AAT3510/5/7/8

PowerManager™

Micropower µP Reset with Watchdog Timer

General Description

The AAT351x PowerManager products are members of AnalogicTech's Total Power Management IC™ (TPMIC™) product family. This family of microprocessor reset circuits provides the ultimate in versatility, allowing system designers full customization of the µP monitor and reset function without any additional components. The AAT351x family offers several combinations of threshold voltage, watchdog timeout period, reset active period, and output drive configurations, which are all factory-programmed options. All devices are available in 32 reset threshold voltages from 2.6V up to 5V, with three watchdog timeout periods from 6.3ms to 1600ms and three reset timeouts from 1ms up to 140ms. Available output configurations are active low push-pull, active low open drain, active low bi-directional, and active high push-pull.

The AAT351x family is designed to ignore fast negative transients on V_{DD} and to ensure that reset outputs remain valid down to 1V.

The AAT351x family is available in the Pb-free, space-saving 5-pin SOT23 surface mount package and is specified over the -40 to +85°C temperature range.

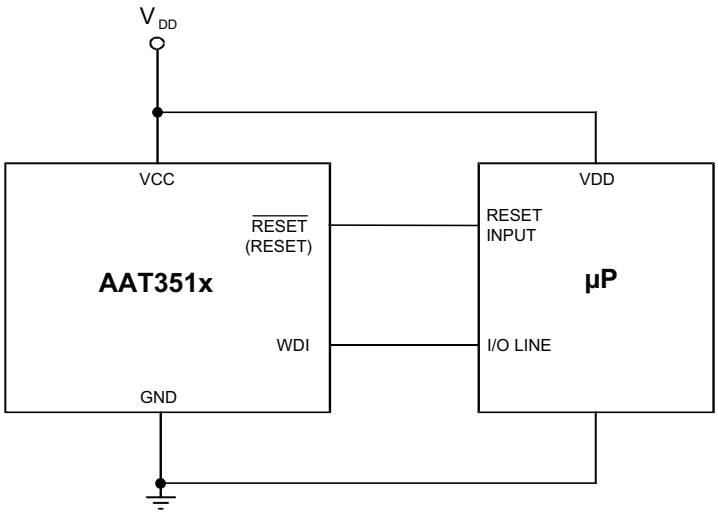
Features

- Tight Voltage Tolerance: ±1.5%
- Low Quiescent Current: 5µA
- Guaranteed Reset Valid Down to 1V
- 32 Voltage Options from 2.6V to 5.0V
- Three Reset Active Period Options:
  - 1ms, 20ms, 140ms
- Three Watchdog Timeout Period Options:
  - 6.3ms, 102ms, 1600ms
- Four Output Options:
  - Open Drain
  - Inverting
  - Non-Inverting
  - Bi-Directional
- Low Temperature Coefficient: 100ppm/°C
- 5-Pin SOT23 Package

Applications

- Critical µP and µC Supply Monitoring
- Embedded Control Systems
- Industrial Controllers
- Intelligent Instruments
- Notebook Computers
- Portable Electronics
- Power-On Reset Circuits

Typical Application

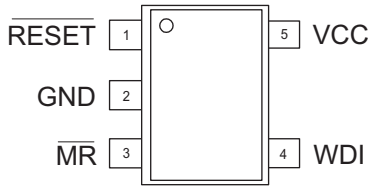


Pin Descriptions

Pin Number			Symbol	Function
AAT3510 AAT3517	AAT3515	AAT3518		
1	1	1	$\overline{\text{RESET}}$	AAT3510/15: $\overline{\text{RESET}}$ output goes low whenever V_{DD} falls below the reset threshold. CMOS push-pull output.
				AAT3517: $\overline{\text{RESET}}$ output goes low whenever V_{DD} falls below the reset threshold. Open drain output. Connect a pull-up resistor to any supply voltage up to 5.5V.
				AAT3518: $\overline{\text{RESET}}$ output goes low whenever VDD falls below the reset threshold. Open drain output. Connect a pull-up resistor to any supply voltage up to 5.5V.
2	2	2	GND	Ground connection pin.
N/A	3	3	RESET	RESET active-high output. This CMOS push-pull signal is the logical inverse of $\overline{\text{RESET}}$.
3	4	N/A	$\overline{\text{MR}}$	Manual reset input pin. Active low. Pull low to force a reset.
4	N/A	4	WDI	Watchdog input pin. Triggers a reset if it remains in a steady state for the duration of the watchdog timer period.
5	5	5	VCC	Input voltage pin.

