   |
|                  |                                                             | 0 to 70     | °C   |
| T <sub>stg</sub> | Storage Temperature Range                                   | − 65 to 150 | °C   |

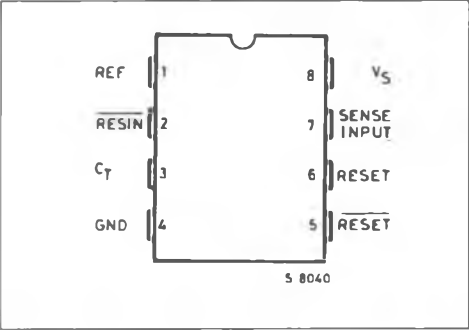
Notes : 1. All voltage values are with respect to the network ground terminal  
2. For the TL7700A, the voltage applied to the SENSE terminal must never exceed V<sub>S</sub>.

RECOMMENDED OPERATING CONDITIONS

| Symbol           | Parameter                            |           | Min. | Max.       | Unit |
|------------------|--------------------------------------|-----------|------|------------|------|
| V <sub>S</sub>   | Supply Voltage                       |           | 3.6  | 18         | V    |
| V <sub>IH</sub>  | High-level Input Voltage at RESIN    |           | 2    |            | V    |
| V <sub>IL</sub>  | Low-level Input Voltage at RESIN     |           |      | 0.6        | V    |
| V <sub>i</sub>   | Voltage at Sense Input               | TL7702A   | 0    | See Note 3 | V    |
|                  |                                      | TL7705A   | 0    | 10         |      |
|                  |                                      | TL7709A   | 0    | 15         |      |
|                  |                                      | TL7712A   | 0    | 20         |      |
|                  |                                      | TL7715A   | 0    | 20         |      |
| I <sub>OH</sub>  | High-level Output Current at RESET   |           |      | − 16       | mA   |
| I <sub>OL</sub>  | Low-level Output Current at RESET    |           |      | 16         | mA   |
| T <sub>amb</sub> | Operating Free-air Temperature Range | TL77 - AI | − 25 | 85         | °C   |
|                  |                                      | TL77 - AC | 0    | 70         |      |

Note : 3. For proper operation of the TL7702A, the voltage applied to the SENSE terminal should not exceed V<sub>S</sub> − 1 V or 6 V, whichever is less.

CONNECTION DIAGRAM AND ORDER CODE



| Temperature Range           | Plastic Minidip | S0-8      |
|-----------------------------|-----------------|-----------|
| Commercial<br>0 to 70 °C    | TL77XXACP       | TL77XXACD |
| Industrial<br>− 40 to 85 °C | TL77XXAIP       | TL77XXAID |

## THERMAL DATA

|                        |                                     |      |     |      |
|------------------------|-------------------------------------|------|-----|------|
| $R_{th \text{ j-amb}}$ | Thermal Resistance Junction-ambient | Max. | 120 | °C/W |
|------------------------|-------------------------------------|------|-----|------|

**ELECTRICAL CHARACTERISTICS** these specifications unless otherwise specified, apply for :  
 $T_{amb} = -25$  to  $85$  °C (TLXXAI) ;  $T_{amb} = 0$  to  $70$  °C (TL77XXAC)

| Symbol           | Parameter                          |         | Test Conditions (1)                          | Min.        | Typ. | Max.  | Unit    |
|------------------|------------------------------------|---------|----------------------------------------------|-------------|------|-------|---------|
| $V_{OH}$         | High-level Output Voltage at RESET |         | $I_{OH} = -16$ mA                            | $V_S - 1.5$ |      |       | V       |
| $V_{OL}$         | Low-Level Output Voltage at RESET  |         | $I_{OL} = 16$ mA                             |             |      | 0.4   | V       |
| $V_{ref}$        | Reference Voltage                  |         | $T_{amb} = 25$ °C                            | 2.48        | 2.53 | 2.58  | V       |
| $V_T$            | Threshold Voltage at SENSE Input   | TL7702A | $V_S = 3.6$ V to $18$ V<br>$T_{amb} = 25$ °C | 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 | 11.0  |         |
|                  |                                    | TL7715A |                                              | 13.2        | 13.5 | 13.8  |         |
| $V_T$            | Threshold Voltage at SENSE Input   | TL7702A | $V_S = 3.6$ V to $18$ V                      | 2.45        | 2.53 | 2.58  | V       |
|                  |                                    | TL7705A |                                              | 4.45        | 4.55 | 4.6   |         |
|                  |                                    | TL7709A |                                              | 7.4         | 7.6  | 7.7   |         |
|                  |                                    | TL7712A |                                              | 10.4        | 10.8 | 11.0  |         |
|                  |                                    | TL7715A |                                              | 13.0        | 13.5 | 13.8  |         |
| $V_{T+}, V_{T-}$ | Hysteresis (2) at SENSE Input      | TL7702A | $V_S = 3.6$ V to $18$ V<br>$T_{amb} = 25$ °C |             | 10   |       | mV      |
|                  |                                    | TL7705A |                                              |             | 15   |       |         |
|                  |                                    | TL7709A |                                              |             | 20   |       |         |
|                  |                                    | TL7712A |                                              |             | 35   |       |         |
|                  |                                    | TL7715A |                                              |             | 45   |       |         |
| $I_I$            | Input Current at RESIN Input       |         | $V_I = 2.4$ V to $V_S$                       |             |      | 20    | $\mu$ A |
|                  |                                    |         | $V_I = 0.4$ V                                |             |      | - 100 |         |
| $I_I$            | Input Current at SENSE Input       | TL7702A | $V_{ref} < V_I < V_S - 1.5$ V                |             | 0.5  | 2     |         |
| $I_{OH}$         | High-level Output Current at RESET |         | $V_O = 18$ V                                 |             |      | 50    |         |
| $I_{OL}$         | Low-level Output Current at RESET  |         | $V_O = 0$ V                                  |             |      | - 50  |         |
| $I_S$            | Supply Current                     |         | All Inputs and out. open                     |             | 1.8  | 3.3   | mA      |

