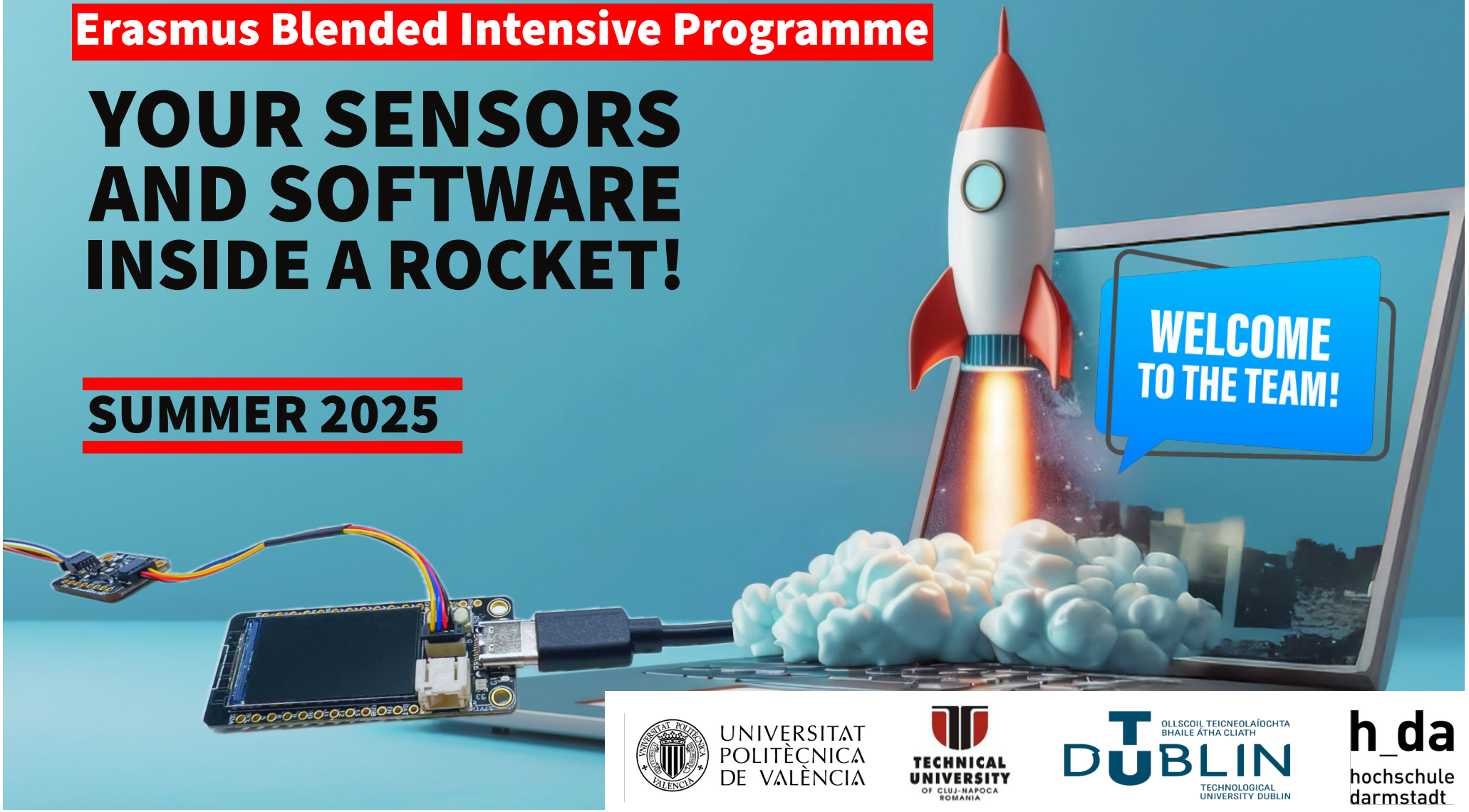
**Erasmus Blended Intensive Programme**

# YOUR SENSORS AND SOFTWARE INSIDE A ROCKET!

**SUMMER 2025**




UNIVERSITAT POLITÈCNICA DE VALÈNCIA

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OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
TU DUBLIN
TECHNOLOGICAL UNIVERSITY DUBLIN

h_da
hochschule darmstadt

# Introduction to Sensate-X

- BIP overview
- Webinars
- Teams
- Model rockets
- Hardware
- Software
- Sensors

# Blended Intensive Programme Overview

1. Online learning (webinars)
2. Web based learning (wikipedia, AI, ...)
3. Team learning (across countries)
4. Hands-on learning (Summer camp in Darmstadt)
5. Launch Day 2025

