PowerManager™

General Description

The AAT3526/7/8 PowerManager™ products are members of AATI's Total Power Management IC™ (TPMIC™) product family. These microprocessor reset circuits are ideal for monitoring voltage supplies in portable systems, where extended battery life is critical. They provide a low cost, reliable solution by eliminating external components. The AAT3526/7/8 products operate by monitoring the system power supply voltage. When the input voltage drops below a fixed threshold, the device asserts a reset signal for a minimum of 150ms after V_{CC} has risen back above the fixed threshold. They are guaranteed to operate down to 1.2V and designed to ignore fast line transients appearing on V_{CC}. The AAT3526/7/8 series is available with three output stage versions: AAT3526 push-pull active low output, AAT3527 push-pull active high output and AAT3528 open drain active low output. The quiescent supply current is extremely low, typically 1µA, making this device ideal for portable battery operated equipment.

The AAT3526/7/8 are available in a 4 pin SOT143 package and are specified over -40° to 85°C operating temperature range.
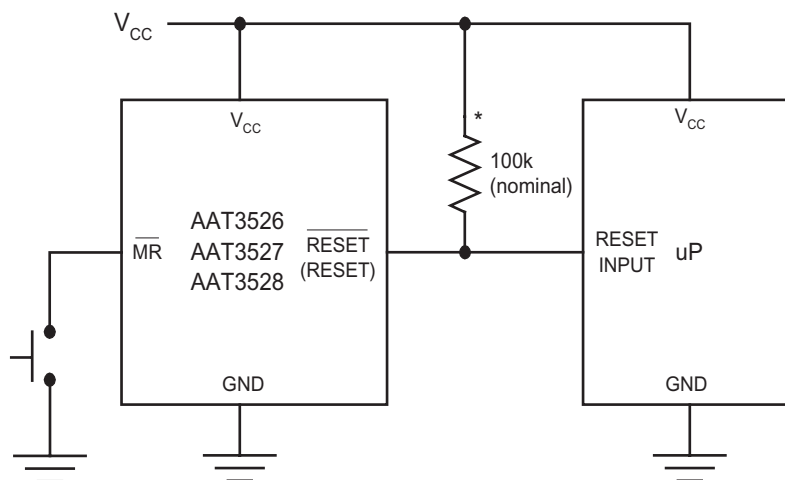
Features

- 1.2V to 5.5V Input voltage range
- Operation down to 1.2V
- Extremely low quiescent current: less than 2µA
- High accuracy detection threshold: ±1.5%
- Monitor Power Supply Voltages
- Fixed thresholds from 2.2V to 4.6V
- Minimum 150ms reset pulse width with fast delay time <20µs
- Debounced Manual Reset Input
- Available output configurations:
    - Open-drain output
    - CMOS active high output
    - CMOS active low output
- Temp range -40 to 85°C
- 4 pin SOT143 package

Applications

- Notebook Computers
- Cell Phones
- Portable Electronics
- Embedded Systems
- Intelligent Instruments

Advanced Information

## Typical Application

*AAT3528 Only

Pin Descriptions

AAT3526, 3527, 3528 (SOT143)

Pin #	Symbol	Function
1	GND	Ground connection
2	RESET (AAT3527)	RESET output remains high while V_{CC} is below the reset threshold and remains so for a minimum of 150ms after V_{CC} raises above the reset threshold.
	$\overline{RESET}$ (AAT3526, AAT3528)	$\overline{RESET}$ output remains low while V_{CC} is below the reset threshold and remains so for a minimum of 150ms after V_{CC} raises above the reset threshold
3	$\overline{MR}$	Manual Reset active low input. A logic low signal on $\overline{MR}$ asserts a reset condition. Asserted reset continues as long as $\overline{MR}$ is low and for a minimum of 150ms after $\overline{MR}$ returns high
4	Vcc	Supply Voltage (+1.2V to +5.5V)

Part Number Descriptions

Part Number	Output Type
AAT3526	Reset Output Push Pull Active Low with Delay
AAT3527	Reset Output Push Pull Active High with Delay
AAT3528	Reset Output Open Drain Active Low with Delay

Pin Configuration

SOT143
(Top View)

GND [1]   [4] V_{CC}
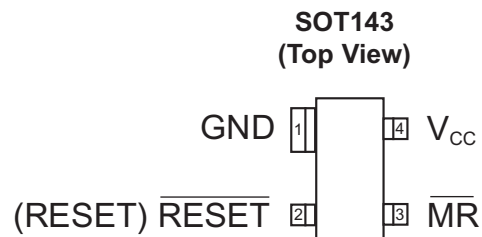
(RESET) $\overline{RESET}$ [2]   [3] $\overline{MR}$

