/MAAXBOARD

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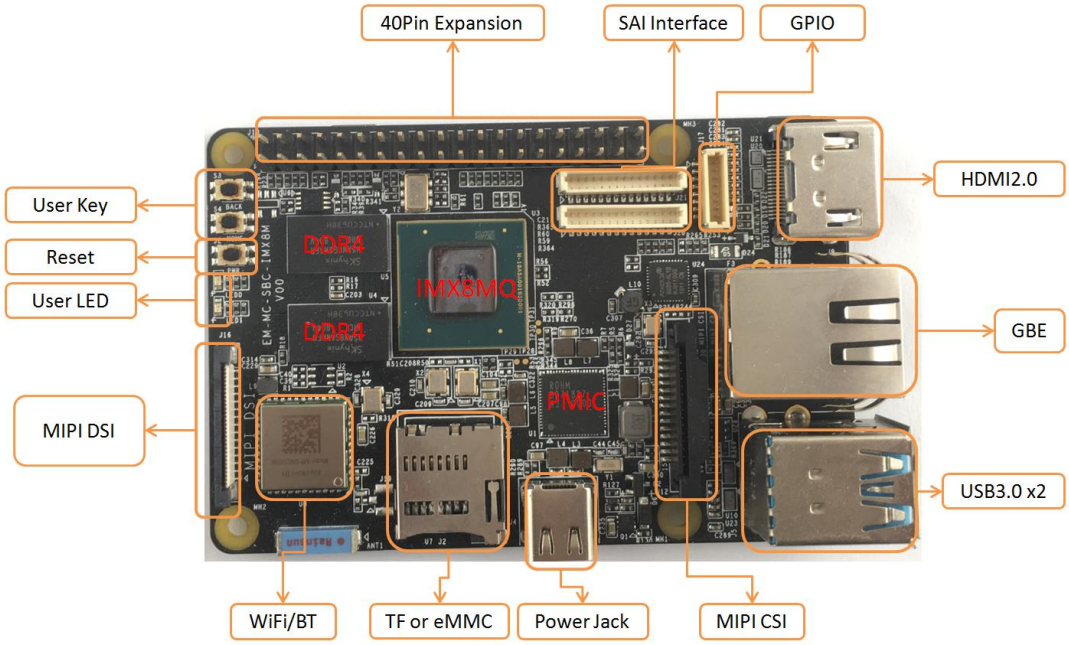

AES-MC-SBC-IMX8M-G Hardware User's Guide

Revision 1

Version 1.0

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1 Document Control

Document Version: 1.0

Document Date: 26 July 2019

2 Version History

Version	Date	Comment
1.0	01 October 2019	Initial Release

Regulatory Compliance:

- AES-MC-SBC-IMX8M-G evaluation board has passed the CE & FCC certification.

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3 Product Overview

3.1 Brief Introduction

The AES-MC-SBC-IMX8M-G is a production ready single board computer, designed by Avnet. The AES-MC-SBC-IMX8M-G is a single board computer based on the 0.1234NXP IMX8M SOC series, which can be used for the areas such as medical instruments, video surveillance, communications, IOT, makers and so on.

In the design of a compact body size, the MaaXBoard offers rich resources of peripheral interfaces, these include: Gigabit Ethernet interface, USB 3.0 interface, MIPI-DSI interface, MIPI-CSI interface, HDMI interface, Micro SD Card interface, UART interface, GPIO interface, Wi-Fi/Bluetooth interface, etc.

3.2 System Block Diagram

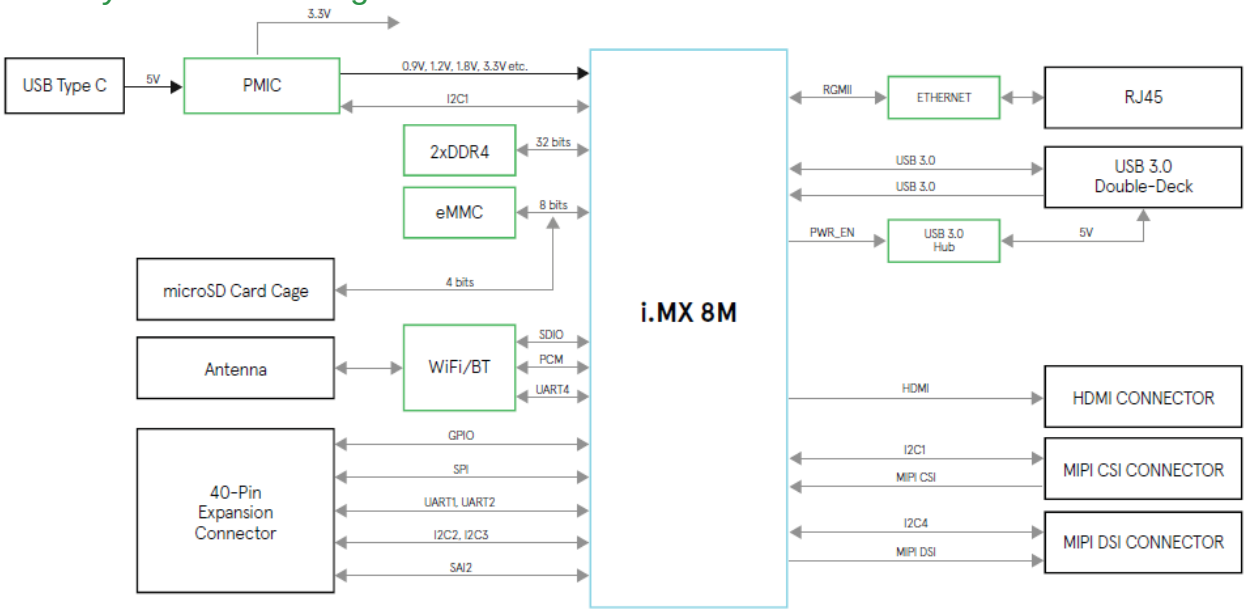


Figure 3.1 AES-MC-SBC-IMX8M-G System Block Diagram

3.3 Packing List

- 1 × AES-MC-SBC-IMX8M-G
- 1 × Anti-static Bag
- 1 × Quick Start Guide
- 1 x Passive Heatsink
- 1 × Box

3.4 Product Specifications

- General Specifications:
  - Operating Temperature: 0~70℃ (When the CPU loads heavy, need external radiator)
  - Power Supply: 5V/3A (Power Adapter)
  - Operating Humidity: 20% ~ 90% (non-condensing)
  - Dimensions: 85mm × 56mm x 12mm
  - PCB Layers：10Layers

- Communication Interface:
  - 1 × 40 Pin IO Interface (Expand I2C, SPI, UART, I2S Interface)
  - 1 × MIPI-CSI Camera Interface
  - 1 × MIPI-DSI Display Interface
  - 1 ×Gigabit Ethernet interface (RJ45)
  - 2 × USB3.0 Host High Speed Interface
  - 1 × Micro SD Card (TF Card) Interface
  - 2 × 8bit GPIO Interface (Support Audio peripheral expand)
  - 1 × HDMI 2.0 Interface
  - 1 × Power Interface (USB Type C Connector)
  - 1 × Reset Button
  - 2 × User Button
  - 1 × Wi-Fi/Bluetooth
  - 2 × User LEDs

3.5 Other Customer Provide Parts

To use the various functions of AES-MC-SBC-IMX8M-G, customer should also provide the following parts which are not contained in AES-MC-SBC-IMX8M-G Package.

- 1 × USB to serial cable (TTL)
- 1 × 1Gbps Network Cable
- 1 × Camera Module
- 1 × MIPI – DSI Displayer
- 1 × 5V/3A Power Supply (USB Type C Interface)
- 1 × HDMI Cable
- 1 × HDMI LCD Screen
- Other tools needed to implement related function

