

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



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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

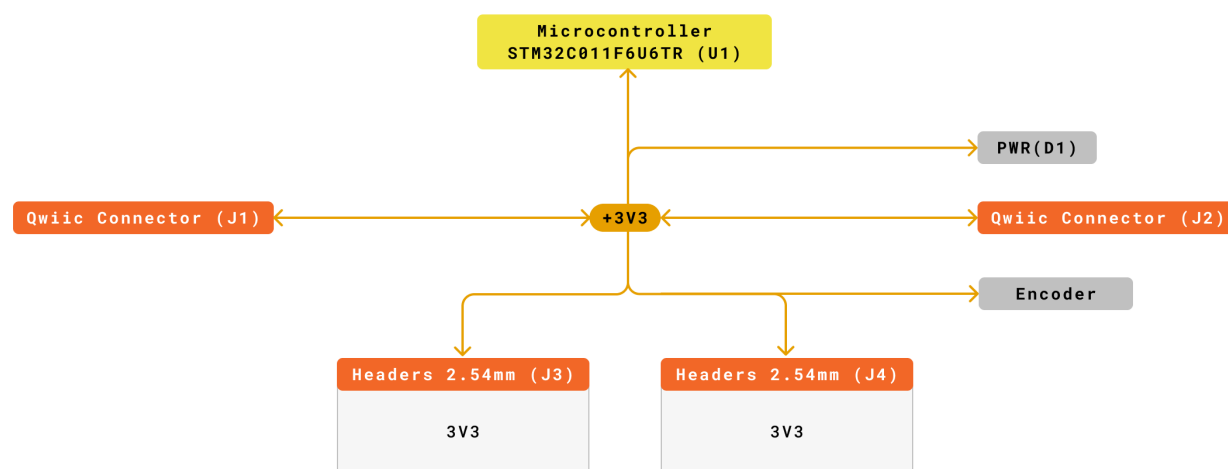
- **Microcontroller supply range:** 2.0 V – 3.6 V (STM32C011F4)
- **Powered at 3.3 V** through the Qwiic interface (in accordance with the Qwiic standard)
- **Operating temperature:** –40 °C to +85 °C

Typical current consumption:

- ~3.4 mA (microcontroller + rotary encoder interface)

5 Power Tree

The power tree for the modulino can be consulted below:



Legend:
 **VIN**
 **VBUS**

 **Connector**
 **Main Part**
 **Internal Part**

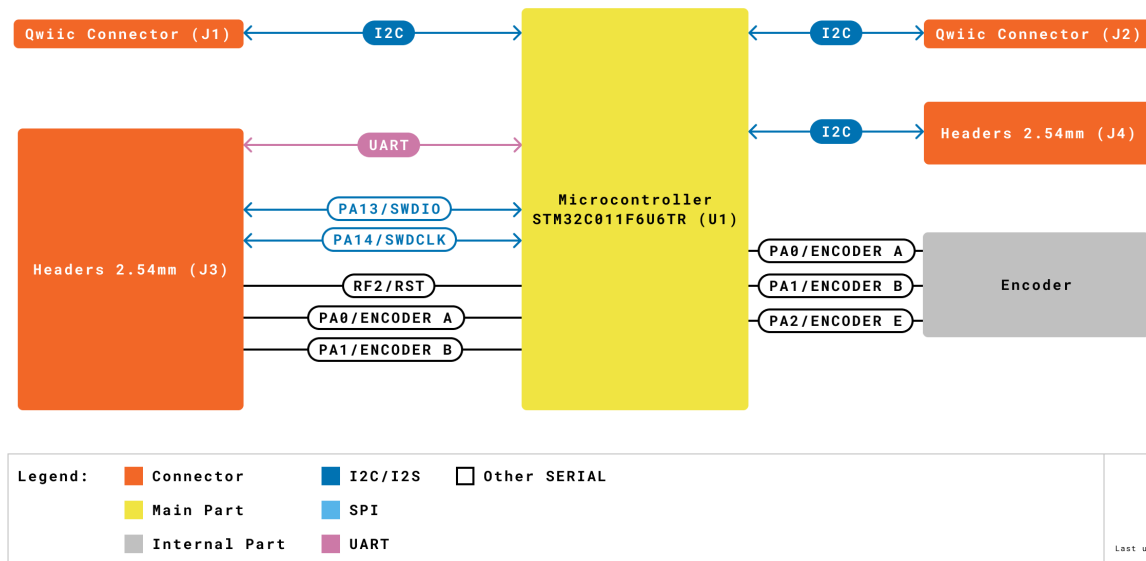
 **+3V3**
 **+5V**


Modulino Knob
SKU code: ADX00197
Power Tree
Last update: 05 Feb, 2025

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)

