3onedata



IEM615 Series
Managed Industrial Ethernet Switch Module
Hardware Quick Installation Manual

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Industrial Ethernet Communication Solution Expert **3onedata Co., Ltd.**

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Preface

Managed industrial Ethernet switch module manual has introduced this module:

- Product Overview
- Encapsulation and size
- Pin definition
- Reference circuit

Audience

This manual applies to the following engineers:

- On-site technical support and maintenance staff
- Hardware engineers

Conventions

Format	Note
" "	Words with “” represent the interface words. Fox example: “Port number”.
>	Multi-level path is separated by ">". Such as opening the local connection path description: Open "Control Panel> Network Connection> Local Area Connection".
Light Blue Font	It represents the words clicked to achieve hyperlink. The font color is as follows: ‘Light Blue’.
About this chapter	The section ‘About this Chapter’ provides links to various sections of this chapter, as well as the corresponding principles/operations section of this chapter.

Icon Convention

Format	Note
Notice	Remind the announcements in the operation, improper operation may result in data loss or equipment damage.
Warning	Pay attention to the notes on the mark, improper operation may cause personal injury.

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Format	Note
 Note	Make a necessary supplementary instruction for operation description.
 Key	Configuration, operation, or tips for device usage.
 Tips	Pay attention to the operation or information to ensure success device configuration or normal working.

Revision Record

Version No.	Revision Date	Revision Description
01	11/21/2013	Product release
02	12/18/2018	Document optimization
03	7/21/2020	Supplementary information regarding module aperture dimensions.
04	9/4/2020	Update pin specifications
05	1/4/2022	Upgrade
06	7/17/2023	Product upgrading

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1 Product Overview

1.1 Product Introduction

IEM615 series is layer 2 managed embedded industrial Ethernet switch module, which has the characteristics of high integration, small size, rich functions, simple and convenient operation. Including the following interface types:

- 5 100M Ethernet interfaces, which support 10/100Base-T(X) copper port and 100Base-FX fiber port.
- 2 TTL UART interfaces, which can be extended to RS-232/485/422 serial port and provide serial-to-Ethernet serial server function.
- 2 TTL CAN ports, which support CAN server function of bidirectional transparent CAN-to-Ethernet transmission.
- 1 CONSOLE port, used for command line to coordinate and debug this module.
- 2 I/O alarm ports, which can be extended to relay alarm.

Note

- This series of modules only supports a combination of 2 CAN or UART interfaces, and cannot support both 2 CAN and 2 TTL UART interfaces at the same time.
- The serial and CAN ports used in the 1 serial port and 1 CAN module are UART1 and CAN1, respectively.

1.2 Product Specification

Interface	
100M copper port	10/100Base-T(X), Automatic Flow Control, Full/half Duplex Mode, MDI/MDI-X Autotunning
100M fiber port	100Base-FX

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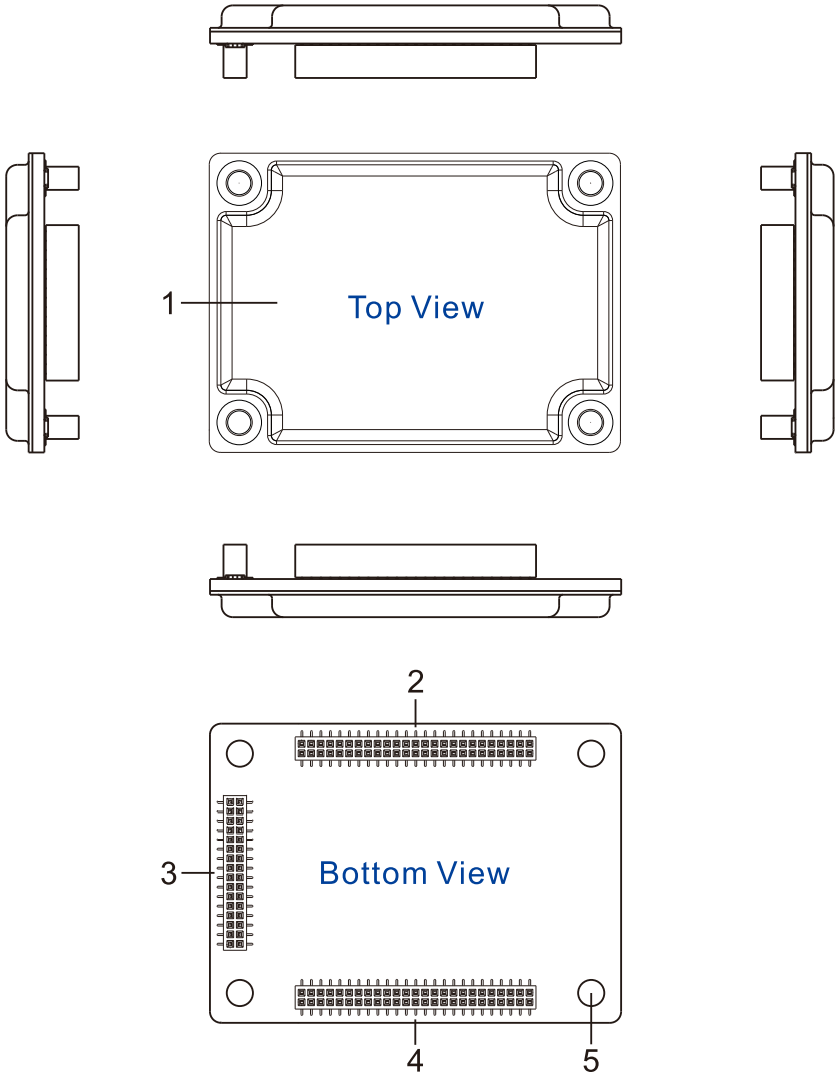
CONSOLE port	CLI command management port
I/O port	Alarm input/output
TTL UART interface	Interface type: TTL level, extensible to RS-232/RS-485/RS-422 Baud rate: 300bps-115200bps
TTL CAN Port	Baud rate: 5kbps-1000kbps
Switch Property	
Backplane bandwidth	1.2G
Buffer size	0.5Mbit
MAC address table	2K
Power Supply	
Input power supply	3.3VDC (±5%)
Power Consumption	
Full load	＜2W
Working Environment	
Working temperature	-40~75℃
Storage temperature	-40~85℃
Working humidity	5%~95%
Mechanical Structure	
Mounting	Embedded installation (pin and female header type)
Dimension (W x H x D)	55mm×9.7mm×40mm

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2 Dimension

2.1 Capsulation Design

The diagram of module structure is as follows:



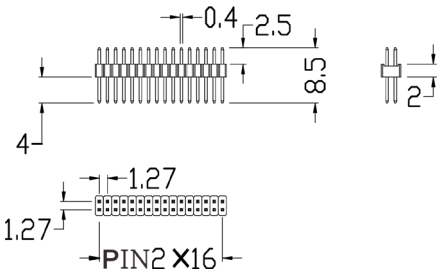
The details of each package label are shown in the following table:

