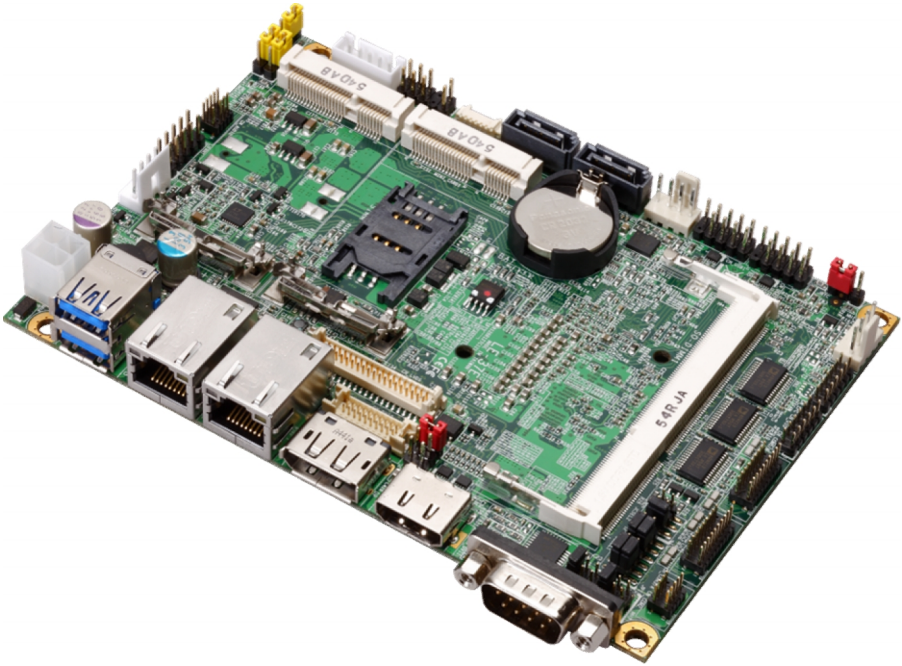
LE-37E

3.5 inch Motherboard

User's Manual

Edition 1.7
2021/07/28



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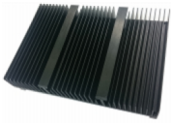
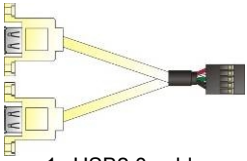
Packing List:

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

1 x LE-37E 3.5 inch Motherboard
(Include Heat Sink)
(Heat Sink : OHS-A / 2181110012)

1 x SATA cable
(OALSATA3-L / 1040529)



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

1 xDC Input Power cable
(OALDC-A / 1040433)

1 x COM Cable
(OALES-BKU1NB / 1040086)

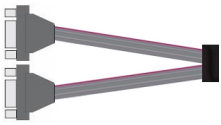
1 x SATA Power cable
(OAL4P-S2 / 1040054)

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

1 x 1 to 3 Power output cable
(OAL4P-2 / 1040051)

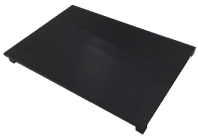
1 x Audio cable
(OALPJ-HDUNB / 1040123)

Optional:



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

1 x Onboard DVI-D cable
(BADPDVI_A & OALDVI-DF13
/ 4120008011 & 1040483)



Heat spreader (OHS-ANF /
2181110018)

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Chapter 1 <Introduction>

1.1 <Product Overview>

LE-37E is 3.5 inch Motherboard which supports 5th/4th Generation Intel® Core™ U-series i7, i5, i3, Celeron Mobile Processor with Wildcat Point PCH-LP, integrated HD Graphics, DDR3L memory, Realtek High Definition Audio, Intel Gigabit LAN, Serial ATA3 with AHCI function for a system.

Intel Broadwell-U Processor with Wildcat Point PCH-LP

The 5th Generation Intel® Core™ U-series processor family is the next generation and compatible with Haswell-U, multi-core mobile processor built on 14/22 nanometer process with MCP technology.

The Broadwell-U has a lower TDP 15W and 28W, it provides new HD Graphics (GT2 and GT3 GPU) support triple display at the same time, maximum supported is up to 16GB of DDR3L, better performance, flexibility and more enhanced security that is suitable for a variety of intelligent systems the ideal choice.

All in One multimedia solution

The board provides high performance onboard graphics, 24-bit dual channel LVDS interface, DisplayPort, HDMI, and High Definition Audio, to meet the very requirement of the multimedia application.

Flexible Expansion Interface

The board provides two MiniPCIe and support mSATA, SIM.

1.2 <Product Specification>

System

Processor	Intel® Broadwell/Haswell Core™ i7, i5, i3, Celeron U-series Processor FCBGA1168 with MCP
Chipset	Wildcat Point-LP
Memory	1 x DDR3L SO-DIMM 1333/1600 MHz up to 8GB 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 onboard lithium battery
Expansion	2 x MiniPCIe (support mSATA) and Card2 half-size choosable, 1 x SIM slot

Graphics

Chipset	Intel® Gen 8/ 7.5 integrated HD Graphics
Display Interface	1 x HDMI/DVI-D, 1 x DisplayPort/DVI-D, 1 x LVDS

LAN

Chip	1 x Intel® I210-AT Gigabit LAN(Optional) 1 x Intel® I218-LM Gigabit LAN (Support iAMT10.0)

