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2010年4月1日
瑞萨电子公司

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H8/300L SLP 系列

通过间隔功能进行 8 位计数器的累加计数

要点

使用定时器 A 的间隔功能，对设定在 RAM 中的 8 位计数器进行累加计数。从初始值 H'00 开始累加计数，当计数到 H'FF 时，就初始化为 H'00，然后重新继续累加计数。

动作确认器件

H8/38024

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1. 说明

- (1) 使用定时器 A 的间隔功能，对设定在 RAM 中的 8 位计数器进行累加计数。
- (2) 通过定时器计数器 A (TCA) 的溢出，产生定时器 A 的中断，在定时器 A 的中断处理中对设定在 RAM 中的计数器进行累加计数或者初始化。
- (3) 设定在 RAM 中的计数器作为 8 位计数器，从初始值 H'00 开始累加计数，当计数到 H'FF 时，就初始化为 H'00，然后重新继续累加计数。
- (4) 设定为以每 104.858ms 产生定时器 A 的中断。

2. 使用功能的说明

- (1) 本例子使用定时器 A 的间隔功能进行 8 位计数器的累加计数。定时器 A 间隔功能的框图如图 1 所示，以下说明定时器 A 间隔功能的框图：

- 系统时钟 (ϕ) 为 5MHz 时钟，是 CPU 和外围功能运行的基准时钟。
- 预定标器 S (PSS) 是以 ϕ 为输入的 13 位计数器，按每个周期进行累加计数。
- 定时器模式寄存器 A (TMA) 是 8 位可读写寄存器，选择预定标器和输入时钟。在本例子中，预定标器选择 PSS，预定标器分频比选择 2048 分频。
- 定时器计数器 A (TCA) 是 8 位的可读累加计数器，通过输入的时钟进行累加计数。如果 TCA 溢出，中断请求寄存器 1 (IRR1) 的定时器 A 溢出中断请求 (IRRTA) 就被置"1"。
- 定时器 A 溢出中断请求标志 (IRRTA) 因 TCA 溢出而被置"1"。如果在 IRRTA 置"1"后，中断允许寄存器 1 (IENR1) 的定时器 A 中断允许 (IENTA) 为"1"并且条件码寄存器 (CCR) 的 I 位已被清"0"，就接受定时器 A 的中断，开始定时器 A 的中断处理。
- 本例子中的 TCA 溢出周期的计算方法如下所示：

$$\begin{aligned} \text{TCA 溢出周期} &= \frac{1}{\text{系统时钟}/2048} \times 256 \\ &= 104.858 \text{ ms} \end{aligned}$$

