

Product Features

- Precision supply-voltage monitor
 - 4.63V (PI4S705, PI4S813L, PI4S707)
 - 4.38V (PI4S706, PI4S706H, PI4S708)
 - 3.08V (PI4S706T, PI4S706TH, PI4S708T)
 - 2.93V (PI4S706S, PI4S706SH, PI4S708S)
 - 2.63V (PI4S706R, PI4S706P, PI4S708R)
- 200ms reset pulse width
- Debounced TTL/CMOS-compatible manual-reset input
- Independent watchdog timer with 1.6sec time-out (PI4S705, 706x, 706xH, and 813L ONLY)
- Reset output signal:
 - Active-low only (PI4S705, 706, 706T, 706S, 706R)
 - Active-high only (PI4S813L, 706H, 706TH, 706SH, 706P)
 - Active-high and active-low (PI4S707, 708, 708T, 708S, 708R)
- Voltage monitor for power-fail or low battery warning
- Guaranteed RESET/RESET valid at $V_{CC} = 1.2V$

Description

The PI4S70xx/PI4S813L family microprocessor (μ P) supervisory circuits are targeted to improve reliability and accuracy of power-supply circuitry in μ P systems. These devices reduce the complexity and number of components required to monitor power-supply and battery functions.

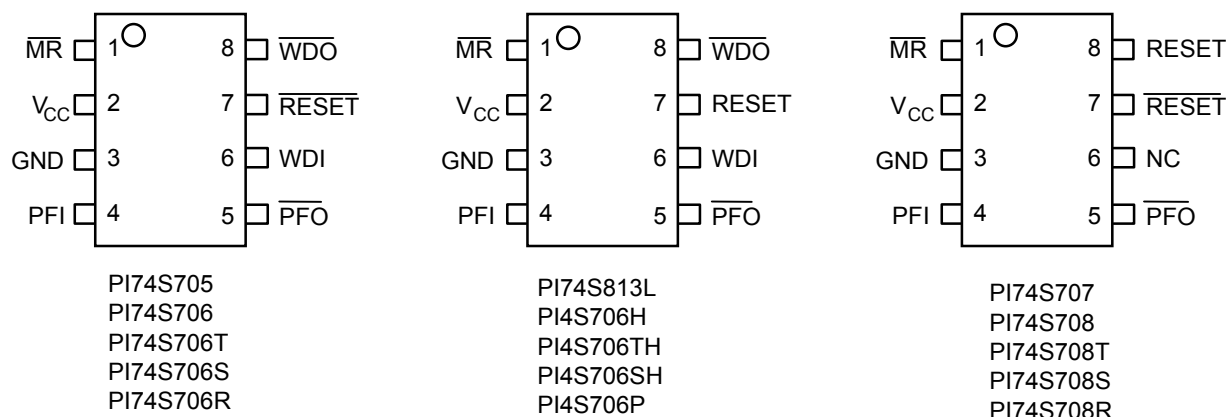
The main functions are:

1. Asserting reset output during power- μ P, power-down and brownout conditions for μ P systems.
2. Detecting power failure or low-battery conditions with a 1.25V threshold detector.
3. Generating an independent watchdog output that goes low if the watchdog input has not been toggled within 1.6 seconds.
4. Asserting reset output with an active-low manual-reset input

Applications

- Computers
- Controllers
- Intelligent Instruments
- Automotive Systems
- Printers
- Critical Microprocessor Power Monitoring

