

# **FT61F02X**

## **IO Application notes**

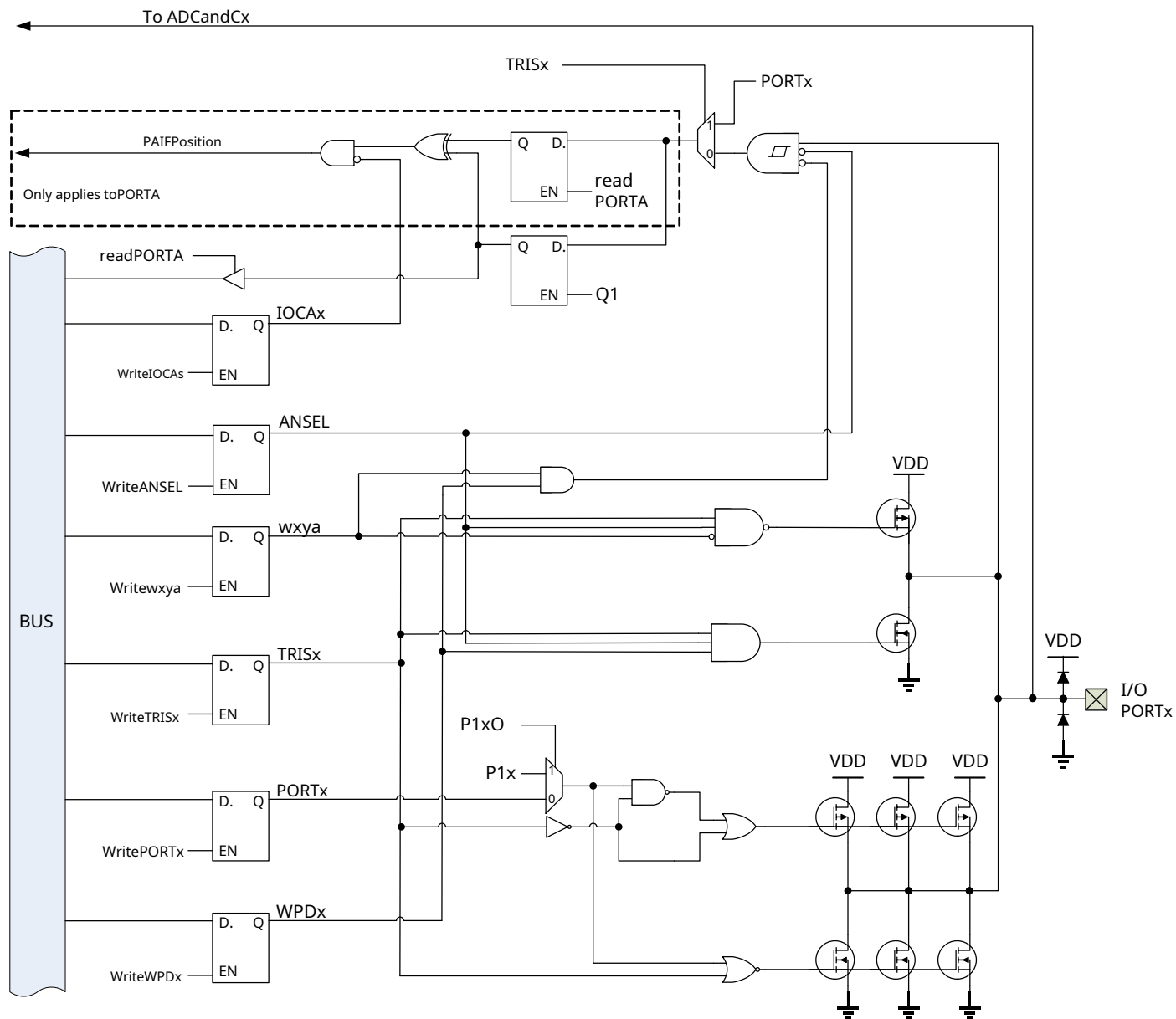
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## FT61F02x I/O application

### 1. I/O port

Depending on the package type, FT61F02x Series chips have a maximum of 14 individual I/O pins available, divided into 2 groups: PORTA (8) and PORTC (6). [surface1-1](#) lists all I/O functions of the pin.



