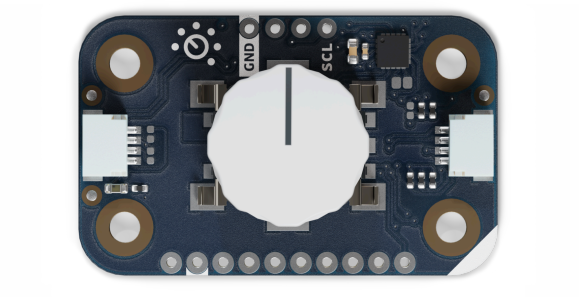
User Manual
SKU: ABX00107



Description

The Modulino® Knob features a **quadrature rotary encoder** (PEC11J-9215F-S0015) paired with an on-board **STM32C011F4 microcontroller**, enabling both precise rotational input and push-button interaction. The node communicates via I2C (Qwiic interface) by default, but can also be reprogrammed or accessed via other communication interfaces for advanced projects.

Target Areas

Maker, beginner, education

Contents

1 Application Examples

- **User Interface Control** Implement smooth menu navigation, scrolling through options, or fine adjustment of parameters (e.g., volume, brightness) in your project.
- **Industrial/Mechanical Projects** Use rotary input for setting machine parameters, calibrating sensors, or controlling motor speed.
- **Educational Tools** Teach the concepts of rotary encoding, I2C interfacing, and microcontroller-based data handling using a simple, hands-on input device.

2 Features

- **Quadrature rotary encoder** with push-switch capability for rich user input.
- **STM32C011F4** microcontroller handling I2C communications and optional reprogramming.
- Operates at **3.3 V** via the Qwiic interface; supports 2.0 V–3.6 V supply range internally.
- **SWD** interface on-board for firmware customization, plus optional UART lines.
- Ideal for **menu navigation**, fine-tuning controls, and interactive IoT or maker projects.

2.1 Contents

SKU	Name	Purpose	Quantity
ABX00107	Modulino® Knob	Quadrature rotary encoder with push switch	1
	I2C Qwiic cable	Compatible with the Qwiic standard	1

3 Related Products

- *SKU: ASX00027* – Arduino® Sensor Kit
- *SKU: K000007* – Arduino® Starter Kit
- *SKU: AKX00026* – Arduino® Oplà IoT Kit

4 Rating

4.1 Recommended Operating Conditions

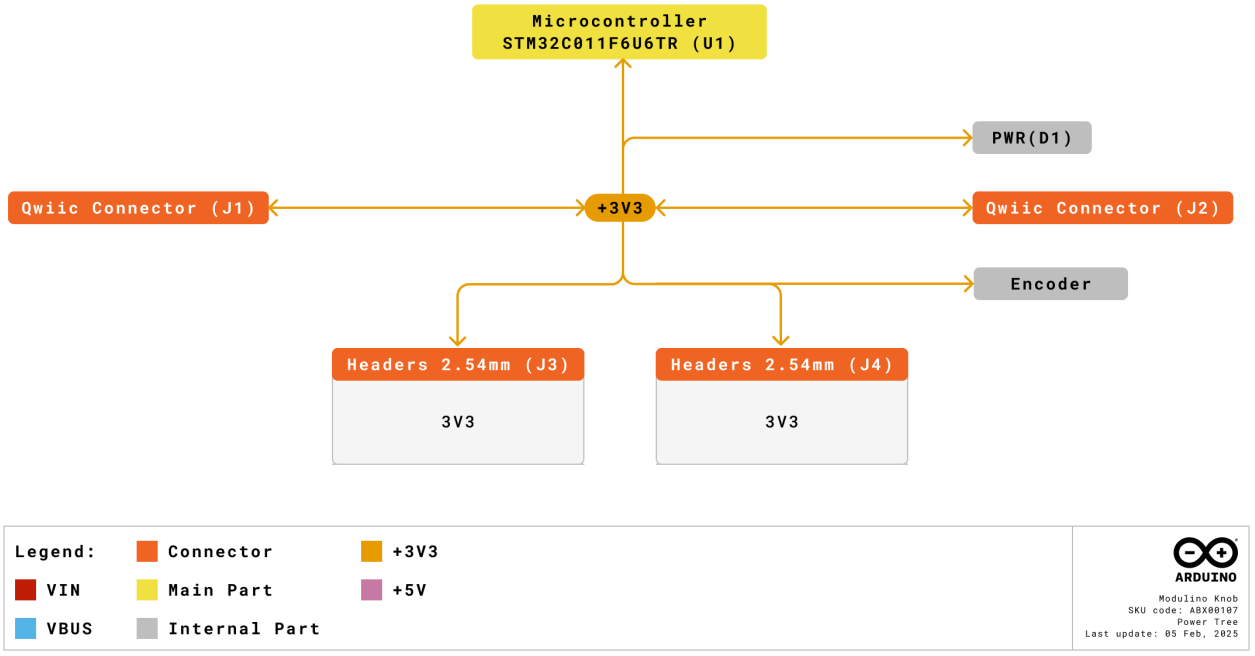
- **Microcontroller supply range:** 2.0 V – 3.6 V (STM32C011F4)
- **Powered at 3.3 V** through the Qwiic interface (in accordance with the Qwiic standard)
- **Operating temperature:** –40 °C to +85 °C

