IS4310-485M2

RS485 Modbus RTU Slave Module with RJ45

Presentation

The IS4310-485M2 is a ready-to-operate module integrating the Modbus RTU Slave chip IS4310 with an RS485 Transceiver. This solution reduces to the minimum expression the design effort of integrating a Modbus RTU Slave with RS485 electrical interface.

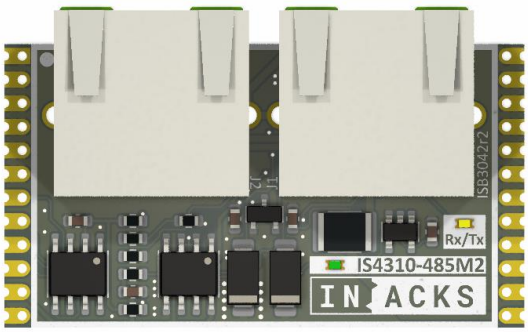
The module is daisy-chained: it integrates two RJ45 connectors with the standard Modbus pinout. Also, it has the power pin routed. With this feature you can design a self-powered Modbus Slave.

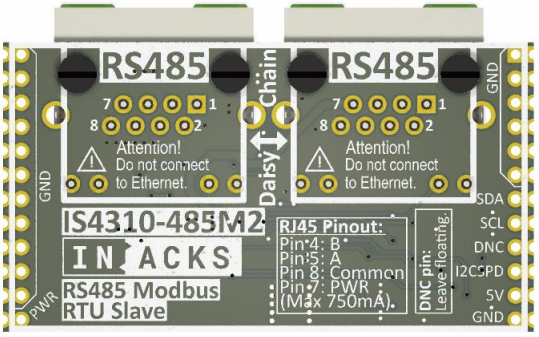
The module can be directly soldered to your PCB with its castellated holes, or you can solder a pin header and use it as a module.

Module Characteristics

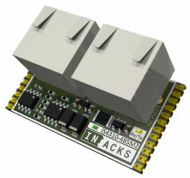
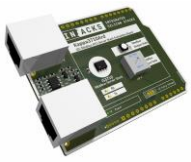
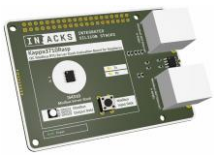
Electrical Characteristics	
Module Voltage	5V
I2C Compatible Voltage Levels	3.3V, 5V

Modbus Characteristics	
Supported Function Codes:	3 (0x03) - Read Holding Registers 6 (0x06) - Write Single Register 16 (0x10) - Write Multiple Registers
Holding Registers:	500
Operating Mode:	RTU
Electrical Interface:	RS485

