

Reset Circuits with Manual Reset Input

FEATURES

- Ultra Low Supply Current 1 μ A(typ.)
- Guaranteed Reset Valid to Vcc=0.9V
- Available in two Output Types: Push-Pull Active Low (AIC811), Push-Pull Active High (AIC812)
- 140ms Min. Power-On Reset Pulse Width
- Internally Fixed Threshold 2.3V, 2.6V, 2.7V, 2.9V, 3.1V, 4.0V, 4.4V, and 4.6V
- Tight Voltage Threshold Tolerance: 1.5%
- Low Profile Package: SOT-23-5, SOT-143, SOT-23-6.

APPLICATIONS

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

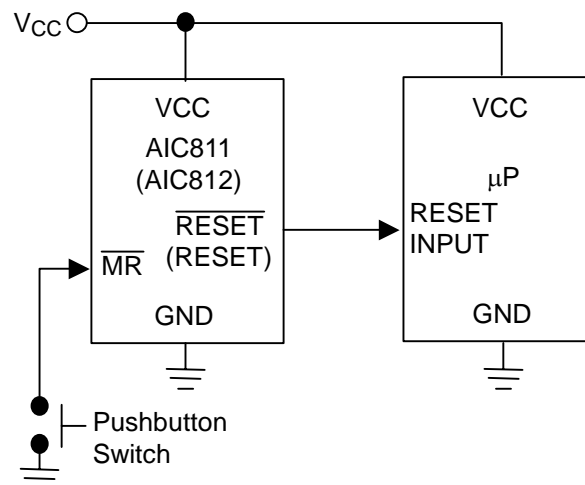
DESCRIPTION

AIC811/AIC812 are low-power microprocessor (μ P) supervisory circuits used to monitor power supplies in μ P and digital systems. They provide applications with benefits of circuit reliability and low cost by eliminating external components. AIC811/AIC812 also offer a manual reset input.

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 AIC811 and AIC812 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 μ A) makes AIC811/AIC812 ideal for portable equipment. The devices are available in SOT-23-5, SOT143, SOT-23-6 package.

TYPICAL APPLICATION CIRCUIT



ORDERING INFORMATION

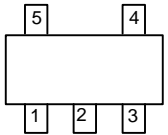
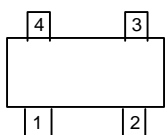
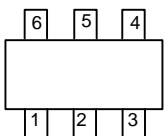
AIC811-XXXXXX
AIC812-XXXXXX

PACKING TYPE
TR: TAPE & REEL
BG: BAG

PACKAGE TYPE
V: SOT-23-5
U4: SOT-143
G: SOT-23-6

P: LEAD FREE COMMERCIAL
G: GREEN PACKAGE

RESET THRESHOLD VOLTAGE
23: 2.3V
26: 2.6V
27: 2.7V
29: 2.9V
31: 3.1V
40: 4.0V
44: 4.4V
46: 4.6V

PIN CONFIGURATION	
SOT-23-5 TOP VIEW 1: GND 2: NC 3: $\overline{\text{RESET}}$ (RESET) 4: $\overline{\text{MR}}$ 5: VCC	
SOT-143 TOP VIEW 1: GND 2: $\overline{\text{RESET}}$ (RESET) 3: $\overline{\text{MR}}$ 4: VCC	
SOT-23-6 TOP VIEW 1: VCC 2: GND 3: NC 4: NC 5: $\overline{\text{MR}}$ 6: $\overline{\text{RESET}}$ (RESET)	

(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: AIC811-31PVTR

→ 3.1V version, in Lead Free SOT-23-5 Package & Tape & Reel Packing Type

- **SOT-23-5 Marking**

Part No.	Marking
AIC811-23PV	BQ23P
AIC811-26PV	BQ26P
AIC811-27PV	BQ27P
AIC811-29PV	BQ29P
AIC811-31PV	BQ31P
AIC811-40PV	BQ40P
AIC811-44PV	BQ44P
AIC811-46PV	BQ46P

Part No.	Marking
AIC812-23PV	BR23P
AIC812-26PV	BR26P
AIC812-27PV	BR27P
AIC812-29PV	BR29P
AIC812-31PV	BR31P
AIC812-40PV	BR40P
AIC812-44PV	BR44P
AIC812-46PV	BR46P

