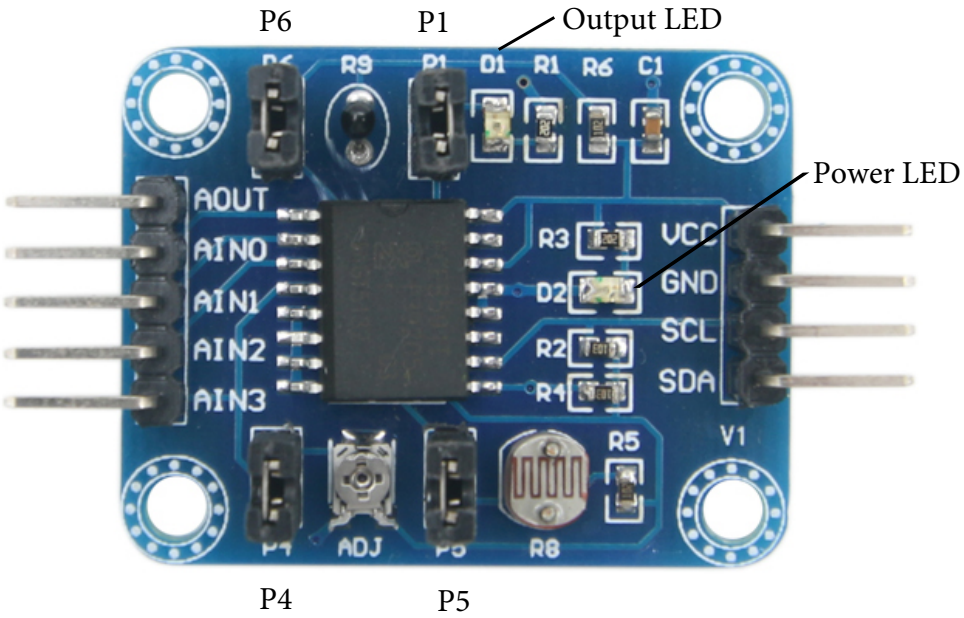
34689-MP

AD/DA Converter Board For Microcontrollers



Aout: DAC Analog Output
Ain0-3: ADC Analog Inputs

VCC: Power supply Positive (+) 2.5~6VDC
GND: Power supply Negative (-)
SCL: Serial clock connection to Microcontroller
SDA: Serial data connection to Microcontroller

Note: Jumpers are used for Demo or Testing and are not required
P1 is the **Aout** output jumper that connects to the Output LED. The LED will change brightness with output level. Remove the P1 jumper if LED indication is not needed.

P4 is the **AIN3** analog input jumper that connects Input 3 to the onboard potentiometer (ADJ). Remove the P4 jumper when connecting to external input source.

P5 is the **AIN2** analog input jumper that connects Input 2 to the onboard photoresistor (R6). Remove the P5 jumper when connecting to external input source.

P6 is the **AIN1** analog input jumper that connects Input 1 to the onboard thermistor (R9). Remove the P6 jumper when connecting to external input source.

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1: GENERAL

For Complete Information on the PCF8591 see the Mfg. Data Sheet

Module uses the PCF8591 is a single-chip, single-supply, low-power 8-bit CMOS data acquisition System On a Chip to provide both 8-bit A/D and D/A conversions.

PCF8591 has 2 programmable control Bytes: one is the address Byte, the other is the conversion control Byte. The high four-bit address is 1001, the low three-bit address is the PIN address A0,A1,A2 is determined by the hardware circuit (in this module they are grounded (0). Therefore, the system can be up to 2*2*2=8 A/D devices with bus interface. The last bit in the address is the data direction (Read or Write) Read operation is "1" from the controller, Write operation is "0". When the bus is operated the primary controller, the first byte is the address of the device followed the Ain address and R/W. The number of Data bytes transferred between the START and STOP conditions is unlimited. Each byte of 8 bits is followed by an acknowledge

2: DEVICE ADDRES BYTE

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
D7	D6	D5	D4	D3	D2	D1	D0
1	0	0	1	0	0	0	R/W

D1,D2,D3 Determined by the hardware circuit, this module the Address Pins A0-A2 are hardwired for 0;

write operation is 0x90, read operation is 0x91,

3: DEVICE CONTROL WORDS

D7	D6	D5	D4	D3	D2	D1	D0
0	A/D	X	X	0	X	X	X

5л 5м Analog (A/D) Input selection bit.

