

## 3-Pin Microprocessor Reset Circuits

### FEATURES

- Ultra-low supply current 1 $\mu$ A (typ.)
- Guaranteed reset valid to V<sub>cc</sub>=0.9V
- Available in three output types:
  - Open-drain active low (SS809N-xxGx)
  - Push-pull active low (SS809-xxGx)
  - Push-pull active high (SS810-xxGx)
- Power-on reset pulse width min. 140ms
- Internally fixed threshold 2.3V, 2.6V, 2.9V, 3.1V, 4.0V, 4.4V, 4.6V
- Tight voltage threshold tolerance: 1.5%

 Packaged in RoHS-compliant SOT-23-3

### APPLICATIONS

- Notebook Computers
- Digital Still Cameras
- PDAs
- Critical Microprocessor Monitoring

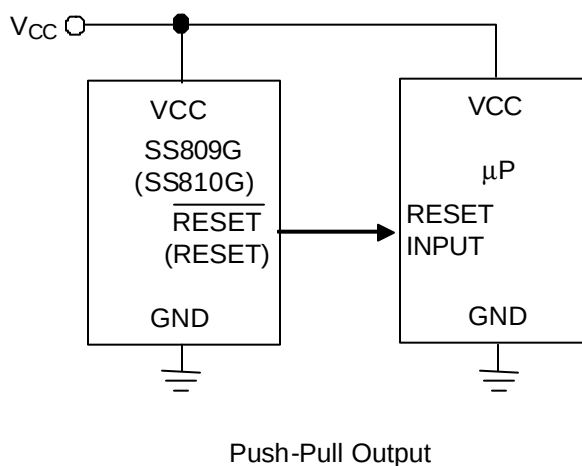
### DESCRIPTION

The SS809G and SS810G are low-power microprocessor ( $\mu$ P) supervisory circuits used to monitor power supplies in  $\mu$ P and digital systems. They improve circuit reliability and reduce cost by eliminating external components.

These devices provide valid signals in applications with V<sub>cc</sub> ranging from 6.0V down to 0.9V. The reset signal lasts for a minimum period of 140ms whenever the V<sub>CC</sub> supply voltage falls below a preset threshold. Both the SS809G and SS810G were designed with a reset comparator to help identify invalid signals lasting less than 140ms. The only difference between the two devices is that one has an active-low  $\overline{\text{RESET}}$  output and the other an active-high RESET output.

Low supply current (1 $\mu$ A) makes the SS809G and SS810G ideal for portable equipment. The devices are available in a SOT-23-3 package.

### TYPICAL APPLICATION CIRCUIT



## ORDERING INFORMATION

## PIN CONFIGURATION

SS809X-XXGU XX  
SS810 -XXGU XX

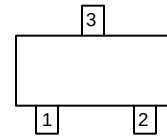
Packing type  
TR: Tape and reel

Package type  
GU: RoHS-compliant Pb-free SOT-23-3

Reset threshold voltage  
23: 2.3V  
26: 2.6V  
29: 2.9V  
31: 3.1V  
40: 4.0V  
44: 4.4V  
46: 4.6V

Output type  
Default: Push-Pull type  
N: N-ch open-drain type

SOT-23-3  
TOP VIEW  
1: GND  
2: RESET (RESET)  
3: VCC



Example: SS809-31GU TR

→ 3.1V, push-pull version in RoHS-compliant SOT-23-3, shipped in tape and reel

## SOT-23 Part Marking

| Part No.   | Marking |
|------------|---------|
| SS809-23GU | RA23P   |
| SS809-26GU | RA26P   |
| SS809-29GU | RA29P   |
| SS809-31GU | RA31P   |
| SS809-40GU | RA40P   |
| SS809-44GU | RA44P   |
| SS809-46GU | RA46P   |

| Part No.    | Marking |
|-------------|---------|
| SS809N-23GU | RB23P   |
| SS809N-26GU | RB26P   |
| SS809N-29GU | RB29P   |
| SS809N-31GU | RB31P   |
| SS809N-40GU | RB40P   |
| SS809N-44GU | RB44P   |
| SS809N-46GU | RB46P   |

