R8C/56E Group

Timer RD Output Compare Function

R01AN1071EJ0100
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Abstract

This document describes a setting example of the output compare function in timer RD.

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

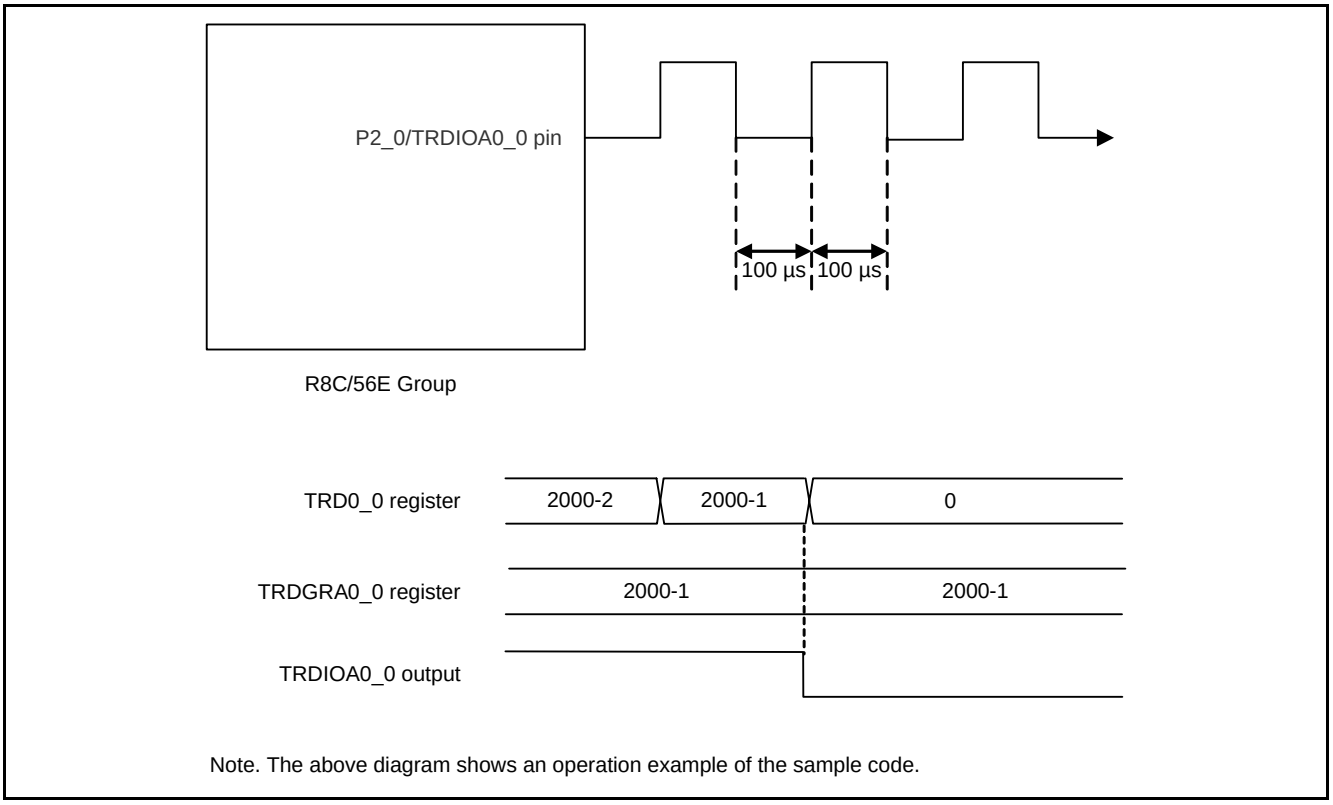
1. Specifications

Output from the TRDIOA0_0 pin is toggled when there is a compare match between the timer RD counter value and the TRDGRA0_0 register value.

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
Output compare function in timer RD	Toggle output from TRDIOA0_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
P2_0/TRDIOA0_0	Output	Signal output for timer RD

4. Software

4.1 Operation Overview

(1) Perform initial setting of timer RD0 by a program. Set the initial output level of theTRDIOA0_0 pin as high.