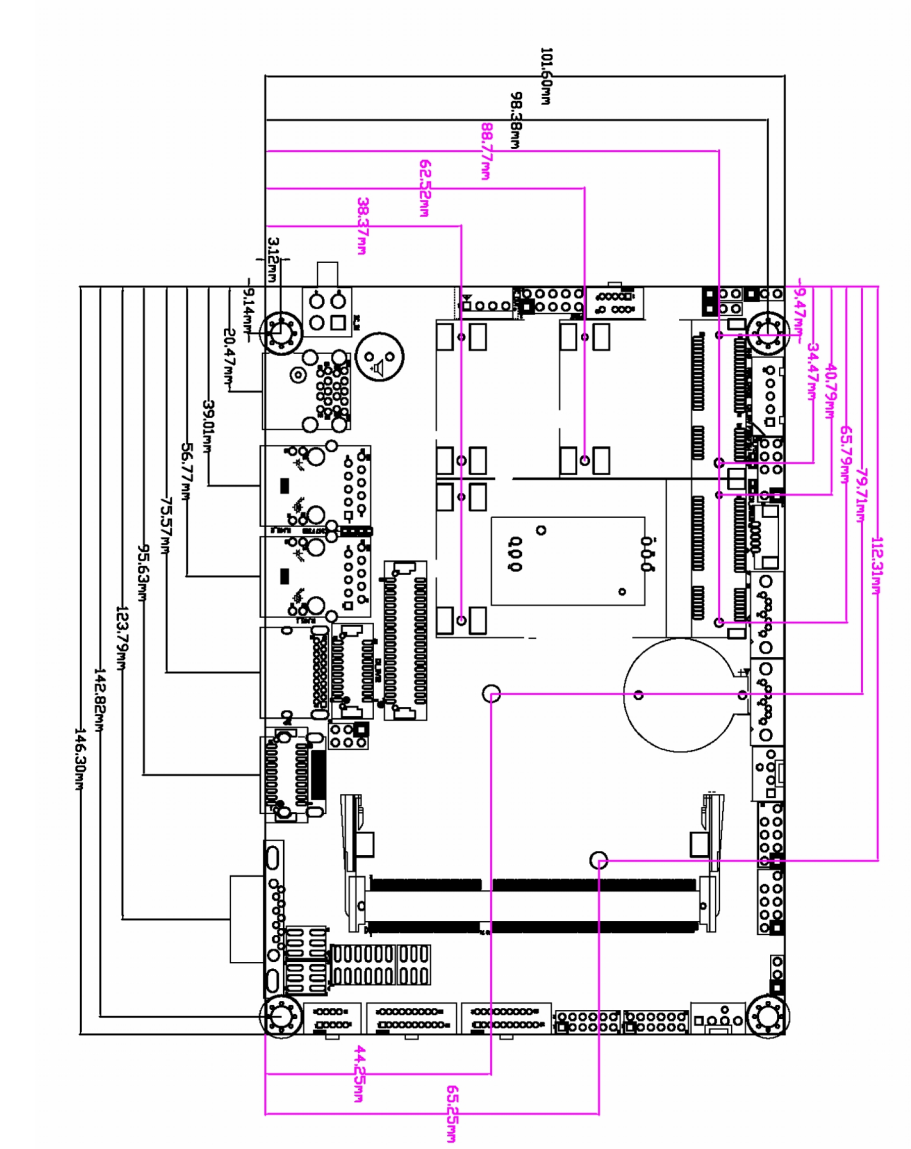
I/O

Serial ATA	2 x SATA3 support RAID 0, 1
Audio	Realtek ALC888 HD Audio
Digital I/O	Programmable 8-bit GPIO with 12 pin-header
Internal I/O	2 x SATA3, 1 x RS232/422/485, 4 x RS232, 1 x PS/2, 4 x USB2.0, 1 x LVDS, 1 x LCD inverter, 1 x LPC, 1 x SMBUS, 1 x DIO, 1 x Audio, 1 x DC Out, 1 x DVI-D (co-lay with HDMI) (optional), 1 x DVI-D (co-lay with DisplayPort) (optional)
Rear I/O	1 x RS232, 1 x HDMI (optional), 1 x DisplayPort (optional), 2 x USB3.0, 2 x LAN

