3-Pin Microprocessor Reset Circuits

❖ GENERAL DESCRIPTION

TheAX6901/2/3/4 are used for microprocessor (µP) supervisory circuits to monitor the power supplies in µP and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V powered circuits.

These circuits perform a single function: they assert a reset signal whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for at least 200ms after VCC has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available. TheAX6901/2/3/4 have push pull outputs. TheAX6901/3 have an active low RESET output, while theAX6902/4 has an active high RESET output. The reset comparator is designed to ignore fast transients on VCC, and the outputs are guaranteed to be in the correct logic state for VCC down to 1V. Low supply current makes theAX6901/2/3/4 ideal for use in portable equipment. TheAX6901/2/3/4 is available in a 3-pin SOT23 package.

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❖ FEATURES

- Precision Monitoring of +2.5,+3V, +3.3V, and +5V Power-Supply Voltages
- Fully Specified Over Temperature
- Available in Three Output Configurations
- Push-Pull RESET Low Output(AX6901/3)
- Push-Pull RESET High Output(AX6902/4
- 200ms (Typ.)min Power-On Reset Pulse Width
- 25µA Supply Current
- Guaranteed Reset Valid to VCC = +1V
- Power Supply Transient Immunity
- No External Components
- Available in the 3-Pin Pb-Free SOT23 Package

❖ **Block Diagram**
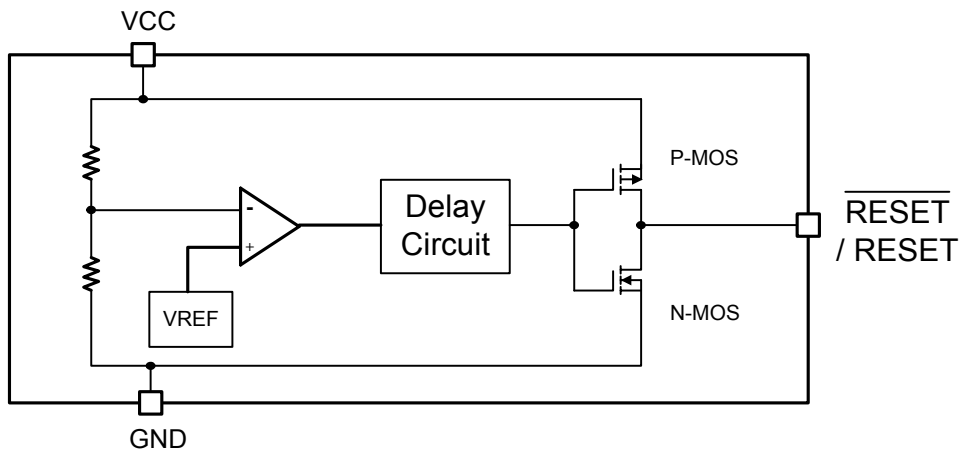
❖ **PIN ASSIGNMENT**

The packages of AX6901/2/3/4 is SOT23; the pin assignment is given by:
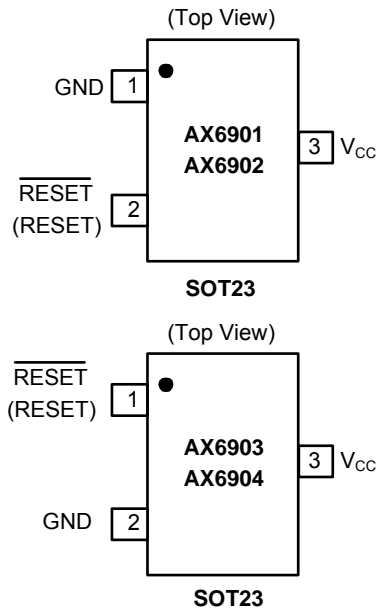
Name	Description
GND	Ground
$\overline{\text{RESET}}$ (RESET)	Reset output pin L: forAX6901/3 H: forAX6902/4
V_{CC}	Operating voltage input

