

To our customers,

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# **78K0R/Kx3 Microcontroller**

## **Sample Program**

### **Operation Manual**

#### **(Measurement of High-/Low-Level Width of Input Signal (Timer Array Unit), ASM Source)**

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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

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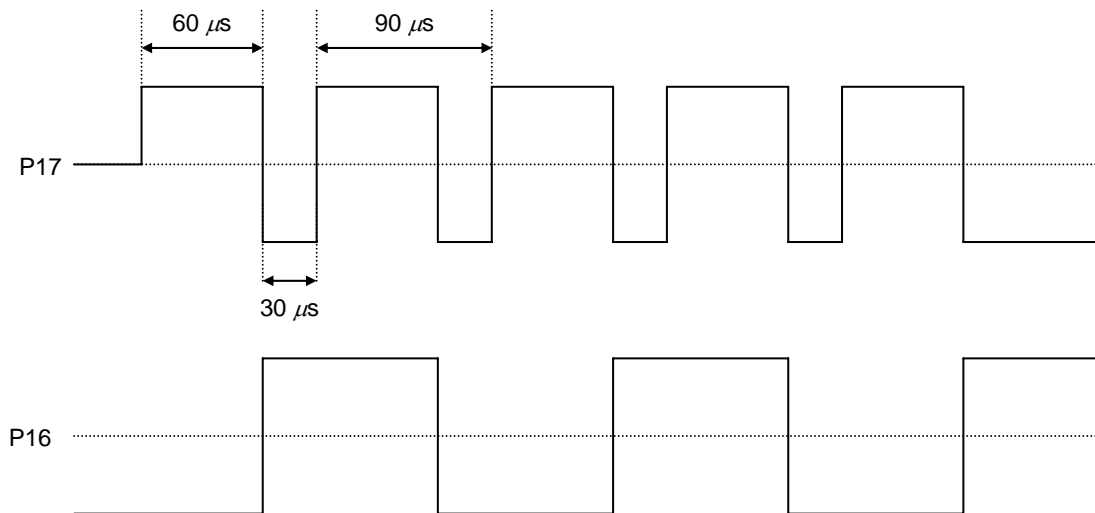
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## 1. OVERVIEW

This manual explains the sample program functions of measurement of high-/low-level width of input signal for the 78K0R/Kx3 microcontroller.

In this sample program, both the rising and falling edges of P17 are detected by using timer channel 2. Each time the rising edge of P17 is detected and INTTM02 is output, TMR02 is read and the high-level width is measured. The measured high-level width is stored in TDR02.

It is assumed that the pulse interval of the signal input to P17 is  $90\ \mu\text{s}$  (H/L =  $60\ \mu\text{s}/30\ \mu\text{s}$ ). P16 is used for checking the operation as it outputs a signal that reverses the high or low level when measuring the high-level width of P17 is completed.



## 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, 8 MHz (0.125 $\mu$ s)
	Timer mode register 02 (TMR02)	Operation clock: CK01, 8 MHz (0.125 $\mu$ s)
	Timer data register 02 (TDR02)	Used to store the pulse width.
	Timer output mode register 0 (TOM0)	Channel 0 toggle operation mode
	Timer output level register 0 (TOL0)	Channel 0 positive logic output (active high)
	Timer output register 0 (TO0)	Channel 0 timer output value is "0".
	Timer output enable register 0 (TOE0)	Enables TO02 operation by counting operation.
	Timer channel start register 0 (TS0)	
	Timer channel stop register 0 (TTO)	
	Port mode register (PM1)	
I/O	Input: P17	
	Output: TO02 (P16)	
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	Input signal pulse measurement



#### 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	<p>Sets P16 to the output mode.</p> <p>Executes initialization processing and then starts measurement of high-/low-level width of input signal.</p> <p>P16's status is reversed when the interrupt request flag of timer channel 2 is set to ON. Then the interrupt request flag is cleared.</p>
Remark	–

[File name]

K0R\_sfr\_set.asm

Functions

Function Name	Processing Outline	Argument	Return Value
STM_LINI	Initializes measurement of high-/low-level width of input signal.	None	None
STM_LSTT	Starts measurement of high-/low-level width of input signal operation.	None	None
STM_LSTP	Stops measurement of high-/low-level width of input signal operation.	None	None

