



## 4 Pin $\mu$ P Voltage Supervisor with Manual Reset

### General Description

The ASM811/ASM812 are cost effective low power supervisors designed to monitor voltage levels of 3.0V, 3.3V and 5.0V power supplies in low-power microprocessor ( $\mu$ P), microcontroller ( $\mu$ C) and digital systems. They provide excellent reliability by eliminating external components and adjustments.

A reset signal is issued if the power supply voltage drops below a preset reset threshold and is asserted for at least 140ms after the supply has risen above the reset threshold. The ASM811 has an active-low output  $\overline{\text{RESET}}$  that is guaranteed to be in the correct state for  $V_{CC}$  down to 1.1V. The ASM812 has an active-high RESET output. The reset comparator is designed to ignore fast transients on  $V_{CC}$ . A debounced manual reset input allows the user to manually reset the systems to bring them out of locked state.

Low power consumption makes the ASM811/ASM812 ideal for use in portable and battery operated equipment. The ASM811/ASM812 are available in a compact 4-pin SOT-143 package and thus use minimal board space.

### Applications

- Computers and Controllers
- Embedded controllers
- Portable/Battery operated systems
- Intelligent instruments
- Wireless communication systems
- PDAs and handheld equipment
- Automotive systems
- Safety Systems

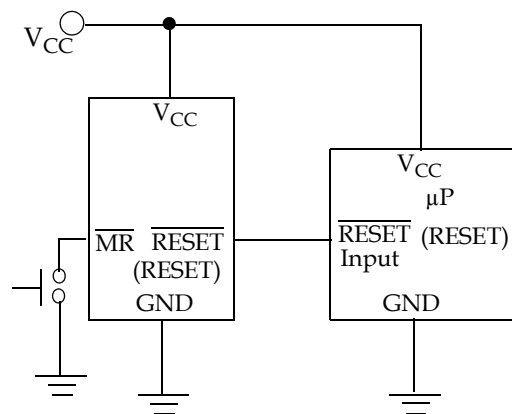
Six voltage thresholds are available to support 3V to 5V systems:

RESET THRESHOLD	
Suffix	Voltage
L	4.63
M	4.38
J	4.00
T	3.08
S	2.93
R	2.63

### Features

- New 4.0V threshold option
- 9 $\mu$ A supply current
- Monitor 5V, 3.3V and 3V supplies
- Manual reset input
- 140ms min. reset pulse width
- Guaranteed over temperature
- Active-low reset valid with 1.1V supply (ASM811)
- Small 4-pin SOT-143 package
- No external components
- Power-supply transient-immune design

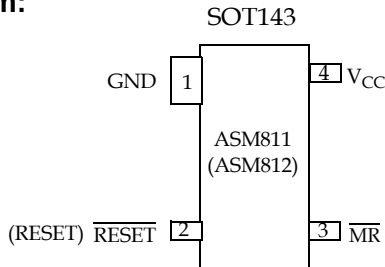
### Typical Operating Circuit



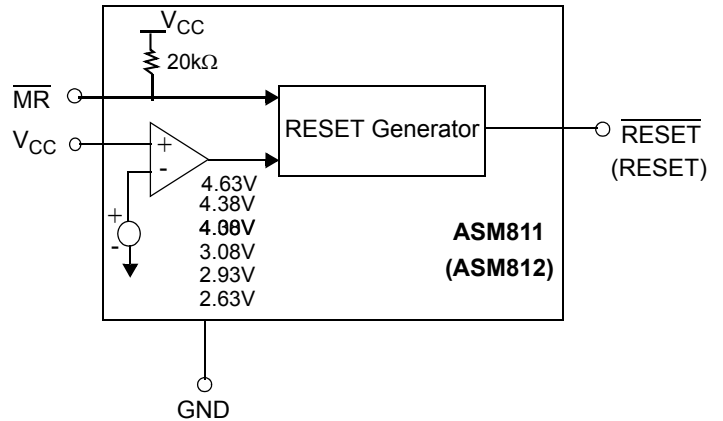


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Pin Diagram:



