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## Low Power, 5V $\mu$ P Reset - Active LOW, Push-Pull Output

### General Description

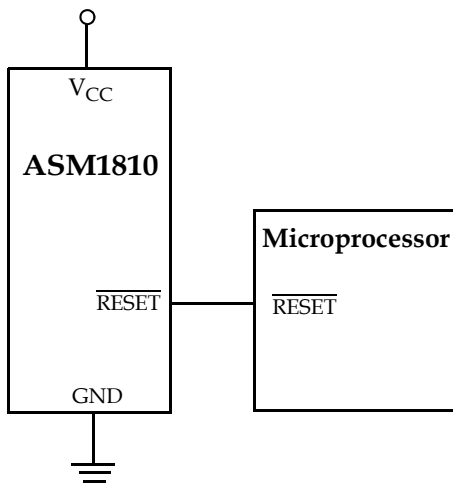
The ASM1810 is a voltage supervisor with low-power, 5V  $\mu$ P active LOW Reset, Push-Pull output. Maximum supply current over temperature is a low 20 $\mu$ A.

The ASM1810 generates an active LOW reset signal whenever the monitored supply is out of tolerance. A precision reference and comparator circuit monitor power supply ( $V_{CC}$ ) level. Tolerance level options are 5%, 10% and 15%. When an out-of-tolerance condition is detected, an internal power-fail signal is generated which forces an active LOW reset signal. After  $V_{CC}$  returns to an in-tolerance condition, the reset signal remains active for 150ms to allow the power supply and system microprocessor to stabilize.

The ASM1810 is designed with a push-pull output stage and operates over the extended industrial temperature range. Devices are available in compact surface mount SOT-23 packages and 3-lead TO-92 packages.

Other low power products in this family include the ASM1811/12/15/16/17, ASM1233D and ASM1233M.

### Typical Operating Circuit



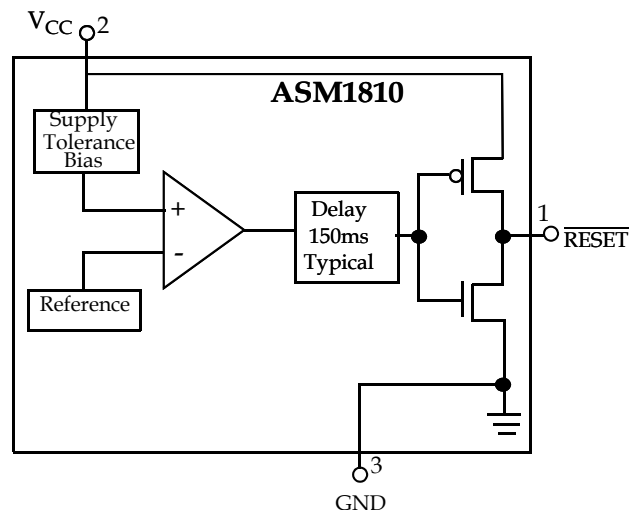
### Key Features

- Low Supply Current  
• 20  $\mu$ A maximum (5.5 V)
- Automatically restarts a microprocessor after power failure
- 150ms reset delay after  $V_{CC}$  returns to an in-tolerance condition
- Active LOW power-up reset
- Precision temperature-compensated voltage reference and comparator
- Eliminates external components
- Low-cost TO-92 package
- Compact surface mount SOT-23 package
- Push-Pull output for minimum current drain
- Operating temperature -40°C to +85°C

### Applications

- Set-top boxes
- Cellular phones
- PDAs
- Energy management systems
- Embedded control systems
- Printers
- Single board computers

