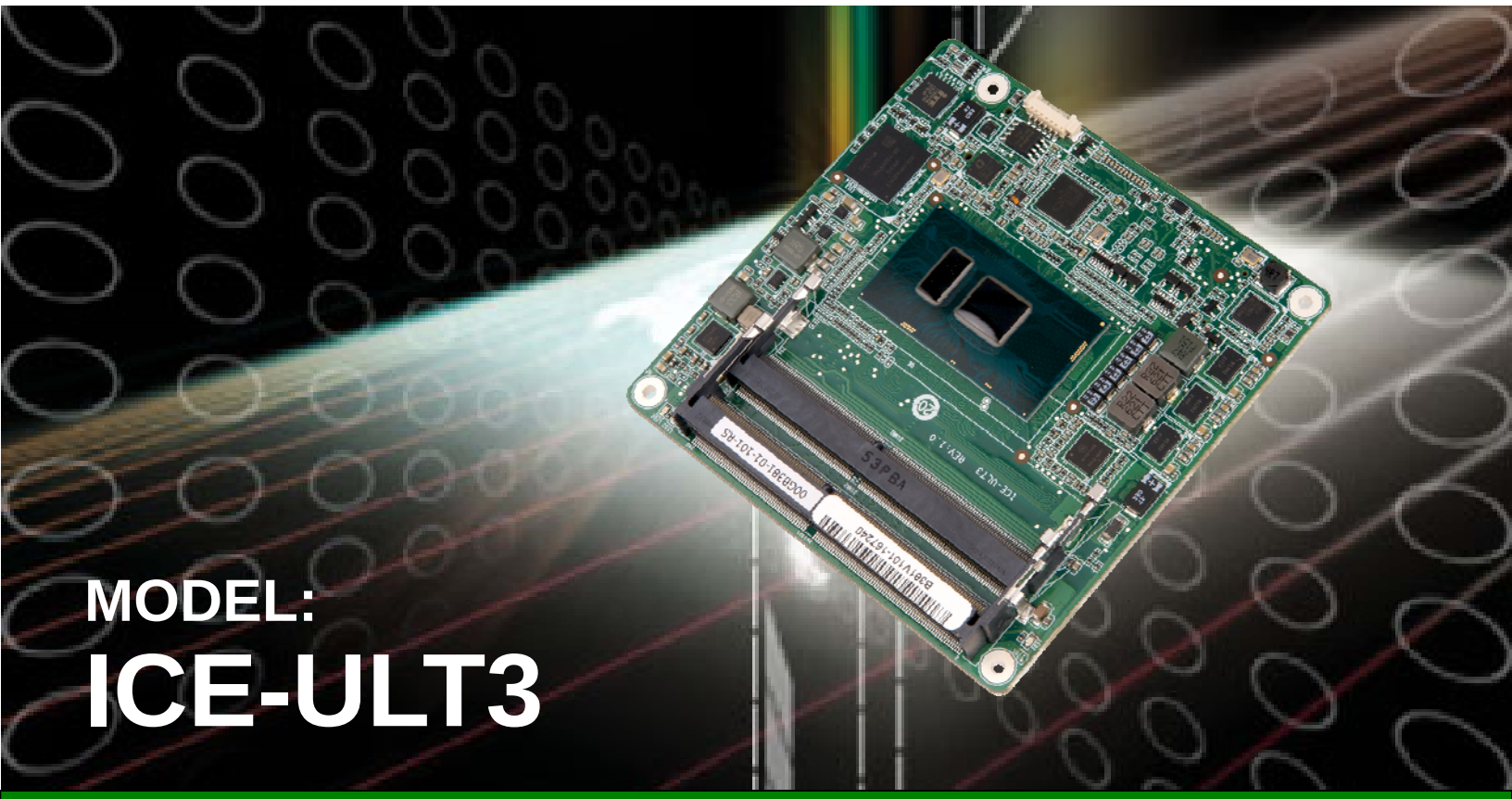
IEI Integration Corp.



MODEL:

ICE-ULT3

COM Express R2.1 Module (Type 6),
6th Gen. Intel® Core™ i7/i5/i3 or Celeron® Processor
Dual DDR4 Slot, SATA 6Gb/s and RoHS Compliant

User Manual

Rev. 1.01 – June 7, 2017

RoHS Lead Free

Revision

Date	Version	Changes
June 7, 2017	1.01	Updated Figure 3-3: COM Express A-B Connector Location (pin B84~B87)
November 2, 2016	1.00	Initial release

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Manual Conventions

WARNING

Warnings appear where overlooked details may cause damage to the equipment or result in personal injury. Warnings should be taken seriously.

CAUTION

Cautionary messages should be heeded to help reduce the chance of losing data or damaging the product.

NOTE

These messages inform the reader of essential but non-critical information. These messages should be read carefully as any directions or instructions contained therein can help avoid making mistakes.

HOT SURFACE

This symbol indicates a hot surface that should not be touched without taking care.

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Chapter

1

Introduction

1.1 Introduction

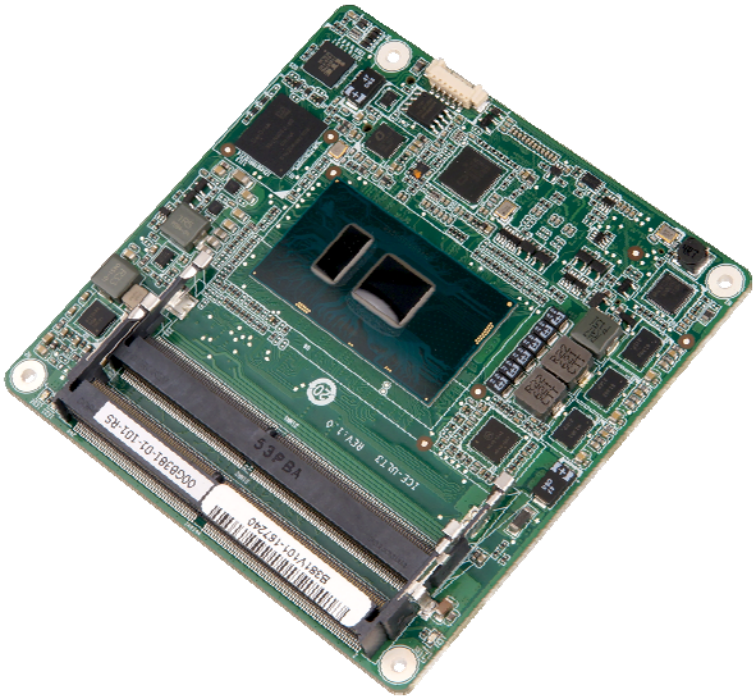


Figure 1-1: ICE-ULT3

The ICE-ULT3 COM Express Type 6 module provides the main processing chips and is connected to a compatible COM Express baseboard. The ICE-ULT3 is preinstalled with 6th generation Intel® Core™ i7/i5/i3 or Celeron® processor. The COM Express standard allows the COM Express baseboard to be designed, while leaving the choice of processor till the later stages of design. The ICE-ULT3 provides a low power option with the full range of modern I/O options. The ICE-ULT3 embedded module is designed for flexible integration by system developers into customized platform devices.

1.2 Model Variations

The model variations for the ICE-ULT3 series are listed in **Table 1-1**.

Model	On-board SoC				
	Name	Clock Speed	# of Cores	L2 Cache	Max TDP
ICE-ULT3-i7	Intel® Core ™ i7-6600U	3.4 GHz	2	4 MB	15 W
ICE-ULT3-i5	Intel® Core ™ i5-6300U	3.0 GHz	2	3 MB	15 W
ICE-ULT3-i3	Intel® Core ™ i3-6100U	2.3 GHz	2	3 MB	15 W
ICE-ULT3-C	Intel® Celeron® 3955U	2.0 GHz	2	3 MB	15 W
ICE-ULT3-CE	Intel® Celeron® 3855U	1.6 GHz	2	2 MB	15 W

Table 1-1: Model Variations

1.3 Features

Some of the ICE-ULT3 COM Express module features are listed below:

- Complies with COM Express Type 6 form factor
- On-board 6th generation Intel® Core™ i7/i5/i3 or Celeron® processor
- Two 260-pin 2133/1867 MHz dual-channel unbuffered DDR4 SDRAM SO-DIMM slots support up to a total of 32 GB of memory
- Intel® HD Graphics technology integrates high-performance graphics and media processing
- Supports DDI, DisplayPort, HDMI and DVI
- Supports USB 3.0, SATA 6Gb/s and GbE
- RoHS compliant

1.4 Board Overview

The on-board components and connectors of the ICE-ULT3 are shown in the figures below.

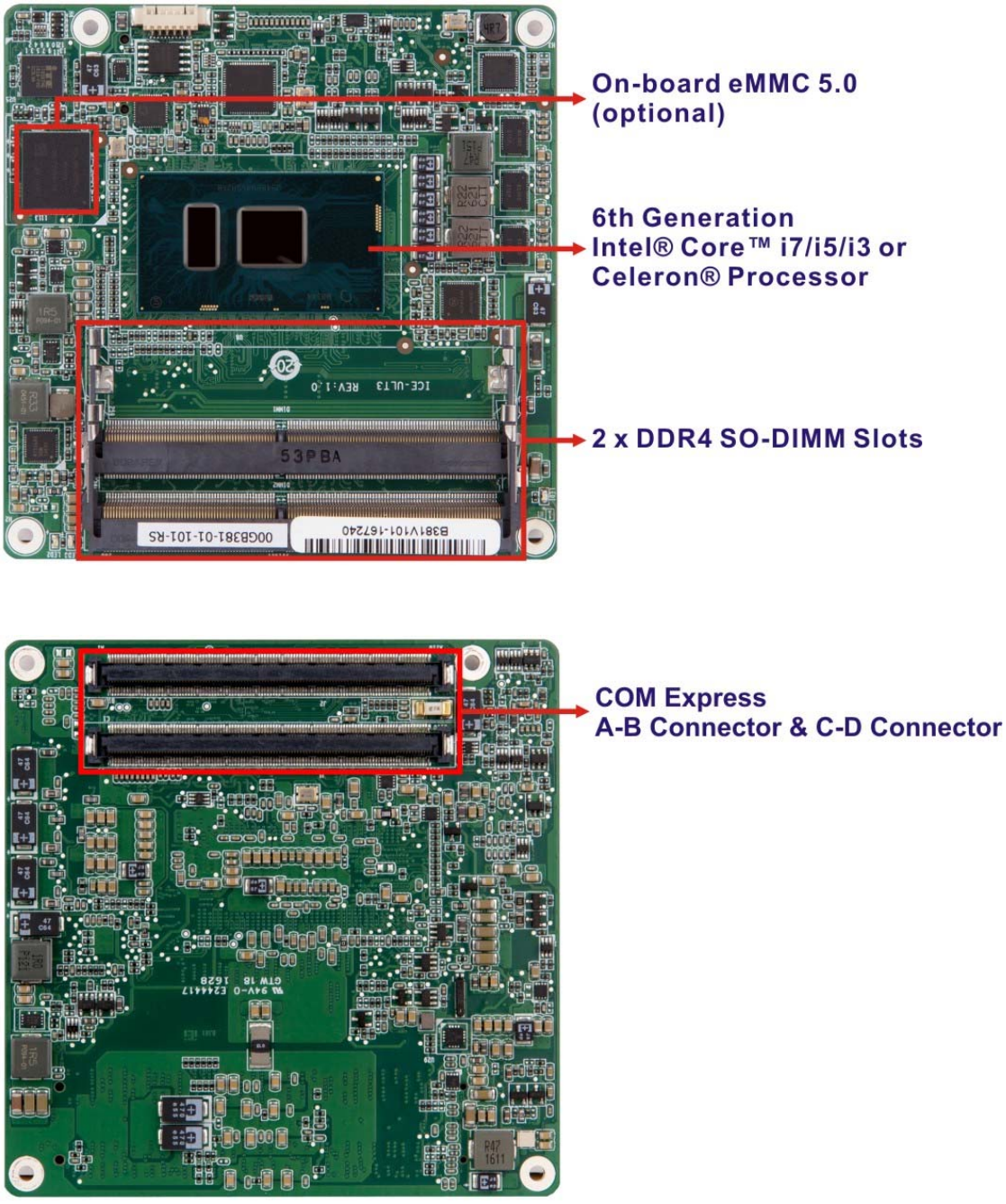


Figure 1-2: On-board Components and Connectors

1.5 Dimensions

The main dimensions of the ICE-ULT3 are shown in the diagrams below.

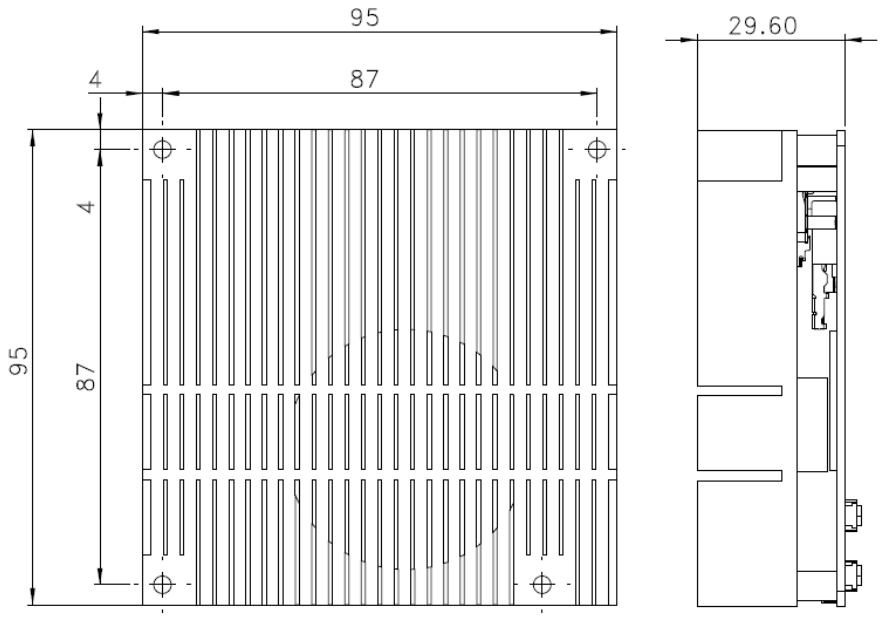


Figure 1-3: ICE-ULT3 Dimensions (with heatsink) (mm)

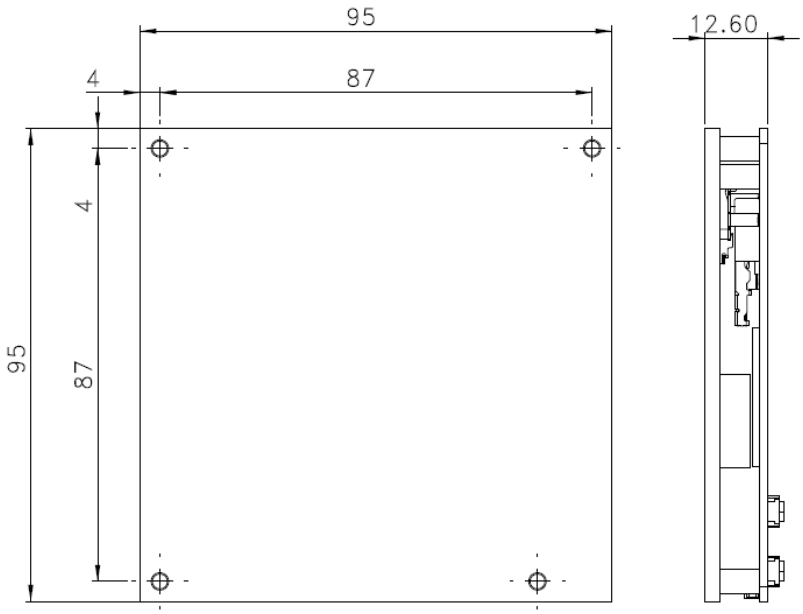


Figure 1-4: ICE-ULT3 Dimensions (without heatsink) (mm)

1.6 Data Flow

Figure 1-5 shows the data flow between the system chipset, the CPU and other components installed on the motherboard.