Part No.	Marking
AIC811-23GV	BQ23G
AIC811-26GV	BQ26G
AIC811-27GV	BQ27G
AIC811-29GV	BQ29G
AIC811-31GV	BQ31G
AIC811-40GV	BQ40G
AIC811-44GV	BQ44G
AIC811-46GV	BQ46G

Part No.	Marking
AIC812-23GV	BR23G
AIC812-26GV	BR26G
AIC812-27GV	BR27G
AIC812-29GV	BR29G
AIC812-31GV	BR31G
AIC812-40GV	BR40G
AIC812-44GV	BR44G
AIC812-46GV	BR46G

- **SOT-143 Marking**

Part No.	Marking
AIC811-23PU4	RG23P
AIC811-26PU4	RG26P
AIC811-27PU4	RG27P
AIC811-29PU4	RG29P
AIC811-31PU4	RG31P
AIC811-40PU4	RG40P
AIC811-44PU4	RG44P
AIC811-46PU4	RG46P

Part No.	Marking
AIC812-23PU4	RH23P
AIC812-26PU4	RH26P
AIC812-27PU4	RH27P
AIC812-29PU4	RH29P
AIC812-31PU4	RH31P
AIC812-40PU4	RH40P
AIC812-44PU4	RH44P
AIC812-46PU4	RH46P

Part No.	Marking
AIC811-23GU4	RG23G
AIC811-26GU4	RG26G
AIC811-27GU4	RG27G
AIC811-29GU4	RG29G
AIC811-31GU4	RG31G
AIC811-40GU4	RG40G
AIC811-44GU4	RG44G
AIC811-46GU4	RG46G

Part No.	Marking
AIC812-23GU4	RH23G
AIC812-26GU4	RH26G
AIC812-27GU4	RH27G
AIC812-29GU4	RH29G
AIC812-31GU4	RH31G
AIC812-40GU4	RH40G
AIC812-44GU4	RH44G
AIC812-46GU4	RH46G

● **SOT-23-6 Marking**

Part No.	Marking
AIC811-23PG	RK23P
AIC811-26PG	RK26P
AIC811-27PG	RK27P
AIC811-29PG	RK29P
AIC811-31PG	RK31P
AIC811-40PG	RK40P
AIC811-44PG	RK44P
AIC811-46PG	RK46P

Part No.	Marking
AIC812-23PG	RL23P
AIC812-26PG	RL26P
AIC812-27PG	RL27P
AIC812-29PG	RL29P
AIC812-31PG	RL31P
AIC812-40PG	RL40P
AIC812-44PG	RL44P
AIC812-46PG	RL46P

Part No.	Marking
AIC811-23GG	RK23G
AIC811-26GG	RK26G
AIC811-27GG	RK27G
AIC811-29GG	RK29G
AIC811-31GG	RK31G
AIC811-40GG	RK40G
AIC811-44GG	RK44G
AIC811-46GG	RK46G

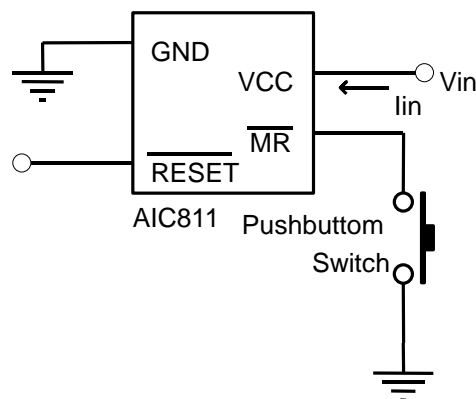
Part No.	Marking
AIC812-23GG	RL23G
AIC812-26GG	RL26G
AIC812-27GG	RL27G
AIC812-29GG	RL29G
AIC812-31GG	RL31G
AIC812-40GG	RL40G
AIC812-44GG	RL44G
AIC812-46GG	RL46G

