AS1901, AS1902, AS1903

Data Sheet

Ultra Low-Power µP Supervisory Circuit

1 General Description

The AS1901/2/3 family is an ultra low-power supervisory circuit device.

The device can be used to monitor the supply voltage of digital systems and microprocessors and initiate a reset when the voltage goes below a predefined threshold. The duration of the reset is 5/20/100/500ms (typ.) after the supply voltage has risen above the threshold.

The AS1901/2/3 exhibit excellent reliability and can reduce application costs by eliminating all external components.

The device is available with different output drivers:

- The AS1901 has a push-pull driver with an active low reset.
- The AS1902 uses the same output stage as the AS1901, but has an active high reset.
- The AS1903 has an open drain output with active low reset.

All devices operate down to a voltage of 1V.

The reset thresholds are factory-trimmable between 2.2V and 3.08V in steps of approximately 100mV.

Each device of the AS1901/2/3 family is offered with four time-out periods of 5/20/100/500ms.

The extremely low current consumption of only 230nA (typ) at 3.3V makes the device ideal for use in portable applications.

All devices are available in a 3-pin SOT23 package.

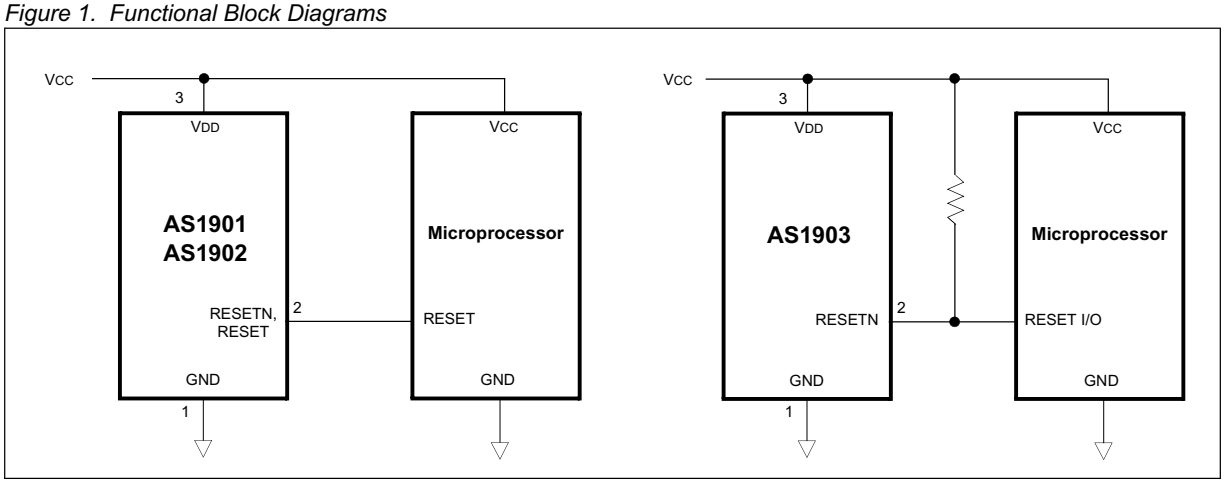
2 Key Features

- Low 230nA (typ) Supply Current
- Precision Monitoring of 2.5-, 3-, and 3.3V-Power Supplies
- Supply Voltage Range: 1.0 to 3.6V
- Reset Threshold Range: 2.2 to 3.1V
- Available in 3 Versions:
  - AS1901 Push Pull RESETN
  - AS1902 Push Pull RESET
  - AS1903 Open Drain RESETN
- 4 Time-Out Periods Ranging from 5 to 500ms
- Detection Voltage Accuracy: ±1.5%
- Temperature Range: -40 to +85°C
- Package: SOT23-3
- Pin Compatible to MAX6326/6327/6328

3 Applications

- Computers
- Intelligent Instruments
- Controllers
- Critical Microprocessor and Microcontroller Power Monitoring
- Portable/Battery-Powered Equipment
- Automotive

