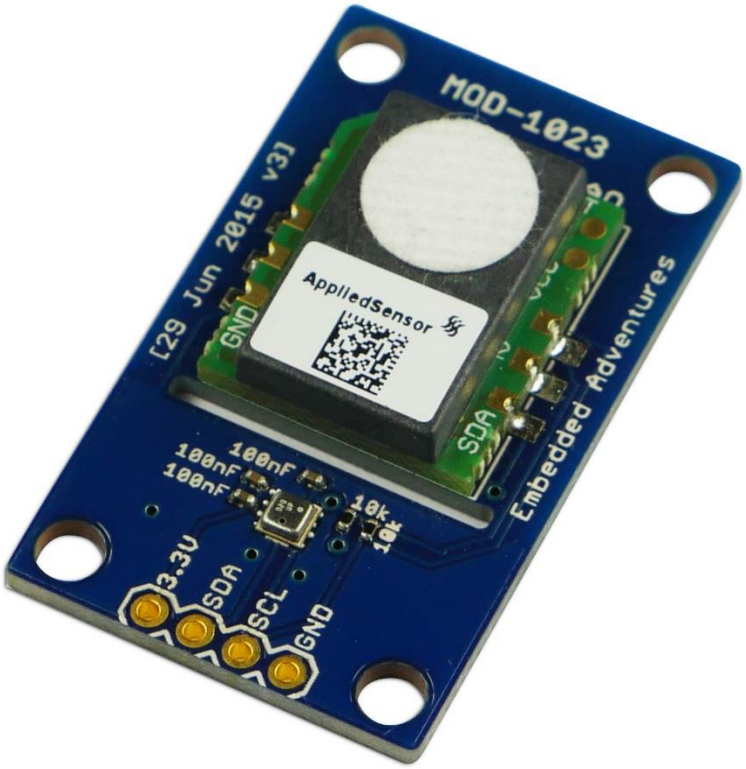
Device: MOD-1023

This document version: v1

Matches module version: v3 [29 June 2015]

Document revision date: 22 September 2015

Description: BME250 Multi Sensor + Indoor Air Quality (Humidity / Temperature / Pressure Sensor, VOCs, C02)



Contents

Introduction

The MOD-1023 is a combo module with the BME280 based temperature, humidity and absolute air pressure sensor chip combined with the AMS IAQ Indoor Air Quality module, adding VOCs and C02 measurements.

Features

The MOD-1023 features the BME280 from Bosch. It is capable of measuring altimeter differences down to 7.5cm, a spectacular result. And it includes temperature and humidity measurements as well. Originally designed for smartphones, this device is virtually a weather station in a tiny chip.

The AMS IAQ module adds Volatile Organic Compounds and Carbon Dioxide measurements. These two measurements are highly correlated to the feeling of "freshness" we apply to air quality. This module was built for air quality monitoring systems for buildings, with the objective to increase air flow when air quality drops.

The modules have been arranged so the output from the BME280 is available as I2C.

Hackability

The MOD-1023 is 100% hackable.

At Embedded Adventures, we believe you have the most fun when you have the most control over your hardware. For the MOD-1023 we provide a datasheet, complete schematic and complete source code. After that, it's all up to you. We'd love to hear about the projects you're using it for – send us information and photos to myproject@embeddedadventures.com

Construction

It's all pre-built! Just add female or male header pins, or solder directly to the board, and away you go.

Connections

The MOD-1023 has one connection port.

VDD	Positive supply. 1.71V – 3.6V.
SDA	I2C data
SCL	I2C clock
GND	Ground (Vss) connection.

Power

The MOD-1023 can be powered from 1.71V – 3.6V. If your microcontroller is using 5V, consider using a bidirectional level converter such as the MOD-1003 from Embedded Adventures (that's us!).

Pull up resistors

I2C requires the use of pull-up resistors. The board comes with the pull-up resistors enabled. If you are connecting to an existing I2C buss that already has pull-up resistors, or you are using internal pull-ups in your microcontroller, you can disable the pull-up resistors by unsoldering the 10k resistors from the MOD-1023 board and making sure the pads are not connected with any residual solder. Having extra pull-ups won't hurt anything, other than a very marginal increase in power consumption.

Specifications

Absolute accuracy – humidity	±3%
Absolute accuracy – pressure	±1hPa
Absolute accuracy – temperature (at 25°C)	±0.5°C
Volatile Organic Compounds	450–2000 ppm CO2 equivalents
Carbon Dioxide	125 – 600 ppb TVOC equivalents

More detailed specifications are available in the BME280 and AMS-IAQ datasheets. The humidity and temperature results can be considered "solid" whereas the pressure sensor accuracy is best in class.

