

rev 1.0

### μP Supervisory Circuit

#### **General Description**

The ASM161 and ASM162 are cost effective, low power supervisory circuits that monitor power supplies in microprocessor, microcontroller and digital systems. If the power supply drops below the reset threshold level, a reset is asserted and remains asserted for atleast 800ms after  $V_{CC}$  has risen above the reset threshold. An improved manual reset architecture gives the system designer additional flexibility.

The debounced manual reset input is negative edge triggered. The reset pulse period generated by a  $\overline{\text{MR}}$  transition is a minimum of 800 ms and a maximum of 2 sec duration. In addition, The  $\overline{\text{MR}}$  input signal is blocked for an additional 49µS minimum after the reset pulse ends. During the  $\overline{\text{MR}}$  disable period, the microcontroller is guaranteed a time period free of additional manual reset signals. During this period DRAM contents can be refreshed or other critical system tasks undertaken. Low power consumption makes the ASM161/162 ideal for use in portable and battery operated equipments. With 3V supplies power consumption is 8µW typically and 30µW maximum. The ASM161 has an open-drain, active-LOW RESET output and requires an external pull-up resistor. The ASM162 has an active HIGH RESET output.

The ASM161/162 are offered in compact 4-pin SOT-143 packages. No external components are required to trim threshold voltage for monitoring different supply voltages. With six different factory set, reset, threshold ranges from 2.63V to 4.63V, the ASM161/162 are suitable for monitoring 5V, 3.6V and 3.0V supplies. The ASM161/162 are available in temperature ranges  $0^{0}$  to  $70^{0}$ c and  $-40^{0}$ c to  $+85^{0}$ c.

Reset Threshold					
Part Suffix Voltage (V)					
L	4.63				
М	4.38				
J	4.00				
Т	3.08				
S	2.93				
R	2.63				

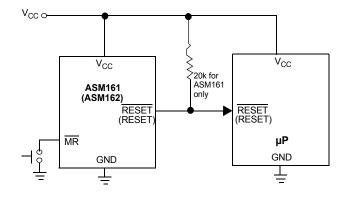
#### **Key Features**

- Edge triggered manual reset input
- single pulse output
- 49µS minimum MR disable period after reset
- CMOS/TTL logic or switch interface
- Debounced input
  - Low supply current extends battery life
    - 6µÅ / 15µA typ/max at 5.5V
    - 4.5µA / 10µA typ/max at 3.6V
- Long reset period
  - 0.8 sec minimum, 2 sec maximum
- Two reset polarity options
  - ASM161: Active LOW, open-drain
  - ASM162: Active HIGH
- Pinout matches the AS811/812
- Small 4-Pin SOT-143 package
- Two temperature ranges: 0<sup>0</sup> to 70<sup>0</sup>c and -40<sup>0</sup>c to +85<sup>0</sup>c

#### **Applications**

- PDAs
- Appliances
- Computers and embedded controllers
- Wireless communication systems
- Battery operated and intelligent instruments
- Automotive systems
- Safety systems

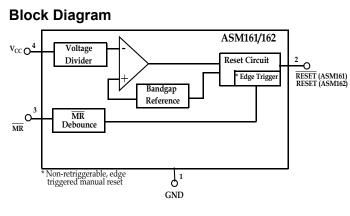
### **Typical Operating Circuit**



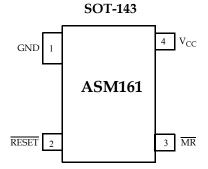


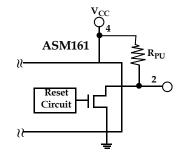
## ASM161 / ASM162

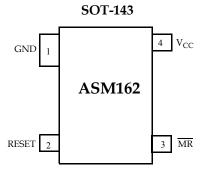
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## **Pin Configuration**







RESET is open drain

### **Pin Description**

Pin	ı #	Pin Name	Description	
ASM161	ASM162	Fin Name		
1	1	GND	Ground.	
2	-	RESET	Active-LOW, open-drain reset output. RESET remains LOW while $V_{CC}$ is below the reset threshold and for 800ms minimum after $V_{CC}$ rises above the reset threshold. An external pull-up resistor is needed.	
-	2	RESET	Active HIGH reset output. RESET remains HIGH while V <sub>CC</sub> is below the reset threshold and for 800ms after V <sub>CC</sub> rises above the reset threshold.	
3	3	MR	Manual reset input. A negative going edge transition on $\overline{\text{MR}}$ asserts reset. Reset remains asserted for one reset time-out period (800 ms min). This active-LOW input has an internal pull-up resistor. It can be driven from a TTL or CMOS logic line or shorted to ground with a switch. Leave open if unused.	
4	4	V <sub>CC</sub>	Power supply input voltage.	