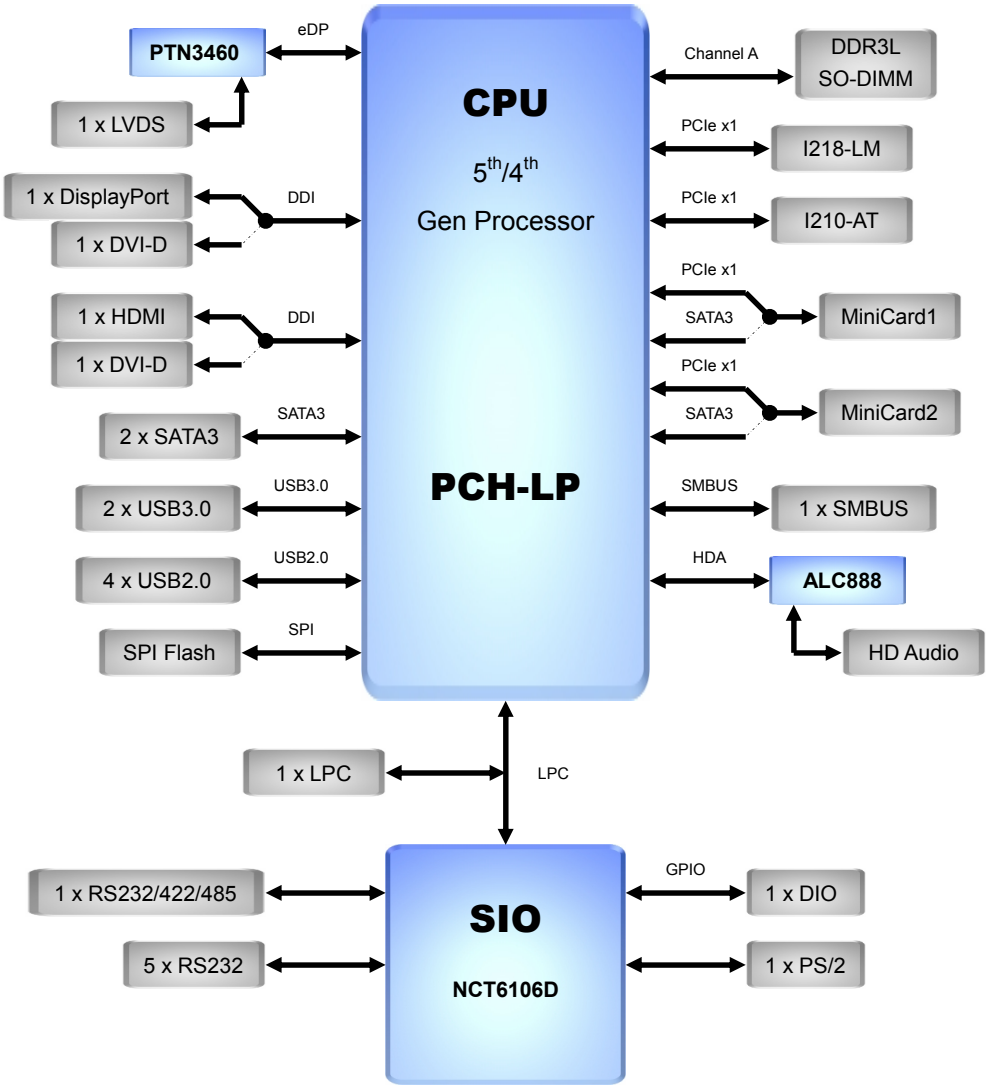
Mechanical & Environmental

Power Requirement	DC input 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>

