



TS809/810/809R/810R

Microprocessor Reset Circuit

SOT-23



Pin assignment:

TS809/810

1. Gnd
2. RESET (RESET)
3. Vcc

Pin assignment:

TS809R/810R

1. RESET (RESET)
2. Gnd
3. Vcc

**Threshold Voltage Option
From 2.0V ~ 4.63V**

General Description

The TS809/810/809R/810R are microprocessor (μ P) supervisory circuit used 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 VCC supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after VCC has risen above the reset threshold. Reset thresholds suitable for operation with a variety of supply voltages are available. The TS809/810/809R/810R have push pull outputs. The TS809/809R have an active low RESET output, while the TS810/810R has an active high (RESET) output. The reset comparator is designed to ignore fast transients on VCC, and the output guaranteed to be in the correct logic state for VCC down to 1V. Low supply correct makes the TS809/810/809R/810R ideal for use in portable equipment.

The TS809/810/809R/810R is available in a 3-pin SOT-23 package.

Features

- ✧ Precision monitoring of +3V, +3.3V and +5V power supply voltage
- ✧ Fully specified over temperature
- ✧ Available in three output configurations
- ✧ Push-Pull RESET low output (TS809/TS809R)
- ✧ Push-Pull RESET high output (TS810/TS810R)
- ✧ 140mS min. power-on reset pulse width
- ✧ 12uA supply current
- ✧ Guaranteed reset valid to Vcc = +1V
- ✧ Power supply transient immunity
- ✧ No external components

Ordering Information

Part No.	Enable Function	Package
TS809CX \underline{x}	Active-Low	SOT-23
TS810CX \underline{x}	Active-High	
TS809RCX \underline{x}	Active-Low	
TS810RCX \underline{x}	Active-High	

Note: \underline{x} is the threshold voltage type, option as

<u>A</u> : 4.63V	<u>H</u> : 2.1V
<u>B</u> : 4.38V	<u>I</u> : 2.0V
<u>C</u> : 4.00V	
<u>D</u> : 3.08V	
<u>E</u> : 2.93V	
<u>F</u> : 2.63V	
<u>G</u> : 2.32V	

Applications

- ✧ Computers
- ✧ Controllers
- ✧ Intelligent instruments
- ✧ Critical uP and uC power monitoring
- ✧ Portable / Battery powered equipment
- ✧ Automotive

Pin Descriptions

Name	Description
Gnd	Ground
<u>RESET</u> (RESET)	Reset output pin <u>RESET</u> – TS809 / TS809R (Active Low) (RESET) – TS810 / TS810R (Active High)
Vcc	Operating voltage input



Absolute Maximum Rating			
Terminal Voltage (with respect to Gnd)	V_{CC}	7	V
<u>RESET</u> & (RESET) push-pull	V_{RESET}	-0.3 ~ ($V_{CC} + 0.3$)	V
Input Current, V_{CC}	I_{CC}	20	mA
Output Current, <u>RESET</u> , (RESET)	I_O	20	mA
Rate of Rise, V_{CC}	V_R	100	V/ μ S
Continuous Power Dissipation ($T_a = +70^\circ\text{C}$) de-rate 4mW/ $^\circ\text{C}$ above +70 $^\circ\text{C}$	P_D	320	mW
Operating Junction Temperature Range	T_{OP}	-40 ~ +125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^\circ\text{C}$
Lead Soldering Temperature (260 $^\circ\text{C}$)	T_{LEAD}	10	S

