

DFI



BT968

COM Express Compact Module User's Manual

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Trademarks

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COM Express Specification Reference

PICMG® COM Express Module™ Base Specification.

<http://www.picmg.org/>

FCC and DOC Statement on Class B

This equipment has been tested and found to comply with the limits for a Class B 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 residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

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About this Manual

This manual can be downloaded from the website, or acquired as an electronic file included in the optional CD/DVD. The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.
2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.
3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.
4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.



Important:

Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Measures

To avoid damage to the system:

- Use the correct AC input voltage range.

To reduce the risk of electric shock:

- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- One BT968 board
- One Heat spreader

Optional Items

- COM331-B carrier board kit
- Heat sink
- Heat spreader with heat sink and fan

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Before Using the System Board

Before using the system board, prepare basic system components.

If you are installing the system board in a new system, you will need at least the following internal components.

- Storage devices such as hard disk drive, DVD-ROM, etc.

You will also need external system peripherals you intend to use which will normally include at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

Specifications

Processor	<ul style="list-style-type: none"> Intel Atom®/Intel® Celeron® processors - N30: Intel® Celeron® N2930, Quad Core, 2M Cache, 1.83 GHz (2.16GHz), 7.5W - J00: Intel® Celeron® J1900, Quad Core, 2M Cache, 2GHz (2.41GHz), 10W - E15: Intel Atom® E3815, Single Core, 0.5M Cache, 1.46GHz, 5W - E27: Intel Atom® E3827, Dual Core, 1M Cache, 1.75GHz, 8W - E45: Intel Atom® E3845, Quad Core, 2M Cache, 1.91GHz, 10W - E26: Intel Atom® E3826, Dual Core, 1M Cache, 1.46GHz, 7W BGA 1170 packaging technology 22nm process technology
System Memory	<ul style="list-style-type: none"> Two 204-pin DDR3L SODIMM sockets (-E45/-E27/-E26/-J00/-N30) <ul style="list-style-type: none"> - Supports up to 8GB system memory - dual channel memory interface One 204-pin DDR3L SODIMM socket (-E15) <ul style="list-style-type: none"> - Supports up to 4GB system memory - single channel memory interface Supports DDR3L 1333MHz (-E45/-E27/-J00/-N30) Supports DDR3L 1066MHz (-E26/-E15) DRAM device technologies: 1Gb, 2Gb and 4Gb DDR3L DRAM technologies are supported for x8 and x16 devices, unbuffered, non-ECC
Graphics	<ul style="list-style-type: none"> Intel® HD Graphics Supports VGA, DDI, LVDS (default) or DDI* interfaces Supports 2 display interfaces at the same time VGA: 24-bit, resolution up to 1920x1200 @60Hz LVDS: NXP PTN3460, 24-bit, dual channel, resolution up to 1920x1200 @60Hz Digital Display Interface: HDMI, DVI and DP HDMI, DVI: resolution up to 1920x1080 @60Hz DP: resolution up to 2560x1600 @ 60Hz Supports hardware acceleration for DirectX 11, OCL 1.2, OGL 3.2, H.264, MPEG2, MVC, VC-1, WMV9 and VP8
Audio	<ul style="list-style-type: none"> Supports High Definition Audio interface
LAN	<ul style="list-style-type: none"> Intel® I210AT Gigabit Ethernet Controller Integrated 10/100/1000 transceiver Fully compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3ab
Serial ATA	<ul style="list-style-type: none"> Supports 2 Serial ATA interfaces SATA 2.0 with data transfer rate up to 3Gb/s Integrated Advanced Host Controller Interface (AHCI) controller
Expansion Interfaces	<ul style="list-style-type: none"> Supports 1 USB 3.0 interface Supports 8 USB 2.0 interfaces <ul style="list-style-type: none"> - 4 integrated USB 2.0 interfaces - 1 USB HSIC for 4 USB 2.0 interfaces Supports 3 PCIe x1 (default); or 1 PCIe x4 (PCIe port 3, by default, is shared with the onboard LAN)* Supports LPC interface Supports I²C interface Supports SMBus interface Supports 2 serial interfaces (TX/RX) Supports 8-bit Digital I/O

eMMC*	<ul style="list-style-type: none"> Supports 4GB, 8GB, 16GB and 32GB eMMC onboard Supports Windows 8.1 only
Trusted Platform Module (TPM)*	<ul style="list-style-type: none"> Provides a Trusted PC for secure transactions Provides software license protection, enforcement and password protection
Damage Free Intelligence	<ul style="list-style-type: none"> Monitors CPU temperature Monitors Vcore/Vgfx/VDDR/1V0/VBAT voltages Monitors CPU/system fan speed Watchdog timer function
BIOS	<ul style="list-style-type: none"> AMI BIOS 64Mbit SPI BIOS
Watchdog Timer	<ul style="list-style-type: none"> Watchdog timeout programmable via software from 1 to 255 seconds
Power Consumption	<ul style="list-style-type: none"> BT968-TS0-E45: 15.88W with E3845 at 1.91GHz and 2x 4GB DDR3L SODIMM
OS Support	<ul style="list-style-type: none"> Windows 7 Ultimate x86 & SP1 (32-bit) Windows 7 Ultimate x64 & SP1 (64-bit) Windows 8 Enterprise x86 (32-bit) Windows 8 Enterprise x64 (64-bit) Windows 8.1 Enterprise x86 (32-bit) Windows 8.1 Enterprise x64 (64-bit) Windows 10 Enterprise x86 (32-bit) Windows 10 Enterprise x64 (64-bit)
Temperature	<ul style="list-style-type: none"> Operating <ul style="list-style-type: none"> : 0°C to 60°C - Atom, Celeron (Fanless) : -20°C to 70°C - Atom (Fanless with air flow) : -40°C to 85°C - Atom (Fanless with air flow) Storage: -40°C to 85°C
Humidity	<ul style="list-style-type: none"> 5% to 90%
MTBF	<ul style="list-style-type: none"> 777,906 hrs @ 25°C; 394,833 hrs @ 45°C Calculation model: Telcordia Issue 2, Method I Case 3 Environment: GB, GC – Ground Benign, Controlled
Power Input	<ul style="list-style-type: none"> 12V, 5VSB, VCC_RTC (ATX mode) 12V, VCC_RTC (AT mode)
PCB	<ul style="list-style-type: none"> Dimensions <ul style="list-style-type: none"> - COM Express® Compact - 95mm (3.74") x 95mm (3.74") Compliance <ul style="list-style-type: none"> - PICMG COM Express® R2.1, Type 6
Certification	<ul style="list-style-type: none"> CE, FCC Class B, RoHS


Note:

*Optional and is not supported in standard model. Please contact your sales representative for more information.

Features

• Watchdog Timer

The Watchdog Timer function allows your application to regularly “clear” the system at the set time interval. If the system hangs or fails to function, it will reset at the set time interval so that your system will continue to operate.

• DDR3L

DDR3L is a higher performance DDR3 SDRAM interface providing less voltage and higher speed successor. DDR3L SDRAM modules support 1066/1333MHz for DDR modules. DDR3L delivers increased system bandwidth and improved performance to provide its higher bandwidth and its increase in performance at a lower power.

• Graphics

The integrated Intel® HD graphics engine delivers an excellent blend of graphics performance and features to meet business needs. It provides excellent video and 3D graphics with outstanding graphics responsiveness. These enhancements deliver the performance and compatibility needed for today's and tomorrow's business applications. Supports VGA, DDI, LVDS (default) or DDI (optional) interfaces for up to 2 display outputs at the same time.

• Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 3Gb/s (SATA 2.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s.

• Gigabit LAN

The Intel® WGI210AT Gigabit LAN controller supports up to 1Gbps data transmission.

• USB

The system board supports the new USB 3.0. It is capable of running at a maximum transmission speed of up to 5 Gbit/s (625 MB/s) and is faster than USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.0 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

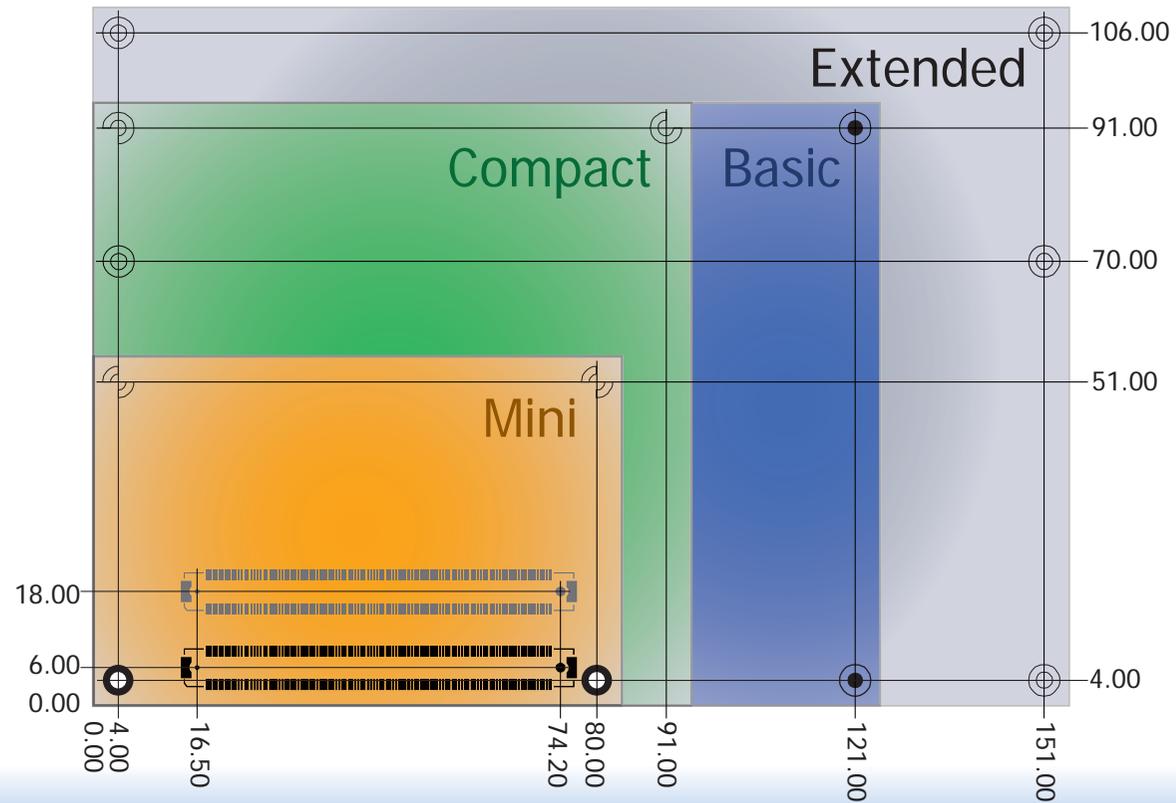
Chapter 2 - Concept

COM Express Module Standards

The figure below indicates the dimensions of the different types of COM Express modules.

BT968 is a COM Express Compact. The dimension is 95mm x 95mm.

- ⊙ Common for all Form Factors
- Extended only
- Basic only
- ⌚ Compact only
- ⌚ Compact and Basic only
- ⌚ Mini only



Specification Comparison Table

The table below shows the COM Express standard specifications and the corresponding specifications supported on the BT968 module.

Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI + USB3) Min / Max	DFI BT968 Type 6
A-B	System I/O		
A-B	PCI Express Lanes 0 - 5	1 / 6	3 (4 for BOM Opt.)
A-B	LVDS Channel A	0 / 1	1
A-B	LVDS Channel B	0 / 1	1
A-B	eDP on LVDS CH A pins	0 / 1	0
A-B	VGA Port	0 / 1	1
A-B	TV-Out	NA	NA
A-B	DDI 0	NA	NA
A-B ⁵	Serial Ports 1 - 2	0 / 2	2
A-B	CAN interface on SER1	0 / 1	0
A-B	SATA / SAS Ports	1 / 4	2
A-B	AC'97 / HDA Digital Interface	0 / 1	1
A-B	USB 2.0 Ports	4 / 8	8
A-B	USB Client	0 / 1	0
A-B	USB 3.0 Ports	NA	NA
A-B	LAN Port 0	1 / 1	1
A-B	Express Card Support	1 / 2	2
A-B	LPC Bus	1 / 1	1
A-B	SPI	1 / 2	1
A-B	System Management		
A-B ⁶	SDIO (muxed on GPIO)	0 / 1	0
A-B	General Purpose I/O	8 / 8	8
A-B	SMBus	1 / 1	1
A-B	I2C	1 / 1	1
A-B	Watchdog Timer	0 / 1	1
A-B	Speaker Out	1 / 1	1
A-B	External BIOS ROM Support	0 / 2	1
A-B	Reset Functions	1 / 1	1



Note:

- 5 Indicates 12V-tolerant features on former VCC_12V signals.
- 6 Cells in the connected columns spanning rows provide a rough approximation of features sharing connector pins.

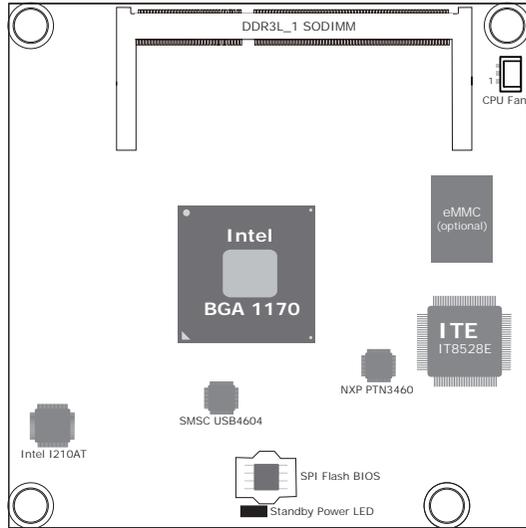
Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI + USB3) Min / Max	DFI BT968 Type 6
A-B	Power Management		
A-B	Thermal Protection	0 / 1	1
A-B	Battery Low Alarm	0 / 1	1
A-B	Suspend/Wake Signals	0 / 3	3
A-B	Power Button Support	1 / 1	1
A-B	Power Good	1 / 1	1
A-B	VCC_5V_SBY Contacts	4 / 4	4
A-B ⁵	Sleep Input	0 / 1	1
A-B ⁵	Lid Input	0 / 1	1
A-B ⁵	Fan Control Signals	0 / 2	2
A-B	Trusted Platform Modules	0 / 1	1
A-B	Power		
A-B	VCC_12V Contacts	12 / 12	12

Module Pin-out - Required and Optional Features C-D Connector. PICMG® COM.0Revision 2.1

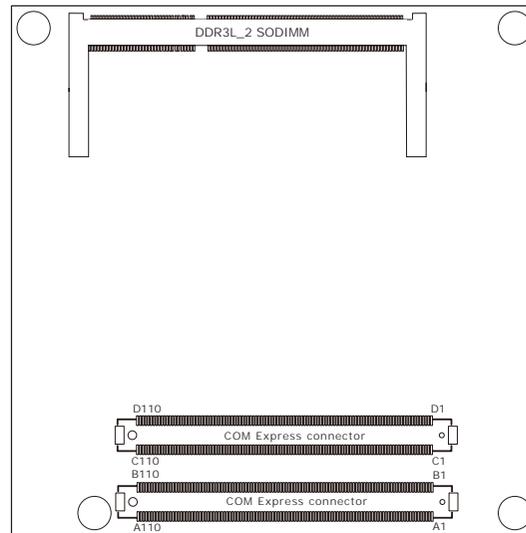
Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI + USB3) Min / Max	DFI BT968 Type 6
C-D	System I/O		
C-D ⁶	PCI Express Lanes 16 - 31	0 / 16	0
C-D ⁶	PCI Express Graphics (PEG)	0 / 1	0
C-D ⁶	Muxed SDVO Channels 1 - 2	NA	NA
C-D ⁶	PCI Express Lanes 6 - 15	0 / 2	0
C-D ⁶	PCI Bus - 32 Bit	NA	NA
C-D ⁶	PATA Port	NA	NA
C-D ⁶	LAN Ports 1 - 2	NA	NA
C-D ⁶	DDIs 1 - 3	0 / 3	1+1 (DDI 2 BOM option with onboard LVDS)
C-D ⁶	USB 3.0 Ports	0 / 4	1
C-D	Power		
C-D	VCC_12V Contacts	12 / 12	12