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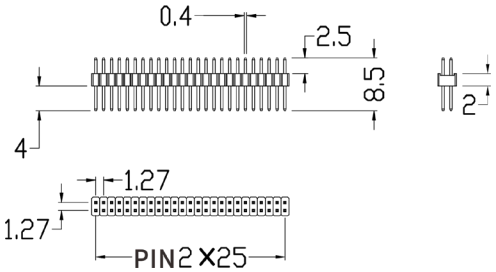
Capsulation	Name	Specification	Note
1	A blade of thermal conductivity	55mm*40mm	External heat sink available
2	Connector C	Connector 2*25, pin spacing 1.27mm, connector height 4.3mm, square hole 0.4mm*0.4mm	—
3	Connector B	Connector 2*16, pin spacing 1.27mm, connector height 4.3mm, square hole 0.4mm*0.4mm	—
4	Connector A	Connector 2*25, pin spacing 1.27mm, connector height 4.3mm, square hole 0.4mm*0.4mm	—
5	Location hole	The diameter of the positioning hole is 3.1±0.15mm, which is suitable for M3 screws. The distance from the center of the circle to the four sides of the PCB is 4mm. Note: A copper column can be used to fix the module on the bottom plate.	The four positioning holes have the same specifications

The needle specifications corresponding to Connector B can refer to the following view, unit is mm:

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The needle specifications corresponding to Connector A and C can refer to the following view, unit is mm:



2.2 Product Dimension

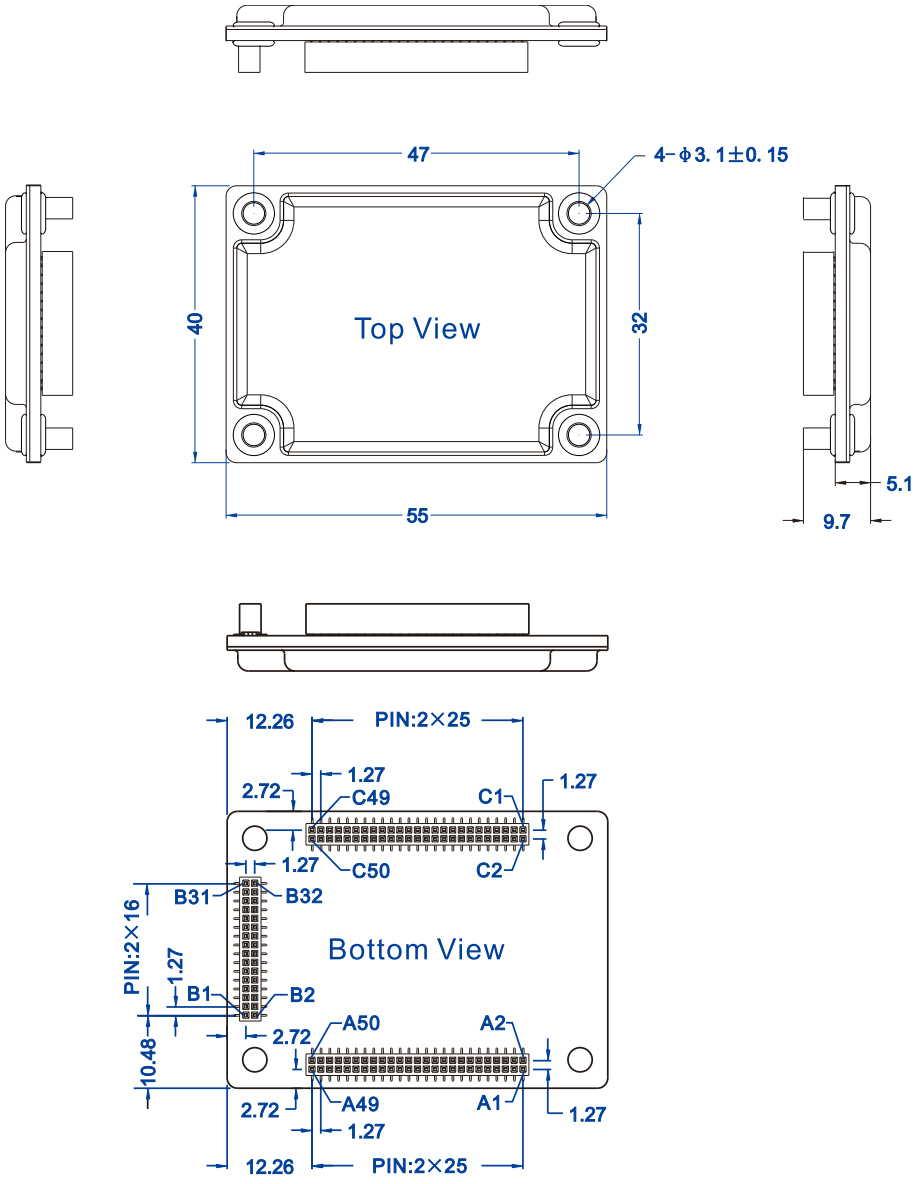
The diagram of module structure dimension is as follows:

Unit: mm

Note

The diameter of the positioning hole is 3.1±0.15mm, which is suitable for M3 screws.

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47
4-φ3.1±0.15
40
Top View
32
55
5.1
9.7
12.26
PIN:2×25
1.27
2.72
C49
C1
1.27
1.27
C50
C2
B31
B32
PIN:2×16
1.27
Bottom View
B1
B2
A50
A2
2.72
10.48
2.72
A49
A1
1.27
1.27
12.26
PIN:2×25

