

# MAXIM

## Voltage Detectors

### General Description

The MAX6806/MAX6807/MAX6808 precision voltage detectors are ideal for accurate monitoring of power supplies in digital systems. They provide circuit reliability and reduce total cost by eliminating external components and adjustments.

The MAX6806/MAX6807/MAX6808 assert a reset signal whenever the supply voltage ( $V_{CC}$ ) falls below the factory-preset,  $\pm 2\%$  accurate threshold. Internal hysteresis ensures stable switching. The MAX6806/MAX6807/MAX6808 are available in 4.6V and 2.6V thresholds (2.3V is also available for the MAX6806 only). The MAX6806 features an active-low, push-pull RESET output; the MAX6807 features an active-high, push-pull RESET output; and the MAX6808 features an active-low, open-drain RESET output. RESET is valid for  $V_{CC}$  down to 1V (MAX6806/MAX6808), and RESET (MAX6807) is guaranteed for  $V_{CC}$  down to 1.2V.

The MAX6806/MAX6807/MAX6808 are available in 3-pin SC70, 3-pin SOT23, and 4-pin SOT143 packages. The SOT143 package includes a manual-reset input.

### Applications

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

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

### Features

- ♦ **Preset Reset Thresholds: 4.6V and 2.6V (2.3V also available for MAX6806 only)**
- ♦  **$\pm 2\%$  Accurate Reset Thresholds**
- ♦ **Reset Output Available in Active-Low (MAX6806), Active-High (MAX6807), and Open-Drain (MAX6808) Versions**
- ♦ **Immune to Power-Supply Transients**
- ♦ **RESET Valid to  $V_{CC} = 1.0V$  (MAX6806/MAX6808)**
- ♦ **35 $\mu A$  Supply Current**
- ♦ **No External Components**
- ♦ **Manual Reset Available with 4-Pin SOT143 Package**
- ♦ **Miniature 3-Pin SC70, 3-Pin SOT23, and 4-Pin SOT143 Packages**

### Ordering Information

| PART          | TEMP. RANGE    | PIN-PACKAGE |
|---------------|----------------|-------------|
| MAX6806XR__-T | -40°C to +85°C | 3 SC70      |
| MAX6806UR__-T | -40°C to +85°C | 3 SOT23     |
| MAX6806US__-T | -40°C to +85°C | 4 SOT143    |
| MAX6807XR__-T | -40°C to +85°C | 3 SC70      |
| MAX6807UR__-T | -40°C to +85°C | 3 SOT23     |
| MAX6807US__-T | -40°C to +85°C | 4 SOT143    |
| MAX6808XR__-T | -40°C to +85°C | 3 SC70      |
| MAX6808UR__-T | -40°C to +85°C | 3 SOT23     |
| MAX6808US__-T | -40°C to +85°C | 4 SOT143    |

\* All devices available in tape-and-reel only, 2500 piece minimum order quantity.

**Note:** Insert the desired number from the Selector Guide into the blank to complete the part number. Also see Selector Guide for top mark.

### Selector Guide

| PART          | RESET OUTPUT          | TOP MARK | NOMINAL $V_{TH}$ (V) <sup>†</sup> |
|---------------|-----------------------|----------|-----------------------------------|
| MAX6806UR46-T | Active-Low, Push-Pull | FZDP     | 4.6                               |
| MAX6806UR26-T |                       | FZDQ     | 2.6                               |
| MAX6806UR23-T |                       | FZDR     | 2.3                               |
| MAX6806US46-T |                       | KABT     | 4.6                               |
| MAX6806US26-T |                       | KABU     | 2.6                               |
| MAX6806US23-T |                       | KABV     | 2.3                               |

<sup>†</sup> Other reset thresholds may be available. Contact factory for availability.

Selector Guide continued at end of data sheet.



Maxim Integrated Products 1

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**For small orders, phone 1-800-835-8769.**

MAX6806/MAX6807/MAX6808

# Voltage Detectors

## ABSOLUTE MAXIMUM RATINGS

V<sub>CC</sub> to GND .....-0.3V to +6.0V  
 RESET,  $\overline{\text{RESET}}$  to GND  
 (MAX6806/MAX6807) .....-0.3V to (V<sub>CC</sub> + 0.3V)  
 $\overline{\text{RESET}}$  to GND (MAX6808).....-0.3V to + 6.0V  
 MR to GND (SOT143 package only) .....-0.3V to + 6.0V  
 Input Current, V<sub>CC</sub> .....±20mA  
 Output Current, RESET,  $\overline{\text{RESET}}$  .....±20mA

