DFI

VP070-M8M

ARM-Based In-vehicle Fanless Touch Panel PC

User's Manual

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FCC and DOC Statement on Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio TV technician for help.

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.

2. Shielded interface cables must be used in order to comply with the emission limits.

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About this Manual

This manual can be retrieved from the website.

The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

Warranty

1. Warranty does not cover damages or failures that arises from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

About this Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- 1 x VP070-M8M System Unit

- 1 Switch Cable

- 12 Rubber Holders

- 1 ADDM UL Battery Addendum

Note: The items are subject to change in the developing stage.
The product and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.

2. Wear an antistatic wrist strap.

3. Do all preparation work on a static-free surface.

4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.

5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.

> **Important:**
> Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Precautions

- Use the correct DC / AC input voltage range.

- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging in the power cord.

- There is danger of explosion if battery incorrectly replaced.

- Replace only with the same or equivalent specifications of batteries recommend by the manufacturer.

- Dispose of used batteries according to local ordinance.

- Keep this system away from humid environments.

- Make sure the system is placed or mounted correctly and stably to prevent the chance of dropping or falling may cause damage.

- The openings on the system shall not be blocked and shall be kept in distance from other objects to make sure of proper air ventilation to protect the system from overheating.

- Dress the cables, especially the power cord, so they will not be stepped on, in contact with high temperature surfaces, or cause any tripping hazards.

- Do not place anything on top of the power cord. Use a power cord that has been approved for use with the system and is compliant with the voltage and current ranges required by the system's electrical specifications.

- If the system is to be unused or stored for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

- If one of the following occurs, consult a service personnel:

  - The power cord or plug is damaged.

  - Liquid has penetrated the system.

  - The system has been exposed to moisture.

  - The system is not working properly.

  - The system is physically damaged.

- The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace the outlet.

- Disconnect the system from the electricity outlet before cleaning. Use a damp cloth for cleaning the surface. Do not use liquid or spray detergents for cleaning.

- Before connecting, make sure that the power supply voltage is correct. The device is connected to a power outlet which should be grounded connection.

The system may burn fingers while running.

Wait for 30 minutes to handle electronic parts after power off.

Chapter 1 - Introduction

▶ **Overview**

Bottom View
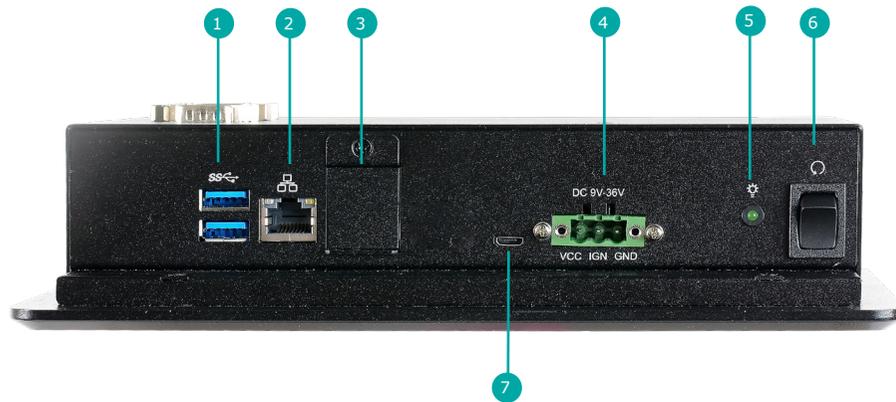
Back View

1	USB 3.1 Gen1
2	LAN
3	SIM
4	Power Input
5	Status LED
6	Reset Switch
7	OTG

| 8 | COM |
| 9 | CANbus |

▶ **Dimensions**

Top View

235.0

150.0

Front View

7.5
6.0
10.5
15.0
6.5
1.5

Side View

53.8

BottomView
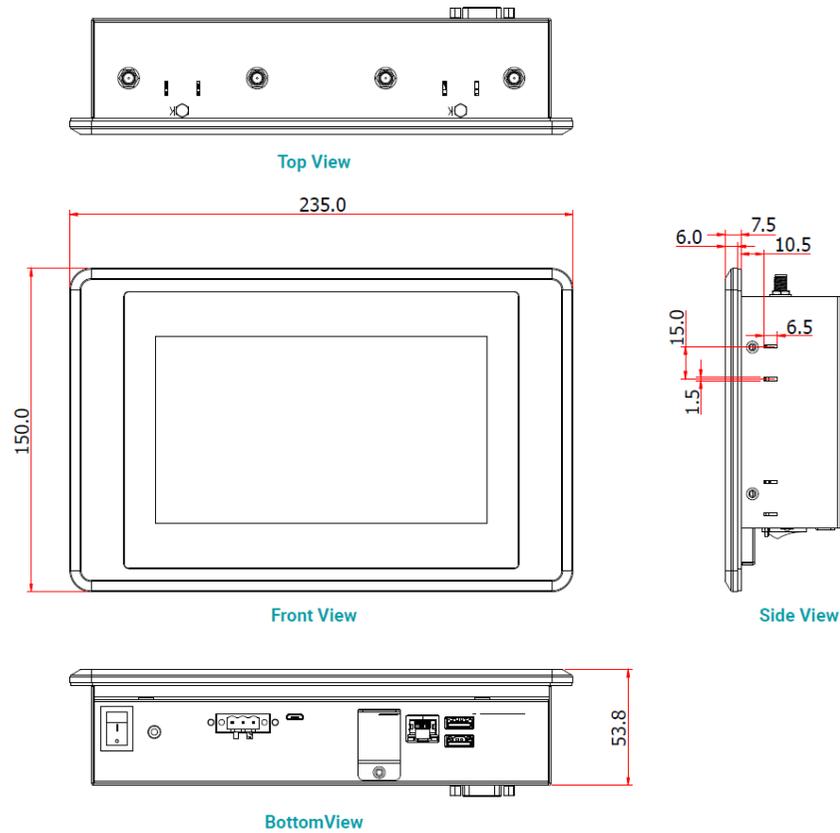
▶ **Key Features**

ARM-Based System:
Support Android 9.0 and Linux

IP Rating:
IP65 Front Panel Protection

Rich I/O Connectivity:
1 GbE, 2 COM, 1 CAN Bus, 2 USB 3.1 Gen1

Application Focus:
In-vehicle Driver HMI

DFI's VP070-M8M equipped with ARM processor is the most energy-efficient All-in-One PC served as driver HMI with significantly longer battery life and high resolution TFT LCD display with capacitive touch. IP65 rated protection, wide operating temperature range, and anti-vibration ensure the system can withstand the bumpy, mountainous environment. Power management features include a wide power input range, surge protection. The built-in IMU sensor helps to record vehicle moving status. 4G, Wi-Fi, and GPS, as well as rich I/O and built-in SIM card/SD card are provided for flexible connectivity and expandability. The above function is to store or transmit the vehicle location or data to the operation center.

▶ **Specifications**

SYSTEM	Processor	NXP i.MX 8M Dual/Quad Cortex-A53, 1.3GHz
	Max. Speed	1.3GHz
MEMORY	Technology	On board Memory 2GB/4GB (Default 2GB) Single Channel LPDDR4 up to 3200 MHz
	Max. Capacity	4GB
	Socket	Memory Down
DISPLAY & TOUCH SCREEN	Display Type	7" PCAP TFT
	Max. Resolution	1024 x 600
	Brightness	425 cd/m²
STORAGE	Internal	Support eMMC 5.1 16GB on board (default) Support up to 64GB (optional)
	External	Micro SD card slot
EXPANSION	Interface	1 x M.2 2242/3042 B Key (USB 3.1 Gen1), Nano SIM Slot support 1 x M.2 2230 E Key (PCIex1/USB2.0)
ETHERNET	Controller	AR8035
AUDIO	Audio Codec	SGTL5000
LED	Indicators	1 x Status LED
Sensor	Sensor	6 axis IMU (3 Accelerometer + 3 Gyroscope)
I/O	Ethernet (Gbe)	1 x Giga LAN
	Serial	1 x RS-232/422/485 1 x RS-232 1 x CAN Bus
	USB	2 USB3.1 Gen1 1 x OTG, micro USB
	Audio	with Amplifier to support 2W speaker (optional) 1 x Line-out & 1 x MIC-in (internal header)
	Buttons	1 x Reset switch
POWER	Type	9~36V DC Power input, with ACC/IGN control
OS SUPPORT	Linux	Yocto 2.5 (optional)
	Android	Android 9.0 (default)

