



**MODEL:**

**PIC0e-B650**

**Half-size PCIe CPU Card with LGA1155 32nm Intel® Core™ i7/i5/i3 CPU and Intel® B65 Chipset, DDR3, VGA, USB 2.0, Dual PCIe GbE, SATA 6Gb/s, HD Audio, RoHS Compliant**

## **User Manual**

# Revision

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| Date              | Version | Changes   |
|-------------------|---------|---|
| July 2, 2018      | 1.03    | Updated Chapter 5: BIOS Screens                   |
| October 7, 2014   | 1.02    | Modified Table 3-9: Front Panel Connector Pinouts |
| November 20, 2013 | 1.01    | Updated Section 5.3.5: SATA Configuration         |
| February 3, 2012  | 1.00    | Initial release                                   |

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Chapter

1

# Introduction

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## 1.1 Introduction



**Figure 1-1: PIC0e-B650 Half-size CPU Card**

The PIC0e-B650 half-size PCIe CPU card is an embedded LGA1155 Intel® Core™ processor i3, i5 or i7 platform. The PIC0e-B650 supports one 204-pin 1066/1333 MHz 8.0 GB (max.) DDR3 SDRAM SO-DIMM. The board includes one VGA connector, and supports a dual-display configuration.

The PIC0e-B650 also comes with two Gigabit Ethernet (GbE) connectors, one SATA 6Gb/s connector, one SATA 3Gb/s connector and four USB 2.0 connector. Serial device connectivity is provided by two internal RS-232 connectors.

The PIC0e-B650 supports an optional Trusted Platform Module (TPM) to provide a trusted and secure base for various applications.

## PIC0e-B650 Half-size PCIe CPU Card

### 1.2 Connectors

The connectors on the PIC0e-B650 are shown in the figure below.

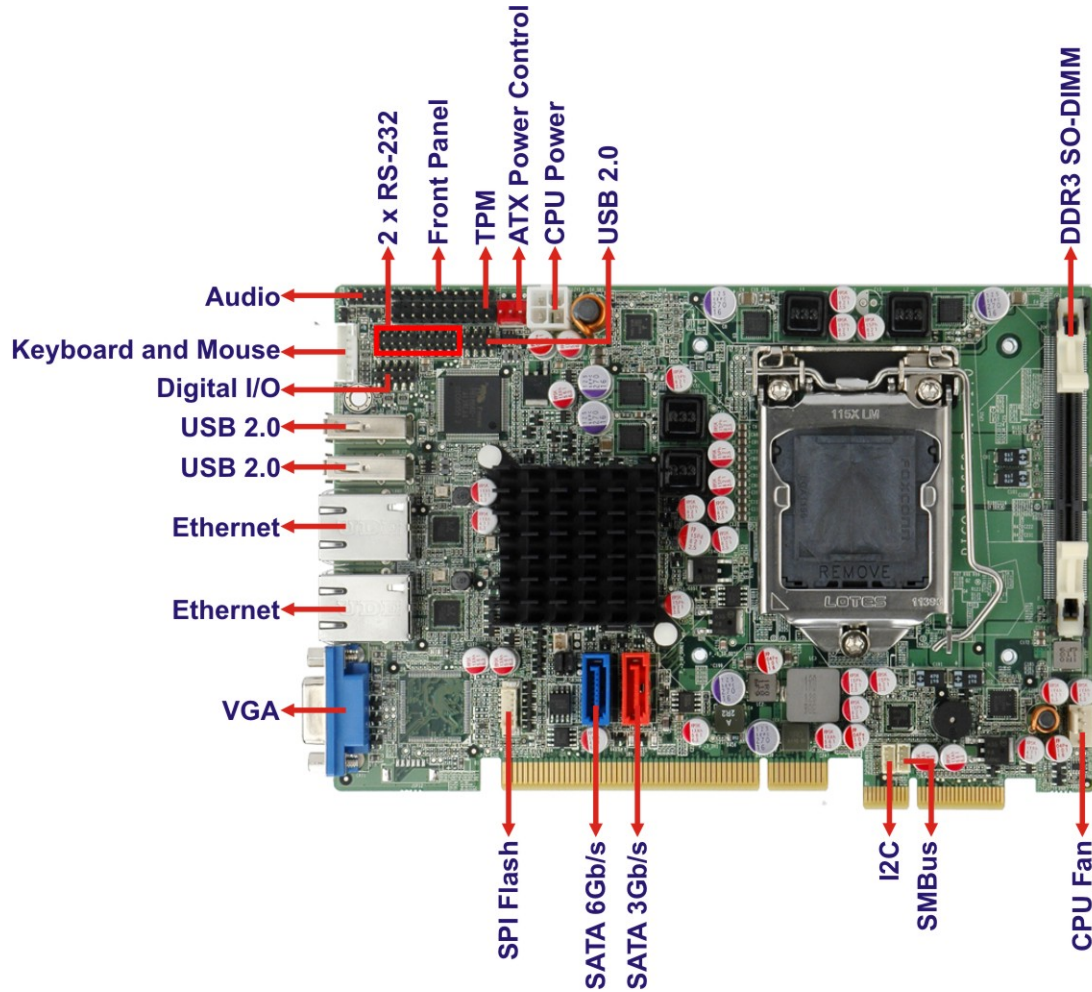


Figure 1-2: Connectors

### 1.3 Dimensions

The dimensions of the board are listed below:

- **Length:** 185 mm
- **Width:** 122 mm

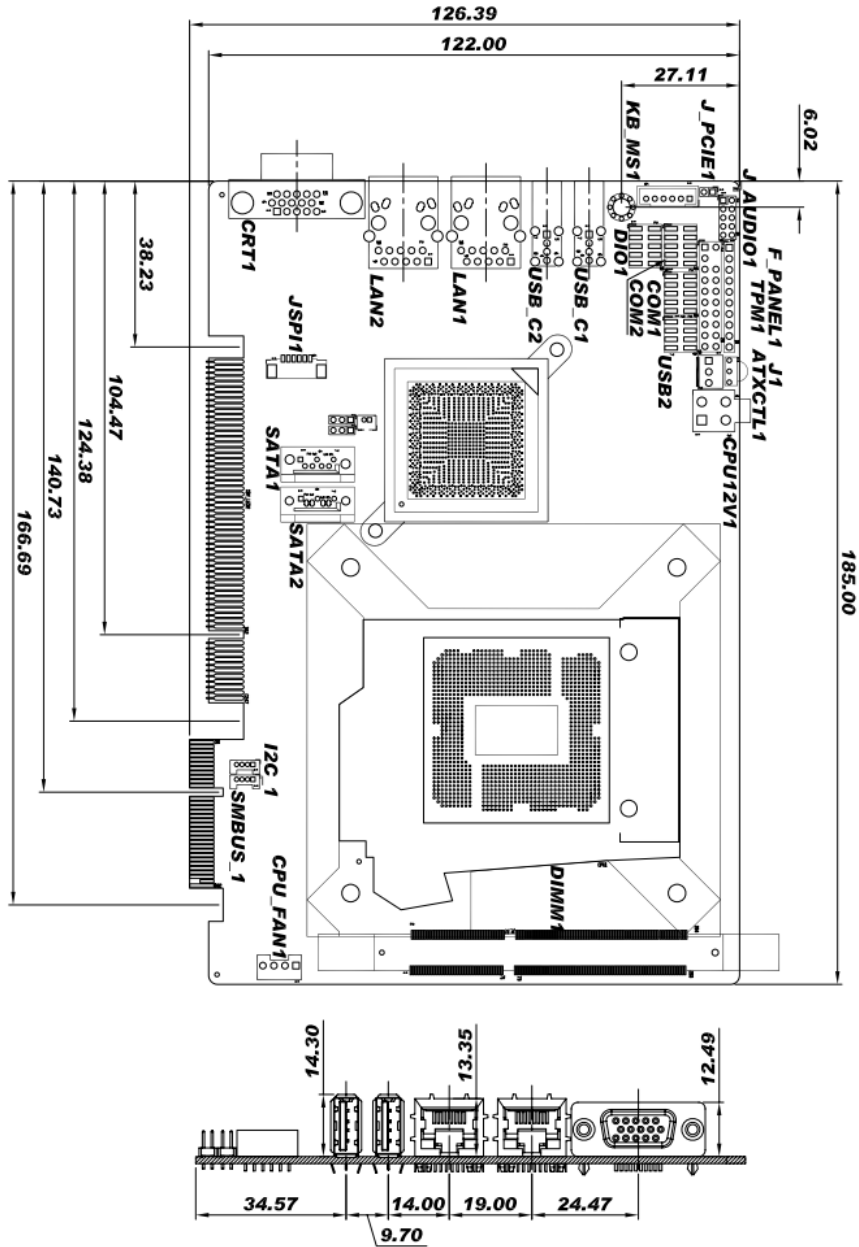


Figure 1-3: PIC0e-B650 Dimensions (mm)



PICOe-B650 Half-size PCIe CPU Card

1.4 Data Flow

Figure 1-4 shows the data flow between the two on-board chipsets and other components installed on the motherboard and described in the following sections of this chapter.

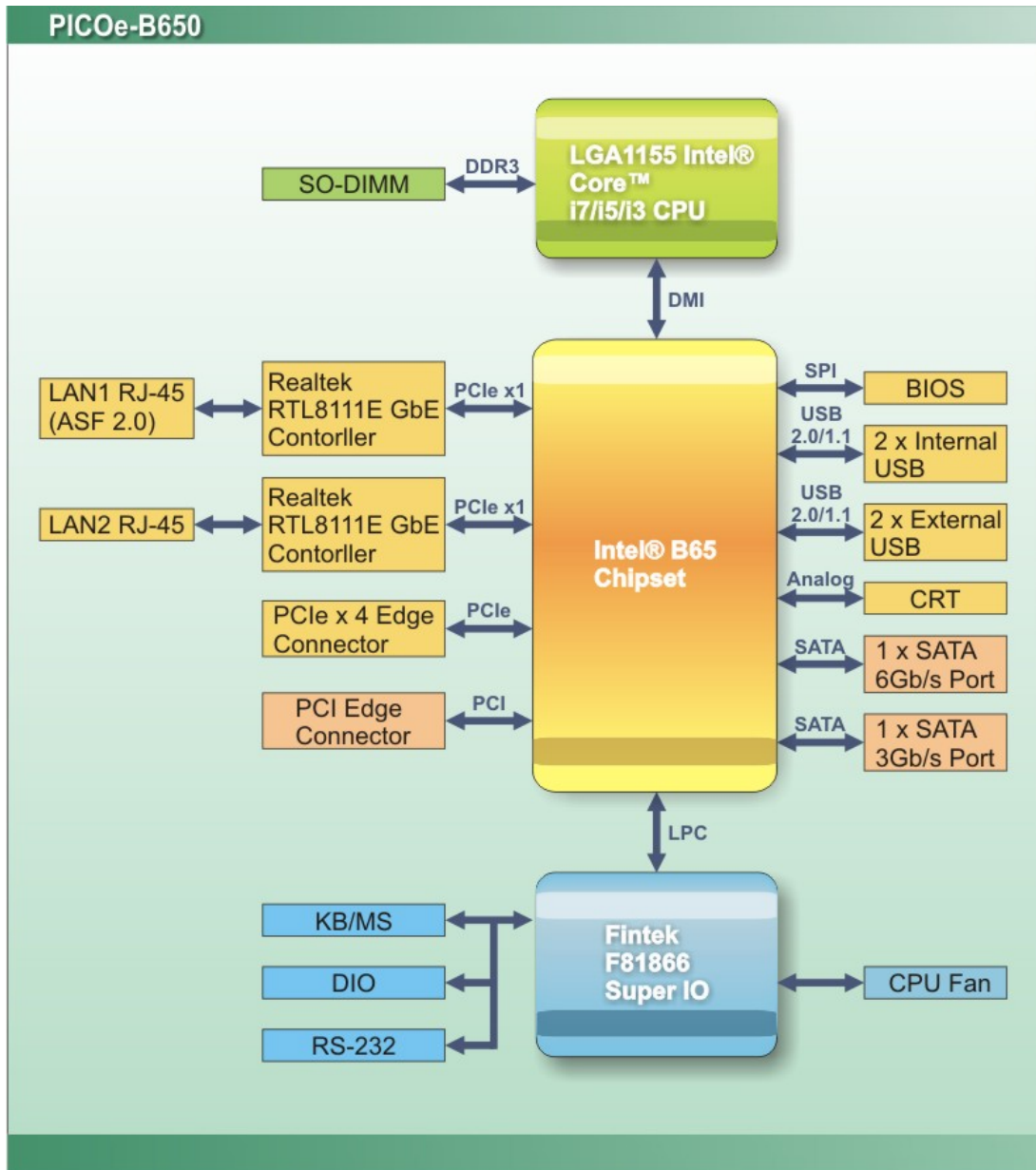


Figure 1-4: Data Flow Block Diagram

## 1.5 Technical Specifications

PIC0e-B650 technical specifications are listed in table below.

| Specification                   | PIC0e-B650   |
|---------------------------------|--|
| <b>Form Factor</b>              | Half-size PCIe CPU Card  |
| <b>CPU Socket</b>               | LGA1155 socket   |
| <b>CPU Options</b>              | Intel® Core™ i7/i5/i3 quad-core/dual-core processor<br>Intel® Pentium®/Celeron® processor      |
| <b>System Chipset</b>           | Intel® B65   |
| <b>Graphics Engine</b>          | Intel® HD Graphics Gen 6 support for DX10.1 and OpenGL 3.0<br>Full MPEG2, VC1, AVC Decode      |
| <b>Memory</b>                   | One 204-pin SO-DIMM socket supports one 1333/1066 MHz DDR3<br>SDRAM SO-DIMM (system max. 8 GB) |
| <b>LAN</b>                      | Dual Realtek RTL8111E PCIe GbE controllers, LAN1 supports ASF 2.0                              |
| <b>BIOS</b>                     | UEFI BIOS  |
| <b>Super I/O</b>                | Fintek F81866  |
| <b>Ethernet Controller</b>      | Two Realtek RTL8111E PCIe GbE controllers<br>(LAN1 with ASF2.0 support)                        |
| <b>Digital I/O</b>              | 8-bit digital I/O (4-bit input, 4-bit output)  |
| <b>Watchdog Timer</b>           | Software programmable supports 1~255 sec. system reset   |
| <b>SMBus</b>                    | One 4-pin wafer connector  |
| <b>I<sup>2</sup>C</b>           | One 4-pin wafer connector  |
| <b>TPM</b>                      | One 20-pin header supports optional Infineon TPM module  |
| <b>Expansion</b>                |  |
| <b>PCI</b>                      | PCI signal via golden finger   |
| <b>PCIe</b>                     | Four PCIe x1 via golden finger   |
| <b>I/O Interface Connectors</b> |  |
| <b>Display</b>                  | One VGA port (VGA integrated in Intel® B65)  |

## PICOe-B650 Half-size PCIe CPU Card

| Specification                                 | PICOe-B650   |
|---|--|
| <b>Ethernet</b>                               | Two RJ-45 GbE ports  |
| <b>Audio</b>                                  | Supports 7.1 channel HD audio via optional IEI AC-KIT-888HD kit  |
| <b>Keyboard/Mouse</b>                         | One keyboard and mouse connector via internal 6-pin header   |
| <b>Serial Ports</b>                           | Two RS-232 serial ports via internal pin header  |
| <b>USB 2.0 ports</b>                          | Two external USB ports<br>Two USB ports via internal pin headers   |
| <b>Storage</b>                                |  |
| <b>Serial ATA</b>                             | One SATA 6Gb/s port<br>One SATA 3Gb/s port   |
| <b>Environmental and Power Specifications</b> |  |
| <b>Power Supply</b>                           | 5 V / 12 V, AT/ATX power support   |
| <b>Power Consumption</b>                      | 5V@3.17A, 12V@0.46A, Vcore_12V@7.26A, 5VSB@0.18A (3.4GHz Intel® Core™ i7-2600K with two 2GB 1333MHz DDR3 memory) |
| <b>Operating Temperature</b>                  | -10°C~60°C   |
| <b>Storage Temperature</b>                    | -20°C~70°C   |
| <b>Humidity</b>                               | 5% ~ 95% (non-condensing)  |
| <b>Physical Specifications</b>                |  |
| <b>Dimensions</b>                             | 185 mm x 122 mm  |
| <b>Weight GW/NW</b>                           | 1000g/260g   |

Table 1-1: Technical Specifications

Chapter

**2**

# Unpacking

---

## PIC0e-B650 Half-size PCIe CPU Card

### 2.1 Anti-static Precautions

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#### **WARNING!**

Static electricity can destroy certain electronics. Make sure to follow the ESD precautions to prevent damage to the product, and injury to the user.

---

Make sure to adhere to the following guidelines:

- ***Wear an anti-static wristband:*** Wearing an anti-static wristband can prevent electrostatic discharge.
- ***Self-grounding:*** Touch a grounded conductor every few minutes to discharge any excess static buildup.
- ***Use an anti-static pad:*** When configuring any circuit board, place it on an anti-static mat.
- ***Only handle the edges of the PCB:*** Don't touch the surface of the motherboard. Hold the motherboard by the edges when handling.

### 2.2 Unpacking Precautions

When the PIC0e-B650 is unpacked, please do the following:

- Follow the antistatic guidelines above.
- Make sure the packing box is facing upwards when opening.
- Make sure all the packing list items are present.

## 2.3 Unpacking Checklist








**NOTE:**


If any of the components listed in the checklist below are missing, do not proceed with the installation. Contact the IEI reseller or vendor the PICOe-B650 was purchased from or contact an IEI sales representative directly by sending an email to [sales@ieiworld.com](mailto:sales@ieiworld.com).

### 2.3.1 Package Contents

The PICOe-B650 is shipped with the following components:







| Quantity | Item and Part Number       | Image   |
|----------|----------------------------|---|
| 1        | PICOe-B650 CPU card        |   |
| 2        | SATA cable                 |  |
| 1        | Dual RS-232 cable          |  |
| 1        | Dual USB cable (w bracket) |  |
| 1        | Mini jumper pack           |  |

## PIC0e-B650 Half-size PCIe CPU Card

|   |                          |   |
|---|--------------------------|---|
| 1 | Quick Installation Guide |  |
|---|--------------------------|---|

### 2.3.2 Optional Items

The PIC0e-B650 is shipped with the following components:

| Item and Part Number   | Image   |
|--|---|
| SATA power cable<br>(P/N: 32102-000100-200-RS)   |    |
| KB/MS cable (with bracket)<br>(P/N: 19800-000075-RS)   |    |
| 7.1 Channel HD Audio kit with Realtek ALC892<br>(P/N: AC-KIT-892HD-R10)                      |  |
| SATA to IDE/CompactFlash® converter board<br>(P/N: SAIDE-KIT01-R10)                          |  |
| Infineon TPM module<br>(P/N: TPM-IN01-R20)   |  |
| High-performance LGA1155/1156 cooler kit (1U chassis compatible, 73W)<br>(P/N: CF-115XA-R10) |  |

Chapter

**3**

# Connectors

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## PIC0e-B650 Half-size PCIe CPU Card

### 3.1 Peripheral Interface Connectors

Section 3.1.1 shows peripheral interface connector locations. Section 3.2 lists all the peripheral interface connectors seen in Section 3.1.1.

#### 3.1.1 PIC0e-B650 Layout

Figure 3-1 shows the on-board peripheral connectors, rear panel peripheral connectors and on-board jumpers.

