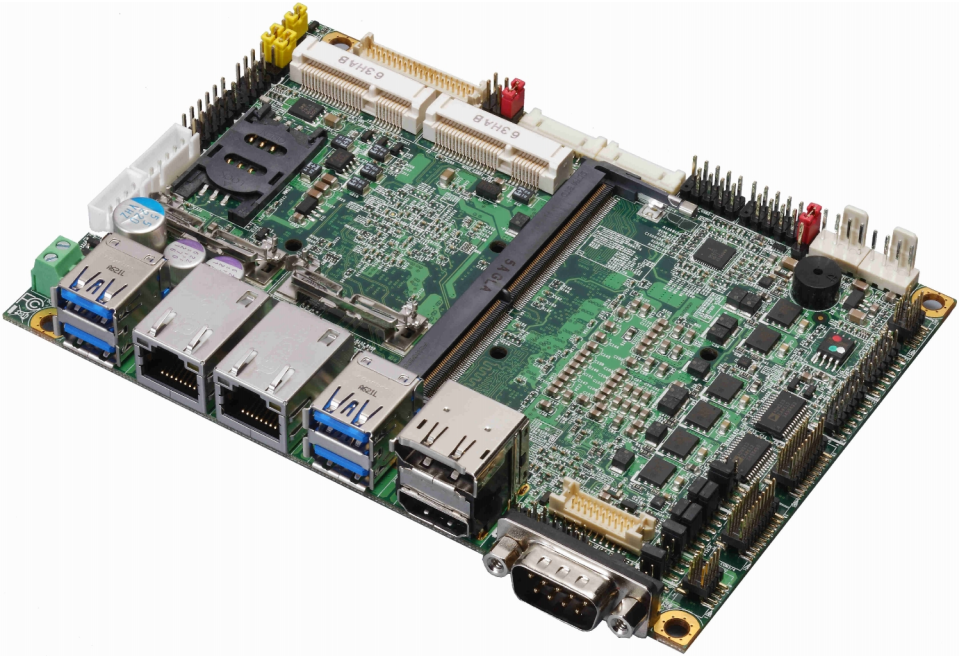
LE-37I

3.5 inch Motherboard

User's Manual

Edition 2.6
2021/07/23



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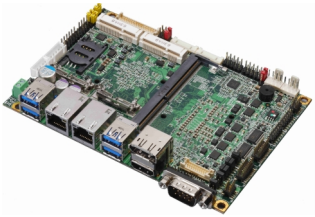
Packing List:

Please check the package content before you starting using the board.



1 x LE-37I Motherboard
(Include Heat spreader for LE-37IS series)
(Include Cooler Fan for LE-37IF series)

1 x Audio cable
(OALPJ-HDUNB / 1040123)

2 x SATA CABLE
(OALSATA3-H10-L35 / 1040523)

1 x COM Cable
(OALES-BKU1NB / 1040086)

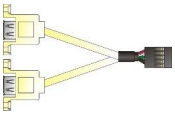
1 x PS/2 Keyboard & Mouse cable
(OALPS2/KM / 1040131)

1 x DVI module
(BADPDVI_A & OALDVI-DF13)
(4120008011 & 1040483)

1 x SATA Power Cable
(OALSATA15-2PJ / 1040613)

1 xDC Input Power Cable
(OALDC-B / 1040513)

1 x VGA Cable
(OALVGA-SNB-7) / (1040557)



1 xUSB2.0 cable
(OALUSBA-3 / 1040173)
(Optional)

1 x Dual COM cable
(OALES-BKU2NB / 1040090)
(Optional)

Printed Matters:

Driver CD (Including User's Manual) x 1

Index

Chapter 1 <Introduction>

1.1 <Product Overview>

LE-37I is 3.5 inch Motherboard which supports Intel® 6th / 7th Gen Intel® Core™/ Xeon® H-series Processor with Intel® QM170 /QM175 /CM238 Chipset, integrated HD Graphics 530/630, DDR4 memory, Realtek High Definition Audio, Intel Gigabit LAN, Serial ATA3

The 6th / 7th Generation Intel® Core™ H-series processor family is new generation and multi-core processor built on 14 nanometer process.

Skylake/ Kaby Lake provide new HD Graphics 530/630 support triple displays at the same time, maximum supported is up to 16GB of DDR4, better performance, flexibility and more enhanced security that is suitable for a variety of intelligent systems the ideal choice.

All in One multimedia solution

LE-37I provides high performance onboard graphics, 18/24-bit single/dual channel LVDS interface, HDMI, DisplayPort, DVI-D, VGA and High Definition Audio, to meet the requirement of the multimedia application.

Flexible Expansion Interface

It includes two minicard slot, 6 x COM port, 4 x USB3.0, and 4 x USB2.0.

Skylake remove EHCI, all USB ports are xHCI

When you install Windows7 with USB device(CDROM, Keyboard, Mouse...), Windows7 can not identify your usb device. You can use SATA CD-ROM and PS/2 to install Windows7.

Kaby Lake only support Windows10 64bit

Intel only support Windows 10 64bit. It may lose some drivers if you use other Windows version.

1.2 <Product Specification>

System

Processor	Intel® 6th / 7th Gen Intel® Core™/ Xeon® H-series Processor, FCBGA1440 package
Chipset	Intel® QM170 /QM175 /CM238
Memory	1 x DDR4 SO-DIMM 2133 MHz up to 16GB, Support Non-ECC, unbuffered memory only
Watchdog Timer	Generates a system reset with internal timer for 1min/s ~ 255min/s
Real Time Clock	Chipset integrated RTC with lithium battery
Expansion	2 x MiniPCIe (support mSATA) 1 x Sim slot

Graphics

Chipset	Intel® 9th Gen integrated HD Graphics
Display Interface	1 x DVI-D, 1 x HDMI, 1 x DisplayPort, 1 x LVDS, 1 x VGA

LAN

Chip	1 x Intel® I219-LM Gigabit PHY LAN (Support iAMT11.0) 1 x Intel® I210-AT Gigabit LAN

