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April 1st, 2010
Renesas Electronics Corporation

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H8S Family

Measuring the High- and Low-Level Periods of a Pulse

Introduction

Measures the high and low widths of a pulse, and stores the result in the RAM.

Target Device

H8S/2339

Contents

1. Specifications

(1) Measures the low and high periods of a pulse and stores the results in the on-chip RAM, as shown in figure 1.
(2) In operation at 19.6608 MHz, the measurement of pulses with high and low widths is possible for every 50.86 ns between 0.86 ns and about 3.33 ms.

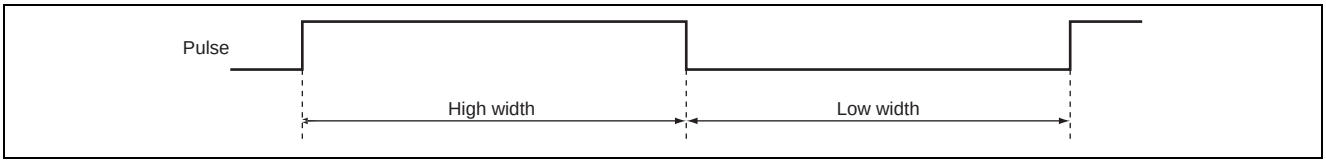


Figure 1 Timing of the Measurement of Pulse Width

2. Description of Function Usage

(1) The high and low widths of the pulse are measured by using TPU0.

(a) The following functions are used; a block diagram is given in figure 2.

- Detection of the rising and falling edges of pulses and setting of the timer value at the time in the internal register (input capture)
- Clearing of the timer counter on generation of the input capture
- Starting up interrupt handling on detection of the rising or falling edge of a pulse

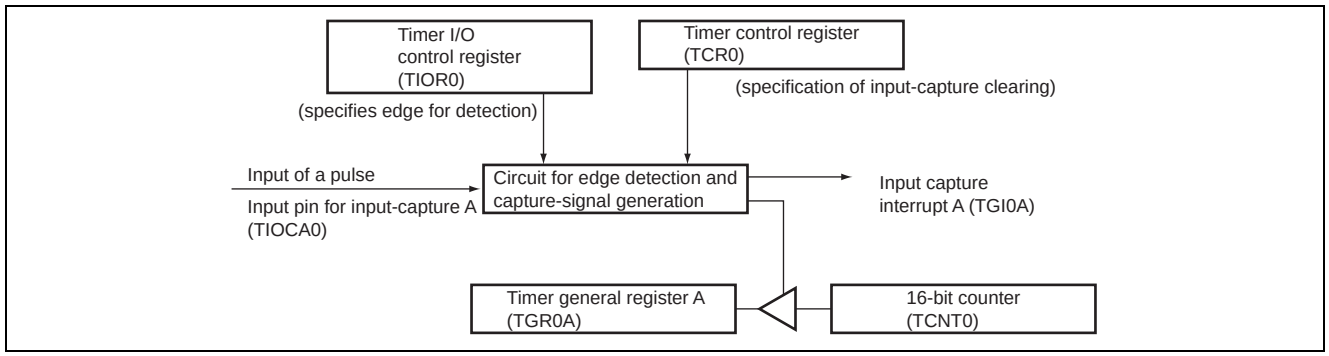


Figure 2 Blocks Used in Measuring the High and Low Periods of a Pulse

3. Principles of Operation

An outline of task operation is given in figure 3. As the figure shows, a combination of hardware and software processing is used to measure the high and low widths of the pulse.

