

# **78K0R/Kx3 Microcontroller Sample Program Operation Manual (PWM Output (Timer Array Unit), ASM Source)**

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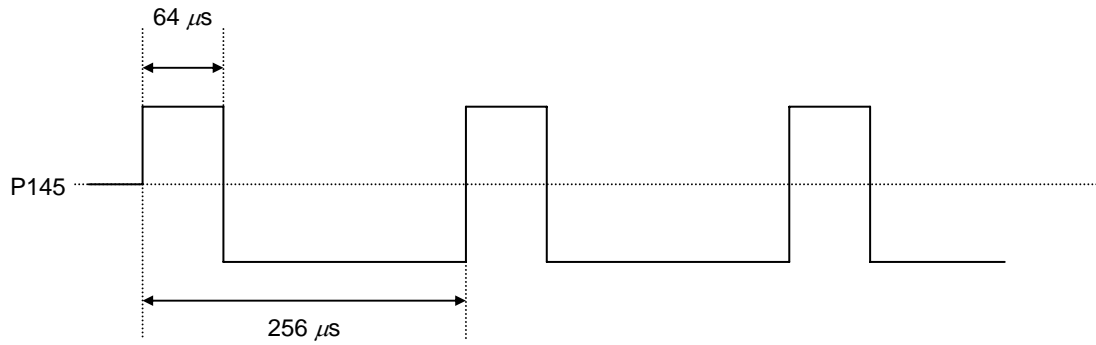
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## 1. OVERVIEW

This manual explains the sample program functions of PWM output for the 78K0R/Kx3 microcontroller.

In this sample program, timer channel 6 is used as the master and timer channel 7 is used as the slave, and a signal with a pulse cycle of  $256 \mu\text{s}$  and a duty factor of 25% is output from output pin P145.



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), 4 MHz (0.25 $\mu$ s)
	Timer mode register 06 (TMR06)	Operation clock: CK01, 8 MHz Master channel
	Timer mode register 07 (TMR07)	Operation clock: CK01, 8 MHz Slave channel
	Timer data register 06 (TDR06)	Pulse cycle: 256 $\mu$ s
	Timer data register 07 (TDR07)	Duty factor: 25%
	Timer output mode register 0 (TOM0)	Channel 6: Toggle mode Channel 7: Combination operation mode with channel 6
	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 TO07 operation by counting operation.
	Timer channel start register 0 (TS00)	
	Timer channel stop register 0 (TT0)	
	Port mode register (PM14)	
Port register (P14)		
I/O	Output: TO07 (P145)	
Interrupt	Timer channels 6, 7	
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	PWM 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 PWM output main processing.
Remark	–

[File name]

K0R\_sfr\_set.asm

Functions

Function Name	Processing Outline	Argument	Return Value
STM_PINI	Initializes PWM output.	None	None
STM_PSTT	Starts PWM output operation.	None	None
STM_PSTP	Stops PWM output operation.	None	None

