USER'S MANUAL

CAPA13S

**AMD® RYZEN™ Embedded
V1605B/V1807B 3.5" Board**

User's Manual

AXIOMTEK

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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.

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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Table of Contents

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Section 1
Introduction

The CAPA13S, a 3.5" board, supports AMD® RYZEN® Embedded V1605B/V1807B processor. It delivers outstanding system performance through high-bandwidth interfaces, multiple I/O functions for interactive applications and various embedded computing solutions.

The CAPA13S has one 260-pin unbuffered SO-DIMM socket for single channel DDR4 2400/3200 MHz memory with maximum capacity up to 16GB. There are three Gigabit/Fast Ethernet ports, one SATA port with transfer rate up to 6Gb/s, two USB 3.2 Gen 2 super speed compliant, two USB 2.0 high speed compliant, and HD audio that can achieve the best stability and reliability for industrial applications. Additionally, it provides you with unique embedded features, such as two serial ports (one RS-232/422/485, one RS-232) and 3.5" form factor that applies an extensive array of PC peripherals.

1.1 Features

- AMD® RYZEN™ quad core V1807B (3.35GHz) and V1605B (2.0GHz)
- 1 DDR4 SO-DIMM supports up to 16 GB memory capacity
- 2 USB 3.2 Gen 2 ports
- 2 USB 2.0 ports
- 2 COM ports
- 3 GbE LAN
- 1 M.2 Key B
- 1 M.2 Key E
- +12V only DC-in supported

1.2 Specifications

- **CPU**
  - AMD® RYZEN™ quad core V1807B 3.35GHz.
  - AMD® RYZEN™ quad core V1605B 2.0GHz.

- **Thermal Solution**
  - Active.

- **Operating Temperature**
  - -20°C~-60°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 260-pin unbuffered DDR4 SO-DIMM socket.
  - Maximum up to 16GB DDR4 2400MHz memory for V1605B.
  - Maximum up to 16GB DDR4 3200MHz memory for V1807B.

- **Onboard Multi I/O**
  - Controller: Fintek F81803.
  - Two serial ports:
    - COM1 supports RS-232/422/485 by BIOS selecting.
    - COM2 supports RS-232 only.

- **Serial ATA**
  - One SATA-600 connector.
  - One M.2 Key B connector in 22x42

- **USB Interface**
  - Two USB ports with fuse protection and complies with USB Spec. Rev. 3.2 Gen 2 in Type A connector.
  - Two USB ports with fuse protection and complies with USB Spec. Rev. 2.0 in 2x5-pin wafer connector.

● **Display**
  ■ Two HDMI with resolution max. up to 3840x2160 @30Hz.
  ■ One DisplayPort supports DP++ with max. resolution 4096x2160 @60Hz.
  ■ One Embedded DisplayPort (eDP) with resolution max. up to 3840x2160 @60Hz.

● **Watchdog Timer**
  ■ 1~255 seconds or minutes; up to 255 levels.

● **Ethernet**
  ■ Three LAN ports with Realtek RTL8111G support 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**
  ■ One M.2 Key E connector in 22x30.

● **Power Input**
  ■ One 2x2-pin connector.
  ■ +12V DC-in only.
  ■ AT 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.***
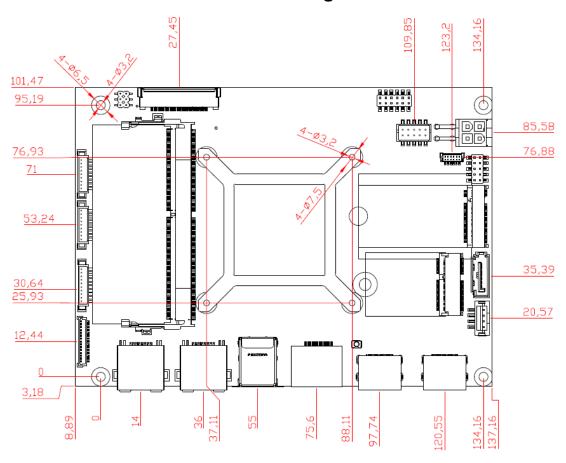
1.3   Utilities

● Graphics driver
● Ethernet driver
● Audio driver
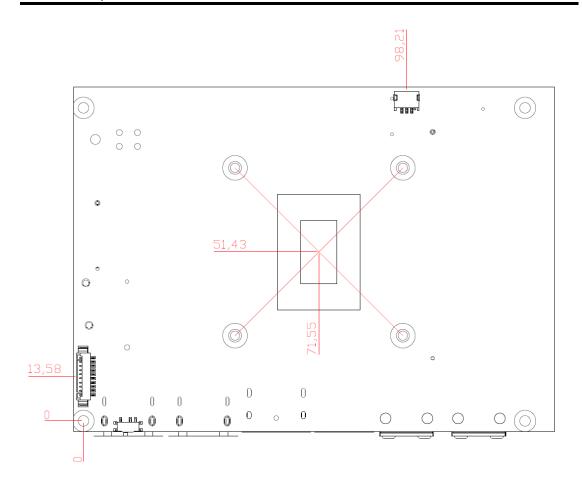
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Section 2
Board and Pin Assignments
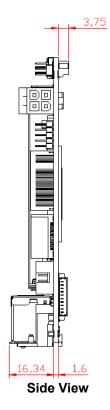
2.1   Board Dimensions and Fixing Holes

Top View

98,21

51,43

71,55

13,58

0

0

Bottom View

3,75

16,34   1,6
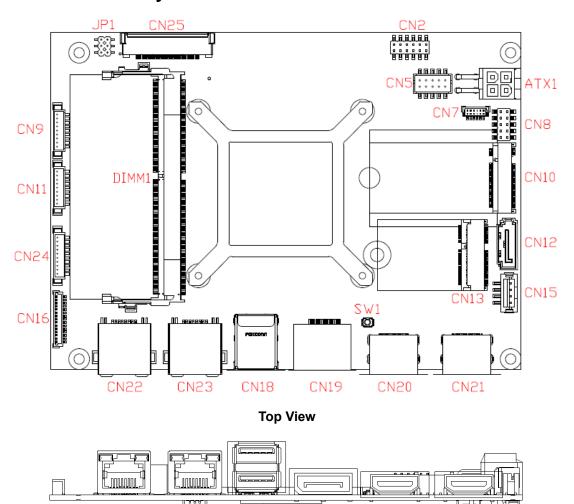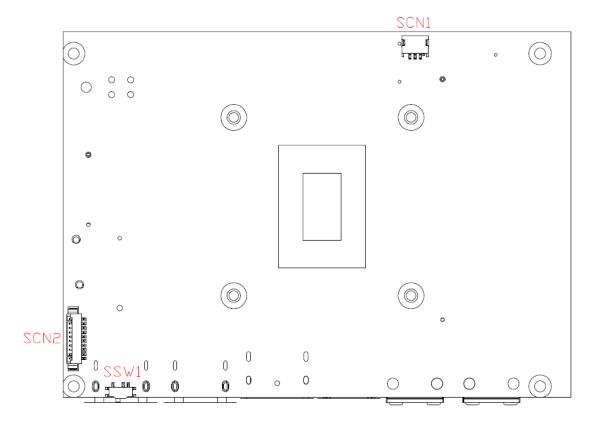
Side View

2.2   Board Layout

Top View

Rear I/O

SCN1

SCN2

SSW1
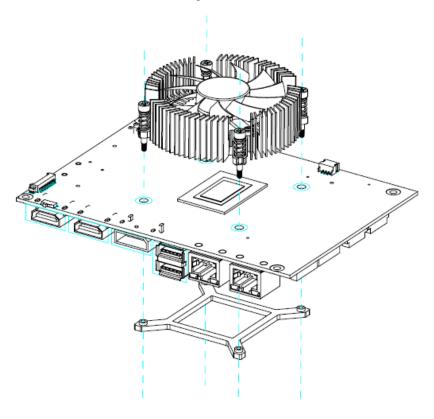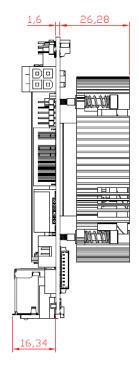
Bottom View

2.3   Installing Cooling Fan
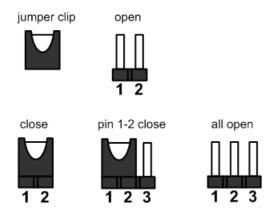
Image below illustrates how to install cooling fan on CAPA13S.

2.4   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 CAPA13S to meet your application purpose. Below you can find a summary table of jumper, switch and onboard default settings.

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

Jumper and Switch	Description	Setting
JP1	eDP Voltage Selection Default: +3.3V	1-2 Close
SW1	Restore BIOS Optimal Defaults Default: Normal Operation	Release
SSW1	Auto Power On Default: Disable	1-2 Close

2.4.1 eDP Voltage Selection (JP1)

This is a 2x3-pin (pitch=2.0mm) jumper. The board supports voltage selection for embedded DisplayPort (eDP). Use JP1 to set eDP connector (CN25) pin 1~4 LCD_VCC to +3.3V, +5V or +12V. To prevent hardware damage, before connecting please make sure that input voltage of display is correct.

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

2.4.2 Restore BIOS Optimal Defaults (SW1)

Use SW1 to clear CMOS. Press the tact switch for at least 1 second to restore BIOS optimal defaults.

