RK3568S Industrial Control Board Hardware Design Use Guidance

Rev. 1. 2

2022-11-17

Version Records

Version Num	Modified instructions	Modifier	Date
V1.0	Initial Documentation	Zbb	2022-8-1
V1.1	Perfect Module Boot Mode	Zbb	2022-8-9
V1.2	Fixed Some Features	Zbb	2022-11-17

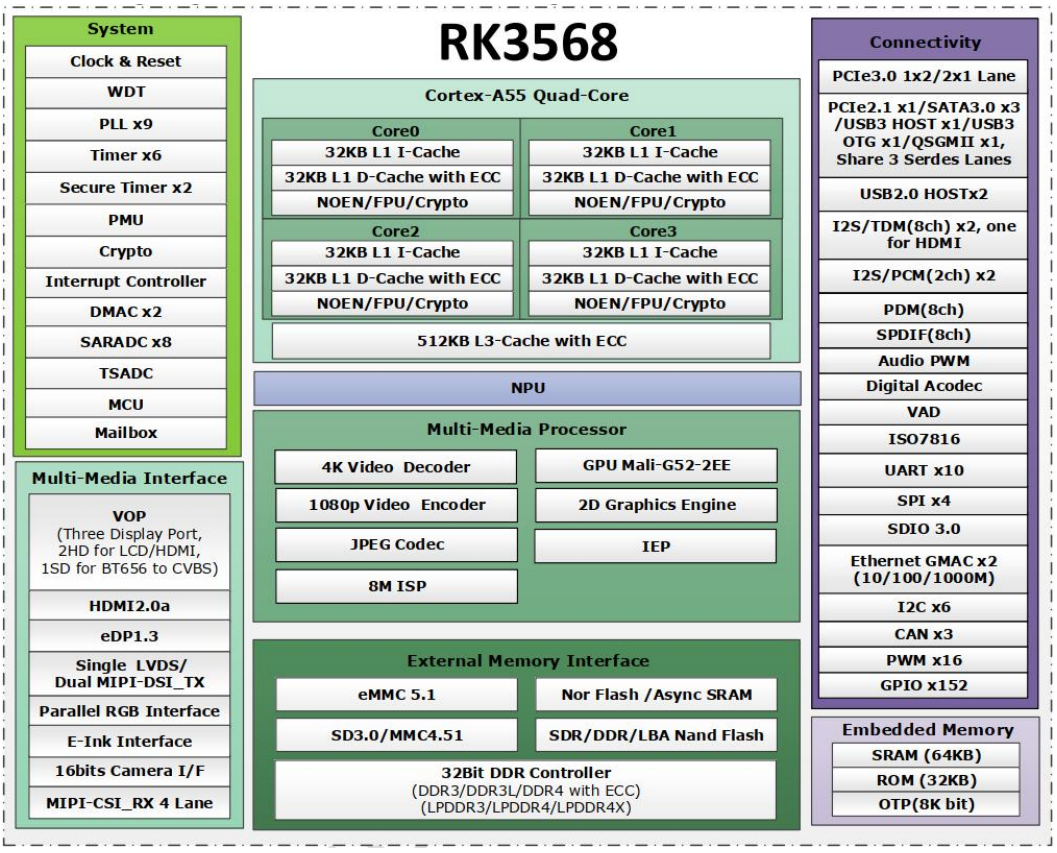
Catalog

Chapter 1 Product Hardware Resources

RK3568S industrial control board is an industrial-grade product launched by WTK, which is mainly used to match the WTK RK3568S industrial core board. Hangzhou WTK RK3568S core board is based on the ARM Cortex-A55 microprocessor of Rockchip company, which has the characteristics of high performance, low power consumption, multi-interface and low cost. At the same time, it provides 3D graphics acceleration and integration of key peripherals, which can meet the needs of various applications. It supports mainstream DDR4 memory, and provides dual-channel Gigabit Ethernet and multi-channel serial port to meet the needs of industrial products.

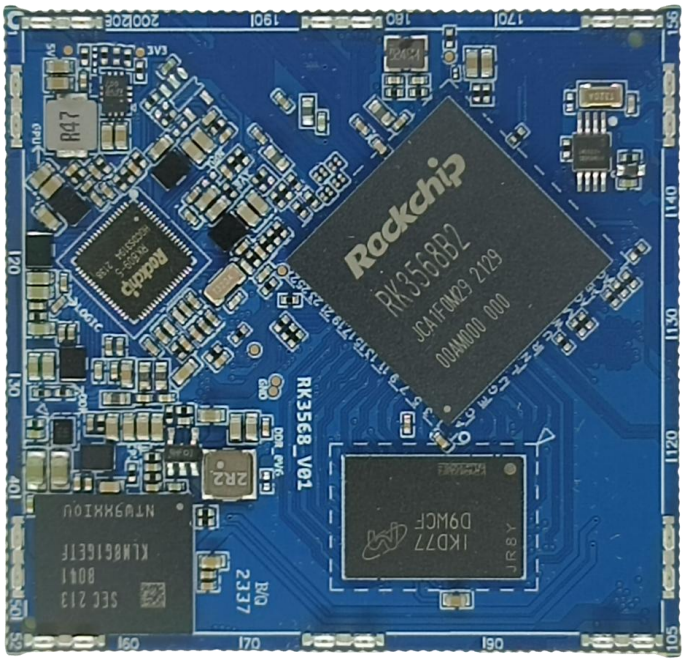
The industrial control board is composed of two parts: RK3568S core board and RK3568S industrial control board. It is equipped with LVDS, HDMI display interface, 2*Gigabit Ethernet, 2*RS232, 2*RS485, 2*CAN, USB2.0 Host, WiFi, 4G, SD card, audio input and output interfaces, and supports external expansion SPI, ADC, I2C, GPIO, backlight, etc.

