IEI Integration Corp.

MODEL:

NANO-HM651

EPIC SBC with Intel® Celeron® 847E Dual-Core CPU and Intel® HM65 Chipset, DDR3, VGA, HDMI, USB 3.0, Dual PCIe GbE, SATA 6Gb/s, HD Audio, RoHS Compliant

User Manual

Rev. 1.03 – April 12, 2017

RoHS Lead Free

Revision

Date	Version	Changes
April 12, 2017	1.03	Added Section 4.5.5: mSATA Auto-detect Jumper
August 26, 2015	1.02	Updated Figure 1-3: NANO-HM651 Dimensions (mm) Added Section 4.6: Chassis Installation
December 15, 2014	1.01	Added Section 3.2.18: USB 2.0 Connector Modified Section 4.5.4: LVDS Panel Resolution Selection Jumper Updated Section 1.3: Dimensions Deleted SMBus connector information
September 10, 2012	1.00	Initial release

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Manual Conventions

WARNING

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

CAUTION

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

NOTE

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

HOT SURFACE

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

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Chapter

1

Introduction

1.1 Introduction

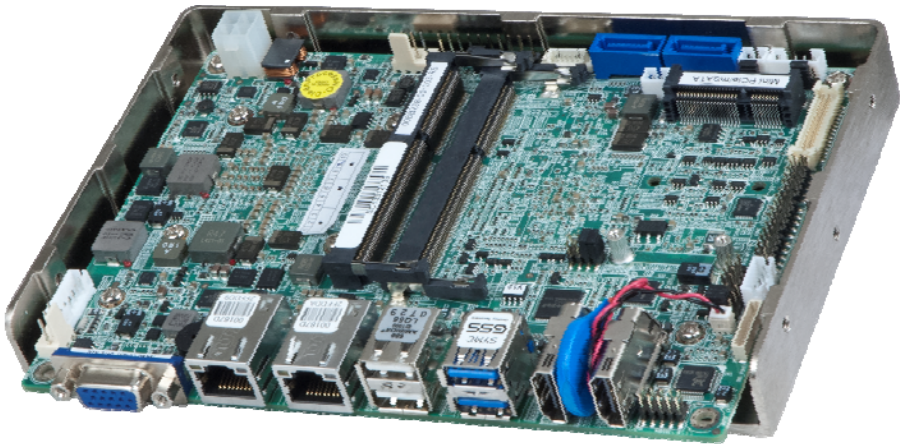


Figure 1-1: NANO-HM651 EPIC SBC

The NANO-HM651 EPIC SBC is an Intel® Celeron® dual-core processor 847E platform. The NANO-HM651 supports two 204-pin 1066/1333 MHz dual-channel DDR3 SDRAM SO-DIMMs (system max. 8.0 GB). The board includes one VGA connector and two HDMI ports supporting a dual-display configuration.

Storage on the board is handled by two SATA 6Gb/s ports for connecting a hard drive, optical drive or SSD. The PCIe Mini slot allows an mSATA card to be installed.

The NANO-HM651 also comes with two Gigabit Ethernet (GbE) connectors, two USB 3.0 connectors and two USB 2.0 connectors. Serial device connectivity is provided by two internal RS-232 connectors and one internal RS-422/485 connector.

1.2 Connectors

The connectors on the NANO-HM651 are shown in the figure below.

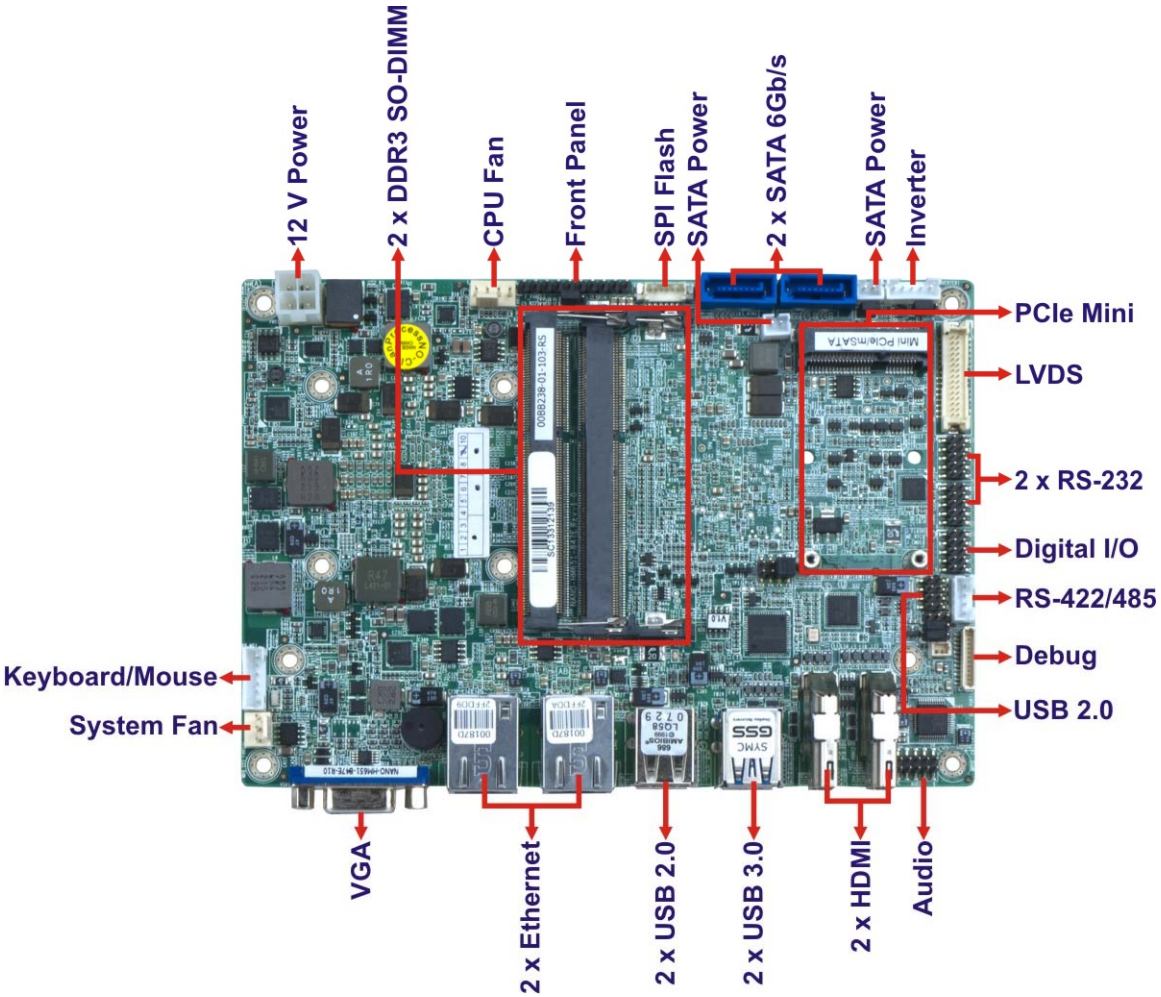


Figure 1-2: Connectors

1.3 Dimensions

The dimensions of the board are listed below:

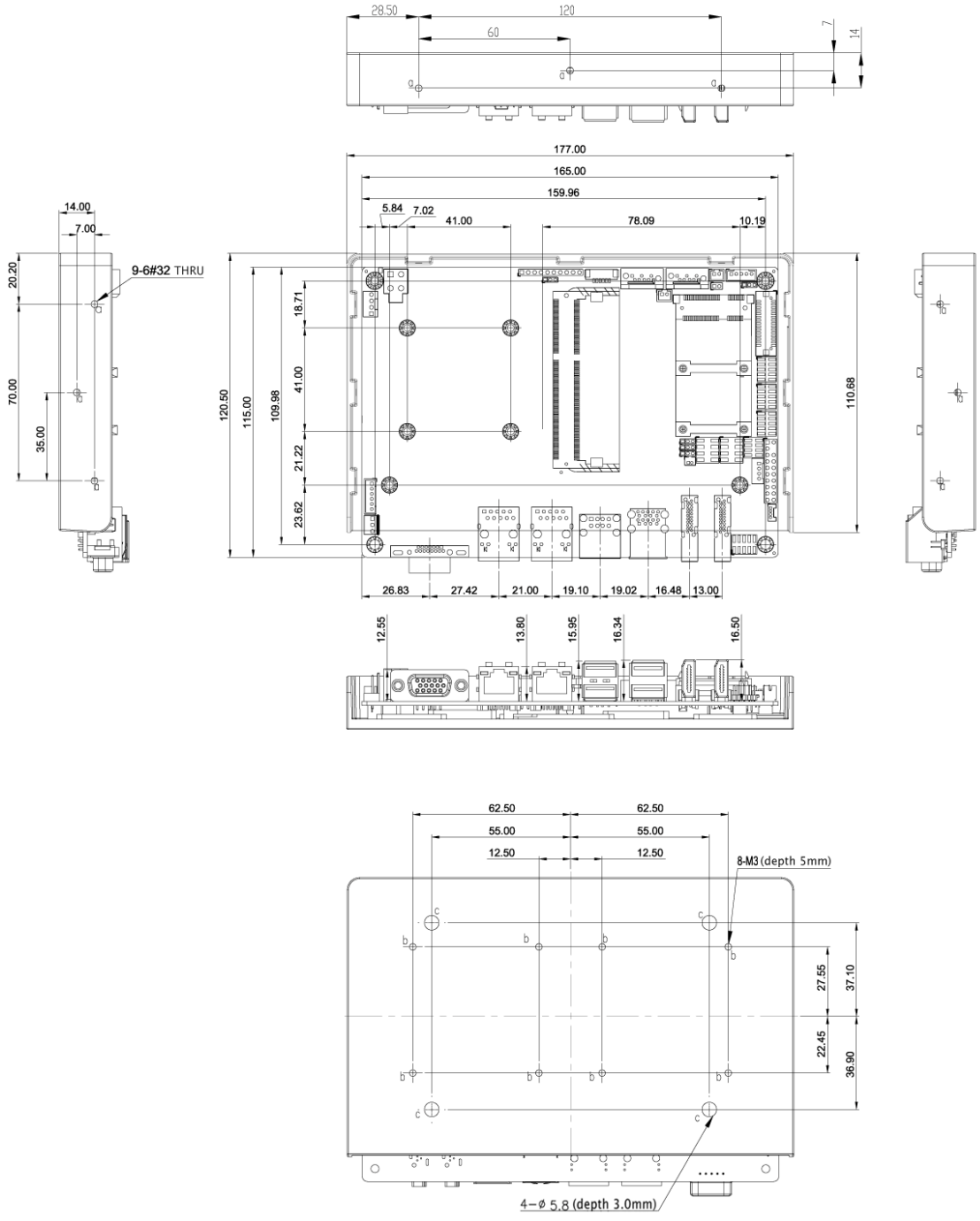


Figure 1-3: NANO-HM651 Dimensions (mm)

1.4 Data Flow

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

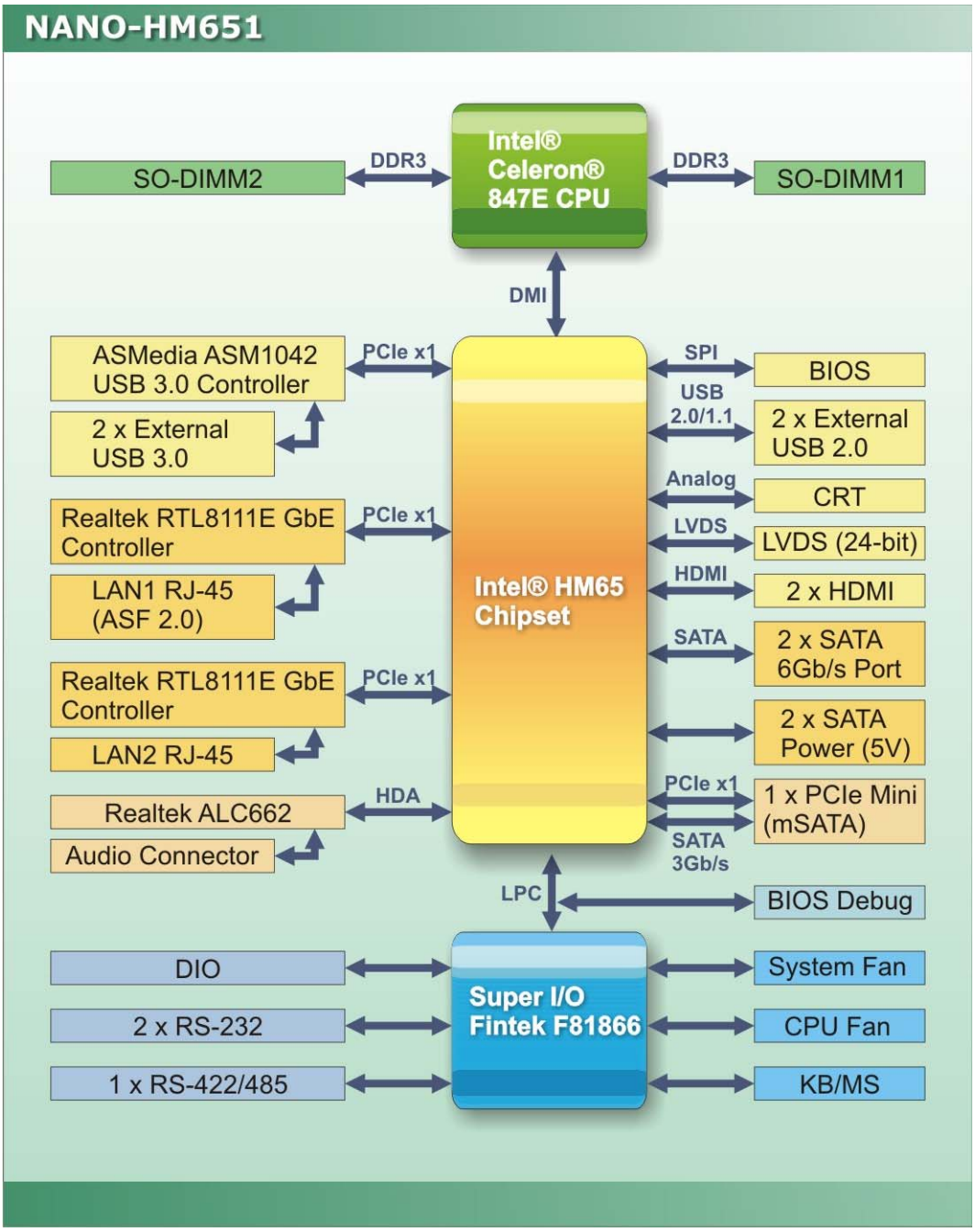


Figure 1-4: Data Flow Block Diagram

1.5 Technical Specifications

NANO-HM651 technical specifications are listed in table below.

Specification	NANO-HM651
Form Factor	EPIC
CPU Options	Intel® Celeron® dual-core 847E processor 1.1GHz
System Chipset	Intel® HM65
Graphics Engine	Intel® HD Graphics Gen 6 support for DX10.1 and OpenGL 3.0 Full MPEG2, VC1, AVC Decode
Memory	Two 204-pin SO-DIMM sockets support two 1333/1066 MHz dual-channel DDR3 SDRAM SO-DIMM (system max. 8 GB)
Ethernet Controller	Two Realtek RTL8111E PCIe GbE controllers with ASF2.0 support
BIOS	UEFI BIOS
Super I/O	Fintek F81866
Digital I/O	8-bit digital I/O (4-bit input, 4-bit output)
Audio Codec	Realtek ALC662 HD Audio codec
Watchdog Timer	Software programmable supports 1~255 sec. system reset
Expansion	
PCIe	One PCIe Mini slot with mSATA support
I/O Interface Connectors	
Display	VGA and LVDS integrated in Intel® HM65: - One VGA port (2048 x 1536@75Hz) - 24-bit dual-channel LVDS (up to 1920 x 1200@60Hz) Two HDMI ports (up to 1920 x 1200@60Hz)
Ethernet	Two RJ-45 GbE ports
Audio	One internal audio connector supports line-out, line-in and mic-in
Serial Ports	Two RS-232 serial ports via internal 10-pin header One RS-422/485 serial ports via internal 4-pin wafer

Specification	NANO-HM651
USB Ports	Two USB 2.0 ports via internal 8-pin header Two external USB 2.0 ports Two external USB 3.0 ports (via ASMedia ASM1042 USB 3.0 extended host controller)
Keyboard/Mouse	One keyboard and mouse connector via internal 6-pin header
Fan	One 4-pin wafer CPU fan connector One 3-pin wafer system fan connector
Storage	
Serial ATA	Two SATA 6Gb/s ports with 5V power connectors
Environmental and Power Specifications	
Power Supply	12 V, AT/ATX power support
Power Consumption	12V@3.01A (Intel® Celeron® with 4GB 1333MHz DDR3 memory)
Operating Temperature	-10°C~60°C
Storage Temperature	-20°C~70°C
Humidity	5% ~ 95% (non-condensing)
Physical Specifications	
Dimensions (LxW)	115 mm x 165 mm
Weight GW/NW	850g/350g

Table 1-1: Technical Specifications

Chapter

2

Unpacking

2.1 Anti-static Precautions

WARNING!

