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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

将连接到 I/O 端口的 LED 进行闪烁

要点

将连接到端口的 2 个 LED 交替进行点灯/熄灯。使用定时器 A 的时钟时基功能，将点灯和熄灯的时间设定为 0.5sec。

动作确认器件

H8/38024

目录

1. 说明

（1） 如图 1 所示，将连接到端口的 2 个 LED 交替进行点灯/熄灯。
（2） 使用定时器 A 的时钟时基功能，将点灯和熄灯的时间设定为 0.5sec。
（3） LED1 连接到端口 9 的 P92 输出管脚，LED2 连接到 P93 输出管脚。
（4） P92 是大电流端口。

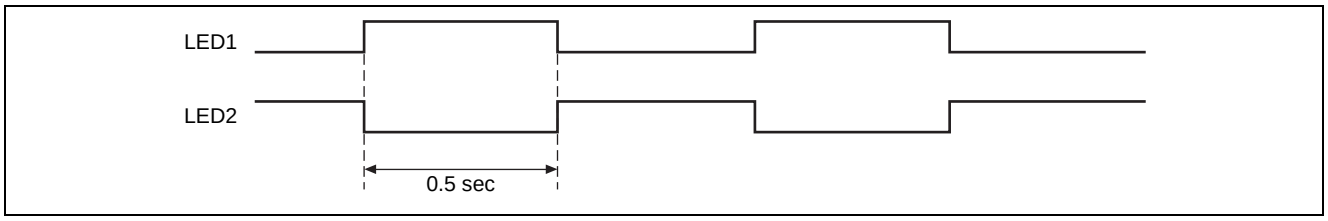


图 1　进行 LED 的闪烁

2. 使用功能的说明

（1） 本例子将连接到 I/O 端口的 LED 进行闪烁。
（a） I/O 端口的框图如图 2 所示，以下说明 I/O 端口的框图：

- 端口数据寄存器 9（PDR9）是保存端口 9 的各个管脚 P95～P90 的数据的 8 位寄存器。如果进行端口 9 的读操作，就直接读 PDR9 的值。因此，不受管脚状态的影响。

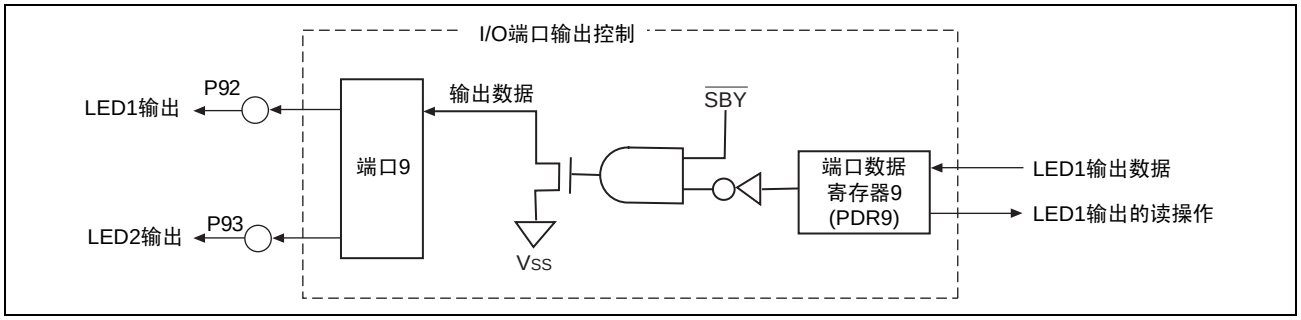


图 2　I/O 端口功能的框图

（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将连接到 I/O 端口的 LED 进行闪烁。

表 1　功能分配

功能	功能分配
PSW	以子时钟（32.768kHz）的 4 分频为输入的 5 位累加计数器
IENTA	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	将定时器 A 设定为时基功能，TCA 溢出周期设定为 0.5sec
TCA	以子时钟（32.768kHz）的 128 分频为输入的 8 位累加计数器
PDR9	保存 P92、P93 输出管脚的数据
P92	LED1 的输出管脚
P93	LED2 的输出管脚

