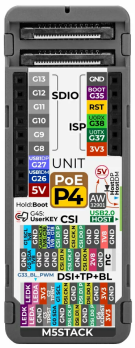
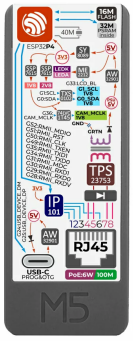
Unit PoE-P4

SKU:U213






Description

Unit PoE-P4 is a high-performance PoE Ethernet embedded controller powered by the **ESP32-P4** SoC (RISC-V 32-bit dual-core @ 360MHz + LP single-core @ 40MHz). It integrates **16MB Flash** and **32MB PSRAM**, and features the built-in **IP101GRI** Ethernet PHY supporting **10/100 Mbps** communication. The device also supports PoE power delivery with a maximum output of 6W, and includes an onboard DC-DC converter to supply system power, greatly simplifying power wiring in practical applications.

It is equipped with a 24P FPC display expansion interface (MIPI DSI + TP + BL) and a 24P FPC camera interface (MIPI CSI), supporting high-resolution display output and image capture. For peripheral expansion, it provides one USB Type-C Host (USB 2.0) port for connecting U disks, HID devices, and other peripherals, plus one USB Type-C (USB 2.0) port supporting OTG and firmware download for debugging. In addition, it features a Hat expansion interface, SDIO & ISP IO expansion interfaces, and a Grove interface, enabling flexible connection to a wide range of sensors and peripherals.

The device also integrates an RGB indicator LED, an infrared transmitter circuit, and a user button to support status indication, local interaction, and infrared signal transmission. It is ideal for applications such as industrial HMI, PoE smart terminals, vision acquisition nodes, smart home controllers, and edge computing devices.

Tutorial

Arduino IDE

This tutorial introduces how to program and control the Unit PoE-P4 using the Arduino IDE.

Features

- ESP32-P4 main controller:
  - 16MB Flash + 32MB PSRAM
- Peripheral interfaces:
  - 1x 24P FPC camera interface: MIPI CSI 2-Lane
  - 1x 24P FPC display expansion interface: MIPI DSI 2-Lane + TP + BL
  - 1x USB Type-C Host interface (USB 2.0)
  - 1x USB Type-C firmware download / OTG interface (USB 2.0)
- Ethernet:

- Integrated IP101 10/100M Ethernet PHY chip
- Supports PoE (active Ethernet) power supply, enabling data transmission and power delivery over a single Ethernet cable

- Human-machine interaction:
  - 1x RGB LED indicator
  - 1x user button
  - 1x infrared transmitter
- Expansion interfaces:
  - HY2.0-4P expansion interface
  - Hat2-Bus 2.54-16P
  - SDIO-Bus 2.56-9P
  - ISP-Bus 2.56-6P

Includes

- 1 x Unit PoE-P4
- 1 x HY2.0-4P Grove Cable (20cm)

Applications

- Industrial Human-Machine Interface (HMI)
- PoE smart terminals
- Vision acquisition nodes
- Smart home controllers
- Edge computing devices

Specifications

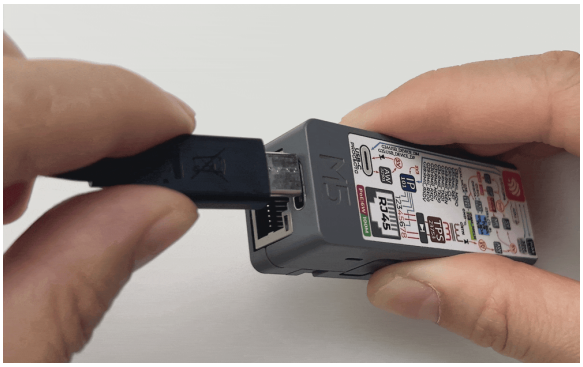
Specification	Parameter
SoC	ESP32-P4NRW32 (RISC-V 32-bit high-performance dual-core processor @ 360 MHz + RISC-V 32-bit low-power single-core coprocessor @ 40 MHz)
Flash	16MB
PSRAM	32MB
Power Input	DC 5V (USB Type-C) / PoE
Ethernet Controller	IP101GRI
Ethernet Speed	10/100M adaptive
Ethernet Interface	RJ45
PoE Standard	Compliant with IEEE 802.3at
PoE Power	Maximum power 6W
Display Interface	24P FPC (0.5mm pin pitch) MIPI DSI 2-Lane + TP + BL
Display Resolution	MIPI DSI display supports up to 1920×1080 (limited by lane count and frame rate)
Camera Interface	24P FPC (0.5mm pin pitch) MIPI CSI 2-Lane
USB Type-C	1x USB Type-C Host interface (USB 2.0) 1x USB Type-C firmware download / OTG interface (USB 2.0)
Power Consumption	Operating current: 5V @ 73.82mA Infrared transmission: 3.3V @ 23.57mA (instantaneous) RGB: 5V @ 75.32mA Full load (display, camera, IR, RGB, etc.): 277.10mA Deep sleep: 5V @ 19.85mA
RGB LED	1 x NH-B2020RGBA-HF
Infrared Transmitter	1 x MHS153IRCT
Operating Temperature	0 ~ 40°C

Specification	Parameter
Product Size	64.0 x 24.0 x 20.2mm
Product Weight	28.2g
Package Size	65.0 x 33.0 x 21.2mm
Gross Weight	35.0g

