AVA-3510

User's Manual

NVIDIA GPU and Intel® AI Computing Platform
for Autonomous Drive Applications

Manual Rev.: 1.4
Revision Date: February 14, 2025
Part Number: 50M-41051-1040

Leading **EDGE COMPUTING**

Revision History

Revision	Description	Date
1.0	Initial release	2022-05-27
1.1	Update table mount damper info	2022-06-23
1.2	Update DIO info (Previous version P/N: 50M-00078-1010)	2023-06-08
1.3	update product specs, images, mechanical dimensions, and illustrations	2024-0913
1.4	Getting started updated and an appendix section added	2025-02-14

Preface

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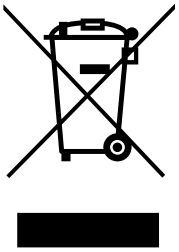
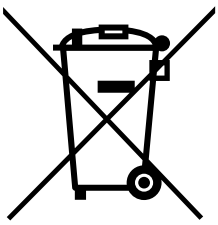


Battery Labels (for products with battery)



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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.

NOTE: Additional information, aids, and tips that help users perform tasks.

CAUTION: Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.

WARNING: Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

he AVA-3510 Series is powered by an Intel® Xeon® E processor coupled with workstation-grade Intel® C246 chipset to support up to 64 GB ECC DDR4 memory. The system features 1x and 2x 2.5" SATA drive bays for storage. The AVA-3510 is equipped with two 10GbE and five 1GbE ports for automotive Ethernet applications and MXM NVIDIA® Quadro® Embedded RTX5000 for AI computing.

2x Mini PCIe slots support in-vehicle communication and telematics. Built-in ignition control allows the system to be deployed on a vehicle and directly powered via the vehicle's power system with 9V to 36V DC. Target applications include, but are not limited to:

- Autonomous drive applications
- Fleet management systems
- In-vehicle digital signage applications

The AVA-3510 is highly suited to extreme environments with features such as wide operating temperature range (-10°C to 55°C) and anti-shock/vibration meeting MIL-STD-810H standards.

The AVA-3510-Gen1 supports 4G cellular connection.

1.1 Features

- Intel® Xeon® E-2278GE processor
- NVIDIA Quadro® Embedded RTX5000 GPU mod-ule (Turing™ architecture)
- Customizable ignition setting
- 1x Mini PCIe slot for optional CAN bus
- 2x 10GbE, 5xGbE
- 2x USB 3.0 lockable, 2x USB 2.0
- 1x M.2 NVMe 2280 M-key slot (factory option)
- 1x Mini PCIe slot for LTE or Wi-Fi module
- 2x 2.5" SATA drive bay
- 9-36 VDC input

1.2 Packing List

Please check that your package contains the items below. If you discover damaged or missing items, please contact your vendor.

- AVA-3510 system
- Table mount brackets (with dampers)
- Table mount and SSD mounting accessories
- Power connector and Wi-Fi/LTE mounting accessories

DO NOT install or apply power to equipment that is damaged or if there is missing/incomplete equipment. Retain the shipping carton and packing materials for inspection. Please contact your ADLINK dealer/vendor immediately for assistance. Obtain authorization from your dealer before returning any product to ADLINK.

1.3 Optional Accessories

AC/DC Power adapter for AVA-3510 (P/N: 31-62179-0000-A0)

- 1x 330WAC/DC adapter, 24V/13.75A

LTE Module Kit for AVA-3510-Gen1 (P/N: 91-95328-100E)

- 1x Mini PCIe LTE/HSPA+ module
- 2x RF cable MHF I(M) to RP-SMA(F), 200mm
- 2x External antenna WWAN(4G)
- 1x LTE heat-spreader (31x31x13.9mm)
- 1x Mounting bracket

Wi-Fi Module Kit for AVA-3510 (P/N: 91-95328-000E)

- 1x Wi-Fi/BT M.2 Wireless-AC 9260
- 1x M.2-to-mPCIe carrier board
- 2x RF cable MHF4(M) to RP-SMA(F), 200mm
- 2x External antenna RP-SMA(M) Wi-Fi 6E
- 1x heat-spreader (35x31x14.25mm)

2 System Architecture

2.1 Product Specifications

Model Name	AVA-3510 - Xeon® E
System Core	
Processor	Intel® Xeon® E-2278GE Processor
Base Freq.	3.3 GHz
Max. Turbo Freq.	4.7 GHz
Chipset	Intel® Chipset C246
Graphics	NVIDIA® Quadro® Embedded RTX5000, MXM 3.1 type B+, PCIe x16 Gen3
Memory	Dual channel 32G DDR4-2666 SODIMM socket, up to 64G
Display	2 x DP and 1 x DP++
Storage Devices	
M.2	NVMe M.2 2280 M-key slot (factory option)
2.5" SATA	1x 256G 2.5" SATA 6Gb/s, 1x open slot
External I/O Interface	
Ethernet	2x 10 GbE (X550, no support for WOL), 4x 1G GbE (i210T), 1x 1G GbE (I219 PHY), 5x RJ45, supports wake on LAN
Serial Port	2x DB9: COM1/2: RS-232/422/485
USB 2.0	2 ports, Type-A connectors
USB 3.1	2 ports, Type -A connector
DIO	2x DB9 con: 4 DI + 4 DO
Internal I/O Interface	
Mini PCIe	2x full size: Optional: 1x LTE Module or Wi-Fi Module, 1x FARO CAN module
µSIM	1 x µSIM Slot (4G/LTE)
MXM Slot	Default: PCIe x16 (For EGX-MXM-RTX5000)
Mechanical	
Dimensions	335(W)mm x 225.1(D)mm x 95(H)mm
Mounting	Table mount
Color	Black
Power Requirements	
DC Input	9-36V DC in with Ignition
AC/DC Power Adapter	Optional: 330W, AC/DC adapter (24V/13.75A)
Fail Reset	Hardware Reset button
Power Button	1x Power On/Off button
Extendable Power Switch	Power box-header
Battery	CMOS battery
Environmental	
Operating Temperature	Standard: -10°C to 55°C
Operating Humidity	EN 50125-1, compliant to EN 60068-2-78
Storage Temperature	-40°C to +70°C
Vibration	MIL-STD-810H Method 514.8, Procedure I, Category 4, Table 514.8C-I, Figure 514.8C-2 – Common carrier (US highway truck vibration exposure).
Shock	Operating MIL-STD-810H, Method 516.8, Procedure I
ESD	Contact ±4kV, air ±8kV
EMC	CE/ FCC Class A, according to EN 55024 & EN 55032 ISO 7637-2 & SAE J1113-11 (Nice to have)

Safety	CE-LVD
Operating System	
Linux	Ubuntu 20.04 (Kernel 5.11)

NOTE:

M.2 and Mini PCIe modules may require an additional thermal solution when operated above 60 °C. Please contact your local ADLINK representative for more information.

2.2 Power Specifications

2.2.1 Power Consumption

The following table presents the AVA-3510 power consumption data at room temperature under the following test conditions.

- Processor:
  - Intel ® Xeon® E-2278GE
- GPU: RTX5000
- Memory: 2x 16GB
- Storage: M.2 SATA 64GB
- TurboBoost Support enabled
- EIST enabled
- cTDP Setting: Normal
- BurnInTest Revision: 4.1.1002
- PTU Revision: 1.4
- Linux: Ubuntu 20.04

Table 1: Power consumption

Input Voltage	Loading	Current	Power Consumption
36VDC	Linux max. mode	7.8A	280W
	Linux idle mode	1.32A	47.52W

2.2.2 System Power Features

Operating Voltage Range

The system is equipped with a wide DC input range from 9V to 36V.

- Input range: 9V to 36V
- Max. input current: 7.8A @36V

2.3 DisplayPort Feature Support

Table 2: DisplayPort feature support

CPU/GPU	DP	DP++
Intel® Xeon®	N/A	3840x2160@60Hz
RTX50000	3840x2160@60Hz	NA

Input Over-Voltage Protection
When the input voltage exceeds 37.88V +5%, the module will shut down.

Input Over-Temperature Protection
Power will automatically shut down when the operating temperature of the power module sensor exceeds 125°C.

Under Voltage Lockout (UVLO)
The undervoltage lockout feature will shut down the power if the input voltage is below 5.2V -5%.

2.4 Functional Block Diagram

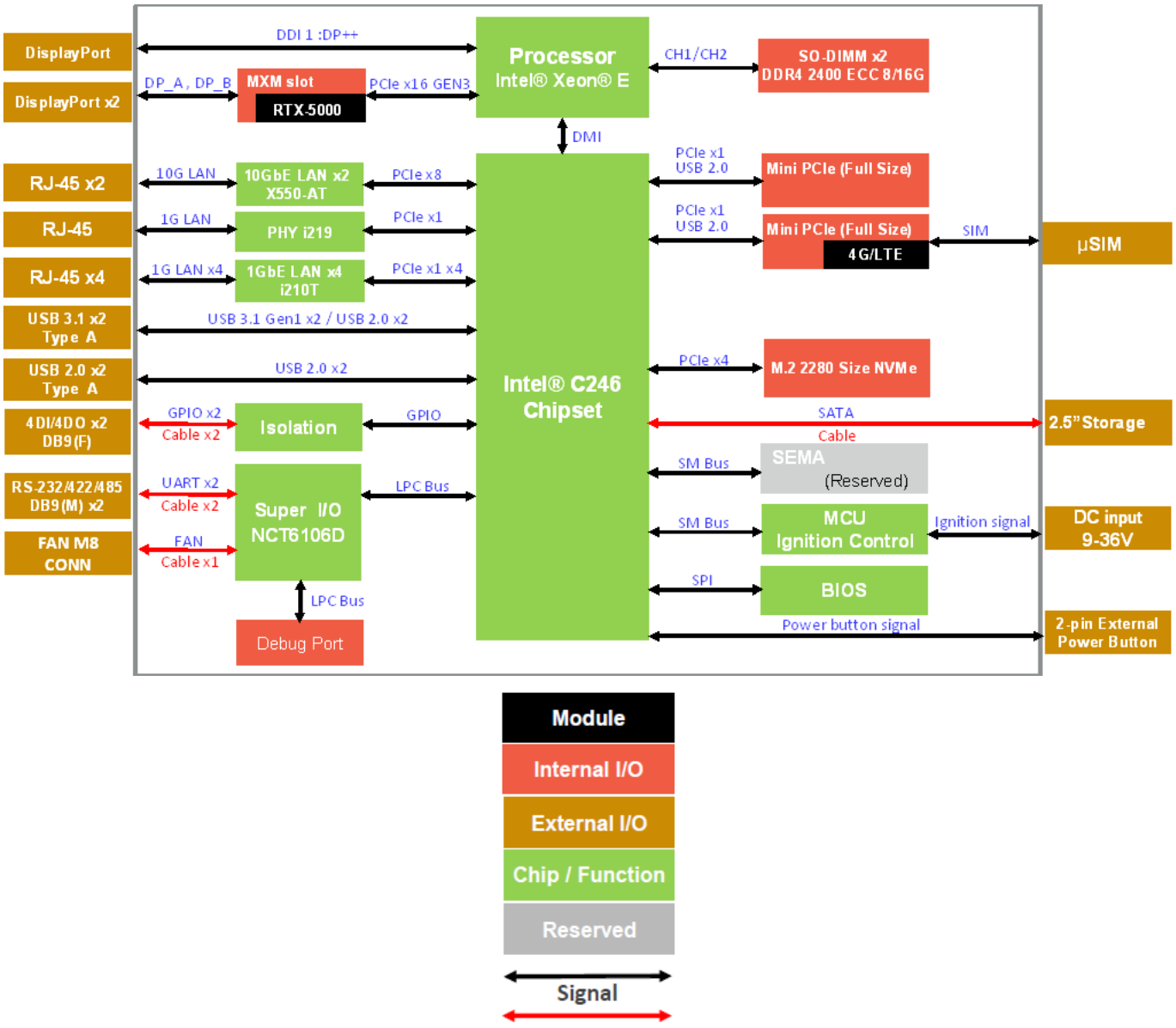

Figure 1: Functional block diagram

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3 Mechanical Layout

3.1 Mechanical Dimensions

All dimension measurements are in mm (millimeters).