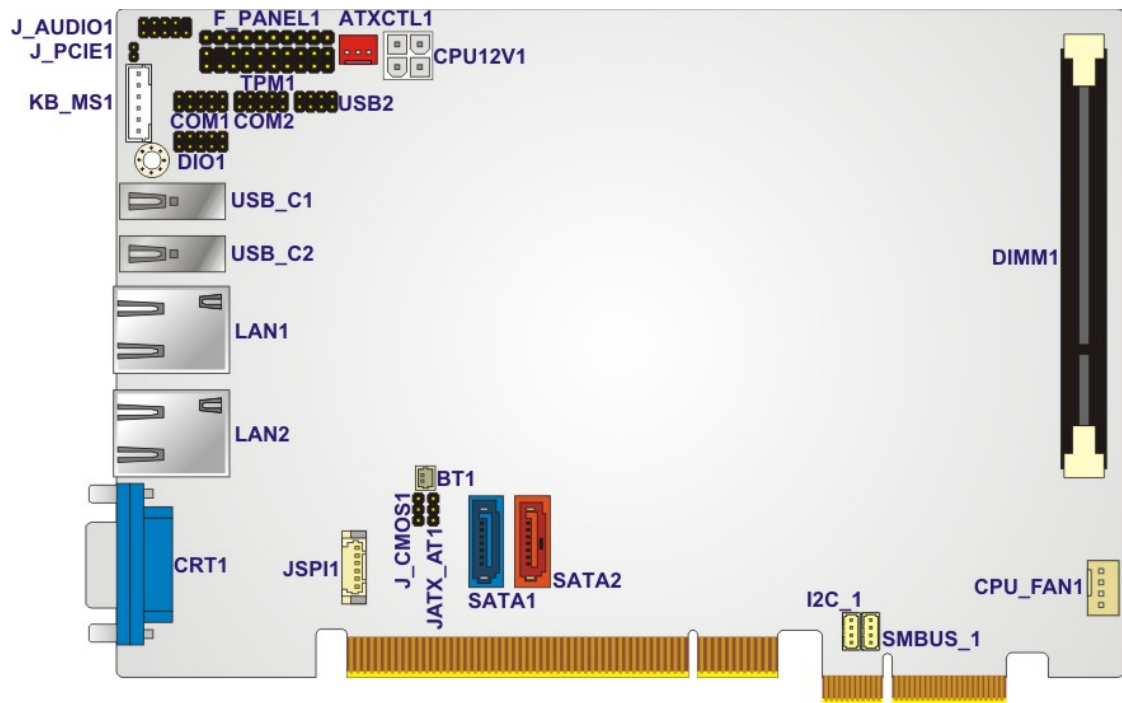


Figure 3-1: Connector and Jumper Locations

#### 3.1.2 Peripheral Interface Connectors

Table 3-1 shows a list of the peripheral interface connectors on the PIC0e-B650. Detailed descriptions of these connectors can be found below.

| Connector                   | Type         | Label    |
|-----------------------------|--------------|----------|
| ATX power control connector | 3-pin wafer  | ATXCTL1  |
| Audio connector             | 9-pin header | J_AUDIO1 |
| Battery connector           | 2-pin wafer  | BT1      |

| Connector                            | Type            | Label      |
|--------------------------------------|-----------------|------------|
| CPU fan connector                    | 4-pin wafer     | CPU_FAN1   |
| CPU power connector                  | 4-pin connector | CPU12V1    |
| DDR3 SO-DIMM                         | 204-pin SO-DIMM | DIMM1      |
| Digital input/output (DIO) connector | 10-pin header   | DIO1       |
| Front panel connector                | 10-pin header   | F_PANEL1   |
| I <sup>2</sup> C connector           | 4-pin wafer     | I2C_1      |
| Keyboard and mouse connector         | 6-pin wafer     | KB_MS1     |
| SATA 6Gb/s connector                 | 7-pin SATA      | SATA1      |
| SATA 3Gb/s connector                 | 7-pin SATA      | SATA2      |
| Serial port connectors (RS-232)      | 10-pin header   | COM1, COM2 |
| SMBus connector                      | 4-pin wafer     | SMBUS_1    |
| SPI flash connector                  | 6-pin wafer     | JSPI1      |
| TPM connector                        | 20-pin header   | TPM1       |
| USB 2.0 connector                    | 8-pin header    | USB2       |

**Table 3-1: Peripheral Interface Connectors**

### 3.1.3 External Interface Panel Connectors

**Table 3-2** lists the rear panel connectors on the PIC0e-B650. Detailed descriptions of these connectors can be found in **Section 3.3** on **page 30**.

| Connector          | Type          | Label  |
|--------------------|---------------|--------|
| Ethernet connector | RJ-45         | LAN1   |
| Ethernet connector | RJ-45         | LAN2   |
| USB 2.0 port       | USB port      | USB_C1 |
| USB 2.0 port       | USB port      | USB_C2 |
| VGA port connector | 15-pin female | CRT1   |

**Table 3-2: Rear Panel Connectors**

## PIC0e-B650 Half-size PCIe CPU Card

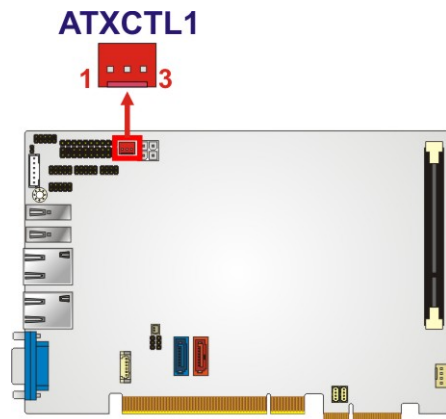
### 3.2 Internal Peripheral Connectors

Internal peripheral connectors are found on the CPU card and are only accessible when the CPU card is outside of the chassis. This section has complete descriptions of all the internal, peripheral connectors on the PIC0e-B650.

#### 3.2.1 ATX Power Supply Enable Connector

- CN Label:** ATXCTL1
- CN Type:** 3-pin wafer (1x3)
- CN Location:** See **Figure 3-2**
- CN Pinouts:** See **Table 3-3**

The ATX power supply enable connector enables the PIC0e-B650 to be connected to an ATX power supply. In default mode, the PIC0e-B650 can only use an AT power supply. To enable an ATX power supply the AT Power Select jumper must also be configured. Please refer to **Section 4.4.1** for more details.



**Figure 3-2: ATX Power Supply Enable Connector Location**

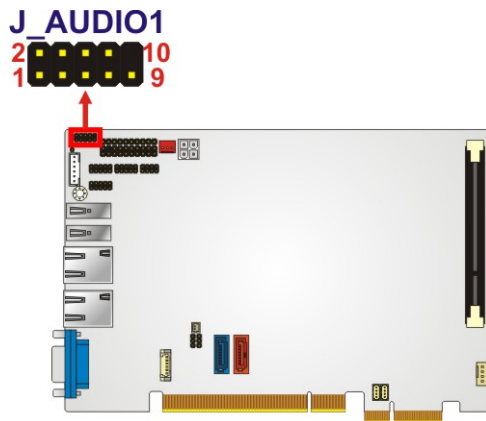
| Pin | Description |
|-----|-------------|
| 1   | GND         |
| 2   | PS-ON       |
| 3   | +5 Standby  |

**Table 3-3: ATX Power Supply Enable Connector Pinouts**

### 3.2.2 Audio Connector

- CN Label:** J\_AUDIO1
- CN Type:** 9-pin header (2x5)
- CN Location:** See **Figure 3-3**
- CN Pinouts:** See **Table 3-4**

The 9-pin audio connector is connected to external audio devices including speakers and microphones for the input and output of audio signals to and from the system.



**Figure 3-3: Audio Connector Location**

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | HDA_SYNC    | 2   | HDA_BITCLK  |
| 3   | HDA_SDOUT   | 4   | PC_BEEP     |
| 5   | HDA_SDINO   | 6   | HDA_RST#    |
| 7   | +5V         | 8   | GND         |
| 9   | +12V        | 10  | GND         |

**Table 3-4: Audio Connector Pinouts**

## PICOe-B650 Half-size PCIe CPU Card

### 3.2.3 Battery Connector



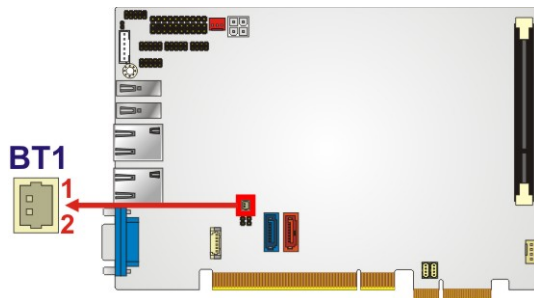
**CAUTION:**

Risk of explosion if battery is replaced by an incorrect type. Only certified engineers should replace the on-board battery.

Dispose of used batteries according to instructions and local regulations.

- CN Label:** BT1
- CN Type:** 2-pin wafer (1x2)
- CN Location:** See **Figure 3-4**
- CN Pinouts:** See **Table 3-5**

This is connected to the system battery. The battery provides power to the system clock to retain the time when power is turned off.



**Figure 3-4: Battery Connector Location**

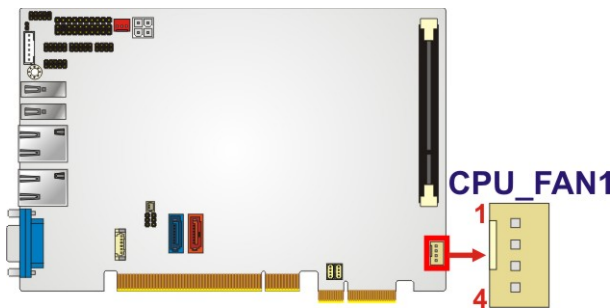
| Pin | Description |
|-----|-------------|
| 1   | Battery+    |
| 2   | Ground      |

**Table 3-5: Battery Connector Pinouts**

### 3.2.4 CPU Fan Connector

- CN Label:** CPU\_FAN1
- CN Type:** 4-pin wafer (1x4)
- CN Location:** See **Figure 3-5**
- CN Pinouts:** See **Table 3-6**

The cooling fan connector provides a 12V, 500mA current to the cooling fan. The connector has a "rotation" pin to get rotation signals from fans and notify the system so the system BIOS can recognize the fan speed. Please note that only specified fans can issue the rotation signals.



**Figure 3-5: +12V Fan Connector Location**

| Pin | Description |
|-----|-------------|
| 1   | GND         |
| 2   | +12V        |
| 3   | FANIO1      |
| 4   | PWM         |

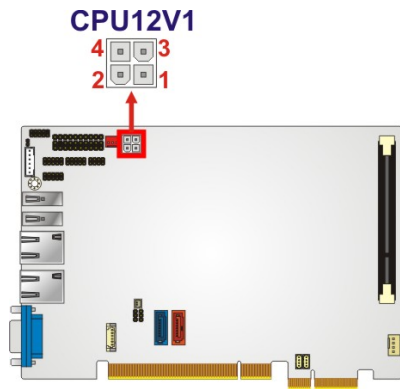
**Table 3-6: +12V Fan Connector Pinouts**

### 3.2.5 CPU 12 V Power Connector

- CN Label:** CPU12 V1
- CN Type:** 4-pin connector
- CN Location:** See **Figure 3-6**
- CN Pinouts:** See **Table 3-7**

## PICOe-B650 Half-size PCIe CPU Card

This connector accepts 12 V of power for the processor.



**Figure 3-6: CPU Power Connector Location**

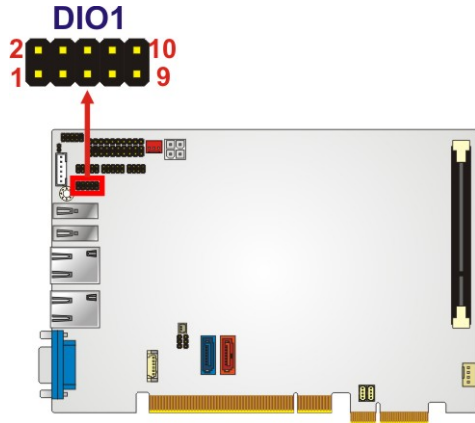
| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | GND         | 2   | GND         |
| 3   | +12 V       | 4   | +12 V       |

**Table 3-7: CPU Power Connector Pinouts**

### 3.2.6 Digital Input/Output (DIO) Connector

- CN Label:** DIO1
- CN Type:** 10-pin header (2x5)
- CN Location:** See **Figure 3-7**
- CN Pinouts:** See **Table 3-8**

The digital input/output connector is managed through a Super I/O chip. The DIO connector pins are user programmable.



**Figure 3-7: DIO Connector Location**

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | GND         | 2   | +5V         |
| 3   | Output 3    | 4   | Output 2    |
| 5   | Output 1    | 6   | Output 0    |
| 7   | Input 3     | 8   | Input 2     |
| 9   | Input 1     | 10  | Input 0     |

**Table 3-8: DIO Connector Connector Pinouts**

### 3.2.7 Front Panel Connector

- CN Label:** F\_PANEL1
- CN Type:** 10-pin header (1x10)
- CN Location:** See **Figure 3-8**
- CN Pinouts:** See **Table 3-9**

The front panel connector connects to external switches and indicators to monitor and controls the CPU card. These indicators and switches include:

- HDD LED
- Power button
- Power LED
- Reset



PICOe-B650 Half-size PCIe CPU Card

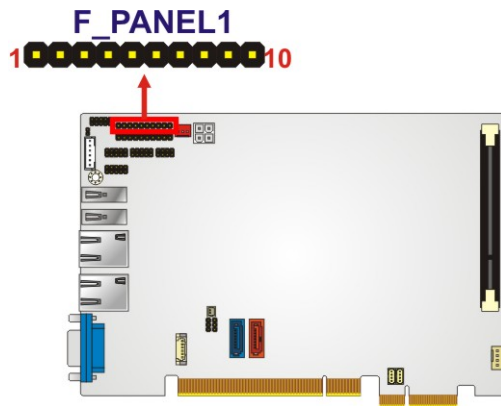


Figure 3-8: Front Panel Connector Location

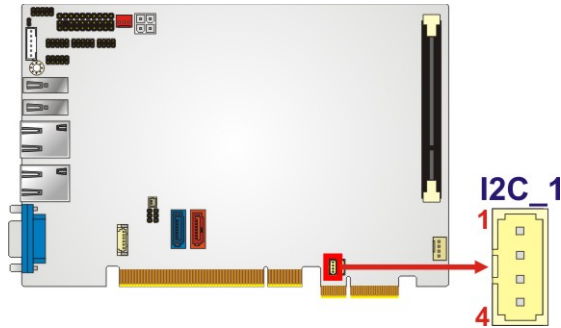
| FUNCTION     | PIN | DESCRIPTION | FUNCTION  | PIN | DESCRIPTION |
|--------------|-----|-------------|-----------|-----|-------------|
|              | 1   | N/A         | Power LED | 6   | PWR_LED+    |
| Power Button | 2   | PWR_BTN     |           | 7   | PWR_LED+    |
|              | 3   | GND         |           | 8   | GND         |
| HDD LED      | 4   | HDD_LED+    | Reset     | 9   | RESET       |
|              | 5   | HDD_LED-    |           | 10  | GND         |

Table 3-9: Front Panel Connector Pinouts

### 3.2.8 I2C Connector

- CN Label:** I2C\_1
- CN Type:** 4-pin wafer (1x4)
- CN Location:** See **Figure 3-9**
- CN Pinouts:** See **Table 3-10**

The I2C connector is used to connect I<sup>2</sup>C-bus devices to the mainboard.



**Figure 3-9: I2C Connector Location**

| Pin | Description |
|-----|-------------|
| 1   | +5V_DUAL    |
| 2   | PCH_GP38_PU |
| 3   | PCH_GP39_PU |
| 4   | GND         |

**Table 3-10: I2C Connector Pinouts**

### 3.2.9 Keyboard/Mouse Connector

- CN Label:** KB\_MS1
- CN Type:** 6-pin header (1x6)
- CN Location:** See **Figure 3-10**
- CN Pinouts:** See **Table 3-11**

The keyboard and mouse connector can be connected to a standard PS/2 cable or PS/2 Y-cable to add keyboard and mouse functionality to the system.

PICOe-B650 Half-size PCIe CPU Card

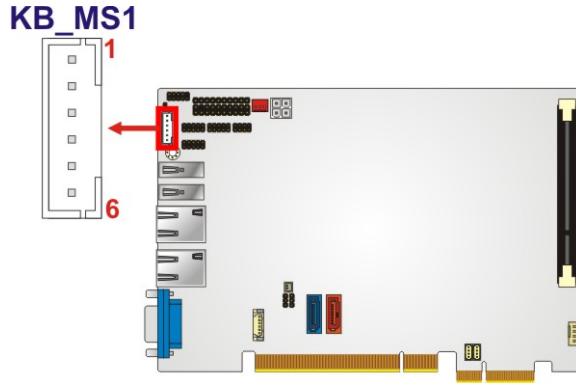


Figure 3-10: Keyboard/Mouse Connector Location

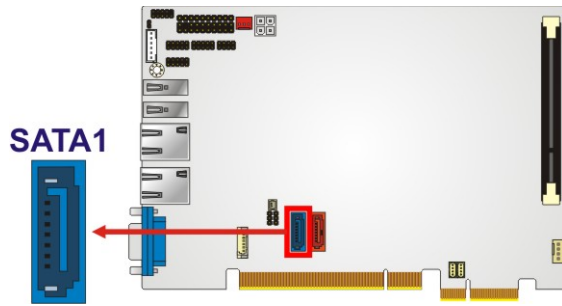
| Pin | Description |
|-----|-------------|
| 1   | VCC5_KBMS   |
| 2   | MS DATA     |
| 3   | MS CLK      |
| 4   | KB DATA     |
| 5   | KB CLK      |
| 6   | GROUND      |

Table 3-11: Keyboard/Mouse Connector Pinouts

3.2.10 SATA 6Gb/s Connector

- CN Label:** SATA1
- CN Type:** 7-pin SATA drive connector
- CN Location:** See Figure 3-11
- CN Pinouts:** See Table 3-12

The SATA connectors connect to SATA hard drives or optical drives with data transfer speeds as high as 6Gb/s.



**Figure 3-11: SATA Drive Connector Location**

| Pin | Description |
|-----|-------------|
| 1   | GND         |
| 2   | TX+         |
| 3   | TX-         |
| 4   | GND         |
| 5   | RX-         |
| 6   | RX+         |
| 7   | GND         |

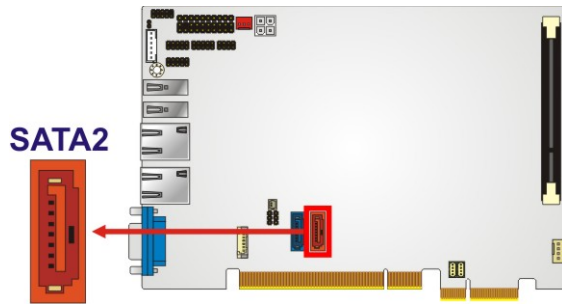
**Table 3-12: SATA Drive Connector Pinouts**

### 3.2.11 SATA 3Gb/s Connector

- CN Label:** SATA2
- CN Type:** 7-pin SATA drive connector
- CN Location:** See **Figure 3-12**
- CN Pinouts:** See **Table 3-13**

The SATA connectors connect to SATA hard drives or optical drives with data transfer speeds as high as 3Gb/s.

**PICOe-B650 Half-size PCIe CPU Card**



**Figure 3-12: SATA Drive Connector Location**

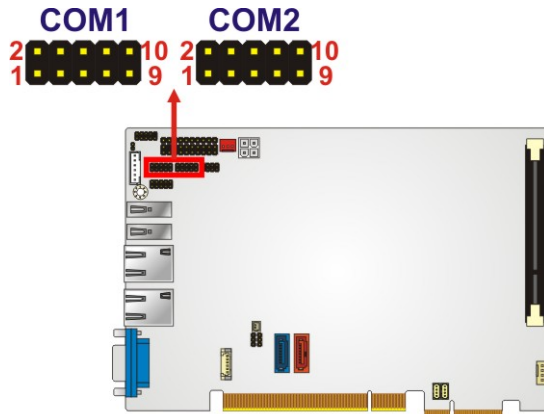
| Pin | Description |
|-----|-------------|
| 1   | GND         |
| 2   | TX+         |
| 3   | TX-         |
| 4   | GND         |
| 5   | RX-         |
| 6   | RX+         |
| 7   | GND         |

**Table 3-13: SATA Drive Connector Pinouts**

**3.2.12 Serial Port Connectors (COM 1 and COM 2)**

- CN Label:** COM1, COM2
- CN Type:** 10-pin header (2x5)
- CN Location:** See Figure 3-13
- CN Pinouts:** See Table 3-14

The 10-pin serial port connectors provide three RS-232 serial communications channels. The COM serial port connectors can be connected to external RS-232 serial port devices.



