ACP-3588

Industrial SBC with Rockchip RK3588

User's Manual

1st Ed – 15 April 2024

Part No. E2047DB0100R

FCC Statement

THIS DEVICE COMPLIES WITH PART 15 FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE.

(2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES.

THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS.

OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

Notice

This guide is designed for experienced users to setup the system within the shortest time. For detailed information, please always refer to the electronic user's manual.

Copyright Notice

Trademark Acknowledgement

Brand and product names are trademarks or registered trademarks of their respective owners.

Disclaimer

Avalue Technology Inc. reserves the right to make changes, without notice, to any product, including circuits and/or software described or contained in this manual in order to improve design and/or performance. Avalue Technology assumes no responsibility or liability for the use of the described product(s), conveys no license or title under any patent, copyright, or masks work rights to these products, and makes no representations or warranties that

these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described in this manual are for illustration purposes only. Avalue Technology Inc. makes no representation or warranty that such application will be suitable for the specified use without further testing or modification.

Life Support Policy

Avalue Technology's PRODUCTS ARE NOT FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE PRIOR WRITTEN APPROVAL OF Avalue Technology Inc.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into body, or (b) support or sustain life and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

A Message to the Customer

Avalue Customer Services

Each and every Avalue's product is built to the most exacting specifications to ensure reliable performance in the harsh and demanding conditions typical of industrial environments. Whether your new Avalue device is destined for the laboratory or the factory floor, you can be assured that your product will provide the reliability and ease of operation for which the name Avalue has come to be known.

Your satisfaction is our primary concern. Here is a guide to Avalue's customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

Technical Support

We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in your product documentation. These answers are normally a lot more detailed than the ones we can give over the phone. So please consult the user's manual first.

To receive the latest version of the user's manual; please visit our Web site at:
http://www.avalue.com

Product Warranty

Avalue warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Avalue, or which have been subject to misuse, abuse, accident or improper installation. Avalue assumes no liability under the terms of this warranty as a consequence of such events. Because of Avalue's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If any of Avalue's products is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details. If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU type and speed, Avalue's products model name, hardware & BIOS revision number, other hardware and software used, etc.) Note anything abnormal and list any on-screen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information available.
3. If your product is diagnosed as defective, obtain an RMA (return material authorization) number from your dealer. This allows us to process your good return more quickly.
4. Carefully pack the defective product, a complete Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Warning: Battery Notice
Important! To prolong battery life, please avoid adhering the battery to possible source of heat.
重要! 為了延長電池壽命，請避免電池附著在有可能出現高溫的地方
バッテリ寿命を延長するために、高温の付近にバッテリーを付着することを避けてください。

Content

1. Getting Started

1.1 Safety Precautions

Warning!

Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

Caution!

Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

1.2 Packing List

Before you begin installing your single board, please make sure that the following materials have been shipped:

- 1 x ACP-3588-A1-1R SBC

If any of the above items is damaged or missing, contact your retailer.

1.3 Document Amendment History

Revision	Date	By	Comment
1st	April 2024	Avalue	Initial Release

1.4 Manual Objectives

This manual describes in details Avalue Technology ACP-3588 Single Board.

We have tried to include as much information as possible but we have not duplicated information that is provided in the standard IBM Technical References, unless it proved to be necessary to aid in the understanding of this board.

We strongly recommend that you study this manual carefully before attempting to set up ACP-3588 or change the standard configurations. Whilst all the necessary information is available in this manual we would recommend that unless you are confident, you contact your supplier for guidance.

Please be aware that it is possible to create configurations within the CMOS RAM that make booting impossible. If this should happen, clear the CMOS settings, (see the description of the Jumper Settings for details).

If you have any suggestions or find any errors regarding this manual and want to inform us of these, please contact our Customer Service department with the relevant details.

1.5 System Specifications

System	
CPU	RockChip RK3588 Octa-core 64-bit 4 x Cortex-A76 + 4 x Cortex-A55 8nm advanced process, up to 2.4GHz
System Memory	4GB LPDDR4
Storage	
M.2	1 x Key.M NGFF 75Pin
SATA	2 x SATA 3.0
eMMC	32GB eMMC
Edge I/O and Onboard I/O	
I/O extension	4xRS232 2xI2C
LAN	1 x 100M/1000M Ethernet
Network others	802.11abgn+Wi-Fi6/BT5 (optional)
USB	1 x USB Host2.0 , 1 x USB OTG 2.0 (Type C) , 2 x USB Host2.0 1 x USB Host3.0
Display	1 x LVDS 1 x MIPI DSI 1 x EDP or 1xHDMI2.1 (choose one from two) 1 x HDMI 2.1
Video Input	1 x HDMI input: 1 x HDMI2.0 4K@60fps 1 x MIPI CSI
Audio	Speaker: Left and right stereo sound 1xSPDIF Audio interface, (microphone array)
GPIO	2 x 20P pitch 2.0mm GPIO/UART/SPI/I2C
DC Input	12V/2A (DC5.5 × 2.1mm)
LED Indicator	LED Power supply × 1
Mechanical & Environmental Specification	
Operating Temp.	-5 ~ 65 °C
Storage Temp.	-10 - 70 °C
Operating Humidity	5% to 95%, non-condensing
Size (L x W)	150*125mm（No heat sink）
Weight	150g
Vibration Test	Package Vibration Test