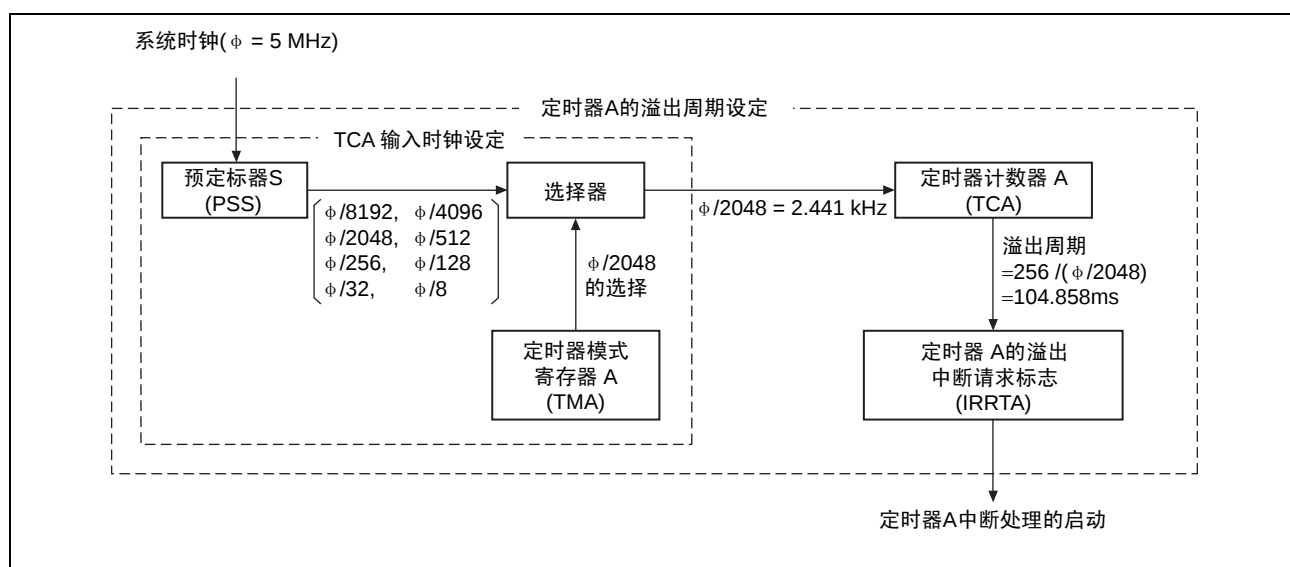


图 1 定时器 A 间隔功能的框图

(2) 本例子的功能分配如表 1 所示。进行如表 1 所示的功能分配并且通过定时器 A 的间隔功能进行 8 位计数器的累加计数。

表 1 功能分配

功能	功能分配
PSS	以系统时钟（5MHz）为输入的 13 位累加计数器
IEN TA	允许定时器 A 的中断请求
IRRTA	反映定时器 A 中断请求的有无
TMA	选择 PSS 以及设定预定标器分频比
TCA	以系统时钟（5MHz）的 2048 分频为输入的 8 位累加计数器

3. 运行说明

(1) 运行说明如图 2 所示。通过如图 2 所示的硬件处理和软件处理，进行定时器 A 间隔功能的 8 位计数器的累加计数。

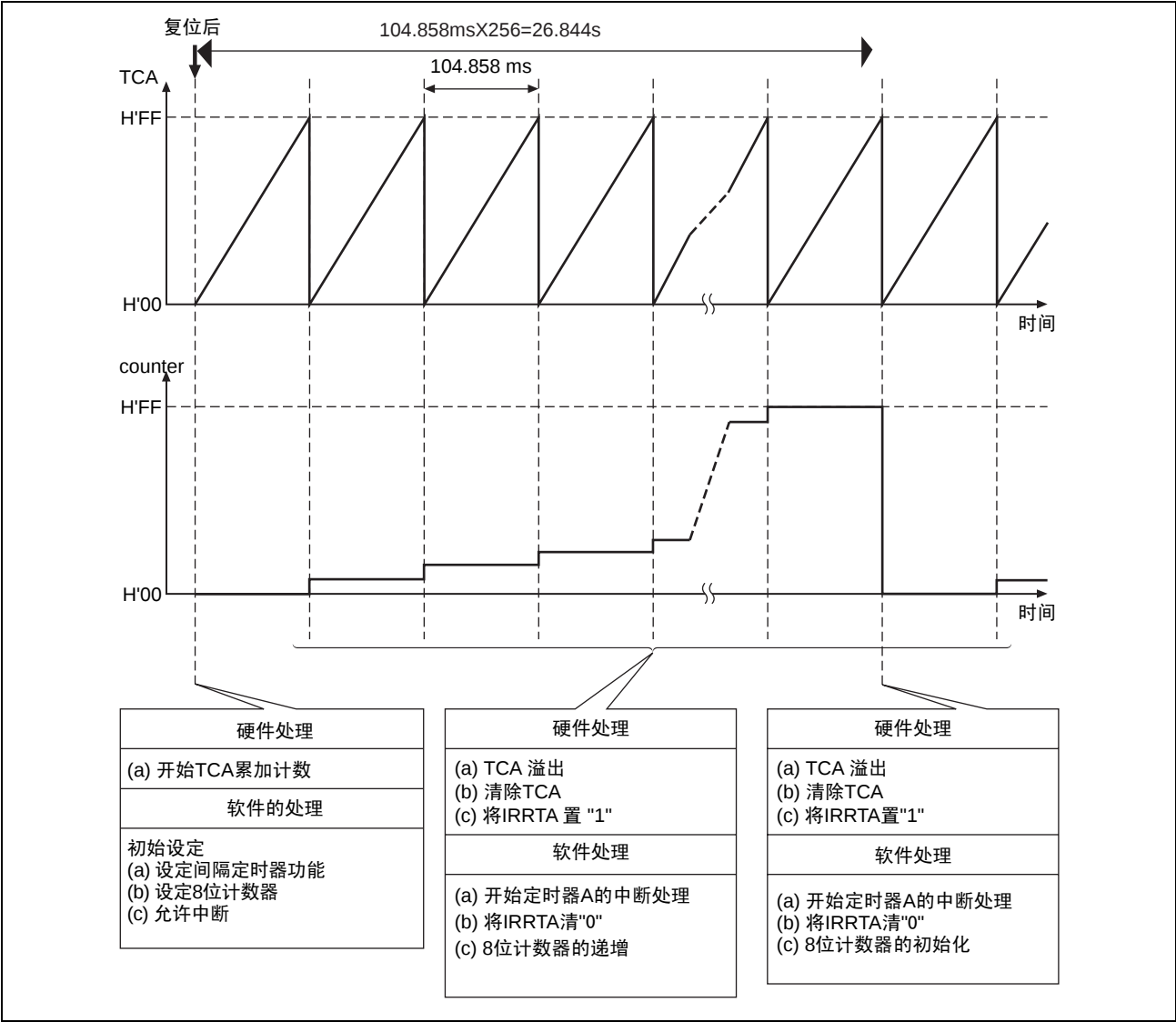


图 2 通过定时器 A 的间隔功能进行 8 位计数器的累加计数的运行说明

4. 软件说明

(1) 模块说明

本例子的模块如表 2 所示。

表 2 模块说明

模块名	标号名	功能
主程序	main	设定间隔定时器和 8 位计数器，允许中断
累加计数	taint	是定时器 A 的中断处理程序，进行 8 位计数器（counter）的递增或者初始化

