CAPA318

Intel® Pentium® Processor N4200 and Celeron® Processor N3350 3.5” Board

User’s Manual

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CAUTION

If you replace wrong batteries, it causes the danger of explosion. It is recommended by the manufacturer that you follow the manufacturer's instructions to only replace the same or equivalent type of battery, and dispose of used ones.

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ESD Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please take care of the following jobs with precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. It discharges static electricity from your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components.

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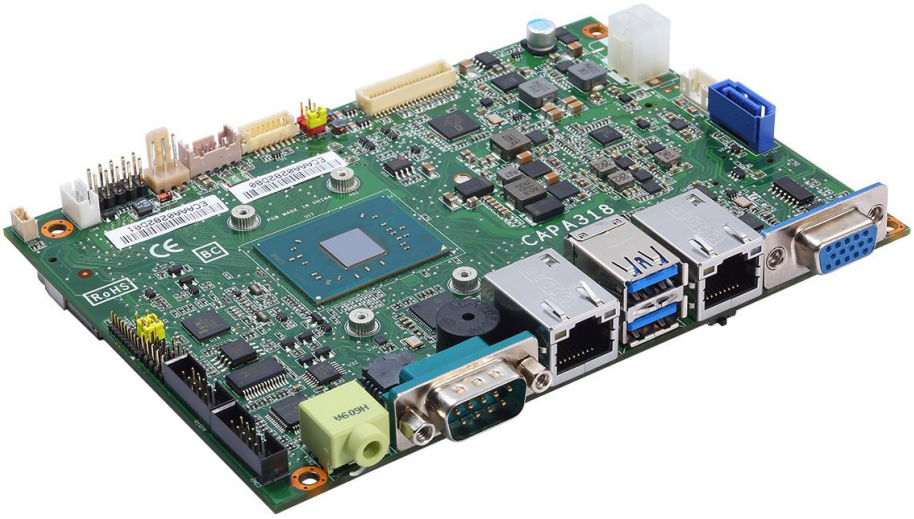
Chapter 1
Introduction



The CAPA318, a 3.5” board, supports Intel® Pentium® N4200 and Celeron® N3350. It delivers outstanding system performance through high-bandwidth interfaces, multiple I/O functions for interactive applications and various embedded computing solutions.

The CAPA318 comes with one 204-pin unbuffered SO-DIMM socket for single channel DDR3L 1600MHz memory, maximum memory capacity up to 8GB. There are two Gigabit/Fast Ethernet ports, one SATA port with transfer rate up to 6Gb/s, two USB 3.0 and two USB 2.0 high speed compliant, and built-in HD audio codec that can achieve the best stability and reliability for industrial applications. Additionally, it provides you with unique embedded features, such as two serial ports and 3.5” form factor that applies an extensive array of PC peripherals.

1.1 Features

- Intel® Pentium® quad core N4200 (1.1GHz) and Celeron® dual core N3350 (1.1GHz)
- 1 DDR3L SO-DIMM supports up to 8GB memory capacity
- 2 USB 3.0 ports and 2 USB 2.0 ports
- 2 COM ports (COM1 for RS-232/422/485, COM2 for RS-232)
- 2 PCI-Express Mini Card
- +12V only DC-in supported

1.2 Specifications

- **CPU**
  - Intel® Pentium® quad core N4200 1.1GHz.
  - Intel® Celeron® dual core N3350 1.1GHz.

- **Thermal Solution**
  - Passive.

- **Operating Temperature**
  - -20°C~+70°C.

- **BIOS**
  - American Megatrends Inc. UEFI (Unified Extensible Firmware Interface) BIOS.
  - 64Mbit SPI Flash, DMI, Plug and Play.
  - PXE Ethernet Boot ROM.

- **System Memory**
  - One 204-pin unbuffered DDR3L SO-DIMM socket.
  - Maximum up to 8GB DDR3L 1600MHz memory.

- **Onboard Multi I/O**
  - Controller: ITE8528.
  - Serial Ports: One RS-232/422/485 (COM1) and one RS-232 (COM2).

- **Serial ATA**
  - One SATA-600 connector.
  - mSATA supported.

- **USB Interface**
  - Two USB 3.0 ports on the rear I/O.
  - Two USB 2.0 ports in 2x5-pin internal wafer connector.

- **Display**
  - One 15-pin D-Sub as VGA connector. The resolution is up to 1920x1200.
  - One 2x20-pin connector for 18/24-bit single/dual channel LVDS and one 8-pin inverter connector. LVDS resolution is up to 1920x1200 in 24-bit dual channels.

- **Watchdog Timer**
  - Timeout value range is 1~65535 seconds.

- **Ethernet**
  - Two RJ-45 LAN ports: Intel® i211AT supports 1000/100/10Mbps Gigabit/Fast Ethernet with Wake-on-LAN and PXE Boot ROM.

- **Audio**
  - HD audio compliant with Realtek ALC662.
  - Line-out and line-in/MIC-in via internal box header.

- **Expansion Interface**
  - Two full-size PCI-Express Mini Card socket with PCI-Express and USB support and complies with PCI-Express Mini Card Spec. V1.2.

- **Power Input**
  - One 2x2-pin connector.
  - +12V DC-in only.
  - Auto power on function supported.

- **Power Management**
  - ACPI (Advanced Configuration and Power Interface).

- **Form Factor**
  - 3.5" form factor.

Note

All specifications and images are subject to change without notice.

1.3 Utilities Supported

- Chipset and graphics driver
- Ethernet driver
- Audio driver
- Trusted Execution Engine

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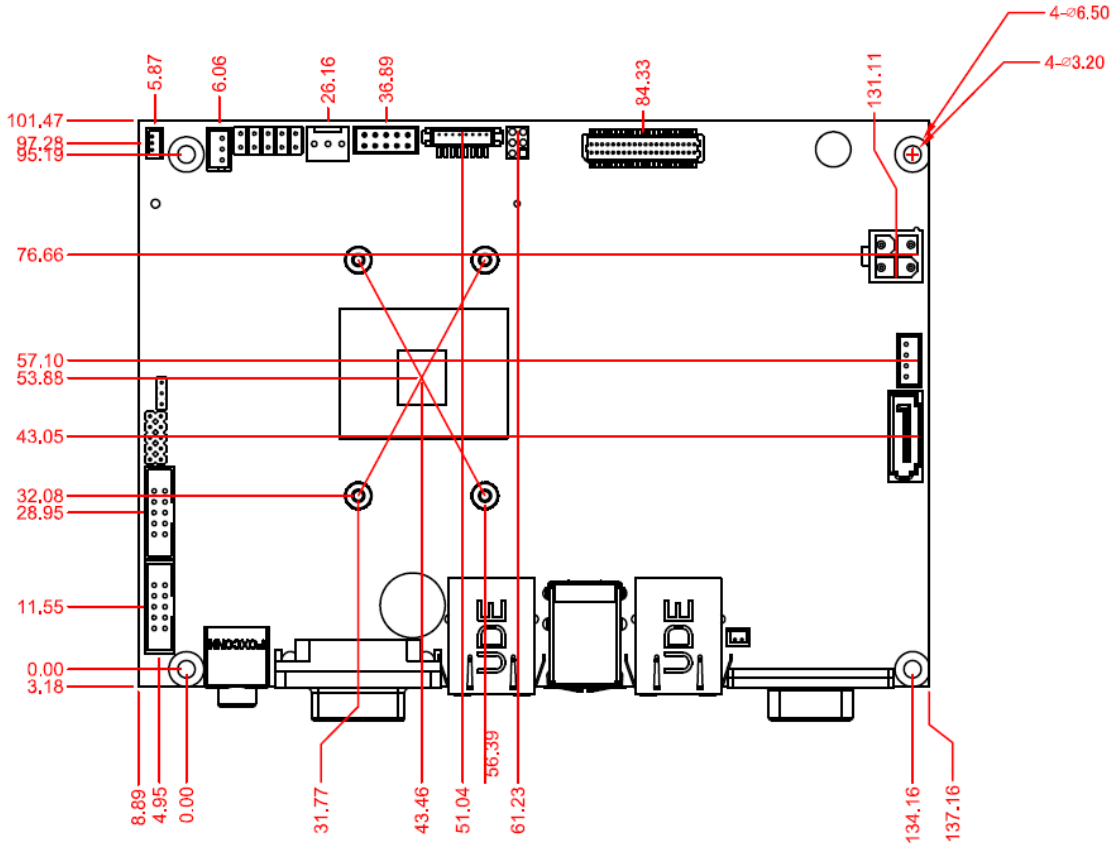
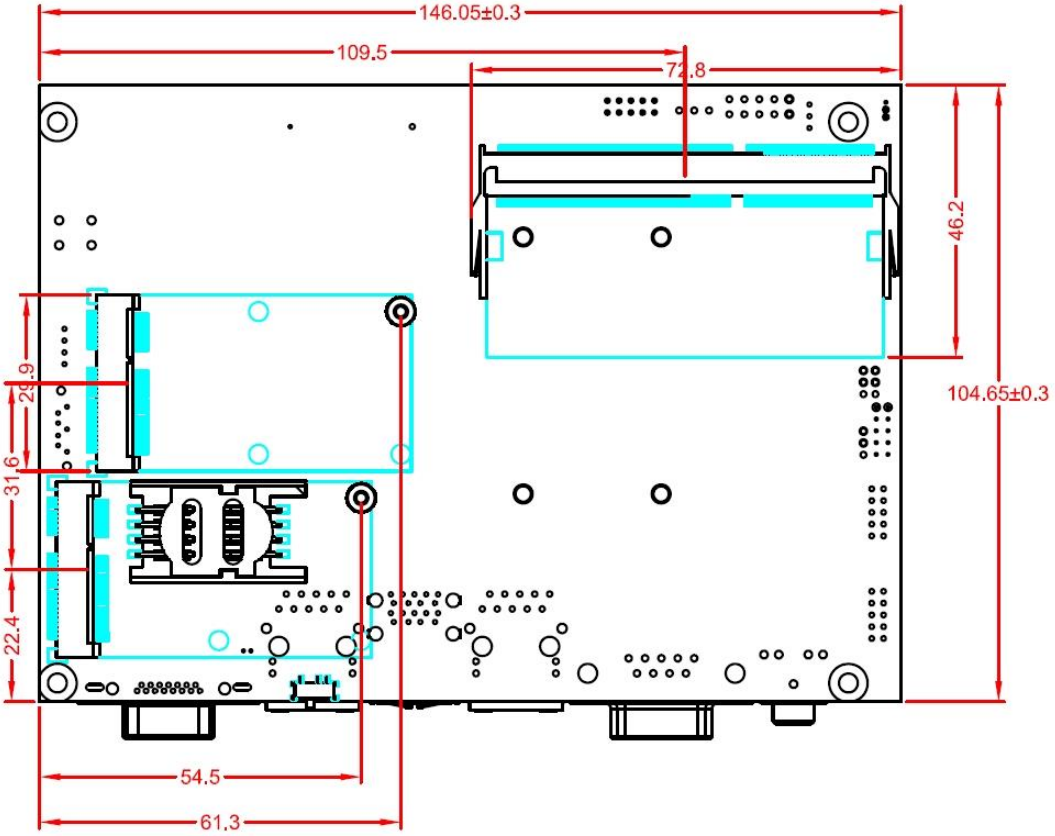
Chapter 2
Board and Pin Assignments

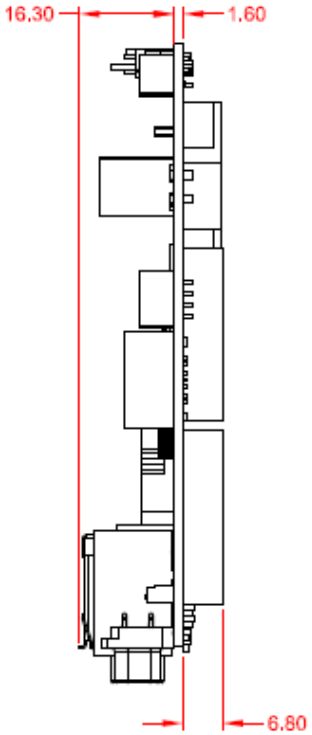
2.1 Board Dimensions and Fixing Holes



Top View

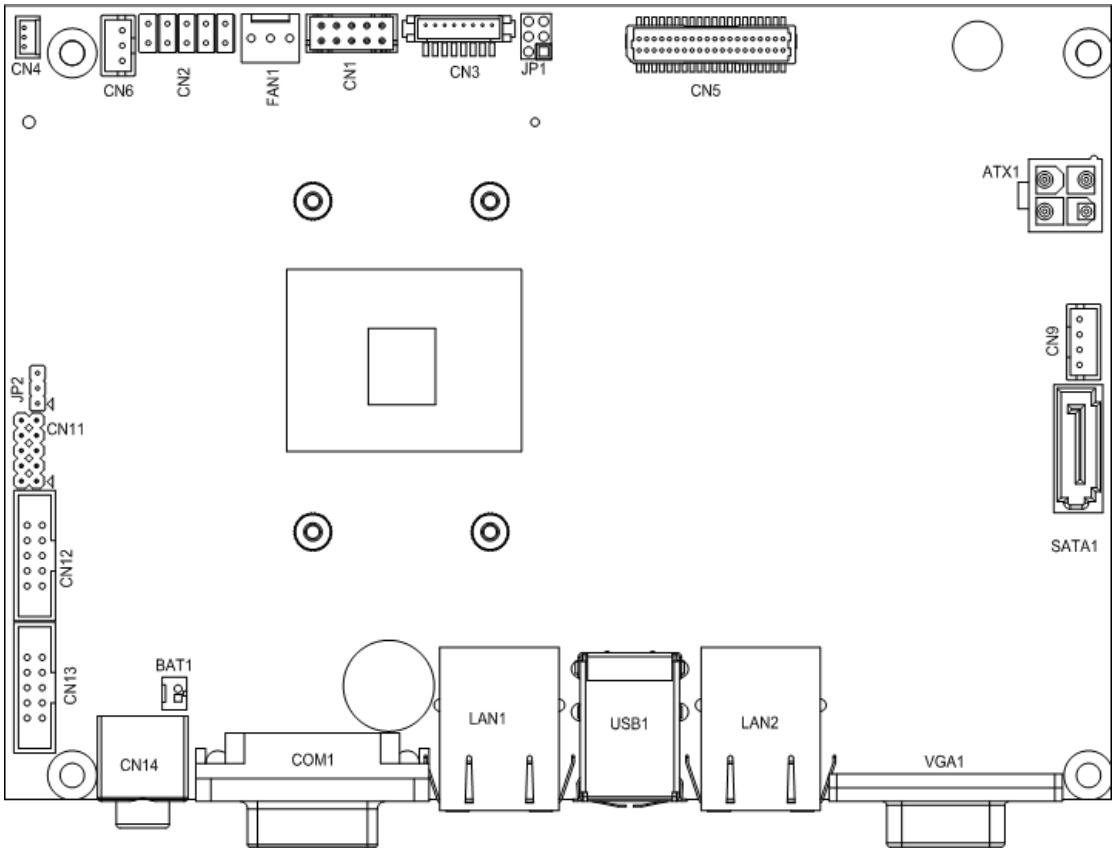


Bottom View

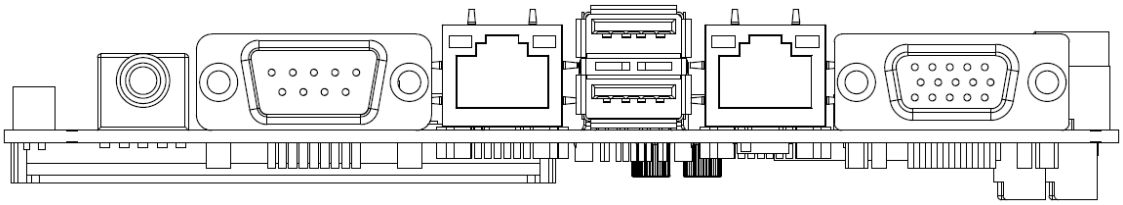


Side View

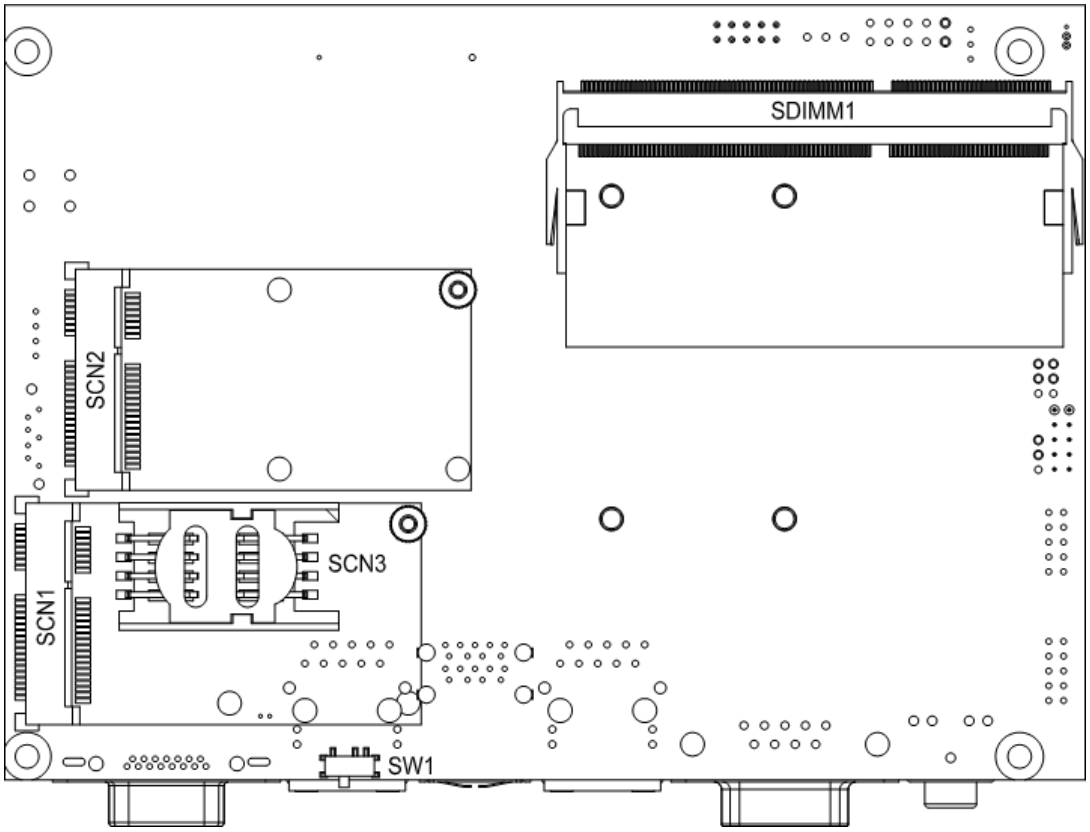
2.2 Board Layout



Top View



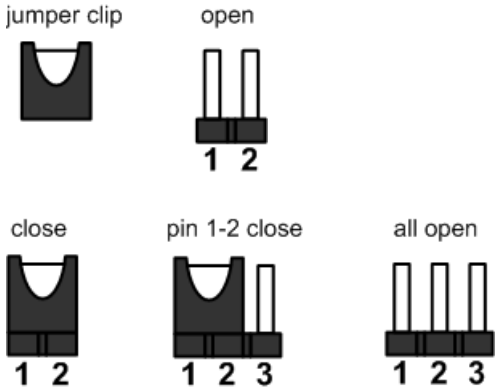
Side View



Bottom View

2.3 Jumper and Switch Settings

Jumper is a small component consisting of jumper clip and jumper pins. Install jumper clip on 2 jumper pins to close. And remove jumper clip from 2 jumper pins to open. Below illustration shows how to set up jumper.