# BIP Timeline

**May**

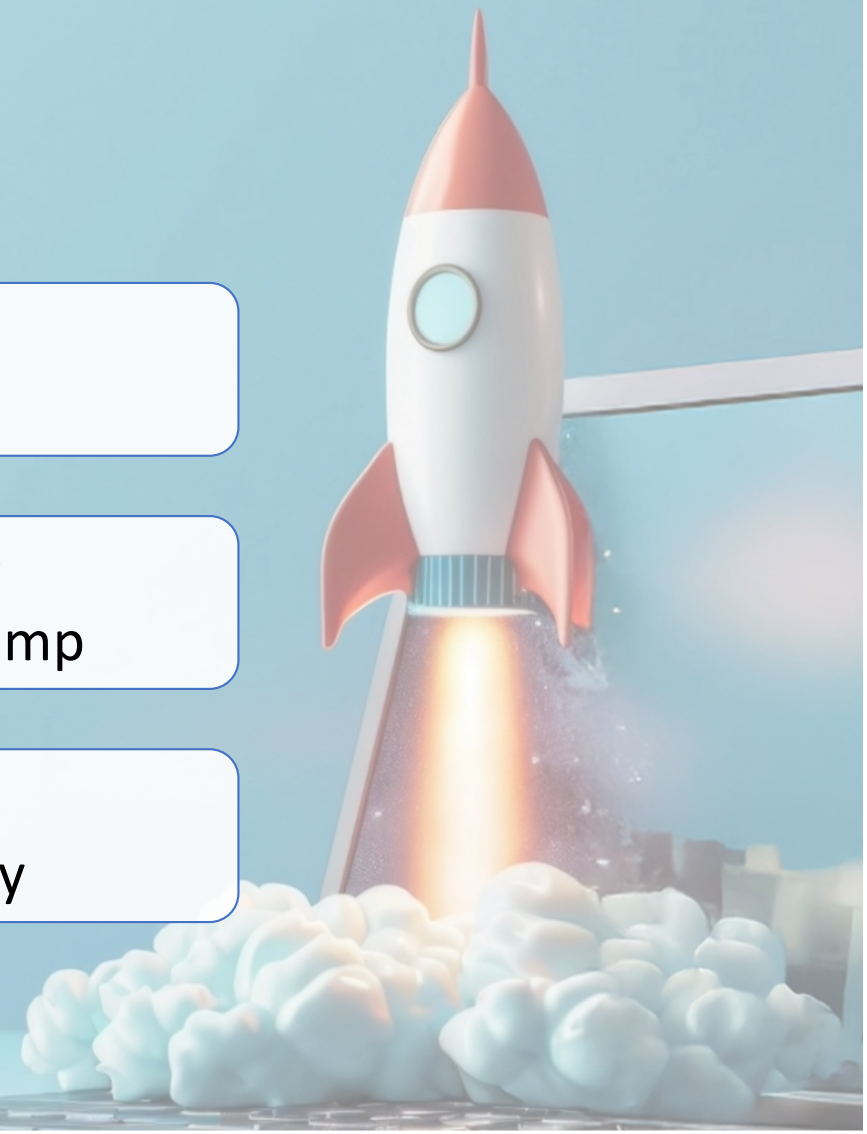
- Introduction (May-20)
- Team assignment / Webinars

**June**

- Team setup and project outline
- Preparation for the Summer Camp

**July**

- Summer Camp (Jul-2 … Jul-9)
- Launch Day + Awards Ceremony



# Webinars

https://et.utcluj.ro/sensate-x/webinars.html

1. Introduction to Microcontrollers
2. Introduction to ARDUINO IDE & Libraries
3. Using Sensors & Actuators, Communication Technologies

