



USER MANUAL

# VTS-8589

Low power quad-core digital signage  
starter kit for OPS systems



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### **Notice 1**

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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### **Notice 3**

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- Do not attempt to force open the battery.
- Do not discard used batteries with regular trash.
- Discard used batteries according to local regulations.



## Safety Precautions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- All cautions and warnings on the equipment should be noted.
- Keep this equipment away from humidity.
- Lay this equipment on a reliable flat surface before setting it up.
- Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
- Place the power cord in such a way that people cannot step on it.
- Always unplug the power cord before inserting any add-on card or module.
- If any of the following situations arises, get the equipment checked by authorized service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment has not worked well or you cannot get it work according to User's Manual.
  - The equipment has dropped and damaged.
  - The equipment has obvious sign of breakage.
- Do not leave this equipment in an environment unconditioned or in a storage temperature above 60°C (140°F). The equipment may be damaged.
- Do not leave this equipment in direct sunlight.
- Never pour any liquid into the opening. Liquid can cause damage or electrical shock.
- Do not place anything over the power cord.
- Do not cover the ventilation holes. The openings on the enclosure protect the equipment from overheating

## Box Contents

### VTS-8589-QP SKU

- 1 x VTS-8589-QP board (with 1.0GHz NXPI i.MX 6QuadPlus Cortex-A9 quad-core SoC)
- 1 x Wi-Fi antenna
- 1 x Wi-Fi antenna cable

### VTS-8589 SKU

- 1 x VTS-8589 board (with 1.0GHz NXPI i.MX 6Quad Cortex-A9 quad-core SoC)
- 1 x Wi-Fi antenna
- 1 x Wi-Fi antenna cable

## Ordering Information

### Part Number

00GFK10H10020

### Description

VTS-8589-QP board with 1.0GHz i.MX 6QuadPlus Cortex-A9 SoC, 8GB eMMC, 4MB SPI Flash ROM, 2GB DDR3 SDRAM, 2 x USB 2.0, Gigabit Ethernet, onboard Wi-Fi, Micro SD card slot, and OPS connector

00GFK10500020

VTS-8589 board with 1.0GHz i.MX 6Quad Cortex-A9 SoC, 8GB eMMC, 4MB SPI Flash ROM, 2GB DDR3 SDRAM, 2 x USB 2.0, Gigabit Ethernet, onboard Wi-Fi, Micro SD card slot, and OPS connector

## Optional Accessories

### AC-to-DC Adapter and Power Cord

#### Part Number

99G63-020306

99G33-02032C

#### Description

AC-to-DC adapter, DC 12V/5A, 60W

Power cord, 180cm, USA type

### Expansion Boards

#### Part Number

00GJE00000020

#### Description

VTS-8592 OPS I/O card with 2 x USB 2.0 ports, HDMI port, audio jack, reset, power button, and 12V~19V DC-in

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# 1. Product Overview

The VTS-8589 board is an all-in-one digital signage kit for Open Pluggable Specification (OPS) systems. Complies with OPS board standard, the VTS-8589 board is powered by a 1.0GHz NXP i.MX 6QuadPlus (or i.MX 6Quad) Cortex-A9 quad-core SoC with power efficient graphics processor to delivers remarkable performance for a wide range digital signage applications.

The VTS-8589 board is fully compatible with Linux kernel 4.1.15 / 3.10.53 operating system, and provides support for extensive connectivity options, including and Gigabit Ethernet port, two USB 2.0 ports, and Micro SD card slot for expandable storage. In addition, the VTS-8589 board has an onboard Wi-Fi controller for Wi-Fi connectivity.

## 1.1. Key Features

- Powered by 1.0GHz NXP i.MX 6QuadPlus (or i.MX 6Quad) Cortex-A9 quad-core SoC
- Open Pluggable Specification (OPS) compliant
- Onboard Wi-Fi support
- Flawless HD video performance up to 1080p
- 8GB onboard eMMC Flash memory
- Supports one Micro SD card slot for expandable storage up to 32GB size
- HTML5 support
- Compatible with Linux kernel operating system
  - Linux kernel 4.1.15 (VTS-8589-QP SKU)
  - Linux kernel 3.10.53 (VTS-8589 SKU)
- Fanless and ultra-low power consumption



## 1.2. Product Specifications

### Processor

- 1.0GHz NXP i.MX 6QuadPlus Cortex-A9 quad-core SoC (VTS-8589-QP SKU)
- 1.0GHz NXP i.MX 6Quad Cortex-A9 quad-core SoC (VTS-8589 SKU)

### System Memory

- 2GB DDR3 SDRAM

### Storage

- 8GB eMMC Flash memory

### Boot Loader

- 4MB SPI Flash ROM

### Graphics

- Vivante GC2000+ GPU (VTS-8589-QP SKU) / Vivante GC2000 GPU (VTS-8589 SKU)
  - Three integrated, independent 3D/2D and video graphics processing units
  - Supports OpenGL® ES 3.0, OpenCL and OpenVG™ 1.1 hardware acceleration
  - Supports MPEG-2, VC1 and H.264 video decoding up to 1080p
  - Supports SD encoding

### LAN

- Micrel KSZ9031RNX Gigabit Ethernet transceiver with RGMII support

### Audio

- NXP SGTL5000 low power stereo codec

### HDMI

- Integrated HDMI Transmitter

### USB

- SMSC USB2514 USB 2.0 High Speed 4-port hub controller

### Wi-Fi

- Realtek RTL 8189ETS SDIO onboard Wi-Fi module

### Onboard I/O

- 1 x Boot Flash select jumper
- 1 x Watchdog select jumper
- 1 x RTC battery connector
- 1 x Wi-Fi antenna connector

### Front Panel I/O

- 1 x Reset button
- 2 x USB 2.0 ports
- 1 x Gigabit Ethernet port
- 1 x Micro SD Card slot

### Back Panel I/O

- 1 x Open Pluggable Specification (OPS) plug connector - includes signal for:
  - 2 x USB 2.0 ports
  - 1 x HDMI port
  - 1 x UART (TTL 3V3)
  - GPIO
  - Audio jack
  - Power (12V~19V)

### Power Supply

- 12V ~ 19V DC-in (included in OPS plug connector)

**Operating Conditions**

- **Operating Temperature**
  - 0°C ~ 45°C
- **Operating Humidity**
  - 0% ~ 90% (relative humidity; non-condensing)

**Form Factor**

- 121mm x 114mm (12.1cm x 11.4cm)

**Operating System**

- Linux kernel 4.1.15 (VTS-8589-QP SKU)
- Linux kernel 3.10.53 (VTS-8589 SKU)

**Notes:**

1. As the operating temperature provided in the specifications is a result of the test performed in VIA's chamber, a number of variables can influence this result. Please note that the working temperature may vary depending on the actual situation and environment. It is highly suggested to execute a solid testing and take all the variables into consideration when building the system. Please ensure that the system runs well under the operating temperature in terms of application.
2. Please note that the lifespan of the onboard eMMC memory chip may vary depending on the amount of access. More frequent and larger data access on eMMC memory makes its lifespan shorter. Therefore, it is highly recommended to use a replaceable external storage (e.g., Micro SD card) for large data access.