Properly configure jumper and switch settings on the CAPA318 to meet your application purpose. Below you can find a summary table of jumpers, switch and onboard default settings.

Note

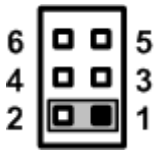
Once the default jumper or switch setting needs to be changed, please do it under power-off condition.

Jumper and Switch	Description	Setting
JP1	LVDS +3.3V/+5V/+12V Voltage Selection Default: +3.3V	1-2 Close
JP2	Restore BIOS Optimal Defaults Default: Normal Operation	1-2 Close
SW1	Auto Power On Default: Disable	1-2 Close

2.3.1 LVDS +3.3V/+5V/+12V Voltage Selection (JP1)

This is a 2x3-pin (pitch=2.0mm) jumper. The board supports voltage selection for flat panel displays. Use these jumpers to set LVDS connector (CN5) pin 1~6 VCCM to +3.3V, +5V or +12V. To prevent hardware damage, before connecting please make sure that the input voltage of flat panel is correct.

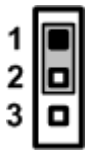
Function	Setting
+3.3V level (Default)	1-2 close
+5V level	2-4 close
+12V level	5-6 close



2.3.2 Restore BIOS Optimal Defaults (JP2)

This is a 1x3-pin (pitch=2.0mm) jumper. Put jumper clip to pin 2-3 for a few seconds then move it back to pin 1-2. Doing this procedure can restore BIOS optimal defaults.

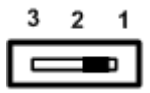
Function	Setting
Normal (Default)	1-2 close
Restore BIOS optimal defaults	2-3 close



2.3.3 Auto Power On (SW1)

If SW1 is enabled for power input, the system will be automatically power on without pressing soft power button. If SW1 is disabled for power input, it is necessary to manually press soft power button to power on the system.

Function	Setting
Disable auto power on (Default)	1-2 close
Enable auto power on	2-3 close



2.4 Connectors

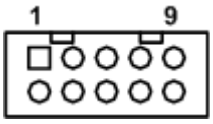
Signals go to other parts of the system through connectors. Loose or improper connection might cause problems, please make sure all connectors are properly and firmly connected. Here is a summary table of connectors on the hardware.

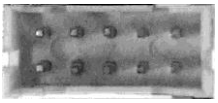
Connector	Description
CN1	USB 2.0 Wafer Port 3 and 4
CN2	Front Panel Connector
CN3	Inverter Connector
CN4	SMBus/I^2C Connector
CN5	LVDS Connector
CN6	SMBus Connector
CN9	SATA Power Connector
CN11	Digital I/O Connector
CN12	COM2 Wafer Connector]
CN13	Audio Connector
CN14	Audio Jack
FAN1	Fan Connector
COM1	COM1 Connector
SATA1	SATA Connector
USB1	USB 3.0 Port 1 and 2
VGA1	VGA Connector
ATX1	ATX Power Connector
LAN1~2	Ethernet Port 1 and 2
SCN1	Full-size PCI-Express Mini Card and mSATA Connector
SCN2	Full-size PCI-Express Mini Card Connector
SCN3	SIM Card Slot
SDIMM1	DDR3L SO-DIMM Connector

2.4.1 USB 2.0 Wafer Connector (CN1)

This 2x5-pin (pitch=2mm) wafer which is compliant with Hirose DF11-xdp-2dsa and a Universal Serial Bus (USB) connector for installing versatile USB 2.0 compliant interface peripherals.

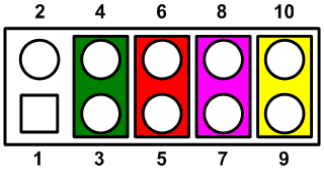
Pin	Signal	Pin	Signal
1	USB VCC (+5V_SBY)	2	USB VCC (+5V_SBY)
3	USB #3_D-	4	USB #4_D-
5	USB #3_D+	6	USB #4_D+
7	GND	8	GND
9	GND	10	GND





2.4.2 Front Panel Connector (CN2)

Pin	Signal	Pin	Signal
1	PWR-	2	PWR+
3	PWRLED-	4	PWRLED+
5	PWRSW-	6	PWRSW+
7	HW RST-	8	HW RST+
9	HDDLED-	10	HDDLED+



Power Status
Pin 1 and pin 2 are for power status button; letting user know the power status of this board.

Power LED
Pin 4 connects anode (+) of LED and pin 3 connects cathode(-) of LED. The power LED lights up when the system is powered on.

Power On/Off Button
Pin 5 and 6 connect the power button on front panel to CPU board, which allows users to turn on or off power supply.

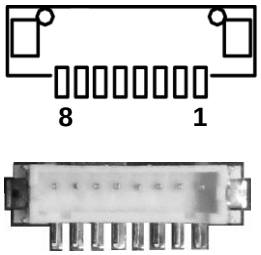
System Reset Switch
Pin 7 and 8 connect the case-mounted reset switch that reboots your computer without turning off the power switch. It is a better way to reboot your system for a longer life of system power supply.

HDD Activity LED
This connection is linked to hard drive activity LED on the control panel. LED flashes when HDD is being accessed. Pin 9 and 10 connect the hard disk drive to the front panel HDD LED, pin 9 is assigned as cathode(-) and pin 10 is assigned as anode(+).

2.4.3 Inverter Connector (CN3)

This is a DF13-8P-1.25C 8-pin (pitch=1.25mm) connector for inverter. We strongly recommend you to use the matching DF13-8P-1.25C connector to avoid malfunction.

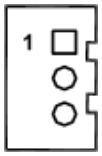
Pin	Signal
1	VBL1 (+12V level)
2	VBL1 (+12V level)
3	VBL2 (+5V level)
4	VBL_ENABLE
5	GND
6	GND
7	GND
8	VBL Brightness Control



2.4.4 SMBus/I^{2}C Connector (CN4)

This connector is a 3-pin (pitch=1.25mm) for SMBus interface which is compatible with I^{2}C.

Pin	Signal
1	CLK_SBY
2	DAT_SBY
3	GND

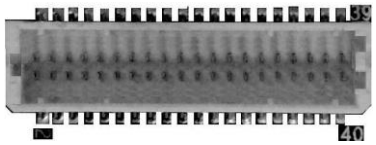


2.4.5 LVDS Connector (CN5)

This board has a 2x20-pin (pitch=1mm) connector for LVDS LCD interface. It is strongly recommended to use the matching JST SHDR-40VS-B connector for LVDS interface. Pin 1~6 VCCM can be set to +3.3V, +5V or +12V by setting JP1 (see section 2.3.1).

18-bit single channel

Pin	Signal	Pin	Signal
1	VCCM	2	VCCM
3	VCCM	4	VCCM
5	VCCM	6	VCCM
7	N.C	8	N.C
9	GND	10	GND
11	N.C	12	N.C
13	N.C	14	N.C
15	GND	16	GND
17	N.C	18	N.C
19	N.C	20	N.C
21	GND	22	GND
23	Channel A D0-	24	N.C
25	Channel A D0+	26	N.C
27	GND	28	GND
29	Channel A D1-	30	N.C
31	Channel A D1+	32	N.C
33	GND	34	GND
35	Channel A D2-	36	Channel A CLK-
37	Channel A D2+	38	Channel A CLK+
39	GND	40	GND



24-bit single channel

Pin	Signal	Pin	Signal
1	VCCM	2	VCCM
3	VCCM	4	VCCM
5	VCCM	6	VCCM
7	N.C	8	N.C
9	GND	10	GND
11	N.C	12	N.C
13	N.C	14	N.C
15	GND	16	GND
17	N.C	18	N.C
19	N.C	20	N.C
21	GND	22	GND
23	Channel A D0-	24	N.C
25	Channel A D0+	26	N.C
27	GND	28	GND
29	Channel A D1-	30	Channel A D3-
31	Channel A D1+	32	Channel A D3+
33	GND	34	GND
35	Channel A D2-	36	Channel A CLK-
37	Channel A D2+	38	Channel A CLK+
39	GND	40	GND

18-bit dual channel

Pin	Signal	Pin	Signal
1	VCCM	2	VCCM
3	VCCM	4	VCCM
5	VCCM	6	VCCM
7	N.C	8	N.C
9	GND	10	GND
11	N.C	12	Channel B D0-
13	N.C	14	Channel B D0+
15	GND	16	GND
17	Channel B CLK-	18	Channel B D1-
19	Channel B CLK+	20	Channel B D1+
21	GND	22	GND
23	Channel A D0-	24	Channel B D2-
25	Channel A D0+	26	Channel B D2+
27	GND	28	GND
29	Channel A D1-	30	N.C
31	Channel A D1+	32	N.C
33	GND	34	GND
35	Channel A D2-	36	Channel A CLK-
37	Channel A D2+	38	Channel A CLK+
39	GND	40	GND

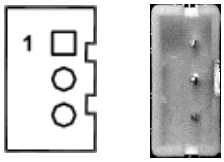
24-bit dual channel

Pin	Signal	Pin	Signal
1	VCCM	2	VCCM
3	VCCM	4	VCCM
5	VCCM	6	VCCM
7	N.C	8	N.C
9	GND	10	GND
11	Channel B D3-	12	Channel B D0-
13	Channel B D3+	14	Channel B D0+
15	GND	16	GND
17	Channel B CLK-	18	Channel B D1-
19	Channel B CLK+	20	Channel B D1+
21	GND	22	GND
23	Channel A D0-	24	Channel B D2-
25	Channel A D0+	26	Channel B D2+
27	GND	28	GND
29	Channel A D1-	30	Channel A D3-
31	Channel A D1+	32	Channel A D3+
33	GND	34	GND
35	Channel A D2-	36	Channel A CLK-
37	Channel A D2+	38	Channel A CLK+
39	GND	40	GND

2.4.6 SMBus Connector (CN6)

This connector is a 3-pin (pitch=2.0mm) wafer connector, which is compliant with JST B3B-PH-K-S, for SMBus interface. The SMBus (System Management Bus) is a simple bus for the purpose of lightweight communication.

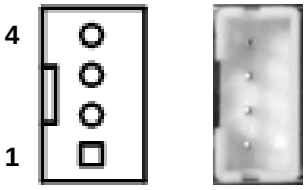
Pin	Signal
1	SMBus clock
2	SMBus data
3	GND



2.4.7 SATA Power Connector (CN9)

The CN9 is a 4-pin (pitch=2mm) wafer connector, which is compliant with JST B4B-PH-K-S, for SATA power interface.

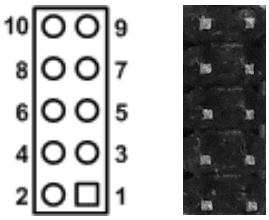
Pin	Signal
1	+12V
2	GND
3	GND
4	+5V



2.4.8 Digital I/O Connector (CN11)

This is a 2x5-pin (pitch=2mm) connector. The board is equipped with an 8-channel (4 inputs and 4 outputs) digital I/O connector that meets requirements for a system customary automation control. The digital I/O can be configured to control cash drawers and sense warning signals from an Uninterrupted Power System (UPS), or perform store security control. You may use software programming to control these digital signals, please refer to Appendix B.

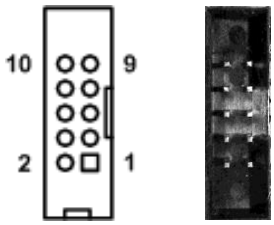
Pin	Signal	Pin	Signal
1	DIO 1	2	DIO 8
3	DIO 2	4	DIO 7
5	DIO 3	6	DIO 6
7	DIO 4	8	DIO 5
9	+5V	10	GND



2.4.9 COM2 Connector (CN12)

This is a 2x5-pin connector for COM2 interface.

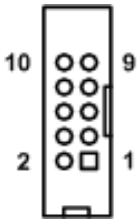
Pin	Signal	Pin	Signal
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND	10	No use



2.4.10 Audio Connector (CN13)

This is a 2x5-pin connector for audio interface.

Pin	Signal	Pin	Signal
1	MIC_IN	2	GND
3	LINE_IN_L	4	GND
5	LINE_IN_R	6	GND
7	AUDIO_OUT_L	8	GND
9	AUDIO_OUT_R	10	GND



2.4.11 Audio Jack (CN14)

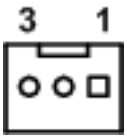
This is audio jack with HD audio support. Install audio driver, and then attach audio device to CN14. Note that CN14 and CN13's audio output pins cannot be connected and used with audio device at the same time.

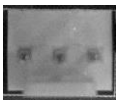
Pin Color	Signal
Green	Audio out

2.4.12 Fan Connector (FAN1)

A fan interface is available through this connector. You can find fan speed within BIOS Setup Utility if fan is installed. For further information, see BIOS Setup Utility: Advanced\Hardware Monitor\PC Health Status (see section 4.4).

Pin	Signal
1	GND
2	+12V level
3	Fan speed feedback

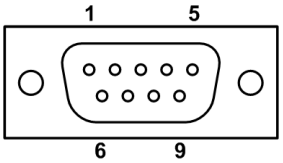




2.4.13 COM1 Connector (COM1)

The pin assignments of RS-232/422/485 are listed in table below. If you need COM1 to support RS-422 or RS-485 communication mode, please refer to BIOS setting in section 4.4.

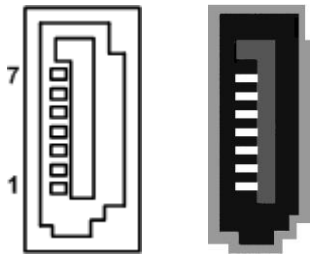
Pin	RS-232	RS-422	RS-485
1	DCD	TX-	Data-
2	RXD	TX+	Data+
3	TXD	RX+	No use
4	DTR	RX-	No use
5	GND	No use	No use
6	DSR	No use	No use
7	RTS	No use	No use
8	CTS	No use	No use
9	RI	No use	No use



2.4.14 SATA Connector (SATA1)

This Serial Advanced Technology Attachment (Serial ATA or SATA) connector is for high-speed SATA interface. It is a computer bus interface for connecting to devices such as hard disk drive.

Pin	Signal
1	GND
2	SATA_TXP0
3	SATA_TXN0
4	GND
5	SATA_RXN0
6	SATA_RXP0
7	GND



2.4.15 USB 3.0 Port (USB1)

The Universal Serial Bus (compliant with USB 3.0 (5Gb/s)) connector on the rear I/O is for installing USB peripherals such as keyboard, mouse, scanner, etc.

