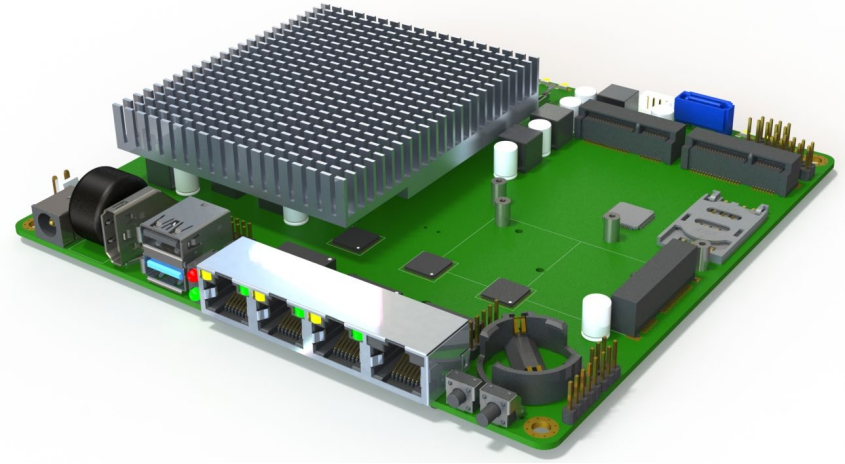


Broachlink NOAH3 Router Motherboard

Quick Hardware Manual

V1.0.5

ORDER INFORMATION

NO.	Model	Processor	Frequency	Memory	HDMI	LAN	USB	COM	MiniPCIe (wifi)	DC IN
1	BL-NOAH3-E3845V10	E3845	1.91GHz	1	1	3*WGI211AT	4	3	1	DC12V

DESC.

160*152mm Noah E3845 Motherboard,3wgi211at,3 MiniPCIE slot (1 4GLte, 1wifi, 1mSATA/wifi Mux), without button battery,HDMI,24 CH GPIO,3 serial (1rs232 rj45 , 2ttl),1sata,1 External pluggable SIM holder / 1 internal hinged SIM holder Mux

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 NOAH3

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, September 15, 2022

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 NOAH3

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.

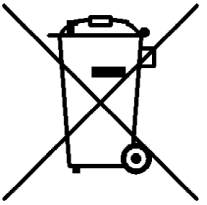
Richard Deng / President

Shenzhen, September 15, 2022

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

1.2 About Noah

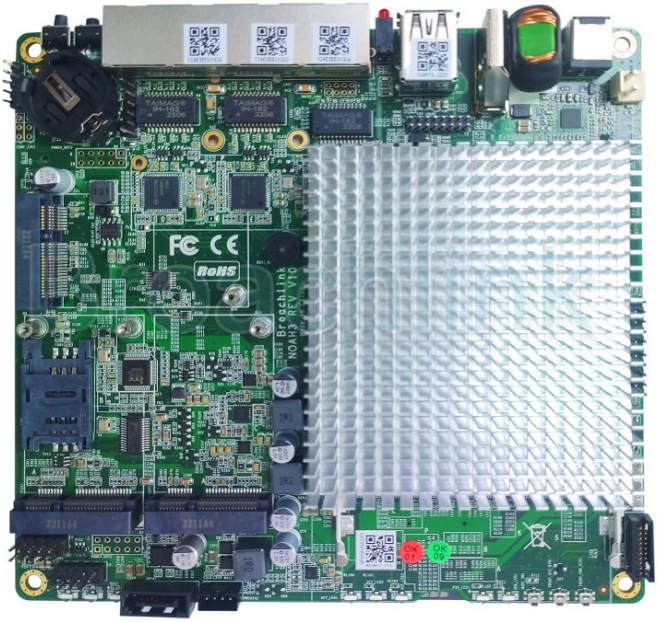
Broachlink NOAH series motherboard are designed for fanless network appliance, like router, firewall, VPN, IPBX, IoT gateway etc. Deeply electronic, mechanical, and software optimized for perfect operation on open source operating systems such as CentOS, OpenBSD, OPNsense, and FreeBSD. The ideal choice 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.

