

EA713MN Product Guide

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1. Scope & Product Outline

This document describes the detailed specifications and design parameters of Xavier Carrier Board with Multiple Video Sources Support. AVerMedia internal product model name is EA713MN and current PCB revision is A. It can operate with NVIDIA Xavier module to build up a high performance embedded system. EA713MN is fully compliance with RoHS. All components and all production procedures have already followed current RoHS rule to produce.

2. Features

Carrier Board Feature List

Connection to Jetson Module

- 699-pin (11x65) Board-Board Connector

Storage

- Micro SD Card Slot

USB

- Micro USB (For Install JetPack) <https://developer.nvidia.com/jetpack>
- 2 x USB 3.1 Gen1 Type A (Host only)

Wired Network

- 2 x Gigabit Ethernet (RJ45 Connector w/LEDs)

M.2 Key E Connector

- PCIe X1 Lane, USB 2.0
- I2S, UART, I2C, Control

M.2 Key M Connector

- 1 x PCIe X4 Lane, Control
- 2 x PCIe X4 Lane (Share Mini Card Bandwidth)

PCIe (Mini Card)

- 4 x full-height miniPCIe expandability of connecting AVerMedia frame grabbers. (Share 2 x M.2 Slot Bandwidth)

HDMI Type A

- HDMI 2.0 output up to 3840 x 2160 p60

Audio

- Microphone input
- Speaker output

Controller

- CAN Bus
- RS485

Expansion Header

- 40-pin (2x20) header
- I2C, SPI, UART, I2S, CAN, D-MIC

UI & Indicators

- Power & Recovery Buttons
- LEDs: Power On/Off Indication

Debug/Serial

- Serial Port Signals (UART, 1x4 header)

Miscellaneous

- SOM Fan Connector: 12V, PWM & Tach
- M.2 Fan Connector: 5V
- Mini-54 MCU for power on control