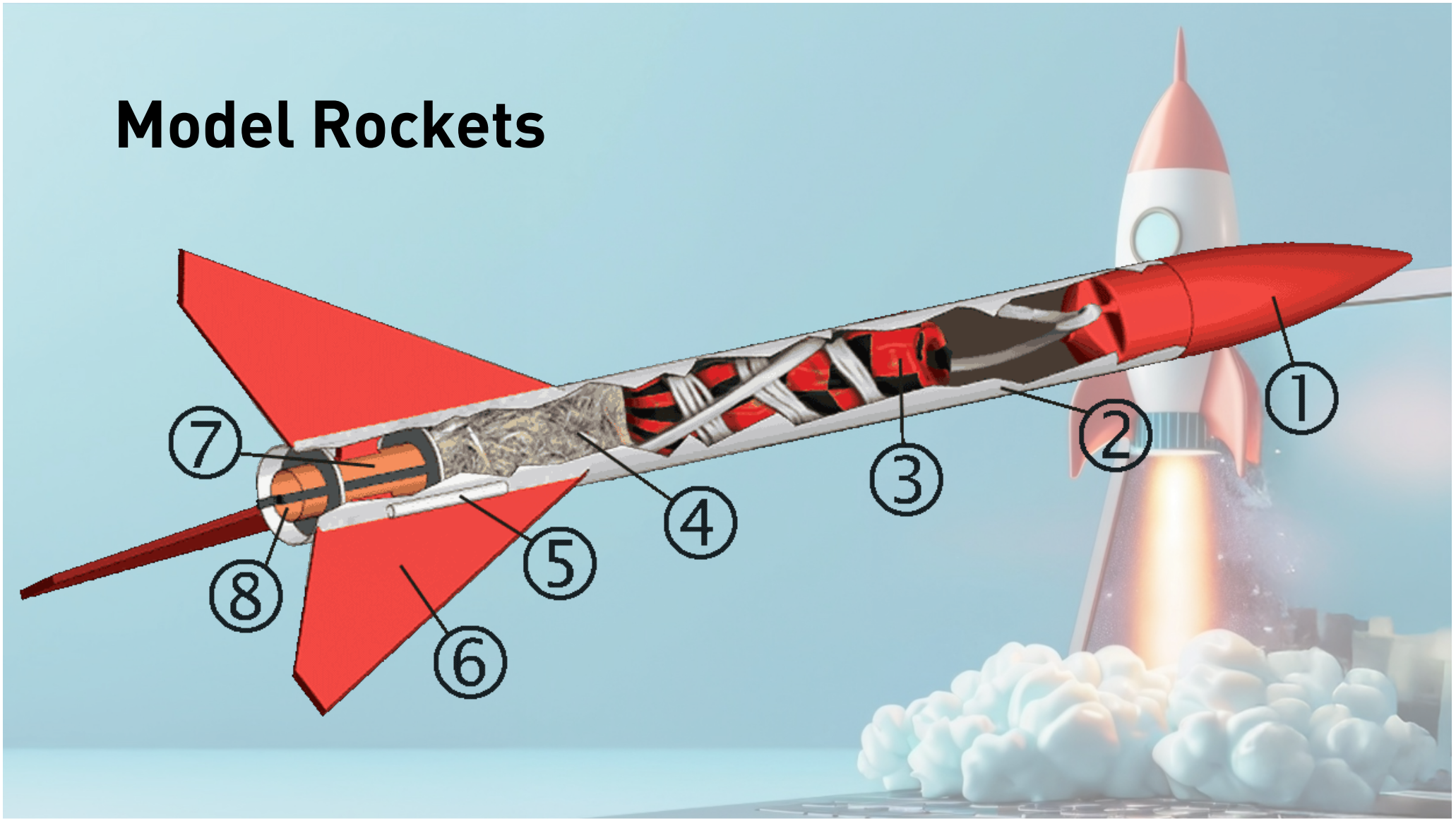
# Teams

- Projects shall be developed in international teams
- ~ 50 students from 4 countries are nominated
- 10-15 teams (4-5 students per team)
- Tasks until summer camp:
  - Team assignment (done by BIP coordination team)
  - Project outline until June-10 (each team)
  - Project outline review (BIP coordination team)
  - Request for parts until summer camp (each team)
    - Shops: https://eckstein-shop.de, https://www.conrad.de, https://www.reichelt.de
    - 3D printers available at h_da