Learn

Download Mode

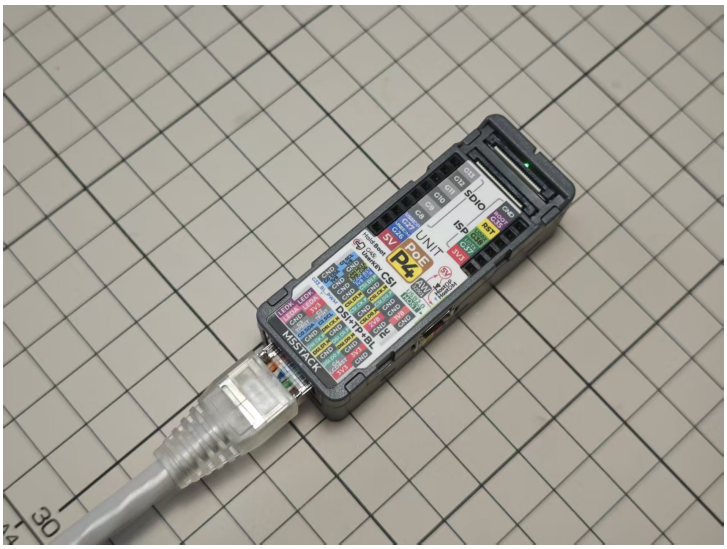
To flash firmware, connect the device to a computer via a USB Type-C data cable. Press and hold the side button for 3 seconds until the green LED lights up. The device will then enter download mode and wait for firmware flashing.



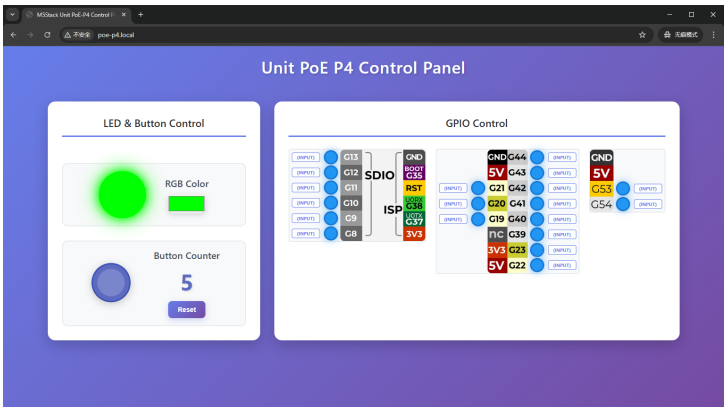
Access Device Control Page

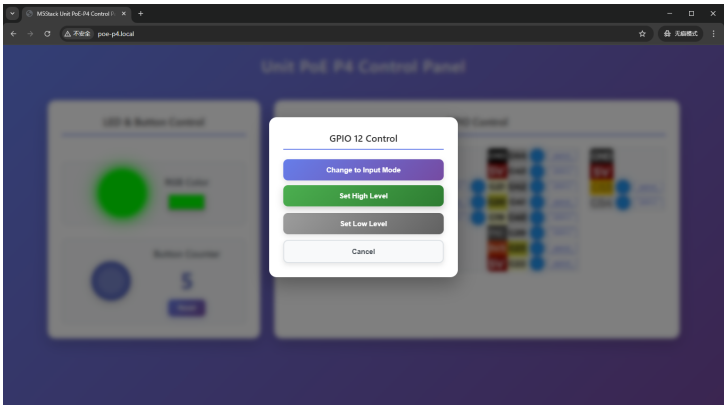
The factory default firmware of the device is preloaded with a WEB control panel, which supports RGB LED color control, button press count statistics, GPIO pin mode switching, and high/low level output. The device control page can be accessed by following these steps:

1. Power on the Unit PoE-P4 and connect it to the Ethernet network.
2. Open the serial monitor and note the device’ s current IP address.
3. Ensure your computer or mobile phone is on the same local area network (LAN) as the device.
4. Access the web control page using one of the following methods:



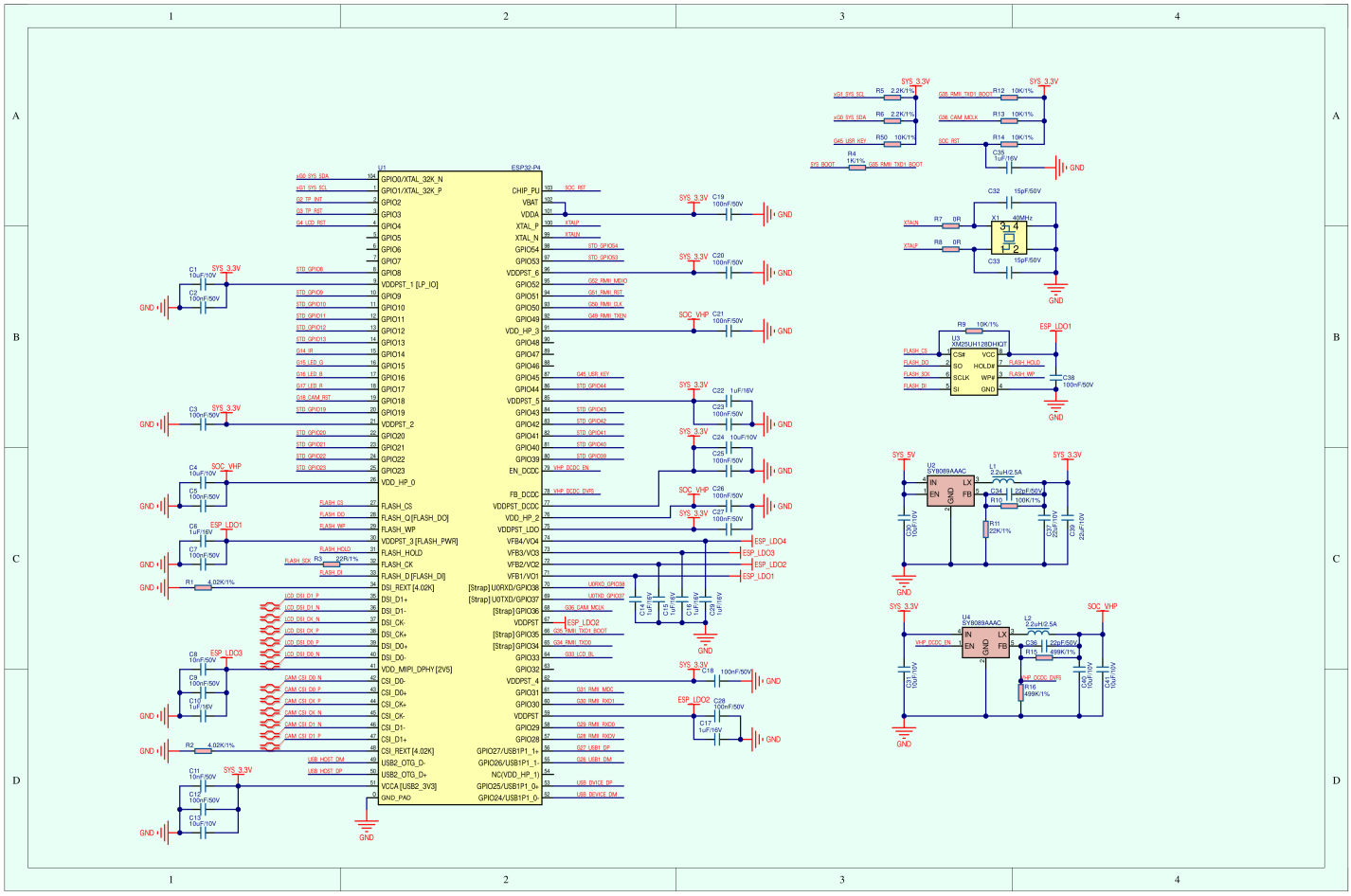
- Enter `poe-p4.local` in your browser
- Copy the IP address shown in the serial monitor and paste it into the browser address bar