MECHANISM	Construction	Aluminum + SGCC
	IP Rating	IP65 Front Panel Protection
	Mounting	Panel Mount /VESA Mount
	Dimensions (W x H x D)	235 x 150 x 54mm
	Weight	2.9kg
ENVIRONMENT	Operating Temperature	-20 to 70°C
	Storage Temperature	-30 to 80°C
	Relative Humidity	10 to 90% RH (non-condensing)
Standards and Certifications	Shock	OP: Half-sine, 3G @ 11ms
		Non-OP: Half-sine, 5G @ 11ms
	Vibration	OP: Random, 1Grms @ 5~500Hz, 30min
		Non-OP: Sweep sine, 3Grms @ 10~500Hz, 30min
	Certifications	CE, FCC, E-Mark R10, RoHS, UKCA

Chapter 2 - Hardware Installations

▶ Removing the Chassis Cover

Please observe the following guidelines and follow the instructions to open the system.

1. Make sure the system and all other peripheral devices connected to it have been powered off.

2. Disconnect all power cords and cables.

Step 1:
The 8 screws of the system are used to secure the cover to the chassis. Remove the screws and put them in a safe place for later use.

Step 2:
Slide the cover to open the system.
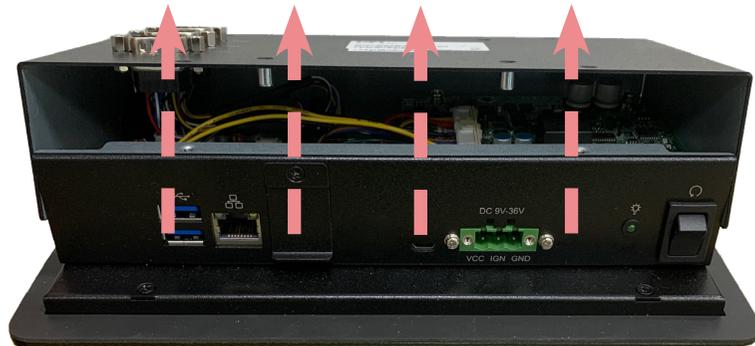
Step 3:
The boards can be easily accessed after the chassis cover is removed.

System Board

Power Board
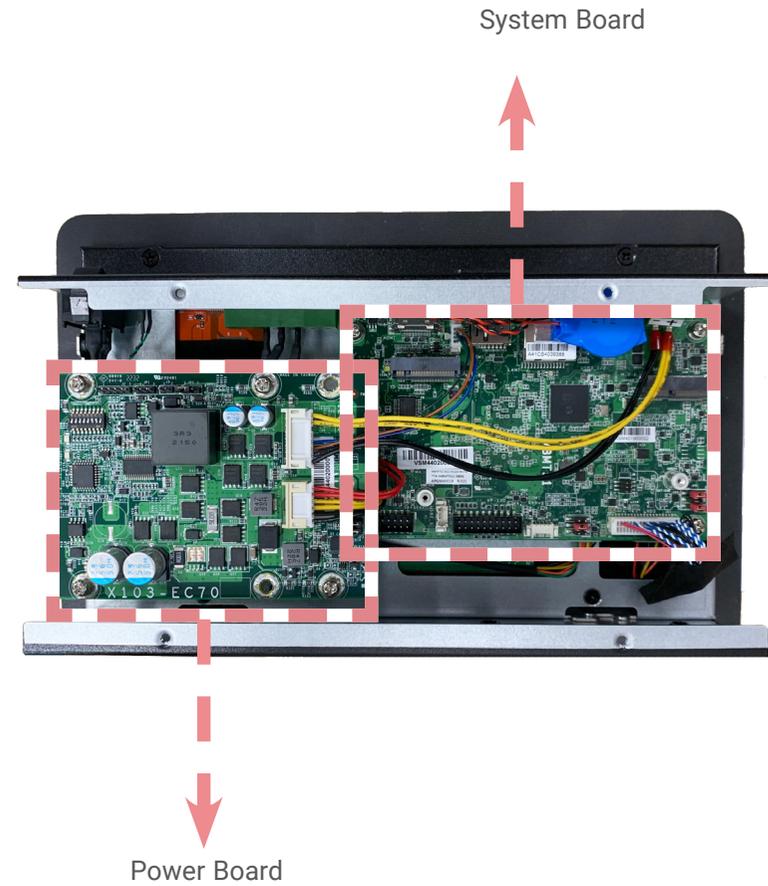
▶ Installing an M.2 Card
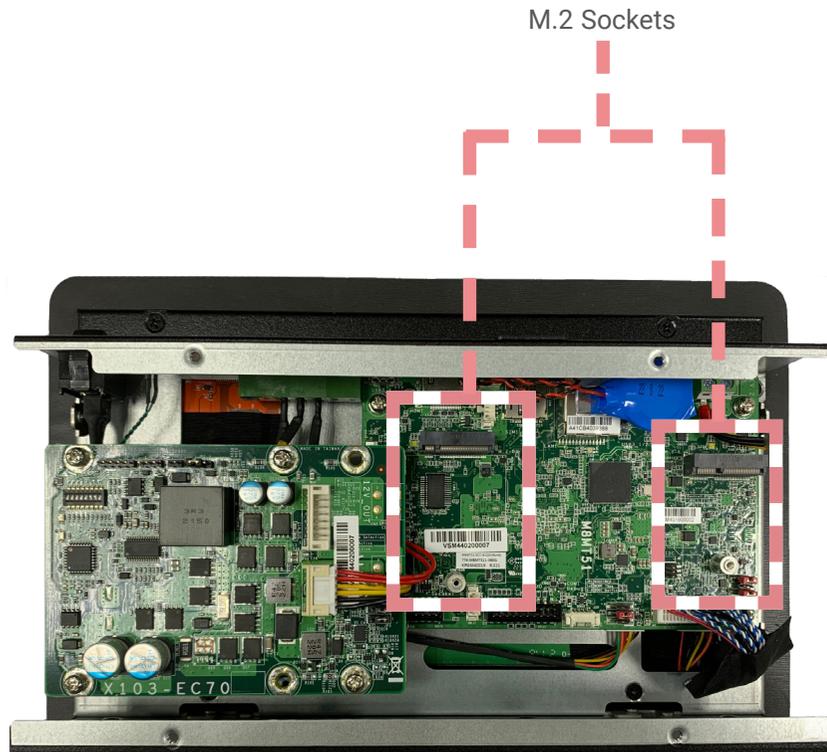
M.2 Sockets

Please follow the steps below to install the card into the socket.

Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.
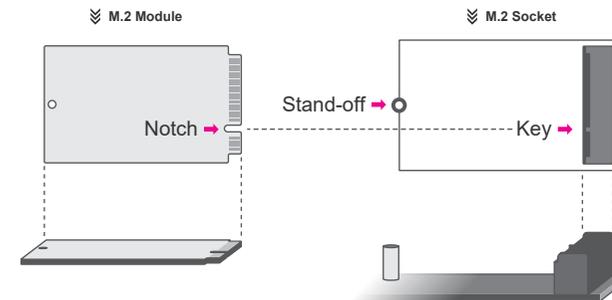
Step 2:
Press the end of the card far from the socket down until against the stand-off.
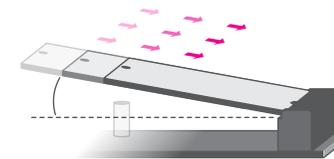
Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.
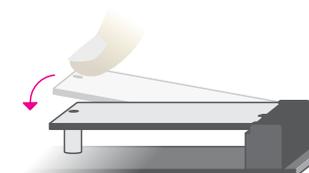
▶ Installing an Antenna

Before installing the antenna, please make sure that the following safety cautions are wellattended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.

Step 1:
There are antenna holes reserved on the side of the system and covered by rubber plugs. Please remove the plug prior to installing an antenna.

