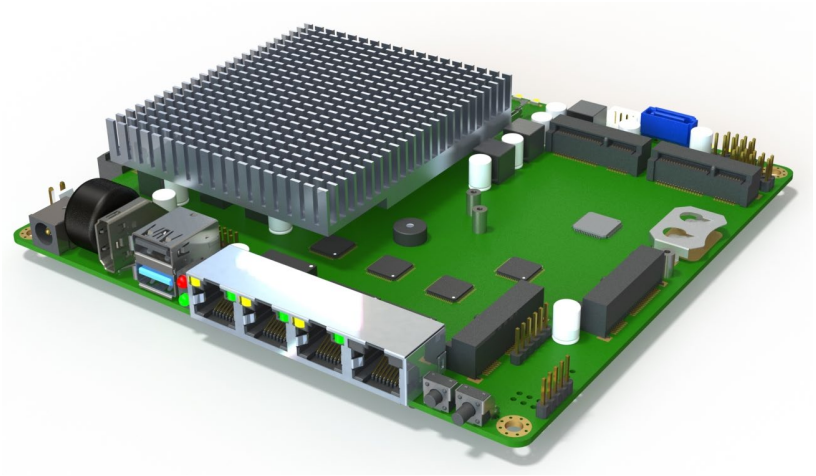


Broachlink NOAH5 Router Motherboard

Quick Hardware Manual

V1.0.5

ORDER INFORMATION

NO.	Model	Processor	Frequency	Memory	HDMI	LAN	USB	COM	MiniPCIe (wifi)	DC IN
1	BL-NOAH5-E3845_V10	E3845	1.91GHz	1	1	3*WGI211AT	4	3	3	DC12V
2	BL-NOAH5-E3845TPM_V10	E3845 With TPM	1.91GHz	1	1	3*WGI211AT	4	3	3	DC12V

Chapter 1 Introduction

1.1 About Noah

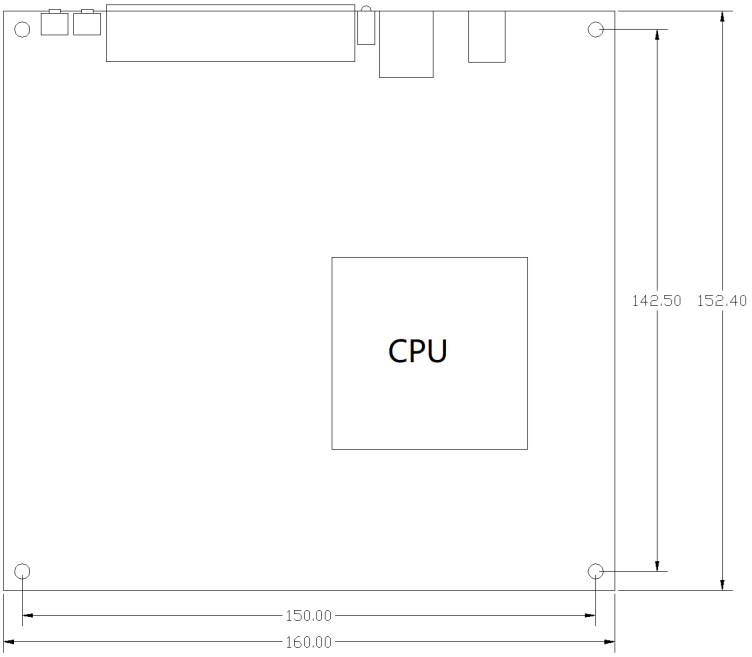
Broachlink NOAH series motherboard are designed for fanless network appliance, like router, firewall, VPN, IPBX, IoT gateway etc. Deeply electronic, mechanical, and software optimized for perfect operation on open source operating systems such as CentOS, OpenBSD, OPNsense, and FreeBSD. The ideal choice for open source community users and geek users. The optimized electronic design enables the product to have ultra-low power consumption, which is 20 % lower than competitive products. The enhanced thermal design gives the product a significant stability advantage in a compact housing, especially in a closed housing. The rich extension features allow end users to flexibly respond to various communication scenarios. In order to help customers quickly achieve product launch, we can provide .step 3D files of the product.