1.1 Product CPU Performance

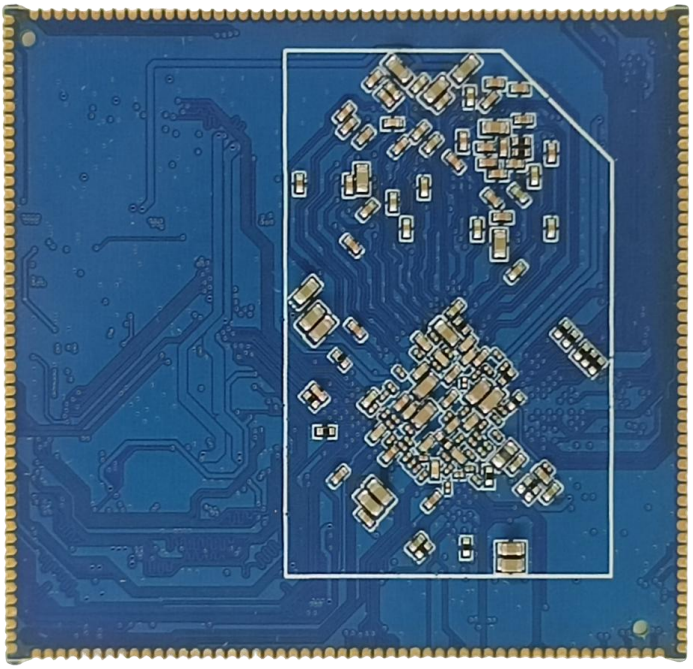


1.2 Product Appearance Diagram

(a) Core Board

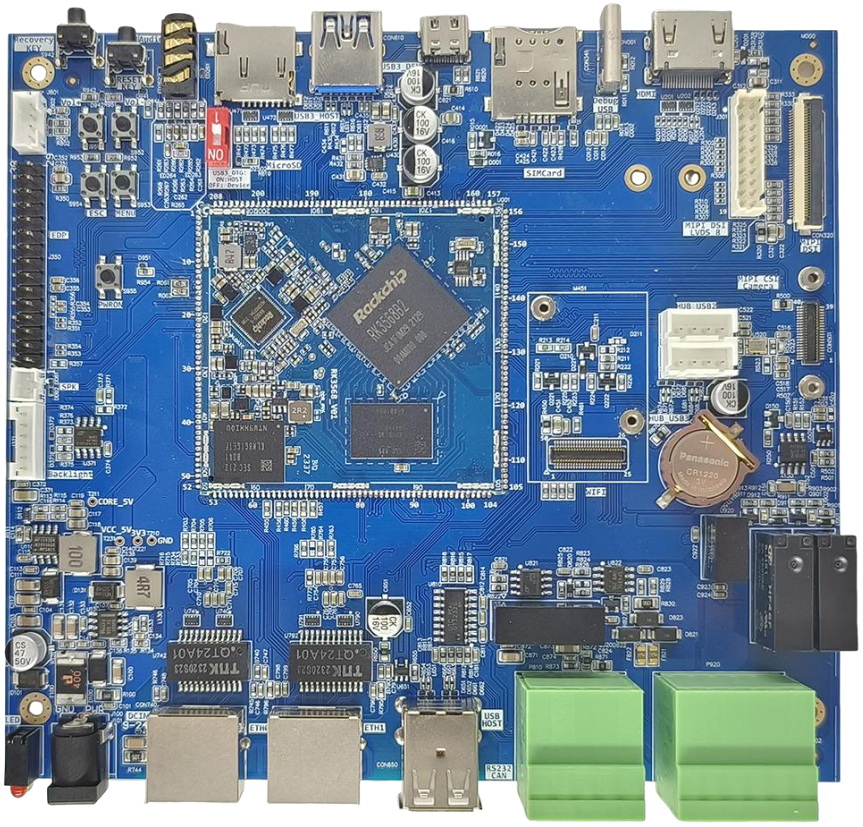


Front of core board

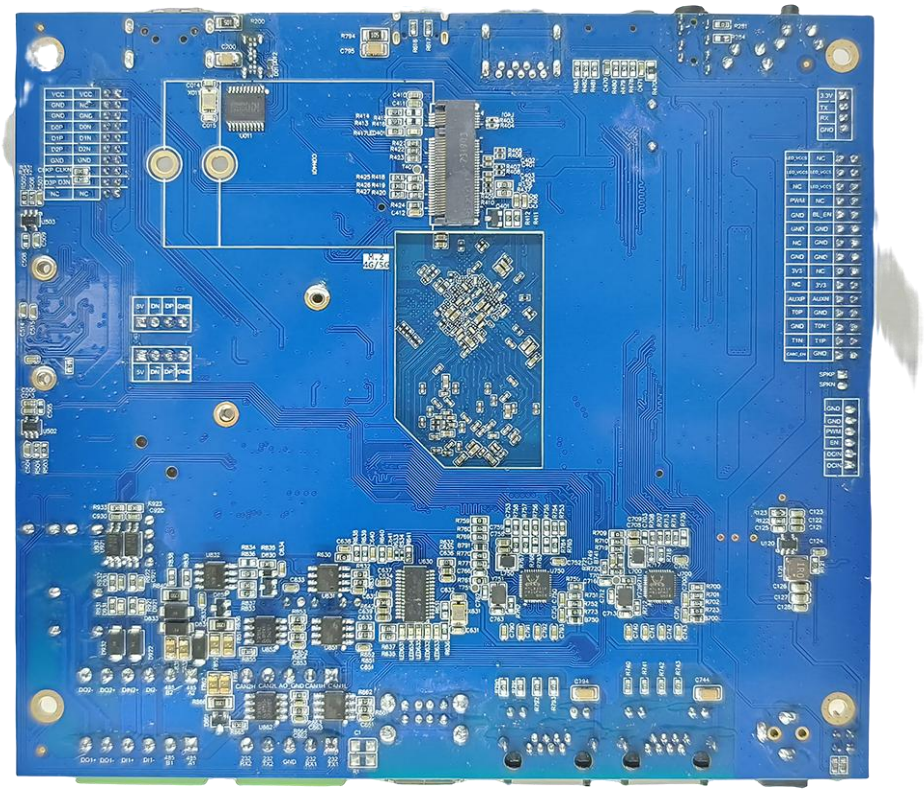


Back of core board

(b) Industrial Control Board

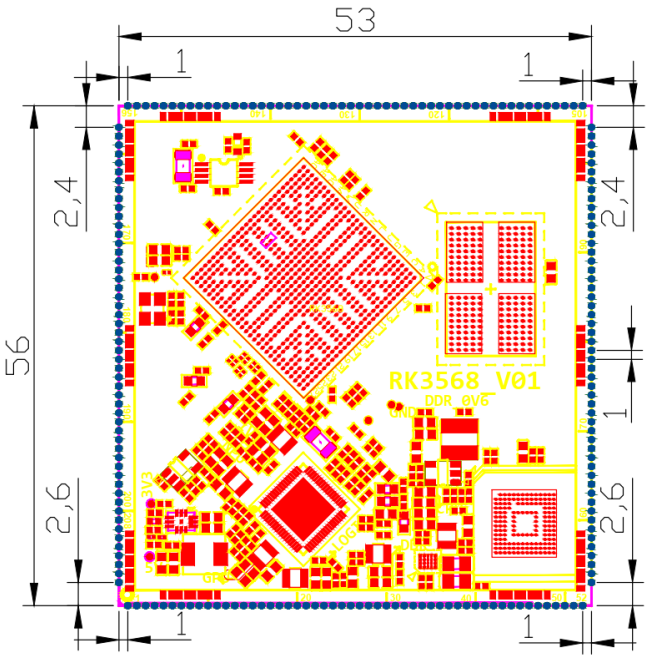


The front of the industrial control board

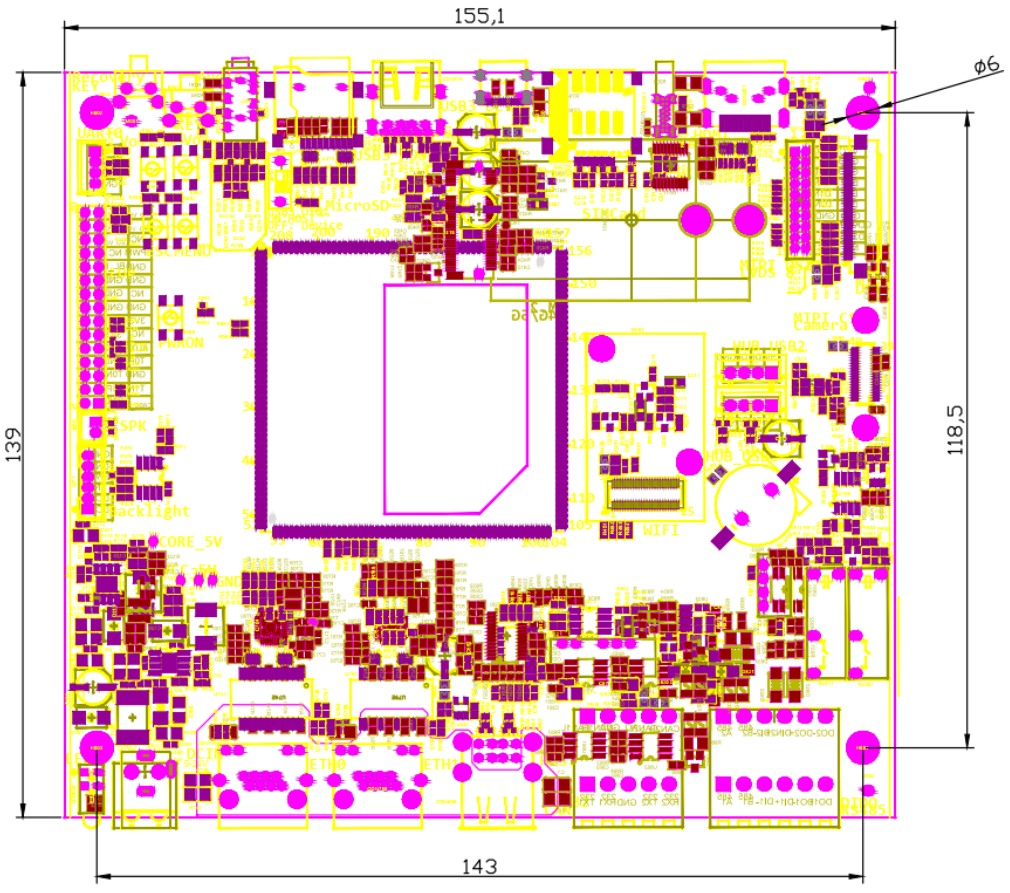


Back of the ICS board

1.2 Product Dimensional Structure Drawing

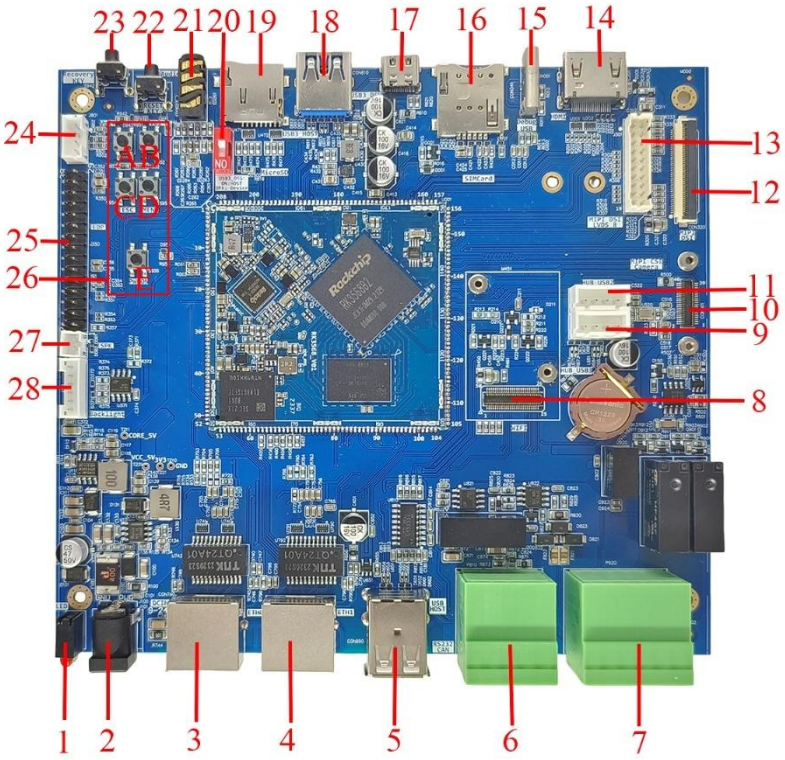


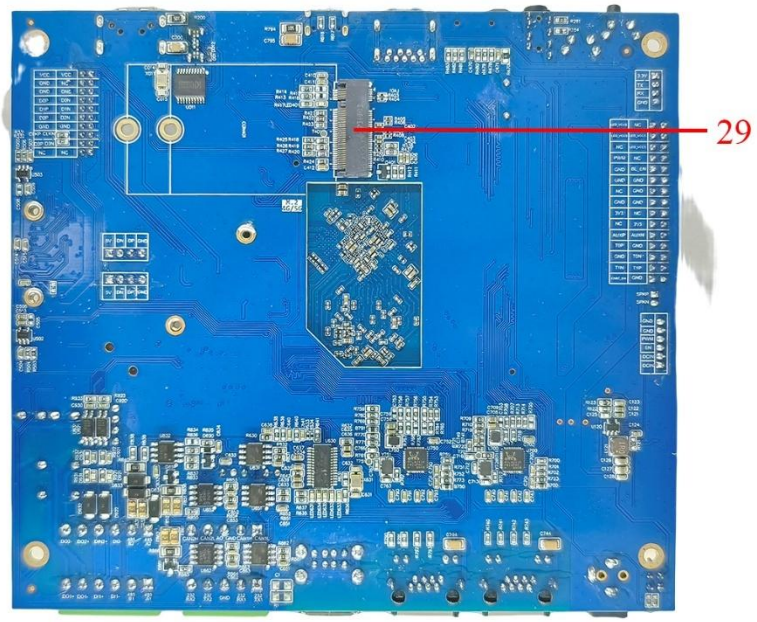
Core board size drawing



Industrial control board size drawing

1.3 Industrial Control Board Resource Interface





Num	Functional Description	Num	Functional Description	Num	Functional Description
1	LED Display Light	11	Host USB port	21	Audio Headphone Jack
2	Power Socket 2.5mm	12	MIPI DSI Interface	22	Reset Button
3	ETH0 Ethernet	13	MIPI DSI/LVDS8 Interface	23	Recovery Button
4	ETH1 Ethernet	14	HDMI Interface	24	UART0 Serial port
5	2 x Host USB port	15	USB Debug Interface	25	EDP Interface
6	RS232/CAN extended Interface1	16	SIM Card	26	KEY Button
7	RS485/IO extended Interface2	17	USB Device Type-C	27	SPK Speaker Interface
8	WiFi Module Interface	18	USB3.0 HOST	28	LCD Backlight
9	Host USB port	19	SD Card	29	Mini-PCIE Interface
10	Camera Interface	20	USB Mode Switch		

Chapter 2 Industrial Control Board Interface Description

2.1 LED

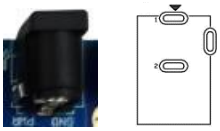
