

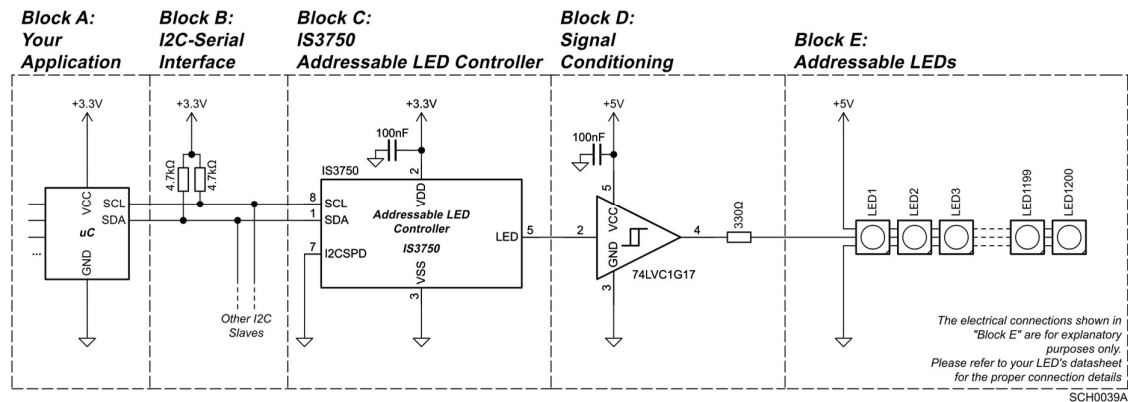
## 6. Implementation Guide

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. Hardware Example

This example shows how to use a microcontroller with the IS3750 to drive up to 1200 LEDs.

More examples can be found on the website.



#### Block A: Your Application

This is the core of your project. Typically, it will be a microcontroller, FPGA, or an embedded computer like a Raspberry Pi, among others.

It's the part of the system where you want to offload CPU load, reduce RAM and Flash usage, and eliminate the need for timers — along with the stress of continuously handling timer interrupts. In short, it's the part you want to keep as clean and simplified as possible.

#### Block B: I2C-Serial Interface

This is the bus where you connect all your I2C slave devices. It can operate at either 3.3V or 5V, as the IS3750 is 5V tolerant.

The I2C-Serial Interface requires pull-up resistors on the SCL and SDA lines. Typical values are 4.7kΩ for Standard Mode (100kHz), and 2kΩ for Fast Mode (400kHz) and Fast Mode Plus (1MHz).

The IS3750 uses the I2C device address 18 by default. If you require a different address, please contact our customization department. Refer to section Appendix/Customization for more details.

#### Block C: IS3750 IC

The IS3750 IC operates at 3.3V. Its I2C-Serial Interface pins are 5V tolerant, allowing direct connection to a 5V microcontroller if needed.

The LED output pin operates at 3.3V. However, addressable LEDs typically require a 5V logic level, so a non-inverting buffer is needed to shift the signal from 3.3V to 5V. There are many suitable buffers available; in this example, the 74LVC1G17 is used.

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

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

#### Block D: Signal Conditioning

The buffer, as explained in the previous paragraph, shifts the 3.3V logic level to 5V for proper LED operation.

A series resistor—typically between 330Ω and 470Ω—is recommended between the buffer and the first addressable LED. This helps reduce signal ringing by adding impedance to better match the trace or wire, thereby damping reflections.

Note: this is **not** a pull-up or pull-down resistor; it's a series resistor placed directly between the buffer output and the LED's data input.

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## Block E: Addressable LEDs

The IS3750 can control any number of LEDs in series—from a single LED up to 1200.

When using more than a few LEDs, special attention must be given to the power supply design. Poor PCB layout or cabling in the power domain can lead to burnt traces or wires, voltage drops, and incorrect LED brightness or spurious flickering.

When powering LEDs from an external power supply, make sure the LEDs and the rest of the circuitry controlling the LEDs share the same voltage reference. The GND of the LEDs and the GND of your control circuit must be connected.