



# 4-Pin, Low-Power $\mu$ P Reset Circuits with Manual Reset

MAX6803/MAX6804/MAX6805

## General Description

The MAX6803/MAX6804/MAX6805 microprocessor ( $\mu$ P) supervisory circuits monitor the power supplies in 2.85V to 5.0V  $\mu$ P and digital systems. They increase circuit reliability and reduce cost by eliminating external components and adjustments. They also feature a debounced manual reset input.

These devices perform a single function: they assert a reset signal whenever the  $V_{CC}$  supply voltage declines below a preset threshold or whenever manual reset is asserted. Reset remains asserted for a preset timeout period after  $V_{CC}$  has risen above the reset threshold or after manual reset is deasserted. The only difference among the three devices is their output. The MAX6804 (push/pull) and MAX6805 (open-drain) have an active-low RESET output, while the MAX6803 (push/pull) has an active-high RESET output. The MAX6803/MAX6804 are guaranteed to be in the correct state for  $V_{CC}$  down to 0.7V. The MAX6805 is guaranteed to be in the correct state for  $V_{CC}$  down to 1.0V.

The reset comparator in these ICs is designed to ignore fast transients on  $V_{CC}$ . Reset thresholds are factory-trimmable between 2.63V and 4.80V, in approximately 100mV increments. These devices are available with a 1ms min, 20ms min, or 100ms min reset timeout period. Ideal for space-critical applications, the MAX6803/MAX6804/MAX6805 come packaged in a 4-pin SOT143. For a lower threshold voltage version, see the MAX6335/MAX6336/MAX6337.

## Applications

Computers  
 Controllers  
 Intelligent Instruments  
 Critical  $\mu$ P/ $\mu$ C Power Monitoring  
 Portable/Battery-Powered Equipment  
 Automotive

**Typical Operating Circuit and Pin Configuration appear at end of data sheet.**

**Selector Guide appears at end of data sheet.**

## Features

- ◆ Ultra-Low 0.7V Operating Supply Voltage
- ◆ Low 4.0 $\mu$ A Supply Current
- ◆ Precision Monitoring of 2.85V to 5.0V Power-Supply Voltages
- ◆ Reset Thresholds Available from 2.63V to 4.80V, in Approximately 100mV Increments
- ◆ Debounced Manual Reset Input
- ◆ Fully Specified over Temperature
- ◆ Three Power-On Reset Timeout Periods Available (1ms min, 20ms min, 100ms min)
- ◆ Low Cost
- ◆ Three Available Output Structures: Push/Pull RESET, Push/Pull RESET, Open-Drain RESET
- ◆ Guaranteed RESET/RESET Valid to  $V_{CC} = 0.7V$  (MAX6803/MAX6804)
- ◆ Power-Supply Transient Immunity
- ◆ No External Components Required
- ◆ 4-Pin SOT143 Package
- ◆ Pin Compatible with MAX811/MAX812 and MAX6314/MAX6315

## Ordering Information

| PART*           | TEMP RANGE      | PIN-PACKAGE |
|-----------------|-----------------|-------------|
| MAX6803US__D_-T | -40°C to +125°C | 4 SOT143    |
| MAX6804US__D_-T | -40°C to +125°C | 4 SOT143    |
| MAX6805US__D_-T | -40°C to +125°C | 4 SOT143    |

\*These devices are available in factory-set  $V_{CC}$  reset thresholds from 2.63V to 4.80V, in approximately 0.1V increments. Choose the desired reset threshold suffix from Table 1 and insert it in the blanks following "US" in the part number. Factory-programmed reset timeout periods are also available. Insert the number corresponding to the desired nominal reset timeout period (1 = 1ms min, 2 = 20ms min, 3 = 100ms min) in the blank following "D" in the part number. There are 15 standard versions with a required order increment of 2500 pieces. Sample stock is generally held on the standard versions only (see Selector Guide). Contact the factory for availability of non-standard versions (required order increment is 10,000 pieces). All devices available in tape-and-reel only.

Devices are available in both leaded and lead-free packaging. Specify lead-free by replacing "-T" with "+T" when ordering.