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#### **Detailed Descriptions**

The reset function ensures the microprocessor is properly reset and powers up into a known condition after a power failure.

#### **Reset Timing**

A reset is generated whenever the supply voltage is below the threshold level ( $V_{CC} < V_{TH}$ ). The reset duration is at least 800ms after  $V_{CC}$  has risen above the reset threshold and is guaranteed to be no more than 2 seconds. The rest signal remains active as long as the monitored supply voltage is below the internal threshold voltage.

The ASM161 has an open-drain, active LOW  $\overrightarrow{\text{RESET}}$  output (which is guaranteed to be in the correct state for V<sub>CC</sub> down to 1.1 V). The ASM161 uses an external pull-up resistor. Output leakage current is under 1µA. A high resistance value can be used to minimize current drain.

The ASM162 generates an active-HIGH RESET output.

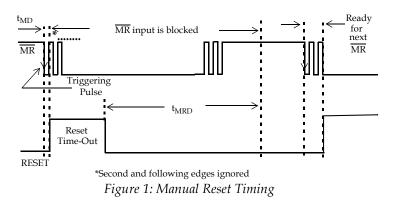
Part Number	Reset Polarity			
ASM161	LOW (use external pull-up resistor)			
ASM162	HIGH			

#### Manual Reset

The ASM161/162 have a unique manual reset circuit. A negative going edge transition on  $\overline{\text{MR}}$  initiates the reset. A manual reset generates a single reset pulse of fixed length. The output-reset pulse remains asserted for the Reset Active Time-Out Period t<sub>RP</sub> and then clears. Once the reset pulse is completed, the  $\overline{\text{MR}}$  input remains disabled for at least 49µS but not more than 122µS. This period is specified as t<sub>MRD</sub>.

During the  $\overline{\text{MR}}$  disabled period, the microcontroller is guaranteed a time period free of new manual reset signals. This period can be used to refresh critical DRAM contents or other system tasks. The  $\overline{\text{MR}}$  pin must be taken HIGH and LOW again after the  $t_{\text{MRD}}$  period has been completed to initiate another reset pulse.

The manual reset input has an internal 20k $\Omega$  pull-up resistor.  $\overline{\text{MR}}$  can be left open if not used.



### **Application Information**

#### **Glitch Resistance**

The ASM161/162 are relatively immune to short duration negative-going V<sub>CC</sub> transients/glitches. A V<sub>CC</sub> transient that goes 100mV below the reset threshold and lasts 20s or less will not typically cause a reset pulse.

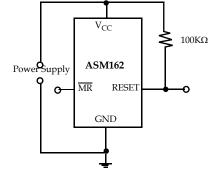


Figure 2: RESET valid with VCC under 1.1V

#### Valid Reset with VCC under 1.1V

To ensure that logic inputs connected to the ASM162 RESET pin are in a known state when V<sub>CC</sub> is under 1.1V, a 100k $\Omega$  pull-down resistor at RESET is needed. The value is not critical.

This scheme does not work with the open-drain outputs of ASM161.



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### **Absolute Maximum Ratings**

Parameter	Min	Мах	Unit				
Pin Terminal Voltage with respect to Ground							
V <sub>CC</sub>	-0.3	6.0	V				
RESET, RESET and MR	-0.3	V <sub>CC</sub> + 0.3	V				
Input Current at V <sub>CC</sub> and MR		20	mA				
Rate of Rise at V <sub>CC</sub>		100	V/µs				
Power Dissipation ( $T_A = 70^{\circ}C$ )		320	mW				
Operating Temperature Range	-40	85	°C				
Storage Temperature Range	-65	160	°C				
Lead Temperature (soldering, 10 sec)		300	°C				
Note: These are stress ratings only and functional operation is not implied. Exposure to absolute maximum rat-							

ings for prolonged time periods may affect device reliability.