Figure 1. Functional Block Diagrams



4 Absolute Maximum Ratings

Stresses beyond those listed in Table 1 may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in Section 5 Electrical Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 1. Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Parameter	Limits	Unit	Notes
V_{DD} to GND	-0.3 to +5	V	
RESET/RESETN to GND	-0.3 to V_{DD} + 0.3	V	
Input Current (V_{DD})	20	mA	
Output Current (RESET, RESETN)	20	mA	
Rate of Rise (V_{DD})	100	V/µs	
Operating Temperature Range (T_A)	-40 to +85	°C	
Storage Temperature Range	-65 to +150	°C	
Package-Body Peak Temperature	+260	°C	The reflow peak soldering temperature (body temperature) specified is in accordance with *IPC/JEDEC J-STD-020C "Moisture/Reflow Sensitivity Classification for non-hermetic Solid State Surface Mount Devices"*

5 Electrical Characteristics

V_{DD} = Full Range; T_A = -40 to +85ºC; Unless Otherwise Specified

Table 2. Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
V_{DD} Range	V_{DD}	T_A = 0 to +70°C	1.0		3.6	V
		T_A = -40 to +85°C	1.2		3.6	
Supply Current (AS1901/2/3)	I_{DD}	V_{DD} = 3.3V, No Load		230	430	nA
Reset Threshold Voltage[1]	V_{TH}	T_A = +25°C	V_{TH} - 1.5%	V_{TH}	V_{TH} + 1.5%	V
		T_A = -40 to +85°C	V_{TH} - 2.5%	V_{TH}	V_{TH} + 2.5%	
V_{DD} to Reset Delay[2]	t_{RD}	V_{DD} = V_{TH} to (V_{TH} - 100mV)		20	50	µs
Reset Active Time-Out Period[3]	t_{TP}		t_{TP} - 40%	t_{TP}	t_{TP} + 60%	ms
RESETN Output Voltage (AS1901/3)	V_{OL}	I_{SINK} = 1.2mA, V_{DD} = 2.1V, Reset Asserted			0.4	V
		I_{SINK} = 400µA, V_{DD} = 1.2V, Reset Asserted			0.4	V
RESETN Output Voltage (AS1901)	V_{OH}	I_{SOURCE} = 1.2mA, V_{DD} = 3.2V	0.8 x V_{DD}			V
RESET Output Voltage (AS1902)	V_{OH}	I_{SOURCE} = 500µA, V_{DD} = 2.1V, Reset Asserted	0.8 x V_{DD}			V
		I_{SOURCE} = 100µA, V_{DD} = 1.2V, Reset Asserted	0.8 x V_{DD}			V
	V_{OL}	I_{SINK} = 1.2mA, V_{DD} = 3.2V, Reset Not Asserted			0.4	V
RESET Threshold Hysteresis	V_{HYST}			10		mV
Open-Drain RESETN Output Leakage Current (AS1903)	I_{LEAK}				0.1	µA

Notes:

[1] See Table 5, “Coding of Factory-Trimmed Reset Threshold Voltages,” on page 5.

[2] Guaranteed by design.

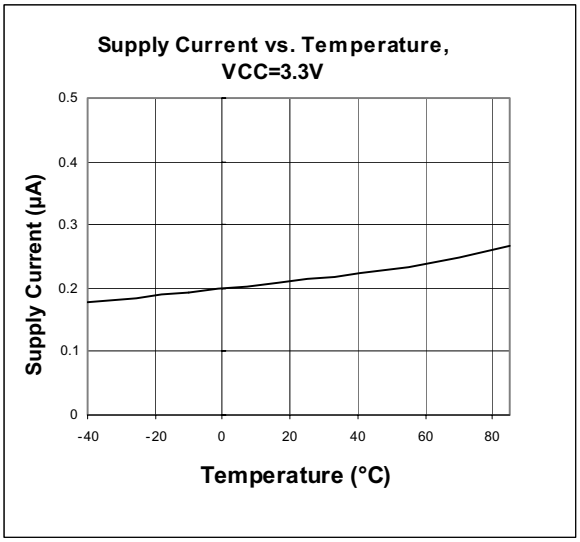
[3] See Table 3, “Coding of Factory-trimmed Reset Active Time-Out Period,” on page 5.