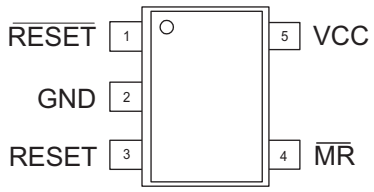
Pin Configuration

5-lead SOT23
(Top View)



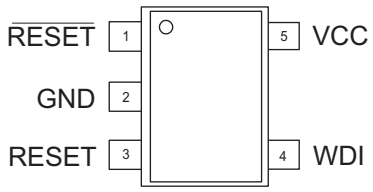
AAT3510
AAT3517

5-lead SOT23
(Top View)



AAT3515

5-lead SOT23
(Top View)



AAT3518

Absolute Maximum Ratings[1]

T_A = 25°C, unless otherwise noted.

Symbol	Description	Max	Units
V_{CC}	V_{CC} to GND	-0.3 to 6	V
V_{MR}, V_{WDI}	$\overline{MR}$, WDI to GND	-0.3 to V_{CC} + 0.3	
V_{RESET}	$\overline{RESET}$ to GND (Push-Pull or Bidirectional Output)		
	RESET to GND (Open Drain Output)	-0.3 to 6	
I_{VCC}, I_{MR}, I_{WDI}	Maximum Continuous Input Current	20	mA
I_{RESET}	RESET/$\overline{RESET}$ Output Current		
dV_{CC}/dt	Rate of Rise of V_{CC}	100	V/µs
T_J	Operating Junction Temperature Range (-40°C to +150°C)	150	°C

Thermal Information[2]

Symbol	Description	Value	Units
Θ_{JA}	Maximum Thermal Resistance	190	°C/W
P_D	Maximum Power Dissipation	526	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.
2. Mounted on an FR4 board.

Electrical Characteristics

V_{CC} = 2.5V to 5.5V, T_A = -40°C to +85°C[1], unless otherwise noted. Typical values are at T_A = 25°C.

Symbol	Description	Conditions		Min	Typ	Max	Units
V_{CC}	Operating Voltage Range	T_A = -40°C to +85°C		1		5.5	V
I_{CC}	Supply Current	AAT3510/7/8: $\overline{MR}$ & WDI Unconnected	V_{CC} = 3.6V		5	15	µA
			V_{CC} = 5.5V		6	18	
		AAT3515: $\overline{MR}$ Unconnected	V_{CC} = 3.6V			15	
			V_{CC} = 5.5V			18	
V_{TH}	Reset Threshold Voltage	T_A = 25°C		V_{THNOM} - 1.5%	V_{TH}	V_{THNOM} + 1.5%	V
		T_A = -40 to +85°C		V_{THNOM} - 2.5%		V_{THNOM} + 2.5%	
T_C	Reference Voltage Temperature Coefficient	-40°C < T_A < +85°C			±40		ppm/°C
t_{RP}	Reset Active Timeout Period	AAT351xIGV-xx-B-x-T1		20	28	40	ms
		AAT351xIGV-xx-C-x-T1		140	200	280	
T_{RD}	V_{CC} to RESET Delay	V_{CC} Falling at 1mV/µs			40		µs
Push/Pull RESET Output (AAT3510, 3515, 3518)							
V_{OL}	$\overline{RESET}$ Low Output Voltage	V_{CC} ≥ 1.0V, I_{SINK} = 50µA				0.3	V
		V_{CC} ≥ 1.2V, I_{SINK} = 100µA					
		V_{CC} ≥ 2.7V, I_{SINK} = 1.2mA					
		V_{CC} ≥ 4.5V, I_{SINK} = 3.2mA				0.4	
V_{OH}	$\overline{RESET}$ High Output Voltage	V_{CC} ≥ 2.7V, I_{SOURCE} = 500µA		0.8 x V_{CC}			
		V_{CC} ≥ 4.5V, I_{SOURCE} = 800µA		V_{CC} - 1.5			
V_{OH}	RESET Low Output Voltage	V_{CC} ≥ 2.7V, I_{SINK} = 1.2mA				0.3	
		V_{CC} ≥ 4.5V, I_{SINK} = 3.2mA				0.4	
	RESET High Output Voltage	V_{CC} ≥ 1.8V, I_{SOURCE} = 150µA		0.8 x V_{CC}			
		V_{CC} ≥ 2.7V, I_{SOURCE} = 500µA					
		V_{CC} ≥ 4.5V, I_{SOURCE} = 800µA		V_{CC} - 1.5			

