I2C ICP-10111 Barometric Pressure Sensor

DEVLAB FACTOR

Mfr. Part #: UE0094

Product Reference Manual (V1.0)

Description

The UNIT DevLab ICP-10111 is a compact, high-precision barometric and temperature sensor built on advanced MEMS capacitive technology. It delivers exceptional accuracy, ultra-low noise, and minimal power consumption, making it ideal for portable and IoT applications that demand reliable environmental data.

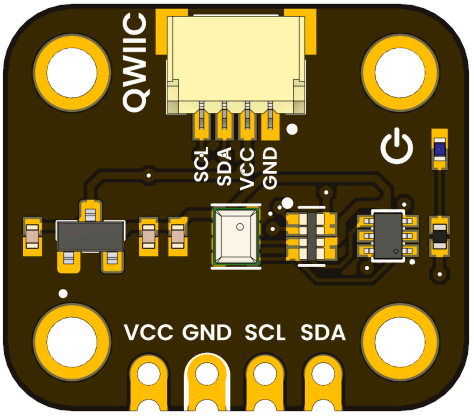
Designed for versatility and stability, this module ensures consistent atmospheric pressure and altitude readings across a wide range of conditions. With its digital I²C interface and DevLab-compatible form factor, the ICP-10111 offers seamless integration into embedded systems for weather monitoring, altitude detection, and environmental sensing.

DevLab format compatibility.

Simplicity and compatibility are the primary objectives of the DevLab form factor. It offers a board layout that is compact and optimized for serial communication, which include I²C interface.

This format enables the establishment of rapid and dependable connections via a Protocol I²C connector that is entirely compliant with the Qwiic and STEMMA standards.

This design guarantees efficient prototyping, accessibility, and simplicity of integration across a variety of devices and modules.



Key Features

- High-precision barometric pressure and temperature sensing
- Ultra-low power consumption for battery-based systems
- I²C digital interface up to 400 kHz
- Wide operating range: −40 °C to +85 °C, 30–110 kPa
- Compact DevLab form factor with QWIIC-compatible JST 1.0 mm connector
- Excellent accuracy and long-term stability for environmental and altitude applications

Hardware Features

- **Integrated Circuit: ICP-10111** pressure sensor
- **Regulator:** 3.3 V onboard linear regulator
- **Level Shifters:** Bi-directional level translation compatible with **3.3 V and 5 V** logic systems
- **Pull-up Resistors:** Connected to **VCC** through level shifter for stable I²C communication
- **Header:** Standard **2.54 mm pitch** pin header for easy prototyping
- **I²C Distribution: JST-SH 1.00 mm** connector, **Qwiic/STEMMA QT** compatible for plug-and-play connectivity

Software Support

- **Arduino IDE:** The official **ue_i2c_icp_10111_sen** library provides **high-level APIs** for accurate and efficient pressure measurement, enabling rapid prototyping and easy integration.
- **PlatformIO / VS Code:** Offers a **professional development environment** with **multi-board build automation**, advanced debugging, and version control integration for streamlined workflows.
- **MicroPython (Basic Support):** Provides essential functionality for pressure data acquisition and I²C communication through simple, script-based interaction.
- **ESP-IDF (Optional):** Recommended for **advanced users** who require **register-level access**, **low-level optimization**, or **AI-based data fusion** capabilities within the ESP32 ecosystem.

Applications

- Environmental and atmospheric pressure monitoring
- Altitude and motion tracking systems
- Smart home and wearable devices
- IoT weather and environmental nodes
- Industrial sensing and calibration equipment

CONTENTS

1 The Board

1.1 Accessories

- 1×4-pin 2.54 mm male header

2 Ratings

2.1 Recommended Operating Conditions

Symbol	Description	Min	Typ	Max	Unit
V_{CC}	Input supply voltage (external input via VCC pin)	3.6	5.0	6.0	V
V_{IL}	Low-level input voltage (I²C interface)	–0.3	–	0.99	V
V_{IH}	High-level input voltage (I²C interface)	2.31	–	5.2	V
V_{OL}	Low-level output voltage (at IOL = 3 mA)	–	–	0.4	V
V_{OH}	High-level output voltage (at IOH = –3 mA)	2.4	–	3.3	V
I_{CC}	Typical operating current (**ICP-10111** active mode)	–	2.6	-	μ A
I_{SLEEP}	Low Power (LP, **ICP-10111** active mode)	–	1.3	-	μA
R_{PULL}	I²C pull-up resistor to Vcc	4.7	–	10	kΩ
T_{OP}	Operating temperature range	–40	–	+85	°C