■ ABSOLUTE MAXIMUM RATINGS

V_{CC}	-0.3V ~6.5V
RESET, $\overline{\text{RESET}}$	-0.3V ~ (VCC+0.3V)
Input Current ($V_{CC}, \overline{\text{MR}}$).....	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	μA	
Reset Threshold	V_{TH}	AIC811-23	$T_A=+25^\circ\text{C}$	2.265	2.3	2.335	V
			$T_A= -40^\circ\text{C}$ to $+85^\circ\text{C}$	2.254		2.346	
		AIC811-26	$T_A=+25^\circ\text{C}$	2.561	2.6	2.639	
			$T_A= -40^\circ\text{C}$ to $+85^\circ\text{C}$	2.548		2.652	
		AIC811-27	$T_A=+25^\circ\text{C}$	2.660	2.7	2.741	
			$T_A= -40^\circ\text{C}$ to $+85^\circ\text{C}$	2.646		2.754	
		AIC811-29	$T_A=+25^\circ\text{C}$	2.857	2.9	2.944	
			$T_A= -40^\circ\text{C}$ to $+85^\circ\text{C}$	2.842		2.958	
AIC811-31	$T_A=+25^\circ\text{C}$	3.054	3.1	3.147			

			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$	3.038		3.162	
		AIC811-40	$T_A = +25^\circ\text{C}$	3.940	4.0	4.060	
			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$	3.920		4.080	
		AIC811-44	$T_A = +25^\circ\text{C}$	4.334	4.4	4.466	
			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$	4.312		4.488	
		AIC811-46	$T_A = +25^\circ\text{C}$	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		μS
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	
$\overline{\text{MR}}$ to Reset Propagation Delay	T_{MD}	$V_{CC} = 6V$			0.5		μS
$\overline{\text{MR}}$ Input Threshold	V_{IH}			$0.7V_{CC}$			V
	V_{IL}					$0.25V_{CC}$	
$\overline{\text{MR}}$ Pull-Up Resistance				10	20	30	$\text{K}\Omega$
$\overline{\text{RESET}}$ 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°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note2: $\overline{\text{RESET}}$ output is for AIC811; RESET output is for AIC812.