1.2 Specification

Processor	CPU: Intel Atom E3845,4 cores,1.91Ghz,2MB L2,AES-NI
	BIOS: AMI 64 Mbit
Memory	Technology: DDR3L 1333MHz
	Max. Capacity: 8 GB
	Socket: 1 x 204 pin SODIMM
Display	1 x HDMI, Maximum Resolution: up to 2560x1600 at 60 Hz
Ethernet	Interface: Up to 3 x RJ45
	Controller: Intel I211 Gigabit
WatchDog Timer	Output: System reset
	Internal Watchdog timer: programmable 1-255s,1-255min, disable
Storage	mSATA: 1 x full size mSATA
	eMMC: 1 (eMMC 4.5, Support Broachlink eMMC Module)
	SATA: 1 x SATAII (Max. Data Transfer Rate up to 3.0 Gb/s)
Internal I/O	Up to 3 Serial: 1 x RS-232 ,2xTTL (Transfer rate up to 1 Mbit/s)
	HDMI: 1
	Reset Button: 2
	Power Button: 2 (For system wake)
	USB: 3 x USB2.0 + 1 x USB3.0
	GPIO: 24-bit GPIOs
Expansion	MINI_PCIE1 for 4G / Lte, Wifi , MINI_PCIE2 for Wifi , MINI_PCIE3 for Wifi
Power	Power input: 12V ±10% only
	Power Consumption (Typical,Minimum system) Noah with E3845: 0.5A @ 12V (5.28W)
	Power Consumption (Max, test in pfSense) Noah with E3845: 1A @ 12V (12W)
Environment	Operating 0 ~ 60° C (32 ~ 140° F) (Operating humidity: 40° C @ 95% RH non-condensing)
	Non-Operating -40° C ~ 85° C and 60° C @ 95% RH non-condensing
Physical Characteristics	Dimensions (L x W): 160 x 152 mm (6.3" x 5.99")
	Weight: 0.45 kg (0.99 lb) (with heatsink)
	Total Height: (with cooler + PCB + Bottom) 33mm

