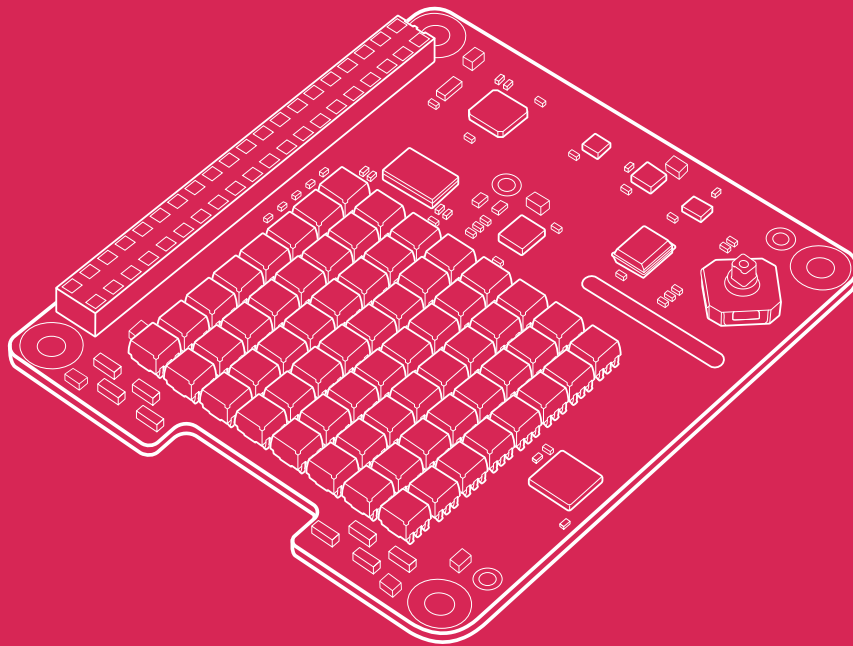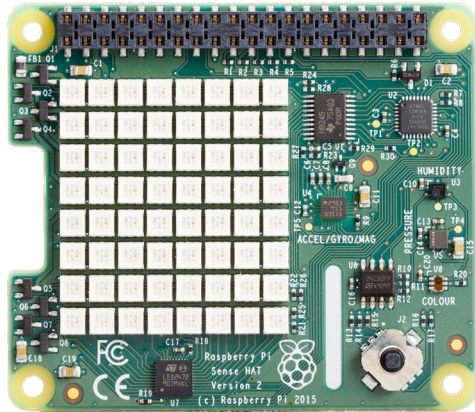# Raspberry Pi Sense HAT

Published January 2023

Overview

The Raspberry Pi Sense HAT gives your Raspberry Pi an array of sensing capabilities. The on-board sensors allow you to monitor pressure, humidity, temperature, colour, orientation, and movement. The bright 8x8 RGB LED matrix allows you to visualise data from the sensors, and the five-button joystick lets users interact with your projects.

The Sense HAT was originally developed for use on the International Space Station, as part of the educational Astro Pi programme run by the Raspberry Pi Foundation in partnership with the European Space Agency. It is well suited to many projects that require position, motion, orientation, or environmental sensing. The Sense HAT is powered by the Raspberry Pi computer to which it is connected.

An officially supported Python library provides access to all of the on-board sensors, the LED matrix, and the joystick.The Sense HAT is compatible with any Raspberry Pi computer with a 40-pin GPIO header.

