USER MANUAL

VIA VAB-820

Low power quad-core platform with advanced multimedia capability for embedded applications

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Regulatory Compliance

FCC-A Radio Frequency Interference Statement

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 commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his personal expense.

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.

Notice 2

Shielded interface cables and A.C. power cord, if any, must be used in order to comply with the emission limits.

Notice 3

The product described in this document is designed for general use, VIA Technologies assumes no responsibility for the conflicts or damages arising from incompatibility of the product. Check compatibility issue with your local sales representatives before placing an order.

Tested To Comply
With FCC Standards
FOR HOME OR OFFICE USE

Battery Recycling and Disposal

- ☐ Only use the appropriate battery specified for this product.
- ☐ Do not re-use, recharge, or reheat an old battery.
- ☐ 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.
- ☐ Put this equipment on a reliable flat surface before setting it up.
- ☐ Check the voltage of the power source and adjust to 110/220V before connecting the equipment to the power inlet.
- ☐ Do not place the power cord where people will step on it.
- ☐ Always unplug the power cord before inserting any add-on card or module.
- ☐ If any of the following situations arise, get the equipment checked by authorized service personnel:
  - The power cord or plug is damaged.
  - Liquid has entered into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment is faulty or you cannot get it work according to User's Manual.
  - The equipment has been dropped and damaged.
  - The equipment has obvious sign of breakage.
- ☐ Do not leave this equipment in extreme temperatures or in a storage temperature above 70°C (158°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

VAB-820-QP SKU

- ☐ 1 x VIA VAB-820 mainboard (with 1.0GHz NXP i.MX 6QuadPlus Cortex-A9 SoC)
- ☐ 1 x DC power cable
- ☐ 1 x Audio cable
- ☐ 1 x USB cable
- ☐ 1 x Console cable (3-wired for debugging the console)

VAB-820 SKU

- ☐ 1 x VIA VAB-820 mainboard (with 1.0GHz NXP i.MX 6Quad Cortex-A9 SoC)
- ☐ 1 x DC power cable
- ☐ 1 x Audio cable
- ☐ 1 x USB cable
- ☐ 1 x Console cable (3-wired for debugging the console)

VAB-820-P SKU (specially designed for AMOS-820)

- ☐ 1 x VIA VAB-820 mainboard (with 1.0GHz NXP i.MX 6Quad Cortex-A9 SoC)
- ☐ 1 x PWB-P255-L PD board
- ☐ 1 x DC power cable
- ☐ 1 x Audio cable
- ☐ 1 x USB cable
- ☐ 1 x Console cable (3-wired for debugging the console)

Ordering Information

Part Number	Description
10GBF10H700A0	Pico-ITX board with 1.0GHz i.MX 6QuadPlus Cortex-A9 SoC, 4GB eMMC, 4MB SPI Flash ROM, 1GB DDR3 SDRAM, HDMI, LVDS, 4 x USB 2.0, USB 2.0 OTG, COM, Gigabit Ethernet, S-Video, Micro SD card slot, miniPCIe slot, 2 x CAN bus, and 12V DC-in
10GBF105000A0	Pico-ITX board with 1.0GHz i.MX 6Quad Cortex-A9 SoC, 4GB eMMC, 4MB SPI Flash ROM, 1GB DDR3 SDRAM, HDMI, LVDS, 4 x USB 2.0, USB 2.0 OTG, COM, Gigabit Ethernet, S-Video, Micro SD card slot, miniPCIe slot, 2 x CAN bus, and 12V DC-in

Optional Accessories

Wireless Modules

Part Number	Description
00GO27100BU2B0D0	VNT9271 IEEE 802.11 b/g/n USB Wi-Fi dongle
EMIO-1533-00A2	VNT9271 IEEE 802.11 b/g/n USB Wi-Fi module with assembly kit
EMIO-5531-00A1	VAB-820-W IEEE 802.11b/g/n USB Wi-Fi & Bluetooth module with assembly kit and antenna
EMIO-2531-00A1	VAB-820-W-M IEEE 802.11b/g/n miniPCIe Wi-Fi & Bluetooth module with assembly kit and antenna
EMIO-2550-00A1	3.75G HSPA/UMTS mobile broadband full size miniPCIe module with GPS and SIM card slot

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1. Product Overview

Based on the ultra-compact Pico-ITX form factor, measuring 10cm x 7.2cm, the VIA VAB-820 is a Pico-ITX board to feature an ARM SoC. With a 1.0GHz NXP i.MX 6QuadPlus (or i.MX 6Quad) Cortex-A9 ARM SoC, the VIA VAB-820 combines three independent, integrated GPUs for 3D/2D graphics acceleration and supports multiple displays.

The ultra-compact VIA VAB-820 Pico-ITX is optimized for both performance and power to meet the high end demands of advanced industrial, energy management and in-vehicle applications, boasting a ruggedized design with an extended operating temperature range from -20 to 70°C, while offering extremely low power consumption.

The VIA VAB-820 provides an impressive selection of rear I/O in a compact form factor including HDMI® port, two USB 2.0 ports, composite input RCA jack and Gigabit Ethernet port. Customers can take advantage of VIA's industry leading hardware and software support to create customized designs with a quick time to market. The VIA VAB-820 is also available with board support packages (BSP) for Android and Linux Kernel operating systems.

1.1. Key Features

- Powered by 1.0GHz NXP i.MX 6QuadPlus (or i.MX 6Quad) Cortex-A9 quad-core SoC
- Supports independent, integrated graphics processing (GPU) for 3D/2D and graphics acceleration and multiple displays
- Flawless HD video performance up to 1080p
- 4GB onboard eMMC Flash memory
- Supports HDMI® port, Gigabit Ethernet port and composite input RCA jack
- Supports four USB 2.0 ports (two as pin header)
- Supports one dual-channel 18/24-bit LVDS panel connector
- Supports two COM connectors with power supply
- Supports two Controller Area Network (FlexCAN)
- Support miniPCIe slot, and Micro SD card slot for expandable storage up to 32GB
- Small form factor and low power design
- Fanless and ultra-low power consumption
- Wide operating temperature range, -20°C ~ 70°C
- Android and Linux solution packs available

VAB-820+PWB-P255-L (VAB-820-P SKU)

- Integrated Powered Device (PD) controller and switching regulator intended for high power IEEE 802.3at and 802.3af applications
- 25W output power from power over Ethernet (PoE) PD board
- Operates from either PoE or external adaptors (12V)

1.2. Product Specifications

1.2.1. VIA VAB-820 Mainboard

Processor
- 1.0GHz NXP i.MX 6QuadPlus Cortex-A9 quad-core SoC (for VAB-820-QP SKU)
- 1.0GHz NXP i.MX 6Quad Cortex-A9 quad-core SoC (for VAB-820 SKU and VAB-820-P SKU)

System Memory
- 1GB DDR3 SDRAM onboard

Storage
- 4GB eMMC Flash memory

Boot Loader
- 4MB SPI Flash ROM

Graphics
- Vivante GC2000+ GPU (VAB-820-QP SKU)
- Vivante GC2000 GPU (VAB-820 SKU and VAB-820-P 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, VC-1 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

Expansion I/O
- 1 x miniPCIe slot

Onboard I/O
- 1 x COM connector with power supply (supports 8-wire DTE mode)
- 1 x COM/CAN connector with power supply (supports one RS-232 (TX/RX) and two FlexCAN TX/RX ports)
- 1 x RTC battery connector
- 1 x MIPI CSI-2 connector (supports 2 data lanes)
- 1 x SPI master connector (supports two SPI slave devices)
- 1 x S-Video input pin header
- 1 x Front audio pin header for Line-in, Line-out and Mic-in
- 1 x Boot flash select jumper (for SPI or micro SD)
- 1 x USB 2.0 and USB 2.0 OTG pin header
- 1 x Miscellaneous pin header (for one I^2C pair, DIO (4GPI + 4 GPO), system reset button and LEDs for power/WPAN/Wi-Fi/WWAN
- 1 x Dual-channel, 18/24-bit LVDS panel connector
- 1 x LVDS Inverter connector
- 1 x LVDS power select jumper
- 1 x DC-in connector (12V)

- 1 x miniPCIe slot (supports multiple connections and buses including JTAG)
- 2 x PoE pin headers (support optional PD power board) (VAB-820-P SKU)

Front Panel I/O

- 1 x Micro SD Card slot

Back Panel I/O

- 1 x HDMI port
- 2 x USB 2.0 ports
- 1 x Gigabit Ethernet port (supports optional IEEE 802.3at type 2)
- 1 x Composite input RCA jack

Watchdog Timer

- Integrated watchdog timer supports two comparison points. Each comparison point can interrupt ARM core, and a second comparison point capable of generating external interrupts on WDOG line

Power Supply

- 12V DC-in

Operating Temperature

- -20°C ~ 70°C (3G & Wi-Fi not included)

Operating Humidity

- 0% ~ 95% (non-condensing)

Operating System

- Android 6.0 and Linux Kernel 4.1.15 (VAB-820-QP SKU)
- Android 5.0 and Linux Kernel 3.14.28 (VAB-820 SKU and VAB-820-P SKU)

Form Factor

- Pico-ITX
- 10cm x 7.2cm (100mm x 72mm)

Compliance

- CE, FCC

Notes:

1. For the software evaluation, please visit our VIA website at http://www.viatech.com
2. 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 program 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.
3. After the VIA VAB-820 is shut down, it remains in standby mode so that some components may retain power. If user has concern about power consumption during shut down, it is recommended to directly unplug the AC adapter from the board.
4. 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.

1.2.2. PWB-P255-L Power Board

- Integrated Powered Device (PD) controller and switching regulator intended for high power IEEE 802.3at and 802.3af applications
- 25W output power from power over Ethernet (PoE)
- Operates from either PoE or external adaptors
- 12V output voltage

Operating Temperature

- -20°C ~ 70°C

Operating Humidity

- 0% ~ 95% (relative humidity; non-condensing)

Form Factor

- 10cm x 5.2cm (100mm x 52mm)

1.3. Layout Diagram

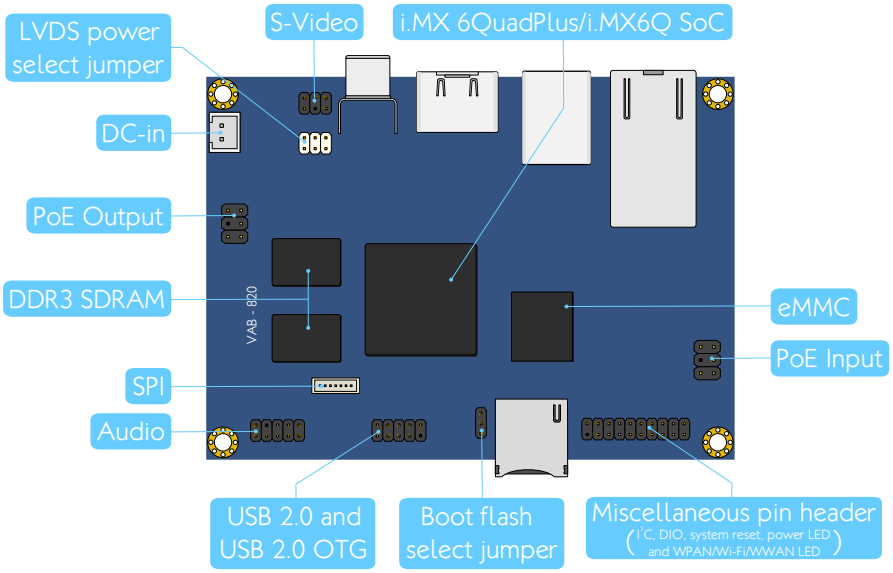

Figure 1: Layout diagram of the VIA VAB-820 (top view)

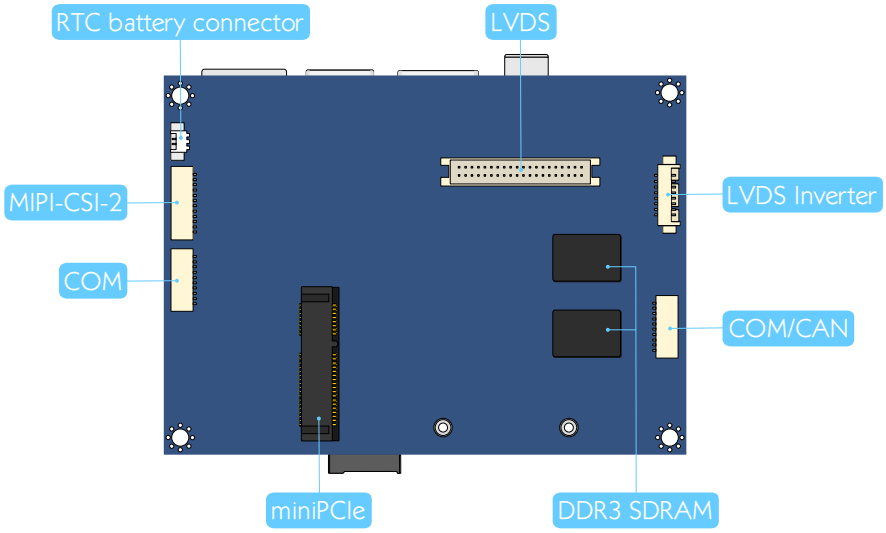

Figure 2: Layout diagram of the VIA VAB-820 (bottom view)

1.4. Product Dimensions

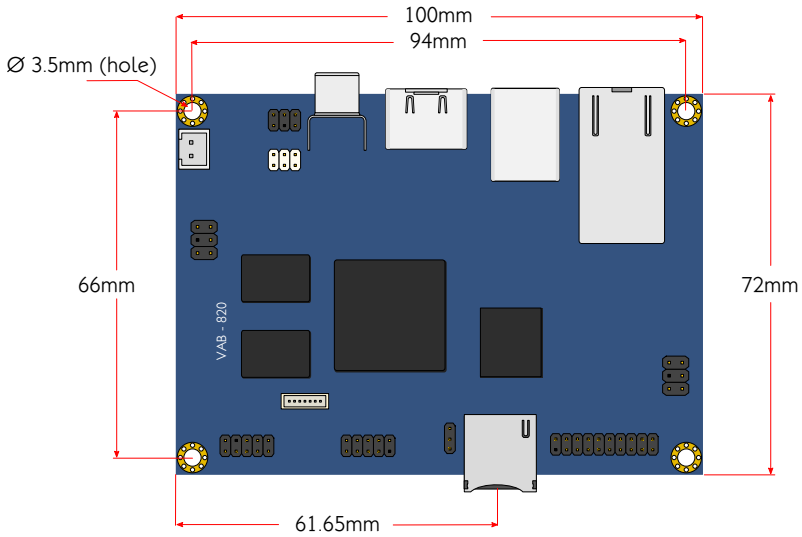

Figure 3: Mounting holes and dimensions of the VIA VAB-820 (top view)