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

Make sure to adhere to the following guidelines:

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

2.2 Unpacking Precautions

When the NANO-HM651 is unpacked, please do the following:

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

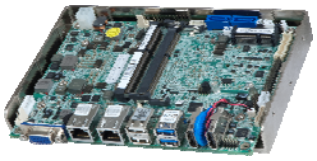
2.3 Unpacking Checklist

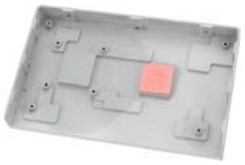
NOTE:

If any of the components listed in the checklist below are missing, do not proceed with the installation. Contact the IEI reseller or vendor the NANO-HM651 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

2.3.1 Package Contents

The NANO-HM651 is shipped with the following components:

Quantity	Item and Part Number	Image
1	NANO-HM651 SBC	
1	SATA and power cable (**P/N:** 32801-000201-300-RS)	
1	AT 12V cable (**P/N**: 32100-087100-RS)	
2	RS-232 cable (**P/N**: 32205-002700-200-RS)	
1	Audio cable (**P/N:** 32007-005200-200-RS)	
2	Plastic retainer clip for securing half-size PCIe Mini card (**PN**: 43124-0010C2-01-RS)	

1	Enclosure heatsink	
1	Mini jumper pack	
1	Utility CD	
1	One Key Recovery CD	
1	Quick Installation Guide	

2.3.2 Optional Items

The following component is optional:

Item and Part Number	Image
Dual USB cable (wo bracket) (**P/N**: 32000-070301-RS)	

Chapter

3

Connectors

3.1 Peripheral Interface Connectors

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

3.1.1 NANO-HM651 Layout

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

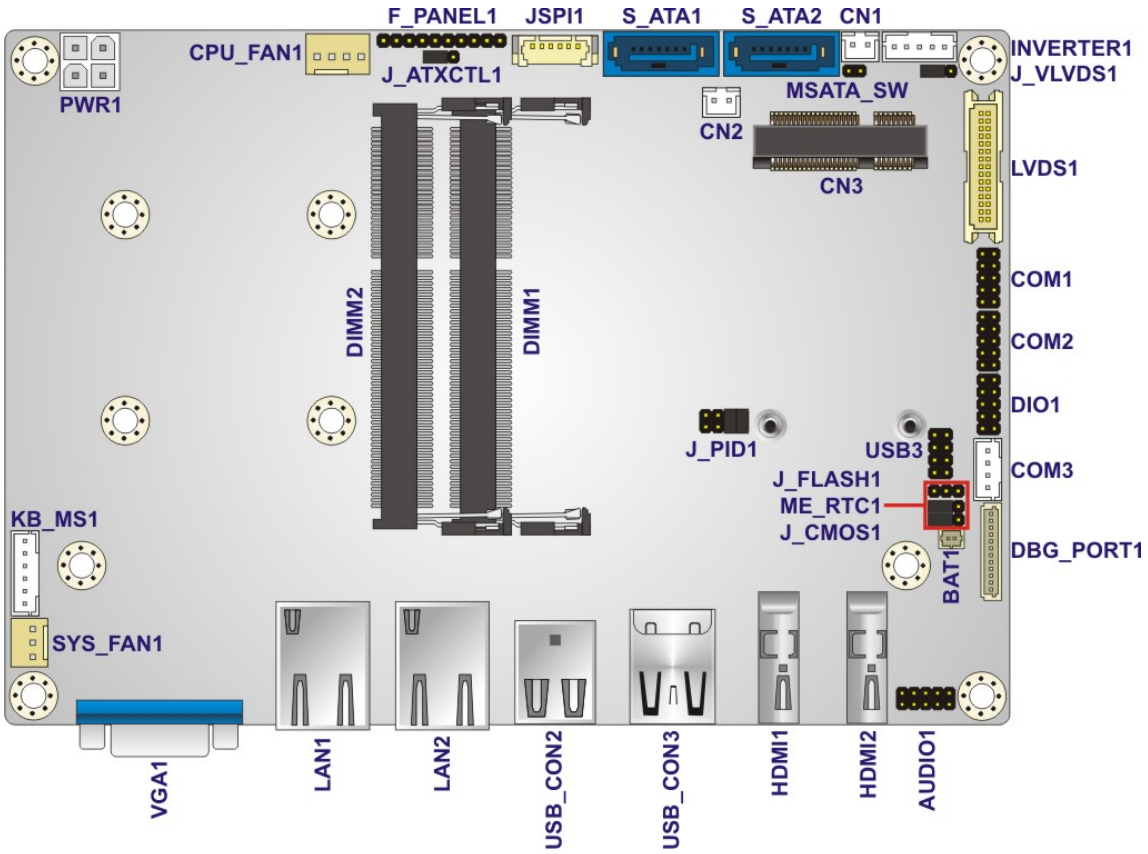


Figure 3-1: Connector and Jumper Locations

3.1.2 Peripheral Interface Connectors

Table 3-1 shows a list of the peripheral interface connectors on the NANO-HM651. Detailed descriptions of these connectors can be found below.

Connector	Type	Label
Audio connector	10-pin header	AUDIO1
Battery connector	2-pin wafer	BAT1
DDR3 SO-DIMM	204-pin SO-DIMM	DIMM1, DIMM2
Digital input/output (DIO) connector	10-pin header	DIO1
Debug port	12-pin connector	DBG_PORT1
Fan connector (CPU)	4-pin wafer	CPU_FAN1
Fan connector (system)	3-pin wafer	SYS_FAN1
Front panel connector	10-pin header	F_PANEL1
Inverter connector	5-pin wafer	INVERTER1
Keyboard and mouse connector	6-pin wafer	KB_MS1
LVDS connector	30-pin crimp	LVDS1
PCIe Mini connector	52-pin PCIe Mini slot	CN3
Power connector	4-pin connector	PWR1
SATA 6Gb/s connectors	7-pin SATA	S_ATA1, S_ATA2
SATA power connectors	2-pin wafer	CN1, CN2
Serial port connectors (RS-232)	10-pin header	COM1, COM2
Serial port connector (RS-422/485)	4-pin wafer	COM3
SPI flash connector	8-pin wafer	JSPI1
USB 2.0 connector	8-pin header	USB3

Table 3-1: Peripheral Interface Connectors

3.1.3 External Interface Panel Connectors

Table 3-2 lists the rear panel connectors on the NANO-HM651. Detailed descriptions of these connectors can be found in **Section 3.2.18** on **page 34**.

Connector	Type	Label
Ethernet connectors	RJ-45	LAN1, LAN2
HDMI connectors	HDMI	HDMI1, HDMI2
USB 2.0 ports	USB port	USB_CON2
USB 3.0 ports	USB port	USB_CON3
VGA port connector	15-pin female	VGA1

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

Internal peripheral connectors are found on the CPU card and are only accessible when the CPU card is outside of the chassis. This section has complete descriptions of all the internal, peripheral connectors on the NANO-HM651.

3.2.1 Audio Connector

CN Label: **AUDIO1**

CN Type: 10-pin header, p=2.0 mm

CN Location: See **Figure 3-2**

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

The 10-pin audio connector is connected to external audio devices including speakers and microphones for the input and output of audio signals to and from the system.

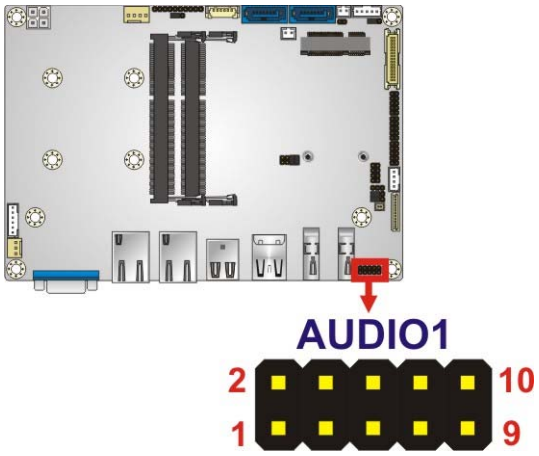


Figure 3-2: Audio Connector Location

Pin	Description	Pin	Description
1	LFRONT-R	2	LLINE-R
3	GND	4	GND
5	LFRONT-L	6	LLINE-L
7	GND	8	GND
9	LMIC1-CONN-R	10	LMIC1-CONN-L

Table 3-3: Audio Connector Pinouts

3.2.2 Battery Connector

CAUTION:

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

Dispose of used batteries according to instructions and local regulations.

CN Label:	**BAT1**
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See **Figure 3-3**
CN Pinouts:	See **Table 3-4**

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

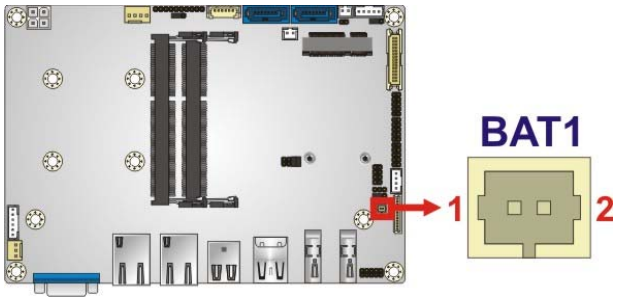


Figure 3-3: Battery Connector Location

Pin	Description
1	Battery+
2	Ground

Table 3-4: Battery Connector Pinouts

3.2.3 Digital Input/Output (DIO) Connector

CN Label: **DIO1**

CN Type: 10-pin header, p=2.0 mm

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

CN Pinouts: See **Table 3-5**

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

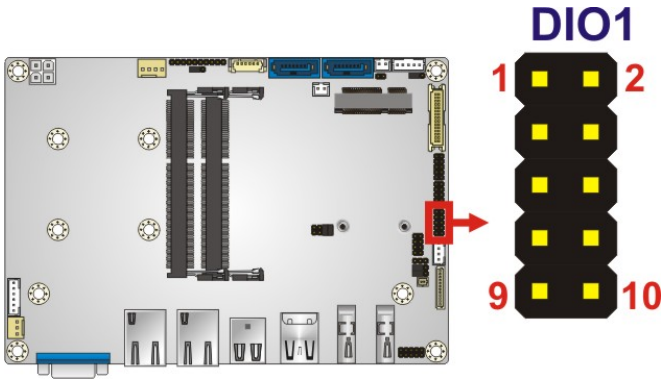


Figure 3-4: DIO Connector Location

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

Table 3-5: DIO Connector Connector Pinouts

3.2.4 Debug Connector

CN Label: **DBG_PORT1**

CN Type: 12-pin connector (1x12)

CN Location: See **Figure 3-5**

CN Pinouts: See **Table 3-6**

The debug connector connects to a debug card for debugging.

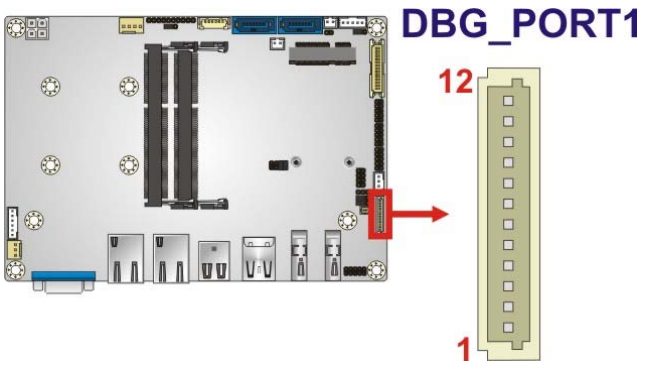


Figure 3-5: EC Debug Connector Location

Pin	Description
1	+V5S
2	+V3.3S
3	GND
4	INT_SERIRQ
5	LPC_AD3
6	LPC_AD2
7	LPC_AD1
8	LPC_AD0
9	LPC_FRAME#
10	BUF_PLT_RST#
11	CLK_PCI_TPM
12	GND

Table 3-6: Debug Connector Pinouts

3.2.5 Fan Connector (CPU)

CN Label:	**CPU_FAN1**
CN Type:	4-pin wafer, p=2.54 mm
CN Location:	See **Figure 3-6**
CN Pinouts:	See **Table 3-7**

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

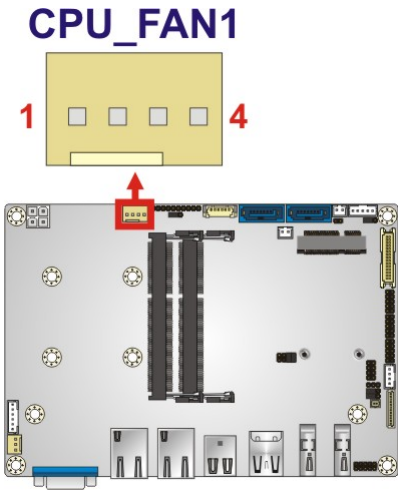


Figure 3-6: CPU Fan Connector Location

Pin	Description
1	GND
2	+12V
3	Rotation Signal
4	PWM Control Signal

Table 3-7: CPU Fan Connector Pinouts

3.2.6 Fan Connector (System)

CN Label:	**SYS_FAN1**
CN Type:	3-pin wafer, p=2.54 mm
CN Location:	See **Figure 3-7**
CN Pinouts:	See **Table 3-8**

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

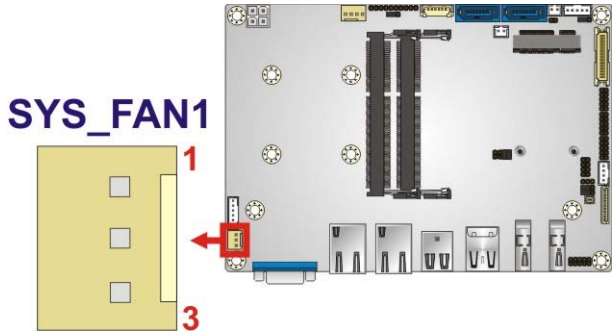


Figure 3-7: System Fan Connector Location

Pin	Description
1	Rotation Signal
2	+12V
3	GND

Table 3-8: System Fan Connector Pinouts

3.2.7 Front Panel Connector

CN Label: **F_PANEL1**

CN Type: 10-pin header, p=2.54 mm

CN Location: See **Figure 3-8**

CN Pinouts: See **Table 3-9**

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

- HDD LED
- Power button
- Power LED
- Reset

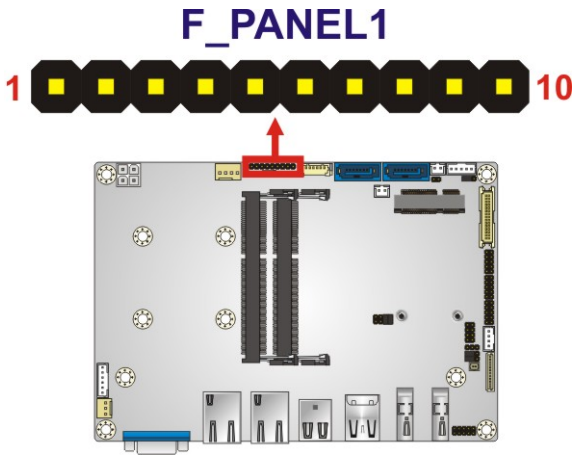


Figure 3-8: Front Panel Connector Location

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

Table 3-9: Front Panel Connector Pinouts

3.2.8 LVDS Backlight Inverter Connector

CN Label: **INVERTER1**

CN Type: 5-pin wafer, p=2.0 mm

CN Location: See **Figure 3-9**

CN Pinouts: See **Table 3-10**

The backlight inverter connector provides power to an LCD panel.

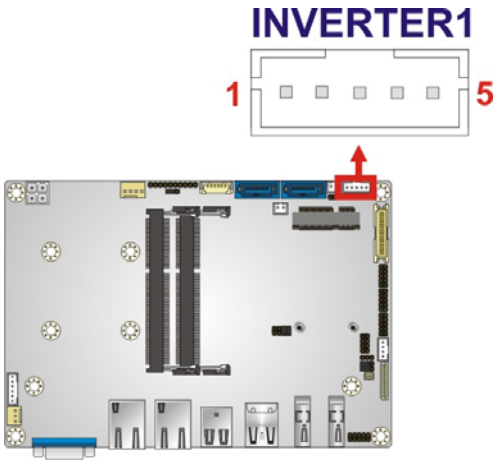


Figure 3-9: Backlight Inverter Connector Location

Pin	Description
1	BACKLIGHT ADJUST
2	GROUND
3	+12 V
4	GROUND
5	BACKLIGHT ENABLE

Table 3-10: Backlight Inverter Connector Pinouts

3.2.9 Keyboard/Mouse Connector

CN Label:	**KB_MS1**
CN Type:	6-pin wafer, p=2.0 mm
CN Location:	See **Figure 3-10**
CN Pinouts:	See **Table 3-11**

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

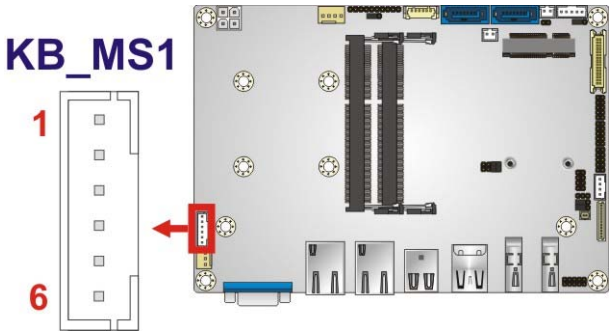


Figure 3-10: Keyboard/Mouse Connector Location

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

Table 3-11: Keyboard/Mouse Connector Pinouts

3.2.10 LVDS LCD Connector

CN Label: **LVDS1**

CN Type: 30-pin crimp, p=1.25 mm

CN Location: See **Figure 3-11**

CN Pinouts: See **Table 3-12**

The LVDS connector is for an LCD panel connected to the board.