Electrical Characteristics ($T_a = 25^\circ\text{C}$, unless otherwise specified.)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Input Supply Voltage	$T_a = -40^\circ\text{C} \sim +85^\circ\text{C}$	V_{CC}	1.0	--	5.5	V
Supply Current	$V_{IN} = V_{IN} * 1.10$	I_{CC}	--	--	3.0	μA
	$V_{IN} = V_{IN} * 1.10, T_a = -40^\circ\text{C} \sim +85^\circ\text{C}$		-	--	5.0	
Reset Threshold	TS809/809R/810/810RCXA	V_{TH}	4.56	4.63	4.7	V
	TS809/809R/810/810RCXB		4.31	4.38	4.45	
	TS809/809R/810/810RCXC		3.94	4.00	4.06	
	TS809/809R/810/810RCXD		3.03	3.08	3.13	
	TS809/809R/810/810RCXE		2.89	2.93	2.97	
	TS809/809R/810/810RCXF		2.59	2.63	2.67	
	TS809/809R/810/810RCXG		2.28	2.32	2.35	
	TS809CXH		2.07	2.1	2.13	
	TS809CXI		1.97	2.0	2.03	
Reset Threshold Temperature Coefficient			30	50	160	ppm/ $^\circ\text{C}$
V_{CC} to Reset Delay	$V_{CC} = V_{TH} - 100\text{mV}$	T_{DELAY}	--	40	--	μS
Reset Active Timeout Period	$T_a = -40^\circ\text{C} \sim +85^\circ\text{C}$		140	210	500	mS
<u>RESET</u> Output (TS809/R) Voltage Low	$V_{CC} < V_{TH(MIN)}, I_{SINK} = 1.2\text{mA}$	V_{OL}	--	--	0.2	V
<u>RESET</u> Output (TS809/R) Voltage High	$V_{CC} > V_{TH(MAX)}, I_{SOURCE} = 0.5\text{mA}, V_{CC} > 1.8\text{V}$	V_{OH}	0.8	--	--	V
	$V_{CC} > V_{TH(MAX)}, I_{SOURCE} = 0.15\text{mA}, 1.8\text{V} \geq V_{CC} > 1.0\text{V}$		V_{CC}	--	--	
(RESET) Output (TS810/R) Voltage Low	$V_{CC} > V_{TH(MIN)}, I_{SINK} = 1.2\text{mA}$	V_{OL}	--	--	0.2	V
(RESET) Output (TS810/R) Voltage High	$V_{CC} < V_{TH(MAX)}, I_{SOURCE} = 0.5\text{mA}, V_{CC} > 1.8\text{V}$	V_{OH}	0.8	--	--	V
	$V_{CC} > V_{TH(MAX)}, I_{SOURCE} = 0.15\text{mA}, 1.8\text{V} \geq V_{CC} > 1.0\text{V}$		V_{CC}	--	--	

Application Note

Function Description

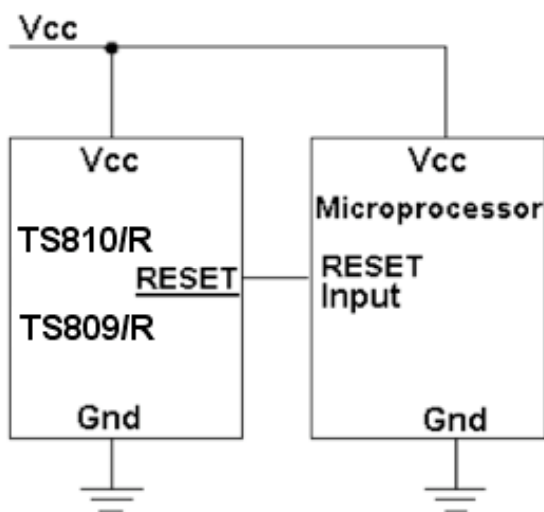
A microprocessor's (μP 's) reset input starts the μP in a known state. The TS809/810/809R/810R assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the V_{cc} supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after V_{cc} has risen above the reset threshold. The TS809/810/809R/810R have a push-pull output stage.

Applications Information

Negative-Going V_{CC} transients in addition to issuing a reset to the μP during power-up, power-down, and brownout conditions, the TS809/810 are relatively immune to short-duration negative-going V_{cc} transients (glitches).

The TS809/810/809R/810R do not generate a reset pulse. The graph was generated using a negative going pulse applied to V_{cc} , 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 V_{cc} 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 V_{cc} transient that goes 100mV below the reset threshold and lasts 20 μ s or less will not cause a reset pulse. A 0.1 μ F bypass capacitor mounted as close as possible to the V_{cc} pin provides additional transient immunity.

