

User Manual

ITA-1610

Fanless Embedded Atom Dual
Core Compact Industrial
Computer

ADVANTECH

Enabling an Intelligent Planet

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In addition, free technical support is available from Advantech engineers every business day. We are always ready to give advice about application requirements or specific information on the installation and operation of any of our products.

Initial Inspection

When you open the carton, please make sure that the following materials have been shipped:

- 1 x ITA-1610 series industrial computer
- 1 x Accessory box
- 1 x Warranty Card

If any of these items are missing or damaged, contact your distributor or sales representative immediately. We have carefully inspected the ITA-1610 mechanically and electrically before shipment. It should be free of marks and scratches and in perfect working order upon receipt. As you unpack the ITA-1610, check it for signs of shipping damage. (For examples: box damage, scratches, dents, etc.) If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also, please notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection, we will make arrangements to repair or replace the unit.

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
8. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
9. All cautions and warnings on the equipment should be noted.
10. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
11. Never pour any liquid into an opening. This may cause fire or electrical shock.
12. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
13. Do not leave this equipment in an environment unconditioned where the storage temperature under 0° C (32° F) or above 40° C (104° F), it may damage the equipment.
14. This equipment has been tested and found to comply with the limits for a Class A digital device. 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.
15. Advantech doesn't provide power component for this product, users should purchase power components with CCC certificate.
16. CAUTION: The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

1. To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
2. Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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Chapter 1

Overview

This chapter provides general information about the ITA-1610.

1.1 Introduction

The ITA-1610 is a fanless compact industrial computer chassis with Atom dual core processor and wide voltage input range, which is specially designed for intelligent transportation applications. This powerful computing platform can withstand operation under harsh conditions 24 hours a day, 7 days a week.

1.2 Specifications

- **System Chipset:** Intel® Atom processor D525 + Intel® ICH8M chipset
- **BIOS:** AMI SPI 16 Mb Flash
- **System Memory:** On-board 1 GB/2 GB DDR3 800
- **Display:** Embedded Gen3.5+GFX Core, Frequency 400 MHz
Up to 256 MB SDRAM shared system memory
- **Dual Display:** Single display resolution up to 2048 x 1536 @ 60 Hz
Dual Display resolution up to 1366 x 768 @ 60 Hz
- **Storage:** Supports 1 x CF slot, 1 x 2.5" HDD slot
- **Expansion Slot:** Supports 1 Mini PCIe slot
- **Ethernet:** 2 x 10/100/1000M Ethernet RJ45 port
- **USB:** 6 x USB2.0
- **VGA:** 2 x VGA
- **Serial I/O:** 2 x COM ports, RS-232/422/485 switchable (4 COM optional for RS-232 switch)
- **Digital I/O:** 1 x 8-ch GPO
- **Audio:** 1 x Speaker out with 2 x 4 w amplifier; 1 Mic input
- **Reserved Zone:** Optional PCA-5650 graphic card expansion for 2 VGA
- **Weight:** 2.26 kg
- **Dimensions (W x D x H):** 200 x 190 x 70 mm

1.3 Power Information

ITA-1610 supports DC 9 ~ 36 V wide voltage input

Table 1.1: Power

DC voltage input	9 V - 36 V
DC current	6.5 A - 3.25 A
DC power interface	2P Phoenix (European Standard)

1.4 Environmental Specifications

Table 1.2: Environmental Specifications

Operating Temperature	With industrial HDD: 0 ~ 40°C With CF card: -25 ~ 60 °C
Storage Temperature	-40 ~ 85°C
Humidity	95% @ 40° C, non-condensing
Vibration	With industrial HDD: 2 Grms @ 5 ~ 500 Hz, random, 1 hr/axis With CF card: 20 G, IEC-68-2-27, half sine wave, 11 ms duration
Safety	UL, CCC, CE, FCC, CB and BSMI compliant

1.5 Dimension Diagram

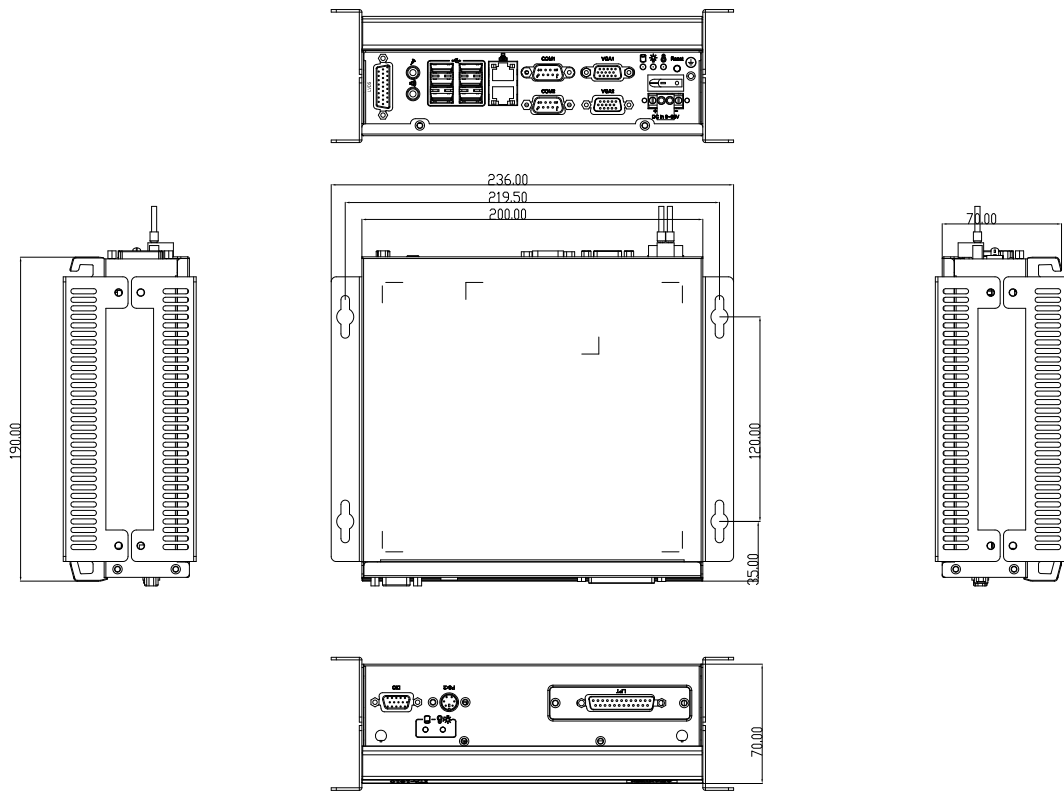


Figure 1.1 Dimension Diagram of ITA-1610

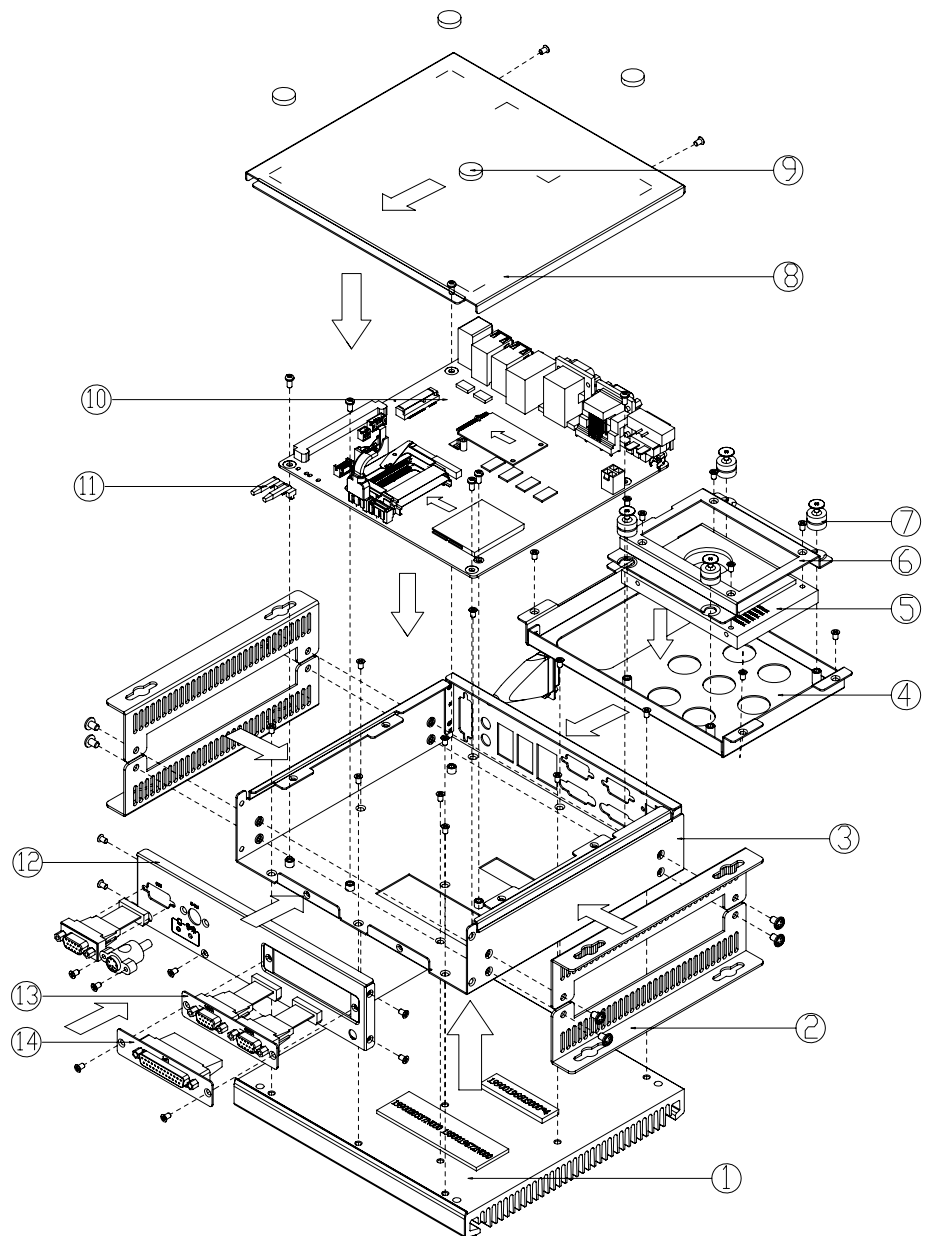


Figure 1.2 Exploded Diagram of ITA-1610

Table 1.3: Part List

1	Heat sink	8	Chassis top cover
2	Chassis foot stand	9	Rubber cushion
3	Chassis bracket	10	Main board
4	HDD bracket	11	Light pipe
5	HDD	12	Front panel
6	HDD fixed bracket	13	VGA shield module
7	HDD buffer cushion	14	LPT shield module

Chapter 2

H/W Installation

This chapter provides H/W Installation about the ITA-1610.

2.1 Introduction

The following sections show the internal jumpers setting and the external connectors pin assignments for application integration.

2.2 System Status Indicators

2.2.1 System Status LED Indicators

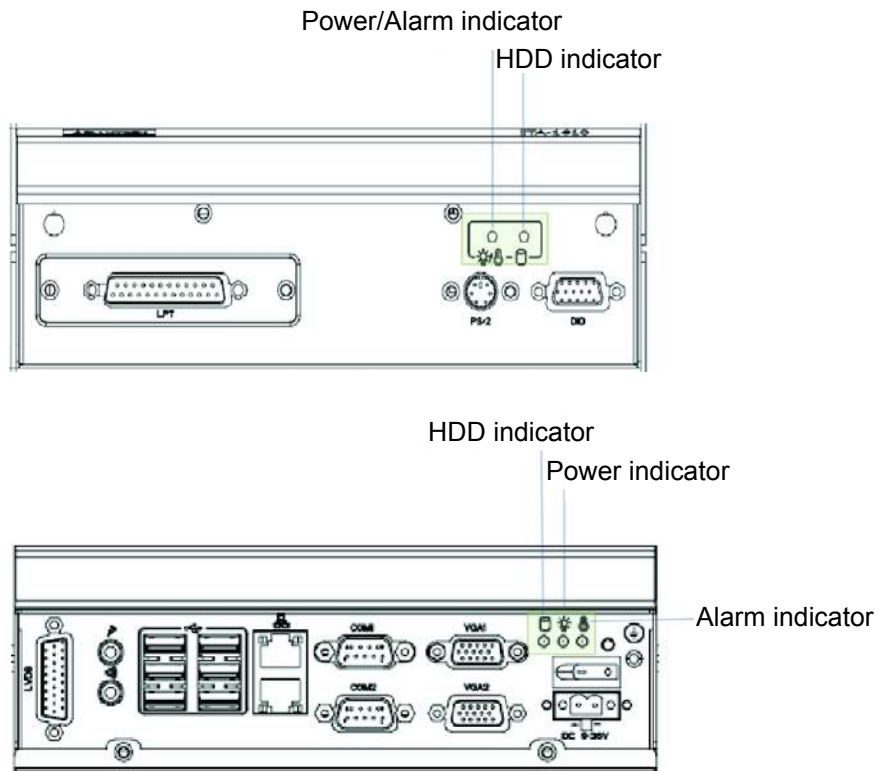


Figure 2.1 Front view

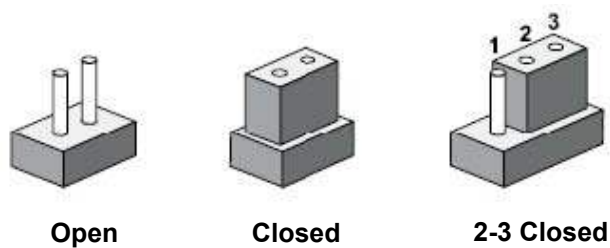
Refer to below table for a LED definition summary.

Item	LED	Status	Color	Description
1	PWR/FAULT	On	Green	System power is on, system is safe
		On	Red	System voltage overheated
2	HDD	On	Yellow	Data being received/transmitted
		Off		No data being received/transmitted

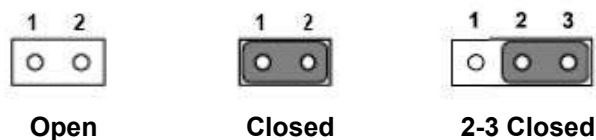
2.3 Jumpers and Connector

2.3.1 Jumper Description

You may configure the ITA-1610 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 remove the clip. Sometime a jumper will have three pins, labelled 1, 2 and 3. In this case you would connect either pins 1 and 2, or 2 and 3.



The jumpers setting are schematically depicted in this manual as follows.



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.

2.3.2 Jumper and Connector Location

The board has a number of connectors and jumpers that allow you to configure your system to suit your application. The table below lists the function of each of the connectors and jumpers. The locations of jumpers and connector on the board are shown in Fig 2.3 and Fig 2.4.

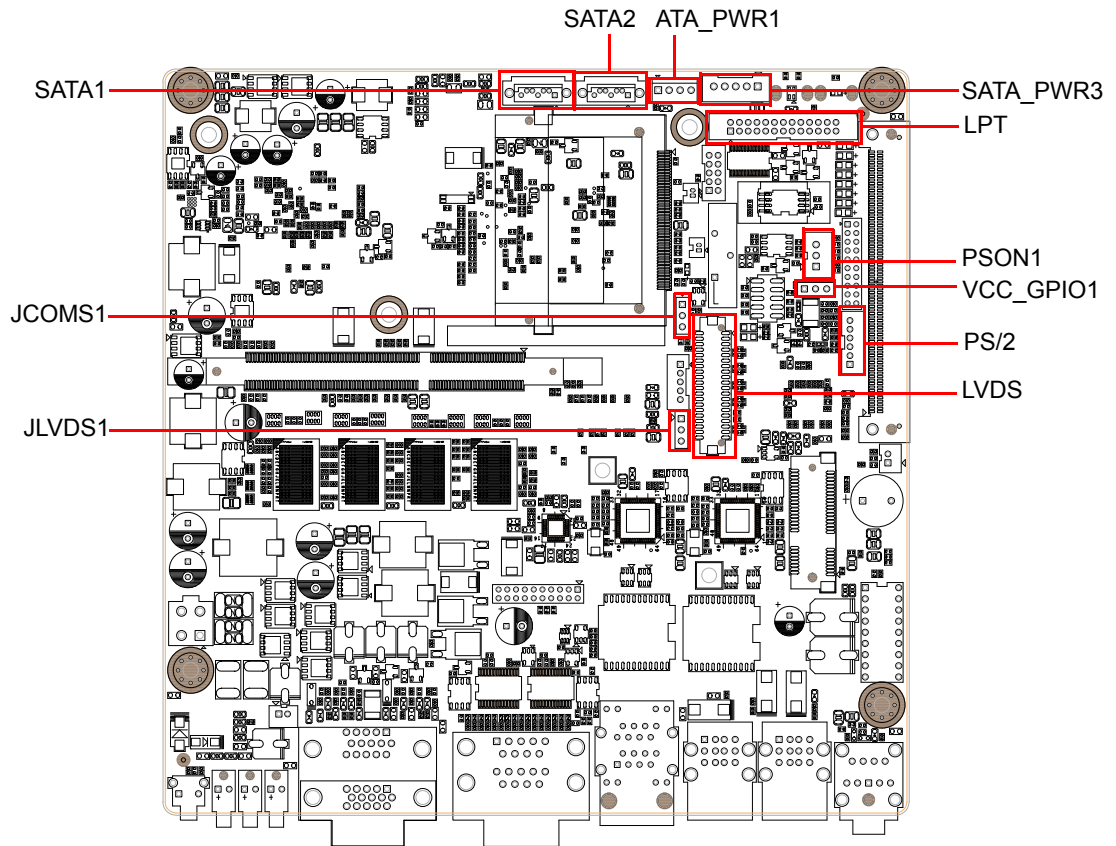


Table 2.1: Jumpers

Label	Function
JLVDs1	LVDS voltage selection
JCOMS1	Clear CMOS settings
VCC_GPIO1	GPIO voltage selection
PSON1	Start-up mode selection
SATA1	SATA data interface 1
SATA2	SATA data interface 2
LPT1	Parallel port
PS2	Keyboard/mouse