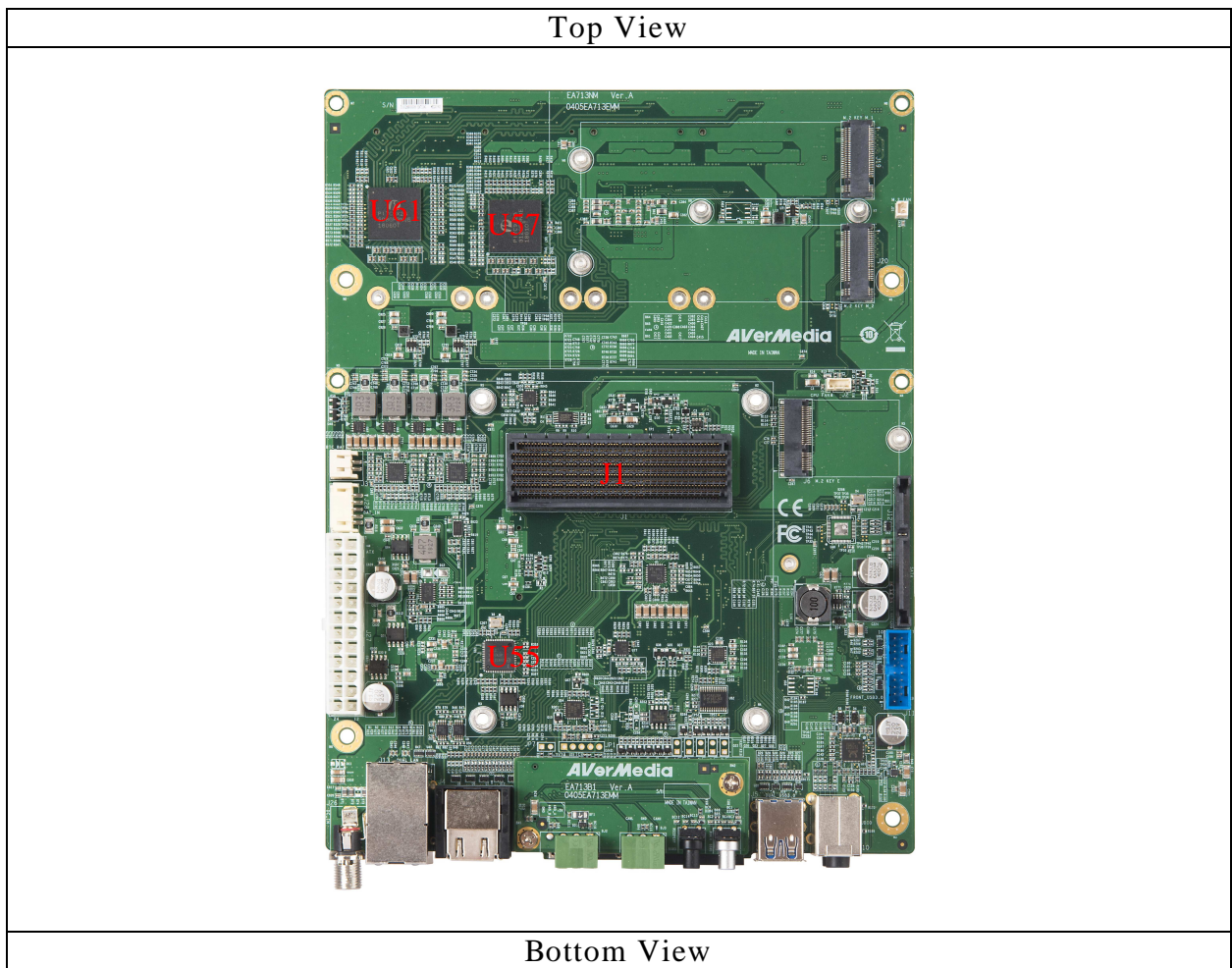
Power

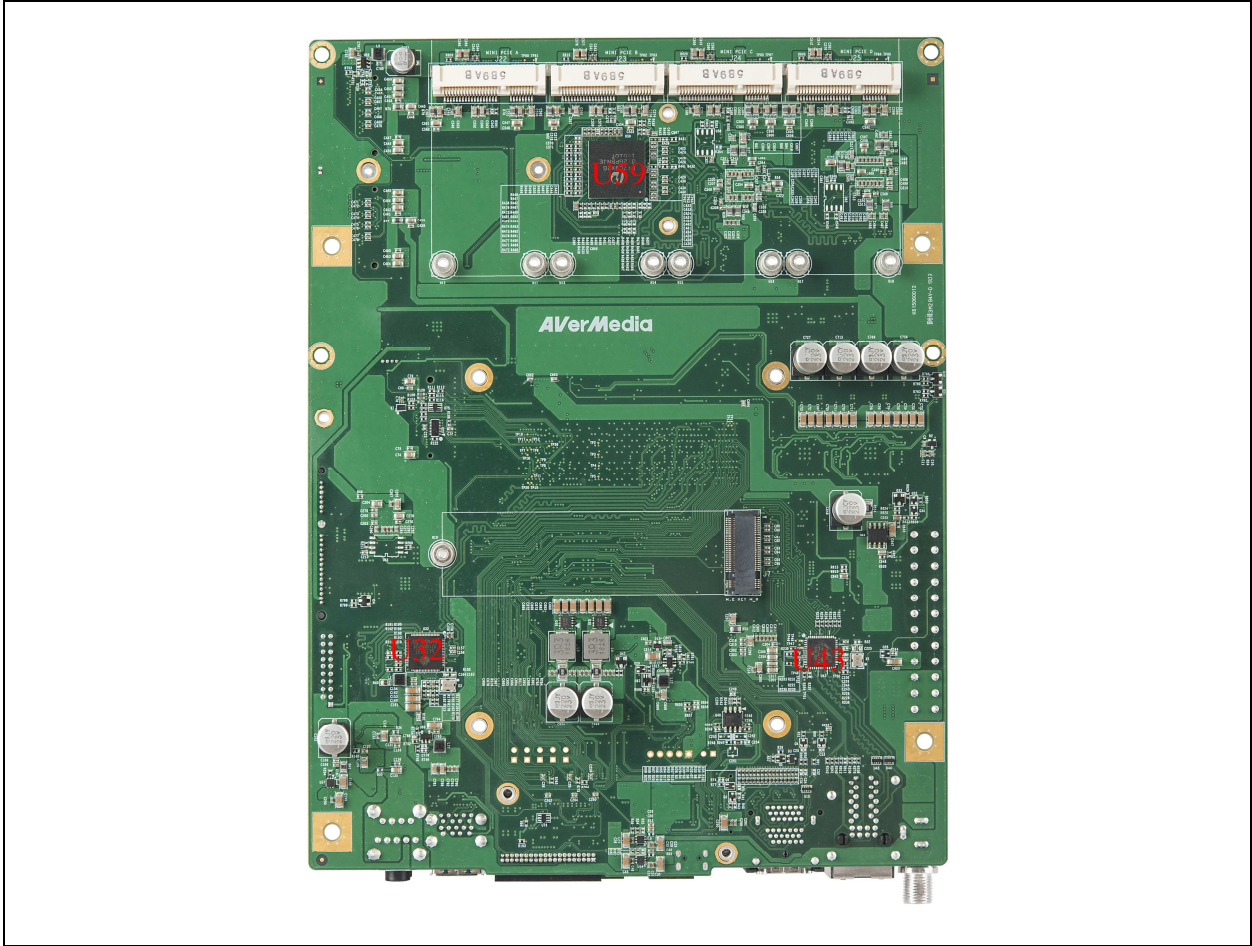
- DC Jack: 9V-15V or ATX power 24 P
- RTC Battery