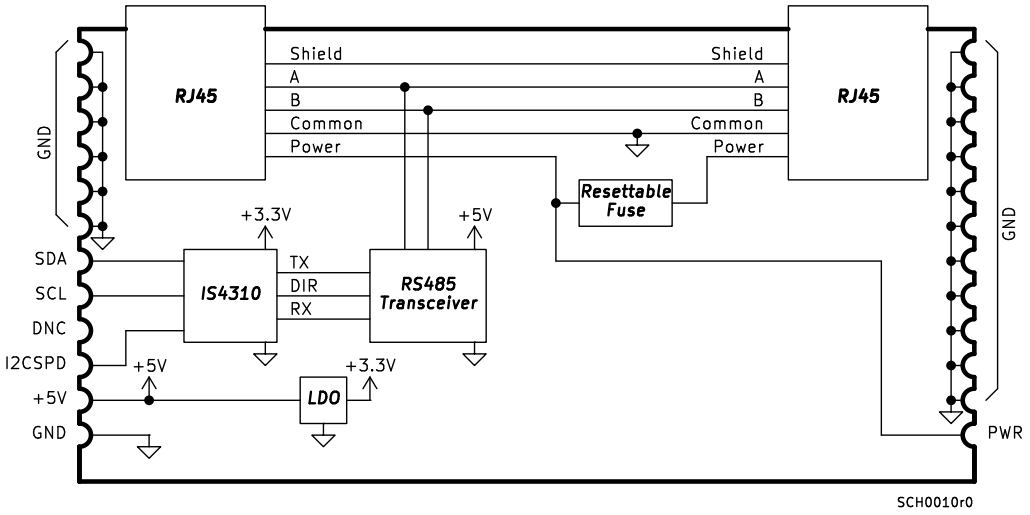




Product Selection Guide

	Part Number		Form Factor	Physical Layer	Stack	Description
Only Stack	IS4310-S8		SO8N	UART 3.3V	Modbus RTU Server	Modbus RTU Slave Stack Chip.
Stack with Physical Layer	IS4310-485M2		Castellated Holes Module	RS485	Modbus RTU Server	IS4310 with RS485 Transceiver. Industrial communications.
	IS4310-ISO485M6		Castellated Holes Module	Isolated RS485	Modbus RTU Server	IS4310 with Isolated RS485 Transceiver. The isolation offers more robust communications and longer RS485 bus distances.
	IS4310-422M3		Castellated Holes Module	RS422	Modbus RTU Server	IS4310 with RS422 Transceiver.
	IS4310-232M4		Castellated Holes Module	RS232	Modbus RTU Server	IS4310 with RS232 Transceiver.
Evaluation Boards	Kappa4310Ard		Arduino Compatible	RS485	Modbus RTU Server	IS4310 Evaluation Board with RS485 Transceiver. Compatible with Arduino.
	Kappa4310Rasp		Raspberry Pi Compatible	RS485	Modbus RTU Server	IS4310 Evaluation Board with RS485 Transceiver. Compatible with Raspberry Pi.

1. Description



The IS4310-485M2 is a compact (44 × 24 mm) module with castellated holes, designed for PCB mounting to function as an RS485 Modbus RTU Slave. It features two key components: the Modbus Slave Stack (IS4310) and an RS485 transceiver.

The module features two RJ45 daisy-chain connectors and supports optional Bus Power daisy-chaining. This Bus Power is routed to the PWR pad, and it enables a design to be self-powered—provided that appropriate voltage regulation is implemented between the PWR pad and the +5V pad.

When using a powered bus, the maximum allowable daisy-chained current is 750mA. A resettable fuse protects the module from excessive currents. Additionally, when using a Powered Modbus Serial Line, ensure the maximum cable current rating is not exceeded.

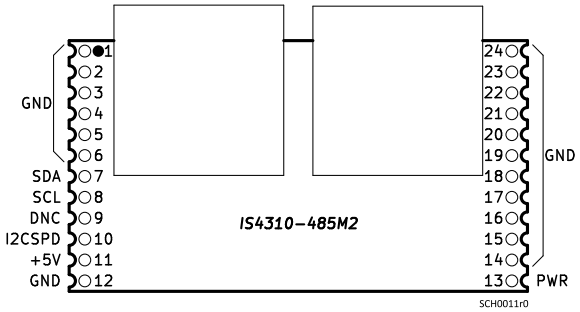
The return path for the PWR pad is through the GND pads, which are connected to the Common signal of the Serial Line.

The Shield pin is daisy-chained and not connected to any pad. All cable shields should be connected to Common and Protective Ground at a single point for the entire bus, ideally at the master device. Ensure that you use shielded cables and connectors to maintain proper electrical continuity across all cable shields on the bus.

The module operates at a fixed voltage of 5V. The I2C pads (SDA and SCL) are open-drain and compatible with both 3.3V and 5V. The DNC pad must be left unconnected. The I2CSPD pin is used for I2C speed selection. The module includes multiple GND pads, and proper soldering of all pads is essential for mechanical stability and durability when attaching the module to the main PCB.

The module also features a green LED to indicate power status and a yellow LED to signal data transmission or reception. Each RJ45 connector includes the same two LEDs with identical functionality.

