R8C/56E Group

Timer RC Input Capture Function

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Abstract

This document describes a setting example of the input capture function in timer RC.

Products

R8C/56E Group

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Contents

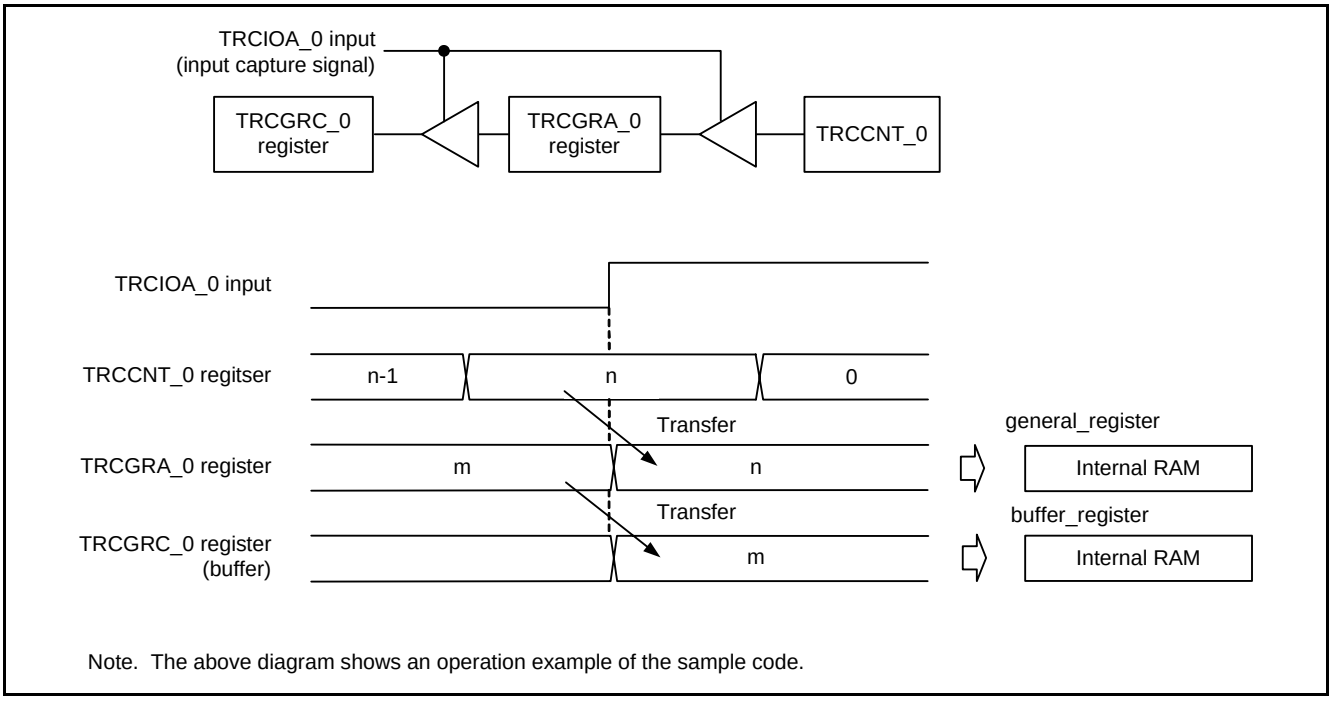
1. Specifications

The timer RC counter value is captured at both rising and falling edges of an input signal to the TRCIOA_0 pin and the pulse width (high or low) is measured. The captured values are stored in internal RAM.

Table 1.1 lists the Peripheral Function and Its Application and Figure 1.1 shows the Operation Overview.

Table 1.1 Peripheral Function and Its Application

Peripheral Function	Application
Input capture function in timer RC	Measure the pulse width (high or low) of an input signal to TRCIOA_0 pin



Note. The above diagram shows an operation example of the sample code.

Figure 1.1 Operation Overview

2. Operation Confirmation Conditions

The sample code accompanying this application note has been run and confirmed under the conditions below.

