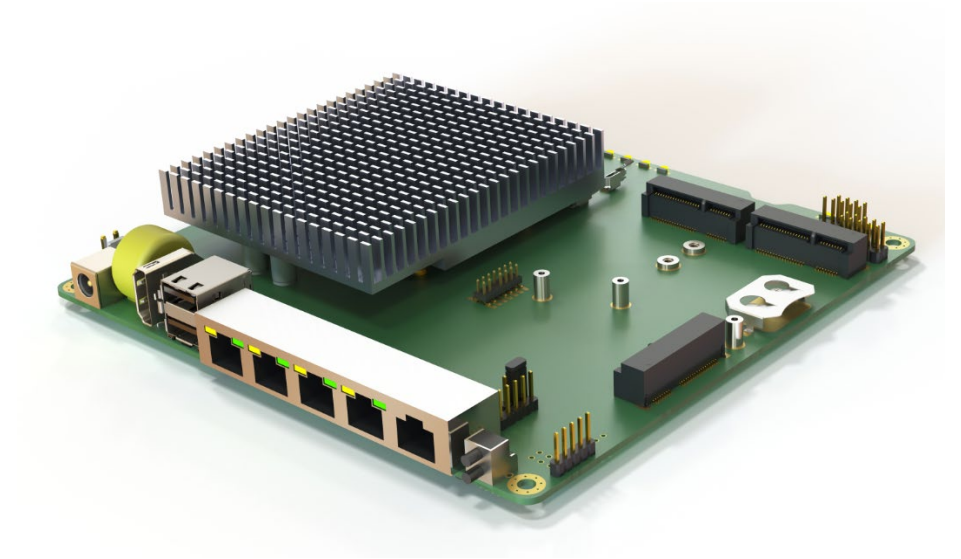


Broachlink NOAH4C Router Motherboard Hardware Manual

V1.0.9

ORDER INFORMATION

NO.	Model	Processor	Frequency	Memory	HDMI	LAN	USB	COM	MiniPCIe (wifi)	DC IN
1	BL-NOAH4C	E3845	1.91GHz	1	1	4*WGI210AT	3	2	1	DC12V

DESC.

160*152mm Noah E3845 Motherboard,4 wgi210AT,3 MiniPCIe slot (1 Msata/4GLte,1wifi/4GLte, 1mSATA), 1 M.2 B-key for 4G/5G,with 2032 battery,HDMI,23 CH GPIO,2 serial (1rs232 rj45 , 1ttl),3 SIM holder

CE Declaration of Conformity

We, the undersigned,

Manufacturer: Broachlink Technology

Address: 1212, Yongtong BLDG,RenMin North Rd.,LuoHu Dist.,Shenzhen City,China

declare, that the product

Product name: System board NOAH4,NOAH4B,NOAH4C

conforms to the following Product Specifications and Regulations:

EMC:

EN 55032:2015

EN 55035:2017

EN 61000-3-2:2014

EN 61000-3-3:2013

IEC 61000-4-2

IEC 61000-4-3

RoHS:

EN 62321-1:2013 (IEC 62321-1:2013)

The product herewith complies with the requirements of the EMC directive 2014/30/EU, and the RoHS directive 2011/65/EU and carries the CE marking accordingly.

Richard Deng / President

Shenzhen, April 20, 2025

FCC Declaration of Conformity

We, the undersigned,

Manufacturer: Broachlink Technology

Address: 1212, Yongtong BLDG,RenMin North Rd.,LuoHu Dist.,Shenzhen City,China

declare, that the product

Product name: System board NOAH4,NOAH4B,NOAH4C

conforms to the following Product Specifications and Regulations:

FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

The device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

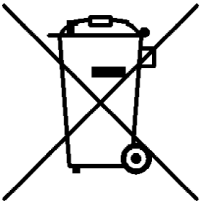
Richard Deng / President

Shenzhen, April 20, 2025

Compliance notes

Test reports available on request. Please note that further compliance testing at the system level may be required for CE mark when other modules such as wireless cards are added.

Recycling / disposal



Do not discard electronic products in household trash! All waste electronics equipment should be recycled according to local regulations.

Information for the recycler:

Remove the CR2032 button battery for separate recycling.