3.6 Interface Locations

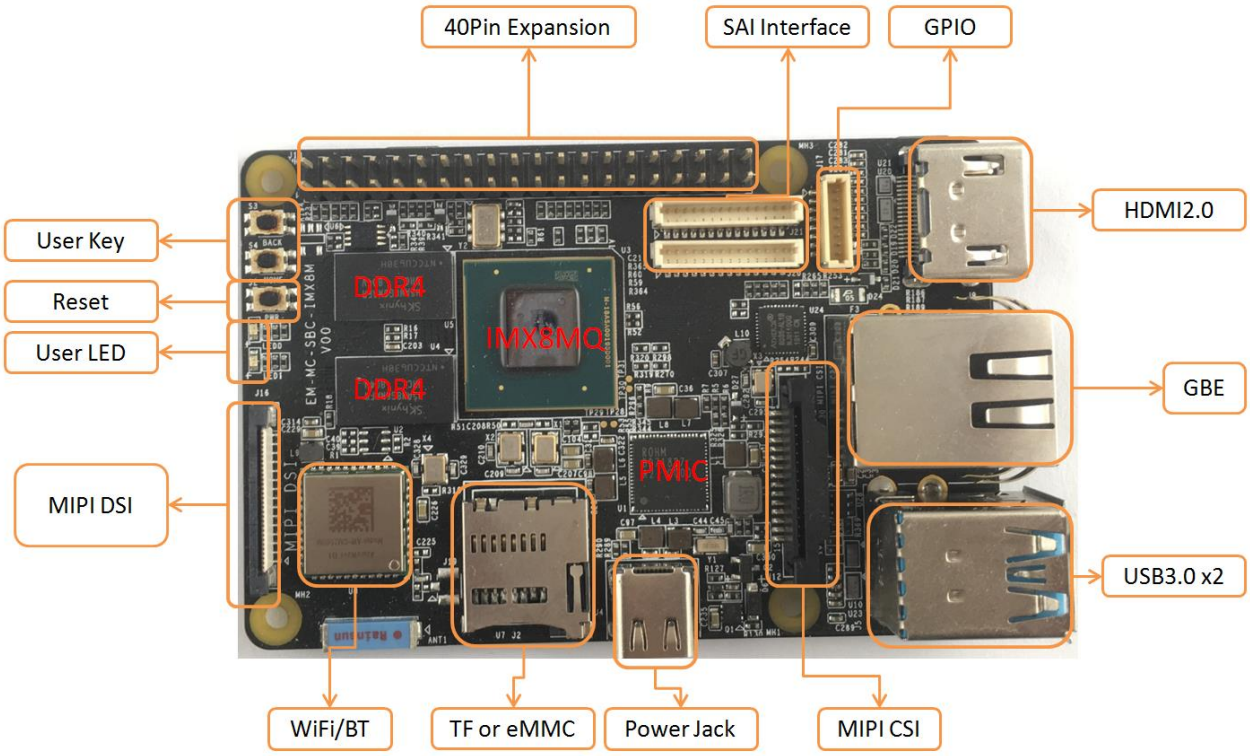


Figure 3.2 AES-MC-SBC-IMX8M-G Top View

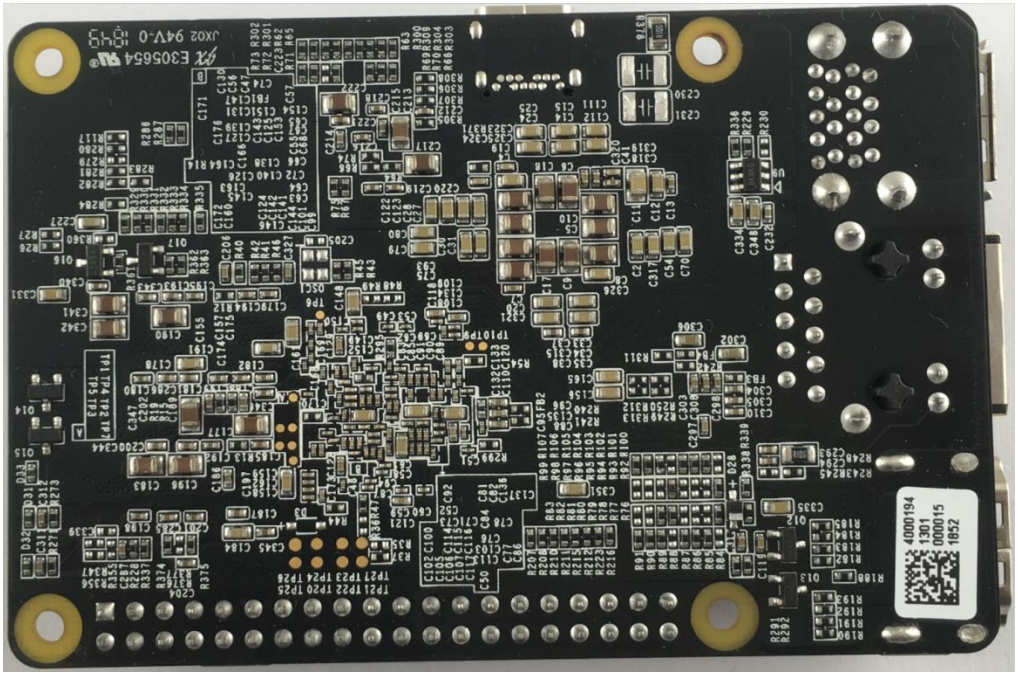


Figure 3.3 AES-MC-SBC-IMX8M-G Bottom View

3.7 Product Dimensions (mm)

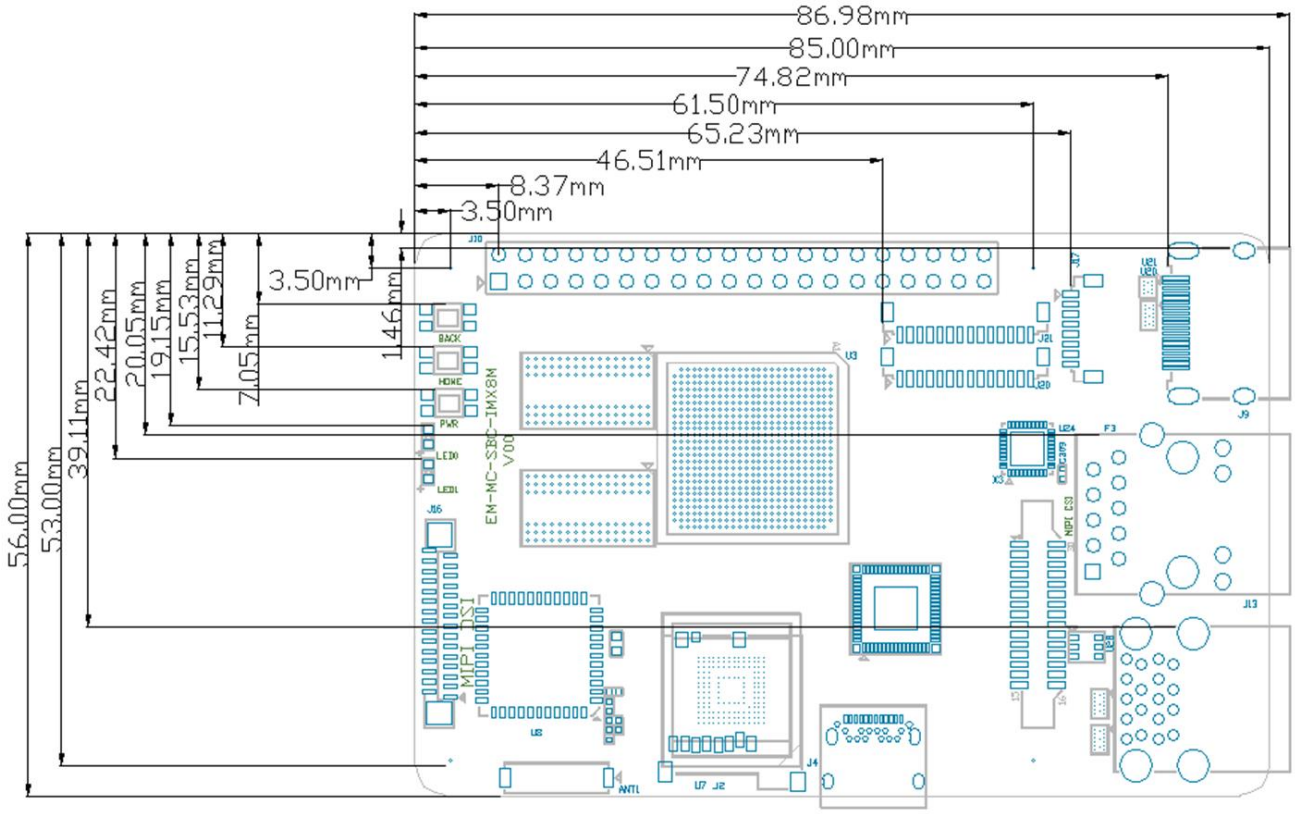


Figure 3.4 Product Dimensions

3.8 Height Distribution (mm)

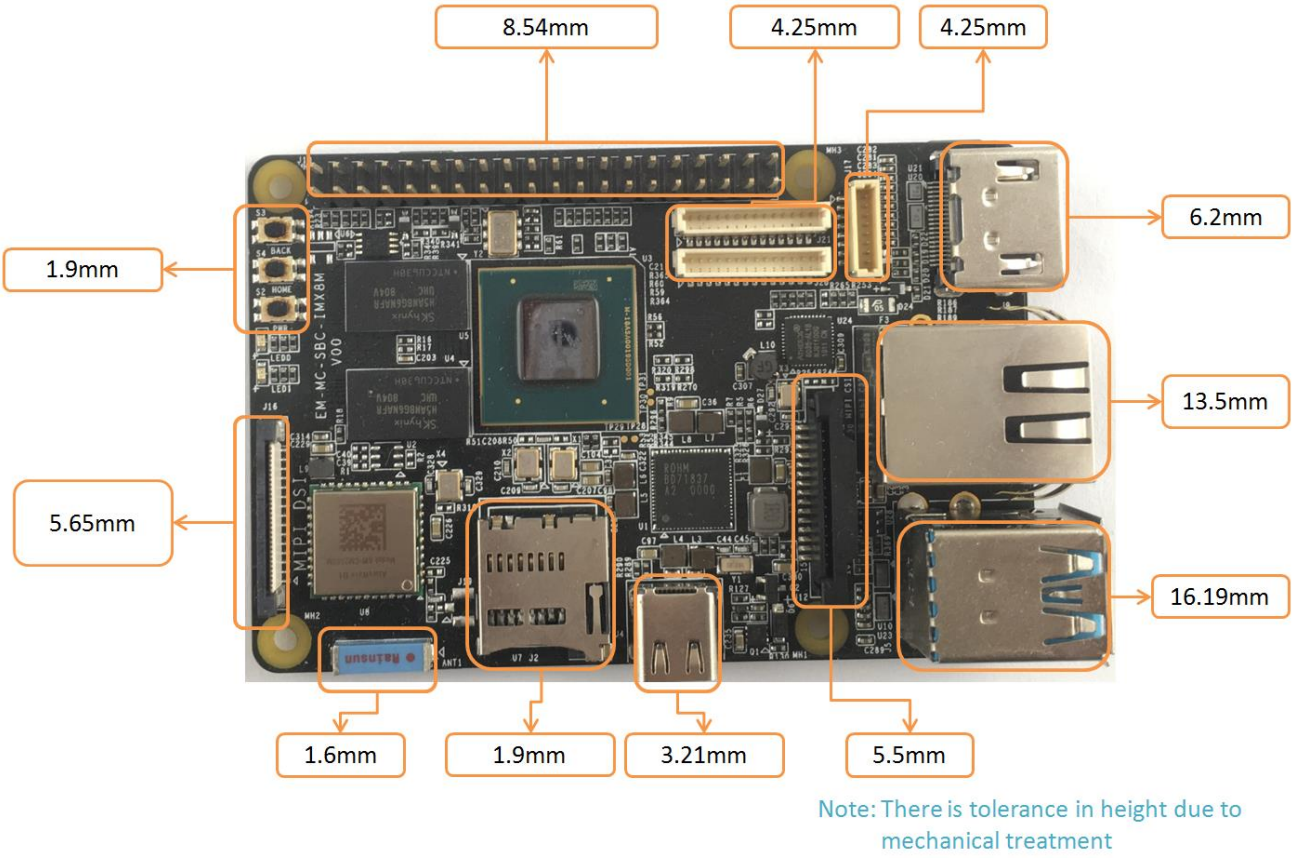


Figure 3.5 Height Distribution

Note: There is tolerance in height due to mechanical treatment.

4 Introduction of Hardware System

This chapter will introduce the structure, expansion and peripheral interfaces of AES-MC-SBC-IMX8M-G hardware system in detail.

4.1 AES-MC-SBC-IMX8M-G Hardware Installation and Start up

4.1.1 Installation

Before starting the AES-MC-SBC-IMX8M-G, you will need to connect all necessary peripheral devices, and then power on the board through the USB type C adapter.

4.1.2 Booting Configuration

The AES-MC-SBC-IMX8M-G supports two boot modes: boot from Micro SD card or boot from eMMC. These two boot modes are mutually exclusive. If users choose to boot from Micro SD card, they should burn the latest image to the card on PC, then install the card to the board. Refer to the software user manual. If users choose to boot from eMMC, just power on the board after the image is programmed into the eMMC. Refer to the eMMC programing guide.

Note: If the eMMC firmware is destroyed by accident, users could update the eMMC image in USB Download mode. Please operate carefully and follow the steps in software user manual strictly to avoid damaging the product.