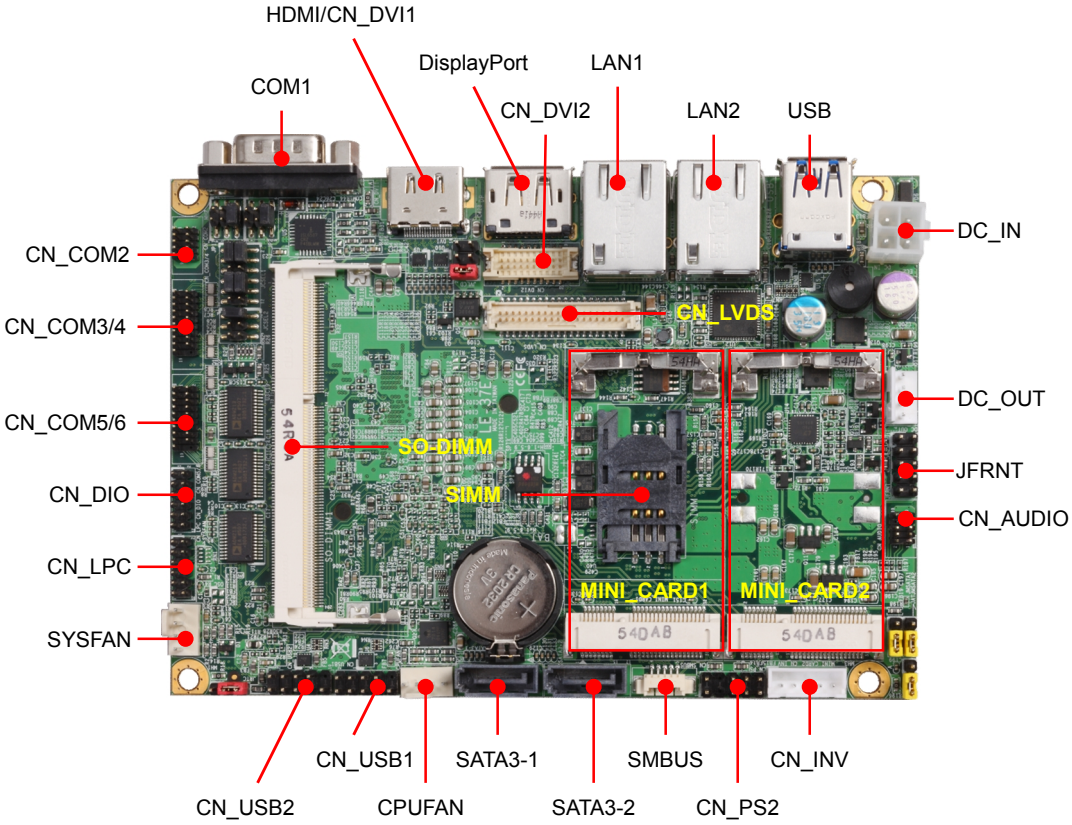


1.4 <Block Diagram>



Chapter 2 <Hardware setup>

2.1 <Connector Location and Reference>



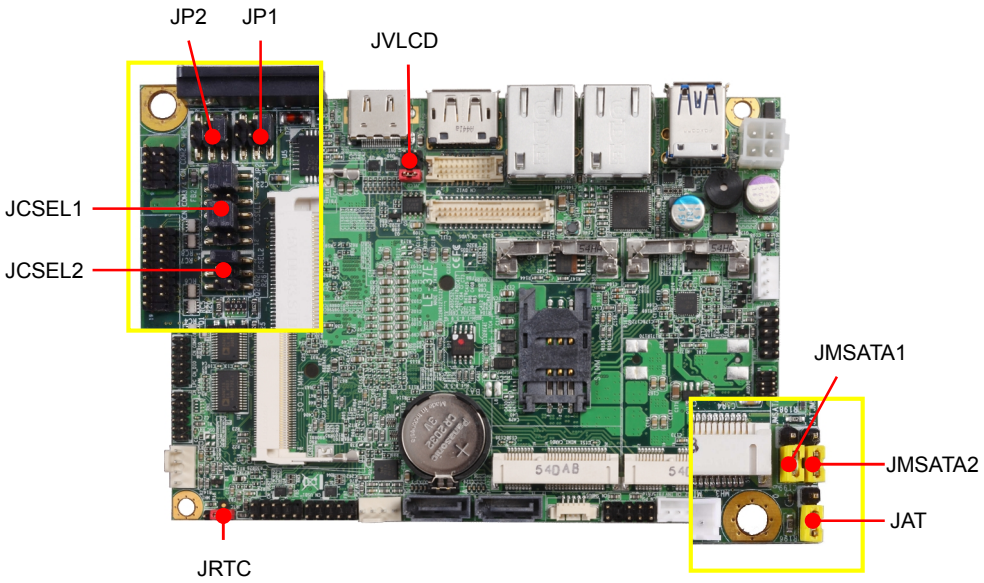
2.1.1 <Internal connectors list>

Connector	Function
SO-DIMM	204-pin DDR3L SO-DIMM slot
SATA3-1/2	7-pin Serial ATA3 connector
CN_AUDIO	5 x 2-pin audio pin header
CN_LPC	6 x 2-pin LPC pin header
CN_DIO	6 x 2-pin General Purpose In/Out pin header
CN_LVDS	20 x 2-pin LVDS connector
CN_INV	5-pin LCD inverter connector
CN_DVI1	10 x 2-pin DVI connector
CN_DVI2	10 x 2-pin DVI connector
CN_COM2	10-pin RS232/422/485 connector
CN_COM3/4	20-pin RS232 connector
CN_COM5/6	20-pin RS232 connector
CN_USB1/2	5 x 2-pin USB2.0 pin header
CN_PS2	5 x 2-pin PS/2 pin header
SMBUS	5-pin SMBus connector
SIMM	6-pin SIM card slot
CPUFAN	4-pin CPU fan connector
SYSFAN	4-pin system fan connector
JFRNT	5 x 2-pin front panel switch/indicator pin header
MINI_CARD1/2	52-pin MiniPCIe card slot
DC_OUT	4-pin SATA Power connector
DC_IN	4-pin ATX12V power connector

2.1.2 <External connectors list>

Connector	Function
COM1	DB9 connector
DisplayPort	DisplayPort connector
HDMI	HDMI connector
USB	2 x USB3.0 connector
LAN1	RJ45 connector
LAN2	RJ45 connector

2.2 <Jumper Location and Reference>



2.2.1 <Jumper list>

Jumper	Function
JAT	Power mode select
JRTC	CMOS Normal/Clear Setting
JVLCD	Panel Voltage Setting
JMSATA1/2	MiniCard1/2 mSATA Setting
JCSEL1/2	CN_COM2 RS232/422/485 select
JP1/2	COM1 and CN_COM2 9-pin setting

2.2.2 <Clear CMOS and Power on type selection>

JRTC: Clear CMOS data jumper

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

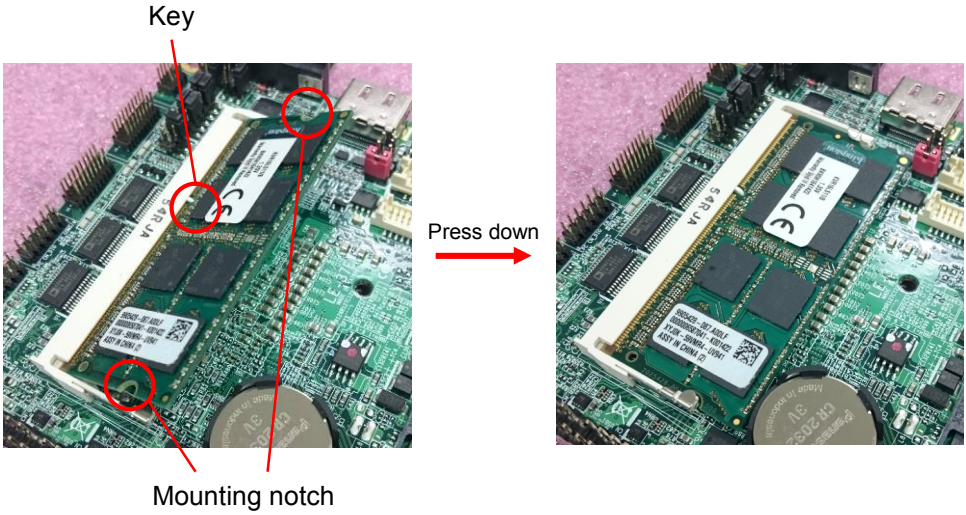
JAT: AT/ATX mode select jumper

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

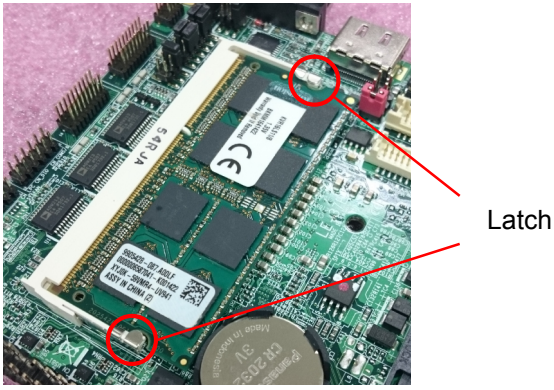
2.3 <Installing the Memory>

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.



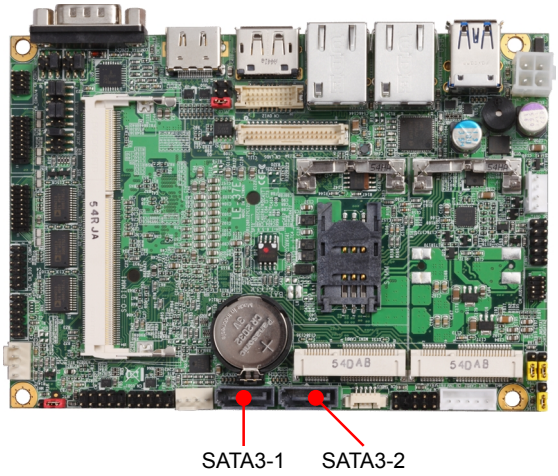
3. To remove the memory, push outward on both sides of the latch.



2.4 <I/O interface>

2.4.1 <Serial ATA interface>

Support RAID0 and 1.