**Figure 3-13: COM Connector Locations**

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | -NDCD1      | 6   | -NCTS1      |
| 2   | -NDSR1      | 7   | -NDTR1      |
| 3   | NSIN1       | 8   | -XRI1       |
| 4   | -NRTS1      | 9   | GND         |
| 5   | NSOUT1      | 10  | GND         |

**Table 3-14: COM Connector Pinouts**

### 3.2.13 SMBus Connector

- CN Label:** SMBUS\_1
- CN Type:** 4-pin wafer (1x4)
- CN Location:** See **Figure 3-14**
- CN Pinouts:** See **Table 3-15**

The SMBus Connector provides a connection to a SMBus (System Management Bus) device.

PICOe-B650 Half-size PCIe CPU Card

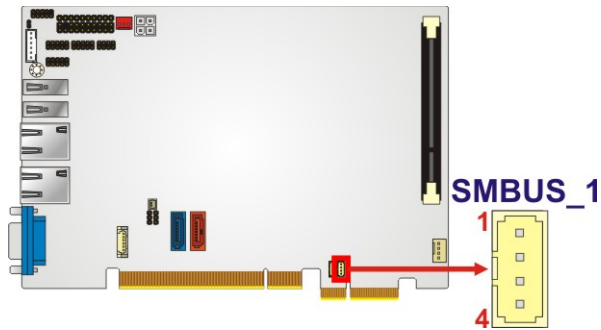


Figure 3-14: SMBus Connector Location

| Pin | Description |
|-----|-------------|
| 1   | +5V_DUAL    |
| 2   | SMBCLK      |
| 3   | SMBDATA     |
| 4   | GND         |

Table 3-15: SMBus Connector Pinouts

3.2.14 SPI Flash Connector

- CN Label:** JSPI1
- CN Type:** 6-pin header (1x6)
- CN Location:** See Figure 3-15
- CN Pinouts:** See Table 3-16

The SPI Flash connector is used to flash the BIOS.

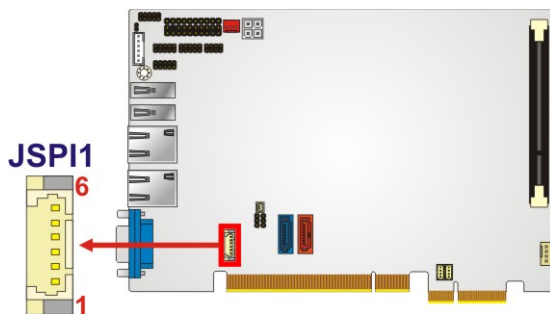


Figure 3-15: SPI Flash Connector Location

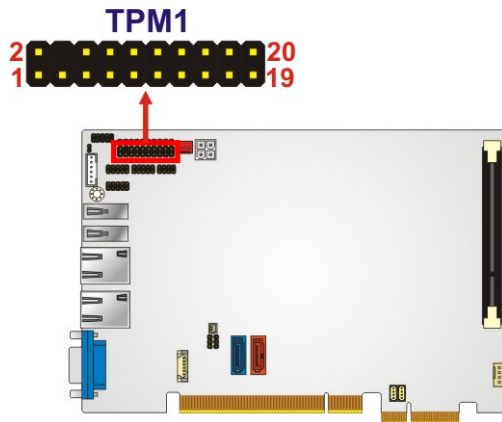
| Pin | Description |
|-----|-------------|
| 1   | SPI_VCC     |
| 2   | SPI_CS#     |
| 3   | SPI_MISO    |
| 4   | SPI_CLK     |
| 5   | SPI_MOSI    |
| 6   | GND         |

**Table 3-16: SPI Flash Connector**

### 3.2.15 TPM Connector

- CN Label:** TPM1
- CN Type:** 20-pin header (2x10)
- CN Location:** See **Figure 3-16**
- CN Pinouts:** See **Table 3-17**

The Trusted Platform Module (TPM) connector secures the system on bootup.



**Figure 3-16: TPM Connector Location**

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | LCLK        | 2   | GND2        |
| 3   | LFRAME#     | 4   | KEY         |
| 5   | LRESET#     | 6   | +5V         |



**PIC0e-B650 Half-size PCIe CPU Card**

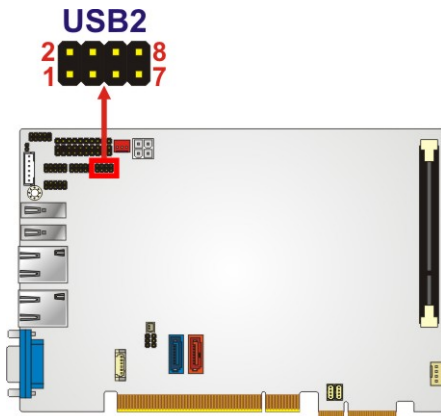
| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 7   | LAD3        | 8   | LAD2        |
| 9   | +3V         | 10  | LAD1        |
| 11  | LAD0        | 12  | GND3        |
| 13  | SCL         | 14  | SDA         |
| 15  | SB3V        | 16  | SERIRQ      |
| 17  | GND1        | 18  | GLKRUN#     |
| 19  | LPCPD#      | 20  | LDRQ#       |

**Table 3-17: TPM Connector Pinouts**

**3.2.16 USB Connectors (Internal)**

- CN Label:** USB2
- CN Type:** 8-pin header (2x4)
- CN Location:** See **Figure 3-17**
- CN Pinouts:** See **Table 3-18**

The internal USB connector provides connectivity to two USB 1.1 or two USB 2.0 ports. Each USB connector can support two USB devices. Additional external USB ports are found on the rear panel. The USB ports are used for I/O bus expansion.



**Figure 3-17: USB Connector Location**

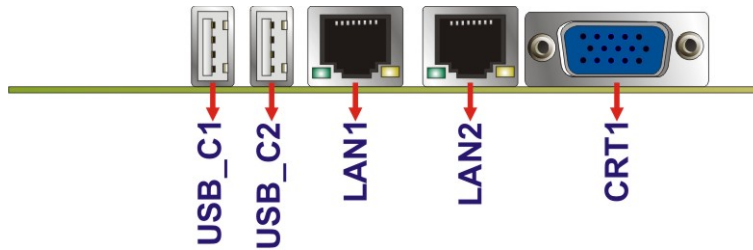
| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | VCC         | 2   | GND         |
| 3   | DATA-       | 4   | DATA+       |
| 5   | DATA+       | 6   | DATA-       |
| 7   | GND         | 8   | VCC         |

**Table 3-18: USB Port Connector Pinouts**

### 3.3 External Peripheral Interface Connector Panel

**Figure 3-18** shows the PIC0e-B650 external peripheral interface connector (EPIC) panel. The PIC0e-B650 EPIC panel consists of the following:

- 2 x RJ-45 LAN connectors
- 2 x USB connectors
- 1 x VGA connector



**Figure 3-18: PIC0e-B650 External Peripheral Interface Connector**

#### 3.3.1 LAN Connectors

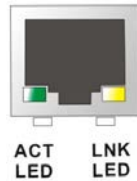
- CN Label:** LAN1 and LAN2
- CN Type:** RJ-45
- CN Location:** See **Figure 3-18**
- CN Pinouts:** See **Table 3-19**

The PIC0e-B650 is equipped with two built-in RJ-45 Ethernet controllers. The controllers can connect to the LAN through two RJ-45 LAN connectors. There are two LEDs on the connector indicating the status of LAN. The pin assignments are listed in the following table:

## PIC0e-B650 Half-size PCIe CPU Card

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | MDIA3-      | 5   | MDIA1+      |
| 2   | MDIA3+      | 6   | MDIA2+      |
| 3   | MDIA2-      | 7   | MDIA0-      |
| 4   | MDIA1-      | 8   | MDIA0+      |

**Table 3-19: LAN Pinouts**



**Figure 3-19: RJ-45 Ethernet Connector**

The RJ-45 Ethernet connector has two status LEDs, one yellow (activity/link) and one green/orange (speed). The yellow LED indicates activity/link on the port and the green/orange LED indicates the connection speed. See **Table 3-20**.

| ACT/LINK LED |               | SPEED LED |                      |
|--------------|---------------|-----------|----------------------|
| STATUS       | DESCRIPTION   | STATUS    | DESCRIPTION          |
| OFF          | No Link       | OFF       | 10 Mbps connection   |
| YELLOW       | Link          | GREEN     | 100 Mbps connection  |
| BLINKING     | Data activity | ORANGE    | 1000 Mbps connection |

**Table 3-20: RJ-45 Ethernet Connector LEDs**

### 3.3.2 USB Connectors

**CN Label:** USB\_C1, USB\_C2

**CN Type:** USB port

**CN Location:** See **Figure 3-18**

**CN Pinouts:** See **Table 3-21**

The PIC0e-B650 has two external USB 2.0 ports. The ports connect to both USB 2.0 and USB 1.1 devices.

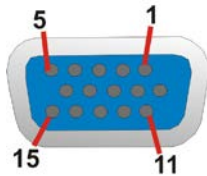
| Pin | Description |
|-----|-------------|
| 1   | VCC         |
| 2   | DATA-       |
| 3   | DATA+       |
| 4   | GND         |

**Table 3-21: USB Port Pinouts**

### 3.3.3 VGA Connector

- CN Label:** VGA1
- CN Type:** 15-pin Female
- CN Location:** See **Figure 3-18**
- CN Pinouts:** See **Figure 3-20** and **Table 3-22**

The PIC0e-B650 has a single 15-pin female connector for connectivity to standard display devices.



**Figure 3-20: VGA Connector**

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1   | RED         | 2   | GREEN       |
| 3   | BLUE        | 4   | NC          |
| 5   | GND         | 6   | GND         |
| 7   | GND         | 8   | GND         |
| 9   | VCC         | 10  | GND         |
| 11  | NC          | 12  | DDC DAT     |
| 13  | HSYNC       | 14  | VSYNC       |
| 15  | DDCCLK      |     |             |

**Table 3-22: VGA Connector Pinouts**

Chapter

4

# Installation

---

## 4.1 Anti-static Precautions

---



### WARNING:

Failure to take ESD precautions during the installation of the PICOe-B650 may result in permanent damage to the PICOe-B650 and severe injury to the user.

---

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the PICOe-B650. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the PICOe-B650 or any other electrical component is handled, the following anti-static precautions are strictly adhered to.

- **Wear an anti-static wristband:** Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- **Self-grounding:** Before handling the board, touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.
- **Use an anti-static pad:** When configuring the PICOe-B650, place it on an anti-static pad. This reduces the possibility of ESD damaging the PICOe-B650.
- **Only handle the edges of the PCB:** When handling the PCB, hold the PCB by the edges.

## 4.2 Installation Considerations

---



### NOTE:

The following installation notices and installation considerations should be read and understood before the PICOe-B650 is installed. All installation notices pertaining to the installation of the PICOe-B650 should be strictly adhered to. Failing to adhere to these precautions may lead to severe damage of the PICOe-B650 and injury to the person installing the CPU card.

---

---



### WARNING:

The installation instructions described in this manual should be carefully followed in order to prevent damage to the PICOe-B650, PICOe-B650 components and injury to the user.

---

Before and during the installation please **DO** the following:

- **Read the user manual:**
  - The user manual provides a complete description of the PICOe-B650 installation instructions and configuration options.
- **Wear an electrostatic discharge cuff (ESD):**
  - Electronic components are easily damaged by ESD. Wearing an ESD cuff removes ESD from the body and helps prevent ESD damage.
- **Place the PICOe-B650 on an antistatic pad:**
  - When installing or configuring the motherboard, place it on an antistatic pad. This helps to prevent potential ESD damage.
- **Turn all power to the PICOe-B650 off:**
  - When working with the PICOe-B650, make sure that it is disconnected from all power supplies and that no electricity is being fed into the system.

Before and during the installation of the PICOe-B650 **DO NOT**:

- Remove any of the stickers on the PCB board. These stickers are required for warranty validation.
- Use the product before verifying all the cables and power connectors are properly connected.
- Allow screws to come in contact with the PCB circuit, connector pins, or its components.

## 4.3 CPU and Memory Installation

---



### **WARNING:**

Do not run the CPU without a heatsink and fan. Without the heatsink and fan, the high temperatures can destroy the CPU and other components. CPUs marked as fanless don't need the fan, but still need adequate ventilation.

---

The CPU, CPU cooling kit and DIMM are the most critical components of the PICOe-B650. If one of these component is not installed the PICOe-B650 cannot run.

### 4.3.1 Socket LGA1155 CPU Installation

---



### **WARNING:**

CPUs are expensive and sensitive components. When installing the CPU please be careful not to damage it in anyway. Make sure the CPU is installed properly and ensure the correct cooling kit is properly installed.

DO NOT touch the pins at the bottom of the CPU. When handling the CPU, only hold it on the sides.

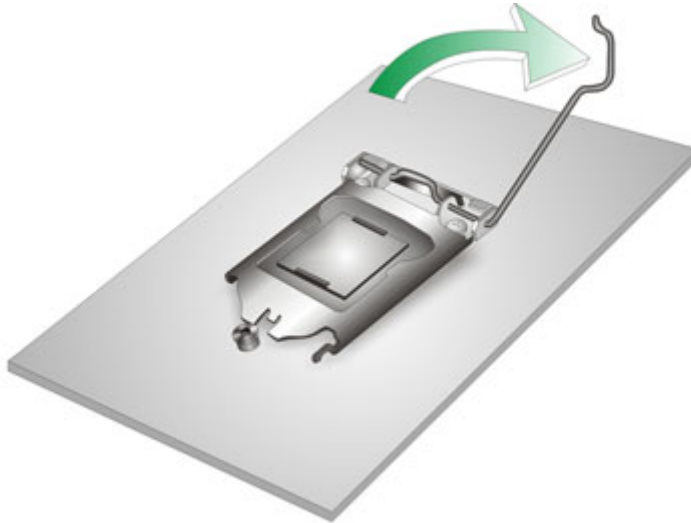
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To install the CPU, follow the steps below.



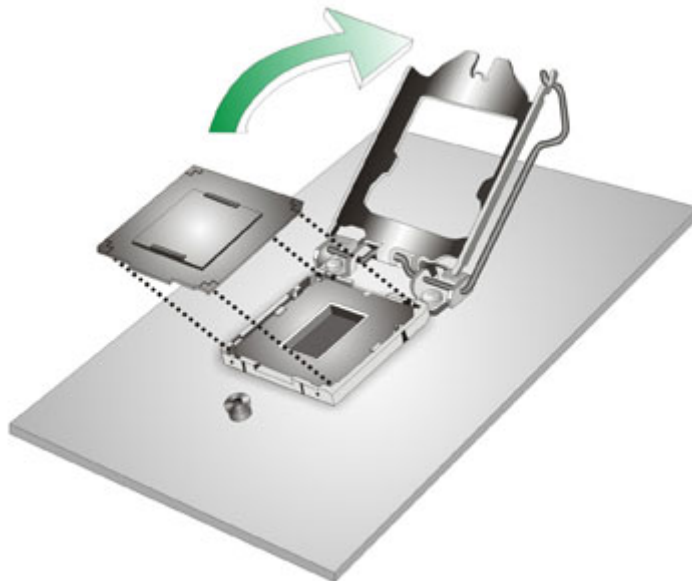
## PIC0e-B650 Half-size PCIe CPU Card

**Step 1:** Disengage the load lever by pressing the lever down and slightly outward to clear the retention tab. Fully open the lever. See **Figure 4-1**.



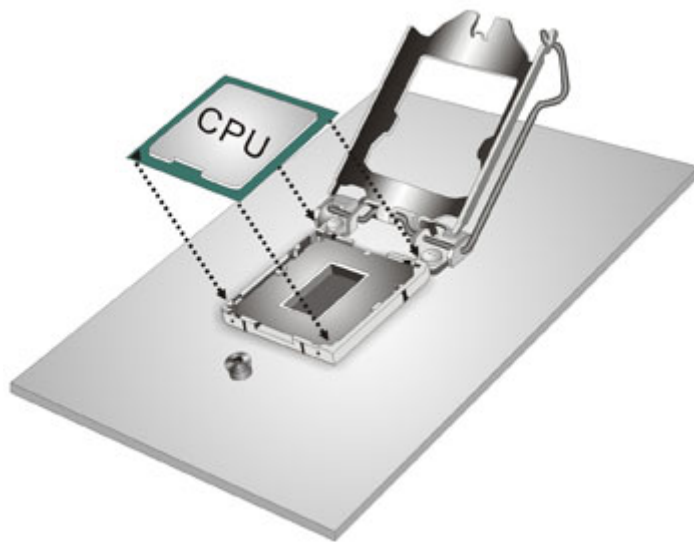
**Figure 4-1:** Disengage the CPU Socket Load Lever

**Step 2:** Open the socket and remove the protective cover. The black protective cover can be removed by pulling up on the tab labeled "Remove". See **Figure 4-2**.



**Figure 4-2:** Remove Protective Cover

- Step 3:** **Inspect the CPU socket.** Make sure there are no bent pins and make sure the socket contacts are free of foreign material. If any debris is found, remove it with compressed air.
- Step 4:** **Orientate the CPU properly.** The contact array should be facing the CPU socket.
- Step 5:** **Correctly position the CPU.** Match the Pin 1 mark with the cut edge on the CPU socket.
- Step 6:** **Align the CPU pins.** Locate pin 1 and the two orientation notches on the CPU. Carefully match the two orientation notches on the CPU with the socket alignment keys.
- Step 7:** **Insert the CPU.** Gently insert the CPU into the socket. If the CPU pins are properly aligned, the CPU should slide into the CPU socket smoothly. See **Figure 4-3.**

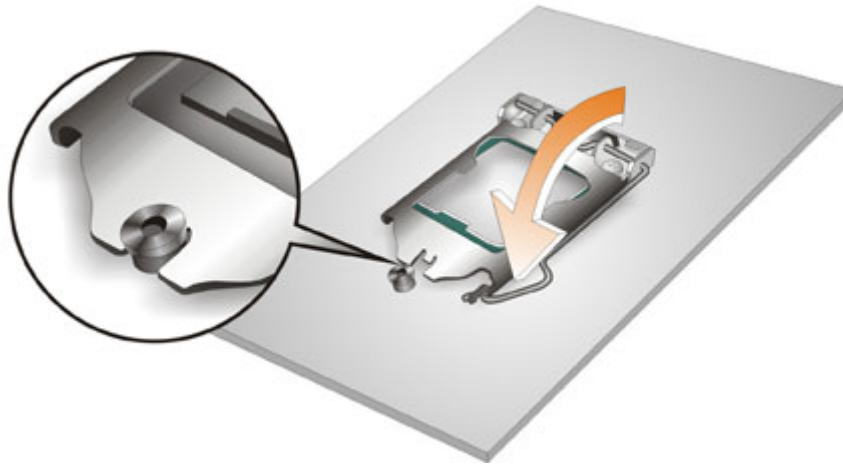


**Figure 4-3: Insert the Socket LGA1155 CPU**

- Step 8:** **Close the CPU socket.** Close the load plate and pull the load lever back a little to have the load plate be able to secure to the knob. Engage the load lever by

## PIC0e-B650 Half-size PCIe CPU Card

pushing it back to its original position (**Figure 4-4**). There will be some resistance, but will not require extreme pressure.



**Figure 4-4: Close the Socket LGA1155**

**Step 9:** Connect the 12 V power to the board. Connect the 12 V power from the power supply to the board.

### 4.3.2 Socket LGA1155 Cooling Kit Installation



#### **WARNING:**

**DO NOT** attempt to install a push-pin cooling fan.

The pre-installed support bracket prevents the board from bending and is **ONLY** compatible with captive screw type cooling fans.