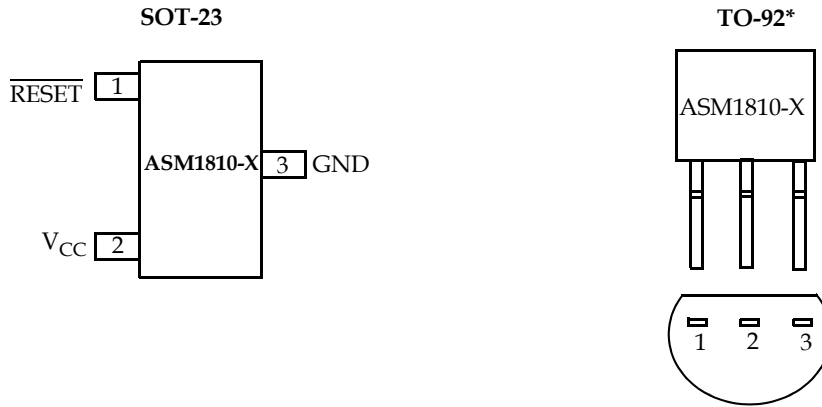
### Block Diagram





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**Pin Configuration**



\* See Ordering Information

**Pin Description**

| Pin # | Pin Name                  | Description             |
|-------|---------------------------|-------------------------|
| 1     | $\overline{\text{RESET}}$ | Active LOW reset output |
| 2     | $V_{CC}$                  | Power supply input      |
| 3     | GND                       | Ground                  |



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**Application Information**

**Operation - Power Monitor**

The ASM1810 detects out-of-tolerance power supply conditions. It resets a processor during power-up, power-down and issues a reset to the system processor when the monitored power supply voltage is below the reset threshold. When an out-of-tolerance  $V_{CC}$  voltage is detected, the  $\overline{\text{RESET}}$  signal is asserted. On power-up,  $\overline{\text{RESET}}$  is kept active (LOW) for approximately 150ms after the power supply voltage has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before  $\overline{\text{RESET}}$  is released.

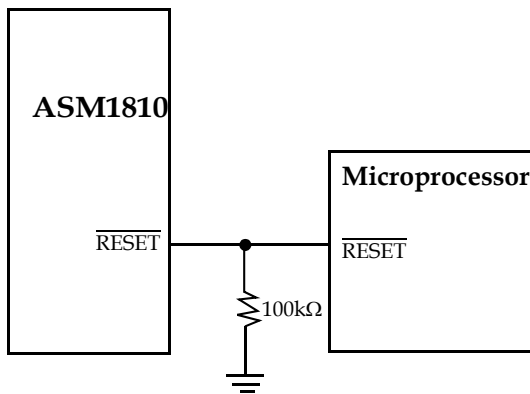


Figure 1:  $\overline{\text{RESET}}$  Valid to 0V  $V_{CC}$

**Output Conditions**

The ASM1810 active LOW reset signal is valid as long as  $V_{CC}$  remains below 1.2V. The  $\overline{\text{RESET}}$  output on the ASM1810 uses a push-pull drive stage that can maintain a valid output below 1.2V. To sink current with  $V_{CC}$  below 1.2V, a resistor can be connected from the reset pin ( $\overline{\text{RESET}}$ ) to Ground (see Figure 1). This configuration will give a valid value on the  $\overline{\text{RESET}}$  output with  $V_{CC}$  approaching 0V. During both power up and down, this configuration will draw current when the RESET is in the high state. A value of 100kΩ should be adequate to maintain a valid connection.