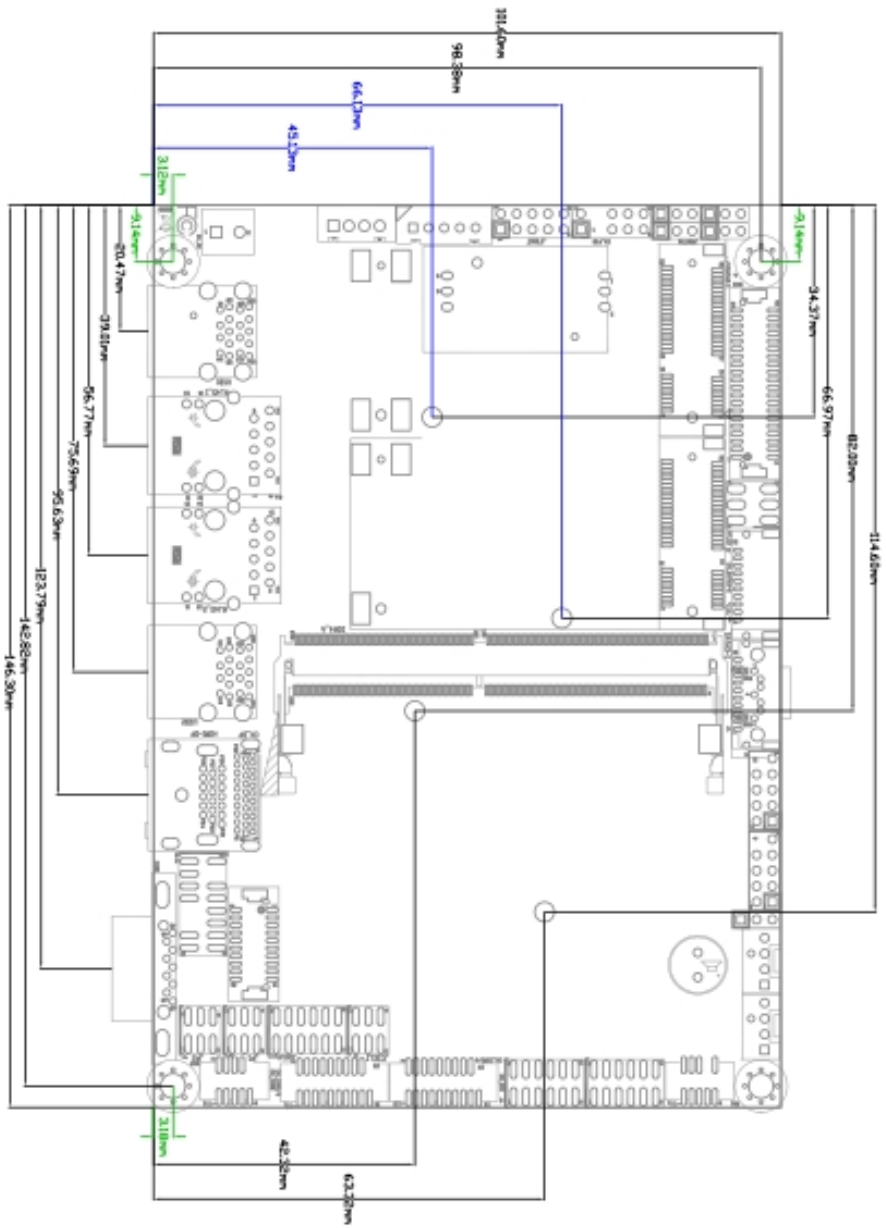
I/O

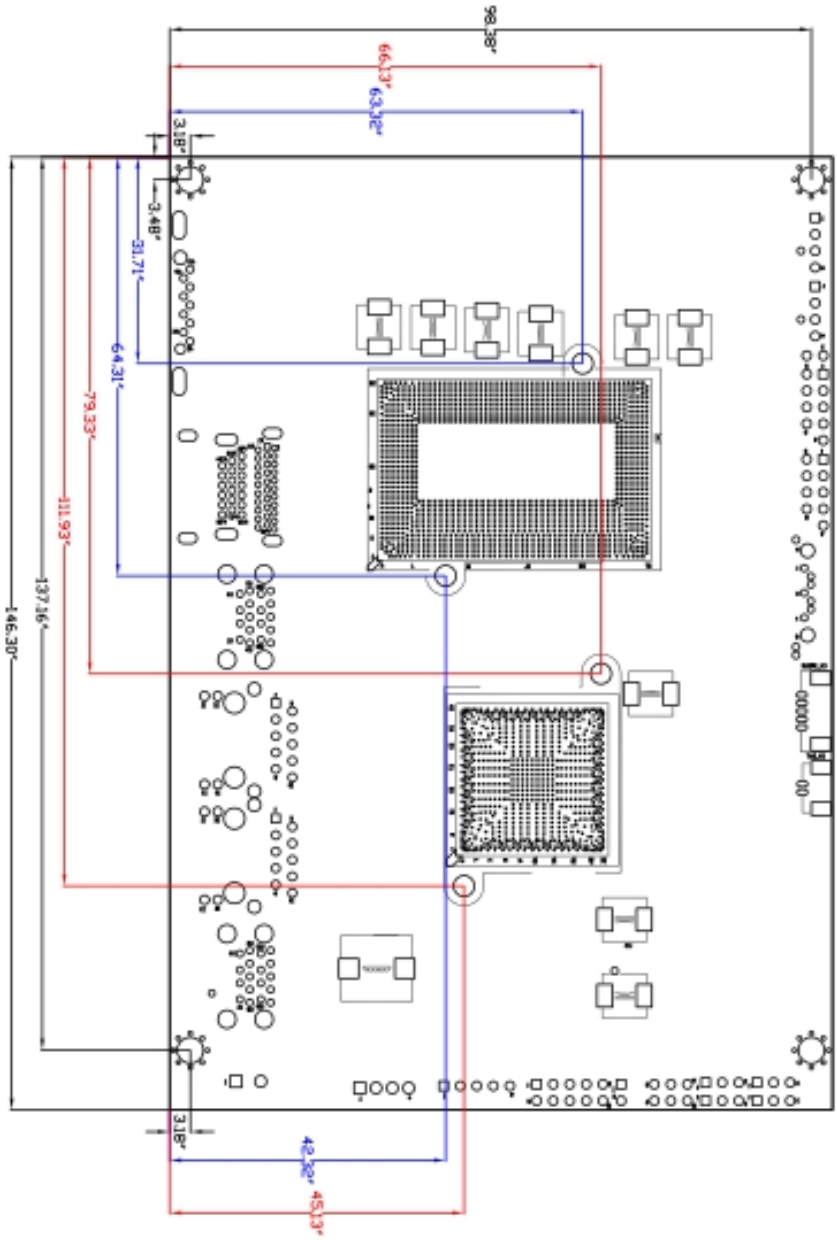
Serial ATA	2 x SATA3
Audio	Realtek ALC262 HD Audio
Internal I/O	2 x SATA3, 4 x RS232, 4 x USB2.0, 1 x LVDS, 1 x LPC, 1 x PS/2 1 x LCD inverter, 1 x GPIO , 1 x Audio, 1 x SMBUS, 1 x VGA, 1 x DVI-D 1 x RS232/422/485
Rear I/O	1 x HDMI , 1 x DisplayPort, 4 x USB3.0, 2 x LAN, 1 x RS232

Mechanical & Environmental

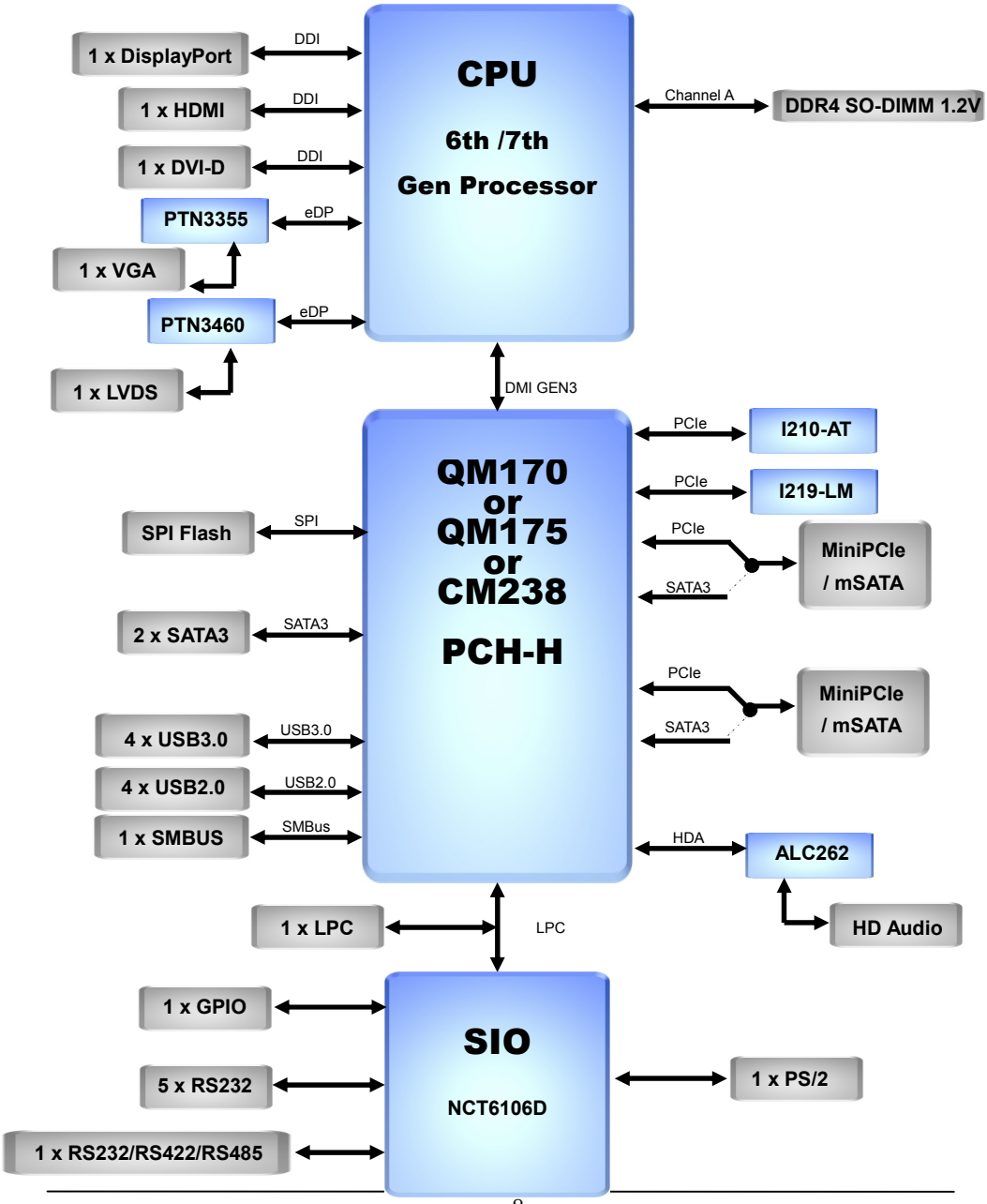
Power Requirement	DC 9~30V
Size & Thickness	146mm x 101mm (L x W), 1.6mm
Temperature	Operating within 0°C~60°C (32°F~140°F) Storage within -20°C~80°C (-4°F~176°F)
Relative Humidity	10%~90%, non-condensing