3 Functional Overview

The **UNIT DevLab ICP-10111** is a **compact, high-precision barometric and temperature sensor module** based on **advanced MEMS capacitive technology**. It integrates an onboard **level shifter** for **3.3 V and 5 V logic compatibility**, ensuring reliable communication across a wide range of microcontrollers and development platforms.

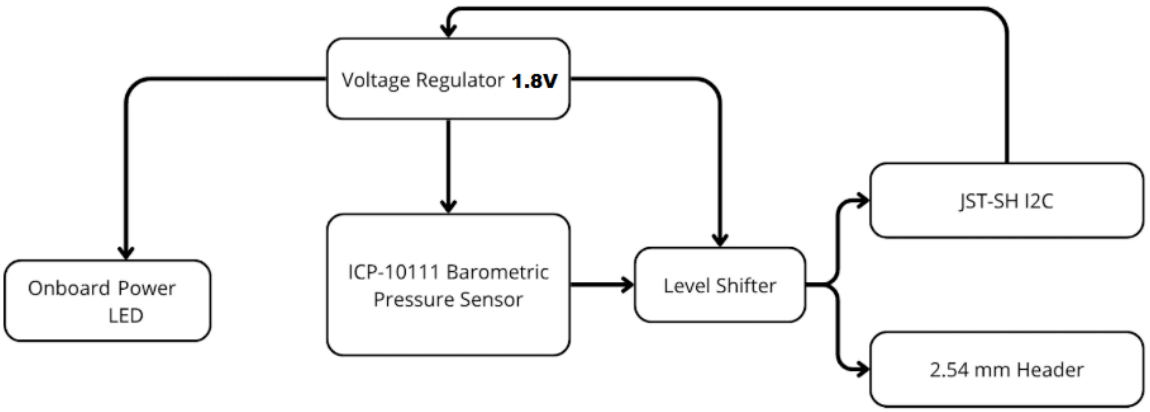
Designed for **accuracy, ultra-low noise, and minimal power consumption**, the ICP-10111 module provides **±1 Pa relative pressure accuracy**, **±1 hPa absolute accuracy**, and **8.5 cm altitude resolution** over a **300 – 1100 hPa** range. Its built-in **temperature sensor** and **400 kHz I²C interface** enable fast, stable, and energy-efficient environmental data acquisition.

The device offers two operation modes:

- **Low-Power Mode:** 1.3 µA current consumption with 3.2 Pa noise.
- **Low-Noise Mode:** 5.2 µA current consumption with 0.8 Pa noise.