# 4-Pin, Low-Power $\mu$ P Reset Circuits with Manual Reset

## ABSOLUTE MAXIMUM RATINGS

Terminal Voltage (with respect to GND)

|   |                              |
|---|------------------------------|
| $V_{CC}$ .....  | -0.3V to +6V                 |
| Push/Pull $\overline{\text{RESET}}$ or $\overline{\text{RESET}}$ , $\overline{\text{MR}}$ ..... | -0.3V to ( $V_{CC} + 0.3$ V) |
| Open-Drain $\overline{\text{RESET}}$ .....  | -0.3V to +6V                 |
| Input Current ( $V_{CC}$ ) .....  | 20mA                         |
| Output Current ( $\overline{\text{RESET}}$ , $\overline{\text{RESET}}$ ) .....                  | 20mA                         |

Continuous Power Dissipation ( $T_A = +70^\circ\text{C}$ )

|  |   |
|--|---|
| 4-Pin SOT143 (derate 4mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$ ) ..... | 320mW                                       |
| Operating Temperature Range .....  | $-40^\circ\text{C}$ to $+125^\circ\text{C}$ |
| Junction Temperature .....   | $+150^\circ\text{C}$                        |
| Storage Temperature Range .....  | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Lead Temperature (soldering, 10s) .....                                      | $+300^\circ\text{C}$                        |

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

( $V_{CC}$  = full range,  $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ , unless otherwise noted. Typical values are at  $V_{CC} = +5.0\text{V}$  and  $T_A = +25^\circ\text{C}$ , reset not asserted.) (Note 1)

| PARAMETER   | SYMBOL   | CONDITIONS  |   | MIN                 | TYP      | MAX                | UNITS            |
|---|----------|---|---|---------------------|----------|--------------------|------------------|
| Supply Voltage Range<br>(Note 1)                                  | $V_{CC}$ | $T_A = 0^\circ\text{C}$ to $+125^\circ\text{C}$   | MAX6803/MAX6804   | 0.7                 |          | 5.5                | V                |
|   |          |   | MAX6805   | 1.0                 |          | 5.5                |                  |
|   |          | $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$ | MAX6803/MAX6804   | 0.78                |          | 5.5                |                  |
|   |          |   | MAX6805   | 1.2                 |          | 5.5                |                  |
| Supply Current  | $I_{CC}$ | No load   | $V_{CC} = +3.0\text{V}$                                   |                     | 4        | 10                 | $\mu\text{A}$    |
|   |          |   | $V_{CC} = +5.0\text{V}$                                   |                     | 5        | 12                 |                  |
| Reset Threshold   | $V_{TH}$ | MAX680_US_ _D_-T,<br>Table 1                      | $T_A = +25^\circ\text{C}$                                 | $V_{TH}$<br>- 1.8%  | $V_{TH}$ | $V_{TH}$<br>+ 1.8% | V                |
|   |          |   | $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$         | $V_{TH}$<br>- 3%    | $V_{TH}$ | $V_{TH}$<br>+ 3%   |                  |
| $V_{CC}$ Falling Reset Delay                                      |          | $V_{CC}$ falling at 10V/ms                        |   |                     | 30       |                    | $\mu\text{s}$    |
| Reset Active Timeout Period                                       | $t_{RP}$ | MAX680_US_ _D1-T                                  |   | 1                   | 1.5      | 2                  | ms               |
|   |          | MAX680_US_ _D2-T                                  |   | 20                  | 30       | 40                 |                  |
|   |          | MAX680_US_ _D3-T                                  |   | 100                 | 150      | 200                |                  |
| $\overline{\text{MR}}$ Minimum Pulse Width                        |          |   |   | 1                   |          |                    | $\mu\text{s}$    |
| $\overline{\text{MR}}$ Glitch Immunity                            |          |   |   |                     | 50       |                    | ns               |
| $\overline{\text{MR}}$ Reset Delay                                |          |   |   |                     | 0.1      |                    | $\mu\text{s}$    |
| $\overline{\text{MR}}$ Input Voltage                              | $V_{IL}$ |   |   | $0.3 \times V_{CC}$ |          |                    | V                |
|   | $V_{IH}$ |   |   | $0.7 \times V_{CC}$ |          |                    |                  |
| $\overline{\text{MR}}$ Pullup Resistance                          |          |   |   | 12                  | 20       | 30                 | $\text{k}\Omega$ |
| $\overline{\text{RESET}}$ Output Low Voltage<br>(MAX6804/MAX6805) | $V_{OL}$ | Reset<br>asserted                                 | $I_{SINK} = 50\mu\text{A}$ , $V_{CC} \geq 1.0\text{V}$    |                     |          | 0.4                | V                |
|   |          |   | $I_{SINK} = 1.2\text{mA}$ , $V_{CC} \geq 2.5\text{V}$     |                     |          | 0.3                |                  |
|   |          |   | $I_{SINK} = 3.2\text{mA}$ , $V_{CC} \geq 4.25\text{V}$    |                     |          | 0.4                |                  |
| $\overline{\text{RESET}}$ Output High Voltage<br>(MAX6804)        | $V_{OH}$ | Reset not<br>asserted                             | $I_{SOURCE} = 500\mu\text{A}$ , $V_{CC} \geq 3.0\text{V}$ | $0.8 \times V_{CC}$ |          |                    | V                |
|   |          |   | $I_{SOURCE} = 800\mu\text{A}$ , $V_{CC} \geq 5.0\text{V}$ | $0.8 \times V_{CC}$ |          |                    |                  |

