3I470DW

Intel® Comet Lake-S Core™ I processor + Intel Q470, DDR4 LAN / DP / HDMI / USB / PCIe / M.2

All-In-One
10th gen. Intel Comet Lake-S Core™ I CPU
HDMI, DP, eDP, PCIe, PCIe mini card, M.2,
Multi-LAN, COM, Nano SIM, SATA, USB
Wide Range DC-input

CAUTION

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.
DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS

NO. 3I470DW
Release date: AUG. 19. 2022

Contents

User Manual edition 0.1, AUG. 19. 2022

Warning !

1. Battery
   Batteries on board are consumables.
   The life time of them are not guaranteed.

2. Fless solution with HDD
   The specification & limitation of HDD should be considered carefully when the fanless solution is implemented.

3. We will not give further notification in case of changes of product information and manual.

4. SATA interface does not support Hot SWAP function.

5. There might be a 20% inaccuracy of WDT at room temperature.

6. Please make sure the voltage specification meets the requirement of equipment before plugging in.

7. There are two types of SSD, commercial grade and industrial grade, which provide different read / write speed performance, operation temperature and life cycle. Please contact sales for further information before making orders.

8. Caution! Please notice that the heat dissipation problem could cause the MB system unstable. Please deal with heat dissipation properly when buying single MB set.

9. Please avoid approaching the heat sink area to prevent users from being scalded with fanless products.

10. If users repair, modify or destroy any component of product unauthorizedly, We will not take responsibility or provide warranty anymore.

11. DO NOT apply any other material which may reduce cooling performance onto the thermal pad.

12. It is important to install a system fan toward the CPU to decrease the possibility of overheating / system hanging up issues, or customer is suggested to have a fine cooling system to dissipate heat from CPU.

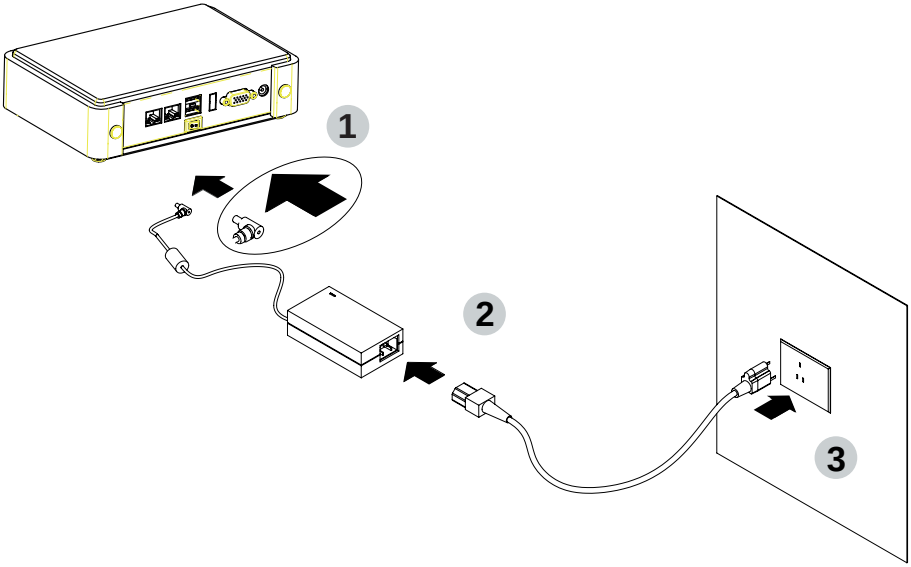
✱ Hardware Notice Guide

1. Before linking power supply with the motherboard, please attach DC-in adapter to the motherboard first. Then plug the adapter power to AC outlet.
   Always shut down the computer normally before you move the system unit or remove the power supply from the motherboard. Please unplug the DC-in adapter first and then unplug the adapter from the AC outlet.
   Please refer photo 1 as standard procedures.
2. In case of using DIRECT DC-in (without adapter), please check the allowed range for voltage & current of cables. And make sure you have the safety protection for outer issues such as short / broken circuit, overvoltage, surge, lightning strike.
3. In case of using DC-out to an external device, please make sure its voltage and current comply with the motherboard specification.
4. The total power consumption is determined by various conditions (CPU / motherboard type, device, application, etc.). Be cautious to the power cable you use for the system, one with UL standard will be highly recommended.
5. It's highly possible to burn out the CPU if you change / modify any parts of the CPU cooler.
6. Please wear wrist strap and attach it to a metal part of the system unit before handling a component. You can also touch an object which is ground connected or attached with metal surface if you don't have wrist strap.
7. Please be careful to handle & don't touch the sharp-pointed components on the bottom of PCBA.
8. Remove or change any components form the motherboard will VOID the warranty of the motherboard.
9. Before you install / remove any components or even make any jumper setting on the motherboard, please make sure to disconnect the power supply first. (follow the aforementioned instruction guide)
10. "POWERON after PWR-Fair" function must be used carefully as below:
    When the DC power adaptor runs out of power, unplug it from the DC current ;
    Once power returns, plug it back after 5 seconds.
    If there is a power outage, unplug it from the AC current, once power returns, plug it back after 30 seconds. Otherwise it will cause system locked or made a severe damage.

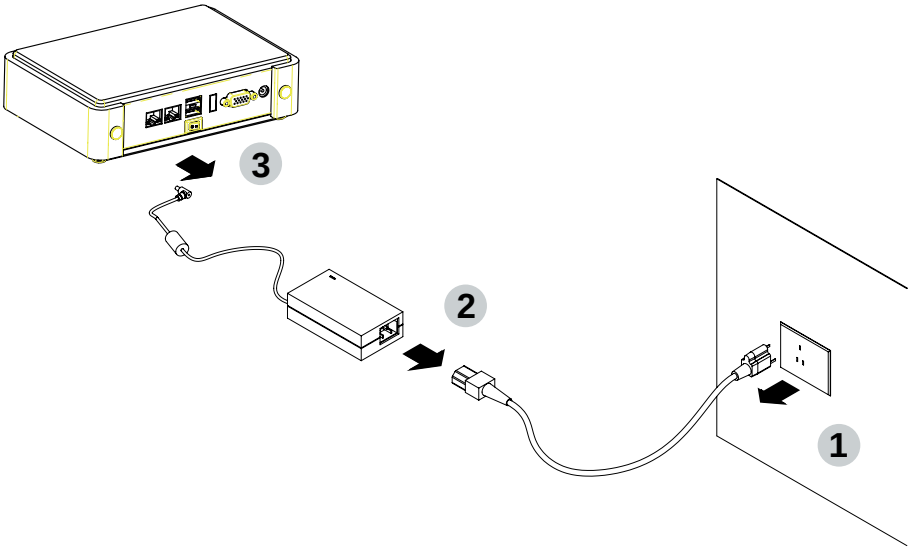
Remark 1:
Always insert / unplug the DC-in horizontally & directly to / from the motherboard. DO NOT twist, it is designed to fit snugly.
Moreover, erratic pull / push action might cause an unpredictable damage to the component & system unit.

Photo 1

Insert



Unplug



Chapter-1

General Information

The 3I470DW with latest Intel 10th Gen Coffee Lake-S Core i CPU and Pentium® / Celeron® Processor All-In-One board in the LGA1200 package with Intel® Q470 Express chipset. The 3I470DW supports high-speed data transfer interfaces such as PCIe 3.0, USB 3.0, and SATA 6 Gb/s (SATA III), with dual-channel DDR4 memory up to 64GB in two SO-DIMM slots, as well as graphics interface for HDMI and Display Port displays.

High-performance and power-efficient communication platform, the embedded motherboard of 3I470DW is specially designed for IoT, industrial, digital signage, medial, POS, retail and factory automation applications. 3I470DW with a wide variety of expansion options including PCIe(x16), PCIe(x8), PCIe(x4), PCIe(x1), or 2 PCIe(x8), 2 PCIe(x4), 2 PCIe(x1), selectable by raiser cards. The platform comes with Intel Gigabit Ethernet controllers and supports Wake-On LAN, vPro with TPM 2.0 and the PXE function in BIOS for Intel LAN chipset, it is perfect control board for networking devices.

The 3I470DW SBC equipped with a variety of interfaces: 5 x LAN, 4 x RS232 / RS422 / 485 serial ports, 4 x USB3.0, 4 x USB 2.0, DP, HDMI & eDP) and expansion slots such as PCIe / mPCIe / M.2 slots for I/O modules (Digital I/O, WiFi, 4G / 5G, LoRA, Bluetooth) Connection options, especially 3.3 / 3.7 auto detect by config pin of the M.2 devices.

In addition to industrial grade components, APOLLO 3I470DW with 500W power riser card RS815 for high power graphic cards for AI solution, 3I470DW are with excellent thermal dispatched design, enable to operate smoothly with automation, machine vision, industrial communication, military and intelligent transportation applications in various harsh environments such as mountains, cold polar climate, mines, oil fields and deserts.

1-1 Major Feature

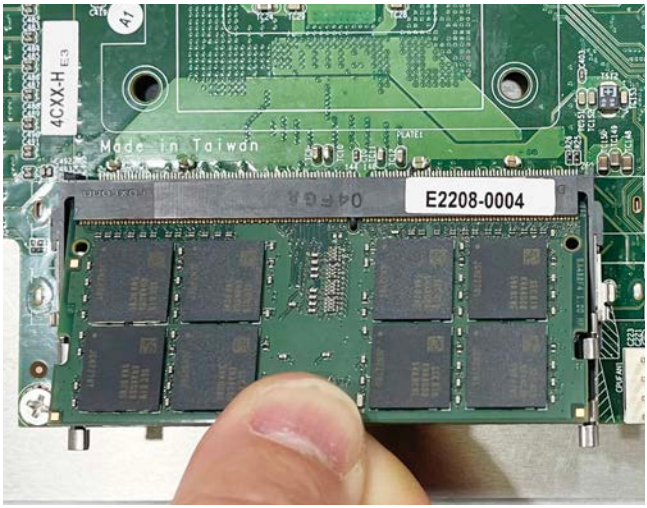
1. The Embedded Coffee Lake-S Platform processor includes Integrated Display Engine, GPU and Integrated Memory Controller. The processor is designed be offered in a LGA1200 package.
2. Intel Q470 Chipset Family Platform Controller Hub (PCH)
3. Supports Two Channels of DDR4 SO-DIMM SDRAM, Max. 32GB, data transfer rates of 2400MT/s.
4. Intel Desktop Coffee Lake-Platform Processor Integrated Graphics.
   GEN 9 architecture supports up to 72 Execution Units (EUs), depending on the processor SKU.
5. Integrated Gigabit LAN Controller with Intel I219LM Gigabit Ethernet PHY supports vPro. total support 5 x 10 / 100 / 1000 Mbps Intel LAN ports.
6. Support DP, HDMI, eDP1.4 2 lanes on Board.
7. Support 4 x RS232 auto switch to RS485 / RS422 by BIOS, (up to 6 series ports for option)
8. 4 x type A USB3.0 external and 4 x USB 2.0 internal
9. ALC888 HD Audio Specification 1.0 Two channels sound. (Option)
10. Two SATA ports 3.0 Data transfer rates up to 6.0 Gb/s (600 MB/s)
11. Support extended 1 x Mini PCIe card for PCIe x 1, mSATA and USB3.0 interface, one M.2 B-Key 3042 / 3052 for PCIe x 2, SATA & USB3.0 device. Support PCIe NVMe storage. There is 1 x SIM Card Socket for 4G LTE & 5G module.
12. Hardware digital Input & Output, 8 x DI / 8 x DO, (up to 16DI / 16DO for option), Hardware Watch Dog Timer, 0~255 sec programmable
13. 1 PCIe x 16 Golden Finger supports 1 PCIe x 1, 4, 8,16 or 1 PCIe x 1, 4 with Riser Cards
14. Support Hardware TPM 2.0

1-2 Specification

1. **CPU:** Embedded Comet Lake-S Platform processor. The processor is designed be offered in a LGA1200 package.
2. **PCH:** Intel Q470 Chipset Family Platform Controller Hub (PCH)
3. **Memory:** Two SO-DIMM slots for DDR4 SDRAM, Max. 64GB, data transfer rates of 2400MT/s
4. **Graphics:** Intel 9th generation (Gen 9) LP graphics and media encode / decode engine supports OpenGL x 4.5, OpenCL x 2.1, Direct3D x 2015, Direct3D 11.2, Direct2D eDP 1.4 2 Lanes up to 1920 x 1080, DP 1.2 3840 x 2160, HDMI 1.4b up to 3840 x 2160.
5. **SATA:** Integrated Serial ATA Host Controller Up to 2 SATA port, SATA Gen3 Data transfer rates up to 6.0 Gb/s (600 MB/s).
6. **LAN:** LAN1 Intel I219LM Gigabit Ethernet PHY. LAN2~5 Intel I210-IT LAN chipset or Intel I211-AT LAN chipset with 10 / 100 / 1000 Mbps.
7. **I/O Chip:** Chipsets for 4 port RS232 / 422 / 485 (6 port for option)
8. **USB:** 4 type A USB 3.0 connector onboard and 4 USB 2.0 (internal)
9. **Sound:** Support line in, line out and MIC in (Option)
10. **eDP:** Support eDP 1.4 2 Lanes up to 1920 x 1080
11. **WDT / DIO:** Hardware digital Input & Output, 8 x DI / 8 x DO (16DI / 16DO for option) / Hardware Watch Dog Timer, 0~255 sec programmable
12. **Expansion interface:** one full-size PCIe Mini card for PCIe x 1, mSATA and USB3.0 interface, 1 M.2 B-key for PCIe x 2, SATA & USB3.0 devices with 1 SIM socket.
13. **Golden Finger:** PCIe x 16 Golden Finger supports 1 PCIe x 1, 4, 8,16 or 2 PCIe x 1, 4, 8 with Riser Cards
14. **TPM:** Infineon SLB 9665 TT 2.0 Trusted Platform Module
15. **BIOS:** AMI UEFI BIOS
16. **Dimension:** 150 x 155 mm
17. **Power:** DC IN +12V~36V

1-3 Installing the SO-DIMM

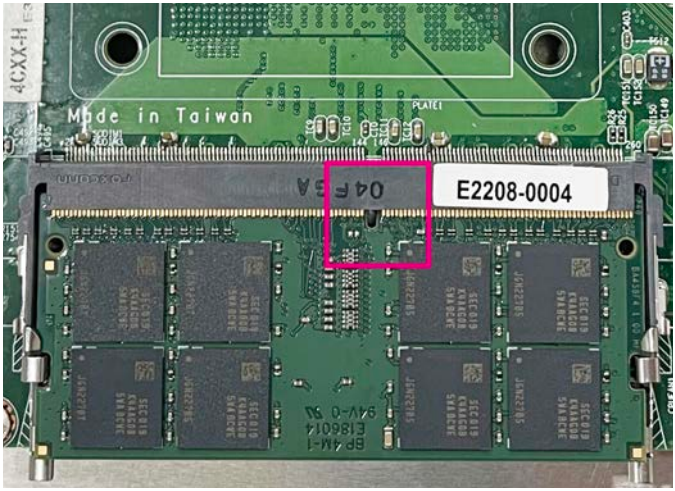
1. Align the SO-DIMM with the connector at a 45 degree angle.



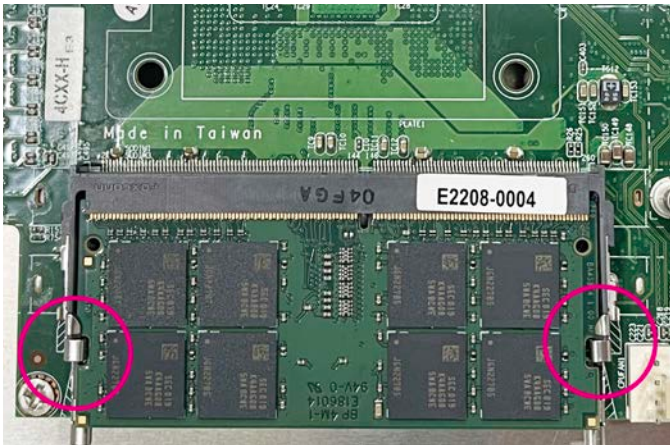
2. Press the SO-DIMM into the connector until you hear a click.

Notices:

1.The connectors are designed to ensure the correct insertion. If you feel resistance, check t h e connectors & golden finger direction, and realign the card.



2. Make sure the retaining clips (on two sides of the slot) lock onto the notches of the card firmly.



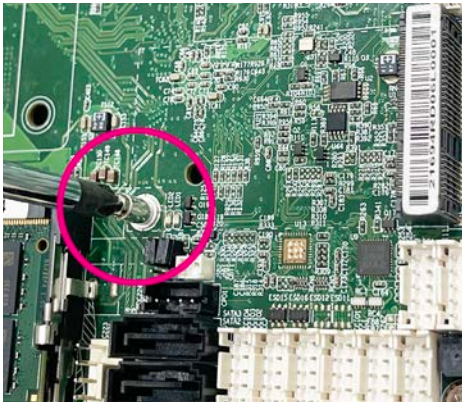
1-3-1-1 Removing the SO-DIMM

1. Release the SO-DIMM by pulling outward the two retaining clips and the SO-DIMM pops up slightly.

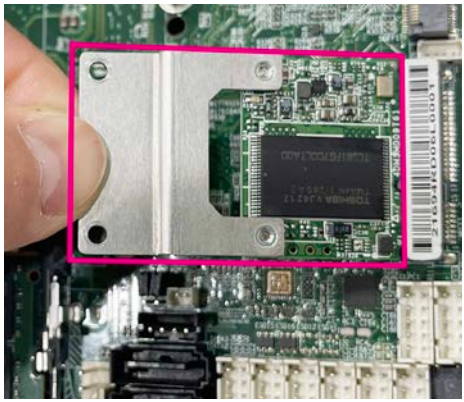
2. Lift the SO-DIMM out of its connector carefully.

1-4 Installing the Mini PCI-e Card (Full Size)