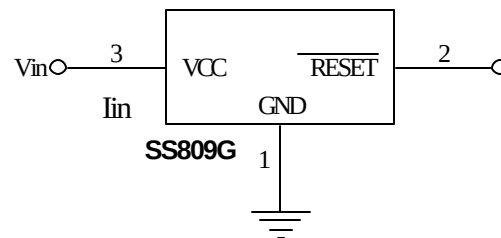
| Part No.   | Marking |
|------------|---------|
| SS810-23GU | RD23P   |
| SS810-26GU | RD26P   |
| SS810-29GU | RD29P   |
| SS810-31GU | RD31P   |
| SS810-40GU | RD40P   |
| SS810-44GU | RD44P   |
| SS810-46GU | RD46P   |

## ABSOLUTE MAXIMUM RATINGS

|                                                              |                    |
|--------------------------------------------------------------|--------------------|
| $V_{CC}$                                                     | -0.3V ~6.5V        |
| RESET, $\overline{\text{RESET}}$                             | -0.3V ~ (VCC+0.3V) |
| Input Current ( $V_{CC}$ )                                   | 20mA               |
| Output Current (RESET or $\overline{\text{RESET}}$ )         | 20mA               |
| Continuous Power Dissipation ( $T_A = +70^{\circ}\text{C}$ ) | 320mW              |
| Operating Junction Temperature Range                         | -40°C ~ 85°C       |
| Storage Temperature Range                                    | - 65°C ~ 125°C     |
| Lead Temperature (Soldering) 10 sec                          | 260°C              |

Note1: Any stress beyond the Absolute Maximum Ratings above may cause permanent damage to the device.

## TEST CIRCUIT



## ELECTRICAL CHARACTERISTICS

(Typical values are at  $T_A=25^{\circ}\text{C}$ , unless otherwise specified.)

| PARAMETER                                | SYMBOL          | TEST CONDITIONS                                                                    |                                 | MIN.               | TYP. | MAX.   | UNIT |
|------------------------------------------|-----------------|------------------------------------------------------------------------------------|---------------------------------|--------------------|------|--------|------|
| Operating Voltage Range                  | V <sub>CC</sub> |                                                                                    |                                 | 0.9                |      | 6      | V    |
| Supply Current                           | I <sub>CC</sub> | V <sub>CC</sub> = V <sub>TH</sub> +0.1V                                            |                                 |                    | 1    | 3      | μA   |
| Reset Threshold                          | V <sub>TH</sub> | SS809-23                                                                           | T <sub>A</sub> =+25°C           | 2.265              | 2.3  | 2.335  | V    |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 2.254              |      | 2.346  |      |
|                                          |                 | SS809-26                                                                           | T <sub>A</sub> =+25°C           | 2.561              | 2.6  | 2.639  |      |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 2.548              |      | 2.652  |      |
|                                          |                 | SS809-29                                                                           | T <sub>A</sub> =+25°C           | 2.857              | 2.9  | 2.944  |      |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 2.842              |      | 2.958  |      |
|                                          |                 | SS809-31                                                                           | T <sub>A</sub> =+25°C           | 3.054              | 3.1  | 3.147  |      |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 3.038              |      | 3.162  |      |
|                                          |                 | SS809-40                                                                           | T <sub>A</sub> =+25°C           | 3.940              | 4.0  | 4.060  |      |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 3.920              |      | 4.080  |      |
|                                          |                 | SS809-44                                                                           | T <sub>A</sub> =+25°C           | 4.334              | 4.4  | 4.466  |      |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 4.312              |      | 4.488  |      |
|                                          |                 | SS809-46                                                                           | T <sub>A</sub> =+25°C           | 4.531              | 4.6  | 4.669  |      |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 4.508              |      | 4.692  |      |
| V <sub>CC</sub> to Reset Delay           | T <sub>RD</sub> | V <sub>CC</sub> =V <sub>TH</sub> to (V <sub>TH</sub> -0.1V), V <sub>TH</sub> =3.1V |                                 |                    | 20   |        | μS   |
| Reset Active Timeout Period              | T <sub>RP</sub> | V <sub>CC</sub> = V <sub>TH(MAX)</sub>                                             | T <sub>A</sub> =+25°C           | 140                | 230  | 560    | mS   |
|                                          |                 |                                                                                    | T <sub>A</sub> = -40°C to +85°C | 100                |      | 1030   |      |
| $\overline{\text{RESET}}$ Output Voltage | V <sub>OH</sub> | V <sub>CC</sub> =V <sub>TH</sub> +0.1V, I <sub>SOURCE</sub> =1mA                   |                                 | 0.8V <sub>CC</sub> |      |        | V    |
|                                          | V <sub>OL</sub> | V <sub>CC</sub> =V <sub>TH</sub> - 0.1V, I <sub>SINK</sub> =1mA                    |                                 |                    |      | 0.2Vcc |      |
| RESET Output Voltage                     | V <sub>OH</sub> | V <sub>CC</sub> =V <sub>TH</sub> -0.1V, I <sub>SOURCE</sub> =1mA                   |                                 | 0.8V <sub>CC</sub> |      |        | V    |
|                                          | V <sub>OL</sub> | V <sub>CC</sub> =V <sub>TH</sub> +0.1V, I <sub>SINK</sub> =1mA                     |                                 |                    |      | 0.2Vcc |      |

