AAT3560/2/4

PowerManager™

NanoPower™ Voltage Detector

General Description

The AAT3560/2/4 series of PowerManager products are part of AnalogicTech's Total Power Management IC™ (TPMIC™) product family. These voltage detectors are ideal for monitoring voltage supplies in portable systems, where extended battery life is critical. They provide a low-cost, reliable solution by eliminating several external components. The AAT3560 series operates by monitoring the system power supply voltage. When the input voltage drops below a fixed threshold, the device output changes state depending upon configuration. When the input voltage rises above the threshold, the device output reverts back to the previous state. The AAT3560 series is available with three different output stages: AAT3560 push-pull active high output; AAT3562 push-pull active low output; and AAT3564 open drain active low output.

The quiescent supply current is extremely low, typically 1µA, making it ideal for portable battery-operated equipment.

AAT3560/2/4 devices are available in a Pb-free, 3-pin SOT23 package and are specified over the -40°C to +85°C operating temperature range.

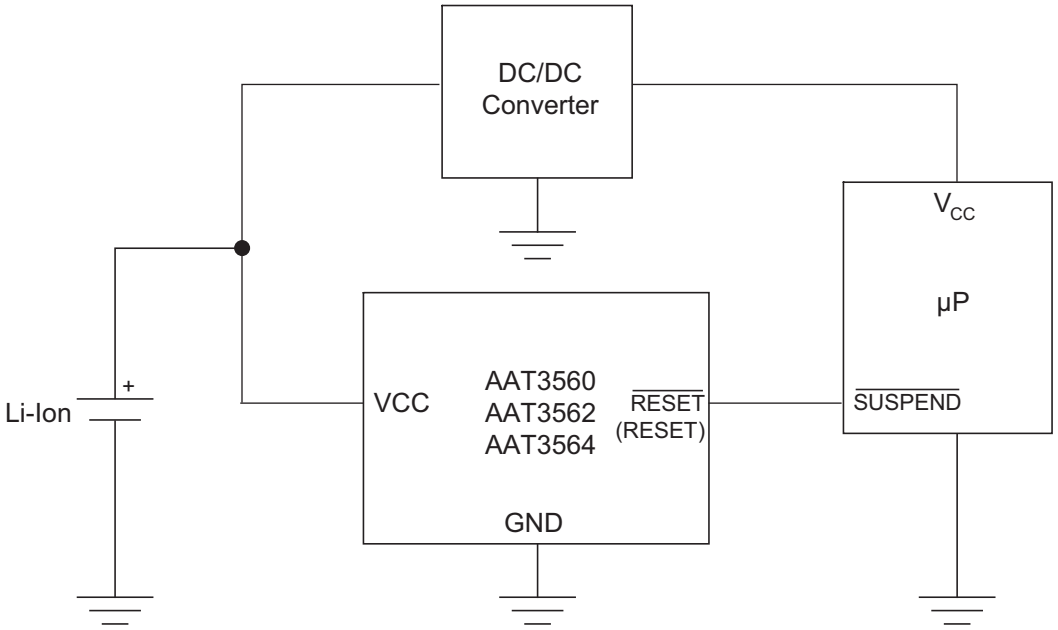
Features

- Input Voltage Range: 1.2V to 5.5V
- Operates 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
- Active Noise Suppression
- Available Output Configurations:
  - Open-Drain Output
  - CMOS Active High Output
  - CMOS Active Low Output
- Temperature Range: -40°C to +85°C
- 3-Pin SOT23 Package

Applications

- Battery Charger Circuits
- Battery Packs
- Data Acquisition Systems
- Intelligent Instruments
- Notebook Computers
- Portable Electronics
- Power Supplies

Typical Application

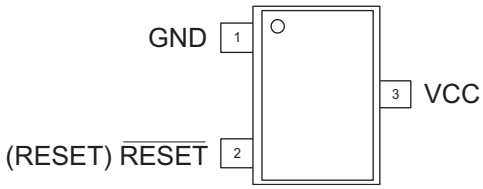


Pin Descriptions

Pin #	Symbol	Function
1	GND	Ground
2	$\overline{\text{RESET}}$ (RESET)	Reset output. See table below for output configurations.
3	VCC	Supply voltage (+1.2V to +5.5V).

Pin Configuration

SOT23-3
(Top View)



Part Number Descriptions

SOT23-3 Part Number	Part Description
AAT3560	RESET Push Pull Active High
AAT3562	$\overline{\text{RESET}}$ Push Pull Active Low
AAT3564	$\overline{\text{RESET}}$ Open Drain, Active Low

Absolute Maximum Ratings[1]

T_A = 25°C, unless otherwise noted.