The industrial control board has designed LED indicator lights, which are red and green. The tag number is LED020. The red LED above is the power supply indicator light, and the green LED below is the board subsystem normal operation indicator light.

LED020 Pin Definition

Pin	Signal	Features
UP	Red LED	Power LED
DOWN	Green LED	System Run LED

2.2 DC Power Interface

The power supply of the industrial control board is DC power Jack block (position number : J100), and 12V power supply is recommended.

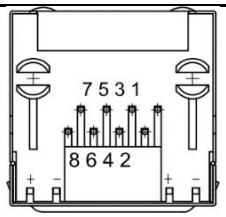


J100 pin Definition:

Pin	Signal	Features
1	PER_IN	Power Input +
2	GND	Ground
3	NC	Reserved

2.3 Ethernet

The industrial control board is designed with two 10Mbps/100Mbps/1000Mbps Ethernet, which is connected to the RJ45 network port through the network transformer (Tag number: CON740, CON790).



CON740 pin Definition:

Pin	Signal	Features
1	ETH0_MDI0_P	Network Data 0+
2	ETH0_MDI0_N	Network Data 0-
3	ETH0_MDI1_P	Network Data 1+
4	ETH0_MDI2_P	Network Data 2+
5	ETH0_MDI2_N	Network Data 2-
6	ETH0_MDI1_N	Network Data 1-
7	ETH0_MDI3_P	Network Data 3+
8	ETH0_MDI3_N	Network Data 3-

CON790 Pin Definition:

Pin	Signal	Features
1	ETH1_MDI0_P	Network Data 0+
2	ETH1_MDI0_N	Network Data 0-
3	ETH1_MDI1_P	Network Data 1+
4	ETH1_MDI2_P	Network Data 2+
5	ETH1_MDI2_N	Network Data 2-
6	ETH1_MDI1_N	Network Data 1-
7	ETH1_MDI3_P	Network Data 3+
8	ETH1_MDI3_N	Network Data 3-

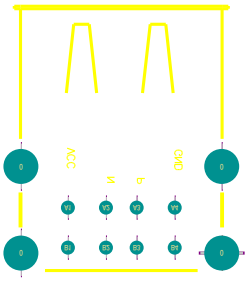
2.4 USB Interface

Two USB controllers are included in the RK3568S family of ARM microprocessors.

