

## ■ FEATURES

- Ultra Low Supply Current 1 $\mu$ A(typ.)
- Guaranteed Reset Valid to Vcc=0.9V
- Available in Three Output Type: Open-Drain Active Low (AIC809N), Push-Pull Active Low (AIC809), Push-Pull Active High (AIC810)
- 140ms Min. Power-On Reset Pulse Width
- Internally Fixed Threshold 2.3V, 2.6V, 2.9V, 3.1V, 4.0V, 4.4V, 4.6V
- Tight Voltage Threshold Tolerance: 1.5%
- Tiny Package in SOT-23

## ■ APPLICATIONS

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

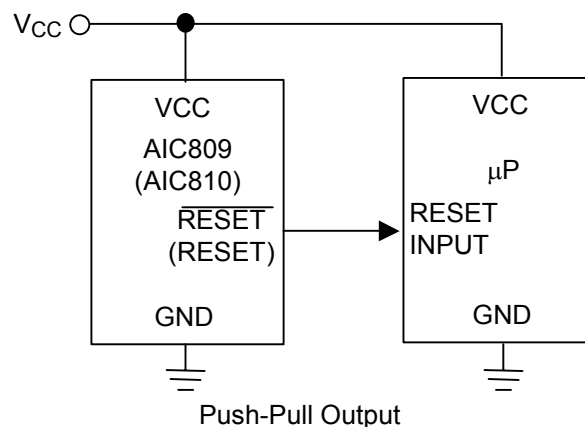
## ■ DESCRIPTION

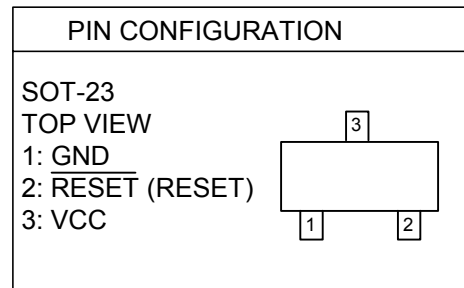
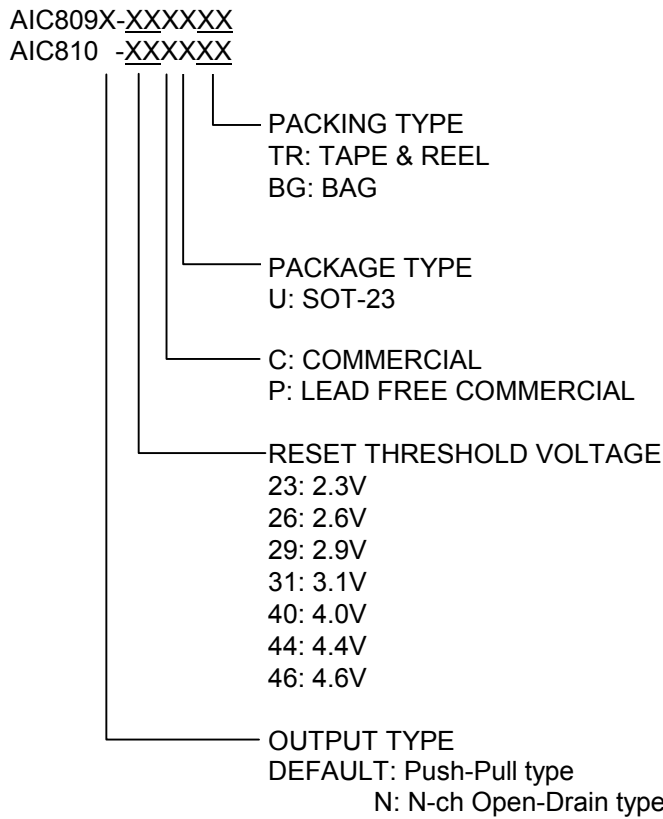
AIC809/AIC810 are low-power microprocessor ( $\mu$ P) supervisory circuits used to monitor power supplies in  $\mu$ P and digital systems. They provide applications with benefits of circuit reliability and low cost by eliminating external components.

These devices perform as valid singles in applications with Vcc ranging from 6.0V down to 0.9V. The reset signal lasts for a minimum period of 140ms whenever VCC supply voltage falls below preset threshold. Both AIC809 and AIC810 were designed with a reset comparator to help identify invalid signals, which last less than 140ms. The only difference between them is that they have an active-low  $\overline{\text{RESET}}$  output and active-high RESET output, respectively.

Low supply current (1 $\mu$ A) makes AIC809/AIC810 ideal for portable equipment. The devices are available in SOT-23 package.