Step 2:
Connect the internal cable to the board's antenna connector, screw the antenna connector through the antenna hole with washers and nuts, and screw on the antenna as illustrated below.
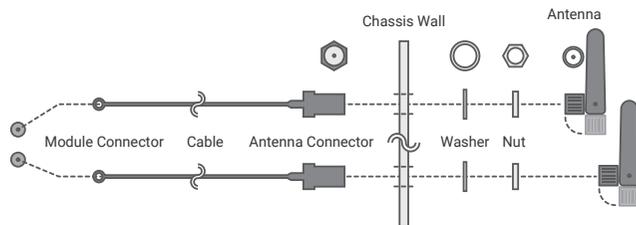
▶ Mounting Options

Wall Mount

Step 1:
Select a place on the wall where you will mount the Panel PC.

Step 2:
Use the provided mounting screws to attach **wall mount bracket 1** onto the wall.

Step 3:
Attach the other bracket (**wall mount bracket 2**) to the rear of the Panel PC.

Step 4:
Slide the Panel PC to **wall mount bracket 1** and attach the two brackets together with the hooks. Then tighten the screw to secure the assembly in place.

screw

Wall mount bracket 2

Wall mount bracket 1
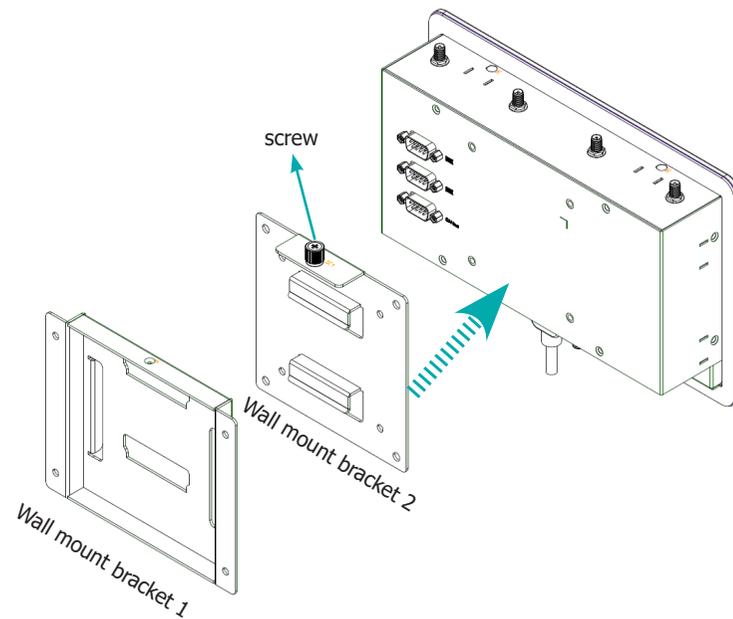
Panel Mount

Step 1:

Select a place on the panel (or wall) where you will mount the Panel PC.

Step 2:

Cut out a shape on the panel that corresponds to the Panel PC's rear dimensions (217.6mm x 127.6mm) and ensure that the Panel PC can be fitted into the panel properly.

The flat panel thickness is less than 10mm. Be sure to route or trim down the thick wall to 10 mm or slightly less for the clamps to recess and be compatible with your wall or enclosure.
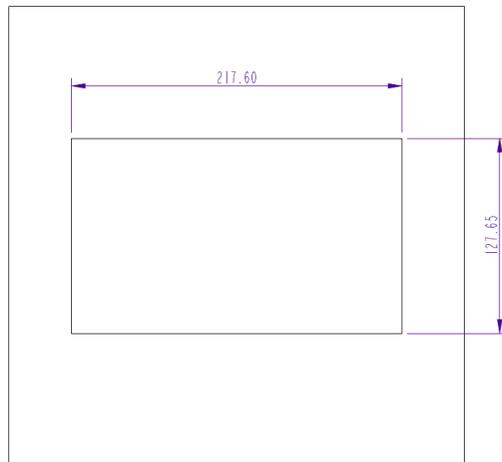

Step 3:

Insert the Panel PC from the outside surface of the panel into the mounting hole until it is properly fitted against the panel.

Step 4:

Position the mounting clamps along the rear edges of the Panel PC and insert them into the slits around the Panel PC.

Step 5:

The first and second clamps must be positioned and secured diagonally prior to mounting the rest of the clamps. Tighten the clamp's screw using an electric screwdriver by pressing the white plastic cap onto the back of the panel. The illustration below shows that all clamps are properly mounted.
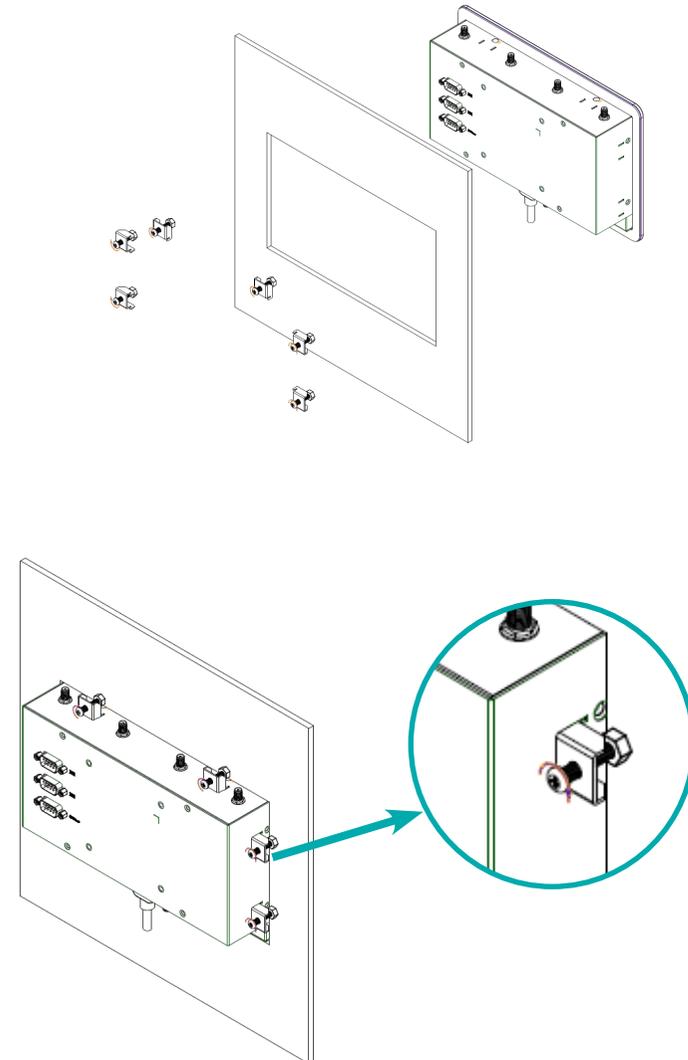
Chapter 3 - System Settings