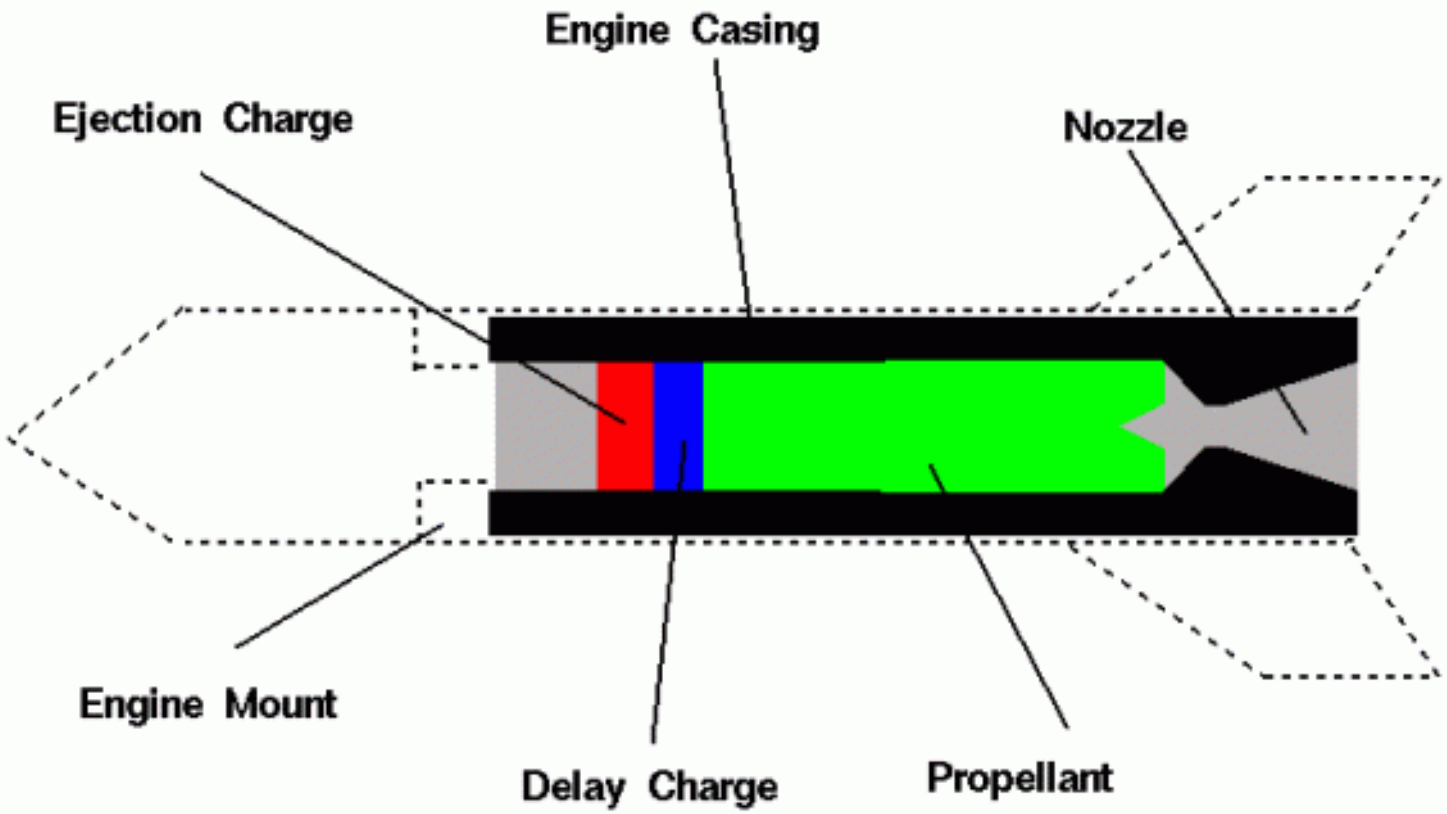
# Summer camp at h_da

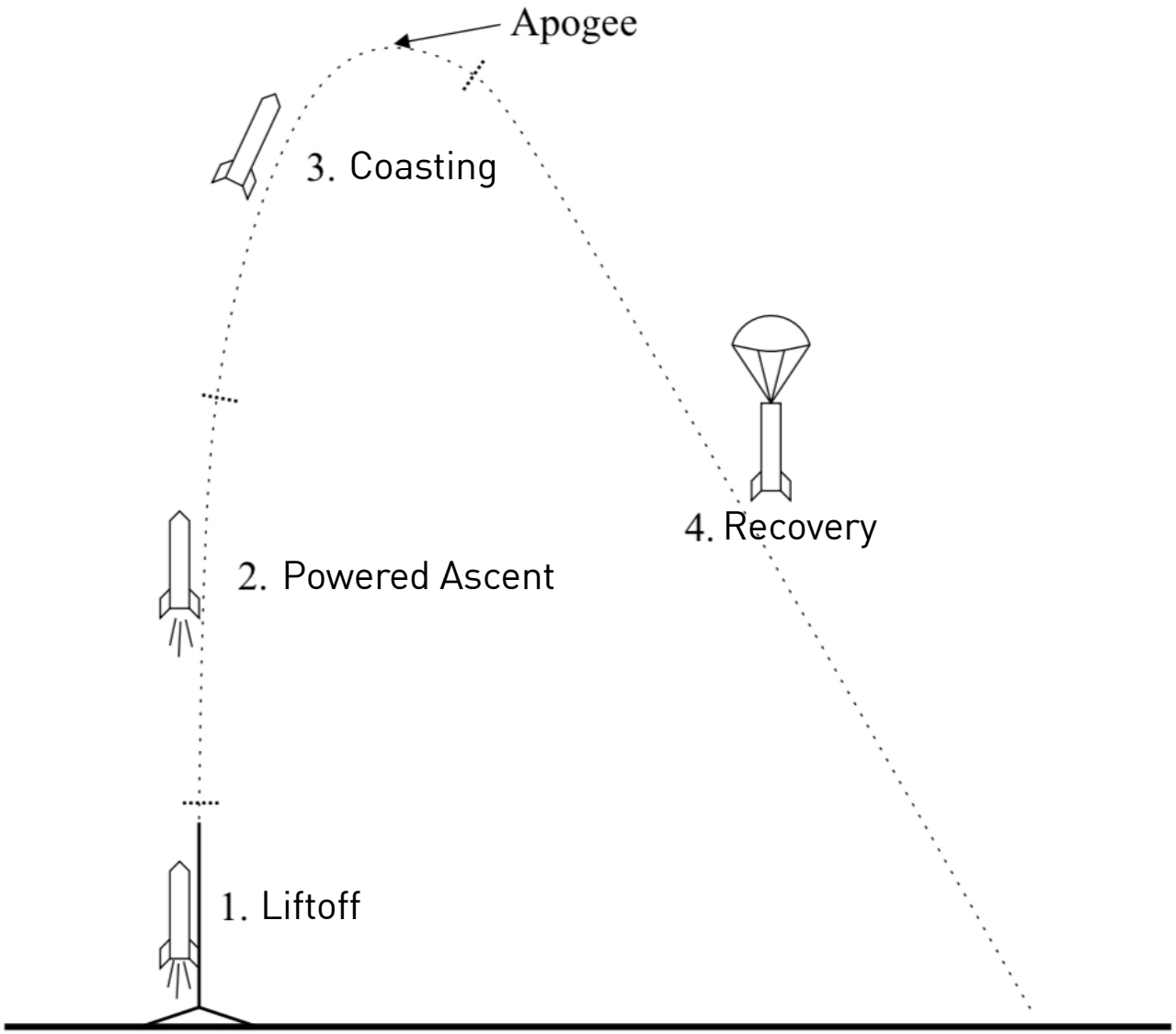
- Jul-2 Welcome Day
- Jul-3 Project workshops
- Jul-4 Project workshops
- Jul-5 Field trip
- Jul-6 Free time
- Jul-7 Project workshops
- Jul-8 Launch day
- Jul-9 Awards Ceremony

