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2010年4月1日  
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# 7542 群

## A/D 转换控制的应用

### 1. 要点

本例程中所使用的外设功能为：

- a. A/D 转换器
- b. 定时器 1(定时器模式)
- c. 定时器 X(脉冲输出模式)

### 2. 说明

该应用说明适用于以下条件：

采用的 MCU：7542 群

振荡频率： 8MHz

存储器容量： ROM 32K, RAM 1KB

### 3. 操作

LED 闪烁控制过程中可分为两种工作状态：

- 等待状态
- 闪烁状态

复位后，程序进入等待状态。LED 以 1KHz 的频率闪烁。当改变电位计的大小时，LED 将会根据电位计输出电压的大小而改变闪烁的频率。如果采样电压值越高，闪烁的频率越慢。当再次按下复位键，程序重新进入等待状态。

### 4. 寄存器的设定

#### 4.1 程序中使用的全局变量

表 4-1 用来说明程序中使用的全局变量：

表 4-1 全局变量表

| 变量名       | 初值  | 大小 | 描述        | 最小 | 最大 | 标志 |
|-----------|-----|----|-----------|----|----|----|
| adcurrent | 00H | 1  | A/D 的当前值  | 00 | FF | —  |
| adpast    | 00H | 1  | A/D 的过去值  | 00 | FF | —  |
| adfirst   | 00H | 1  | A/D 的初值   | 00 | FF | —  |
| sign      | 00H | 1  | A/D 值变化标志 | 00 | 01 | —  |
| sign1     | FFH | 1  | P03 输出值标志 | 00 | FF | —  |
| resetr    | 00H | 1  | 模式标志      | 00 | 01 | —  |

#### 4.2 定时器 1(定时器模式)

图 1 显示 10 毫秒主循环的设置：

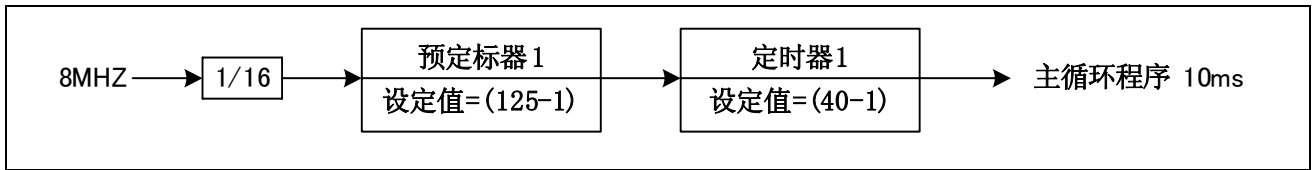
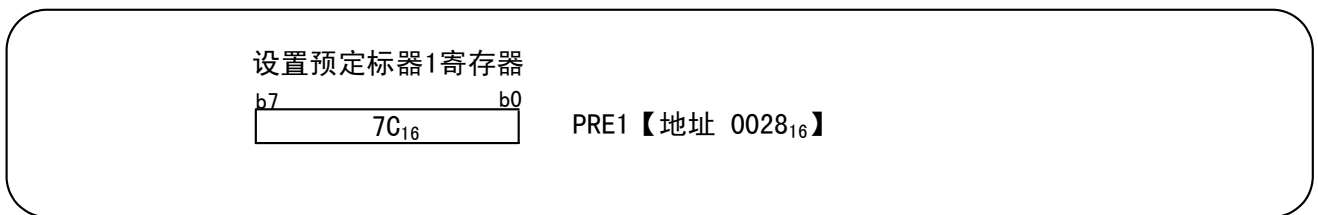


