

QRB551

Embedded 3.5" SBC

User's Manual

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Trademarks

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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 QRB551 board

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 over-heating.

- 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.

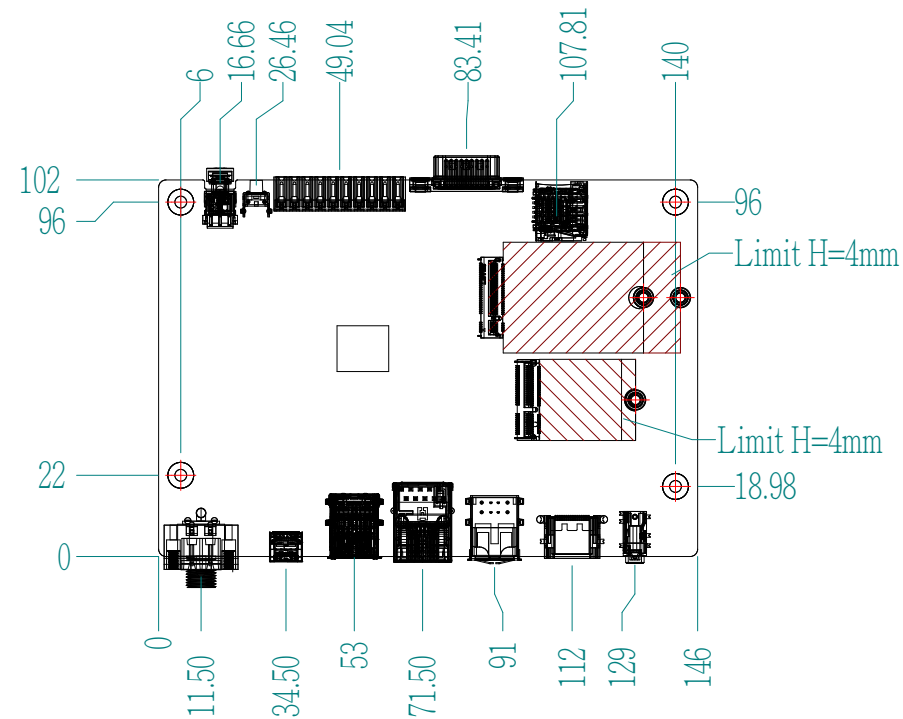
Chapter 1 - Introduction

► Specifications

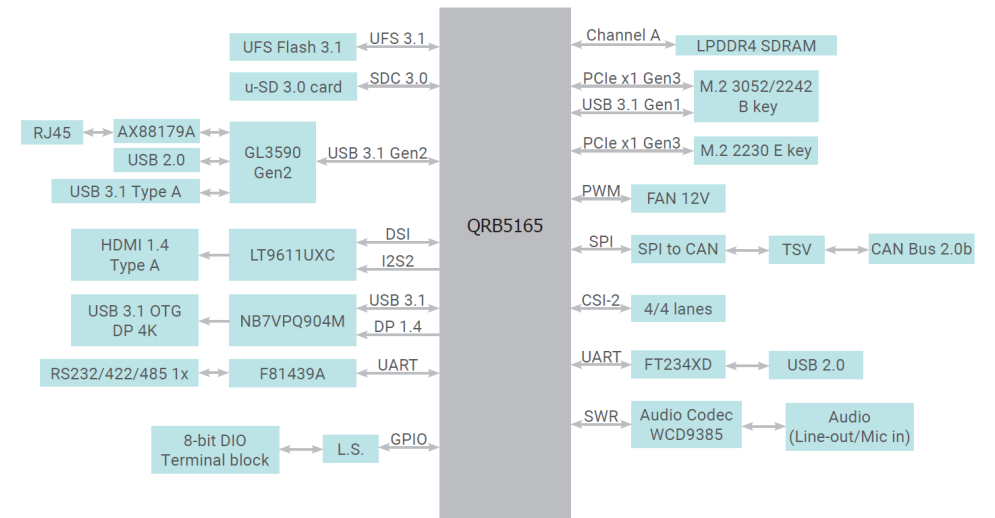
SYSTEM	Processor	QRB5165, 8x Kryo 585 2.84Ghz
	Memory	POP LPDDR4, 6/8GB (Next stage: LPDDR5)
GRAPHICS	Controller	Adreno 650 GPU
	Feature	DirectX 12, Open GL 4.6, Vulkan 1.2 HW Decode: AV1, AVC/H.264, MJPEG, HEVC/H.265, VP9, SCC HW Encode: MJPEG, AVC/H.264, HEVC/H.265, VP9, SCC
	Display	1 x HDMI Type A ,w/audio. 1080P support on Linux. 1 x USB type C DP, 4K
	Dual Displays	Main HDMI + Second USB type C DP
STORAGE	UFS	Support UFS 3.0, default 128GB
EXPANSION		
	Interface	1 x M.2 B key 3052/2242 (PCIEx2, reserve USB3.1) reference RM502G Quactel 1 x M.2 E key 2230 (PCIe x1) reference QCA6391 Wifi module 1 x Nano SIM slot
AUDIO	Audio Codec	Audio codec WCD9385
ETHERNET	Controller	AX88179A USB3 to GbE controller
REAR I/O	Ethernet	1 x GbE (RJ-45) (optional from rear USB2)
	Serial	1 x RS232/422/485 (DB9)
	USB	2 x USB 3.1 Gen1 Type A , 1 x USB 2 Type A 1 x USB 3.1 OTG Type C w/DP 4K 2 x USB 2.0
	Display	1 x HDMI 1.4
	DIO	1 x 8-bit DIO terminal block
	Audio	1 x Line out/Mic in audio jack
	Debug	1 x Micro USB debug UART