1.3 Specification

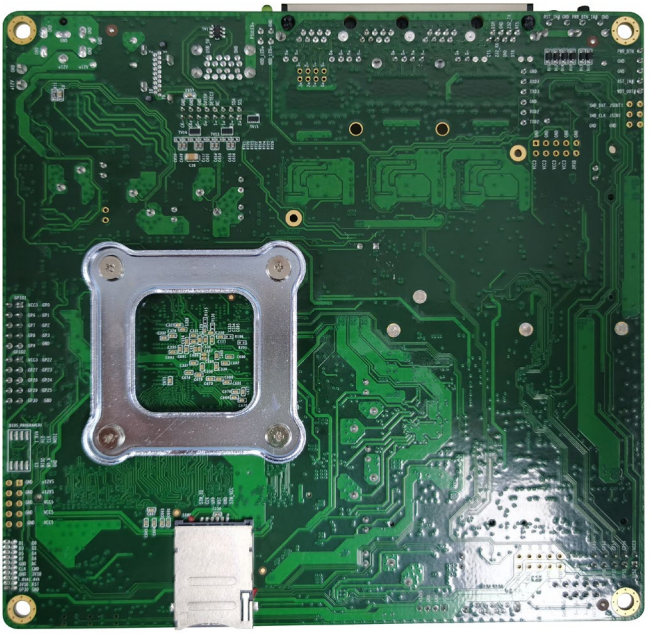
Processor	CPU: Intel Atom E3845 Core: 4 Frequency: 1.91GHz L2 Cache: 2MB AES: AES-NI
	BIOS: AMI 64 Mbit
Memory	Technology: DDR3L 1333MHz
	Max. Capacity: 8 GB
	Socket: 1 x 204 pin SODIMM
Display	1 x HDMI Maximum Resolution: up to 2560x1600 at 60 Hz
Ethernet	Interface: Up to 3
	Controller: Intel I211
	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	Dimensions (L x W): 160 x 152 mm (6.3" x 5.99")

Characteristics	Weight: 0.45 kg (0.99 lb) (with heatsink)
	Total Height: (with cooler + PCB + Bottom) 33mm

