

Broachlink NOAH4 Router Motherboard Quick Hardware Manual

V1.0.4

ORDER INFORMATION

NO.	Model	Processor	Frequency	Memory	HDMI	LAN	USB	COM	MiniPCle (wifi)	DC IN
1	BL-NOAH4- E3845V10	E3845	1.91GHz	1	1	4*WGI211A T	4	3	1	DC12V

DESC.

160*152mm Noah E3845 Motherboard,4wgi211AT,3 MiniPCle slot (1 4GLte,1wifi ,1mSATA) ,without button battery,HDMI,24 CH GPIO,3 serial (1rs232 rj45 , 2ttl),1sata,1 External pluggable SIM holder

Chapter 1 Introduction

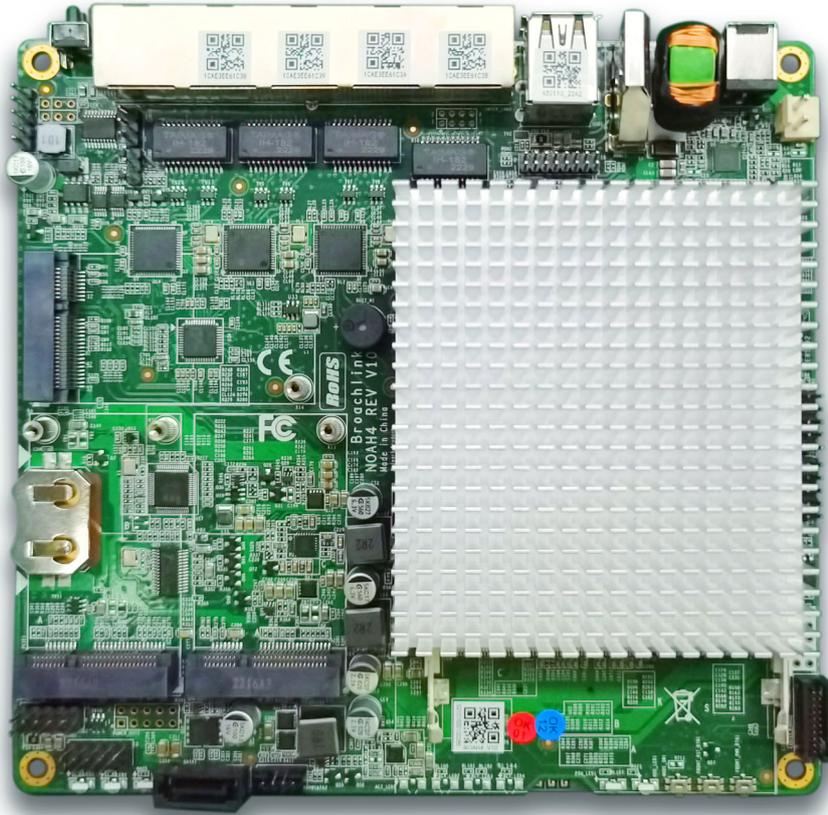
1.1 About Noah

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.