Applications Circuit



Ensuring a Valid Reset Output Down to $V_{cc}=0$

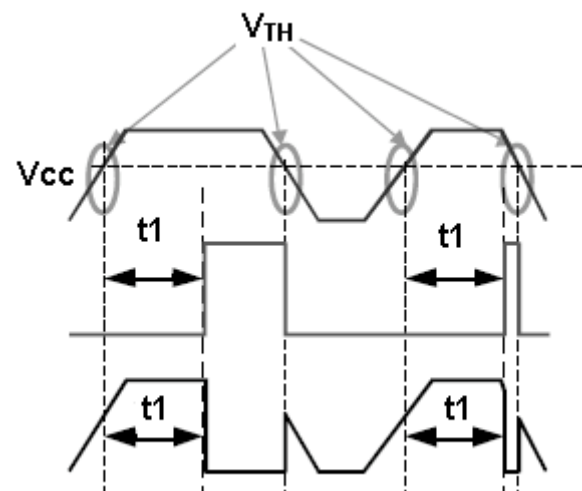
When V_{cc} falls below 1V, the TS809/810/809R/810R reset output no longer sinks current - it becomes an open circuit. Therefore, high impedance CMOS logic input connected to reset can drift to undetermined voltages.

This presents no problem in most applications since most μP and other circuitry is inoperative with V_{cc} below 1V. However, in applications where reset must be valid down to 0V, adding a pull down resistor to reset causes and stray leakage currents to flow to ground, holding reset low (Figure 2.) $R1$'s value is not critical; 100K is large enough not to load reset and small enough to pull RESET to ground. For the TS809/810/809R/810R if reset is required to remain valid for $V_{cc} < 1V$.

Benefits of Highly Accurate Reset Threshold

Most μP supervisor ICs have 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.