1. Over-temperature limits are guaranteed by design, not production tested.

Electrical Characteristics

V_{CC} = 2.5V to 5.5V, T_A = -40°C to +85°C[1], unless otherwise noted. Typical values are at T_A = 25°C.

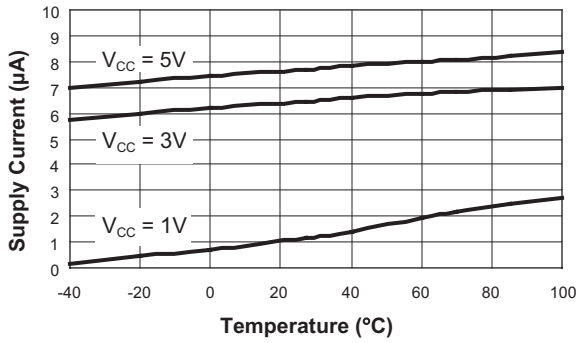
Symbol	Description	Conditions	Min	Typ	Max	Units
Open-Drain $\overline{\text{RESET}}$ Output (AAT3517, 3518)						
V_{OL}	$\overline{\text{RESET}}$ Low Output Voltage	V_{CC} ≥ 1.0V, I_{SINK} = 50µA			0.3	V
		V_{CC} ≥ 1.2V, I_{SINK} = 100µA				
		V_{CC} ≥ 2.7V, I_{SINK} = 1.2mA				
		V_{CC} ≥ 4.5V, I_{SINK} = 3.2mA			0.4	
$I_{D(OFF)}$	Reset Leakage Current				1.0	µA
Watchdog Input (AAT3510, 3517, 3518)						
t_{WD}	Watchdog Timeout Period	AAT351xIGV-xx-x-B-T1	71	102	153	ms
		AAT351xIGV-xx-x-C-T1[2]	1.12	1.6	2.4	s
t_{WDI}	WDI Minimum Pulse Width	V_{IL} = 0.3 x V_{CC}, V_{IH} = 0.7 x V_{CC}		50		ns
V_{IL}	WDI Input Threshold[3]		0.3 x V_{CC}			
V_{IH}					0.8 x V_{CC}	V
I_{WDI}	WDI Input Current[4]	WDI = V_{CC}, Time Average		120	160	µA
		V_{WDI} = 0, Time Average	-20	-15		
Manual RESET Input (3515)						
V_{IL}	$\overline{\text{MR}}$ Input Threshold		0.3 x V_{CC}			
V_{IH}	$\overline{\text{MR}}$ Input Threshold				0.7 x V_{CC}	V
	$\overline{\text{MR}}$ Input Pulse Width		1			µs
	$\overline{\text{MR}}$ Glitch Rejection			100		ns
	$\overline{\text{MR}}$ Internal Pull-Up Resistance	T_A = 25°C	35	52	75	kΩ
	$\overline{\text{MR}}$ to Reset Delay	V_{CC} = 5V		230		ns

1. Over-temperature limits are guaranteed by design, not production tested.
2. Watchdog timeout period C is not available on AAT3518.
3. WDI is internally serviced within the watchdog period if WDI is left unconnected.
4. The WDI input current is specified as the average input current when the WDI input is driven high or low. The WDI input is designed for a three-stated-output device with a 10µA maximum leakage current and capable of driving a maximum capacitive load of 200pF. The three-state device must be able to source and sink at least 200µA when active.

