AVerAI Carrier Board and Box PC

EN713-AAE9/ EN713/ NX213B

Designed for NVIDIA® Jetson Nano/ Xavier NX Module

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Preface

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Revision History

Revision	Date	Updates
1.00	02/24/2021	Initial release.

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ESD Warning

Electronic components and circuits are sensitive to Electrostatic Discharge (ESD). When handling any circuit board assemblies including AVerMedia AVerAI products, it is highly recommended that ESD safety precautions can be observed. ESD safe best practices can include, but are not limited to the following ones.

1. Leave the circuit board in the antistatic package until it is ready to be installed.
2. Use a grounded wrist strap when handling the circuit board. At a minimum, you need to touch a grounded metal object to dissipate any static charge, which may be present on you.
3. Avoid handling the circuit board in the carpeted areas.
4. Handle the board by the edges and avoid the contact with the components.
5. Only handle the circuit boards in ESD safe areas, which may include ESD floor and/or table mats, wrist strap stations, and ESD safe lab coats.

1.0 Introduction

AVerMedia AVerAI EN713-AAE9 is a fully featured carrier board developed for NVIDIA® Jetson Nano/ Xavier NX module (EN713/NX213B). It is specifically designed to have eight 10/100Mb Ethernet ports with PoE (PSE, Power Sourcing Equipment) support.

Operating with NVIDIA® Jetson Nano/ Xavier NX module, EN713-AAE9/EN713/NX213B can process eight channels of 1080p30 video stream, which makes it the perfect choice in building the high performance AI edge computing platform for the intelligent video analytics applications.

EN713-AAE9/ EN713/ NX213B have compact size, which can fit in the compact platform for the commercial and industrial application. And it can operate in the temperature range from -10°C up to 70°C. AVerAI EN713-AAE9/ EN713/ NX213B provides not only the access to a great list of latest interfaces on Nano/ Xavier NX module but also 1x RS-485 interface, 1x micro controller unit (MCU), and 1x RTC battery as the function enrichment.