Function	Setting
Normal (Default)	Release
Restore BIOS optimal defaults	Press

2.4.3 Auto Power On (SSW1)

If SSW1 is enabled for power input, the system will be automatically power on without pressing soft power button. If SSW1 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

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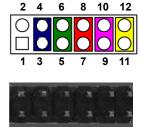
Signals go to other parts of the system through connectors. Loose or improper connection might cause problems, please make sure all connectors are properly and firmly connected. Here is a summary table of connectors on the hardware.

Connector	Description
CN2	Front Panel Connector
CN5	USB 2.0 Wafer Connector
CN7	SIM Card Wafer Connector
CN8	Digital I/O Connector
CN9, CN11	COM1 and COM2 Wafer Connectors
CN10	M.2 2242/3042 Key B Connector
CN12	SATA Connector
CN13	M.2 2230 Key E Connector
CN15	SATA Power Connector
CN16	Ethernet Port 3 Wafer Connector
CN18	USB 3.2 Port 1 and 2
CN19	DisplayPort Connector
CN20, CN21	HDMI Connectors
CN22, CN23	Ethernet Port 1 and 2
CN24	Audio Connector
CN25	eDP Connector
ATX1	ATX Power Connector
SCN1	Fan Connector
SCN2	DC +5V/15W Power Output Connector
DIMM1	DDR4 SO-DIMM Connector

2.5.1   Front Panel Connector (CN2)

This is a 2x6-pin header (pitch=2.0mm) for front panel interface.

Pin	Signal	Pin	Signal
1	BUZZER-	2	BUZZER+
3	GND	4	PWR_PSON
5	PWRLED-	6	PWRLED+
7	PWRSW-	8	PWRSW+
9	HW RST-	10	HW RST+
11	HDDLED-	12	HDDLED+

Internal Buzzer
Pin 1(-) and 2(+) connect the internal buzzer cable.

Power Status (PS-ON)
Pin 4 and pin 3 are PS-ON signal which are connected to know the power status of this board.

Power LED
Pin 6 connects anode (+) of LED and pin 5 connects cathode (-) of LED. The power LED lights up when the system is powered on.

Power On/Off Button
Pin 8 and 7 connect the power button on front panel to CPU board, which allows users to turn on or off power.

System Reset Switch
Pin 10 and 9 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.
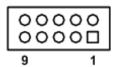
HDD Activity LED
This connection is linked to hard drive activity LED on the control panel. LED flashes when HDD is being accessed. Pin 12 and 11 connect the hard disk drive to the front panel HDD LED, pin 11 is assigned as cathode(-) and pin 12 is assigned as anode(+).

2.5.2   USB 2.0 Wafer Connector (CN5)

This is a 2x5-pin (pitch=2mm) wafer connector, which is compliant with Hirose DF11-XDP-2DSA, 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_1_DM0	4	USB_1_DM1
5	USB_1_DP0	6	USB_1_DP1
7	GND	8	GND
9	GND	10	GND
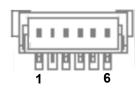
2.5.3   SIM Card Wafer Connector (CN7)

The CN7 is a 6-pin (pitch=1.0mm) wafer connector, which is compliant with JST B6B-PH-K-S, for SIM Card interface. AX93A19 is suggested to use for CN7 to have SIM card slot.

In order to work properly, the SIM card must be used together with 3G/4G LTE module in M.2 Key B connector/CN10. It is mainly used in 3G/4G LTE cellular network application.

Pin	Signal
1	PWR
2	RESET
3	CLK
4	DAT
5	VPP
6	GND
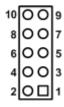
2.5.4   Digital I/O Connector (CN8)

This is a 2x5-pin (pitch=2.0mm) connector. The board is equipped with an 8-bit digital I/O 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	Digital Input Output 0 (Default: Output)	2	Digital Input Output 7 (Default: Input)
3	Digital Input Output 1 (Default: Output)	4	Digital Input Output 6 (Default: Input)
5	Digital Input Output 2 (Default: Output)	6	Digital Input Output 5 (Default: Input)
7	Digital Input Output 3 (Default: Output)	8	Digital Input Output 4 (Default: Input)
9	+5V level	10	GND
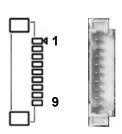
2.5.5   COM1 and COM2 Wafer Connectors (CN9 and CN11)

These are 9-pin (pitch=1.25mm) connectors which are compliant with Molex 53047-0910. The pin assignments of RS-232/RS-422/RS-485 are listed in table below. If you need COM1 port to support RS-422 or RS-485, please refer to BIOS setting in section 4.4.
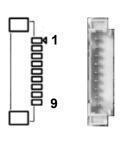
CN9 (for COM1):

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

CN11 (for COM2):

Pin	RS-232
1	DCD
2	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND

2.5.6   M.2 2242/3042 Key B Connector (CN10)

The CN10 is a M.2 Key B connector. It is suggested to install the M.2 storage module via SATA with 22mm width and 42mm length or the M.2 cellular module via USB 2.0 with 30mm width and 42mm length. It also supports the M.2 storage module via PCIe x2 by BOM option with hardware change.
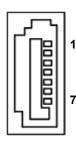
Pin	Signal	Pin	Signal
1	CONFIG_3	2	+3.3V_SBY
3	GND	4	+3.3V_SBY
5	GND	6	Full Card PWR OFF
7	USB_0_DP0	8	W_DISABLE#
9	USB_0_DM0	10	NC
11	GND	12	
13		14	Key B
15	Key B	16	
17		18	
19		20	NC
21	CONFIG_0	22	NC
23	GPIO11(+1.8V)	24	NC
25	NC	26	NC
27	GND	28	NC
29	PCIE_RXN4	30	SIM_RST
31	PCIE_RXP4	32	SIM_CLK
33	GND	34	SIM_DATA
35	PCIE_TXN4	36	SIM_PWR
37	PCIE_TXP4	38	NC
39	GND	40	SMB_CLK_SBY(+1.8V)
41	SATA1_RXP/ PCIE_RXN5	42	SMB_DATA_SBY(+1.8V)
43	SATA1_RXN/ PCIE_RXP5	44	NC
45	GND	46	NC
47	SATA1_TXN/ PCIE_TXN5	48	NC
49	SATA1_TXP/ PCIE_TXP5	50	PERST#
51	GND	52	CLK_REQ4
53	PCIE_CLKN4	54	PEWAKE#
55	PCIE_CLKP4	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	PLTRST(+1.8V)	68	SUSCLK
69	CONFIG_1	70	+3.3V_SBY
71	GND	72	+3.3V_SBY
73	GND	74	+3.3V_SBY
75	CONFIG_2		

2.5.7 SATA Connector (CN12)

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
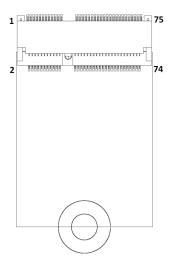
2.5.8   M.2 2230 Key E Connector (CN13)

The CN13 is a M.2 2230 Key E connector. It is suggested to install the M.2 wireless module via PCIe x1 and USB 2.0 with 22mm width and 30mm length.

Pin	Signal	Pin	Signal
1	GND	2	+3.3V_SBY
3	USB_0_DP3	4	+3.3V_SBY
5	USB_0_DM3	6	NC
7	GND	8	NC
9	NC	10	NC
11	NC	12	NC
13	NC	14	NC
15	NC	16	NC
17	NC	18	GND
19	NC	20	NC
21	NC	22	NC
23	NC	24	
25		26	
27	Key E	28	Key E
29		30	
31		32	NC
33	GND	34	NC
35	PCIE_TXP0	36	NC
37	PCIE_TXN0	38	NC
39	GND	40	NC
41	PCIE_RXP0	42	NC
43	PCIE_RXN0	44	NC
45	GND	46	NC
47	PCIE_CLKP2	48	NC
49	PCIE_CLKN2	50	SUSCLK(+3.3V)
51	GND	52	PERST#(+3.3V)
53	CLK_REQ2	54	W_DIS2#(+3.3V)
55	PEWAKE0#	56	W_DI12#(+3.3V)
57	GND	58	SMB_DATA_SBY(+3.3V)
59	NC	60	SMB_CLK_SBY(+3.3V)
61	NC	62	NC
63	GND	64	NC
65	NC	66	NC
67	NC	68	NC
69	GND	70	NC
71	NC	72	+3.3V_SBY
73	NC	74	+3.3V_SBY
75	GND		

2.5.9   SATA Power Connector (CN15)

This 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
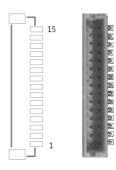
2.5.10   Ethernet Wafer Connector (CN16)

This is a wafer connector which is compliant with JST BM15B-SRSS-TB 15-pin (pitch=1.0mm) for Ethernet port 3 interface.

It is suggested to connect AX93287 to have RJ-45 connector for Ethernet connection.
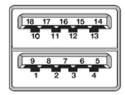
Pin	Signal
1	GND
2	LAN_LINK_ACT
3	LAN_VDD33
4	GND
5	MDI0+
6	MDI0-
7	MDI1+
8	MDI2+
9	MDI2-
10	MDI1-
11	MDI3+
12	MDI3-
13	GND
14	LAN_100_LED
15	LAN_1000_LED

2.5.11 USB 3.2 Port (CN18)

The board comes with two Universal Serial Bus (compliant with USB 3.2 Gen 2 (10Gb/s)) ports on the rear I/O for installing USB peripherals such as keyboard, mouse, scanner, etc.