Our enclosures are made of aluminum.

Chapter 1 Introduction

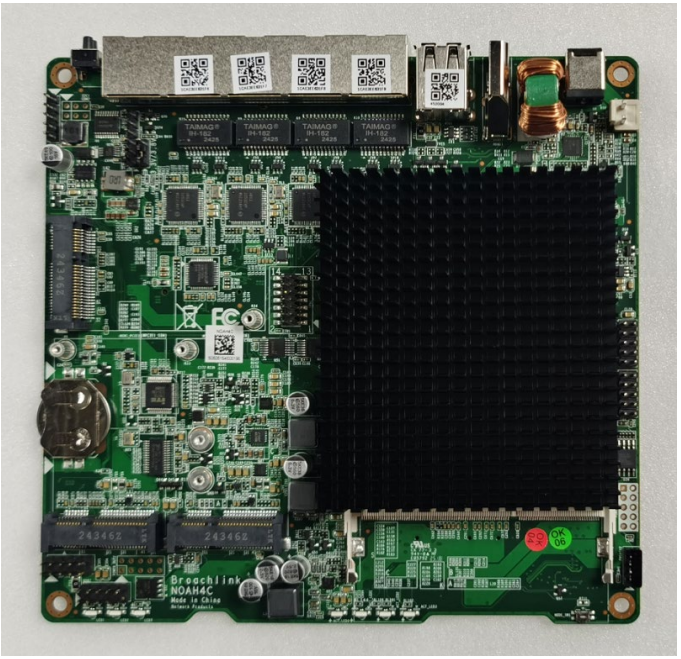
1.1 About Noah

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.

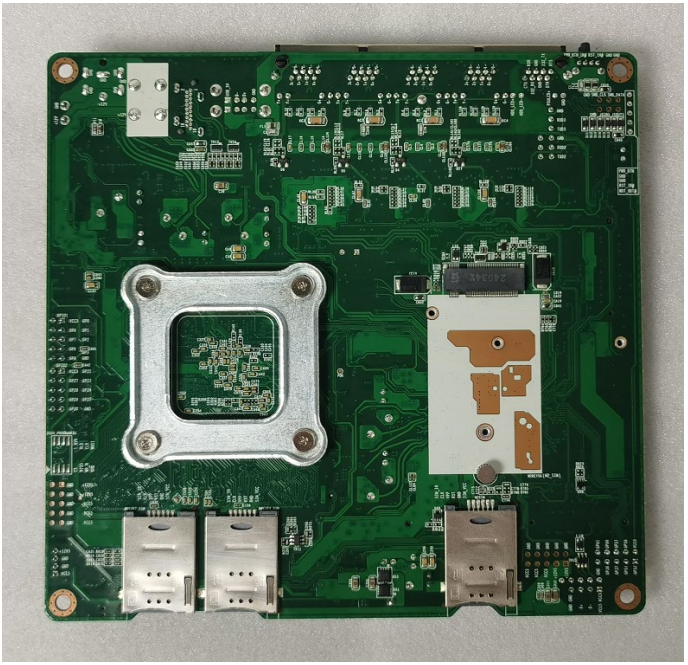
1.2 Specification

Processor	CPU: Intel Atom E3845,4 core, 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 4
	Controller: Intel WGI210AT Gigabit
	Connector: RJ45
WatchDog Timer	Output: System reset
	Internal Watchdog timer: programmable 1-255s,1-255min, disable
Storage	MINI_PCIE1,MSATA1:2 full size mSATA
	Speed: SATAII (Max. Data Transfer Rate up to 3.0 Gb/s)
Internal I/O	Up to 3 Serial: 1 x RS-232 ,1xTTL (Transfer rate up to 1 Mbit/s)
	HDMI: 1
	Reset Button: 2
	Power Button: 2 (For system wake)
	USB: 3 x USB2.0
	GPIO: 23-bit GPIOs
Expansion	MINI_PCIE1 for MSATA/4GLte , MINI_PCIE2 for Wifi/4GLte
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: 0.41 kg (0.99 lb) (with heatsink)
	Total Height: (with cooler + PCB + Bottom) 33mm

