Kappa4310Ard

IS4310 Arduino Shield

Presentation

The **Kappa4310Ard** is an evaluation board for the **IS4310** Modbus chip. It enables engineers to easily evaluate the IS4310 without the need for soldering or developing their own prototype—offering a ready-to-use solution. The board features an RGB LED and a potentiometer to simulate an actuator and a sensor.

Designed as a shield with the **Arduino form factor**, the Kappa4310Ard benefits from its widespread popularity, ensuring compatibility with various microcontroller boards, including **Arduino** and **STM32 Nucleo Boards**, among others.

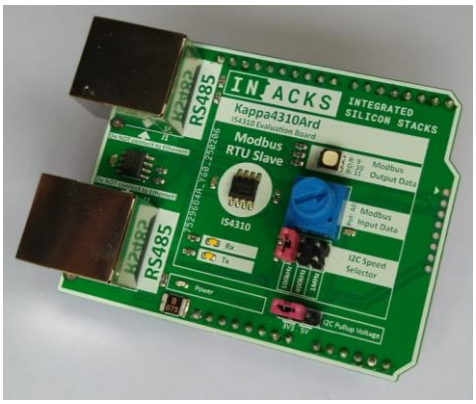
The board features an **RS485 electrical interface** and includes **two daisy-chained RJ45 connectors** for seamless integration.

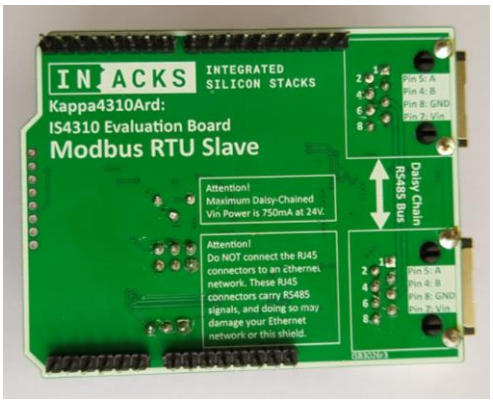
The IS4310 is an ideal solution for **ensuring Modbus protocol timing constraints**, reducing CPU load, and eliminating the need for dedicated pins. It includes **500 Holding Registers** for engineers to use and supports Function Codes 3 (0x03), 6 (0x06), and 16 (0x10).

Shield Characteristics

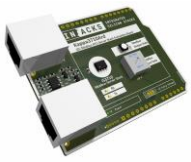
Modbus Characteristics	
Supported Function Codes:	3 (0x03) - Read Holding Registers 6 (0x06) - Write Single Register 16 (0x10) - Write Multiple Registers
Holding Registers:	500
Operating Mode:	RTU
Electrical Interface:	RS485
Default Modbus Configuration:	19200