4.2 Details of Interfaces

This section will introduce the constructions, principles, interface definitions and considerations of use of AES-MC-SBC-IMX8M-G peripherals in detail, so that users may have a deep understanding of the hardware circuitry of the board.

4.2.1 POWER IN

The AES-MC-SBC-IMX8M-G uses a USB Type C interface as the +5V power in. Note that the USB Type C interface only provides power supply function, do not support data communication.

The Power adapter should support 3A or above current output.

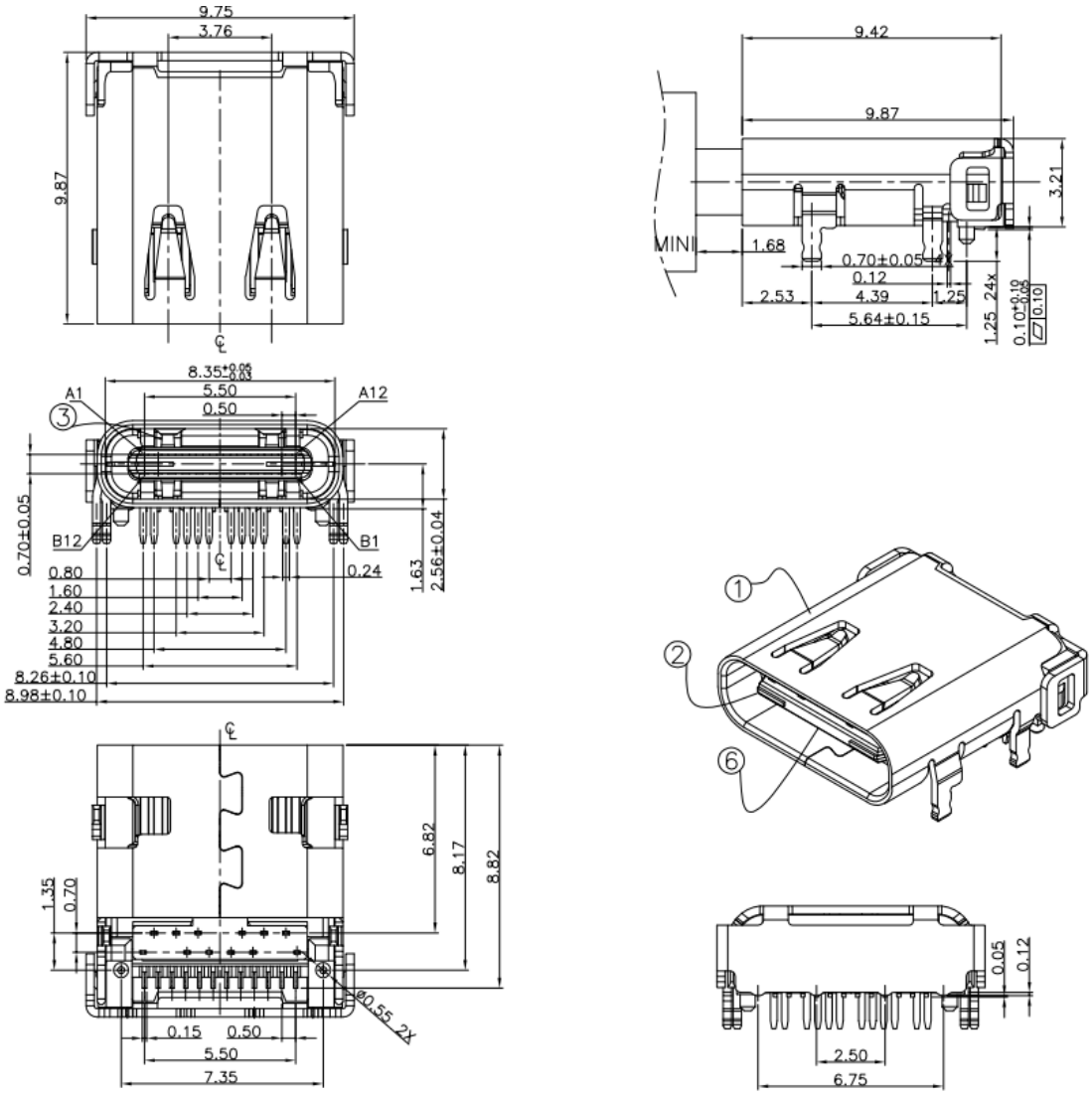


Figure 4.1 USB Type C Slot

4.2.2 Button

There are 3 buttons on the AES-MC-SBC-IMX8M-G, S2 as the system reset button for the board, S3 and S4 as user button.

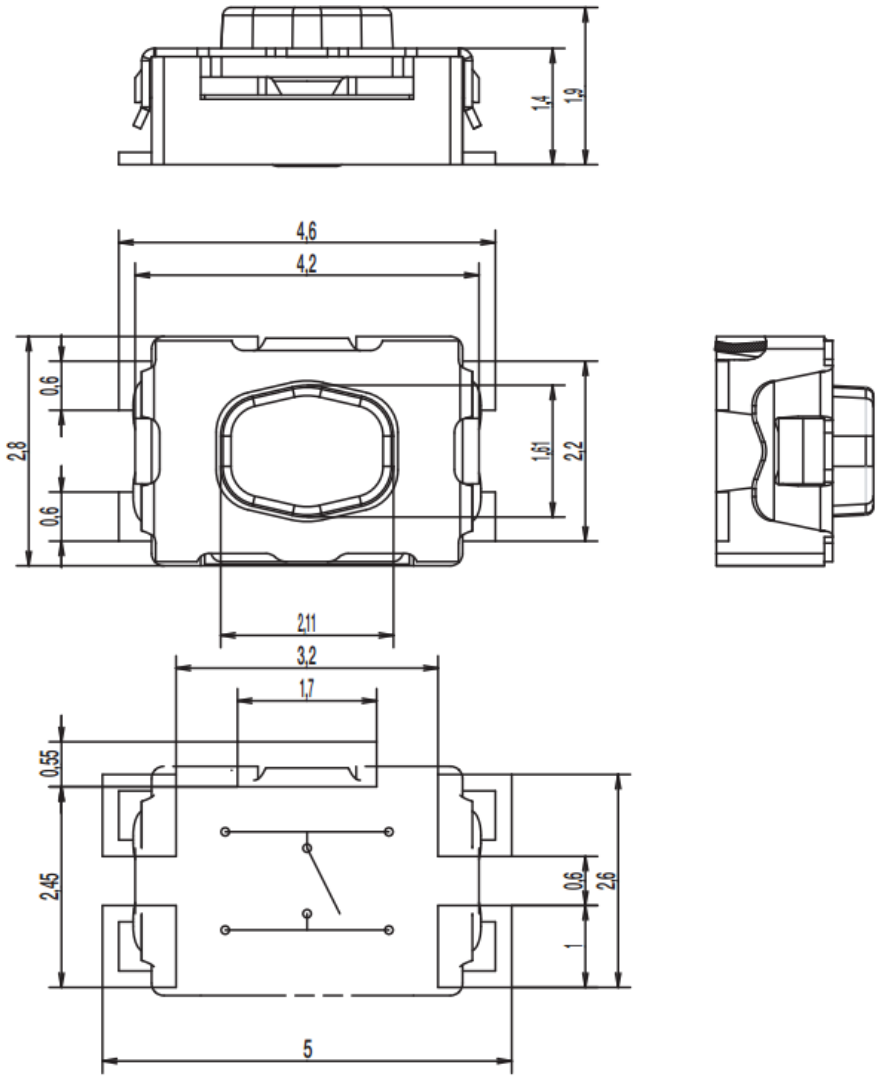


Figure 4.2 Button

4.2.3 HDMI

Powerful video display is an important feature of AES-MC-SBC-IMX8M-G. The HDMI 2.0 interface support up to 4096 x 2160 at 60Hz display output.

J9 is the interface for connecting an HDMI display device on the AES-MC-SBC-IMX8M-G, which is a standard HDMI 19Pin connector. Its specification and dimension are as follows:

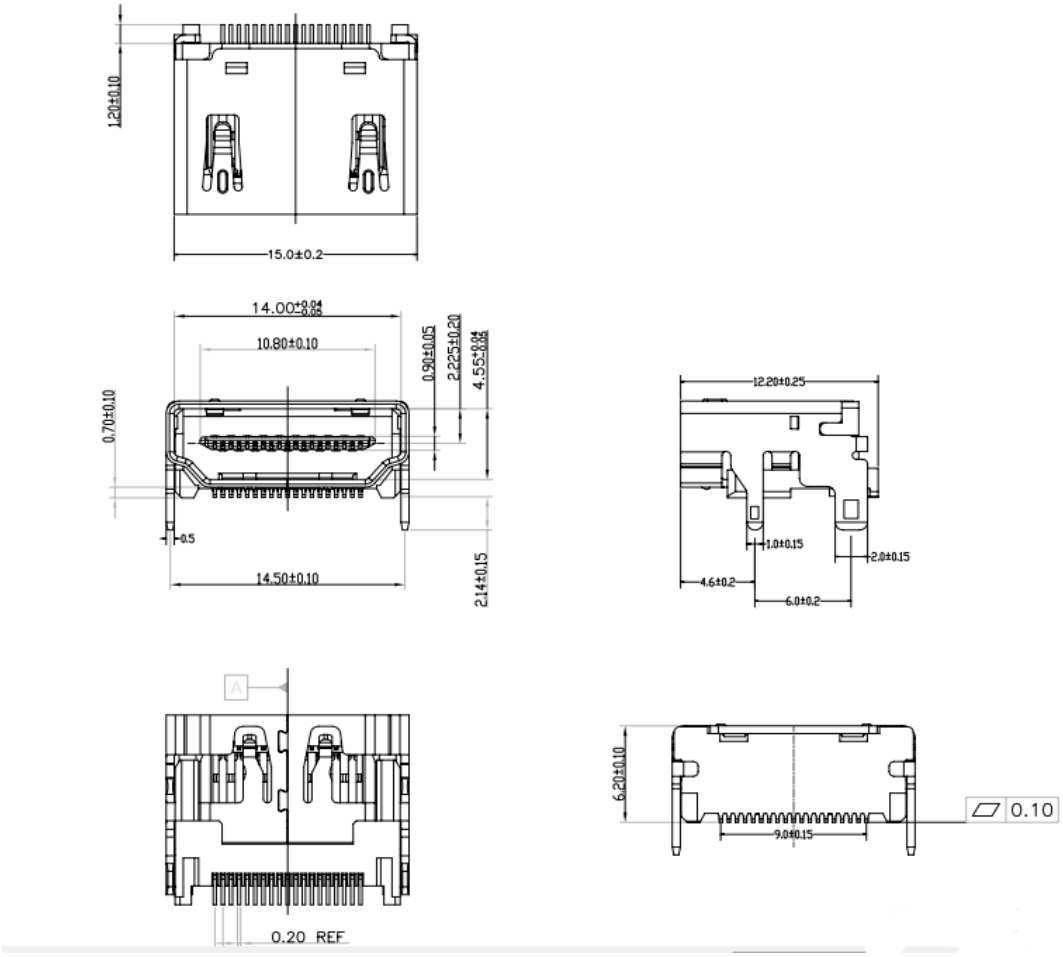


Figure 4.3 HDMI Connector

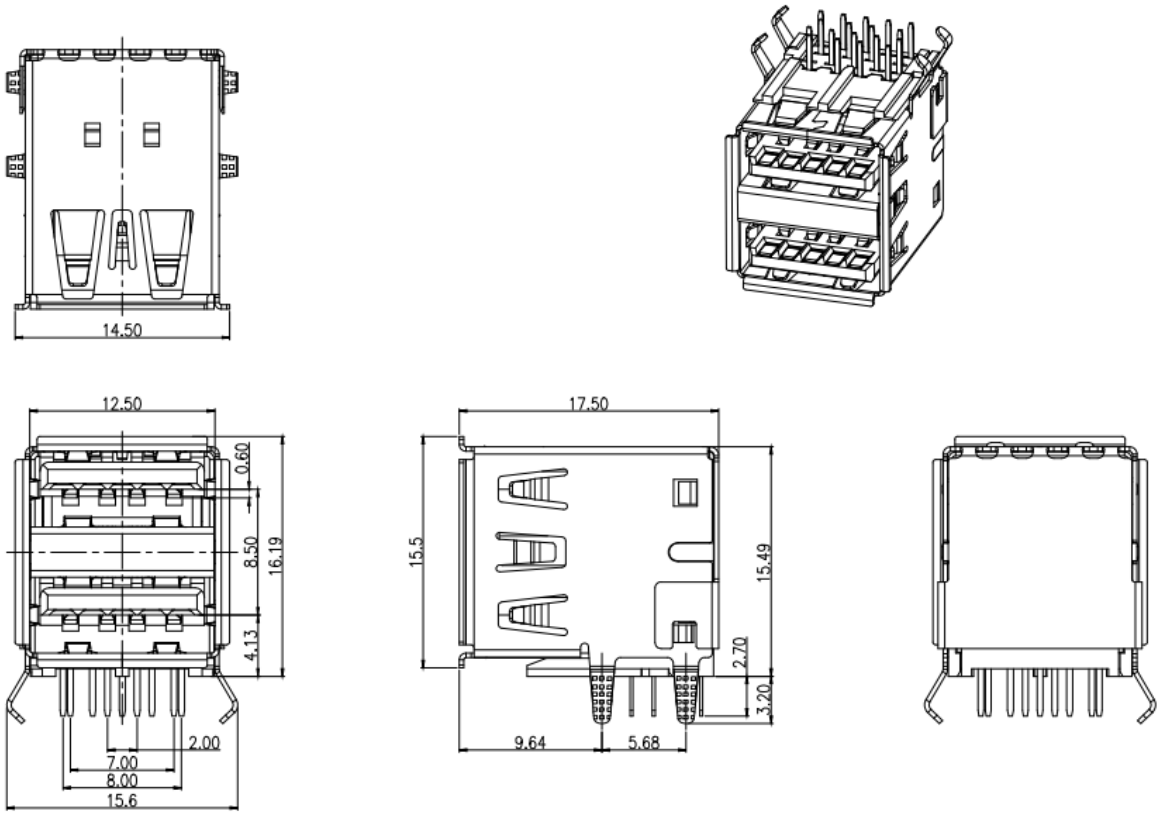
Table 4.1 HDMI Pin Definitions

HDMI(J9)				
Pin	Signal Name	Ball	Description	Signal Type
1	HDMI_TX2+	K4	HDMI data 2 differential positive	Differential Data
2	GND			Ground

3	HDMI_TX2-	K3	HDMI data 2 differential negative	Differential Data
4	HDMI_TX1+	J4	HDMI data 1 differential positive	Differential Data
5	GND			Ground
6	HDMI_TX1-	J3	HDMI data 1 differential negative	Differential Data
7	HDMI_TX0+	K6	HDMI data 0 differential positive	Differential Data
8	GND			Ground
9	HDMI_TX0-	K5	HDMI data 0 differential negative	Differential Data
10	HDMI_CLK+	J6	HDMI clock differential positive	Differential Data
11	GND			Ground
12	HDMI_CLK-	J5	HDMI clock differential negative	Differential Data
13	HDMI_CEC	W4	HDMI consumer electronic control	IO
14	NC		No Connection	
15	HDMICONN_I2CSCL	U5	HDMI display data channel clock	IO
16	HDMICONN_I2CSDA	T7	HDMI display data channel data	
17	GND		Ground	Ground
18	5V_VDD			Power
19	HDMICONN_HPLG	K1	HDMI display hot plug detect	IO
20	GND_SHELDS			Ground
21	GND_SHELDS			
22	GND_SHELDS			
23	GND_SHELDS			

4.2.4 USB Host

AES-MC-SBC-IMX8M-G provides a Double-layer USB Host connector (J5), the two USB port are two independent controllers, and each one could provide full speed USB3.0 data communication function, used to extend external devices in USB protocol.



Pin Number	Signal Name	Pin Number	Signal Name
1	VBUS	10	VBUS
2	D−	11	D−
3	D+	12	D+
4	GND	13	GND
5	StdA_SSRX−	14	StdA_SSRX−
6	StdA_SSRX+	15	StdA_SSRX+
7	GND_DRAIN	16	GND_DRAIN
8	StdA_SSTX−	17	StdA_SSTX−
9	StdA_SSTX+	18	StdA_SSTX+
Shell	Shield		

Figure 4.4 Double-layer USB Host connector

Table 4.2 USB Interface Pin Definition

USB Connector(J5)				
Pin	Signal Description	Ball	Description	Signal Type
1	VBUS1	D14		Power
2	USB1_HOST_DN	B14	USB1 PHY USB2.0 differential signal pair negative	Differential signal
3	USB1_HOST_DP	A14	USB1 PHY USB2.0 differential signal pair positive	
4	GND			Ground
5	USB1_HOST_RXN	B12	USB1 PHY USB3.0 received differential signal pair negative	Differential signal
6	USB1_HOST_RXP	A12	USB1 PHY USB3.0 received differential signal pair positive	
7	GND			Ground
8	USB1_HOST_TXN	B13	USB1 PHY USB3.0 transmit differential signal pair negative	Differential signal
9	USB1_HOST_TXP	A13	USB1 PHY USB3.0 transmit differential signal pair positive	
10	VBUS2	D9		Power
11	USB2_HOST_DN	B10	USB2 PHY USB2.0 differential signal pair negative	Differential signal
12	USB2_HOST_DP	A10	USB2 PHY USB2.0 differential signal pair positive	
13	GND			Ground
14	USB2_HOST_RXN	B8	USB2 PHY USB3.0 received differential signal pair negative	Differential signal
15	USB2_HOST_RXP	A8	USB2 PHY USB3.0 received differential signal pair positive	
16	GND			Ground
17	USB2_HOST_TXN	B9	USB2 PHY USB3.0 transmit differential signal pair negative	Differential signal

18	USB2_HOST_TXP	A9	USB2 PHY USB3.0 transmit differential signal pair positive	Differential signal
S1	Case Earth			Earth Ground
S2	Case Earth			
S3	Case Earth			
S4	Case Earth			

4.2.5 RJ-45

J13 is the physical interface of Gigabit Ethernet, the interface information is shown in the following picture:

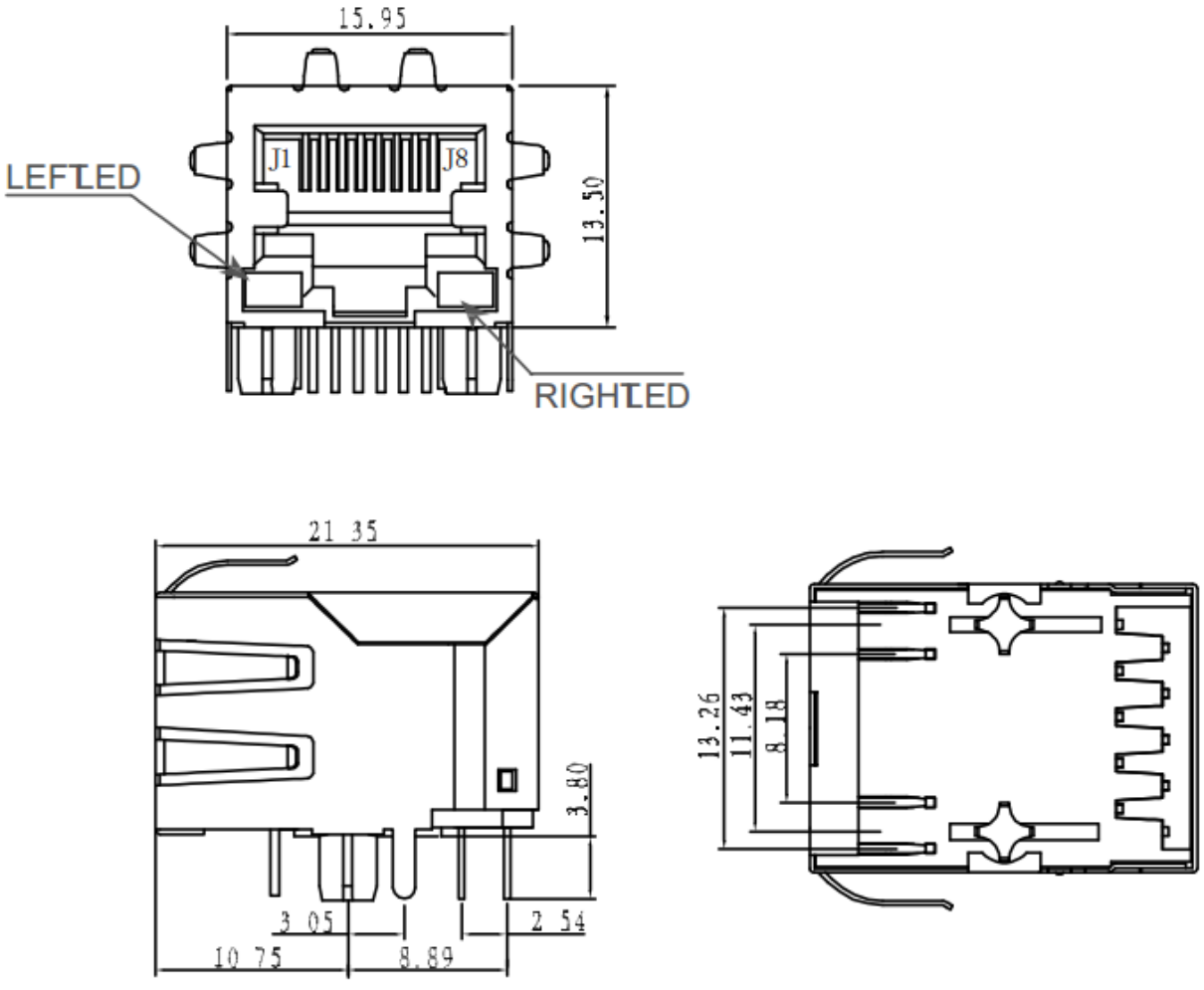


Figure 4.5 RJ45 Connector

Table 4.3 Ethernet Interface Pin Definition

RJ45 Ethernet(J13)				
Pin	Signal Description	Ball	Description	Signal Type
1	MIIA_TRP0		Media-dependent interface 0 positive	Differential signal
2	MIIA_TRN0		Media-dependent interface 0 negative	
3	MIIA_TRP1		Media-dependent interface 1 positive	
4	MiIA_TRN1		Media-dependent interface 1 negative	
5	NC		No connection	
6	NC		No connection	
7	MIIA_TRP2		Media-dependent interface 2 positive	Differential signal
8	MIIA_TRN2		Media-dependent interface 2 negative	
9	MIIA_TRP3		Media-dependent interface 3 positive	
10	MIIA_TRN3		Media-dependent interface 3 negative	
11	MIIA_LED_LINK/ Pull-up		Parallel LED output for data transmit	IO
12	Pull-down/ MIIA_LED_LINK			
13	MIIA_LED_ACT		Parallel LED output for 10/100/1000 BASE-T activity, active blinking	
14	Pull-up			
15	GND		Ground	Ground
16	GND		Ground	

4.2.6 Camera

J12 on the AES-MC-SBC-IMX8M-G is a 30-pin FPC connector that supports MIPI 2Lane Camera input.

The following picture shows the information of J12:

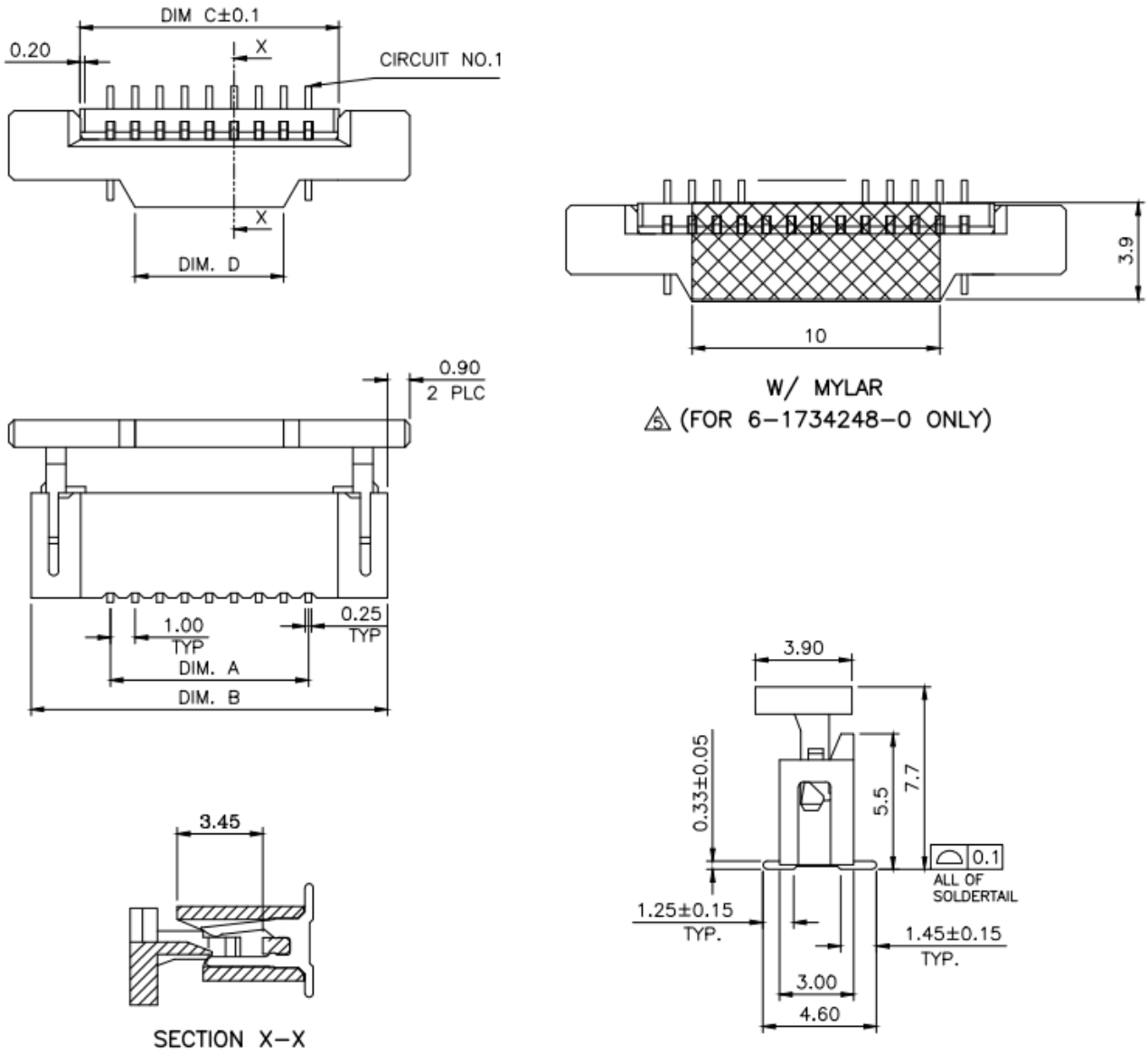


Figure 4.6 Camera Connector

Table 4.4 Camera Connector Pin Definition

Camera(J12)				
Pin	Signal Description	Ball		Signal Type

1	GND			Ground
2	CAM1_DN0	A23	MIPI CSI 1 received differential signal 0 pair negative	Differential signal
3	CAM1_DP0	B23	MIPI CSI 1 received differential signal 0 pair positive	
4	GND			Ground
5	CAM1_DN1	C22	MIPI CSI 1 received differential signal 1 pair negative	Differential signal
6	CAM1_DP1	D22	MIPI CSI 1 received differential signal 1 pair positive	
7	GND			Ground
8	CAM1_CN	A22	MIPI CSI 1 received differential clock pair negative	Differential signal
9	CAM1_CP	B22	MIPI CSI 1 received differential clock pair positive	
10	GND			Ground
11	GPIO3_IO18	K21	Output for powering sensor	Output
12	GPIO3_IO14	M20	Output for resetting sensor	Output
13	I2C1_SCL		I2C1 clock output	Output
14	I2C1_SDA		I2C1 data	IO
15	NVCC_3V3			Power
16	NC		No connection	
17	NC		No connection	
18	NC		No connection	
19	NC		No connection	
20	NC		No connection	
21	NC		No connection	
22	NC		No connection	
23	NC		No connection	
24	NC		No connection	
25	NC		No connection	
26	NC		No connection	
27	NC		No connection	
28	NC		No connection	

29	NC		No connection
30	NC		No connection

4.2.7 40 Pin Expansion Pin Header

J10 on the AES-MC-SBC-IMX8M-G is a 40 pin Extend Interface, used to support external devices.

The following picture shows the information of the 40 Pin expansion connector J10:

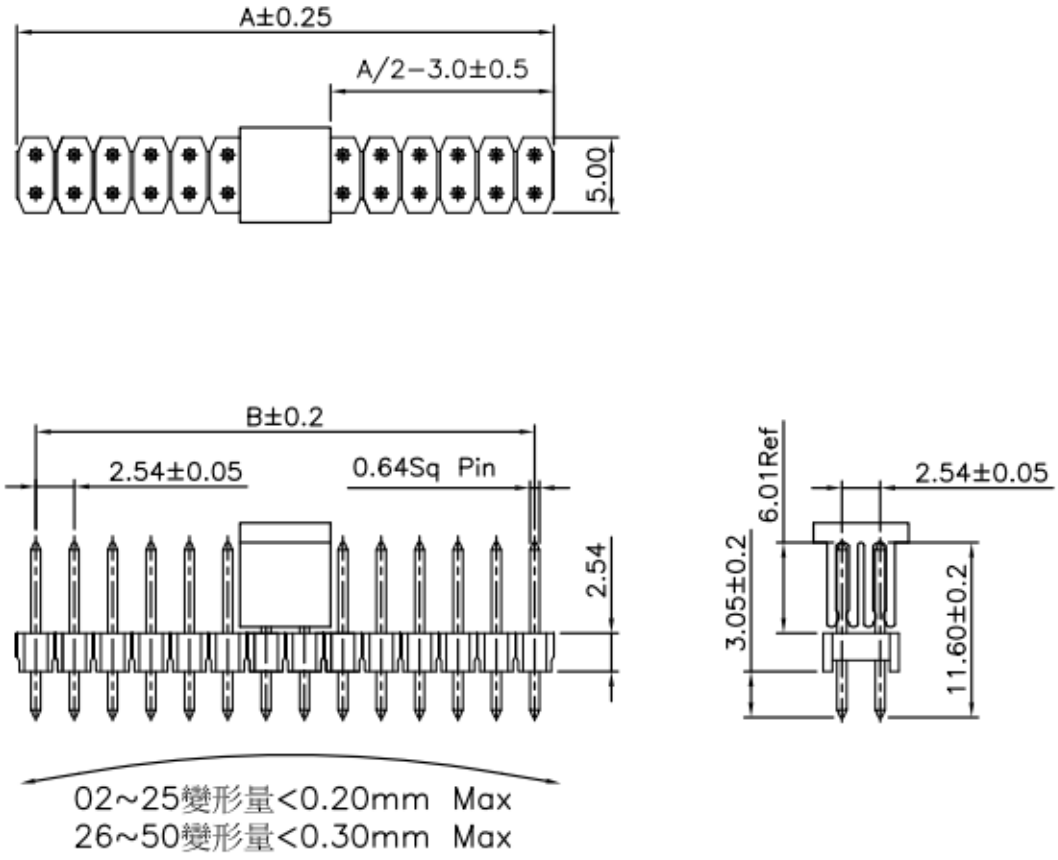


Figure 4.7 2.54mm Double Row Pin Header

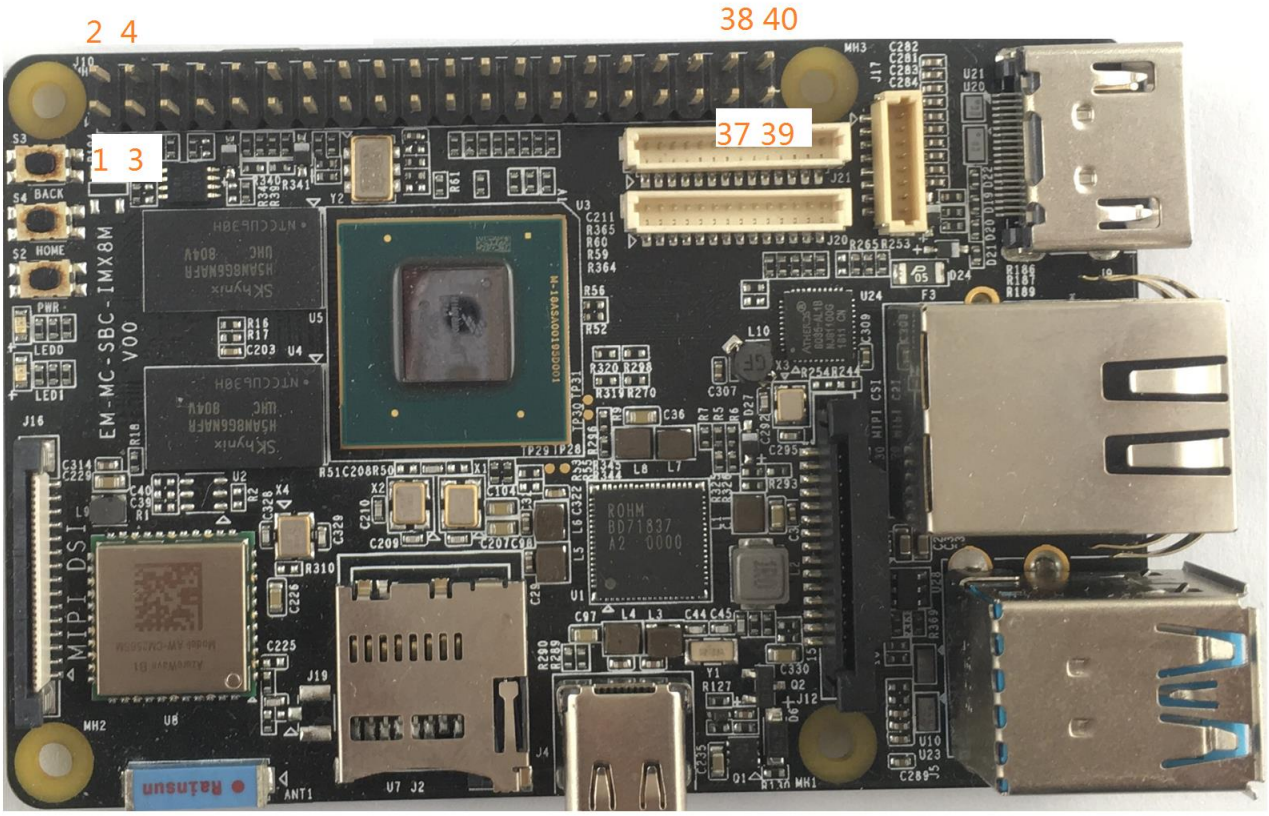


Figure 4.8 40Pin Pin Header Pin1 Position

Table 4.5 40 Pin Expansion Pin Header Definition

Expansion(J10)				
Pin	Signal Description	Ball		Signal Type
1	NVCC_3V3		3.3V/500mA output	Power
2	5V_IN		5V power supply input or output	Power
3	I2C2_SDA	F7	General-purpose input/output	IO
4	5V_IN		5V power supply input or output	Power
5	I2C2_SCL	G7	General-purpose input/output	IO
6	GND		Ground	Ground

7	GPIO3_IO16	K20	General-purpose input/output	IO
8	UART1_TXD	A7	General-purpose input/output	
9	GND		Ground	Ground
10	UART1_RXD	C7	General-purpose input/output	IO
11	GPIO3_IO17	K22	General-purpose input/output	
12	SAI2_TXC	J5	General-purpose input/output	
13	GPIO3_IO08	H22	General-purpose input/output	
14	GND		UART5 transmit Data	Ground
15	GPIO3_IO09	J21	General-purpose input/output	IO
16	UART2_RXD	B6	General-purpose input/output	
17	NVCC_3V3		3.3V/500mA output	Power
18	UART2_TXD	D6	General-purpose input/output	IO
19	GPIO3_IO06	G20	General-purpose input/output	
20	GND		Ground	Ground
21	GPIO3_IO07	J20	General-purpose input/output	IO
22	GPIO3_IO15	K19	General-purpose input/output	
23	GPIO3_IO00	G19	General-purpose input/output	
24	GPIO3_IO01	H19	General-purpose input/output	
25	GND		Ground	Ground
26	GPIO3_IO02	G21	General-purpose input/output	IO
27	I2C3_SDA	E9	General-purpose input/output	

28	I2C3_SCL	G8	General-purpose input/output	
29	GPIO3_IO05	H21	General-purpose input/output	
30	GND		Ground	Ground
31	GPIO3_IO10	L20	General-purpose input/output	IO
32	GPIO1_IO15	J6	General-purpose input/output	
33	GPIO1_IO13	K6	General-purpose input/output	
34	GND		Ground	Ground
35	SAI2_RXFS	J4	General-purpose input/output	IO
36	GPIO1_IO03		General-purpose input/output	
37	GPIO3_IO11	J22	General-purpose input/output	
38	SAI2_RXD	H6	General-purpose input/output	
39	GND		Ground	Ground
40	SAI2_TXD	G6	General-purpose input/output	IO

4.2.8 Wi-Fi/Bluetooth

AES-MC-SBC-IMX8M-G onboard Wi-Fi/Bluetooth module, support Wi-Fi 2.4G/5G Frequency, and Bluetooth V4.2 standard. The Wi-Fi/Bluetooth antennas have two type: onboard ceramic antenna or IPEX antenna.

- IPEX antenna (customized version)
  IPEX antenna is empty welding in default, if the customer needs to use this interface, please contact the Embest to customize.

  IPEX antenna connector's specification as follows:

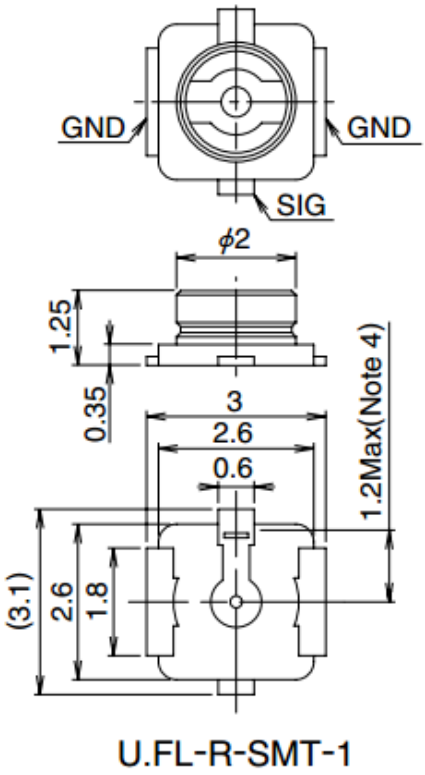


Figure 4.9 IPEX Antenna Connector

Table 4.6 Antenna Connector Pin Definition

Antenna(J19)			
Pin	Signal Description	Ball	Signal Type
1	IN	Data transmit	Antenna
2	GND		Ground
3	GND		

- Onboard Ceramic Antenna (Default)
  Onboard Ceramic Antenna's specification as follows:

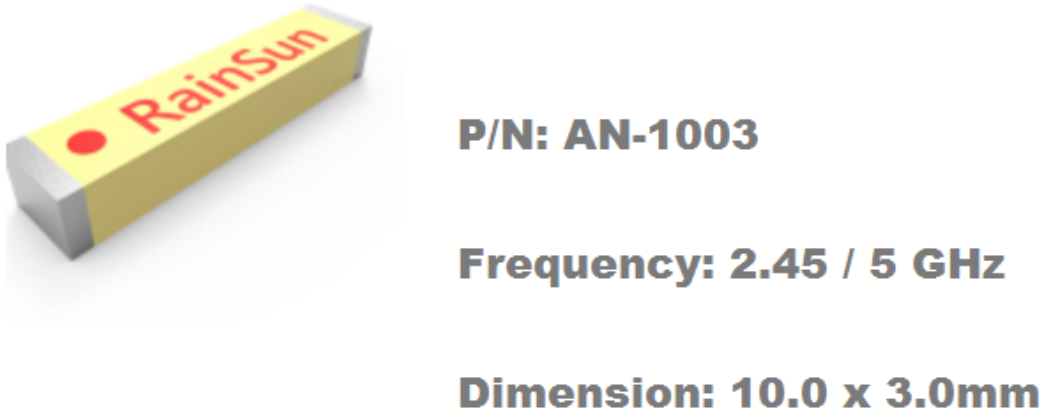


Figure 4.10 Onboard Ceramic Antenna

4.2.9 Micro SD Card (TF Card)

MicroSD card (TF Card) is used to start the code, the program system curing storage, or provide external storage function.