3 Pin Definition Description

3.1 Pin Definition View

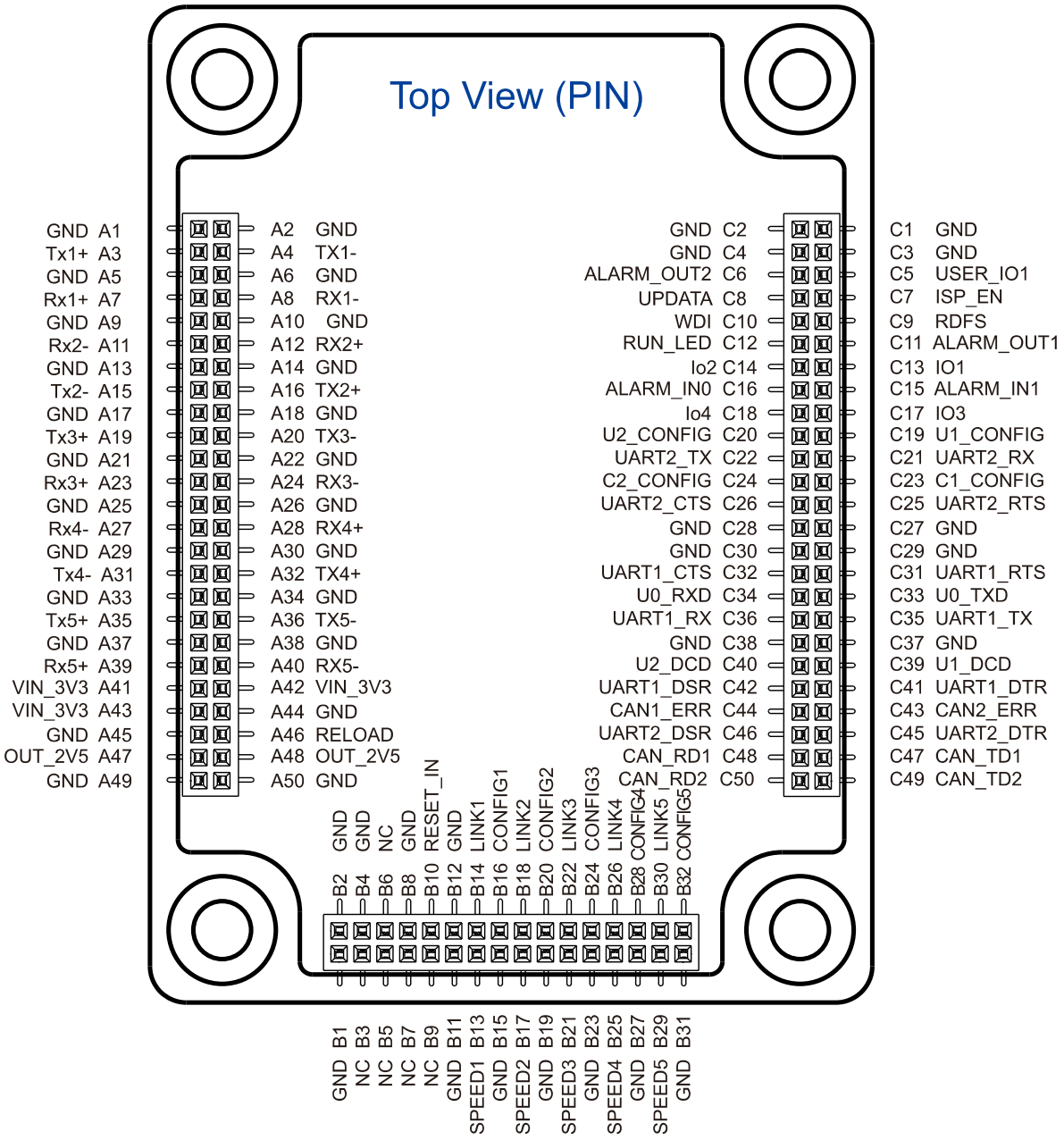
Note

In order to facilitate users to view pin definition when PCB board wiring, the pin definition diagram adopts the top view Angle as shown below.



Top view of module pin number and name is as follows:

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3.2 Pin Definition Name Description

Pin Identification	Note
GND	Ground
RX	Receive Data
TX	Transmit Data
VIN_3V3	VIN:Voltage Input; 3V3: 3.3VDC
OUT_2V5	OUT: Output

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Pin Identification	Note
	2V5:2.5VDC
NC	No Connect
OUT	Output
IN	Input
IO	Input/ Output
ISP_EN	ISP: In System Program EN: Enable
WDI	Watch Dog Input
RDFS	Restore Default Factory Settings
LED	Light Emitting Diode
U_CONFIG	UART_CONFIG, Serial Port Configuration
UART	Universal Asynchronous Receiver/Transmitter
C_CONFIG	CAN_CONFIG, CAN Port Configuration
CAN	Controller LAN Network, CAN port
CTS	Clear to Send
RTS	Request to Send
RXD	Receive Data
TXD	Transmit Data
DCD	Data Carrier Detect
DSR	Data Set Ready
DTR	Data Terminal Ready
ERR	Error
CAN_RD	CAN:Controller Area Network, CAN port; RD: Receive Data
CAN_TD	CAN: Controller Area Network, CAN port; TD: Transmit Data

3.3 Pin Definition List

Pin Definition (A1-A50) of Connector A (JP1)

Pin No.	PIN Name	Pin No.	PIN Name
A1	GND	A2	GND
A3	TX1+	A4	TX1-
A5	GND	A6	GND

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Pin No.	PIN Name	Pin No.	PIN Name
A7	RX1+	A8	RX1-
A9	GND	A10	GND
A11	RX2-	A12	RX2+
A13	GND	A14	GND
A15	TX2-	A16	TX2+
A17	GND	A18	GND
A19	TX3+	A20	TX3-
A21	GND	A22	GND
A23	RX3+	A24	RX3-
A25	GND	A26	GND
A27	RX4-	A28	RX4+
A29	GND	A30	GND
A31	TX4-	A32	TX4+
A33	GND	A34	GND
A35	TX5+	A36	TX5-
A37	GND	A38	GND
A39	RX5+	A40	RX5-
A41	VIN_3V3	A42	VIN_3V3
A43	VIN_3V3	A44	GND
A45	GND	A46	RELOAD
A47	OUT_2V5	A48	OUT_2V5
A49	GND	A50	GND

Pin Definition (B1-B32) of Connector B (JP2)

Pin No.	PIN Name	Pin No.	PIN Name
B1	GND	B2	GND
B3	NC	B4	GND
B5	NC	B6	NC
B7	NC	B8	GND
B9	NC	B10	RESET_IN
B11	GND	B12	GND
B13	SPEED1	B14	LINK1
B15	GND	B16	CONFIG1
B17	SPEED2	B18	LINK2
B19	GND	B20	CONFIG2

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Pin No.	PIN Name	Pin No.	PIN Name
B21	SPEED3	B22	LINK3
B23	GND	B24	CONFIG3
B25	SPEED4	B26	LINK4
B27	GND	B28	CONFIG4
B29	SPEED5	B30	LINK5
B31	GND	B32	CONFIG5

Pin Definition (C1-C50) of Connector C (JP3)

Pin No.	PIN name	Pin No.	PIN name
C1	GND	C2	GND
C3	GND	C4	GND
C5	USER_IO1	C6	ALARM_OUT2
C7	ISP_EN	C8	UPDATA
C9	RDFS	C10	WDI
C11	ALARM_OUT1	C12	RUN_LED
C13	IO1	C14	IO2
C15	ALARM_IN1	C16	ALARM_IN0
C17	IO3	C18	IO4
C19	U1_CONFIG	C20	U2_CONFIG
C21	UART2_RX	C22	UART2_TX
C23	C1_CONFIG	C24	C2_CONFIG
C25	UART2_RTS	C26	UART2_CTS
C27	GND	C28	GND
C29	GND	C30	GND
C31	UART1_RTS	C32	UART1_CTS
C33	U0_TXD	C34	U0_RXD
C35	UART1_TX	C36	UART1_RX
C37	GND	C38	GND
C39	U1_DCD	C40	U2_DCD
C41	UART1_DTR	C42	UART1_DSR
C43	CAN2_ERR	C44	CAN1_ERR
C45	UART2_DTR	C46	UART2_DSR
C47	CAN_TD1	C48	CAN_RD1
C49	CAN_TD2	C50	CAN_RD2

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3.4 Detailed Pin Definition Description

3.4.1 100M Ethernet Port

Pin definition description of 5 100M Ethernet interfaces:

PIN Name	Pin No.	Type	Function Description
RX1+	A7	Input	Positive end of 100M Ethernet interface data receiving. • When the 100M Ethernet port 1-5 are configured to 100M copper ports, RX+ [1:5] is directly connected to the network transformer. • When the 100M Ethernet port 1-5 are configured to 100M fiber ports, RX+ [1:5] is directly connected to the positive output end of the optical module. • When this pin is not used, it recommended be left suspended.
RX2+	A12		
RX3+	A23		
RX4+	A28		
RX5+	A39		
RX1-	A8	Input	Negative end of 100M Ethernet interface data receiving. • When the 100M Ethernet port 1-5 are configured to 100M copper ports, RX-[1:5] is directly connected to the network transformer. • When the 100M Ethernet port 1-5 are configured to 100M fiber ports, RX-[1:5] is directly connected to the negative output end of the fiber receiver. • When this pin is not used, it recommended be left suspended.
RX2-	A11		
RX3-	A24		
RX4-	A27		
RX5-	A40		
TX1+	A3	Output	Positive end of 100M Ethernet interface data transmission. • When the 100M Ethernet port 1-5 are configured to 100M copper ports, TX+ [1:5] is directly connected to the network transformer. • When the 100M Ethernet port 1-5 are configured to 100M fiber ports, TX+ [1:5] is directly connected to the positive input end of the optical module.
TX2+	A16		
TX3+	A19		
TX4+	A32		
TX5+	A35		

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PIN Name	Pin No.	Type	Function Description
			• When this pin is not used, it is recommended to be suspended.
TX1-	A4	Output	Negative end of 100M Ethernet interface data transmission. • When the 100M Ethernet port 1-5 are configured to 100M copper ports, TX-[1:5] is directly connected to the network transformer. • When the 100M Ethernet port 1-5 are configured to 100M fiber ports, TX-[1:5] is directly connected to the negative input end of the optical module. • When this pin is not used, it recommended be left suspended.
TX2-	A15		
TX3-	A20		
TX4-	A31		
TX5-	A36		
CONFIG1	B16	Input	100M Ethernet interface configuration pin. • When CONFIG [1:5] is grounded, the corresponding 100M Ethernet Port 1-5 are configured to 100M copper ports. • When CONFIG[1:5] is connected to the +3.3VDC power supply through a 4.7kΩ resistor, the corresponding 100M Ethernet Port 1-5 are configured to 100M fiber ports. • Grounding is recommended when this pin is not in use.
CONFIG2	B20		
CONFIG3	B24		
CONFIG4	B28		
CONFIG5	B32		

3.4.2 Power and Ground Signal

Pin definition description of power supply and ground signal:

PIN name	Pin No.	Type	Function Description
VIN_3V3	A41,A42,A43	Input	3.3VDC voltage input, which supplies power to the module.
OUT_2V5	A47,A48	Output	When this pin is not used, it recommended be left suspended.
GND	A1,A2,A5,A6,A9,A10,A13,A14,A17,A18,A21,A22,A25,A26,	Ground	Ground signal

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PIN name	Pin No.	Type	Function Description
	A29,A30,A33,A34,A37,A38,A44,A45,A49,A50,B1,B2,B4,B8,B11,B12,B15,B19,B23,B27,B31,C1,C2,C3,C4,C27,C28,C29,C30,C37,C38		

3.4.3 TTL UART Interface

TTL UART can be extended to RS-232/RS-485/RS-422 serial port.

Pin definition description of 2 TTL UART:

PIN name	Pin No.	Type	Function Description
UART1_RX	C36	Input	UART1 receive signal
UART1_TX	C35	Output	UART1 send signal
UART1_RTS	C31	Output	UART1 request to end signal Note: When UART1 is extended to RS-485/422 serial port, this pin is used as RS-485 receive/transmit enable.
UART1_CTS	C32	Input	UART1 clear to send signal
UART1_DTR	C41	Output	UART1 data send ready signal
UART1_DSR	C42	Input	UART1 peer device ready signal.
UART2_RX	C21	Input	UART2 received data signal
UART2_TX	C22	Output	UART2 transmitted data signal
UART2_RTS	C25	Output	UART2 request to send signal Note: When UART2 is extended to RS-485/422 serial port, this pin is used as RS-485 receive/transmit enable.
UART2_CTS	C26	Input	UART2 clear to send signal
UART2_DTR	C45	Output	UART2 device ready signal
UART2_DSR	C46	Input	UART2 peer device ready signal
U1_DCD	C39	Input	UART1 carrier detect signal
U2_DCD	C40	Input	UART2 carrier detect signal

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3.4.4 TTL CAN Port

Pin definition description of 2 TTL CAN ports:

PIN Name	Pin No.	Type	Function Description
CAN_TD1	C47	Output	CAN1 send signal
CAN_RD1	C48	Input	CAN1 receive signal
CAN_TD2	C49	Output	CAN2 send signal
CAN_RD2	C50	Input	CAN2 receive signal

3.4.5 CONSOLE Port (Debugging Port)

Pin definition description of CONSOLE port:

PIN Name	Pin No.	Type	Function Description
U0_RXD	C34	Input	UART0 receiving signal, which is only used for debugging this module by CONSOLE port.
U0_TXD	C33	Output	UART0 transmitting signal, which is only used for debugging this module by CONSOLE port.

3.4.6 I/O Alarm Interface

Pin definition description of I/O alarm port:

PIN Name	Pin No.	Type	Function Description
ALARM_OUT2	C6	Output	2 alarm signal output pin, corresponding to 2 alarm information input states. When any input state changes, both output states will change. • ALARM_OUT1 can be extended as a relay, which is active at low level. • ALARM_OUT2 can be extended as an alarm indicator, which is active at
ALARM_OUT1	C11		

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PIN Name	Pin No.	Type	Function Description
			low level.
ALARM_IN0	C16	Input	2 alarm signal input pins, which can configure alarm input types by yourself, such as power alarm information detection. High-level effective range: 2.7~3.5VDC.
ALARM_IN1	C15		

3.4.7 Indicator

Pin definition description of indicator:

PIN Name	Pin No.	Type	Function Description
CPU_RUN	C12	Output	Output pin of run indicator signal.
CAN1_ERR	C44	Output	CAN1 error indicator, active low level.
CAN2_ERR	C43	Output	CAN2 error indicator, which is active at low level.
LINK1	B14	Output	100M Ethernet port connection and data transceiving indication pin LINK [1:5]. • When pin LINK [1:5] outputs high level, it indicates that the corresponding 100M Ethernet Port 1--5 are not connected. • When pin LINK [1:5] outputs low level, it indicates that the corresponding 100M Ethernet Port 1--5 are connected. • When pin LINK [1:5] outputs alternating high and low levels, it indicates that the corresponding 100M Ethernet Port 1--5 have data transmission.
LINK2	B18		
LINK3	B22		
LINK4	B26		
LINK5	B30		
SPEED1	B13	Output	100M Ethernet interface rate indication pin SPEED [1: 5]. • When the 100M Ethernet port 1-5 are configured to 10BASE-T, the corresponding pin SPEED [1:5] outputs high levels. • When the 100M Ethernet port 1-5 are configured to 10BASE-TX, the corresponding pin SPEED [1:5] outputs low levels.
SPEED2	B17		
SPEED3	B21		
SPEED4	B25		
SPEED5	B29		

