Arduino底层 Atmega2560寄存器操作

原创 时光匠 2019-06-03 15:14:28 2021 已收藏 8 版权
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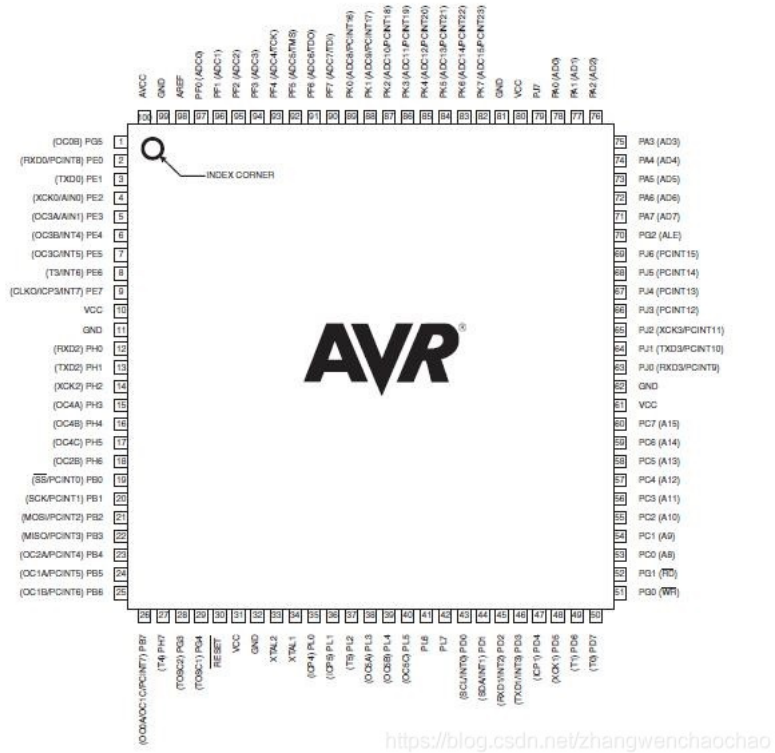
@Arduino底层 Atmega2560寄存器操作
#ATMEGA2560引脚图如下，100个引脚

Figure 1-1. TQFP-pinout ATmega640/1280/2560



引脚如下所示

Pin Number Pin Name Mapped Pin Name
1 PG5 (OC0B) Digital pin 4 (PWM)
2 PE0 (RXD0/PCINT8) Digital pin 0 (RX0)
3 PE1 (TXD0) Digital pin 1 (TX0)
4 PE2 (XCK0/AIN0)
5 PE3 (OC3A/AIN1) Digital pin 5 (PWM)
6 PE4 (OC3B/INT4) Digital pin 2 (PWM)
7 PE5 (OC3C/INT5) Digital pin 3 (PWM)
8 PE6 (T3/INT6)
9 PE7 (CLKO/ICP3/INT7)
10 VCC VCC
11 GND GND
12 PH0 (RXD2) Digital pin 17 (RX2)
13 PH1 (TXD2) Digital pin 16 (TX2)
14 PH2 (XCK2)
15 PH3 (OC4A) Digital pin 6 (PWM)
16 PH4 (OC4B) Digital pin 7 (PWM)
17 PH5 (OC4C) Digital pin 8 (PWM)
18 PH6 (OC2B) Digital pin 9 (PWM)
19 PB0 (SS/PCINT0) Digital pin 53 (SS)
20 PB1 (SCK/PCINT1) Digital pin 52 (SCK)
21 PB2 (MOSI/PCINT2) Digital pin 51 (MOSI)
22 PB3 (MISO/PCINT3) Digital pin 50 (MISO)
23 PB4 (OC2A/PCINT4) Digital pin 10 (PWM)
24 PB5 (OC1A/PCINT5) Digital pin 11 (PWM)