TYPICAL PERFORMANCE CHARACTERISTICS

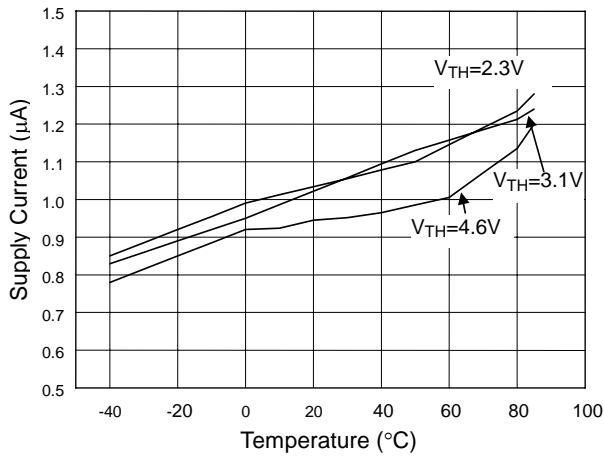


Fig 1 Supply Current vs. Temperature

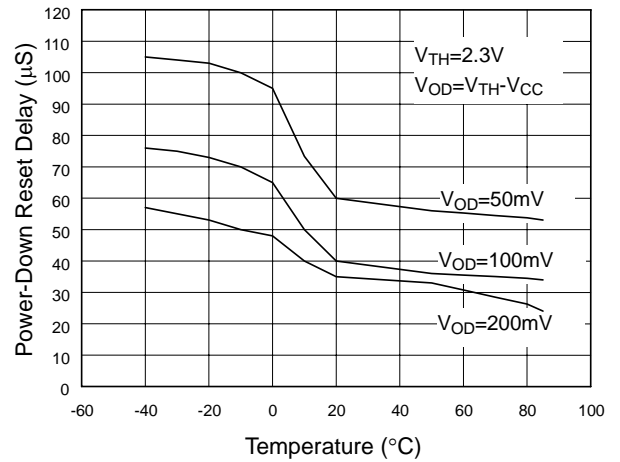


Fig 2 Power-Down Reset Delay vs. Temperature

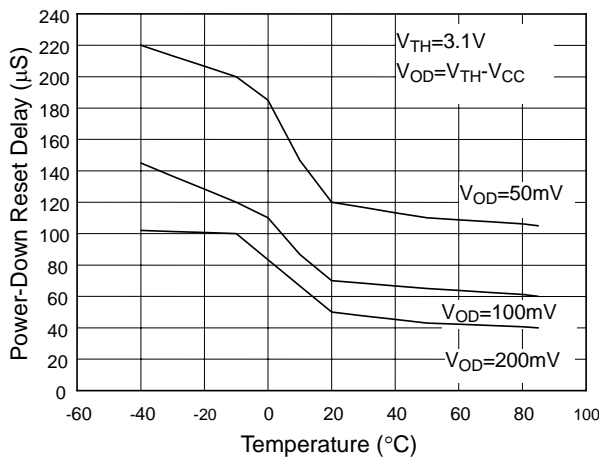


Fig 3 Power-Down Reset Delay vs. Temperature

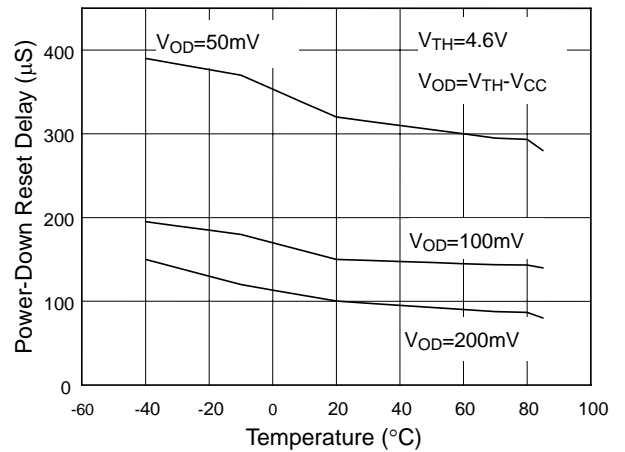


Fig 4 Power-Down Reset Delay vs. Temperature

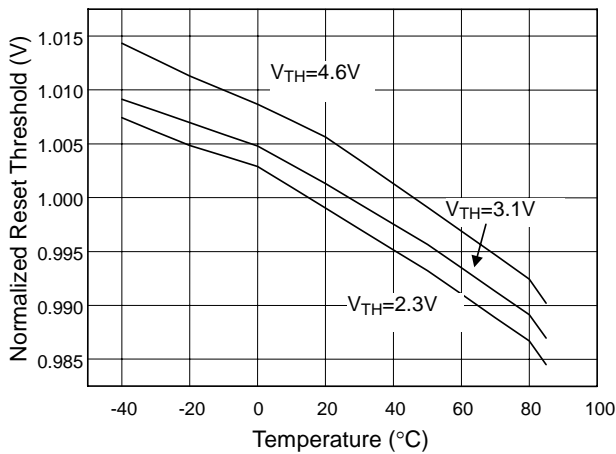


Fig 5 Normalized Reset Threshold vs. Temperature

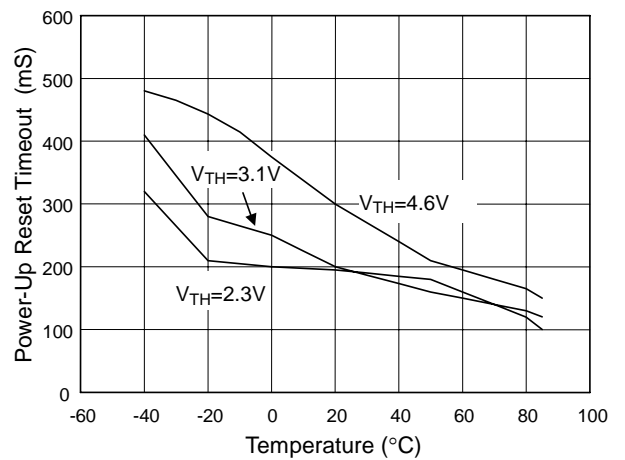
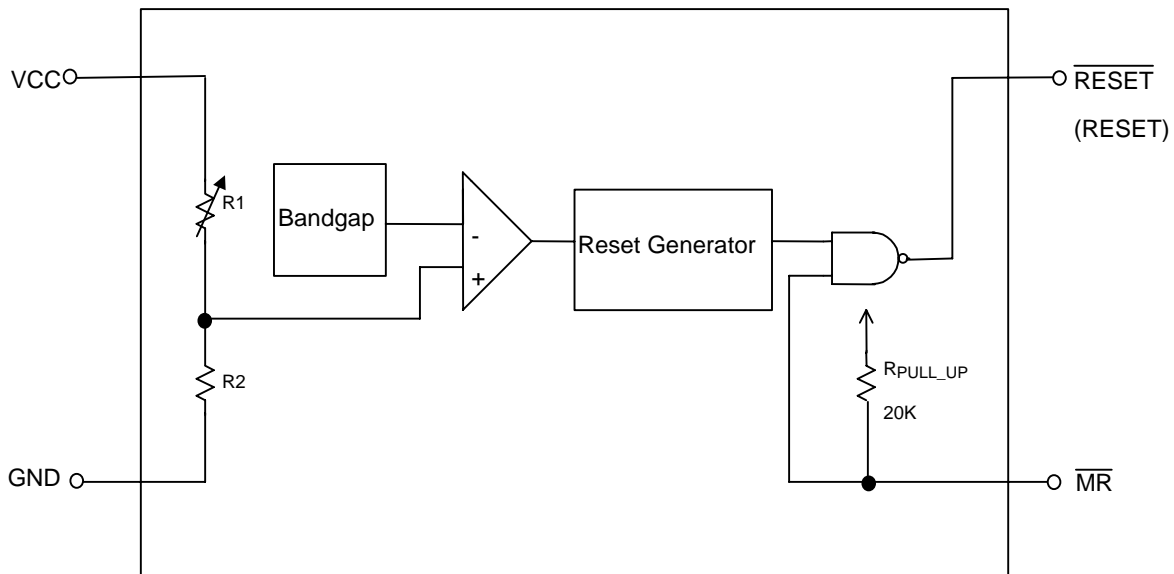


Fig 6 Power-Up Reset Timeout vs. Temperature

■ BLOCK DIAGRAM



■ PIN DESCRIPTIONS

GND Pin : Ground.

$\overline{\text{RESET}}$ Pin (AIC811) : Active low output pin. $\overline{\text{RESET}}$ Output remains low while V_{cc} below reset threshold.

RESET Pin (AIC812) : Active high output pin. RESET output remains high while V_{cc} below reset threshold.

$\overline{\text{MR}}$ Pin : Logic low manual reset input. This active-low input has an internal 20k Ω pull-up resistor. It can be driven by a TTL or CMOS, or shorted to ground with a switch. Leave open when unused.

Vcc Pin : Supply voltage.

■ DETAILED DESCRIPTIONS OF TECHNICAL TERMS

RESET OUTPUT

μP will be activated at a valid reset state. These μP 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 $V_{TH} > V_{CC} > 0.9V$. Once V_{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_{CC} drops below the reset threshold), $\overline{\text{RESET}}$ goes low. Any time V_{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_{CC} returns above the reset threshold, and $\overline{\text{RESET}}$ remains low for the reset timeout period.

The manual reset input ($\overline{\text{MR}}$) can also initiate a reset. AIC812 has an active-high RESET output that is the inverse of AIC811's $\overline{\text{RESET}}$ output.

MANUAL RESET INPUT

Many μ P-based products require manual reset capability, allowing operators, test technicians, or external logic circuitry to initiate a reset. Logic low on $\overline{\text{MR}}$ asserts reset. Reset will remain asserted for the Reset Active Timeout Period (t_{RP}) after $\overline{\text{MR}}$ returns high. This input has an internal 20K pull-up resistor, so it can be floating if it is not used. $\overline{\text{MR}}$ can be driven with TTL or CMOS-logic levels, or with open-drain/collector outputs. Another alternative is to connect a normal switch from $\overline{\text{MR}}$ to GND to create a manual reset function. Connecting a 0.1 μ F capacitor from $\overline{\text{MR}}$ to ground

can provide noise immunity to prevent noise caused by long cables of $\overline{\text{MR}}$ or noisy environment.

BENEFITS OF HIGHLY ACCURATE RESET THRESHOLD

AIC811/812 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 μ P during power-up, power-down, and brownout conditions, AIC811 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, AIC811 $\overline{\text{RESET}}$ 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, AIC811/2 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.