# Model Rockets

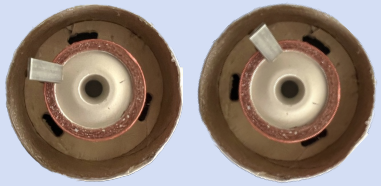


# Model Solid Rocket Engine

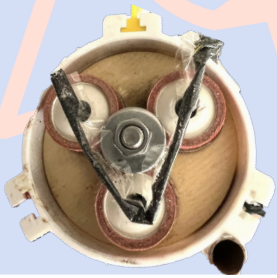



Apogee
3. Coasting
4. Recovery
2. Powered Ascent
1. Liftoff

**Sagitta**
L 615 mm
⌀ 35 mm
2 stages
1x C6-0
1x A6-4
235m



**Auriga**
L 895 mm
⌀ 50 mm
1 stage
2x C6-5
1x C6-P
225m



**A6M2C**
L 665 mm
⌀ 50 mm
1 stage
1x C6-3

48 m

**A6M1C**
L 665 mm
⌀ 50 mm
1 stage
4x C6-P
1x B4-4
31 m

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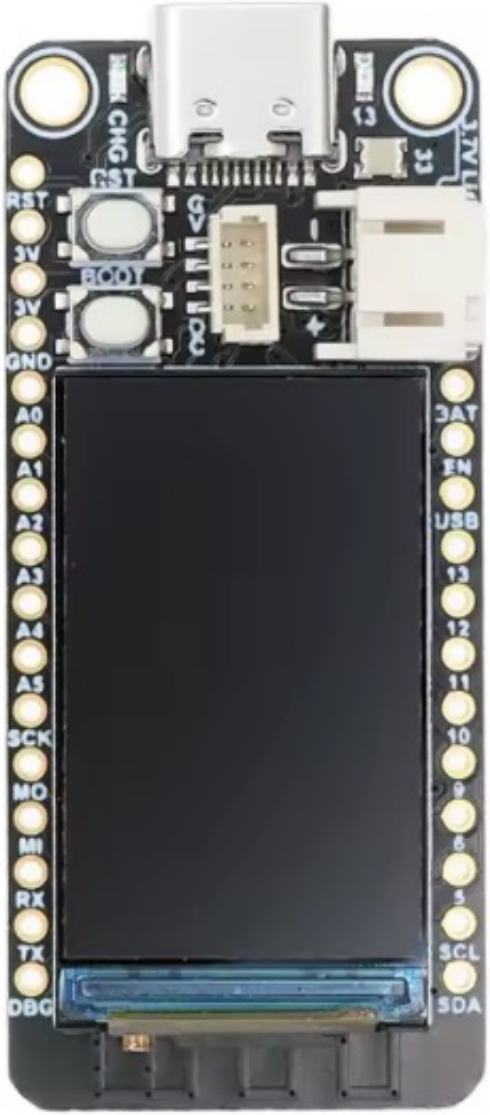
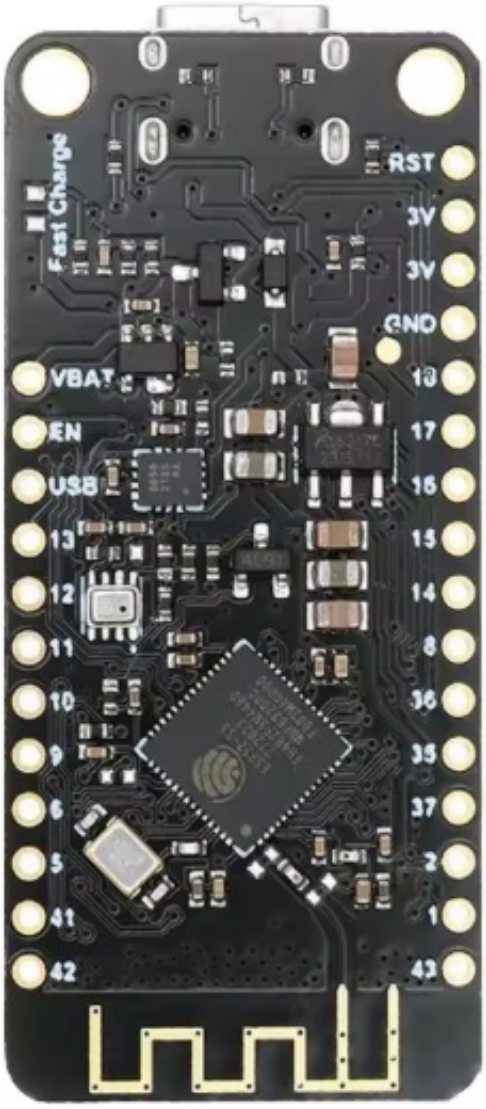
# Hardware

