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M32C/82,83 Group

How to use intelligent I/O interrupt

1.0 Abstract

An intelligent I/O has multiple interrupt request factors, such as a time measurement interrupt and a waveform generation interrupt. An intelligent I/O arrange several interrupt requests factors and use them as one intelligent I/O interrupt.

2.0 Introduction

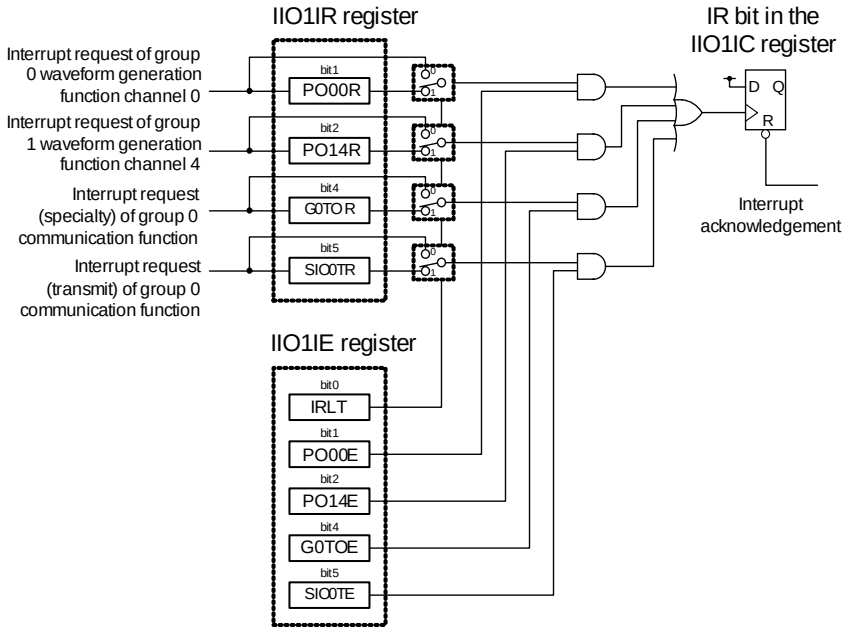
This application note introduces how to use the intelligent I/O interrupt

M32C/82 group

M32C/83 group

3.0 Detailed description

This application note describes M32C/83 group intelligent I/O interrupt 1 as one example.



When using an intelligent I/O interrupt 1, set the IRLT bit in the IIO1IE register to "1" (use the interrupt request by an interrupt) and set the interrupt enabled bit in the IIO1IE register to "1". For example, when using both the group 0 waveform generation function channel 0 (PO00) interrupt and the group 1 waveform generation function channel 4 (PO14) interrupt, set both the PO00 bit and the PO14 bit in the IIO1IE register to "1". When the PO00 interrupt request is generated, the PO00R bit in the IIO1IR register becomes "1" and when the PO14R interrupt request is generated, the PO14R bit in the IIO1IR register becomes "1". When either the PO00R bit or the PO14R bit, or both of them become "1", the IR bit in the IIO1IC register becomes "1". When reading the IIO1IR register within an interrupt process, the microcomputer judges the generated interrupt factors and executes the interrupt processes.

Once an interrupt is acknowledged, the IR bit becomes "0" automatically. However, the PO00R bit and PO14R bit don't become "0". Write "00_{16}" into the IIO1IR register within an interrupt process. When completing an interrupt process without writing "00_{16}" into the IIO1IR register, the IR bit keeps "0" even an interrupt request is generated again. (An interrupt is not generated).

3.1 Interrupt process flow

An intelligent I/O interrupt process flow is shown in Figure 2.

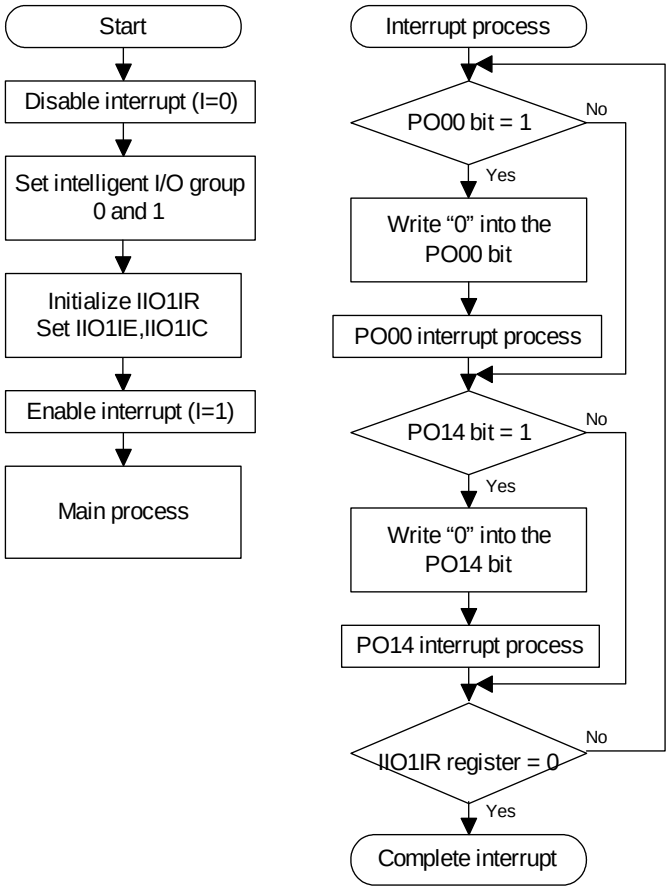


Figure 2

3.2 A way of setting

The setting procedure of the IIO1IR register, the IIO1IE register and the IIO1IC register and the setting value are shown to execute "3.0 Detailed description". Refer to the application note (M16C-39-0212) regarding the settings of an intelligent I/O group 0 and 1. Also refer to the user's manual of a relative microcomputer for details of each register.

