Kappa3750Rasp

IS3750 Raspberry Pi Shield

Presentation

The **Kappa3750Rasp** is an **evaluation board** for the **IS3750** Addressable LED controller chip. It enables engineers to easily evaluate the IS3750 without the need for soldering or developing their own prototype—offering a **ready-to-use solution**. The board features 28x WS2812BAddressable LEDs to test your code. The IS3750 is **LED-agnostic**, meaning it can control GRB, RGB, GRBW, or any other color combination.

The board also features two selection jumpers: one to set the **I2C speed** (100 kHz, 400 kHz, or 1 MHz), and another to select the **I2C pull-up voltage** (3.3 V or floating).

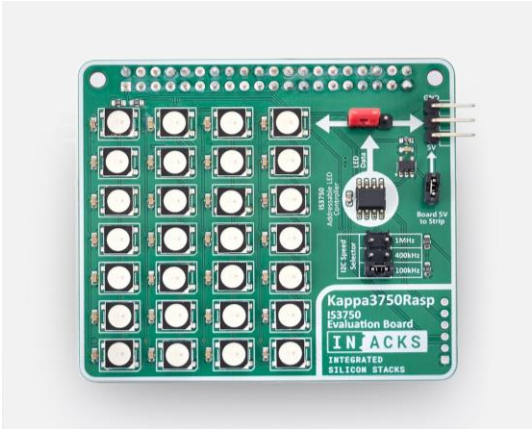
Designed as a shield with the **Raspberry Pi form factor**, the Kappa3750Rasp benefits from its widespread popularity, ensuring compatibility with various single board computers (SBC).

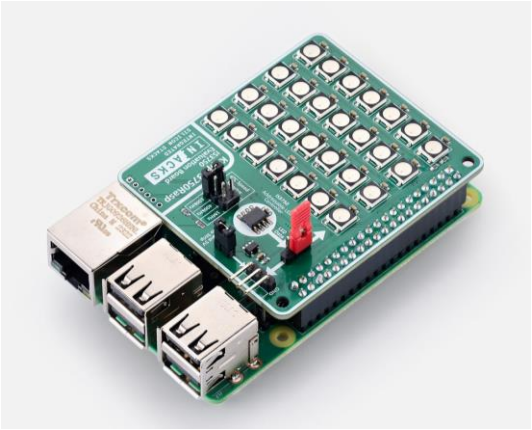
The IS3750 is an ideal solution for **ensuring Addressable LED protocol timing constraints**, reducing CPU load, RAM usage and eliminating the need for a dedicated pin. It can control up to 1200 LEDs.

Characteristics

IS3750 Characteristics	
Total LEDs to control:	1200 3-color LEDs or 900 4-color LEDs
LED Channels:	1
LED Color Type:	LED Agnostic: GRB, RGB, GRBW, etc.
Compatible LEDs:	WS2811, WS2812 / WS2812B / WS2812C, WS2813, WS2815, NeoPixel, SK6812, GS8208, Works with any LED using the compatible Addressable LED protocol
Max Frame Refresh Rate:	27.77 Hz
I2C Compatible Speed:	100 kHz, 400 kHz, 1 MHz

Shield Characteristics	
Form Factor	Raspberry Pi Compatible
I2C Configurable Voltage Levels:	3.3V or floating
I2C Configurable Speed:	100 kHz, 400 kHz, 1 MHz
LEDs:	28 LEDs on PCB or connector for external LED strip



