IoT Air Quality Sensor Board

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Board Description

Uses Espressif ESP32-WROOM-32U as its COM/processor.

Functional modules include:
Panasonic AMG8833 Infrared Sensor
USB-UART
USB Micro-B Jack

Board Dimensions

3cm x 5cm
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1 Modules on Board

1.8V -> 1.8V (4)

USB DEVICE -> USB (1)

5.0V -> VIN (2)

3.3V -> 3.3V (7)
3.3V -> 3.3V (8)
3.3V -> 3.3V (5)
3.3V -> 3.3V (3)

12C -> 12C (7)
SYSEN -> ENABLE (3)
UART DOWNLOAD -> UART (1)

GPIN NC2

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1.1 Converters

1.1.1 USB-UART (v20) (1)

Also known as an FTDI, this USB to UART converter allows a USB connection to the board to behave as a virtual RS232 serial connection. It offers direct and complete access to the system from a development machine by way of the FTDI FT232RQ USB – UART IC.

Technical documentation for the FT232RQ is available at:


This USB to UART converter connects a host machine from USB Micro-B Jack (10) to UART DOWN-LOAD on Espressif ESP32-WROOM-32U (8).

1.2 Power

1.2.1 3.3V/1.5A Regulator (v20) (2)

This DC to DC step down regulator provides a 3.3V DC output at 1.5A needed by certain components on this board. It is capable of accepting an input voltage between 3.1 to 16V DC and output is controlled by the TI TPS6211 buck regulator.

It receives VIN from USB Micro-B Jack (10).

The datasheet for the TPS6211 regulator is available at:


This regulator provides 3.3V to:

- Top-side LED (3)
- 1.8V/0.15A LDO (5)
- Espressif ESP32-WROOM-32U (8)
- Bosch BME680 Environmental Sensor (7)

1.2.2 1.8V/0.15A LDO (v7) (5)

This efficient and precise low-voltage CMOS regulator is optimized for ultra-low noise applications, with an initial accuracy better than 1% and 85A constant ground current over load. The Micrel MIC5247-1.8YM5 linear regulator provides power to noise-sensitive modules that need a 1.8V input.

The datasheet for MIC5247 regulators is available at:


http://127.0.0.1:9009/

It receives:

- 3.3V from 3.3V/1.5A Regulator (2)
- SYS_EN from Espressif ESP32-WROOM-32U (8)

The following modules receive 1.8V DC from this regulator:
1.3 Lights and Switches

1.3.1 Top-side LED (v8) (3)

The top-side LED module contains a 1608 standard size LED of a user-selected color, mounted on the top side of a Geppetto board.

The LED is active-high on SYSEN from Espressif ESP32-WROOM-32U (8).

1.3.2 Tactile Switch (v21) (6)

This 4.9 sq. mm pull-down touch switch provides a user input for the signal NC2 on NC (9).

1.4 Sensors

1.4.1 Sensirion SGP30 Gas Sensor (v1) (4)

The SGP30 is a digital multi-pixel gas sensor designed for easy integration into air purifier, demand-controlled ventilation, and IoT applications. Sensirions CMOSens technology offers a complete sensor system on a single chip featuring a digital I2C interface, a temperature controlled micro hotplate, and two preprocessed indoor air quality signals. As the first metal-oxide gas sensor featuring multiple sensing elements on one chip, the SGP30 provides more detailed information about the air quality. The analog supply voltage range for this sensor is between 1.62V and 1.98V. The module supports 1.8V and 3.3V logic levels. The sensor is a very small 6-pin DFN package: 2.45mm x 2.45mm x 0.9mm. The sensor has low power consumption of 4.8mA at 1.8V.


The SGP30-2.5K module receives:

- 1.8V from 1.8V on 1.8V/0.15A LDO (5)
- I2C from I2C on Espressif ESP32-WROOM-32U (8)
- VLOGIC from VLOGIC on Espressif ESP32-WROOM-32U (8)

1.4.2 Bosch BME680 Environmental Sensor (v1) (7)

The BME680 is an integrated environmental sensor developed specifically for mobile applications and wearables where size and low power consumption are key requirements. It communicates over I2C or SPI.

Download the datasheet for the BME680 at:


Highlights
- I2C slave addr: 0x76
Its I²C bus is connected to I2C on Espressif ESP32-WROOM-32U (8)

1.5 Processors

1.5.1 Espressif ESP32-WROOM-32U (v4) (8)

ESP32-WROOM-32D and ESP32-WROOM-32U are powerful, generic Wi-Fi+BT+BLE MCU modules that target a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding.

3.3V operation. Requires:

- 3.3V from 3.3V/1.5A Regulator (2)
- EN from NC (9)

Provides:

- UART DOWNLOAD to USB-UART (1)
- SYSEN to:
  - Top-side LED (3)
  - 1.8V/0.15A LDO (5)
- I2C to:
  - Sensirion SGP30 Gas Sensor (4)
  - Bosch BME680 Environmental Sensor (7)

1.6 Headers

1.6.1 NC (v17) (9) — NC

No connection

1.7 USB

1.7.1 USB Micro-B Jack (v18) (10)

The USB micro-B port module allows your design to connect as a USB device to a USB host. This module is connected to USB.DEVICE on USB-UART (1).

It supplies 5.0V to:

- 3.3V/1.5A Regulator (2)
2 Module Connections Graph

Figure 1: excludes power modules
3 Module Power Graph

- **USB Micro-B Jack**: 5.0V, 2000mW
- **3.3V/1.5A Regulator**
  - 3.3V, 33mW
  - 3.3V, 17mW
  - 3.3V, 1650mW
  - 3.3V, 60mW
- **Top-side LED**
- **1.8V/0.15A LDO**
- **Espressif ESP32-WROOM-32U**
- **Bosch BME680 Environmental Sensor**
- **Sensirion SGP30 Gas Sensor**: 1.8V, 9mW