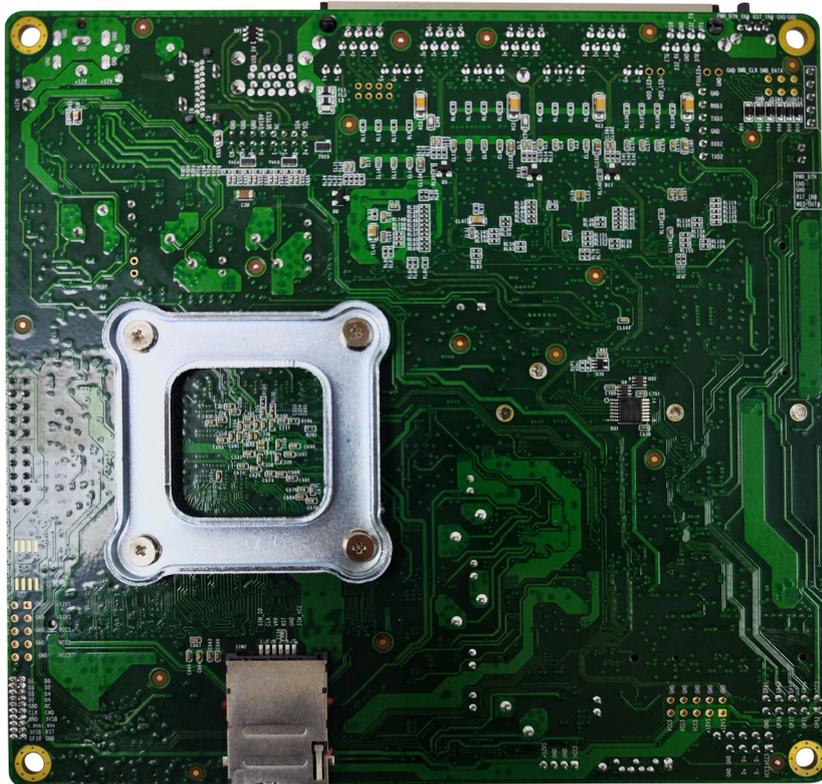
1.2 Specification

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 I211 Gigabit
	Connector: RJ45
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 , MINI_PCIE2 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