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❖ ORDER/MARKING INFORMATION

Order Information	Top Marking

Order Information

AX690X X X X ─── Packing
A : Taping

Enable | Voltage | Package

1: Active-Low
2: Active-High
3: Active-Low
4: Active-High

A: 4.63   B:SOT23
B: 4.38
C: 4.00
D: 3.08
E: 2.93
F: 2.63
G: 2.25

Top Marking

XXYW
→ WW : 01~26(A~Z)
  27~52(a~z)
→ Year : 7 = 2007
  A = 2010
→ Part number code

Appendix

Part Number	Identification Code	Part Number	Identification Code
AX6901A	CA	AX6903A	CO
AX6901B	CB	AX6903B	CP
AX6901C	CC	AX6903C	CQ
AX6901D	CD	AX6903D	CR
AX6901E	CE	AX6903E	CS
AX6901F	CF	AX6903F	CT
AX6901G	CG	AX6903G	CU
AX6902A	CH	AX6904A	C1
AX6902B	CI	AX6904B	C2
AX6902C	CJ	AX6904C	C3
AX6902D	CK	AX6904D	C4
AX6902E	CL	AX6904E	C5
AX6902F	CM	AX6904F	C6
AX6902G	CN	AX6904G	C7

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❖ Absolute Maximum Ratings (at T_A=25   )

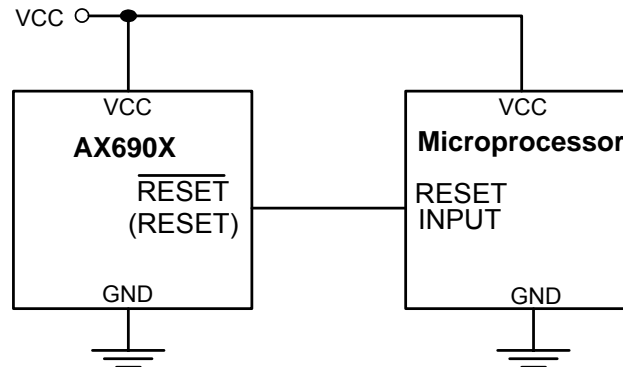| Characteristics	Symbol	Rating	Unit
VCC Pin Voltage	V_{CC}	GND - 0.3 to GND + 6.5	V
RESET, $\overline{RESET}$ (push-pull) Pin Voltage	V_{RESET}	GND - 0.3 to V_{CC} + 0.3	V
Input Current, V_{CC}	I_{CC}	20	mA
Output Current, RESET, $\overline{RESET}$	I_O	5	mA
Operating Supply Voltage	V_{OP}	+1.0 to +6.0	V
Power Dissipation	PD	(T_J-T_A) / θ_{JA}	mW
Storage Temperature Range	T_{ST}	-40 to +150	
Operating Temperature Range	T_{OP}	-20 to +85	
Junction Temperature	T_J	-20 to +125	
Thermal Resistance from Junction to case	θ_{JC}	110	/W
Thermal Resistance from Junction to ambient	θ_{JA}	250	/W

Note1 : $_{JA}$ is measured with the PCB copper area of approximately 1 in^2(Multi-layer). that need connect to V_{SS} pin.