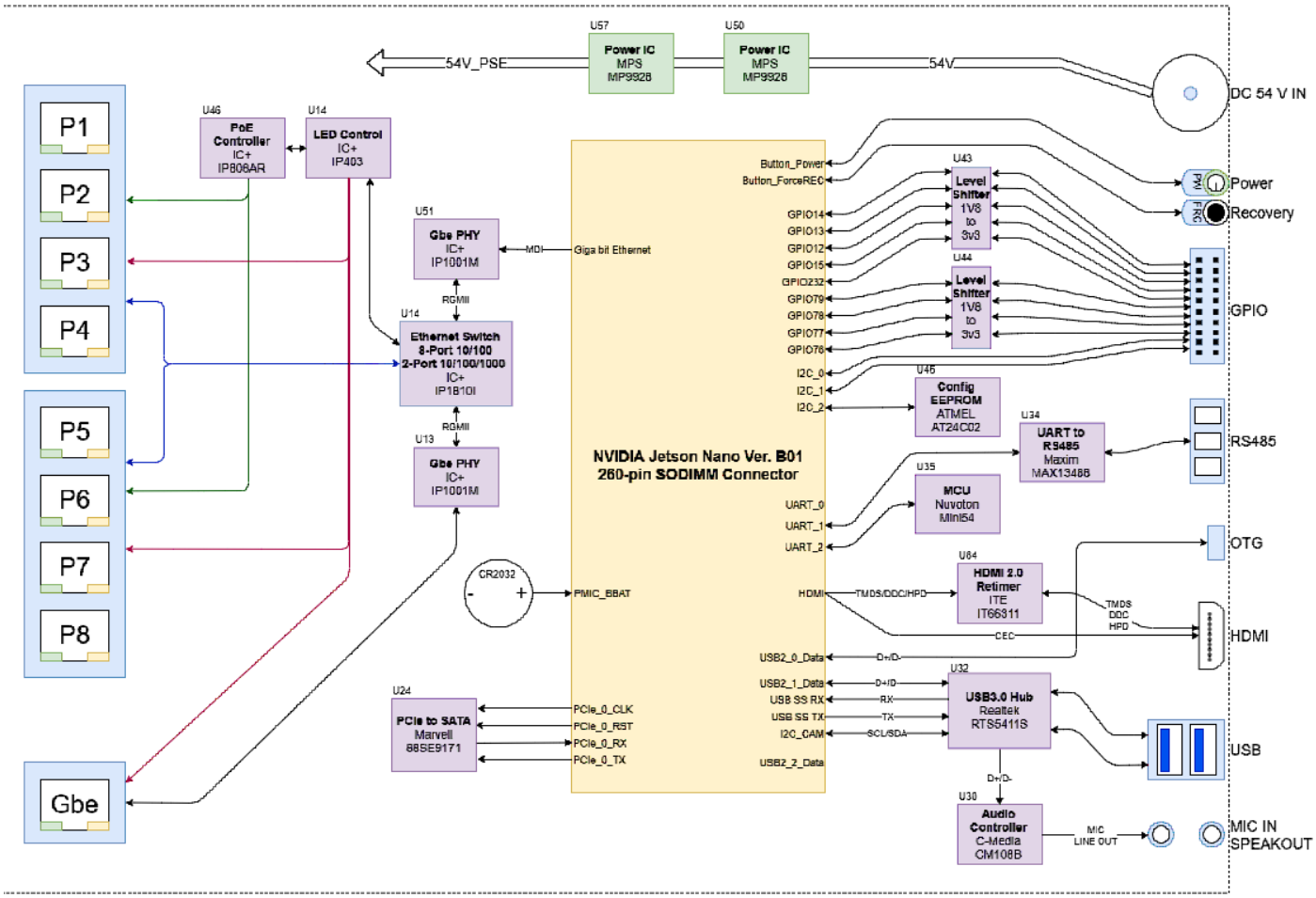
1.1 Product Specifications

Product Name	Fanless/Fan/Carrier Board	Fanless Box PC EN713/ NX213B	Carrier Board EN713-AAE9
Core	System on Module (SoM)	Equips NVIDIA® Jetson Nano™/ Xavier NX module	Fully support NVIDIA® Jetson Nano™/ Xavier NX module
Front I/O	HDMI 2.0 Output	1x HDMI 2.0a/b Type-A supports maximum resolution 3840x2160 at 60Hz	
	USB 2.0	1x USB 2.0 Micro-B for recovery	
	USB 3.0	2x USB 3.0 Type-A	
	10/100/1000 BASE-T Ethernet	1x GbE RJ-45	
		8 ports PoE (8x 10/100 MbE RJ-45 PSE, Power Sourcing Equipment, IEEE 802.3 AT/AF with power budget)	
	SATA Rev. 3.0	1x	
	Audio	1x Mic-in, 1x Speaker-out	

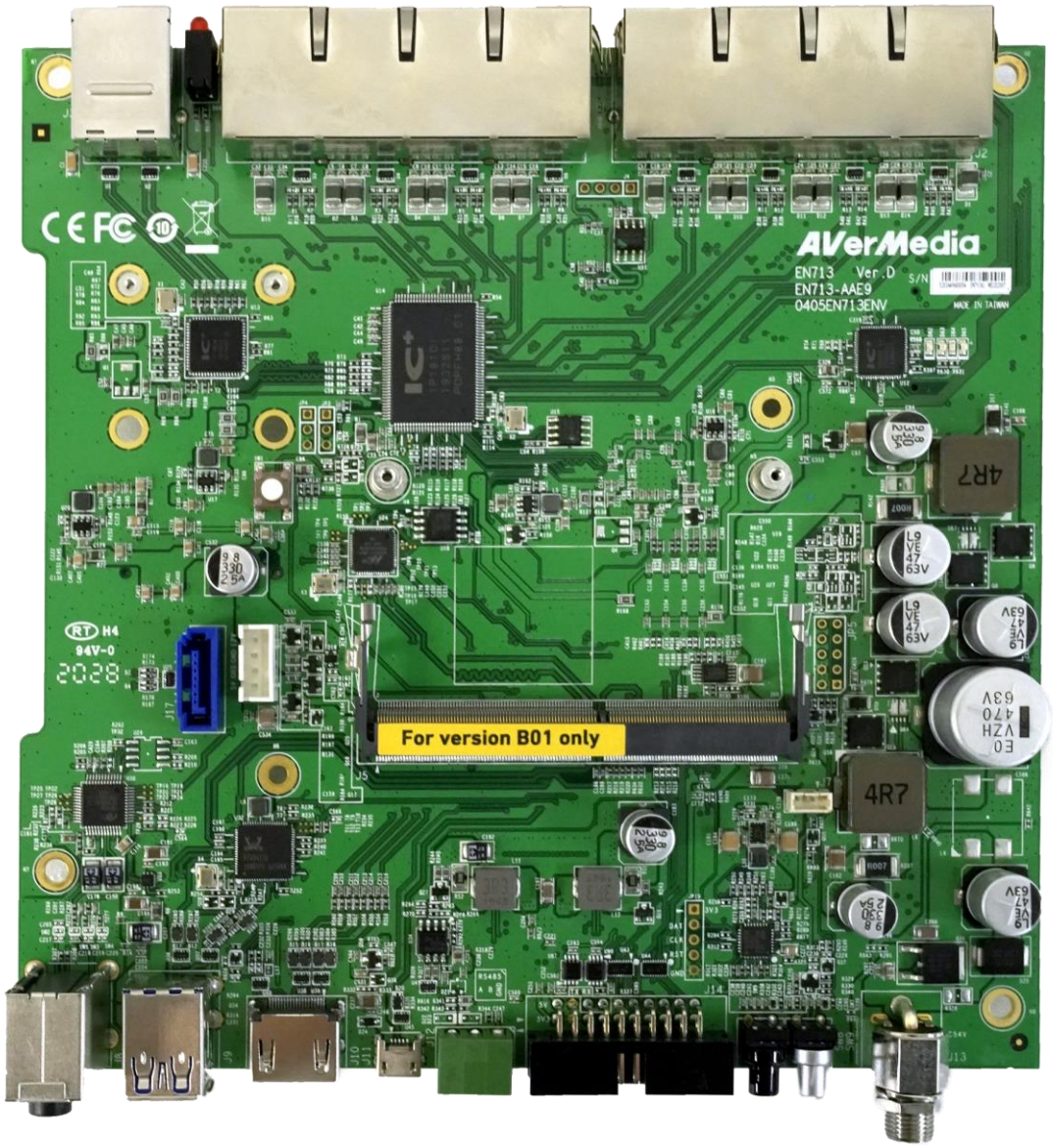
	RS-485	1x RS-485 Euroblock (3 pins)		
	Expansion Header	20 pin with 1x 3.3V UART2, 1x SPI, 1x I2S, 2x I2C		
	Power Button	1x with a Green color LED		
	Recovery Button	X 1		
Internal PCIe Sockets	Mini-PCIe	Alternative option: 1x Mini-PCIe slot , Only support USB 2.0 (for Wi-Fi/BT card, reserved)		
Power	Power Input	54V/2.78A for PoE (PSE, IEEE 802.3 AT/AF with power budget)		
Environment	Operating Temperature	-10°C ~ 65°C fanless chassis with AVerCooler™ Wave-Fin	-10°C ~ 65°C Fanless chassis	-10°C ~ 70°C
	Storage Temperature	-20°C ~ 85°C		
	Relative Humidity	40 °C @ 95%, Non-Condensing		
Physical Characteristics	Chassis Dimension	W:212mm x L:196mm x H:60mm (W:226 mm with mounting ears)	W:190mm x L:175mm x H:80mm (W:225mm with mounting ears)	W:170mm x L:170mm x H:4.5mm
	Weight	1.25 Kg	4 Kg	269g
	Thermal Solution	With fanless chassis	With fanless chassis	(Optional) with fan module
	Mounting	Desk/Wall/Din Rail	Desk/Wall/Din Rail	N/A
Regulation	EMC/Safety	CE/FCC Class B, KC		