图 1 10 毫秒主循环的设置

定时器 1 工作为定时器模式，用于控制 10 毫秒主程序循环周期，设置如下图：



### 4.3 定时器 X (脉冲输出模式)

图 2 显示 1 毫秒闪烁时间的设置：

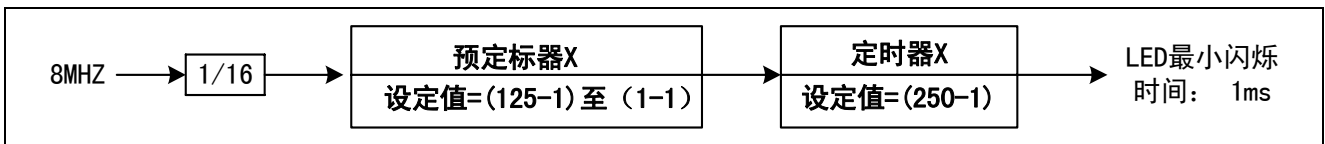
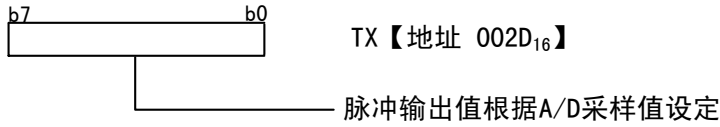