Rate of Rise, V<sub>CC</sub> .....100V/μs  
 Continuous Power Dissipation (T<sub>A</sub> = +70°C)  
   SOT23, SOT143 (derate 4mW/°C above +70°C) .....320mW  
   SC70 (derate 2.17mW/°C above +70°C) .....174mW  
 Operating Temperature Range .....-40°C to +85°C  
 Storage Temperature Range .....-65°C to +160°C  
 Lead Temperature (soldering, 10sec) .....+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> = -40°C to +85°C, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C.) (Note 1)

| PARAMETER                                                     | SYMBOL            | CONDITIONS                                                                     |              | MIN                | TYP                      | MAX                      | UNITS  |
|---------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------|--------------|--------------------|--------------------------|--------------------------|--------|
| Supply Voltage Range                                          | V <sub>CC</sub>   | T <sub>A</sub> = 0°C to +70°C                                                  |              | 1.0                |                          | 5.5                      | V      |
|                                                               |                   | T <sub>A</sub> = -40°C to +85°C                                                |              | 1.2                |                          | 5.5                      |        |
| Supply Current                                                | I <sub>CC</sub>   | V <sub>CC</sub> = +3.6V, no load                                               |              |                    | 35                       | 60                       | μA     |
|                                                               |                   | V <sub>CC</sub> = +5.5V, no load                                               |              |                    | 50                       | 80                       |        |
| Reset Threshold                                               | V <sub>TH-</sub>  | T <sub>A</sub> = +25°C,<br>V <sub>CC</sub> falling                             | MAX680__ _46 | 4.508              | 4.60                     | 4.692                    | V      |
|                                                               |                   |                                                                                | MAX680__ _26 | 2.548              | 2.60                     | 2.652                    |        |
|                                                               |                   |                                                                                | MAX680__ _23 | 2.254              | 2.30                     | 2.346                    |        |
| Reset Threshold Hysteresis                                    | V <sub>HYST</sub> | T <sub>A</sub> = +25°C, Figure 2                                               |              |                    | 0.02<br>V <sub>TH-</sub> | 0.03<br>V <sub>TH-</sub> | V      |
| $\overline{\text{RESET}}$ Output Voltage<br>(MAX6806/MAX6808) | V <sub>OL</sub>   | I <sub>SINK</sub> = 20μA, V <sub>CC</sub> = 1.0V                               |              |                    |                          | 0.3                      | V      |
|                                                               |                   | I <sub>SINK</sub> = 1.0mA, V <sub>CC</sub> = 2.0V                              |              |                    |                          | 0.4                      |        |
|                                                               | V <sub>OH</sub>   | I <sub>SOURCE</sub> = 2.0mA, V <sub>CC</sub> = 5.0V<br>(MAX6806 only)          |              | 0.8V <sub>CC</sub> |                          |                          |        |
| $\overline{\text{RESET}}$ Output Leakage Current              | I <sub>OH</sub>   | V <sub>CC</sub> = 5.5V, $\overline{\text{RESET}}$ deasserted<br>(MAX6808 only) |              |                    |                          |                          | μA     |
| RESET Output Voltage<br>(MAX6807)                             | V <sub>OH</sub>   | I <sub>SOURCE</sub> = 20μA, V <sub>CC</sub> = 1.2V                             |              | 0.8V <sub>CC</sub> |                          |                          | V      |
|                                                               |                   | I <sub>SOURCE</sub> = 400μA, V <sub>CC</sub> = 2.0V                            |              | 0.8V <sub>CC</sub> |                          |                          |        |
|                                                               | V <sub>OL</sub>   | I <sub>SINK</sub> = 3.2mA, V <sub>CC</sub> = 5.0V                              |              |                    |                          | 0.4                      |        |
| V <sub>CC</sub> to Reset Delay (Note 2)                       |                   | V <sub>CC</sub> falling at 1mV/μs                                              |              |                    | 30                       |                          | μs     |
| Reset Threshold Tempco                                        |                   |                                                                                |              |                    | 30                       |                          | ppm/°C |
| MR Pull-Down Resistance                                       | R <sub>MR</sub>   |                                                                                |              | 40                 | 80                       | 120                      | kΩ     |
| MR Input Threshold                                            | V <sub>IL</sub>   | V <sub>CC</sub> > V <sub>TH+</sub>                                             |              |                    |                          | 0.6                      | V      |
|                                                               | V <sub>IH</sub>   |                                                                                |              | 0.7V <sub>CC</sub> |                          |                          |        |