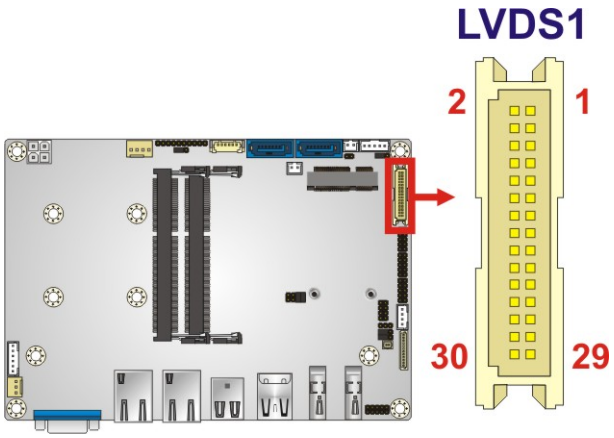


Figure 3-11: LVDS Connector Location

Pin	Description	Pin	Description
1	GROUND	2	GROUND
3	LVDS_A_TX0-P	4	LVDS_A_TX0-N
5	LVDS_A_TX1-P	6	LVDS_A_TX1-N
7	LVDS_A_TX2-P	8	LVDS_A_TX2-N
9	LVDS_A_TXCLK-P	10	LVDS_A_TXCLK-N
11	LVDS_A_TX3-P	12	LVDS_A_TX3-N
13	GROUND	14	GROUND
15	LVDS_B_TX0-P	16	LVDS_B_TX0-N
17	LVDS_B_TX1-P	18	LVDS_B_TX1-N
19	LVDS_B_TX2-P	20	LVDS_B_TX2-N
21	LVDS_B_TXCLK-P	22	LVDS_B_TXCLK-N
23	LVDS_B_TX3-P	24	LVDS_B_TX3-N

Pin	Description	Pin	Description
25	GROUND	26	GROUND
27	+LCD VCC	28	+LCD VCC
29	+LCD VCC	30	+LCD VCC

Table 3-12: LVDS Connector Pinouts

3.2.11 PCIe Mini Card Slot

CN Label: **CN3**

CN Type: PCIe Mini card slot

CN Location: See **Figure 3-12**

CN Pinouts: See **Table 3-13**

The PCIe Mini card slot enables a PCIe Mini card expansion module to be connected to the board. Cards supported include among others wireless LAN (WLAN) cards and mSATA cards.

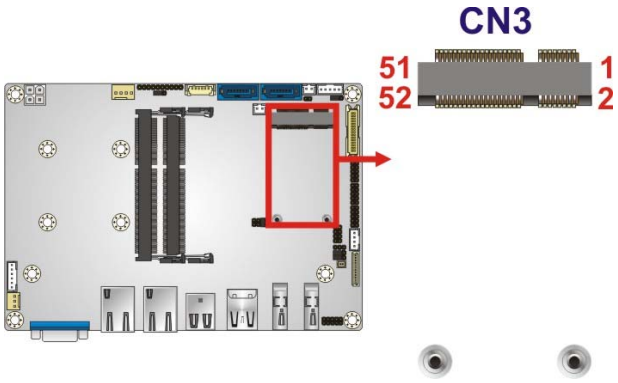


Figure 3-12: PCIe Mini Card Slot Location

Pin	Description	Pin	Description
1	PCIE_WAKE#	2	VCC3
3	N/C	4	GND
5	N/C	6	1.5V
7	N/C	8	N/C
9	GND	10	N/C

Pin	Description	Pin	Description
11	CLK-	12	N/C
13	CLK+	14	N/C
15	GND	16	N/C
17	PCIRST#	18	GND
19	N/C	20	VCC3
21	GND	22	PCIRST#
23	PERN2	24	3VDual
25	PERP2	26	GND
27	GND	28	1.5V
29	GND	30	SMBCLK
31	PETN2	32	SMBDATA
33	PETP2	34	GND
35	GND	36	USBD-
37	N/C	38	USBD+
39	N/C	40	GND
41	N/C	42	N/C
43	N/C	44	N/C
45	N/C	46	N/C
47	N/C	48	1.5V
49	N/C	50	GND
51	N/C	52	VCC3

Table 3-13: PCIe Mini Card Slot Pinouts

3.2.12 Power Connector

CN Label:	**PWR1**
CN Type:	4-pin connector, p=4.2 mm
CN Location:	See **Figure 3-13**
CN Pinouts:	See **Table 3-14**

This connector accepts 12 V of power for the processor.

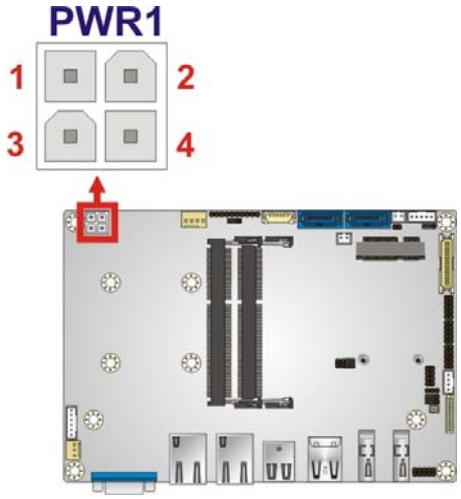


Figure 3-13: CPU Power Connector Location

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

Table 3-14: CPU Power Connector Pinouts

3.2.13 SATA 6Gb/s Connector

CN Label: **S_ATA1, S_ATA2**

CN Type: 7-pin SATA drive connector

CN Location: See **Figure 3-14**

CN Pinouts: See **Table 3-15**

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

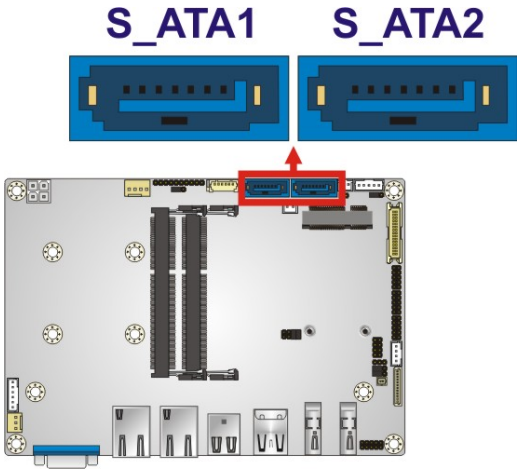


Figure 3-14: SATA Drive Connector Locations

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

Table 3-15: SATA Drive Connector Pinouts

3.2.14 SATA Power Connectors

CN Label:	**CN1, CN2**
CN Type:	2-pin wafer, p=2.0 mm
CN Location:	See **Figure 3-15**
CN Pinouts:	See **Table 3-16**

Use the SATA Power Connector to connect to SATA device power connections. Total +5V SATA power is 2A (CN1+CN2).

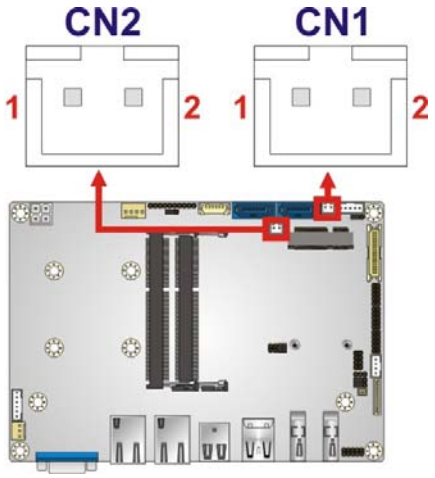


Figure 3-15: SATA Power Connector Locations

Pin	Description
1	+V5S
2	GND

Table 3-16: SATA Power Connector Pinouts

3.2.15 Serial Port Connectors (COM 1 and COM 2)

CN Label:	**COM1, COM2**
CN Type:	10-pin header, p=2.0 mm
CN Location:	See **Figure 3-16**
CN Pinouts:	See **Table 3-17**

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

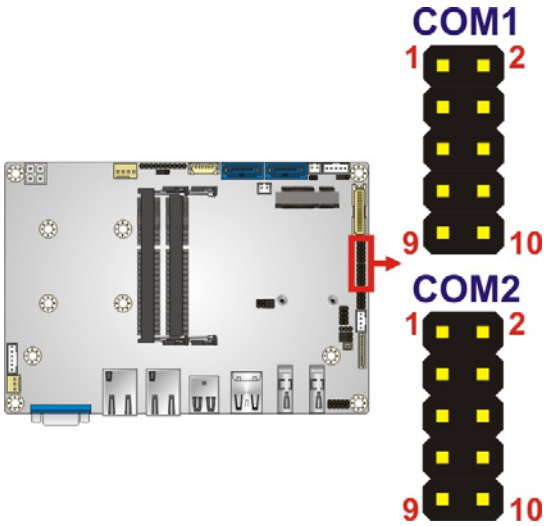


Figure 3-16: COM Connector Locations

Pin	Description	Pin	Description
1	-NDCD	6	-NCTS
2	-NDSR	7	-NDTR
3	NSIN	8	-XRI
4	-NRTS	9	GND
5	NSOUT	10	GND

Table 3-17: COM Connector Pinouts

3.2.16 Serial Port Connector (COM3)

CN Label:	**COM3**
CN Type:	4-pin wafer, p=2.0 mm
CN Location:	See **Figure 3-17**
CN Pinouts:	See **Table 3-18**

NOTE:

These pins are shared with those on the main serial port. Use either the pins on the main connector, or on this connector, but not both.

This connector provides RS-422 or RS-485 communications.

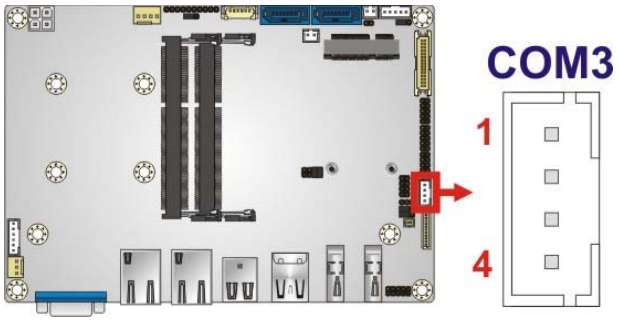


Figure 3-17: Serial Port Connector Location

Pin	Description
1	RXD422-
2	RXD422+
3	TXD422+/TXD485+
4	TXD422-/TXD485-

Table 3-18: Serial Port Connector Pinouts

Use the optional RS-422/485 cable to connect to a serial device. The pinouts of the DB-9 connector are listed below.

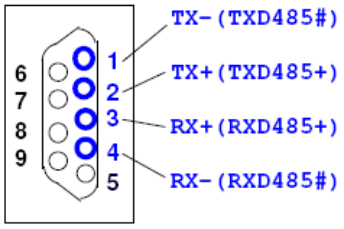
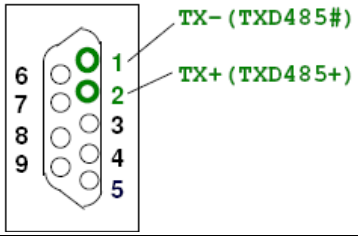
RS-422 Pinouts	RS-485 Pinouts
	

Table 3-19: DB-9 RS-422/485 Pinouts

3.2.17 SPI Flash Connector

CN Label: **JSPI1**

CN Type: 8-pin wafer, p=1.25 mm

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

CN Pinouts: See **Table 3-20**

The SPI Flash connector is used to flash the BIOS.

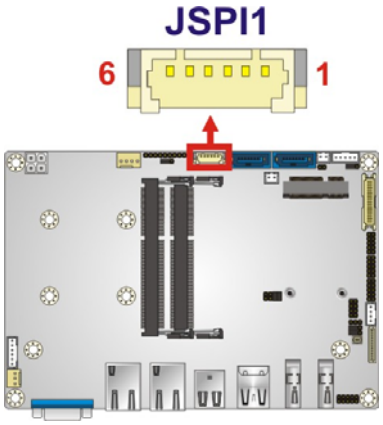


Figure 3-18: SPI Flash Connector Location

Pin	Description	Pin	Description
1	+V3.3M_SPI_CON	5	SPI_SI_SW
2	SPI_CS	6	GND
3	SPI_SO_SW	7	GND
4	SPI_CLK_SW	8	GND

Table 3-20: SPI Flash Connector

3.2.18 USB 2.0 Connector

CN Label:	**USB3**
CN Type:	8-pin wafer, p=2.0 mm
CN Location:	See **Figure 3-19**
CN Pinouts:	See **Table 3-21**

The internal USB 2.0 connector supports two USB 2.0 ports.

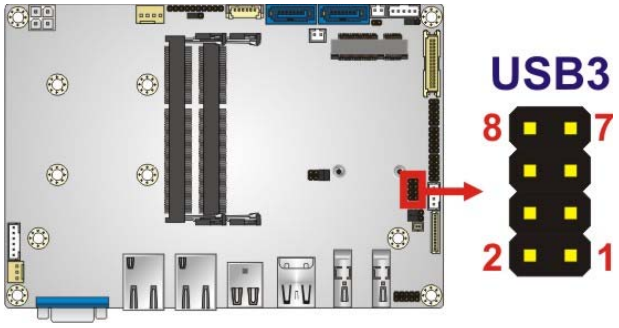


Figure 3-19: USB 2.0 Connector Location

Pin	Description	Pin	Description
1	VCC_USB_2_3	2	GND
3	DATA2-	4	DATA3+
5	DATA2+	6	DATA3-
7	GND	8	VCC_USB_2_3

Table 3-21: USB 2.0 Connector

3.3 External Peripheral Interface Connector Panel

Figure 3-20 shows the NANO-HM651 external peripheral interface connector (EPIC) panel. The NANO-HM651 EPIC panel consists of the following:

- 2 x RJ-45 LAN connectors
- 2 x HDMI connectors
- 2 x USB 2.0 connectors
- 2 x USB 3.0 connectors
- 1 x VGA connector

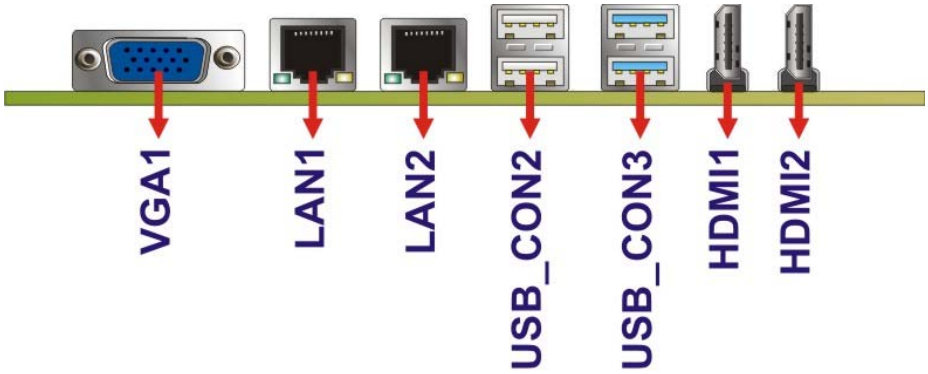


Figure 3-20: NANO-HM651 External Peripheral Interface Connector

3.3.1 Ethernet Connectors

CN Label:	**LAN1 and LAN2**
CN Type:	RJ-45
CN Location:	See **Figure 3-20**
CN Pinouts:	See **Table 3-22**

The NANO-HM651 is equipped with two built-in RJ-45 Ethernet controllers. The controllers can connect to the LAN through two RJ-45 LAN connectors. There are two LEDs on the connector indicating the status of LAN. The pin assignments are listed in the following table:

Pin	Description	Pin	Description
1	LAN1_MDI0+	7	LAN1_MDI2+
2	LAN1_MDI0-	8	LAN1_MDI2-
3.	LAN1_MDI1+	9	LAN1_MDI3+
4.	LAN1_MDI1-	10	LAN1_MDI3-

Table 3-22: LAN Pinouts

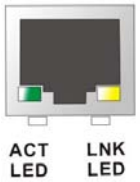


Figure 3-21: RJ-45 Ethernet Connector

The RJ-45 Ethernet connector has two status LEDs, one yellow (activity/link) and one green/orange (speed). The yellow LED indicates activity/link on the port and the green/orange LED indicates the connection speed. See **Table 3-23**.

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

Table 3-23: RJ-45 Ethernet Connector LEDs

3.3.2 HDMI Connectors

CN Label: **HDMI1, HDMI2**

CN Type: HDMI connector

CN Location: See **Figure 3-20**

CN Pinouts: See **Table 3-24** and **Figure 3-22**

The HDMI connector connects to a display device with HDMI interface.

Pin	Description	Pin	Description
1	HDMI_DATA2	13	N/C
2	GND	14	N/C
3	HDMI_DATA2#	15	HDMI_SCL
4	HDMI_DATA1	16	HDMI_SDA
5	GND	17	GND
6	HDMI_DATA1#	18	+5V
7	HDMI_DATA0	19	HDMI_HPD
8	GND	20	HDMI_GND
9	HDMI_DATA0#	21	HDMI_GND
10	HDMI_CLK	22	HDMI_GND
11	GND	23	HDMI_GND
12	HDMI_CLK#		

Table 3-24: HDMI Connector Pinouts

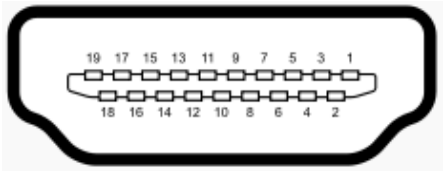


Figure 3-22: HDMI Connector

3.3.3 USB 2.0 Connectors

CN Label: **USB_CON2**

CN Type: USB 2.0 port

CN Location: See **Figure 3-20**

CN Pinouts: See **Table 3-25**

The NANO-HM651 has two external USB 2.0 ports. The ports connect to both USB 2.0 and USB 1.1 devices.