Pin	Signal	Pin	Signal
1	USB_VCC (+5V)	10	USB_VCC (+5V)
2	USB #0_D-	11	USB #1_D-
3	USB #0_D+	12	USB #1_D+
4	GND	13	GND
5	SSRX0-	14	SSRX1-
6	SSRX0+	15	SSRX1+
7	GND	16	GND
8	SSTX0-	17	SSTX1-
9	SSTX0+	18	SSTX1+
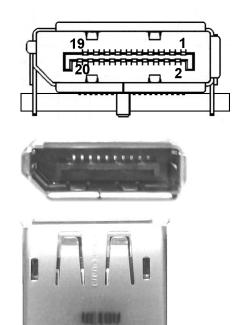
2.5.12 DisplayPort Connector (CN19)

The DisplayPort interface is available through connector CN19.

Pin	Signal
1	DP_LANE0
2	GND
3	DP_LANE0#
4	DP_LANE1
5	GND
6	DP_LANE1#
7	DP_LANE2
8	GND
9	DP_LANE2#
10	DP_LANE3
11	GND
12	DP_LANE3#
13	Detect Pin
14	GND
15	DP_AUX
16	GND
17	DP_AUX#
18	DP_HPDE
19	GND
20	+3.3V
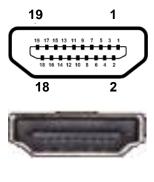
2.5.13   HDMI Connector (CN20 and CN21)

The HDMI (High-Definition Multimedia Interface) is a compact digital interface which is capable of transmitting high-definition video and high-resolution audio over a single cable. The board comes with two HDMI connectors on the rear I/O.
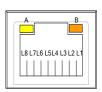
Pin	Signal	Pin	Signal
1	HDMI OUT_DATA2+	2	GND
3	HDMI OUT_DATA2-	4	HDMI OUT_DATA1+
5	GND	6	HDMI OUT_DATA1-
7	HDMI OUT_DATA0+	8	GND
9	HDMI OUT_DATA0-	10	HDMI OUT_Clock+
11	GND	12	HDMI OUT_Clock-
13	N.C.	14	N.C.
15	HDMI OUT_SCL	16	HDMI OUT_SDA
17	GND	18	+5V
19	HDMI_HTPLG		
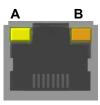
2.5.14   Ethernet Ports (CN22 and CN23)

The board has two RJ-45 Ethernet connectors; CN22 for LAN1 and CN23 for LAN2. Connection can be established by plugging one end of the Ethernet cable into this 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 Off: No link Blinking: Data activity detected		
B	Speed LED 1000: Orange 100/10: Green/OFF		
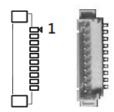
2.5.15 Audio Connector (CN24)

This is a 10-pin (pitch=1.25mm) wafer connector, which is compliant with Molex 53047-1010, for audio interface.
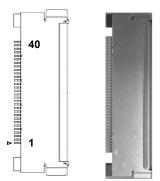
Pin	Signal	Pin	Signal
1	MIC_IN	2	GND
3	LINE_IN_L	4	GND
5	LINE_IN_R	6	GND
7	AUDIO_OUT_L	8	GND
9	AUDIO_OUT_R	10	GND

2.5.16 eDP Connector (CN25)

The eDP interface is available through 40-pin connector (CN25), which is compliant with IPEX-20143. Pin 1~4 LCD_VCC can be set to +3.3V, +5V or +12V with JP1.

Pin	Signal	Pin	Signal
1	LCD_VCC	21	TXN0
2	LCD_VCC	22	TXP0
3	LCD_VCC	23	High Speed_GND
4	LCD_VCC	24	AUXP
5	NC	25	AUXN
6	LCD_GND	26	High Speed_GND
7	LCD_GND	27	BKLT_GND
8	LCD_GND	28	BKLT_GND
9	LCD_GND	29	BKLT_GND
10	HPD	30	BKLT_GND
11	High Speed_GND	31	NC
12	TXN3	32	BKLT_CTRL
13	TXP3	33	BKLT_EN
14	High Speed_GND	34	NC
15	TXN2	35	NC
16	TXP2	36	BKLT_VCC_12V
17	High Speed_GND	37	BKLT_VCC_12V
18	TXN1	38	BKLT_VCC_12V
19	TXP1	39	BKLT_VCC_12V
20	High Speed_GND	40	NC
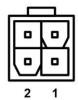
2.5.17   ATX Power Connector (ATX1)

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 input interface. Follow the connector orientation to plug the external power supply. 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

2.5.18   Fan Connector (SCN1)

This is a 3-pin (pitch=1.5mm) connector for fan interface.

Pin	Signal
1	GND
2	+12V level
3	Fan speed feedback
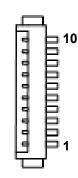
2.5.19   DC +5V/15W Power Output Connector (SCN2)

The SCN2 is a 10-pin (pitch=1.25mm) wafer connector, which is compliant with Molex 53261-054 series, for power output interface.

Pin	Signal
1	+5V
2	+5V
3	+5V
4	+5V
5	N.C
6	N.C
7	GND
8	GND
9	GND
10	GND

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Section 3
Hardware Description

3.1   Microprocessors

The CAPA13S supports AMD Ryzen^{TM} Embedded V1000 series SoC which enables your system to operate under Windows® 10 environments. The system performance depends on the microprocessor. Make sure all correct settings are arranged for the installed microprocessor to prevent the CPU from damages.

3.2   BIOS

The CAPA13S uses AMI Plug and Play BIOS with a single 64Mbit SPI Flash.

3.3   System Memory
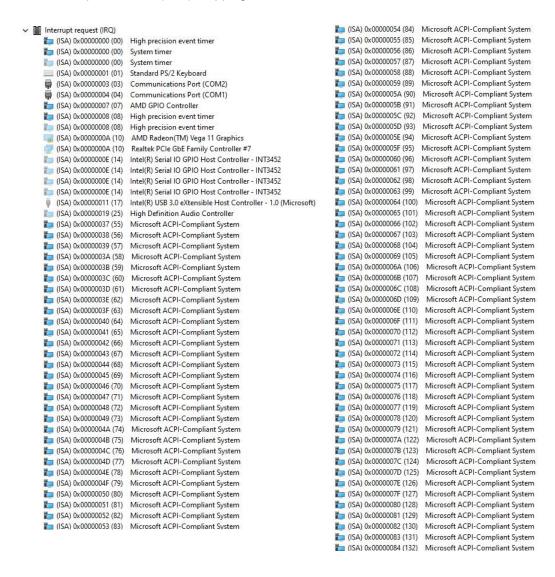
The CAPA13S supports one 260-pin DDR4 SO-DIMM socket. The memory module comes in sizes of 4GB, 8GB and 16GB.

3.4   I/O Port Address Map


```
∨ 📟 Input/output (IO)
   > 🖥 [0000000000000000 - 00000000000003AF]  PCI Express Root Complex
   > 🖥 [00000000000003B0 - 00000000000003DF]  PCI Express Root Complex
   > 🖥 [00000000000003E0 - 0000000000000CF7]  PCI Express Root Complex
   > 🖥 [0000000000000D00 - 000000000000FFFF]  PCI Express Root Complex
```

3.5 Interrupt Controller (IRQ) Map

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

IRQ	Device
(ISA) 0x00000000 (00)	High precision event timer
(ISA) 0x00000000 (00)	System timer
(ISA) 0x00000000 (00)	System timer
(ISA) 0x00000001 (01)	Standard PS/2 Keyboard
(ISA) 0x00000003 (03)	Communications Port (COM2)
(ISA) 0x00000004 (04)	Communications Port (COM1)
(ISA) 0x00000007 (07)	AMD GPIO Controller
(ISA) 0x00000008 (08)	High precision event timer
(ISA) 0x00000008 (08)	High precision event timer
(ISA) 0x0000000A (10)	AMD Radeon(TM) Vega 11 Graphics
(ISA) 0x0000000A (10)	Realtek PCIe GbE Family Controller #7
(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) 0x00000011 (17)	Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
(ISA) 0x00000019 (25)	High Definition Audio Controller
(ISA) 0x00000037 (55)	Microsoft ACPI-Compliant System
(ISA) 0x00000038 (56)	Microsoft ACPI-Compliant System
(ISA) 0x00000039 (57)	Microsoft ACPI-Compliant System
(ISA) 0x0000003A (58)	Microsoft ACPI-Compliant System
(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
(ISA) 0x00000045 (69)	Microsoft ACPI-Compliant System
(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
(ISA) 0x00000053 (83)	Microsoft ACPI-Compliant System
(ISA) 0x00000054 (84)	Microsoft ACPI-Compliant System
(ISA) 0x00000055 (85)	Microsoft ACPI-Compliant System
(ISA) 0x00000056 (86)	Microsoft ACPI-Compliant System
(ISA) 0x00000057 (87)	Microsoft ACPI-Compliant System
(ISA) 0x00000058 (88)	Microsoft ACPI-Compliant System
(ISA) 0x00000059 (89)	Microsoft ACPI-Compliant System
(ISA) 0x0000005A (90)	Microsoft ACPI-Compliant System
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(ISA) 0x0000005C (92)	Microsoft ACPI-Compliant System
(ISA) 0x0000005D (93)	Microsoft ACPI-Compliant System
(ISA) 0x0000005E (94)	Microsoft ACPI-Compliant System
(ISA) 0x0000005F (95)	Microsoft ACPI-Compliant System
(ISA) 0x00000060 (96)	Microsoft ACPI-Compliant System
(ISA) 0x00000061 (97)	Microsoft ACPI-Compliant System
(ISA) 0x00000062 (98)	Microsoft ACPI-Compliant System
(ISA) 0x00000063 (99)	Microsoft ACPI-Compliant System
(ISA) 0x00000064 (100)	Microsoft ACPI-Compliant System
(ISA) 0x00000065 (101)	Microsoft ACPI-Compliant System
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(ISA) 0x0000006C (108)	Microsoft ACPI-Compliant System
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(ISA) 0x00000079 (121)	Microsoft ACPI-Compliant System
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(ISA) 0x0000007B (123)	Microsoft ACPI-Compliant System
(ISA) 0x0000007C (124)	Microsoft ACPI-Compliant System
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(ISA) 0x00000080 (128)	Microsoft ACPI-Compliant System
(ISA) 0x00000081 (129)	Microsoft ACPI-Compliant System
(ISA) 0x00000082 (130)	Microsoft ACPI-Compliant System
(ISA) 0x00000083 (131)	Microsoft ACPI-Compliant System
(ISA) 0x00000084 (132)	Microsoft ACPI-Compliant System

