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R8C/10群

定时器Y运行（定时器模式）

1. 概要

本资料说明了定时器Y的定时器模式的使用例。

2. 前言

在本资料中说明的例子，适合以下单片机在下列条件下使用。

- 单片机 : R8C/10、R8C/11、R8C/12、R8C/13群
- 主时钟输入振荡频率 : 16MHz

和R8C/10群有相同SFR（外围控制寄存器）的其它R8C/Tiny系列，也可以使用本程序。但有时会因增加一部分功能等情况而有所改变，所以必须通过手册进行确认。在使用本应用说明时必须进行充分的评价。

3. 定时器模式的运行

- (1) 如果将计数开始标志置“1”，计数器则对计数源进行递减计数。
- (2) 下溢时，重新装入再装入寄存器的内容，然后继续计数。同时，定时器Y中断请求位变为“1”。
- (3) 如果将计数开始标志清“0”，计数器则保持计数值并停止。

定时器模式运行时序如图1所示。

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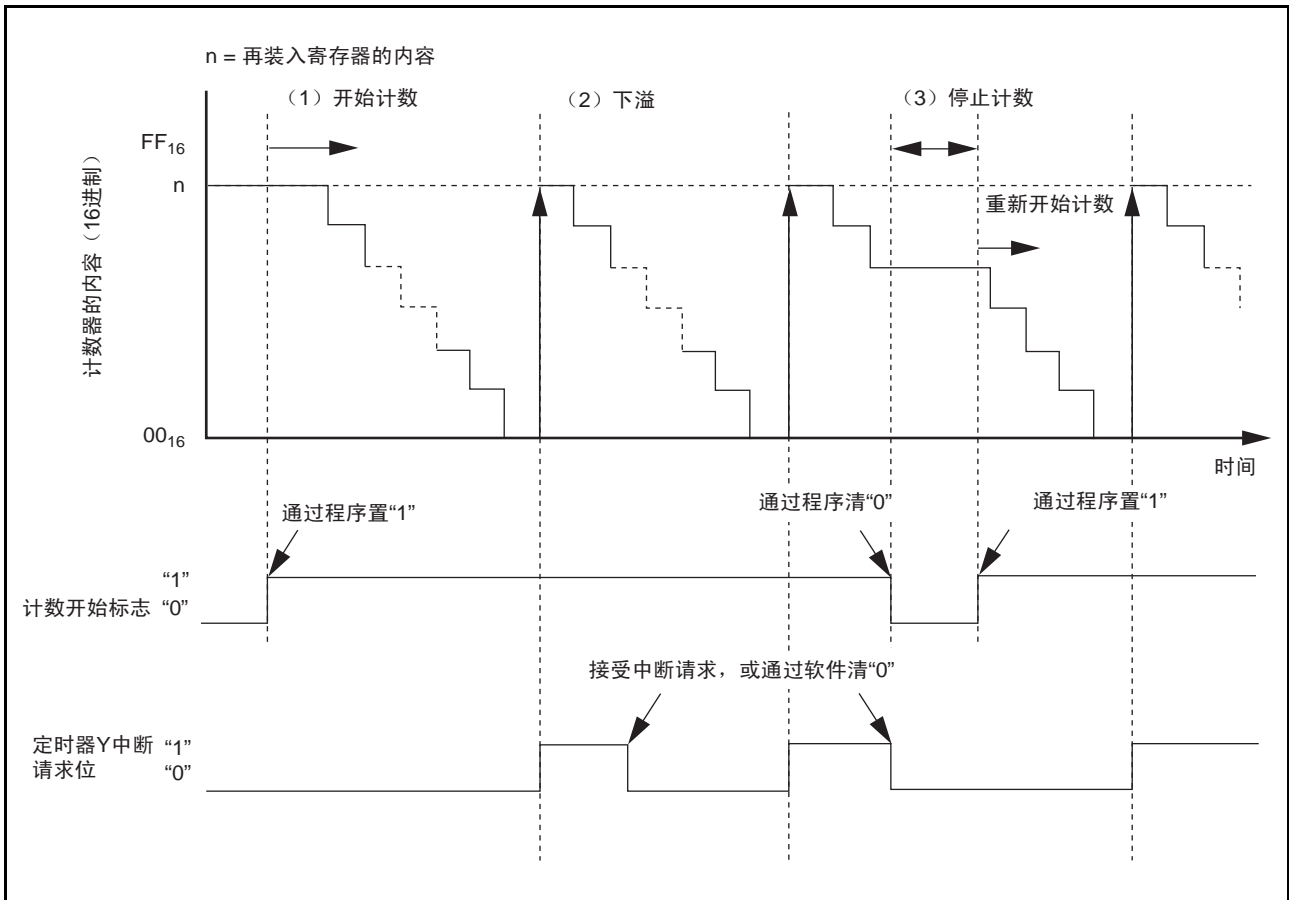