Note2:  $\overline{\text{RESET}}$  output is for the SS809G; RESET output is for the SS810G.

Note3: Specifications for operating temperature ranges from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  are guaranteed by Statistical Quality Controls (SQC), with no production testing.

## TYPICAL PERFORMANCE CHARACTERISTICS

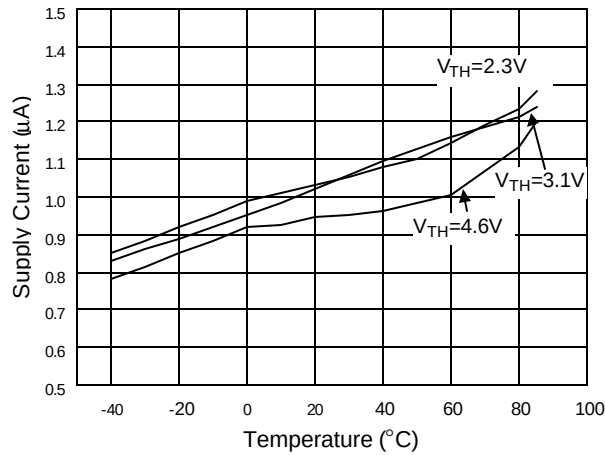


Fig 1 Supply Current vs. Temperature

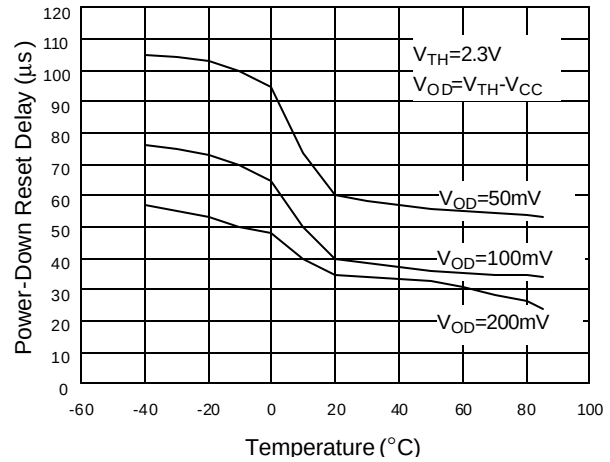


Fig 2 Power-Down Reset Delay vs. Temperature

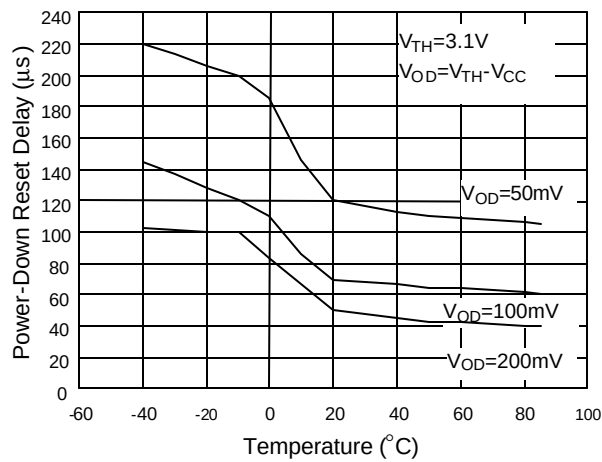


Fig 3 Power-Down Reset Delay vs. Temperature

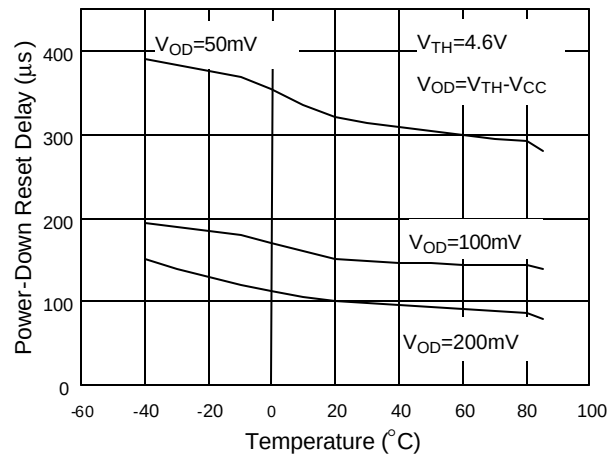