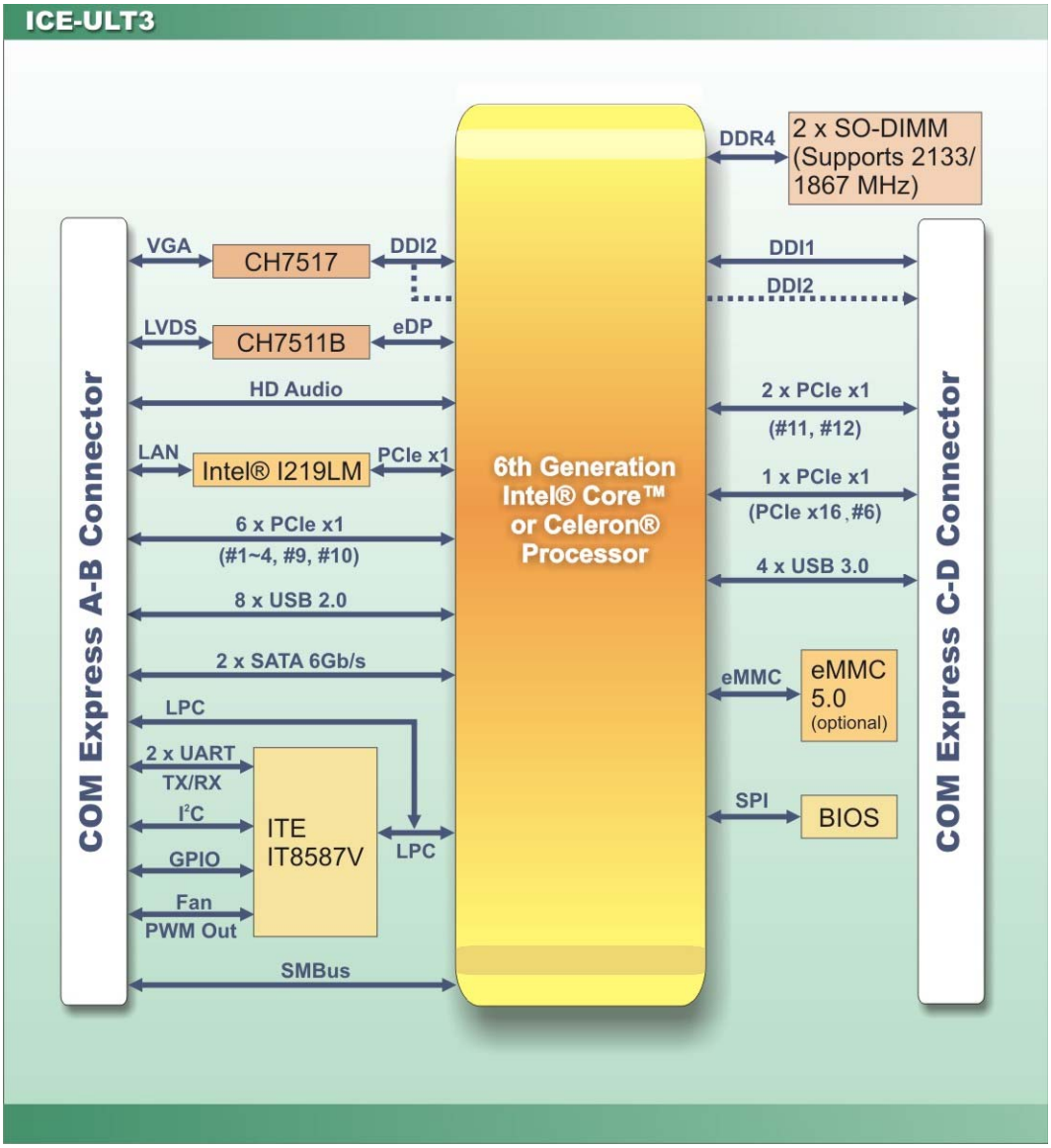


Figure 1-5: Data Flow Diagram

1.7 Technical Specifications

The ICE-ULT3 technical specifications are listed below.

	ICE-ULT3
Form Factor	PICMG COM Express R2.1 Type 6
On-board SoC	6th generation Intel® mobile ULT on-board SoC: ▪ Intel® Core™ i7-6600U (up to 3.4GHz, dual-core, 4MB cache, TDP=15W) ▪ Intel® Core™ i5-6300U (up to 3.0GHz, dual-core, 3MB cache, TDP=15W) ▪ Intel® Core™ i3-6100U (up to 2.3GHz, dual-core, 3MB cache, TDP=15W) ▪ Intel® Celeron® processor 3955U (up to 2.0GHz, dual-core, 2MB cache, TDP=15W) ▪ Intel® Celeron® processor 3855U (up to 1.6GHz, dual-core, 2MB cache, TDP=15W)
Memory	Two 260-pin 2133/1867 MHz dual-channel unbuffered DDR4 SDRAM SO-DIMM slots support up to a total of 32 GB of memory
Graphics Engine	Intel® HD Graphics Gen 9 supports DirectX 11/12, OpenGL 4.3/4/4, OpenCL 2.x and ES 2.0. Decode/Encode for HEVC, VP8, VP9.2, VDENC
Ethernet	Intel® I219LM Ethernet controller with Intel® AMT 11.0 support
BIOS	UEFI BIOS
Embedded Controller	ITE IT8587VG-FX
Watchdog Timer	Software programmable supports 1~255 sec. system reset
Storage	Two SATA 6Gb/s (signal to baseboard) Optional eMMC 5.0
Display **(Signal to Baseboard)**	One DDI: DisplayPort/HDMI/DVI One DDI: DP to VGA via CH7517 (one optional DisplayPort/HDMI/DVI) One DDI: eDP to LVDS via CH7511B (18/24-bit dual-channel LVDS)

	ICE-ULT3
Expansions (Signal to Baseboard)	1 x PCIe x1 signal to base board (via PCIe x16 channel) 8 x PCIe x1 signal to base board
I/O Interfaces (Signal to Baseboard)	4 x USB 2.0 4 x USB 3.0 (with four USB 2.0) 2 x RS-232 (2-wire) HD Audio 8-bit GPIO SMBus I^2C LPC TPM
Power Consumption	+12V @ 2.57 A , 5VSB@0.04A, 5V@0.02A (Intel® Core™ i7-6600U with two 8GB 2400 MHz DDR4 memory)
Operating Temperature	-20ºC ~ 65ºC
Storage Temperature	-30ºC ~ 75ºC
Operating Humidity	5% ~ 95% (non-condensing)
Dimensions	95 mm x 95 mm
Weight (GW/NW)	600 g/200 g

Table 1-2: ICE-ULT3 Specifications

Chapter

2

Packing List

2.1 Anti-static Precautions

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 ICE-ULT3 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 Packing List

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 ICE-ULT3 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The ICE-ULT3 is shipped with the following components:

Quantity	Item and Part Number	Image
1	ICE-ULT3 COM Express Module	
1	Heatsink	
1	Utility CD	
1	Quick Installation Guide	

Table 2-1: Packing List

2.4 Optional Items

The following are optional components which may be separately purchased:

Item and Part Number	Image
Baseboard for COM Express Type 6 modules (**P/N**: ICE-DB-T6R-R11)	

Table 2-2: Optional Items

Chapter

3

Connectors

3.1 Peripheral Interface Connectors

This chapter details all the connectors.

3.1.1 ICE-ULT3 Layout

The figures below show all the connectors on the front side and the solder side.

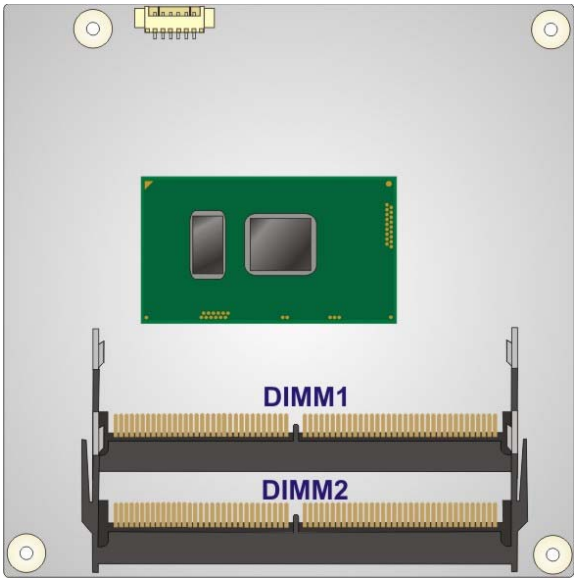


Figure 3-1: Connectors (Front Side)

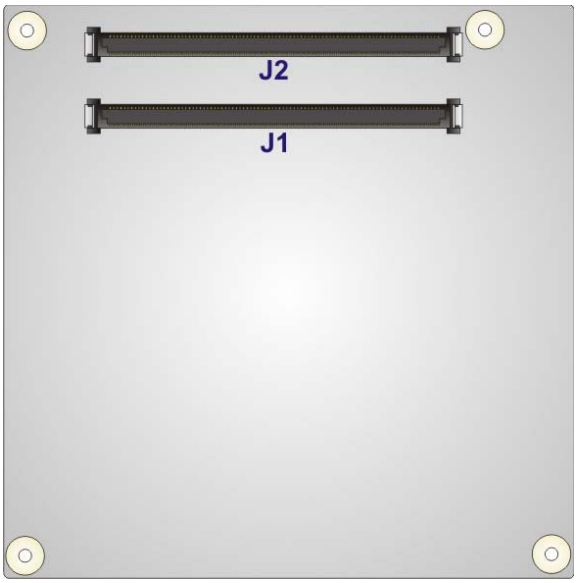


Figure 3-2: Connectors (Solder Side)

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the ICE-ULT3.

Connector	Type	Label
COM Express A-B connector	COM Express connector	J2
COM Express C-D connector	COM Express connector	J1
DDR4 SO-DIMM slot	260-pin SO-DIMM slot	DIMM1, DIMM2

Table 3-1: Peripheral Interface Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the ICE-ULT3.

3.2.1 COM Express A-B Connector

CN Label: **J2**

CN Type: 220-pin COM Express connector

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

CN Pinouts: See **Table 3-2**

The standard COM Express A-B connector location and pinouts are shown below.

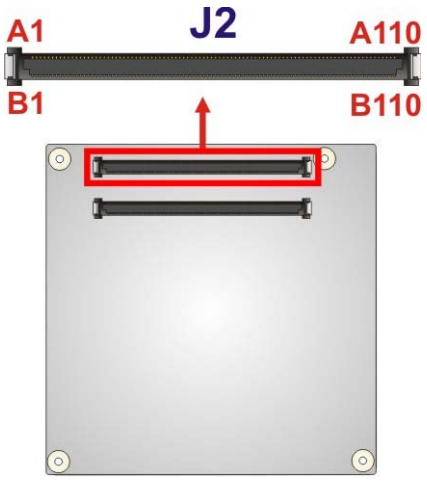


Figure 3-3: COM Express A-B Connector Location

Pin No.	Description	Pin No.	Description
A1	GND	B1	GND15
A2	GBE0_MDI3-	B2	GBE0_ACT#
A3	GBE0_MDI3+	B3	LPC_FRAME#
A4	GBE0_LINK100#	B4	LPC_AD0
A5	GBE0_LINK1000#	B5	LPC_AD1
A6	GBE0_MDI2-	B6	LPC_AD2
A7	GBE0_MDI2+	B7	LPC_AD3
A8	RSVD	B8	RSVD
A9	GBE0_MDI1-	B9	RSVD
A10	GBE0_MDI1+	B10	LPC_CLK
A11	GND1	B11	GND16
A12	GBE0_MDI0-	B12	PWRBTN#
A13	GBE0_MDI0+	B13	SMB_CK
A14	GBE0_CTREF	B14	SMB_DAT
A15	SUS_S3#	B15	SMB_ALERT#
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SUS_S4#	B18	SUS_STAT#
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND2	B21	GND17
A22	RSVD	B22	RSVD
A23	RSVD	B23	RSVD
A24	SUS_S5#	B24	PWR_OK
A25	RSVD	B25	RSVD
A26	RSVD	B26	RSVD
A27	BATLOW#	B27	WDT
A28	ATA_ACT#	B28	RSVD
A29	AC/HD_SYNC	B29	AC/HD_SDIN1
A30	AC/HD_RST#	B30	AC/HD_SDIN0
A31	GND3	B31	GND18
A32	AC/HD_BITCLK	B32	SPKR

Pin No.	Description	Pin No.	Description
A33	AC/HD_SDOUT	B33	I2C_CLK
A34	BIOS_DISABLE#	B34	I2C_DAT
A35	THRMTRIP#	B35	RSVD
A36	USB6-	B36	USB7-
A37	USB6+	B37	USB7+
A38	USB_6_7_OC#	B38	USB_4_5_OC#
A39	USB4-	B39	USB5-
A40	USB4+	B40	USB5+
A41	GND4	B41	GND19
A42	USB2-	B42	USB3-
A43	USB2+	B43	USB3+
A44	USB_2_3_OC#	B44	USB_0_1_OC#
A45	USB0-	B45	USB1-
A46	USB0+	B46	USB1+
A47	VCC_RTC	B47	RSVD
A48	RSVD	B48	RSVD
A49	RSVD	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#
A51	GND5	B51	GND20
A52	PCIE_TX5+	B52	PCIE_RX5+
A53	PCIE_TX5-	B53	PCIE_RX5-
A54	GPI0	B54	GPO1
A55	PCIE_TX4+	B55	PCIE_RX4+
A56	PCIE_TX4-	B56	PCIE_RX4-
A57	GND6	B57	GPO2
A58	PCIE_TX3+	B58	PCIE_RX3+
A59	PCIE_TX3-	B59	PCIE_RX3-
A60	GND7	B60	GND21
A61	PCIE_TX2+	B61	PCIE_RX2+
A62	PCIE_TX2-	B62	PCIE_RX2-
A63	GPI1	B63	GPO3
A64	PCIE_TX1+	B64	PCIE_RX1+

Pin No.	Description	Pin No.	Description
A65	PCIE_TX1-	B65	PCIE_RX1-
A66	GND8	B66	WAKE0#
A67	GPI2	B67	RSVD
A68	PCIE_TX0+	B68	PCIE_RX0+
A69	PCIE_TX0-	B69	PCIE_RX0-
A70	GND9	B70	GND22
A71	LVDS_A0+	B71	LVDS_B0+
A72	LVDS_A0-	B72	LVDS_B0-
A73	LVDS_A1+	B73	LVDS_B1+
A74	LVDS_A1-	B74	LVDS_B1-
A75	LVDS_A2+	B75	LVDS_B2+
A76	LVDS_A2-	B76	LVDS_B2-
A77	LVDS_VDD_EN	B77	LVDS_B3+
A78	LVDS_A3+	B78	LVDS_B3-
A79	LVDS_A3-	B79	LVDS_BKLT_EN
A80	GND10	B80	GND23
A81	LVDS_A_CK+	B81	LVDS_B_CK+
A82	LVDS_A_CK-	B82	LVDS_B_CK-
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL
A84	LVDS_I2C_DAT	B84	VCC5SBY1
A85	GPI3	B85	VCC5SBY2
A86	RSVD	B86	VCC5SBY3
A87	RSVD	B87	VCC5SBY4
A88	PCIE0_CK_REF+	B88	BIOS_DIS1#
A89	PCIE0_CK_REF-	B89	VGA_RED
A90	GND11	B90	GND24
A91	SPI_VCC	B91	VGA_GRN
A92	SPI_MISO	B92	VGA_BLU
A93	GPO0	B93	VGA_HSYNC
A94	SPI_CLK	B94	VGA_VSYNC
A95	SPI_MOSI	B95	VGA_I2C_CK
A96	RSVD	B96	VGA_I2C_DAT

Pin No.	Description	Pin No.	Description
A97	RSVD (TYPE 10#)	B97	SPI_CS#
A98	RS1_TX	B98	RSVD
A99	RS1_RX	B99	RSVD
A100	GND13	B100	GND25
A101	RS2_TX	B101	FAN_PWMOUT
A102	RS2_RX	B102	FAN_TACHIN
A103	LID#	B103	SLEEP#
A104	VCC_12V7	B104	VCC_12V16
A105	VCC_12V8	B105	VCC_12V17
A106	VCC_12V9	B106	VCC_12V18
A107	VCC_12V10	B107	VCC_12V19
A108	VCC_12V11	B108	VCC_12V20
A109	VCC_12V12	B109	VCC_12V21
A110	GND14	B110	GND26

Table 3-2: COM Express A-B Connector Pin Definitions

3.2.2 COM Express C-D Connector

CN Label: **J1**

CN Type: 220-pin COM Express connector

CN Location: See **Figure 3-4**

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

The standard COM Express C-D connector location and pinouts are shown below.