---

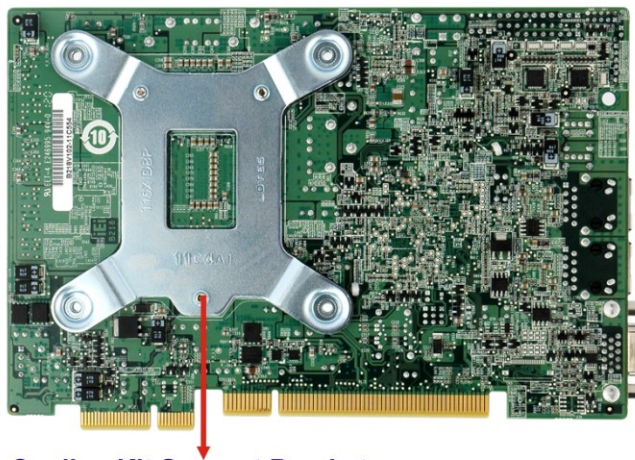
The cooling kit can be bought from IEI. The cooling kit has a heatsink and fan.

**WARNING:**

Do not wipe off (accidentally or otherwise) the pre-sprayed layer of thermal paste on the bottom of the heat sink. The thermal paste between the CPU and the heat sink is important for optimum heat dissipation.

To install the cooling kit, follow the instructions below.

**Step 1:** A cooling kit bracket is pre-installed on the rear of the CPU card. See **Figure 4-5**.



**Cooling Kit Support Bracket**

**Figure 4-5: Cooling Kit Support Bracket**

**Step 2:** Place the cooling kit onto the socket LGA1155 CPU. Make sure the CPU cable can be properly routed when the cooling kit is installed.

**Step 3:** Mount the cooling kit. Gently place the cooling kit on top of the CPU. Make sure the four threaded screws on the corners of the cooling kit properly pass through the holes of the cooling kit bracket.

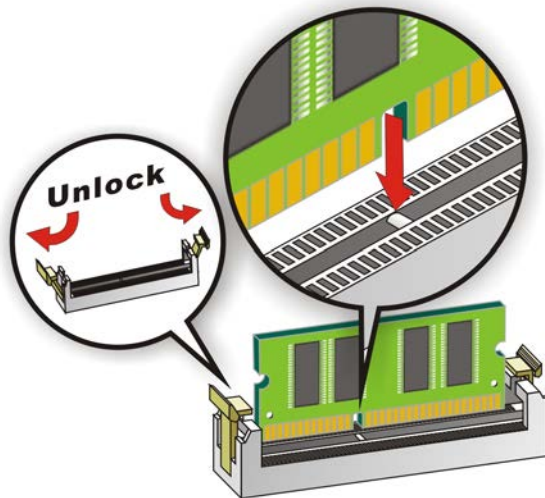
**Step 4:** Secure the cooling kit by fastening the four retention screws of the cooling kit.

## PIC0e-B650 Half-size PCIe CPU Card

**Step 5: Connect the fan cable.** Connect the cooling kit fan cable to the fan connector on the PIC0e-B650. Carefully route the cable and avoid heat generating chips and fan blades.

### 4.3.3 SO-DIMM Installation

To install a SO-DIMM, please follow the steps below and refer to **Figure 4-6**.



**Figure 4-6: SO-DIMM Installation**

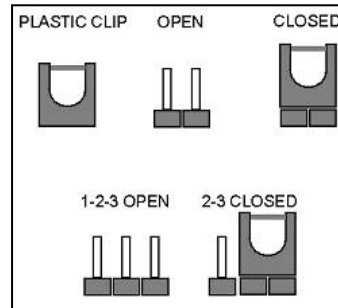
- Step 1:** Open the SO-DIMM socket handles. Open the two handles outwards as far as they can. See Figure 4-6.
- Step 2:** **Align the SO-DIMM with the socket.** Align the DIMM so the notch on the memory lines up with the notch on the memory socket. See **Figure 4-6**.
- Step 3:** **Insert the SO-DIMM.** Once aligned, press down until the SO-DIMM is properly seated. Clip the two handles into place. See **Figure 4-6**.
- Step 4:** **Removing a SO-DIMM.** To remove a SO-DIMM, push both handles outward. The memory module is ejected by a mechanism in the socket.

## 4.4 Jumper Settings



**NOTE:**

A jumper is a metal bridge used to close an electrical circuit. It consists of two or three metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To CLOSE/SHORT a jumper means connecting the pins of the jumper with the plastic clip and to OPEN a jumper means removing the plastic clip from a jumper.



Before the PIC0e-B650 is installed in the system, the jumpers must be set in accordance with the desired configuration. The jumpers on the PIC0e-B650 are listed in **Table 4-1**.

| Description              | Label    | Type         |
|--------------------------|----------|--------------|
| AT/ATX power mode select | JATX_AT1 | 3-pin header |
| Clear CMOS               | J_CMOS1  | 3-pin header |
| PCIe status select       | J_PCIE1  | 2-pin header |

**Table 4-1: Jumpers**

### 4.4.1 AT/ATX Power Mode Select Jumper

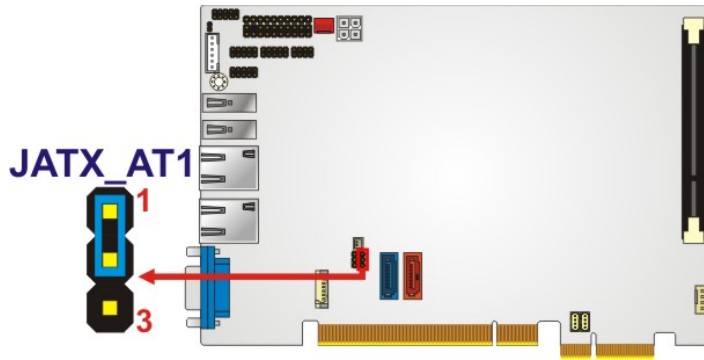
- Jumper Label:** JATX\_AT1
- Jumper Type:** 3-pin header
- Jumper Settings:** See **Table 4-2**
- Jumper Location:** See **Figure 4-7**

The AT/ATX Power Select jumper specifies the systems power mode as AT or ATX.

## PIC0e-B650 Half-size PCIe CPU Card

| Setting   | Description             |
|-----------|-------------------------|
| Short 1-2 | Use ATX power (Default) |
| Short 2-3 | Use AT power            |

**Table 4-2: AT/ATX Power Mode Jumper Settings**



**Figure 4-7: AT/ATX Power Mode Jumper Location**

### 4.4.2 Clear CMOS Jumper

|                         |                       |
|-------------------------|-----------------------|
| <b>Jumper Label:</b>    | <b>J_CMOS1</b>        |
| <b>Jumper Type:</b>     | 3-pin header          |
| <b>Jumper Settings:</b> | See <b>Table 4-3</b>  |
| <b>Jumper Location:</b> | See <b>Figure 4-8</b> |

If the PIC0e-B650 fails to boot due to improper BIOS settings, the clear CMOS jumper clears the CMOS data and resets the system BIOS information. To do this, use the jumper cap to close pins 2 and 3 for a few seconds then reinstall the jumper clip back to pins 1 and 2.

If the “CMOS Settings Wrong” message is displayed during the boot up process, the fault may be corrected by pressing the F1 to enter the CMOS Setup menu. Do one of the following:

- Enter the correct CMOS setting
- Load Optimal Defaults
- Load Failsafe Defaults.

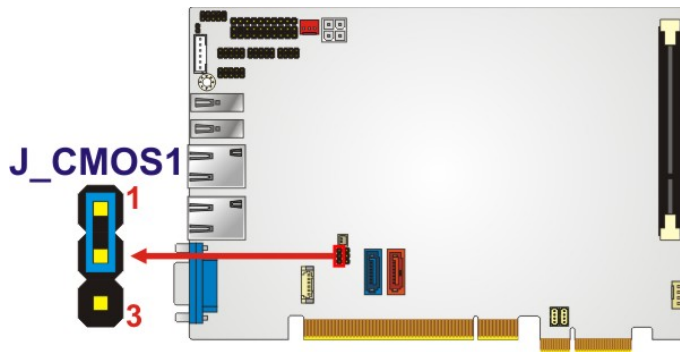
After having done one of the above, save the changes and exit the CMOS Setup menu.

The clear CMOS jumper settings are shown in **Table 4-3**.

| Setting     | Description               |
|-------------|---------------------------|
| Short 1 - 2 | Keep CMOS Setup (Default) |
| Short 2 - 3 | Clear CMOS Setup          |

**Table 4-3: Clear CMOS Jumper Settings**

The location of the clear CMOS jumper is shown in **Figure 4-8** below.



**Figure 4-8: Clear CMOS Jumper**

#### 4.4.3 PCIe Status Select Jumper

- Jumper Label:** J\_PCIE1
- Jumper Type:** 2-pin header
- Jumper Settings:** See **Table 4-4**
- Jumper Location:** See **Figure 4-9**

The **PCIe Status Select** jumper allows the PCIe status to be configured. The **PCIe Status Select** jumper settings are shown in **Table 4-4**.

| Setting | Description            |
|---------|------------------------|
| Open    | One PCIe x4            |
| Short   | Four PCIe x1 (Default) |

**Table 4-4: PCIe Status Select Jumper Settings**

The PCIe Status Select jumper location is shown in **Figure 4-9**.



## PIC0e-B650 Half-size PCIe CPU Card

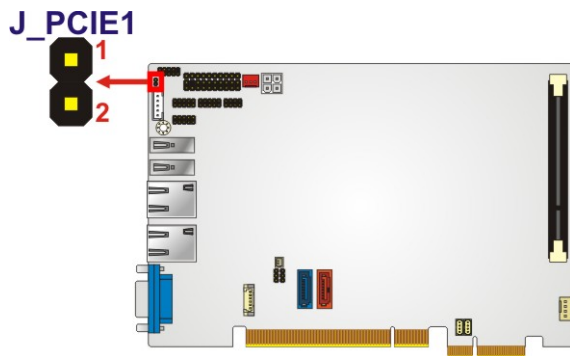


Figure 4-9: PCIe Status Select Jumper Pinout Locations

## 4.5 Chassis Installation

### 4.5.1 Airflow



#### **WARNING:**

Airflow is critical to the cooling of the CPU and other onboard components. The chassis in which the PIC0e-B650 must have air vents to allow cool air to move into the system and hot air to move out.

The PIC0e-B650 must be installed in a chassis with ventilation holes on the sides allowing airflow to travel through the heat sink surface. In a system with an individual power supply unit, the cooling fan of a power supply can also help generate airflow through the board surface.

### 4.5.2 Backplane Installation

Before the PIC0e-B650 can be installed into the chassis, a backplane must first be installed. Please refer to the installation instructions that came with the backplane and the chassis to see how to install the backplane into the chassis.

**NOTE:**

IEI has a wide range of backplanes available. Please contact your PICOe-B650 vendor, reseller or an IEI sales representative at [sales@iei.com.tw](mailto:sales@iei.com.tw) or visit the IEI website (<http://www.ieworld.com.tw>) to find out more about the available chassis.

### 4.5.3 CPU Card Installation

To install the PICOe-B650 CPU card onto the backplane, carefully align the CPU card interface connectors with the corresponding socket on the backplane. To do this, please refer to the reference material that came with the backplane. Next, secure the CPU card to the chassis. To do this, please refer to the reference material that came with the chassis.

## 4.6 Internal Peripheral Device Connections

This section outlines the installation of peripheral devices to the onboard connectors.

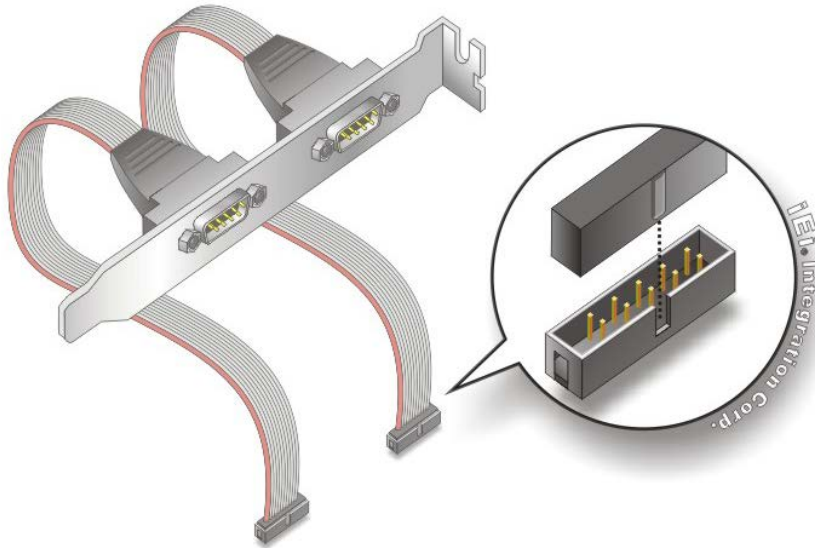
### 4.6.1 Dual RS-232 Cable with Slot Bracket

The dual RS-232 cable slot connector consists of two connectors attached to two independent cables. Each cable is then attached to a D-sub 9 male connector that is mounted onto a slot. To install the dual RS-232 cable, please follow the steps below.

**Step 1: Locate the connectors.** The locations of the RS-232 connectors are shown in **Chapter 3**.

**Step 2: Insert the cable connectors.** Insert one connector into each serial port pin headers. See **Figure 4-10**.

## PIC0e-B650 Half-size PCIe CPU Card



**Figure 4-10: Dual RS-232 Cable Installation**

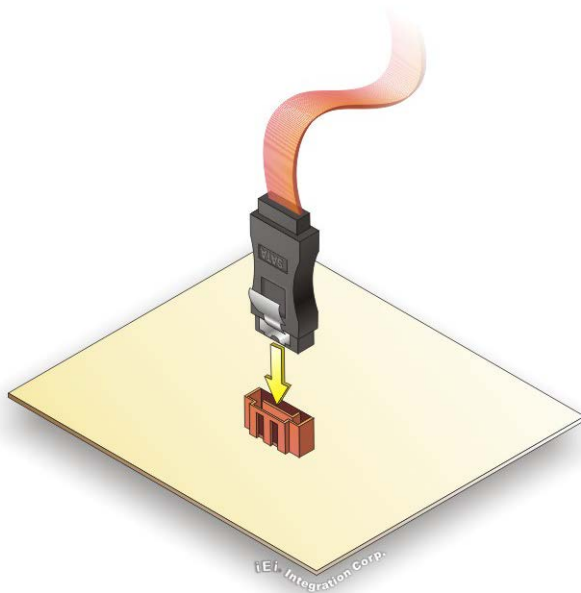
**Step 3: Secure the bracket.** The dual RS-232 connector has two D-sub 9 male connectors secured on a bracket. To secure the bracket to the chassis please refer to the reference material that came with the chassis

### 4.6.2 SATA Drive Connection

The PIC0e-B650 is shipped with two SATA drive cables. To connect the SATA drives to the connectors, please follow the steps below.

**Step 1: Locate the connectors.** The locations of the SATA drive connectors are shown in **Chapter 3**.

**Step 2: Insert the cable connector.** Insert the cable connector into the on-board SATA drive connector until it clips into place. See **Figure 4-11**.

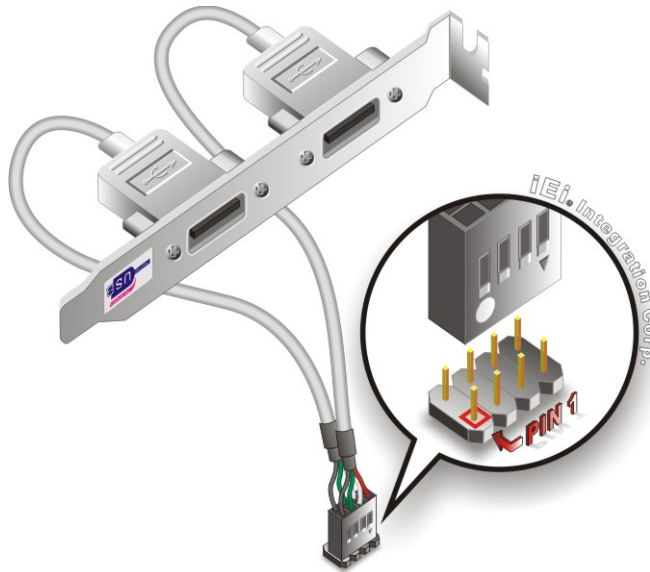


**Figure 4-11: SATA Drive Cable Connection**

- Step 3:** **Connect the cable to the SATA disk.** Connect the connector on the other end of the cable to the connector at the back of the SATA drive. See **Figure 4-12**.
- Step 4:** **Connect the SATA power cable.** Connect the SATA power connector to the back of the SATA drive. See **Figure 4-12**.



the on-board connectors. See **Figure 4-13**.



**Figure 4-13: Dual USB Cable Connection**

**Step 4:** **Attach the bracket to the chassis.** The USB 2.0 connectors are attached to a bracket. To secure the bracket to the chassis please refer to the installation instructions that came with the chassis.

## 4.7 External Peripheral Interface Connection

The following external peripheral devices can be connected to the external peripheral interface connectors.

- RJ-45 Ethernet cable connectors
- USB devices
- VGA monitors

To install these devices, connect the corresponding cable connector from the actual device to the corresponding PICOe-B650 external peripheral interface connector making sure the pins are properly aligned.

## PIC0e-B650 Half-size PCIe CPU Card

### 4.7.1 LAN Connection

There are two external RJ-45 LAN connectors. The RJ-45 connectors enable connection to an external network. To connect a LAN cable with an RJ-45 connector, please follow the instructions below.

**Step 1:** **Locate the RJ-45 connectors.** The locations of the USB connectors are shown in **Chapter 3**.

**Step 2:** **Align the connectors.** Align the RJ-45 connector on the LAN cable with one of the RJ-45 connectors on the PIC0e-B650. See **Figure 4-14**.

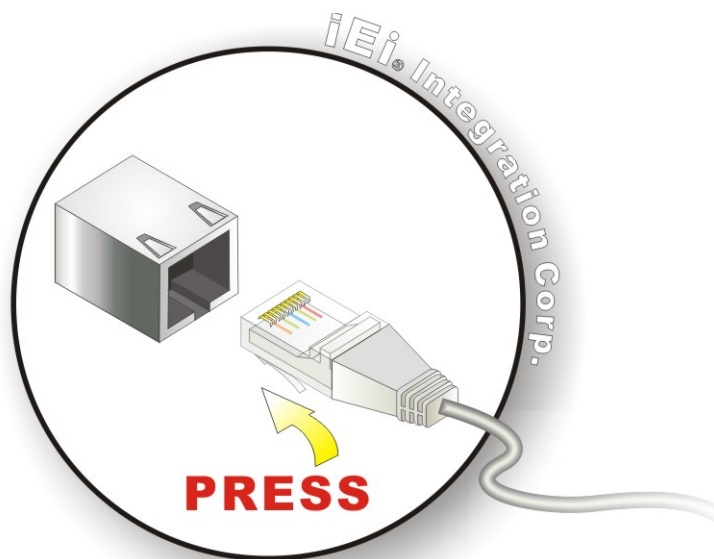


Figure 4-14: LAN Connection

**Step 3:** **Insert the LAN cable RJ-45 connector.** Once aligned, gently insert the LAN cable RJ-45 connector into the onboard RJ-45 connector.

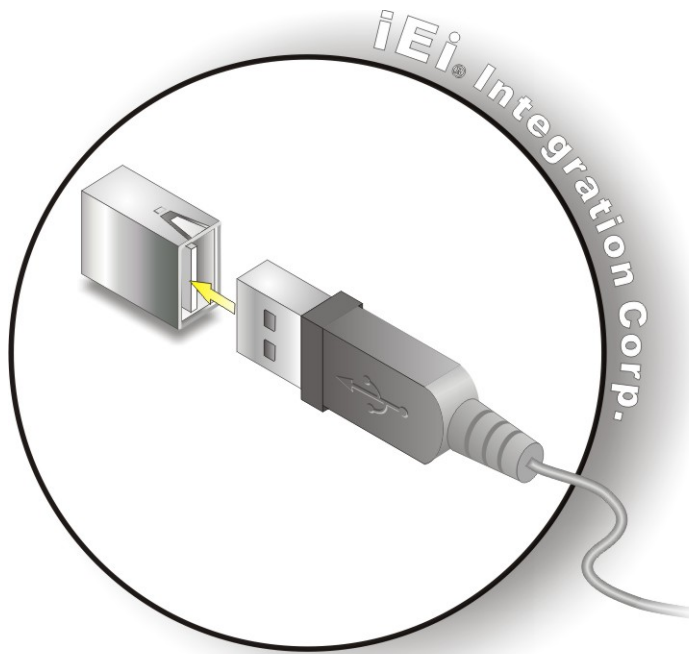
### 4.7.2 USB Connection

The external USB Series "A" receptacle connector provides easier and quicker access to external USB devices. Follow the steps below to connect USB devices to the PIC0e-B650.

