


SPE HAT mini User's Manual

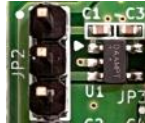


Part names and functions




1. Single pair Ethernet cable and shield wire connection terminal
The terminal block for connecting twisted pair cables for Single pair Ethernet, where the twisted pair cable is connected to the (+) and (-) positions on the substrate. When using a shield wire, connect the shield to this position marked (SH).
2. 40-pin connector for Raspberry Pi
The connector for connecting to Raspberry Pi. When attaching or detaching it from Raspberry Pi, please apply a gentle force and slowly insert or remove it. Applying excessive force may cause the pins on the Raspberry Pi side to bend.
3. 3.3V power enable/disable jumper pin (JP1)


Jumper settings:
 Jumper 1-2: Enable 3.3V power
 Jumper 2-3: Disable 3.3V power
- When selecting 1.8V using the 3.3V/1.8V power switching jumper pin (5), it is fine to enable the 3.3V power. However, if 3.3V is selected with (5) and this jumper is in the disabled position, power will not be supplied to the board.
4. 1.8V power enable/disable jumper pin (JP2)

- 1
 - 2
 - 3
- 
- Jumper settings:
 Jumper 1-2: Enable 1.8V power
 Jumper 2-3: Disable 1.8V power


When selecting 3.3V with the power switch jumper pin (5), it is okay to enable the 1.8V power. However, if 1.8V is selected with (5) and this jumper pin is in the disable position, power will not be supplied to the substrate.

5. 3.3V / 1.8V Power Switch Jumper Pin (JP3)
This is a jumper pin for switching the power supply to the devices on the substrate.

- 
- 3
 - 2
 - 1
- Jumper settings:
 Jumper 1-2: 3.3V power supply
 Jumper 2-3: 1.8V power supply

When the amplitude setting is 2.4Vp-p, be sure to use a 3.3V power supply.

6. Amplitude Setting 2.4Vp-p / 1.0Vp-p Switch Jumper Pin (JP4)
The jumper pin for switching the output amplitude setting of 10BASE-T1L. Unless there is a special reason, set it to 2.4Vp-p. Also, when using a twisted-pair cable of 200m or more, set it to 2.4Vp-p.

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- Jumper settings:
 Jumper on 1-2: Amplitude 2.4Vp-p
 No jumper on 1-2: Amplitude 1.0Vp-p

When the amplitude setting is 2.4Vp-p, be sure to use a 3.3V power supply.

7. Link up/access LED (Red)
Lights up when connection is established. Blinks when communication is in progress between the devices.
8. Amplitude mode LED (Green)
Lights up when the amplitude mode is set to 2.4Vp-p, and turns off when set to 1.0Vp-p. Even if the amplitude mode jumper is set to 2.4Vp-p, the amplitude mode may be set to 1.0Vp-p depending on the result of auto-negotiation with the communication partner. If both devices are set to 2.4Vp-p amplitude mode, it will operate in the 2.4Vp-p mode. However, if one of the devices is set to 1.0Vp-p amplitude mode, both devices will operate in the 1.0Vp-p mode after auto-negotiation.

Setup

1. Jumper pin settings
Set jumper pins JP1 to JP4 according to the conditions for which they will be used. The initial jumper settings for this product are as follows:

- JP1: Jumper 1-2 (3.3V power supply enabled)
- JP2: Jumper 2-3 (1.8V power supply disabled)
- JP3: Jumper 1-2 (Selecting 3.3V power supply)
- JP4: Jumper (Amplitude set to 2.4Vp-p)

2. Make sure the Raspberry Pi Zero to be connected is powered off

Please confirm that the power to the device to be connected is turned off. If you unplug and replug the product while the power is on, it may malfunction.

3. Mounting on Raspberry Pi Zero

Attach this product to the 40-pin GPIO terminal of the Raspberry Pi Zero. The product is designed to be connected to the Raspberry Pi Zero, but it can also be attached to the Raspberry Pi.