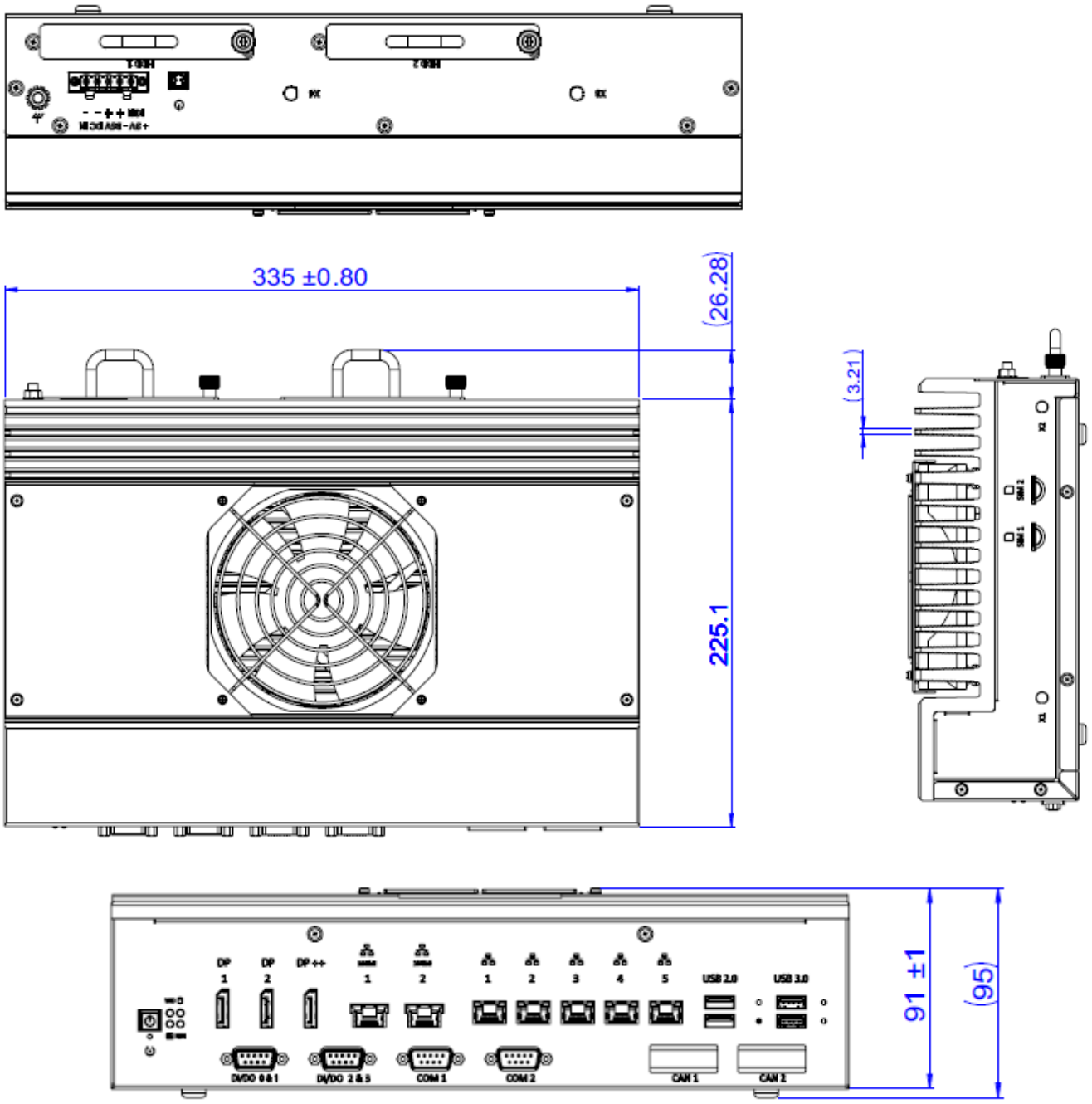


Figure 2: Mechanical dimensions

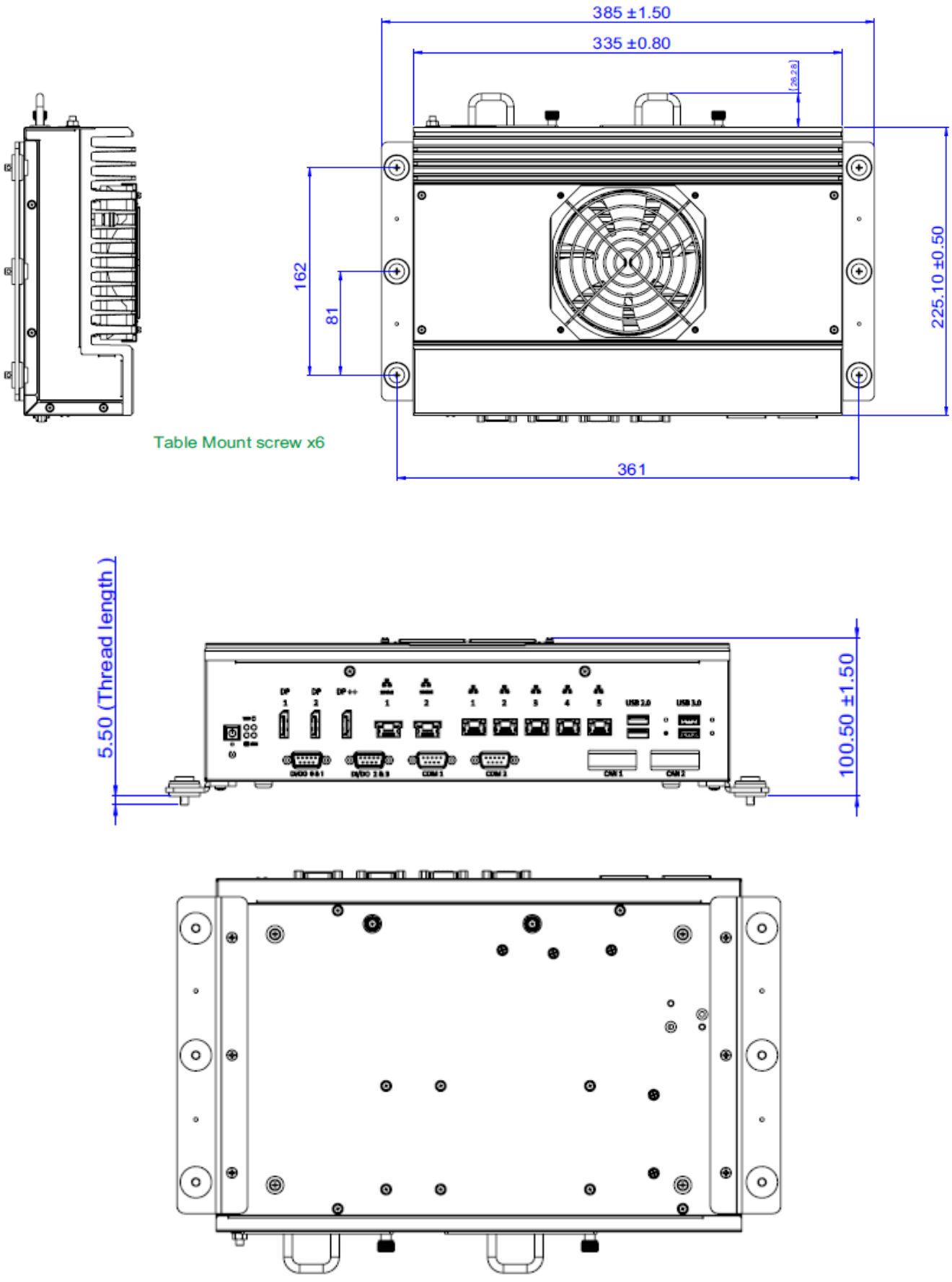


Figure 3: Mechanical dimensions with table mount

3.2 Connector Locations

All dimension measurements are in mm (millimeters).

Front View

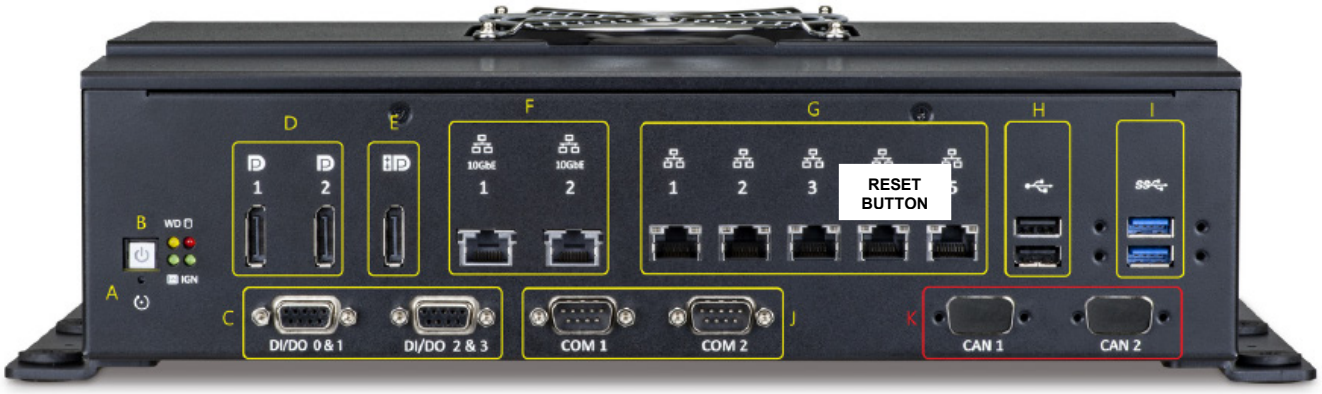


Figure 4: Connector locations (Front view)

Table 3: Connector labels (Front view)

A	System reset button
B	Power on/off button
C	DI/DO
D	DisplayPort
E	DP++
F	RJ-45 10 GbE
G	RJ-45 1 GbE
H	USB 2.0
I	USB 3.0
J	RS-232/422/485
K	Optional CAN bus

Rear View

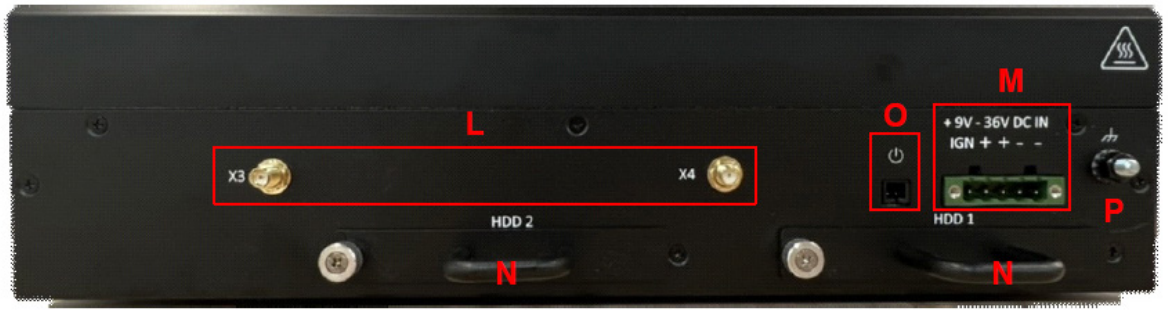


Figure 5: Connector locations (Rear view)

Table 4: Connector labels (Front view)

L	Antenna connectors
M	DC power input header
N	USB 3.0
O	2.5” SATA drive bays
P	Ground stud

Right Side View

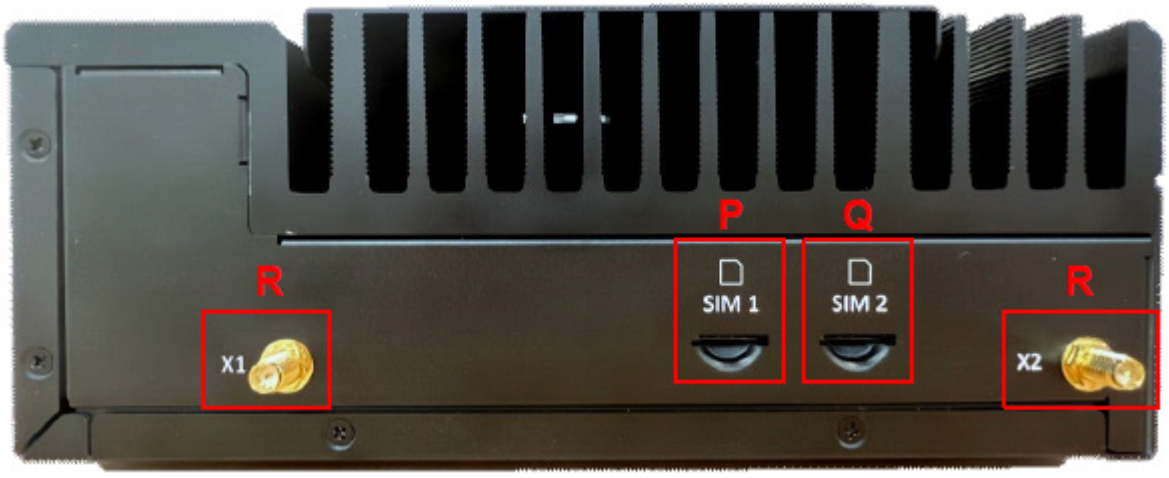


Figure 6: Connector locations (Right side view)

Table 5: Connector labels (Right side view)

P	Unused SIM slot
Q	4G SIM slot
R	Antenna connectors

4 Getting Started

Follow the instructions in this chapter to install a Wi-Fi or LTE module, table mounting brackets, 2.5" SATA SSD, ground cable, and DC power supply.

NOTE

Only one optional Mini PCIe module is supported.
The user may install either a Wi-Fi or LTE module.

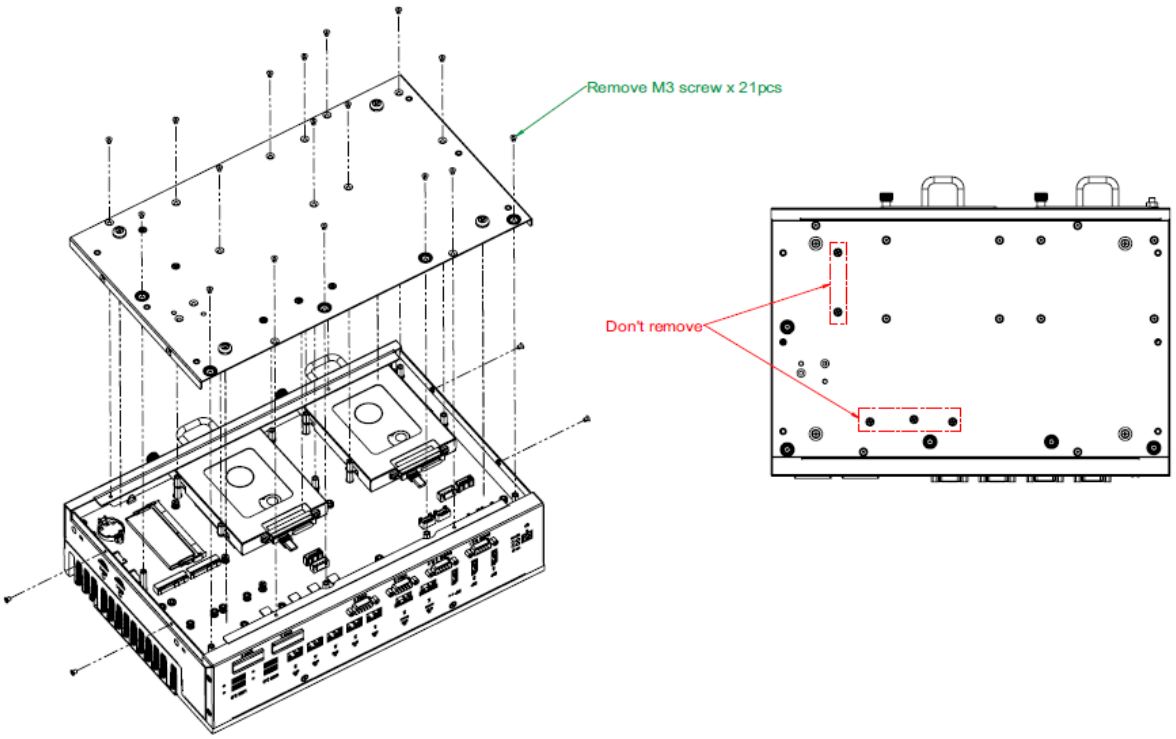
4.1 Removing the Bottom Cover

To install the Wi-Fi and LTE modules, first remove the bottom cover as explained below.

1. Place the box PC on a suitable surface with the bottom side facing up. Remove the 17 M3 screws from the bottom and 2 screws from each of the I sides (left and right), as indicated below (a total 21 screws).

NOTE

Do not remove the screws marked with “DO NOT REMOVE.”

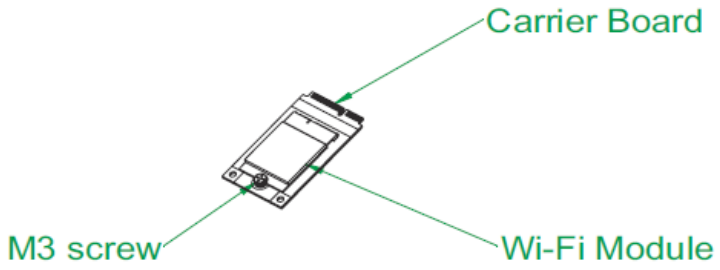


2. Lift the bottom cover off of the chassis.
3. To reinstall the bottom cover, place it in its original location and replace the 21 screws removed above.

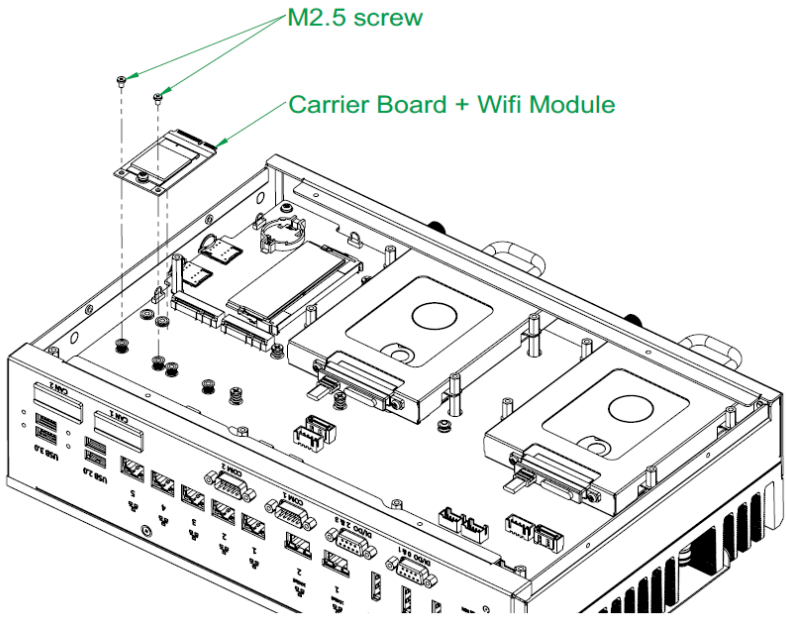
4.2 Installing a Wi-Fi Module (Optional)

Follow the instructions below to install a Wi-Fi module.

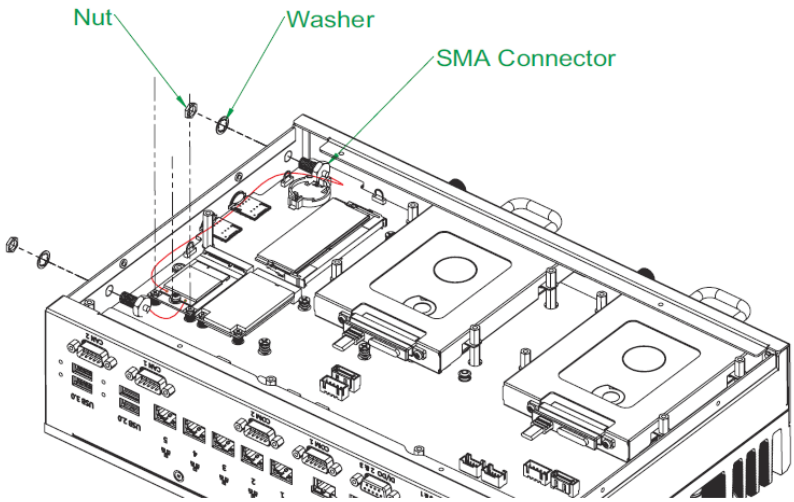
1. Insert the M.2 Wi-Fi module into the provided M.2-to-mPCIe carrier board, and install the M3 screw to secure it.