3. 运行说明

（1） 运行说明如图 3 所示。通过如图 3 所示的硬件处理和软件处理，进行连接到 I/O 的 LED 闪烁。

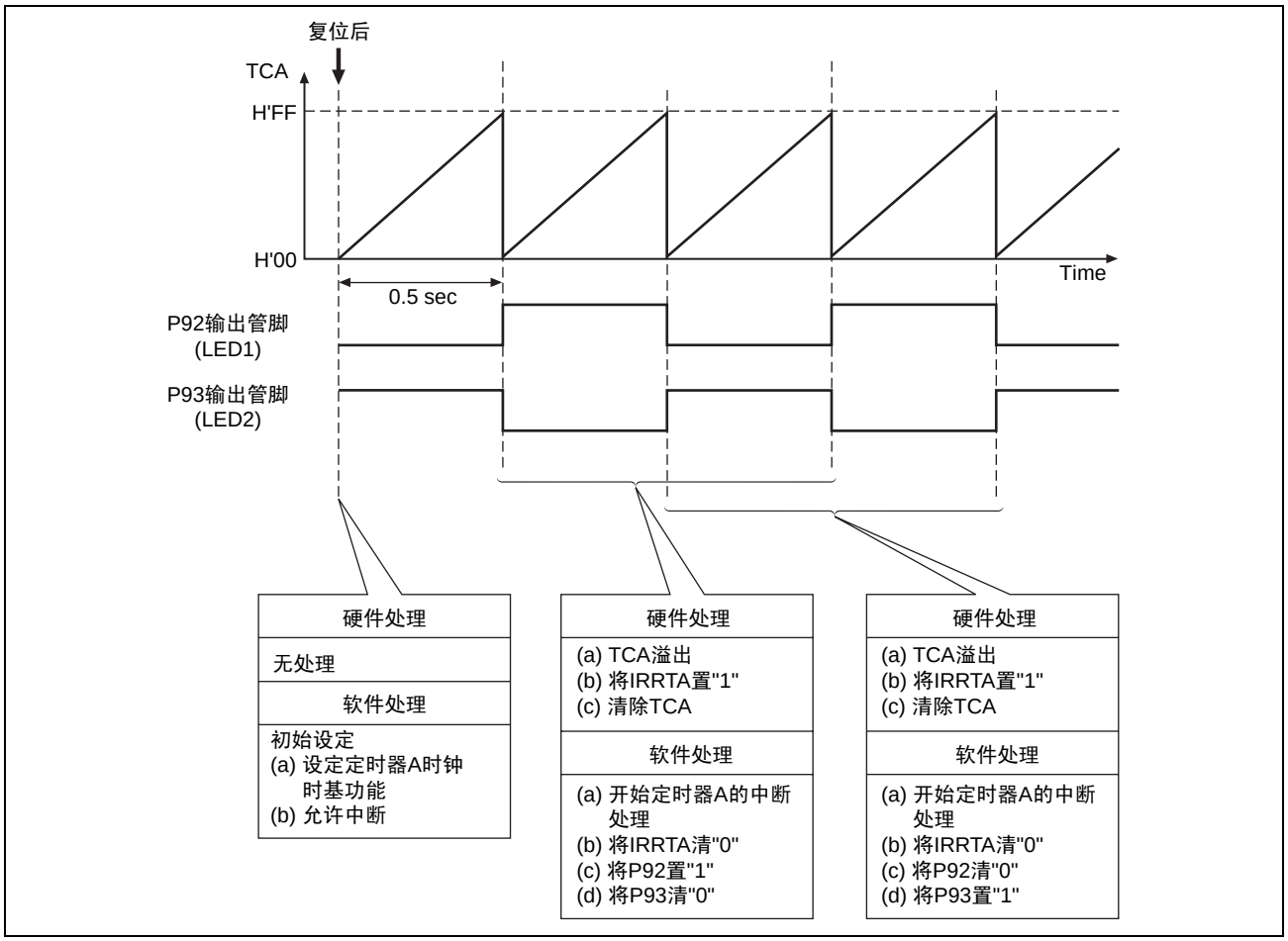


图 3 进行连接到 I/O 端口的 LED 闪烁的运行说明

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	设定定时器 A 的时钟时基功能和 I/O 端口，允许中断
端口输出	taint	是定时器 A 的中断处理程序，判断 LED1、LED2 的输出进行输出控制