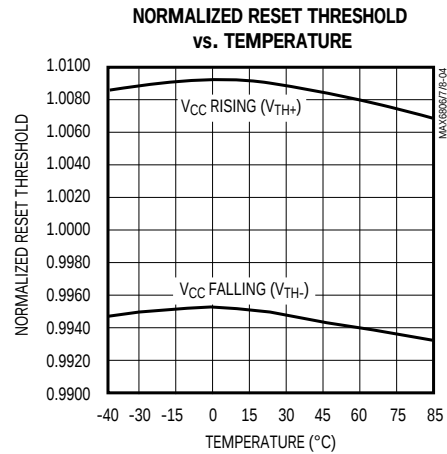
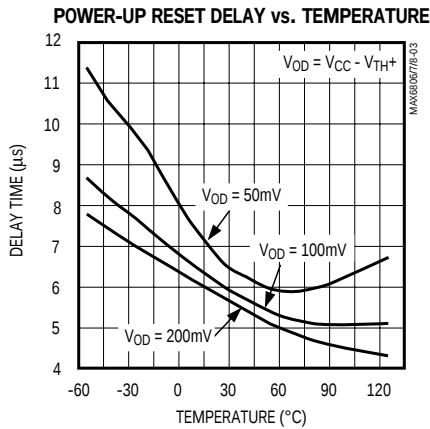
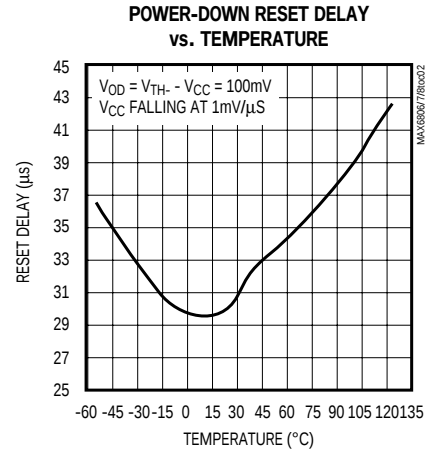
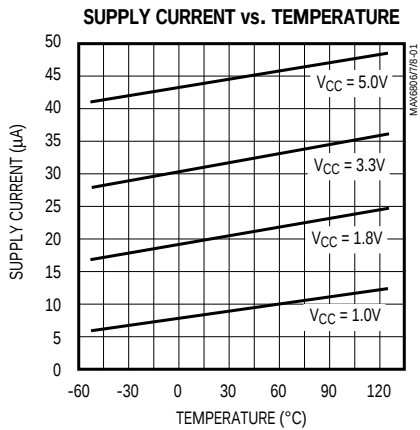
**Note1:** All devices are 100% production tested at T<sub>A</sub> = +25°C, and are guaranteed by design for T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, as specified.

**Note 2:**  $\overline{\text{RESET}}$  output for MAX6806/MAX6808, RESET output for MAX6807.

# Voltage Detectors

## Typical Operating Characteristics

( $T_A = +25^\circ\text{C}$ , unless otherwise noted.)



MAX6806/MAX6807/MAX6808

## Pin Description

| PIN        |        | NAME                      | FUNCTION                                                                                                                                                       |
|------------|--------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOT23/SC70 | SOT143 |                           |                                                                                                                                                                |
| 1          | 1      | $\overline{\text{RESET}}$ | Active-Low Reset Output (MAX6806/MAX6808). $\overline{\text{RESET}}$ remains low while $V_{CC}$ is below the reset-threshold voltage or while MR is held high. |
|            |        | RESET                     | Active-High Reset Output (MAX6807). RESET remains high while $V_{CC}$ is below the reset-threshold voltage or while MR is held high.                           |
| 2          | 4      | GND                       | Ground                                                                                                                                                         |
| 3          | 3      | VCC                       | Supply Voltage Input                                                                                                                                           |
| —          | 2      | MR                        | Active-High Manual Reset Input. Internal 80k $\Omega$ resistor to GND.                                                                                         |

# Voltage Detectors

## Detailed Description

### Reset Output

The MAX6806 voltage detector features an active-low, push-pull RESET output, while the MAX6807 features an active-high, push-pull RESET output. Unlike micro-processor ( $\mu$ P) supervisory circuits that offer a reset timeout period, the MAX6806 and MAX6807 RESET goes high and RESET goes low virtually immediately once  $V_{CC}$  exceeds the reset threshold. If a brownout occurs ( $V_{CC}$  falls below the reset threshold), RESET goes low and RESET goes high. RESET is guaranteed to be a logic low for  $V_{CC} \geq 1V$  and RESET is guaranteed to be a logic high for  $V_{CC} \geq 1.2V$ .

The MAX6808 features an active-low, open-drain RESET output. The output sinks current when  $V_{CC}$  falls below the reset threshold. Connect a pull-up resistor from RESET to any supply voltage up to 6V (Figure 1). Select a resistor value large enough to provide a logic low and small enough to provide a logic high while supplying all input and leakage currents connected to the RESET line. A 100k $\Omega$  resistor is sufficient in applications driving high-impedance loads.

The manual reset input (MR, 4-pin SOT143 package) can also initiate a reset (see *Manual Reset Input* section).

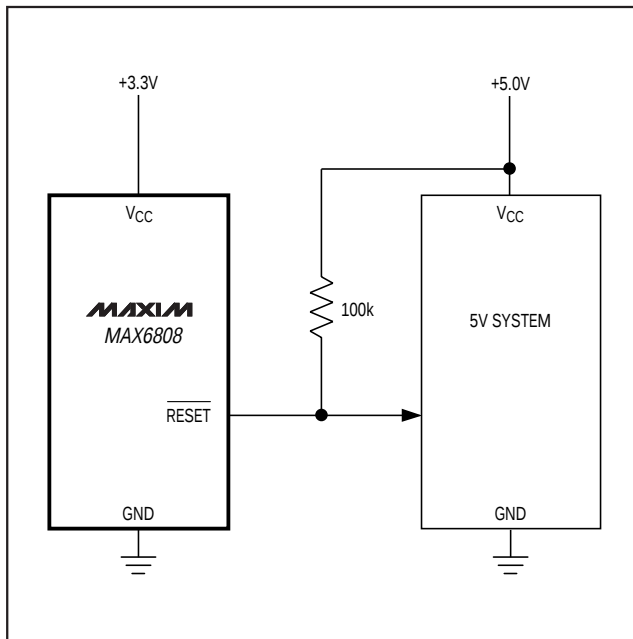


Figure 1. The MAX6808 open-drain RESET output allows use with multiple supplies.

