



SM39R 系列 **KBI** 功能使用方法

1 适用产品:

1.1 SM39R16A2/ SM39R12A2/ SM39R08A2

2 **KBI** 使用说明:

2.1 共有 4 个 I/O 可致能为 **KBI** 功能 I/O。

2.2 由 Port 0 共 4 个 I/O，分别对应至 4 个独立的旗标(KBF.0~ KBF.3)，且共享同一个中断向量位置 (0x5B)。

2.3 可由程序设定为高准位或低准位触发。

2.4 当触发讯号输入至 **KBI** 任一引脚，其对应的旗标将会被设置为"1"，并且进入中断子程序。

2.5 **KBI** 功能主要可做为 2x2 矩阵式键盘扫描，或其它应用。

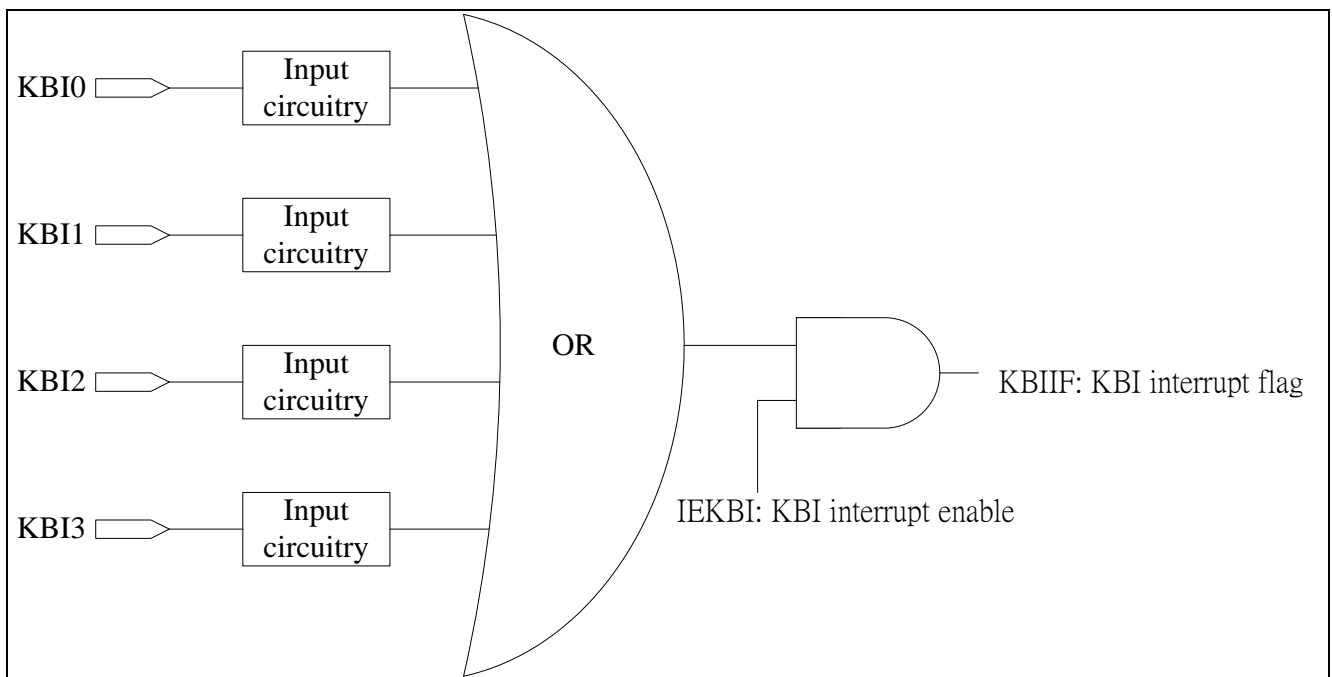


Fig. Interrupts from KBI 4 inputs

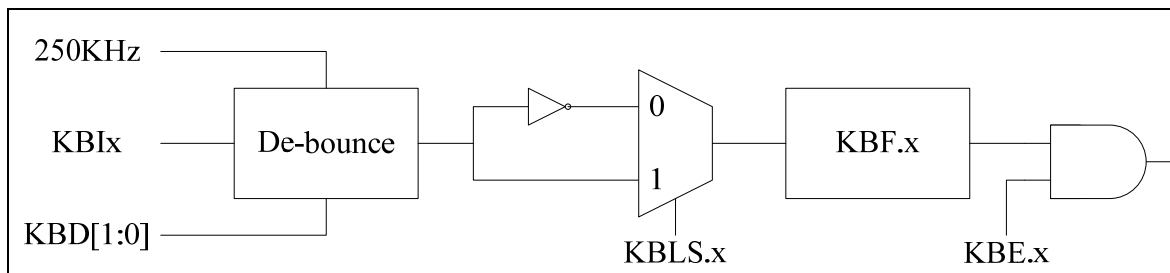


Fig. keyboard input circuitry



2.6 KBI 相关缓存器:

KBI	Description	Direct	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	RESET
KBI function											
KBLS	KBI level selection	93h	-	-	-	-	<i>KBLS3</i>	<i>KBLS2</i>	<i>KBLS1</i>	<i>KBLS0</i>	00H
KBE	KBI input enable	94h	-	-	-	-	<i>KBE3</i>	<i>KBE2</i>	<i>KBE1</i>	<i>KBE0</i>	00H
KBF	KBI flag	95h	-	-	-	-	<i>KBF3</i>	<i>KBF2</i>	<i>KBF1</i>	<i>KBF0</i>	00H
KBD	KBI De-bounce control register	96h	<i>KBDEN</i>	-	-	-	-	-	<i>KBD1</i>	<i>KBD0</i>	00H
