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April 1st, 2010
Renesas Electronics Corporation

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78K0R/Kx3 Microcontroller

Sample Program

Operation Manual

(External Event Counter (Timer Array Unit), C Source)

This software is for reference only and NEC Electronics does not guarantee its operation.
Thoroughly evaluate this software on your set prior to use.

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1st Product Solution Group, Multipurpose Microcomputer Systems Division,
Microcomputer Operations Unit
NEC Electronics Corporation

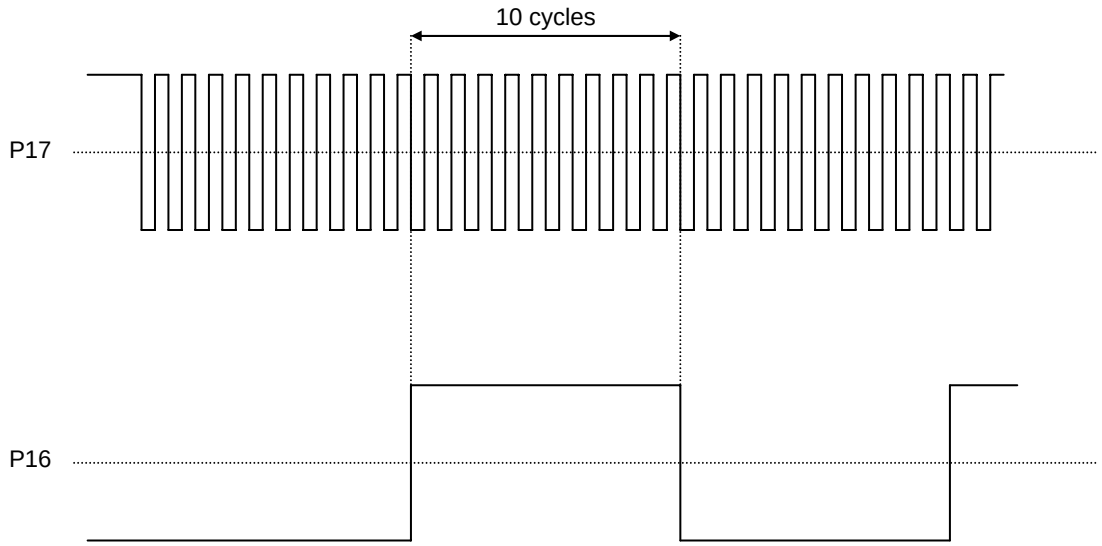
CONTENTS

1. OVERVIEW

This manual explains the sample program functions of the external event counter for the 78K0R/Kx3.

In this sample program, the rising edge of P17 is detected by using timer channel 2. The main clock whose frequency is $1/2^5$ is used as the count clock. The valid number of times of counting the edge is 10, and INTTM02 is output at the 10th count. When INTTM02 is output, output pin P16 performs a toggle output.

This sample program uses the rising edge of P17 as an external event and toggles the output of P16 when INTTM02 is output.



2. RESOURCES USED

Resource	Description	Remark
Main clock specification	Internal high-speed oscillator used (8 MHz (TYP.))	Supplied to CPU and peripheral hardware
	High-speed system clock used (20 MHz)	Oscillated by initial processing
Subclock	XT1 (32.768 kHz)	Oscillated by initial processing
Related hardware	Peripheral enable register 0 (PER0)	Controls the input clock of the timer array unit.
	Timer clock select register 0 (TPS0)	Operation clock: CK01 ($1/2^5$), 0.25 MHz (4.0 μs)
	Timer mode register 02 (TMR02)	Operation clock: CK01, 8 MHz (0.125 μs)
	Timer data register 02 (TDR02)	Valid edge detection counts: 10 counts
	Timer output mode register 0 (TOM0)	Channel 2 toggle operation mode
	Timer output level register 0 (TOL0)	Channel 2 positive logic output (active high)
	Timer output register 0 (TO0)	Channel 2 timer output value is “0”.
	Timer channel start register 0 (TS0)	
	Timer channel stop register 0 (TTO)	
	Port mode register (PM1)	
	Port register (P1)	
I/O	Input: P17 Output: P16	
Interrupt	Timer interrupt	
Others	Not used	

3. SOFTWARE CONFIGURATION

Files

File Name	Processing Outline
K0R_def.h	Definition file
K0R_init.c	Initialization processing
K0R_ext.h	External declaration
K0R_main.c	Main processing
K0R_sfr_set.c	External event counter

4. FUNCTION EXPLANATIONS

[File name]

K0R_main.c

Function

Function Name	Processing Outline	Argument	Return Value
main	External event counter main processing	None	None

Function explanations

Function name	Main
Processing	External event counter main processing
Argument	–
Return value	–
Description	Sets P16 to the output mode. Executes initialization processing and then starts external event counter measurement. P16's status is reversed when the interrupt request flag of timer channel 02 is set to ON. Then the interrupt request flag is cleared.
Remark	–

[File name]

K0R_sfr_set.c

Functions

Function Name	Processing Outline	Argument	Return Value
STM_EINI	Initializes external event counter.	None	None
STM_ESTT	Starts external event counter operation.	None	None
STM_ESTP	Stops external event counter operation.	None	None