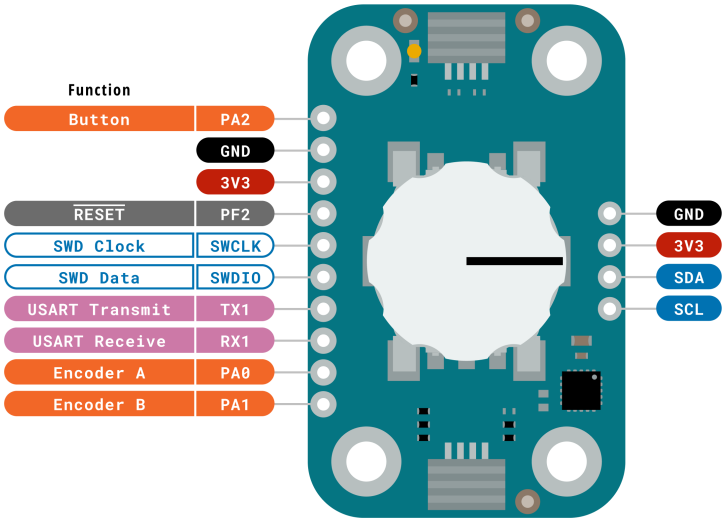
Pin	Function
GND	Ground
3.3 V	Power Supply (3.3 V)
SDA	I2C Data
SCL	I2C Clock

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.



Legend:	Digital	I2C	Other SERIAL
	Power	Analog	SPI
	Ground	Main Part	UART/USART
			Analog
			PWM/Timer

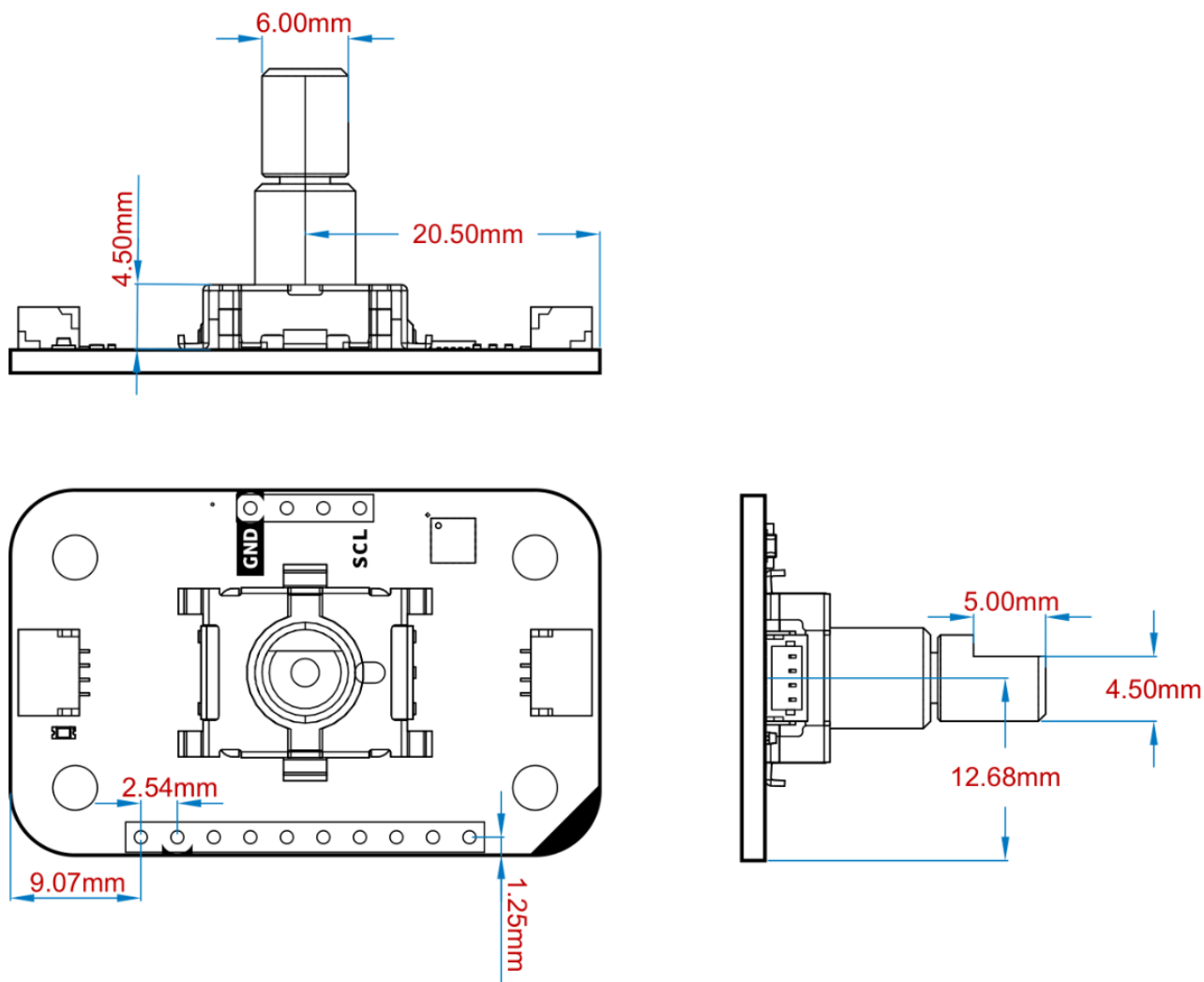
Modulino Knob
SKU code: ABX00107
Pinout
Last update: 18 Jun, 2024