## ■ TYPICAL APPLICATION CIRCUIT



**ORDERING INFORMATION**


(Additional voltage versions with a unit of 0.1V within the voltage range from 1.5V to 5.5V for this product line may be available on demand with prior consultation with AIC.)

Example: AIC809-31-CUTR

→ 3.1V and push-pull version, in SOT-23 Package & Tape & Reel Packing Type

AIC809-31-PUTR

→ 3.1V and push-pull version, in Lead Free SOT-23 Package & Tape & Reel Packing Type

**SOT-23 Marking**

Part No.	Marking
AIC809-23CU	RA23
AIC809-26CU	RA26
AIC809-29CU	RA29
AIC809-31CU	RA31
AIC809-40CU	RA40
AIC809-44CU	RA44
AIC809-46CU	RA46

Part No.	Marking
AIC809N23CU	RB23
AIC809N26CU	RB26
AIC809N29CU	RB29
AIC809N31CU	RB31
AIC809N40CU	RB40
AIC809N44CU	RB44
AIC809N46CU	RB46

Part No.	Marking
AIC810-23CU	RD23
AIC810-26CU	RD26
AIC810-29CU	RD29
AIC810-31CU	RD31
AIC810-40CU	RD40
AIC810-44CU	RD44
AIC810-46CU	RD46

Part No.	Marking
AIC809-23PU	RA23P
AIC809-26PU	RA26P
AIC809-29PU	RA29P
AIC809-31PU	RA31P
AIC809-40PU	RA40P
AIC809-44PU	RA44P
AIC809-46PU	RA46P

Part No.	Marking
AIC809N23PU	RB23P
AIC809N26PU	RB26P
AIC809N29PU	RB29P
AIC809N31PU	RB31P
AIC809N40PU	RB40P
AIC809N44PU	RB44P
AIC809N46PU	RB46P

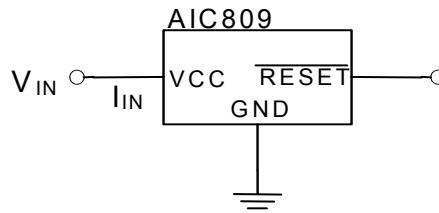
Part No.	Marking
AIC810-23PU	RD23P
AIC810-26PU	RD26P
AIC810-29PU	RD29P
AIC810-31PU	RD31P
AIC810-40PU	RD40P
AIC810-44PU	RD44P
AIC810-46PU	RD46P

## ■ 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
Junction Temperature .....	125°C
Storage Temperature Range.....	- 65°C ~ 150°C
Lead Temperature (Soldering) 10 sec.....	260°C

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

## ■ TEST CIRCUIT



**ELECTRICAL CHARACTERISTICS**

 (Typical values are at  $T_A=25^\circ\text{C}$ , unless otherwise specified.) (Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Operating Voltage Range	$V_{CC}$		0.9		6	V	
Supply Current	$I_{CC}$	$V_{CC} = V_{TH} + 0.1V$		1	3	$\mu\text{A}$	
Reset Threshold	$V_{TH}$	AIC809-23	$T_A=+25^\circ\text{C}$	2.265	2.3	2.335	V
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	2.254		2.346	
		AIC809-26	$T_A=+25^\circ\text{C}$	2.561	2.6	2.639	
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	2.548		2.652	
		AIC809-29	$T_A=+25^\circ\text{C}$	2.857	2.9	2.944	
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	2.842		2.958	
		AIC809-31	$T_A=+25^\circ\text{C}$	3.054	3.1	3.147	
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	3.038		3.162	
		AIC809-40	$T_A=+25^\circ\text{C}$	3.940	4.0	4.060	
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	3.920		4.080	
		AIC809-44	$T_A=+25^\circ\text{C}$	4.334	4.4	4.466	
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	4.312		4.488	
		AIC809-46	$T_A=+25^\circ\text{C}$	4.531	4.6	4.669	
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	4.508		4.692	
$V_{CC}$ to Reset Delay	$T_{RD}$	$V_{CC}=V_{TH}$ to ( $V_{TH}-0.1V$ ), $V_{TH}=3.1V$		20		$\mu\text{S}$	
Reset Active Timeout Period	$T_{RP}$	$V_{CC} = V_{TH(MAX)}$	$T_A=+25^\circ\text{C}$	140	230	560	mS
			$T_A=-40^\circ\text{C to }+85^\circ\text{C}$	100		1030	
$\overline{\text{RESET}}$ Output Voltage	$V_{OH}$	$V_{CC}=V_{TH}+0.1V$ , $I_{SOURCE}=1\text{mA}$	$0.8V_{CC}$			V	
	$V_{OL}$	$V_{CC}=V_{TH}-0.1V$ , $I_{SINK}=1\text{mA}$			$0.2V_{CC}$		
RESET Output Voltage	$V_{OH}$	$V_{CC}=V_{TH}-0.1V$ , $I_{SOURCE}=1\text{mA}$	$0.8V_{CC}$			V	
	$V_{OL}$	$V_{CC}=V_{TH}+0.1V$ , $I_{SINK}=1\text{mA}$			$0.2V_{CC}$		