1.3 Actual photo



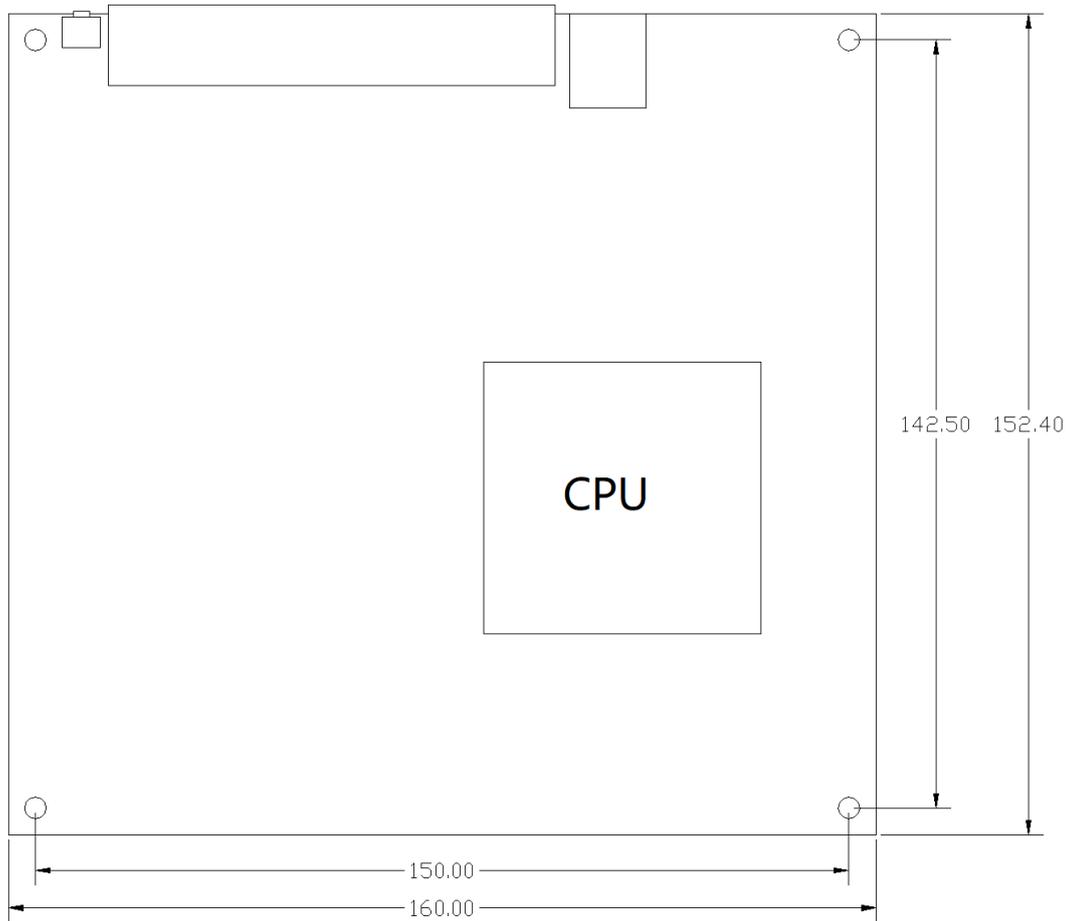
Actual photo at top



Actual photo at bottom

Chapter 2 Connectors

2.1 Dimension

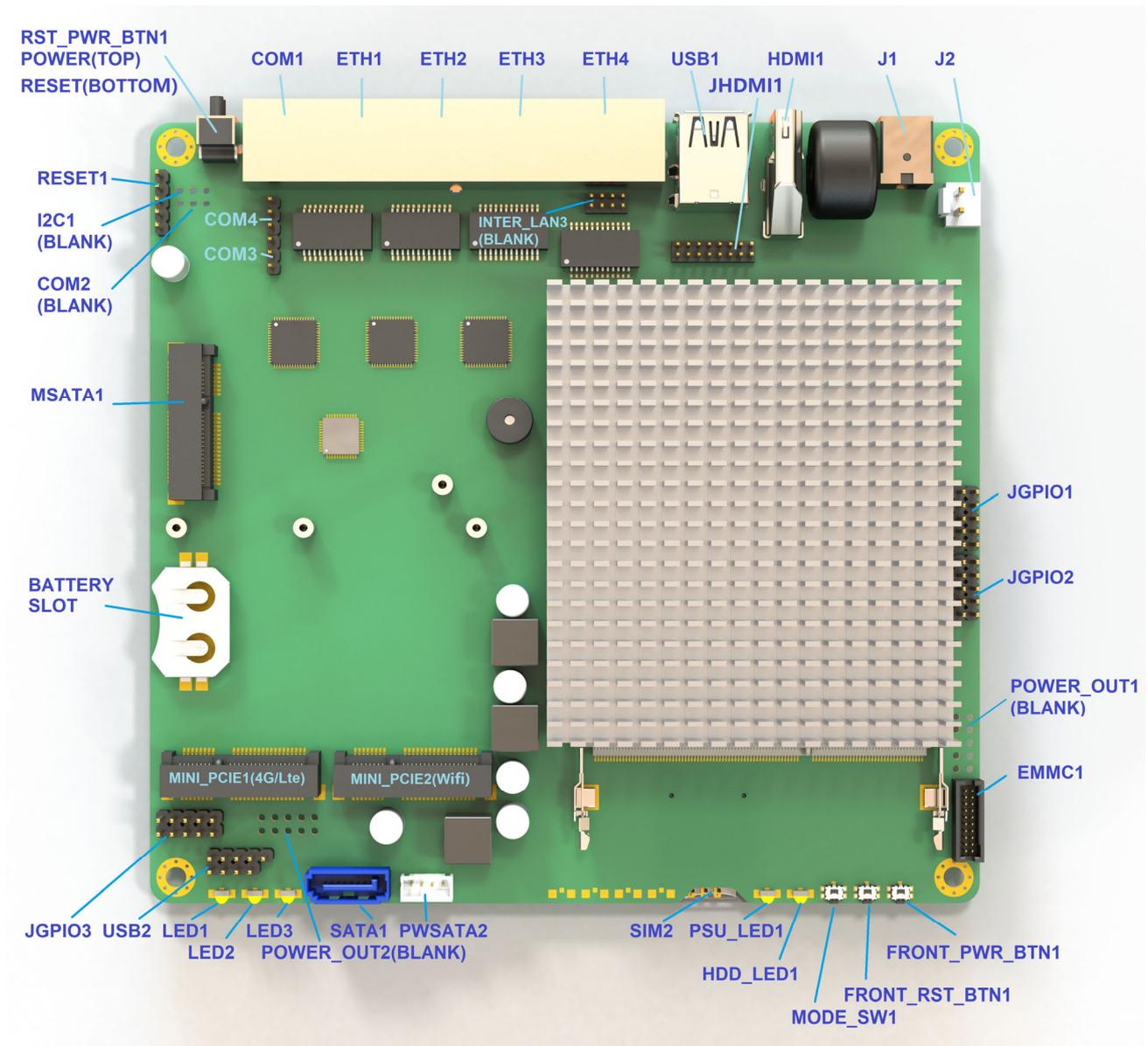


NOAH4 Dimension

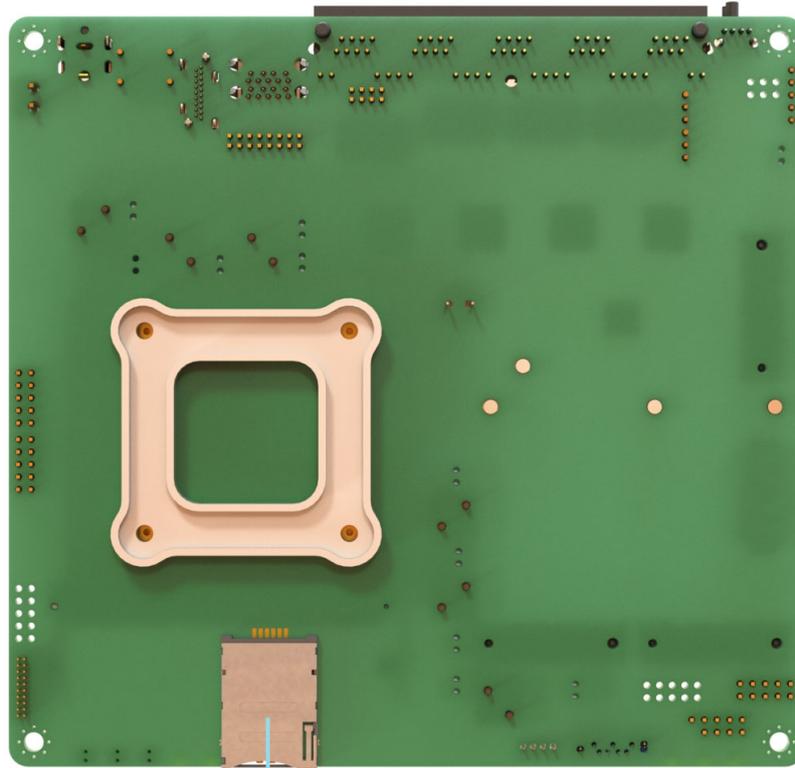
2D/3D file are available. Please contact factory for more info.

broachlink@gmail.com

2.2 NOAH4 Connector Layout

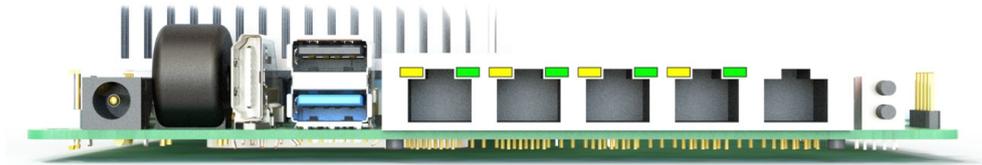