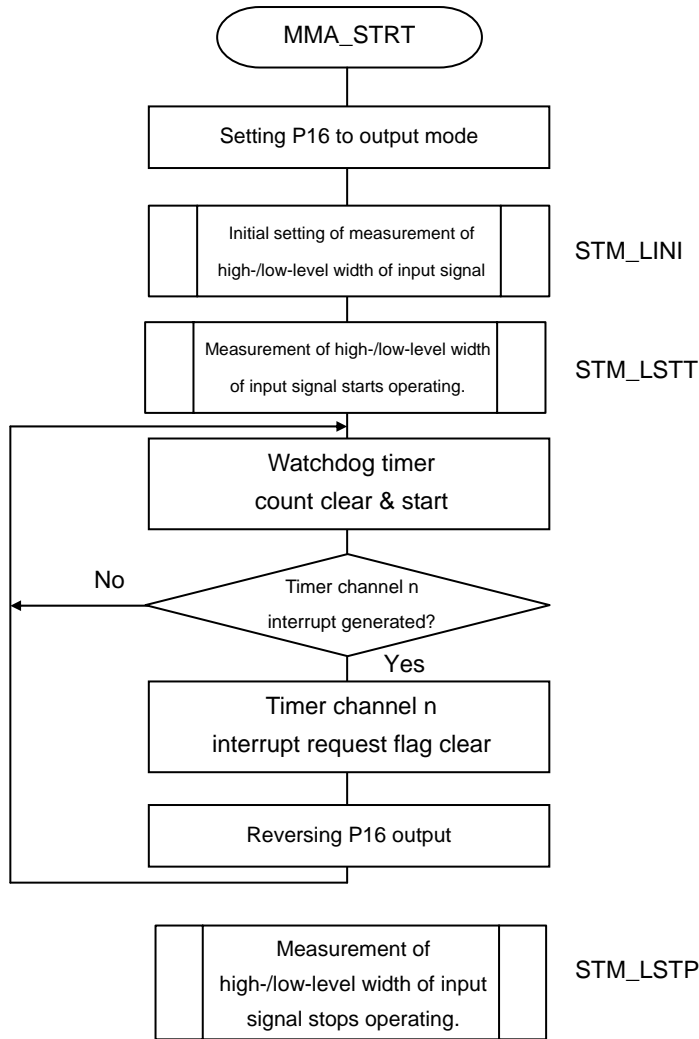
## Function explanations

Function name	STM_LINI
Processing	Initializes measurement of high-/low-level width of input signal.
Argument	–
Return value	–
Description	<p>Initializes the timer array unit.</p> <ul style="list-style-type: none"> <li>• Supplies a timer array unit input clock.</li> </ul> <p>Initializes timer channel 2.</p> <ul style="list-style-type: none"> <li>• Operation mode: Operation clock CK01, selection of the valid edge of the TI02 pin input, both edge selection (high-level width measurement), capture &amp; one-count mode</li> <li>• Output mode: Toggle operation mode</li> </ul>
Remark	This function is called after reset.

