NEC

8-Bit Timer 1 (TM1) in Interval Timer Mode

On-Chip Peripheral Program Example August 1999

Description

The 8-bit timer/event counter (TM1) in the μPD7805x/μPD78005x subseries can be used as an interval timer, external event counter, or square-wave output.

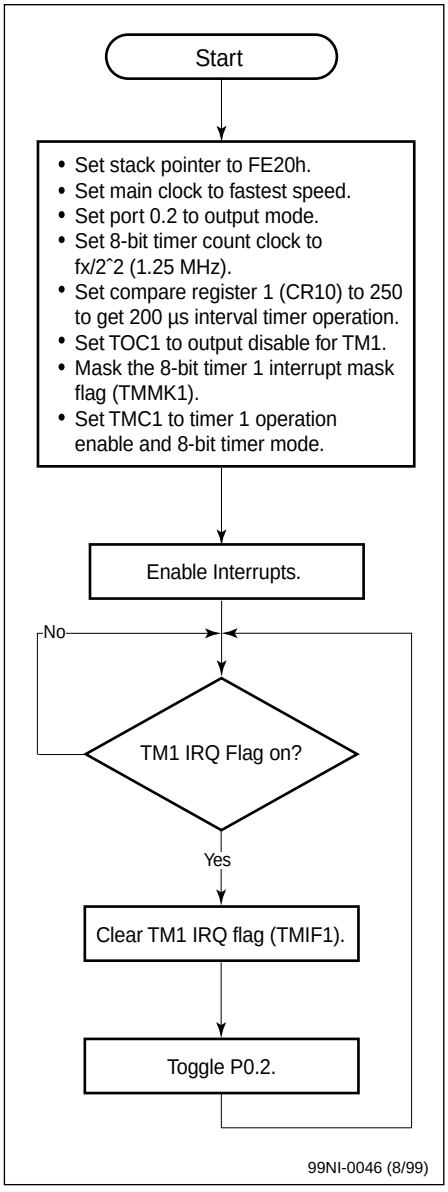
This program demonstrates how TM1 operates in interval timer mode. When the count value of TM1 matches the value set to the 8-bit compare register (CR10), the interrupt request flag (TMIF1) is set to 1 and counting continues with TM1 cleared to 0.

This program does not use an interrupt service routine. Instead, a loop polls the interrupt request flag (TMIF1) that toggles the port pin 0.2.

Program Specifications

- Interval time: 200 μs
- Interrupt handling: polling the timer interrupt flag
- Pins used in program: P02/INTP2 (port pin toggles every 100 μs)

Flowchart


Start
• Set stack pointer to FE20h.
• Set main clock to fastest speed.
• Set port 0.2 to output mode.
• Set 8-bit timer count clock to fx/2ˆ2 (1.25 MHz).
• Set compare register 1 (CR10) to 250 to get 200 µs interval timer operation.
• Set TOC1 to output disable for TM1.
• Mask the 8-bit timer 1 interrupt mask flag (TMMK1).
• Set TMC1 to timer 1 operation enable and 8-bit timer mode.
Enable Interrupts.
No
TM1 IRQ Flag on?
Yes
Clear TM1 IRQ flag (TMIF1).
Toggle P0.2.
99NI-0046 (8/99)

Assembly Language Program

```
;*********************************************************************
; Date:       06/4/1999
;
; Parameters:  - fastest CPU clock
;                (fx = 5.00 MHz; 1 CPU clock cycle = 200 ns)
;              - 200 ms interval time
;              - count clock is fx (1.25 MHz)
;              - interrupt polling method
;              - port 0.2 toggles every 200 µs
;*********************************************************************

;=======================================
;=     Specify Interrupt Vectors        =
;=======================================

RES_VEC     CSEG AT 0000h              ; Set main program start vector
             DW     Start

;=======================================
;=     Main Program                     =
;=======================================

MAIN         CSEG
Start:       DI                         ; Disable interrupts
             MOVW   AX, #0FE20h         ; Load SP address
             MOVW   SP, AX              ; Set Stack Pointer
             MOV    OSMS,#01h           ; Don't use scaler
             MOV    PCC, #00h           ; Main system clock at fastest setting
             CLR1   P0.2                ; Latch port 0.2 low
             CLR1   PM0.2               ; Set port 0.2 output mode
             MOV    TCL1,#07h           ; Select counter clock to fx (1.25 MHz)
             MOV    CR10,#250           ; Set Compare register to 250 for 200 µs interval
             MOV    TOC1,#00h           ; Disable output function
             MOV    TMC1,#01h           ; Set to TM1 operational enable and
                                        ; 8-bit timer mode
             SET1   TMMK1               ; Mask the 8-bit timer 1 interrupt bit
             EI                         ; Enable interrupts
Loop1:       BF     TMIF1,$$            ; Wait for TM1 IRQ flag on
             CLR1   TMIF1               ; Clear TM1 IRQ flag
             XOR    P0,#04h             ; Toggle port 0.2
             BR     $Loop1              ; Branch back to Loop1
             END
```

C Language Program

```
/*********************************************************************
; Date:       06/4/1999
;
; Parameters:  - fastest CPU clock
;               (fx = 5.00 MHz; 1 CPU clock cycle = 200 ns)
;              - 200 ms interval time
;              - count clock is fx (1.25 MHz)
;              - interrupt polling method
;              - port 0.2 toggles every 200 µs
;*********************************************************************/

/* extension functions in K0/K0S compiler */
#pragma sfr  /* key word to allow SFR names in C code */
#pragma EI   /* key word for EI instruction in C code */

/*;=====================================
;=     Constants/Variables             =
;=====================================*/
#define TRUE        1
#define FALSE       0

/*=====================================
;=     Main Program                    =
;=====================================*/

void main(void)
{
      OSMS = 0x01;              /* Don't use scaler */
      PCC = 0x00;               /* Main system clock at fastest setting */
      P0.2 = 0;                 /* Latch port 0.2 low */
      PM0.2 = 0;                /* Set port 0.2  Output  mode */
      TCL1 = 0x07;              /* Select counter clock to fx(1.25 MHz) */
      CR10 = 250;               /* Set Compare register to 250 for 200 µs interval */
      TOC1 = 0x00;              /* Disable output function */
      TMC1 = 0x01;              /* Set TMC1 to TM1 operational enable and 8-bit timer mode */
      TMMK1= 1;                 /* Mask the 8-bit timer 1 interrupt mask bit */
      EI();                     /* Enable interrupts */
      while( TRUE)              /* beginning of while loop */
      {
            while( !TMIF1);     /* Wait for TM1 IRQ flag on */
            TMIF1 = 0;          /* Clear TM1 IRQ flag */
            P0 ^= 0x04;         /* toggle port 0.2 */
      }                         /* end of while(TRUE) */
 }                              /* end of function main() */
```

NEC

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