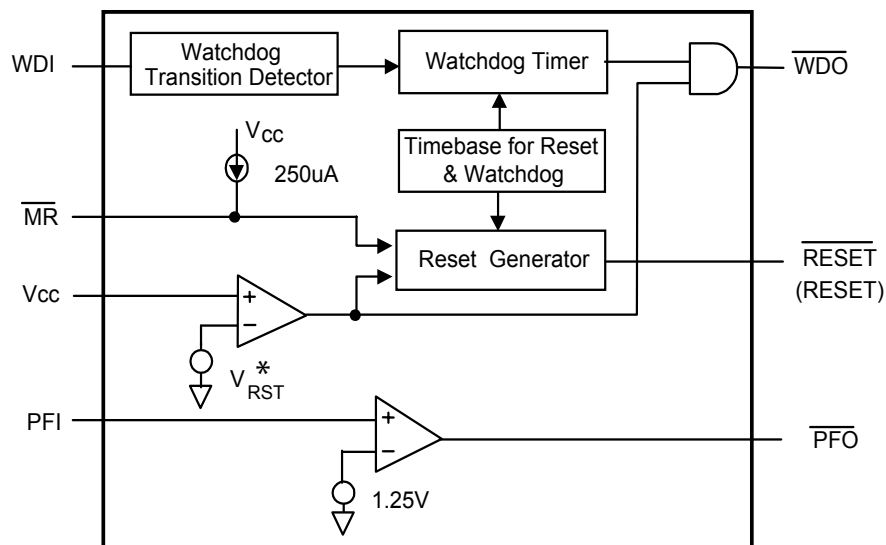
Product Pin Configuration



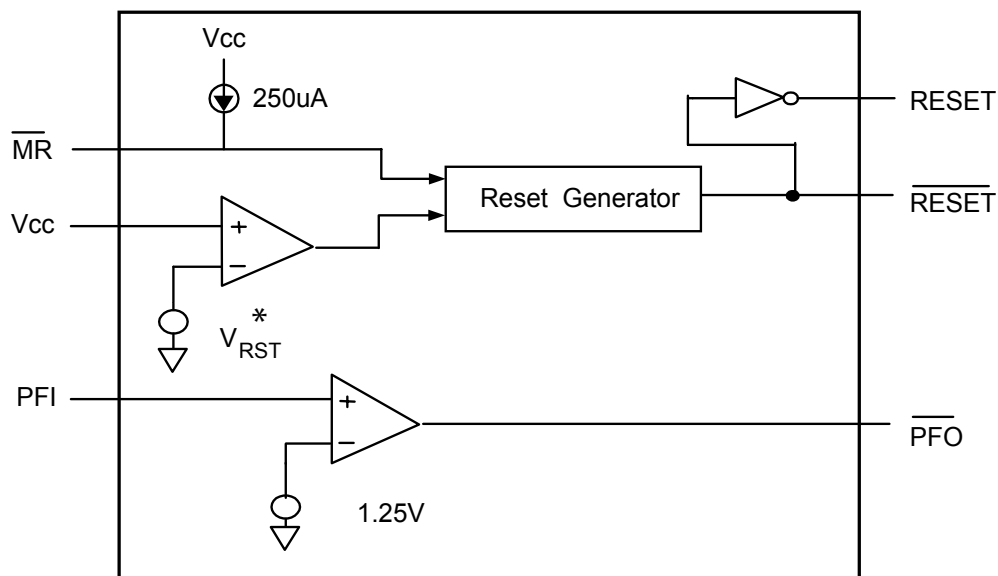
Top View

Pin Description

Pin Name	Type	Description
$\overline{\text{MR}}$	Input	Manual-Reset: triggers a reset pulse when pulled below 0.8V, active low. It has an internal 250μA pull-up current and can be driven from a TTL or CMOS logic line as well as shorted to ground with a switch.
V _{CC}	Power	Power Supply
GND	Ground	Ground Reference for all signals
PFI	Input	Power-Fail Voltage Monitor Input: When PFI is less than 1.25V, $\overline{\text{PFO}}$ goes low. Connect PFI to GND or V _{CC} when not used.
$\overline{\text{PFO}}$	Output	Power-Fail Output: it gets low and sinks current when PFI is less than 1.25V; otherwise $\overline{\text{PFO}}$ stays high.
WDI	Input	Watchdog Input: If WDI remains high or low for 1.6sec, the internal watchdog timer runs out and $\overline{\text{WDO}}$ goes low. Floating WDI or connecting WDI to a high-impedance three-state buffer disables the watchdog feature. The internal watchdog timer clears whenever reset is asserted, WDI is three-stated, or WDI sees a rising or falling edge.
NC		No Connect
$\overline{\text{RESET}}$	Output	Reset Output pulses: low for 200ms when triggered, and stays low whenever V _{CC} is below the reset threshold. It remains low for 200ms after V _{CC} rises above the reset threshold or $\overline{\text{MR}}$ goes from low to high. A watchdog timeout will not trigger $\overline{\text{RESET}}$ unless $\overline{\text{WDO}}$ is connected to $\overline{\text{MR}}$.
$\overline{\text{WDO}}$	Output	Watchdog Output: pulls low when the internal watchdog timer finishes its 1.6sec count and does not go high again until the watchdog is cleared. $\overline{\text{WDO}}$ also goes low during low-line conditions. Whenever V _{CC} is below the reset threshold, $\overline{\text{WDO}}$ stays low; however, unlike $\overline{\text{RESET}}$, $\overline{\text{WDO}}$ does not have minimum pulse width. As soon as V _{CC} rises above the reset threshold, $\overline{\text{WDO}}$ goes high with no delay.
RESET	Output	The inverse of $\overline{\text{RESET}}$: active high. Whenever $\overline{\text{RESET}}$ is high, RESET is low.