Table 2.1 Operation Confirmation Conditions

Item	Contents
MCU used	R8C/56E Group
Operating frequencies	• XIN: 20 MHz • System clock: 20 MHz • CPU clock: 20 MHz
Operating voltage	5.0 V (2.7 and 5.5 V)
Integrated development environment	Renesas Electronics Corporation High-performance Embedded Workshop Version 4.09.00.007
C compiler	Renesas Electronics Corporation M16C Series, R8C Family C Complier V.5.45 Release 01
	Compile options -D__UART0__ -c -finfo -dir "$(CONFIGDIR)" -R8C (Default setting is used in the integrated development environment.)

3. Hardware

3.1 Pin Used

Table 3.1 lists the Pin Used and Its Function.

Table 3.1 Pin Used and Its Function

Pin Name	I/O	Function
P1_1/TRCIOA_0	Input	Signal input for timer RC

4. Software

4.1 Operation Overview

(1) Perform initial setting of timer RC by a program.

(2) Set the CTS bit in the TRCMR_0 register to 1 to start the timer RC count.

(3) When a rising or falling edge is detected from the TRCIOA_0 pin, the value in the TRCGRA_0 register is transferred to the TRCGRC_0 register and the value in the TRCCNT_0 register is transferred to the TRCGRA_0 register. Then, the TRCCNT_0 register is cleared to 0000h and the IMFA bit in the TRCSR_0 register becomes 1.

(4) Read the IMFA bit by a program. If it is set to 1, the value in the TRCGRA_0 register is stored in the general_register and the value in the TRCGRC_0 register is stored in the buffer_register.

Table 4.1 lists the Timer RC Setting.

Table 4.1 Timer RC Setting

Item	Setting
Timer RC channel	Channel 0
Operation mode	Timer mode: Input capture function
Input capture register	TRCGRA_0 register
Buffer register	TRCGRC_0 register
Input edge	Both (rising and falling) edges
Counter clear function	Used
Digital filter function	Not used
Interrupts	Not used

4.2 Required Memory Size

Table 4.2 lists the Required Memory Size.

Table 4.2 Required Memory Size

Memory Used	Size	Remarks
ROM	195 bytes	In the r01an0985_src.c.module
RAM	4 bytes	In the r01an0985_src.c.module
Maximum user stack usage	10 bytes	
Maximum interrupt stack usage	0 bytes	

Note: The required memory size varies depending on the C compiler version and compile options.

4.3 Variables

Table 4.3 lists the Global Variables.

Table 4.3 Global Variables

Type	Variable Name	Contents	Function Used
unsigned short	general_register	Store the value captured at the TRCGRA_0 register.	main
unsigned short	buffer_register	Store the value captured at the TRCGRC_0 register.	main

4.4 Functions

Table 4.4 lists the Functions.

Table 4.4 Functions

Function Name	Outline
mcu_init	System clock setting
timer_rc_init	Initial setting of timer RC

4.5 Function Specifications

The following tables list the sample code function specifications.

mcu_init	
Outline	System clock setting
Header	None
Declaration	void mcu_init(void)
Description	Set the system clock.
Arguments	None
Returned Value	None

timer_rc_init	
Outline	Initial setting of timer RC
Header	None
Declaration	void timer_rc_init(void)
Description	Perform initial setting to use the input capture function in timer RC.
Arguments	None
Returned Value	None

4.6 Flowcharts

4.6.1 Main Processing

Figure 4.1 shows the Main Processing.