▶ System Layout

Power Board

Power Board

①	ST-Link / SWD
②	MCU Debug
③	Remote Switch
④	Remote Switch High/Low Active
⑤	12V DC Out
⑥	9V~36V In
⑦	Host Bus Communication
⑧	Host Bus Communication
⑨	SW1
⑩	LED1(Red): Debug LED for the MCU
⑪	LED2 (Green): R/W LED
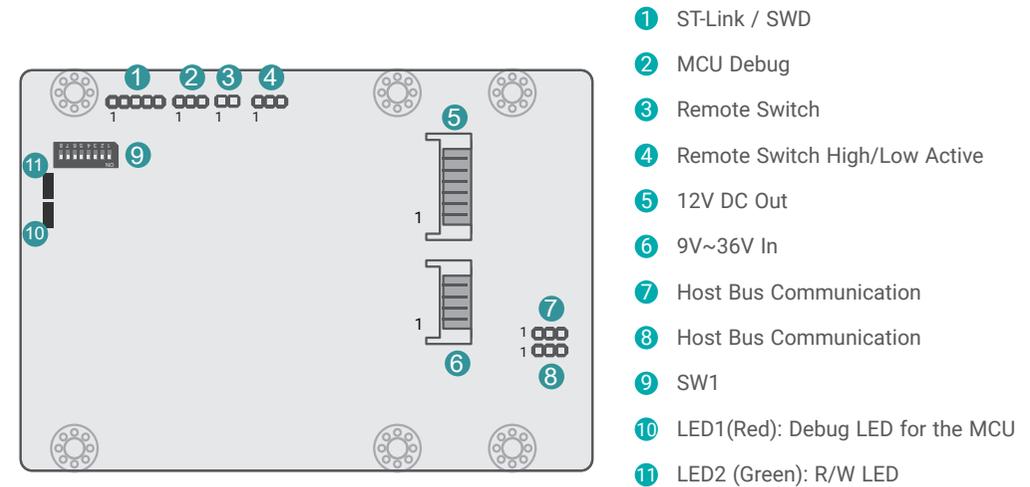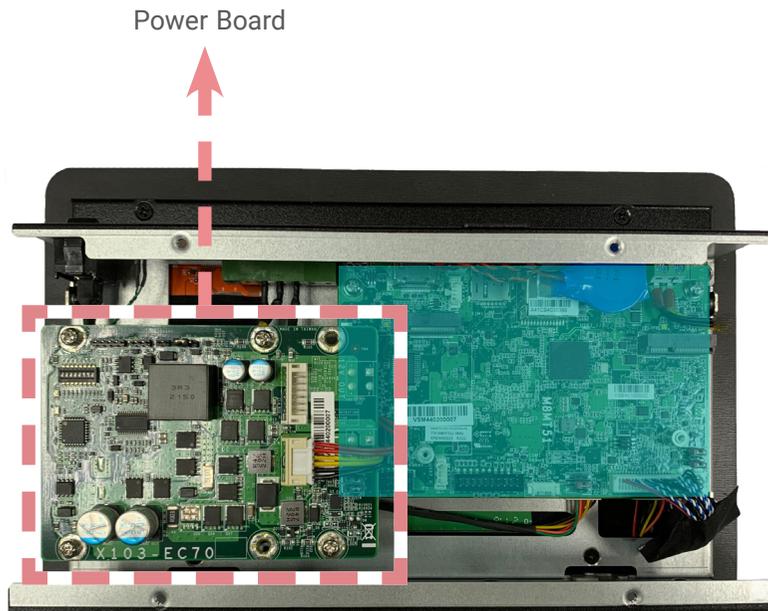
> **Important:**
> Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

System Board

System Board
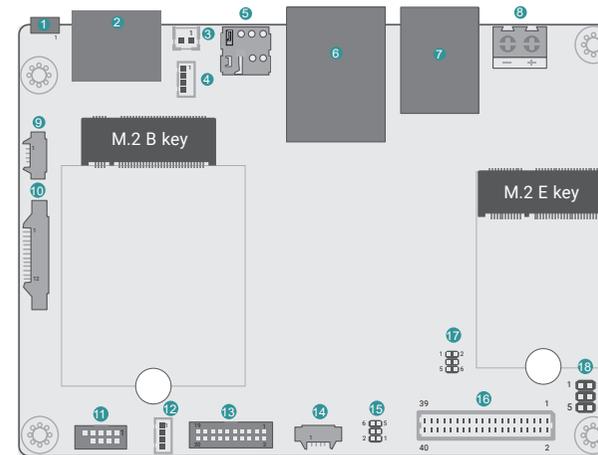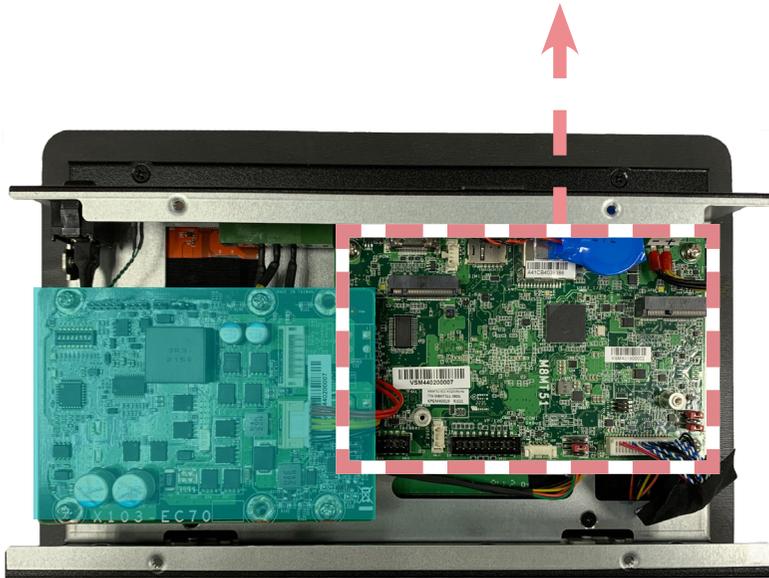
① USB2_4	⑫ USB2_3
② HDMI	⑬ VP IO
③ Battery	⑭ COM1 Debug
④ Power Link	⑮ Boot CFG
⑤ SIM Slot	⑯ LVDS
⑥ LAN	⑰ I2C
⑦ USB3.0	⑱ LED Backlight
⑧ DC-IN	
⑨ Audio	
⑩ DIO	
⑪ Speaker	

System Board - uSD Card Slot

System Board
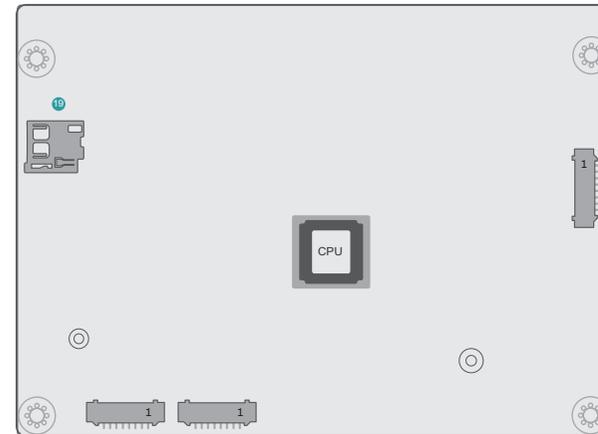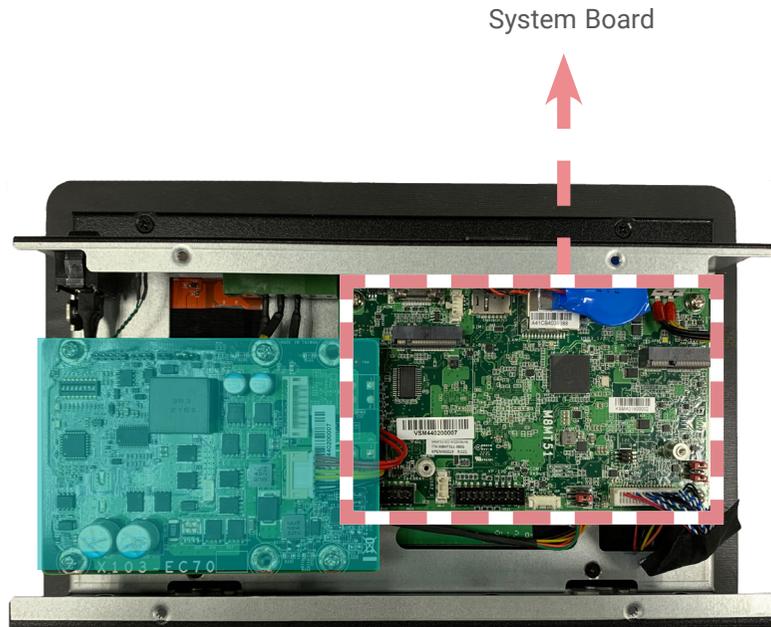
⑲ uSD Card Slot

▶ **Jumper Settings- Power Board**

Host Bus Communication (JP3, JP4)

Remote Switch High/Low Active (JP2)

