Chipsee

Industrial PC

# PPC-CM5-215

PN: CS19108RA5215

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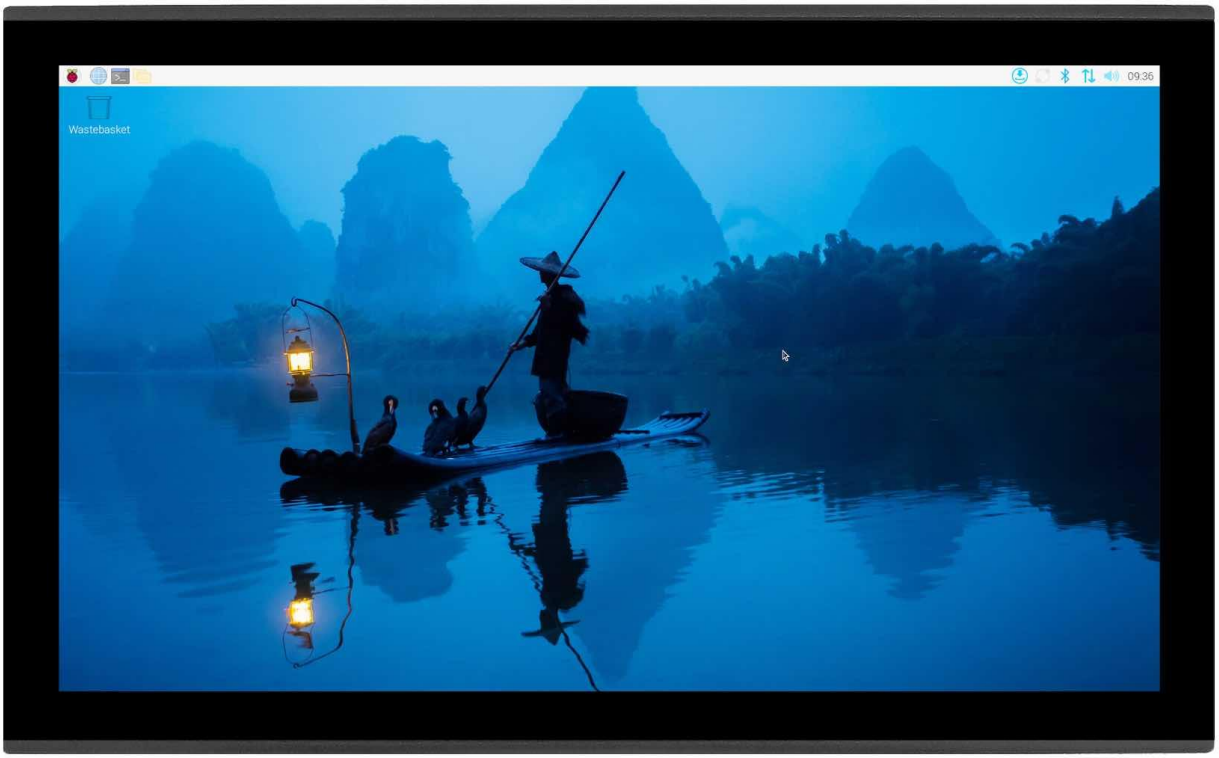
# PPC-CM5-215

## Front View



# Rear View

CAUTION
Hot surface!!
警告
CAUTION
To prevent electric shock. Do not remove the cover repairs, maintenance work must be performed by professionals.
Chipsee
CAUTION
Hot surface

# Side View 1

# Side View 2

# Product Overview

The Cortex®-A76 Raspberry Pi® series PPC-CM5-215 (PN: CS19108RA5215) is a high-quality industrial Pi PC. This single board computer features a 21.5” ten-point capacitive touch screen with a resolution of 1920 x 1080 pixels and brightness of 250 cd/$m^2$ Raspberry Pi Display.

Key Applications

- Human Machine Interface  HMI
- Process Control
- Process Monitoring
- HMI
- IIoT node
- Environmental Monitoring
- PLC
- Automotive applications
- ATM…

It is available as a device hosed in a casing with bezels, thus facilitating different installation options:

- Installation on an industrial cabinet
- Integration with the existing equipment

The PPC-CM5-215 industrial Pi PC is based around the powerful Raspberry Pi® Compute Module 5, powered by the Quad Cortex®-A76 processor with a processor speed of 2.4GHz.

# Ordering Options

Chipsee products can be customized during the ordering process. The product will be shipped with the pre-installed factory defaults if no extra requirements are specified. The table in the Specifications section provides information about the default options bundled with the product.

> **Note**
>
> You can order PPC-CM5-215 from the official Chipsee Store or from your nearest distributor.

## Pi® CM5 Module

The Pi® Compute Module 5 appears in different versions (different RAM size: 2GB, 4GB, or 8GB SDRAM based on CM5 and different eMMC size: 0GB, 16GB, 32GB, or 64GB based on CM5).

The PPC-CM5-215 industrial Pi PC does not include the CM5 Raspberry Pi® module by default.

If you would like to purchase it with a CM5, you can select it at the Chipsee store during the ordering process.

## Operating System

This product comes with a pre-installed Raspberry Pi OS (Software Documentation). Chipsee software engineers have created all the drivers, so every hardware feature is readily available for any standard development tool.

If your project requires a different OS, please **Contact us**, and we'll make a customized version that suits your needs.

## Optional Features

The PPC-CM5-215 industrial Pi PC does not include the 3G/4G/LTE modules by default. These modules are optional and can be selected at the Chipsee store during the ordering process.

The product has a PCIe Gen 2 × 1 (5Gbps), M.2 M-Key 2230/2242/2260/2280 socket (PCIe 3.0 is possible but experimental for CM5), you can use it with your NVMe SSD or other modules that can fit in the slot and supports the protocol. By default the NVMe SSD is not mounted.

> **Warning**
>
> Installation, repair, and maintenance tasks should be performed by trained personnel only.
> Chipsee does not bear any responsibility for damage caused by inadequate handling of the product.

# Specifications

The PPC-CM5-215 industrial Pi PC offers a broad range of performance and connectivity options for scalable integration, providing expandability according to future needs. Some of the key features are listed in the table below.

