THE DATASHEET OF

AS1904C23-T

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Contact information:

Headquarters:
ams AG
Tobelbaderstrasse 30
8141 Unterpremstaetten, Austria
Tel: +43 (0) 3136 500 0
e-Mail: ams_sales@ams.com

Please visit our website at **www.ams.com**

AS1904, AS1905, AS1906

Ultra Low-Power µP Supervisory Circuit

DataSheet

World's Lowest Power Consumption!

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1 General Description

The AS1904/5/6 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 device exhibits excellent reliability and can reduce application costs by eliminating all external components.

The device is available with different output drivers:

- The AS1904 has a push-pull driver with an active low reset.
- The AS1905 uses the same output stage as the AS1904, but has an active high reset.
- The AS1906 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 AS1904/5/6 family is offered with four time-out periods of 5/20/100/500ms.

The extremely low current consumption of only 150nA (typ) at 3.3V makes the device ideal for use in portable applications.

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

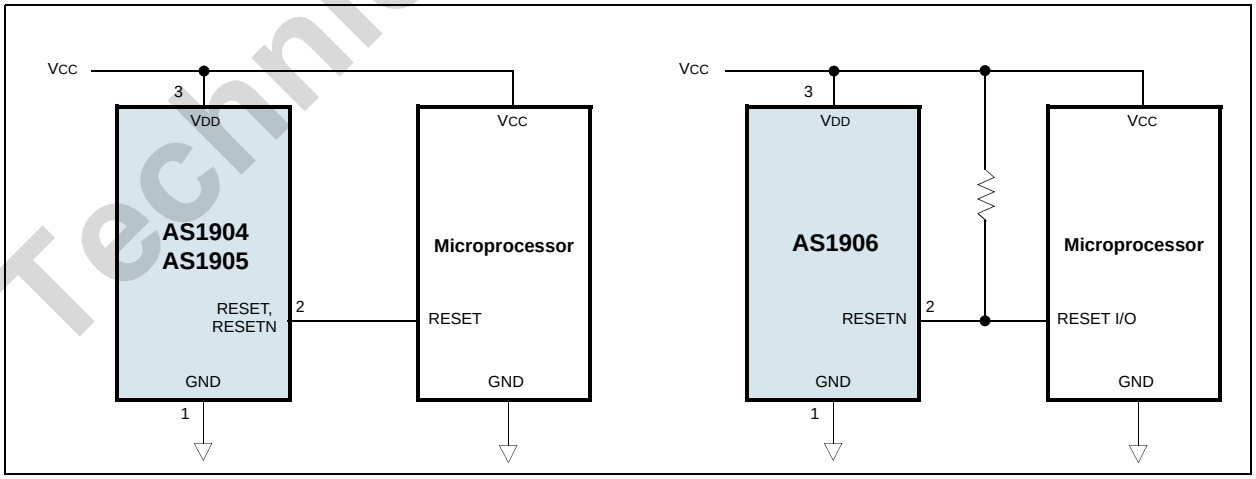
2 Key Features

- Low 150nA (typical) Supply Current
- Precision Monitoring of 2.5-, 3-, and 3.3V-Power Supplies
- Supply Voltage Range 1.0 to 3.6V
- Reset Threshold Available from 2.2 to 3.1V
- Available in three Versions
  - AS1904 Push-Pull RESETN
  - AS1905 Push-Pull RESET
  - AS1906 Open Drain RESETN
- 4 Time-Out Periods Ranging from 5 to 500ms
- Detection Voltage Accuracy: ±1.5%
- Temperature Range: -40 to +85°C
- SOT23-3 Package
- Superior Upgrade to austriamicrosystems AS1901/2/3 Device Family

3 Applications

The devices are ideal for computers, intelligent instruments, controllers, critical microprocessor and microcontroller, power monitoring and portable/battery-powered equipment.

