

## FEATURES

- High Accurate  $\pm 2\%$
- Precision monitoring of +3V, +3.3V, and +5V Power supply voltage
- Fully specified over temperature
- Available in three output configurations
- Push-Pull RESET low output (MAX809)
- Push-Pull (RESET) high output (MAX810)
- 200ms typ. Power-on reset pulse width
- 25 $\mu$ s supply current
- Guaranteed reset valid to  $V_{CC}=+1V$
- Power supply transient immunity

The MAX809/810 series are used for microprocessor ( $\mu$ P) supervisory circuits to monitor the power supplies in  $\mu$ P and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V, +2.5V powered circuits.

These circuits perform a single function: they assert a reset signal whenever the  $V_{CC}$  supply voltage declines below a preset threshold, keeping it asserted for at least 200ms after  $V_{CC}$  has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available. MAX809/810 series have push pull outputs. MAX809 series has an active low

## Ordering Information

### MAX810T

RESET VOLTAGE: L=4.63V  
M=4.38V  
J=4.00V  
T=3.08V  
S=2.93V  
R=2.63V

## APPLICATION

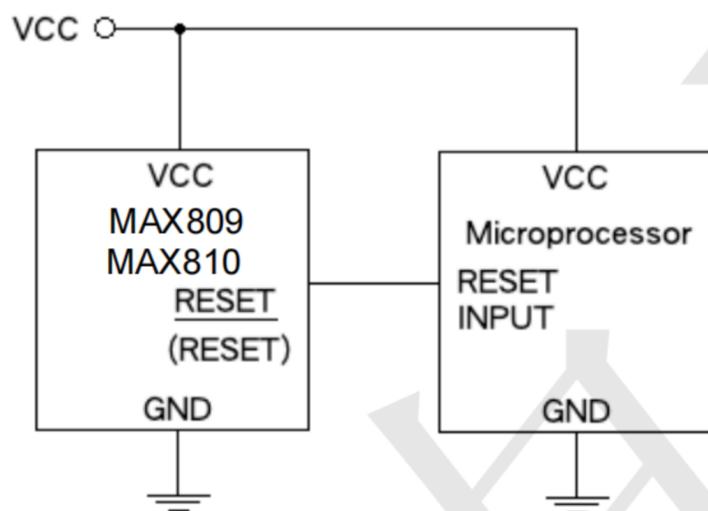
- Battery-operated systems and controllers
- Intelligent instruments
- Critical  $\mu$ P and  $\mu$ C power monitoring
- Portable / Battery powered equipment
- Automotive

RESET output, while the MAX810 has an active high RESET output. The reset comparator is designed to ignore fast transients on  $V_{CC}$ , and the outputs are guaranteed to be in the correct logic state for  $V_{CC}$  down to 1.0V. Low supply current makes MAX809/810 series ideal for use in portable equipment.

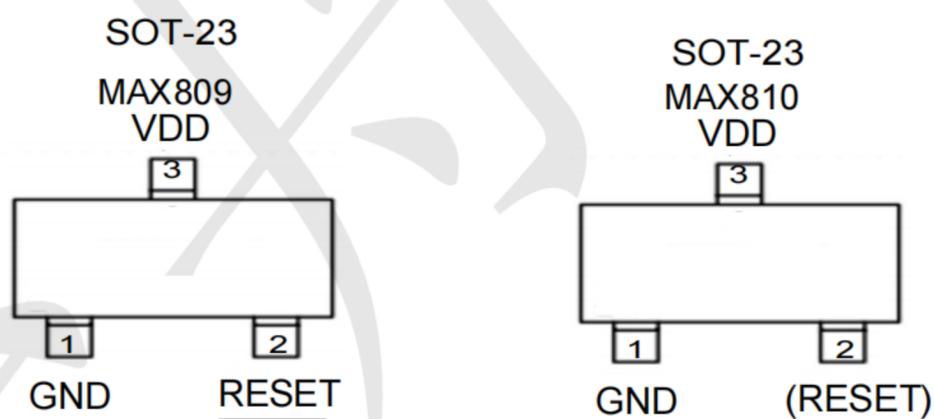
## Marking:

MAX809L: AAAA  
MAX810L: AGAA  
MAX809M: ABAA  
MAX810M: AHAA  
MAX809J: CWAA  
MAX809T: ACAA  
MAX810T: AJAA  
MAX809S: ADAA  
MAX810S: AKAA  
MAX809R: AFAA  
MAX810R: ALAA