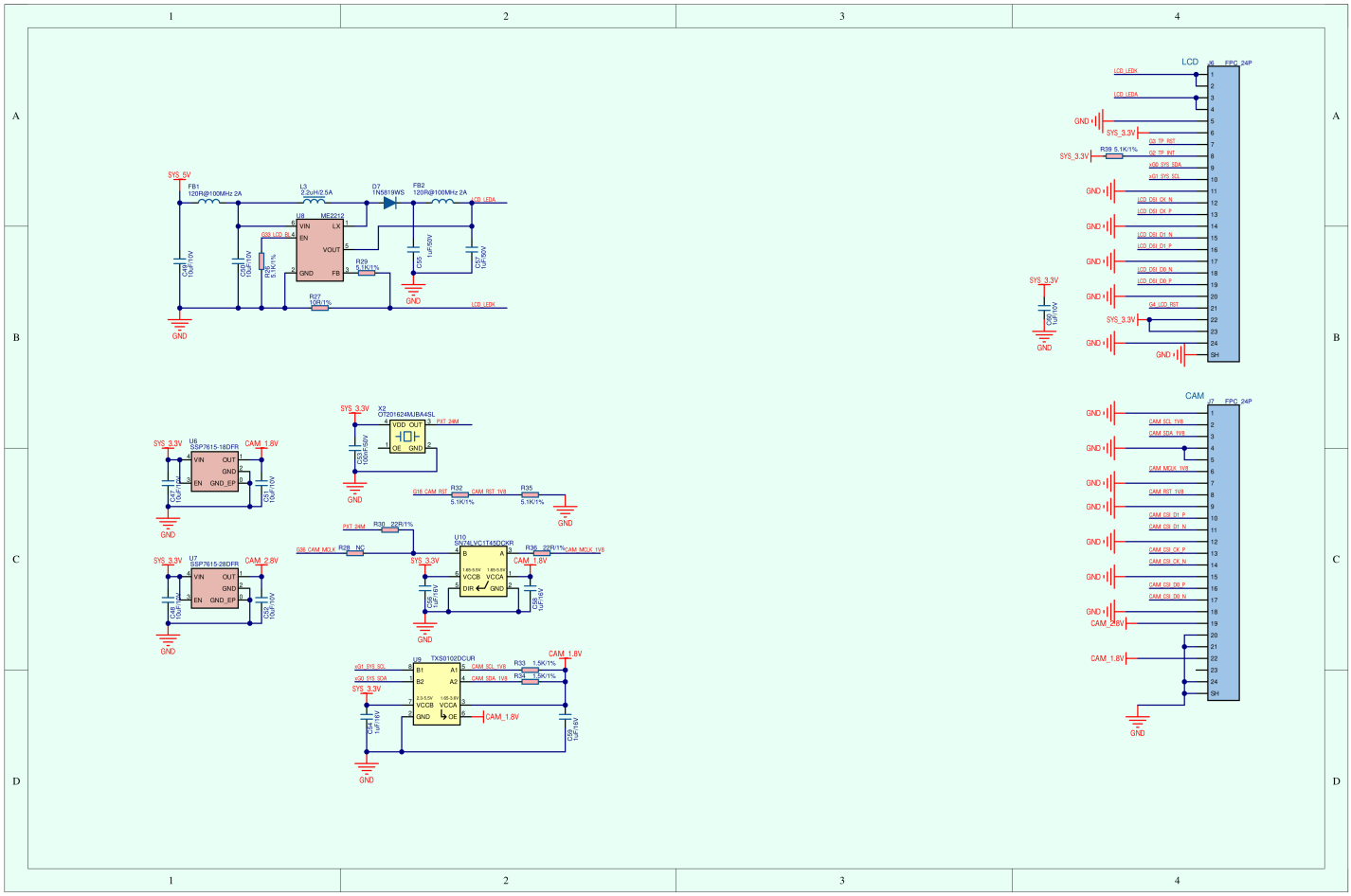


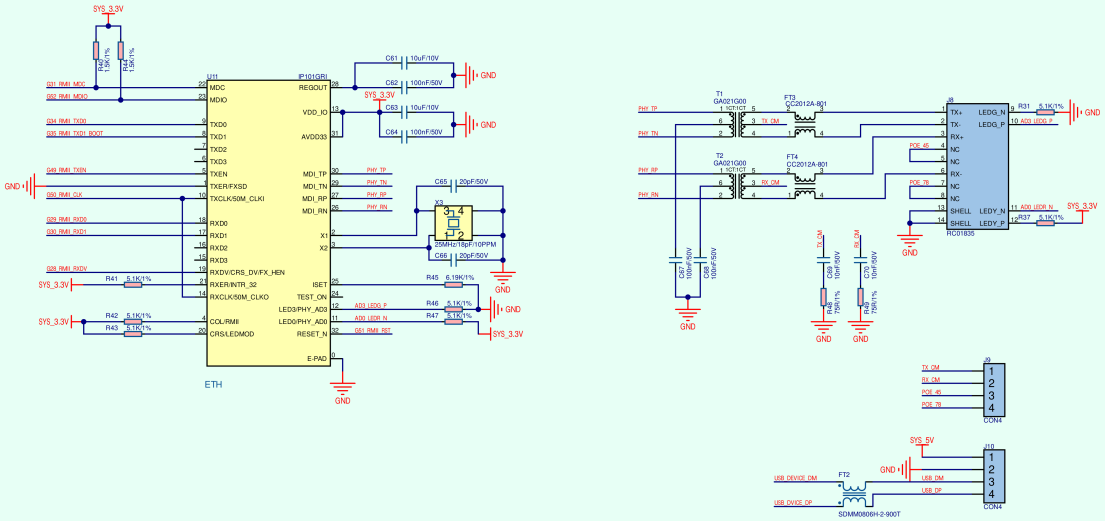


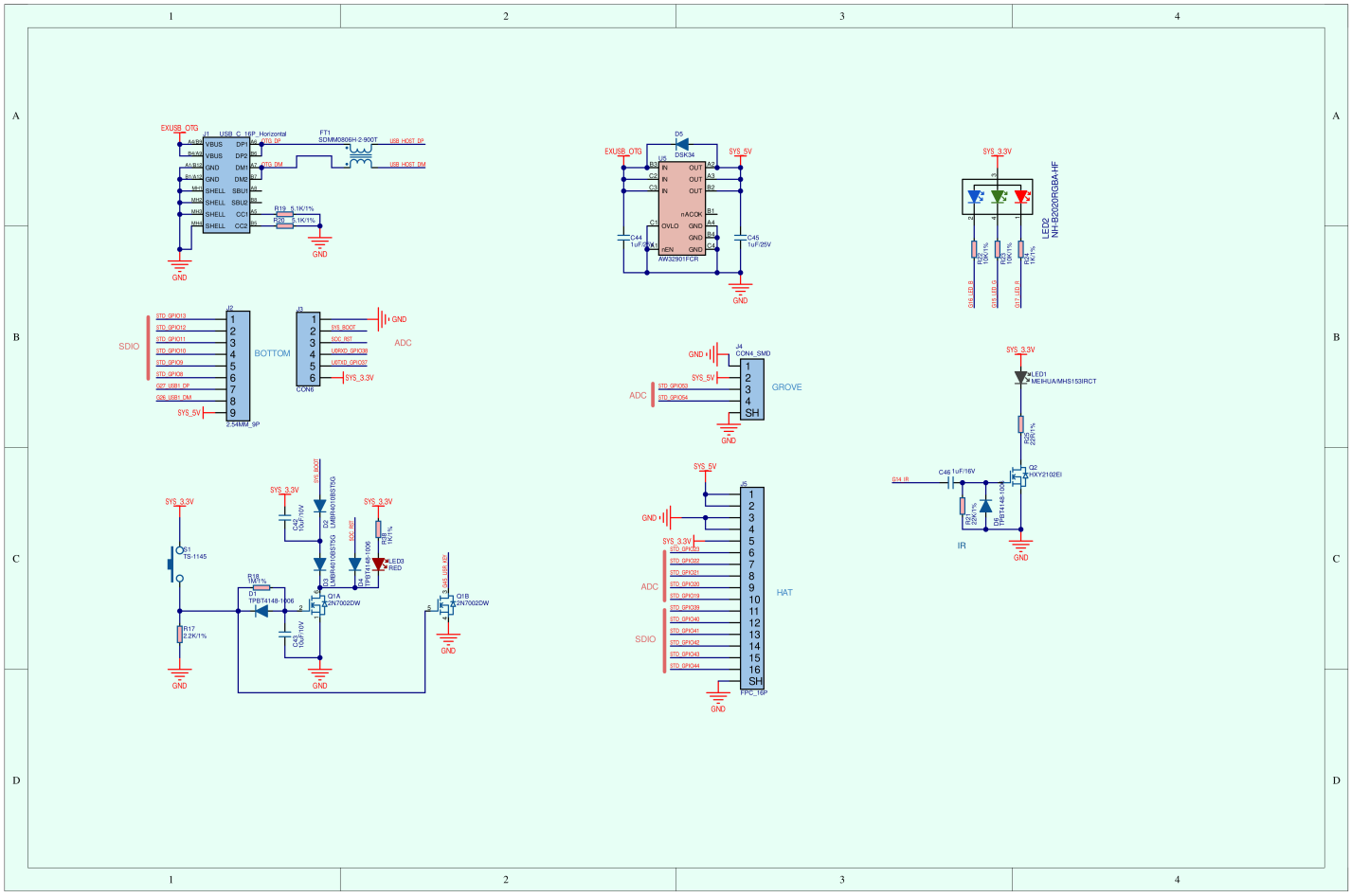
Schematics