NOAH4 connectors layout at the top



SIM2

NOAH4 connectors layout at the bottom

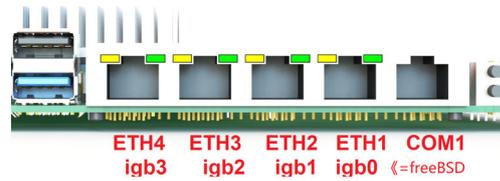
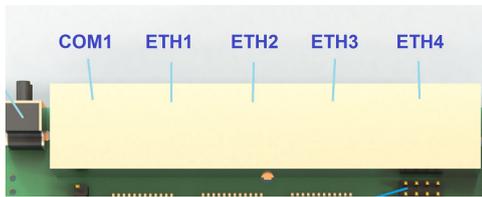


NOAH4 I/O ports layout

2.3 Connectors List

COM1

Compact design for small enclosures.



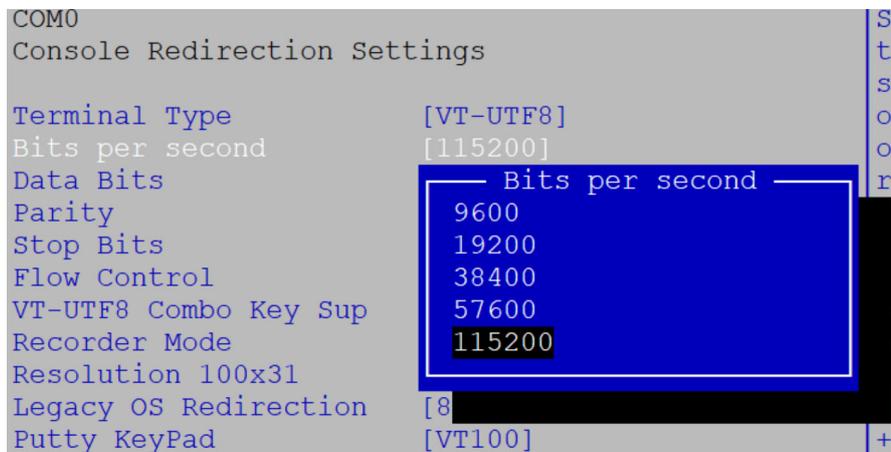
COM1

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).