**TYPICAL APPLICATIN CIRCUIT**



**Pin Definition**



### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Terminal Voltage (with respect to GND)	$V_{CC}$	GND - 0.3 to GND +6.5	V
<u>RESET</u> & (RESET) push-pull	$V_{RESET}$	GND - 0.3 to $V_{CC}$ +0.3	V
Input Current, $V_{CC}$	$I_{CC}$	20	mA
Output Current, <u>RESET</u> , (RESET)	$I_O$	5	mA
Power Dissipation	$P_D$	$(T_J - T_A) / R_{\theta JA}$	mW
Operating Junction Temperature Range	$T_{J.OPR}$	-40 ~ +125	°C
Storage Temperature Range	$T_{STG}$	-65 ~ +150	°C
Lead Soldering Temperature (260°C)	$T_{LEAD}$	10	s

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	MAXIMUM	UNIT
Thermal Resistance from Junction to Case	$R_{\theta JC}$	110	°C/W
Thermal Resistance from Junction to Ambient <sup>(Note 1)</sup>	$R_{\theta JA}$	250	°C/W

**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 5V$ ,  $T_A = 25^\circ C$  unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Input Supply Voltage	$T_A = -40^\circ C \sim +85^\circ C$	$V_{CC}$	1.0	--	6	V
Supply Current	$V_{CC} = V_{TH} + 1V$	$I_{CC}$	--	25	35	$\mu A$
Reset Threshold	MAX809/810L	$V_{TH}$	4.54	4.63	4.71	V
	MAX809/810M		4.29	4.38	4.46	
	MAX809/810J		3.92	4.00	4.08	
	MAX809/810T		3.02	3.08	3.15	
	MAX809/810S		2.87	2.93	3.00	
	MAX809/810R		2.57	2.63	2.69	
Reset Threshold Temperature Coefficient	$T_A = 0 \sim +85^\circ C$	$V_{THT}$	--	50	--	ppm/ $^\circ C$
Set-up Time	$V_{CC} = 0 \sim (V_{TH} - 100mV)$	$T_{SET}$	1	--	--	$\mu s$
$V_{CC}$ to Reset Delay	$V_{CC} = V_{TH} \sim (V_{TH} - 100mV)$	$T_{RD}$	--	20	--	$\mu s$
Reset Active Timeout Period	$T_A = 0 \sim +85^\circ C$	$T_{DELAY}$	140	200	260	ms
RESET Output (MAX809) Voltage Low	$1.8V < V_{CC} < V_{TH(MAX)}$ , $I_{SINK} = 1.2mA$	$V_{OL}$	--	--	0.3	V
	$1.2V < V_{CC} < 1.8V$ , $I_{SINK} = 50\mu A$					
RESET Output (MAX809) Voltage High	$V_{CC} > V_{TH(MAX)}$ , $I_{SOURCE} = 500\mu A$	$V_{OH}$	$0.8 V_{CC}$	--	--	V
(RESET) Output (MAX810) Voltage Low	$V_{CC} > V_{TH(MAX)}$ , $I_{SINK} = 1.2mA$	$V_{OL}$	--	--	0.3	V

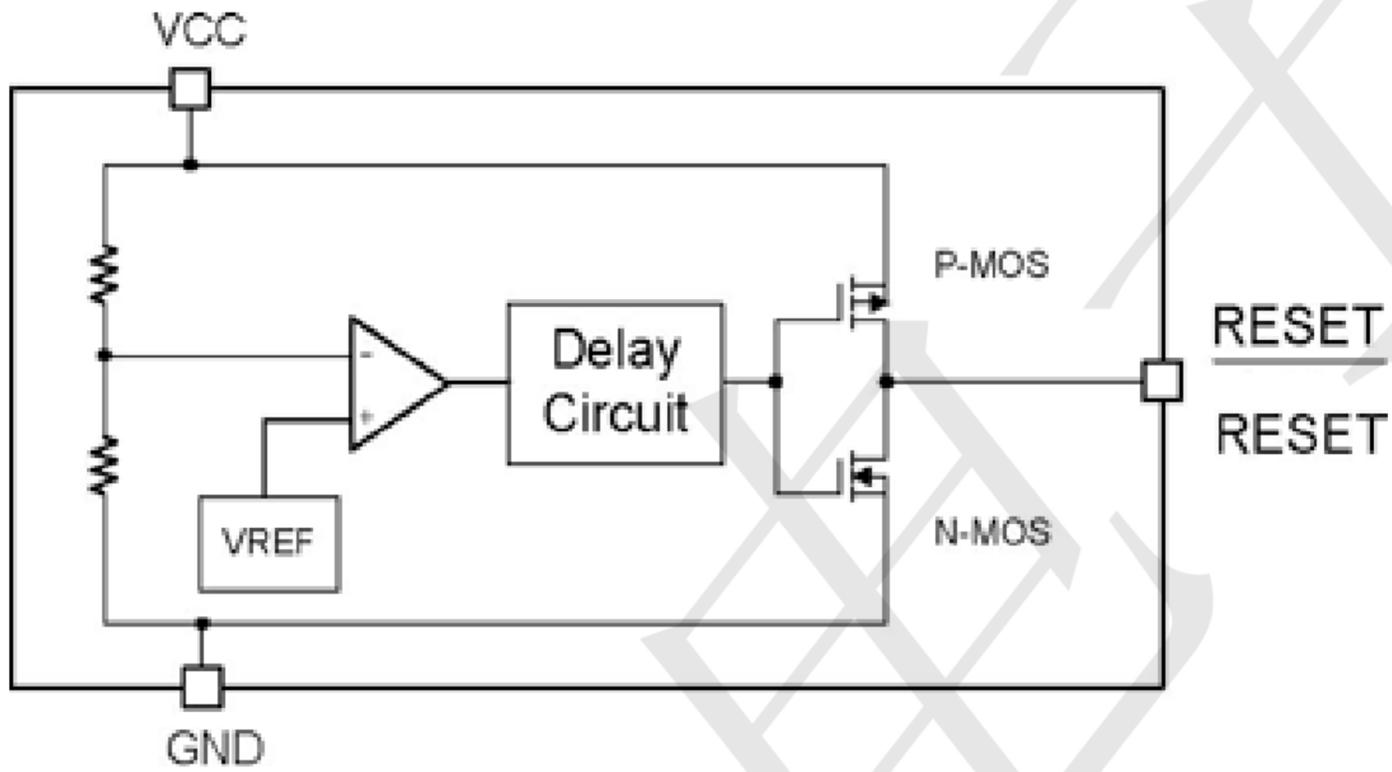
**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 5V$ ,  $T_A = 25^\circ C$  unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
(RESET) Output (MAX810) Voltage High	$1.8V < V_{CC} < V_{TH(MAX)}$ , $I_{SOURCE} = 500\mu A$	$V_{OH}$	$0.8 V_{CC}$	--	--	V
	$1.2V < V_{CC} < 1.8V$ , $I_{SOURCE} = 150\mu A$					
Hysteresis at $V_{CC}$	Input Voltage	$V_{HVS}$	--	40	--	mV