INTERNAL I/O	Camera	1 x MIPI-CSI2 for 2x 4 lanes camera , reference OV9282
	SD	1 x uSD3.0 card
	CANBus	1 x CAN bus 2.0b
	FAN	1 x FAN 12V PWM control
WATCHDOG TIMER	Output & Interval	TBD
	Type	12VDC
POWER	Connector	Default DC jack , co-lay 2-pole terminal block
	Consumption	TBD
	RTC Battery	CR2032 Coin Cell
OS SUPPORT	Linux	Ubuntu 18.04 (Linux Kernel 4.19)
MECHANISM	Dimensions	3.5" SBC Form Factor 146mm (5.75") x 102mm (4.02")
	Height	PCB: 1 mm Top Side: 8 mm, Bottom Side: 2.5 mm
ENVIRONMENT	Temperature	Operating: 0 to 60°C Storage: -40 to 85°C
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
	MTBF	TBD
STANDARDS AND CERTIFICATIONS	Certifications	CE, FCC, RoHS, UKCA

► Dimensions



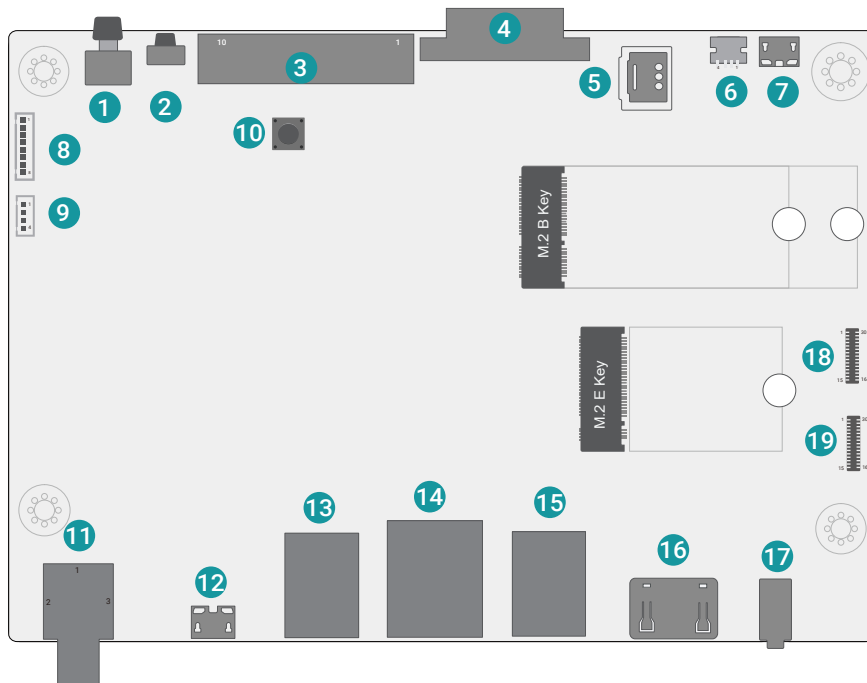
► Block Diagram



Chapter 2 - Hardware Installations

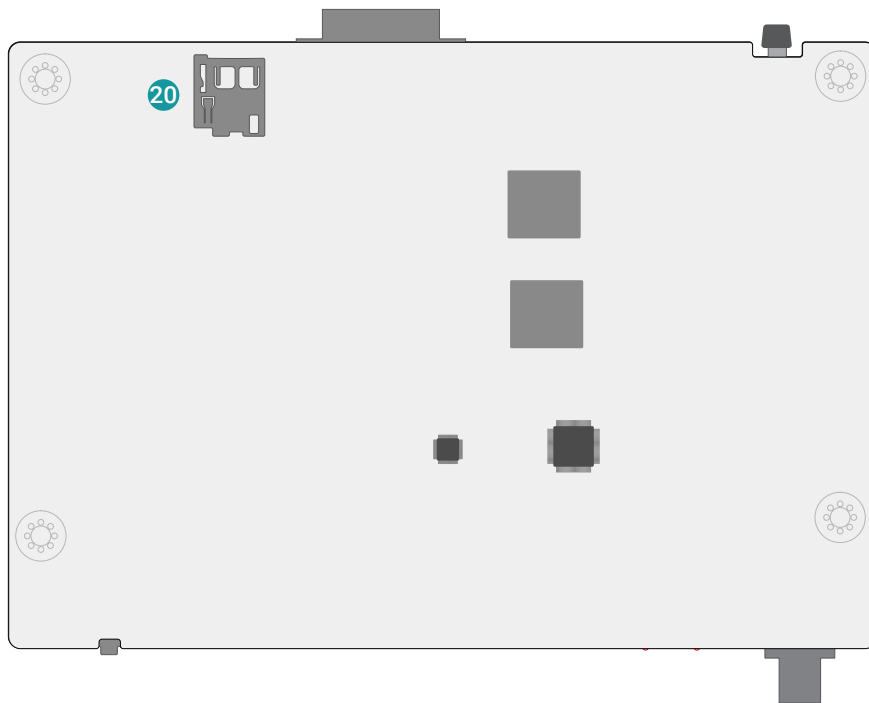
► Overview

Top View



1	Power Button	9	Fan	17	Audio
2	Reset Button	10	USB Boot	18	Main Camera
3	DIO	11	DC-in	19	Tracking Camera
4	COM1	12	USB3.2		
5	SIM Card	13	USB3_1/2		
6	CAN Bus	14	LAN1		
7	Debug UART	15	USB2_1/2		
8	Front Panel	16	HDMI		