Chapter 2 Connectors

2.1 Dimension

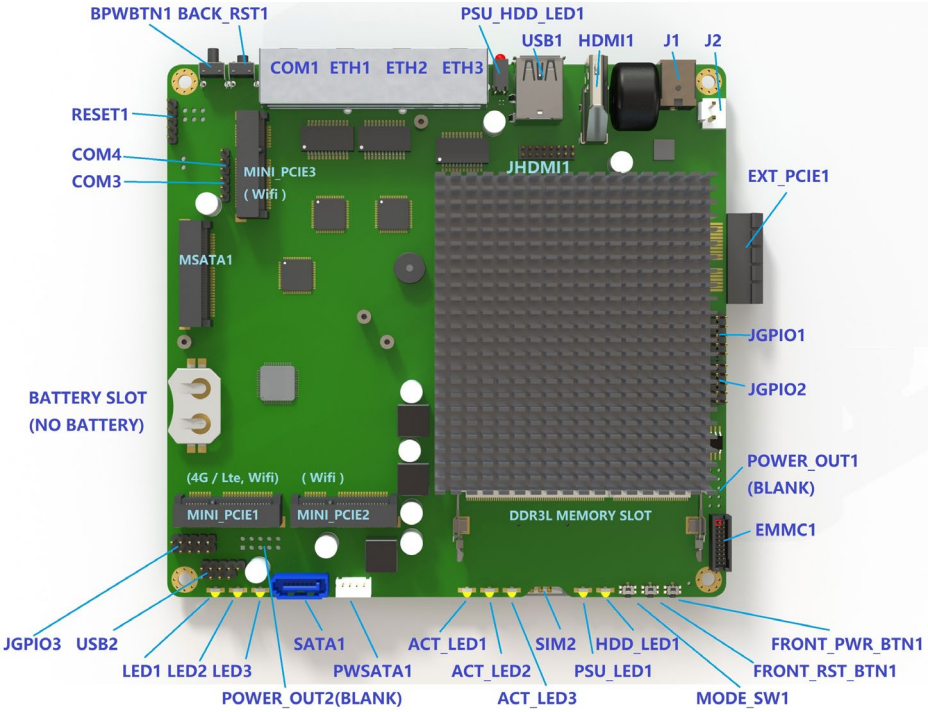


NOAH5 Dimension

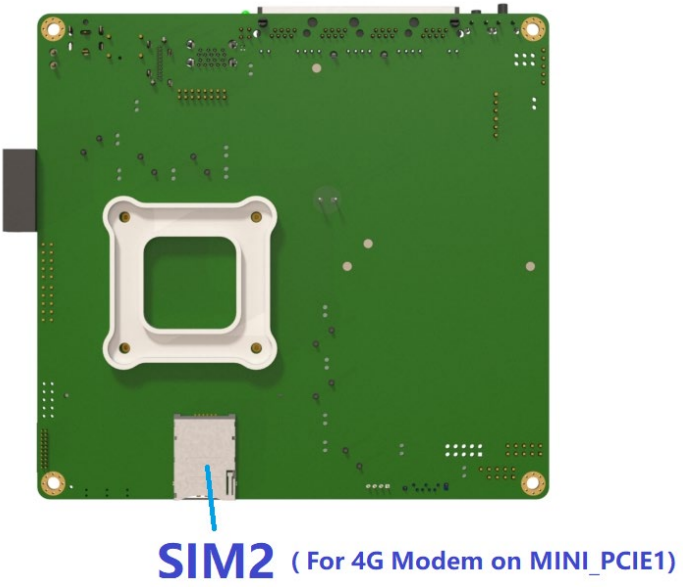
2D/3D file are available. Please contact factory for more info.

broachlink@gmail.com

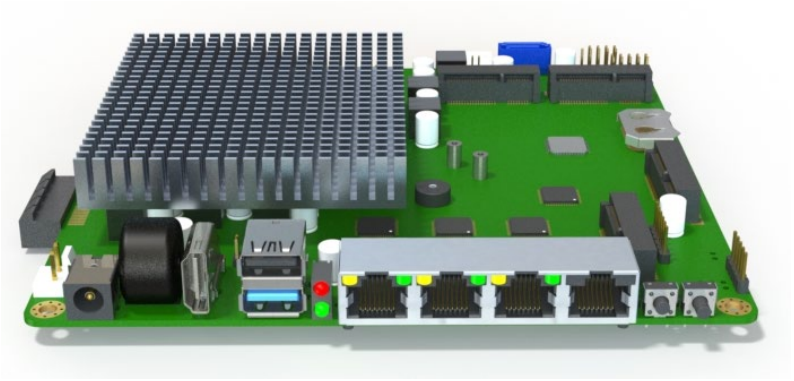
2.2 NOAH5 Connector Layout



NOAH5 connectors layout at the top



NOAH5 connectors layout at the bottom

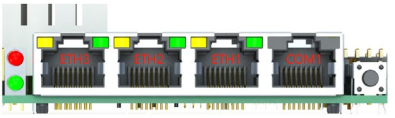


NOAH5 I/O ports layout

2.3 Connectors List

COM1,ETH1,ETH2,ETH3

Compact design for small enclosures.



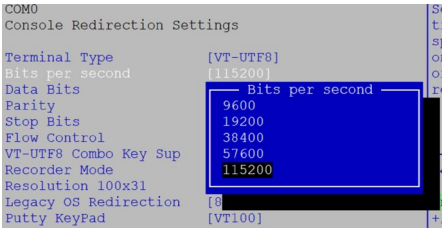
COM1 Definition

RJ45 console port. Support remote PC accessing.

PIN	NAME	PIN	NAME
1	RTS	2	DTR
3	TXD	4	GND
5	GND	6	RXD
7	DSR	8	CTS

Support typical baud rate from 9600bps ~ 115200bps (115200 default).

Baud rate setting in BIOS



Baud rate setting in freeBSD

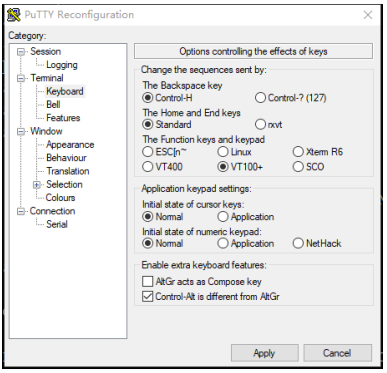
root@:/ # vi /boot/loader.conf

console="comconsole" // select serial port as console

comconsole_speed=115200 // 115200 is recommended

autoboot_delay="0" // waiting time setting

Recommended settings on PuTTY (remote windows PC)



ETH1,ETH2,ETH3 Definition

PIN	NAME	PIN	NAME
1	MDI_0+	2	MDI_0-
3	MDI_1+	4	MDI_2+
5	MDI_2-	6	MDI_1-
7	MDI_3+	8	MDI_3-

In FreeBSD, ETH1~ETH3 correspond to igb0~igb2 respectively.