Electrical Characteristics	
I2C Compatible Voltage Levels	3.3V and 5V



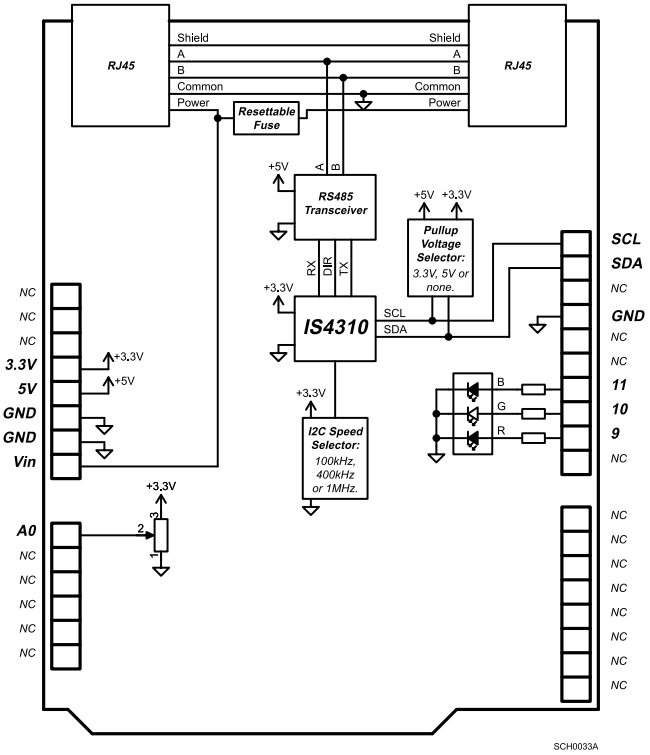


Product Selection Guide

	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

1.1. General Description



The core of the Kappa4310Ard Modbus Shield is the IS4310 I2C Modbus RTU Server chip, which is connected to an RS485 transceiver. This transceiver interfaces with the daisy-chained RJ45 connectors. Since the connectors are daisy-chained, they are functionally identical—connecting the Modbus master to either one makes no difference.

The IS4310 I2C-Serial Interface connects to the I2C pins of the shield. The shield includes a jumper that allows selection of the I2C pull-up voltage: 5V, 3.3V, or Floating. The Floating option is useful when the pull-up resistors are located outside the Kappa4310Ard.

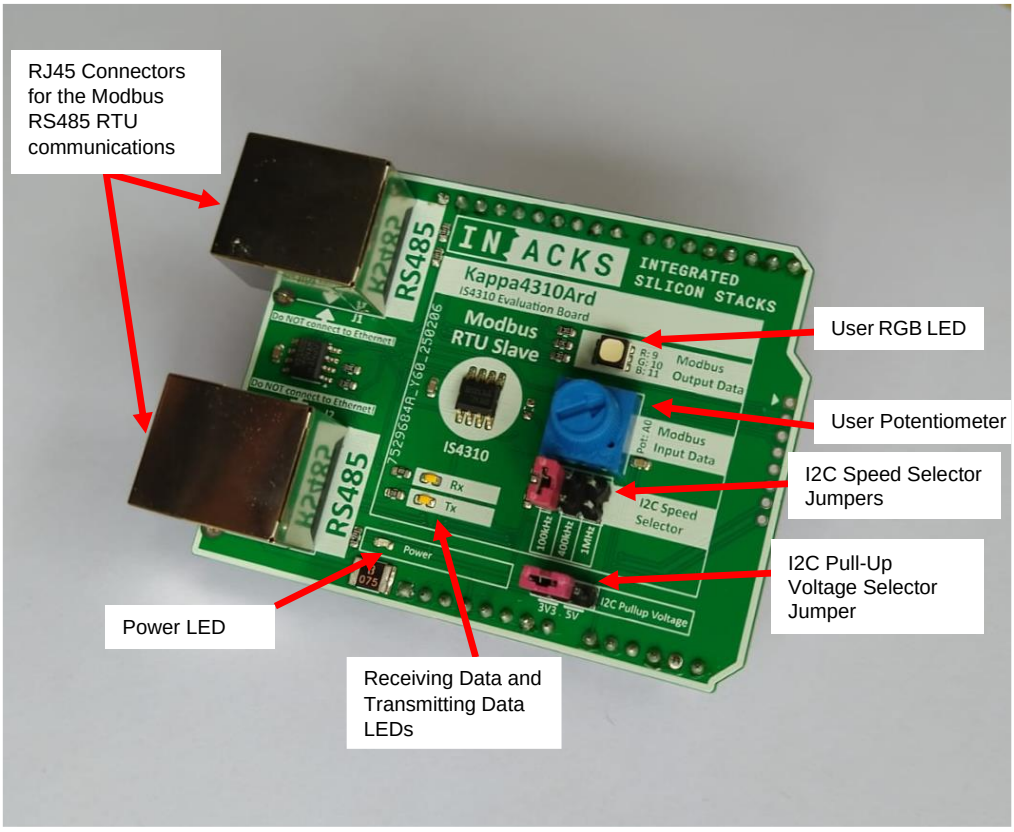
It is crucial to ensure that pull-up resistors are present either on the shield or elsewhere in the circuit. Without pull-up resistors, the I2C-Serial Interface will not function.