### 1.3. Layout Diagram

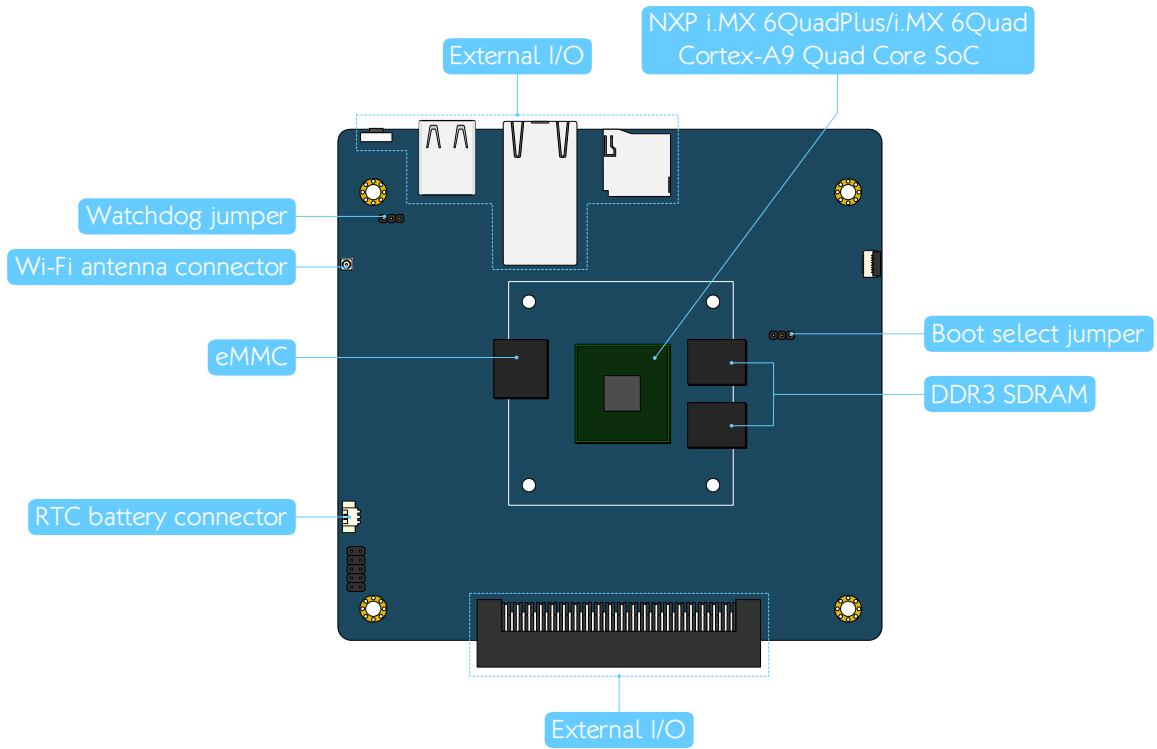


Figure 1: Layout diagram of the VTS-8589 (top side)

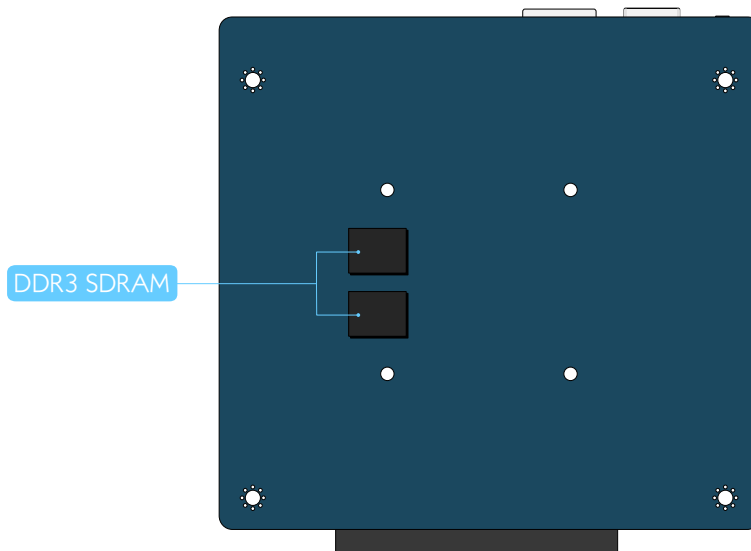


Figure 2: Layout diagram of the VTS-8589 (bottom side)