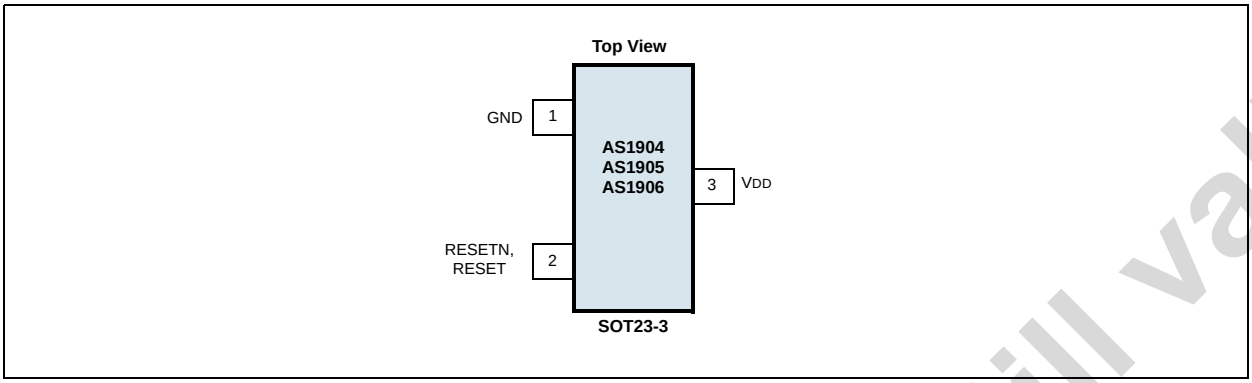
Figure 1. Functional Block Diagrams



4 Pinout

Pin Assignments

Figure 2. Pin Assignments (Top View)



Pin Descriptions

Table 1. Pin Descriptions

Pin Number		Pin Name	Description
AS1904/AS1906	AS1905		
1	1	GND	Ground
2	-	RESETN	Active-low reset output. RESETN remains low while V_{DD} is below the reset threshold and for t_{TP} after V_{DD} rises above the reset threshold. RESETN is open-drain on the AS1906 and push-pull on the AS1904.
-	2	RESET	Active-high reset output. RESET remains high while V_{DD} is below the reset threshold and for t_{TP} after V_{DD} rises above the reset threshold.
3	3	V_{DD}	Supply voltage.

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5 Absolute Maximum Ratings

Stresses beyond those listed in Table 2 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 the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 2. Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Parameter	Limits	Units	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"*

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6 Electrical Characteristics

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

Table 3. 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	V
Supply Current	I_{DD}	V_{DD} = 3.3V, No Load		150	290	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
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 (AS1904/AS1906)	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 (AS1904)	V_{OH}	I_{SOURCE} = 1.2mA, V_{DD} = 3.2V	0.8 x V_{DD}			V
RESET Output Voltage (AS1905)	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 (AS1906)	I_{LEAK}				0.1	µA

Notes:

[1] See Table 6, “Coding of Factory-Trimmed Reset Threshold Voltages,” on page 6.

[2] Guaranteed by design.

[3] See Table 4, “Coding of Factory-trimmed Reset Active Time-Out Period,” on page 6.

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7 Typical Operating Characteristics

Figure 3. Supply Current vs. Temperature

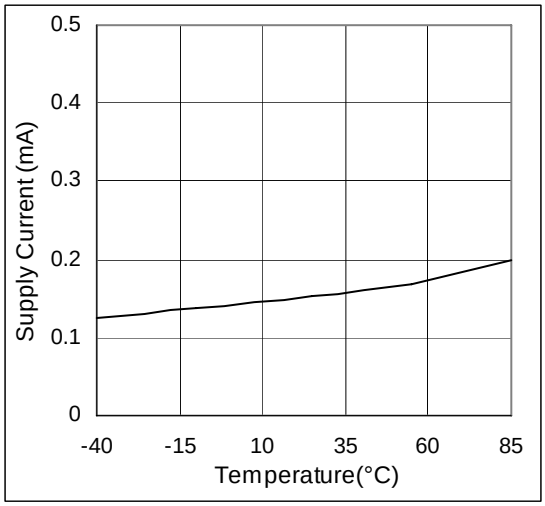


Figure 4. Power Down Reset Delay vs. Temp.