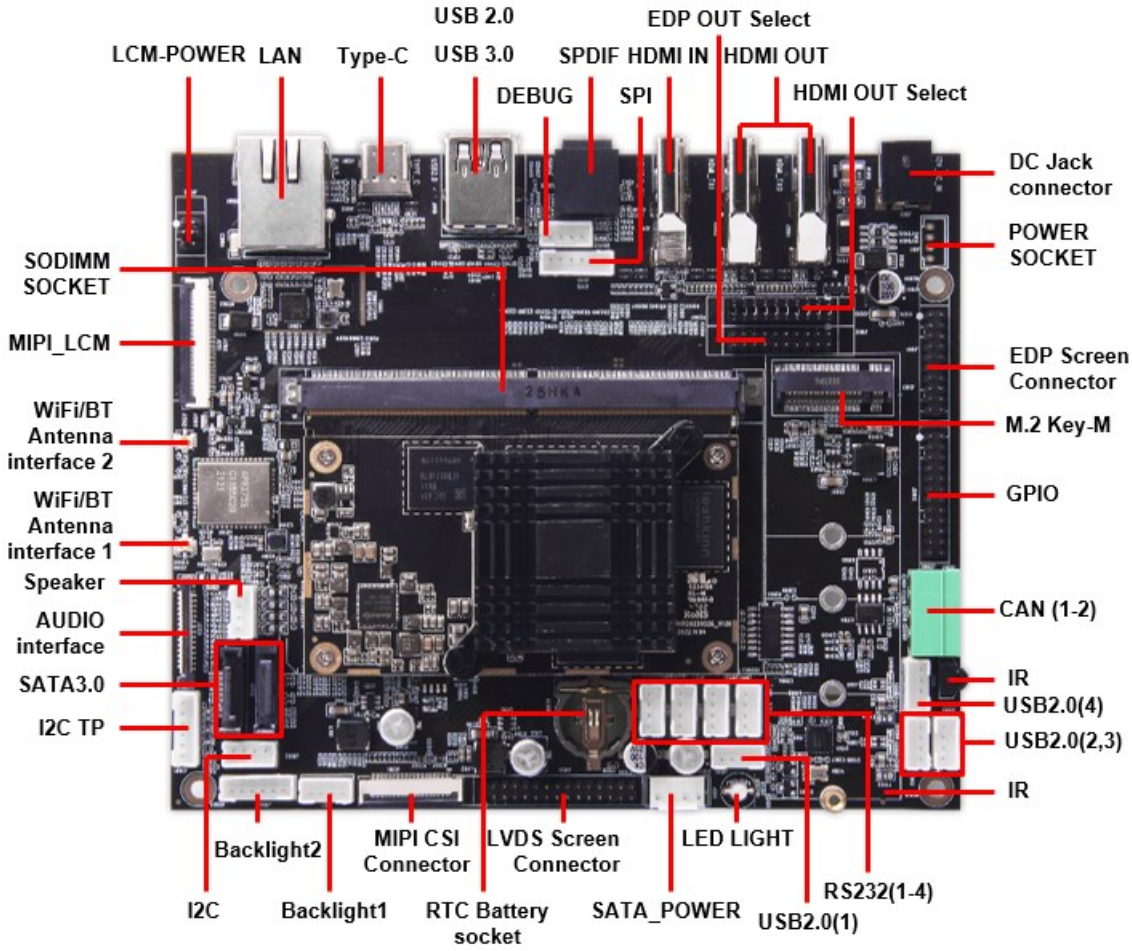
Vibration Test	Reference IEC60068-2-64 Testing procedures Test Fh: Vibration broadband random Test 1. PSD: 0.026G²/Hz, 2.16 Grms 2. Non-operation mode 3. Test Frequency: 5-500Hz 4. Test Axis: X,Y and Z axis 5. 30 min. per each axis 6. IEC 60068-2-64 Test:Fh Random Vibration Operation Reference IEC60068-2-64 Testing procedures Test Fh : Vibration broadband random Test 1. PSD: 0.00454G²/Hz, 1.5 Grms 2. Operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh Random Vibration Non Operation Reference IEC60068-2-64 Testing procedures Test Fh : Vibration broadband random Test 1. PSD: 0.01818G²/Hz, 3.0 Grms 2. Non Operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh
Drop Test	Reference ISTA 2A, Method : IEC-60068-2-32 Test: Ed Drop Test 1. One corner , three edges, six faces 2. ISTA 2A, IEC-60068-2-32 Test:Ed
OS Information	Andrio 12

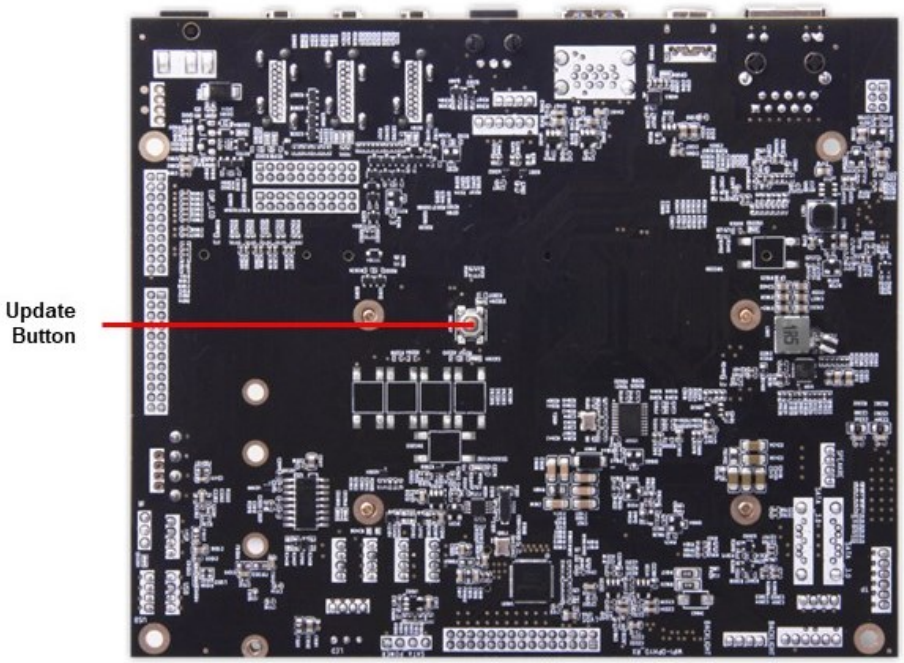
.