| PPC-CM5-215 | |
|---|---|
| **CPU** | Raspberry Pi® CM5/CM5Lite; BCM2712 Quad(4) Core Cortex-A76 at 2.4GHz |
| **RAM** | 2GB, 4GB, or 8GB SDRAM based on CM5 |
| **eMMC** | 0GB, 16GB, 32GB, or 64GB based on CM5 |
| **Display** | 21.5" IPS LCD, 1920 x 1080 px, brightness 250 $cd/m^2$ |
| **Touch** | 10-point capacitive touch with 1mm Armored Glass |
| **Storage** | Support for 1 x TF Card1 |
| **PCIe** | PCIe Gen 2 × 1 (5Gbps), M.2 M-Key 2230/2242/2260/2280 socket |
| **USB** | 2 x USB 3.0 type-A Host, 1 x USB type-C OTG |
| **LAN** | 1 x Giga LAN |
| **Audio** | 3.5mm Audio Out Connector, 2W Speaker Internal |
| **Buzzer** | Onboard Buzzer, driven by GPIO |
| **RTC** | High accuracy RTC with farad capacitor, can work 1 week after power off (default). High accuracy RTC with lithium coin battery, can work 3 years after power off (optional) |
| **RS232** | Default to 2 x RS232, up to 4 x RS232 |
| **RS485** | Default to 2 x RS4852, these 2 x RS485 can be configured as 2 x RS232 |
| **CAN** | 1 x CAN FD BUS, Arbitration Bit Rate up to 1Mbps, Data Bit Rate up to 8Mbps |
| **GPIO** | 8 Channels, 4 Input, 4 Output |
| **I2C** | Not Supported |
| **WiFi/BT** | Optional (Depends on CM5)3 |
| **ZIGBEE** | No |
| **HDMI** | 1 x HDMI 2.0 out, can be driven up to 4K 60FPS |
| **3G/4G/LTE** | Supported, not mounted by default |
| **Camera** | Yes, not mounted by default. |
| **Power Input** | From 15V to 30V (supports optional 24V ignition signal) |
| **Current** | 1400mA max at 15V, 1200mA typical at 15V |
| **Power Consumption** | 21W max, 18W typical |

| PPC-CM5-215 | |
|---|---|
| **Working Temperature** | From 0°C to +50°C |
| **OS** | Raspberry Pi OS |
| **Dimensions** | CS19108RA5215P: 535 x 331 x 52.5mm |
| **Weight** | CS19108RA5215P: 5.5kg |
| **Mounting Method** | CS19108RA5215P: Panel, VESA |

Table 375 Key Features

1 TF card slot, **only** used with CM5 Lite to boot system, **cannot** be used as external storage for CM5

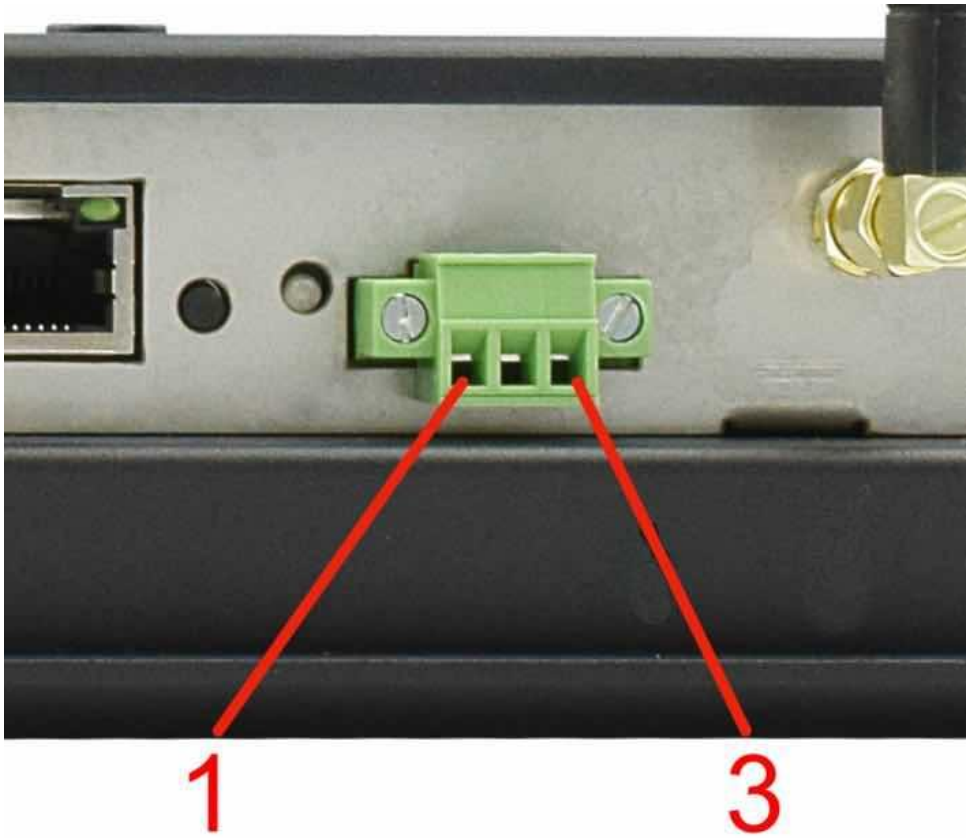
2 The RS485 circuit controls the Input and Output direction automatically, there's no need to control it from within the software.

3 The default product without the CM5 does not include a Wi-Fi/BT module. You can include a CM5 that has the Wi-Fi/BT module at the Chipsee store during the ordering process.

# Power Input

The PPC-CM5-215 industrial Pi PC can be powered by a wide range of input voltages: From 15V to 30V (supports optional 24V ignition signal) DC.

It is a **3 Pin, 3.81mm screw terminal** connector. As shown in the figure below.




*Power Input*

Note that the "**+**" sign represents the positive power input, the "**-**" terminal is shorted to the ground.

| Power Input Definition | | |
|---|---|---|
| **Pin Number** | **Definition** | **Description** |
| Pin 1 | Positive Input | DC Power **Positive Terminal** |
| Pin 2 | Negative Input | DC Power **Negative Terminal** |
| Pin 3 | Ground | **Power System Ground** |

