19-1421; Rev 1; 4/99

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, ±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 $\overline{RESET}$ output; the MAX6807 features an active-high, push-pull RESET output; and the MAX6808 features an active-low, open-drain $\overline{RESET}$ output. $\overline{RESET}$ 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 µP and µC 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)**
- **±2% Accurate Reset Thresholds**
- **Reset Output Available in Active-Low (MAX6806), Active-High (MAX6807), and Open-Drain (MAX6808) Versions**
- **Immune to Power-Supply Transients**
- **$\overline{RESET}$ Valid to V_{CC} = 1.0V (MAX6806/MAX6808)**
- **35µA 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)†
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

† *Other reset thresholds may be available. Contact factory for availability.*

Selector Guide continued at end of data sheet.

ABSOLUTE MAXIMUM RATINGS

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

Rate of Rise, V_{CC} 100V/µs
Continuous Power Dissipation (T_A = +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_{CC} = +5V, T_A = -40°C to +85°C, unless otherwise noted. Typical values are at T_A = +25°C.) (Note 1)

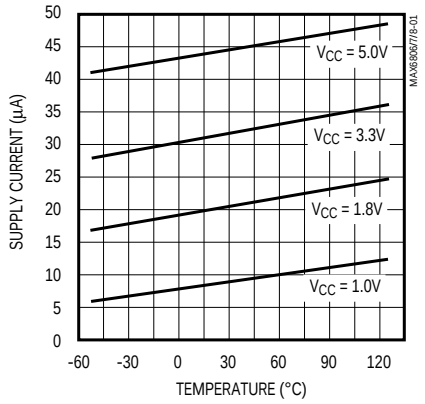
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Voltage Range	V_{CC}	T_A = 0°C to +70°C		1.0		5.5	V
		T_A = -40°C to +85°C		1.2		5.5	
Supply Current	I_{CC}	V_{CC} = +3.6V, no load			35	60	µA
		V_{CC} = +5.5V, no load			50	80	
Reset Threshold	V_{TH-}	T_A = +25°C, V_{CC} falling	MAX680_ _ _46	4.508	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_{HYST}	T_A = +25°C, Figure 2			0.02 V_{TH-}	0.03 V_{TH-}	V
$\overline{RESET}$ Output Voltage (MAX6806/MAX6808)	V_{OL}	I_{SINK} = 20µA, V_{CC} = 1.0V				0.3	V
		I_{SINK} = 1.0mA, V_{CC} = 2.0V				0.4	
	V_{OH}	I_{SOURCE} = 2.0mA, V_{CC} = 5.0V (MAX6806 only)		0.8V_{CC}			
$\overline{RESET}$ Output Leakage Current	I_{OH}	V_{CC} = 5.5V, $\overline{RESET}$ deasserted (MAX6808 only)					µA
RESET Output Voltage (MAX6807)	V_{OH}	I_{SOURCE} = 20µA, V_{CC} = 1.2V		0.8V_{CC}			V
		I_{SOURCE} = 400µA, V_{CC} = 2.0V		0.8V_{CC}			
	V_{OL}	I_{SINK} = 3.2mA, V_{CC} = 5.0V				0.4	
V_{CC} to Reset Delay (Note 2)		V_{CC} falling at 1mV/µs			30		µs
Reset Threshold Tempco					30		ppm/°C
MR Pull-Down Resistance	R_{MR}			40	80	120	kΩ
MR Input Threshold	V_{IL}	V_{CC} > V_{TH+}				0.6	V
	V_{IH}			0.7V_{CC}			

Note1: All devices are 100% production tested at T_A = +25°C, and are guaranteed by design for T_A = T_{MIN} to T_{MAX}, as specified.
Note 2: $\overline{RESET}$ output for MAX6806/MAX6808, RESET output for MAX6807.

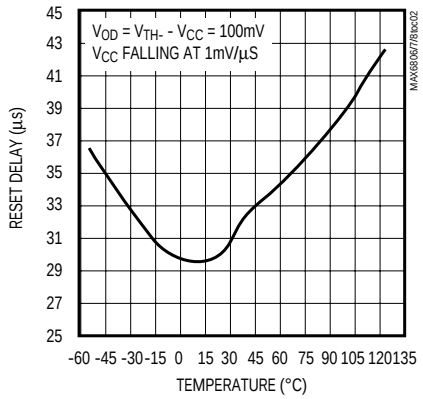
Typical Operating Characteristics

(T_A = +25°C, unless otherwise noted.)