### Manual Reset Input

Many applications require manual-reset capabilities, allowing an operator, a test technician, or external logic circuitry to initiate a reset. A logic high on MR asserts a reset and remains asserted while MR is high. This input has an 80k $\Omega$  pull-down resistor, so the input may be left unconnected if not used. Connect a normally open momentary switch from MR to  $V_{CC}$  to create a manual-reset function. If MR is driven from long cables or if the device is used in a noisy environment, connecting a 0.1 $\mu$ F capacitor from MR to ground provides noise immunity.

### Hysteresis

The MAX6806/MAX6807/MAX6808 feature internal hysteresis that creates two trip points: one for the rising supply voltage and one for the falling supply voltage (Figure 2). The hysteresis prevents the output from oscillating (chattering) when  $V_{CC}$  is near the reset threshold.

### Reset Threshold Accuracy

The MAX6806/MAX6807/MAX6808 are ideal for systems using a 5V  $\pm 5\%$ , 3V  $\pm 5\%$ , or 2.5V  $\pm 5\%$  power supply with ICs specified for 5V  $\pm 10\%$ , 3V  $\pm 10\%$ , or 2.5V  $\pm 10\%$ , respectively. The reset is guaranteed to assert after the power supply falls out of regulation, but before power drops below the minimum specified operating voltage range for the system ICs.

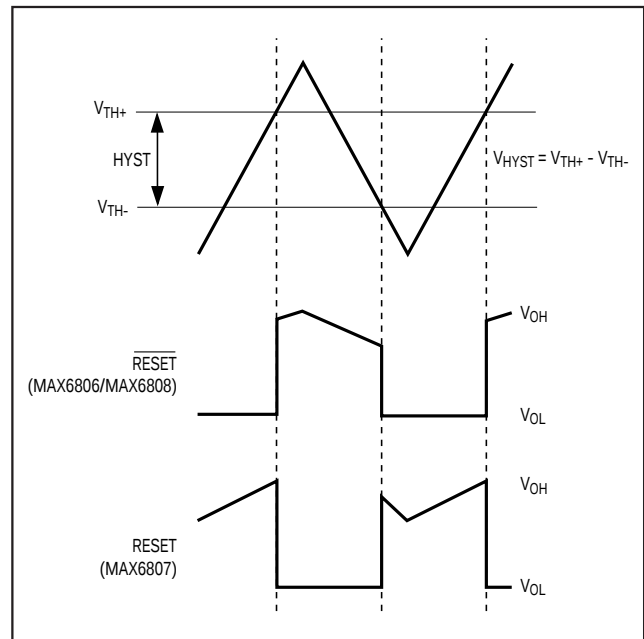


Figure 2. Input and Output Waveforms with  $V_{CC}$  Varied

# Voltage Detectors

## Applications Information

### Negative-Going VCC Transients

In addition to asserting a reset signal during power-up, power-down, and brown-out conditions, the MAX6806/MAX6807/MAX6808 are immune to short-duration, negative-going VCC transients.

Figure 3 displays typical transient durations vs. reset-comparator overdrive for which the MAX6806/MAX6807/MAX6808 do **not** generate a reset pulse. The graph was generated using a negative-going pulse applied to VCC, starting 0.5V above the actual reset threshold and ending below it by the magnitude indicated (reset-comparator overdrive). The graph indicates the maximum pulse width a negative-going VCC transient can have without causing a reset pulse. As the magnitude of the transient increases (goes further below the reset threshold), the maximum allowable pulse width decreases. A 0.1μF capacitor mounted as close as possible to VCC provides additional transient immunity.