1.3 Actual photo



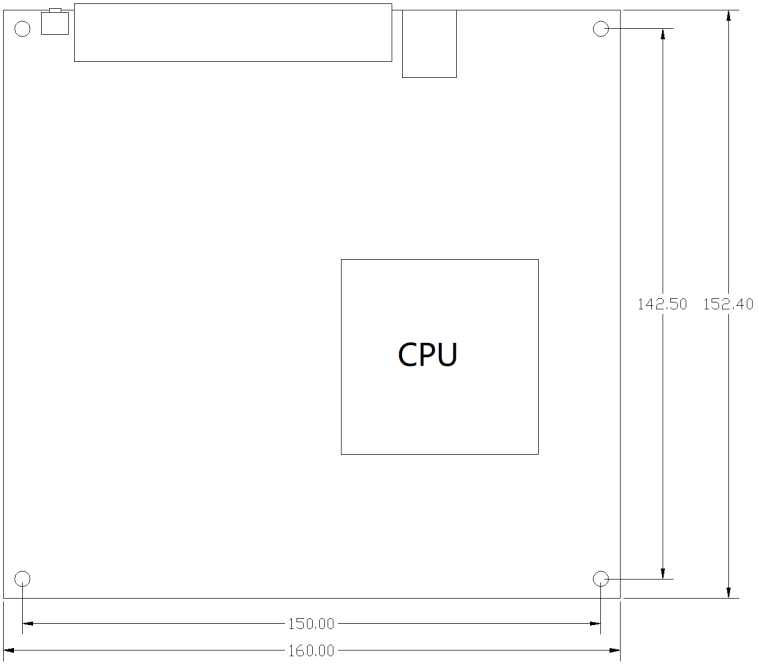
Actual photo at top



Actual photo at bottom

Chapter 2 Connectors

2.1 Dimension

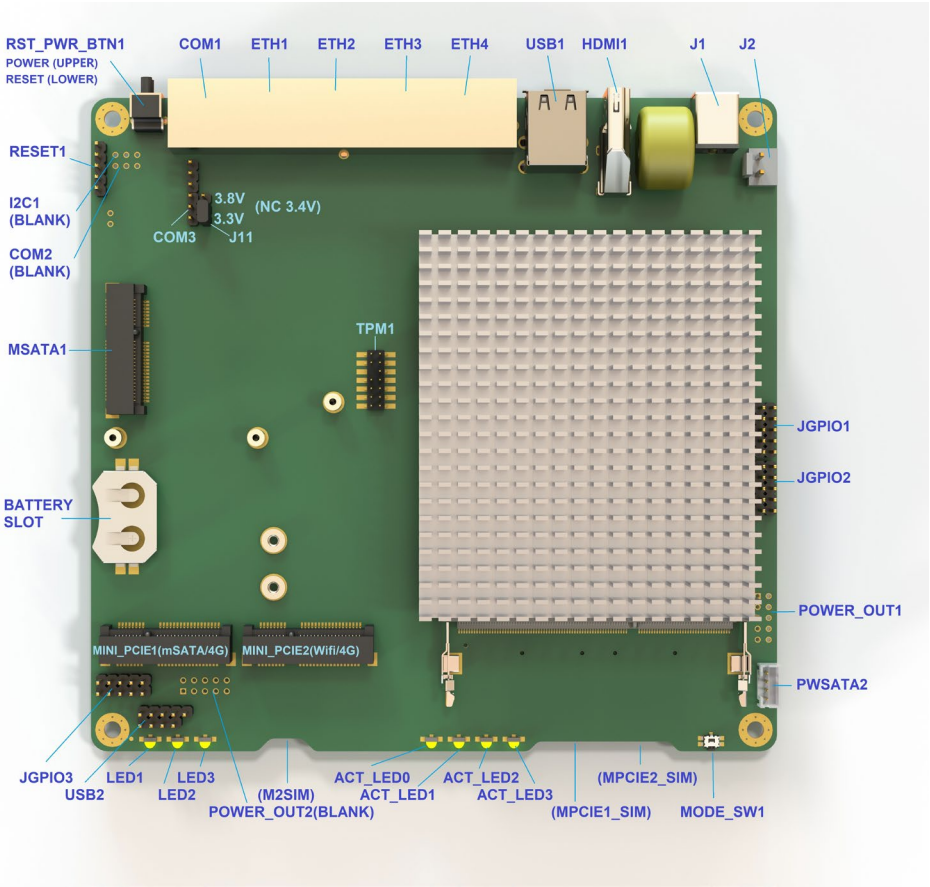


NOAH4C Dimension

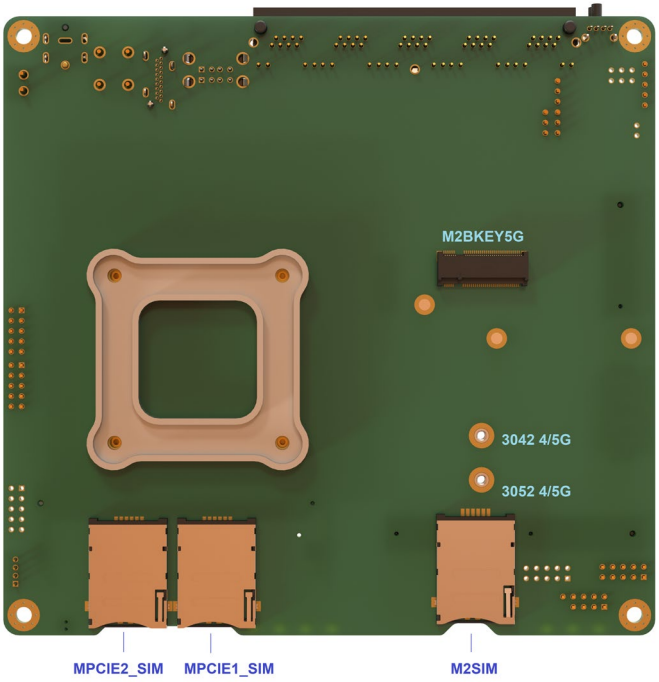
2D/3D file are available. Please contact factory for more info.

broachlink@gmail.com

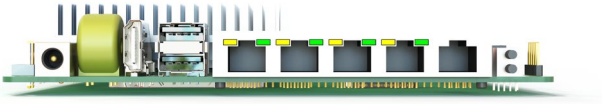
2.2 NOAH4C Connector Layout



NOAH4C connectors layout at the top



NOAH4C connectors layout at the bottom

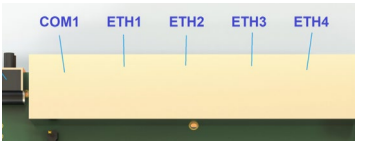


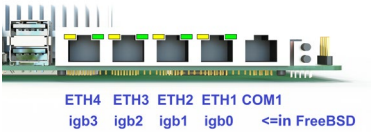
NOAH4C I/O ports layout

2.3 Connectors List

COM1,ETH1,ETH2,ETH3,ETH4

Compact design for small enclosures.