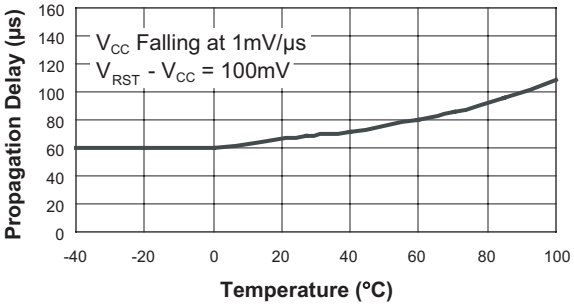
Typical Characteristics

Unless otherwise noted, V_{IN} = 3V, T_A = 25°C.

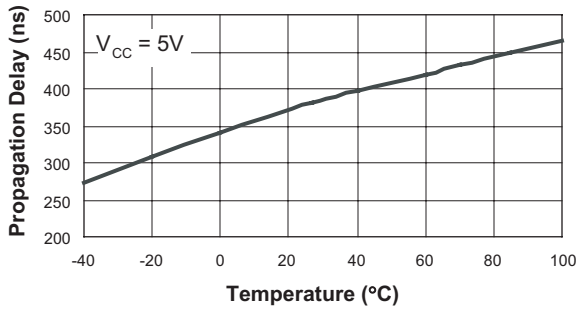
Supply Current vs. Temperature



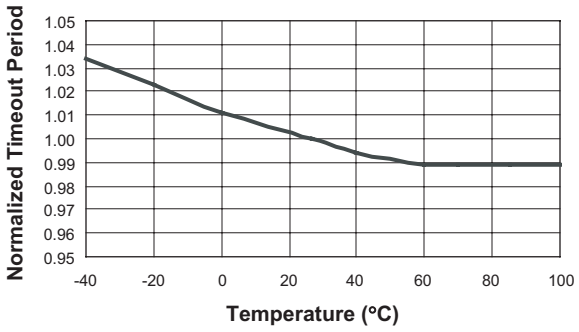
V_{CC} Falling to RESET Propagation Delay vs. Temperature



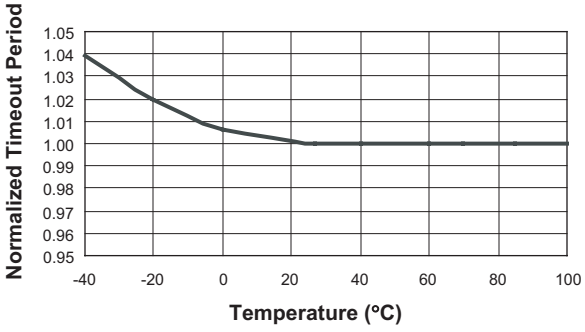
Manual Reset to RESET Propagation Delay vs. Temperature



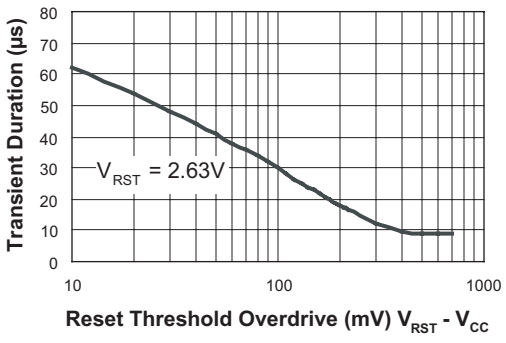
Normalized Reset Timeout Period vs. Temperature



Normalized Watchdog Timeout Period vs. Temperature



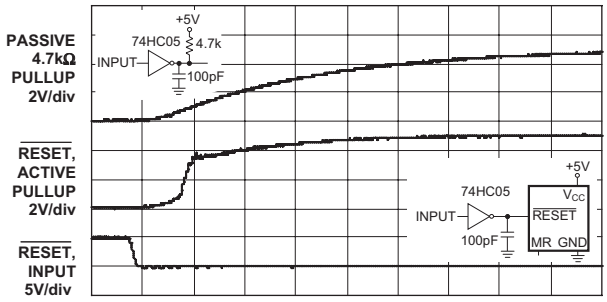
Maximum V_{CC} Transient Duration vs. Reset Threshold Overdrive