(1) Set IIO1IE = 0b00000001

Bit Position	Symbol	Bit Name & Function
Bit [7:1]	---	Interrupt Enable Bits 7 thru 1 Set the bits to 0b0000000
Bit 0	IRLT	Interrupt Request Select Bit Set the bits to “1” 0b1 enables that the request is used for the interrupt.

Bits [7:1] and bit IRLT must not be set to 1 at the same time.

(2) Set Register IIO1IR = 0b00000000

Bit Position	Symbol	Bit Name & Function
Bits [7:1]	---	Set the bits to 0b0000000
Bit 0	---	Don't use (Set the bit to 0b0)

The register must be set 0x00 here.

(3) Set Register IIO1IE = 0b00000111

Bit Position	Symbol	Bit Name & Function
Bits [7:3]	---	Don't use (Set the bits to 0b00000)
Bit 2	PO14	Set the interrupt enable bit of group 1 waveform generation function channel 4 to “1” (enable interrupt)
Bit 1	PO00	Set the interrupt enable bit of group 0 waveform generation function channel 0 to “1” (enable interrupt)
Bit 0	IRLT	Interrupt Request Select Bit

(4) Set Register IIO1IC = 0b00000***

Bit Position	Symbol	Bit Name & Function
Bits [7:4]	---	Don't use (Set the bits to 0b0000)
Bit 3	IR	Interrupt Request Bit 0b0 sets no interrupt request.
Bits [2:0]	ILVL2-0	Interrupt Priority Level Select Bits Set the values

4.0 Sample program

```
/************************************************************/
/*    FILE NAME : rej05b0285_src.c                          */
/*    Version     : 1.10                                    */
/*    FUNCTION    : Intelligent I/O Interrupt               */
*/************************************************************/
/* Rev.1.00 -> Rev.1.10
        Interrupt setting procedure is changed.
*/
/*********************************/
/*     include file                */
/*********************************/
#include <stdio.h>
#include "sfr32c83.h"

/*********************************/
/*     Function Definition         */
/*********************************/
void iio_int(void);
#pragma INTERRUPT iio_int

/*********************************/
/*     main function               */
/*********************************/
void main(void){
      /*    main clock set       */
      prc0 = 1;                    /*    protect off    */
      mcd = 0x12;                    /*    main clock : no division    */
      prc0 = 0;                    /*    protect on    */

      p7 = 0;
      pd7 = 0xff;

      /* iio group 0 initial set */
      g0bcr0 = 0x7f;              /* Base timer count source = f1 */
      g0bcr1 = 0x01;               /* Base timer control register1 */

      g0pocr0 = 0x00;              /* Single phase waveform output */
      g0po0 = 0x1000;

      ps9 = 1;                     /* P150 : outc00 */

      g0fs = 0xfe;                /* Channel 0 = Waveform generation */
      g0fe = 0x01;                 /* Channel 0 enabled */
```

```
    /* iio group 1 initial setting*/
      g1bcr0 = 0x7f;                /* Base timer count source = f1 */
      g1bcr1 = 0x00;                /* Base timer control register 1 */

      g1pocr4 = 0x00;               /* Single-phase waveform output */
      g1po4 = 0x5000;

      ps8 = 1;                      /* P140 : outc14 */

      g1fs = 0x00;                  /* Channel 4 = waveform generation */
      g1fe = 0x10;                  /* Channel 4 enable */

      iio1ie = 0x01;                /* Latch interrupt request */
      iio1ir = 0x00;                /* Interrupt request flag clear    */
      iio1ie = 0x07;                /* PO00E,PO14E    Interrupt enable */
      iio1ic |= 0x03;               /* iio1ic Priority level 3 */

      g0bcr1 |= 0x10;               /* Base timer start */
      g1bcr1 |= 0x10;               /* Base timer start */

      asm("fset     i");                  /* Interrupt enable */

      while(1){
            g1po4 = ((unsigned short)p1<<4) + p0;     /* P140 Waveform output data */
                                    change */
      }
}

/* Intelligent I/O interrupt */
void iio_int(void){
      unsigned char i;
      p7 |= 0x80;
      while(iio1ir & 0x6 ){
            /* PO00 interrupt process */
            if( iio1ir & 0x2 ){
                  iio1ir &= 0x04;
                  p7 |= 0x40;
                  for( i=0; i<=30; i++);
                  p7 &= 0xbf;
            }
            /* PO14 interrupt process */
            if( iio1ir & 0x4 ){
                  iio1ir &= 0x02;
                  p7 |= 0x40;
                  for( i=0; i<=10; i++);
                  p7 &= 0xbf;
            }
      }
      p7 &= 0x7f;
}
/*---------------------------------------------------------------------- program end */
```

REVISION HISTORY	M32C/83 Group how to use intelligent I/O interrupt

Rev.	Date	Description	
		Page	Summary
1.00	Sep 30, 2003	-	First edition issued
1.10	Jun 16, 2004	-	Interrupt setting procedure is changed

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