root@:~ # uname -a

FreeBSD 12.0-RELEASE FreeBSD 12.0-RELEASE r341666 GENERIC amd64

root@:~ # dmesg | grep address

igb0: Ethernet address: 1c:ae:3e:e0:13:7a **ETH1 the network port close to COM1**

igb1: Ethernet address: 1c:ae:3e:e0:13:7b **ETH2**

igb2: Ethernet address: 1c:ae:3e:e0:13:7c **ETH3 network port close to USB connector**

IP setting

root@:/ # vi /etc/rc.conf

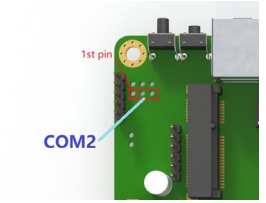
```
clear_tmp_enable="YES"
sendmail_enable="NONE"
hostname=""
#ifconfig_igb0="DHCP"                                    // dhcp
ifconfig_igb0="inet 192.168.1.210 netmask 255.255.255.0"   // static IP of igb0
ifconfig_igb1="inet 192.168.7.210 netmask 255.255.255.0"
ifconfig_igb2="inet 192.168.8.210 netmask 255.255.255.0"
sshd_enable=#"YES"
```

```
# Set dumpdev to "AUTO" to enable crash dumps, "NO" to disable
dumpdev="AUTO"
sshd_enable=yes                                    // sshd
```

COM2 (BLANK)

It's the copy of RJ45 console port COM1, RS232 level.

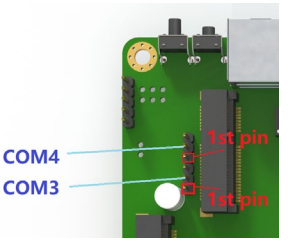
The port would be available as soon as pin header soldered.



PIN	NAME
1	TXD
2	RXD
3	GND

COM3,COM4 (TTL level)

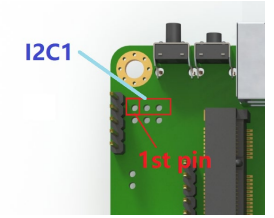
The both TTL level serial ports are from a USB bus convert chip CH340.



PIN	NAME
1	TXD
2	RXD
3	GND

I2C1(BLANK)

The port would be available as soon as pin header soldered.

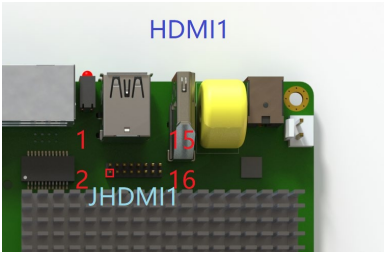


PIN	NAME
1	DATA
2	CLK
3	GND

HDMI Connectors (HDMI1,JHDMI)

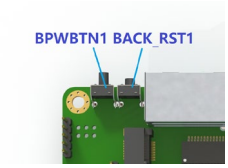
JHDMI is the copy of HDMI1, prepared for the client who needs HDMI pin header inside. User can enable JHDMI by removing 8 resistors RDM1 ~ RDM8.

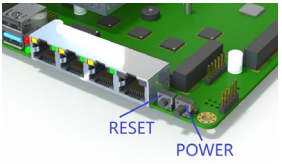
JHDMI definition



PIN	NAME	PIN	NAME
1	2+	2	HDMI_SCL
3	2+	4	HDMI_SDA
5	1+	6	NC
7	1-	8	DETECT
9	0+	10	DVI_5V (OFF IN S4)
11	0-	12	GND
13	CLK+	14	GND
15	CLK-	16	GND

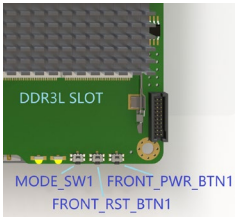
BPWBTN1 & BACK_RST1



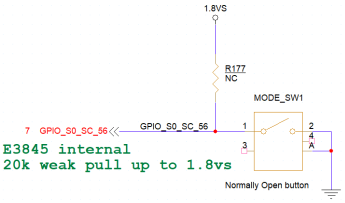


PIN	NAME
BPWBTN1	Power button
BACK_RST1	Reset button

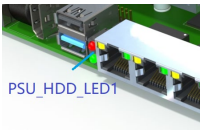
FRONT_PWR_BTN1, FRONT_RST_BTN1, MODE_SW1