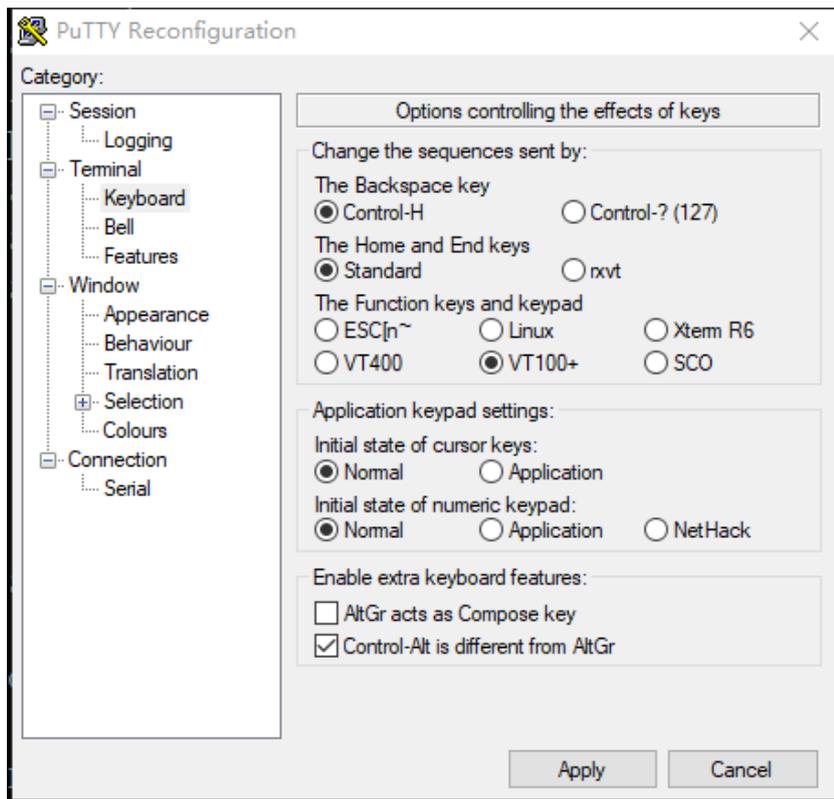
Baud rate setting in BIOS



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
```

```
igb2: Ethernet address: 1c:ae:3e:e6:1d:2b ETH4 network port close to USB connector
```

IP setting

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

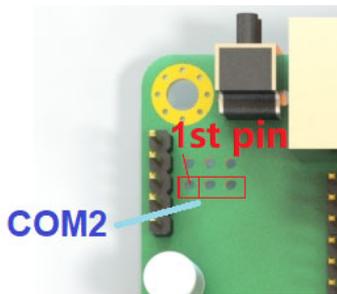
```
clear_tmp_enable="YES"
```

```
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.

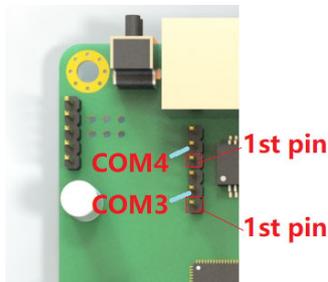
The port would be available as soon as pin header soldered.



PIN	NAME
1	TXD
2	RXD
3	GND

COM3 ~ COM4 (TTL level)

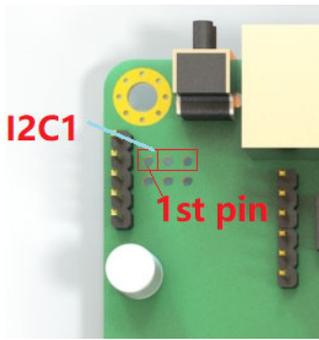
The both TTL level serial ports are from a USB bus convert chip CH340.



