

Description

The APX809/810 are used for microprocessor (μ P) supervisory circuits to monitor the power supplies in μ P 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.

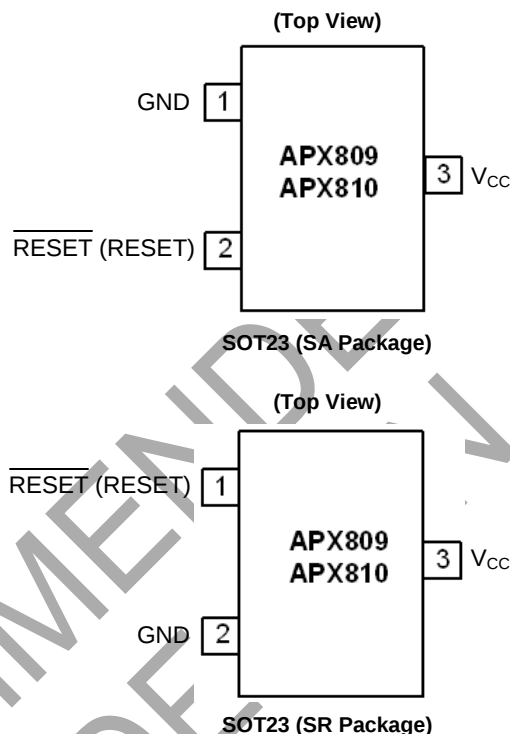
These circuits perform a single function: they assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold, keeping it asserted for at least 240ms after V_{CC} has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available. The APX809/810 have push pull outputs. The APX809 have an active low $\overline{\text{RESET}}$ output, while the APX810 has an active high RESET output. The reset comparator is designed to ignore fast transients on V_{CC} , and the outputs are guaranteed to be in the correct logic state for V_{CC} down to 1V. Low supply current makes the APX809/810 ideal for use in portable equipment. The APX809/810 is available in a 3-pin SOT23 package.

Features

- Precision Monitoring of 2.5V, 3V, 3.3V, and 5V Power-Supply Voltages
- Fully Specified Over Temperature
- Available in Three Output Configurations
- Push-Pull $\overline{\text{RESET}}$ Active Low (APX809)
- Push-Pull RESET Active High (APX810)
- 200ms Typ Power-On Reset Pulse Width
- 30 μ A Supply Current (Typ.)
- Guaranteed Reset Valid to $V_{CC} = 1V$
- No External Components
- SOT23: Available in "Green" Molding Compound (No Br, Sb)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

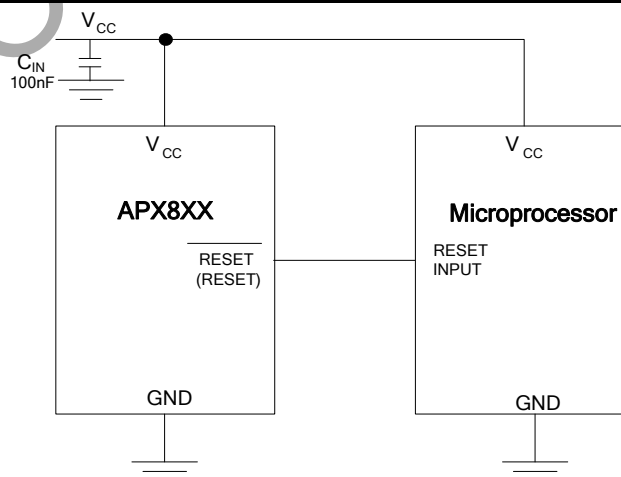
Pin Assignments



Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical μ P and μ C Power Monitoring
- Portable/Battery Powered Equipment