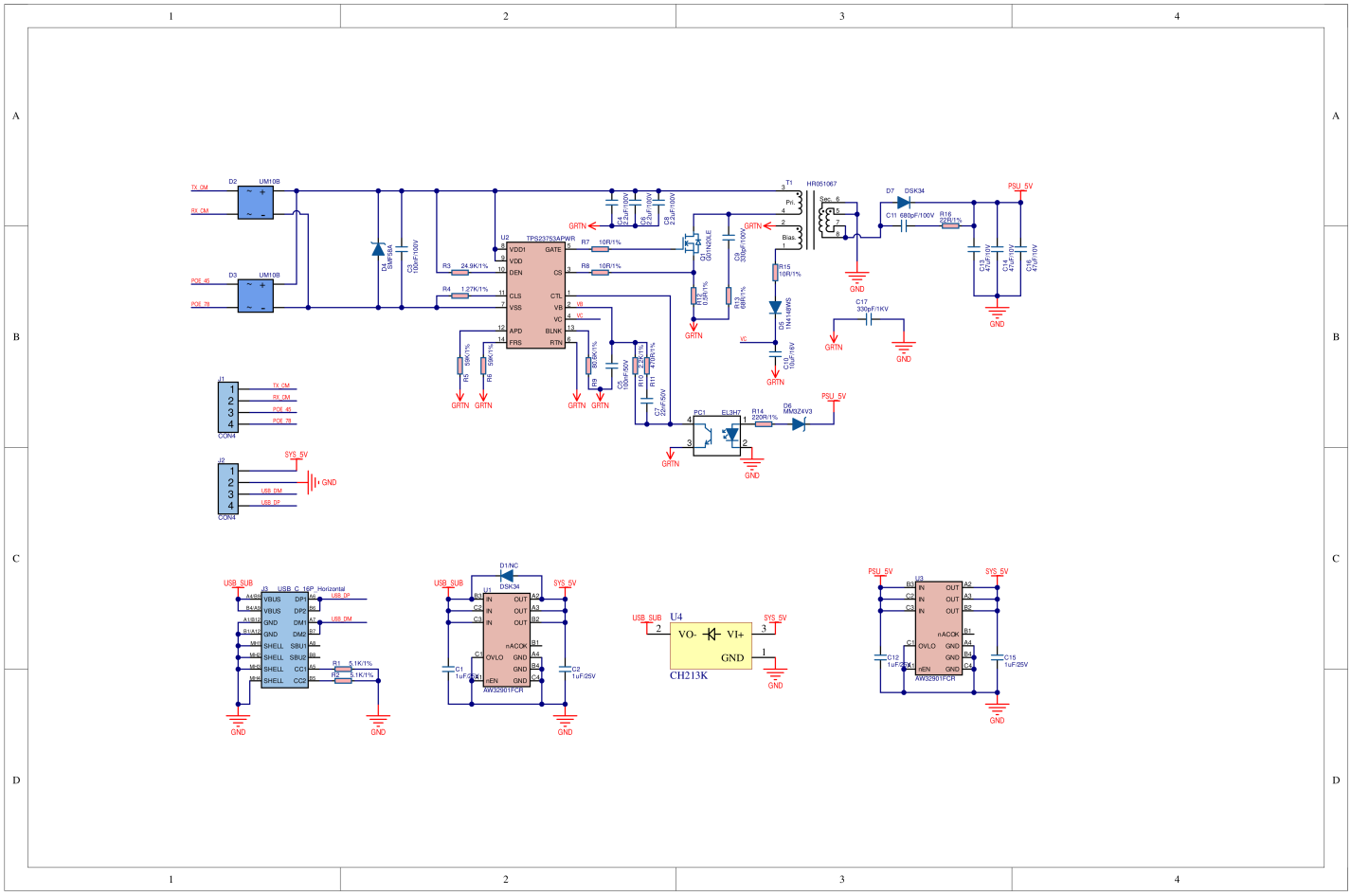
- Unit PoE-P4 Mainboard Schematics PDF
- Unit PoE-P4 Power Board Schematics PDF
- Unit PoE-P4 HAT Expansion Interface Schematics PDF