1.3 <Mechanical Drawing>



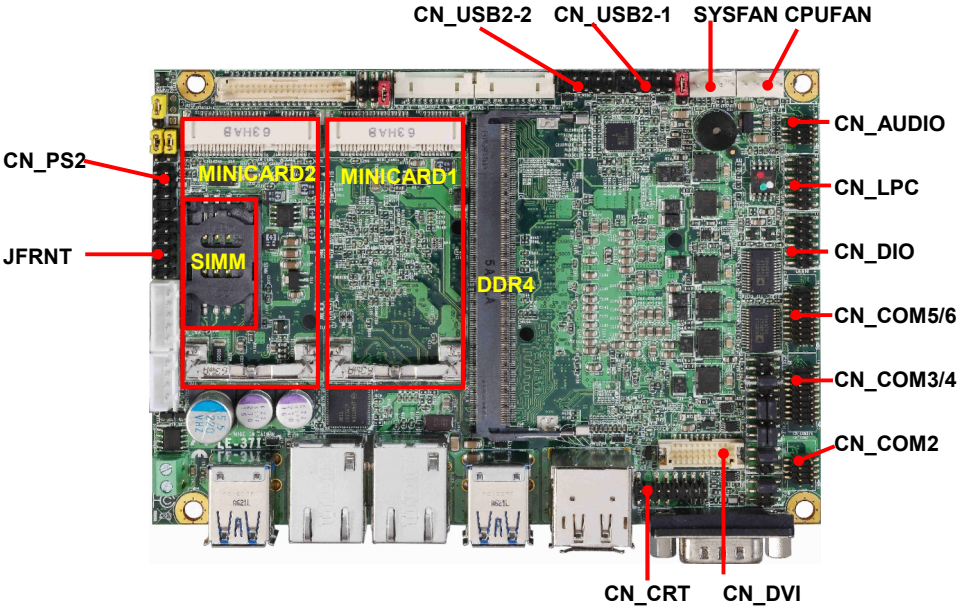

98.38"
66.13"
63.32"
3.18"
3.48"
31.71"
64.31"
79.33"
111.93"
137.36"
146.30"
3.18"
42.32"
45.13"

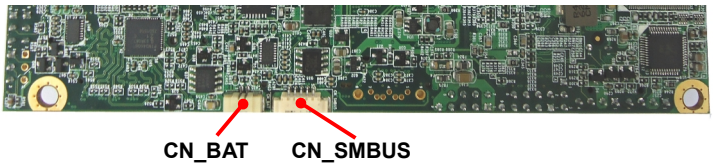
1.4 <Block Diagram>

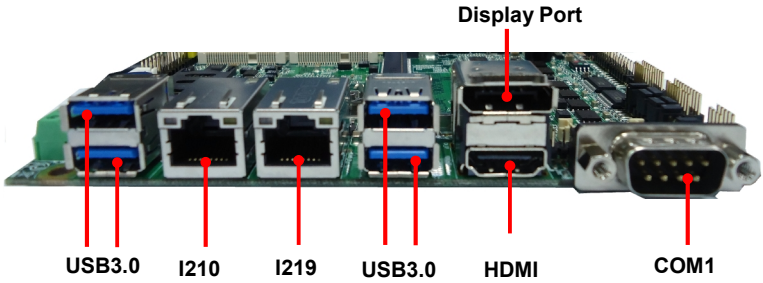


Chapter 2 <Hardware setup>

2.1 <Connector Location and Reference>







2.1.1 <Internal connectors list>

Connector	Function
DDR4	260-pin DDR4 SO-DIMM slot
SATA3-1/2	10-pin Serial ATA3 connector
CN_AUDIO	5 x 2-pin audio pin header
CN_LPC	6 x 2-pin LPC pin header
CN_LVDS	20 x 2-pin LVDS connector
CN_INV	5-pin LCD inverter connector
CN_SMBUS	5-pin SMBus connector
CN_COM2	10-pin RS232/485/422 for COM2
CN_COM3/4 / 5/6	20-pin RS232 connector
CN_USB 2-1 / 2-2	5 x 2-pin USB2.0 pin header
CN_DIO	6 x 2-pin digital I/O connector
CN_CRT	16-pin VGA connector
CN_BAT	2-pin Battery connector
CN_DVI	10 x 2-pin DVI connector
CPUFAN	4-pin CPU fan connector
SYSFAN	4-pin system fan connector
JFRNT	10-pin front panel switch/indicator connector
MINI_CARD1	52-pin MiniPCIe card slot (support MSATA by JMSATA1)
MINI_CARD2	52-pin MiniPCIe card slot (support MSATA by JMSATA2)
DC_IN	2-pin power input Terminal Block
SIMM	6-pin socket

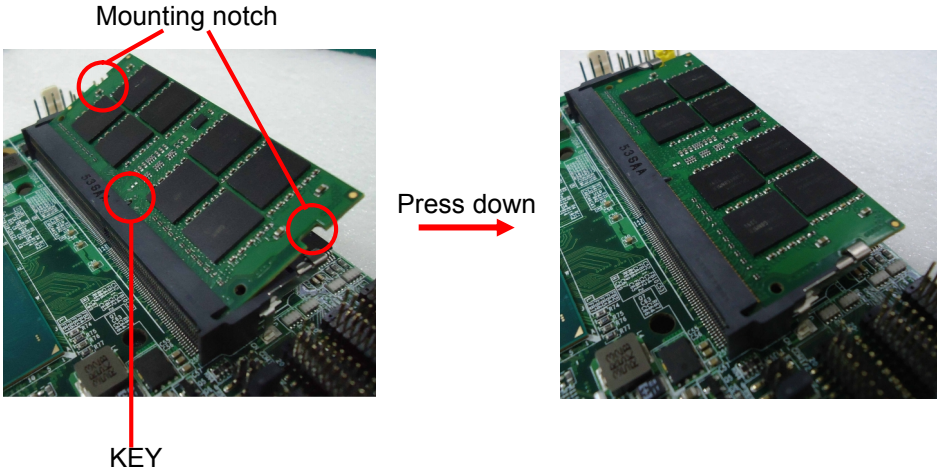
2.1.2 <External connectors list>

Connector	Function
DisplayPort	DisplayPort connector
HDMI	HDMI connector
RJ45-1/2	RJ45 connector
USB3.0 1/2	USB3.0 connector
COM1	DB9 Serial port connector

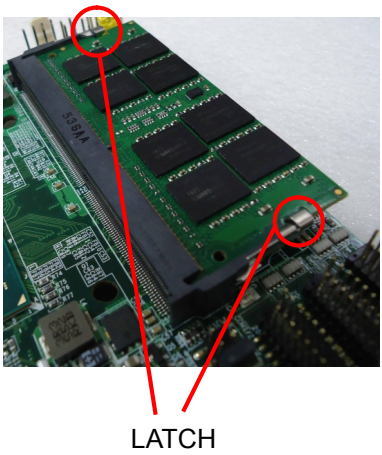
2.2 <Memory Setup>

In the process, the board must be powered off.