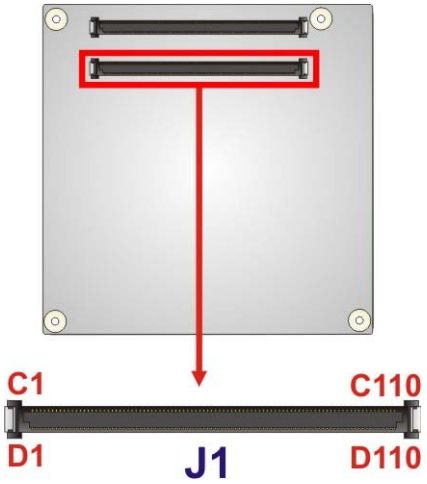


Figure 3-4: COM Express C-D Connector Location

Pin No.	Description	Pin No.	Description
C1	GND0	D1	GND15
C2	GND	D2	GND
C3	USB_SSRX0-	D3	USB_SSTX0-
C4	USB_SSRX0+	D4	USB_SSTX0+
C5	GND	D5	GND
C6	USB_SSRX1-	D6	USB_SSTX1-
C7	USB_SSRX1+	D7	USB_SSTX1+
C8	GND	D8	GND
C9	USB_SSRX2-	D9	USB_SSTX2-
C10	USB_SSRX2+	D10	USB_SSTX2+
C11	GND1	D11	GND16
C12	USB_SSRX3-	D12	USB_SSTX3-
C13	USB_SSRX3+	D13	USB_SSTX3+
C14	GND	D14	GND
C15	RSVD	D15	DDI1_CTRLCLK_AUX+
C16	RSVD	D16	DDI1_CTRLDATA_AUX-
C17	RSVD	D17	RSVD
C18	RSVD	D18	RSVD
C19	PCIE_RX6+	D19	PCIE_TX6+
C20	PCIE_RX6-	D20	PCIE_TX6-
C21	GND2	D21	GND17

Pin No.	Description	Pin No.	Description
C22	PCIE_RX7+	D22	PCIE_TX7+
C23	PCIE_RX7-	D23	PCIE_TX7-
C24	DDI1_HPD	D24	RSVD
C25	RSVD	D25	RSVD
C26	RSVD	D26	DDI1_PAIR0+
C27	RSVD	D27	DDI1_PAIR0-
C28	RSVD	D28	RSVD
C29	RSVD	D29	DDI1_PAIR1+
C30	RSVD	D30	DDI1_PAIR1-
C31	GND3	D31	GND18
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
C35	RSVD	D35	RSVD
C36	RSVD	D36	DDI1_PAIR3+
C37	RSVD	D37	DDI1_PAIR3-
C38	RSVD	D38	RSVD
C39	RSVD	D39	DDI2_PAIR0+
C40	RSVD	D40	DDI2_PAIR0-
C41	GND4	D41	GND19
C42	RSVD	D42	DDI2_PAIR1+
C43	RSVD	D43	DDI2_PAIR1-
C44	RSVD	D44	DDI2_HPD
C45	RSVD	D45	RSVD
C46	RSVD	D46	DDI2_PAIR2+
C47	RSVD	D47	DDI2_PAIR2-
C48	RSVD	D48	RSVD
C49	RSVD	D49	DDI2_PAIR3+
C50	RSVD	D50	DDI2_PAIR3-
C51	GND5	D51	GND20
C52	PEG_RX0+	D52	PEG_TX0+
C53	PEG_RX0-	D53	PEG_TX0-

Pin No.	Description	Pin No.	Description
C54	RSVD (TYPE0#)	D54	RSVD
C55	RSVD	D55	RSVD
C56	RSVD	D56	RSVD
C57	RSVD (TYPE1#)	D57	GND (TYPE2#)
C58	RSVD	D58	RSVD
C59	RSVD	D59	RSVD
C60	GND7	D60	GND21
C61	RSVD	D61	RSVD
C62	RSVD	D62	RSVD
C63	RSVD1	D63	RSVD10
C64	RSVD2	D64	RSVD9
C65	RSVD	D65	RSVD
C66	RSVD	D66	RSVD
C67	RSVD3	D67	GND28
C68	RSVD	D68	RSVD
C69	RSVD	D69	RSVD
C70	GND9	D70	GND22
C71	RSVD	D71	RSVD
C72	RSVD	D72	RSVD
C73	RSVD	D73	RSVD
C74	RSVD	D74	RSVD
C75	RSVD	D75	RSVD
C76	GND8	D76	GND29
C77	RSVD4	D77	RSVD
C78	RSVD	D78	RSVD
C79	RSVD	D79	RSVD
C80	GND10	D80	GND23
C81	RSVD	D81	RSVD
C82	RSVD	D82	RSVD
C83	RSVD5	D83	RSVD8
C84	GND6	D84	GND30
C85	RSVD	D85	RSVD

Pin No.	Description	Pin No.	Description
C86	RSVD	D86	RSVD
C87	GND35	D87	GND31
C88	RSVD	D88	RSVD
C89	RSVD	D89	RSVD
C90	GND27	D90	GND24
C91	RSVD	D91	RSVD
C92	RSVD	D92	RSVD
C93	GND11	D93	GND32
C94	RSVD	D94	RSVD
C95	RSVD	D95	RSVD
C96	GND12	D96	GND33
C97	RSVD6	D97	RSVD
C98	RSVD	D98	RSVD
C99	RSVD	D99	RSVD
C100	GND13	D100	GND25
C101	RSVD	D101	RSVD
C102	RSVD	D102	RSVD
C103	GND	D103	GND34
C104	VCC_12V1	D104	VCC_12V7
C105	VCC_12V2	D105	VCC_12V8
C106	VCC_12V3	D106	VCC_12V9
C107	VCC_12V4	D107	VCC_12V10
C108	VCC_12V5	D108	VCC_12V11
C109	VCC_12V6	D109	VCC_12V12
C110	GND14	D110	GND26

Table 3-3: COM Express C-D Connector Pin Definitions

3.2.3 SO-DIMM Connectors

CN Label:	**DIMM1, DIMM2**
CN Type:	260-pin DDR4 SO-DIMM connector
CN Location:	See **Figure 3-5**

The SO-DIMM connectors are for installing DDR4 memory on the system.

NOTE:

If there is only one memory module being installed, install it in the **DIMM1** slot.

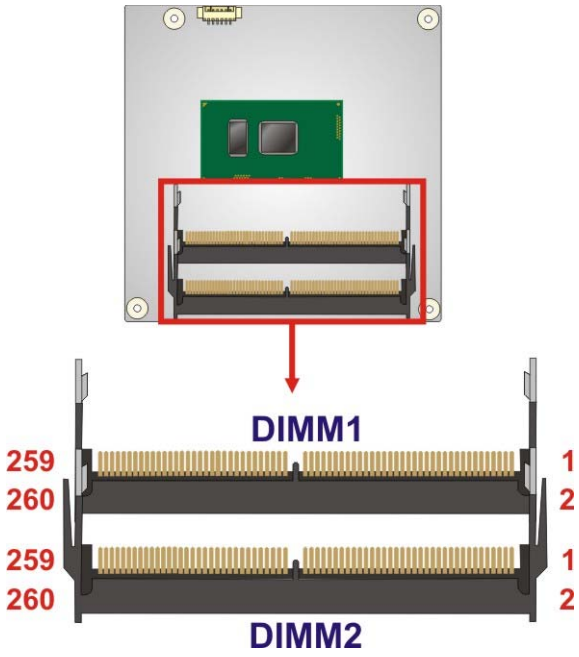


Figure 3-5: SO-DIMM Connector Locations

Chapter

4

Installation

4.1 Anti-static Precautions

WARNING:

Failure to take ESD precautions during the installation of the ICE-ULT3 may result in permanent damage to the ICE-ULT3 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the ICE-ULT3. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the ICE-ULT3 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 ICE-ULT3, place it on an antic-static pad. This reduces the possibility of ESD damaging the ICE-ULT3.
- ***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 installation. All installation notices must be strictly adhered to. Failing to adhere to these precautions may lead to severe damage and injury to the person performing the installation.

WARNING:

The installation instructions described in this manual should be carefully followed in order to prevent damage to the 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 ICE-ULT3 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 ICE-ULT3 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 ICE-ULT3 off:
  - When working with the ICE-ULT3, 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 ICE-ULT3 **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 SO-DIMM Installation

WARNING:

Using incorrectly specified SO-DIMM may cause permanent damage to the ICE-ULT3. Please make sure the purchased SO-DIMM complies with the memory specifications of the ICE-ULT3. SO-DIMM specifications compliant with the ICE-ULT3 are listed in Chapter 1.

To install a SO-DIMM into a SO-DIMM socket, please follow the steps below and refer to **Figure 4-1**.

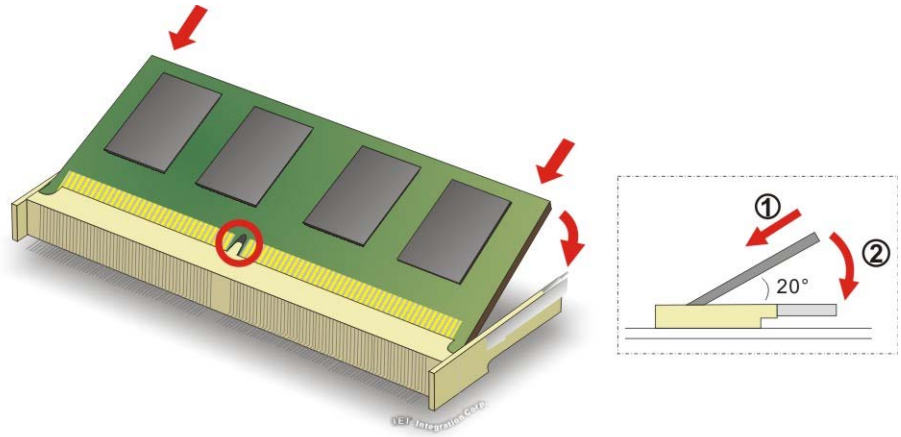


Figure 4-1: SO-DIMM Installation

Step 1: **Locate the SO-DIMM socket**. Place the ICE-ULT3 on an anti-static mat with the front side facing up.

Step 2: **Align the SO-DIMM with the socket**. Align the notch on the memory with the notch on the memory socket.

Step 3: **Insert the SO-DIMM**. Push the memory in at a 20º angle.

Step 4: **Seat the SO-DIMM**. Gently push downwards and the arms clip into place.

4.4 Mounting ICE-ULT3 to Baseboard

NOTE:

Baseboard can be designed by the end user, customized by IEI, or purchased from IEI. For more information visit the IEI website (www.ieiworld.com) or contact an IEI sales representative.

WARNING:

Never run the COM Express module without the heatsink and a thermal pad. The thermal pad acts as a thermal interface between the module and the heatsink. The heatsink must be installed on the ICE-ULT3 to maintain proper operating temperatures. Make sure to maintain the heatsink temperature under 60°C in operation.

Follow the steps below to install the ICE-ULT3 to the optional baseboard.

Step 1: Align the two COM Express connector on the solder side of the ICE-ULT3 with the corresponding connector on the baseboard. Gently push the COM Express module down to ensure the connectors are properly connected (Figure 4-2).

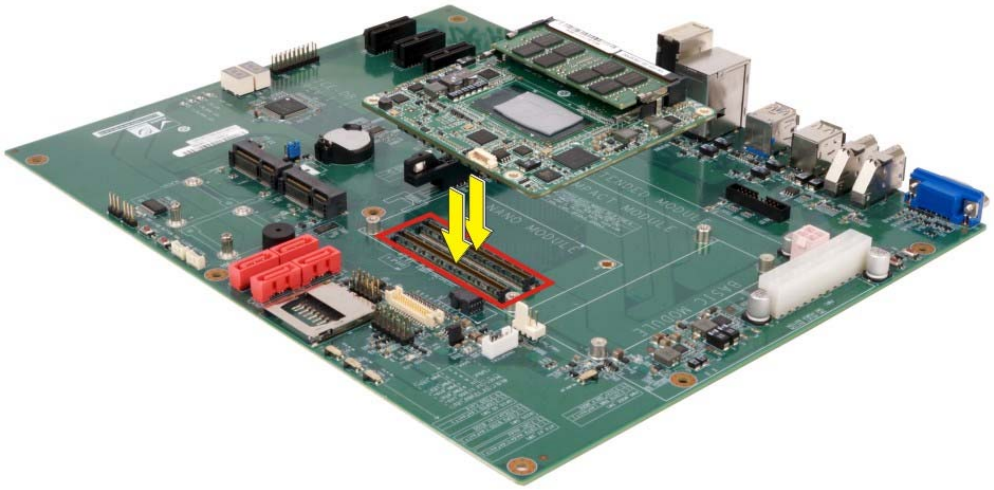


Figure 4-2: Connect the COM Express Connectors

Step 2: Ensure a thermal pad is placed on the CPU of the ICE-ULT3.

Step 3: Place the heatsink on the ICE-ULT3, aligning the retention screw holes (Figure 4-3).

Step 4: Secure the heatsink to the ICE-ULT3 and the baseboard with the supplied retention screws (Figure 4-3).

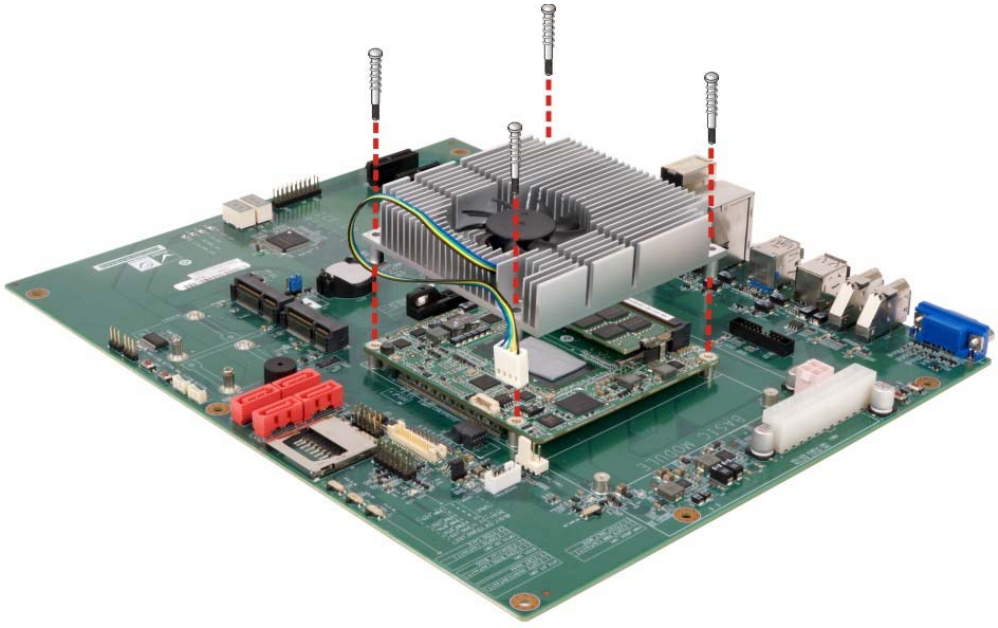


Figure 4-3: Secure the Heatsink

Chapter

5

BIOS

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 UEFI 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
+	Increase the numeric value or make changes

Key	Function
-	Decrease the numeric value or make changes
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 changes and Exit BIOS
Esc key	Main Menu – Quit and not save changes into CMOS Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu

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.

5.1.5 BIOS Menu Bar

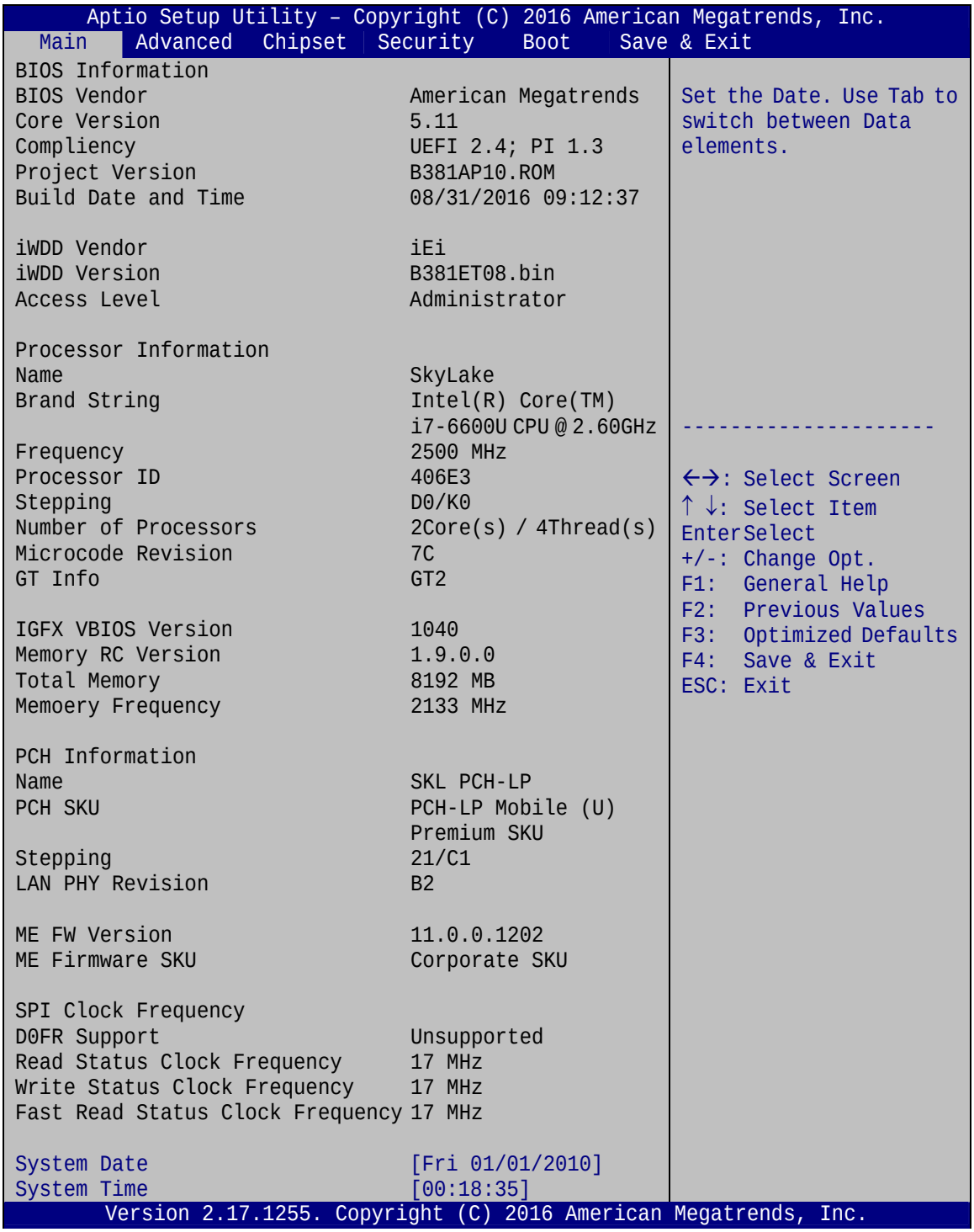
The **menu bar** on top of the BIOS screen has the following main items:

- Main – Changes the basic system configuration.
- Advanced – Changes the advanced system settings.
- Chipset – Changes the chipset settings.
- Security – Sets User and Supervisor Passwords.
- Boot – Changes the system boot configuration.
- 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.