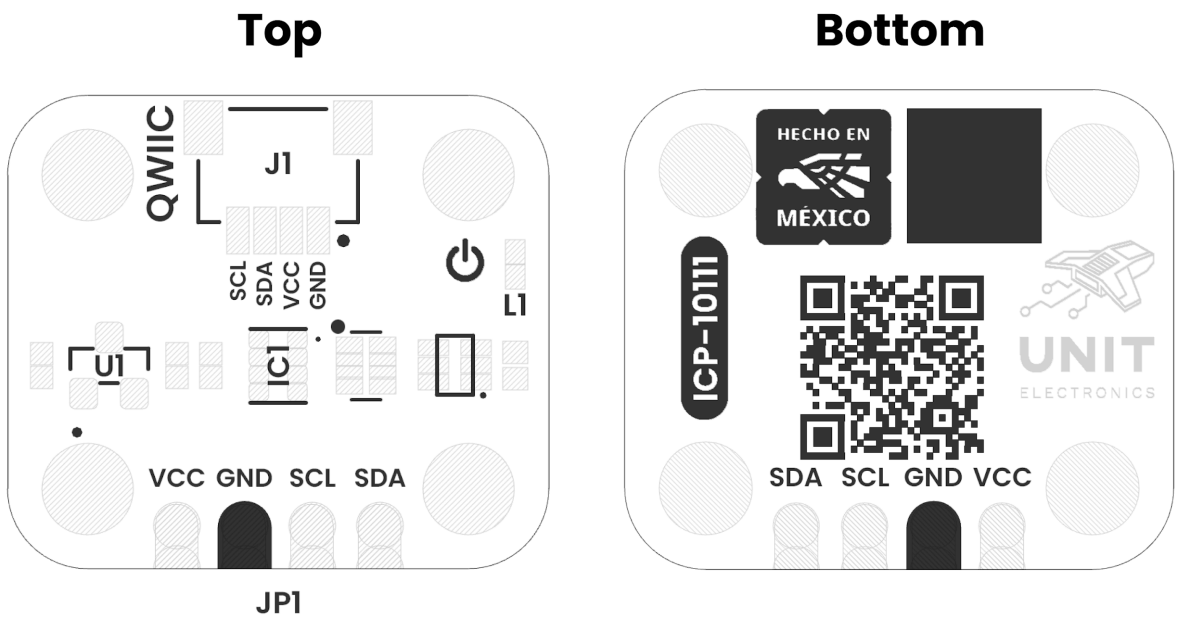
With a **temperature coefficient offset of ±0.5 Pa/°C**, the ICP-10111 ensures outstanding thermal stability and consistent performance. Its combination of **DevLab-compatible form factor**, **Qwiic/STEMMA I²C interface**, and **robust design** makes it ideal for **weather monitoring, drone flight control, altitude detection, wearable devices, and IoT environmental sensing**

3.1 Block Diagram



Block Diagram of ICP-10111 Barometric Pressure Sensor

3.2 Board Topology



Views of Board Topology

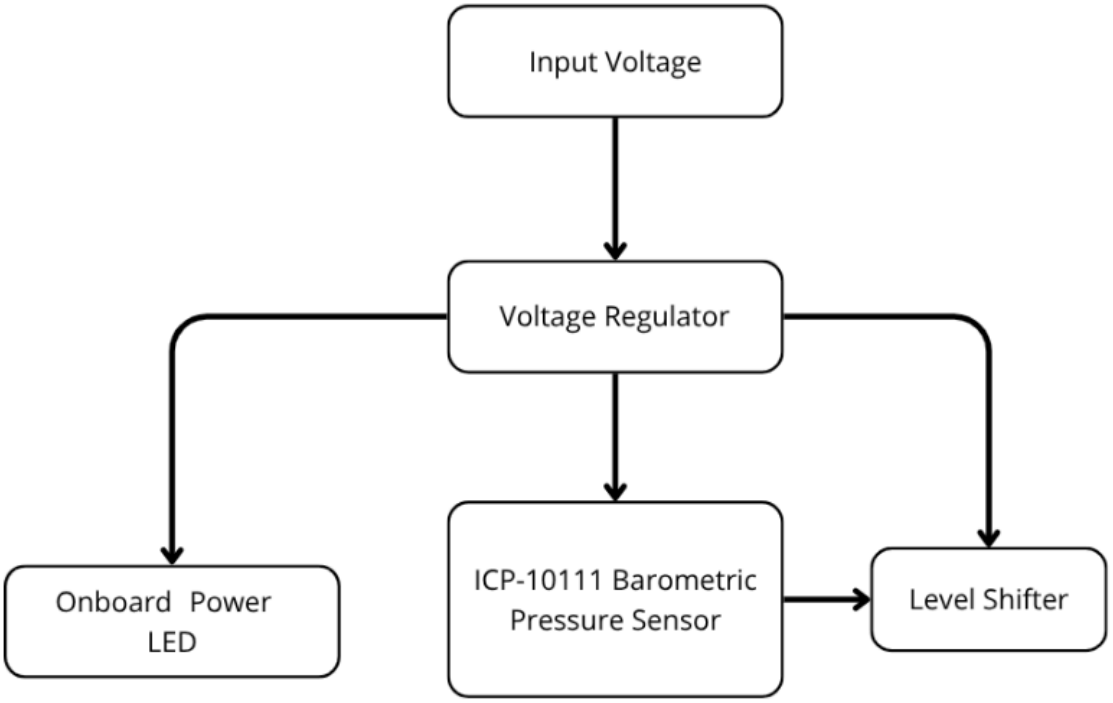
Views of ICP-10111 Barometric Pressure Sensor Topology