Table 2.2: JLVDs1: LVDS Voltage Selection

Closed Pins	Result
1-2	+V5
2-3	Normal (+3.3 V)*
*Default	



Table 2.3: JCOMS1: CMOS Clear Function

Closed Pins	Result
1-2	Normal (+V3.3_SB)
2-3	Clear CMOS

* Default setting



Table 2.4: VCC_GPIO1: GPIO Voltage Selection

Closed Pins	Result
1-2	Normal (+V5_SB)*
2-3	+V3.3_SB

*Default

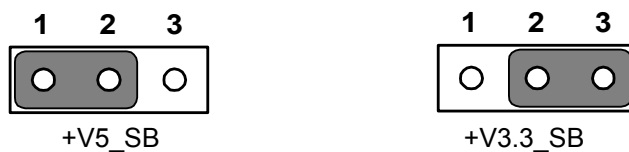


Table 2.5: PSON1: Startup-up Mode Selection

Closed Pins	Result
1-2	AT Mode
2-3	ATX Mode*

*Default



2.4 Rear I/O Connectors

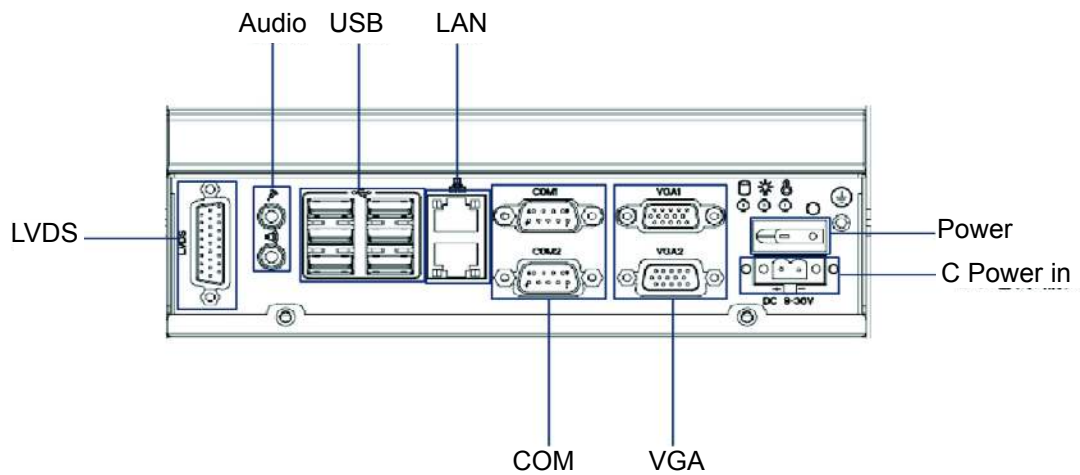
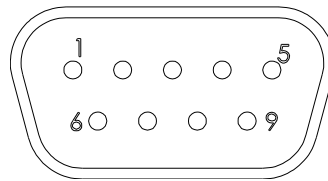


Figure 2.2 ITA-1610 Rear I/O Interfaces

2.4.1 COM Connector

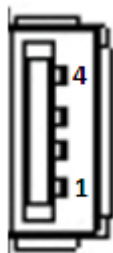
ITA-1610 series provides up to two D-sub 9-pin connectors for RS-232/422/485.



	RS-232	RS-422	RS-485
Pin	Signal Name	Signal Name	Signal Name
1	DCD	Tx-	DATA-
2	RxD	Tx+	DATA+
3	TxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC

2.4.2 USB Connector

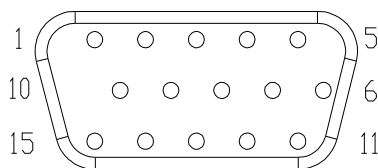
ITA-1610 series provides six USB interface connectors, which are USB UHCI, Rev. 2.0 compliant. The USB interface can be disabled in the system BIOS setup.



Pin	Signal Name
1	+V5(VCC)
2	USB_data-
3	USB_data+
4	GND

2.4.3 VGA Connector

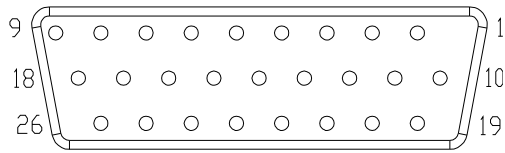
ITA-1610 offers two standard VGA Interface connectors by D-sub 15-pin female connector.



Pin	Signal Name
1	Red
2	Green
3	Blue
4	NC
5	GND
6	GND
7	GND
8	GND
9	+5 V
10	GND
11	NC
12	DDC-DATA
13	H-SYNC
14	V-SYNC
15	DDC-CLK

2.4.4 LVDS Connector

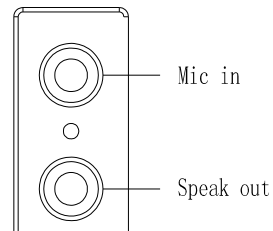
ITA-1610 provides one LVDS interface, which could connect a monitor through cables.



Pin	Signal name	Pin	Signal name
1	TXL0+	2	TXL1+
3	TXL2+	4	TXL3+
5	NC	6	NC
7	NC	8	NC
9	NC	10	TXLCLK-
11	TXL0-	12	TXL1-
13	TXL2-	14	TXL3-
15	NC	16	INNVCC
17	BLENABLE	18	GND
19	TXLCLK+	20	LCDVCC
21	NC	22	GND
23	GND	24	GND
25	GND	26	NC

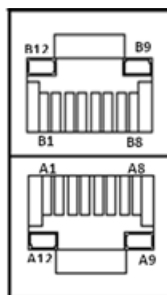
2.4.5 Audio in Connector

ITA-1610 provides one integrated Mic-in/speaker out audio connector.



2.4.6 LAN Connector

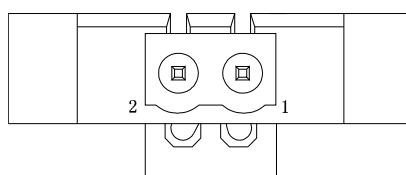
ITA-1610 Series provide two Intel 82583V Ethernet controllers, which are fully compliant with IEEE 802.3u 10/100/1000 Mbps standard.



Pin	Signal name	Signal name
A1/B1	MDIO0+	MDIO0+
A2/B2	MDIO0-	MDIO0-
A3/B3	MDIO1+	MDIO1+
A4/B4	MDIO2+	MDIO2+
A5/B5	MDIO2-	MDIO2-
A6/B6	MDIO1-	MDIO1-
A7/B7	MDIO3+	MDIO3+
A8/B8	MDIO3-	MDIO3-
A9/B9	LED GREEN-	LED GREEN-
A10/B10	LED GREEN+	LED GREEN+
A11/B11	1000M LED	1000M LED
A12/B12	100m/10M LED	100m/10M LED

2.4.7 Phoenix Terminal Connector

ITA-1610 provides one 2-pin phoenix terminal connectors for power input.



Pin	Signal name
1	Positive pole
2	GND

2.5 Front I/O Connectors

ITA-1610: 1 x PS/2, 1 x 8-ch DI/O, 1 x LPT (can be expanded to 2 x VGA by PCA-5650, optional)

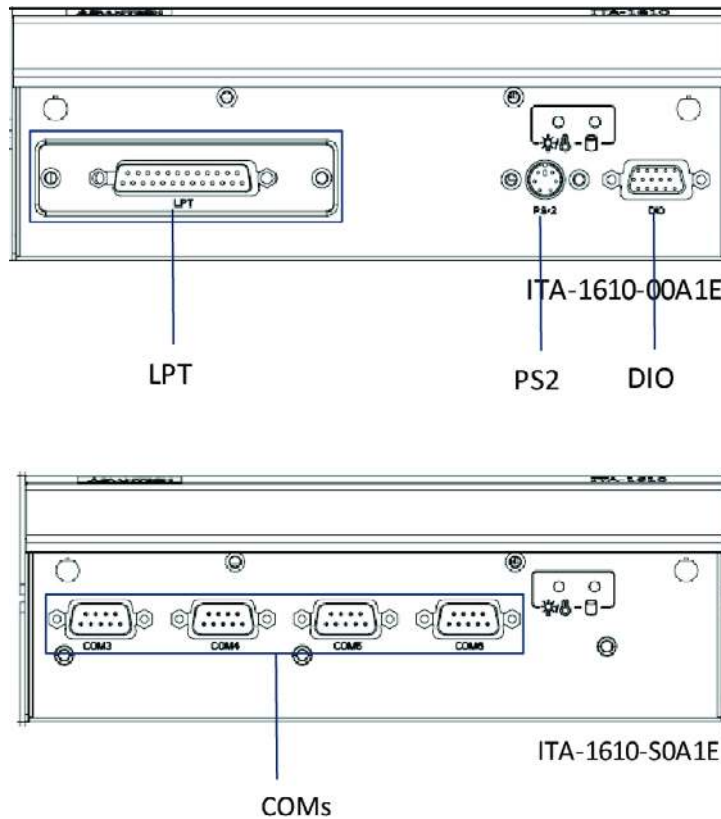
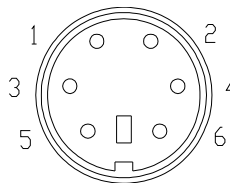


Figure 2.3 ITA-1610 Front I/O Connectors

2.5.1 PS/2 Connector

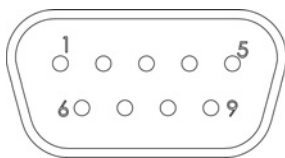
ITA-1610-00A1E provides one PS/2 interface for mouse or keyboard connection.



Pin	Signal name
1	KB_Z_DAT
2	MS_Z_DAT
3	GND
4	+V5_PS2
5	KB_Z_CLK
6	MS_Z_CLK

2.5.2 DIO Connector

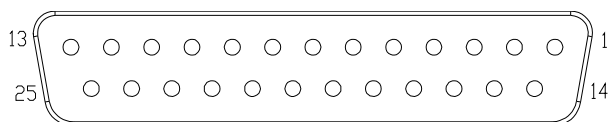
ITA-1610 00A1E provides one 8-bit DIO connector.



Pin	Signal Name	Pin	Signal Name
1	GPIO0	6	GPIO4
2	GPIO1	7	GPIO5
3	GPIO2	8	GPIO6
4	GPIO3	9	GPIO7
5	GND	?	?

2.5.3 LPT Connector

ITA-1610-00A1E provides one LPT interface (in the accessory box, replace by yourself), which could connect a monitor through cables.



Pin	Signal Name	Pin	Signal Name
1	LPT_z_STB#	14	LPT_AFD#
2	LPT_z_PD0	15	LPT_ERR#
3	LPT_PD1	16	LPT_INIT#
4	LPT_PD2	17	LPT_SLIN#
5	LPT_PD3	18	GND
6	LPT_PD4	19	GND
7	LPT_PD5	20	GND
8	LPT_PD6	21	GND
9	LPT_PD7	22	GND
10	LPT_ACK#	23	GND
11	LPT_BUSY	24	GND
12	LPT_PE	25	GND
13	LPT_SLCT	26	NC

Chapter 3

System Setup

This chapter introduces the installation process of ITA-1610.

3.1 Introduction

The following procedures will instruct you to install all modules into the ITA-1610 system.

3.1.1 Install Mainboard CF Card

ITA-1610 mainboard front panel has a CF card slot, you can insert a CF card into it directly.

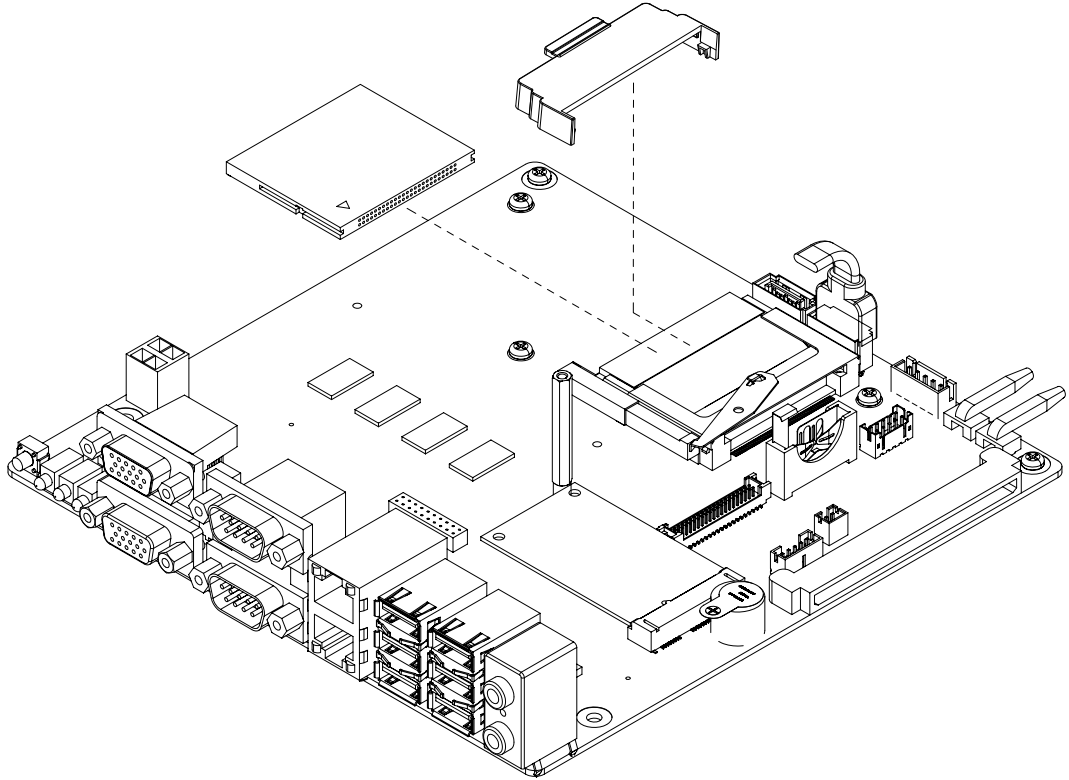


Figure 3.1 Installing Mainboard CF Card

3.1.2 Installing Mini PCIe Card

The ITA-1610 mainboard support a Mini PCIe expansion card. please refer the below installation procedure.

1. Insert a Mini PCIe card into mainboard PCIe slot.
2. Lock and fix the Mini PCIe card by a copper pillar.

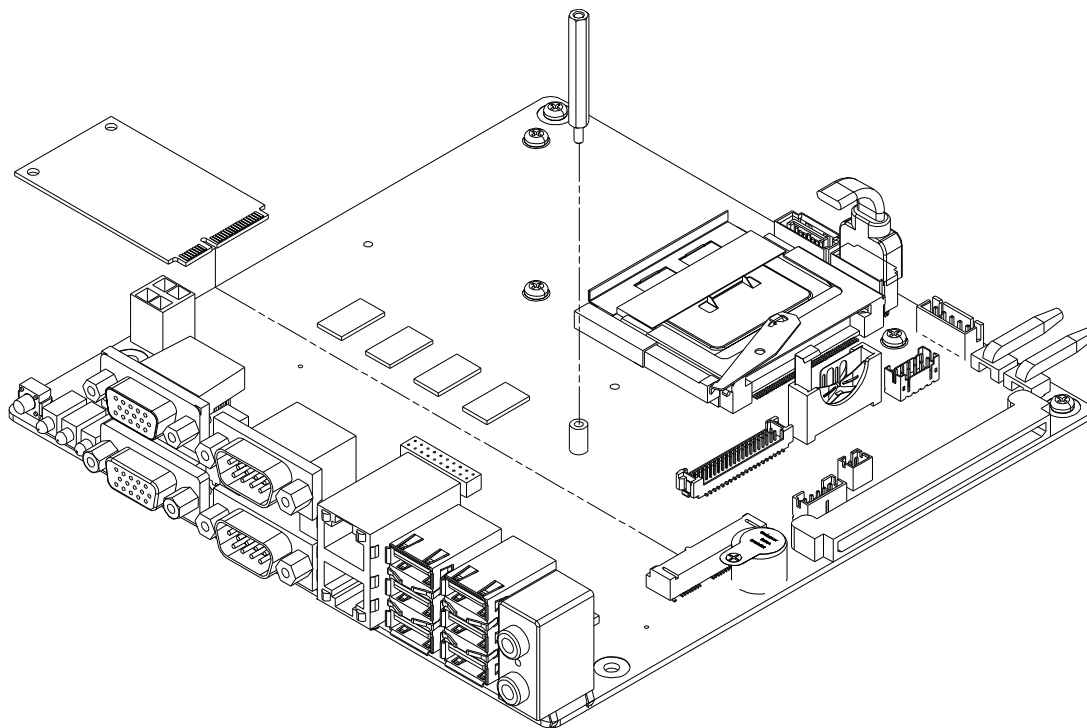


Figure 3.2 Installing Mini PCIe Card

3.1.3 Installing the HDD Module

The ITA-1610 reserves a space for a 2.5" HDD module. Please refer to the following instructions to install the hard disk drive.

1. Place the HDD into 2.5" HDD holder, and lock it with 4 screws.
2. HDD holder has 4 semi-circles (2 bigger and 2 smaller) on both sides, which are used to place rubber cushions, the black ones for bigger semi-circles and transparent ones for smaller semi-circles.
3. Place the HDD holder onto HDD bracket, and secure it with 4 screws.
4. Connect the complete HDD module to the chassis and fix it with 4 screws.
5. Stick the cooling pad onto the PCB panel of HDD. Please align the cooling pad with the magnetic head to protect the head from being covered.