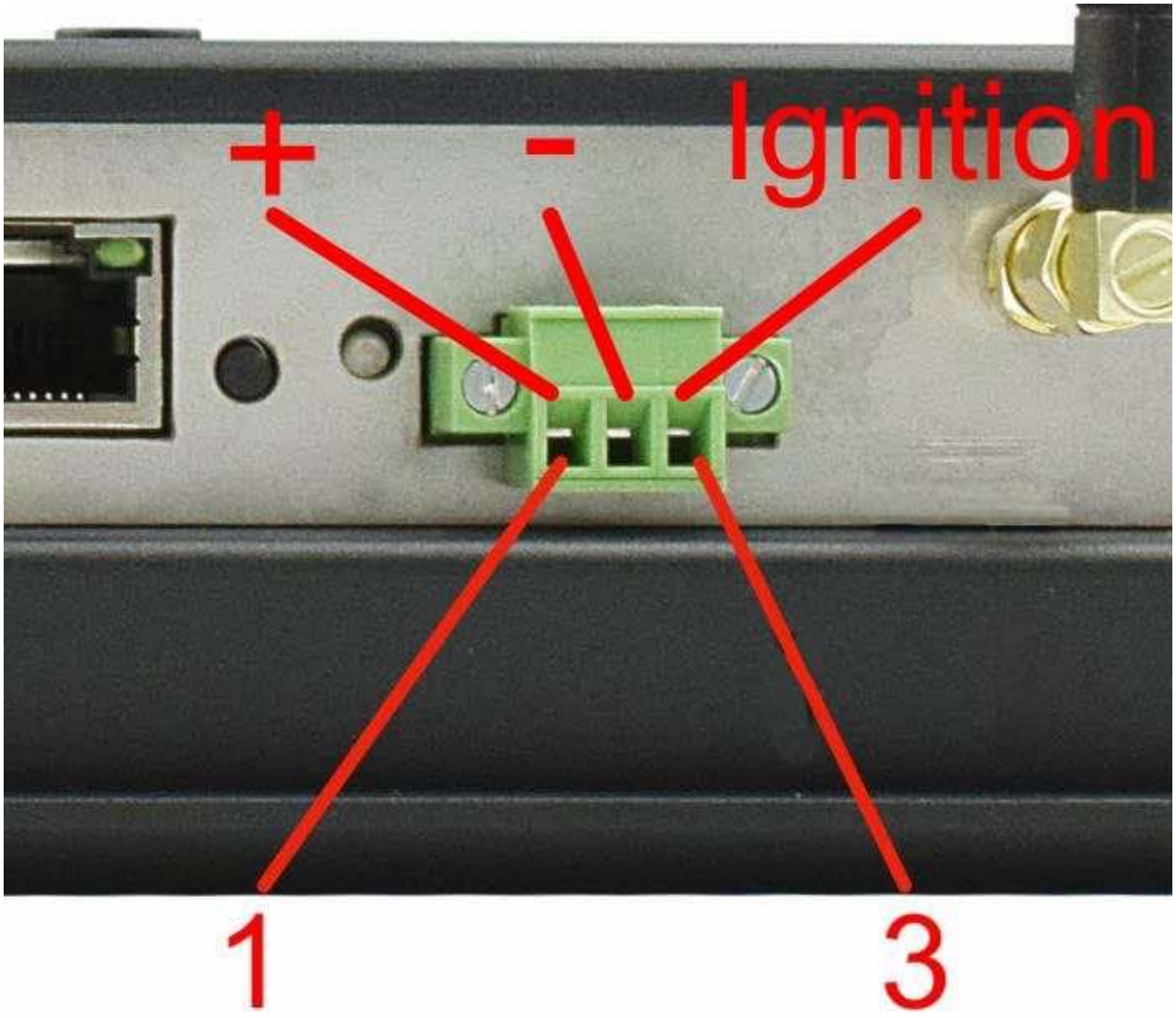
Table 376 Power Connector

> **Note**
>
> The system ground "**G**" is connected to power negative "**-**" on board.

## Ignition Signal

The product has a “ignition signal” **optional** feature. By default the ignition signal is not installed. If you need this feature you can contact us when placing an order. In this setup, Pin 3 is the ignition signal pin.

To use this feature, apply a 24V DC input (relative to -) to Pin 3. If Pin 3 detects a low input voltage, the product will be shutdown. If Pin 3 detects a high input voltage, the product will be boot and running.




*Power Input (with Ignition Signal)*

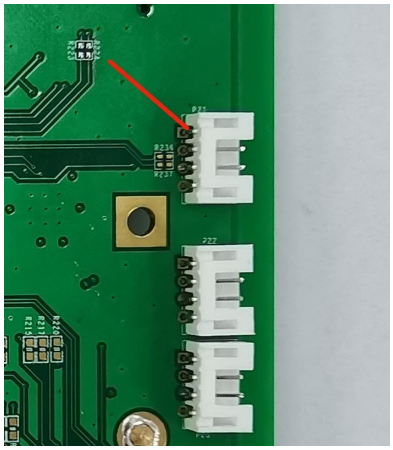
| Power Input Definition | | |
|---|---|---|
| **Pin Number** | **Definition** | **Description** |
| Pin 1 | Positive Input | DC Power **Positive Terminal** |
| Pin 2 | Negative Input | DC Power **Negative Terminal** |

| Power Input Definition | | |
|---|---|---|
| Pin 3 | Ignition | **Ignition Signal** |

Table 377 Power Connector with Ignition Signal

# Touch Screen

The PPC-CM5-215 industrial Pi PC uses a 10-point capacitive touch with 1mm Armored Glass screen. However, the Raspberry Pi OS supports only One-Point touch.
The figure below shows the capacitive touch screen connected to the motherboard via the USB connector.



*Capacitive Touch Connector*

**Attention**

A capacitive touch screen is susceptible to power noise and Electromagnetic Radiation (EMR). It may cause LCD ripples or even capacitive touch malfunction. If using a capacitive multi-touch test application, you might notice the touch points float erratically across the display. There are several solutions to this problem:

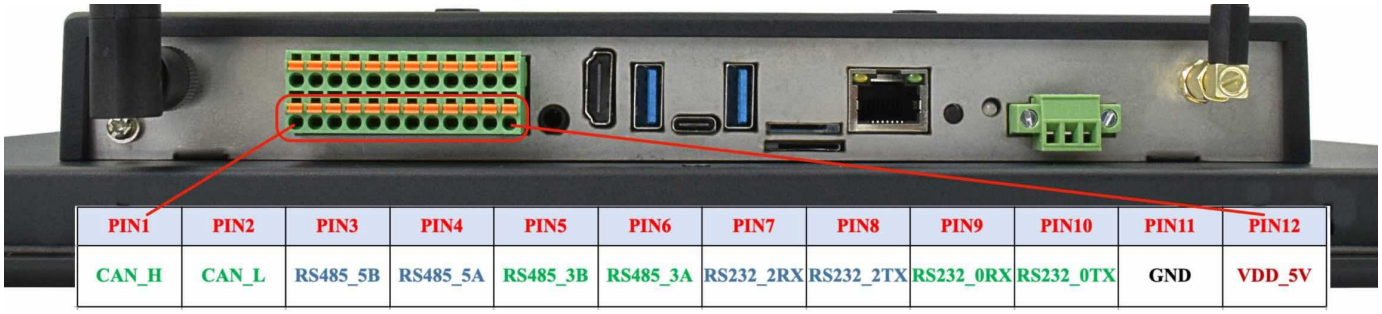
1. Use a high-quality Power Adapter Unit (PSU) with low EMR. You can also provide power from a battery.
2. Make sure that the PPC-CM5-215 Power Input connector (pin 3) is properly connected to the Power System Ground to provide sufficient EMI shielding and eliminate the problem entirely.
3. Bad GND problems can also be confirmed by touching pin 3 of the Power Input connector with one hand while operating the capacitive touch screen with the other hand. In this case, the operator's body acts as the Power System Ground.

# Connectivity

There are many connectivity options available on the PPC-CM5-215 industrial Pi PC. It has 2 x USB 3.0 type-A Host, 1 x USB type-C OTG, 1 x Giga LAN (RJ45) Ethernet connector supporting up to 1 Gbps, and 4 x UART and 1 x CAN FD terminals (RS232/RS485/CAN).

## RS232/RS485/CAN

The serial communication interfaces (RS485, RS232, and CAN) are routed to a phoenix terminal, as illustrated in the figure below.