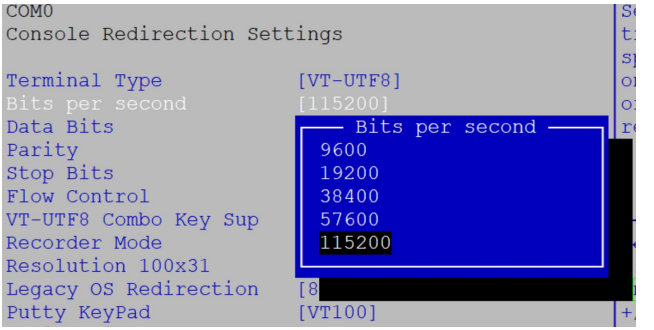
COM1

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

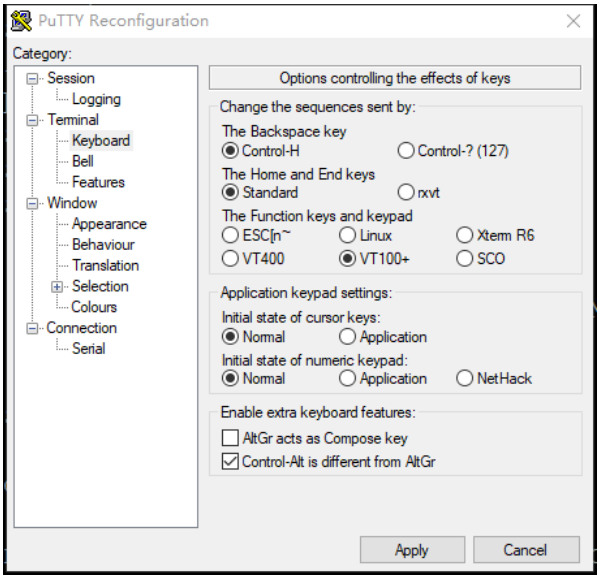
root@:/ # vi /boot/loader.conf

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,ETH4

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:e6:1d:28 **ETH1 the network port close to COM1**

igb1: Ethernet address: 1c:ae:3e:e6:1d:29 **ETH2**

igb2: Ethernet address: 1c:ae:3e:e6:1d:2a **ETH3**

igb3: Ethernet address: 1c:ae:3e:e6:1d:2b **ETH4 network port close to USB connector**