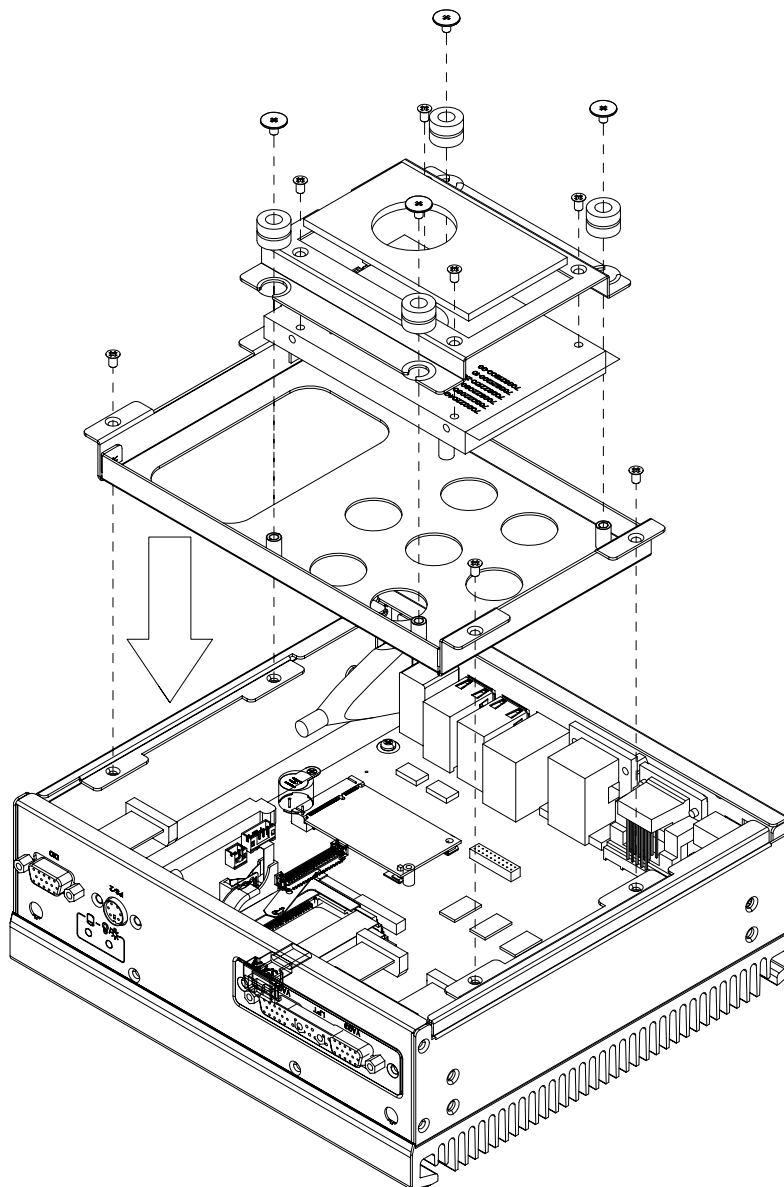


Figure 3.3 Installing the HDD Module

3.1.4 Installing the Top Cover

Please follow the procedures below to install chassis top cover.

1. Insert the top cover on the chassis front panel from the opening point and place it well.
2. Fix the chassis top cover with 4 screws.

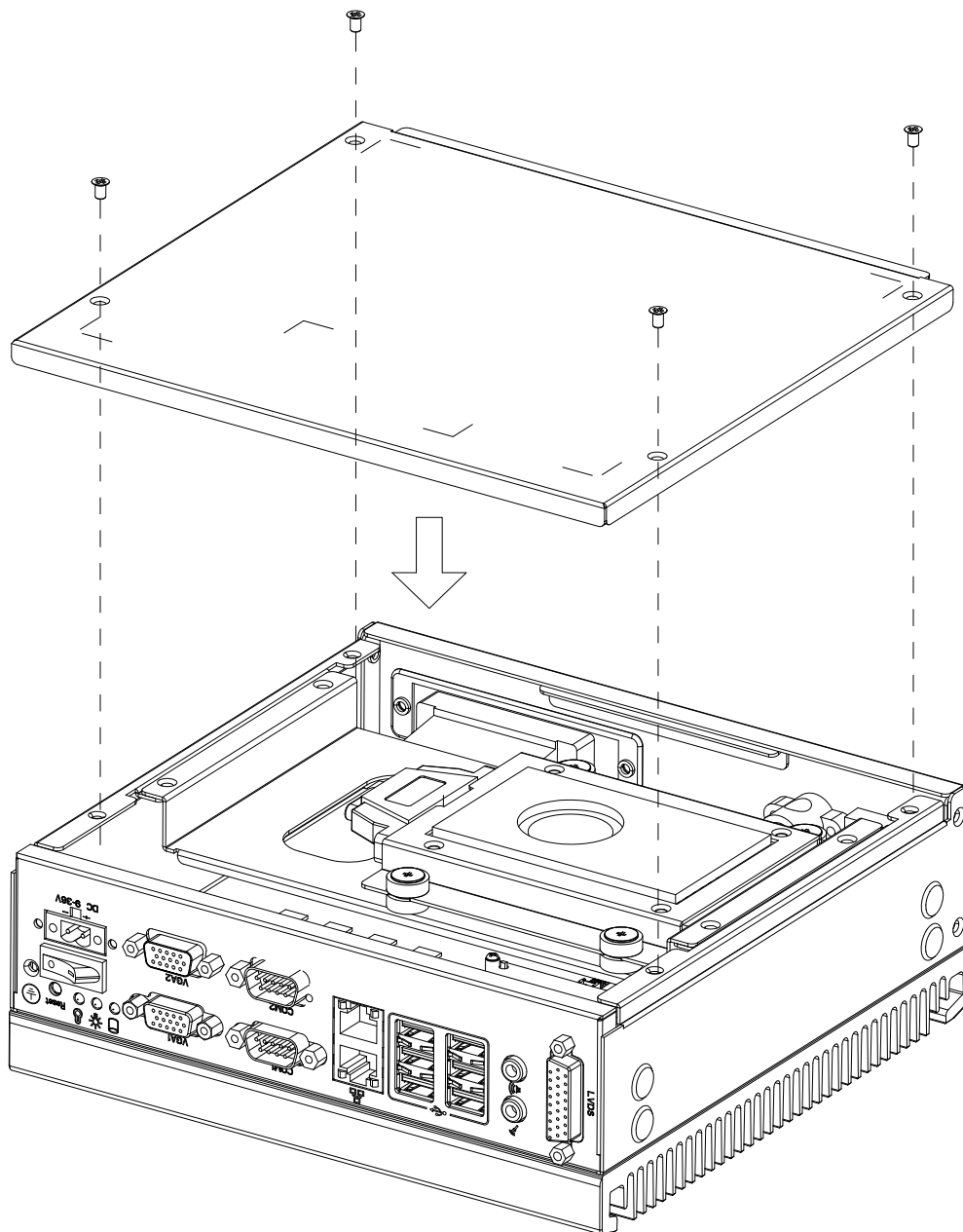


Figure 3.4 Installing the Top Cover

3.1.5 Installing the Foot Stand

Align the 2 foot stands with the screw holes in the chassis side panel, and secure them with screws. Top and bottom installation are both supported. (See Fig 3.5)

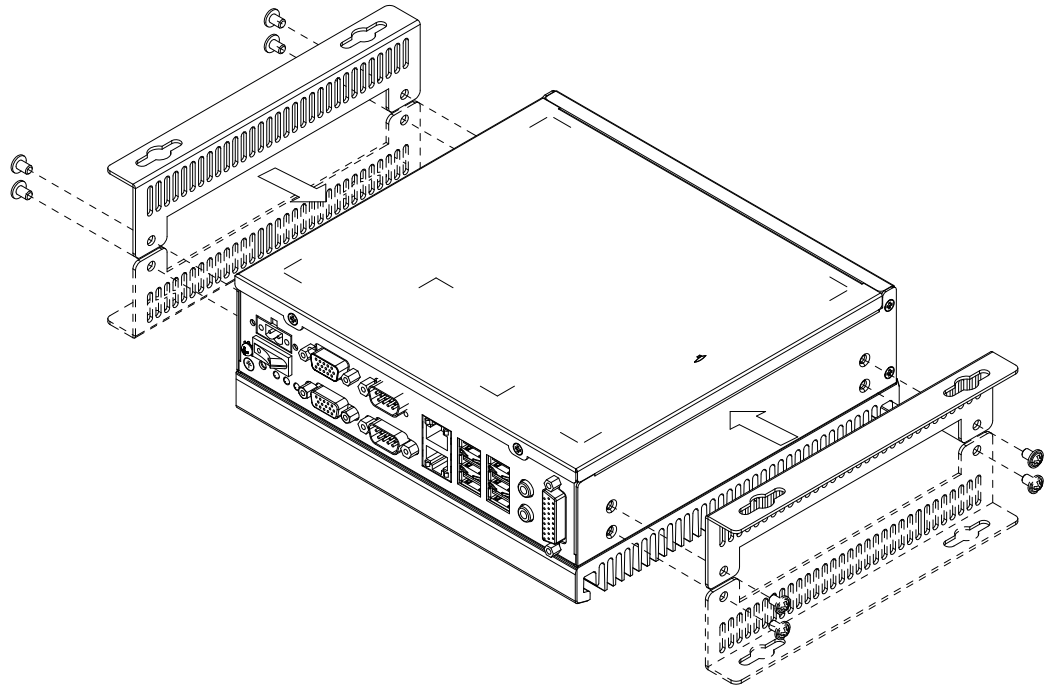


Figure 3.5 Installing the Foot Stand

Chapter 4

AMI BIOS

This chapter introduces how to configure AMI BIOS.

4.1 Introduction

AMIBIOS has been integrated into many motherboards for over a decade. This chapter introduces how to configure BIOS for ITA-1610 series. With the AMIBIOS Setup program, you can modify BIOS settings and control the special features of your computer. The Setup program uses a number of menus for making changes and turning the special features on or off. This chapter describes the basic navigation of the ITA-1610 setup screens.

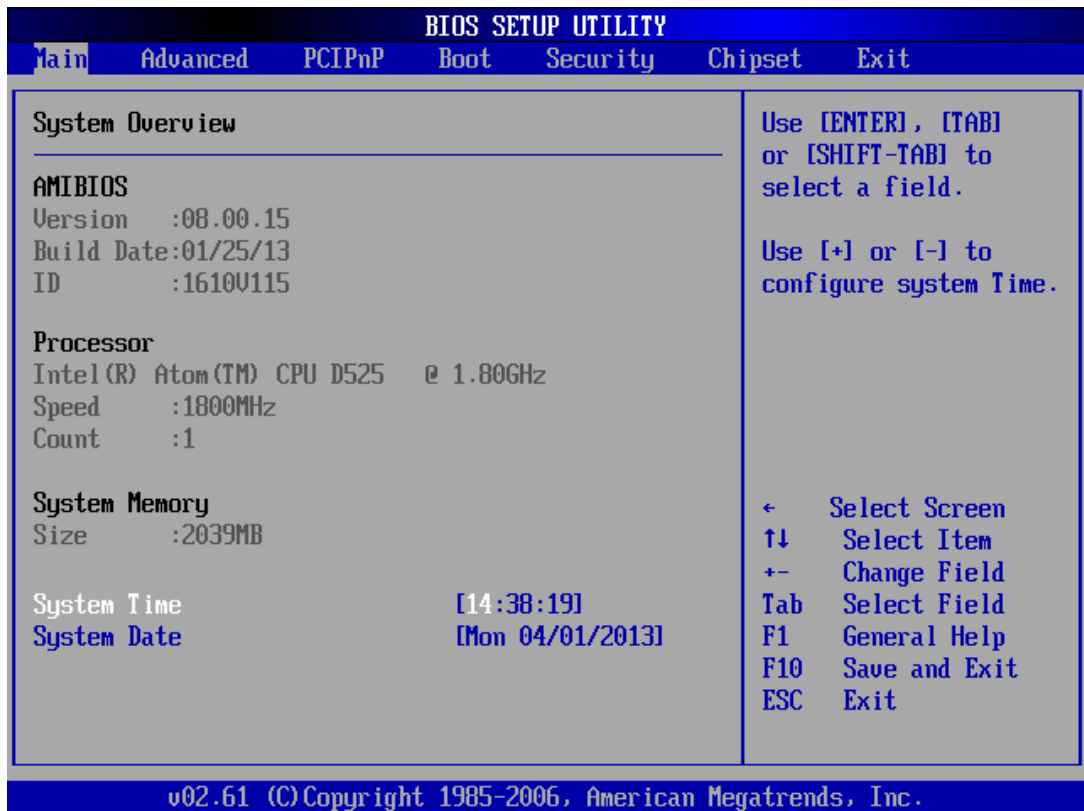


Figure 4.1: Setup Program Initial Screen

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

4.2 Entering Setup

Turn on the computer to enter POST screen where BIOS and CPU information will be shown. Press and you will immediately be allowed to enter Setup.

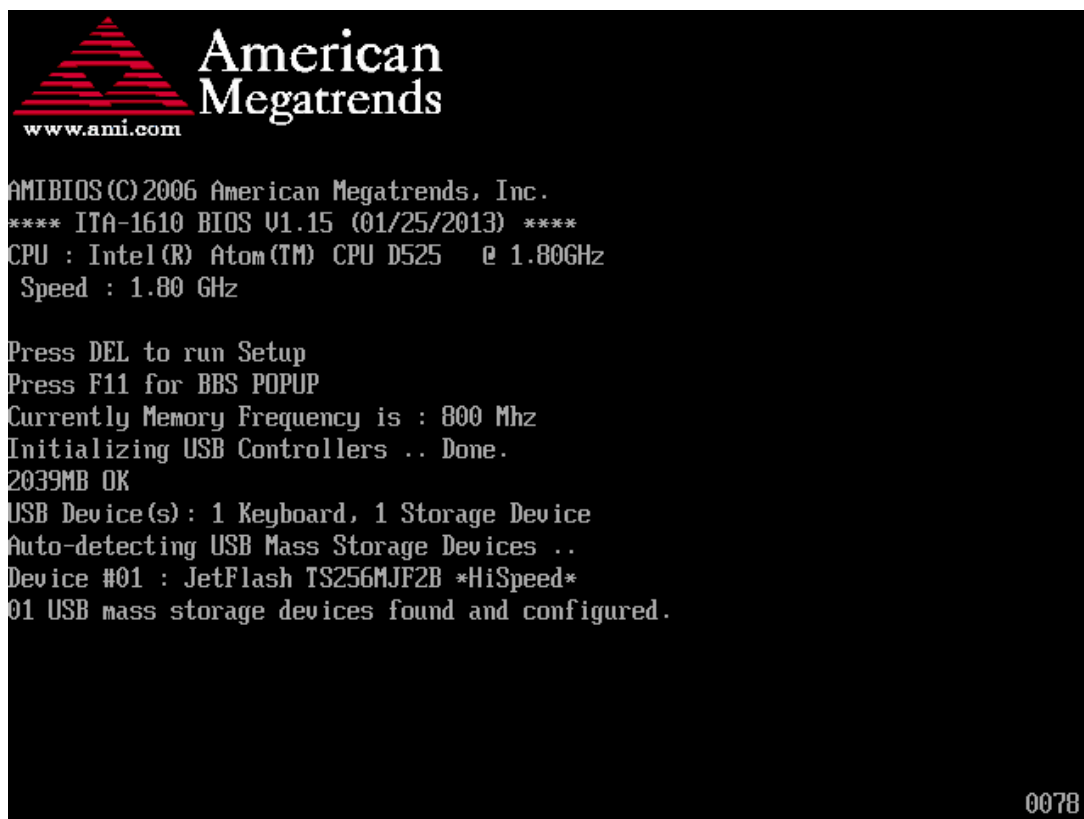


Figure 4.2: Press to Enter Setup

4.2.1 Main Setup

When you first enter the BIOS Setup Utility, you will enter 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.

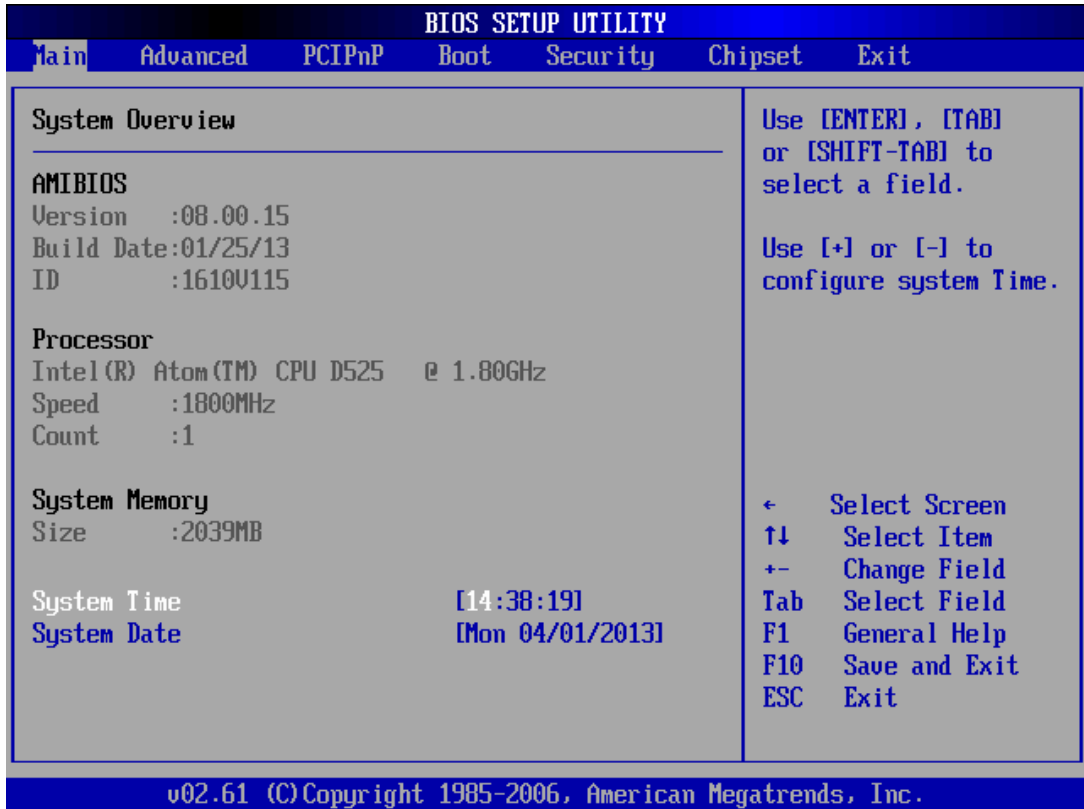


Figure 4.3: Main Setup Screen

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.

4.2.2 Advanced BIOS Features Setup

Select the Advanced tab from the ITA-1610 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 screen is shown below. The sub menus are described on the following pages.