Note: Specifications are subject to change without notice.

2. Hardware Configuration

2.1 Product Overview

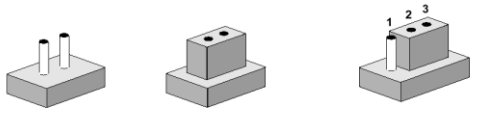




2.2 Jumper and Connector List

You can configure your board to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch.

It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper you connect the pins with the clip. To "open" a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case, you would connect either two pins.



Open Closed Closed 2-3

The jumper settings are schematically depicted in this manual as follows:

Open Closed Closed 2-3

A pair of needle-nose pliers may be helpful when working with jumpers.

Connectors on the board are linked to external devices such as hard disk drives, a keyboard, or floppy drives. In addition, the board has a number of jumpers that allow you to configure your system to suit your application.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

The following tables list the function of each of the board's jumpers and connectors.

Connectors

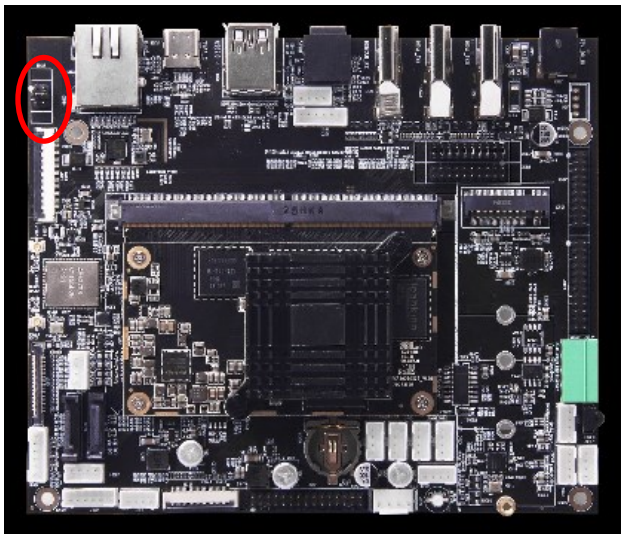
Label	Function	Note
LAN	LAN	100M/1000M Ethernet
Type-C	Type-C	
USB 2.0 **USB 3.0**	USB 2.0 Type A/USB 3.0 Type A	
DEBUG	DEBUG	4P Header , pitch 2.0mm
SPDIF	SPDIF	
SPI	SPI	6P Header, pitch 2.0mm
HDMI IN	HDMI IN	
HDMI OUT	HDMI OUT (1,2)	
HDMI OUT Select	HDMI OUT Select	10P , 2.0mm spacing
EDP OUT Select	eDP OUT Select	10P , 2.0mm spacing

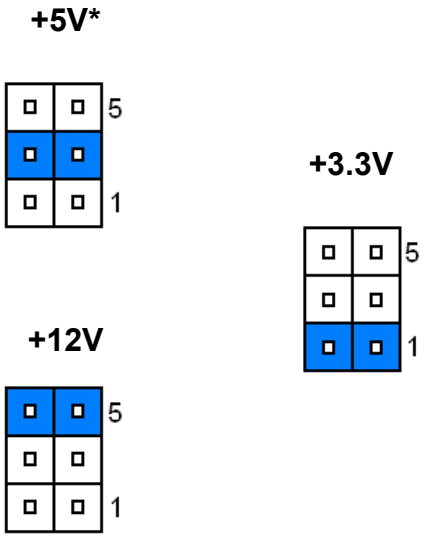
DC Jack connector	DC Jack connector	12V/2A
POWER SOCKET	POWER SOCKET	4P Header, pitch 2.0mm
EDP Screen Connector	eDP Screen Connector	10P header, pitch 2.0mm
M.2 Key-M	M.2 Key-M	NGFF 75Pin
GPIO	GPIO	12P header, pitch 2.00mm
CAN(1,2)	CAN	4P 3.81mm phoenix terminal
IR	IR	
USB2.0(4)	USB2.0(4)	4P Header, pitch 2.0mm
USB2.0(2,3)	USB2.0(2,3)	4P Header, pitch 2.0mm
RS232(1-4)	RS232(1-4)	4P Header, pitch 2.0mm
LED LIGHT	LED LIGHT	(External Expansion IR)
USB2.0(1)	USB2.0(1)	4P Header, pitch 2.0mm
SATA_POWER	SATA_POWER	4P Header, pitch 2.54mm
RTC Battery socket	RTC Battery socket	
LVDS Screen Connector	LVDS Screen Connector	15P header, pitch 2.0mm
MIPI CSI Connector	FPC Connector	30P FPC, pitch 0.5mm(MIPI CSI)
Backlight1	Backlight1	4P Header, pitch 2.0mm
Backlight2	Backlight2	6P Header, pitch 2.0mm 12V Power
I2C	I2C	4P Header, pitch 2.0mm
I2C TP	I2C TP	6P Header, pitch 2.0mm
SATA3.0	SATA3.0	
AUDIO interface	AUDIO interface	30P, FPC pitch 0.5mm (Mic array)
Speaker	Speaker	4P Header, pitch 2.0mm
WiFi/BT Antenna interface 1	WiFi/BT Antenna interface 1	IPEX
WiFi/BT Antenna interface 2	WiFi/BT Antenna interface 2	IPEX
SODIMM SOCKET	SODIMM SOCKET	MXM 314P 0.5mm H7.8 SMD
MIPI_LCM	FPC Connector	40P, FPC pitch 0.5mm (MIPI DSI)