Chapter 3 - Hardware Installation

Board Layout

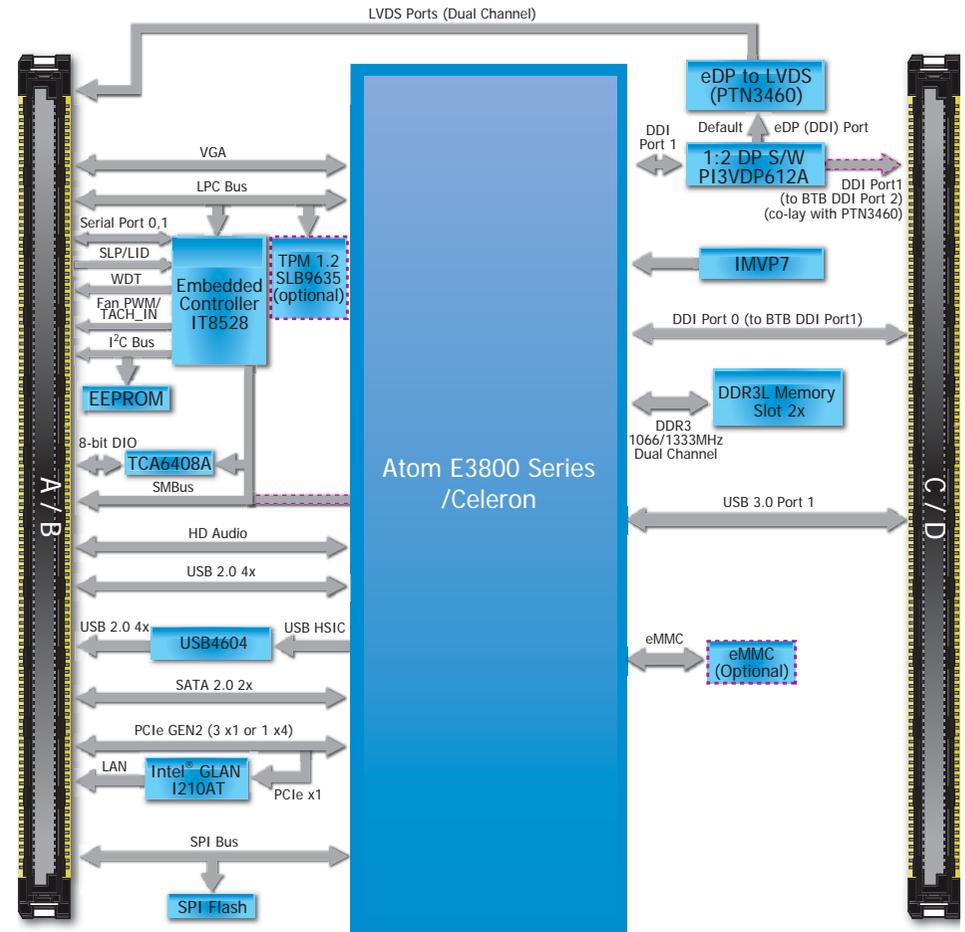


Top View



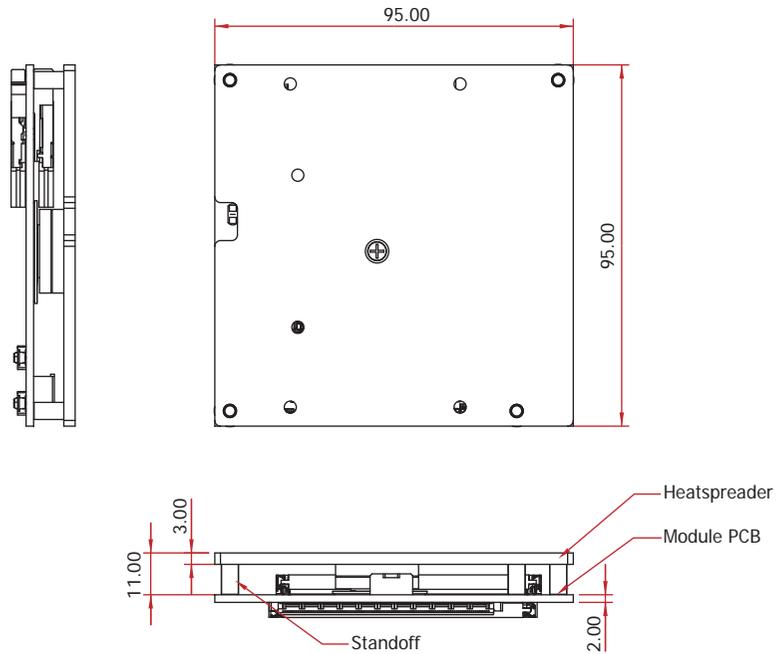
Bottom View

Block Diagram



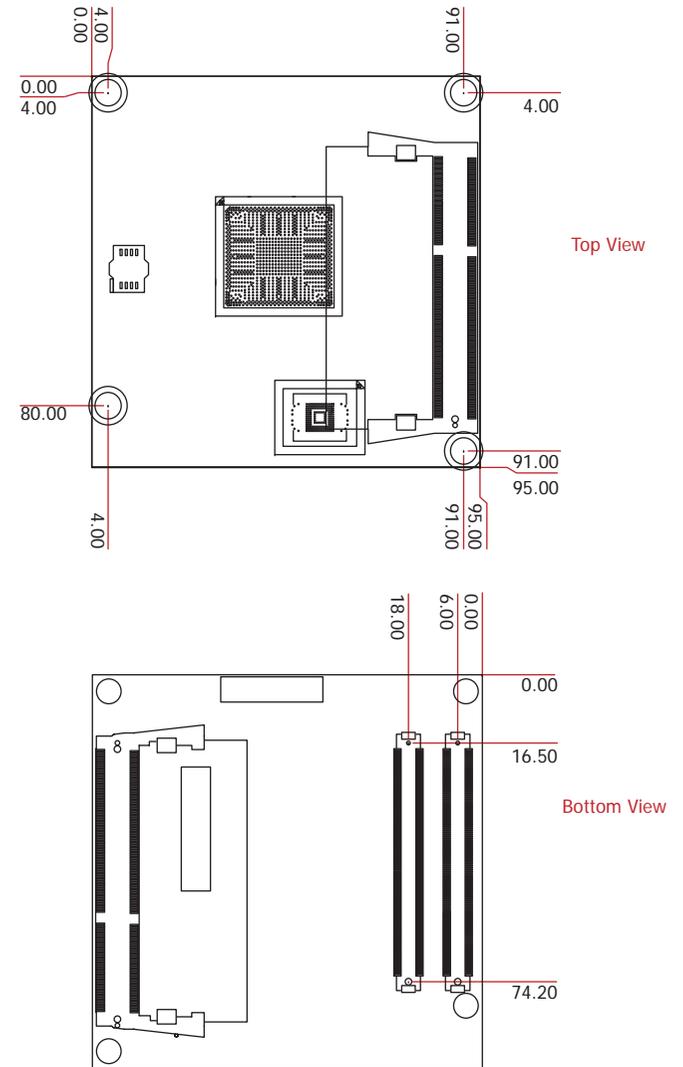
Mechanical Diagram

BT968 Module with Heat Sink



Side View of the Module with Heat Sink and Carrier Board

BT968 Module



**Important:**

Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

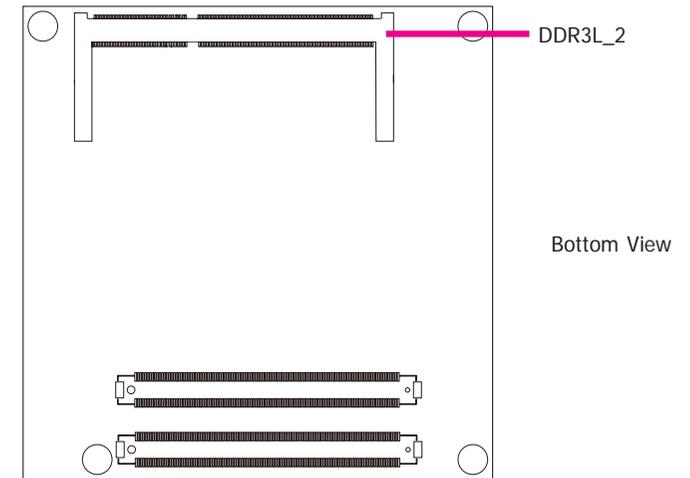
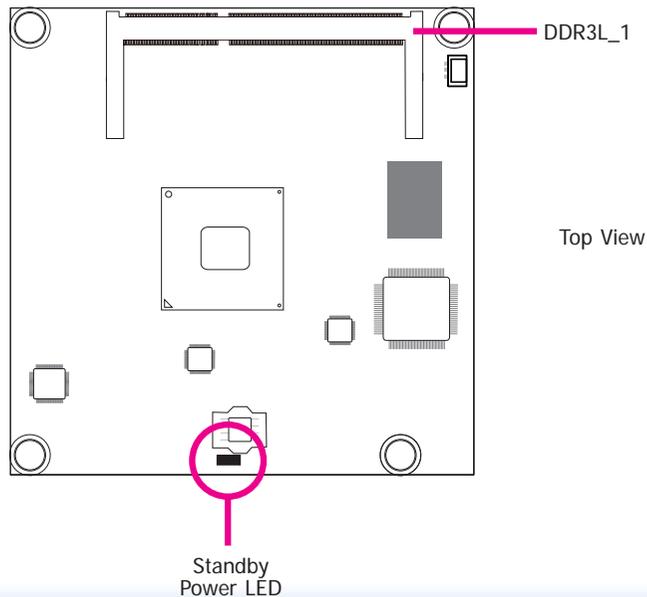
System Memory

The system board is equipped with one or two 204-pin SODIMM sockets that support DDR3L memory modules depending on the CPU processor supported.

- Two 204-pin DDR3L SODIMM sockets (-E45/-E27/-E26/-J00/-N30)
 - up to 8GB system memory
 - dual channel memory interface
- One 204-pin DDR3L SODIMM socket (-E25/-E15/-N07)
 - up to 4GB system memory
 - single channel memory interface

**Important:**

When the Standby Power LED lights red, it indicates that there is power on the board. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the board and components.

**Note:**

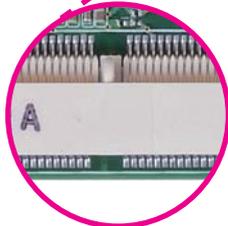
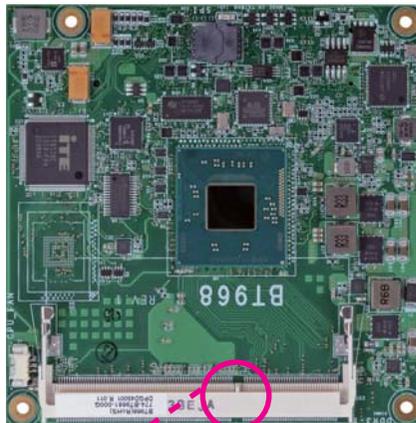
When installing one DDR3L SODIMM only, make sure to install it on the socket (SO-DIMM 1) that is located on the top side of the module.

Installing the DIMM Module

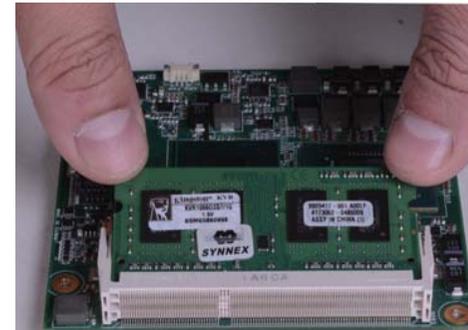

Note:

The system board used in the following illustrations may not resemble the actual one. These illustrations are for reference only.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the SODIMM socket on the system board.
4. Note the key on the socket. The key ensures the module can be plugged into the socket in only one direction.



5. Grasping the module by its edges, align the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.

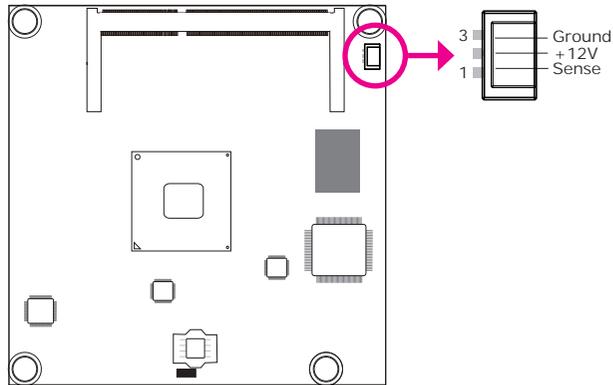


6. Push down the module until the clips at each end of the socket lock into position. You will hear a distinctive "click", indicating the module is correctly locked into position.



Connectors

CPU Fan Connector



Connect the CPU fan's cable connector to the CPU fan connector on the board. The cooling fan will provide adequate airflow throughout the chassis to prevent overheating the CPU and board components.

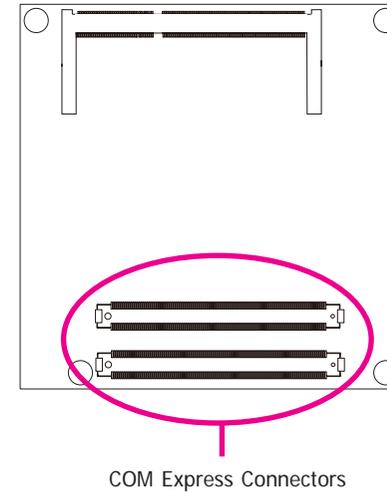
BIOS Setting

"Module Board H/W Monitor" submenu in the Advanced menu of the BIOS will display the current speed of the cooling fan. Refer to chapter 4 of the manual for more information.

COM Express Connectors

The COM Express connectors are used to interface the BT968 COM Express board to a carrier board. Connect the COM Express connectors (located on the solder side of the board) to the COM Express connectors on the carrier board.

Refer to the "Installing BT968 onto a Carrier Board" section for more information.



Refer to the following pages for the pin functions of these connectors.

COM Express Connectors

Row A		Row B	
A1	GND (FIXED)	B1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#
A3	GBE0_MDI3+	B3	LPC_FRAME#
A4	GBE0_LINK100#	B4	LPC_AD0
A5	GBE0_LINK1000#	B5	LPC_AD1
A6	GBE0_MDI2-	B6	LPC_AD2
A7	GBE0_MDI2+	B7	LPC_AD3
A8	GBE0_LINK#	B8	LPC_DRQ0# (NA)
A9	GBE0_MDI1-	B9	LPC_DRQ1# (NA)
A10	GBE0_MDI1+	B10	LPC_CLK
A11	GND (FIXED)	B11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#
A13	GBE0_MDI0+	B13	SMB_CK
A14	GBE0_CTREF	B14	SMB_DAT
A15	SUS_S3#	B15	SMB_ALERT#
A16	SATA0_TX+	B16	SATA1_TX+
A17	SATA0_TX-	B17	SATA1_TX-
A18	SUS_S4#	B18	SUS_STAT#
A19	SATA0_RX+	B19	SATA1_RX+
A20	SATA0_RX-	B20	SATA1_RX-
A21	GND (FIXED)	B21	GND (FIXED)
A22	SATA2_TX+ (NA)	B22	SATA3_TX+ (NA)
A23	SATA2_TX- (NA)	B23	SATA3_TX- (NA)
A24	SUS_S5#	B24	PWR_OK
A25	SATA2_RX+ (NA)	B25	SATA3_RX+ (NA)
A26	SATA2_RX- (NA)	B26	SATA3_RX- (NA)
A27	BATLOW#	B27	WDT
A28	(S)ATA_ACT#	B28	NA
A29	AC/HDA_SYNC	B29	AC/HDA_SDIN1
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0

Row A		Row B	
A31	GND (FIXED)	B31	GND (FIXED)
A32	AC/HDA_BITCLK	B32	SPKR
A33	AC/HDA_SDOUT	B33	I2C_CK
A34	BIOS_DIS0#	B34	I2C_DAT
A35	THRMTrip#	B35	THRM#
A36	USB6-	B36	USB7-
A37	USB6+	B37	USB7+
A38	USB_6_7_OC#	B38	USB_4_5_OC#
A39	USB4-	B39	USB5-
A40	USB4+	B40	USB5+
A41	GND (FIXED)	B41	GND (FIXED)
A42	USB2-	B42	USB3-
A43	USB2+	B43	USB3+
A44	USB_2_3_OC#	B44	USB_0_1_OC#
A45	USB0-	B45	USB1-
A46	USB0+	B46	USB1+
A47	VCC_RTC	B47	EXCD1_PERST#
A48	EXCD0_PERST#	B48	EXCD1_CPPE#
A49	EXCD0_CPPE#	B49	SYS_RESET#
A50	LPC_SERIRQ	B50	CB_RESET#
A51	GND (FIXED)	B51	GND (FIXED)
A52	PCIE_TX5+(NA)	B52	PCIE_RX5+(NA)
A53	PCIE_TX5-(NA)	B53	PCIE_RX5-(NA)
A54	GPIO	B54	GPO1
A55	PCIE_TX4+(NA)	B55	PCIE_RX4+(NA)

Row A		Row B	
A56	PCIE_TX4-(NA)	B56	PCIE_RX4-(NA)
A57	GND	B57	GPO2
A58	PCIE_TX3+	B58	PCIE_RX3+
A59	PCIE_TX3-	B59	PCIE_RX3-
A60	GND (FIXED)	B60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+
A62	PCIE_TX2-	B62	PCIE_RX2-
A63	GPI1	B63	GPO3
A64	PCIE_TX1+	B64	PCIE_RX1+
A65	PCIE_TX1-	B65	PCIE_RX1-
A66	GND	B66	WAKE0#
A67	GPI2	B67	WAKE1#
A68	PCIE_TX0+	B68	PCIE_RX0+
A69	PCIE_TX0-	B69	PCIE_RX0-
A70	GND(FIXED)	B70	GND (FIXED)
A71	LVDS_A0+	B71	LVDS_B0+
A72	LVDS_A0-	B72	LVDS_B0-
A73	LVDS_A1+	B73	LVDS_B1+
A74	LVDS_A1-	B74	LVDS_B1-
A75	LVDS_A2+	B75	LVDS_B2+
A76	LVDS_A2-	B76	LVDS_B2-
A77	LVDS_VDD_EN	B77	LVDS_B3+
A78	LVDS_A3+	B78	LVDS_B3-
A79	LVDS_A3-	B79	LVDS_BKLT_EN
A80	GND (FIXED)	B80	GND (FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+
A82	LVDS_A_CK-	B82	LVDS_B_CK-
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A85	GPI3	B85	VCC_5V_SBY

Row A		Row B	
A86	RSVD	B86	VCC_5V_SBY
A87	RSVD	B87	VCC_5V_SBY
A88	PCIE0_CK_REF+	B88	BIOS_DIS1#
A89	PCIE0_CK_REF-	B89	VGA_RED
A90	GND (FIXED)	B90	GND (FIXED)
A91	SPI_POWER	B91	VGA_GRN
A92	SPI_MISO	B92	VGA_BLU
A93	GPO0	B93	VGA_HSYNC
A94	SPI_CLK	B94	VGA_VSYNC
A95	SPI_MOSI	B95	VGA_I2C_CK
A96	TPM_PP	B96	VGA_I2C_DAT
A97	NC	B97	SPI_CS#
A98	SER0_TX	B98	RSVD
A99	SER0_RX	B99	RSVD
A100	GND (FIXED)	B100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT
A102	SER1_RX	B102	FAN_TACHIN
A103	LID#	B103	SLEEP#
A104	VCC_12V	B104	VCC_12V
A105	VCC_12V	B105	VCC_12V
A106	VCC_12V	B106	VCC_12V
A107	VCC_12V	B107	VCC_12V
A108	VCC_12V	B108	VCC_12V
A109	VCC_12V	B109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)

Row C		Row D	
C1	GND (FIXED)	D1	GND (FIXED)
C2	GND	D2	GND
C3	USB_SSRX0-	D3	USB_SSTX1-
C4	USB_SSRX0+	D4	USB_SSTX1+
C5	GND	D5	GND
C6	NA	D6	NA
C7	NA	D7	NA
C8	GND	D8	GND
C9	NA	D9	NA
C10	NA	D10	NA
C11	GND (FIXED)	D11	GND (FIXED)
C12	NA	D12	NA
C13	NA	D13	NA
C14	GND	D14	GND
C15	DDI1_PAIR6+ (NA)	D15	DDI1_CTRLCLK_AUX+
C16	DDI1_PAIR6- (NA)	D16	DDI1_CTRLDATA_AUX-
C17	RSVD	D17	RSVD
C18	RSVD	D18	RSVD
C19	PCIE_RX6+ (NA)	D19	PCIE_TX6+ (NA)
C20	PCIE_RX6- (NA)	D20	PCIE_TX6- (NA)
C21	GND (FIXED)	D21	GND (FIXED)
C22	PCIE_RX7+ (NA)	D22	PCIE_TX7+ (NA)
C23	PCIE_RX7- (NA)	D23	PCIE_TX7- (NA)
C24	DDI1_HPD	D24	RSVD
C25	DDI1_PAIR4+ (NA)	D25	RSVD
C26	DDI1_PAIR4- (NA)	D26	DDI1_PAIR0+
C27	RSVD	D27	DDI1_PAIR0-
C28	RSVD	D28	RSVD
C29	DDI1_PAIR5+ (NA)	D29	DDI1_PAIR1+
C30	DDI1_PAIR5- (NA)	D30	DDI1_PAIR1-

Row C		Row D	
C31	GND (FIXED)	D31	GND (FIXED)
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
C35	RSVD	D35	RSVD
C36	DDI3_CTRLCLK_AUX+ (NA)	D36	DDI1_PAIR3+
C37	DDI3_CTRLDATA_AUX- (NA)	D37	DDI1_PAIR3-
C38	DDI2_DDC_AUX_SEL (NA)	D38	RSVD
C39	DDI3_PAIR0+ (NA)	D39	DDI2_PAIR0+
C40	DDI3_PAIR0- (NA)	D40	DDI2_PAIR0-
C41	GND (FIXED)	D41	GND (FIXED)
C42	DDI3_PAIR1+ (NA)	D42	DDI2_PAIR1+
C43	DDI3_PAIR1- (NA)	D43	DDI2_PAIR1-
C44	DDI3_HPD (NA)	D44	DDI2_HPD
C45	RSVD	D45	RSVD
C46	DDI3_PAIR2+ (NA)	D46	DDI2_PAIR2+
C47	DDI3_PAIR2- (NA)	D47	DDI2_PAIR2-
C48	RSVD	D48	RSVD
C49	DDI3_PAIR3+ (NA)	D49	DDI2_PAIR3+
C50	DDI3_PAIR3- (NA)	D50	DDI2_PAIR3-
C51	GND (FIXED)	D51	GND (FIXED)
C52	PEG_RX0+ (NA)	D52	PEG_TX0+ (NA)
C53	PEG_RX0- (NA)	D53	PEG_TX0- (NA)
C54	TYPE0# (NC)	D54	PEG_LANE_RV# (NA)
C55	PEG_RX1+ (NA)	D55	PEG_TX1+ (NA)

Row C		Row D	
C56	PEG_RX1- (NA)	D56	PEG_TX1- (NA)
C57	TYPE1# (NC)	D57	TYPE2# (GND)
C58	PEG_RX2+ (NA)	D58	PEG_TX2+ (NA)
C59	PEG_RX2- (NA)	D59	PEG_TX2- (NA)
C60	GND (FIXED)	D60	GND (FIXED)
C61	PEG_RX3+ (NA)	D61	PEG_TX3+ (NA)
C62	PEG_RX3- (NA)	D62	PEG_TX3- (NA)
C63	RSVD	D63	RSVD
C64	RSVD	D64	RSVD
C65	PEG_RX4+ (NA)	D65	PEG_TX4+ (NA)
C66	PEG_RX4- (NA)	D66	PEG_TX4- (NA)
C67	NC	D67	GND
C68	PEG_RX5+ (NA)	D68	PEG_TX5+ (NA)
C69	PEG_RX5- (NA)	D69	PEG_TX5- (NA)
C70	GND (FIXED)	D70	GND (FIXED)
C71	PEG_RX6+ (NA)	D71	PEG_TX6+ (NA)
C72	PEG_RX6- (NA)	D72	PEG_TX6- (NA)
C73	GND	D73	GND
C74	PEG_RX7+ (NA)	D74	PEG_TX7+ (NA)
C75	PEG_RX7- (NA)	D75	PEG_TX7- (NA)
C76	GND	D76	GND
C77	RSVD	D77	RSVD
C78	PEG_RX8+ (NA)	D78	PEG_TX8+ (NA)
C79	PEG_RX8- (NA)	D79	PEG_TX8- (NA)
C80	GND (FIXED)	D80	GND (FIXED)
C81	PEG_RX9+ (NA)	D81	PEG_TX9+ (NA)
C82	PEG_RX9- (NA)	D82	PEG_TX9- (NA)
C83	RSVD	D83	RSVD
C84	GND	D84	GND
C85	PEG_RX10+ (NA)	D85	PEG_TX10+ (NA)

Row C		Row D	
C86	PEG_RX10- (NA)	D86	PEG_TX10- (NA)
C87	GND	D87	GND
C88	PEG_RX11+ (NA)	D88	PEG_TX11+ (NA)
C89	PEG_RX11- (NA)	D89	PEG_TX11- (NA)
C90	GND (FIXED)	D90	GND (FIXED)
C91	PEG_RX12+ (NA)	D91	PEG_TX12+ (NA)
C92	PEG_RX12- (NA)	D92	PEG_TX12- (NA)
C93	GND	D93	GND
C94	PEG_RX13+ (NA)	D94	PEG_TX13+ (NA)
C95	PEG_RX13- (NA)	D95	PEG_TX13- (NA)
C96	GND	D96	GND
C97	RSVD	D97	RSVD
C98	PEG_RX14+ (NA)	D98	PEG_TX14+ (NA)
C99	PEG_RX14- (NA)	D99	PEG_TX14- (NA)
C100	GND (FIXED)	D100	GND (FIXED)
C101	PEG_RX15+ (NA)	D101	PEG_TX15+ (NA)
C102	PEG_RX15- (NA)	D102	PEG_TX15- (NA)
C103	GND	D103	GND
C104	VCC_12V	D104	VCC_12V
C105	VCC_12V	D105	VCC_12V
C106	VCC_12V	D106	VCC_12V
C107	VCC_12V	D107	VCC_12V
C108	VCC_12V	D108	VCC_12V
C109	VCC_12V	D109	VCC_12V
C110	GND (FIXED)	D110	GND (FIXED)

