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April 1st, 2010
Renesas Electronics Corporation

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78K0R/Kx3 Microcontroller

Sample Program

Operation Manual

(Interval Timer/Square Wave Output (Timer Array Unit), ASM 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.

ZUD-CC-07-0071-E
January, 2008

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

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M8E 02. 11-1

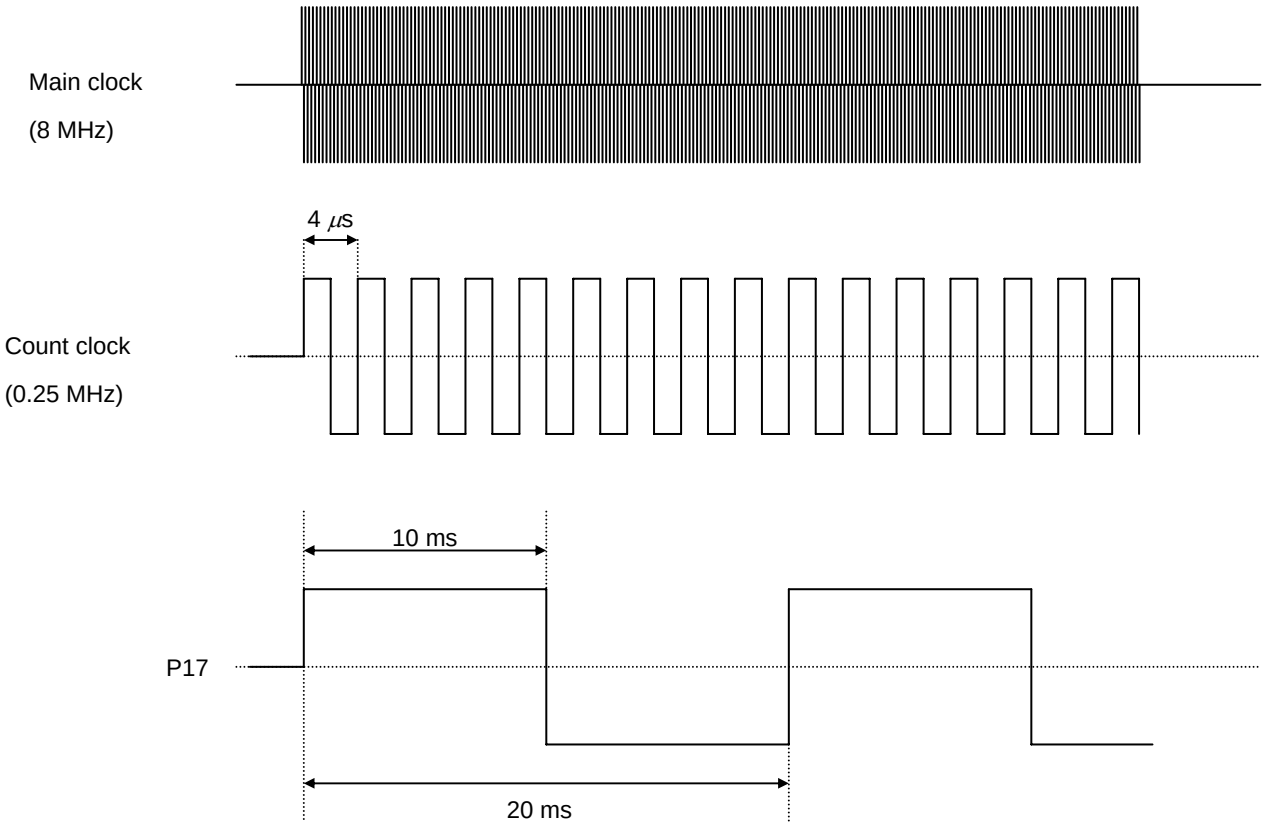
CONTENTS

1. OVERVIEW

This manual explains sample program functions of the interval timer/square wave output for the 78K0R/Kx3.

In this sample program, an interrupt is generated at intervals of 10 ms (every 2,500 counts) by using a count clock whose frequency is $1/2^5$ of that of the main clock (8 MHz).

A toggle operation is performed by using output pin P17 to output a square wave with a cycle of 20 ms and a duty factor of 50% when the interrupt is generated.