Tricks and traps

Arduino code is available for use, including the detailed calculations of the humidity, temperature and pressure taken from the datasheet source code examples. There

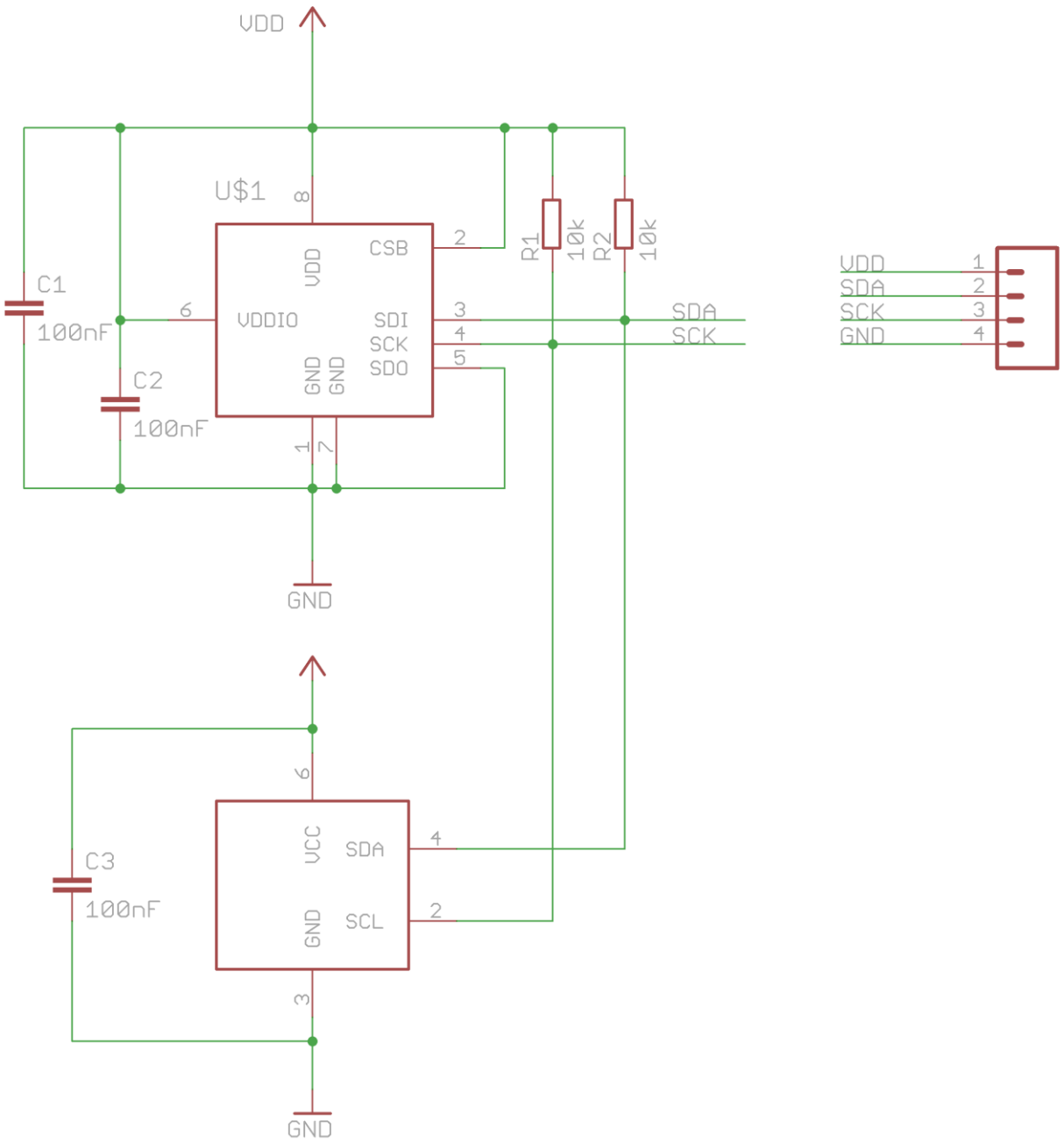
are several different methods offered depending on how accurate you want your results to be versus program size. The example sketch uses all available methods by way of showing the differences.

It is important to read the BME280 compensation parameters before taking measurements and also to turn on at least 1x oversampling for all three sensors (humidity, temperature, pressure), if you want to get values back from all three sensors. The default is not to sample at all, so triggering a measurement will result in a 0x8000 read in value for all three!

The BME280 chip starts out in **sleep** mode when powered up. You can choose to force it to make a single measurement by changing to the **forced** mode. To make use of the oversampling and filter to smooth out readings over time, put the chip in **normal** mode. It will then take regular measurements based on the tstandby parameter (see writeStandbyTime).