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3.4.8 Other Pins

PIN Name	Pin No.	Type	Function Description
RELOAD	A46	Reserved	Unused pin, please suspend it.
RESET_IN	B10	Input	Module reset pin, when the duration of inputing low level of this pin is greater than 200ms, the system enters the reset state.
USER_IO1	C5	Reserved	Unused pin, please suspend it.
ISP_EN	C7	Input	Program upgrade, active low level, it is recommended to pull high.
UPDATA	C8	Input	Program upgrade, active low level, it is recommended to pull high. When the module is powered on, it samples the pin signal. When the pin is connected to low level, the module program starts to upgrade.
RDFS	C9	Input	Restore the factory settings. Active low level, it is recommended to pull high.
WDI	C10	Reserved	Unused pin, please suspend it.
IO1	C13	Reserved	Unused pin, please suspend it.
IO2	C14	Reserved	Unused pin, please suspend it.
IO3	C17	Reserved	Unused pin, please suspend it.
IO4	C18	Reserved	Unused pin, please suspend it.
U1_CONFIG	C19	Reserved	Unused pin, please suspend it.
U2_CONFIG	C20	Reserved	Unused pin, please suspend it.
C1_CONFIG	C23	Reserved	Unused pin, please suspend it.
C2_CONFIG	C24	Reserved	Unused pin, please suspend it.

3.4.9 Reserved Pins

PIN Name	Pin No.	Type	Function Description
NC	B3，B5，B6，B7，B9	Reserved	Unused pin, please suspend it.

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4 Reference Circuit

Note

The ground signal in the reference circuit is identified as follows:

- ⏚: GND, ground signal;
- ⏥: FG, frame grounding.

4.1 100M Ethernet Port

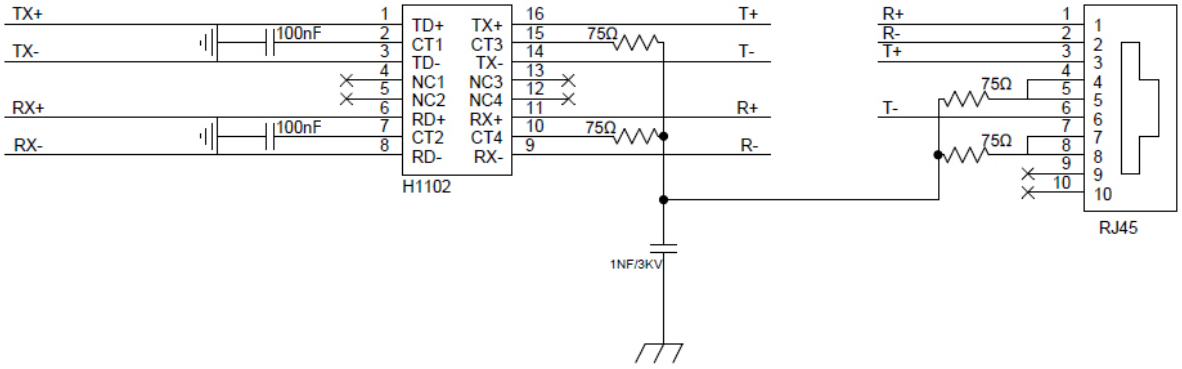
5 100M Ethernet port signal and configuration pin definition are as follows:

PIN Name	Type	Configuration Method
CONFIG[1:5]	100M Ethernet port type configuration input	100M Ethernet interface configuration pin. • When CONFIG [1:5] is grounded, the corresponding 100M Ethernet Port 1-5 are configured to 100M copper ports. • When CONFIG[1:5] is connected to the +3.3VDC power supply through a 4.7kΩ resistor, the corresponding 100M Ethernet Port 1-5 are configured to 100M fiber ports. • Grounding is recommended when this pin is not in use.
RX+[1:5]	Positive input end of data receiving	
RX-[1:5]	Negative input end of data receiving	
TX+[1:5]	Positive output end of data transmission	
TX-[1:5]	Negative output end of data transmission	

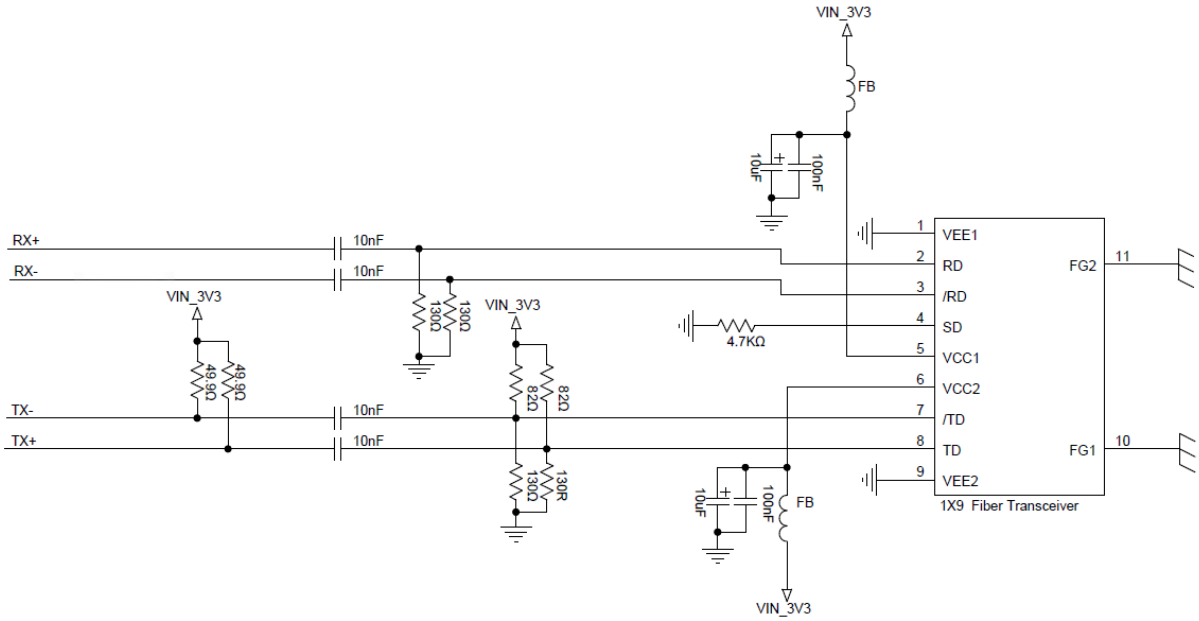
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Reference Circuit of 100M Copper Port

The network transformer in the reference circuit diagram of 100M copper port is a 1: 1 network transformer. The recommended model is H1102 or other compatible products.