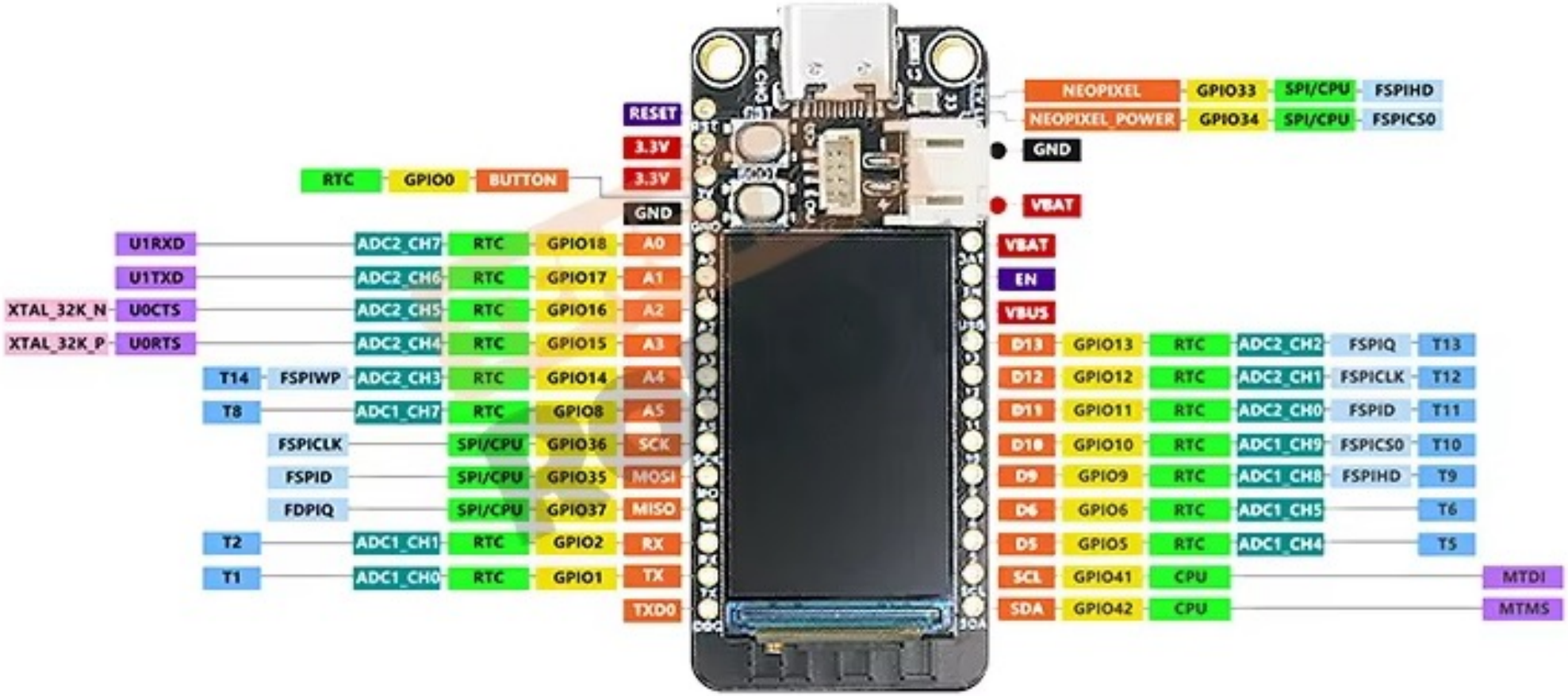
- ESP32 S3 µController
- BMP280 pressure sensor
- QMI8658C IMU
- Lithium Battery charger
- USB-C
- STEMMA/QT-Connector
- 1.14 inch TFT display