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Symbol	Description	Value	Units
V_{CC}	V_{CC} to GND	-0.3 to 5.5	V
V_{MR}	$\overline{MR}$ to GND	-0.3 to V_{CC}+0.3	V
V_{RESET}	$\overline{RESET}$ to GND (Push-Pull Output)	-0.3 to V_{CC}+0.3	V
	RESET to GND (Open Drain Output)	-0.3 to 5.5	
I_{VCC}, I_{MR}	Maximum Continuous Input Current	20	mA
I_{RESET}	RESET/$\overline{RESET}$ Current	20	mA
dVcc/dt	Rate of rise of V_{CC}	100	V/µs
T_J	Operating Junction Temperature Range	-40 to 150	°C
T_{LEAD}	Maximum Soldering Temperature (at Leads) for 10s	300	°C

Note: Stresses above those listed in Absolute Maximum Ratings may cause permanent damage to the device. Functional operation at conditions other than the operating conditions specified is not implied. Only one Absolute Maximum rating should be applied at any one time.

Thermal Information

Symbol	Description	Value	Units
Θ_{JA}	Maximum Thermal Resistance (SOT143)[1]	200	°C/W
P_D	Maximum Power Dissipation (SOT143)[1]	320	mW

Note 1: Mounted on an FR4 board.

## Electrical Characteristics (V_{IN} = 5V, T_A = -40 to 85°C unless otherwise noted. Typical values are at T_A=25°C, V_{CC} = 5V for 4.63/4.38V versions, V_{CC} = 3.3V for 3.08/2.93V versions, V_{CC} = 3.0V for 2.63V versions and V_{CC} = 2.5V for 2.32/2.2V versions)

| Symbol	Description	Conditions	Min	Typ	Max	Units
V_{CC}	Operation Voltage	T_A = 0°C to +70°C	1.0		5.5	V
		T_A = -40°C to +85°C	1.2		5.5	
I_Q	Quiescent Current	V_{CC} = 5.5V		1.05	3	µA
		V_{CC} = 3V		0.85	2	
V_{TH}	RESET Threshold (Table 1)	T_A = 25°C	V_{TH} -1.5%	V_{TH}	V_{TH} +1.5%	V
		T_A = -40°C to +85°C	V_{TH} -2.5%	V_{TH}	V_{TH} +2.5%	
ΔV_{TH}/°C	RESET Threshold Tempco			40		ppm/°C
t_P	RESET Propagation Delay	V_{CC} = V_{TH} to (V_{TH} -100mV)		15		µs
t_{RDY}	RESET Active Timeout Period		150	250	400	ms
t_{MR}	$\overline{MR}$ Minimum Pulse Width		10			µs
MRGI	$\overline{MR}$ Glitch Immunity			100		ns
t_{MD}	$\overline{MR}$ to Reset Propagation Delay			0.5		µs
V_{IH}	$\overline{MR}$ Input Threshold	V_{CC} = $V_{TH(MAX)}$, $V_{TH} \geq$ 4.38V	2.3			V
		V_{CC} = $V_{TH(MAX)}$, $V_{TH} <$ 4.38V	$0.7 \times V_{CC}$			
V_{IL}	$\overline{MR}$ Input Threshold	V_{CC} = $V_{TH(MAX)}$, $V_{TH} \geq$ 4.38V			0.8	V
		V_{CC} = $V_{TH(MAX)}$, $V_{TH} <$ 4.38V			$0.25 \times V_{CC}$	
R_{MR}	$\overline{MR}$ Pull-Up Resistance		10	20	30	kΩ
V_{OL}	RESET Low Output Voltage AAT3526, AAT3528	I_{SINK} =1.6mA, $V_{CC} >$ 2.1V, RESET asserted			0.3	V
		I_{SINK} =100µA, $V_{CC} >$1.2V, RESET asserted			0.4	
V_{OH}	RESET High Output Voltage AAT3526	I_{SOURCE} = 800 µA	V_{CC} -1.5			V
V_{OL}	RESET Low Output Voltage AAT3527	I_{SINK} =1.2mA, $V_{CC} >$ 1.2V, RESET not asserted			0.3	V
		I_{SINK} = 3.2mA, $V_{CC} >$ 4.5V, RESET not asserted			0.4	
V_{OH}	RESET High Output Voltage AAT3527	I_{SOURCE} = 500µA, $V_{CC} >$ 2.1V, RESET asserted	$0.8V_{CC}$			V
		I_{SOURCE} = 50µA, $V_{CC} >$ 1.2V, RESET asserted	$0.8V_{CC}$			
I_{DOFF}	RESET leakage current, AAT3528	$V_{CC} > V_{TH}$			1	µA