Reference Circuit of 100M Fiber Port



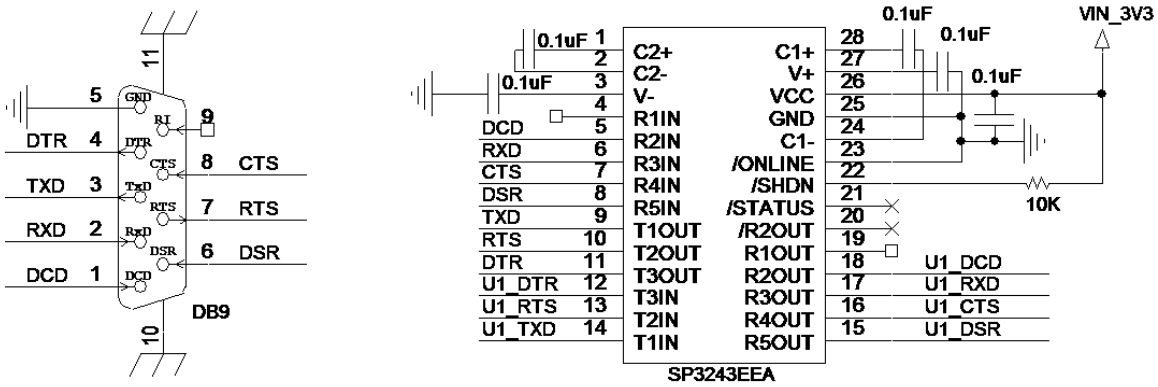
4.2 TTL UART Interface

The module has 2 TTL UART interfaces, which can be configured into RS-232 and RS-485/422 communication modes. Each communication mode has reference circuit and description information, and the user can configure the communication mode according to the requirements.

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PIN Name	Type	Configuration Method
UART_RX[1:2]	Input	UART1-2 receive signal
UART_TX[1:2]	Output	UART1-2 send signal
UART_CTS[1:2]	Input	UART1-2 clear to send signal
UART_RTS[1:2]	Output	UART1-2 request to send signal Note: When UART is extended to RS-485/422 serial port, this pin is used as RS-485 receive/transmit enable.
UART_DSR[1:2]	Input	UART1-2 peer device ready signal
UART_DTR[1:2]	Output	UART1-2 device ready signal
U_DCD[1:2]	Input	UART1-2 carrier detect signal

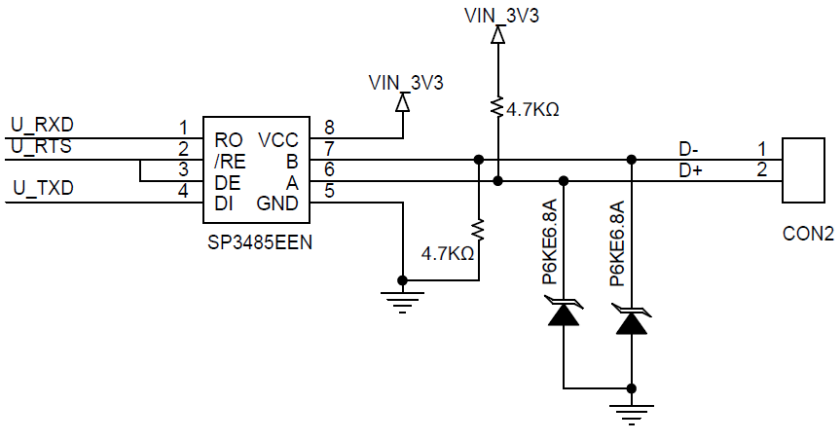
RS-232 Reference Circuit



RS-485 (Two-wire) Reference Circuit

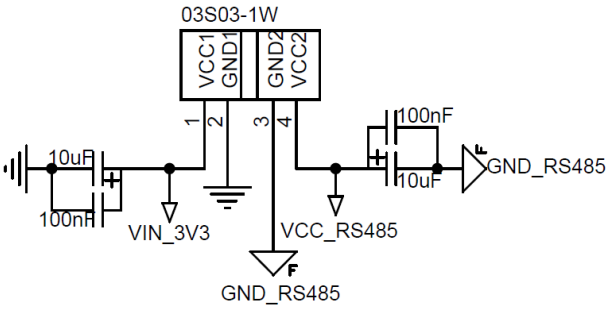
RS-485 two-wire connection method adopts half-duplex communication mode; this connection mode is a bus topology structure, and up to 32 nodes can be connected on the same bus. Master-slave communication is generally adopted in RS-485 communication network, that is, one master has multiple slaves. RS-485 sends and receives in differential mode.

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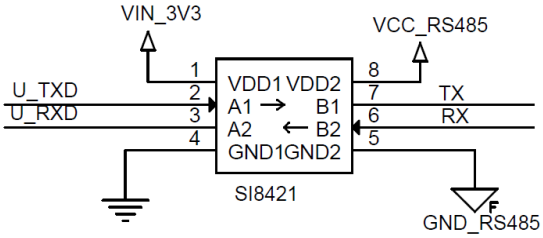


RS-485 (Two-wire) with Isolation Reference Circuit

Isolation power supply:

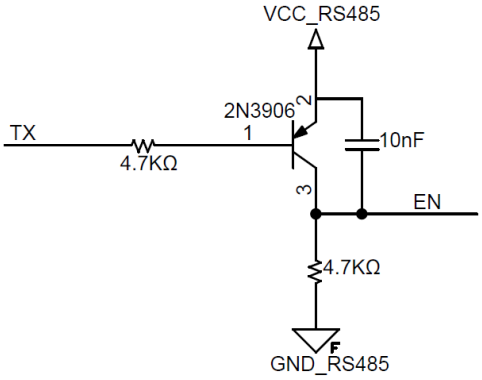


Signal isolation:



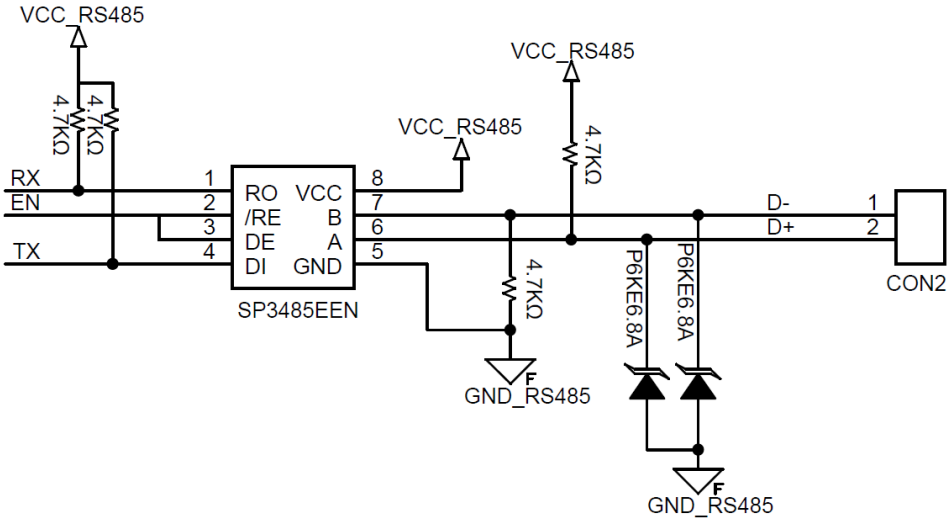
Direction automatic control circuit:

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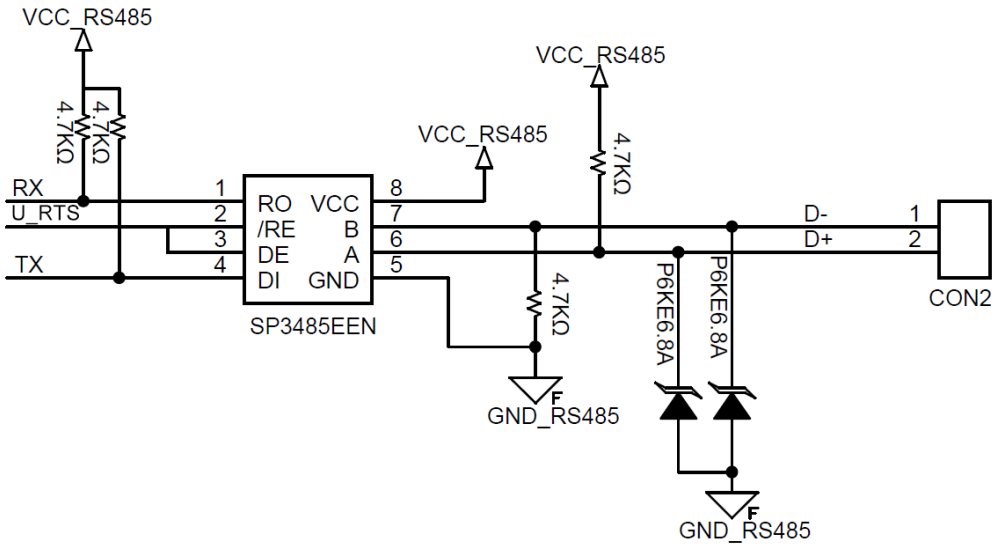
Serial port to RS-485 circuit:

- The above direction automatic control circuit is used, and the RS-485 direction is controlled by triode. The RS-485 reference circuit is as follows.



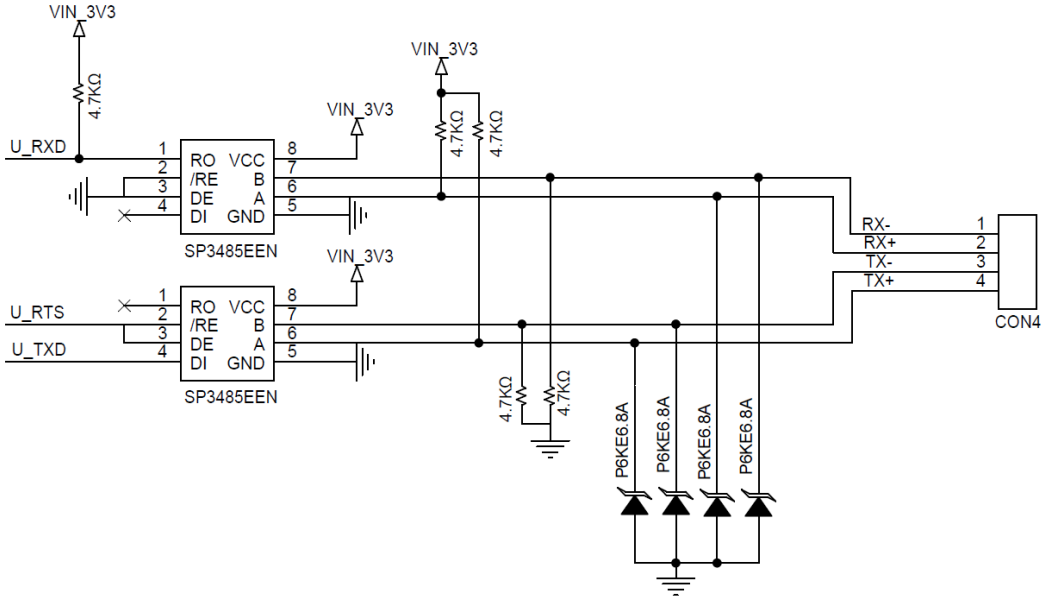
- Use the U_RTS pin of the module directly to control the RS-485 direction, and the RS-485 reference circuit is as follows.

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RS-422 Reference Circuit

RS-422 four-wire connection mode adopts full-duplex communication mode, which can realize point-to-multipoint communication.



4.3 TTL CAN Interface

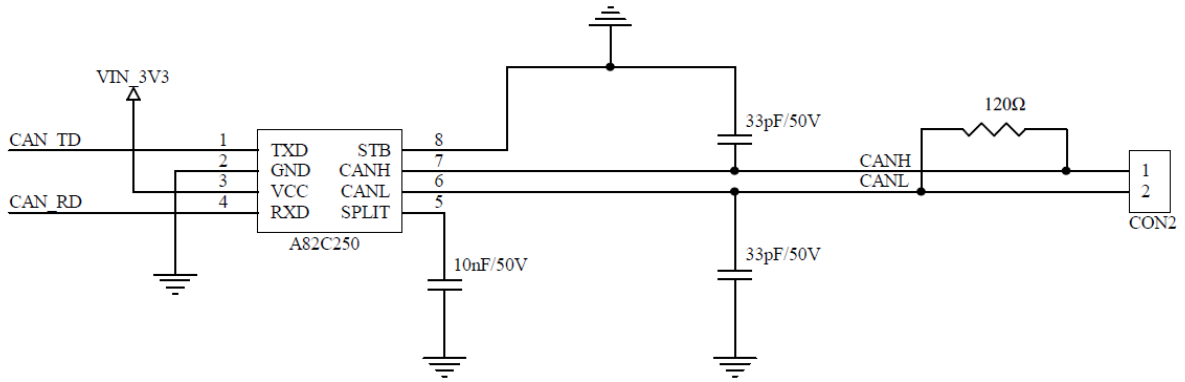
The module has two CAN bus interfaces, and 128 contacts can be hooked on the bus.

PIN Name	Type	Configuration Method
CAN_TD[1:2]	Output	CAN send signal
CAN_RD[1:2]	Input	CAN receive signal
CAN1_ERR	Output	CAN error indicator. Active low
CAN2_ERR	Output	

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CAN Reference Circuit

The CAN bus is connected to the physical bus through the two output terminals CANH and CANL of the CAN transceiver interface chip A82C250. The state of the CANH terminal can only be high level or suspending state, and that of the CANL terminal can only be low level or suspending state. Because of its different level properties, a terminal resistor should be added to the terminal of the CAN.



