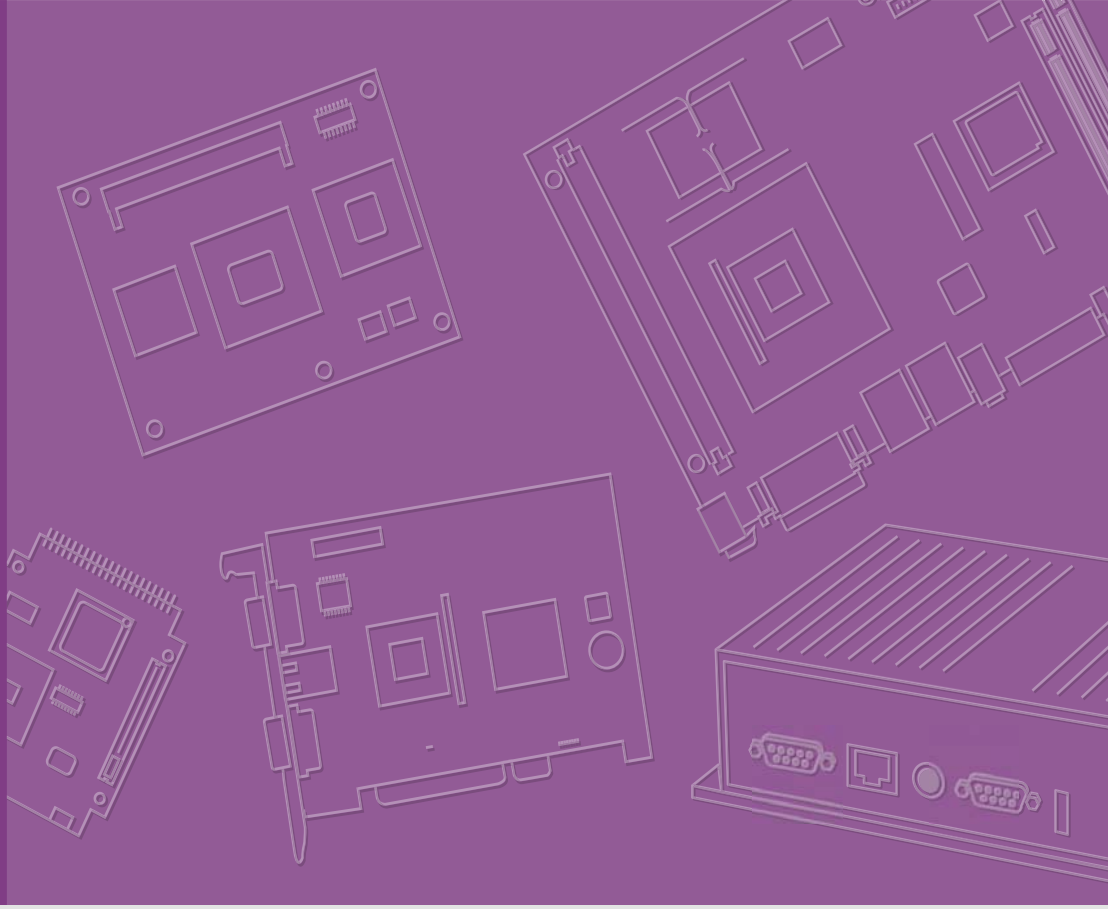

User Manual

MIO-5251

Intel® Celeron® J1900 & Atom™ E3825, 3.5" MI/O-Compact SBC, DDR3L, VGA, HDMI/DP, 48-bit LVDS/eDP, 2GbE, Mini PCIe, mSATA/SD card, iManager, MIOe

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This manual is for the MIO-5251.

Part No. 2006525110 Edition 1

Printed in China September 2014

Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

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. Opera- thin 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.

Caution! *There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manflatterer. Discard used batteries according to the manufacturer's instructions.*

Technical Support and Assistance

1. Visit the Advantech website at http://support.advantech.com where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Packing List

Before you begin installing your card, please make sure that the following materials have been shipped:

- 1 x MIO-5251 SBC
- 1 x SATA Cable 30cm (p/n: 1700006291)
- 1 x SATA Power Cable 35cm (p/n: 1700018785)
- 1 x Audio Cable 20cm (p/n: 1700019584)
- 2 x COM Cable 22cm (p/n: 1701200220)
- 1 x Heatsink (19mm) (p/n: 1960062791T001)
- 1 x Startup manual (p/n: 2006525100)
- 1 x Mini Jumper(10pcs package) (p/n: 9689000002)
- 1 x Screw Kit (4pcs screws for miniPCIe) (p/n: 9666525100E)
- 1 x SUSIAccess Pro package (p/n: 968EMLSAP1)

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

Optional MIOe Module

Part Number	Description
MIOe-210-D6A1E	4 x RS232/422/485, 2x RS422/485, 8-bit GPIO
MIOe-220-B3A1E	3 x Intel® Gigabit Ethernet with PCIe Switch
MIOe-230-L0A1E	DisplayPort or 48-bit LVDS, 2 x USB2.0
MIOe-DB5000-01A1E	MI/O extension evaluation board
MIOe-3674-AE	4-port PoE ports
MIOe-3680-AE	2-Port CAN-Bus with Isolation Protection
MIOe-PWR1-00E	12-24V wide range power module (by cable, not via MIOe)
MIOe-PWR2	9-36V wide range power module (by cable, not via MIOe)

Optional Accessories

Part number	Description
1960065073N001	Heat spreader 16.7mm height
1757003995	AC-to-DC Adapter 12V/5A, 0-40°C
1703100264	Internal 1-Port USB cable 22.5cm

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Chapter 1

General Information

This chapter gives background information on the MIO-5251.

Sections include:

- Introduction
- Specifications
- Block diagram
- Board layout and dimensions

1.1 Introduction

MIO-5251 is designed using MI/O Extension form factor (compact series, 146 x 102 mm) and powered by the latest generation of Intel® Celeron® J1900 and Atom™ E3825 processors which have low power features but also good performance computing, especially for multimedia capabilities compared to earlier generations. Meanwhile, MIO-5251 offers flexible expansion possibilities: two full-size mini PCIe, 2nd LVDS through MIOe-230, SD card, SIM holder, MIOe with PCIex1, SMBus, 3xUSB2.0, LPC, line out, DisplayPort, and power interface.

MIO-5251 supports various display interfaces including HDMI/DisplayPort, VGA, 48-bit LVDS/eDP, and rich I/O: 2 x GbE, SATA, mSATA/SD card, 4xSerial Ports, USB 3.0 and 4 x USB 2.0.

1.2 Specifications

1.2.1 Functional Specifications

- **Processor:**
  - Celeron® J1900 2.0GHz (burst frequency 2.42GHz), Quad Cores, Four Threads
  - Atom™ E3825 1.33GHz, Dual Cores, Two Threads
  - Cache Hierarchy
    * 32 KB 8-way L1 instruction cache and 24 KB 6-way L1 data cache per core
    * 1 MB, 16-way L2 cache, shared per two cores
  - Supported C-states: C0, C1, C6, C7
  - Advanced Technologies
    * Intel® Virtualization Technology (VT-x)
    * Intel® 64 Architecture
    * Enhanced Intel SpeedStep Technology
    * Intel® Trusted Execution Engine (TXE)
  - Power Management
    * ACPI 5.0
    * System sleep states: S0, S3, S4, S5
- **System Memory Support**
  - Non-ECC, DDR3L SODIMM up to 8GB
  - 64 bit data bus
  - x8 and x16 DDR3L SDRAM device data widths
  - DDR3L with 1066 MT/s data rates for E3825, total memory bandwidth 8.5GB/s
  - DDR3L with 1333 MT/s data rates for J1900, total memory bandwidth can be scalable to 21.3GB/s
  - Aggressive power management to reduce power consumption
- **Graphic and Media Engine**
  - Intel® 7th generation (Gen 7) graphics and media encode/decode engine
  - GFX: Normal 688 MHz / Burst 854 MHz for J1900, Normal 533 MHz for E3825
  - Graphic Features:
    * 3D HW Acceleration: DirectX11, OpenGL3.2, OpenCL1.2
    * HW Video Decode: H.264, MPEG2, MVC, VC-1, WMV9, MJPEG and VP8
    * HW Video Encode: H.264, (MPEG2 and MVC only for J1900)
  - Multi-display interfaces: VGA, HDMI/DisplayPort (default HDMI), 48-bit LVDS/eDP (default LVDS). MIOe's DisplayPort interface is shared with DisplayPort on rear I/O.

  * Supports Extend/ Clone Mode with multi-display device
  * Dual display: any two combination between VGA, HDMI/DisplayPort/MIOe's DisplayPort, LVDS/eDP

– Specification and Resolution
  * VGA: 2560 x 1600 at 60Hz
  * HDMI/DisplayPort: HDMI 1.4a with audio, up to 1080P at 60Hz. DisplayPort is supported standard version 1.1a with audio, up to 2560x1600 at 60Hz
  * LVDS/eDP: 48-bit dual channel LVDS up to WUXGA 1920x1200 at 60Hz via CH7511, eDP is supported standard version 1.3 with audio up to 2560 x1600 at 60Hz
  * Inverter power: 1A @ 5V/12V

– 3D HW Acceleration: OGL4.0, DirectX 11.1
– HW Video Decode: H.264, MPEG2, VC-1, VP8
– HW Video Encode: H.264, MPEG2 (max at 1080p)

■ **Gigabit Ethernet**

– Controller: Intel® i210
  * 10/100/1000 BASE-T
  * IEEE 802.3az Energy Efficient Ethernet (EEE), which defines Low Power Idle (LPI) state
  * IEEE 1588/802.1AS precision time synchronization
  * 9.5 KB Jumbo frames supported (Full-duplex)
  * Flow Control supported
  * Magic packet wake-up enable with unique MAC address

■ **Peripheral interface**

– MIOe Expansion
  * DisplayPort (Supported by T-P/N due to shared with the DisplayPort on rear I/O)
  * 1 PCIe x1
  * 3 USB 2.0
  * LPC
  * HD Audio: Line out
  * SMBus
  * Power: +5 Vsb/+12 Vsb, Power On, Reset

– 1 Serial-ATA port, up to 3.0Gb/s transfer rate (300 MB/s), supports independent DMA operation
  * SATA Power: 5V / 12V

– 1 x USB 3.0 & 4 x USB2.0
  * One USB3.0 and three USB2.0 on rear I/O, one internal USB2.0
  * USB3.0 SuperSpeed (SS), implements xHCI software host controller interface
  * Multiplexed with EHCI controller that are High-Speed/Full-Speed (HS/FS)
  * USB source: USB3.0 and USB2.0's dual port on rear I/O's USB signal directly from CPU, USB2.0 dual port on rear I/O + internal USB + mini PCIe from USB hub1, mSATA + 3xUSB3.0 for MIOe from USB hub2
  * Support wake-up from sleeping state S3
  * Power supply: 0.5A @ 5V for USB2.0, 1A @ 5V for USB3.0

– 2 RS-232 for COM1/2, 2 RS-232/422/485 for COM3/4 (ESD protection: air gap ±15kV, contact ±8kV
– 8-bit Programmable General Purpose Input/ Output from iManager (5V tolerance)
– 1 SMBus / I^2C channel from iManager
– Watchdog timer: Output System Reset, Programmable counter from 1 ~ 255 minutes/ seconds
– Mini PCIe / mSATA
  * 1 Full-size Mini PCIe with SIM holder (with PCIe and USB interface)
  * 1 Full-size mSATA (with SATA and USB interface)
  * Power supply: 1.1 A @ 3.3 V, 0.375 A @ 1.5 V

- SD slot: supported by T-P/N, shared the location with mSATA

- **High Definition Audio:**
  - Intel® High Definition Audio Interface
  - High Definition Audio Codec with Realtek proprietary loss-less content protection technology
  - Supports 1 Line-input, 1 Line output, 1 Mic-input
- **BIOS**
  - AMI UEFI 64 Mbit, BIOS for 64 or 32bit is different, default version is for 64bit
  - Default setting is Legacy boot, that can be manually changed to UEFI boot. If default setting to UEFI is needed, that can be done by T-P/N

1.2.2 OS support

MIO-5251 supports Win8, Win7, WES8, WES7, WEC7, Linux kernel 3.x, VxWorks 6.9.3.3, Android Kit Kat 4.4

Win7 only supports Legacy mode and Win8 for UEFI mode.

For further information about OS support of MIO-5251, please Advantech website: http://support.advantech.com.tw/ or contact the technical support center.

1.2.3 Mechanical Specifications

- **Dimensions:** 146 x 102 mm (5.7 x 4 inches)
- **Height:** top side 19mm, PCB 1.6mm, bottom side 6.8mm, total 27.4mm
- **Weight:** 0.5 kg (reference weight of total package)

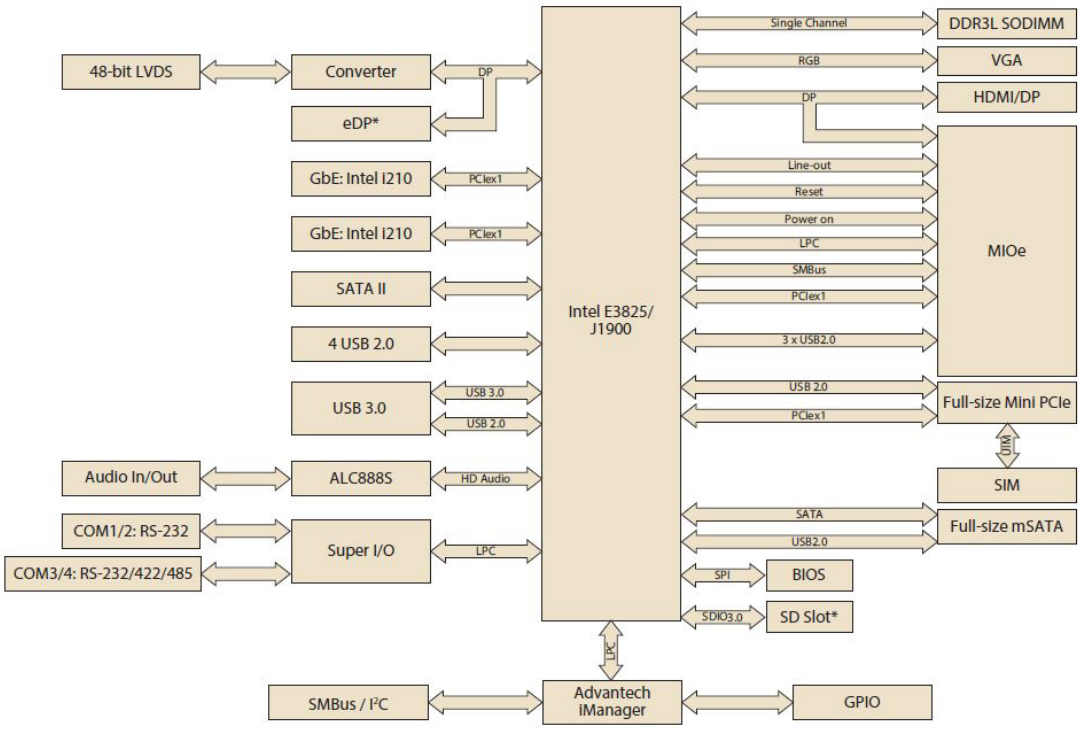
1.2.4 Electrical Specifications

- **Power Requirement:** Single +12V DC ± 10% power input
- **Power Consumption:**
  - Max load
    * MIO-5251J-U0A1E: 1.16A @ 12V (13.92W)
    * MIO-5251E-S3A1E: 0.81A @ 12V (9.72W)
  - Idle mode
    * MIO-5251J-U0A1E: 0.62A @ 12V (7.44W)
    * MIO-5251E-S3A1E: 0.42A @ 12V (5.04W)
- **Power Consumption Conditions:**
  - Test software: 3DMark 2006
  - Max. load: Measure the maximum current value which system under maximum load (CPU: Top speed, RAM &Graphic: Full loading)
  - Idle mode: Measure the current value when system in windows mode and without running any program
- **RTC Battery:**
  - Typical Voltage: 3.0 V
  - Normal discharge capacity: 210 mAh

1.2.5 Environmental

- **Operating temperature:** 0 ~ 60°C (32 ~ 140°F)
- **Operating Humidity:** 40°C @ 85% RH Non-Condensing
- **Storage Temperature:** Storage temperature: -40~85°C
- **Storage Humidity:** Relative humidity: 95% @ 60°C

