



instructables

PCF8591 (i2c Analog I/O Expander) Fast Easy Usage



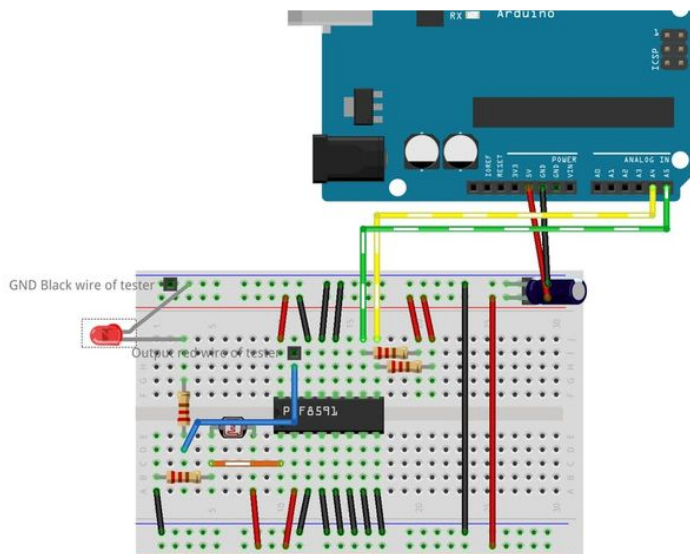
by xxreef

Library to use i2c pcf8591 IC with arduino and esp8266.

This IC can control (until 4) analog input and/or 1 analog output like measure voltage, read thermistor value or fade a led.

Can read analog value and write analog value with only 2 wire (perfect for ESP-01).

I try to simplify the use of this IC, with a minimal set of operation.



Step 1: How I2c Works

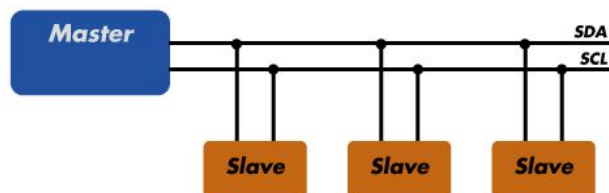
I2C works with its two wires, the SDA(data line) and SCL(clock line).

Both these lines are open-drain, but are pulled-up with resistors.

Usually there is one master and one or multiple

slaves on the line, although there can be multiple masters, but we'll talk about that later.

Both masters and slaves can transmit or receive data, therefore, a device can be in one of these four states: master transmit, master receive, slave transmit, slave receive.



Step 2:

You can find my library here.

To download.

Click the DOWNLOADS button in the top right corner, rename the uncompressed folder PCF8591.

Check that the PCF8591 folder contains PCF8591.cpp and PCF8591.h.

Place the PCF8591 library folder your /libraries/ folder.

You may need to create the libraries subfolder if it's your first library.

Restart the IDE.

Step 3: Usage

Constructor: you must pass the address of i2c (to check the address use this guide I2cScanner)

```
PCF8591(uint8_t address);
```

for esp8266 if you want specify SDA and SCL pin use this:

```
PCF8591(uint8_t address, uint8_t sda, uint8_t scl);
```

Step 4: Read Value

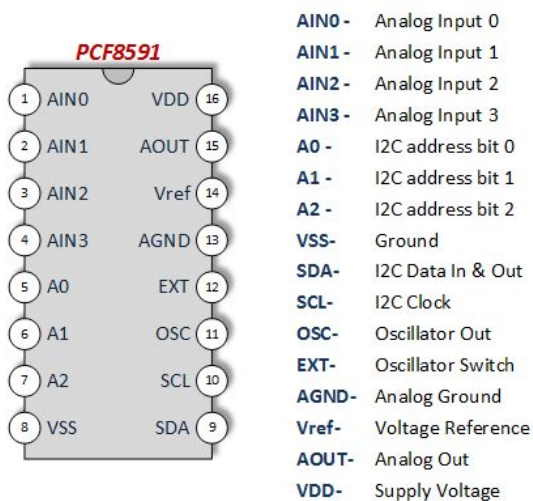
IC as you can see in the image have 4 analog input and 1 analog output.

