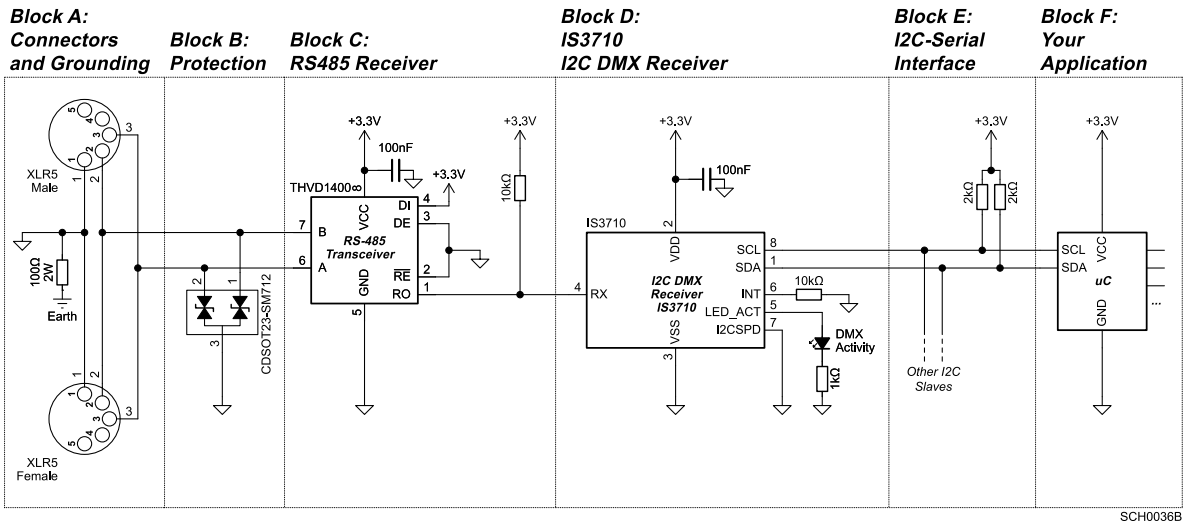
6. Hardware Examples

The following chapter represents an application design example for explanation proposals and is not part of the product standard. The customer must design his own solution, choose its most appropriate components and validate the final product according to the legislation and the Modbus specifications.

6.1. Non-Isolated Receiver

This example shows the design of a DMX Receiver using a non-isolated receiver.

The standard requires the manufacturers to label this type of receiver as **NON-ISO**.



Block A: Connector and Grounding

Connector

The official DMX connector is the XLR-5. Exceptions include RJ45, miniature connectors, and screw terminal connectors. However, despite its popularity and widespread use, XLR-3 is not part of the DMX standard and should not be used.

XLR-5 connectors are typically used in professional equipment, while XLR-3 connectors are more common in cost-sensitive devices. XLR-3 is generally cheaper than XLR-5.

Using an XLR-3 connector has the drawback of making your product compatible with standard microphone cables, which are specifically designed for low-frequency analog audio—not digital signals. As a result, microphone cables are not suitable for DMX.

DMX products use two connectors in daisy-chain configuration.

- Pin 1: Singal-Common
- Pin 2: Pair A Data -
- Pin 3: Pair A Data +
- Pin 4: Pair B not used
- Pin 5: Pair B not used

Cable

The DMX cable screen must be connected to XLR-5 pin 1 and not to its shell.

Use only twister pair cable to carry the DMX signal.

Grounding-Earthing

Do not connect the pin 1 (Singal-Common) of the XLR-5 connector directly to the earth (the mains earth), as this can create dangerous current loops. Signal-Common should be connected to earth through a 100Ω resistor to limit potential current flow through the DMX cable. This is especially important in large installations.

Block B: Protection

The protection stage is influenced by several factors, including the intrinsic robustness and protection features of the transceiver or receiver chip, the product's budget, and its required reliability, among other considerations. Refer to your transceiver's documentation to determine the appropriate protection requirements.

In the schematic, a bidirectional 400-W transient suppressor diodes (CDSOT23-SM712) are used to protect against surge transients.

Block C: Receiver

DMX operates over the RS485 electrical standard. Therefore, an RS485 transceiver or receiver is required to convert the differential RS485 signals to TTL-compatible voltage levels before entering the IS3710.

5 V transceivers or receivers can be used with the IS3710, as its RX pin is 5 V tolerant.

Since a DMX receiver never transmits data, the DE and RE pins of the transceiver can be tied to GND to keep it permanently in receiver mode.

Block D: IS3710

The IS3710 is very simple to integrate into your design.

A decoupling capacitor should be placed on the power pins (VDD and VSS). It is recommended to use a 100 nF, 10-25 V low-ESR ceramic capacitor.

The I2CSPD pin defines the I2C speed. Connect this pin to GND for a speed of 100 kHz. For 400 kHz, it should be pulled to 1.65 V, which is half of 3.3 V. This can be achieved with a simple resistor voltage divider using 3.3 V and GND. For 1 MHz, the pin must be connected to 3.3 V. This pin is not 5 V tolerant.

Block E: I2C-Serial Interface

For proper operation of the I2C Serial Interface, pull-up resistors to 3.3 V or 5 V are necessary. Typical resistor values are 4.7 kΩ for Standard Mode (100 kHz) and 2 kΩ for both Fast Mode (400 kHz) and Fast Mode Plus (1 MHz).

Block F: Your Application

Here is the rest of your product design. Typically, a microcontroller interfaces with the IS3710, but a microprocessor or a single-board computer, such as a Raspberry Pi, can also be used as long as they are equipped with an I2C Serial Interface.