2.0 Product Overview

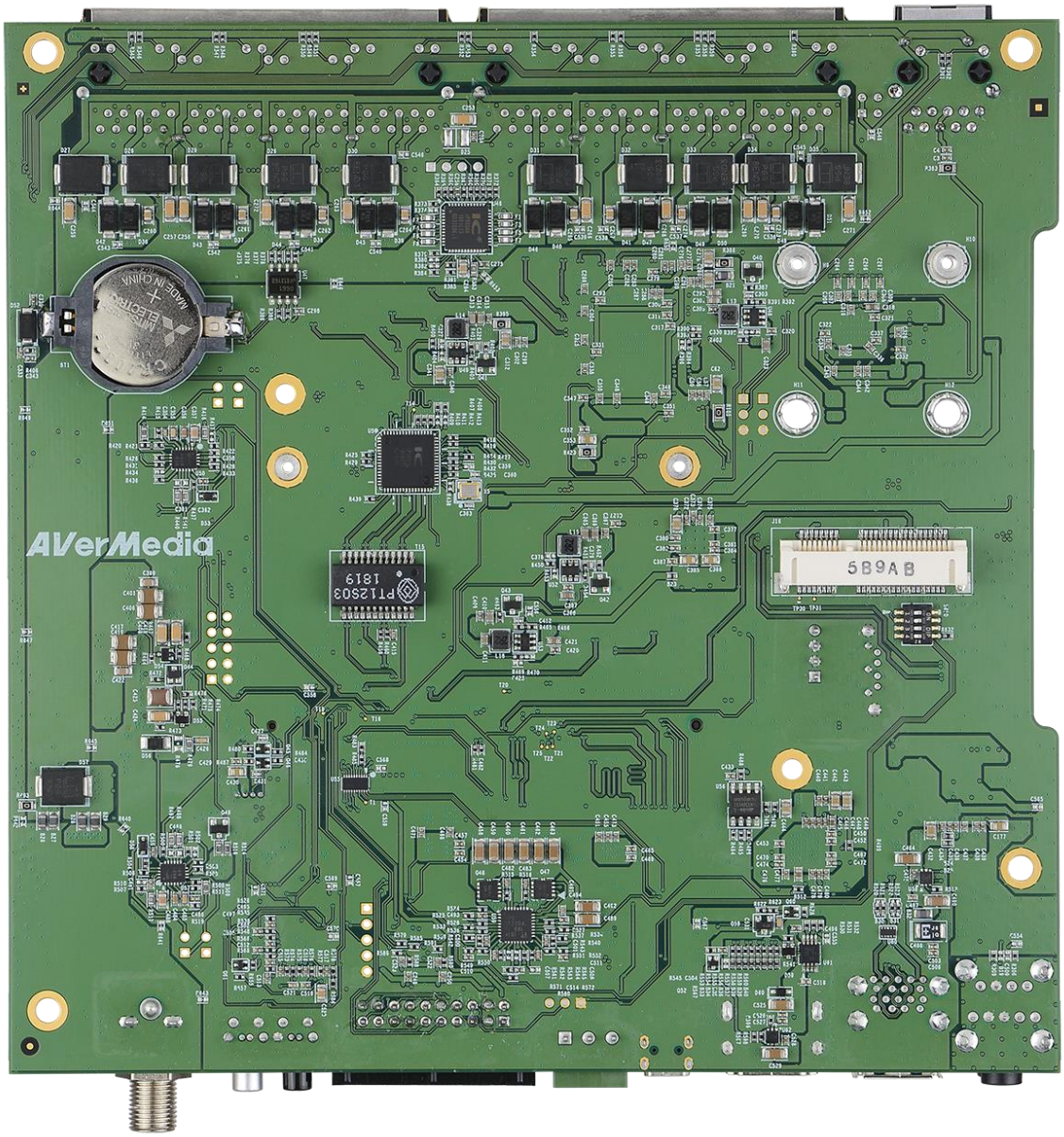
2.1 Block Diagram



2.2 Top View of Carrier Board



Bottom View of Carrier Board



2.3 Connector Summary

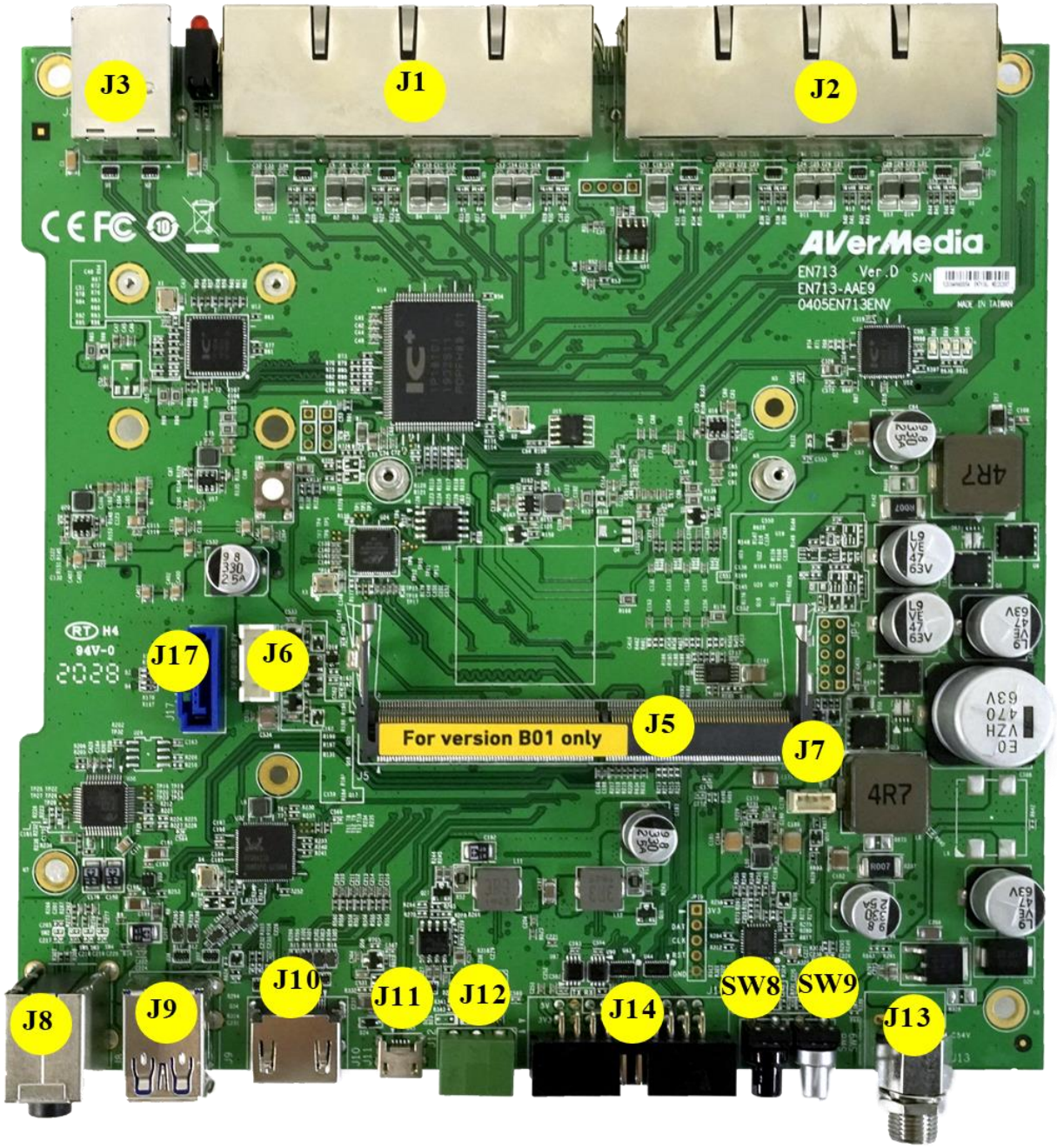
Designation	Description
J1	RJ45 10/100Mb 4-port Ethernet connector with POE support
J2	RJ45 10/100Mb 4-port Ethernet connector with POE support
J3	RJ45 1Gb single-port Ethernet connector
J5	260-pin SODIMM connector for NVIDIA® Jetson Nano/ Xavier NX module
J6	SATA power wafer
J7	Fan wafer
J8	Mic and speaker connector
J9	USB 3.1 Gen 1 2-port connector with 900mA x2
J10	HDMI video output connector
J11	USB/OTG micro-type connector
J12	RS-485 connector
J13	54VDC power Jack
J14	20-pin header UART console for debug, I2C, GPIO
J16	Mini card for USB only
J17	SATA connector
BT1	RTC battery connector