Note1: Specifications are production tested at  $T_A=25^\circ\text{C}$ . Specifications over the  $-40^\circ\text{C}$  to  $85^\circ\text{C}$  operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note2:  $\overline{\text{RESET}}$  output is for AIC809; RESET output is for AIC810.

**TYPICAL PERFORMANCE CHARACTERISTICS**

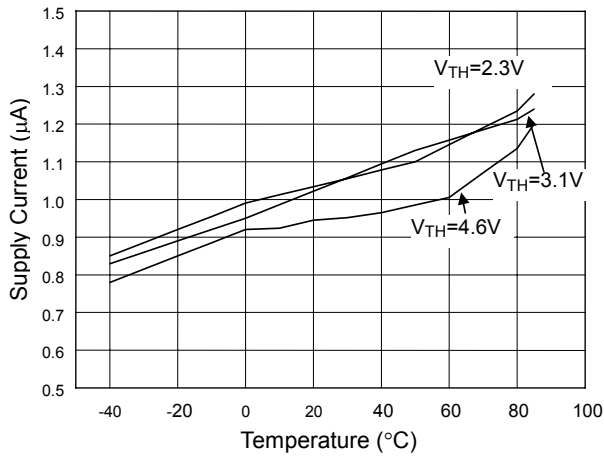


Fig 1 Supply Current vs. Temperature

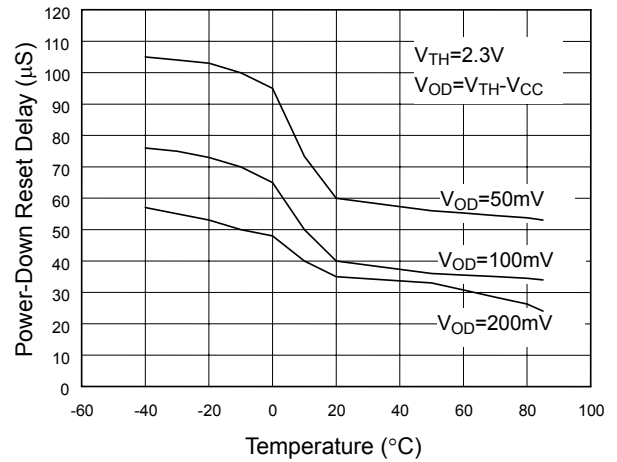