PIN	NAME
1	TXD
2	RXD
3	GND

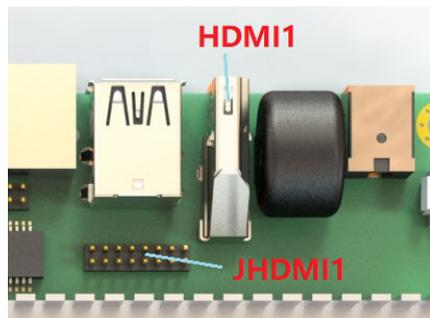
I2C1(BLANK)

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



PIN	NAME
1	DATA
2	CLK
3	GND

HDMI1, JHDMI1



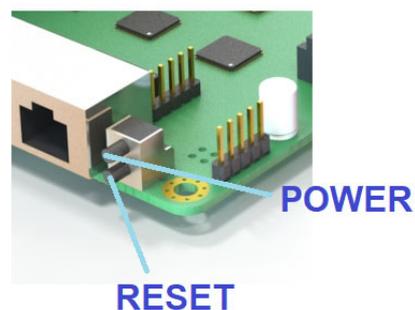
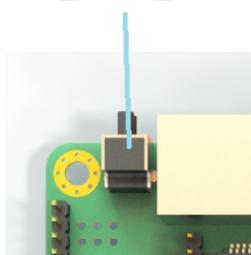
JHDMI1 is the copy of HDMI1, prepared for the client who needs HDMI pin header inside. User can enable JHDMI1 by removing 8 resistors RDM1 ~ RDM8.

JHDMI1 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

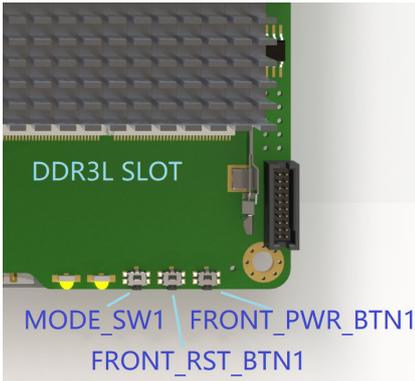
RST_PWR_BTN1

RST_PWR_BTN1

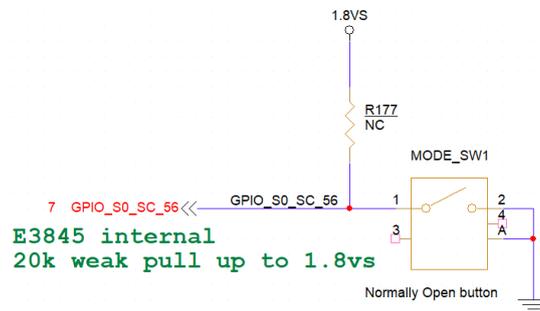


POSITION	FUNCTION
Upper	Power Button
Lower	Reset Button

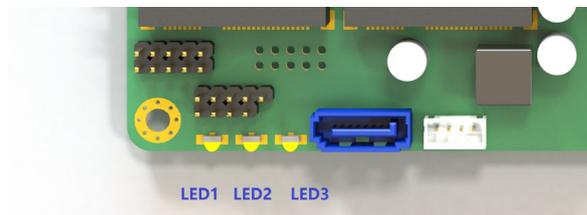
FRONT_PWR_BTN1,FRONT_RST_BTN1,MODE_SW1



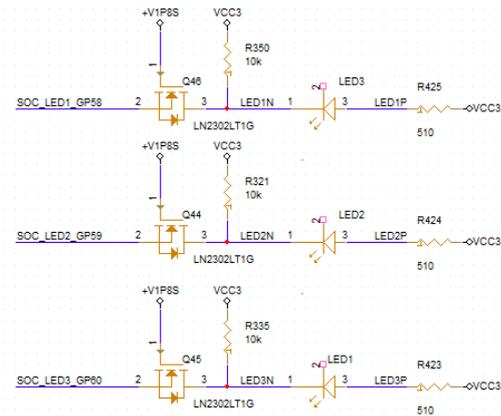
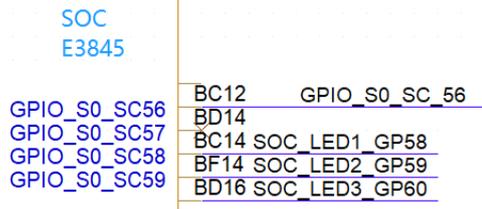
PIN	NAME
FRONT_PWR_BTN1	Power Button the copy of BPWBTN1
FRONT_RST_BTN1	Reset Button the copy of BACK_RST1
MODE_SW1	GPIO pin. Wired out from GPIO_S0_SC56 of SOC (pin BC12).