# 4-Pin, Low-Power $\mu\text{P}$ Reset Circuits with Manual Reset

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## ELECTRICAL CHARACTERISTICS (continued)

( $V_{CC}$  = full range,  $T_A$  =  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$ , unless otherwise noted. Typical values are at  $V_{CC}$  =  $+5.0\text{V}$  and  $T_A$  =  $+25^\circ\text{C}$ , reset not asserted.) (Note 1)

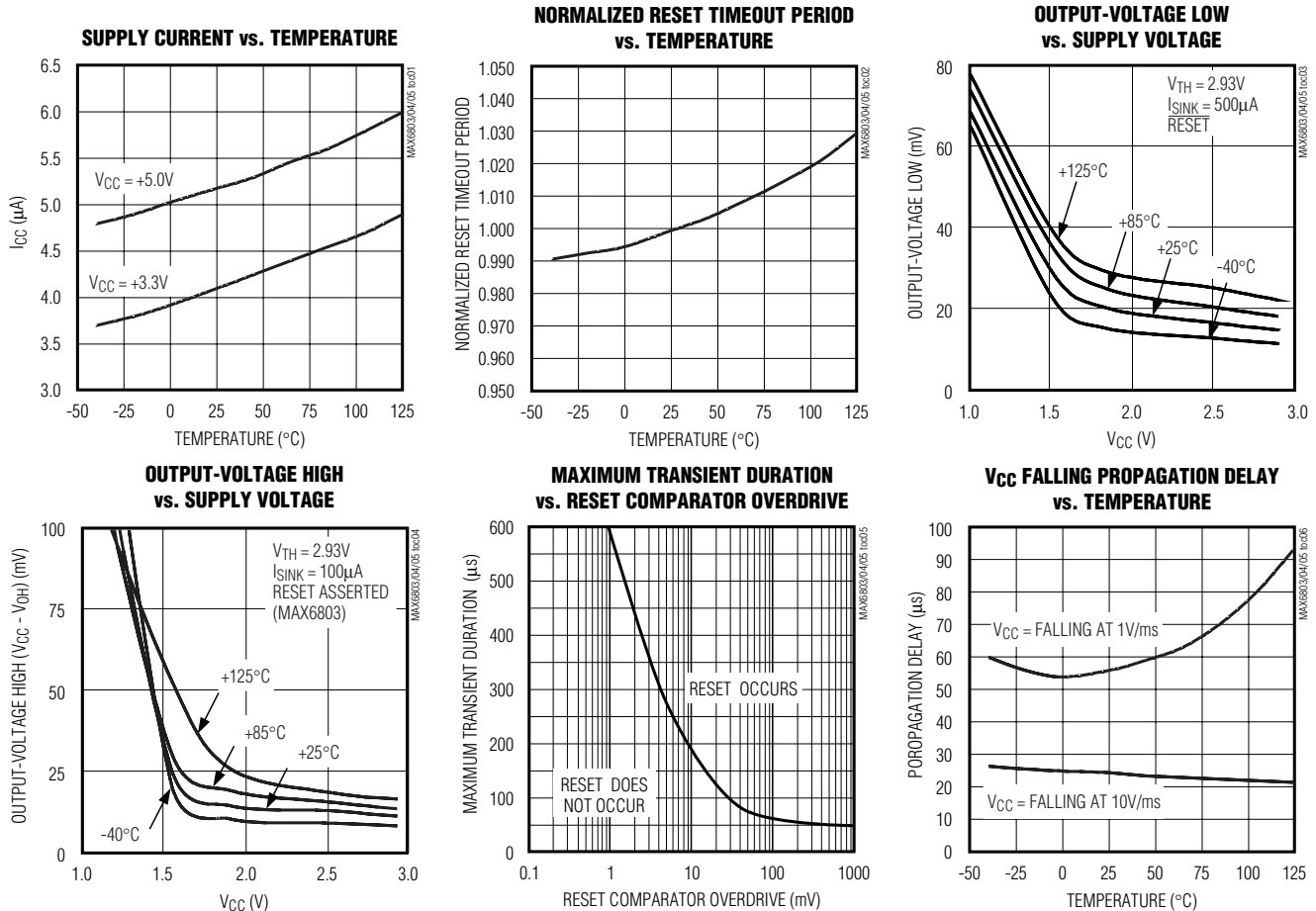
| PARAMETER  | SYMBOL   | CONDITIONS                             | MIN   | TYP                 | MAX | UNITS         |
|--|----------|--|---|---------------------|-----|---------------|
| RESET Output Voltage (MAX6803)                     | $V_{OH}$ | Reset asserted                         | $I_{SOURCE} = 1\mu\text{A}, V_{CC} \geq 1.0\text{V}$    | $0.8 \times V_{CC}$ |     | V             |
|  |          |  | $I_{SOURCE} = 200\mu\text{A}, V_{CC} \geq 1.8\text{V}$  | $0.8 \times V_{CC}$ |     |               |
|  |          |  | $I_{SOURCE} = 800\mu\text{A}, V_{CC} \geq 4.25\text{V}$ | $0.8 \times V_{CC}$ |     |               |
|  | $V_{OL}$ | Reset not asserted                     | $I_{SINK} = 1.2\text{mA}, V_{CC} \geq 3.0\text{V}$      | 0.3                 |     | V             |
| $I_{SINK} = 3.2\text{mA}, V_{CC} \geq 5.0\text{V}$ |          |  | 0.4   |                     |     |               |
| RESET Output Leakage Current (MAX6805)             |          | $V_{CC} > V_{TH}$ , RESET not asserted |   |                     | 0.5 | $\mu\text{A}$ |