3. Hardware

3.1 Key Component List

Table 1





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Table 2:

Locations	Descriptions of Components
J1	SOCKET_699PIN_for NVIDIA Jetson Xavier System-on-Module
U57	3Port-12Lane PCI Express Gen 2 Switch
U59	3Port-12Lane PCI Express Gen 2 Switch
U61	6-Port/ 8-Lane PCI Express Gen 2 Switch
U55	Intel Ethernet Controller
U43	Integrated 10/ 100/ 1000 Mbps Energy Efficient Ethernet Transceiver
U32	USB 3.1 Gen 1 Hub Controller

3.2 Block Diagram

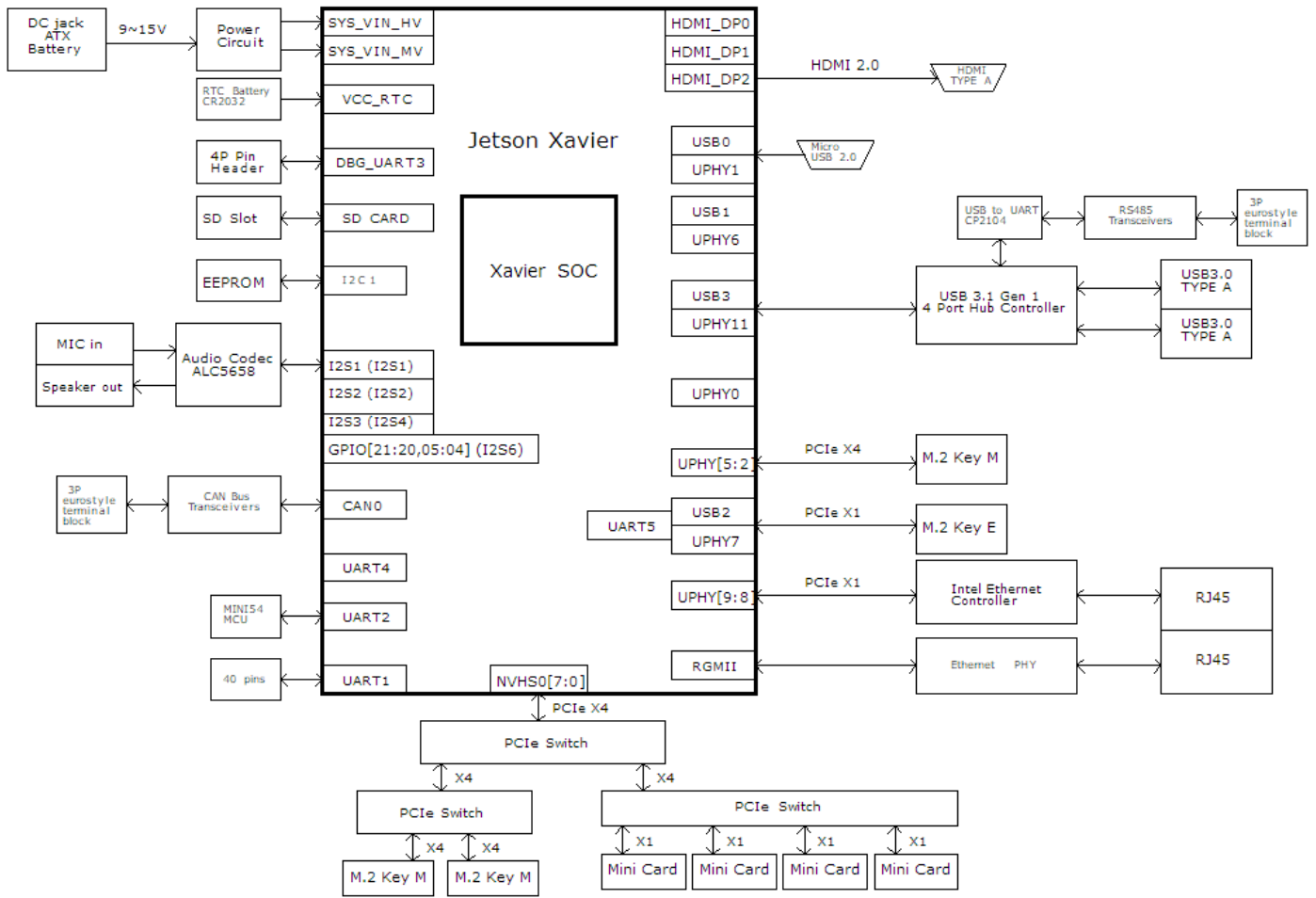


Figure1. Block Diagram.

3.3 Board Dimensions

Table 3:

Form Factor	Customization
PCB Size	170 mm x 220mm
Thickness	1.6 mm

3.4 I/O Connector

Table 4: (Please refer to mechanical drawing for more detail)

I/O Connector	External	J26	DC jack x1 OD:5.5/ 2.5 with lock
		J8	USB 2.0 Micro B (For Install JetPack)
		J9	Micro SD card slot x1
		J4	HDMI 2.0 Output (Type A) from Xavier
		J13-1(top)	Gigabit Ethernet X1 (RJ45) from Ethernet Controller
		J13-2(down)	Gigabit Ethernet X1 (RJ45) from Ethernet PHY Transceiver
		J5-1, J5-2	USB3.1 Gen1 type A x2 from USB 3.1 Gen 1 Hub Controller
		J10-1(top)	Microphone input X1 (3.5mm Phone Jack)
		J10-2(down)	Speaker output X1 (3.5mm Phone Jack)
		J14	GPIO Expand 40pin (2x20 1.27mm pitch Pin header)
		BSW1	Power Button with LED
		BSW3	Recovery Button with LED
		BJ2	RS485 (3 circuits eurostyle terminal block)
		BJ3	CAN Bus (3 circuits eurostyle terminal block)
	Internal	J27	ATX 24Pin (ATX Power input)
		J3	RTC power input wafer (RTC Battery)