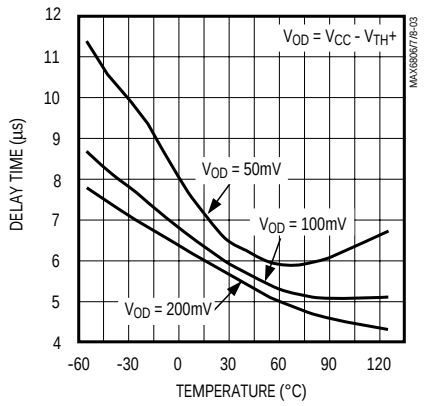
SUPPLY CURRENT vs. TEMPERATURE



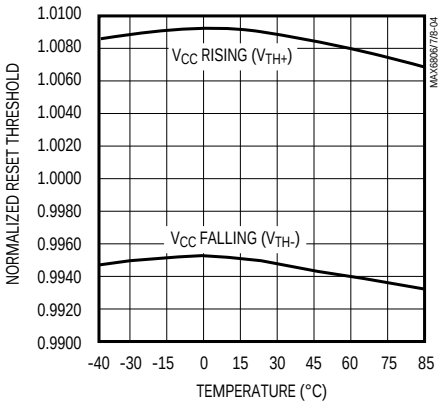
POWER-DOWN RESET DELAY vs. TEMPERATURE



POWER-UP RESET DELAY vs. TEMPERATURE



NORMALIZED RESET THRESHOLD vs. TEMPERATURE



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	V_{CC}	Supply Voltage Input
—	2	MR	Active-High Manual Reset Input. Internal 80kΩ resistor to GND.

Detailed Description

Reset Output

The MAX6806 voltage detector features an active-low, push-pull $\overline{RESET}$ output, while the MAX6807 features an active-high, push-pull RESET output. Unlike microprocessor (µP) supervisory circuits that offer a reset timeout period, the MAX6806 and MAX6807 $\overline{RESET}$ 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), $\overline{RESET}$ goes low and RESET goes high. $\overline{RESET}$ 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 $\overline{RESET}$ output. The output sinks current when V_{CC} falls below the reset threshold. Connect a pull-up resistor from $\overline{RESET}$ 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 $\overline{RESET}$ line. A 100kΩ 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).

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 80kΩ 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 0.1µF 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 ±5%, 3V ±5%, or 2.5V ±5% power supply with ICs specified for 5V ±10%, 3V ±10%, or 2.5V ±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.

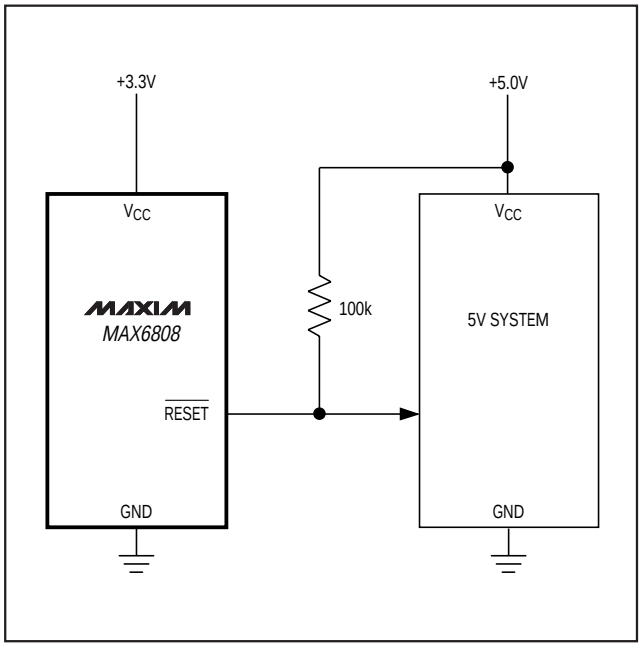


Figure 1. The MAX6808 open-drain $\overline{RESET}$ output allows use with multiple supplies.