LCM-POWER	LCM-POWER	3PHeader, pitch 2.0mm (3.3V/5V/12V optional)
Update Button	Update Button	

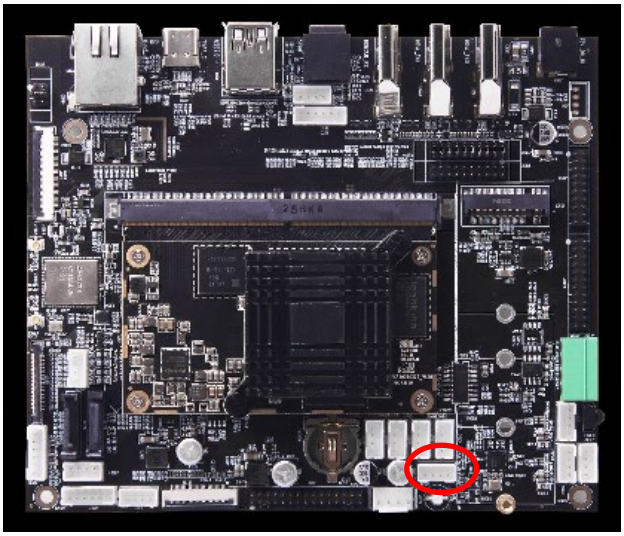
2.3 Setting Jumpers & Connectors

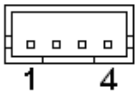
2.3.1 PANEL POWER (J1702)





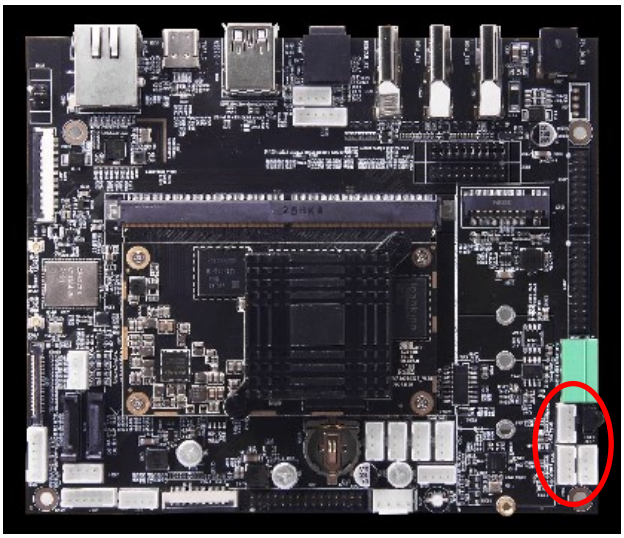
2.3.2 USB Connector (J1501)





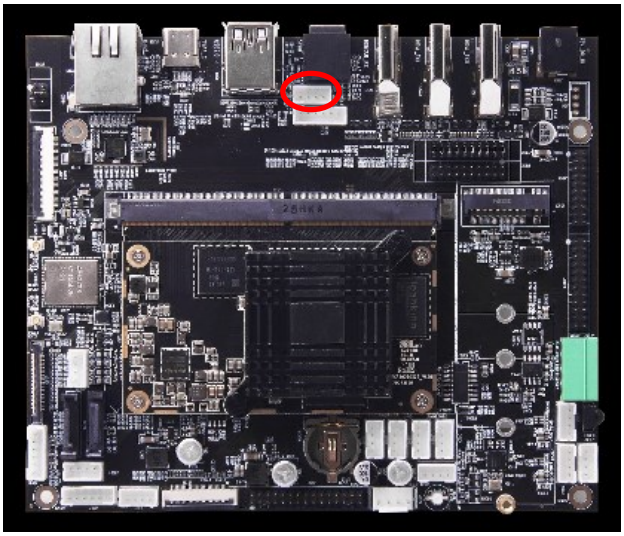
PIN	Signal
1	GND
2	DP
3	DM
4	VCC

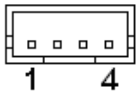
2.3.3 USB Connector (J1502/J1503/J1504)



PIN	Signal
4	VCC
3	DM
2	DP
1	GND

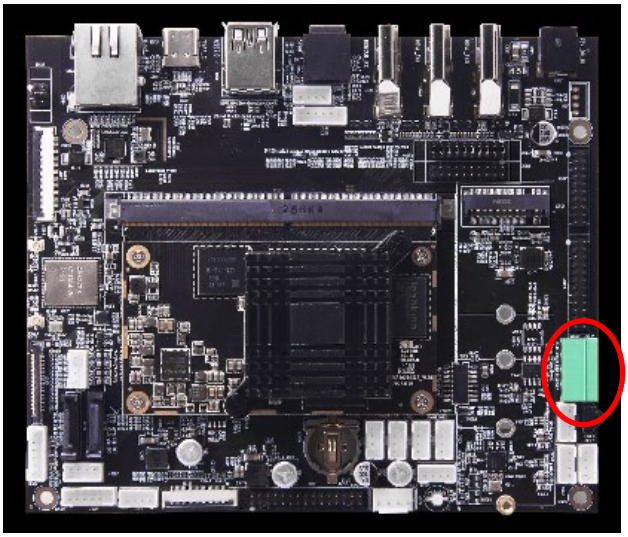
2.3.4 Debug Connector (J3101)