1.4 Actual photo



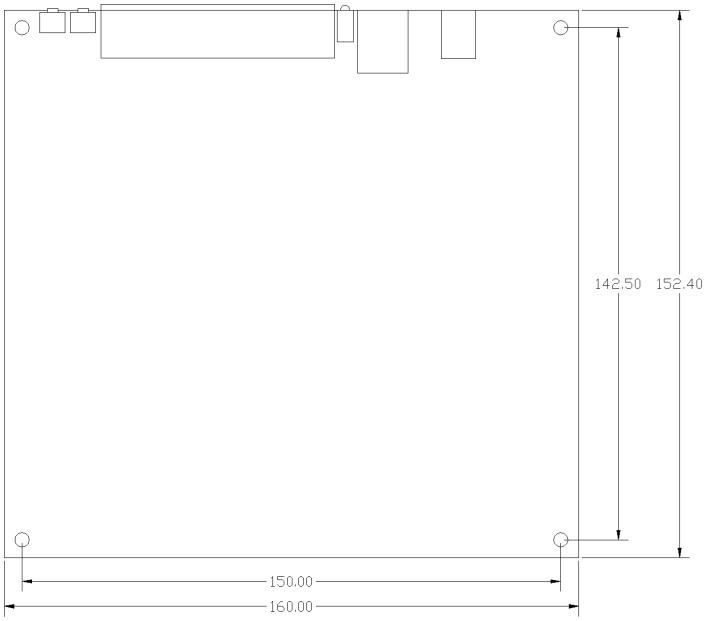
Actual photo at top



Actual photo at bottom

Chapter 2 Connectors

2.1 Dimension

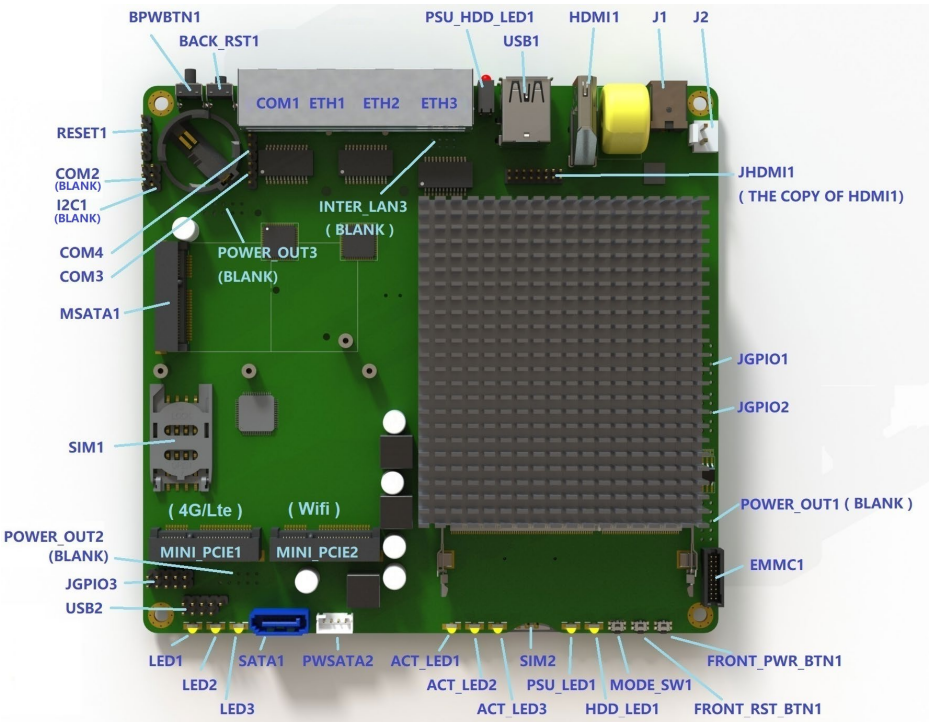


NOAH3 Dimension

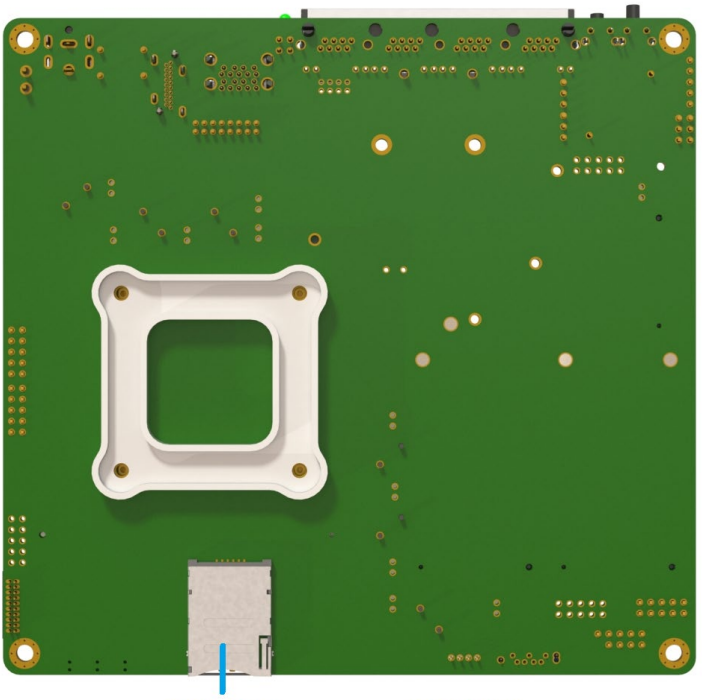
2D/3D file are available. Please contact factory for more info.

broachlink@gmail.com

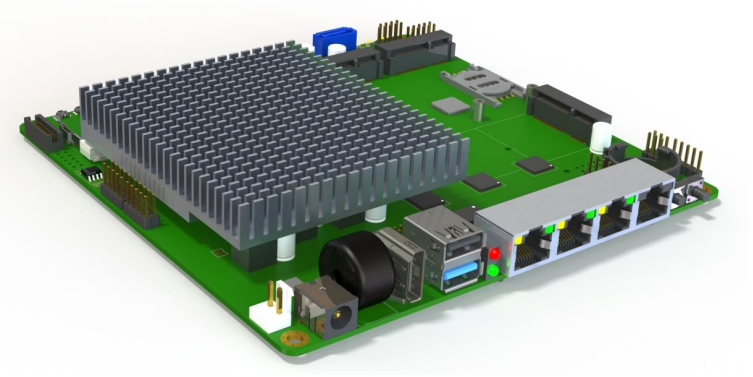
2.2 NOAH3 connectors layout



NOAH3 connectors layout at top



NOAH3 connectors layout at bottom

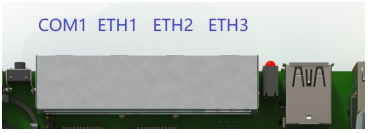


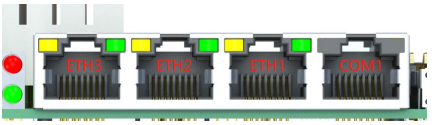
NOAH3 I/O ports layout at back

2.3 Connectors List

COM1,ETH1,ETH2,ETH3

Compact design for small enclosures.