25 PB6 (OC1B/PCINT6) Digital pin 12 (PWM)
26 PB7 (OC0A/OC1C/PCINT7) Digital pin 13 (PWM)
27 PH7 (T4)
28 PG3 (TOSC2)
29 PG4 (TOSC1)
30 RESET RESET
31 VCC VCC
32 GND GND
33 XTAL2 XTAL2
34 XTAL1 XTAL1
35 PL0 (ICP4) Digital pin 49
36 PL1 (ICP5) Digital pin 48
37 PL2 (T5) Digital pin 47
38 PL3 (OC5A) Digital pin 46 (PWM)
39 PL4 (OC5B) Digital pin 45 (PWM)
40 PL5 (OC5C) Digital pin 44 (PWM)
41 PL6 Digital pin 43
42 PL7 Digital pin 42
43 PD0 (SCL/INT0) Digital pin 21 (SCL)
44 PD1 (SDA/INT1) Digital pin 20 (SDA)
45 PD2 (RXDI/INT2) Digital pin 19 (RX1)
46 PD3 (TXD1/INT3) Digital pin 18 (TX1)
47 PD4 (ICP1)
48 PD5 (XCK1)
49 PD6 (T1)
50 PD7 (T0) Digital pin 38
51 PG0 (WR) Digital pin 41
52 PG1 (RD) Digital pin 40
53 PC0 (A8) Digital pin 37
54 PC1 (A9) Digital pin 36
55 PC2 (A10) Digital pin 35
56 PC3 (A11) Digital pin 34
57 PC4 (A12) Digital pin 33
58 PC5 (A13) Digital pin 32
59 PC6 (A14) Digital pin 31
60 PC7 (A15) Digital pin 30
61 VCC VCC
62 GND GND
63 PJ0 (RXD3/PCINT9) Digital pin 15 (RX3)
64 PJ1 (TXD3/PCINT10) Digital pin 14 (TX3)
65 PJ2 (XCK3/PCINT11)
66 PJ3 (PCINT12)
67 PJ4 (PCINT13)
68 PJ5 (PCINT14)
69 PJ6 (PCINT 15)
70 PG2 (ALE) Digital pin 39
71 PA7 (AD7) Digital pin 29
72 PA6 (AD6) Digital pin 28
73 PA5 (AD5) Digital pin 27
74 PA4 (AD4) Digital pin 26
75 PA3 (AD3) Digital pin 25
76 PA2 (AD2) Digital pin 24
77 PA1 (AD1) Digital pin 23
78 PA0 (AD0) Digital pin 22
79 PJ7
80 VCC VCC
81 GND GND
82 PK7 (ADC15/PCINT23) Analog pin 15
83 PK6 (ADC14/PCINT22) Analog pin 14
84 PK5 (ADC13/PCINT21) Analog pin 13

85 PK4 (ADC12/PCINT20) Analog pin 12
86 PK3 (ADC11/PCINT19) Analog pin 11
87 PK2 (ADC10/PCINT18) Analog pin 10
88 PK1 (ADC9/PCINT17) Analog pin 9
89 PK0 (ADC8/PCINT16) Analog pin 8
90 PF7 (ADC7) Analog pin 7
91 PF6 (ADC6) Analog pin 6
92 PF5 (ADC5/TMS) Analog pin 5
93 PF4 (ADC4/TMK) Analog pin 4
94 PF3 (ADC3) Analog pin 3
95 PF2 (ADC2) Analog pin 2
96 PF1 (ADC1) Analog pin 1
97 PF0 (ADC0) Analog pin 0
98 AREF Analog Reference
99 GND GND
100 AVCC VCC

寄存器操作

操作一个IO口主要用到3个寄存器，只要我们配置好这三个寄存器，就可以用AVR单片机的方式去从底层控制IO口（控制输出状态的寄存器PORTX，读取输入状态的寄存器PINX，配置IO口为输入或者输出状态的寄存器DDRX），下面我们详细介绍这三个寄存器。

1.DDRX寄存器—配置IO口为输入或输出方式

DDRx Register

Bit No.	7	6	5	4	3	2	1	0
Name	DDx7	DDx6	DDx5	DDx4	DDx3	DDx2	DDx1	DDx0
Initial Value	0	0	0	0	0	0	0	0

Upper Nibble Lower Nibble

DDRX中的X代指A,B,C,D，例如PA0中的A，我们假设配置PA0为输出模式，则 DDRA=（0X01<<0），即令上图中的DDX0为高，X替换为A，同理，我们令PA1为输出模式，DDRA = (0X01<<1),如果令PA1与PA0同时为输出，则DDRA |= (0X01 << 0) | (0X01 << 1).
置零的时候为输入模式

2. PORTX寄存器—用于配置输出状态–当DDRX设置IO口为输出模式的时候，portx控制IO口输出高电平或者低电平。

PORTx Register

Bit No.	7	6	5	4	3	2	1	0
Name	Px7	Px6	Px5	Px4	Px3	Px2	Px1	Px0
Initial Value	0	0	0	0	0	0	0	0

Upper Nibble Lower Nibble

还有一点刚才没提到，如PORTX寄存器，二进制0b0000 0000，八个0分别对应px7到px0的一位，但是我们在函数中用十六进制表示，即0x00 = 0b0000 0000， 0xff = 0b1111 1111

PORTX使用依旧简单，例如令PA1输出高电平 PORTA |= (0X01 << 1)，即令上面寄存器图px1 = 0。
当然这前提就是先配置PA1的DDRX为输出状态

3.PINX寄存器—当IO口配置为输入模式时，用于读取输入的电平状态

Table 13-1. Port Pin Configurations

DDxn	PORTxn	PUD (in MCUCR)	I/O	Pull-up	Comment
0	0	X	Input	No	Tri-state (Hi-Z)
0	1	0	Input	Yes	Pxn will source current if ext. pulled low
0	1	1	Input	No	Tri-state (Hi-Z)
1	0	X	Output	No	Output Low (Sink)
1	1	X	Output	No	Output High (Source)

自己看图，不详解释了

4.例程

```
void setup() {
   DDRC = 0xFF;    //  port C 输出
  PORTC|=0XFF;
  DDRB = 0x00;      //portB 输入
  PORTB=0XFF;
}

void loop() {
       if(PINB==0XFE)PORTC&= ~(1<<6);   //读取portB,满足条件则将PC6置低
}
```