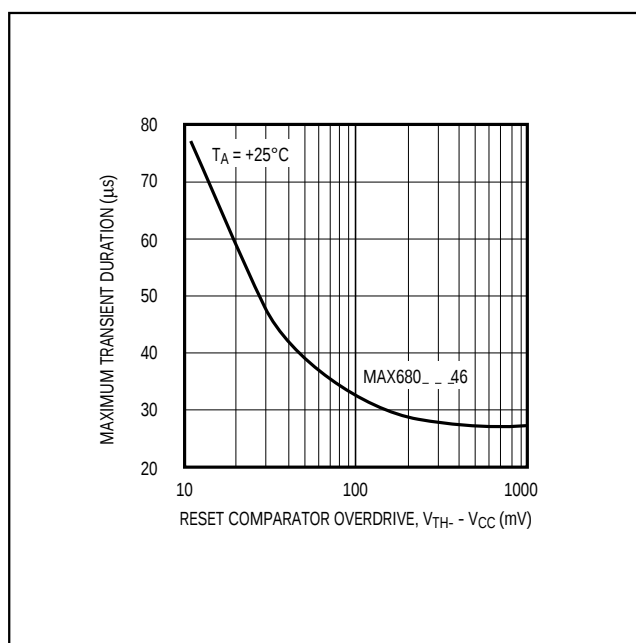


Figure 3. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive

### Ensuring a Valid Reset Output Down to

VCC = Ground

When VCC falls below 1V, the MAX6806/MAX6808  $\overline{\text{RESET}}$  output no longer sinks current—it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to  $\overline{\text{RESET}}$  can drift to undetermined voltages. This presents no problem in most applications, since most circuitry is inoperative when VCC is below 1V. In applications where  $\overline{\text{RESET}}$  must be valid down to ground, add a pull-down resistor to  $\overline{\text{RESET}}$  so any stray leakage currents flow to ground, holding  $\overline{\text{RESET}}$  low (Figure 4). Select R1 to be large enough not to load  $\overline{\text{RESET}}$  and small enough to pull  $\overline{\text{RESET}}$  to ground. For most applications, 100kΩ will not load  $\overline{\text{RESET}}$  and will pull  $\overline{\text{RESET}}$  to ground. Similarly, if RESET (MAX6807) must be valid below 1.2V, add a pull-up resistor to RESET.

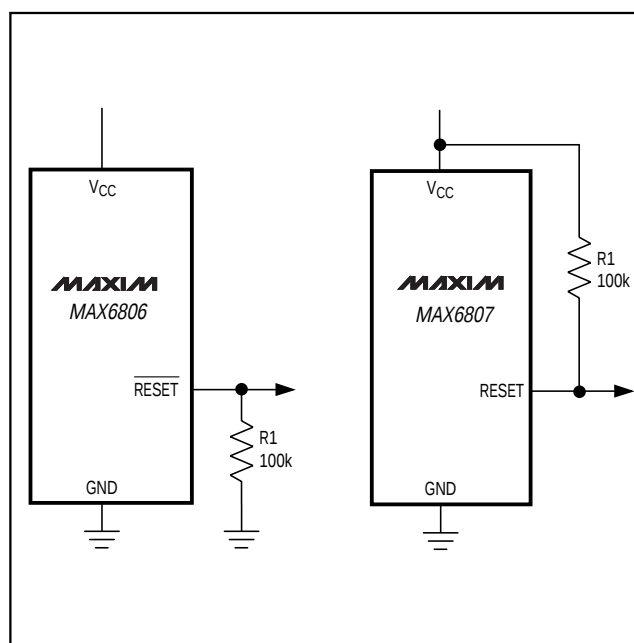


Figure 4.  $\overline{\text{RESET}}$  / RESET Valid to VCC = Ground Circuit

# Voltage Detectors

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

$\mu$ Ps with bidirectional reset pins (such as the Motorola 68HC11 series) can contend with push-pull  $\overline{\text{RESET}}$  outputs, resulting in indeterminate logic levels. Use the MAX6808 with the open-drain  $\overline{\text{RESET}}$  when interfacing to this type of controller.