图1 定时器模式运行时序

4. 应用例

4.1 应用例的说明

(1) 定时器Y每4ms产生一次下溢。

$$4\text{ms} = (1/f_8) \times (\text{预分频器 } Y+1) \times (\text{定时器 } Y+1) \\ = 62.5\text{ns} \times 8 \times (31 + 1) \times (249 + 1)$$

定时器Y每下溢一次，就产生一次定时器Y中断请求。通过程序对定时器Y中断进行250次计数，就会建立1秒的时序，并更新显示数据。

(2) LED连接到端口P11～P14，显示“L”有效电平。显示数据为0000b～1111b，并且每过1秒就加上1。使用的引脚如图2所示。

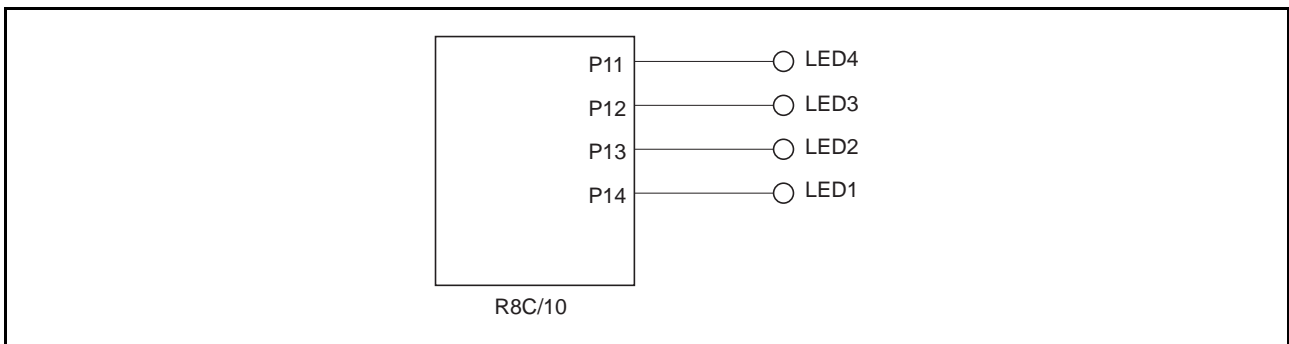


图2 使用的引脚

另外，本样本程序在SFR的位分配的情况下，有可能对不使用的功能位进行操作。这些设定值请根据用户系统的使用情况进行设定。

4.2 主要寄存器的设定

定时器计数源设定寄存器的设定

定时器计数源设定寄存器【008E₁₆地址】TCSS

定时器Y计数源选择位

b3 b2	计数源	计数源的周期 f(XIN): 16MHz时
0 0	f1	62.5ns
0 1	f8	500ns
1 0	fRING	约8μs
1 1	CNTR1引脚的输入	—