1.1. Module Pinout



Pad	Name	Type	Description
7	SDA	Open Drain 3.3V (5V Tolerant)	SDA pin of the IS4310: Open drain, it requires pull-up.
8	SCL	Open Drain 3.3V (5V Tolerant)	SCL pin of the IS4310: Open drain, it requires pull-up.
9	DNC	Do Not Connect	This pad must be left floating.
10	I2CSPD	Analog Input 0 to 3.3V	I2CSPD pin of the IS4310: I2C-Serial Interface Speed Selection. • For 100kHz pull to GND. • For 400kHz make a voltage divider of VDD/2 (1.65V). • For 1MHz pull to 3.3V. Attention: Voltage in this pin above 4V will damage the IS4310.
11	+5V	Module Power (Power In)	Power supply for the module.
13	PWR	Bus Power (Power Out)	Some RS485 buses may carry power to supply the slaves on it. The power can range from 5V to 24V. The maximum allowed daisy chained current is 750mA.
1 to 6, 12, and 14 to 24	GND	Ground	Ground reference pad. GND pads are connected to the “Common” of the RS485 bus. GND pads are not connected to the shield of the connector and cable of the RS485 bus. GND pads are the return of the optional Power on the bus (PWR Pad).

SCL and SDA Pads

I2C-Compatible Bus Interface Pads.

Both pads are open-drain and must be pulled up to 3.3V or 5V. The pull-up resistor value should be chosen based on the bus speed and capacitance. Typical values are 4.7kΩ for Standard Mode (100kbps) and 2.2kΩ for Fast Mode (400kbps) at both 3.3V and 5V.

+5V Pad

Module Power Supply Pad.

This pad is the power input for the entire module. The module includes an LDO to regulate the voltage down to 3.3V for the IS4310 power supply.

5V must be supplied to this pad. Bypass capacitors are included on the module, no need to place them outside of the module.

PWR Pad

Bus Power Supply Pad.

The Modbus Serial Line Bus can optionally carry power to its connected devices. When using RJ45 connectors, the Bus Power Supply is on pin 2. The bus voltage can range from 5V to 24V.

This module daisy-chains the Bus Power Supply from one RJ45 connector and routes it to this pad.

This PWR Pad allows your design to be self-powered from the bus, eliminating the need for an external power supply. If designing a self-powered Slave, please note that not all Modbus Serial Line Buses carry power, and proper voltage regulation must be implemented on the PWR Pad.

The maximum daisy-chained current is 750mA. The module includes a resettable fuse to limit the current.

GND Pads

Module Ground.

The GND pads the 0V of the module.

These pads are also connected to the Common signal of the RS485 bus and therefore serve as the return path for the PWR Pad.

The common signal of the RS485 bus must be connected to protective ground, preferably at a single point. The recommended location is at the master device.

GND pads are not connected to the shield of the RS485 cables and connectors, as all shields should be connected to protective ground at a single point for the entire bus, ideally at the master device.

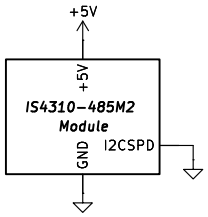
The module has multiple GND pads, all of which must be soldered to ensure proper mechanical attachment of the module to the main PCB. This is especially important when the RJ45 connectors are plugged in, as a significant amount of force is applied to the module. Failing to solder all pads or poor soldering can cause the module to detach from the main PCB.

I2CSPD Pad

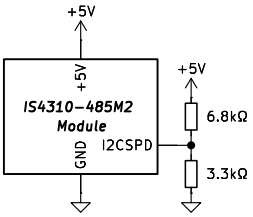
I2C-Serial Interface Speed Selection Pad.

This pad is directly connected to the pin I2CSPD of the IS4310. It configures the IS4310 internal I2C-Serial Interface timings and filters to properly work with the selected bus speed.

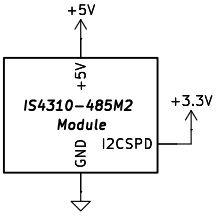
- For a **100kHz** setting, set the I2CSPD pad to GND.