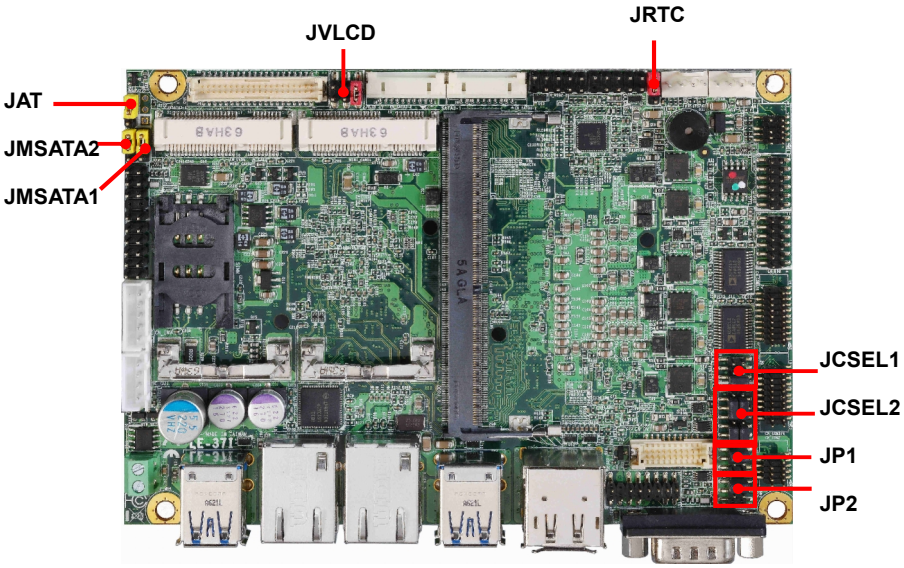
1. Put the memory tilt into the slot. Note the Memory notch key aligned slot key.
2. Then press down till lock into the mounting notch.



3. To remove the memory, push outward on both sides of the latch.



2.3 <Jumper Location and Reference>



2.3.1 <Jumper list>

Jumper	Function
JAT	Power mode select
JRTC	CMOS Normal/Clear Setting
JVLCD	Panel Voltage Setting
JMSATA1	MiniCard 1 MSATA Setting
JMSATA2	MiniCard 2 MSATA Setting
JP1	COM2 Voltage Setting (For Pin 9)
JP2	COM1 Voltage Setting (For Pin 9)
JCSEL1	COM2 RS-232 RS422 RS485 Setting
JCSEL2	COM2 RS-232 RS422 RS485 Setting

2.3.2 <Clear CMOS and Power on type selection>

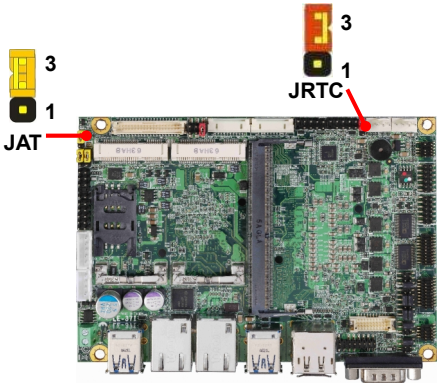
The board's data of CMOS can be setting in BIOS. If the board refuses to boot due to inappropriate CMOS settings, here is how to proceed to clear (reset) the CMOS to its default values.

JAT: AT/ATX mode select jumper

Jumper settings	Function
1-2	AT mode
2-3	ATX mode (Default)

JRTC: Clear CMOS data jumper

Jumper settings	Function
1-2	Clear CMOS
2-3	Normal (Default)

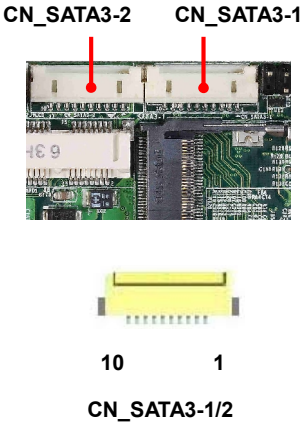


2.4 <I/O interface>

2.4.1 <Serial ATA interface>

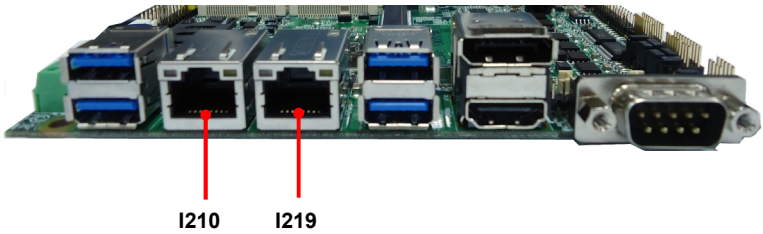
CN_SATA3-1/2: SATA3 10-pin connector

Pin	Signal
1	GND
2	TX+
3	TX-
4	GND
5	NA
6	NA
7	GND
8	RX-
9	RX+
10	GND



2.4.2 <Ethernet interface>

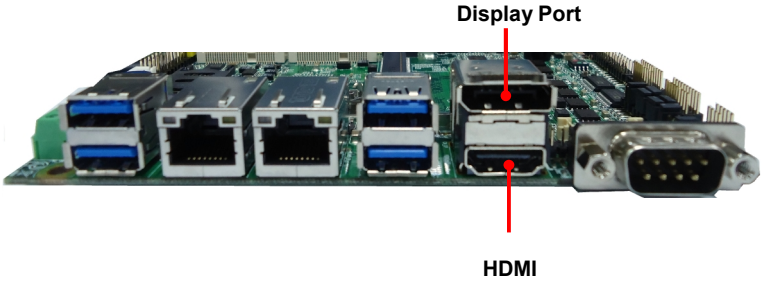
The board provide I219-LM PHY Gigabit Ethernet and I210-AT Gigabit Ethernet on rear I/O.Intel I219-LM and I210 supports operation at 10/100/1000 Mb/s data rates, with IEEE802.3 compliance and Wake-On-LAN supported.

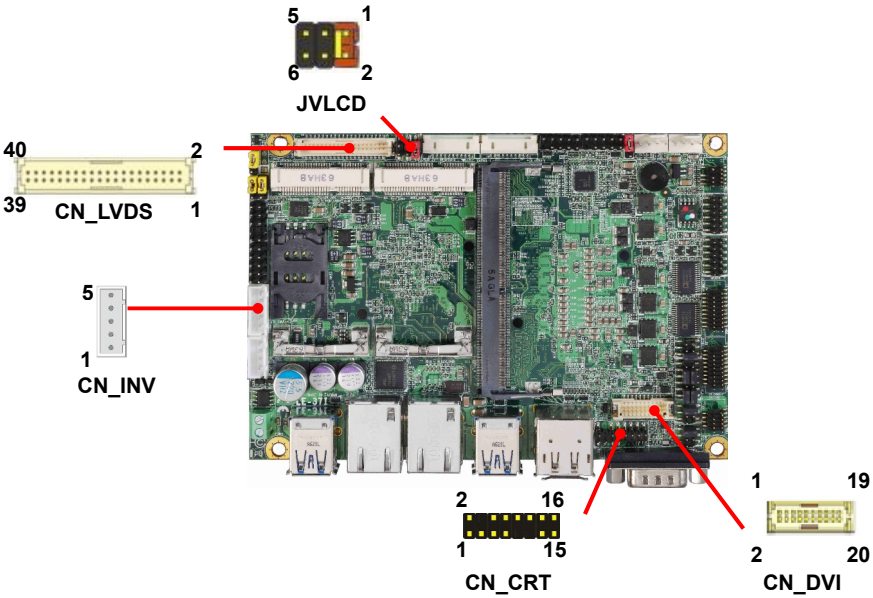


2.4.3 <Display interface>

Based on the 6th /7th Gen CPU with built-in HD Graphics 530 /630, VGA and DVI up to **1920x1080@60Hz**, DisplayPort up to **4096x2304@60Hz** , HDMI up to **4096x2304@24Hz** on rear IO. About the internal Display, LVDS (PTN3460) up to **1920x1200@60Hz** support 18/24-bit color depth and single/dual channel. About select LCD Panel Type in BIOS, please refer **Appendix B**.

The built-in HD Graphics support triple display function with clone mode and extended mode.





