



# AL968

## COM Express Compact Module User's Manual

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## Trademarks

Product names or trademarks appearing in this manual are for identification purpose only and are the properties of the respective owners.

## 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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## 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 AL968 board
- One Heat sink (Height: 22.6mm)

## Optional Items

- COM332-B carrier board kit
- Heat spreader (Height: 11mm)

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.

- Memory module
- Storage devices such as hard disk drive, 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

SYSTEM	Processor	Intel Atom® Processor E3900 Series, BGA 1296 Intel Atom® x7-E3950 Processor, Quad Core, 2M Cache, 1.6GHz (2.0GHz), 12W Intel Atom® x5-E3940 Processor, Quad Core, 2M Cache, 1.6GHz (1.8GHz), 9.5W Intel Atom® x5-E3930 Processor, Dual Core, 2M Cache, 1.3GHz (1.8GHz), 6.5W Intel® Pentium® Processor N4200, Quad Core, 2M Cache, 1.1GHz (2.5GHz), 6W Intel® Celeron® Processor N3350, Dual Core, 2M Cache, 1.1GHz (2.4GHz), 6W
	Memory	Two 204-pin SODIMM up to 8GB Dual Channel DDR3L 1866MHz
	BIOS	AMI SPI 128Mbit
GRAPHICS	Controller	Intel® HD Graphics
	Feature	OpenGL 5.0, DirectX 12, OpenCL 2.1 HW Decode: AVC/H.264, MPEG2, VC1, WMV9, JPEG/MJPEG, HEVC/H.265, VP8, VP9, MVC HW Encode: AVC/H.264, JPEG/MJPEG, HEVC/H.265, VP8, VP9, MVC
	Display	1 x VGA/DDI (DDI available upon request) 1 x LVDS/eDP (eDP available upon request) 1 x DDI VGA: resolution up to 1920x1200 @ 60Hz LVDS: dual channel 24-bit, resolution up to 1920x1200 @ 60Hz eDP: resolution up to 3840x2160 @ 60Hz HDMI: resolution up to 3840x2160 @ 30Hz DP++: resolution up to 4096x2160 @ 60Hz
	Triple Display	VGA + LVDS + DDI DDI + eDP + DDI (available upon request)
	Interface	4 x PCIe x1 (Gen 2) 1 x SDIO (available upon request) 1 x LPC 1 x I²C 1 x SMBus 1 x SPI 2 x UART (TX/RX)
EXPANSION	eMMC	1 x 8GB/16GB/32GB eMMC (available upon request)
AUDIO	Interface	HD Audio
ETHERNET	Controller	1 x Intel® I211AT PCIe (10/100/1000Mbps) (0°C to 60°C) or 1 x Intel® I210IT PCIe (10/100/1000Mbps) (-40°C to 85°C)
I/O	USB	4 x USB 3.0 8 x USB 2.0
	SATA	2 x SATA 3.0 (up to 6Gb/s)
	DIO	1 x 8-bit DIO

WATCHDOG TIMER	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
SECURITY	TPM	Available Upon Request
POWER	Type	12V, 5VSB, VCC_RTC (ATX mode) 12V, VCC_RTC (AT mode)
	Consumption	TBD
OS SUPPORT (UEFI ONLY)	Windows	Windows 10 IoT Enterprise 64-bit
	Linux	Ubuntu 15.10 (Intel® graphic driver available)
ENVIRONMENT	Temperature	Operating: 0 to 60°C/-40 to 85°C Storage: -40 to 85°C
	Humidity	Operating: 10 to 90% RH Storage: 10 to 90% RH
	MTBF	TBD
MECHANICAL	Dimensions	COM Express® Compact 95mm (3.74") x 95mm (3.74")
	Compliance	PICMG COM Express® R2.1, Type 6

## 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 supporting 1866MHz 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. It supports 1 x VGA/DDI (DDI available upon request), 1 x LVDS/eDP (eDP available upon request) and 1 x DDI interfaces for triple display outputs.

### • Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 6Gb/s (SATA 3.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s. The bandwidth of the SATA 3.0 will be limited by carrier board design.

### • Gigabit LAN

The Intel® I211AT Gigabit LAN controller (0°C to 60°C) or Intel® I210IT Gigabit LAN controller (-40°C to 85°C) 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 shows the dimensions of the different types of COM Express modules.

AL968 is a COM Express Compact module. The dimension is 95mm (3.74") x 95mm (3.74").

