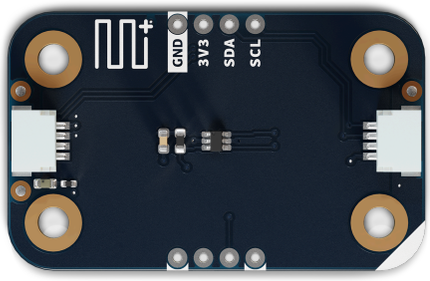
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User Manual
SKU: ABX00174



English

Description

The Modulino Extender features the LTC4311 I2C accelerator, enabling reliable I2C communication over long cable distances and with high-capacitance loads. By providing boosted pull-up current during bus transitions, this transparent module allows extended cable runs up to 30 meters while maintaining signal integrity and communication speed.

Target Areas

Maker, beginner, education, advanced prototyping

Product Intended Use

Arduino Hardware Products are primarily intended for development and prototyping but may also support production solutions. Developers must design and verify security controls early, based on the intended deployment environment. Security is a shared responsibility between Arduino and the solution builder, who must assess the hardware's available security features and add any necessary protections.

Visit docs.arduino.cc/tutorials/security/intended-use-and-security-model/ for the complete Arduino Hardware Products: Intended use and Security model.

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1 Application Examples

- **Long-Distance Sensor Networks** Connect sensors and modules over extended cable runs (tested up to 30 m with Cat5e or Cat6, STP/FTP cables).
- **High-Capacitance Systems** Maintain reliable I2C communication when bus capacitance exceeds the standard 400 pF limit.
- **Remote Installations** Place sensors and actuators at greater distances from the main controller for flexible project layouts.

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2 Features

- **LTC4311** I2C/SMBus accelerator for enhanced signal integrity.
- **Transparent operation** requiring no address configuration or special commands.
- **Boosted pull-up current** during positive bus transitions for fast edge rates.
- Supports bus capacitances **beyond 400 pF** standard limit.
- **Wide supply voltage range:** 1.6 V – 5.5 V.
- **Two 1×4 headers** (not mounted) for optional direct connections.
- **Two unpopulated pull-up resistor pads** for additional customization.
- Operates at **3.3 V** via the Qwiic interface.

2.1 Contents

SKU	Name	Purpose	Quantity
ABX00174	Modulino Extender	I2C signal accelerator for long cables	1
	Long I2C Qwiic cable (10cm)	Compatible with the Qwiic standard	2

3 Related Products

- **SKU: ABX00087** – Arduino® UNO R4 WiFi
- **SKU: ABX00162** – Arduino® UNO Q
- **SKU: ABX00142/ABX00143** – Arduino® Nano R4
- **SKU: ASX00061** – Nano Connector Carrier
- **SKU: AKX00069** – Plug and Make Kit

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4 Rating

4.1 Recommended Operating Conditions

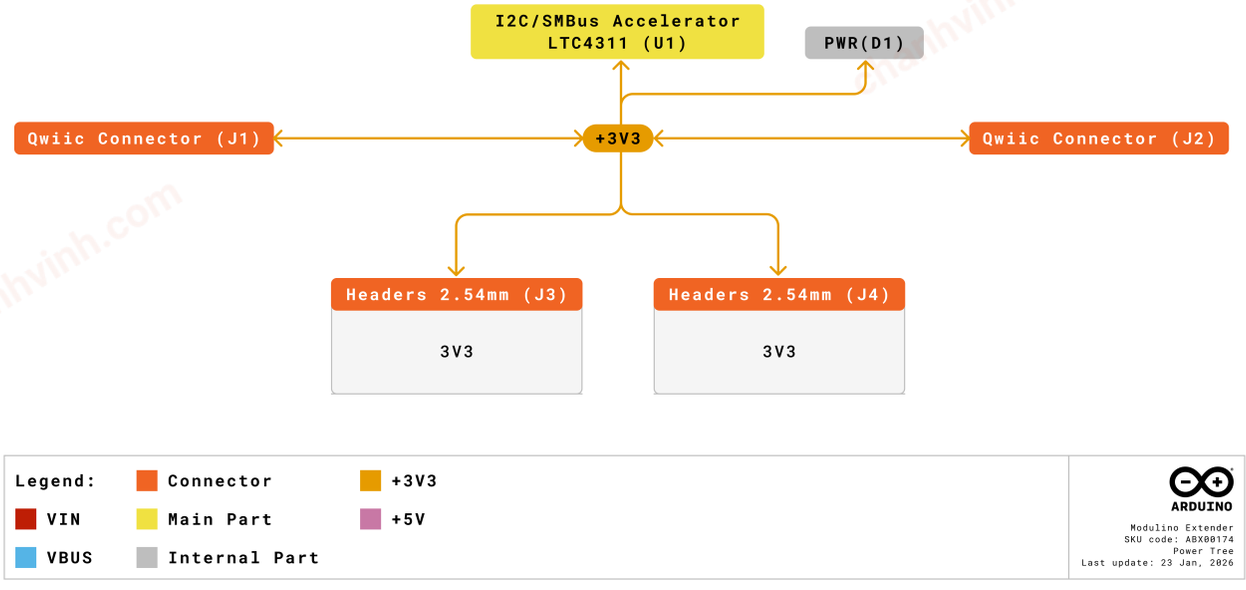
- **Supply voltage:** 1.6 V – 5.5 V (LTC4311)
- **Powered at 3.3 V** through the Qwiic interface (in accordance with the Qwiic standard)
- **Operating temperature:** –40 °C to +85 °C
- **Maximum I2C speed:** Up to 400 kHz (supports standard and fast-mode)