**Notes :** 1. All characteristics are measured with  $C = 0.1$   $\mu$ F from Pin 1 to GND, and with  $C = 0.1$   $\mu$ F from Pin 3 to GND.  
 2. Hysteresis is the difference between the positive going input threshold voltage,  $V_{T+}$ , and the negative going input threshold voltage,  $V_{T-}$ .

SWITCHING CHARACTERISTICS

| Symbol     | Parameter                                  | Test Conditions                                                                | Min. | Typ. | Max. | Unit    |
|------------|--------------------------------------------|--------------------------------------------------------------------------------|------|------|------|---------|
| $t_{pi}$   | Pulse Width at SENSE Input                 | $V_{ih} = V_{ityp} + 0.04 \times V_i$<br>$V_{il} = V_{ityp} - 0.04 \times V_i$ | 0.9  |      |      | $\mu s$ |
| $t_{pi}$   | Pulse Width at RESIN Input                 |                                                                                | 0.4  |      |      | $\mu s$ |
| $t_{po}$   | Pulse Width at Output                      | $C_f = 0.1 \mu F$                                                              | 0.65 | 1.3  | 2.6  | ms      |
| $t_{pdHL}$ | Propagation Delay Time from RESIN to RESET | $C_L = 100 pF$ $V_S = 5 V$<br>$R_L = 4.7 K\Omega$                              |      |      | 1    | $\mu s$ |
| $t_{r/f}$  | Rise/Falltime at RESET and RESET           | $C_L = 10 pF$ $V_S = 5 V$<br>$R_L = 4.7 K\Omega$                               |      |      | 1    | $\mu s$ |

Figure 1 : Multiple Power Supply System Reset Generation.

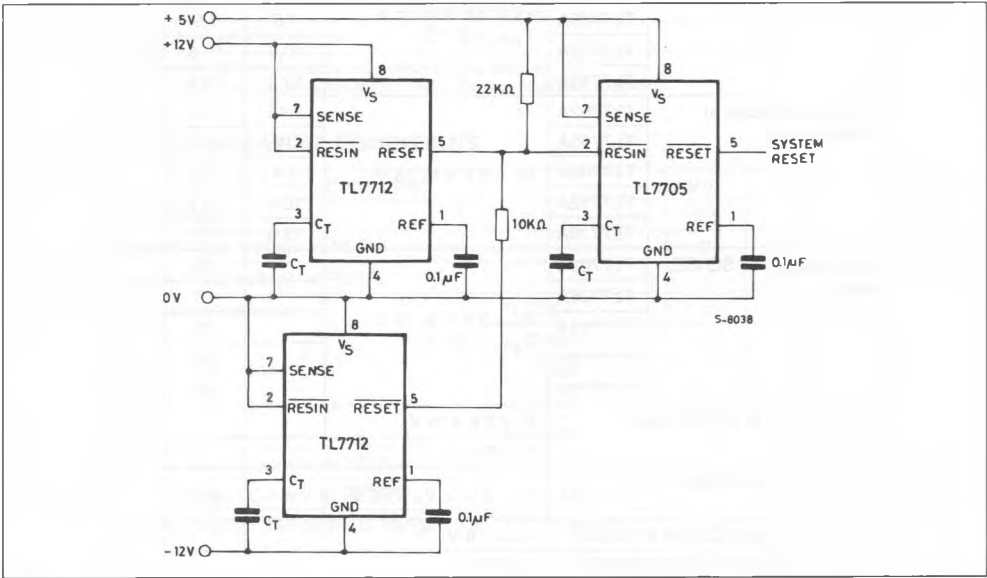


Figure 2 : Reset Controller for  $\mu P$ .