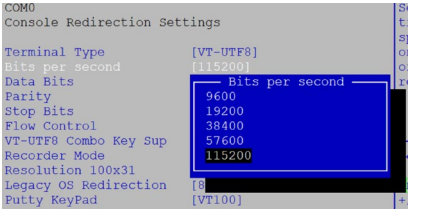
COM1 Definition

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

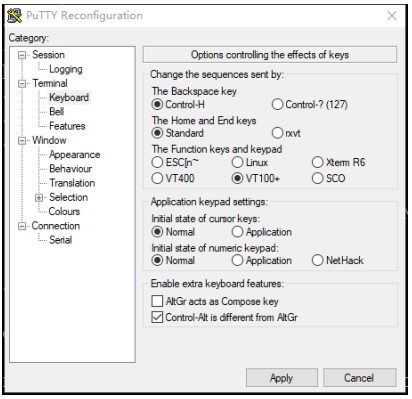
root@:/ # vi /boot/loader.conf

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

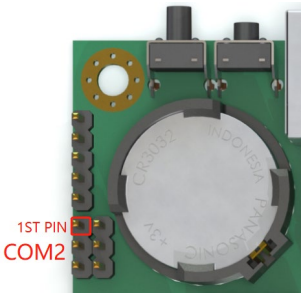
```
clear_tmp_enable="YES"
sendmail_enable="NONE"
hostname=""
#ifconfig_igb0="DHCP"                                    // dhcp
ifconfig_igb0="inet 192.168.1.210 netmask 255.255.255.0"   // static IP of igb0
ifconfig_igb1="inet 192.168.7.210 netmask 255.255.255.0"
ifconfig_igb2="inet 192.168.8.210 netmask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

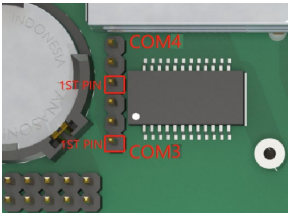
The port would be available as soon as pin header soldered.



PIN	NAME
1	TXD
2	RXD
3	GND

COM3 ~ COM4 (TTL level)

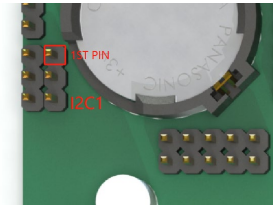
The both TTL level serial pin headers are from a USB bus convert chip CH340.



PIN	NAME
1	TXD
2	RXD
3	GND

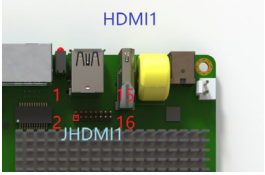
I2C1(BLANK):

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



PIN	NAME
1	DATA
2	CLK
3	GND

HDMI1,JHDMI1

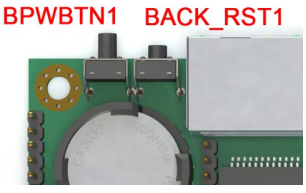


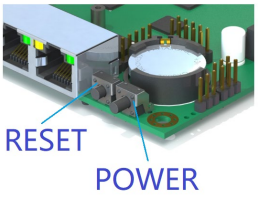
JHDMI is the copy of HDMI1, prepared for the client who needs HDMI pin header inside. User can enable JHDMI by removing 8 resistors RDM1 ~ RDM8.

JHDMI1

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

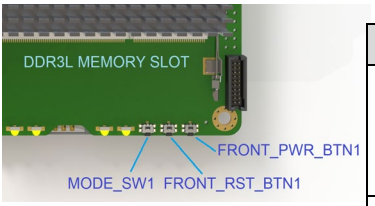
BPWBTN1,BACK_RST1

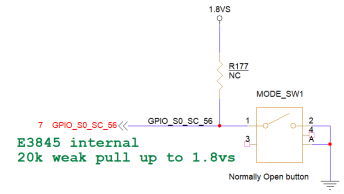




PIN	NAME
BPWBTN1	Power button
BACK_RST1	Reset button

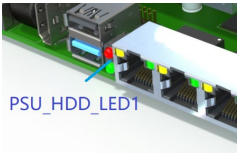
FRONT_PWR_BTN1,FRONT_RST_BTN1,MODE_SW1





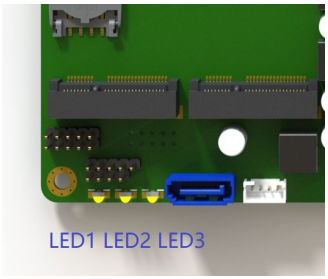
NAME	FUNCTION
FRONT_PWR _BTN1	POWER BUTTON . the copy of the BPWBTN1
FRONT_RST _BTN1	RESET BUTTON the copy of the BACK_RST1
MODE_SW1	GPIO pin. Wired out from GPIO_S0_SC56 of SOC (pin BC12).

PSU_HDD_LED1



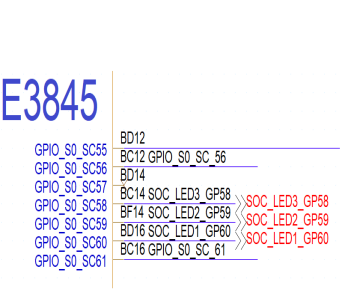
NAME	FUNCTION
RED LED	HDD Activity light, blink when HDD in reading/writing.
GREEN LED	Power Status. Light off in case system is in shutdown