(2) Set the TSTART0 bit in the TRDSTR_0 register to 1 to start the timer RD0 count.

(3) When the count value in the TRD0_0 register matches the value of the TRDGRA0_0 register, the output level of the TRDIOA0_0 pin is toggled. Then, the count value in the TRD0_0 register is cleared.

Table 4.1 lists the Timer RD Setting.

Table 4.1 Timer RD Setting

Item	Setting
Timer RD channel	Channel 0
Operation mode	Timer mode: Output compare function : Toggle output (output inverted every 100 µs) 100 µs = f1 × (TRDGRA0_0 + 1) = 1/20 MHz × 2000
Output compare register	TRDGRA0_0 register
Counter clear function	Used
Pulse output forced cutoff input 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	76 bytes	In the r01an1071_src.c.module
RAM	0 bytes	In the r01an1071_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 Functions

Table 4.3 lists the Functions.

Table 4.3 Functions

Function Name	Outline
mcu_init	System clock setting
timer_rd_init	Initial setting of timer RD

4.4 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_rd_init	
Outline	Initial setting of timer RD
Header	None
Declaration	void timer_rd_init(void)
Description	Perform initial setting to use the output compare function in timer RD.
Arguments	None
Returned Value	None

4.5 Flowcharts

4.5.1 Main Processing

Figure 4.1 shows the Main Processing.