（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。

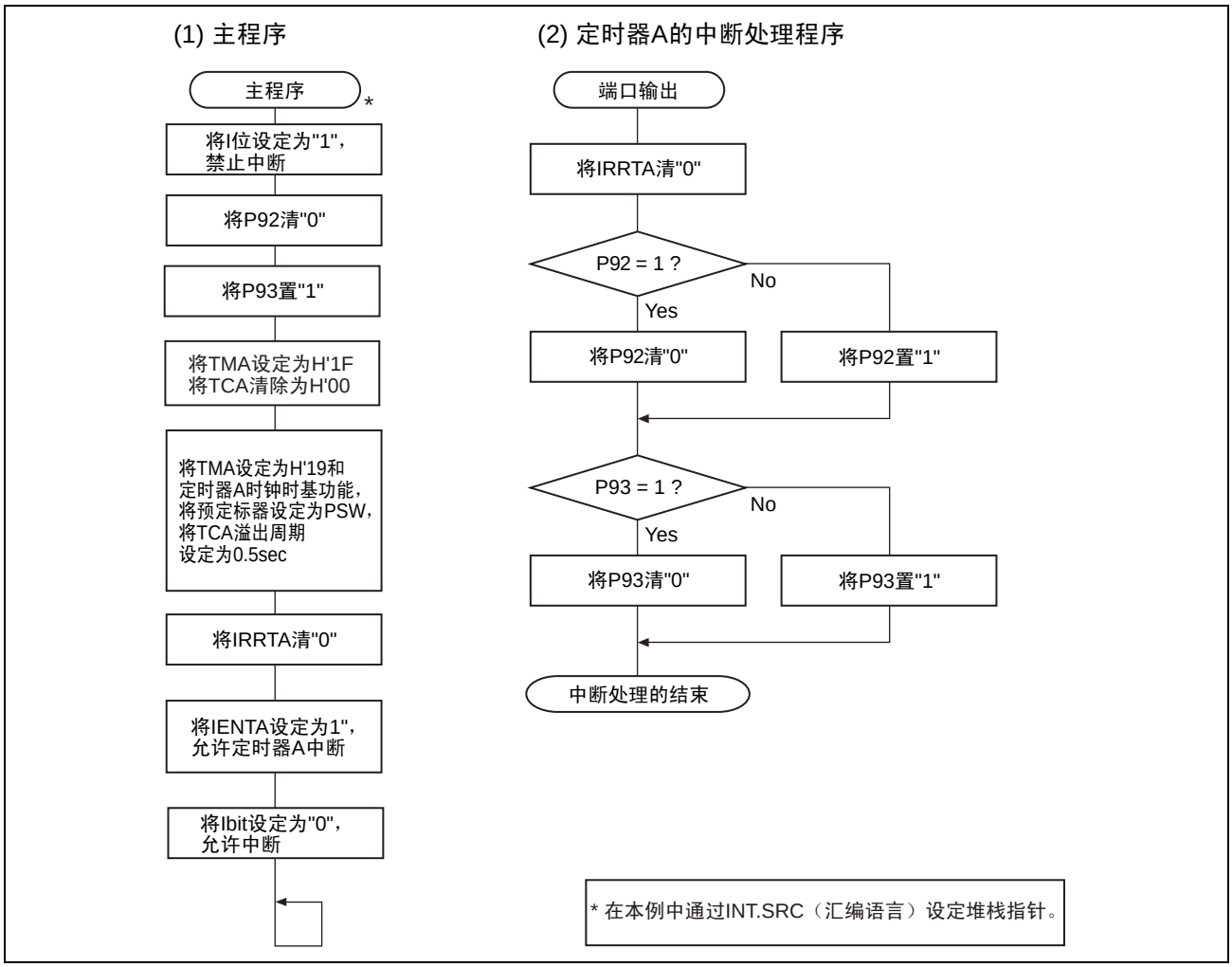
表 3　使用内部寄存器的说明

寄存器名		功能	地址	设定值
TMA	TMA3 TMA2 TMA1 TMA0	定时器模式寄存器 A（内部时钟选择 3～0） ：当 TMA3="1"、TMA2="0"、TMA1="0"、TMA0="1"时， 将定时器 A 功能设定为时钟时基功能，预定标器设定为 PSW， TCA 溢出周期设定为 0.5sec	H'FFB0 位 3 位 2 位 1 位 0	TMA3="1" TMA2="0" TMA1="0" TMA0="1"
TCA		定时器计数器 A ：以 PSW 的输出时钟为输入且 0.5sec 溢出的 8 位累加计数器	H'FFB1	H'00
PDR9	P92	端口数据寄存器 9（端口数据寄存器 93） ：当 P93=0 时，P93 管脚的输出电平为"Low" ：当 P93=1 时，P93 管脚的输出电平为"High"	H'FFDC 位 3	1
	P93	端口数据寄存器 9（端口数据寄存器 92） ：当 P92=0 时，P92 管脚的输出电平为"Low" ：当 P92=1 时，P92 管脚的输出电平为"High"	H'FFDC 位 2	0
IENR1	IENTA	中断允许寄存器 1（定时器 A 中断允许） ：当 IENTA=0 时，禁止定时器 A 的中断请求 ：当 IENTA=1 时，允许定时器 A 的中断请求	H'FFF3 位 7	1
IRR1	IRRTA	中断请求寄存器 1（定时器 A 中断请求标志） ：当 IRRTA="0"时，没有定时器 A 的中断请求 ：当 IRRTA="1"时，有定时器 A 的中断请求	H'FFF6 位 7	0

（4） 使用 RAM 的说明

本例子不使用 RAM。

5. 流程图


(1) 主程序
主程序
*
将I位设定为"1"，
禁止中断
将P92清"0"
将P93置"1"
将TMA设定为H'1F
将TCA清除为H'00
将TMA设定为H'19和
定时器A时钟时基功能，
将预定标器设定为PSW，
将TCA溢出周期
设定为0.5sec
将IRRTA清"0"
将IENTA设定为1"，
允许定时器A中断
将Ibit设定为"0"，
允许中断
(2) 定时器A的中断处理程序
端口输出
将IRRTA清"0"
P92 = 1 ?
No
Yes
将P92清"0"
将P92置"1"
P93 = 1 ?
No
Yes
将P93清"0"
将P93置"1"
中断处理的结束
* 在本例中通过INT.SRC（汇编语言）设定堆栈指针。

6. 程序清单

6.1 INIT.SRC（程序清单）

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

```
/************************************************************/
/*                                                          */
/*  H8/300L Super Low Power Series                          */
/*     -H8/38024 Series-                                    */
/*  Application Note                                        */
/*                                                          */
/*  'Flickering of LEDs Connected to I/O Port'              */
/*                                                          */
/*  Function                                                */
/*  : I/O Port                                              */
/*                                                          */
/*  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     PDR9_BIT    (*(struct BIT *)0xFFDC)             /* Port Data Register 9           */
#define     P93         PDR9_BIT.b3                         /* Port Data Register 93          */
#define     P92         PDR9_BIT.b2                         /* Port Data Register 92          */