JP4
JP3
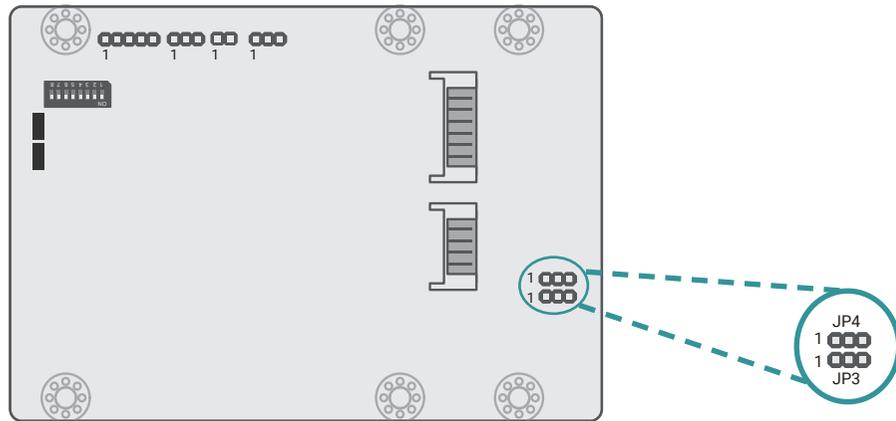
- 1-2 On: Reserved

- 2-3 On: TX/RX UART (default)
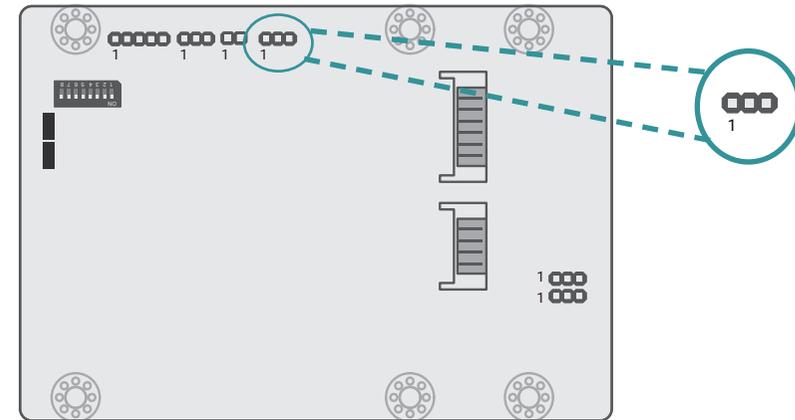
- 1-2 On: High Active (default)

- 2-3 On: Low Active

SW1
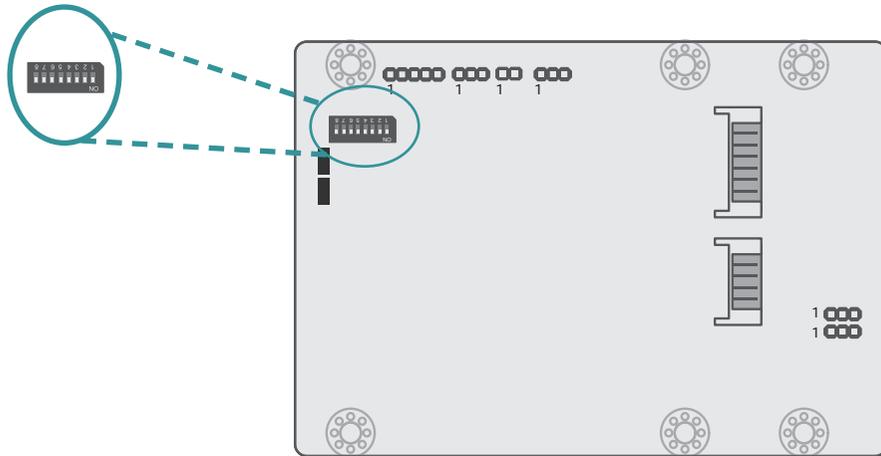
24V / 12V Select

1	Output Voltage
On	12V (default)
Off	24V
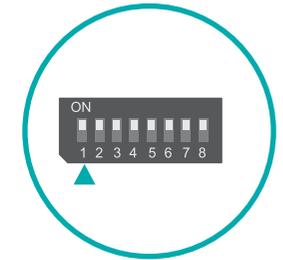
POWER ON Delay Switch

2	Delay On/Off
On	On, delay duration defined by 4 and 5
Off	Off, delay = 3 seconds by default
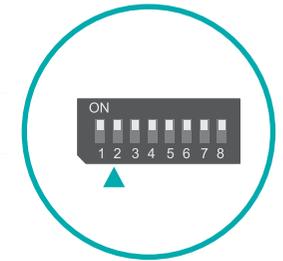
POWER OFF Delay Switch

3	Delay On/Off
On	On, delay duration defined by 6, 7, and 8
Off	Off, delay = 0 second by default
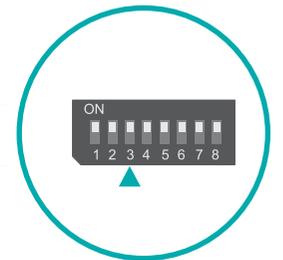
> **Important:**
> Power-off the system and then unplug the power cord prior to setting the switches. Failure to do so will cause severe damage to the system and components.

POWER ON Delay Time Select

5	4	Delay Duration
On	On	10 seconds (default)
On	Off	30 seconds
Off	On	1 miniute
Off	Off	5 minutes
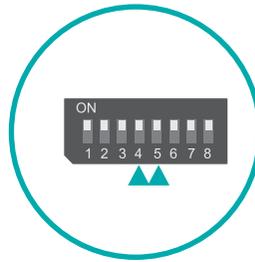
POWER OFF Delay Time Select

8	7	6	Delay Duration
On	On	On	30 seconds (default)
On	On	Off	1 minute
On	Off	On	3 minutes
On	Off	Off	5 minutes
Off	On	On	10 minutes
Off	On	Off	15 minutes
Off	Off	On	30 minutes
Off	Off	Off	1 hour
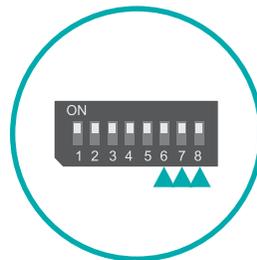
▶ **Jumper Settings- System Board**

Boot Config (JP1)
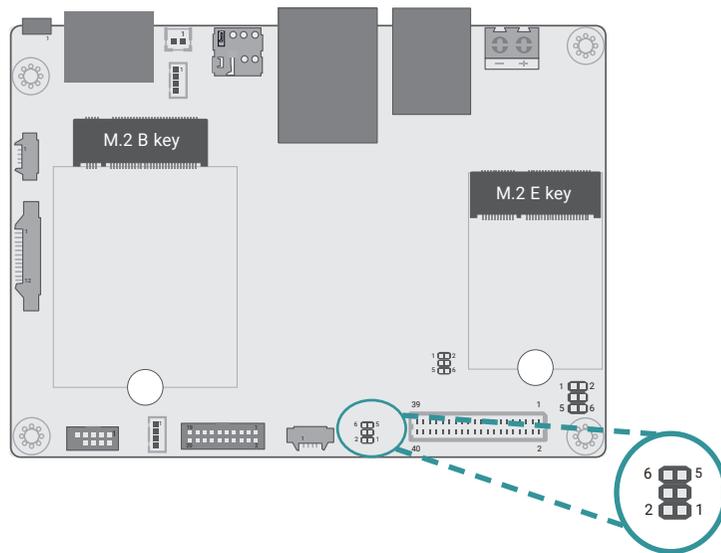
LED Backlight (JP5)

- ■ 1-2 Off: Internal Boot (default)
- ■ 1-2 On: Serial Downloader
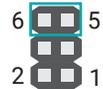
- ■ 5-6 Off: EMMC@eSDHC3 (default)
- ■ 5-6 On: uSD@eSDHC2
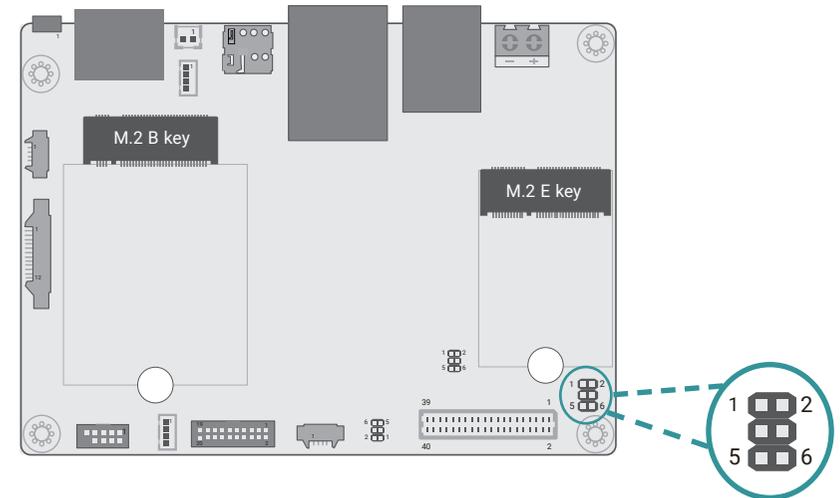
For VEN & VPWM
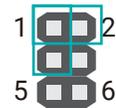
- ■ 1-2 On: 3.3V (Default)
- ■ 1-3 On: 5V