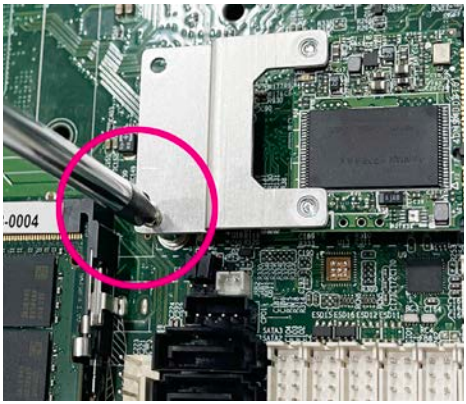
1. Unscrew the screw on the board



2. Plug in the Mini Card in a 45 angle

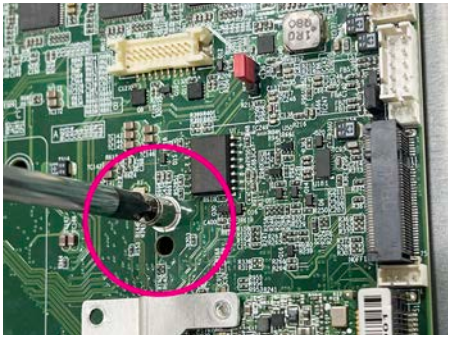


3. Gently push down the Mini Card and screw the screw back.

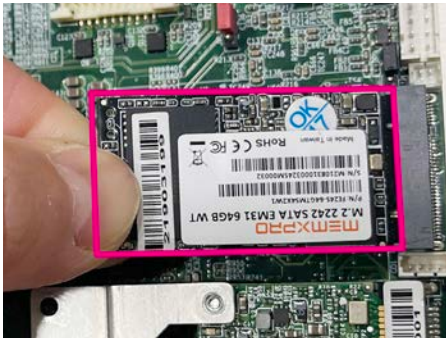


1-5 Directions for installing the M.2B Key Mini Card

1. Unscrew the screw on the board



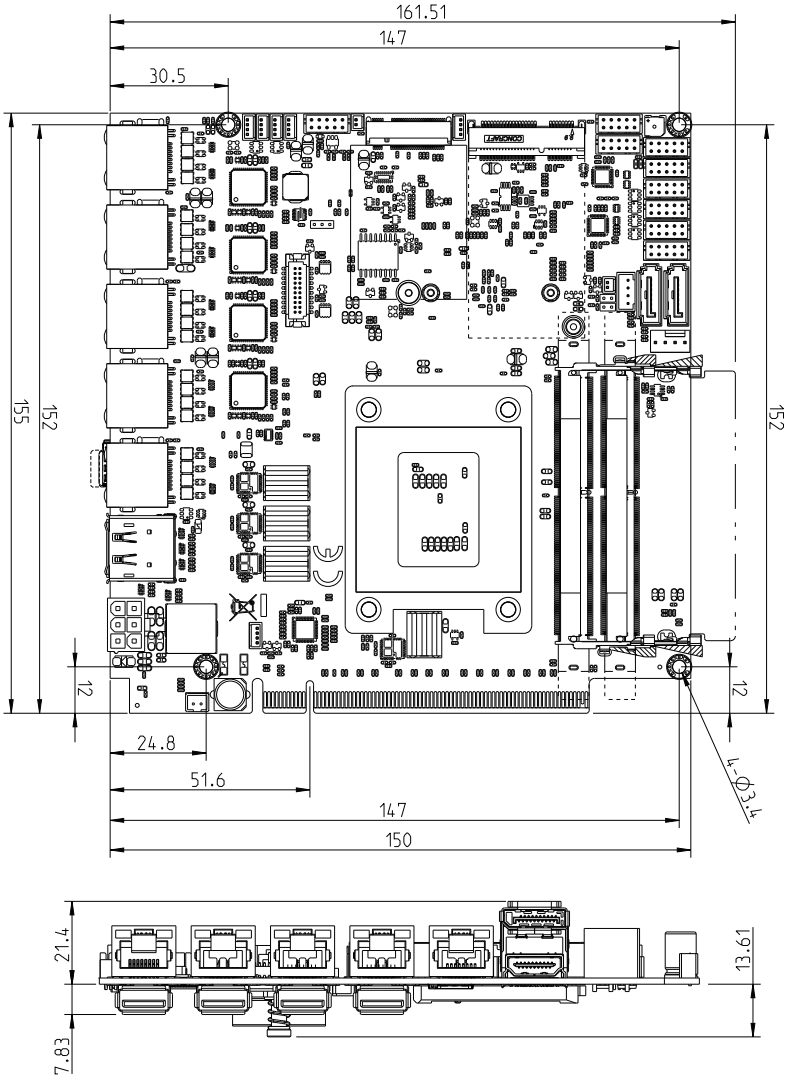
2. Plug in the Mini Card in a 45 angle



3. Gently push down the Mini Card and screw the screw back.

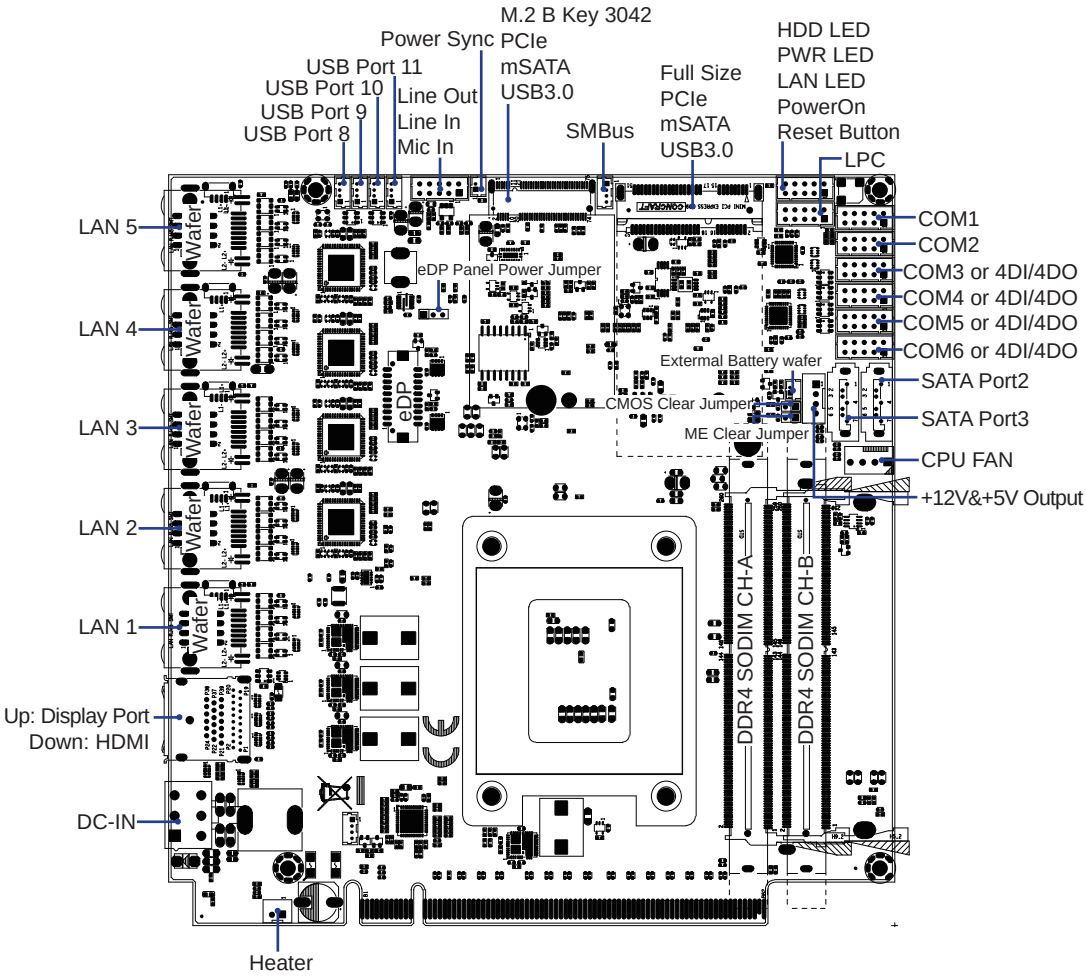
Chapter-2

2-1 Dimension-3I470DW



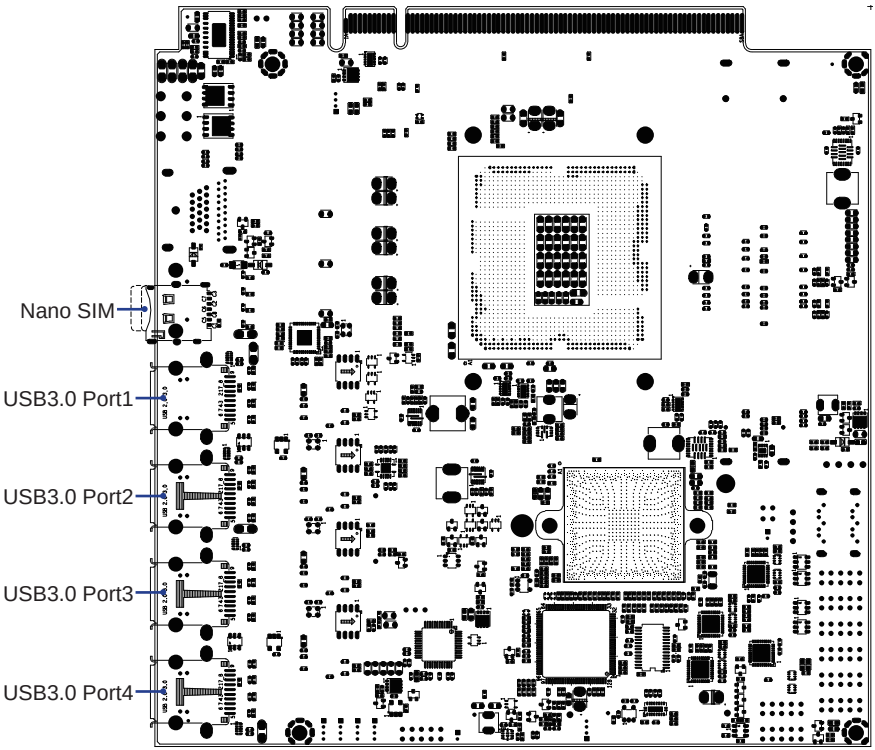
2-2 Layout-3I470DW-Function Map

TOP



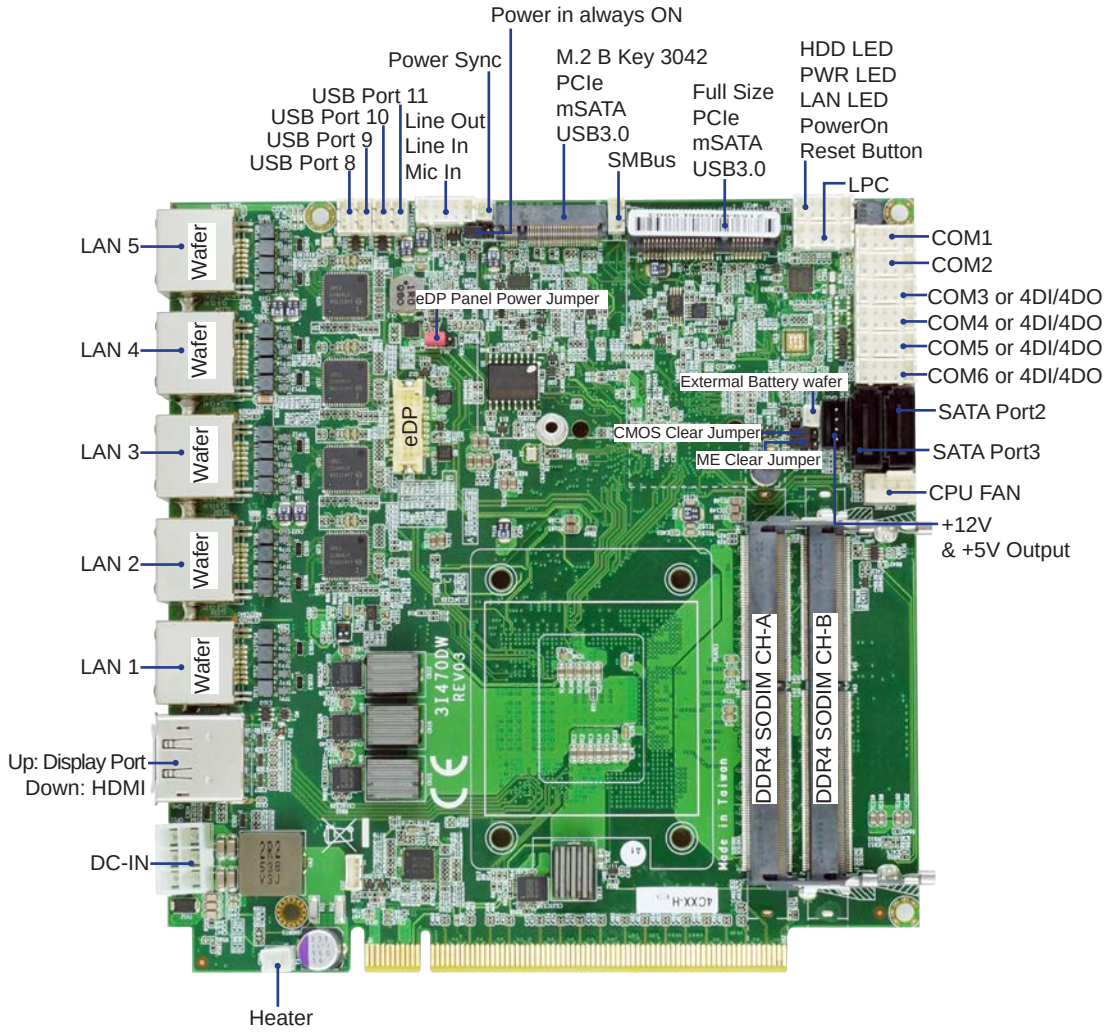
2-2-1 Layout-3I470DW-Function Map

BOT



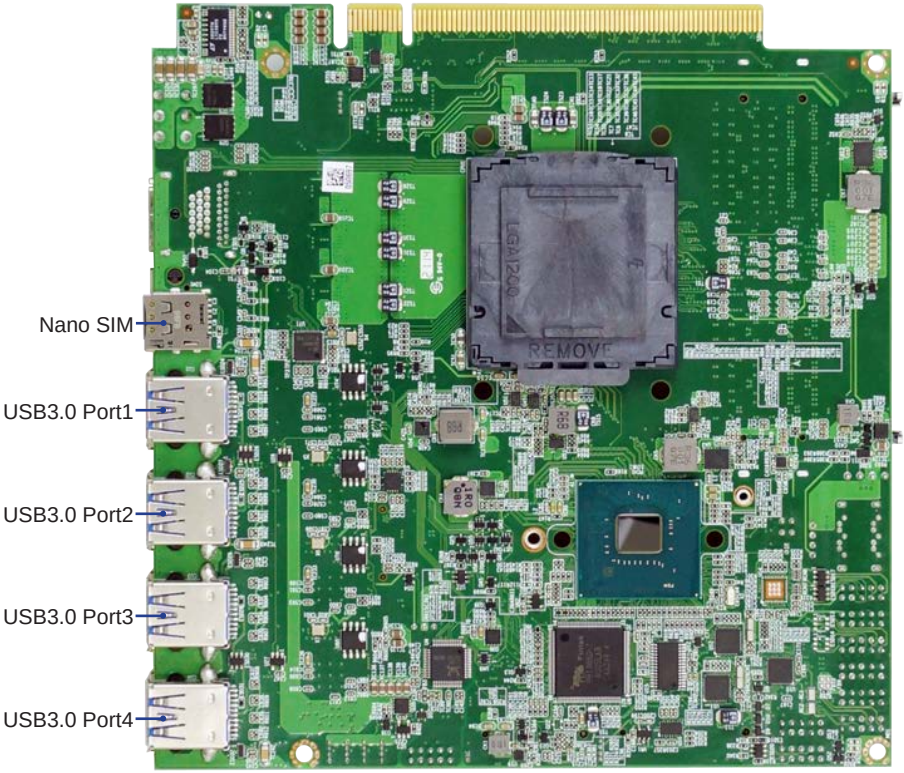
2-3 Function Map-3I470DW

TOP



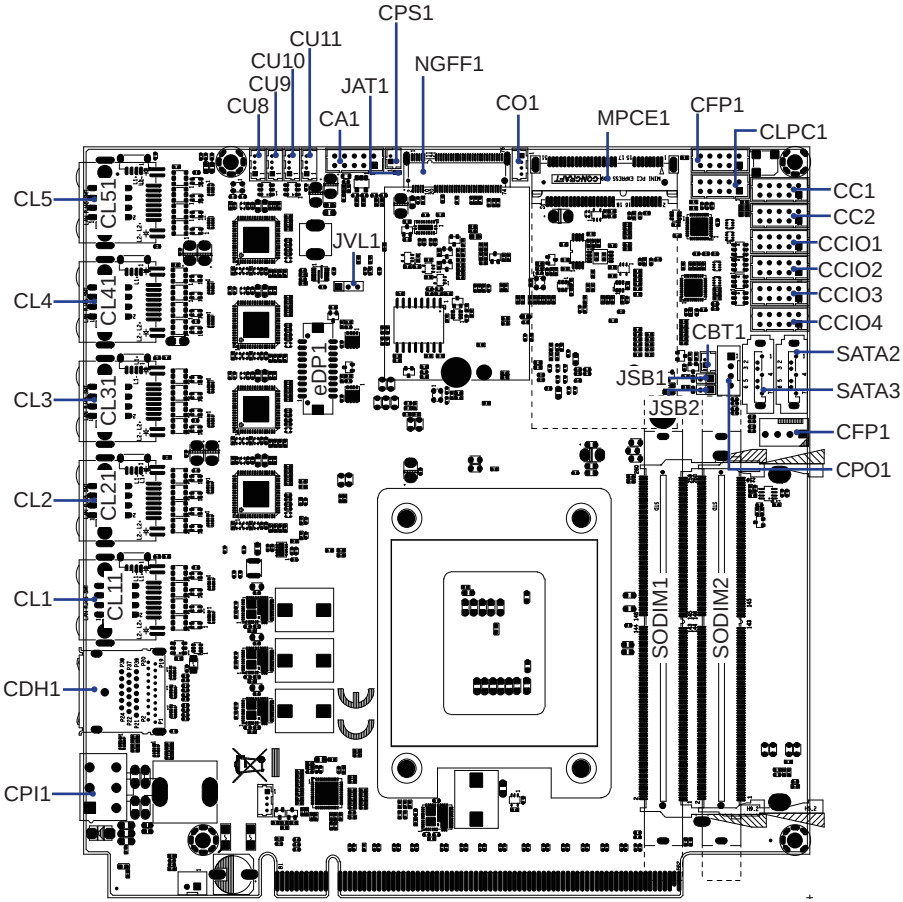
2-3-1 Function Map-3I470DW

BOT



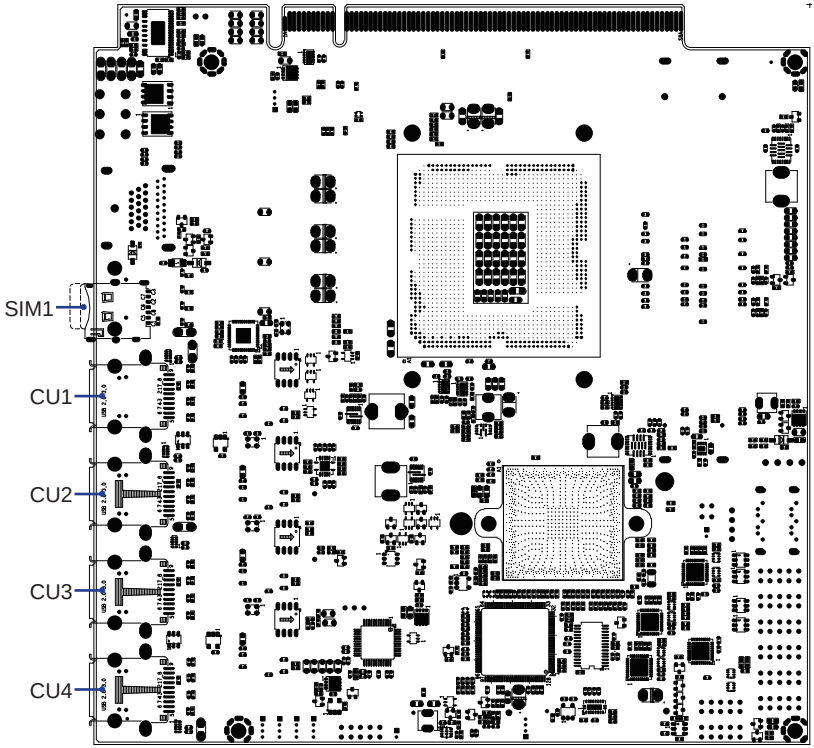
2-4 Connector MAP-3I470DW

TOP



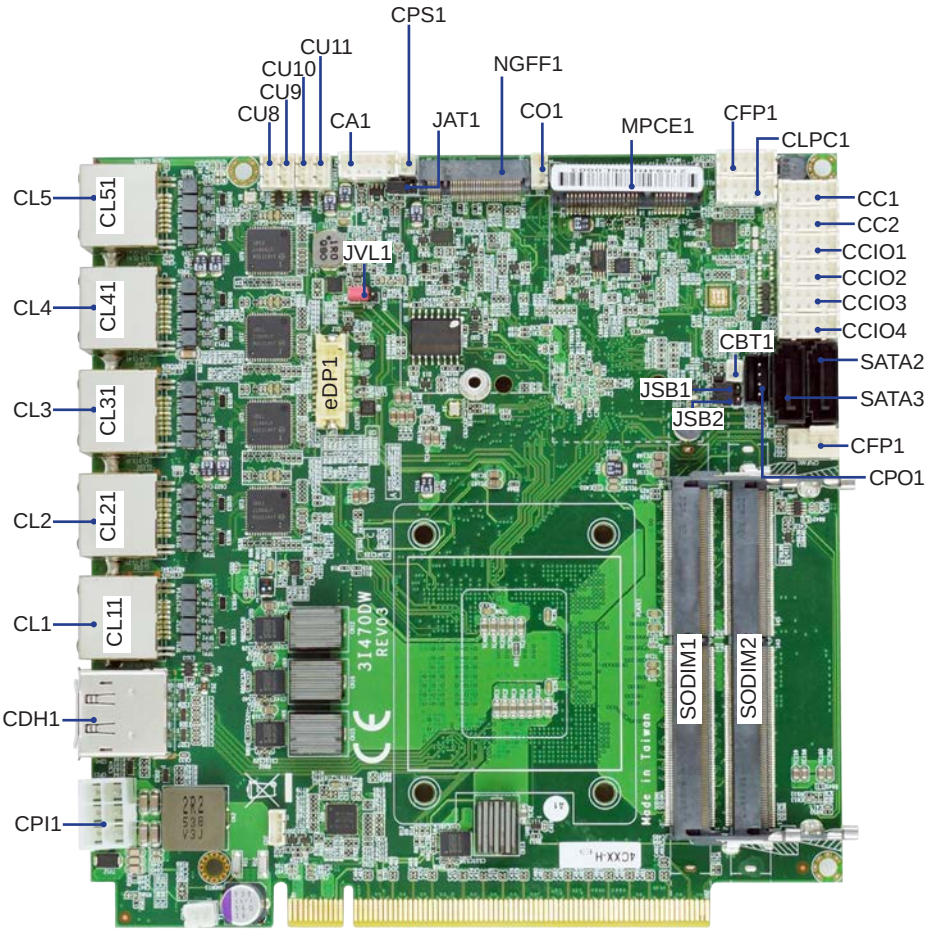
2-4-1 Connector MAP-3I470DW

BOT



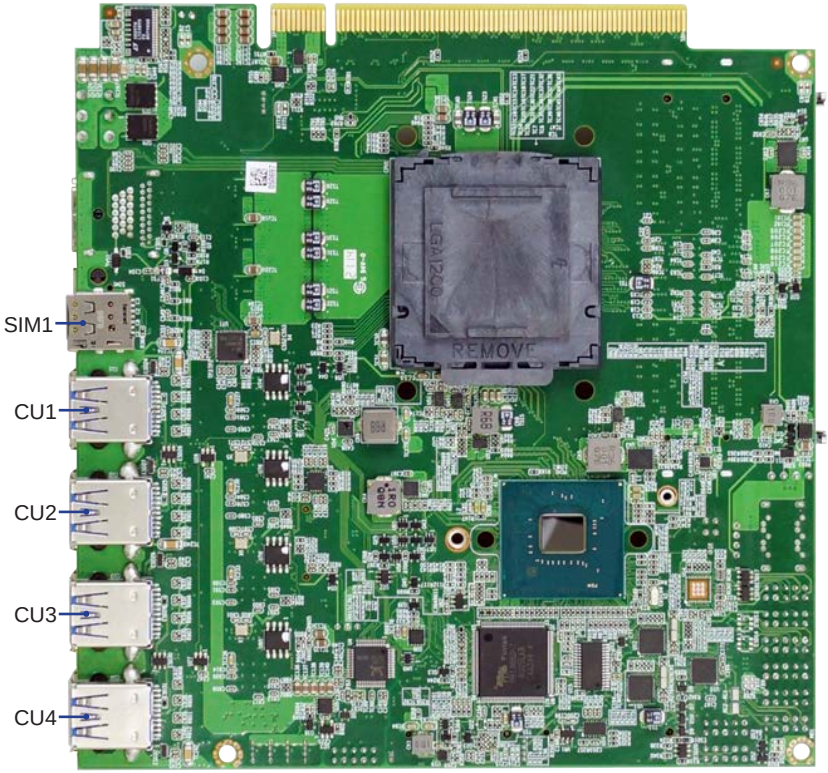
2-5 Diagram- 3I470DW

TOP



2-5-1 Diagram- 3I470DW

BOT



2-8 List of Jumpers

JSB1: CMOS DATA Clear
JSB2: ME DATA Clear
JVL1: eDP panel power select
JAT1: Power in always ON function

2-9 Jumper Setting Description

A jumper is ON as a closed circuit with a plastic cap covering two pins. A jumper is OFF as an open circuit without the plastic cap. Some jumpers have three pins, labeled 1, 2, and 3. You could connect either pin 1 and 2 or 2 and 3.The below figure 2.2 shows the examples of different jumper settings in this manual.

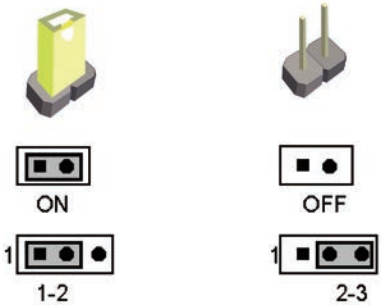


Figure 2.2

All jumpers already have its default setting with the plastic cap inserted as ON, or without the plastic cap as OFF. The default setting may be referred in this manual with a " * " symbol .

2-10 JSB1: CMOS DATA Clear

A battery must be used to retain the motherboard configuration in CMOS RAM.

Close Pin1 and pin 2 of JSB2 to store the CMOS data.