5.2 Main

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



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]**

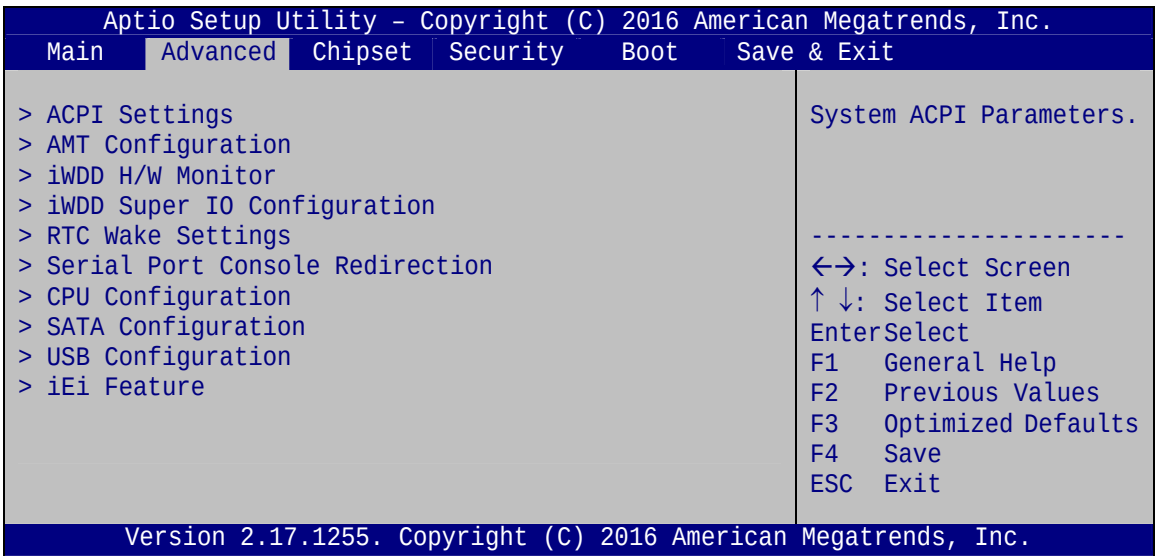
Use the **System Time** option to set the system time. Manually enter the hours, minutes and seconds.

5.3 Advanced

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

WARNING!

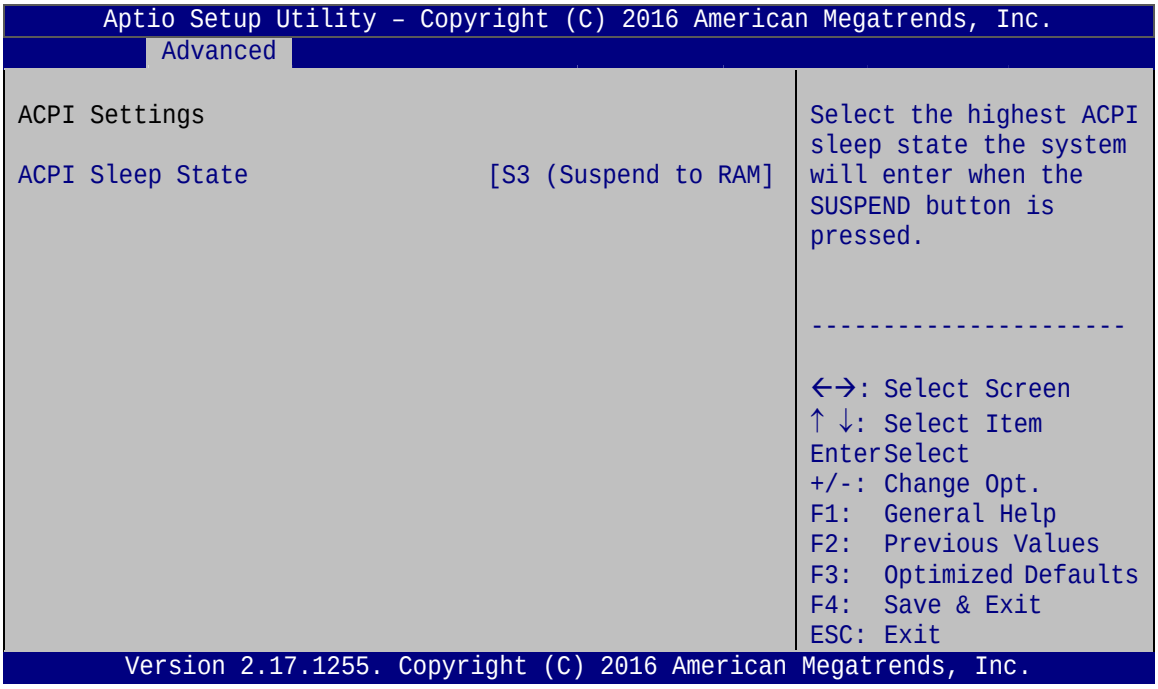
Setting the wrong values in the sections below may cause the system to malfunction. Make sure that the settings made are compatible with the hardware.



BIOS Menu 2: Advanced

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 Settings

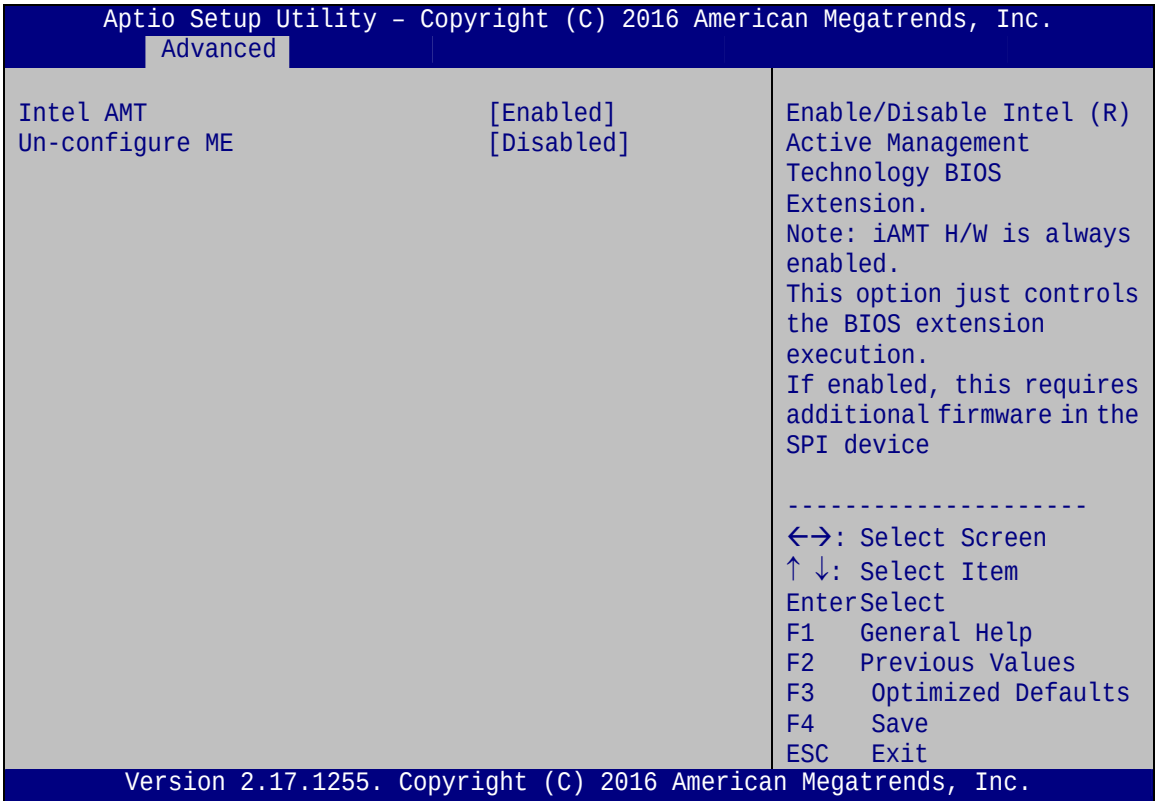
➔ **ACPI Sleep State [S3 (Suspend to RAM)]**

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

➔ **S3 (Suspend to RAM)** DEFAULT 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 AMT Configuration

The **AMT Configuration** menu (**BIOS Menu 4**) allows Intel® Active Management Technology (AMT) options to be configured.



BIOS Menu 4: AMT Configuration

➔ **Intel AMT [Enabled]**

Use **Intel AMT** option to enable or disable the Intel® AMT function.

➔ **Disabled** Intel® AMT is disabled

➔ **Enabled** **DEFAULT** Intel® AMT is enabled

➔ **Un-configure ME [Disabled]**

Use the **Un-configure ME** option to perform ME unconfigure without password operation.

➔ **Disabled** **DEFAULT** Not perform ME unconfigure

➔ **Enabled** To perform ME unconfigure

5.3.3 iWDD H/W Monitor

The **iWDD H/W Monitor** menu (**BIOS Menu 5**) contains the fan configuration submenus and displays operating temperature, fan speeds and system voltages.

```
Aptio Setup Utility – Copyright (C) 2016 American Megatrends, Inc.
        Advanced
PC Health Status                                  Smart Fan Mode Select

CPU temperature                 :+451 °C

CPU_FAN1 Speed                  :1429 RPM

CPU_CORE                        :+0.917 V         ---------------------
+5V                             :+5.002 V         ←→: Select Screen
+12V                            :+11.876 V        ↑ ↓: Select Item
+DDR                            :+1.211 V         EnterSelect
+5VSB                           :+5.002 V         + -   Change Opt.
+3.3VSB                         :+3.259 V         F1    General Help
                                                  F2    Previous Values
> Smart Fan Mode Configuration                    F3    Optimized Defaults
                                                  F4    Save & Exit
                                                  ESC   Exit
Version 2.17.1255. Copyright (C) 2016 American Megatrends, Inc.
```

BIOS Menu 5: iWDD H/W Monitor

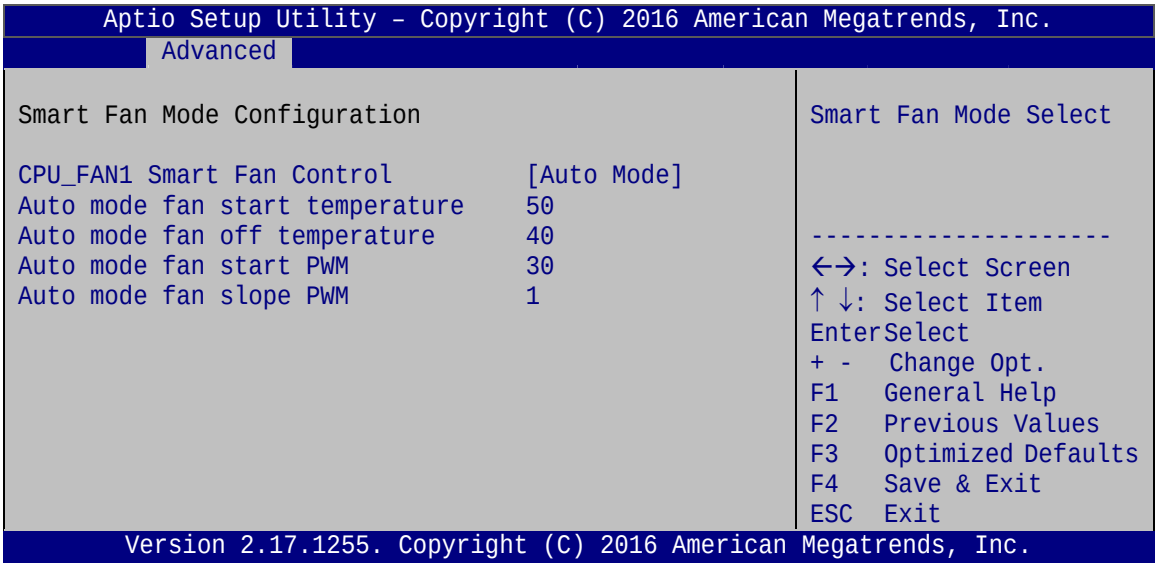
➔ **PC Health Status**

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

- CPU Temperature
- CPU Fan Speed
- Voltages
  - CPU_CORE
  - +5V
  - +12V
  - +DDR
  - +5VSB
  - +3.3VSB

5.3.3.1 Smart Fan Mode Configuration

Use the **Smart Fan Mode Configuration** submenu (**BIOS Menu 6**) to configure fan temperature and speed settings.



BIOS Menu 6: Smart Fan Mode Configuration

➔ **CPU_FAN1 Smart Fan Control [Auto Mode]**

Use the **CPU_FAN1 Smart Fan Control** BIOS option to configure the CPU Smart Fan.

➔ **Manual Mode** The fan spins at the speed set in the Manual Mode option

➔ **Auto Mode** **DEFAULT** The fan adjusts its speed using these settings:

- Auto mode fan start temperature
- Auto mode fan off temperature
- Auto mode fan start PWM
- Auto mode fan slope PWM

➔ **Auto mode fan start temperature [50]**

WARNING:

Setting this value too high may cause the fan to rotate at full speed only when the CPU is at a very high temperature and therefore cause the system to be damaged.

The **Auto mode fan start temperature** option can only be set if the **SYS_FAN1 Smart Fan Control** option is set to **Auto Mode**. If the system temperature is between **Start Temperature** and **Off Temperature**, the fan speed change to be **Start PWM**. To set a value, select the **Auto mode fan start temperature** option and enter a decimal number between 1 and 100.

➔ **Auto mode fan off temperature [40]**

WARNING:

Setting this value too high may cause the fan to speed up only when the CPU is at a very high temperature and therefore cause the system to be damaged.

The **Auto mode fan off temperature** option can only be set if the **SYS_FAN1 Smart Fan control** option is set to **Auto Mode**. If the system temperature is lower than **Auto mode fan off temperature**, the fan speed change to be lowest. To set a value, select the **Auto mode fan off temperature** option and enter a decimal number between 1 and 100.

➔ **Auto mode fan start PWM [30]**

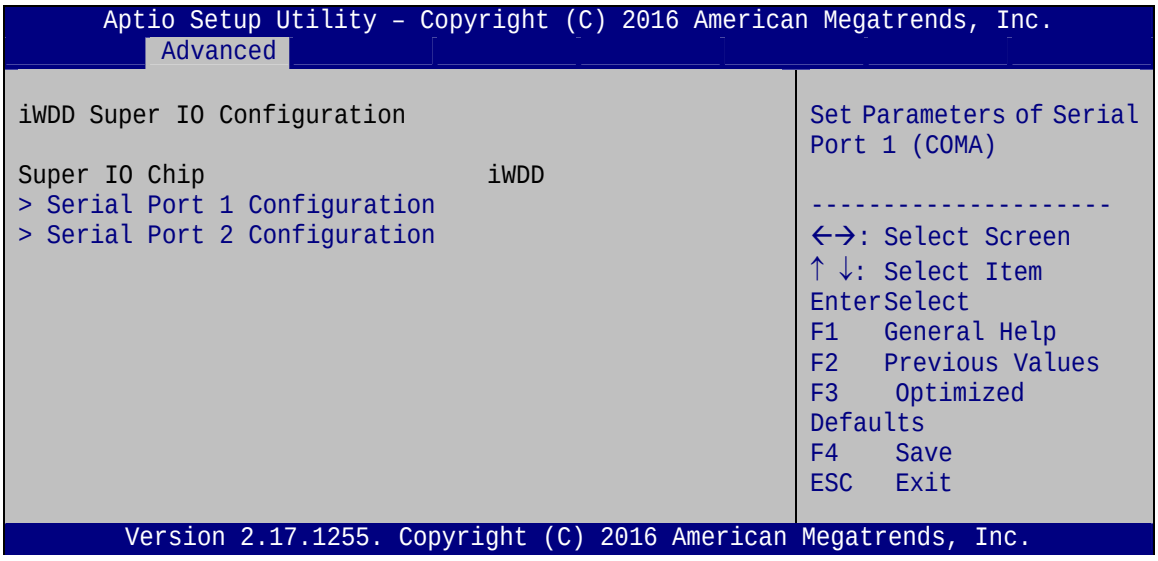
The **Auto mode fan start PWM** option can only be set if the **SYS_FAN1 Smart Fan control** option is set to **Auto Mode**. Use the **Auto mode fan start PWM** option to set the PWM start value. To set a value, select the **Auto mode fan start PWM** option and enter a decimal number between 1 and 100.