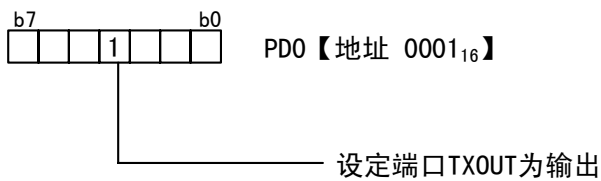
图 2 1 毫秒闪烁时间的设置

定时器 X 用于控制 LED 的闪烁频率，设置如下图：

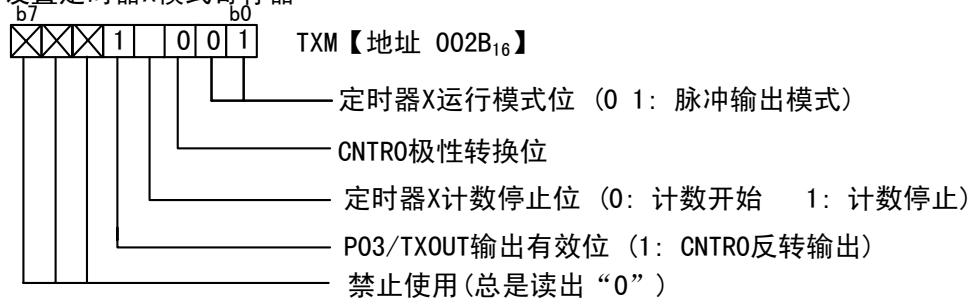
### 设置定时器X寄存器



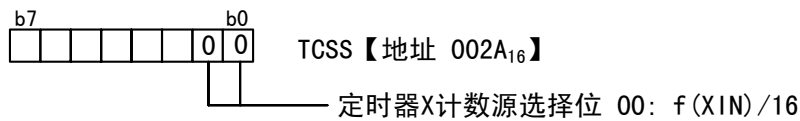
### 设置端口P0方向寄存器



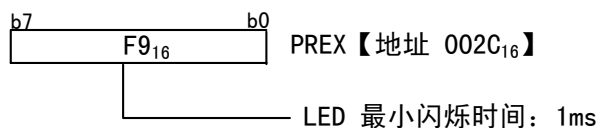
### 设置定时器X模式寄存器



### 设置定时器计数源设定寄存器

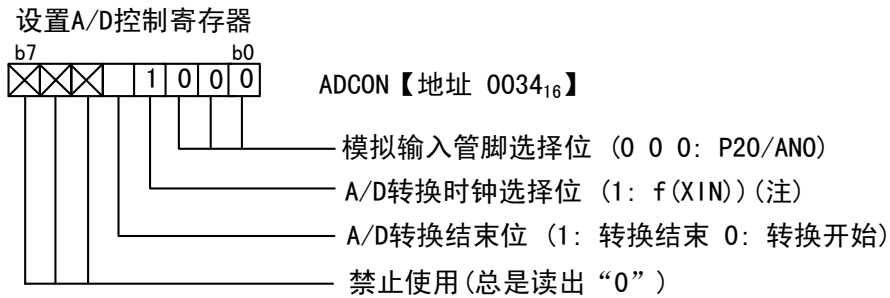


### 设置预定标器X寄存器

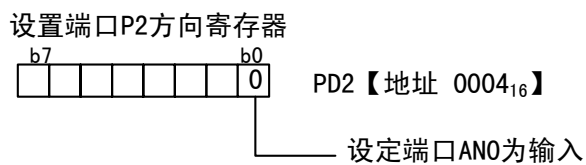


#### 4.4 A/D 转换器设定

电位计的输出电压通过 AN0(P20)输入到 A/D 转换器，因此需要进行模拟输入管脚的选择设定。设置如下图：

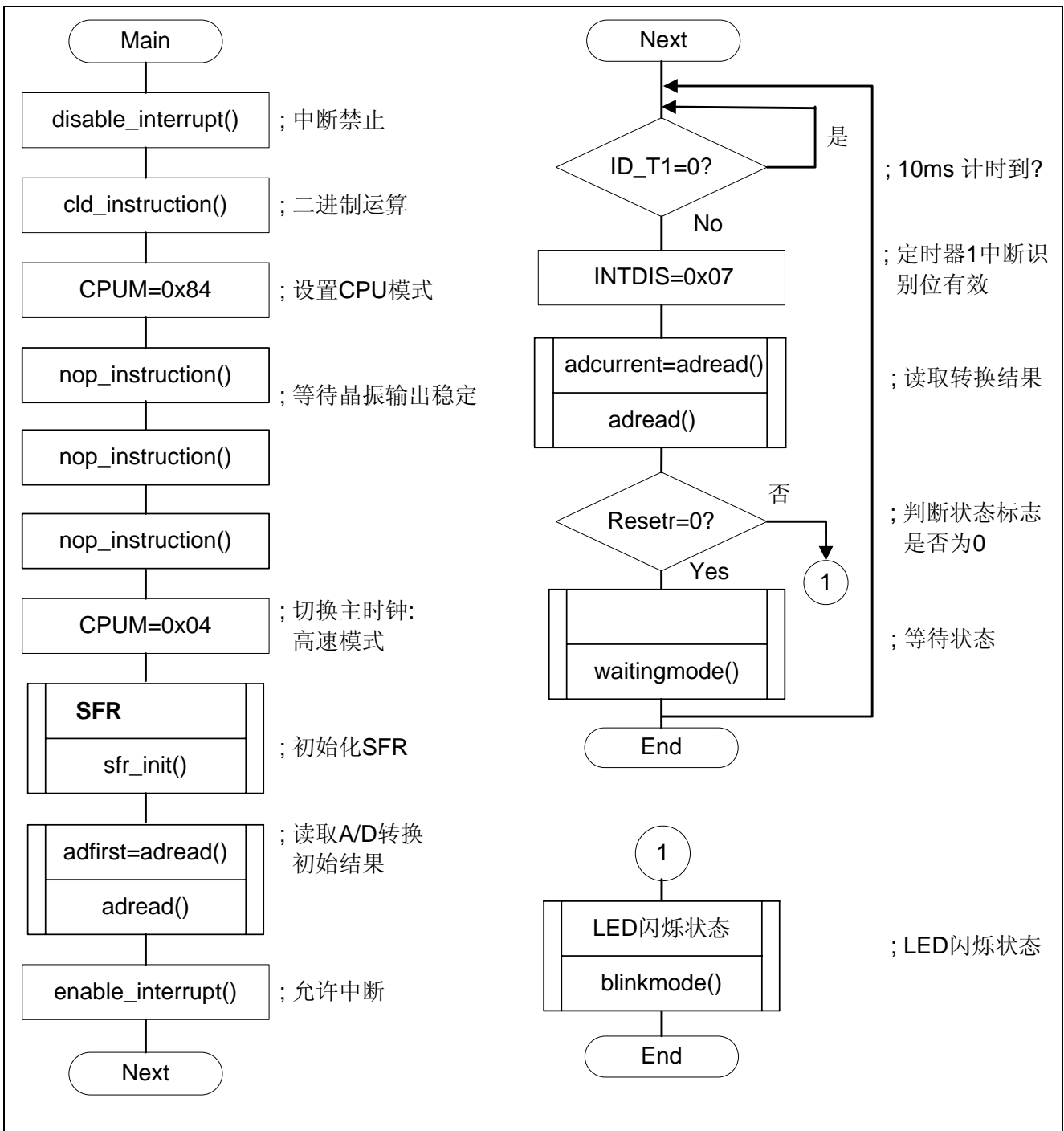


注：该位为1时，只能在陶瓷振荡器或内部振荡器时使用；该位为0时，只能使用RC振荡

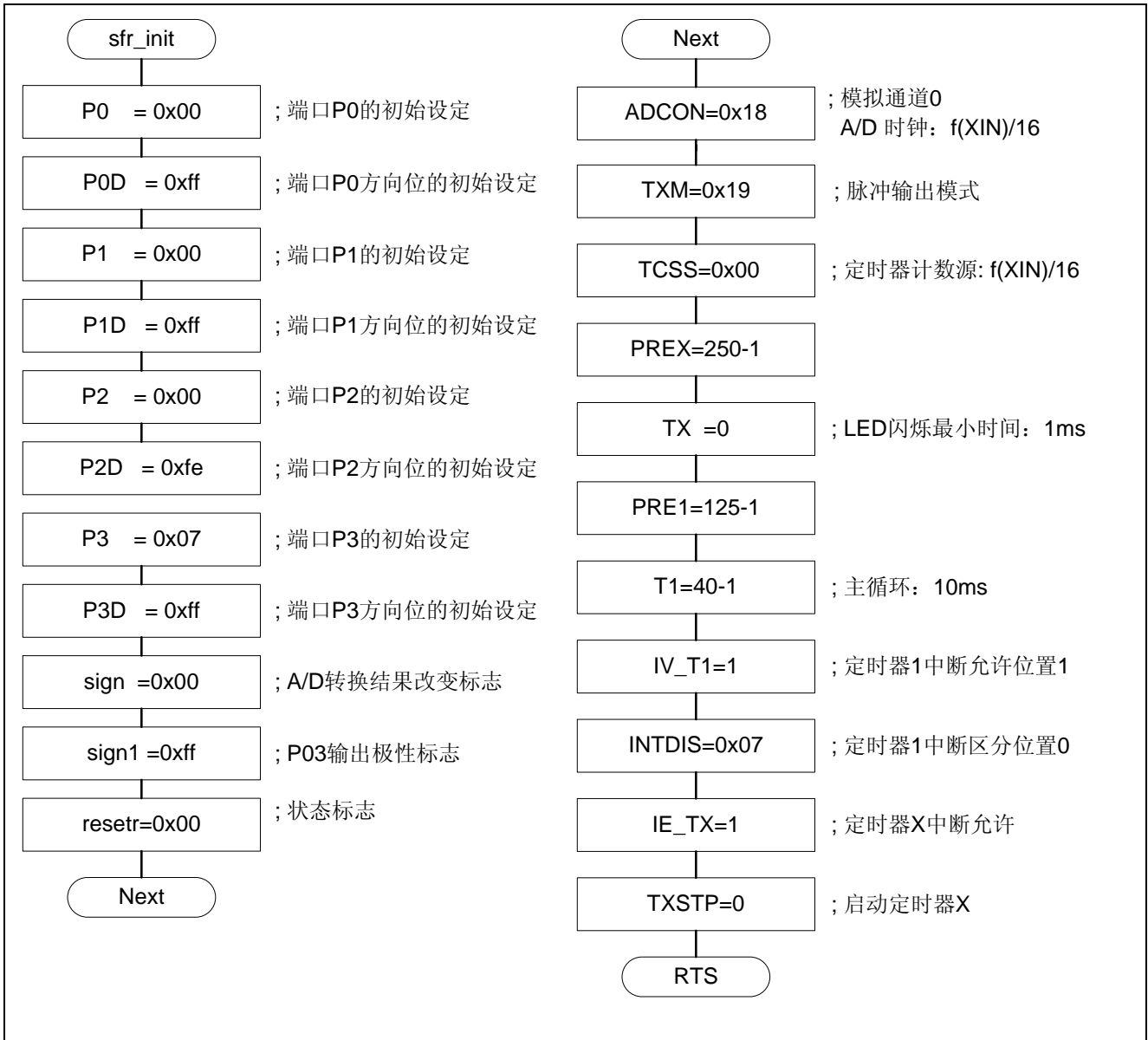