The industrial control board expands one of the four USB hosts through the USB HUB chip.

2.4.1 USB2.0 Host Type-A Interface

Two of the four USB hosts are exported through the double-layer USB Type-A interface (Tag number: CON650).

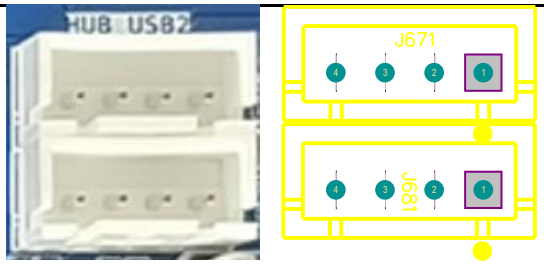


CON650 Definition:

Pin	Signal	Features
A1	VBUS_D	Bottom USB HOST1 Power
A2	D-_D	Bottom USB HOST1-
A3	D+_D	Bottom USB HOST1+
A4	GND_D	Bottom USB Ground
B1	VBUS_U	Top USB HOST2 Power
B2	D-_U	Top USB HOST2-
B3	D+_U	Top USB HOST2+
B4	GND_U	Top USB Ground

2.4.2 USB2.0 HOST Interface

Two of the four USB hosts are through the DIP 4PIN socket(HUB_USB3 tag number:J681,HUB_USB2 tag number:J671).



J681 Definition:

Pin	Signal	Features
A1	USB_5V_CN	USB 5V Power
A2	J_USB_D3_N	HUB USB3-
A3	J_USB_D3_P	HUB USB3+
A4	GND	USB Ground

J671 Definition:

Pin	Signal	Features
A1	USB_5V_CN	USB 5V Power
A2	J_USB_D2_N	HUB USB2-
A3	J_USB_D2_P	HUB USB2+
A4	GND	USB Ground

2.4.3 USB OTG Interface

One USB OTG interface is designed on the industrial control board in the form of Type-C interface (bit number CON611), which can support USB OTG mode.

CON611 definition:

Pin	Signal	Features
A1B12	GND	Ground

A4B9	VBUS	Power Supply
B8	NC	Reserved
A5	CC1	CC1
B7	TYPEC_USB_N	USB-
A6	TYPEC_USB_P	USB+
B6	TYPEC_USB_P	USB+
A7	TYPEC_USB_N	USB-
B5	CC2	CC2
A8	NC	Reserved
B4A9	VBUS	Power Supply
B1A12	GND	Ground

2.4.4 USB3.0 HOST Interface

One USB3.0 Host interface is designed on the industrial control board in the form of Type-A interface (bit number CON610).