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

Table 3-25: USB 2.0 Port Pinouts

3.3.4 USB 3.0 Connectors

CN Label: **USB_CON3**

CN Type: USB 3.0 port

CN Location: See **Figure 3-20**

CN Pinouts: See **Table 3-26**

The USB 3.0 connector can be connected to a USB device.

Pin	Description
1	VBUS
2	D1-
3	D1+
4	GND1
5	STDA_SSRX1_N
6	STDA_SSRX1_P
7	GND_DRAIN

Pin	Description
8	STDA_SSTX1_N
9	STDA_SSTX1_P

Table 3-26: USB 3.0 Port Pinouts

3.3.5 VGA Connector

CN Label: **VGA1**

CN Type: 15-pin Female

CN Location: See **Figure 3-20**

CN Pinouts: See **Figure 3-23** and **Table 3-27**

The NANO-HM651 has a single 15-pin female connector for connectivity to standard display devices.

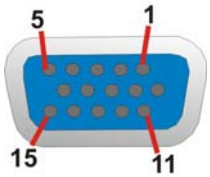


Figure 3-23: VGA Connector

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

Table 3-27: VGA Connector Pinouts

Chapter

4

Installation

4.1 Anti-static Precautions

WARNING:

Failure to take ESD precautions during the installation of the NANO-HM651 may result in permanent damage to the NANO-HM651 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the NANO-HM651. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the NANO-HM651 or any other electrical component is handled, the following anti-static precautions are strictly adhered to.

- ***Wear an anti-static wristband***: Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- ***Self-grounding***: Before handling the board, touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.
- ***Use an anti-static pad***: When configuring the NANO-HM651, place it on an anti-static pad. This reduces the possibility of ESD damaging the NANO-HM651.
- ***Only handle the edges of the PCB***: When handling the PCB, hold the PCB by the edges.

4.2 Installation Considerations

NOTE:

The following installation notices and installation considerations should be read and understood before the NANO-HM651 is installed. All installation notices pertaining to the installation of the NANO-HM651 should be strictly adhered to. Failing to adhere to these precautions may lead to severe damage of the NANO-HM651 and injury to the person installing the CPU card.

WARNING:

The installation instructions described in this manual should be carefully followed in order to prevent damage to the NANO-HM651, NANO-HM651 components and injury to the user.

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

- **Read the user manual**:
  - The user manual provides a complete description of the NANO-HM651 installation instructions and configuration options.
- **Wear an electrostatic discharge cuff (ESD)**:
  - Electronic components are easily damaged by ESD. Wearing an ESD cuff removes ESD from the body and helps prevent ESD damage.
- **Place the NANO-HM651 on an antistatic pad**:
  - When installing or configuring the motherboard, place it on an antistatic pad. This helps to prevent potential ESD damage.
- **Turn all power to the NANO-HM651 off**:
  - When working with the NANO-HM651, make sure that it is disconnected from all power supplies and that no electricity is being fed into the system.

Before and during the installation of the NANO-HM651 **DO NOT:**

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

4.3 SO-DIMM Installation

WARNING:

Using incorrectly specified SO-DIMM may cause permanently damage the NANO-HM651. Please make sure the purchased SO-DIMM complies with the memory specifications of the NANO-HM651. SO-DIMM specifications compliant with the NANO-HM651 are listed in the specification table of Chapter 1.

To install an SO-DIMM, please follow the steps below and refer to Figure 4-1.

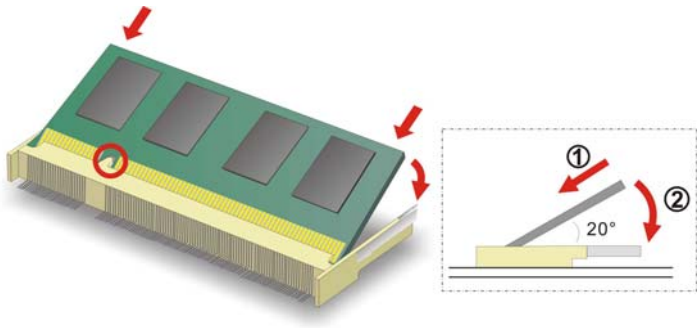


Figure 4-1: SO-DIMM Installation

Step 1: **Locate the SO-DIMM socket**. Place the board on an anti-static mat.

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

Step 3: **Insert the SO-DIMM**. Push the memory in at a 20º angle. (See Figure 4-1)

Step 4: **Seat the SO-DIMM**. Gently push downwards and the arms clip into place. (See Figure 4-1)

4.4 PCIe Mini Card Installation

To install the PCIe Mini card, please refer to the diagram and instructions below.

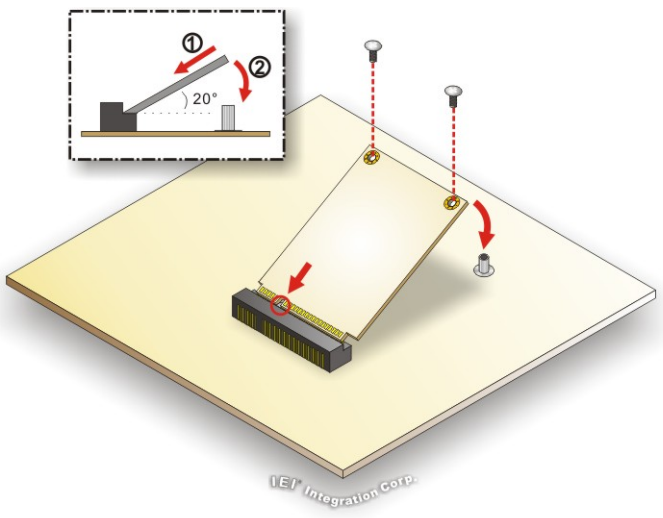


Figure 4-2: PCIe Mini Card Installation

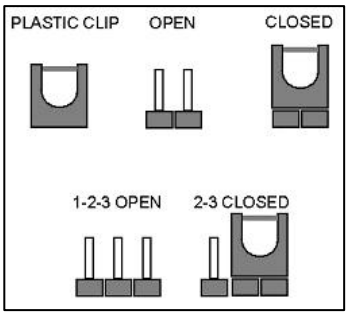
Step 1: **Insert into the socket at an angle**. Line up the notch on the card with the notch on the connector. Slide the PCIe Mini card into the socket at an angle of about 20º.

Step 2: **Push the card down and secure it with retention screws**. Push the other end of the card down and secure the card with two retention screws.

4.5 Jumper Settings

NOTE:

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



Before the NANO-HM651 is installed in the system, the jumpers must be set in accordance with the desired configuration. The jumpers on the NANO-HM651 are listed in **Table 4-1**.

Description	Label	Type
AT/ATX power mode select	J_ATXCTL1	3-pin header
Clear CMOS	J_CMOS1	3-pin header
LVDS voltage select	J_VLVDS1	3-pin header
LVDS panel resolution select	J_PID1	8-pin header
mSATA auto-detect	MSATA_SW	2-pin header
TPM setting	ME_RTC1	3-pin header
Flash descriptor security override	J_FLASH1	3-pin header

Table 4-1: Jumpers

4.5.1 AT/ATX Power Mode Select Jumper

Jumper Label:	**J_ATXCTL1**
Jumper Type:	3-pin header, p=2.0 mm
Jumper Settings:	See **Table 4-2**
Jumper Location:	See **Figure 4-3**

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

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

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

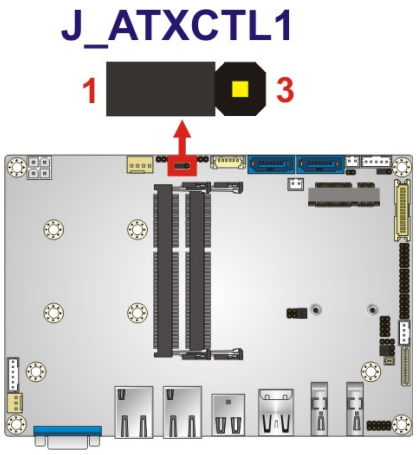


Figure 4-3: AT/ATX Power Mode Jumper Location

4.5.2 Clear CMOS Jumper

Jumper Label:	**J_CMOS1**
Jumper Type:	3-pin header, p=2.0 mm
Jumper Settings:	See **Table 4-3**
Jumper Location:	See **Figure 4-4**

If the NANO-HM651 fails to boot due to improper BIOS settings, the clear CMOS jumper clears the CMOS data and resets the system BIOS information. To do this, use the jumper cap to close pins 2 and 3 for a few seconds then reinstall the jumper clip back to pins 1 and 2.

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

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

Table 4-3: Clear CMOS Jumper Settings

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

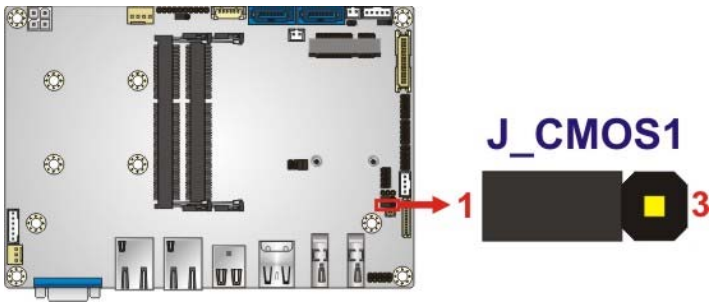


Figure 4-4: Clear CMOS Jumper

4.5.3 LVDS Voltage Selection Jumper

WARNING:

Incorrect voltages can destroy the LCD panel. Make sure to select a voltage that matches the voltage required by the LCD panel.

Jumper Label:	**J_VLVDS1**
Jumper Type:	3-pin header, p=2.0 mm
Jumper Settings:	See **Table 4-4**
Jumper Location:	See **Figure 4-5**

The LCD voltage selection jumper sets the voltage of the power supplied to the LCD panel.

Setting	Description
Short 1-2	+3.3 V (Default)
Short 2-3	+5.0 V

Table 4-4: LVDS Voltage Selection Jumper Settings

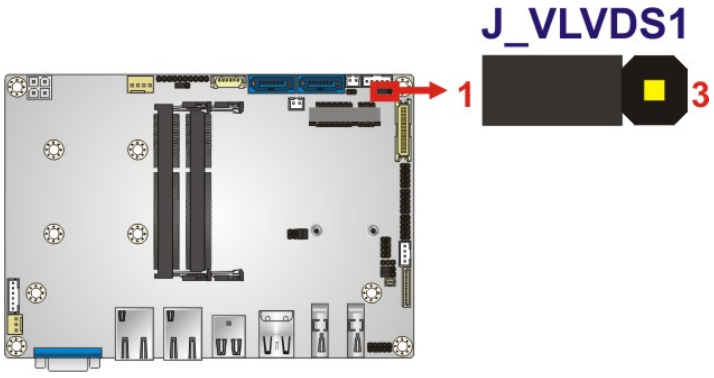


Figure 4-5: LVDS Voltage Selection Jumper Location

4.5.4 LVDS Panel Resolution Selection Jumper

Jumper Label: **J_PID1**

Jumper Type: 8-pin header, p=2.0 mm

Jumper Settings: See **Table 4-5**

Jumper Location: See **Figure 4-6**

The **LVDS Panel Resolution Selection** jumper allows the LVDS screen voltage to be set.

The **LVDS Panel Resolution Selection** jumper settings are shown in **Table 4-5**.

Pin	Description
Open	640 X 480 (18bit)
1-2	800 X 600 (18bit)
3-4	1024 X 768 (18bit)
1-2 and 3-4	1024 X 768 (24bit)
5-6	1280 X 800 (24bit)
1-2 and 5-6	1280 X 1024 (48bit)
3-4 and 5-6	1366 X 768 (24bit)
7-8	1400 X 1050 (48bit)
1-2 and 3-4 and 5-6	1440 X 900 (48bit)
1-2 and 7-8	1600 X 900 (48bit)
3-4 and 7-8	1600 X 1200 (48bit)
1-2 and 3-4 and 7-8	1680 X 1050 (48bit)
5-6 and 7-8	1920 X 1080 (48bit)
1-2 and 5-6 and 7-8	1920 X 1200 (48bit)
3-4 and 5-6 and 7-8	2048x1536 (48bit)
Short all	LVDS Disabled

Table 4-5: LVDS Screen Resolution Jumper Settings

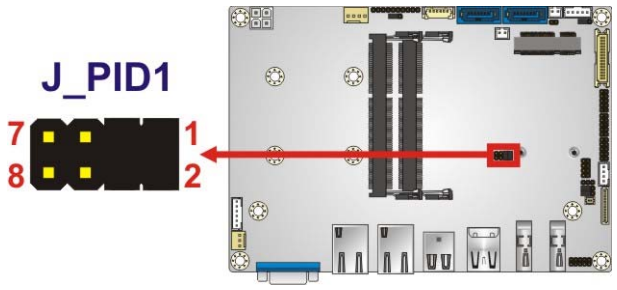


Figure 4-6: LVDS Screen Resolution Jumper Locations

4.5.5 mSATA Auto-detect Jumper

Jumper Label:	**MSATA_SW1**
Jumper Type:	2-pin header, p=2.0 mm
Jumper Settings:	See **Table 4-6**
Jumper Location:	See **Figure 4-7**

The mSATA Auto-detect Jumper configures the PCIe Mini / mSATA slot (CN3).

Setting	Description
Open	Detect mSATA automatically (Default)
Short	mSATA enabled

Table 4-6: mSATA Auto-detect Jumper Settings

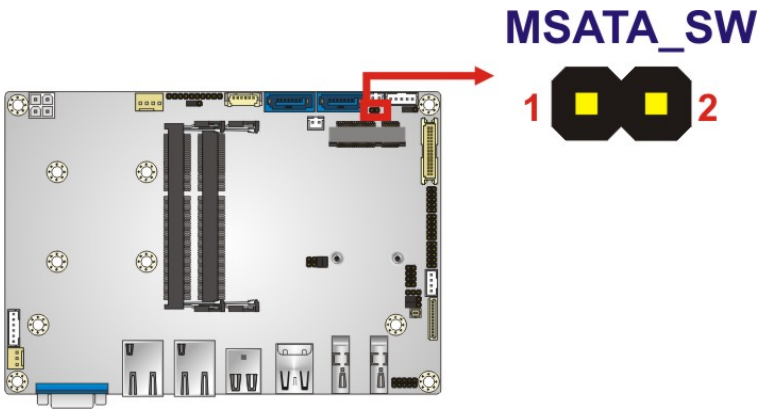


Figure 4-7: mSATA Auto-detect Jumper Location

4.5.6 TPM Setting Jumper

Jumper Label: **ME_RTC1**

Jumper Type: 3-pin header, p=2.0 mm

Jumper Settings: See **Table 4-7**

Jumper Location: See **Figure 4-8**

The TPM Setting jumper configures the TPM setting.

Setting	Description
Short 1-2	Save ME RTC registers (Default)
Short 2-3	Clear ME RTC registers

Table 4-7: TPM Setting Jumper Settings

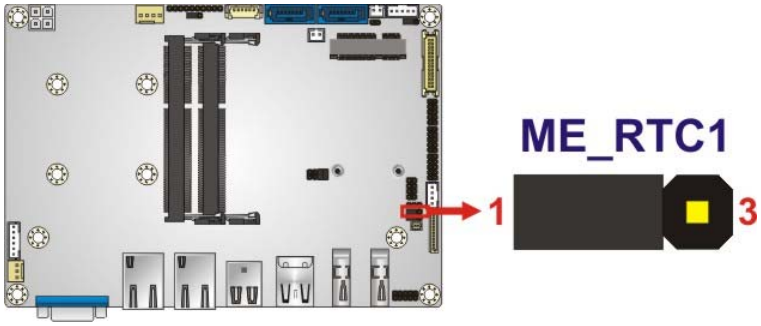


Figure 4-8: TPM Setting Jumper Location

4.5.7 Flash Descriptor Security Override Jumper

Jumper Label: **J_FLASH1**

Jumper Type: 3-pin header, p=2.0 mm

Jumper Settings: See **Table 4-8**

Jumper Location: See **Figure 4-9**

The Flash Descriptor Security Override jumper specifies whether to override the flash descriptor.

Setting	Description
Short 1-2	Disabled (No override)
Short 2-3	Enabled (Override)

Table 4-8: Flash Descriptor Security Override Jumper Settings

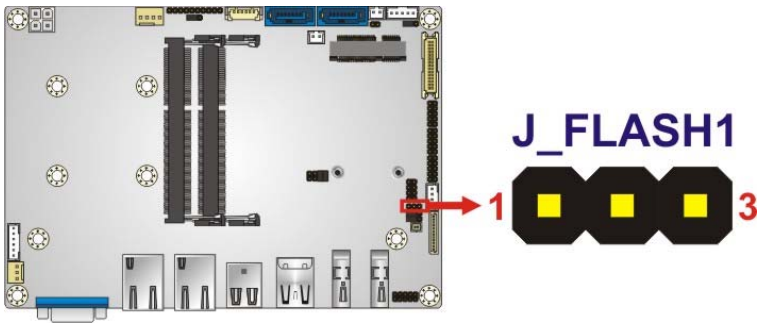


Figure 4-9: Flash Descriptor Security Override Jumper Location

4.6 Chassis Installation

4.6.1 Heat Sink Enclosure

WARNING:

Never run the NANO-HM651 without the heat sink secured to the board. The heat sink ensures the system remains cool and does not need addition heat sinks to cool the system.