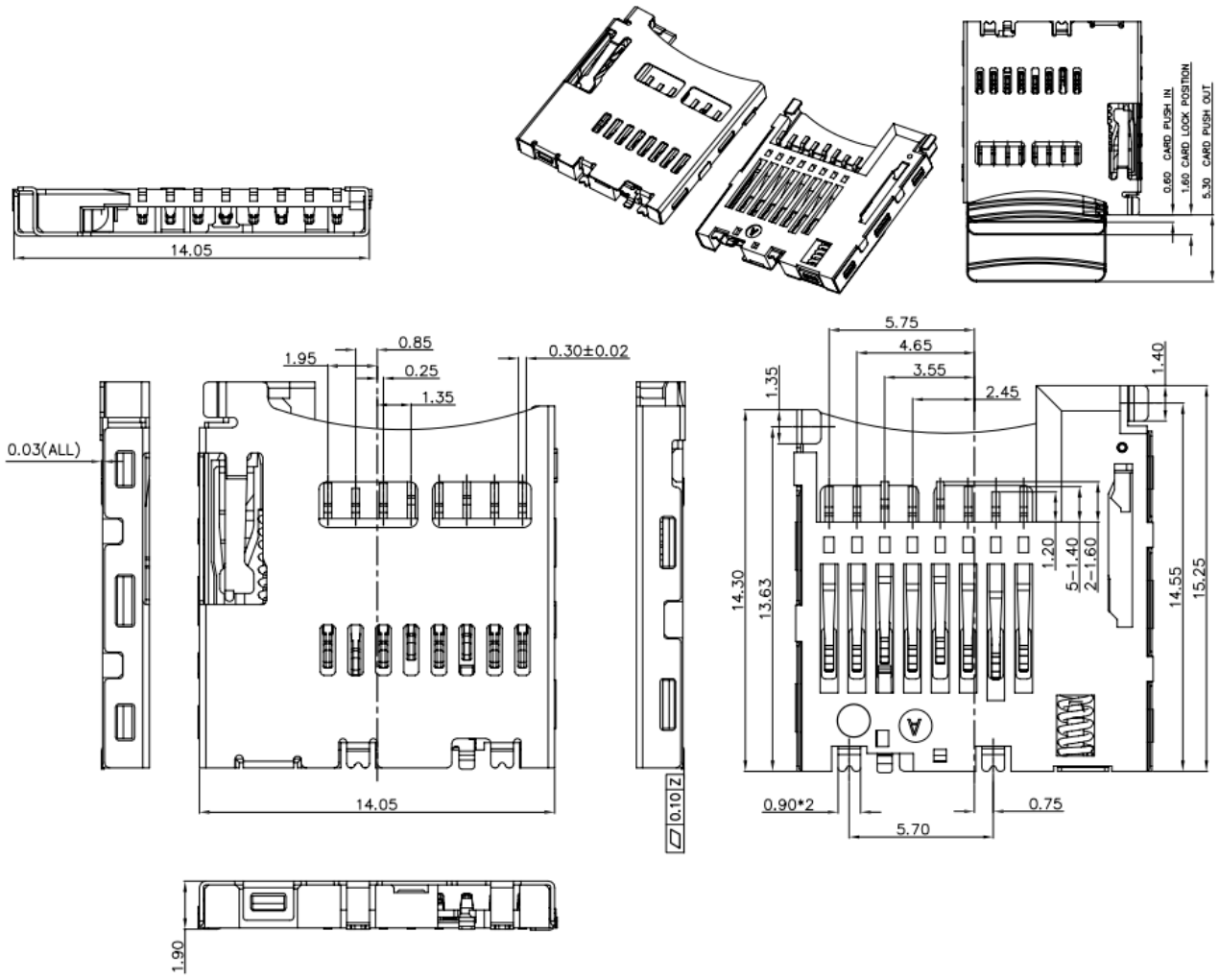


Figure 4.11 Micro SD Card Slot

Table 4.7 Micro SD Card Slot Pin Definition

TF card connector(J2)				
Pin	Signal Description	Ball		Signal Type
1	MMC_DAT2	A23	MMC Data bit2	IO
2	MMC_DAT3	B22	MMC Data bit3	
3	MMC_CMD	F19	MMC command	

4	3.3V_VDD		3.3V power supply	Power
5	MMC_CLK	C21	MMC reference clock	IO
6	GND			Ground
7	MMC_DAT0	A22	MMC Data bit0	IO
8	MMC_DAT1	E20	MMC Data bit1	
9	MMC_CD	R6	MMC card detect	
10	SHELL			SHELL
11	SHELL			
12	SHELL			
13	SHELL			

4.2.10 Extend Interface J17

J17 on the AES-MC-SBC-IMX8M-G is a 8 pin Wafer connector, used to support GPIO or UART interface, SPDIF.

The following picture shows the information of the 8 pin Wafer connector J17:

No. of Contacts	DIMENSIONS	
	DIM A	DIM B
02	1.00	4.50
03	2.00	5.50
04	3.00	6.50
05	4.00	7.50
06	5.00	8.50
07	6.00	9.50
08	7.00	10.50
09	8.00	11.50
10	9.00	12.50
11	10.00	13.50
12	11.00	14.50
13	12.00	15.50
14	13.00	16.50
15	14.00	17.50
16	15.00	18.50
17	16.00	19.50
18	17.00	20.50
19	18.00	21.50
20	19.00	22.50

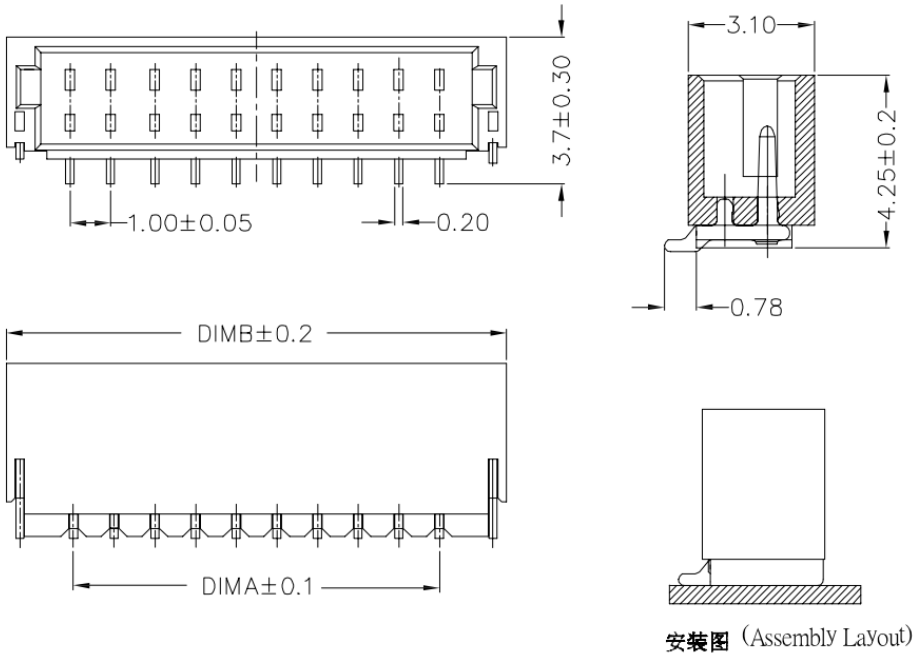


Figure 4.12 8 Pin Wafer Connector

Table 4.8 J17 Pin Definition

Expansion Interface1 (J17)				
Pin	Signal Description	Ball	Description	Signal Type
1	SPDIF_TX	F6	SPDIF output	IO
2	SPDIF_RX	G6	SPDIF input	
3	SPDIF_EXT_CLK	E6	SPDIF external clock input	
4	GND		GND	Ground
5	UART4_RXD	C6	UART4 Receive Data	IO
6	UART4_TXD	D7	UART4 Transmit Data	
7	GND		Ground	Ground
8	NVCC_3V3		3.3V power supply	Power

4.2.11 Extend Interface J20

J20 on the AES-MC-SBC-IMX8M-G is a 14 pin Wafer connector, used to support GPIO (SA1) expansion.

The following picture shows the information of the 8 pin Wafer connector J20:

No. of Contacts	DIMENSIONS	
	DIM A	DIM B
02	1.00	4.50
03	2.00	5.50
04	3.00	6.50
05	4.00	7.50
06	5.00	8.50
07	6.00	9.50
08	7.00	10.50
09	8.00	11.50
10	9.00	12.50
11	10.00	13.50
12	11.00	14.50
13	12.00	15.50
14	13.00	16.50
15	14.00	17.50
16	15.00	18.50
17	16.00	19.50
18	17.00	20.50
19	18.00	21.50
20	19.00	22.50

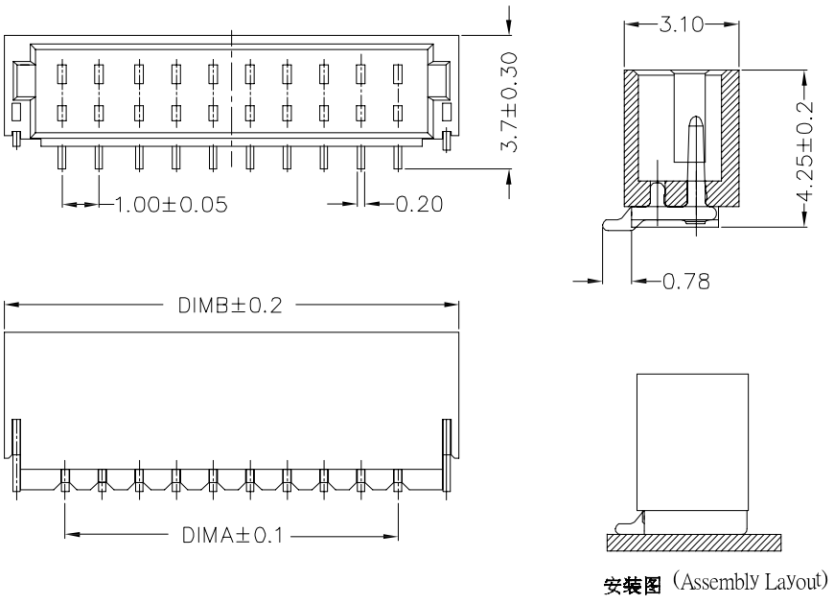


Figure 4.13 14 Pin Wafer Connector

Table 4.9 J20 Pin Definition

Expansion Interface1 (J20)				
Pin	Signal Description	Ball	Description	Signal Type
1	NVCC_3V3		3.3V/500mA power output	Power
2	GND		Ground	Ground
3	SAI1_MCLK	A3	SAI1 master clock output	IO
4	SAI1_TXC	E1	SAI1 transmit bit clock	
5	SAI1_TXFS	H1	SAI1 transmit L/R clock	
6	GND		Ground	Ground
7	SAI1_TXD7	C1	SAI1 transmit data bit7	IO
8	SAI1_TXD6	B3	SAI1 transmit data bit6	
9	SAI1_TXD5	C2	SAI1 transmit data bit5	
10	SAI1_TXD4	D2	SAI1 transmit data bit4	
11	SAI1_TXD3	D1	SAI1 transmit data bit3	
12	SAI1_TXD2	B2	SAI1 transmit data bit2	
13	SAI1_TXD1	E2	SAI1 transmit data bit1	
14	SAI1_TXD0	F2	SAI1 transmit data bit0	

4.2.12 Extend Interface J21

J21 on the AES-MC-SBC-IMX8M-G is a 14 pin Wafer connector, used to support GPIO (SA1) expansion.