预分频器Y寄存器的设定

预分频器Y寄存器【0081₁₆地址】PREY

设定为31

定时器Y寄存器的设定

定时器Y主寄存器【0083₁₆地址】TYPR

设定为249

定时器模式的选择及各功能的选择

定时器Y、Z模式寄存器【0080₁₆地址】TYZMR

定时器模式的选择

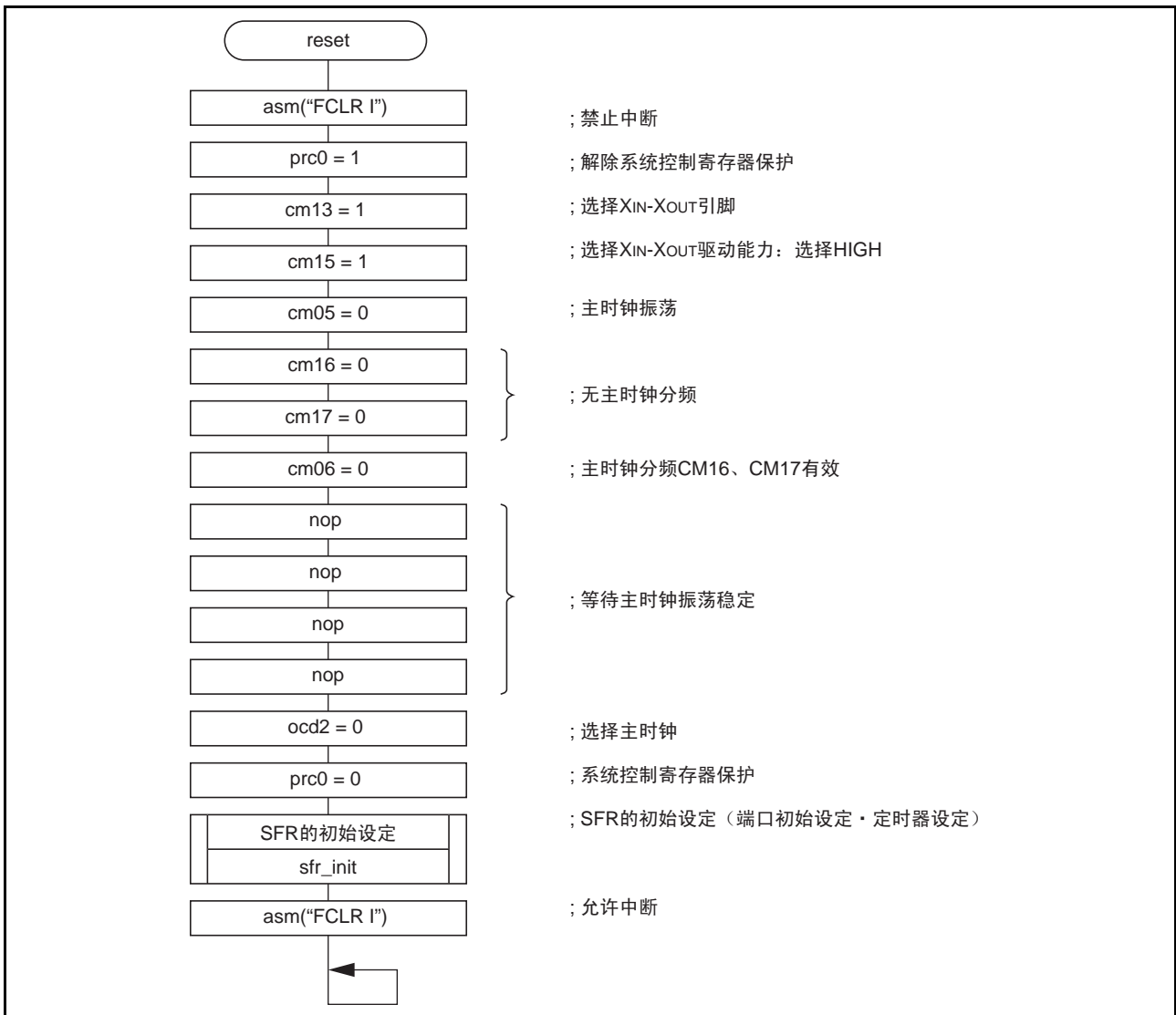
INT2/CNTR1 极性切换位