*RS232-RS485-CAN on the* PPC-CM5-215 *Industrial PC*

| Pin Number | Definition | Description | OS Node |
|---|---|---|---|
| Pin 1 | CAN_H | CPU SPI0, CAN H signal | |
| Pin 2 | CAN_L | CPU SPI0, CAN L signal | CAN0 |
| Pin 3 | RS485_5- | CPU UART5, RS485 –(B) signal | |
| Pin 4 | RS485_5+ | CPU UART5, RS485 +(A) signal | /dev/ttyAMA4 |
| Pin 5 | RS485_3- | CPU UART3, RS485 –(B) signal | |
| Pin 6 | RS485_3+ | CPU UART3, RS485 +(A) signal | /dev/ttyAMA2 |
| Pin 7 | RS232_2_RXD | CPU UART2, RS232 RXD signal | |
| Pin 8 | RS232_2_TXD | CPU UART2, RS232 TXD signal | /dev/ttyAMA1 |
| Pin 9 | RS232_0_RXD | CPU UART0, RS232 RXD signal, Debug Port | |
| Pin 10 | RS232_0_TXD | CPU UART0, RS232 TXD signal Debug Port | /dev/ttyAMA0 |
| Pin 11 | GND | System Ground | |
| Pin 12 | +5V | System +5V Power Output, No more than 1A Current output | |

Table 378 RS232 / RS485 / CAN Pin Definition for 10.1 inch and above products

**Attention**

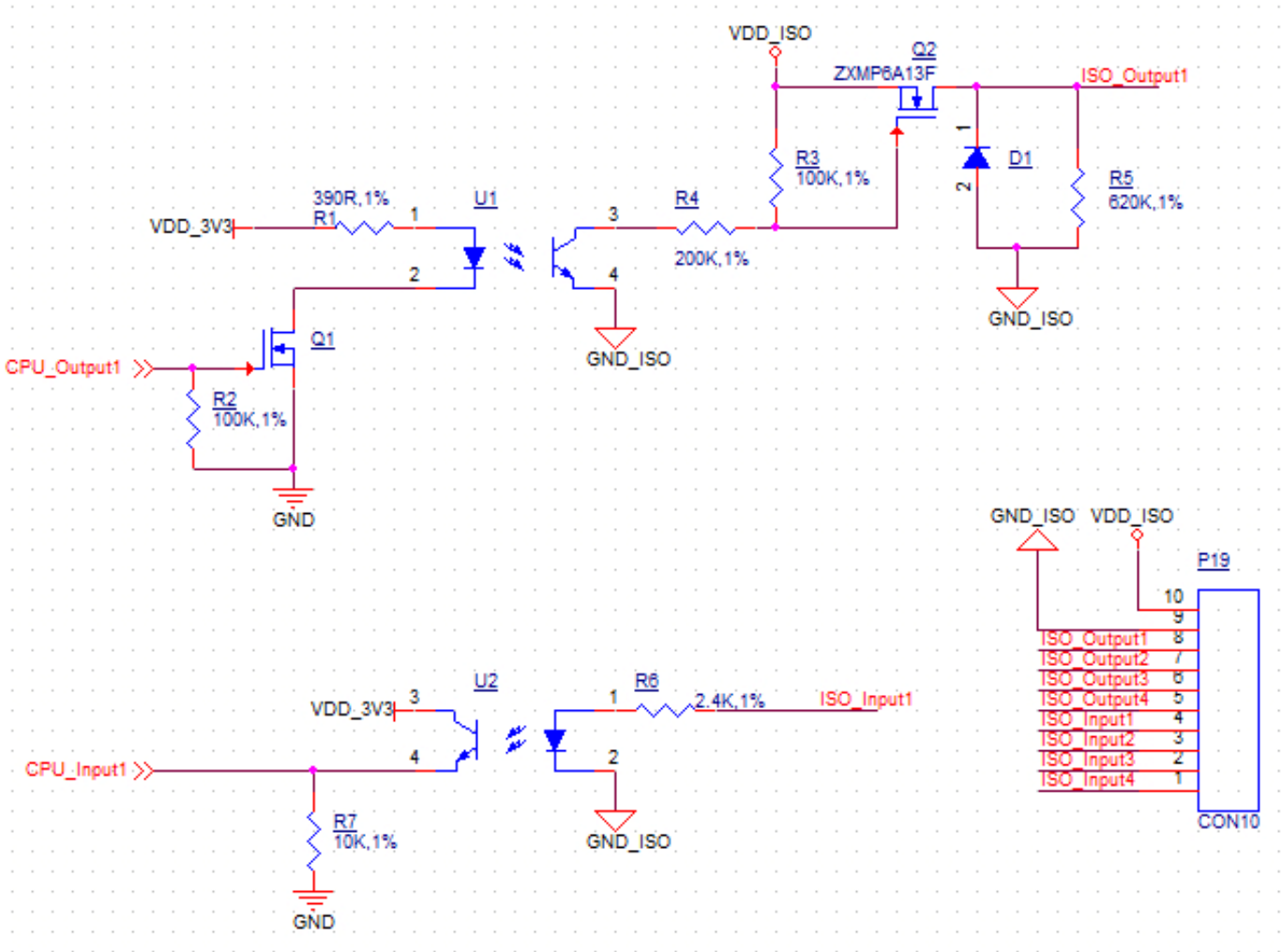
1. RS485_3 and RS485_5 can control the input and output direction automatically. There's no need to control it from within the software.
2. The 120Ω match resistor for RS485 is **NOT** mounted by default.
3. The 120Ω match resistor for CAN is **NOT** mounted by default. Be sure to mount the match resistor when testing CAN.
4. The 2 x RS485 can be configured to 2 x RS232, if you want a custom configuration, you can contact us when placing an order.

## GPIO Port

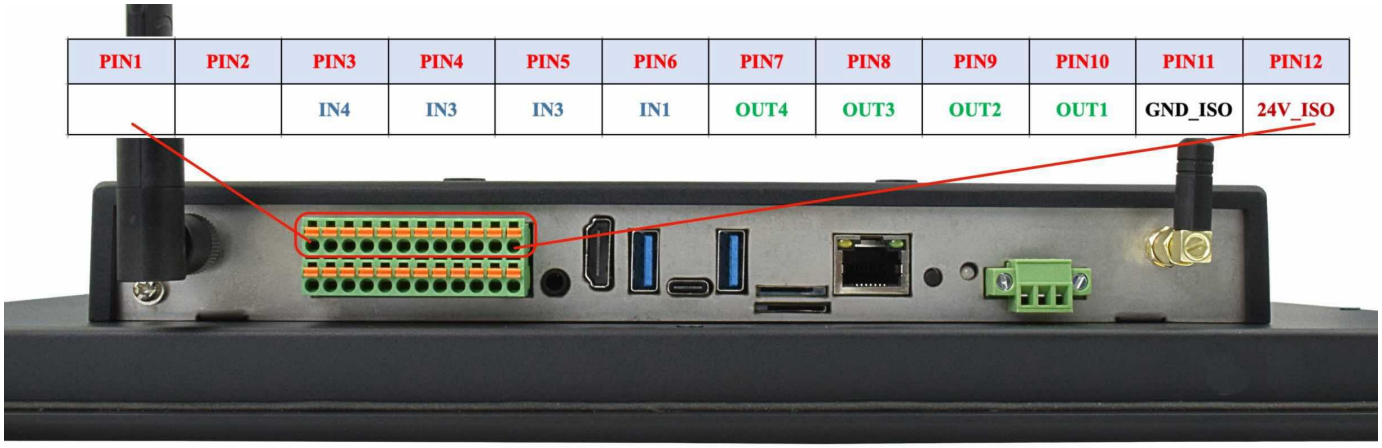
The PPC-CM5-215 industrial Pi PC has a **phoenix connector**, as shown in the figure below. The table below gives details about the definition of every Pin.