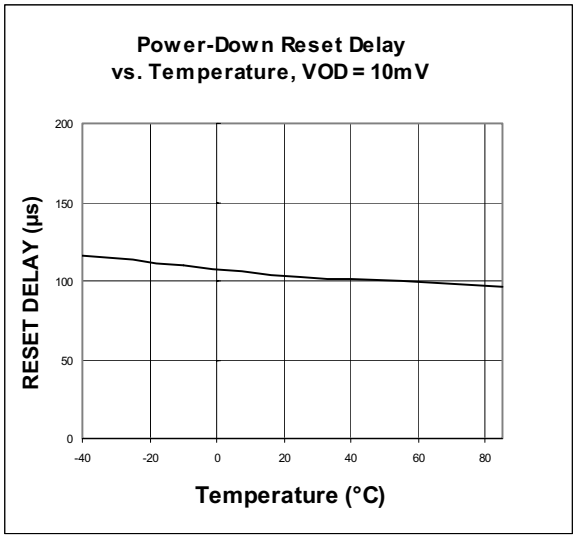
6 Operation

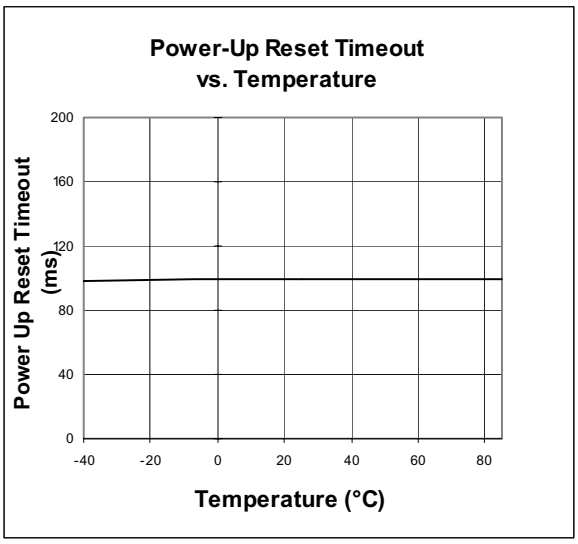
6.1 Interfacing to Microprocessors with Bi-Directional Reset Pins

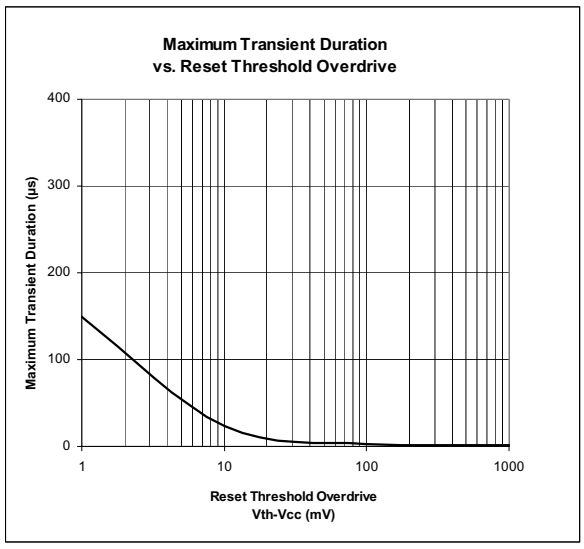
The device has an open drain RESETN output, which enables easy interfacing to microprocessors (µP) with bi-directional reset pins, such as the Motorola 68HC11. The RESETN pin of the microcontroller (µC) can be connected directly to the µP supervisor's RESETN output with a single pull-up resistor (see Figure 1 on page 1).

6.2 Operating Characteristics









6.3 Negative-Going VDD Transients

The device is optimized to ignore short-duration, negative-going VDD transients (glitches) in order to avoid incorrect resets.

In the graph Maximum Transient Duration vs. Reset Threshold Overdrive (page 4), the conditions are shown, for which the reset pulses are not generated. In the graph the maximum pulse width that a negative VDD transient may have when a reset signal is generated. As the amplitude of the transient increases, the maximum allowable pulse width decreases.