⊙ Common for all Form Factors

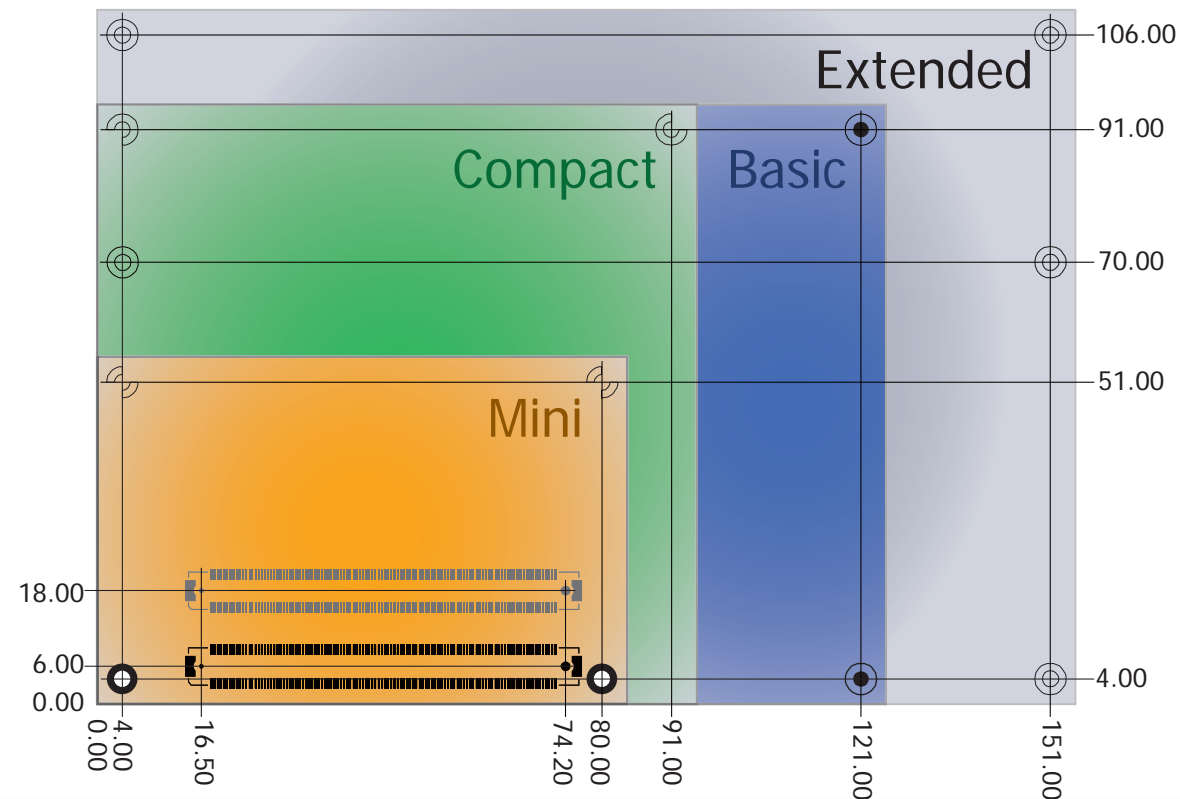
○ Extended only

● 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 AL968 module.

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

Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI + USB3) Min / Max	DFI AL968 Type 6
A-B	System I/O		
A-B	PCI Express Lanes 0 - 5	1 / 6	3
A-B	LVDS Channel A	0 / 1	0 / 1 (Option : eDP or LVDS)
A-B	LVDS Channel B	0 / 1	1
A-B	eDP on LVDS CH A pins	0 / 1	0 / 1 (Option : eDP or LVDS)
A-B	VGA Port	0 / 1	0
A-B	TV-Out	NA	NA
A-B	DDI 0	NA	NA
A-B <sup>5</sup>	Serial Ports 1 - 2	0 / 2	2
A-B	CAN interface on SER1	0 / 1	0
A-B	SATA / SAS Ports	1 / 4	1/2 (Option : SATA or USB3.0)
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 <sup>6</sup>	SDIO (muxed on GPIO)	0 / 1	0/1 (Option : SDIO or DIO)
	General Purpose I/O	8 / 8	8 (Option : SDIO or DIO)
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

- 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.