- For a **400kHz** setting, set the I2CSPD to 1.65V using a voltage divider. This can be achieved using a 6.8kΩ and a 3.3kΩ resistors from the I2CSPD pad: one to 5V and the other to GND. Please note that applying a voltage higher than 3.3V to I2CSPD pad would permanently damage the IS4310 IC.



- For a **1000MHz** setting, set the I2CSPD pad to 3.3V. Please note that pulling I2CSPD to 5V would permanently damage the IS4310 IC.



Important Remark:
A mismatch between the configured I2C speed and the actual operating I2C speed (e.g., configuring the bus for 100kHz but operating at 1MHz) can lead to an inconsistent state where some I2C messages are processed while others are not.

Ensure a proper match between the actual operating speed and the configured speed at the I2CSPD pad: If your bus works at 100kHz, ensure the I2CSPD pad is tied to VSS. If it works at 400kHz ensure the pad is at 1.65V. If it works at 1000MHz, ensure the pad is at 3.3V.

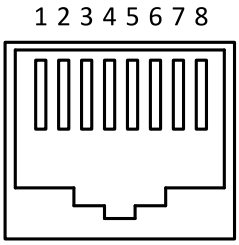
1.2. RJ45 Connectors

Typical Modbus Serial Line connectors include Screw Terminals, RJ45, and D-Sub 9-pin (commonly known as DB9), among others. The device-side connector must be female, while the cable-side connector must be male.

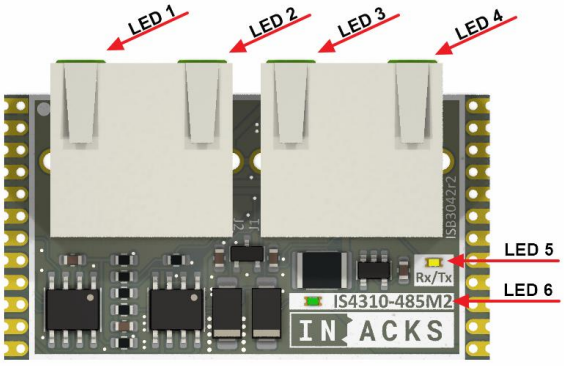
When selecting a RJ45 cable, ensure it has shield and make sure to connect the cable shield to the connector shield to ensure proper electrical continuity across all cable shields on the bus.

Do not connect the shield to the Common. All cable shields should be connected to Common and Protective Ground at a single point for the entire bus, ideally at the master device.

Optionally, power can be supplied to your system through the Modbus connector. In this case, a four-position connector would be used for A, B, Common, and Power. In that case, the Common serves as the reference for A and B signals as well as the return path for Power. The voltage should be within the 5V to 24V range.

RJ45 Connector for RS485 Modbus	
	1: NC
	2: NC
	3: NC
	4: B (D1)
	5: A (D0)
	6: NC
	7: Bus Power Supply (optional)
	8: Common
	Shield: Cable Shield
Attention! The RJ45 connector is intended for the Modbus RS485 bus and must not be connected to an Ethernet network. Connecting it to an Ethernet network may cause damage to Ethernet devices or this device.	