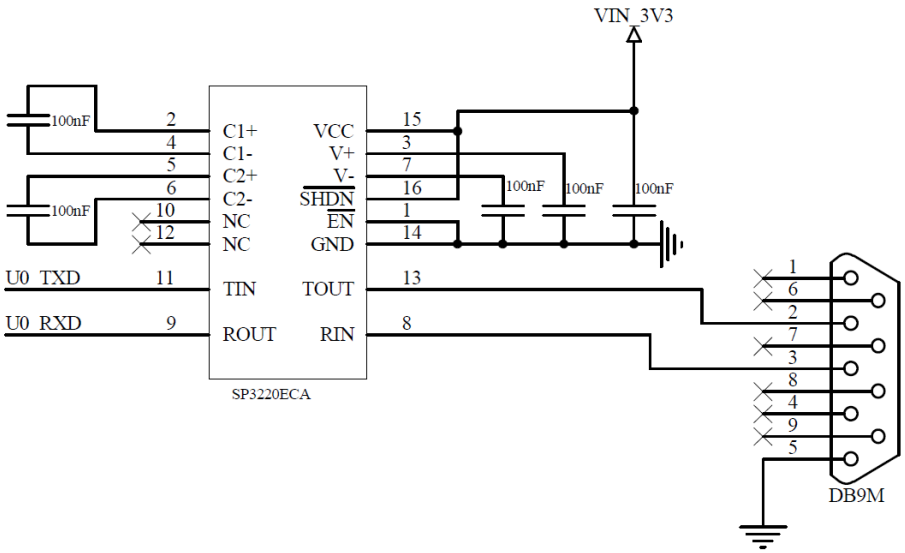
4.4 CONSOLE Port (Debugging Port)

UART0 debugging interface serves as the CONSOLE port of this module, mainly used for building CLI management platform.

PIN Name	Pin No.	Type	Function Description
U0_RXD	C34	Input	UART0 receiving signal, which is only used for debugging this module by CONSOLE port.
U0_TXD	C33	Output	UART0 transmitting signal, which is only used for debugging this module by CONSOLE port.

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Reference Circuit of CONSOLE Port



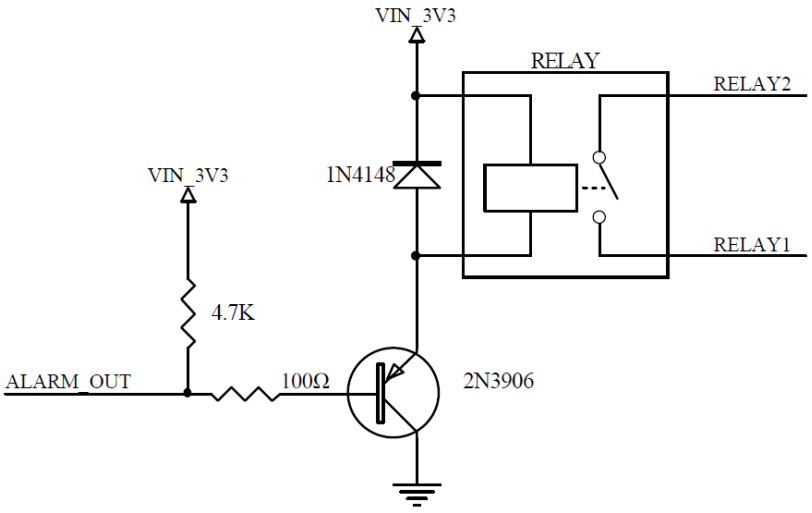
4.5 I/O Alarm Interface

The module has two alarm signal inputs, and the alarm input type can be self-configured. There are two alarm signals outputs for relay alarm output, which is active-low.

PIN Name	Type	Configuration Method
ALARM_IN[0:1]	Input	2 alarm signal input pins, which can configure alarm input types by yourself, including low level and high level alarms.
ALARM_OUT1	Output	Relay alarm output, low-level alarm.
ALARM_OUT2	Output	Alarm indicator output pin, active at low level.

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Reference Circuit of Relay Alarm

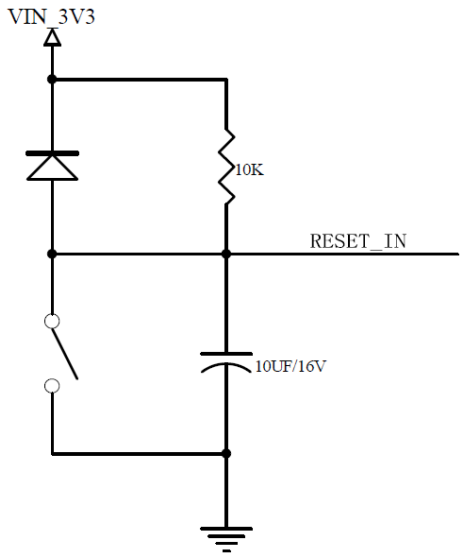


4.6 Reset Interface

The module provides an external manual reset input pin, and an external hardware reset circuit can be designed for manual reset.

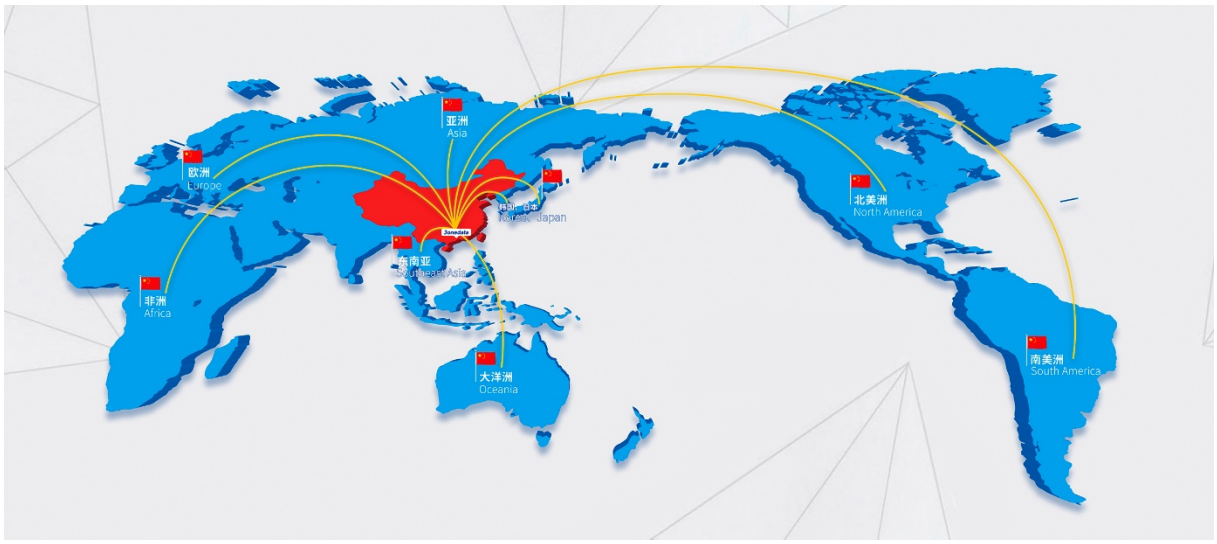
PIN Name	Type	Configuration Method
RESET_IN	Input	Module reset pin, when the duration of inputing low level of this pin is greater than 200ms, the system enters the reset state.

Reset Reference Circuit



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