COM Express Connectors Signal Description

Pin Types
 I Input to the Module
 O Output from the Module
 I/O Bi-directional input / output signal
 OD Open drain output

AC97/HDA Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
AC/HAD_RST#	A30	O CMOS	3.3V Suspend/3.3V			Connect to CODEC pin 11 RESET# Reset output to CODEC, active low.
AC/HDA_SYNC	A29	O CMOS	3.3V/3.3V			Connect to CODEC pin 10 SYNC Sample-synchronization signal to the CODEC(s).
AC/HDA_BITCLK	A32	I/O CMOS	3.3V/3.3V			Connect to CODEC pin 6 BIT_CLK Serial data clock generated by the external CODEC(s).
AC/HDA_SDOUT	A33	O CMOS	3.3V/3.3V			Connect to CODEC pin 5 SDATA_OUT Serial TDM data output to the CODEC.
AC/HDA_SDIN2	B28	I/O CMOS	3.3V Suspend/3.3V	HDA_SDIN2 NA		NC
AC/HDA_SDIN1	B29	I/O CMOS	3.3V Suspend/3.3V			Connect 33 Ω In series to CODEC1 pin 8 SDATA_IN Serial TDM data inputs from up to 3 CODECs.
AC/HDA_SDINO	B30	I/O CMOS	3.3V Suspend/3.3V			Connect 33 Ω in series to CODEC0 pin 8 SDATA_IN

Gigabit Ethernet Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
GBEO_MDIO+	A13	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MDIO+/- Gigabit Ethernet Controller 0: Media Dependent Interface Differential Pairs 0,1,2,3. The MDI can operate in 1000, 100 and 10 Mbit / sec modes. Some pairs are unused in some modes, per the following: 1000BASE-T 100BASE-TX 10BASE-T
GBEO_MDIO-	A12	I/O Analog	3.3V max Suspend			
GBEO_MD11+	A10	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MD11+/- MDI[0]+/- B1_DA+/- TX+/- TX+/- MDI[1]+/- B1_DB+/- RX+/- RX+/- MDI[2]+/- B1_DC+/- MDI[3]+/- B1_DD+/-
GBEO_MD11-	A9	I/O Analog	3.3V max Suspend			
GBEO_MD12+	A7	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MD12+/-
GBEO_MD12-	A6	I/O Analog	3.3V max Suspend			
GBEO_MD13+	A3	I/O Analog	3.3V max Suspend			Connect to Magnetics Module MD13+/-
GBEO_MD13-	A2	I/O Analog	3.3V max Suspend			
GBEO_ACT#	B2	OD CMOS	3.3V Suspend/3.3V			Connect to LED and recommend current limit resistor 150 Ω to 3.3VSB Gigabit Ethernet Controller 0 activity indicator, active low.
GBEO_LINK#	A8	OD CMOS	3.3V Suspend/3.3V			NC Gigabit Ethernet Controller 0 link indicator, active low.
GBEO_LINK100#	A4	OD CMOS	3.3V Suspend/3.3V			Connect to LED and recommend current limit resistor 150 Ω to 3.3VSB Gigabit Ethernet Controller 0 1000 Mbit / sec link indicator, active low.
GBEO_LINK1000#	A5	OD CMOS	3.3V Suspend/3.3V			Connect to LED and recommend current limit resistor 150 Ω to 3.3VSB Gigabit Ethernet Controller 0 1000 Mbit / sec link indicator, active low.

SATA Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
SATA0_TX+	A16	O SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA0 Conn TX pin Serial ATA or SAS Channel 0 transmit differential pair.
SATA0_TX-	A17	O SATA	AC coupled on Module	AC Coupling capacitor		
SATA0_RX+	A19	I SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA0 Conn RX pin Serial ATA or SAS Channel 0 receive differential pair.
SATA0_RX-	A20	I SATA	AC coupled on Module	AC Coupling capacitor		
SATA1_TX+	B16	O SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA1 Conn TX pin Serial ATA or SAS Channel 1 transmit differential pair.
SATA1_TX-	B17	O SATA	AC coupled on Module	AC Coupling capacitor		
SATA1_RX+	B19	I SATA	AC coupled on Module	AC Coupling capacitor		Connect to SATA1 Conn RX pin Serial ATA or SAS Channel 1 receive differential pair.
SATA1_RX-	B20	I SATA	AC coupled on Module	AC Coupling capacitor		
SATA2_TX+	A22	O SATA	AC coupled on Module	AC Coupling capacitor		NA (No support) NA (No support)
SATA2_TX-	A23	O SATA	AC coupled on Module	NA		
SATA2_RX+	A25	I SATA	AC coupled on Module	NA		NA (No support)
SATA2_RX-	A26	I SATA	AC coupled on Module	NA		NA (No support)
SATA3_TX+	B22	O SATA	AC coupled on Module	NA		NA (No support)
SATA3_TX-	B23	O SATA	AC coupled on Module	NA		NA (No support)
SATA3_RX+	B25	I SATA	AC coupled on Module	NA		NA (No support)
SATA3_RX-	B26	I SATA	AC coupled on Module	NA		NA (No support)
ATA_ACT#	A28	I/O CMOS	3.3V / 3.3V	PU 47K to 3.3V		Connect to LED and recommend current limit resistor 220Ω to 3.3V ATA (parallel and serial) or SAS activity indicator, active low.

PCI Express Lanes Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
PCIE_TX0+	A68			AC Coupling capacitor		Connect to PCIE device or slot PCI Express Differential Transmit Pairs 0
PCIE_TX0-	A69	O PCIE	AC coupled on Module	AC Coupling capacitor		
PCIE_RX0+	B68					Device - Connect AC Coupling cap 0.1uF Slot - Connect to PCIE Conn pin PCI Express Differential Receive Pairs 0
PCIE_RX0-	B69	I PCIE	AC coupled off Module			
PCIE_TX1+	A64			AC Coupling capacitor		Connect to PCIE device or slot PCI Express Differential Transmit Pairs 1
PCIE_TX1-	A65	O PCIE	AC coupled on Module	AC Coupling capacitor		
PCIE_RX1+	B64					Device - Connect AC Coupling cap 0.1uF Slot - Connect to PCIE Conn pin PCI Express Differential Receive Pairs 1
PCIE_RX1-	B65	I PCIE	AC coupled off Module			
PCIE_TX2+	A61			AC Coupling capacitor		Connect to PCIE device or slot PCI Express Differential Transmit Pairs 2
PCIE_TX2-	A62	O PCIE	AC coupled on Module	AC Coupling capacitor		
PCIE_RX2+	B61					Device - Connect AC Coupling cap 0.1uF Slot - Connect to PCIE Conn pin PCI Express Differential Receive Pairs 2
PCIE_RX2-	B62	I PCIE	AC coupled off Module			
PCIE_TX3+	A58			AC Coupling capacitor		Connect to PCIE device or slot (This Port is BOM Option with On board LAN) PCI Express Differential Transmit Pairs 3 (This Port is BOM Option with On board LAN)
PCIE_TX3-	A59	O PCIE	AC coupled on Module	AC Coupling capacitor		
PCIE_RX3+	B58					Device - Connect AC Coupling cap 0.1uF (This Port is BOM Option with On board LAN) Slot - Connect to PCIE Conn pin PCI Express Differential Receive Pairs 3 (This Port is BOM Option with On board LAN)
PCIE_RX3-	B59	I PCIE	AC coupled off Module			
PCIE_TX4+	A55			NA		NA (No support) NA (No support)
PCIE_TX4-	A56	O PCIE	AC coupled on Module	NA		

PCI Express Lanes Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
PCIE_RX4+	B55	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PCIE_RX4-	B56					
PCIE_TX5+	A52	O PCIE	AC coupled on Module	NA	NA (No support)	NA (No support)
PCIE_TX5-	A53			NA		
PCIE_RX5+	B52	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PCIE_RX5-	B53					
PCIE_TX6+	D19	O PCIE	AC coupled on Module	NA	NA (No support)	NA (No support)
PCIE_TX6-	D20			NA		
PCIE_RX6+	C19	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PCIE_RX6-	C20					
PCIE_TX7+	D22	O PCIE	AC coupled on Module	NA	NA (No support)	NA (No support)
PCIE_TX7-	D23			NA		
PCIE_RX7+	C22	I PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
PCIE_RX7-	C23			NA		
PCIE0_CLK_REF+	A88	O PCIE	PCIE		Connect to PCIE device, PCIE CLK Buffer or slot	Reference clock output for all PCI Express and PCI Express Graphics lanes.
PCIE0_CLK_REF-	A89					

PEG Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
PEG_TX0+	D52	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX0-	D53			NA ==> (ALL PEG)		
PEG_RX0+	C52	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX0-	C53					
PEG_TX1+	D55	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX1-	D56			NA ==> (ALL PEG)		
PEG_RX1+	C55	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX1-	C56					
PEG_TX2+	D58	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX2-	D59			NA ==> (ALL PEG)		
PEG_RX2+	C58	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX2-	C59					
PEG_TX3+	D61	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX3-	D62			NA ==> (ALL PEG)		
PEG_RX3+	C61	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX3-	C62					
PEG_TX4+	D65	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX4-	D66			NA ==> (ALL PEG)		
PEG_RX4+	C65	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX4-	C66					
PEG_TX5+	D68	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX5-	D69			NA ==> (ALL PEG)		
PEG_RX5+	C68	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX5-	C69					
PEG_TX6+	D71	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX6-	D72			NA ==> (ALL PEG)		
PEG_RX6+	C71	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX6-	C72					
PEG_TX7+	D74	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX7-	D75			NA ==> (ALL PEG)		
PEG_RX7+	C74	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX7-	C75					
PEG_TX8+	D78	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX8-	D79			NA ==> (ALL PEG)		
PEG_RX8+	C78	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX8-	C79					
PEG_TX9+	D81	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX9-	D82			NA ==> (ALL PEG)		
PEG_RX9+	C81	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX9-	C82					
PEG_TX10+	D85	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX10-	D86			NA ==> (ALL PEG)		
PEG_RX10+	C85	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX10-	C86					
PEG_TX11+	D88	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX11-	D89			NA ==> (ALL PEG)		
PEG_RX11+	C88	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX11-	C89					
PEG_TX12+	D91	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX12-	D92			NA ==> (ALL PEG)		
PEG_RX12+	C91	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX12-	C92					

PEG Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
PEG_TX13+	D94	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX13-	D95	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_RX13+	C94	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX13-	C95	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_TX14+	D98	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX14-	D99	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_RX14+	C98	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX14-	C99	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_TX15+	D101	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_TX15-	D102	O PCIE	AC coupled on Module	NA ==> (ALL PEG)	NA (No support)	NA (No support)
PEG_RX15+	C101	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_RX15-	C102	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
PEG_LANE_RV#	D54	I CMOS	3.3V / 3.3V		NA (No support)	NA (No support)

ExpressCard Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
EXCDD_CPPE#	A49	I CMOS	3.3V / 3.3V			PCI ExpressCard: PCI Express capable card request, active low, one per card
EXCD1_CPPE#	B48	I CMOS	3.3V / 3.3V			
EXCDD_PERST#	A48	O CMOS	3.3V / 3.3V			PCI ExpressCard: reset, active low, one per card
EXCD1_PERST#	B47	O CMOS	3.3V / 3.3V			

DDI Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
DDI1_PAIR0+/SDVO1_RED+	D26	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 0 differential pairs/Serial Digital Video B red output differential pair
DDI1_PAIR0-/SDVO1_RED-	D27	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR1+/SDVO1_GRN+	D29	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 1 differential pairs/Serial Digital Video B green output differential pair
DDI1_PAIR1-/SDVO1_GRN-	D30	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR2+/SDVO1_BLU+	D32	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 2 differential pairs/Serial Digital Video B blue output differential pair
DDI1_PAIR2-/SDVO1_BLU-	D33	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR3+/SDVO1_CK+	D36	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	DDI 1 Pair 3 differential pairs/Serial Digital Video B clock output differential pair.
DDI1_PAIR3-/SDVO1_CK-	D37	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device	
DDI1_PAIR4+/SDVO1_INT+	C25	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
DDI1_PAIR4-/SDVO1_INT-	C26	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
DDI1_PAIR5+/SDVO1_TVCLKIN+	C29	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
DDI1_PAIR5-/SDVO1_TVCLKIN-	C30	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
DDI1_PAIR6+/SDVO1_FLDSTALL+	C15	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
DDI1_PAIR6-/SDVO1_FLDSTALL-	C16	I PCIE	AC coupled off Module		NA (No support)	NA (No support)
DDI1_CTRLCLK_AUX+/SDVO1_CTRLCLK	D15	I/O PCIE	AC coupled on Module	PD 100K to GND (S/W IC between Rpu/PCH)	Connect to DP AUX+	DP AUX+ function if DDI1_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V, PD 100K to GND (S/W IC between Rpu/Rpd resistor)	Connect to HDMI/DVI I2C CTRLCLK	HDMI/DVI I2C CTRLCLK if DDI1_DDC_AUX_SEL is pulled high
DDI1_CTRLCLK_AUX-/SDVO1_CTRLDATA	D16	I/O PCIE	AC coupled on Module	PU 100K to 3.3V (S/W IC between Rpu/PCH)	Connect to DP AUX-	DP AUX- function if DDI1_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V/PU 100K to 3.3V (S/W IC between 2.2K/100K resistor)	Connect to HDMI/DVI I2C CTRLDATA	HDMI/DVI I2C CTRLDATA if DDI1_DDC_AUX_SEL is pulled high
DDI1_HPD	C24	I CMOS	3.3V / 3.3V	PD 100K	PD 1M and Connect to device Hot Plug Detect	DDI Hot-Plug Detect
DDI1_DDC_AUX_SEL	D34	I CMOS	3.3V / 3.3V	PD 1M	PU 100K to 3.3V for DDC(HDMI/DVI)	Selects the function of DDI1_CTRLCLK_AUX+ and DDI1_CTRLDATA_AUX-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI2_PAIR0+	D39	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	DDI 2 Pair 0 differential pairs (This Port is BIOS Option with On board LVDS (DP to LVDS))
DDI2_PAIR0-	D40	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	
DDI2_PAIR1+	D42	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	DDI 2 Pair 1 differential pairs (This Port is BIOS Option with On board LVDS (DP to LVDS))
DDI2_PAIR1-	D43	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	
DDI2_PAIR2+	D46	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	DDI 2 Pair 2 differential pairs (This Port is BIOS Option with On board LVDS (DP to LVDS))
DDI2_PAIR2-	D47	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	
DDI2_PAIR3+	D49	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	DDI 2 Pair 3 differential pairs (This Port is BIOS Option with On board LVDS (DP to LVDS))
DDI2_PAIR3-	D50	O PCIE	AC coupled off Module		Connect AC Coupling Capacitors 0.1uF to Device (This Port is BIOS Option with On board LVDS (DP to LVDS))	

DDI Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
DDI2_CTRLCLK_AUX+	C32	I/O PCIE	AC coupled on Module	PD 100K to GND (S/W IC between Rpu/PCH)	Connect to DP AUX+	DP AUX+ function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V, PD 100K to GND (S/W IC between Rpu/Rpd resistor)	Connect to HDMI/DVI I2C CTRLCLK	HDMI/DVI I2C CTRLCLK if DDI2_DDC_AUX_SEL is pulled high
DDI2_CTRLCLK_AUX-	C33	I/O PCIE	AC coupled on Module	PU 100K to 3.3V (S/W IC between Rpu/PCH)	Connect to DP AUX-	DP AUX- function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V/PU 100K to 3.3V (S/W IC between 2.2K/100K resistor)	Connect to HDMI/DVI I2C CTRLDATA	HDMI/DVI I2C CTRLDATA if DDI2_DDC_AUX_SEL is pulled high
DDI2_HPD	D44	I CMOS	3.3V / 3.3V	PD 100K	PD 1M and Connect to device Hot Plug Detect	DDI Hot-Plug Detect
DDI2_DDC_AUX_SEL	C34	I CMOS	3.3V / 3.3V	PD 1M to GND	PU 100K to 3.3V for DDC(HDMI/DVI)	Selects the function of DDI2_CTRLCLK_AUX+ and DDI2_CTRLDATA_AUX-. DDI[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI[n]_AUX pair as the DDC channel. Carrier DDI[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI3_PAIR0+	C39	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR0-	C40	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR1+	C42	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR1-	C43	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR2+	C4	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR2-	C47	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR3+	C49	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_PAIR3-	C50	O PCIE	AC coupled off Module	NA	NA (No support)	NA (No support)
DDI3_CTRLCLK_AUX+	C36	I/O PCIE	AC coupled on Module	NA	NA (No support)	NA (No support)
		I/O OD CMOS	3.3V / 3.3V	NA	NA (No support)	NA (No support)
DDI3_CTRLCLK_AUX-	C37	I/O PCIE	AC coupled on Module	NA	NA (No support)	NA (No support)
		I/O OD CMOS	3.3V / 3.3V	NA	NA (No support)	NA (No support)
DDI3_HPD	C44	I CMOS	3.3V / 3.3V	NA	NA (No support)	NA (No support)
DDI3_DDC_AUX_SEL	C38	I CMOS	3.3V / 3.3V	NA	NA (No support)	NA (No support)

USB Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
USB0+	A46	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 0
USB0-	A45	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 1
USB1+	B46	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 2
USB1-	B45	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 3
USB2+	A43	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 4
USB2-	A42	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 5
USB3+	B43	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 6
USB3-	B42	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 7
USB4+	A40	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 8
USB4-	A39	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 9
USB5+	B40	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 10
USB5-	B39	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 11
USB6+	A37	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 12
USB6-	A36	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 13
USB7+	B37	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 14
USB7-	B36	I/O USB	3.3V Suspend/3.3V		Connect 90Ω @100MHz Common Choke in series and ESD suppressors to GND to USB connector	USB differential pairs 15, USB7 may be configured as a USB client or as a host, or both, at the Module designer's discretion. (CR901-B default set as a host)

USB Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
USB_0_1_OC#	B44	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 0 and 1. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_2_3_OC#	A44	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 2 and 3. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_4_5_OC#	B38	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 4 and 5. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.
USB_6_7_OC#	A38	I CMOS	3.3V Suspend/3.3V	PU 10k to 3.3VSB	Connect to Overcurrent of USB Power Switch	USB over-current sense, USB channels 6 and 7. A pull-up for this line shall be present on the Module. An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board.

LVDS Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
LVDS_A0+	A71	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel A differential pairs The LVDS flat panel differential pairs (LVDS_A[0:3]+/-, LVDS_B[0:3]+/-, LVDS_A_CK+/-, LVDS_B_CK+/-) shall have 100Ω terminations across the pairs at the destination. These terminations may be on the Carrier Board if the Carrier Board implements a LVDS deserializer on-board
LVDS_A0-	A72	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A1+	A73	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A1-	A74	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A2+	A75	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel B differential pairs The LVDS flat panel differential pairs (LVDS_A[0:3]+/-, LVDS_B[0:3]+/-, LVDS_A_CK+/-, LVDS_B_CK+/-) shall have 100Ω terminations across the pairs at the destination. These terminations may be on the Carrier Board if the Carrier Board implements a LVDS deserializer on-board
LVDS_A2-	A76	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A3+	A78	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A3-	A79	O LVDS	LVDS		Connect to LVDS connector	
LVDS_A_CK+	A81	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel A differential clock
LVDS_A_CK-	A82	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B0+	B71	O LVDS	LVDS		Connect to LVDS connector	LVDS Channel B differential clock
LVDS_B0-	B72	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B1+	B73	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B1-	B74	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B2+	B75	O LVDS	LVDS		Connect to LVDS connector	LVDS panel power enable
LVDS_B2-	B76	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B3+	B77	O LVDS	LVDS		Connect to LVDS connector	LVDS panel backlight enable
LVDS_B3-	B78	O LVDS	LVDS		Connect to LVDS connector	
LVDS_B_CK+	B81	O LVDS	LVDS		Connect to LVDS connector	LVDS panel backlight brightness control
LVDS_B_CK-	B82	O LVDS	LVDS		Connect to LVDS connector	
LVDS_VDD_EN	A77	O CMOS	3.3V / 3.3V		Connect to enable control of LVDS panel power circuit	LVDS panel power enable
LVDS_BKLT_EN	B79	O CMOS	3.3V / 3.3V		Connect to enable control of LVDS panel backlight power circuit.	
LVDS_BKLT_CTRL	B83	O CMOS	3.3V / 3.3V		Connect to brightness control of LVDS panel backlight power circuit.	LVDS panel backlight brightness control
LVDS_I2C_CLK	A83	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V	Connect to DDC clock of LVDS panel	
LVDS_I2C_DAT	A84	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V	Connect to DDC data of LVDS panel	I2C data line for LVDS display use

LPC Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
LPC_AD0	B4				Connect to LPC device	LPC multiplexed address, command and data bus
LPC_AD1	B5					
LPC_AD2	B6	I/O CMOS	3.3V / 3.3V			
LPC_AD3	B7					
LPC_FRAME#	B3	O CMOS	3.3V / 3.3V			
LPC_DRO0#	B8	I CMOS	3.3V / 3.3V			
LPC_DRO1#	B9	I CMOS	3.3V / 3.3V			
LPC_SERIRO	A50	I/O CMOS	3.3V / 3.3V			
LPC_CLK	B10	O CMOS	3.3V / 3.3V			

SPI Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
SPI_CS#	B97	O CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device CS# pin Chip select for Carrier Board SPI - may be sourced from chipset SPI0 or SPI1
SPI_MISO	A92	I CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device SO pin Data in to Module from Carrier SPI
SPI_MOSI	A95	O CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device SI pin Data out from Module to Carrier SPI
SPI_CLK	A94	O CMOS	3.3V Suspend/3.3V			Connect a series resistor 33Ω to Carrier Board SPI Device SCK pin Clock from Module to Carrier SPI
SPI_POWER	A91	O	3.3V Suspend/3.3V			Power supply for Carrier Board SPI – sourced from Module – nominally 3.3V. The Module shall provide a minimum of 100mA on SPI_POWER. Carriers shall use less than 100mA of SPI_POWER. SPI_POWER shall only be used to power SPI devices on the Carrier
BIOS_DIS0#	A34					Selection straps to determine the BIOS boot device. The Carrier should only float these or pull them low, please refer to COM Express Module Base Specification Revision 2.1 for strapping options of BIOS disable signals.
BIOS_DIS1#	B88	I CMOS	NA			

BIOS DIS1#	BIOS DIS0#	Chipset SPI CS1# Destination	Chipset SPI CS0# Destination	Carrier SPI_CS#	SPI Descriptr	Bios Entry	Ref Line
1	1	Module	Module	High	Module	SPI0/SPI1	0
1	0	Module	Module	High	Module	Carrier FWH	1
0	1	Module	Carrier	SPI0	Carrier	SPI0/SPI1	2
0	0	Carrier (Default)	Module (Default)	SPI1 (Default)	Module (Default)	SPI0/SPI1 (Default)	3

VGA Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
VGA_RED	B89	O Analog	Analog	PD 150R		PD 150R,connect to VGA connector with EMI filter & ESD protect component. Red for monitor. Analog output
VGA_GRN	B91	O Analog	Analog	PD 150R		PD 150R,connect to VGA connector with EMI filter & ESD protect component. Green for monitor. Analog output
VGA_BLU	B92	O Analog	Analog	PD 150R		PD 150R,connect to VGA connector with EMI filter & ESD protect component. Blue for monitor. Analog output
VGA_HSYNC	B93	O CMOS	3.3V / 3.3V			Connect to VGA connector with a3.3V Buffer IC to isolate PCH & Display Device Horizontal sync output to VGA monitor
VGA_VSYNC	B94	O CMOS	3.3V / 3.3V			Connect to VGA connector with a 33V Buffer IC to isolate PCH & Display Device Vertical sync output to VGA monitor
VGA_I2C_CK	B95	I/O OD CMOS	3.3V / 3.3V	PD 2.2K to 3.3V		Connect to VGA connector with a 3.3V to 5V Level shift circuit. DDC clock line (I2C port dedicated to identify VGA monitor capabilities)
VGA_I2C_DAT	B96	I/O OD CMOS	3.3V / 3.3V	PD 2.2K to 3.3V		Connect to VGA connector with a 3.3V to 5V Level shift circuit. DDC data line.