**Note 1:** All parts are production tested at  $T_A$  =  $+25^\circ\text{C}$ . Over temperature limits are guaranteed by design and not production tested.

**Note 2:**  $I_{SOURCE}$  for the MAX6803 is  $100\text{nA}$ ;  $I_{SINK}$  for the MAX6804 is  $100\text{nA}$ ;  $I_{SINK}$  for the MAX6805 is  $50\mu\text{A}$ .

## Typical Operating Characteristics

(Reset not asserted,  $T_A$  =  $+25^\circ\text{C}$ , unless otherwise noted.)



# 4-Pin, Low-Power $\mu$ P Reset Circuits with Manual Reset

## Pin Description

| PIN     |                    | NAME                      | FUNCTION   |
|---------|--------------------|---------------------------|--|
| MAX6803 | MAX6804<br>MAX6805 |                           |  |
| 1       | 1                  | GND                       | Ground   |
| —       | 2                  | $\overline{\text{RESET}}$ | Active-Low Reset Output. $\overline{\text{RESET}}$ is asserted while $V_{CC}$ is below the reset threshold, or while $\overline{\text{MR}}$ is asserted. $\overline{\text{RESET}}$ remains asserted for a reset timeout period ( $t_{RP}$ ) after $V_{CC}$ rises above the reset threshold or $\overline{\text{MR}}$ is deasserted. $\overline{\text{RESET}}$ on the MAX6804 is push/pull. $\overline{\text{RESET}}$ on the MAX6805 is open-drain. |
| 2       | —                  | RESET                     | Active-High Reset Output. RESET is asserted high while $V_{CC}$ is below the reset threshold or while $\overline{\text{MR}}$ is asserted, and RESET remains asserted for a reset timeout period ( $t_{RP}$ ) after $V_{CC}$ rises above the reset threshold or $\overline{\text{MR}}$ is deasserted. RESET on the MAX6803 is push/pull.  |
| 3       | 3                  | $\overline{\text{MR}}$    | Manual Reset Input. A logic low on $\overline{\text{MR}}$ asserts reset. Reset remains asserted as long as $\overline{\text{MR}}$ is low, and for the reset timeout period ( $t_{RP}$ ) after $\overline{\text{MR}}$ goes high. Leave unconnected or connect to $V_{CC}$ if not used.  |
| 4       | 4                  | $V_{CC}$                  | Supply Voltage Input   |