4. Turn on the power to the Raspberry Pi Zero

After confirming that the 40-pin connector is securely plugged in, turn on the power to the Raspberry Pi Zero. Even if the OS starts up after the power is turned on, the red and green LEDs will not light up until the driver is installed and linked.

5. Building and installing the driver

The method for building and installing the driver varies depending on Linux distribution. The following GitHub page explains how to build and install the driver for the Raspberry Pi OS.

https://github.com/OKS-Tech-Japan/spehat_driver

6. Connecting the twisted-pair cable

Connect the 10BASE-T1L devices with a twisted-pair cable. After the devices are connected, auto-negotiation is automatically performed between the devices and the red LED lights up. The green LED only lights up when the amplitude is set to 2.4Vp-p.

Note that if the red LED does not light up and the green LED flashes irregularly, the signal quality flowing through the twisted-pair cable may be poor, and auto-negotiation may fail or the link may not be established. Please shorten the cable length or replace it with a cable with good transmission quality.

Specifications

Compliance Standards	10BASE-T1L(IEEE 802.3cg-2019)
Transmission Speed	10Mbps (standard)
Transmission Distance	1000m (standard)
Termination Resistance	100 Ohms
Amplitude Mode	2.4Vp-p / 1.0Vp-p
Power Voltage	3.3V / 1.8V
Power Supply	Supply from Raspberry Pi zero
Power Consumption	0.5W max
Insulation Resistance	1500VDC (design value)
Operating Temperature	-20 to 70 Celsius
Operating Humidity	10 to 85%RH (no condensation)
Dimensions	W: 65mm D: 30mm H: 20mm
Weight	15g

About twisted pair cables

The 10BASE-T1L standard claims a transmission distance of 1000m, but the actual distance that can be transmitted depends on the characteristics and quality of the twisted pair cable used, as well as the environment in which the cable and equipment are placed. Therefore, our company does not select or guarantee any specific cable. Please select the cable yourself and evaluate the entire system, including the equipment, before use.

Notices

- This product has been developed and manufactured for general electronic use. It is not intended for use in systems that require extremely high reliability and safety, such as medical equipment that supports life, aerospace equipment, trunk communication equipment, atomic energy control equipment, etc. Please do not use this product for these purposes.
- This product is not designed for explosion-proof applications. Please do not use it in locations where explosion-proof structures are required.
- Do not modify or repair this product.
- This product is a precision electronic device. Do not bend it, apply excessive force, or subject it to strong impacts.
- When installing or removing this product, be sure to turn off the power of the target equipment to be installed, and remove the static electricity of the installer before performing the work.
- When installing and using this product, please follow the instructions and precautions of the user manual of the target equipment to be installed.
- Do not use this product in humid or dusty environments. Also, please be careful not to touch the terminal parts of this product with dirt or foreign objects.
- If you notice any abnormalities, please stop using the product immediately and contact us.

Precautions for storage

Please do not store this product in the following locations as there is a risk of product degradation:

- Locations exposed to direct sunlight
- Dusty areas
- Areas where there is a possibility of water exposure
- Areas with open flames or high heat (above 70 Celsius) or high humidity (above 85%), areas where condensation occurs, or areas with rapid temperature changes
- Locations where strong magnetic fields or static electricity are generated.

Product Warranty Policy

Please refer to the Terms and Conditions of Sale on our website.

https://www.okstech.co.jp/en/products/terms_and_cond.html

Disclaimer

- Our liability for breach of duty and tort liability shall be limited to the purchase price of this product, regardless of our intention or negligence.
- We shall not be liable for any consequential, incidental, indirect, or emotional damages, or for any loss of profits or earnings arising from the failure of this product.
- We do not guarantee the data damage or inconsistency between related data caused by the use of this product.

- The transfer speed and transmission distance of this product are standard values and are not guaranteed to perform at that level.

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