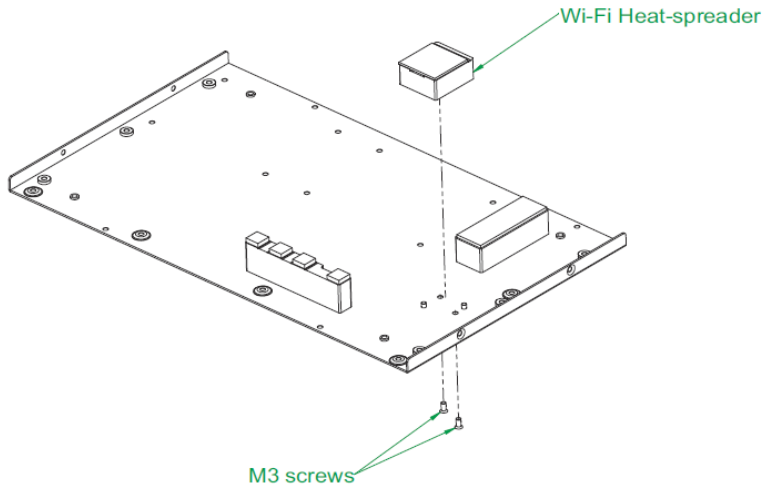
2. Insert the Wi-Fi + carrier board assembly into the Mini PCIe slot and secure it using two M2.5 screws.



3. Connect the internal RF cables to the module (follow the routing in red) and install the SMA connectors into the antenna openings.



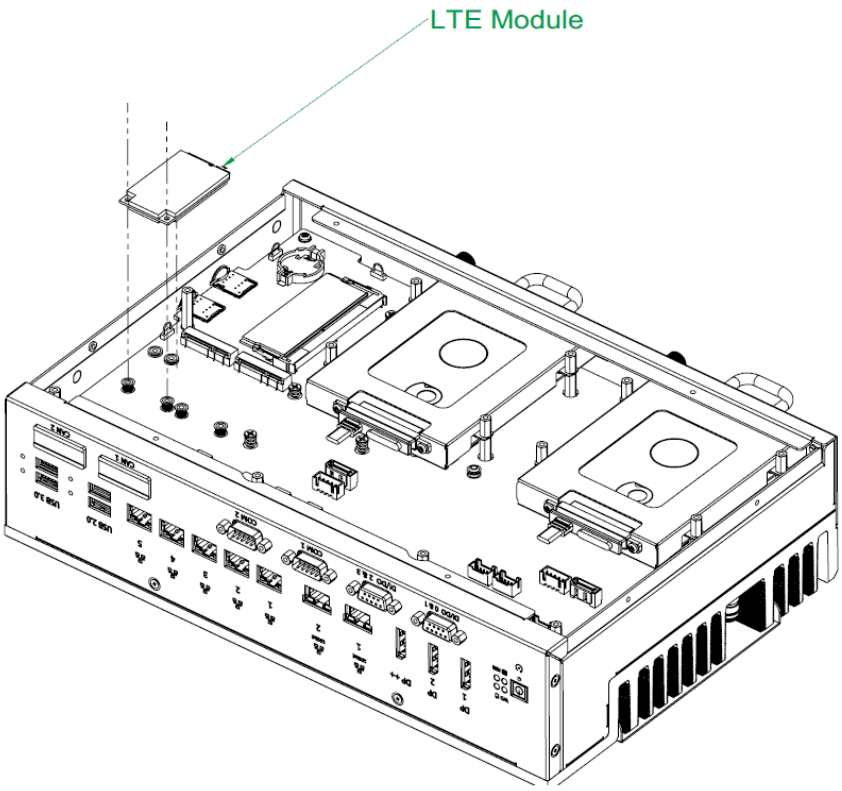
4. Secure the Wi-Fi heat spreader to the inside of the bottom cover using the M3 screws.



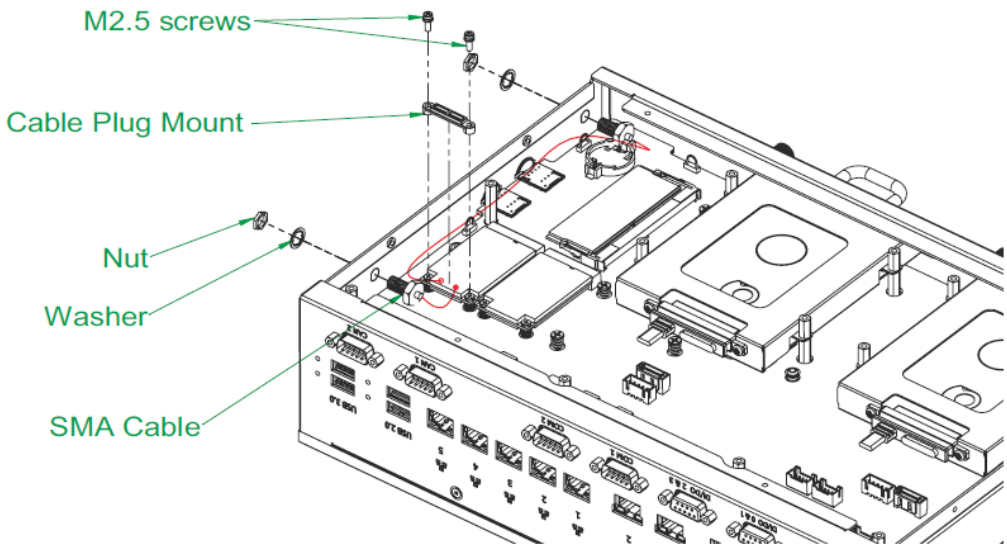
4.3 Installing an LTE Module (Optional)

Follow the instructions below to install an LTE module.

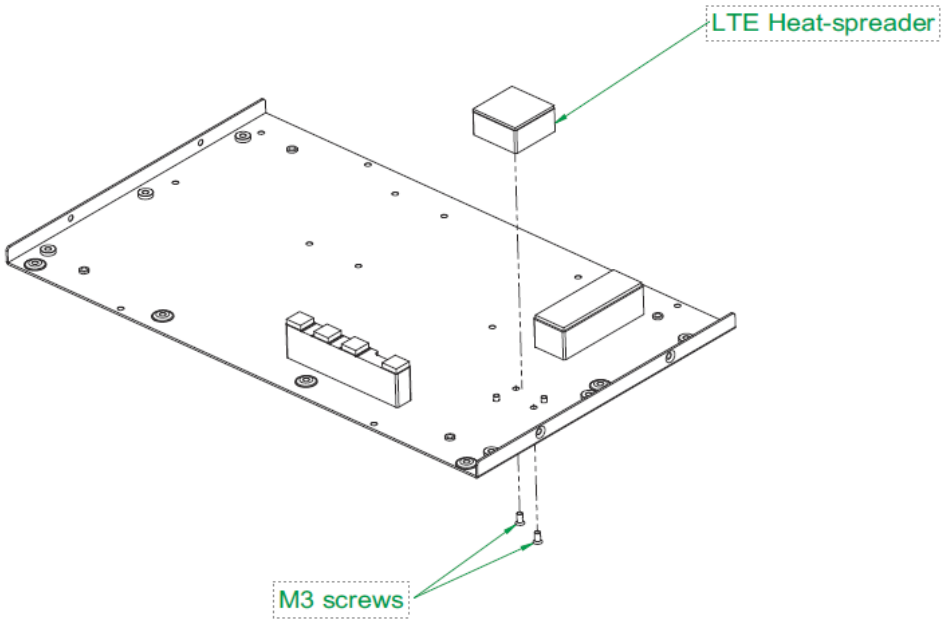
1. Insert the LTE module into the Mini PCIe slot and secure it using two M2.5 screws.



2. Connect the internal RF cables to the module (follow the routing in red), install the cable plug mount, and install the SMA connectors into the antenna openings as indicated.

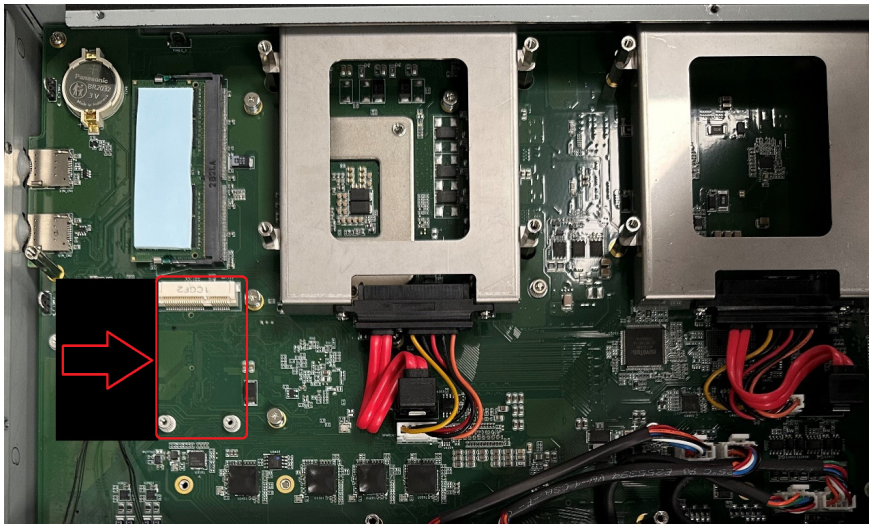


3. Secure the LTE heat-spreader to the inside of the bottom cover using two M3 screws.



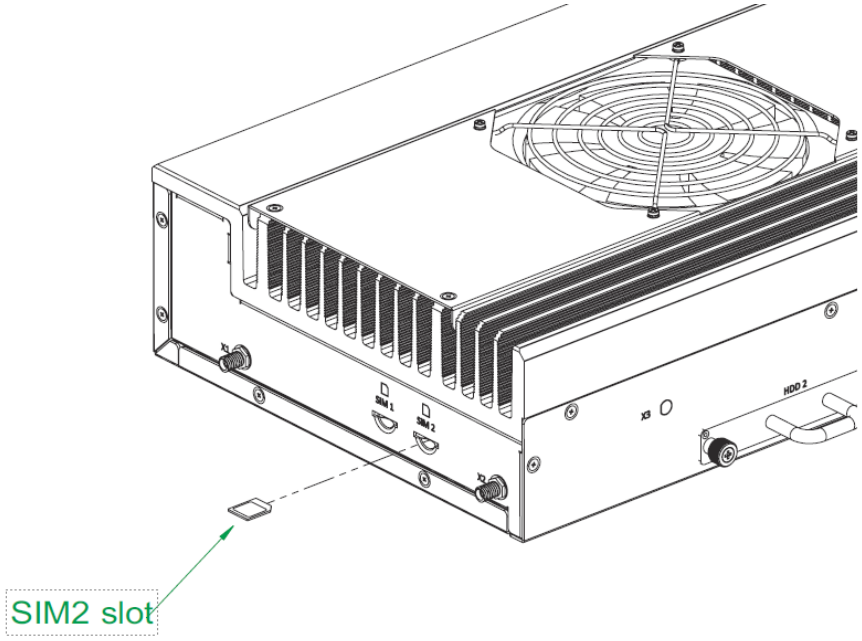
4.4 Installing CAN Module (Optional)

The CAN module must be installed in the inner mPCIe slot, as shown in the diagram below.



4.5 Installing a µSIM for LTE (Optional)

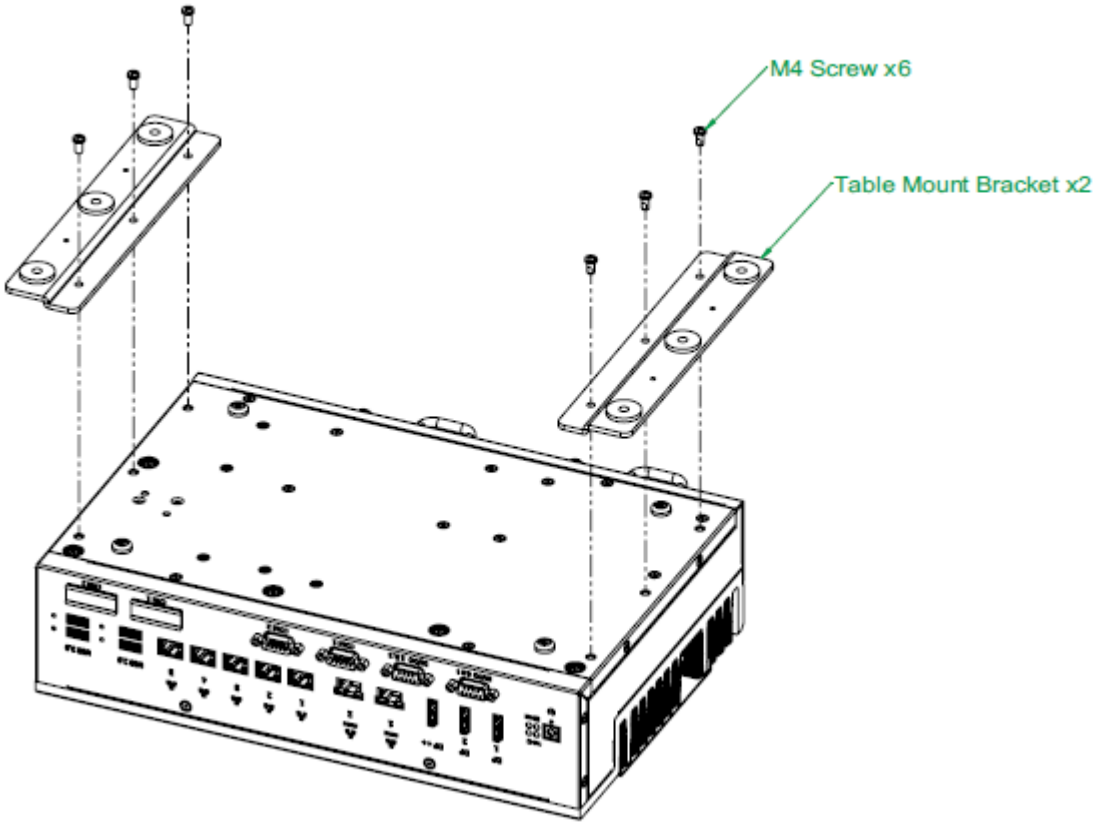
Insert a µSIM module into the SIM2 slot as shown.



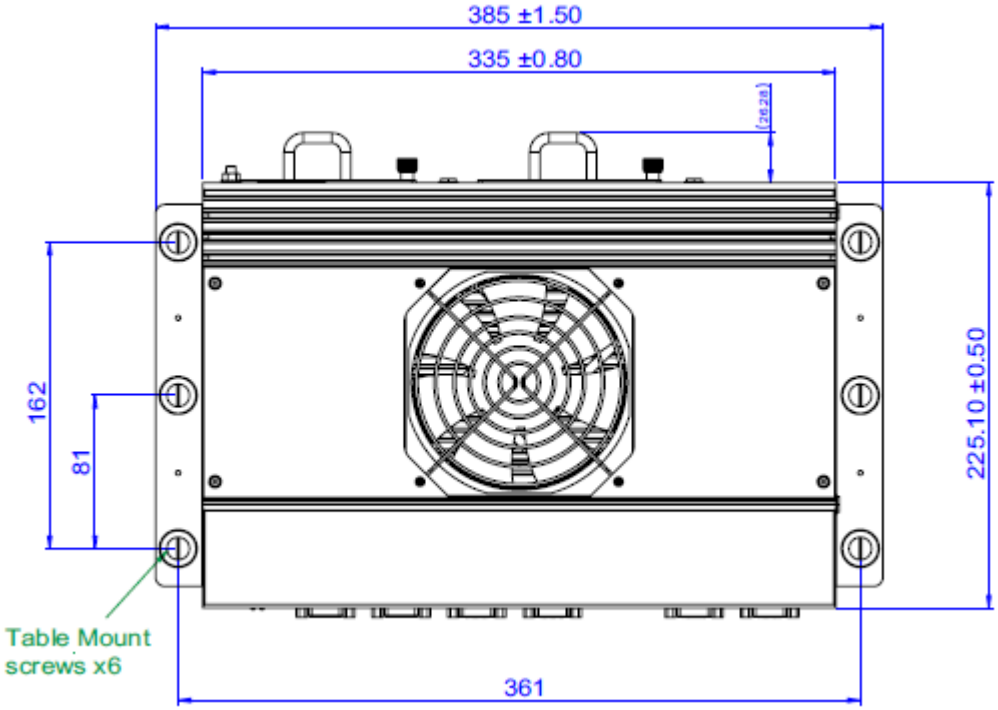
4.6 Table Mounting

The AVA-3510 can be surface-mounted using the table mount brackets and screws provided.