For VLED Backlight
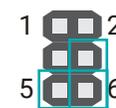
- ■ 5-6 On: Backlight Power 12V (default)
- ■ 4-6 On: Backlight Power 5V

▶ **Pin Assignment- Power Board**

12V DC-Out (CN3)
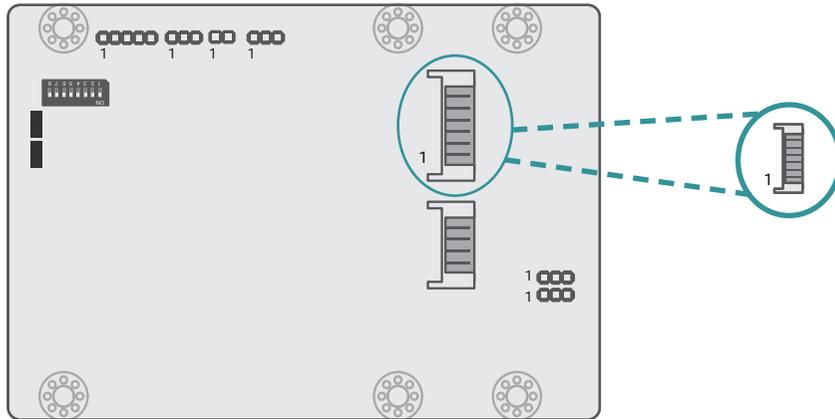
9V~36V In (J1)

Pin	Assignment
1	GND
2	GND
3	Power Button
4	Host TX
5	Host RX
6	12VSB
7	12VSB
8	12VSB
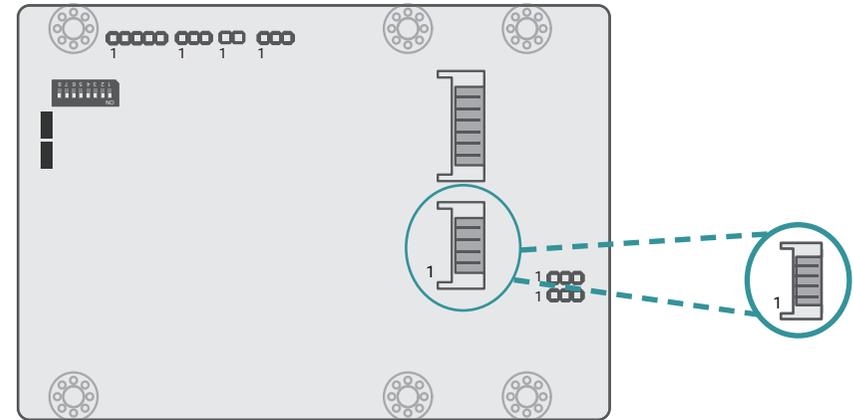
Pin	Assignment
1	V_In
2	V_In
3	Ignition
4	Ignition
5	GND
6	GND

The 9V~36V In box headers are for ignition and power input to the power board, which then converts to 12VDC for output to the system board.

Jumper Settings
Power on/off, delay time, and other power related aspects can be configured via SW1 as previously instructed in this chapter.

MCU Connector (J2)
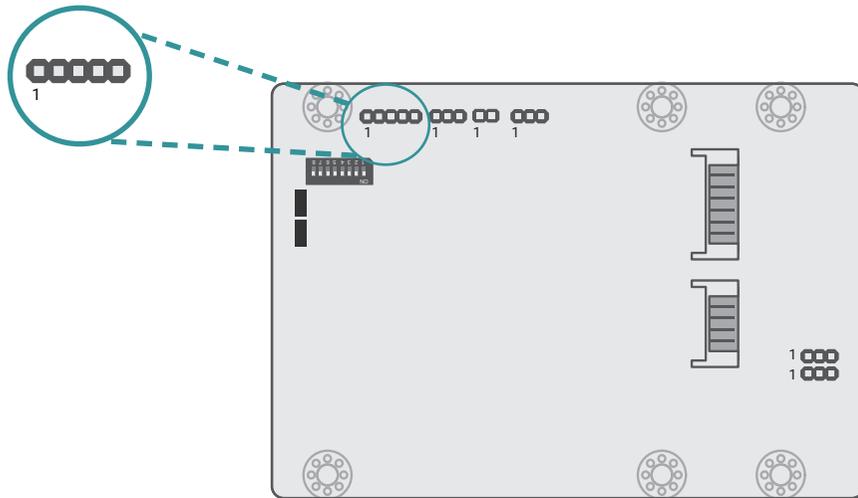
MCU Debug (JP1)

Pin	Assignment
1	3V
2	GND
3	SYS_SWDIO
4	SYS_SWCLK
5	STMCU_RST#
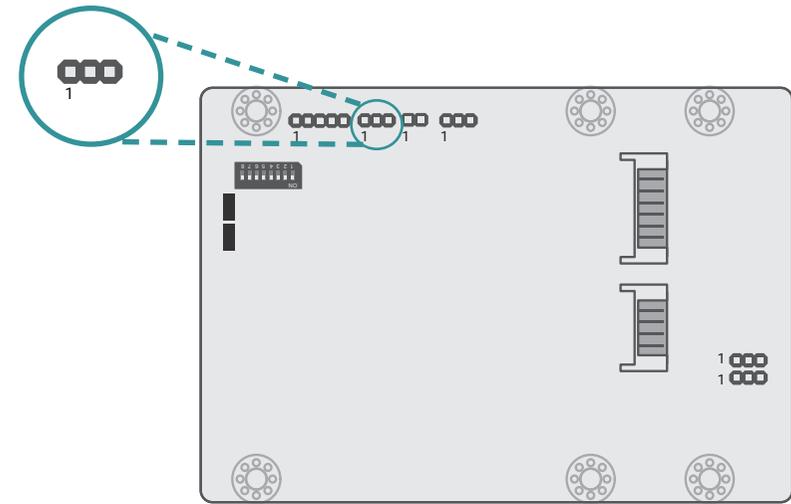
Pin	Assignment
1	UART_TX
2	UART_RX
3	GND

Remote Switch (J3)
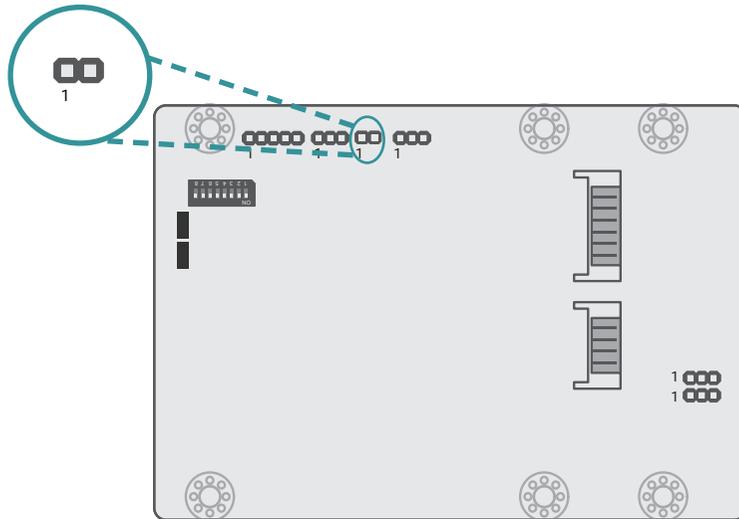
Pin	Assignment
1	Power Button
2	GND