To clear the CMOS, follow the procedures below:

1. Turn off the system and unplug the AC power.
2. Make sure there is no AC & DC power connect to the system or MB.
3. Close pin 2-3 of JSB2 for a few seconds.
4. Return to default setting by close pin 1-2
5. Connect DC IN power cable back to DC IN Power connector

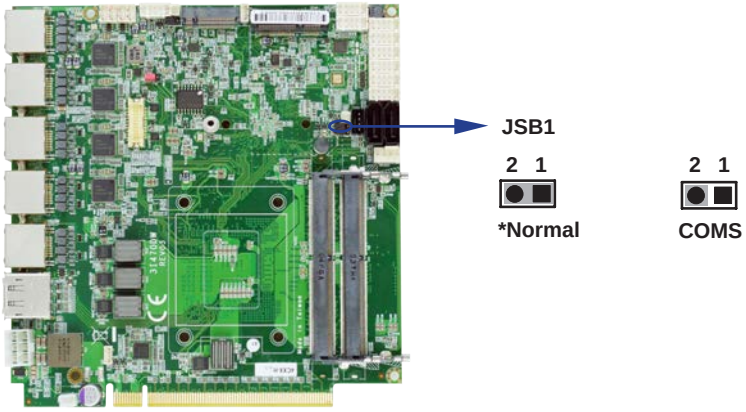
JSB1	DESCRIPION
*1-x	Normal set
1-2	CMOS data clear

Note: Do not clear CMOS unless

1. Troubleshooting

2. Forget password

3. You fail over-clocking system

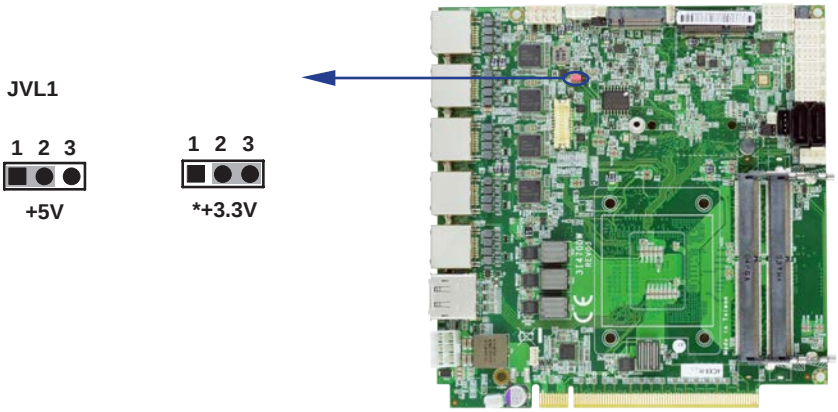


2-11 JSB2: ME DATA Clear

JSB2	DESCRIPION
*1-x	Normal Set
1-2	ME data clear

2-12 JVL1: eDP panel power select

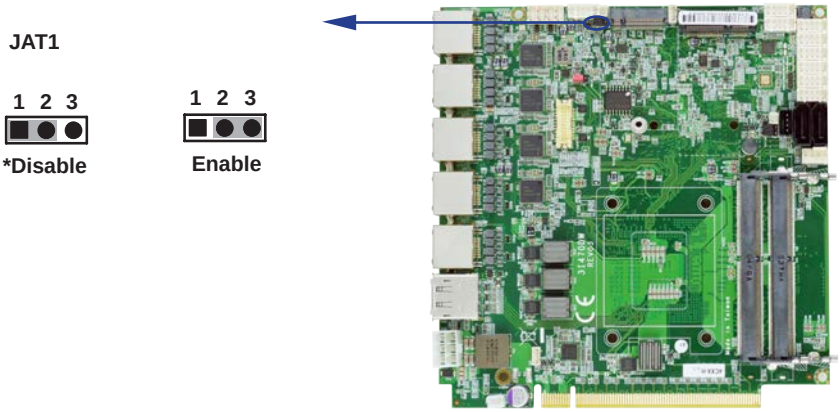
JVL1	DESCRIPION
1-2	+5V
*2-3	+3.3V



2-13 JAT1: Power in always ON function

JVL1	DESCRIPION
*1-2	Disable
2-3	Enable

Note: Power in always ON function default is disabled.



Chapter-3

Connection

This chapter provides all necessary information of the peripheral's connections, switches and indicators. Always power off the board before you install the peripherals.

3-1 List of Connectors

CBT1:	COMS battery 1x2 pin (1.25mm) wafer
CA1:	Line-out / Line-in / Mic-in 2x5 pin (2.0mm) Wafer (Option)
CC1:	COM port1 2x5 pin (2.0mm) wafer.
CC2:	COM port2 2x5 pin (2.0mm) wafer.
CCIO1:	4DI / 4DO or COM port 3 2x5 pin (2.0mm) Wafer
CCIO2:	4DI / 4DO or COM port 4 2x5 pin (2.0mm) Wafer
CCIO3:	4DI / 4DO or COM port 5 2x5 pin (2.0mm) Wafer
CCIO4:	4DI / 4DO or COM port 6 2x5 pin (2.0mm) Wafer
CDH1:	Display Port and HDMI connector.
CFP1:	Front Panel connector 2x5 pin (2.0mm) wafer
CL1:	LAN1 RJ45 connector.
CL2:	LAN2 RJ45 connector.
CL3:	LAN3 RJ45 connector.
CL4:	LAN4 RJ45 connector.
CL5:	LAN5 RJ45 connector.
CL11:	LAN1 2x4 (2.0mm) wafer (OEM).
CL21:	LAN2 2x4 (2.0mm) wafer (OEM).
CL31:	LAN3 2x4 (2.0mm) wafer (OEM).
CL41:	LAN4 2x4 (2.0mm) wafer (OEM).
CL51:	LAN5 2x4 (2.0mm) wafer (OEM).
CLPC1:	LPC 2x5 pin (2.00mm) Wafer
CO1:	SMBus 4 pin (1.25mm) Wafer
CPI1:	Motherboard DC-IN 2x3 pin (2.54mm) ATX wafer
CPO1:	+12V / +5V power output 4 pin (2.0mm) Black wafer
CPS1:	External Power-On sync 2 pin (1.25mm) wafer.
CU1:	USB 3.0 Port 1 Type A connector.
CU2:	USB 3.0 Port 2 Type A connector.
CU3:	USB 3.0 Port 3 Type A connector.
CU4:	USB 3.0 Port 4 Type A connector.
CU8:	USB 2.0 port 4 pin (1.25mm) Wafer
CU9:	USB 2.0 port 4 pin (1.25mm) Wafer
CU10:	USB 2.0 port 4 pin (1.25mm) Wafer

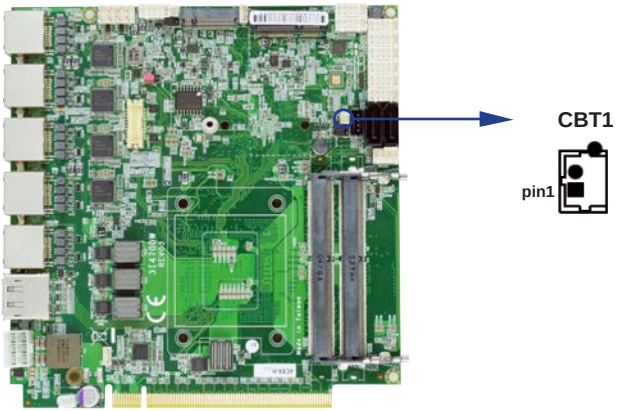
CU11:	USB 2.0 port 4 pin (1.25mm) Wafer
EDP1:	eDP 2x10 pin (1.25mm) connector
SATA2:	SATA port 2 connector 7 pin
SATA3:	SATA port 3 connector 7 pin
SIM1:	Nano push-push SIM socket.
SODIMM1:	DDR4 Channel 0 SODIMM
SODIMM2:	DDR4 Channel 1 SODIMM
MPCE1:	Full size mini card port 1 sockets 52 pin
M.2:	M.2 B Key 3042 sockets.

3-2 CMOS battery connector

● CBT1: CMOS Battery 1x2 pin (1.25mm) Wafer.

PIN NO.	DESCRIPTION
1	GND
2	+3V

Note:
1. When the board without Adaptor plug in, this board power RTC consumption about 2.7uA
2. If adaptor always plug in RTC power consumption about 0.1uA

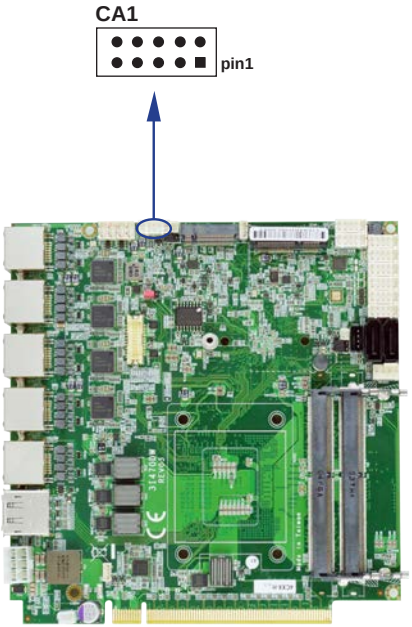


3-3 Audio interface

● CA1: Line-out / Line-in / Mic-in 2x5 pin (2.0mm) Wafer

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	Line-out-R	2	MIC-IN
3	Line-in-R	4	GND
5	GND	6	GND
7	Line-in-L	8	+5V
9	Line-out-L	10	MIC-IN

Note: This is option item for audio function.



3-4 CC1 / CC2 COM port1 / port2 2x5 pin (2.0mm) wafer

- **RS232 Mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND	10	+5V

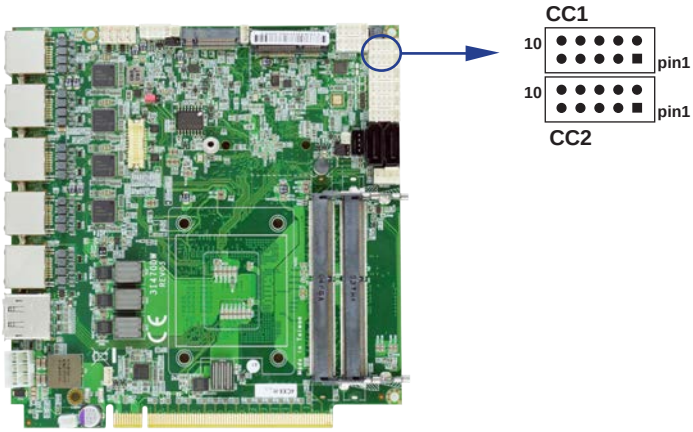
- **RS485 Mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	Data -	6	NC
2	Data+	7	NC
3	NC	8	NC
4	NC	9	NC
5	GND	10	+5V

- **RS422 Mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	TX -	6	NC
2	TX+	7	NC
3	RX+	8	NC
4	RX-	9	NC
5	GND	10	+5V

Note:
1. Pin 9 RI has +12V or +5V voltage, but default is RI, voltage for OEM.
2. UART default supports RS232 and RS422 / RS485 by BIOS selected



3-5 CCIO 1/2/3/4 COM port 3/4/5/6 and DI/DO 2x5 pin (2.0mm) wafer For COM 3/4/5/6:

- **RS232 Mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND	10	+5V

- **RS485 Mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	Data-	6	NC
2	Data+	7	NC
3	NC	8	NC
4	NC	9	NC
5	GND	10	+5V

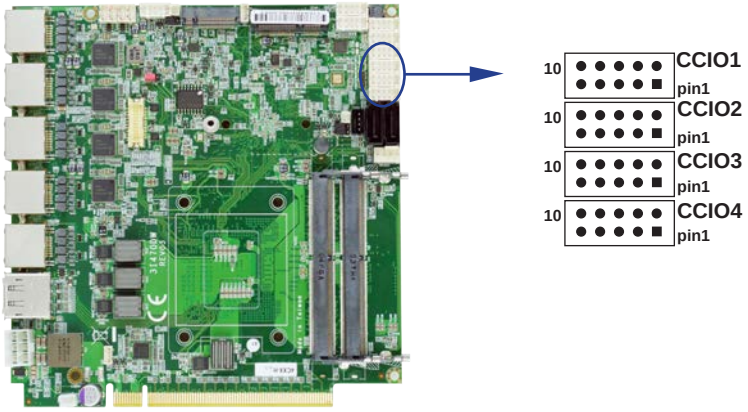
- **RS422 Mode**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	TX-	6	NC
2	TX+	7	NC
3	RX+	8	NC
4	RX-	9	NC
5	GND	10	+5V

3-6 For DI / DO

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DI-0,4,8,12	2	DO-3,7,11,15
3	DI-1,5,9,13	4	DO-2,6,10,14
5	DI-2,6,10,14	6	DO-1,5,9,13
7	DI-3,7,11,15	8	DO-0,4,8,12
9	GND	10	+5V

Note:
1. COM or DI / DO decided by OEM order and BOM controlled
2. UART default is RS232 and RS422 / RS485 by BIOS selected
3. DI pin default pull up 10KΩ to +5V
4. DI / DO should connect to isolated card to control external device if need.



- **WDT For F81966D-I watch dog timer device:**

DC spec:

Input low Voltage (VIL): +0.8 Max

Input High Voltage(VIH): +2V Min

Output low Current (IOL): 10mA (Min) VOL=0.4V

Output High Current (IOH): -10mA (Min) VOH=2.4V

Watch Dog Time value 0~255 sec

The system will be issued reset. When WDT is enable the hardware start down counter to zero.

The reset timer have 10~20% tolerance upon the Temperature.

Note: If want to SDK support. Please contact to sales window.

3-6-1 IO Device: F81966 DIO under Windows

The Sample code source you can download from

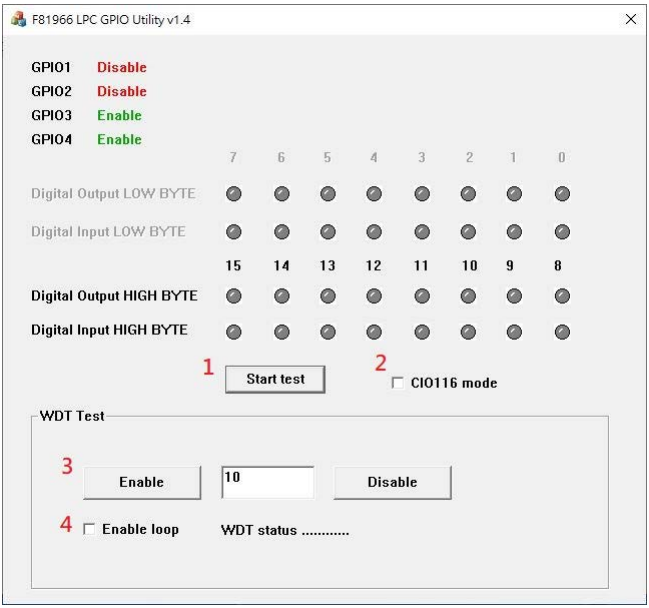
http://tprd.info/lexwiki/index.php/IO_Device:F81966_LPC_DIO_under_Windows

Source file: F81966_LPC_GPIO_Utility_Src_v1.5.zip

Binary file: F81966_LPC_GPIO_Utility_Bin_x86_v1.5.zip F81966_LPC_GPIO_Utility_Bin_x64_v1.5.zip

F81966 DLL: F81966_DLL_x32_v1.0.zip F81966_DLL_x64_v1.0.zip

Introduction F81966 DIO



1. Start test Button, Send bits one by one and one by one receive
2. CIO116 mode for CIO116 module use
3. Set time countdown, If the end of the countdown, the trigger signal to reboot
4. Enable loop, Continuously reset the WDT to ensure that when the system is normal, the restart signal will not be triggered.

F81966_DLL Function

```
F81966_DLL_API bool  F81966_LPC_Init(pF81966_status status);

F81966_DLL_API BYTE  F81966_LPC_Digital_Read_LOW();
F81966_DLL_API void  F81966_LPC_Digital_Write_LOW(BYTE byteValue);
F81966_DLL_API BYTE  F81966_LPC_Digital_Read_HIGH();
F81966_DLL_API void  F81966_LPC_Digital_Write_HIGH(BYTE byteValue);

F81966_DLL_API void  F81966_LPC_Set_WDT_Enable(BYTE byteValue);
F81966_DLL_API void  F81966_LPC_Set_WDT_Disable();
```

Digital Input / Output test

Note when using the following boards: 3I470DW
CIO1 needs to be controlled by CIO3

	Digital output Low Byte		Digital iutput Low Byte	
CIO1	Do	0	Di	0
	Do	1	Di	1
	Do	2	Di	2
	Do	3	Di	3
CIO2	Do	4	Di	4
	Do	5	Di	5
	Do	6	Di	6
	Do	7	Di	7

	Digital output High Byte		Digital iutput High Byte	
CIO3	Do	8	Di	8
	Do	9	Di	9
	Do	10	Di	10
	Do	11	Di	11
CIO4	Do	12	Di	12
	Do	13	Di	13
	Do	14	Di	14
	Do	15	Di	15

sample code

```
Set CIO1 CIO2 Digital Output all high
F81966_LPC_Digital_Write_LOW(256);

Set CIO1 CIO2 Digital Output all low
F81966_LPC_Digital_Write_LOW(0);

Set CIO1 Digital Output bit 4 high
F81966_LPC_Digital_Write_LOW(16);

Set CIO2 Digital Output bit 10 high
F81966_LPC_Digital_Write_HIGH(4);
```

```
Read Din
value = F81966_LPC_Digital_Read_LOW();
```

Watch Dog test

sample code

```
Set WDT 10 sec
F81966_LPC_Set_WDT_Enable(10);
```

```
Disable WDT
F81966_LPC_Set_WDT_Disable();
```

3-6-2 IO Device: F81966 DIO under Linux console

The Sample code source you can download from

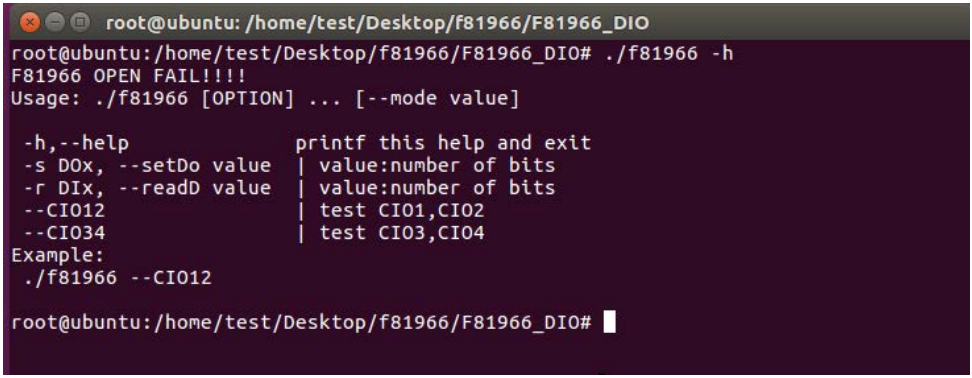
http://tprd.info/lexwiki/index.php/IO_Device:F81966_LPC_DIO_under_Linux_console

Source file: F81966_DIO_v1.1L_Src

Binary file: F81966_DIO_v1.1L_Bin_x86 F81966_DIO_v1.1L_Bin_x64

F81966 Libary : F81966_LIB_v1.1L_x86 F81966_LIB_v1.1L_x64

Introduction F81966 DIO



1. Start test Button, Send bits one by one and one by one receive
2. CIO116 mode for CIO116 module use
3. Set time countdown, If the end of the countdown, the trigger signal to reboot
4. Enable loop, Continuously reset the WDT to ensure that when the system is normal, the restart signal will not be triggered.

F81966_DLL Function

```
bool F81966_OPEN();
void F81966_Init();
void F81966_LPC_Write(BYTE LDNData, BYTE reg, BYTE value);
BYTE F81966_LPC_Read(BYTE LDNData, BYTE reg);
void F81966_LPC_Digital_Write_LOW(BYTE byteValue);
void F81966_LPC_Digital_Write_HIGH(BYTE byteValue);
BYTE F81966_LPC_Digital_Read_LOW();
BYTE F81966_LPC_Digital_Read_HIGH();
void F81966_LPC_Set_WDT_Enable(BYTE byteValue);
void F81966_LPC_Set_WDT_Disable();
void EntryLPC();
void ExitLPC();
```

Digital Input / Output test

Note when using the following boards: 3I470DW
CIO1 needs to be controlled by CIO3

	Digital output Low Byte		Digital iutput Low Byte	
CIO1	Do	0	Di	0
	Do	1	Di	1
	Do	2	Di	2
	Do	3	Di	3
CIO2	Do	4	Di	4
	Do	5	Di	5
	Do	6	Di	6
	Do	7	Di	7

	Digital output High Byte		Digital iutput High Byte	
CIO3	Do	8	Di	8
	Do	9	Di	9
	Do	10	Di	10
	Do	11	Di	11
CIO4	Do	12	Di	12
	Do	13	Di	13
	Do	14	Di	14
	Do	15	Di	15

sample code

```
Set CIO1 CIO2 Digital Output all high
F81966_LPC_Digital_Write_LOW(256);

Set CIO1 CIO2 Digital Output all low
F81966_LPC_Digital_Write_LOW(0);

Set CIO1 Digital Output bit 4 high
F81966_LPC_Digital_Write_LOW(16);

Set CIO2 Digital Output bit 10 high
F81966_LPC_Digital_Write_HIGH(4);
```

```
Read Din
value = F81966_LPC_Digital_Read_LOW();
```

Watch Dog test

sample code

```
Set WDT 10 sec
F81966_LPC_Set_WDT_Enable(10);
```

```
Disable WDT
F81966_LPC_Set_WDT_Disable();
```

3-7 CDH1: Display Port and HDMI Connector

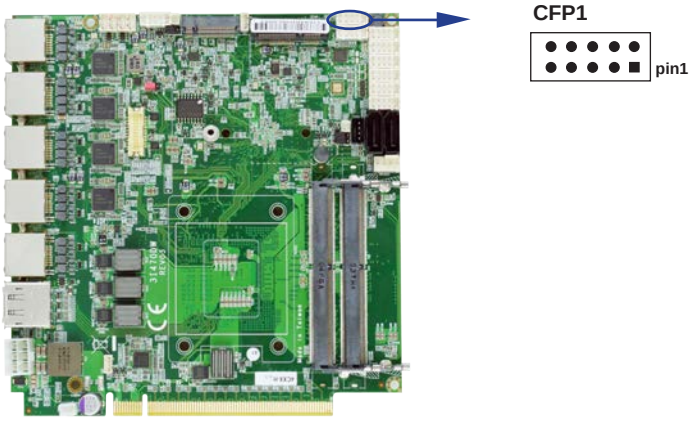
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DATA0+	2	GND
3	DATA0-	4	DATA1+
5	GND	6	DATA1-
7	DATA2+	8	GND
9	DATA2-	10	DATA3+
11	GND	12	DATA3-
13	GND	14	GND
15	AUX+	16	GND
17	AUX-	18	H.P. Detect
19	GND	20	+3.3V

- **HDMI:**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	TMDS DATA2+	2	GND
3	TMDS DATA2-	4	TMDS DATA1+
5	GND	6	TMDS DATA1-
7	TMDS DATA0+	8	GND
9	TMDS DATA0-	10	TMDS CLK+
11	GND	12	TMDS CLK-
13	NC	14	NC
15	DDC CLOCK	16	DDC DATA
17	GND	18	+5V
19	H.P. Detect		

3-8 CFP1: Front Panel connector 2x5 pin (2.0mm) wafer

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	Power button pin	2	Power button GND
3	Reset pin	4	Reset GND
5	Power LED-	6	Power LED+
7	HDD LED-	8	HDD LED+
9	LAN LED-	10	LAN LED+



3-9 LAN Interface

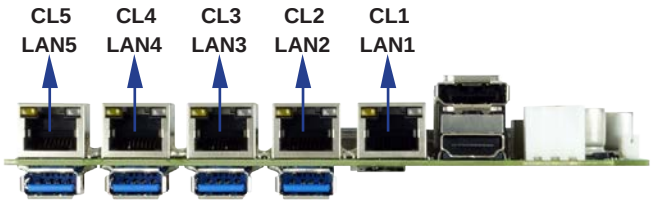
● CL1/2/3/4/5: RJ45 LAN1/2/3/4/5 Connector

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	MDI0+	5	MDI2-
2	MDI0-	6	MDI1-
3	MDI1+	7	MDI3+
4	MID2+	8	MDI3-

● CL11/21/31/41/51: LAN1/2/3/4/5 2x4 pin (2.0mm) wafer (OEM)

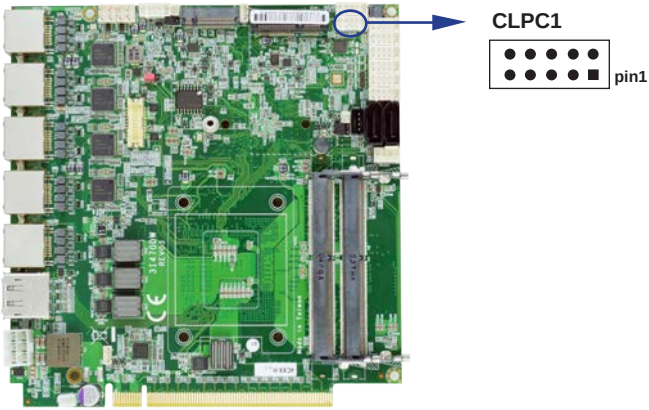
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	MDI0-	2	MDI0+
3	MDI2+	4	MID1+
5	MDI1-	6	MDI2-
7	MDI3-	8	MDI3+

Note: These CL11/21/31/41/51 wafer default hasn't been existed.