Block Diagram



Pin Description

Pin #		Pin Name	Function
ASM811	ASM812		
1	1	GND	Ground.
2	-	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ is asserted LOW if $V_{CC}$ falls below $V_{TH}$ and remains LOW for $T_{RST}$ after $V_{CC}$ exceeds the Threshold. In addition, $\overline{\text{RESET}}$ is active LOW as long as the manual reset is low.
-	2	RESET	RESET is asserted HIGH if $V_{CC}$ falls below $V_{TH}$ and remains HIGH for $T_{RST}$ after $V_{CC}$ exceeds the threshold. In addition, RESET is active HIGH as long as the manual reset is low.
3	3	$\overline{\text{MR}}$	Manual Reset Input. A logic LOW on $\overline{\text{MR}}$ asserts reset. Reset remains active as long as $\overline{\text{MR}}$ is LOW and for $T_{MRST}$ after $\overline{\text{MR}}$ returns HIGH. The active low input has an internal 20kΩ pull-up resistor. The input should be left open if not used. It can be driven by TTL or CMOS logic or shorted to ground by a switch.
4	4	$V_{CC}$	Power supply input voltage (3.0V, 3.3V, 5.0V)

Detailed Description

A proper reset input enables a microprocessor / microcontroller to start in a known state. ASM811/812 assert reset to prevent code execution errors during power-up, power-down and brown-out conditions.

Reset Timing

The reset signal is asserted- LOW for the ASM811 and HIGH for the ASM812- when the  $V_{CC}$  supply voltage falls below the threshold trip voltage and remains asserted for 140ms minimum after the  $V_{CC}$  has risen above the threshold.

Manual Reset ( $\overline{\text{MR}}$ ) Input

A logic low on  $\overline{\text{MR}}$  asserts  $\overline{\text{RESET}}$  LOW on the ASM811 and RESET HIGH on the ASM812.  $\overline{\text{MR}}$  is internally pulled high through a 20kΩ resistor and can be driven by TTL/CMOS gates or with open collector/drain outputs.  $\overline{\text{MR}}$  can be left open if not used.  $\overline{\text{MR}}$  may be connected to ground through a normally-open momentary switch without an external debounce circuit.

A 0.1μF capacitor from  $\overline{\text{MR}}$  to ground can be added for additional noise immunity.

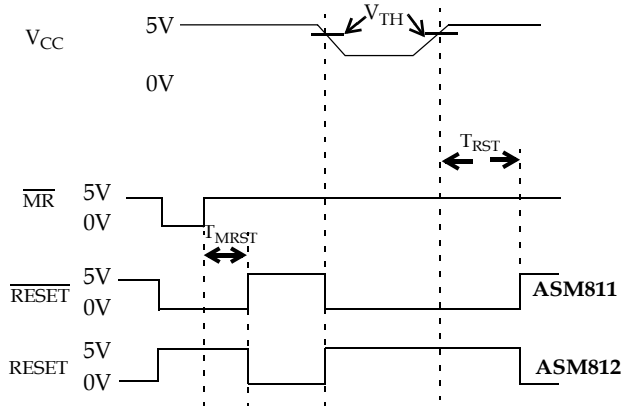
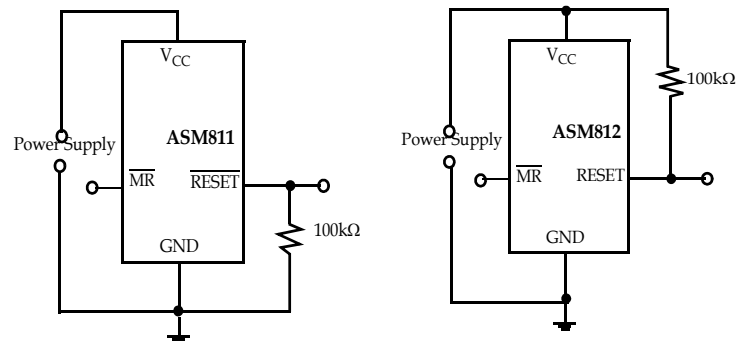


Figure 1: Reset Timing and Manual Reset ( $\overline{MR}$ )



Figures 2 & 3: RESET valid with  $V_{CC}$  under 1.1V

**Reset Output Operation**

In  $\mu P / \mu C$  systems it is important to have the processor and the system begin operation from a known state. A reset output to a processor is provided to prevent improper operation during power supply sequencing or low voltage brown-out conditions.