## Applications Information

### Manual Reset Input

Many  $\mu$ P-based products require manual reset capability, allowing the operator, a test technician, or external logic circuitry to initiate a reset. A logic low on  $\overline{\text{MR}}$  asserts reset. Reset remains asserted while  $\overline{\text{MR}}$  is low, and for the reset active timeout period after  $\overline{\text{MR}}$  returns high.  $\overline{\text{MR}}$  has an internal 20k $\Omega$  pullup resistor, so it can be left unconnected if not used. Connect a normally open momentary switch from  $\overline{\text{MR}}$  to GND to create a manual reset function; external debounce circuitry is not required.

### Interfacing to $\mu$ Ps with Bidirectional Reset Pins

Since the  $\overline{\text{RESET}}$  output on the MAX6805 is open-drain, this device interfaces easily with  $\mu$ Ps that have bidirectional reset pins, such as the Motorola 68HC11. Connecting the  $\mu$ P supervisor's  $\overline{\text{RESET}}$  output directly to the microcontroller's ( $\mu$ C's)  $\overline{\text{RESET}}$  pin with a single pullup resistor allows either device to assert reset (Figure 1).

### Negative-Going $V_{CC}$ Transients

In addition to issuing a reset to the  $\mu$ P during power-up, power-down, and brownout conditions, these devices are relatively immune to short-duration, negative-going  $V_{CC}$  transients (glitches). The *Typical Operating Characteristics* show the Maximum Transient Duration vs. Reset Comparator Overdrive graph. The graph

shows the maximum pulse width that a negative-going  $V_{CC}$  transient may typically have without issuing a reset signal. As the amplitude of the transient increases, the maximum allowable pulse width decreases.

### Ensuring a Valid Reset Output down to $V_{CC} = 0$

When  $V_{CC}$  falls below 1V and approaches the minimum operating voltage of 0.7V, push/pull-structured reset sinking (or sourcing) capabilities decrease drastically. High-impedance CMOS-logic inputs connected to the  $\overline{\text{RESET}}$  pin can drift to indeterminate voltages. This does not present a problem in most cases, since most

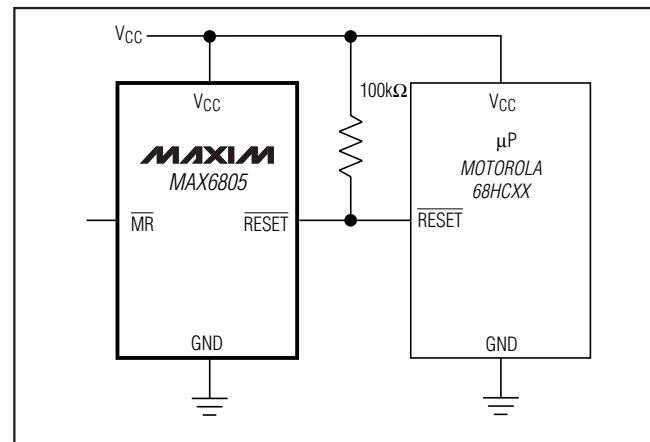


Figure 1. Interfacing to  $\mu$ Ps with Bidirectional Reset Pins

# 4-Pin, Low-Power $\mu\text{P}$ Reset Circuits with Manual Reset

MAX6803/MAX6804/MAX6805

$\mu\text{P}$ s and circuitry do not operate when  $V_{CC}$  drops below 1V. For the MAX6804 application where  $\overline{\text{RESET}}$  must be valid down to 0, adding a pulldown resistor between  $\overline{\text{RESET}}$  and GND removes stray leakage currents, holding  $\overline{\text{RESET}}$  low (Figure 2a). The pulldown resistor value is not critical;  $100\text{k}\Omega$  is large enough not to load  $\overline{\text{RESET}}$ , and small enough to pull it low. For the MAX6803, where  $\overline{\text{RESET}}$  must be valid to  $V_{CC} = 0$ , a  $100\text{k}\Omega$  pullup resistor between  $\overline{\text{RESET}}$  and  $V_{CC}$  will hold  $\overline{\text{RESET}}$  high when  $V_{CC}$  falls below 0.7V (Figure 2b).