Typical Characteristics

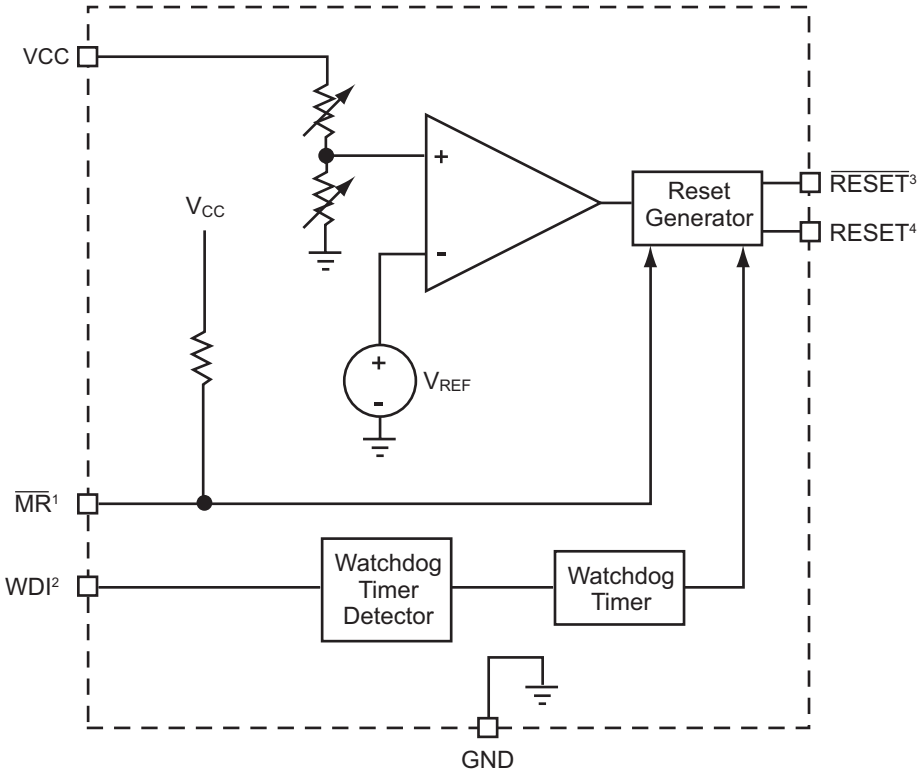
Unless otherwise noted, V_{IN} = 3V, T_A = 25°C.

Bidirectional Pullup Characteristic



Time (200ns/div)

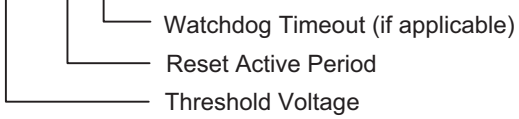
Functional Block Diagram



1. MR pin available on AAT3510/5/7.
2. WDI pin avaliable on AAT3510/7/8.
3. RESET pin available on AAT3510/5/7/8.
4. RESET pin available on AAT3515/8.