Fig 2 Power-Down Reset Delay vs. Temperature

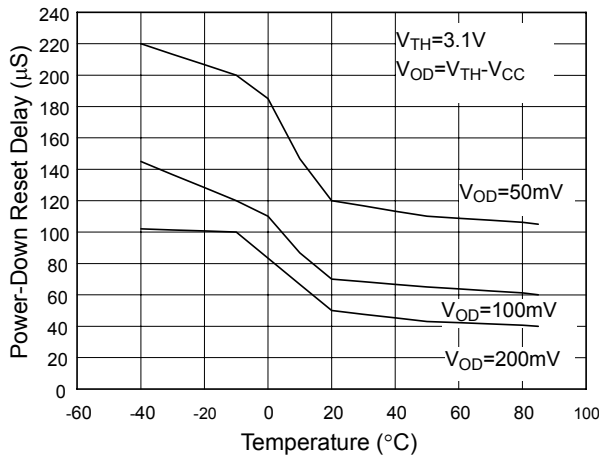


Fig 3 Power-Down Reset Delay vs. Temperature

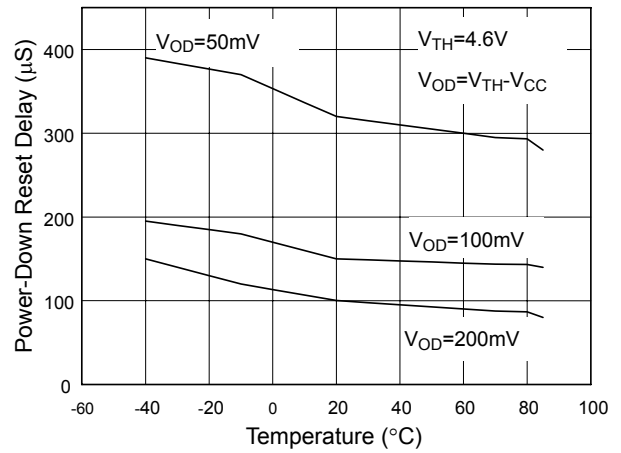


Fig 4 Power-Down Reset Delay vs. Temperature

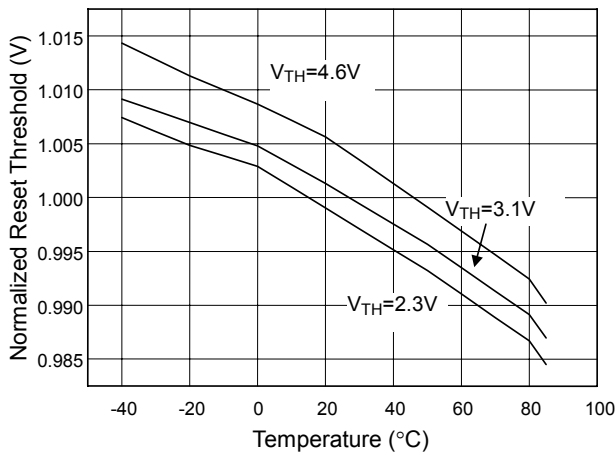


Fig 5 Normalized Reset Threshold vs. Temperature

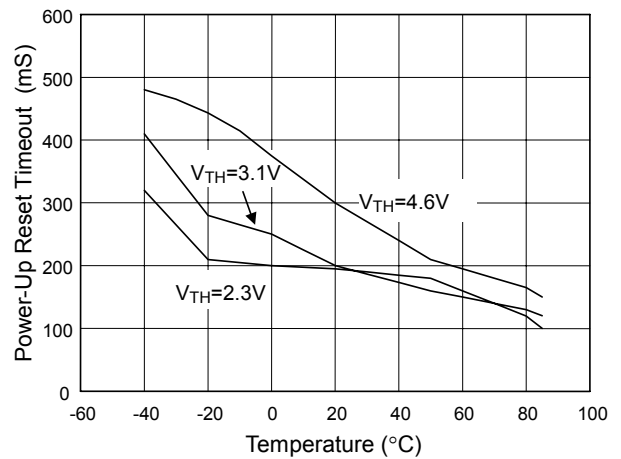
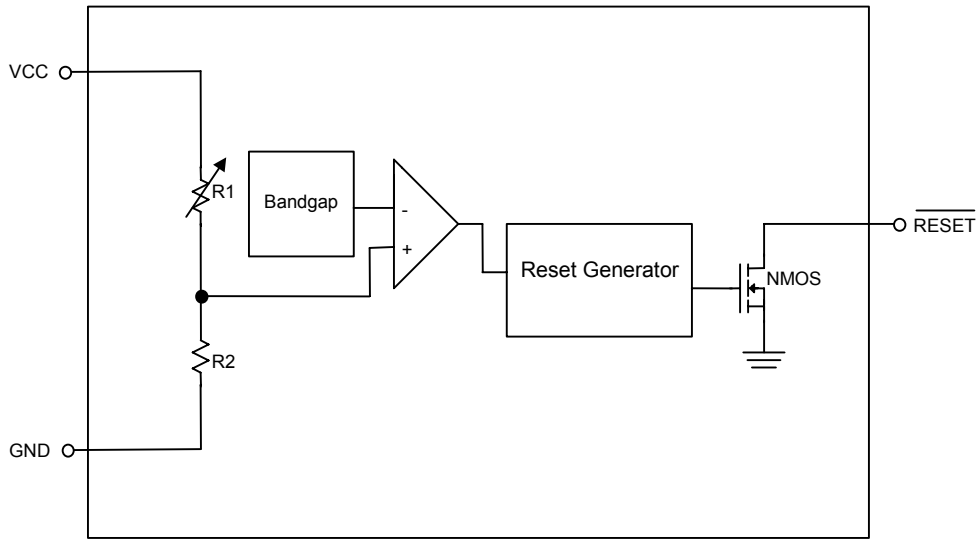
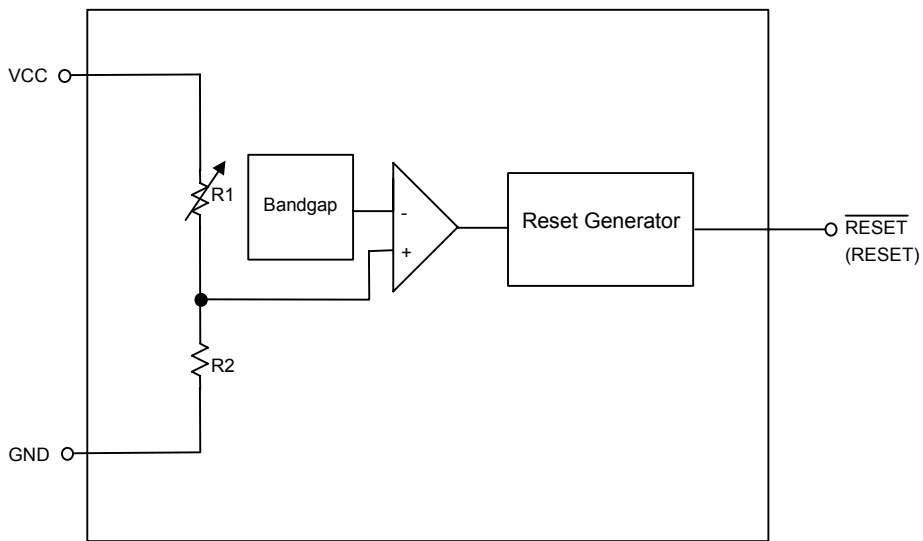