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

Thermal Information[2]

Symbol	Description	Value	Units
Θ_{JA}	Maximum Thermal Resistance	200	°C/W
P_D	Maximum Power Dissipation	320	mW

1. 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.
2. Mounted on an FR4 board.

Electrical Characteristics

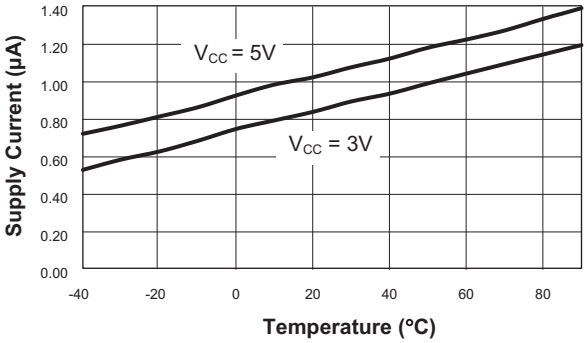
V_{IN} = 5V; T_A = -40°C to +85°C, unless otherwise noted. Typical values are at T_A = 25°C; V_{CC} = 5V for 4.63/4.38V versions; V_{CC} = 3.3V for 3.08/2.93V versions; V_{CC} = 3.0V for 2.63V version; V_{CC} = 2.5V for 2.32/2.2V versions.

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} = 3V		0.85	2	µA
		V_{CC} = 5.5V		1.05	3	
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%	
$dV_{TH}/°C$	RESET Threshold Tempco			40		ppm/°C
V_{OL}	$\overline{RESET}$ Low Output Voltage AAT3562, AAT3564	I_{SINK} = 1.2mA, V_{CC} = $V_{TH(min)}$, V_{TH} ≤ 3.08V, $\overline{RESET}$ Asserted			0.3	V
		I_{SINK} = 3.2mA, V_{CC} = $V_{TH(min)}$, V_{TH} > 3.08V, $\overline{RESET}$ Asserted			0.4	
V_{OH}	$\overline{RESET}$ High Output Voltage AAT3562	I_{SOURCE} = 800µA, V_{TH} > 3.08V, V_{CC} > $V_{TH\ (max)}$	V_{CC} -1.5			V
		I_{SOURCE} = 500µA, V_{TH} ≤ 3.08V, V_{CC} > $V_{TH\ (max)}$	0.8 V_{CC}			
V_{OL}	$\overline{RESET}$ Low Output Voltage AAT3560	I_{SINK} = 1.2mA, V_{CC} > $V_{TH\ (max)}$, V_{TH} ≤ 3.08V, RESET Not Asserted			0.3	V
		I_{SINK} = 3.2mA, V_{CC} > $V_{TH\ (max)}$, V_{TH} > 3.08V, RESET Not Asserted			0.4	
V_{OH}	RESET High Output Voltage AAT3560	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}	$\overline{RESET}$ Leakage Current AAT3564	V_{CC} > V_{TH}			1	µA

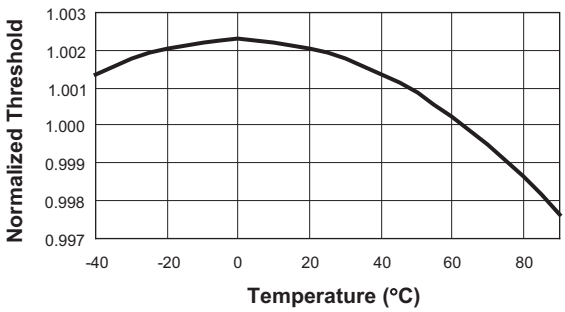
Typical Characteristics

V_{IN} = 5V; T_A = 25°C, unless otherwise noted.