WARNING:

When running the NANO-HM651, do not put the NANO-HM651 directly on a surface that can not dissipate system heat, especially the wooden or plastic surface. It is highly recommended to run the NANO-HM651

→ on a heat dissipation surface or

→ using copper pillars to hold the board up from the chassis

When the NANO-HM651 is shipped, it is secured to a heat sink with eight retention screws. If the NANO-HM651 must be removed from the heat sink, the eight retention screws must be removed.

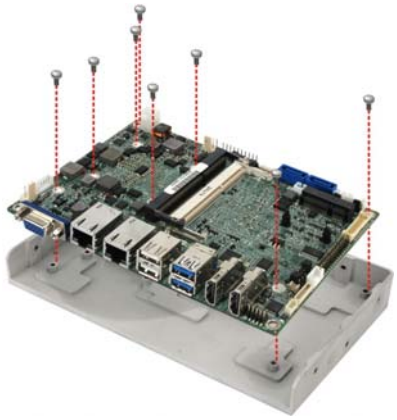


Figure 4-10: Heat Sink Retention Screws

4.6.2 Motherboard Installation

Each side of the heat sink enclosure has several screw holes allowing the NANO-HM651 to be mounted into a chassis (please refer to **Figure 1-3** for the detailed dimensions). The user can design or select a chassis that has screw holes matching up with the holes on the heat sink enclosure for installing the NANO-HM651. The following diagram shows an example of motherboard installation.

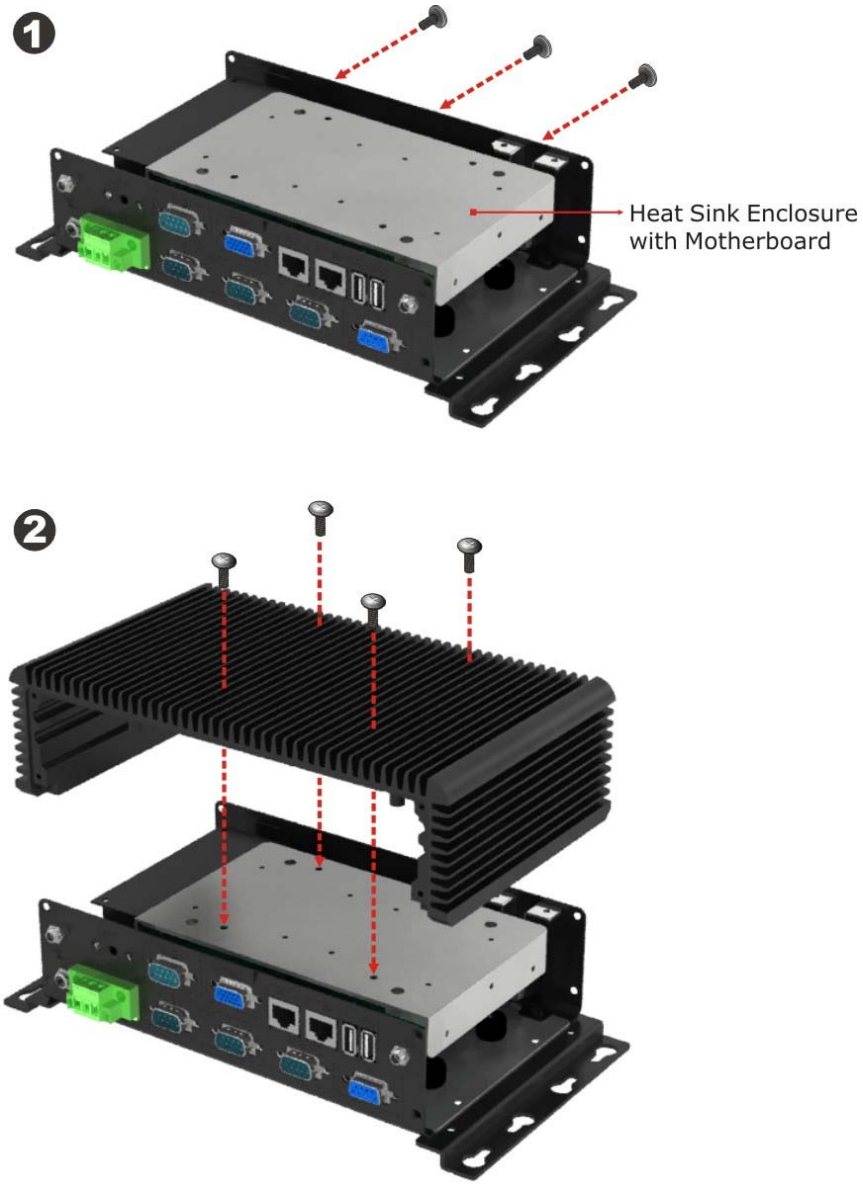


Figure 4-11: Motherboard Installation Example

4.7 Internal Peripheral Device Connections

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

4.7.1 AT Power Connection

Follow the instructions below to connect the NANO-HM651 to an AT power supply.

WARNING:

Disconnect the power supply power cord from its AC power source to prevent a sudden power surge to the NANO-HM651.

Step 1: **Locate the power cable**. The power cable is shown in the packing list in **Chapter 3**.

Step 2: **Connect the Power Cable to the Motherboard**. Connect the 4-pin (2x2) Molex type power cable connector to the AT power connector on the motherboard. See Figure 4-12.

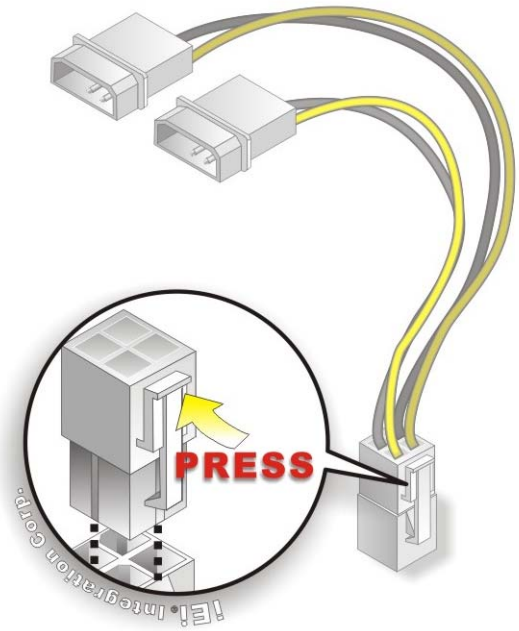


Figure 4-12: Power Cable to Motherboard Connection

Step 3: **Connect Power Cable to Power Supply**. Connect one of the 4-pin (1x4) Molex type power cable connectors to an AT power supply. See Figure 4-13.

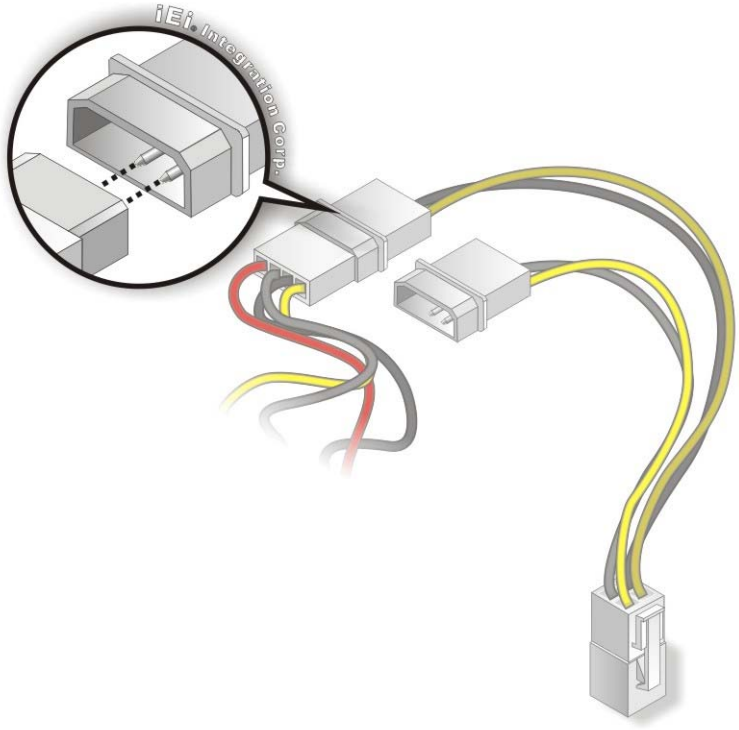


Figure 4-13: Connect Power Cable to Power Supply

4.7.2 Audio Kit Installation

The Audio Kit that came with the NANO-HM651 connects to the audio connector on the NANO-HM651. The audio kit consists of three audio jacks. Mic-in connects to a microphone. Line-in provides a stereo line-level input to connect to the output of an audio device. Line-out, a stereo line-level output, connects to two amplified speakers. To install the audio kit, please refer to the steps below:

Step 1: **Locate the audio connector**. The location of the 10-pin audio connector is shown in **Chapter 3**.

Step 2: **Align pin 1**. Align pin 1 on the on-board connector with pin 1 on the audio kit connector. Pin 1 on the audio kit connector is indicated with a white dot. See Figure 4-14.

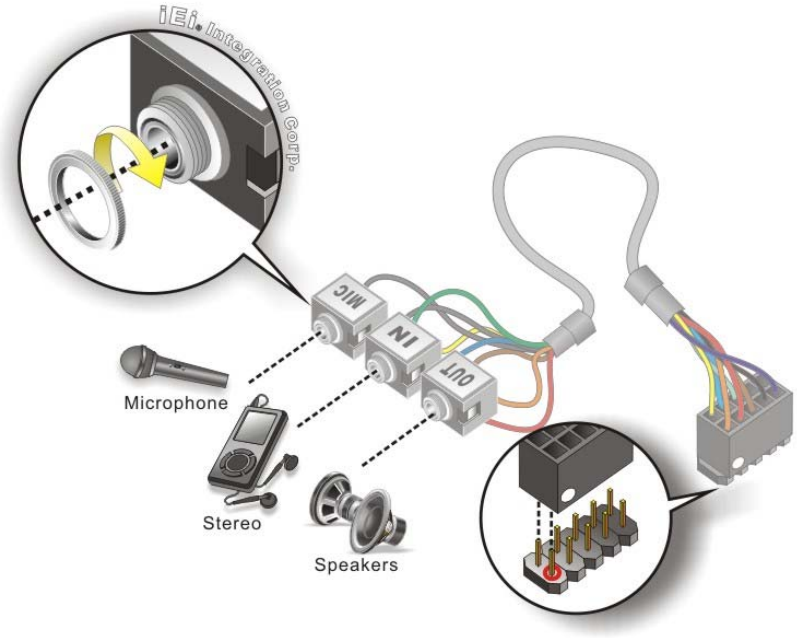


Figure 4-14: Audio Kit Cable Connection

Step 3: **Connect the audio devices**. Connect speakers to the line-out audio jack. Connect the output of an audio device to the line-in audio jack. Connect a microphone to the mic-in audio jack.

4.7.3 SATA Drive Connection

The NANO-HM651 is shipped with a SATA drive cable. To connect the SATA drive to the connector, please follow the steps below.

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

Step 2: **Insert the cable connector**. Insert the cable connector into the on-board SATA drive connector and the SATA power connector. See **Figure 4-15**.

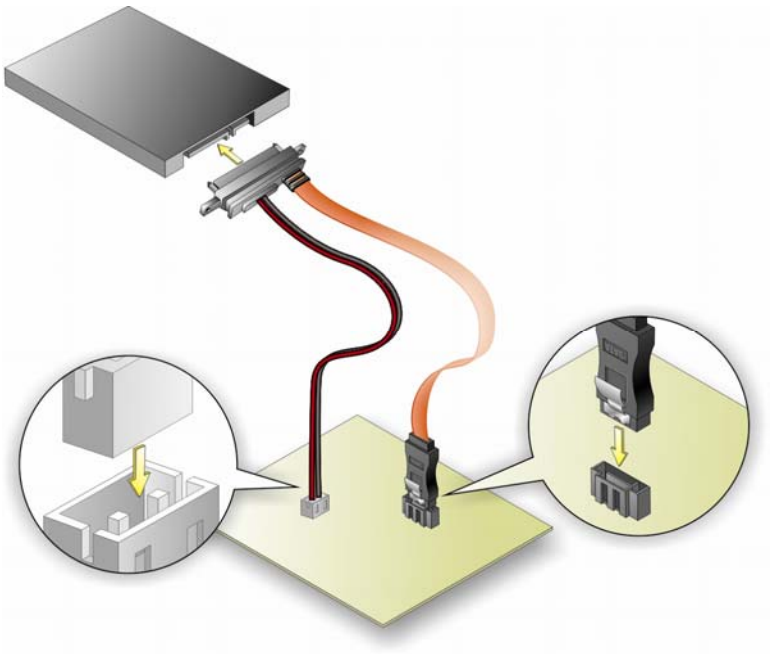


Figure 4-15: SATA Drive Cable Connection

Step 3: **Connect the cable to the SATA disk**. Connect the connector on the other end of the cable to the connector at the back of the SATA drive. See **Figure 4-15**.

Step 4: To remove the SATA cable from the SATA connector, press the clip on the connector at the end of the cable.

4.7.4 Single RS-232 Cable

The single RS-232 cable consists of one serial port connector attached to a serial communications cable that is then attached to a D-sub 9 male connector. To install the single RS-232 cable, please follow the steps below.

Step 1: **Locate the connector**. The location of the RS-232 connector is shown in **Chapter 3**.

Step 2: **Insert the cable connector**. Insert the connector into the serial port box header. See Figure 4-16. A key on the front of the cable connectors ensures the connector can only be installed in one direction.

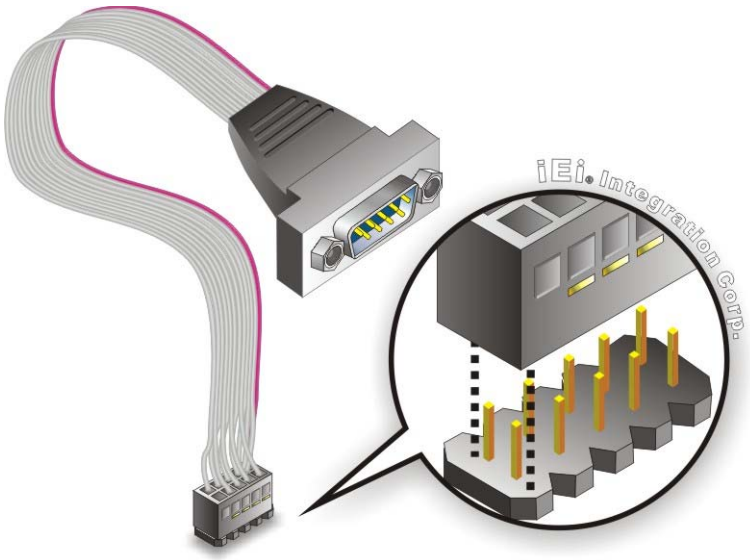


Figure 4-16: Single RS-232 Cable Installation

Step 3: **Secure the bracket**. The single RS-232 connector has two retention screws that must be secured to a chassis or bracket.

Step 4: **Connect the serial device**. Once the single RS-232 connector is connected to a chassis or bracket, a serial communications device can be connected to the system.

4.7.5 USB Cable (Optional)

The NANO-HM651 is shipped with a dual port USB 2.0 cable. To connect the USB cable connector, please follow the steps below.

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

WARNING:

If the USB pins are not properly aligned, the USB device can burn out.

Step 2: **Align the connectors**. The cable has two connectors. Correctly align pin 1on each cable connector with pin 1 on the NANO-HM651 USB connector.

Step 3: **Insert the cable connectors**. Once the cable connectors are properly aligned with the USB connectors on the NANO-HM651, connect the cable connectors to the on-board connectors. See Figure 4-17.

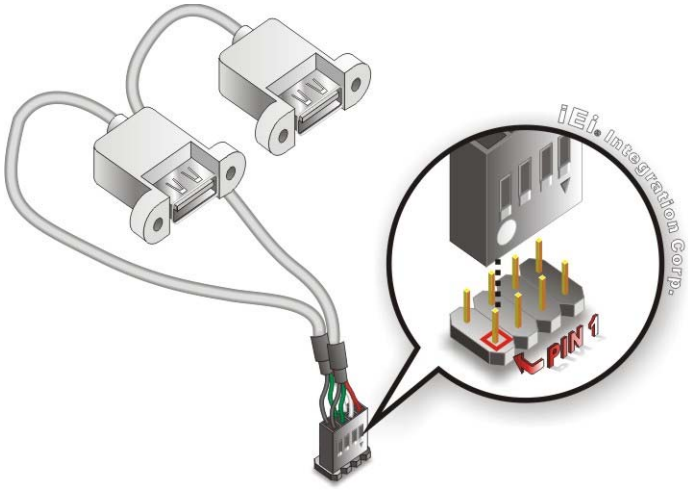


Figure 4-17: Dual USB Cable Connection

Step 4: **Attach the USB connectors to the chassis**. The USB 2.0 connectors each of two retention screw holes. To secure the connectors to the chassis please refer to the installation instructions that came with the chassis.

4.8 Software Installation

All the drivers for the NANO-HM651 are on the CD that came with the system. To install the drivers, please follow the steps below.

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

NOTE:

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

Step 2: The driver main menu appears (**Figure 4-18**).

