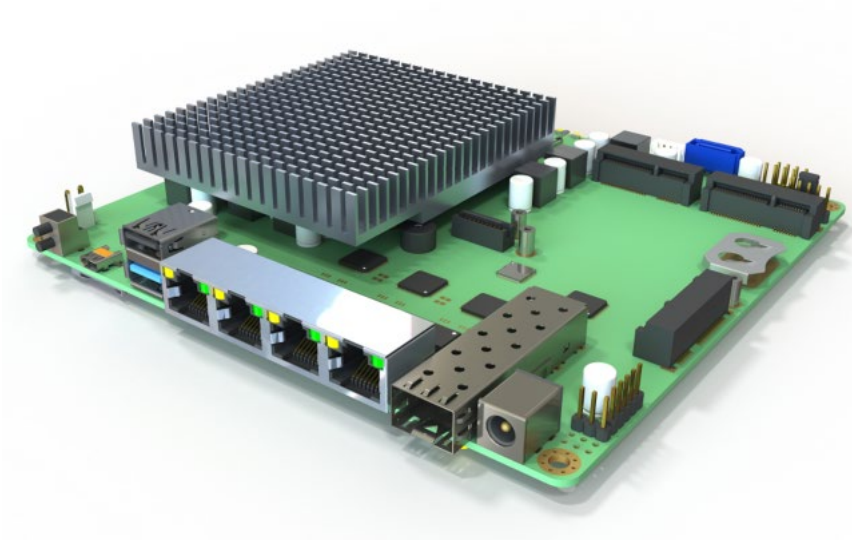


Broachlink NOAH6 Router Motherboard

Quick Hardware Manual

V1.0.2

ORDER INFORMATION

NO.	Model	CPU	TPM	Frequency	Memory	Micro HDMI	LAN	USB	COM	MiniPCIe (wifi)	DC IN
1	BL-NOAH6-E3845_V10	E3845	NO	1.91GHz	1	1	3*WGI210AT+1*WGI210AS	4	2	1	DC12V
2	BL-NOAH6-E3845TPM_V10	E3845	YES	1.91GHz	1	1	3*WGI210AT+1*WGI210AS	4	2	1	DC12V

Chapter 1 Introduction

1.1 About Noah

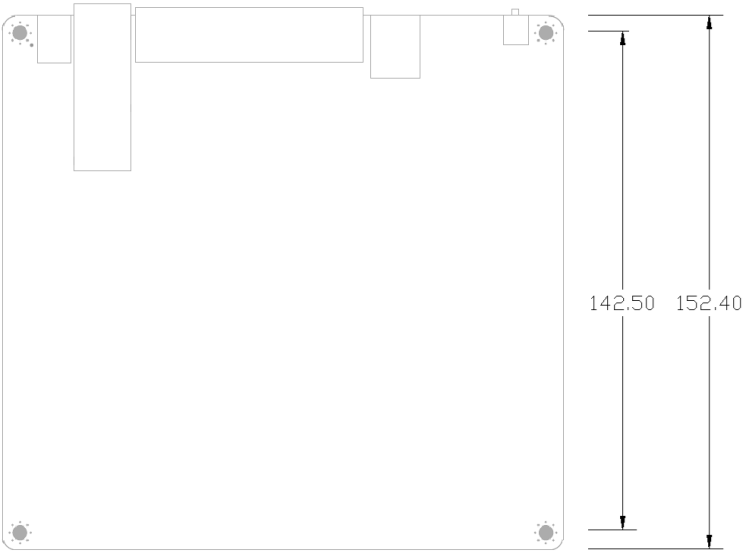
Broachlink NOAH series motherboard are designed for fanless network appliance, like router, firewall, VPN, IPBX, IoT gateway etc. Deeply electronic, mechanical, and software optimized for perfect operation on open source operating systems such as CentOS, OpenBSD, OPNsense, and FreeBSD. The ideal choice 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: 1 x Giga SFP + 3 x RJ45
	Controller: Intel I210AS Gigabit , Intel I210AT 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: 20-bit GPIOs
Expansion	MINI_PCIE1 for 4G / Lte, MINI_PCIE2 for 4G / Lte,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) (Without any addon card on miniPCI slot)
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