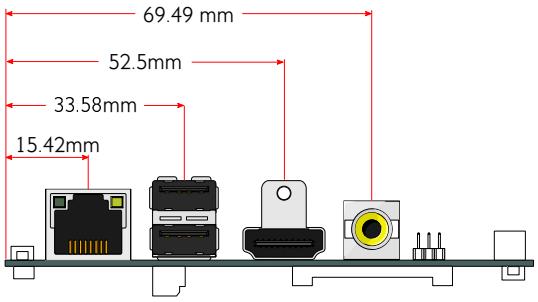

Figure 4: External I/O port dimensions of the VIA VAB-820 (back panel)

1.5. Height Distribution

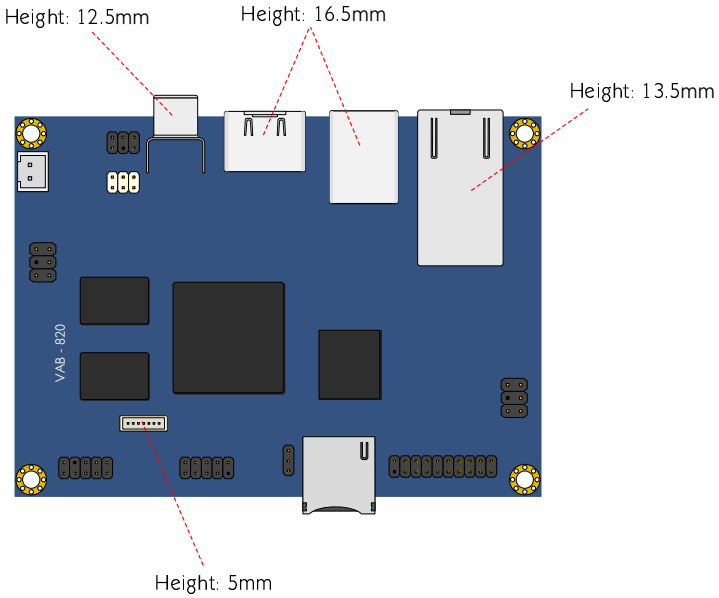

Figure 5: Height distribution of the VIA VAB-820 (top view)

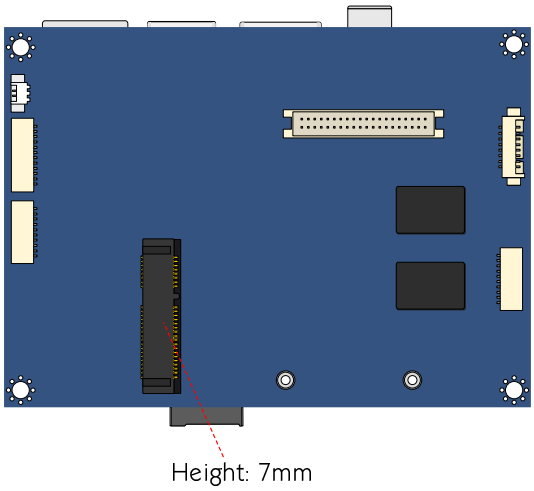

Figure 6: Height distribution of the VIA VAB-820 (bottom view)

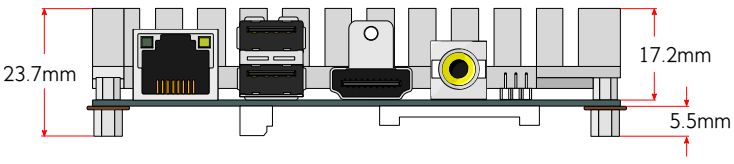

Figure 7: Height distribution of the VIA VAB-820 with the heatsink installed

2. I/O Interface

VIA VAB-820 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

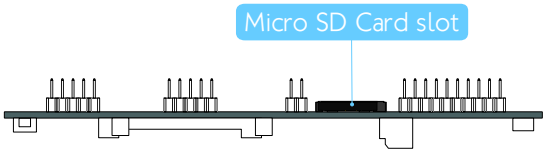

Figure 8: Front panel I/O

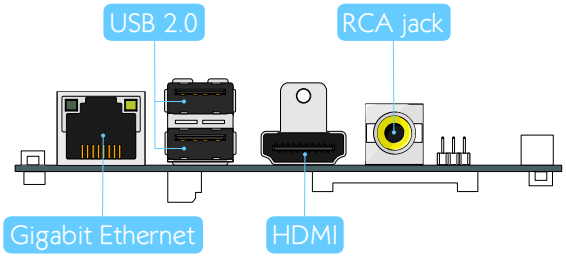

Figure 9: Back panel I/O

2.1.1. Micro SD Card Slot

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

Figure 10: 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 integrated Gigabit Ethernet port is using an 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.

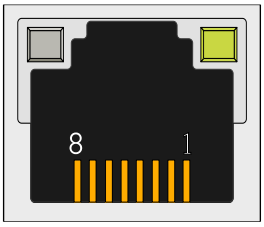

Figure 11: Gigabit Ethernet port diagram

Pin	Signal
1	Signal pair 1+
2	Signal pair 1-
3	Signal pair 2+
4	Signal pair 3+
5	Signal pair 3-
6	Signal pair 2-
7	Signal pair 4+
8	Signal pair 4-

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.

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

Table 3: Gigabit Ethernet port LED color definition

2.1.3. USB 2.0 Port

The VIA VAB-820 mainboard provides two USB 2.0 ports. Each USB port gives complete Plug and Play and hot swap capability for external devices. The USB interface complies with USB UHCI, Rev. 2.0. The pinout of the typical USB 2.0 port is shown below.

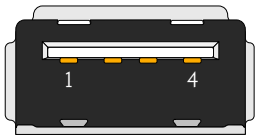

Figure 12: USB 2.0 port diagram

USB0	
Pin	Signal
1	VCC
2	USB1_data-
3	USB1_data+
4	GND

USB1	
Pin	Signal
1	VCC
2	USB2_data-
3	USB2_data+
4	GND

Table 4: USB 2.0 port pinout

2.1.4. HDMI® Port

The integrated 19-pin HDMI port uses an HDMI Type A receptacle connector defined in HDMI specification. The HDMI port is used to connect high definition video and digital audio using a single cable. It allows connecting the digital video devices which utilize a high definition video signal. The pinout of the HDMI port is shown below.

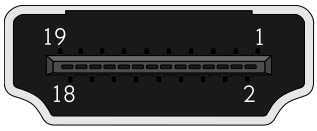

Figure 13: HDMI® port diagram

Pin	Signal	Pin	Signal
1	TMDS Data0+	2	GND
3	TMDS Data0–	4	TMDS Data1+
5	GND	6	TMDS Data1–
7	TMDS Data2+	8	GND
9	TMDS Data2–	10	TMDS Data3+
11	GND	12	TMDS Data3–
13	CEC	14	NC
15	HDMI Clock	16	HDMI Data
17	GND	18	HDMI Power
19	Hot Plug Detect		

Table 5: HDMI® port pinout

2.1.5. RCA Jack

The RCA jack connects to external composite video input device.

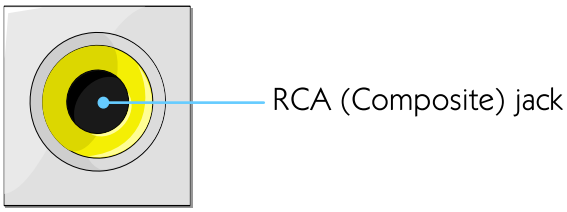

Figure 14: RCA jack diagram

Description	RCA Jack
Video	Composite Video Input

Table 6: RCA jack pinout

2.2. Onboard Connectors

2.2.1. USB 2.0 and USB 2.0 OTG Pin Header

The mainboard includes one USB 2.0 and USB 2.0 OTG pin header block labeled as "J8". The USB 2.0 and USB 2.0 OTG pin header is used for connecting USB and USB OTG devices. The pinout of the pin header is shown below.

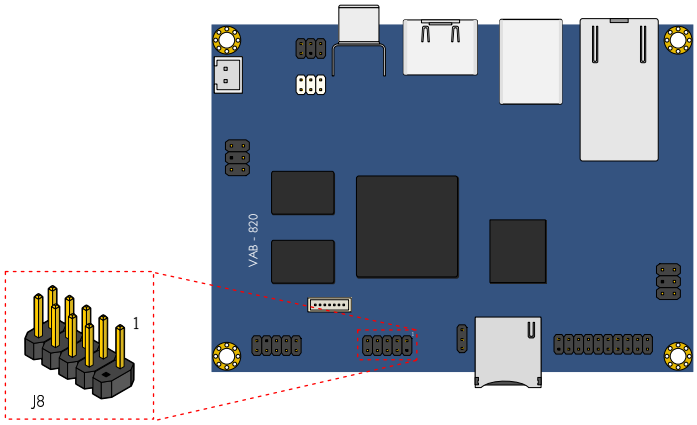

Figure 12: USB 2.0 and USB 2.0 OTG pin header diagram

Pin	Signal	Pin	Signal
1	GND	2	-
3	USB_OTG_ID	4	GND
5	OTG_DP	6	USBD_T3+
7	OTG_DN	8	USBD_T3-
9	OTG_VBUS	10	USB_VBUS

Table 7: USB 2.0 and USB 2.0 OTG pin header pinout

2.2.2. Front Audio Pin Header

The mainboard has a front audio pin header for Line-out, Line-in and Mic-in. This pin header is labeled as "AUDIO1". The pinout of the front audio pin header is shown below.

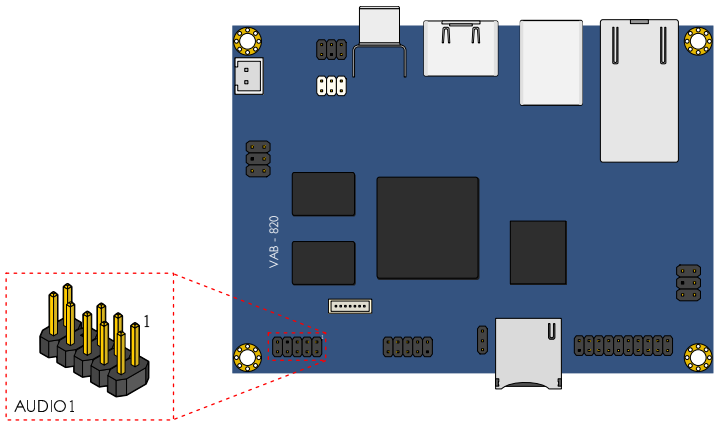

Figure 13: Front audio pin header diagram

Pin	Signal	Pin	Signal
1	HEAD_RIGHT	2	HEAD_LEFT
3	LINE_IN_R	4	LINE_IN_L
5	MIC_IN	6	MIC_IN
7	-	8	NC
9	GND_ANALOG	10	GND_ANALOG

Table 8: Front audio pin header pinout

2.2.3. Miscellaneous Pin Header

The mainboard includes one miscellaneous pin header block labeled as "J7". The miscellaneous pin header is used for connecting Digital I/O (GPIO), I²C devices and providing access to system reset switch, power LED and WPAN/Wi-Fi/WWAN LED. The pinout of the miscellaneous pin header is shown below.

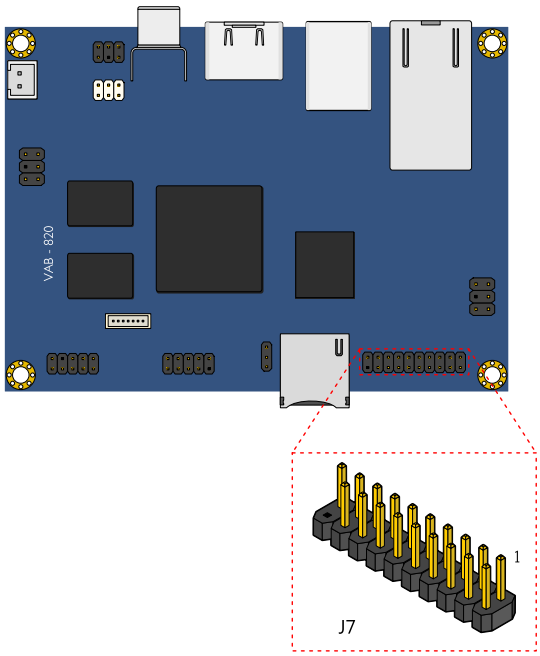

Figure 14: Miscellaneous pin header diagram

Pin	Signal	Pin	Signal
1	RESET_N	2	P_LED+
3	GND	4	P_LED-
5	12C3_SCL	6	W_LED+
7	12C3_SDA	8	W_LED-
9	5VIN	10	GND
11	GPIO_1	12	GPIO_7
13	GPIO_2	14	GPIO_8
15	GPIO_4	16	GPIO_9
17	GPIO_5	18	GPIO_16
19	GND	20	-

Table 9: Miscellaneous pin header pinout

2.2.4. SPI Connector

The mainboard has one 7-pin SPI flash connector. The SPI (Serial Peripheral Interface) connector is used to communicate with external SPI slave devices. The connector is labeled as "J10". The pinout of the SPI connector is shown below.

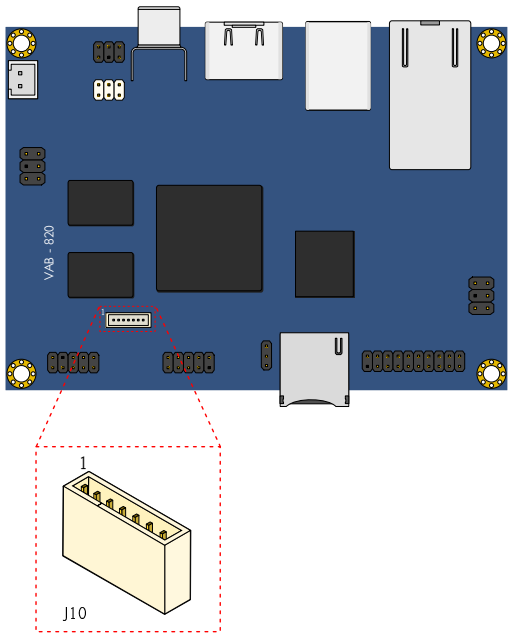

Figure 15: SPI connector diagram

Pin	Signal
1	CSPI3_CLK
2	CSPI3_MOSI
3	CSPI3_MISO
4	3P3V
5	CSPI3_CS0
6	GND
7	CSPI3_CS1

Table 10: SPI connector pinout

2.2.5. PoE Pin Header

The mainboard has two PoE pin headers. The PoE pin headers are used to connect to optional PD power board for implementation of Power Over Ethernet. The PoE input pin header is labeled as "J13". The PoE output pin header is labeled as "J14". The pinout of the pin header is shown below.