CN_CRT: VGA 16-pin connector (Pitch 2.00 mm)

Pin	Signal	Pin	Signal
1	BR	2	BG
3	BB	4	NC
5	IOGND1	6	IOGND1
7	IOGND1	8	IOGND1
9	NC	10	IOGND1
11	NC	12	5VCDA
13	5HSYNC	14	5VSYNC
15	5VCLK	16	NC

CN_LVDS: LVDS 40-pin connector (Model: HIROSE DF13-40DP-1.25V compatible)

Pin	Signal	Pin	Signal
1	Set by JVLCD	**2**	Set by JVLCD
3	GND	**4**	Detect (Active low)
5	B_LVDS_0-	**6**	A_LVDS_0-
7	B_LVDS_0+	**8**	A_LVDS_0+
9	GND	**10**	GND
11	B_LVDS_1-	**12**	A_LVDS_1-
13	B_LVDS_1+	**14**	A_LVDS_1+
15	GND	**16**	GND

17	B_LVDS_2-	**18**	A_LVDS_2-
19	B_LVDS_2+	**20**	A_LVDS_2+
21	GND	**22**	GND
23	B_LVDS_3-	**24**	A_LVDS_CLK-
25	B_LVDS_3+	**26**	A_LVDS_CLK+
27	GND	**28**	GND
29	B_LVDS_CLK-	**30**	A_LVDS_3-
31	B_LVDS_CLK+	**32**	A_LVDS_3+
33	GND	**34**	GND
35	NC	**36**	LVDS_DDCSCL
37	NC	**38**	LVDS_DDCSDA
39	NC	**40**	NC

Note: Pin4 only need to be connected to GND

CN_INV: LVDS 5-pin Backlight power connector

Pin	Signal
1	12V
2	Backlight Control
3	GND
4	GND
5	Enable Backlight

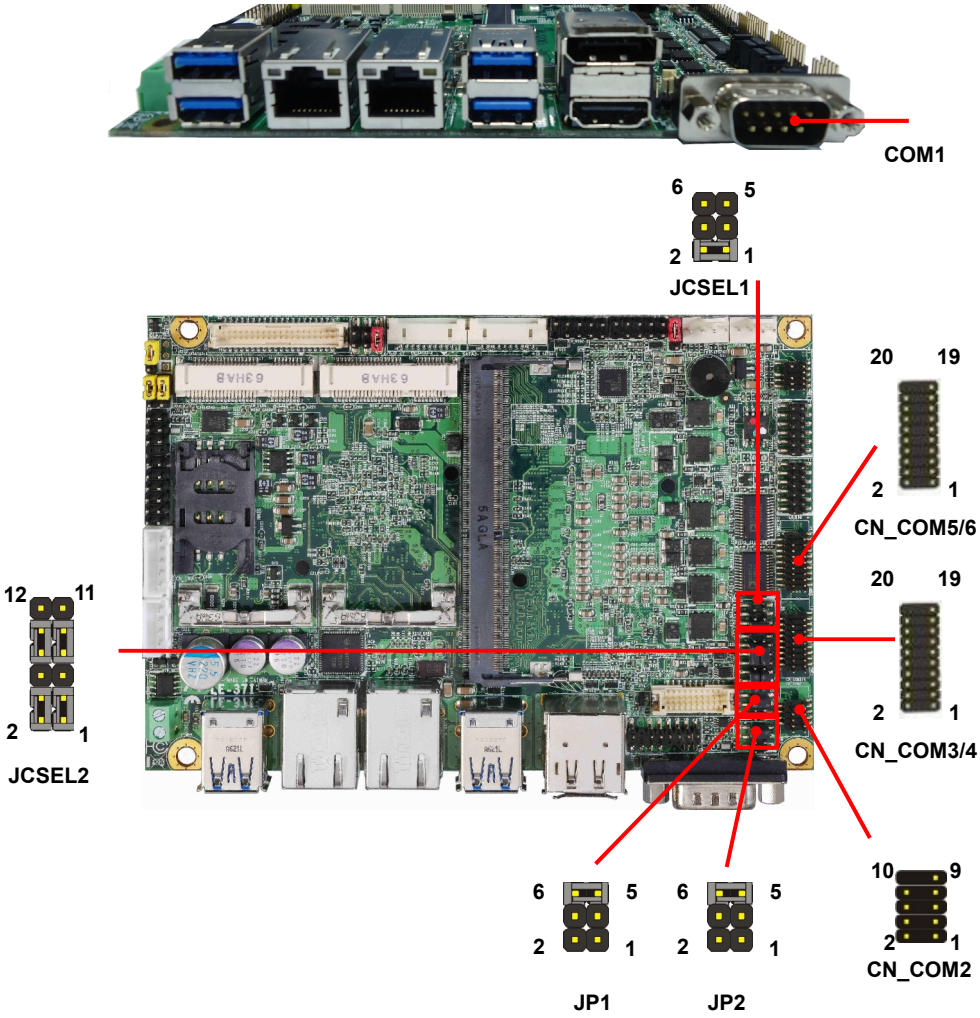
JVLCD: LVDS panel power select jumper

Jumper settings	Function
1-2	3.3V (Default)
3-4	5V
5-6	12V

CN_DVI: DVIonboard 20-pin connector

Pin	Signal	Pin	Signal
1	+5V	2	N/C
3	HPD	4	Ground
5	TMDSTX0N	6	TMDSTX0P
7	Ground	8	TMDSTX1N
9	TMDSTX1P	10	Ground
11	TMDSTX2N	12	TMDSTX2P
13	Ground	14	TMDSTXCN
15	TMDSTXCP	16	Ground
17	DVI_DA	18	DVI_SL
19	N/C	20	N/C

2.4.4 <Serial Port interface>



COM1: RS232 DB9 connector

Pin	Signal	Pin	Signal
1	DCD	**2**	RXD
3	TXD	**4**	DTR
5	GND	**6**	DSR
7	RTS	**8**	CTS
9	Set by JP2	**10**	Key

CN_COM2: RS232/422/485 10-pin header (Pitch 2.54 x 1.27mm)

Pin	Signal	Pin	Signal
1	DCD/ 422TX-/ 485-	2	RXD/ 422TX+/ 485+
3	TXD/ 422RX+	4	DTR/ 422RX-
5	GND	6	DSR
7	RTS	8	CTS
9	Set by JP1	10	Key

Note: Use JCSEL1 and JCSEL2 to select communication mode

COM3/4: COM 20-pin header (Pitch 2.54 x 1.27mm)

Pin	Signal	Pin	Signal
1	DCD1	2	RXD1
3	TXD1	4	DTR1
5	GND	6	DSR1
7	RTS1	8	CTS1
9	RI1	10	NC
11	DCD2	12	RXD2
13	TXD2	14	DTR2
15	GND	16	DSR2
17	RTS2	18	CTS2
19	RI2	20	Key

COM5/6: COM 20-pin header (Pitch 2.54 x 1.27mm)

Pin	Signal	Pin	Signal
1	DCD1	2	RXD1
3	TXD1	4	DTR1
5	GND	6	DSR1
7	RTS1	8	CTS1
9	RI1	10	NC
11	DCD2	12	RXD2
13	TXD2	14	DTR2
15	GND	16	DSR2
17	RTS2	18	CTS2
19	RI2	20	Key

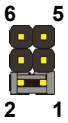
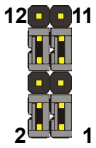
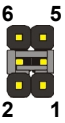
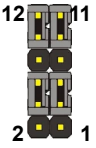
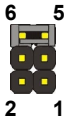
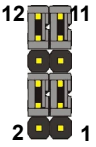
JP1, JP2: COM1, COM2 pin-9 setting

Jumper settings	Function
1-2	5V
3-4	12V
5-6	RI (Default)