PIN	NAME
MODE_SW1	GPIO pin. GPIO_S0_SC56 of SOC (pin BC12).
FRONT_RST_BTN1	Reset Button the copy of BACK_RST1
FRONT_PWR_BTN1	Power Button the copy of the BPWBTN1

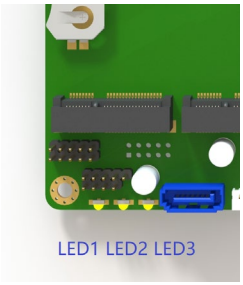


PSU_HDD_LED1

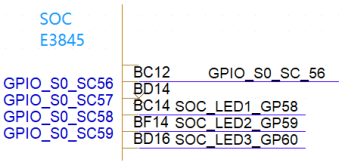


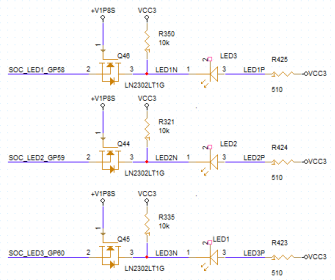
NAME	FUNCTION
RED LED	HDD Activity light, blink when HDD in reading/writing.
GREEN LED	Power Status. Light off in case system is in shutdown

LED1,LED2,LED3

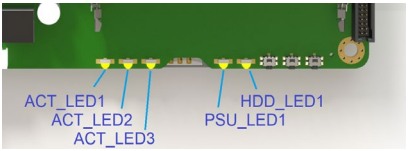


NAME	FUNCTION
LED1	GPIO pin. Wired out from GPIO_S0_SC60 of SOC (pin BD16).
LED2	GPIO pin. Wired out from GPIO_S0_SC59 of SOC (pin BF14).
LED3	GPIO pin. Wired out from GPIO_S0_SC58 of SOC (pin BC14).





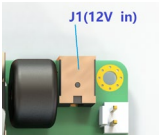
HDD_LED1,PSU_LED1,ACT_LED1,ACT_LED2,ACT_LED3

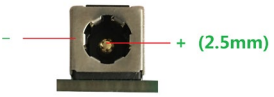


NAME	FUNCTION
HDD_LED1	HDD Activity light, blink when HDD in reading/writing.
PSU_LED1	Power Status. Always on when the PSU is plugged in, regardless of whether the system is in shutdown (S4).
ACT_LED1~3	Activity LED1~3 of ETH1~3

J1

12V power in connector, 5.5mm/2.5mm.



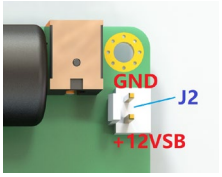


PIN	NAME
Central pin	+12VSB (ALWAYS ON)
Another pin	GND

J2

J2 is the copy of J1, it can be arranged for input or output, depends on client's demand.

Compatible with Broachlink UPS,POE,PSE cards.



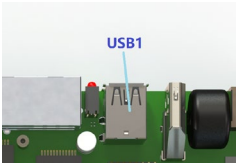
PIN	NAME
1	+12VSB (ALWAYS ON)
2	GND

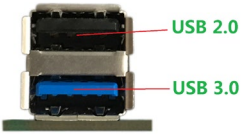
Caution:

12V_S (OFF IN S4) and +12VSB (ALWAYS ON) are different power rail.

Must not wire +12VSB to 12V_S , Short them would damage the motherboard.

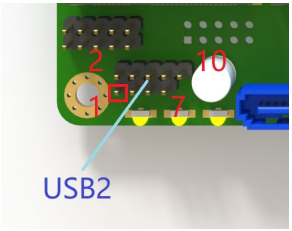
USB1





Position	USB Speed
Upper port	USB2.0
Lower port	USB3.0

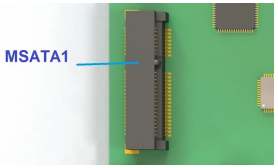
USB2



PIN	NAME	PIN	NAME
1	VCC	2	VCC
3	D0-	4	D1-
5	D0+	6	D1+
7	GND	8	GND
		10	GND

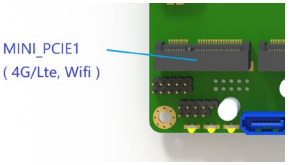
MSATA1 (SSD)

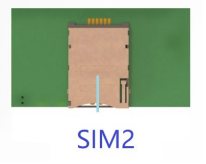
Support mSATA SSD. SATA 2.0 , 3.0 Gb/s.