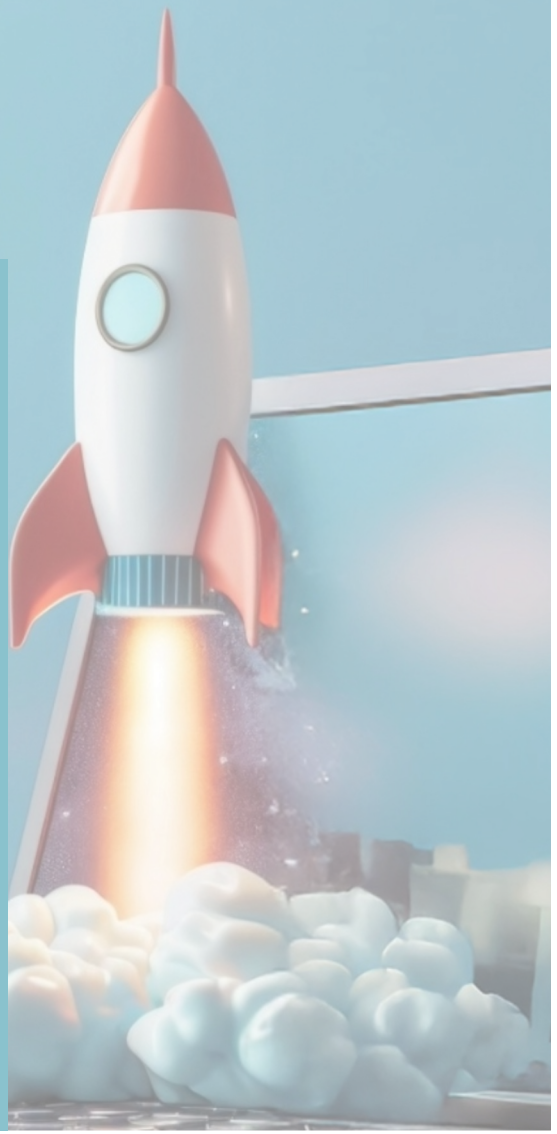



# Hardware

https://de.aliexpress.com/item/1005006455931427.html



# Software Arduino IDE

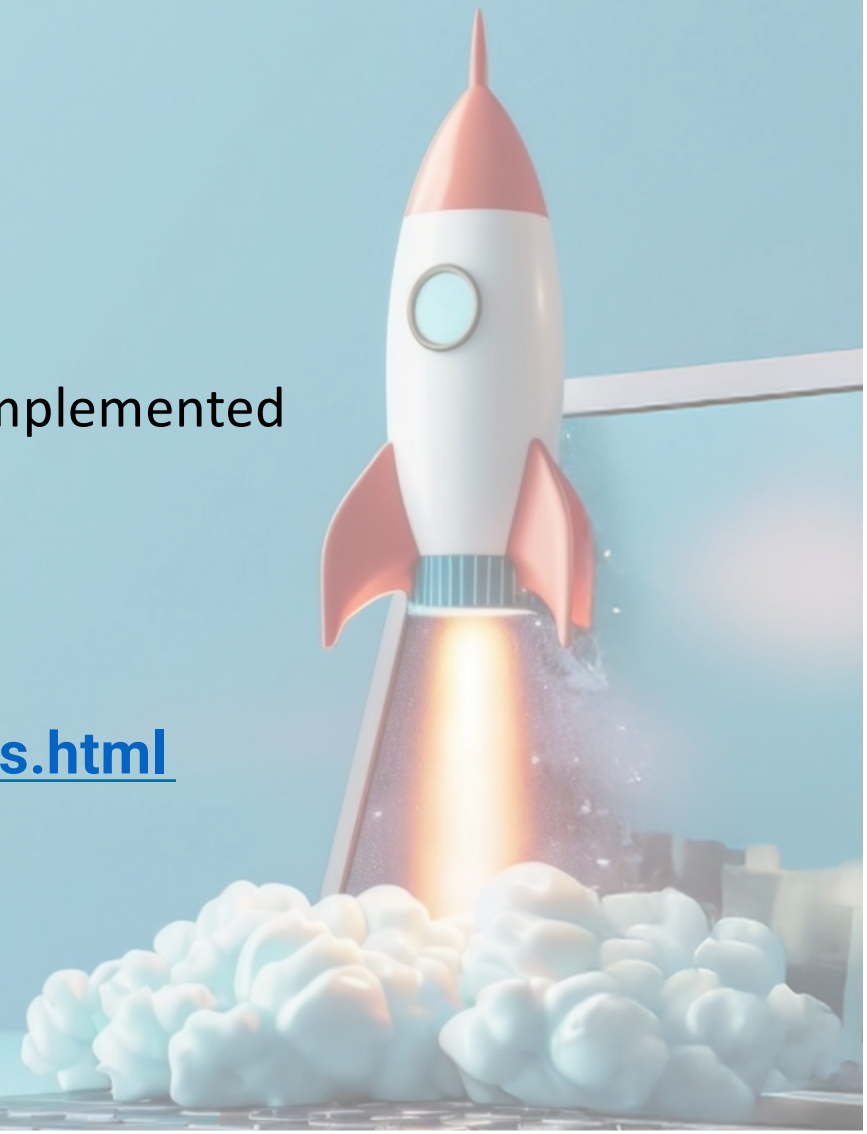


# Software Arduino IDE

- Sensors and display need libraries
- A start sketch has all the basics already implemented

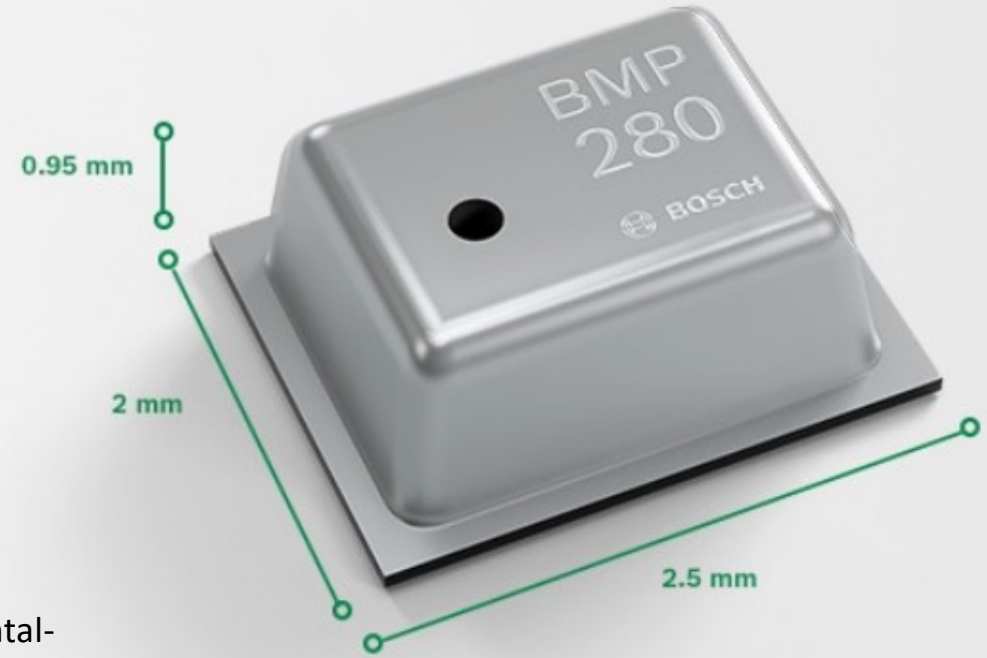
- Start sketch can be downloaded here:

**https://et.utcluj.ro/sensate-x/resources.html**



# BMP280

- Pressure: 300...1100 hPa
- Temperature: -40…85°C
- Absolute accuracy: ~ ±1 hPa
- Resolution: 0.01 hPa ( < 10 cm)
- Interface: I2C / SPI