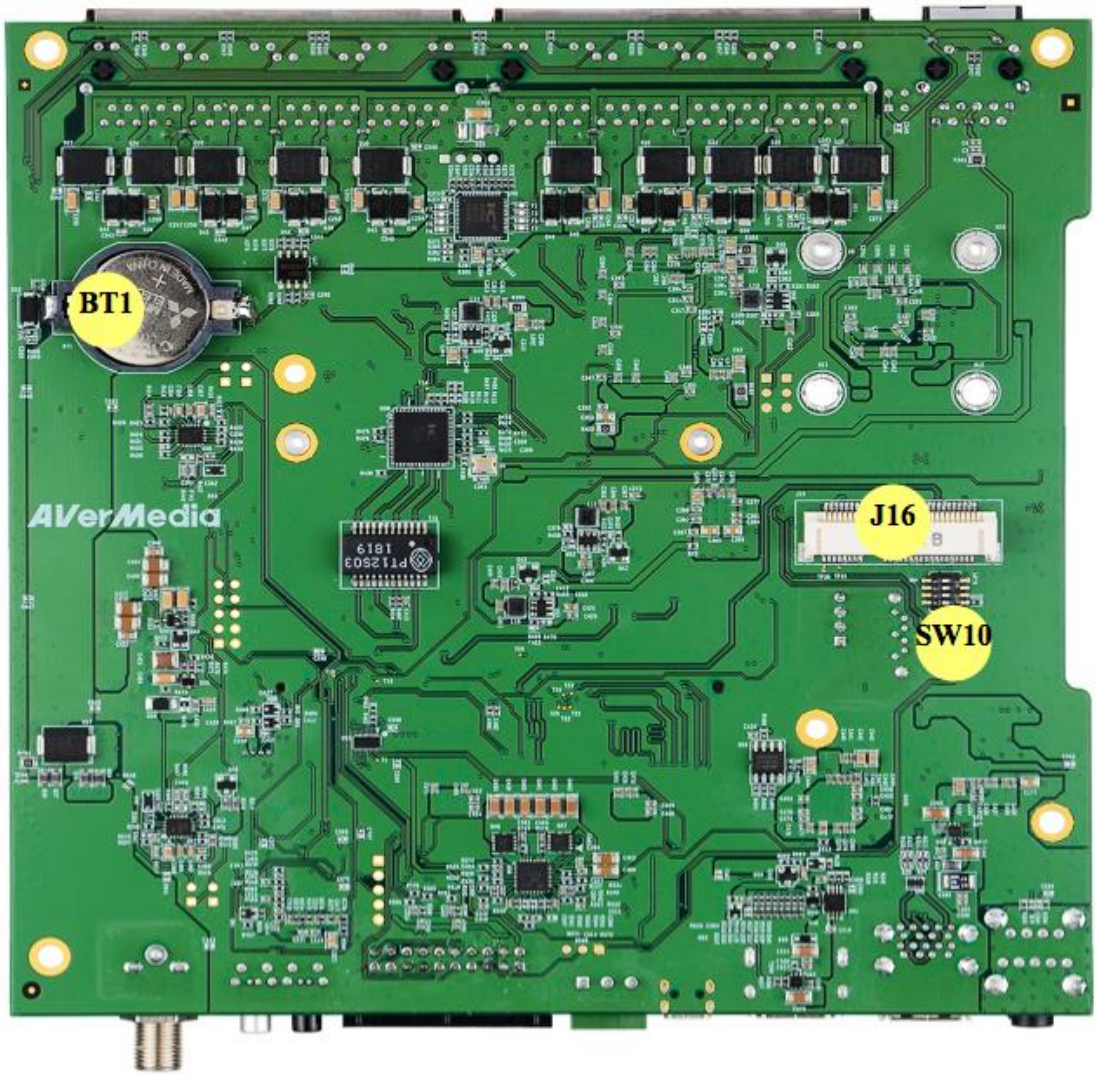
2.4 Switch Summary

Designation	Description
SW8	Force recovery button
SW9	Power on button
SW10	4-pin DIP switch with four sets of setting as defined in Section 3.20.