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 μs)
	Timer mode register 02 (TMR02)	Operation clock: CK01, 8 MHz (0.125 μs)
	Timer data register 02 (TDR02)	Interval cycle: 10 ms (4 μs $\times$ 2500)
	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 output enable register 0 (TOE0)	Channel 2 timer output enable (valid when square wave is output)
	Timer channel start register 0 (TS0)	
	Timer channel stop register 0 (TTO)	
	Port mode register (PM1)	
	Port register (P1)	
I/O	Output: TO02 (P17)	
Interrupt	Timer channel 2	
Others	Not used	

3. SOFTWARE CONFIGURATION

Files

File Name	Processing Outline
K0R_vct.asm	Vector processing
K0R_init.asm	Initialization processing
K0R_main.asm	Main processing
K0R_sfr_set.asm	Interval timer/square wave output

4. FUNCTION EXPLANATIONS

[File name]

K0R_main.asm

Function

Function Name	Processing Outline	Argument	Return Value
MMA_STRT	Main routine	None	None

Function explanations

Function name	MMA_STRT
Processing	Main routine
Argument	–
Return value	–
Description	Executes initialization processing and then starts interval timer/square wave output. After timer channel 2 interrupt request flag is set to ON, clears it.
Remark	–

[File name]

K0R_sfr_set.asm

Functions

Function Name	Processing Outline	Argument	Return Value
STM_IINI	Initializes interval timer/square wave output.	None	None
STM_ISTT	Starts interval timer/square wave output operation.	None	None
STM_ISTP	Stops interval timer/square wave output operation.	None	None

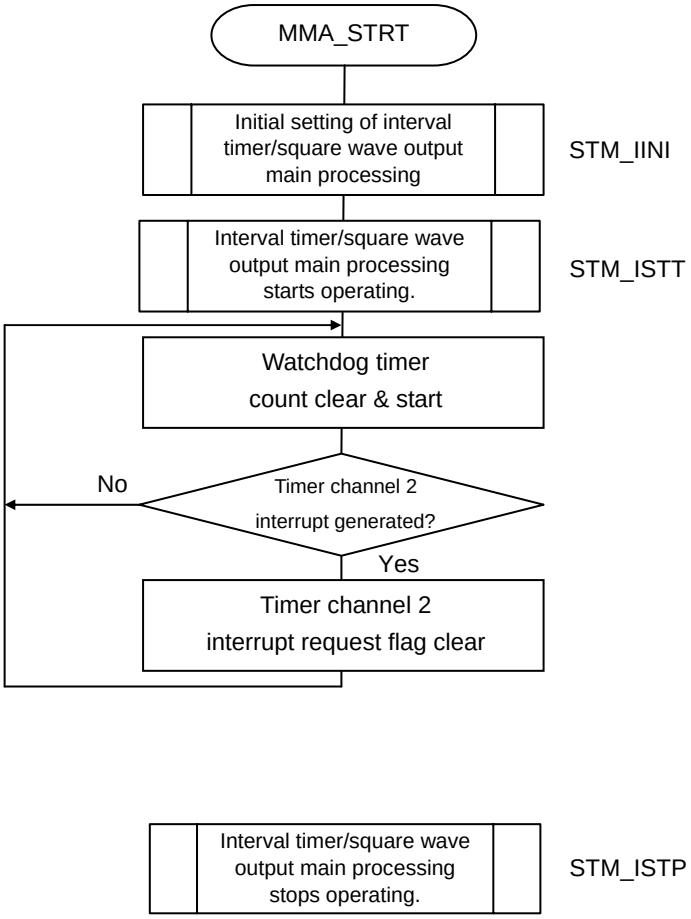
Function explanations

Function name	STM_IINI
Processing	Initializes interval timer/square wave output.
Argument	–
Return value	–
Description	Initializes the timer array unit. • Supplies a timer array unit input clock. • Sets the clock frequency of CK01 to 4 μs. Initializes timer channel 2. • Uses operation clock CK01 and sets the interval timer mode. • Sets the generation cycle to 10 ms. • Enables output.
Remark	–

Function name	STM_ISTT
Processing	Starts interval timer/square wave output operation.
Argument	–
Return value	–
Description	Starts timer channel 2 operation. • Enables output. • Starts operation. • Clears interrupt request flag. • Enables interrupts.
Remark	–