**Attention**

1. In order to use the Isolated Output, you need to add an external Isolated Power to the VDD_ISO and GND_ISO. The power voltage should not exceed 24V.
2. The output current can achieve 500mA for every channel, but it also depends on the isolated power that is connected.
3. In order to use the Isolated Input, you need to add a signal to the ISO_InputX and GND_ISO. A 2.4KΩ resistor, as R6, has been added to limit the input current, as shown in the figure below. This resistor should work well for the 5-24V input signal. If your input signal is less than 5V, please change this input resistor. The reduced schematic is for reference purpose, if you need the precise resistor schematic, please contact us.




*Isolated GPIO reduced schematic*




*GPIO Connector*

| GPIO Connector Pin Definition: | | |
|---|---|---|
| **Pin Number** | **Definition** | **Description** |
| Pin 12 | 24V_ISO | Isolated Power +24V Input |
| Pin 11 | GND_ISO | Isolated Ground |
| Pin 10 | OUT1 | Isolated Output 1 |
| Pin 9 | OUT2 | Isolated Output 2 |
| Pin 8 | OUT3 | Isolated Output 3 |
| Pin 7 | OUT4 | Isolated Output 4 |
| Pin 6 | IN1 | Isolated Input 1 |
| Pin 5 | IN2 | Isolated Input 2 |
| Pin 4 | IN3 | Isolated Input 3 |
| Pin 3 | IN4 | Isolated Input 4 |

Table 379 GPIO Connector Pin-out

## USB Connectors

There are 2 x USB 3.0 type-A Host, 1 x USB type-C OTG onboard, as shown in the figure below.

*USB HOST Connectors*

> **Attention**
>
> These two USB host connectors can drive 500mA for each channel at most.

The product has one USB Type-C OTG connector that works as a slave by default. You can use it to establish a connection with the host PC and for downloading the system to the eMMC of CM5 module.

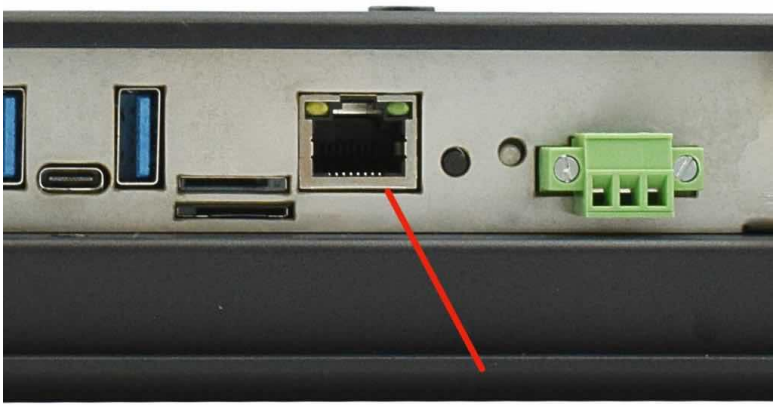
*USB Type-C OTG Connector*

**Warning**

1. Be careful not to touch surrounding electronic components accidentally while plugging in USB devices into the embedded Industrial PC version.

## LAN

The 1 x Giga LAN provides Ethernet connectivity over standardized Ethernet cables as shown in the figure below. The integrated Ethernet interface supports up to 1 Gbps data throughput. These Giga LAN signals come from the CM5 module directly.



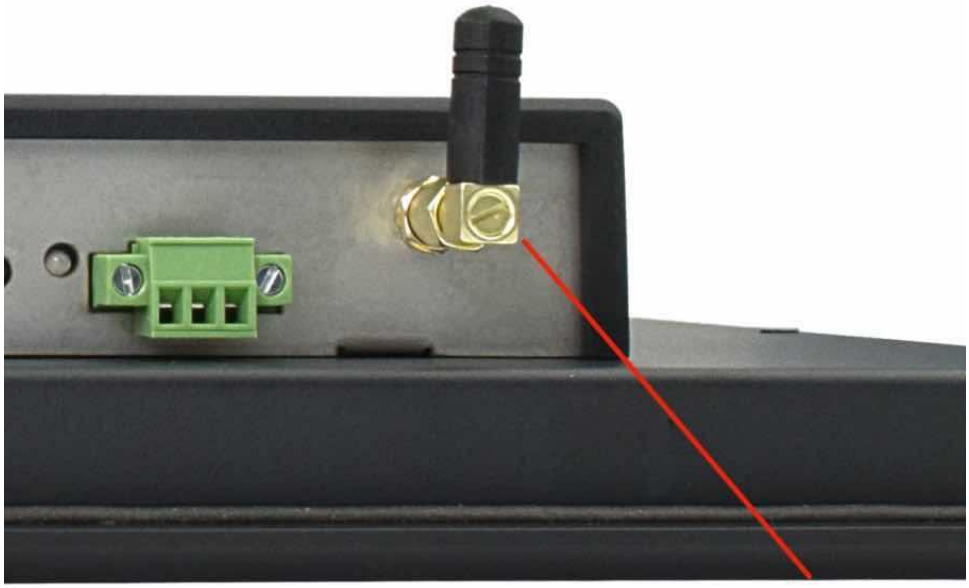
*RJ45 LAN Connector*

**Note**

Use CAT5 or better cables to achieve full data throughput over maximum distance defined by the 1000BASE-T standard (100m).

## WiFi & BT Module

The default PPC-CM5-215 without the CM5 does not include a Wi-Fi/BT module.
If you include a CM5 that has the Wi-Fi/BT module, the product will have Wi-Fi/BT feature.
The product also has an SMA connector for an external WiFi/BT antenna:



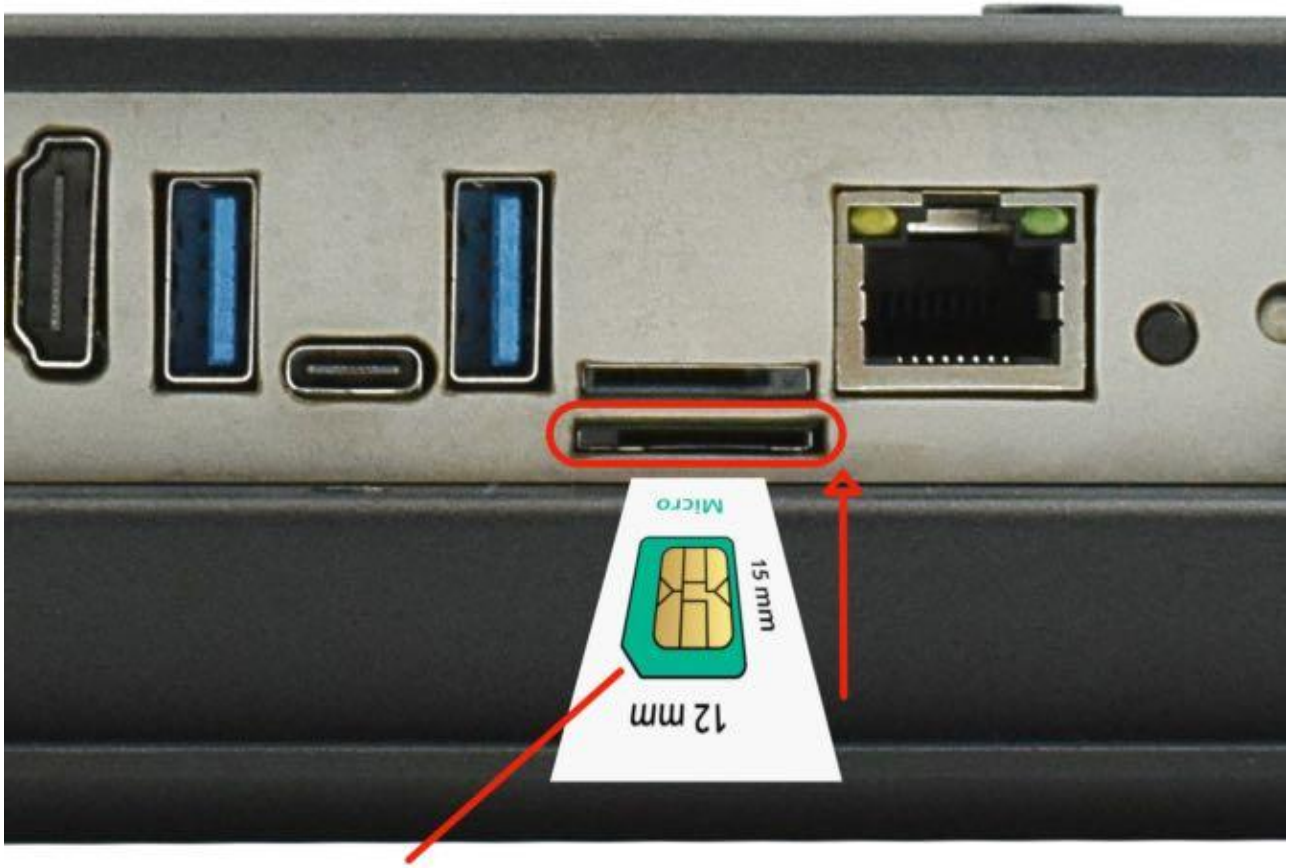
*WiFi+BT Antenna*

**Attention**

The product does not come shipped with the Wi-Fi/BT module by default.

## 3G/4G/LTE Module

The PPC-CM5-215 industrial Pi PC is equipped with a **mini-PCIe connector** that can connect to a 3G/4G/LTE module. The customer will also need a SIM Card Holder and a 3G/4G/LTE antenna to ensure 3G/4G/LTE works on the PPC-CM5-215. SIM card does **NOT** support hot plug. **Power off** before inserting or removing SIM card.




*SIM Card Direction*

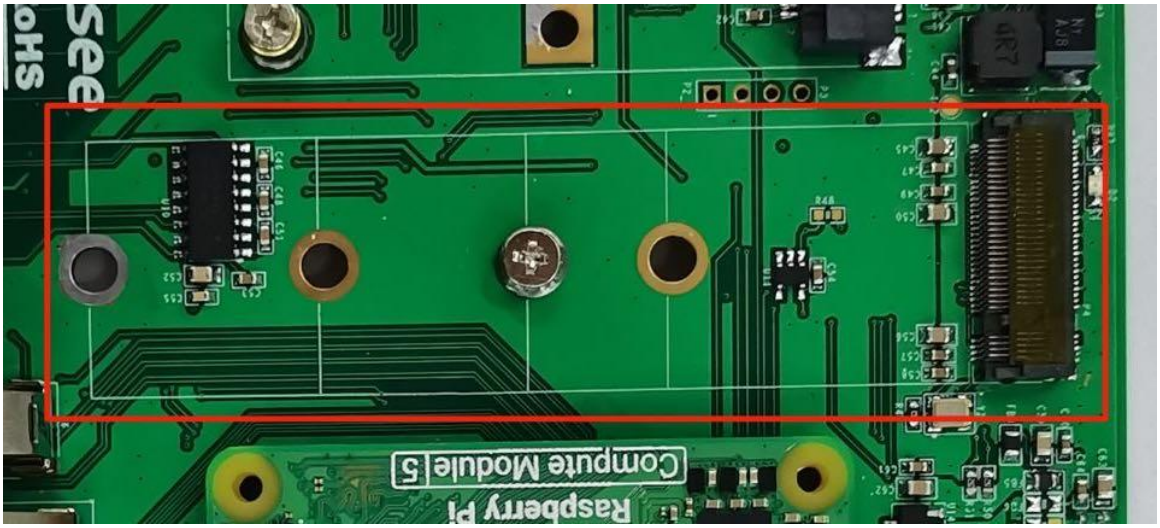
*3G/4G/LTE Module*

**Attention**

The product does not come shipped with the 3G/4G/LTE module by default. If you need to use 3G/4G/LTE, you can contact us when placing an order, we can install the necessary hardware for you.

## M.2 Module

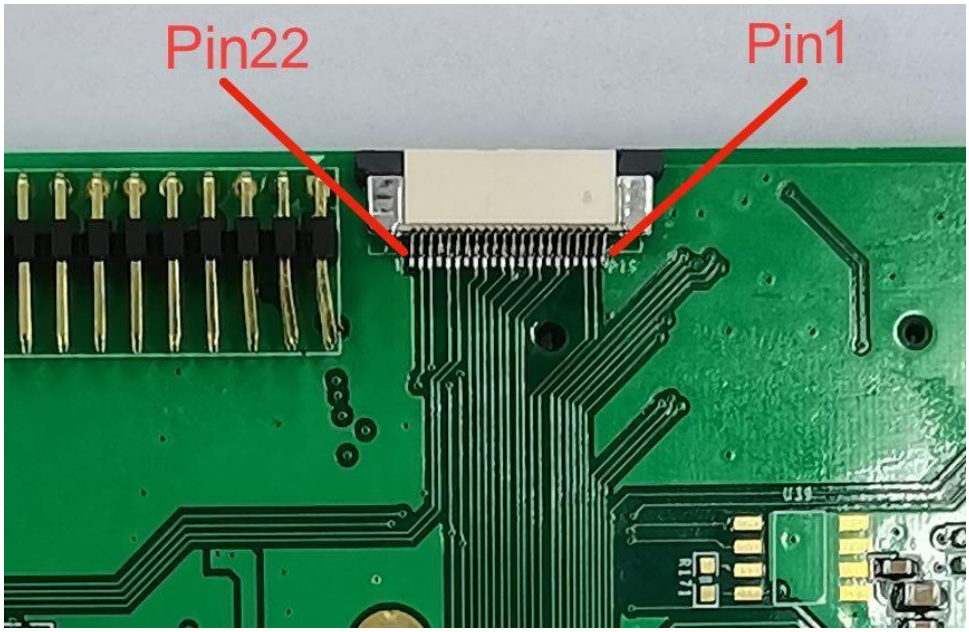
The PPC-CM5-215 industrial Pi PC has a M.2 slot, it supports NVME m.2 SSD or other m.2 modules such as an AI compute module. It's PCIe Gen 2 × 1 (5Gbps), M.2 M-Key 2230/2242/2260/2280 socket. The modules are **not included** in the product **by default**.