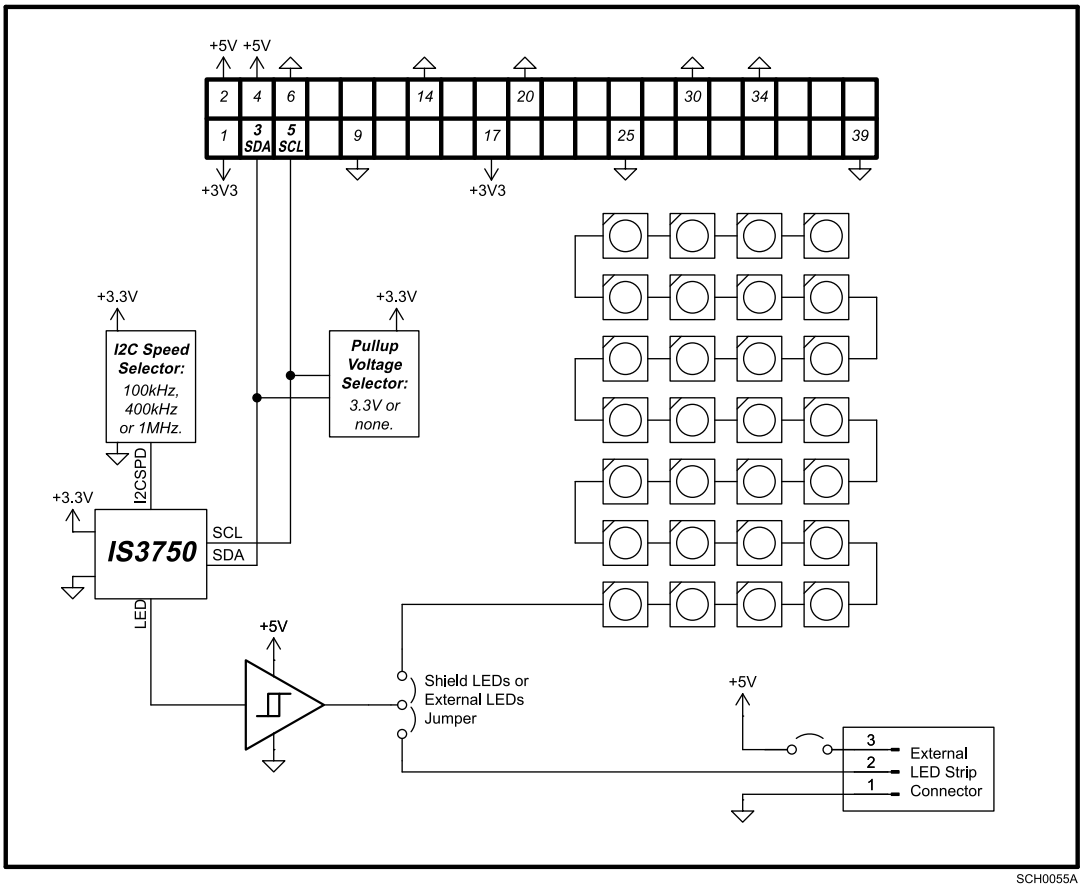


Product Selection Guide

	Part Number		Form Factor	Stack	Description
Only Stack	IS3750-S8		SO8N	Addressable LED WS2811, WS2812, WS2812B, WS2812C, WS2813, WS2815, and compatible protocol LEDs.	Addressable LED Controller Stack Chip. [Vist Product Page]
Evaluation Boards	Kappa3750Ard		Arduino Compatible		Evaluation board for the IS3750 with Arduino form factor. It features the IS3750 mounted on a PCB compatible with Arduino and other commercial microcontroller boards, such as the STMicroelectronics Nucleo. The board includes a series of LEDs, allowing you to easily test the IS3750 without any need for soldering. [Visit Product Page]
	Kappa3750Rasp		Raspberry Pi Compatible		Evaluation board for the IS3750 with Raspberry Pi form factor. It features the IS3750 mounted on a PCB compatible with Raspberry Pi and other commercial embedded computer boards. The board includes a series of LEDs, allowing you to easily test the IS3750 without any need for soldering. [Visit Product Page]