5. 流程图

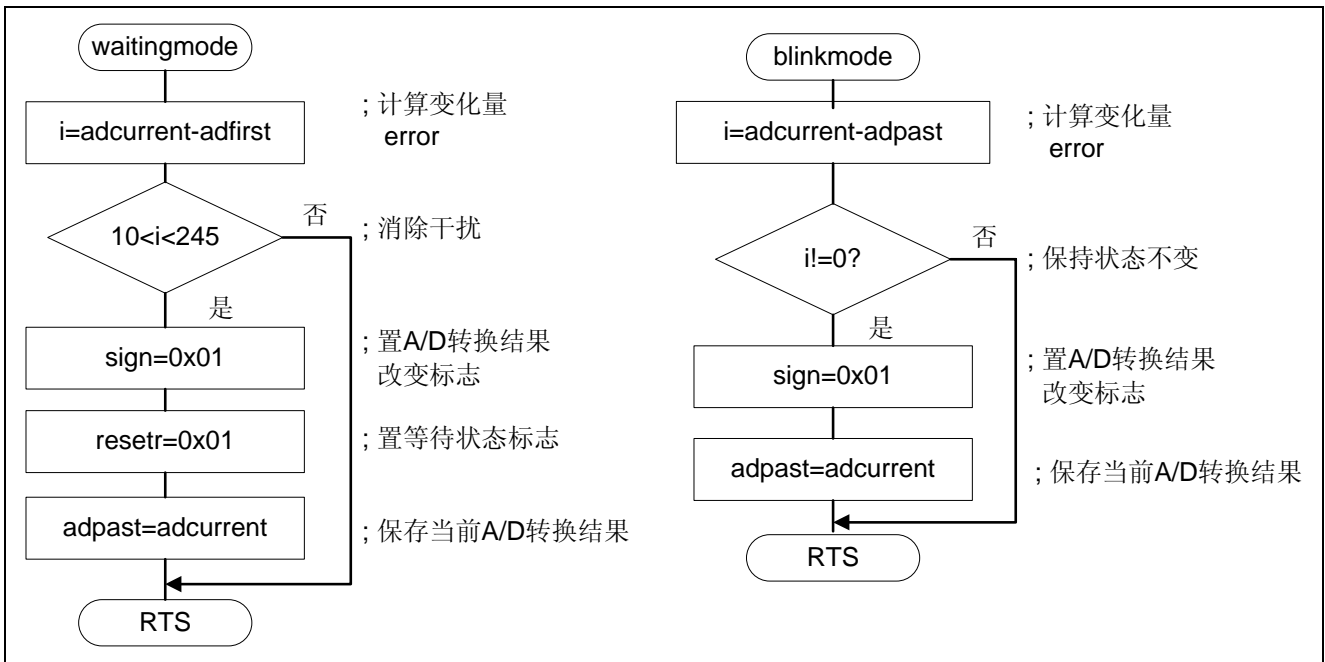
主循环程序，其流程图如下：



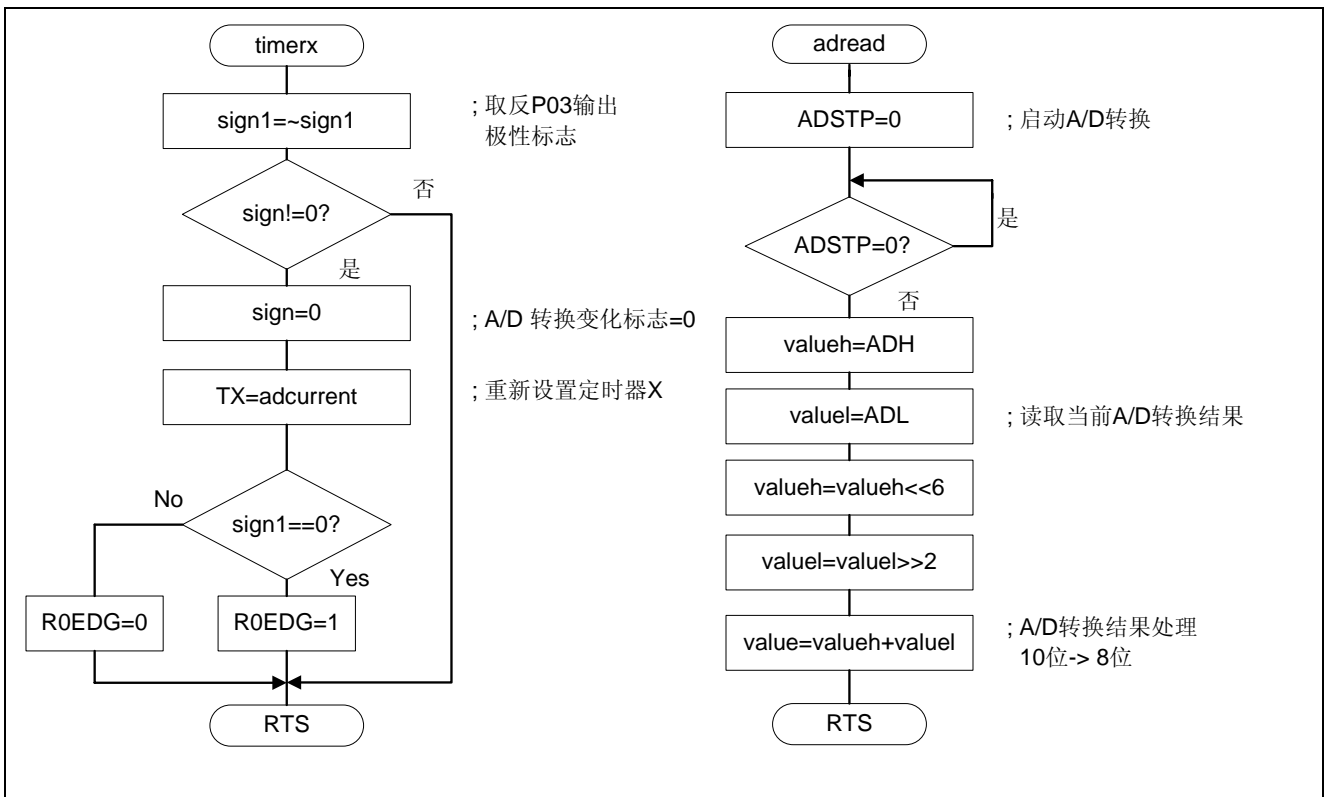
5.1 复位后初始设定子程序流程图如下:



5.2 等待状态控制与 LED 闪烁状态控制子程序，其流程图如下：



5.3 定时器 X 中断处理子程序，A/D 转换结果处理子程序，其流程图如下：



## 6. 参考程序

```

/*****
* File Name : main.c
* Contents : Demo Program For AD Converter And Timer X
*           (Pulse Output Mode)
* Copyright (C) 2006, Renesas Technology Corp. All right reserved.
* Version : 1.00 ( 2005-10-15 ) Initial
*
*****/
#include<intr740.h>
#include "adconvert.h"
#include "SFR_7542.h"

void main(void)
{
    disable_interrupt(); /* Interrupt Disable */