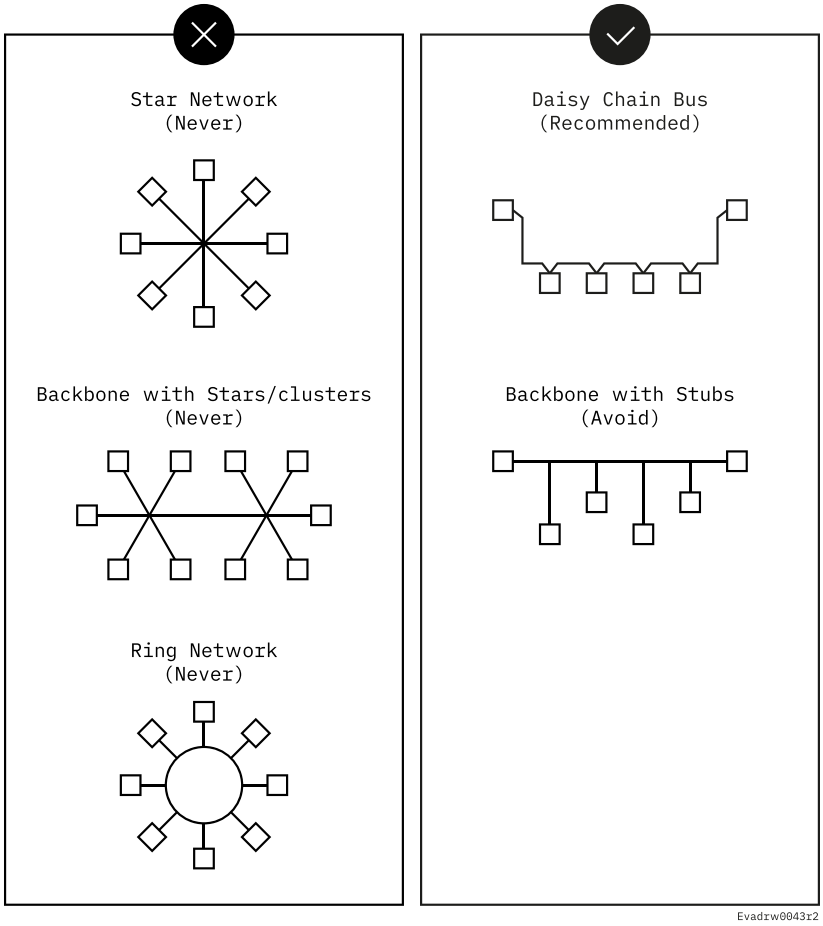
1.3. LEDs

LED Location	LED #	Description
	1, 3, 6	**Power Indicator** Green: Module On Off: Module Off
	2, 4, 5	**Data Indicator** Yellow Flashing: Transmitting or Receiving Data Off: No Data