(ISA) 0x00000085 (133)	Microsoft ACPI-Compliant System
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(ISA) 0x00000145 (325)	Microsoft ACPI-Compliant System		(ISA) 0x00000175 (373)	Microsoft ACPI-Compliant System
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			(ISA) 0x0000017A (378)	Microsoft ACPI-Compliant System
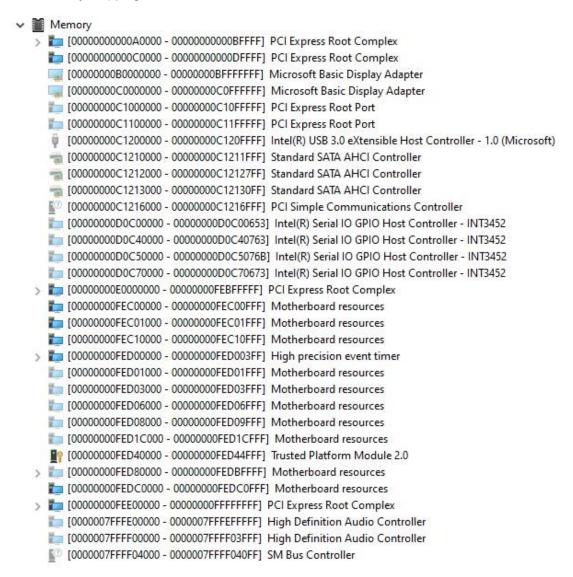
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(ISA) 0x0000017C (380)	Microsoft ACPI-Compliant System	(ISA) 0x000001AC (428)	Microsoft ACPI-Compliant System
(ISA) 0x0000017D (381)	Microsoft ACPI-Compliant System	(ISA) 0x000001AD (429)	Microsoft ACPI-Compliant System
(ISA) 0x0000017E (382)	Microsoft ACPI-Compliant System	(ISA) 0x000001AE (430)	Microsoft ACPI-Compliant System
(ISA) 0x0000017F (383)	Microsoft ACPI-Compliant System	(ISA) 0x000001AF (431)	Microsoft ACPI-Compliant System
(ISA) 0x00000180 (384)	Microsoft ACPI-Compliant System	(ISA) 0x000001B0 (432)	Microsoft ACPI-Compliant System
(ISA) 0x00000181 (385)	Microsoft ACPI-Compliant System	(ISA) 0x000001B1 (433)	Microsoft ACPI-Compliant System
(ISA) 0x00000182 (386)	Microsoft ACPI-Compliant System	(ISA) 0x000001B2 (434)	Microsoft ACPI-Compliant System
(ISA) 0x00000183 (387)	Microsoft ACPI-Compliant System	(ISA) 0x000001B3 (435)	Microsoft ACPI-Compliant System
(ISA) 0x00000184 (388)	Microsoft ACPI-Compliant System	(ISA) 0x000001B4 (436)	Microsoft ACPI-Compliant System
(ISA) 0x00000185 (389)	Microsoft ACPI-Compliant System	(ISA) 0x000001B5 (437)	Microsoft ACPI-Compliant System
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(ISA) 0x00000187 (391)	Microsoft ACPI-Compliant System	(ISA) 0x000001B7 (439)	Microsoft ACPI-Compliant System
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(ISA) 0x0000018A (394)	Microsoft ACPI-Compliant System	(ISA) 0x000001BA (442)	Microsoft ACPI-Compliant System
(ISA) 0x0000018B (395)	Microsoft ACPI-Compliant System	(ISA) 0x000001BB (443)	Microsoft ACPI-Compliant System
(ISA) 0x0000018C (396)	Microsoft ACPI-Compliant System	(ISA) 0x000001BC (444)	Microsoft ACPI-Compliant System
(ISA) 0x0000018D (397)	Microsoft ACPI-Compliant System	(ISA) 0x000001BD (445)	Microsoft ACPI-Compliant System
(ISA) 0x0000018E (398)	Microsoft ACPI-Compliant System	(ISA) 0x000001BE (446)	Microsoft ACPI-Compliant System
(ISA) 0x0000018F (399)	Microsoft ACPI-Compliant System	(ISA) 0x000001BF (447)	Microsoft ACPI-Compliant System
(ISA) 0x00000190 (400)	Microsoft ACPI-Compliant System	(ISA) 0x000001C0 (448)	Microsoft ACPI-Compliant System
(ISA) 0x00000191 (401)	Microsoft ACPI-Compliant System	(ISA) 0x000001C1 (449)	Microsoft ACPI-Compliant System
(ISA) 0x00000192 (402)	Microsoft ACPI-Compliant System	(ISA) 0x000001C2 (450)	Microsoft ACPI-Compliant System
(ISA) 0x00000193 (403)	Microsoft ACPI-Compliant System	(ISA) 0x000001C3 (451)	Microsoft ACPI-Compliant System
(ISA) 0x00000194 (404)	Microsoft ACPI-Compliant System	(ISA) 0x000001C4 (452)	Microsoft ACPI-Compliant System
(ISA) 0x00000195 (405)	Microsoft ACPI-Compliant System	(ISA) 0x000001C5 (453)	Microsoft ACPI-Compliant System
(ISA) 0x00000196 (406)	Microsoft ACPI-Compliant System	(ISA) 0x000001C6 (454)	Microsoft ACPI-Compliant System
(ISA) 0x00000197 (407)	Microsoft ACPI-Compliant System	(ISA) 0x000001C7 (455)	Microsoft ACPI-Compliant System
(ISA) 0x00000198 (408)	Microsoft ACPI-Compliant System	(ISA) 0x000001C8 (456)	Microsoft ACPI-Compliant System
(ISA) 0x00000199 (409)	Microsoft ACPI-Compliant System	(ISA) 0x000001C9 (457)	Microsoft ACPI-Compliant System
(ISA) 0x0000019A (410)	Microsoft ACPI-Compliant System	(ISA) 0x000001CA (458)	Microsoft ACPI-Compliant System
(ISA) 0x0000019B (411)	Microsoft ACPI-Compliant System	(ISA) 0x000001CB (459)	Microsoft ACPI-Compliant System
(ISA) 0x0000019C (412)	Microsoft ACPI-Compliant System	(ISA) 0x000001CC (460)	Microsoft ACPI-Compliant System
(ISA) 0x0000019D (413)	Microsoft ACPI-Compliant System	(ISA) 0x000001CD (461)	Microsoft ACPI-Compliant System
(ISA) 0x0000019E (414)	Microsoft ACPI-Compliant System	(ISA) 0x000001CE (462)	Microsoft ACPI-Compliant System
(ISA) 0x0000019F (415)	Microsoft ACPI-Compliant System	(ISA) 0x000001CF (463)	Microsoft ACPI-Compliant System
(ISA) 0x000001A0 (416)	Microsoft ACPI-Compliant System	(ISA) 0x000001D0 (464)	Microsoft ACPI-Compliant System
(ISA) 0x000001A1 (417)	Microsoft ACPI-Compliant System	(ISA) 0x000001D1 (465)	Microsoft ACPI-Compliant System
(ISA) 0x000001A2 (418)	Microsoft ACPI-Compliant System	(ISA) 0x000001D2 (466)	Microsoft ACPI-Compliant System
(ISA) 0x000001A3 (419)	Microsoft ACPI-Compliant System	(ISA) 0x000001D3 (467)	Microsoft ACPI-Compliant System
(ISA) 0x000001A4 (420)	Microsoft ACPI-Compliant System	(ISA) 0x000001D4 (468)	Microsoft ACPI-Compliant System
(ISA) 0x000001A5 (421)	Microsoft ACPI-Compliant System	(ISA) 0x000001D5 (469)	Microsoft ACPI-Compliant System
(ISA) 0x000001A6 (422)	Microsoft ACPI-Compliant System	(ISA) 0x000001D6 (470)	Microsoft ACPI-Compliant System
(ISA) 0x000001A7 (423)	Microsoft ACPI-Compliant System	(ISA) 0x000001D7 (471)	Microsoft ACPI-Compliant System
(ISA) 0x000001A8 (424)	Microsoft ACPI-Compliant System	(ISA) 0x000001D8 (472)	Microsoft ACPI-Compliant System
(ISA) 0x000001A9 (425)	Microsoft ACPI-Compliant System	(ISA) 0x000001D9 (473)	Microsoft ACPI-Compliant System
(ISA) 0x000001AA (426)	Microsoft ACPI-Compliant System	(ISA) 0x000001DA (474)	Microsoft ACPI-Compliant System
		(ISA) 0x000001DB (475)	Microsoft ACPI-Compliant System