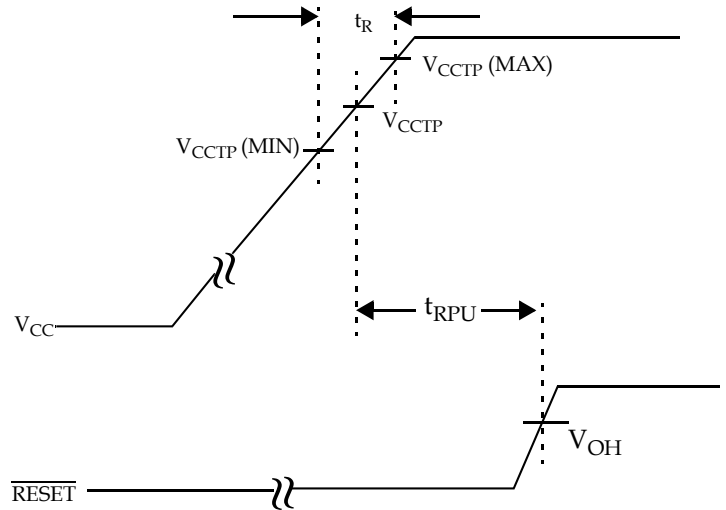


Figure 2: Timing Diagram: Power-Up

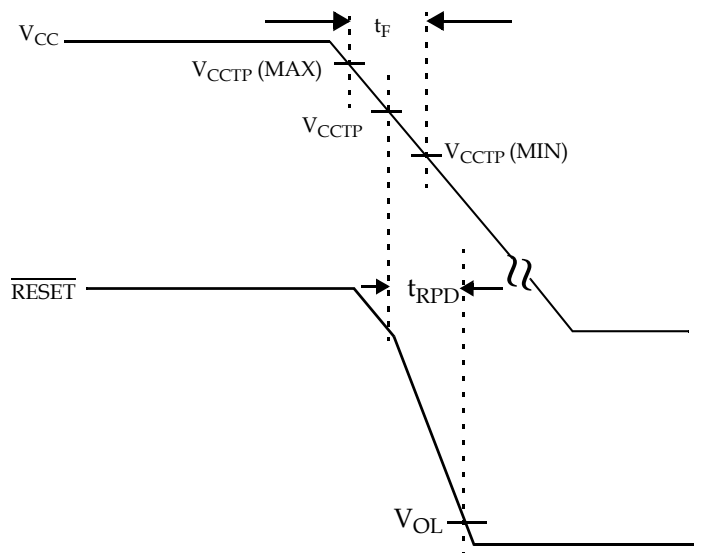


Figure 3: Timing Diagram: Power-Down



## Absolute Maximum Ratings

| Parameter                          | Min  | Max            | Unit |
|------------------------------------|------|----------------|------|
| Voltage on $V_{CC}$                | -0.5 | 7              | V    |
| Voltage on $\overline{RESET}$      | -0.5 | $V_{CC} + 0.5$ | V    |
| Operating Temperature Range        | -40  | 85             | °C   |
| Soldering Temperature (for 10 sec) |      | 260            | °C   |
| Storage Temperature                | -55  | 125            | °C   |

NOTE: These are stress ratings only and functional use is not implied. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability.

## Electrical Characteristics

Unless otherwise noted  $V_{CC} = 1.25V$  to  $5.5V$  and specifications are over the operating temperature range of  $-40^{\circ}C$  to  $+85^{\circ}C$ . All voltages are referenced to ground.

| Parameter  | Symbol     | Conditions                                       | Min             | Typ             | Max  | Unit    |
|--|------------|--|-----------------|-----------------|------|---------|
| Supply voltage   | $V_{CC}$   |  | 1.2             |                 | 5.5  | V       |
| Output voltage   | $V_{OH}$   | $I_{OUT} < 500 \mu A$                            | $V_{CC} - 0.5V$ | $V_{CC} - 0.1V$ |      | V       |
| Output Current   | $I_{OH}$   | Output = 2.4V, $V_{CC} \geq 2.7V$                |                 | 350             |      | $\mu A$ |
| Output Current   | $I_{OL}$   | Output = 0.4V, $V_{CC} \geq 2.7V$                | +10             |                 |      | mA      |
| Operating Current  | $I_{CC}$   | $V_{CC} < 5.5V$ , $\overline{RESET}$ output open |                 | 8               | 20   | $\mu A$ |
| $V_{CC}$ Trip Point (ASM1810-5)                                | $V_{CCTP}$ |  | 4.50            | 4.62            | 4.75 | V       |
| $V_{CC}$ Trip Point (ASM1810-10)                               | $V_{CCTP}$ |  | 4.25            | 4.37            | 4.49 | V       |
| $V_{CC}$ Trip Point (ASM1810-15)                               | $V_{CCTP}$ |  | 4.00            | 4.12            | 4.24 | V       |
| Output Capacitance   | $C_{OUT}$  |  |                 |                 | 10   | pF      |
| $V_{CC}$ Detect to $\overline{RESET}$ Low                      | $t_{RPD}$  |  |                 | 2               | 5    | $\mu s$ |
| $V_{CC}$ Slew Rate<br>( $V_{CCTP} (MAX)$ to $V_{CCTP} (MIN)$ ) | $t_F$      |  | 300             |                 |      | $\mu s$ |
| $V_{CC}$ Slew Rate<br>( $V_{CCTP} (MIN)$ to $V_{CCTP} (MAX)$ ) | $t_R$      |  | 0               |                 |      | ns      |
| $V_{CC}$ Detect to $\overline{RESET}$ High                     | $t_{RPU}$  | $t_r = 5\mu s$                                   | 100             | 150             | 300  | ms      |

Note: The  $t_F$  value is for reference in defining values for  $t_{RPD}$  and should not be considered for proper operation or use.