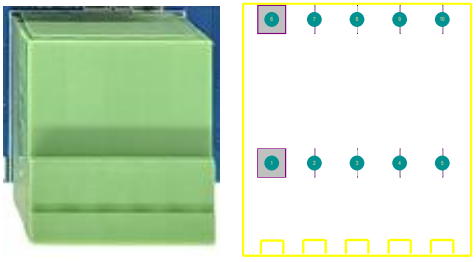
CON610 definition:

Pin	Signal	Features
1	VBUS	USB 5V Power
2	D-	USB2.0 -
3	D+	USB2.0 +

4	GND1	USB Ground
5	RX-	SUB3.0 SSRXN-
6	RX+	USB3.0 SSRXP+
7	GND2	USB Ground
8	TX-	SUB3.0 SSTXN-
9	TX+	USB3.0 SSTXP+

2.5 Expansion Terminal Interface1

Industrial control board design expansion port 1 (bit number: P810), including RS232 and CAN, using a double-layer 2 x 8Pin spacing 3.81mm terminal outlet.

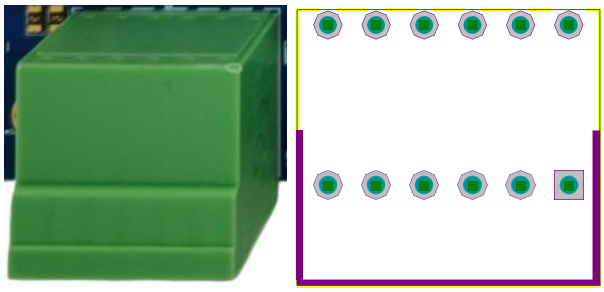


CON960 pin Definition:

Pin	Signal	Description	Pin	Signal	Description
1	RS232_TX1	RS232 Serial1 Send	6	CAN1_OUTL	CAN1 -
2	RS232_RX1	RS232 Serial1 Receive	7	CAN1_OUTH	CAN1 +
3	GND	Ground	8	GND	Ground
4	RS232_TX2	RS232 Serial2 Send	9	CAN2_OUTL	CAN2 -
5	RS232_RX2	RS232 Serial2 Receive	10	CAN2_OUTH	CAN2 +

2.6 Expansion Terminal Interface2

The industrial control board is designed with expansion interface 2 (bit number: P920), including RS485, I/O and other functional interfaces, using a double layer 2*6Pin spacing 3.81mm terminal lead out.

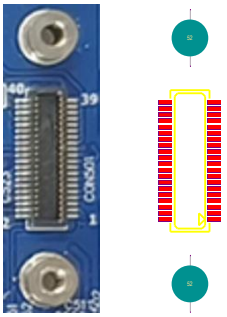


P920 pin Definition:

Pin	Signal	Description	Pin	signal	Description
1	RS485_A1	RS485 Serial1 A	7	RS485_A2	RS485 Serial2 A
2	RS485_B1	RS485 Serial1 B	8	RS485_B2	RS485 Serial2 B
3	DI_IN1-	GPIO 1 input -	9	DI_IN2-	GPIO 2 Input -
4	DI_IN1+	GPIO 1 input+	10	DI_IN2+	GPIO 2 Input+
5	DO_1-	GPIO 1 Output1 -	11	DO_2+	GPIO 2 Output+
6	DO_1+	GPIO 1 Output1+	12	DO_2-	GPIO 2 Output -

2.7 Camera Interface

The industrial control board designs a set of camera interfaces (Tag number: CON501) through its mipi csi function, and the interface form is Board to Board interface.



CON501 pin Definition：

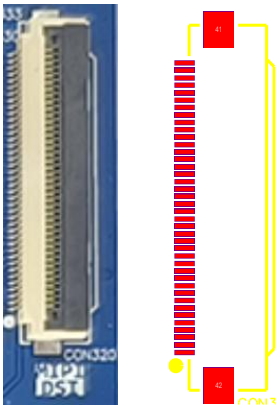
Pin	Signal	Description	Pin	signal	Description
1	IR_AVDD2.8V	IR Lens Voltage	2	RGB_AVDD3.3V	RGB Lens Voltage
3	IR_PWDN	IR Lens Mode Config	4	IR_RESET	IR Lens Reset
5	I2C_SCL	I2C Clock	6	I2C_SDA	I2C Data
7	GND	Ground	8	IR_MCLK	IR Lens Main Clock
9	GND	Ground	10	IR_MCP	IR Len Clock+
11	IR_MCN	IR Lens Clock -	12	GND	Ground
13	IR_MDP0	IR Lens Data0+	14	IR_MDN0	IR Lens Data0 -
15	GND	Ground	16	IR_MDP1	IR Lens Data1+
17	IR_MDN1	IR Lens Data1 -	18	GND	Ground
19	DOVDD_1.8V	GPIO Analog Voltage	20	NC	Reserve
21	IR_EN	IR Lens Enable	22	IR_DVDD1.2V	IR Lens Digital Voltage
23	RGB_DVDD1.2V	RGB Lens Digital Voltage	24	RGB_PWDN	RGB Lens Enable
25	RGB_RESET	RGB Lens Reset	26	GND	Ground
27	RGB_MCLK	RGB Lens Main Clock	28	GND	Ground
29	RGB_MCP	RGB Lens Clock+	30	RGB_MCN	RGB Lens Clock -
31	GND	Ground	32	RGB_MDP0	RGB Lens Data0+
33	RGB_MDN0	RGB Lens Data0 -	34	GND	Ground
35	RGB_MDP1	RGB Lens Data1+	36	RGB_MDN1	RGB Lens Data1 -
37	GND	Ground	38	VCC5V0_CAM	Camera Power 5V
39	VCC5V0_CAM	Camera Power 5V	40	VCC5V0_CAM	Camera Power 5V

2.8 LCD Display Interface

The RK3568S industrial control board is designed with MIPI DSI interface、HDMI interface、LVDS interface、EDP interface. Applied to LCD screen display.

2.8.1 MIPI DSI Interface

The MIPI display interface on the industrial control board is a 40pin, 0.1mm spacing FPC flip type socket (tag number: CON320), which supports high-definition MIPI interface LCD display.