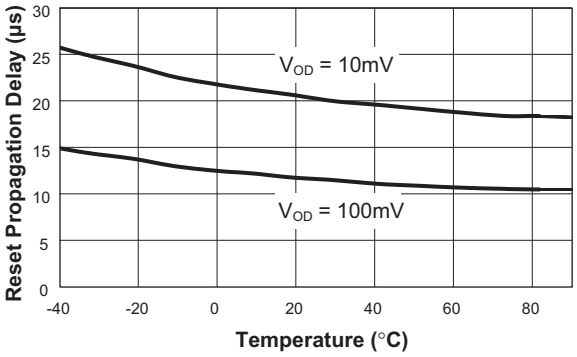
Supply Current vs. Temperature



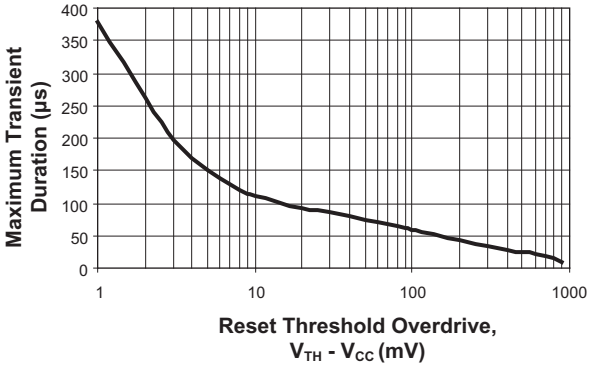
Normalized Reset Threshold vs. Temperature



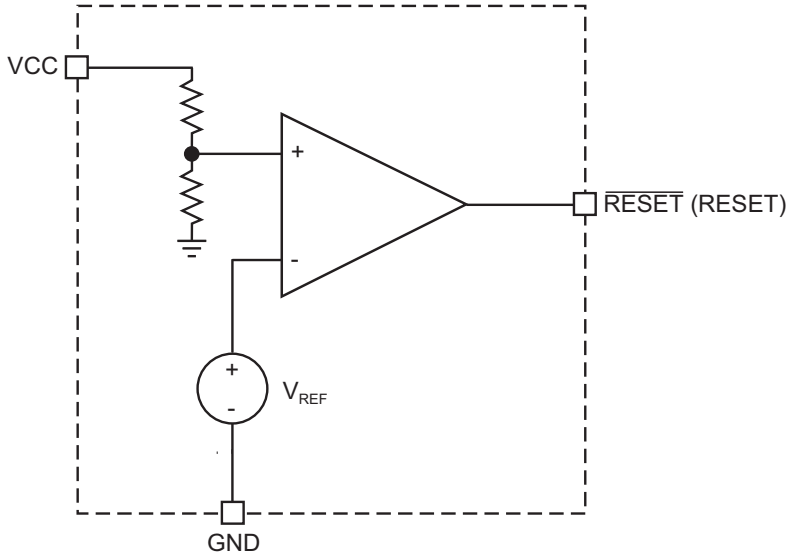
Power-Down Reset Propagation Delay vs. Temperature



Maximum Transient Duration vs. Reset Threshold Overdrive



Functional Block Diagram



Functional Description

General

The AAT3560 series of NanoPower voltage detectors monitor a system power supply and assert an output signal (low for AAT3562 and AAT3564; high for AAT3560) when the supply voltage drops below a factory-programmed threshold voltage. The output signal will remain valid until the input voltage falls below the minimum operating voltage of 1V. Below this value, the output voltage is undefined. When the input voltage rises above the factory-programmed threshold, the output signal will resume its inactive state. An active noise-suppression circuit in the AAT3560/2/4 gives the output excellent immunity from power supply transients. See graph titled "Maximum Transient Duration vs. Reset Threshold Overdrive" for further information.

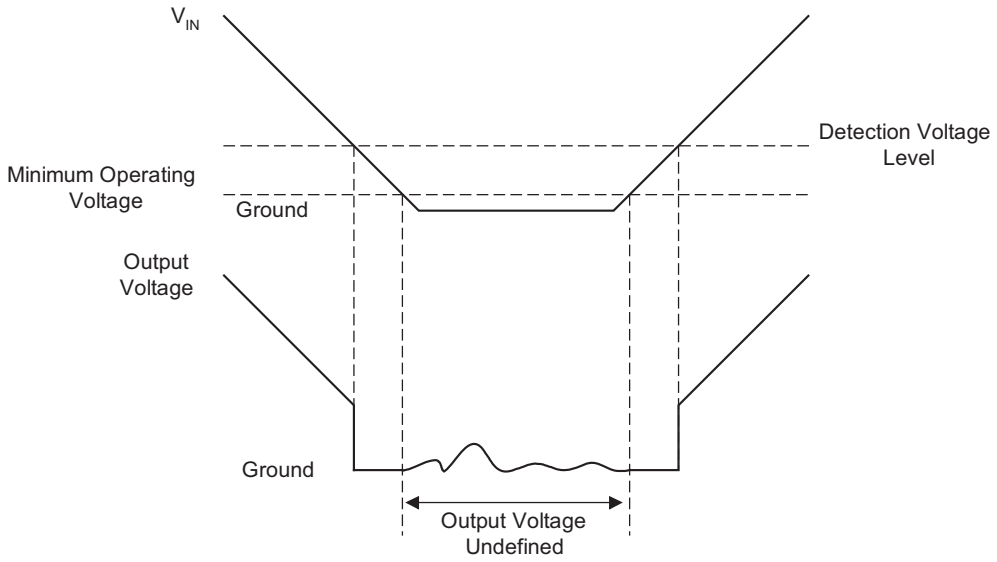


Figure 1: AAT3562 Timing Diagram.