1.3 Block Diagram



1.4 Board layout: dimensions

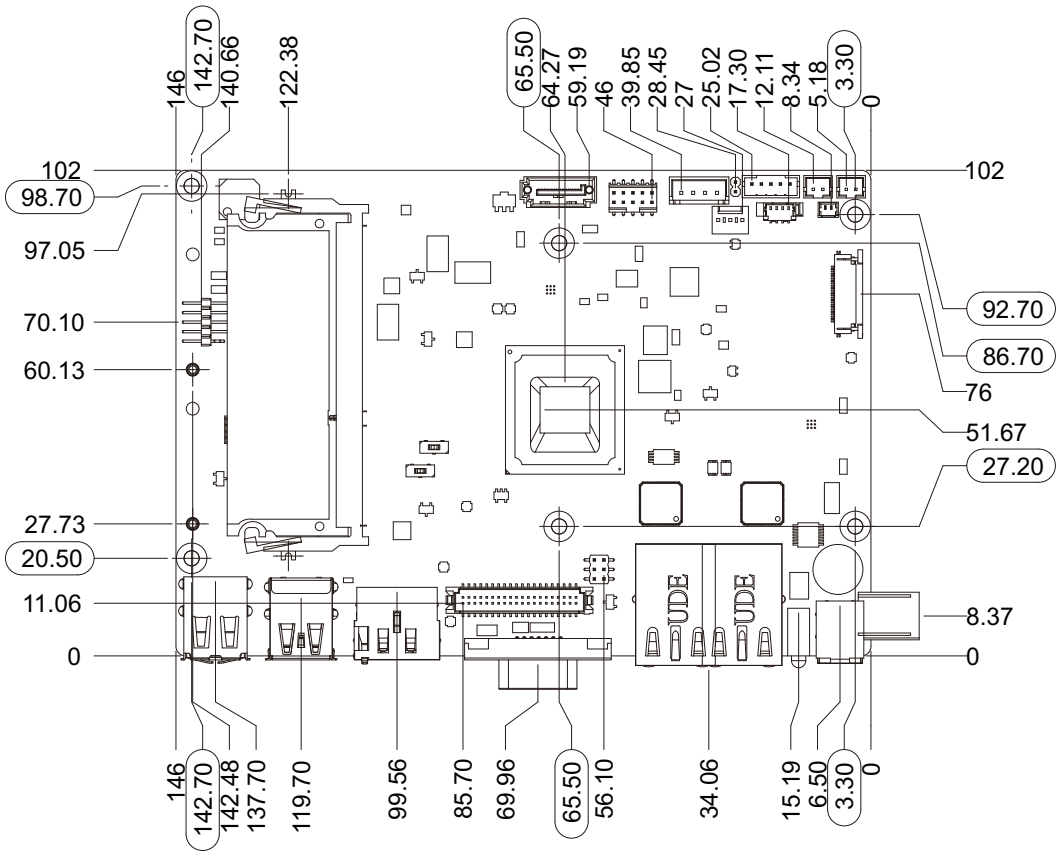


Figure 1.1 MIO-5251 Mechanical Drawing (Top Side)

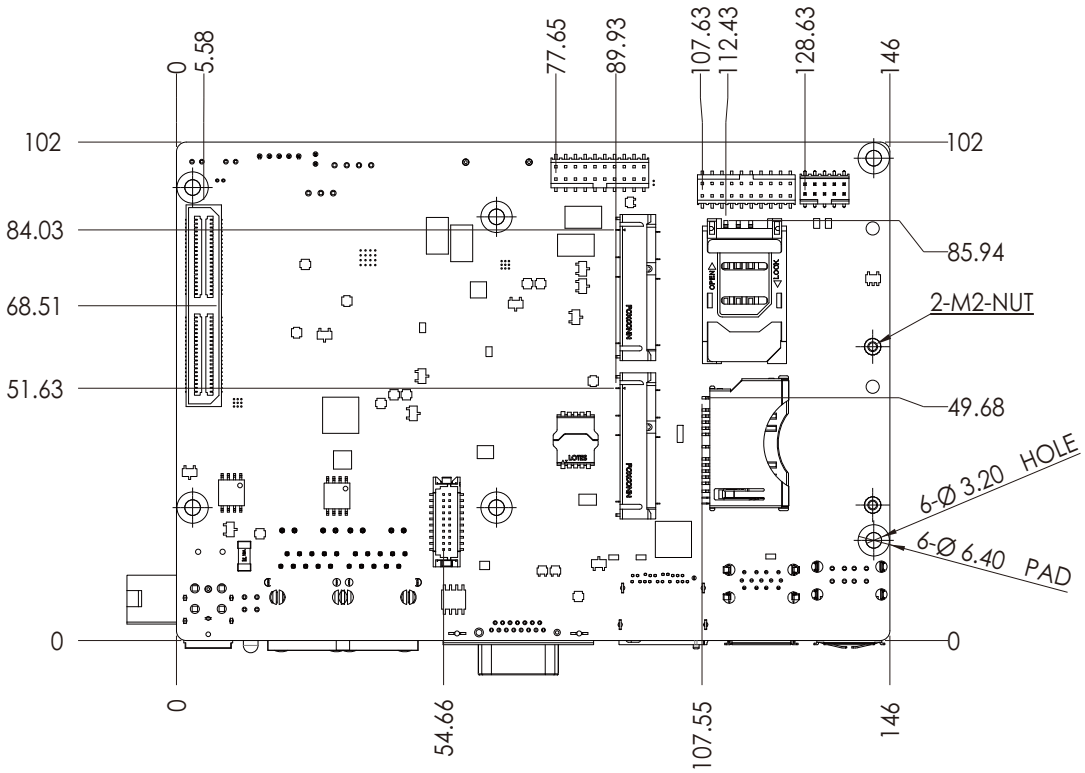


Figure 1.2 MIO-5251 Mechanical Drawing (Bottom Side)

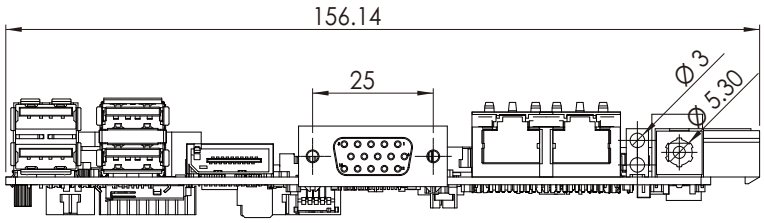


Figure 1.3 MIO-5251 Mechanical Drawing (Coastline)

Chapter 2

Installation

This chapter explains the setup procedures of the MIO-5251 hardware, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read all safety precautions before you begin the installation procedure.

2.1 Jumpers & Switches

The MIO-5251 has a number of jumpers that allow you to configure your system to suit your application. The table below lists the functions of the various jumpers.

Table 2.1: Jumpers & Switches	
J2	Auto Power On
J5	LCD Power
SW2	Clear CMOS

2.2 Connectors

Onboard connectors link the MIO-5251 to external devices such as hard disk drives, a keyboard, or floppy drives. The table below lists the function of each of the connectors.

Table 2.2: Connectors	
Label	**Function**
CN1	12V Power Input
CN4	SD Card
CN6	SODIMM
CN7	Power Switch
CN9	Reset
CN10	GPIO
CN11	VGA
CN12	HDMI (Optional DP)
CN13	SATA Power
CN14	SATA
CN15	Mini PCIe
CN16	mSATA
CN17	SIM Holder
CN18	External USB2.0
CN19	External USB3.0+USB2.0
CN20	COM1/2: RS-232
CN21	COM3/4: RS-232/422/485
CN24	GbE
CN27	Audio
CN29	MIOe
CN30	Inverter Power
CN31	LVDS
CN32	eDP
CN33	SMBus/I^2C
CN34	Internal USB2.0
FAN1	System Fan

2.3 Locating Connectors

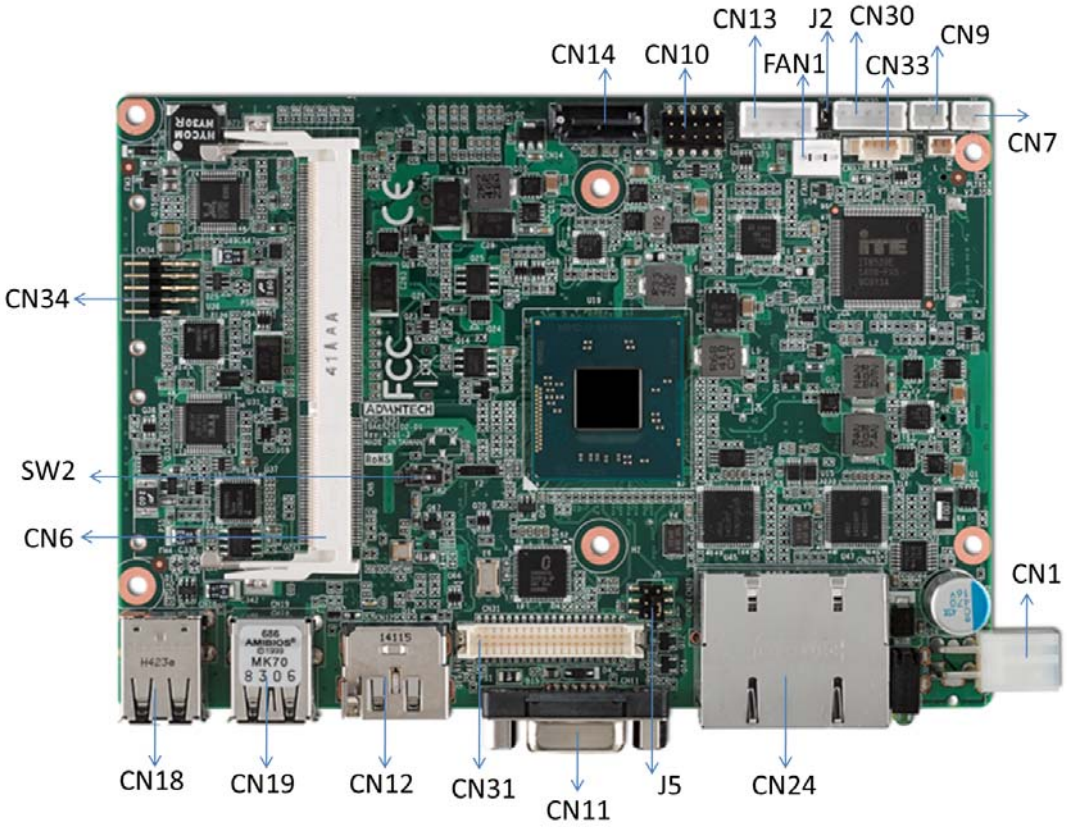


Figure 2.1 MIO-5251 Connector Locations (Top Side)

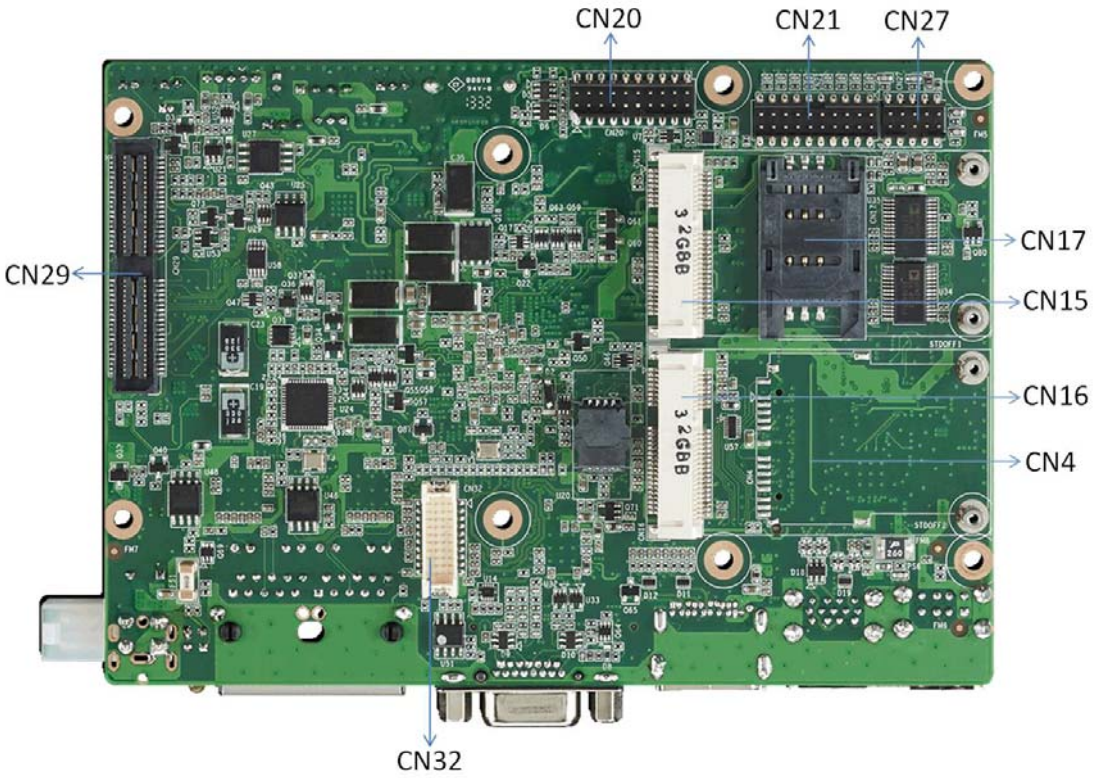
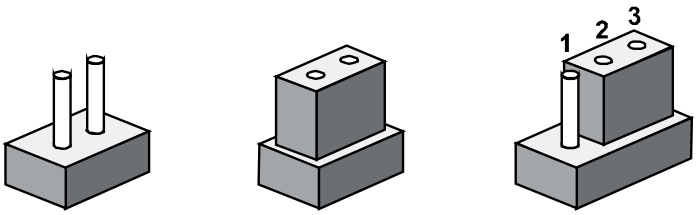


Figure 2.2 MIO-5251 Connector Locations (Bottom Side)

2.4 Setting Jumpers

You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To “close” a jumper, you connect the pins with the clip. To “open” a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2, or 2 and 3.

The jumper settings are schematically depicted in this manual as follows:



open **closed** **closed 2-3**

A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes. Generally, you simply need a standard cable to make most connections.

2.4.1 Auto Power On Setting (J2)

Table 2.3: Auto Power On Setting (J2)

Setting	Function
(Open)	Power Button for Power On
(Close)*	Auto Power On

* Default

2.4.2 LCD Power (J5)

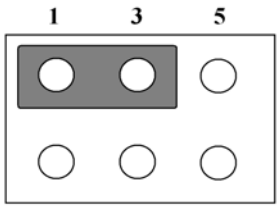


Table 2.4: LCD Power (J5)

Setting	Function
(1-3)*	+3.3V
(3-5)	+5V
(3-4)	+12V

2.4.3 Clear CMOS (SW2)

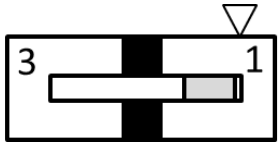


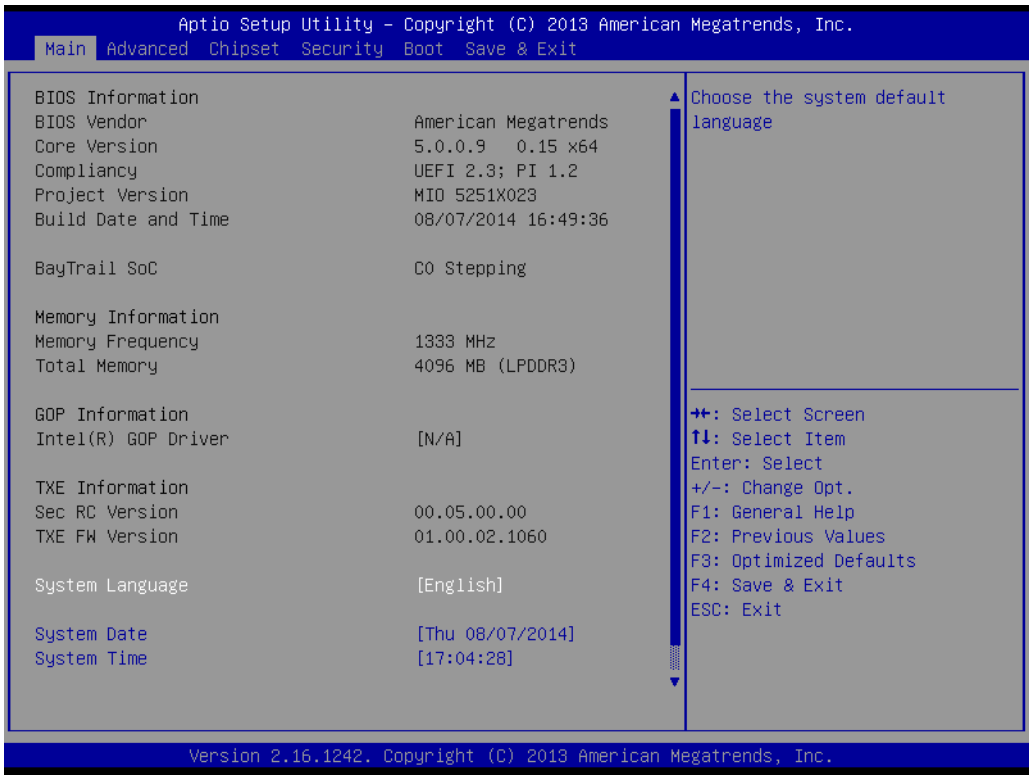
Table 2.5: Clear CMOS (SW2)

Setting	Function
(1)*	Normal
(3)	Clear CMOS

Chapter 3

AMI BIOS Setup

AMIBIOS has been integrated into a plethora of motherboards for decades. With the AMIBIOS Setup program, you can modify BIOS settings and control the various system features. This chapter describes the basic navigation of the MIO-5251 BIOS setup screens.