❖ Electrical Characteristics T_A=25   (unless otherwise noted)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	I_{CC}	V_{CC} = V_{TH}+1.0V	-	35	50	µA
Reset Threshold T_A=25ºC	V_{TH}	AP1701/2/3/4A	4.54	4.63	4.71	V
		AP1701/2/3/4B	4.29	4.38	4.46	
		AP1701/2/3/4C	3.92	4.00	4.08	
		AP1701/2/3/4D	3.02	3.08	3.15	
		AP1701/2/3/4E	2.87	2.93	3.00	
		AP1701/2/3/4F	2.57	2.63	2.69	
		AP1701/2/3/4G	2.20	2.25	2.30	
Reset Threshold Tempco	V_{THT}	Guaranteed by Design	-	50		ppm/ºC
Set-up Time	T_S	V_{CC} = 0 to (V_{TH} – 100mV)	1	-	-	µs
Reset Active Timeout Period	T_{DELAY}	T_A = 0ºC to +70ºC	140	200	260	ms
$\overline{RESET}$ Output Voltage Low	V_{OL}	V_{CC} = V_{TH} min, I_{SINK} = 1.2mA,AX6901/3	-	-	0.3	V
		V_{CC} = V_{TH} min, I_{SINK} = 3.2mA	-	-	0.4	
		V_{CC} > 1.0V, I_{SINK} = 50uA	-	-	0.3	
$\overline{RESET}$ Output Voltage High	V_{OH}	V_{CC} > V_{TH} max, I_{SOURCE} = 500uA,AX6901/3	0.8V_{CC}	-	-	V
		V_{CC} > V_{TH} max, I_{SOURCE} = 800uA	V_{CC} –1.5		-	
RESET Output Voltage Low	V_{OL}	V_{CC} = V_{TH} max, I_{SINK} = 1.2mA,AX6902/4	-	-	0.3	V
		V_{CC} = V_{TH} max, I_{SINK} = 3.2mA	-	-	0.4	
RESET Output Voltage High	V_{OH}	1.8V < V_{CC} < V_{TH} min, I_{SOURCE} = 150uA,AX6902/4	0.8 V_{CC}	-	-	V
Hysteresis at V_{CC}	V_{Hys}	Input voltage	-	40	-	mV
Output Short-Circuit $\overline{RESET}$	I_{OS}		-	-	-500	µA

❖ Application Circuit

VCC ○———————————————

VCC		VCC
AX690X		**Microprocessor**
$\overline{\text{RESET}}$ (RESET)		RESET INPUT
GND		GND

❖ Function Descriptions

A microprocessor's (µP's) reset input starts the µP in a known state. TheAX6901/2/3/4 assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the VCC supply voltage declines below a preset threshold, keeping it asserted for at least 200ms after VCC has risen above the reset threshold. TheAX6901/2/3/4 have a push-pull output stage.

❖ Application Information

Negative-Going VCC Transients

In addition to issuing a reset to the µP during power-up, power-down, and brownout conditions, the AX6901/2/3/4 are relatively immune to short-duration negative-going VCC transients (glitches).

The AX6901/2/3/4 do not generate a reset pulse. The graph was generated using a negative going pulse applied to VCC, starting 0.5V above the actual reset threshold and ending below it by the magnitude indicated (reset comparator overdrive). The graph indicates the maximum pulse width a negative going VCC transient can have without causing a reset pulse. As the magnitude of the transient increases (goes farther below the reset threshold), the maximum allowable pulse width decreases. Typically, a VCC transient that goes 50mV below the reset threshold A 0.1µF bypass capacitor mounted as close as possible to the VCC pin provides additional transient immunity.

Ensuring a Valid Reset Output Down to VCC = 0

$\overline{\text{RESET}}$ is guaranteed to be a logic low for VCC > 1V. Once VCC exceeds the reset threshold, an internal timer keeps $\overline{\text{RESET}}$ low for the reset timeout period; after this interval, $\overline{\text{RESET}}$ goes high. If a brownout condition occurs (VCC dips below the reset threshold), $\overline{\text{RESET}}$ goes low. Any time VCC goes below the reset threshold, the internal

timer resets to zero, and $\overline{\text{RESET}}$ goes low. The internal timer starts after VCC returns above the reset threshold, and $\overline{\text{RESET}}$ remains low for the reset timeout period.