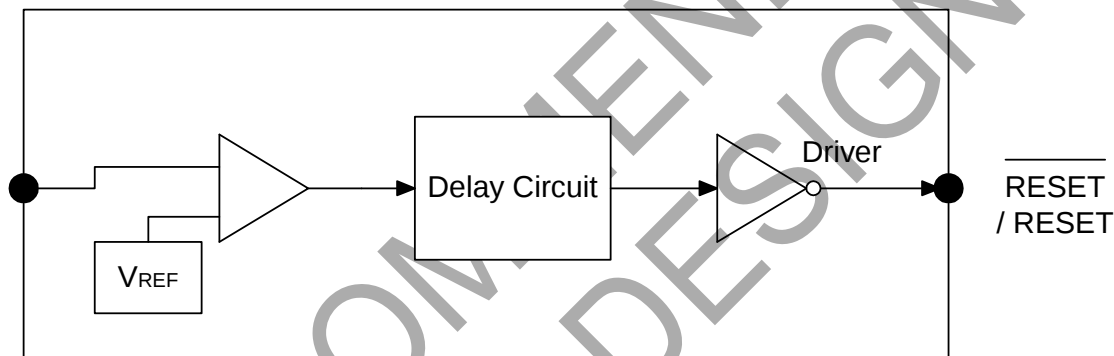
Typical Applications Circuit



Pin Descriptions

Pin Name	Description
GND	Ground
$\overline{\text{RESET}}$ (RESET)	Reset Output Pin L: for APX809 H: for APX810
V _{CC}	Operating Voltage Input

Functional Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	5	kV
ESD MM	Machine Model ESD Protection	500	V
V _{CC}	Supply Voltage	-0.3 to +6.0	V
V _{RESET}	RESET, $\overline{\text{RESET}}$ (Push-pull)	-0.3 to (V _{CC} + 0.3)	V
I _{CC}	Input Current, V _{CC}	20	mA
I _O	Output Current, RESET, $\overline{\text{RESET}}$	20	mA