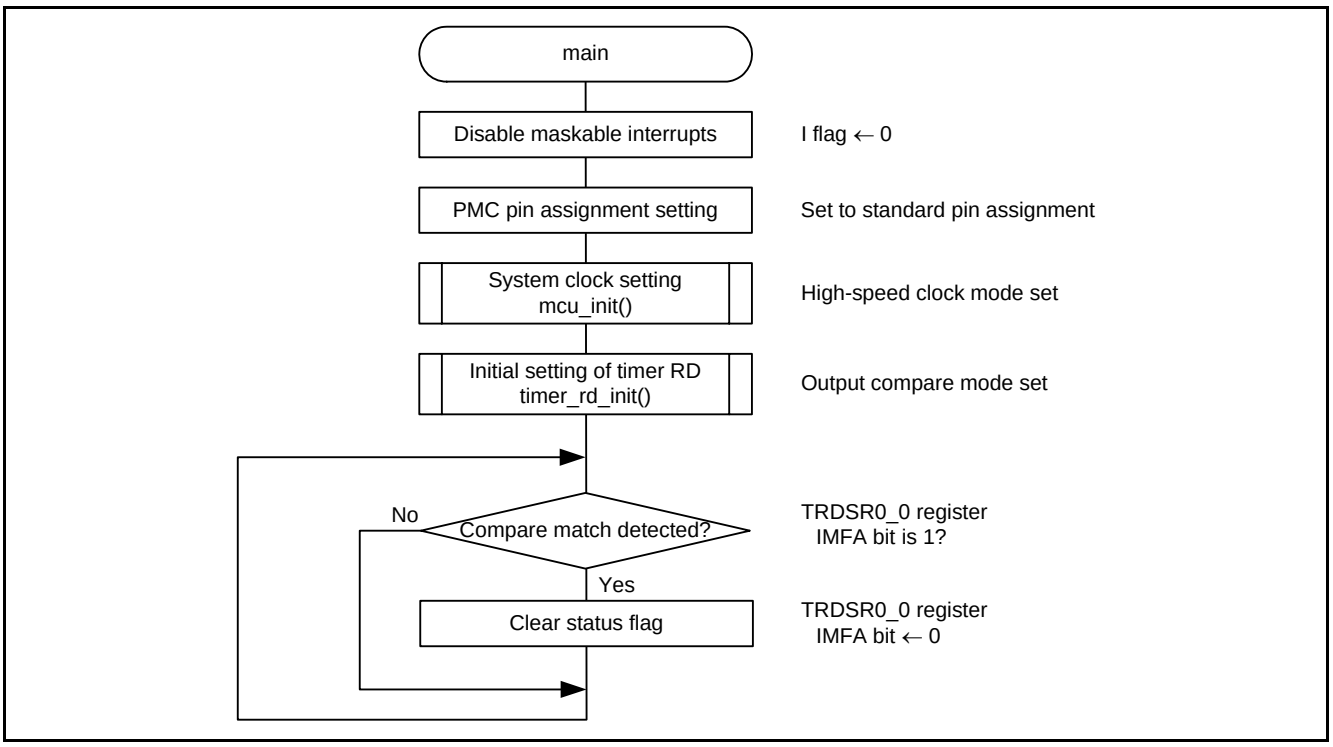


Figure 4.1 Main Processing

4.5.2 System Clock Setting

Figure 4.2 shows the System Clock Setting.

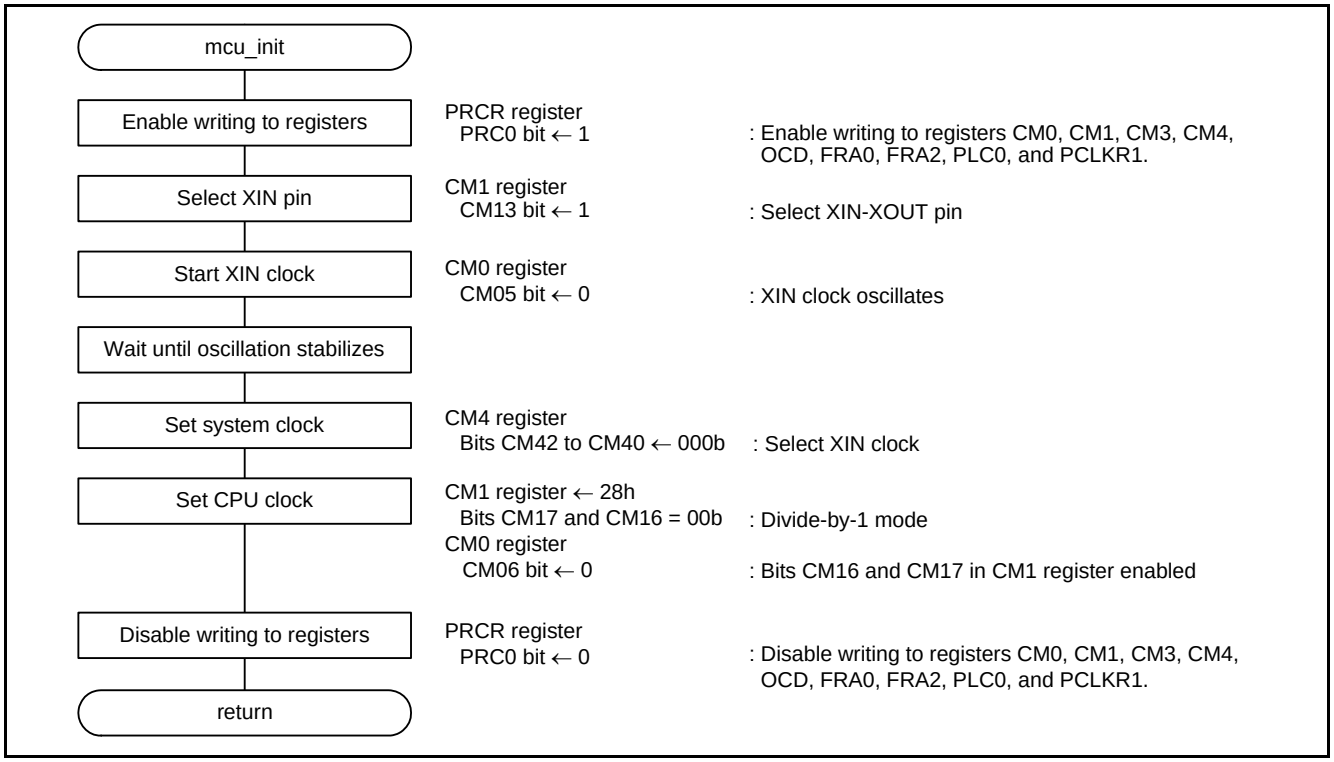


Figure 4.2 System Clock Setting

4.5.3 Initial Setting of Timer RD

Figure 4.3 shows the Initial Setting of Timer RD.