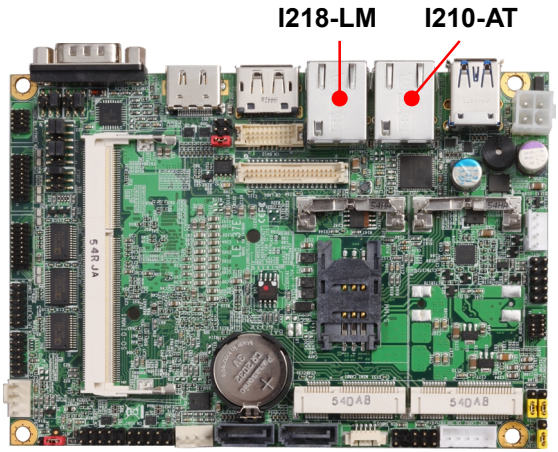


2.4.2 <Ethernet interface>

The board provide I210-AT and I218-LM Gigabit Ethernet which supports WOL on rear I/O.

It supports Intel® AMT 10.0 feature.

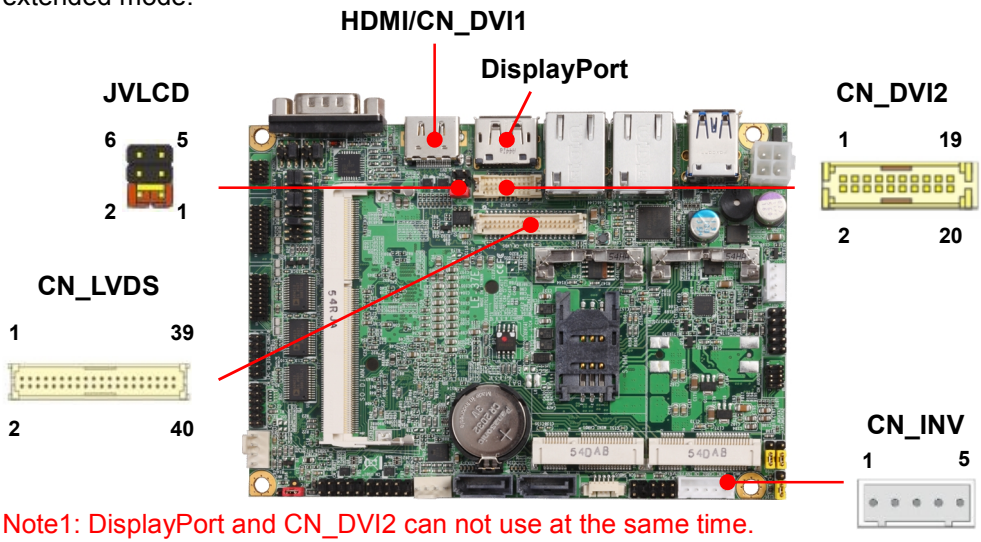
(Note that the CPU must support vPro technology, ex: i7-5650U)



2.4.3 <Display interface>

Based on the 5th/4th Gen CPU with built-in HD Graphics, the DisplayPort up to **3840x2160 @ 60Hz**, the HDMI resolution up to **2560x1600 @ 60Hz** and LVDS (PTN3460) up to **1920x1200 @ 60Hz** support 18/24-bit color depth and dual channel.

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



Note1: DisplayPort and CN_DVI2 can not use at the same time.

Note2: HDMI connector can change like CN_DVI2 pin-header.

CN_DVI1/2: DVI 20-pin connector

Pin	Signal	Pin	Signal
1	5V	**2**	NC
3	HPD	**4**	GND
5	TMDS_TX0-	**6**	TMDS_TX0+
7	GND	**8**	TMDS_TX1-
9	TMDS_TX1+	**10**	GND
11	TMDS_TX2-	**12**	TMDS_TX2+
13	GND	**14**	TMDS_CLK-
15	TMDS_CLK+	**16**	GND
17	SDA	**18**	SCL
19	NC	**20**	NC

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

Pin	Signal	Pin	Signal
2	Set by JVLCD	**1**	Set by JVLCD
4	Detect (Active low)	**3**	GND
6	A_LVDS_0-	**5**	B_LVDS_0-
8	A_LVDS_0+	**7**	B_LVDS_0+
10	GND	**9**	GND
12	A_LVDS_1-	**11**	B_LVDS_1-
14	A_LVDS_1+	**13**	B_LVDS_1+
16	GND	**15**	GND
18	A_LVDS_2-	**17**	B_LVDS_2-
20	A_LVDS_2+	**19**	B_LVDS_2+
22	GND	**21**	GND
24	A_LVDS_CLK-	**23**	B_LVDS_3-
26	A_LVDS_CLK+	**25**	B_LVDS_3+
28	GND	**27**	GND
30	A_LVDS_3-	**29**	B_LVDS_CLK-
32	A_LVDS_3+	**31**	B_LVDS_CLK+
34	GND	**33**	GND
36	LVDS_DDCSCL	**35**	NC
38	LVDS_DDCSDA	**37**	NC
40	NC	**39**	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	Reserve
4	GND
5	Enable Backlight