IP setting

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

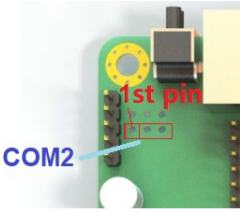
clear_tmp_enable="YES"

```
sendmail_enable="NONE"
hostname=""
#ifconfig_igb0="DHCP"                                    // dhcp
ifconfig_igb0="inet 192.168.1.210 netmask 255.255.255.0"   // static IP on igb0
ifconfig_igb1="inet 192.168.7.210 netmask 255.255.255.0"   // static IP on igb1
ifconfig_igb2="inet 192.168.8.210 netmask 255.255.255.0"   // static IP on igb2
ifconfig_igb3="inet 192.168.9.210 netmask 255.255.255.0"   // static IP on igb3
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.

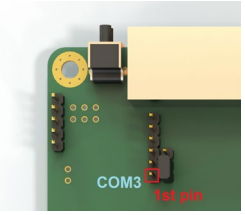
The port would be available as soon as pin header soldered.



PIN	NAME
1	TXD
2	RXD
3	GND

COM3 (TTL level)

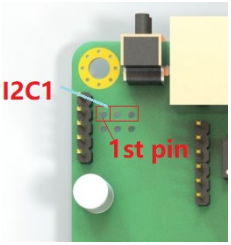
The both TTL level serial ports are from a USB bus convert chip CH340.



PIN	NAME
1	TXD
2	RXD
3	GND

I2C1(BLANK)

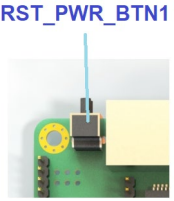
The port would be available as soon as pin header soldered.

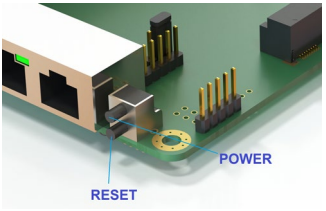


PIN	NAME
1	DATA
2	CLK
3	GND

HDMI1

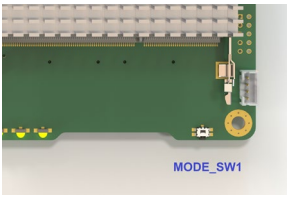
RST_PWR_BTN1



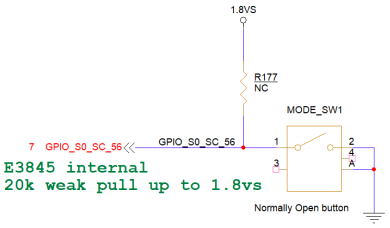


POSITION	FUNCTION
Upper	Power Button
Lower	Reset Button

MODE_SW1

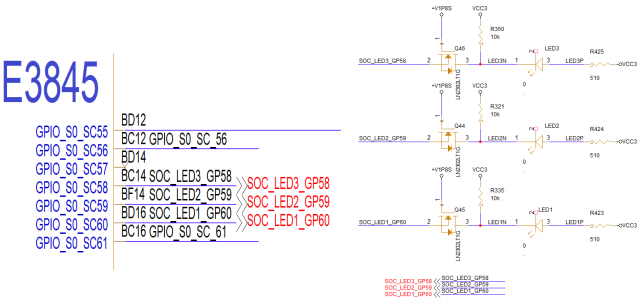


PIN	NAME
MODE_SW1	GPIO pin. Wired out from GPIO_S0_SC56 of SOC (pin BC12).



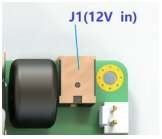
LED1,LED2,LED3

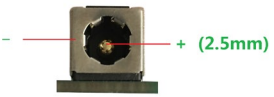
NAME	FUNCTION
LED1	GPIO pin. Wired out from GPIO_S0_SC60 of SOC (pin BD16).
LED2	GPIO pin. Wired out from GPIO_S0_SC59 of SOC (pin BF14).
LED3	GPIO pin. Wired out from GPIO_S0_SC58 of SOC (pin BC14).



J1

12V power in connector, 5.5mm/2.5mm. It is recommended to use a power supply validated by us to ensure the reliability of the appliance.



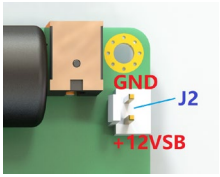