Fig 4 Power-Down Reset Delay vs. Temperature

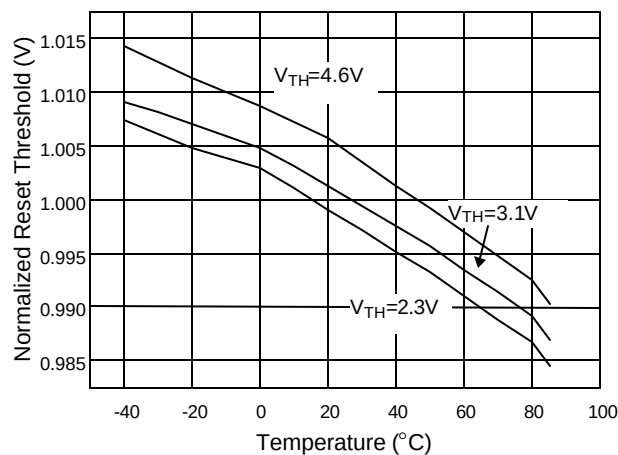


Fig 5 Normalized Reset Threshold vs. Temperature

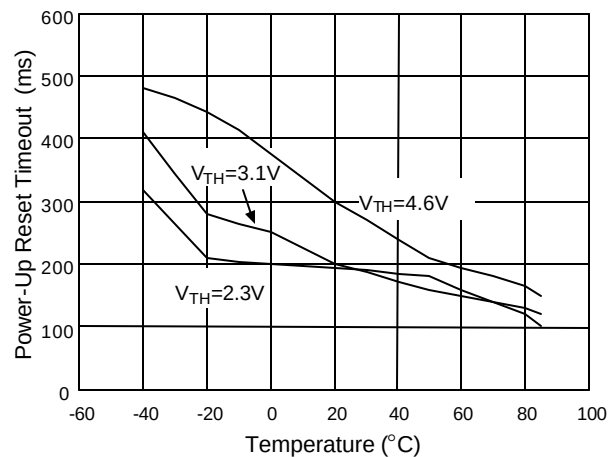
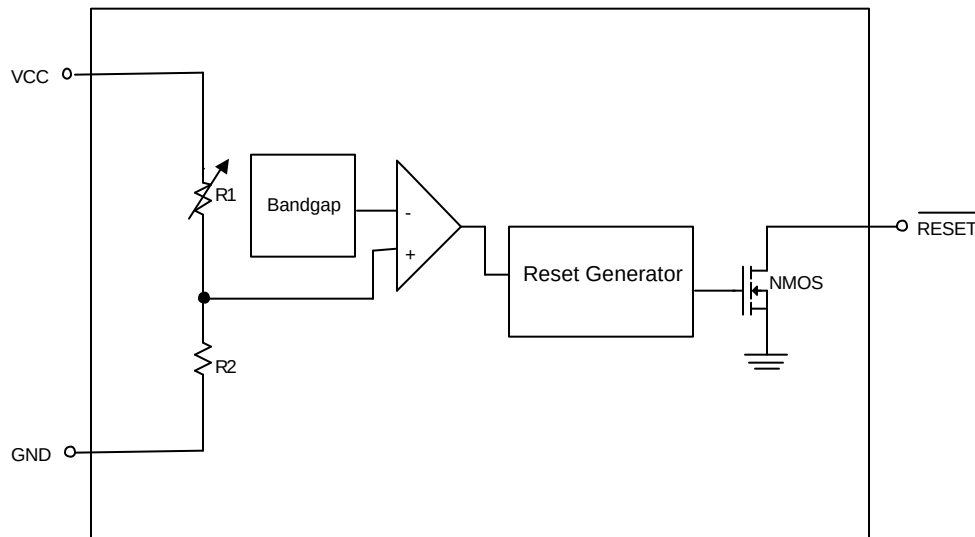
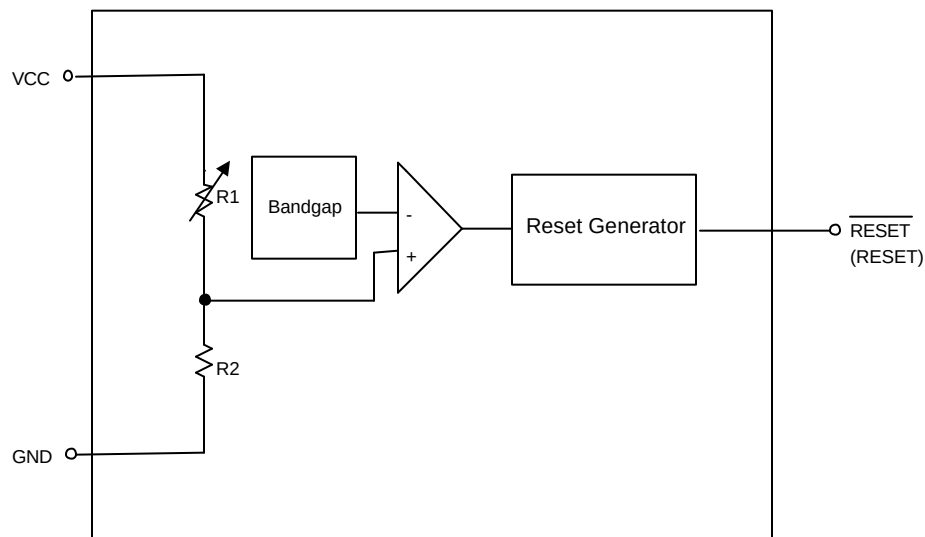


Fig 6 Power-Up Reset Timeout vs. Temperature

## BLOCK DIAGRAM



N-ch Open-Drain Type



Push-Pull Type

## PIN DESCRIPTIONS

GND Pin : Ground.

RESET Pin (SS809G) : Active low output pin. RESET Output remains low while Vcc is below the reset

RESET Pin (SS810G) : Active high output pin. RESET output remains high while Vcc is below the reset threshold.

Vcc Pin : Supply voltage.

## DETAILED DESCRIPTIONS OF TECHNICAL TERMS

### **RESET OUTPUT**

The  $\mu$ P will be activated at a valid reset state. These  $\mu$ P supervisory circuits assert reset to prevent code execution errors during power-up, power-down, or brownout conditions.

$\overline{\text{RESET}}$  is guaranteed to be a logic low for  $V_{\text{TH}} > V_{\text{CC}} > 0.9\text{V}$ . Once  $V_{\text{CC}}$  exceeds the reset threshold, an internal timer keeps  $\overline{\text{RESET}}$  low for the reset timeout period; after this interval,  $\overline{\text{RESET}}$  goes high.