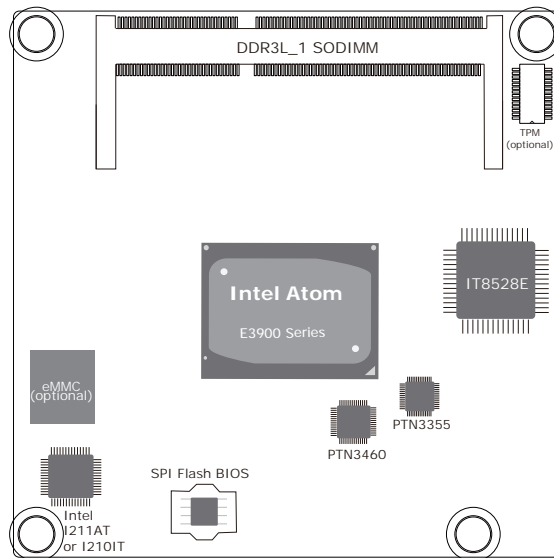
Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI + USB3) Min / Max	DFI AL968 Type 6
A-B	Power Management		
A-B	Thermal Protection	0 / 1	1
A-B	Battery Low Alarm	0 / 1	1
A-B	Suspend/Wake Signals	0 / 3	1
A-B	Power Button Support	1 / 1	1
A-B	Power Good	1 / 1	1
A-B	VCC_5V_SBY Contacts	4 / 4	4
A-B <sup>5</sup>	Sleep Input	0 / 1	1
A-B <sup>5</sup>	Lid Input	0 / 1	1
A-B <sup>5</sup>	Fan Control Signals	0 / 2	2
A-B	Trusted Platform Modules	0 / 1	1 (Option)
A-B	Power		
A-B	VCC_12V Contacts	12 / 12	12

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

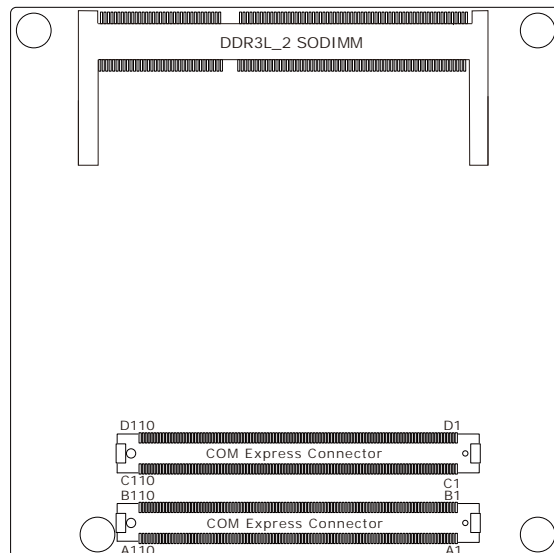
Connector	Feature	COM Express Module Base Specification Type 6 (No IDE or PCI, add DDI + USB3) Min / Max	DFI AL968 Type 6
C-D	System I/O		
C-D <sup>6</sup>	PCI Express Lanes 16 - 31	0 / 16	0
	PCI Express Graphics (PEG)	0 / 1	0
	Muxed SDVO Channels 1 - 2	NA	NA
C-D <sup>6</sup>	PCI Express Lanes 6 - 15	0 / 2	0
	PCI Bus - 32 Bit	NA	NA
	PATA Port	NA	NA
	LAN Ports 1 - 2	NA	NA
	DDIs 1 - 3	0 / 3	DDIO (Option : DDIO or VGA)
	USB 3.0 Ports	0 / 4	3/4 (Option : SATA or USB3.0)
C-D	Power		
C-D	VCC_12V Contacts	12 / 12	12