Specification

Pressure/temperature sensor:	STMicro LPS25HB
	• 260 to 1260 hPa absolute pressure range
	• 24-bit pressure data output
	• 0 to +65°C accurate temperature measurement range (±2°C)
	• 16-bit temperature data output
Humidity temperature sensor:	STMicro HTS221
	• 0 to 100% relative humidity range
	• 15 to 40°C accurate temperature measurement range (±0.5°C)
	• 16-bit data output
IMU:	STMicro LSM9DS1
	Accelerometer/gyroscope/magnetometer
	• ±16g acceleration measurement range
	• ±16 gauss magnetometer measurement range
	• ±2000dps gyroscope measurement range
	• 16-bit resolution for each measurement channel
Colour sensor:	TCS3400 RGB colour and brightness sensor
LED matrix:	8×8 RGB LED display
Joystick:	5-button miniature joystick with up, down, left, right, and middle-click
Compliance:	For a full list of local and regional product approvals, please visit pip.raspberrypi.com
Production lifetime:	The Raspberry Pi Sense HAT will remain in production until at least January 2028

Physical specification


Note: all dimensions in mm
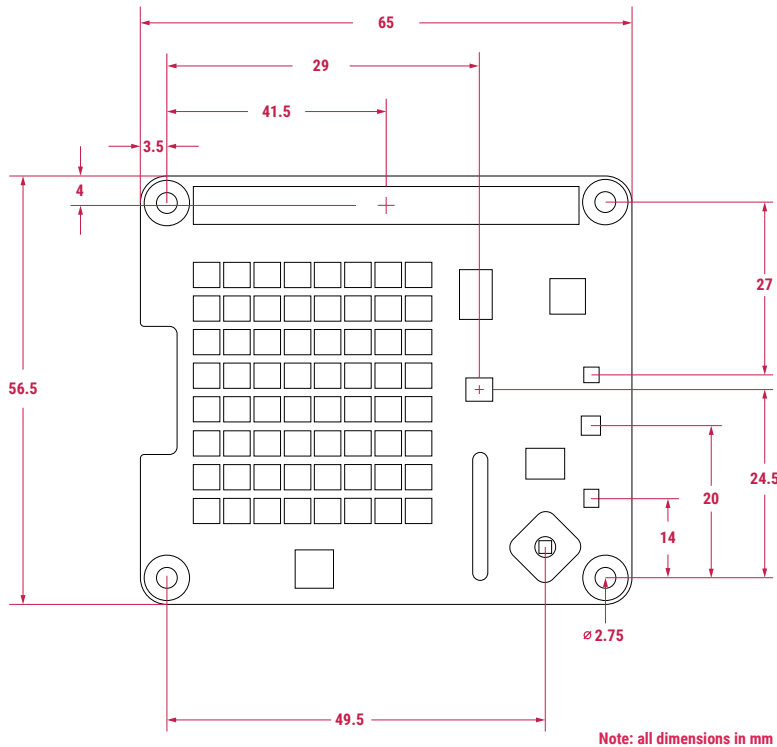
WARNINGS

- This product shall only be connected to a Raspberry Pi via the GPIO header.

- Any external power supply used with the Raspberry Pi Sense HAT shall comply with relevant regulations and standards applicable in the country of intended use.

- This product should be operated in a well-ventilated environment, and if used inside a case, the case should not be covered.

- Whilst in use, this product should be placed on a stable, flat, non-conductive surface, and should not be contacted by conductive items.

- The connection of incompatible devices to the Raspberry Pi Sense HAT may affect compliance, result in damage to the unit, and invalidate the warranty.

- The connection of incompatible devices to the GPIO connection of a Raspberry Pi computer may affect compliance and result in damage to the unit and invalidate the warranty.

- All peripherals used with this product should comply with relevant standards for the country of use and be marked accordingly to ensure that safety and performance requirements are met.

- The cables and connectors of all peripherals used with this product must have adequate insulation so that relevant safety requirements are met.

- Operation of this device requires adult supervision.

SAFETY INSTRUCTIONS

To avoid malfunction or damage to this product, please observe the following:

- Do not expose to water or moisture, or place on a conductive surface whilst in operation.

- Do not expose to heat from any source; Raspberry Pi computers and the Raspberry Pi Sense HAT are designed for reliable operation at normal ambient temperatures.

- Take care whilst handling to avoid mechanical or electrical damage to the printed circuit board and connectors.

