

Description

The Modulino® Buzzer, powered by an on-board **STM32C011F4** microcontroller, provides a compact and versatile way to generate sound alerts and tones through I2C control. Perfect for audible notifications, alarm systems, or simple musical applications in IoT and maker projects.

Target Areas

Maker, beginner, education



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1 Application Examples

- **Audible Alerts** Integrate a buzzer notification when a sensor reading crosses a threshold (e.g., temperature limit, motion detected).
- **Alarm & Security Systems** Produce warning tones in response to environment triggers or user-defined events.
- **Interactive Learning Tools** Combine with other Modulino® nodes (e.g., buttons, sensors) to create hands-on educational projects showcasing real-time sound feedback.



2 Features

- **PKLCS1212E4001** buzzer controlled by an **STM32C011F4** microcontroller over I2C (Qwiic).
- Operates at **3.3 V** (in line with Qwiic standards, 2.0–3.6 V MCU range).
- **SWD** header for optional reprogramming or custom sound logic.
- Ideal for **alarm tones**, **status beeps**, or **simple audio feedback**.

2.1 Contents

SKU	Name	Purpose	Quantity
ABX00108	Modulino® Buzzer	Produce sounds or alerts via I2C control	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

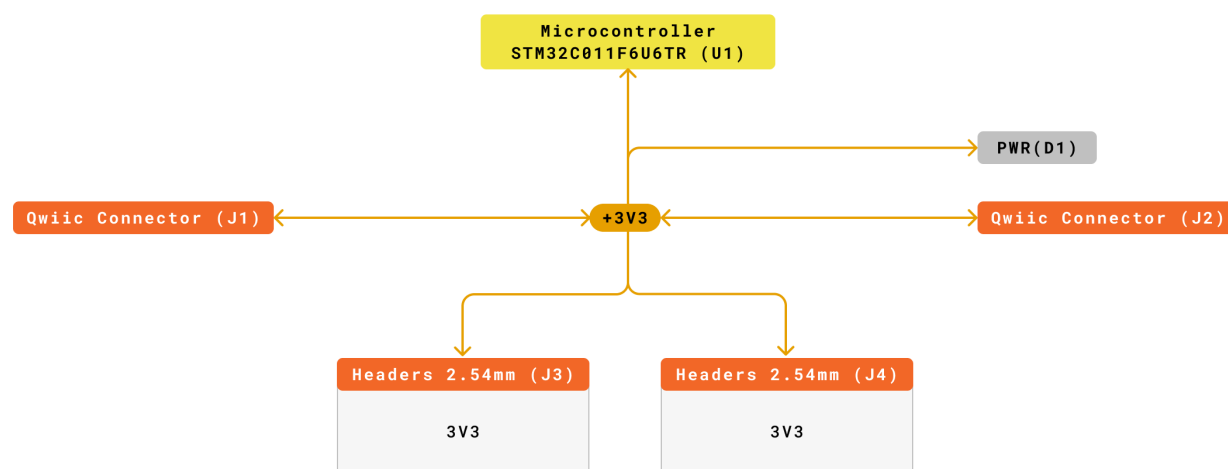
- **Microcontroller supply range:** 2.0 V – 3.6 V (STM32C011F4)
- **Powered at 3.3 V** through the Qwiic interface (in accordance with the Qwiic standard)
- **Operating temperature:** –40 °C to +85 °C

Typical current consumption:

- ~6.4 mA when buzzer is active

5 Power Tree

The power tree for the modulino can be consulted below:



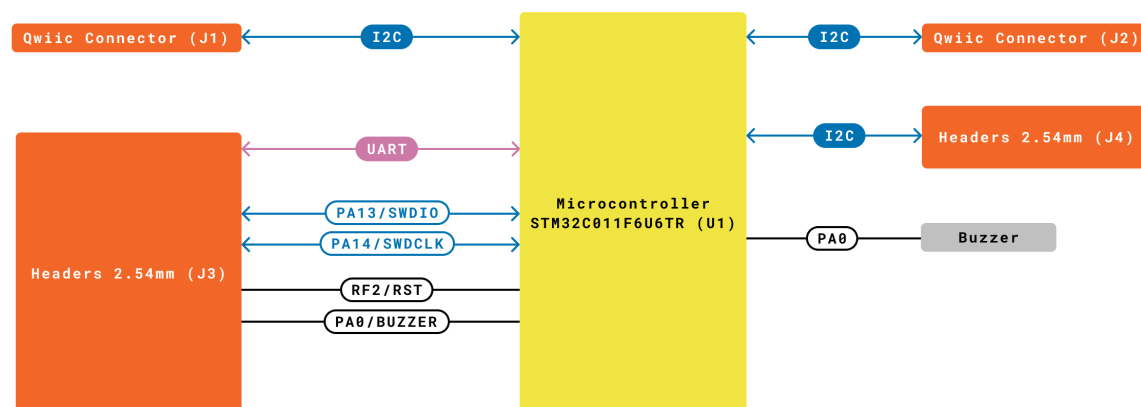
Legend:	Connector	+3V3
VIN	Main Part	+5V
VBUS	Internal Part	