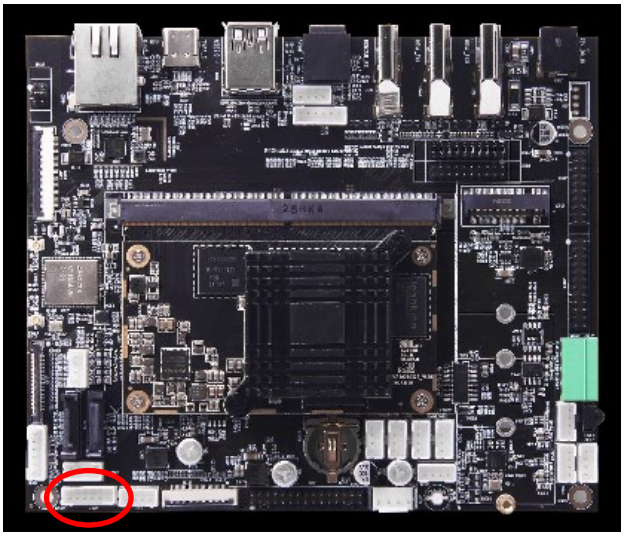
PIN	Signal
1	RX
2	Ground
3	TX
4	VCC

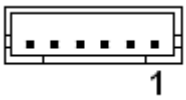
2.3.5 CAN Bus Connector (J2906)



PIN	Signal
4	GND
3	CAN_L
2	GND
1	CAN_H

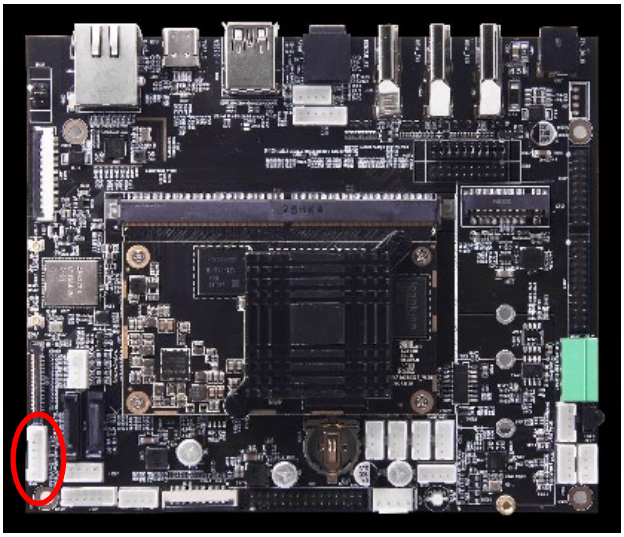
2.3.6 SPI Connector (J3102)





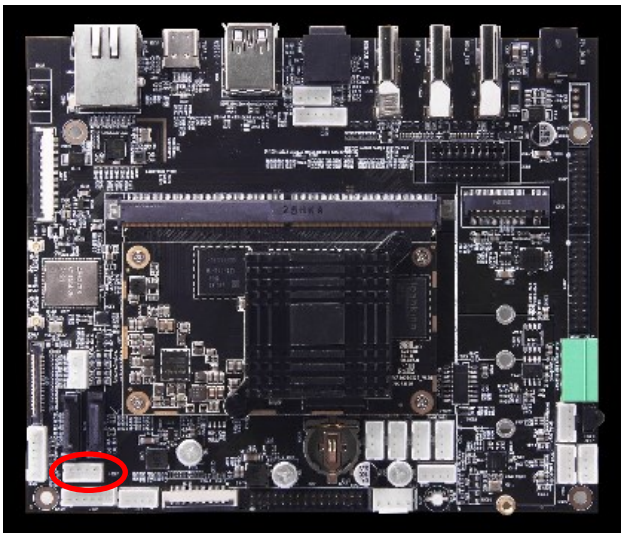
PIN	Signal
1	GND
2	SPI_MOSI
3	SPI_MISO
4	SPI_CLK
5	SPI_CS
6	VCC_SPI

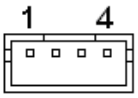
2.3.7 I2C for TP Connector (J3001)



PIN	Signal
6	GND
5	RESET
4	INT
3	SDA
2	SCL
1	VCC

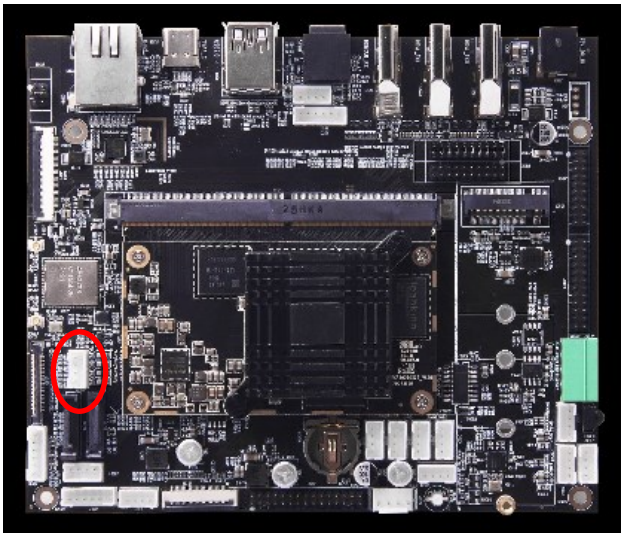
2.3.8 I2C Connector (J3002)