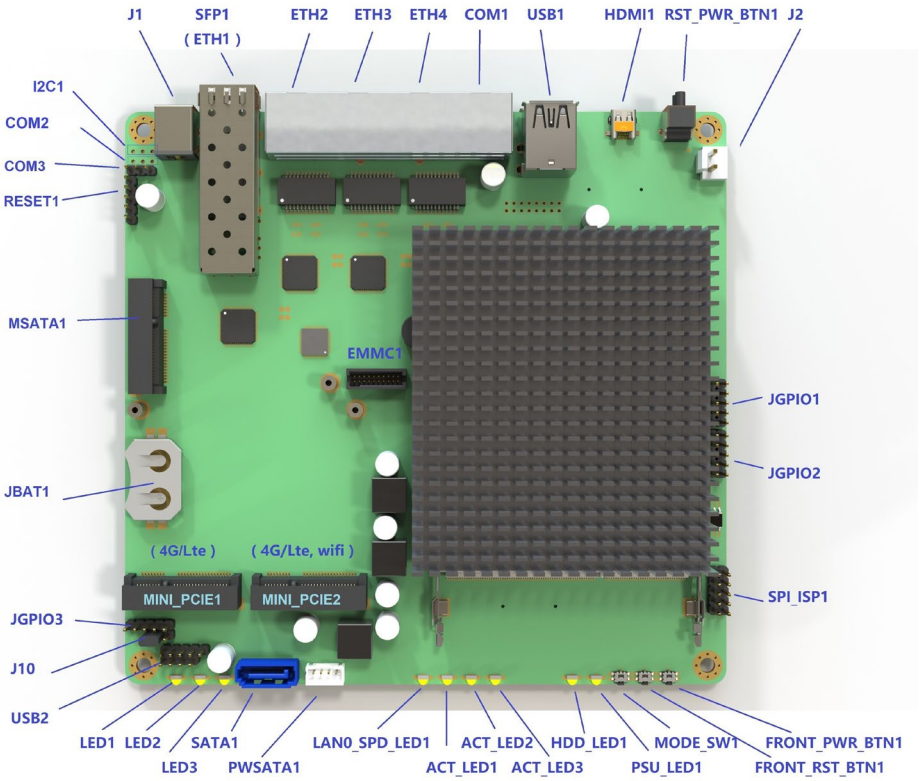


NOAH6 Dimension

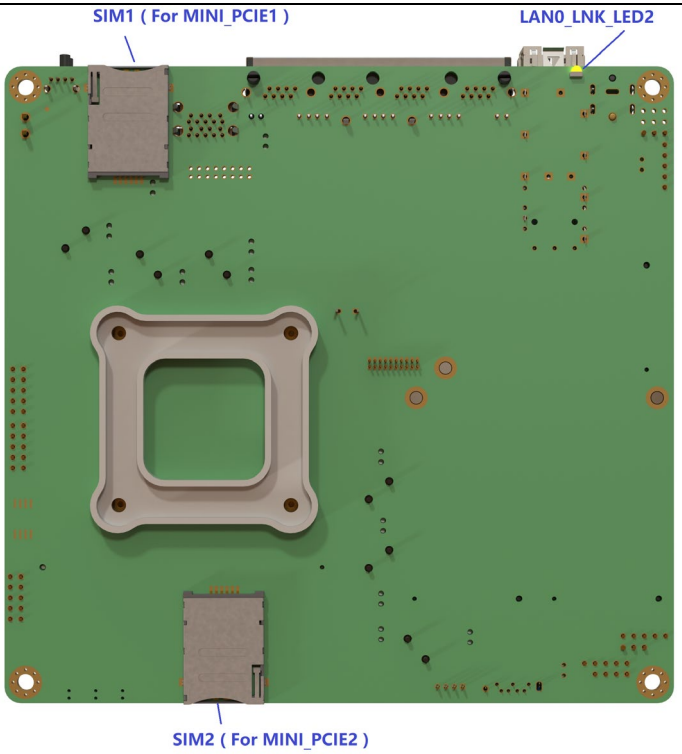
2D/3D file are available. Please contact factory for more info.