➔ **Auto mode fan slope PWM [1]**

The **Auto mode fan slope PWM** option can only be set if the **SYS_FAN1 Smart Fan control** option is set to **Auto Mode**. Use the **Auto mode fan slope PWM** option to select the linear rate at which the PWM mode increases with respect to an increase in temperature. To set a value, select the **Auto mode fan slope PWM** option and enter a decimal number between 1 and 64.

5.3.4 iWDD Super IO Configuration

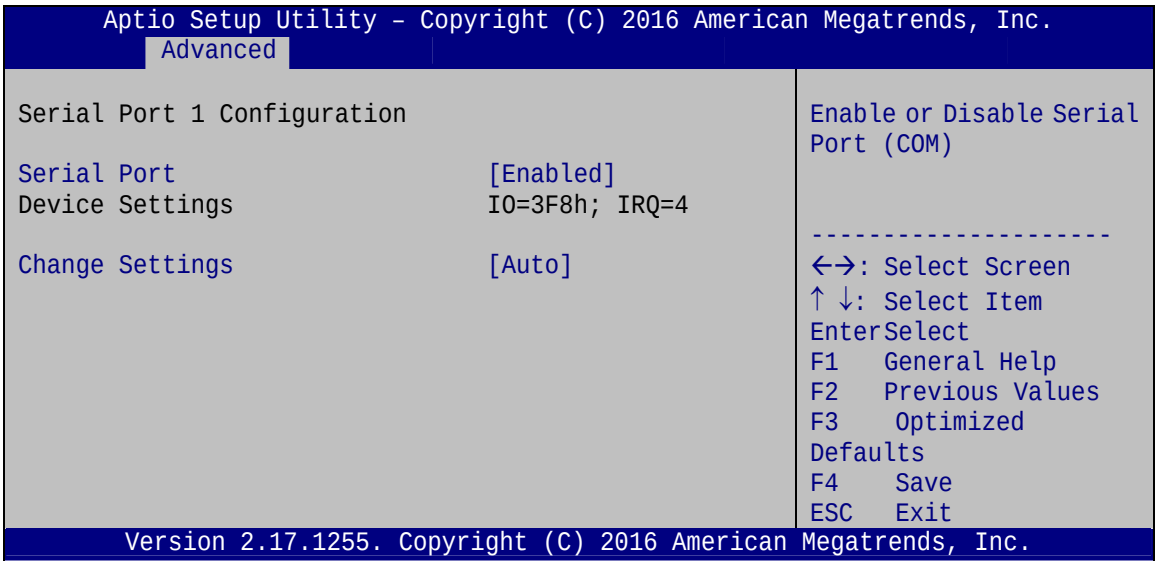
Use the **iWDD Super IO Configuration** menu (**BIOS Menu 7**) to set or change the configurations for the serial ports.



BIOS Menu 7: iWDD Super IO Configuration

5.3.4.1 Serial Port n Configuration

Use the **Serial Port n Configuration** menu (**BIOS Menu 8**) to configure the serial port n.



BIOS Menu 8: Serial Port n Configuration

5.3.4.1.1 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=4**		Serial Port I/O port address is 3F8h and the interrupt address is IRQ4

➔ **IO=3F8h; IRQ=3, 4,5,6,7,9,10,11,12**	Serial Port I/O port address is 3F8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12
➔ **IO=2F8h; IRQ=3, 4,5,6,7,9,10,11,12**	Serial Port I/O port address is 2F8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12
➔ **IO=3E8h; IRQ=3, 4,5,6,7,9,10,11,12**	Serial Port I/O port address is 3E8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12
➔ **IO=2E8h; IRQ=3, 4,5,6,7,9,10,11,12**	Serial Port I/O port address is 2E8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12

5.3.4.1.2 Serial Port 2 Configuration

➔ **Serial Port [Enabled]**

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

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

➔ **Change Settings [Auto]**

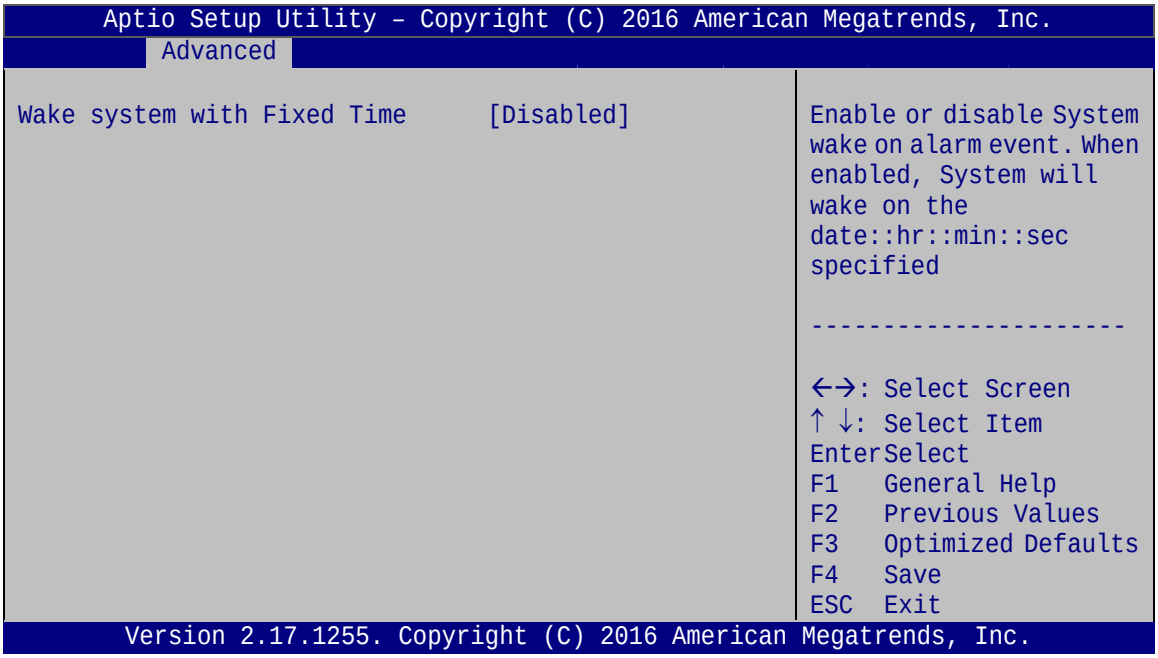
Use the **Change Settings** option to change the serial port IO port address and interrupt address.

➔ **Auto**	**DEFAULT**	The serial port IO port address and interrupt address are automatically detected.
➔ **IO=2F8h; IRQ=3**		Serial Port I/O port address is 2F8h and the interrupt address is IRQ3
➔ **IO=3F8h; IRQ=3, 4,5,6,7,9,10,11,12**		Serial Port I/O port address is 3F8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12
➔ **IO=2F8h; IRQ=3, 4,5,6,7,9,10,11,12**		Serial Port I/O port address is 2F8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12
➔ **IO=3E8h; IRQ=3, 4,5,6,7,9,10,11,12**		Serial Port I/O port address is 3E8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12

➔ **IO=2E8h; IRQ=3, 4,5,6,7,9,10,11,12** — Serial Port I/O port address is 2E8h and the interrupt address is IRQ3,4,5,6,7,9,10,11,12

5.3.5 RTC Wake Settings

The **RTC Wake Settings** menu (**BIOS Menu 9**) configures RTC wake event.



BIOS Menu 9: 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

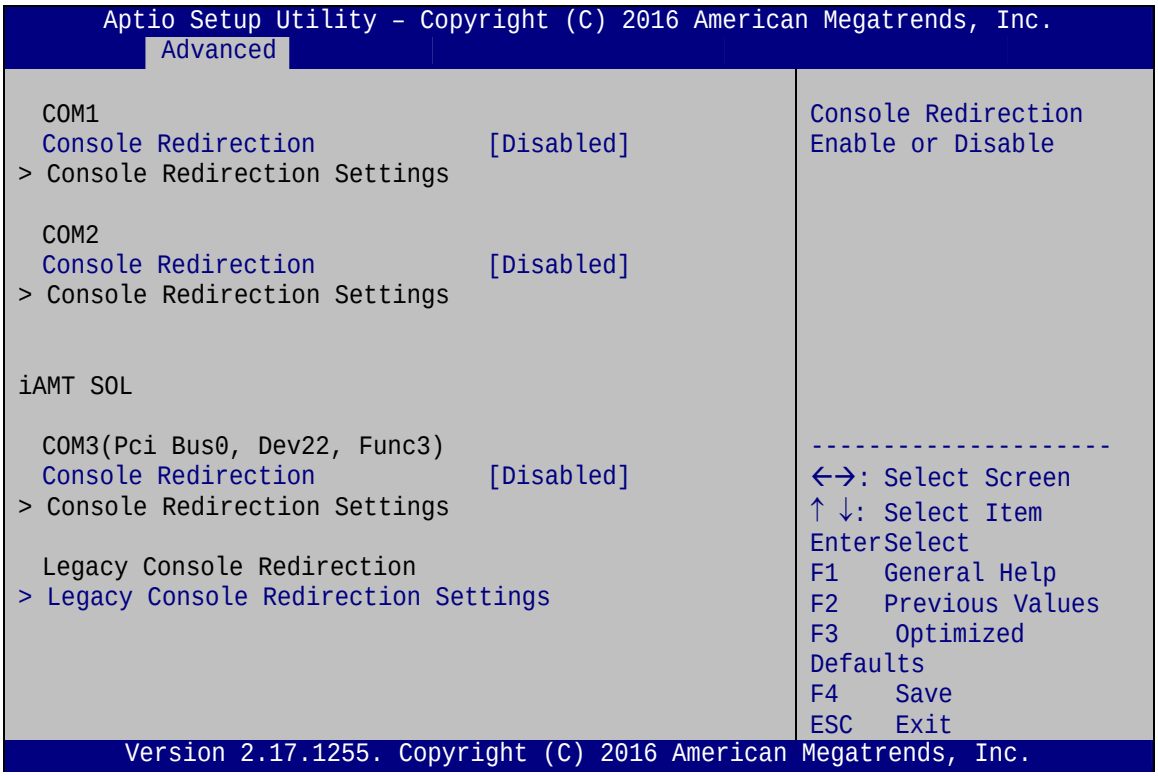
Wake up minute

Wake up second

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

5.3.6 Serial Port Console Redirection

The **Serial Port Console Redirection** menu (**BIOS Menu 10**) 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 10: Serial Port Console Redirection

➔ **Console Redirection [Disabled]**

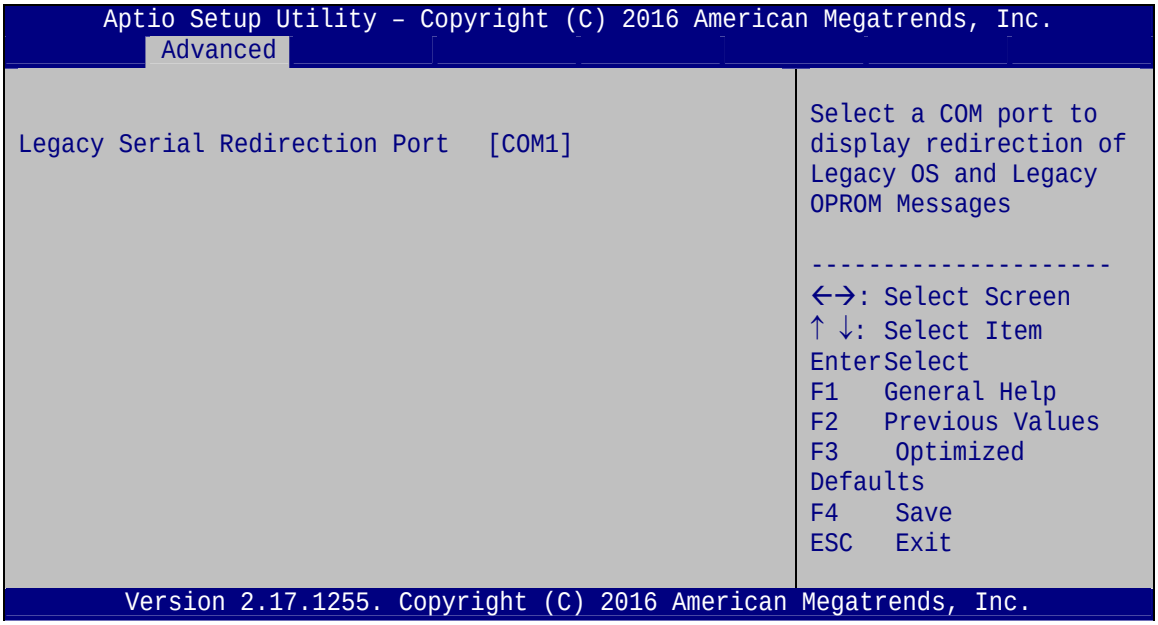
Use **Console Redirection** option to enable or disable the console redirection function.

➔ **Disabled** **DEFAULT** Disabled the console redirection function

➔ **Enabled** Enabled the console redirection function

5.3.6.1 Legacy Console Redirection Settings

The **Legacy Console Redirection Settings** menu (**BIOS Menu 11**) allows the legacy console redirection options to be configured.



BIOS Menu 11: Legacy Console Redirection Settings

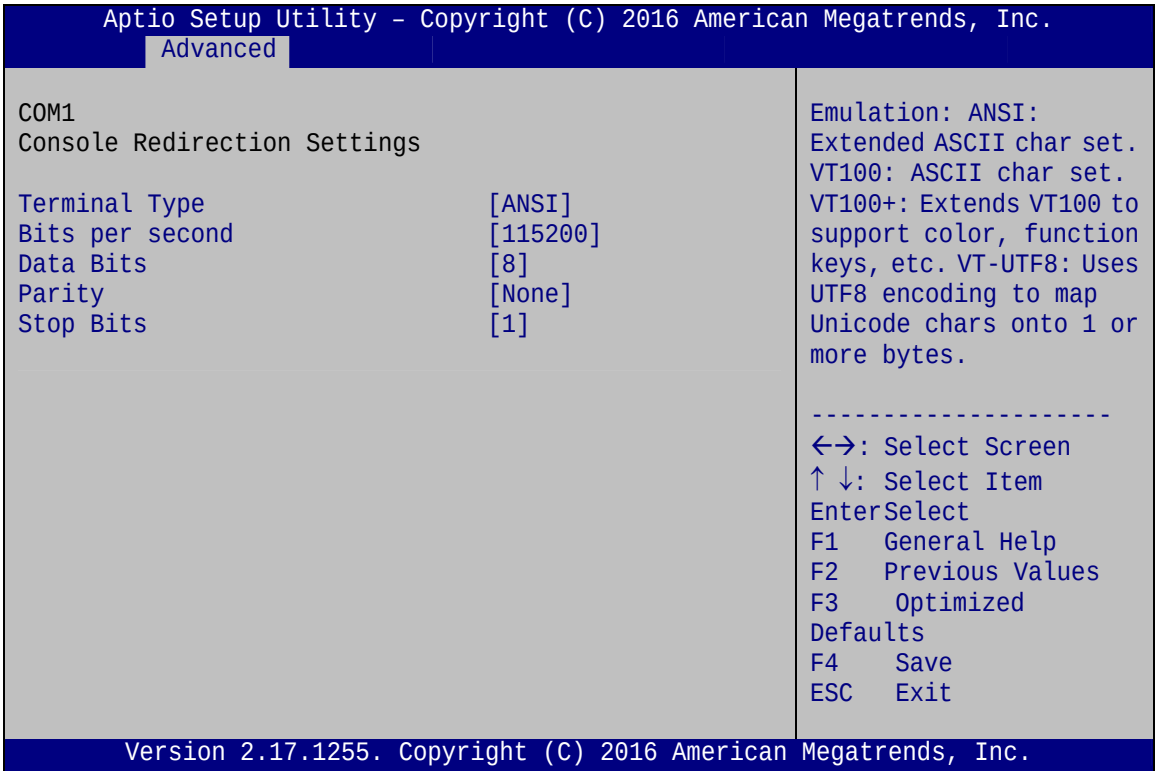
➔ **Legacy Serial Redirection Port [COM1]**

Use the **Legacy Serial Redirection Port** option to specify a COM port to display redirection of legacy OS and legacy OPROM messages. The options include:

- COM1 **DEFAULT**
- COM2
- COM3 (Pci Bus0, Dev22, Func3)

5.3.6.2 Console Redirection Settings

The **Console Redirection Settings** menu (**BIOS Menu 12**) allows the console redirection options to be configured. The option is active when Console Redirection option is enabled.



