



# Low-Cost, Power-On Reset and Watchdog Controllers

MAX698/MAX699

## General Description

The MAX698/MAX699 monitor the +5V supply in microprocessor ( $\mu$ P) and digital systems. They supply a RESET pulse of at least 140ms duration on power-up, power-down, and during low-voltage brownout conditions. Circuit reliability is increased at reduced cost by eliminating all external components and adjustments.

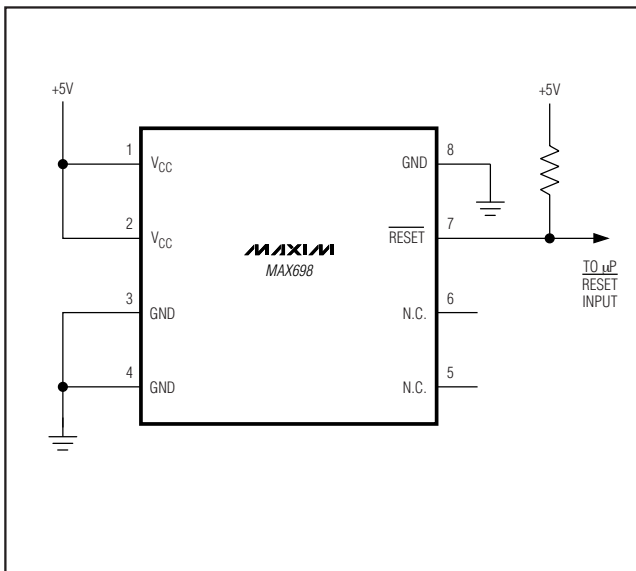
The MAX699 includes all features of the MAX698, but also provides a watchdog input to monitor microprocessor activity. The RESET output goes low if the watchdog input (WDI) is not toggled within 1 second. The watchdog feature can be disabled by leaving WDI open.

Both parts are supplied in 8-lead PDIP and 16-lead 0.3in wide small outline (SO) packages and are specified from 0°C to +70°C for C grade devices and -40°C to +85°C for E devices. The SO versions, with more pins than the 8-lead PDIP, have additional outputs not available in DIP packages. These are RESET (without inversion) and watchdog output (WDO).

## Applications

- Computers
- Controllers
- Intelligent Instruments
- Automotive Systems
- Critical  $\mu$ P Power Monitoring

## Typical Operating Circuit



## Features

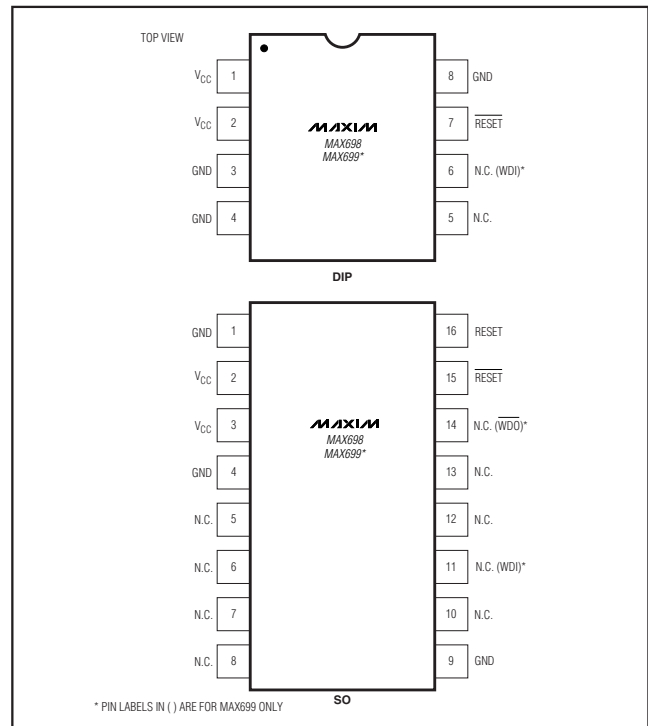
- ◆ Precision Voltage Monitor
- ◆ Power-OK/Reset Time Delay
- ◆ Watchdog Timer
- ◆ Minimum Component Count

## Ordering Information

| PART*     | TEMP RANGE     | PIN-PACKAGE |
|-----------|----------------|-------------|
| MAX698CPA | 0°C to +70°C   | 8 PDIP      |
| MAX698CWE | 0°C to +70°C   | 16 Wide SO  |
| MAX698EPA | -40°C to +85°C | 8 PDIP      |
| MAX698EWE | -40°C to +85°C | 16 Wide SO  |
| MAX699CPA | 0°C to +70°C   | 8 PDIP      |
| MAX699CWE | 0°C to +70°C   | 16 Wide SO  |
| MAX699EPA | -40°C to +85°C | 8 PDIP      |
| MAX699EWE | -40°C to +85°C | 16 Wide SO  |

\*Devices are available in both leaded and lead-free packaging. Specify lead free by adding the + symbol at the end of the part number when ordering.