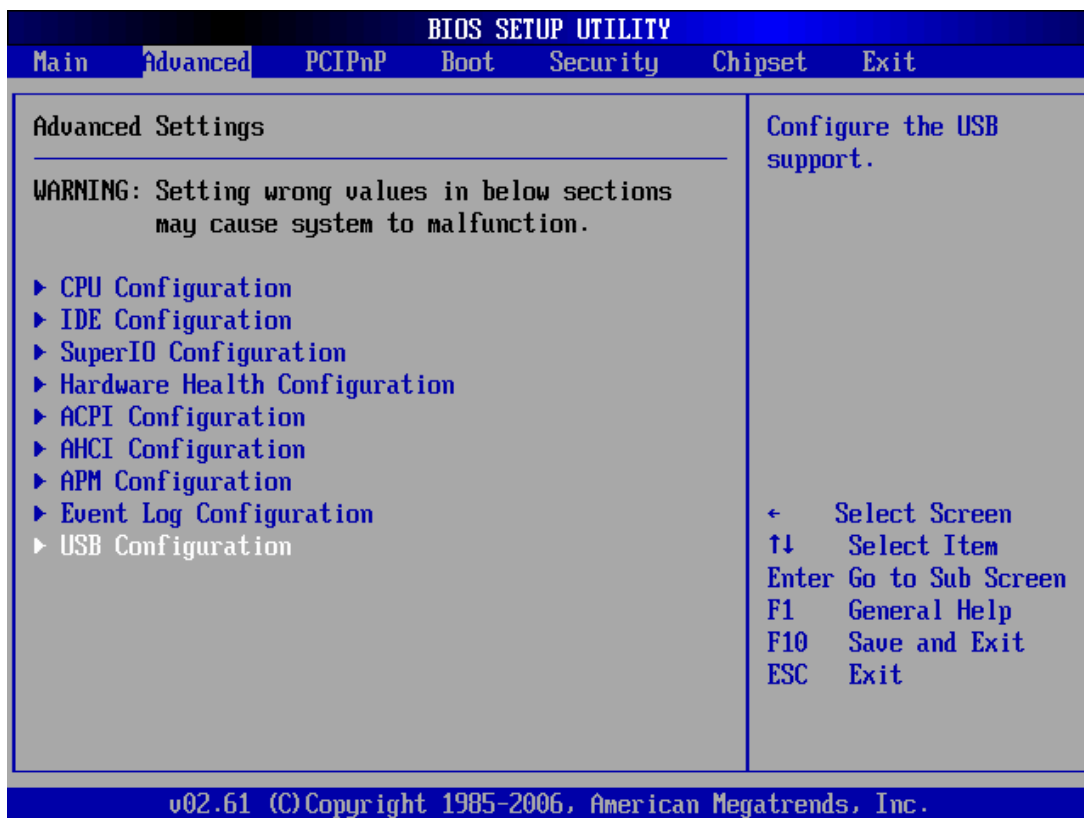


Figure 4.4: Advanced BIOS Features Setup Screen

4.2.2.1 CPU Configuration

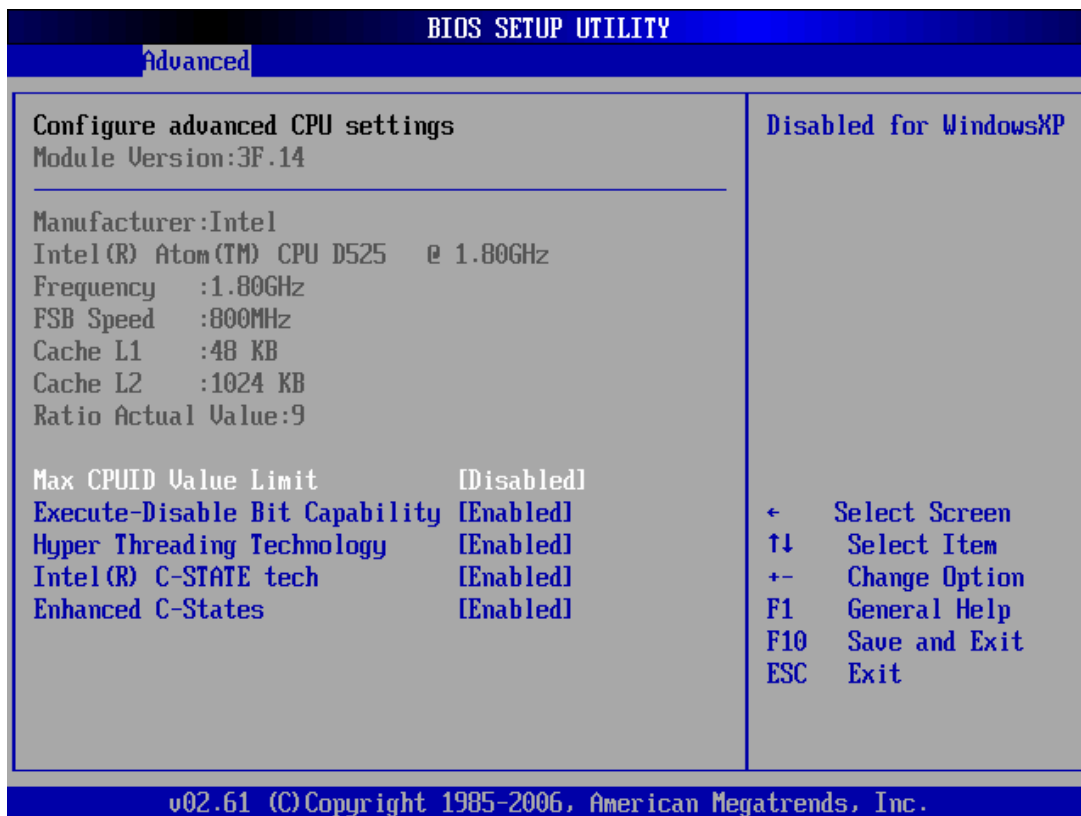


Figure 4.5: CPU Configuration

- **Max CPUID Value Limit**
This item allows users to configure max CPUID Value Limit.
- **Execute-Disable Bit Capability**
This item allows users to enable or disable Execute Disable Bit Feature. The default setting is "Enabled".
- **Hyper Threading Technology**
This item allows users to enable or disable Intel Hyper Threading Technology. The default setting is "Enabled".
- **Intel(R) C-STATE tech**
This function saves CPU power consumption in system halt states.
- **Enhanced C-States**
This item is used to enable/disable any C-states. Default setting is "Enabled".

4.2.2.2 IDE Configuration

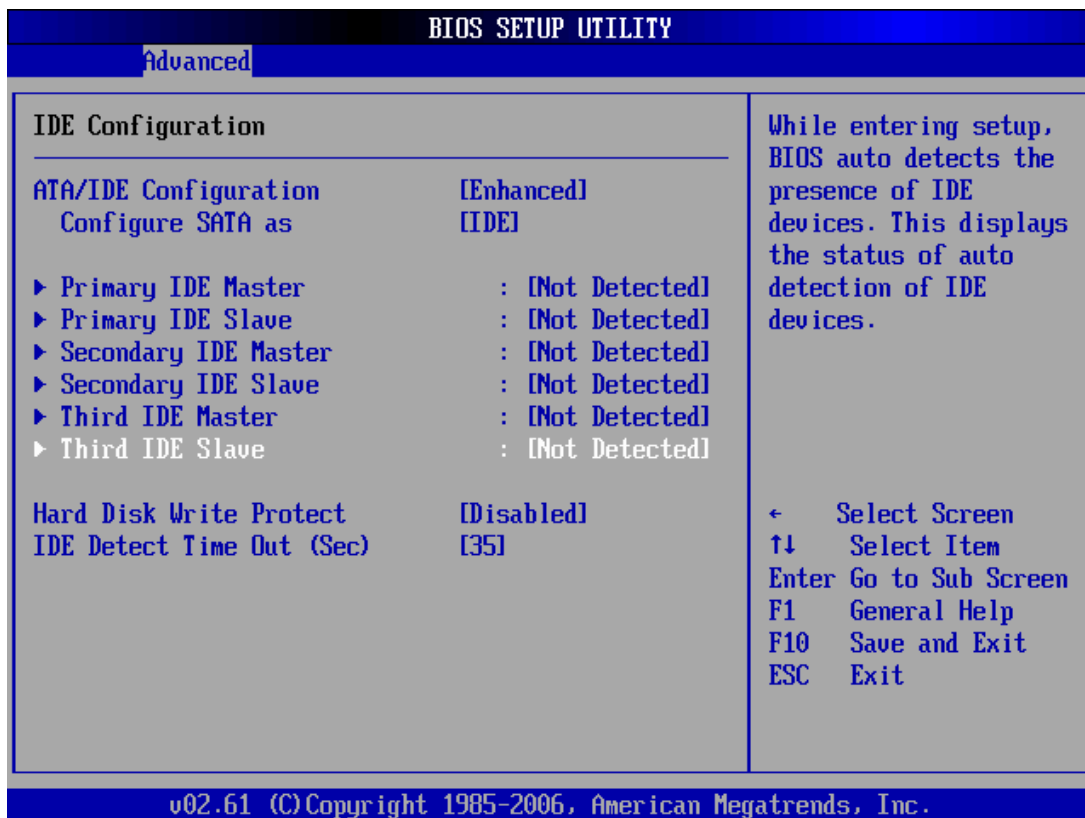


Figure 4.6: IDE Configuration

- **IDE Configuration**
The default setting is “Enabled”. It will enable all SATA resources when enabled.
- **Enhanced Mode**
This has two options: IDE and AHCI. The default setting is “IDE”, Legacy IDE Mode Setting.
- **Primary/Secondary/Third/Fourth IDE Master and Slave**
While entering setup, BIOS auto detects the presence of IDE devices. This displays the status of auto detection of IDE devices.
 - **Type: Select SATA driver type.** The options are [Not installed], [Auto], [CD/DVD] and [ARMD].
 - **LBA/Large Mode: Enable or disable LBA mode.**
 - **Block (Multi-Sector Transfer): Enable or disable multi-sector data transfer.**
 - **PIO Mode: Select PIO mode.**
 - **DMA Mode: Select DMA mode.**
 - **S.M.A.R.T.: Select intelligent monitoring, analysis and report technology**
 - **32Bit Data Transfer: Enable or disable 32-bit data transfer.**
- **Hard Disk Write Protect**
Enable or disable device write protect feature. This item is only available when the device is visited through BIOS. And it is only effective under DOS. The default configuration is “Disabled”.
- **IDE Detect Time Out (Sec)**
This item allows users to detect ATA/ATAPI device’s time out value. The default value is “35”.

4.2.2.3 Super I/O Configuration

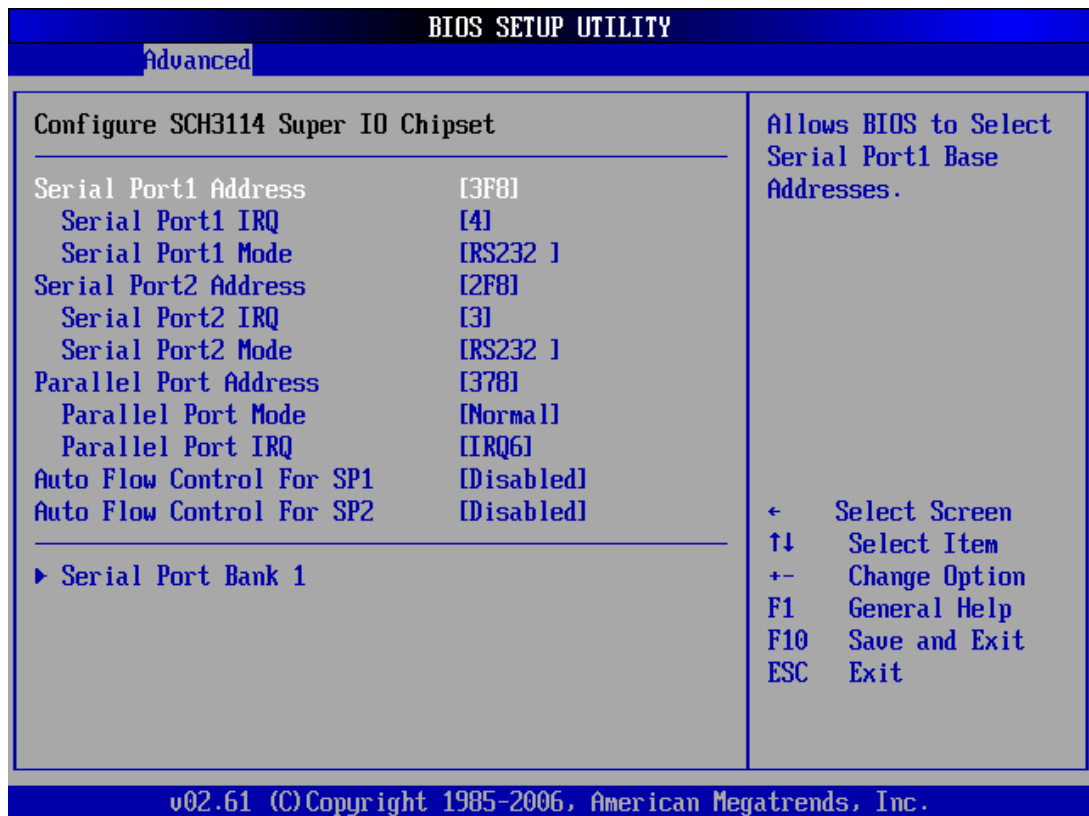


Figure 4.7: Super I/O Configuration

- **Serial Port1/2/ Address and IRQ and Mode setting**
This option configures serial port 1/2 base addresses and IRQ, as well as RS-232/422/485 mode.
- **Parallel Port Address and IRQ and Mode setting**
This option configures parallel port base addresses and IRQ, as well as RS-232/422/485 mode.
- **Auto Flow Control For Serial Port1**
This option configures serial port 1's 485 protocol. Options are "Enabled" and "Disabled".
- **Auto Flow Control For Serial Port2**
This option configures serial port 2's 485 protocol. Options are "Enabled" and "Disabled".

4.2.2.4 Hardware Health Configuration

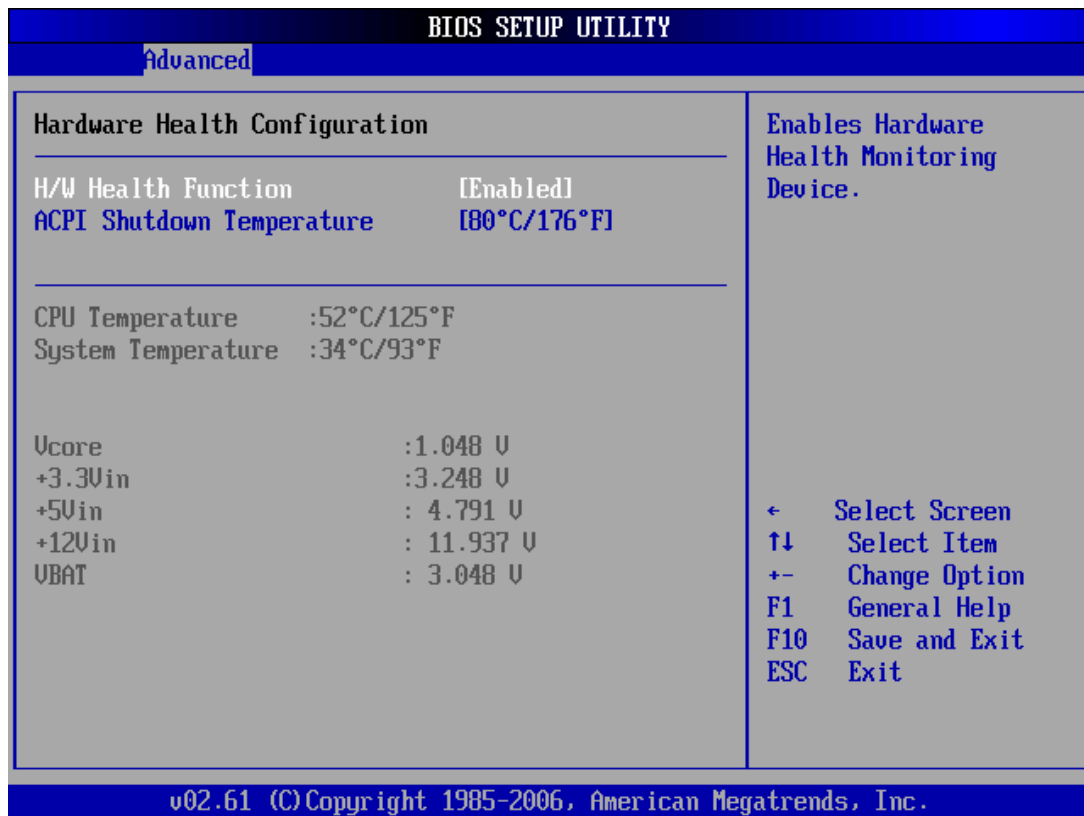


Figure 4.8: Hardware Health Configuration

- **H/W Health Function**
This item is used to enable hardware monitoring function.
- **ACPI Shutdown Temperature**
Use this to set the ACPI shutdown temperature threshold. When the system reaches the shutdown temperature, it will automatically shutdown to protect the system from over heating damage. Users can view system temperature, CPU temperature and fan states here.