Since the MAX6805 has an open-drain, active-low output, it typically uses a pullup resistor. With this device,  $\overline{\text{RESET}}$  will most likely not maintain an active condition, but will drift to a non-active level due to the pullup resistor and the reduced sinking capability of the open-drain device. Therefore, this device is not recommended for applications where the  $\overline{\text{RESET}}$  pin is required to be valid down to  $V_{CC} = 0$ .

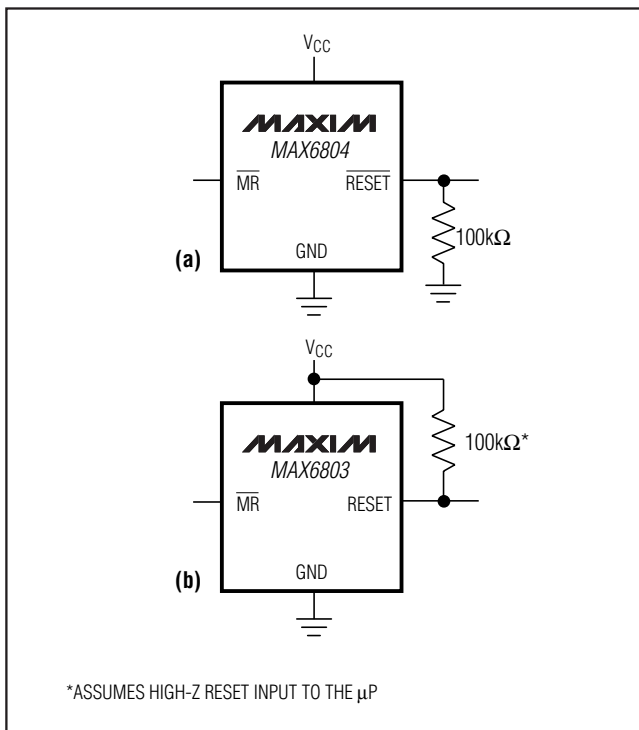
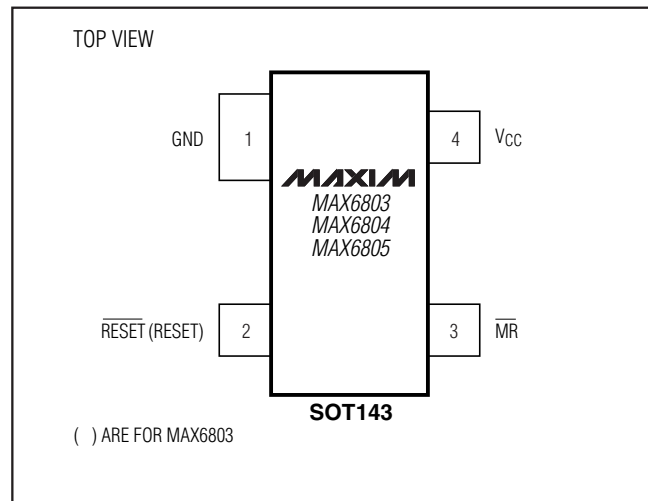
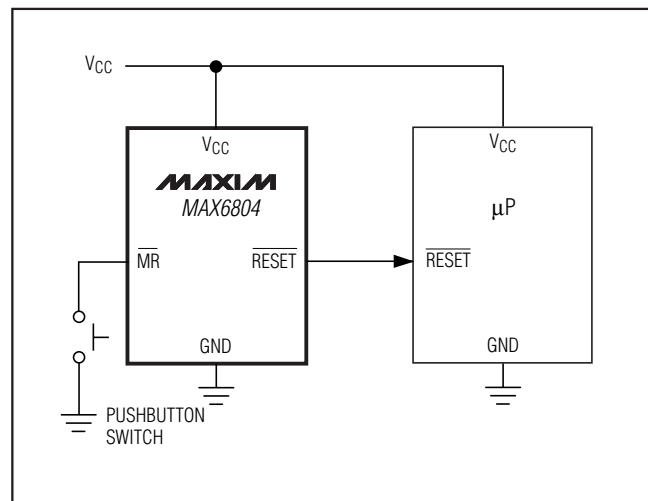