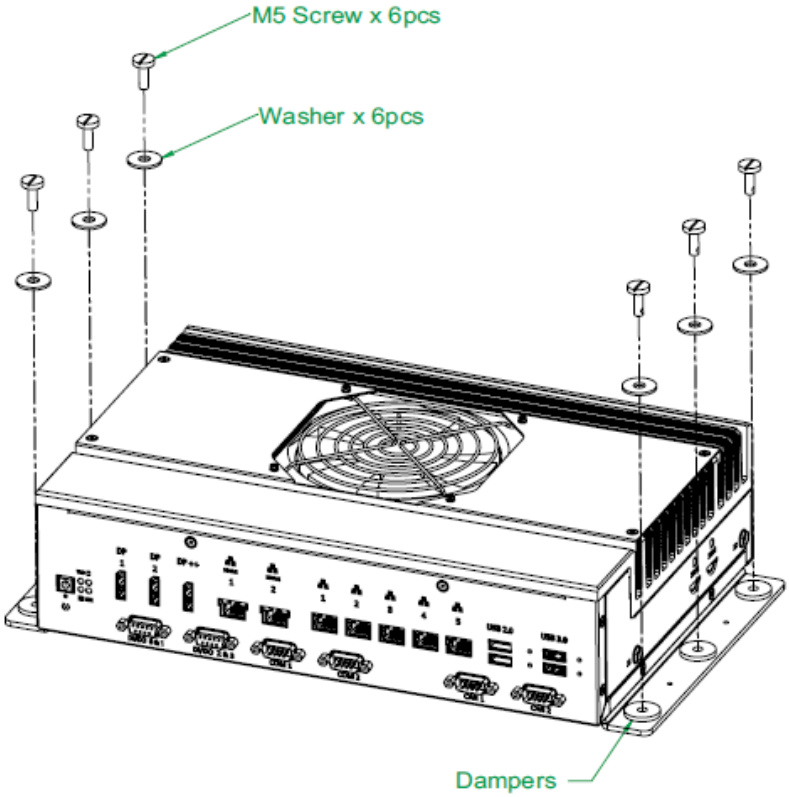
1. Secure the brackets to the chassis using with the 6 screws provided.



Dimensions: mm



2. Mount the system to the table.

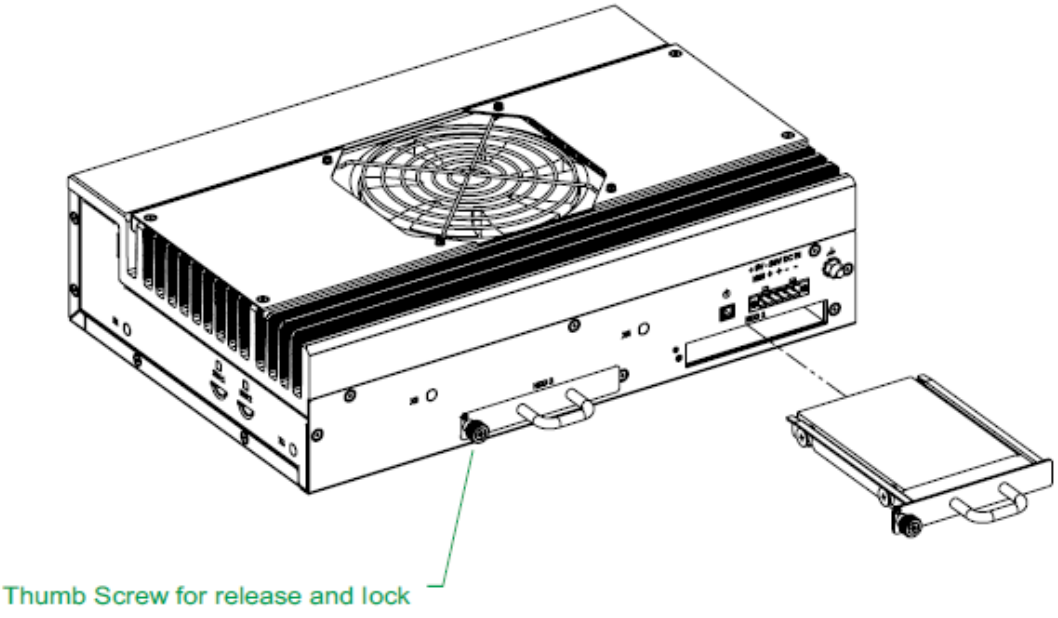


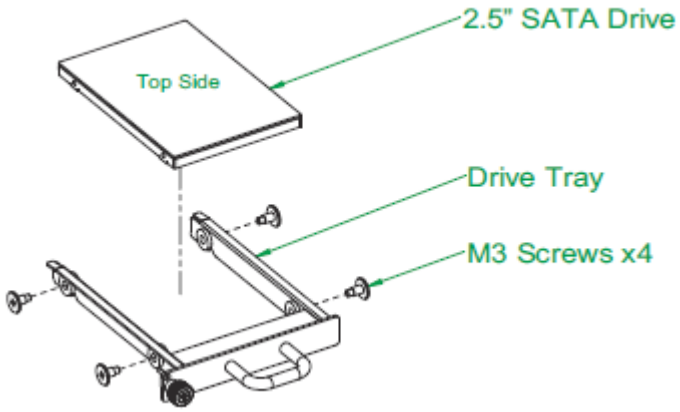
NOTE

- Recommended operating temperature of dampers is from -20°C to 60°C.
- Dampers must be kept away from fire and organic solvents.

4.7 2.5" SATA SSD Installation

Loosen the captive screw securing the SATA drive tray and pull it out. Secure the SATA module to the tray with four M3 screws, then insert the module into the slot. Tighten the captive screw.





4.8 Connections

4.8.1 Connecting a Ground Cable

CAUTION:

Connect the ground cable before making any other connections. When disassembling the system, always detach the ground cable last.

- Use a ground cable with a cross section of at least 16AWG and an M5 size ring terminal.
- Slide the ring terminal onto the ground stud and secure it with the locking M5 nut.

4.9 Connecting Peripherals

Connect all the peripheral devices needed for your system to function.

4.10 Connecting the Power Supply

WARNING:

- Work on the computer system may only be carried out by personnel qualified for the specific task and who have the training and experience to identify risks and avoid potential hazards.
- Make sure that a ground cable has been connected to the system before connecting an external power supply and switching on the system.
- Make sure that the voltage supplied by the external power supply conforms with specifications of the system.

Use the provided power connector to connect the power supply to the DC Power Input Header on the rear of the chassis (DECA ME050-50805). The device will power up when the power supply is turned on.

Figure 7: Power connector

Table 6: DC Power Input Header Pin Definition

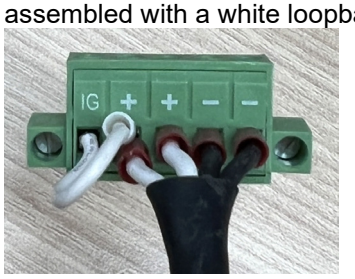
Pin #	Signal
1	P_+IGNITION
2	P_+VIN_PROTECT
3	P_+VIN_PROTECT
4	GND
5	GND

NOTE

If you are not using the ignition function, you must install a loopback wire (minimum UL1007 18AWG) to connect pins 1 and 2 or else the system will not power up. Refer to Optional AC/DC Power Adapter on pg. 26.

4.11 Optional AC/DC Power Adapter

If you have purchased the optional AC/DC power adapter (P/N: 31-62179-0000-A0), the power connector will be assembled with a white loopback wire connecting pins 1 and 2.



The default setting with loopback wire installed is ignition function disabled. To enable the ignition function, remove the loopback wire and connect pin 1 to your ignition equipment.

4.12 Starting Up the System

Upon startup, the system will auto-detect storage devices and boot from the operating system, if found. To change the boot device order, press <Del> or <Esc> to enter BIOS setup menu and change the Boot Option settings. If no operating system is found, the system will enter the BIOS setup menu automatically.

The AVA-3510 is delivered without an operating system installed.

NOTE

When an MXM graphics module is installed, the default Primary Display BIOS setting (Auto) will send bootup display output to DP2-DP3 (MXM graphics). To send bootup display output to DP1 (integrated Intel graphics), go to BIOS Settings Graphics Configuration on page 45.

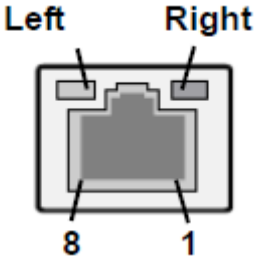
5 Connectors and Pinouts

5.1 Pin Definitions

Please refer to figure 4: Connector locations (Front view) on page 15.

5.1.1 RJ-45 GbE Connectors

Pin #	10BASE-T/100BASE-TX	1000BASE-T/10GBASE-T
1	TX+	LAN_TX0+
2	TX-	LAN_TX0-
3	RX+	LAN_TX1+
4	—	LAN_TX2+
5	—	LAN_TX2-
6	RX-	LAN_TX1-
7	—	LAN_TX3+
8	—	LAN_TX3-



1GbE LED Status Definitions

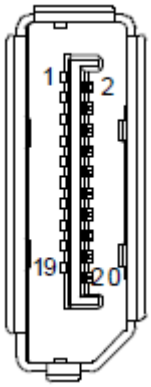
Status	Left LED	Right LED
No cable connection	Off	Off
Cable connected and no data transfer	1G: Yellow 100M: Green 10M: Off	Yellow
1G Link with data transfer	Yellow	Yellow & Flashing
100M Link with data transfer	Green	Yellow & Flashing
10M Link with data transfer	Off	Yellow & Flashing

10GbE LED status definitions

Status	Left LED	Right LED
No cable connection	Off	Off
Cable connected and no data transfer	10G: Green & Flashing 1G: Yellow	Yellow
10G Link with data transfer	Green & Flashing	Yellow & Flashing
1G Link with data transfer	Yellow	Yellow & Flashing

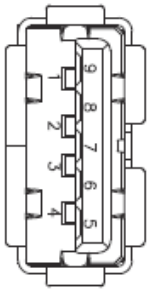
5.1.2 DisplayPort/DP++ Connectors

Pin #	Signal	Pin #	Signal
1	CN_DP0_P	2	Ground
3	CN_DP0_N	4	CN_DP1_P
5	Ground	6	CN_DP1_N
7	CN_DP2_P	8	Ground
9	CN_DP2_N	10	CN_DP3_P
11	Ground	12	CN_DP3_N
13	CN_CAD-L	14	CN_CEC
15	CN_AUX_P	16	Ground
17	CN_AUX_N	18	DDP_HPD
19	Ground	20	P3V3



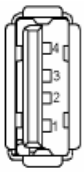
5.1.3 USB 3.0 Connector

Pin #	Signal
1	+5V_USB3
2	USB2_P0_DN
3	USB2_P0_DP
4	GND
5	USB3_P0_RXN
6	USB3_P0_RXP
7	GND
8	USB3_P0_TXN
9	USB3_P0_TXP



5.1.4 USB 2.0 Connectors

Pin #	Signal
1	Vcc
2	UV0-
3	UV0+
4	GND



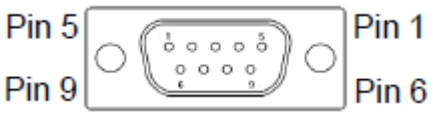
5.1.5 External Power Button Connector

Pin #	Signal
1	PWR_BTN-L
2	GND

5.1.6 DIO DB9 Connectors

The location and pin definitions of the optional DIO connectors are as shown below.

Pin #	Port 0/1	Port 2/3
1	DI0	DI2
2	DI1	DI3
3	NC	NC
4	DO0	DO2
5	DO1	DO3
6	DI_GDN	DI_GDN
7	DO Power (sink)	DO Power (sink)
8	NC	NC
9	DO_GND	DO_GND



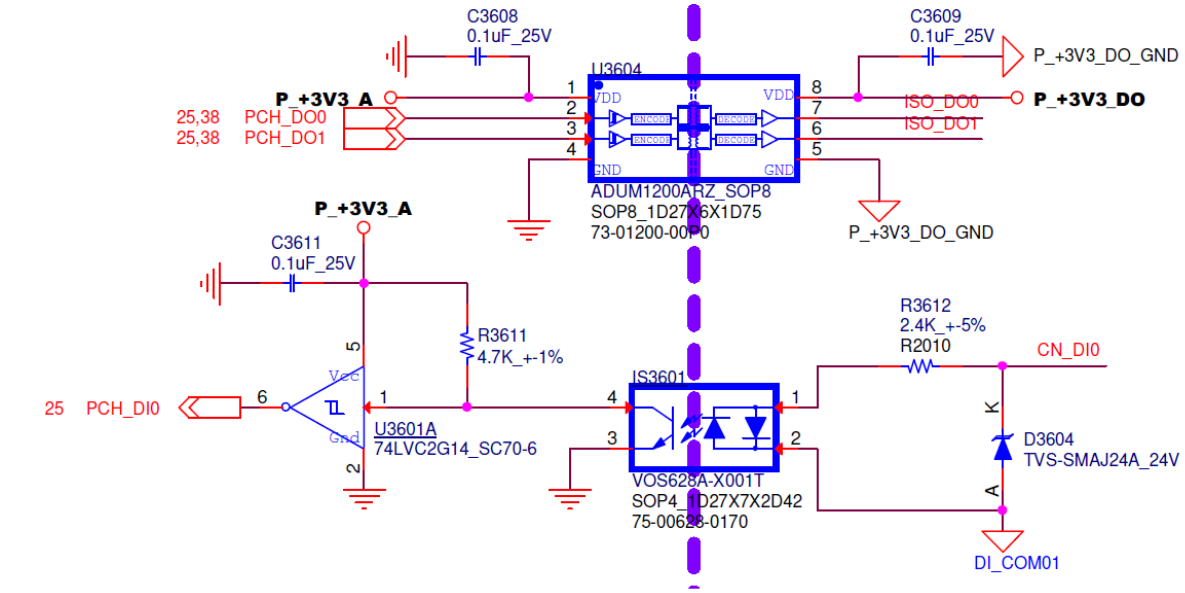
Optical Isolated Input Channel

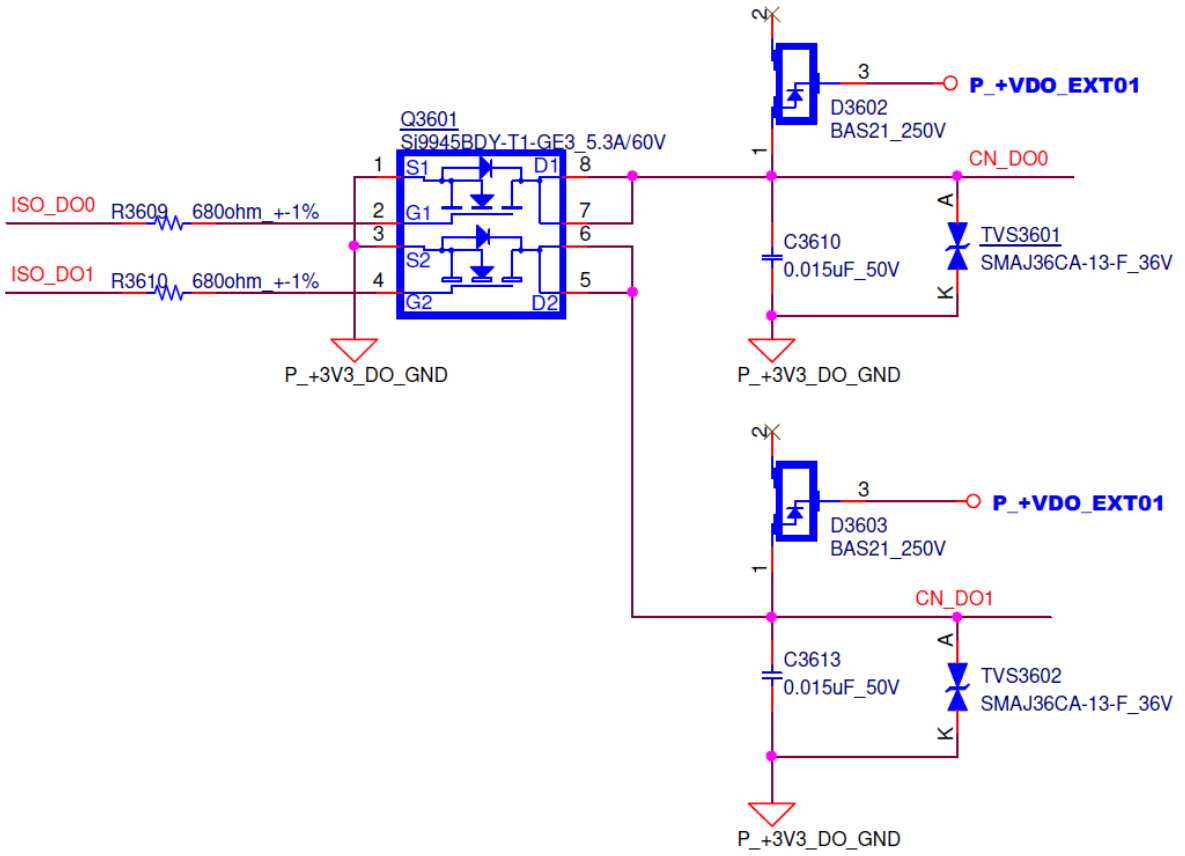
Number of Channel	2 DI
Input Voltage	5–24V dc logic H: 5–24V logic L: 0–1.5V
Input Resistance	2.4kΩ @ 0.5W
Isolated Voltage	1500VDC