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### Family Selection Guide

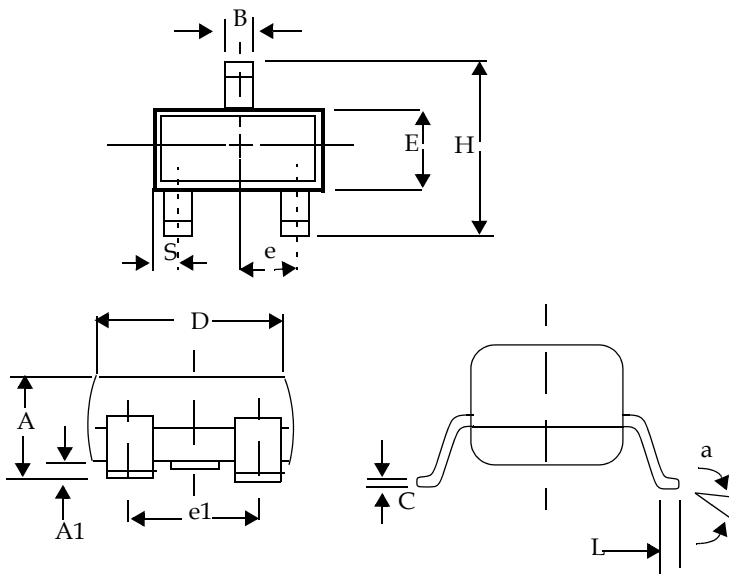
| Part #   | RESET Voltage (V)   | RESET Time (ms) | Output Stage | RESET Polarity |
|----------|---------------------|-----------------|--------------|----------------|
| ASM1810  | 4.620, 4.370, 4.120 | 150             | Push-Pull    | LOW            |
| ASM1811  | 4.620, 4.350, 4.130 | 150             | Open-Drain   | LOW            |
| ASM1812  | 4.620, 4.350, 4.130 | 150             | Push-Pull    | HIGH           |
| ASM1815  | 3.060, 2.880, 2.550 | 150             | Push-Pull    | LOW            |
| ASM1816  | 3.060, 2.880, 2.550 | 150             | Open-Drain   | LOW            |
| ASM1817  | 3.060, 2.880, 2.550 | 150             | Push-Pull    | HIGH           |
| ASM1233D | 4.625, 4.375, 4.125 | 350             | Open-Drain   | LOW            |
| ASM1233M | 4.625, 4.375, 2.720 | 350             | Open-Drain   | LOW            |



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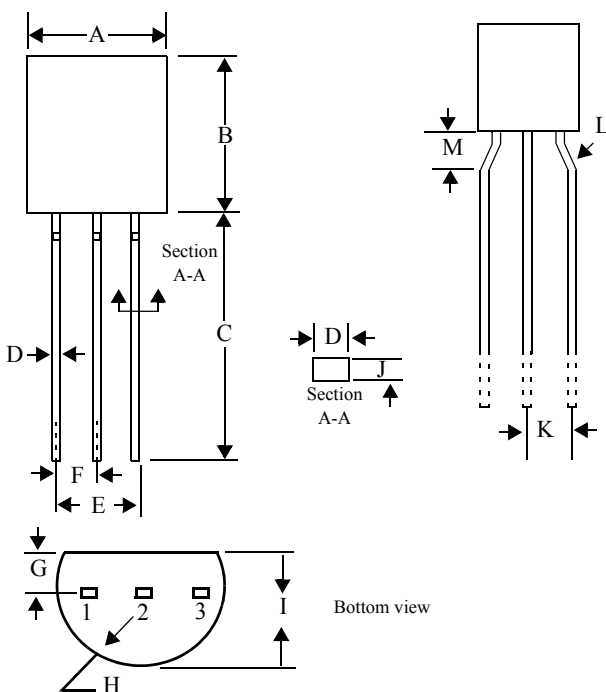
Package Dimension