Modulino Buzzer
SKU code: ABX00100
Power Tree
Last update: 05 Feb, 2025

Modulino® Buzzer Power Tree

6 Block Diagram

This module features an STM32C011F4 microcontroller that drives a PKLCS1212E4001 buzzer. It communicates with the host over I2C (Qwiic). Advanced users can reprogram the MCU for custom audio patterns or logic.



Legend:	■ Connector	■ I2C/I2S	 Other SERIAL
	■ Main Part	■ SPI	
	■ Internal Part	■ UART	



Modulino® Buzzer block diagram

7 Functional Overview

The Modulino® Buzzer node receives sound commands or frequency/tone data via I2C. The STM32C011F4 microcontroller then drives the buzzer, producing audible tones or beeps. For more advanced usage, users can re-flash the firmware via SWD to generate custom waveforms or integrate additional logic.

7.1 Technical Specifications (Module-Specific)

Specification	Details
Microcontroller	STM32C011F4
Accuracy	ADC: ± 2 LSB typical INL
Resolution	12-bit ADC
Actuator	PKLCS1212E4001 buzzer
Supply Voltage	Min: 2.0 V, Max: 3.6 V
Power Consumption	~6.4 mA (buzzer active)
Accuracy	ADC: ± 2 LSB typical INL (for advanced usage)
Resolution	12-bit ADC (potential for custom expansions)
Communication	I2C (Qwiic), SWD, optional UART if reprogrammed



7.2 Pinout

Qwiic / I2C (1×4 Header)

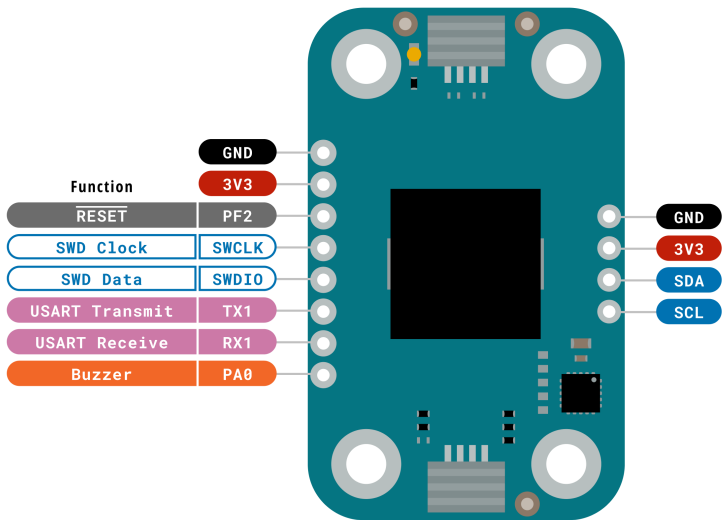
Pin	Function
GND	Ground
3.3 V	Power Supply (3.3 V)
SDA	I2C Data
SCL	I2C Clock

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

Additional 1×8 Header (Buzzer & MCU Signals)

Pin	Function
PA0	Buzzer signal (PWM)
RX1	UART Receive
TX1	UART Transmit
SWDIO	SWD Data
SWCLK	SWD Clock
PF2	NRST (Reset)

Note: You can drive the buzzer with custom signals (PWM supplied to the PA0 pin) or reprogram the STM32C011F4 via SWD for alternate modes or advanced functionality.



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

Modulino Buzzer
SKU code: ABX00108
Pinout
Last update: 18 Jun, 2024

Pinout Overview

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

The mechanical drawing shows the top and bottom views of the PCB. The top view is a rectangle with dimensions 41.00mm (width) and 31.42mm (length). It features a central component with a 3.00mm width and a 14.50mm length. The bottom view is a rounded rectangle with dimensions 11.61mm (width) and 1.25mm (length). It includes a central component with a 12.00mm width and 12.00mm height, a speaker symbol, and a pin header with pins labeled GND, 3V3, SDA, and SCL. Other dimensions include 2.54mm, 16.69mm, and Ø3.20mm.