## Pin Configuration



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## ABSOLUTE MAXIMUM RATINGS

|  |                          |
|--|--------------------------|
| V <sub>CC</sub> .....                            | -0.3V to +6.0V           |
| Input Voltage (with respect to GND)              |                          |
| WDI, WDO, RESET, $\overline{\text{RESET}}$ ..... | -0.3V to V <sub>CC</sub> |
| Operating Temperature Range                      |                          |
| C Suffix.....                                    | 0°C to +70°C             |
| E Suffix.....                                    | -40°C to +85°C           |
| Rate of Rise, V <sub>CC</sub> .....              | 100V/ $\mu$ s            |

|  |                 |
|--|-----------------|
| Power Dissipation (T <sub>A</sub> = +70°C)   |                 |
| 8-Pin PDIP (derated 5mW/°C above +70°C)..... | 400mW           |
| 16-Pin SO (derated 7mW/°C above +70°C).....  | 600mW           |
| Storage Temperature Range.....               | -65°C to +150°C |
| Lead Temperature (soldering, 10s).....       | +300°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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = +5V, T<sub>A</sub> = +25°C, unless otherwise noted.)

| PARAMETER   | CONDITIONS            |   | MIN  | TYP  | MAX  | UNITS   |
|---|-----------------------|---|------|------|------|---------|
| Operating Voltage Range                                 | T <sub>A</sub> = full |   | 3.0  |      | 5.5  | V       |
| Supply Current  |                       |   |      |      | 5    | mA      |
| Power-Up Reset Deassertion                              | T <sub>A</sub> = full |   | 4.50 | 4.65 | 4.75 | V       |
| Power-Up Reset Assertion                                | T <sub>A</sub> = full |   | 4.4  |      |      | V       |
| Hysteresis  |                       |   |      | 40   |      | mV      |
| Reset Output Pulse Width                                |                       |   | 140  |      | 500  | ms      |
| $\overline{\text{RESET}}$ OUTPUT (Open Drain)           | Output low            | I <sub>SINK</sub> = 1.6mA, V <sub>CC</sub> = 4.4V       |      |      | 0.4  | V       |
|   | Output high           | I <sub>SOURCE</sub> = 1 $\mu$ A, V <sub>CC</sub> = 5V   | 3.5  |      |      |         |
| RESET OUTPUT (SO Package Only)                          | Output low            | I <sub>SINK</sub> = 1.6mA, V <sub>CC</sub> = 5V         |      |      | 0.4  | V       |
|   | Output high           | I <sub>SOURCE</sub> = 1 $\mu$ A, V <sub>CC</sub> = 4.4V | 3.5  |      |      |         |
| $\overline{\text{WDO}}$ Output (MAX699 SO Package Only) | Output low            | I <sub>SINK</sub> = 1.6mA, V <sub>CC</sub> = 5V         |      |      | 0.4  | V       |
|   | Output high           | I <sub>SOURCE</sub> = 1 $\mu$ A, V <sub>CC</sub> = 4.4V | 3.5  |      |      |         |
| MAX699 Watchdog Timeout Period                          |                       |   | 1.00 | 1.6  | 2.25 | s       |
| MAX699 Minimum WDI Input Pulse Width                    |                       |   | 200  |      |      | ns      |
| MAX699 WDI Input Threshold                              | V <sub>CC</sub> = +5V | Logic-low   |      |      | 0.8  | V       |
|   |                       | Logic-high  | 3.8  |      |      |         |
| MAX699 WDI Input Current                                | WDI = V <sub>CC</sub> |   |      | 20   | 50   | $\mu$ A |
|   | WDI = 0V              |   | -50  | -15  |      |         |

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## Pin Description

**MAX698/MAX699**

| PIN        |         | NAME                                  | FUNCTION  |
|------------|---------|---------------------------------------|---|
| SO         | PDIP    |                                       |   |
| 1, 4, 9    | 3, 4, 8 | GND                                   | Chip Power Ground   |
| 2, 3       | 1, 2    | V <sub>CC</sub>                       | +5V Sense Input and MAX698/MAX699 Chip Power  |
| 5–8, 10–14 | 5, 6    | N.C.                                  | No Connection   |
| 10         | 6       | WDI (MAX699 Only)                     | (MAX699 Only.) A three-level input. If WDI remains high or low for more than the watchdog timeout period, RESET pulses low (WDO also goes low on the MAX699 SO package). If WDI is unconnected, the watchdog circuit is disabled.   |
| 14         | —       | $\overline{\text{WDO}}$ (MAX699 Only) | (MAX699 Only.) Goes low when WDI remains high or low for more than the watchdog timeout period. $\overline{\text{WDO}}$ is set high at the next WDI transition. If WDI is unconnected or at midsupply, $\overline{\text{WDO}}$ remains high. $\overline{\text{WDO}}$ also remains high when V <sub>CC</sub> falls below 4.4V. |
| 15         | 7       | $\overline{\text{RESET}}$             | Goes low when V <sub>CC</sub> falls below internally set threshold (see the <i>Electrical Characteristics</i> table).   |
| 16         | —       | RESET                                 | Goes high when V <sub>CC</sub> falls below internally set threshold.  |