Typical current consumption:

- ~3.4 mA (microcontroller + rotary encoder interface)

5 Power Tree

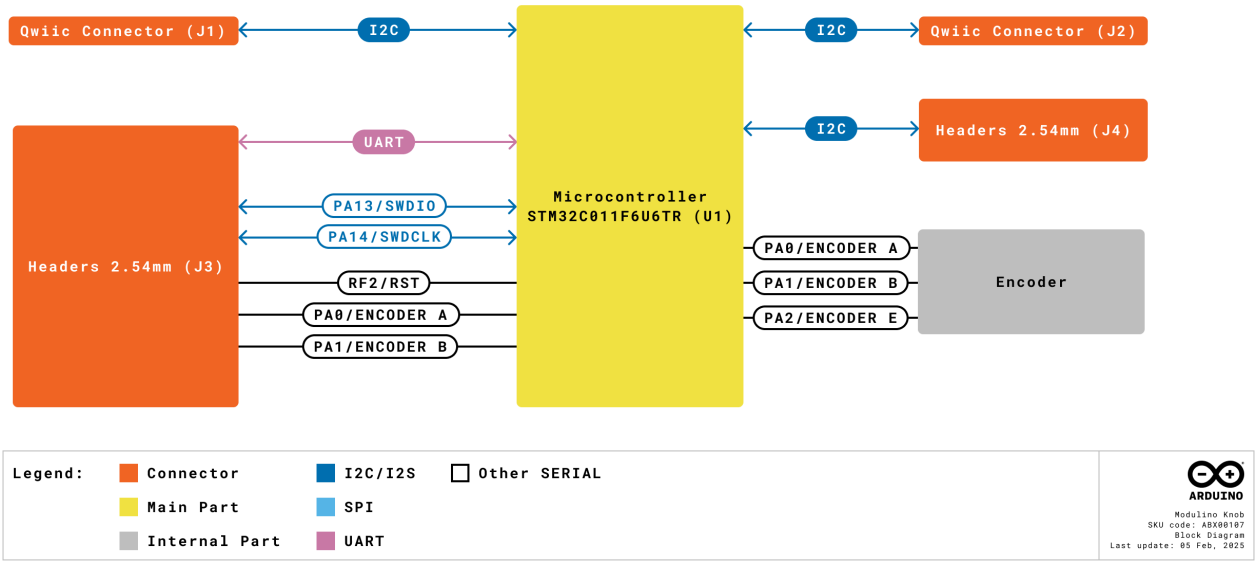
The power tree for the modulino can be consulted below:



Modulino® Knob Power Tree

6 Block Diagram

This module includes an STM32C011F4 microcontroller, reading the quadrature signals from the rotary encoder and a push switch. It communicates via I2C by default but can be customized via SWD for additional functionalities.



Modulino® Knob block diagram

7 Functional Overview

The Modulino® Knob node reads a **quadrature rotary encoder** (including push-switch action), translating positional and switch states into data accessible via I2C. The on-board MCU (STM32C011F4) can also support other protocols (UART, SPI, I2S) if reprogrammed. By default, I2C data allows host microcontrollers (e.g., Arduino® UNO R4 WiFi) to read knob rotation and button states easily.