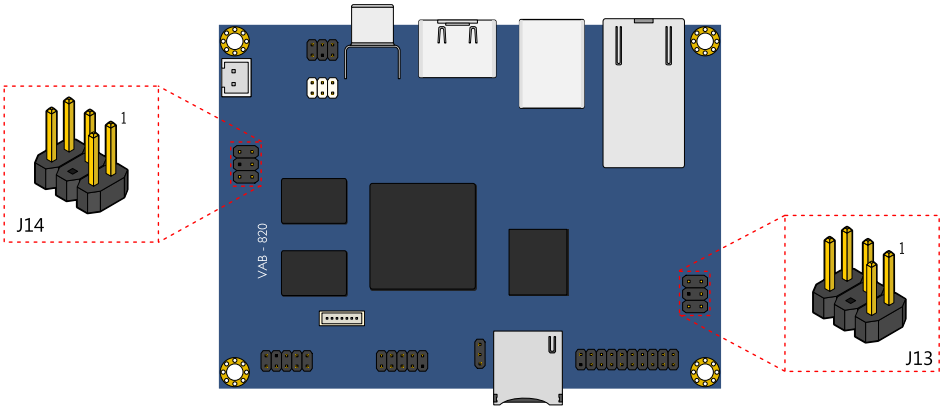

Figure 16: PoE (Input/Output) pin header diagram

J13: Input			
Pin	Signal	Pin	Signal
1	WIRE1	2	WIRE2
3	NC	4	-
5	WIRE3	6	WIRE4

Table 11: PoE Input pin header pinout

J14: Output			
Pin	Signal	Pin	Signal
1	POE_12V	2	POE_12V
3	NC	4	-
5	GND	6	GND

Table 12: PoE Output pin header pinout

2.2.6. DC-In Connector

The mainboard has a +12V DC-in power connector to provide additional power to the rest of the system. The 2-pin power connector is used to connect the DC-in power jack. The connector is labeled as "J9". The pinout of the DC-in connector is shown below.

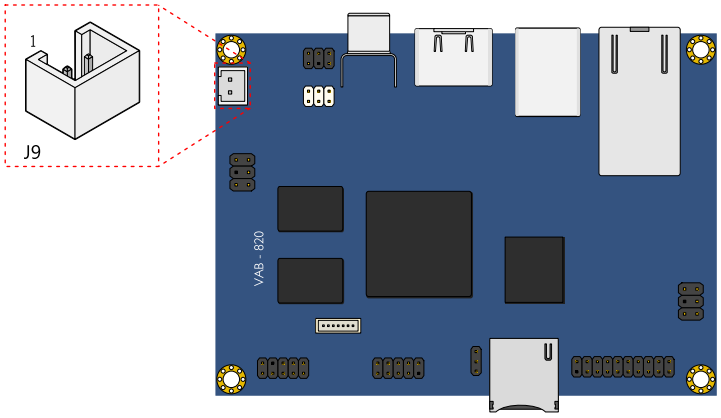

Figure 17: DC-in connector diagram

Pin	Signal
1	+12V
2	GND

Table 13: DC-in connector pinout

2.2.7. S-Video Input Pin Header

The mainboard provides an S-Video input pin header. The S-Video input pin header is an analog video connector for connecting TV monitor or S-Video input devices. The pinout of the S-Video input pin header is shown below.

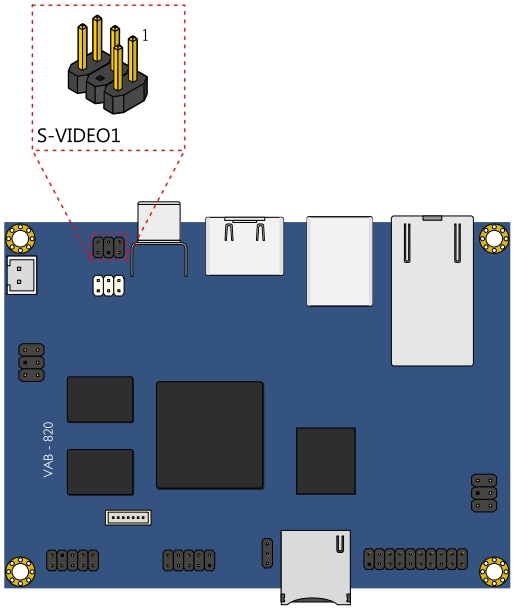

Figure 18: S-Video input pin header diagram

Pin	Signal	Pin	Signal
1	C	2	GND
3	Y	4	-
5	NC	6	GND

Table 14: S-Video input pin header pinout

2.2.8. RTC Battery Connector

The mainboard is equipped with an 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 RTC battery connector is labeled as "J1". The pinout of the RTC battery connector is shown below.

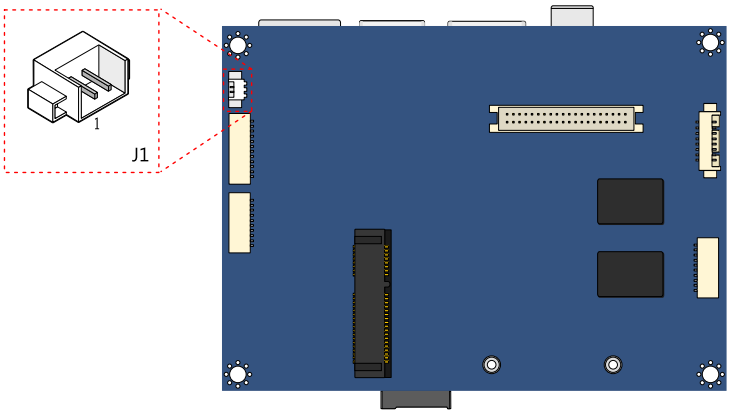

Figure 19: RTC battery connector diagram

Pin	Signal
1	VBAT
2	GND

Table 15: RTC battery connector pinout

2.2.9. MiniPCIe Slot

The mainboard is equipped with a miniPCIe slot for wireless networking option such as WPAN/Wi-Fi/ WWAN. The miniPCIe slot is compatible with all PCIe 2.0 miniPCIe modules that are full-length or half-length. The pinout of the miniPCIe slot is shown below.

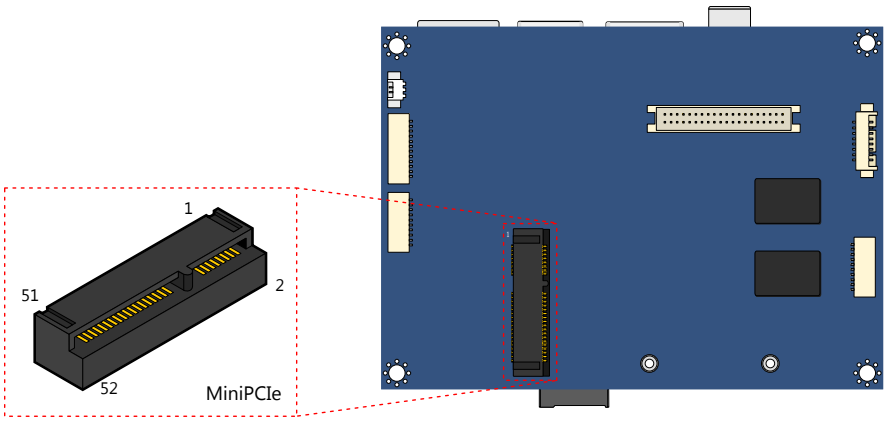

Figure 14: MiniPCIe slot diagram

Pin	Signal	Pin	Signal
1	PCIE_WAKE_B	2	MPCIE_3V3
3	GND	4	GND
5	JTAG_TCK	6	VCC15
7	JTAG_TMS	8	-
9	GND	10	NC
11	PCIe_CREFCLKM	12	NC
13	PCIe_CREFCLKP	14	NC
15	GND	16	-
17	JTAG_TD1	18	GND
19	JTAG_TD0	20	PCIE_DIS_B
21	GND	22	PCIE_RST_B
23	PCIe_CRXM	24	MPCIE_3V3
25	PCIe_CRXP	26	GND
27	GND	28	VCC15
29	GND	30	PCIe_SMB_CLK
31	PCIe_CTXM	32	PCIe_SMB_DATA
33	PCIe_CTXP	34	GND
35	GND	36	PCIE_USB_DM
37	GND	38	PCIE_USB_DP
39	MPCIE_3V3	40	GND
41	MPCIE_3V3	42	LED_WWAN_B
43	GND	44	LED_WLAN_B
45	JTAG_nTRST	46	LED_WPAN_B
47	JTAG_nSRST	48	VCC15
49	GND	50	GND
51	NC	52	MPCIE_3V3

Table 16: MiniPCIe slot pinout

2.2.10. LVDS Connector

The mainboard has one 40-pin LVDS panel connector on the bottom side. The onboard LVDS panel connector allows to connect the panel's LVDS cable to support the dual-channel 18/24-bit display. Backlight controls are integrated into the LVDS panel connector pinout. The LVDS connector is labeled as "LVDS1". The pinout of the LVDS connector is shown below.

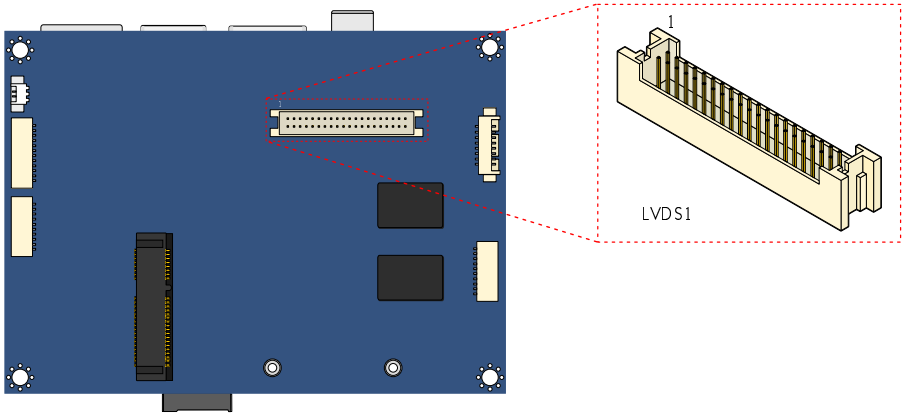

Figure 14: LVDS connector diagram

Pin	Signal	Pin	Signal
1	LVDS1_TX0_NC	2	PVDD
3	LVDS1_TX0_PC	4	PVDD
5	GND	6	GND
7	LVDS1_TX1_NC	8	GND
9	LVDS1_TX1_PC	10	LVDS0_TX0_NC
11	GND	12	LVDS0_TX0_PC
13	LVDS1_TX2_NC	14	GND
15	LVDS1_TX2_PC	16	LVDS0_TX1_NC
17	GND	18	LVDS0_TX1_PC
19	LVDS1_CLK_NC	20	GND
21	LVDS1_CLK_PC	22	LVDS0_TX2_NC
23	GND	24	LVDS0_TX2_PC
25	LVDS1_TX3_NC	26	GND
27	LVDS1_TX3_PC	28	LVDS0_CLK_NC
29	GND	30	LVDS0_CLK_PC
31	5VIN	32	GND
33	3P3V	34	LVDS0_TX3_NC
35	NC	36	LVDS0_TX3_PC
37	NC	38	LVDS0_EDID_SCL
39	NC	40	LVDS0_EDID_SDA

Table 17: LVDS connector pinout

2.2.11. LVDS Inverter Connector

The mainboard has one LVDS inverter connector located on the bottom side of the board for supplying power to the backlight of the LCD panel. The connector is labeled as "INVERTER". The pinout of the LVDS inverter connector is shown below.

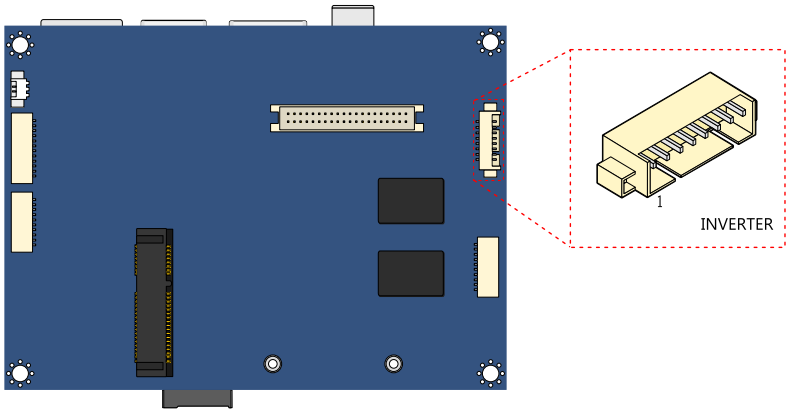

Figure 20: LVDS inverter connector diagram

Pin	Signal
1	IVDD
2	IVDD
3	LVDS_EN
4	DISP0_CONTRAST
5	LVDS_EN
6	DISP0_CONTRAST
7	GND
8	GND

Table 18: LVDS inverter connector pinout

2.2.12. MIPI CSI-2 Connector

The mainboard includes one MIPI CSI-2 connector on the bottom side of the board. The MIPI CSI-2 connector is used to connect to a camera serial interface in order to support a wide range of imaging solutions. The connector is labeled as "J18". The pinout of the MIPI CSI-2 connector is shown below.

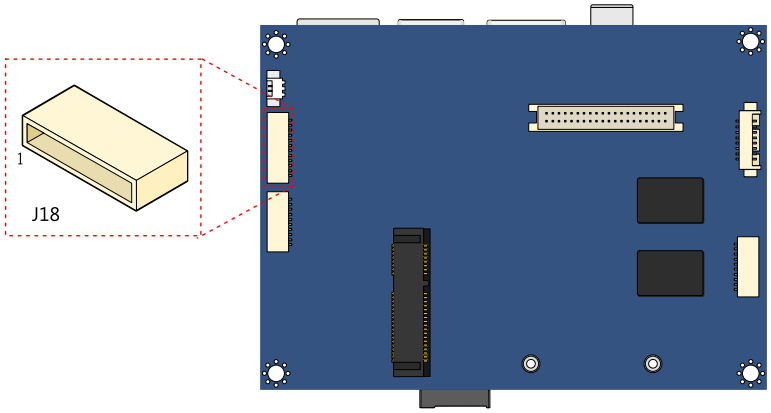

Figure 21: MIPI CSI-2 connector diagram

Pin	Signal
1	5VIN
2	12C2_SCL
3	12C2_SDA
4	GND
5	CSI_CLK0P
6	CSI_CLK0M
7	GND
8	CSI_D0P
9	CSI_D0M
10	GND
11	CSI_D1M
12	CSI_D1P

Table 19: MIPI CSI-2 connector pinout

2.2.13. COM Connector

The mainboard includes onboard COM connector on the bottom side of the board. The onboard COM connector labeled as "J4" is used to attach additional COM ports that support RS-232 standard with DTE (Data Terminal Equipment) type. The pinout of the COM connector is shown below.