*M.2 Connector*

## Camera Connector

The PPC-CM5-215 industrial Pi PC has a 22 Pin **Camera Connector**. The camera signals come from CAM1. The table below gives details about the definition of every pin.




*Camera Connector*

| **Camera Connector Pin Definition:** | | |
|---|---|---|
| **Pin Number** | **Definition** | **Description** |
| Pin 1 | GND | Power Ground |
| Pin 2 | CAM1_DN0 | CSI Negative Channel 0 |
| Pin 3 | CAM1_DP0 | CSI Positive Channel 0 |
| Pin 4 | GND | Power Ground |
| Pin 5 | CAM1_DN1 | CSI Negative Channel 1 |
| Pin 6 | CAM1_DP1 | CSI Positive Channel 1 |
| Pin 7 | GND | Power Ground |
| Pin 8 | CAM1_CN | CSI Negative CLK |
| Pin 9 | CAM1_CP | CSI Positive CLK |
| Pin 10 | GND | Power Ground |
| Pin 11 | CAM1_DN2 | CSI Negative Channel 2 |
| Pin 12 | CAM1_DP2 | CSI Positive Channel 2 |
| Pin 13 | GND | Power Ground |
| Pin 14 | CAM1_DN3 | CSI Negative Channel 3 |
| Pin 15 | CAM1_DP3 | CSI Positive Channel 3 |

| Camera Connector Pin Definition: | | |
|---|---|---|
| Pin 16 | GND | Power Ground |
| Pin 17 | CAM_GPIO0 | CAM GPIO0, use for disable camera power and module |
| Pin 18 | CAM_GPIO1 | CAM GPIO1, use for disable camera power and module |
| Pin 19 | GND | Power Ground |
| Pin 20 | SCL0 | CPU I2C SCL0 signal |
| Pin 21 | SDA0 | CPU I2C SDA0 signal |
| Pin 22 | +3.3V | System +3.3V Power Output, No more than 500mA Current output |

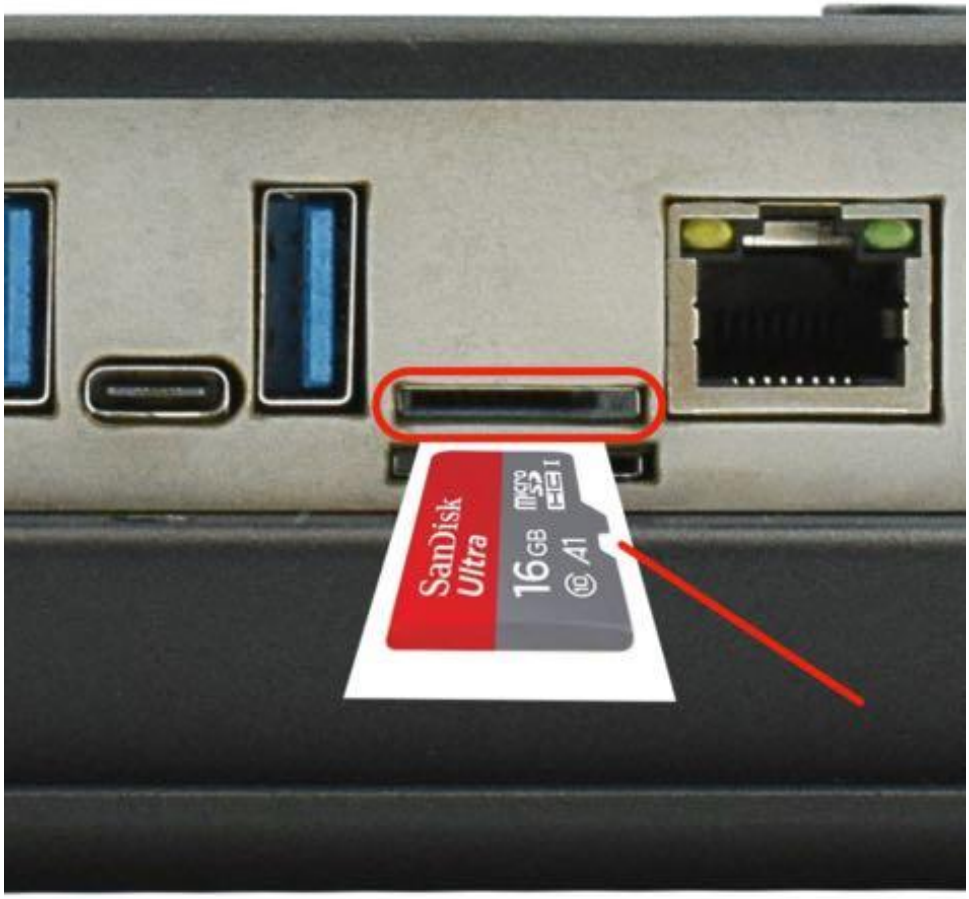
Table 380 Camera Connector Pin-out

**Attention**

1. The camera connector is supported but not mounted by default. Please contact us when placing an order if you need to use camera on the PPC-CM5-215.

# TF Card Slot

The PPC-CM5-215 industrial Pi PC features 1 x **TF Card (micro SD) slot**. A slot can address up to 128GB of memory.



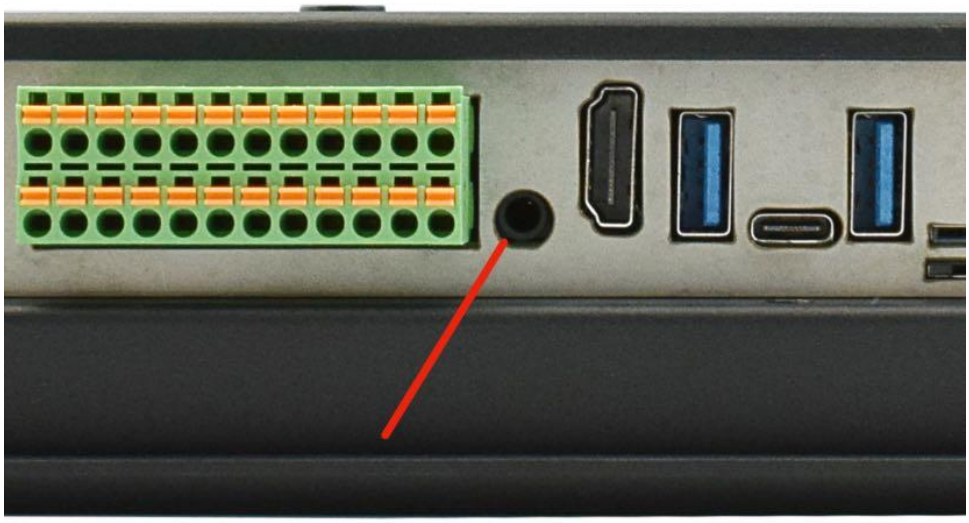

*TF (micro SD) Card Slot*

**Attention**

1. The TF card cannot be used for memory extension. It is only used for system boot-up for CM5 LITE model.
2. The product does not come shipped with the TF card by default.