Table 3.2.1 - Components Overview

Ref.	Description
IC1	ICP-10111 Barometric Pressure Sensor
L1	Power On LED
U1	ME6206A18XG 1.8V Regulator
JP1	2.54 mm Castellated Holes
J1	QWIIC Connector (JST 1 mm pitch) for I2C

3.3 I2C ICP-10111 Barometric Pressure Sensor

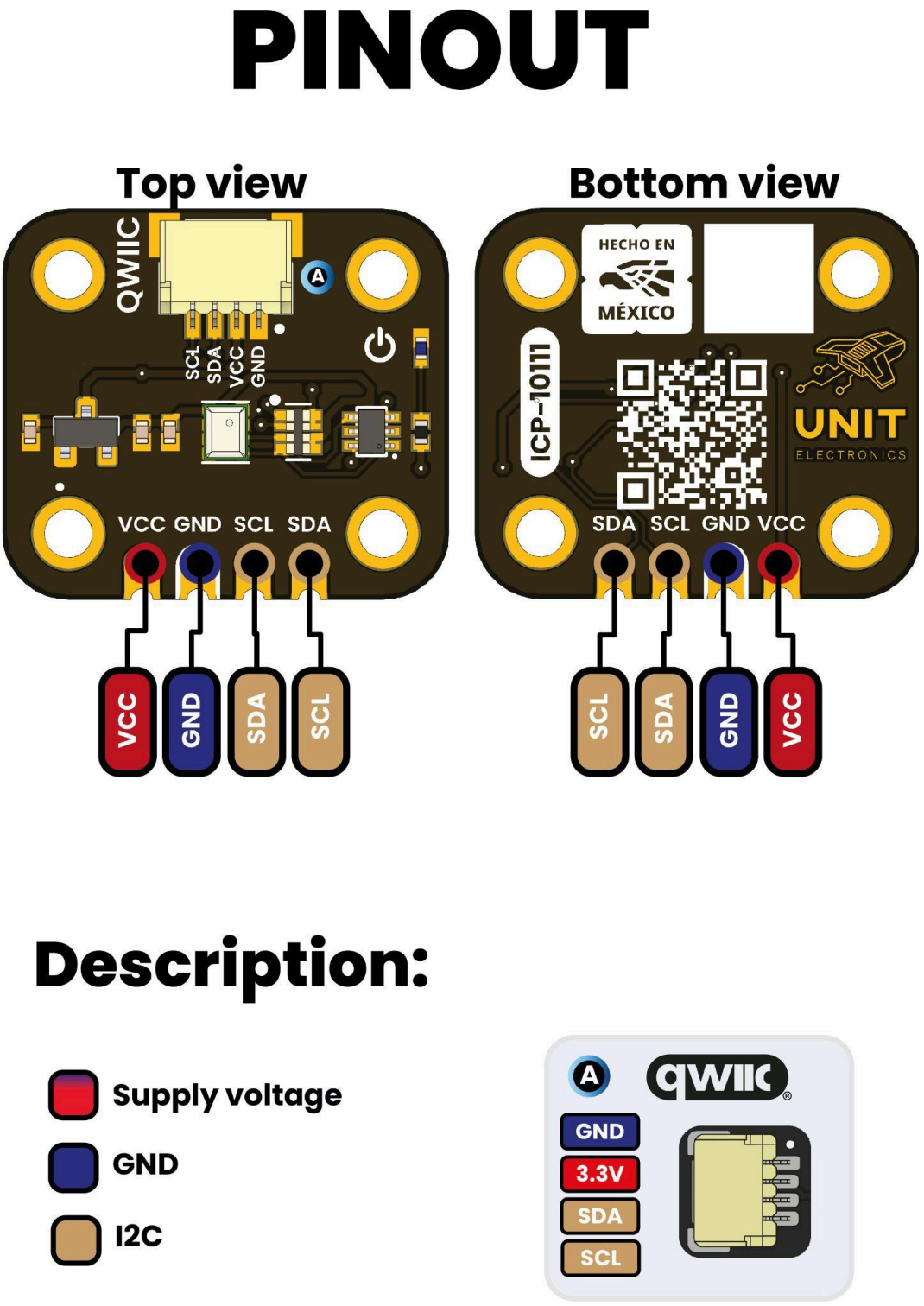
3.9 Power Tree



Power Tree

4 Connectors & Pinouts

4.1 General Pinout



ICP-10111 Barometric Pressure Sensor Module *General Pinout*

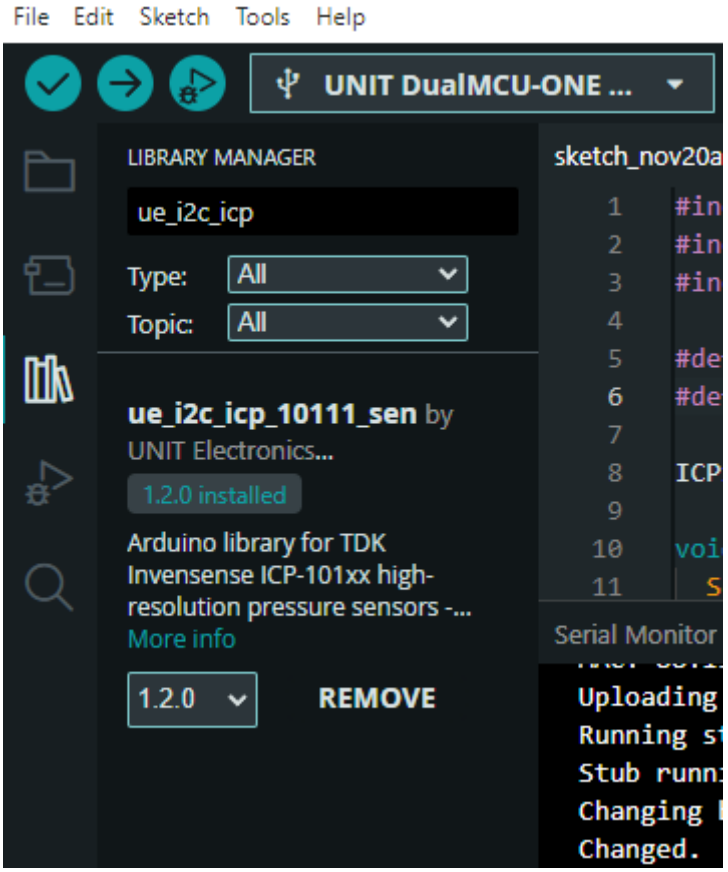
4.2 Pinout General Description

Pin Label	Description
VCC	Power supply (3.3V or 5V)
GND	Ground
SDA	I²C data
SCL	I²C clock

5 Board Operation

5.1 Getting Started with arduino IDE

To begin using the UNIT Electronics ICP-10111 barometric pressure sensor with the Arduino IDE, you must first install the official UNIT I²C library available in our GitHub repository. This library provides a high-level API that simplifies sensor initialization, measurement requests, and data retrieval for both pressure and temperature.



Once the library is installed, you can include it in your project and start communicating with the sensor through the I²C bus. The following example demonstrates the basic workflow: initializing the module, performing a measurement in **NORMAL** mode, and printing the resulting pressure (in Pascals) and temperature (in Celsius) via the serial monitor. This minimal setup allows you to quickly verify correct wiring, sensor functionality, and communication with your development board.