		J22	full-height minicard slot, MiniPCIe 0 PCI Express Gen2.0 from PCI Express Switch
		J23	full-height minicard slot, MiniPCIe 1 PCI Express Gen2.0 from PCI Express Switch
		J24	full-height minicard slot, MiniPCIe 2 PCI Express Gen2.0 from PCI Express Switch
		J25	full-height minicard slot, MiniPCIe 3 PCI Express Gen2.0 from PCI Express Switch
		J7	2280 M.2 KEY M PCI Express Gen4.0 (PCIe X4 Lane) from Xavier
		J19	2280 M.2 KEY M PCI Express Gen2.0 (PCIe X4 Lane) from PCI Express Switch
		J20	2280 M.2 KEY M PCI Express Gen2.0 (PCIe X4 Lane) from PCI Express Switch
		J6	2230 M.2 KEY E PCI Express Gen4.0 (PCIe X1 Lane) from Xavier
J2	FAN 1*4pin 1.25mm pitch wafer for Xavier (Joint Tech _A1250WV-04PNLNT1N00B)		

		J21	FAN 1*2pin 1.25mm pitch wafer for M.2 device (MOLEX 53047-0210)
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SOM Fan connector (J2) Pin Descriptions

Wafer type : Joint Tech_A1250WV-04PNLNT1N00B			
Pin#	Signal Name	Usage/Description	Type/Dir Default
1	GND	Ground	Ground
2	VCC	12V Power Supply	Power
3	FAN_TACH	Fan Tachometer signal	Input
4	FAN_PWM	Fan Pulse Width Modulation signal	Output

M.2 Fan connector (J21) Pin Descriptions

Wafer Type : MOLEX_53047-0210			
Pin#	Signal Name	Usage/Description	Type/Dir Default
1	VCC	5V Power Supply	Power
2	GND	Ground	Ground

GPIO Expand (J14) Pin Descriptions

The carrier board includes a 40-pin (2x20, 1.27mm pitch) Expansion Header (J14). The connector used on the carrier board is a CHAMPWAY CB25-G4024H010-03. The GPIO Level Shift voltage is fixed on 3.3V.