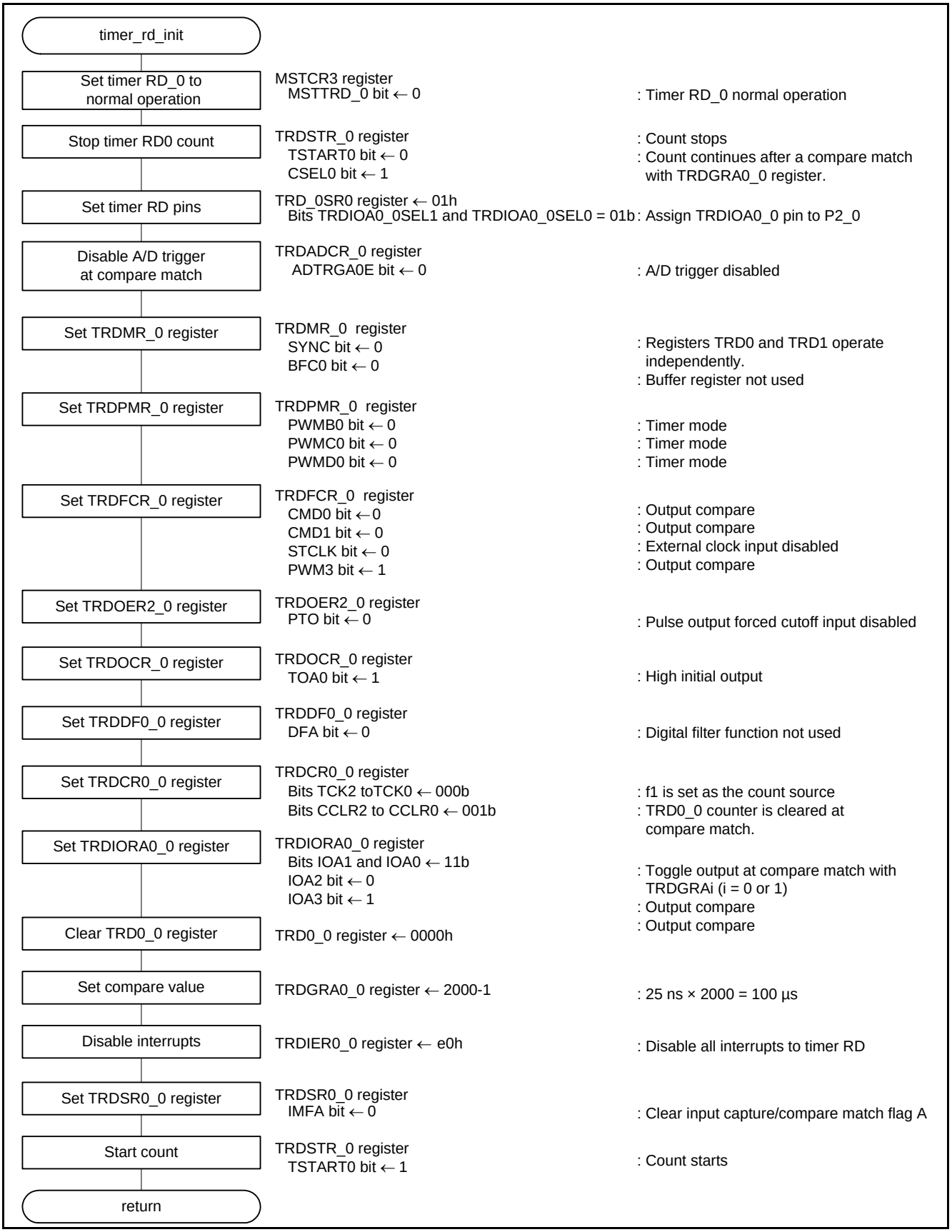


Figure 4.3 Initial Setting of Timer RD

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

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REVISION HISTORY	R8C/56E Group Application Note Timer RD Output Compare 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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