Serial Interface Signals Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
SER0_TX	A98	O CMOS	5V / 12V		PD 4.7K	General purpose serial port 0 transmitter (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
SER0_RX	A99	I CMOS	5V / 12V		PU 47K to 3.3V	General purpose serial port 0 receiver (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
SER1_TX	A101	O CMOS	5V / 12V		PD 4.7K	General purpose serial port 1 transmitter (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
SER1_RX	A102	I CMOS	5V / 12V		PU 47K to 3.3V	General purpose serial port 1 receiver (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)

Miscellaneous Signal Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
I2C_CK	B33	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		General purpose I2C port clock output
I2C_DAT	B34	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		General purpose I2C port data I/O line
SPKR	B32	O CMOS	3.3V / 3.3V			Output for audio enunciator - the "speaker" in PC-AT systems. This port provides the PC beep signal and is mostly intended for debugging purposes.
WDT	B27	O CMOS	3.3V / 3.3V			Output indicating that a watchdog time-out event has occurred.
FAN_PWNOUT	B101	O OD CMOS	3.3V / 3.3V			Fan speed control. Uses the Pulse Width Modulation (PWM) technique to control the fan's RPM. (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
FAN_TACHIN	B102	I OD CMOS	3.3V / 3.3V			Fan tachometer input for a fan with a two pulse output. (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
TPM_PP	A96	I CMOS	3.3V / 3.3V	PD 10K		Trusted Platform Module (TPM) Physical Presence pin. Active high. TPM chip has an internal pull down. This signal is used to indicate Physical Presence to the TPM.

Power and System Management Signals Descriptions

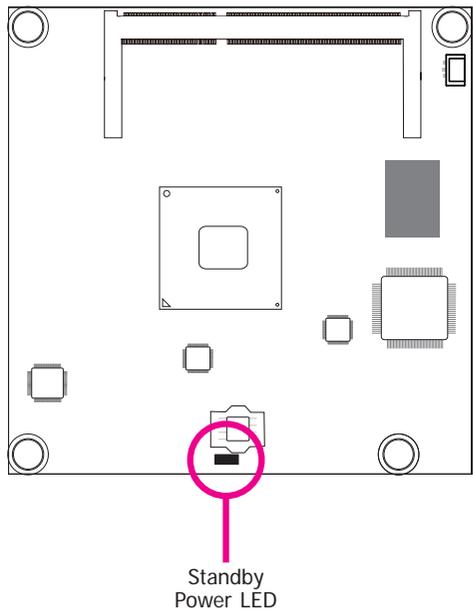
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
PWRBTN#	B12	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		A falling edge creates a power button event. Power button events can be used to bring a system out of S5 soft off and other suspend states, as well as powering the system down.
SYS_RESET#	B49	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		Reset button input. Active low request for Module to reset and reboot. May be falling edge sensitive. For situations when SYS_RESET# is not able to reestablish control of the system, PWR_OK or a power cycle may be used.
CB_RESET#	B50	O CMOS	3.3V Suspend/3.3V	PD 100K		Reset output from Module to Carrier Board. Active low. Issued by Module chipset and may result from a low SYS_RESET# input, a low PWR_OK input, a VCC_12V power input that falls below the minimum specification, a watchdog timeout, or may be initiated by the Module software.
PWR_OK	B24	I CMOS	3.3V / 3.3V			Power OK from main power supply. A high value indicates that the power is good. This signal can be used to hold off Module startup to allow Carrier based FPGAs or other configurable devices time to be programmed.
SUS_STAT#	B18	O CMOS	3.3V Suspend/3.3V			Indicates imminent suspend operation; used to notify LPC devices.
SUS_S3#	A15	O CMOS	3.3V Suspend/3.3V			Indicates system is in Suspend to RAM state. Active low output. An inverted copy of SUS_S3# on the Carrier Board may be used to enable the non-standby power on a typical ATX supply.
SUS_S4#	A18	O CMOS	3.3V Suspend/3.3V			Indicates system is in Suspend to Disk state. Active low output.
SUS_S5#	A24	O CMOS	3.3V Suspend/3.3V			Indicates system is in Soft Off state.
WAKE0#	B66	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		PCI Express wake up signal.
WAKE1#	B67	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3VSB		General purpose wake up signal. May be used to implement wake-up on PS2 keyboard or mouse activity.
BATLOW#	A27	I CMOS	3.3V Suspend/ 3.3V			Indicates that external battery is low. This port provides a battery-low signal to the Module for orderly transitioning to power saving or power cut-off ACPI modes.
LID#	A103	I OD CMOS	3.3V Suspend/12V	PU 10K to 3.3VSB		LID switch. Low active signal used by the ACPI operating system for a LID switch. (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
SLEEP#	B103	I OD CMOS	3.3V Suspend/12V	PU 10K to 3.3VSB		Sleep button. Low active signal used by the ACPI operating system to bring the system to sleep state or to wake it up again. (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
THRM#	B35	I CMOS	3.3V / 3.3V	PU 10K to 3.3V		Input from off-Module temp sensor indicating an over-temp situation.
THRMTRIP#	A35	O CMOS	3.3V / 3.3V	PU 10K to 3.3V		Active low output indicating that the CPU has entered thermal shutdown.
SMB_CK	B13	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		System Management Bus bidirectional clock line.
SMB_DAT	B14	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3VSB		System Management Bus bidirectional data line.
SMB_ALERT#	B15	I CMOS	3.3V Suspend/3.3V			System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system.

GPIO Signals Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
GPO0	A93	O CMOS	3.3V / 3.3V			General purpose output pins. Upon a hardware reset, these outputs should be low.
GPO1	B54					
GPO2	B57					
GPO3	B63					
GPI0	A54	I CMOS	3.3V / 3.3V			General purpose input pins. Pulled high internally on the Module.
GPI1	A63					
GPI2	A67					
GPI3	A85					

Power and GND Signal Descriptions						
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	BT968	Carrier Board	Description
VCC_12V	A104–A109 B104–B109 C104–C109 D104–D109	Power				Primary power input: +12V nominal. All available VCC_12V pins on the connector(s) shall be used.
VCC_5V_SBY	B84–B87	Power				Standby power input: +5.0V nominal. If VCC5_SBY is used, all available VCC_5V_SBY pins on the connector(s) shall be used. Only used for standby and suspend functions. May be left unconnected if these functions are not used in the system design.
VCC_RTC	A47	Power				Real-time clock circuit-power input. Nominally +3.0V.
GND	A1, A11, A21, A31, A41, A51, A57, A60, A66, A70, A80, A90, A100, A110, B1, B11, B21, B31, B41, B51, B60, B70, B80, B90, B100, B110, C1, C2, C5, C8, C11, C14, C21, C31, C41, C51, C60, C70, C73, C76, C80, C84, C87, C90, C93, C96, C100, C103, C110, D1, D2, D5, D8, D11, D14, D21, D31, D51, D60, D67, D70, D73, D76, D80, D84, D87, D90, D93, D96, D100, D103, D110	Power				Ground - DC power and signal and AC signal return path. All available GND connector pins shall be used and tied to Carrier Board GND plane.

Standby Power LED



This LED will light when the system is in the standby mode.

Cooling Option

Heat Sink with Cooling Fan



Note:

The system board used in the following illustrations may not resemble the actual board. These illustrations are for reference only.



Top View of the Heat Sink



Bottom View of the Heat Sink

- "1" denotes the location of the thermal pad designed to contact the corresponding components that are on BT968.



Important:

Remove the plastic covering from the thermal pad prior to mounting the heat sink onto BT968.

Installing BT968 onto a Carrier Board

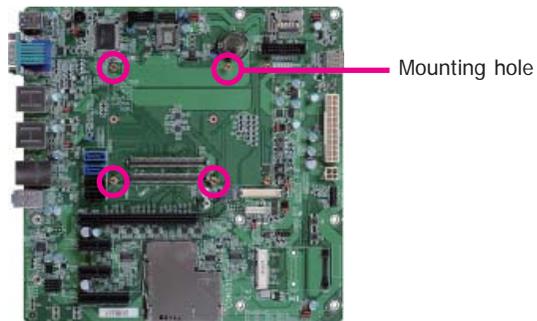


Important:

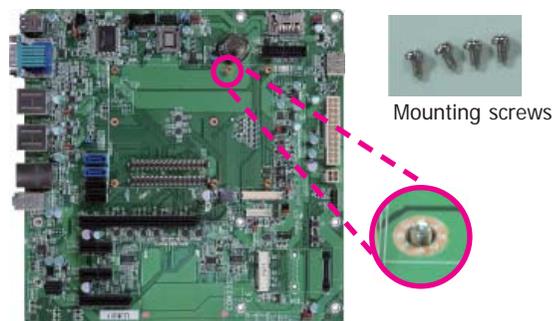
The carrier board (COM331-B) used in this section is for reference purpose only and may not resemble your carrier board. These illustrations are mainly to guide you on how to install BT968 onto the carrier board of your choice.

• To download COM331-B datasheet and manual

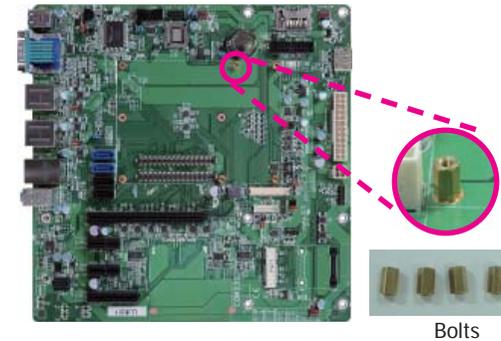
1. Now install the module and heatsink assembly onto the carrier board. The photo below shows the locations of the mounting holes on the carrier board.



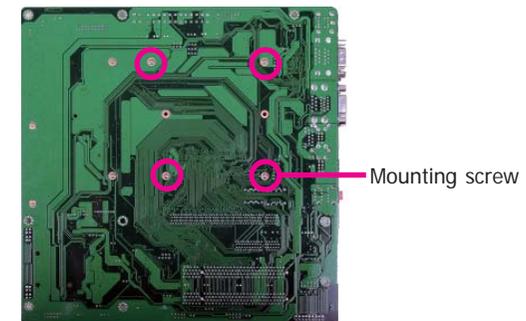
2. Insert the provided mounting screws into the mounting holes - from the bottom through the top of the carrier board.



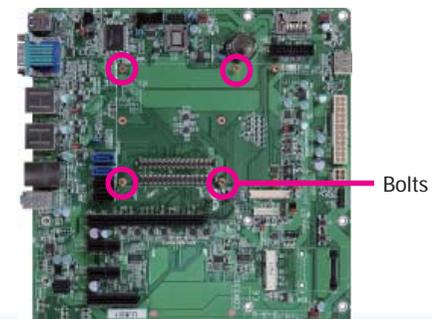
3. While supporting the mounting screw at the bottom, from the top side of the board, fasten a bolt into the screw.



4. The photo below shows the solder side of the board with the screws already fixed in place.



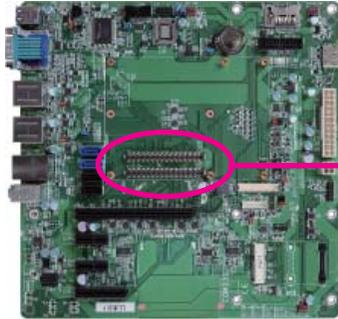
5. The photo below shows the component side of the board with the bolts already fixed in place.



- Grasping BT968 by its edges, position it on top of the carrier board with its mounting holes aligned with the bolts on the carrier board. This will also align the COM Express connectors of the two boards to each other.



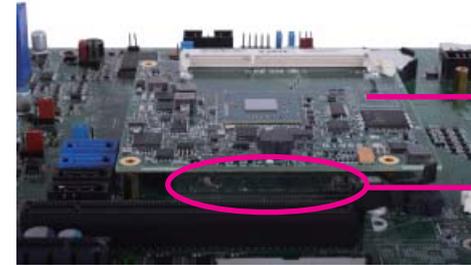
COM Express connectors on BT968



COM Express connectors on the carrier board



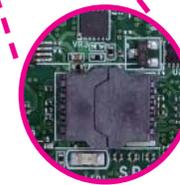
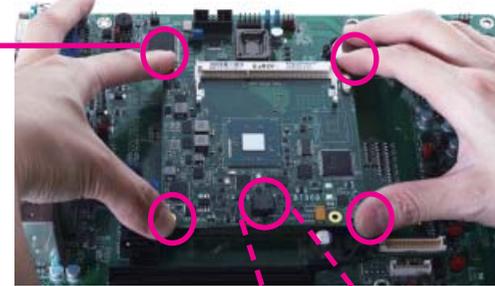
- Press BT968 down firmly until it is completely seated on the COM Express connectors of the carrier board.



BT968

COM Express connectors on the carrier board

Pressing points



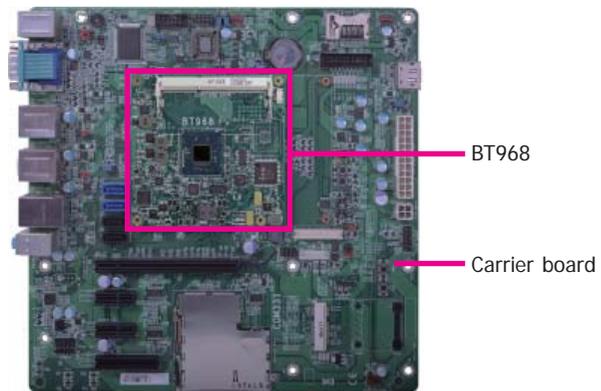
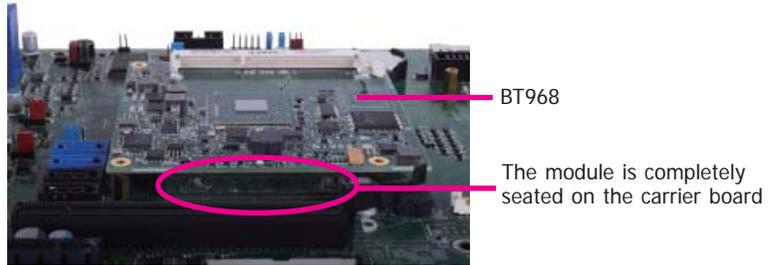
BIOS ROM socket



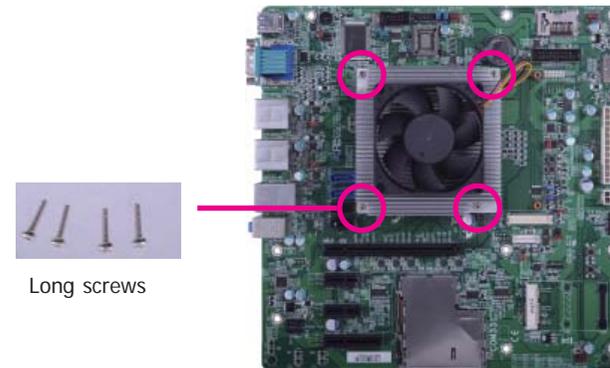
Note:

The illustrations above show the pressing points of the module onto the carrier board. Be careful when pressing the module, it may damage the socket.

- Verify that the module is firmly seated onto the COM Express connectors of the carrier board.



- Use the provided mounting screws to secure BT968 with heat sink to the carrier board and then connect the cooling fan's cable to the fan connector on BT968. The photo below shows the locations of the long mounting screws.



- And then connect the cooling fan's cable to the fan connector on BT968.



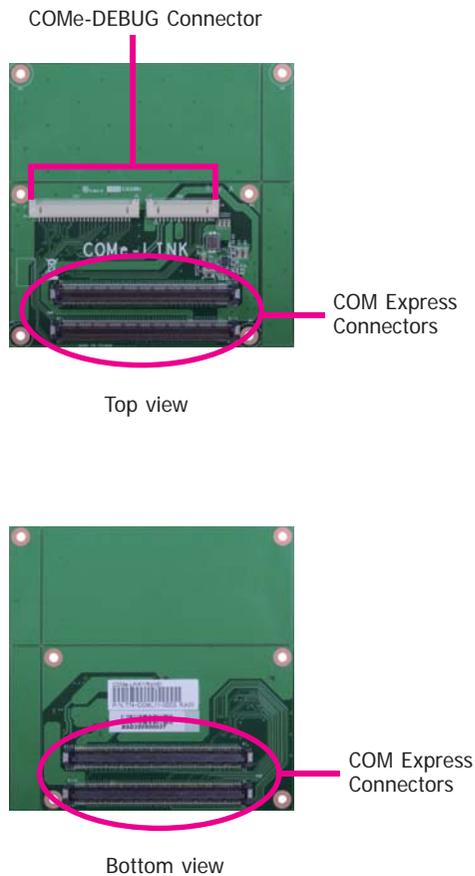
Installing the COM Express Debug Card



Note:
The system board used in the following illustrations may not resemble the actual board. These illustrations are for reference only.

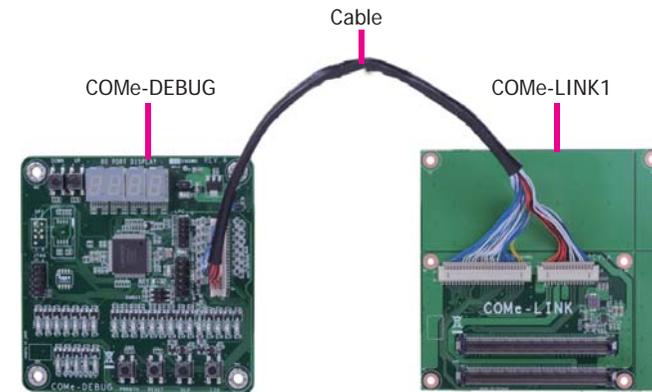
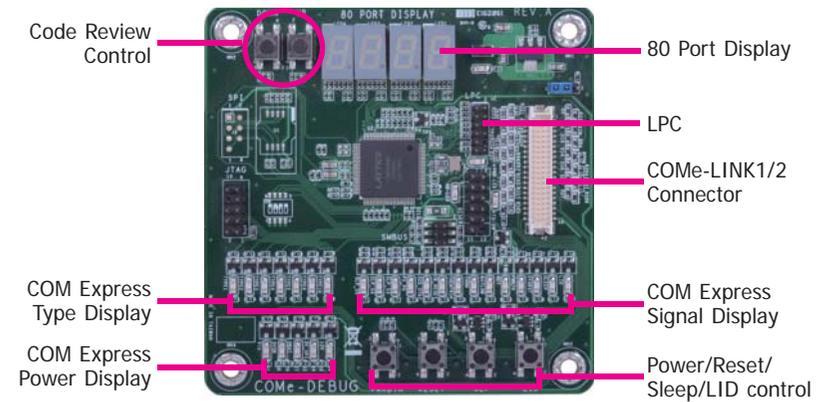
1. COMe-LINK1 is the COM Express debug card designed for COM Express Compact modules to debug and display signals and codes of COM Express modules.