P _D	Continuous Power Dissipation (T _A = +70°C), De-rate 4mW/°C above +70°C	400	mW
T _{OP}	Operating Junction Temperature Range	-40 to +105	°C
T _{ST}	Storage Temperature Range	-65 to +150	°C

Recommended Operating Conditions

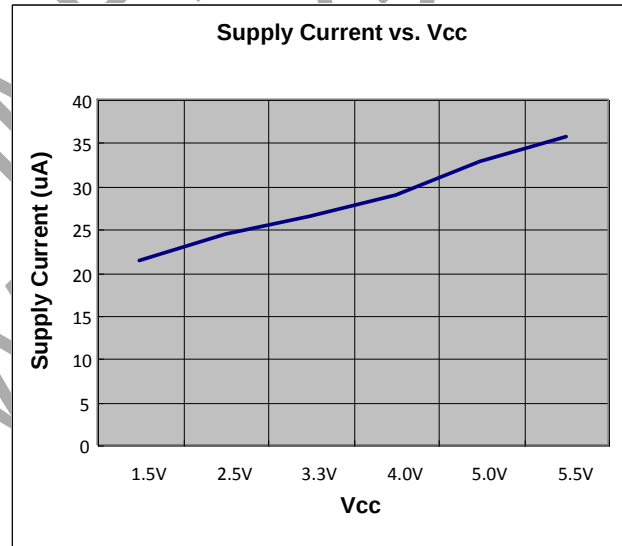
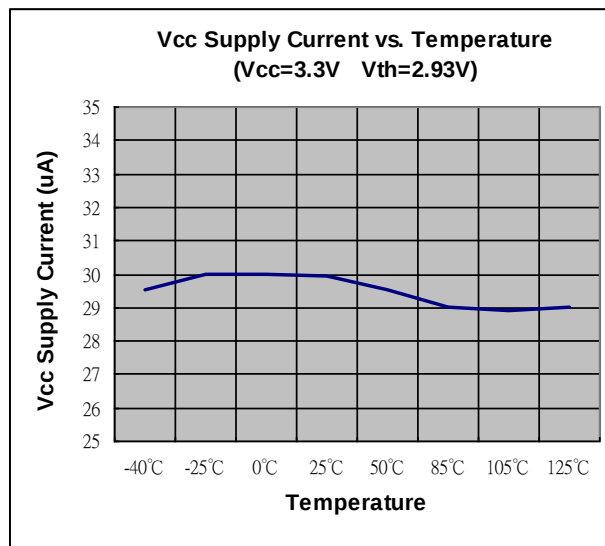
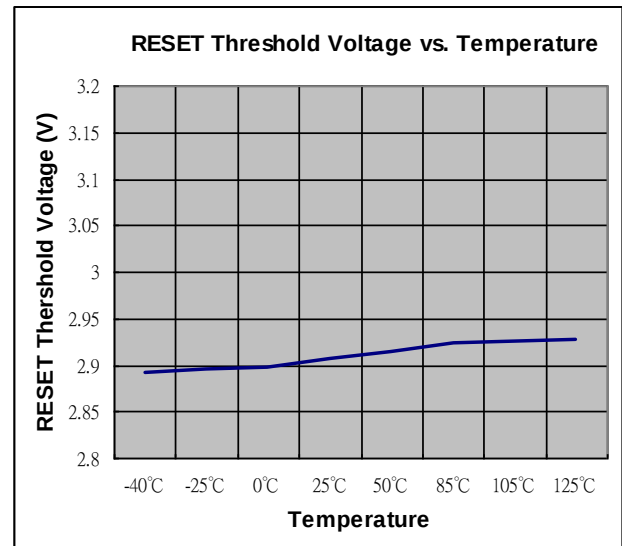
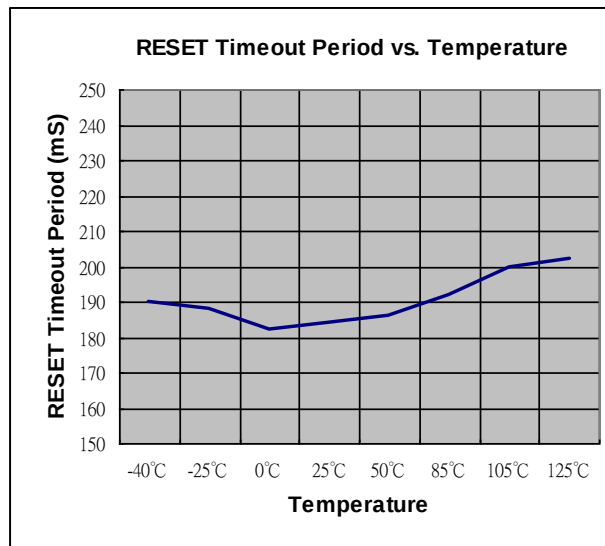
Symbol	Parameter	Min	Max	Unit
V _{CC}	Supply Voltage	1.1	5.5	V
V _{IN}	Input Voltage	0	(V _{CC} + 0.3)	V
T _A	Operating Ambient Temperature Range	-40	+85	°C
t _R	V _{CC} Rising Time (V _{CC} = 0 to V _T)	—	100	μs