The ASM811/812 are designed to monitor the system power supply voltages and issue a reset signal when the levels are out of range. RESET outputs are guaranteed to be active for  $V_{CC}$  above 1.1V. When  $V_{CC}$  exceeds the reset threshold, an internal timer keeps RESET active for the reset timeout period, after which RESET becomes inactive (HIGH for the ASM811 and LOW for the ASM812). If  $V_{CC}$  drops below the reset threshold, RESET automatically becomes active. Alternatively, external circuitry or an operator can initiate this condition using the Manual Reset ( $\overline{MR}$ ) pin.  $\overline{MR}$  can be left open if it is not used.  $\overline{MR}$  can be driven by TTL/CMOS logic or even an external switch.

**Valid Reset with  $V_{CC}$  under 1.1V**

To ensure logic inputs connected to the ASM811  $\overline{RESET}$  pin are in a known state when  $V_{CC}$  is under 1.1V, a 100k $\Omega$  pull-down resistor at  $\overline{RESET}$  is needed. The value is not critical. A 100k $\Omega$  pull-up resistor to  $V_{CC}$  is needed with the ASM812.

**Application Information**

**Negative VCC Transients**

Typically short duration transients of 100mV amplitude and 20 $\mu s$  duration do not cause a false RESET. A 0.1 $\mu F$  capacitor at  $V_{CC}$  increases transient immunity.

**Bidirectional Reset Pin Interfacing**

The ASM811/812 can interface with  $\mu P / \mu C$  bi-directional reset pins by connecting a 4.7k $\Omega$  resistor in series with the ASM811/812 reset output and the  $\mu P / \mu C$  bi-directional reset input pin.

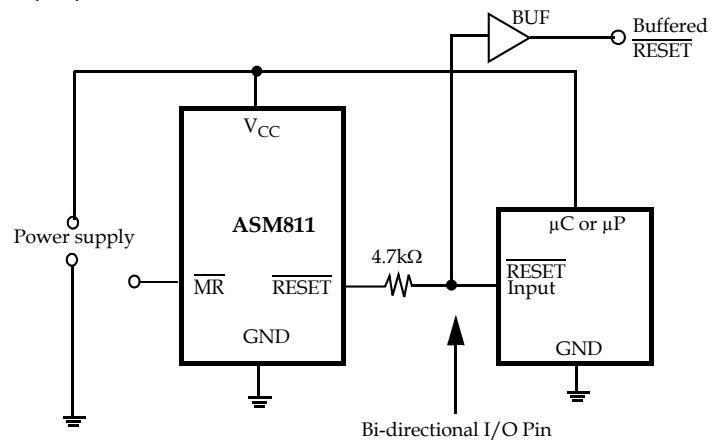


Figure 4: Bi-directional Reset Pin Interface

**Absolute Maximum Ratings, Table 1:**

Parameter	Min	Max	Units
Pin Terminal Voltage With Respect To Ground			
$V_{CC}$	-0.3	6.0	V
RESET, $\overline{\text{RESET}}$ and $\overline{\text{MR}}$	-0.3	$V_{CC} + 0.3$	V
Input current at $V_{CC}$ and $\overline{\text{MR}}$		20	mA
Output current: RESET, $\overline{\text{RESET}}$		20	mA
Rate of Rise at $V_{CC}$		100	V/ $\mu$ s
Note: These are stress ratings only and the functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability.			

**Absolute Maximum Ratings, Table 2:**

Parameter	Min	Max	Units
Power Dissipation ( $T_A = 70^\circ\text{C}$ ) Derate SOT-143 4mW/ $^\circ\text{C}$ above $70^\circ\text{C}$		320	$\mu$ W
Operating temperature range	-40	105	$^\circ\text{C}$
Storage temperature range	-65	160	$^\circ\text{C}$
Lead temperature (Soldering, 10 sec)		300	$^\circ\text{C}$
Note: These are stress ratings only and the functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability.			