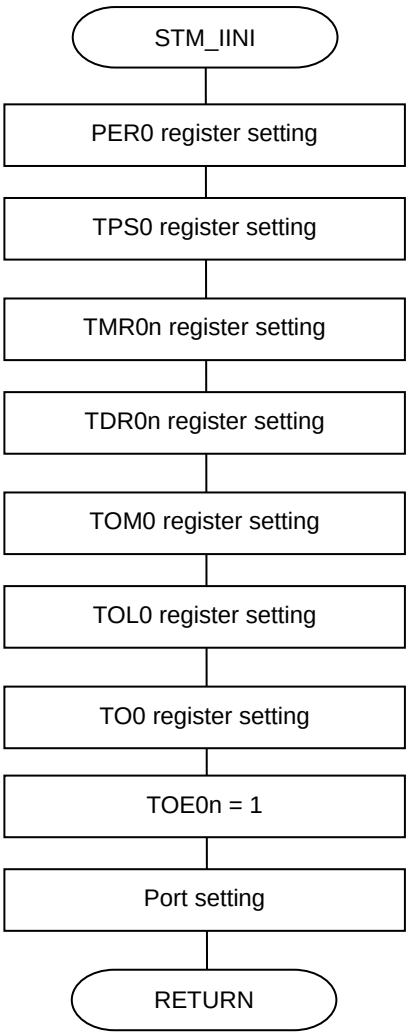
Function name	STM_ISTP
Processing	Stops interval timer/square wave output operation.
Argument	–
Return value	–
Description	Stops timer channel 2 operation. • Stops operation. • Disables output.
Remark	–

5. FLOWCHARTS



Remark n = 0 to 7 can be set.

n = 2 for this sample program.



Supplies a timer array unit input clock.

Determines the clock frequency (CK01 used).
Sets the clock cycle of CK01 to 4 μs.

Determines the operation mode of the channel.
Uses operation clock CK01 for timer channel n.

Sets the interval (cycle) value.
Sets the generation cycle of timer channel n to 10 ms.

Sets the timer output mode register.

Sets the timer output level register.

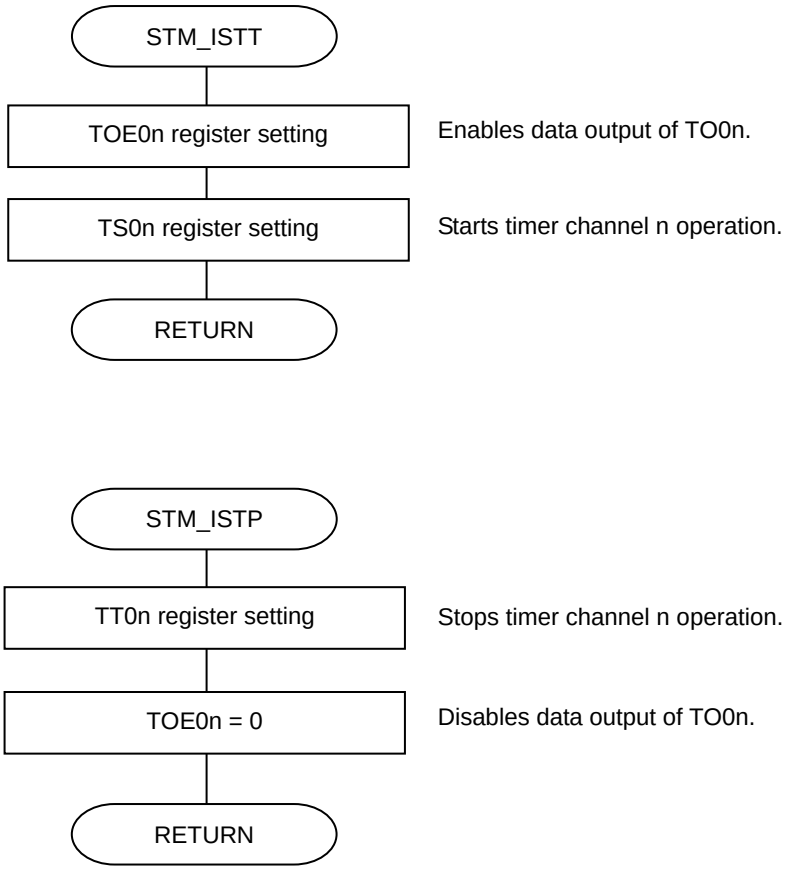
Sets the timer output register.

Enables data output of TO0n.

Validates data output of the target channel by setting the port register and port mode register.

Remark n = 0 to 7 can be set.

n = 2 for this sample program.



Remark n = 0 to 7 can be set.

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