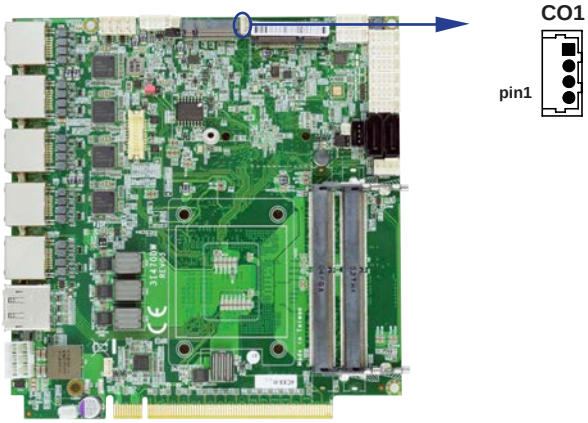
3-10 CLPC1: for LPC signal 2x5 pin wafer (2.0mm)

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	AD3	2	CLK
3	AD2	4	FRAME
5	AD1	6	RESET
7	AD0	8	SERIAL IRQ
9	GND	10	+3.3V



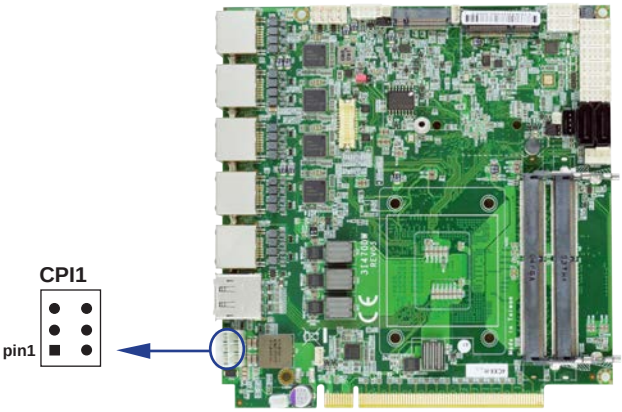
3-11 CO1: SMBus Bus 4 pin (1.25mm) Wafer

PIN NO.	DESCRIPTION
1	+3.3V
2	GND
3	SMBus Clock
4	SMBus DATA



3-12 CPI1: Mother board DC Power input (ATX 2x3 pin 2.54 mm Wafer)

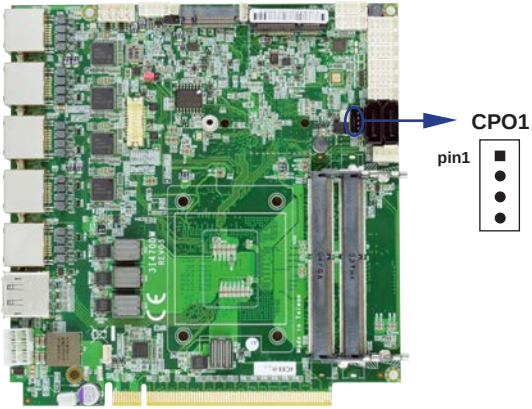
PIN NO.	DESCRIPTION
1,3,5	DC-IN
2,4,6	GND



3-13 CPO1: +12V / +5V DC voltage output wafer connector (Black) (1x4 pin 2.0 mm)

PIN NO.	DESCRIPTION
1	+5V
2	GND
3	GND
4	+12V*

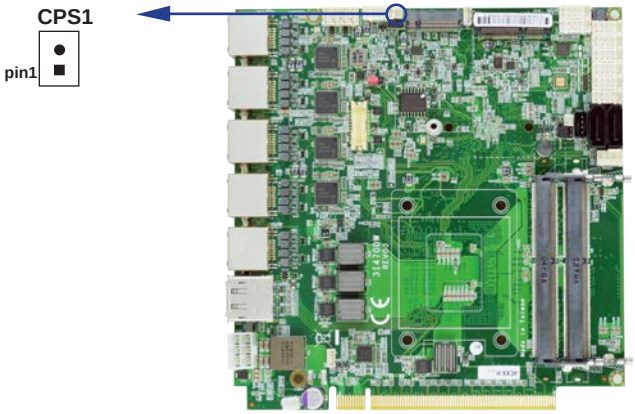
*Note:
Attention! Check Device Power in spec



3-14 CPS1: External Power-On Sync control

PIN NO	DESCRIPTION
1	GND
2	PS_ON_N

*Note:
The sync signal is Low active. When Motherboard powered on that is Low, Power-off is high.
The signal is +3.3V tolerance.
It can be used for gold finger power to sync motherboard power sequence.

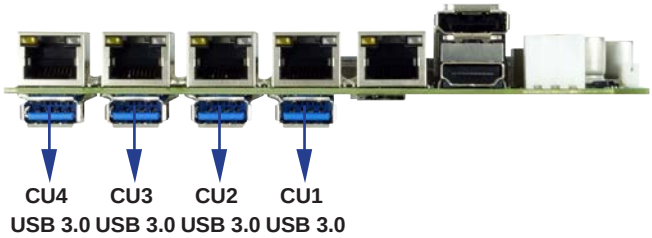


3-15 USB 3.0 and USB 2.0

● CU1/2/3/4: USB 3.0 Port 1/2/3/4 Type A Connector

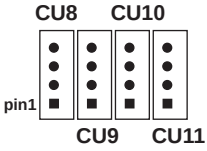
PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VBUS	5	SS_RX-
2	D-	6	SS_RX+
3	D+	7	GND
4	GND	8	SS_TX-
		9	SS_TX+

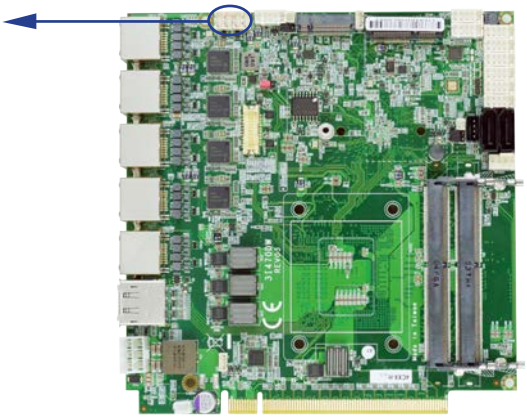
Note: the power supply 0.9A for each USB 3.0 respect specification.



● CU8/9/10/11 USB 2.0 port (1x4 pin 1.25mm Wafer)

PIN NO.	DESCRIPTION
1	+5V
2	DATA-
3	DATA+
4	GND



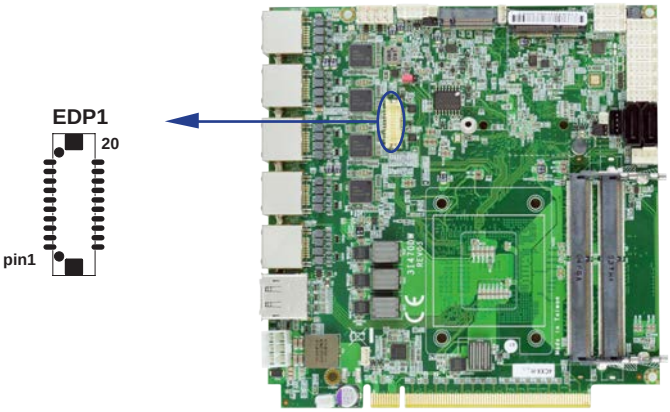


3-16 Display & Touch Interface

● EDP1: eDP interface (2x10 pin 1.25mm wafer)

PIN NO	DESCRIPTION	PIN NO	DESCRIPTION
1	Lane-0-DATA-	2	+12V
3	Lane-0-DATA+	4	+12V
5	Lane-1-DATA-	6	GND
7	Lane-1-DATA+	8	GND
9	Backlight Enable	10	GND
11	PWM dimming	12	GND
13	I2C Clock	14	+LCD (5V or 3.3V)
15	I2C Data	16	+LCD (5V or 3.3V)
17	eDP Aux+	18	+LCD (5V or 3.3V)
19	eDP Aux-	20	GND

Note:
1. eDP interface support 2 lanes.
2. JVL1: eDP panel +5V / +3.3V (default) Voltage select.
3. eDP1 PIN 9 for panel backlight enable. +3.3V Level
4. eDP1 PIN 11 for panel backlight dimming control

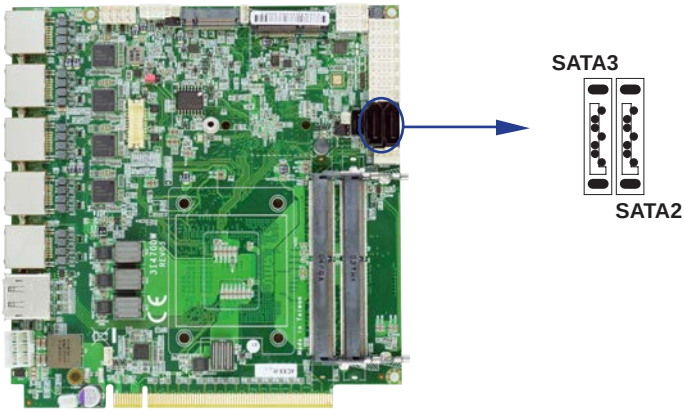


3-17 SATA interface

- **SATA2 / SATA3: SATA port 1x7 pin Connector**

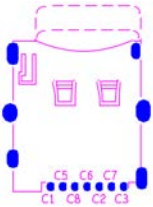
PIN NO.	DESCRIPTION
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND

Note:
1. CPO1 provide SATA HDD power +12V, GND, +5V

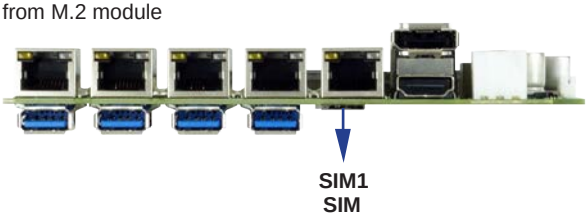


3-18 SIM1: Nano Push-Push SIM socket

PIN NO.	DESCRIPTION
C1	Power
C2	Reset
C3	Clock
C5	GND
C6	NC.
C7	Data
C8	SIM detect

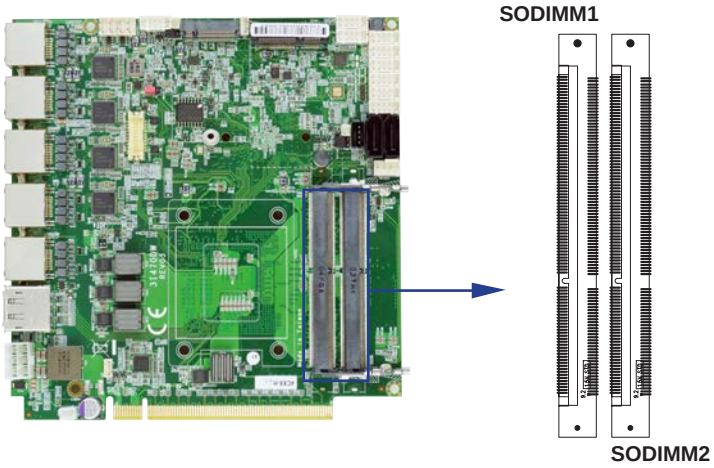


Note: 1. The SIM signal comes from M.2 module



3-19 SODIMM1 / SODIMM2 socket

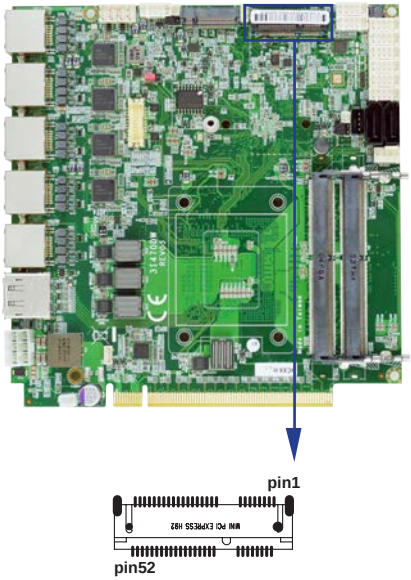
Note:
SODIM1 / SODIM2: SO-DIMM DDR4 1.2V DRAM Socket
Only Support un-buffer type module
Only suport Raw card type A.C.E.



3-20 Module socket

• MPCE1 PCI Express Mini card

PIN NO.	Description	PIN NO.	Description
1	NC	2	+3.3V
3	NC	4	GND
5	NC	6	+1.5V
7	NC	8	NC
9	GND	10	NC
11	PCIe-CLK-	12	NC
13	PCIe-CLK+	14	NC
15	GND	16	NC
KEY			
17	NC	18	GND
19	WAKEUP_LTE	20	W_DISABLE_N
21	GND	22	Reset
23	PCIe-RX- / mSATA-RX+	24	+3.3V
25	PCIe-RX+ / mSATA-RX-	26	GND
27	GND	28	+1.5V
29	GND	30	SMB-CLK
31	PCIe-TX- / mSATA-TX-	32	SMB-DATA
33	PCIe-TX+ / mSATA-TX+	34	GND
35	GND	36	USB-DATA-
37	GND	38	USB-DATA+
39	+3.3V	40	GND
41	+3.3V	42	NC
43	GND	44	NC
45	NC	46	NC
47	NC	48	+1.5V
49	NC	50	GND
51	mSATA / PCIe detect	52	+3.3V



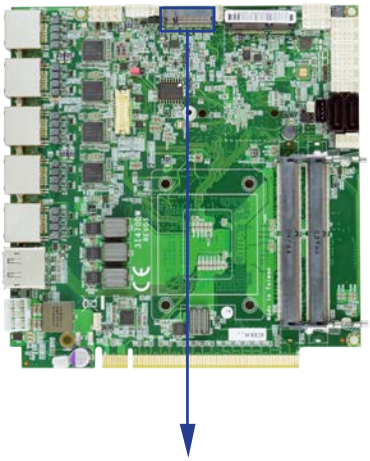
MPCE1

Note:

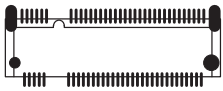
1. Pin 51 mSATA / PCIe auto detect function.
2. USB 3.0 need selected by BIOS item.

3-21 NGFF1: B Key size

PIN NO.	Description	PIN NO.	Description
1	CONFIG_3	2	+3.3V or +3.7V
3	GND	4	+3.3V or +3.7V
5	GND	6	Full_Card_Power_OFF_N
7	USB-DATA-	8	W_DISABLE_1_N
9	USB-DATA+	10	LED#
11	GND		
KEY			
21	CONFIG_0	22	NC
23	NC	24	NC
25	NC	26	W_DISABLE_2_N
27	GND	28	NC
29	NC	30	NC
31	NC	32	NC
33	GND	34	NC
35	NC	36	NC
37	NC	38	NC
39	GND	40	NC
41	PCIe-RX-	42	NC
43	PCIe-RX+	44	NC
45	GND	46	NC
47	PCIe-TX-	48	NC
49	PCIe-TX+	50	RESET#
51	GND	52	NC
53	PCIe-CLK-	54	NC
55	PCIe-CLK+	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	LTE_RESET_N	68	NC
69	CONFIG_1	70	+3.3V or +3.7V
71	GND	72	+3.3V or +3.7V
73	GND	74	+3.3V or +3.7V
75	CONFIG_2		



NGFF1



Note:
1. Auto-detect PCIe, mSATA and USB 3.0 interface.
2. Supported PCIe NVMe storage.
3. The power voltage +3.3V or +3.7V are decided by CONFIG_x pin of M.2 device.

3-22 Connector wafer of Compatible Brand and part number list

Location	CKTS	PITCH	Brand Name	Mating connector	Cable housing
CBT1	1x2 2Pin	1.25mm	MOLEX	53047-0210	51021-0200
CA1	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CC1	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CC2	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CCIO1	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CCIO2	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CCIO3	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CCIO4	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CFP1	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CLPC1	2x5 10Pin	2.00mm	JST	B10B-PHDSS	PHDR-10VS
CO1	1x4 4Pin	1.25mm	MOLEX	53047-0410	51021-0400
CPO1	1x4 4Pin	2.00mm	JST	B4B-PH-KL	PHR-4
CPS1	1x2 2Pin	1.25mm	MOLEX	53047-0210	51021-0200
CU8	1x4 4Pin	1.25mm	MOLEX	53047-0410	51021-0400
CU9	1x4 4Pin	1.25mm	MOLEX	53047-0410	51021-0400
CU10	1x4 4Pin	1.25mm	MOLEX	53047-0410	51021-0400
CU11	1x4 4Pin	1.25mm	MOLEX	53047-0410	51021-0400
eDP1	2x10 20Pin	1.25mm	HIROSE	DF13-20DS-1.25C	DF13-20DP-1.25V

Chapter-4

Introduction of BIOS

The BIOS is a program located in the Flash Memory on the motherboard.
This program is a bridge between motherboard and operating system.
When you start the computer, the BIOS program gains control.
The BIOS first operates an auto-diagnostic test called POST (Power on Self Test) for all the necessary hardware, it detects the entire hardware devices and configures the parameters of the hardware synchronization. After these tasks are completed, BIOS will give control of the computer back to operating system (OS). Since the BIOS is the only channel for hardware and software to communicate with, it is the key factor of system stability and of ensuring your system performance at best.
In the BIOS Setup main menu, you can see several options. We will explain these options in the following pages. First, let us see the function keys you may use here:

Press <Esc> to quit the BIOS Setup.
Press ↑↓←→(up, down, left, right) to choose the option you want to confirm or modify.
Press <F10> to save these parameters and to exit the BIOS Setup menu after you complete the setup of BIOS parameters.
Press Page Up/Page Down or +/- keys to modify the BIOS parameters for the active option.

4-1 Enter Setup

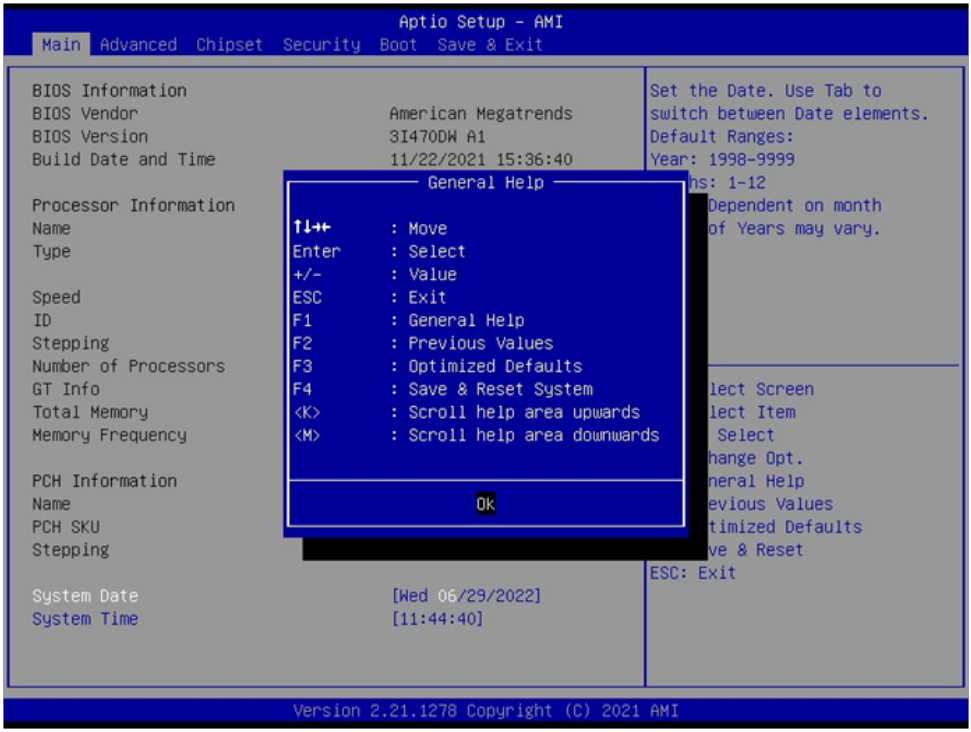
Power on the computer and press <Del> key immediately to enter Setup.
If the message disappears before your respond but you still wish to enter Setup, restart the system by turning it OFF then ON or pressing the "RESET" button on the system case. You may also restart the system by simultaneously pressing <Ctrl>, <Alt> and <Delete> keys.