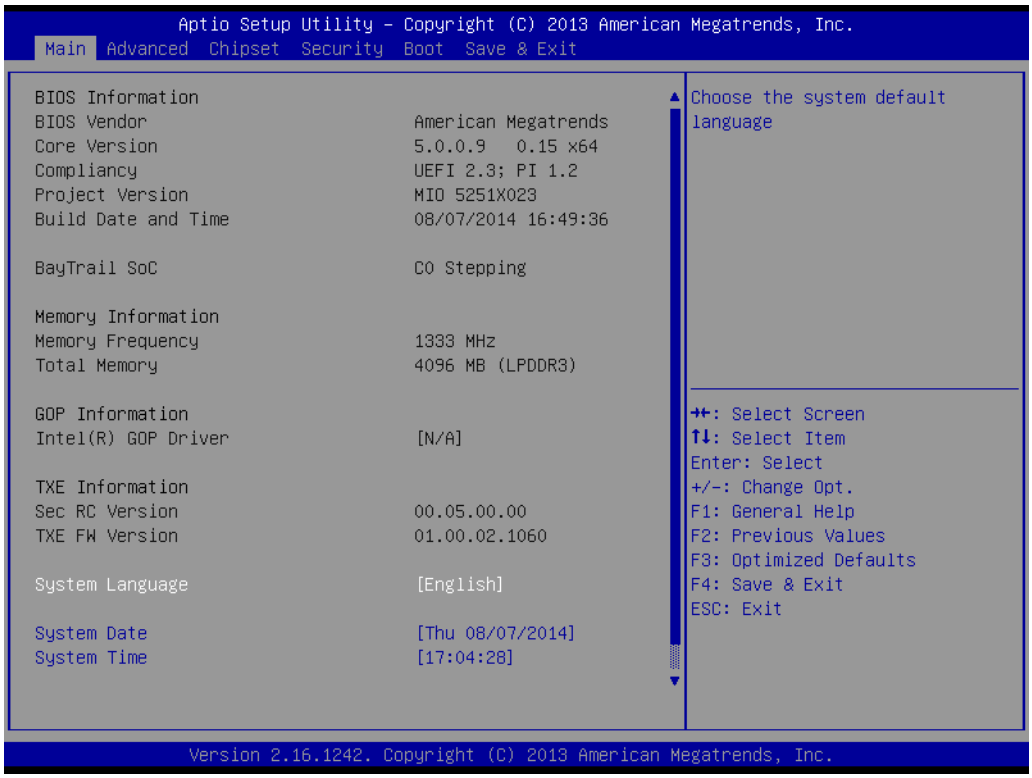
AMI BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This information is stored in battery-backed CMOS so it retains the Setup information when the power is turned off.

3.1 Entering Setup

Turn on the computer and check for the patch code. If there is a number assigned to the patch code, it means that the BIOS supports your CPU. If there is no number assigned to the patch code, please contact an Advantech application engineer to obtain an up-to-date patch code file. This will ensure that your CPU's system status is valid. After ensuring that you have a number assigned to the patch code, press <DEL> and you will immediately be allowed to enter Setup.

3.1.1 Main Setup

When you first enter the BIOS Setup Utility, you will encounter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.



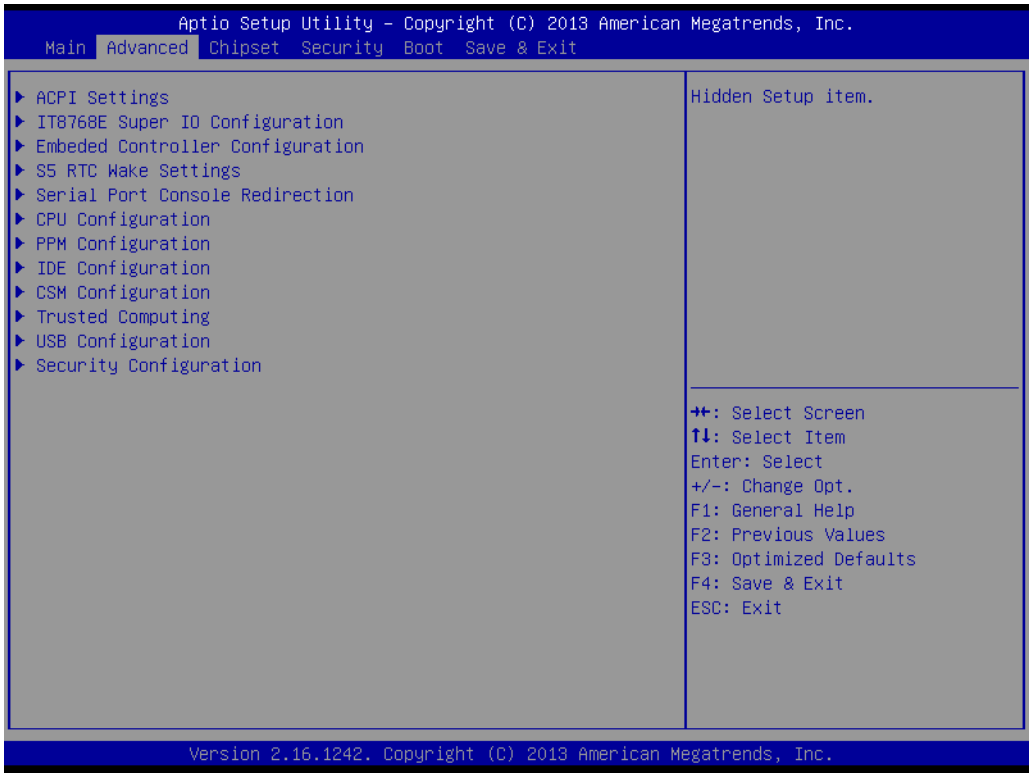
The Main BIOS setup screen has two main frames. The left frame displays all the options that can be configured. Grayed-out options cannot be configured; options in blue can. The right frame displays the key legend.

Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

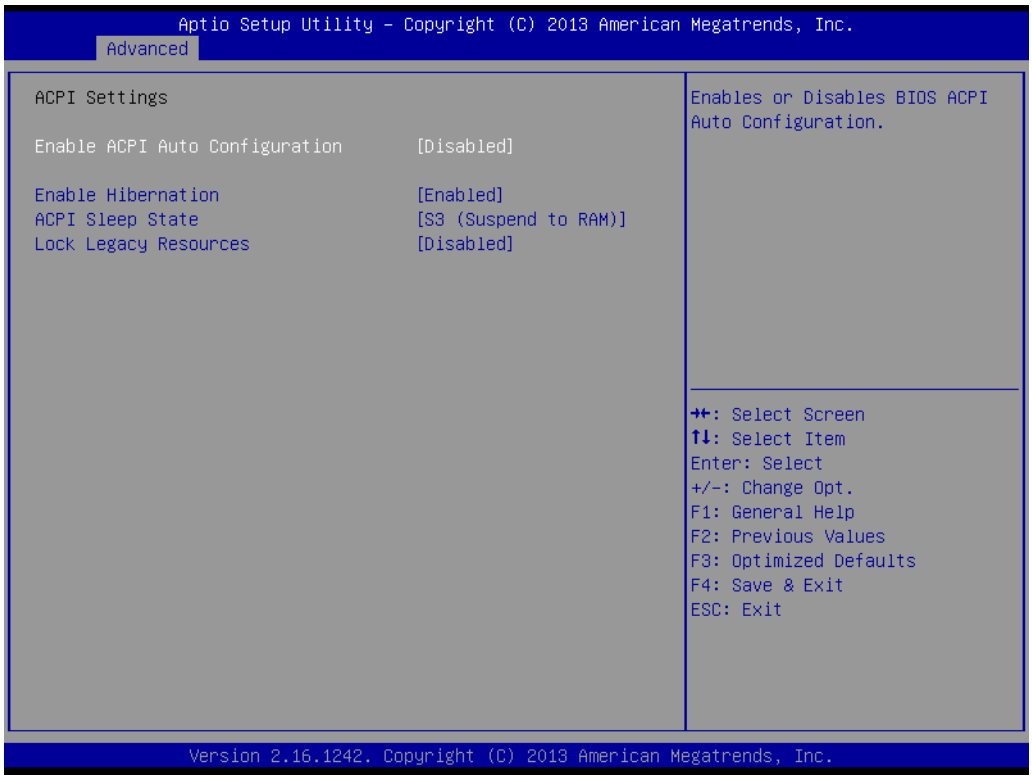
- **System time / System date**
  Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time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

3.1.2 Advanced BIOS Features Setup

Select the Advanced tab from the MIO-5251 setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as CPU Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screens is shown below. The sub menus are described on the following pages.

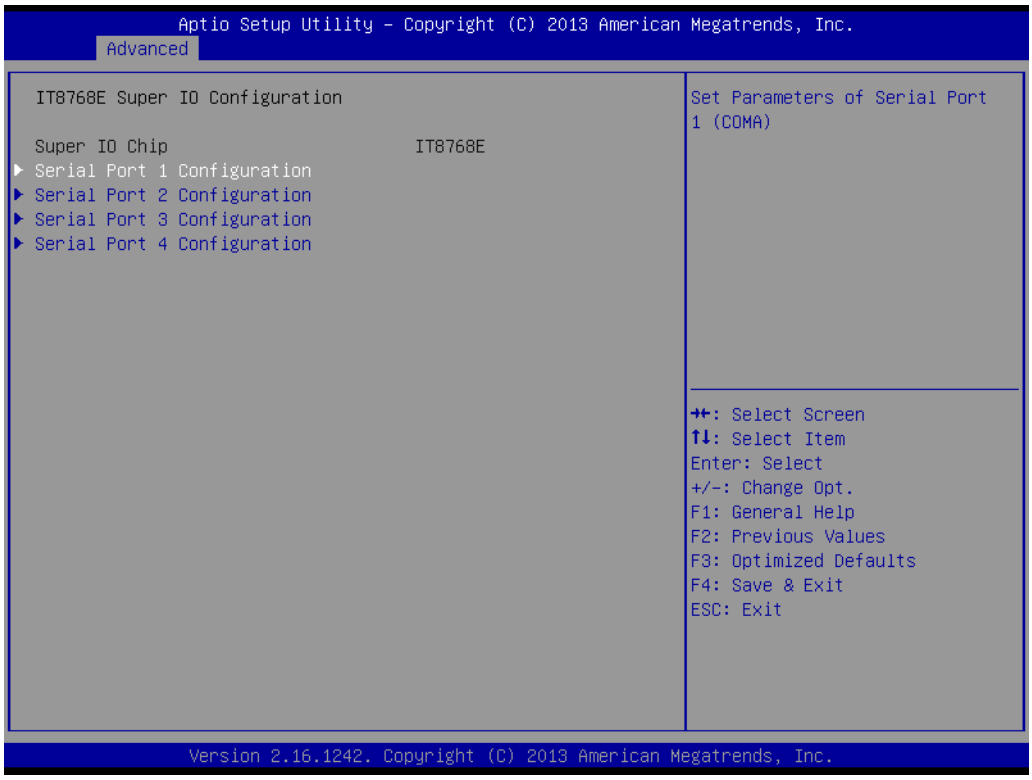


3.1.2.1 ACPI Settings



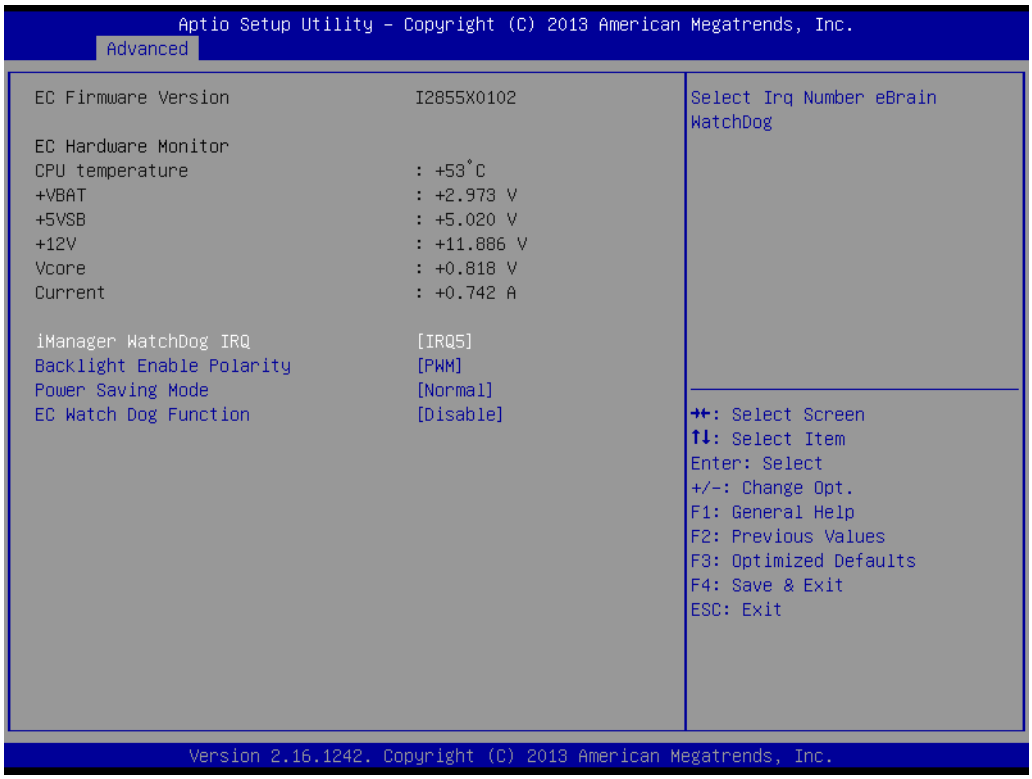
- **Enable ACPI Auto Configuration**
  Enable or disable BIOS ACPI auto configuration.
- **Enable Hibernation**
  Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
- **ACPI Sleep State**
  Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.
- **Lock Legacy Resources**
  Enables or Disables Lock of Legacy Resources

3.1.2.2 Super I/O Configuration



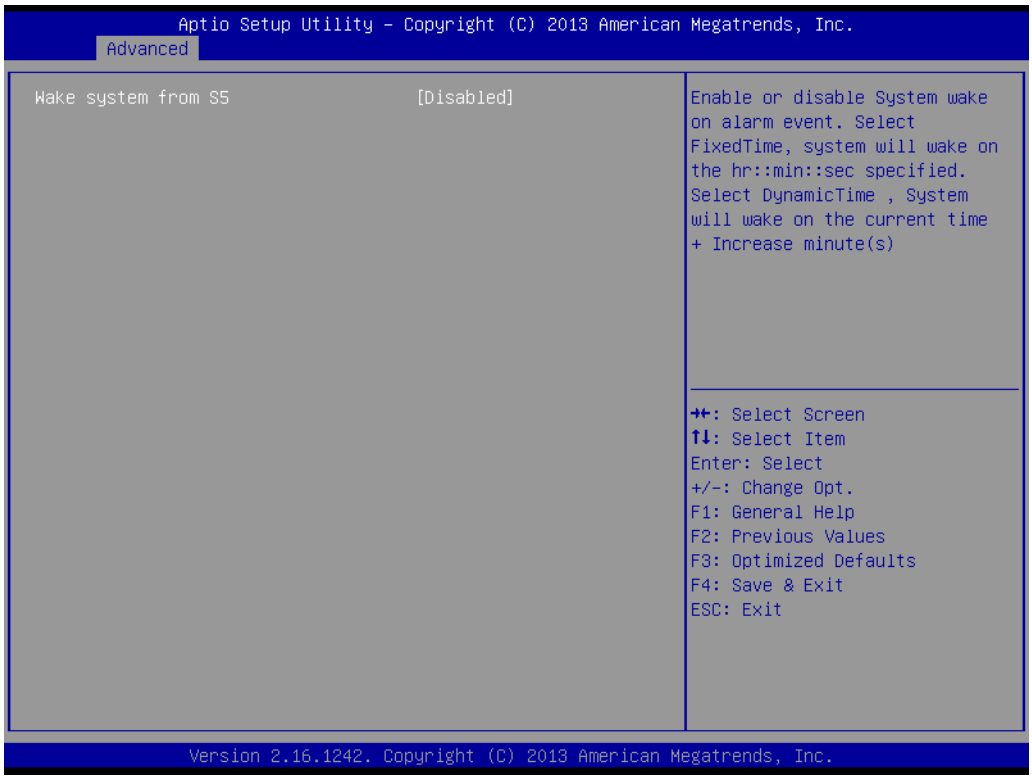
- **Serial Port 1 Configuration**
  Set Parameters of Serial Port 1 (COMA).
- **Serial Port 2 Configuration**
  Set Parameters of Serial Port 2 (COMB).
- **Serial Port 3 Configuration**
  Set Parameters of Serial Port 3 (COMC).
- **Serial Port 4 Configuration**
  Set Parameters of Serial Port 4 (COMD).