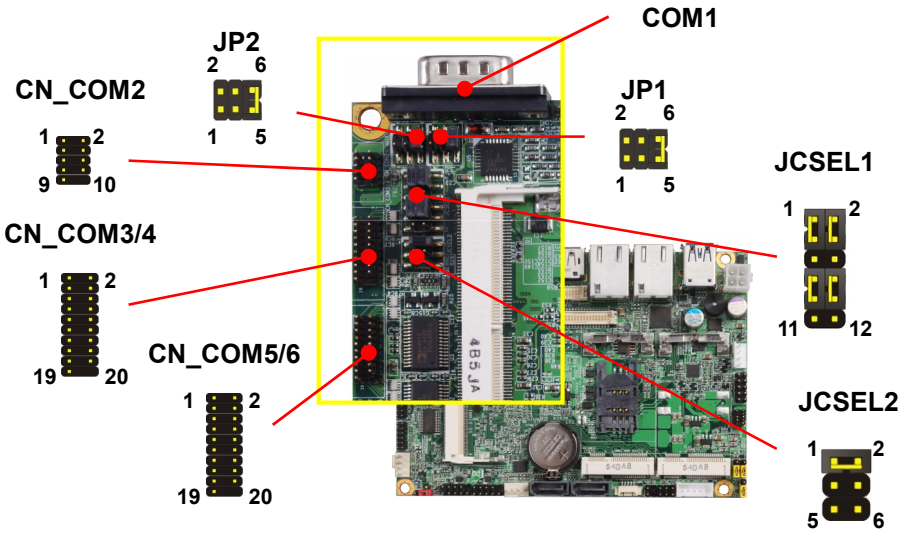
JVLCD: LVDS panel power select jumper

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

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

Other may cause damage

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 1.27mm x 2.54mm)

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

COM3/4,5/6: RS232 20-pin header (Pitch 1.27mm x 2.54mm)

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

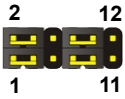
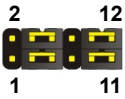
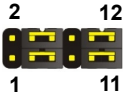
JP1, JP2: COM1, COM2 pin-9 setting

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

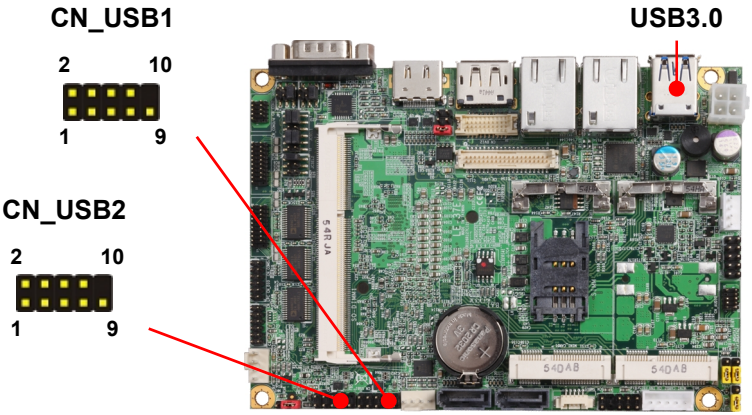
Effective patterns of connection: 1-2 / 3-4 / 5-6

Other may cause damage

JCSEL1, JCSEL2: For configure COM2 communication mode

Function	JCSEL1	JCSEL2
RS232		
RS485		
RS422		

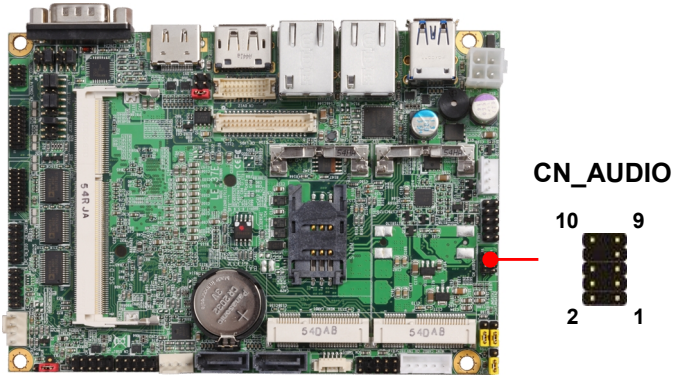
2.4.5 <USB interface>



CN_USB1/2: Front panel USB2.0 10-pin header (Pitch 2.54mm)

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

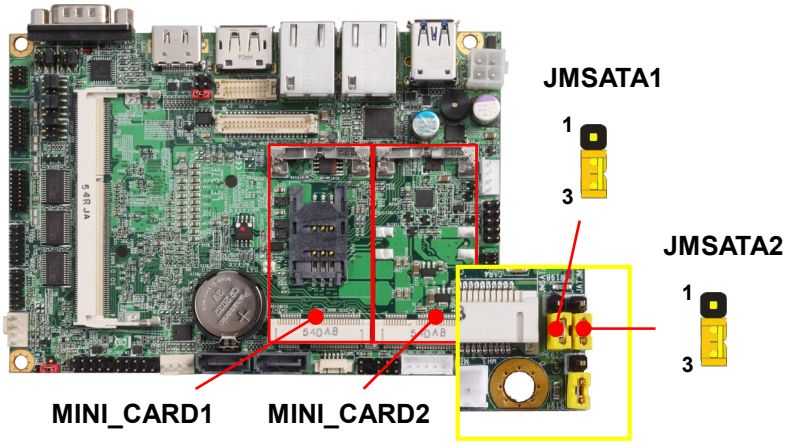
2.4.6 <Audio interface>



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_CARD2 have some special design to compatible our MiniPCIe card (ex: MPX-574D2, MPX-210D2 etc) and MINI_CARD1/2 supports mSATA set by JMSATA1/2.

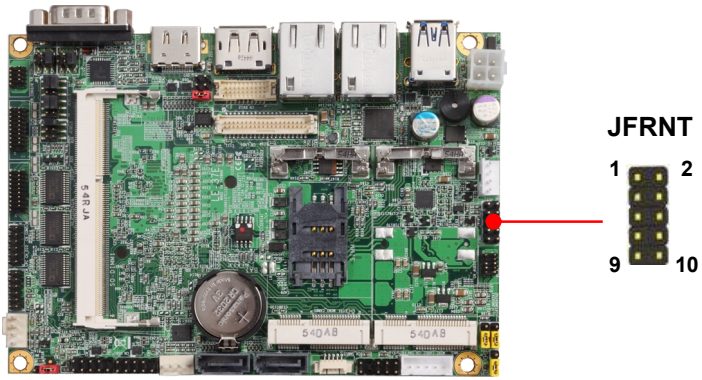
MINI_CARD1 supports SIM card to use 3G module.