4-2 BIOS Menu Screen & Function Keys

In the above BIOS Setup main menu of, you can see several options.
We will explain these options step by step in the following pages of this chapter, but let us first see a short description of the function keys you may use here:

- Press >< (right, left) to select screen;
- Press ↑↓ (up, down) to choose, in the main menu, the option you want to confirm or to modify.
- Press <Enter> to select.
- Press <+>/<–> or <F5>/<F6> keys when you want to modify the BIOS parameters for the active option.
- [F1]: General help.
- [F2]: Previous values.
- [F3]: Optimized defaults.
- [F4]: Save & Exit.
- Press <Esc> to quit the BIOS Setup.

4-3 General Help



Status Page Setup Menu / Option Page Setup Menu

Press F1 to pop up a help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window, press <Esc>.

4-4 Menu Bars

There are six menu bars on top of BIOS screen:
Main To change system basic configuration
Advanced To change system advanced configuration
Chipset To change PCH IO configuration
Security Password settings
Boot Quiet boot or boot from USB selected.
Save & Exit Save setting, loading and exit options.
User can press the right or left arrow key on the keyboard to switch from menu bar.
The selected one is highlighted.

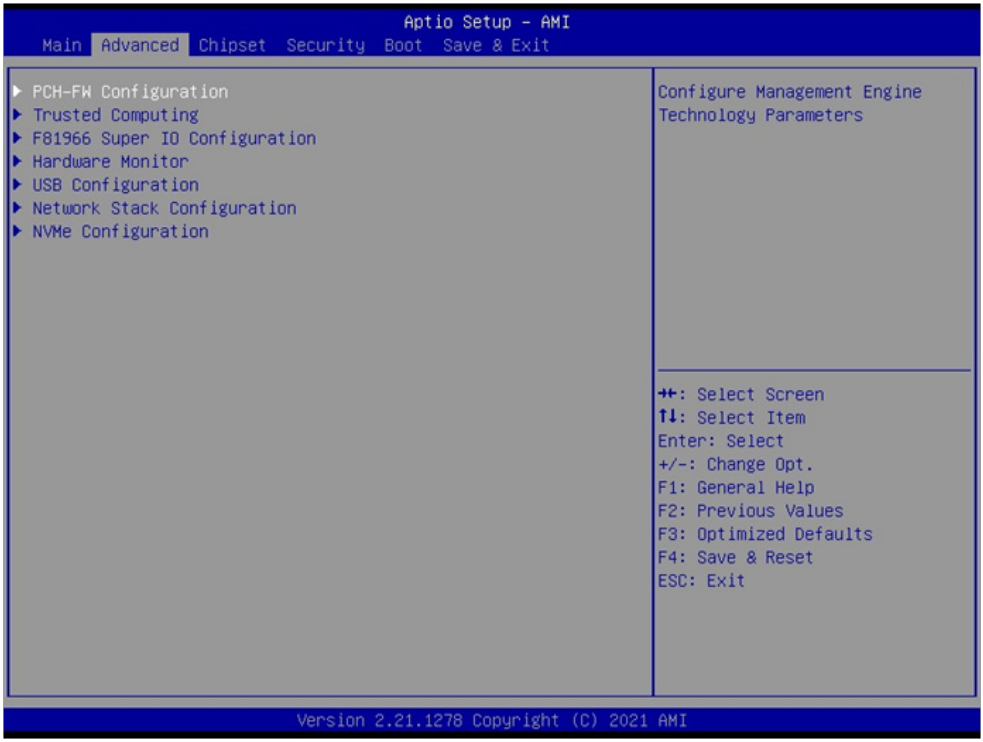
4-5 Main

Main menu screen includes some basic system information. Highlight the item and then use the <+> or <-> and numerical keyboard keys to select the value you want in each item.

System Date
Set the Date. Please use [Tab] to switch between data elements.

System Time
Set the Time. Please use [Tab] to switch between data elements.

4-6 Advanced



PCH-FW Configuration
Please refer section 4-6-1

Trusted Computing
Please refer section 4-6-2

F81966 Super IO Configuration
Please refer section 4-6-3

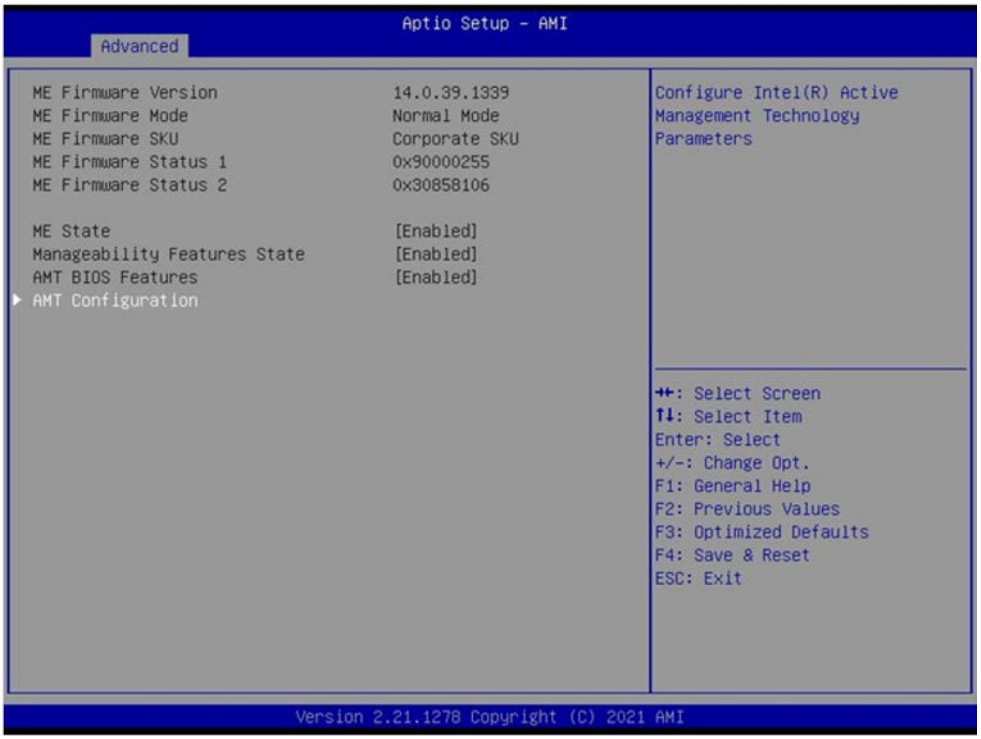
Hardware Monitor
Please refer section 4-6-4

USB Configuration
Please refer section 4-6-5

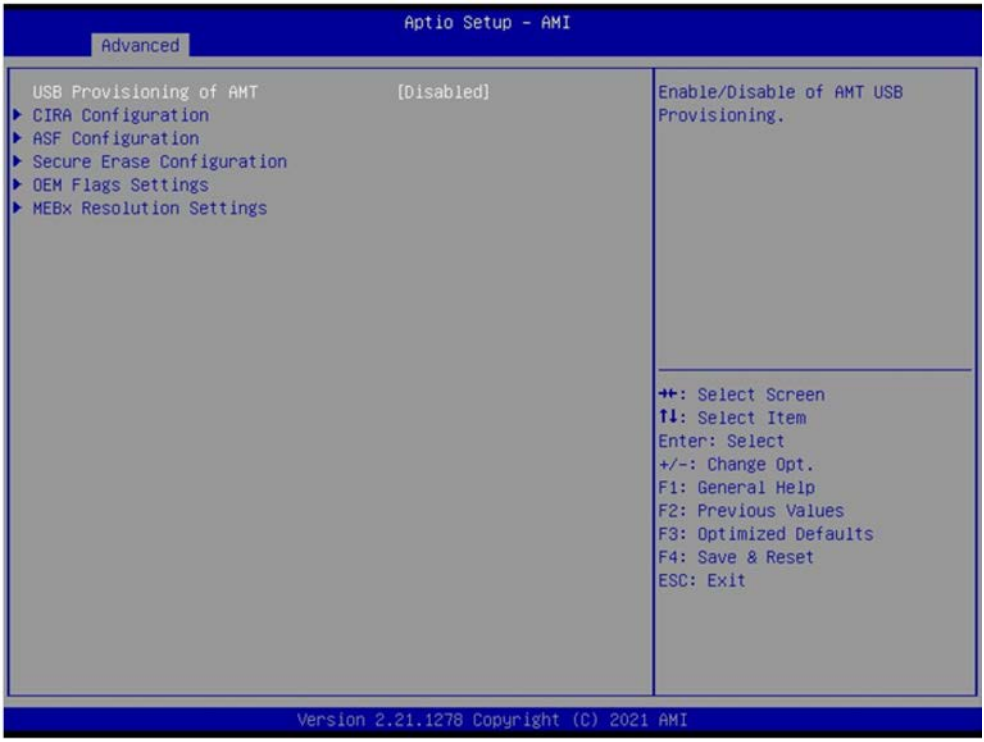
Network Stack Configuration
Please refer section 4-6-6

NVMe Configuration
Please refer section 4-6-7

4-6-1 PCH-FW Configuration



Manageability Features Status & AMT BIOS Features is to Enable AMT Configuration Settings or not, default is Enabled.



CIRA Configuration
Please refer section 4-6-1-1

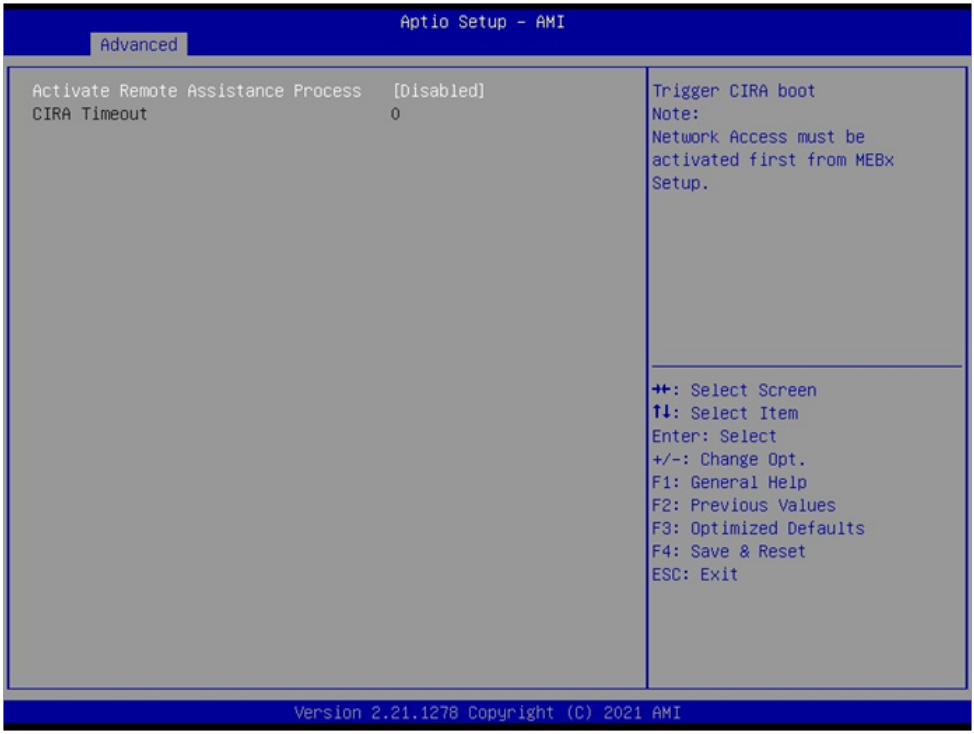
ASF Configuration
Please refer section 4-6-1-2

Secure Erase Configuration
Please refer section 4-6-1-3

OEM Flags Settings
Please refer section 4-6-1-4

MEBx Resolution Settings
Please refer section 4-6-1-5

4-6-1-1 CIRA Configuration

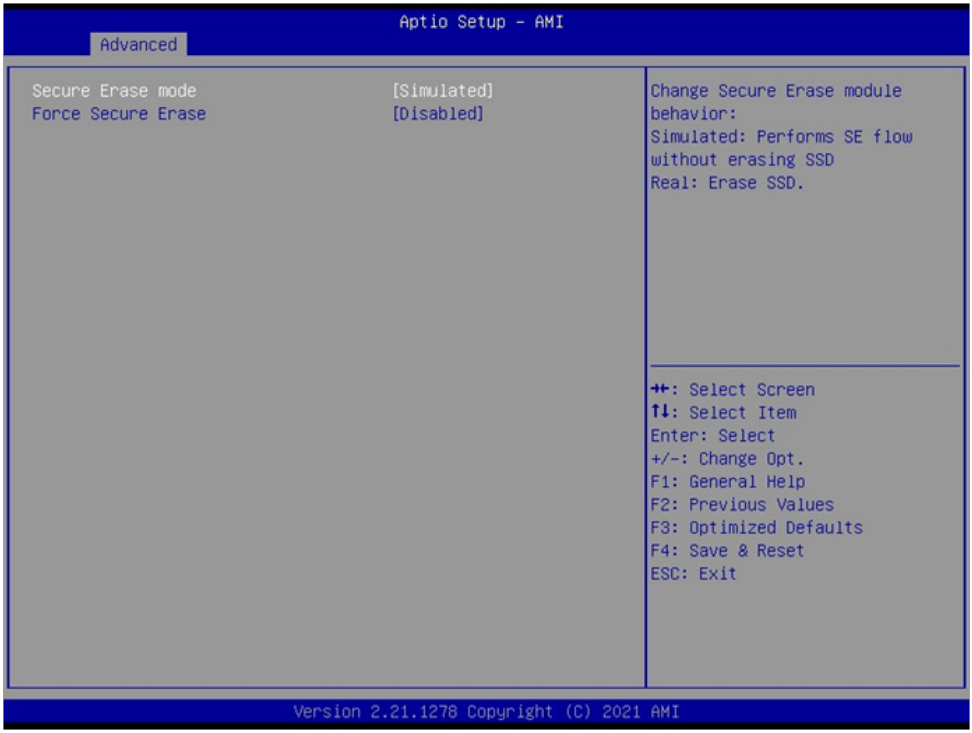


To trigger CIRA Boot. Note:
Network access must be activated first from MEBx setup.

4-6-1-2 ASF Configuration

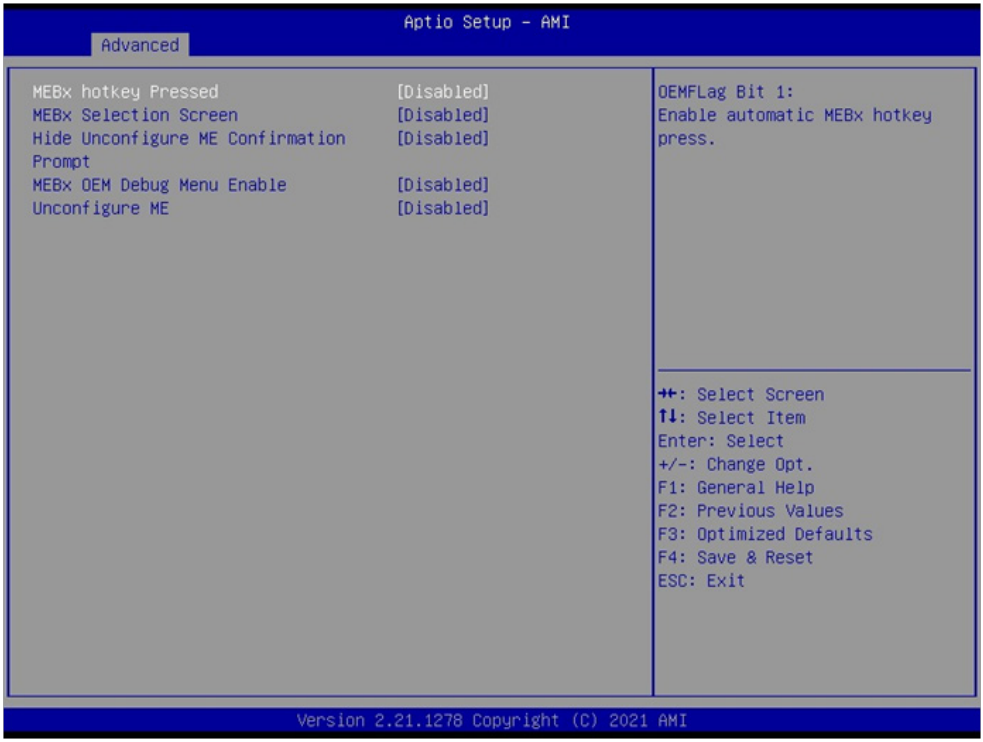
To Enable progress to receive PET events or not.

4-6-1-3 Secure Erase Configuration

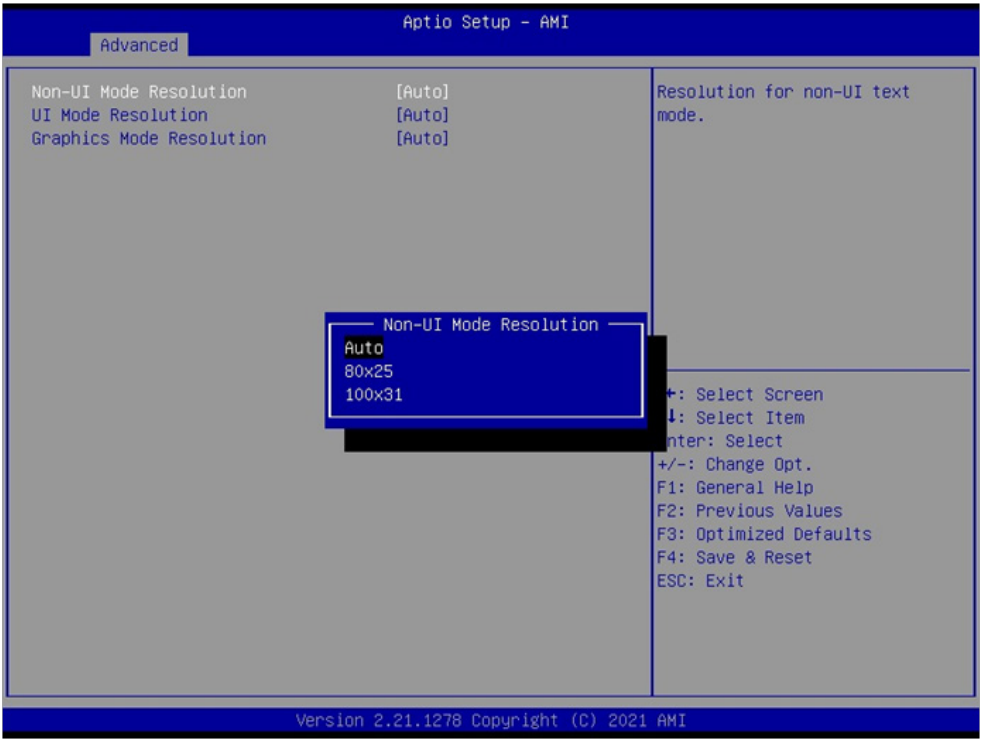


To change the behavior of Secure Erase module. There are Simulated & Real. Default is Simulated.