7.1 Technical Specifications

Specification	Details
Microcontroller	STM32C011F4 (handles I2C, rotary encoder logic)
Accuracy	ADC: ±2 LSB typical INL
Resolution	12-bit ADC
Encoder	PEC11J-9215F-S0015 (quadrature + push switch)
Supply Voltage	Min: 2.0 V, Max: 3.6 V
Power Consumption	~3.4 mA
Encoder Range	360° (continuous rotation)
Communication	I2C (Qwiic), SWD (debug/reprogram), optional UART
Resolution	Internal 12-bit ADC (for custom expansions)

7.2 Pinout

Qwiic / I2C (1×4 Header)

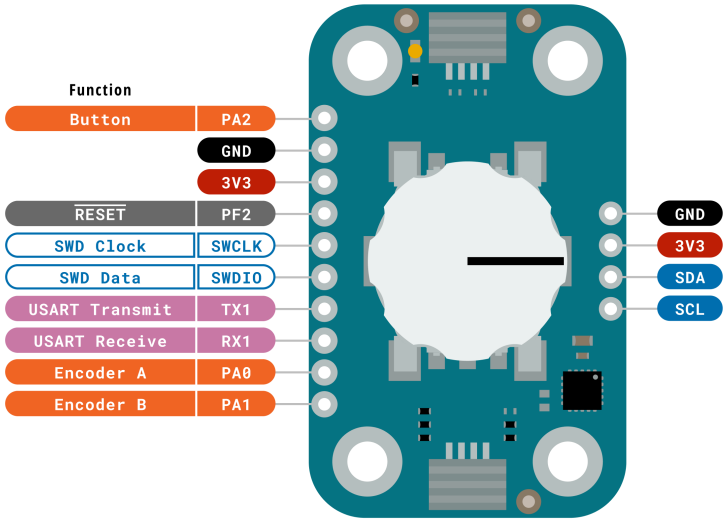
Pin	Function
GND	Ground
3.3 V	Power Supply (3.3 V)
SDA	I2C Data
SCL	I2C Clock

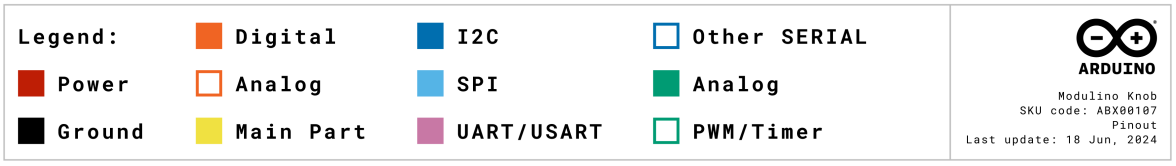
These pads and the Qwiic connectors share the same I2C bus at 3.3 V.

Additional 1×10 Header (Knob & MCU Signals)

Pin	Function
PA0	Encoder Pin A
PA1	Encoder Pin B
PA2	Push Switch
RX1	UART Receive
TX1	UART Transmit
SWDIO	SWD Data
SWCLK	SWD Clock
PF2	NRST (Reset)

Note: By default, the STM32C011F4 firmware manages the rotary encoder via I2C registers. Advanced users may modify this behavior by flashing custom code through SWD.