4.2.2.5 ACPI Configuration

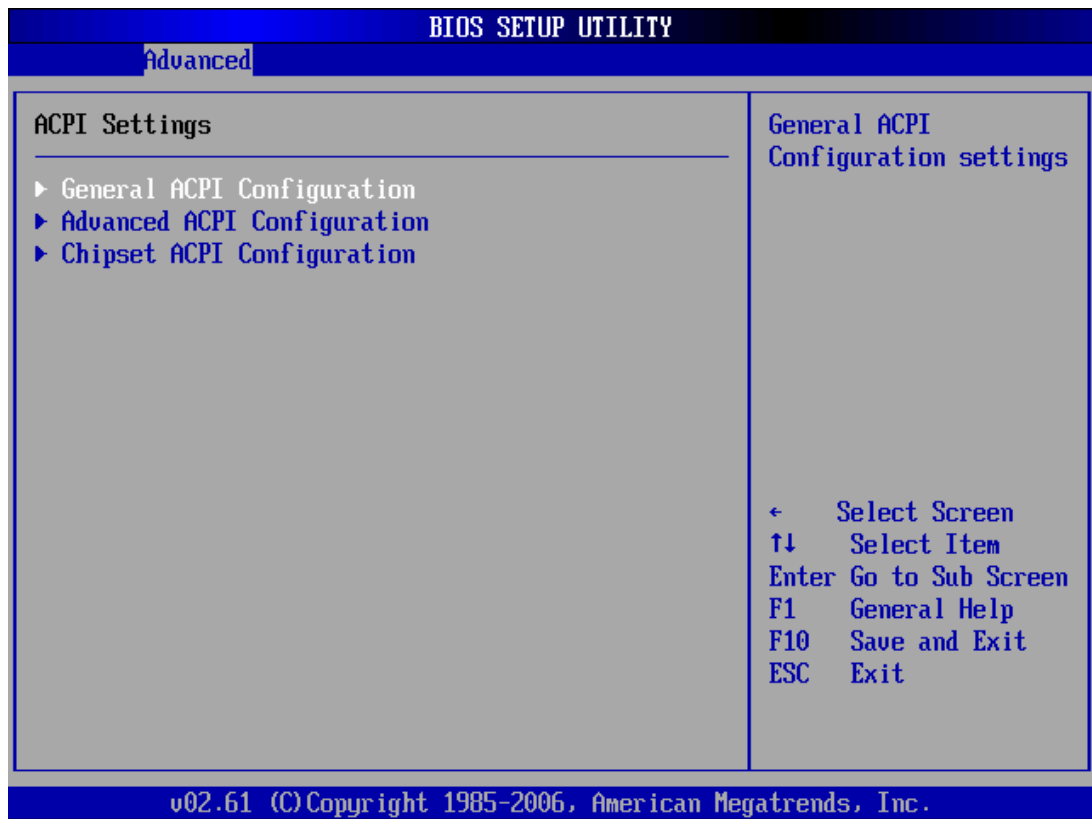


Figure 4.9: ACPI Settings

Note! The power mode is set as "ATX" by default. Only Advanced ACPI Configuration option is available when being changed as "AT".



■ General ACPI Configuration

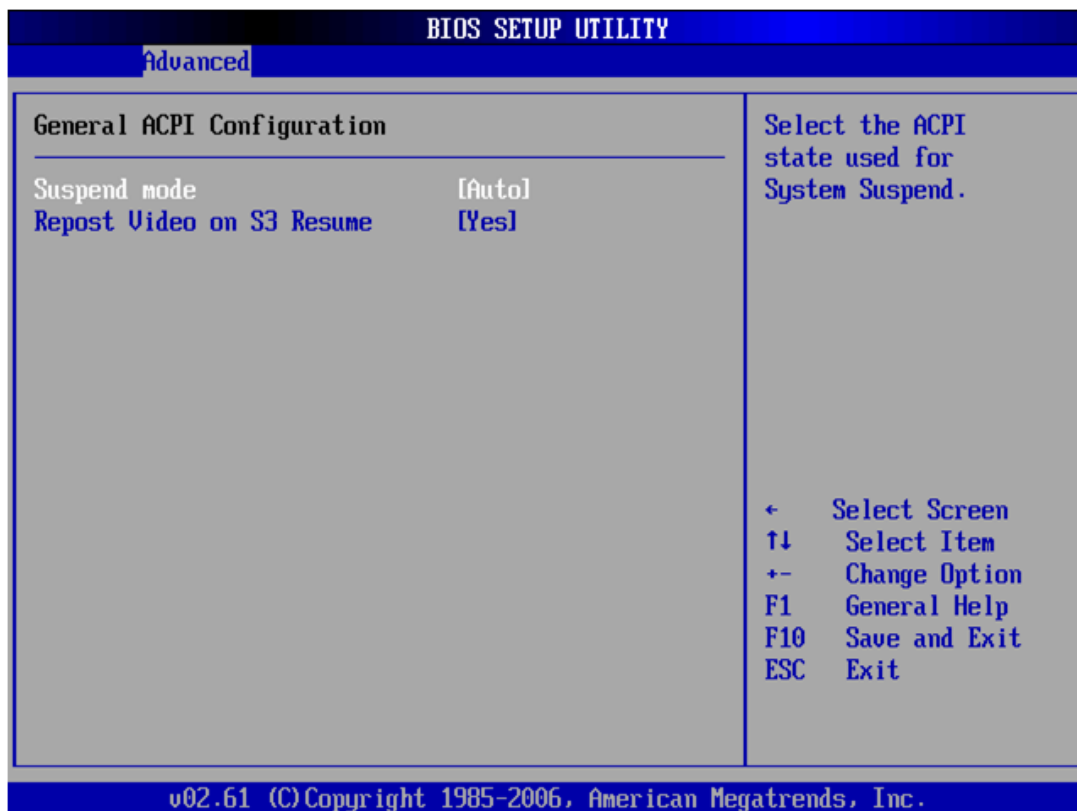


Figure 4.10: General ACPI Configuration

- **Suspend mode**
Select ACPI state for system hibernation. The default setting is “Auto”.
- **Repost Video on S3 Resume**
Confirm whether to call VGA BIOS when system recovers from S3/SRT. The default setting is “Yes”.

■ Advanced ACPI Configuration

Users can configure other ACPI items here.



Figure 4.11: Advanced ACPI Configuration

– **ACPI version features**

This item allows users to enable RSDP pointer for 64-bit fixed system specification table. Set this item to allow or forbid system to comply with ACPI 1.0/2.0/3.0 specification.

– **ACPI APIC Support**

Enable or disable table pointer to align RSDT pointer. The default setting is "Enabled".

– **AMI OEMB table**

Enable or disable ACPI OEMB table pointer to align RSDT pointer. The default setting is "Enabled".

– **Headless mode**

Enable or disable Headless operation mode by ACPI. The default setting is "Disabled".

■ Chipset ACPI Configuration

This item is used to configure other ACPI options.



Figure 4.12: Chipset ACPI configuration

- **Energy Lake Feature**
Can be enabled or disabled. The default setting is “Disabled.”
- **APIC ACPI SCI IRQ**
Can be enabled or disabled. The default setting is “Disabled.”
- **USB Device Wakeup From S3**
Can be enabled or disabled. The default setting is “Disabled.”
- **High performance Event Timer**
Can be enabled or disabled. The default setting is “Disabled.”
- **HPET Memory Address**
Set HPET memory address. The default setting is “FED00000h”.

4.2.2.6 AHCI Configuration

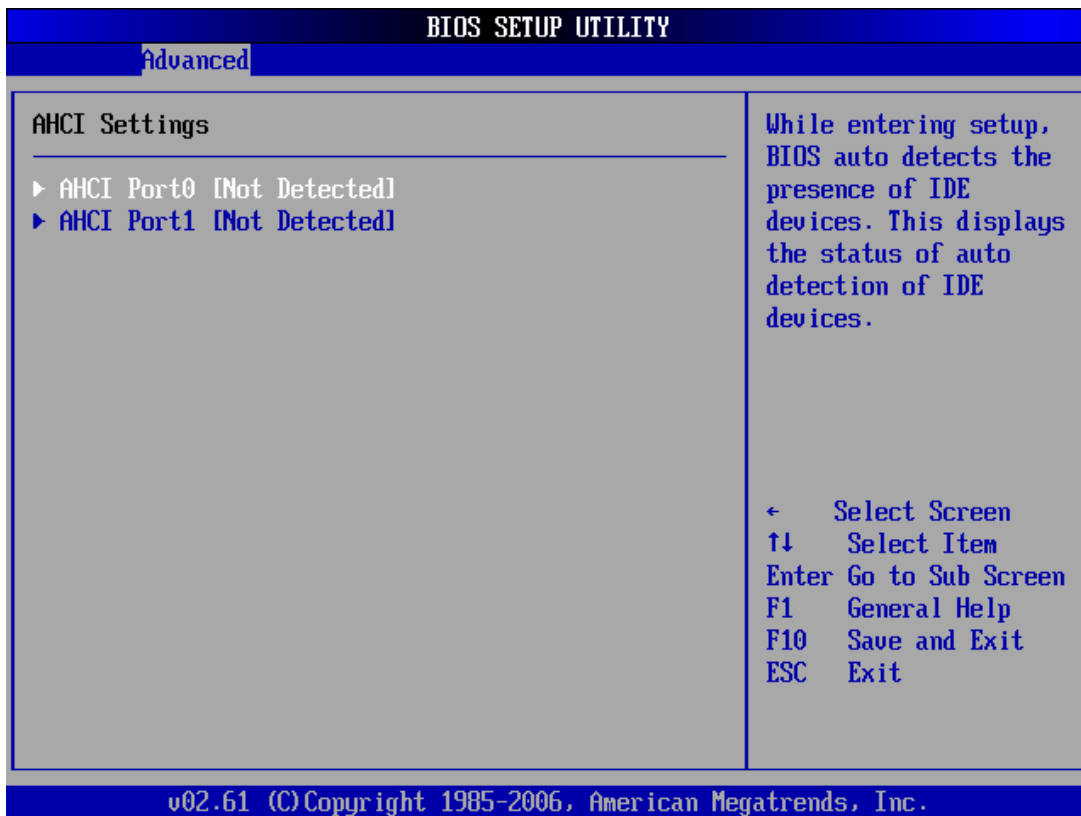


Figure 4.13: AHCI Configuration

■ AHCI Port0 /Port1 Detect

When entering setup screen, BIOS will automatically detect SATA device, and show the state of existing SATA devices.

- **Type:** Select the device type connected to system: [Not Installed], [Auto].
- **S.M.A.R.T.:** Select intelligent monitoring, analysis and report technology.

4.2.2.7 APM Configuration

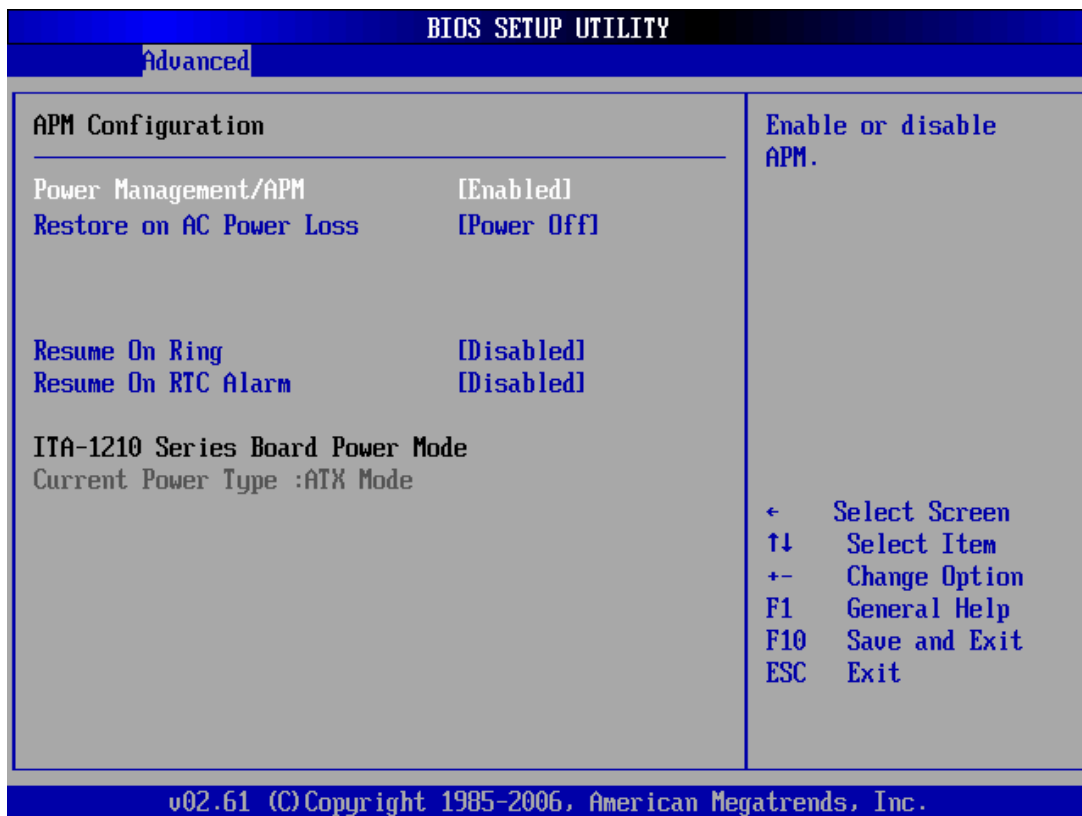


Figure 4.14: APM Configuration

- **APM Configuration**

Includes 5 options.

- **Power Management /APM**

Options are “Disabled” and “Enabled”. The default setting is “Enabled”.

- **Restore on AC Power Loss**

Options are Power off/Power on/Last state. The default setting is “Power Off”.

- **Resume on Ring**

Options are “Disabled” and “Enabled”. The default setting is “Disabled”

- **Resume on RTC Alarm**

Options are “Disabled” and “Enabled”. The default setting is “Disabled”

- **ITA-1610 Series Power Mode**

Detects current power mode: “AT mode” or “ATX mode”.

4.2.2.8 Event Log Configuration

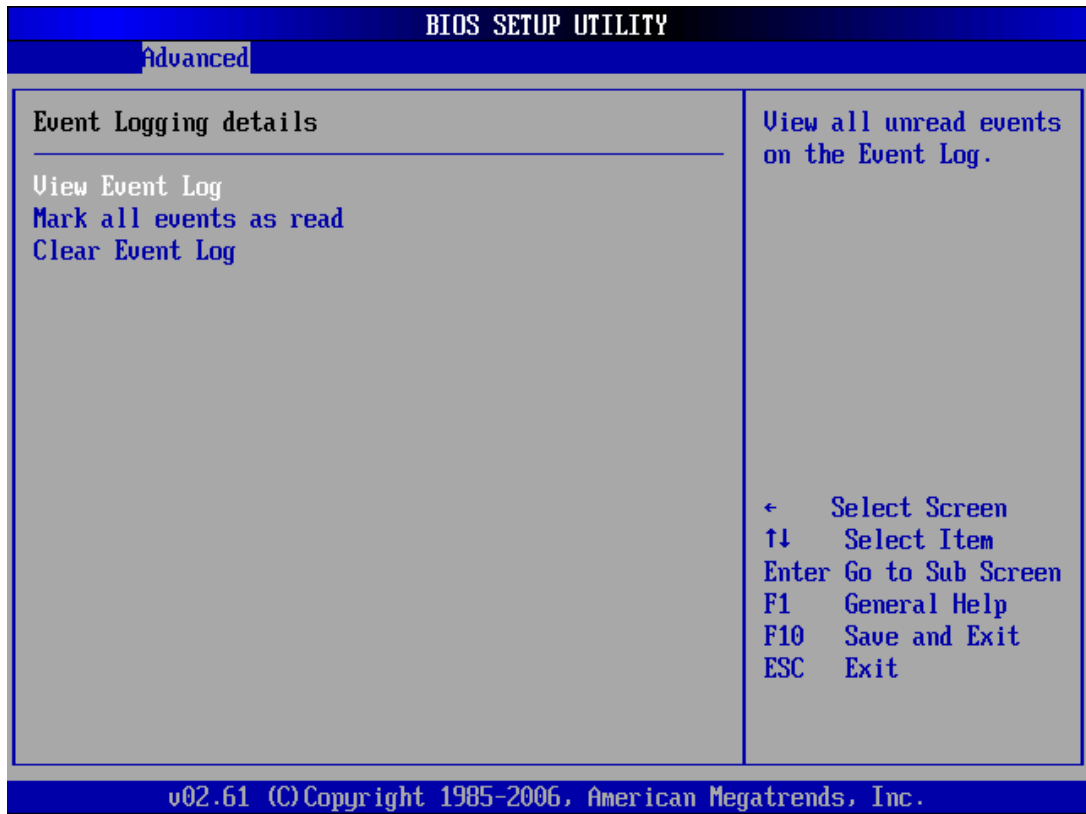


Figure 4.15: Event Log Configuration

- **View Event log**
Users can view all unread event in the event log, including the errors and warnings appearing in BIOS startup process.
- **Mark all events as read**
Mark all unread events as read. The last option is "No Unread Log".
- **Clear Event log**
Give up all unread logs, and consider them as read. The first option is "No Unread Log".

4.2.2.9 USB Configuration

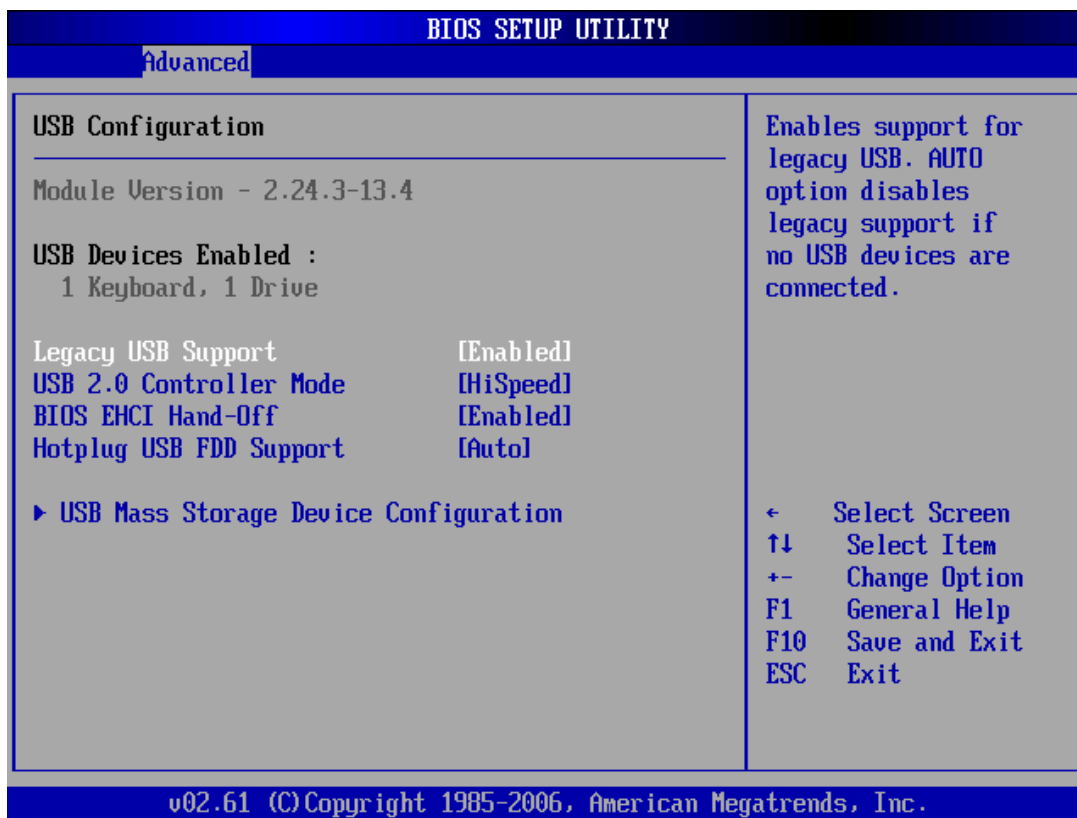


Figure 4.16: USB Configuration

- **Legacy USB Support**
Enable support for traditional USB. It will be automatically set as “Disabled” when no USB device is connected. The default setting is “Enabled”.
- **USB 2.0 Controller Mode**
Options are Hi Speed/ Full speed. The default setting is “Hi Speed”.
- **BIOS EHCI Hand-Off**
Enables operating system without hand-off feature.
- **Hotplug USB FDD Support**
System will create a virtual FDD device connected with hot swap FDD. The virtual device is only automatically generated when no USB FDD exists.