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

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

Note: JMSATA1 set the MINI_CARD1, JMSATA2 set the MINI_CARD2

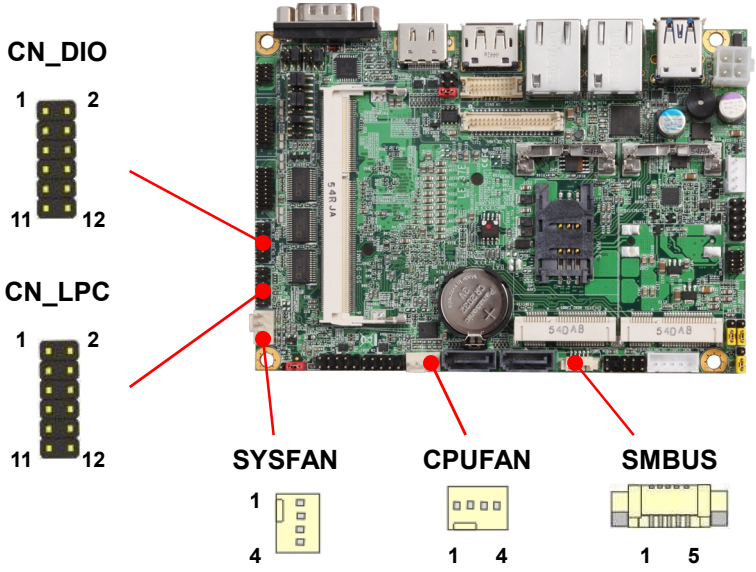
2.4.8 <Front panel switch and indicator>



JFRNT: Front panel switch and indicator 14-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 <Other interface>



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

Note: Support TPM module.

SMBUS: SMBus 5-pin connector

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

CPUFAN: CPU cooler fan 4-pin connector

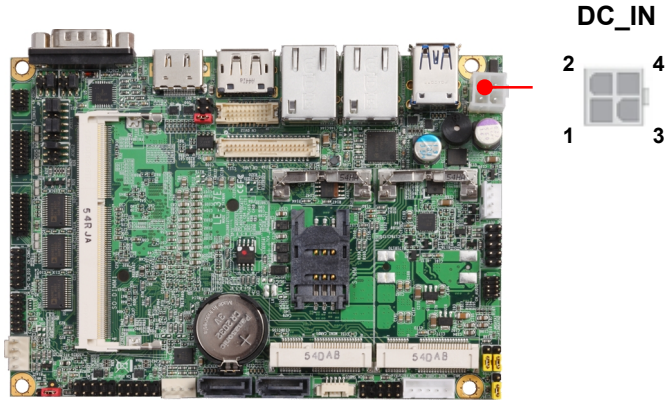
Pin	1	2	3	4
Signal	GND	12V	Sensor	Control

SYSFAN: System cooler fan 4-pin connector

Pin	1	2	3	4
Signal	GND	12V	Sensor	Control

2.5 <Power supply>

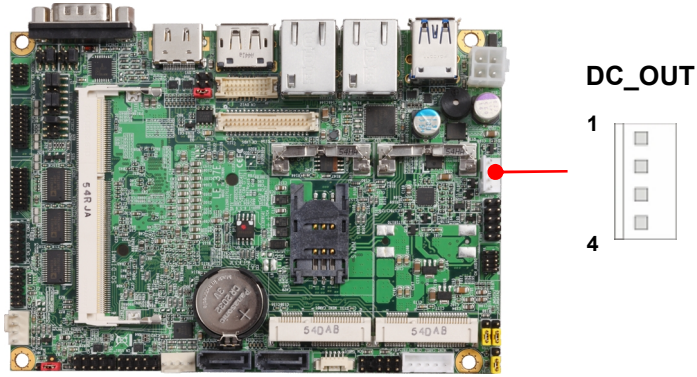
2.5.1 <Power input>



DC_IN: ATX12V 4-pin power connector

Pin	Signal	Pin	Signal
1	GND	2	GND
3	9~30V Power input	4	9~30V Power 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:

http://www.commell.com.tw/Download/BIOS/FPT10.rar

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 <Installation driver Notes>

B.1 <iAMT(ME) driver>

Before installing, it need to install Microsoft Hotfix KB2685611 first for Win7 32/64 bit. More information please refer

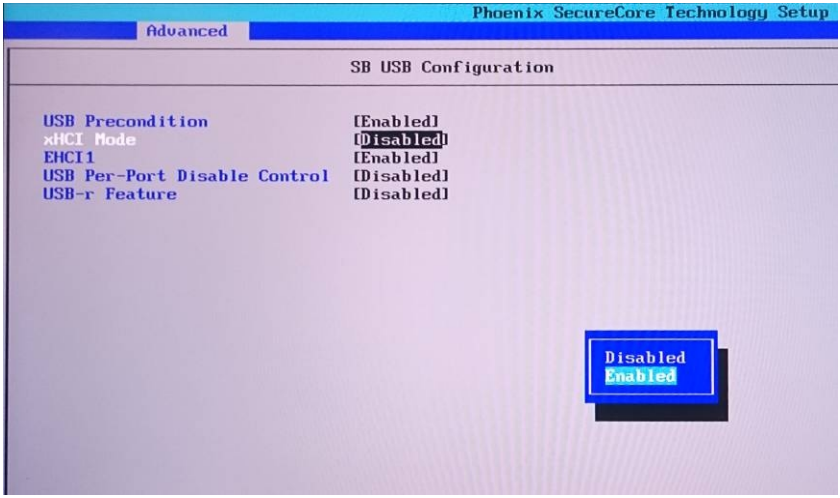
https://www.microsoft.com/en-us/download/details.aspx?id=38423

B.2 <USB3.0 driver>

Before Win7 install the USB3.0 driver or use in Win8 and Win8.1, xHCI needs to be enabled in the BIOS.