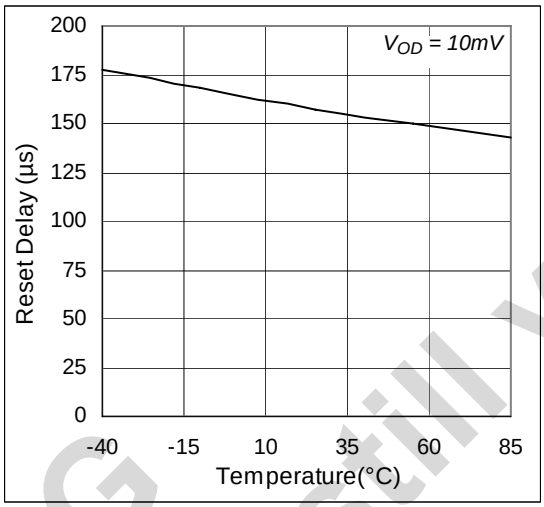


Figure 5. Power-Up Reset Timeout vs. Temperature

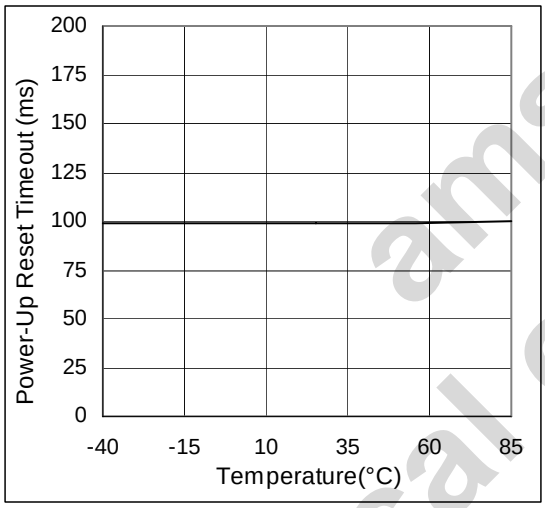
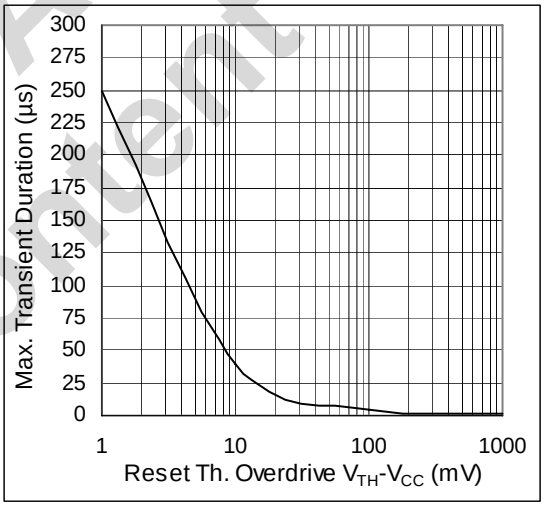


Figure 6. Max. Trans. Duration vs. Reset Th.



Overdrive

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8 Detailed Description

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).

Negative-Going VDD Transients

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

In the graph Maximum Transient Duration vs. Reset Threshold Overdrive (page 6) , the conditions are shown, for which the reset pulses are not generated. In the graph the maximum pulse width that a negative V_{DD} transient may have when a reset signal is generated. As the amplitude of the transient increases, the maximum allowable pulse width decreases.

Options

Table 4. 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 5. Output Variants

Device	Output Functionality
AS1904xxx	Active Low (RESETN)
AS1905xxx	Active High (RESET)
AS1906xxx	Open Drain (RESETN)