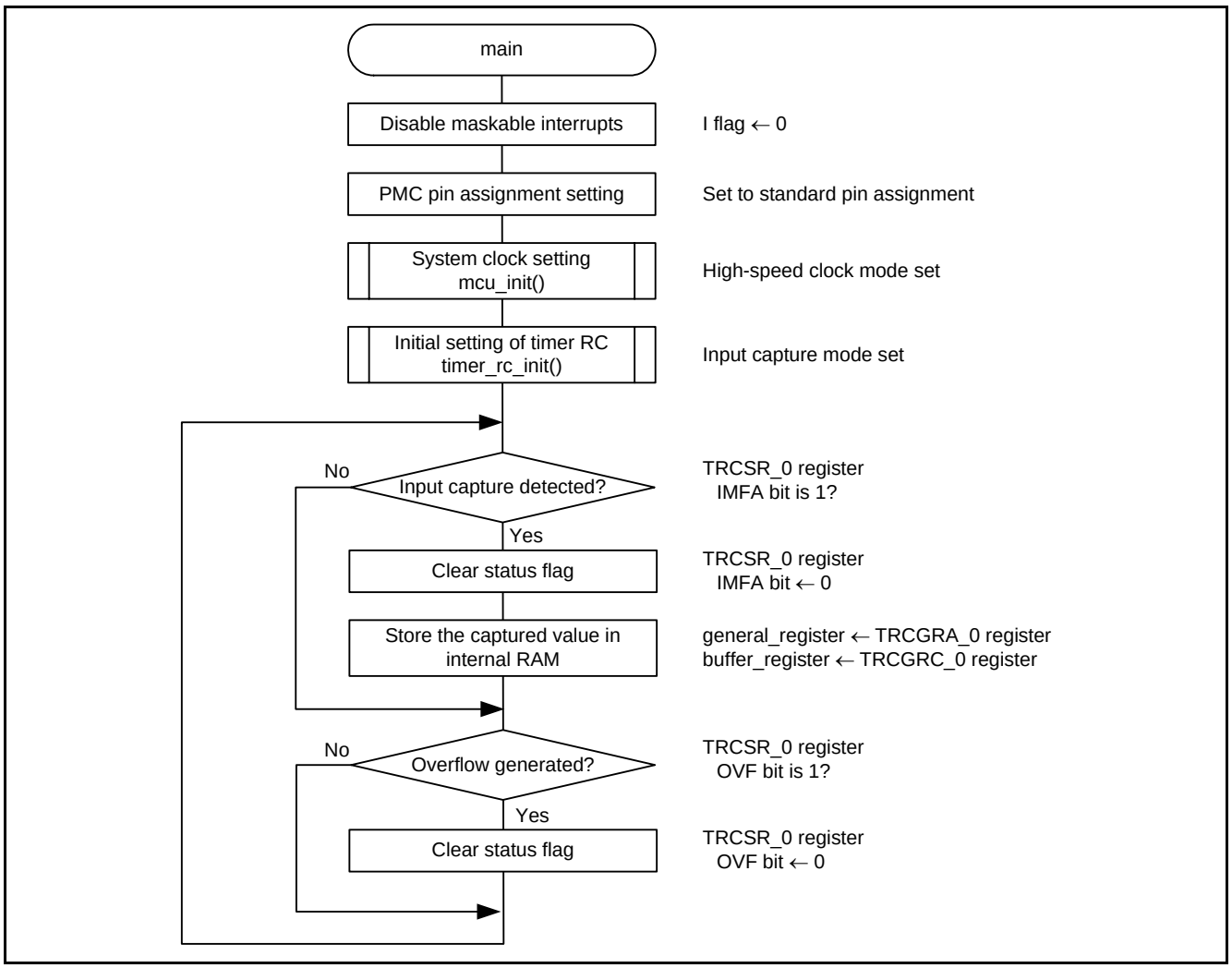


Figure 4.1 Main Processing

4.6.2 System Clock Setting

Figure 4.2 shows the System Clock Setting.