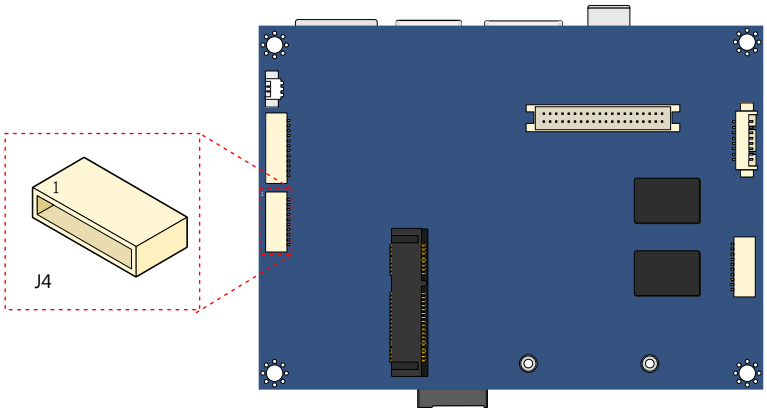

Figure 22: COM connector diagram

Pin	Signal
1	5VIN
2	COM_RXD1
3	COM_TXD1
4	COM_DCD1
5	COM_RI1
6	GND
7	COM_DTR1
8	COM_CTS1
9	COM_RTS1
10	COM_DSR1

Table 20: COM connector pinout

2.2.14. COM/CAN Connector

The mainboard includes onboard COM/CAN connectors on the bottom side of the board. The onboard COM/CAN connector labeled as "J5" is primarily used to attach additional COM port for debug purpose. The CAN bus can also be supported through this connector. The pinout of the COM/CAN connector is shown below.

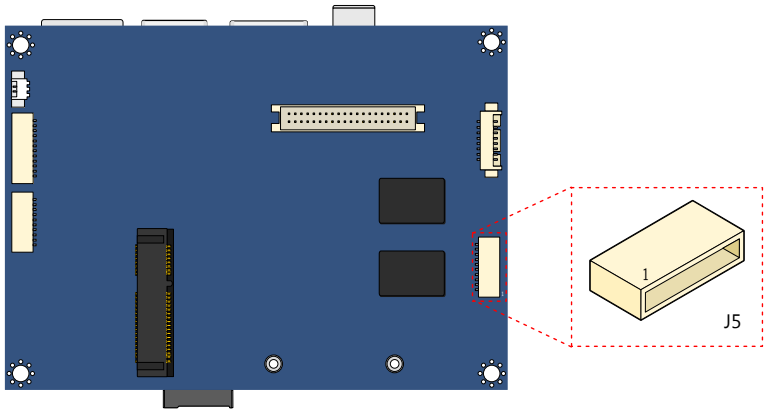

Figure 23: COM/CAN connector diagram

Pin	Signal
1	5VIN
2	COM2_RX
3	COM2_TX
4	NC
5	NC
6	GND
7	CAN_RX2
8	CAN_TX2
9	CAN_TX1
10	CAN_RX1

Table 21: COM/CAN connector pinout

Note:
For CAN bus communication, the physical bus requires an external transceiver to make the transfer.

3. Onboard Jumpers

This section will explain how to configure the VIA VAB-820 mainboard 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.

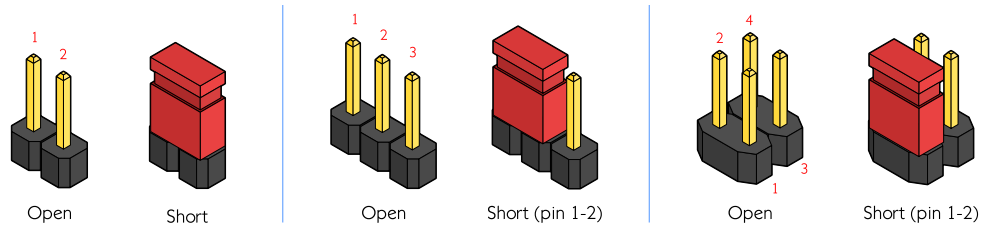

Figure 24: Jumper settings example

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. LVDS Power Select Jumper

The mainboard has a power select connector that determines the input voltage for the LVDS panel connector (LVDS1) and LVDS inverter (INVERTER1). The pins 1, 3, and 5 correspond to INVERTER1. The pins 2, 4, and 6 correspond to LVDS1. The jumper is labeled as "J3" .The jumper settings are shown below.

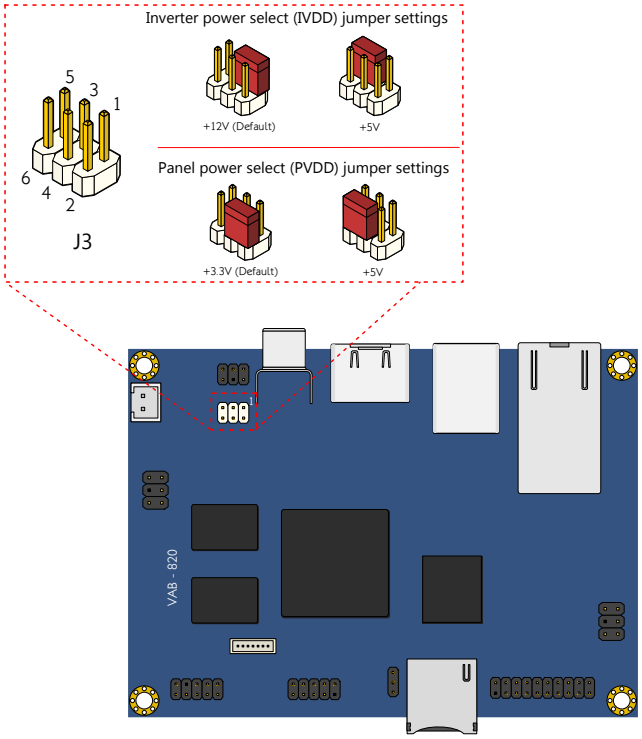

Figure 25: LVDS power select jumper diagram

Inverter power	Pin 1	Pin 3	Pin 5
+12V (default)	Short	Short	Open
+5V	Open	Short	Short

Panel power	Pin 2	Pin 4	Pin 6
+3.3V (default)	Short	Short	Open
+5V	Open	Short	Short

Table 22: LVDS power select jumper settings

3.2. Boot Flash Select Jumper

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

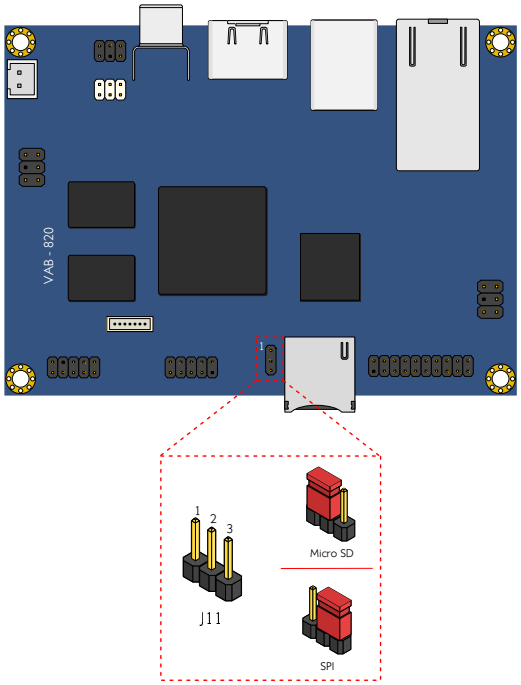

Figure 26: Boot flash select jumper diagram

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

Table 23: Boot flash select jumper settings

4. Hardware Installation

4.1. Installing into a Chassis

The VIA VAB-820 can be fitted into any chassis that has the mounting holes compatible with the standard Pico-ITX mounting hole locations. Additionally, the chassis must meet the minimum height requirements for specified areas of the mainboard.

4.1.1. Suggested minimum chassis dimensions

The figure below shows the suggested minimum space requirements that a chassis should have in order to work well with the VIA VAB-820.

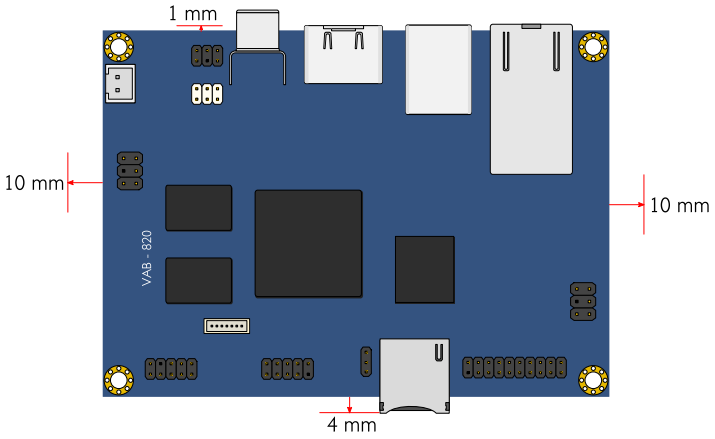

Figure 27: Suggested minimum chassis dimensions

Each side of the mainboard should have a buffer zone from the internal wall of the chassis. The side of the mainboard that accommodates the I/O coastline should have a buffer of 1.00 mm. The side on the opposite end of the I/O coastline should have a buffer of at least 4.00 mm. The two sides adjacent to the I/O coastline should have at least a 10.00 mm buffer.

4.1.2. Suggested minimum chassis height

The figure below shows the suggested minimum height requirements for the internal space of the chassis. It is not necessary for the internal ceiling to be evenly flat. What is required is that the internal ceiling height must be strictly observed for each section that is highlighted.

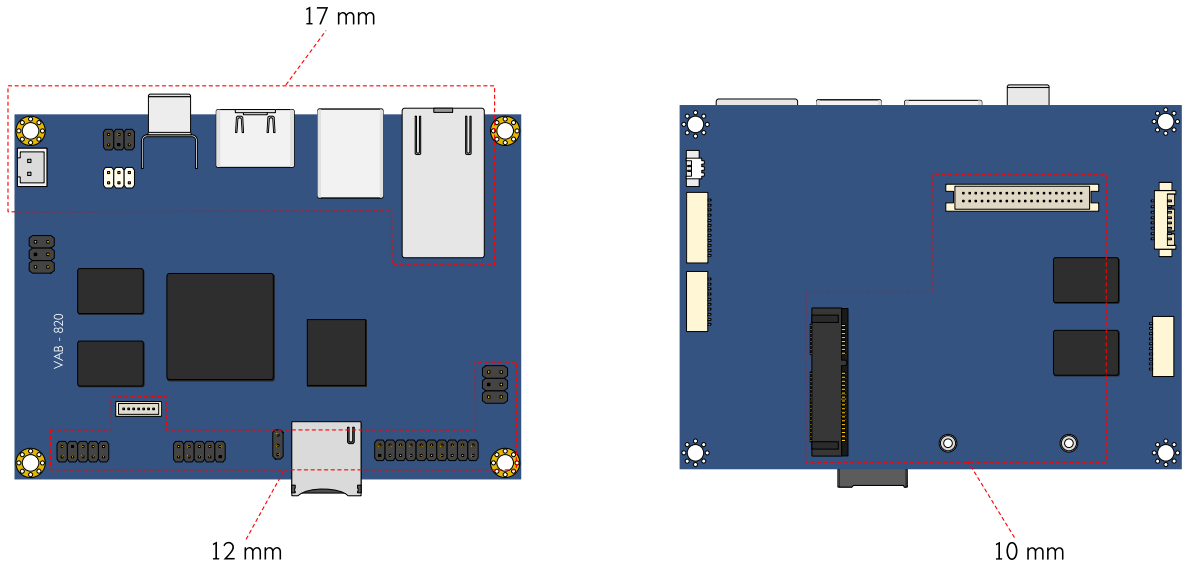

Figure 28: Suggested minimum internal ceiling height

4.1.3. Suggested keepout areas

The figure below shows the areas of the mainboard that is highly suggested to leave unobstructed.

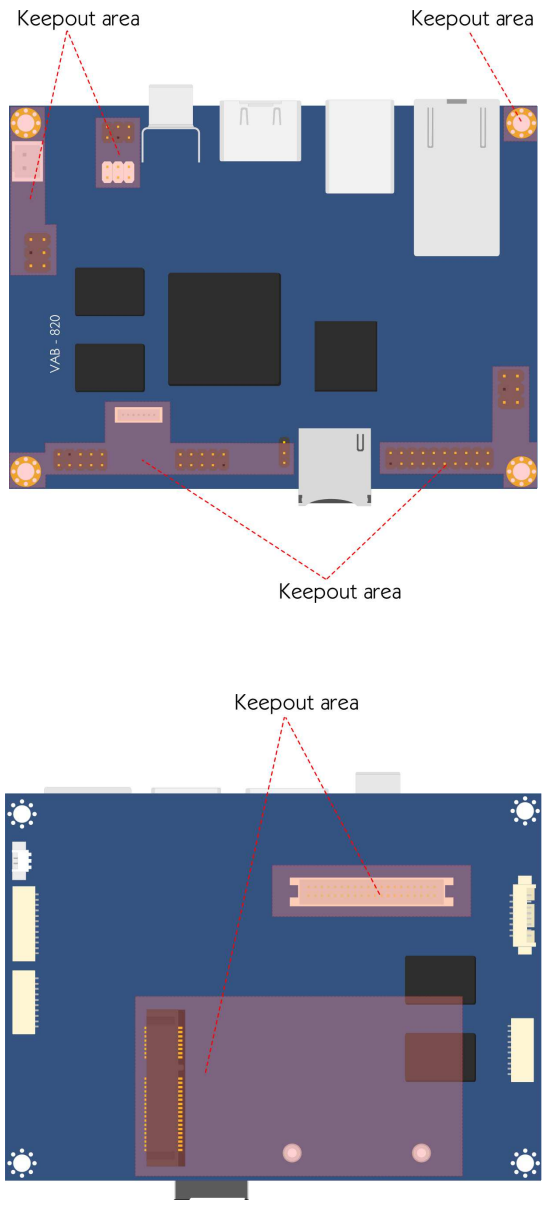

Figure 29: Suggested keepout areas

4.2. Installing the Heatsink (VAB-820-QP & VAB-820 SKU)

Step 1

Align the heatsink over the three mounting holes.

