LoRaSense RGB HAT

Product Overview

The LoRaSense HAT is an advanced multi-functional expansion board designed for Raspberry Pi, ideal for applications in smart automation, environmental monitoring, and remote control systems. It integrates a temperature and humidity sensor, LoRa communication, RGB LED, and a high-power relay, along with extensive GPIO access.

Key Features

1. **Temperature and Humidity Sensor:**
    - High precision measurement with I2C interface communication.
    - Accuracy up to 0.03% for sensitive environmental monitoring.
2. **LoRa 433 MHz Communication Module:**
    - Long-range communication up to 10 km in rural areas.
    - Supports various modulation modes including FSK, GFSK, MSK, GMSK, LoRaTM, and OOK.
3. **Relay Output:**
    - Capable of switching devices on and off with a rating of 220 V 10A.
    - Direct control through GPIO or remotely via LoRa signals.
4. **RGB LED:**
    - Programmable for status indication or aesthetic enhancement.
    - Controlled via GPIO pins.

5. **Multiple Interface Support:**
    - Includes UART, I2C, and SPI interfaces for expanded connectivity.
    - 8 GPIO pins available for additional peripherals.

Specifications

- **Power Supply:** 3.3V to 5V from Raspberry Pi.
- **Operating Frequency:** 420 – 450 MHz for LoRa.
- **Humidity Measurement Range:** 0% to 100% RH.
- **Temperature Measurement Range:** -40°C to 85°C.
- **Dimensions:** 65mm x 56mm x 21mm (L x W x H).
- **Weight:** 48 grams.

Pin Description

- **GPIO:** Detailed pinout for all GPIO connections.
- **I2C:** SCL and SDA pins for sensor communication.
- **SPI:** Specific pins for LoRa module communication.
- **UART:** RX and TX for external microcontroller communication.

Usage Examples

- **Smart Home Systems:** Use the sensor inputs to control HVAC systems based on the environmental data.
- **Agricultural Projects:** Automate irrigation systems using temperature and humidity data combined with remote control via LoRa.
- **Industrial Monitoring:** Setup remote monitoring and control systems for industrial machinery and environment management.

Step-by-Step Installation: Attaching the LoRaSense HAT to a Raspberry Pi

Step 1: Preparing the Raspberry Pi Before attaching the LoRaSense HAT, ensure your Raspberry Pi is powered off to prevent any electrical shorts or damage. If you have an existing microSD card inserted, it's safe to leave it as it is.

Step 2: Attaching the HAT Align the pins on the LoRaSense HAT with the GPIO header on the Raspberry Pi. Gently press down until the HAT sits snugly on the Raspberry Pi's GPIO pins. Ensure that all pins are correctly aligned and that the HAT is firmly in place without using excessive force.

Step 3: Securing the HAT Some HATs come with spacers and screws to securely mount the board to the Raspberry Pi. If included, fasten these to help stabilize the connection and prevent any physical damage during use.

Step 4: Powering Up Once the HAT is securely attached, connect your Raspberry Pi to its power supply and switch it on. The Raspberry Pi will boot up as normal, and the HAT will receive power directly from the GPIO connection.