1. Description

1.1. General Description



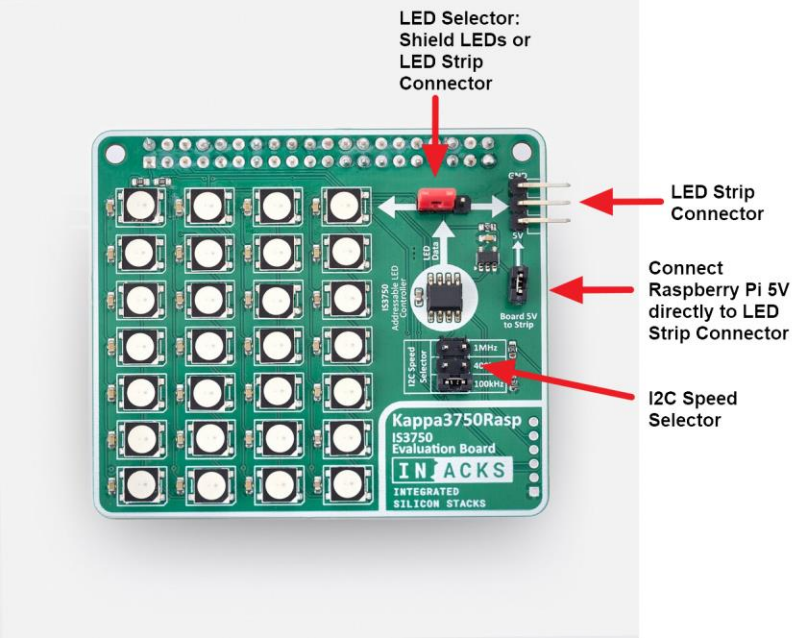
The core of the Kappa3750Rasp is the IS3750 I2C Addressable LED controller chip, which is connected to a 5V Schmitt trigger. The Schmitt trigger converts the 3.3 V LED data output to 5 V LED. Generally, addressable LEDs operate at 5 V, so the Schmitt trigger matches the 3.3 V output of the IS3750 to the 5 V level required by the LEDs.

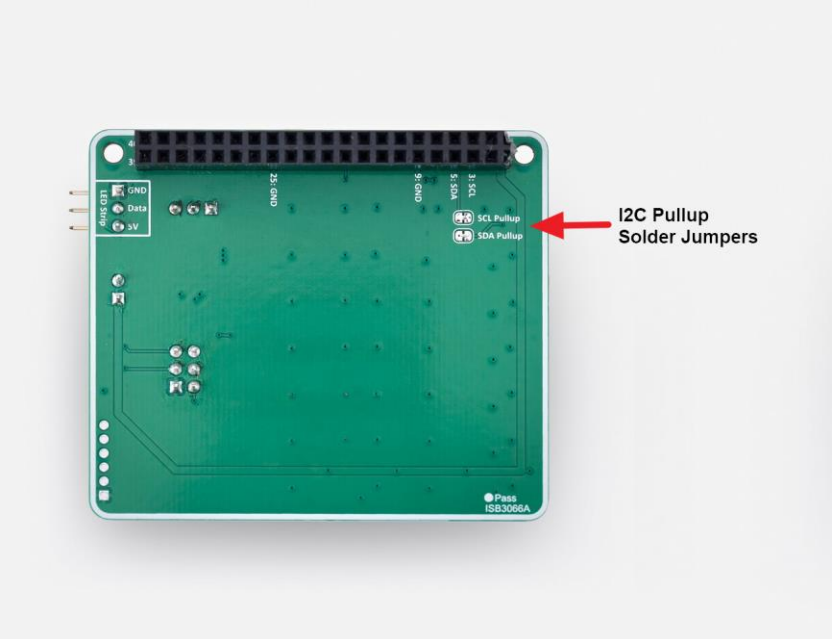
The IS3750 I2C-Serial Interface connects to the I2C pins of the shield. The shield includes a jumper that allows selection of the I2C pull-up voltage: 3.3V or Floating. The Floating option is useful when the pull-up resistors are located outside the Kappa3750Rasp.

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 IS3750 I2C-Serial Interface is 5V tolerant, it can operate with I2C pull-up voltages of 5V.