IEN1	Interrupt Enable 1 register	B8H	EXEN2	-	IEIIC	IELVI	<i>IEKBI</i>	IEADC	IESPI	IEPWM	00H
IRCON	Interrupt request register	C0H	EXF2	TF2	IICIF	LVIIF	<i>KBIIF</i>	ADCIF	SPIIF	PWMIF	00H

Mnemonic: KBLS

Address: 93h

7	6	5	4	3	2	1	0	Reset
-	-	-	-	<i>KBLS3</i>	<i>KBLS2</i>	<i>KBLS1</i>	<i>KBLS0</i>	00H

KBLS.3: 触发准位设定位 (Keyboard Line 3 level selection bit)

0: 设定为低准位触发

1: 设定为高准位触发

KBLS.2: 触发准位设定位 (Keyboard Line 2 level selection bit)

0: 设定为低准位触发

1: 设定为高准位触发

KBLS.1: 触发准位设定位 (Keyboard Line 1 level selection bit)

0: 设定为低准位触发

1: 设定为高准位触发

KBLS.0: 触发准位设定位 (Keyboard Line 0 level selection bit)

0: 设定为低准位触发

1: 设定为高准位触发

Mnemonic: KBE

Address: 94h

7	6	5	4	3	2	1	0	Reset
-	-	-	-	<i>KBE3</i>	<i>KBE2</i>	<i>KBE1</i>	<i>KBE0</i>	00H

KBE.3: 致能位 (Keyboard Line 3 enable bit)

0: KBI 禁能, 预设为一般的出入埠(GPIO)

1: KBI 致能, 当触发讯号输入时, KBF.7 = 1, 会触发中断

KBE.2: 致能位 (Keyboard Line 2 enable bit)

0: KBI 禁能, 预设为一般的出入埠(GPIO)

1: KBI 致能, 当触发讯号输入时, KBF.7 = 1, 会触发中断

KBE.1: 致能位 (Keyboard Line 1 enable bit)

0: KBI 禁能, 预设为一般的出入埠(GPIO)