Since the IS4310 is 5V tolerant, it can operate with I2C pull-up voltages of 5V and with transceivers powered at 5V. Using 5V transceivers provides better noise immunity and allows for longer bus distances.

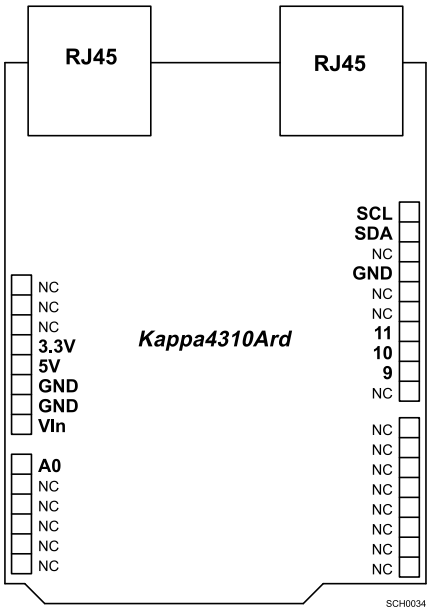
The Shield has 3 LEDs. The Rx yellow LED will blink on received data, and Tx yellow LED will blink on the IS4310 answer. The Power green LED will indicate that the board has detected power. Please note that the board requires both 3.3V and 5V to operate.

A potentiometer is placed on the board to provide a software variable that can be easily adjusted. By reading the analog value of the potentiometer and storing it in a Holding Register, you can continuously monitor the changes on the Modbus Master in real time as you adjust the potentiometer's position. This is a typical application for Modbus sensor development. The output voltage of the potentiometer ranges from 0V to 3.3V.

To develop an actuator, an RGB LED is placed on the board to display the state of Modbus Holding Registers. For example, you can create a traffic light simulation: write a program that reads values from three Holding Registers and adjusts the PWM of each LED accordingly. This is a typical application for Modbus actuator development.


RJ45 Connectors for the Modbus RS485 RTU communications
User RGB LED
User Potentiometer
I2C Speed Selector Jumpers
I2C Pull-Up Voltage Selector Jumper
Power LED
Receiving Data and Transmitting Data LEDs
Kappa4310Ard
IS4310 Evaluation Board
Modbus RTU Slave
IS4310
Modbus Output Data
Modbus Input Data
I2C Speed Selector
I2C Pullup Voltage
Power
Rx
Tx
RS485
Do NOT connect to Ethernet!

1.2. Module Pinout



Name	Type	Description
NC	Not Connected	These pins have no electrical connection. They can be used by other shields or by your own proposal.
3.3V	3.3V Power In	The shield needs 3.3V and 5V to operate.
5V	5V Power In	
GND	Ground	Ground reference. GND is connected to the “Common” of the RS485 bus. GND is NOT connected to the shield of the RJ45 connector. Refer to section “Bus Topology” for more details.
Vin	Optional (Power In)	This power method is optional and is only for advanced users. Vin pin connects to the pin 7 (“Bus Power Supply”) of the RJ45. This allows the Arduino and the Kappa4310Ard to be self-powered from the bus power.
A0	Analog	User potentiometer for prototyping proposals. The output voltage ranges from 0V to 3.3V.
SCL and SDA	Open Drain 5V Tolerant	SCL and SDA pin of the IS4310 I2C-Serial Interface pins. Ensure the proper jumper pull-up configuration on the shield:  • Placing the jumper on 3V3 sets the SCL and SDA pull-up voltage to 3.3V. • Placing the jumper on 5V sets the SCL and SDA pull-up voltage to 5V. • Leaving the jumper off leaves SCL and SDA floating. This option is useful when pull-up resistors are located elsewhere in the circuit.
9	Red LED	User RGB LED for prototyping proposals.
10	Green LED	
11	Blue LED	

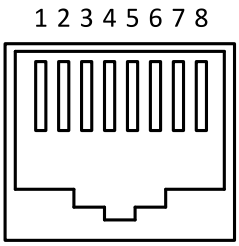
1.3. RJ45 Connectors

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.