Optical Isolated Output Channel

Number of Channel	2 DI
Output Voltage	3.3VDC min, 35VDC maximum
Sink Current	250mA/Ch
Isolated Voltage	1500VDC
Onboard Isolated 3.3V Output Power	200mA

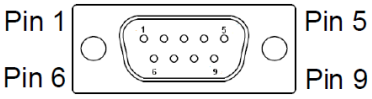
DIO Reference Circuits





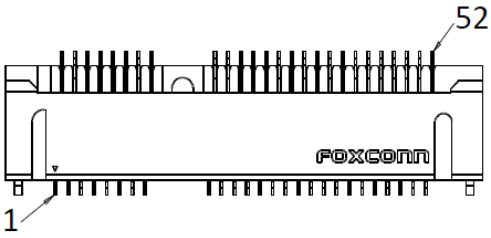
5.1.7 COM DB9 Connectors

Pin #	RS-232	RS-422	RS-485
1	DCD	TXD-	D-
2	RXD	TXD+	D+
3	TXD	RXD+	NA
4	DTR	RXD-	NA
5	GND	NA	NA
6	DSR	NA	NA
7	RTS	NA	NA
8	CTS	NA	NA
9	RI	NA	NA



5.1.8 Mini PCIe Connector

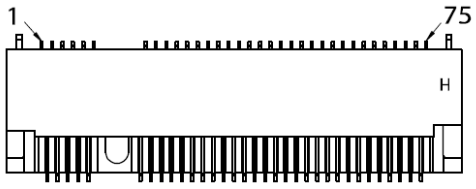
Pin #	Signal	Pin #	Signal
1	PCIE_WAKE#	2	P_+3V3_MPCIE
3	N/C	4	GND
5	N/C	6	P_+1V5_S
7	MPCIE0_CLKREQ#	8	P_+3V3_UIM
9	GND	10	UIM_DATA
11	REFCLK_MPCIE_N	12	UIM_CLK
13	REFCLK_MPCIE_P	14	UIM_RST
15	GND	16	UIM_VPP
17	N/C	18	GND
19	N/C	20	N/C
21	GND	22	PLTRST_MINIPCIE-L
23	MPCIE_RXN	24	P_+3V3_MPCIE
25	MPCIE_RXP	26	GND
27	GND	28	P_+1V5_S
29	GND	30	MPCIE_CLK
31	MPCIE_TXN	32	MPCIE_DAT
33	MPCIE_TXP	34	GND
35	GND	36	MPCIE_USB_N
37	GND	38	MPCIE_USB_P
39	P_+3V3_MPCIE	40	GND
41	P_+3V3_MPCIE	42	N/C
43	GND	44	N/C
45	N/C	46	N/C



Pin #	Signal	Pin #	Signal
47	N/C	48	P_+1V5_S
49	N/C	50	GND
51	N/C	52	P_+3V3_MPCIE

5.2 M.2 Connector

Pin #	Signal	Pin #	Signal
1	GND	2	P_+3V3_NGFF
3	GND	4	P_+3V3_NGFF
5	PCH_PCIE_RX9_N	6	NA
7	PCH_PCIE_RX9_P	8	NA
9	GND	10	NA
11	PCH_PCIE_TX9_N	12	P_+3V3_NGFF
13	PCH_PCIE_TX9_P	14	P_+3V3_NGFF
15	GND	16	P_+3V3_NGFF
17	PCH_PCIE_RX10_N	18	P_+3V3_NGFF
19	PCH_PCIE_RX10_P	20	NA
21	GND	22	NA
23	PCH_PCIE_TX10_N	24	NA
25	PCH_PCIE_TX10_P	26	NA
27	GND	28	NA
29	PCH_PCIE_RX11_N	30	NA
31	PCH_PCIE_RX11_P	32	NA
33	GND	34	NA
35	PCH_PCIE_TX11_N	36	NA
37	PCH_PCIE_TX11_P	38	PCH_SATA_DEVSLP1
39	GND	40	NA
41	PCH_PCIE_RX12_P	42	NA
43	PCH_PCIE_RX12_N	44	NA
45	GND	46	NA
47	PCH_PCIE_TX12_N	48	NA
49	PCH_PCIE_TX12_P	50	PCIE_PLTRST_BUF-L
51	GND	52	PCH_CLK_REQ3-L
53	PCH_PCIE_CLK3_N	54	NA
55	PCH_PCIE_CLK3_P	56	NA
57	GND	58	NA
67	NA	68	NA



Pin #	Signal	Pin #	Signal
69	SATA_PCIE_M2_SEL	70	P_+3V3_NGFF
71	GND	72	P_+3V3_NGFF
73	GND	74	P_+3V3_NGFF
75	GND		

5.3 Status LEDs

LED Indicator	Color	Description
Disk Drive (SATA)	Red	When blinking, it indicates the SATA drive is active.
Watchdog (WD)	Yellow	Indicates watchdog timer status. When the watchdog timer starts, the LED flashes. When the timer is expired, the system will auto reboot.
Diagnostic (DG)	Green	Indicates BIOS POST status. When BIOS POST finishes: OFF When BIOS POST is running or fails: ON
Ignition LED	Green	Ignition signal input 9-36V: ON Ignition signal input outside of 9-36V: OFF LED will flash during the boot up/power off delay time
Power Button LED	Blue	Idle on OS: ON Suspend: Blinking (1Hz) Hibernation: Blinking (1Hz) Power Off: OFF

5.4 Power Button

The power button is non-latched with a blue LED indicator. Press the button to turn on the system, then the power LED will light up.. If the system hangs, press the button for 5 seconds to turn off the system completely.

System Status	Power Button LED
Idle on OS	On
Suspend	Blinking (1Hz)
Hibernation	Blinking (1Hz)
Power Off	Off

5.5 Reset Button

The reset button is a non-latched. Press the reset button to restart the system. If the system hangs, press the button to restart the system.

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6 BIOS Settings

6.1 Menu Structure

This section presents the primary menus of the AMIBIOS® EFI BIOS setup utility. Use the following table as a quick reference for the contents of the BIOS Setup Utility. The subsections describe the submenus and options for each menu item.

To enter the BIOS Setup Utility:

1. Power on the motherboard
2. Press < Delete > when the prompt appears.
3. The BIOS setup menu will display. You can access the other setup interfaces from the main BIOS settings menu.

NOTE

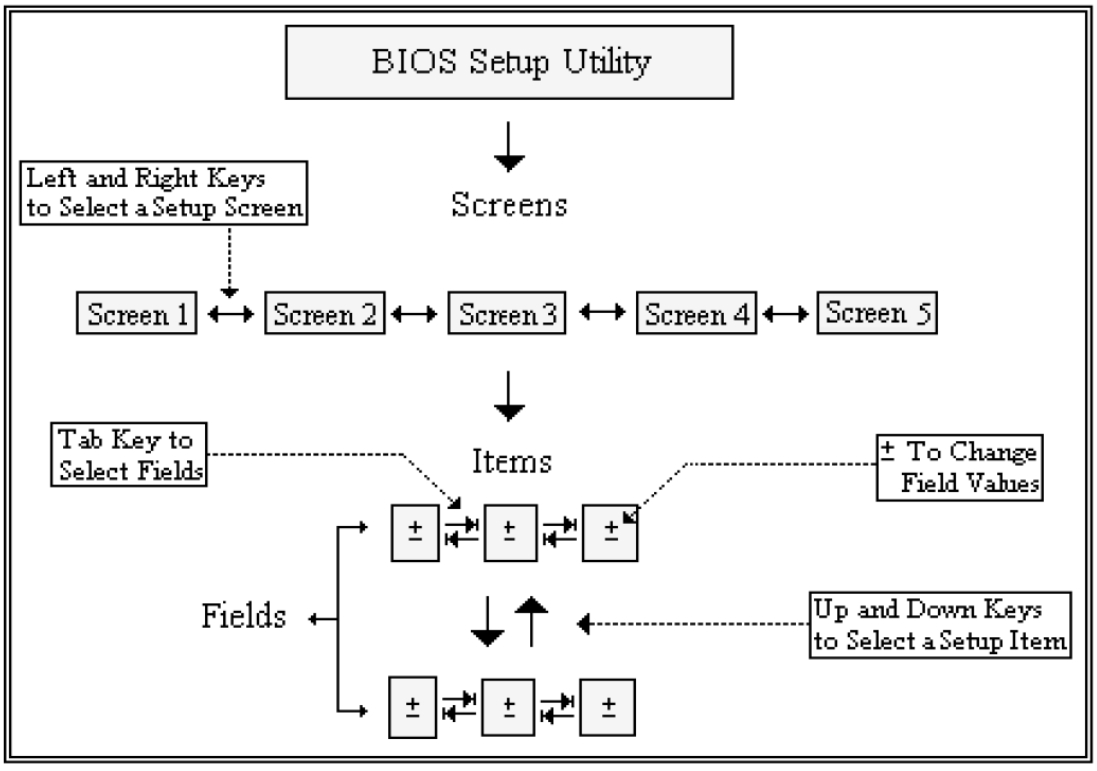
In most, cases. the < Delete > key is used to invoke the setup screen. There are several cases that use other keys, such as <F1 >, < F2 >, and so on.

Setup Menu
The main BIOS setup menu is the first screen that you can navigate. Each main BIOS setup menu option is described in this user's guide.

The Main BIOS setup menu screen has two main frames. The left frame displays all the options that can be configured. "Grayed" options cannot be configured, "Blue" options can be.

The right frame displays the key legend. Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

Navigation
The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process.



NOTE

There is a hotkey legend located in the right frame of most setup screens.

→← Left/Right
The Left and Right < Arrow > keys allow you to select a setup screen. For example: Main screen, Advanced screen, Chipset screen, and so on.

↑↓ Up/Down
The Up and Down < Arrow > keys allow you to select
a setup item or sub-screen.

+- Plus/Minus
The Plus and Minus < Arrow > keys allow you to change the field value of a particular setup item.
For example:
Date and Time.

Tab
The < Tab > key allows you to select setup fields.

ESC
The < Esc > key allows you to discard any changes you have made and exit the Setup. Press the < Esc > key to exit the setup without saving your changes. Press the < Enter > key to discard changes and exit. You can also use the < Arrow > key to select Cancel and then press the < Enter > key to abort this function and return to the previous screen.

6.2 Menu Setup

When you first enter the Setup Utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. The Main BIOS Setup menu options are:

- Main Menu
- Advanced Menu
- Chipset Menu
- Security Menu
- Boot Menu
- Save & Exit Menu

6.2.1 BIOS Information

Upon entering the BIOS Setup Utility, the Main Menu is displayed, providing read-only information about your system and also allows you to set the System Date and Time. Refer to the tables below for details of the submenus and settings.

Feature	Options	Description
BIOS Vendor	**Info-only.** American Megatrends	Display vendor name of system BIOS.
BIOS Version	**Info-only.** x.yy.zz	Display version of booting BIOS.
Build Date	**Info-only.** MM/DD/YYYY	Shows the date that BIOS was built.
MRC Version	**Info-only.** w.x.y.z	Display the revision of MRC code which is implemented in BIOS.
VBIOS Version	**Info-only.** yyyy/x.y.zzzz	*VBIOS Version:* Displayed when video option ROM is set to “Legacy Only”. *GOP Version:* Displayed when video option ROM is set to “UEFI Only”.
ME FW Version	**Info-only.**	Display the version of Intel manageability firmware

	ww.x.yy.zzzz	which is implemented in BIOS.

6.2.2 System Information

Feature	Options	Description
Project Name	**Info-only.** AVA-3510	Shows the project name.
CPU Board Version	**Info-only.** A1/A2/A3/…	Shows the CPU board HW version.
CPU Brand String	**Info-only.** Intel(R) Core, …	Shows what CPU is booting the system.
Stepping	**Info-only.** R0	Shows what CPU Stepping.
Total Memory	**Info-only.** XXXX MB (DDRx)	Shows total memory size used on the motherboard and memory type.
Memory Frequency	**Info-only.** XXXX MHz	Shows memory's frequency.
PCH SKU	**Info-only.** CMxx	Shows what PCH SKU is designed on motherboard.
Stepping	**Info-only.** B0	Shows what PCH Stepping.

6.2.3 System Date and Time

Feature	Options	Description
System Date	MM/DD/YYYY	For configuring/showing system date. When setting the date, use <Tab> key to switch between Date elements.
System Time	HH:MM:SS	For configuring/showing system time. When setting the time, use <Tab> key to switch between Time elements.
Access Level	**Info-only.** Administrator/User	Shows what access level is used to enter BIOS setup menu.

6.3 Advanced Menu

This menu contains the settings for most of the user interfaces in the system.

Feature	Option	Description
► CPU Configuration	Submenu	
► Power Management	Submenu	
► Serial Console Redirection	Submenu	
► USB Configuration	Submenu	
► AMT Configuration	Submenu	
► Onboard Devices Configuration	Submenu	
► NCT6106D HW Monitor	Submenu	
► BIOS Watchdog Timer	Submenu	
► NVMe Configuration	Submenu	
► Network Stack Configuration	Submenu	
► Intel(R) Ethernet Converged Network Adapter X550-T2 – XX:XX:XX:XX:XX:XX	Submenu	
► Miscellaneous	Submenu	

6.3.1 Advanced > CPU Configuration

Feature	Option	Description
Type	**Info-only**	Shows the CPU information.
Package	**Info-only**	Shows the CPU information.
Stepping	**Info-only**	Shows the CPU information.
Number of Processors	**Info-only**	Shows the CPU information.
ID	**Info-only**	Shows the CPU information.
Microcode Revision	**Info-only**	Shows the CPU information.
Speed	**Info-only**	Shows the CPU information.
L1 Data Cache	**Info-only**	Shows the CPU information.
L1 Instruction Cache	**Info-only**	Shows the CPU information.
L2 Cache	**Info-only**	Shows the CPU information.
L3 Cache	**Info-only**	Shows the CPU information.
L4 Cache	**Info-only**	Shows the CPU information.
VMX	**Info-only**	Shows the CPU information.
SMX/TXT	**Info-only**	Shows the CPU information.
Hyper-Threading	**Disabled**, Enabled	Enabled for Windows XP and Linux (OS optimized for Hyper- Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology).
Active Processor Cores	**All**, 1, 2, 3, 4, 5, 6, 7, 8	Number of cores to enable in each processor package.
Intel (VMX) Virtualization Technology	Disabled, **Enabled**	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
Intel Trusted Execution Technology	**Disabled**, Enabled	Enables utilization of additional hardware capabilities provided by Intel (R) Trusted Execution Technology.
Intel(R) SpeedStep(tm)	**Disabled**, Enabled	Allows more than two frequency ranges to be supported.
Intel(R) Speed Shift Technology	Disabled, **Enabled**	Enable/Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware-controlled P-states.
Turbo Mode	Disabled, **Enabled**	Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).
C states	**Disabled**, Enabled	Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.
Tcc Activation Offset	**0**	Offset from factory set Tcc activation temprature at which the Thermal Control Circuit must be activated. Tcc will be activated at: Tcc Activation Temp – Tcc Activation Offset. Tcc Activation Offset range is 0 to 63.