Figure 2. Ensuring Reset Valid down to  $V_{CC} = 0$

## Pin Configuration



## Typical Operating Circuit



## 4-Pin, Low-Power $\mu$ P Reset Circuits with Manual Reset

Table 1. Factory-Trimmed Reset Thresholds

| RESET THRESHOLD SUFFIX | $T_A = +25^\circ\text{C}$ |                  |       | $T_A = -40^\circ\text{C to } +125^\circ\text{C}$ |       |
|------------------------|---------------------------|------------------|-------|--|-------|
|                        | MIN                       | TYP ( $V_{TH}$ ) | MAX   | MIN  | MAX   |
| 48                     | 4.714                     | 4.80             | 4.886 | 4.656  | 4.944 |
| 47                     | 4.615                     | 4.70             | 4.785 | 4.559  | 4.841 |
| 46                     | 4.547                     | 4.63             | 4.713 | 4.491  | 4.769 |
| 45                     | 4.419                     | 4.50             | 4.581 | 4.365  | 4.635 |
| 44                     | 4.301                     | 4.38             | 4.459 | 4.249  | 4.511 |
| 43                     | 4.223                     | 4.30             | 4.377 | 4.171  | 4.429 |
| 42                     | 4.124                     | 4.20             | 4.276 | 4.074  | 4.326 |
| 41                     | 4.026                     | 4.10             | 4.174 | 3.977  | 4.223 |
| 40                     | 3.928                     | 4.00             | 4.072 | 3.880  | 4.120 |
| 39                     | 4.830                     | 3.90             | 3.970 | 3.783  | 4.017 |
| 38                     | 3.732                     | 3.80             | 3.868 | 3.686  | 3.914 |
| 37                     | 3.633                     | 3.70             | 3.767 | 3.589  | 3.811 |
| 36                     | 3.535                     | 3.60             | 3.665 | 3.492  | 3.708 |
| 35                     | 3.437                     | 3.50             | 3.563 | 3.395  | 3.605 |
| 34                     | 3.339                     | 3.40             | 3.461 | 3.298  | 3.502 |
| 33                     | 3.241                     | 3.30             | 3.359 | 3.201  | 3.399 |
| 32                     | 3.142                     | 3.20             | 3.258 | 3.104  | 3.296 |
| 31                     | 3.025                     | 3.08             | 3.135 | 2.988  | 3.172 |
| 30                     | 2.946                     | 3.00             | 3.054 | 2.910  | 3.090 |
| 29                     | 2.877                     | 2.93             | 2.983 | 2.842  | 3.018 |
| 28                     | 2.750                     | 2.80             | 2.850 | 2.716  | 2.884 |
| 27                     | 2.651                     | 2.70             | 2.749 | 2.619  | 2.781 |
| 26                     | 2.583                     | 2.63             | 2.677 | 2.551  | 2.709 |

# 4-Pin, Low-Power $\mu$ P Reset Circuits with Manual Reset

## Selector Guide (Standard Versions\*)

| PART            | OUTPUT STAGE                         | NOMINAL $V_{TH}$ (V) | MIN RESET TIMEOUT (ms) | SOT TOP MARK |
|-----------------|--------------------------------------|----------------------|------------------------|--------------|
| MAX6803US26D3-T | Push/Pull RESET                      | 2.63                 | 100                    | KACH         |
| MAX6803US29D3-T | Push/Pull RESET                      | 2.93                 | 100                    | KACI         |
| MAX6803US31D3-T | Push/Pull RESET                      | 3.08                 | 100                    | KACJ         |
| MAX6803US44D3-T | Push/Pull RESET                      | 4.38                 | 100                    | KACK         |
| MAX6803US46D3-T | Push/Pull RESET                      | 4.63                 | 100                    | KACL         |
| MAX6804US26D3-T | Push/Pull $\overline{\text{RESET}}$  | 2.63                 | 100                    | KACN         |
| MAX6804US29D3-T | Push/Pull $\overline{\text{RESET}}$  | 2.93                 | 100                    | KACP         |
| MAX6804US31D3-T | Push/Pull $\overline{\text{RESET}}$  | 3.08                 | 100                    | KACQ         |
| MAX6804US44D3-T | Push/Pull $\overline{\text{RESET}}$  | 4.38                 | 100                    | KACR         |
| MAX6804US46D3-T | Push/Pull $\overline{\text{RESET}}$  | 4.63                 | 100                    | KACS         |
| MAX6805US26D3-T | Open-Drain $\overline{\text{RESET}}$ | 2.63                 | 100                    | KACO         |
| MAX6805US29D3-T | Open-Drain $\overline{\text{RESET}}$ | 2.93                 | 100                    | KACU         |
| MAX6805US31D3-T | Open-Drain $\overline{\text{RESET}}$ | 3.08                 | 100                    | KACV         |
| MAX6805US44D3-T | Open-Drain $\overline{\text{RESET}}$ | 4.38                 | 100                    | KACW         |
| MAX6805US46D3-T | Open-Drain $\overline{\text{RESET}}$ | 4.63                 | 100                    | KACX         |