The AMS-IAQ takes 5 minutes to settle until first reading is available, during which time it will show an ERROR reading from the status register.

Schematic



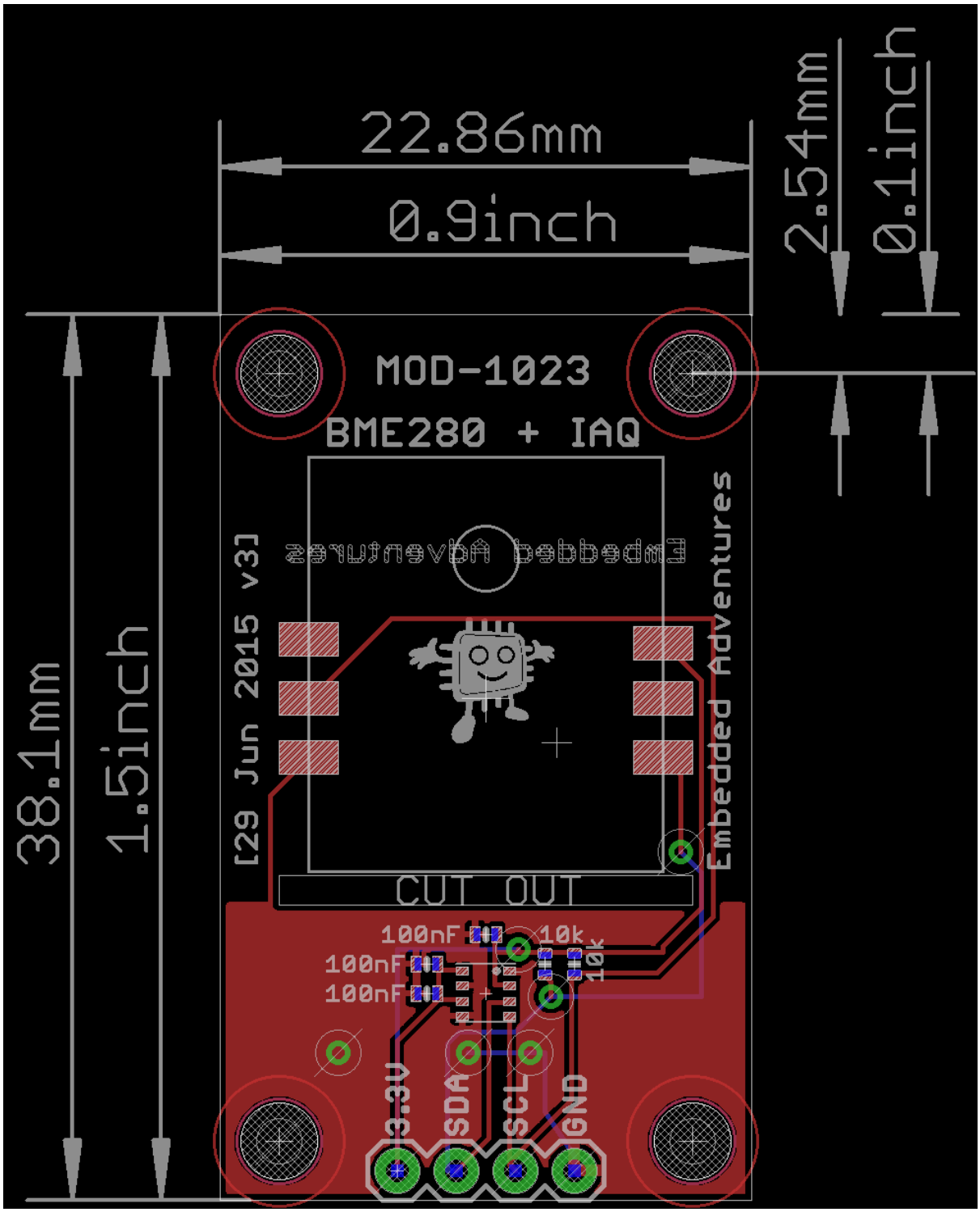
The MOD-1023 schematic is pretty straightforward. Don't forget to have a look at the BME280 and AMS IAQ datasheets so you know how to get the most out of the sensors.

Programming

Grab the BME280.zip and AMS-IAQ.zip from the MOD-1023 product page at www.embeddedadventures.com, and unzip it into your Arduino/libraries directory.

Load up the bme280_test sketch and ams-iaq_test sketch from the examples directory and you're up and running!

PCB



Versions

Version	Date	Comments
Version 1	22 Sep 2015	Initial Version for board v3