The expansion connector includes various audio & control interfaces including:

- I2S(See Note)
- Audio Clock/ Control
- Digital Microphone IF
- I2C (x2) (See Note)
- SPI (See Note)
- UART (See Note)
- CAN

Table 4:

J14	GPIO Expand 40pin (2x20 1.27mm pitch Box header)
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Note: The GPIO Level Shift voltage is fixed on 3.3V

Table 5:

Wafer type : CHAMPWAY CB25-G4024H010-03							
Pin	Signal Name	Device Directly Connected to Signal	Associated Jetson Module Pin Name	Usage/Description	Type/ Direction	GPIO Max Drive or Power Pin Current Capability	Notes
1	+5V_SYSTEM	TPS51220 5V Supply	-	Main 5.0V Supply	Power	1A	1
2	+3V3_SYSTEM	TPS51220 3.3V Supply	-	Main 3.3V Supply	Power	1A	1
3	+5V_SYSTEM	TPS51220 5V Supply	-	Main 5.0V Supply	Power	1A	1
4	I2C_GP5_DAT_3V3	2SK3019	I2C_GP5_DATA	General I2C #5 Data (3.3V)	Bidir/ OD	3.3mA	2
5	GND	-	-	Ground	Ground	-	
6	I2C_GP5_CLK_3V3	2SK3019	I2C_GP5_CLK	General I2C #5 Clock (3.3V)	Bidir/ OD	3.3mA	2
7	UART1_TX_3V3	TXB0108	UART1_TX	UART #1 Transmit	Output	20uA	3
8	MCLK05_3V3	TXB0108	AUDIO_MCLK	Audio Master Clock (1.8/ 3.3V)	Bidir	20uA	3
9	UART1_RX_3V3	TXB0108	UART1_RX	UART #1 Receive	Input	20uA	3
10	GND	-	-	Ground	Ground	-	
11	I2S2_CLK_3V3	TXB0108	I2S2_CLK	Audio I2S #2 Clock	Bidir	20uA	3
12	UART1_RTS_3V3	TXB0108	UART1_RTS#	UART #1 Request to Send	Output	20uA	3
13	GND	-	-	Ground	Ground	-	
14	PWM01_3V3	TXB0108	GPIO32	Pulse Width Modulation #1	Bidir	20uA	3
15	GPIO8_AO_DMIC_IN_DATA	Xavier	GPIO8	Digital Mic Input Data(3.3V)	Input	3.3mA	5
16	GPIO27_PWM2_3V3	TXB0108	GPIO27	GPIO/ Pulse Width Modulation #2	Bidir	20uA	3
17	GPIO35_PWM3_3V3	TXB0108	GPIO35	GPIO/ Pulse Width Modulation #3	Bidir	20uA	3,7
18	+3V3_SYSTEM	TPS51220 3.3V Supply	-	Main 3.3V Supply	Power	1A	1
19	GND	-	-	Ground	Ground	-	
20	SPI1_MOSI_3V3	TXB0108	SPI1_MOSI	SPI #1 Master Out/ Slave In (1.8/ 3.3V)	Bidir	20uA	3
21	GPIO17_40HEADER_3V3	TXB0108	GPIO17	GPIO	Bidir	20uA	3
22	SPI1_MISO_3V3	TXB0108	SPI1_MISO	SPI #1 Master In/ Slave Out (1.8/ 3.3V)	Bidir	20uA	3
23	SPI1_CS0_3V3	TXB0108	SPI1_CS0#	SPI #1 Chip Select #0 (1.8/ 3.3V)	Bidir	20uA	3
24	SPI1_SCK_3V3	TXB0108	SPI1_CLK	SPI #1 Shift Clock (1.8/ 3.3V)	Bidir	20uA	3
25	SPI1_CS1_3V3	TXB0108	SPI1_CS1#	SPI #1 Chip Select#1 (1.8/ 3.3V)	Bidir	20uA	3
26	GND	-	-	Ground	Ground	-	
27	I2C_GP2_CLK_3V3	2SK3019	I2C_GP2_CLK	General I2C #2 Clock (3.3V)	Bidir/ OD	3.3mA	2