## 1.4. Product Dimensions

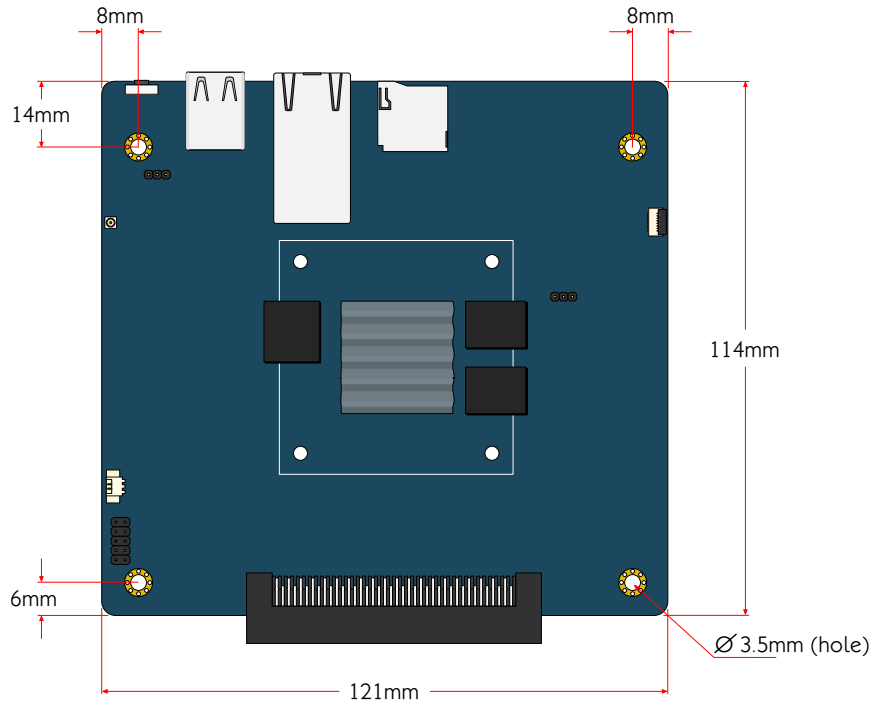


Figure 3: Mounting holes and dimensions of the VTS-8589 board

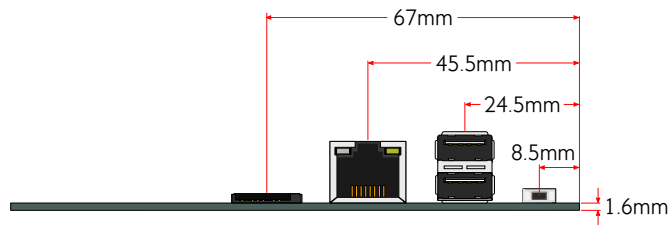


Figure 4: External I/O port dimensions of the VTS-8589 board (front panel)

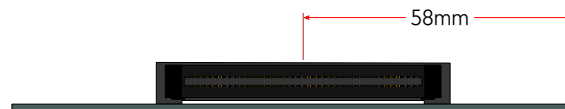


Figure 5: External I/O port dimensions of the VTS-8589 board (back panel)

## 1.5. Height Distribution

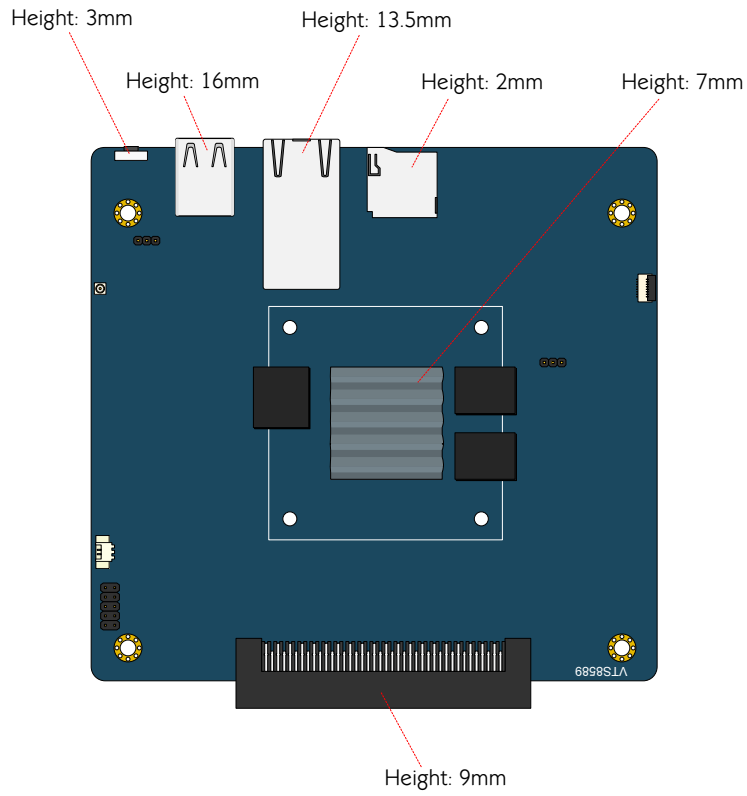


Figure 6: Height distribution of the VTS-8589 board

## 2. I/O Interface

VTS-8589 has a selection of interfaces integrated into the board. It includes a selection of frequently used ports as part of the external I/O coastline.

### 2.1. External I/O Ports

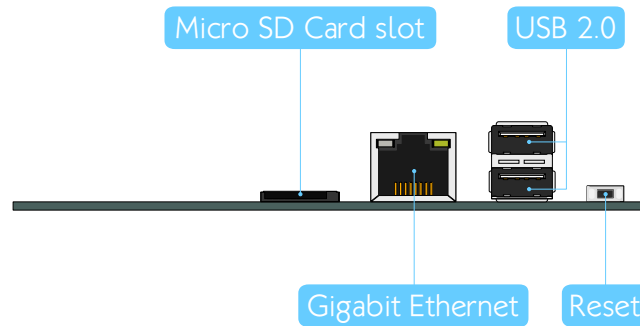


Figure 7: Front panel I/O

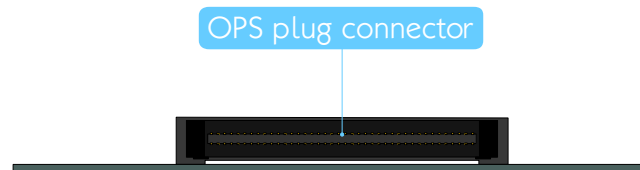


Figure 8: Back panel I/O

#### 2.1.1. Micro SD Card Slot

The Micro SD card slot offers expandable storage up to 32GB size.



Figure 9: Micro SD card slot diagram

Pin	Signal
1	SD0DATA2
2	SD0DATA3
3	SD0CMD
4	VDD (3.3V)
5	SD0CLK
6	GND
7	SD0DATA0
8	SD0DATA1
9	SD0_CD

Table 1: Micro SD card slot pinout

## 2.1.2. Gigabit Ethernet Port

The VTS-8589 is equipped with Gigabit Ethernet port. The Gigabit Ethernet port is using 8 Position 8 Contact (8P8C) receptacle connector or commonly referred to as RJ-45. It is fully compliant with IEEE 802.3 (10BASE-T), 802.3u (100BASE-TX), and 802.3ab (1000BASE-T) standards. The pinout of the Gigabit Ethernet port is shown below.

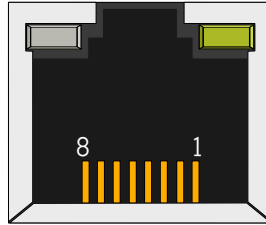


Figure 10: Gigabit Ethernet port diagram

Pin	Signal
1	LAN1_TD0+
2	LAN1_TD0-
3	LAN1_TD1+
4	LAN1_TD1-
5	LAN1_TD2+
6	LAN1_TD2-
7	LAN1_TD3+
8	LAN1_TD3-

Table 2: Gigabit Ethernet port pinout

The Gigabit Ethernet port (RJ-45) is equipped with two LED indicators on the front side to show its Active/Link status and Speed status.