### Electrical Characteristics:

Unless otherwise noted,  $V_{CC}$  is over the full voltage range,  $T_A = -40^\circ\text{C}$  to  $105^\circ\text{C}$ .  
 Typical values at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$  for L/M/J devices,  $V_{CC} = 3.3\text{V}$  for T/S devices and  $V_{CC} = 3\text{V}$  for R devices.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{CC}$	Input Voltage Range	$T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$	1.1		5.5	V	
		$T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	1.2		5.5	V	
$I_{CC}$	Supply Current (Unloaded)	$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $V_{CC} < 5.5\text{V}$ , L/M/J		9	15	$\mu\text{A}$	
		$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $V_{CC} < 3.6\text{V}$ , R/S/T		6.8	10		
		$T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} < 5.5\text{V}$ , L/M/J			25		
		$T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} < 3.6\text{V}$ , R/S/T			20		
$V_{TH}$	Reset Threshold	L devices	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$	4.56 4.50 4.40	4.63	4.70 4.75 4.86	V
		M devices	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$	4.31 4.25 4.16	4.38	4.45 4.50 4.56	
		J devices	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$	3.93 3.89 3.80	4.00	4.06 4.10 4.20	
		T devices	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$	3.04 3.00 2.92	3.08	3.11 3.15 3.23	
		S devices	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$	2.89 2.85 2.78	2.93	2.96 3.00 3.08	
		R devices	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ $T_A = 85^\circ\text{C}$ to $105^\circ\text{C}$	2.59 2.55 2.50	2.63	2.66 2.70 2.76	
$TC_{VTH}$	Reset Threshold Temp. Coefficient			30		ppm/ $^\circ\text{C}$	
	$V_{CC}$ to Reset Delay	$V_{CC} = V_{TH}$ to $(V_{TH} - 125\text{mV})$ ,		60		$\mu\text{s}$	
	Reset Active Timeout Period	$T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$	140		560	ms	
		$T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	100	240	840		
$t_{MR}$	$\overline{\text{MR}}$ Minimum Pulse Width		10			$\mu\text{s}$	

## Notes:

1. Production testing done at  $T_A = 25^\circ\text{C}$ . Over-temperature specifications guaranteed by design only using six sigma design limits.
2.  $\overline{\text{RESET}}$  output is active LOW for the ASM811 and RESET output is active HIGH for the ASM812.
3. Glitches of 100ns or less typically will not generate a reset pulse.



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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
	$\overline{\text{MR}}$ Glitch Immunity	Note 3		100		ns
$t_{\text{MD}}$	$\overline{\text{MR}}$ to RESET Propagation Delay	Note 2		0.5		$\mu\text{s}$
$V_{\text{IH}}$	$\overline{\text{MR}}$ Input Threshold	$V_{\text{CC}} > V_{\text{TH}}$ (MAX), ASM811/812L/M/J	2.3			V
$V_{\text{IL}}$					0.8	
$V_{\text{IH}}$	$\overline{\text{MR}}$ Input Threshold	$V_{\text{CC}} > V_{\text{TH}}$ (MAX), ASM811/812R/S/T	$0.77V_{\text{CC}}$			V
$V_{\text{IL}}$					$0.25V_{\text{CC}}$	
	$\overline{\text{MR}}$ Pullup Resistance		10	20	30	$k\Omega$
$V_{\text{OL}}$	Low $\overline{\text{RESET}}$ Output Voltage (ASM811)	$V_{\text{CC}} = V_{\text{TH min.}}$ , $I_{\text{SINK}} = 1.2\text{mA}$ , ASM811R/S/T			0.3	V
		$V_{\text{CC}} = V_{\text{TH min.}}$ , $I_{\text{SINK}} = 3.2\text{mA}$ , ASM811L/M/J			0.4	
		$V_{\text{CC}} > 1.1\text{V}$ , $I_{\text{SINK}} = 50\mu\text{A}$			0.3	
$V_{\text{OH}}$	High $\overline{\text{RESET}}$ Output Voltage (ASM811)	$V_{\text{CC}} > V_{\text{TH max.}}$ , $I_{\text{SOURCE}} = 500\mu\text{A}$ , ASM811R/S/T	$0.8V_{\text{CC}}$			V
		$V_{\text{CC}} > V_{\text{TH max.}}$ , $I_{\text{SOURCE}} = 800\mu\text{A}$ , ASM811L/M/J	$V_{\text{CC}} - 1.5$			
$V_{\text{OL}}$	Low RESET Output Voltage (ASM812)	$V_{\text{CC}} = V_{\text{TH max.}}$ , $I_{\text{SINK}} = 1.2\text{mA}$ , ASM812R/S/T			0.3	V
		$V_{\text{CC}} = V_{\text{TH max.}}$ , $I_{\text{SINK}} = 3.2\text{mA}$ , ASM812L/M/J			0.4	
$V_{\text{OH}}$	High RESET Output Voltage (ASM812)	$1.8\text{V} < V_{\text{CC}} < V_{\text{TH min.}}$ , $I_{\text{SOURCE}} = 150\mu\text{A}$	$0.8V_{\text{CC}}$			V
$T_{\text{RST}}$	Active Reset Timeout Period	$V_{\text{CC}} > V_{\text{TH}}$	140	240		msec
$T_{\text{MRST}}$	Manual Active Reset Timeout Period	$\overline{\text{MR}}$ returns HIGH		180		msec