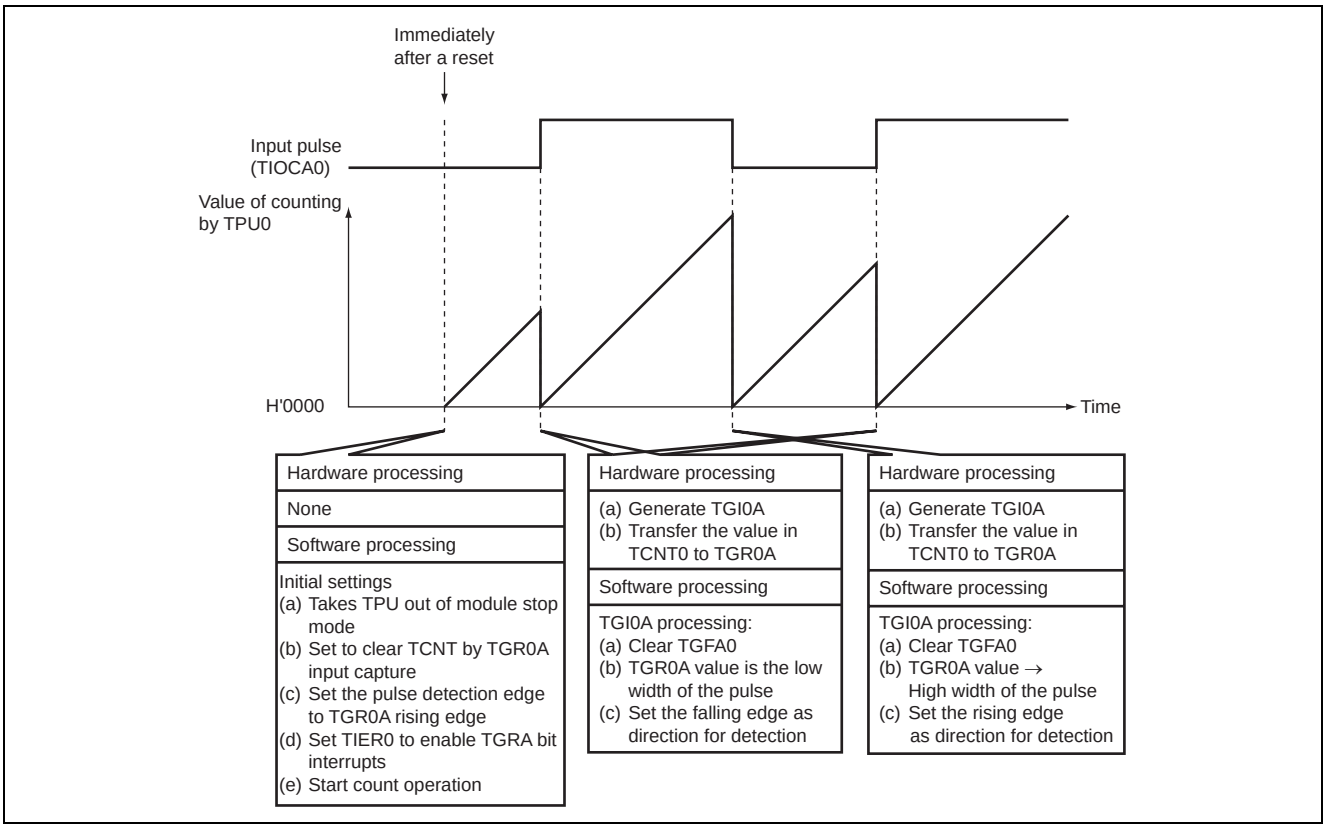


Figure 3 Measuring the Pulse Width

4. Software Description

(1) Function

Function	Label	Description
Main routine	PWHLN	Initializes setting of the TPU and RAM
Measurement of high/low periods	PWHL1	Initiated by TGI0A; reads the values of TGR0A that indicate the high and low periods of the pulse and places them in RAM

(2) Arguments

Label	Description	Data Type	Used in	I/O
pwh_hdata	Sets the timer value for the high period of the pulse. The period is obtained by this expression: pulse-high width (ns) = timer value x ϕ (cycle time, 50.86 ns in operation at 19.66 MHz)	unsigned short	Measurement of high and low periods of the pulse	Output
pwh_ldata	Sets the timer value for the low period of the pulse. The period is obtained by this expression: pulse-low width (ns) = timer value x ϕ (cycle time, 50.86 ns in operation at 19.66 MHz)	unsigned short		