Block Diagram for PI4S705, PI4S706x, PI4S706xH, PI4S813L


$*V_{\text{RST}}$ = RESET Threshold Voltage

Block Diagram for PI4S707, PI4S708x


$*V_{\text{RST}}$ = RESET Threshold Voltage

Functional Description

The PI4S70xxx/813L family can assert reset output during power-up, power-down and brownout conditions for μP system, detect power failure or low-battery conditions with a 1.25V threshold detector and have watchdog functions. Refer to Function Reference Table for their individual features. For the typical application see Figure 4.

Reset Output

The supervisory circuits can assert reset for a microprocessor during power-up, power-down and brownout to prevent code execution errors.

On power-up, once V_{CC} reaches about 1.2V, $\overline{RESET}$ is a guaranteed logic low of 0.4V or less. As V_{CC} rises, $\overline{RESET}$ stays low. When V_{CC} rises above the reset threshold, an internal timer releases $\overline{RESET}$ after about 200ms. $\overline{RESET}$ pulses low whenever V_{CC} drops below the reset threshold (brownout condition). If brownout occurs in the middle of a previously initiated reset pulse, the pulse continues for at least another 140ms.

On power-down, once V_{CC} falls below the reset threshold, $\overline{RESET}$ stays low and is guaranteed to be 0.4V or less until V_{CC} drops below 1.2V.

The PI4S706xH, PI4S707, PI4S708x and PI4S813L active-high $\overline{RESET}$ output is simply the complement of the $\overline{RESET}$ output, and is guaranteed to be valid with V_{CC} down to 1.2V. Some μPs, such as Intel's 80C51, require an active-high reset pulse.

Watchdog Timer

The watchdog circuit monitors the μP's activity. If the μP does not toggle the watchdog input (WDI) within 1.6sec and WDI is not in high impedance, $\overline{WDO}$ goes low. As long as $\overline{RESET}$ is asserted or the WDI input is in high impedance, the watchdog timer will stay cleared and will not count. As soon as reset is released and WDI is driven high or low, the timer will start counting. Pulses as short as 50ns can be detected.

Typically, $\overline{WDO}$ will be connected to the non-maskable interrupt input (NMI) of a μP. When V_{CC} drops below the reset threshold, $\overline{WDO}$ will go low whether or not the watchdog timer has timed out yet. Normally this would trigger an NMI interrupt, but $\overline{RESET}$ goes low simultaneously, and thus overrides the NMI interrupt. If WDI is left unconnected, $\overline{WDO}$ can be used as a low-line output. Since floating WDI disables the internal timer, $\overline{WDO}$ goes low only when V_{CC} falls below the reset threshold, thus functioning as a low-line output.