3.0 Feature Description

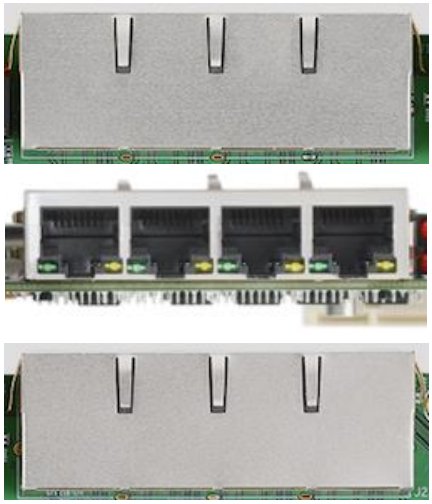
3.1 Connector and Switch Locations





3.2 10/100Mb 4-port Ethernet Connectors

Function	10/100Mb 4-port Ethernet connectors, used to connect IP cameras and/or the network switches.
Location	J1 and J2
Type Description	RJ45*4 with integrated magnetics for PoE application
Manufacturer and Part Number	CHAMPWAY, CWJ46614AENL
Mating Connector	Any standard 10/100Mb Ethernet mating connector can be applicable.
Pinout	Comply with Ethernet standards.

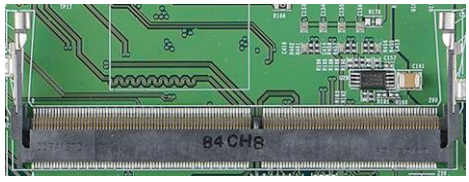


		
Remarks	POE support is enabled on J1 and J2.	

3.3 1Gb single-port Ethernet Connector

Function	1Gb single-port Ethernet connector, used to connect to the host system.	
Location	J3	
Type Description	RJ45 with integrated magnetics	
Manufacturer and Part Number	FOXCONN, JFM38013-0L03-4F-BX3	
Mating Connector	Any standard 1Gb Ethernet mating connector can be applicable.	
Pinout	Comply with Ethernet standards.	
Remarks	None	

3.4 260-Pin SODIMM Connector

Function	Used to mount with and connect to NVIDIA® Jetson Nano/ Xavier NX module.	
Location	J5	
Type Description	260-pin SODIMM connector	
Manufacturer and Part Number	FOXCONN, ASAA826-EASB0-7H	
Mating Connector	DDR4 SO-DIMM 260PIN 9.2mmH STANDARD	
Pinout	Please refer to NVIDIA Jetson Nano System-on-Module datasheet for the pinout details.	
Remarks	None	

3.5 SATA Power Wafer and SATA Connector

<table>
<tr><td>Function</td><td>2.5” hard drive/SSD
3.5” surveillance hard drive/SSD</td><td rowspan="6">  </td></tr>
<tr><td>Location</td><td>J6 (on the left) and J17 (on the right)</td></tr>
<tr><td>Type Description</td><td>SATA HD power (on the left) and signal (on the right) connector</td></tr>
<tr><td>Manufacturer and Part Number</td><td>J6:
PINREX, 753-81-04TW00
J17:
FOXCONN, LE18077-Z54B-4H</td></tr>
<tr><td>Mating Connector</td><td>4-pin wafer and SATA 3.0 connector</td></tr>
<tr><td>Pinout</td><td>J6:<table><tr><th>Pin Number</th><th>Description</th></tr><tr><td>1</td><td>5V Power</td></tr><tr><td>2</td><td>GND</td></tr><tr><td>3</td><td>GND</td></tr><tr><td>4</td><td>12V Power</td></tr></table>J17: Please refer to SATA 3.0 standard</td></tr>
<tr><td>Remarks</td><td colspan="2">None</td></tr>
</table>

3.6 Fan Wafer

<table>
<tr><td>Function</td><td>Fan power and control wafer</td><td rowspan="6">  </td></tr>
<tr><td>Location</td><td>J7</td></tr>
<tr><td>Type Description</td><td>1*4 pin wafer with 1.25 mm pitch</td></tr>
<tr><td>Manufacturer and Part Number</td><td>Joint Tech,
A1250WV-04PNLNT1N00B</td></tr>
<tr><td>Mating Connector</td><td>(Combination with PINREX’s housing)</td></tr>
<tr><td>Pinout</td><td><table><tr><th>Pin Number</th><th>Description</th></tr><tr><td>1</td><td>GND</td></tr><tr><td>2</td><td>5V Power</td></tr><tr><td>3</td><td>TACH from fan to module</td></tr><tr><td>4</td><td>PWM from module to fan</td></tr></table></td></tr>
<tr><td>Remarks</td><td colspan="2">None</td></tr>
</table>

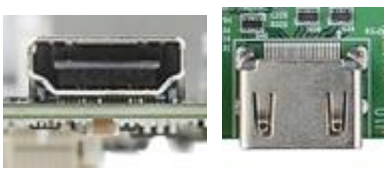
3.7 Mic and Speaker Connector

Function	Mic and speaker jack	
Location	J8	
Type Description	3.5 mm miniature jack	
Manufacturer and Part Number	JKCR, PJD-035-87HAB	
Mating Connector	2 or 3 conductors type plug	
Pinout	Mic input (on the top) and speaker output (on the bottom)	
Remarks	None	

3.8 USB 3.1 Gen 1 2-Port Connector

Function	USB 3.1 Gen 1 device connector	
Location	J9	
Type Description	2-port USB Type-A female connector	
Manufacturer and Part Number	CHAMPWAY, CU3B-AFR15U-096H	
Mating Connector	Any USB standard Type-A interface cable or device.	
Pinout	Please refer to USB 3.1 Gen 1 standard.	
Remarks	Support 900mA x2	