	Active LED (Left LED on RJ-45 port)	Link LED (Right LED on RJ-45 port)
Link Off	LED is off	LED is off
Speed_10Mbit	Flash in Orange color	LED is off
Speed_100Mbit	Flash in Orange color	The LED is always On in Red color
Speed_1000Mbit	Flash in Orange color	The LED is always On in Green color

Table 3: Gigabit Ethernet port LED color definition

## 2.1.3. USB 2.0 Port

The VTS-8589 is equipped with two USB 2.0 ports. Each port gives complete Plug & Play and hot swapping capability for external devices. The USB interface complies with USB UHCI, Rev. 2.0. The pinout of the USB 2.0 ports are shown below.

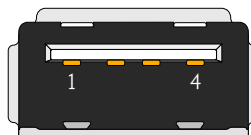


Figure 11: USB 2.0 port diagram

USB 2.0 port 1		USB 2.0 port 2	
Pin	Signal	Pin	Signal
1	VCC	1	VCC
2	USB1_data-	2	USB2_data-
3	USB1_data+	3	USB2_data+
4	GND	4	GND

Table 4: USB 2.0 port pinout

## 2.1.4. Reset Button

The VTS-8589 comes with a reset button on the front panel. The reset button allows the user to reboot or reset the system forcibly without turning off the system power.



Figure 12: Reset button diagram

## 2.1.5. Open Pluggable Specification Plug Connector

The VTS-8589 comes with an Open Pluggable Specification (OPS) plug connector on the back panel that provides hardware interface connecting the OPS board to the OPS display or OPS I/O card. The OPS plug connector contains signal groups of HDMI, USB 2.0, UART, GPIO, audio, and power (12V~19V) interfaces. The OPS plug connector consists of 80-pins. The pinout of the OPS plug connector is shown below.



Figure 13: OPS plug connector diagram

Pin	Signal	Pin	Signal
1	RSVD	41	RSVD
2	RSVD	42	RSVD
3	GND	43	RSVD
4	RSVD	44	RSVD
5	RSVD	45	RSVD
6	GND	46	RSVD
7	RSVD	47	RSVD
8	RSVD	48	RSVD
9	GND	49	RSVD
10	RSVD	50	SYS_FAN
11	RSVD	51	UART_RXD
12	GND	52	UART_TXD
13	RSVD	53	GND
14	RSVD	54	RSVD
15	RSVD	55	RSVD
16	GND	56	GND
17	TMDS_CLK-	57	RSVD
18	TMDS_CLK+	58	RSVD
19	GND	59	GND
20	TMDS0-	60	RSVD
21	TMDS0+	61	RSVD
22	GND	62	GND
23	TMDS1-	63	USB_PN1
24	TMDS1+	64	USB_PP1
25	GND	65	GND
26	TMDS2-	66	USB_PN0
27	TMDS2+	67	USB_PP0
28	GND	68	GND
29	DVI_DDC_DATA	69	AZ_LINEOUT_L
30	DVI_DDC_CLK	70	AZ_LINEOUT_R



31	DVI_HPD	71	CEC
32	GND	72	PB_DET
33	+12V~+19V	73	PS_ON#
34	+12V~+19V	74	PWR_STATUS
35	+12V~+19V	75	GND
36	+12V~+19V	76	GND
37	+12V~+19V	77	GND
38	+12V~+19V	78	GND
39	+12V~+19V	79	GND
40	+12V~+19V	80	GND

Table 5: OPS plug connector pinout

## 2.2. Onboard Connectors

### 2.2.1. RTC Battery Connector

The VTS-8589 is equipped with onboard RTC battery connector used for connecting the external cable battery that provides power to the 32.768KHz crystal oscillator for Real Time Clock (RTC). The pinout of the RTC connector is shown below.

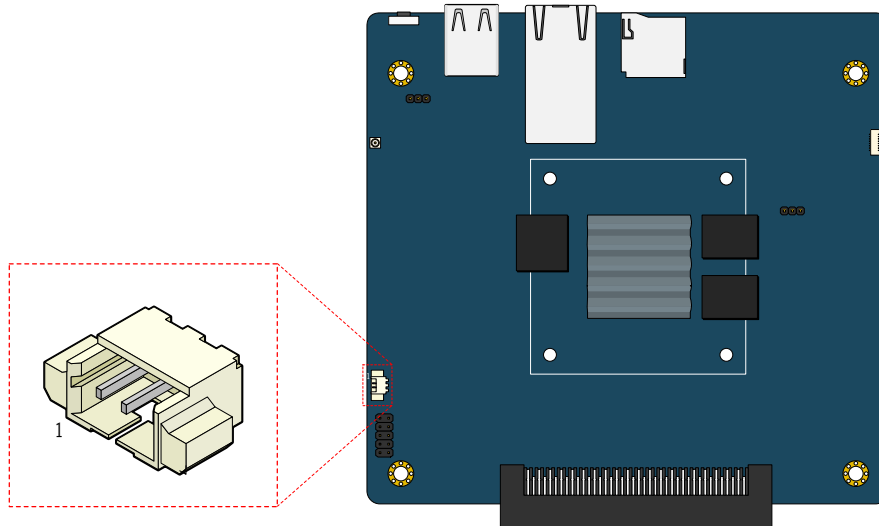


Figure 14: RTC battery connector diagram

Pin	Signal
1	VBAT
2	GND

Table 6: RTC battery connector pinout

### 2.2.2. Wi-Fi Antenna Connector

The VTS-8589 is equipped with an onboard Wi-Fi antenna connector (micro-RF connector) used for connecting the Wi-Fi antenna cable to provide Wi-Fi connection. The Wi-Fi antenna connector is labeled as "VCC\_WIFI".

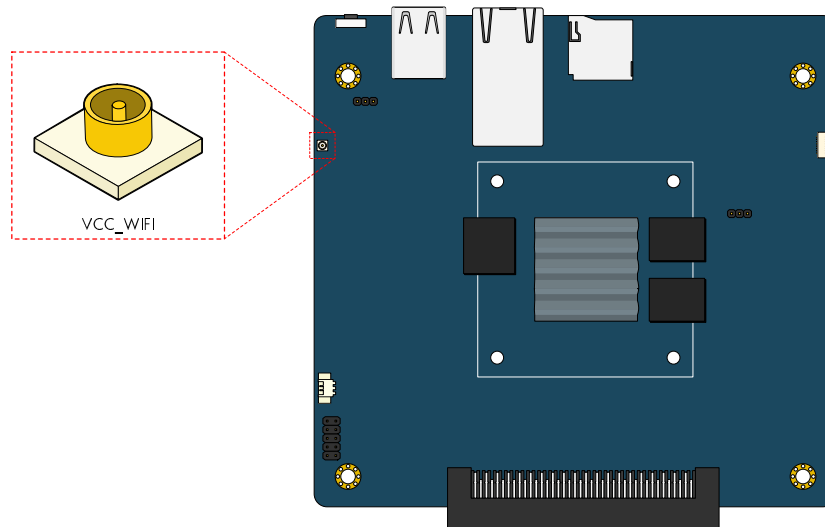


Figure 15: Wi-Fi antenna connector diagram

## 3. Onboard Jumpers

This section will explain how to configure the VTS-8589 board to match the needs of your application by setting the jumpers.