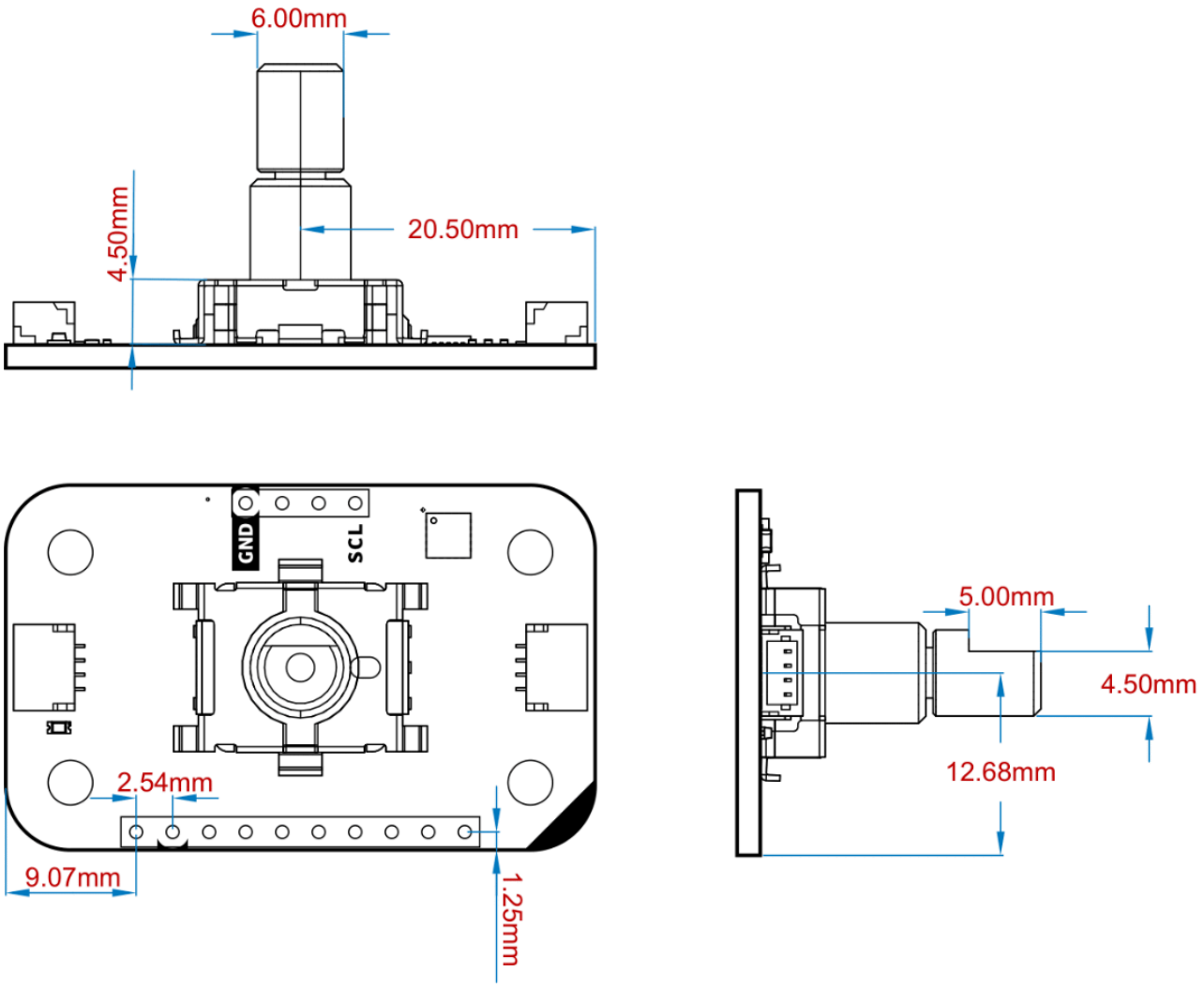


Pinout Overview

7.3 Power Specifications

- **Nominal operating voltage:** 3.3 V via Qwiic
- **MCU voltage range:** 2.0 V–3.6 V