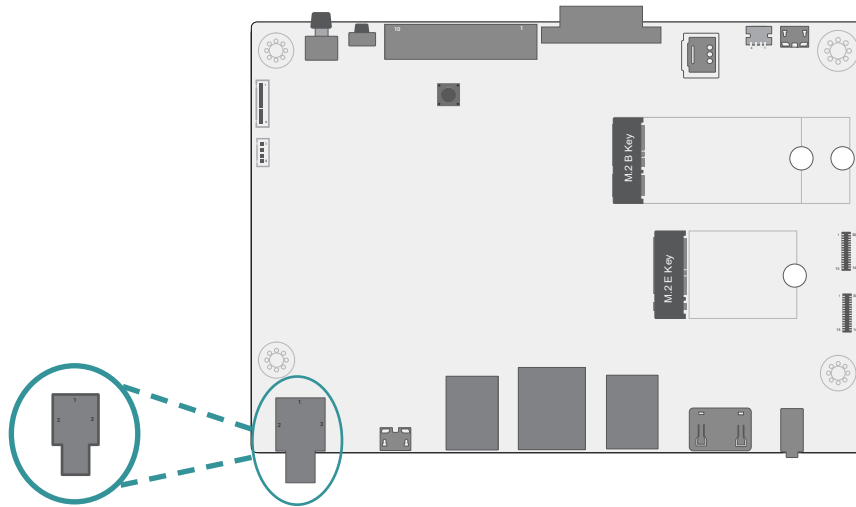
Bottom View



20 uSD Card

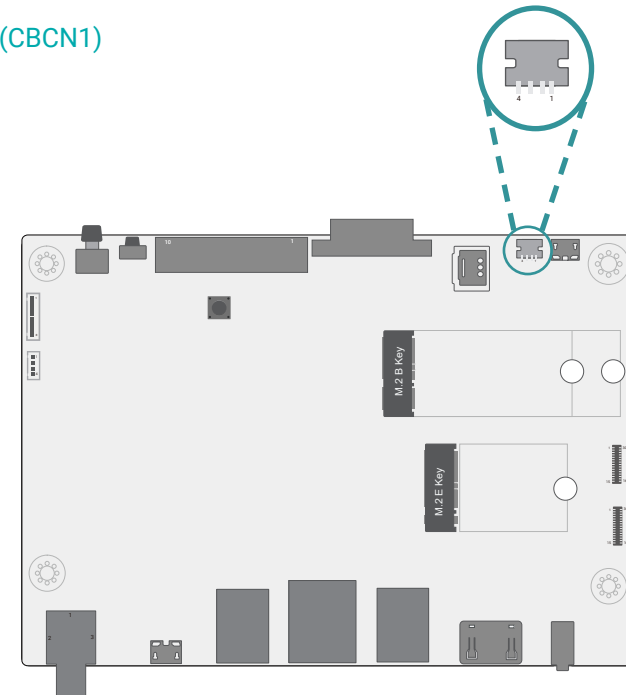
► Pin Assignment

DC-in (DCCN1)



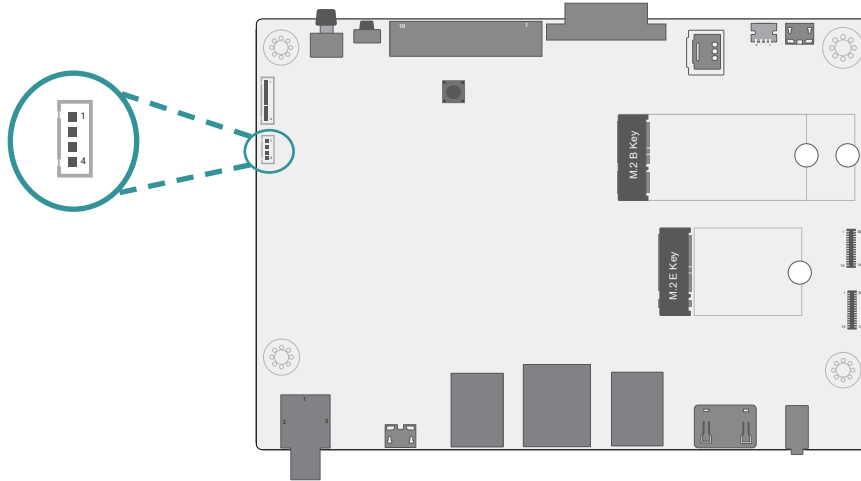