00 Channel 0 01 Channel 1 10 Channel 2 11 Channel 4

D2 Auto-increment flag. is set, the channel number is incremented automatically after each A/D conversion. **Also See "D6"**

D33 Fixed at "0"

D4 D5 Analog Input Addressing

00 4 single ended Channels: Ain0/Ch. 0 Ain1/Ch. 2 Ain2/Ch. 3 Ain3/Ch. 4

01 3 Differential Channels: Common(-) input

10 2 Single ended (Ain0&Ain1) and 1 Differential (Ain2 & 3)

11 2 Full Differential Inputs (Ain0 & 1=Ch. 0/ Ain 2&3= Ch. 2)

D6 Analog Output Flag Bit: "1" If the auto-increment mode is desired in applications where the internal oscillator is used, the analog output enable flag must be set "1" in the control byte. This allows the internal oscillator to run continuously, to prevent conversion errors. This Bit can be reset "0" at other times to reduce power consumption.

D7 Fixed at "0"

4: GENERAL CONVERSION

1: Number of conversion steps: 2^N-1, For 8-bit AD/DA, the resolution (Steps) is 255 (2^8-1)

2: Resolution using 8-bit sampling,the minimum voltage it can distinguish is Vin/255

5: D/A CONVERSION

The third byte sent in HEX format is stored in the DAC data register and is converted to the corresponding analog voltage using the on-chip D/A converter. This D/A converter consists of a resistor divider chain connected to the external reference voltage with 256 taps and selection switches. The tap-decoder switches one of these taps to the DAC output line

Data Format

MSB							LSB	
D7	D6	D5	D4	D3	D2	D1	D0	DAC data register

Vo Formula

$$V_{AOUT} = V_{AGND} + \frac{V_{VREF} - V_{AGND}}{256} \sum_{i=0}^{7} Di \times 2^i$$

The analog output voltage is buffered by an auto-zeroed unity gain amplifier. Setting the analog output enable flag of the control register switches this buffer amp on or off. In the active state, the output voltage is held until a further data byte is sent.

6: A/D CONVERSION

The A/D converter uses the successive approximation conversion technique. The on-chip D/A converter and a high-gain comparator are used temporarily during an A/D conversion cycle.

An A/D conversion cycle is always started after sending a valid read mode address to a PCF8591 device. The A/D conversion cycle is triggered at the trailing edge of the acknowledge clock pulse and is executed while transmitting the result of the previous conversion

Once a conversion cycle is triggered, an input voltage sample of the selected channel is stored by a track and hold circuit. This circuit holds the output voltage while executing the A/D conversion and is converted to the corresponding 8-bit binary code.

Samples picked up from when using the Inputs configured as Differential inputs are converted to an 8-bit two's complement code

A/D conversion period is always started after sending a valid read mode address to PCF8591. A/D conversion period is triggered after the response clock pulse is followed.

The operation is divided into four steps:

(1), send address byte, select the device.

(2), send control bytes, select the appropriate channel.

(3), Resend address byte, select the device.

4), receiving the data of the target channel

7: CONTROL

In the Serial bus, the device address must be a starting condition and sent as the first byte. The second byte sent to PCF8591 is stored in a control register, which is used to control the function of the register. Third byte sent to PCF8591is stored in the DAC data register. and using the chip on D/A to convert the corresponding analog voltage.

8:MECHANICAL