7.4 Mechanical Information



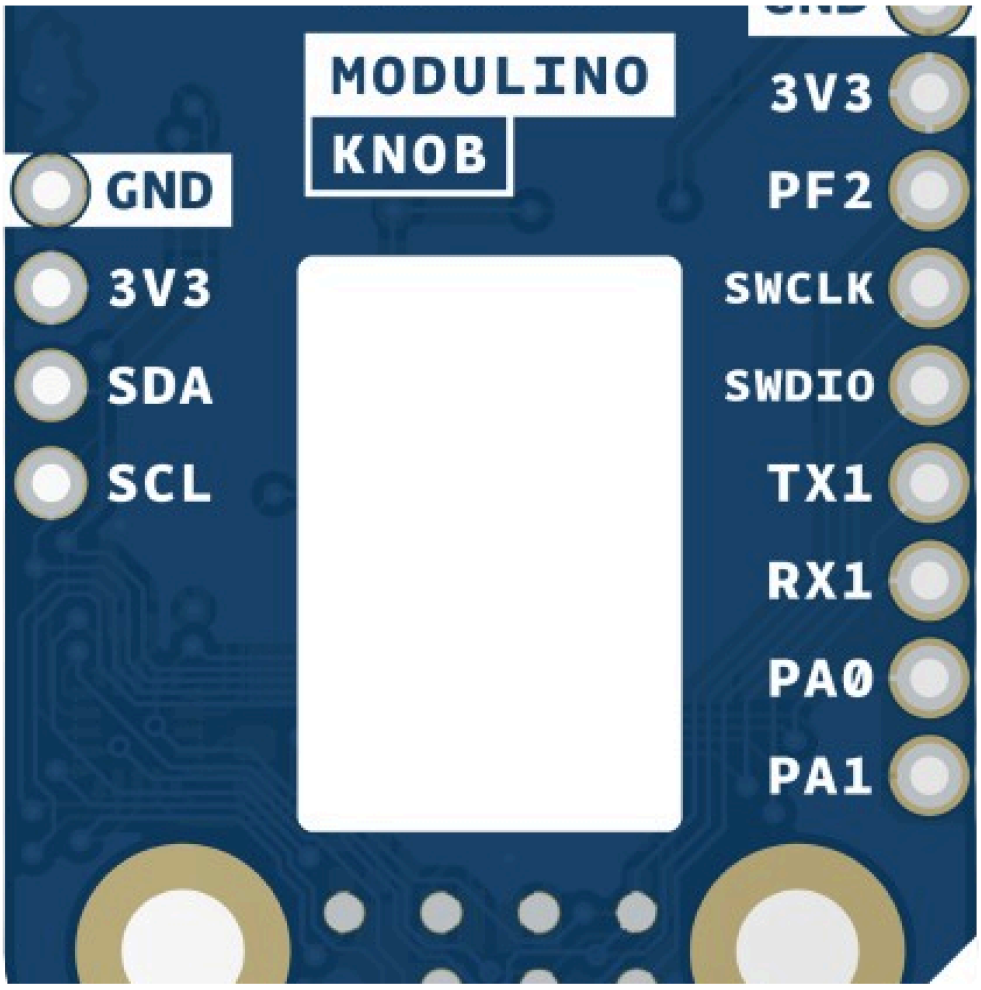
Modulino® Knob Mechanical Information

- Board dimensions: 41 mm × 25.36 mm
- Thickness: 1.6 mm (±0.2 mm)
- Four mounting holes (Ø 3.2 mm)
  - Hole spacing: 16 mm vertically, 32 mm horizontally

7.5 I2C Address Reference

Board Silk Name	Sensor	Modulino I2C Address (HEX)	Editable Addresses (HEX)	Hardware I2C Address (HEX)
MODULINO KNOB	Quadrature Encoder + MCU	0x76	Any custom address (via FW config)	0x3A

Note: Default I2C address is **0x76**. You can change it through the Modulino® library or by flashing custom firmware. A white rectangle on the board silk can be used to label the new address.

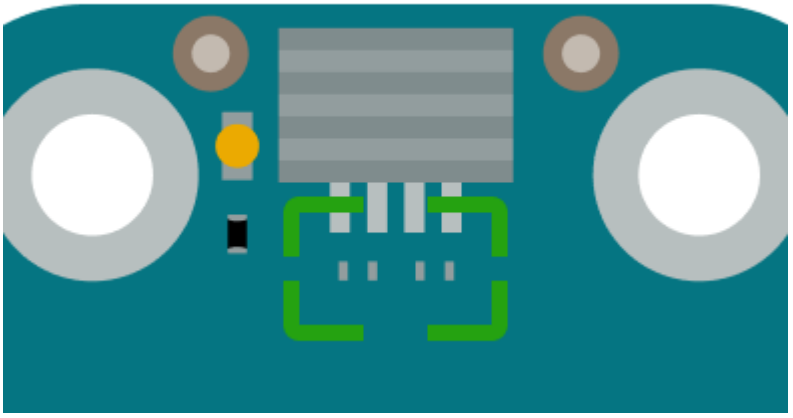


Blank silk for identification

7.5.1 Pull-up Resistors

The module has pads for optional I2C pull-up mounting in both data lines. No resistors are mounted by default but in case the resistors are need 4.7 K resistors in an SMD 0402 format are recommended.

These are positioned near the Qwiic connector on the power LED side.



