Understanding I2C Bus Isolation

Pull-ups, bus topology, and crossing an isolation barrier — generic background, no product ordering codes.

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1. I2C pull-ups — one set on the bus

SDA and SCL are open-drain: both lines need pull-up resistors to the I/O supply. In typical MCU + codec setups the pull-ups sit on the **master** side (I2C controller side) — not because the standard forbids them elsewhere, but because that is where boards usually provide them.

Do not enable a second set on the slave: parallel pull-ups change rise times and can violate timing limits.

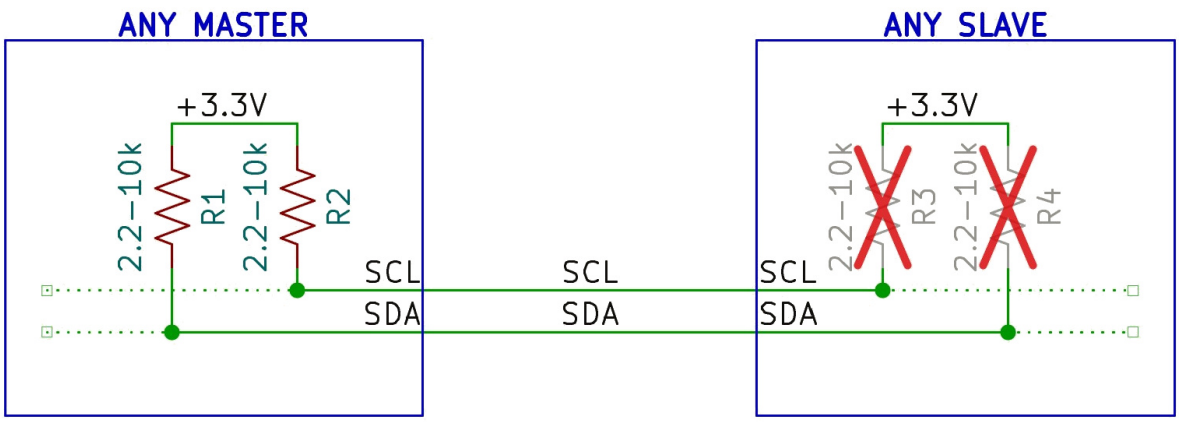

Figure 10. I²C SDA/SCL — pull-ups on the master side; typical 2.2–10 kΩ.

2. I2C through galvanic isolation

When the MCU and codec sit on opposite sides of an isolation barrier, SDA and SCL can cross through a dedicated I2C isolator IC. The same pull-up rule applies: provide pull-ups on *one* domain — usually the master / controller side — not duplicated on both.

Isolated I2C transceivers support common speeds up to **Fast Mode Plus (1 Mbit/s)** on many parts. **Clock stretching** behavior depends on the exact isolator — some parts pass stretch and others do not. On I2S-001 (**D = 1**), the fitted isolator **supports clock stretching**; the **isolated** side is the weaker bus side and the **noisy** side is the stronger side where the master and pull-ups typically live. See the User's Guide for jumpers and wiring.

3. I2C alongside I2S

Codec control over I2C is separate from I2S audio clocks and data. Count I2C as **two additional wires** (SDA + SCL) when planning how many signals must cross isolation — independent of how many I2S lines you need.

For Turul I2S-001 pin numbers, jumpers, and factory options, use the I2S-001 User's Guide.