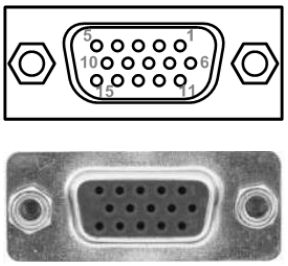
USB 3.0 port 1 and 2:

Pin	Signal	Pin	Signal
1	USB_VCC (+5V)	10	USB_VCC (+5V)
2	USB #1_D-	11	USB #2_D-
3	USB #1_D+	12	USB #2_D+
4	GND	13	GND
5	SSRX1-	14	SSRX2-
6	SSRX1+	15	SSRX2+
7	GND	16	GND
8	SSTX1-	17	SSTX2-
9	SSTX1+	18	SSTX2+

2.4.16 VGA Connector (VGA1)

This is a standard 15-pin D-Sub connector. It is commonly used for VGA display. This VGA interface configuration can be configured via software utility.

Pin	Signal	Pin	Signal
1	RED	2	GREEN
3	BLUE	4	N.C
5	GND	6	GND
7	GND	8	GND
9	CRT_VCC	10	GND
11	N.C	12	DDC_DATA
13	Hsync	14	Vsync
15	DDC_CLK		

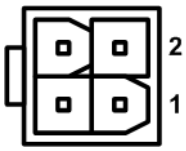


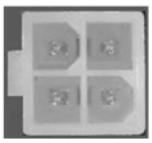
2.4.17 ATX Power Connector (ATX1)

Steady and sufficient power can be supplied to all components on the board by connecting the power connector. Please make sure all components and devices are properly installed before connecting the power connector.

The ATX1 is a 4-pin power supply interface. External power supply plug fits into ATX1 in only one orientation. Properly press down power supply plug until it completely and firmly fits into this connector. Loose connection may cause system instability.

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

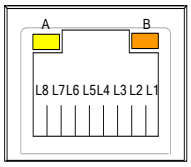


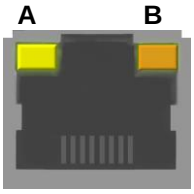


2.4.18 Ethernet Ports (LAN1 and LAN2)

The board has two RJ-45 connectors: LAN1 and LAN2. Ethernet connection can be established by plugging one end of the Ethernet cable into this RJ-45 connector and the other end (phone jack) to a 1000/100/10-Base-T hub.

Pin	1000 Base-T	100/10 Base-T	Description
L1	BI_DA+	TX+	Bidirectional or Transmit Data+
L2	BI_DA-	TX-	Bidirectional or Transmit Data-
L3	BI_DB+	RX+	Bidirectional or Receive Data+
L4	BI_DC+	N.C.	Bidirectional or Not Connected
L5	BI_DC-	N.C.	Bidirectional or Not Connected
L6	BI_DB-	RX-	Bidirectional or Receive Data-
L7	BI_DD+	N.C.	Bidirectional or Not Connected
L8	BI_DD-	N.C.	Bidirectional or Not Connected
A	Active Link LED (Yellow) Off: No link Blinking: Data activity detected		
B	Speed LED 1000: Orange 100/10: Green/OFF		

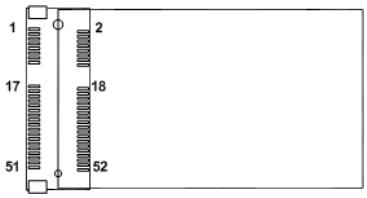




2.4.19 Full-size PCI-Express Mini Card and mSATA Connector (SCN1)

This is a full-size PCI-Express Mini Card connector on the bottom side complying with PCI-Express Mini Card Spec. V1.2. It supports either PCI-Express, USB 2.0 or SATA (mSATA). Since the default setting is mSATA, if PCI-Express Mini Card is needed to insert, please refer to section 4.4 to change the setting.

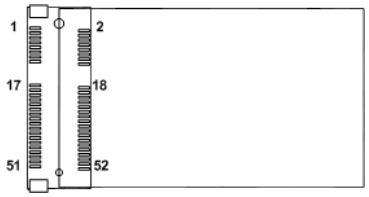
Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	SIM_PWR
9	GND	10	SIM_DATA
11	REFCLK-	12	SIM_CLK
13	REFCLK+	14	SIM_REST
15	GND	16	SIM_VPP
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	PE_RXN2/SATA_RXP	24	+3.3VSB
25	PE_RXP2/SATA_RXN	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PE_TXN2/SATA_TXN	32	SMB_DATA
33	PE_TXP2/SATA_TXP	34	GND
35	GND	36	USB_D5-
37	GND	38	USB_D5+
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB



2.4.20 Full-size PCI-Express Mini Card Connector (SCN2)

This is a full-size PCI-Express Mini Card connector on the bottom side supporting PCI-Express x1 or USB 2.0. It also complies with PCI-Express Mini Card Spec. V1.2.

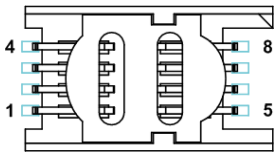
Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3VSB
3	No use	4	GND
5	No use	6	+1.5V
7	CLKREQ#	8	SIM_PWR
9	GND	10	SIM_DATA
11	REFCLK-	12	SIM_CLK
13	REFCLK+	14	SIM_REST
15	GND	16	SIM_VPP
17	No use	18	GND
19	No use	20	W_DISABLE#
21	GND	22	PERST#
23	PE_RXN3	24	+3.3VSB
25	PE_RXP3	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PE_TXN3	32	SMB_DATA
33	PE_TXP3	34	GND
35	GND	36	USB_D6-
37	GND	38	USB_D6+
39	+3.3VSB	40	GND
41	+3.3VSB	42	No use
43	GND	44	No use
45	No use	46	No use
47	No use	48	+1.5V
49	No use	50	GND
51	No use	52	+3.3VSB

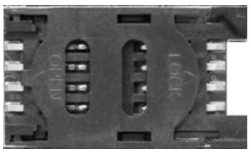


2.4.21 SIM Card Socket (SCN3)

This board has SCN3 socket on the bottom side for inserting SIM Card. In order to work properly, the SIM Card must be used together with 3G module which is inserted to SCN1 or SCN2. It is mainly used in 3G wireless network application.

Pin	Signal
1	PWR
2	RST
3	CLK
4	NC
5	GND
6	VPP
7	I/O
8	NC





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Chapter 3
Hardware Description

3.1 Microprocessors

The CAPA318 supports Intel® Pentium® N4200 and Celeron® N3350 processors which enable your system to operate under Windows® 10 environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for your installed microprocessor to prevent the CPU from damages.

3.2 BIOS

The CAPA318 uses AMI Plug and Play BIOS with a single 64Mbit SPI Flash.

3.3 System Memory

The CAPA318 supports one 204-pin DDR3L SO-DIMM socket for maximum memory capacity up to 8GB DDR3L SDRAMs. The memory module comes in sizes of 2GB, 4GB and 8GB.

3.4 I/O Port Address Map

Input/output (IO)

- [0000000000000000 - 000000000000006F] PCI Express Root Complex
- [0000000000000020 - 0000000000000021] Programmable interrupt controller
- [0000000000000024 - 0000000000000025] Programmable interrupt controller
- [0000000000000028 - 0000000000000029] Programmable interrupt controller
- [000000000000002C - 000000000000002D] Programmable interrupt controller
- [000000000000002E - 000000000000002F] Motherboard resources
- [0000000000000030 - 0000000000000031] Programmable interrupt controller
- [0000000000000034 - 0000000000000035] Programmable interrupt controller
- [0000000000000038 - 0000000000000039] Programmable interrupt controller
- [000000000000003C - 000000000000003D] Programmable interrupt controller
- [0000000000000040 - 0000000000000043] System timer
- [000000000000004E - 000000000000004F] Motherboard resources
- [0000000000000050 - 0000000000000053] System timer
- [0000000000000061 - 0000000000000061] Motherboard resources
- [0000000000000063 - 0000000000000063] Motherboard resources
- [0000000000000065 - 0000000000000065] Motherboard resources
- [0000000000000067 - 0000000000000067] Motherboard resources
- [0000000000000070 - 0000000000000070] Motherboard resources
- [0000000000000070 - 0000000000000077] System CMOS/real time clock
- [0000000000000078 - 0000000000000CF7] PCI Express Root Complex
- [0000000000000080 - 000000000000008F] Motherboard resources
- [0000000000000092 - 0000000000000092] Motherboard resources
- [00000000000000A0 - 00000000000000A1] Programmable interrupt controller
- [00000000000000A4 - 00000000000000A5] Programmable interrupt controller
- [00000000000000A8 - 00000000000000A9] Programmable interrupt controller
- [00000000000000AC - 00000000000000AD] Programmable interrupt controller
- [00000000000000B0 - 00000000000000B1] Programmable interrupt controller
- [00000000000000B2 - 00000000000000B3] Motherboard resources
- [00000000000000B4 - 00000000000000B5] Programmable interrupt controller
- [00000000000000B8 - 00000000000000B9] Programmable interrupt controller
- [00000000000000BC - 00000000000000BD] Programmable interrupt controller
- [0000000000000248 - 000000000000024F] Communications Port (COM1)
- [0000000000000258 - 000000000000025F] Communications Port (COM2)
- [00000000000003B0 - 00000000000003BB] Intel(R) HD Graphics
- [00000000000003C0 - 00000000000003DF] Intel(R) HD Graphics
- [0000000000000400 - 000000000000047F] Motherboard resources
- [00000000000004D0 - 00000000000004D1] Programmable interrupt controller
- [0000000000000500 - 00000000000005FE] Motherboard resources
- [0000000000000600 - 000000000000061F] Motherboard resources
- [0000000000000680 - 000000000000069F] Motherboard resources
- [0000000000000D00 - 000000000000FFFF] PCI Express Root Complex
- [000000000000164E - 000000000000164F] Motherboard resources
- [000000000000D000 - 000000000000DFFF] Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD9
- [000000000000E000 - 000000000000EFFF] Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD8
- [000000000000F000 - 000000000000F03F] Intel(R) HD Graphics
- [000000000000F040 - 000000000000F05F] Intel(R) Celeron(R)/Pentium(R) Processor SMBUS - 5AD4
- [000000000000F060 - 000000000000F07F] Standard SATA AHCI Controller
- [000000000000F080 - 000000000000F083] Standard SATA AHCI Controller
- [000000000000F090 - 000000000000F097] Standard SATA AHCI Controller

3.5 Interrupt Controller (IRQ) Map

The interrupt controller (IRQ) mapping list is shown as follows:

Interrupt request (IRQ)

(ISA) 0x00000000 (00)	System timer
(ISA) 0x00000008 (08)	High precision event timer
(ISA) 0x0000000A (10)	Communications Port (COM1)
(ISA) 0x0000000B (11)	Communications Port (COM2)
(ISA) 0x0000000E (14)	Intel(R) Serial IO GPIO Host Controller - INT3452
(ISA) 0x0000000E (14)	Intel(R) Serial IO GPIO Host Controller - INT3452
(ISA) 0x0000000E (14)	Intel(R) Serial IO GPIO Host Controller - INT3452
(ISA) 0x0000000E (14)	Intel(R) Serial IO GPIO Host Controller - INT3452
(ISA) 0x00000036 (54)	Microsoft ACPI-Compliant System
(ISA) 0x00000037 (55)	Microsoft ACPI-Compliant System
(ISA) 0x00000038 (56)	Microsoft ACPI-Compliant System
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(ISA) 0x0000003B (59)	Microsoft ACPI-Compliant System
(ISA) 0x0000003C (60)	Microsoft ACPI-Compliant System
(ISA) 0x0000003D (61)	Microsoft ACPI-Compliant System
(ISA) 0x0000003E (62)	Microsoft ACPI-Compliant System
(ISA) 0x0000003F (63)	Microsoft ACPI-Compliant System
(ISA) 0x00000040 (64)	Microsoft ACPI-Compliant System
(ISA) 0x00000041 (65)	Microsoft ACPI-Compliant System
(ISA) 0x00000042 (66)	Microsoft ACPI-Compliant System
(ISA) 0x00000043 (67)	Microsoft ACPI-Compliant System
(ISA) 0x00000044 (68)	Microsoft ACPI-Compliant System
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(ISA) 0x00000046 (70)	Microsoft ACPI-Compliant System
(ISA) 0x00000047 (71)	Microsoft ACPI-Compliant System
(ISA) 0x00000048 (72)	Microsoft ACPI-Compliant System
(ISA) 0x00000049 (73)	Microsoft ACPI-Compliant System
(ISA) 0x0000004A (74)	Microsoft ACPI-Compliant System
(ISA) 0x0000004B (75)	Microsoft ACPI-Compliant System
(ISA) 0x0000004C (76)	Microsoft ACPI-Compliant System
(ISA) 0x0000004D (77)	Microsoft ACPI-Compliant System
(ISA) 0x0000004E (78)	Microsoft ACPI-Compliant System
(ISA) 0x0000004F (79)	Microsoft ACPI-Compliant System
(ISA) 0x00000050 (80)	Microsoft ACPI-Compliant System
(ISA) 0x00000051 (81)	Microsoft ACPI-Compliant System
(ISA) 0x00000052 (82)	Microsoft ACPI-Compliant System
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(ISA) 0x00000054 (84)	Microsoft ACPI-Compliant System
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(ISA) 0x00000059 (89)	Microsoft ACPI-Compliant System
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(ISA) 0x00000068 (104)	Microsoft ACPI-Compliant System
(ISA) 0x00000069 (105)	Microsoft ACPI-Compliant System
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(ISA) 0x000000CB (203) Microsoft ACPI-Compliant System
(ISA) 0x000000CC (204) Microsoft ACPI-Compliant System
(ISA) 0x00000100 (256) Microsoft ACPI-Compliant System
(ISA) 0x00000101 (257) Microsoft ACPI-Compliant System
(ISA) 0x00000102 (258) Microsoft ACPI-Compliant System
(ISA) 0x00000103 (259) Microsoft ACPI-Compliant System
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(ISA) 0x000001FD (509) Microsoft ACPI-Compliant System
(ISA) 0x000001FE (510) Microsoft ACPI-Compliant System
(ISA) 0x000001FF (511) Microsoft ACPI-Compliant System
(PCI) 0x00000003 (03) Intel SD Host Controller
(PCI) 0x00000019 (25) High Definition Audio Controller
(PCI) 0x00000027 (39) Intel SD Host Controller
(PCI) 0x0000002A (42) Intel SD Host Controller
(PCI) 0x00000400 (1024) Intel SD Host Controller
(PCI) 0xFFFFFFEC (-20) Intel(R) I211 Gigabit Network Connection #2
(PCI) 0xFFFFFFED (-19) Intel(R) I211 Gigabit Network Connection #2
(PCI) 0xFFFFFFEE (-18) Intel(R) I211 Gigabit Network Connection #2
(PCI) 0xFFFFFFEF (-17) Intel(R) I211 Gigabit Network Connection #2
(PCI) 0xFFFFFFF0 (-16) Intel(R) I211 Gigabit Network Connection #2
(PCI) 0xFFFFFFF1 (-15) Intel(R) I211 Gigabit Network Connection #2
(PCI) 0xFFFFFFF2 (-14) Intel(R) I211 Gigabit Network Connection
(PCI) 0xFFFFFFF3 (-13) Intel(R) I211 Gigabit Network Connection

(PCI) 0xFFFFFFF4 (-12) Intel(R) I211 Gigabit Network Connection
(PCI) 0xFFFFFFF5 (-11) Intel(R) I211 Gigabit Network Connection
(PCI) 0xFFFFFFF6 (-10) Intel(R) I211 Gigabit Network Connection
(PCI) 0xFFFFFFF7 (-9) Intel(R) I211 Gigabit Network Connection
(PCI) 0xFFFFFFF8 (-8) Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
(PCI) 0xFFFFFFF9 (-7) Intel(R) Trusted Execution Engine Interface
(PCI) 0xFFFFFFFA (-6) Intel(R) HD Graphics
(PCI) 0xFFFFFFFB (-5) Standard SATA AHCI Controller
(PCI) 0xFFFFFFFC (-4) Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD6
(PCI) 0xFFFFFFFD (-3) Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD9
(PCI) 0xFFFFFFFE (-2) Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD8

3.6 Memory Map

The memory mapping list is shown as follows:

Memory
[000000000000A0000 - 000000000000BFFFF] Intel(R) HD Graphics
[000000000000A0000 - 000000000000BFFFF] PCI Express Root Complex
[000000000000C0000 - 000000000000DFFFF] PCI Express Root Complex
[000000000000E0000 - 000000000000FFFFF] PCI Express Root Complex
[000000007B800001 - 000000007BFFFFFF] PCI Express Root Complex
[000000007C000001 - 000000007FFFFFFF] PCI Express Root Complex
[0000000080000000 - 000000008FFFFFFF] Intel(R) HD Graphics
[0000000080000000 - 000000008CFFFFFF] PCI Express Root Complex
[0000000090000000 - 0000000090FFFFFF] Intel(R) HD Graphics
[0000000091000000 - 0000000091 0FFFFF] High Definition Audio Controller
[0000000091100000 - 0000000091 1FFFFF] Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD9
[000000009 11DC000 - 000000009 11DFFFF] Intel(R) I211 Gigabit Network Connection #2
[000000009 11E0000 - 000000009 11FFFFF] Intel(R) I211 Gigabit Network Connection #2
[0000000091200000 - 0000000091 2FFFFF] Intel(R) Celeron(R)/Pentium(R) Processor PCI Express Root Port - 5AD8
[000000009 12DC000 - 000000009 12DFFFF] Intel(R) I211 Gigabit Network Connection
[000000009 12E0000 - 000000009 12FFFFF] Intel(R) I211 Gigabit Network Connection
[0000000091300000 - 000000009 130FFFF] Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
[0000000091310000 - 000000009 1313FFF] High Definition Audio Controller
[0000000091314000 - 000000009 1315FFF] Standard SATA AHCI Controller
[0000000091316000 - 000000009 13160FF] Intel(R) Celeron(R)/Pentium(R) Processor SMBUS - 5AD4
[0000000091317000 - 000000009 1317FFF] Intel SD Host Controller
[0000000091318000 - 000000009 1318FFF] Intel SD Host Controller
[0000000091319000 - 000000009 1319FFF] Intel SD Host Controller
[000000009131A000 - 000000009 131AFFF] Intel SD Host Controller
[000000009131B000 - 000000009 131BFFF] Intel SD Host Controller
[000000009131C000 - 000000009 131CFFF] Intel SD Host Controller
[000000009131D000 - 000000009 131D7FF] Standard SATA AHCI Controller
[000000009131E000 - 000000009 131E0FF] Standard SATA AHCI Controller
[0000000091321000 - 000000009 1321FFF] Intel(R) Trusted Execution Engine Interface
[00000000D0C00000 - 00000000D0C00653] Intel(R) Serial IO GPIO Host Controller - INT3452
[00000000D0C40000 - 00000000D0C40763] Intel(R) Serial IO GPIO Host Controller - INT3452
[00000000D0C50000 - 00000000D0C5076B] Intel(R) Serial IO GPIO Host Controller - INT3452
[00000000D0C70000 - 00000000D0C70673] Intel(R) Serial IO GPIO Host Controller - INT3452
[00000000E0000000 - 00000000EFFFFFFF] Motherboard resources
[00000000E0000000 - 00000000EFFFFFFF] PCI Express Root Complex
[00000000FEA00000 - 00000000FEAFFFFF] Motherboard resources
[00000000FED00000 - 00000000FED003FF] High precision event timer
[00000000FED01000 - 00000000FED01FFF] Motherboard resources
[00000000FED03000 - 00000000FED03FFF] Motherboard resources
[00000000FED06000 - 00000000FED06FFF] Motherboard resources
[00000000FED08000 - 00000000FED09FFF] Motherboard resources
[00000000FED1C000 - 00000000FED1CFFF] Motherboard resources
[00000000FED40000 - 00000000FED44FFF] Trusted Platform Module 2.0
[00000000FED80000 - 00000000FEDBFFFF] Motherboard resources
[00000000FEE00000 - 00000000FEEFFFFF] Motherboard resources

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Chapter 4
AMI BIOS Setup Utility

The AMI UEFI BIOS provides users with a built-in setup program to modify basic system configuration. All configured parameters are stored in a flash chip to save the setup information whenever the power is turned off. This chapter provides users with detailed description about how to set up basic system configuration through the AMI BIOS setup utility.

4.1 Starting

To enter the setup screens, follow the steps below:

1. Turn on the computer and press the <Del> key immediately.
2. After you press the <Del> key, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as the Advanced and Chipset menus.

Note

If your computer cannot boot after making and saving system changes with BIOS setup, you can restore BIOS optimal defaults by setting JP2 (see section 2.3.2).

It is strongly recommended that you should avoid changing the chipset’s defaults. Both AMI and your system manufacturer have carefully set up these defaults that provide the best performance and reliability.

4.2 Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.

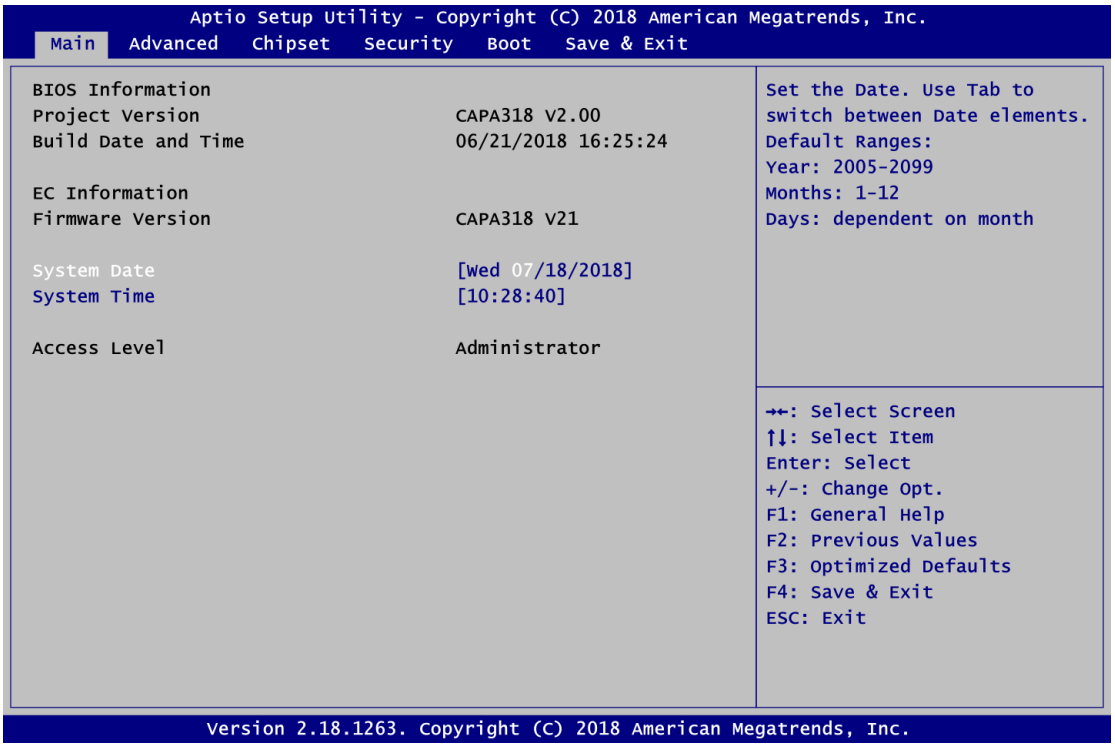
Note

Some of the navigation keys differ from one screen to another.

Hot Keys	Description
→← Left/Right	The Left and Right <Arrow> keys allow you to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow you to select a setup screen or sub-screen.
+– Plus/Minus	The Plus and Minus <Arrow> keys allow you to change the field value of a particular setup item.
Tab	The <Tab> key allows you to select setup fields.
F1	The <F1> key allows you to display the General Help screen.
F2	The <F2> key allows you to Load Previous Values.
F3	The <F3> key allows you to Load Optimized Defaults.
F4	The <F4> key allows you to save any changes you have made and exit Setup. Press the <F4> key to save your changes.
Esc	The <Esc> key allows you to discard any changes you have made and exit the Setup. Press the <Esc> key to exit the setup without saving your changes.
Enter	The <Enter> key allows you to display or change the setup option listed for a particular setup item. The <Enter> key can also allow you to display the setup sub- screens.

4.3 Main Menu

When you first enter the setup utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is shown below.



- **BIOS and EC Information**
  Display BIOS and EC firmware information.

- **System Date/Time**
  Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

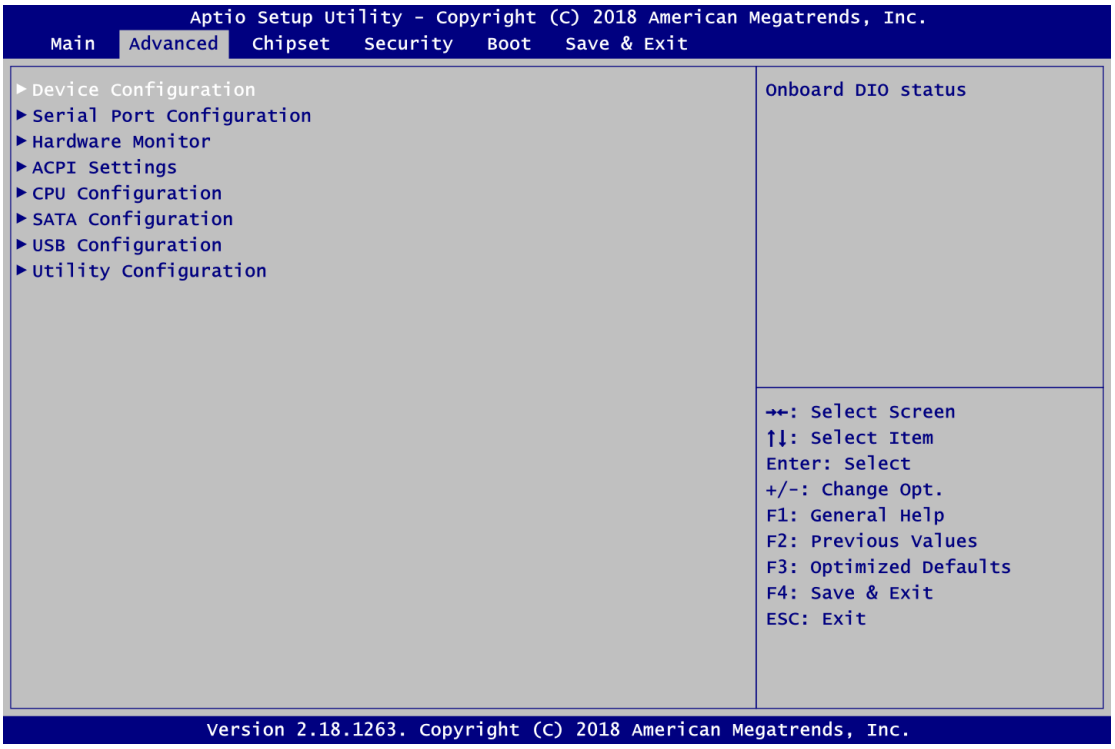
- **Access Level**
  Display the access level of current user.

4.4 Advanced Menu

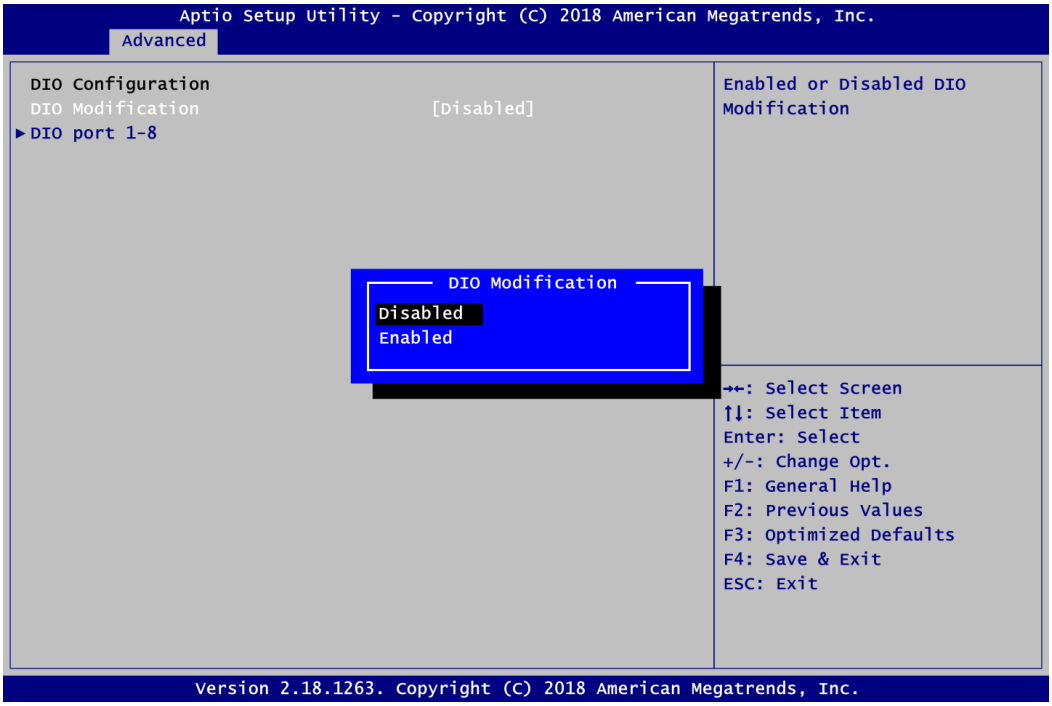
The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

- ► Device Configuration
- ► Serial Port Configuration
- ► Hardware Monitor
- ► ACPI Settings
- ► CPU Configuration
- ► SATA Configuration
- ► USB Configuration
- ► Utility Configuration

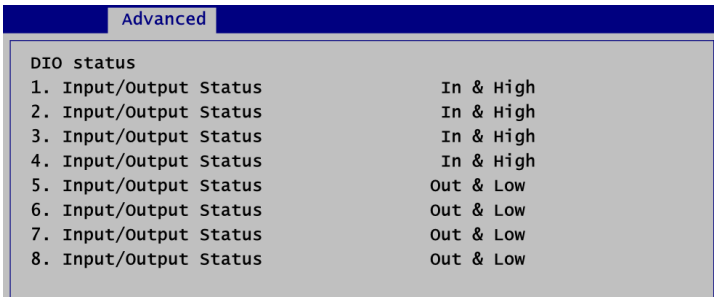
For items marked with "►", please press <Enter> for more options.



- **Device Configuration**
  A description of selected item appears on the right side of the screen. For items marked with "►", please press <Enter> for more options.



DIO Modification
Enable or disable digital I/O modification. The default is disabled. Once it is enabled, you can load manufacture default and access to the DIO status sub screen to set output or input.



Load Manufacture Default
Use this option to load default settings.

DIO port 1-8
Select this option to open DIO status sub screen to set output or input for each port.