COMe-LINK1

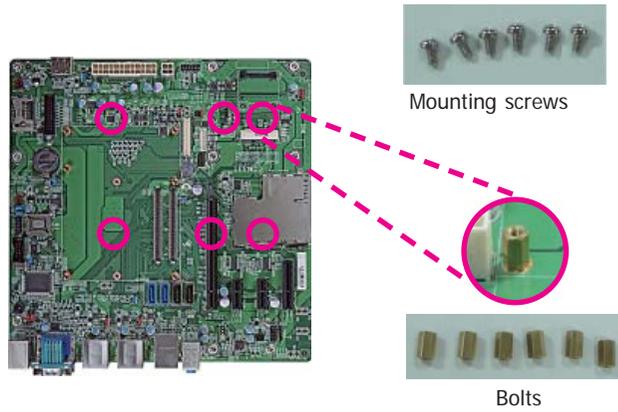


2. Connect the COMe-DEBUG card to COMe-LINK1 via a cable.

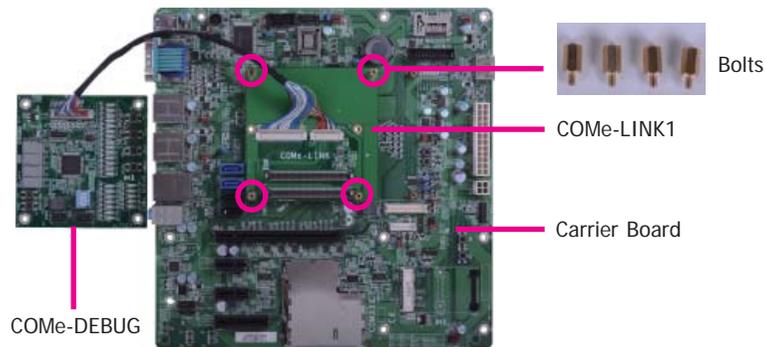
COMe-DEBUG



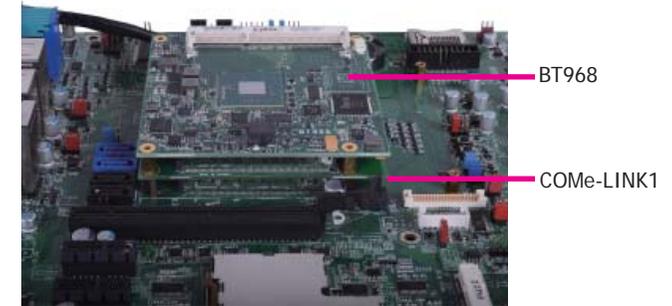
- Fasten bolts with mounting screws through mounting holes to be fixed in place.



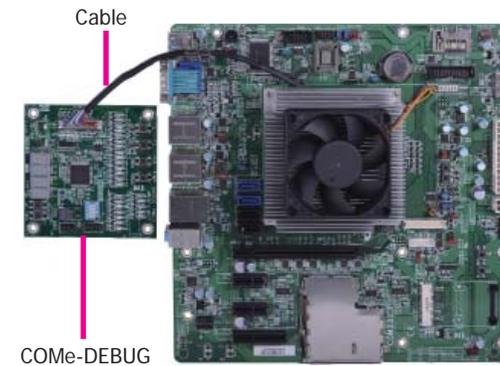
- Use the provided bolts to fix the COMe-LINK1 debug card onto the carrier board.



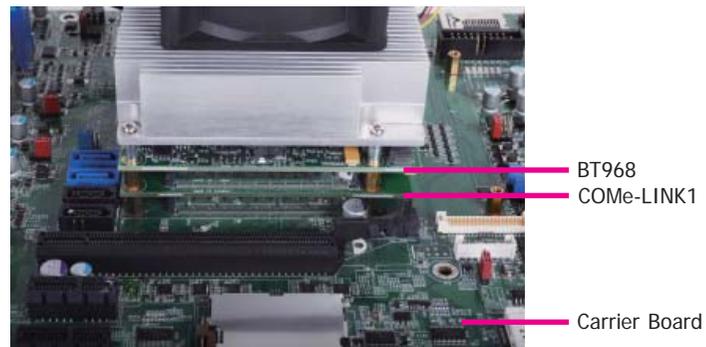
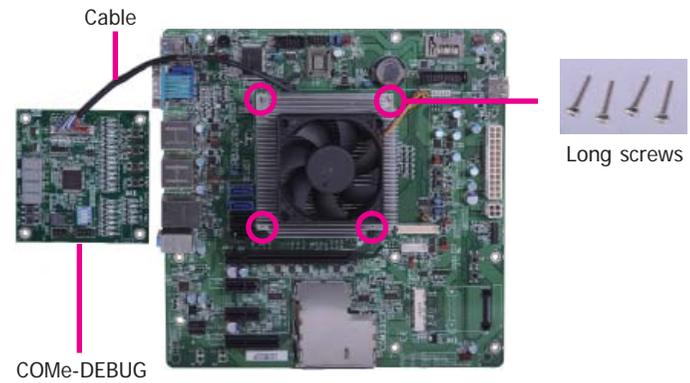
- Grasp BT968 by its edges to press it down on the top of the COMe-LINK1 debug card.



- Then, grasp the heat sink by its edges and position it down firmly on the top of the BT968.



- Use the long mounting screws to secure the heat sink on the top of the BT968 and the COMe-LINK1 debug card and connect the cooling fan's cable to the fan connector on BT968. The photo below shows the locations of long mounting screws.



Side View of the Module, Debug Card and Carrier Board

Chapter 4 - BIOS Setup

Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added.

It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.



Note:

The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

Default Configuration

Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.

The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and keys simultaneously.

Legends

KEYs	Function
Right and Left Arrows	Moves the highlight left or right to select a menu.
Up and Down Arrows	Moves the highlight up or down between submenus or fields.
<Esc>	Exits to the BIOS setup utility
+ (plus key)	Scrolls forward through the values or options of the highlighted field.
- (minus key)	Scrolls backward through the values or options of the highlighted field.
<F1>	Displays general help
<F2>	Displays previous values
<F3>	Optimized defaults
<F4>	Saves and reset the setup program.
<Enter>	Press <Enter> to enter the highlighted submenu

Scroll Bar

When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

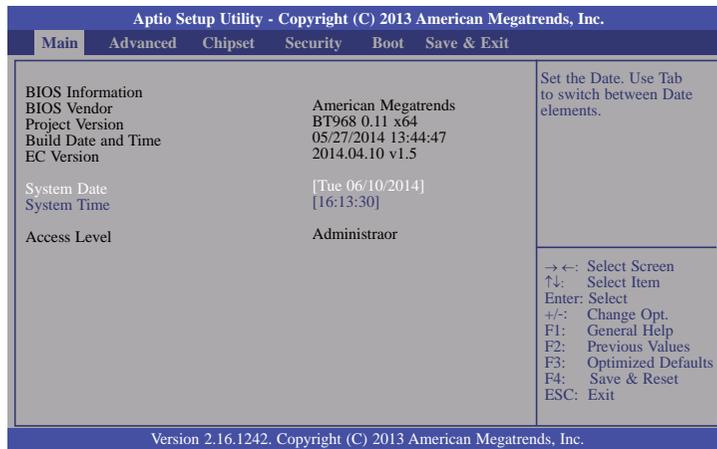
Submenu

When "►" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

AMI BIOS Setup Utility

Main

The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.



System Date

The date format is <day>, <month>, <date>, <year>. Day displays a day, from Sunday to Saturday. Month displays the month, from January to December. Date displays the date, from 1 to 31. Year displays the year, from 1980 to 2099.

System Time

The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

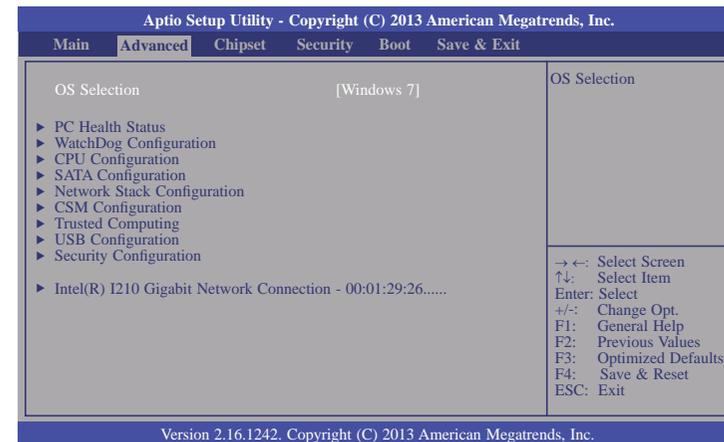
Advanced

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.



Important:

Setting incorrect field values may cause the system to malfunction.

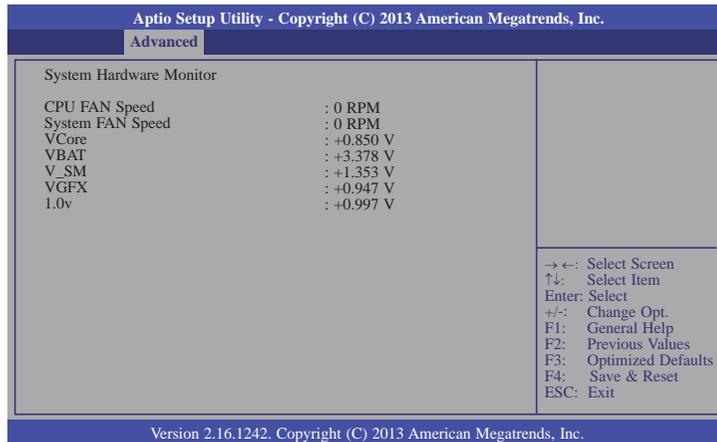


OS Selection

Select the OS support: Windows 7 or Windows 8.X.

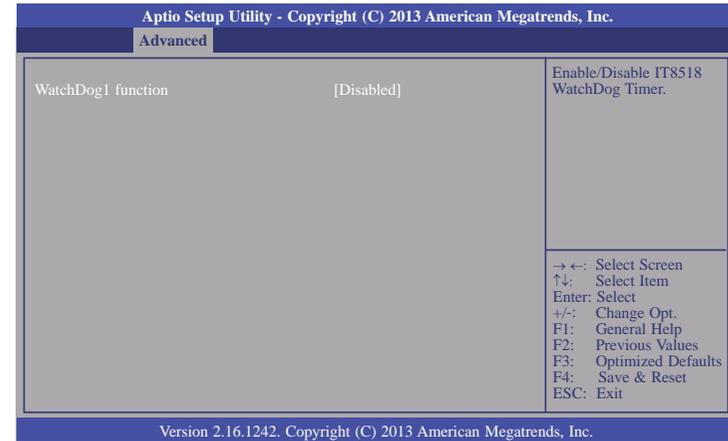
PC Health Status

This section only displays the hardware health monitor.

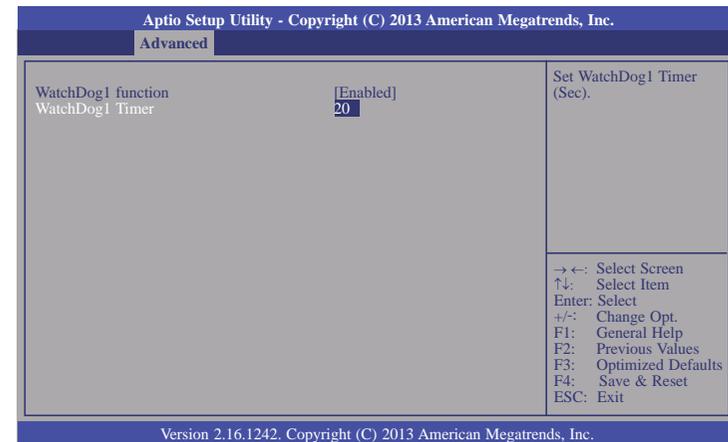


WatchDog Configuration

This field is used to enable or disable the Watchdog timer function.

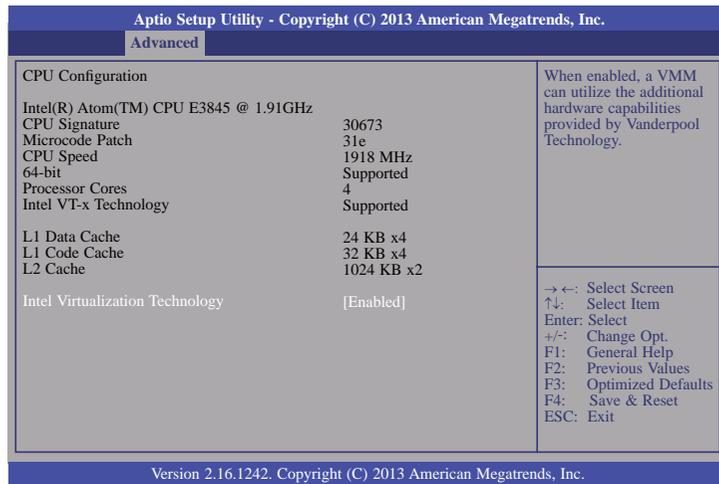


When enabled, it will display the following information:



CPU Configuration

This section is used to configure the CPU. It will also display the detection of CPU information.

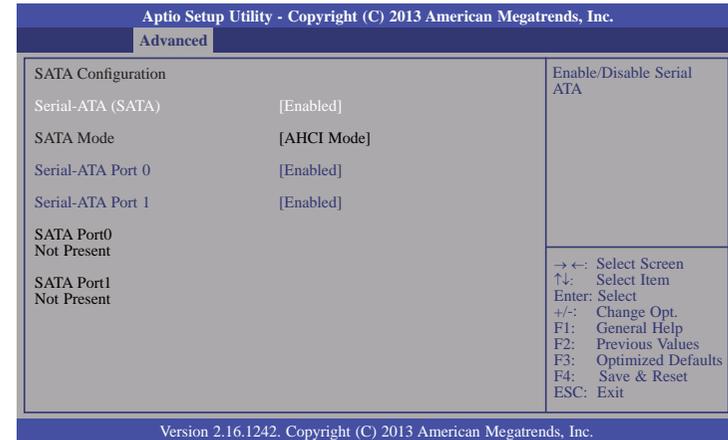


Intel Virtualization Technology

When this field is set to enabled, the VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

SATA Configuration

This section is used to configure the settings of SATA device.

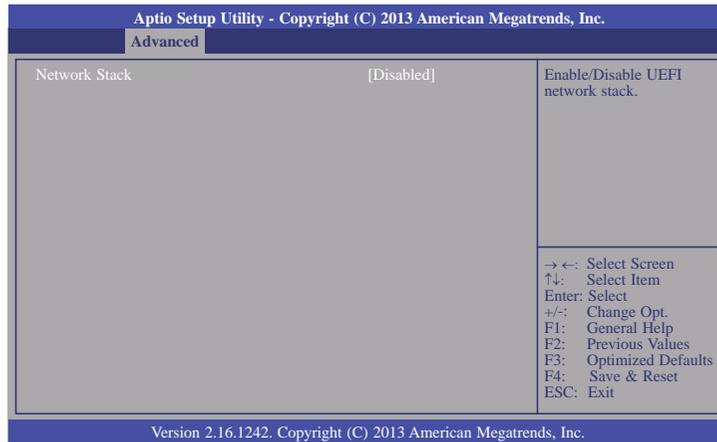


Serial ATA Port 0 and 1

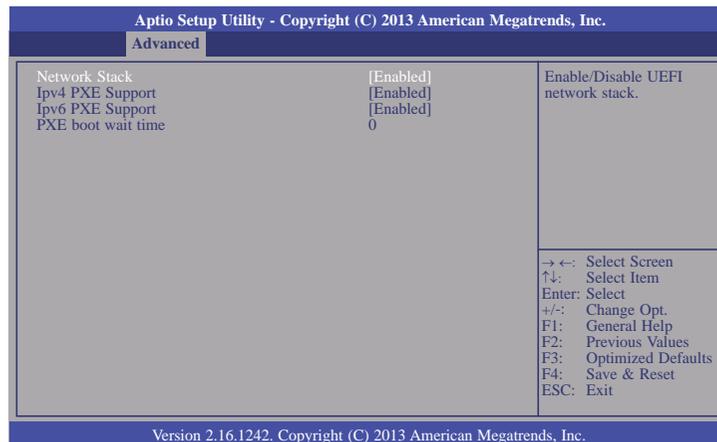
This field is used to enable or disable the Serial ATA port 0 and 1.

Network Stack

This section is used to enable or disable UEFI network stack.



When Network Stack is set to enabled, it will display the following information:



Ipv4 PXE Support

When enabled, Ipv4 PXE boot supports. When disabled, Ipv4 PXE boot option will not be created.

Ipv6 PXE Support

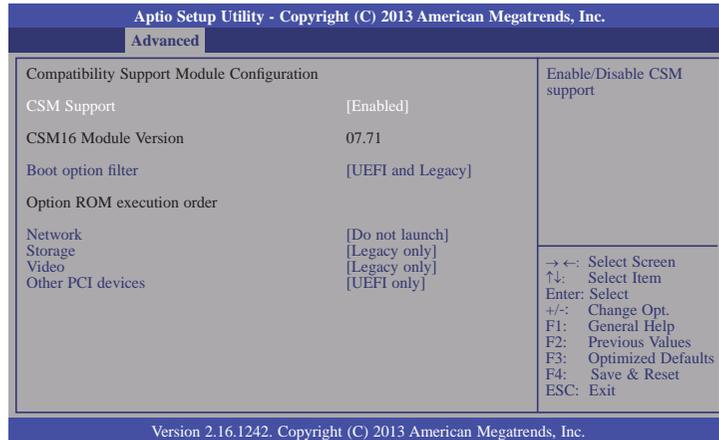
When enabled, Ipv6 PXE boot supports. When disabled, Ipv6 PXE boot option will not be created.

PXE boot wait time

Enter the wait time value to abort the PXE boot.

CSM Configuration

This section configures the CSM settings.



CSM Support

This field is used to enable or disable the CSM support.

Boot option filter

This option controls Legacy/UEFI ROMs priority.

Network

This field controls the execution of UEFI and Legacy PXE OpROM.

Storage

This field controls the execution of UEFI and Legacy Storage OpROM.

Video

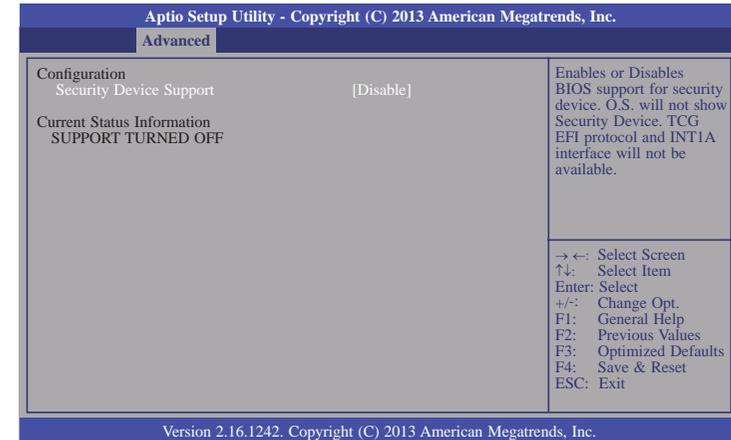
This field controls the execution of UEFI and Legacy Video OpROM.

Other PCI devices

This field determines OpROM execution policy for devices other than network, storage or video.

Trusted Computing

This section configures settings relevant to Trusted Computing innovations.

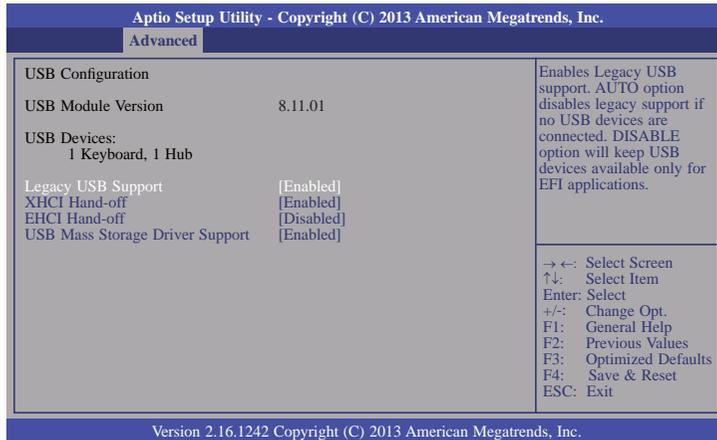


Security Device Support

Enables or Disables the BIOS support for the security device. O.S. will not show the security device. TCG EFI protocol and TNT1A interface will not be available.

USB Configuration

This section is used to configure parameters of the USB device.



Legacy USB Support

Enabled

Enable legacy USB.

Auto

Disable support for legacy when no USB devices are connected.

Disabled

Keep USB devices available only for EFI applications.

XHCI Hand-off

This is a workaround for OSes without the XHCI hand-off support. The change of XHCI ownership should be claimed by the EHCI driver.

EHCI Hand-off

This is a workaround for OSes without the EHCI hand-off support. The change of EHCI ownership should be claimed by the EHCI driver.

USB Mass Storage Driver Support

Enable or disable the support of the USB Mass Storage Driver.



Important:

When installing Windows 7, only native USB 2.0 devices (USB port 0 to USB port 3) can operate under DOS mode. Please refer to the following tables for more information on the type of USB ports.