Note that if enable xHCI, all USB port will unusable in Win7. So first need copy driver folder to your HDD, then enable xHCI, and use PS/2 to do install. The path is "X:\Driver\USB3.0\Intel_USB_3.0_xHC_Driver_4.0.0.27_PV"

Advanced > South Bridge Configuration > SB USB Config > xHCI Mode



Appendix C <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.

BIOS panel type selection form (BIOS Version:1.0)			
Single / Dual channel		Single / Dual channel	
NO.	Type	NO.	Type
1	640 x 480	9	1680 x 1050
2	800 x 600	10	1920 x 1200
3	1024 x 768	11	1440 x 900
4	1280 x 1024	12	1600 x 900
5	1400 x 1050 Reduced Blanking	13	800 x 480
6	1400 x 1050 non-Reduced Blanking	14	1280 x 800
7	1600 x 1200	15	1920 x 1080
8	1366 x 768	16	OEM Keep (Ver 1.1)

Appendix D <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 GPIO3)

-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 NCT6102D datasheet

Appendix E <Programmable Watch Dog Timer>

Timeout value range

1 to 255 Minute and Second

Program sample

Watchdog timer setup as system reset with 5 second of timeout

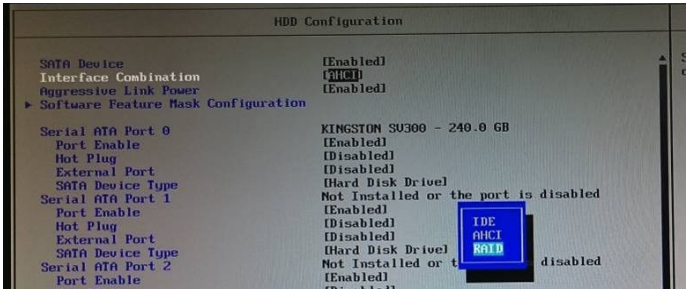
```
-o 4E 87        ;enter configuration
-o 4E 87
-o 4E 07
-o 4F 08        ;select Logical Device
-o 4E 30
-o 4F 01        ; activate WDTO# function
-o 4E F5
-o 4F 00        ;set "00" is second mode, set "04" is minute mode
-o 4E F6
-o 4F 05        ;00h: Timeout Disable
                ;01h: Timeout 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 NCT6102D datasheet

Appendix F <SATA RAID function setting>

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

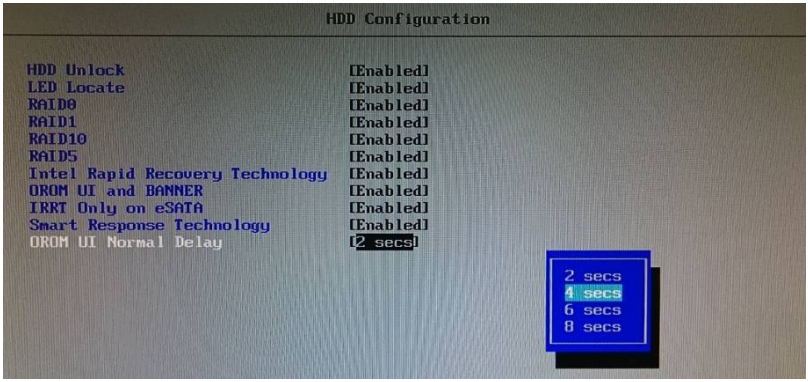
[Advanced] > [HDD Configuration] > [Interface Combination] > [RAID]



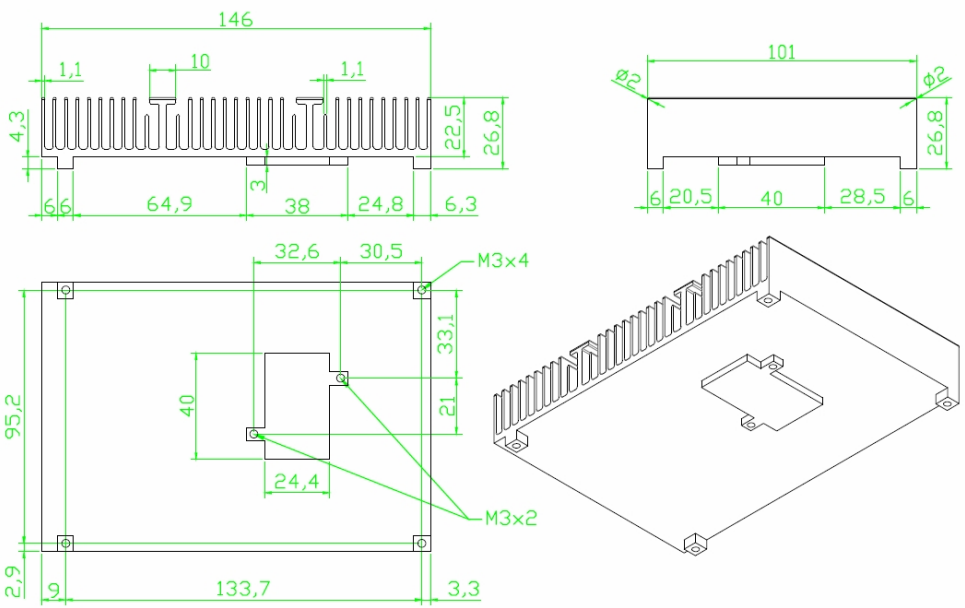
At boot time, press <CTRL + I> to enter the RAID configuration menu.

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

[HDD Configuration] > [Software Feature Mask Configuration] > [OROM UI Normal Delay] (Need to set RAID mode first)



Appendix G <Heat Sink Note>



According the Heat sink drawing, the screw hole size in the four corners is M3 and depth 4mm, and consider the board thickness is 1.6mm, please use copper pillars that thread length is 5mm to fix chassis.

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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