\*Sample stock is generally held on all standard versions.

## Chip Information

TRANSISTOR COUNT: 505

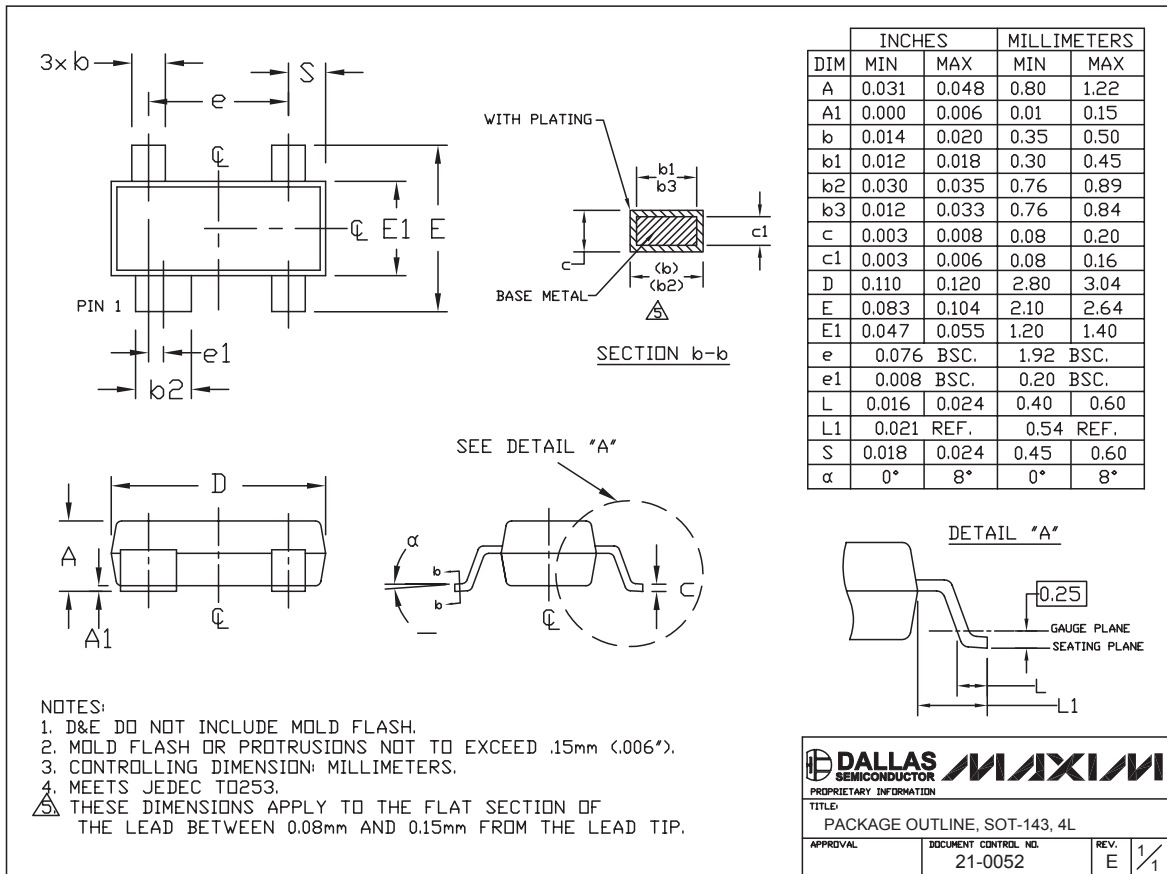
PROCESS: BiCMOS

MAX6803/MAX6804/MAX6805

# 4-Pin, Low-Power $\mu$ P Reset Circuits with Manual Reset

## Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)



SOT-143 4LEPS

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