broachlink@gmail.com

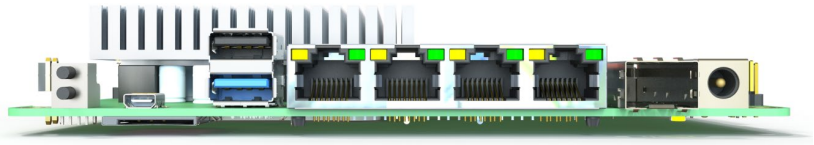
2.2 NOAH6 Connectors Layout



NOAH6 connectors layout at the top



NOAH6 connectors layout at the bottom

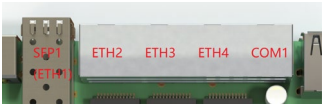


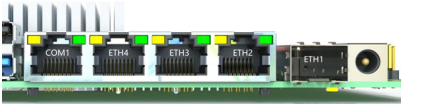
NOAH6 I/O ports layout

2.3 Connectors List

ETH1,ETH2,ETH3,ETH4,COM1

Compact design for small enclosures.





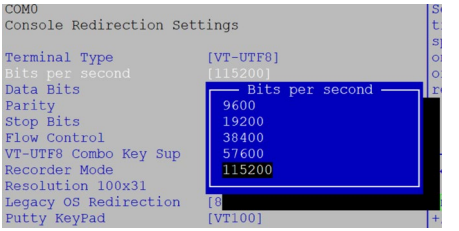
COM1 Definition

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

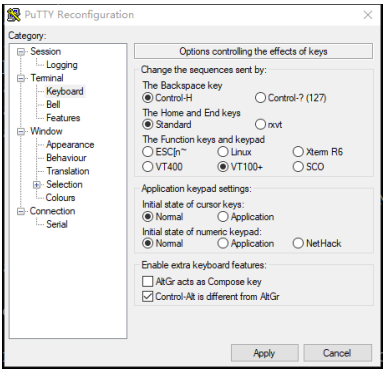
root@:/ # vi /boot/loader.conf

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)



SFP1 (ETH1)

The port support Giga SFP fiber module, or SFP RJ45 module.

ETH2,ETH3,ETH4 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~ETH4 correspond to igb0~igb3 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:e6:22:6a **ETH1 the SFP port**

igb1: Ethernet address: 1c:ae:3e:e6:22:6b **ETH2**

igb2: Ethernet address: 1c:ae:3e:e6:22:6c **ETH3**

igb3: Ethernet address: 1c:ae:3e:e6:22:6d **ETH4 network port close to COM1**

IP setting

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

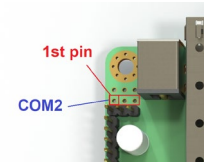
```
clear_tmp_enable="YES"
sendmail_enable="NONE"
hostname=""
#ifconfig_igb0="DHCP"                                    // dhcp
ifconfig_igb0="inet 192.168.1.210 netmask 255.255.255.0"   // static IP of igb0
ifconfig_igb1="inet 192.168.2.210 netmask 255.255.255.0"
ifconfig_igb2="inet 192.168.3.210 netmask 255.255.255.0"
ifconfig_igb3="inet 192.168.4.210 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 setting
```

COM2 (BLANK)

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

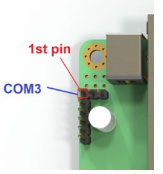
The port would be available as soon as pin header has been soldered.