- **DIO Status**
  DIO Status sub screen.

```
Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
Advanced

DIO Status                                  Input/Output Setting
1. Input/Output Status          Out & High
   Input/Output Setting         [Output]
   High/Low Setting             [High]
2. Input/Output Status           In & High
   Input/Output Setting         [Input]
3. Input/Output Status          Out & High
   Input/Output Setting         [Output]
   High/Low Setting             [High]
4. Input/Output Status           In & High
   Input/Output Setting         [Input]
5. Input/Output Status          Out & High
   Input/Output Setting         [Output]
   High/Low Setting             [High]
6. Input/Output Status          In & High
   Input/Output Setting         [Input]
7. Input/Output Status          Out & High
   Input/Output Setting         [Output]
   High/Low Setting             [High]
8. Input/Output Status           In & High
   Input/Output Setting         [Input]

                                            →←: Select Screen
                                            ↑↓: Select Item
                                            Enter: Select
                                            +/-: Change Opt.
                                            F1: General Help
                                            F2: Previous Values
                                            F3: Optimized Defaults
                                            F4: Save & Exit
                                            ESC: Exit

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```
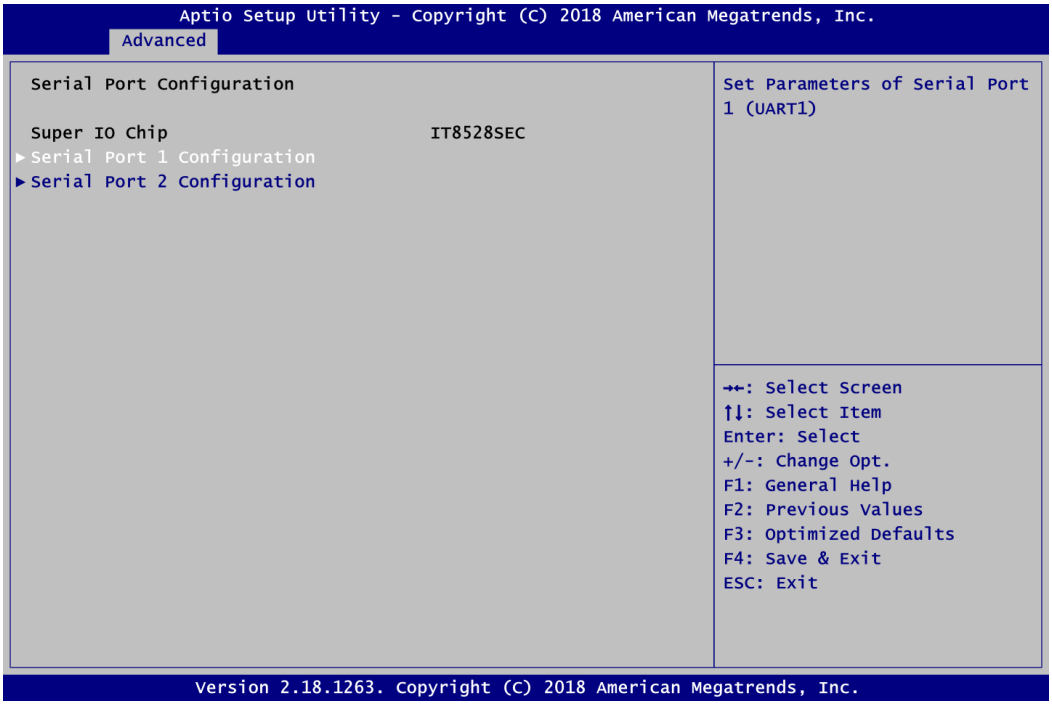
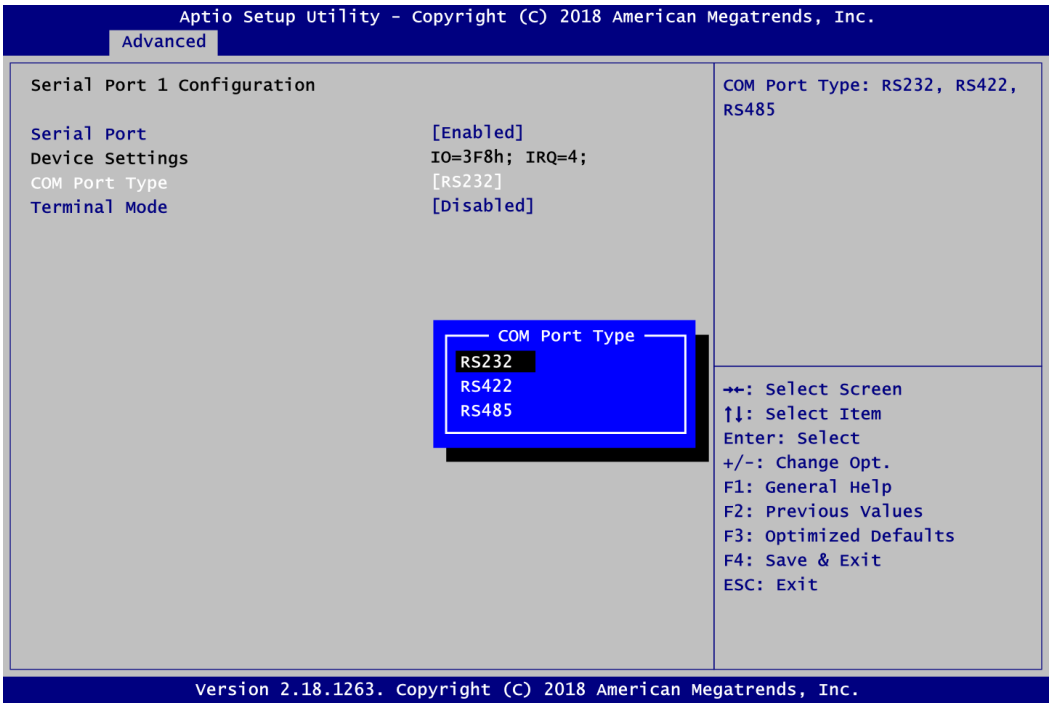

- **Serial Port Configuration**
  You can use this screen to select options for the Serial Port Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "►", please press <Enter> for more options.

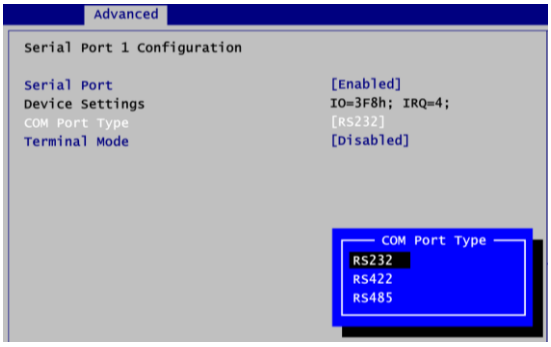


Serial Port 1~2 Configuration
Use these items to set parameters related to serial port 1~2.

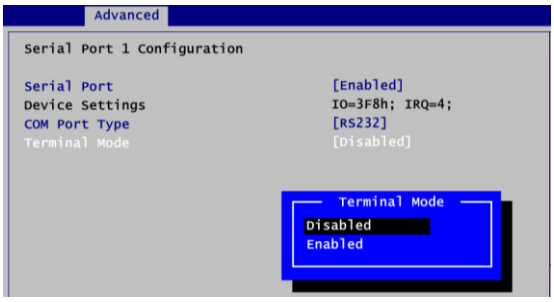
- **Serial Port 1 Confuguration**



Serial Port
Enable or disable serial port 1. The optimal setting for base I/O address is 3F8h and for interrupt request address is IRQ4.

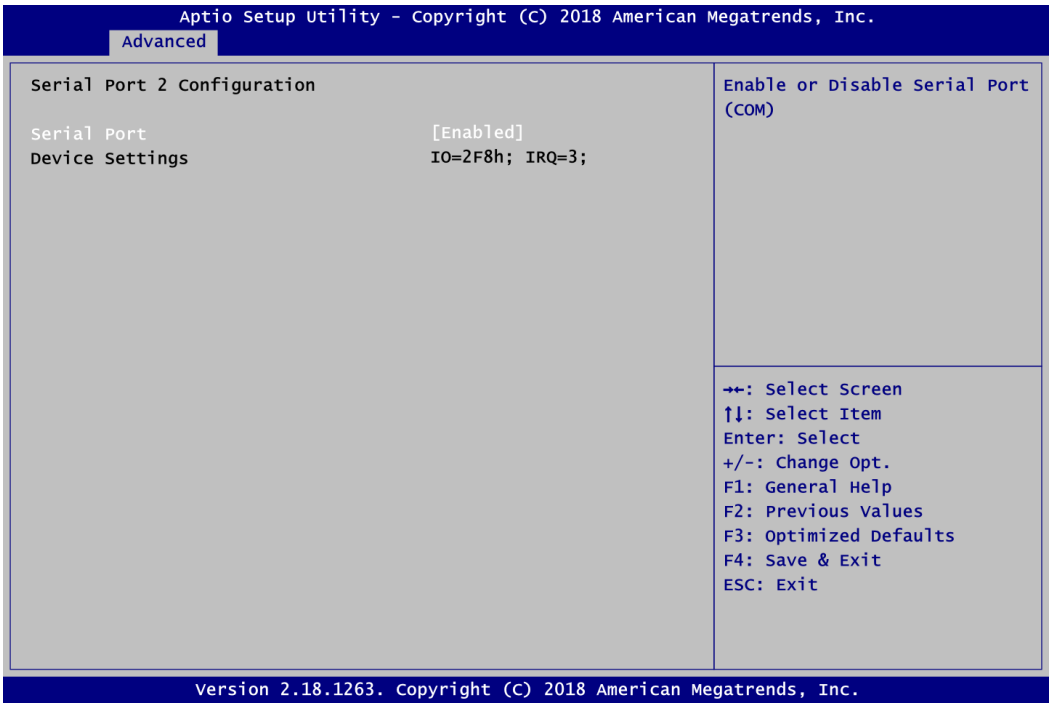


COM Port Type
Use this item to set RS-232/422/485 communication mode.



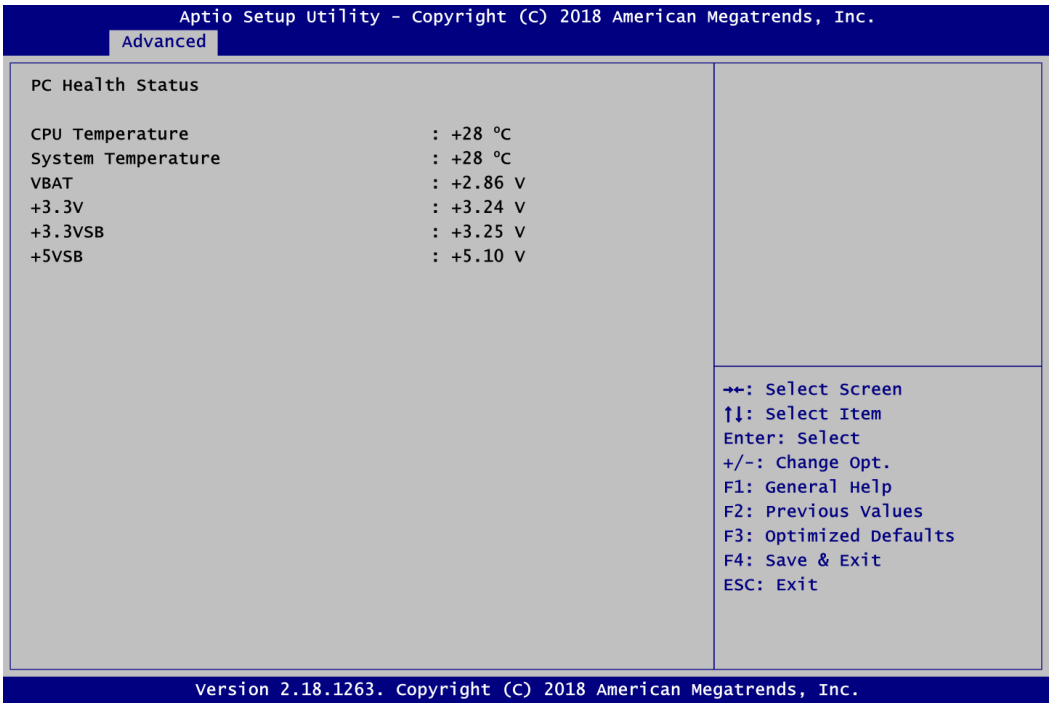
Terminal Mode
Enable terminal mode to enable the RS-422/485 termination resistor to enhance the signal.