BIOS Menu 12: Console Redirection Settings

➔ **Terminal Type [ANSI]**

Use the **Terminal Type** option to specify the remote terminal type.

➔ **VT100**		The target terminal type is VT100
➔ **VT100+**		The target terminal type is VT100+
➔ **VT-UTF8**		The target terminal type is VT-UTF8
➔ **ANSI**	**DEFAULT**	The target terminal type is ANSI

➔ **Bits per second [115200]**

Use the **Bits per second** option to specify the serial port transmission speed. The speed must match the other side. Long or noisy lines may require lower speeds.

➔ **9600**		Sets the serial port transmission speed at 9600.
➔ **19200**		Sets the serial port transmission speed at 19200.
➔ **57600**		Sets the serial port transmission speed at 57600.
➔ **115200**	**DEFAULT**	Sets the serial port transmission speed at 115200.

➔ **Data Bits [8]**

Use the **Data Bits** option to specify the number of data bits.

➔ **7**		Sets the data bits at 7.
➔ **8**	**DEFAULT**	Sets the data bits at 8.

➔ **Parity [None]**

Use the **Parity** option to specify the parity bit that can be sent with the data bits for detecting the transmission errors.

➔ **None**	**DEFAULT**	No parity bit is sent with the data bits.
➔ **Even**		The parity bit is 0 if the number of ones in the data bits is even.
➔ **Odd**		The parity bit is 0 if the number of ones in the data bits is odd.
➔ **Mark**		The parity bit is always 1. This option does not provide error detection.
➔ **Space**		The parity bit is always 0. This option does not provide error detection.

➔ **Stop Bits [1]**

Use the **Stop Bits** option to specify the number of stop bits used to indicate the end of a serial data packet. Communication with slow devices may require more than 1 stop bit.

➔	**1**	**DEFAULT**	Sets the number of stop bits at 1.
➔	**2**		Sets the number of stop bits at 2.

5.3.7 CPU Configuration

Use the **CPU Configuration** menu (**BIOS Menu 13**) to view detailed CPU specifications and configure the CPU.

```
      Aptio Setup Utility – Copyright (C) 2016 American Megatrends, Inc.
         Advanced
 CPU Configuration                                  | Enabled for Windows XP
                                                    | and Linux (OS optimized
 Intel(R) Core(TM) i7-6600U CPU @ 2.60GHz           | for Hyper-Threading
 CPU Signature                    406E3             | Technology) and Disabled
 Microcode Patch                  7C                | for other OS (OS not
 Max CPU Speed                    2600 MHz          | optimized for
 Min CPU Speed                    400 MHz           | Hyper-Threading
 CPU Speed                        2500 MHz          | Technology). When
 Processor Cores                  2                 | Disabled only one thread
 Hyper Threading Technology       Supported         | per enabled core is
 Intel VT-x Technology            Supported         | enabled.
 Intel SMX Technology             Supported         |
 64-bit                           Supported         |
 EIST Technology                  Supported         |----------------------
                                                    |
 L1 Data Cache                    32 KB x 2         | ←→: Select Screen
 L1 Code Cache                    32 KB x 2         | ↑ ↓: Select Item
 L2 Cache                         256 KB x 2        | Enter Select
 L3 Cache                         4 MB              | F1   General Help
                                                    | F2   Previous Values
 Hyper-threading                  [Enabled]         | F3    Optimized
 Active Processor Cores           [All]             | Defaults
 Intel Virtualization Technology  [Disabled]        | F4    Save
 Intel(R) SpeedStep(tm)           [Enabled]         | ESC   Exit
 CPU C states                     [Disabled]        |
      Version 2.17.1255. Copyright (C) 2016 American Megatrends, Inc.
```

BIOS Menu 13: CPU Configuration

➔ **Hyper Threading Function [Enabled]**

Use the Hyper Threading function to enable or disable the CPU hyper threading function.

➔	**Disabled**		Disables the use of hyper threading technology
➔	**Enabled**	**DEFAULT**	Enables the use of hyper threading technology

➔ **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.

➔ **Intel® Virtualization Technology [Disabled]**

Use the **Intel® Virtualization Technology** option to enable or disable virtualization on the system. When combined with third party software, Intel® Virtualization technology allows several OSs to run on the same system at the same time.

➔	**Disabled**	**DEFAULT**	Disables Intel® Virtualization Technology.
➔	**Enabled**		Enables Intel® Virtualization Technology.

➔ **Intel® SpeedStep™ [Enabled]**

Use the **Intel® SpeedStep™** option to enable or disable the Intel® SpeedStep Technology.

➔	**Disabled**		Disables the Intel® SpeedStep Technology.
➔	**Enabled**	**DEFAULT**	Enables the Intel® SpeedStep Technology.

➔ **CPU C State [Disabled]**

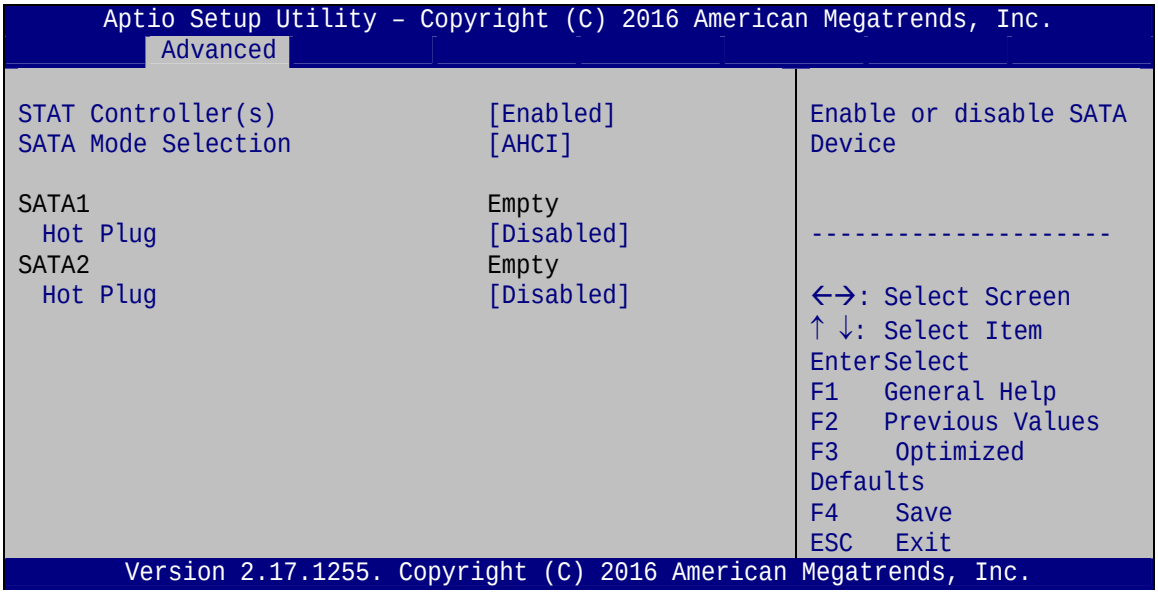
Use the **CPU C State** option to enable or disable CPU C state.

➔ **Disabled** **DEFAULT** Disables CPU C state.

➔ **Enabled** Enables CPU C state.

5.3.8 SATA Configuration

Use the **SATA Configuration** menu (**BIOS Menu 14**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 14: SATA Configuration

➔ **STAT Controller(s) [Enabled]**

Use the **STAT Controller(s)** option to enable or disable the SATA device.

➔ **Enabled** **DEFAULT** Enables the SATA device.

➔ **Disabled** Disables the SATA device.

➔ **SATA Mode Selection [AHCI]**

Use the **SATA Mode Selection** option to configure SATA devices as AHCI devices.

➔ **AHCI**	**DEFAULT**	Configures SATA devices as AHCI device.
➔ **RAID**		Configures SATA devices as RAID device.

NOTE:

Before accessing the RAID configuration utility, ensure to set the **Option ROM Messages** BIOS option in the **Boot** menu to **Force BIOS**. This is to allow the "Press <CTRL+I> to enter Configuration Utility……" message to appear during POST. Press Ctrl+I when prompted to enter the RAID configuration utility.

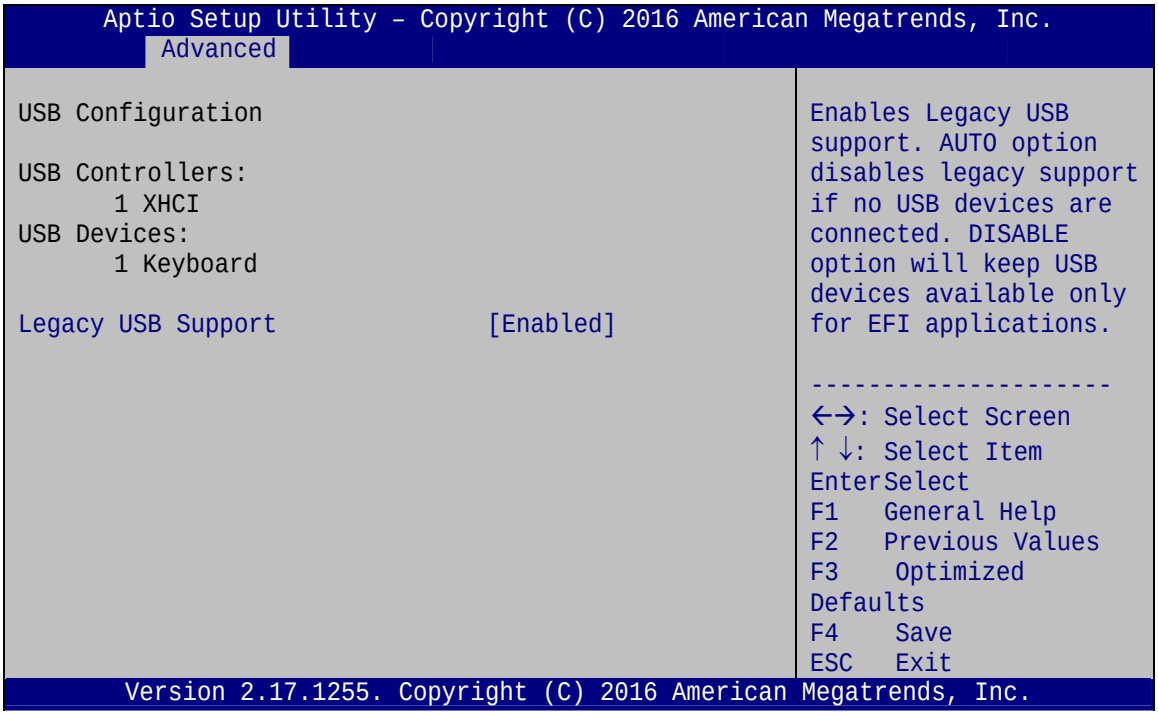
➔ **Hot Plug [Disabled]**

Use the **Hot Plug** option to enable or disable the SATA device hot plug.

➔ **Disabled**	**DEFAULT**	Disables the SATA device hot plug.
➔ **Enabled**		Enables the SATA device hot plug

5.3.9 USB Configuration

Use the **USB Configuration** menu (**BIOS Menu 15**) to read USB configuration information and configure the USB settings.



BIOS Menu 15: USB Configuration

➔ **USB Devices**

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

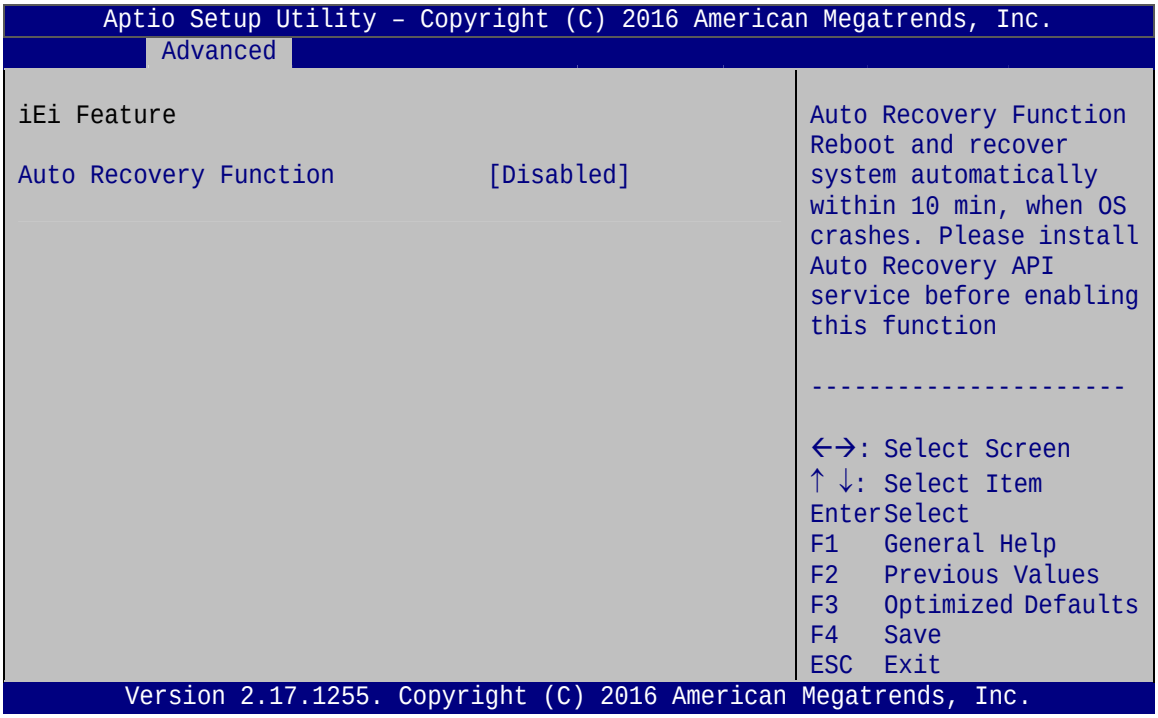
➔ **Legacy USB Support [Enabled]**

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

5.3.10 IEI Feature

Use the **IEI Feature** menu (**BIOS Menu 16**) to configure One Key Recovery function.



BIOS Menu 16: IEI Feature

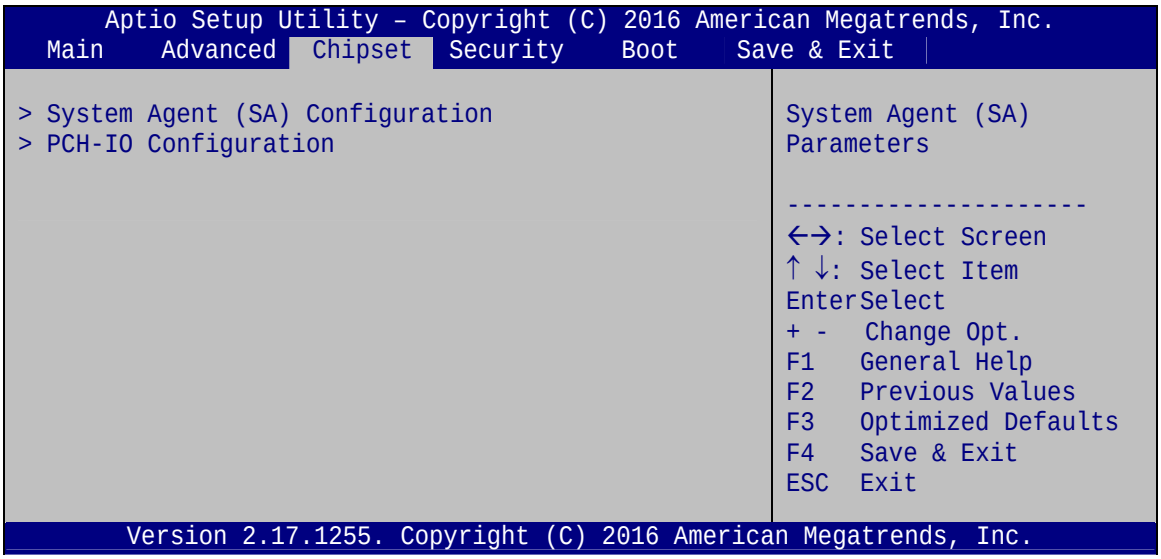
➔ **Auto Recovery Function [Disabled]**

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

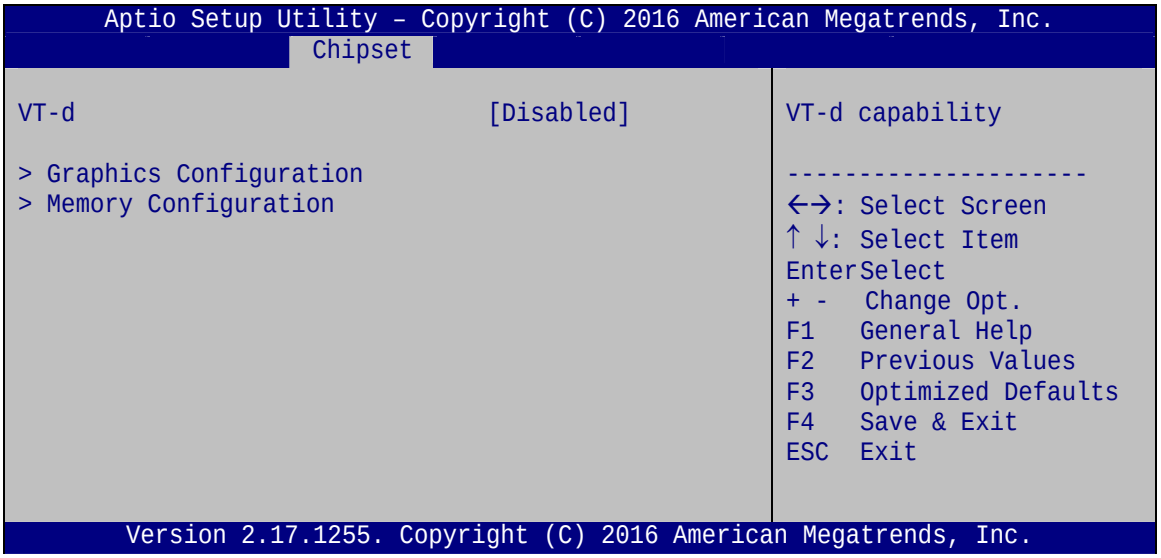
Use the **Chipset** menu (**BIOS Menu 17**) to configure the system chipset.