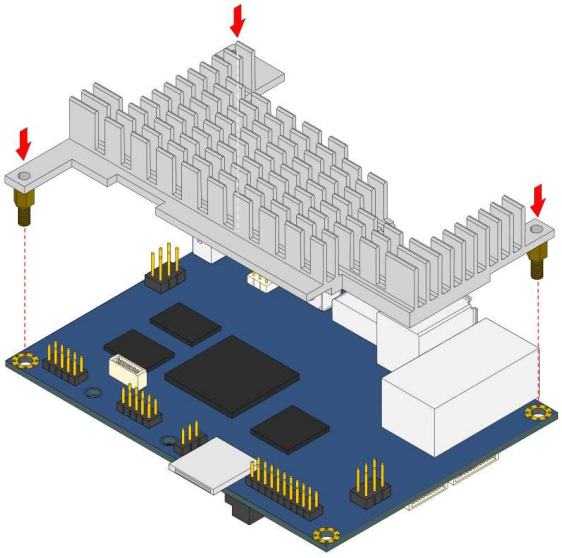

Figure 30: Aligning the heatsink over the mounting points

Step 2

Install the heatsink. Make sure the thread of the hex standoff screws are inserted into the mounting holes.

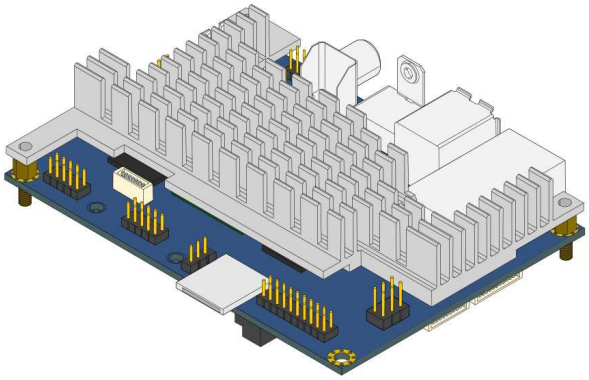

Figure 31: Installing the heatsink

Step 3

Install the board into the chassis. Make sure the board mounting hole and three hex standoff screws are align correctly with the chassis standoffs.

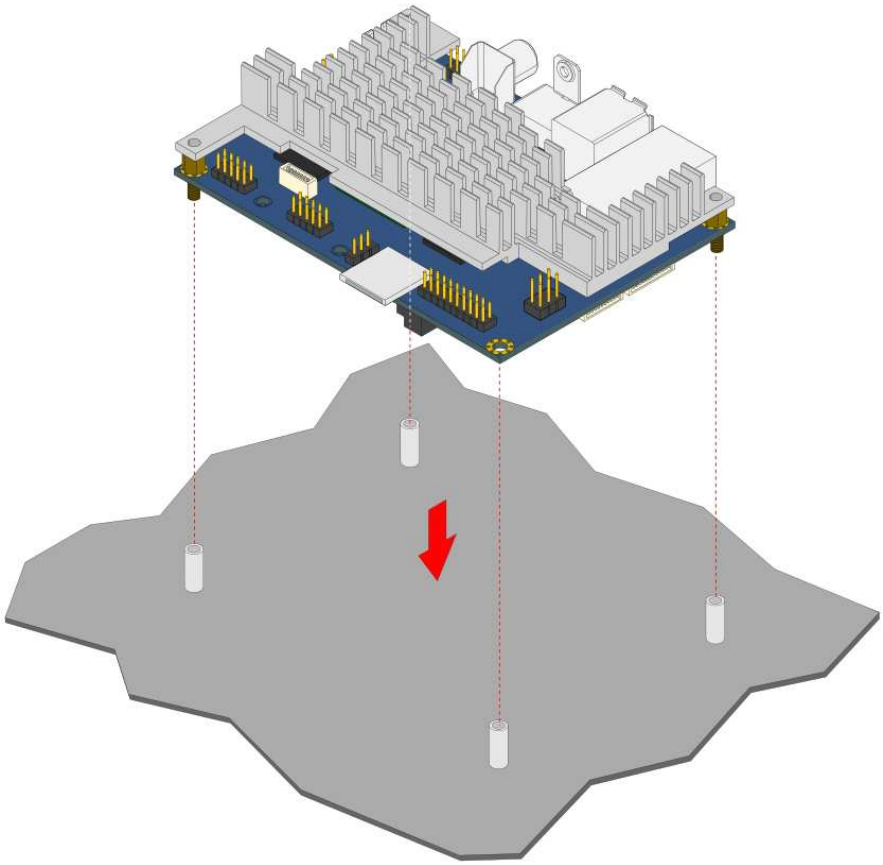

Figure 32: Installing the board to the chassis

Step 4

Secure the board with three M1.7 or M1.8 screws, and one M3 screw.

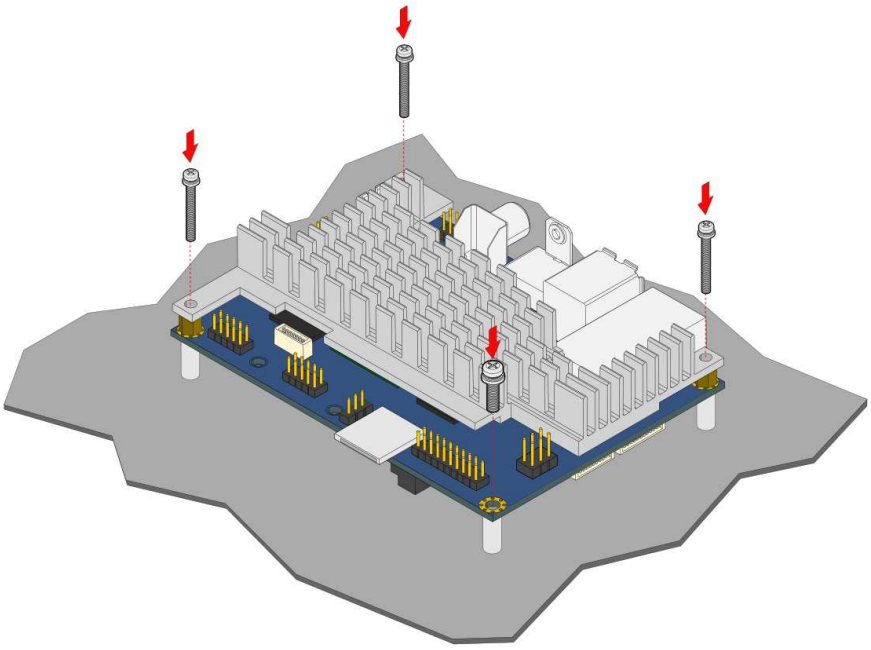

Figure 33: Securing the board to the chassis

4.3. Installing the Heatsink and PWB-P255-L PD power board (VAB-820-P SKU)

Step 1

Apply the thermal grease (about 0.06cc) on top of the processor before installing the heatsink.

Step 2

Align the heatsink over the four mounting holes. Use two 10mm hex standoff screws, one 11.7mm hex standoff screw and one M3*6 screw to fix the heatsink on top of the board (please refer to the figure below for the placement). Secure the screws with four M3 nuts on the bottom side of the board.

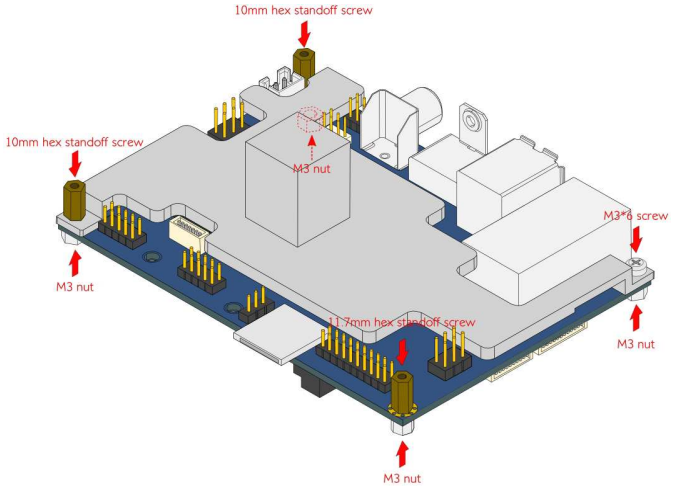

Figure 34: Installing the heatsink

Step 3

Align the PD power board over the heatsink, secure the PD power board with three M3*6 screws. PoE connectors from the PD power board will be firmly inserted in the PoE pin headers of the VIA VAB-820 mainboard.

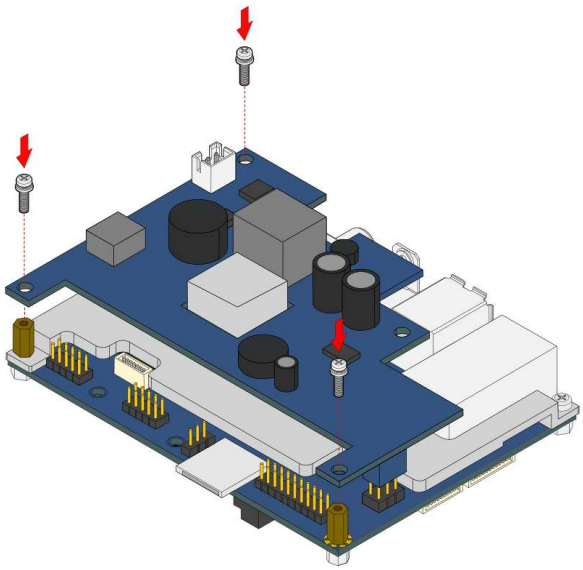

Figure 35: Installing the PD power board

Note:

When the PD power board is installed, connect the DC-in jack to the DC-in power connector that is on the PD power board, not the one on the VIA VAB-820.

5. Software and Technical Support

5.1. Android and Linux Support

The VIA VAB-820 features a complete software evaluation image featuring the Android and Linux kernel operating systems.

- Android 6.0 and Linux kernel 4.1.15 (VAB-820-QP SKU)
- Android 5.0 and Linux kernel 3.14.28 (VAB-820 SKU and VAB-820-P SKU)

5.2. Technical Support and Assistance

- For utilities downloads and the latest documentation and information about VIA VAB-820, please visit our website at http://www.viatech.com/en/boards/pico-itx/vab-820/
- For technical support and additional assistance, always contact your local sales representative or board distributor, or go to https://www.viatech.com/en/support/driver-support-faq/technical-support/ for technical support.
- For OEM clients and system integrators developing a product for long term production, other code and resources may also be made available. Please visit our website at https://www.viatech.com/en/about/contact/ to submit a request.

Appendix A. Installing Wireless Accessories

This chapter provides information on how to install the USB dongle (VIA VNT9271) and EMIO modules (VIA EMIO-1533, VIA EMIO-5531, VIA EMIO-2531 & VIA EMIO-2550) on the VIA VAB-820 board. It is recommended to use a grounded wrist strap before handling computer components. Electrostatic discharge (ESD) can damage some components.

A.1. Installing the VIA VNT9271 USB Wi-Fi Dongle

Step 1

Locate a USB 2.0 port on the back panel I/O.

Step 2

Insert the VIA VNT9271 dongle (P/N: 00GO27100BU2B0D0) in one of the USB 2.0 port.

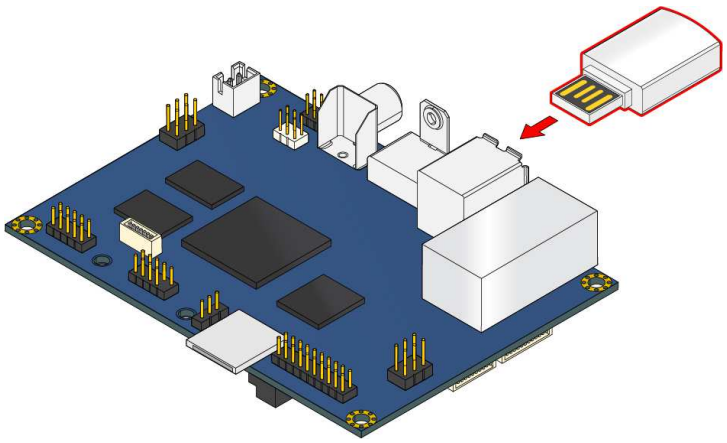

Figure 36: Installing the VIA VNT9271 dongle

A.2. Installing VIA EMIO-1533 USB Wi-Fi Module

Step 1

Mount the VIA EMIO-1533 module to the prepared standoff on the chassis. Align the two mounting holes on the EMIO-1533 module with the mounting holes on the standoffs, and then secure the VIA EMIO-1533 module in place with two screws.

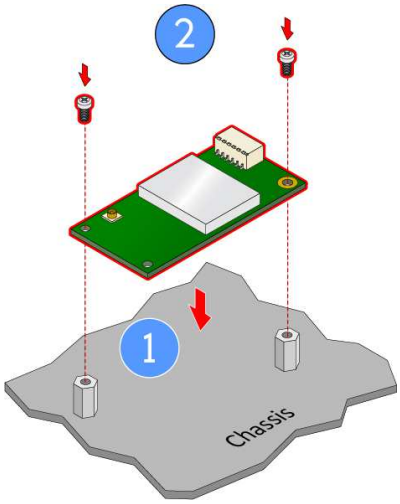

Figure 37: Installing the VIA EMIO-1533 module to the chassis

Step 2

Connect one end of the USB Wi-Fi cable to pin 4, 6, 8 and 10 of the onboard USB 2.0 & USB 2.0 OTG pin header (J8) on the VIA VAB-820 board, and then connect the other end of the cable to the VIA EMIO-1533 module.

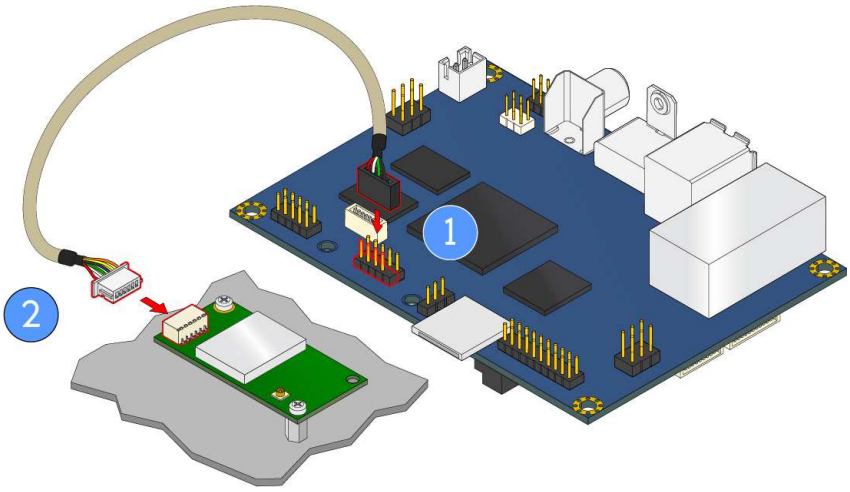

Figure 38: Connecting the USB Wi-Fi cable of VIA EMIO-1533 module

Step 3

Insert the Wi-Fi antenna cable into the antenna hole from the inside of the panel I/O plate. Insert the toothed washer, fasten it with the nut and install the external antenna.