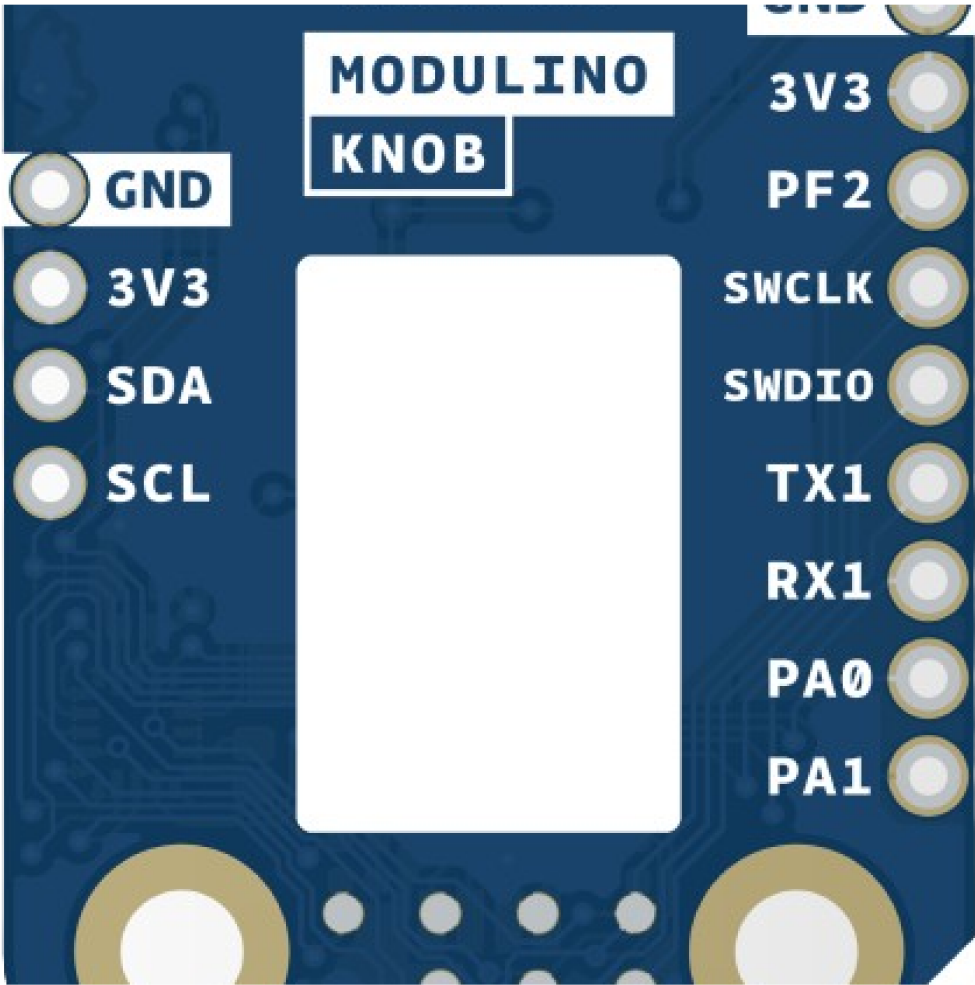
- Board dimensions: 41 mm × 25.36 mm
- Thickness: 1.6 mm (±0.2 mm)
- Four mounting holes (Ø 3.2 mm)
 - Hole spacing: 16 mm vertically, 32 mm horizontally



7.5 I2C Address Reference

Board Silk Name	Sensor/Actuator	Modulino I2C Address (HEX)	Editable Addresses (HEX)	Hardware I2C Address (HEX)
MODULINO BUZZER	1× Buzzer	0x3C	Any custom address (via FW config)	0x1E

Note: Default address is **0x3C**, but custom firmware can reassign it. Check your library or code for details.

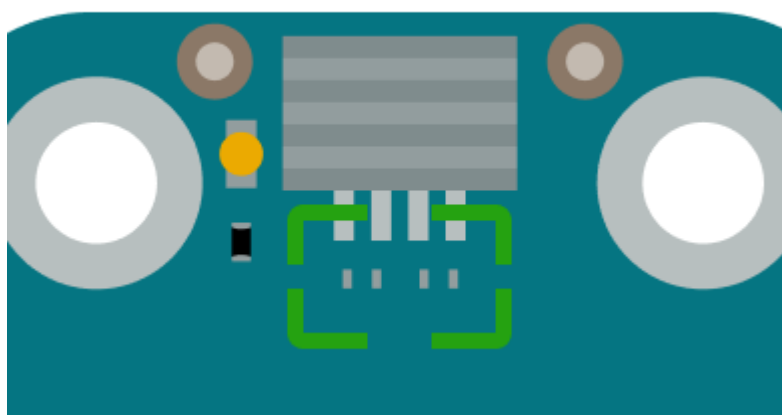


Blank silk for identification

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

By default, the Modulino® Buzzer node responds to I2C commands to produce tones or beep patterns. You can integrate it with the Arduino IDE or any 3.3 V microcontroller environment. Advanced users may flash custom code via the SWD header to implement unique waveforms or logic.

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