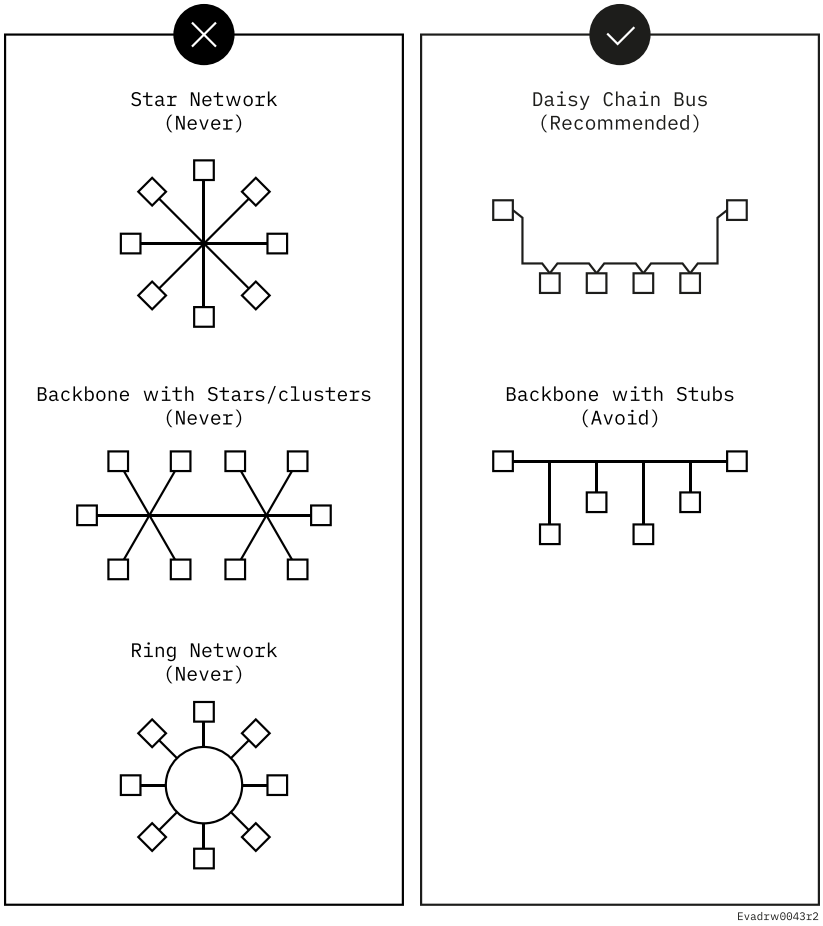
Optionally, power can be supplied to your system through the pin 7 of the RJ45 connector.

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.	