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### **Electrical Characteristics**

Unless otherwise noted,  $V_{CC}$  is over the full range and TA = 0<sup>o</sup> to 70<sup>o</sup>c for ASM161/162 X C and T<sub>A</sub> = -40<sup>o</sup>c to +85<sup>o</sup>c for ASM161/162 X E devices. Typical values at T<sub>A</sub> = 25<sup>o</sup>c,  $V_{CC}$  = 5V for L/M/J devices,  $V_{CC}$  = 3.3V for T/S devices and  $V_{CC}$  = 3V for R devices

Parameter	Symbol	Conditions		Min	Тур	Мах	Unit
Input Voltage (V <sub>CC</sub> ) Range	V <sub>CC</sub>	$T_A = 0^{\circ}C$ to $70^{\circ}C$		1.1		5.5	V
Supply Current	I <sub>CC</sub>	$T_A = 0^{\circ}C$ to 70°C, $T_A = -40^{\circ}C$ to +85°C	V <sub>CC</sub> < 5.5V, L/M/J		6	15	μA
(Unloaded)		$T_A = 0^{\circ}C$ to 70°C, $T_A = -40^{\circ}C$ to +85°C	V <sub>CC</sub> < 3.6V, R/S/T		4.5	10	μΛ
		L Devices	T <sub>A</sub> = 25°C	4.56	4.63	4.70	
			Note 1	4.50		4.75	
		M devices	T <sub>A</sub> = 25°C	4.31	4.38	4.45	
			Note 1	4.25		4.50	
		J devices	T <sub>A</sub> = 25°C	3.93	4.00	4.06	- V
Reset Threshold	V		Note 1	3.89		4.10	
Reset mieshold	V <sub>TH</sub>	T devices	T <sub>A</sub> = 25°C	3.04	3.08	3.11	
			Note 1	3.00		3.15	
		S devices	T <sub>A</sub> = 25°C	2.89	2.93	2.96	
			Note 1	2.85		3.00	
		R devices	T <sub>A</sub> = 25°C	2.59	2.63	2.66	
			Note 1	2.55		2.70	
Reset Threshold Temp Coefficient	T <sub>CVTH</sub>				30		ppm/ °C
V <sub>CC</sub> to reset delay		$V_{CC} = V_{TH}$ to ( $V_{TH}$ -100mV)			20		μS
	t <sub>RPW</sub>	$T_A = 0^{\circ}C$ to $70^{\circ}C$		800	1400	2000	
Reset Pulse Width		T <sub>A</sub> = -40°C to 85°C		560		2240	ms
MR Minimum Pulse Width	t <sub>MR</sub>			10			μS
MR Glitch Immunity					100		ns
MR to RESET Propaga- tion Delay	t <sub>MD</sub>				0.5		μs



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Parameter	Symbol	Conditions	Min	Тур	Max	Unit
	V <sub>IH</sub>	V <sub>CC</sub> > V <sub>TH</sub> (MAX), L/M/J devices	2.3			V
	V <sub>IL</sub>	$v_{\rm CC} > v_{\rm TH}(w_{\rm AX}), L/w/J devices$			0.8	V
MR Input Threshold	V <sub>IH</sub>		0.7V <sub>CC</sub>			V
	V <sub>IL</sub>	V <sub>CC</sub> > V <sub>TH</sub> (MAX), R/S/T devices			0.25V <sub>CC</sub>	V
MR Delay to MR Retrig-	4	T <sub>A</sub> = 0°C to 70°C	49	85	122	0
ger	t <sub>MRD</sub>	$T_A = -40^{\circ}C$ to $85^{\circ}C$		85		μS
MR pull-up resistance			10	20	30	KΩ
	V <sub>OL</sub>	V <sub>CC</sub> = V <sub>TH</sub> min., I <sub>SINK</sub> = 1.2mA, ASM161 R/S/T			0.3	
Low RESET output volt- age (ASM161)		V <sub>CC</sub> = V <sub>TH</sub> min., I <sub>SINK</sub> = 3.2mA, ASM161 L/M/J			0.4	V
		V <sub>CC</sub> > 1.1, I <sub>SINK</sub> = 50µA			0.3	
RESET Output Leak- age Current (ASM161)	I <sub>LKG</sub>	$V_{\text{DRAIN}} \le 6.0V$ , 0°C $\le T_{\text{A}} \le 70$ °C			1	μA
Low RESET output volt- age (ASM162)	V <sub>OL</sub>	V <sub>CC</sub> = V <sub>TH</sub> min., I <sub>SINK</sub> = 1.2mA, ASM162 R/S/T			0.3	V
	*OL	V <sub>CC</sub> = V <sub>TH</sub> min., I <sub>SINK</sub> = 3.2mA, ASM162 L/M/J			0.4	v
HIGH RESET Output Voltage (ASM162)	V <sub>OH</sub>	1.8 <v<sub>CC<v<sub>THmin., I<sub>SOURCE</sub> = 150 μA</v<sub></v<sub>	0.8V <sub>CC</sub>			V