(2) 参数的说明

本例子不使用参数。

(3) 使用内部寄存器的说明

本例子使用的内部寄存器如表 3 所示。

表 3 使用内部寄存器的说明

寄存器名		功能	地址	设定值
IENR1	IENR1	中断允许寄存器 1（定时器 A 中断允许） ：当 IENR1=0 时，禁止定时器 A 的中断请求 ：当 IENR1=1 时，允许定时器 A 的中断请求	H'FFF3 位 7	1
IRR1	IRR1	中断请求寄存器 1（定时器 A 中断请求标志） ：当 IRR1=0 时，没有定时器 A 的中断请求 ：当 IRR1=1 时，有定时器 A 的中断请求	H'FFF6 位 7	0
TMA		定时器模式寄存器 A ：当 TMA=H'12 时，将定时器 A 功能设定为间隔功能、TCA 输入时钟源设定为 PSS 以及预定标器分频比设定为 2048	H'FFB0	H'12
TCA		定时器计数器 A ：以系统时钟的 2048 分频为输入的 8 位累加计数器	H'FFB1	H'00

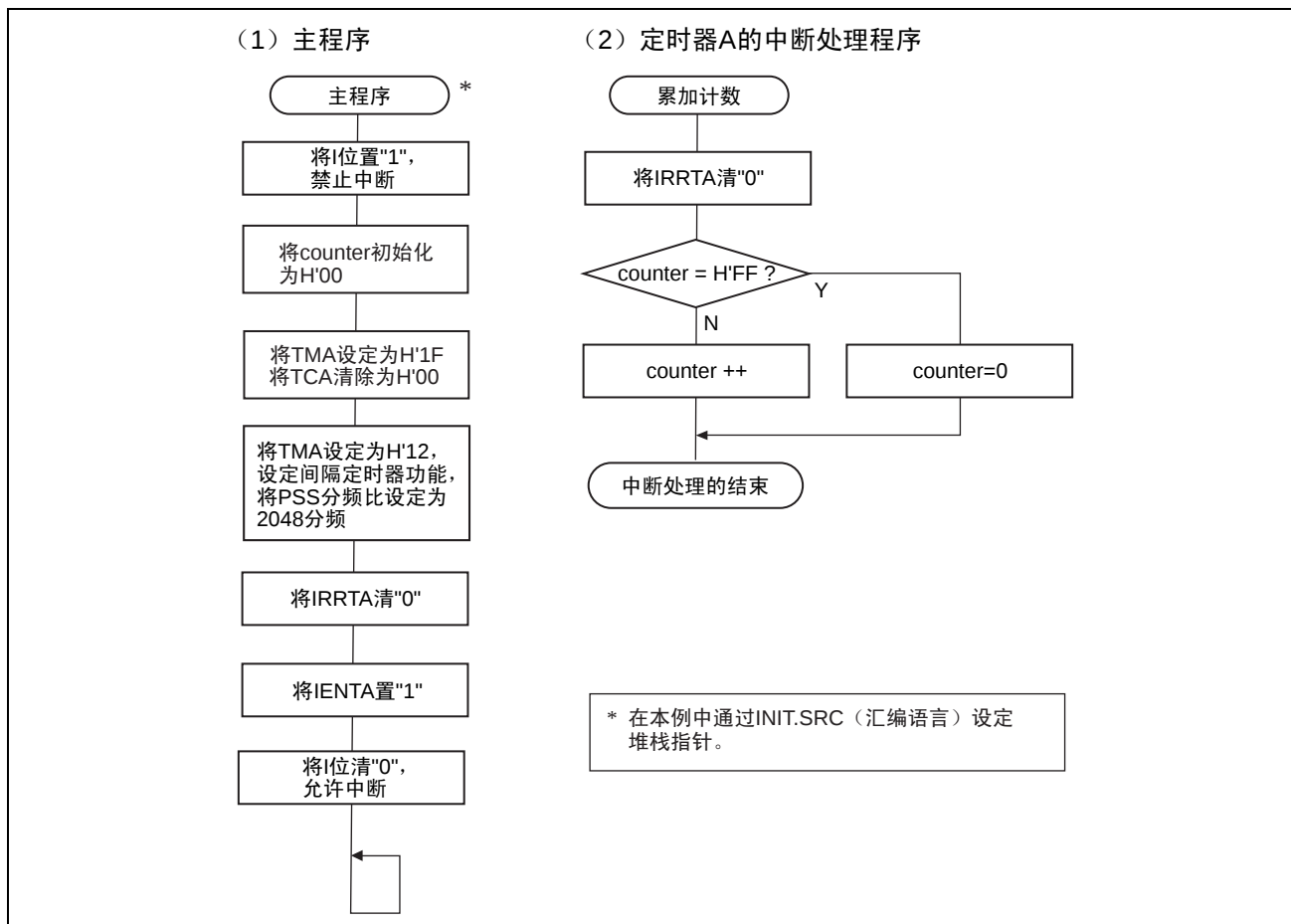
(4) 使用 RAM 的说明

本例子使用的 RAM 如表 4 所示。

表 4 使用 RAM 的说明

标号名	功能	地址	使用模块名
counter	8 位计数器	H'FB80	主程序 累加计数

5. 流程图



6. 程序清单

6.1 INIT.SRC (程序清单)

```

        .EXPORT  _INIT
        .IMPORT  _main
;
        .SECTION P, CODE
        _INIT:
        MOV.W    #'FF80, R7
        LDC.B    #B'10000000, CCR
        JMP      @_main
;
        .END

/*****
/*
/* H8/300L Super Low Power Series
/* -H8/38024 Series-
/* Application Note
/*
/* '8-bit Counter Count-Up by Interval Function'
/*
/* Function
/* :Timer A Interval Timer
/*
/* External Clock : 10MHz
/* Internal Clock : 5MHz
/* Sub Clock      : 32.768kHz
/*
*****/

#include <machine.h>

/*****
/* Symbol Definition
*****/
struct BIT {
    unsigned char  b7:1;    /* bit7 */
    unsigned char  b6:1;    /* bit6 */
    unsigned char  b5:1;    /* bit5 */
    unsigned char  b4:1;    /* bit4 */
    unsigned char  b3:1;    /* bit3 */
    unsigned char  b2:1;    /* bit2 */
    unsigned char  b1:1;    /* bit1 */
    unsigned char  b0:1;    /* bit0 */
};

#define TMA        *(volatile unsigned char *)0xFFB0 /* Timer Mode Register A */
#define TCA        *(volatile unsigned char *)0xFFB1 /* Timer Counter A */
#define IENR1_BIT  (*(struct BIT *)0xFFF3)          /* Interrupt Enable Register 1 */