3.1.2.3 Embedded Controller Configuration



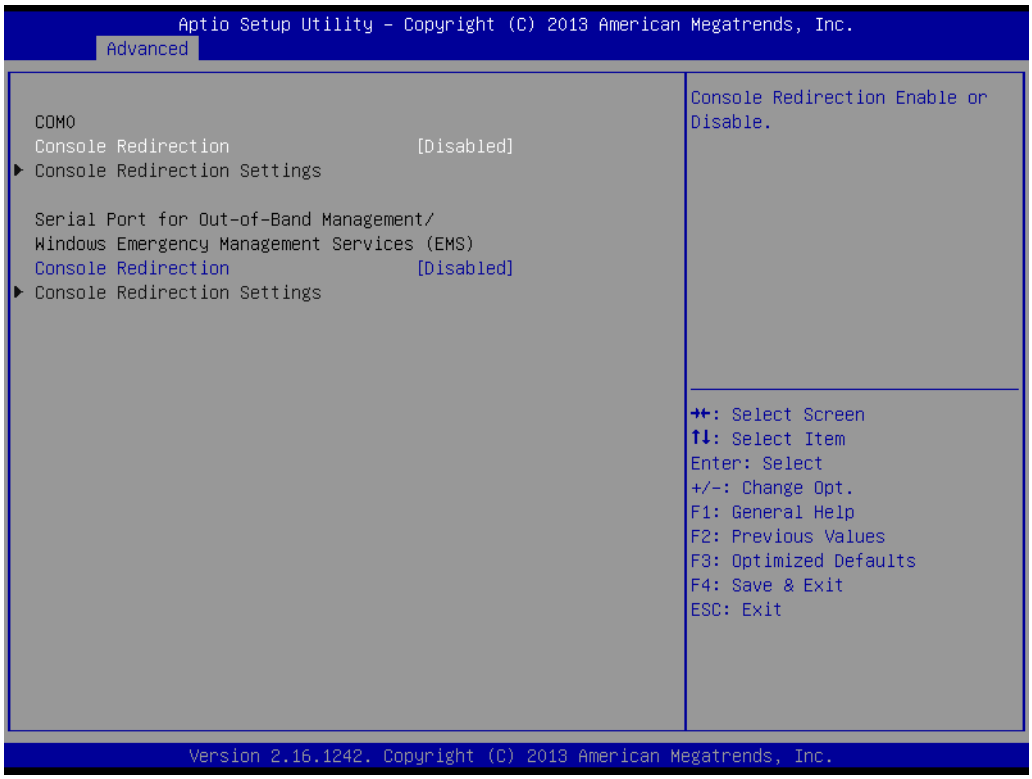
- **EC Hardware Monitor**
  This page display all information about system Temperature/Voltage/Current.
- **iManager WatchDog IRQ**
  This item allows users to set the IRQ number of EC watchdog.
- **Backlight Enable Polarity**
  This item allows users to set backlight mode.
- **EC Power Saving Mode**
  This item allows users to set board's power saving mode when off.
- **EC Watch Dog Function**
  This item allows users to select EC watchdog timer.

3.1.2.4 S5 RTC Wake Settings



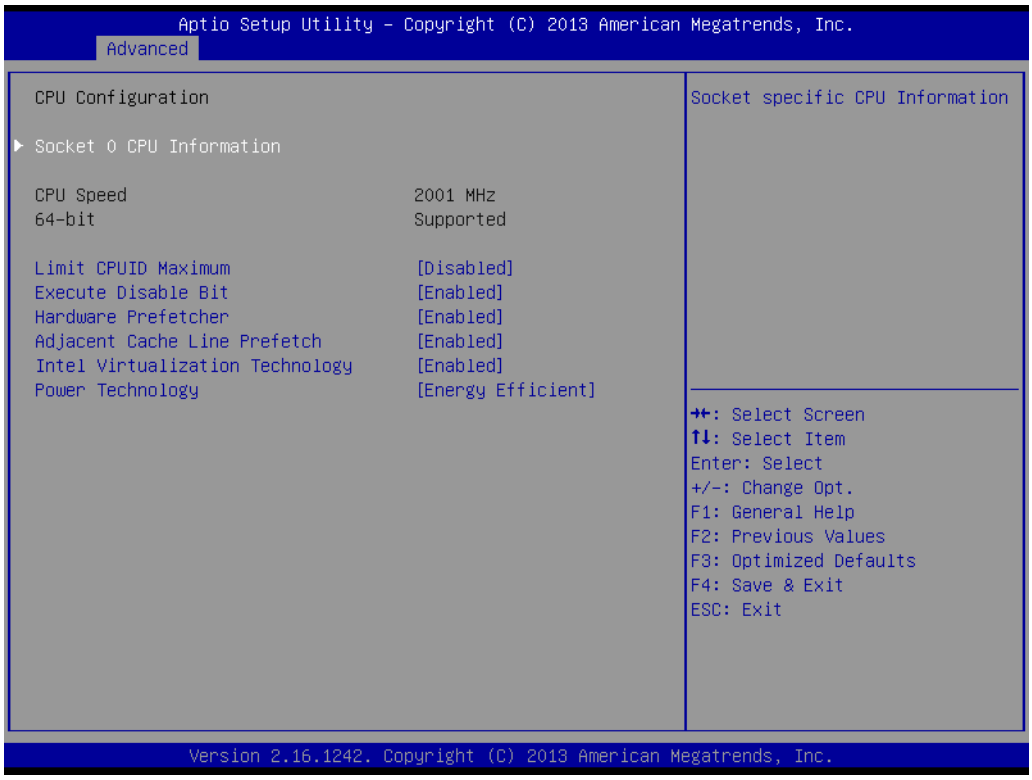
- **Wake system from S5**
  Enable or disable System wake on alarm event. Select FixedTime, system will wake on the hr::min::sec specified.

3.1.2.5 Serial Port Console Redirection



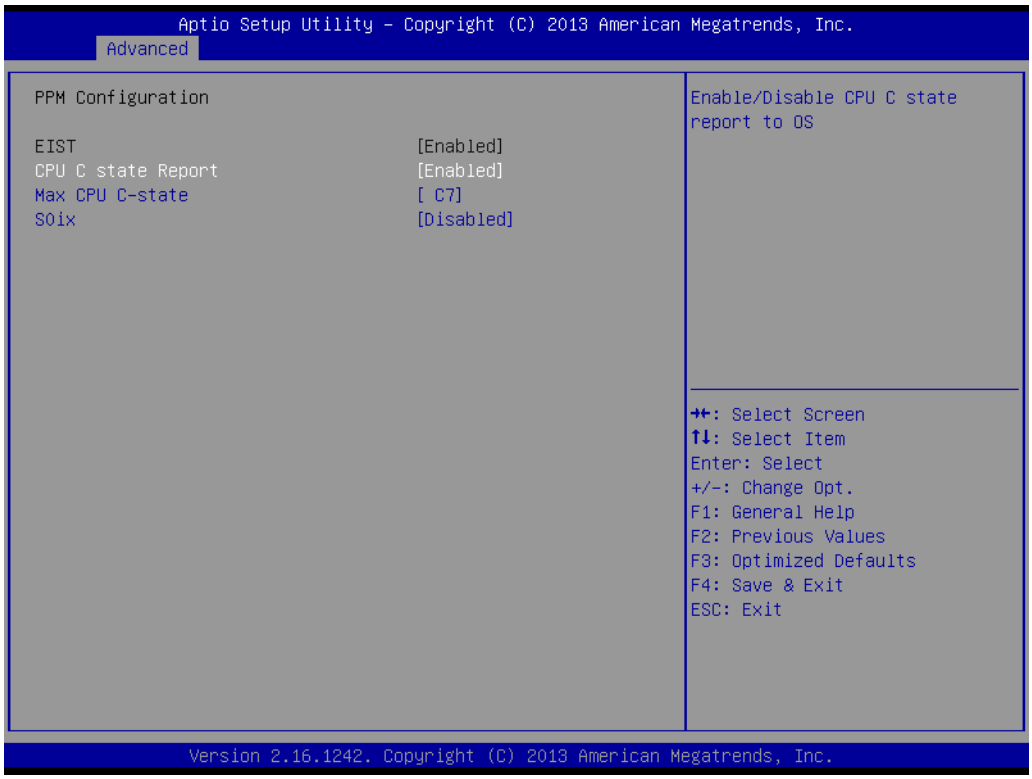
- **Console Redirection**
  This item allows users to enable or disable console redirection for Microsoft Windows Emergency Management Services (EMS).
- **Console Redirection**
  This item allows users to configuration console redirection detail settings.

3.1.2.6 CPU Configuration



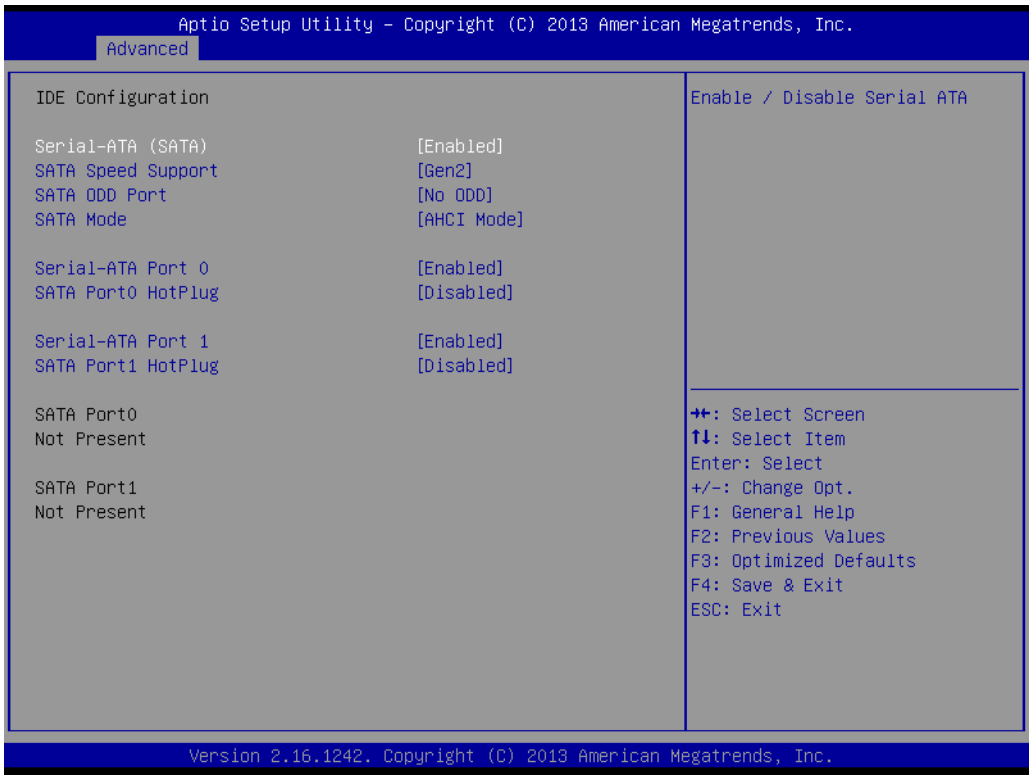
- **Limit CPUID Maximum**
  Disabled for Windows XP.
- **Execute Disable Bit**
  XD can prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS (Windows Server 2003 SP1, Windows XP SP2, SuSE Linux 9.2, RedHat Enterprise 3 Update 3.)
- **Hardware Prefetcher**
  Enable the mid level cache(L2) streamer prefetcher.
- **Adjacent Cache Line Prefetch**
  Enable the mid level cache(L2) prefetching of adjacent cache lines.
- **Intel Virtualization Technology**
  When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
- **Power Technology**
  Enable the power management features.

3.1.2.7 PPM Configuration



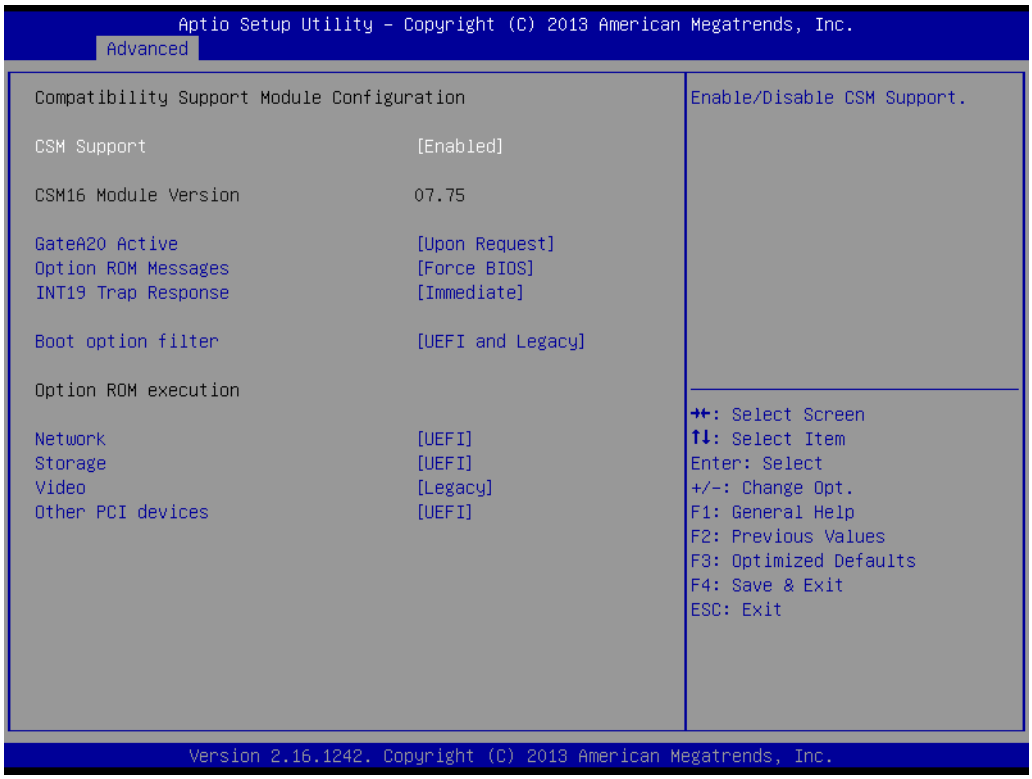
- **CPU C state Report**
  Enable/Disable CPU C state report to OS.
- **Max CPU C-state**
  This option controls Max C state that the processor will support.
- **S0ix**
  Enable/Disable CPU S0ix state.