picture1-1 portPort Structure Diagram

I/O The pins have the following functions ([surface1-3](#), [surface1-4](#)):

- digital output
- digital input
- weak pull-up
- weak pulldown (PA4, PC1, PC2, PC3)

In addition, some I/O has the following special features:

1. Program debug pin (ISP-Data, ISP-CLK), hardware internal connection, no need to set.

2. pass IDEs Interface configuration, and the function loaded when the chip is initialized and configured ([surface1-2](#)):

- External Clock/Crystal Input (OSC1, OSC2)
- Internal clock output
- System external reset (/MCLR B)

3. corresponding to the instruction I/O pins for configuration of other functions, which can be divided into 3 kind:

#### a. digital output

- PWM
- Enhanced PWM
- ECCP compare output

#### b. digital input

- Timer0 clock input
- Timer1 clock input
- Timer1 Gating input
- ECCP capture input
- external edge interrupt
- GPIO sport change interrupt

#### c. analog input

- LVD/BOR
- ADC
- V<sub>REF</sub>
- Comparators

#### d. analog output

- V<sub>REG</sub> regulator output

pin name	ISP debugging	clock	ADC	Stabilizer	Comparators	to interrupt	ECCP/PWM	numberI/O pull-up/pull-down	source current (mA)	Sink current (mA)
PA0	CLK		AN0		C1IN+	-		- / --	twenty four	35
PA1	DATA		AN1		C1IN-	-		- / --	twenty four	35
PA2		T0CKI	AN2		C1OUT	-		- / --	twenty four	35
PA3			AN3			-		- / --	twenty four	35
PA4				VREGP		-		- / -	twenty four	35
PA5						- + /MCLRB		- / --	twenty four	35
PA6		output /OSC-				-		- / --	twenty four	35
PA7		T1CKI /OSC+				-		- / --	twenty four	35
PC0			AN4 (V <sub>REF</sub> )		C2IN+		P1F	- / --	twenty four	35
PC1			AN5		C2IN-	INT	P1E	- / -	twenty four	35
PC2			AN6				PWM5/P1D	- / -	twenty four	35
PC3							PWM4/P1C	- / -	twenty four	35
PC4					C2OUT		PWM3/P1B	- / --	twenty four	35
PC5				VREGN			CCP1/P1A	- / --	twenty four	35
Note		T1G=PA6							V <sub>DD</sub> =5, V <sub>DS</sub> =0.5	

surface1-1 I/O port function

## 1.1. I/O Summary of Port Related Registers

name	Features	default
RDCTRL	when $TRISx = 0$ (output enable), read $PORTx$ register return value - input latch - output latch	output latch
MCLRE	external I/O reset	closure
FOSC	- LP:PA7 (+) and PA6 (-) Connect to external low-speed crystal - oscillator XT:PA7 (+) and PA6 (-) Connect to external high-speed - crystal oscillator EC:PA7 (+) connected to an external clock - input, PA6 for I/O INTOSC:PA6 output "instruction clock", PA7 for I/O <u>INTOSCIO</u> :PA7 and PA6 for I/O	INTOSCIO

surface1-2I/O Related initialization configuration registers

name	address	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	reset value
ANSEL	0x91	ANSEL [7:0]								1111 1111
TRISA	0x85	TRISA[7:0], PORTA direction control								1111 1111
TRISC	0x87	—	—	PORTC direction control						— — 11 1111
PORTA	0x05	PORTA output register								xxxx xxxx
PORTC	0x07	—	—	PORTC output register						— — xx xxxx
WPUA	0x95	PORTA weak pull-up								1111 1111
WPUC	0x88	—	—	PORTC weak pull-up						— — 00 0000
WPD	0x89	—	—	—	WPDA4	WPDC1	WPDC2	WPDC3	—	— — — 0 000—
IOCA <sub>s</sub>	0x96	IOCA[7:0]: PORTA Port Change Interrupt Settings								0000 0000
OPTIONS	0x81	/PAPU	INTEDG	TOCS	TOSE	PSA	PS2	PS1	PS0	1111 1111