Typical Characteristics

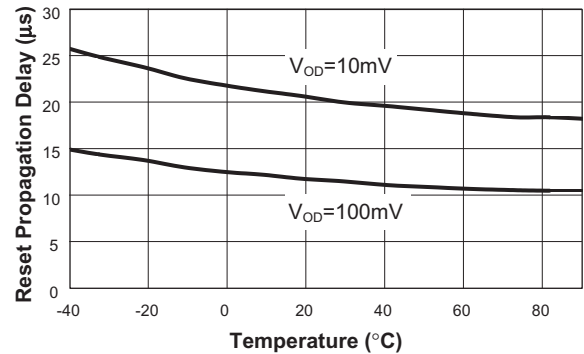### Supply Current vs. Temperature
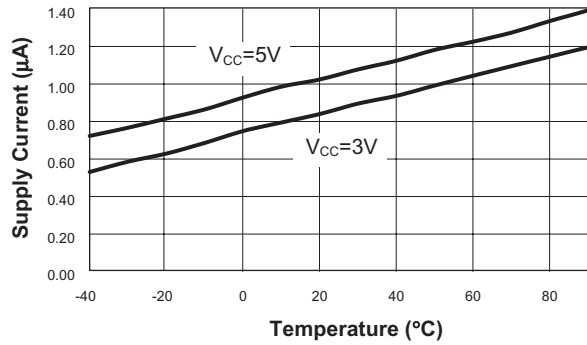
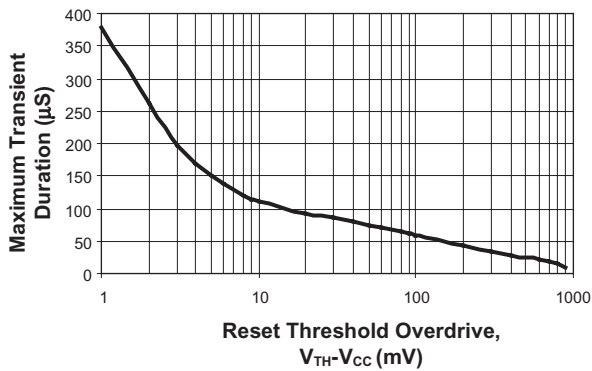### Normalized Reset Threshold vs. Temperature
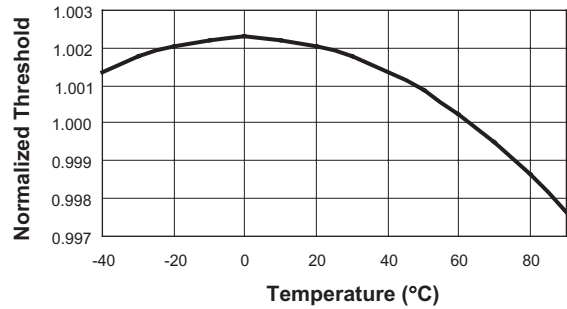
Power-Up Reset Timeout vs. Temperature
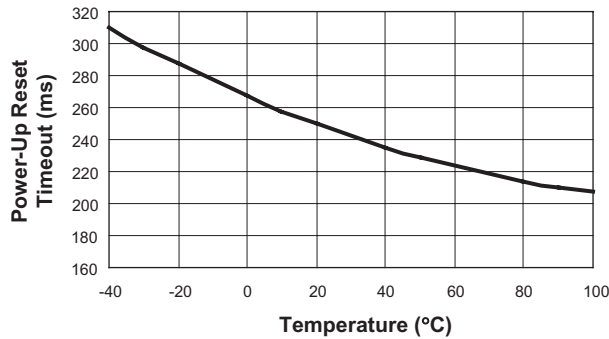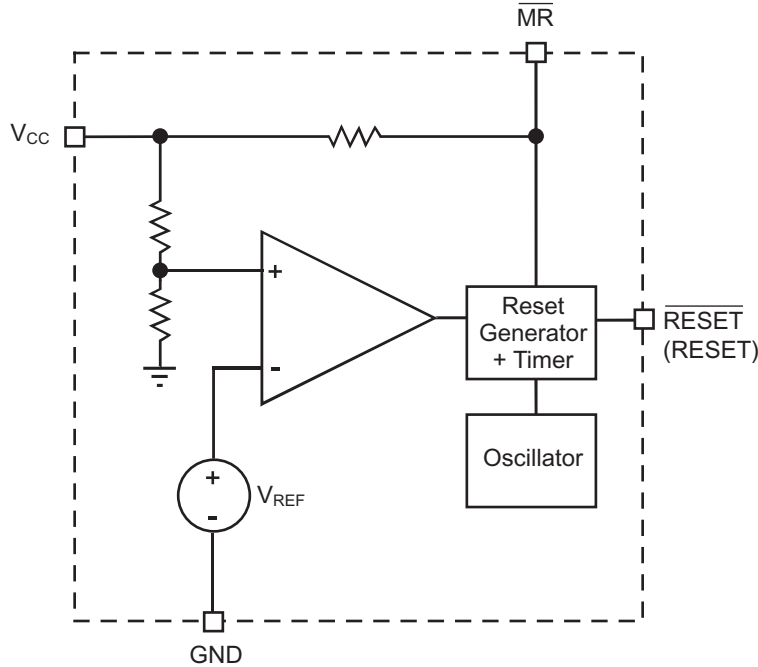