PIN	NAME
1	TXD
2	RXD
3	GND

COM3 (TTL level)

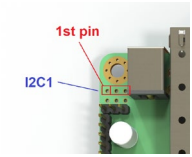
The both TTL level serial ports are from a USB bus convert chip CH340.



PIN	NAME
1	TXD
2	RXD
3	GND

I2C1(BLANK)

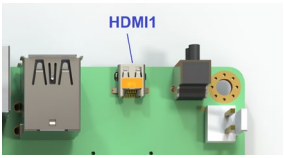
The port would be available as soon as pin header soldered.



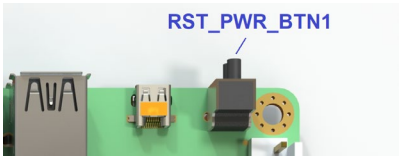
PIN	NAME
1	DATA
2	CLK
3	GND

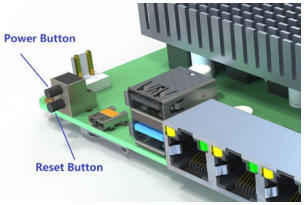
HDMI1

HDMI1 is micro HDMI female connector. Please use a micro HDMI male to HDMI female cable to connect monitor to NOAH6.



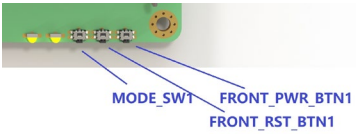
RST_PWR_BTN1



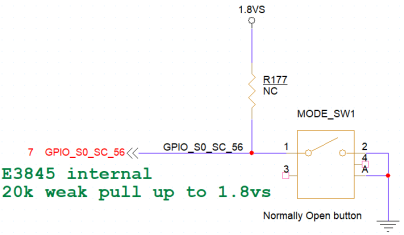


POSITION	FUNCTION
Upper	Power Button
Lower	Reset Button

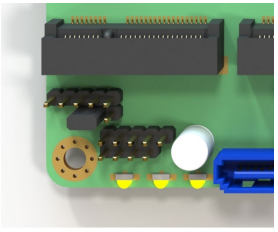
FRONT_PWR_BTN1, FRONT_RST_BTN1, MODE_SW1



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

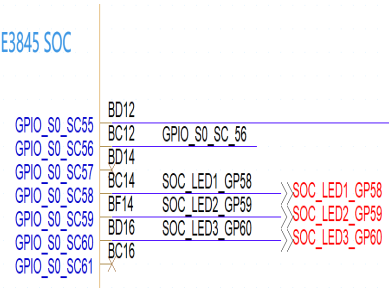


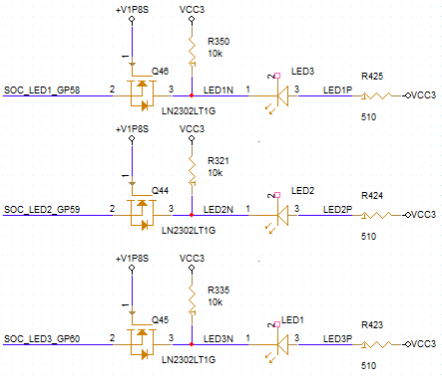
LED1,LED2,LED3



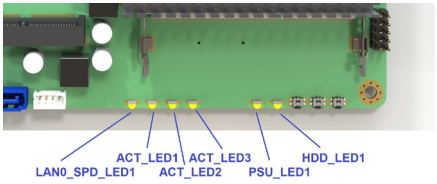
LED1 LED2 LED3

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).