PIN	NAME
Central pin	+12VSB (ALWAYS ON)
Another pin	GND

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:

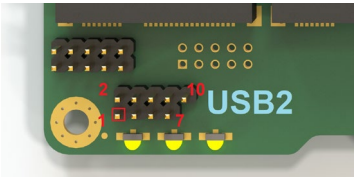
12V_S (OFF IN S4) and +12VSB (ALWAYS ON) are different power rail.

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

USB1

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

USB2

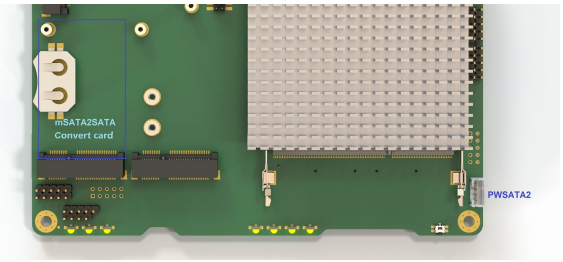


PIN	NAME	PIN	NAME
1	VCC	2	VCC
3	D0-	4	D1-
5	D0+	6	D1+
7	GND	8	GND
		10	GND

PWSATA2

Using PWSATA2 and Broachlink mSATA2SATA convert card to support SATA 3.5/2.5 inch Hard

drive.

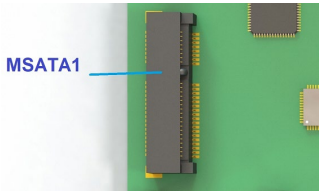


PWSATA2 definition

PIN	NAME
1	VCC
2	GND
3	GND
4	12V_S

MSATA1 (SSD)

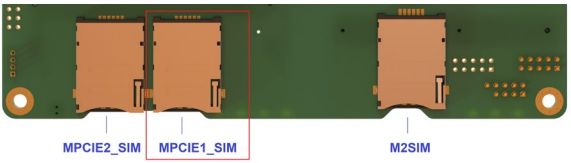
Support mSATA SSD. SATA 2.0 , 3.0 Gb/s.



MINI_PCIE1 (mSATA /4G-Lte)

Support 4G/LTE module with MPCIE1_SIM holder.

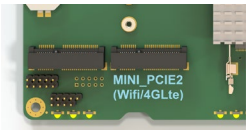
NOAH4C use SIO_GP22(pin8 of ITE8772) to connect reset signal input of 4G modem (pin22 of MINI_PCIE1). User can output low level pluse on SIO_GP22 signal to reset modem without reset whole system.

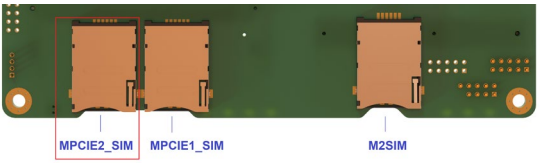


MINI_PCIE2 (Wifi/4GLte)

The slot support the wifi cards, PCIe Gen2.It's compatible with Broachlink copper and optical mini PCIe cards.

Support 4G/LTE module with MPCIE1_SIM holder. NOAH4C use SIO_GP56(pin41 of ITE8772) to connect reset signal input of 4G modem (pin22 of MINI_PCIE2).User can output low level pluse on SIO_GP56 signal to reset modem without reset whole system.





M2BKEY5G (4G/5G)

Support M.2 B key 30x42mm or 30x52mm 4G/5G module.

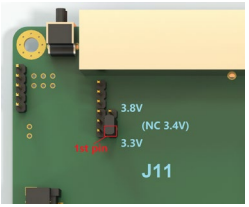
The M.2 slot integrated USB3.0 signal features with 5Gbps throughput for 5G cards.

M2SIM is connected to M2BKEY5G.

NOAH4C use SIO_GP65 (pin55 of ITE8772) to connect reset signal input of 4G modem (pin67 of M.2 connector).User can output low level pluse on SIO_GP65 signal to reset modem without reset whole system.