If a brownout condition occurs ( $V_{\text{CC}}$  drops below the reset threshold),  $\overline{\text{RESET}}$  goes low. Any time  $V_{\text{CC}}$  goes below the reset threshold, the internal timer resets to zero, and  $\overline{\text{RESET}}$  goes low. The internal timer is activated after  $V_{\text{CC}}$  returns above the reset

threshold, and  $\overline{\text{RESET}}$  remains low for the reset timeout period.

### **BENEFITS OF HIGHLY ACCURATE RESET THRESHOLD**

The SS809G and SS810G with specified voltage as  $5\text{V} \pm 10\%$  or  $3\text{V} \pm 10\%$  are ideal for systems using a  $5\text{V} \pm 5\%$  or  $3\text{V} \pm 5\%$  power supply. The reset is guaranteed to assert after the power supply falls out of regulation, but before the power drops below the minimum specified operating voltage range of the system ICs. The pre-trimmed thresholds reduce the range over which an undesirable reset may occur.

## APPLICATION INFORMATION

### **NEGATIVE-GOING VCC TRANSIENTS**

In addition to issuing a reset to the  $\mu$ P during power-up, power-down, and brownout conditions, the SS809G series are relatively resistant to short-duration negative-going VCC transients.

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

When VCC falls below 0.9V, the SS809G  $\overline{\text{RESET}}$  output no longer sinks current; it becomes an open circuit. In this case, high-impedance CMOS logic inputs connected to  $\overline{\text{RESET}}$  can drift to undetermined voltages. Therefore, the SS809G/810G are perfect for most CMOS applications down to VCC

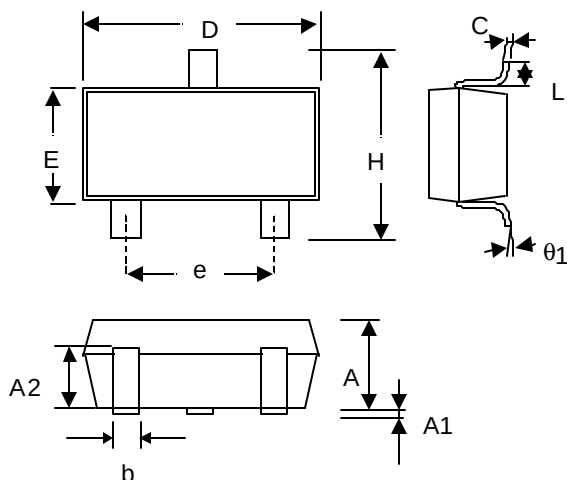
of 0.9V. However in applications where  $\overline{\text{RESET}}$  must be valid down to 0V, adding a pull-down resistor to  $\overline{\text{RESET}}$  causes any leakage currents to flow to ground, holding  $\overline{\text{RESET}}$  low.

### **INTERFACING TO A MICROPROCESSOR WITH BIDIRECTIONAL RESET PINS**

The  $\overline{\text{RESET}}$  output on the SS809N is open drain, and this device interfaces easily with  $\mu$ Ps that have bidirectional reset pins. Connecting the  $\mu$ P supervisor's  $\overline{\text{RESET}}$  output directly to the microcontroller's  $\overline{\text{RESET}}$  pin with a single pull-up resistor allows either device to assert reset.

## PHYSICAL DIMENSIONS

### SOT-23-3 (unit: mm)



| SYMBOL | MIN        | MAX  |
|--------|------------|------|
| A      | 1.00       | 1.30 |
| A1     | —          | 0.10 |
| A2     | 0.70       | 0.90 |
| b      | 0.35       | 0.50 |
| C      | 0.10       | 0.25 |
| D      | 2.70       | 3.10 |
| E      | 1.40       | 1.80 |
| e      | 1.90 (TYP) |      |
| H      | 2.60       | 3.00 |
| L      | 0.37       | —    |
| θ1     | 1°         | 9°   |

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