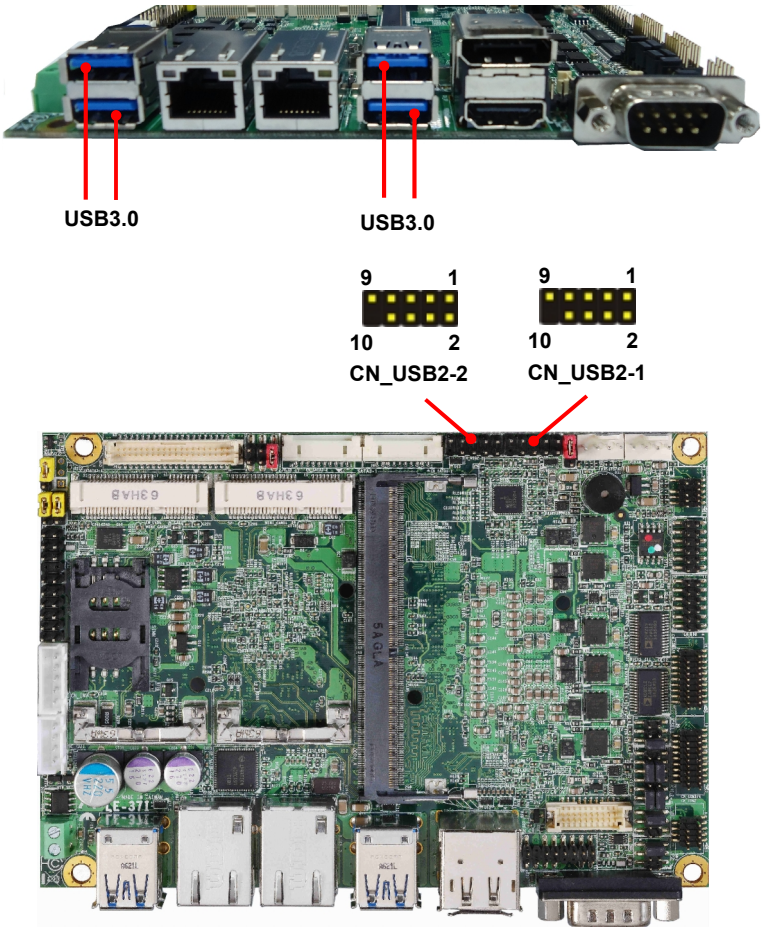
Effective patterns of connection: 1-2 / 3-4 / 5-6

Other may cause damage

JCSEL1, JCSEL2: For configure COM2 communication mode

Function	JCSEL1	JCSEL2
RS232 (Default)		
RS485		
RS422		

2.4.5 <USB interface>

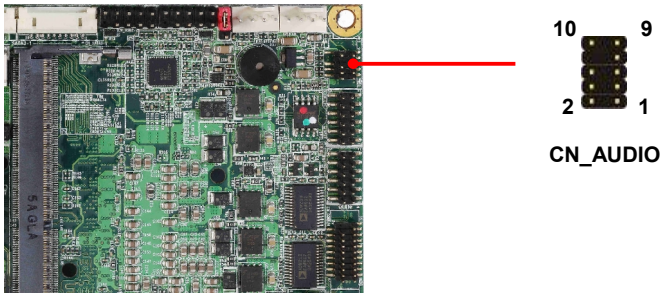


CN_USB 2-1/2-2: USB2.0 10-pin header (Pitch 2.54 mm)

Pin	Signal	Pin	Signal
1	5VSB	**2**	5VSB
3	DATA0-	**4**	DATA1-
5	DATA0+	**6**	DATA1+
7	GND	**8**	GND
9	GND	**10**	Key

Install USB3.0 Driver If you want to use CN_USB 2-1/2-2 in Windows7.

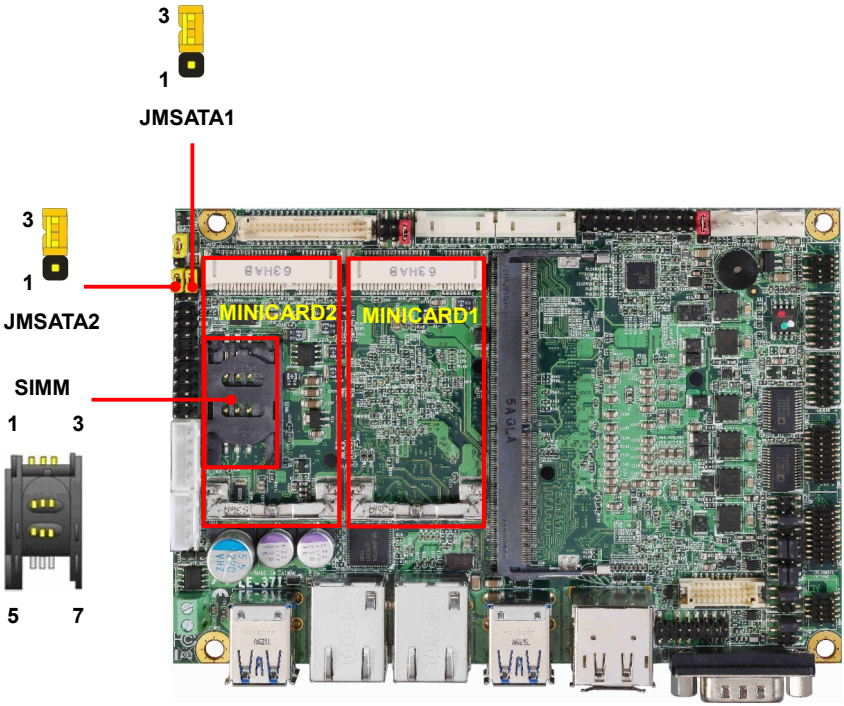
2.4.6 <Audio interface>



CN_AUDIO: Front panel audio 10-pin header (Pitch 1.27mm x 2.54mm)

Pin	Signal	Pin	Signal
1	MIC_L	**2**	GND
3	MIC_R	**4**	NC
5	FP_OUT_R	**6**	MIC_DETECT
7	SENSE	**8**	Key
9	FP_OUT_L	**10**	FP_OUT_DETECT

2.4.7 <Expansion slot>



MINI_CARD1 and MINI_CARD2 support mSATA by JMSATA1/2, and have some special design to compatible our mini-PCIe card.
(ex: MPX-574D2, MPX-210D2 etc),
MINI_CARD2 can connect SIM card with 3G module.

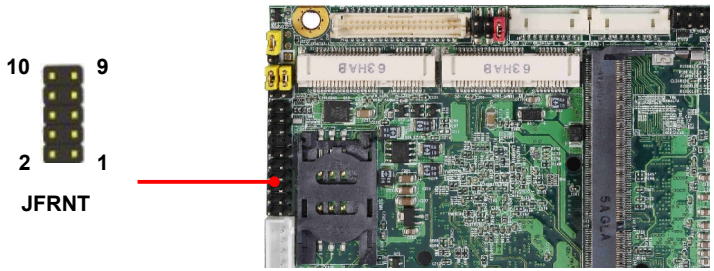
JMSATA1/2: Setting MINI_CARD1/2 to support PCIe/mSATA

Jumper settings	Function
1-2	Support mSATA
2-3	Normal operation (Default)

SIMM: (3G MiniPCIe Mode)

Pin	Signal	Pin	Signal
1	SIMVCC	**2**	SIMRST
3	SIMCLK	**4**	NC
5	GND	**6**	SIMVPP
7	SIMDATA		

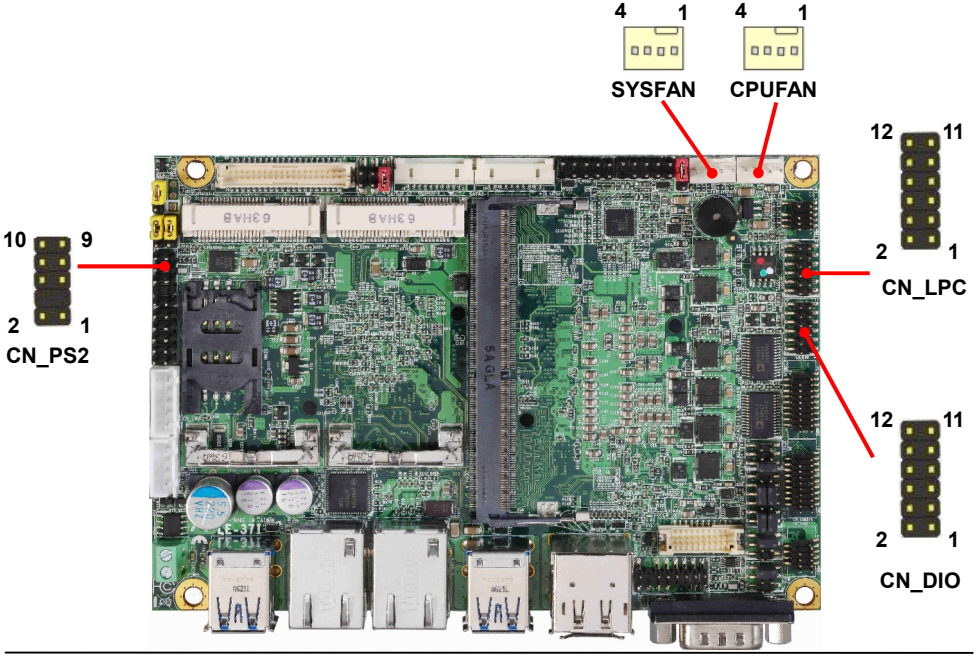
2.4.8 <Front panel switch and indicator>

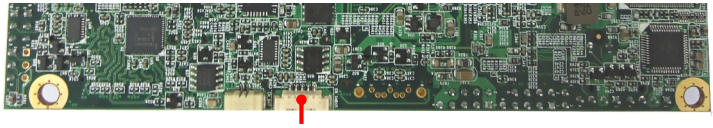


JFRNT: Front panel switch and indicator 10-pin header (Pitch 2.54mm)

Pin	Signal	Pin	Signal
1	Power_ON-	2	Power_ON+
3	Speaker-	4	Speaker+
5	HDD_LED-	6	HDD_LED+
7	Power_LED-	8	Power_LED+
9	Reset+	10	Reset-

2.4.9 <GPIO and Other interface>





CN_SMBUS

When using GPIO function, please note:

As Output: Open-drain, most applications need use an external pull up resistor. (If not may cause damage)

As Input: TTL-level.