Table 6. 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

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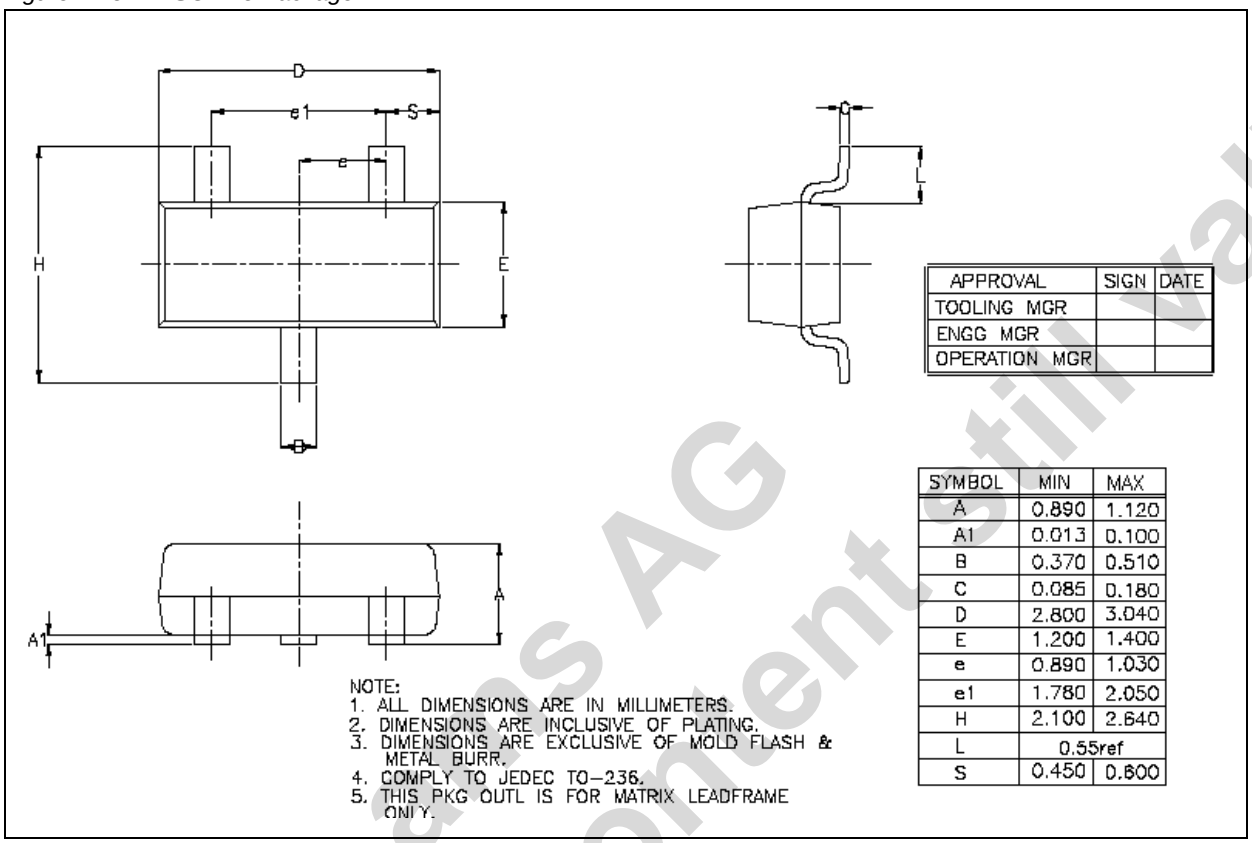
9 Package Drawings and Markings

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

Figure 7. 3-Pin SOT-23 Package.



APPROVAL	SIGN	DATE
TOOLING MGR		
ENGG MGR		
OPERATION MGR		

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

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10 Ordering Information

The device is available in the following standard versions.

Standard Part	Threshold (V)	Duration (mS)	Marking
AS1904C23	2.32	100	ASGI
AS1904C26	2.63	100	ASDB
AS1904C31	3.08	100	ASDG
AS1905C23	2.32	100	ASDI
AS1905C26	2.63	100	ASDL
AS1905C31	3.08	100	ASDQ
AS1906C23	2.32	100	ASDS
AS1906C26	2.63	100	ASDV
AS1906C28	2.8	100	ASDX
AS1906C31	3.08	100	ASGK

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

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Contact Information

Headquarters
austriamicrosystems AG
A-8141 Schloss Premstaetten, Austria

Tel: +43 (0) 3136 500 0
Fax: +43 (0) 3136 525 01

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