    cld_instruction(); /* Binary Arithmetic Executed */
    CPUM=0x84; /* Single Chip Mode,Stack Page0,On-Chip OSC */
    nop_instruction(); /* Waiting For Stable Of Oscillation */
    nop_instruction();
    nop_instruction();
    CPUM=0x04; /* Switch To Main Clock,High-Speed Mode */
    sfr_init(); /* Initialize SFR */
    adfirst=adread(); /* Read First A/D Conversion Value */
    enable_interrupt(); /* Interrupt Enable */
    while(1)
    {
        while(ID_T1 ==0){} /* 10ms Finished? */
        INTDIS=0x07; /* Timer1 Interrupt Discrimination Bit Valid */
        adcurrent = adread();
        if(resetr==0)
            waitingmode(); /* Go To Waiting State */
        else
            blinkmode(); /* Go To Blink State */
    }
}
/*****
Name : timerx
Parameters : None
Returns : None
Description : Change the TX value
*****/
interrupt void timerx(void)
{
    sign1 = ~sign1; /* Inverse P03 Output Value */
    if(sign1!=0)
    {
        sign = 0; /* A/D Conversion Value Changed Bit =0 */
        TX = adcurrent; /* Send A/D Conversion Value To TX */
        if(sign1==0)
            ROEDG = 1;
        else
            ROEDG = 0;
    }
}