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



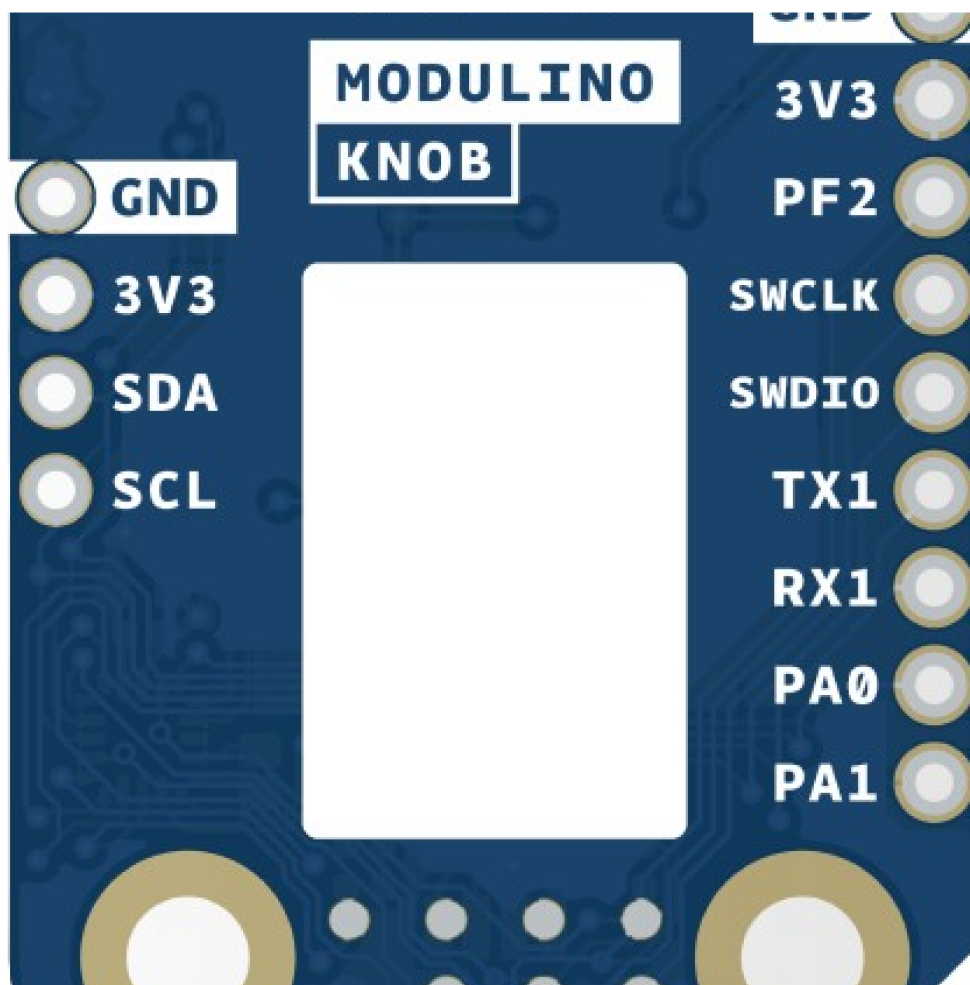
Modulino® Knob Mechanical Information

- 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.

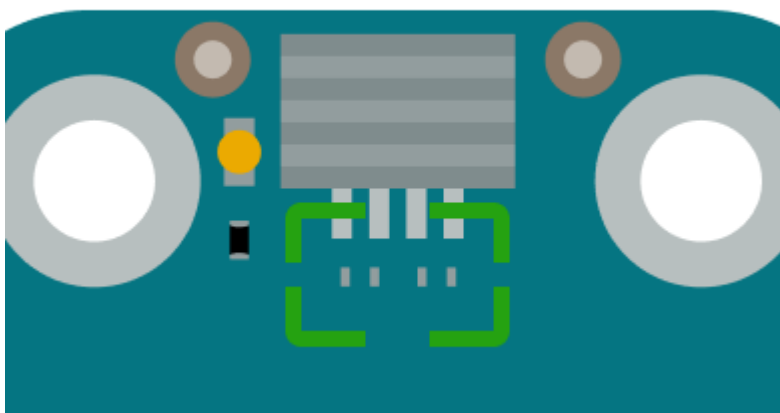


Blank silk for identification

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.



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
11/07/2024	1	First release