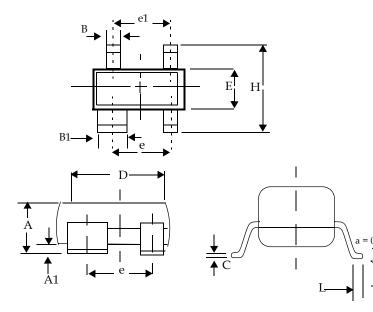
Notes: 1. Over operating temperature range.



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Package Dimensions

Plastic SOT - 143 (4Pin)



Plastic SOT - 143 (4 pin)

	Inches		Millim	eters
	Min	Мах	Min	Max
	Plastic	SOT-143	(4-Pin)	
А	0.031	0.047	0.787	1.194
A1	0.001	0.005	0.025	0.127
В	0.014	0.022	0.356	0.559
B1	0.030	0.038	0.762	0.965
С	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
е	0.070	0.080	1.778	2.032
e1	0.071	0.079	1.803	2.007
Н	0.082	0.098	2.083	2.489
L	0.004	0.012	0.102	0.305



### rev 1.0 Ordering Information

#### Reset Temperature Package Marking Threshold Range **Pin-Package** Part Number<sup>1</sup> (XX Lot Code) (V) (°C) TAXX ASM161LCUS/T 4.63 0 TO 70 4-SOT-143 ASM161MCUS/T 4.38 0 TO 70 4-SOT-143 TBXX ASM161JCUS/T 4.00 0 TO 70 4-SOT-143 TCXX TDXX ASM161TCUS/T 3.08 0 TO 70 4-SOT-143 2.93 0 TO 70 4-SOT-143 TEXX ASM161SCUS/T ASM161RCUS/T 2.63 0 TO 70 4-SOT-143 TFXX ASM162LCUS/T 4.63 0 TO 70 4-SOT-143 TGXX THXX ASM162MCUS/T 4.38 0 TO 70 4-SOT-143 ASM162JCUS/T 4.00 0 TO 70 4-SOT-143 TIXX 4-SOT-143 3.08 0 TO 70 TJXX ASM162TCUS/T ASM162SCUS/T 2.93 0 TO 70 4-SOT-143 TKXX ASM162RCUS/T 2.63 0 TO 70 4-SOT-143 TLXX ASM161LEUS/T 4.63 -40 TO 85 4-SOT-143 TMXX ASM161MEUS/T 4.38 -40 TO 85 4-SOT-143 TNXX ASM161JEUS/T 4.00 -40 TO 85 4-SOT-143 TOXX ASM161TEUS/T 3.08 -40 TO 85 4-SOT-143 TPXX ASM161SEUS/T 2.93 -40 TO 85 4-SOT-143 TQXX ASM161REUS/T 2.63 -40 TO 85 4-SOT-143 TRXX TSXX ASM162LEUS/T 4.63 -40 TO 85 4-SOT-143 ASM162MEUS/T 4.38 -40 TO 85 4-SOT-143 TTXX TUXX ASM162JEUS/T 4.00 -40 TO 85 4-SOT-143 ASM162TEUS/T 3.08 -40 TO 85 4-SOT-143 TVXX ASM162SEUS/T 2.93 -40 TO 85 4-SOT-143 TWXX ASM162REUS/T 2.63 -40 TO 85 4-SOT-143 TXXX

Notes: 1. Tape and Reel packaging is indicated by the /T designation.





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