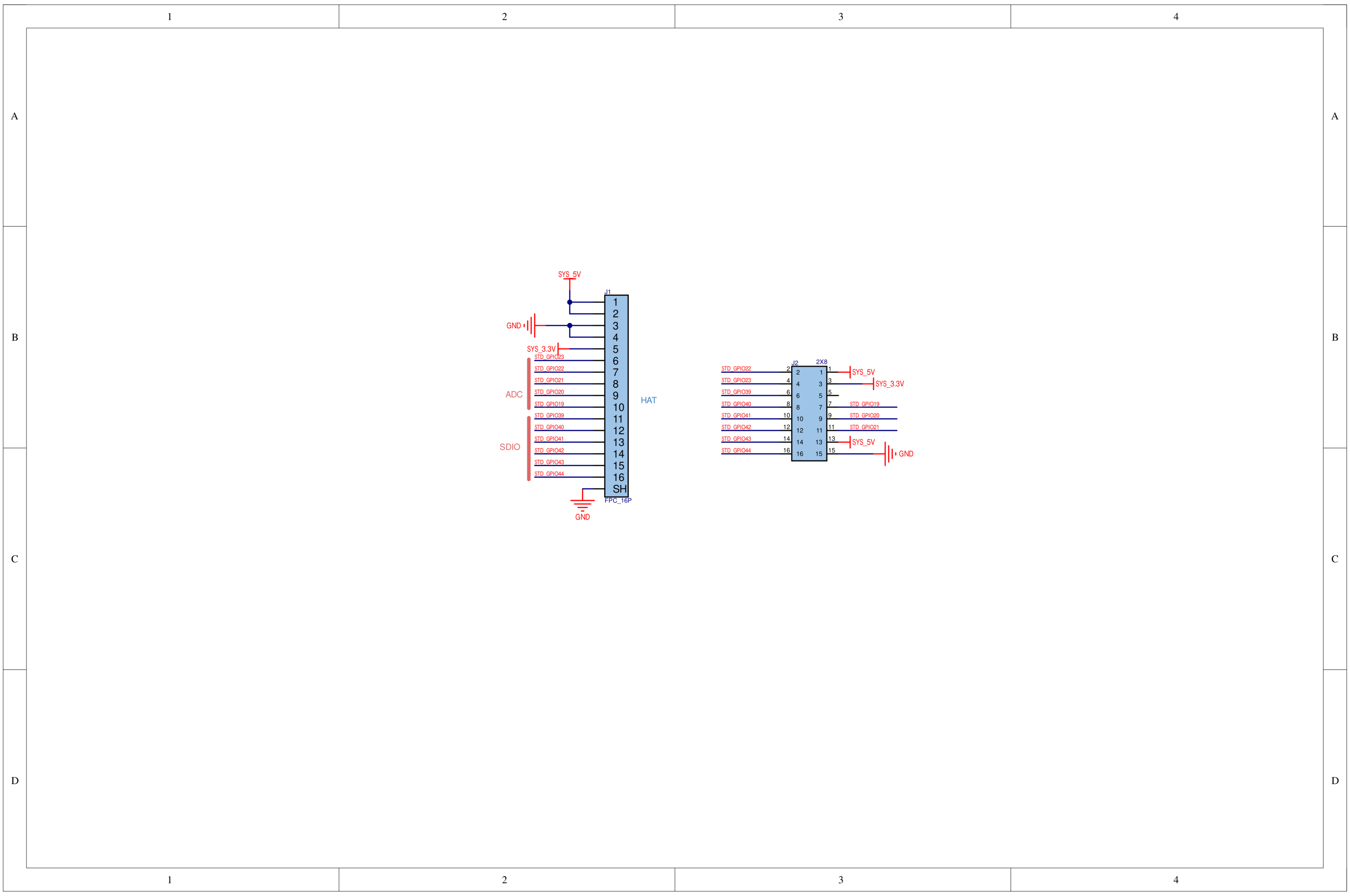





SYS_3.3V
R40 1.5K/1%
R44 1.5K/1%
U11
IP101GR
MDC
MDIO
TXD0
TXD1
TXD2
TXD3
TXEN
TXER/FXSD
TXCLK/50M_CLKI
RXD0
RXD1
RXD2
RXD3
RXDV/CRS_DV/FX_HEN
RXER/INTR_32
RXCLK/50M_CLKO
COL/RMII
CRS/LEDMOD
REGOUT
VDD_IO
AVDD33
MDI_TP
MDI_TN
MDI_RP
MDI_RN
X1
X2
ISET
TEST_ON
LED3/PHY_ADR
LED0/PHY_ADR
RESET_N
E-PAD
ETH
C61 10uF/10V
C62 100nF/50V
C63 10uF/10V
C64 100nF/50V
C65 20pF/50V
C66 20pF/50V
X3
25MHz/18pF/10PPM
R41 5.1K/1%
R42 5.1K/1%
R43 5.1K/1%
R45 6.19K/1%
R46 5.1K/1%
R47 5.1K/1%
GND
T1
GA021G00
T2
GA021G00
FT3
CC2012A-801
FT4
CC2012A-801
J8
HC01635
R31 5.1K/1%
R37 5.1K/1%
C57 100nF/50V
C58 100nF/50V
C59 10nF/50V
C60 10nF/50V
R2 75R/1%
R3 75R/1%
J9
CON4
J10
CON4
FT2
SDMM0806H-2-900T


EXUSB_OTG
J1
USB_C_16P_Horizontal
FT1
SDMM0806H-2-900T
USB HOST_DP
USB HOST_DM
R19 5.1K/1%
R20 5.1K/1%
GND
D5
DSK34
SYS_5V
U5
AW32901FCR
C44 1uF/25V
C45 1uF/25V
SYS_3.3V
LED2
NH-B2020RGBA-HF
R22 100R/1%
R23 100R/1%
R24 1K/1%
J2
SDIO
BOTTOM
2.54MM_9P
J3
CON6
ADC
J4
CON4_SMD
GROVE
C46 1uF/16V
Q2
2SJ0HXY2102EI
R27 22K/1%
D6
TPBT4148-1006
IR