Power-Down Reset Propagation Delay vs. Temperature

Maximum Transient Duration vs. Reset Threshold Overdrive

Functional Block Diagram

Functional Description

General

During start-up, the reset pin on a microprocessor ensures that it is fully reset and starts up in a known condition. The AAT3526/7/8 series of microprocessor reset devices monitor the supply voltage to a microprocessor and assert a reset signal whenever the V_{CC} voltage falls below a factory programmed threshold. This threshold is accurate within +/-1.5% at 25ºC and within +/- 2.5% over the entire operating temperature range. The reset signal remains asserted for a minimum of 150ms after V_{CC} has risen above the threshold as shown in Figure 1.
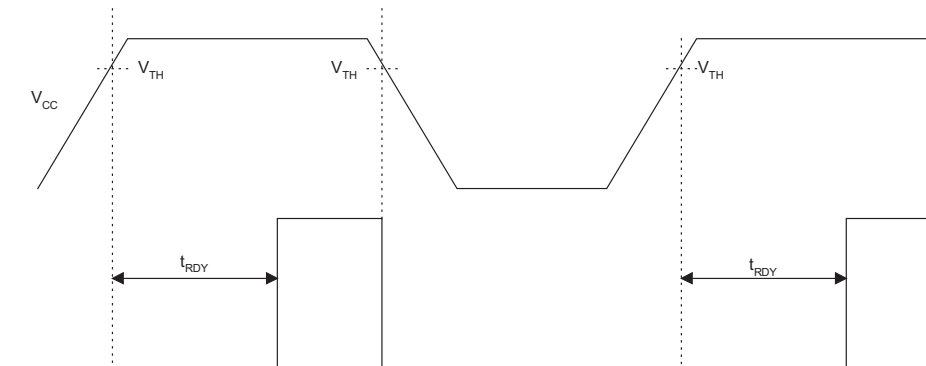

Figure 1: Reset Timing Diagram

Applications Information

Reset Output Options

The AAT3528 has an active low open drain output and the AAT3526/7 have a push-pull output. The AAT3528 may be used in multiple voltage systems, with an external pull-up resistor. This allows the AAT3528 to interface to microprocessors with higher supply voltages up to 5.5V (Figure 2). In the event of a power down or brown-out condition the reset signal remains valid until the V_{CC} drops below 1.2V. To ensure validity down to ground an external 100kΩ resistor should be connected between the RESET output and GND.

Manual Reset Input

A logic low signal on $\overline{MR}$ asserts a reset condition. Reset continues to be asserted as long as $\overline{MR}$ is low and for a minimum of 150ms after $\overline{MR}$ returns high. This input is internally pulled up to V_{CC} via a 20kΩ resistor, so leaving the pin unconnected is acceptable if manual reset function is not needed. The $\overline{MR}$ input is internally debounced which allows use of a mechanical switch. It should be a normally-open momentary switch connected from $\overline{MR}$ to GND. Additionally, the $\overline{MR}$ pin can be driven from TTL, CMOS, or open drain logic outputs.