Electrical Characteristics (@T_A = -40 to +85°C, unless otherwise note. Typical values are at T_A = +25°C.)

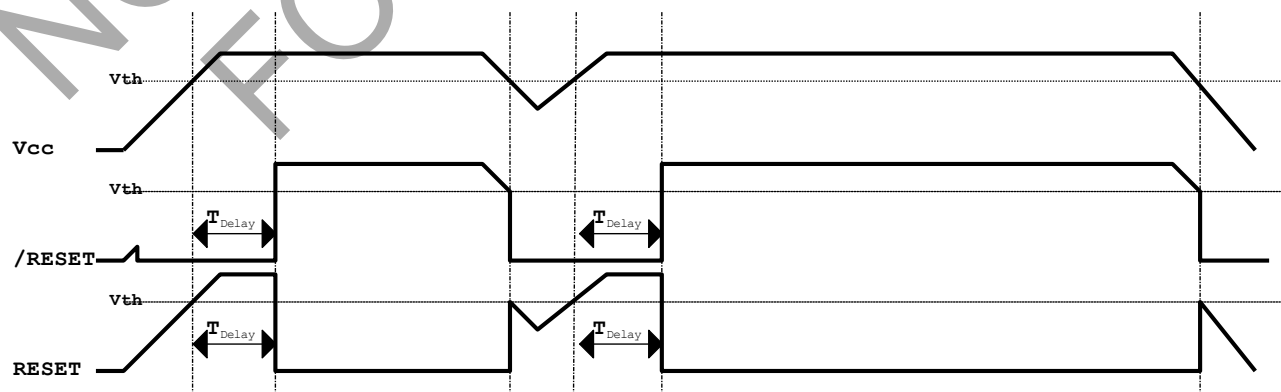
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V _{CC}	V _{CC} Range	T _A = 0°C to +70°C	1.0	—	5.5	V
I _{CC}	Supply Current	V _{TH} + 0.2V	—	30	40	μA
V _{TH}	Reset Threshold	APX809/810-23	2.21	2.25	2.30	V
		APX809/810-26	2.59	2.63	2.69	
		APX809/810-29	2.88	2.93	3.00	
		APX809/810-31	3.02	3.08	3.15	
		APX809/810-40	3.93	4.00	4.08	
		APX809/810-44	4.31	4.38	4.47	
		APX809/810-46	4.56	4.63	4.72	
		APX809/810-23	2.20	2.25	2.30	V
		APX809/810-26	2.57	2.63	2.69	
		APX809/810-29	2.86	2.93	3.00	
		APX809/810-31	3.00	3.08	3.15	
		APX809/810-40	3.92	4.00	4.08	
		APX809/810-44	4.29	4.38	4.47	
		APX809/810-46	4.54	4.63	4.72	
	Reset Threshold Tempco	—	—	30	—	ppm/°C
t _S	Set-up Time	V _{CC} = V _{TH} to (V _{TH} - 100mV)	—	20	—	μs
t _{DELAY}	Reset Active Timeout Period	T _A = 0°C to +85°C	140	200	280	ms
V _{OL}	RESET Output Voltage Low (APX809)	V _{CC} = V _{TH} - 0.2, I _{SINK} = 1.2mA	—	—	0.3	V
		V _{CC} = V _{TH} - 0.2, I _{SINK} = 3.2mA	—	—	0.4	
		V _{CC} > 1.0V, I _{SINK} = 50μA	—	—	0.3	
V _{OH}	RESET Output Voltage-High (APX809)	V _{CC} > V _{TH} + 0.2, I _{SOURCE} = 500μA	0.8V _{CC}	—	—	V
		V _{CC} > V _{TH} + 0.2, I _{SOURCE} = 800μA	V _{CC} - 1.5	—	—	
V _{OL}	RESET Output Voltage-Low (APX810)	V _{CC} = V _{TH} + 0.2, I _{SINK} = 1.2mA	—	—	0.3	V
		V _{CC} = V _{TH} + 0.2, I _{SINK} = 3.2mA	—	—	0.4	
V _{OH}	RESET Output Voltage-High (APX810)	1.8V < V _{CC} < V _{TH} - 0.2, I _{SOURCE} = 150μA	0.8V _{CC}	—	—	V
θ _{JA}	Thermal Resistance Junction-to-Ambient	SOT23 (Note 4)	—	201	—	°C/W
θ _{JC}	Thermal Resistance Junction-to-Case	SOT23 (Note 4)	—	56	—	°C/W

Note: 4. Test condition for SOT23: Devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Performance Characteristics



Timing Diagram



Functional Description

A microprocessor's (μP 's) reset input starts the μP in a known state. The APX809/810 assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold, keeping it asserted for at least 240ms after V_{CC} has risen above the reset threshold. The APX809/810 have a push-pull output stage.

Ensuring a Valid Reset Output

Down to $V_{CC} = 0$

$\overline{RESET}$ is guaranteed to be a logic low for $V_{CC} > 1V$. Once V_{CC} exceeds the reset threshold, an internal timer keeps $\overline{RESET}$ low for the reset timeout period; after this interval, $\overline{RESET}$ goes high. If a brownout condition occurs (V_{CC} dips below the $\overline{RESET}$ reset threshold), $\overline{RESET}$ goes low. Any time V_{CC} goes below the reset threshold, the internal timer resets to zero, and $\overline{RESET}$ goes low. The internal timer starts after V_{CC} returns above the reset threshold, and $\overline{RESET}$ remains low for the reset timeout period.

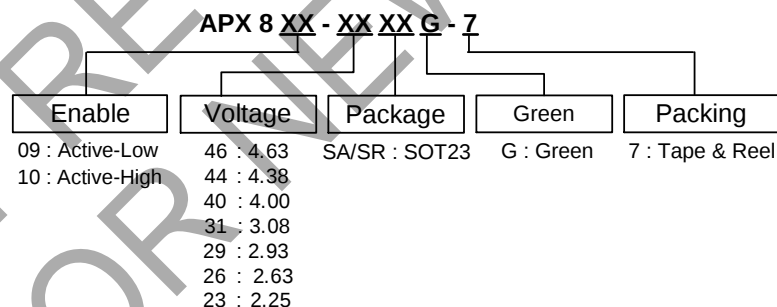
When V_{CC} falls below 1V, the APX809 $\overline{RESET}$ output no longer sinks current — it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to $\overline{RESET}$ can drift to undetermined voltages.