S1
TS-1145
R17 2.2K/1%
R18 1M/1%
D1
TPBT4148-1006
C47 10uF/10V
D2
LMBR40180ST5G
C48 10uF/10V
D3
LMBR40180ST5G
D4
TPBT4148-1006
LED3
RED
R25 1K/1%
Q1A
2N7002DW
Q1B
2N7002DW
J5
FPC_16P
HAT
SYS_BOOT
SYS_RST
GND


TX_DM
RX_DM
POE_45
POE_78
D2
UM10B
D3
UM10B
SMF36A
C3
100nF/100V
U2
TPS23753APWR
VDD1
VDD
DEN
CLS
VSS
APD
FRS
GATE
CS
CTL
VB
VC
BLNK
RTN
R3 24.9K/1%
R4 1.27K/1%
R5 39R/1%
R6 54R/1%
R7 10R/1%
R8 10R/1%
R9 80.6K/1%
C4 2.2uF/100V
C5 2.2uF/100V
C6 2.2uF/100V
C7 2.2uF/100V
C8 2.2uF/100V
C9 100nF/50V
R10 10R/1%
R11 10R/1%
R12 10R/1%
C10 100nF/50V
C11 22uF/50V
Q1 IPD70N10S4L
C30 33pF/100V
R15 10R/1%
D5 1N4148WS
C16 10uF/16V
T1
HR051067
Pri.
Sec. 6
Bias
D7 DSK34
C11 680pF/100V
R18 82R/1%
C13 47uF/16V
C14 47uF/16V
C15 47uF/16V
C17 330pF/1KV
PSU_5V
GND
GRTN
VC
VB
J1
CON4
J2
CON4
SYS_5V
USB_DM
USB_DP
PC1 EL3H7
R14 220R/1%
D6 MMSZ4V3
J3 USB_C_16P_Horizontal
VBUS
GND
SHELL
CC1
CC2
DP1
DP2
DM1
DM2
SBU1
SBU2
R1 5.1K/1%
R2 5.1K/1%
USB_SUB
U1 DSK34
D1/NC
IN
OUT
nACOK
OVLO
nEN
AW32501FCR
C1 1uF/25V
C2 1uF/25V
U4
CH213K
VO-
VI+
U3 AW32901FCR
C12 1uF/25V
C15 1uF/25V