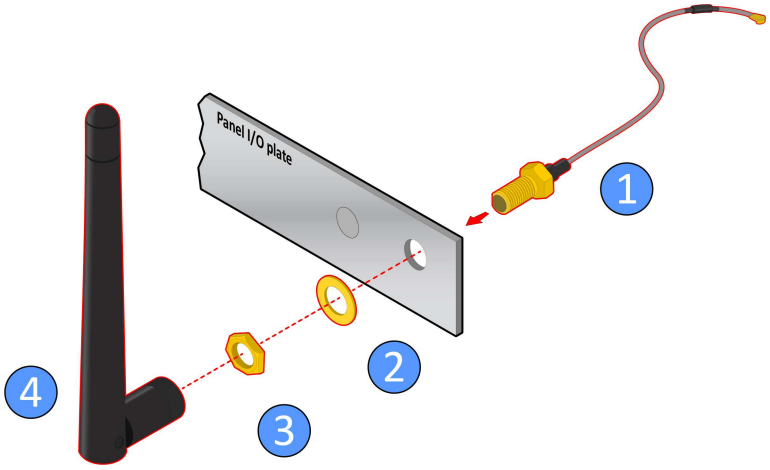

Figure 39: Installing the Wi-Fi antenna cable and antenna

Step 4

Connect the other end of the Wi-Fi antenna cable to the micro-RF connector on the VIA EMIO-1533 module.

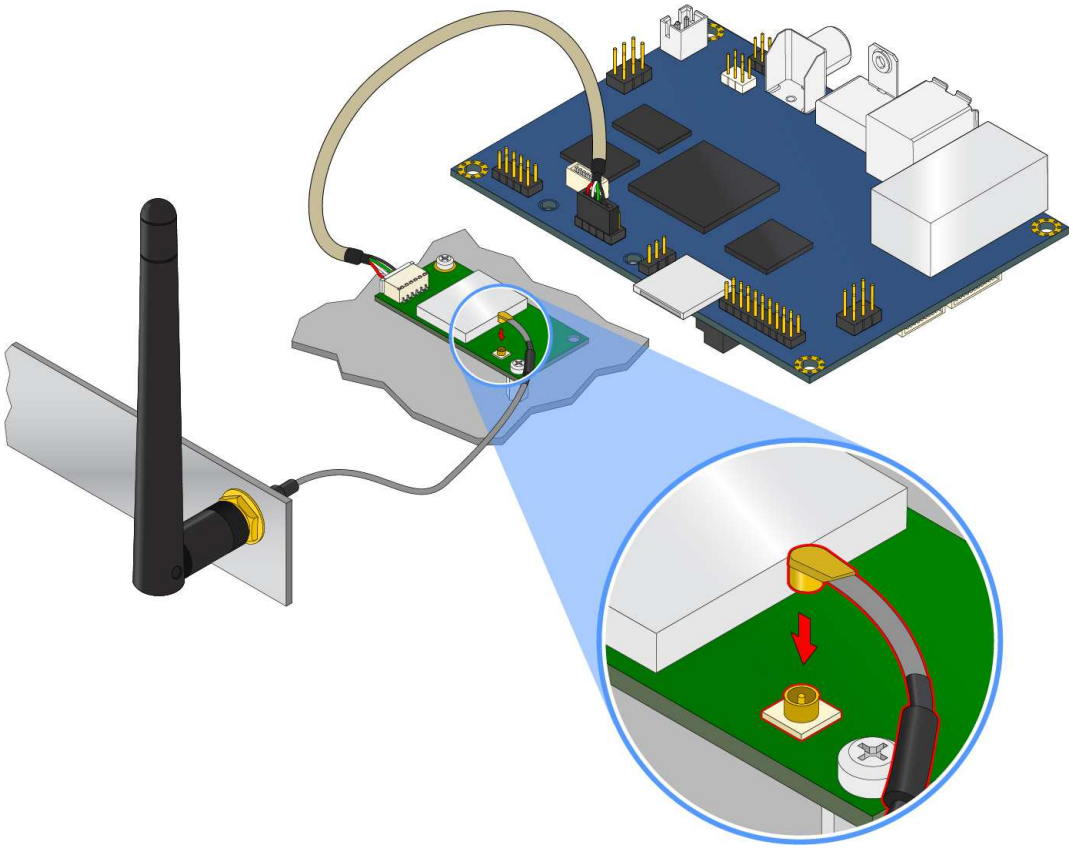

Figure 40: Connecting the Wi-Fi antenna cable to the micro-RF connector on VIA EMIO-1533 module

A.3. Installing VIA EMIO-5531 USB Wi-Fi & Bluetooth Module

Step 1

Mount the VIA EMIO-5531 module to the prepared standoff on the chassis. Align the two mounting holes on the VIA EMIO-5531 module with the mounting holes on the standoffs, and then secure the VIA EMIO-5531 module in place with two screws.

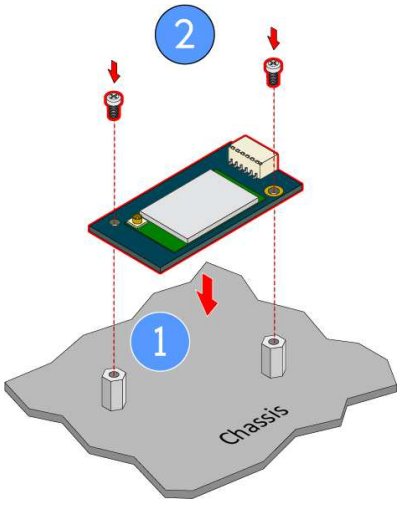

Figure 41: Installing the VIA EMIO-5531 module to the chassis

Step 2

Connect one end of the USB Wi-Fi cable to pin 4, 6, 8 and 10 of the onboard USB 2.0 & USB 2.0 OTG pin header (J8) on the VIA VAB-820 board, and then connect the other end of the cable to the VIA EMIO-5531 module.

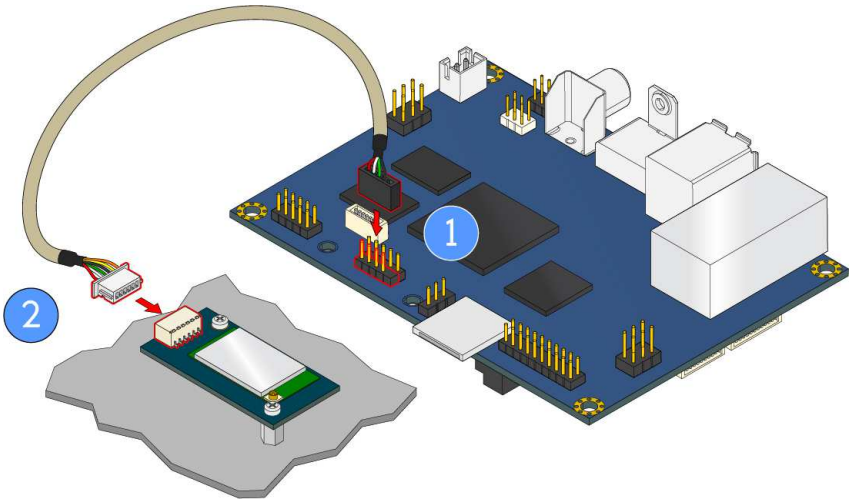

Figure 42: Connecting the USB Wi-Fi cable of VIA EMIO-5531 module

Step 3

Insert the Wi-Fi antenna cable into the antenna hole from the inside of the panel I/O plate. Insert the toothed washer, fasten it with the nut and install the external antenna.

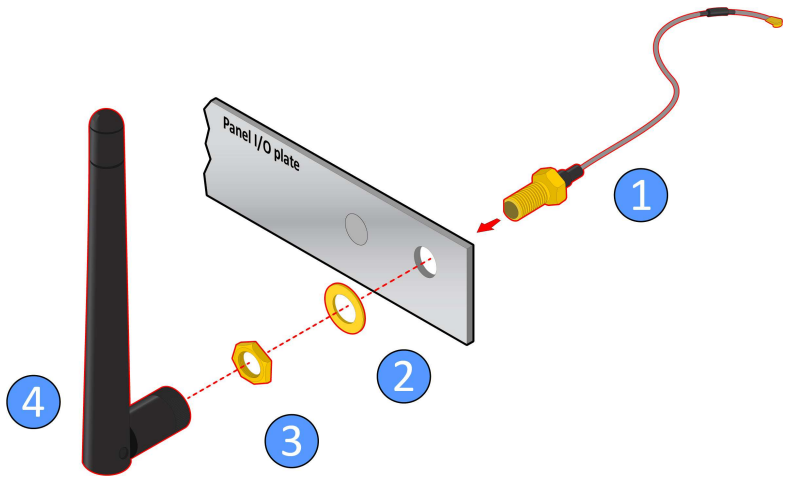

Figure 43: Installing the Wi-Fi antenna cable and antenna

Step 4

Connect the other end of the Wi-Fi antenna cable to the micro-RF connector on the VIA EMIO-5531 module.

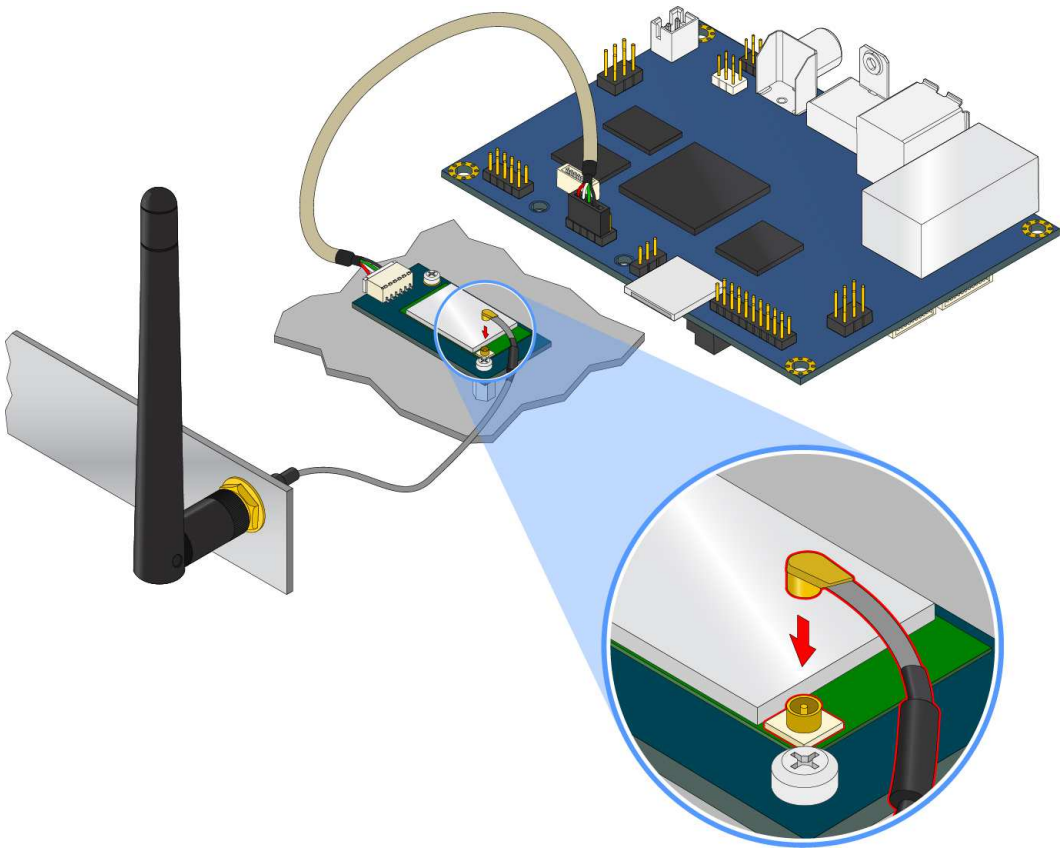

Figure 44: Connecting the Wi-Fi antenna cable to the micro-RF connector on VIA EMIO-5531 module

A.4. Installing VIA EMIO-2531 miniPCIe Wi-Fi & Bluetooth Module

Step 1

Remove the screw and nut from the VIA EMIO-2531 module as shown in the figure below.

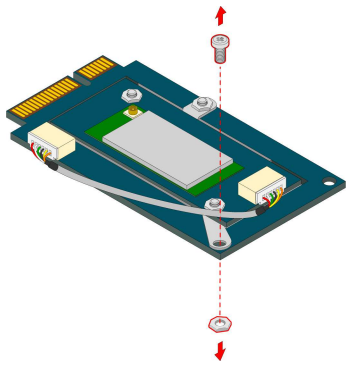

Figure 45: Removing the screw and nut from the VIA EMIO-2531 module

Step 2

Align the notch on the VIA EMIO-2531 module with its counterpart on the miniPCIe slot. Then insert the module at a 30° angle.

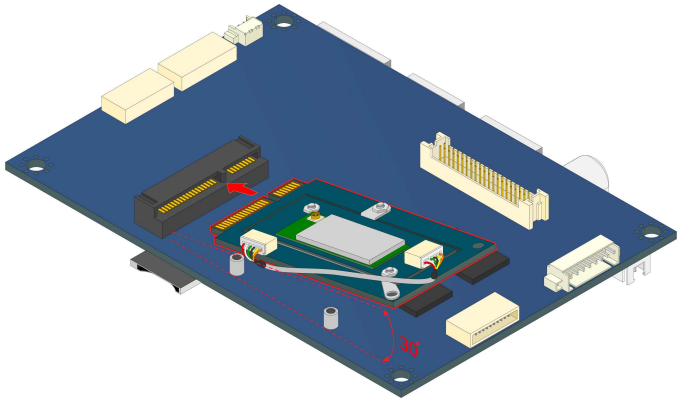

Figure 46: Installing the VIA EMIO-2531 module

Step 3

Once the module has been inserted, push down the module until the screw hole aligns with the mounting hole on the standoff. Reinstall the screw to secure the module to the standoff.

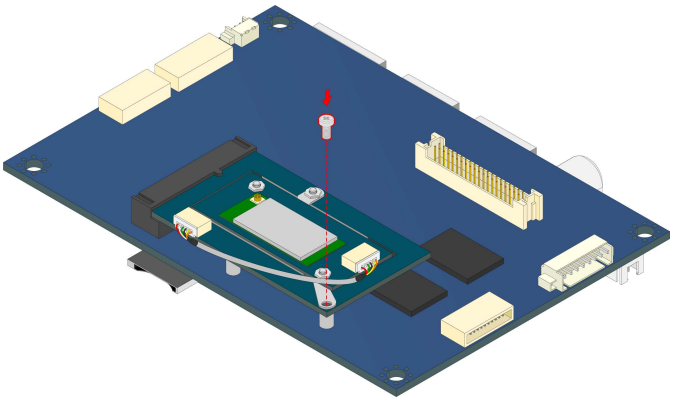

Figure 47: Securing the VIA EMIO-2531 module

Step 4

Insert the Wi-Fi antenna cable into the antenna hole from the inside of the panel I/O plate. Insert the toothed washer, fasten it with the nut and install the external antenna.