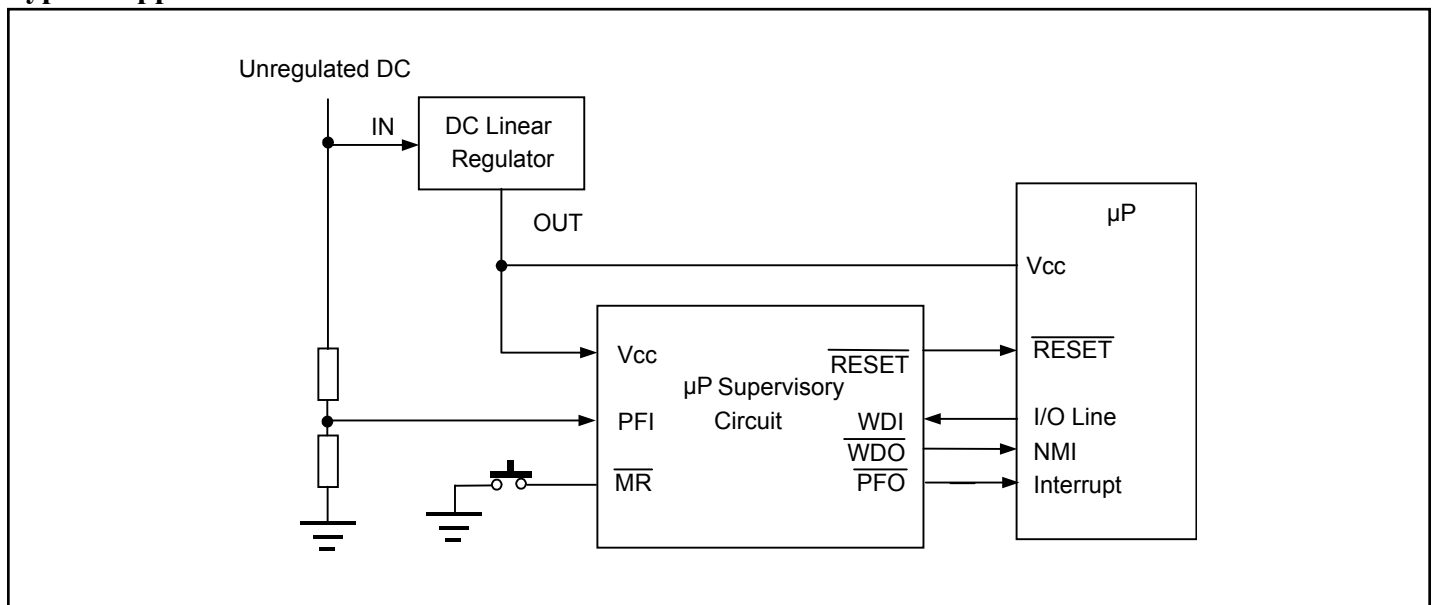
Manual Reset

The manual-reset input ($\overline{MR}$) allows reset to be triggered by a push-button switch. The switch is effectively debounced by the 140ms minimum reset pulse width. $\overline{MR}$ is TTL/CMOS logic compatible, so it can be driven by any external logic line.

Power-Fail Comparator

The power-fail comparator will send out a low signal once detects a voltage lowered than 1.25V. It can be used for various purposes because its output and non-inverting input are not internally connected. The inverting input is internally connected to a 1.25V reference.

Typical Application Circuit



Function Reference Table

Part No.	Reset Threshold	Reset Active Low or High	Nom. Reset Time (ms), t_{RS}	Nom. Watchdog Time (sec), t_{WD}	Power Fail Comp.	Manual Reset Input
PI4S705	4.63V	LOW	200	1.6	1.25V detector	Yes
PI4S813L	4.63V	HIGH	200	1.6	1.25V detector	Yes
PI4S707	4.63V	LOW, HIGH	200	unavailable	1.25V detector	Yes
PI4S706	4.38V	LOW	200	1.6	1.25V detector	Yes
PI4S706H	4.38V	HIGH	200	1.6	1.25V detector	Yes
PI4S708	4.38V	LOW, HIGH	200	unavailable	1.25V detector	Yes
PI4S706T	3.08V	LOW	200	1.6	1.25V detector	Yes
PI4S706TH	3.08V	HIGH	200	1.6	1.25V detector	Yes
PI4S708T	3.08V	LOW, HIGH	200	unavailable	1.25V detector	Yes
PI4S706S	2.93V	LOW	200	1.6	1.25V detector	Yes
PI4S706SH	2.93V	HIGH	200	1.6	1.25V detector	Yes
PI4S708S	2.93V	LOW, HIGH	200	unavailable	1.25V detector	Yes
PI4S706R	2.63V	LOW	200	1.6	1.25V detector	Yes
PI4S706P	2.63V	HIGH	200	1.6	1.25V detector	Yes
PI4S708R	2.63V	LOW, HIGH	200	unavailable	1.25V detector	Yes