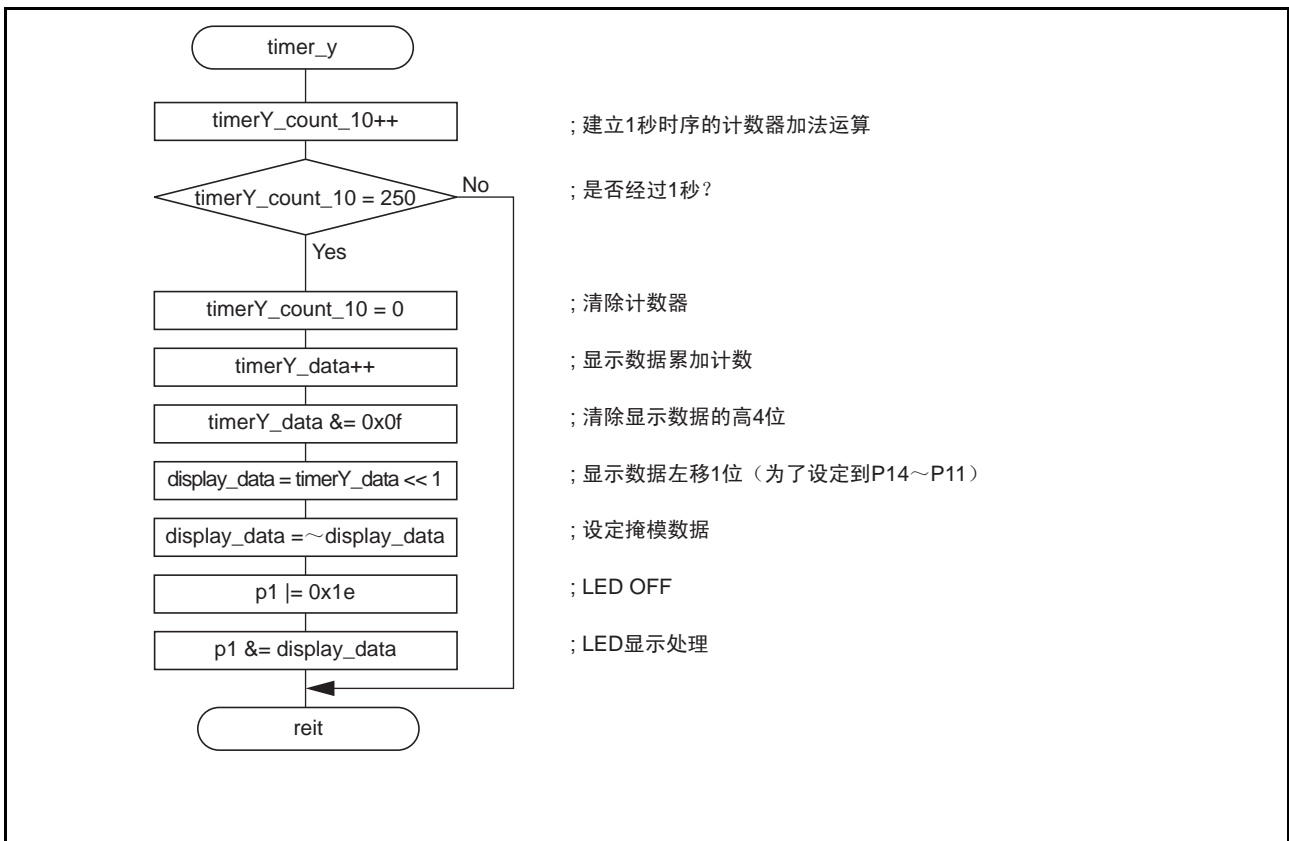
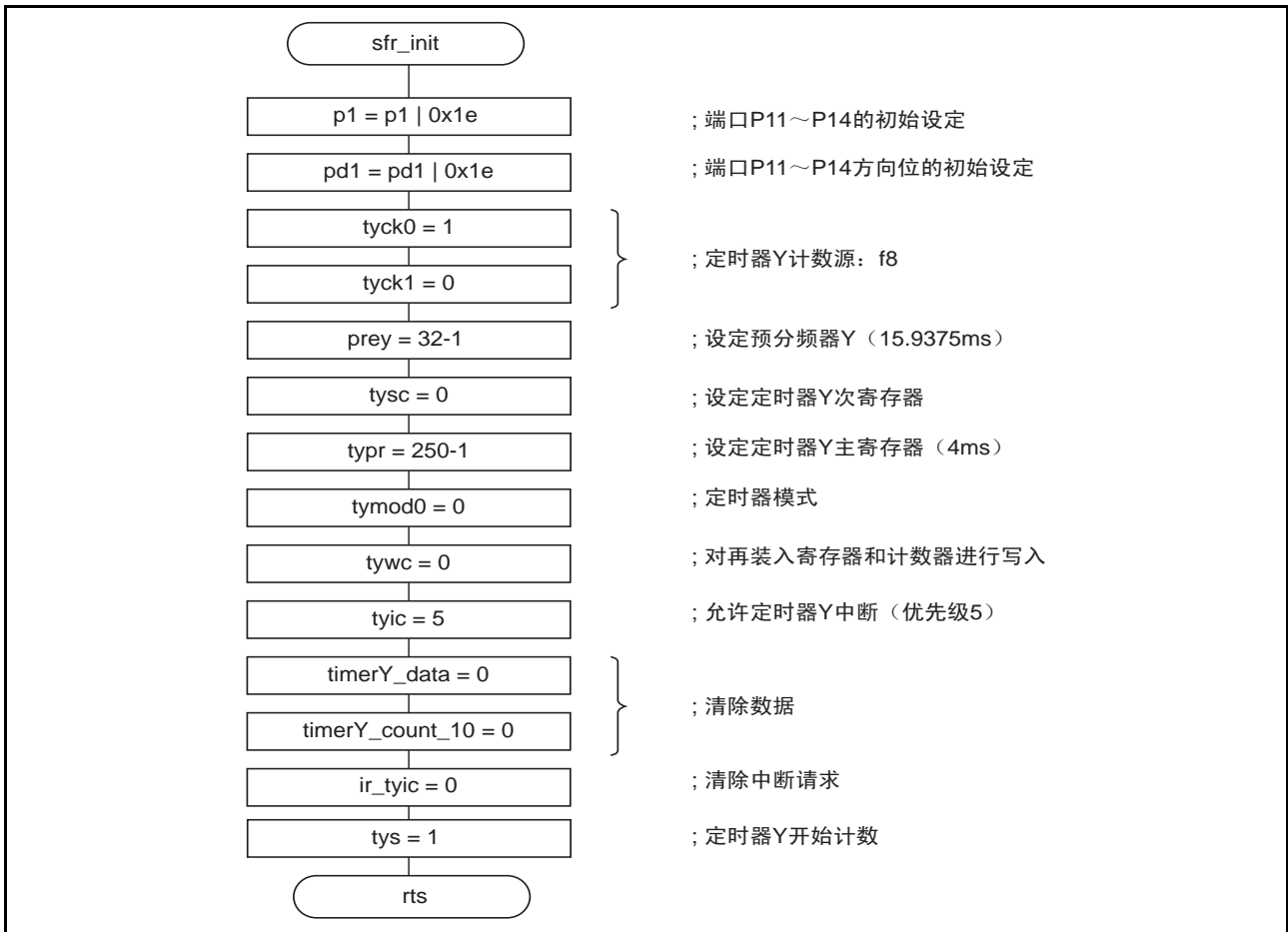
定时器Y写入控制位 对再装入寄存器和计数器进行写入选择