7 Options

Table 3. Coding of Factory-trimmed Reset Active Time-Out Period

Device	Suffix	t_{TP} in Milliseconds		
		Min	Typ	Max
AS190x_xx	A	3	5	8
AS190x_xx	B	12	20	32
AS190x_xx	C	60	100	160
AS190x_xx	D	300	500	800

Table 4. Output Variants

Device	Output Functionality
AS1901xxx	Active Low (RESETN)
AS1902xxx	Active High (RESET)
AS1903xxx	Open Drain (RESETN)

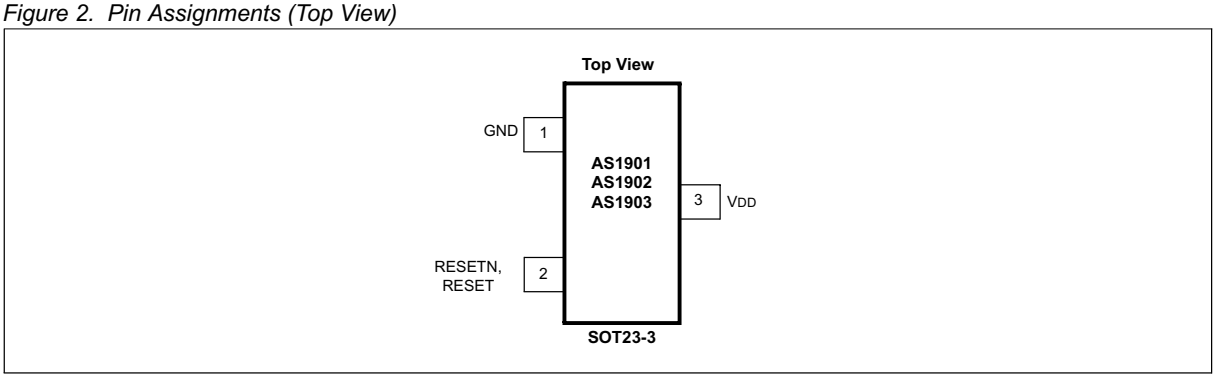
Table 5. Coding of Factory-Trimmed Reset Threshold Voltages

Device	Suffix	Reset Threshold Voltage, V_{TH} in V				
		T_A = +25°C			T_A = -40 to +85°C	
		Min	Typ	Max	Min	Max
AS190xx__	22	2.167	2.2	2.233	2.145	2.255
AS190xx__	23	2.285	2.32	2.355	2.262	2.378
AS190xx__	24	2.364	2.4	2.436	2.340	2.460
AS190xx__	25	2.463	2.5	2.538	2.438	2.563
AS190xx__	26	2.591	2.63	2.669	2.564	2.696
AS190xx__	27	2.660	2.7	2.741	2.633	2.768
AS190xx__	28	2.758	2.8	2.842	2.730	2.870
AS190xx__	29	2.886	2.93	2.974	2.857	3.003
AS190xx__	30	2.955	3.0	3.045	2.925	3.075
AS190xx__	31	3.034	3.08	3.126	3.003	3.157

8 Pinout and Packaging

8.1 Pin Assignments

Figure 2. Pin Assignments (Top View)