### Jumper Description

A jumper consists of pair conductive pins used to close in or bypass an electronic circuit to set up or configure particular feature using a jumper cap. The jumper cap is a small metal clip covered by plastic. It performs like a connecting bridge to short (connect) the pair of pins. The usual colors of the jumper cap are black/red/blue/white/yellow.

### Basic Jumper Configuration

There are two settings of the jumper pin: “**Short** and **Open**”. The pins are “**Short**” when a jumper cap is placed on the pair of pins. The pins are “**Open**” if the jumper cap is removed.

In addition, there are jumpers that have three or more pins, and some pins are arranged in series. In case of a jumper with three pins, place the jumper cap on pin 1 and pin 2 or pin 2 and 3 to **Short** it.

Some jumper size is small or mounted on the crowded location on the board that makes it difficult to access. Therefore, using a long-nose pliers in installing and removing the jumper cap is very helpful.

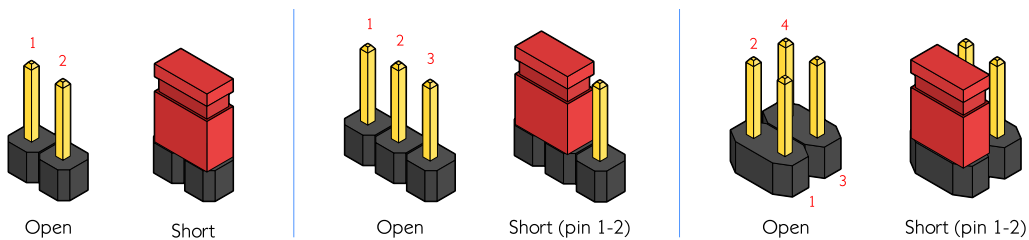


Figure 16: Jumper settings example



**Caution:**

Make sure to install the jumper cap on the correct pins. Installing it in the wrong pin might cause damage and malfunction.

### 3.1. Boot Select Jumper

The boot select jumper labeled as “J11” is set to specify the boot device: SPI and Micro SD. The default setting is the SPI. The boot select jumper settings are shown below.

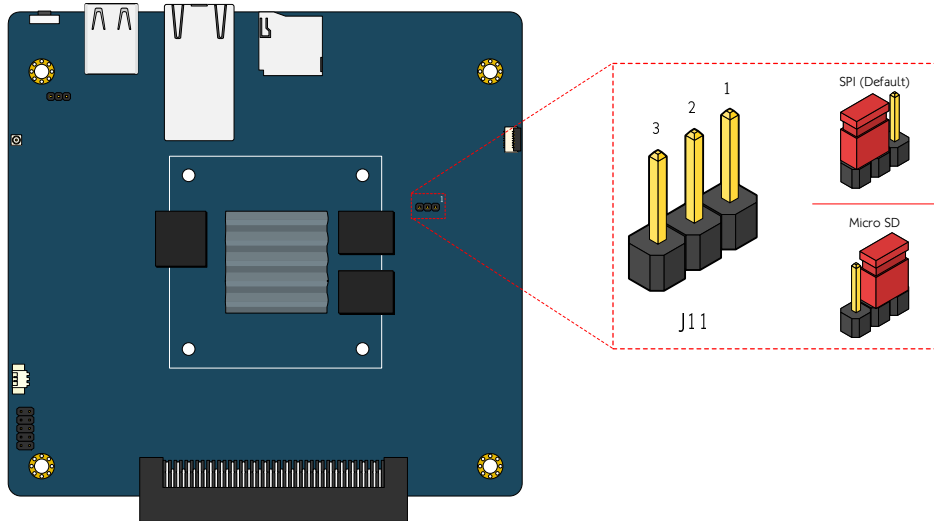


Figure 17: Boot select jumper diagram

Setting	Pin 1	Pin 2	Pin 3
SPI (default)	Open	Short	Short
Micro SD	Short	Short	Open

Table 7: Boot select jumper settings

### 3.2. Watchdog Jumper

The watchdog jumper is used to enable or disable the watchdog function. The jumper is labeled as “J14”. The jumper settings are shown below.

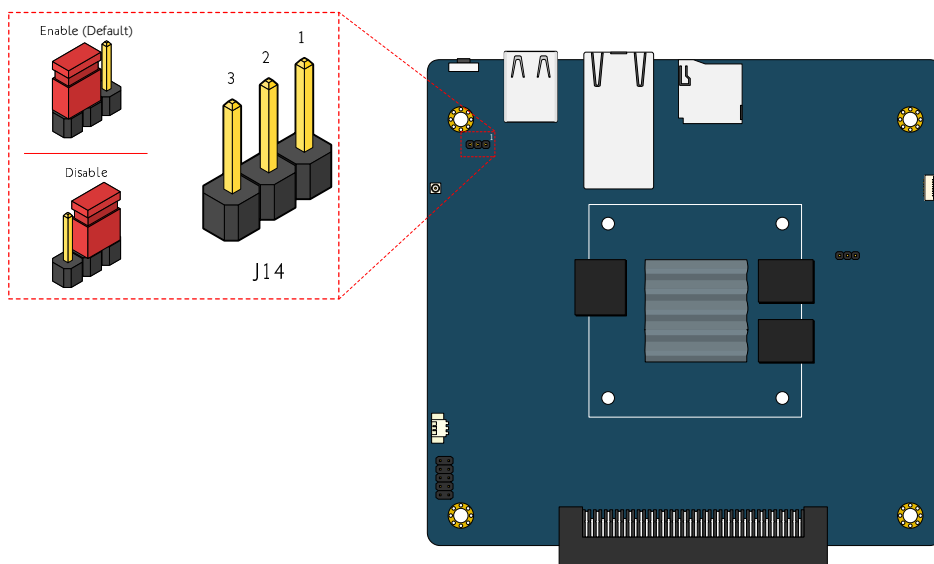


Figure 18: Watchdog jumper diagram

Setting	Pin 1	Pin 2	Pin 3
Enable (default)	Open	Short	Short
Disable	Short	Short	Open

Table 8: Watchdog jumper settings

## 4. Hardware Installation

### 4.1. Installing the VTS-8592 OPS I/O card (optional)

The VTS-8592 is an optional OPS I/O card for VTS-8589 board. It can be connected through OPS connector.