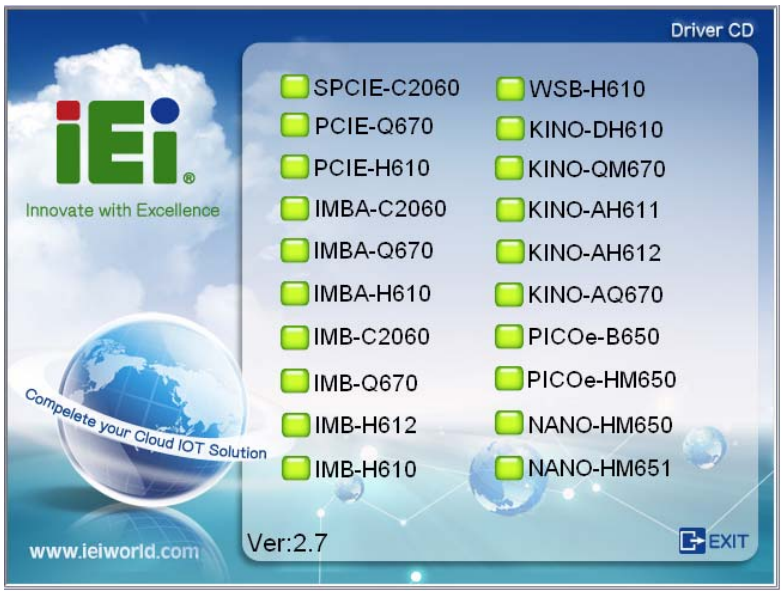


Figure 4-18: Introduction Screen

Step 3: Click **NANO-HM651**.

Step 4: A new screen with a list of available drivers appears (**Figure 4-19**).

Figure 4-19: Available Drivers

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

Chapter

5

BIOS Screens

5.1 Introduction

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

NOTE:

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

5.1.1 Starting Setup

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

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

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

5.1.2 Using Setup

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

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

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

Table 5-1: BIOS Navigation Keys

5.1.3 Getting Help

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

5.1.4 Unable to Reboot After Configuration Changes

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

5.1.5 BIOS Menu Bar

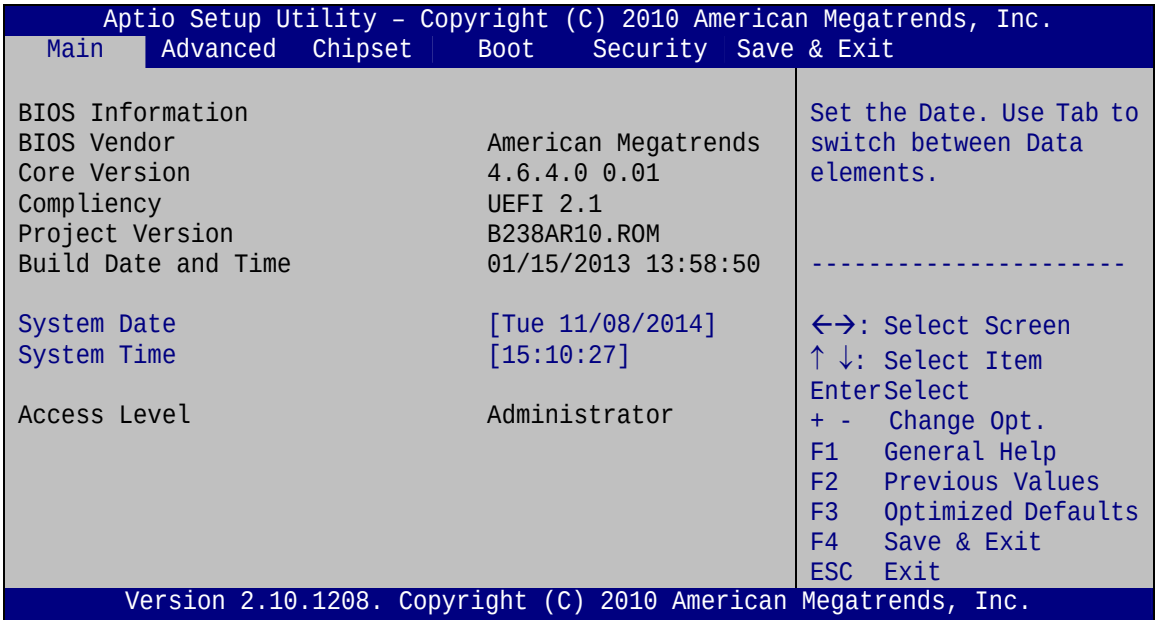
The **menu bar** on top of the BIOS screen has the following main items:

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

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

5.2 Main

The **Main** BIOS menu (**BIOS Menu 1**) appears when the **BIOS Setup** program is entered. The **Main** menu gives an overview of the basic system information.



BIOS Menu 1: Main

➔ **System Overview**

The **BIOS Information** lists a brief summary of the BIOS. The fields in **BIOS Information** cannot be changed. The items shown in the system overview include:

- **BIOS Vendor:** Installed BIOS vendor
- **Core Version:** Current BIOS version
- **Project Version:** the board version
- **Build Date and Time:** Date and time the current BIOS version was made

The System Overview field also has two user configurable fields:

➔ **System Date [xx/xx/xx]**

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

➔ **System Time [xx:xx:xx]**

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

5.3 Advanced

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

WARNING!

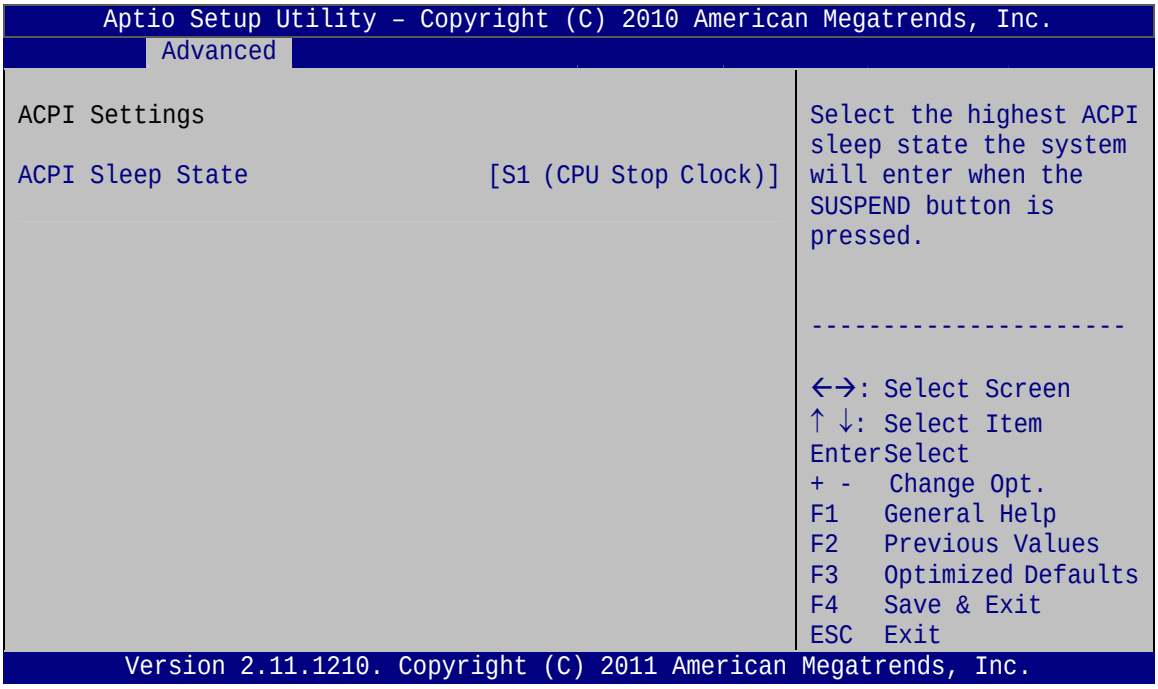
Setting the wrong values in the sections below may cause the system to malfunction. Make sure that the settings made are compatible with the hardware.

```
      Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
  Main    Advanced   Chipset    Boot    Security   Save & Exit

> ACPI Settings                                   System ACPI Parameters
> RTC Wake Settings
> CPU Configuration
> SATA Configuration
> USB Configuration                               ----------------------
> F81866 Super IO Configuration
> F81866 H/M Monitor                              ←→: Select Screen
> Serial Port Console Redirection                 ↑ ↓: Select Item
> iEi Feature                                     EnterSelect
                                                  + -   Change Opt.
                                                  F1    General Help
                                                  F2    Previous Values
                                                  F3    Optimized Defaults
                                                  F4    Save & Exit
                                                  ESC   Exit
        Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 2: Advanced

5.3.1 ACPI Settings

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



BIOS Menu 3: ACPI Configuration

➔ **ACPI Sleep State [S1 (CPU Stop Clock)]**

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

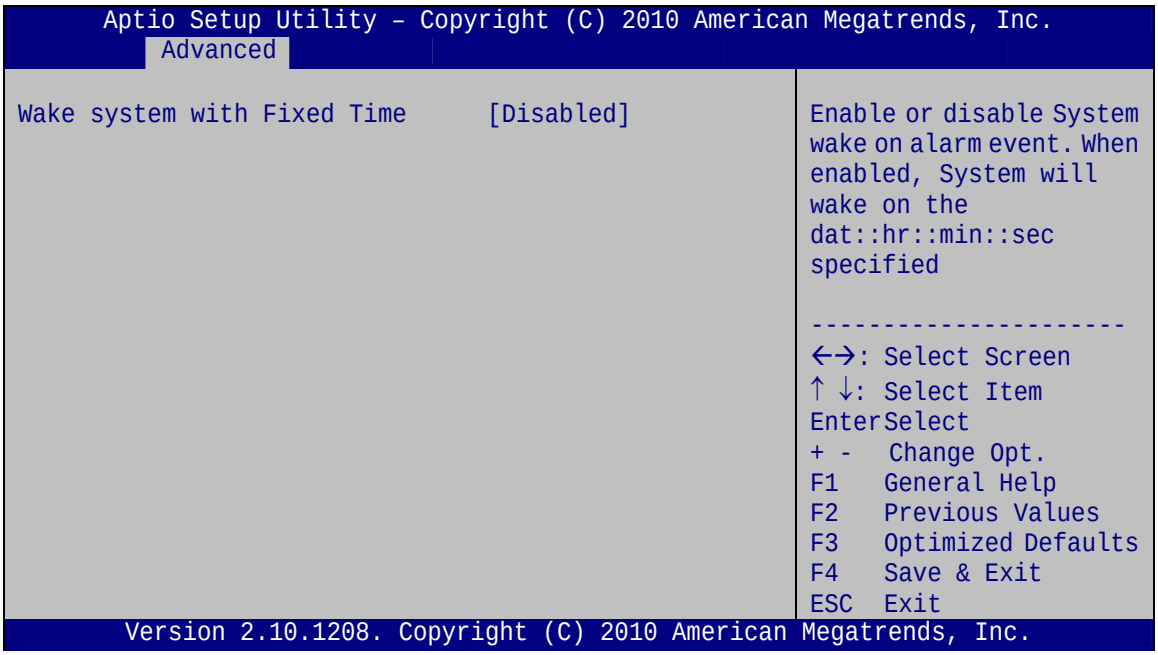
➔ **Suspend Disabled**

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

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

5.3.2 RTC Wake Settings

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



BIOS Menu 4: RTC Wake Settings

➔ **Wake System with Fixed Time [Disabled]**

Use the **Wake System with Fixed Time** option to specify the time the system should be roused from a suspended state.

➔ **Disabled** **DEFAULT** The real time clock (RTC) cannot generate a wake event

➔ **Enabled** If selected, the following appears with values that can be selected:

*Wake up every day

*Wake up date

*Wake up hour

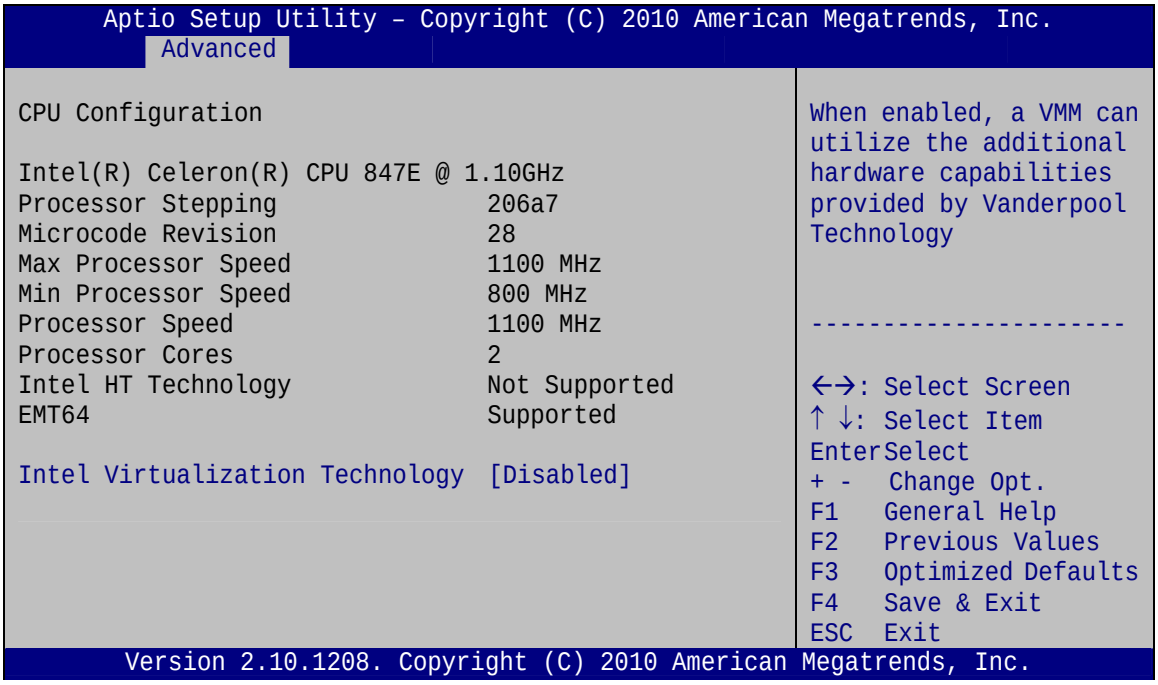
*Wake up minute

*Wake up second

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

5.3.3 CPU Configuration

Use the **CPU Configuration** menu (**BIOS Menu 5**) to enter the **CPU Information** submenu or enable Intel Virtualization Technology.



BIOS Menu 5: CPU Configuration

The CPU Configuration menu (**BIOS Menu 5**) lists the following CPU details:

- Processor Type: Lists the brand name of the CPU being used
- Processor Stepping: Lists the CPU processing stepping
- Microcode Revision: Lists the microcode revision being used.
- Max processor Speed: Lists the maximum CPU processing speed.
- Min processor Speed: Lists the minimum CPU processing speed.
- Processor Speed: Lists the CPU processing speed
- Processor Cores: Lists the number of the processor core
- Intel HT Technology: Indicates if Intel HT Technology is supported by the CPU.
- EMT64: Indicates if EM64T is supported by the CPU.

➔ **Intel Virtualization Technology [Disabled]**

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

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

5.3.4 SATA Configuration

Use the **SATA Configuration** menu (**BIOS Menu 6**) to change and/or set the configuration of the SATA devices installed in the system.

```
Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
        Advanced
SATA Configuration                          Determines how SATA
                                            controller(S) operate.
SATA Mode Selection             [IDE]

S_ATA1                          Empty
S_ATA2                          Empty

                                            ------------------

                                            ←→: Select Screen
                                            ↑ ↓: Select Item
                                            EnterSelect
                                            + -   Change Opt.
                                            F1    General Help
                                            F2    Previous Values
                                            F3    Optimized Defaults
                                            F4    Save & Exit
                                            ESC   Exit
Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 6: SATA Configuration

➔ **SATA Mode Selection [IDE]**

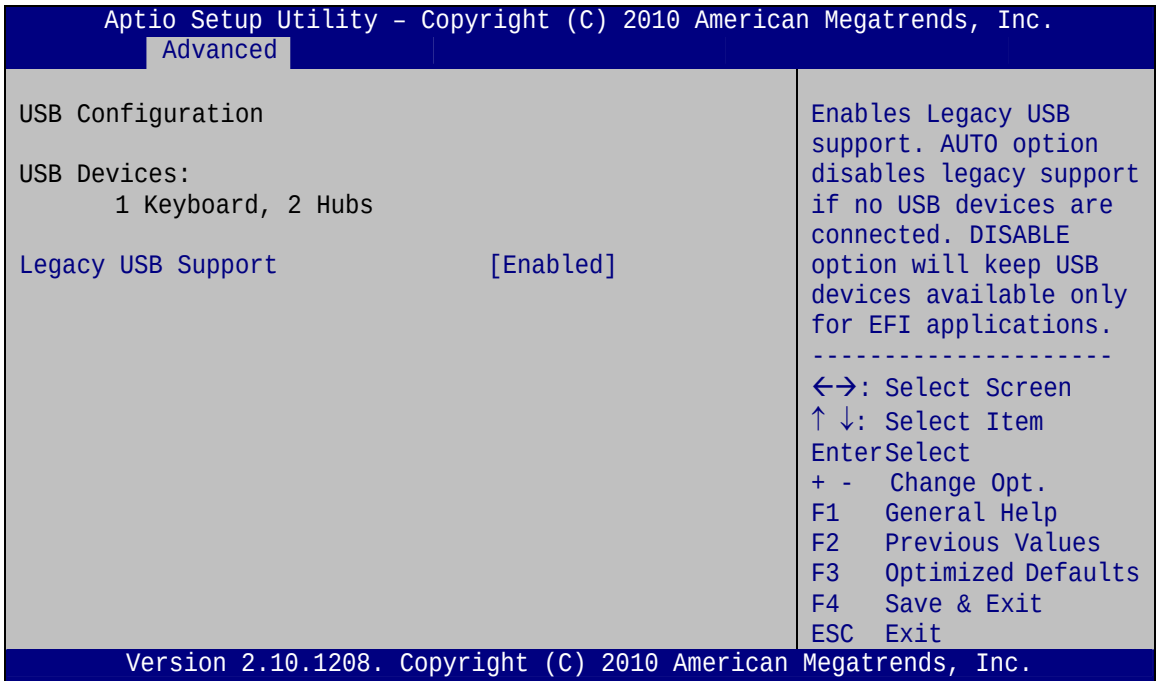
Use the **SATA Mode Selection** option to configure SATA devices as normal IDE devices.