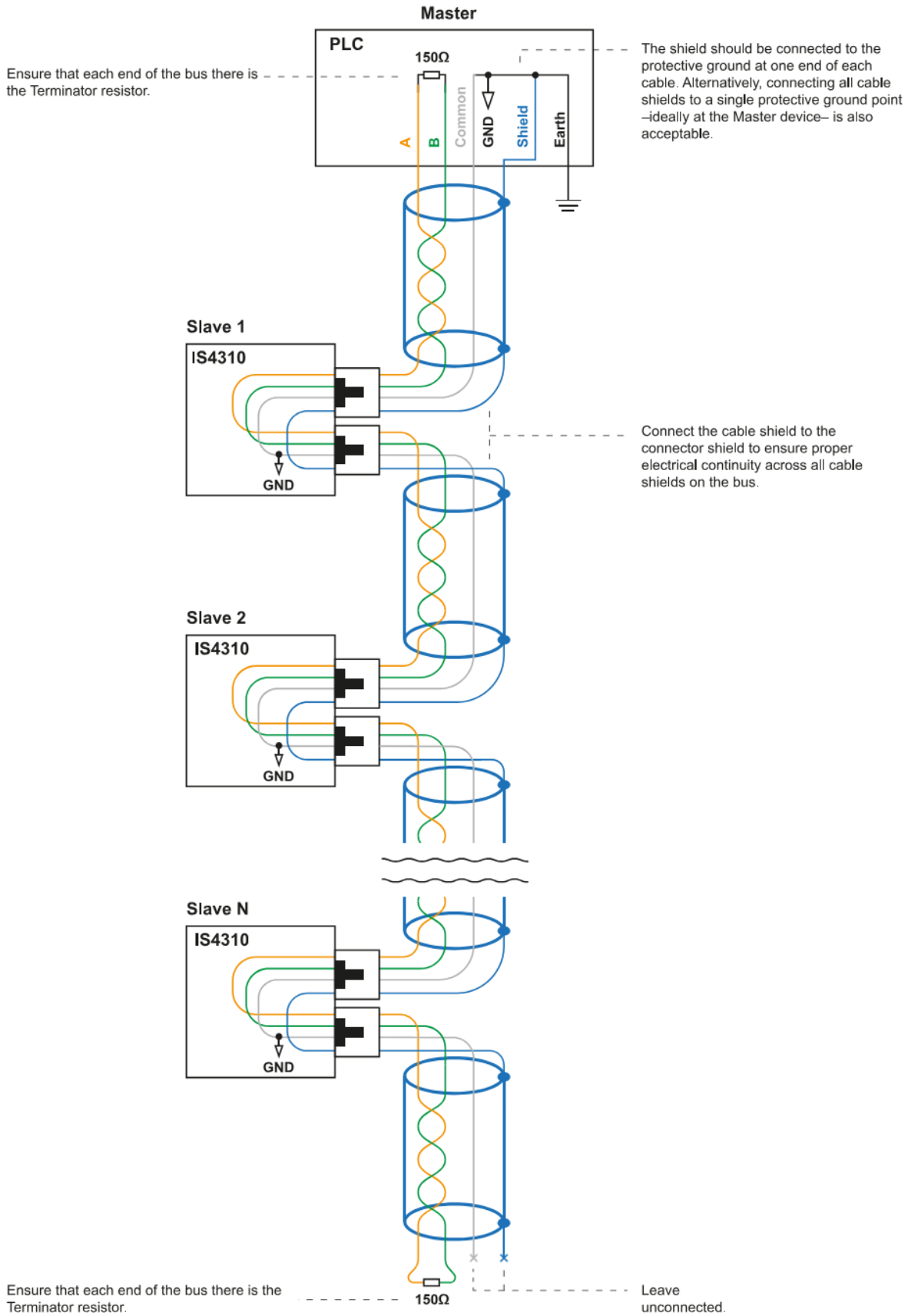
2. Bus Recommendations

2.1. Bus Topology

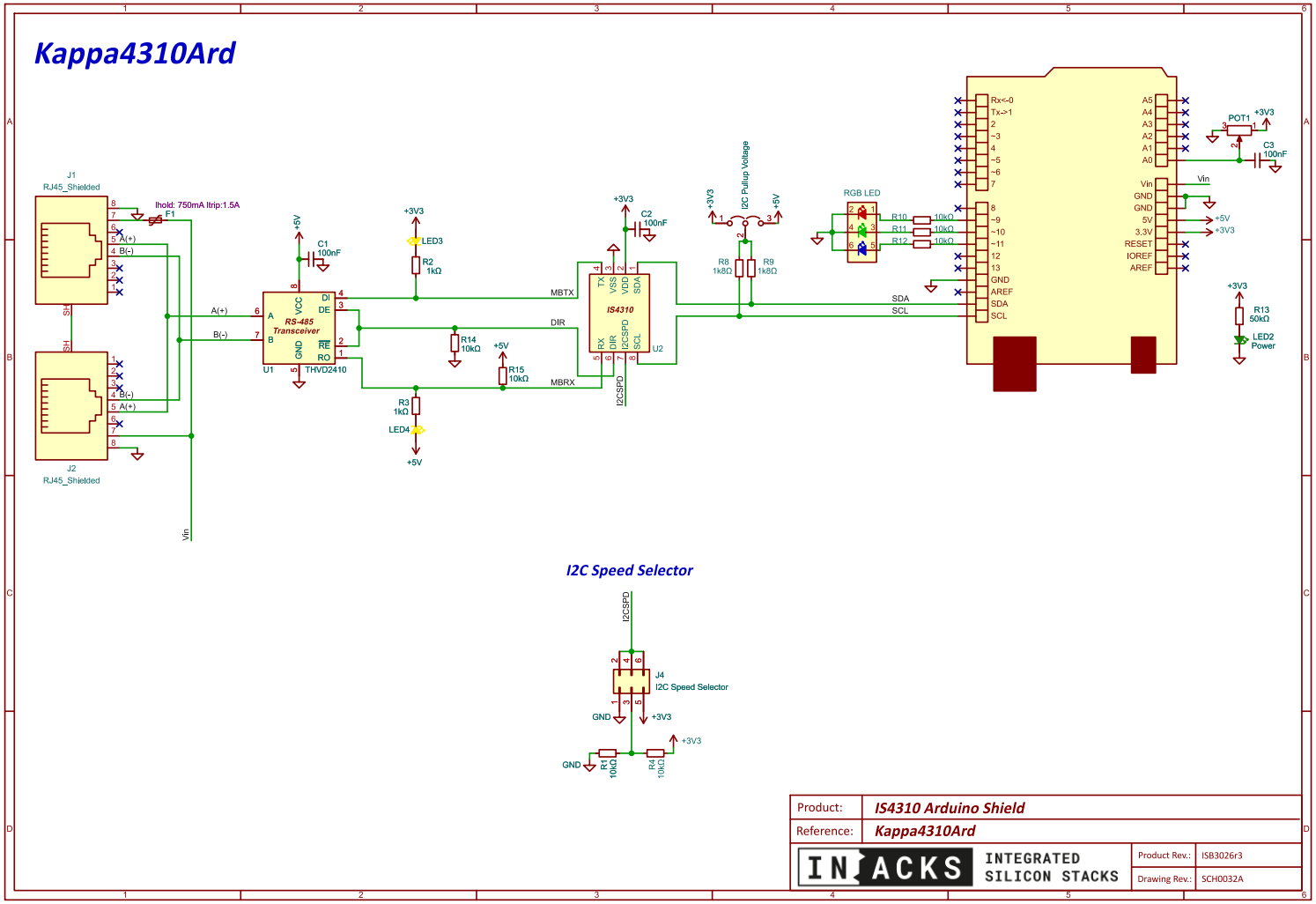
In an RS485 setup without a repeater, a single trunk cable runs through the system, with devices connected in a daisy-chain manner. Short cables derivations (stubs) are also allowed but not recommended. Keep the derivation distance as short as possible. Other topologies are not allowed.



2.2. Cable Wiring



3. Schematic


Kappa4310Ard
J1
RJ45_Shielded
Ihold: 750mA Itrip:1.5A
F1
J2
RJ45_Shielded
A(+)
B(-)
Vin
C1
100nF
U1
RS-485
Transceiver
THVD2410
LED3
R2
1kΩ
R3
1kΩ
LED4
R14
10kΩ
R15
10kΩ
MBTX
MBRX
DIR
C2
100nF
U2
IS4310
I2CSPD
I2C Pullup Voltage
R8
1k8Ω
R9
1k8Ω
RGB LED
R10
10kΩ
R11
10kΩ
R12
10kΩ
SDA
SCL
POT1
C3
100nF
R13
50kΩ
LED2
Power
I2C Speed Selector
J4
I2C Speed Selector
R1
10kΩ
R4
10kΩ
Product: IS4310 Arduino Shield
Reference: Kappa4310Ard
INTEGRATED SILICON STACKS
Product Rev.: ISB3026r3
Drawing Rev.: SCH0032A

Content

Appendix

Revision History

Document Revision

Date	Revision Code	Description
March 2025	ISDOC130**A**	Initial Release

Shield Revision

Date	Revision Code	Description
February 2025	ISB3026r3	Initial Release

Documentation Feedback

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

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