**Step 1:** **Locate the USB Series "A" receptacle connectors.** The location of the USB

Series "A" receptacle connectors are shown in **Chapter 3**.

- Step 2: Insert a USB Series "A" plug.** Insert the USB Series "A" plug of a device into the USB Series "A" receptacle on the external peripheral interface. See **Figure 4-15**.



**Figure 4-15: USB Connector**

### 4.7.3 VGA Monitor Connection

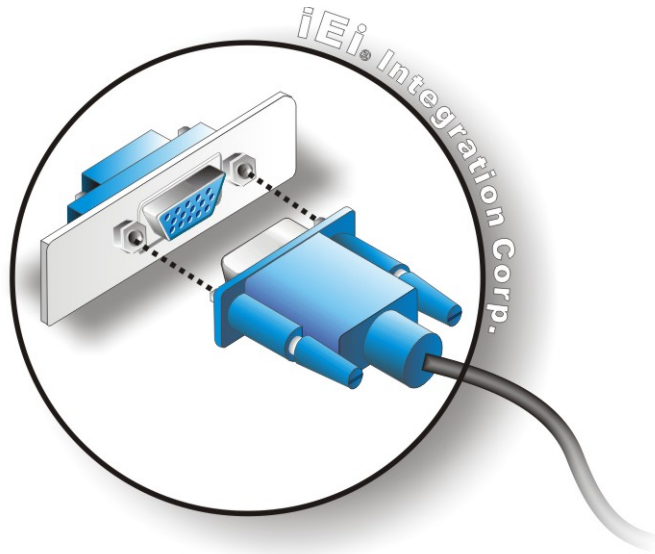
The PIC0e-B650 has a single female DB-15 connector on the external peripheral interface panel. The DB-15 connector is connected to a CRT or VGA monitor. To connect a monitor to the PIC0e-B650, please follow the instructions below.

- Step 1: Locate the female DB-15 connector.** The location of the female DB-15 connector is shown in **Chapter 3**.
- Step 2: Align the VGA connector.** Align the male DB-15 connector on the VGA screen cable with the female DB-15 connector on the external peripheral interface.
- Step 3: Insert the VGA connector.** Once the connectors are properly aligned with the



## PIC0e-B650 Half-size PCIe CPU Card

insert the male connector from the VGA screen into the female connector on the PIC0e-B650. See **Figure 4-16**.



**Figure 4-16: VGA Connector**

**Step 4: Secure the connector.** Secure the DB-15 VGA connector from the VGA monitor to the external interface by tightening the two retention screws on either side of the connector.

## 4.8 Software Installation

All the drivers for the PICOe-B650 are available on IEI Resource Download Center (<https://download.ieiworld.com>). Type PICOe-B650 and press Enter to find all the relevant software, utilities, and documentation.

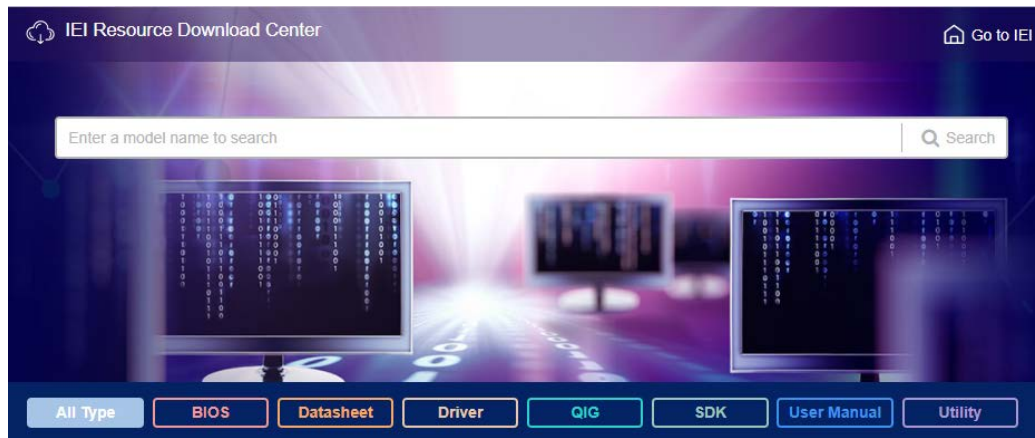


Figure 4-17: IEI Resource Download Center

### 4.8.1 Driver Download

To download drivers from IEI Resource Download Center, follow the steps below.

**Step 1:** Go to <https://download.ieiworld.com>. Type PICOe-B650 and press Enter.



**Step 2:** All product-related software, utilities, and documentation will be listed. You can choose **Driver** to filter the result.

## PIC0e-B650 Half-size PCIe CPU Card

Keyword: "WAFFER-BW", Searching Result : 8 Records.

WAFFER-BW [Product Info](#)

Embedded Computer > Single Board Computer > Embedded Board  
3.5" SBC with Intel® 14nm Pentium®/Celeron® on-board SoC

| File Name  | Published  | Version | File Checksum                    |
|--|------------|---------|----------------------------------|
| <a href="#">7B000-001168-RS_V1.4.iso (2.99 GB)</a> | 2017/12/19 | 1.40    | 7FB3D8A55C9F2EB072E30AF64257FA51 |

**Step 3:** Click the driver file name on the page and you will be prompted with the following window. You can download the entire ISO file (❶), or click the small arrow to find an individual driver and click the file name to download (❷).

7B000-001168-RS\_V1.4.iso

❶ [Click here to download entire ISO file. \(2.99 GB\)](#)

\* Download individual file \*

- Docs
  - ❷ 1.Chipset
    - 2.VGA
    - 3.Audio
    - 4.Lan
    - 5.USB 3.0
    - 6.Serial IO
    - 7.TXE
    - 8.Manual



### NOTE:

To install software from the downloaded ISO image file in Windows 8, 8.1 or 10, double-click the ISO file to mount it as a virtual drive to view its content. On Windows 7 system, an additional tool (such as Virtual CD-ROM Control Panel from Microsoft) is needed to mount the file.

Chapter

**5**

# BIOS Screens

---

## PICOe-B650 Half-size PCIe CPU Card

### 5.1 Introduction

The BIOS is programmed onto the BIOS chip. The BIOS setup program allows changes to certain system settings. This chapter outlines the options that can be changed.



#### NOTE:

Some of the BIOS options may vary throughout the life cycle of the product and are subject to change without prior notice.

---

#### 5.1.1 Starting Setup

The AMI BIOS is activated when the computer is turned on. The setup program can be activated in one of two ways.

1. Press the **DELETE** or **F2** key as soon as the system is turned on or
2. Press the **DELETE** or **F2** key when the “**Press Del to enter SETUP**” message appears on the screen.

If the message disappears before the **DELETE** or **F2** key is pressed, restart the computer and try again.

#### 5.1.2 Using Setup

Use the arrow keys to highlight items, press **ENTER** to select, use the PageUp and PageDown keys to change entries, press **F1** for help and press **ESC** to quit. Navigation keys are shown in.

| Key         | Function                                |
|-------------|---|
| Up arrow    | Move to previous item                   |
| Down arrow  | Move to next item                       |
| Left arrow  | Move to the item on the left hand side  |
| Right arrow | Move to the item on the right hand side |

| Key     | Function   |
|---------|--|
| F1 key  | General help, only for Status Page Setup Menu and Option Page Setup Menu   |
| F2 key  | Load previous values.  |
| F3 key  | Load optimized defaults  |
| F4 key  | Save all the CMOS changes  |
| Esc key | Main Menu – Quit and not save changes into CMOS<br>Status Page Setup Menu and Option Page Setup Menu --<br>Exit current page and return to Main Menu |

**Table 5-1: BIOS Navigation Keys**

### 5.1.3 Getting Help

When **F1** is pressed a small help window describing the appropriate keys to use and the possible selections for the highlighted item appears. To exit the Help Window press **Esc** or the **F1** key again.

### 5.1.4 Unable to Reboot After Configuration Changes

If the computer cannot boot after changes to the system configuration is made, CMOS defaults. Use the jumper described in **Chapter 4**.

### 5.1.5 BIOS Menu Bar

The **menu bar** on top of the BIOS screen has the following main items:

- Main – Changes the basic system configuration.
- Advanced – Changes the advanced system settings.
- Chipset – Changes the chipset settings.
- Boot – Changes the system boot configuration.
- Security – Sets User and Supervisor Passwords.
- Save & Exit – Selects exit options and loads default settings

The following sections completely describe the configuration options found in the menu items at the top of the BIOS screen and listed above.

## PIC0e-B650 Half-size PCIe CPU Card

### 5.2 Main

The **Main** BIOS menu (**BIOS Menu 1**) appears when the **BIOS Setup** program is entered.

The **Main** menu gives an overview of the basic system information.

| Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc. |                     |         |  |          |             |
|--|---------------------|---------|--|----------|-------------|
| Main   | Advanced            | Chipset | Boot   | Security | Save & Exit |
| BIOS Information   |                     |         | Set the Date. Use Tab to switch between Data elements. |          |             |
| BIOS Vendor  | American Megatrends |         |  |          |             |
| Core Version   | 4.6.5.3             |         |  |          |             |
| Compliance   | UEFI 2.3; PI 1.2    |         |  |          |             |
| Project Version  | B218AR25.ROM        |         |  |          |             |
| Build Date   | 11/06/2013 11:25:11 |         | -----  |          |             |
| Processor Information  |                     |         | ←→: Select Screen                                      |          |             |
| Name   | IvyBridge           |         | ↑ ↓: Select Item                                       |          |             |
| Brand String   | Intel(R)Core(TM)i5- |         | EnterSelect  |          |             |
| Frequency  | 3000 MHz            |         | + - Change Opt.  |          |             |
| Processor ID   | 306a8               |         | F1 General Help  |          |             |
| Stepping   | E0/L0               |         | F2 Previous Values                                     |          |             |
| Number of Processors   | 4Core(s)/4Thread(s) |         | F3 Optimized Defaults                                  |          |             |
| Microcode Revision   | 10                  |         | F4 Save & Exit   |          |             |
| GT Info  | GT2 (1150 MHz)      |         | ESC Exit   |          |             |
| IGFX VBIOS Version   |                     |         | 2132   |          |             |
| Memory RC Version  |                     |         | 1.6.0.0  |          |             |
| Total Memory   |                     |         | 8192 MB (DDR3)   |          |             |
| Memory Frequency   |                     |         | 1333 Mhz   |          |             |
| PCH Information  |                     |         |  |          |             |
| Name   | CougarPoint         |         |  |          |             |
| Stepping   | 05/B3               |         |  |          |             |
| TXT Capability of Platform/PCH                                     |                     |         | Supported  |          |             |
| LAN PHY Revision   |                     |         | N/A  |          |             |
| ME FW Version  |                     |         | 8.0.0.1351   |          |             |
| ME Firmware SKU  |                     |         | 1.5MB  |          |             |
| SPI Clock Frequency  |                     |         |  |          |             |
| D0FR Support   |                     |         | Unsupported  |          |             |
| Read Status Clock Frequency  |                     |         | 33 MHz   |          |             |
| Write Status Clock Frequency                                       |                     |         | 33 MHz   |          |             |
| Fast Read Status Clock Frequency                                   |                     |         | 33 MHz   |          |             |
| System Date  |                     |         | [Tue 03/04/2011]                                       |          |             |
| System Time  |                     |         | [15:10:27]   |          |             |
| Access Level   |                     |         | Administrator  |          |             |
| Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.    |                     |         |  |          |             |

**BIOS Menu 1: Main**

The System Overview field also has two user configurable fields:

→ **System Date [xx/xx/xx]**

Use the **System Date** option to set the system date. Manually enter the day, month and year.

→ **System Time [xx:xx:xx]**

Use the **System Time** option to set the system time. Manually enter the hours, minutes and seconds.

### 5.3 Advanced

Use the **Advanced** menu (**BIOS Menu 2**) to configure the CPU and peripheral devices through the following sub-menus:



#### WARNING!

Setting the wrong values in the sections below may cause the system to malfunction. Make sure that the settings made are compatible with the hardware.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Main  Advanced  Chipset  Boot  Security  Save & Exit
-----
> ACPI Settings
> RTC Wake Settings
> Trusted Computing
> CPU Configuration
> SATA Configuration
> Intel TXT(LT) Configuration
> USB Configuration
> F81866 Super IO Configuration
> F81866 H/M Monitor
> Serial Port Console Redirection
> iEi Feature

System ACPI Parameters
-----
<->: Select Screen
↑ ↓: Select Item
Enter>Select
+ - Change Opt.
F1 General Help
F2 Previous Values
F3 Optimized Defaults
F4 Save & Exit
ESC Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
    