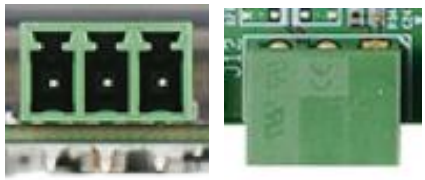
3.9 HDMI Video Output Connector

Function	HDMI Type-A TX connector	
Location	J10	
Type Description	HDMI Type-A female connector	
Manufacturer and Part Number	Compupack, ACNHM220028-001	
Mating Connector	Any HDMI standard Type-A interface cable or device.	
Pinout	Please refer to HDMI standard.	
Remarks	None	

3.10 USB/OTG Micro-Type Connector

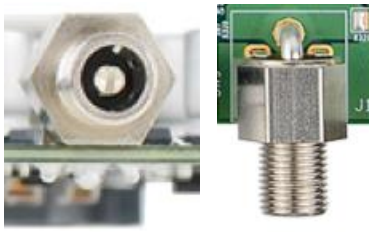
Function	OTG programming recovery	
Location	J11	
Type Description	USB Micro-type female connector	
Manufacturer and Part Number	Fullglory, FG-MCB-111440	
Mating Connector	Any USB standard Micro-type interface cable or device.	
Pinout	Please refer to USB Micro-type standard.	
Remarks	None	

3.11 RS-485 Connector

Function	RS485 interface from Jetson Nano module UART control	
Location	J12	
Type Description	3-pin terminal block	
Manufacturer and Part Number	DECA, ME030-38103T	
Mating Connector	Combination with the plug terminal block from DECA	
Pinout	Pin Number / Description: 1 – GND; 2 – B; 3 – A	
Remarks		

3.12 54VDC Power Jack

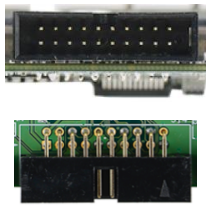
Function	54V DC power input
Location	J13
Type Description	2.5 mm power jack
Manufacturer and Part Number	JKCR, DCD-020-105B
Mating Connector	Any 2.5mm power plug cable
Pinout	Pin Number / Description 3 / GND 1 / 54V Power 2 / GND
Remarks	None



3.13 20-Pin Header

Function	UART console for debug, I2C, GPIO
Location	J14
Type Description	2.54 mm pitch 2*10 header
Manufacturer and Part Number	COXOC, 302AE20PGAR003
Mating Connector	Any 2.5mm pitch DuPont wire
Pinout	EN713

Address	Pin Name	20-Pin Index		Pin Name	Address
	+3V3	1	2	+5V	
	GND	3	4	GND	
/dev/i2c-1	I2C1_SDA	5	6	UART2_TXD_3V3	Debug Console
	I2C1_SCL	7	8	UART2_RXD_3V3	/dev/ttyS0
/dev/i2c-0	I2C0_SDA	9	10	GND	
	I2C0_SCL	11	12	SPI1_SCK	gpio14
gpio79	I2S0_SCLK	13	14	SPI1_MISO	gpio13
gpio78	I2S0_DOUT	15	16	SPI1_MOSI	gpio12
gpio77	I2S0_DIN	17	18	SPI1_CS0	gpio15
gpio76	I2S0_FS	19	20	SPI1_CS1	gpio232



NX213B

Address	Pin Name	20-pin index		Pin Name	Address
	+3V3	1	2	+5V	
	GND	3	4	GND	
/dev/i2c-8	I2C1_SDA	5	6	UART2_TXD	/dev/ttyTCU0 Debug Console
	I2C1_SCL	7	8	UART2_RXD	
/dev/i2c-1	I2C0_SDA	9	10	GND	
	I2C0_SCL	11	12	SPI1_SCK	gpio480 Bidirection
gpio445 Bidirection	I2S0_SCLK	13	14	SPI1_MISO	gpio481 Bidirection
gpio446 Bidirection	I2S0_DOUT	15	16	SPI1_MOSI	gpio482 Bidirection
gpio447 Bidirection	I2S0_DIN	17	18	SPI1_CS0	gpio483 Bidirection
gpio448 Bidirection	I2S0_FS	19	20	SPI1_CS1	gpio484 Bidirection

Remarks	GPIO uses 3.3V

3.14 Mini Card Connector

Function	LTE or Wi-Fi Module
Location	J16
Type Description	Mini-Card for USB
Manufacturer and Part Number	FOXCONN, AS0B221-S68Q-7H
Mating Connector	Any Mini-Card standard interface device.
Pinout	Please refer to Mini-Card standard for the pinout details.
Remarks	Support USB 2.0 only, not PCIe