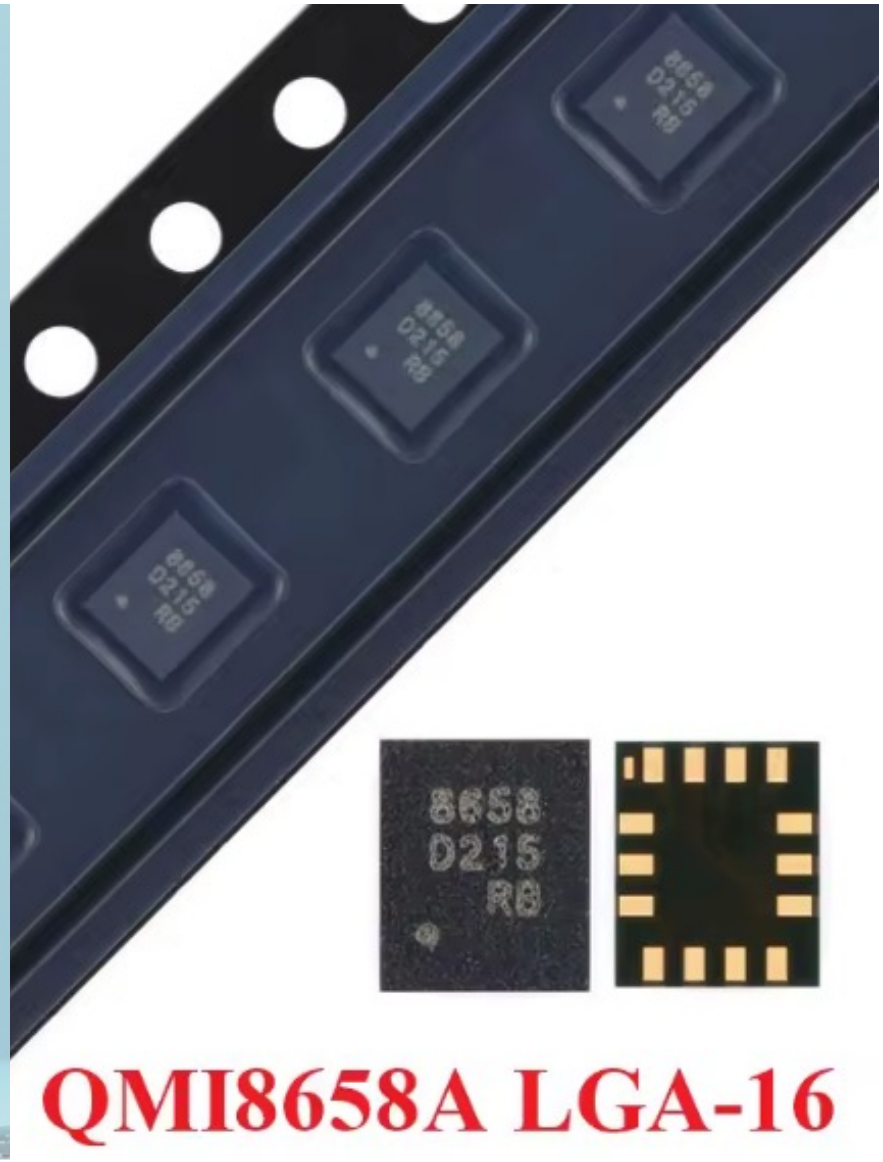



https://www.bosch-sensortec.com/products/environmental-sensors/pressure-sensors/bmp280/

# QMI8658

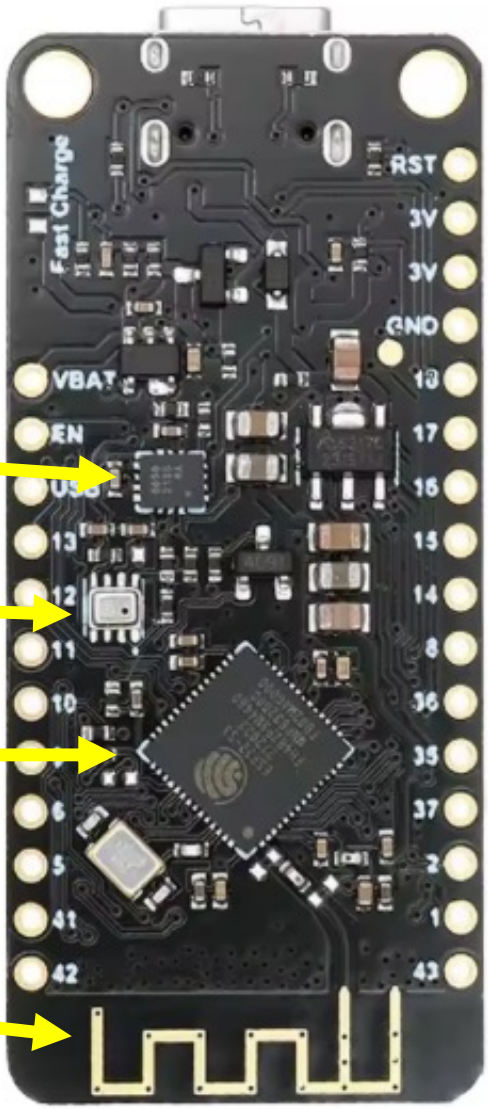
**Low Noise, Wide Bandwidth 6D Inertial Measurement Unit with Motion Co-Processor and Sensor Fusion**

- Accelerometer and gyroscope sensors
- Complete inertial measurement unit (IMU) with sensor fusion library with specified orientation accuracy of ±3° pitch and roll, ±5° yaw/heading
- Large sensor dynamic ranges from ±16°/s to ±2048°/s for gyroscope and ±2 g to ±16 g for accelerometer



# PCB

- QMI8658C IMU
- BMP280 pressure sensor
- ESP32 S3
- WLAN/BT-Antenna



# Questions?