8.2 Pin Descriptions

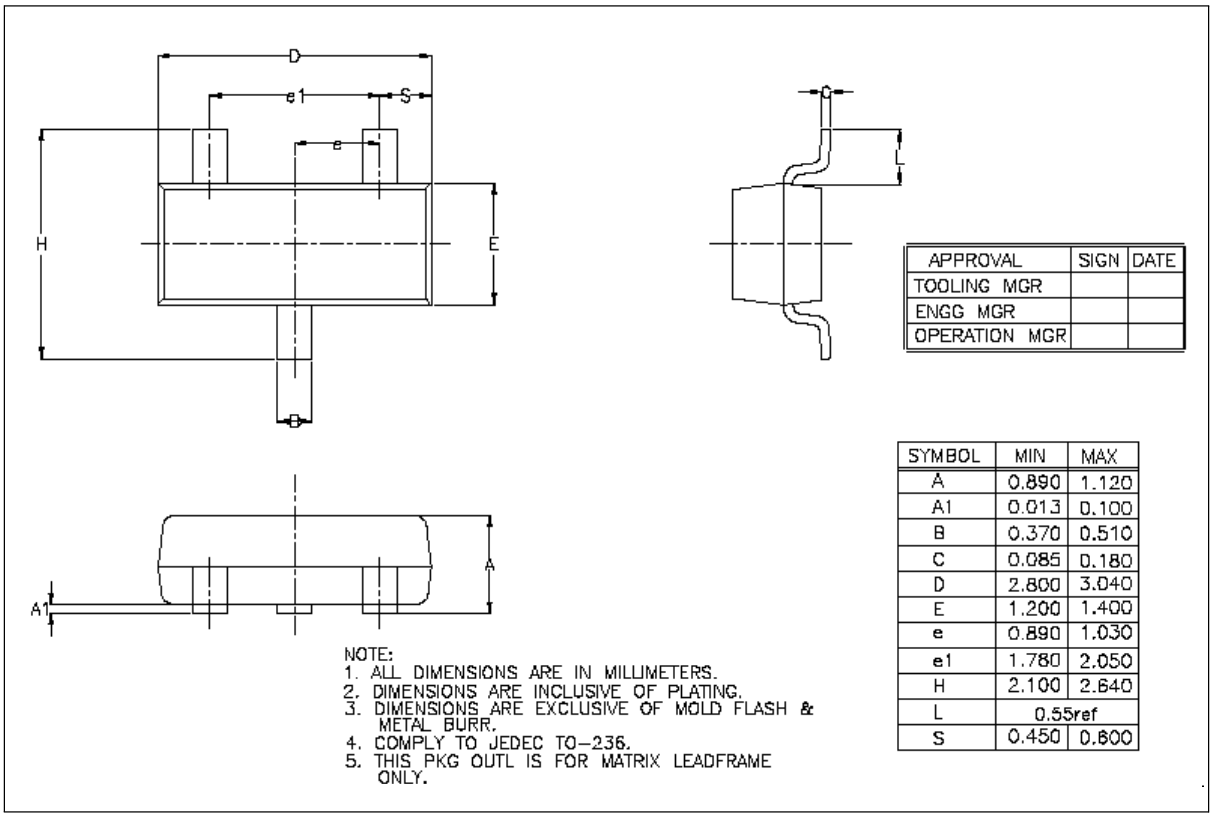
Table 6. Pin Descriptions

Pin Number		Pin Name	Description
AS1901/AS1903	AS1902		
1	1	GND	Ground
2	-	RESETN	Active-low reset output. RESETN remains low while VDD is below the reset threshold and for tTP after VDD rises above the reset threshold. RESETN is open-drain on the AS1903 and push-pull on the AS1901.
-	2	RESET	Active-high reset output. RESET remains high while VDD is below the reset threshold and for tTP after VDD rises above the reset threshold.
3	3	VDD	Supply voltage.

8.3 Package Drawings and Markings

The device is available in a 3-pin SOT-23 package.

Figure 3. 3-Pin SOT-23 Package.



SYMBOL	MIN	MAX
A	0.890	1.120
A1	0.013	0.100
B	0.370	0.510
C	0.085	0.180
D	2.800	3.040
E	1.200	1.400
e	0.890	1.030
e1	1.780	2.050
H	2.100	2.640
L	0.55ref	
S	0.450	0.600

9 Ordering Information

The device is available in the following standard versions.

Standard Part	Threshold	Duration	Marking
AS1901C23	2.32	100ms	ASBA
AS1901C26	2.63	100ms	ASBD
AS1901C31	3.08	100ms	ASBI
AS1902C23	2.32	100ms	ASBK
AS1902C26	2.63	100ms	ASBN
AS1902C31	3.08	100ms	ASBS
AS1903C23	2.32	100ms	ASBU
AS1903C26	2.63	100ms	ASBX
AS1903C31	3.08	100ms	ASB3

Non-standard versions require a minimum order of 30,000 units. Contact austriamicrosystems for availability of non-standard versions.

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