- **Serial Port 2 Configuration**



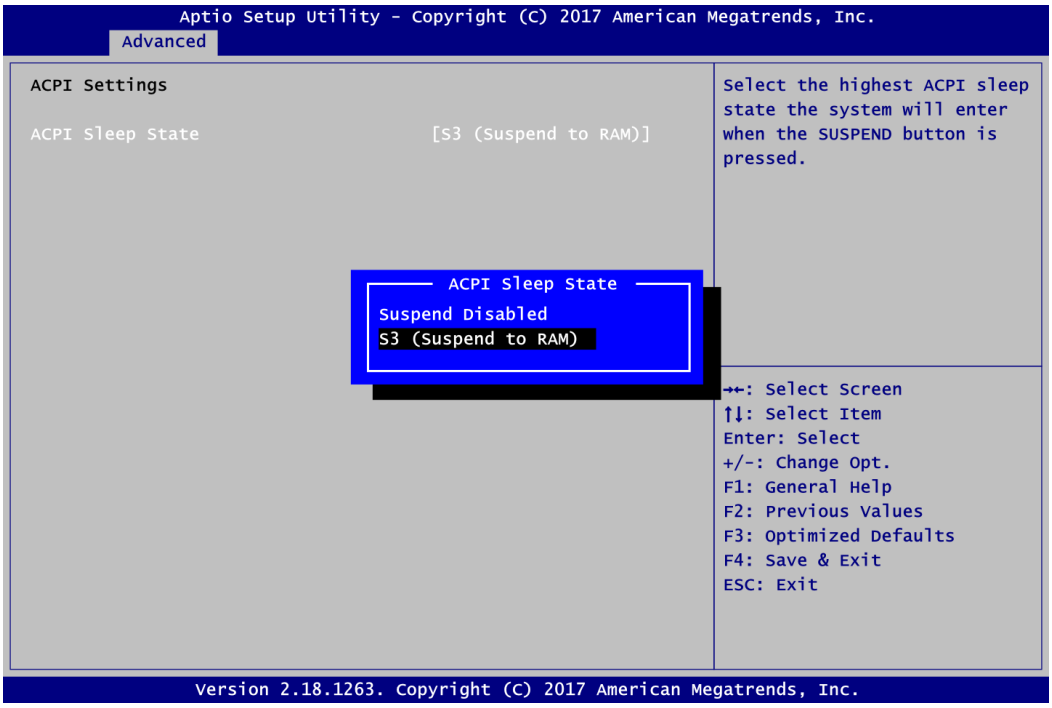
Serial Port
Enable or disable serial port 2. The optimal setting for base I/O address is 2F8h and for interrupt request address is IRQ3.

- **Hardware Monitor**
  This screen monitors hardware health status.



This screen displays the temperature of system and CPU, and system voltages (VBAT, +3.3V, +3.3VSB and +5VSB).

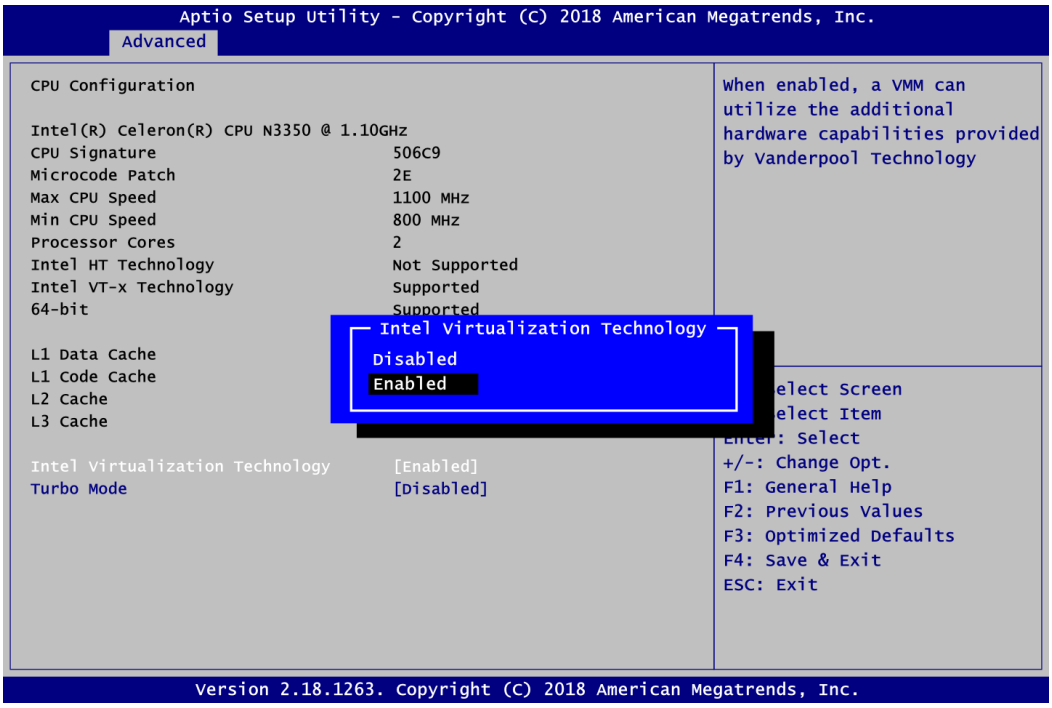
- **ACPI Settings**



ACPI Sleep State

Select the ACPI (Advanced Configuration and Power Interface) sleep state. Configuration options are Suspend Disabled and S3 (Suspend to RAM). The S3 (Suspend to RAM) option selects ACPI sleep state the system will enter when suspend button is pressed.

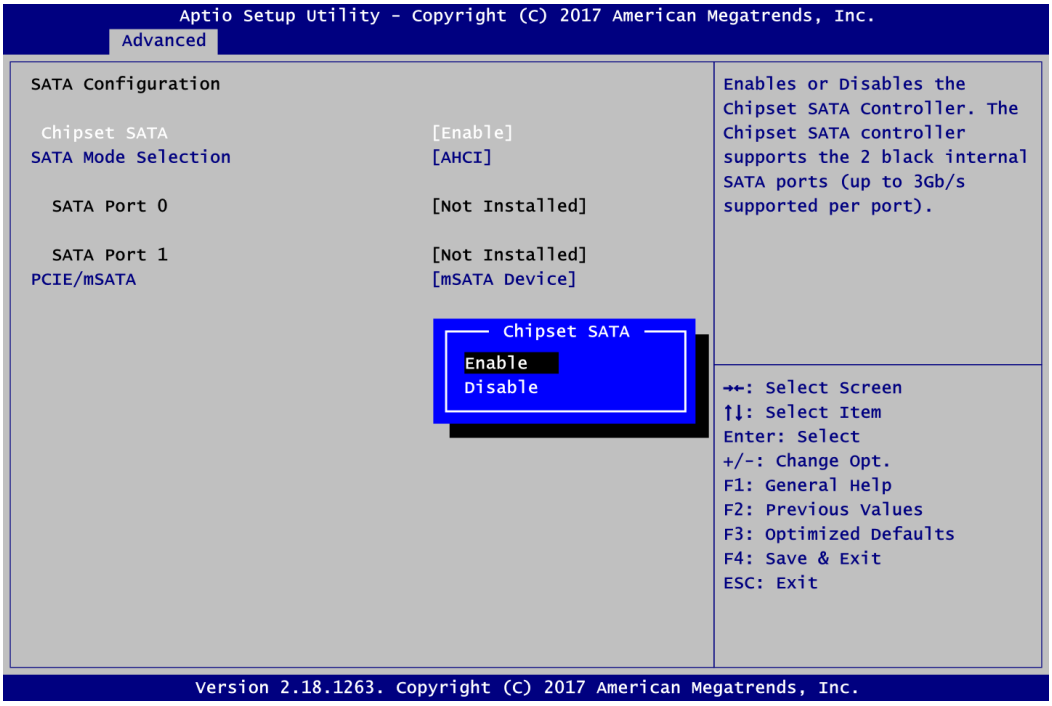
- **CPU Configuration**
  This screen shows the CPU Configuration.



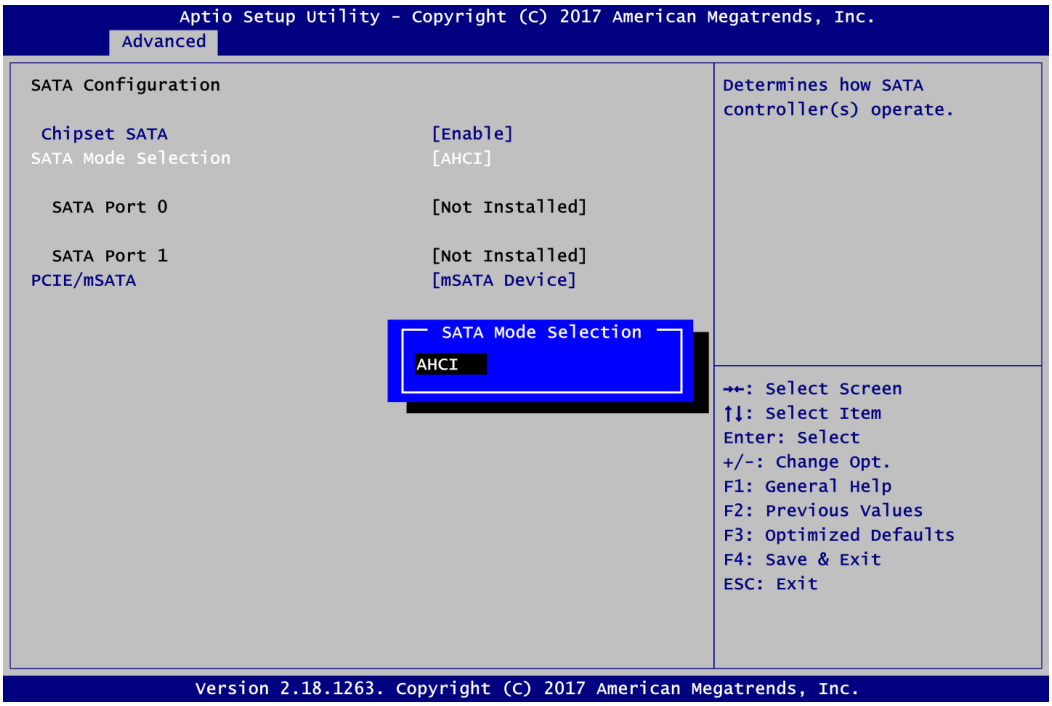
Intel Virtualization Technology
Enable or disable Intel Virtualization Technology. When enabled, a VMM (Virtual Machine Mode) can utilize the additional hardware capabilities. It allows a platform to run multiple operating systems and applications independently, hence enabling a computer system to work as several virtual systems.

Turbo Mode
Enable or disable turbo mode.

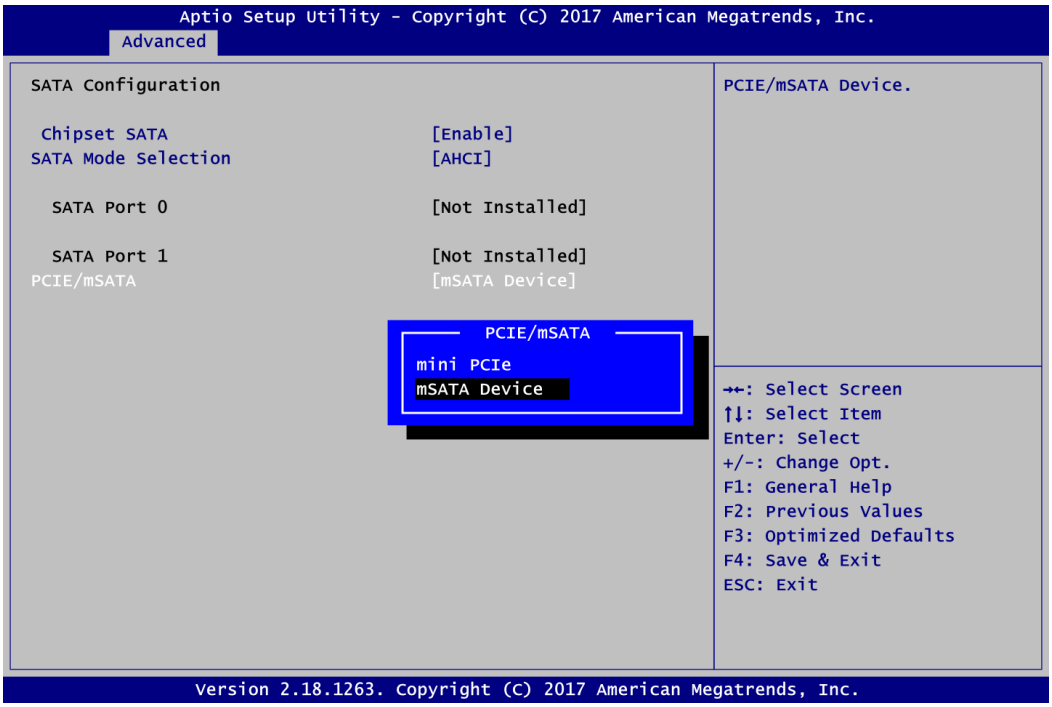
- **SATA Configuration**
  In the SATA Configuration menu, you can see the currently installed hardware in the SATA ports. During system boot up, the BIOS automatically detects the presence of SATA devices.



Chipset SATA
Enable or disable Chipset SATA Controller. The default is Enable.



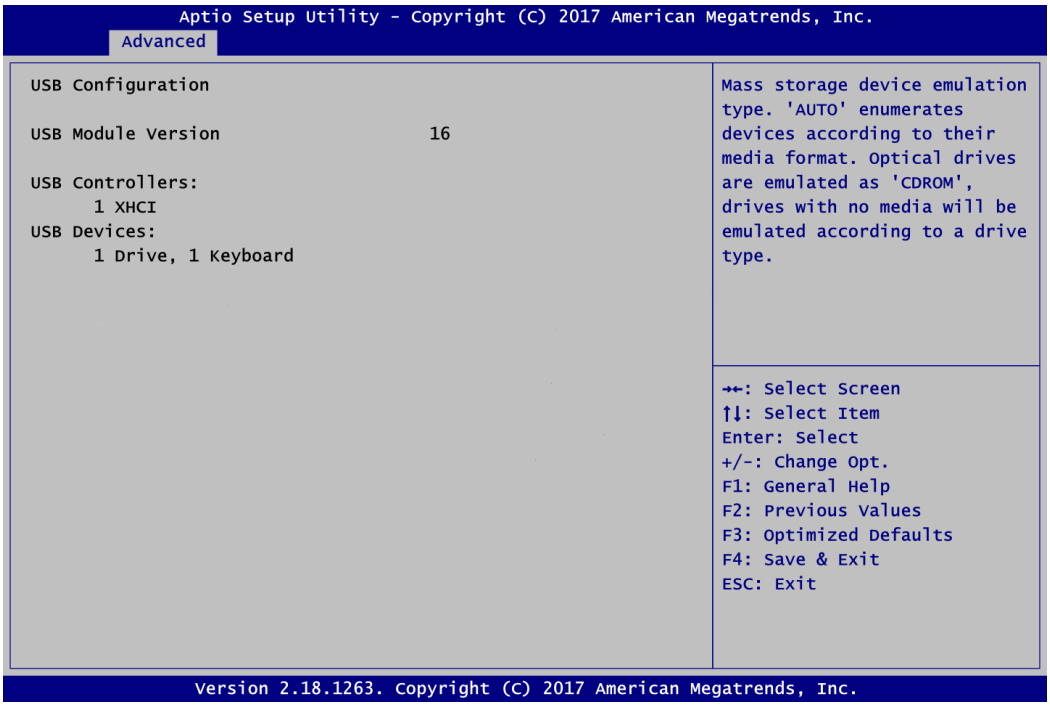
SATA Mode Selection
Determine how SATA controller(s) operate.



PCIE/mSATA

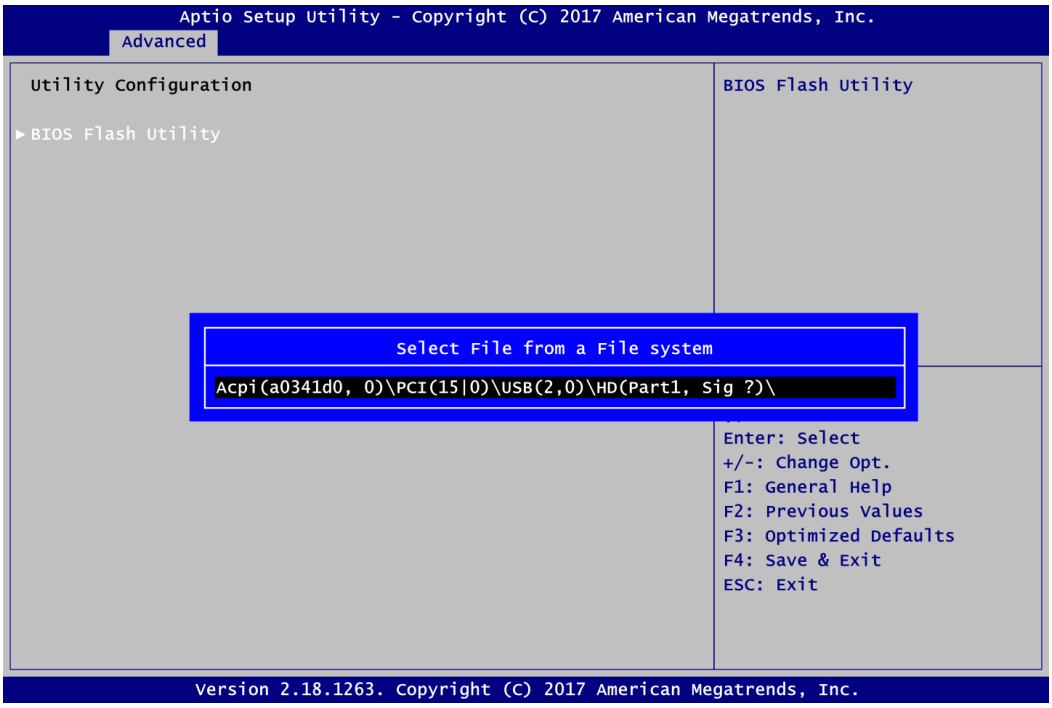
Choose PCIE or mSATA for PCI-Express Mini Card. The default is mSATA. If PCI-Express Mini Card is needed to insert to SCN1 (see section 2.4.19), please change setting to PCIE.

- **USB Configuration**



USB Devices
Display all detected USB devices.

- **Utility Configuration**



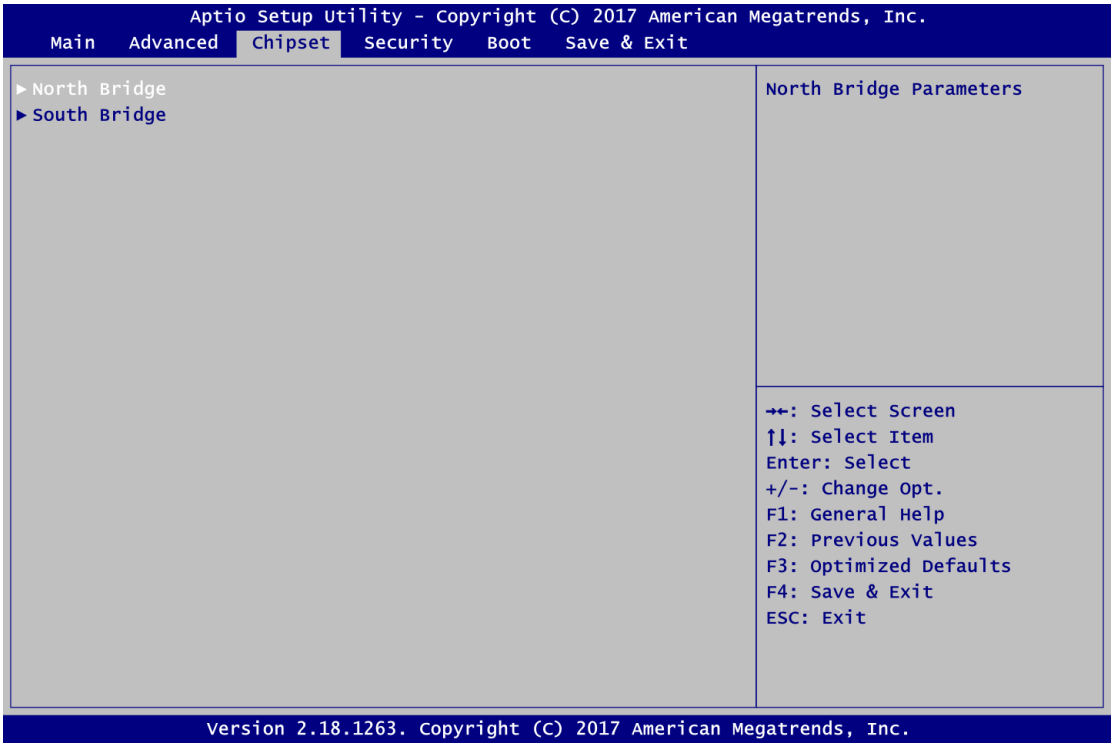
BIOS Flash Utility
BIOS flash utility configuration. For more detailed information, please refer to Appendix C.

4.5 Chipset Menu

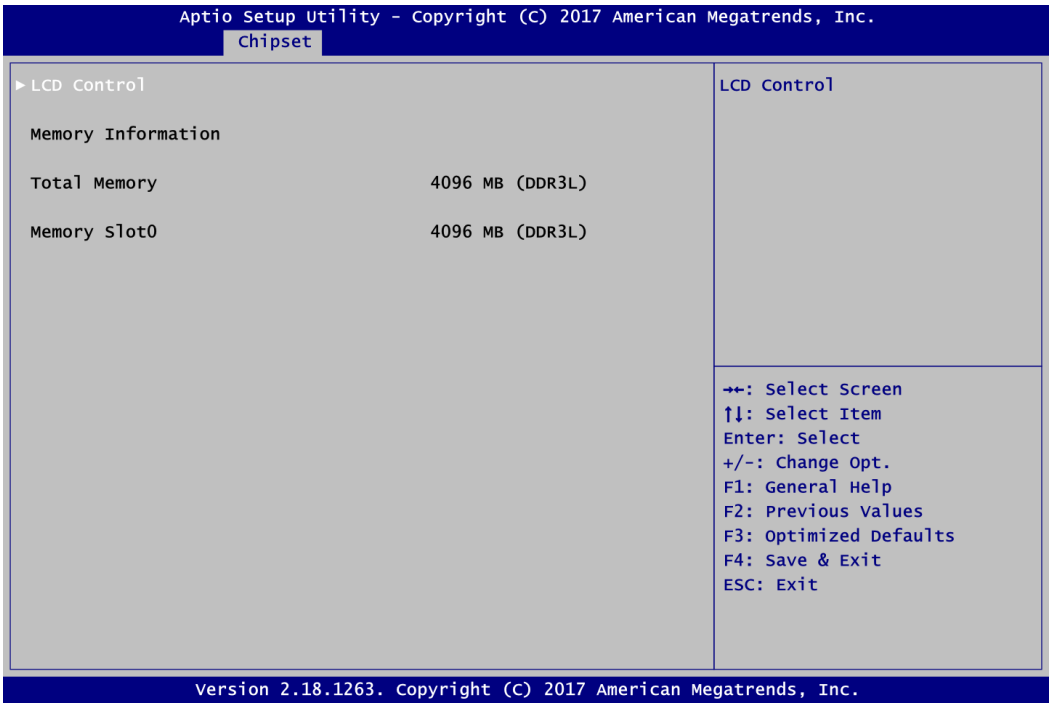
The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

- ► North Bridge
- ► South Bridge

For items marked with "►", please press <Enter> for more options.

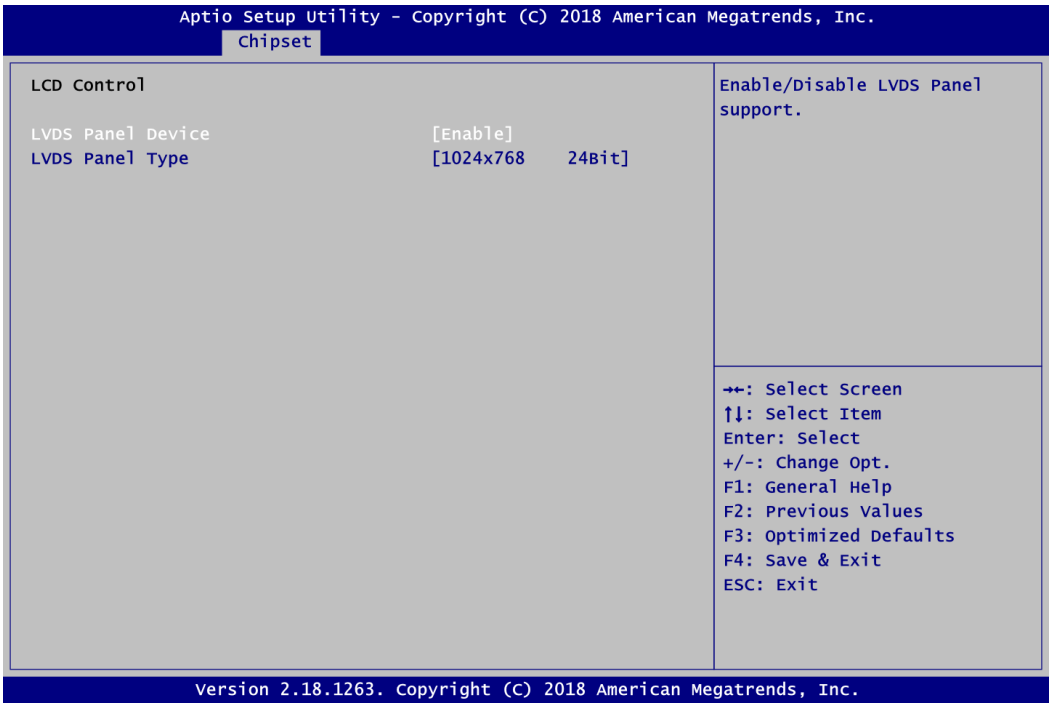


- **North Bridge**