#### Step 1

Align the OPS receptacle connector on VTS-8592 OPS I/O card with the OPS plug connector on the VTS-8589 board.

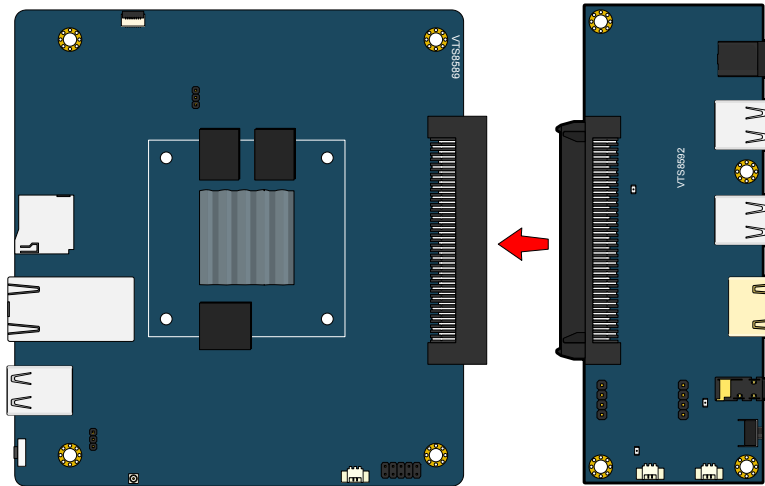


Figure 19: Installing the VTS-8592 OPS I/O card

#### Step 2

Gently connect the OPS receptacle connector into the OPS plug connector. There will be a slight tension as the OPS receptacle connector is being inserted.

#### Step 3

Secure the VTS-8592 OPS IO card to the chassis with four screws.

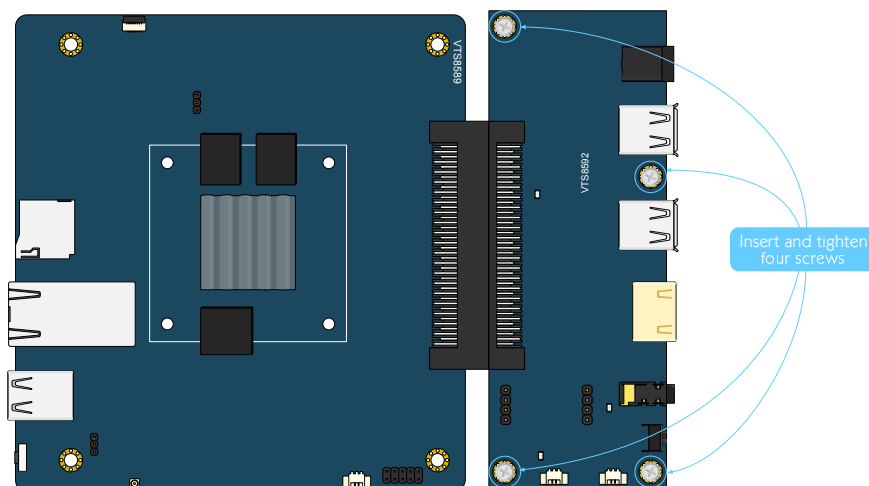


Figure 20: Securing the VTS-8592 OPS I/O card



#### Note:

The VTS-8592 is an optional OPS I/O card. User can still install the VTS-8589 board with OPS chassis directly to the OPS display without using the VTS-8592 card.

## 5. Software and Technical Supports

### 5.1. Linux Support

The VTS-8589 is highly compatible with Linux kernel operating system.

- Linux kernel 4.1.15 (VTS-8589-QP SKU)
- Linux kernel 3.10.53 (VTS-8589 SKU)

#### 5.1.1. Driver Installation

##### Linux Driver Support

Linux drivers are provided through various methods including:

- Drivers provided by VIA
- Using a driver built into a distribution package
- Visiting [www.viatech.com](http://www.viatech.com) for the latest updated drivers
- Installing a third party driver (such as the ALSA driver from the Advanced Linux Sound Architecture project for integrated audio)

### 5.2. Technical Supports and Assistance

- For technical support and additional assistance, always contact your local sales representative or board distributor, or go to <http://www.viatech.com/en/about/contact/> to fill up the form request.
- For OEM clients and system integrators developing a product for long term production, other code and resources may also be made available. Contact VIA to submit a request.

## Appendix A. VTS-8592 OPS I/O Card

The VTS-8592 is an optional OPS I/O card designed especially for VTS-8589 board. The VTS-8592 card can support two USB 2.0 ports, HDMI port, audio jack, rest button and power on/off button and DC-in jack.

### A.1. VTS-8592 Specifications

#### Front Panel I/O

- 1 x Power On/Off button
- 1 x Audio jack
- 1 x HDMI port
- 2 x USB 2.0 ports
- 1 x DC-in jack (12V~19V)

#### Back Panel I/O

- 1 x OPS receptacle connector

#### Onboard I/O

- 1 x Power button connector
- 1 x System fan connector
- 1 x UART pin header (+3.3V)
- 1 x Power status pin header
- 1 x System fan LED
- 1 x Power LED
- 1 x Pluggable board detect LED

#### Dimensions

- 121.8mm x 45.6mm (12.18cm x 4.56cm)

#### Operating Temperature

- -0°C ~ 45°C

#### Operating Humidity

- 0 ~ 90% (relative humidity; non-condensing)