■ **USB Mass Storage Device Configuration**

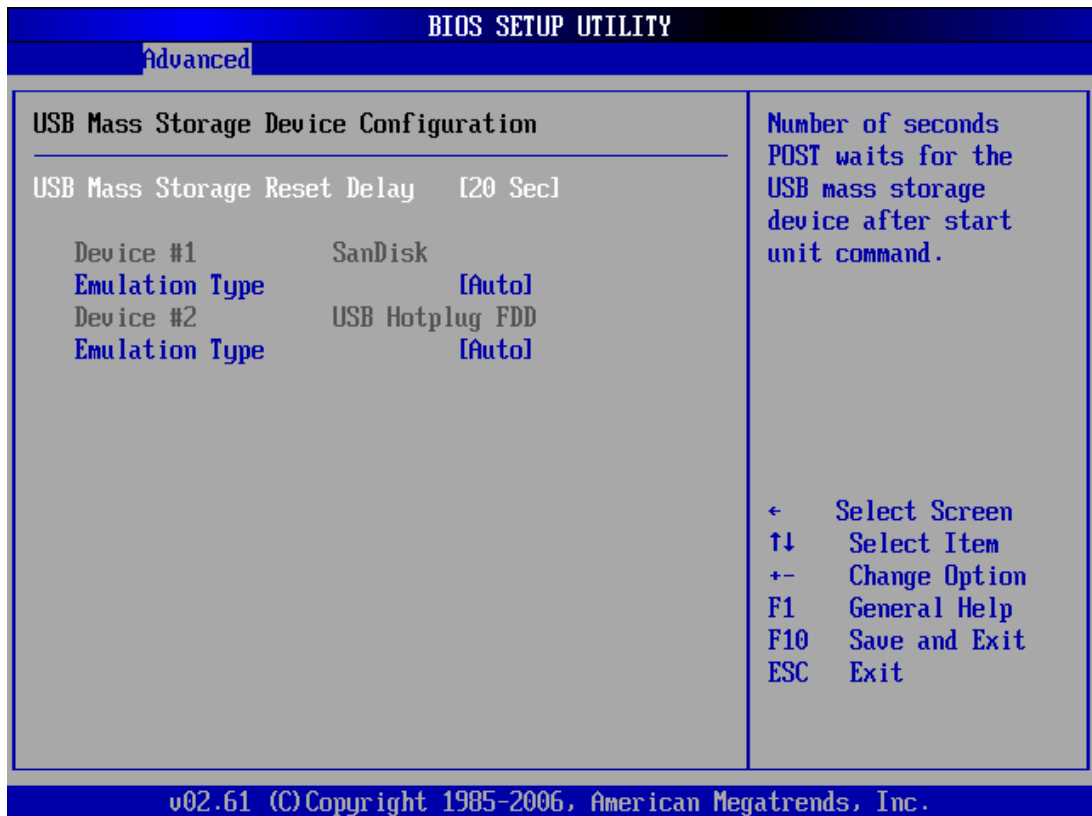


Figure 4.17: USB Mass Storage Device Configuration

- **USB Mass Storage Reset Delay**
POST time (seconds) of USB mass storage after starting the unit command.
- **USB Devices Emulation Type**
Set the simulation type of current USB device: [Auto], [Floppy], [Forced FDD], [Hard Disk] and [CDROM].
If set to “Auto”, USB devices smaller than 530 MB will be simulated as FDD, and others as HDD. If set as “Forced FDD”, FDD format drives can be started as FDD, such as ZIP drives.

4.2.3 PCI/PnP Setup

Select the PCI/PnP tab from the ITA-1610 setup screen to enter the Plug and Play BIOS Setup screen. You can display a Plug and Play BIOS Setup option by highlighting it using the <Arrow> keys. All Plug and Play BIOS Setup options are described in this section. The Plug and Play BIOS Setup screen is shown below.

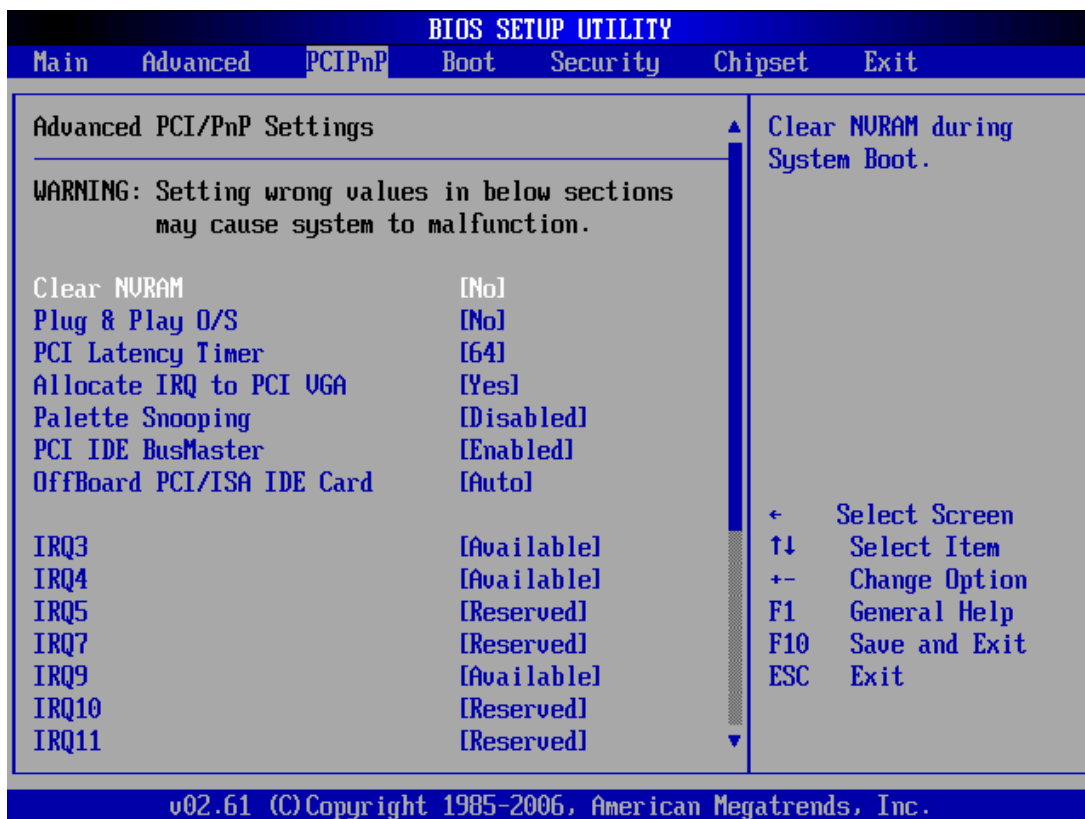


Figure 4.18: PCI/PnP Setup

- **Clear NVRAM**
Set this value to force the BIOS to clear the Non-Volatile Random Access Memory (NVRAM). The Optimal and Fail-Safe default setting is No.
- **Plug and Play O/S**
When set as “No”, BIOS will configure all devices in the system. When set as “Yes”, if users have installed plug and play O/S, O/S will configure plug and play devices that don’t need to start. The default setting is No.
- **PCI Latency Timer**
Use this to adjust the PCI Latency Timer. This option sets the latency of all PCI devices on the PCI bus. The Optimal and Fail-Safe default setting is 64.
- **Allocate IRQ to PCI VGA**
Set this value to allow or stop the system from giving the VGA adapter card an interrupt address. The Optimal and Fail-Safe default setting is Yes.
- **Palette Snooping**
Set this value to allow the system to modify the Palette Snooping settings. The Optimal and Fail-Safe default setting is Disabled.
- **PCI IDE BusMaster**
Set this value to allow or prevent the use of PCI IDE Busmastering. The Optimal and Fail-Safe default setting is Disabled.

- **OffBoard PCI/ISA IDE Card**
Set this value to allow an add-on PCI/ISA IDE card to be selected. The Optimal and Fail-Safe default setting is Auto.
- **IRQ3/4/5/7/10/11/15**

Available	Specified IRQ is available to be used by PCI/PnP devices.
Reserved	Specified IRQ is reserved for use by Legacy ISA devices.

4.2.4 Boot Setup Utility

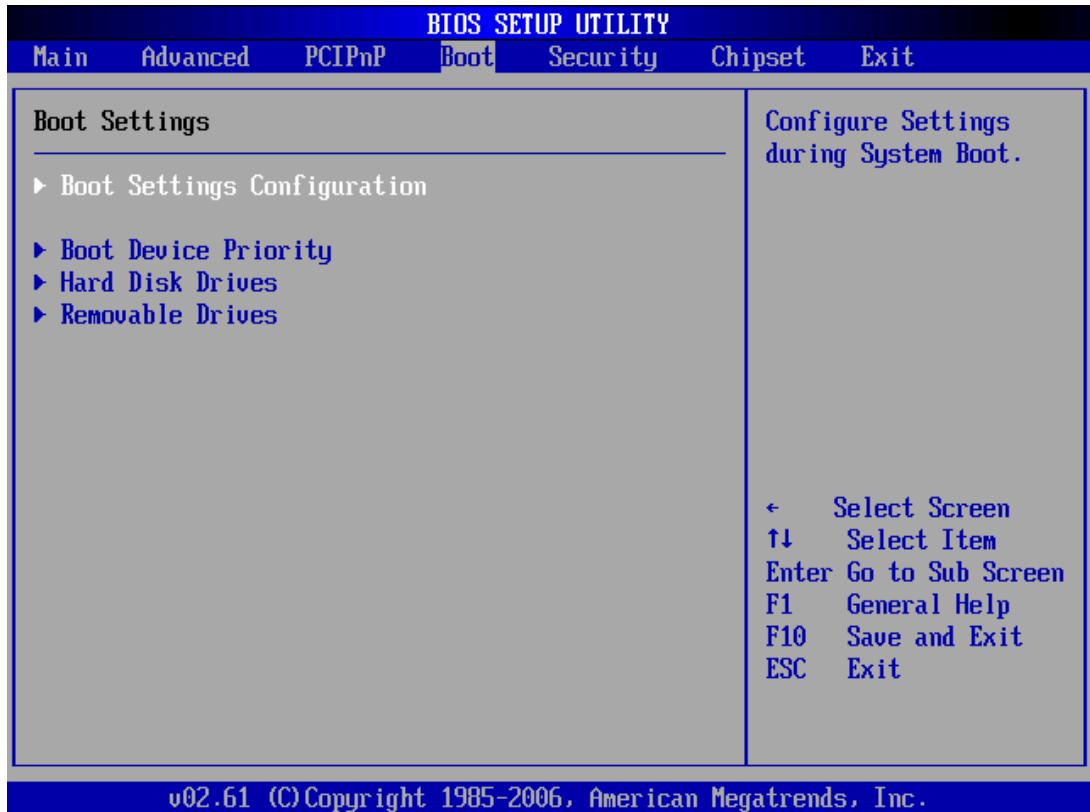


Figure 4.19: Boot Setup Utility

Note! Only when at least one HDD is connected to ITA-1610, “Hard Disk Drives” option will be shown in the setup screen.



4.2.4.1 Boot Settings Configuration

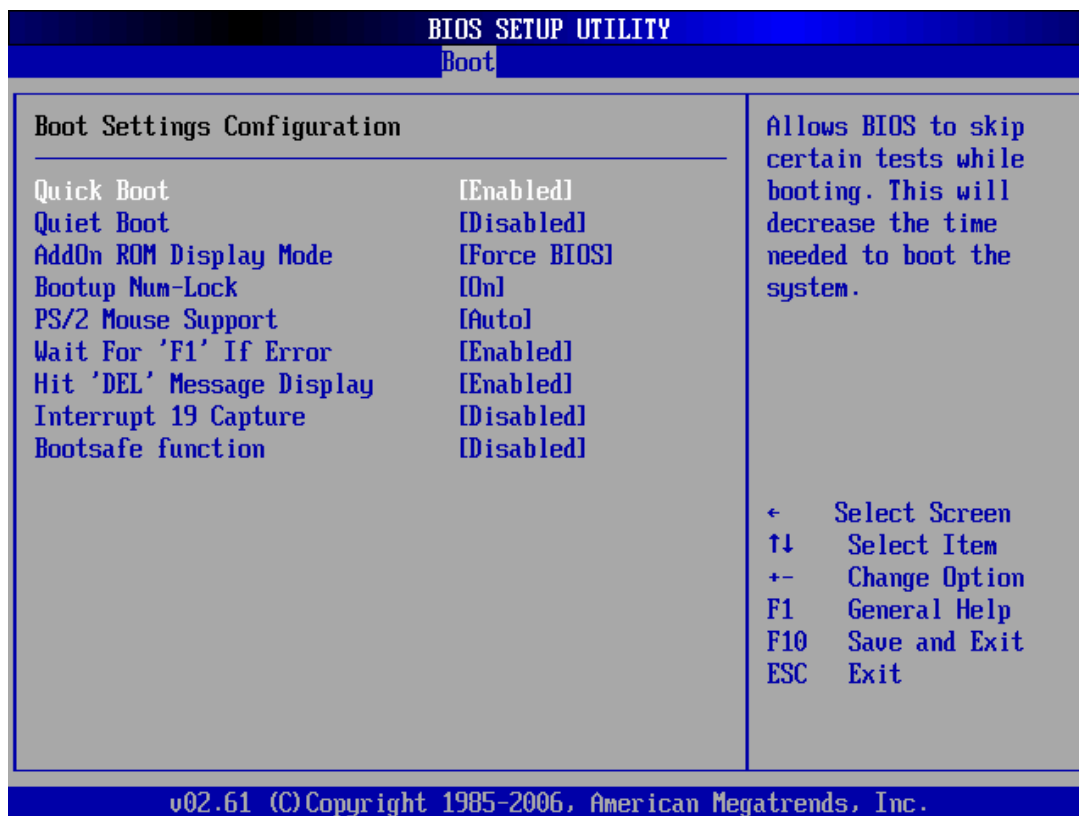


Figure 4.20: Boot Settings Configuration

- **Quick Boot**
Allows the BIOS to skip certain tests while booting. The default setting is “Enabled”.
- **Quiet Boot**
If this option is set to Disabled, the BIOS displays normal POST messages. If Enabled, an OEM Logo is shown instead of POST messages.
- **AddON Rom Display Mode**
Sets the display mode of optional ROM.
- **Bootup Num-Lock**
Select the Power-on state for Numlock.
- **PS/2 Mouse Support**
Selects support for PS/2 Mouse. (Only available under DOS)
- **Wait For 'F1' If Error**
Wait for the F1 key to be pressed if an error occurs.
- **Hit 'DEL' Message Display**
Displays “Press DEL to run Setup” in POST.
- **Interrupt 19 Capture**
Some add-on cards' ROM options need Interrupt 19, this is to enable or disable supporting this kind of add-on cards. This setting is required by PCI card based on ROM configuration utility.
- **Bootsafe function**
This option allows users to enable or disable bootsafe function.
- **Boot Device Priority**
Configures the boot priority of available devices: [Hard Disk Device], [Removable Device], [CD-DVD ROM].

4.2.5 Security Setup

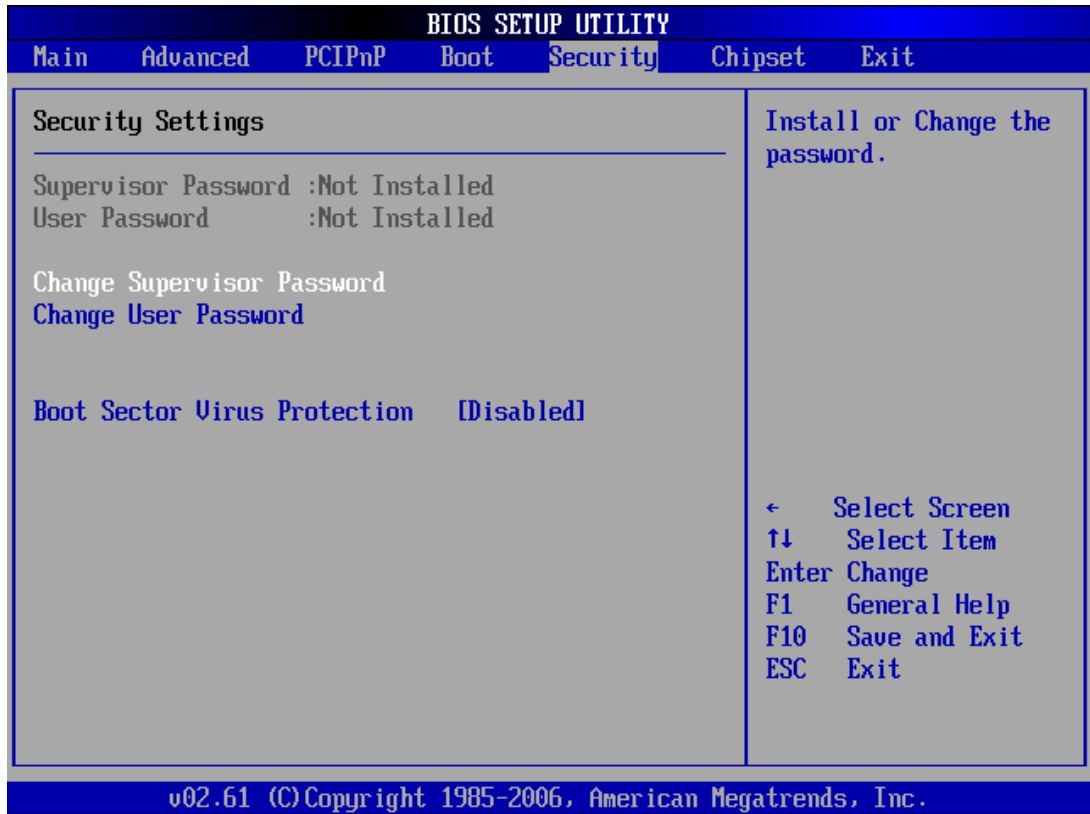


Figure 4.21: Password Configuration

Select Security Setup from the ITA-1610 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 password**
- **Change user password**
- **Boot sector Virus protection**

The boot sector virus protection will warn if any program tries to write to the boot sector. The default setting under DOS is "Disabled".