Generic pull-up resistor position

8 Device Operation

The Modulino® Knob node acts as an I2C target device on the Qwiic bus. It detects rotation steps (increment/decrement), push-switch events, and reports them to the host controller. If the included firmware doesn't meet your needs, you can reprogram the STM32C011F4 via SWD.

8.1 Getting Started

Use any Arduino or other 3.3 V microcontroller environment. An official Modulino® library may be available to streamline reading rotary values and push-switch states. Ensure your master device shares the same 3.3 V reference and I2C bus.

8.2 Board Recovery

All Arduino® boards have a built-in bootloader which allows flashing the board via USB. In case a sketch locks up the processor and the board is not reachable anymore via USB, it is possible to enter bootloader mode by double-tapping the reset button right after the power-up.

Certifications

9 Certifications Summary

Certification	Status
CE/RED (Europe)	Yes
UKCA (UK)	Yes
FCC (USA)	Yes
IC (Canada)	Yes
RoHS	Yes
REACH	Yes
WEEE	Yes

10 Declaration of Conformity CE DoC (EU)

We declare under our sole responsibility that the products above are in conformity with the essential requirements of the following EU Directives and therefore qualify for free movement within markets comprising the European Union (EU) and European Economic Area (EEA).

11 Declaration of Conformity to EU RoHS & REACH 211 01/19/2021

Arduino boards are in compliance with RoHS 2 Directive 2011/65/EU of the European Parliament and RoHS 3 Directive 2015/863/EU of the Council of 4 June 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Substance	Maximum limit (ppm)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl ethers (PBDE)	1000
Bis(2-Ethylhexyl) phthalate (DEHP)	1000
Benzyl butyl phthalate (BBP)	1000
Dibutyl phthalate (DBP)	1000
Diisobutyl phthalate (DIBP)	1000

Exemptions: No exemptions are claimed.

Arduino Boards are fully compliant with the related requirements of European Union Regulation (EC) 1907 /2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). We declare none of the SVHCs (https://echa.europa.eu/web/guest/candidate-list-table), the Candidate List of Substances of Very High Concern for authorization currently released by ECHA, is present in all products (and also package) in quantities totaling in a concentration equal or above 0.1%. To the best of our knowledge, we also declare that our products do not contain any of the substances listed on the "Authorization List" (Annex XIV of the REACH regulations) and Substances of Very High Concern (SVHC) in any significant amounts as specified by the Annex XVII of Candidate list published by ECHA (European Chemical Agency) 1907 /2006/EC.

12 Conflict Minerals Declaration

As a global supplier of electronic and electrical components, Arduino is aware of our obligations with regard to laws and regulations regarding Conflict Minerals, specifically the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502. Arduino does not directly source or process conflict minerals such as Tin, Tantalum, Tungsten, or Gold. Conflict minerals are contained in our products in the form of solder or as a component in metal alloys. As part of our reasonable due diligence, Arduino has contacted component suppliers within our supply chain to verify their continued compliance with the regulations. Based on the information received thus far we declare that our products contain Conflict Minerals sourced from conflict-free areas.

13 FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.
3. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator & your body.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

English: User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. this device may not cause interference.

2. this device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil nedoit pas produire de brouillage.
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC SAR Warning:

English: This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

French: Lors de l'installation et de l'exploitation de ce dispositif, la distance entre le radiateur et le corps est d'au moins 20 cm.

Important: The operating temperature of the EUT can't exceed 85 °C and shouldn't be lower than -40 °C.

Hereby, Arduino S.r.l. declares that this product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.

Company Information

Company name	Arduino SRL
Company Address	Via Andrea Appiani, 25 - 20900 MONZA（Italy)

Reference Documentation

Ref	Link
Arduino IDE (Desktop)	https://www.arduino.cc/en/Main/Software
Arduino Courses	https://www.arduino.cc/education/courses
Arduino Documentation	https://docs.arduino.cc/
Arduino IDE (Cloud)	https://create.arduino.cc/editor
Cloud IDE Getting Started	https://docs.arduino.cc/cloud/web-editor/tutorials/getting-started/getting-started-web-editor
Project Hub	https://projecthub.arduino.cc/
Library Reference	https://github.com/arduino-libraries/
Online Store	https://store.arduino.cc/

Revision History

Date	Revision	Changes
14/05/2025	1	First release