## A.2. VTS-8592 Layout Diagram

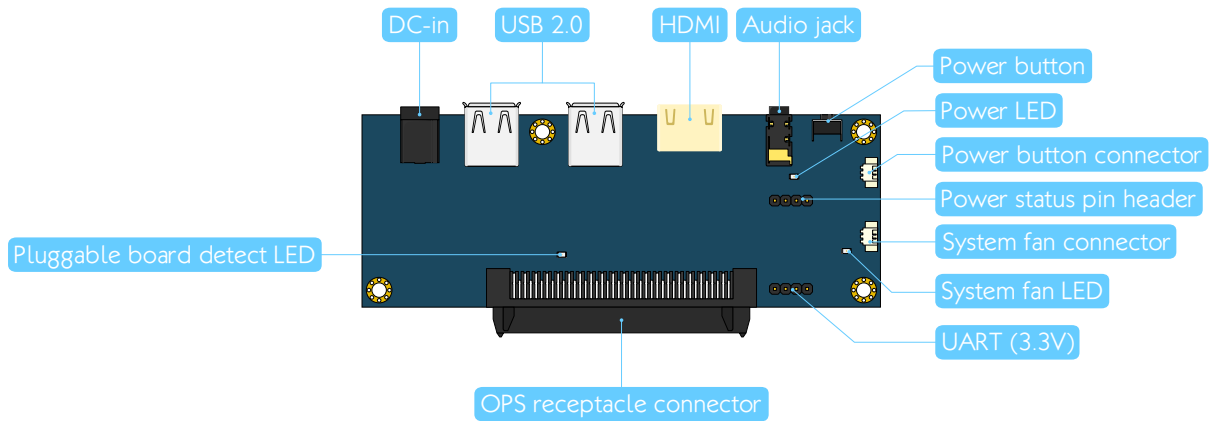


Figure 21: Layout diagram of the VTS-8592 OPS I/O card

## A.3. VTS-8592 Dimensions

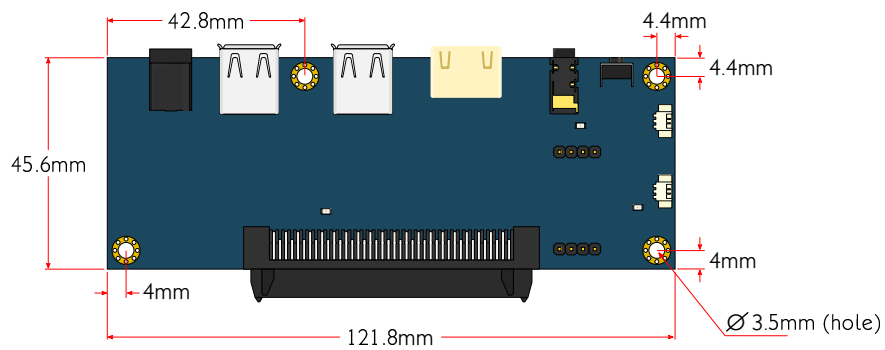


Figure 22: Mounting holes and dimensions of the VTS-8592 OPS I/O card (top side)

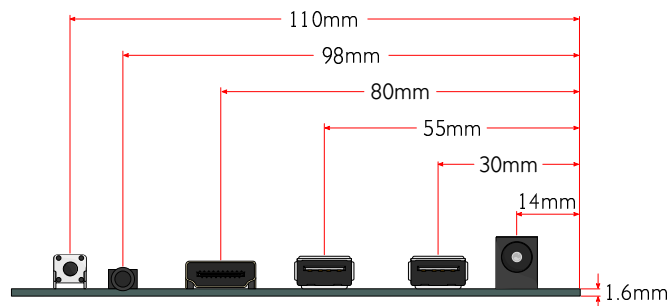


Figure 23: External I/O port dimensions of the VTS-8592 OPS I/O card (front panel)

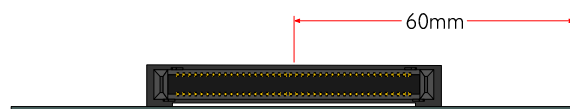


Figure 24: External I/O port dimension of the VTS-8592 OPS I/O card (back panel)