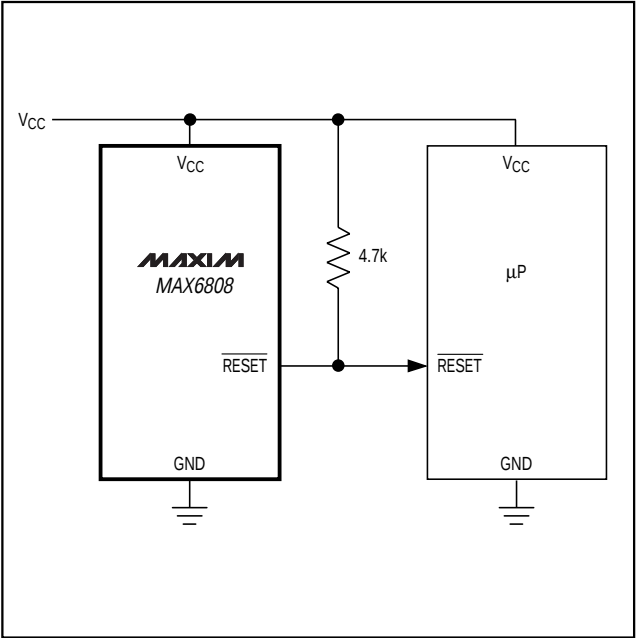


Figure 5. Interfacing to  $\mu$ Ps with Bidirectional Reset I/O

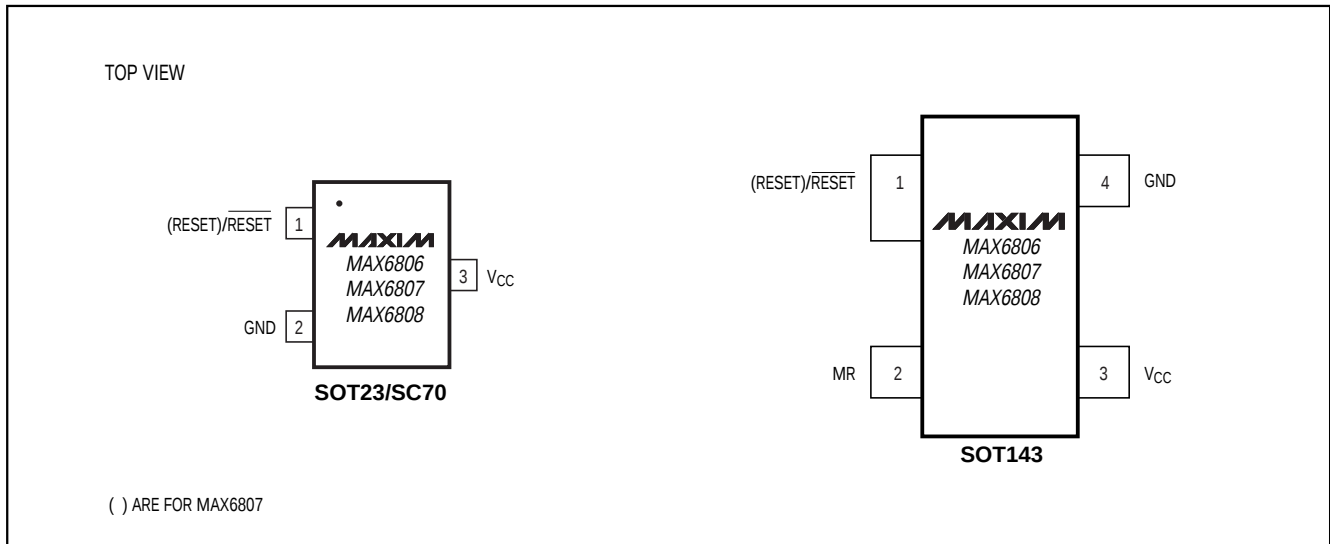
## Selector Guide (continued)

| PART*                 | RESET OUTPUT           | TOP MARK | NOMINAL $V_{TH}$ (V) <sup>†</sup> |
|-----------------------|------------------------|----------|-----------------------------------|
| MAX6806XR46-T         | Active-Low, Push-Pull  | AAA      | 4.6                               |
| MAX6806XR26-T         |                        | AAB      | 2.6                               |
| MAX6806XR23-T         |                        | AAC      | 2.3                               |
| <b>MAX6807</b> UR46-T | Active-High, Push-Pull | FZDS     | 4.6                               |
| MAX6807UR26-T         |                        | FZDT     | 2.6                               |
| MAX6807US46-T         |                        | KABW     | 4.6                               |
| MAX6807US26-T         |                        | KABX     | 2.6                               |
| MAX6807XR46-T         |                        | AAD      | 4.6                               |
| MAX6807XR26-T         |                        | AAE      | 2.6                               |
| <b>MAX6808</b> UR46-T | Active-Low, Open-Drain | FZDU     | 4.6                               |
| MAX6808UR26-T         |                        | FZDV     | 2.6                               |
| MAX6808US46-T         |                        | KABY     | 4.6                               |
| MAX6808US26-T         |                        | KABZ     | 2.6                               |
| MAX6808XR46-T         |                        | AAF      | 4.6                               |
| MAX6808XR26-T         |                        | AAG      | 2.6                               |

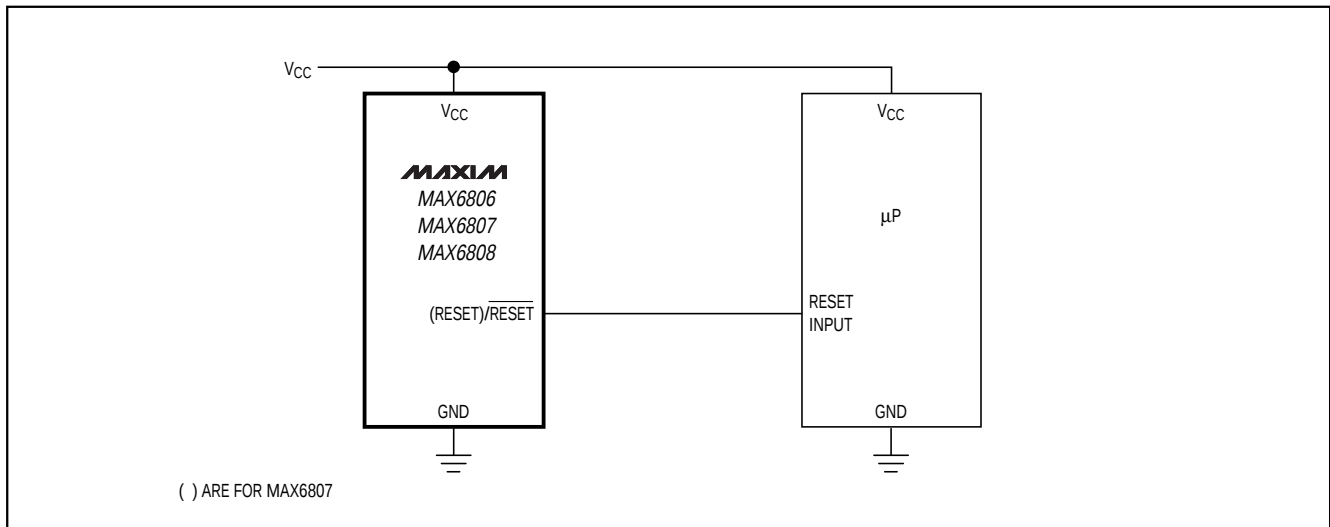
<sup>†</sup> Other reset thresholds may be available. Contact factory for availability.