Pin	Assignment
1	+12V
2	GND
3	GND

CAN Bus (CBCN1)



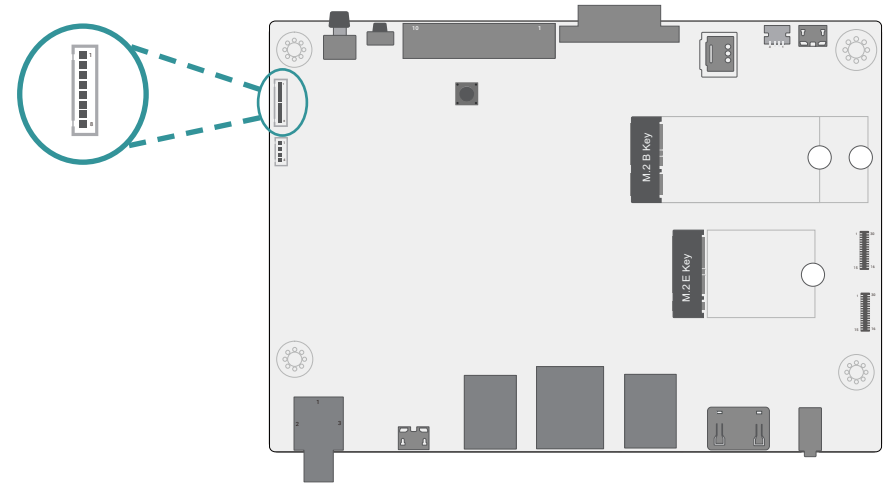
Pin	Assignment
1	+5V
2	CAN1H
3	CAN1L
4	GND

Fan (SFJ1)