▶ **Pin Assignment- System Board**

COM1 Debug (J10)
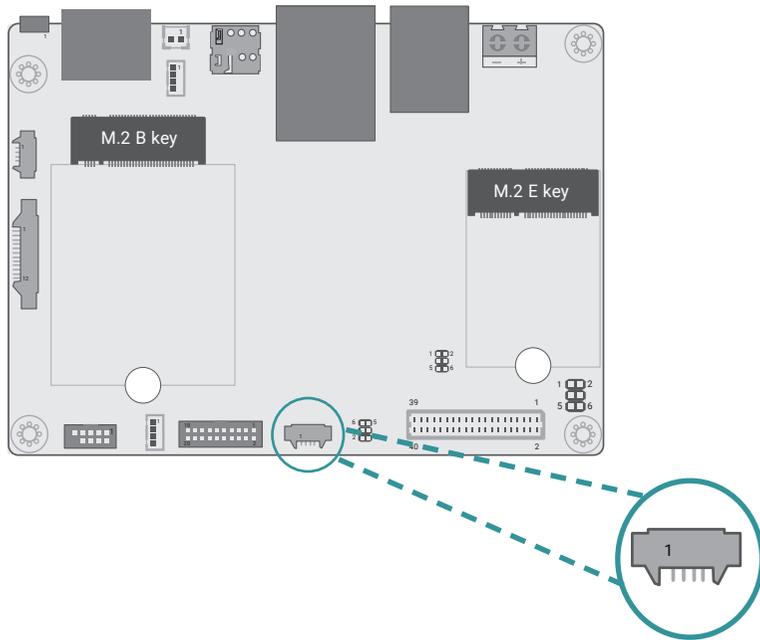
USB2_3 (UBJ1)

Pin	Assignment
1	+3.3V
2	UART1_RX
3	UART1_TX
4	GND
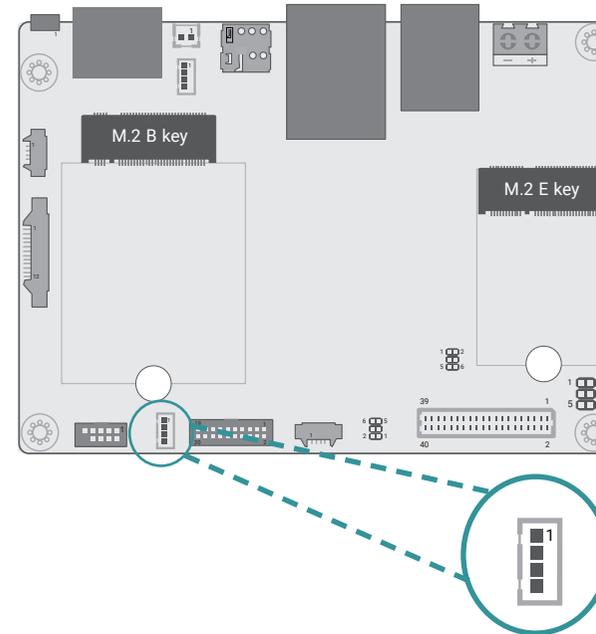
Pin	Assignment
1	+5V
2	USBDN
3	USBDP
4	GND

Speaker (AUJ1)
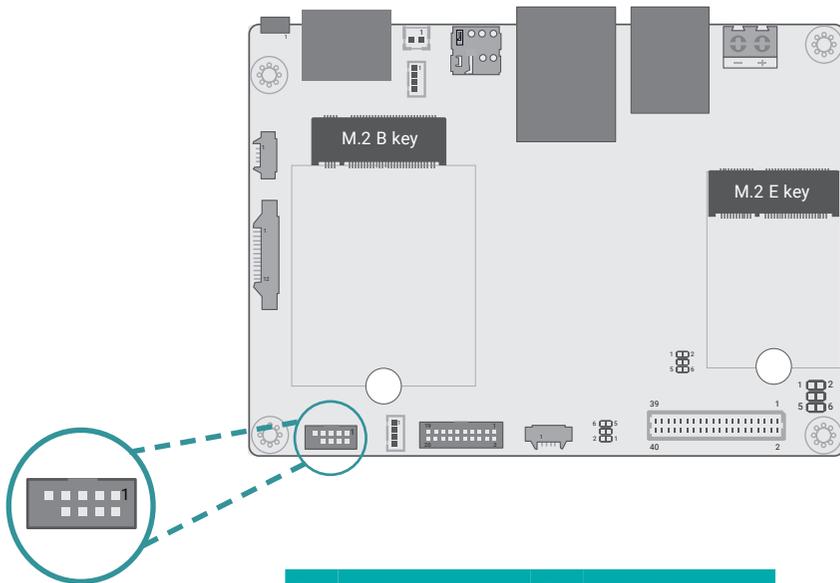
Audio (AUJ2)

Pin	Assignment	Pin	Assignment
1	NC	2	SPK_R-
3	NC	4	SPK_R+
5	NC	6	SPK_L+
7	NC	8	SPK_L-
9	NC		
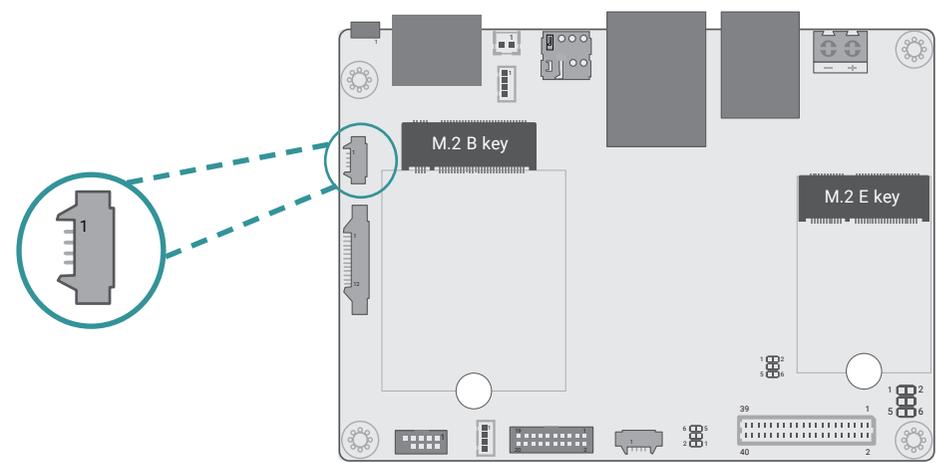
Pin	Assignment
1	LOUT_L
2	LOUT_R
3	AGND
4	MIC_IN

DIO (IOJ1)
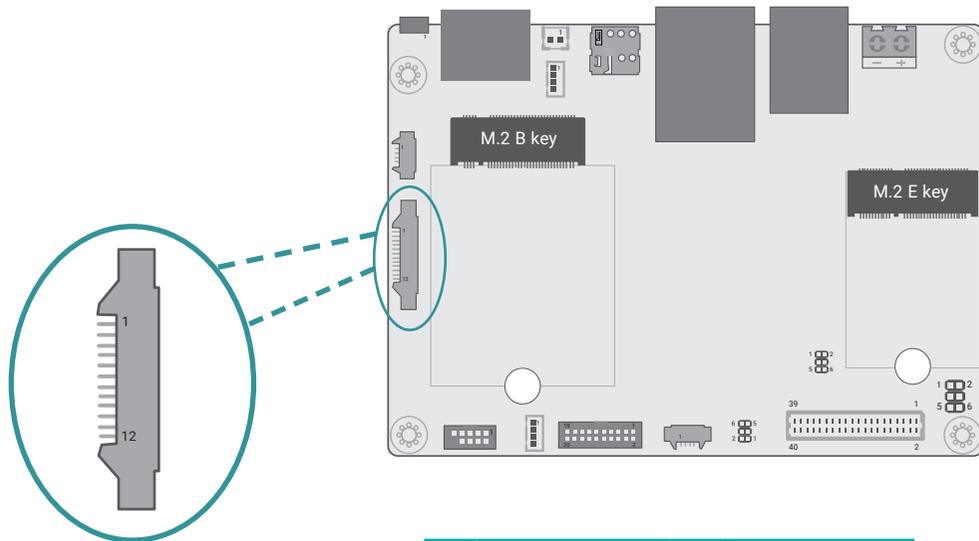
I2C (J8)