3.1.2.8 IDE Configuration



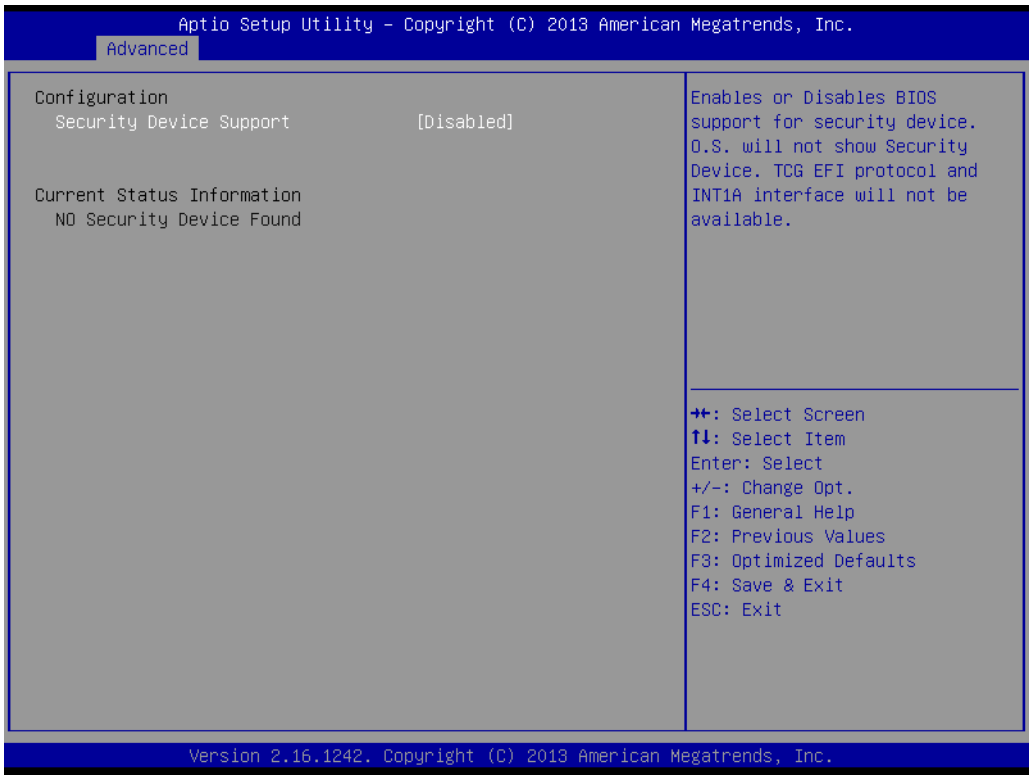
- **Serial-ATA (SATA)**
  Enable / Disable Serial ATA.
- **SATA Speed Support**
  SATA Speed Support Gen1 or Gen2.
- **SATA ODD Port**
  SATA ODD is Port0 or Port1.
- **SATA Mode**
  Select IDE / AHCI.
- **Serial-ATA Port 0 / Port1**
  Enable / Disable Serial ATA Port0 / Port1.
- **SATA Port 0 / Port1 HotPlug**
  Enable / Disable SATA Port0 / Port1 hotplug function.

3.1.2.9 CSM Configuration



- **CSM Support**
  Enable/Disable CSM Support.
- **GateA20 Active**
  UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
- **Option ROM Messages**
  Set display mode for Option ROM.
- **INT19 Trap Response**
  BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.
- **Boot option filter**
  This option controls Legacy/UEFI ROMs priority.
- **Network**
  Controls the execution of UEFI and Legacy PXE OpROM.
- **Storage**
  Controls the execution of UEFI and Legacy Storage OpROM.
- **Video**
  Controls the execution of UEFI and Legacy Video OpROM.
- **Other PCI devices**
  Determines OpROM execution policy for devices other than Network, Storage, or Video.

3.1.2.10 Trusted Computing

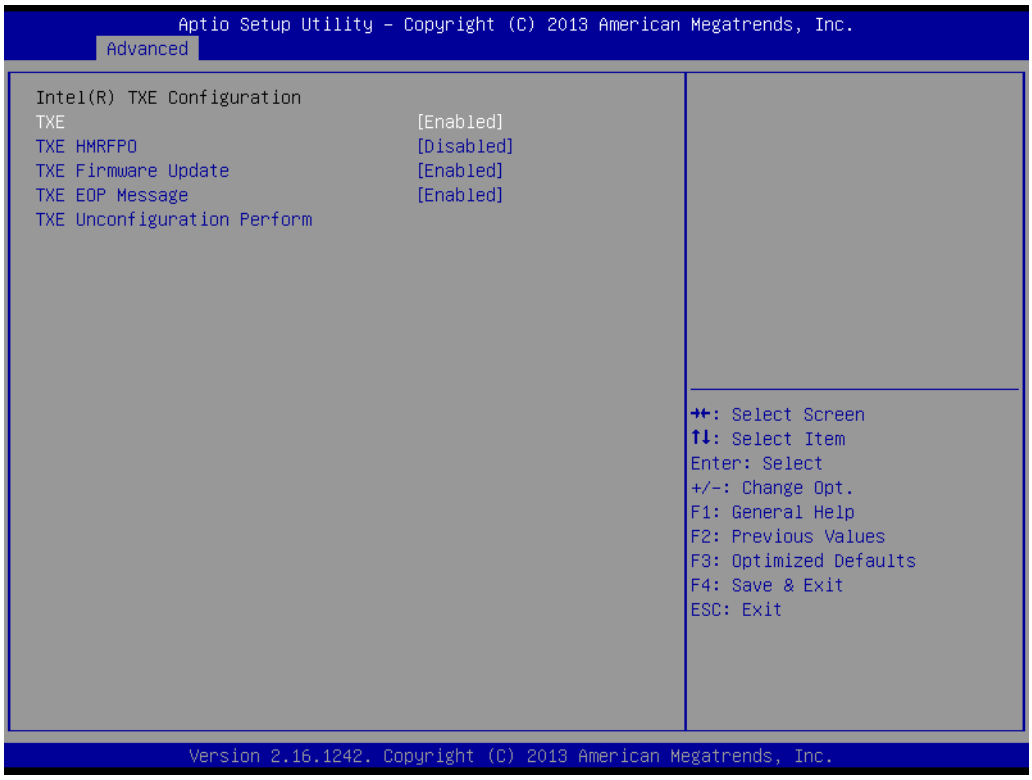


- **Trusted Computing**
  Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

3.1.2.11 USB Configuration

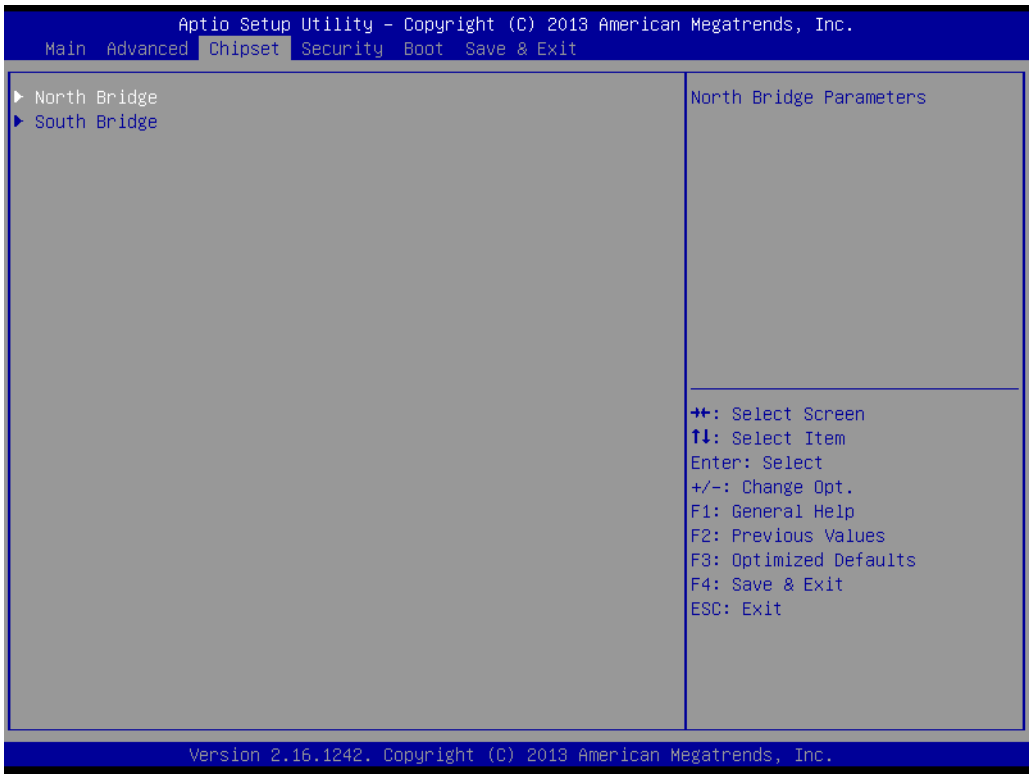
- **Legacy USB Support**
  Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
- **XHCI Hand-off**
  This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
- **EHCI Hand-Off**
  This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should claim by EHCI driver.
- **USB Mass Storage Driver Support**
  Enable/Disable USB Mass Storage Driver Support.
- **USB transfer time-out**
  Time-out value for control, Bulk, and interrupt transfers.
- **Device reset time-out**
  USB mass storage device start unit command time-out.
- **Device power-up delay**
  Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

3.1.2.12 Security Configuration



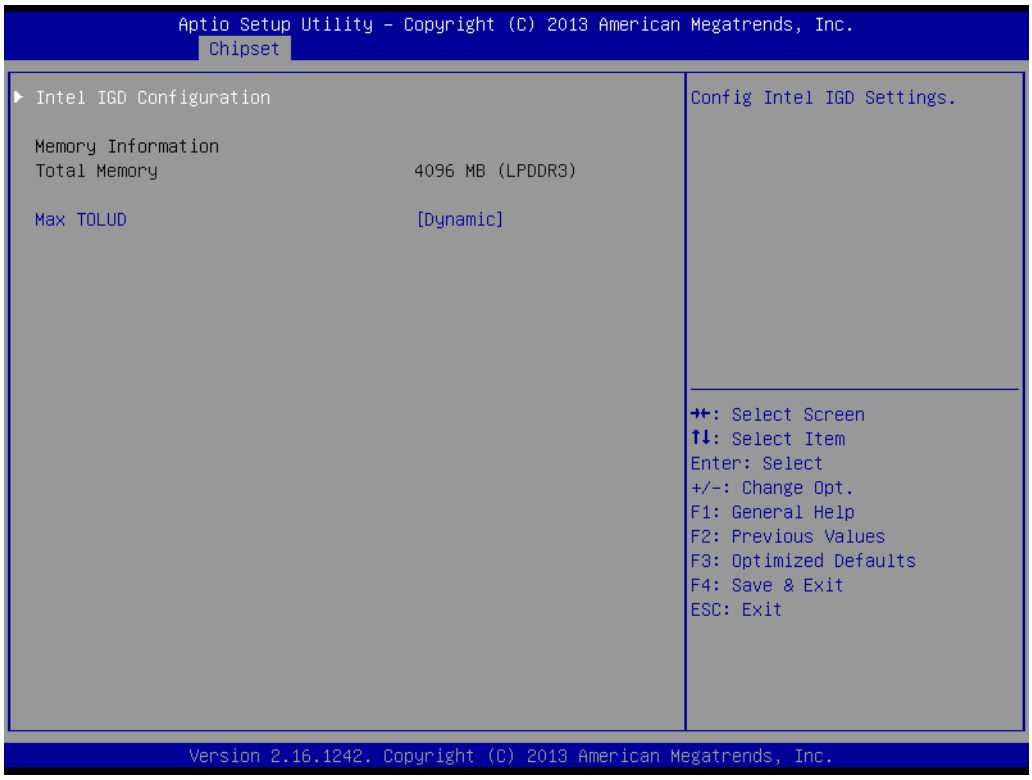
- **TXE**
- **TXE HMRFPO Disable**
- **TXE Firmware Update**
- **TXE EOP Message**
  Send EOP Message Before Enter OS
- **TXE Unconfiguration Perform**
  Revert TXE settings to factory defaults

3.1.3 Chipset Configuration



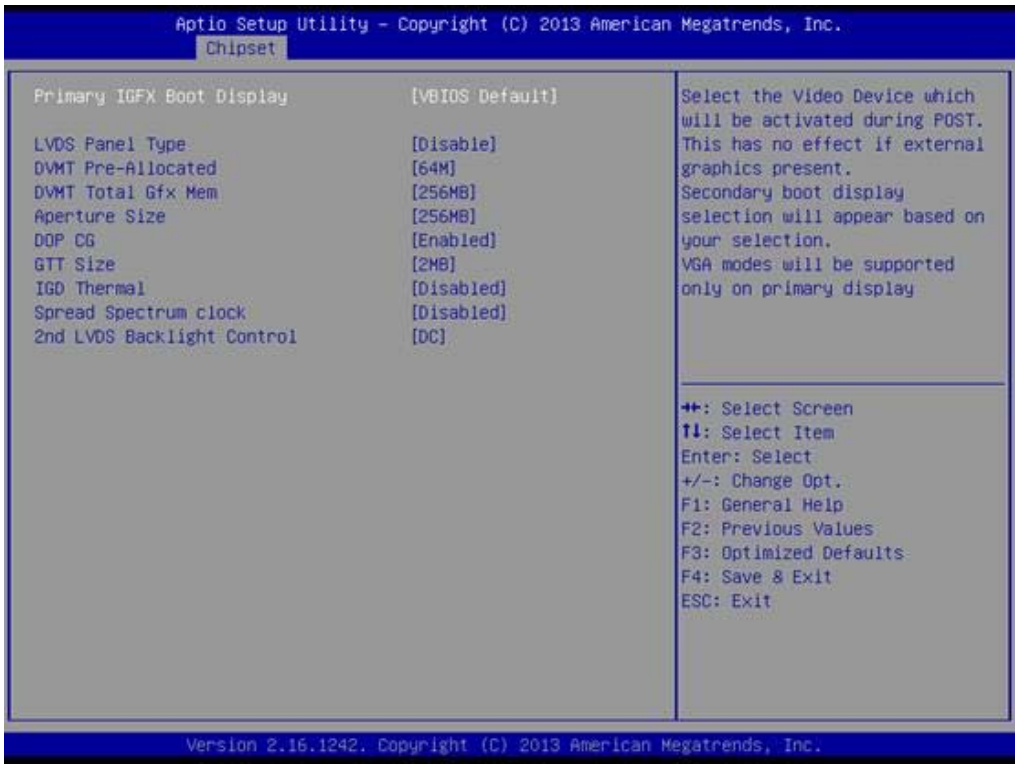
- **North Bridge**
  Details for North Bridge items.
- **South Bridge**
  Details for South Bridge items.

3.1.3.1 North Bridge



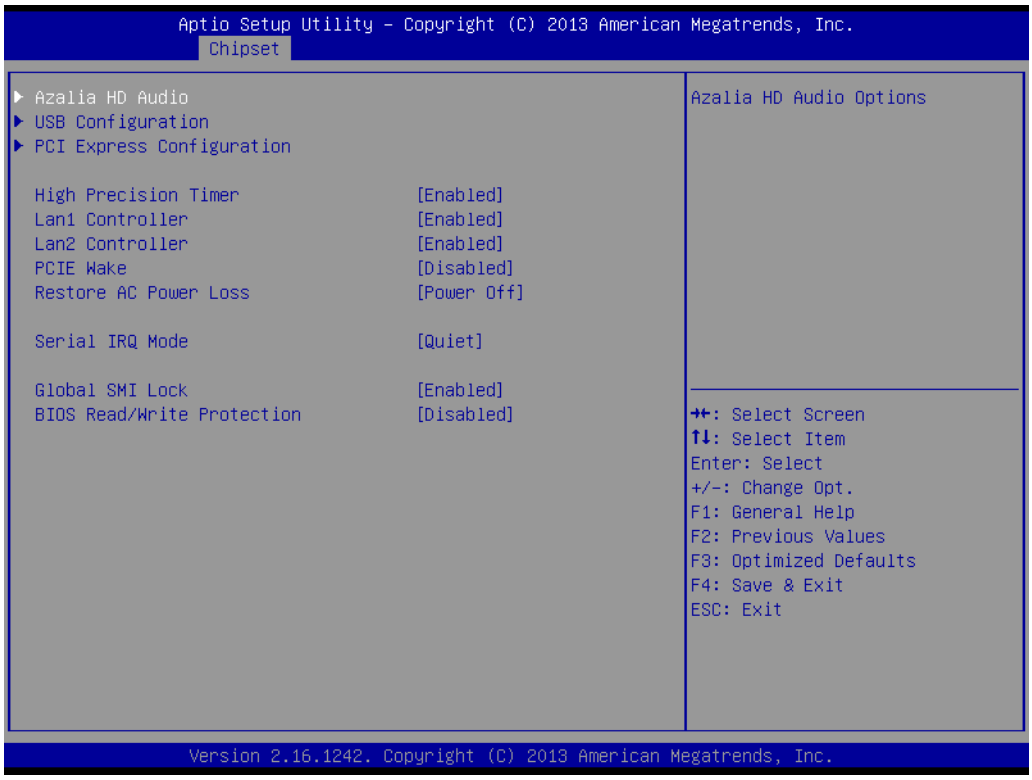
- **Intel IGD Configuration**
  Config Intel IGD Settings.
- **Max TOLUD**
  Maximum Value of TOLUD.