28	I2C_GP2_DAT_3V3	2SK3019	I2C_GP2_DATA	General I2C #2 Data (3.3V)	Bidir/ OD	3.3mA	2
29	GND	-	-	Ground	Ground	-	
30	CAN0_RX	Xavier	CAN0_DIN	CAN #0 Data In (3.3V)	Input	3.3mA	5
31	GPIO9_CAN1_GPIO0	Xavier	GPIO9	Digital Mic Input Clock (3.3V)	Bidir	3.3mA	5
32	CAN0_TX	Xavier	CAN0_DOUT	CAN #0 Data Out(3.3V)	Output	3.3mA	5
33	GND	-	-	Ground	Ground	-	
34	CAN1_DOUT	Xavier	CAN1_DOUT	CAN #1 Data Out (3.3V)	Output	3.3mA	5
35	UART1_CTS_3V3	TXB0108	UART1_CTS#	UART #1 Clear to Send	Input	20uA	3
36	I2S2_FS_3V3	TXB0108	I2S2_FS AUDIO	I2S #2 Left/ Right Clock	Bidir	20uA	3
37	I2S2_SDIN_3V3	TXB0108	I2S2_SDIN	Audio I2S #2 Data in	Input	20uA	3,7
38	CAN1_DIN	Xavier	CAN1_DIN	CAN #1 Data In (3.3V)	Input	3.3mA	5
39	I2S2_SDOUT_3V3	- TXB0108	-I2S2_SDOUT	Audio I2S #2 Data Out	Output	20uA	3,7
40	GND	-	-	Ground	Ground	-	

Legend

Ground	Power	N/ A	N/ A	Reserved	Unassigned on carrier board
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Notes:

1. This is current capability per power pin.
2. These pins are connected to Tegra signals through either an I2C or FET level shifter.
3. Due to the design of these level translators, the output drivers are very weak so they can be overdriven by another connected device output for bidirectional support.
4. These pins connect to a SN74LVC4T245 buffer. The voltage level at the header pins is selectable
5. These pins are directly connected to Xavier. The max drive that meets full Data Sheet VOL/ VOH is 1mA. 2mA drive is supported at restricted VOL/ VOH levels. See the associated OEM Product Design Guide Pads section for details.
6. In the Type/ Dir column, Output is to Expansion Module. Input is from Expansion Module. Bidir is for Bidirectional signals.
7. The direction indicated matches that indicated in the reference design schematics. These signals can be bidirectional.

3.5 Ability of Power Provision

The ability of carrier board to provide power is listed in Table 5.

Table 5:

Symbol	Min.	Max.	Total Power
DC Jack Input	9V	15V	60W(Max.)

3.6 Thermal Specifications

The case temperature of key components is listed in Table 6.

Table 6:

Components	Components Case Temperature Specifications
3Port-12Lane PCI Express Gen 2 Switch (U57)	Tcase = 95
3Port-12Lane PCI Express Gen 2 Switch (U59)	Tcase = 95
6-Port/ 8-Lane PCI Express Gen 2 Switch (U61)	Tcase = 95
Intel Ethernet Controller I210 (U55)	Tcase = 95
Integrated 10/ 100/ 1000 Mbps Energy Efficient Ethernet Transceiver (U43)	Tcase = 95
USB 3.1 Gen 1 Hub Controller (U32)	Tcase = 95

3.8 EMI Specifications

EMI/ EMS test specification are listed in Table 7

Table 7 :

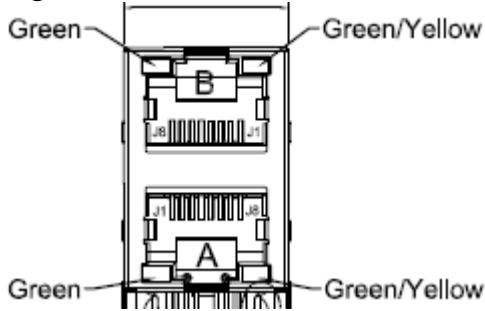
Criteria	Specification	Reference
EMI	EN55032 standard	CE
EMS	EN55024 standard	CE

3.9 Buttons and Indicators

Buttons (Switches)

Button	Description	Usage
BSW1	Power button & power indication	<ol style="list-style-type: none"> Used to power system up if off, or power down if on. If held for >7 seconds, will force a full system power cycle. Indicates when the carrier board is powered on
BSW3	Recovery button & Status indication LED	<ol style="list-style-type: none"> Used to enter Force Recovery Mode. Button is held down while either system is first powered on, or by pressing & releasing reset button while Recovery button is pressed. Status indication RGB LED (This is customized by the user)

Gigabit Ethernet (LAN Port LEDs)



Top(B)

Activity LED(left)		Link/Speed LED(right)	
Status	Description	State	Description
Green Blinking	Data transmission or receiving is occurring	Yellow	1000M link Speed
Off	No data transmission or receiving is occurring	Green	100M link Speed

Down(A)