```

```

/*****
Name      : sfr_init
Parameters : None
Returns   : None
Description : Initial the port and signal
*****/
void sfr_init(void)
{
    P0      = 0x00;          /* Port P0,Output Low Level */
    P0D     = 0xff;        /* Port P0 Directional Register,Output Mode */
    P1      = 0x00;          /* Port P1,Output Low Level*/
    P1D     = 0xff;        /* Port P1 Directional Register,Output Mode */
    P2      = 0x00;          /* Port P2,Output Low Level*/
    P2D     = 0xfe;        /* Port P2 Directional Register,Output Mode */
    P3      = 0x07;          /* Port P3,Output Low Level*/
    P3D     = 0xff;        /* Port P3 Directional Register,Output Mode */
    sign    = 0x00;          /* A/D Value Changed Sign */
    sign1   = 0xff;        /* P03 Port Value Sign */
    resetr  = 0x00;        /* Mode Sign */
    ADCON   = 0x18;        /* Analog Channel 0, AD Clock:f(XIN)/16 */
    TXM     = 0x19;        /* Pulse Output Mode */
    TCSS    = 0x00;        /* TIMEX Clock Source: f(XIN)/16 */
    PREX    = 250-1;
    TX      = 0;           /* LED3 Minimal Blink Time:1ms */
    PRE1    = 125-1;
    T1      = 40-1;        /* Main Loop:10ms */
    IV_T1   = 1;          /* Timel Interrupt Valid */
    INTDIS  = 0x07;        /* Timerl Interrupt Discrimination Bit Valid */
    IE_TX   = 1;          /* Timer X Interrupt Enable */
    TXSTP   = 0;          /* Start Timer X */
}
/*****
Name      : adread
Parameters : None
Returns   : None
Description : Read A/D value
*****/
unsigned char adread(void)
{
    unsigned char value1, valueh, value;

    ADSTP = 0;           /* Start A/D */
    while (ADSTP ==0){} /* Wait For A/D Conversion Endding */
    valueh = ADH;
    value1 = ADL;        /* Get A/D Conversion Value */
    valueh = valueh<<6;
    value1 = value1>>2; /* Convert 10 Bit To 8 Bit */
    value  = value1+valueh; /* Get 8 Bit A/D Value */
    return(value);
}

```

```

/*****
Name      : waitingmode
Parameters : None
Returns   : None
Description : When reset disposal the pulse output
*****/
void waitingmode(void)
{
    unsigned char i;
    i=adcurrent-adfirst;          /* Get Error */
    if(10<i&& i<245)              /* Chattering Elimination */
    {
        sign = 0x01;              /* A/D Value Changed Sign=1 */
        resetr = 0x01;           /* Mode Sign=1 */
        adpast = adcurrent;       /* Send A/D Current Value To Past Memory */
    }
}
/*****
Name      : blinkmode
Parameters : None
Returns   : None
Description : When normal disposal the pulse output
*****/
void blinkmode(void)
{
    unsigned char i;
    i = adcurrent-adpast;        /* Get Error */
    if(i!=0)
    {
        sign = 0x01;              /* A/D Conversion Change Sign=1 */
        adpast = adcurrent;       /* Send A/D Current Value To Past Memory */
    }
}

*****
* File Name   : AD_Convert.H                                           *
* Copyright (C) 2006, Renesas Technology Corp. All right reserved.    *
* Version     : 1.00 ( 2005-10-15 ) Initial                          *
*****/
#ifndef ADCONVERT
#define ADCONVERT
void sfr_init(void);          /* SFR Setting Subprogram */
unsigned char adread(void);   /* Read A/D Conversion Subprogram */
void waitingmode(void);      /* Waiting State Subprogram */
void blinkmode(void);        /* Blink State Subprogram */
unsigned char adfirst;        /* First A/D Conversion Value */
unsigned char adcurrent;      /* Current A/D Conversion Value */
unsigned char adpast;         /* Past A/D Conversion Value */
unsigned char sign;           /* A/D Value Changed Sign */
unsigned char sign1;          /* P03 port value sign */
unsigned char resetr;         /* Mode Sign */
#endif
/* ADCONVERT */

```

## 7. 参考文献

硬件手册

7542 群数据手册

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  - 2) 植埋于人体使用的装置。
  - 3) 用于治疗（切除患部、给药等）的装置。
  - 4) 其他直接影响到人的生命的装置。
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