3.1.3.2 Intel IGD Configuration



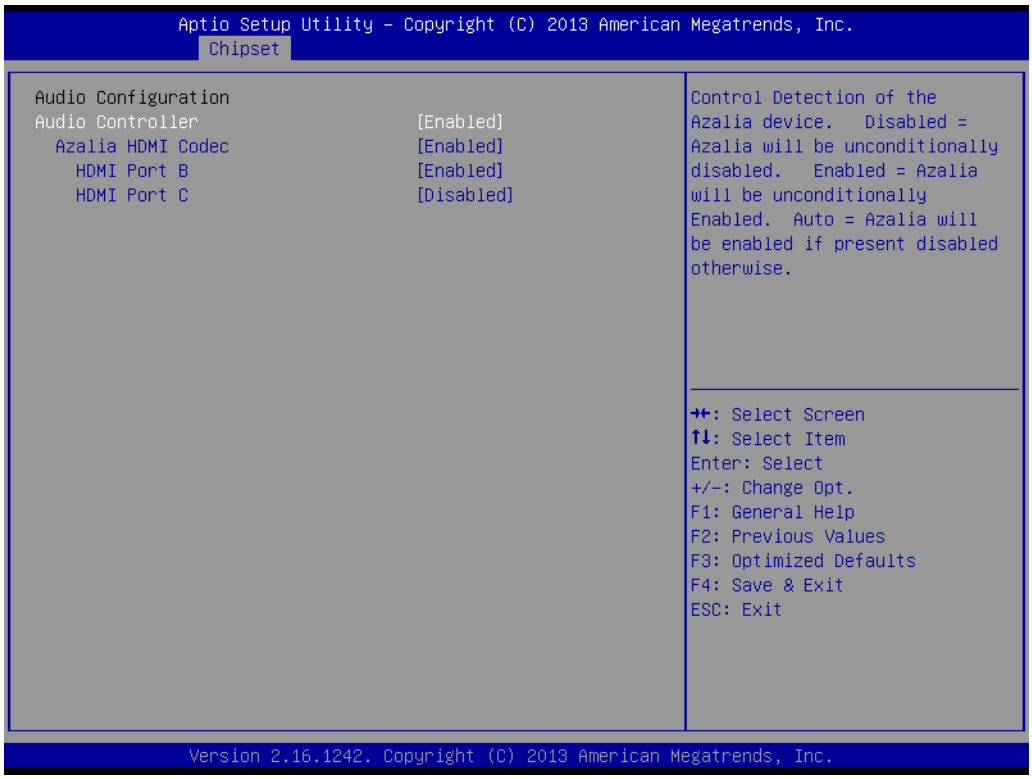
- **Primary IGFX Boot Display**
  Select the Video Device which will be activated during POST. This has no effect if an external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.
- **LVDS Panel Type**
  This item allow user to select LVDS panel type.
- **DVMT Pre-Allocated**
  Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
- **DVMT Total Gfx Mem**
  Select DVMT 5.0 Total Graphic Memory size used by the Internal Graphics Device.
- **Aperture Size**
  Select the Aperture Size.
- **DOP CG**
  Enable/Disable DOP clock gating.
- **GTT Size**
  Select the GTT Size
- **IGD Thermal**
  Enable/Disable IGD Thermal.
- **Spread Spectrum clock**
  Enable/Disable Spread Spectrum clock.

3.1.3.3 South Bridge



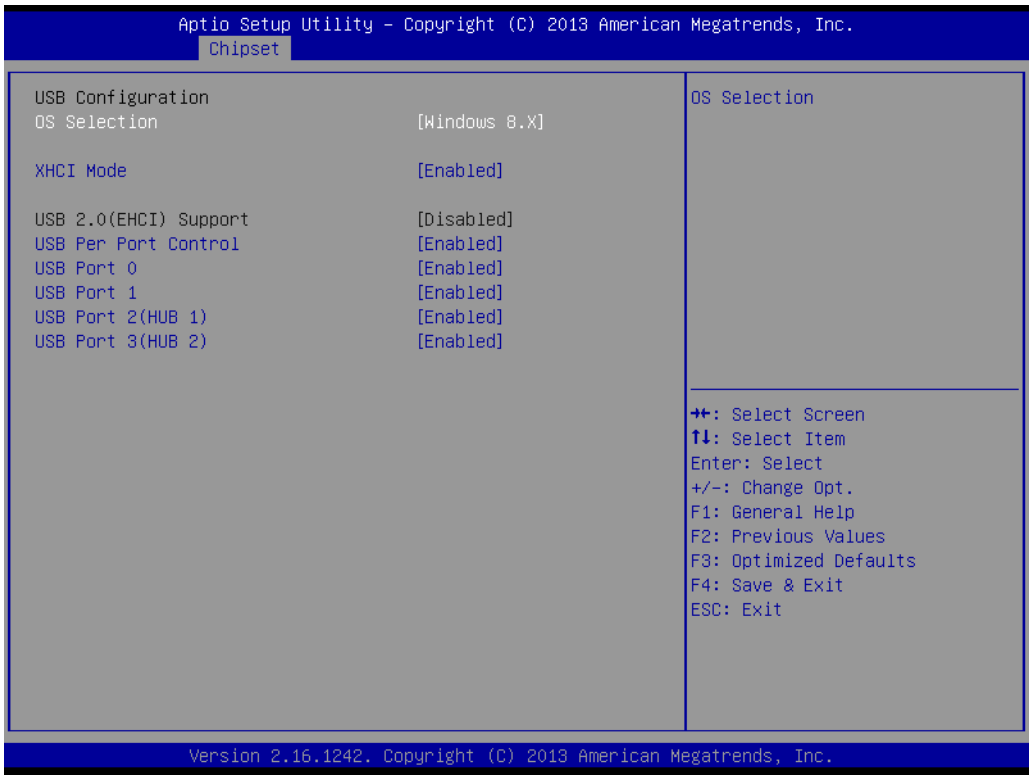
- **Azalia HD Audio**
  Azalia HD Audio Options.
- **USB Configuration**
  USB Configuration Settings.
- **PCI Express Configuration**
  PCI Express Configuration settings.
- **High Precision Timer**
  Enables or disables the high precision timer.
- **LAN1 Controller**
  Enable or Disable the LAN1.
- **LAN2 Controller**
  Enable or Disable the LAN2.
- **PCIE Wake**
  Enable or Disable PCIE to wake the system from S5.
- **Restore AC Power Loss**
  Select AC power state when power is re-applied after a power failure.
- **Serial IRQ Mode**
  Configure Serial IRQ Mode.
- **Global SMI Lock**
  Enable or Disable SMI lock.
- **BIOS Read/Write Protection**
  Enable or Disable BIOS SPI region read/write protect.

3.1.3.4 Azalia HD Audio



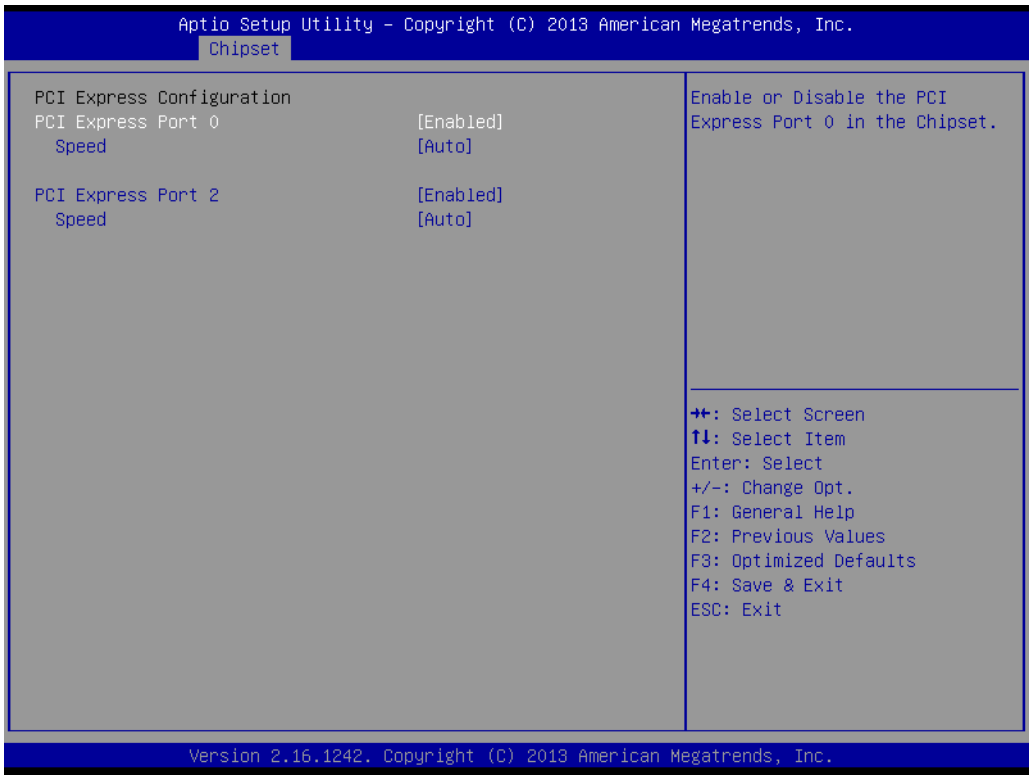
- **Audio Controller**
  Control Detection of the Azalia device. Disabled = Azalia will be unconditionally disabled. Enabled = Azalia will be unconditionally Enabled. Auto = Azalia will be enabled if present disabled otherwise.
- **Azalia HDMI Codec**
  Enable/Disable internal HDMI codec for Azalia
- **HDMI Port B**
  Enable/Disable HDMI Port B
- **HDMI Port C**
  Enable/Disable HDMI Port C

3.1.3.5 USB Configuration



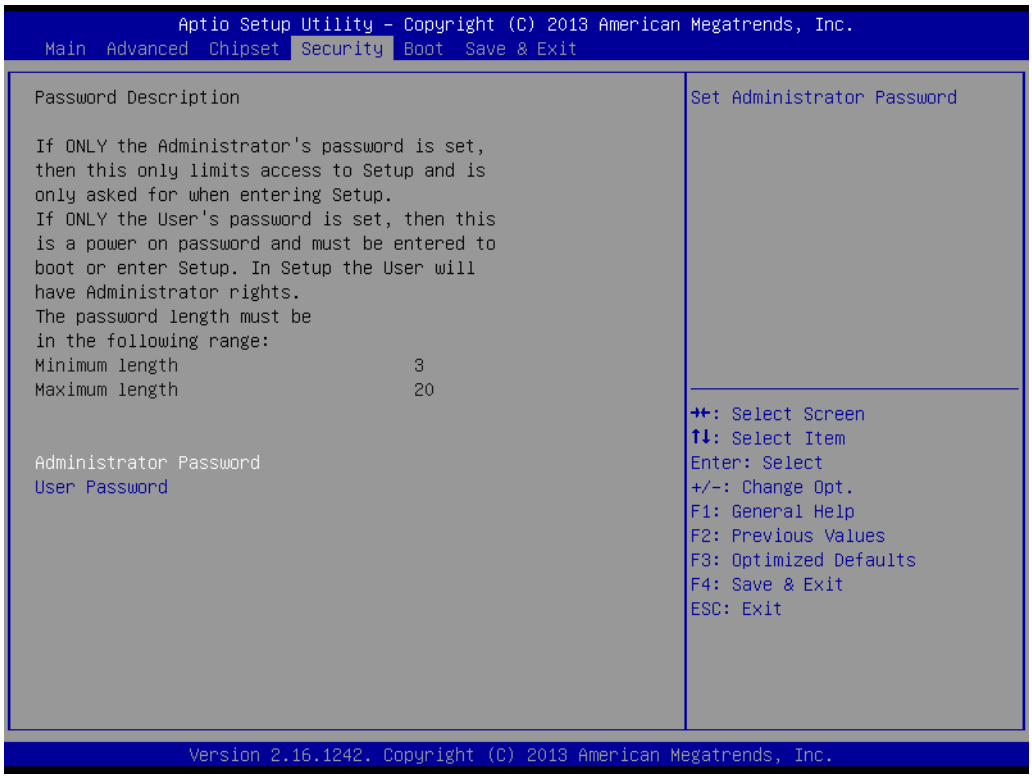
- **OS Selection**
  OS Selection to choose Windows 8.X / Windows 7.
- **XHCI Mode**
  Mode of operation of xHCI controller.
- **USB 2.0(EHCI) Support**
  Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled.
- **USB Per Port Control**
  Control each of the USB ports (0~3). Enable: Enable USB per port; Disable: Use USB port X settings.

3.1.3.6 PCI Express Configuration



- **PCI Express Port0 / Port2**
  Enable or Disable the PCI Express Port0 / Port 2 in the Chipset.
- **Speed**
  Configure PCIe Port Speed.