(ISA) 0x000001DC (476)   Microsoft ACPI-Compliant System
(ISA) 0x000001DD (477)   Microsoft ACPI-Compliant System
(ISA) 0x000001DE (478)   Microsoft ACPI-Compliant System
(ISA) 0x000001DF (479)   Microsoft ACPI-Compliant System
(ISA) 0x000001E0 (480)   Microsoft ACPI-Compliant System
(ISA) 0x000001E1 (481)   Microsoft ACPI-Compliant System
(ISA) 0x000001E2 (482)   Microsoft ACPI-Compliant System
(ISA) 0x000001E3 (483)   Microsoft ACPI-Compliant System
(ISA) 0x000001E4 (484)   Microsoft ACPI-Compliant System
(ISA) 0x000001E5 (485)   Microsoft ACPI-Compliant System
(ISA) 0x000001E6 (486)   Microsoft ACPI-Compliant System
(ISA) 0x000001E7 (487)   Microsoft ACPI-Compliant System
(ISA) 0x000001E8 (488)   Microsoft ACPI-Compliant System
(ISA) 0x000001E9 (489)   Microsoft ACPI-Compliant System
(ISA) 0x000001EA (490)   Microsoft ACPI-Compliant System
(ISA) 0x000001EB (491)   Microsoft ACPI-Compliant System
(ISA) 0x000001EC (492)   Microsoft ACPI-Compliant System
(ISA) 0x000001ED (493)   Microsoft ACPI-Compliant System
(ISA) 0x000001EE (494)   Microsoft ACPI-Compliant System
(ISA) 0x000001EF (495)   Microsoft ACPI-Compliant System
(ISA) 0x000001F0 (496)   Microsoft ACPI-Compliant System
(ISA) 0x000001F1 (497)   Microsoft ACPI-Compliant System
(ISA) 0x000001F2 (498)   Microsoft ACPI-Compliant System
(ISA) 0x000001F3 (499)   Microsoft ACPI-Compliant System
(ISA) 0x000001F4 (500)   Microsoft ACPI-Compliant System
(ISA) 0x000001F5 (501)   Microsoft ACPI-Compliant System
(ISA) 0x000001F6 (502)   Microsoft ACPI-Compliant System
(ISA) 0x000001F7 (503)   Microsoft ACPI-Compliant System
(ISA) 0x000001F8 (504)   Microsoft ACPI-Compliant System
(ISA) 0x000001F9 (505)   Microsoft ACPI-Compliant System
(ISA) 0x000001FA (506)   Microsoft ACPI-Compliant System
(ISA) 0x000001FB (507)   Microsoft ACPI-Compliant System
(ISA) 0x000001FC (508)   Microsoft ACPI-Compliant System
(ISA) 0x000001FD (509)   Microsoft ACPI-Compliant System
(ISA) 0x000001FE (510)   Microsoft ACPI-Compliant System
(ISA) 0x000001FF (511)   Microsoft ACPI-Compliant System
(PCI) 0x00000035 (53)   AMD Audio CoProcessor
(PCI) 0x00000035 (53)   High Definition Audio Controller
(PCI) 0x00000036 (54)   High Definition Audio Controller
(PCI) 0x00000037 (55)   AMD SFH KMDF I2C
(PCI) 0xFFFFFFE1 (-31)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE2 (-30)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE3 (-29)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE4 (-28)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE5 (-27)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE6 (-26)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE7 (-25)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE8 (-24)   AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFE9 (-23)   AMD PSP 10.0 Device

(PCI) 0xFFFFFFEA (-22)	AMD PSP 10.0 Device
(PCI) 0xFFFFFFEB (-21)	AMD Radeon(TM) Vega 8 Graphics
(PCI) 0xFFFFFFEC (-20)	AMD Radeon(TM) Vega 8 Graphics
(PCI) 0xFFFFFFED (-19)	AMD Radeon(TM) Vega 8 Graphics
(PCI) 0xFFFFFFEE (-18)	Realtek PCIe GbE Family Controller #3
(PCI) 0xFFFFFFEF (-17)	Realtek PCIe GbE Family Controller #2
(PCI) 0xFFFFFFF0 (-16)	Realtek PCIe GbE Family Controller
(PCI) 0xFFFFFFF1 (-15)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF2 (-14)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF3 (-13)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF4 (-12)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF5 (-11)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF6 (-10)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF7 (-9)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF8 (-8)	AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft)
(PCI) 0xFFFFFFF9 (-7)	Standard SATA AHCI Controller
(PCI) 0xFFFFFFFA (-6)	PCI Express Root Port
(PCI) 0xFFFFFFFB (-5)	PCI Express Root Port
(PCI) 0xFFFFFFFC (-4)	PCI Express Root Port
(PCI) 0xFFFFFFFD (-3)	PCI Express Root Port
(PCI) 0xFFFFFFFE (-2)	PCI Express Root Port

3.6 Memory Map

The memory mapping list is shown as follows:

```
∨ 🖿 Memory
  > 🖿 [00000000000A0000 - 00000000000BFFFF]  PCI Express Root Complex
    🖿 [00000000000C0000 - 00000000000DFFFF]  PCI Express Root Complex
    🖳 [00000000B0000000 - 00000000BFFFFFFF]  Microsoft Basic Display Adapter
    🖳 [00000000C0000000 - 00000000C0FFFFFF]  Microsoft Basic Display Adapter
    🖿 [00000000C1000000 - 00000000C10FFFFF]  PCI Express Root Port
    🖿 [00000000C1100000 - 00000000C11FFFFF]  PCI Express Root Port
    🖭 [00000000C1200000 - 00000000C120FFFF]  Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)
    🖴 [00000000C1210000 - 00000000C1211FFF]  Standard SATA AHCI Controller
    🖴 [00000000C1212000 - 00000000C12127FF]  Standard SATA AHCI Controller
    🖴 [00000000C1213000 - 00000000C12130FF]  Standard SATA AHCI Controller
    🖗 [00000000C1216000 - 00000000C1216FFF]  PCI Simple Communications Controller
    🖿 [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 - 00000000FEBFFFFF]  PCI Express Root Complex
    🖿 [00000000FEC00000 - 00000000FEC00FFF]  Motherboard resources
    🖿 [00000000FEC01000 - 00000000FEC01FFF]  Motherboard resources
    🖿 [00000000FEC10000 - 00000000FEC10FFF]  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
    🖿 [00000000FEDC0000 - 00000000FEDC0FFF]  Motherboard resources
  > 🖿 [00000000FEE00000 - 00000000FFFFFFFF]  PCI Express Root Complex
    🖿 [0000007FFFE00000 - 0000007FFFEFFFFF]  High Definition Audio Controller
    🖿 [0000007FFFF00000 - 0000007FFFF03FFF]  High Definition Audio Controller
    🖗 [0000007FFFF04000 - 0000007FFFF040FF]  SM Bus Controller
```

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Section 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 section 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 SW1 (see section 2.4.2).***

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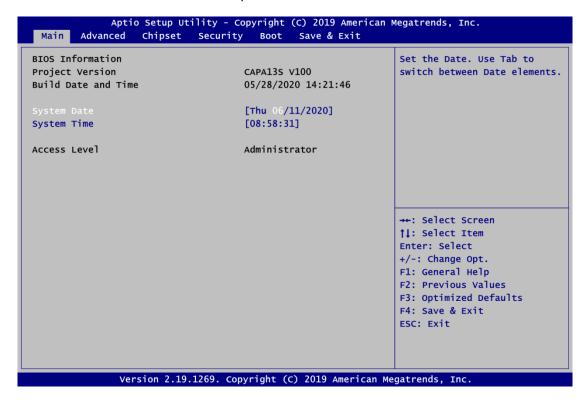
Note	***Some of the navigation keys differ from one screen to another.***

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.