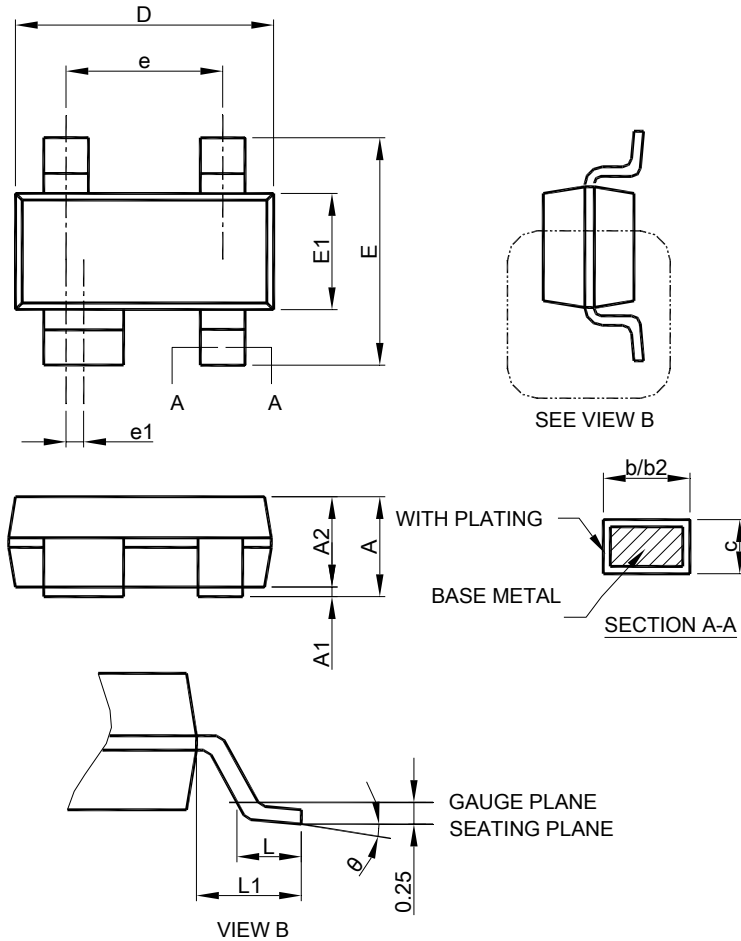
INTERFACING TO μ P WITH BIDIRECTIONAL RESET PINS

μ Ps with bidirectional reset pins can contend with AIC811/812 reset outputs. If AIC811 $\overline{\text{RESET}}$ output is asserted high and the μ P wants to pull it low, indeterminate logic levels may occur. To correct such cases, connect a resistor between AIC811 $\overline{\text{RESET}}$ (or AIC812 $\overline{\text{RESET}}$) output and

the μ P reset I/O. Buffer the reset output to other system components.

■ PHYSICAL DIMENSIONS (unit: mm)

● SOT-143



SYMBOL	SOT-143	
	MILLIMETERS	
	MIN.	MAX.
A	0.80	1.22
A1	0.05	0.15
A2	0.75	1.07
b	0.30	0.50
b2	0.76	0.89
c	0.08	0.20
D	2.80	3.04
E	2.10	2.64
E1	1.20	1.40
e	1.92 BSC	
e1	0.20 BSC	
L	0.40	0.60
L1	0.54 REF	
θ	0°	8°