(3) Internal Registers

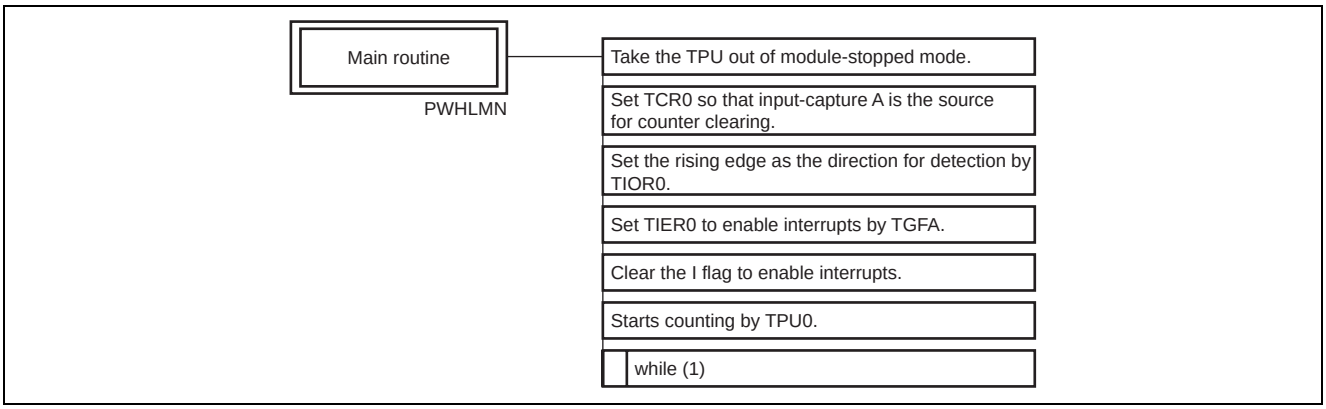
Register	Description	Used in
TSTR	Starts/stops the timer counter	Main routine
TCR0	Selects the TCNT counter clock, and sets input-capture A as the source for clearing the counter	Main routine
TIOR0	Sets the transfer value in TCNT to TGR0A on detection of the rising or falling edge of the pulse	Main routine
TIER0	Enables generation of TGI0A interrupts	Main routine, measurement of the high and low periods of the pulse
TGR0A	Sets the values of TCNT on rising and falling edges of the pulse signal for measuring the pulse cycle	Measurement of the high and low periods of the pulse
TSR0	Indicates the generation of input-capture A	Measurement of the high and low periods of the pulse
MSTPCR	Takes the TPU out of module-stopped mode	Main routine

(4) RAM Usage

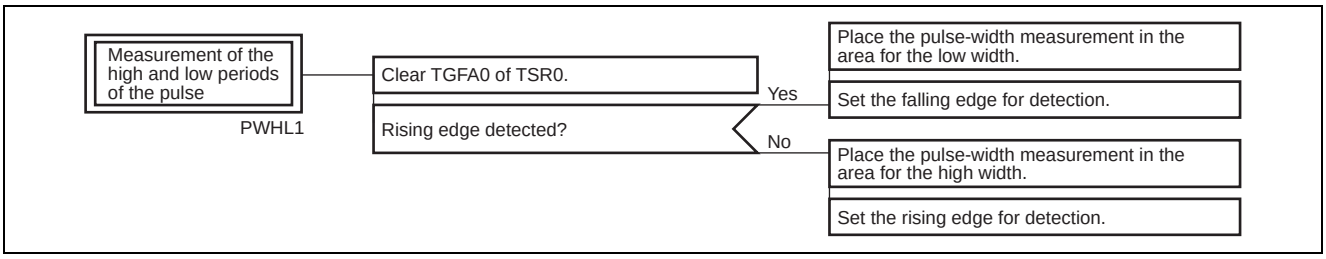
In this sample task, no RAM is used other than that for argument storage.

5. PAD

(1) Main routine



(2) Measurement of high and low widths of a pulse



Revision Record

		Description	
Rev.	Date	Page	Summary
1.00	Feb.17.05	—	First edition issued

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