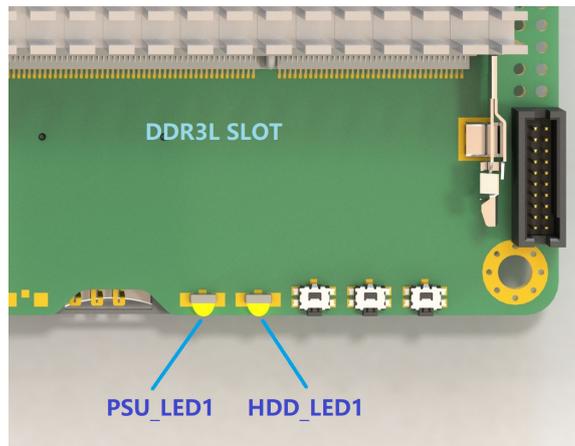
LED1,LED2,LED3



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).



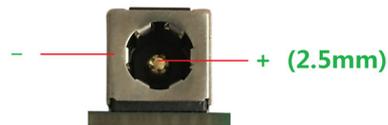
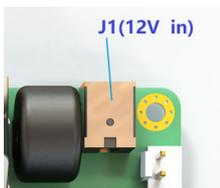
HDD_LED1, PSU_LED1



NAME	FUNCTION
HDD_LED1	HDD Activity light, blink when HDD in reading/writing.
PSU_LED1	Power Status. Light off in case system is in shutdown (S4)

J1

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

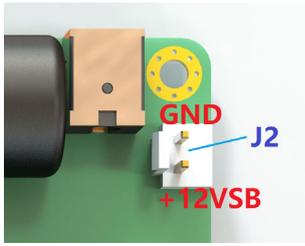


PIN	NAME
Central pin	+12VSB (ALWAYS ON)
Another pin	GND

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.



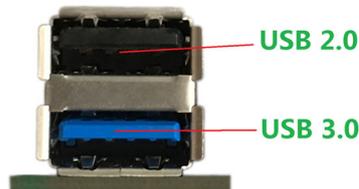
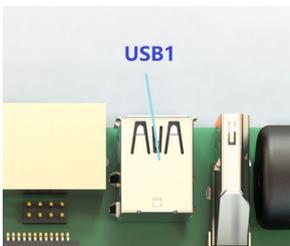
PIN	NAME
1	+12VSB (ALWAYS ON)
2	GND

Caution:

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

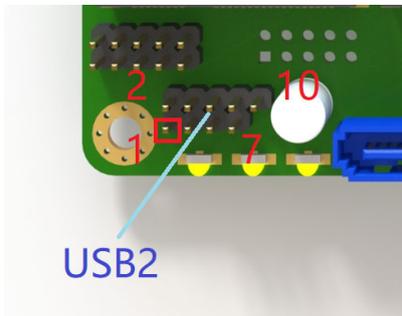
Must not wire +12VSB to 12V_S , Short them would damage the motherboard.

USB1



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

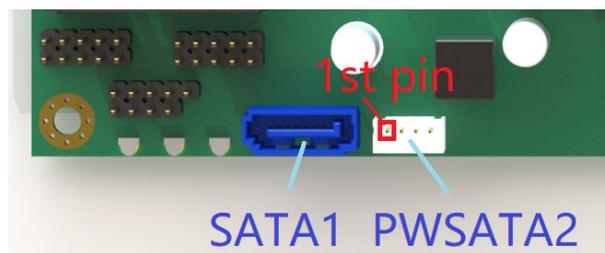
USB2



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

SATA1,PWSATA2

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



SATA1 definition

PWSATA2 definition

Broachlink

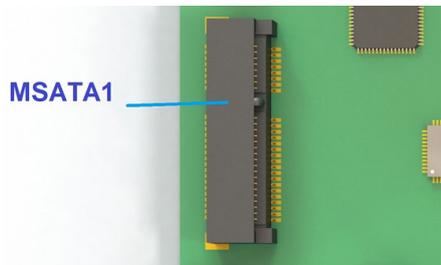
NOAH ROUTER MOTHERBOARD

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

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 (4G/Lte)

