ANALOG TO DIGITAL CONVERTOR ADC

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ADC

- An ADC converts an input voltage into a number and has a resolution.
- A 10 Bit ADC has a range of 0-1023. (2^10=1024)
- The ADC also has a Reference voltage(ARef).
- When input voltage is GND the output is 0
- When input voltage is equal to ARef the output is 1023
- So the input range is 0-ARef and digital output is 0-1023.

ADC REGISTERS

To configure the working of the ADC we have different registers :

- **ADC Multiplexer Selection Register – ADMUX** : For selecting the reference voltage and the input channel.
- **ADC Control and Status Register A – ADCSRA** : As the name says it has the status of ADC and is also use for controlling it.
- **The ADC Data Register – ADCL and ADCH** : The final result of conversion is here.

ADMUX

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
REFS1	REFS0	ADLAR	MUX4	MUX3	MUX2	MUX1	MUX0
0	0	0	0	0	0	0	0

Refrence Sel. Bits

00 -> AREF, Internal V_{REF} OFF

01 -> V_{REF} is equal to V_{AVCC}

10 -> Reserved

11 -> V_{REF} = 2.56V (Internal Ref V)

ADC Channel Sel. Bits

0000 -> ADC0	0100 -> ADC4
0001 -> ADC1	0101 -> ADC5
0010 -> ADC2	0110 -> ADC6
0011 -> ADC3	0111 -> ADC7

ADSCRA

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ADEN	ADSC	ADATE	ADIF	ADIE	ADPS2	ADPS1	ADPS0
0	0	0	0	0	0	0	0

ADC Prescaler Sel. Bits

000 -> 2	100 -> 16
001 -> 2	101 -> 32
010 -> 4	110 -> 64
011 -> 8	111 -> 128

ADCL and ADCH

15	14	13	12	11	10	9	8	
–	–	–	–	–	–	ADC9	ADC8	ADCH
ADC7	ADC6	ADC5	ADC4	ADC3	ADC2	ADC1	ADC0	ADCL
7	6	5	4	3	2	1	0	

READING ADC INPUT

- uint16_t ReadADC(uint8_t ch) {
- *//Select ADC Channel ch must be 0-7*
- ch=ch&0b00000111;
- ADMUX|=ch;
- *//Start Single conversion*
- ADCSRA|=(1<<ADSC);
- *//Wait for conversion to complete*
- **while**(!(ADCSRA & (1<<ADIF))); *//Clear ADIF by writing one to it*
- ADCSRA|=(1<<ADIF);
- **return**(ADC); }

- **THANK YOU**