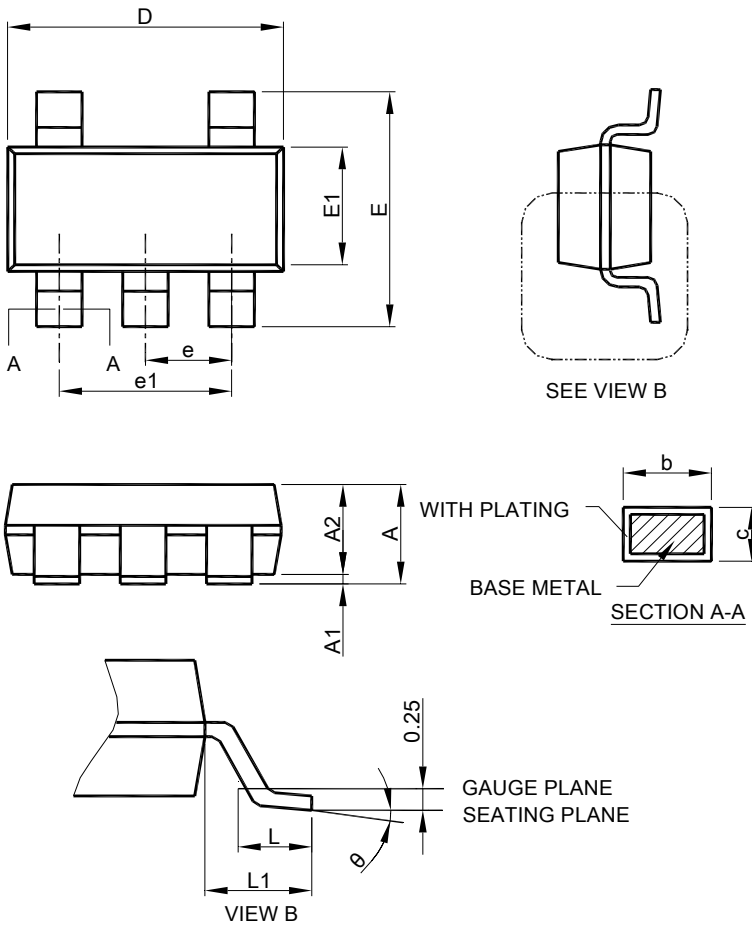
Note: 1. Refer to JEDEC TO-253AA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.

3. Dimension "E1" does not include inter-lead flash or protrusions.

4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

● SOT-23-5

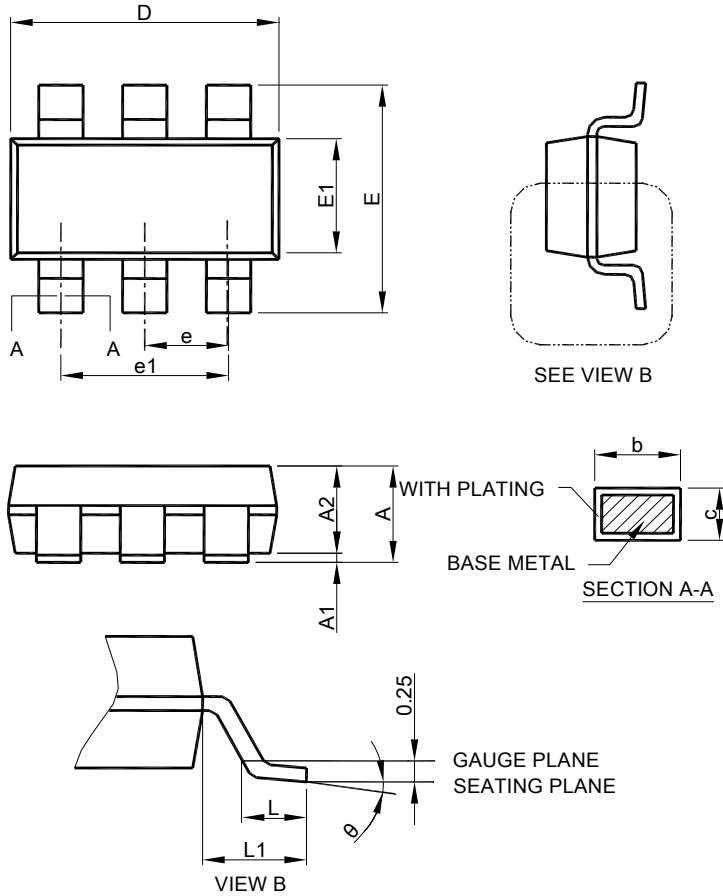


SYMBOL	SOT-23-5	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.05	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
q	0°	8°

Note : 1. Refer to JEDEC MO-178AA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.
3. Dimension "E1" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

● SOT-23-6



SYMBOL	SOT-23-6	
	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	0.42 REF	
θ	0°	8°

- Note : 1. Refer to JEDEC MO-178AB.
 2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.
 3. Dimension "E1" does not include inter-lead flash or protrusions.
 4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Note:

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