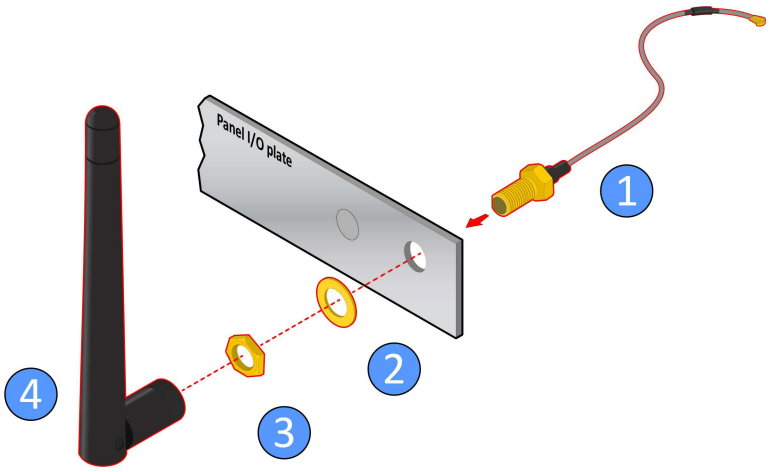

Figure 48: Installing the Wi-Fi antenna cable and antenna

Step 5

Connect the other end of the Wi-Fi antenna cable to the micro-RF connector on the VIA EMIO-2531 module.

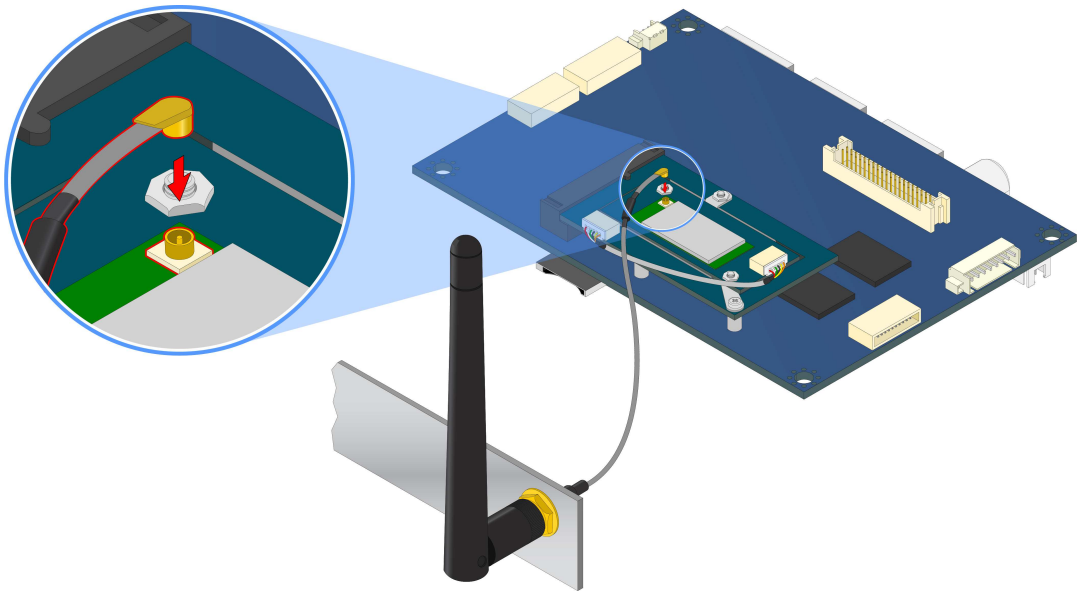

Figure 49: Connecting the Wi-Fi antenna cable to the micro-RF connector on VIA EMIO-2531

A.5. Installing VIA EMIO-2550 miniPCIe Mobile Broadband Module

Step 1

Insert first the 3G SIM card on the bottom side of the VIA EMIO-2550 module (VIA EMIO-2550-00A1).

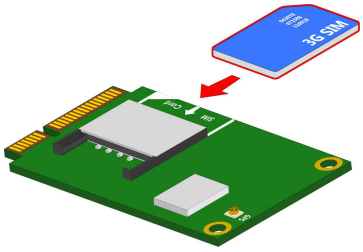

Figure 50: Inserting the 3G SIM card

Step 2

Align the notch on the VIA EMIO-2550 module with its counterpart on the miniPCIe slot. Then insert the module at a 30° angle.

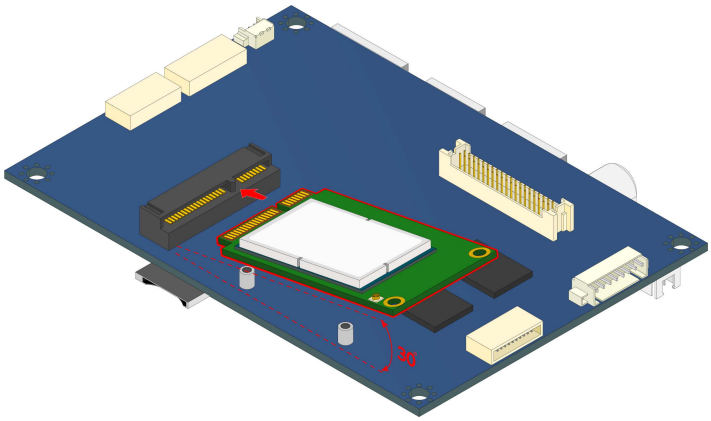

Figure 51: Installing the VIA EMIO-2550 module

Step 3

Once the module has been inserted, push down the module until the screw hole aligns with the mounting hole on the standoff. Then secure the module to the standoff.

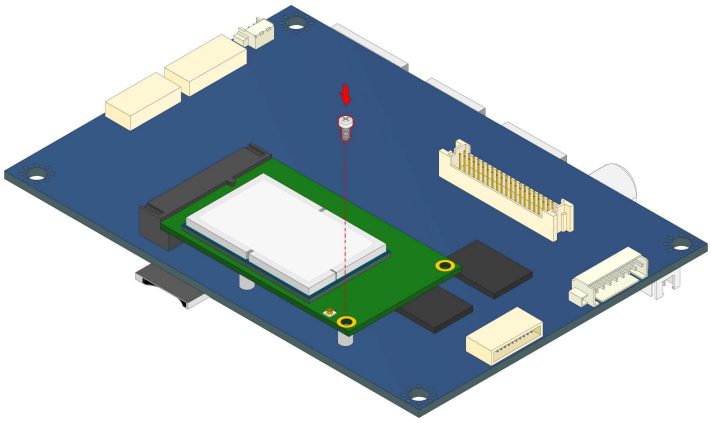

Figure 52: Securing the VIA EMIO-2550 module

Step 4

Insert the 3G antenna cable into the antenna hole from the inside of the panel I/O plate. Insert the toothed washer, fasten it with the nut and install the external antenna.

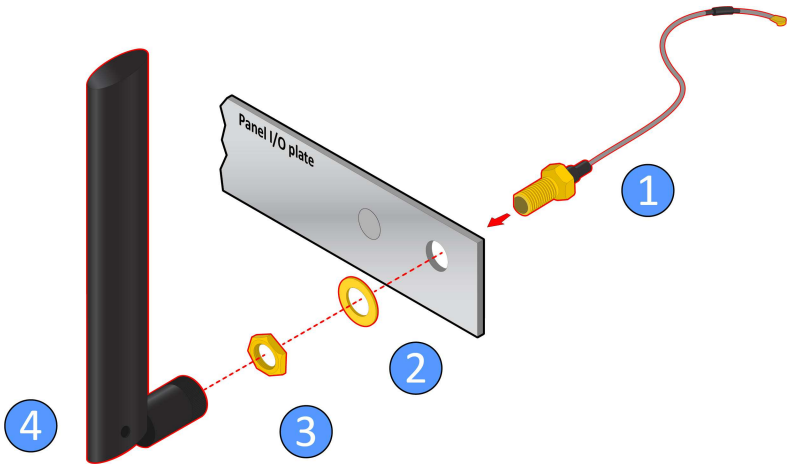

Figure 53: Installing the 3G antenna cable and antenna

Step 5

Connect the other end of the 3G antenna cable to the micro-RF connector labeled "MAIN" on the VIA EMIO-2550 module.

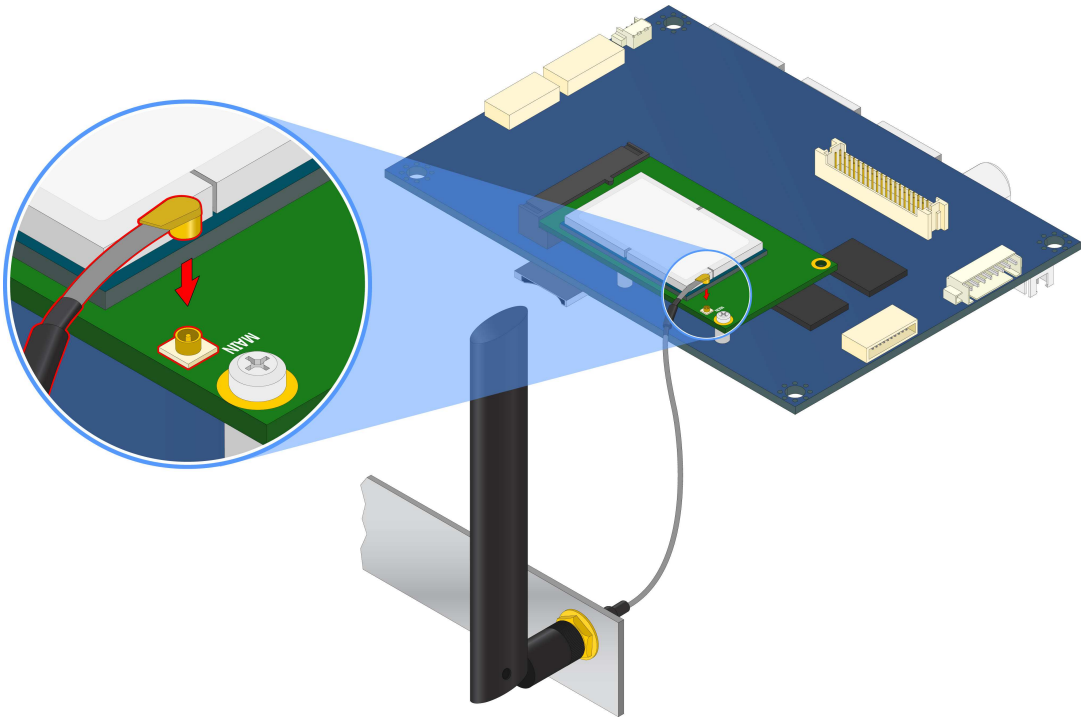

Figure 54: Connecting the 3G antenna cable to the micro-RF connector on VIA EMIO-2550

Appendix B. Starter Kit

B.1. Starter Kit Assembly

The starter kit includes the following items:

- ☐ 1 x VIA VAB-820 mainboard
- ☐ 1 x VAB-820-A daughterboard
- ☐ 1 x RTC battery
- ☐ 1 x AC adapter
- ☐ 1 x Power cord
- ☐ 1 x DC cable
- ☐ 2 x Transmittal cable
- ☐ 1 x Audio cable
- ☐ 1 x COM/CAN converter cable
- ☐ 1 x 10.4" LCD panel including PCAP touch screen (optional)
- ☐ 1 x USB cable (optional)
- ☐ 1 x LVDS cable (optional)
- ☐ 1 x Backlight power cable (optional)

B.2. VAB-820-A Specifications

PCB Size

- 10cm x 3.7cm (100mm x 37mm)

I/O Coastline

- 1 x Reset button
- 1 x Power LED
- 1 x WPAN/Wi-Fi/WWAN LED
- 1 x COM port (supports 8-wire DTE mode)
- 1 x COM/CAN port (supports one RS-232 (TX/RX) and two CAN Bus (Supporting CAN Protocol specification Version 2.0 B) through a COM/CAN converter cable
- 1 x USB 2.0 port
- 1 x Micro USB 2.0 OTG port (Type B connector supporting OTG)

Onboard Connectors and Jumper

- 1 x COM connector (J4)
- 1 x COM/CAN connector (J5)
- 1 x DIO pin header (4 GPI + 4 GPO)
- 1 x CAN Bus jumper (J2)

CAN Bus Transceiver

- TI SN65HVD1050 EMC Optimized CAN transceiver

B.3. VAB-820-A Layout Diagram

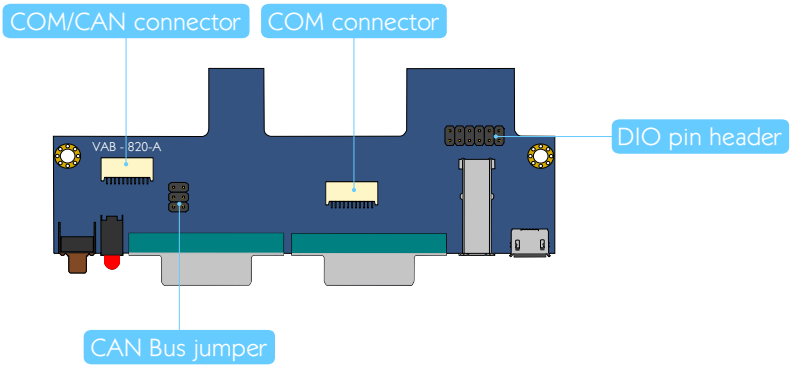

Figure 55: VAB-820-A layout (top side)

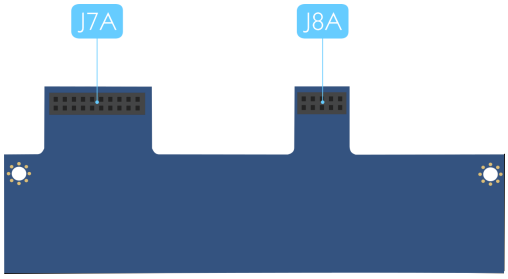

Figure 56: VAB-820-A layout (bottom side)