➔ **IDE**	**DEFAULT**	Configures SATA devices as normal IDE device.

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

5.3.5 USB Configuration

Use the **USB Configuration** menu (**BIOS Menu 7**) to read USB configuration information and configure the USB settings.



BIOS Menu 7: USB Configuration

➔ **USB Devices**

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

➔ **Legacy USB Support [Enabled]**

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

➔ **Enabled** **DEFAULT** Legacy USB support enabled

➔ **Disabled** Legacy USB support disabled

5.3.6 F81866 Super IO Configuration

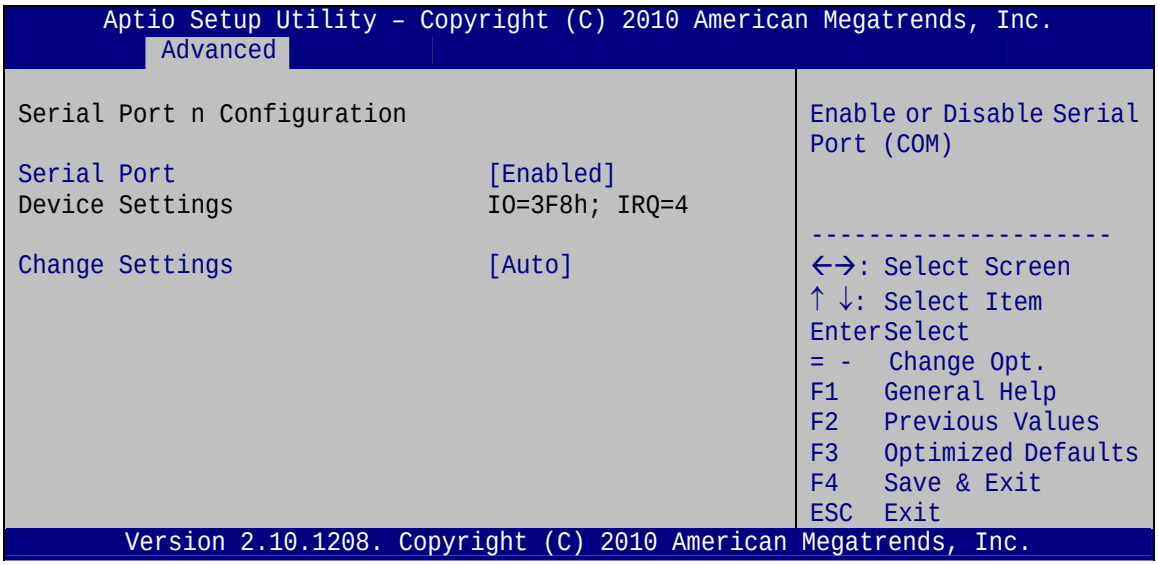
Use the **F81866 Super IO Configuration** menu (**BIOS Menu 8**) to set or change the configurations for the serial ports.

```
      Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
          Advanced
 F81866 Super IO Configuration                  | Set Parameters of Serial
                                                | Port 1 (COMA)
 F81866 Super IO Chip              F81866       |
 > Serial Port 1 Configuration                  |
 > Serial Port 2 Configuration                  | ---------------------
 > Serial Port 3 Configuration                  | ←→: Select Screen
                                                | ↑ ↓: Select Item
                                                | Enter Select
                                                | + -   Change Opt.
                                                | F1    General Help
                                                | F2    Previous Values
                                                | F3    Optimized Defaults
                                                | F4    Save & Exit
                                                | ESC   Exit
      Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 8: F81866 Super IO Configuration

5.3.6.1 Serial Port n Configuration

Use the **Serial Port n Configuration** menu (**BIOS Menu 9**) to configure the serial port n.



BIOS Menu 9: Serial Port n Configuration Menu

5.3.6.1.1 Serial Port 1 Configuration

➔ **Serial Port [Enabled]**

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

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

➔ **Change Settings [Auto]**

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

- ➔ **Auto** **DEFAULT** — The serial port IO port address and interrupt address are automatically detected.
- ➔ **IO=3F8h; IRQ=4** — Serial Port I/O port address is 3F8h and the interrupt address is IRQ4

➔ **IO=3F8h; IRQ=3, 4**		Serial Port I/O port address is 3F8h and the interrupt address is IRQ3, 4
➔ **IO=2F8h; IRQ=3, 4**		Serial Port I/O port address is 2F8h and the interrupt address is IRQ3, 4
➔ **IO=3E8h; IRQ=3, 4**		Serial Port I/O port address is 3E8h and the interrupt address is IRQ3, 4
➔ **IO=2E8h; IRQ=3, 4**		Serial Port I/O port address is 2E8h and the interrupt address is IRQ3, 4

5.3.6.1.2 Serial Port 2 Configuration

➔ **Serial Port [Enabled]**

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

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

➔ **Change Settings [Auto]**

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

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

➔ **IO=2E8h; IRQ=3, 4**		Serial Port I/O port address is 2E8h and the interrupt address is IRQ3, 4

5.3.6.1.3 Serial Port 3 Configuration

➔ **Serial Port [Enabled]**

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

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

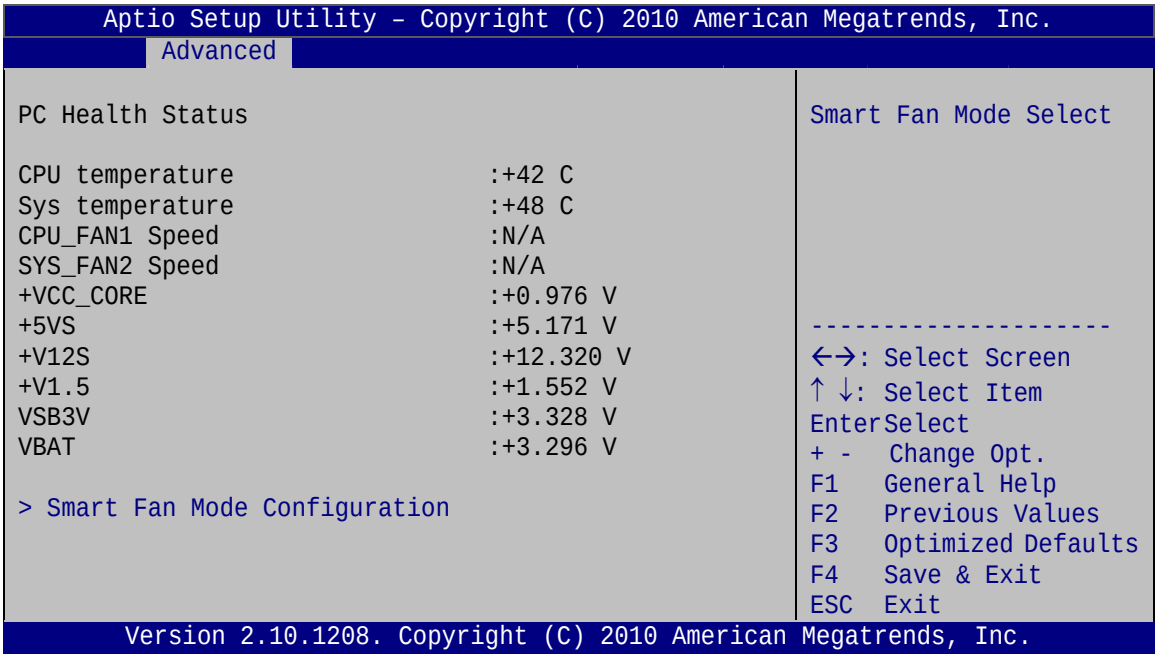
➔ **Change Settings [Auto]**

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

➔ **Auto**	**DEFAULT**	The serial port IO port address and interrupt address are automatically detected.
➔ **IO=3E8h; IRQ=10**		Serial Port I/O port address is 3E8h and the interrupt address is IRQ10
➔ **IO=3F8h; IRQ=10**		Serial Port I/O port address is 3F8h and the interrupt address is IRQ10
➔ **IO=2F8h; IRQ=10**		Serial Port I/O port address is 2F8h and the interrupt address is IRQ10
➔ **IO=3E8h; IRQ=10**		Serial Port I/O port address is 3E8h and the interrupt address is IRQ10
➔ **IO=2E8h; IRQ=10**		Serial Port I/O port address is 2E8h and the interrupt address is IRQ10
➔ **IO=2E0h; IRQ=10**		Serial Port I/O port address is 2E0h and the interrupt address is IRQ10

5.3.7 H/W Monitor

The H/W Monitor menu (**BIOS Menu 10**) contains the fan configuration submenus and displays operating temperature, fan speeds and system voltages.



BIOS Menu 10: H/W Monitor

➔ **PC Health Status**

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

- System Temperatures:
  - CPU Temperature
  - System Temperature
- Fan Speed:
  - CPU Fan Speed
  - System Fan Speed
- Voltages:
  - VCC_core
  - +5VS
  - +V12S

- +V1.5
- VSB3V
- VBAT

5.3.7.1 Smart Fan Mode Configuration

Use the **Smart Fan Mode Configuration submenu** (**BIOS Menu 11**) to configure fan temperature and speed settings.

```
Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
        Advanced
Smart Fan Mode Configuration                    Smart Fan Mode Select

CPU Fan Smart Fan Control       [Auto Duty-Cycle Mode]
Temperature 1                   60
Temperature 2                   50
Temperature 3                   40
Temperature 4                   30
SYS Fan Smart Fan Control       [Auto Duty-Cycle Mode]
Temperature 1                   60
Temperature 2                   50
Temperature 3                   40
Temperature 4                   30
                                                    ---------------------
                                                    ←→: Select Screen
                                                    ↑ ↓: Select Item
                                                    EnterSelect
                                                    + -   Change Opt.
                                                    F1    General Help
                                                    F2    Previous Values
                                                    F3    Optimized Defaults
                                                    F4    Save & Exit
                                                    ESC   Exit
Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 11: Smart Fan Mode Configuration

➔ **CPU Fan Smart Fan Control [Auto Duty-Cycle Mode]**

Use the **CPU Smart Fan control** option to configure the CPU Smart Fan.

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

➔ **Temperature 1**

Use the **Temperature 1** to control fan speed. If CPU temperature is higher than this setting, the fan duty cycle is 100. Use the + or – key to change the fan **Temperature 1** value. Enter a decimal number between 0 and 100.

➔ **Temperature 2**

Use the **Temperature 2** to control fan speed. If CPU temperature is higher than this setting, the fan duty cycle is 85. Use the + or – key to change the fan **Temperature 2** value. Enter a decimal number between 0 and 100.

➔ **Temperature 3**

Use the **Temperature 3** to control fan speed. If CPU temperature is higher than this setting, the fan duty cycle is 70. Use the + or – key to change the fan **Temperature 3** value. Enter a decimal number between 0 and 100.

➔ **Temperature 4**

Use the **Temperature 4** to control fan speed. If CPU temperature is higher than this setting, the fan duty cycle is 60. If CPU temperature is lower than this setting, the fan duty cycle is 50. Use the + or – key to change the fan **Temperature 4** value. Enter a decimal number between 0 and 100.

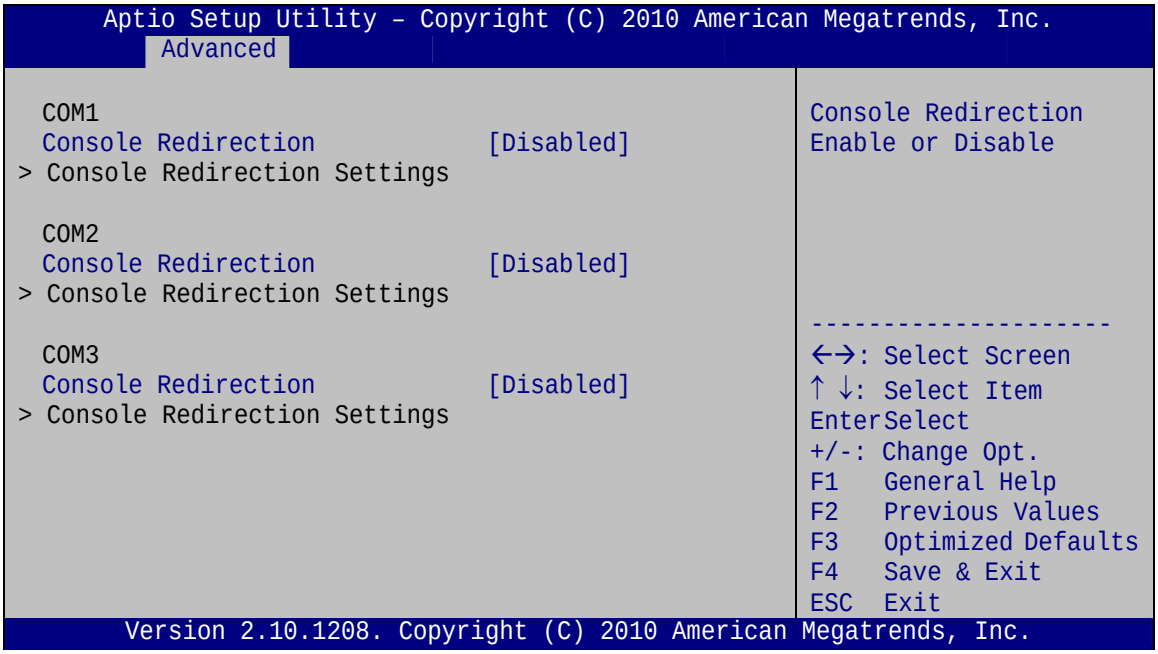
➔ **SYS Fan Smart Fan Control [Auto Duty-Cycle Mode]**

Use the **SYS Fan Smart Fan Control** option to configure the CPU Smart Fan.

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

5.3.8 Serial Port Console Redirection

The **Serial Port Console Redirection** menu (**BIOS Menu 12**) allows the console redirection options to be configured. Console redirection allows users to maintain a system remotely by re-directing keyboard input and text output through the serial port.



BIOS Menu 12: Serial Port Console Redirection

➔ **Console Redirection [Disabled]**

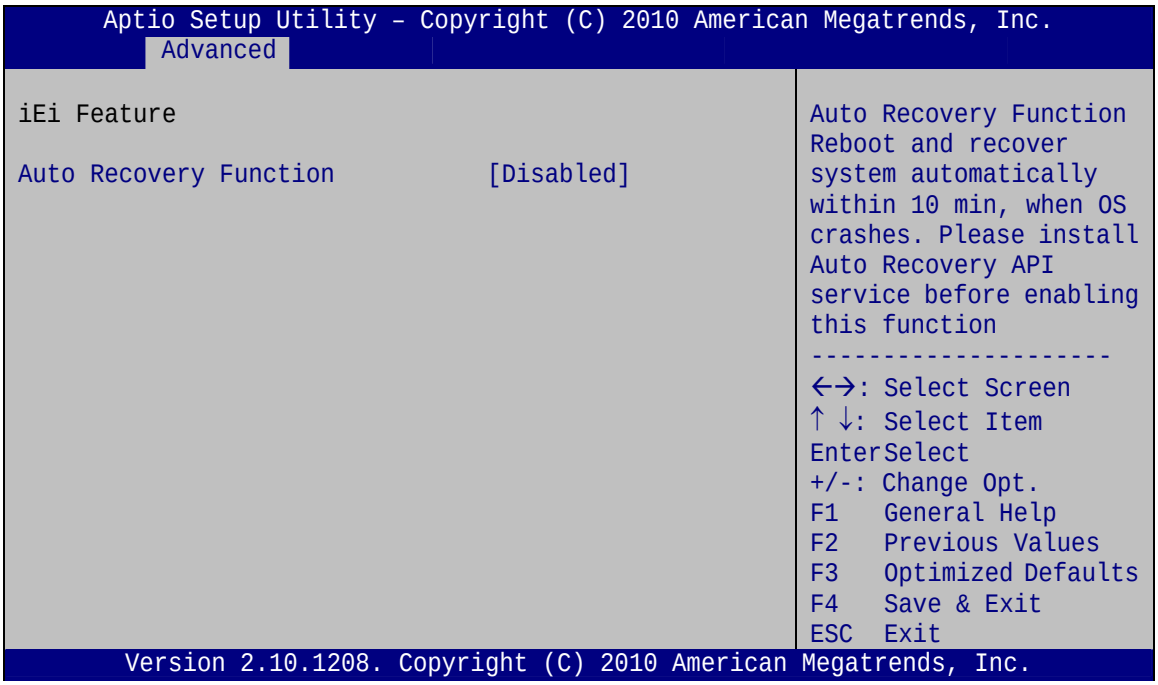
Use **Console Redirection** option to enable or disable the console redirection function.