4.2.6 Advanced Chipset Settings



Figure 4.22: Advanced Chipset Settings

4.2.6.1 North Bridge Chipset Configuration

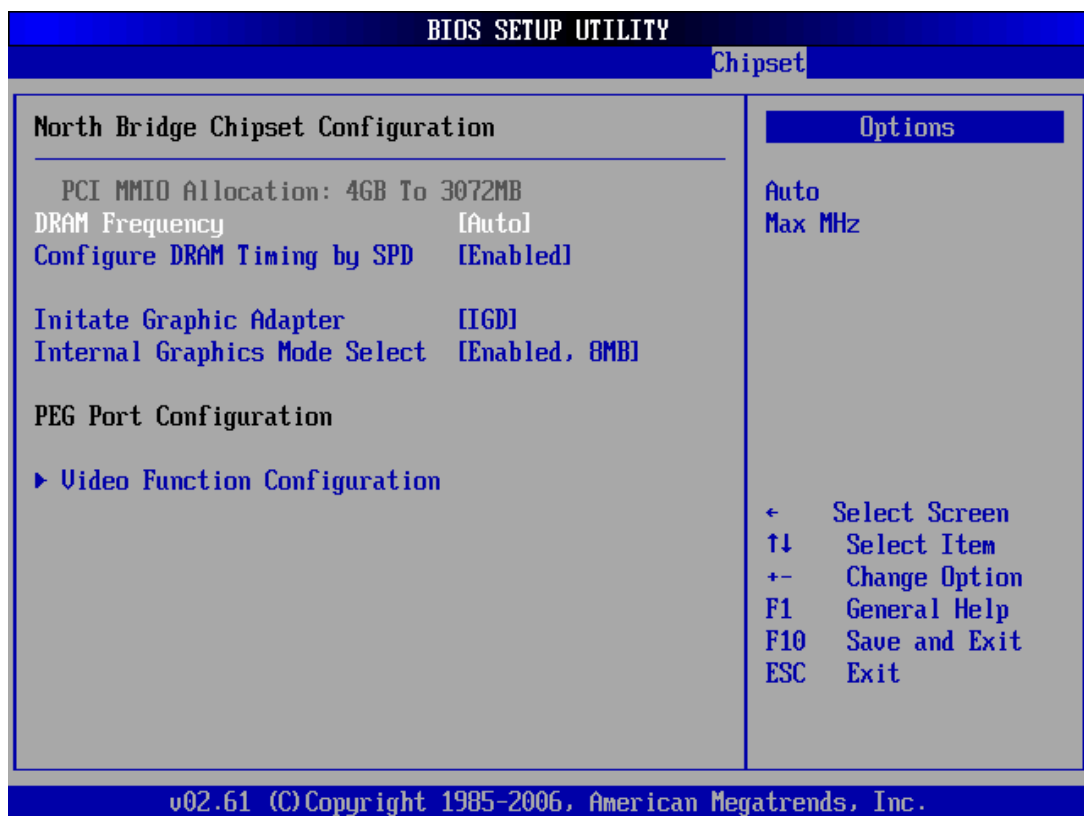


Figure 4.23: North bridge chipset configuration

- **DRAM Frequency**
This setting allows user to select DRAM frequency. The default setting is “Auto” by SPD.
- **Configure DRAM Timing by SPD**
This setting allows user to select DRAM Timing by SPD or manually, and enable or disable DRAM SPD detect.
- **Initiate Graphic Adapter**
This setting allows user to select which graphics controller to be the primary graphic device when booting up. It is recommend not to modify this option.
- **Internal Graphics Mode Select**
Allows the built-in graphic card to occupy certain system memory.
- **Video Function Configuration**



Figure 4.24: Video Function Configuration

- **DVMT Mode select**
Sets the available video mode of system: “DVMT Mode” or “Fixed Mode”.
- **DVMT/Fixed memory**
Sets the memory capacity of video in “Fixed Mode”.
- **Boot Display Device**
Sets the boot display device in POST process. The default setting is “CRT+LVDS”.
- **Flat Panel Type**
Sets the panel resolution, the default setting is “1024x768 (24-bit)”.

4.2.6.2 South Bridge Chipset Configuration

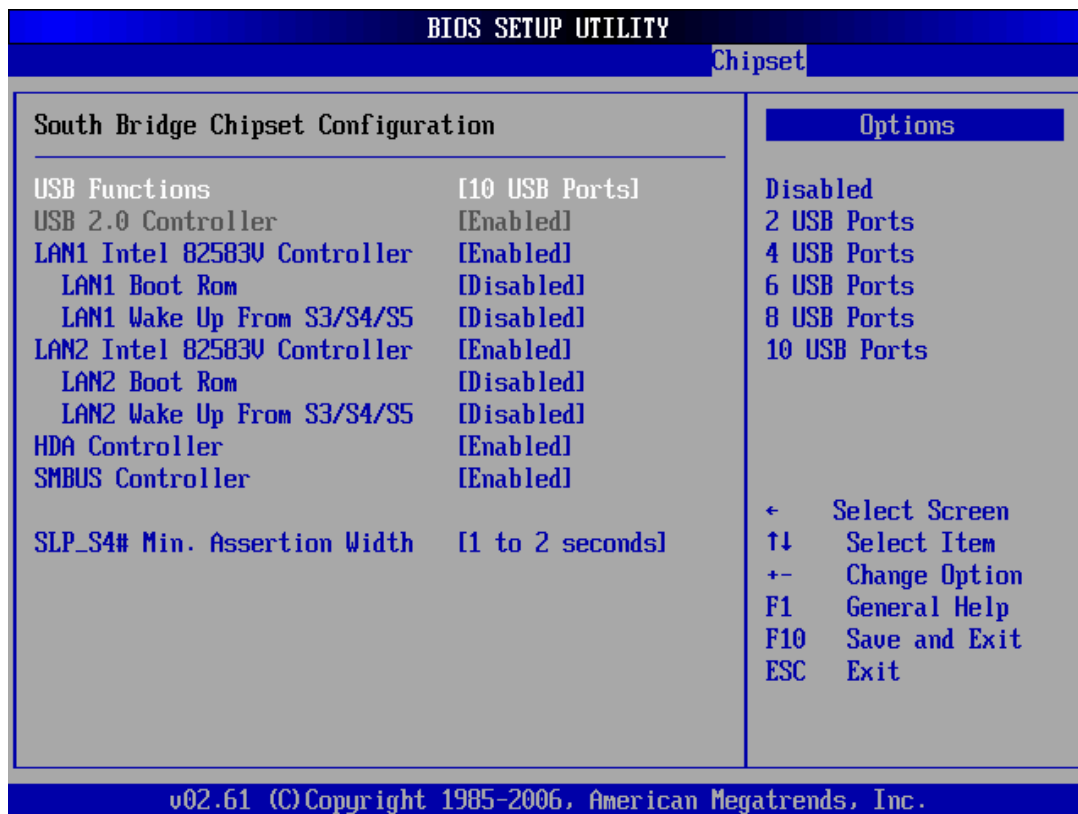


Figure 4.25: South Bridge Chipset Configuration

- **USB Functions**
The default setting is “10 USB Ports”.
- **USB 2.0 Controller**
Enable or Disable USB 2.0 controller. When set 10 ports, this option will become grey.
- **LAN1 Intel 82583V Controller**
Enable or disable Intel LAN1 controller.
- **LAN1 Boot ROM**
Set to boot from “PCI ROM” or “Not for LAN1”.
- **LAN1 Wake Up from s3/s4/s5**
Enable or diable LAN1 wake up from S3/S4/S5.
- **LAN2 Intel 82583V Controller**
Enable or diable Intel LAN2 controller.
- **LAN2 Boot ROM**
Set boot from “PCI ROM” or “Not for LAN2”.
- **LAN2 Wake Up from s3/s4/s5**
Enable or disable LAN2 wake up from S3/S4/S5.
- **HDA Controller**
Enable or disable HD audio controller.
- **SMBUS Controller**
Enable or disable SMBus controller.
- **SLP_S4# Min. Assertion Width**
Set the minimum assertion width of Slp_S4# when booting up. The default setting is “1-2 seconds”.

4.2.7 Exit Option

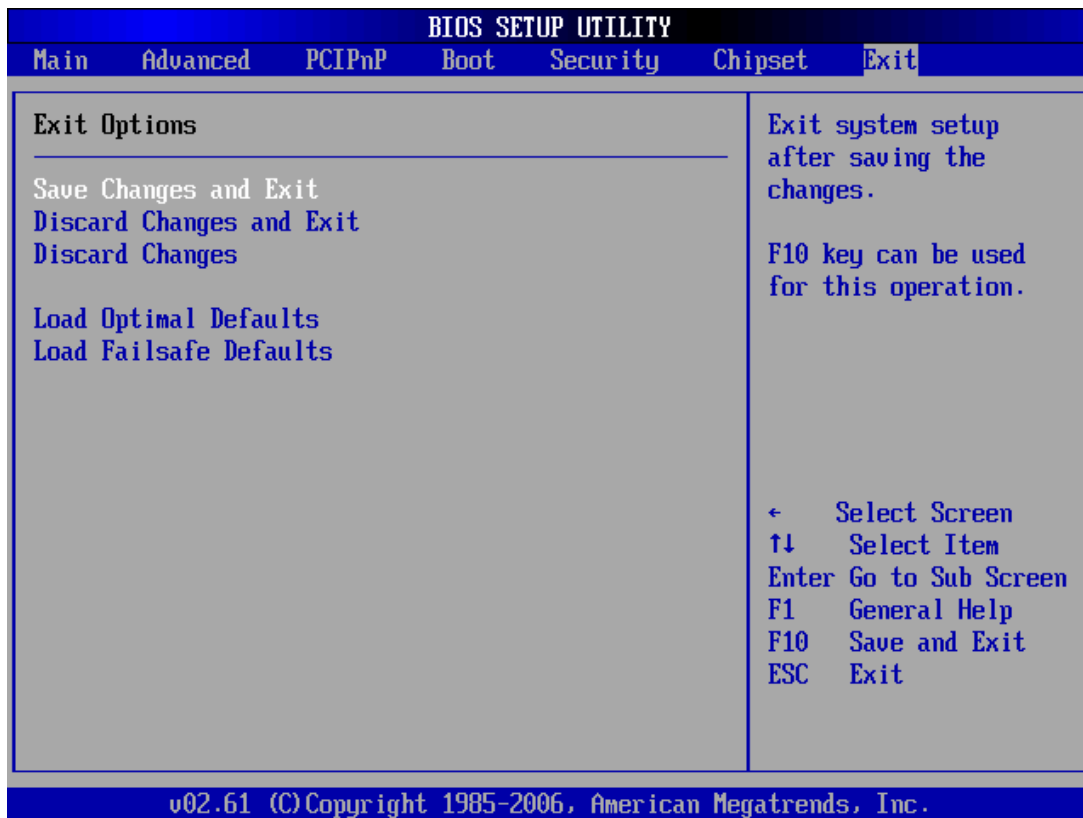


Figure 4.26: Exit Option

4.2.7.1 Save Changes and Exit

When you have completed system configuration, select this option to save your changes, exit BIOS setup and reboot the computer so the new system configuration parameters can take effect.

1. Select Exit Saving Changes from the Exit menu and press <Enter>. The following message appears:
Save Configuration Changes and Exit Now?
[Ok] [Cancel]
2. Select Ok or Cancel.

4.2.7.2 Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configuration.

1. Select Exit Discarding Changes from the Exit menu and press <Enter>. The following message appears:
Discard Changes and Exit Setup Now?
[Ok] [Cancel]
2. Select Ok to discard changes and exit.

4.2.7.3 Discard Changes

Select Discard Changes from the Exit menu and press <Enter>.

4.2.7.4 Load Optimal Defaults

The ITA-1610 automatically configures all setup items to optimal settings when you select this option. Select Load Optimal Defaults from the Exit menu and press <Enter>.

4.2.7.5 Load Failsafe Defaults

The ITA-1610 automatically configures all setup options to fail-safe settings when you select this option. Fail-Safe Defaults are designed for maximum system stability, but not maximum performance. Select Fail-Safe Defaults from the Exit menu and press <Enter>.

Chapter 5

Driver Installation

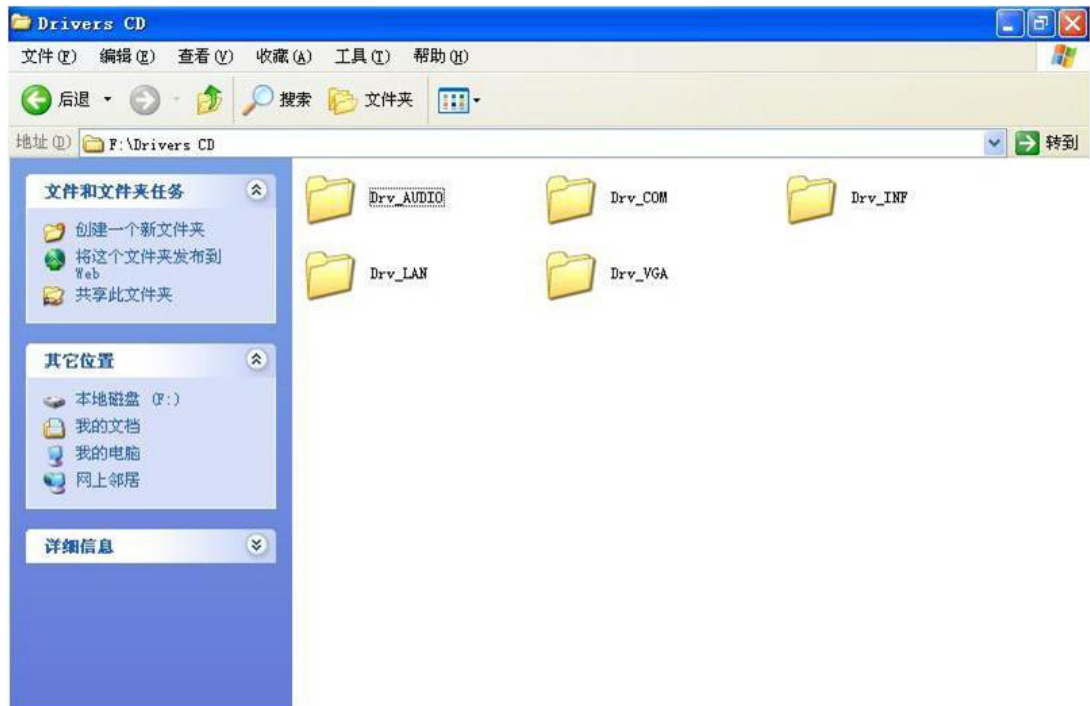
This chapter describes how to install drivers.

5.1 Introduction

Advantech offers a complete range of Device Driver and software supports for Windows programming developers. You can apply the Windows Device Drivers to the most popular Windows Programming tools, such as Visual C++, Visual Basic, Borland C++ Builder and Borland Delphi.

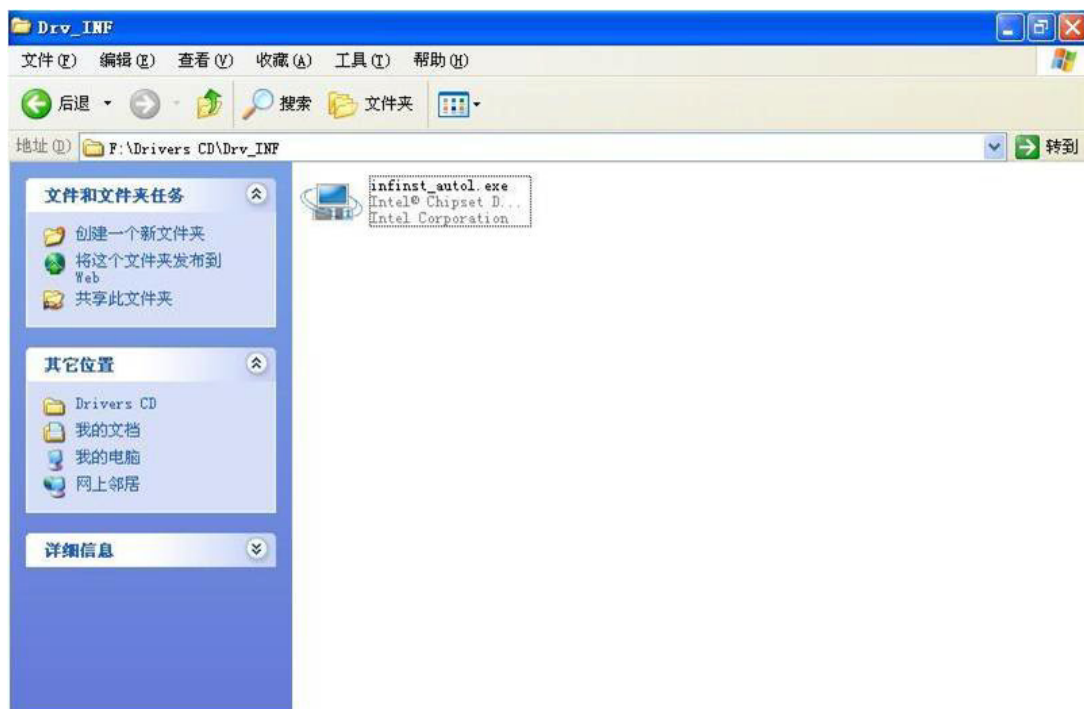
5.2 Driver Installation

Insert the driver CD into your system's CD-ROM drive. You can see the ITA-1610 driver folder items.