## Notes:

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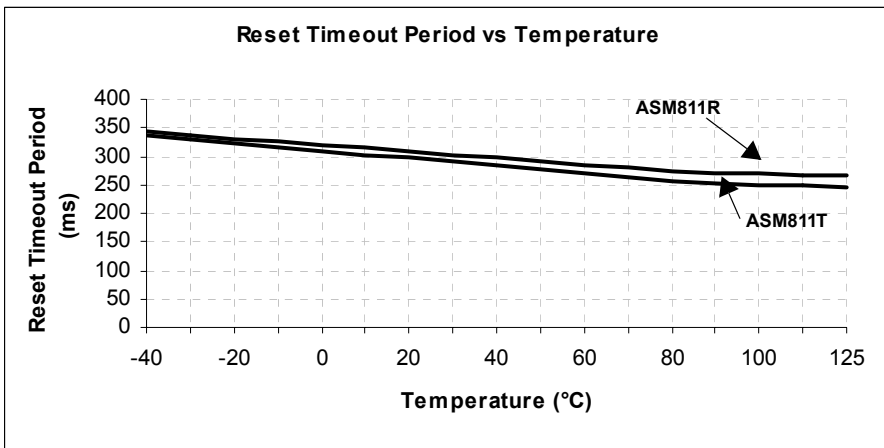
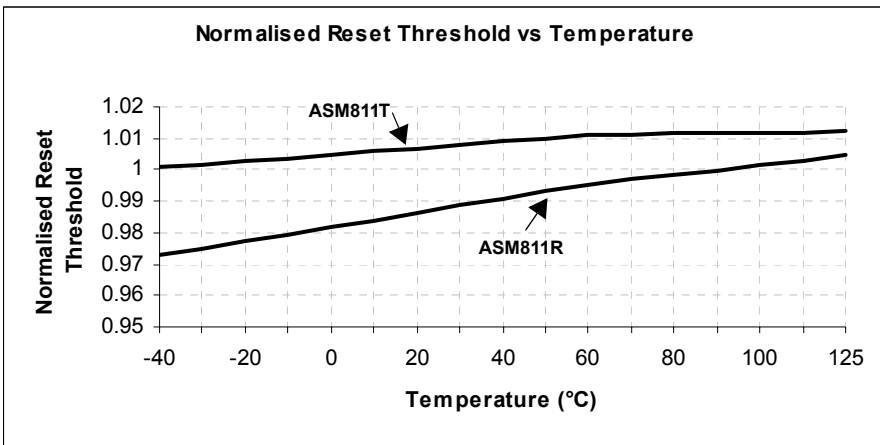
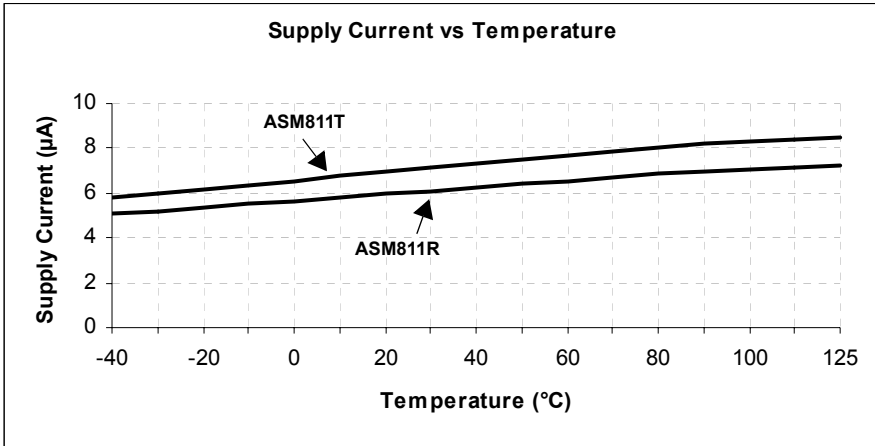