Fig 6 Power-Up Reset Timeout vs. Temperature

■ BLOCK DIAGRAMS



N-ch Open-Drain Type



Push-Pull Type

## ■ PIN DESCRIPTIONS

GND Pin : Ground.

$\overline{\text{RESET}}$  Pin (AIC809) : Active low output pin.  $\overline{\text{RESET}}$  Output remains low while Vcc is below the reset threshold.

RESET Pin (AIC810) : Active high output pin. RESET output remains high while Vcc is below the reset threshold.

Vcc Pin : Supply voltage.

## ■ DETAIL DESCRIPTIONS OF TECHNICAL TERMS

### **RESET OUTPUT**

$\mu$ 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 VCC 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 (VCC drops below the reset threshold),  $\overline{\text{RESET}}$  goes low. Any time VCC goes below the reset threshold, the internal timer resets to zero, and  $\overline{\text{RESET}}$  goes low. The

internal timer is activated after VCC returns above the reset threshold, and  $\overline{\text{RESET}}$  remains low for the reset timeout period.

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

AIC809/810 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 power drops below the minimum specified operating voltage range of the system ICs. The pre-trimmed thresholds are reducing 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, AIC809 series are relatively resistant to short-duration negative-going VCC transient.

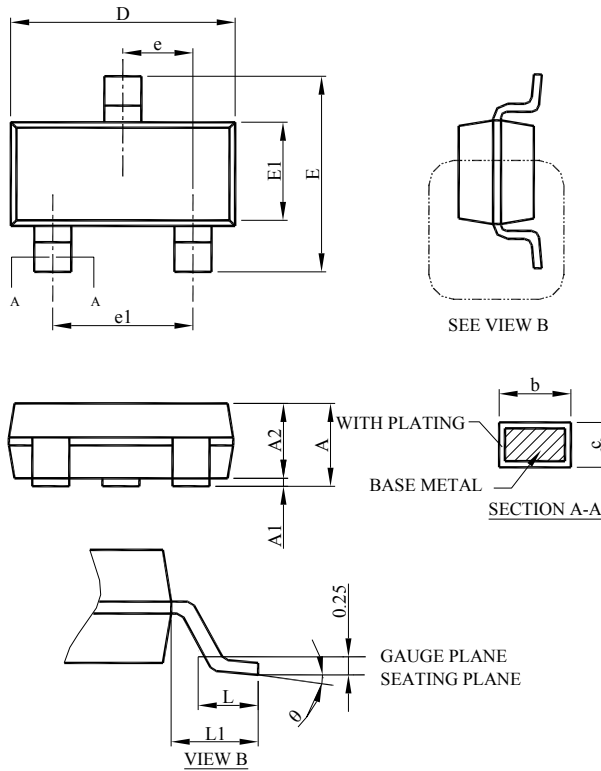
### **ENSURING A VALID RESET OUTPUT DOWN TO VCC=0**

When VCC falls below 0.9V, AIC809  $\overline{\text{RESET}}$  output no longer sinks current; it becomes an open circuit. In this case, high-impedance CMOS logic inputs connecting to  $\overline{\text{RESET}}$  can drift to undetermined voltages. Therefore, AIC809/810 with CMOS is perfect for most applications of VCC

below 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 $\mu$ P WITH BIDIRECTIONAL RESET PINS**

The  $\overline{\text{RESET}}$  output on the AIC809N is open drain, 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 (unit: mm)**
**SOT-23**


SYMBOL	SOT-23	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.05	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
$\theta$	0°	8°

**Note:**

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