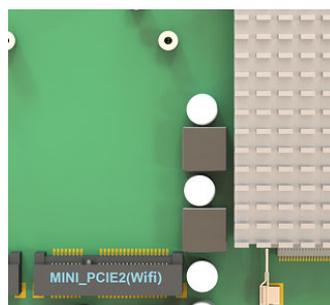
Support 4G/LTE module with SIM2 SIM holder.



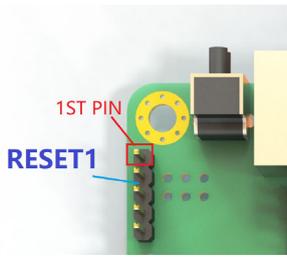
MINI_PCIE2 (Wifi)

The slot support the wifi cards, PCIe Gen2.

Also compatible with Broachlink copper and optical mini PCIe cards.



RESET1



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

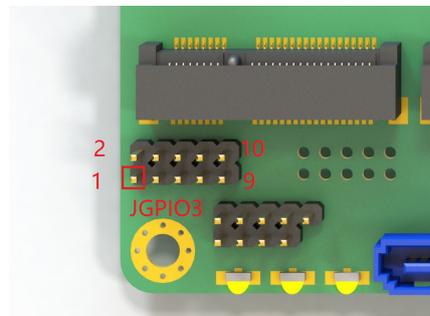
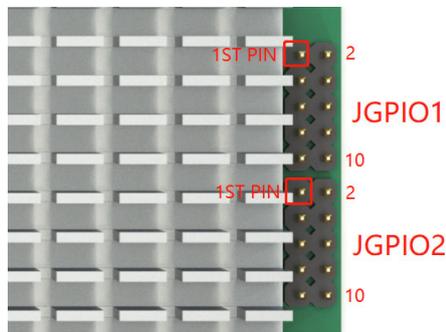
Shorting pin 4~5 means the watchdog will trigger a system reset after WDT timeout.

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



JGPIO1, JGPIO2, JGPIO3

NOAH4 has three 10-pin headers to 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

GPIO3 (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

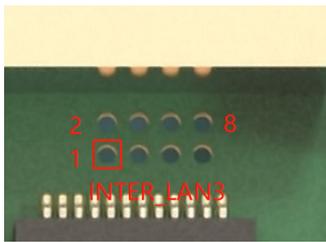
Appendix:

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

INTER_LAN3 (BLANK)

The pin header is not soldered by default.

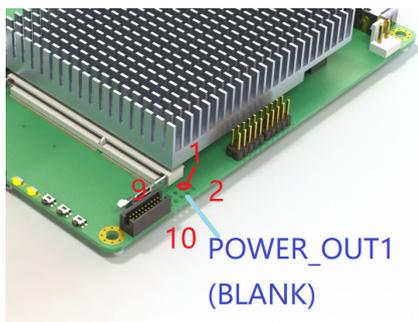
It's the copy of ETH4. Some user need to internal interconnect it to other cards inside appliance.



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

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

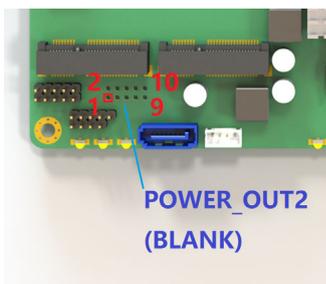
Caution:

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.

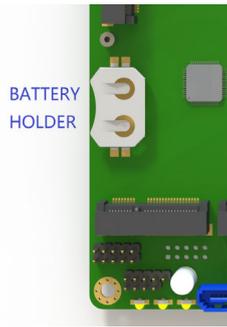


PIN	NAME	PIN	NAME
1	12V_S (OFF IN S4)	2	GND
3	12V_S (OFF IN S4)	4	GND
5	VCC	6	GND
7	VCC	8	GND
9	VCC	10	GND

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
Top Pin	Positive