# Voltage Detectors

## Pin Configurations



## Typical Operating Circuit

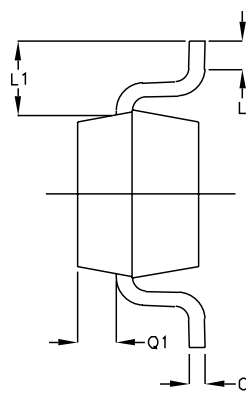
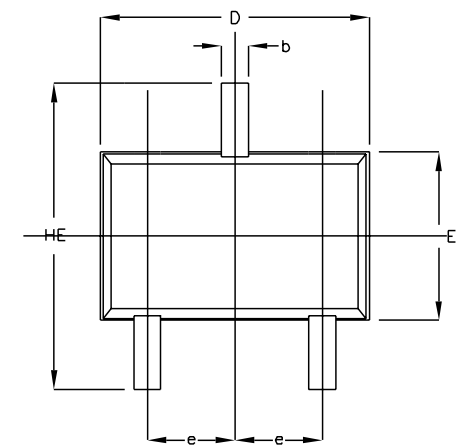


## Chip Information

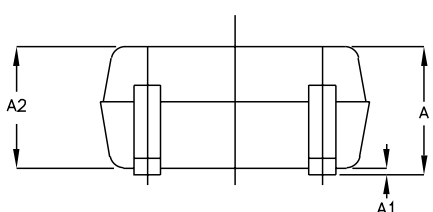
TRANSISTOR COUNT: 72

# Voltage Detectors

## Package Information



| SYMBOL | MIN   | MAX  |
|--------|-------|------|
| e      | 0.65  | BSC  |
| D      | 1.80  | 2.20 |
| b      | 0.25  | 0.40 |
| E      | 1.15  | 1.35 |
| HE     | 1.80  | 2.40 |
| Q1     | 0.10  | 0.40 |
| A2     | 0.80  | 1.00 |
| A1     | 0.00  | 0.10 |
| A      | 0.80  | 1.10 |
| c      | 0.10  | 0.18 |
| L      | 0.10  | 0.30 |
| L1     | 0.425 | TYP. |



- NOTE:
- 1. ALL DIMENSIONS ARE IN MILLIMETERS
  - 2. DIMENSIONS ARE INCLUSIVE OF PLATING
  - 3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH & METAL BURR
  - 4. ALL SPECIFICATIONS COMPLY TO EIAJ SC70
  - 5. COPLANARITY 4 MILS. MAX.

PROPRIETARY INFORMATION

TITLE:  
PACKAGE OUTLINE, SC70, 3L

|          |                                |          |     |
|----------|--------------------------------|----------|-----|
| APPROVAL | DOCUMENT CONTROL NO<br>21-0075 | REV<br>A | 1/1 |
|----------|--------------------------------|----------|-----|

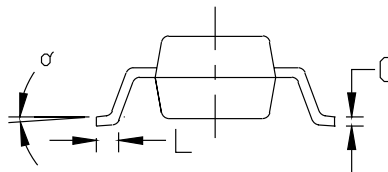
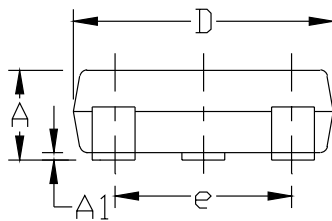
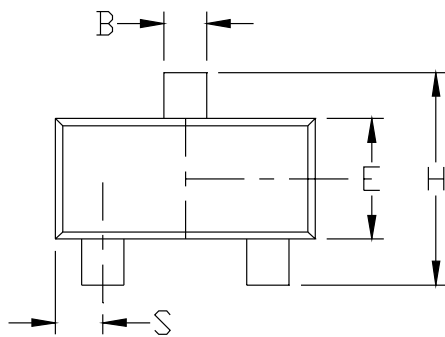
SC70, 3LEPS