  This screen allows users to configure parameters of North Bridge chipset.

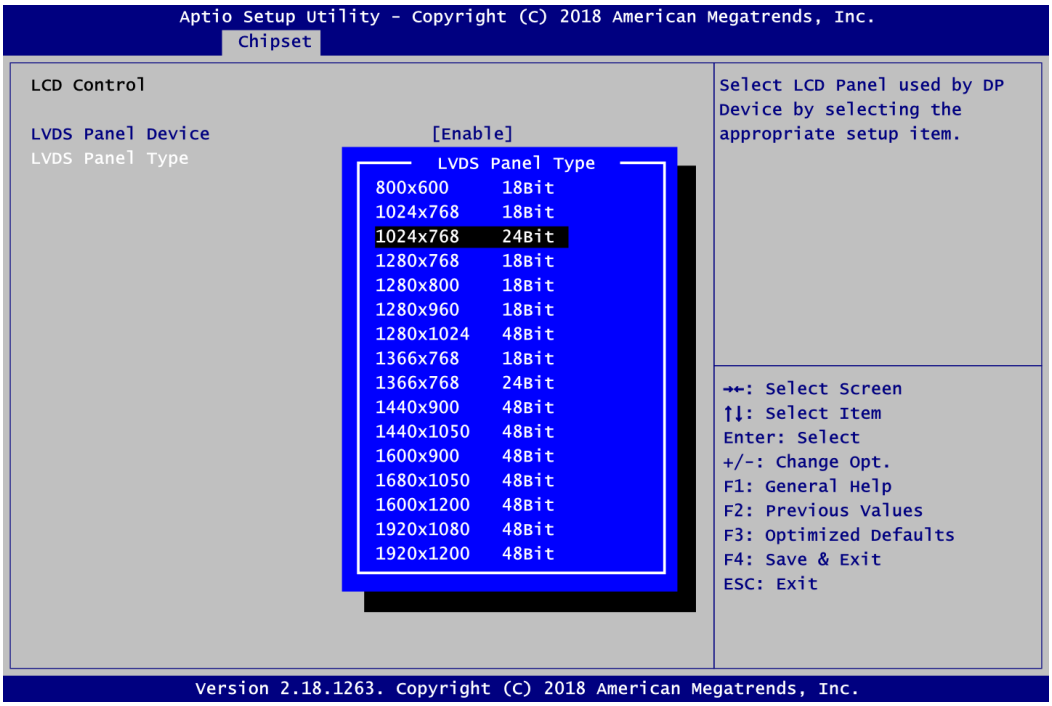


LCD Control
This item allows you to select LCD panel control options. Please press <Enter> to go to the sub menus.

Memory Information
Display system memory information.

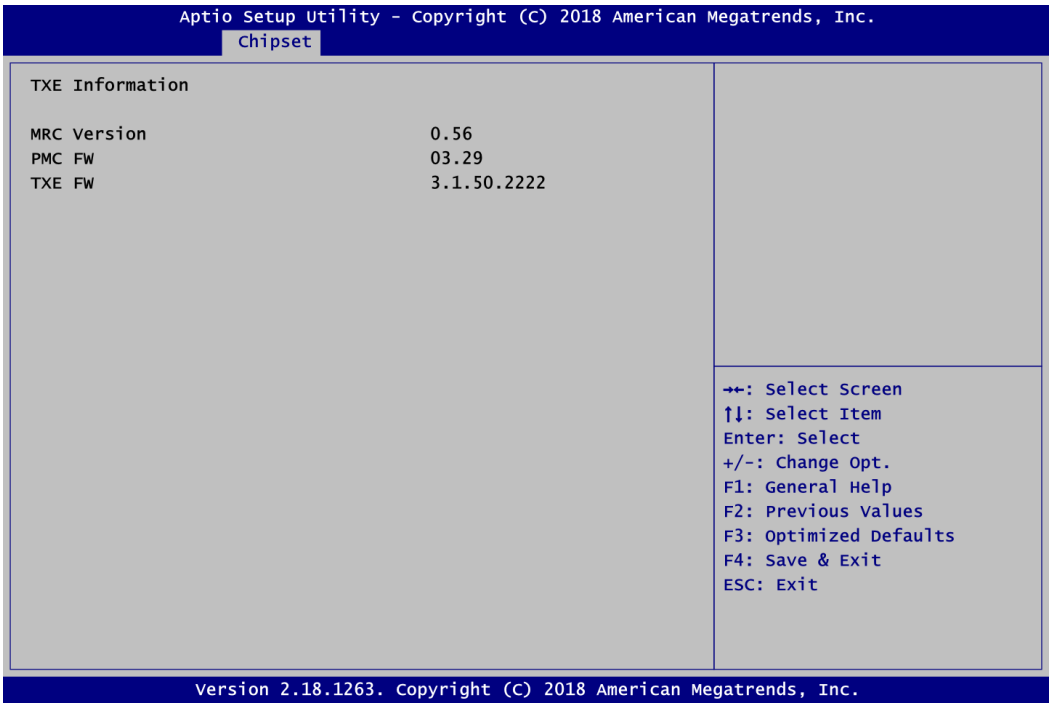


LVDS Panel Device
Enable or disable LVDS panel device.



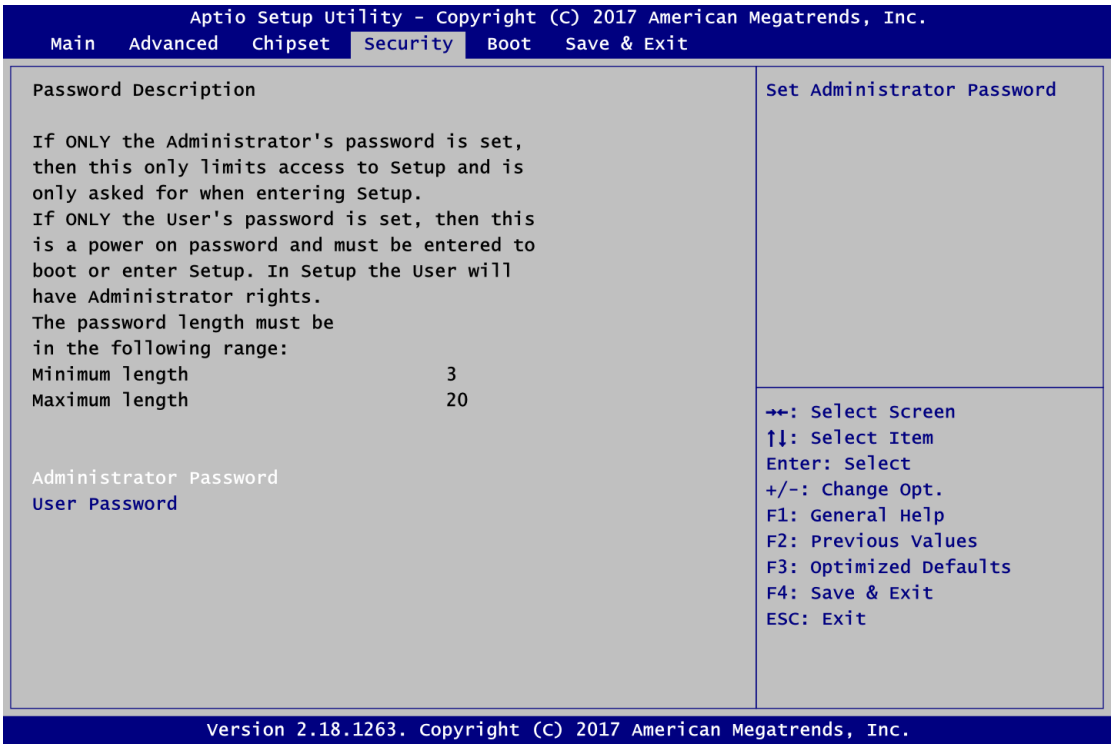
LVDS Panel Type
Select LVDS panel resolution for the display device by selecting the appropriate setup item.

- **South Bridge**
  This screen shows the information of South Bridge chipset.



4.6 Security Menu

The Security menu allows users to change the security settings for the system.

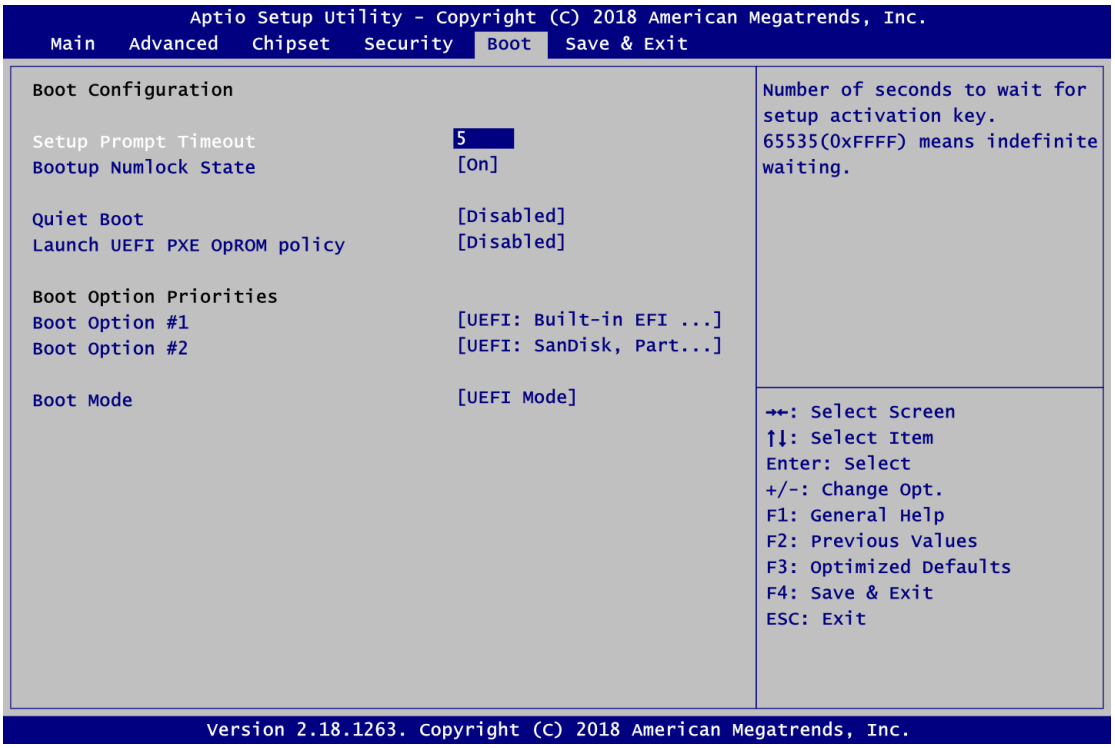


- **Administrator Password**
  This item indicates whether an administrator password has been set (installed or uninstalled).

- **User Password**
  This item indicates whether an user password has been set (installed or uninstalled).

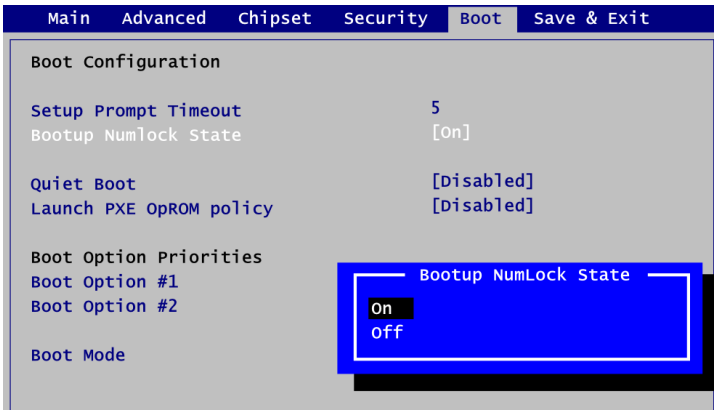
4.7 Boot Menu

The Boot menu allows users to change boot options of the system.

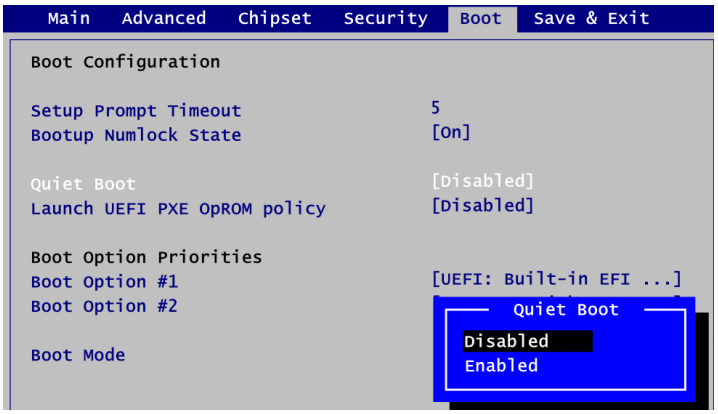


- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

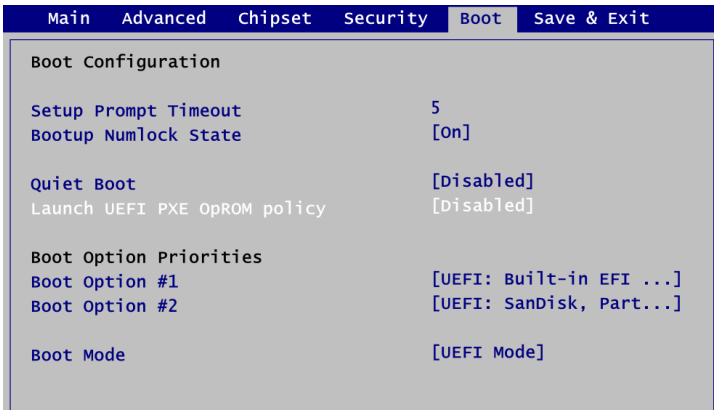
- **Bootup NumLock State**
  Use this item to select the power-on state for the keyboard NumLock.



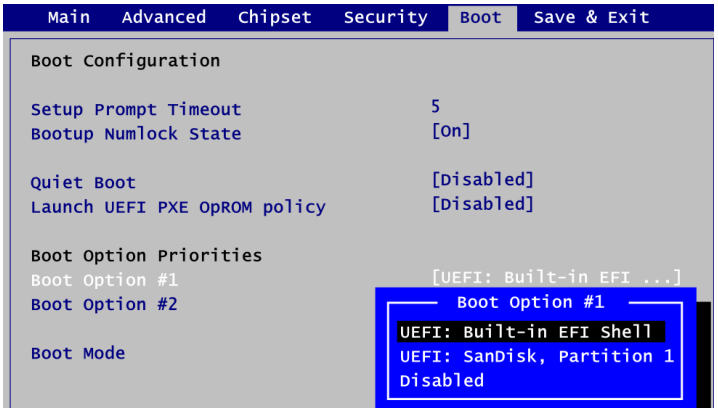
- **Quiet Boot**
  Select to display either POST output messages or a splash screen during boot-up.



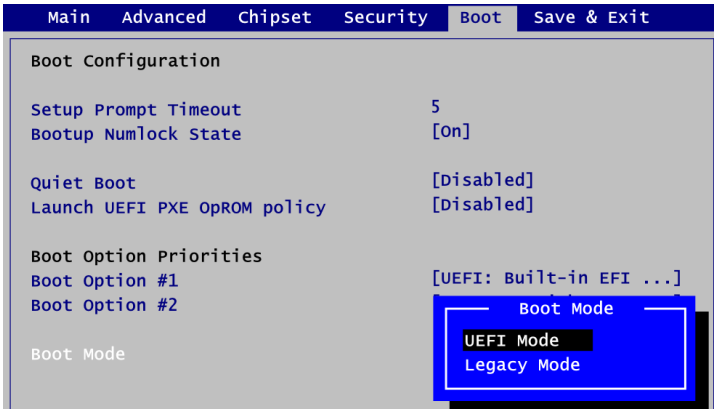
- **Launch UEFI PXE OpROM**
  Control the execution of UEFI PXE OpROM.

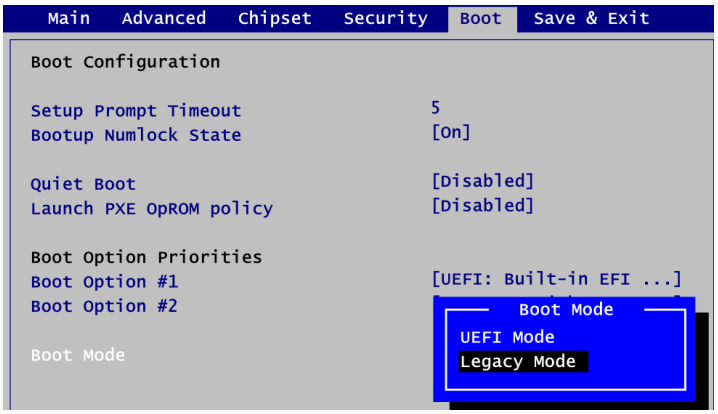


- **Boot Option Priorities**
  These are settings for boot priority. Specify the boot device priority sequence from the available devices.

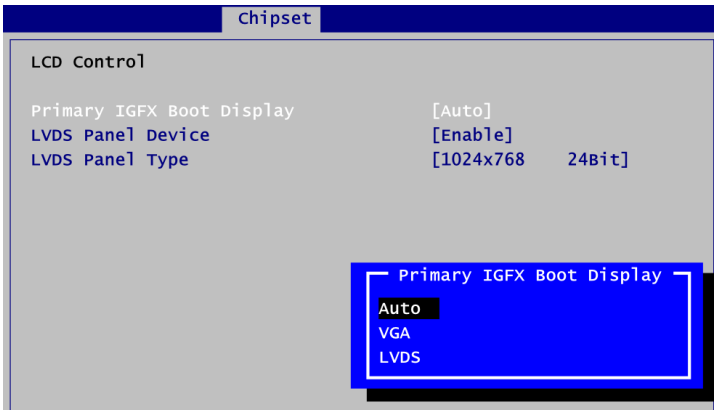


- **Boot Mode**
  Use this item for boot mode settings.
  - UEFI Boot: Select support to boot any UEFI-capable OS.
  - Legacy Boot: Select support to boot non UEFI-capable OS that expects a legacy BIOS interface.



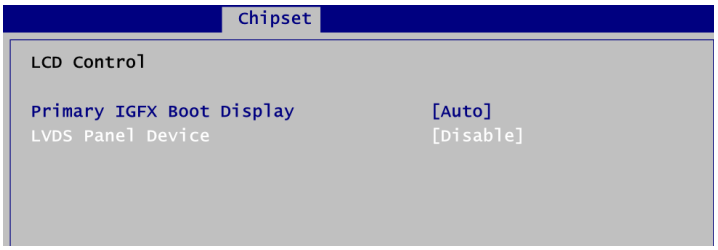


Note that the Primary IGFX Boot Display option appears only if Legacy Mode is selected, see image below.



Primary IGFX Boot Display

Select the video device which will be activated during POST (Power-On Self Test). The following image shows the option list when LVDS Panel Device is disabled.



4.8 Save & Exit Menu

The Save & Exit menu allows users to load your system configuration with optimal or fail-safe default values.