Factory-Trimmed Reset Thresholds[1] and Ordering Information

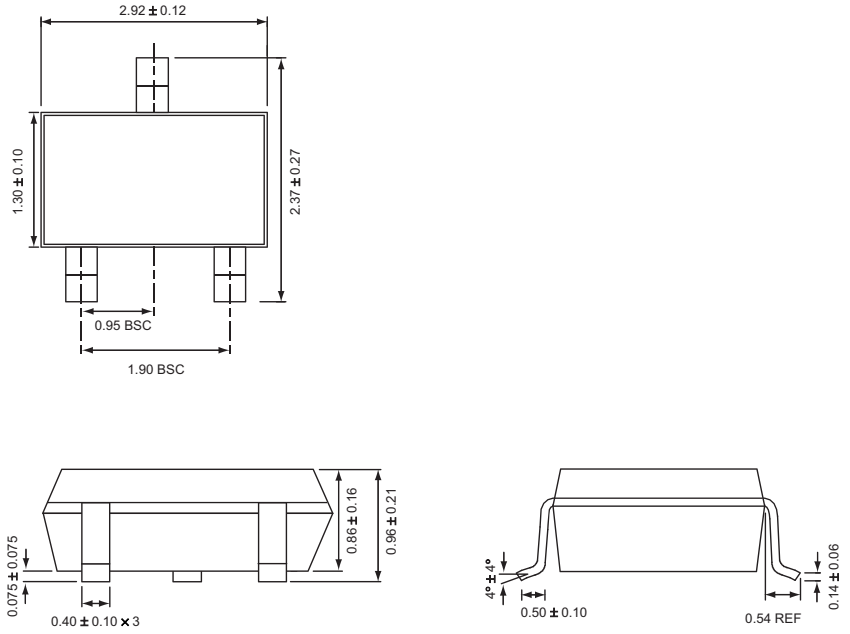
Ordering Part Number[2]	Package Marking Code[3]	Reset Threshold Voltage, V_{TH} (V)				
		T_A = 25°C			T_A = -40°C to +85°C	
		MIN	TYP	MAX	MIN	MAX
AAT3560IGY-2.20-T1	EBXYY	2.167	2.200	2.233	2.145	2.255
AAT3562IGY-2.20-T1	FWXYY					
AAT3562IGY-2.30-T1	FXXYY	2.266	2.300	2.335	2.243	2.358
AAT3560IGY-2.50-T1	ECXYY	2.463	2.500	2.538	2.438	2.563
AAT3562IGY-2.50-T1	IPXYY					
AAT3562IGY-2.70-T1	FOXYY	2.660	2.700	2.741	2.633	2.768
AAT3562IGY-3.10-T1	KOXYY	3.054	3.100	3.147	3.023	3.178

Pb-free

All AnalogicTech products are offered in Pb-free packaging. The term "Pb-free" means semiconductor products that are in compliance with current RoHS standards, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. For more information, please visit our website at http://www.analogictech.com/about/quality.aspx.

Package Information

SOT23-3



All dimensions in millimeters.

1 Contact local sales office for custom trim options.
2. Sample stock is generally held on part numbers listed in **BOLD**.
3. XYY = assembly and date code.

Advanced Analogic Technologies, Inc.
3230 Scott Boulevard, Santa Clara, CA 95054
Phone (408) 737-4600
Fax (408) 737-4611

© Advanced Analogic Technologies, Inc.
AnalogicTech cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an AnalogicTech product. No circuit patent licenses, copyrights, mask work rights, or other intellectual property rights are implied. AnalogicTech reserves the right to make changes to their products or specifications or to discontinue any product or service without notice. Except as provided in AnalogicTech's terms and conditions of sale, AnalogicTech assumes no liability whatsoever, and AnalogicTech disclaims any express or implied warranty relating to the sale and/or use of AnalogicTech products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. Testing and other quality control techniques are utilized to the extent AnalogicTech deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed. AnalogicTech and the AnalogicTech logo are trademarks of Advanced Analogic Technologies Incorporated. All other brand and product names appearing in this document are registered trademarks or trademarks of their respective holders.