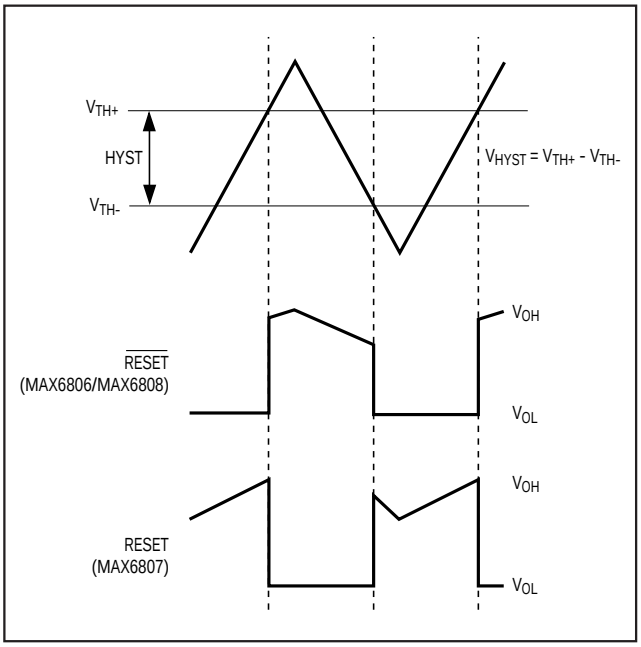


Figure 2. Input and Output Waveforms with V_{CC} Varied

Applications Information

Negative-Going V_{CC} 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 V_{CC} 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 V_{CC}, 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 V_{CC} 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 V_{CC} provides additional transient immunity.

Ensuring a Valid Reset Output Down to V_{CC} = Ground

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

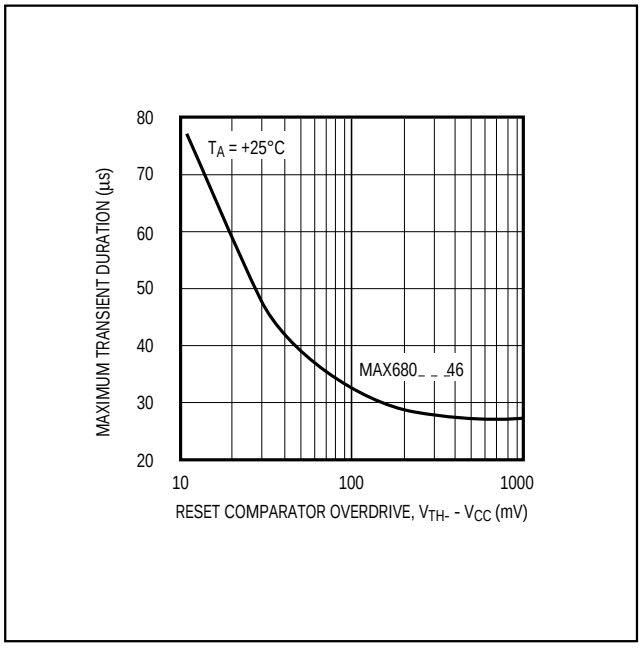


Figure 3. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive

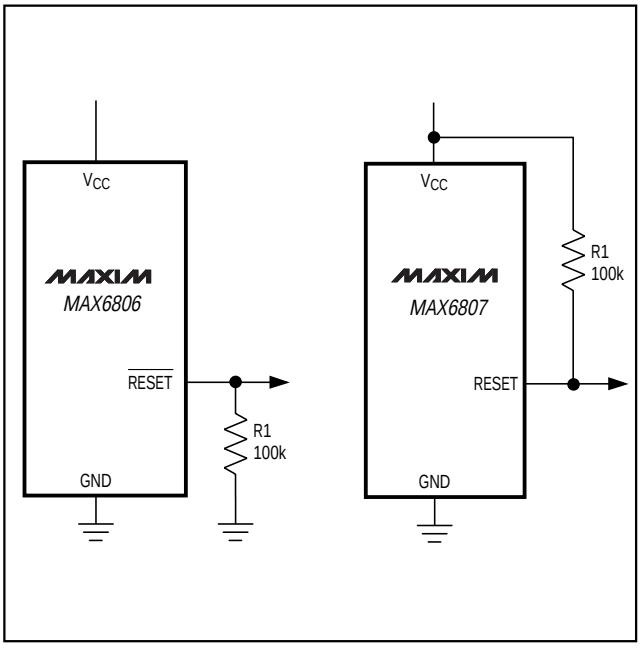


Figure 4. $\overline{RESET}$ / RESET Valid to V_{CC} = Ground Circuit

Interfacing to µPs with Bidirectional Reset Pins

µPs 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.