So to read all analog input in one transmission you can do (the value is from 0 to 255):

```
PCF8591::AnalogInput ai = pcf8591.analogReadAll();  
Serial.print(ai.ain0);  
Serial.print(" - ");  
Serial.print(ai.ain1);  
Serial.print(" - ");  
Serial.print(ai.ain2);  
Serial.print(" - ");  
Serial.println(ai.ain3);
```

if you want read a single analog input or channel:

```
int ana = pcf8591.analogRead(AIN0); // read analog 0
```



Step 5: Read Vale From Channel

This IC have multiple type of read and you can use Analog input or analog channel (when you use single read analog input and channel are in the pictures).

For example to read the value of channel 0 in Two differential input you must do:

```
int ana = pcf8591.analogRead(CHANNEL0, TWO_DIFFERENTIAL_INPUT); // read analog 0
```

ANALOG INPUT PROGRAMMING:

00 four single-ended inputs

AIN0 channel 0

AIN1 channel 1

AIN2 channel 2

AIN3 channel 3

01 three differential inputs

AIN0 → channel 0

AIN1 → channel 1

AIN2 → channel 2

AIN3 → channel 2

10 single-ended and differential mixed

AIN0 channel 0

AIN1 channel 1

AIN2 → channel 2

AIN3 → channel 2

11 two differential inputs

AIN0 → channel 0

AIN1 → channel 1

AIN2 → channel 1

AIN3 → channel 1

Step 6: Write Value

If you want write an analog value you must do (the value is from 0 to 255):

```
pcf8591.analogWrite(128);
```

Step 7: Additional Features

Additional feature is to read a write voltage: For the calculation of voltage you must pass some parameter:

- `microcontrollerReferenceVoltage`: get voltage from microcontroller voltage (only AVR no esp8266 for esp 3.3v fixed)
 - `referenceVoltage`: if `microcontrollerReferenceVoltage` false take this value
- The command are:

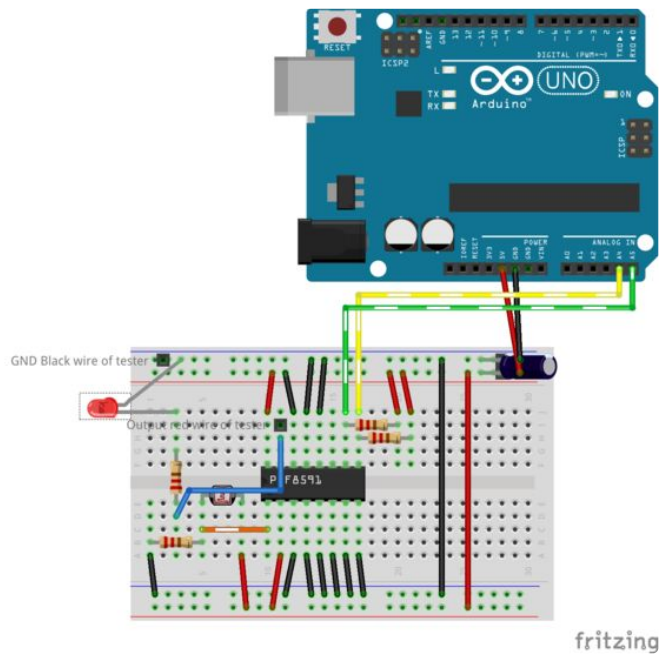
```
void voltageWrite(float value, bool microcontrollerReferenceVoltage = true, float referenceVoltage = 5.0);  
float voltageRead(uint8_t analogPin, bool microcontrollerReferenceVoltage = true, float referenceVoltage = 5.0);
```

An examples is:

```
pcf8591.voltageWrite(2.7); // 2.7Volts output  
delay(3000);
```

```
float ana0V = pcf8591.voltageRead(AIN0); // Read voltage from analog 0  
Serial.println(ana0V);
```

Step 8: Examples Connection Diagram



Step 9: Thanks

i2c project series:

- Temperature humidity sensor
- Analog expander
- Digital expander