1
2
3
4
A
B
C
D
SYS_5V
J1
GND
SYS_3.3V
STD_GPIO23
STD_GPIO22
STD_GPIO21
STD_GPIO20
STD_GPIO19
STD_GPIO39
STD_GPIO40
STD_GPIO41
STD_GPIO42
STD_GPIO43
STD_GPIO44
ADC
SDIO
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 SH
FPC_16P
HAT
GND
J2
2X8
STD_GPIO22
STD_GPIO23
STD_GPIO39
STD_GPIO40
STD_GPIO41
STD_GPIO42
STD_GPIO43
STD_GPIO44
SYS_5V
SYS_3.3V
STD_GPIO19
STD_GPIO20
STD_GPIO21
SYS_5V
GND

PinMap

Ethernet

ESP32-P4	G31	G52	G51
IP101	SMI_MDC	SMI_MDIO	PHY_RST

ESP32-P4	G28	G29	G30	G34	G35	G49	G50
IP101	RMII_RXDV	RMII_RXD0	RMII_RXD1	RMII_TXD0	RMII_TXD1	RMII_TXEN	RMII_CLK

LCD

ESP32-P4	G4	G33	DSI_CLK_N	DSI_CLK_P	DSI_D1_N	DSI_D1_P	DSI_D0_N	DSI_D0_P
FPC - MIPI DSI	LCD_RST	LCD_BL	LCD_DSI_CK_N	LCD_DSI_CK_P	LCD_DSI_D1_N	LCD_DSI_D1_P	LCD_DSI_D0_N	LCD_DSI_D0_P

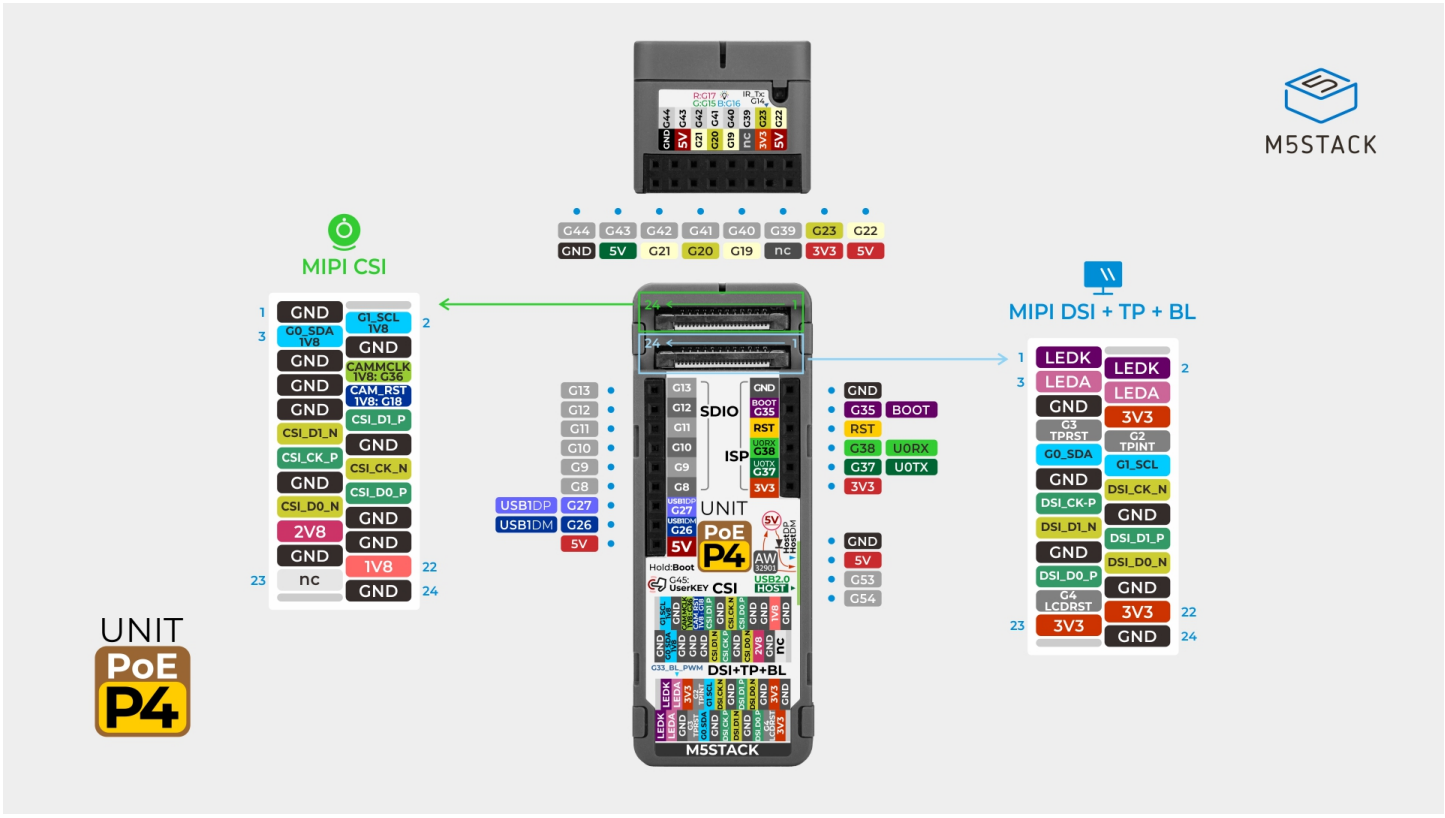
TP

ESP32-P4	G0	G1	G3	G2
FPC - TP	SDA	SCL	TP_RST	TP_INT

Camera

ESP32-P4	CSI_CK_N	CSI_CK_P	CSI_D1_N	CSI_D1_P	CSI_D0_N	CSI_D0_P
MIPI CSI FPC	CAM_CSI_CK_N	CAM_CSI_CK_P	CAM_CSI_D1_N	CAM_CSI_D1_P	CAM_CSI_D0_N	CAM_CSI_D0_P