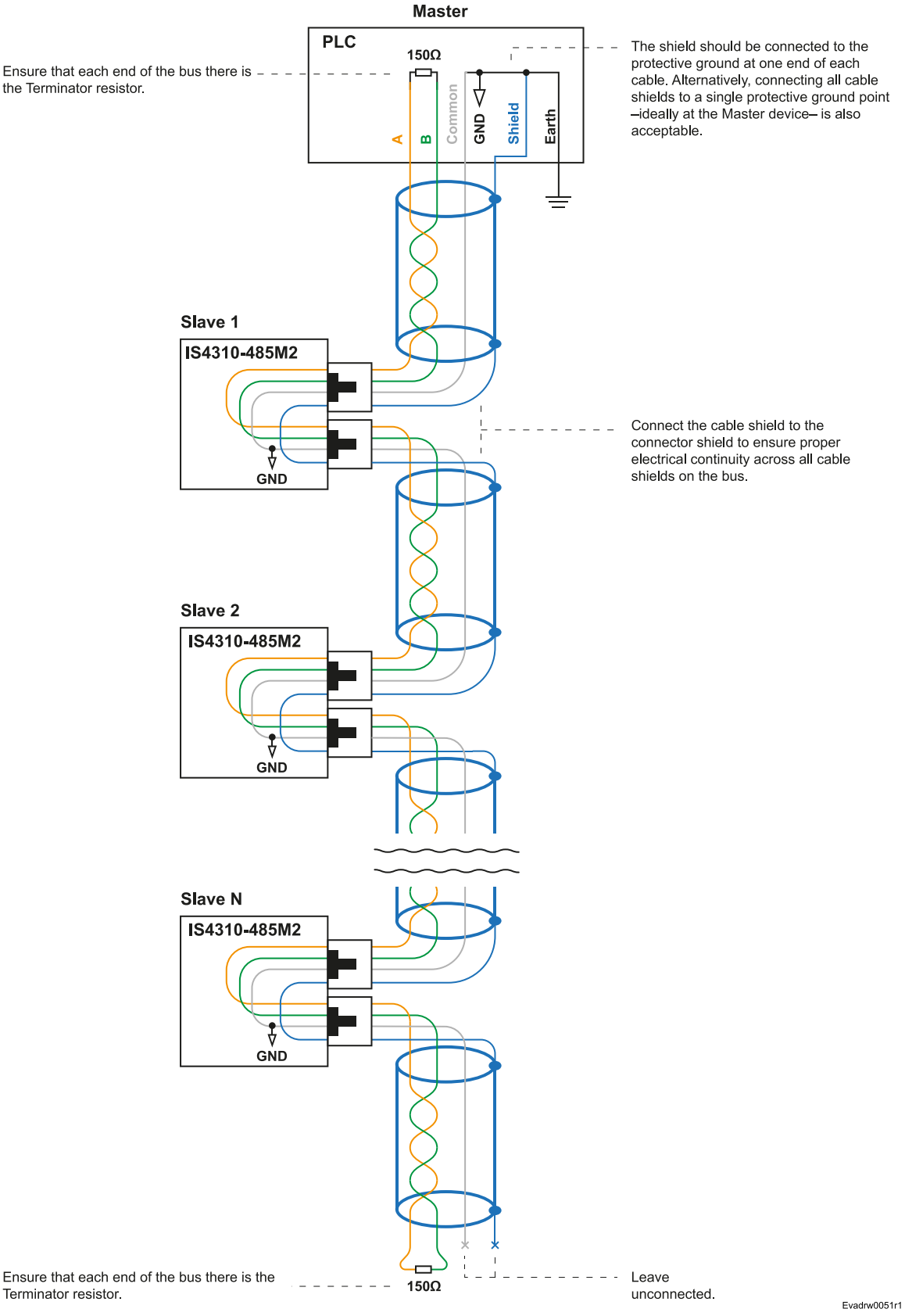
2. Bus Recommendations

2.1. Topology

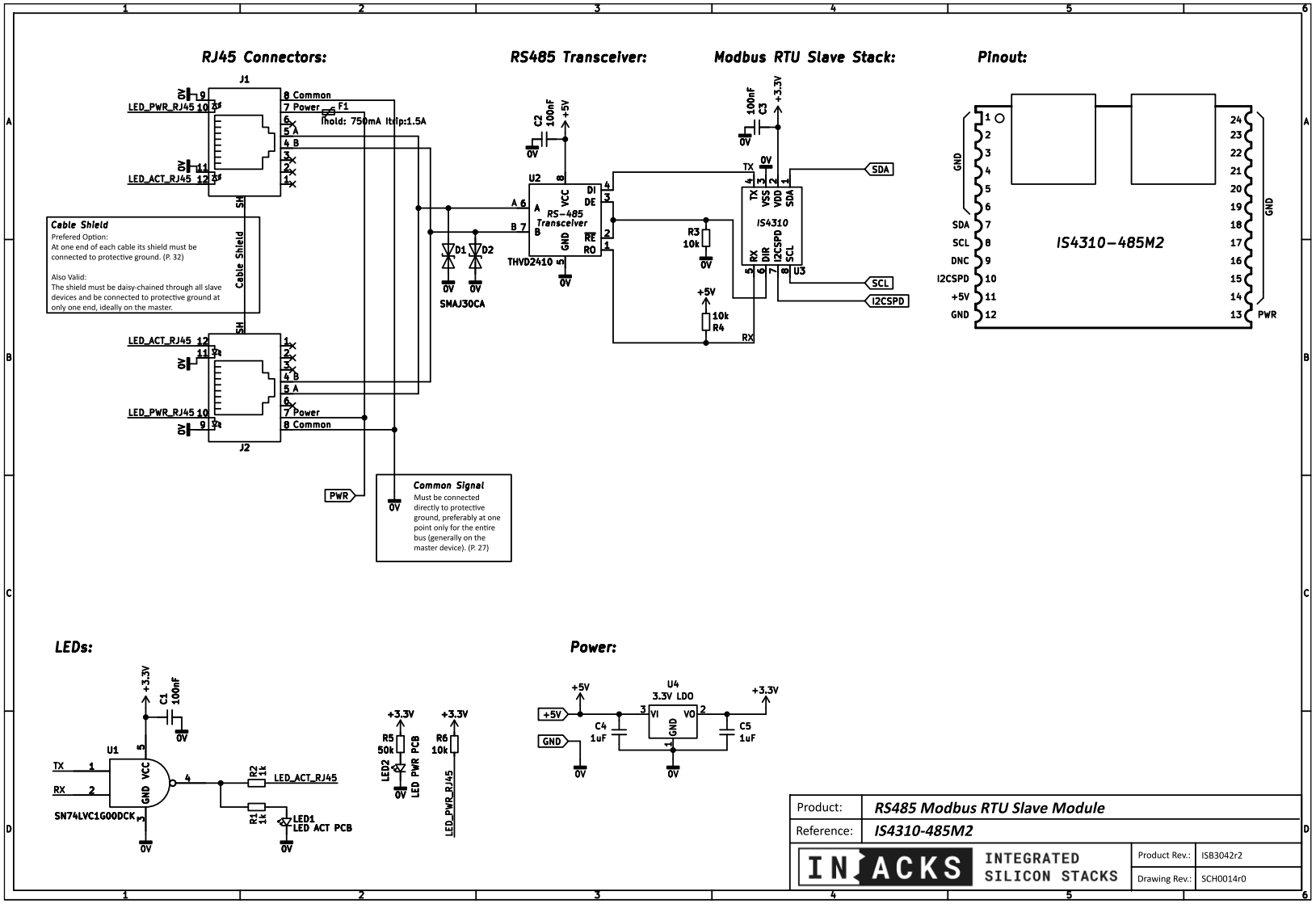
In an RS485 setup without a repeater, a single trunk cable runs through the system, with devices connected in a daisy-chain manner. Short cables derivations (stubs) are also allowed but not recommended. Keep the derivation distance as short as possible. Other topologies are not allowed.