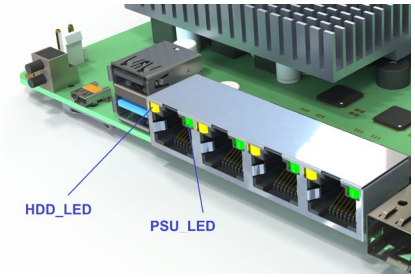


HDD_LED1,PSU_LED1,ACT_LED1,ACT_LED2,ACT_LED3



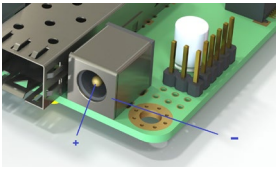
NAME	FUNCTION
HDD_LED1	HDD Activity light, blink when HDD in reading/writing.
PSU_LED1	Power Status. Always on when the PSU is plugged in, regardless of whether the system is in shutdown (S4).
LAN0_SPD_LED1	Activity LED of ETH0
ACT_LED1~3	Activity LED of ETH2~4

The 2 led on top of RJ45 serial port are copy of HDD_LED1 and PSU_LED1.



J1

12V power in DC jack, 5.5mm x 2.5mm.

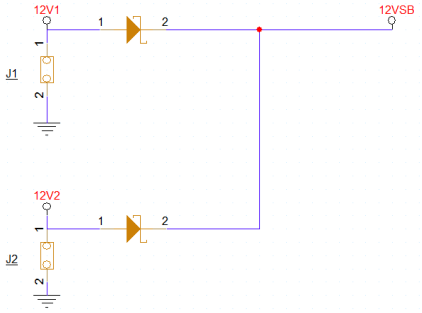


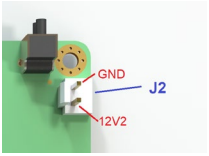
PIN	NAME
Central pin	+12V1 (ALWAYS ON)
Another pin	GND

J2

J2 and J1 is wired OR logic, it can be arranged for backup input , depends on client's demand.

This pin header is compatible with Broachlink UPS,POE,PSE cards.





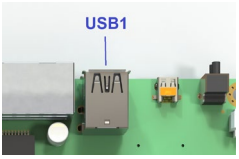
PIN	NAME
1	+12V1 (ALWAYS ON)
2	GND

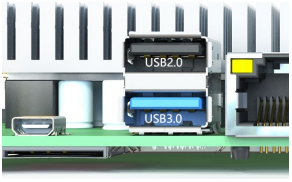
Caution:

12V_S (OFF IN S4) and +12V1 (ALWAYS ON) are different power rail.

Don't wire +12V1 to 12V_S , Short them would damage the motherboard.

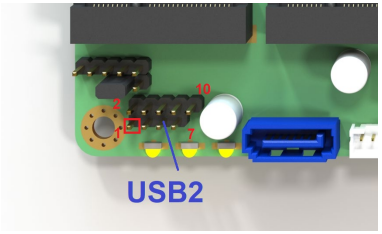
USB1





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

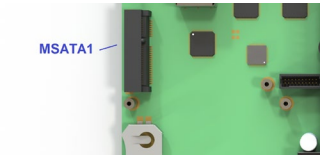
USB2



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

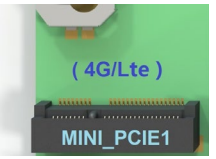
MSATA1 (SSD)

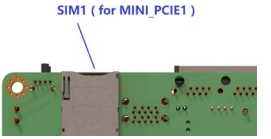
Support mSATA SSD. SATA 2.0 , 3.0 Gb/s.

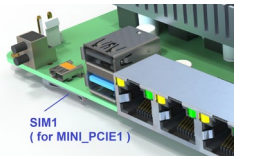


MINI_PCIE1 (4G/Lte, Wifi)

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



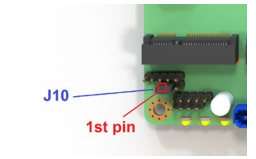




J10

The jumper is used for setting voltage of 4G card in MINI_PCIE1.

In a poor signal environment, if the 4G card can accept maximum voltage of 4V, it is strongly recommended to set this jumper to 3.8V.