Absolute Maximum Ratings

Storage Temperature -65°C to +150°C
 Ambient Temperature with Power Applied 0°C to +70°C
 Supply Voltage to Ground Potential (V_{CC} to GND) -0.3V to +7.0V
 DC Input Voltage (All inputs except V_{CC} and GND) -0.3V to $V_{CC}+0.3V$
 DC Output Current (All outputs) 20mA
 Power Dissipation (W package) 500mW

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC Electrical Characteristics

($V_{CC}=4.75V$ to $5.5V$ for PI4S705, PI4S813L, PI4S707 ; $V_{CC}=4.5V$ to $5.5V$ for PI4S706, PI4S706H, PI4S708; $V_{CC}=3.15V$ to $5.5V$ for PI4S706T, PI4S706TH, PI4S708T; $V_{CC}=3.0V$ to $5.5V$ for PI4S706S, PI4S706SH, PI4S708S; $V_{CC}=2.7V$ to $5.5V$ for PI4S706R, PI4S706P, PI4S708R; $T_A=0^{\circ}C$ to $70^{\circ}C$; unless otherwise noted.)

Symbol	Description	Test Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage for PI4S70xxx, 813L		1.2		5.5	V
V_{IH1}	$\overline{MR}$ Input High Voltage	$V_{CC} > 4.0V$	2	2.4		
		$V_{CC} \leq 4.0V$	$0.7 \times V_{CC}$			
V_{IH2}	WDI Input High Voltage		$0.7 \times V_{CC}$			
V_{IL1}	$\overline{MR}$ Input Low Voltage	$V_{CC} > 4.0V$			0.8	
		$V_{CC} \leq 4.0V$			$0.2 \times V_{CC}$	
V_{IL2}	WDI Input Low Voltage				$0.3 \times V_{CC}$	
T_A	Operating Temperature		0		70	°C

DC Electrical Characteristics (Continued)

Symbol	Description	Test Conditions	Min	Typ	Max	Unit
I_{CC}	Operational Power Supply Current	PI4S705, 706, 706H, 707, 708, 813L, $V_{CC} = 5V$; PI4S706S, 706SH, 706T, 706TH, 708S, 708T, $V_{CC} = 3.3V$; PI4S706P, 706R, 708R, $V_{CC} = 3.0V$; Left WDI un-connected (No output load)		30	200	μA
V_{RST}	Reset Threshold Voltage *	PI4S705, 707, 813L	4.50	4.63	4.75	V
		PI4S706, 706H, 708	4.25	4.38	4.50	
		PI4S706T, 706TH, 708T	3.00	3.08	3.15	
		PI4S706S, 706SH, 708S	2.85	2.93	3.00	
		PI4S706P, 706R, 708R	2.55	2.63	2.70	
V_{RTH}	Reset Threshold Hysteresis *			70		mV
V_{OH}	Output HIGH Voltage	$V_{CC} > 4.5V$ $I_{source} = 800\mu A$	$V_{CC}-1.5$			V
		$V_{CC} > 2.7V$ $I_{source} = 500\mu A$	$0.8 \times V_{CC}$			
		$V_{CC} \geq 1.2V$ $I_{source} = 4\mu A$	$0.8 \times V_{CC}$			
V_{OL}	Output LOW Voltage	$V_{CC} > 4.5V$ $I_{sink} = 3.2mA$			0.4	
		$V_{CC} > 2.7V$ $I_{sink} = 1.2mA$			0.3	
		$V_{CC} \geq 1.2V$ $I_{sink} = 50\mu A$			0.3	
V_{PFT}	PFI Input Threshold	V_{PFI} varies from 1.0V to 1.5V	1.20	1.25	1.30	
I_{PFI}	PFI Input Current	PFI connected to V_{CC}			2	μA
		PFI connected to GND	-2			
I_{WDI}	Average WDI Input Current**	WDI connected to V_{CC}		30	100	
		WDI connected to GND	-100	-30		
I_{MR}	$\overline{MR}$ Input Current	$\overline{MR} = 0$, $V_{CC} = 5V$	-600	-250	-100	