```
Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
Main   Advanced   Chipset   Security   Boot   Save & Exit

Save Options                                   Exit system setup after saving
Save Changes and Exit                          the changes.
Discard Changes and Exit

Save Changes and Reset
Discard Changes and Reset

Save Changes
Discard Changes

Default Options
Restore Defaults                               →←: Select Screen
Save as User Defaults                          ↑↓: Select Item
Restore User Defaults                          Enter: Select
                                               +/-: Change Opt.
Boot Override                                  F1: General Help
UEFI: Built-in EFI Shell                       F2: Previous Values
UEFI: Ut163 TS1GJFV10 0.00, Partition 1        F3: Optimized Defaults
Ut163 TS1GJFV10 0.00                           F4: Save & Exit
                                               ESC: Exit

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```

- **Save Changes and Exit**
  When you have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.

- **Discard Changes and Exit**
  Select this option to quit Setup without making any permanent changes to the system configuration and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.

- **Save Changes and Reset**
  When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.

- **Discard Changes and Reset**
  Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

- **Save Changes**
  When you have completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

- **Discard Changes**
  Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.

- **Restore Defaults**
  It automatically sets all Setup options to a complete set of default settings when you select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.

- **Save as User Defaults**
  Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.

- **Restore User Defaults**
  It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.

- **Boot Override**
  Select a drive to immediately boot that device regardless of the current boot order.

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Appendix A
Watchdog Timer

A.1 About Watchdog Timer

After the system stops working for a while, it can be auto-reset by the watchdog timer. The integrated watchdog timer can be set up in the system reset mode by program.

A.2 How to Use Watchdog Timer

Assembly sample code :

```
mov     dx,fa10         ; 5 seconds (Maximum is 65535 seconds; fill in
                        ; 0xFA10 and 0xFA11 register, ex: 0xFA11=0x01,
                        ; 0xFA10=0x68 means 360 seconds)
mov     al,05
out     dx,al

mov     dx,fa12         ; Enable WDT
mov     al,01
out     dx,al
```

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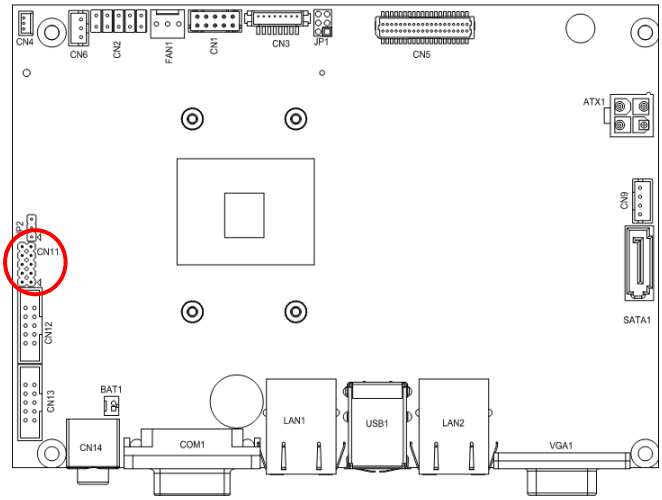
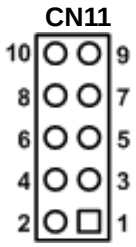
Appendix B
Digital I/O

B.1 About Digital I/O

The onboard GPIO or digital I/O has 8 bits (DIO1~8). Each bit can be set to function as input or output by software programming. In default, all pins are pulled high with +5V level (according to main power). The BIOS default settings are 4 inputs and 4 outputs where all of these pins are set to 1.





Pin	Signal	Pin	Signal
1	DO1	2	DI8
3	DI2	4	DO7
5	DO3	6	DI6
7	DI4	8	DO5
9	+5V	10	GND

B.2 Digital I/O Programming

Assembly sample code :

```
mov     dx,fa31         ; Set DIO 0-7 to Output
mov     al,00
out     dx,al

mov     dx,fa32         ; Set DIO 4-7 to High
mov     al,f0
out     dx,al

mov     dx,fa31         ; Set DIO 0-7 to Input
mov     al,ff
out     dx,al

mov     dx,fa32         ; Get DIO 0-7 status
in      al,dx

mov     dx,fa31         ; Set DIO 0-4 to Input, 5-7 to Output
mov     al,1f           ; al = 1F => 00011111
out     dx,al

mov     dx,fa32         ; Set DIO 6 to High
mov     al,40           ; al = 40 => 01000000
out     dx,al

in      al,dx           ; Get DIO 0-7 status
```

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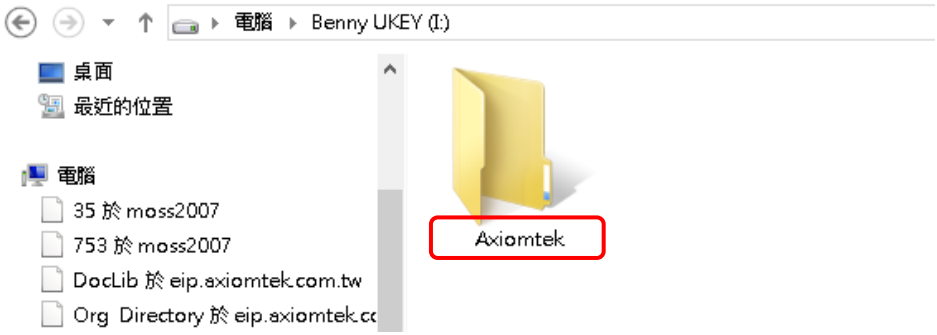
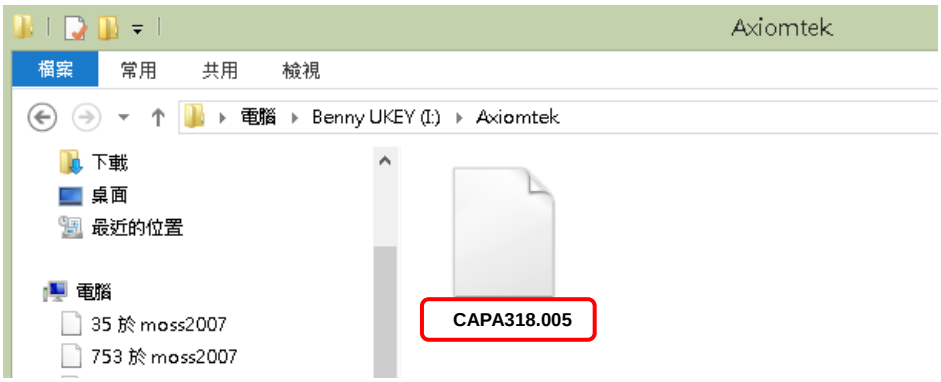
Appendix C
BIOS Flash Utility

The BIOS Flash utility is a new helpful function in BIOS setup program. With this function you can easily update system BIOS without having to enter operating system. In this appendix you may learn how to do it in just a few steps. Please read and follow the instructions below carefully.

1. In your USB flash drive, create a new folder and name it “Axiomtek”, see figure below.



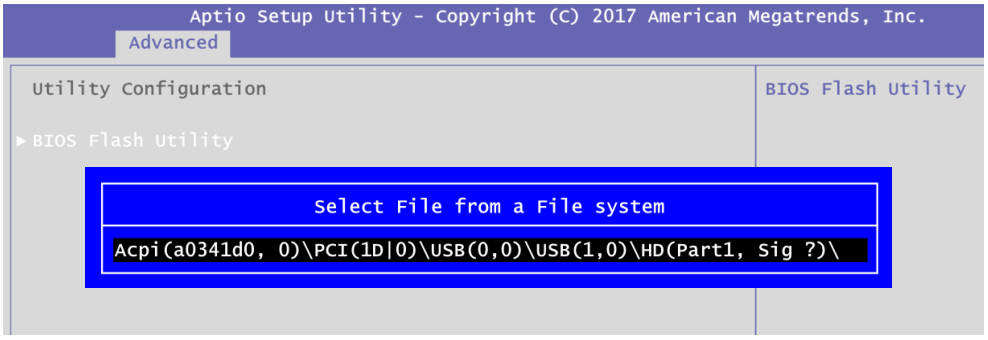
2. Copy BIOS ROM file (e.g. CAPA318.005) to “Axiomtek” folder.



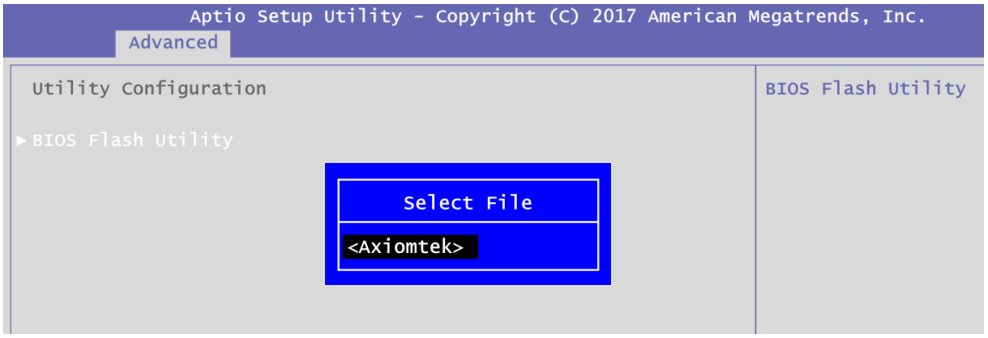
3. Insert the USB flash drive to your system.

4. Enter BIOS setup menu and go to Advanced\Utility Configuration. Select BIOS Flash Utility and press <Enter>.

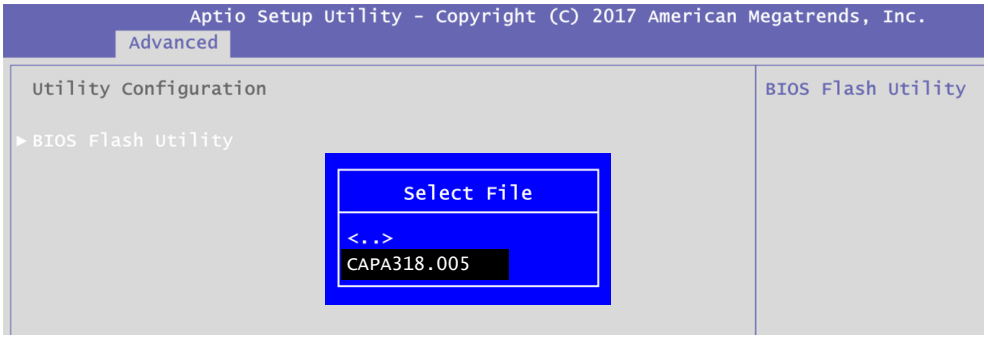
5. BIOS automatically detect all USB drive(s) attached to the system. In this example only one USB drive is attached to the system. That's why, you can see only one device is displayed in figure below.



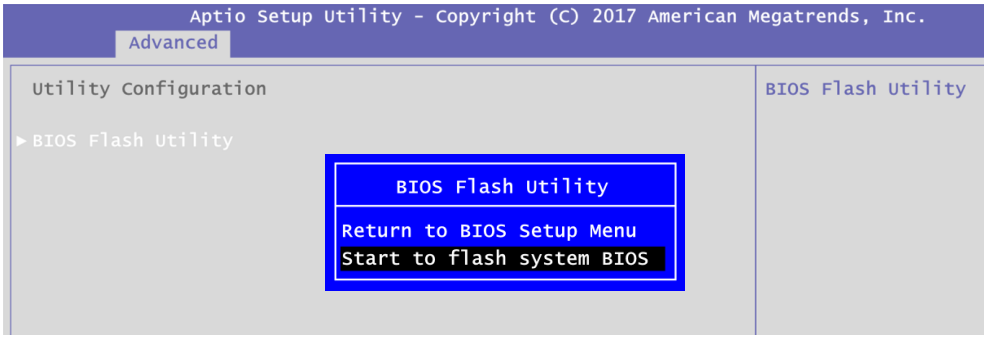
6. Select the USB drive containing BIOS ROM file you want to update using the <↑> or <↓> key. Then press <Enter> to get into "Axiomtek" folder.



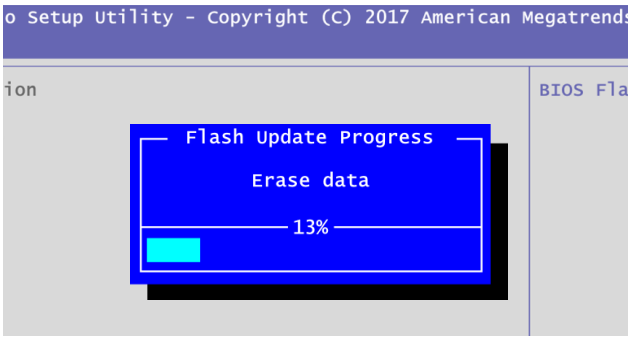
7. Now you can see the BIOS ROM file on the screen, press <Enter> to select.

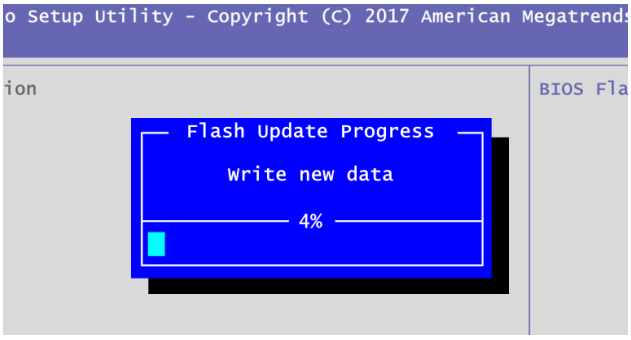


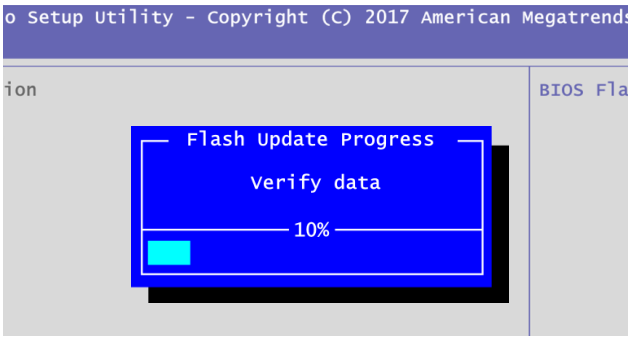
8. Select Start to flash system BIOS option to begin updating procedure.



9. Please wait while BIOS completes the entire flash update process: erase data, write new data and verify data.







10. When you see the following figure, press <Enter> to finish the update process. After that the system will shut down and restart immediately.