When VCC falls below 1V, theAX6901/3 RESET output no longer sinks current—it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to $\overline{\text{RESET}}$ can drift to undetermined voltages.
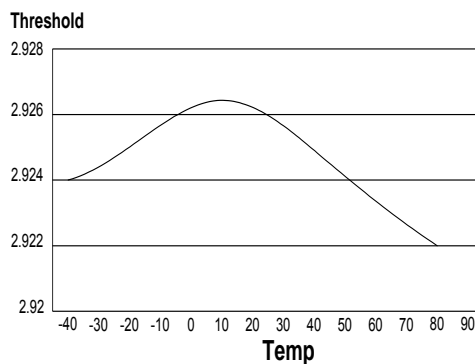
This presents no problem in most applications since most µP and other circuitry is inoperative with VCC below 1V. However, in applications where $\overline{\text{RESET}}$ must be valid down to 0V, adding a pull down resistor to $\overline{\text{RESET}}$ causes any stray leakage currents to flow to ground, holding $\overline{\text{RESET}}$ low. R1's value is not critical; 100k is large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground. For theAX6902/4 if RESET is required to remain valid for VCC < 1V.

Benefits of Highly Accurate Reset Threshold

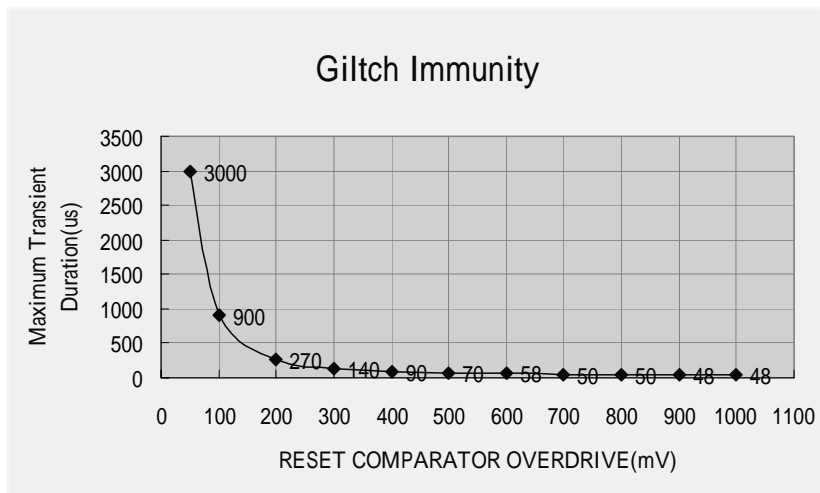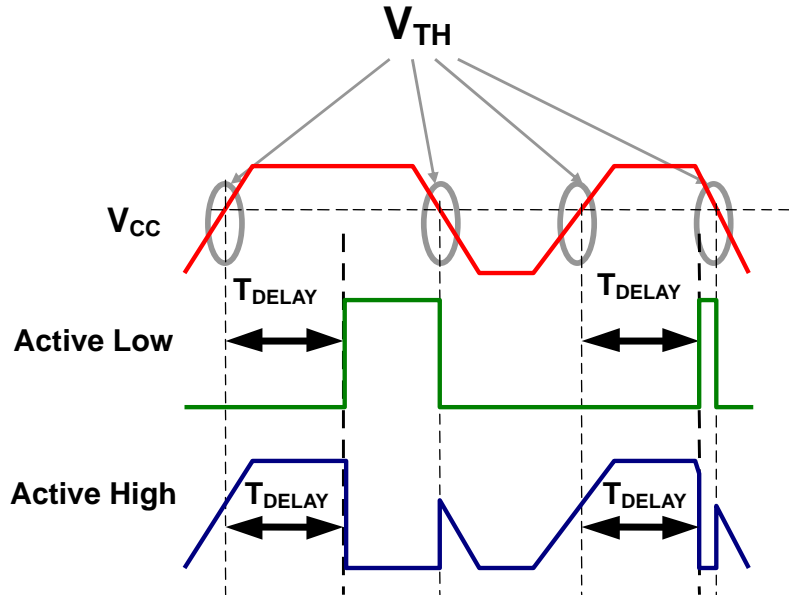Most µP supervisor ICs have reset threshold voltages between 5% and 10% below the value of nominal sup-ply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal. When using ICs rated at only the nominal supply ±5%, this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted.
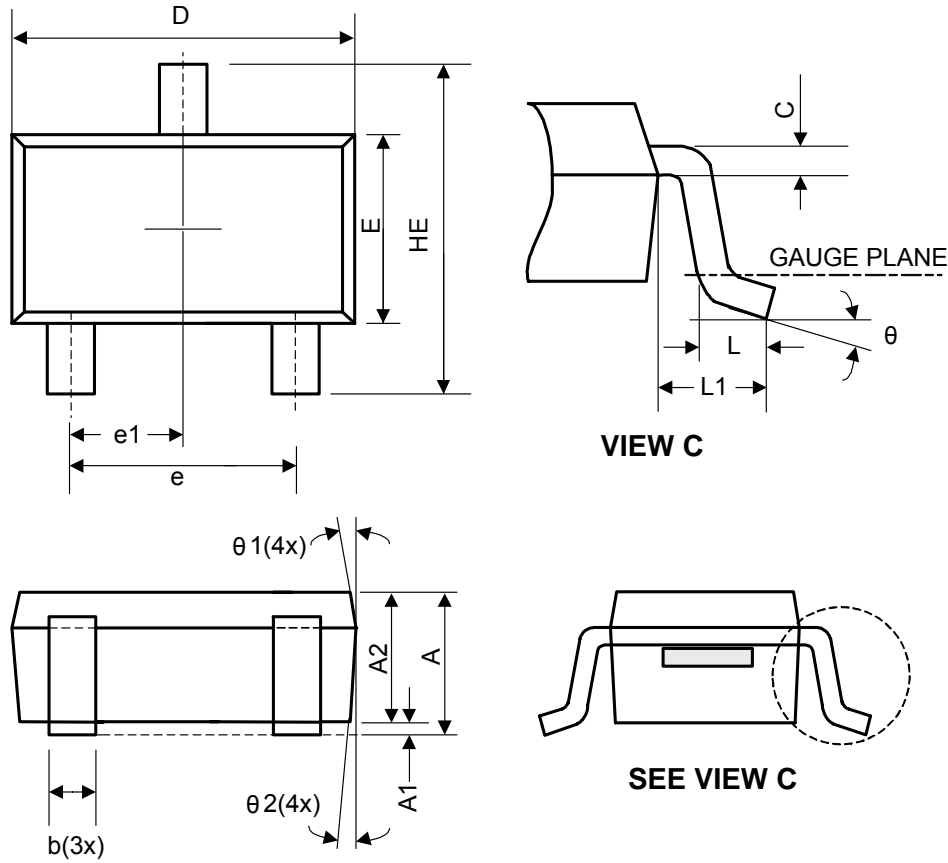
❖ Typical Characteristics

Threshold v.s. Temp
(V_{TH}=2.93V)

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❖ **Timing Diagram**

Giltch Immunity

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❖ Package Outlines

VIEW C

SEE VIEW C

Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.		Min.	Nom.	
A	1.05	-	A	1.05	-	A
A1	0.05	-	A1	0.05	-	A1
A2	1.00	1.10	A2	1.00	1.10	A2
b	0.25	-	b	0.25	-	b
C	0.08	-	C	0.08	-	C
D	2.70	2.90	D	2.70	2.90	D
E	1.50	1.60	E	1.50	1.60	E
HE	2.60	2.80	HE	2.60	2.80	HE
L	0.30	-	L	0.30	-	L
L1	0.50	0.60	L1	0.50	0.60	L1
e	1.80	1.90	e	1.80	1.90	e
e1	0.85	0.95	e1	0.85	0.95	e1
θ	0°	5°	θ	0°	5°	θ
θ1	3°	5°	θ1	3°	5°	θ1
θ2	6°	8°	θ2	6°	8°	θ2