J11

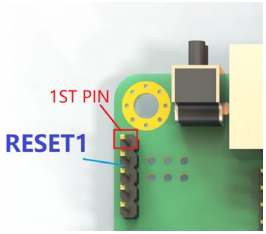
The jumper is used for setting supply voltage of 4G/5G card in M2BKEY5G. If the 4G/5G card can accept maximum voltage of 4V, it is strongly recommended to set this jumper to 3.8V especially poor signal environment.



Jumper setting	Voltage of MINI_PCIE1
1-2 (Default)	3.3V
2-3	3.8V
No Jumper	3.4V

Caution: Wrong voltage setting may demage modem,Please make sure the recommended voltage of modem before operation.User can get the information from modem hardware guide or datasheet.

RESET1



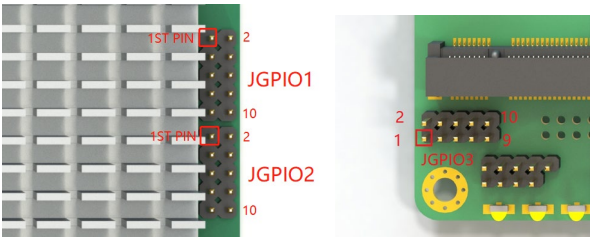
PIN	NAME
1	Power button
2	GND
3	GND
4	RESET#
5	Watchdog_trigger# Active-Low level

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

NOAH4C has three 10pin headers to support up to 23 channels 3.3V GPIO signals. 16 channels are controlled by SOC E3845, and the remaining 7 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

GPIO3 (Super I/O source)

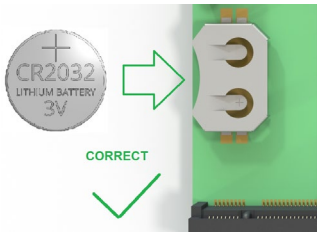
PIN	NAME	PIN	NAME
1	GP52	2	3.3V
3	GP51	4	NC
5	GP37	6	GP57
7	GP36	8	GP60
9	GND	10	GP61

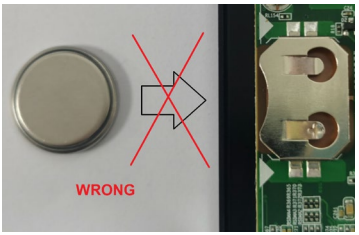
In order to help developers carry out secondary development on NOAH, broachlink has released GPIO development tools, including BL-GPIO-KIT (purchase separately) 3 x 8 CH GPIO card, and FreeBSD, Linux, windows demo code. Contact broachlink@gmail.com for more info.

Battery holder (CR2032)

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

PIN	NAME
Pin On PCB	Negative
Top Pin	Positive



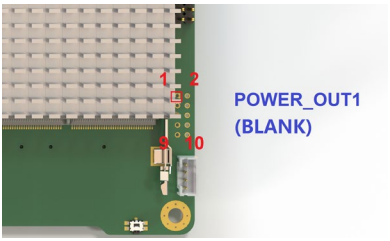


Appendix:

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

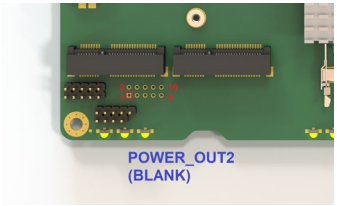
Caution:

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	0	GND

**Note: VCC (5V voltage , OFF IN S4)*