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**Typical Operating Characteristics**

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October 2003



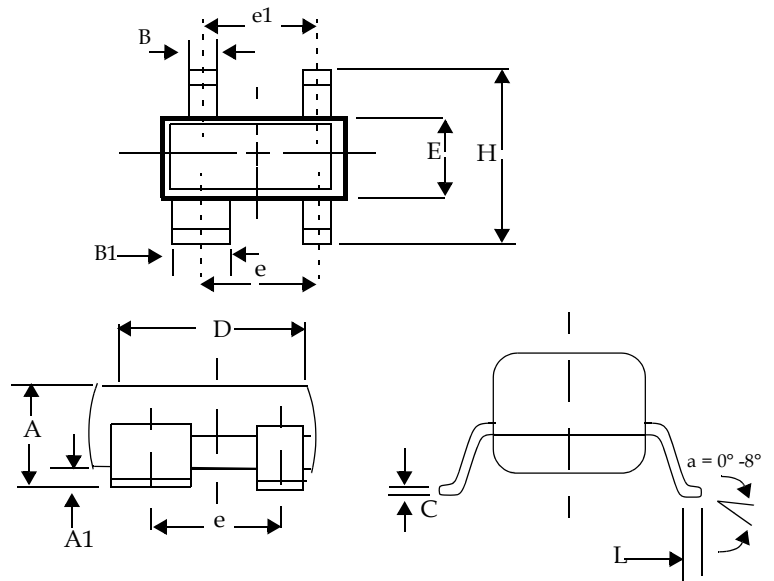
ASM811, ASM812

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Package Dimensions:

Plastic SOT-143 (4-Pin)

	Inches		Millimeters	
	Min	Max	Min	Max
A	0.031	0.047	0.787	1.194
A1	0.001	0.005	0.025	0.127
B	0.014	0.022	0.356	0.559
B1	0.030	0.038	0.762	0.965
C	0.0034	0.006	0.086	0.152
D	0.105	0.120	2.667	3.048
E	0.047	0.055	1.194	1.397
e	0.070	0.080	1.778	2.032
e1	0.071	0.079	1.803	2.007
H	0.082	0.098	2.083	2.489
L	0.004	0.012	0.102	0.305







**Ordering Information:**

Part Number <sup>1</sup>	Reset Threshold (V)	Temperature Range	Pin-Package	Package Marking (XX Lot Code)
<b>ASM811 ACTIVE LOW <math>\overline{\text{RESET}}</math></b>				
ASM811LEUS-T	4.63	-40°C to +105°C	4-SOT143	SMXX
ASM811MEUS-T	4.38	-40°C to +105°C	4-SOT143	SNXX
ASM811JEUS-T	4.00	-40°C to +105°C	4-SOT143	SOXX
ASM811TEUS-T	3.08	-40°C to +105°C	4-SOT143	SPXX
ASM811SEUS-T	2.93	-40°C to +105°C	4-SOT143	SQXX
ASM811REUS-T	2.63	-40°C to +105°C	4-SOT143	SRXX
<b>ASM812 ACTIVE HIGH RESET</b>				
ASM812LEUS-T	4.63	-40°C to +105°C	4-SOT143	SSXX
ASM812MEUS-T	4.38	-40°C to +105°C	4-SOT143	STXX
ASM812JEUS-T	4.00	-40°C to +105°C	4-SOT143	SUXX
ASM812TEUS-T	3.08	-40°C to +105°C	4-SOT143	SVXX
ASM812SEUS-T	2.93	-40°C to +105°C	4-SOT143	SWXX
ASM812REUS-T	2.63	-40°C to +105°C	4-SOT143	SXXX
Notes:				
1. Tape and Reel packaging is indicated by the -T designation.				

**Related Products:**

	ASM809	ASM810	ASM811	ASM812
Max Supply Current	15µA	15µA	15µA	15µA
Package Pins	3	3	4	4
Manual RESET input			■	■
Package Type	SOT - 23	SOT - 23	SOT - 143	SOT - 143
Active-HIGH RESET Output		■		■
Active-LOW $\overline{\text{RESET}}$ Output	■		■	



## ASM811, ASM812



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