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

➔ **Enabled** Enabled the console redirection function

5.3.9 IEI Feature

Use the **IEI Feature** menu (**BIOS Menu 13**) to configure One Key Recovery function.



BIOS Menu 13: IEI Feature

➔ **Auto Recovery Function [Disabled]**

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

➔ **Disabled** **DEFAULT** Auto recovery function disabled

➔ **Enabled** Auto recovery function enabled

5.4 Chipset

Use the **Chipset** menu (**BIOS Menu 14**) to access the Northbridge, Southbridge, Integrated Graphics, and ME Subsystem configuration menus.

WARNING!

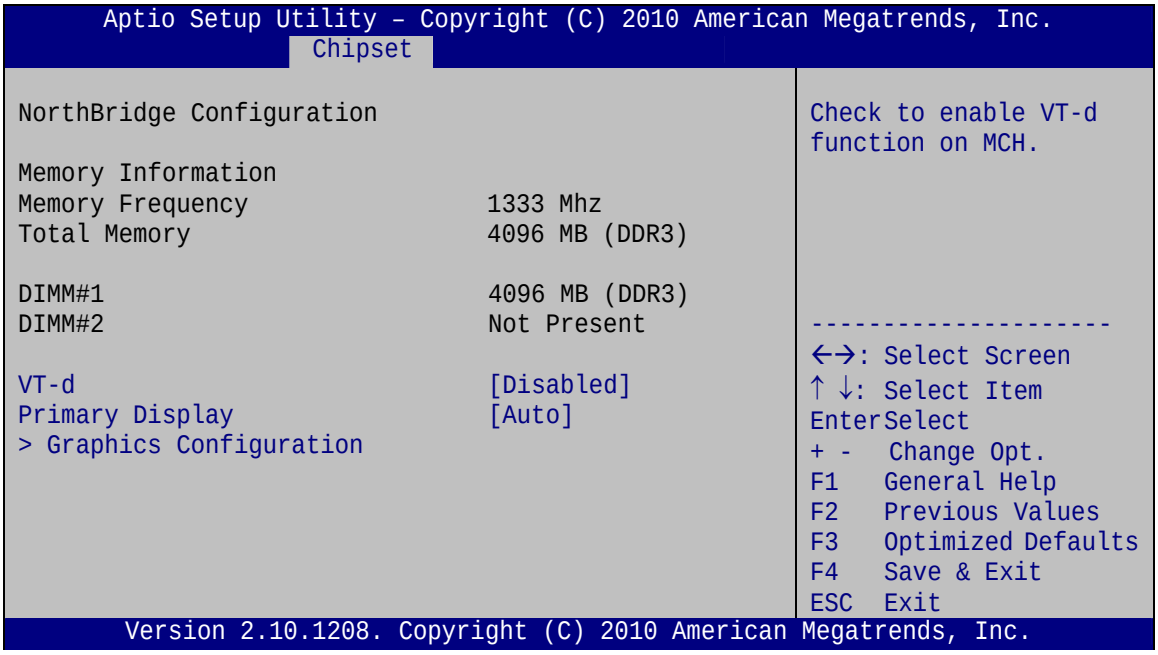
Setting the wrong values for the Chipset BIOS selections in the Chipset BIOS menu may cause the system to malfunction.

```
      Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
  Main    Advanced  Chipset    Boot    Security  Save & Exit

> NorthBridge Configuration                    North Bridge Parameters
> SouthBridge Configuration

                                               ---------------------
                                               ←→: Select Screen
                                               ↑ ↓: Select Item
                                               EnterSelect
                                               + -   Change Opt.
                                               F1    General Help
                                               F2    Previous Values
                                               F3    Optimized Defaults
                                               F4    Save & Exit
                                               ESC   Exit
        Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 14: Chipset

5.4.1 NorthBridge Configuration

Use the **NorthBridge Configuration** menu (**BIOS Menu 15**) to configure the Northbridge chipset.



BIOS Menu 15:Northbridge Configuration

➔ **VT-d [Disabled]**

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

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

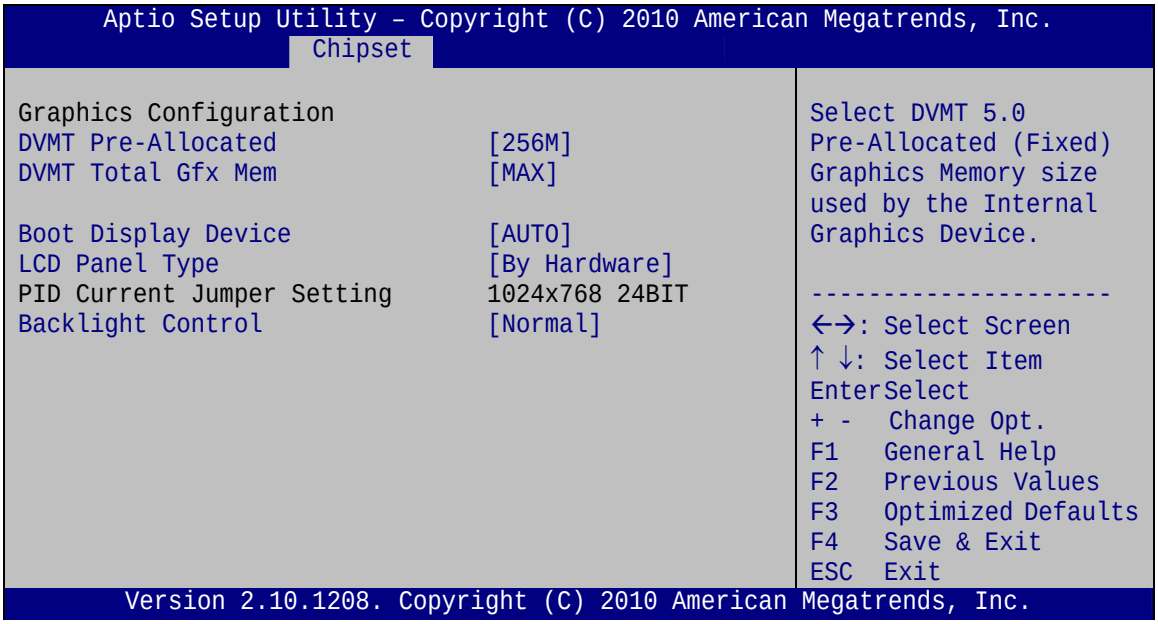
➔ **Primary Display [Auto]**

Use the **Primary Display** option to select the primary display controller the system uses. The following options are available:

- Auto **DEFAULT**
- IGFX
- PEG

5.4.1.1 Graphics Configuration

Use the **Graphics Configuration** menu to configure the video device connected to the system.



BIOS Menu 16:Graphics Configuration

➔ **DVMT Pre-Allocated [256MB]**

Use the **DVMT Pre-Allocated** option to specify the amount of memory that can be allocated as graphics memory. Configuration options are listed below.

- 32M
- 64M
- 128M
- 256M **DEFAULT**
- 512M

➔ **DVMT Total Gfx Mem [MAX]**

Use the **DVMT Total Gfx Mem** option to specify the total amount of memory that can be allocated as graphics memory. Configuration options are listed below.

- 128M

- 256M
- MAX **DEFAULT**

➔ **Boot Display Device [AUTO]**

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

- AUTO **DEFAULT**
- CRT
- LVDS
- HDMI
- HDMI2

➔ **LCD Panel Type [By Hardware]**

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

- By Hardware **DEFAULT**
- 640x480 (18bit)
- 800x600 (18bit)
- 1024x768 (18bit)
- 1024x768 (24bit)
- 1280x800 (24bit)
- 1280x1024 (48bit)
- 1366x768 (24bit)
- 1440x900 (48bit)
- 1400x1050 (48bit)
- 1600x900 (48bit)
- 1600x1200 (48bit)
- 1680x1050 (48bit)
- 1920x1080 (48bit)
- 1920x1200 (48bit)
- 2048x1536 (48bit)

➔ **Backlight Control [Normal]**

Use the **Backlight Control** option to select backlight control mode.

➔ **Normal**	**DEFAULT**	Brightest at low voltage level.
➔ **Inverted**		Brightest at high voltage level.

5.4.2 Southbridge Configuration

Use the **Southbridge Configuration** menu (**BIOS Menu 17**) to configure the Southbridge chipset.

```
Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
                    Chipset
SouthBridge Configuration                  | Select AC power state
                                           | when power is re-applied
Auto Power Button Status      [Disable (ATX)]| after a power failure.
                                           |
Restore AC Power Loss         [Last State] | ---------------------
                                           | ←→: Select Screen
Azalia                        [Enabled]    | ↑ ↓: Select Item
  Azalia Internal HDMI Codec  [Enabled]    | EnterSelect
                                           | + -   Change Opt.
                                           | F1    General Help
                                           | F2    Previous Values
                                           | F3    Optimized Defaults
                                           | F4    Save & Exit
                                           | ESC   Exit
Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 17: Southbridge Chipset Configuration

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

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

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

➔ **Azalia [Enabled]**

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

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

➔ **Enabled** **DEFAULT** The onboard High Definition Audio controller is detected automatically and enabled

➔ **Azalia Internal HDMI Codec [Enabled]**

Use the **Azalia Internal HDMI Codec** option to enable or disable the internal HDMI codec.

➔ **Disabled** The onboard HDMI codec is disabled

➔ **Enabled** **DEFAULT** The onboard HDMI codec is enabled

5.5 Boot

Use the **Boot** menu (**BIOS Menu 18**) to configure system boot options.

```
Aptio Setup Utility – Copyright (C) 2010 American Megatrends, Inc.
  Main    Advanced   Chipset    Boot    Security   Save & Exit

Boot Configuration                          Select the keyboard
Bootup NumLock State          [On]          NumLock state
Quiet Boot                    [Enabled]
Launch PXE OpROM              [Disabled]
Option ROM Messages           [Force BIOS]  ---------------------
UEFI Boot                     [Disabled]    ←→: Select Screen
                                            ↑ ↓: Select Item
Boot Option Priorities                      EnterSelect
                                            + -   Change Opt.
                                            F1    General Help
                                            F2    Previous Values
                                            F3    Optimized Defaults
                                            F4    Save & Exit
                                            ESC   Exit
      Version 2.10.1208. Copyright (C) 2010 American Megatrends, Inc.
```

BIOS Menu 18: Boot

➔ **Bootup NumLock State [On]**

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

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

➔ **Quiet Boot [Enabled]**

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

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

➔ **Launch PXE OpROM [Disabled]**

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

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

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

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

➔ **Force BIOS**	**DEFAULT**	Sets display mode to force BIOS.

➔ **Keep Current** Sets display mode to current.

➔ **UEFI Boot [Disabled]**

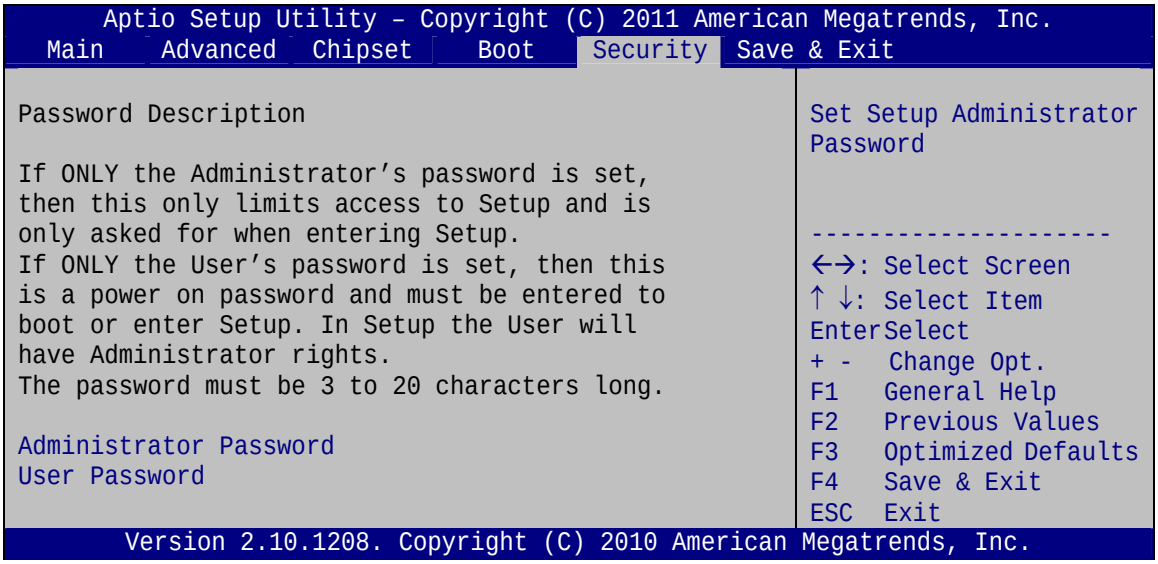
Use the **UEFI Boot** option to enable or disable to boot from the UEFI devices.

➔ **Enabled** Boot from UEFI devices is enabled.

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

5.6 Security

Use the **Security** menu (**BIOS Menu 19**) to set system and user passwords.



BIOS Menu 19: Security

➔ **Administrator Password**

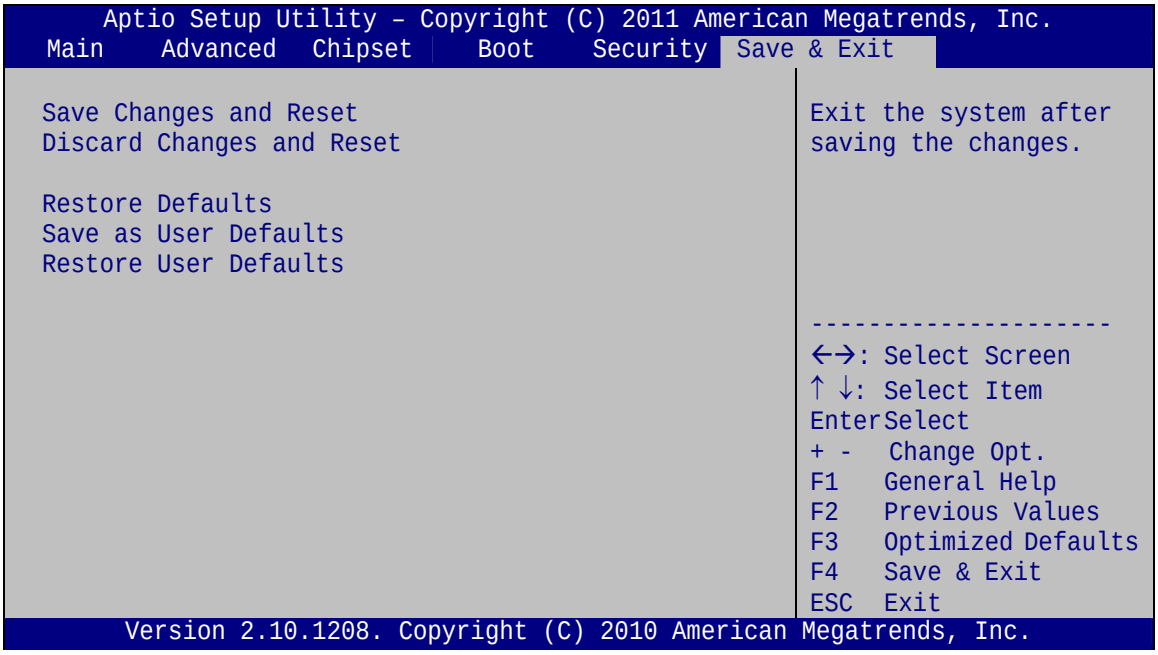
Use the **Administrator Password** to set or change a administrator password.

➔ **User Password**

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

5.7 Exit

Use the **Exit** menu (**BIOS Menu 20**) to load default BIOS values, optimal failsafe values and to save configuration changes.



BIOS Menu 20:Exit

➔ **Save Changes and Reset**

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

➔ **Discard Changes and Reset**

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

➔ **Restore Defaults**

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

➔ **Save as User Defaults**

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

➔ **Restore User Defaults**

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

Appendix

A

Regulatory Compliance

DECLARATION OF CONFORMITY

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

FCC WARNING

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

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

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

Appendix

B

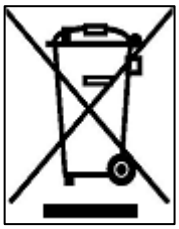
Product Disposal

CAUTION:

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

Dispose of used batteries according to instructions and local regulations.

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



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

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

Appendix

C

BIOS Options

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

Appendix

D

Terminology

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

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

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

Appendix

E

Digital I/O Interface

The DIO connector on the NANO-HM651 is interfaced to GPIO ports on the Super I/O chipset. The DIO has both 8-bit digital inputs and 8-bit digital outputs. The digital inputs and digital outputs are generally control signals that control the on/off circuit of external devices or TTL devices. Data can be read or written to the selected address to enable the DIO functions.

NOTE:

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

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

INT 15H:

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

Assembly Language Sample 1

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

AL low byte = value

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

Assembly Language Sample 2

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

Digital Output is 1001b

Appendix

F

Watchdog Timer

NOTE:

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

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

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

INT 15H:

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

Table F-1: AH-6FH Sub-function

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

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

NOTE:

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

EXAMPLE PROGRAM:

```
; INITIAL TIMER PERIOD COUNTER

;
W_LOOP:
;

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

;
; ADD THE APPLICATION PROGRAM HERE
;

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

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

;
; EXIT ;
```

Appendix

G

Hazardous Materials Disclosure

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

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

Please refer to the following table.

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

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

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

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

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

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

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

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