1: KBI 致能, 当触发讯号输入时, KBF.7 = 1, 会触发中断

KBE.0: 致能位 (Keyboard Line 0 enable bit)

0: KBI 禁能, 预设为一般的出入埠(GPIO)

1: KBI 致能, 当触发讯号输入时, KBF.7 = 1, 会触发中断



Mnemonic: KBF

Address: 95h

7	6	5	4	3	2	1	0	Reset
-	-	-	-	KBF3	KBF2	KBF1	KBF0	00H

KBF.3: KBI 触发旗标 (Keyboard Line 3 flag)

- 1: 当 KBI3 侦测到输入讯号时, KBF.3 由硬件设为"1", 并产生 KBI 中断;
- 0: 必须由软件清除为"0"

KBF.2: KBI 触发旗标 (Keyboard Line 2 flag)

- 1: 当 KBI2 侦测到输入讯号时, KBF.2 由硬件设为"1", 并产生 KBI 中断;
- 0: 必须由软件清除为"0"

KBF.1: KBI 触发旗标 (Keyboard Line 1 flag)

- 1: 当 KBI1 侦测到输入讯号时, KBF.1 由硬件设为"1", 并产生 KBI 中断;
- 0: 必须由软件清除为"0"

KBF.0: KBI 触发旗标 (Keyboard Line 0 flag)

- 1: 当 KBI0 侦测到输入讯号时, KBF.0 由硬件设为"1", 并产生 KBI 中断;
- 0: 必须由软件清除为"0"

Mnemonic: KBD

Address: 96h

7	6	5	4	3	2	1	0	Reset
KBDEN	-	-	-	-	-	KBD1	KBD0	00H

KBDEN: 除弹跳功能致能位(Enable KBI de-bounce function).

预设为致能(The default KBI function is enabled).

KBDEN = 0, 致能除弹跳功能

KBDEN = 1, 禁能除弹跳功能

KBD[1:0]: 除弹跳时间设定位. 若 KBDEN = "0", 则预设为 320 ms.

KBD[1:0] = 00, 除弹跳时间为 320 ms.

KBD[1:0] = 01, 除弹跳时间为 160 ms.

KBD[1:0] = 10, 除弹跳时间为 80 ms.

KBD[1:0] = 11, 除弹跳时间为 40 ms.

Mnemonic: IEN1

Address: B8h

7	6	5	4	3	2	1	0	Reset
EXEN2	-	IEIIC	IELVI	IEKBI	IEADC	IESPI	IEPWM	00H

IEKBI: KBI interrupt enable.

IEKBI = 0 – Disable KBI interrupt.

IEKBI = 1 – Enable KBI interrupt.

Mnemonic: IRCON

Address: C0h

7	6	5	4	3	2	1	0	Reset
EXF2	TF2	IICIF	LVIF	KBIIF	ADCIF	SPIIF	PWMIF	00H

KBIIF: KBI interrupt flag. Must be cleared by software.



2.7 以下是 **KBI** 相对应的中断向量表:

Table 11-1: Interrupt vectors

Interrupt Request Flags	Interrupt Vector Address	Interrupt Number *(use Keil C Tool)
IE0 – External interrupt 0	0003h	0
TF0 – Timer 0 interrupt	000Bh	1
IE1 – External interrupt 1	0013h	2
TF1 – Timer 1 interrupt	001Bh	3
RI/TI – Serial channel interrupt	0023h	4
TF2/EXF2 – Timer 2 interrupt	002Bh	5
PWMIF – PWM interrupt	0043h	8
SPIIF – SPI interrupt	004Bh	9
ADCIF – A/D converter interrupt	0053h	10
KBIIF – keyboard Interface interrupt	005Bh	11
LVIIIF – Low Voltage Interrupt	0063h	12
IICIF – IIC interrupt	006Bh	13
Comparator interrupt	0093h	18

*See Keil C about C51 User's Guide about Interrupt Function description

KBI 中断应用的参考程序:

Description	<ol style="list-style-type: none"> 1. KBI I/O 全部致能, Ch.0/Ch.1 高准位侦测 Ch.2/Ch.3 低准位侦测 2. De-bounce 时间为 40ms
C 语言	<pre>//===== // SYNCMOS TECHNOLOGY //===== #include "SM39R16A2.h" #include " SM39R16A2_KBI.h " #define KBI_VECTOR 11 //KBI Interrupt Vevtor #define d_KBLS 0x03 //KBI Low/High level detection selection (0~0x0F) #define d_KBEX 0x0F //KBI Input Enable (0~0x0F) #define d_KBDEN 0x00 //KBI De-bounce Function Enable #define d_KBDS 0x03 //KBD[1:0] KBI De-bounce Time Selection (0~3) #define d_KBIIE 0x01 //KBI Interrupt Enable bit void KBI_initialize(void) //Initialize KBI { EA=0; //Disable All Interrupt Function IEKBI=(d_KBIIE); //Enable KBI Interrupt Function KBD=(d_KBDEN<<7) (d_KBDS); //Enable KBI De-bounce and De-bounce Time Function</pre>

Specifications subject to change without notice, contact your sales representatives for the most recent information.



```
KBLS=(d_KBLS);           //KBI Input High/Low Level Select
KBE=(d_KBEX);           //KBI Input Channel Enable
EA=1;                   //Enable All Interrupt
}
//-----//
void KBI_Disable(void)
{
    IEKBI=0;             //Disable KBI Interrupt
    KBE=0;               //Disable KBI Function
}
//-----//
void KBI_ISR(void) interrupt KBI_VECTOR //KBI Interrupt Subroutine
{
    switch(KBF)          //Decision Occur Channel Flag (KBF)
    {
        case 0x08:      //KBI Channel 3 Occur Interrupt(KBF3)
            P1_3=0;
            break;
        case 0x04:      //KBI Channel 2 Occur Interrupt(KBF2)
            P1_2=0;
            break;
        case 0x02:      //KBI Channel 1 Occur Interrupt(KBF1)
            P1_1=0;
            break;
        case 0x01:      //KBI Channel 0 Occur Interrupt(KBF0)
            P1_0=0;
            break;
    }
    KBF=0;
    ///KBIIF=0; //Hardware Clear KBI Flag
}
void main(void)         //Main Function Start
{
    KBI_initialize(); //Call KBI Initial Subroutine
    while(1);
    //KBI_Disable();
}
```



Description	<p>1. KBI I/O 全部致能 Ch.0~3 高准位侦测 De-bounce 时间为 320ms</p> <p>2. 当外部触发讯号至 KBI I/O 时产生中断，并将结果显示于 Port1</p>
汇编	<pre> //===== // SYNCMOS TECHNOLOGY //===== SFR KBLS = 0x93; ;Keyboard level selector register SFR KBE = 0x94; ;Keyboard input enable register SFR KBF = 0x95; ;Keyboard interrupt flag register SFR KBD = 0x96; ;de-bounce mechanism select SFR IEN0 = 0xA8; SFR IEN1 = 0xB8; SFR IRCON = 0xC0; ORG 0000H JMP BEGIN ORG 005BH JMP KBI_INT ;===== ;KBI INTERRUPT INIT ROUTINE ;===== BEGIN: MOV IEN0,#80H ;EA =1 MOV IEN1,#08H ;IEKBI =1 MOV KBD,#00H ;KBI de-bounce function and set de-bounce time is 320 ms. MOV KBLS,#0FFH ;High level detect ; MOV KBLS,#00H ;Low level detect MOV KBE,#0FFH ;KBI all pin enable MOV KBF,#00H ;KBI all flag clear JMP START ;===== ;MAIN ;===== START: JMP START ;===== ;KBI INTERRUPT ROUTINE ;===== KBI_INT: MOV P1,KBF MOV KBF,#00H ANL IRCON,#08H RETI END </pre>

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