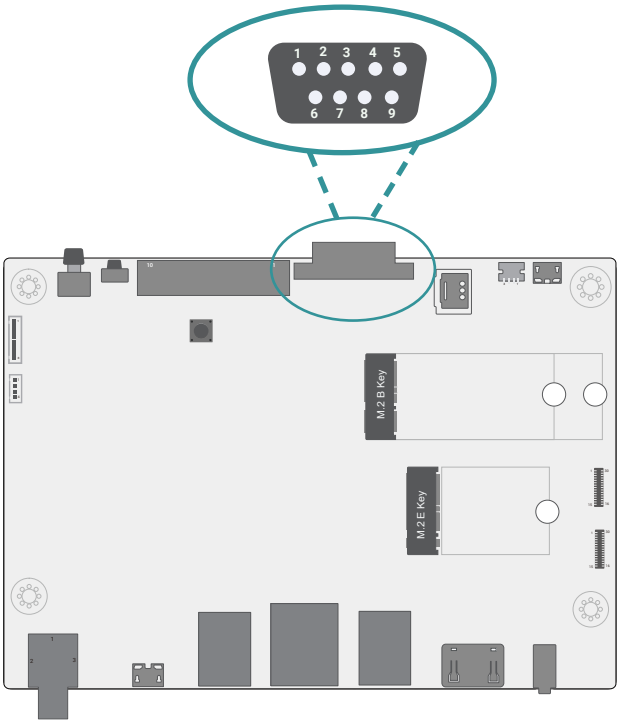
Pin	Assignment
1	GND
2	+12V
3	RSV
4	PWM(5V)

Front Panel (FPJ1)



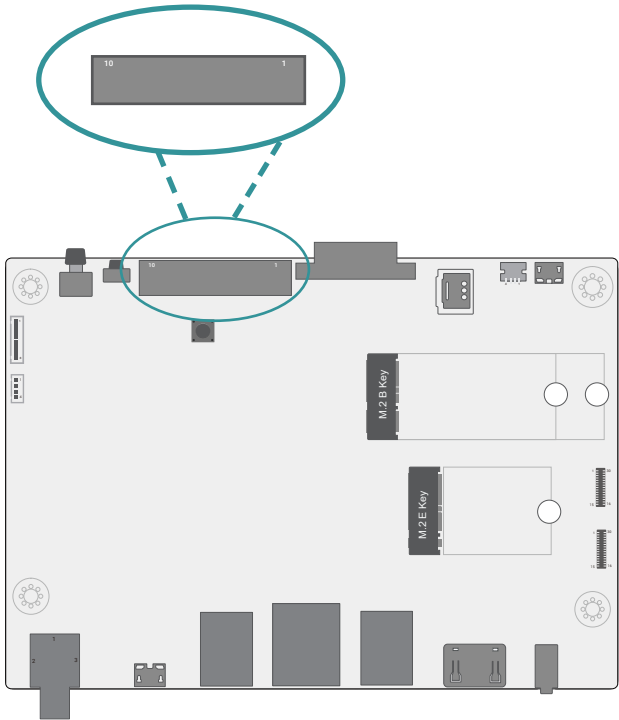
Pin	Assignment	Pin	Assignment
1	PWRBTN#	2	LED(3.3V)
3	GND	4	PWM(3.3V)
5	GND	6	RSTBTN#
7	RSV	8	NC

COM1 (TSCN1)



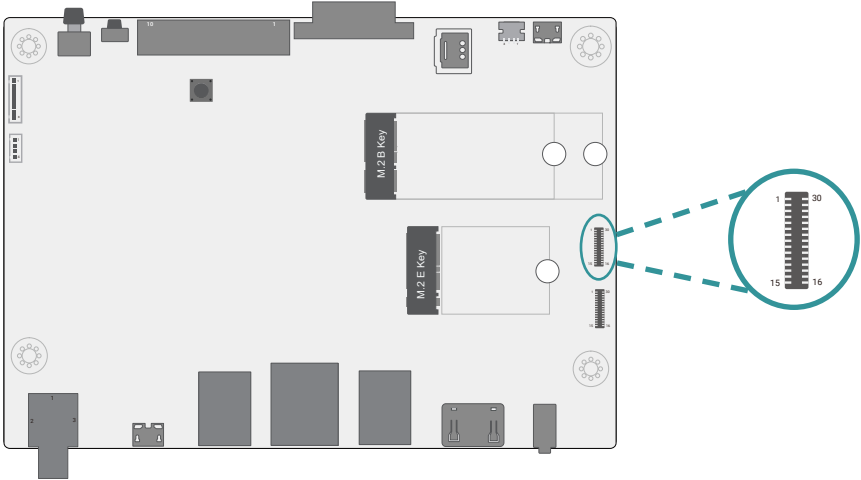
Pin	Assignment	Pin	Assignment
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	NC
7	RTS	8	CTS
9	NC		