BIOS Menu 17: Chipset

5.4.1 System Agent (SA) Configuration

Use the **System Agent (SA) Configuration** menu (**BIOS Menu 18**) to configure the System Agent (SA) parameters.



BIOS Menu 18: System Agent (SA) Configuration

➔ **VT-d [Disabled]**

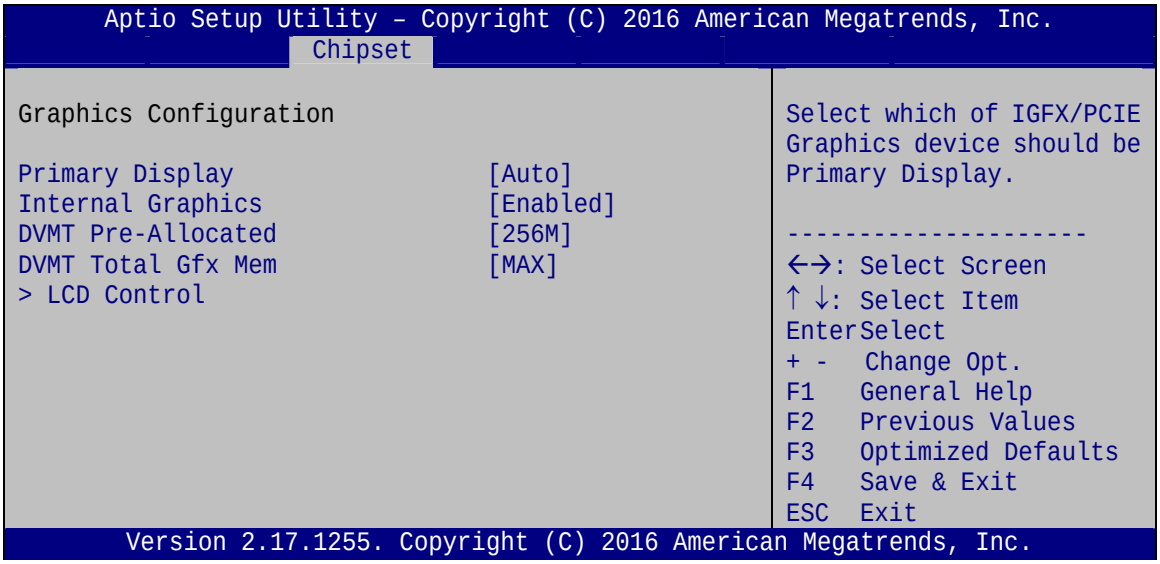
Use the **VT-d** option to enable or disable VT-d support.

➔ **Disabled** **DEFAULT** Disable VT-d support.

➔ **Enabled** Enable VT-d support.

5.4.1.1 Graphics Configuration

Use the **Graphics Configuration** menu (**BIOS Menu 19**) to configure the graphics settings.



BIOS Menu 19: Graphics Configuration

➔ **Primary Display [Auto]**

Use the **Primary Display** option to select the graphics controller used as the primary boot device. Configuration options are listed below:

- Auto **DEFAULT**
- IGFX
- PCIE

➔ **Internal Graphics [Enabled]**

Use the **Internal Graphics** option to enable or disable the internal graphics device.

➔ **Auto**		The internal graphics device is automatically detected and enabled.
➔ **Disabled**		Disable the internal graphics device.
➔ **Enabled**	**DEFAULT**	Enable the internal graphics device. The following options/submenu appear with values that can be selected: DVMT Pre-Allocated DVMT Total Gfx Mem LCD Control

➔ **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
- 128M
- 256M **DEFAULT**
- 512M

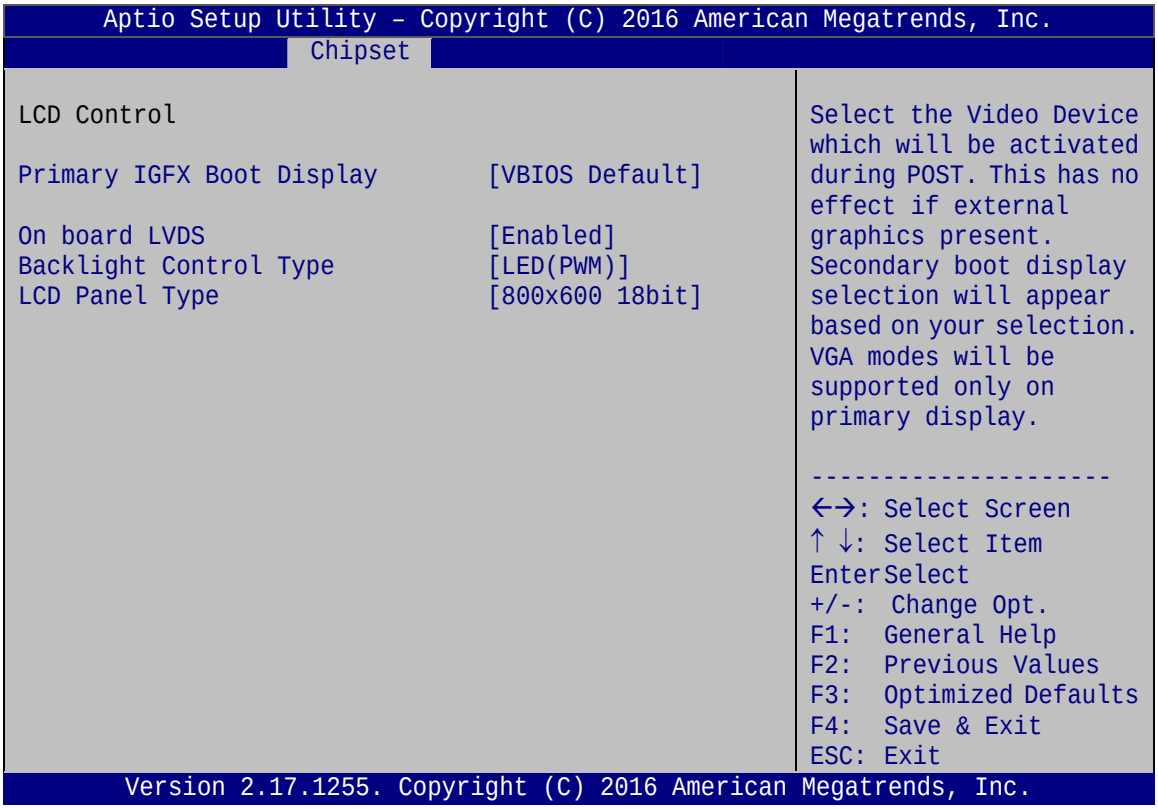
➔ **DVMT Total Gfx Mem [MAX]**

Use the **DVMT Total Gfx Mem** option to select DVMT 5.0 total graphic memory size used by the internal graphics device. The following options are available:

- 128M
- 256M
- MAX **DEFAULT**

5.4.1.1.1 LCD Control

Use the **LCD Control** submenu (**BIOS Menu 20**) to select a display device which will be activated during POST.



BIOS Menu 20: LCD Control

➔ **Primary IGFX Boot Display [VBIOS Default]**

Use the **Primary IGFX Boot Display** option to select the display device used by the system when it boots.

- VBIOS Default **DEFAULT**
- DP1
- LVDS
- DP2/VGA1

➔ **On board LVDS [Enabled]**

Use the **On board LVDS** option enables or disables the on-board LVDS connector.

➔	**Disabled**		The on-board LVDS connector is disabled.
➔	**Enabled**	**DEFAULT**	The on-board LVDS connector is disabled.

➔ **Backlight Control Type [LED (PWM)]**

Use the **Backlight Control Type** option to specify the backlight control type. Configuration options are listed below.

- LED (PWM) **DEFAULT**
- CCFL (DC)

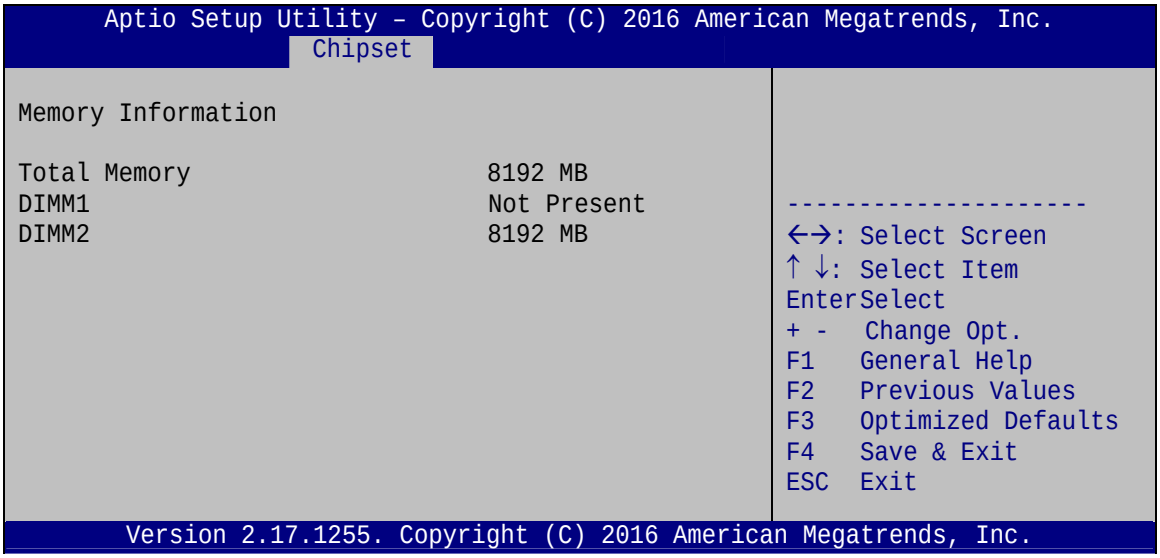
➔ **LCD Panel Type [800x600 18bit]**

Use the **LCD Panel Type** option to select the type of flat panel connected to the system. Configuration options are listed below.

▪ 800x600	18bit	**DEFAULT**
▪ 1024x768	18bit	
▪ 1024x768	24bit	
▪ 1280x768	18bit	
▪ 1280x800	18bit	
▪ 1280x960	18bit	
▪ 1280x1024	48bit	
▪ 1366x768	18bit	
▪ 1366x768	24bit	
▪ 1440x900	48bit	
▪ 1440x1050	48bit	
▪ 1600x900	48bit	
▪ 1680x1050	48bit	
▪ 1600x1200	48bit	
▪ 1920x1080	48bit	
▪ 1920x1200	48bit	

5.4.1.2 Memory Configuration

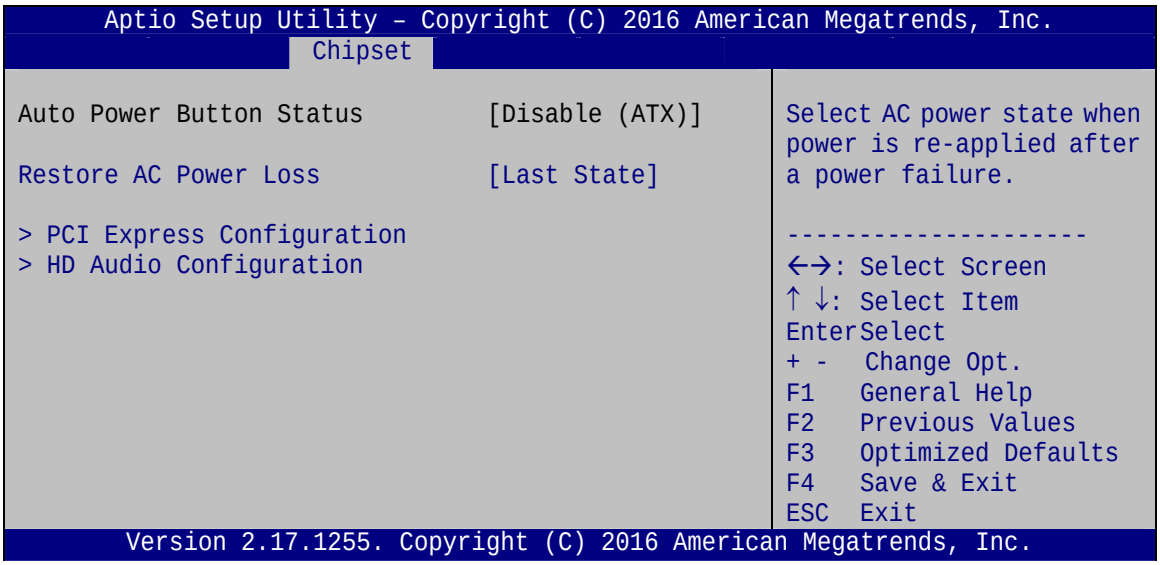
Use the **Memory Configuration** submenu (**BIOS Menu 21**) to display the memory information.



BIOS Menu 21: Memory Configuration

5.4.2 PCH-IO Configuration

Use the **PCH-IO Configuration** menu (**BIOS Menu 22**) to configure the PCH-IO chipset.



BIOS Menu 22: PCH-IO Configuration

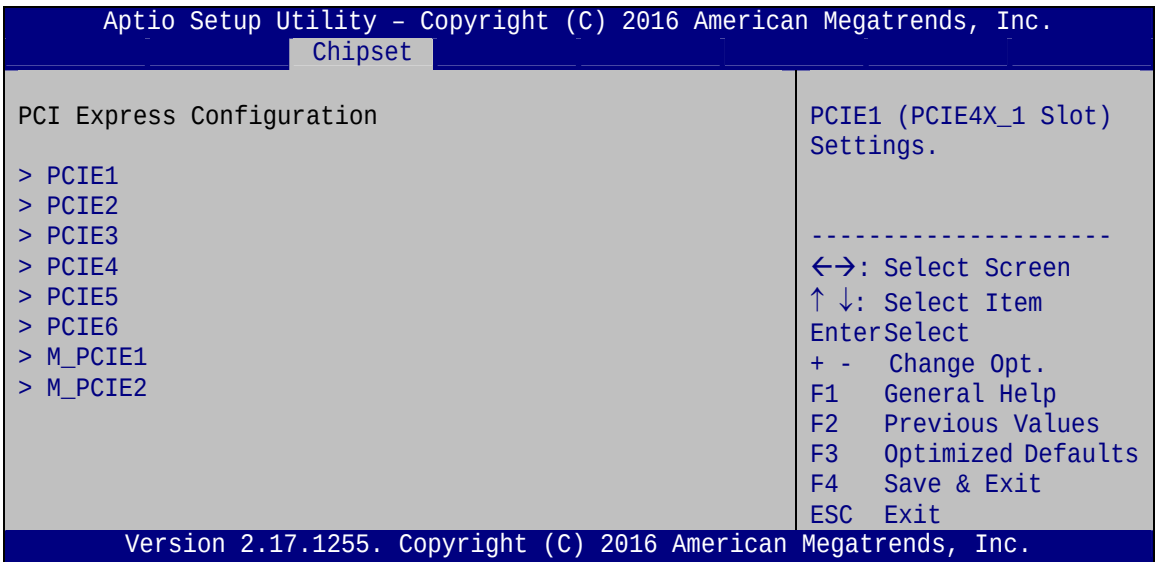
➔ **Restore AC Power Loss [Last State]**

Use the **Restore AC Power** 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.

5.4.2.1 PCI Express Configuration

Use the **PCI Express Configuration** submenu (**BIOS Menu 23**) to configure the PCI Express slots.



BIOS Menu 23: PCI Express Configuration

The PCIe slot submenus all contain the following options:

➔ **PCIe Speed [Auto]**

Use the **PCIe Speed** option to configure the PCIe interface speed.

- Auto **DEFAULT**
- Gen 1

- Gen 2
- Gen 3

➔ **Detect Non-Compliance Device [Disabled]**

Use the **Detect Non-Compliance Device** option to enable or disable detecting if a non-compliance PCI Express device is connected to the PCI Express slot.