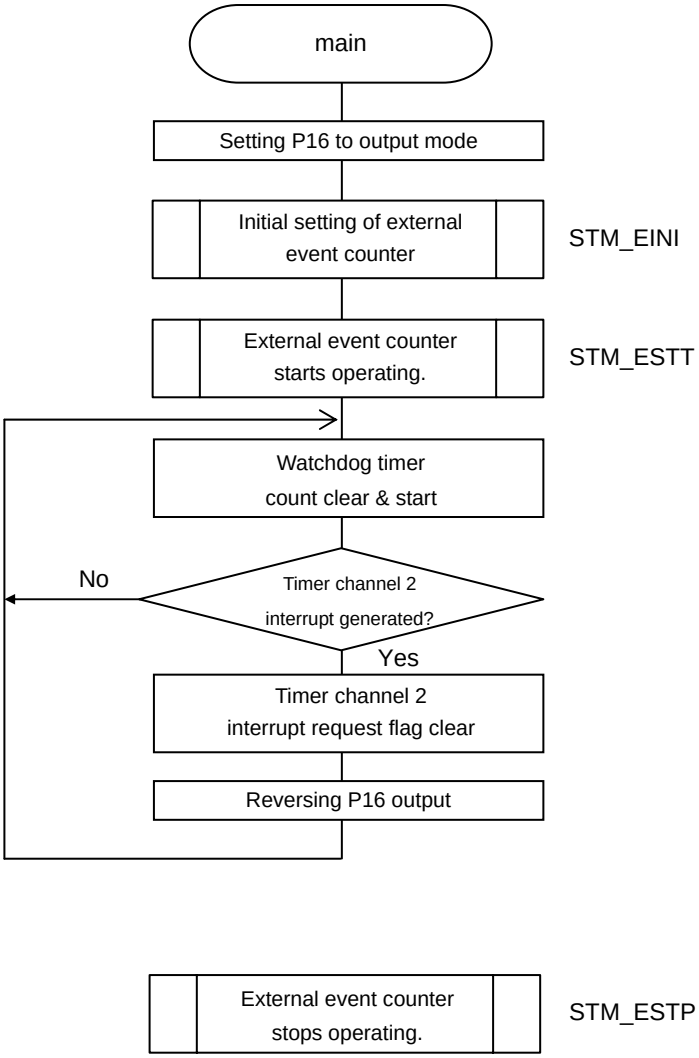
Function explanations

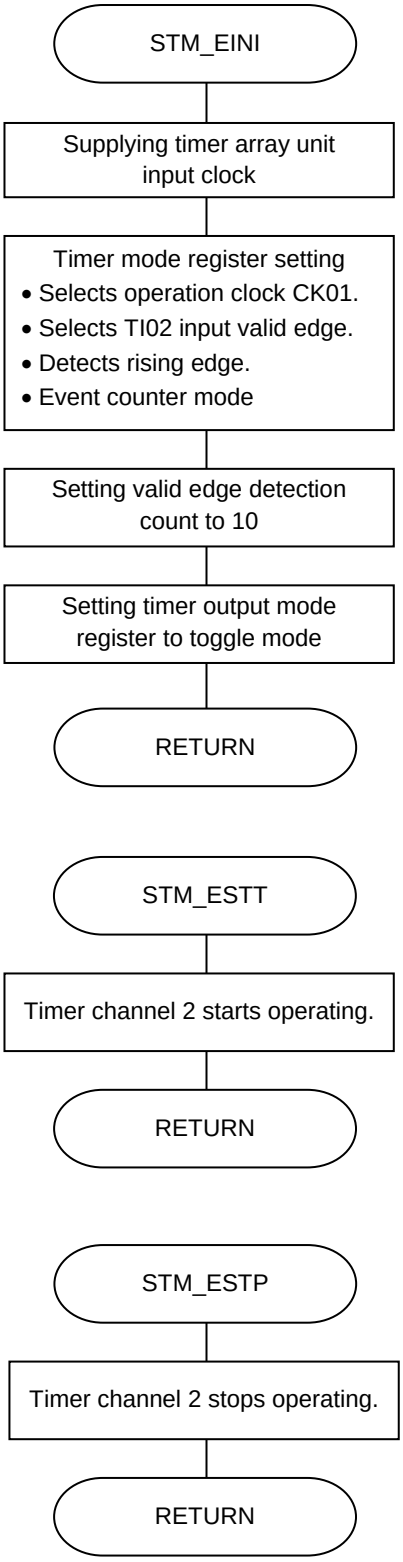
Function name	STM_EINI
Processing	Initializes external event counter.
Argument	–
Return value	–
Description	Initializes the timer array unit. • Supplies a timer array unit input clock. • Sets the clock frequency to 4 μs. Initializes timer channel 2. • Operation mode: Operation clock CK01, selection of the valid edge of the TI02 pin input, rising edge detection, event counter mode • Output mode: Toggle operation mode • Sets the valid edge detection count to 10.
Remark	This function is called after reset.

Function name	STM_ESTT
Processing	Starts external event counter operation.
Argument	–
Return value	–
Description	Starts timer channel 2 operation.
Remark	–

Function name	STM_ESTP
Processing	Stops external event counter operation.
Argument	–
Return value	–
Description	Stops timer channel 2 operation.
Remark	–

5. FLOWCHARTS




STM_EINI
Supplying timer array unit input clock
Timer mode register setting
• Selects operation clock CK01.
• Selects TI02 input valid edge.
• Detects rising edge.
• Event counter mode
Setting valid edge detection count to 10
Setting timer output mode register to toggle mode
RETURN
STM_ESTT
Timer channel 2 starts operating.
RETURN
STM_ESTP
Timer channel 2 stops operating.
RETURN