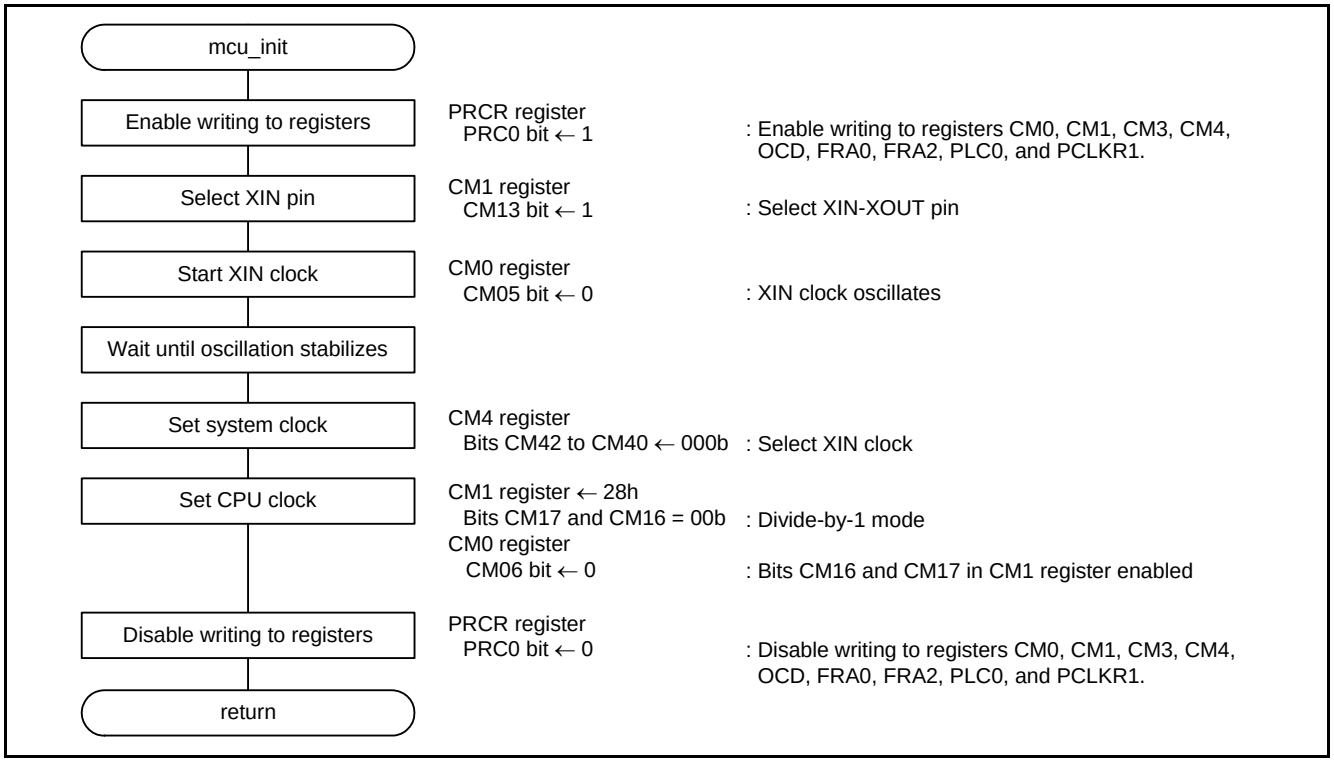


Figure 4.2 System Clock Setting

4.6.3 Initial Setting of Timer RC

Figure 4.3 shows the Initial Setting of Timer RC.