➔ **Disabled**	**DEFAULT**	Disables to detect if a non-compliance PCI Express device is connected to the PCI Express slot.
➔ **Enabled**		Enables to detect if a non-compliance PCI Express device is connected to the PCI Express slot.

5.4.2.2 HD Audio Configuration

Use the **HD Audio Configuration** submenu (**BIOS Menu 24**) to configure the High Definition Audio codec.

```
Aptio Setup Utility – Copyright (C) 2016 American Megatrends, Inc.
                    Chipset

HD Audio Configuration                          Control Detection of the
                                                Azalia device.
HD Audio                        [Enabled]       Disable = HDA will be
                                                unconditionally
                                                disabled
                                                Enabled = HDA will be
                                                unconditionally
                                                enabled.

                                                ---------------------
                                                ←→: Select Screen
                                                ↑ ↓: Select Item
                                                EnterSelect
                                                + -   Change Opt.
                                                F1    General Help
                                                F2    Previous Values
                                                F3    Optimized Defaults
                                                F4    Save & Exit
                                                ESC   Exit
Version 2.17.1255. Copyright (C) 2016 American Megatrends, Inc.
```

BIOS Menu 24: HD Audio Configuration

➔ **HD Audio [Enabled]**

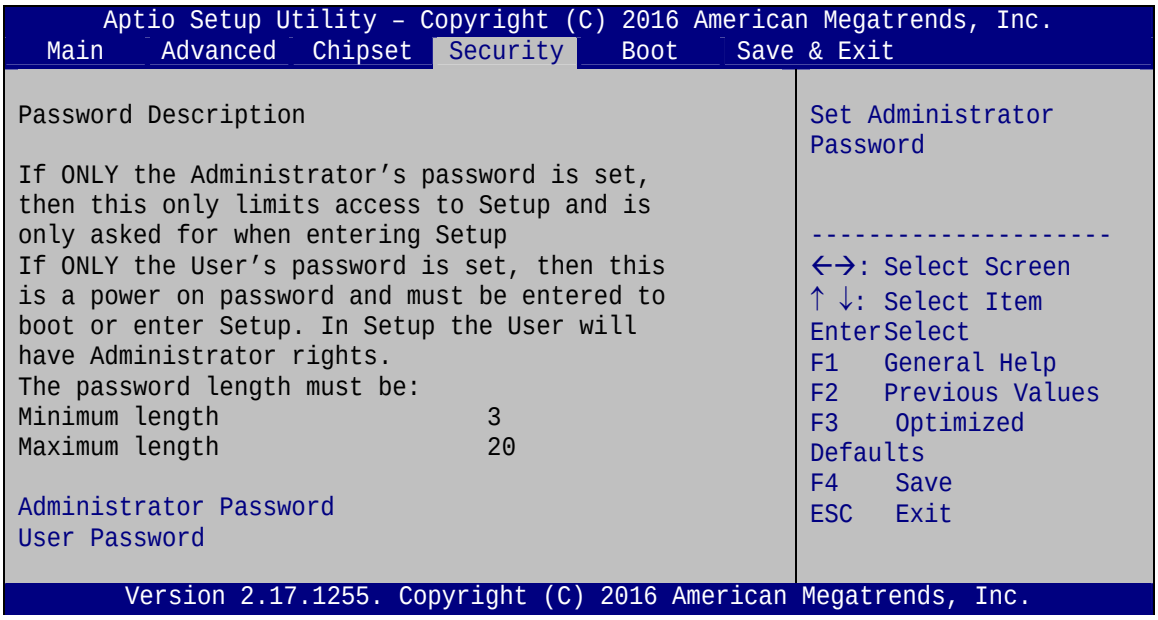
Use the **HD Audio** BIOS option to enable or disable the High Definition Audio controller.

➔ **Disabled** The High Definition Audio controller is disabled.

➔ **Enabled** **DEFAULT** The High Definition Audio controller is enabled.

5.5 Security

Use the **Security** menu (**BIOS Menu 25**) to set system and user passwords.



BIOS Menu 25: Security

➔ **Administrator Password**

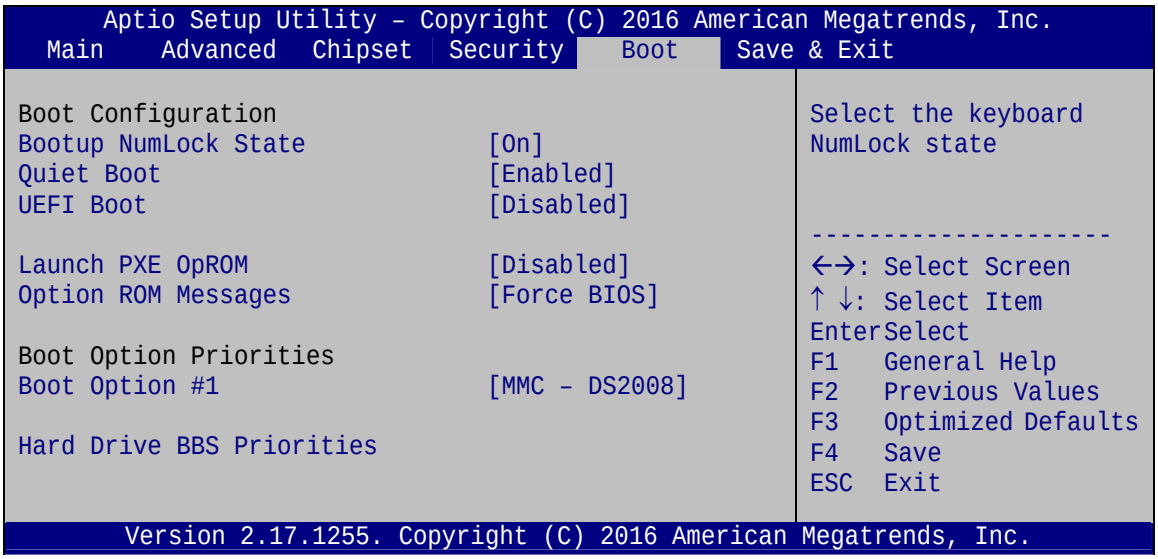
Use the **Administrator Password** to set or change a administrator password.

➔ **User Password**

Use the **User Password** to set or change a user password.

5.6 Boot

Use the **Boot** menu (**BIOS Menu 26**) to configure system boot options.



BIOS Menu 26: 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.

➔ **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

➔ **UEFI Boot [Disabled]**

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

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

➔ **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.

➔ **Option ROM Messages [Force BIOS]**

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

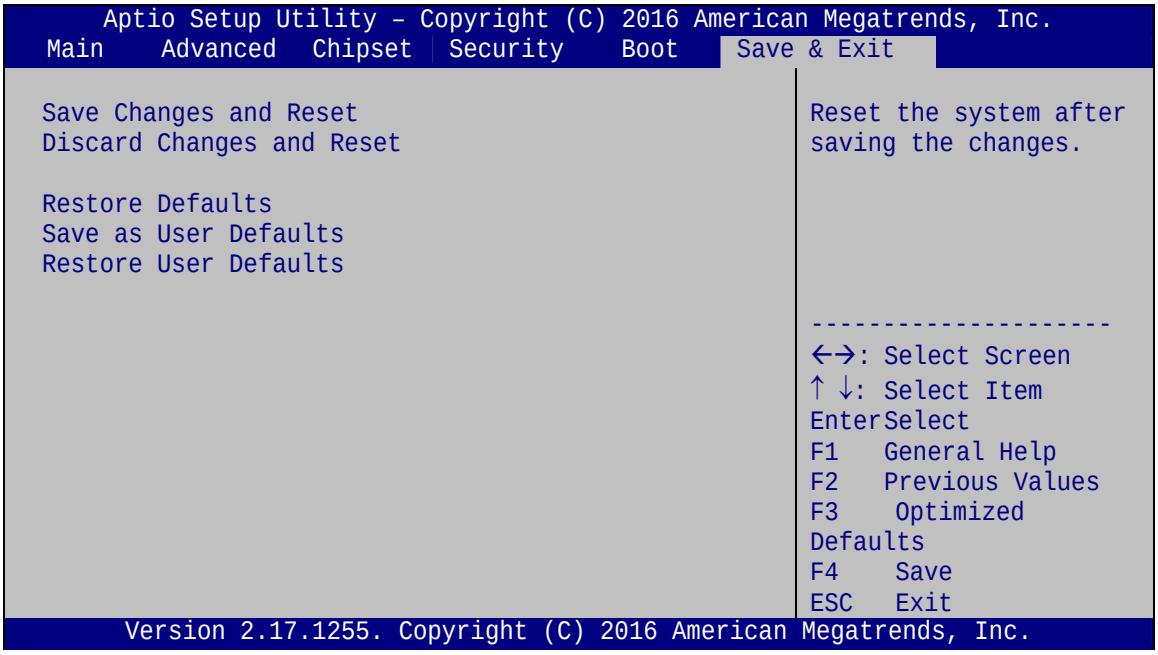
➔ **Force BIOS**	**DEFAULT**	Sets display mode to force BIOS.
➔ **Keep Current**		Sets display mode to current.

➔ **Boot Option Priority**

Use the **Boot Option Priority** function to set the system boot sequence from the available devices. The drive sequence also depends on the boot sequence in the individual device section.

5.7 Exit

Use the **Exit** menu (**BIOS Menu 27**) to load default BIOS values, optimal failsafe values and to save configuration changes.



BIOS Menu 27: Exit

➔ **Save Changes and Reset**

Use the **Save Changes and Reset** option to save the changes made to the BIOS options and to exit the BIOS configuration setup program.

➔ **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.

Chapter

6

Software Drivers

NOTE:

The content of the CD may vary throughout the life cycle of the product and is subject to change without prior notice. Visit the IEI website or contact technical support for the latest updates.

6.1 Software Installation

All the drivers for the ICE-ULT3 are on the CD that came with the system. To install the drivers, please follow the steps below.

Step 1: Insert the CD that came with the system into a CD drive connected to the system.

NOTE:

If the installation program doesn't start automatically:
Click "Start->Computer->CD Drive->autorun.exe"

Step 2: The driver main menu appears (**Figure 6-1**).

Figure 6-1: Start Up Screen

Step 3: Click ICE-ULT3.

Step 4: The list of drivers in **Figure 6-2** appears.

Step 5: Install all of the necessary drivers in the menu.

Figure 6-2: Drivers

6.2 Available Software Drivers

All the drivers for the ICE-ULT3 are on the utility CD that came with the system. The utility CD contains drivers for Windows 7, Windows 8 and Windows 10 operating systems. If the drivers are not installed automatically, please install the following drivers manually.

The following drivers can be installed on the **ICE-ULT3**:

- Chipset
- VGA
- LAN
- Audio
- USB 3.0 (Windows 7 OS only)
- Kernel-Mode Driver Framework (Windows 7 OS only)
- ME (Intel® AMT)
- RST (Intel® Rapid Storage Technology)
- Intel® Serial IO (Windows 8.1/10 64-bit OS only)

NOTE:

The Intel TXE requires that Microsoft's "Kernel-Mode Driver Framework (KMDF) version 1.11 update for Windows 7" must be installed first on Windows 7 OS. If the KMDF is not installed, either error 37 or error 28 may appear on the Intel TXE device in Device Manager.

Please find the KMDF version 1.11 update for Windows 7 in the TXE driver folder in the driver CD or click the following link to download it.

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

6.3 Installing Windows 7 from USB 3.0 Drives

Microsoft Windows 7 installation media does not include native driver support for USB 3.0, so during installation, a keyboard/mouse connected to a USB 3.0 port does not respond. The Windows 7 USB 3.0 Creator Utility automates the steps to update a Windows 7 installation image so that it contains USB 3.0 drivers. To install Windows 7 from a USB drive onto the ICE-ULT3, please follow the steps described below.

Step 1: Create a USB flash drive installer. Use your Windows 7 DVD or ISO image to create a bootable USB flash drive. Instructions on how to do are found on Microsoft's website.

Step 2: Download and unzip the Windows 7 USB 3.0 Creator utility to a temporary folder on the Admin system.

Step 3: Connect the USB device containing the Windows 7 image to the Admin system.

Step 4: Right-click the file "Installer_Creator.exe" and select Run as administrator.

Step 5: Browse to the root of the USB drive.

Step 6: Click "Create Image" to begin the creation process.

Step 7: Wait for the process to finish. It can take up to 15 minutes.

Step 8: Using the updated installer, proceed with the Windows 7 installation as you normally would.

Appendix

A

Regulatory Compliance

DECLARATION OF CONFORMITY

This equipment has been tested and found to comply with specifications for CE marking. If the user modifies and/or installs other devices in the equipment, the CE conformity declaration may no longer apply.

FCC WARNING

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Appendix

B

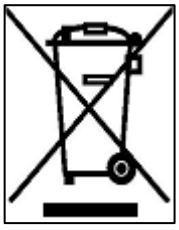
Product Disposal

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.

- Outside the European Union – If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority so as to comply with the correct disposal method.
- Within the European Union – The device that produces less waste and is easier to recycle is classified as electronic device in terms of the European Directive 2012/19/EU (WEEE), and must not be disposed of as domestic garbage.



EU-wide legislation, as implemented in each Member State, requires that waste electrical and electronic products carrying the mark (left) must be disposed of separately from normal household waste. This includes monitors and electrical accessories, such as signal cables or power cords. When you need to dispose of your device, please follow the guidance of your local authority, or ask the shop where you purchased the product. The mark on electrical and electronic products only applies to the current European Union Member States.

Please follow the national guidelines for electrical and electronic product disposal.

Appendix

C

BIOS Options

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

System Date [xx/xx/xx] **35**
System Time [xx:xx:xx] **35**
ACPI Sleep State [S3 (Suspend to RAM)] **36**
Intel AMT [Enabled] **37**
Un-configure ME [Disabled] **37**
PC Health Status **38**
CPU_FAN1 Smart Fan Control [Auto Mode] **39**
Auto mode fan start temperature [50] **40**
Auto mode fan off temperature [40] **40**
Auto mode fan start PWM [30] **40**
Auto mode fan slope PWM [1] **41**
Serial Port [Enabled] **42**
Change Settings [Auto] **42**
Serial Port [Enabled] **43**
Change Settings [Auto] **43**
Wake system with Fixed Time [Disabled] **44**
Console Redirection [Disabled] **46**
Legacy Serial Redirection Port [COM1] **46**
Terminal Type [ANSI] **47**
Bits per second [115200] **48**
Data Bits [8] **48**
Parity [None] **48**
Stop Bits [1] **49**
Hyper Threading Function [Enabled] **50**
Active Processor Cores [All] **50**
Intel® Virtualization Technology [Disabled] **50**
Intel® SpeedStep™ [Enabled] **50**
CPU C State [Disabled] **51**
STAT Controller(s) [Enabled] **51**
SATA Mode Selection [AHCI] **52**
Hot Plug [Disabled] **52**
USB Devices **53**
Legacy USB Support [Enabled] **53**

Auto Recovery Function [Disabled] 54
VT-d [Disabled] 56
Primary Display [Auto] 56
Internal Graphics [Enabled] 57
DVMT Pre-Allocated [256M] 57
DVMT Total Gfx Mem [MAX] 57
Primary IGFX Boot Display [VBIOS Default] 58
On board LVDS [Enabled] 59
Backlight Control Type [LED (PWM)] 59
LCD Panel Type [800x600 18bit] 59
Restore AC Power Loss [Last State] 61
PCIe Speed [Auto] 61
Detect Non-Compliance Device [Disabled] 62
HD Audio [Enabled] 63
Administrator Password 63
User Password 63
Bootup NumLock State [On] 64
Quiet Boot [Enabled] 65
UEFI Boot [Disabled] 65
Launch PXE OpROM [Disabled] 65
Option ROM Messages [Force BIOS] 65
Boot Option Priority 65
Save Changes and Reset 66
Discard Changes and Reset 66
Restore Defaults 66
Save as User Defaults 67
Restore User Defaults 67

Appendix

D

Digital I/O Interface

The DIO connector on the ICE-ULT3 is interfaced to GPIO ports on the Super I/O chipset. The DIO has both 8-bit digital inputs and 8-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:

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

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 output value

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

E

Watchdog Timer

NOTE:

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

The Watchdog Timer is provided to ensure that standalone systems can always recover from catastrophic conditions that cause the CPU to crash. This condition may have occurred by external EMIs or a software bug. When the CPU stops working correctly, Watchdog Timer either performs a hardware reset (cold boot) or a Non-Maskable Interrupt (NMI) to bring the system back to a known state.

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

INT 15H:

AH – 6FH Sub-function:	
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 E-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.

NOTE:

When exiting a program it is necessary to disable the Watchdog Timer, otherwise the system resets.

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

F

Hazardous Materials Disclosure

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 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
壳体	O	O	O	O	O	O
显示	O	O	O	O	O	O
印刷电路板	O	O	O	O	O	O
金属螺帽	O	O	O	O	O	O
电缆组装	O	O	O	O	O	O
风扇组装	O	O	O	O	O	O
电力供应组装	O	O	O	O	O	O
电池	O	O	O	O	O	O

O: 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。