## A.4. VTS-8592 Height Distribution

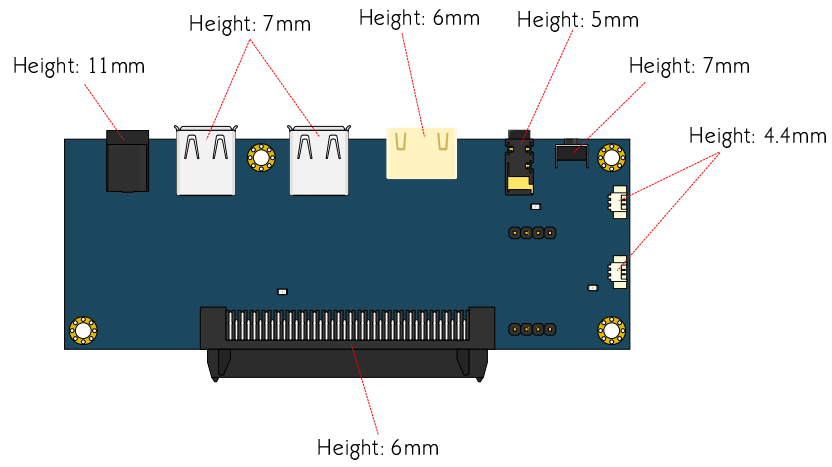


Figure 25: Height distribution of the VTS-8592 OPS I/O card

## A.5. VTS-8592 Connectors and LEDs

### A.5.1. System Fan Connector

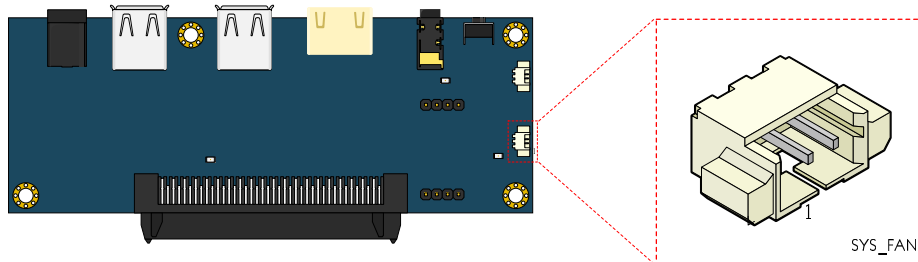


Figure 26: System fan connector diagram

Pin	Signal
1	+12V
2	GND

Table 9: System fan connector pinout

### A.5.2. Power Button Connector

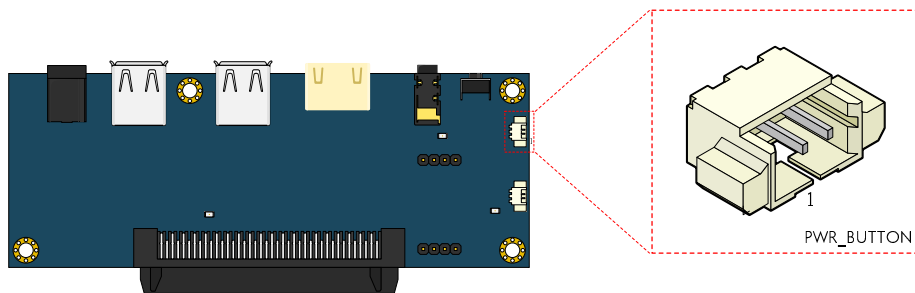


Figure 27: Power button connector diagram

Pin	Signal
1	+12V
2	GND

Table 10: Power button connector pinout

### A.5.3. Power Status Pin Header

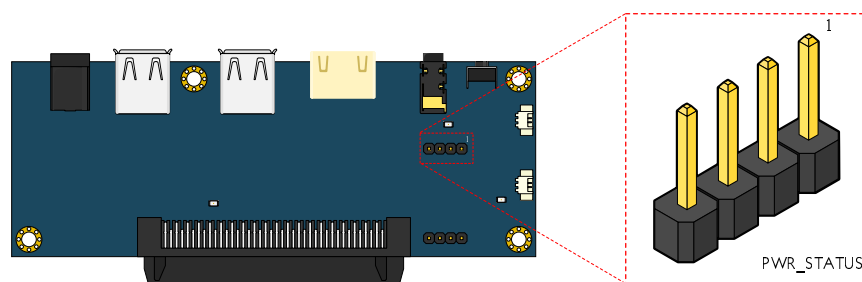


Figure 28: Power status pin header diagram

Pin	Signal
1	SYS_FAN (GPIO)
2	PB_DET
3	PWR_STATUS
4	GND

Table 11: Power status pin header pinout

### A.5.4. UART (3.3V) Pin Header

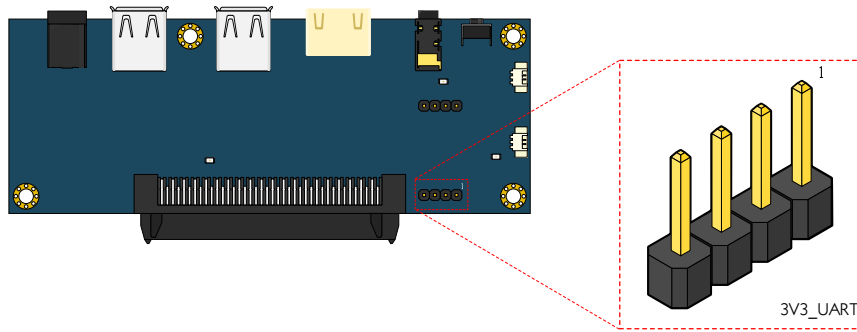


Figure 29: UART (3.3V) pin header diagram

Pin	Signal
1	NC
2	RXD
3	TXD
4	GND

Table 12: UART (3.3V) pin header pinout

### A.5.5. Power LED

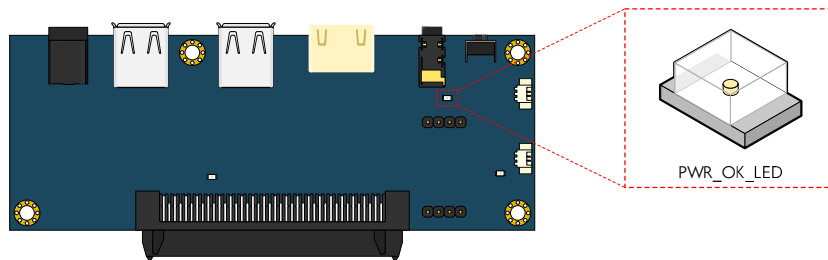


Figure 30: Power LED diagram

### A.5.6. System Fan LED

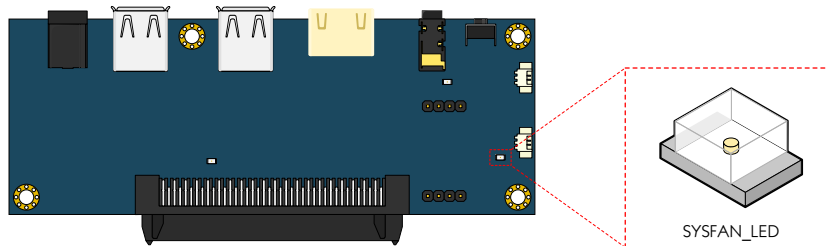


Figure 31: System fan LED diagram

### A.5.7. Pluggable Board Detect LED

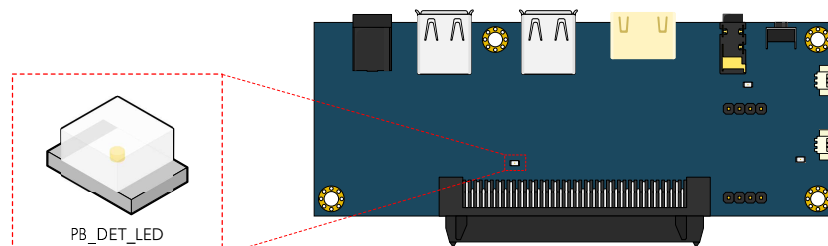


Figure 32: Pluggable board detect LED diagram

## Appendix B. Mating Connector Vendor Lists

The following tables listed the mating connector vendors of VTS-8589 board.

Labels	Function	Vendor	Part Number
J11	Boot select jumper	Neltron Industrial	2210SM-03G-B1-CP
J14	Watchdog jumper	Neltron Industrial	2210SM-03G-B1-CP
J100	OPS plug connector	JAE	TX25-80P-LT-H1E
J1	RTC battery connector	Neltron Industrial	1251R-02-SM1-TR-F5
J27	Wi-Fi antenna connector	ACES	50990-00108-001
J2	Micro SD Card slot	ATOM	MR01-AP20330
J16	Gigabit Ethernet port	Trxcom	TRJK0072AONL
USB0/1	USB 2.0 port	FOXCONN	UB1112C-8FDE-4F
SW4	Reset button	WKD	TS-018A

Table 13: VTS-8589 mating connector vendor lists



#### Taiwan Headquarters

1F, 531 Zhong-zheng Road,  
Xindian Dist., New Taipei City 231  
Taiwan

Tel: 886-2-2218-5452  
Fax: 886-2-2218-9860  
Email: [embedded@via.com.tw](mailto:embedded@via.com.tw)



#### USA

940 Mission Court  
Fremont, CA 94539,  
USA

Tel: 1-510-687-4688  
Fax: 1-510-687-4654  
Email: [embedded@viatech.com](mailto:embedded@viatech.com)



#### Japan

3-15-7 Ebisu MT Bldg. 6F,  
Higashi, Shibuya-ku  
Tokyo 150-0011  
Japan

Tel: 81-3-5466-1637  
Fax: 81-3-5466-1638  
Email: [embedded@viatech.co.jp](mailto:embedded@viatech.co.jp)



#### China

Tsinghua Science Park Bldg. 7  
No. 1 Zongguancun East Road,  
Haidian Dist., Beijing, 100084  
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Tel: 86-10-59852288  
Fax: 86-10-59852299  
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#### Europe

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