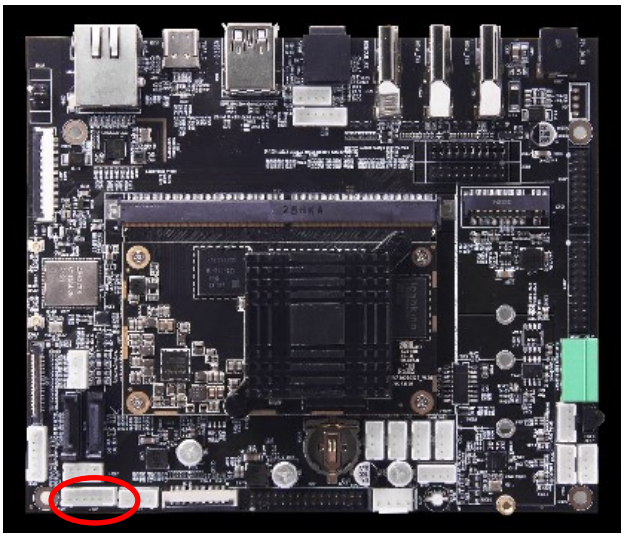
PIN	Signal
1	VCC
2	SCL
3	SDA
4	GND

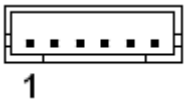
2.3.9 SPEAKER Connector (J2401)



PIN	Signal
1	AL+
2	AL-
3	AR+
4	AR-

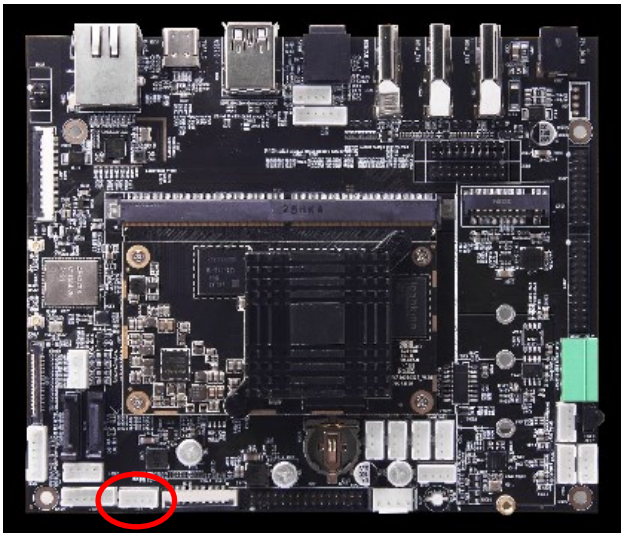
2.3.10 BACKLIGHT Connector (J1602)

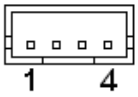




PIN	Signal
1	GND
2	GND
3	PWM
4	EN
5	VCC
6	VCC

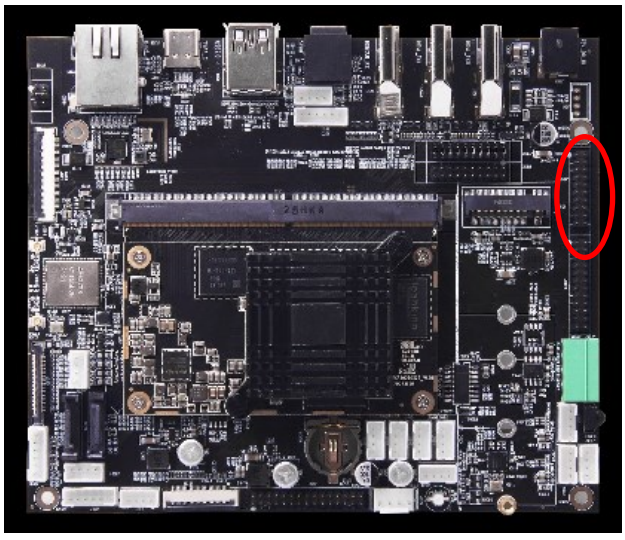
2.3.11 BACKLIGHT for no Backlight Board Panel (J1601)

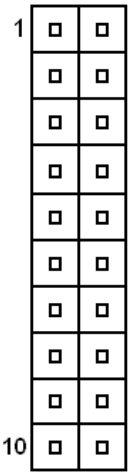




PIN	Signal
1	POWER
2	POWER
3	GND
4	GND

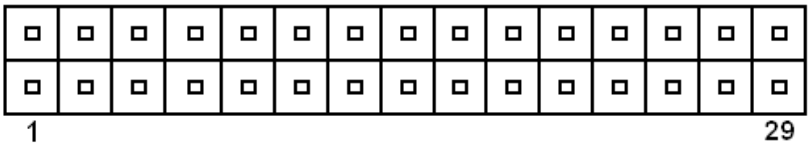
2.3.12 eDP Connector (J1901)

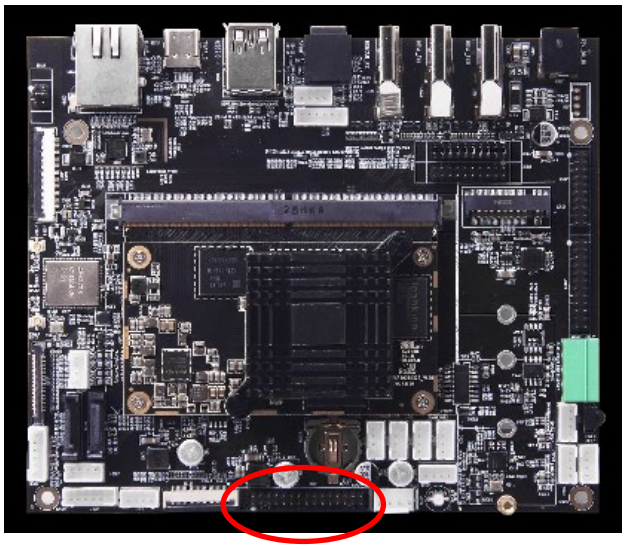




Signal	PIN	PIN	Signal
VDD	1	2	VDD
GND	3	4	GND
D0-	5	6	D0+
D1-	7	8	D1+
D2-	9	10	D2+
D3-	11	12	D3+
GND	13	14	GND
AUX-	15	16	AUX+
GND	17	18	GND
VCC/GND	19	20	EDP_HDP