定时器Y计数开始标志 计数开始时设定为“1”

定时器Z的相关位

4.3 流程图





5. 参考程序例

```

/*****
*
*   File Name      : main.c
*   Contents       : R8C/10 Timer Y Timer Mode Test Program
*   Copyright, 2004 RENESAS TECHNOLOGY CORPORATION
*                   AND RENESAS SOLUTIONS CORPORATION, All rights reserved.
*   Version        : 1.10
*   note           : 0.01 : First version
*                   : 1.10(2004.08.23): Comment is revised
*****/
#include "sfr_r810.h" /* Definition of the R8C/10 SFR */

/* Definition of RAM area */
unsigned int timerY_data;
unsigned int timerY_count_10;

/* Declaration of function prototype */
void sfr_init(void); /* Initial setting of SFR registers */

main() {
    asm("FCLR I"); /* Interrupt disable */

    /*-----
    -Change on-chip oscillator clock to Main clock -
    -----*/
    prc0 = 1; /* Protect off */
    cm13 = 1; /* Xin Xout */
    cm15 = 1; /* XCIN-XCOUT drive capacity select bit : HIGH */
    cm05 = 0; /* Xin on */
    cm16 = 0; /* Main clock = No division mode */
    cm17 = 0;
    cm06 = 0; /* CM16 and CM17 enable */
    asm("nop"); /* Waiting for stable of oscillation */
    asm("nop");
    asm("nop");
    asm("nop");
    ocd2 = 0; /* Main clock change */
    prc0 = 0; /* Protect on */

    /*-----
    - Initialize SFR -
    -----*/
    sfr_init(); /* Initial setting of SFR registers */

    asm("FSET I"); /* Interrupt enable */

    /*-----
    - Loop of main -
    -----*/
    while(1){ /* Main processing */
        }
}

```

```

/*****
Name:          sfr_init
Parameters:    None
Returns:       None
Description:    Initial setting of SFR registers
*****/
void sfr_init(void){
    /* Setting port registers */
    p1 = p1 | 0x1e;          /* P14-P11 = H(Led 4.3.2.1) */

    /* Setting port direction registers */
    pd1 = pd1 | 0x1e;      /* P14-P11 port direction = output */

    tyck0 = 1;             /* Timer Y count source = f8 */
    tyck1 = 0;

    /* Setting main cycle timer */
    /* 16MHz * 1/8 * 32 * 250 = 4.00ms */
    prey = 32-1;          /* Setting Prescaler Y register */
    tysc = 0;             /* Setting timer Y secondary register */
    typr = 250-1;        /* Setting timer Y register */

    tymod0 = 0;           /* Timer Y : timer mode */
    tywc = 0;             /* Write to timer and reload register
simultaneously */
    tyic = 5;            /* Interrupt priority level = 5 */

    timerY_data = 0;      /* Display data initialization */
    timerY_count_10 = 0; /* 1 second counter initialization */

    ir_tyic = 0;         /* Interrupt request flag clear */
    tys = 1;            /* Timer Y count start flag = start */
}
    
```

```

/*****
Name:          interrupt Timer y
Parameters:    None
Returns:       None
Description:    Timer y
*****/
#pragma interrupt timer_y
void timer_y(void){

    unsigned int display_data;

    timerY_count_10++;                /* 1 second counter increment */

    if ( timerY_count_10 == 250 ) {   /* 1 second have passed ? */
        timerY_count_10 = 0;         /* 1 second counter clear */
        timerY_data++;               /* Display data increment */
        timerY_data &= 0x0f;         /* Display data mask */
        display_data = timerY_data << 1; /* Display data shift */
        display_data = ~display_data; /* Display data set */
        pl |= 0x1e;                  /* LED Clear */
        pl &= display_data;          /* LED On */
    }
}

```

6. 参考文档

硬件手册

R8C/10群硬件手册

（最新版请从瑞萨科技公司主页获取。）

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		页	要点
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