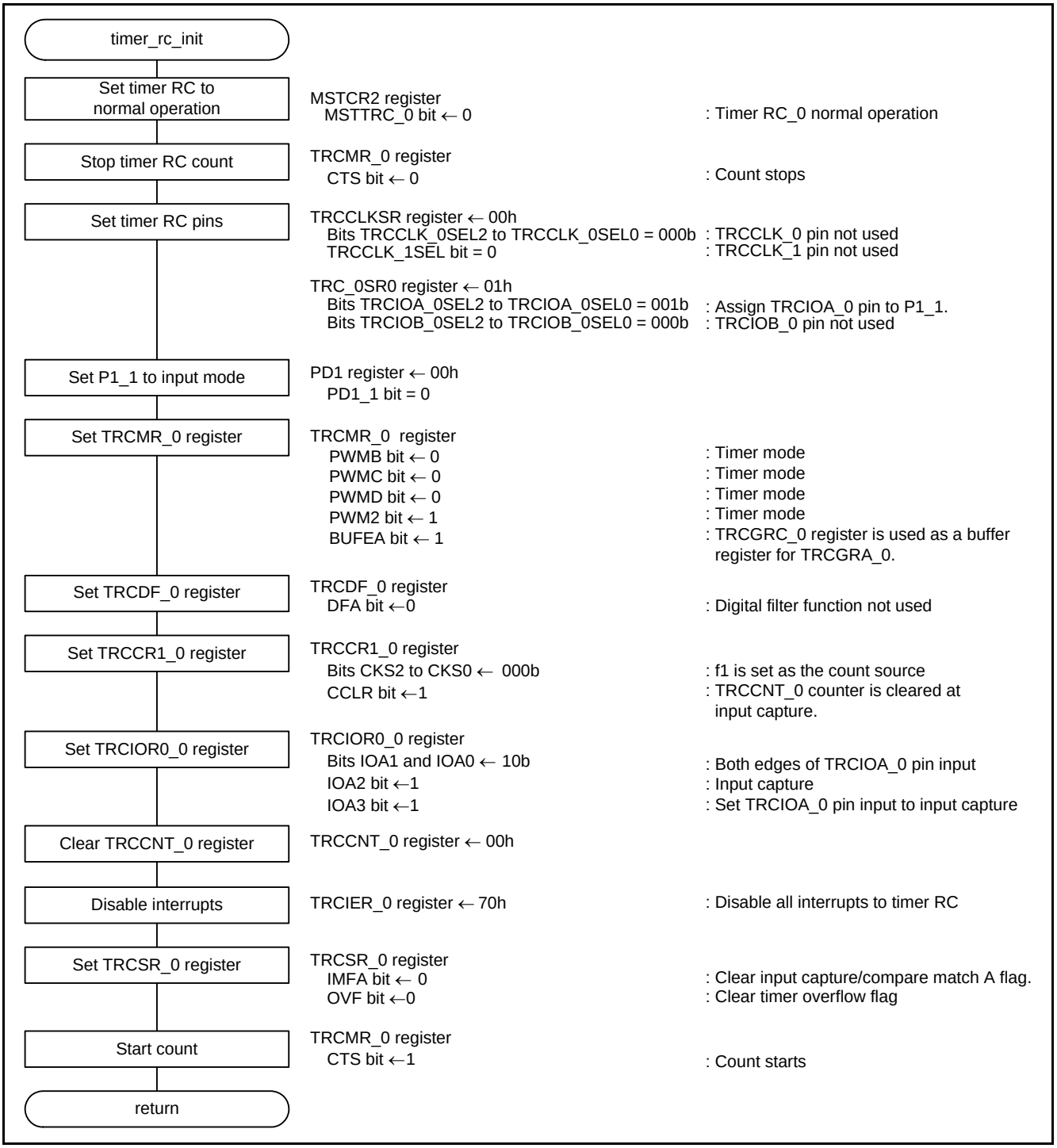


Figure 4.3 Initial Setting of Timer RC

5. Sample Code

Sample code can be downloaded from the Renesas Electronics website.

6. Reference Documents

User's Manual: Hardware

R8C/56E Group User's Manual: Hardware Rev.1.00

The latest version can be downloaded from the Renesas Electronics website.

Technical Update/Technical News

The latest information can be downloaded from the Renesas Electronics website.

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REVISION HISTORY	R8C/56E Group Application Note Timer RC Input Capture Function

Rev.	Date	Description	
		Page	Summary
1.00	June 29, 2012	—	First edition issued

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins
   Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.
   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.
2. Processing at Power-on
   The state of the product is undefined at the moment when power is supplied.
   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.
3. Prohibition of Access to Reserved Addresses
   Access to reserved addresses is prohibited.
   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.
4. Clock Signals
   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.
   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.
5. Differences between Products
   Before changing from one product to another, i.e. to one with a different type number, confirm that the change will not lead to problems.
   — The characteristics of MPU/MCU in the same group but having different type numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different type numbers, implement a system-evaluation test for each of the products.

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