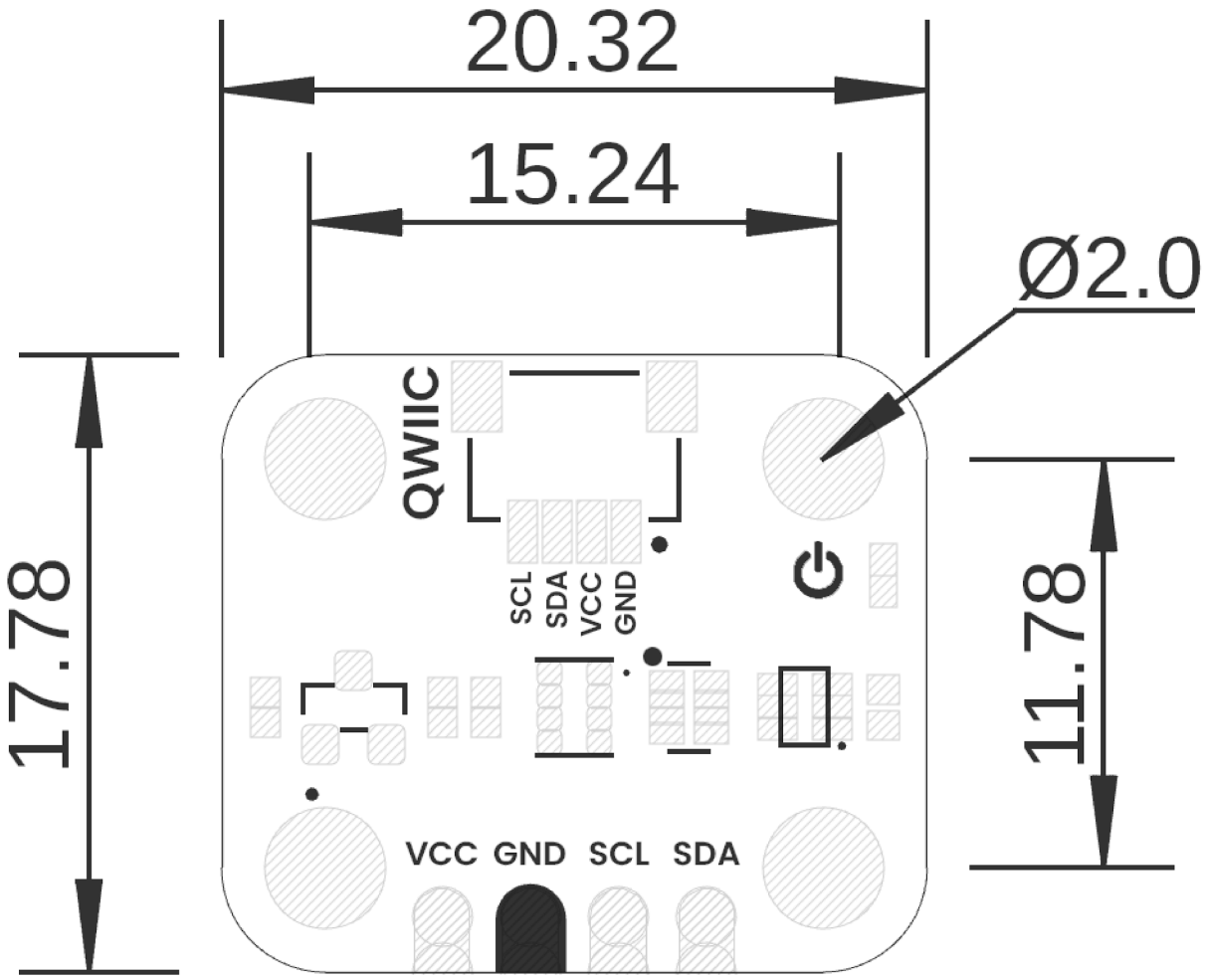
A complete example is shown below:

```
#include <Arduino.h>
#include "ue_i2c_icp_10111_sen.h"
#include <Wire.h>

#define SDA_PIN 6
#define SCL_PIN 7

ICP101xx sensor;

void setup() {
  Serial.begin(115200);
  while (!Serial) delay(10);

  Wire.begin(SDA_PIN, SCL_PIN);

  // Initialize sensor.
  if (!sensor.begin(&Wire)) {
    Serial.println("ERROR: Could not initialize sensor!");
    Serial.println("Check I2C wiring and connections.");
    while (1) delay(1000);
  }
}

void loop() {
  sensor.measure(sensor.NORMAL);

  float pressure = sensor.getPressurePa();
  float temperature = sensor.getTemperatureC();

  Serial.print("Pressure: ");
  Serial.print(pressure);
  Serial.println(" Pa");

  Serial.print("Temperature: ");
  Serial.print(temperature);
  Serial.println(" °C");

  delay(1000);
}
```