GPIO DC characteristics

5V TTL-level Input Pin						
Parameter	**Sym**	**Min**	**Typ**	**Max**	**Unit**	**Conditions**
Input Low Threshold Voltage	V_{t-}	0.5	0.8	1.1	V	V_{CC} = 3.3V
Input High Threshold Voltage	V_{t+}	1.6	2.0	2.4	V	V_{CC} =3.3V
Hystersis	V_{TH}	0.5	1.2		V	V_{CC} =3.3V
Input High Leakage	I_{LIH}			+10	μA	V_{IN} = 3.3V
Input Low Leakage	I_{LIL}			-10	μA	V_{IN} = 0V
Open-drain output pin with 12-mA sink capability						
Output Low Voltage	V_{OL}			0.4	V	I_{OL} = 12 mA

CN_DIO: GPIO 12-pin header (Pitch 2.00mm)

Pin	Signal	Pin	Signal
1	GND	**2**	GND
3	GPIO0	**4**	GPIO4
5	GPIO1	**6**	GPIO5
7	GPIO2	**8**	GPIO6
9	GPIO3	**10**	GPIO7
11	5V	**12**	12V

CN_LPC: LPC 12-pin header (Pitch 2.00mm)

Pin	Signal	Pin	Signal
1	CLK	2	RST
3	-LFRAME	4	LAD3
5	LAD2	6	LAD1
7	LAD0	8	3.3V
9	SERIRQ	10	GND
11	3.3VSB	12	NC

CN_PS/2: PS/2 10-pin header (Pitch 2.54mm)

Pin	Signal	Pin	Signal
1	KB_DATA	2	M_DATA
3	NC	4	NC
5	GND	6	GND
7	VCC	8	VCC
9	KB_CLK	10	M_CLK

CN_SMBUS: SMBus 5-pin connector

Pin	Signal
1	5V
2	NC
3	SMBDAT
4	SMBCLK
5	GND

CPUFAN: CPU cooler fan 4-pin connector

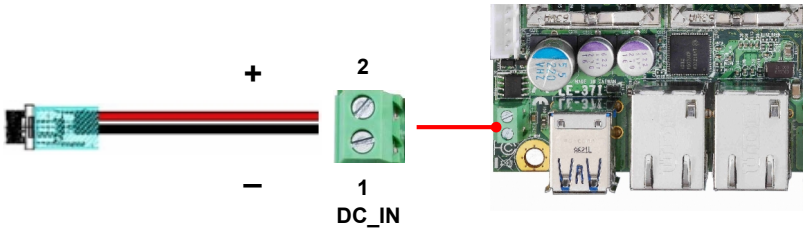
Pin	1	2	3	4
Signal	GND	12V	Sensor	Control

SYSFAN: System cooler fan 4-pin connector

Pin	1	2	3	4
Signal	GND	12V	Sensor	Control

2.5 <Power supply>

2.5.1 <Power input>



DC_IN: Terminal Block 2-pin power connector

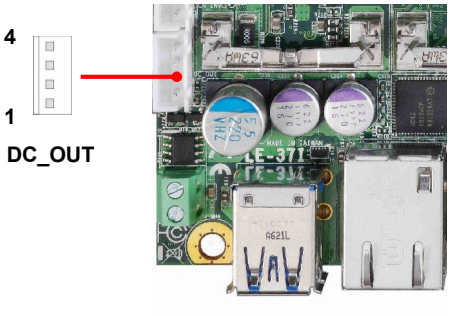
Pin	Signal	Pin	Signal
1	GND	2	Power in

The power support 9~30V wide voltage input.

2.5.2 <Power output>

DC_OUT: SATA power 4-pin connector

Pin	Signal
1	12V
2	GND
3	GND
4	5V



Appendix A <Flash BIOS>

A.1 <Flash tool>

The board is based on Phoenix BIOS and can be updated easily by the BIOS auto flash tool. You can download the tool online at the address below:

FPT TOOL

The tool's file name is "fpt.exe", it's the utility that can write the data into the BIOS flash chip and update the BIOS.

A.2 <Flash BIOS process>

1. Please make a bootable UFD which can boot into DOS enviroment.
2. Unzip the flash tool and copy it into bootable UFD.
3. Add a bin file to the same folder..
4. Power on the system and flash the BIOS under the DOS environment.
   (Command: fpt –savemac –f xxx.bin)
5. Power off the system and then power on.

Appendix B <LCD Panel Type select>

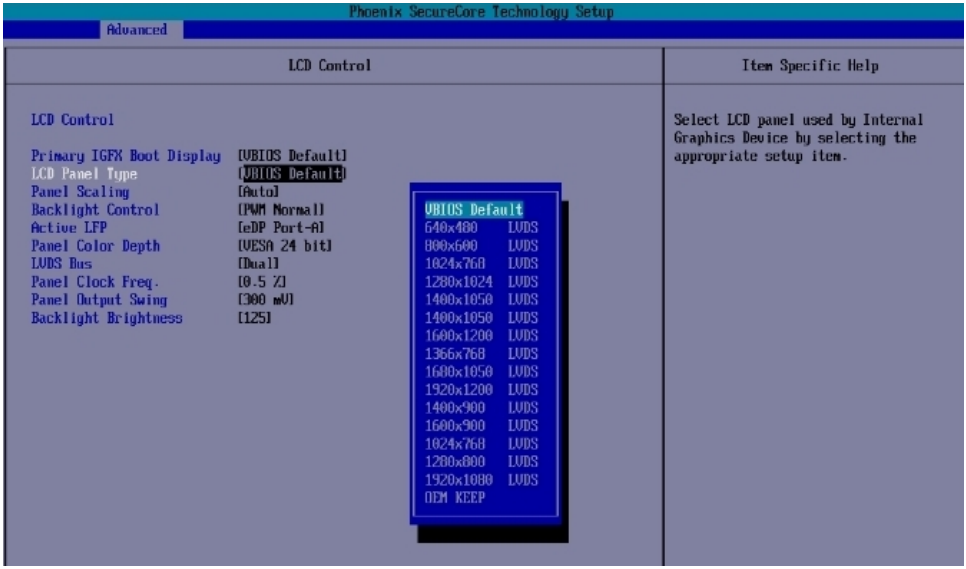
According your panel, it need to select the correct resolution in the BIOS. If there is no fit your panel type, please feedback for us to make OEM modol.