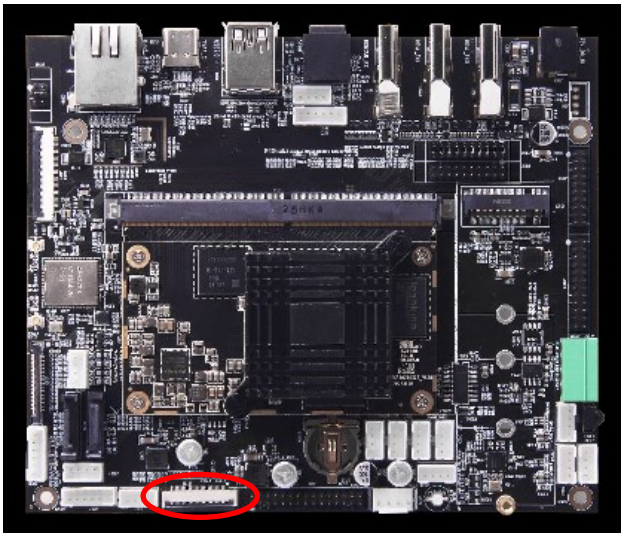
2.3.13 LVDS Connector (J1801)





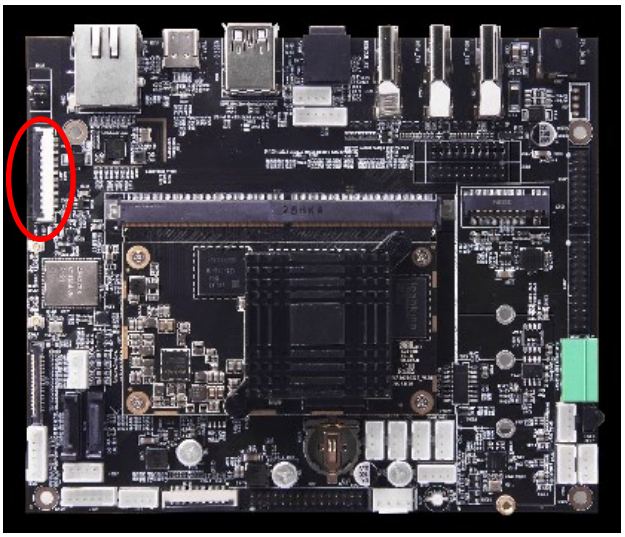
Signal	PIN	PIN	Signal
VDD	1	2	VDD
VDD	3	4	GND
GND	5	6	GND
LVDS0_DN0	7	8	LVDS0_DP0
LVDS0_DN1	9	10	LVDS0_DP1
LVDS0_DN2	11	12	LVDS0_DP2
GND	13	14	GND
LVDS0_CLKN	15	16	LVDS0_CLKP
LVDS0_DN3	17	18	LVDS0_DP3
LVDS1_DN0	19	20	LVDS1_DP0
LVDS1_DN1	21	22	LVDS1_DP1
LVDS1_DN2	23	24	LVDS1_DP2
GND	25	26	GND
LVDS1_CLKN	27	28	LVDS1_CLKP
LVDS1_DN3	29	30	LVDS1_DP3

2.3.14 MIPI CSI Connector (J2201)



PIN	Signal
1	NC
2	VCC2V8
3	VDD1V2
4	VCC1V8
5	NC
6	GND
7	VCC2V8
8	GND
9	SDA
10	SCL
11	RESET
12	VCC1V8
13	GND
14	MCLK
15	GND
16	DP3
17	DN3
18	GND
19	DP2
20	DN2
21	GND
22	DP1
23	DN1
24	GND
25	CLKP
26	CLKN
27	GND
28	DP0
29	DN0
30	GND

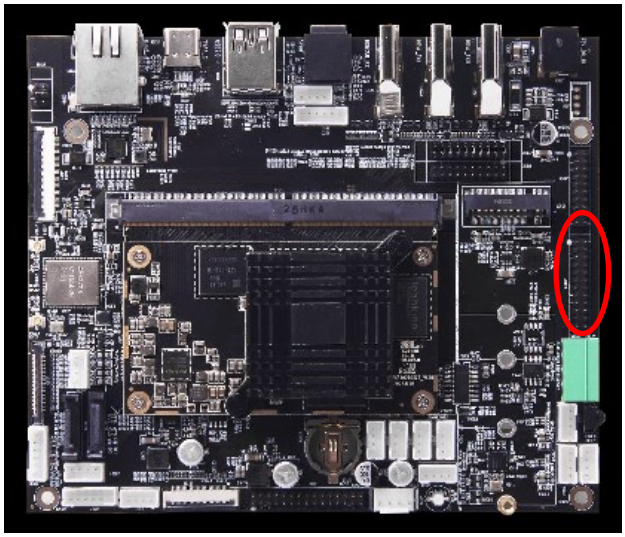
2.3.15 MIPI DSI Connector (J1703)

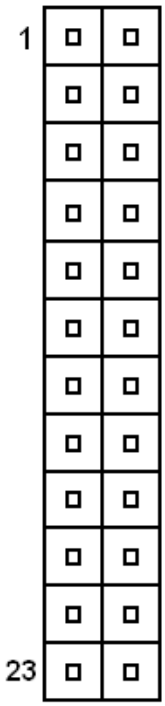


PIN	Signal
1	NC
2	VCI_3.3V
3	IOVCC
4	GND
5	RESET
6	NC
7	GND
8	DN0
9	DP0
10	GND

PIN	Signal
11	DN1
12	DP1
13	GND
14	CLKN
15	CLKP
16	GND
17	DN2
18	DP2
19	GND
20	DN3
21	DN3
22	GND
23	NC
24	NC
25	GND
26	ID
27	PWM_OUT
28	NC
29	NC
30	GND
31	LED-
32	LED-
33	NC
34	NC
35	NC
36	NC
37	NC
38	NC
39	LED+
40	LED+