```

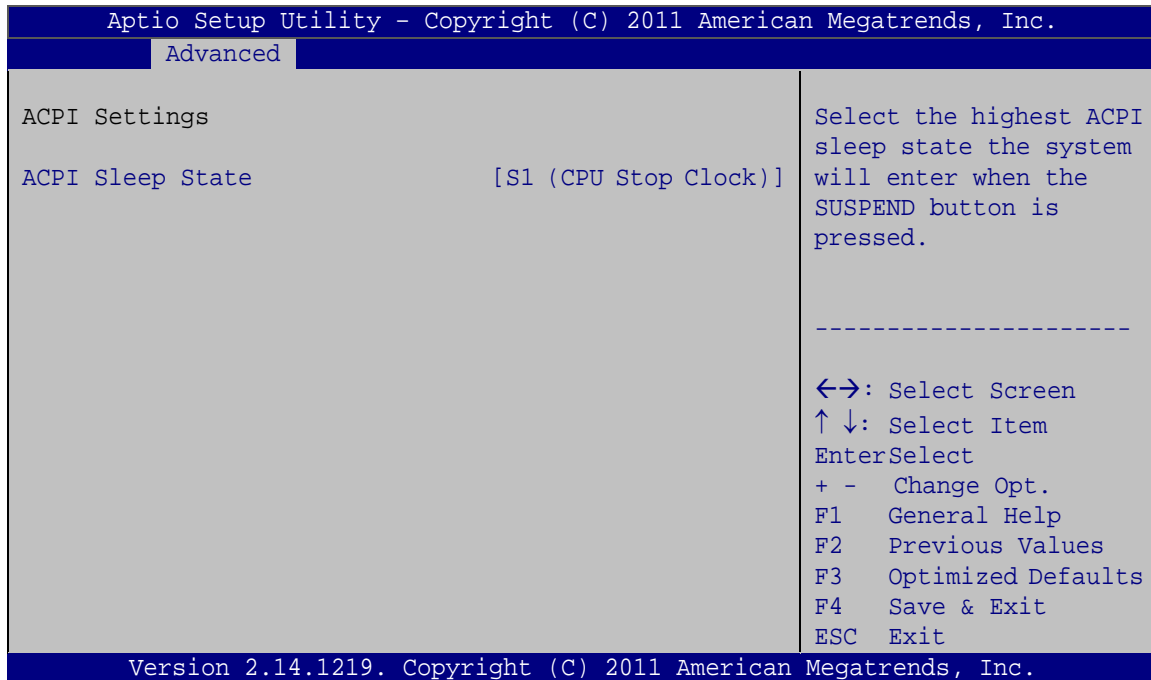
**BIOS Menu 2: Advanced**



## PIC0e-B650 Half-size PCIe CPU Card

### 5.3.1 ACPI Settings

The **ACPI Settings** menu (**BIOS Menu 3**) configures the Advanced Configuration and Power Interface (ACPI) options.



#### BIOS Menu 3: ACPI Configuration

##### → ACPI Sleep State [S1 (CPU Stop Clock)]

Use the **ACPI Sleep State** option to specify the sleep state the system enters when it is not being used.

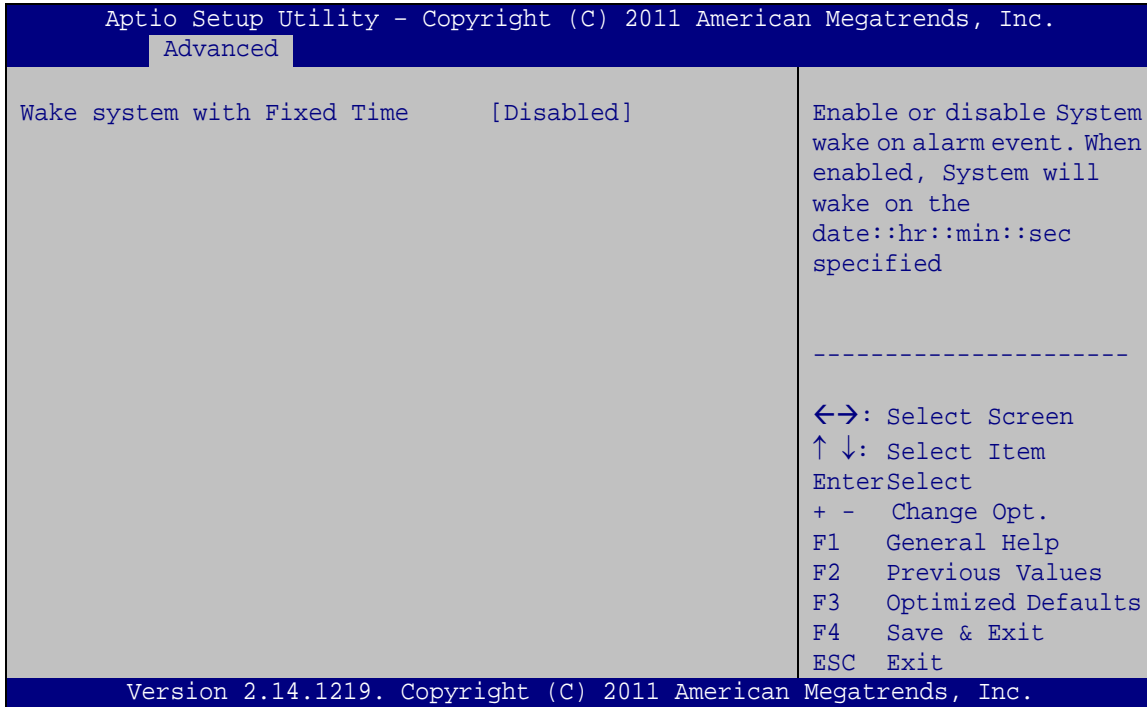
##### → Suspend Disabled

→ **S1 (CPU Stop DEFAULT Clock)** The system enters S1(POS) sleep state. The system appears off. The CPU is stopped; RAM is refreshed; the system is running in a low power mode.

→ **S3 (Suspend to RAM)** The caches are flushed and the CPU is powered off. Power to the RAM is maintained. The computer returns slower to a working state, but more power is saved.

### 5.3.2 RTC Wake Settings

The **RTC Wake Settings** menu (**BIOS Menu 4**) configures RTC wake event.



#### BIOS Menu 4: RTC Wake Settings

##### → Wake system with Fixed Time [Disabled]

Use the **Wake system with Fixed Time** option to enable or disable the system wake on alarm event.

- **Disabled**      **DEFAULT**      The real time clock (RTC) cannot generate a wake event
- **Enabled**      If selected, the **Wake up every day** option appears allowing you to enable to disable the system to wake every day at the specified time. Besides, the following options appear with values that can be selected:

Wake up date

Wake up hour

## PIC0e-B650 Half-size PCIe CPU Card

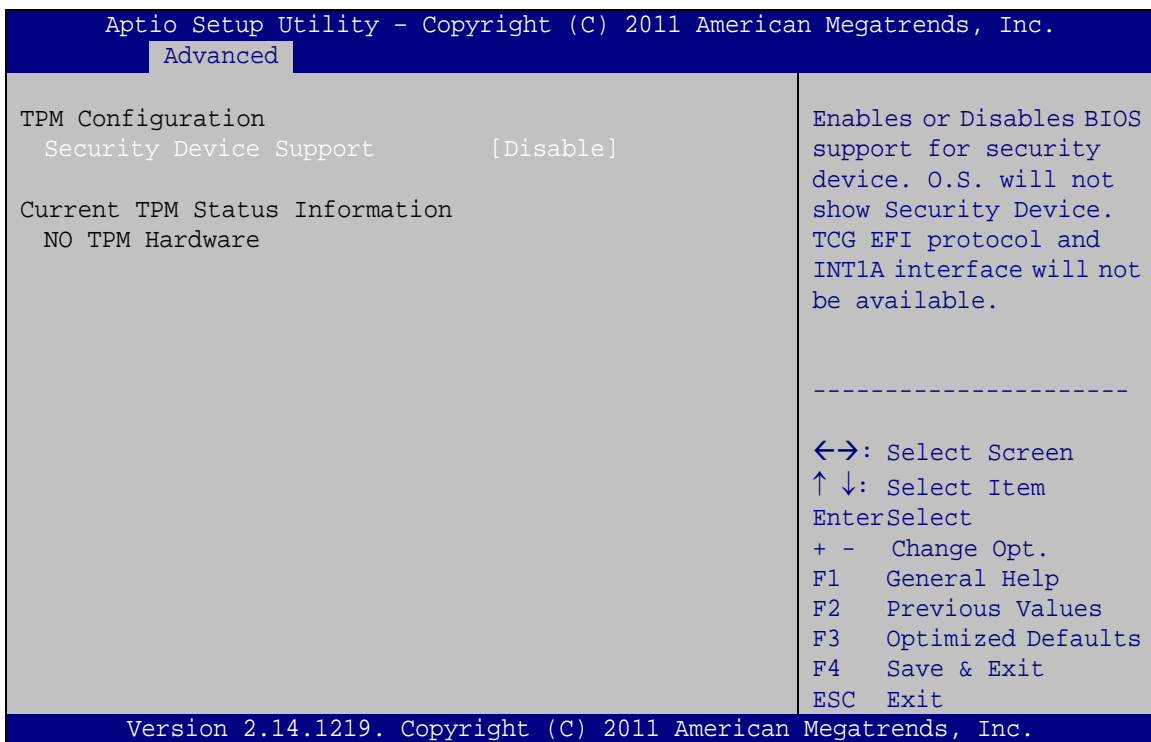
Wake up minute

Wake up second

After setting the alarm, the computer turns itself on from a suspend state when the alarm goes off.

### 5.3.3 Trusted Computing

Use the **Trusted Computing** menu (**BIOS Menu 5**) to configure settings related to the Trusted Computing Group (TCG) Trusted Platform Module (TPM).



#### BIOS Menu 5: Trusted Computing

##### → Security Device Support [Disable]

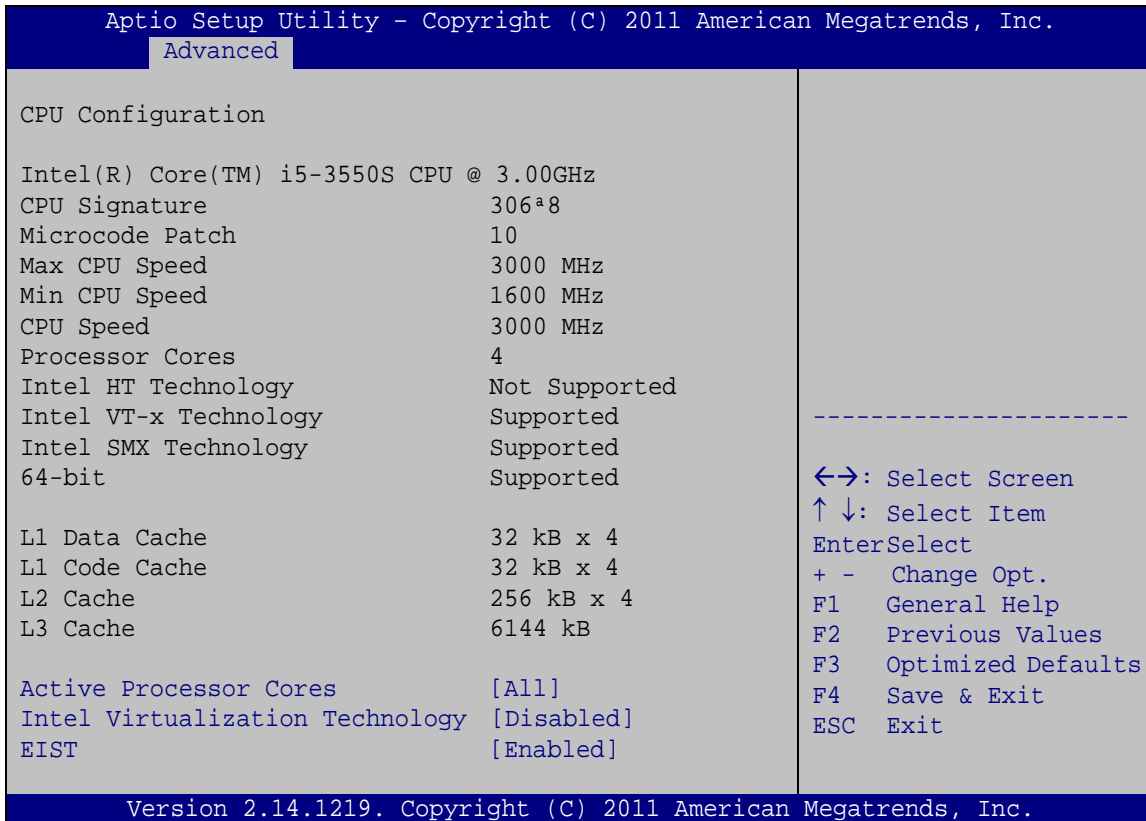
Use the **Security Device Support** option to configure support for the TPM.

→ **Disable** **DEFAULT** TPM support is disabled.

→ **Enable** TPM support is enabled.

### 5.3.4 CPU Configuration

Use the **CPU Configuration** menu (**BIOS Menu 6**) to view detailed CPU specifications and configure the CPU.



#### BIOS Menu 6: CPU Configuration

##### → Active Processor Cores [All]

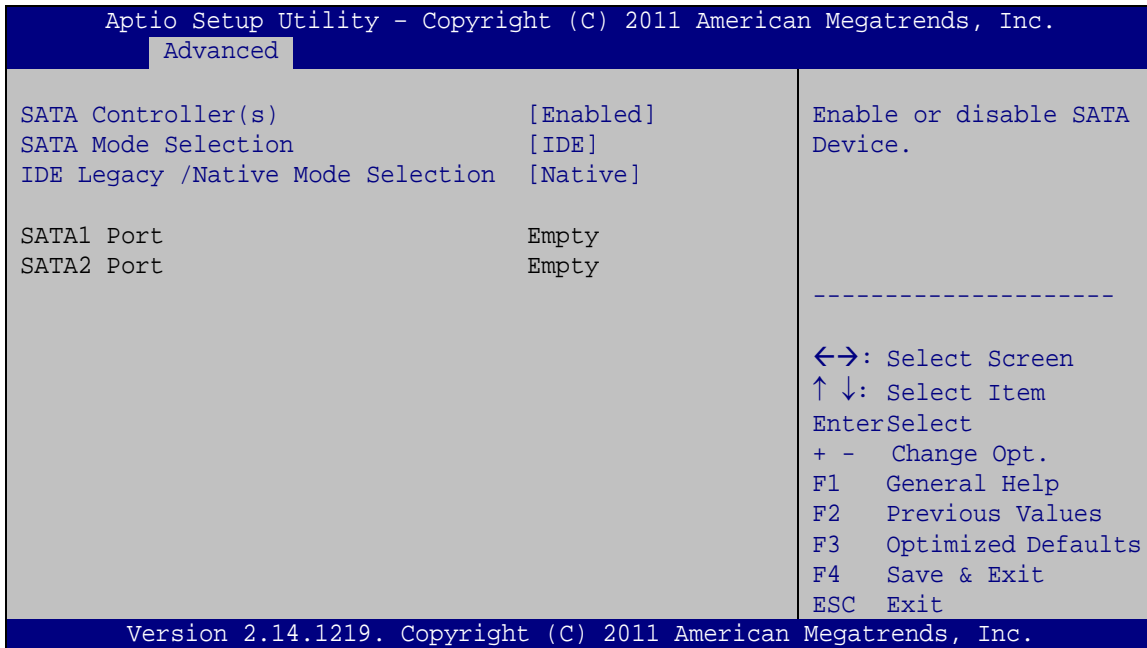
Use the **Active Processor Cores** BIOS option to enable numbers of cores in the processor package.

- **All**      **DEFAULT**      Enable all cores in the processor package.
- **1**                      Enable one core in the processor package.
- **2**                      Enable two cores in the processor package.
- **3**                      Enable three cores in the processor package.



### 5.3.5 SATA Configuration

Use the **SATA Configuration** menu (**BIOS Menu 7**) to change and/or set the configuration of the SATA devices installed in the system.



#### BIOS Menu 7: SATA Configuration

##### → SATA Controller(s) [Enabled]

Use the **SATA Controller(s)** option to configure the SATA controller.

- **Enhanced**      **DEFAULT**      Configures the on-board SATA controller to be in Enhanced mode. In this mode, IDE channels and SATA channels are separated.
- **Disabled**                      Disables the on-board SATA controller.

##### → SATA Mode Selection [IDE]

Use the **SATA Mode Selection** option to configure SATA device mode.

- **IDE**                      **DEFAULT**      Configures SATA devices as normal IDE device.
- **AHCI**                      Configures SATA devices as AHCI device.

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### → IDE Legacy /Native Mode Selection [IDE]

Use the **IDE Legacy /Native Mode Selection** option to configure IDE mode. This option is valid only when the above **SATA Mode Selection** BIOS option is set to IDE.

- **Native**            **DEFAULT**    Configures SATA devices as native mode.
- **Legacy**                            Configures SATA devices as IDE legacy.

### 5.3.6 Intel TXT(LT) Configuration

Use the **Intel TXT(LT) Configuration** menu to configure Intel Trusted Execution Technology support.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced
-----
Intel Trusted Execution Technology Configuration

Intel TXT support only can be enabled/disabled if SMX
is enabled. VT and VT-d support must also be enabled prior
to TXT.

Secure Mode Extensons (SMX)            Enabled

Intel TXT(LT) Support                    [Disabled]

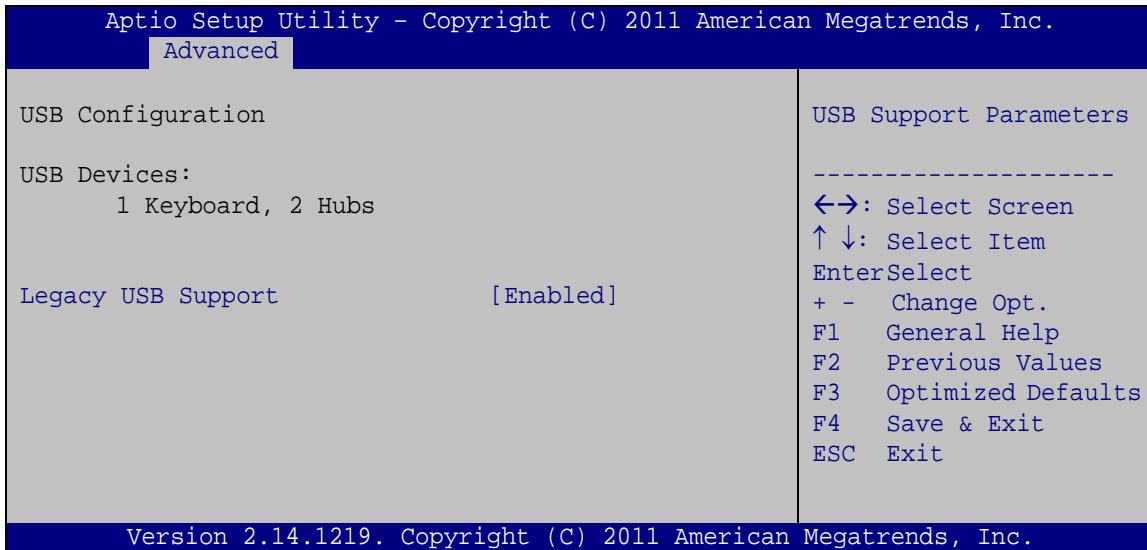
-----
<->: Select Screen
↑ ↓: Select Item
EnterSelect
+ - Change Opt.
F1 General Help
F2 Previous Values
F3 Optimized Defaults
F4 Save & Exit
ESC Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
  
```

**BIOS Menu 8: Intel TXT(LT) Configuration**

### 5.3.7 USB Configuration

Use the **USB Configuration** menu (**BIOS Menu 9**) to read USB configuration information and configure the USB settings.



#### BIOS Menu 9: USB Configuration

##### → USB Devices

The **USB Devices Enabled** field lists the USB devices that are enabled on the system

##### → Legacy USB Support [Enabled]

Use the **Legacy USB Support** BIOS option to enable USB mouse and USB keyboard support. Normally if this option is not enabled, any attached USB mouse or USB keyboard does not become available until a USB compatible operating system is fully booted with all USB drivers loaded. When this option is enabled, any attached USB mouse or USB keyboard can control the system even when there is no USB driver loaded onto the system.

- **Enabled**      **DEFAULT**      Legacy USB support enabled
- **Disabled**                      Legacy USB support disabled
- **Auto**                              Legacy USB support disabled if no USB devices are connected



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### 5.3.8 F81866 Super IO Configuration

Use the **F81866 Super IO Configuration** menu (**BIOS Menu 10**) to set or change the configurations for the FDD controllers, parallel ports and serial ports.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced
Super IO Configuration
Super IO Chip                Fintek F81866
> Serial Port 1 Configuration
> Serial Port 2 Configuration

Set Parameters of Serial
Port 1 (COMA)
-----
<->: Select Screen
↑ ↓: Select Item
EnterSelect
+ -  Change Opt.
F1   General Help
F2   Previous Values
F3   Optimized Defaults
F4   Save & Exit
ESC  Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

```

**BIOS Menu 10: F81866 Super IO Configuration**

#### 5.3.8.1 Serial Port n Configuration

Use the **Serial Port n Configuration** menu (**BIOS Menu 11**) to configure the serial port n.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
  Advanced
Serial Port n Configuration
Serial Port                [Enabled]
Device Settings            IO=3F8h; IRQ=3
Change Settings            [Auto]

Enable or Disable Serial
Port (COM)
-----
<->: Select Screen
↑ ↓: Select Item
EnterSelect
= -  Change Opt.
F1   General Help
F2   Previous Values
F3   Optimized Defaults
F4   Save & Exit
ESC  Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

```

**BIOS Menu 11: Serial Port n Configuration Menu**

### 5.3.8.1.1 Serial Port 1 Configuration

→ **Serial Port [Enabled]**

Use the **Serial Port** option to enable or disable the serial port.

- **Disabled**                      Disable the serial port
- **Enabled      DEFAULT**      Enable the serial port

→ **Change Settings [Auto]**

Use the **Change Settings** option to change the serial port IO port address and interrupt address.

- **Auto              DEFAULT**      The serial port IO port address and interrupt address are automatically detected.
- **IO=3F8h;  
IRQ=3**                      Serial Port I/O port address is 3F8h and the interrupt address is IRQ3
- **IO=3F8h;  
IRQ=3**                      Serial Port I/O port address is 3F8h and the interrupt address is IRQ3
- **IO=2F8h;  
IRQ=3**                      Serial Port I/O port address is 2F8h and the interrupt address is IRQ3
- **IO=2C0h;  
IRQ=3**                      Serial Port I/O port address is 2C0h and the interrupt address is IRQ3
- **IO=2C8h;  
IRQ=3**                      Serial Port I/O port address is 2C8h and the interrupt address is IRQ3

### 5.3.8.1.2 Serial Port 2 Configuration

→ **Serial Port [Enabled]**

Use the **Serial Port** option to enable or disable the serial port.

- **Disabled**                      Disable the serial port

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→ **Enabled**      **DEFAULT**      Enable the serial port

### → **Change Settings [Auto]**

Use the **Change Settings** option to change the serial port IO port address and interrupt address.

- |   |                           |                |   |
|---|---------------------------|----------------|---|
| → | <b>Auto</b>               | <b>DEFAULT</b> | The serial port IO port address and interrupt address are automatically detected. |
| → | <b>IO=2F8h;<br/>IRQ=4</b> |                | Serial Port I/O port address is 2F8h and the interrupt address is IRQ4            |
| → | <b>IO=3F8h;<br/>IRQ=4</b> |                | Serial Port I/O port address is 3F8h and the interrupt address is IRQ4            |
| → | <b>IO=2F8h;<br/>IRQ=4</b> |                | Serial Port I/O port address is 2F8h and the interrupt address is IRQ4            |
| → | <b>IO=2C0h;<br/>IRQ=4</b> |                | Serial Port I/O port address is 2C0h and the interrupt address is IRQ4            |
| → | <b>IO=2C8h;<br/>IRQ=4</b> |                | Serial Port I/O port address is 2C8h and the interrupt address is IRQ4            |

### 5.3.9 F81866H/W Monitor

The F81866 H/W Monitor menu (**BIOS Menu 12**) contains the fan configuration submenus and displays operating temperature, fan speeds and system voltages.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Advanced
PC Health Status
Smart Fan Mode Select

> Smart Fan Mode Configuration
CPU temperature           :+47 C
System temperature       :+36 C
CPU_FAN1 Speed           :4643 RPM
V_CPU_CORE                :+0.912 V
+3.3V                    :+3.328 V
V_1P05_ME                 :+1.048 V
V_SM                      :+1.616 V
VSB5V                    :+4.536 V
+V3.3S                   :+3.328 V
VSB3V                    :+3.392 V
VBAT                     :+2.992 V

-----
<->: Select Screen
↑ ↓: Select Item
EnterSelect
+ - Change Opt.
F1  General Help
F2  Previous Values
F3  Optimized Defaults
F4  Save & Exit
ESC Exit

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```

### BIOS Menu 12: F81866 H/W Monitor

#### → PC Health Status

The following system parameters and values are shown. The system parameters that are monitored are:

- System Temperatures:
  - CPU Temperature
  - System Temperature
- Fan Speed:
  - CPU Fan Speed
- Voltages:
  - V\_CPU\_CORE
  - +3.3V
  - V\_1P05\_ME
  - V\_SM
  - VSB5V
  - +V3.3S
  - VSB3V
  - VBAT

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### 5.3.9.1 Smart Fan Mode Configuration

Use the **Smart Fan Mode Configuration (BIOS Menu 13)** submenu to configure fan 1 temperature and speed settings.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
-----
Advanced
-----
Smart Fan Mode Configuration

CPU_FAN1 Smart Fan Control      [Auto Duty-Cycle Mode]
CPU Temperature 1                60
CPU Temperature 2                50
CPU Temperature 3                40
CPU Temperature 4                30