# Audio Connectors

The PPC-CM5-215 industrial Pi PC features some audio peripherals. It has 1 x **3.5mm audio output jack**.
Also, the PPC-CM5-215 industrial Pi PC has a miniature 2W internal speaker for audio reproduction, as well as a small buzzer for alarm/notification sounds.



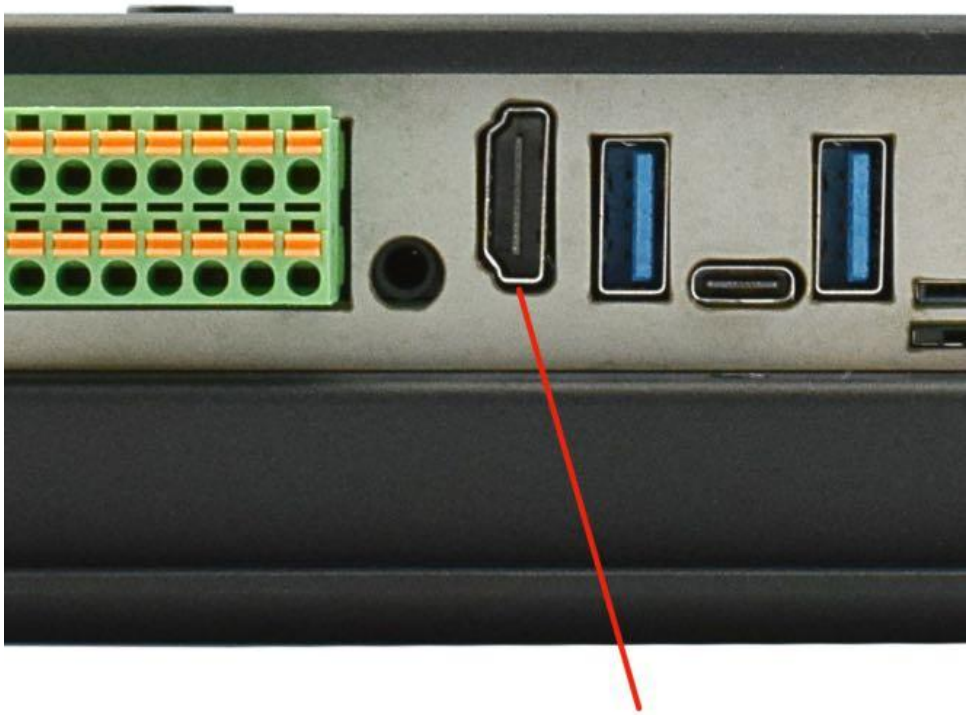
*Audio Connector*

**Attention**

By plugging in the headphone cable, the internal speaker will be disabled automatically.

# HDMI Connector

The PPC-CM5-215 industrial Pi PC supports 1 x HDMI 2.0 out, can be driven up to 4K 60FPS.



*Micro HDMI Connector*

# PROG Button

The PPC-CM5-215 industrial Pi PC has one button for entering usb download mode, as shown in the figure below.

When booting **with** the button being pressed, the Raspberry Pi will boot from the USB connector. You can use this feature to download the OS software to the internal eMMC.

When booting **without pressing** the button, the Raspberry Pi will boot from the internal eMMC.

There is no need to press the button during regular operation. However, if you need to reinstall the OS, please refer to the detailed information on how to reflash the OS from the Software Documentation.

*PROG Button*

# Mounting Procedure

## CS19108RA5215P

You can mount CS19108RA5215P with VESA mounting (guide): **75 x 75** mm or **100 x 100** mm, 4 x **M4** (6mm) screws.

You can mount CS19108RA5215P with PANEL mounting (guide).

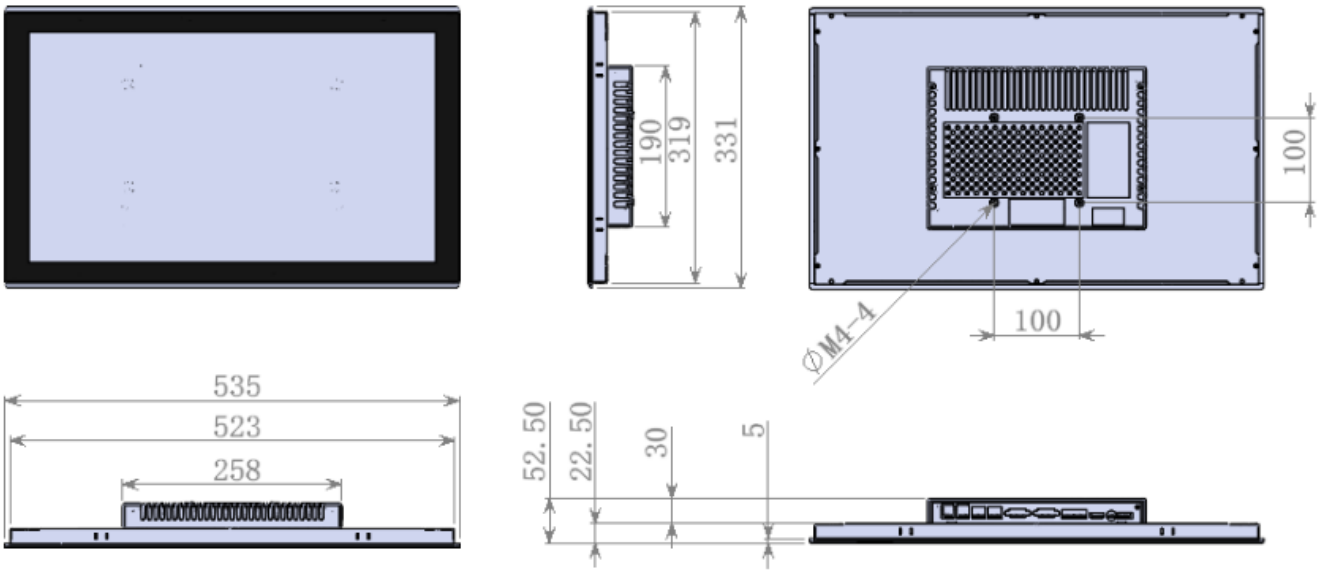
> **Attention**
>
> Please make sure the display is not exposed to high pressure when mounting into an enclosure.

# Mechanical Specifications

## CS19108RA5215P

For CS19108RA5215P, the outer mechanical dimensions are 535 x 331 x 52.5mm (W x L x H).

Please refer to the technical drawing in the figure below for details related to the specific product measurements.




*Technical Drawing*

# Disclaimer

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