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
    Main   Advanced   Chipset   Security   Boot   Save & Exit

   BIOS Information                                        Set the Date. Use Tab to
   Project Version              CAPA13S V100               switch between Date elements.
   Build Date and Time          05/28/2020 14:21:46

   System Date                  [Thu 06/11/2020]
   System Time                  [08:58:31]

   Access Level                 Administrator


                                                          →←: 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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```

● **BIOS Information**
Display BIOS 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.
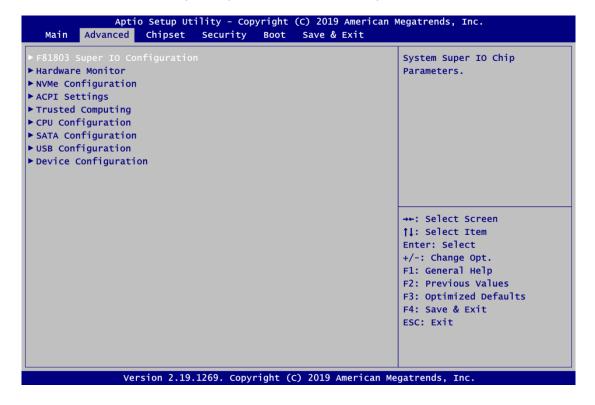
4.4   Advanced Menu

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:
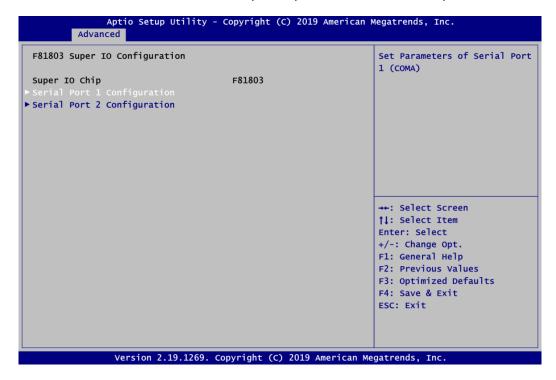
>   ►   F81803 Super IO Configuration
>   ►   Hardware Monitor
>   ►   NVMe Configuration (Optional)
>   ►   ACPI Settings
>   ►   Trusted Computing
>   ►   CPU Configuration
>   ►   SATA Configuration
>   ►   USB Configuration
>   ►   Device Configuration

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

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
    Main    Advanced    Chipset    Security    Boot    Save & Exit

 ► F81803 Super IO Configuration                        System Super IO Chip
 ► Hardware Monitor                                     Parameters.
 ► NVMe Configuration
 ► ACPI Settings
 ► Trusted Computing
 ► CPU Configuration
 ► SATA Configuration
 ► USB Configuration
 ► Device Configuration

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

         Version 2.19.1269. Copyright (C) 2019 American Megatrends, Inc.
```

● **F81803 Super IO Configuration**
You can use this screen to select options for 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.

```
            Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Advanced

   F81803 Super IO Configuration                              Set Parameters of Serial Port
                                                              1 (COMA)
   Super IO Chip                        F81803
 ► Serial Port 1 Configuration
 ► Serial Port 2 Configuration




                                                              →←: 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 1~2 Configuration
Use these items to set parameters related to serial port 1~2.

● **Serial Port 1 Configuration**

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
     Advanced

  Serial Port 1 Configuration                                Enable or Disable Serial Port
                                                             (COM)
  Serial Port                     [Enabled]
  Device Settings                 IO=3F8h; IRQ=4;

  COM Port Type                   [RS232]
  Terminal Mode                   [Disabled]




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



          Version 2.19.1269. Copyright (C) 2019 American Megatrends, Inc.
```

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.

```
          Advanced

  Serial Port 1 Configuration

  Serial Port                     [Enabled]
  Device Settings                 IO=3F8h; IRQ=4;

  COM Port Type                   [RS232]
  Terminal Mode                   [Disabled]
                              ┌─── COM Port Type ───┐
                              │ RS232               │
                              │ RS422               │
                              │ RS485               │
                              └─────────────────────┘
```
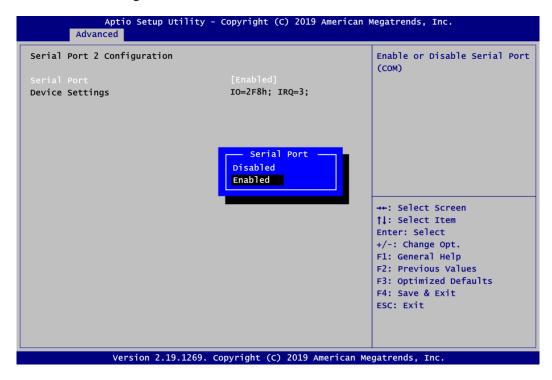
COM Port Type
Use this item to set RS-232/422/485 communication mode.

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

● **Serial Port 2 Configuration**

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Advanced

 Serial Port 2 Configuration                                     Enable or Disable Serial Port
                                                                 (COM)
 Serial Port                        [Enabled]
 Device Settings                    IO=2F8h; IRQ=3;



                             ┌──── Serial Port ────┐
                             │ Disabled            │
                             │ Enabled             │
                             └─────────────────────┘
                                                                 →←: 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
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.
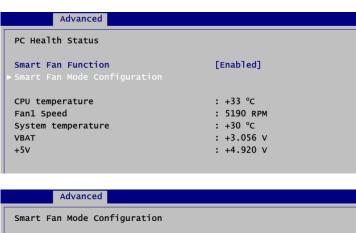
```
           Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
      Advanced

PC Health Status                                          Enable or Disable Smart Fan

Smart Fan Function              [Disabled]

CPU temperature                 : +33 °C
Fan1 Speed                      : 5190 RPM
System temperature              : +30 °C
VBAT                            : +3.056 V
+5V                             : +4.920 V

                          ┌──── Smart Fan Function ────┐
                          │ Disabled                   │
                          │ Enabled                    │       ←→: Select Screen
                          └────────────────────────────┘       ↑↓: Select Item
                                                                Enter: Select
                                                                +/-: Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F3: Optimized Defaults
                                                                F4: Save & Exit
                                                                ESC: Exit


           Version 2.19.1269. Copyright (C) 2019 American Megatrends, Inc.
```

This screen displays the temperature of system and CPU, fan speed in RPM and system voltages (VBAT and +5V).
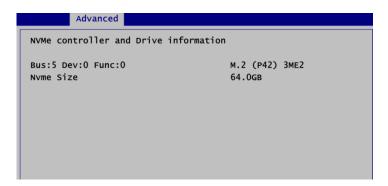
Smart Fan Function
Enable or disable Smart Fan control function. Once enabled, you will be able to go further for Smart Fan Mode Configuration, see image below.

```
      Advanced

PC Health Status

Smart Fan Function              [Enabled]
► Smart Fan Mode Configuration

CPU temperature                 : +33 °C
Fan1 Speed                      : 5190 RPM
System temperature              : +30 °C
VBAT                            : +3.056 V
+5V                             : +4.920 V
```

```
      Advanced

Smart Fan Mode Configuration

CpuFan Boundary 1 temperature        60
CpuFan Boundary 2 temperature        50
CpuFan Boundary 3 temperature        40
CpuFan Expect Speed 1                100
CpuFan Expect Speed 2                80
CpuFan Expect Speed 3                60
Cpufan Limit hysteresis              2
```

● **NVMe Configuration (Optional)**
If M.2 NVMe card is installed in M.2 2242/3042 Key B Connector (CN10) (see section 2.5.8) with BOM option change, you will also need customized BIOS to show and enable NVMe Configuration. The following screen displays NVMe (Non-Volatile Memory Express) controller and drive information.

```
              Advanced
   NVMe controller and Drive information

   Bus:5 Dev:0 Func:0                    M.2 (P42) 3ME2
   Nvme Size                             64.0GB
```

● **ACPI Settings**

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
              Advanced

   ACPI Settings                                          Select the highest ACPI sleep
                                                          state the system will enter
   ACPI Sleep State              [S3 (Suspend to RAM)]    when the SUSPEND button is
                                                          pressed.


                            ┌───── ACPI Sleep State ─────┐
                            │  Suspend Disabled          │
                            │  S3 (Suspend to RAM)       │
                            └────────────────────────────┘
                                                          →←: 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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```

ACPI Sleep State
Select the ACPI (Advanced Configuration and Power Interface) sleep state. Configuration options are Suspend Disabled and S3 (Suspend to RAM). When S3 (Suspend to RAM) option is selected, the system will enter after suspend button is pressed.

● **Trusted Computing**
You can use this screen for TPM (Trusted Platform Module) configuration. It also shows current TPM status information.

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Advanced

 TPM20 Device Found                                  Enables or Disables BIOS
 Firmware Version:              73.4                  support for security device.
 Vendor:                        STM                   O.S. will not show Security
                                                      Device. TCG EFI protocol and
 Security Device Support        [Enable]              INT1A interface will not be
 Active PCR banks               SHA-1, SHA256         available.
 Available PCR banks            SHA-1, SHA256

                     ┌─ Security Device Support ─┐
                     │ Disable                   │
                     │ Enable                    │
                     └───────────────────────────┘    ←→: 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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```

Security Device Support
Enable or disable BIOS support for security device.

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

```
              Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
     Advanced

 CPU Configuration                                          Enable/disable CPU
                                                            Virtualization
 Module Version: RavenCpu 18
 AGESA Version: RavenPI 1105

 Socket0: AMD Ryzen Embedded V1605B with Radeon Vega Gfx
 4 Core(s) Running @ 2038 MHz 1218 mV
 Processor Family: 17h
 Processor Model: 10h-1Fh
 CPUID: 00810F10                 ┌──────  SVM Mode  ──────┐
 Max Speed:2000 MHz              │ Disabled               │
 Min Speed:1600 MHz              │ Enabled                │
 Microcode Patch Level: 810100B  └────────────────────────┘

 --------- Cache per core ---------
 L1 Instruction Cache: 64 KB/4-way                          →←: Select Screen
        L1 Data Cache: 32 KB/8-way                          ↑↓: Select Item
            L2 Cache: 512 KB/8-way                          Enter: Select
  Total L3 Cache per Socket: 4 MB/16-way                    +/-: Change Opt.
 SVM Mode                        [Enabled]                  F1: General Help
 Core Performance Boost          [Disabled]                 F2: Previous Values
                                                            F3: Optimized Defaults
                                                            F4: Save & Exit
                                                            ESC: Exit

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```

SVM Mode
Enable or disable SVM (Secure Virtual Machine) mode. Once enabled, you will be able to install a virtual machine on your system.