DIO (IOJ1)



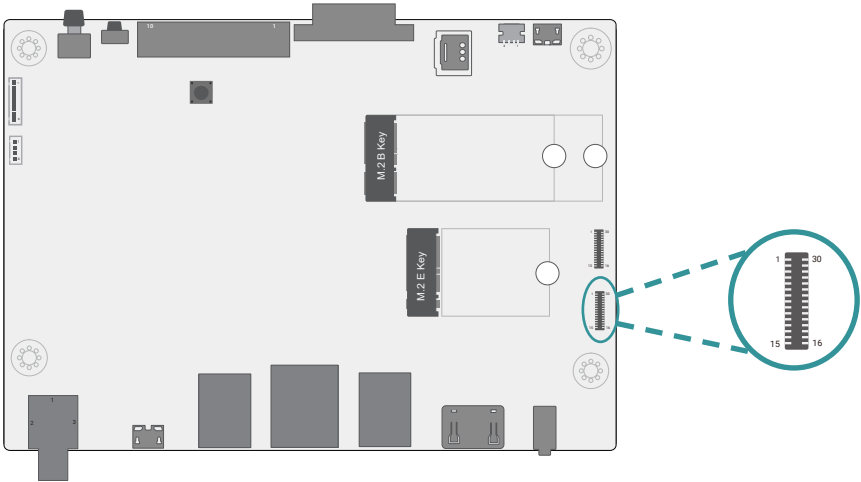
Pin	Assignment	Pin	Assignment
1	DIO0	2	DIO1
3	DIO2	4	DIO3
5	DIO4	6	DIO5
7	DIO6	8	DIO7
9	+3.3V	10	GND

Main Camera (CMJ2)



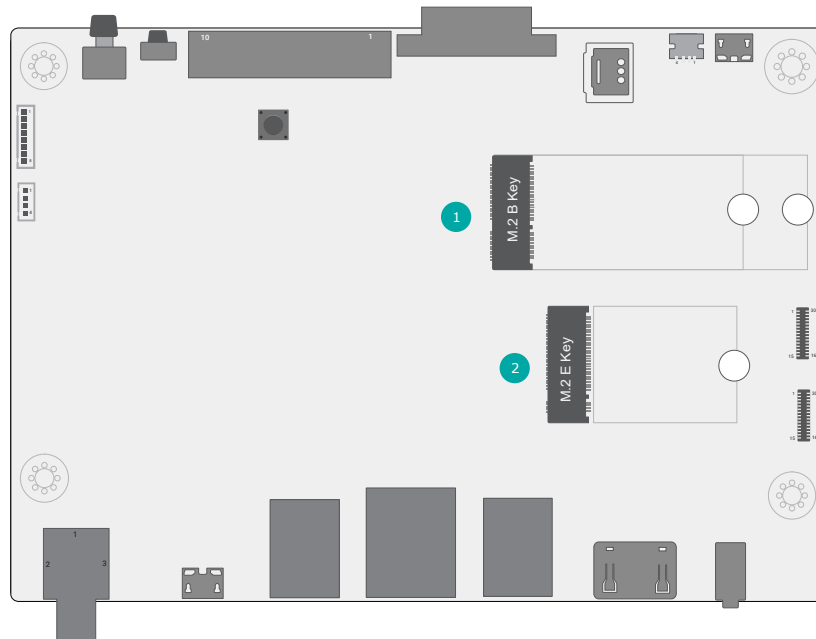
Pin	Assignment	Pin	Assignment
1	Strobe	2	SPI_CLK
3	+2.8V	4	SPI_MOSI
5	RST#	6	GND
7	CSI_D2P	8	CSI_D2M
9	GND	10	CSI_D0P
11	CSI_D0M	12	GND
12	CSI_D3P	14	CSI_D3M
15	RSV	16	GND
17	CSI_D1M	18	CSI_D1P
19	GND	20	CSI_CKM
21	CSI_CKP	22	GND
23	CSI_MCLK	24	GND
25	I2C_SCL	26	I2C_SDA
27	SPI_CS	28	+1.8V
29	SPI_MISO	30	+1.1V