MINI_PCIE1 (4G/Lte, Wifi)

Support Wifi , and 4G/LTE module with SIM holder SIM2 (bottom)

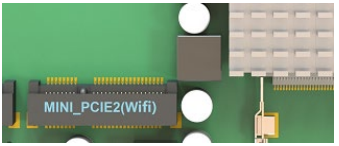




MINI_PCIE2 (Wifi)

The slot support the wifi cards, PCIe Gen2.

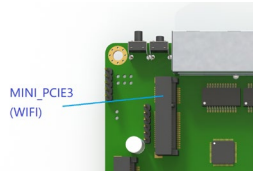
Broachlink copper and optical mini PCIe network cards are compatible with the slot.



MINI_PCIE3 (Wifi)

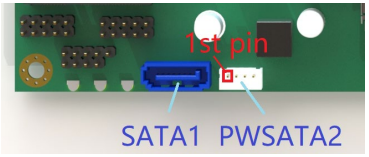
The slot support the wifi cards, PCIe Gen2.

Broachlink copper and optical mini PCIe network cards are compatible with the slot.



SATA1,PWSATA2

Support SATA 3.5/2.5 inch Hard drive. SATA 2.0 , 3.0 Gb/s (300 MB/s)



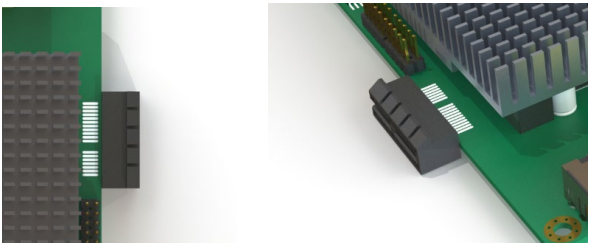
SATA1 definition

PIN	NAME
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND

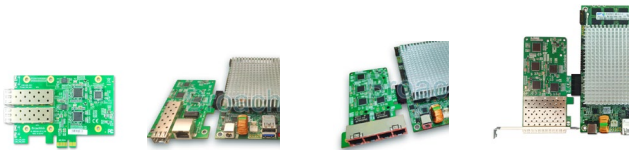
PWSATA2 definition

PIN	NAME
1	VCC
2	GND
3	GND
4	12V_S

EXT_PCIE1

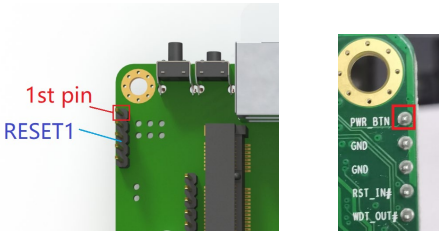


Side PCIe x1 Gen2 slot. This interface is used to expand X1 PCIE cards, especially optimized for network VOIP cards. Broachlink PCIe x1 copper / SFP cards are also compatible with the slot. Through flexible combinations, integrators can quickly build devices with various ports.



PIN	NAME	PIN	NAME
A1	NC	B1	*12V_S (OFF IN S4)*
A2	*12V_S (OFF IN S4)*	B2	*12V_S (OFF IN S4)*
A3	*12V_S (OFF IN S4)*	B3	*12V_S (OFF IN S4)*
A4	GND	B4	GND
A5	NC	B5	SMB_CLK
A6	NC	B6	SMB_DAT
A7	NC	B7	GND
A8	NC	B8	3.3V
A9	3.3V	B9	NC
A10	3.3V	B10	3.3VSB (ALWAYS ON)
A11	PERST#	B11	WAKE#
KEY NOTCH			
A12	GND	B12	NC
A13	PCIE_CLK+	B13	GND
A14	PCIE_CLK-	B14	PCIE_TX+
A15	GND	B15	PCIE_TX-
A16	PCIE_RX+	B16	GND
A17	PCIE_RX-	B17	NC
A18	GND	B18	GND

RESET1



PIN	NAME
1	Power button
2	GND
3	GND
4	RESET#
5	Watchdog_trigger# Active-Low level

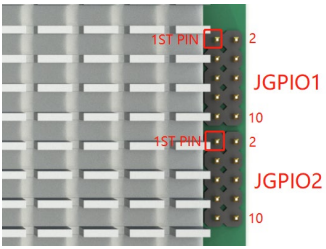
Shorting pin 4~5 means the watchdog will trigger a system reset after WDT timeout.