# Voltage Detectors

## Package Information (continued)

### NOTES:

1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
3. CONTROLLING DIMENSION: MILLIMETER



| DIM      | INCHES |       | MILLIMETERS |       |
|----------|--------|-------|-------------|-------|
|          | MIN    | MAX   | MIN         | MAX   |
| A        | 0.031  | 0.047 | 0.787       | 1.194 |
| A1       | 0.001  | 0.005 | 0.025       | 0.127 |
| B        | 0.014  | 0.022 | 0.356       | 0.559 |
| C        | 0.0034 | 0.006 | 0.086       | 0.152 |
| D        | 0.105  | 0.120 | 2.667       | 3.048 |
| E        | 0.047  | 0.055 | 1.194       | 1.397 |
| e        | 0.070  | 0.080 | 1.778       | 2.032 |
| H        | 0.082  | 0.098 | 2.083       | 2.489 |
| L        | 0.004  | 0.012 | 0.102       | 0.305 |
| S        | 0.017  | 0.022 | 0.432       | 0.559 |
| $\alpha$ | 0°     | 8°    | 0°          | 8°    |

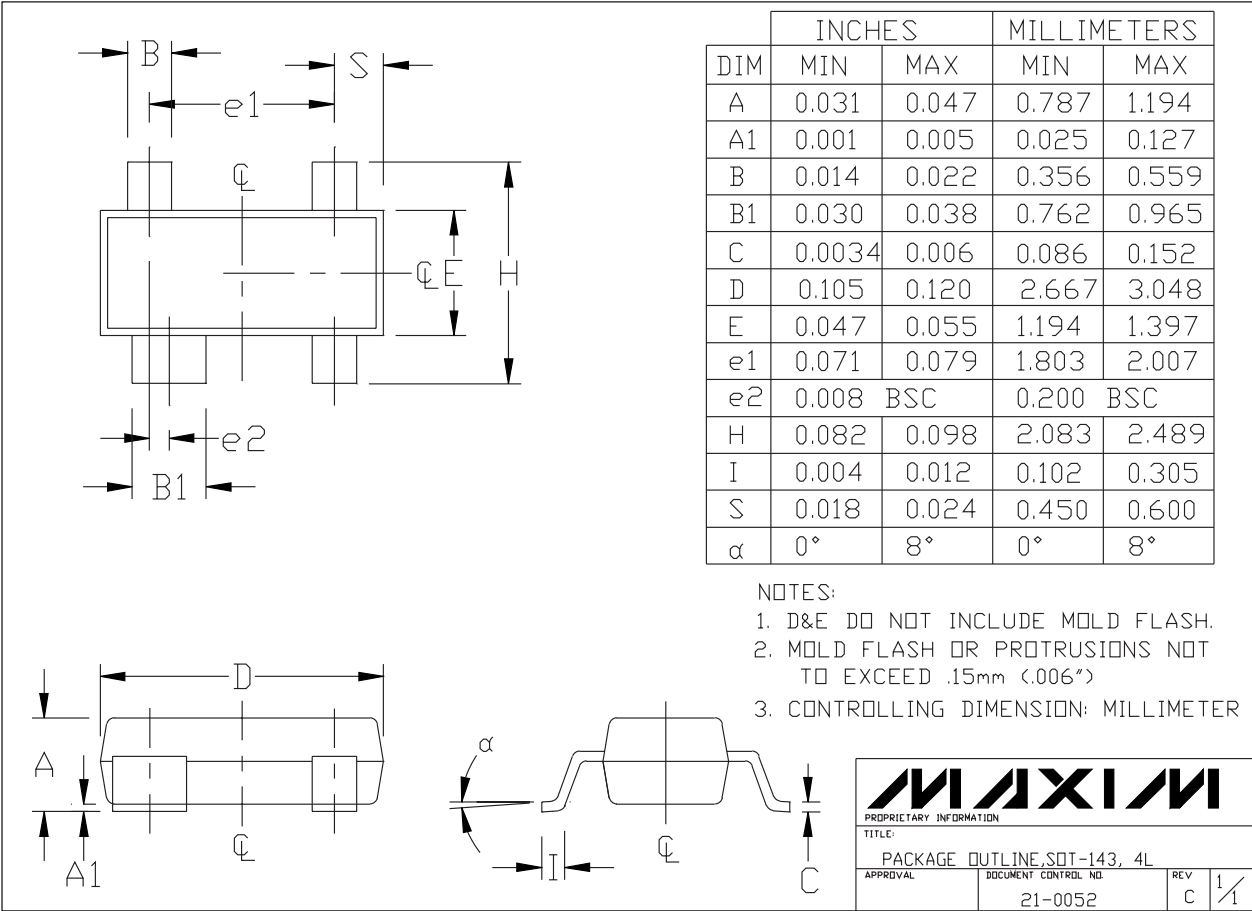
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| <b>MAXIM</b>                |                      |     |     |
| PROPRIETARY INFORMATION     |                      |     |     |
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| PACKAGE OUTLINE, SOT-23, 3L |                      |     |     |
| APPROVAL                    | DOCUMENT CONTROL NO. | REV | 1/1 |
|                             | 21-0051              | C   |     |

SOT03LEPS

MAX6806/MAX6807/MAX6808

# Voltage Detectors

## Package Information (continued)



SOT143LEPS

## *Voltage Detectors*

### NOTES

MAX6806/MAX6807/MAX6808

# Voltage Detectors

## NOTES

*Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.*

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