Tracking Camera (CMJ1)



Pin	Assignment	Pin	Assignment
1	Strobe	2	NC
3	+2.8V	4	GND
5	RST#	6	GND
7	CSI_D2P	8	CSI_D2M
9	GND	10	CSI_D0P
11	CSI_D0M	12	GND
12	CSI_D3P	14	CSI_D3M
15	RSV	16	GND
17	CSI_D1M	18	CSI_D1P
19	GND	20	CSI_CKM
21	CSI_CKP	22	GND
23	CSI_MCLK	24	GND
25	I2C_SCL	26	I2C_SDA
27	PWDN	28	+1.8V
29	GND	30	+1.2V

► Expansion Slots



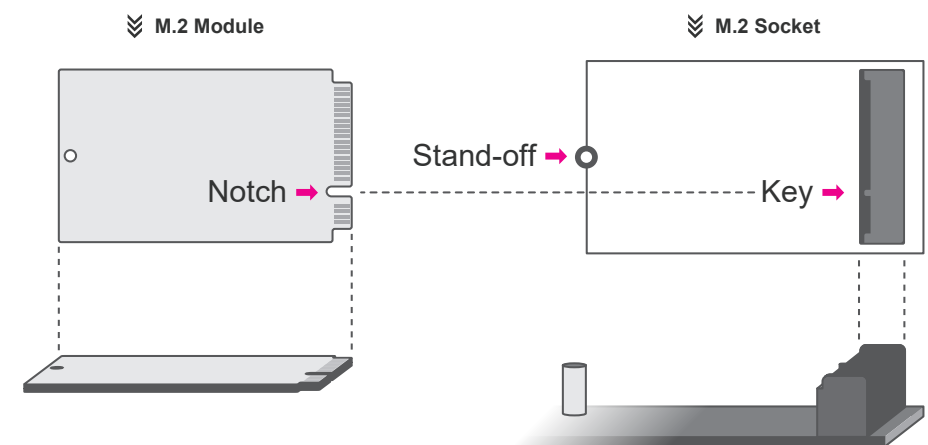
1 M.2 B-Key

2 M.2 E-Key

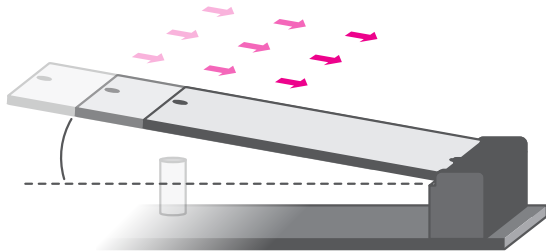
Installing the M.2 Module

Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.

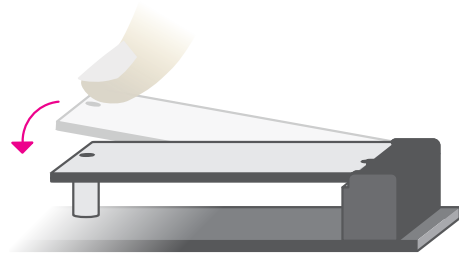


Please follow the steps below to install the card into the socket.



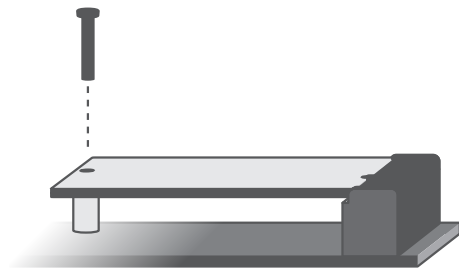
Step 1:

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.

Appendix A- Mating Connectors

► The Mating Connectors List

Please refer to the following list of the mating connectors.

Function	Connector	Connector information	Rate output
Camera1 Camera2	CMJ1 CMJ2	HIROSE, 2*15P/0.4mm , BM20B(0.8)-30DS-0.4V(51), HEADER BTB CONN	
FW upgrade	DPJ1	PINREX, 1*4P/1.25mm,712-73-045WE0, BOX HEADER	
CAN bus	CBCN1	TOKUTSU, 1*4/1.0mm, 1W1003WOR0-04,BOX HEADER	
Front Panel	FPJ1	MOLEX, 1*8P/1.25mm, 53398-0871, BOX HEADER	
Fan	SFJ1	PINREX, 1*4P/1.25mm, 712-73-045WE0, BOX HEADER	+5V/0.5A