Pin	Assignment	Pin	Assignment
1	DIO0	2	DIO1
3	DIO2	4	DIO3
5	DIO4	6	DIO5
7	DIO6	8	DIO7
9	+5V	10	PWM
11	GND	12	GND
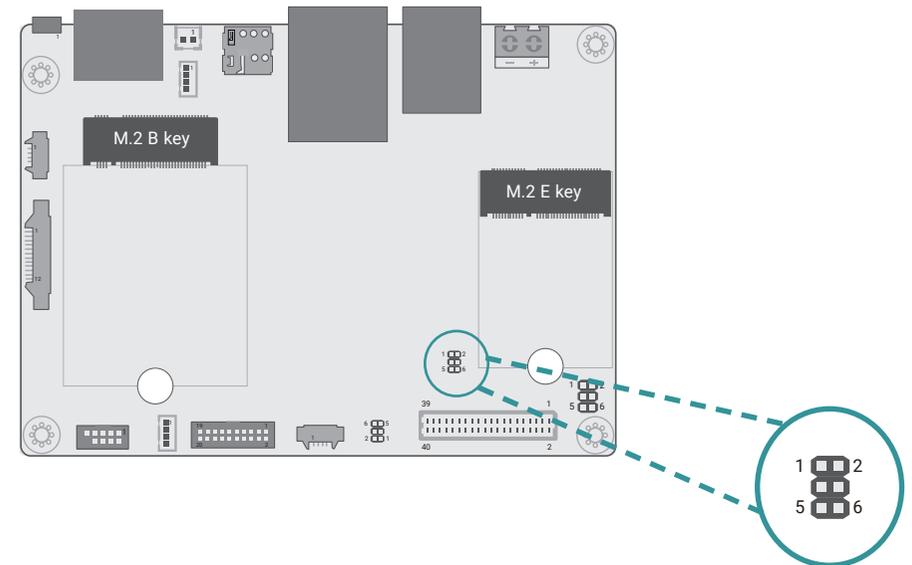
Pin	Assignment	Pin	Assignment
1	+3.3V_TP	2	GND
3	TP_SCL	4	TP_ALT#
5	TP_SDA	6	TP_RST#

VP IO (VPJ1)
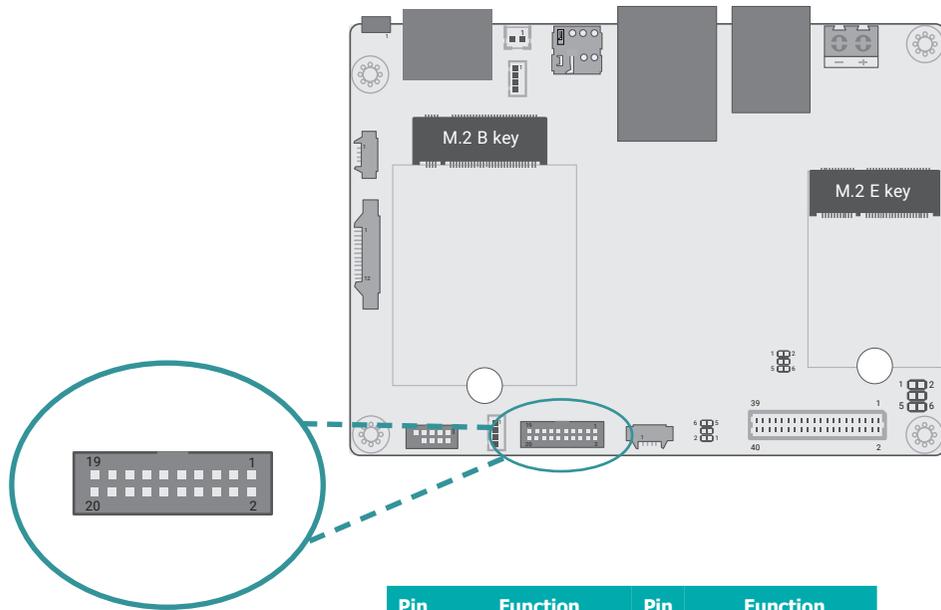
Pin	Function	Pin	Function
1	+5V	2	CAN_GND
3	SOUTN3	4	CAN_H
5	LVDS_A2+	6	CAN_L
7	SINN3	8	UR1_TX_232
9	SINN4	10	UR1_RX_232
11	SOUTN4	12	RTSN2
13	DTRN4	14	CTSN2
15	RTSN4	16	SOUTN2
17	CTSN4	18	SINN2
19	GND	20	GND

LVDS (J11)
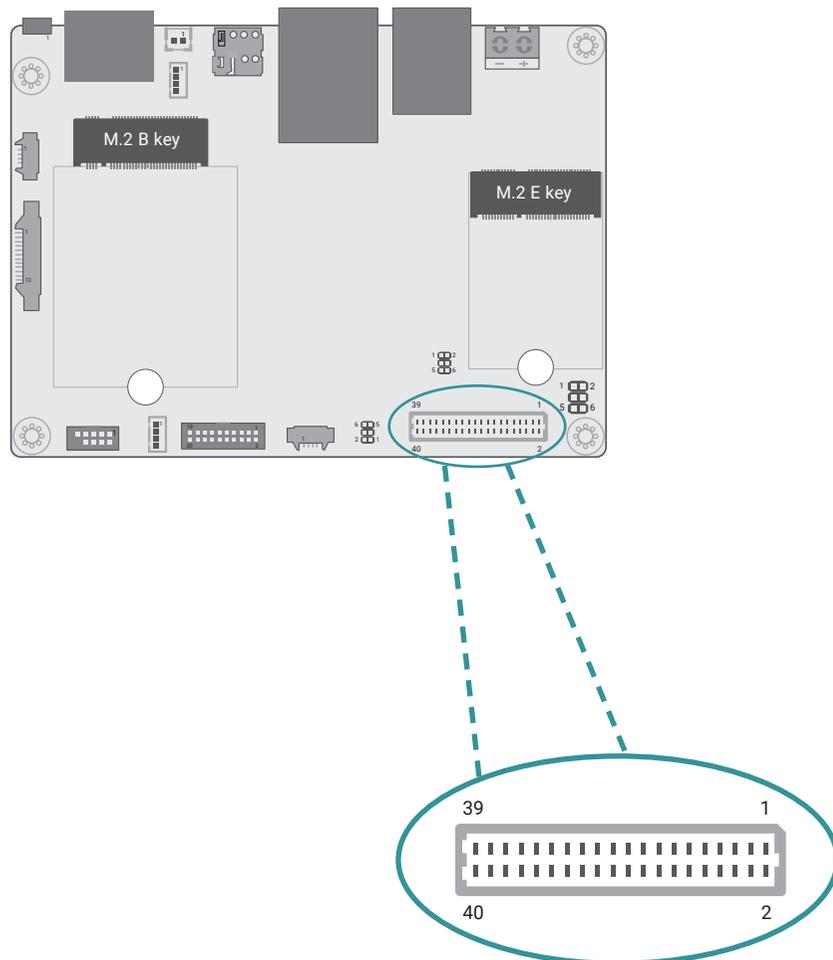
Pin	Function	Pin	Function
1	GND	2	GND
3	LVDS_A2-	4	LVDS_B3+
5	LVDS_A2+	6	LVDS_B3-
7	GND	8	GND
9	LVDS_A3-	10	LVDS_B2+
11	LVDS_A3+	12	LVDS_B2-
13	GND	14	GND
15	LVDS_A0-	16	LVDS_B1+
17	LVDS_A0+	18	LVDS_B1-
19	GND	20	GND
21	LVDS_A1-	22	LVDS_B0+
23	LVDS_A1+	24	LVDS_B0-
25	GND	26	GND
27	LVDS_A_CLK-	28	LVDS_B_CLK-
29	LVDS_A_CLK+	30	LVDS_B_CLK+
31	GND	32	GND
33	GND	34	GND
35	+VDD_3.3V	36	+VDD_5V
37	+VDD_3.3V	38	+VDD_5V
39	+VDD_3.3V	40	+VDD_5V