5.2.1 Chipset Windows Driver Setup

Insert the driver CD into your system's CD-ROM drive. You can see the driver folder items. Navigate to the "Drv_INF" folder and click "infinst_autol.exe" to complete the installation of the driver.



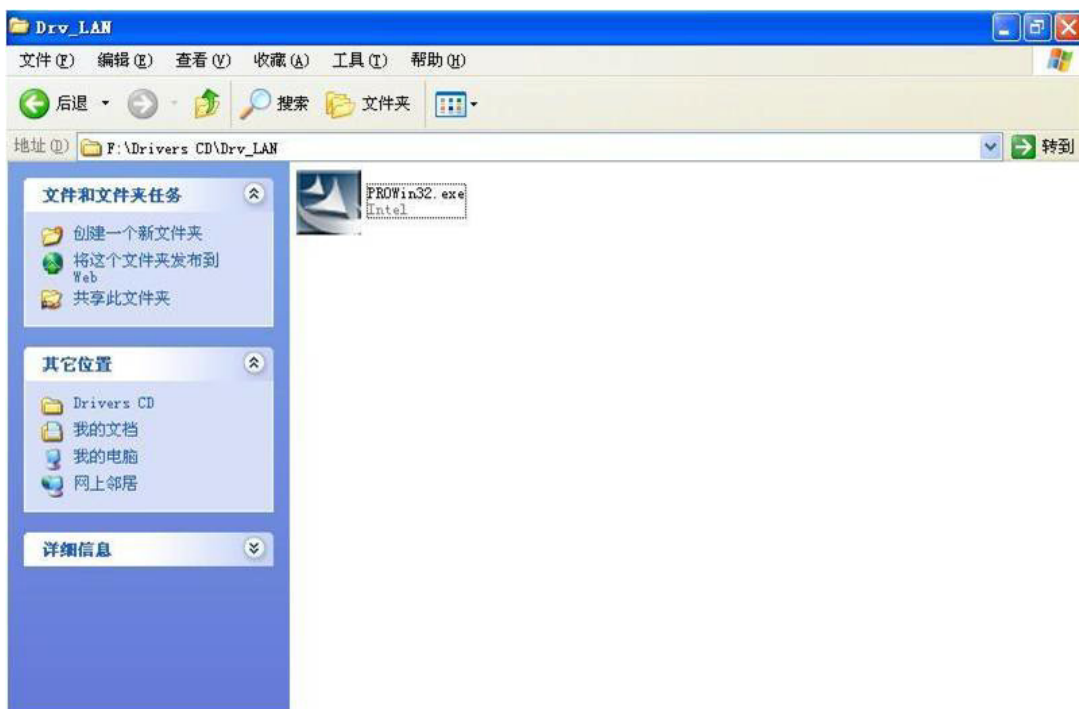
5.2.2 VGA Windows Driver Setup

Insert the driver CD into your system's CD-ROM drive. You can see the driver folders items. Navigate to the "Drv_VGA" folder and click "Setup.exe" to complete the installation of the drivers.



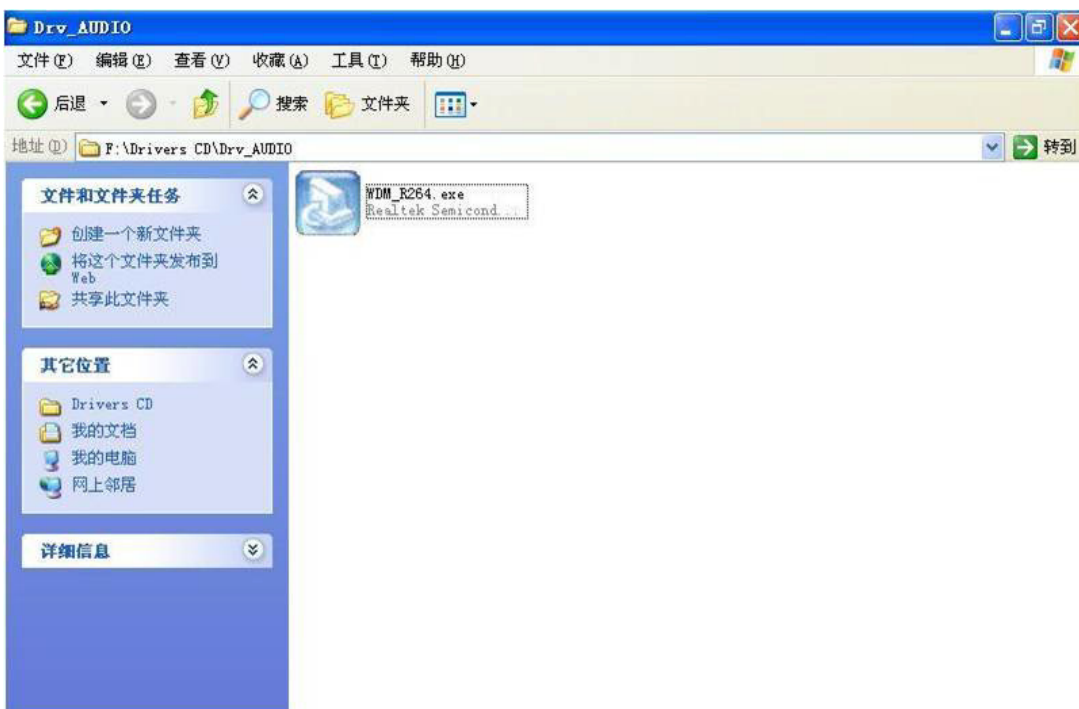
5.2.3 LAN Windows Driver Setup

Insert the driver CD into your system's CD-ROM drive. You can see the driver folder items. Navigate to the "Drv_LAN" folder and click "PROWin32.exe" to complete the installation of the drivers.



5.2.4 Audio Windows Driver Installation

Insert the driver CD into your system's CD-ROM drive. You can see the driver folders items. Navigate to the "Drv_AUDIO" folder and click "WDM_R264.exe" to complete the installation of the drivers.



Chapter 6

GPIO Programming Guide

This chapter introduces GPIO programming Guide.

Please carefully read and refer to the below examples and source codes in bold.
Please download NXP Semiconductors PAC9554 spec to start programming.

1. Digital IO definition of ITA-1610:
2. Configuration sequence:
ITA-1610's GPIO is realized by a PCA9554 GPIO IC on ICH SMBUS. As a result, configuration and access to GPIO IC should be done via accessing IO Space of ICH SMBUS controller.

Below is the table of ICH SMBUS IO Space:

SMB_BASE + Offset	Mnemonic	Register Name	Default	Type
00h	HST_STS	Host Status	00h	R/WC, RO, R/WC (special)
02h	HST_CNT	Host Control	00h	R/W, WO
03h	HST_CMD	Host Command	00h	R/W
04h	XMIT_SLVA	Transmit Slave Address	00h	R/W
05h	HST_D0	Host Data 0	00h	R/W
06h	HST_D1	Host Data 1	00h	R/W

For ITA-1610, IO address of **SMB_BASE** in the above table is 0x400.

Refer to Chapter 3 for detailed code of accessing SMBUS IO.

SMBUS slave address of GPIO 00 - GPIO 07's PCA9554 is 0x40 (8bit address):

GPIO 00 - GPIO 07: PCA9554 0x40 (IO0 - IO7)

Below table is for PCA9554:

Symbol	Pin			Description
	DIP16, SO16, SSOP16, TSSOP16	HVQFN16	SSOP20	
A0	1	15	6	address input 0
A1	2	16	7	address input 1
A2	3	1	9	address input 2
IO0	4	2	10	input/output 0
IO1	5	3	11	input/output 1
IO2	6	4	12	input/output 2
IO3	7	5	14	input/output 3
V _{SS}	8	6 ⁽¹⁾	15	supply ground
IO4	9	7	16	input/output 4
IO5	10	8	17	input/output 5
IO6	11	9	19	input/output 6
IO7	12	10	20	input/output 7
INT	13	11	1	interrupt output (open-drain)
SCL	14	12	2	serial clock line
SDA	15	13	4	serial data line
V _{DD}	16	14	5	supply voltage
n.c.	-	-	3, 8, 13, 18	not connected

PCA9554 register:

Command	Protocol	Function
0	read byte	Input Port register
1	read/write byte	Output Port register
2	read/write byte	Polarity Inversion register
3	read/write byte	Configuration register

In write transmission, command byte is the first byte after the address byte. It is used as a pointer to decide which register to read/write.

PCA9554 has four registers to control GPIO.

PCA9554 register 0:

This register is read only. It shows input logic level of the pin, and has nothing to do with the input or output direction defined by Register 3. It will not respond to write operation.

Default value “X” is determined by external logic level. Usually, it is 1, indicating there is internal pull-up resistor but no external signal.

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

If a certain GPIO Pin is set to Input, you can read corresponding Input value by reading corresponding bit of register 0.

PCA9554 register 1:

This register reflects outgoing logic level of pins defined as outputs by Register 3. The Bit value in this register will not respond to input pin. When reading this register, value of flip-flop which controls output will be returned, while the actual pin's physical signal value will not be returned.

Legend: * default value.

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

If a certain GPIO Pin is set to Output. you can read corresponding Output value by reading corresponding bit of register 1.

PCA9554 register 2:

This register allows the user to invert polarity of Input Port register data. If value of a certain bit is set (marked as "1"), data polarity of corresponding Input Port will be inverted. If the values is cleared (marked as "0"), the Input Port data remains the previous polarity.

Legend: * default value.

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

If a certain GPIO Pin is set to Input. you can set corresponding bit of register 2 to control Input pin.

PCA9554 register 3:

This register configures directions of I/O pins. If value of a certain bit of this register is set, pin of corresponding port will be defined as inputs with high impedance output driver. If the value is cleared, then the port will be defined as outputs. When reset, initial definition of I/O will be inputs with weak pull-up to VDD.

Table 7. Register 3 - Configuration register bit description

Legend: * default value.

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

Register 3 is used to set GPIO to Input or Output:

If the corresponding bit is '0', then GPIO pin is enabled as Output;

If the corresponding bit is '1' then GPIO pin is enabled as Input.

Examples:

Take ITA-1610 as example,. Suppose GPIO 00 is set to Output, GPIO 07 is set to Input, both pins are connected, then how to set the corresponding registers?

GPIO 00 corresponds to PCA9554 0x40 IO0, while GPIO 07 corresponds to PCA9554 0x40 IO7.

Set GPIO 00 to Output:

1. Read value of SMBUS slave 0x40 register 3 byte,
2. Set bit 0 the value read in step 1 to 0 and write it to SMBUS slave 0x40 register 3,
3. Read value of SMBUS slave 0x40 register 1 byte,
4. Depending on the output value is Low or High, set bit 0 the value read in step 3 to 0 or 1 and write it to SMBUS slave 0x40 register 1.

Set GPIO 07 to Input value:

1. Read value of SMBUS slave 0x40 register 3 byte,
2. Set bit 7 the value read in step 1 to 1 and write it to SMBUS slave 0x40 register 3,
3. Read value of SMBUS slave 0x40 register 0 byte,
Determine Input value to be Low or High according to value of step 3 bit7.


```

chk_smbus_ready();//Determine if SMBUS is ready

outportb(SMBUS_PORT + 3, offset);//write register offset to SMB_BASE + 3
moredelay();//long time delay
moredelay();//long time delay

outportb(SMBUS_PORT + 5, value);//Write data value to SMB_BASE + 5
moredelay();//long time delay
moredelay();//long time delay

outportb(SMBUS_PORT + 2, 0x48);//Write SMBUS command to SMB_BASE +
2, 0x48 means starting Byte data transmission
moredelay();//long time delay
moredelay();//long time delay

for (i = 0; i <= 0x100; i++)
{
    newiodelay();//long time delay
}

chk_smbus_ready();//Determine if SMBUS is ready
}

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
/
int chk_smbus_ready()
//Determine if SMBUS is ready or finished. Basically, it will wait for a long time to
see whether SMBUS has finished the transmission command because errors
hardly occur. So, in SMBUS byte read and write, BIOS Code does not determine
the return value of this function
{
    int i, result = 1;
    BYTE data;

    for (i = 0; i <= 0x800; i++)
    {
        //SMB_BASE + 0 is SMBUS status value
        data = inportb(SMBUS_PORT);//Read SMBUS status value once
        data = check_data(SMBUS_PORT);//Read SMBUS status value several
times
        outportb(SMBUS_PORT, data);//Write back SMBUS status value which
means clear status value(Write 1 to the corresponding bit will clear status)

        if (data & 0x02)
        { //If bit 1 is set to 1 (this means the command is finished), then
SMBUS is ready
            result = 0;//SMBUS ready
            break;
        }

        if (!(data & 0xBF))
        { //If each bit except bit 2 is set to 0, this means SMBUS error , then
SMBUS is ready
            result = 0;//SMBUS ready
            break;

```

```

    }

    if (data & 0x04)
    { //If bit 2 is set to 1 (this means SMBUS error), then error has
occurred in SMBUS. This rarely happens
        result = 1;//SMBUS error
        break;
    }
}

return result;
}

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
/
BYTEcheck_data(WORD addr)
{
    int i;
    BYTE data;

    for(i = 0; i <= 6; i++)
    {
        data = inportb(addr);
        if (data != 0)
            break;
    }

    return data;
}

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
/
voidnewdelay()
//short time delay
{
    outportb(0xeb, 0);//IO port 0xeb is not occupied by any device actually.
Writing value to this port can cause time delay. The user can also use other
methods instead
}

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
/
voidmoredelay()
//long time delay
{
    int i;
    for (i = 0; i < 20; i++)
    {
        outportb(0xeb, 0);//IO port 0xeb is not occupied by any device actually.
Writing value to this port can cause time delay. The user can also use other
methods instead
    }
}

*****
*
GPIO simulation code

```


(Take GPIO 00 and GPIO 07 in Chapter 2 for example)

GPIO 00 output High:

```
data = smbus_read_byte(0x40, 0x03); //Read slave 0x40 register 3 byte
data &= 0xfe; //Set bit 0 to 0
smbus_write_byte(0x40, 0x03, data) //Write back, GPIO 00 is set to Output
data = smbus_read_byte(0x40, 0x01) //Read slave 0x40 register 1
data |= 0x01; //Set bit 0 to 1, which means High
smbus_write_byte(0x40, 0x01, data) //Write back, output High value
```

Read Input value from GPIO 07:

```
data = smbus_read_byte(0x40, 0x03); //Read slave 0x40 register 3 byte
data |= 0x80; //Set bit 7 to 1
smbus_write_byte(0x40, 0x03, data) //Write back, GPIO 07 is set to Input
data = smbus_read_byte(0x40, 0x00) //Read slave 0x40 register 0.
```

Response value of bit 7 can determine whether Input is Low or High

Appendix **A**

Programming the Watchdog Timer

A.1 Programming the Watchdog Timer

The ITA-1610's watchdog timer can be used to monitor system software operation and take corrective action if the software fails to function within the programmed period. This section describes the operation of the watchdog timer and how to program it.

A.1.1 Watchdog Timer Overview

The watchdog timer is built into the super I/O controller SMSC SCH3114. It provides the following user-programmable functions:

- Can be enabled or disabled via user program
- Timer can be set from 1 to 255 seconds or 1 to 255 minutes
- Generates an interrupt or resets signal if the software fails to reset the timer before time-out

A.1.2 Programming the Watchdog Timer

The I/O port address of the watchdog timer is A00h (hex).

Table A.1: Watchdog Timer Registers

Address: A00h (hex)		
Register Shift	Read/Write	Description
65 (hex)	write	Set seconds or minutes as units for the timer. Write 0 to bit 7: set second as counting unit. [default] Write 1 to bit 7: set minutes as counting unit.
66 (hex)	write	0: Stop timer [default] 01~FF (hex): The amount of the count, in seconds or minutes, depends on the value set in register 65 (hex). This number decides how long the watchdog timer waits for strobe before generating an interrupt or reset signal. Writing a new value to this register can reset the timer to count with the new value.
67 (hex)	read/write	Configure watchdog timer Bit 1: Write 1 to enable keyboard to reset the timer, 0 to disable. [default] Bit 2: Write 1 to enable mouse to reset the timer, 0 to disable. [default] Bit 7~4: Set the interrupt mapping of watchdog timer: 1111=IRQ15 0011=IRQ3 0010=IRQ2 0001=IRQ1 0000=Disable [default]
68 (hex)	read/write	Control watchdog timer Bit0: Read watchdog state; 1=Timer timeout Bit2: Write 1 to immediately generate timeout signal, and automatically return to 0 (Write only). Bit3: Writer 1 to allow triggering of timer timeout when P20 is effective, 0 to disable. [default]

A.1.3 Example Program

```

1. Enable watchdog timer and set 10 sec. as timeout interval
Mov dx,A65h ; Select register 65h, watchdog timer I/O port address A00h+ register
shifts 65h
Mov al,80h ; Set second as counting unit
Out dx,al

Mov dx,A66h ; Select register 66h, watchdog timer I/O port address A00h+ register
shift 66h
Mov al,10 ; Set timeout interval as 10 seconds and start counting
Out dx,al
;-----

2. Enable watchdog timer and set 5 min. as timeout interval
;-----
Mov dx,A65h ; Select register 65h, watchdog timer I/O port address A00h+ register
shifts 65h
Mov al,00h ; Set minute as counting unit
Out dx,al

Mov dx,A66h ; Select register 66h, watchdog timer I/O port address A00h+ register
shifts 66h
Mov al,5 ;Set timeout interval as 5 minutes and start counting
Out dx,al
;-----

3. Enable watchdog timer to be reset by mouse
;-----
Mov dx,A67h ; Select register 67h, watchdog timer I/O port address A00h+ register
shifts 67h
In al,dx
Or al,4h ; Enable watchdog timer to be reset by mouse
Out dx,al
;-----

4. Enable watchdog timer to be reset by keyboard
;-----
Mov dx,A67h ; Select register 67h, watchdog timer I/O port address A00h+ register
shifts 67h
In al,dx
Or al,2h ; Enable watchdog timer to be reset by keyboard
Out dx,al
;-----

5. Generate a time-out signal without timer counting
;-----
Mov dx,A68h ; Select register 68h, watchdog timer I/O port address A00h+ register
shifts 68h
In al,dx
Or al,4h ; Generate a time-out signal
Out dx,al
;-----

```

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