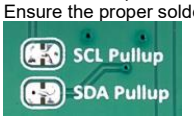
The shield has 28 WS2812B addressable LEDs.


LED Selector:
Shield LEDs or
LED Strip
Connector
LED Strip
Connector
Connect
Raspberry Pi 5V
directly to LED
Strip Connector
I2C Speed
Selector
Kappa3750Rasp
IS3750
Evaluation Board
INTEGRATED
SILICON STACKS

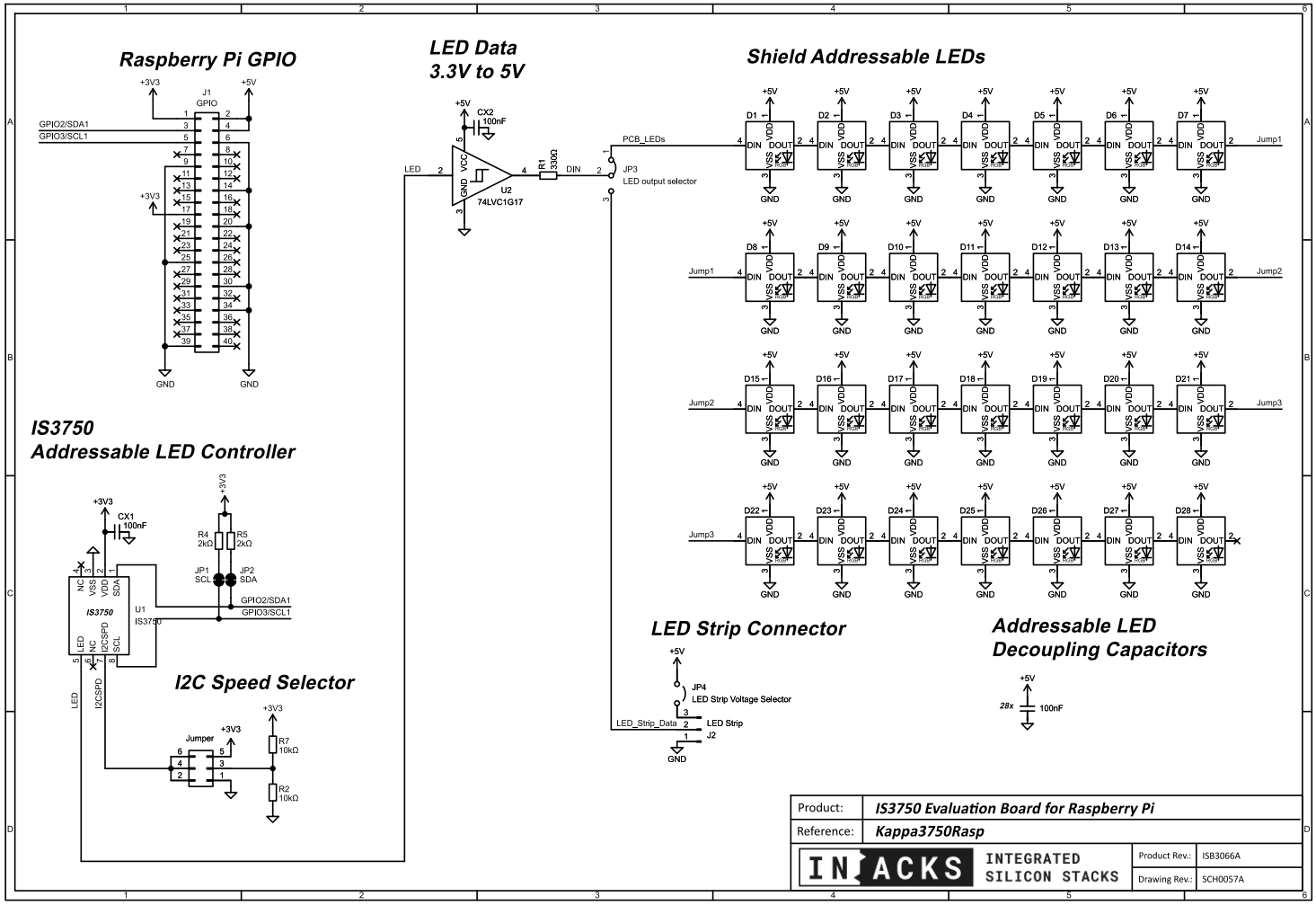

I2C Pullup
Solder Jumpers
SCL Pullup
SDA Pullup

1.2. Module Pinout

SCH0056A

Name	Type	Description
NC	Not Connected	These pins have no electrical connection on the shield. 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.
SCL and SDA	Open Drain 5V Tolerant	SCL and SDA pin of the IS3750 I2C-Serial Interface pins. Ensure the proper solder jumper configuration on the shield:  • Placing solder on the SCL jumper pull-ups the SCL voltage to 3.3V. • Placing solder on the SDA jumper pull-ups the SDA voltage to 3.3V. • Leaving the solder jumpers open leaves SCL and SDA floating. This is useful when pull-up resistors are provided elsewhere in the circuit

1.3. Schematic



2. Firmware Implementation Guide

2.1. Raspberry Pi Example

This example (ISXMPL3750ex3) demonstrates how to use the IS3750 Addressable LED Controller chip with an Raspberry Pi SBC using Python.

You can find the complete example at: www.inacks.com/isxmpl3750ex3

You can get the IS3750 evaluation board (Kappa3750Ard) compatible with Arduino UNO form factor boards at: www.inacks.com/kappa3750rasp

```python
from smbus2 import SMBus, i2c_msg
import time

I2C_BUS = 1  # Use 1 for most Raspberry Pi models
DEVICE_ADDRESS = 0x12  # 7-bit I2C address of the IS3750

# IS3750 register map
REGISTER_SHOW = 0x00
REGISTER_LED1_RED = 0x01
REGISTER_LED1_GREEN = 0x02
REGISTER_LED1_BLUE = 0x03