The following picture shows the information of the 8 pin Wafer connector J21:

No. of Contacts	DIMENSIONS	
	DIM A	DIM B
02	1.00	4.50
03	2.00	5.50
04	3.00	6.50
05	4.00	7.50
06	5.00	8.50
07	6.00	9.50
08	7.00	10.50
09	8.00	11.50
10	9.00	12.50
11	10.00	13.50
12	11.00	14.50
13	12.00	15.50
14	13.00	16.50
15	14.00	17.50
16	15.00	18.50
17	16.00	19.50
18	17.00	20.50
19	18.00	21.50
20	19.00	22.50

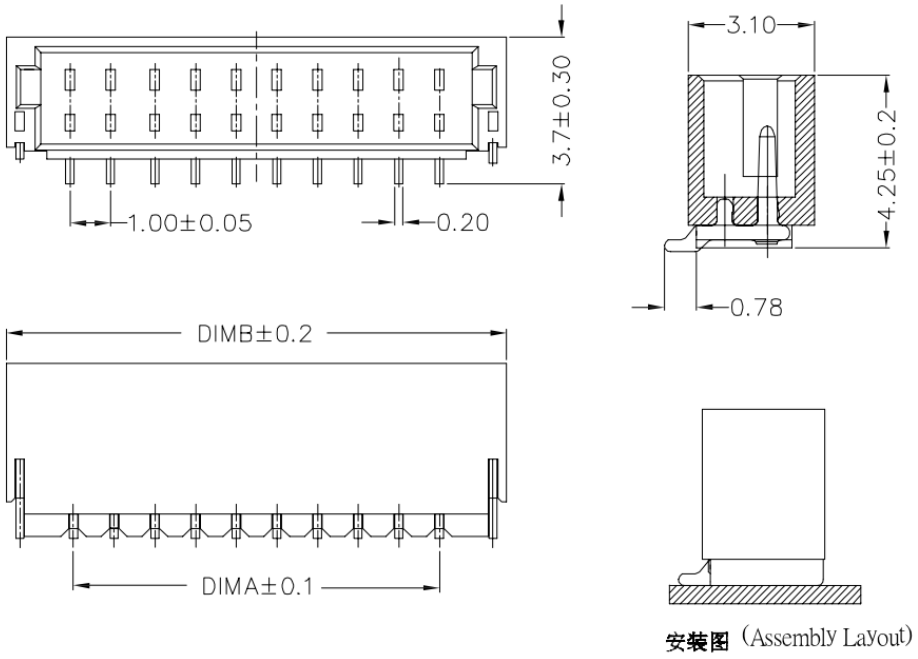


Figure 4.14 14 Pin Wafer Connector

Table 4.10 J21 Pin Definition

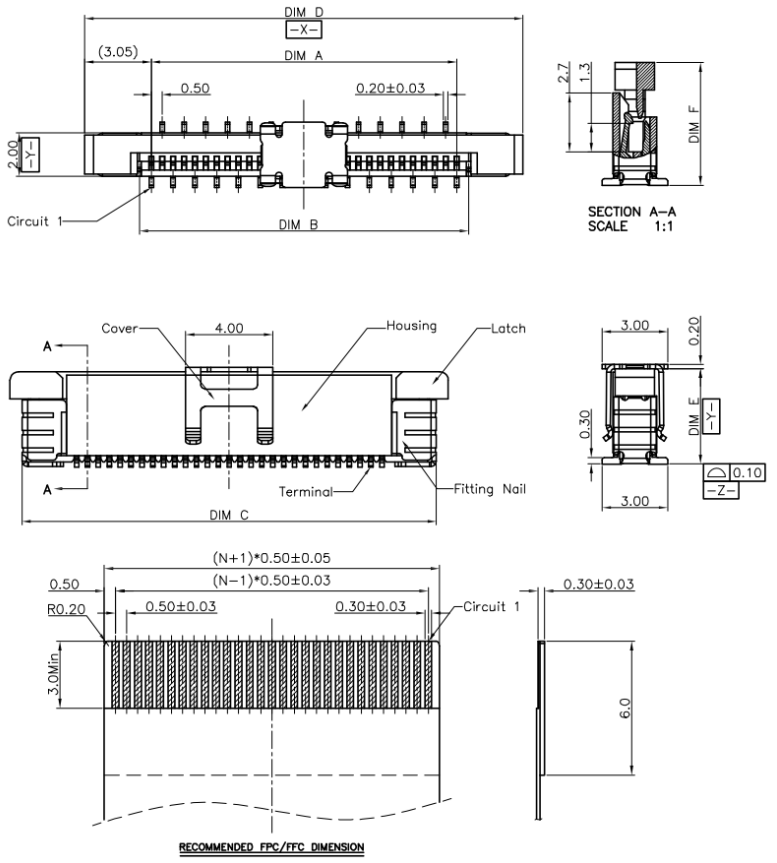
Expansion Interface1 (J21)				
Pin	Signal Description	Ball	Description	Signal Type
1	NVCC_3V3		3.3V/500mA power output	Power
2	GND		Ground	Ground
3	SAI1_MCLK	A3	SAI1 master clock output	IO
4	SAI1_RXC	K1	SAI1 receive bit clock	
5	SAI1_RXFS	L1	SAI1 receive L/R clock	
6	GND		Ground	Ground

7	SAI1_RXD7	G1	SAI1 receive data bit7	IO
8	SAI1_RXD6	G2	SAI1 receive data bit6	
9	SAI1_RXD5	F1	SAI1 receive data bit5	
10	SAI1_RXD4	J1	SAI1 receive data bit4	
11	SAI1_RXD3	J2	SAI1 receive data bit3	
12	SAI1_RXD2	H2	SAI1 receive data bit2	
13	SAI1_RXD1	L2	SAI1 receive data bit1	
14	SAI1_RXD0	K2	SAI1 receive data bit0	

4.2.13 MIPI-DSI

J16 on the AES-MC-SBC-IMX8M-G is a 30 pin FPC connector that supports MIPI-DSI high-definition and small size screen.

The following picture shows the information of 30-pin FPC connector J16:



CKTS	DIM A	DIM B	DIM C	DIM D	DIM E
4	1.50	2.60	6.50	7.60	
5	2.00	3.10	7.00	8.10	
6	2.50	3.60	7.50	8.60	
7	3.00	4.10	8.00	9.10	
8	3.50	4.60	8.50	9.60	
9	4.00	5.10	9.00	10.10	
10	4.50	5.60	9.50	10.60	
11	5.00	6.10	10.00	11.10	
12	5.50	6.60	10.50	11.60	
13	6.00	7.10	11.00	12.10	
14	6.50	7.60	11.50	12.60	
15	7.00	8.10	12.00	13.10	
16	7.50	8.60	12.50	13.60	
17	8.00	9.10	13.00	14.10	
18	8.50	9.60	13.50	14.60	
19	9.00	10.10	14.00	15.10	4.40
20	9.50	10.60	14.50	15.60	
21	40.00	11.10	15.00	16.10	
22	10.50	11.60	15.50	16.60	
23	11.00	12.10	16.00	17.10	
24	11.50	12.60	16.50	17.60	
25	12.00	13.10	17.00	18.10	
26	12.50	13.60	17.50	18.60	
27	13.00	14.10	18.00	19.10	
28	13.50	14.60	18.50	19.60	
29	14.00	15.10	19.00	20.10	
30	14.50	15.60	19.50	20.60	
31	15.00	16.10	20.00	21.10	
32	15.50	16.60	20.50	21.60	
33	16.00	17.10	21.00	22.10	
34	16.50	17.60	21.50	22.60	

Figure 4.15 30 Pin FPC Connector (MIPI-DSI)

Table 4.11 J16 Pin Definition

30Pin FPC Connector (J16)				
Pin	Signal Description	Ball	Description	Signal Type
1	GND		Ground	Ground
2	DSI_DP3	B15	MIPI DSI transmit differential signal 3 pair positive	Differential output
3	DSI_DN3	A15	MIPI DSI transmit differential signal 3 pair negative	
4	GND		Ground	Ground
5	DSI_DP2	B18	MIPI DSI transmit differential signal 2 pair positive	Differential output
6	DSI_DN2	A18	MIPI DSI transmit differential signal 2 pair negative	
7	GND		Ground	Ground
8	DSI_DP1	B16	MIPI DSI transmit differential signal 1 pair positive	Differential output
9	DSI_DN1	A16	MIPI DSI transmit differential signal 1 pair negative	
10	GND		Ground	Ground
11	DSI_DP0	B17	MIPI DSI transmit differential signal 0 pair positive	Differential output
12	DSI_DN0	A17	MIPI DSI transmit differential signal 0 pair negative	
13	GND		Ground	Ground
14	DSI_CKP	D16	MIPI DSI clock differential signal pair positive	Differential output
15	DSI_CKN	C16	MIPI DSI clock differential signal pair negative	
16	GND		Ground	Ground
17	DSI_TS_RST	P5	Touch screen reset output	Output
18	DSI_TS_nINT	A4	Touch screen interrupt input	Input
19	I2C4_SDA	F9	I2C port 4 data	IO
20	I2C4_SCL	F8	I2C port 4 clock	Output
21	DSI_EN	D5	MIPI DSI backlight enable output	Output

22	DSI_BL_PWM	T7	MIPI DSI backlight PWM output	Output
23	GND		Ground	Ground
24	NC		No connection	
25	NC		No connection	
26	GND		Ground	Ground
27	NC		No connection	
28	VSYS		5V power output	Power
29	VSYS		5V power output	
30	VSYS		5V power output	

4.3 Introduction of Peripheral Chips

4.3.1 AR8035

AR8035 Integrated 10/100/1000 Mbps Ethernet Transceiver. The AR8035 is a single port 10/100/1000 Mbps Tri-speed Ethernet PHY, which provides a low power, low BOM (Bill of Materials) cost solution for comprehensive applications including consumer, enterprise, carrier and home networks, etc.

AR8035 supports IEEE 802.3az Energy Efficient Ethernet (EEE) standard and Atheros proprietary SmartEEE, which allows legacy MAC/SoC devices without 802.3az support to function as the complete 802.3az system.

4.3.2 BD71837

The BD71837MWV integrates all the power voltage for i.MX 8M, including the peripheral power voltage. This significantly reduces the difficulty when customers develop their system. It shortens the development cycle and the development period of the product.

BD71837MWV is a Power Management IC specially designed for i.MX 8M by ROHM Semiconductor. It integrates 8 Buck regulators and 7 LDOs, supporting the processor to dynamically adjust the power to achieve the goal of energy saving. The chip provides 1.8V/3.3V optional MMC card power supply at the same time. Users could choose 1.8V or 3.3V output by changing the resistor to fit multimedia cards with various types of protocols. It provides a 32.768 kHz Crystal Oscillator Driver which could power the clocks circuit directly. It also provides several protection modes: output short circuit, output over voltage/current, over thermal protection, etc.

4.3.3 AW-CM256SM

The AW-CM256SM wireless module is compliant with the IEEE 802.11a/b/g/n/ac standard, supports connection up to 433.3Mbps transmit/receive (connect to WLAN using 802.11 ac protocol). The AW-CM256SM module provides a SDIO interface to Wi-Fi, UART/PCM interface to Bluetooth Functions. It enables a low power consumption and high-performance solution that is fit for IOT and other application fields.