Core Performance Boost
If enabled, the CPU can be boosted up to its maximum clock speed when needed.
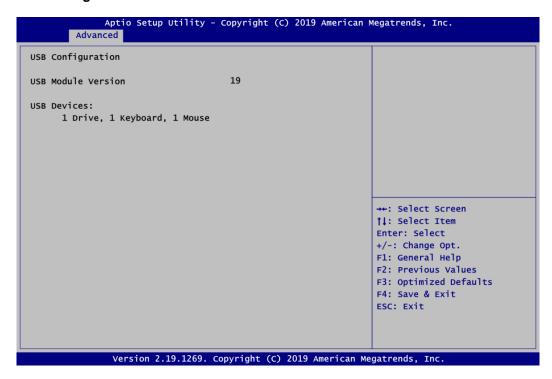
- **SATA Configuration**
  During system boot up, BIOS automatically detects the presence of SATA devices. In the SATA Configuration menu, you can see the hardware currently installed in SATA ports.

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
         Advanced

  SATA Configuration

  SATA Port0                        AXIOMTEK Corp. (31.0GB)
  SATA Port1(M.2 KeyB)              Not Present




                                                          →←: 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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```

- **USB Configuration**

```
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         Advanced

  USB Configuration

  USB Module Version                19

  USB Devices:
       1 Drive, 1 Keyboard, 1 Mouse




                                                          →←: 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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```

USB Devices
Display all detected USB devices.

- **Onboard Device Configuration**.
  A description of the selected item appears on the right side of the screen. For items marked with "▶", please press <Enter> for more options.
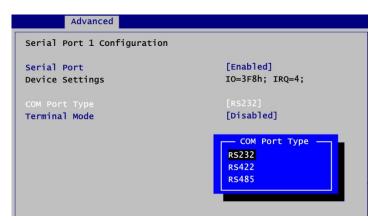
```
                Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Advanced

 ▶ Onboard Device Configuration                    Onboard Device Configuration
                                                   status



                                                   →←: 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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```
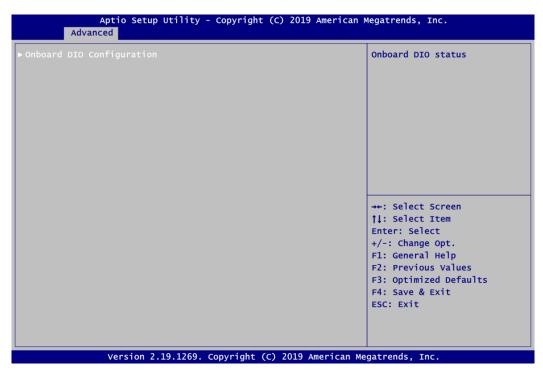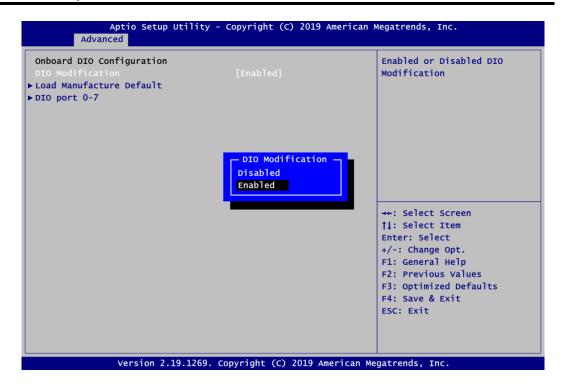
Onboard Device Configuration
Use this option to configure onboard device (e.g., Digital I/O setting).

- **Onboard DIO Configuration**
  You can use this screen to select options for the 8-bit Digital I/O Configuration. A description of the selected item appears on the right side of the screen. For items marked with "▶", please press <Enter> for more options.

```
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   Advanced

 ▶ Onboard DIO Configuration                       Onboard DIO status



                                                   →←: 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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```

```
          Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
              Advanced

  Onboard DIO Configuration                                  Enabled or Disabled DIO
  DIO Modification                    [Enabled]              Modification
  ▶ Load Manufacture Default
  ▶ DIO port 0-7

                              ┌─ DIO Modification ─┐
                              │ Disabled           │
                              │ Enabled            │
                              └────────────────────┘

                                                             →←: 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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```

DIO Modification
Enable or disable digital I/O modification. The default is Disabled.
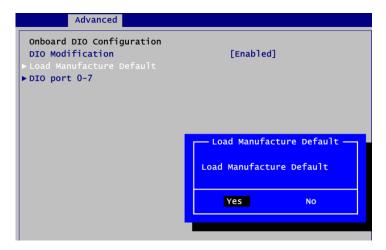
DIO port 0-7
Select this option to open DIO status sub-screen.
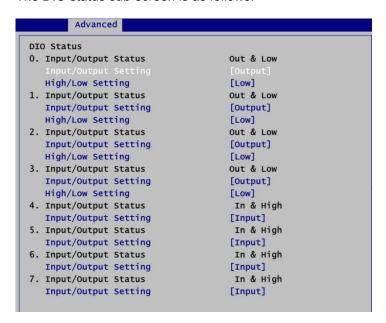
If DIO Modification is disabled, you are not allowed to change inputs/outputs setting. The DIO status sub-screen is as follows:

```
              Advanced

  DIO status
  0. Input/Output Status          Out & Low
  1. Input/Output Status          Out & Low
  2. Input/Output Status          Out & Low
  3. Input/Output Status          Out & Low
  4. Input/Output Status          In & High
  5. Input/Output Status          In & High
  6. Input/Output Status          In & High
  7. Input/Output Status          In & High
```

If DIO Modification is enabled, you can load manufacture default and access to the DIO status sub-screen to change input/output setting, see image below.

```
                    Advanced

     Onboard DIO Configuration
     DIO Modification                [Enabled]
   ▶ Load Manufacture Default
   ▶ DIO port 0-7




                        ┌─── Load Manufacture Default ───┐
                        │                                │
                        │   Load Manufacture Default     │
                        │                                │
                        │         Yes          NO        │
                        └────────────────────────────────┘
```

The DIO status sub-screen is as follows:

```
                    Advanced

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

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:
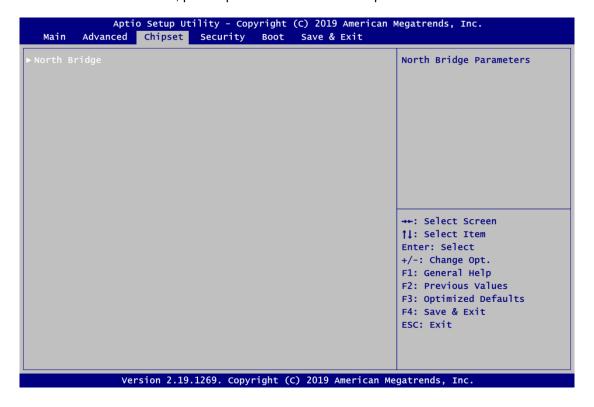
► North Bridge

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

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Main    Advanced   Chipset   Security    Boot    Save & Exit

 ▶ North Bridge                                    North Bridge Parameters




                                                   →←: 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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```

● **North Bridge**
This screen shows system memory information.

```
             Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
             Chipset

North Bridge Configuration

Memory Information

Total Memory: 16384 MB (DDR4)

                                                          →←: 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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```

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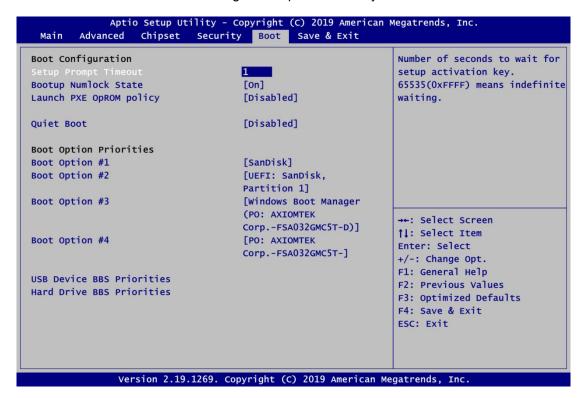
The Security menu allows users to change the security settings for the system.

```
         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
   Main   Advanced   Chipset   Security   Boot   Save & Exit

 Password Description                                 Set Administrator Password

 If ONLY the Administrator's password is set,
 then this only limits access to Setup and is
 only asked for when entering Setup.
 If ONLY the User's password is set, then this
 is a power on password and must be entered to
 boot or enter Setup. In Setup the User will
 have Administrator rights.
 The password length must be
 in the following range:
 Minimum length              3
 Maximum length              20                       →←: Select Screen
                                                      ↑↓: Select Item
 Administrator Password                               Enter: Select
 User Password                                        +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit


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```

● **Administrator Password**.
  Set administrator password.

● **User Password**
  Set user password.

4.7   Boot Menu

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

```
           Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
    Main   Advanced   Chipset   Security   Boot   Save & Exit

    Boot Configuration                                    Number of seconds to wait for
    Setup Prompt Timeout              1                   setup activation key.
    Bootup Numlock State              [On]                65535(0xFFFF) means indefinite
    Launch PXE OpROM policy           [Disabled]          waiting.