6.3.2 Advanced > Power Management

Feature	Option	Description
State After G3	**Power On**, Power Off, Last State	Specify what state to go to when power is re-applied after a power failure (G3 state).
RTC Wake system from S5	**Disabled**, Fixed Time, Dynamic Time	Enable or disable system wake on alarm event. Select FixedTime, system will wake on the hr::min::sec specified. Select DynamicTime , System will wake on the current time + Increase minute(s)
I219 LAN Wake	**Enabled**, Disabled	Disable/Enable onboard LAN I219 wake capability

6.3.3 Serial Console Redirection

Feature	Option	Description
Console Redirection	**Disabled** Enabled	To enable or disable console redirection of COMx.
Console Redirection Settings	**Submenu**	The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

6.3.3.1. Advanced > Serial Console Redirection > Serial Console Redirection

Feature	Option	Description
Terminal Type	VT100, VT100Plus, VT- UTF8, **ANSI**	Configure the type of console emulation. Emulation: **ANSI:** Extended ASCII char set. **VT100:** ASCII char set. **VT100+:** Extends VT100 to support color, function keys, etc. **VT-UTF8:** Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per second	9600 19200 38400 57600 **115200**	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speed.
Data Bits	7 **8**	Configure the number of data bits in each transmitted or received serial character for both serial ports.
Parity	**None**, Even, Odd, Mark, Space	Configures if parity bit is generated (transmit data) or checked. A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the number of 1's in the data bits is even. Odd: parity bit is 0 if number of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit.
Stop Bits	**1** 2	Configures the number of stop bits transmitted and received in each serial character for both serial ports. Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may

		require more than 1 stop bit.
Flow Control	**None**, Hardware RTS/CTS	Configures flow control for console redirection. Hardware flow control uses RTC/CTS. Software flow control uses XON/XOFF.
VT-UTF8 Combo Key Support	Disabled **Enabled**	Enable VT-UTF8 combination key support for ANSI/VT100 terminals.
Recorder Mode	**Disabled** Enabled	With this mode enabled only text will be sent. This is to capture terminal data.
Resolution 100x31	**Disabled** Enabled	Enables or disables extended terminal resolution.
Putty KeyPad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select Function Keys and Key Pad on Putty.

6.3.4 Advanced > USB Configuration

Feature	Option	Description
USB Module Version	**Info-only**	
USB Controllers	**Info-only**	
USB Devices	**Info-only**	
USB Mass Storage Driver Support	**Enabled** Disabled	Enable/Disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec, 5 sec, 10 sec, **20 sec**	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec, **20 sec**, 30 sec, 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	**Auto,** Manual	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

6.3.5 Advanced > AMT Configuration

Feature	Option	Description
AMT BIOS Features	Disabled, **Enabled**	When disabled AMT BIOS Features are no longer supported and user is no longer able to access MEBx Setup.
MEBx hotkey Pressed	**Disabled**, Enabled	

6.3.6 Advanced > Onboard Devices Configuration

Feature	Option	Description
COMx Device Settings	**Info-only**	
COMx Control	**RS232**, RS422,	Select COMx mode. RS232,

6.3.7 Advanced > NCT6106D HW Monitor

Feature	Option	Description
CPU Temperature	**Info-only**	
Board Temperature	**Info-only**	
System Fan Speed	**Info-only**	
System Fan Control Mode	Manual Mode, **SMART FAN IV**, Auto Mode	Configure Fan Control Mode. Select Manual Mode, user can configure a fixed fan duty. Select SMART FAN IV, user can configure 4 temperatures and 4 fan duties, it offers 3 slopes to control the fan speed. Select Auto Mode, fan will run at automatic speed with optimal thermal solution.
T1	45	T1 (Temperature 1), Range: 1-100
T1 Duty	102	Set T1 related DC/PWM value, Range: 0-255
T2	54	T2 (Temperature 2), Range: 1-100
T2 Duty	178	Set T2 related DC/PWM value, Range: 0-255
T3	60	T3 (Temperature 3), Range: 1-100
T3 Duty	242	Set T3 related DC/PWM value, Range: 0-255
T4	66	T4 (Temperature 4), Range: 1-100
T4 Duty	255	Set T4 related DC/PWM value, Range: 0-255
Critical	83	Critical Temperature
+VCORE	**Info-only**	
+12V_S	**Info-only**	
+5V_S	**Info-only**	
+3.3V_S	**Info-only**	
+3.3V_SIO_AVSB	**Info-only**	
+3.3V_VBAT_SIO	**Info-only**	

6.3.8 Advanced > BIOS Watchdog Timer

Feature	Option	Description
BIOS POST Watchdog	**Disabled**, Second Mode, Minute Mode	1. Disable: Disable WatchDog Timer; 2. Second Mode: Enable Watchdog Timer in second mode; 3. Minute Mode: Enable Watchdog Timer in minute mode.

6.3.9 Advanced > NVMe Configuration

Feature	Option	Description
NVMe Device	**Submenu**	Show NVMe devices information.

6.3.10 Advanced > Network Stack Configuration

Feature	Option	Description
Network Stack	**Disabled** Enabled	Enable/Disable UEFI Network Stack
IPv4 PXE Support	**Disabled** Enabled	Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.
IPv4 HTTP Support	**Disabled** Enabled	Enable/Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.
IPv6 PXE Support	**Disabled** Enabled	Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.
IPv6 HTTP Support	**Disabled** Enabled	Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.
IPSEC Certificate	Disabled **Enabled**	Enable/Disable IPSEC Certificate. If disabled, IPSEC Certificate will not be available.
PXE boot wait time	0	Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.
Media detect count	1	Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

6.3.11 Advanced > Intel ® Ethernet Converged Network Adapter

Feature	Option	Description
>Firmware Image Properties	**Submenu**	Show NIC Firmware information
>NIC Configuration	**Submenu**	
Blink LEDs	**0**	
UEFI Driver	**Info-only**	
Adapter PBA	**Info-only**	
Device Name	**Info-only**	
Chip Type	**Info-only**	
PCI Device ID	**Info-only**	
PCI Address	**Info-only**	
Link Status	**Info-only**	
MAC Address	**Info-only**	
Virtual MAC Address	**Info-only**	

6.3.12 Advanced > Miscellaneous

Feature	Option	Description
IGN Timeout of Power On	**OFF,** 0 sec, 1 sec, 2 sec, 3 sec, 4 sec, 5 sec, 6 sec, 7 sec, 8 sec, 9 sec, 10 sec, 11sec, 12 sec, 13 sec, 14 sec, 15 sec	IGN Timeout of Power On
IGN Timeout of Power Off	**OFF**, 0 sec, 10 sec, 15 sec, 30 sec, 1 min, 2 min, 5 min, 10 min	IGN Timeout of Power Off

6.4 Chipset

This menu contains the settings for most of the internal chipset I/O in the system.

Feature	Option	Description
System Agent (SA) Configuration	**Submenu**	
PCH-IO Configuration	**Submenu**	
Above 4G Decoding	**Disabled,** Enabled	Enables or Disables 64-bit capable devices to be decoded in above 4g address space (only if system supports 64-bit PCI decoding).

6.4.1 Chipset > System Agent (SA) Configuration

Feature	Option	Description
SA PCIe Code Version	**Info-only**	
VT-d	**Info-only**	
Memory Configuration	**Submenu**	
Graphics Configuration	**Submenu**	
MXM Port Configuration	**Submenu**	
VT-d	Disabled, **Enabled**	VT-d capability

6.4.1.1. Chipset > System Agent (SA) Configuration > Memory Configuration

Feature	Option	Description
Memory RC Version	**Info-only**	
Memory Frequency	**Info-only**	
Memory Timings (tCL-tRCD-tRP-tRAS)	**Info-only**	
Channel x Slot x	**Info-only**	
Size	**Info-only**	
Number of Ranks	**Info-only**	
Manufacturer	**Info-only**	

6.4.1.2. Chipset > System Agent (SA) Configuration > Graphics Configuration

Feature	Option	Description
Primary Display	**Auto**, IGFX, PEG	Select which of IGFX/PEG/PCIe Graphics device should be Primary Display.
Internal Graphics	Auto, Disabled, **Enabled**	Keep IGFX enabled based on the setup options.
GTT Size	2MB, 4MB, **8MB**	Select the GTT Size
Aperture Size	128MB, **256MB**, 512MB, 1024MB, 2048MB	Select the Aperture Size
DVMT Pre-Allocated	4M, 8M, 16M, **32M**, 64M	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx Mem	128M, **256M**, MAX	Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device.
Primary Display	**Auto**, IGFX, PEG	Select which of IGFX/PEG/PCIe Graphics device should be Primary Display.

6.4.1.3. Chipset > System Agent (SA) Configuration > MXM Configuration

Feature	Option	Description
MXM Port	**Info-only**	
Speed	**Auto**, Gen1, Gen2, Gen3	Control PCIe Max Speed

6.4.2 Chipset > PCH-IO Configuration

Feature	Option	Description
SATA And RST Configuration	**Submenu**	
M.2 Device Configuration	**Submenu**	

6.4.2.1. Chipset > PCH-IO Configuration > SATA and RST Configuration

Feature	Option	Description
SATA Controller(s)	**Enabled,** Disabled	Enable/Disable All SATA devices.
SATA Mode Selection	**AHCI**	Determines how SATA controller(s) operate.
SATA Test Mode	Enabled**, Disabled**	Test Mode Enable/Disable (Loop Back).
SATA Controller Speed	Default, Gen1, Gen2, **Gen3**	Indicates the maximum speed the SATA controller can support.
SATA HDD X	**Info-only**	
Software Preserve	**Info-only**	
SATA HDD X	Disabled**, Enabled**	Enable/Disable SATA devices.

6.4.2.2. Chipset > PCH-IO Configuration > M.2 Device Configuration

Feature	Option	Description
M.2 Port Device Link Selection	2X2, **X4**	To configure M.2 port's PCIe link as X1 or X2

6.5 Boot

Feature	Option	Description
Setup Prompt Timeout	**1**	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	On **Off**	Select the keyboard NumLock state after system boot.
Quiet Boot	Disabled **Enabled**	**Enabled:** will show splash screen during POST. **Disabled:** will show boot message during POST.
Boot Option #1~#8	Hard Disk CD/DVD USB Hard Disk USB CD/DVD USB Key USB Floppy USB Lan Network Disabled	Set system boot order.

6.6 Security

Feature	Option	Description
Administrator Password	**Enter to set password**	Configure/Clear Administrator Password. When pressing enter, a menu will be popped up for creating new password. When password installed, press enter without inputting password, it will clear password.
User Password	**Enter to set password**	Configure/Clear User Password. When pressing enter, a menu will be popped up for creating new password. When password installed, press enter without inputting password, it will clear password.
Secure Boot menu	**Submenu**	
P1:xxxx	**Submenu**	For HDD security, it will list all HDD detected on motherboard. Select the HDD and then press enter can figure/clear HDD password.

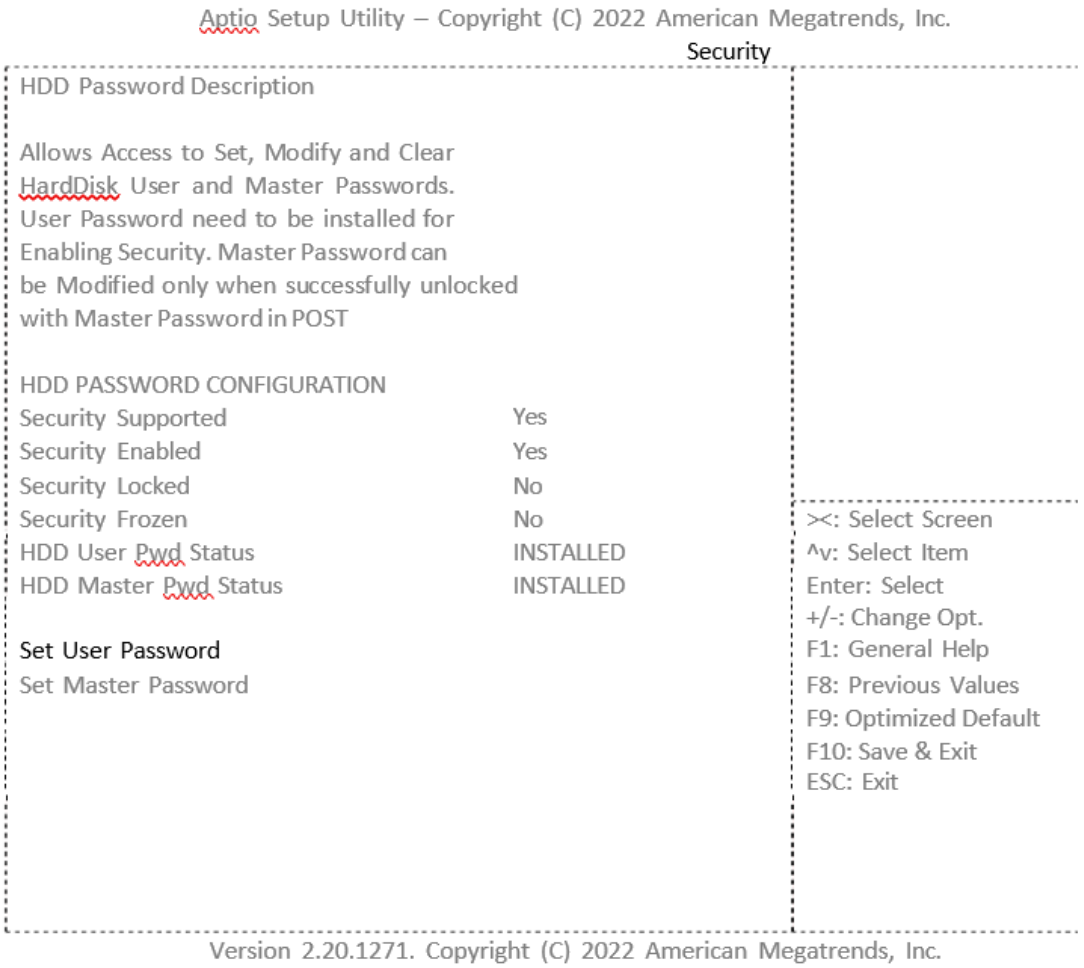
6.6.1 Chipset > Secure Boot Menu

Feature	Option	Description
System Mode	**Info-only**	
Secure Boot	**Info-only**	
Vendor Keys	Valid	
Secure Boot Control	Disabled **Enabled**	Secure Boot can be enabled if: 1. System running in User mode with enrolled Platform Key (PK) CSM function is disabled.

Secure Boot Mode	**Standard**, Custom	Secure Boot mode options:

HDD Password

When selecting an HDD to configure passwords, the BIOS will open a new setup page, as shown below. The method for configuring HDD passwords is the same as for BIOS passwords. Once a password is set, its status will be displayed on the screen, such as 'INSTALLED' under 'HDD User Pwd Status.' If no HDD user password is installed, you can change the master password without confirming the previously set password. Once an HDD user password is installed, the HDD master password cannot be changed.