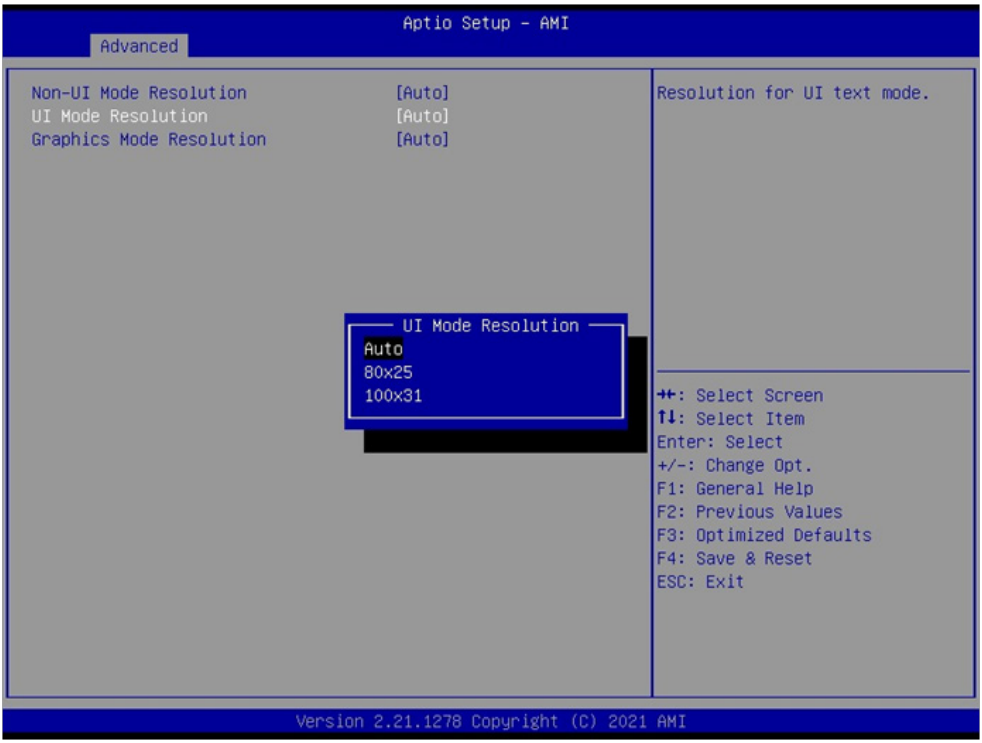
4-6-1-4 OEM Flags Settings



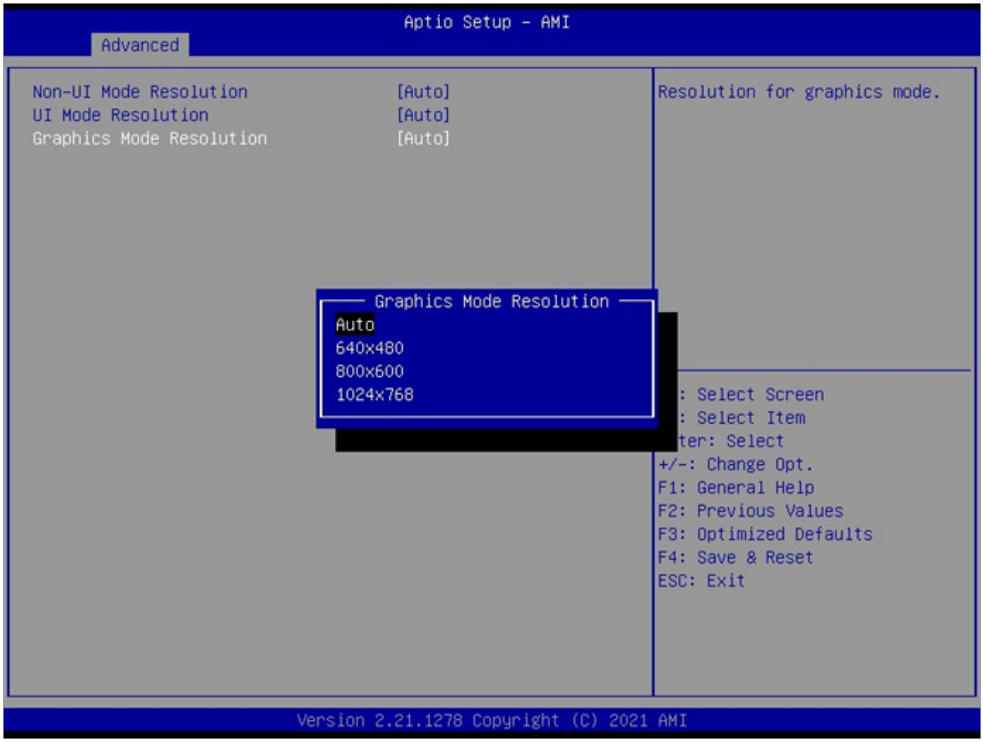
4-6-1-5 MEBx Resolution Settings



Resolution for Non-UI text Mode. There are Auto, 80x25, 100x31

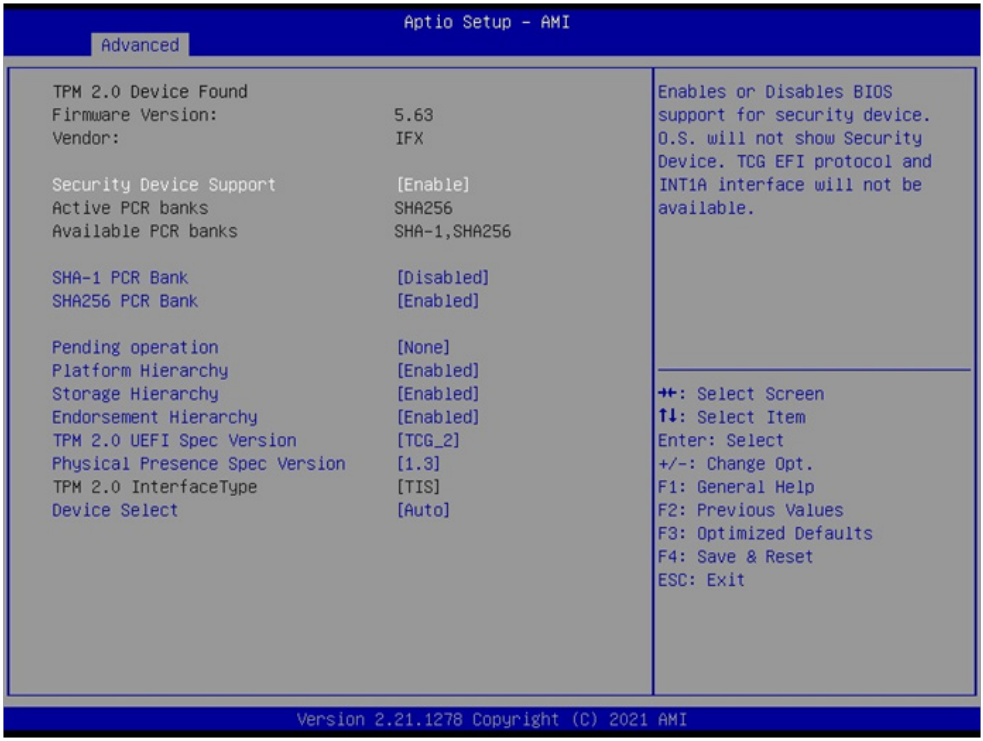


Resolution for UI text Mode. There are Auto, 80x25, 100x31



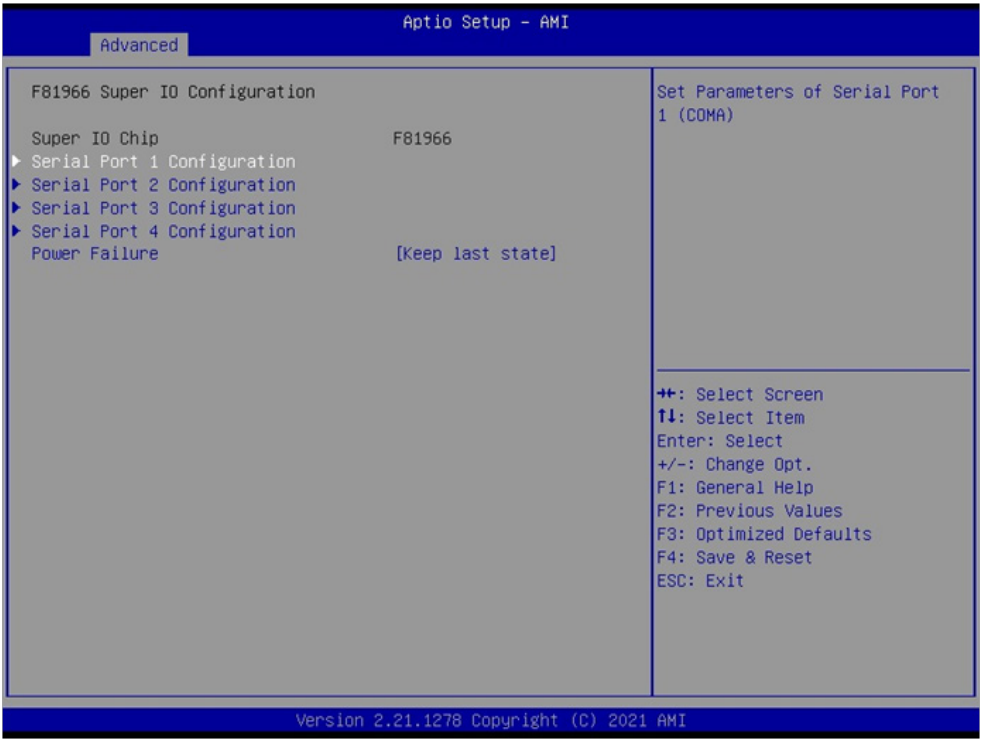
Resolution for Graphics Mode. There are Auto, 640x480, 800x600, 1024x768

4-6-2 Trusted Computing



To enable support security device or not.

4-6-3 F81966 Super IO Configuration



Serial Port 1 Configuration
Please refer section 4-6-3-1

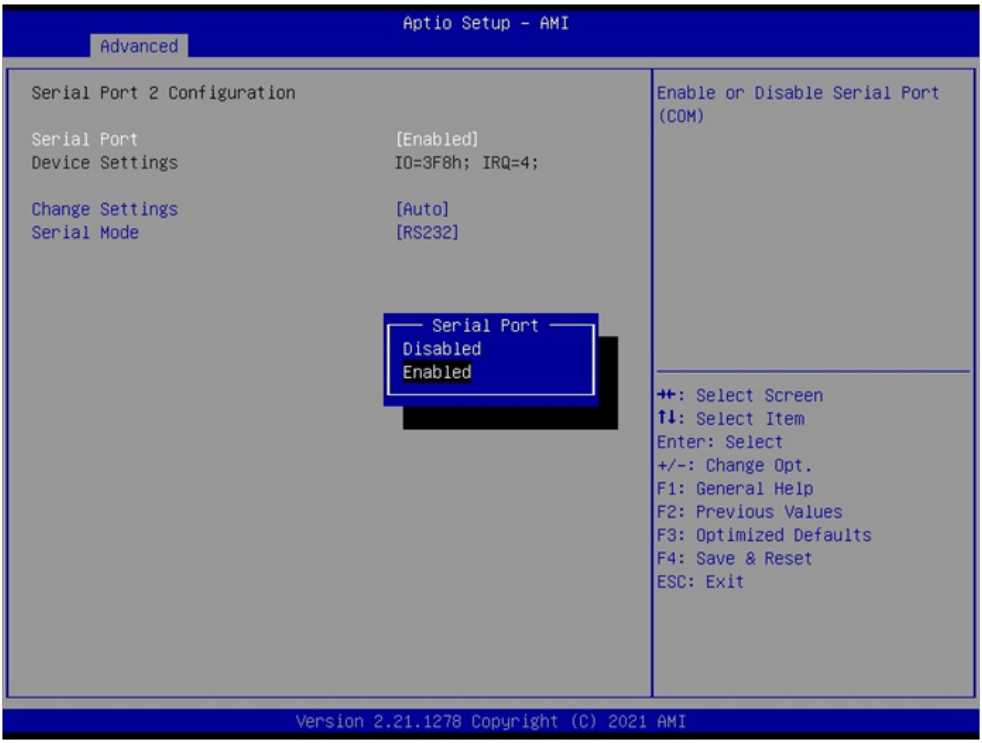
Serial Port 2 Configuration
Please refer section 4-6-3-2

Serial Port 3 Configuration
Please refer section 4-6-3-3

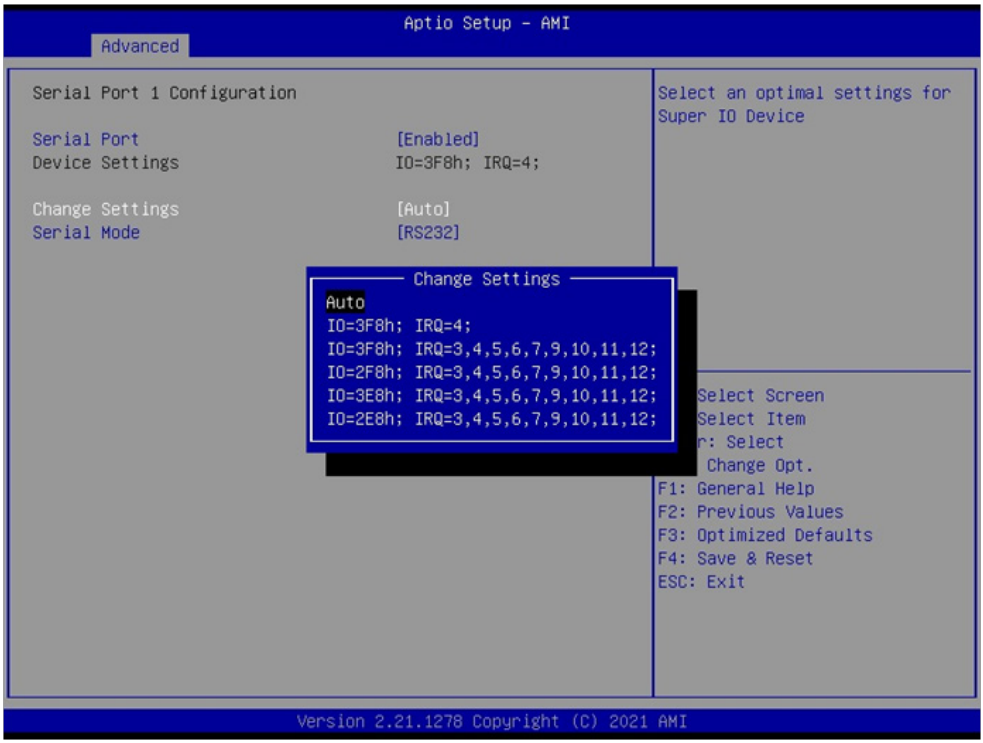
Serial Port 4 Configuration
Please refer section 4-6-3-4

Power Failure
Please refer section 4-6-3-5

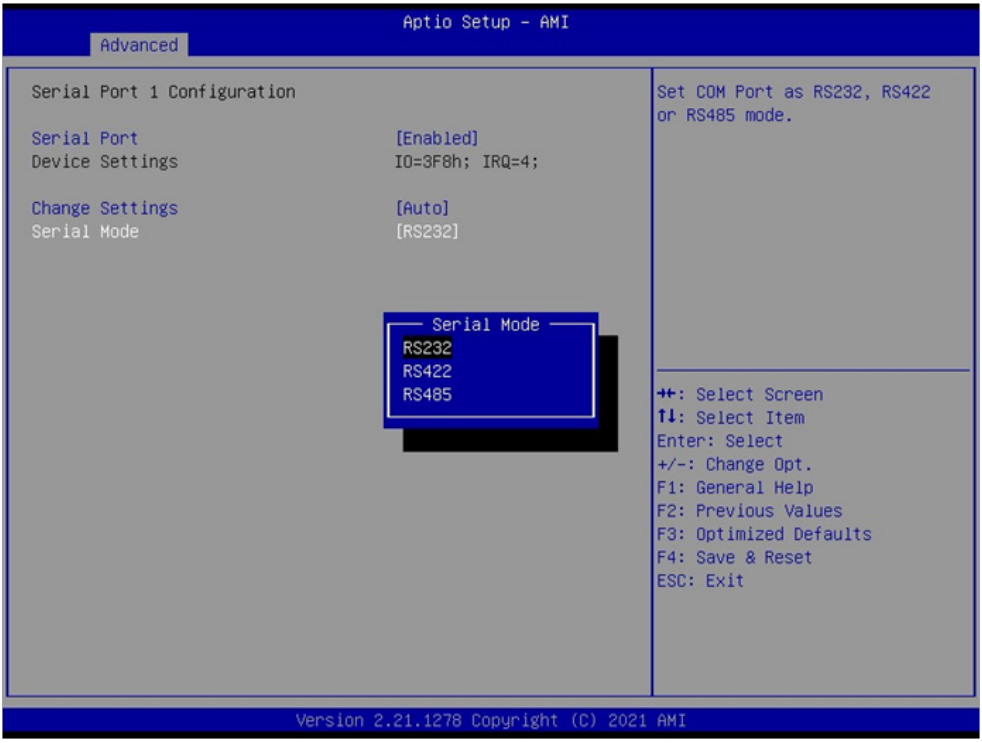
4-6-3-1 Serial Port 1 Configuration



To Enable Serial port or not, default is Enabled.

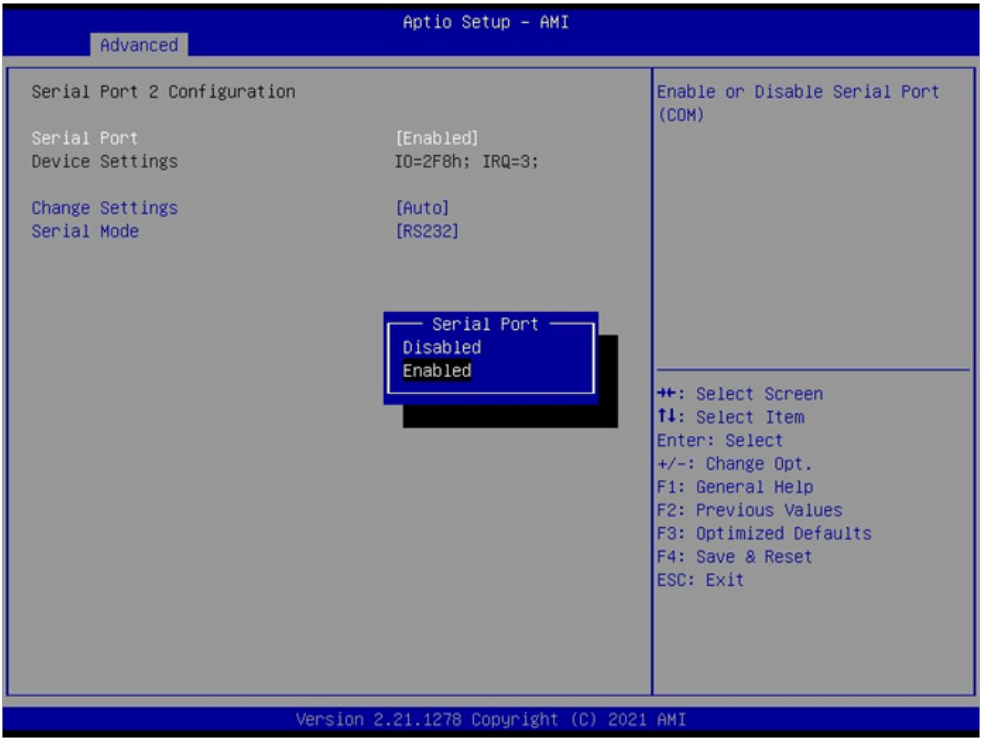


Change Settings, default is Auto.

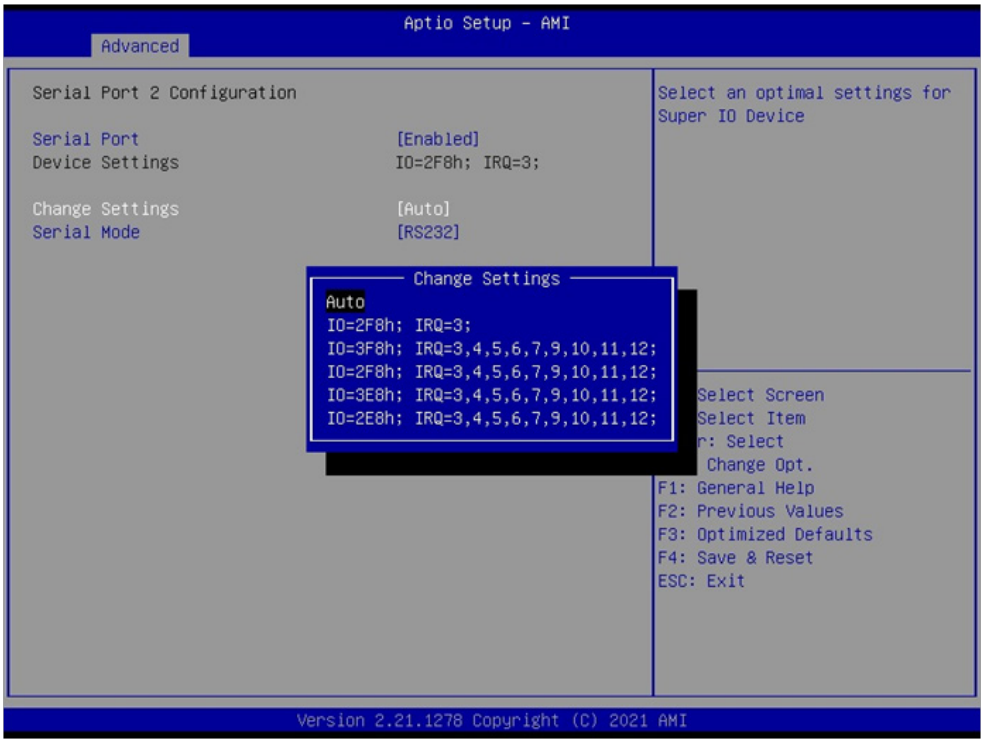


To select the Serial port to RS232 / RS422 / RS485, default is RS232.

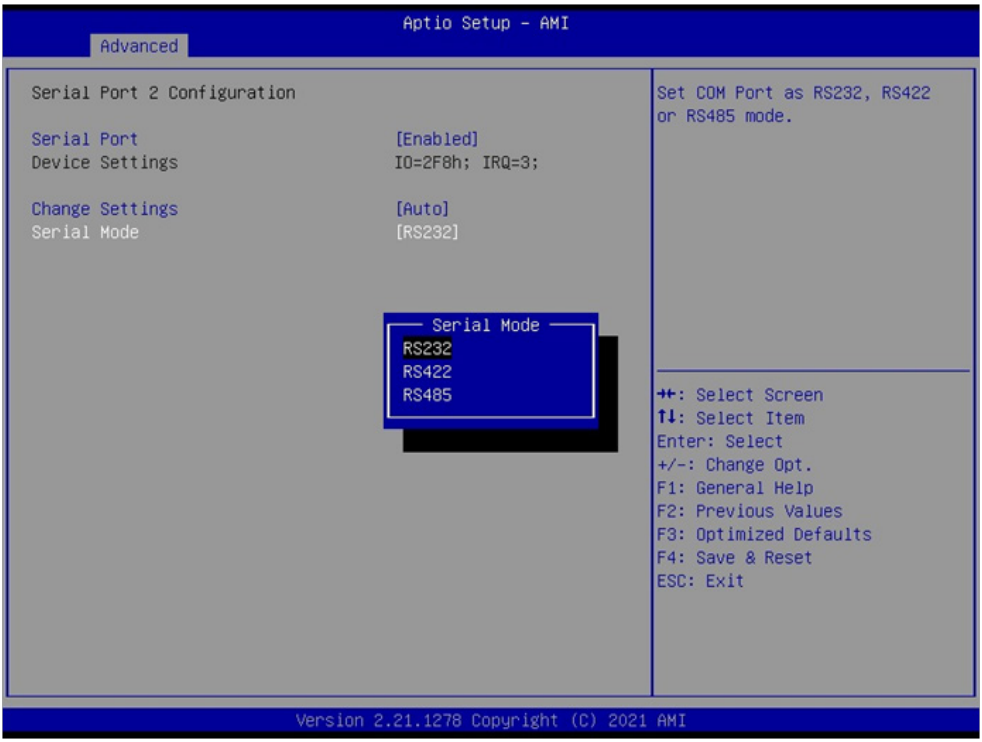
4-6-3-2 Serial Port 2 Configuration



To Enable Serial port or not, default is Enabled.