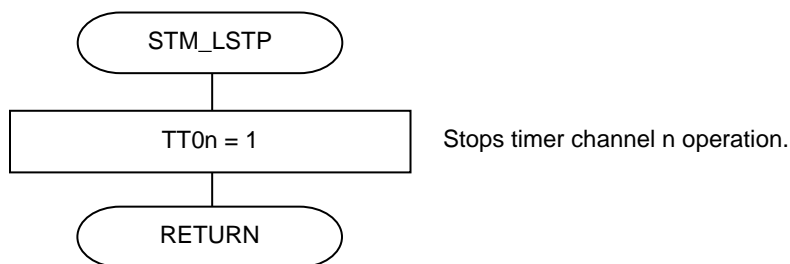
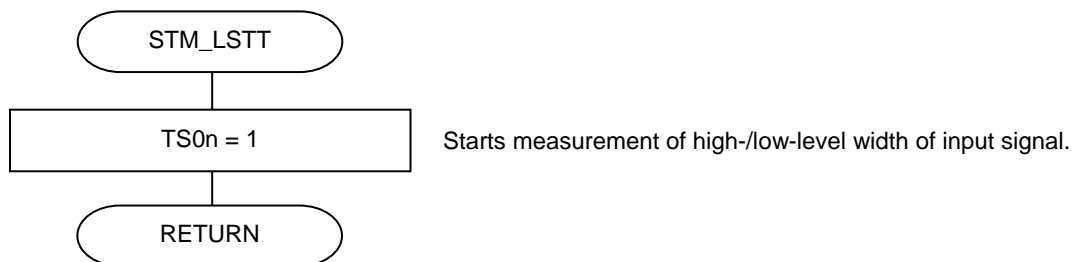
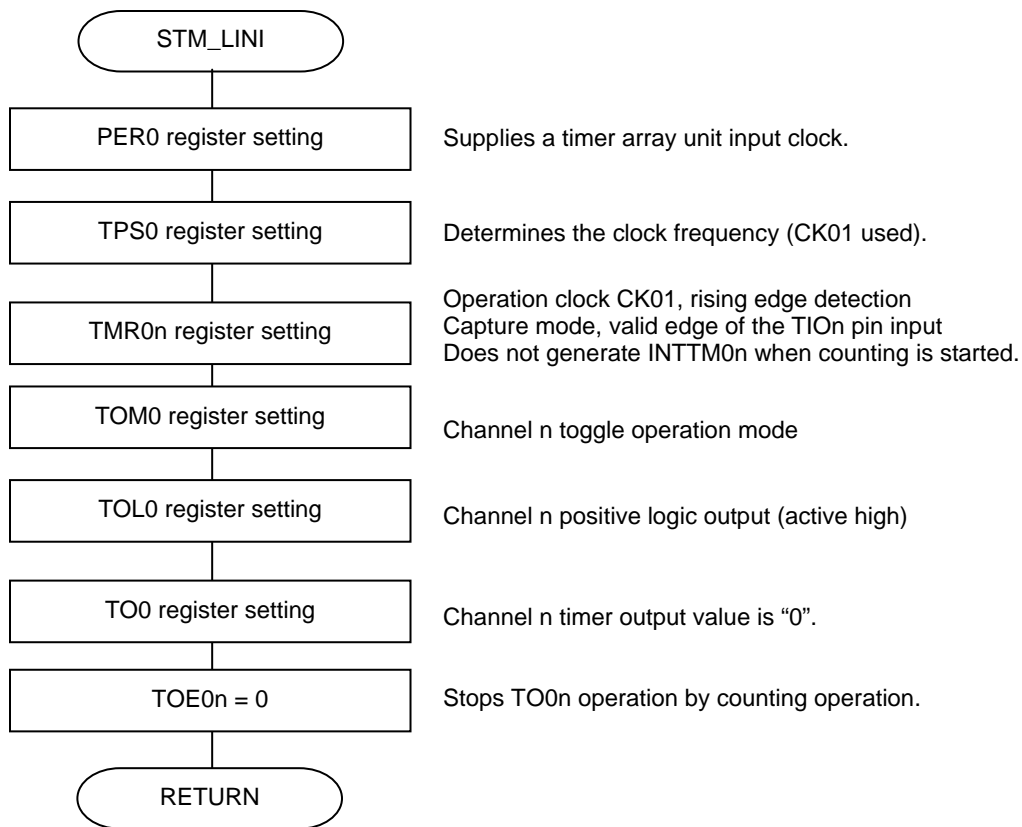
Function name	STM_LSTT
Processing	Starts measurement of high-/low-level width of input signal operation.
Argument	–
Return value	–
Description	Starts timer channel 2 operation.
Remark	–

Function name	STM_LSTP
Processing	Stops measurement of high-/low-level width of input signal operation.
Argument	–
Return value	–
Description	Stops timer channel 2 operation.
Remark	–

5. FLOWCHARTS



**Remark** n = 0 to 7 can be set.  
 n = 2 for this sample program.



**Remark** n = 0 to 7 can be set.  
 n = 2 for this sample program.