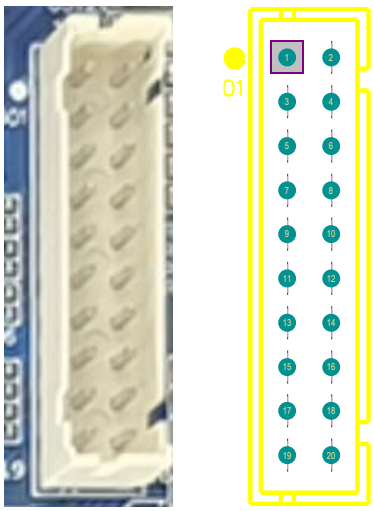
CON320 pin Definition:

Pin	Signal	Description	Pin	Signal	Description
1	5V	5V Power	21	DSI_CLK+	MIPI DSI Clock+
2	5V	5V Power	22	DSI_CLK-	MIPI DSI Clock -
3	5V	5V Power	23	GND	Ground
4	5V	5V Power	24	DSI_T1+	MIPI DSI Data1+
5	GND	Ground	25	DSI_T1-	MIPI DSI Data1 -
6	GND	Ground	26	GND	Ground
7	GND	Ground	27	DSI_T0+	MIPI DSI Data0+
8	EN-PWR	Power Enable	28	DSI_T0-	MIPI DSI Data0 -
9	EN-BIAS	BIAS Enable	29	GND	Ground
10	EN-PWM	PWM Enable	30	TP_SCL	IIC Clock (or Connect CTP)

11	GND	Ground	31	TP_SDA	IIC Data (or Connect CTP)
12	ID0	LCD ID0	32	TP_INT	Initialization GPIO (or Connect CTP)
13	ID1	LCD ID1	33	TP_RESET	Reset GPIO (or Connect CTP)
14	GND	Ground	34	GND	Ground
15	DSI_T3+	MIPI DSI Data3+	35	IIS_BCK	Reverse
16	DSI_T3-	MIPI DSI Data3-	36	IIS_RCK	Reverse
17	GND	Ground	37	IIS_RXD	Reverse
18	DSI_T2+	MIPI DSI Data2+	38	IIS_TXD	Reverse
19	DSI_T2-	MIPI DSI Data2-	39	GPIO_INT	LCD Initialization
20	GND	Ground	40	GND	Ground

2.8.2 LVDS Interface

The LVDS interface on the industrial control board is 2*10pin, 2.0mm space DIP interface.(Tag number:J301),which supports HD LCD display.



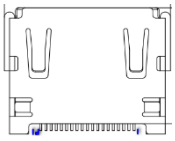
J301引脚定义：

Pin	Signal	Description	Pin	Signal	Description

1	VCC_SYS	LVDS Power	2	VCC_SYS	LVDS Power
3	NC	Reverse	4	GND	Ground
5	GND	Ground	6	GND	Ground
7	LVDS_DT0_N	LVDS Data0 -	8	LVDS_DT0_P	LVDS Data0+
9	LVDS_DT1_N	LVDS Data1 -	10	LVDS_DT1_P	LVDS Data1+
11	LVDS_DT2_N	LVDS Data2 -	12	LVDS_DT2_P	LVDS Data2+
13	GND	Ground	14	GND	Ground
15	LVDS_DCLK_N	LVDS Clock -	16	LVDS_DCLK_P	LVDS Clock+
17	LVDS_DT3_N	LVDS Data3 -	18	LVDS_DT3_P	LVDS Data3+
19	NC	Reverse	20	NC	Reverse

2.8.3 HDMI Interface

The industrial control board is designed with 1 HDMI display interface (CON201) to support the direct display of HDMI display.

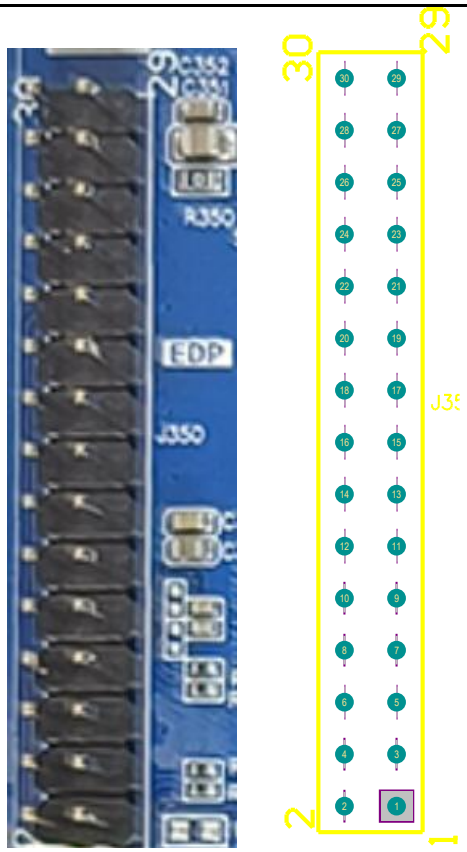
CON201 Definition:

Pin	Signal	Features
1	TD2+	HDMI Data 2+
2	TD2_GND	HDMI Data 2 Ground
3	TD2-	HDMI Data 2-
4	TD1+	HDMI Data 1+
5	TD1_GND	HDMI Data 1 Ground

6	TD1-	HDMI Data 1-
7	TD0+	HDMI Data 0+
8	TD0_GND	HDMI Data 0 Ground
9	TD0-	HDMI Data 0-
10	TCK+	HDMI Clock +
11	TCK_GND	HDMI Clock Ground
12	TCK-	HDMI Clock -
13	CEC	HDMI CEC
14	NC	Reserved
15	SCL	HDMI IIC's Clock
16	SDA	HDMI IIC's Data
17	DDC/CEC_GND	CEC Ground
18	+5V	+5V Power Supply
19	HOT_PLUG_DET	Hot Plug Detection

2.8.4 EDP Interface

The EDP display interface on the industrial control board is a 2 * 15 pin DIP straight pin socket (Tag number: J350) with a spacing of 2.54mm, supporting high-definition EDP interface LCD display.



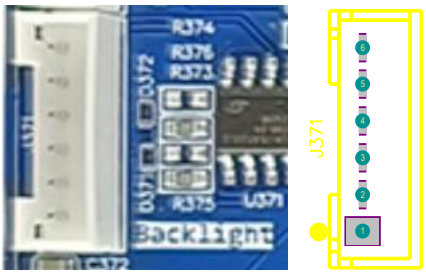
J350 pin Definition：

Pin	Signal	Description	Pin	Signal	Description
1	CABC_EN	CABC Enable	2	GND	Ground
3	ML1-	Main Channel1 -	4	ML1+	Main Channel1+
5	GND	Ground	6	ML0-	Main Channel0 -
7	ML0+	Main Channel0+	8	GND	Ground
9	AUX+	Auxiliary channel+	10	AUX-	Auxiliary channel -
11	GND	Ground	12	VCCS	VCC Power
13	VCCS	VCC Power	14	BIST_EN	Build in Self-Test Enable
15	GND	Ground	16	GND	Ground
17	HPD	Hot Plug Detection	18	BL_GND	Backlight ground
19	BL_GND	Backlight ground	20	BL_GND	Back light ground