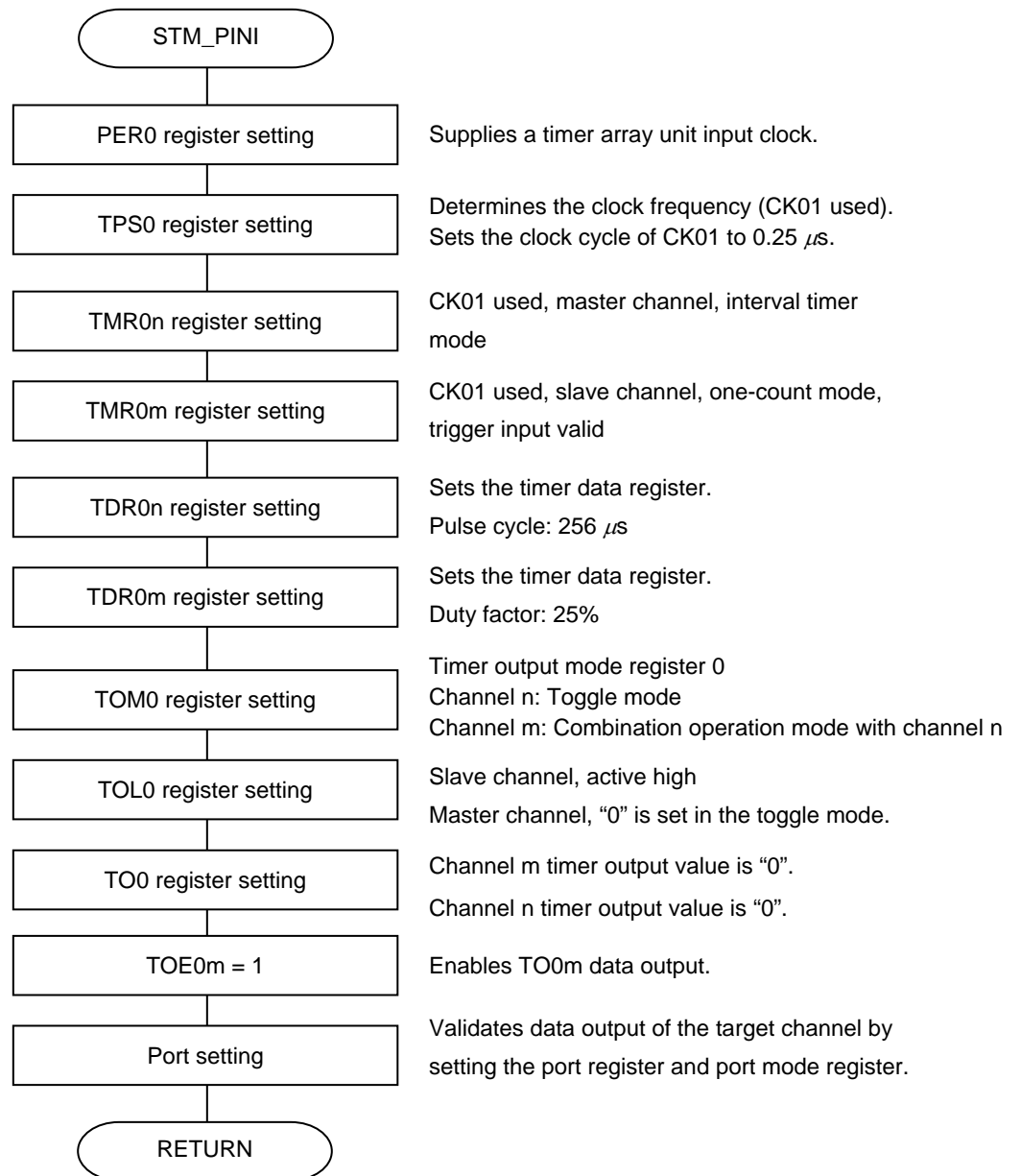
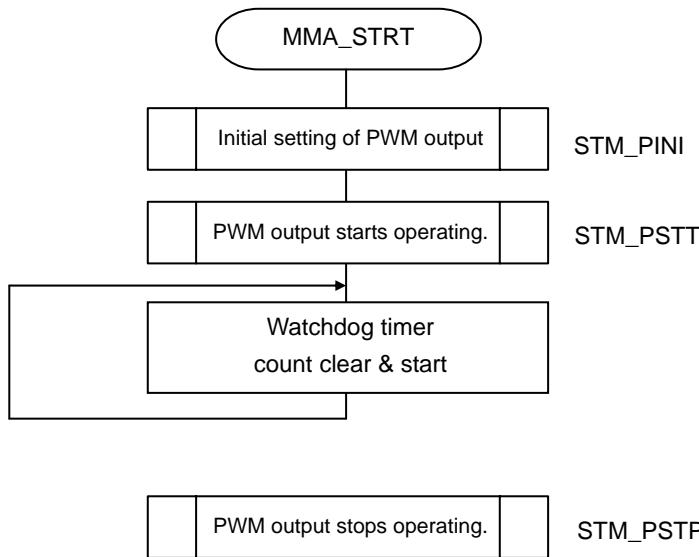
Function explanations