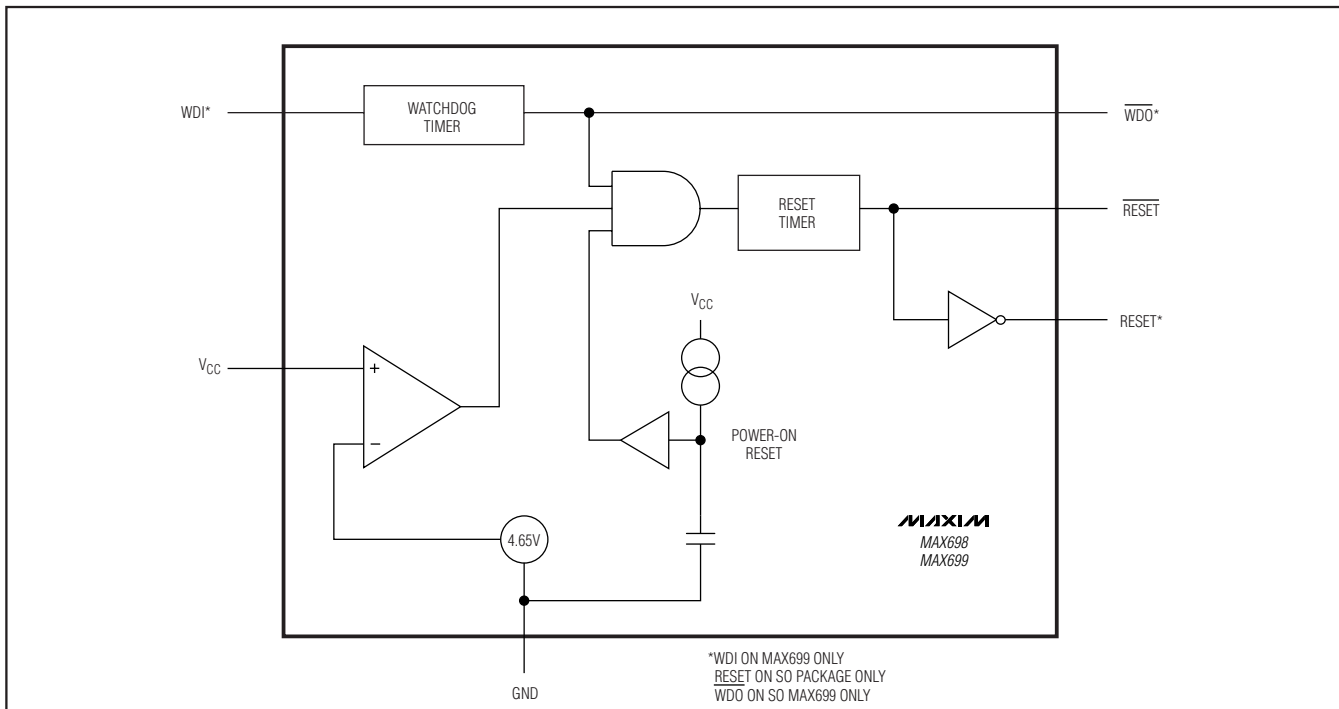


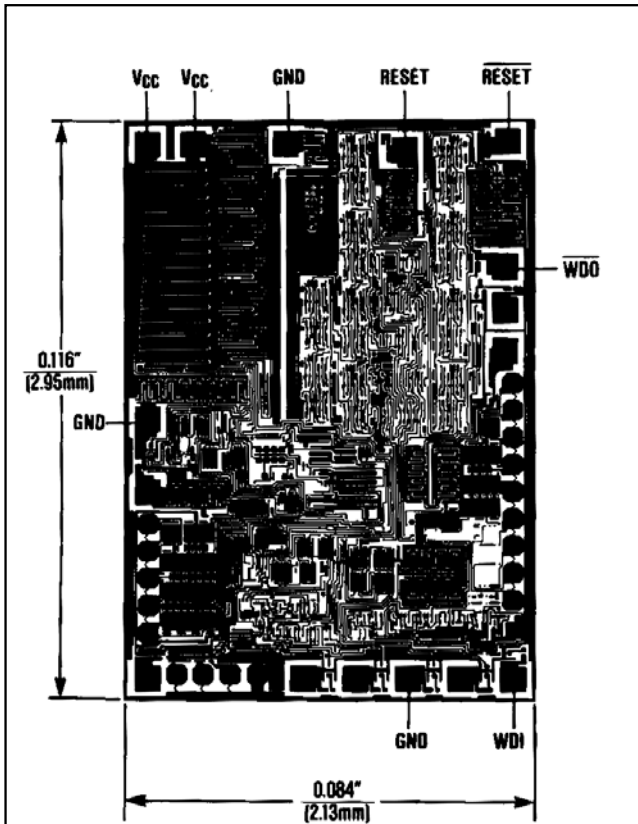
Figure 1. Block Diagram

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## Package Information

For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).

## Chip Topography



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