- Whilst it is powered, avoid handling the printed circuit board, or only handle it by the corners to minimise the risk of electrostatic discharge damage.
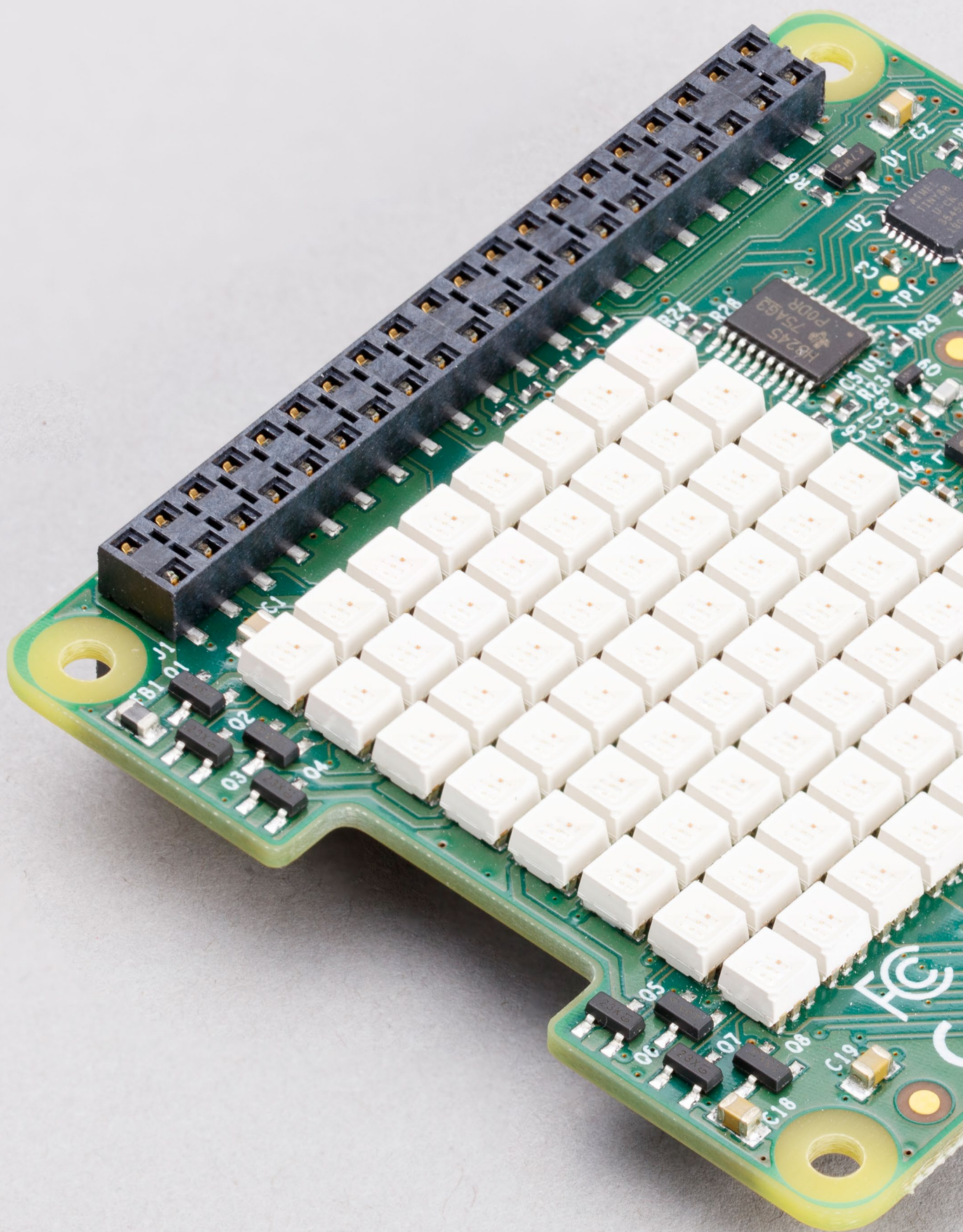
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