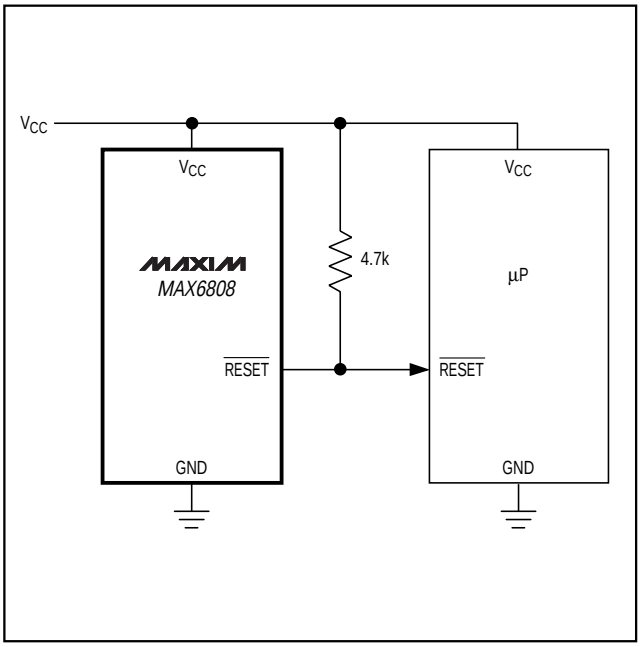


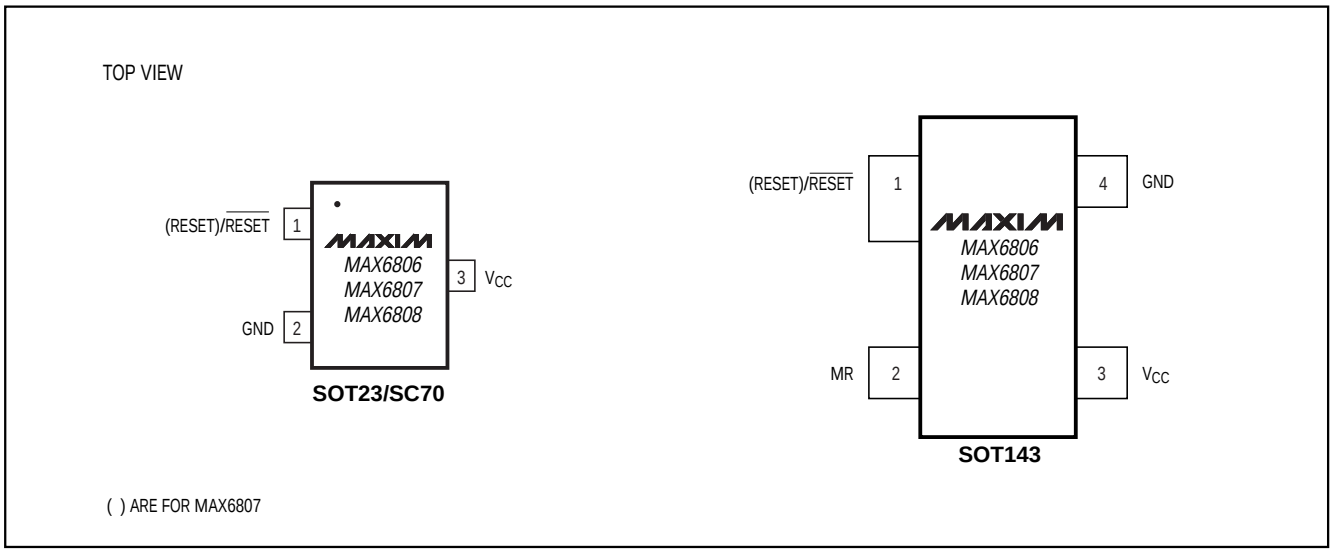
Figure 5. Interfacing to µPs with Bidirectional Reset I/O

Selector Guide (continued)