Typical current consumption:

- LTC4311 supply current: ~200 µA typical
- Additional current during bus transitions for accelerated pull-up

5 Power Tree

The power tree for the Modulino node can be consulted below:

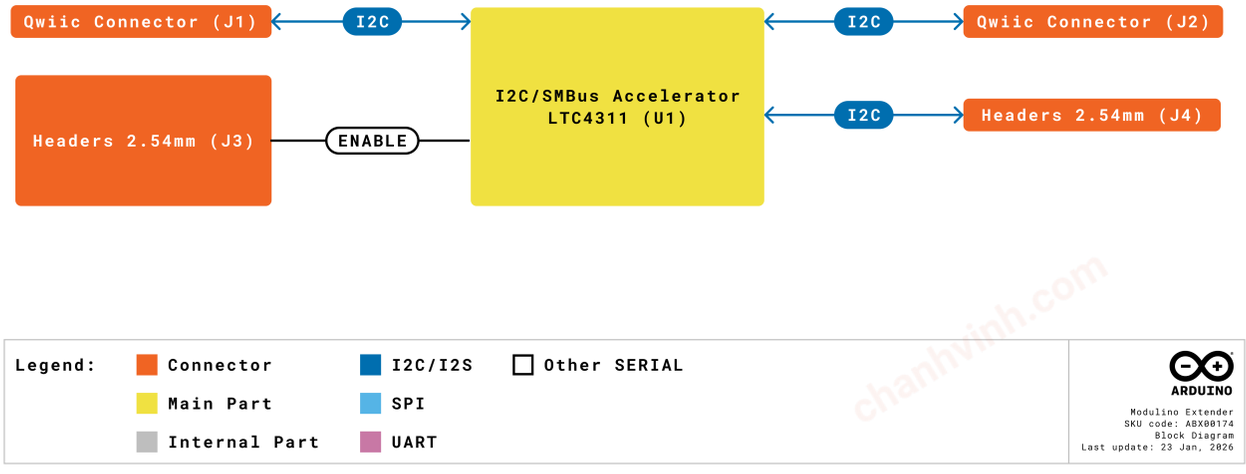


Modulino Extender Power Tree

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6 Block Diagram

This module features an LTC4311 I2C accelerator that sits transparently between I2C devices. It detects bus transitions and provides boosted current to speed up rising edges, improving signal integrity for long cables and high-capacitance loads.



Modulino Extender block diagram

7 Functional Overview

The Modulino Extender solves a common problem in I2C systems: signal degradation over long cables or with many connected devices. Standard I2C pull-up resistors provide constant current, resulting in slow rise times when bus capacitance is high. The LTC4311 monitors the I2C bus and injects additional pull-up current only during positive transitions (low-to-high), significantly increasing the slew rate and maintaining square waveforms. This acceleration is transparent to the I2C protocol and requires no configuration. The device automatically handles both standard-mode (100 kHz) and fast-mode (400 kHz) I2C communication. Testing has confirmed reliable operation with cables up to 30 m in length.

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7.1 Technical Specifications (Module-Specific)

Specification	Details
I2C Accelerator	LTC4311ISC6#TRMPBF
Supply Voltage	Min: 1.6 V, Max: 5.5 V
Supply Current	~200 µA typical
I2C Speed	Up to 400 kHz (Fast-mode)
Bus Capacitance	Supports loads beyond standard 400 pF limit
Operation Mode	Transparent (no addressing required)
Communication	I2C pass-through
Enable Pin	Optional control for power-down mode

7.2 Pinout

Qwiic Connectors (2×, 1×4 each)

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

The Extender sits between two Qwiic connectors, transparently accelerating signals passing through.

Optional 1×4 Headers (2×, not mounted, holes provided)

Header 1 (Input Side)

Pin	Function
GND	Ground
3V3	3.3 V Power
SCL	I2C Clock
SDA	I2C Data
ENABLE	Enable control

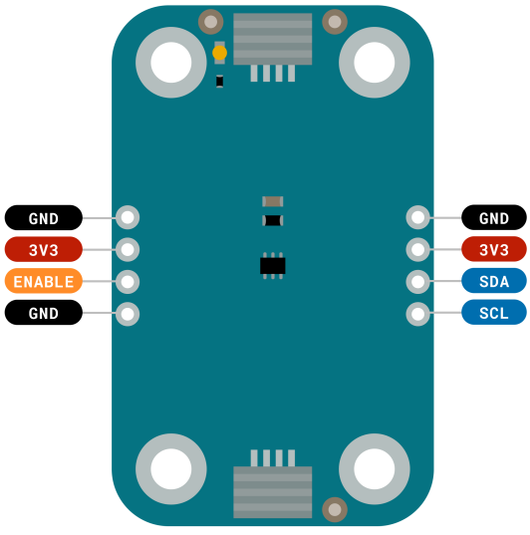
Header 2 (Output Side)