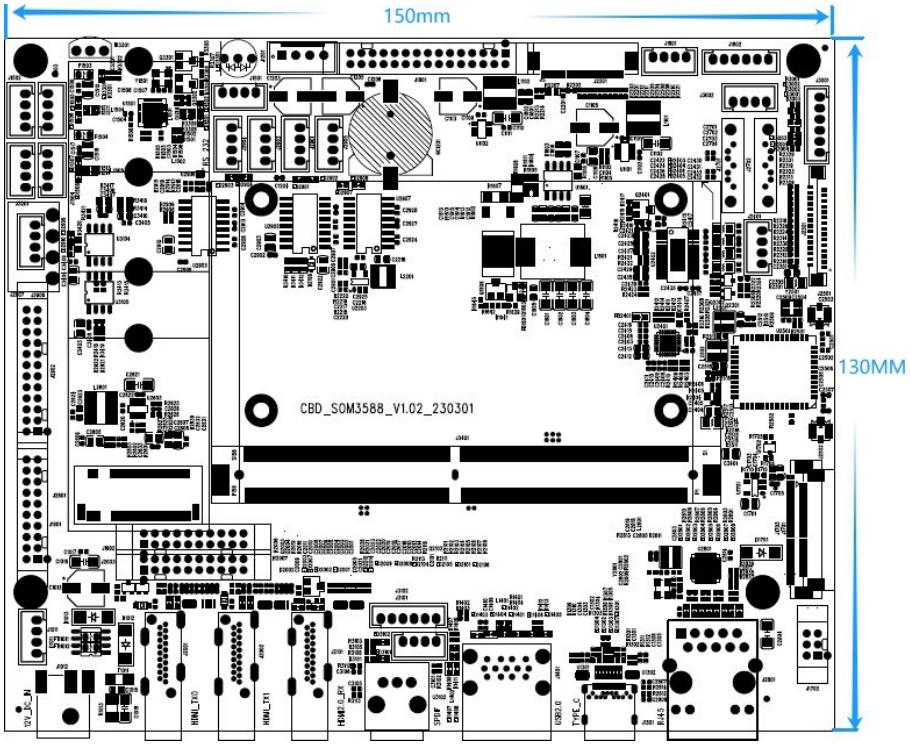
2.3.16 GPIO Connector (J2902)



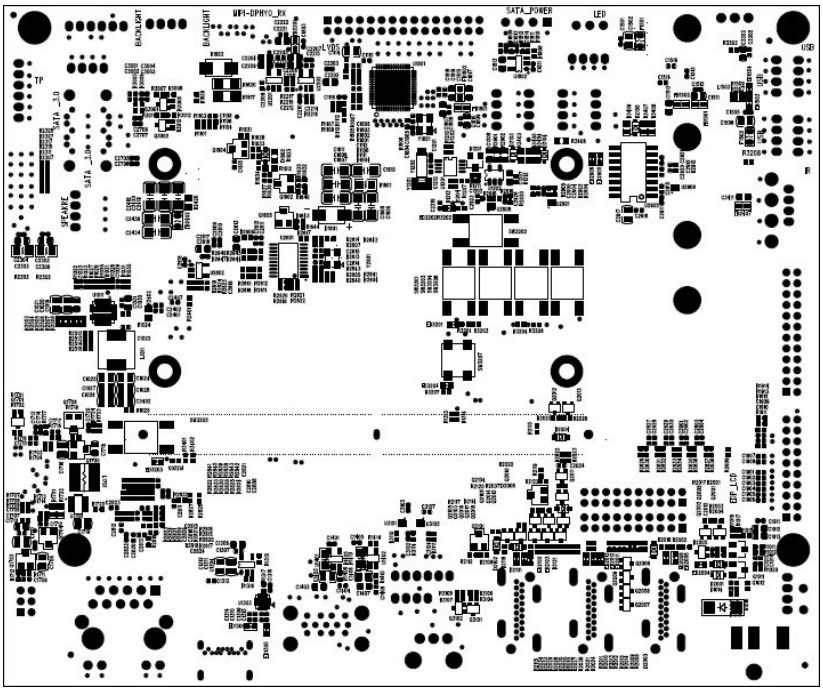


Signal	PIN	PIN	Signal
SDMMC0_ D3/GPIO4_D3	1	2	I2C4_SCL/ GPIO2_B5
SDMMC0_ D2/GPIO4_D2	3	4	I2C4_SDA/ GPIO2_B4
SDMMC0_ D1/GPIO4_D1	5	6	TYPEC1_USB20_ VBUSDET
SDMMC0_ D0/GPIO4_D0	7	8	TYPEC1_ USB20_OTG_ID
SDMMC0_ CLK/GPIO4_D5	9	10	I2C1_SCL/ GPIO0_D4
GND	11	12	I2C1_SDA/ GPIO0_D5
SDMMC0_ CMD/GPIO4_D4	13	14	SARADC_IN2
SDMMC0_ DET/GPIO0_A4	15	16	SARADC_ VIN3_HP_HOOK
SDMMC0_PWREN/ GPIO4_A5	17	18	SARADC_IN4
SARADC_IN6	19	20	SARADC_IN7
VCC_3V3	21	22	VCC_5V0
GND	23	24	GND

3. Mechanical Drawing



Unit: mm



Unit: mm