Table 1. OS Selection

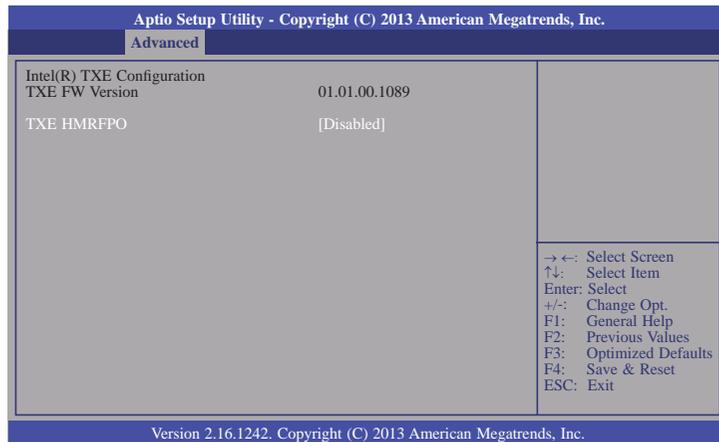
Operation Environment for Customers	DOS	Windows 7	Windows 8.x	Linux
OS Selection in the BIOS Advanced Menu	Windows 8.x	Windows 7	Windows 8.x	Windows 8.x
Available USB ports	All	When installing Windows 7 first time, only native USB 2.0 ports can work. Please refer to the USB type in table 2 below.	All	All

Table 2. The Type of USB Ports

Model Name	BT968
USB 3.0	Native
USB 0	Native
USB 1	Native
USB 2	Native
USB 3	Native
USB 4	HSIC port 0
USB 5	HSIC port 1
USB 6	HSIC port 2
USB 7	HSIC port 3

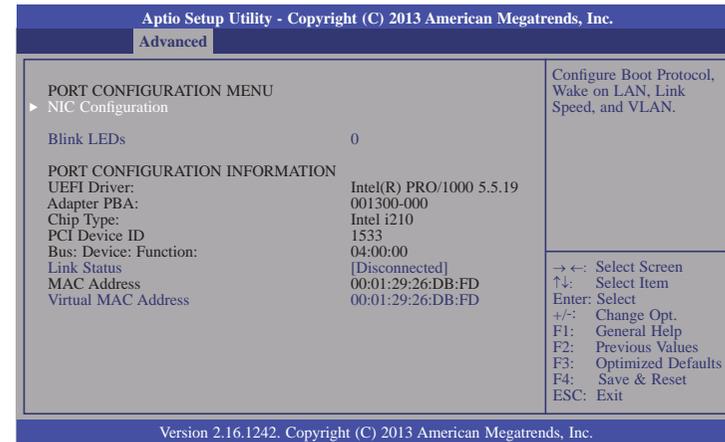
Security Configuration

This section configures the setting relevant to the Intel(R) Anti-Theft Technology.



Intel(R) I210 Gigabit Network Connection - 00:01:29:26...

This section is used to configure the parameters of Gigabit Ethernet device.



Blink LEDs

Identify the physical network port by blinking the associated LED.

Link Status

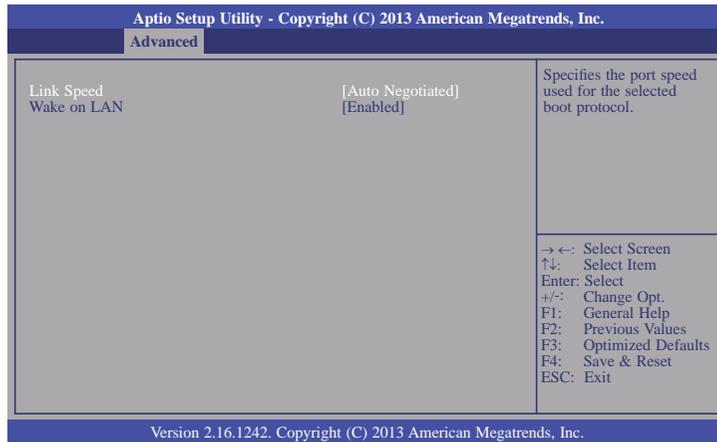
This field indicates the link status of the network device.

Virtual MAC Address

This field indicates programmatically assignable MAC address for the network port.

NIC Configuration

This field is used to configure the network device.



Link Speed

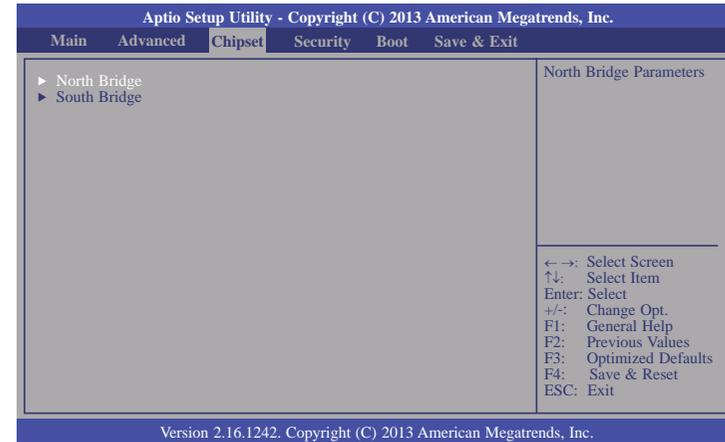
Specify the port speed which is used for the selected boot protocol.

Wake on LAN

Enables the server to be powered on using an in-band magic packet.

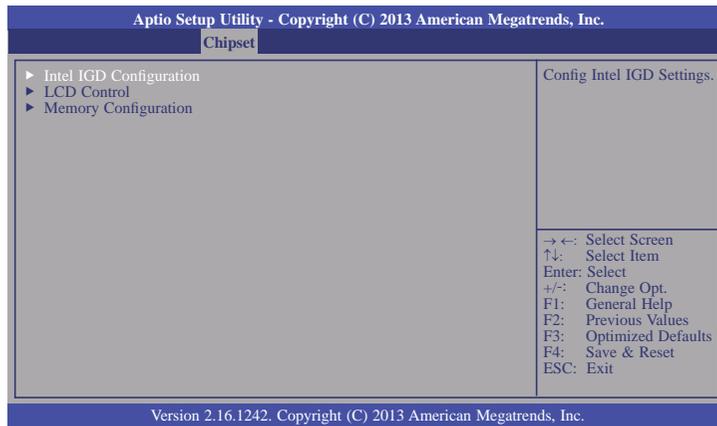
Chipset

The section configures the relevant functions of chipset.

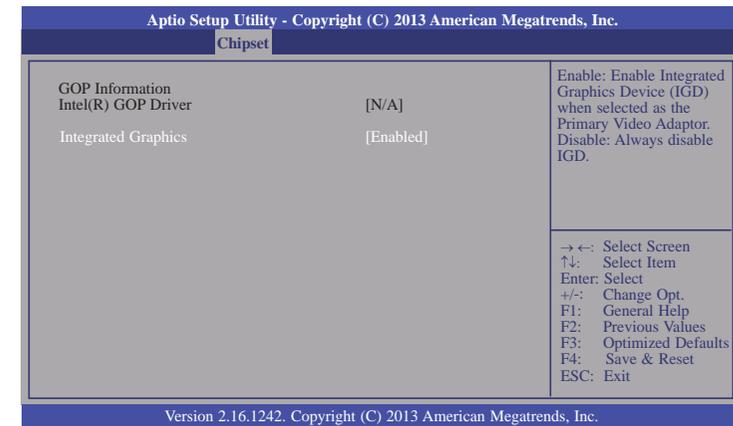


North Bridge

This section configures the North bridge parameters.



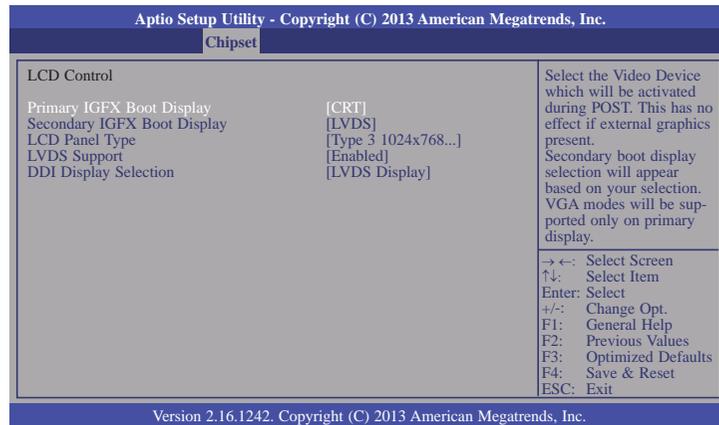
Intel IGD Configuration



Integrated Graphics

Enable or disable the integrated graphics device (IGD). When enabled, the integrated graphics device is selected as the primary video adaptor.

LCD Control



Primary IGFX Boot Display

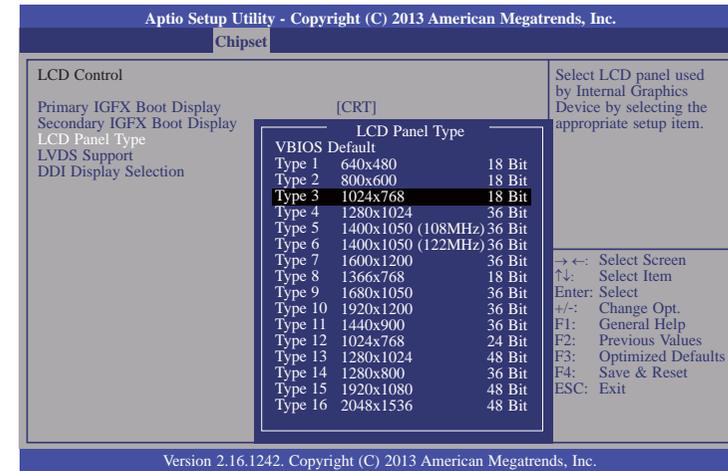
Select the Video Device which will be activated during POST. This has no effect if the external graphics presents. The selection of secondary boot display will appear based on your selection. VGA modes will be supported only on primary display.

Secondary IGFX Boot Display

Select the secondary display device: CRT, LVDS, DDI-1 or DDI-2. LVDS is the default setting.

LCD Panel Type

Select the LCD panel used by Internal Graphics Device by selecting the appropriate setup item. Please refer to the screen shown below.



LVDS Support

Enable or disable the onboard LVDS function.

DDI Display Selection

The item is related to BTB I/F DDI2 port.

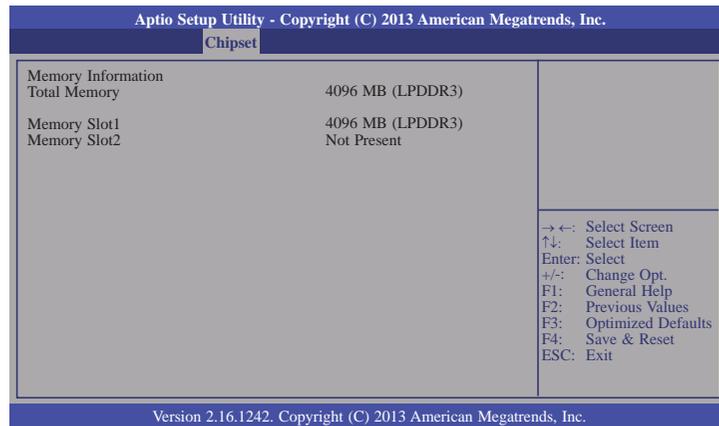


Note:

The default setting of DDI2 port is LVDS display. You can switch the setting to DDI display (DP/HDMI/DVI) via the BIOS configuration. When selecting DDI2 display, the Digital Display Audio function will not be supported. If you have the request for DDI2 Display Audio function on DP or HDMI device, please contact your sales representative for more information on the customized BIOS. Disable the LVDS support fully in the customized BIOS setting and the DDI display will work functionally.

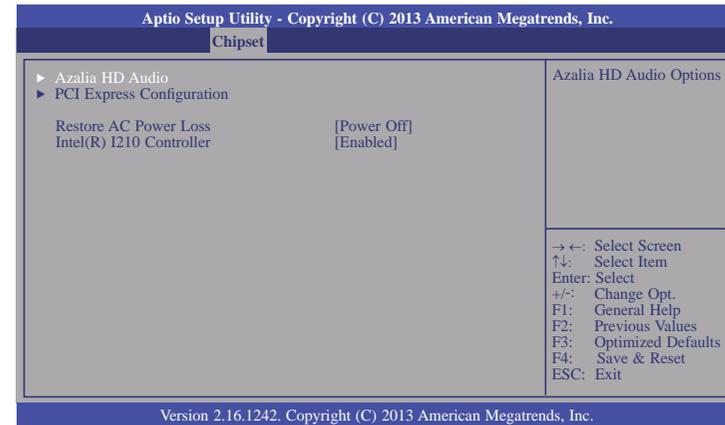
Memory Configuration

This section only displays the parameters of memory configuration.



South Bridge

This field is used to configure the parameters of the South Bridge.



Restore AC Power Loss

Power Off

When power returns after an AC power failure, the system's power is off. You must press the Power button to power-on the system.

Power On

When power returns after an AC power failure, the system will automatically power-on.

Last State

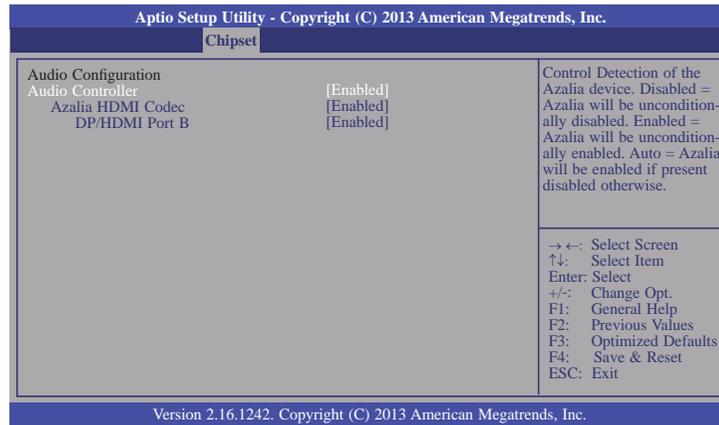
When power returns after an AC power failure, the system will return to the state where you left off before power failure occurs. If the system's power is off when AC power failure occurs, it will remain off when power returns. If the system's power is on when AC power failure occurs, the system will power-on when power returns.

Intel(R) I210 Controller

Enable the Intel(R) I210 ethernet controller.

Azalia HD Audio

This section configures Azalia HD Audio options.



Audio Controller

This item controls the detection of the Azalia device.

Disabled

Azalia will be unconditionally disabled.

Enabled

Azalia will be unconditionally enabled.

Auto

Azalia will be enabled automatically.

Azalia HDMI Codec

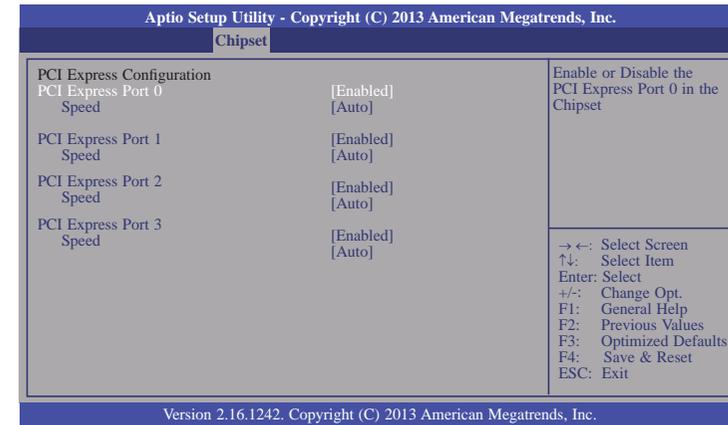
Enable or disable the internal HDMI codec for Azalia.

DP/HDMI Port B

Enable or disable the DP/HDMI Port B.

PCI Express Configuration

This section configures settings relevant to PCI Express devices.



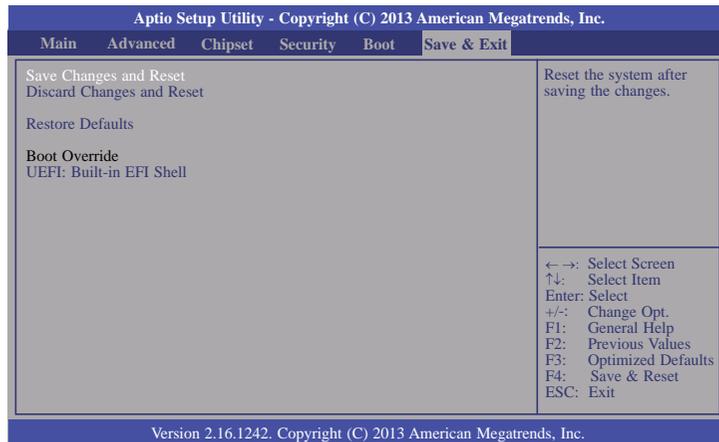
PCI Express Port 0-3

Enable or disable the PCI Express port in the chipset.

Speed

Select the speed for the PCI Express devices. The options are Auto, Gen1 or Gen2.

Save & Exit



Save Changes and Reset

To save the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system after saving all changes made.

Discard Changes and Reset

To discard the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system setup without saving any changes.

Restore Defaults

To restore and load the optimized default values, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore the default values of all the setup options.

Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility, AFUDOS.EXE. Please contact technical support or your sales representative for the files.

To execute the utility, type:

```
A:> AFUDOS BIOS_File_Name /b /p /n
then press <Enter>.
```

```
C:\AFU\AFUDOS>afudos filename /B /P /N

AMI Firmware Update Utility(APTIO) v2.25
Copyright (C)2008 American Megatrends Inc. All Rights Reserved.

Reading file ..... done
Erasing flash ..... done
Writing flash ..... done
Verifying flash ..... done
Erasing BootBlock ..... done
Writing BootBlock ..... done
Verifying BootBlock ..... done

C:\AFU\AFUDOS>
```

After finishing BIOS update, please turn off the AC power. Wait about 10 seconds and then turn on the AC power again.

Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.
2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.
3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.

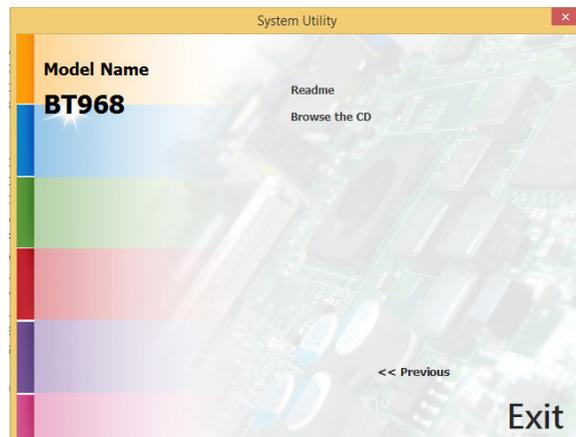
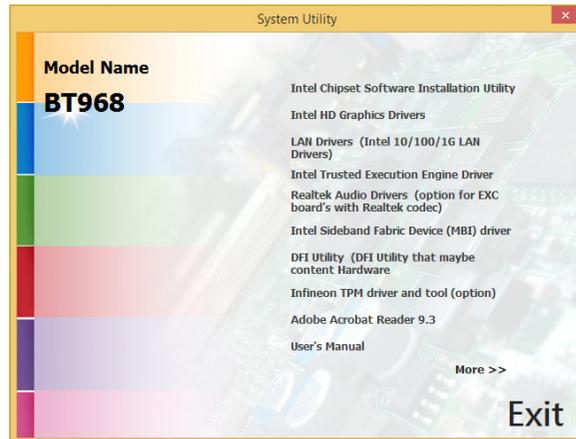
**Note:**

- a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

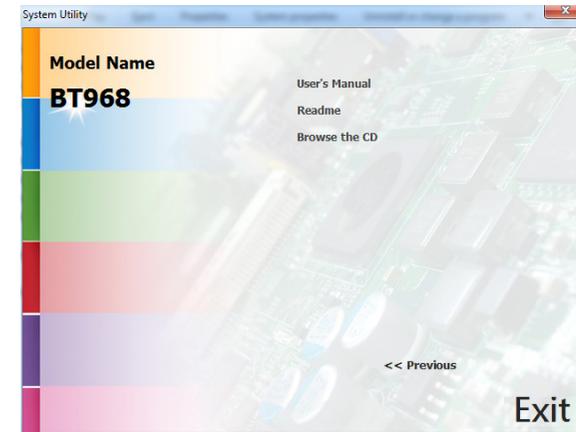
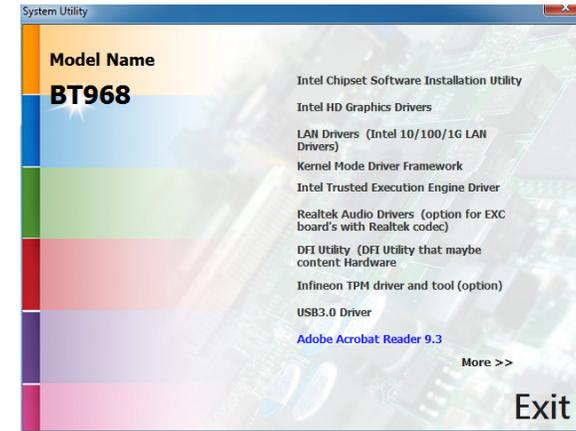
Chapter 5 - Supported Software

Install drivers, utilities and software applications that are required to facilitate and enhance the performance of the system board. You may acquire the software from your sales representatives, from an optional DVD included in the shipment, or from the website download page at <https://www.dfi.com/DownloadCenter>.