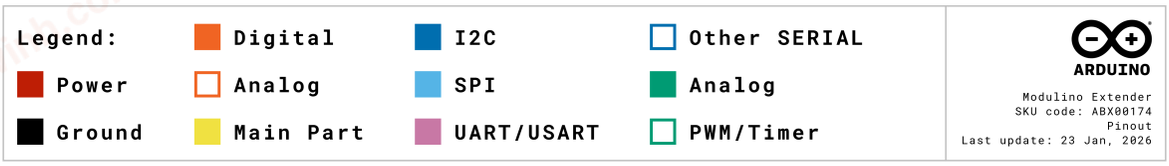
Pin	Function
GND	Ground
3V3	3.3 V Power
SCL	I2C Clock
SDA	I2C Data
ENABLE	Enable control

Note:

- Pull-up resistor pads (unpopulated) are available if additional pull-ups are needed.
- ENABLE pin can be used to disable the accelerator for low-power applications (active high).

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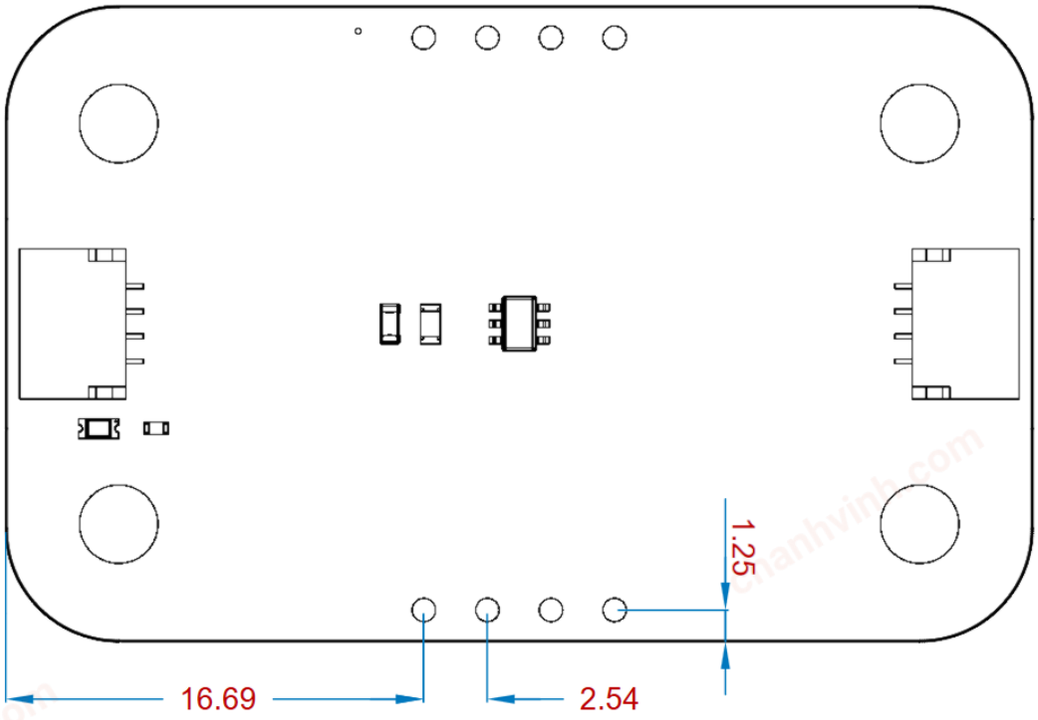
Pinout Overview

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7.3 Power Specifications

- **Nominal operating voltage:** 3.3 V via Qwiic
- **LTC4311 voltage range:** 1.6 V–5.5 V

7.4 Mechanical Information



Modulino Extender 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

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7.5 I2C Address Reference

The Modulino Extender has no I2C address. It operates transparently on the bus, accelerating signals without appearing as a device.

Board Silk Name	Component	Modulino I2C Address (HEX)	Notes
MODULINO EXTENDER	LTC4311	N/A (transparent)	No addressing required, pass-through operation

8 Device Operation

The Extender requires no configuration or addressing. Simply insert it into your I2C chain between the controller and remote devices. The LTC4311 automatically detects bus activity and provides accelerated pull-up during positive transitions. For best results, place the Extender close to the controller (beginning of the cable run) or in the middle of long cable segments.

8.1 Performance Characteristics

Testing has demonstrated:

- Standard Qwiic cables: Improved waveform squareness, faster rise times
- 30 m cables: Maintains reliable communication
- Compatible with all Modulino modules and standard I2C devices

Company Information

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

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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
23/03/2026	1	First release
20/10/2026	2	Added note for Intended Use