Activity LED(left)		Link/Speed LED(right)	
Status	Description	State	Description
Green	Data transmission or receiving is occurring	Yellow	1000M link Speed
Off	No data transmission or receiving is occurring	Yellow Blinking	100M link Speed

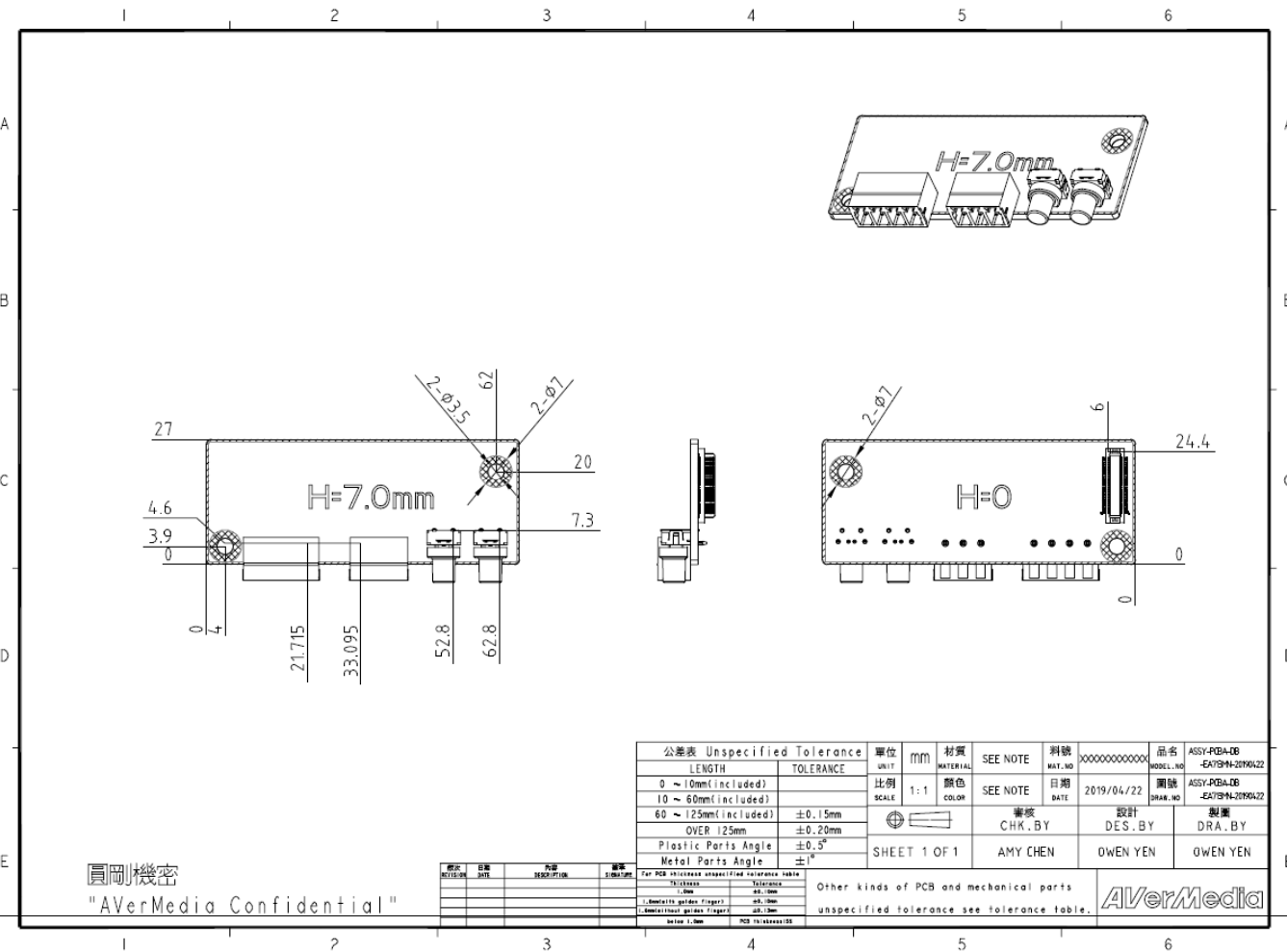
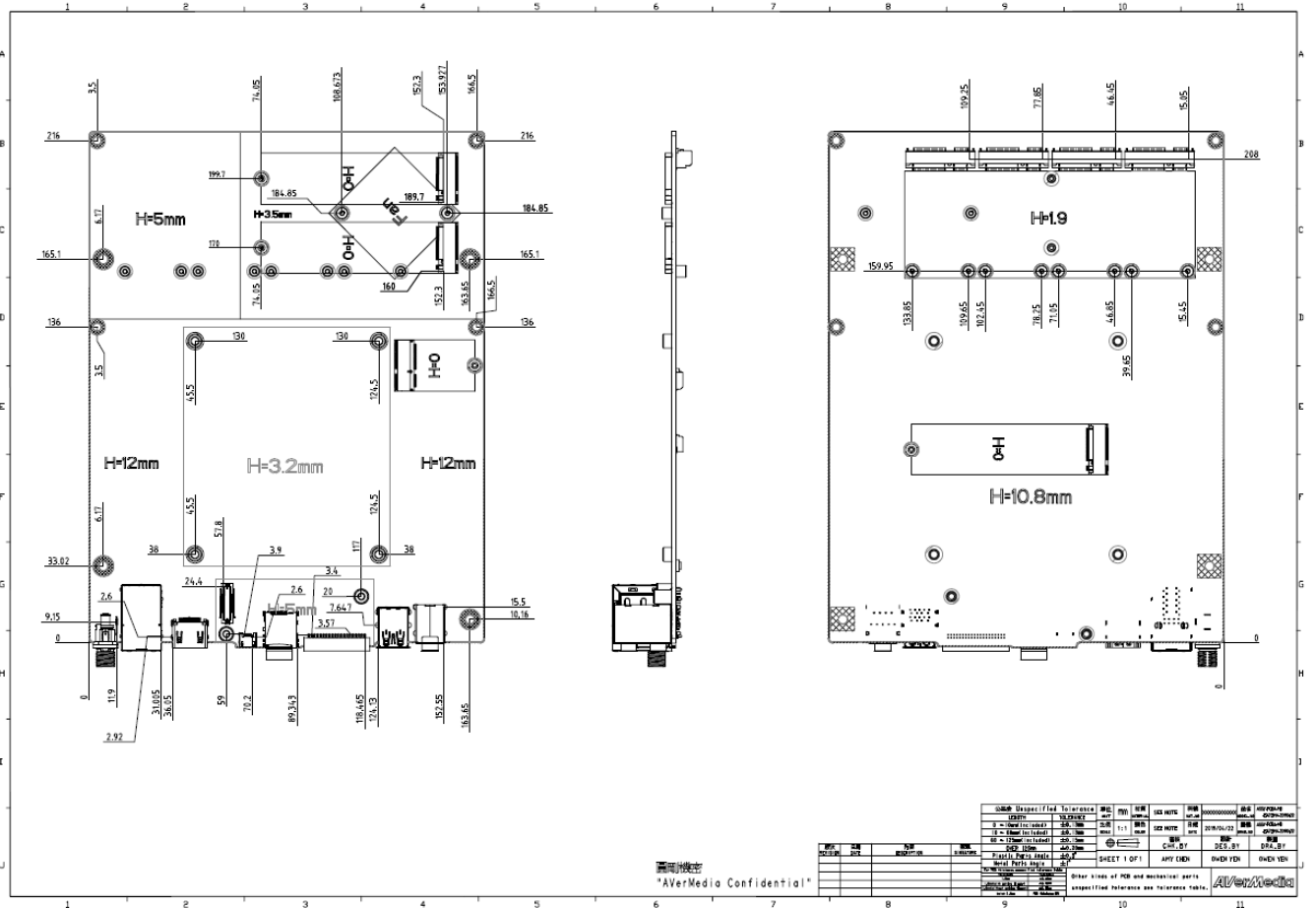
4. Software

BSP (board support package) : NVIDIA JETSON JETPACK

5. Firm ware

Item	Location	Firmware Version	Noted
Mini54	U54	19051118	Auto Power on Function

6. ID Specifications



7. Reliability

Table 8:

Criteria	Specification	Reference
Low Temperature	Operating: -10 C/48 hrs	IEC 68-2-1
	Storage: -20 C/24 hrs	
High Temperature	Operating: 70 C/48 hrs	IEC 68-2-2
	Storage: 85 C /24 hrs	
High Humidity	Operating: 70C, 95%RH/48 hrs	IEC 68-2-30
	Storage: 85C, 95%RH/24 hrs	
Cold Start	Operating: -10 C/1hr	IEC 68-2-1
Hot Start	Operating: 70C, 95%RH/1hr	IEC 68-2-2
Package Drop	According to the ISTA 2A test standard	ISTA 2A