For Windows 8.x



For Windows 7



Note:

This step can be ignored if the applications are standalone files.

Intel Chipset Software Installation Utility

The Intel Chipset Device Software is used for updating Windows® INF files so that the Intel chipset can be recognized and configured properly in the system.

To install the utility, click “Intel Chipset Software Installation Utility” on the main menu.

1. Setup is ready to install the utility. Click Next.



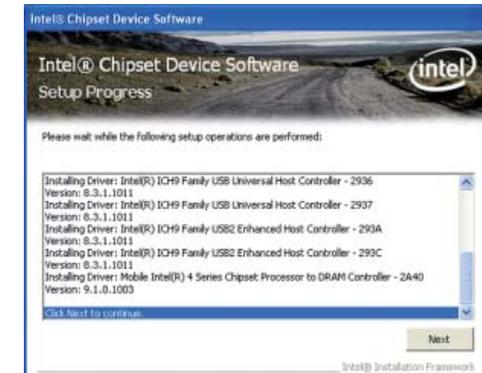
2. Read the license agreement then click Yes.



3. Go through the readme document for more installation tips then click Next.



4. After all setup operations are done, click Next.



5. Click “Yes, I want to restart this computer now” then click Finish.

Restarting the system will allow the new software installation to take effect.



Intel HD Graphics Drivers

To install the driver, click “Intel HD Graphics Drivers” on the main menu.

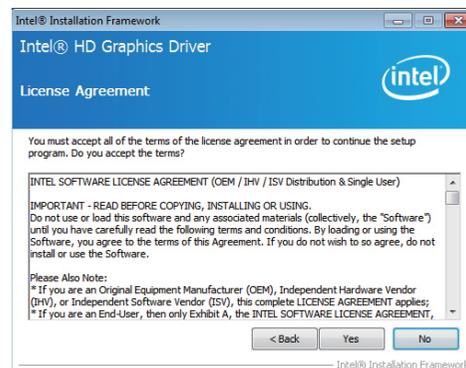
1. Setup is now ready to install the graphics driver. Click Next.



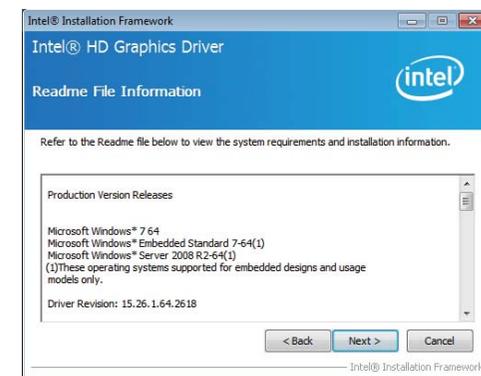
By default, the “Automatically run WinSAT and enable the Windows Aero desktop theme” is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 7/Windows 8 desktop appears. The “blank screen” period is the time Windows is testing the graphics performance.

We recommend that you skip this process by disabling this function then click Next.

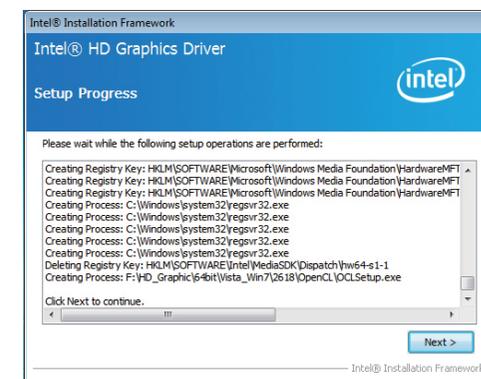
2. Read the license agreement then click Yes.



3. Go through the readme document for system requirements and installation tips then click Next.

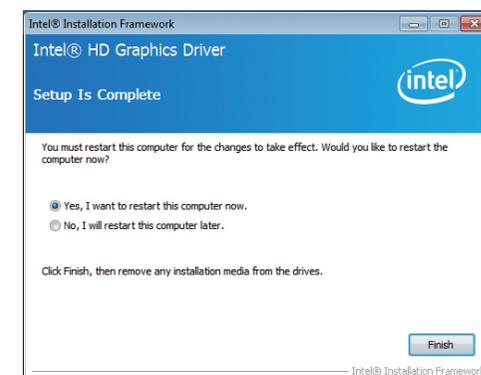


4. Setup is now installing the driver. Click Next to continue.



5. Click “Yes, I want to restart this computer now” then click Finish.

Restarting the system will allow the new software installation to take effect.



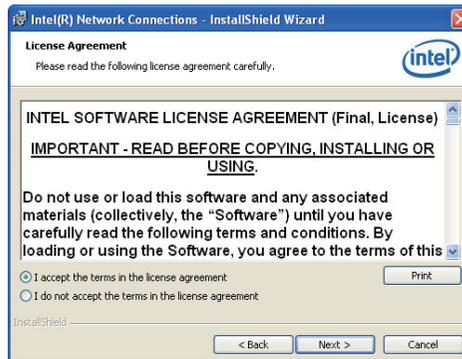
Intel LAN Drivers

To install the driver, click “Intel LAN Drivers” on the main menu.

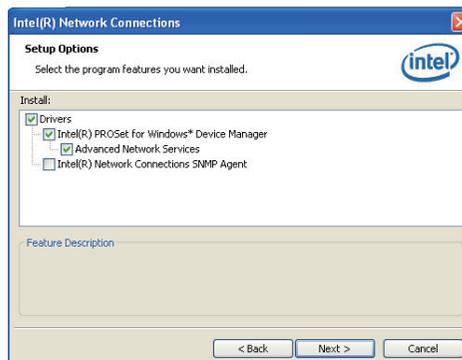
1. Setup is ready to install the driver. Click Next.



2. Click “I accept the terms in the license agreement” then click “Next”.



3. Select the program features you want installed then click Next.



4. Click Install to begin the installation.



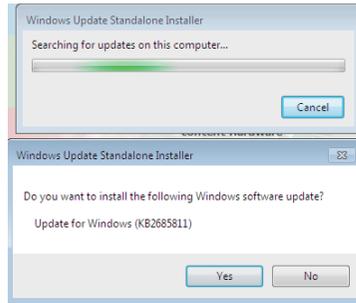
5. After completing installation, click Finish.



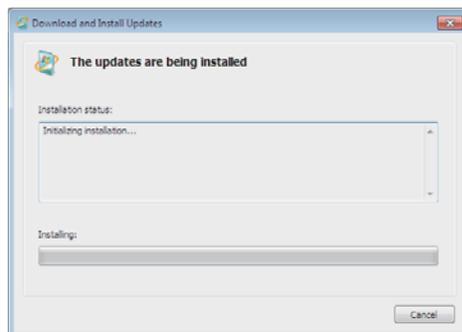
Kernel Mode Driver Framework (For Windows 7 only)

To install the driver, click “Kernel Mode Driver Framework” on the main menu.

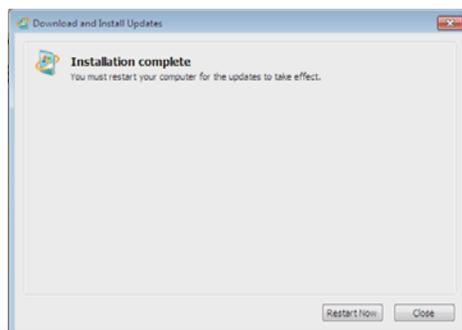
1. Click “Yes” to install the update.



2. The update is installed now.



3. Click “Restart Now” to restart your computer when the installation is complete.



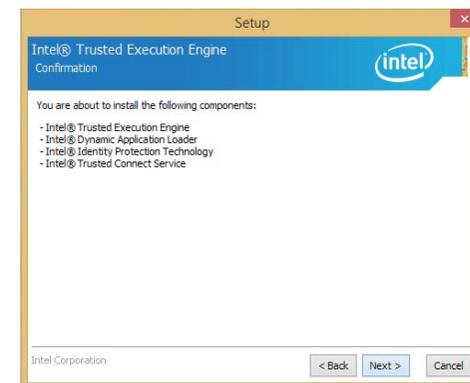
Intel Trusted Execution Engine Driver

To install the driver, click “Intel Trusted Execution Engine Driver” on the main menu.

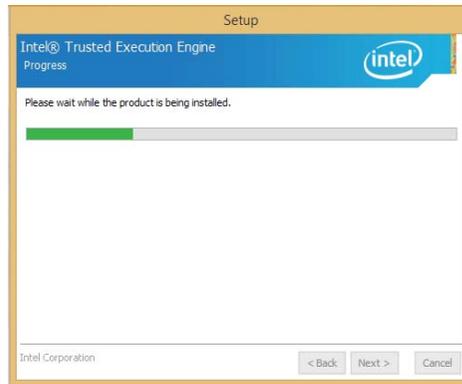
1. Tick “I accept the terms in the License Agreement” and then click “Next.”



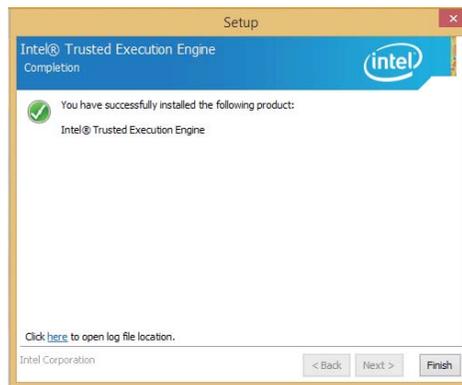
2. The step shows the components which will be installed. Then, Click Next.



3. The step displays the installing status in the progress.



4. Click "Finish" when the installation is complete.



Realtek Audio Drivers

To install the driver, click "Realtek Audio Drivers" on the main menu.

1. Setup is now ready to install the audio driver. Click Next.
2. Follow the remainder of the steps on the screen; clicking "Next" each time you finish a step.



3. Click "Yes, I want to restart my computer now" then click Finish.

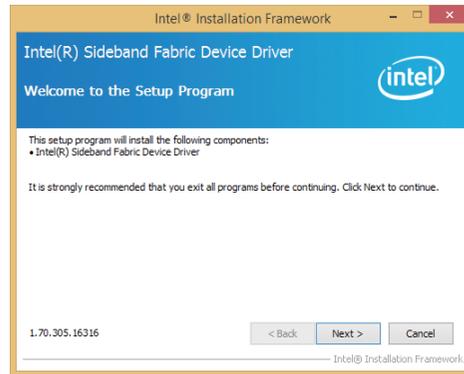
Restarting the system will allow the new software installation to take effect.



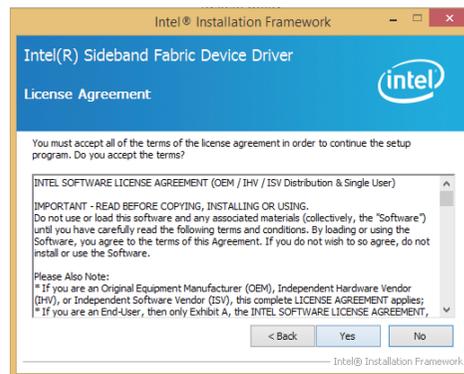
Intel Sideband Fabric Device (MBI) Driver (For Windows 8 only)

To install the driver, click "Intel Sideband Fabric Device (MBI) Driver" on the main menu.

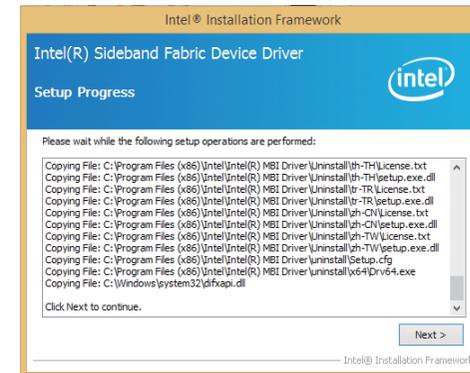
1. The setup program will be installed. Click "Next" to continue.



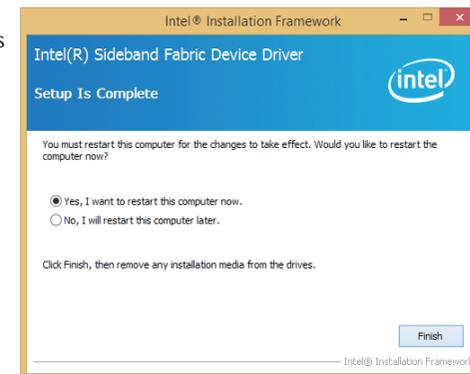
2. Click "Yes" to accept the License Agreement.



3. The step performs setup operations. Click "Next" to continue.



4. Click "Finish" to restart the computer when the setup is completely installed.



DFI Utility

DFI Utility provides information about the board, HW Health, Watchdog, DIO, and Backlight. To access the utility, click “DFI Utility” on the main menu.



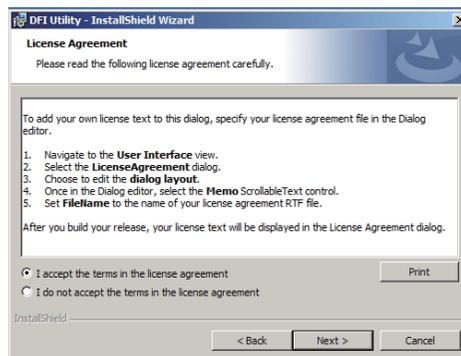
Note:

If you are using Windows 7, you need to access the operating system as an administrator to be able to install the utility.

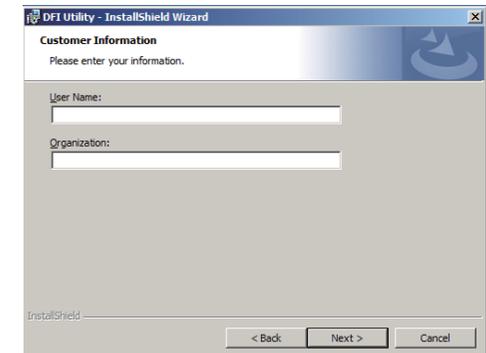
1. Setup is ready to install the DFI Utility driver. Click Next.



2. Click “I accept the terms in the license agreement” and then click Next.



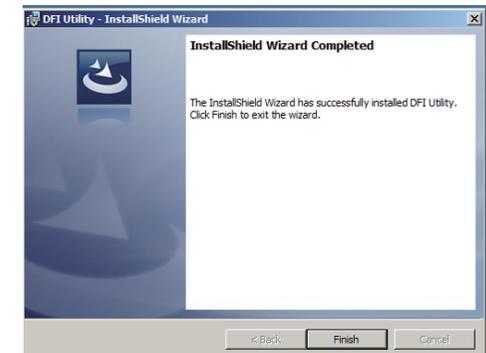
3. Enter “User Name” and “Organization” information and then click Next.



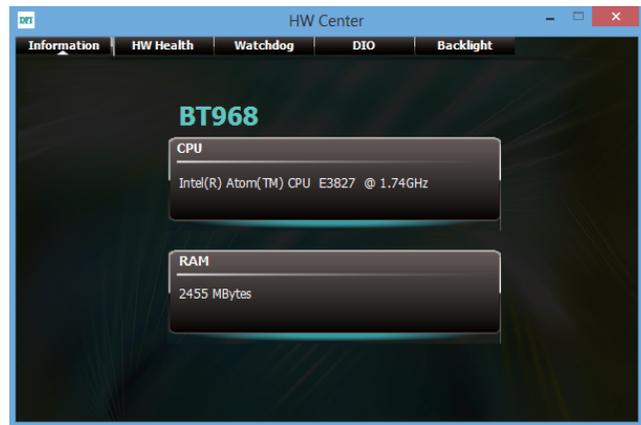
4. Click Install to begin the installation.



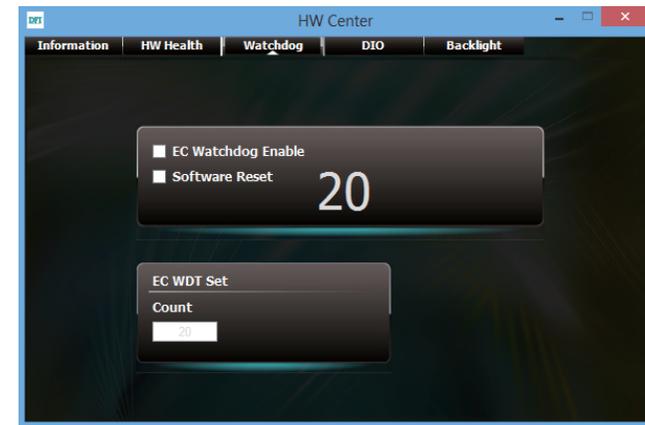
5. After completing installation, click Finish.



The DFI Utility icon will appear on the desktop. Double-click the icon to open the utility.



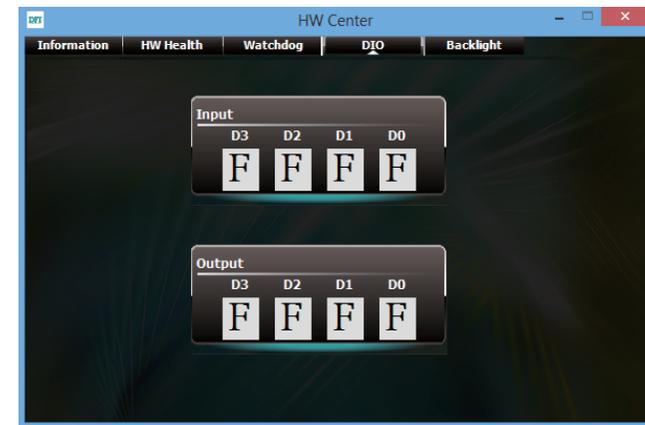
Information



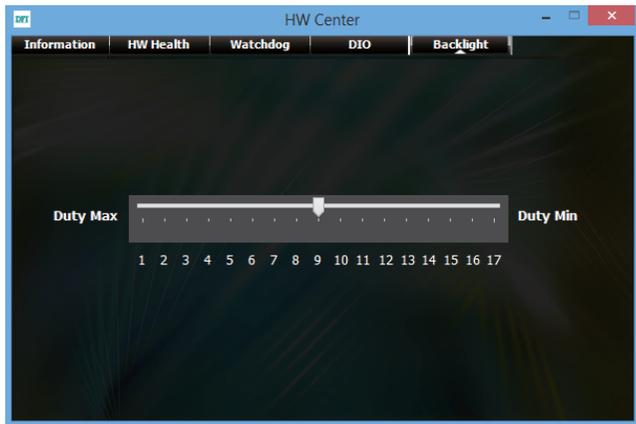
WatchDog



HW Health



DIO



Backlight

Infineon TPM Driver and Tool (option)

To install the driver, click “Infineon TPM driver and tool (option)” on the main menu.

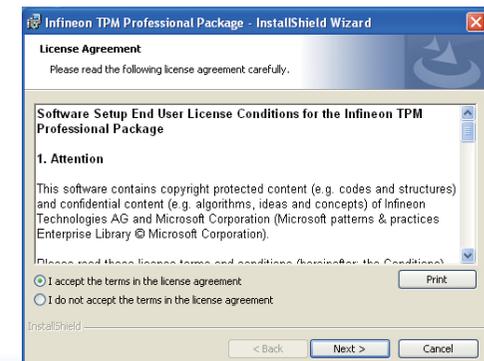
1. The setup program is preparing to install the driver.



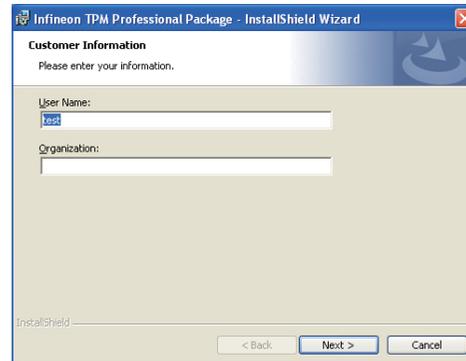
2. The setup program is now ready to install the utility. Click Next.



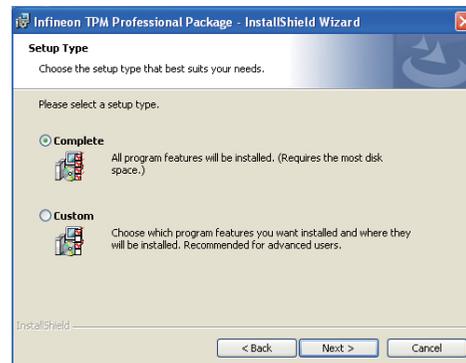
3. Click “I accept the terms in the license agreement” and then click “Next”.



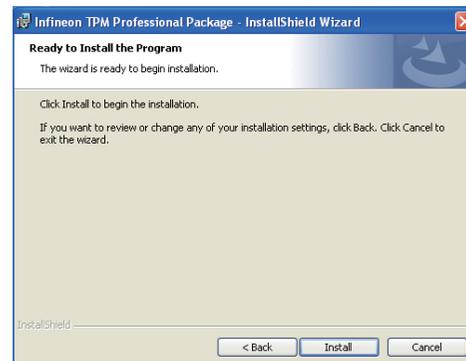
4. Enter the necessary information and then click Next.