#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 );

/************************************************************/
/*  Vector Address                                          */
/************************************************************/
#pragma section    V1                                 /* VECTOR SECTOIN SET           */
void (*const VEC_TBL1[])(void) = {
/* 0x00 - 0x0f */
   INIT                                            /* 00 Reset                    */
};
#pragma section    V2                                 /* VECTOR SECTOIN 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            */

   TMA = 0x1F;                                       /* Initialize Timer Counter A      */
   TMA = 0x19;                                       /* Initialize TCA Overflow Period   */

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

   P92 = 0;                                          /* Initialize P92 Terminal Output   */
   P93 = 1;                                          /* Initialize P93 Terminal Output   */

   set_imask_ccr(0);                                  /* Interrupt Enable             */

   while(1){
      ;
   }
}

/************************************************************/
/*  Timer A Interrupt                                       */
/************************************************************/
void   taint ( void )
{
   IRRTA = 0;                                        /* Clear IRRTA                  */
   if ( P92 == 1 ){                                   /* Turn on LED1 ?                */
      P92 = 0;                                       /* Turn off LED1                */
   }
   else{
      P92 = 1;                                       /* Turn on LED1                 */
```

```
    }

    if ( P93 == 1 ){                          /* Turn on LED2 ?          */
       P93 = 0;                              /* Turn off LED2           */
    }
    else{
       P93 = 1;                              /* Turn on LED2            */
    }
}
```

连接地址的指定

段名	地址
CV1	H'0000
CV2	H'0016
P	H'0100

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		页	修订要点
1.00	2006.03.21	—	初版发行

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