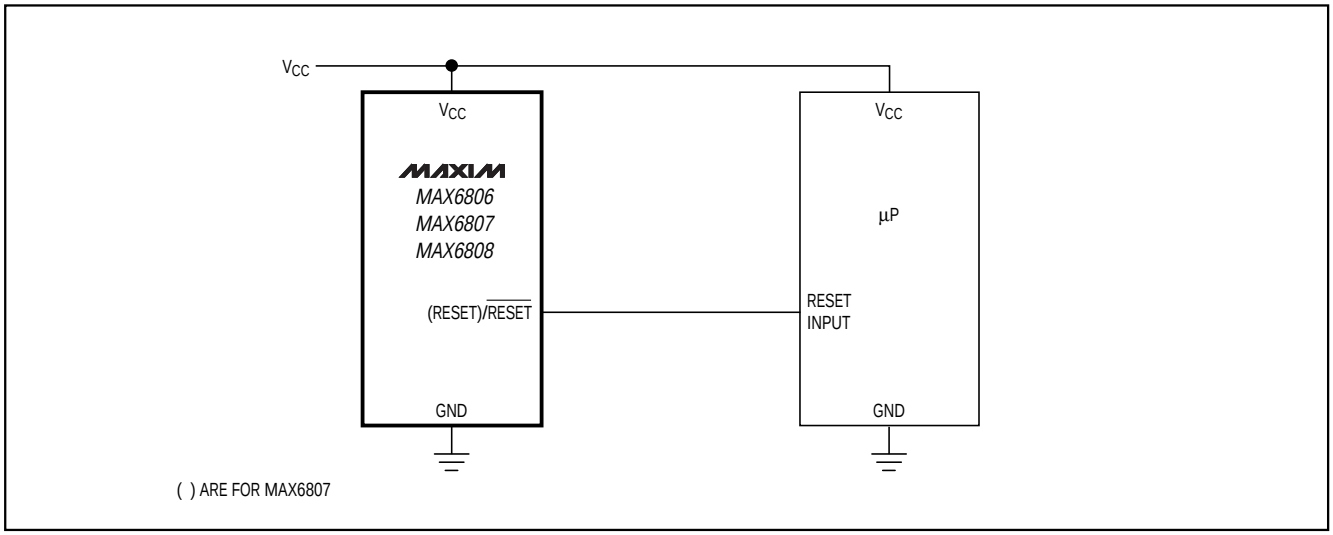
PART*	RESET OUTPUT	TOP MARK	NOMINAL V_{TH-} (V)†
MAX6806XR46-T	Active-Low, Push-Pull	AAA	4.6
MAX6806XR26-T		AAB	2.6
MAX6806XR23-T		AAC	2.3
MAX6807UR46-T	Active-High, Push-Pull	FZDS	4.6
MAX6807UR26-T		FZDT	2.6
MAX6807US46-T		KABW	4.6
MAX6807US26-T		KABX	2.6
MAX6807XR46-T		AAD	4.6
MAX6807XR26-T		AAE	2.6
MAX6808UR46-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