* Valid for both RESET and $\overline{RESET}$.

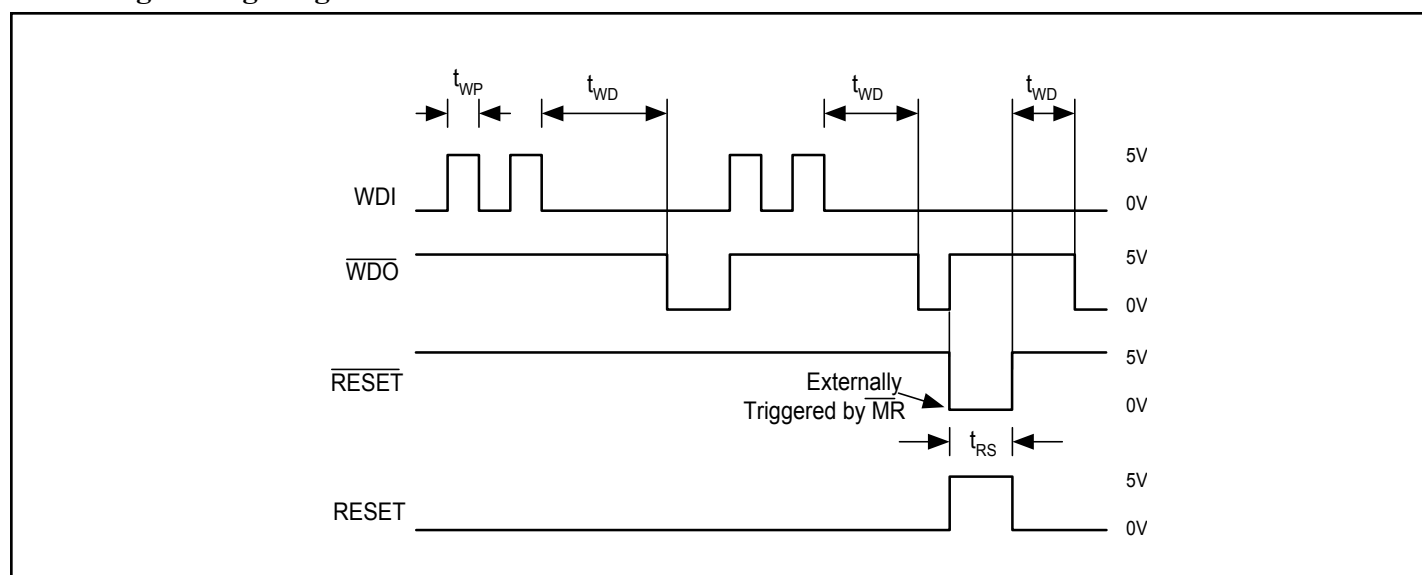
** WDI is internally serviced within the watchdog period if WDI is left unconnected.