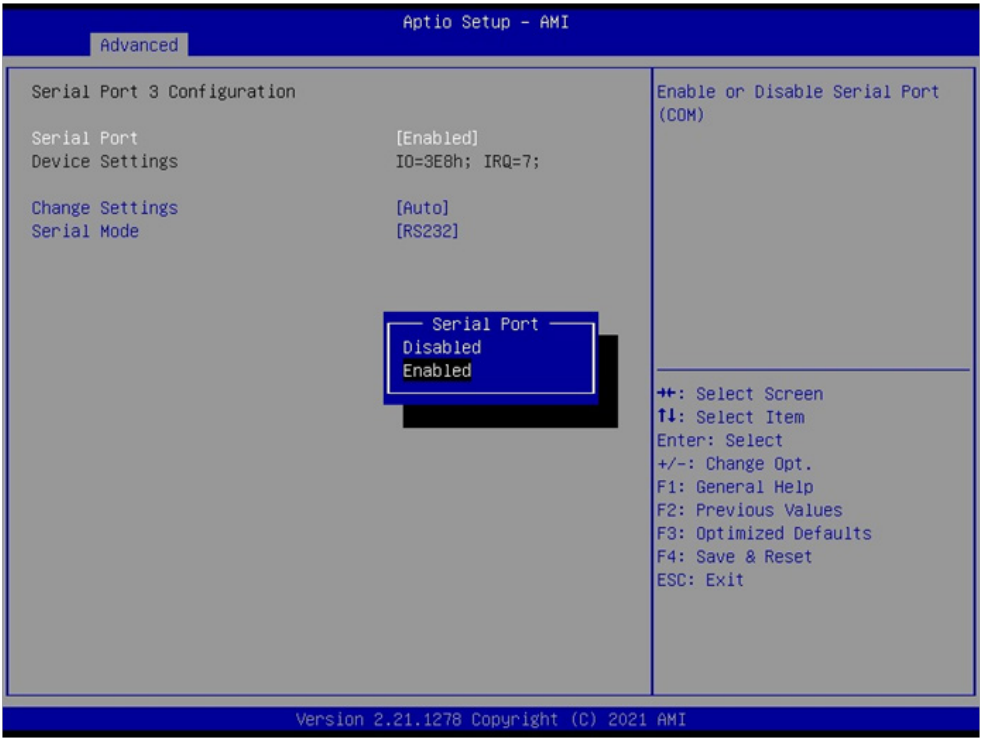


Change Settings, default is Auto.

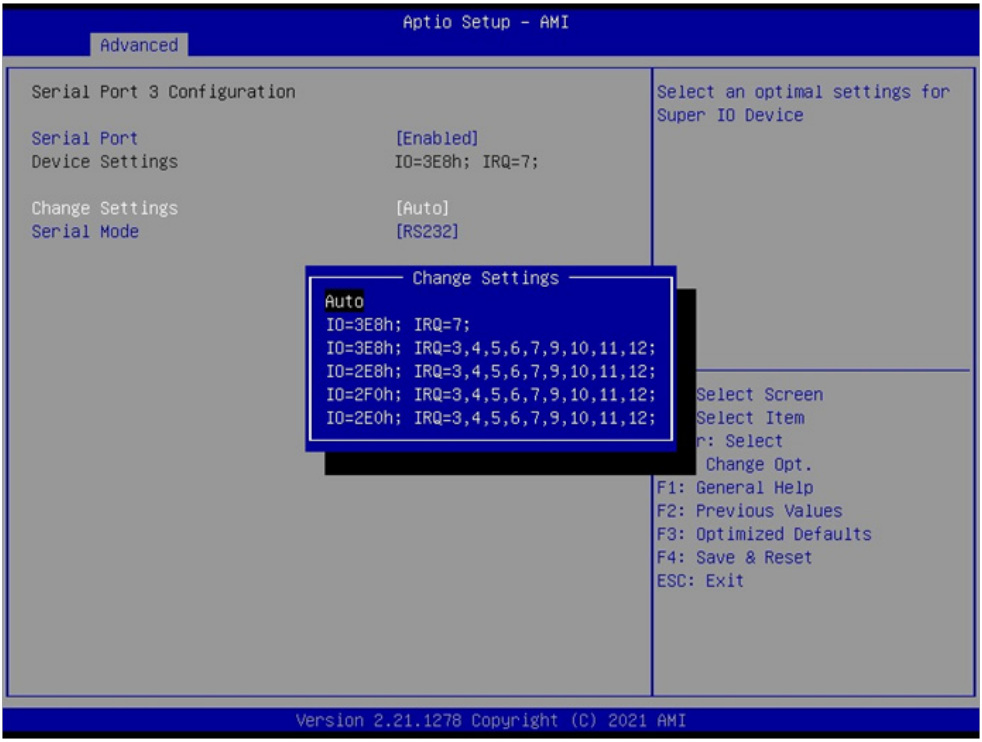


To select the Serial port to RS232 / RS422 / RS485, default is RS232.

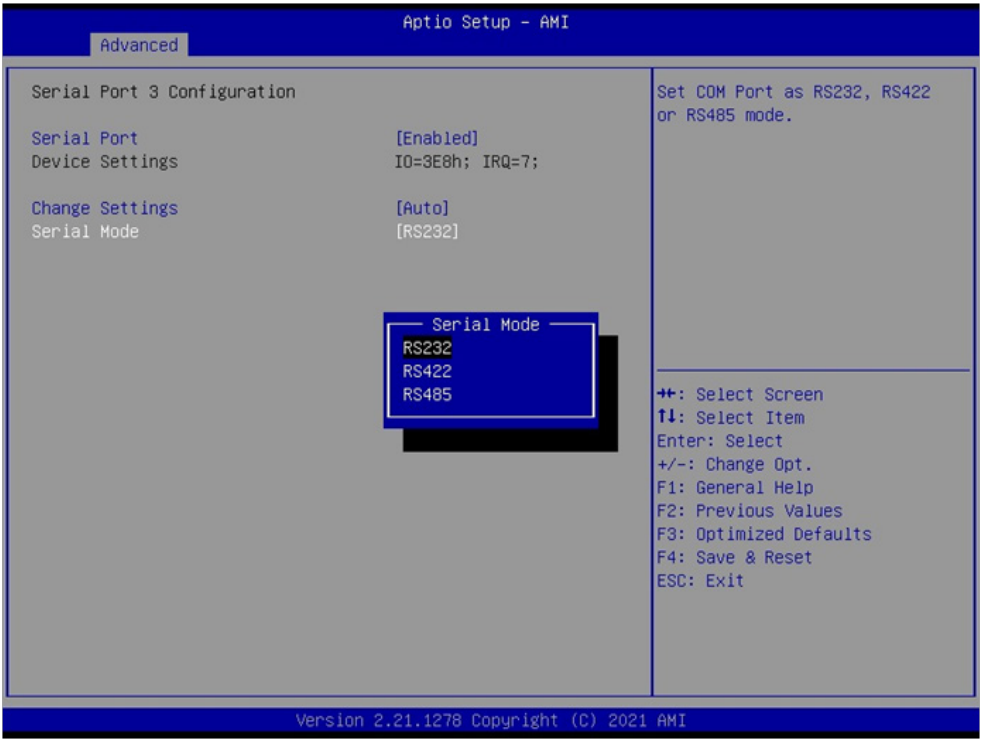
4-6-3-3 Serial Port 3 Configuration



To Enable Serial port or not, default is Enabled.

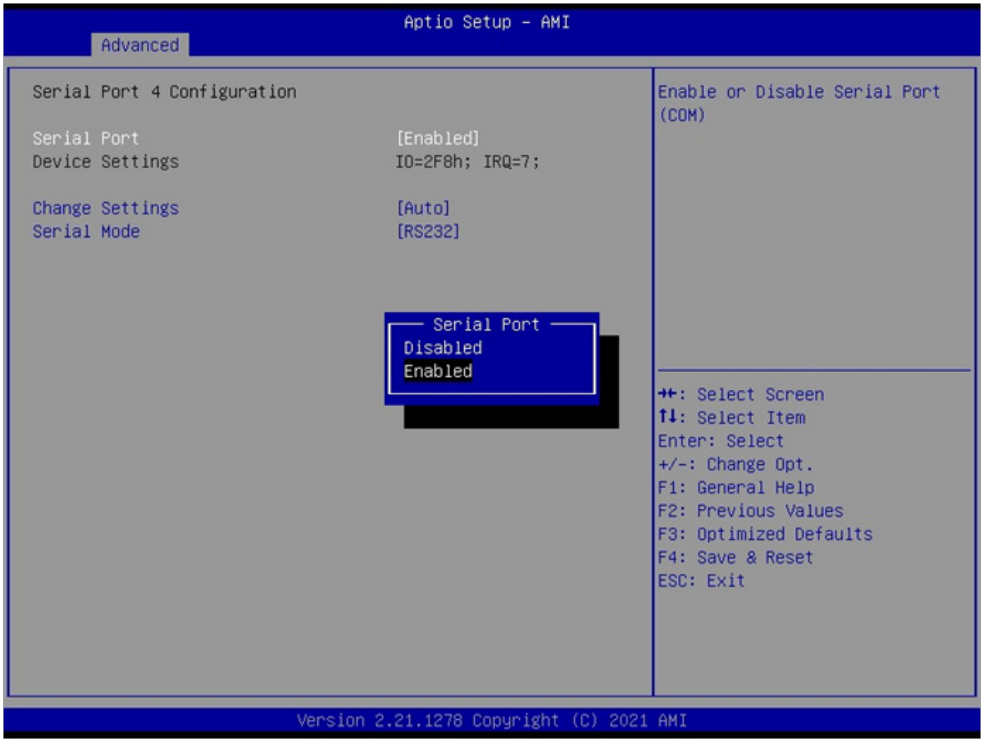


Change Settings, default is Auto.

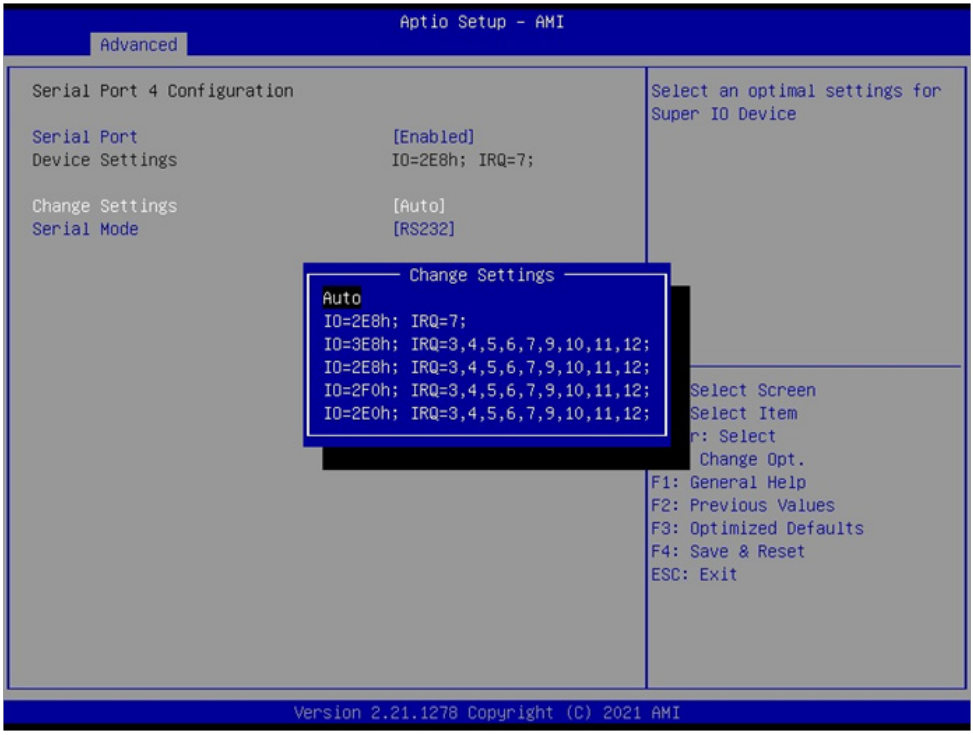


To select the Serial port to RS232 / RS422 / RS485, default is RS232.

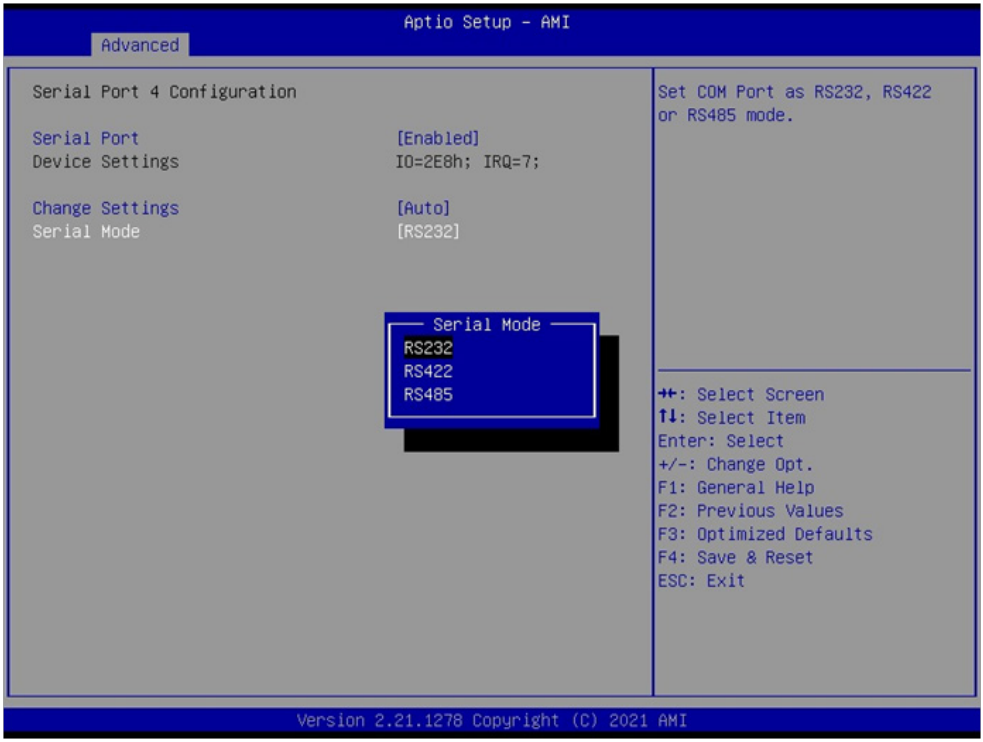
4-6-3-4 Serial Port 4 Configuration



To Enable Serial port or not, default is Enabled.

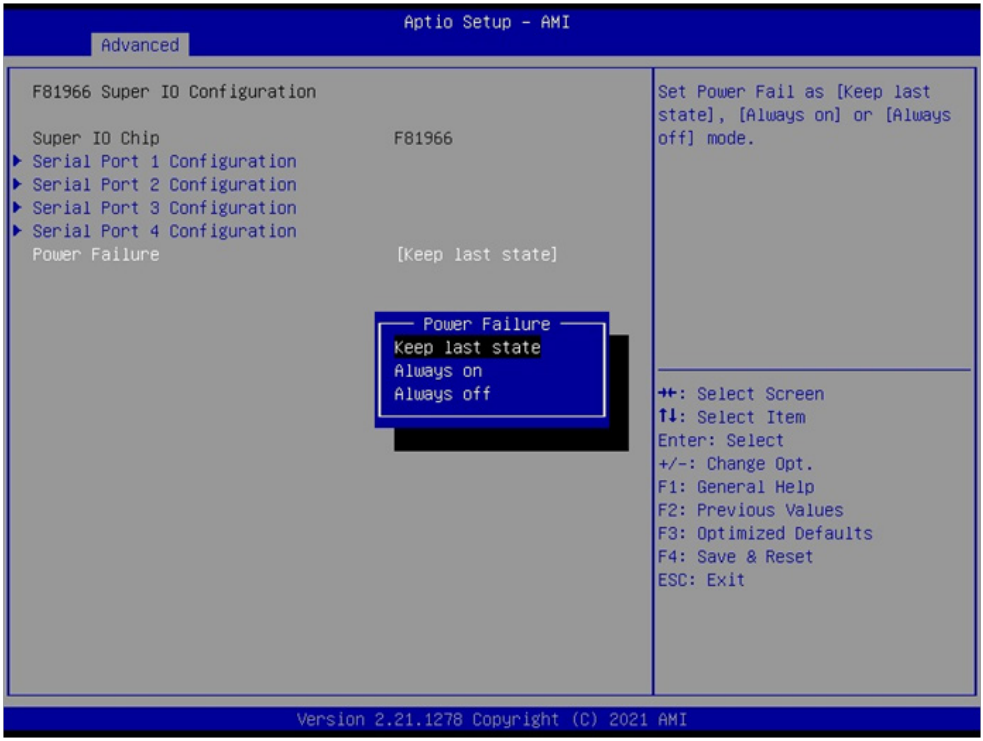


Change Settings, default is Auto.



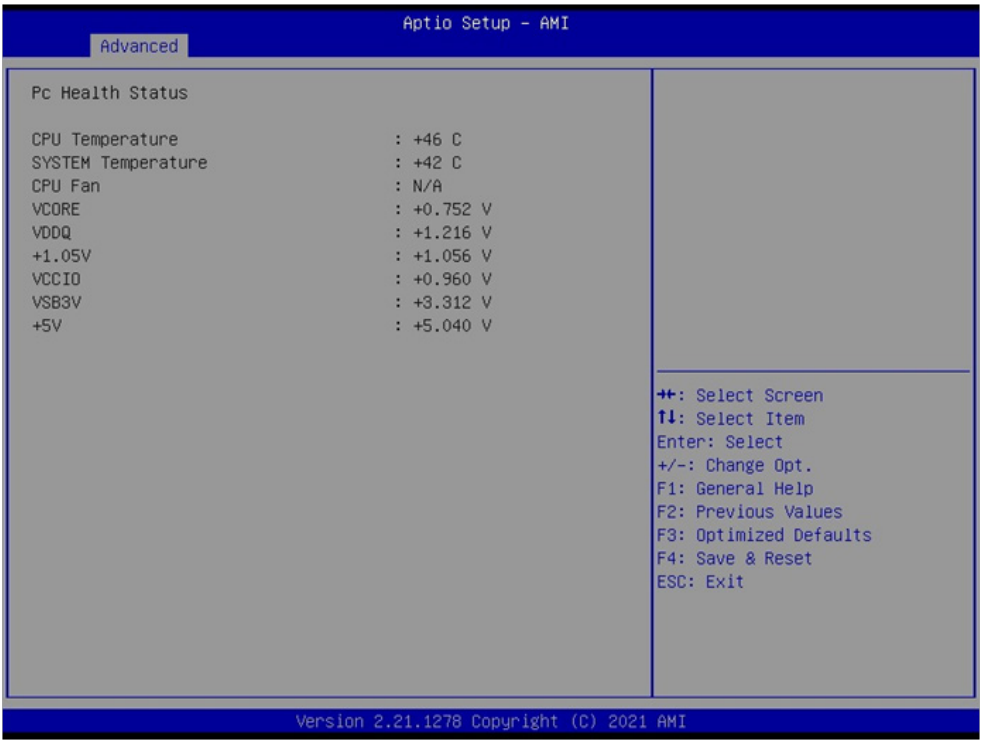
To select the Serial port to RS232 / RS422 / RS485, default is RS232.

4-6-3-5 Power Failure



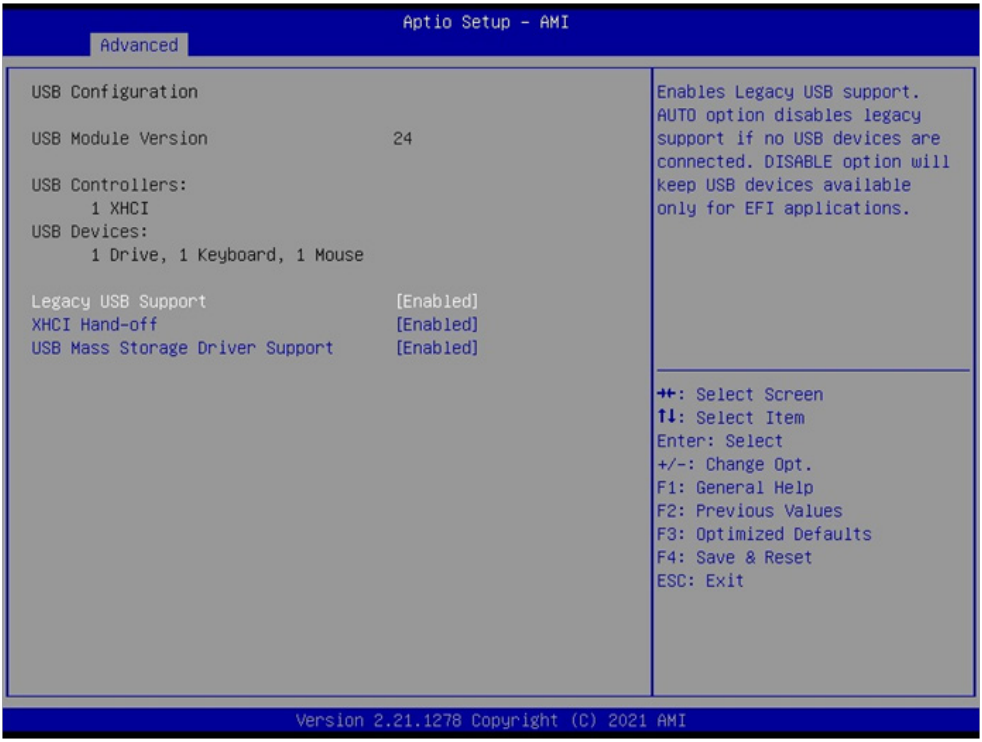
To select the power behavior after power fail, default is Keep last state.

4-6-4 Hardware Monitor



Press [Enter] to view PC health status.
This section shows the status of your CPU, Fan, and overall system.
This is only available when there is Hardware Monitor function onboard.

4-6-5 USB Configuration

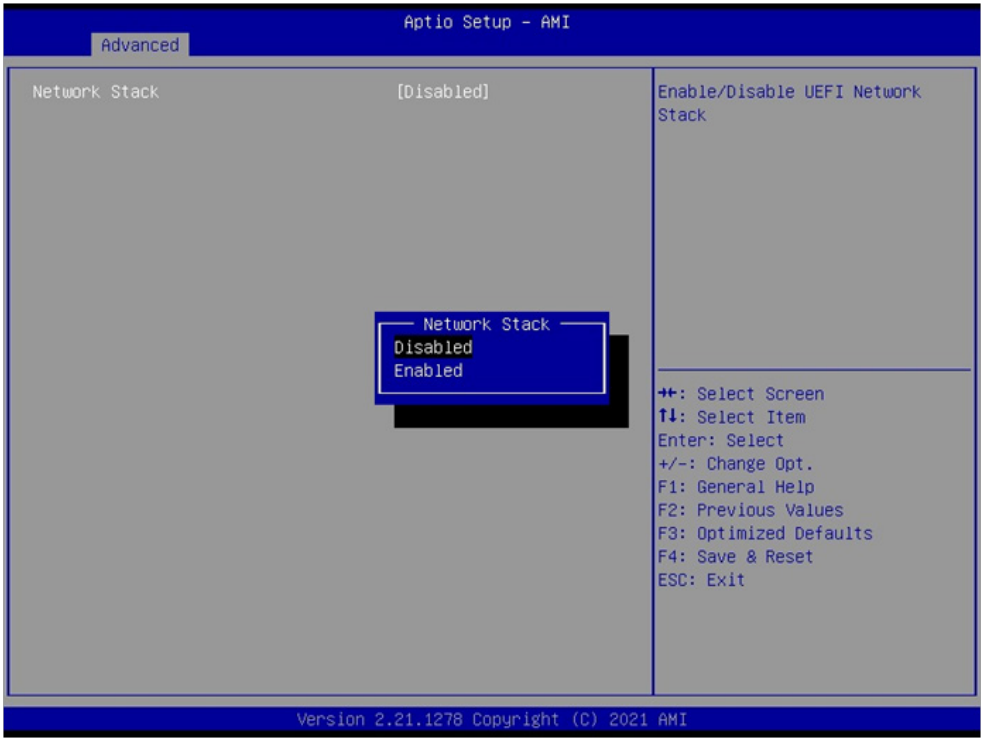


Legacy USB Support
Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. Disable option will keep USB devices available only for EFI applications.
The optional settings are: Enabled (default), Disabled, Auto.