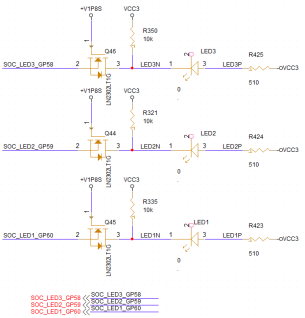
LED1,LED2,LED3

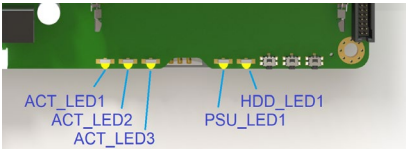


NAME	FUNCTION
LED1	GPIO pin. Wired out from GPIO_S0_SC60 of SOC (pin BD16).
LED2	GPIO pin. Wired out from GPIO_S0_SC59 of SOC (pin BF14).
LED3	GPIO pin. Wired out from GPIO_S0_SC58 of SOC (pin BC14).

HDD_LED1,PSU_LED1,ACT_LED1,ACT_LED2,ACT_LED3



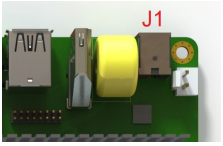


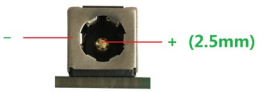


NAME	FUNCTION
HDD_LED1	HDD Activity light, blink when HDD in reading/writing.
PSU_LED1	Power Status. Always on when the PSU is plugged in, regardless of whether the system is in shutdown (S4).
ACT_LED1~3	Activity LED1~3 of ETH1~3

J1

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



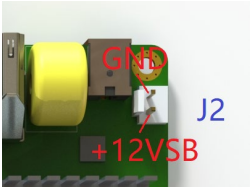


PIN	NAME
Central pin	+12VSB (ALWAYS ON)
Another pin	GND

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

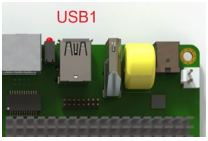
Caution:

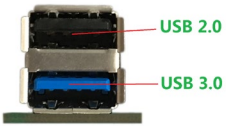
12V_S (OFF IN S4) and +12VSB (ALWAYS ON) are different power rail.

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

USB1

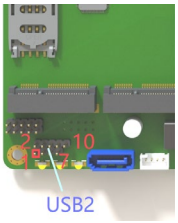
The port consists of 1* USB2.0 and 1* USB3.0.





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

USB2

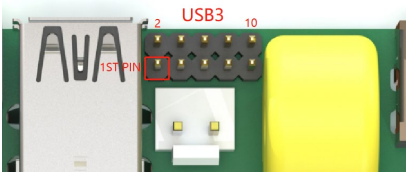


PIN	NAME	PIN	NAME
1	VCC	2	VCC
3	D0-	4	D1-
5	D0+	6	D1+
7	GND	8	GND
9	/	10	GND

USB3 (BLANK)

The pin header is not soldered by default. The port is the copy of USB3.0 of USB1.

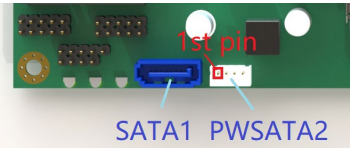
The port would be available as soon as pin header soldered.



PIN	NAME	PIN	NAME
1	VCC	2	USB3_RXP0
3	USB_N0	4	USB3_RXN0
5	USB_P0	6	GND
7	GND	8	USB3_TXP0
9	GND	10	USB3_TXN0

SATA1,PWSATA2

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



SATA1 definition

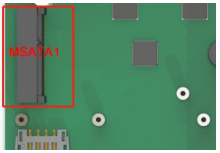
PIN	NAME
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND

PWSATA2 definition

PIN	NAME
1	VCC
2	GND
3	GND
4	12V_S

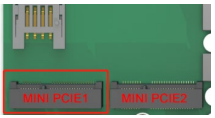
MSATA1 (SSD)

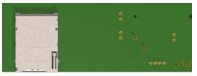
Support mSATA SSD. SATA 2.0 , 3.0 Gb/s (300 MB/s)