AC Electrical Characteristics

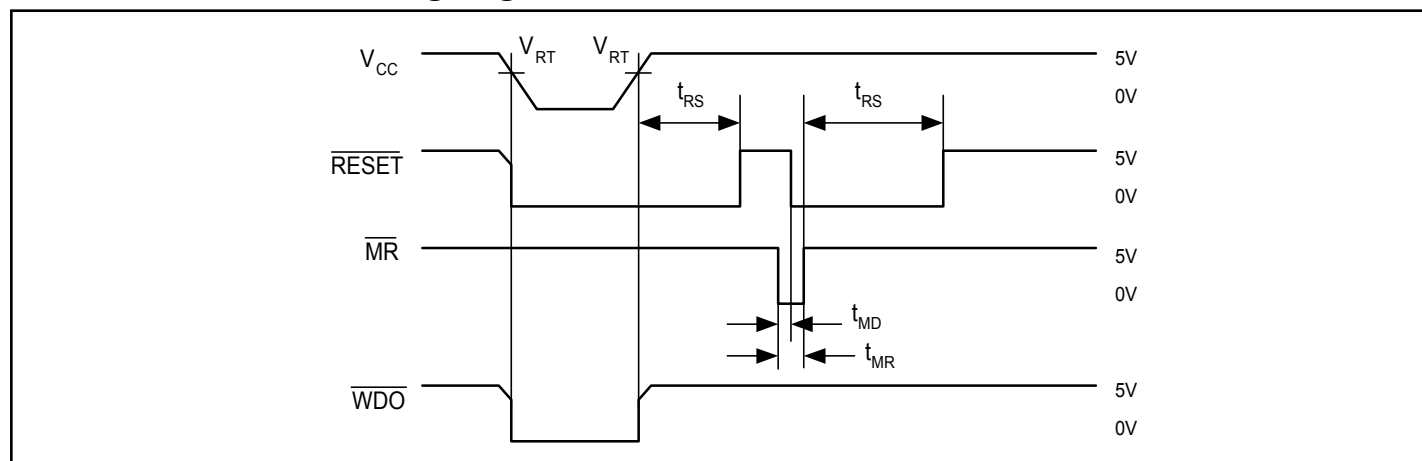
(V_{CC} = 4.75V to 5.5V for PI4S705, PI4S813L, PI4S707 ; V_{CC} = 4.5V to 5.5V for PI4S706, PI4S706H, PI4S708; V_{CC} = 3.15V to 5.5V for PI4S706T, PI4S706TH, PI4S708T; V_{CC} = 3.0V to 5.5V for PI4S706S, PI4S706SH, PI4S708S; V_{CC} = 2.7V to 5.5V for PI4S706R, PI4S706P, PI4S708R; T_A = 0°C to 70°C; unless otherwise noted.)