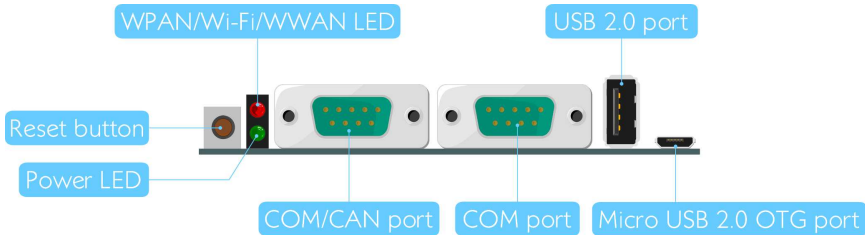

Figure 57: VAB-820-A I/O coastline layout

B.4. VAB-820-A Dimensions

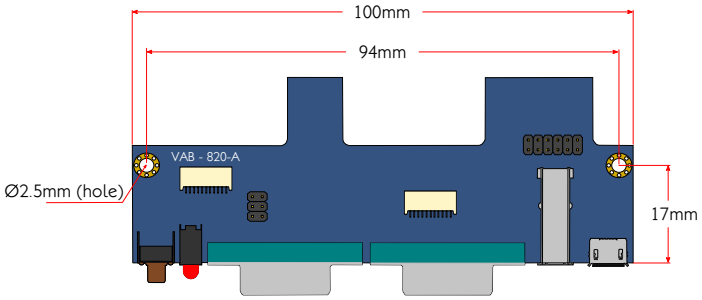

Figure 58: Mounting holes and dimensions of the VAB-820-A

B.5. VAB-820-A Connector and Jumper

B.5.1. Onboard Connector Pinout

B.5.1.1. DIO Pin Header

Pin	Signal	Pin	Signal
1	-	2	-
3	GPO_1	4	GPI_7
5	GPO_2	6	GPI_8
7	GPO_4	8	GPI_9
9	GPO_5	10	GPI_16
11	GND	12	GND

B.5.1.2. COM Connector (J4)

Pin	Signal
1	-
2	COM_RXD1
3	COM_TXD1
4	COM_DCD1
5	COM_RI1
6	GND
7	COM_DTR1
8	COM_CTS1
9	COM_RTS1
10	COM_DSR1

B.5.1.3. COM/CAN Connector (J5)

Pin	Signal
1	-
2	COM2_RX
3	COM2_TX
4	-
5	-
6	GND
7	CAN_RX2
8	CAN_TX2
9	CAN_TX1
10	CAN_RX1

B.5.2. Jumper Settings

B.5.2.1. CAN Bus Jumper (J2)

CAN Bus Setting	Pin 1	Pin 3	Pin 5
Enabled CAN Termination (default)	Short	Short	Open
	Pin 2	Pin 4	Pin 6
	Short	Short	Open

Table 24: CAN Bus jumper settings

B.5.3. I/O Coastline Pinout

B.5.3.1. Micro USB 2.0 OTG Port

Pin	Signal
1	OTG_VCC
2	OTG_DN
3	OTG_DP
4	USB_OTG_ID
5	GND

B.5.3.2. USB 2.0 Port

Pin	Signal
1	USB3_VCC
2	USBD_T3-
3	USBD_T3+
4	GND

B.5.3.3. COM Port

Pin	Signal
1	COM_DCD1
2	COM_RXD1
3	COM_TXD1
4	COM_DTR1
5	GND
6	COM_DSR1
7	COM_RTS1
8	COM_CTS1
9	COM_RI1

B.5.3.4. COM/CAN Port

Pin	Signal
1	CANH1
2	COM2_RX
3	COM2_TX
4	CANL2
5	GND
6	CANL1
7	GND
8	CANH2
9	VCC5

B.5.3.5. Power and WPAN/Wi-Fi/WWAN LED

Pin	Signal	Pin	Signal
A1	3P3V	C1	P_LED
A2	3P3V	C2	LED_WLAN

B.5.3.6. Reset Button

Pin	Signal
1	RESET_N
2	GND
3	GND
4	GND

B.6. COM/CAN Conversion Cable

B.6.1. COM/CAN Conversion Cable Pinout

CAN1	
Pin	Signal
2	CANL1
6	GND
7	CANH1
9	VCC5

CAN2	
Pin	Signal
2	CANL2
6	GND
7	CANH2
9	VCC5

COM	
Pin	Signal
2	COM2_RX
3	COM2_TX
5	GND

Note:

Do not directly plug a COM cable to the COM/CAN port. Please use the COM/CAN conversion cable when connecting to the COM/CAN port.

B.7. Connecting the VAB-820-A Daughterboard

Step 1

Firmly attach the two connectors J7A and J8A on the bottom of the VAB-820-A daughterboard with the pin headers J7 and J8 on the VIA VAB-820 mainboard.

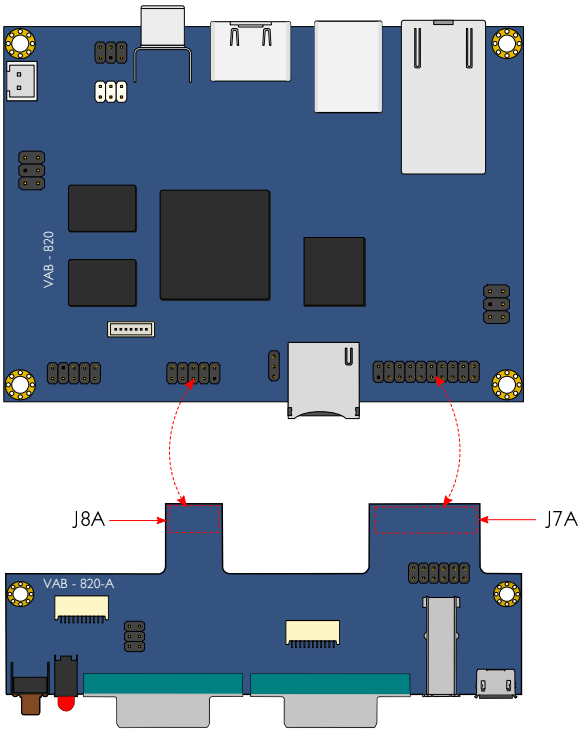

Figure 59: Connecting the VAB-820-A daughterboard to the VIA VAB-820 mainboard

Step 2

Plug one end of the transmittal cable to the COM connector on the VAB-820-A daughterboard, and the other end of the transmittal cable to the COM connector on the bottom side of the mainboard.

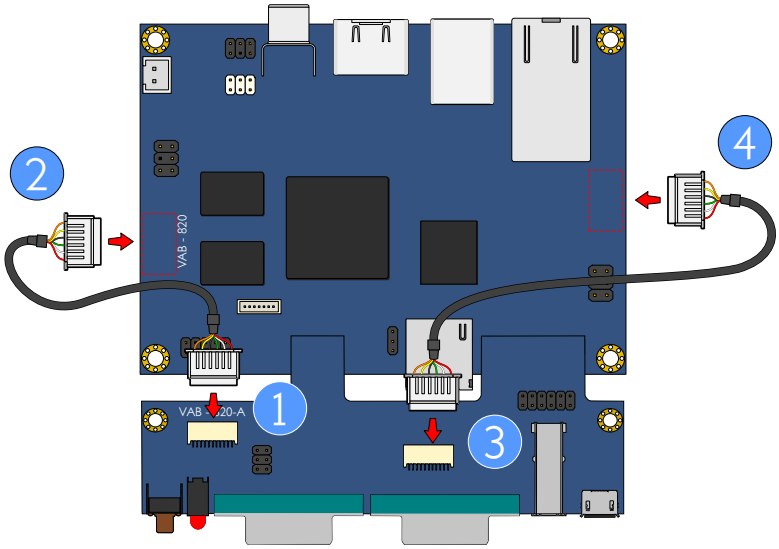

Figure 60: Connecting the transmittal cables

B.7.1. Cable Connections

The figure below shows the cable connections:

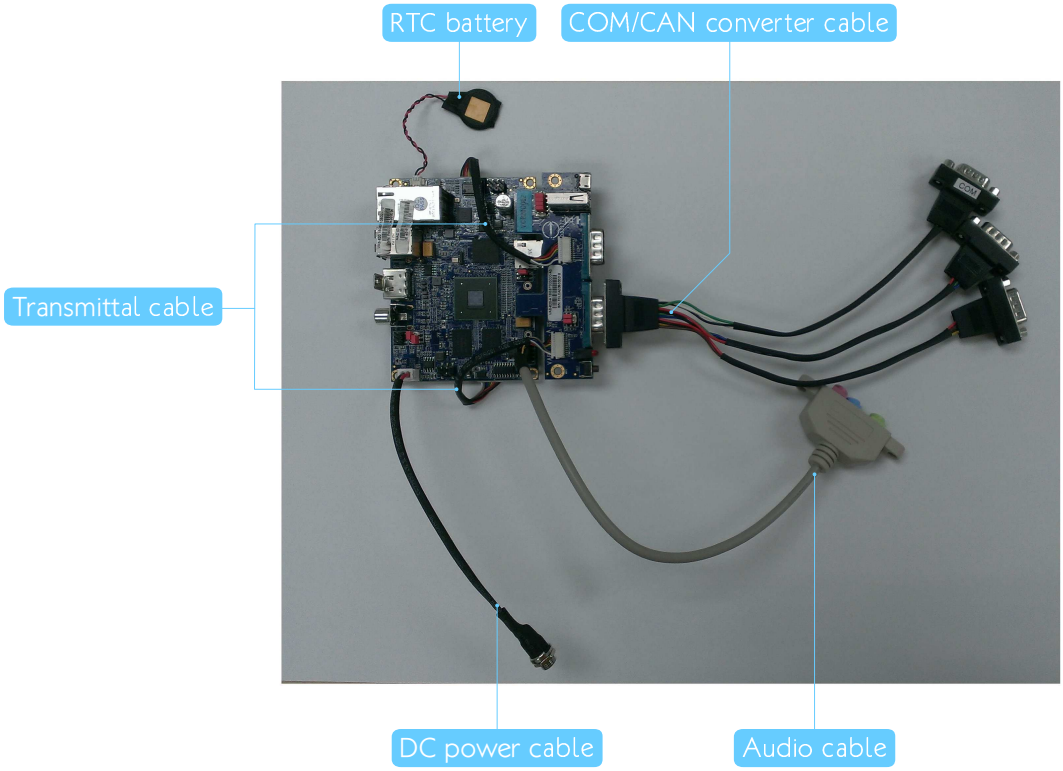

Figure 61: Cable connections

B.7.2. Panel Connections

The figure below shows the panel connections:

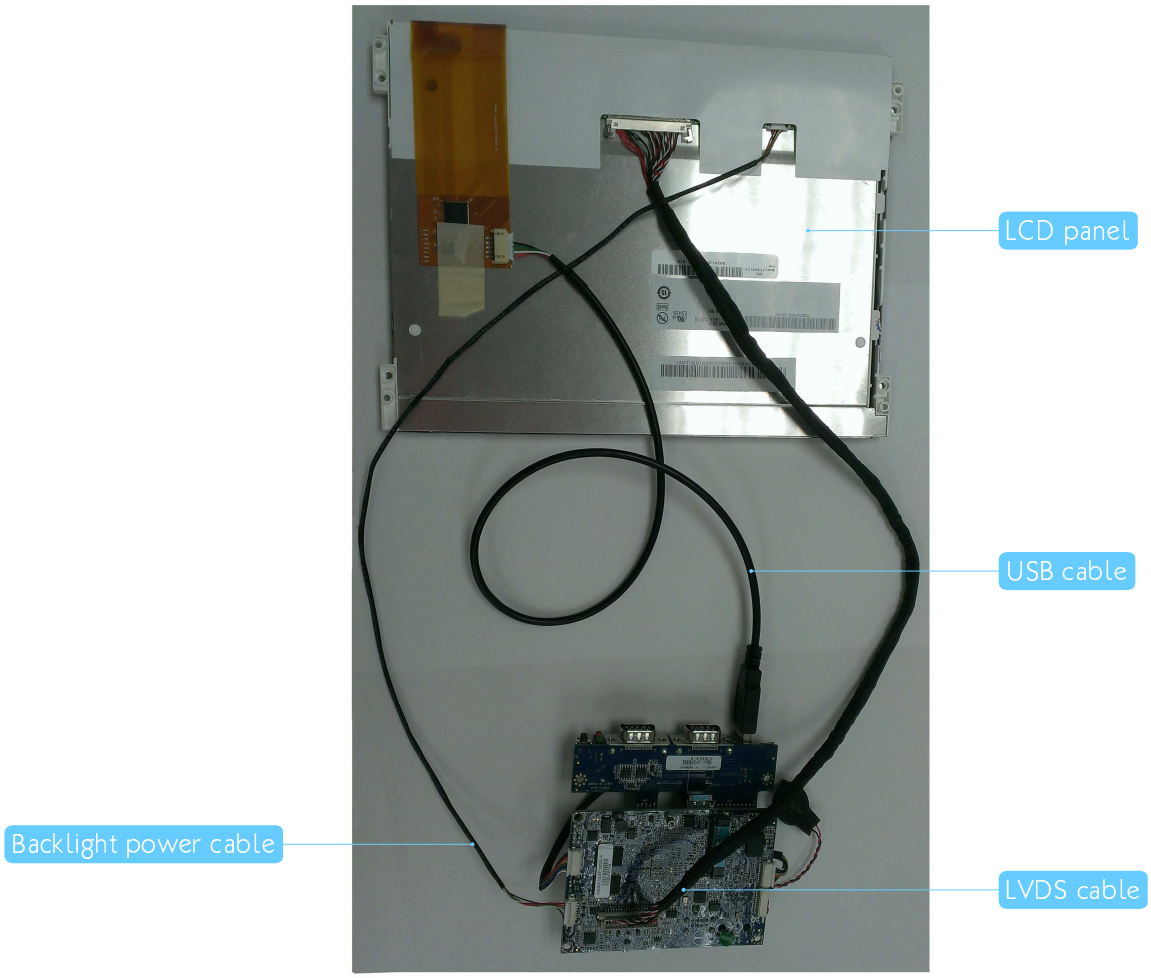

Figure 62: Panel connections

B.8. Mating Connector Vendors List

The following table lists the mating connector vendors of the VIA VAB-820 mainboard.

Connectors	Vendor & P/N	Mating Vendor & P/N	
J1	99G30-170512	ACES 85206-0200	MOLEX 51021-**00
INVERTER	99G30-170542	ACES 85206-0800	MOLEX 51021-**00
LVDS1	99G30-170152	ACES 44002-4000	HRS DF13-**DS-1.258C
J10	99G30-170852	ACES 87214-0700	
J4 & J5	99G30-021457	ACES 87214-1000	
J18	99G30-170642	ACES 87214-1000	
S-VIDEO1	99G30-05474I	Neltron 2208S-XXG 2208R-XXG 2208SM-XXG	SAMTEC SSW Series
AUDIO1	99G30-05454I		
J8	99G30-05380I		
J7	99G30-05301I		
J9	99G30-021525	Neltron 2318HJ-02	JST XH Series
J13, J14	99H30-05770K	Neltron 2214S-XXG-85 2214R-XXG-85	SAMTEC SSW Series

Table 25: VIA VAB-820 mating connector vendors list

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

USA

940 Mission Court
Fremont, CA 94539,
USA

Tel: 1-510-687-4688
Fax: 1-510-687-4654
Email: 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

China

Tsinghua Science Park Bldg. 7
No. 1 Zongguancun East Road,
Haidian Dist., Beijing, 100084
China

Tel: 86-10-59852288
Fax: 86-10-59852299
Email: embedded@viatech.com.cn

Europe

Email: embedded@via-tech.eu