6.7 Save & Exit

Feature	Option	Description
Save Changes and Exit	**Enter**	Save changed settings and exit BIOS setup utility.
Discard Changes and Exit	**Enter**	Skip changed setting and exit BIOS setup utility.
Save Changes and Reset	**Enter**	Save all changed settings and let system do reset to boot system.
Discard Changes and Reset	**Enter**	Discard all changed settings and let system do reset to boot system.
Save Changes	**Enter**	Save all changed settings.
Discard Changes	**Enter**	Discard changes done so far to any of the setup options.
Restore Default	**Enter**	Load the default made when BIOS was built.
Save as User Default	**Enter**	Save all changed done so far as User Defaults.
Restore User Default	**Enter**	Load the default that user save as user defaults.
Boot Override	**Info-only**	

7 Appendix A: Determine GPIO Pins on AVA-3510 Gen 1

7.1 Reference Environment

- Platform: AVA-3510 gen1
- Target OS: Ubuntu 20.04.1 LTS (Kernel 5.15.0-126-generic)

7.2 Locate GPIO Controller

1. **List all the gpiochip nodes under "/sys/class/gpio".**
2. **Check the gpiochip system node**

Command:

$ ls -l /sys/class/gpio

$ sudo cat /sys/kernel/debug/gpio

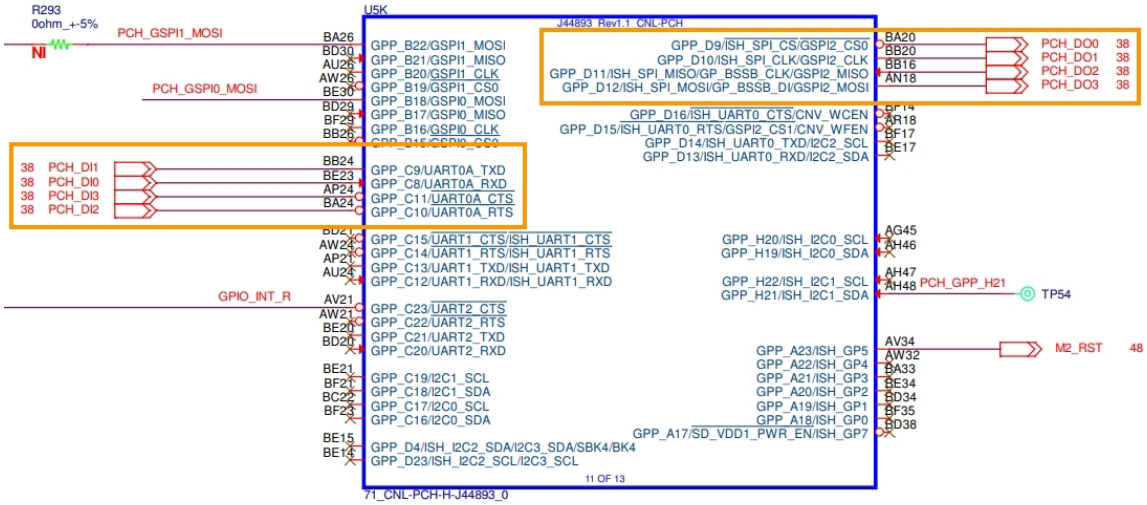
For kernel 5.15, gpiochip0 numbering begins at "660"; that is the GPIO base assigned by the PCH pinctrl driver for this platform.

```
test@test-AVA-3510:~/Desktop$ ls -l /sys/class/gpio/
total 0
--w------- 1 root root 4096 Dec 17 14:08 export
lrwxrwxrwx 1 root root    0 Dec 17 14:09 gpiochip655 -> ../../devices/pci0000:00
/0000:00:14.0/usb1/1-6/1-6:1.1/gpio/gpiochip655
lrwxrwxrwx 1 root root    0 Dec 17 14:09 gpiochip658 -> ../../devices/pci0000:00
/0000:00:14.0/usb1/1-6/1-6:1.0/gpio/gpiochip658
lrwxrwxrwx 1 root root    0 Dec 17 14:08 gpiochip660 -> ../../devices/pci0000:00
/INT3450:00/gpio/gpiochip660
--w------- 1 root root 4096 Dec 17 14:08 unexport
test@test-AVA-3510:~/Desktop$ sudo cat /sys/kernel/debug/gpio
[sudo] password for test:
gpiochip2: GPIOs 655-657, parent: usb/1-6:1.1, cp210x, can sleep:

gpiochip1: GPIOs 658-659, parent: usb/1-6:1.0, cp210x, can sleep:

gpiochip0: GPIOs 660-1023, parent: platform/INT3450:00, INT3450:00:
test@test-AVA-3510:~/Desktop$
```

7.3 Find GPIO Pins

1. Check the GPIO function number in the schematics

There are 4 * DI and 4 * DO pins



2. Check the pinctrl debug system node.

There is a gpiochip device named “INIT3450:00” under the kernel debug system node.

$ sudo ls -l /sys/kernel/debug/pinctrl

```
test@test-AVA-3510:~/Desktop$ sudo ls -l /sys/kernel/debug/pinctrl
[sudo] password for test:
total 0
drwxr-xr-x 2 root root 0 Dec 17 14:08 INT3450:00
-r--r--r-- 1 root root 0 Dec 17 14:08 pinctrl-devices
-r--r--r-- 1 root root 0 Dec 17 14:08 pinctrl-handles
-r--r--r-- 1 root root 0 Dec 17 14:08 pinctrl-maps
```

3. Check the pinctrl debug functions under the gpiochip device node.

$ sudo ls -l /sys/kernel/debug/pinctrl/INT3450\:00/

```
root@test-AVA-3510:/home/test/Desktop# sudo ls -l /sys/kernel/debug/pinctrl/INT3450\:00/
total 0
-r--r--r-- 1 root root 0 十二 17 14:08 gpio-ranges
-r--r--r-- 1 root root 0 十二 17 14:08 pinconf-groups
-r--r--r-- 1 root root 0 十二 17 14:08 pinconf-pins
-r--r--r-- 1 root root 0 十二 17 14:08 pingroups
-r--r--r-- 1 root root 0 十二 17 14:08 pinmux-functions
-r--r--r-- 1 root root 0 十二 17 14:08 pinmux-pins
--w------- 1 root root 0 十二 17 14:08 pinmux-select
-r--r--r-- 1 root root 0 十二 17 14:08 pins
root@test-AVA-3510:/home/test/Desktop#
```

4. Find the “pins function name” under the “pins system node”.

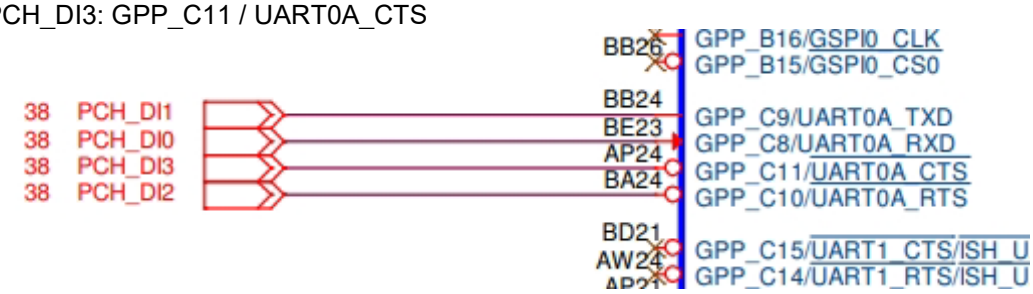
Display function name by pins node

$ sudo cat /sys/kernel/debug/pinctrl/INT34C6\:00/pins

```
pin 52 (SMBDATA) 65:INT3450:00 mode 1 0x44000402 0x00000049 0x00000000
pin 53 (SMBALERTB) 66:INT3450:00 GPIO 0x44000200 0x0000004a 0x00000800 [ACPI]
pin 54 (SML0CLK) 67:INT3450:00 mode 1 0x44000402 0x0000004b 0x00000000
pin 55 (SML0DATA) 68:INT3450:00 mode 1 0x44000402 0x0000004c 0x00000000
pin 56 (SML0ALERTB) 69:INT3450:00 GPIO 0x44000200 0x0000004d 0x00000000 [ACPI]
pin 57 (SML1CLK) 70:INT3450:00 not available
pin 58 (SML1DATA) 71:INT3450:00 not available
pin 59 (UART0_RXD) 72:INT3450:00 GPIO 0x82100102 0x00000050 0x00000000
pin 60 (UART0_TXD) 73:INT3450:00 GPIO 0x82100100 0x00000051 0x00000000
pin 61 (UART0_RTSB) 74:INT3450:00 GPIO 0x82100100 0x00000052 0x00000000
pin 62 (UART0_CTSB) 75:INT3450:00 GPIO 0x82100102 0x00000053 0x00000000
pin 63 (UART1_RXD) 76:INT3450:00 GPIO 0x44000300 0x00000054 0x00000000 [ACPI]
pin 64 (UART1_TXD) 77:INT3450:00 GPIO 0x44000300 0x00000055 0x00000000 [ACPI]
pin 65 (UART1_RTSB) 78:INT3450:00 GPIO 0x44000300 0x00000056 0x00000000 [ACPI]
pin 66 (UART1_CTSB) 79:INT3450:00 GPIO 0x44000300 0x00000057 0x00000000 [ACPI]
pin 67 (I2C0_SDA) 80:INT3450:00 mode 1 0x44000702 0x00000058 0x00000000 [ACPI]
pin 68 (I2C0_SCL) 81:INT3450:00 mode 1 0x44000702 0x00000059 0x00000000 [ACPI]
pin 69 (I2C1_SDA) 82:INT3450:00 mode 1 0x44000702 0x0000005a 0x00000000 [ACPI]
pin 70 (I2C1_SCL) 83:INT3450:00 mode 1 0x44000702 0x0000005b 0x00000000 [ACPI]
pin 71 (UART2_RXD) 84:INT3450:00 GPIO 0x44000300 0x0000005c 0x00000000 [ACPI]
pin 72 (UART2_TXD) 85:INT3450:00 GPIO 0x44000300 0x0000005d 0x00000000 [ACPI]
pin 73 (UART2_RTSB) 86:INT3450:00 GPIO 0x44000300 0x0000005e 0x00000000 [ACPI]
pin 74 (UART2_CTSB) 87:INT3450:00 GPIO 0x44000300 0x0000005f 0x00000000 [ACPI]
pin 75 (SPI1_CSB) 96:INT3450:00 GPIO 0x44000300 0x00000060 0x00000000 [ACPI]
pin 76 (SPI1_CLK) 97:INT3450:00 GPIO 0x44000300 0x00000061 0x00000000 [ACPI]
pin 77 (SPI1_MISO_IO_1) 98:INT3450:00 GPIO 0x44000300 0x00000062 0x00000000 [ACPI]
pin 78 (SPI1_MOSI_IO_0) 99:INT3450:00 GPIO 0x44000300 0x00000063 0x00000000 [ACPI]
pin 79 (ISH_I2C2_SDA) 100:INT3450:00 GPIO 0x44000300 0x00000064 0x00000000 [ACPI]
pin 80 (SSP2_SFRM) 101:INT3450:00 mode 3 0x44000f00 0x00000065 0x00000000 [ACPI]
pin 81 (SSP2_TXD) 102:INT3450:00 mode 3 0x44000f00 0x00000066 0x00000000 [ACPI]
pin 82 (SSP2_RXD) 103:INT3450:00 GPIO 0x44000300 0x00000067 0x00000000 [ACPI]
pin 83 (SSP2_SCLK) 104:INT3450:00 GPIO 0x44000300 0x00000068 0x00000000 [ACPI]
pin 84 (ISH_SPI_CSB) 105:INT3450:00 GPIO 0x44000201 0x00000069 0x00000000
pin 85 (ISH_SPI_CLK) 106:INT3450:00 GPIO 0x44000201 0x0000006a 0x00000000
pin 86 (ISH_SPI_MISO) 107:INT3450:00 GPIO 0x44000201 0x0000006b 0x00000000
pin 87 (ISH_SPI_MOSI) 108:INT3450:00 GPIO 0x44000201 0x0000006c 0x00000000
pin 88 (ISH_UART0_RXD) 109:INT3450:00 GPIO 0x44000300 0x0000006d 0x00000000 [ACPI]
pin 89 (ISH_UART0_TXD) 110:INT3450:00 GPIO 0x44000300 0x0000006e 0x00000000 [ACPI]
pin 90 (ISH_UART0_RTSB) 111:INT3450:00 GPIO 0x44000300 0x0000006f 0x00000000 [ACPI]
pin 91 (ISH_UART0_CTSB) 112:INT3450:00 GPIO 0x44000300 0x00000070 0x00000000 [ACPI]
```

Refer to the schematics, the DI0/DI1/DI2/DI3 pins are:

- PCH_DI0: GPP_C8 / UART0A_RXD
- PCH_DI1: GPP_C9 / UART0A_TXD
- PCH_DI2: GPP_C10 / UART0A_RTS
- PCH_DI3: GPP_C11 / UART0A_CTS



Search the DI pins by function name

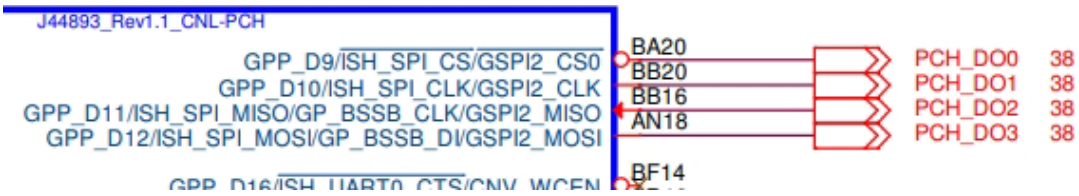
$ sudo cat /sys/kernel/debug/pinctrl/INT34C6\:00/pins | grep -i UART0

```
root@test-AVA-3510:/home/test/Desktop# sudo cat /sys/kernel/debug/pinctrl/INT3450\:00/pins | grep -i UART0
pin 59 (UART0_RXD) 72:INT3450:00 GPIO 0x82100100 0x00000050 0x00000000
pin 60 (UART0_TXD) 73:INT3450:00 GPIO 0x82100100 0x00000051 0x00000000
pin 61 (UART0_RTSB) 74:INT3450:00 GPIO 0x82100100 0x00000052 0x00000000
pin 62 (UART0_CTSB) 75:INT3450:00 GPIO 0x82100100 0x00000053 0x00000000
```

DI0/DI1/DI2/DI3 corresponds to pins 59/60/61/62.

Refer to the schematic, the DO0/DO1/DO2/DO3 pins are:

- PCH_DO0: GPP_D9 / ISH_SPI_CS / GSPI2_CS0
- PCH_DO1: GPP_D10 / ISH_SPI_CLK / GSPI2_CLK
- PCH_DO2: GPP_D11 / ISH_SPI_MISO / GP_BSSB_CLK /GSPI2_MISO
- PCH_DO3: GPP_D12 / ISH_SPI_MOSI / GP_BSSB_DI / GSPI2_MOSI



Search the DO pins by function name

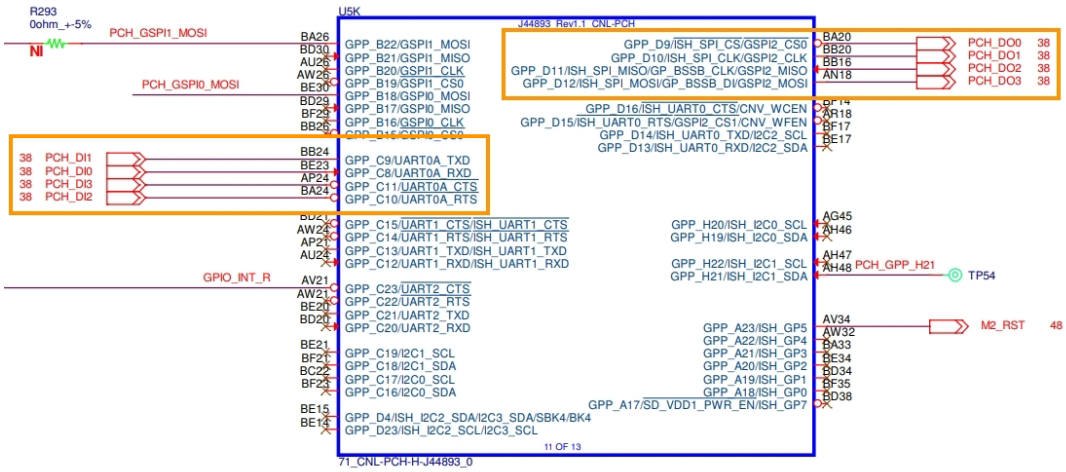
$ sudo cat /sys/kernel/debug/pinctrl/INT34C6\:00/pins | grep -i UART0

```
root@test-AVA-3510:/home/test/Desktop# sudo cat /sys/kernel/debug/pinctrl/INT3450\:00/pins | grep -i ISH_SPI
pin 84 (ISH_SPI_CSB) 105:INT3450:00 GPIO 0x44000201 0x00000069 0x00000000
pin 85 (ISH_SPI_CLK) 106:INT3450:00 GPIO 0x44000201 0x0000006a 0x00000000
pin 86 (ISH_SPI_MISO) 107:INT3450:00 GPIO 0x44000201 0x0000006b 0x00000000
pin 87 (ISH_SPI_MOSI) 108:INT3450:00 GPIO 0x44000201 0x0000006c 0x00000000
```

DO0/DO1/DO2/DO3 corresponds to pins 84/85/86/87.

5. Check the GPIO function number in the schematics.

There are 4 * DI and 4 * DO pins



6. Check the pinctrl debug system node.

There is a gpiochip device named “INIT3450:00” under the kernel debug system node.