**Note :**

- $R_{\theta JA}$  is measured the PCB copper area of approximately  $1in^2$  (Multi-layer). Needs to connect to  $V_{SS}$  pin.

**BLOCK DIAGRAM**



## APPLICATION INFORMATION

Negative-Going  $V_{CC}$  transients in addition to issuing a reset to the  $\mu P$  during power-up, power-down, and brownout conditions, the MAX809/810 are relatively immune to short-duration negative-going  $V_{CC}$  transients (glitches).

The MAX809/810 does 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 farther below the reset threshold), the maximum allowable pulse width decreases. Typically, a  $V_{CC}$  transient that goes 100mV below the reset threshold and lasts 20 $\mu$ S or less will not cause a reset pulse. A 0.1 $\mu$ F bypass capacitor mounted as close as possible to the  $V_{CC}$  pin provides additional transient immunity.

## FUNCTION DESCRIPTION

A microprocessor's reset input starts the  $\mu P$  in a known state. The MAX809/810 assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the  $V_{CC}$  supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after  $V_{CC}$  has risen above the reset threshold. The MAX809/810 have a push-pull output stage.

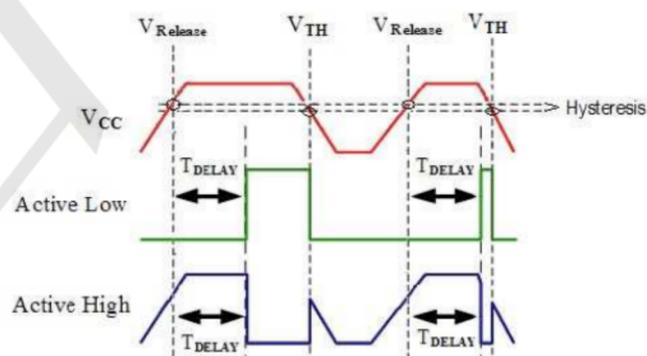
## ENSURING A VALID RESET OUTPUT DOWN TO $V_{CC}=0$

RESET is guaranteed to be a logic low for  $V_{CC} > 1.0V$ . Once  $V_{CC}$  exceeds the reset threshold, an internal timer keeps RESET low for the reset timeout period; after this interval, RESET goes high. If a brownout condition occurs ( $V_{CC}$  dips below the reset threshold), RESET goes low. Any time  $V_{CC}$  goes below the reset threshold, the internal timer resets to zero, and RESET goes low. The internal timer starts after  $V_{CC}$  returns above the reset threshold, and RESET remains low for the reset timeout period. When  $V_{CC}$  falls below 1V, the MAX809/810 reset output no longer sinks current - it becomes an open circuit. Therefore, high impedance CMOS logic input connected to reset can drift to undetermined voltages. This present no problem in most applications since most  $\mu P$  and other circuitry is inoperative with  $V_{CC}$  below 1V. However, in applications where reset must be valid down to 0V, adding a pull down resistor to reset causes and stray leakage currents to flow to ground, holding reset low (Figure 2.) R1's value is not critical; 100K is large enough not to load reset and small enough to pull RESET to ground. For the MAX809/810 if reset is required to remain valid for  $V_{CC} < 1V$ .