† *Other reset thresholds may be available. Contact factory for availability.*

Pin Configurations



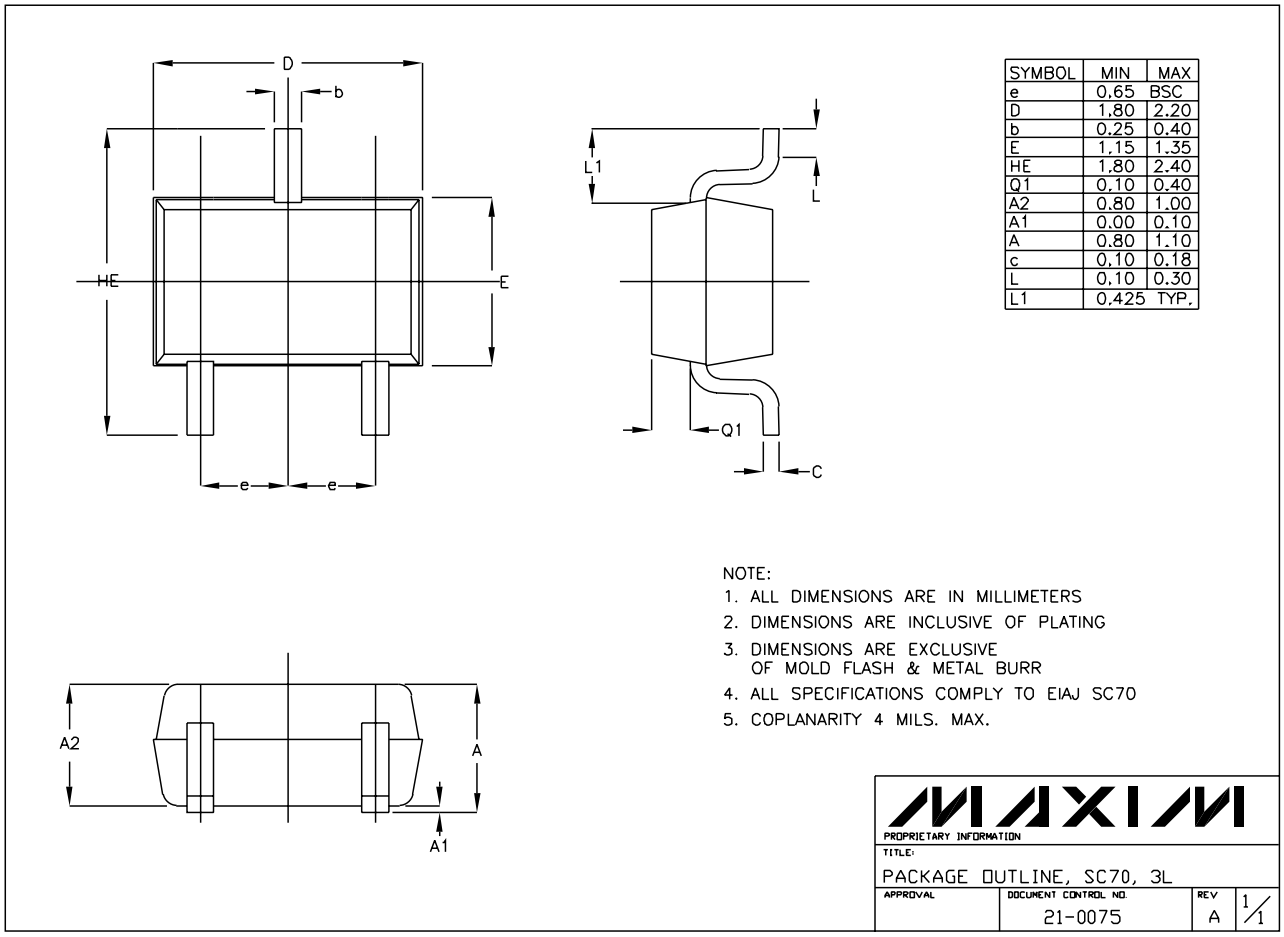
Typical Operating Circuit



Chip Information

TRANSISTOR COUNT: 72

Package Information



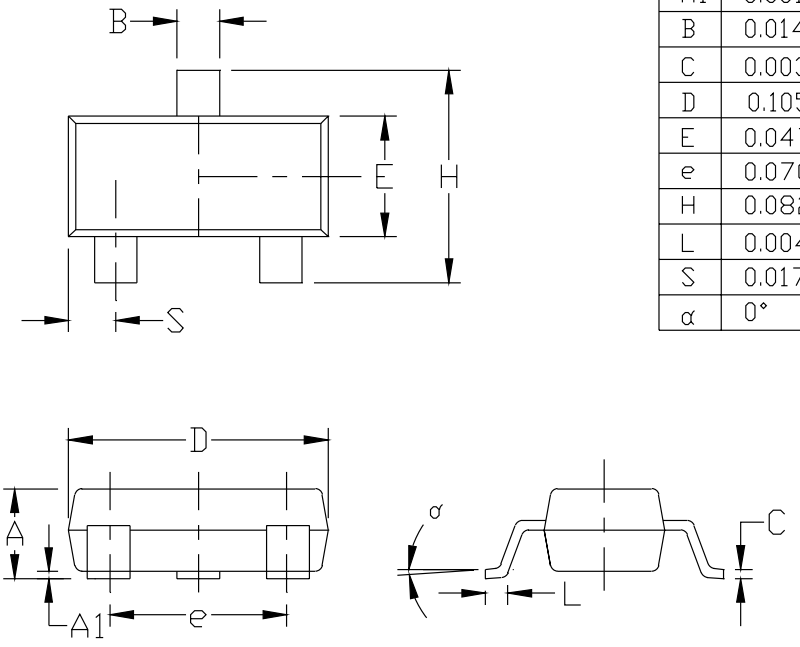
SYMBOL	MIN	MAX
e	0.65	BSC
D	1.80	2.20
b	0.25	0.40
E	1.15	1.35
HE	1.80	2.40
Q1	0.10	0.40
A2	0.80	1.00
A1	0.00	0.10
A	0.80	1.10
c	0.10	0.18
L	0.10	0.30
L1	0.425	TYP.