Function name	STM_PINI
Processing	Initializes PWM output.
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> <li>• Sets the clock frequency to 0.25 <math>\mu</math>S.</li> </ul> <p>Initializes timer channel 6 (master).</p> <ul style="list-style-type: none"> <li>• Operation mode: Operation clock CK01, master channel, interval timer mode</li> <li>• Output mode: Toggle operation mode</li> <li>• Sets the pulse cycle to 256 <math>\mu</math>S (0.25 <math>\mu</math>S <math>\times</math> 1,024).</li> </ul> <p>Initializes timer channel 7 (slave).</p> <ul style="list-style-type: none"> <li>• Operation mode: Operation clock CK01, slave channel, one-count mode</li> <li>• Output mode: Combination operation mode</li> <li>• Sets the duty factor to 25% ((256/1,024) <math>\times</math> 100).</li> <li>• Enables output.</li> </ul> <p>Sets P145 to the output mode.</p>
Remark	This function is called after reset.

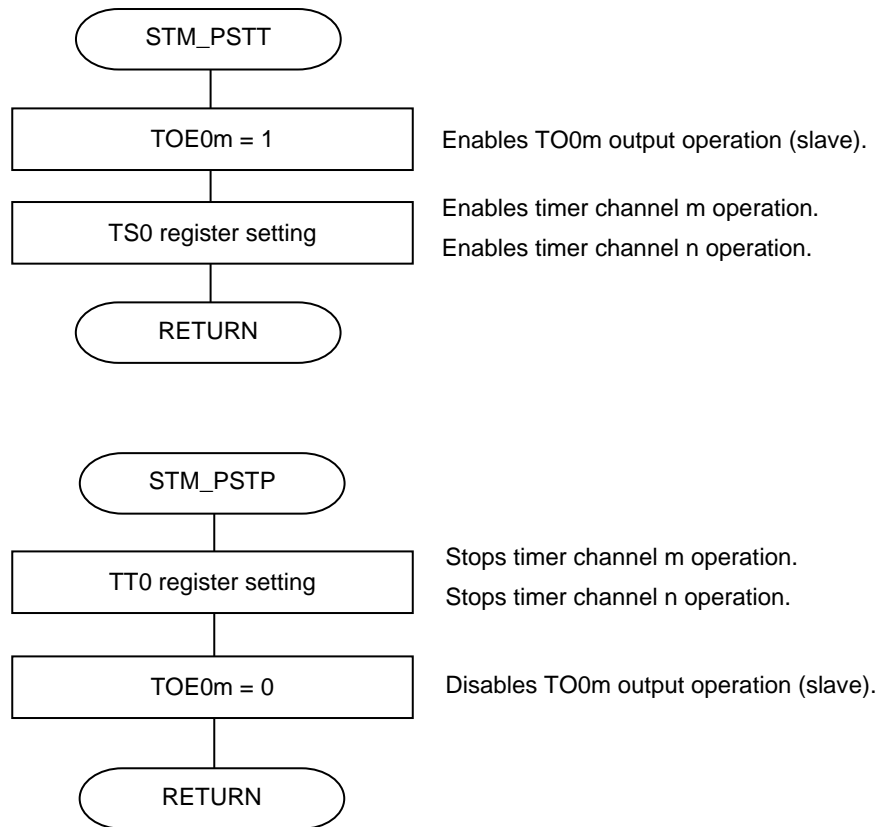
Function name	STM_PSTT
Processing	Starts PWM output operation.
Argument	–
Return value	–
Description	<p>Enables the output operation of timer channel 7 (slave).</p> <p>Starts operation of timer channels 6 and 7.</p>
Remark	–

Function name	STM_PSTP
Processing	Stops PWM output operation.
Argument	–
Return value	–
Description	<p>Stops operation of timer channels 6 and 7.</p> <p>Disables the output operation of timer channel 7 (slave).</p>
Remark	–

5. FLOWCHARTS



**Remark** n = 0, 2, 4, 6 can be set. m = n + 1  
n = 6, m = 7 for this sample program.



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 m = n + 1  
 n = 6, m = 7 for this sample program.