Timing Diagram



Electrical Characteristics Curve

Figure 1. Reset Time vs. Temperature

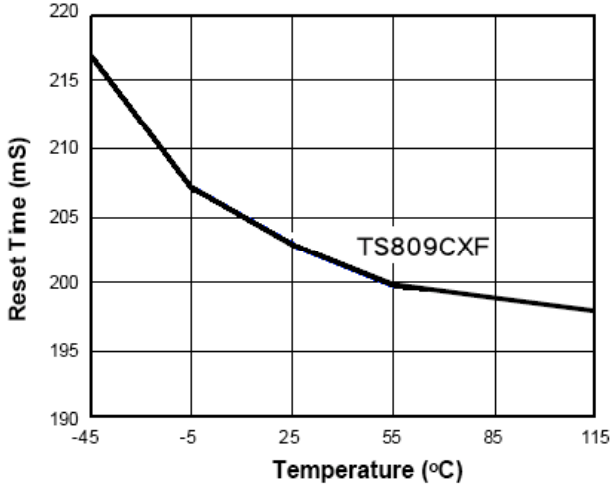


Figure 2. Threshold vs. Temperature

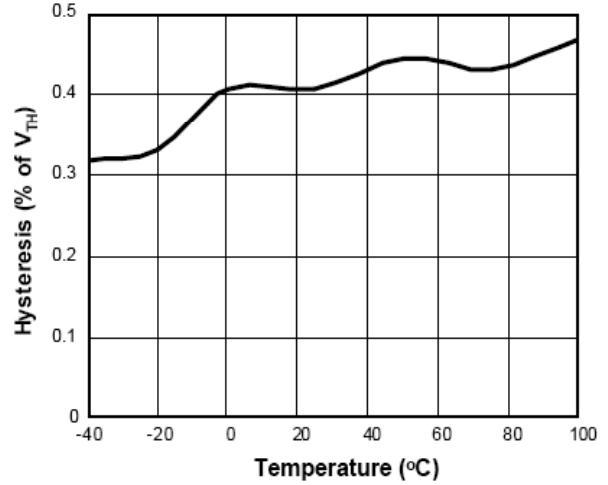


Figure 3. I_{IN} vs. Temperature

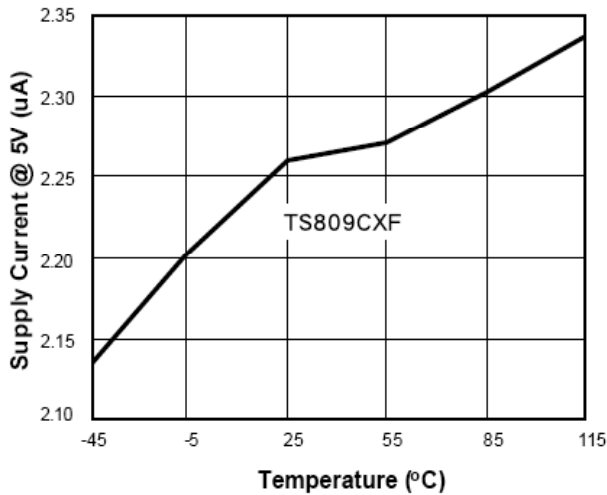


Figure 4. Reset Time vs. Temperature

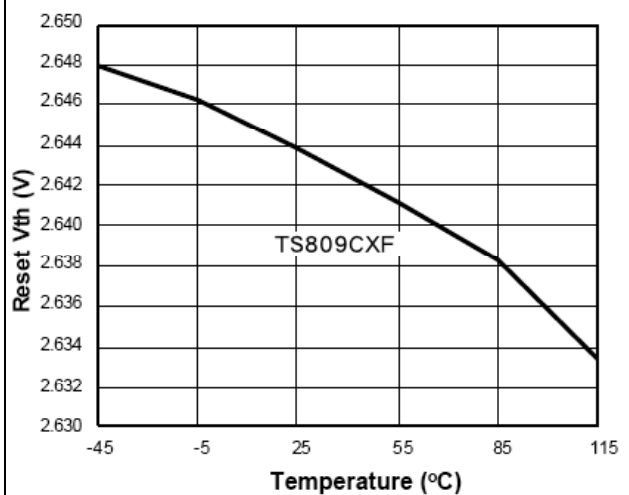


Figure 5. I_{IN} vs. V_{IN}

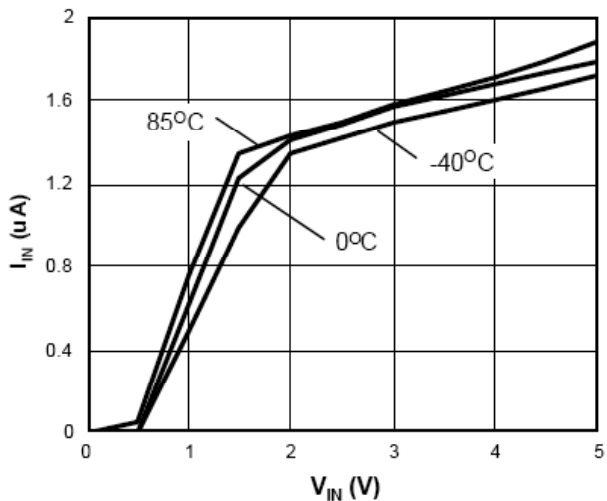
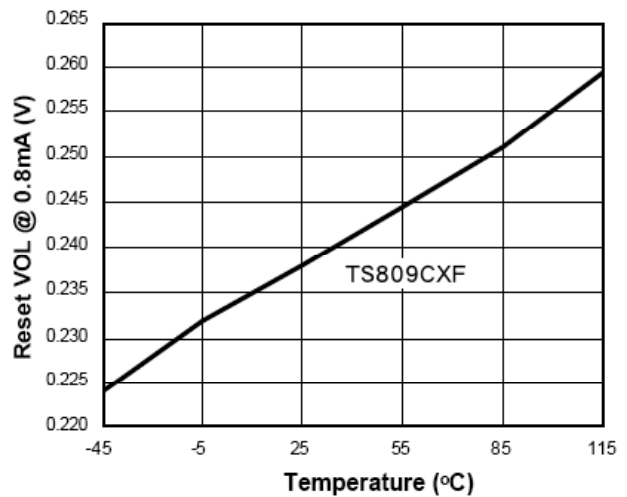
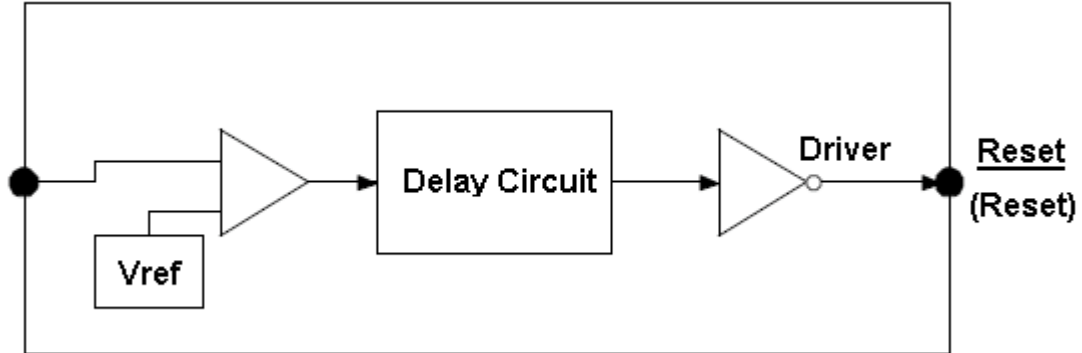