Plastic SOT-23 (3-Pin)



|                               | Inches    |        | Millimeters |      |
|-------------------------------|-----------|--------|-------------|------|
|                               | Min       | Max    | Min         | Max  |
| <b>Plastic SOT-23 (3-Pin)</b> |           |        |             |      |
| A                             | 0.031     | 0.050  | 0.80        | 1.27 |
| A1                            | 0.004     | 0.010  | 0.10        | 0.25 |
| B                             | 0.015     | 0.020  | 0.37        | 0.51 |
| C                             | 0.003     | 0.007  | 0.085       | 0.18 |
| D                             | 0.110     | 0.120  | 2.80        | 3.04 |
| E                             | 0.047     | 0.055  | 1.20        | 1.40 |
| e                             | 0.035     | 0.040  | 0.89        | 1.03 |
| e1                            | 0.070     | 0.080  | 1.78        | 2.05 |
| H                             | 0.083     | 0.1039 | 2.10        | 2.64 |
| L                             | 0.027 REF |        | 0.069 REF   |      |
| S                             | 0.018     | 0.024  | 0.45        | 0.60 |

TO-92 (3-Pin)



|                      | Inches        |       | Millimeters |       |
|----------------------|---------------|-------|-------------|-------|
|                      | Min           | Max   | Min         | Max   |
| <b>TO-92 (3-Pin)</b> |               |       |             |       |
| A                    | 0.175         | 0.195 | 4.45        | 4.95  |
| B                    | 0.170         | 0.192 | 4.32        | 4.96  |
| C                    | 0.500         | 0.610 | 12.70       | 15.49 |
| D                    | 0.016         | 0.022 | 0.406       | 0.559 |
| E                    | 0.095         | 0.105 | 2.41        | 2.67  |
| F                    | 0.045         | 0.060 | 1.14        | 1.52  |
| G                    | 0.045         | 0.060 | 1.14        | 1.52  |
| H                    | 0.085         | 0.095 | 2.16        | 2.41  |
| I                    | 0.130         | 0.155 | 3.30        | 3.94  |
| J                    | 0.014         | 0.020 | 0.35        | 0.51  |
| K                    | 0.093         | 0.115 | 2.36        | 2.92  |
| L                    | 45°           | 60°   | 45°         | 60°   |
| M                    | 0.118 Typical |       | 3.00        |       |



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Ordering Information

| Device Summary |                          |                     |                 |                        |                |                |                | Package Marking |   |   |   |
|----------------|--------------------------|---------------------|-----------------|------------------------|----------------|----------------|----------------|-----------------|---|---|---|
| Part ** Number | RESET Output Voltage (V) | RESET Tolerance (%) | RESET Time (ms) | Push-Pull Output Stage | TO-92* Package | SOT-23 Package | RESET Polarity | A               | B | C | D |
| ASM1810-5      | 4.62                     | 5                   | 150             | u                      | u              |                | LOW            |                 |   |   |   |
| ASM1810-10     | 4.37                     | 10                  | 150             | u                      | u              |                | LOW            |                 |   |   |   |
| ASM1810-15     | 4.12                     | 15                  | 150             | u                      | u              |                | LOW            |                 |   |   |   |
| ASM1810R-5     | 4.62                     | 5                   | 150             | u                      |                | u              | LOW            | B               | A | X | X |
| ASM1810R-10    | 4.37                     | 10                  | 150             | u                      |                | u              | LOW            | B               | B | X | X |
| ASM1810R-15    | 4.12                     | 15                  | 150             | u                      |                | u              | LOW            | B               | C | X | X |

\* Add /S to Part Number for straight (unformed) leads. (i.e. ASM18xx-x/S)  
 \*\* Add /T to Part Number for Tape and Reel (i.e ASM18xx-x/T)  
 XX- Date Code



**ASM1810**



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