This basic example serves as a starting point for integrating the ICP-10111 sensor into your IoT, environmental monitoring, and barometric applications.

```
Pressure: 78144.64 Pa
Temperature: 26.06 °C
Pressure: 78143.67 Pa
Temperature: 26.02 °C
Pressure: 78141.53 Pa
Temperature: 25.98 °C
Pressure: 78144.33 Pa
Temperature: 25.95 °C
Pressure: 78142.28 Pa
Temperature: 25.92 °C
Pressure: 78142.50 Pa
Temperature: 25.88 °C
Pressure: 78145.13 Pa
Temperature: 25.86 °C
```

6 Mechanical Information



Mechanical dimensions in millimeters (mm)

Mechanical dimensions in millimeters

7 Company Information

Company name	UNIT Electronics
Company website	https://uelectronics.com/
Company Address	Salvador 19, Cuauhtémoc, 06000 Mexico City, CDMX

8 Reference Documentation

Ref	Link
Documentation	https://github.com/UNIT-Electronics-MX/unit_icp10111_barometric_pressure_sensor
Uelectronics-library Package	https://github.com/UNIT-Electronics-MX/ue_i2c_icp_10111_sen
Wiki	https://wiki.uelectronics.com/wiki/devlab-i2c-icp-10111-barometric-pressure-sensor
Thonny IDE	https://thonny.org/
Arduino IDE	https://www.arduino.cc/en/software
Visual Studio Code	https://code.visualstudio.com/download
IPC-10111	https://product.tdk.com/system/files/dam/doc/product/sensor/pressure/capacitive-pressure/data_sheet/ds-000177-icp-10111-v1.3.pdf

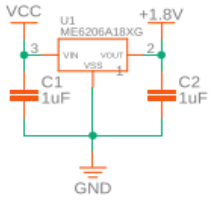
9 Appendix

9.1 Schematic

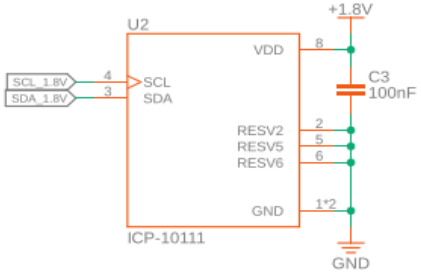
(*https://github.com/UNIT-Electronics-MX/unit_devlab_i2c_icp10111_barometric_pressure_sensor/blob/main/hardware/unit_sch_V_0_0_1_ue0094_ICP-10111.pdf*)

Mounting Holes

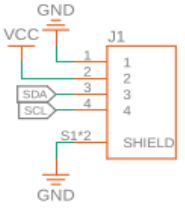
Voltage Regulator



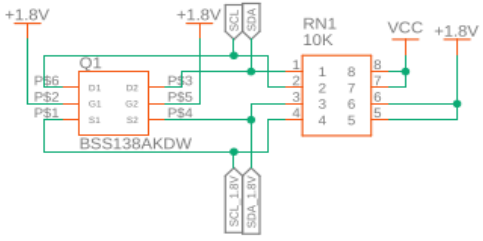
ICP-10111



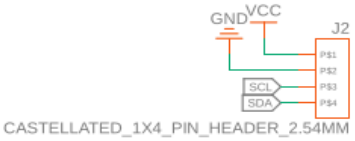
JST Connector



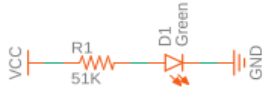
Level Shifter



Headers



Power On LED



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