21	BL_GND	Backlight ground	22	LCD_BLEN	LCD Backlight Enable
23	LCD_PWM	LCD PWM Input	24	NC	Reverse
25	NC	Reverse	26	LED_VCCS	LED Backlight Power
27	LED_VCCS	LED Backlight Power	28	LED_VCCS	LED Backlight Power
29	LED_VCCS	LED Backlight Power	30	NC	Reverse

2.8.5 Backlight Interface

The backlight interface on the industrial control board is a 6pin with a spacing of 2.0mm.(Tag number:J371)

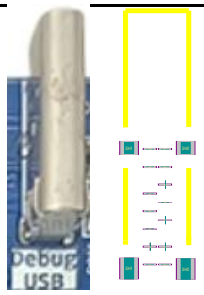


J371 Pin Definition:

Pin	Signal	Description
1	VCC12V_DCIN	DC 12V Input
2	VCC12V_DCIN	DC 12V Input
3	SBL_EN	Back Light Enable
4	SBL_PWM	Back Light PWM
5	GND	Ground
6	GND	Ground

2.9 Debug USB Interface

The DEBUG USB port for debugging is designed on the industrial control board. The outlet form is the serial port of UART TTL through the serial port to the USB chip, it is led out in the form of type-C interface (Tag number: CON001).

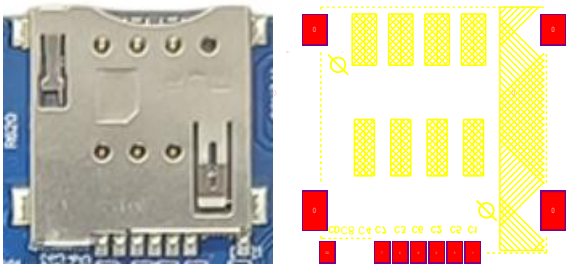


CON001 Type-C port wire sequence:

Pin	Signal	Description	Pins	Signal	Description
A1	GND	Ground	B12	GND	Ground to ground
A4	NC	Reserved	B9	NC	Reserved
A5	GND	Pull Down Through 5.1k Resistor	B8	NC	Reserved
A6	Debug_USB_P	Debug USB+	B7	Debug_USB_N	Debug USB-
A7	Debug_USB_N	Debug USB-	B6	Debug_USB_P	Debug USB+
A8	NC	Reserved	B5	GND	Pull Down Through 5.1k Resistor
A9	NC	Reserved	B4	NC	Reserved
A12	GND	Ground to ground	B1	GND	Ground to ground

2.10 SIM Card

The industrial control board is designed to work with the 4G of mini-PCIE SIM card (position number: CON341), which provides the application of telephone card/data flow card/Internet of things card for the work of the module.

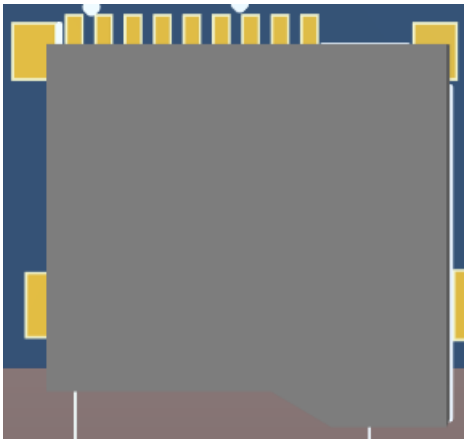


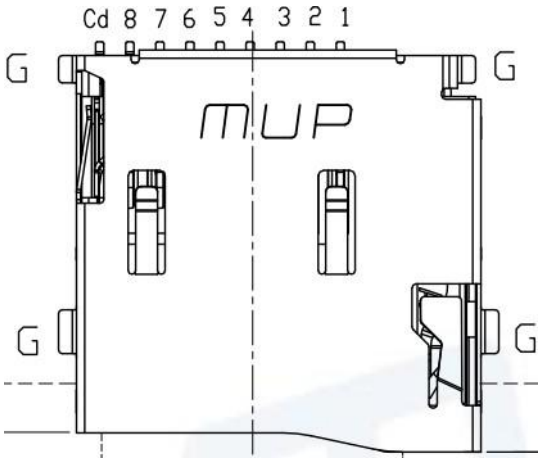
CON341 pin Definition:

Pin	Signal	Description
CD	SIM_DET	SIM card Detection Insert
1	SIM_VCC	SIM Card Power
2	SIM_RST	SIM Card Reset
3	SIM_CLK	SIM Card Clock
5	GND	Ground
6	NC	Reserved
7	SIM_DAT	SIM Card Data

2.11 SD Card

The industrial control board is designed with 1 channel microSD card (Tag number : J470), which supports the board to start from the SD card, and can store data and files from the SD card.





CON470 Definition:

Pin	Signal	Features
1	DAT2	Data 2
2	DAT3	Data 3

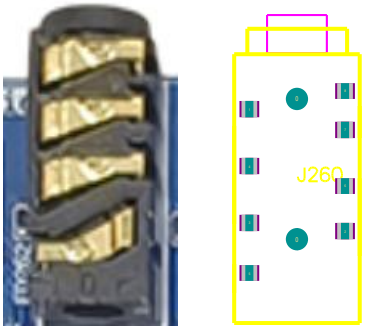
3	CMD	Commands
4	VDD	Power Supply
5	CLK	Clock
6	GND	Ground
7	DAT0	Data 0
8	DAT1	Data 1

2.12 Audio Interface

The industrial control board has designed an audio circuit (directly led out from the core board RK809), which is led out from the HPR_OUT/HPL_OUT on the core board as headphone output and from the SPKP_SUT/SPKN-OUT on the core board as speaker interface. The four segment 3.5mm headphone has a tag number J260, and the SPK speaker interface has a tag number J060.

2.12.1 Audio Headphone Interface

The audio headphone interface on the industrial control board is a four segment 3.5mm headphone jack, with tag number J260.



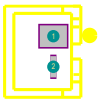
J260 Headphone Interface definition：

Pin	Signal	Features
1	AGND	Ground
2	HPL_OUT	Headphone Left Out

3	HPR_OUT	Headphone Right Out
4	MIC1_INN	MIC Audio In
5	NC	Reverse
6	NC	Reverse
7	NC	Reverse
8	HP_DET	Headphone insertion detection

2.12.2 Audio SPK Interface

The industrial control board has designed a 2Pin interface (Tag number: P240) for SPK speakers, which can support speakers with 4 Ω and 3W.