Pin Mapping

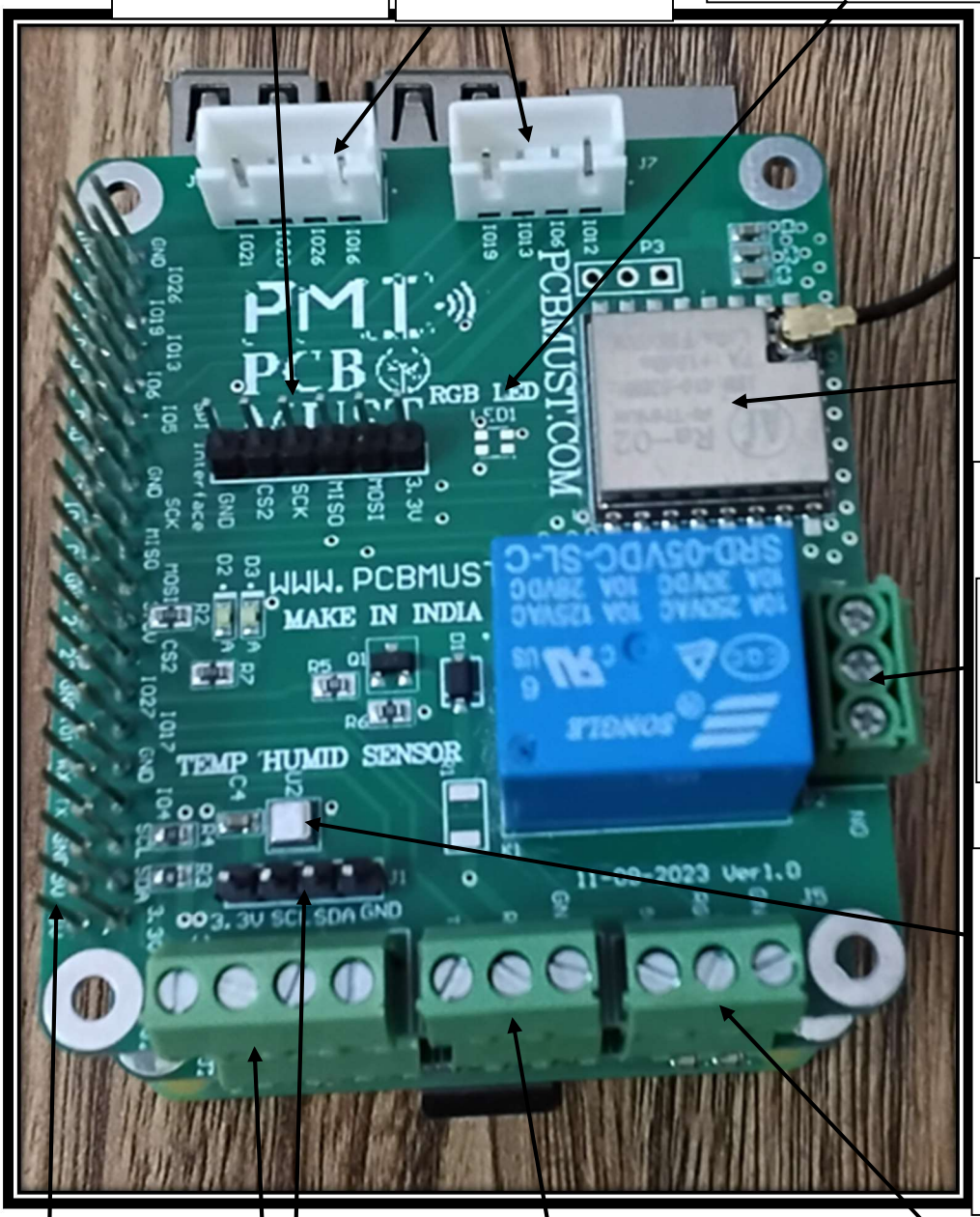
S.No.	Component	Pin Name	Raspberry Pi Pin Number	Description
1	**Raspberry Pi Connector**	3.3V	1, 17	Power Supply (3.3V)
		5V	2, 4	Power Supply (5V)
		Ground	6, 9, 14, 20, 25, 30, 34, 39	Ground
		GPIO	7, 8, 10, 11, 12, 13, 15, 16, 18, 19, 21, 22, 23, 24, 26, 27, 28, 29, 31, 32, 33, 35, 36, 37, 38, 40	General Purpose Input/Output Pins
2	**LoRa Module (RA-02)**	MOSI	19	Master Out Slave In (SPI)
		MISO	21	Master In Slave Out (SPI)
		SCK	23	Serial Clock (SPI)
		NSS (CS)	24	Chip Select (SPI)
		RESET	22	Reset Pin
		DIO0	7	Digital Input/Output
		3.3V	1	Power Supply (3.3V)
		GND	9	Ground
3	**RGB LED Interface (WS2812B)**	Data Input	12	Data Input for LED
		5V	2	Power Supply (5V)
		GND	14	Ground
4	**Temp and Humidity Sensor (AHT20)**	SDA	3	Serial Data Line (I2C)
		SCL	5	Serial Clock Line (I2C)
		3.3V	1	Power Supply (3.3V)
		GND	6	Ground
5	**Relay Interface**	Input Signal	13	Control Signal from GPIO
		VDD (3.3V)	1	Power Supply (3.3V)
		GND	9	Ground

6	**GPIO Header Interface**	GPIO12	32	
		GPIO6	31	
		GPIO13	33	
		GPIO19	35	
		GPIO16	36	
		GPIO26	37	
		GPIO20	38	
		GPIO21	40	
7	**SPI Header Interface**	MOSI	19	Master Out Slave In (SPI)
		MISO	21	Master In Slave Out (SPI)
		SCK	23	Serial Clock (SPI)
		CS	26	Chip Select (SPI)
		RESET	22	Reset Pin
		DIO0	7	Digital Input/Output
		3.3V	1	Power Supply (3.3V)
		GND	9	Ground

Extra SPI Interface

GPIO Header

On Board RGB LED



LORA Interface

Relay Interface

Temp Humid Sensor Interface

I2C Interface

UART Interface

WS2812 RGB LED Interface

Stackable Header

Top View

Bottom View