Package Information (continued)

SOTPO3L.EPS

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

	INCHES		MILLIMETERS	
DIM	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
α	0°	8°	0°	8°

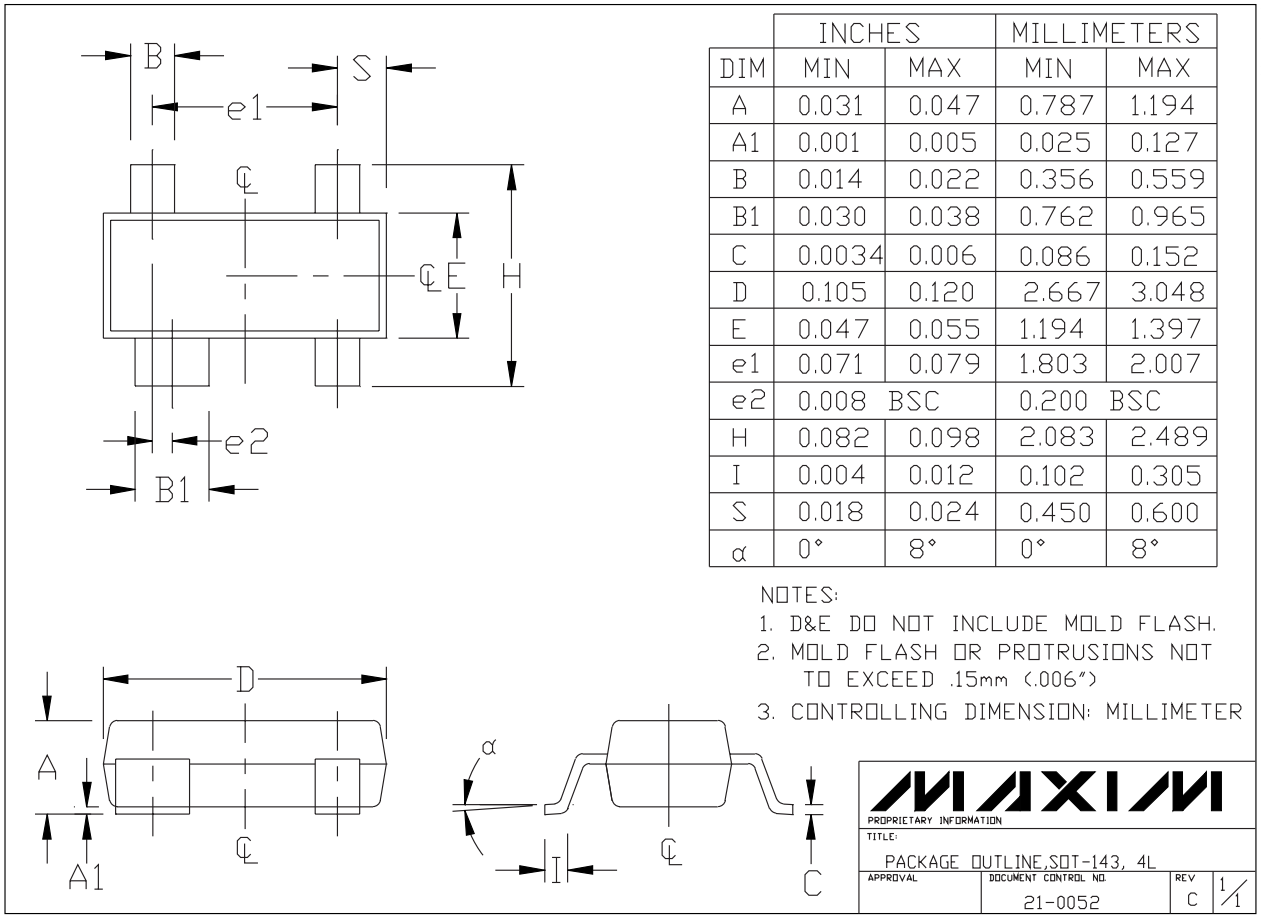


MAXIM
PROPRIETARY INFORMATION

TITLE:
PACKAGE OUTLINE,SOT-23, 3L

APPROVAL	DOCUMENT CONTROL NO.	REV	
	21-0051	C	1/1

Package Information (continued)



DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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
B1	0.030	0.038	0.762	0.965
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
e1	0.071	0.079	1.803	2.007
e2	0.008 BSC		0.200 BSC	
H	0.082	0.098	2.083	2.489
I	0.004	0.012	0.102	0.305
S	0.018	0.024	0.450	0.600
α	0°	8°	0°	8°

NOTES

NOTES