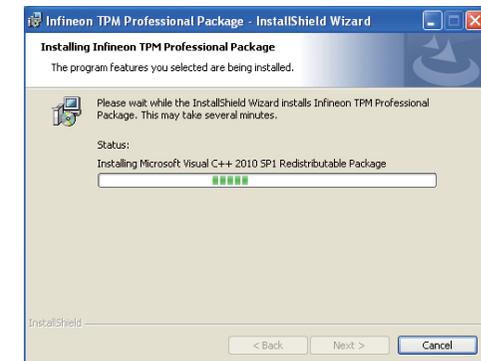
5. Select a setup type and then click Next.



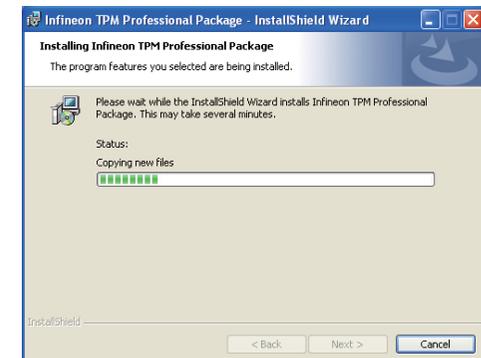
6. Click Install.



7. TPM requires installing the Microsoft Visual C++ package prior to installing the utility. Click Install.



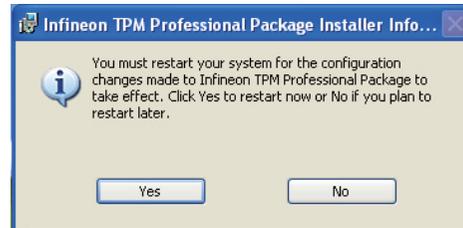
8. The setup program is currently installing the Microsoft Visual C++ package.



9. Click Finish.



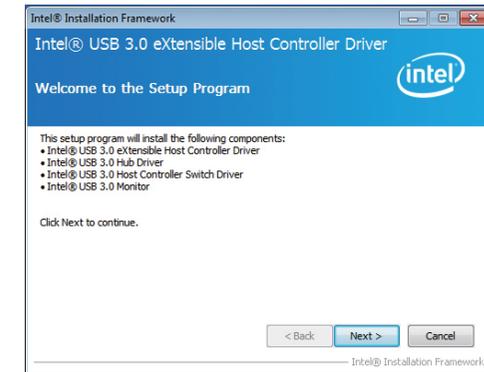
10. Click "Yes" to restart your system.



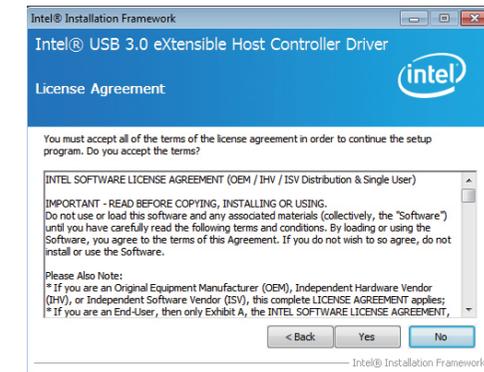
Intel USB 3.0 Drivers (For Windows 7 Only)

To install the driver, click "Intel USB 3.0 Driver" on the main menu.

1. Setup is ready to install the driver. Click Next.



2. Read the license agreement then click Yes.



Chapter 6 - GPIO Programming Guide

Function Description

Get_EC_Data (unsigned char ucData): Read a Byte data from EC.

Write_EC_Data (unsigned char ucData, unsigned char Data): Write a Byte data to EC.

Sample Code

GPIO Input Process

```
EC_DIO_Read_Input()
{
    BYTE Data;

    //Pin0-3 Input Mode
    Data = Get_EC_Data(0xBA);
    Data |= 0x80;
    Write_EC_Data(0xBA, Data);
    while(((Get_EC_Data(0xBA) >> 7)&0x01))
    {
        Data = Get_EC_Data(0xBA);
    }

    Return Data ;
}
```

GPIO Output Process

```
EC_DIO_Write_Output(unsigned char udata)
{
    //Pin4-7 Output Mode
    udata <<= 4;
    udata |= 0x01;
    Write_EC_Data(0xBB, udata);

    return 0;
}

EC_DIO_Read_Output()
{
    BYTE Data;

    //Pin4-7 Output Mode
    Write_EC_Data(0xBB, 0x02);
    Delay;
    Data = Get_EC_Data(0xBB);
    Data >>= 4;
    Return Data ;
}
```

Appendix A - NLITE and AHCI Installation Guide

nLite

nLite is an application program that allows you to customize your XP installation disc by integrating the RAID/AHCI drivers into the disc. By using nLite, the F6 function key usually required during installation is no longer needed.



Note:

The installation steps below are based on nLite version 1.4.9. Installation procedures may slightly vary if you're using another version of the program.

1. Download the program from nLite's official website.

<http://www.nliteos.com/download.html>

2. Install nLite.



Important:

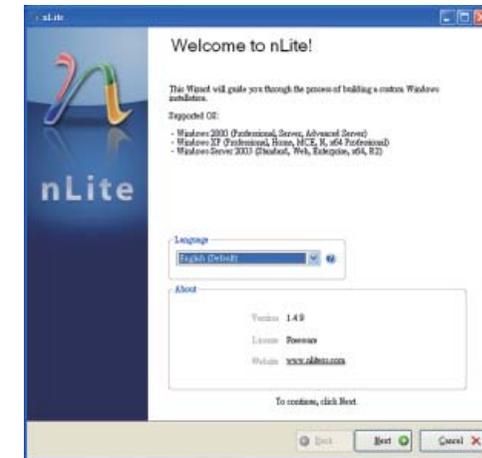
Due to it's coding with Visual.Net, you may need to first install .NET Framework prior to installing nLite.

3. Download relevant RAID/AHCI driver files from Intel's website. The drivers you choose will depend on the operating system and chipset used by your computer.

The downloaded driver files should include iaahci.cat, iaAHCI.inf, iastor.cat, iaStor.inf, IaStor.sys, license.txt and TXTSETUP.OEM.

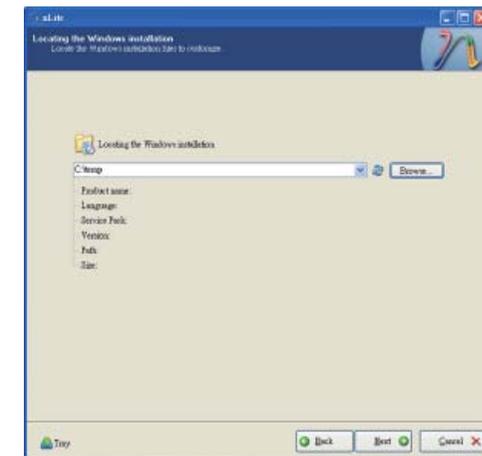


4. Insert the XP installation disc into an optical drive.
5. Launch nLite. The Welcome screen will appear. Click Next.

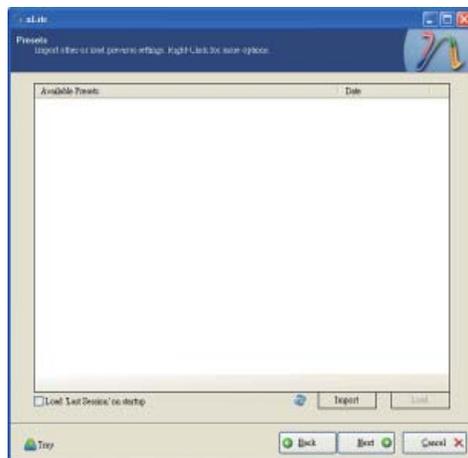


6. Click Next to temporarily save the Windows installation files to the designated default folder.

If you want to save them in another folder, click Browse, select the folder and then click Next.



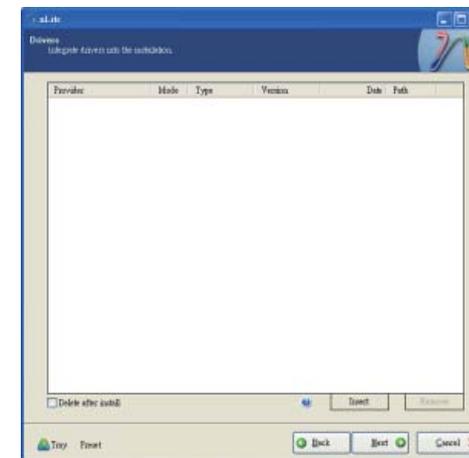
7. Click Next.



8. In the Task Selection dialog box, click Drivers and Bootable ISO. Click Next.

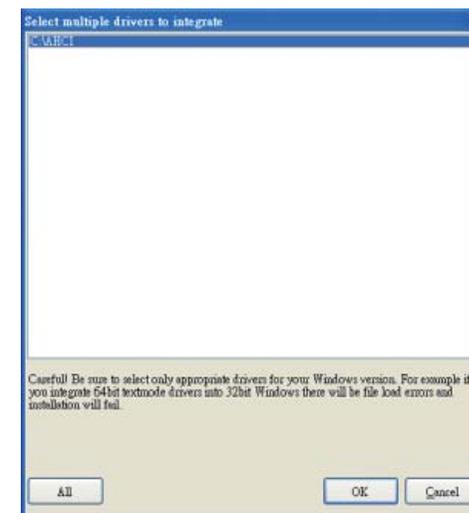


9. Click Insert and then select Multiple driver folder to select the drivers you will integrate. Click Next.

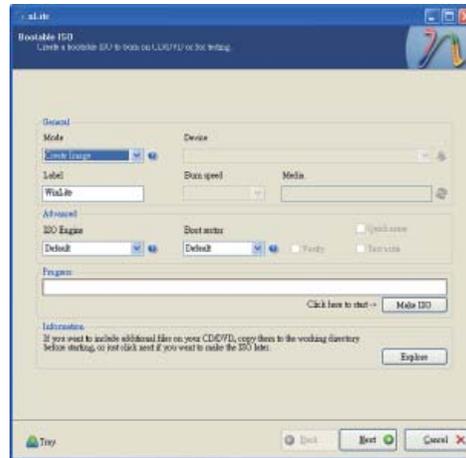


10. Select only the drivers appropriate for the Windows version that you are using and then click OK.

Integrating 64-bit drivers into 32-bit Windows or vice versa will cause file load errors and failed installation.

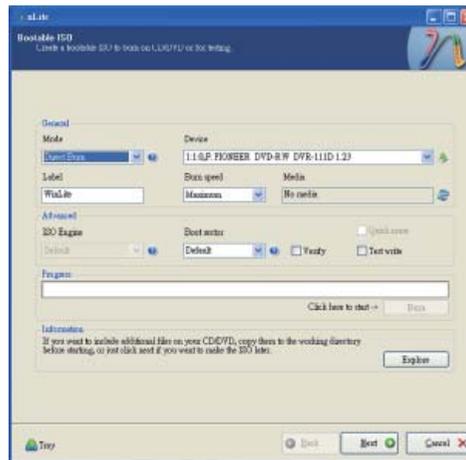


15. To create an image, select the Create Image mode under the General section and then click Next.



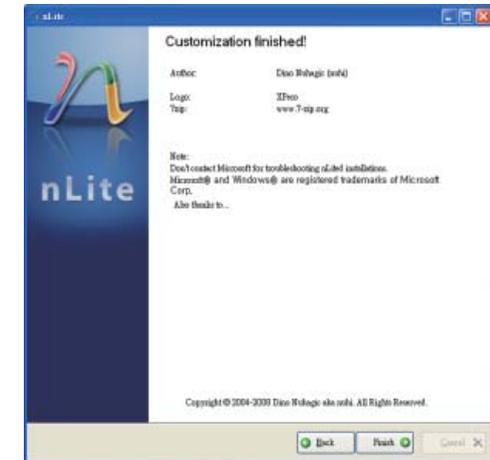
16. Or you can choose to burn it directly to a disc by selecting the Direct Burn mode under the General section.

Select the optical device and all other necessary settings and then click Next.

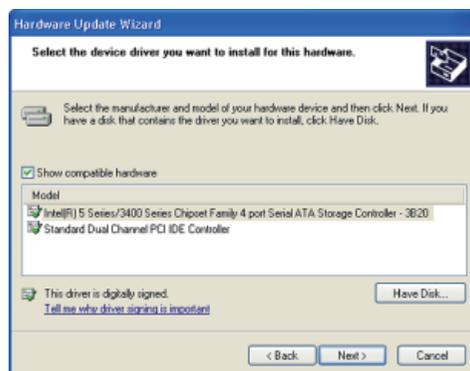


17. You have finished customizing the Windows XP installation disc. Click Finish.

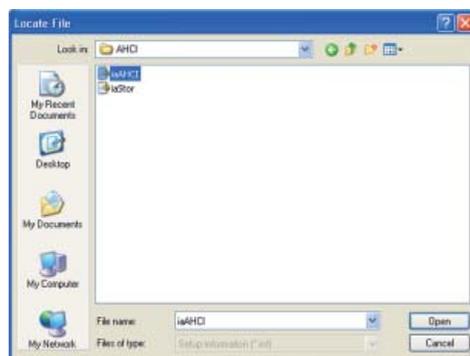
Enter the BIOS utility to configure the SATA controller to RAID/AHCI. You can now install Windows XP.



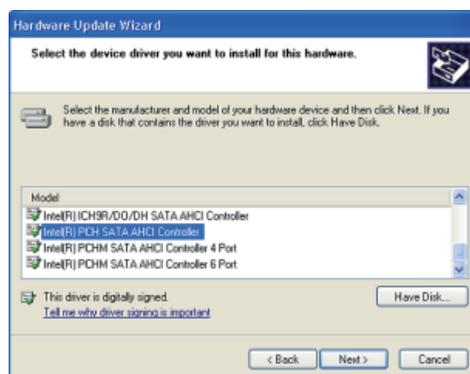
8. Click "Have Disk".



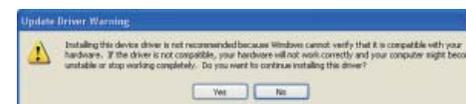
9. Select C:\AHCI\iaAHCI.inf and then click Open.



10. Select the appropriate AHCI Controller of your hardware device and then click Next.



11. A warning message appeared because the selected SATA controller did not match your hardware device.

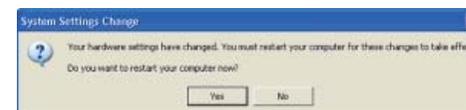


Ignore the warning and click Yes to proceed.

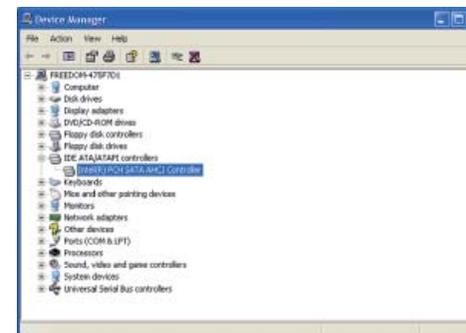
12. Click Finish.



13. The system's settings have been changed. Windows XP requires that you restart the computer. Click Yes.



14. Enter the BIOS utility and modify the SATA controller from IDE to AHCI. By doing so, Windows will work normally with the SATA controller that is in AHCI mode.



Appendix B - Watchdog Sample Code

```

#include <stdio.h>
//-----
#define EC_EnablePort 0x66
#define EC_DataPort 0x62
//-----
void WriteEC(char,int);
void SetWdTime(int,int);
int GetWdTime(void);
//-----
main()
{
    unsigned int countdown;
    unsigned int input,count_h,count_l;

    printf("Input WD Time: ");
    scanf("%d",&input);
    printf("\n");
    count_h=input>>8;
    count_l=input&0x00FF;
    SetWdTime(count_h,count_l);

    while(1)
    {
        countdown = GetWdTime();
        delay(100);
        printf("\rTime Remaining: %d ",countdown);
    }
}
//-----
void SetWdTime(int count_H,int count_L)
{
    //Set Count
    WriteEC(0xB5,count_H); //High Byte
    WriteEC(0xB6,count_L); //Low Byte
    //Enable Watch Dog Timer
    WriteEC(0xB4,0x01);
}
//-----

int GetWdTime(void)
{
    int sum,data_h,data_l;
    //Select EC Read Type
    outportb(EC_EnablePort,0x80);
    delay(5);
    //Get Remaining Count High Byte
    outportb(EC_DataPort,0xF4);
    delay(5);
    data_h=inportb(EC_DataPort);
    delay(5);
    //Select EC Read Type
    outportb(EC_EnablePort,0x80);
    delay(5);
    //Get Remaining Count Low Byte
    outportb(EC_DataPort,0xF5);
    delay(5);
    data_l=inportb(EC_DataPort);
    delay(5);

    data_h<=8;
    data_h&=0xFF00;
    sum=data_h|data_l;
    return sum;
}
//-----
void WriteEC(char EC_Addr, int data)
{
    //Select EC Write Type
    outportb(EC_EnablePort,0x81);
    delay(5);
    outportb(EC_DataPort,EC_Addr);
    delay(5);
    outportb(EC_DataPort,data);
    delay(5);
}
//-----

```

Appendix C - System Error Message

When the BIOS encounters an error that requires the user to correct something, either a beep code will sound or a message will be displayed in a box in the middle of the screen and the message, PRESS F1 TO CONTINUE, CTRL-ALT-ESC or DEL TO ENTER SETUP, will be shown in the information box at the bottom. Enter Setup to correct the error.

Error Messages

One or more of the following messages may be displayed if the BIOS detects an error during the POST. This list indicates the error messages for all Awards BIOSes:

CMOS BATTERY HAS FAILED

The CMOS battery is no longer functional. It should be replaced.

**Important:**

Danger of explosion if battery incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the battery manufacturer's instructions.

CMOS CHECKSUM ERROR

Checksum of CMOS is incorrect. This can indicate that CMOS has become corrupt. This error may have been caused by a weak battery. Check the battery and replace if necessary.

DISPLAY SWITCH IS SET INCORRECTLY

The display switch on the motherboard can be set to either monochrome or color. This indicates the switch is set to a different setting than indicated in Setup. Determine which setting is correct, either turn off the system and change the jumper or enter Setup and change the VIDEO selection.

Appendix D - Troubleshooting

Troubleshooting Checklist

This chapter of the manual is designed to help you with problems that you may encounter with your personal computer. To efficiently troubleshoot your system, treat each problem individually. This is to ensure an accurate diagnosis of the problem in case a problem has multiple causes.

Some of the most common things to check when you encounter problems while using your system are listed below.

1. The power switch of each peripheral device is turned on.
2. All cables and power cords are tightly connected.
3. The electrical outlet to which your peripheral devices connected is working. Test the outlet by plugging in a lamp or other electrical device.
4. The monitor is turned on.
5. The display's brightness and contrast controls are adjusted properly.
6. All add-in boards in the expansion slots are seated securely.
7. Any add-in board you have installed is designed for your system and is set up correctly.

Monitor/Display

If the display screen remains dark after the system is turned on:

1. Make sure that the monitor's power switch is on.
2. Check that one end of the monitor's power cord is properly attached to the monitor and the other end is plugged into a working AC outlet. If necessary, try another outlet.
3. Check that the video input cable is properly attached to the monitor and the system's display adapter.
4. Adjust the brightness of the display by turning the monitor's brightness control knob.

The picture seems to be constantly moving.

1. The monitor has lost its vertical sync. Adjust the monitor's vertical sync.
2. Move away any objects, such as another monitor or fan, that may be creating a magnetic field around the display.
3. Make sure your video card's output frequencies are supported by this monitor.

The screen seems to be constantly wavering.

1. If the monitor is close to another monitor, the adjacent monitor may need to be turned off. Fluorescent lights adjacent to the monitor may also cause screen wavering.

Power Supply

When the computer is turned on, nothing happens.

1. Check that one end of the AC power cord is plugged into a live outlet and the other end properly plugged into the back of the system.
2. Make sure that the voltage selection switch on the back panel is set for the correct type of voltage you are using.
3. The power cord may have a "short" or "open". Inspect the cord and install a new one if necessary.

Hard Drive

Hard disk failure.

1. Make sure the correct drive type for the hard disk drive has been entered in the BIOS.
2. If the system is configured with two hard drives, make sure the bootable (first) hard drive is configured as Master and the second hard drive is configured as Slave. The master hard drive must have an active/bootable partition.

Excessively long formatting period.

If your hard drive takes an excessively long period of time to format, it is likely a cable connection problem. However, if your hard drive has a large capacity, it will take a longer time to format.

Serial Port

The serial device (modem, printer) doesn't output anything or is outputting garbled characters.

1. Make sure that the serial device's power is turned on and that the device is on-line.
2. Verify that the device is plugged into the correct serial port on the rear of the computer.
3. Verify that the attached serial device works by attaching it to a serial port that is working and configured correctly. If the serial device does not work, either the cable or the serial device has a problem. If the serial device works, the problem may be due to the onboard I/O or the address setting.
4. Make sure the COM settings and I/O address are configured correctly.

Keyboard

Nothing happens when a key on the keyboard was pressed.

1. Make sure the keyboard is properly connected.
2. Make sure there are no objects resting on the keyboard and that no keys are pressed during the booting process.

System Board

1. Make sure the add-in card is seated securely in the expansion slot. If the add-in card is loose, power off the system, re-install the card and power up the system.
2. Check the jumper settings to ensure that the jumpers are properly set.
3. Verify that all memory modules are seated securely into the memory sockets.
4. Make sure the memory modules are in the correct locations.
5. If the board fails to function, place the board on a flat surface and seat all socketed components. Gently press each component into the socket.
6. If you made changes to the BIOS settings, re-enter setup and load the BIOS defaults.