Supply Voltage Transient Behavior

In some cases fast negative transients of short duration can appear on the V_{CC} power supply. The AAT3526/7/8 series devices provide some immunity to line transients which can generate invalid reset pulses. Figure 1 shows typical behavior to short duration pulses verses RESET comparator overdrive. As shown in the Maximum Transient Duration vs. Reset Threshold Overdrive graph, when the transient voltage becomes larger, the time allowed before asserting a reset becomes shorter. e.g. typically a transient of 100mV below the reset threshold would have to present for more than 50µs to cause a reset. Immunity can be increased by the addition of a small by-pass capacitor of 0.1µF connected as close to the V_{CC} pin as possible.
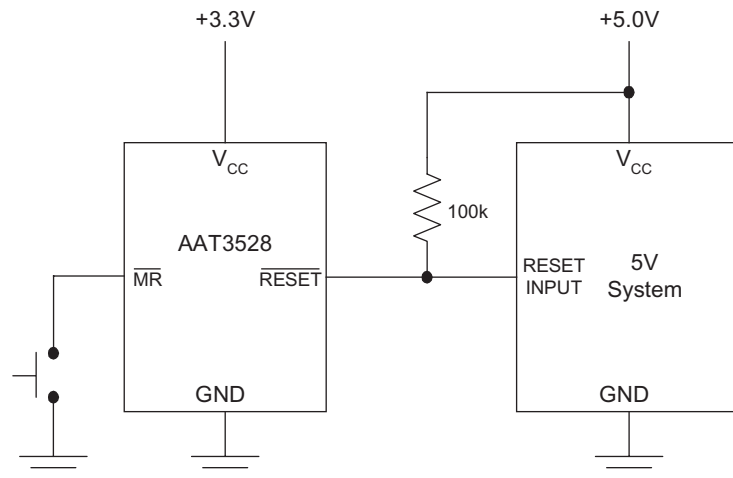
**Figure 2: Using AAT3528 Open Drain Output with Multiple Supplies**

Factory Trimmed Reset Thresholds* and Ordering Information Table 1

Ordering Part Number	Marking	Reset Threshold Voltage, V_{TH} (V)				
		T_A = 25ºC			T_A = 40 to 85ºC	
		Min	Typ	Max	Min	Max
AAT3526ICX-2.32-200-T1 AAT3527ICX-2.32-200-T1 AAT3528ICX-2.32-200-T1		2.285	2.320	2.355	2.262	2.378
AAT3526ICX-2.63-200-T1 AAT3527ICX-2.63-200-T1 AAT3528ICX-2.63-200-T1		2.591	2.630	2.669	2.564	2.696
AAT3526ICX-2.93-200-T1 AAT3527ICX-2.93-200-T1 AAT3528ICX-2.93-200-T1		2.886	2.930	2.974	2.857	3.003
AAT3526ICX-3.08-200-T1 AAT3527ICX-3.08-200-T1 AAT3528ICX-3.08-200-T1		3.034	3.080	3.126	3.003	3.157
AAT3526ICX-4.38-200-T1 AAT3527ICX-4.38-200-T1 AAT3528ICX-4.38-200-T1		4.314	4.380	4.446	4.271	4.490
AAT3526ICX-4.63-200-T1 AAT3527ICX-4.63-200-T1 AAT3528ICX-4.63-200-T1		4.561	4.630	4.699	4.514	4.746

*Contact Local Sales Office for custom trimmed options

Package Information

SOT143
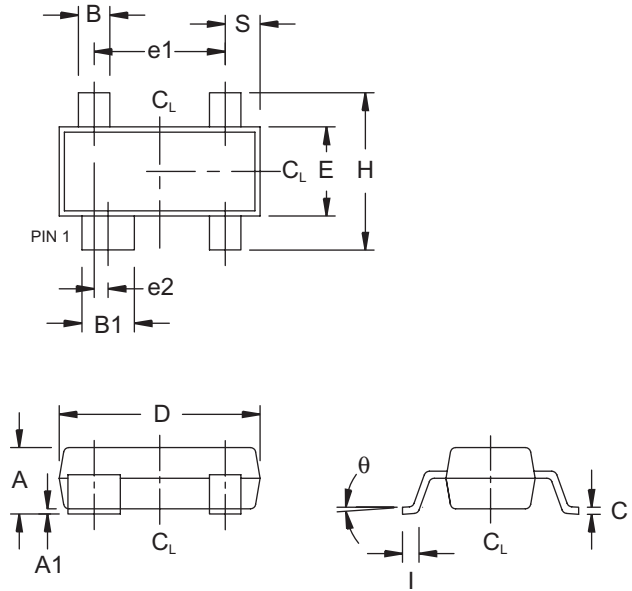
Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	0.787	1.194	0.031	0.047
A1	0.025	1.027	0.001	0.005
B	0.356	0.559	0.014	0.022
B1	0.762	0.965	0.030	0.038
C	0.086	0.152	0.0034	0.006
D	2.667	3.048	0.105	0.120
E	1.194	1.397	0.047	0.055
E1	1.803	2.007	0.071	0.079
E2	0.200 BSC		0.008 BSC	
H	2.083	2.489	0.082	0.098
I	0.102	0.305	0.004	0.012
S	0.450	0.600	0.018	0.024
Θ	0°	8°	0°	8°

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