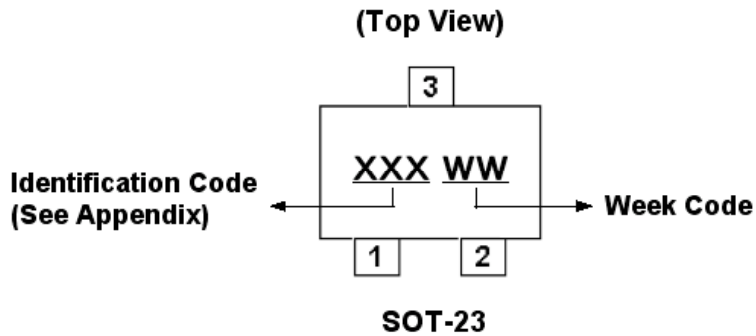
Figure 6. Reset Voltage vs. Temperature



Function Block

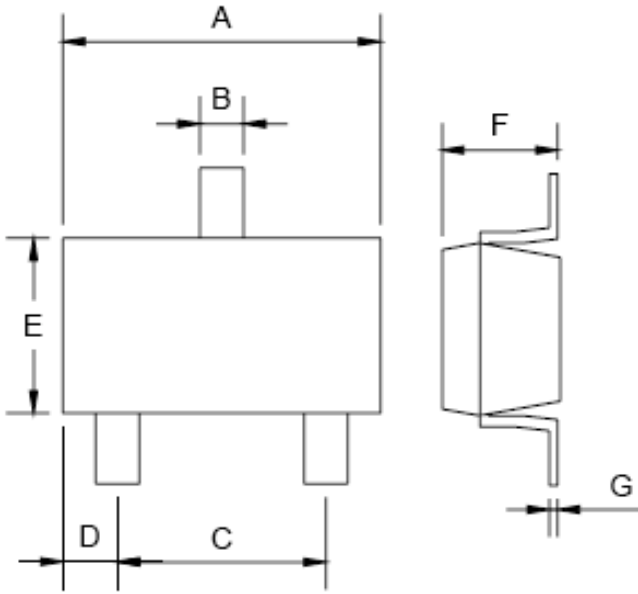


Marking Information



Part No.	Identification Code	Part No.	Identification Code	Part No.	Identification Code	Part No.	Identification Code
TS809CXA	ARK	TS810CXA	ARJ	TS809RCXA	ABA	TS810RCXA	ACA
TS809CXB	ARN	TS810CXB	ALS	TS809RCXB	ABB	TS810RCXB	ACB
TS809CXC	ASB	TS810CXC	AAC	TS809RCXC	ATQ	TS810RCXC	ACC
TS809CXD	ASA	TS810CXD	ASU	TS809RCXD	ATO	TS810RCXD	ACD
TS809CXE	AMO	TS810CXE	ALV	TS809RCXE	AUV	TS810RCXE	ACE
TS809CXF	AMP	TS810CXF	AZM	TS809RCXF	ABF	TS810RCXF	ACF
TS809CXG	ATT	TS810CXG	AAG	TS809RCXG	ABG	TS810RCXG	ACG
TS809CXH	ASK	--	--	--	--	--	--
TS809CXI	BDT	--	--	--	--	--	--

SOT-23 Mechanical Drawing



SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.88	2.91	0.113	0.115
B	0.39	0.42	0.015	0.017
C	1.78	2.03	0.070	0.080
D	0.51	0.61	0.020	0.024
E	1.59	1.66	0.063	0.065
F	1.04	1.08	0.041	0.043
G	0.07	0.09	0.003	0.004