surface1-3I/O Addresses and reset values of associated user registers

name	state		register	address	reset value
TRISA	PORTA	portPort digital output (direction control)	TRISA[7:0]	0x85	RW-1111 1111
TRISC	PORTC	1 =closure 0 =Enable (turn off pull-up/pull-down)	TRISC[5:0]	0x87	RW-11 1111
ANSEL	1 =Close pull-up/pull-down, and digital input (Only applies to8individualADC aisle) 0 =(no action)		ANSEL[7:0]	0x91	RW-1111 1111
/PAPU	1 =close allPORTApull-up function 0 =Pull up byWPUAcontrol		OPTION[7]	0x81	RW-1
WPUA	PORTA	weak pull-up	WPUA[7:0]	0x95	RW-1111 1111
WPUC	PORTC	1 =Enable (PORTADefaults) 0 =closure (PORTCDefaults)	WPUC[5:0]	0x88	RW-00 0000
WPDA4	PORTA	weak pull-down	WPD[4]	0x89	RW-0
WPDC	PORTC	1 =Enable                      0 =closure	WPD[3:1]		RW-000
PORTA	PORTA	data output register	PORTA[7:0]	0x05	RW-xxxx xxxx
PORTC	PORTC		PORTC[5:0]	0x07	RW-xx xxxx

surface1-4I/O Related user registers

## 1.2. I/O configuration

each port, all need to be configured as follows according to their corresponding functions (surface1-5):

- weak pull-up
- weak pulldown (PA4, PC1, PC2, PC3)
- digital input
- digital output

Features	digital input	pull-up/pull-down	digital output	set up
ISP-DATA	On	Off	On	(hardware built-in, ignore instruction)
ISP-CLK	On	Off	Off	(hardware built-in, ignore instruction)
/MCLR	On	pull up	Off	(Initialize configuration, ignore directive)
clock output	(neglect)	Off	On	(Initialize configuration, ignore directive)
OSC+ (EC)	On	(optional)	Off	(Initialize configuration, ignore directive)
OSC+ / OSC- (LP, XT)	Off	Off	Off	(Initialize configuration, ignore directive)
ADC	Off	Off	Off	TRISx = 1; ANSELx = 1
V <sub>REF</sub>	Off	Off	Off	TRISx = 1
Comparator input	Off	Off	On	TRISx = 1; ANSELx = 1
Comparator output	On	Off	On	TRISx = 0
Timer0 clock	On	(optional)	Off	TRISx = 1
Timer1 clock	On	(optional)	Off	TRISx = 1
Timer1 gating	On	(optional)	Off	TRISx = 1
Timer3/4/5 clock	On	(optional)	Off	TRISx = 1
port change interrupt	On	(optional)	Off	TRISx = 1
PC1-INT	On	(optional)	Off	TRISx = 1
digital input	On	(optional)	Off	TRISx = 1
PWM	On	Off	On	TRISx = 0
ECCP	On	(optional)	Off	TRISx = 1
Stabilizer	(neglect)	Off	Off	VREG_OE = 1
digital output	On	Off	On	TRISx = 0

surface1-5 I/O Configuration Flags and User Registers

Note:

1. TRISx = 0: "Digital output" is enabled, "Pull-up/pull-down" is automatically turned off (ignored WPD, WPUx), TRISbit has priority over ANSELx.
2. TRISx = 1: "Digital output" off.
3. ANSELx = 1: "Pull-up", "level change interrupt", "digital input" automatically closed (ignored WPD, WPUx).
4. The only command that can turn off the "digital input" is "ANSELx = 1".
5. "/PAPU=1" close all PAx "weak pull-up" function of the port. PCx There are no such control bits.
6. /MCLREnable: PA5 The weak pull-up function is automatically enabled (ignore the WPUA[5]); read PORTA[5] value is "0".

7. rightPORTxdata output register for write operations, I/OThe port will output the corresponding logic level. Each group up to 8 individual I/OThe data registers share the same address, and the write operation actually performs the process of 'read-modify-write', that is, read the group firstPORTxPort latch value (output or input), then modified, and written backPORTxdata register.