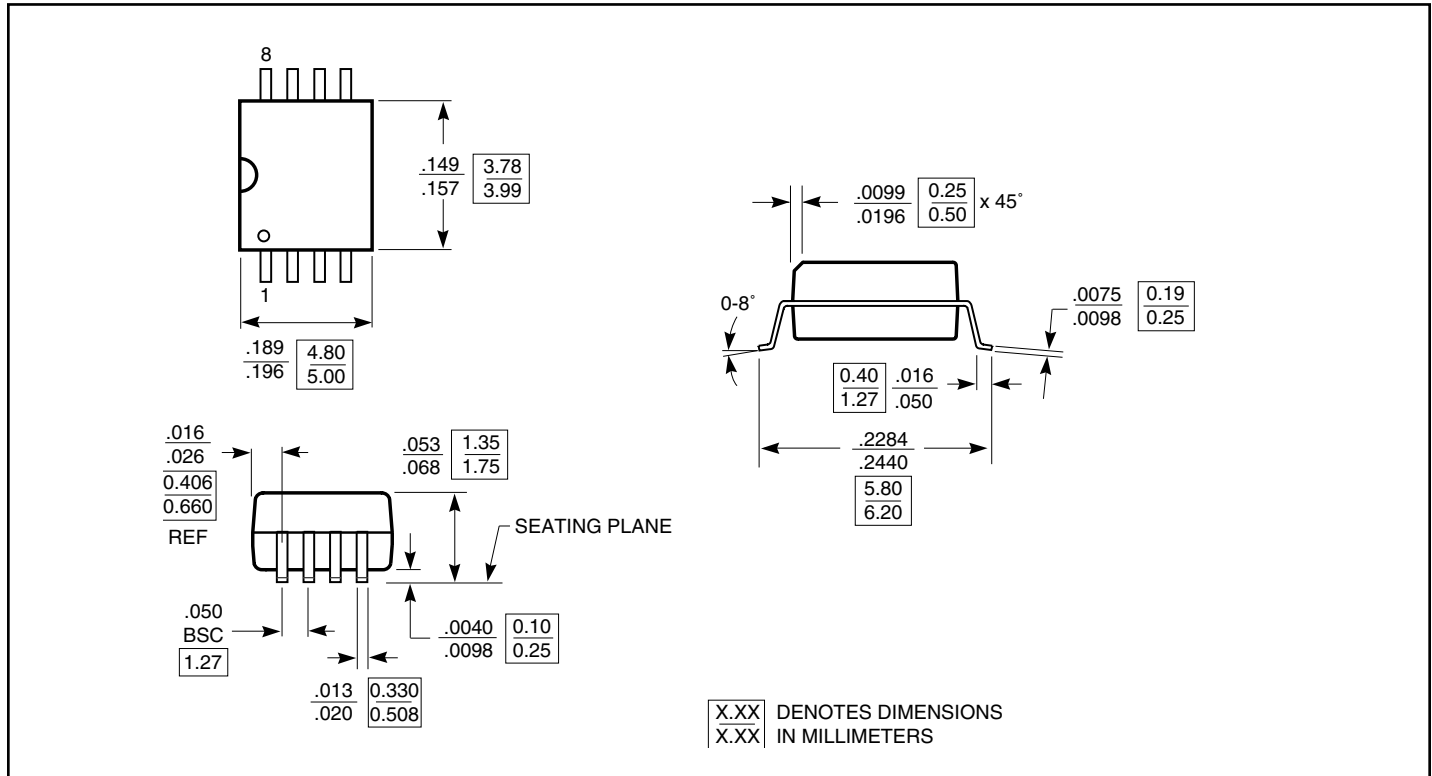
Symbol	Description	Test Conditions	Min	Typ	Max	Units
t_{RS}	Reset Pulse Width	$\overline{MR}$ from low to High	140	200	280	ms
t_{WD}	Watchdog Timeout Period	WDI and $\overline{MR}$ tied to V_{CC}	1	1.6	2.25	s
t_{MR}	$\overline{MR}$ Pulse Width		150			ns
t_{MD}	$\overline{MR}$ to RESET Output Delay	V_{CC} = 5.0V			250	
t_{WP}	WDI Pulse Width		50			

Watchdog Timing Diagram



$\overline{RESET}$, $\overline{MR}$, and $\overline{WDO}$ Timing Diagram with WDI 3-stated. ($\overline{RESET}$ output is the inverse of $\overline{RESET}$ shown).



Packaging Mechanical: 8-pin 150-mil wide plastic SOIC (W)

Ordering Information

Ordering Code	Packaging Code	Package Type	Reset Threshold
PI4S705W	W	8-pin, 150 mil wide plastic SOIC	4.63V
PI4S813LW	W	8-pin, 150 mil wide plastic SOIC	4.63V
PI4S707W	W	8-pin, 150 mil wide plastic SOIC	4.63V
PI4S706W	W	8-pin, 150 mil wide plastic SOIC	4.38V
PI4S706HW	W	8-pin, 150 mil wide plastic SOIC	4.38V
PI4S708W	W	8-pin, 150 mil wide plastic SOIC	4.38V
PI4S706TW	W	8-pin, 150 mil wide plastic SOIC	3.08V
PI4S706THW	W	8-pin, 150 mil wide plastic SOIC	3.08V
PI4S708TW	W	8-pin, 150 mil wide plastic SOIC	3.08V
PI4S706SW	W	8-pin, 150 mil wide plastic SOIC	2.93V
PI4S706SHW	W	8-pin, 150 mil wide plastic SOIC	2.93V
PI4S708SW	W	8-pin, 150 mil wide plastic SOIC	2.93V
PI4S706RW	W	8-pin, 150 mil wide plastic SOIC	2.63V
PI4S706PW	W	8-pin, 150 mil wide plastic SOIC	2.63V
PI4S708RW	W	8-pin, 150 mil wide plastic SOIC	2.63V

Notes:

1. Thermal characteristics can be found on the company web site at <http://www.pericom.com/packaging/mechanicals.php>