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

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
  
```

#### BIOS Menu 13: FAN 1 Configuration

##### → CPU\_FAN1 Smart Fan Control [Auto Duty-Cycle Mode]

Use the **CPU\_FAN1 Smart Fan Control** option to configure the CPU Smart Fan.

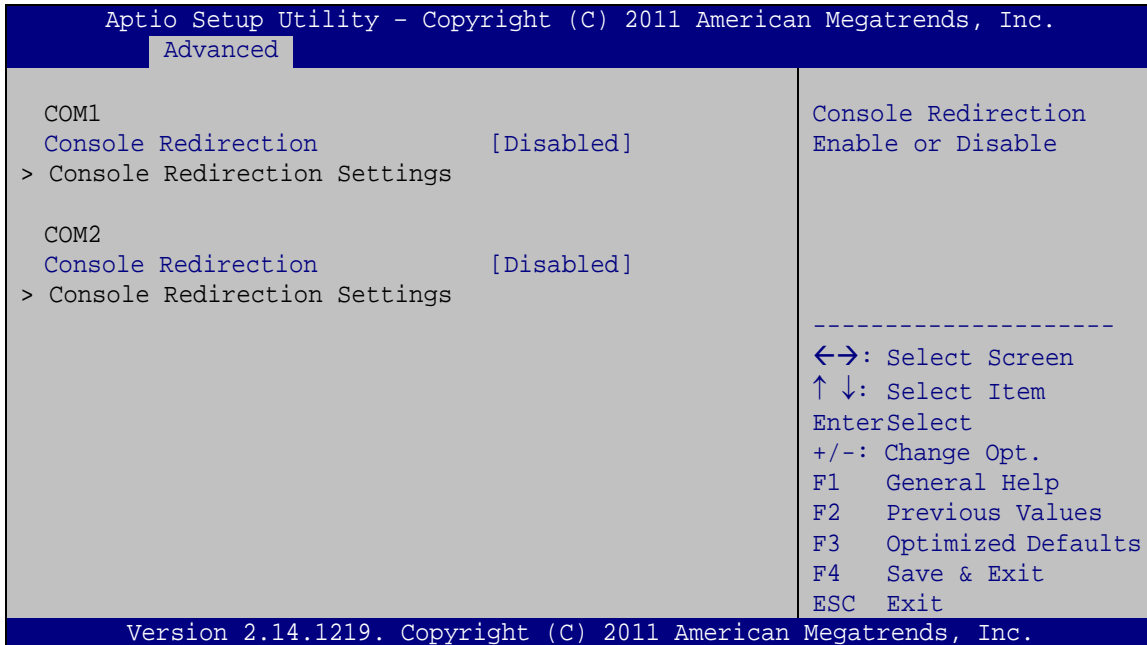
- **Manual Duty Mode**      The fan spins at the speed set in Manual Duty settings
- **Auto Duty-Cycle Mode**    **DEFAULT**    The fan adjusts its speed using Auto Duty-Cycle settings

##### → CPU Temperature n

Use the + or – key or enter a decimal number to change the fan **CPU Temperature n** value.

### 5.3.10 Serial Port Console Redirection

The **Serial Port Console Redirection** menu (**BIOS Menu 14**) allows the console redirection options to be configured. Console redirection allows users to maintain a system remotely by re-directing keyboard input and text output through the serial port.



#### BIOS Menu 14: Serial Port Console Redirection

##### → Console Redirection [Disabled]

Use **Console Redirection** option to enable or disable the console redirection function.

- **Disabled**      **DEFAULT**      Disabled the console redirection function
- **Enabled**                      Enabled the console redirection function

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### 5.3.11 IEI Feature

Use the **IEI Feature** menu (**BIOS Menu 15**) to configure One Key Recovery function.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
-----
Advanced
-----
iEi Feature
Auto Recovery Function          [Disabled]
                                Auto Recovery Function
                                Reboot and recover
                                system automatically
                                within 10 min, when OS
                                crashes. Please install
                                Auto Recovery API
                                service before enabling
                                this function
                                -----
                                ←→: Select Screen
                                ↑↓: Select Item
                                Enter>Select
                                F1   General Help
                                F2   Previous Values
                                F3   Optimized Defaults
                                F4   Save
                                ESC  Exit
-----
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```

#### BIOS Menu 15: IEI Feature

##### ➔ Auto Recovery Function [Disabled]

Use the **Auto Recovery Function** BIOS option to enable or disable the auto recovery function of the IEI One Key Recovery.

- ➔ **Disabled**      **DEFAULT**      Auto recovery function disabled
- ➔ **Enabled**        Auto recovery function enabled

## 5.4 Chipset

Use the **Chipset** menu (**BIOS Menu 16**) to access the PCH-IO and SA configuration menus.



### WARNING!

Setting the wrong values for the Chipset BIOS selections in the Chipset BIOS menu may cause the system to malfunction.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Main   Advanced  Chipset  Boot   Security  Save & Exit
-----
> PCH-IO Configuration
> System Agent (SA) Configuration

PCH Parameters
-----
<->: Select Screen
↑ ↓: Select Item
Enter>Select
+ - Change Opt.
F1  General Help
F2  Previous Values
F3  Optimized Defaults
F4  Save & Exit
ESC Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
    
```

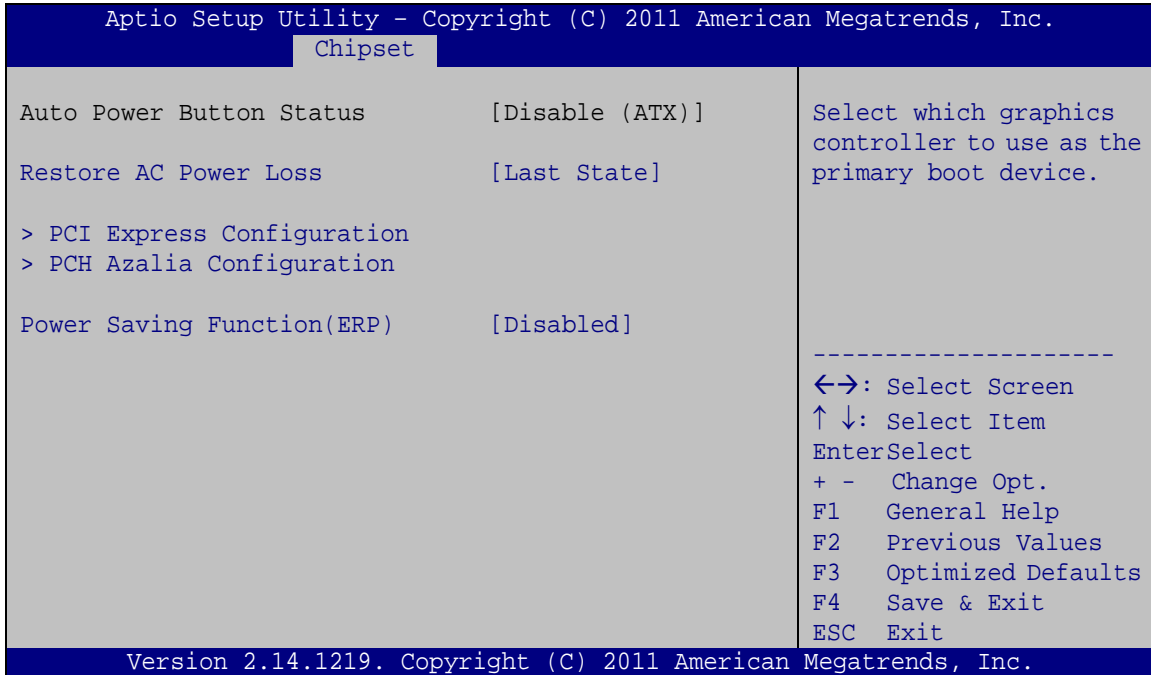
**BIOS Menu 16: Chipset**



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### 5.4.1 PCH-IO Configuration

Use the **PCH-IO Configuration** menu (**BIOS Menu 17**) to configure the PCH chipset.



#### BIOS Menu 17:Northbridge Chipset Configuration

##### ➔ Restore on AC Power Loss [Last State]

Use the **Restore on AC Power Loss** BIOS option to specify what state the system returns to if there is a sudden loss of power to the system.

- ➔ **Power Off**                      The system remains turned off
- ➔ **Power On**                        The system turns on
- ➔ **Last State**    **DEFAULT**    The system returns to its previous state. If it was on, it turns itself on. If it was off, it remains off.

##### ➔ Power Saving Function(ERP) [Disabled]

Use the **Power Saving Function(ERP)** BIOS option to enable or disable the power saving function.

- ➔ **Disabled**            **DEFAULT**    Power saving function is disabled.

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➔ Enabled

Power saving function is enabled. It will reduce power consumption when the system is off.

### 5.4.1.1 PCI Express Configuration

Use the **PCI Express Configuration** menu (**BIOS Menu 18**) to configure the PCIe Mini slots.

```
Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Chipset
-----
PCI Express Configuration
> PCI Express Root Port 1
> PCI Express Root Port 2
> PCI Express Root Port 3
> PCI Express Root Port 4

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

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

**BIOS Menu 18: PCI Express Configuration**

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### 5.4.1.1.1 PCI Express Root Port n

Use the **PCI Express Root Port n** menu (**BIOS Menu 19**) to configure the PCIe Mini slot settings.



#### BIOS Menu 19: M\_PCIE2 Configuration Menu

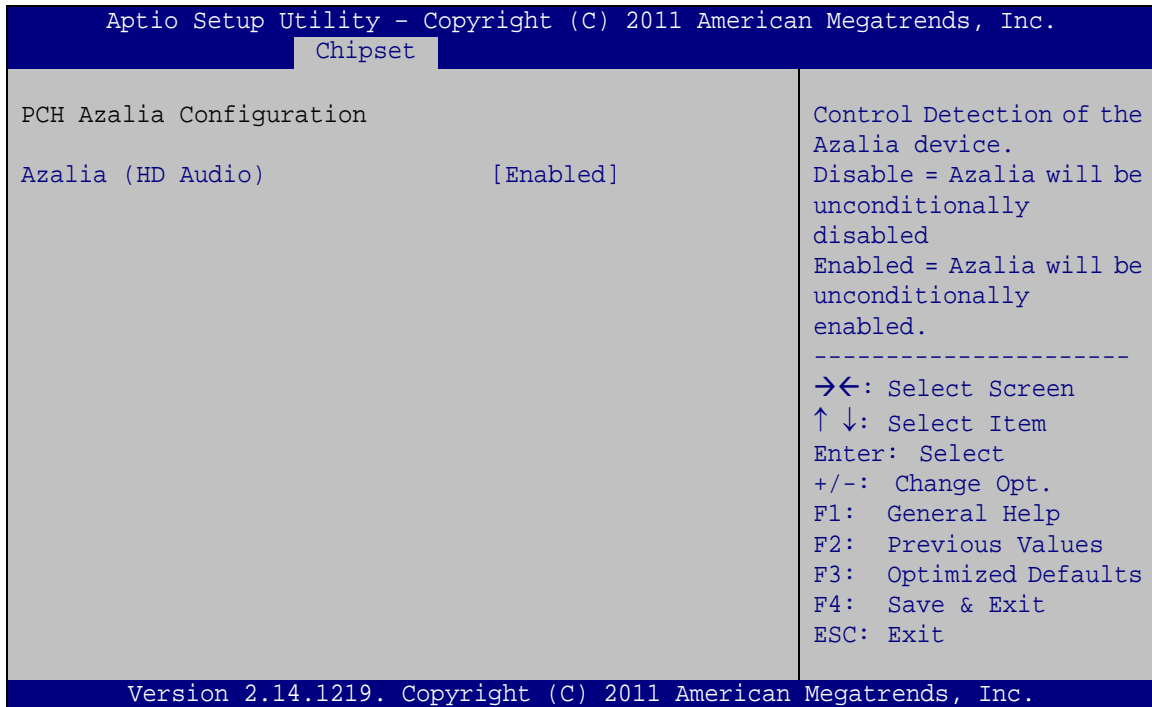
##### → PCIe Speed [Auto]

Use this option to select the support type of the PCIe Mini slot. The following options are available:

- Auto                   **Default**
- Gen1
- Gen2

### 5.4.1.2 PCH Azalia Configuration

Use the **PCH Azalia Configuration** menu (**BIOS Menu 20**) to configure the HD Audio settings.



#### BIOS Menu 20: PCH Azalia Configuration

##### → Azalia (HD Audio) [Enabled]

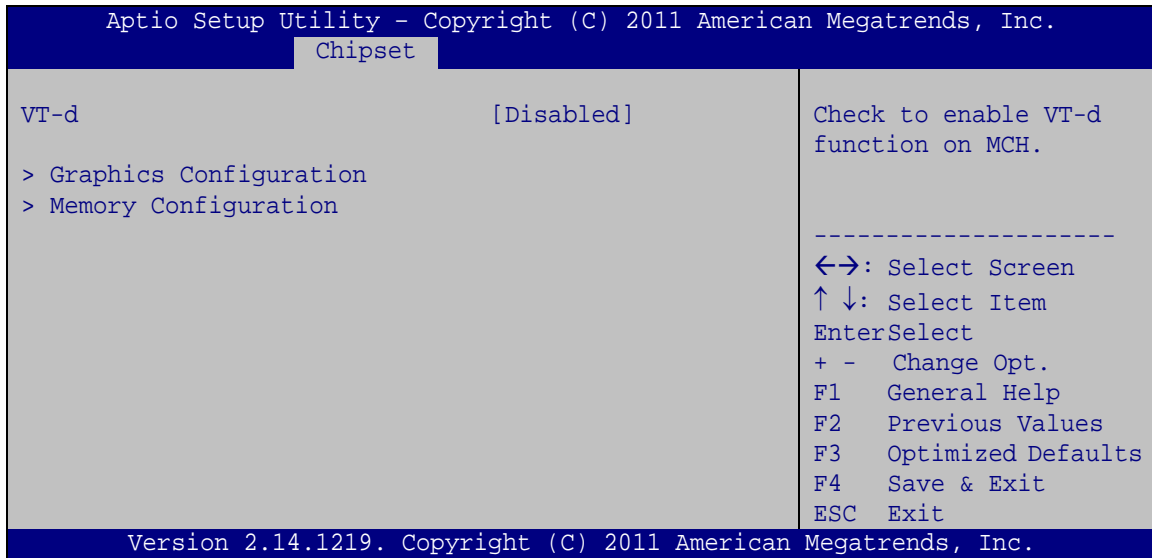
Use the **Azalia (HD Audi)** option to enable or disable the High Definition Audio controller.

- **Disabled**                      The onboard High Definition Audio controller is disabled
- **Enabled    DEFAULT**        The onboard High Definition Audio controller automatically detected and enabled

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### 5.4.2 System Agent (SA) Configuration

Use the **System Agent (SA) Configuration** menu (**BIOS Menu 21**) to configure the SA chipset.



#### BIOS Menu 21: System Agent (SA) Configuration

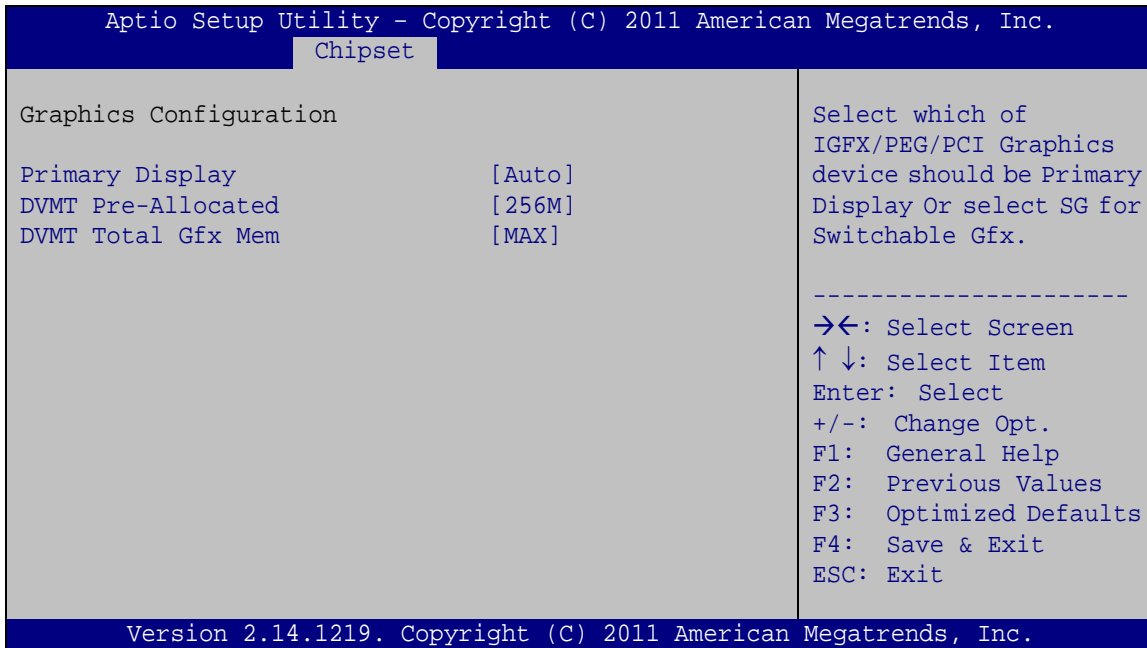
##### → VT-d [Disabled]

Use the **VT-d** option to enable or disable VT-d support.

- **Disabled**                      **DEFAULT**      Disables VT-d support.
- **Enabled**                              Enables VT-d support.

### 5.4.2.1 Graphics Configuration

Use the **Graphics Configuration (BIOS Menu 22)** menu to configure the video device connected to the system.



#### BIOS Menu 22: Graphics Configuration

##### → Primary Display [Auto]

Use the **Primary Display** option to select the display device used by the system when it boots. Configuration options are listed below.

- Auto **DEFAULT**
- IGFX
- PCI

##### → DVMT Pre-Allocated [256M]

Use the **DVMT Pre-Allocated** option to set the amount of system memory allocated to the integrated graphics processor when the system boots. The system memory allocated can then only be used as graphics memory, and is no longer available to applications or the operating system. Configuration options are listed below:

- 32M
- 64M

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- 128M
- 256M                      **Default**
- 512M

### → DVMT Total Gfx Mem [MAX]

Use the **DVMT Total Gfx Mem** option to select DVMT5.0 total graphic memory size used by the internal graphic device. The following options are available:

- 256M
- 128M
- MAX                        **Default**

## 5.4.2.2 Memory Configuration

Use the **Memory Configuration** submenu (**BIOS Menu 23**) to view memory information.

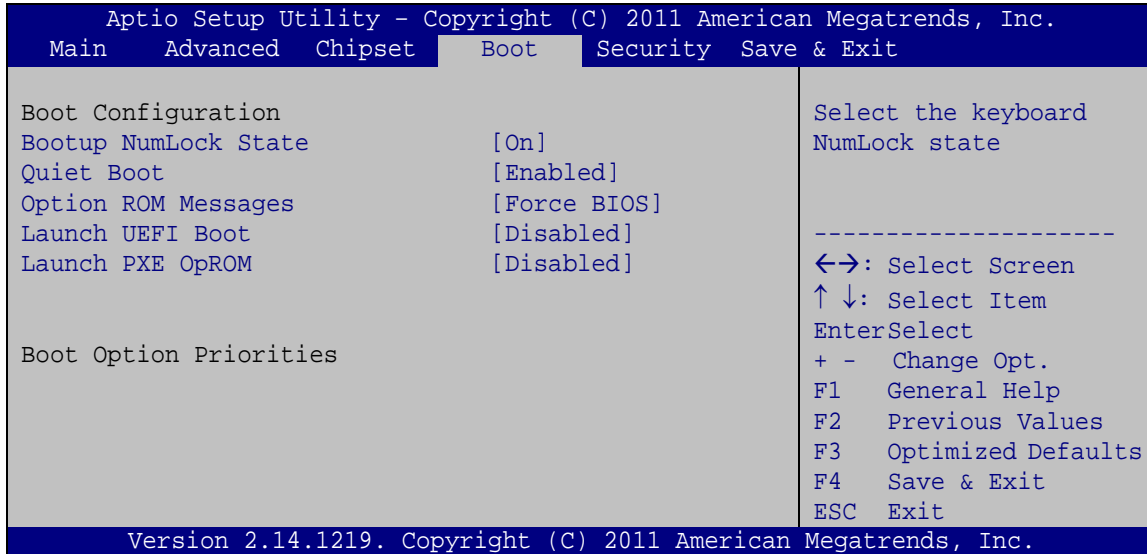
```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Chipset
Memory Configuration
Total Memory          8192 MB (DDR3)
DIMM1                 8192 MB (DDR3)
-----
-><: Select Screen
↑ ↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
  
```

**BIOS Menu 23: Memory Configuration**

## 5.5 Boot

Use the **Boot** menu (**BIOS Menu 24**) to configure system boot options.



### BIOS Menu 24: Boot

#### → Bootup NumLock State [On]

Use the **Bootup NumLock State** BIOS option to specify if the number lock setting must be modified during boot up.

- **On**                      **DEFAULT**                      Allows the Number Lock on the keyboard to be enabled automatically when the computer system boots up. This allows the immediate use of the 10-key numeric keypad located on the right side of the keyboard. To confirm this, the Number Lock LED light on the keyboard is lit.
  
- **Off**                                      Does not enable the keyboard Number Lock automatically. To use the 10-keys on the keyboard, press the Number Lock key located on the upper left-hand corner of the 10-key pad. The Number Lock LED on the keyboard lights up when the Number Lock is engaged.



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### → Quiet Boot [Enabled]

Use the **Quiet Boot** BIOS option to select the screen display when the system boots.

- **Disabled** Normal POST messages displayed
- **Enabled** **DEFAULT** OEM Logo displayed instead of POST messages

### → Option ROM Messages [Force BIOS]

Use the **Option ROM Messages** option to set the Option ROM display mode.

- **Force BIOS** **DEFAULT** Sets display mode to force BIOS.
- **Keep Current** Sets display mode to current.

### → Launch PXE OpROM [Disabled]

Use the **Launch PXE OpROM** option to enable or disable boot option for legacy network devices.

- **Disabled** **DEFAULT** Ignore all PXE Option ROMs
- **Enabled** Load PXE Option ROMs

### → UEFI Boot [Disabled]

Use the **UEFI Boot** option to enable or disable to boot from the UEFI devices.

- **Disabled** **DEFAULT** Boot from UEFI devices is disabled.
- **Enabled** Boot from UEFI devices is enabled.



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### 5.7 Save & Exit

Use the **Save & Exit** menu (**BIOS Menu 26**) to load default BIOS values, optimal failsafe values and to save configuration changes.

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Main   Advanced  Chipset   Boot     Security  Save & Exit
-----
Save Changes and Reset
Discard Changes and Reset

Restore Defaults
Save as User Defaults
Restore User Defaults

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

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

```

#### BIOS Menu 26:Exit

##### → Save Changes and Reset

Use the **Save Changes and Reset** option to save the changes made to the BIOS options and reset the system.