8. Digital output and digital input functions can coexist, and some applications need to enable digital output and digital input at the same time.

9. whenTRISx = 0when, throughIDEsThe interface can choose to readPORTxOutput or input the value of the latch.

10. During a full reset or system reset, thePORTxregisters are not reset, butTRISxwill be reset to "1", thereby turning off the output.

11. whenIOWhen the weak pull-up and weak pull-down are enabled at the same time, the weak pull-down will be disabled and the weak pull-up will work.

PC1-INTandPORTAFor port change interrupt settings, see[chapter](#)**Error! Reference source not found.**"interruption".



## 2.Application example

```
//*****
***** /*file name:TEST_61F02x_IO.C
* Features:    FT61F02x-IODemo
* IC:          FT61F023 SOP16
* Crystal:     16M/2T
* illustrate:  whenDemoPortInWhen floating or high level,
*              Demo Port Outoutput50Hzduty cycle50%Waveform
*              DemoPortInWhen grounded,Demo Port Outoutput high level
*
*              FT61F023 SOP16
*
*              -----
* VDD-----| 1(VDD)    (VSS)16|-----GND
* NC-----| 2(PA7)    (PA0)15|-----NC
* NC-----| 3(PA6)    (PA1)14|-----NC
* NC-----| 4(PA5)    (PA2)13|-----NC
* DemoPortIn--| 5(PC3)  (PA3)12|--DemoPortOut
* NC-----| 6(PC2)    (PC0)11|-----NC
* NC-----| 7(PA4)    (PC1)10|-----NC
* NC-----| 8(PC5)    (PC4)09|- -----NC
*
*              -----
*/

//*****
#include "SYSCFG.h"

//*****Macro definition *****
#define Demo Port Out    PA3
#define DemoPortIn      PC3
/*-----
* Function name:POWER_INITIAL
* Features:    Power-on system initialization
* enter:      none
* output:     none
*
*              -----
----- */ void POWER_INITIAL (void)
{
    OSCCON = 0B01110001;    //IRCF=111=16MHz/2T=8MHz,0.125μs//Temporarily
    INTCON = 0;            disable all interrupts
    PORTA = 0B00000000;
    TRISA = 0B00000000;    //PAinput Output0-output1-enter
    PORTC = 0B00000000;
    TRISC = 0B00001000;    //PCinput Output0-output1-enter //
                          PC3-output
    WPUA = 0B00000000;    //PAPort pull-up control1-pull up0-close pull //
    WPUC = 0B00001000;    PCPort pull-up control1-pull up0-close pull
}
```

```

OPTION = 0B00001000;          //Bit3=1, WDT MODE, PS=000=WDT RATE 1:1
MSCKCON = 0B00000000;
//Bit6->0,prohibitPA4,PC5Regulated output
//Bit5->0,TIMER2the clock isFosc //Bit4->0,
prohibitLVR
CMCON0 = 0B00000111;          //turn off the comparator,Cxfor numbersIOmouth
}
/*-----
* Function name:Delay Us
* Features:   Short delay function --16M-2T--probably fast1%about.
* enter:      TimeDelay time length Delay time lengthTime µs none
* output:
-----
----- * / void DelayUs(unsigned char Time)
{
    unsigned char a;
    for(a=0;a<Time;a++)
    {
        NOP();
    }
}
/*-----
* Function name:DelayMs
* Features:   Short delay function fast1%
* enter:      TimeDelay time length Delay time lengthTime ms
* output:     none
-----
----- * / void DelayMs(unsigned char Time)
{
    unsigned char a, b;
    for(a=0;a<Time;a++)
    {
        for(b=0;b<5;b++)
        {
            DelayUs(197);
        }
    }
}
/*-----
* Function name:main
* Features:   main function
* enter:      none
* output:     none

```

```
-----  
*/ void main()  
{  
    POWER_INITIAL();           //system initialization  
    while(1)  
    {  
        DemoPortOut = 1;  
        DelayMs(10);           //10ms  
        if(DemoPortIn == 1)    //Determine whether the input is high  
        {  
            DemoPortOut = 0;  
        }  
        DelayMs(10);  
    }  
}
```

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