You can find the setting from

[Advanced] → [Intel Advanced Menu]

→ [SA configuration] → [Graphics confuguration] → [LCD control]

→ [LCD Panel Type]

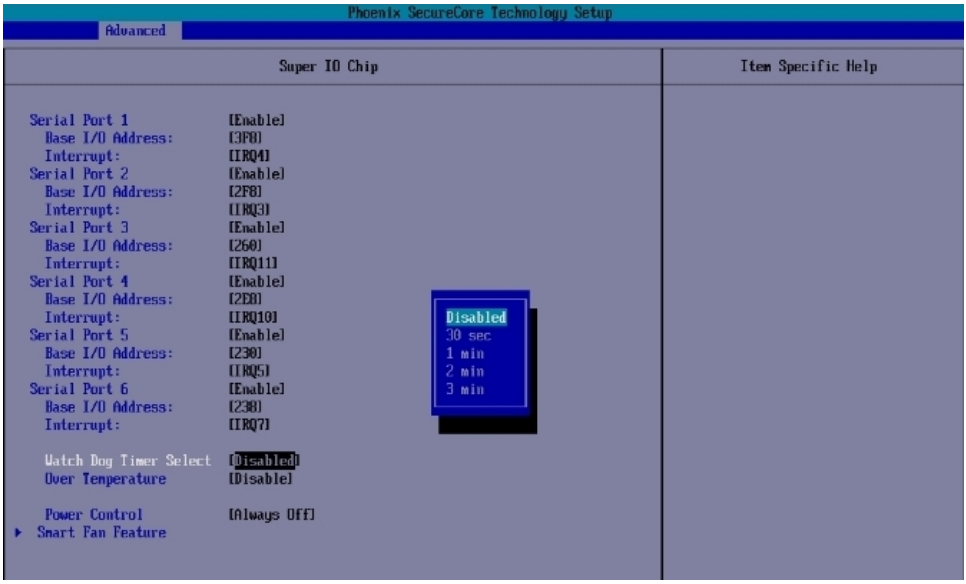


Appendix C <Programmable Watch Dog Timer>

The watchdog timer makes the system auto-reset while it stops to work for a period.The integrated watchdog timer can be setup as system reset mode by program.You can select Timer setting in the BIOS, after setting the time options, the system will reset according to the period of your selection.

Find the setting from

[Advanced] → [Intel Advanced Menu] → [Super IO Chip]



Timeout value range

1 to 255 Minute and Second

Program sample

Watchdog timer setup as system reset with 5 second of timeout

```
-o 4E 87        ;enter configuration
-o 4E 87
-o 4E 07
-o 4F 08        ;select Logical Device
-o 4E 30
-o 4F 01        ; activate WDTO# function
-o 4E F0
-o 4F 00        ;set "00" is second mode, set "08" is minute mode
-o 4E F1
-o 4F 05        ;00h: Timeout Disable
                ;01h: Timeout occurs after 1 minute only
                ;02h: Timeout occurs after 2 second/minute
                ;03h: Timeout occurs after 3 second/minute
                                    ⋮
                ;FFh: Timeout occurs after 255 second/minute
                (The deviation is approx 1 second.)
```

For further information, please refer to Nuvoton NCT6106D datasheet

Appendix D <Hardware monitor >

Find the setting from [Misc] → [SIO NCT6106D Hardware Monitor]

Appendix E <Programmable GPIO >

The GPIO' can be programmed with the MS-DOS debug program using simple IN/OUT commands.

The DC characteristics please refer to GPIO paragraph (Page20).

GPIO	0	1	2	3	4	5	6	7
bit	0	1	2	3	4	5	6	7

-o 4E 87 ;enter configuration

-o 4E 87

-o 4E 07

-o 4F 07 ;select Logical Device

-o 4E 30

-o 4F 10 ;activate GPIO function (The board use GPIO4)

-o 4E F0

-o 4F XX ;set "01" GPIO as input, set "00" GPIO as output

-o 4E F1

-o 4F XX ;if set GPIO as output, this register's value can be set "00~ FF"

Optional

-o 4E F2

-o 4F XX ;set "01", the respective bit are inverted (Both input and output)

;set "00", the respective bit are normal

For further information, please refer to Nuvoton NCT6106D datasheet

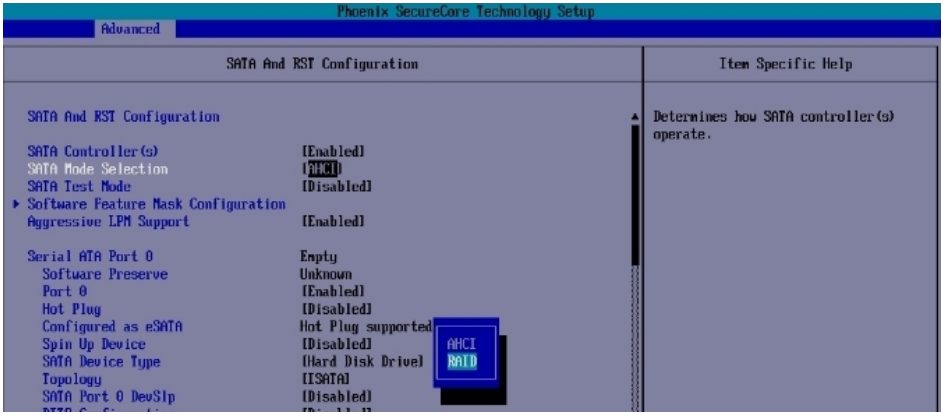
Appendix F <RAID Setting>

When use RAID function, it need to enter the BIOS set RAID mode first.

Find the setting from

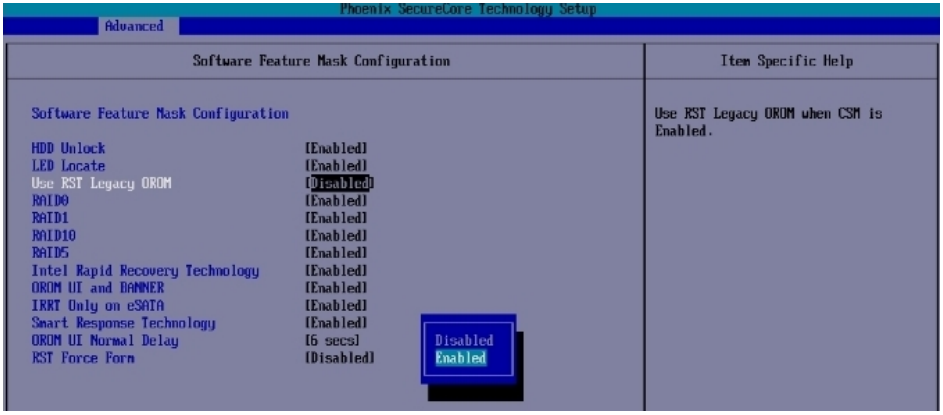
[Advanced] → [Intel Advanced Menu] → [PCH-IO Configuration]

→ [SATA Configuration] → [SATA Mode Selection]



SATA And RST Configuration → Software Feature Mask Configuration

Set Use RST Legacy OROM → [Enable]

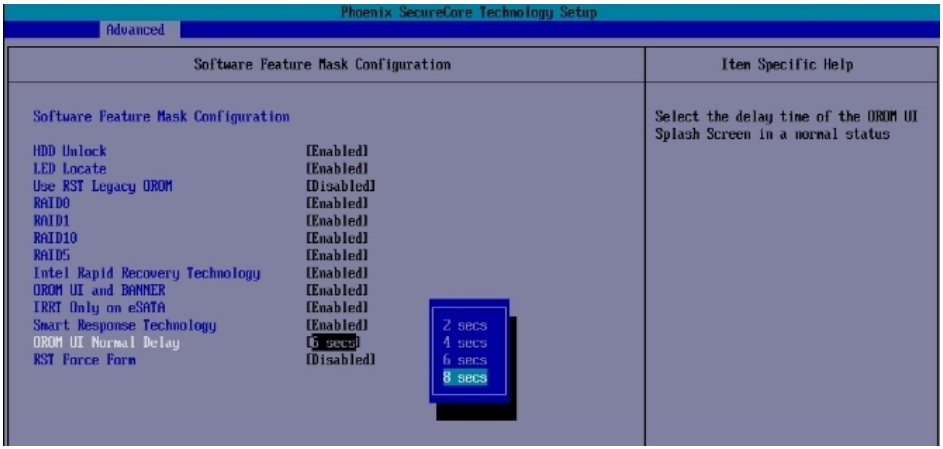


If this screen stop time is too short, it can be set in the BIOS.

[Advanced] → [Intel Advanced Menu] → [PCH-IO Configuration]

→ [SATA Configuration] → [Software Feature Mask Configuration]

→ [OROM UI Normal Delay] → [8 sec] **(Need to set RAID mode first)**



At boot time, press <CTRL + I> to enter the RAID configuration menu.

Contact information

Any advice or comment about our products and service, or anything we can help you please don't hesitate to contact with us. We will do our best to support you for your products, projects and business.

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