##### → Discard Changes and Reset

Use the **Discard Changes and Reset** option to exit the system without saving the changes made to the BIOS configuration setup program.

##### → Restore Defaults

Use the **Restore Defaults** option to load the optimal default values for each of the parameters on the Setup menus. **F3 key can be used for this operation.**

→ **Save as User Defaults**

Use the **Save as User Defaults** option to save the changes done so far as user defaults.

→ **Restore User Defaults**

Use the **Restore User Defaults** option to restore the user defaults to all the setup options.

Appendix

**A**

# BIOS Options

---

Below is a list of BIOS configuration options in the BIOS chapter.

|                          |  |           |
|--------------------------|--|-----------|
| <input type="checkbox"/> | <b>System Date [xx/xx/xx]</b> .....                            | <b>60</b> |
| <input type="checkbox"/> | <b>System Time [xx:xx:xx]</b> .....                            | <b>60</b> |
| <input type="checkbox"/> | <b>ACPI Sleep State [S1 (CPU Stop Clock)]</b> .....            | <b>61</b> |
| <input type="checkbox"/> | <b>Wake system with Fixed Time [Disabled]</b> .....            | <b>62</b> |
| <input type="checkbox"/> | <b>Security Device Support [Disable]</b> .....                 | <b>63</b> |
| <input type="checkbox"/> | <b>Active Processor Cores [All]</b> .....                      | <b>64</b> |
| <input type="checkbox"/> | <b>Intel Virtualization Technology [Disabled]</b> .....        | <b>65</b> |
| <input type="checkbox"/> | <b>EIST [Enabled]</b> .....                                    | <b>65</b> |
| <input type="checkbox"/> | <b>SATA Controller(s) [Enabled]</b> .....                      | <b>66</b> |
| <input type="checkbox"/> | <b>SATA Mode Selection [IDE]</b> .....                         | <b>66</b> |
| <input type="checkbox"/> | <b>IDE Legacy /Native Mode Selection [IDE]</b> .....           | <b>67</b> |
| <input type="checkbox"/> | <b>USB Devices</b> .....                                       | <b>68</b> |
| <input type="checkbox"/> | <b>Legacy USB Support [Enabled]</b> .....                      | <b>68</b> |
| <input type="checkbox"/> | <b>Serial Port [Enabled]</b> .....                             | <b>70</b> |
| <input type="checkbox"/> | <b>Change Settings [Auto]</b> .....                            | <b>70</b> |
| <input type="checkbox"/> | <b>Serial Port [Enabled]</b> .....                             | <b>70</b> |
| <input type="checkbox"/> | <b>Change Settings [Auto]</b> .....                            | <b>71</b> |
| <input type="checkbox"/> | <b>PC Health Status</b> .....                                  | <b>72</b> |
| <input type="checkbox"/> | <b>CPU_FAN1 Smart Fan Control [Auto Duty-Cycle Mode]</b> ..... | <b>73</b> |
| <input type="checkbox"/> | <b>CPU Temperature n</b> .....                                 | <b>73</b> |
| <input type="checkbox"/> | <b>Console Redirection [Disabled]</b> .....                    | <b>74</b> |
| <input type="checkbox"/> | <b>Auto Recovery Function [Disabled]</b> .....                 | <b>75</b> |
| <input type="checkbox"/> | <b>Restore on AC Power Loss [Last State]</b> .....             | <b>77</b> |
| <input type="checkbox"/> | <b>Power Saving Function(ERP) [Disabled]</b> .....             | <b>77</b> |
| <input type="checkbox"/> | <b>PCIe Speed [Auto]</b> .....                                 | <b>79</b> |
| <input type="checkbox"/> | <b>Azalia (HD Audio) [Enabled]</b> .....                       | <b>80</b> |
| <input type="checkbox"/> | <b>VT-d [Disabled]</b> .....                                   | <b>81</b> |
| <input type="checkbox"/> | <b>Primary Display [Auto]</b> .....                            | <b>82</b> |
| <input type="checkbox"/> | <b>DVMT Pre-Allocated [256M]</b> .....                         | <b>82</b> |
| <input type="checkbox"/> | <b>DVMT Total Gfx Mem [MAX]</b> .....                          | <b>83</b> |
| <input type="checkbox"/> | <b>Bootup NumLock State [On]</b> .....                         | <b>84</b> |
| <input type="checkbox"/> | <b>Quiet Boot [Enabled]</b> .....                              | <b>85</b> |
| <input type="checkbox"/> | <b>Option ROM Messages [Force BIOS]</b> .....                  | <b>85</b> |

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|  |    |
|--|----|
| <input type="checkbox"/> Launch PXE OpROM [Disabled] ..... | 85 |
| <input type="checkbox"/> UEFI Boot [Disabled] .....        | 85 |
| <input type="checkbox"/> Administrator Password .....      | 86 |
| <input type="checkbox"/> User Password .....               | 86 |
| <input type="checkbox"/> Save Changes and Reset .....      | 87 |
| <input type="checkbox"/> Discard Changes and Reset .....   | 87 |
| <input type="checkbox"/> Restore Defaults .....            | 87 |
| <input type="checkbox"/> Save as User Defaults .....       | 88 |
| <input type="checkbox"/> Restore User Defaults .....       | 88 |

Appendix

**B**

# Terminology

---



## PIC0e-B650 Half-size PCIe CPU Card

|                      |   |
|----------------------|---|
| <b>AC '97</b>        | Audio Codec 97 (AC'97) refers to a codec standard developed by Intel® in 1997.  |
| <b>ACPI</b>          | Advanced Configuration and Power Interface (ACPI) is an OS-directed configuration, power management, and thermal management interface.  |
| <b>AHCI</b>          | Advanced Host Controller Interface (AHCI) is a SATA Host controller register-level interface.   |
| <b>ATA</b>           | The Advanced Technology Attachment (ATA) interface connects storage devices including hard disks and CD-ROM drives to a computer.   |
| <b>ARMD</b>          | An ATAPI Removable Media Device (ARMD) is any ATAPI device that supports removable media, besides CD and DVD drives.  |
| <b>ASKIR</b>         | Amplitude Shift Keyed Infrared (ASKIR) is a form of modulation that represents a digital signal by varying the amplitude (“volume”) of the signal. A low amplitude signal represents a binary 0, while a high amplitude signal represents a binary 1. |
| <b>BIOS</b>          | The Basic Input/Output System (BIOS) is firmware that is first run when the computer is turned on and can be configured by the end user   |
| <b>CODEC</b>         | The Compressor-Decompressor (CODEC) encodes and decodes digital audio data on the system.   |
| <b>CompactFlash®</b> | CompactFlash® is a solid-state storage device. CompactFlash® devices use flash memory in a standard size enclosure. Type II is thicker than Type I, but a Type II slot can support both types.  |
| <b>CMOS</b>          | Complimentary metal-oxide-conductor is an integrated circuit used in chips like static RAM and microprocessors.   |
| <b>COM</b>           | COM refers to serial ports. Serial ports offer serial communication to expansion devices. The serial port on a personal computer is usually a male DB-9 connector.  |
| <b>DAC</b>           | The Digital-to-Analog Converter (DAC) converts digital signals to analog signals.   |
| <b>DDR</b>           | Double Data Rate refers to a data bus transferring data on both the rising and falling edges of the clock signal.   |

|                 |  |
|-----------------|--|
| <b>DMA</b>      | Direct Memory Access (DMA) enables some peripheral devices to bypass the system processor and communicate directly with the system memory.   |
| <b>DIMM</b>     | Dual Inline Memory Modules are a type of RAM that offer a 64-bit data bus and have separate electrical contacts on each side of the module.  |
| <b>DIO</b>      | The digital inputs and digital outputs are general control signals that control the on/off circuit of external devices or TTL devices. Data can be read or written to the selected address to enable the DIO functions.                                  |
| <b>EHCI</b>     | The Enhanced Host Controller Interface (EHCI) specification is a register-level interface description for USB 2.0 Host Controllers.  |
| <b>EIDE</b>     | Enhanced IDE (EIDE) is a newer IDE interface standard that has data transfer rates between 4.0 MBps and 16.6 MBps.   |
| <b>EIST</b>     | Enhanced Intel® SpeedStep Technology (EIST) allows users to modify the power consumption levels and processor performance through application software. The application software changes the bus-to-core frequency ratio and the processor core voltage. |
| <b>FSB</b>      | The Front Side Bus (FSB) is the bi-directional communication channel between the processor and the Northbridge chipset.  |
| <b>GbE</b>      | Gigabit Ethernet (GbE) is an Ethernet version that transfers data at 1.0 Gbps and complies with the IEEE 802.3-2005 standard.  |
| <b>GPIO</b>     | General purpose input  |
| <b>HDD</b>      | Hard disk drive (HDD) is a type of magnetic, non-volatile computer storage device that stores digitally encoded data.  |
| <b>ICH</b>      | The Input/Output Control Hub (ICH) is an Intel® Southbridge chipset.   |
| <b>IrDA</b>     | Infrared Data Association (IrDA) specify infrared data transmission protocols used to enable electronic devices to wirelessly communicate with each other.   |
| <b>L1 Cache</b> | The Level 1 Cache (L1 Cache) is a small memory cache built into the system processor.  |
| <b>L2 Cache</b> | The Level 2 Cache (L2 Cache) is an external processor memory cache.  |

## PICOe-B650 Half-size PCIe CPU Card

|                  |   |
|------------------|---|
| <b>LCD</b>       | Liquid crystal display (LCD) is a flat, low-power display device that consists of two polarizing plates with a liquid crystal panel in between.   |
| <b>LVDS</b>      | Low-voltage differential signaling (LVDS) is a dual-wire, high-speed differential electrical signaling system commonly used to connect LCD displays to a computer.  |
| <b>POST</b>      | The Power-on Self Test (POST) is the pre-boot actions the system performs when the system is turned-on.   |
| <b>RAM</b>       | Random Access Memory (RAM) is volatile memory that loses data when power is lost. RAM has very fast data transfer rates compared to other storage like hard drives.   |
| <b>SATA</b>      | Serial ATA (SATA) is a serial communications bus designed for data transfers between storage devices and the computer chipsets. The SATA bus has transfer speeds up to 1.5 Gbps and the SATA II bus has data transfer speeds of up to 3.0 Gbps. |
| <b>S.M.A.R.T</b> | Self Monitoring Analysis and Reporting Technology (S.M.A.R.T) refers to automatic status checking technology implemented on hard disk drives.   |
| <b>UART</b>      | Universal Asynchronous Receiver-transmitter (UART) is responsible for asynchronous communications on the system and manages the system's serial communication (COM) ports.  |
| <b>UHCI</b>      | The Universal Host Controller Interface (UHCI) specification is a register-level interface description for USB 1.1 Host Controllers.  |
| <b>USB</b>       | The Universal Serial Bus (USB) is an external bus standard for interfacing devices. USB 1.1 supports 12Mbps data transfer rates and USB 2.0 supports 480Mbps data transfer rates.   |
| <b>VGA</b>       | The Video Graphics Array (VGA) is a graphics display system developed by IBM.   |

Appendix

C

# Digital I/O Interface

---

## PIC0e-B650 Half-size PCIe CPU Card

### C.1 Introduction

The DIO connector on the PIC0e-B650 is interfaced to GPIO ports on the Super I/O chipset. The DIO has both 4-bit digital inputs and 4-bit digital outputs. The digital inputs and digital outputs are generally control signals that control the on/off circuit of external devices or TTL devices. Data can be read or written to the selected address to enable the DIO functions.



#### NOTE:

For further information, please refer to the datasheet for the Super I/O chipset.

---

The BIOS interrupt call **INT 15H** controls the digital I/O.

#### INT 15H:

|                      |                                 |
|----------------------|---------------------------------|
| <b>AH – 6FH</b>      |                                 |
| <u>Sub-function:</u> |                                 |
| <b>AL – 8</b>        | : Set the digital port as INPUT |
| <b>AL</b>            | : Digital I/O input value       |

### C.2 Assembly Language Sample 1

```
MOV     AX, 6F08H      ;setting the digital port as input
INT     15H           ;
```

AL low byte = value

|   |
|---|
| AH – 6FH                                |
| Sub-function:                           |
| AL – 9 : Set the digital port as OUTPUT |
| BL : Digital I/O input value            |

### C.3 Assembly Language Sample 2

```
MOV     AX, 6F09H      ;setting the digital port as output
MOV     BL, 09H        ;digital value is 09H
INT     15H           ;
```

Digital Output is 1001b

Appendix

**D**

# Watchdog Timer

---



**NOTE:**

The following discussion applies to DOS. Contact IEI support or visit the IEI website for drivers for other operating systems.

The Watchdog Timer is a hardware-based timer that attempts to restart the system when it stops working. The system may stop working because of external EMI or software bugs. The Watchdog Timer ensures that standalone systems like ATMs will automatically attempt to restart in the case of system problems.

A BIOS function call (INT 15H) is used to control the Watchdog Timer.

INT 15H:

| <b>AH – 6FH Sub-function:</b> |   |
|-------------------------------|---|
| AL – 2:                       | Sets the Watchdog Timer's period.   |
| BL:                           | Time-out value (Its unit-second is dependent on the item "Watchdog Timer unit select" in CMOS setup). |

**Table D-1: AH-6FH Sub-function**

Call sub-function 2 to set the time-out period of Watchdog Timer first. If the time-out value is not zero, the Watchdog Timer starts counting down. When the timer value reaches zero, the system resets. To ensure that this reset condition does not occur, calling sub-function 2 must periodically refresh the Watchdog Timer. However, the watchdog timer is disabled if the time-out value is set to zero.

A tolerance of at least 10% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time-consuming.



## PIC0e-B650 Half-size PCIe CPU Card



### NOTE:

The Watchdog Timer is activated through software. The software application that activates the Watchdog Timer must also deactivate it when closed. If the Watchdog Timer is not deactivated, the system will automatically restart after the Timer has finished its countdown.

### EXAMPLE PROGRAM:

**; INITIAL TIMER PERIOD COUNTER**

;

**W\_LOOP:**

;

```

MOV      AX, 6F02H      ;setting the time-out value
MOV      BL, 30         ;time-out value is 48 seconds
INT      15H

```

;

**; ADD THE APPLICATION PROGRAM HERE**

;

```

CMP      EXIT_AP, 1     ;is the application over?
JNE      W_LOOP        ;No, restart the application

```

```

MOV      AX, 6F02H      ;disable Watchdog Timer
MOV      BL, 0         ;
INT      15H

```

;

**; EXIT ;**

Appendix

**E**

# **Hazardous Materials Disclosure**

---

## PIC0e-B650 Half-size PCIe CPU Card

The details provided in this appendix are to ensure that the product is compliant with the Peoples Republic of China (China) RoHS standards. The table below acknowledges the presences of small quantities of certain materials in the product, and is applicable to China RoHS only.

A label will be placed on each product to indicate the estimated “Environmentally Friendly Use Period” (EFUP). This is an estimate of the number of years that these substances would “not leak out or undergo abrupt change.” This product may contain replaceable sub-assemblies/components which have a shorter EFUP such as batteries and lamps. These components will be separately marked.

Please refer to the following table.

| Part Name               | Toxic or Hazardous Substances and Elements |              |              |                              |                                |                                       |
|-------------------------|--|--------------|--------------|------------------------------|--------------------------------|---------------------------------------|
|                         | Lead (Pb)                                  | Mercury (Hg) | Cadmium (Cd) | Hexavalent Chromium (CR(VI)) | Polybrominated Biphenyls (PBB) | Polybrominated Diphenyl Ethers (PBDE) |
| Housing                 | O  | O            | O            | O                            | O                              | O                                     |
| Display                 | O  | O            | O            | O                            | O                              | O                                     |
| Printed Circuit Board   | O  | O            | O            | O                            | O                              | O                                     |
| Metal Fasteners         | O  | O            | O            | O                            | O                              | O                                     |
| Cable Assembly          | O  | O            | O            | O                            | O                              | O                                     |
| Fan Assembly            | O  | O            | O            | O                            | O                              | O                                     |
| Power Supply Assemblies | O  | O            | O            | O                            | O                              | O                                     |
| Battery                 | O  | O            | O            | O                            | O                              | O                                     |

O: This toxic or hazardous substance is contained in all of the homogeneous materials for the part is below the limit requirement in SJ/T11363-2006 (now replaced by GB/T 26572-2011).

X: This toxic or hazardous substance is contained in at least one of the homogeneous materials for this part is above the limit requirement in SJ/T11363-2006 (now replaced by GB/T 26572-2011).

此附件旨在确保本产品符合中国 RoHS 标准。以下表格标示此产品中某有毒物质的含量符合中国 RoHS 标准规定的限量要求。

本产品上会附有“环境友好使用期限”的标签，此期限是估算这些物质“不会有泄漏或突变”的年限。本产品可能包含有较短的环境友好使用期限的可替换元件，像是电池或灯管，这些元件将会单独标示出来。

| 部件名称   | 有毒有害物质或元素 |           |           |                 |               |                     |
|--------|-----------|-----------|-----------|-----------------|---------------|---------------------|
|        | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(CR(VI)) | 多溴联苯<br>(PBB) | 多溴二苯<br>醚<br>(PBDE) |
| 壳体     | ○         | ○         | ○         | ○               | ○             | ○                   |
| 显示     | ○         | ○         | ○         | ○               | ○             | ○                   |
| 印刷电路板  | ○         | ○         | ○         | ○               | ○             | ○                   |
| 金属螺帽   | ○         | ○         | ○         | ○               | ○             | ○                   |
| 电缆组装   | ○         | ○         | ○         | ○               | ○             | ○                   |
| 风扇组装   | ○         | ○         | ○         | ○               | ○             | ○                   |
| 电力供应组装 | ○         | ○         | ○         | ○               | ○             | ○                   |
| 电池     | ○         | ○         | ○         | ○               | ○             | ○                   |

○: 表示该有毒有害物质在该部件所有物质材料中的含量均在 SJ/T 11363-2006 (现由 GB/T 26572-2011 取代) 标准规定的限量要求以下。

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 (现由 GB/T 26572-2011 取代) 标准规定的限量要求。