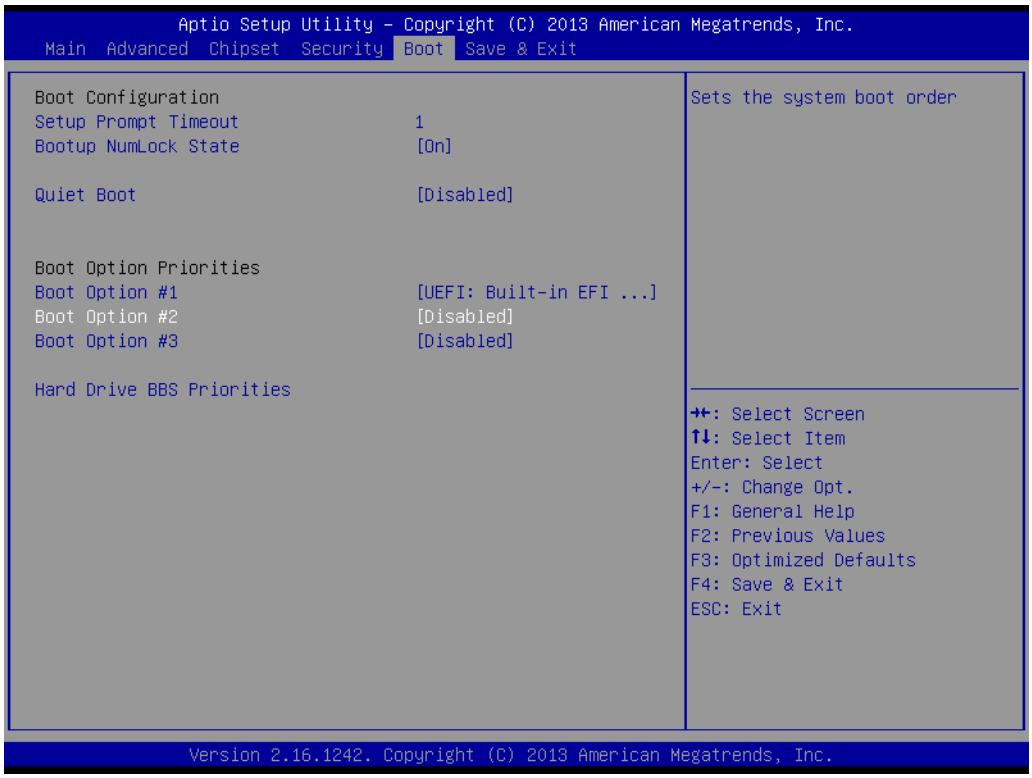
3.1.4 Security



Select Security Setup from the MIO-5251 Setup main BIOS setup menu. All Security Setup options, such as password protection and virus protection are described in this section. To access the sub menu for the following items, select the item and press <Enter>:

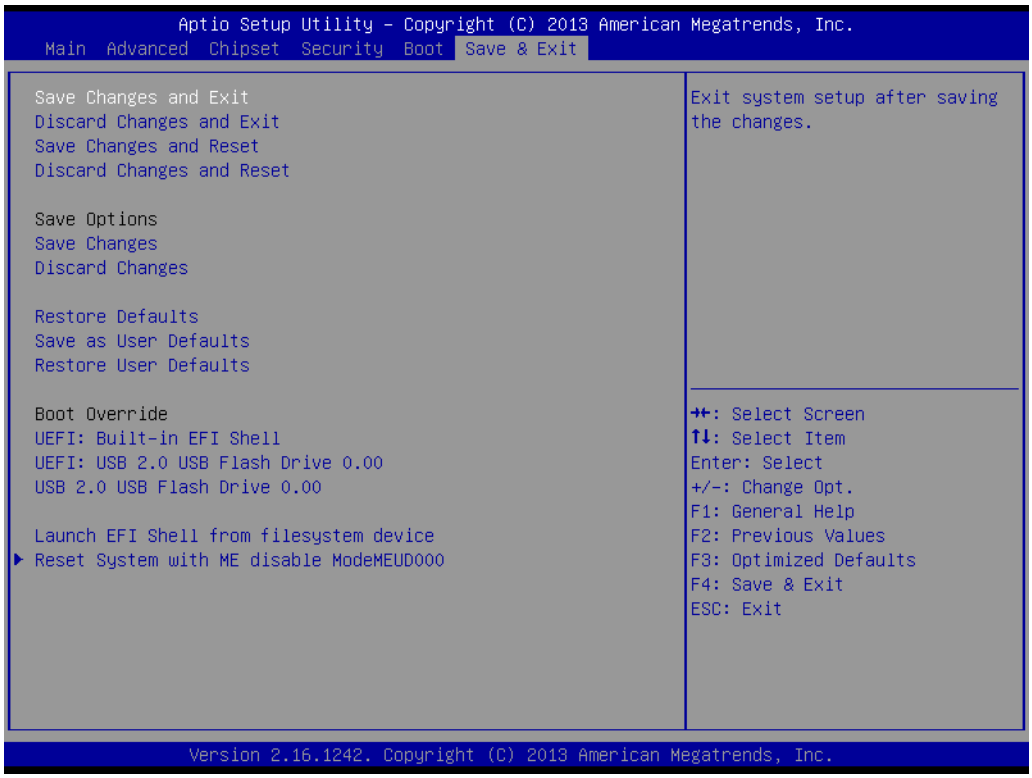
- **Change Administrator / User Password**
  Select this option and press <ENTER> to access the sub menu, and then type in the password.

3.1.5 Boot



- **Setup Prompt Timeout**
  Number of seconds that the firmware will wait before initiating the original default boot selection. A value of 0 indicates that the default boot selection is to be initiated immediately on boot. A value of 65535(0xFFFF) indicates that firmware will wait for user input before booting. This means the default boot selection is not automatically started by the firmware.
- **Bootup NumLock State**
  Select the keyboard NumLock state.
- **Quiet Boot**
  Enables or disables Quiet Boot option.
- **Boot Option #1**
  Sets the system boot order.

3.1.6 Save & Exit



- **Save Changes and Exit**
  This item allows you to exit system setup after saving the changes.
- **Discard Changes and Exit**
  This item allows you to exit system setup without saving any changes.
- **Save Changes and Reset**
  This item allows you to reset the system after saving the changes.
- **Discard Changes and Reset**
  This item allows you to rest system setup without saving any changes.
- **Save Changes**
  This item allows you to save changes done so far to any of the options.
- **Discard Changes**
  This item allows you to discard changes done so far to any of the options.
- **Restore Defaults**
  This item allows you to restore/load default values for all the options.
- **Save as User Defaults**
  This item allows you to save the changes done so far as user defaults.
- **Restore User Defaults**
  This item allows you to restore the user defaults to all the options.
- **Boot Override**
  Boot device select can override your boot priority.

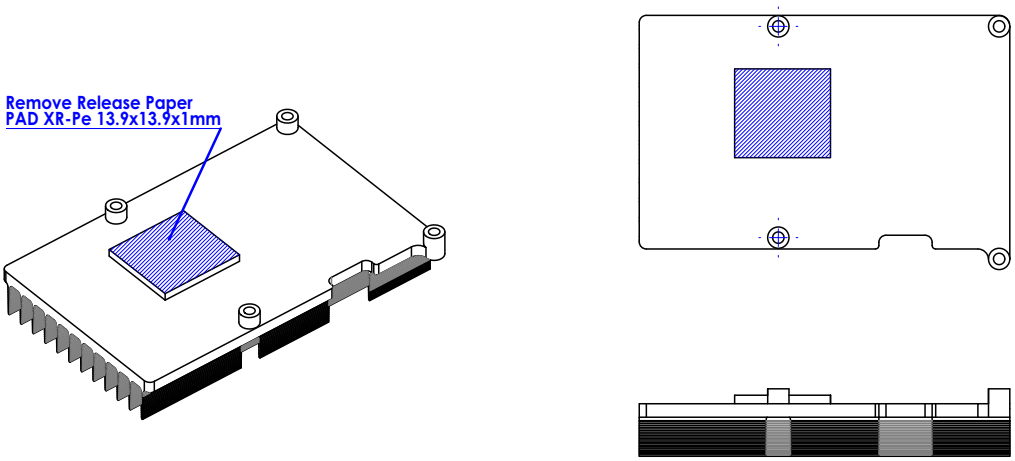
Chapter 4

MIOe Installation

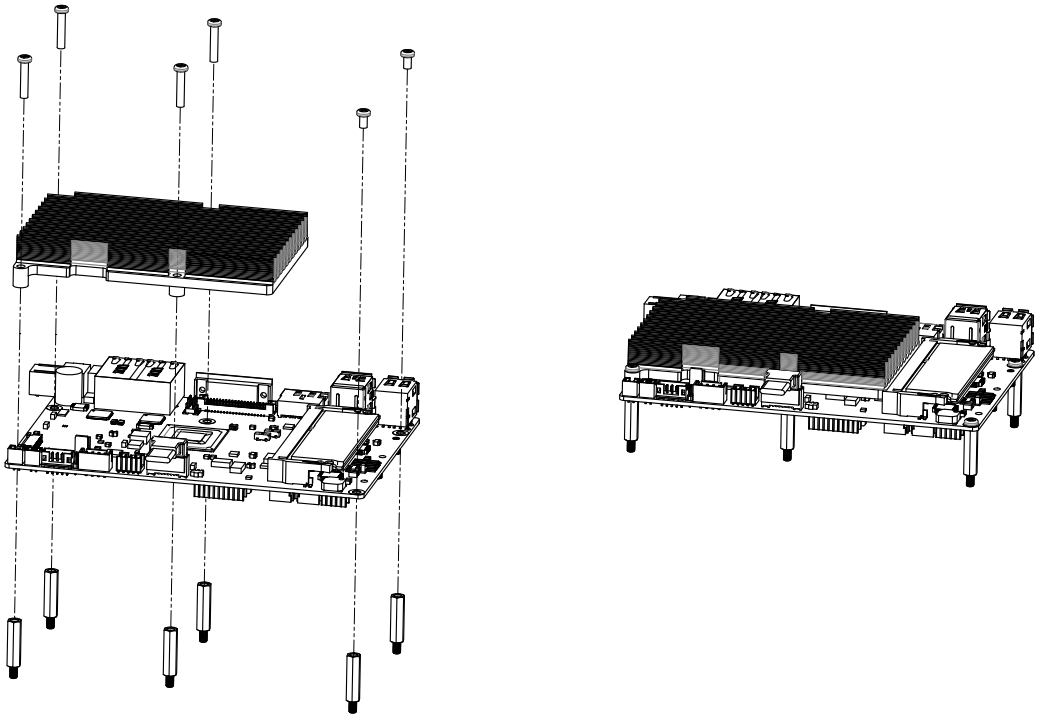
The MI/O compact form factor SBC is a new-generation SBC design with a variety of mechanical improvements. Here is the quick installation guide for our thermal design and MIOe module installation.

4.1 Quick Installation Guide:

1. There is a Heatsink / Cooler in the white box inside the package. Carefully remove the release paper from the thermal pad before installation.



2. There are six screws and six studs inside the white box, please install the heat-sink into place as per illustration below:



Appendix A

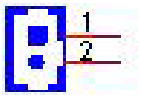
Pin Assignments

This appendix contains information of a detailed or specialized nature.
Sections include:

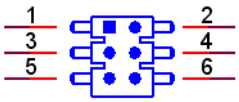
- **Jumper and Connector Tables**

A.1 Jumper List

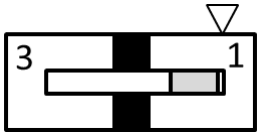
J2	Auto Power On Setting
Part Number	1653002101
Footprint	HD_2x1P_79_D
Description	PIN HEADER 2*1P 180D(M)SQUARE 2.0mm DIP W/O Pb
Setting	Function
NC	Power Button for Power On
(1-2)*	Auto Power On



J5	LCD Power
Part Number	1653003260
Footprint	HD_3x2P_79
Description	PIN HEADER 3x2P 2.0mm 180D(M) SMD 21N22050
Setting	Function
(1-3)*	+3.3V
(3-5)	+5V
(3-4)	+12V

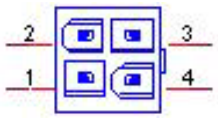


SW2	Clear CMOS
Part Number	1600000071
Footprint	SW_3P_CJS-1201TA1
Description	CJS-1201TA1
Pin	Pin Name
1	NC
2	RTC_TEST#
3	GND

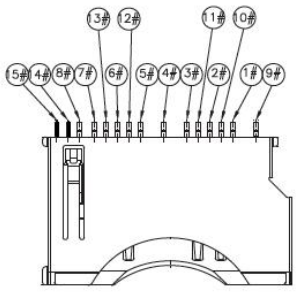


A.2 Connector Pin Definition

CN1	12V Power Input
Part Number	1655003865
Footprint	WF_2x2P_165_BOX_RA_D_740SP
Description	ATX PWRCONN 2x2P 4.2mm 90D(M) DIP 740-77-04TS50
Pin	Pin Name
1	GND
2	GND
3	+12V
4	+12V

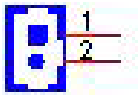


CN4	SD Card
Part Number	1654010952-01
Footprint	SDCARD_15P_SDC5-15M1-KNM0-0
Description	SD Card 15P SMD G/F SDC5-15M1-KNM0-01
Pin	Pin Name
1	DAT3
2	CMD
3	VSS1
4	VDD
5	CLK
6	VSS2
7	DAT0
8	DAT1
9	DAT2
10	NC
11	NC
12	NC
13	NC
14	SD3_CD#
15	SD3_WP

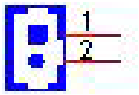


CN6	SODIMMDDR3_204
Part Number	1651002088
Footprint	SODIMMDDR3_204P_AS0A626-HA
Description	DDR3 SODIMM H=9.2mm 204P SMD AS0A626-HASN-7H

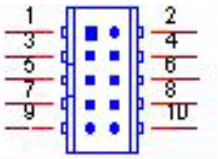
CN7	Power Switch
Part Number	1655302020
Footprint	WF_2P_79_BOX_R1_D
Description	WAFER BOX 2P 2.0mm 180D(M) DIP A2001WV2-2P
Pin	Pin Name
1	PSIN
2	GND



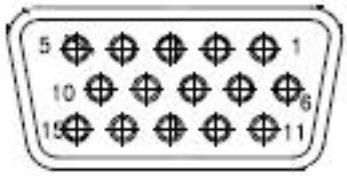
CN9	Reset
Part Number	1655302020
Footprint	WF_2P_79_BOX_R1_D
Description	WAFER BOX 2P 2.0mm 180D(M) DIP A2001WV2-2P
Pin	Pin Name
1	RESET#
2	GND



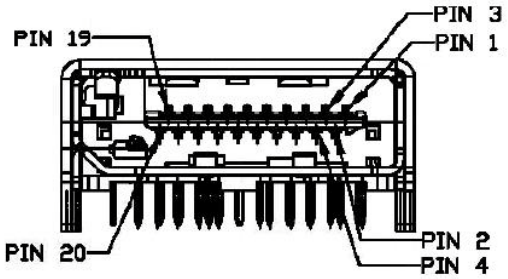
CN10	GPIO
Part Number	1653004099
Footprint	HD_5x2P_79_23N685B-10M10
Description	BOX HEADER 5x2P 2.00mm 180D(M) SMD 23N685B-10M10
Pin	Pin Name
1	+5V
2	GPIO4
3	GPIO0
4	GPIO5
5	GPIO1
6	GPIO6
7	GPIO2
8	GPIO7
9	GPIO3
10	GND



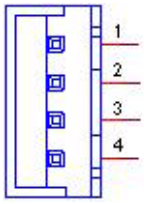
CN11	VGA
Part Number	1654000055
Footprint	DBVGA-VF5MS
Description	D-SUB Conn. 15P 90D(F) DIP 070242FR015S200ZU
Pin	Pin Name
1	RED
2	GREEN
3	BLUE
4	NC
5	GND
6	GND
7	GND
8	GND
9	NC
10	GND
11	NC
12	DDAT
13	HSYNC
14	VSYNC
15	DCLK



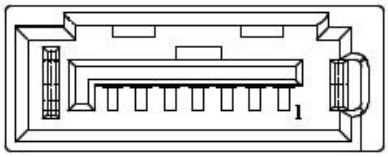
CN12	**HDMI/DP**
Part Number	1654010203
Footprint	HDMICON_21P_845-002-217CRL
Description	HDMI+DISPLAY Conn. 20P 90D(M) DIP 845-002-217CRL
Pin	Pin Name
1	ML_Lane0(p)/TMDS Data2+
2	GND/TMDS Data2 Shield
3	ML_Lane0(n)/TMDS Data2–
4	ML_Lane1(p)/TMDS Data1+
5	GND/TMDS Data1 Shield
6	ML_Lane1(n)/TMDS Data1–
7	ML_Lane2(p)/TMDS Data0+
8	GND/TMDS Data0 Shield
9	ML_Lane2(n)/TMDS Data0–
10	ML_Lane3(p)/TMDS Clock+
11	GND/TMDS Clock Shield
12	ML_Lane3(n)/TMDS Clock–
13	CONFIG1/Reserved
14	CONFIG2/Reserved
15	AUX CH(p)/SCL
16	GND/SDA
17	AUX CH(n)/DDC Ground
18	Hot Plug Detect/+5V Power
19	GND/Hot Plug Detect
20	+3.3V



CN13	SATA Power
Part Number	1655001154
Footprint	WF_4P_98_BOX_R1_D
Description	WAFER BOX 4P 2.50mm 180D(M) DIP 24W1170-04S10-01
Pin	Pin Name
1	+5V
2	GND
3	GND
4	+12V

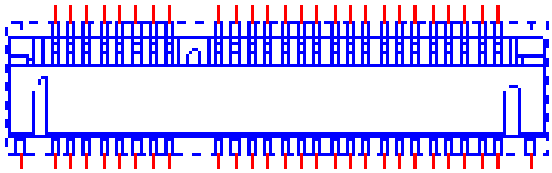


CN14	SATA
Part Number	1654007578
Footprint	SATA_7P_WATF-07DBN6SB1U
Description	Serial ATA 7P 1.27mm 180D(M) SMD WATF-07DBN6SB1U
Pin	Pin Name
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND



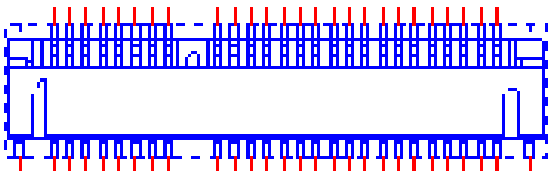
CN15	**Mini PCIE**
Part Number	1654002538
Footprint	FOX_AS0B226-S68K7F
Description	MINI PCI E 52P 6.8mm 90D SMD AS0B226-S68Q-7H
Pin	Pin Name
1	WAKE#
2	+3.3VSB
3	NC
4	GND
5	NC
6	+1.5V
7	NC
8	UIM_PWR
9	GND
10	UIM_DATA
11	REFCLK-
12	UIM_CLK
13	REFCLK+
14	UIM_RESET
15	GND
16	UIM_VPP
17	NC
18	GND
19	NC
20	W_DISABLE#
21	GND
22	PERST#
23	PERn0
24	+3.3VSB
25	PERp0
26	GND
27	GND
28	+1.5V
29	GND
30	SMB_CLK
31	PETn0
32	SMB_DAT
33	PETp0
34	GND
35	GND
36	USB D-
37	GND
38	USB D+
39	+3.3VSB
40	GND
41	+3.3VSB

42	NC
43	SEL
44	NC
45	NC
46	NC
47	NC
48	+1.5V
49	NC
50	GND
51	NC
52	+3.3VSB

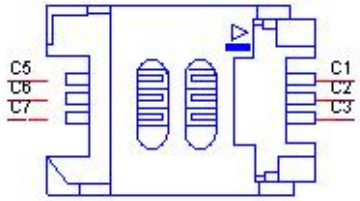


CN16	**mSATA**
Part Number	1654002538
Footprint	FOX_AS0B226-S68K7F
Description	MINI PCI E 52P 6.8mm 90D SMD AS0B226-S68Q-7H
Pin	Pin Name
1	NC
2	+3.3V
3	NC
4	GND
5	NC
6	+1.5V
7	NC
8	NC
9	GND
10	NC
11	NC
12	NC
13	NC
14	NC
15	GND
16	NC
17	NC
18	GND
19	NC
20	NC
21	GND
22	NC
23	B+
24	+3.3V

25	B-
26	GND
27	GND
28	+1.5V
29	GND
30	SMB_CLK
31	A-
32	SMB_DAT
33	A+
34	GND
35	GND
36	USB D-
37	GND
38	USB D+
39	+3.3V
40	GND
41	+3.3V
42	NC
43	NC
44	NC
45	NC
46	NC
47	NC
48	+1.5V
49	NC
50	GND
51	NC
52	+3.3V

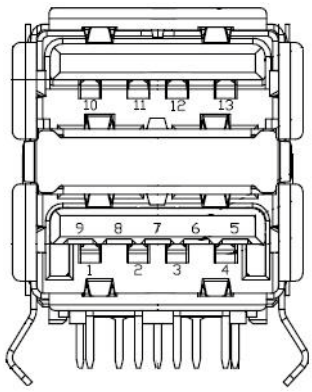


CN17	SIM Holder
Part Number	1654010809-01
Footprint	SIM_6P_5210622-SINR03
Description	SIM card conn. 6p 2.54mm 90D(F) SMD 5210622-SINR
Pin	Pin Name
C1	UIM_PWR
C2	UIM_RESET
C3	UIM_CLK
C5	GND
C6	UIM_VPP
C7	UIM_DATA

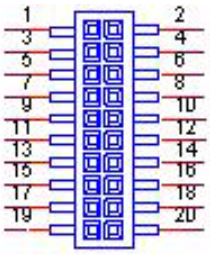


CN18	External USB
Part Number	1654009513
Footprint	USB_8P_UB1112C-8FDE-4F
Description	USB CONN. 8P 2.0mm 90D DIP UB1112C-8FDE-4F
Pin	Pin Name
1	+5V
2	D-
3	D+
4	GND
5	+5V
6	D-
7	D+
8	GND

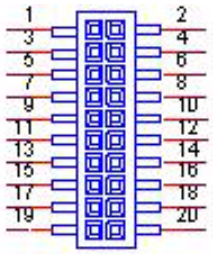
CN19	**External USB2.0+USB3.0**
Part Number	1654010199
Footprint	USB_13P_UEA1112C-UHS6-4F
Description	USB Conn. 2.0+3.0 13P 90D(F) DIP UEA1112C-UHS6-4
Pin	Pin Name
1	+5V
2	D-
3	D+
4	GND
5	SSRX-
6	SSRX+
7	GND
8	SSTX-
9	SSTX+
10	+5V
11	D-
12	D+
13	GND



CN20	**COM1/COM2**
Part Number	1653004793
Footprint	HD_10x2P_79_23N685B-20M10
Description	BOX HEADER 10x2P 2.0mm 180D(M)SMD 23N685B-20M10B
Pin	Pin Name
1	DCD1#
2	DSR1#
3	RXD1
4	RTS1#
5	TXD1
6	CTS1#
7	DTR1#
8	RI1#
9	GND
10	GND
11	DCD2#
12	DSR2#
13	RXD2
14	RTS2#
15	TXD2
16	CTS2#
17	DTR2#
18	RI2#
19	GND
20	GND

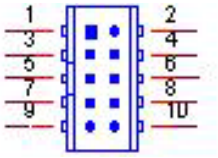


CN21	COM3/COM4
Part Number	1653004793
Footprint	HD_10x2P_79_23N685B-20M10
Description	BOX HEADER 10x2P 2.0mm 180D(M)SMD 23N685B-20M10B
Pin	Pin Name
1	422TX3-/485D3-/DCD3#
2	DSR3#
3	422TX3+/485D3+/RXD3
4	RTS3#
5	422RX3+/TXD3
6	CTS3#
7	422RX3-/DTR3#
8	RI3#
9	GND
10	GND
11	422TX4-/485D4-/DCD4#
12	DSR4#
13	422TX4+/485D4+/RXD4
14	RTS4#
15	422RX4+/TXD4
16	CTS4#
17	422RX4-/DTR4#
18	RI4#
19	GND
20	GND



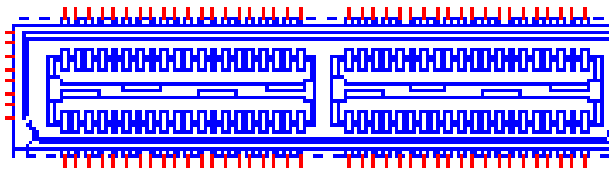
CN24	GbE
Part Number	1652003274
Footprint	RJ45_14P_RTA-195AAK1A
Description	PHONE JACK RJ45 28P DIP RTB-19GB9J1A
Pin	Pin Name
1	TX+(10/100),BI_DA+(GHz)
2	TX-(10/100),BI_DA-(GHz)
3	RX+(10/100),BI_DB+(GHz)
4	BI_DC+(GHz)
5	BI_DC-(GHz)
6	RX-(10/100),BI_DB-(GHz)
7	BI_DD+(GHz)
8	BI_DD-(GHz)

CN27	Audio
Part Number	1653004099
Footprint	HD_5x2P_79_23N685B-10M10
Description	BOX HEADER 5x2P 2.00mm 180D(M) SMD 23N685B-10M10
Pin	Pin Name
1	LOUTR
2	LINR
3	GND
4	GND
5	LOUTL
6	LINL
7	GND
8	GND
9	MIC1R
10	MIC1L

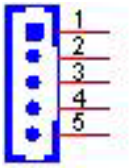


CN29	**MIOe**
Part Number	1654006235
Footprint	MIOE_CPUSIDE
Description	B/B Conn. 40x2P 0.8mm 180D(F) SMD QSE-040-01-L-D
Pin	Pin Name
1	GND
2	GND
3	PCIE_RX0+
4	PCIE_TX0+
5	PCIE_RX0-
6	PCIE_TX0-
7	GND
8	GND
9	PCIE_RX1+
10	PCIE_TX1+
11	PCIE_RX1-
12	PCIE_TX1-
13	GND
14	GND
15	PCIE_RX2+
16	PCIE_TX2+
17	PCIE_RX2-
18	PCIE_TX2-
19	GND
20	GND
21	PCIE_RX3+
22	PCIE_TX3+
23	PCIE_RX3-
24	PCIE_TX3-
25	GND
26	GND
27	PCIE_CLK+
28	LOUTL
29	PCIE_CLK-
30	LOUTR
31	GND
32	AGND
33	SMB_CLK
34	NC
35	SMB_DAT
36	NC
37	PCIE_WAKE#
38	NC
39	RESET#
40	NC
41	SLP_S3#

42	CLK33M
43	NC
44	LPC_AD0
45	DDP_HPD
46	LPC_AD1
47	GND
48	LPC_AD2
49	DDP_AUX+
50	LPC_AD3
51	DDP_AUX-
52	LPC_DRQ#0
53	GND
54	LPC_SERIRQ
55	DDP_D0+
56	LPC_FRAME#
57	DDP_D0-
58	GND
59	GND
60	USB0_D+
61	DDP_D1+
62	USB0_D-
63	DDP_D1-
64	GND
65	GND
66	USB1_D+/USB_SSTX+
67	DDP_D2+
68	USB1_D-/USB_SSTX-
69	DDP_D2-
70	GND
71	GND
72	USB2_D+/USB_SSRX+
73	DDP_D3+
74	USB2_D-/USB_SSRX-
75	DDP_D3-
76	GND
77	GND
78	USB_OC#
79	+12VSB
80	+12VSB
83	GND
84	GND
85	GND
86	GND
87	+5VSB
88	+5VSB
89	+5VSB
90	+5VSB

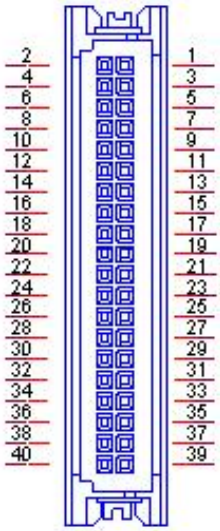


CN30	Inverter Power
Part Number	1655000453
Footprint	WHL5V-2M-24W1140
Description	WAFER BOX 2.0mm 5P 180D(M) DIP WO/Pb JIH VEI
Pin	Pin Name
1	+12V
2	GND
3	ENABKL
4	VBR
5	+5V

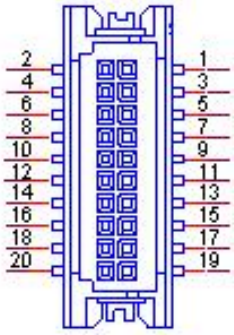


CN31	LVDS
Part Number	1653920200
Footprint	SPH20X2
Description	B/B Conn. 40P 1.25mm 90D SMD DF13-40DP-1.25V(91)
Pin	Pin Name
1	+5V or +3.3V
2	+5V or +3.3V
3	GND
4	GND
5	+5V or +3.3V
6	+5V or +3.3V
7	LVDS0_D0-
8	LVDS1_D0-
9	LVDS0_D0+
10	LVDS1_D0+
11	GND
12	GND
13	LVDS0_D1-
14	LVDS1_D1-
15	LVDS0_D1+
16	LVDS1_D1+
17	GND

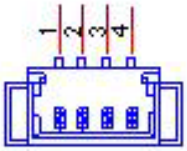
18	GND
19	LVDS0_D2-
20	LVDS1_D2-
21	LVDS0_D2+
22	LVDS1_D2+
23	GND
24	GND
25	LVDS0_CLK-
26	LVDS1_CLK-
27	LVDS0_CLK+
28	LVDS1_CLK+
29	GND
30	GND
31	NC
32	NC
33	GND
34	GND
35	LVDS0_D3-
36	LVDS1_D3-
37	LVDS0_D3+
38	LVDS1_D3+
39	NC
40	NC



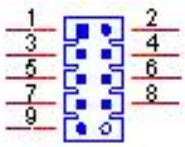
CN32	**eDP**
Part Number	1653910261
Footprint	SPH10X2
Description	B/B Conn 10x2P 1.25mm 180D(M)SMD DF13-20DP-1.25V
Pin	Pin Name
1	GND
2	GND
3	D0-
4	D3-
5	D0+
6	D3+
7	GND
8	NC
9	D1-
10	GND
11	D1+
12	AUX-
13	GND
14	AUX+
15	D2-
16	GND
17	D2+
18	Hot Plug Detect
19	+5V or +3.3V
20	+5V or +3.3V



CN33	SMBus/I²C
Part Number	1655904020
Footprint	FPC4V-125M
Description	WAFER 4P 1.25mm 180D(M) SMD 85205-04001
Pin	Pin Name
1	GND
2	SMB_DAT
3	SMB_CLK
4	+5V



CN34	Internal USB
Part Number	1653003718
Footprint	HD_5x2P_79_RA_N10_21N22050
Description	PIN HEADER 5x2P 2.00mm 90D(M) SMD 21N22050
Pin	Pin Name
1	+V5SB_USB_UTC
2	NC
3	USB6_HUB1_z_P-
4	NC
5	USB6_HUB1_z_P+
6	NC
7	GND
8	NC
9	GND



FAN1	System Fan
Part Number	1655003010
Footprint	WHP3VA
Description	Wafer 2.54mm 3P 180D(M) DIP 22-27-2031
Pin	Pin Name
1	GND
2	+V12
3	N/A

Appendix B

System Assignments

This appendix contains information of a detailed nature. Sections include:

- **System I/O Ports**
- **1st MB Memory Map**
- **Interrupt Assignments**

B.1 System I/O Ports

Table B.1: System I/O Ports

Addr. Range (Hex)	Device
20–2D	Interrupt Controller
2E – 2F	Motherboard resources
30 – 3D	Interrupt Controller
40 – 43	System timer
4E – 4F	Motherboard resources
50 – 53	System timer
61 – 67	Motherboard resources
70 - 7F	System CMOS/real time clock
80 - 92	Motherboard resources
A0 – B1	Interrupt Controller
B2 – B3	Motherboard resources
B4 – BD	Interrupt Controller
272 – 273	Motherboard resources
290 – 29F	Embedded Controller resources
2E8 – 2EF	COM4
2F8 – 2FF	COM2
3B0 – 3DF	Intel® HD Graphics
3E8 – 3EF	COM3
3F8 – 3FF	COM1
400 – 47F	Motherboard resources
4D0 – 4D1	Interrupt Controller
500 – 57F	Motherboard resources

B.2 1st MB Memory Map

Table B.2: 1st MB Memory Map

Addr. Range (Hex)	Device
A0000h - BFFFFh	Intel® HD Graphics
A0000h - BFFFFh	PCI Bus
C0000h - DFFFFh	PCI Bus
E0000h - FFFFFh	PCI Bus
90400000 – 905FFFFF	Intel® Trusted Execution Engine Interface
E0000000 - FEFFFFFF	System resources

B.3 Interrupt Assignments

Table B.3: Interrupt assignments

Interrupt#	Interrupt source
NMI	Parity error detected
IRQ0	System timer
IRQ1	Using SERIRQ, Keyboard Emulation
IRQ2	Slave controller INTR output
IRQ3	Communications Port (COM2)
IRQ4	Communications Port (COM1)
IRQ5	Communications Port (COM4) / iManager WatchDog IRQ
IRQ6	Available
IRQ7	Communications Port (COM3)
IRQ8	Internal RTC or HPET
IRQ9	Microsoft ACPI-Compliant System
IRQ10	Available
IRQ11	Available
IRQ12	Available
IRQ13	Numeric data processor
IRQ14	SATA controller
IRQ15	SATA controller

Appendix C

EC Watchdog Timer Sample Code

C.1 EC Watchdog Timer sample code

```
EC_Command_Port = 0x29Ah
EC_Data_Port = 0x299h
Write EC HW ram = 0x89
Watch dog event flag = 0x57
Watchdog reset delay time = 0x5E
Reset event = 0x04
Start WDT function = 0x28
================================================
.model small
.486p
.stack 256
.data
.code
org 100h
.STARTup

mov dx, EC_Command_Port
mov al,89h          ; Write EC HW ram.
out dx,al

mov dx, EC_Data_Port
mov al, 5Fh         ; Watchdog reset delay time low byte (5Eh is high byte) index.
out dx,al

mov dx, EC_Data_Port
mov al, 30h         ;Set 3 seconds delay time.
out dx,al

mov dx, EC_Command_Port
mov al,89h          ; Write EC HW ram.
out dx,al

mov dx, EC_Data_Port
mov al, 57h         ; Watch dog event flag.
out dx,al

mov dx, EC_Data_Port
mov al, 04h          ; Reset event.
out dx,al

mov dx, EC_Command_Port
mov al,28h          ; start WDT function.
out dx,al

.exit
END
```

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All product specifications are subject to change without notice.