#define IENTA      IENR1_BIT.b7                     /* Timer A Interrupt Enable */
#define IRR1_BIT   (*(struct BIT *)0xFFF6)          /* Interrupt Request Register 1 */
#define IRRTA      IRR1_BIT.b7                     /* Timer A Interrupt Request Flag */

#pragma interrupt (taint)
/*****

```

```

/* Function define */
/*****/
extern void INIT ( void ); /* SP Set */
void main ( void );
void taint ( void );

/*****/
/* RAM define */
/*****/
unsigned char counter; /* 8bit Counter */

/*****/
/* Vector Address */
/*****/
#pragma section V1 /* VECTOR SECT0IN SET */
void (*const VEC_TBL1[])(void) = {
/* 0x00 - 0x0f */
INIT /* 00 Reset */
};
#pragma section V2 /* VECTOR SECT0IN SET */
void (*const VEC_TBL2[])(void) = {
taint /* 16 Timer A Interrupt */
};

#pragma section /* P */
/*****/
/* Main Program */
/*****/
void main ( void )
{

    set_imask_ccr(1); /* Interrupt Disable */

    counter = 0; /* Initialize 8bit Counter */

    TMA = 0x1F; /* Initialize Timer Counter A */
    TMA = 0x12; /* Initialize Timer A Function & TCA input clock period */

    IRRTA = 0; /* Clear IRRTA */
    IENTA = 1; /* Timer A Interrupt Enable */

    set_imask_ccr(0); /* Interrupt Enable */

    while(1){
        ;
    }
}

/*****/
/* Timer A Interrupt */
/*****/
void taint ( void )
{
    IRRTA = 0; /* Clear IRRTA */

    if(counter == 0xff){ /* 8bit Counter = 0xff? */
        counter = 0; /* Clear 8bit Counter */
    }
}

```

```
    }  
    else{  
        counter++;           /* Increment 8bit Counter      */  
    }  
}
```

连接地址的指定

段名	地址
CV1	H'0000
CV2	H'0016
P	H'0100
B	H'FB80

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Rev.	发行日	修订内容	
		页	修订要点
1.00	2006.03.21	—	初版发行

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