3.15 RTC Battery Connector

Function	RTC battery for module
Location	BT1

<table>
<tr><td>Type Description</td><td>RTC holder and RTC battery</td><td rowspan="4"></td></tr>
<tr><td>Manufacturer and Part Number</td><td>Holder:
LOTES, AAA-BAT-054-P06
RTC Battery:
MITSUBISHI, CR2032 3V</td></tr>
<tr><td>Mating Connector</td><td>Any CR2032 3V battery</td></tr>
<tr><td>Pinout</td><td><table><tr><th>Pin Number</th><th>Description</th></tr><tr><td>1</td><td>3V Power</td></tr><tr><td>2</td><td>GND</td></tr></table></td></tr>
<tr><td>Remarks</td><td colspan="2">Please be reminded to pay the proper attention on the polarity of this 3V battery, when it is being replaced. The correct placement is to keep the “+” mark on the battery outward, as shown in the above photo.</td></tr>
</table>

3.16 Force Recovery Button

Function	Force recovery	
Location	SW8	
Type Description	Button	
Manufacturer and Part Number	N/A	
Mating Connector	N/A	
Pinout	N/A	
Remarks	None	

3.17 Power on Button

Function	Power control button	
Location	SW9	
Type Description	Button with Green LED	
Manufacturer and Part Number	N/A	
Mating Connector	N/A	
Pinout	N/A	
Remarks	The green light on LED is activated when the board is powered on.	

3.18 4-Pin DIP Switch

<table>
<tr><td>Function</td><td>Optional function selection</td><td rowspan="6">  </td></tr>
<tr><td>Location</td><td>SW10</td></tr>
<tr><td>Type Description</td><td>4 SPST DIP switch</td></tr>
<tr><td>Manufacturer and Part Number</td><td>N/A</td></tr>
<tr><td>Mating Connector</td><td>N/A</td></tr>
<tr><td>Pinout</td><td>Please refer to the following table.</td></tr>
<tr><td>Remarks</td><td colspan="2">
<table>
<tr><th>SW10</th><th>Default (OFF)</th><th>ON</th></tr>
<tr><td>S1</td><td>Fan PWM controller</td><td>Fan always on</td></tr>
<tr><td>S2</td><td>Auto power on</td><td>Auto power on disabled</td></tr>
<tr><td>S3</td><td>RS-485 normal mode</td><td>RS-485 terminal mode</td></tr>
<tr><td>S4</td><td>Test mode off</td><td>Test mode on (for the factory use)</td></tr>
</table>
</td></tr>
</table>

3.19 Other Switch and Jumpers

Other switch and jumpers, such as SW1, JP3, JP4, and JP5, etc. marked on the printed circuit board of EN713-AAE9 carrier board, are reserved for the internal use by AVerMedia. They are not open to the client application.

4.0 Installation

1. Check and ensure all the external system power supplies are turned off.

2. Install NVIDIA® Jetson Nano/ Xavier NX module onto 260-pin SODIMM connector (J5). Check and be sure to follow the manufacturer's instructions for the proper installation of the mounting hardware, heat sink or heat spreader, fan, and any other applicable requirements from the associated manufacturers.

3. Install the necessary cables for the application. The cables can include the following ones. For the additional information of these mentioned cables, please refer to 8.0 Cable Assembly in this manual.

   - Power cable to the input power connector (J13) on the carrier board.
   - HDMI video display cable to HDMI video output connector (J10).
   - Mouse and keyboard cables to USB connectors (J9).

4. Connect the power cable to the power adapter.

5. Turn on the power adapter. (Please be reminded NOT to power on the system by plugging in the live power.)

5.0 Software

For L4T (Linux for Tegra) BSP and the software support associated with NVIDIA® Jetson Nano/ Xavier NX module, please check this link, https://www.avermedia.com/professional/download/en713_aae9#ans_part / https://www.avermedia.com/professional/download/nx213b#ans_part, to download the file from AVerMedia website.

6.0 Force Recovery Mode

USB 3.l/OTG port (J11) can be used to re-program NVIDIA® Jetson Nano/ Xavier NX module by using the other host system running NVIDIA Jetpack™, as the procedure described below.

1. Power off the system. Ensure the system power must be completely OFF, instead of staying in the suspend mode or the sleep mode.

2. Connect a USB cable from OTG USB port to the other host system which will be used to re-program the new system file into NVIDIA® Jetson Nano/ Xavier NX module.

3. Press and hold down Force Recovery Button (SW8) and then power on the carrier board.

4. After three seconds, release Force Recovery Button.

5. NVIDIA® Jetson Nano/ Xavier NX module will show up on the USB list of the host system as a new NVIDIA target device.

6. After the system software is updated successfully, please ensure to power off the system. A clean power-on will then revert OTG port back to the host mode.

7.0 Power Consumption

Item Description	Power Consumption
Theoretical Maximum System Power Consumption	● Maximum power consumption of EN713 is 13.5W (w/ HDMI, RJ45), and embedded w/ POE , that would be extra up to 100W ● Maximum power consumption of NX213B is 15.2W (w/ HDMI, RJ45), and embedded w/ POE , that would be extra up to 100W (maximum power consumption up to 150W based on adapter)
Typical System Power Consumption	The power consumption under the normal operating mode is depending on the application software running with NVIDIA® Jetson Nano /Xavier NX.