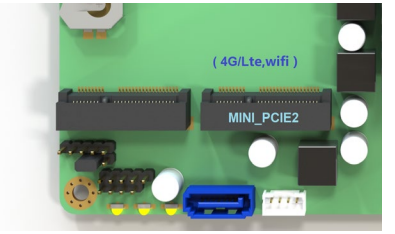


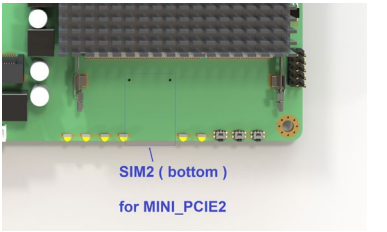
Jumper setting	Voltage of MINI_PCIE1
1-2 (default)	3.4V
2-3	3.8V

MINI_PCIE2 (4G/Lte, Wifi)

The slot support the wifi cards, PCIe Gen2.

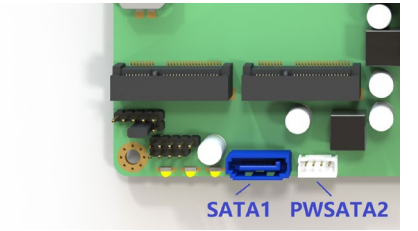
Broachlink copper and optical mini PCIe network cards are compatible with the slot.





SATA1,PWSATA2

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



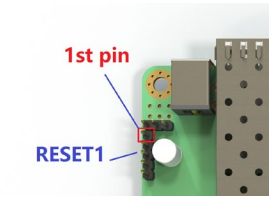
SATA1 definition

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

RESET1



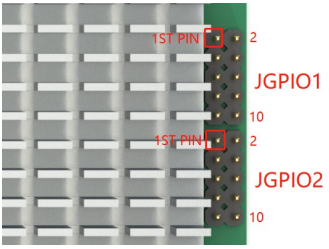
PIN	NAME
1	Power button
2	GND
3	GND
4	RESET#
5	Watchdog_trigger# Active-Low level

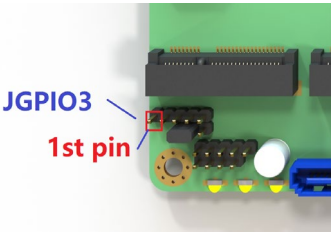
Shorting pin 4~5 means the watchdog will trigger a system reset after WDT timeout.

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

JGPIO1,JGPIO2,JGPIO3

NOAH6 has three 10-pin headers that support up to 20 channels 3.3V GPIO signals. 16 channels are controlled by SOC E3845, and the remaining 4 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

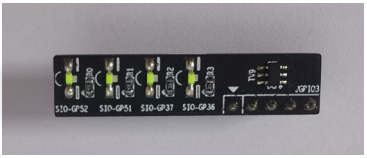
JGPIO2 (SOC source)

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

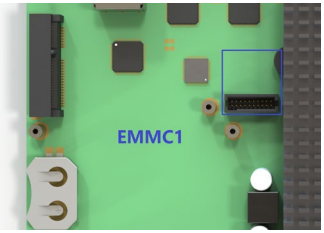
JGPIO3 (Super I/O source)

PIN	NAME
1	GP52
3	GP51
5	GP37
7	GP36
9	GND

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

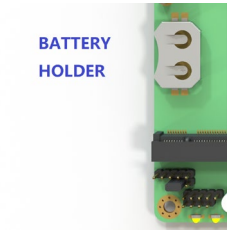


PIN	NAME	PIN	NAME
1	eMMC_D0	2	eMMC_D1
3	eMMC_D2	4	eMMC_D3
5	eMMC_D4	6	eMMC_D5
7	eMMC_D6	8	eMMC_D7
9	NC	10	GND
11	eMMC_CMD	12	eMMC_CLK

13	3.3VSB	14	GND
15	1.8VSB	16	1.8VSB
17	eMMC_RESET	18	3.3VSB
19	GND	20	GND

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