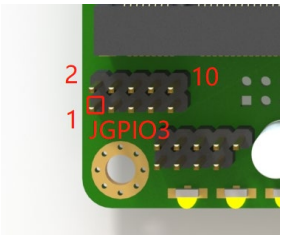
Users can refer to the marks on the bottom of the PCB to wire out the pin headers.

JGPIO1,JGPIO2,JGPIO3

NOAH5 has three 10-pin headers that support up to 24 channels 3.3V GPIO signals. 16 channels

are controlled by SOC E3845, and the remaining 8 channels are controlled by SUPER IO IT8772.





JGPIO1 (SOC source)

PIN	NAME	PIN	NAME
1	GP0	2	VCC3
3	GP1	4	GP6
5	GP2	6	GP7
7	GP3	8	GP8
9	GND	10	GP9

JGPIO2 (SOC source)

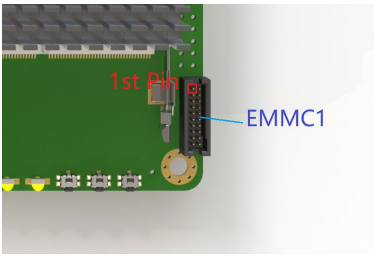
PIN	NAME	PIN	NAME
1	GP22	2	VCC3
3	GP23	4	GP27
5	GP24	6	GP28
7	GP25	8	GP29
9	GND	10	GP30

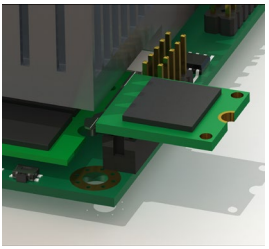
JGPIO3 (Super I/O source)

PIN	NAME	PIN	NAME
1	GP52	2	3.3V
3	GP51	4	GP56
5	GP37	6	GP57
7	GP36	8	GP60
9	GND	10	GP61

In order to help developers carry out secondary development on NOAH, broachlink has released GPIO development tools, including BL-GPIO-KIT (purchase separately) 3 x 8 CH GPIO card, and FreeBSD, Linux, windows demo code. Contact broachlink@gmail.com for more info.

EMMC1





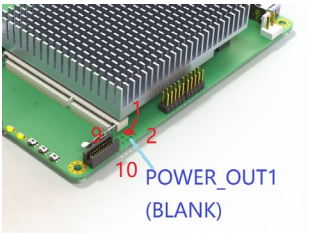
PIN	NAME	PIN	NAME
1	eMMC_D0	2	eMMC_D1
3	eMMC_D2	4	eMMC_D3
5	eMMC_D4	6	eMMC_D5
7	eMMC_D6	8	eMMC_D7
9	NC	10	GND
11	eMMC_CMD	12	eMMC_CLK
13	3.3VSB	14	GND
15	1.8VSB	16	1.8VSB
17	eMMC_RESET	18	3.3VSB
19	GND	20	GND

Appendix:

Some pin headers are not soldered by default. Developers & system integrators can use them flexibly as needed.

POWER_OUT1 (BLANK)

The pin header is not soldered by default.



PIN	NAME	PIN	NAME
1	12V_S (OFF IN S4)	2	GND
3	12V_S (OFF IN S4)	4	GND
5	VCC	6	GND
7	VCC	8	GND
9	VCC	10	GND

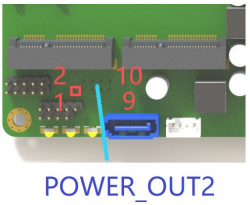
Caution:

12V_S (OFF IN S4) and +12VSB (ALWAYS ON) are different power rail.

Must not wire +12VSB to 12V_S , Short them would damage the motherboard.

POWER_OUT2 (BLANK)

The pin header is not soldered by default.



PIN	NAME	PIN	NAME
1	12V_S (OFF IN S4)	2	GND
3	12V_S (OFF IN S4)	4	GND
5	VCC	6	GND
7	VCC	8	GND
9	VCC	10	GND

VCC (5V voltage , OFF IN S4)

Battery holder (No battery)

For safe transportation reasons, the button battery is not assembled by default.

PIN	NAME
Pin On PCB	Negative
Upper Pin	Positive