2.2. Cable Wiring

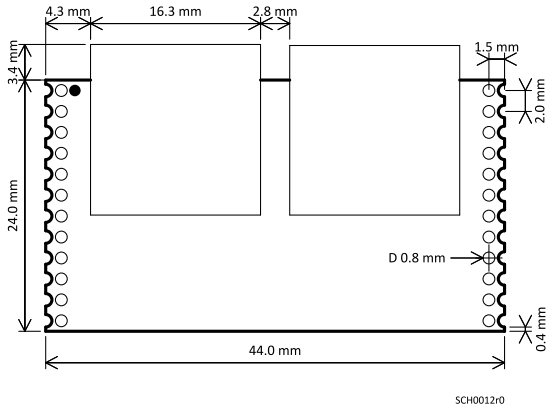


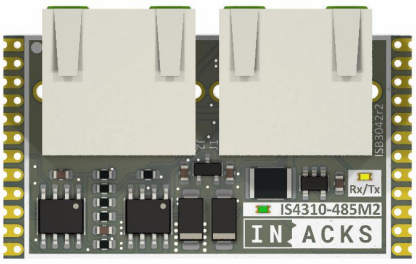
3. Schematic

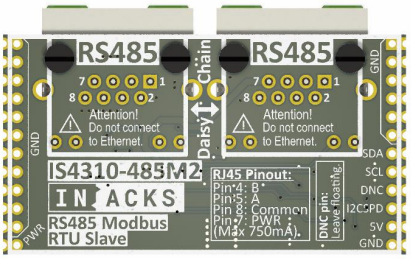

RJ45 Connectors:
RS485 Transceiver:
Modbus RTU Slave Stack:
Pinout:
J1
J2
8 Common
7 Power
F1
Ihold: 750mA Itrip:1.5A
LED_PWR_RJ45
LED_ACT_RJ45
Cable Shield
Prefered Option:
At one end of each cable its shield must be connected to protective ground. (P. 32)
Also Valid:
The shield must be daisy-chained through all slave devices and be connected to protective ground at only one end, ideally on the master.
SMAJ30CA
RS-485 Transceiver
THVD2410
IS4310
IS4310-485M2
SDA
SCL
I2CSPD
PWR
Common Signal
Must be connected directly to protective ground, preferably at one point only for the entire bus (generally on the master device). (P. 27)
LEDs:
Power:
SN74LVC1G00DCK
LED ACT PCB
LED PWR PCB
3.3V LDO
Product: RS485 Modbus RTU Slave Module
Reference: IS4310-485M2
INTEGRATED SILICON STACKS
Product Rev.: ISB3042r2
Drawing Rev.: SCH0014r0

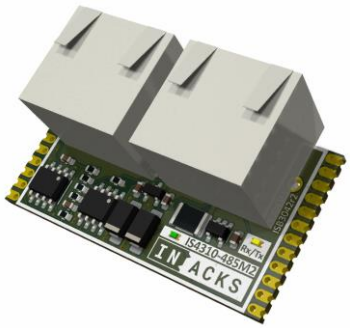
4. Mechanical Dimensions

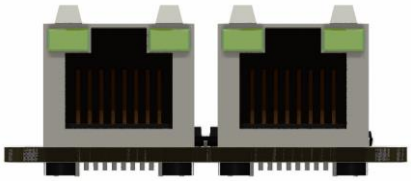
M2 Package











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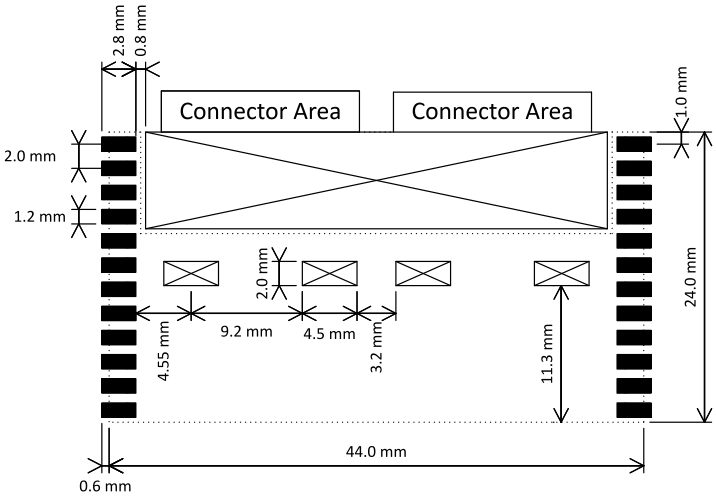
SILICON STACKS

Units
Millimeters

Notes
This drawing is for general information only.
Not to scale.

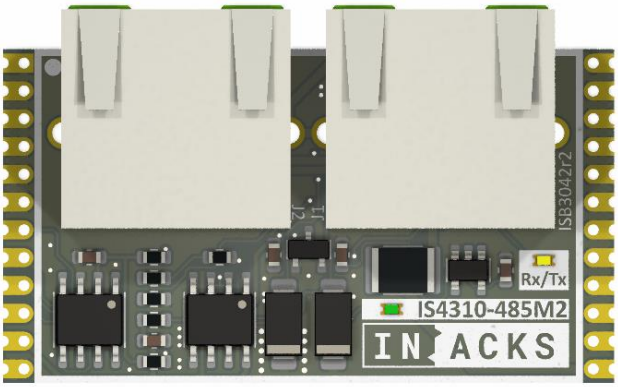
M2 Recommended Footprint



Legend:

Copper
No-PCB Area
Silkscreen

SCH0013r0



Units
Millimeters

Notes
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Content

Appendix

Revision History

Document Revision

Date	Revision Code	Description
February 2025	ISDOC126**A**	Initial Release
February 2025	ISDOC126**B**	Added “Cable Wiring” diagram.

Module Revision

Date	Revision Code	Description
February 2025	ISB3042**A**	Initial Release

Documentation Feedback

Feedback and error reporting on this document are very much appreciated.

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