REGISTER_LED2_RED = 0x04
REGISTER_LED2_GREEN = 0x05
REGISTER_LED2_BLUE = 0x06
REGISTER_LED3_RED = 0x07
REGISTER_LED3_GREEN = 0x08
REGISTER_LED3_BLUE = 0x09

def write_register(start_register, data_bytes):
    """
    Write a block of data starting at a 16-bit register address.

    :param start_register: The 16-bit register address to start writing to.
    :param data_bytes: A list of bytes to write.
    """
    high_addr = (start_register >> 8) & 0xFF
    low_addr = start_register & 0xFF
    with SMBus(I2C_BUS) as bus:
        msg = i2c_msg.write(DEVICE_ADDRESS, [high_addr, low_addr] + data_bytes)
        bus.i2c_rdwr(msg)

def show_leds():
    """Send the 'show' command to apply the LED updates."""
    write_register(REGISTER_SHOW, [1])

def clear_all_led_registers():
    """Clear all LED registers by sending 3600 zero bytes."""
    data = [0] * (1200 * 3)
    write_register(REGISTER_LED1_RED, data)

# Example usage loop
while True:
    clear_all_led_registers()
    write_register(REGISTER_LED1_GREEN, [5])
    show_leds()
    time.sleep(1)

    clear_all_led_registers()
    write_register(REGISTER_LED2_RED, [5])
    write_register(REGISTER_LED2_GREEN, [5])
    show_leds()
    time.sleep(1)

    clear_all_led_registers()
    write_register(REGISTER_LED3_RED, [5])
    show_leds()
    time.sleep(1)
```

Content

Appendix

Revision History

Document Revision

Date	Revision Code	Description
July 2025	ISDOC140**A**	- Initial Release

Shield Revision

Date	Revision Code	Description
July 2025	ISB3066**A**	- Initial Release

Documentation Feedback

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

feedback@inacks.com

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