This presents no problem in most applications since most μP and other circuitry is inoperative with V_{CC} below 1V. However, in applications where $\overline{RESET}$ must be valid down to 0V, adding a pull down resistor to $\overline{RESET}$ causes any stray leakage currents to flow to ground, holding $\overline{RESET}$ low. R1's value is not critical; 100k are large enough not to load $\overline{RESET}$ and small enough to pull $\overline{RESET}$ to ground. For the APX810 if $\overline{RESET}$ is required to remain valid for $V_{CC} < 1V$.

Benefits of Highly Accurate Reset Threshold

Most μP supervisor ICs has reset threshold voltages between 5% and 10% below the value of nominal supply 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 $\pm 5\%$, 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.

Ordering Information



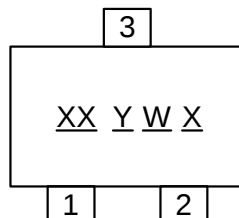
Part Number	Package Code	Packaging (Note 5)	7" Tape and Reel	
			Quantity	Part Number Suffix
APX809-XXSAG-7	SA	SOT23	3000/Tape & Reel	-7
APX810-XXSAG-7	SA	SOT23	3000/Tape & Reel	-7
APX809-XXSRG-7	SR	SOT23	3000/Tape & Reel	-7
APX810-XXSRG-7	SR	SOT23	3000/Tape & Reel	-7

Note: 5. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at <http://www.diodes.com/package-outlines.html>.

Marking Information

(1) SOT23

(Top View)



XX : Identification code

Y : Year 0~9

W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week

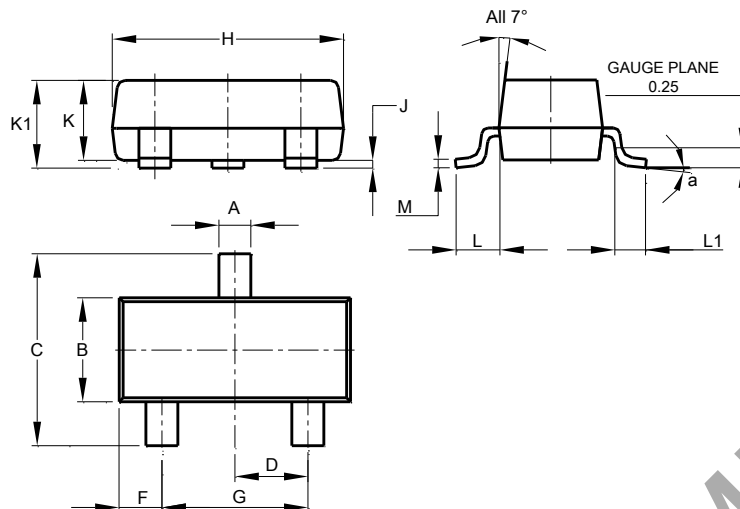
X : A~Z : Green

Device	Package	Identification Code
APX809-46SA	SOT23	X2
APX809-44SA	SOT23	X3
APX809-40SA	SOT23	X4
APX809-31SA	SOT23	X5
APX809-29SA	SOT23	X6
APX809-26SA	SOT23	X7
APX809-23SA	SOT23	X8
APX810-46SA	SOT23	XA
APX810-44SA	SOT23	XB
APX810-40SA	SOT23	XC
APX810-31SA	SOT23	XD
APX810-29SA	SOT23	XE
APX810-26SA	SOT23	XF
APX810-23SA	SOT23	XG
APX809-46SR	SOT23	Y2
APX809-44SR	SOT23	Y3
APX809-40SR	SOT23	Y4
APX809-31SR	SOT23	Y5
APX809-29SR	SOT23	Y6
APX809-26SR	SOT23	Y7
APX809-23SR	SOT23	Y8
APX810-46SR	SOT23	YA
APX810-44SR	SOT23	YB
APX810-40SR	SOT23	YC
APX810-31SR	SOT23	YD
APX810-29SR	SOT23	YE
APX810-26SR	SOT23	YF
APX810-23SR	SOT23	YG

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23

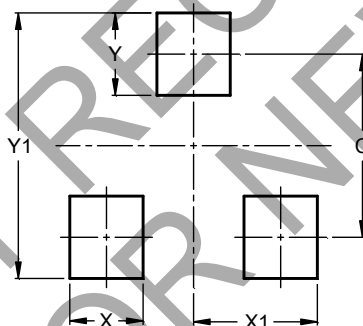


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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