ESP32-P4	G0	G1	G18	G36
MIPI CSI FPC	SDA_1V8	SCL_1V8	CAM_RST	CAM_MCLK



USB Type-C

ESP32-P4	USB2_OTG_DP	USB2_OTG_DN
USB 2.0 HOST	HOST_DP	HOST_DN

ESP32-P4	G25	G24
USB 2.0 Download / OTG	USB0_DP	USB0_DN

IR & RGB LED & Button

ESP32-P4	G14	G15	G16	G17	G45
IR	IR_TX				
RGB LED		LED_GREEN	LED_BLUE	LED_RED	
Button					KEY_USER

HY2.0-4P

HY2.0-4P	Black	Red	Yellow	White
PORT.CUSTOM	GND	5V	G53	G54

SDIO & ISP

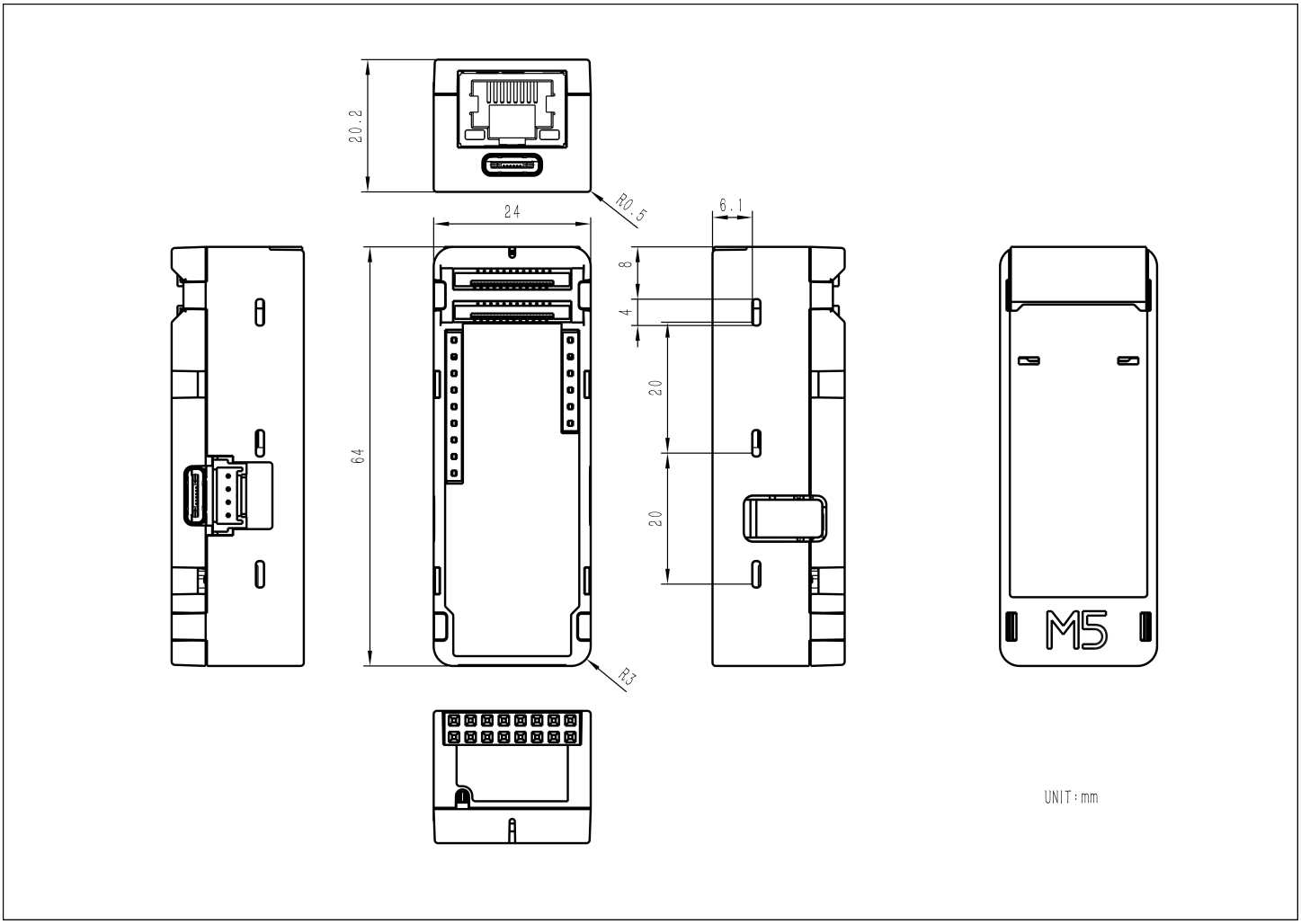
FUNC	PIN	LEFT	RIGHT	PIN	FUNC
	G13	1	1	GND	
	G12	2	2	G35	BOOT
	G11	3	3	RST	
	G10	4	4	G38	UART0_RX
	G9	5	5	G37	UART0_TX
	G8	6	6	3V3	
USB1_DP	G27	7			
USB1_DM	G26	8			
	5V	9			

Hat2-Bus

PIN	LEFT	RIGHT	PIN
GND	1	2	G44
5V	3	4	G43
G21	5	6	G42
G20	7	8	G41
G19	9	10	G40
NC	11	12	G39
3V3	13	14	G23
5V	15	16	G22

Model Size

- Unit PoE-P4 Model Size PDF



Datasheets

- ESP32-P4
- IP101GRI
- TPS23753A

Softwares

Arduino

- Unit PoE-P4 Arduino Quick Start

ESP-IDF

- Unit PoE-P4 Factory Firmware Source Code
- Unit PoE-P4 Factory Firmware Build Guide

Other

- Unit PoE-P4 Factory Reset Firmware Tutorial

Video

- Unit PoE-P4 Product Introduction and Feature Overview

U213-Unit-PoE-P4-video_EN.mp4