XHCI Hand-off
This is a workaround for OS without XHCI handoff support. The XHCI ownership change should be claimed by XHCI driver.
The optional settings are: Enabled, Disabled.

USB Mass Storage Driver Support
To enable USB mass storage support or not, default is Enabled.

4-6-7 Network Stack Configuration



To enable the UEFI Network stack or not, default is Disabled.

4-6-8 NVMe Configuration

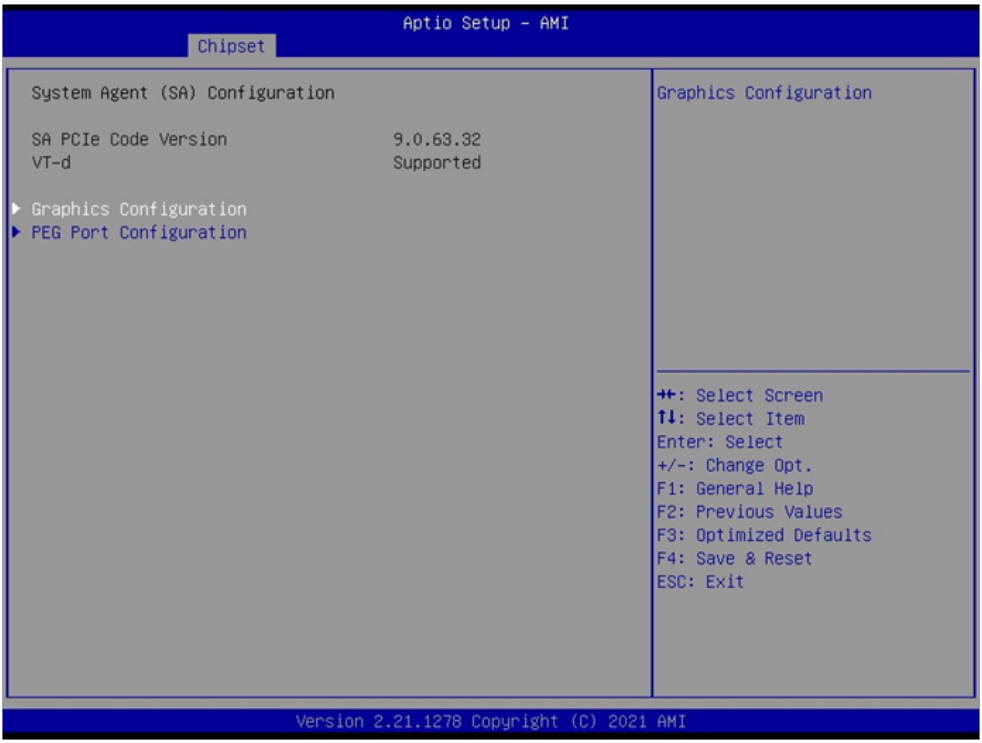
To detect NVMe storage automatically.

4-7 Chipset

System Agent (SA) Configuration.
Please refer section 4-7-1

PCH-IO Configuration.
Please refer section 4-7-2

4-7-1 System Agent (SA) Configuration



Graphics Configuration.
Please refer section 4-7-1-1

PEG Port Configuration.
Please refer section 4-7-1-2

4-7-1-1 Graphics Configuration

Primary Display
To select which of IGFX / PEG Graphics device should be Primary Display Or select SG for Switchable Gfx. The optional settings are: Auto, IGFX (default), PEG, PCI.

Internal Graphics
Keep IGFX enabled based on the setup options. The optional settings are: Auto, Enabled (default), Disabled.

GTT Size
Graphics Translation Table Size. The optional settings are: 2MB, 4MB, 8MB (default)

Aperture Size
The optional settings are: 128MB, 256MB (default), 512MB, 1024MB, 2048MB

DVMT Pre-Allocated
Use this item to select DVMT 5.0 pre-allocated (fixed) graphics memory size used by the internal graphics device. The optional settings are: 16MB, 32MB, 64MB (default)

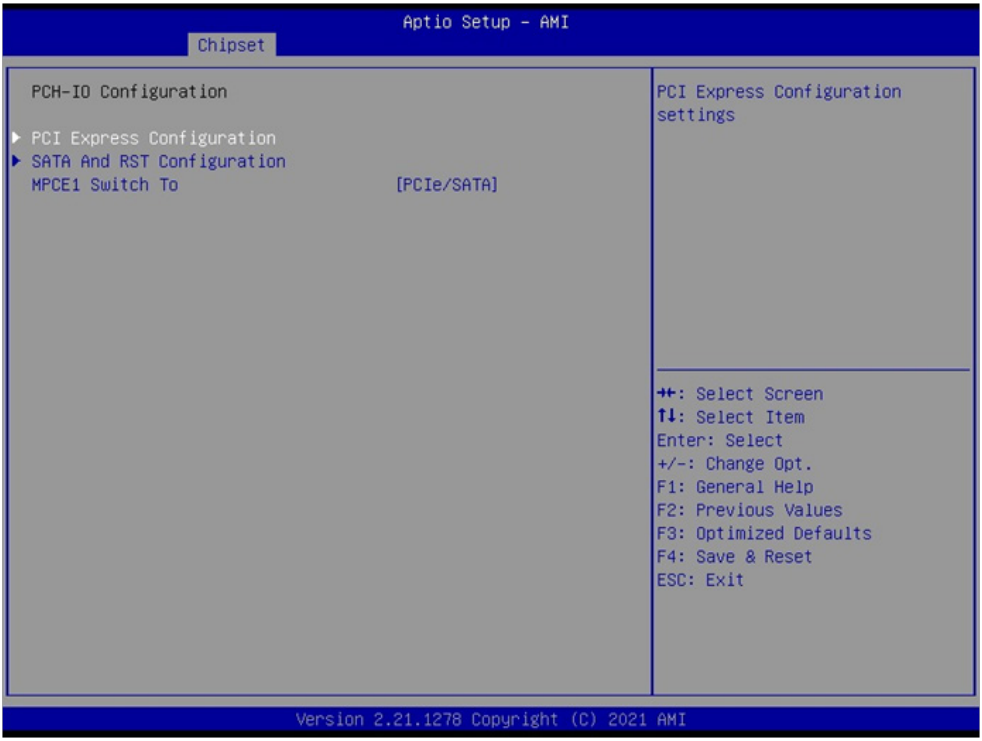
DVMT Total Gfx Mem
Use this item to select DVMT 5.0 total graphics memory size used by the internal graphics device
The optional settings are: 128MB, 256MB (default), MAX.

4-7-1-2 PEG Port Configuration

Enable Root Port
To enable the Root Port or not. The optional settings are: Auto (default), Enabled, Disabled.

Max Link Speed
Configure PEG Port Max Speed. The optional settings are: Auto (default), Gen1, Gen2, Gne3.

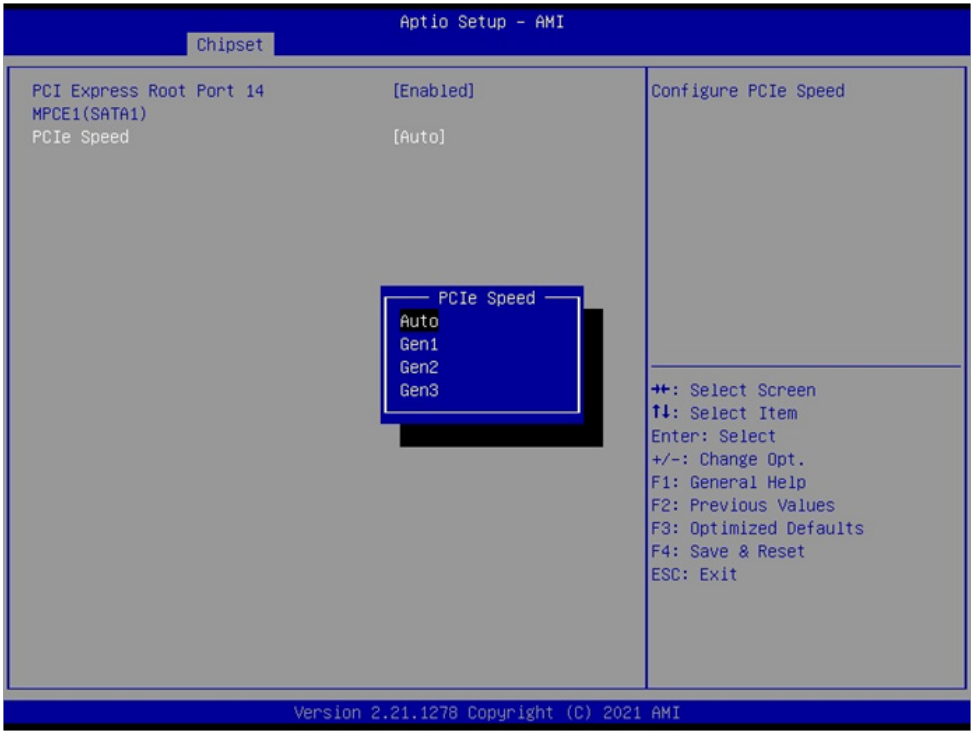
4-7-2 PCH-IO Configuration



PCI Express Configuration.
Please refer section 4-7-2-1

SATA And RST Configuration.
Please refer section 4-7-2-2

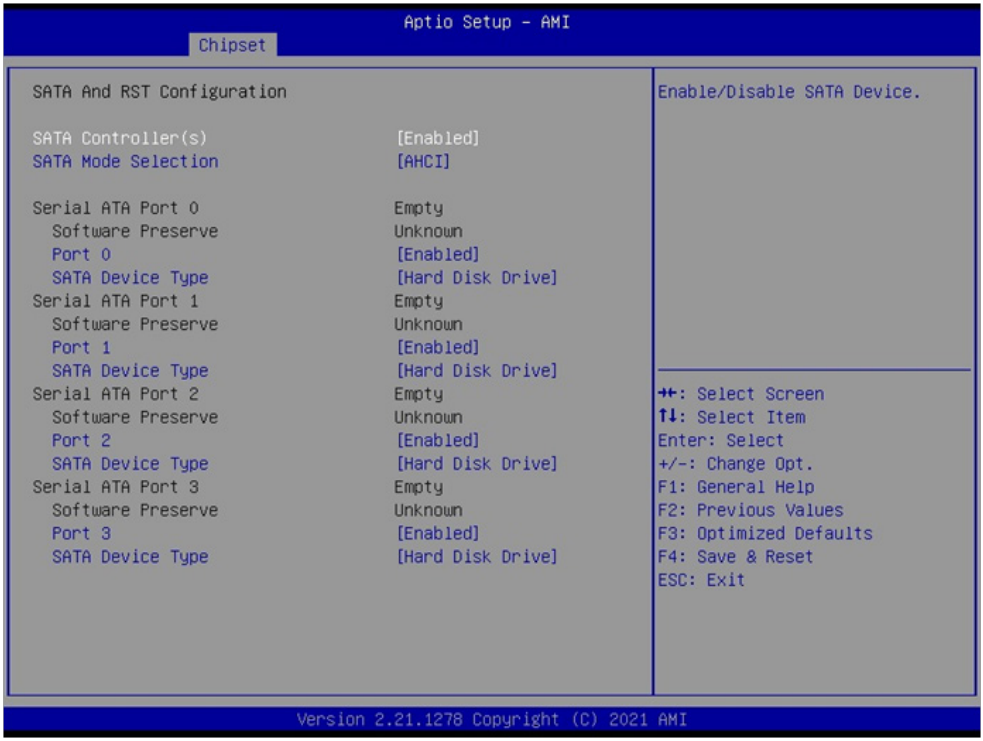
4-7-2-1 PCI Express Configuration



PCI Express Root Port 14 (MPCE1 / SATA1)
The optional settings are: Enabled (default), Disabled.

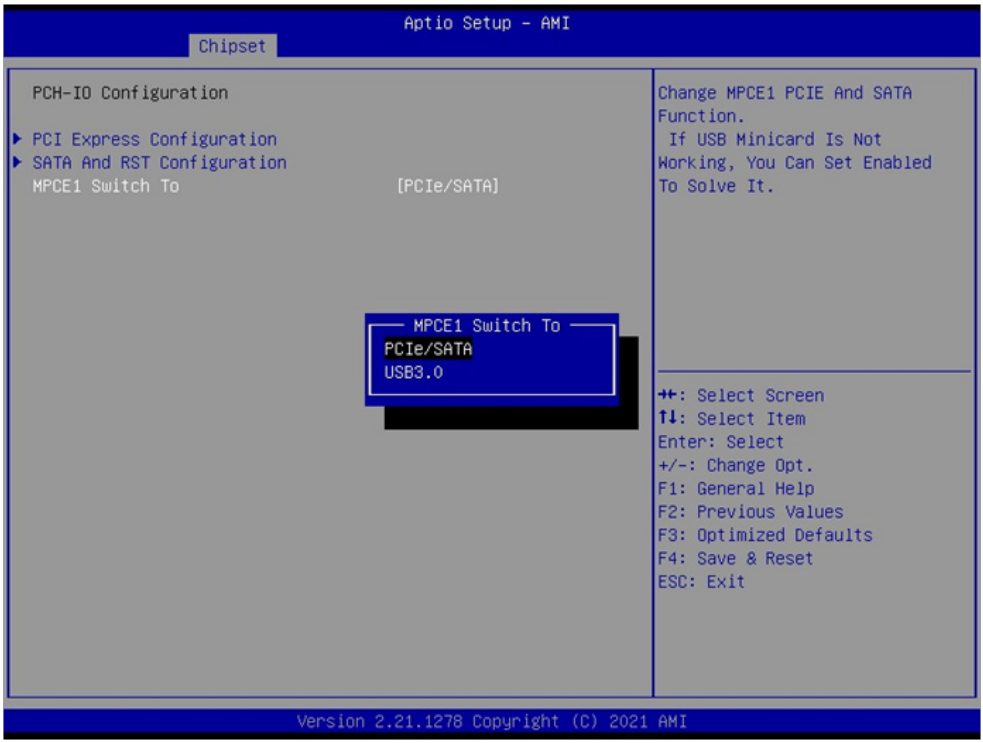
PCI Speed
To select PCI Express port speed. The optional settings are: Auto (default), Gen1, Gen2, Gen3

4-7-2-2 SATA And RST Configuration



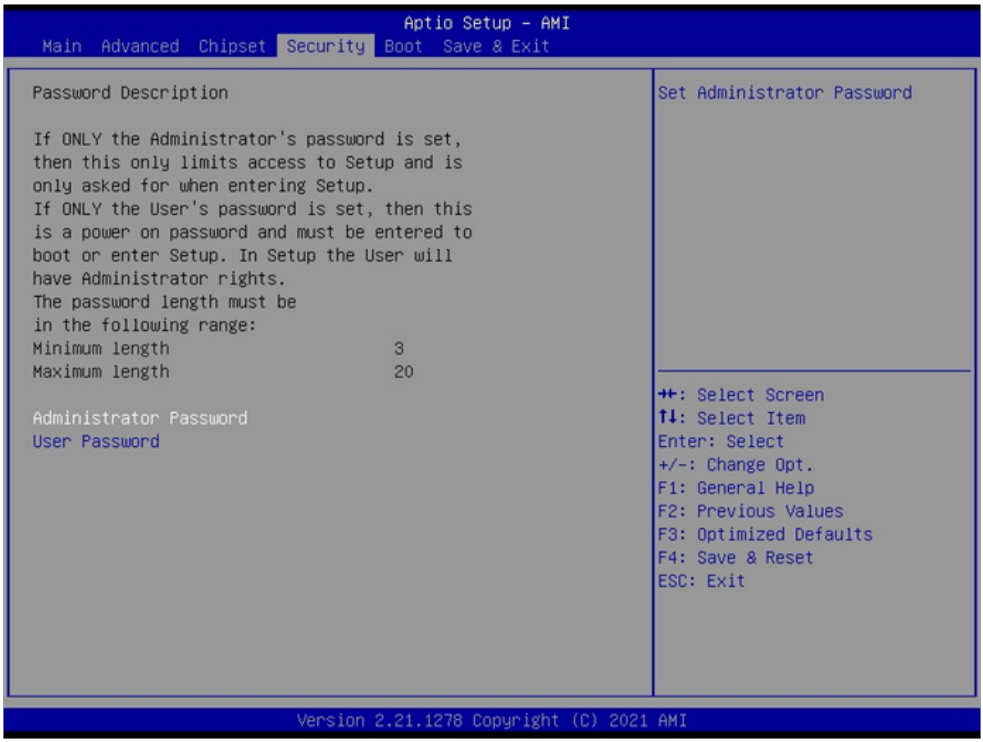
SATA Controller
Use this item to Enable or Disable SATA Device.

SATA Mode Selection
Determines how SATA controller(s) operate. The optional settings are: AHCI, Intel RST Premium.



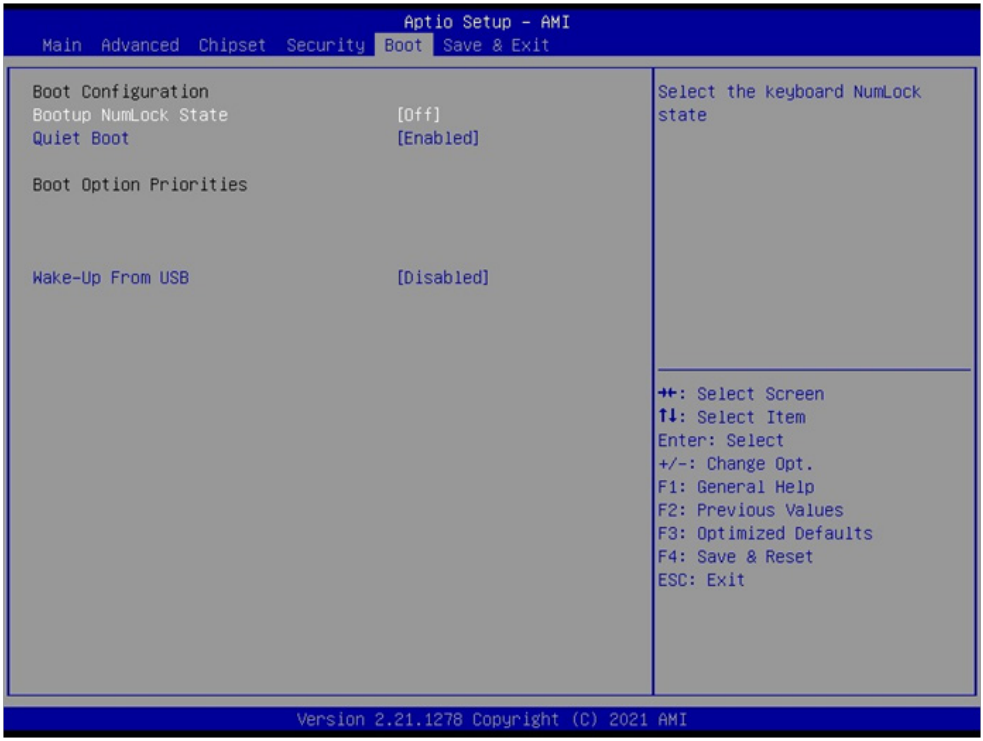
MPCE1 switch to PCIe / SATA or USB 3.0

4-8 Security



Administrator Password
User Password
To set up an Administrator or an User password

4-9 Boot



Bootup NumLock State
To select Power-on state for NumLock, default is <On>

Quiet Boot
The optional settings are: Enabled (default), Disabled.

Wake-Up From USB
The optional settings are: Enabled, Disabled (default).

4-10 Save & Exit

Save Change and Reset
Save configuration and reset

Discard Changes and Reset
Reset without saving the changes

Restore Defaults
To restore the optimal default for all the setup options

4-11 How to update Insyde BIOS

Under DOS Mode

STEP 1. Prepare a bootable disc.
(Storage device could be USB FDD or USB pen drive.)

STEP 2. Copy utility program to your bootable disc. You may download it from our website.

STEP 3. Copy the latest BIOS for your LEX motherboard from our website to your bootable disc.

STEP 4. (Here take 3I470DW as an example, please enter your motherboard's name)
Insert your bootable disc into X: (X could be C:, A: or others.
It depends on which type of storage device you use.)

Start the computer and type

X:\: H2OFFT-D.EXE 3I470DW.ROM –BIOS -ALL

3I470DW.ROM is the file name of the latest BIOS.

It may be 3I470DW.ROM or 3I470DW.ROM, etc.

Please leave one space between .ROM & -BIOS -ALL

By Bay Trail series mainboard, please type

X:\: H2OFFT-D.EXE 3I470DW.ROM –BIOS -ALL

-BIOS : Flash BIOS region

-ALL : Flash all

STEP 5. Press ENTER and the BIOS will be updated,
Computer will restart automatically.

Appendix B: Resolution list

640 x 480 x (256 / 16bit / 32bit)
800 x 600 x (256 / 16bit / 32bit)
1024 x 768 x (256 / 16bit / 32bit)
1152 x 864 x (256 / 16bit / 32bit)
1280 x 600 x (256 / 16bit / 32bit)
1280 x 720 x (256 / 16bit / 32bit)
1280 x 768 x (256 / 16bit / 32bit)
1280 x 800 x (256 / 16bit / 32bit)
1280 x 960 x (256 / 16bit / 32bit)
1280 x 1024 x (256 / 16bit / 32bit)
1400 x 1050 x (256 / 16bit / 32bit)
1440 x 900 x (256 / 16bit / 32bit)
1600 x 900 x (256 / 16bit / 32bit)
1600 x 1200 x (256 / 16bit / 32bit)
1680 x 1050 x (256 / 16bit / 32bit)
1920 x 1080 x (256 / 16bit / 32bit)
1920 x 1200 x (256 / 16bit / 32bit)