Factory-Trimmed Reset Thresholds[1] and Ordering Information

AAT351x IGV-X.XX-X-X-T1



Reset Active Period

A: $T_{R(MIN)}$ = 1ms
B: $T_{R(MIN)}$ = 20ms
C: $T_{R(MIN)}$ = 140ms

Watchdog Timeout Period

A: $T_{WD(NOM)}$ = 6.3ms
B: $T_{WD(NOM)}$ = 102ms
C: $T_{WD(NOM)}$ = 1600ms1

VDD Threshold Voltage

2.63: $V_{TH(NOM)}$ = 2.63V
2.70: $V_{TH(NOM)}$ = 2.7V
2.80: $V_{TH(NOM)}$ = 2.8V
2.93: $V_{TH(NOM)}$ = 2.93V
3.00: $V_{TH(NOM)}$ = 3.0V
3.08: $V_{TH(NOM)}$ = 3.08V
3.20: $V_{TH(NOM)}$ = 3.2V
3.30: $V_{TH(NOM)}$ = 3.3V
3.40: $V_{TH(NOM)}$ = 3.4V
3.50: $V_{TH(NOM)}$ = 3.5V
3.60: $V_{TH(NOM)}$ = 3.6V
3.70: $V_{TH(NOM)}$ = 3.7V
3.80: $V_{TH(NOM)}$ = 3.8V
3.90: $V_{TH(NOM)}$ = 3.9V
4.00: $V_{TH(NOM)}$ = 4.0V
4.10: $V_{TH(NOM)}$ = 4.1V
4.20: $V_{TH(NOM)}$ = 4.2V
4.38: $V_{TH(NOM)}$ = 4.3V
4.40: $V_{TH(NOM)}$ = 4.38V
4.50: $V_{TH(NOM)}$ = 4.5V
4.63: $V_{TH(NOM)}$ = 4.63V
4.70: $V_{TH(NOM)}$ = 4.7V
4.80: $V_{TH(NOM)}$ = 4.8V
4.90: $V_{TH(NOM)}$ = 4.9V
5.00: $V_{TH(NOM)}$ = 5.0V

1. Watchdog timeout period C is not available on AAT3518.

Ordering Information

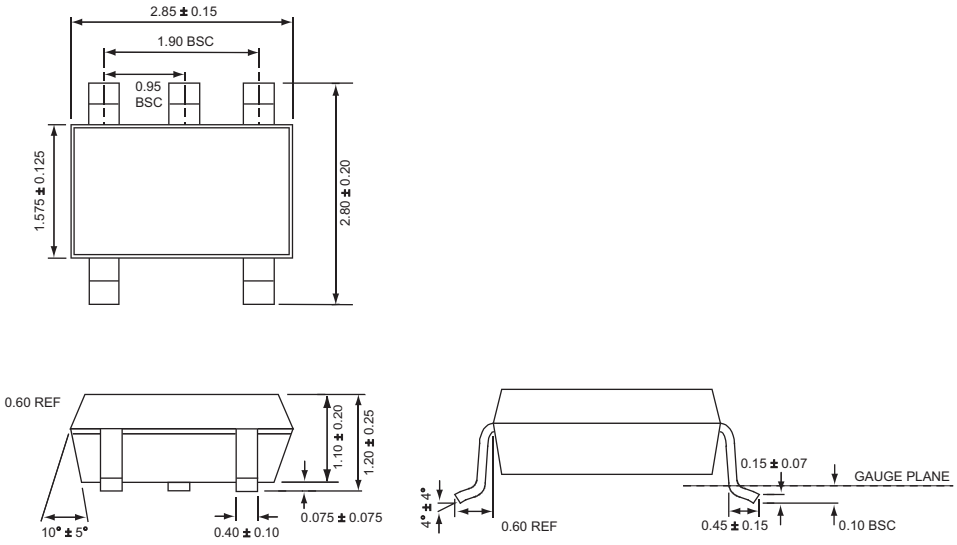
Package	Marking[1]	Part Number (Tape and Reel)[2]
SOT23-5	HVXYY	**AAT3510IGV-2.63-C-C-T1**
	HUXYY	**AAT3510IGV-2.93-C-C-T1**
	HGXYY	**AAT3510IGV-3.08-C-C-T1**
	HHXYY	**AAT3510IGV-4.38-C-C-T1**
	HEXYY	**AAT3515IGV-2.63-C-T1**
	HIXYY	**AAT3515IGV-2.93-B-T1**
	KLXYY	**AAT3515IGV-2.93-C-T1**
	JNXYY	**AAT3515IGV-3.08-C-T1**
	KMXYY	**AAT3515IGV-4.38-C-T1**
	MFXYY	**AAT3515IGV-4.63-C-T1**
	INXYY	**AAT3517IGV-2.63-C-C-T1**
	LZXYY	**AAT3517IGV-2.8-B-C-T1**
	IQXYY	**AAT3517IGV-2.93-C-C-T1**
	P9XYY	**AAT3518IGV-3.00-B-B-T1**

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/aboutus/quality.php.

Package Information

SOT23-5



All dimensions in millimeters.

1. XYY = date and assembly code.
2. Sample stock is generally held on part numbers listed in **BOLD**.

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