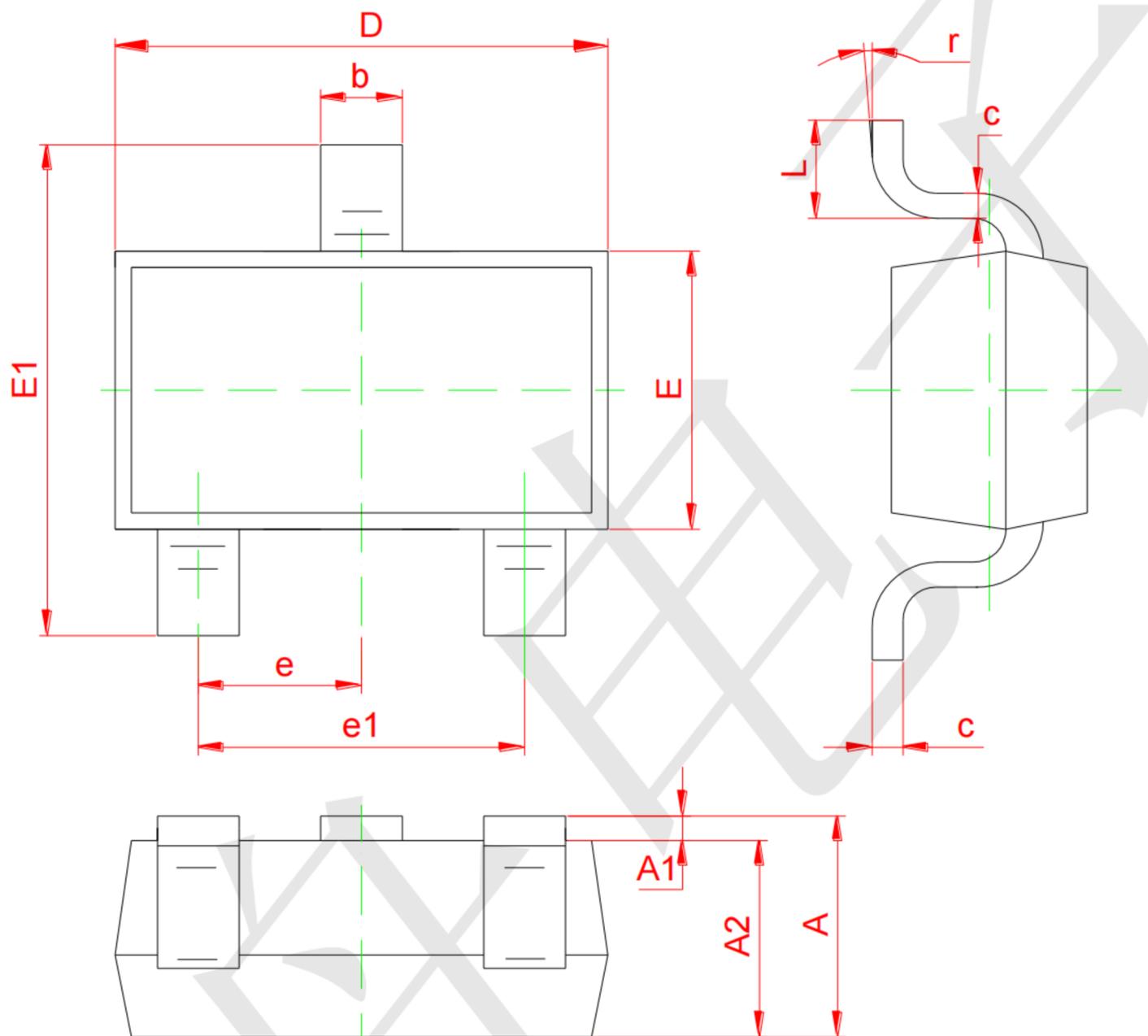
## BENEFITS OF HIGHLY ACCURATE RESET THRESHOLD

Most  $\mu P$  supervisor ICs has reset threshold voltages between 5% and 10% below the value of nominal supply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal. When using ICs rated at only the nominal supply  $\pm 5\%$ , this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset many or may not be asserted.

## TIMMING DIAGRAM



**Package information**



Symbol	Dimensions In Millimeters	
	Min	Max
A1	0.02	0.1
A2	1.0 Typical	
b	0.4 Typical	
c	0.1 Typical	
D	2.70	3.10
E	1.10	1.50
E1	2.20	2.60
e1	1.80	2.00
L	0.35	0.48