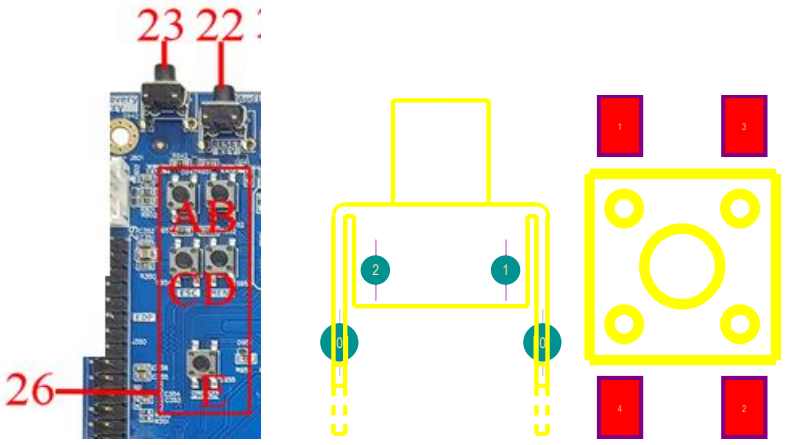


P240 Pin Definition：

Pin	Signal	Features
1	SPKP_OUT	SPK+
2	SPKN_OUT	SPK-

2.13 KEY

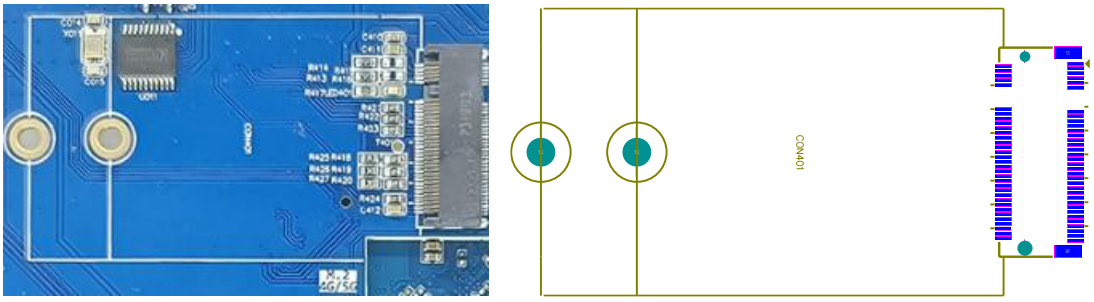
There are a total of 7*KEY buttons designed on the industrial computer (2*side buttons, 5*patch buttons, with tag numbers: S941, S942, S951, S952, S953, S954), which are respectively for power on/off, cold reset, and warm reset. Two side buttons and one flat button.



Function Definition of Buttons：

Num	Tag	Signal	Function
22	S941	RESET KEY	System Reset
23	S942	Recovery KEY	Burn Program Mode
26	A:2951	Vol-	Audio volume reduction
	B:S952	Vol+	Audio volume increase
	C:S954	ESC	**Escape**
	D:S953	MENU	Trigger MENU
	E:S955	PWRON	Switch On/Off, Short Press for Standby

2.14 4G/5G Module M.2 Interface



CON340 Pin Definition:

Pin	Signal	Features	Pin	Signal	Features
1	Config3	Reverse	2	VCC	Module Power
3	GND	Ground	4	VCC	Module Power
5	GND	Ground	6	PWR_ONOFF	Power On/Off
7	USB_DP	USB Data+	8	W_DISABLE	Module Disable
9	USB_DM	USB Data -	10	WWAN_LED	State LED
11	GND	Ground			
			20	PCM_CLK	Reverse
21	Config0	Reverse	22	PCM_DIN	Reverse
23	WAKE_ON_WAN	Reverse	24	PCM_DOUT	Reverse
25	I2C_CLK	Reverse	26	BCODE_OUT	Reverse
27	GND	Ground	28	PCM_SYNC	Reverse
29	USB_SS_TXM	USB3.0 Data TX -	30	USIM1_RST	USIM Reset
31	USB_SS_TXP	USB3.0 Data TX+	32	USIM1_CLK	USIM Clock
33	GND	Ground	34	USIM1_DAT	USIM Data
35	USB_SS_RXM	USB3.0 Data RX -	36	USIM1_VDD	USIM Power
37	USB_SS_RXP	USB3.0 Data RX+	38	WAKEUP_IN	Wakeup Input
39	GND	Ground	40	USIM2_DET	Reverse
41	PCIE_TXM	PCIE Data TX -	42	USIM2_DAT	Reverse
43	PCIE_TXP	PCIE Data TX+	44	USIM2_CLK	Reverse
45	GND	Ground	46	USIM2_RST	Reverse

47	PCIE_RXM	PCIE Data RX -	48	USIM2_VDD	Reverse
49	PCIE_RXP	PCIE Data RX+	50	PCIE_RSTn	PCIE Reset
51	GND	Ground	52	PCIE_CLKREQ n	PCIE Clock Interrupt
53	PCIE_REFCLKM	PCIE Reference Clock-	54	PCIE_WAKEn	PCIE Wake Up
55	PCIE_REFCLKP	PCIE Reference Clock+	56	RESV	Reverse
57	GND	Ground	58	RESV	Reverse
59	SPI_CS	Reverse	60	SPI_DIN	Reverse
61	SPI_CLK	Reverse	62	UART_RXD	Reverse
63	SPI_DOUT	Reverse	64	UART_TXD	Reverse
65	RFFE_VIO18	Reference Voltage	66	USIM1_DET	USIM Detection
67	nRESET	Reset	68	I2C_SDA	Reverse
69	Config1	Reverse	70	VCC	Module Power
71	GND	Ground	72	VCC	Module Power
73	GND	Ground	74	VCC	Module Power
75	Config2	Reverse			

Chapter 3 Contact Us

Hangzhou Weathink Electronics Co. LTD

Address: Room 306, 5 / F, Jinzhiyuan Building, 1380 Wenyi West Road, Cangqian Street, Yuhang District, Hangzhou City

Tel: 15906719369

Sales Email: sales@weathink.com

Technical Support Email: support@weathink.com

Chapter 4 Claims

This document provides information about the products of Hangzhou Vixenco Electronics Co., LTD. This document does not grant any license to intellectual property rights, express or implied, or by prohibiting speech or otherwise. In addition to the responsibility stated in the terms and conditions of sale of the products, Hangzhou Vixenco Electronics Co., Ltd. does not assume any other liability. Furthermore, the sale and/or use of the Products are made without warranty of any kind, either express or implied, including warranty of fitness for a particular purpose, merchantability or liability for infringement of any patent, copyright or other intellectual property rights.