    Quiet Boot                        [Disabled]

    Boot Option Priorities
    Boot Option #1                    [SanDisk]
    Boot Option #2                    [UEFI: SanDisk,
                                      Partition 1]
    Boot Option #3                    [Windows Boot Manager
                                      (P0: AXIOMTEK
                                      Corp.-FSA032GMC5T-D)]     →←: Select Screen
    Boot Option #4                    [P0: AXIOMTEK             ↑↓: Select Item
                                      Corp.-FSA032GMC5T-]       Enter: Select
                                                                +/-: Change Opt.
    USB Device BBS Priorities                                   F1: General Help
    Hard Drive BBS Priorities                                   F2: Previous Values
                                                                F3: Optimized Defaults
                                                                F4: Save & Exit
                                                                ESC: Exit


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```

- **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.

- **Launch PXE OpROM policy**
  Use this item to enable or disable the boot ROM function of the onboard LAN chip when the system boots up.

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

- **Boot Option Priorities [Boot Option #1, …]**
  These are settings for boot priority. Specify the boot device priority sequence from the available devices.
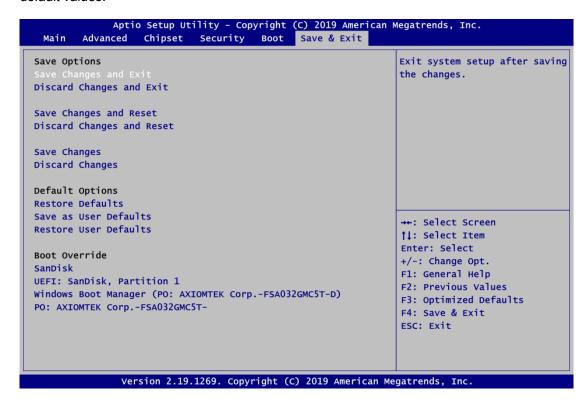
- **USB Device/Hard Drive BBS Priorities**
  Set the boot order of the specific devices in this group. This option appears only if at least one device of this group is detected.

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) 2019 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
    SanDisk                                             F2: Previous Values
    UEFI: SanDisk, Partition 1                          F3: Optimized Defaults
    Windows Boot Manager (PO: AXIOMTEK Corp.-FSA032GMC5T-D)   F4: Save & Exit
    PO: AXIOMTEK Corp.-FSA032GMC5T-                     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
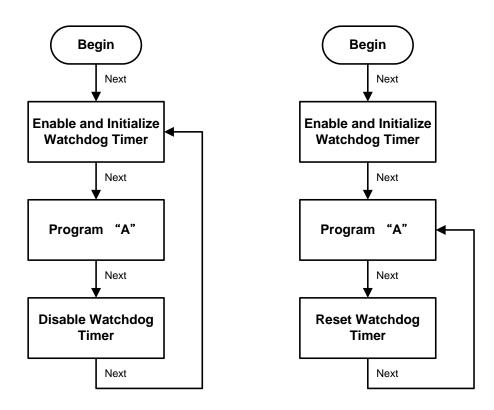
Software stability is major issue in most application. Some embedded systems are not watched by operator for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us solution.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

A.2   How to Use Watchdog Timer

The I/O port base addresses of watchdog timer are 2E (hex) and 2F (hex). The 2E (hex) and 2F (hex) are address and data port respectively.

Assume that program A is put in a loop that must execute at least once every 10ms. Initialize watchdog timer with a value bigger than 10ms. If the software has no problems; watchdog timer will never expire because software will always restart the counter before it reaches zero.

A.3 Sample Program

Assembly sample code :

```
;Enable WDT:
mov     dx,2Eh
mov     al,87              ;Un-lock super I/O
out     dx,al
out     dx,al

;Select Logic device:
mov     dx,2Eh
mov     al,07h
out     dx,al
mov     dx,2Fh
mov     al,07h
out     dx,al

;Enable WDT base address:
mov     dx,2Eh
mov     al,30h
out     dx,al
mov     dx,2Fh
mov     al,01h
out     dx,al

;Activate WDT:
mov     dx,2Eh
mov     al,0F0h
out     dx,al
mov     dx,2Fh
mov     al,80h
out     dx,al

;Set base timer :
mov     dx,2Eh
mov     al,0F6h
out     dx,al
mov     dx,2Fh
mov     al,Mh              ;M=00h,01h,...FFh (hex),Value=0 to 255
out     dx,al              ;(see      Note below)

;Set Second or Minute :
mov     dx,2Eh
mov     al,0F5h
out     dx,al
mov     dx,2Fh
mov     al,Nh              ;N=71h or 79h(see      Note below)
out     dx,al
```

Note:

If **N**=71h, the time base is set to second.
M = time value
    00: Time-out disable
    01: Time-out occurs after 1 second
    02: Time-out occurs after 2 seconds
    03: Time-out occurs after 3 seconds
    .
    .
    FFh: Time-out occurs after 255 seconds

*If **N**=79h, the time base is set to minute.*
M *= time value*

 00: Time-out disable
 01: Time-out occurs after 1 minute
 02: Time-out occurs after 2 minutes
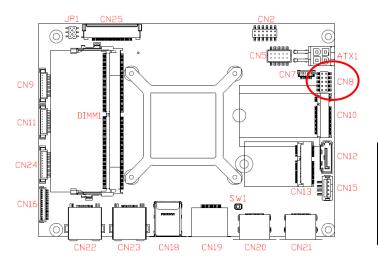 *03: Time-out occurs after 3 minutes*

  .
  .
 FFh: Time-out occurs after 255 minutes

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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. 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.

CN8

Pin	Signal	Pin	Signal
1	DIO0	2	DIO7
3	DIO1	4	DIO6
5	DIO2	6	DIO5
7	DIO3	8	DIO4
9	+5V	10	GND

B.2   Digital I/O Programming

- I^2C to GPIO PCA9554PW GPIO.
- I^2C address: 01000100.

Command byte

Command	Protocol	Function
0	Read byte	Input port register
1	Read/write byte	Output port register
2	Read/write byte	Polarity inversion register
3	Read/write byte	Configuration register

The command byte is the first byte to follow the address byte during a write transmission. It is used as a pointer to determine which of the following registers will be written or read.

Register 0: Input port register.
This register is a read-only port. It reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by Register 3. Writes to this register have no effect.

The default "X" is determined by the externally applied logic level, normally "1" when no external signal externally applied because of the internal pull-up resistors.

Register 0 – Input port register bit description

Bit	Symbol	Access	Value	Description
7	I7	Read only	X	
6	I6	Read only	X	
5	I5	Read only	X	
4	I4	Read only	X	Determined by externally applied logic level.
3	I3	Read only	X	
2	I2	Read only	X	
1	I1	Read only	X	
0	I0	Read only	X	

Register 1: Output port register.
This register reflects the outgoing logic levels of the pins defined as outputs by Register 3. Bit values in this register have no effect on pins defined as inputs. Reads from this register return the value that is in the flip-flop controlling the output selection, not the actual pin value.

Register 1 – Output port register bit description

Bit	Symbol	Access	Default Value	Description
7	O7	R	1	
6	O6	R	1	
5	O5	R	1	
4	O4	R	1	Reflects outgoing logic levels of pins defined as outputs by Register 3.
3	O3	R	1	
2	O2	R	1	
1	O1	R	1	
0	O0	R	1	

Register 2: Polarity Inversion register.
This register allows the user to invert the polarity of the Input port register data. If a bit in this register is set (written with "1"), the corresponding Input port data is inverted. If a bit in this register is cleared (written with "0"), the Input port data polarity is retained.

Register 2 – Polarity inversion register bit description

Bit	Symbol	Access	Default Value	Description
7	N7	R/W	0	
6	N6	R/W	0	
5	N5	R/W	0	Inverts polarity of Input port register data.
4	N4	R/W	0	0 = Input port register data retained (default value).
3	N3	R/W	0	1 = Input port register data inverted.
2	N2	R/W	0	
1	N1	R/W	0	
0	N0	R/W	0	

Register 3: Configuration register.
This register configures the directions of the I/O pins. If a bit in this register is set, the corresponding port pin is enabled as an input with high-impedance output driver. If a bit in this register is cleared, the corresponding port pin is enabled as an output. At reset, the I/Os are configured as inputs with a weak pull-up to V_{DD}.

Register 3 – Configuration register bit description

Bit	Symbol	Access	Default Value	Description
7	C7	R/W	1	
6	C6	R/W	1	
5	C5	R/W	1	Configures the directions of the I/O pins.
4	C4	R/W	1	0 = Corresponding port pin enabled as an output.
3	C3	R/W	1	1 = Corresponding port pin configured as input
2	C2	R/W	1	(default value).
1	C1	R/W	1	
0	C0	R/W	1	