$ sudo ls -l /sys/kernel/debug/pinctrl

```
test@test-AVA-3510:~/Desktop$ sudo ls -l /sys/kernel/debug/pinctrl
[sudo] password for test:
total 0
drwxr-xr-x 2 root root 0 Dec 17 14:08 INT3450:00
-r--r--r-- 1 root root 0 Dec 17 14:08 pinctrl-devices
-r--r--r-- 1 root root 0 Dec 17 14:08 pinctrl-handles
-r--r--r-- 1 root root 0 Dec 17 14:08 pinctrl-maps
```

7. Check the pinctrl debug functions under the gpiochip device node

$ sudo ls -l /sys/kernel/debug/pinctrl/INT3450\:00/

```
root@test-AVA-3510:/home/test/Desktop# sudo ls -l /sys/kernel/debug/pinctrl/INT3450\:00/
total 0
-r--r--r-- 1 root root 0 十二 17 14:08 gpio-ranges
-r--r--r-- 1 root root 0 十二 17 14:08 pinconf-groups
-r--r--r-- 1 root root 0 十二 17 14:08 pinconf-pins
-r--r--r-- 1 root root 0 十二 17 14:08 pingroups
-r--r--r-- 1 root root 0 十二 17 14:08 pinmux-functions
-r--r--r-- 1 root root 0 十二 17 14:08 pinmux-pins
--w------- 1 root root 0 十二 17 14:08 pinmux-select
-r--r--r-- 1 root root 0 十二 17 14:08 pins
root@test-AVA-3510:/home/test/Desktop#
```

8. Find the “pins function name” under the “pins system node”

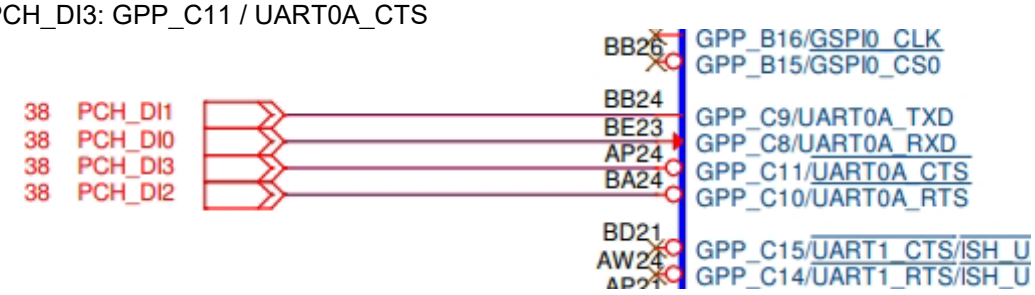
Display the function name by the pins node

$ sudo cat /sys/kernel/debug/pinctrl/INT34C6\:00/pins

```
pin 52 (SMBDATA) 65:INT3450:00 mode 1 0x44000402 0x00000049 0x00000000
pin 53 (SMBALERTB) 66:INT3450:00 GPIO 0x44000200 0x0000004a 0x00000800 [ACPI]
pin 54 (SML0CLK) 67:INT3450:00 mode 1 0x44000402 0x0000004b 0x00000000
pin 55 (SML0DATA) 68:INT3450:00 mode 1 0x44000402 0x0000004c 0x00000000
pin 56 (SML0ALERTB) 69:INT3450:00 GPIO 0x44000200 0x0000004d 0x00000000 [ACPI]
pin 57 (SML1CLK) 70:INT3450:00 not available
pin 58 (SML1DATA) 71:INT3450:00 not available
pin 59 (UART0_RXD) 72:INT3450:00 GPIO 0x82100102 0x00000050 0x00000000
pin 60 (UART0_TXD) 73:INT3450:00 GPIO 0x82100100 0x00000051 0x00000000
pin 61 (UART0_RTSB) 74:INT3450:00 GPIO 0x82100100 0x00000052 0x00000000
pin 62 (UART0_CTSB) 75:INT3450:00 GPIO 0x82100102 0x00000053 0x00000000
pin 63 (UART1_RXD) 76:INT3450:00 GPIO 0x44000300 0x00000054 0x00000000 [ACPI]
pin 64 (UART1_TXD) 77:INT3450:00 GPIO 0x44000300 0x00000055 0x00000000 [ACPI]
pin 65 (UART1_RTSB) 78:INT3450:00 GPIO 0x44000300 0x00000056 0x00000000 [ACPI]
pin 66 (UART1_CTSB) 79:INT3450:00 GPIO 0x44000300 0x00000057 0x00000000 [ACPI]
pin 67 (I2C0_SDA) 80:INT3450:00 mode 1 0x44000702 0x00000058 0x00000000 [ACPI]
pin 68 (I2C0_SCL) 81:INT3450:00 mode 1 0x44000702 0x00000059 0x00000000 [ACPI]
pin 69 (I2C1_SDA) 82:INT3450:00 mode 1 0x44000702 0x0000005a 0x00000000 [ACPI]
pin 70 (I2C1_SCL) 83:INT3450:00 mode 1 0x44000702 0x0000005b 0x00000000 [ACPI]
pin 71 (UART2_RXD) 84:INT3450:00 GPIO 0x44000300 0x0000005c 0x00000000 [ACPI]
pin 72 (UART2_TXD) 85:INT3450:00 GPIO 0x44000300 0x0000005d 0x00000000 [ACPI]
pin 73 (UART2_RTSB) 86:INT3450:00 GPIO 0x44000300 0x0000005e 0x00000000 [ACPI]
pin 74 (UART2_CTSB) 87:INT3450:00 GPIO 0x44000300 0x0000005f 0x00000000 [ACPI]
pin 75 (SPI1_CSB) 96:INT3450:00 GPIO 0x44000300 0x00000060 0x00000000 [ACPI]
pin 76 (SPI1_CLK) 97:INT3450:00 GPIO 0x44000300 0x00000061 0x00000000 [ACPI]
pin 77 (SPI1_MISO_IO_1) 98:INT3450:00 GPIO 0x44000300 0x00000062 0x00000000 [ACPI]
pin 78 (SPI1_MOSI_IO_0) 99:INT3450:00 GPIO 0x44000300 0x00000063 0x00000000 [ACPI]
pin 79 (ISH_I2C2_SDA) 100:INT3450:00 GPIO 0x44000300 0x00000064 0x00000000 [ACPI]
pin 80 (SSP2_SFRM) 101:INT3450:00 mode 3 0x44000f00 0x00000065 0x00000000 [ACPI]
pin 81 (SSP2_TXD) 102:INT3450:00 mode 3 0x44000f00 0x00000066 0x00000000 [ACPI]
pin 82 (SSP2_RXD) 103:INT3450:00 GPIO 0x44000300 0x00000067 0x00000000 [ACPI]
pin 83 (SSP2_SCLK) 104:INT3450:00 GPIO 0x44000300 0x00000068 0x00000000 [ACPI]
pin 84 (ISH_SPI_CSB) 105:INT3450:00 GPIO 0x44000201 0x00000069 0x00000000
pin 85 (ISH_SPI_CLK) 106:INT3450:00 GPIO 0x44000201 0x0000006a 0x00000000
pin 86 (ISH_SPI_MISO) 107:INT3450:00 GPIO 0x44000201 0x0000006b 0x00000000
pin 87 (ISH_SPI_MOSI) 108:INT3450:00 GPIO 0x44000201 0x0000006c 0x00000000
pin 88 (ISH_UART0_RXD) 109:INT3450:00 GPIO 0x44000300 0x0000006d 0x00000000 [ACPI]
pin 89 (ISH_UART0_TXD) 110:INT3450:00 GPIO 0x44000300 0x0000006e 0x00000000 [ACPI]
pin 90 (ISH_UART0_RTSB) 111:INT3450:00 GPIO 0x44000300 0x0000006f 0x00000000 [ACPI]
pin 91 (ISH_UART0_CTSB) 112:INT3450:00 GPIO 0x44000300 0x00000070 0x00000000 [ACPI]
```

Refer to the schematics, the DI0/DI1/DI2/DI3 pins are:

- PCH_DI0: GPP_C8 / UART0A_RXD
- PCH_DI1: GPP_C9 / UART0A_TXD
- PCH_DI2: GPP_C10 / UART0A_RTS
- PCH_DI3: GPP_C11 / UART0A_CTS



Search the DI pins by function name

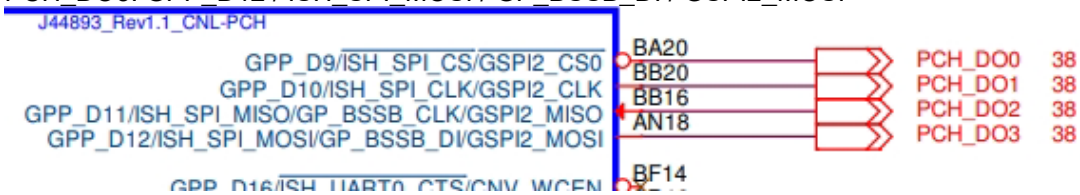
$ sudo cat /sys/kernel/debug/pinctrl/INT34C6\:00/pins | grep -i UART0

```
root@test-AVA-3510:/home/test/Desktop# sudo cat /sys/kernel/debug/pinctrl/INT3450\:00/pins | grep -i UART0
pin 59 (UART0_RXD) 72:INT3450:00 GPIO 0x82100100 0x00000050 0x00000000
pin 60 (UART0_TXD) 73:INT3450:00 GPIO 0x82100100 0x00000051 0x00000000
pin 61 (UART0_RTSB) 74:INT3450:00 GPIO 0x82100100 0x00000052 0x00000000
pin 62 (UART0_CTSB) 75:INT3450:00 GPIO 0x82100100 0x00000053 0x00000000
```

DI0/DI1/DI2/DI3 corresponds to pins 59/60/61/62.

Refer to the schematic, the DO0/DO1/DO2/DO3 pins are:

- PCH_DO0: GPP_D9 / ISH_SPI_CS / GSPI2_CS0
- PCH_DO1: GPP_D10 / ISH_SPI_CLK / GSPI2_CLK
- PCH_DO2: GPP_D11 / ISH_SPI_MISO / GP_BSSB_CLK /GSPI2_MISO
- PCH_DO3: GPP_D12 / ISH_SPI_MOSI / GP_BSSB_DI / GSPI2_MOSI



Search the DO pins by function name

$ sudo cat /sys/kernel/debug/pinctrl/INT34C6\:00/pins | grep -i UART0

```
root@test-AVA-3510:/home/test/Desktop# sudo cat /sys/kernel/debug/pinctrl/INT3450\:00/pins | grep -i ISH_SPI
pin 84 (ISH_SPI_CSB) 105:INT3450:00 GPIO 0x44000201 0x00000069 0x00000000
pin 85 (ISH_SPI_CLK) 106:INT3450:00 GPIO 0x44000201 0x0000006a 0x00000000
pin 86 (ISH_SPI_MISO) 107:INT3450:00 GPIO 0x44000201 0x0000006b 0x00000000
pin 87 (ISH_SPI_MOSI) 108:INT3450:00 GPIO 0x44000201 0x0000006c 0x00000000
```

DO0/DO1/DO2/DO3 corresponds to pins 84/85/86/87.

9. Find the Pins' function group under gpio-ranges system node

Pins 97 & 98 in PINS group [79 - 104], GPIOS number range is [689 – 714]

$ sudo cat /sys/kernel/debug/pinctrl/INT3450\:00/gpio-ranges

```
root@test-AVA-3510:/home/test/Desktop# sudo cat /sys/kernel/debug/pinctrl/INT3450\:00/gpio-ranges
GPIO ranges handled:
0: INT3450:00 GPIOS [660 - 684] PINS [0 - 24]
32: INT3450:00 GPIOS [692 - 717] PINS [25 - 50]
64: INT3450:00 GPIOS [724 - 747] PINS [51 - 74]
96: INT3450:00 GPIOS [756 - 779] PINS [75 - 98]
128: INT3450:00 GPIOS [788 - 795] PINS [99 - 106]
160: INT3450:00 GPIOS [820 - 851] PINS [115 - 146]
192: INT3450:00 GPIOS [852 - 875] PINS [155 - 178]
224: INT3450:00 GPIOS [884 - 907] PINS [179 - 202]
256: INT3450:00 GPIOS [916 - 928] PINS [203 - 215]
288: INT3450:00 GPIOS [948 - 971] PINS [216 - 239]
320: INT3450:00 GPIOS [980 - 997] PINS [269 - 286]
352: INT3450:00 GPIOS [1012 - 1023] PINS [287 - 298]
root@test-AVA-3510:/home/test/Desktop#
```

The DI pins 59/60/61/62 in PINS group [51 - 74], GPIOs range [724 – 747]

The DO pins 84/85/86/87 in PINS group [75 - 98], GPIOs range [756 – 779]

Calculate DI pins using GPIO number: 732/733/734/735 on this Linux kernel

DI0 = pin59 = gpio732 (59 – 51 + 724 = 732)

DI1 = pin60 = gpio733 (60 – 51 + 724 = 733)

DI2 = pin61 = gpio734 (61 – 51 + 724 = 734)

DI3 = pin62 = gpio735 (62 – 51 + 724 = 735)

Calculate DO pins using GPIO number: 765/766/767/768 on this Linux kernel

DO0 = pin84 = gpio765 (84 – 75 + 756 = 765)

DO1 = pin85 = gpio766 (85 – 51 + 756 = 766)

DO2 = pin86 = gpio767 (86 – 51 + 756 = 767)

DO3 = pin87 = gpio768 (87 – 51 + 756 = 768)

7.4 Test the GPIO Function

DIO control from PCH GPIO: Pin is gpio 732~735 and gpio 765~768 are used for this platform.

1. Add the corresponding GPIO number to the system node. The DIO is controlled by PCH GPIO

$ sudo echo 732 > /sys/class/gpio/export

$ sudo echo 733 > /sys/class/gpio/export

$ sudo echo 734 > /sys/class/gpio/export

$ sudo echo 735 > /sys/class/gpio/export

$ sudo echo 765 > /sys/class/gpio/export

$ sudo echo 766 > /sys/class/gpio/export

$ sudo echo 767 > /sys/class/gpio/export

$ sudo echo 768 > /sys/class/gpio/export

2. The DI direction is the input, the DO direction is the output

$ sudo echo in > /sys/class/gpio/gpio732/direction

$ sudo echo in > /sys/class/gpio/gpio733/direction

$ sudo echo in > /sys/class/gpio/gpio734/direction

$ sudo echo in > /sys/class/gpio/gpio735/direction

$ sudo echo out > /sys/class/gpio/gpio765/direction

$ sudo echo out > /sys/class/gpio/gpio766/direction

$ sudo echo out > /sys/class/gpio/gpio767/direction

$ sudo echo out > /sys/class/gpio/gpio768/direction

3. Check the DIO gpio state.

$ cat /sys/kernel/debug/gpio

```
test@test-AVA-3510:~/AVA-3510/utility/DIO_Test$ sudo cat /sys/kernel/debug/gpio
gpiochip2: GPIOs 655-657, parent: usb/1-6:1.1, cp210x, can sleep:

gpiochip1: GPIOs 658-659, parent: usb/1-6:1.0, cp210x, can sleep:

gpiochip0: GPIOs 660-1023, parent: platform/INT3450:00, INT3450:00:
 gpio-732 (                    |sysfs               ) in  lo
 gpio-733 (                    |sysfs               ) in  lo
 gpio-734 (                    |sysfs               ) in  lo
 gpio-735 (                    |sysfs               ) in  lo
 gpio-765 (                    |sysfs               ) out lo
 gpio-766 (                    |sysfs               ) out lo
 gpio-767 (                    |sysfs               ) out lo
 gpio-768 (                    |sysfs               ) out lo
```

4. Get DI GPIO value.

$ sudo cat /sys/class/gpio/gpio732/value

$ sudo cat /sys/class/gpio/gpio733/value

$ sudo cat /sys/class/gpio/gpio734/value

$ sudo cat /sys/class/gpio/gpio735/value

5. Set the DO GPIO value "1" to output high.

$ sudo echo 1 > /sys/class/gpio/gpio765/value

$ sudo echo 1 > /sys/class/gpio/gpio766/value

$ sudo echo 1 > /sys/class/gpio/gpio767/value

$ sudo echo 1 > /sys/class/gpio/gpio768/value

6. Set the DO GPIO value "0" to output low.

$ sudo echo 0 > /sys/class/gpio/gpio765/value

$ sudo echo 0 > /sys/class/gpio/gpio766/value

$ sudo echo 0 > /sys/class/gpio/gpio767/value

$ sudo echo 0 > /sys/class/gpio/gpio768/value

7. Remove the DIO GPIO used, unregister the corresponding GPIO number to the system node.

$ sudo echo 732 > /sys/class/gpio/unexport

$ sudo echo 733 > /sys/class/gpio/unexport

$ sudo echo 734 > /sys/class/gpio/unexport

$ sudo echo 735 > /sys/class/gpio/unexport

$ sudo echo 765 > /sys/class/gpio/unexport

$ sudo echo 766 > /sys/class/gpio/unexport

$ sudo echo 767 > /sys/class/gpio/unexport

$ sudo echo 768 > /sys/class/gpio/unexport

Safety Instructions

Read and follow all instructions marked on the product and in the documentation before you operate your system. Retain all safety and operating instructions for future use.

- Please read these safety instructions carefully.
- Please keep this User‘s Manual for later reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment, turn off the power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources.
  - Keep equipment away from high heat or high humidity.
  - Keep equipment properly ventilated (do not block or cover ventilation openings).
  - Make sure to use recommended voltage and power source settings.
  - Secure the power cord (do not place any object on/over the power cord).
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings.
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.
- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

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