MINI_PCIE1 (4G/Lte)

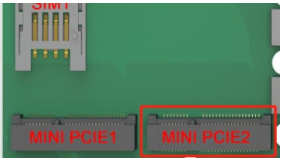
Support 4G/LTE module with SIM1/2 SIM holder.SIM2 (bottom) is the copy of SIM1, prepared for the client who needs inserting the SIM card from outside the enclosure.



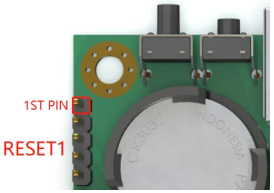


MINI_PCIE2 (Wifi)

The slot support the wifi cards, PCIe Gen2. Broachlink mini PCIe cards are compatible with it.



RESET1



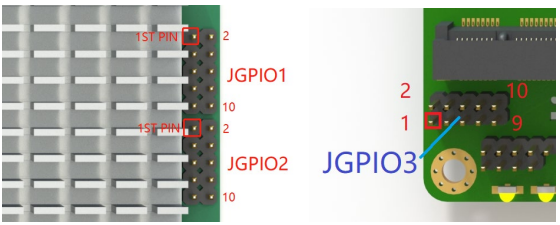
PIN	NAME
1	Power button
2	GND
3	GND
4	RESET#
5	Watchdog_trigger# out. Active-Low level

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

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

JGPIO1,JGPIO2,JGPIO3

NOAH3 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)

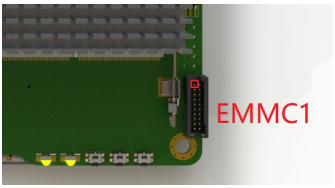
PIN	NAME	PIN	NAME
1	GP22	2	VCC3
3	GP23	4	GP27
5	GP24	6	GP28
7	GP25	8	GP29
9	GND	10	GP30

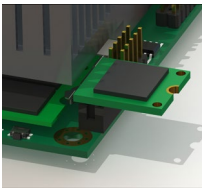
JGPIO3 (Super I/O source)

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

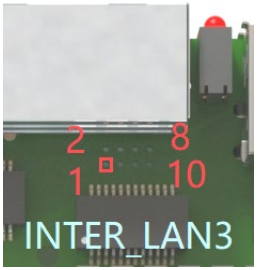
Appendix:

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

INTER_LAN3 (BLANK)

The pin header is not soldered by default.

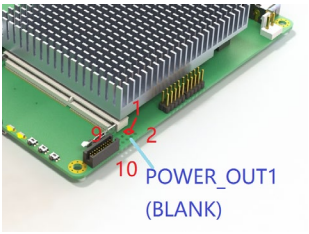
It's the copy of ETH3.Some user need to internal interconnect it to other cards inside appliance.



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

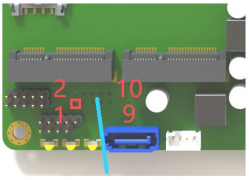
Caution:

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.



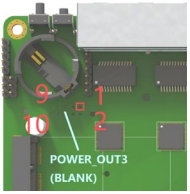
POWER_OUT2

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)

POWER_OUT3 (BLANK)

The pin header is not soldered by default.



PIN	*NAME*	*PIN*	*NAME*
1	*GND*	*2*	*3.3V*
3	*GND*	*4*	*3.3V*
5	*GND*	*6*	*3.3V*
7	*GND*	*8*	*3.3V*
9	*GND*	*10*	*3.3VSB (ALWAYS ON)*

Caution:

3.3V (Alias VCC3, Off in S4) and 3.3VSB (ALWAYS ON) are different power rail.

Must not wire 3.3V to 3.3VSB , Short the both rail would damage the motherboard.

Battery slot (No battery)

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

PIN	NAME
Central pin	Negative
Another pin	Positive