## Chapter 3 - Hardware Installation

### Board Layout

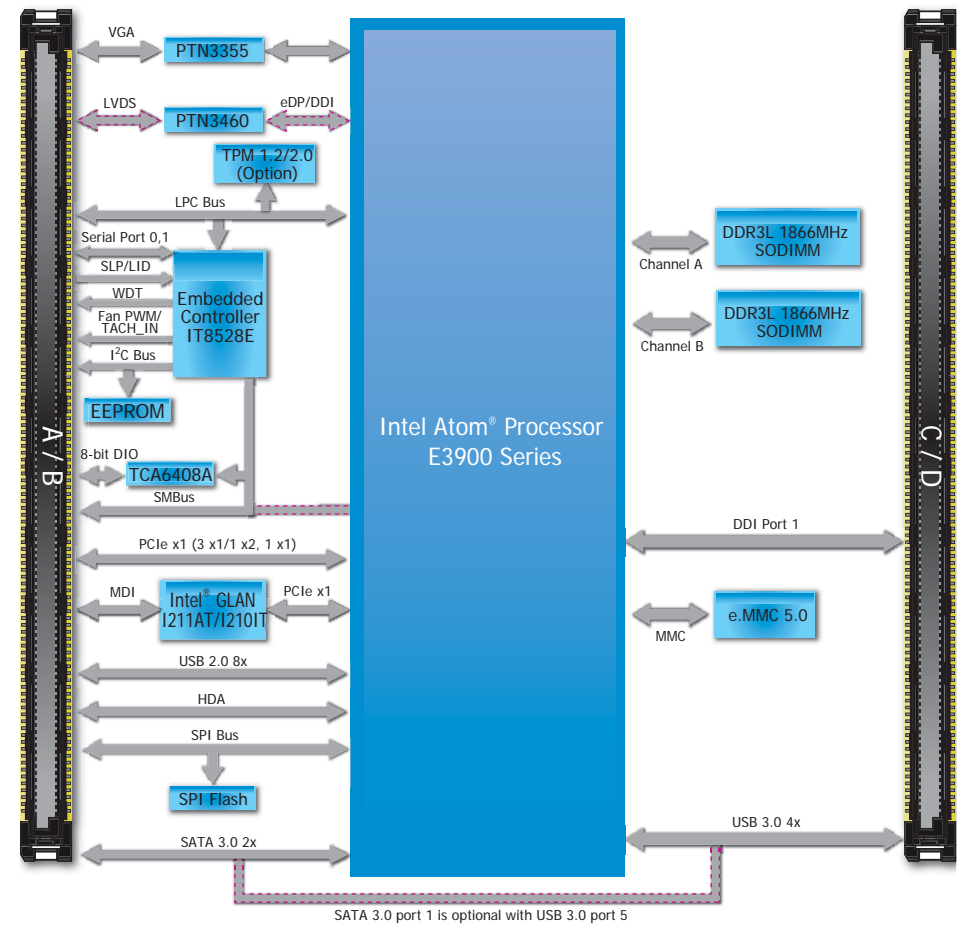


Top View

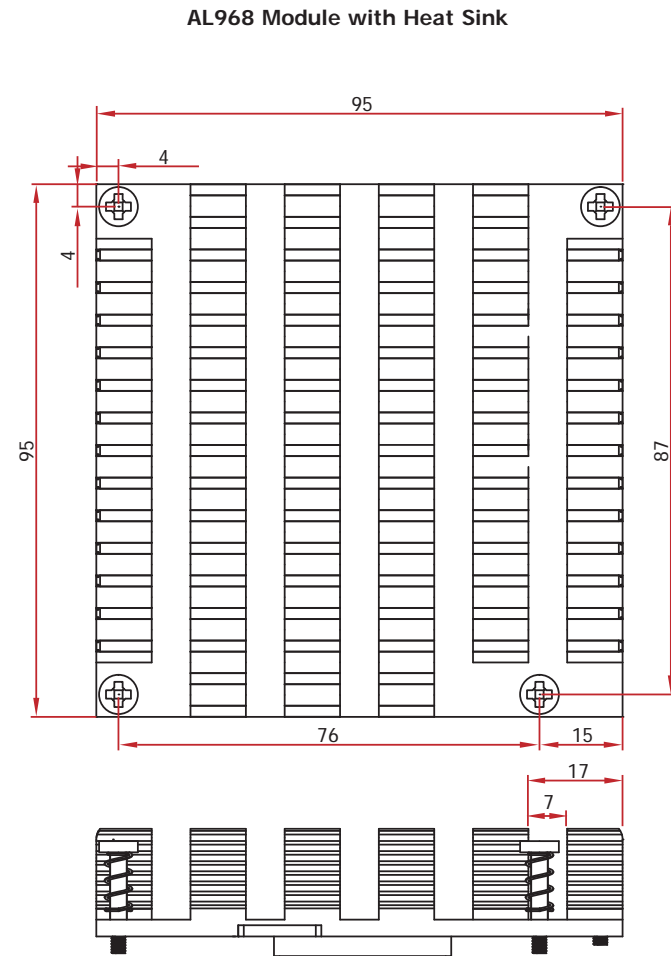


Bottom View

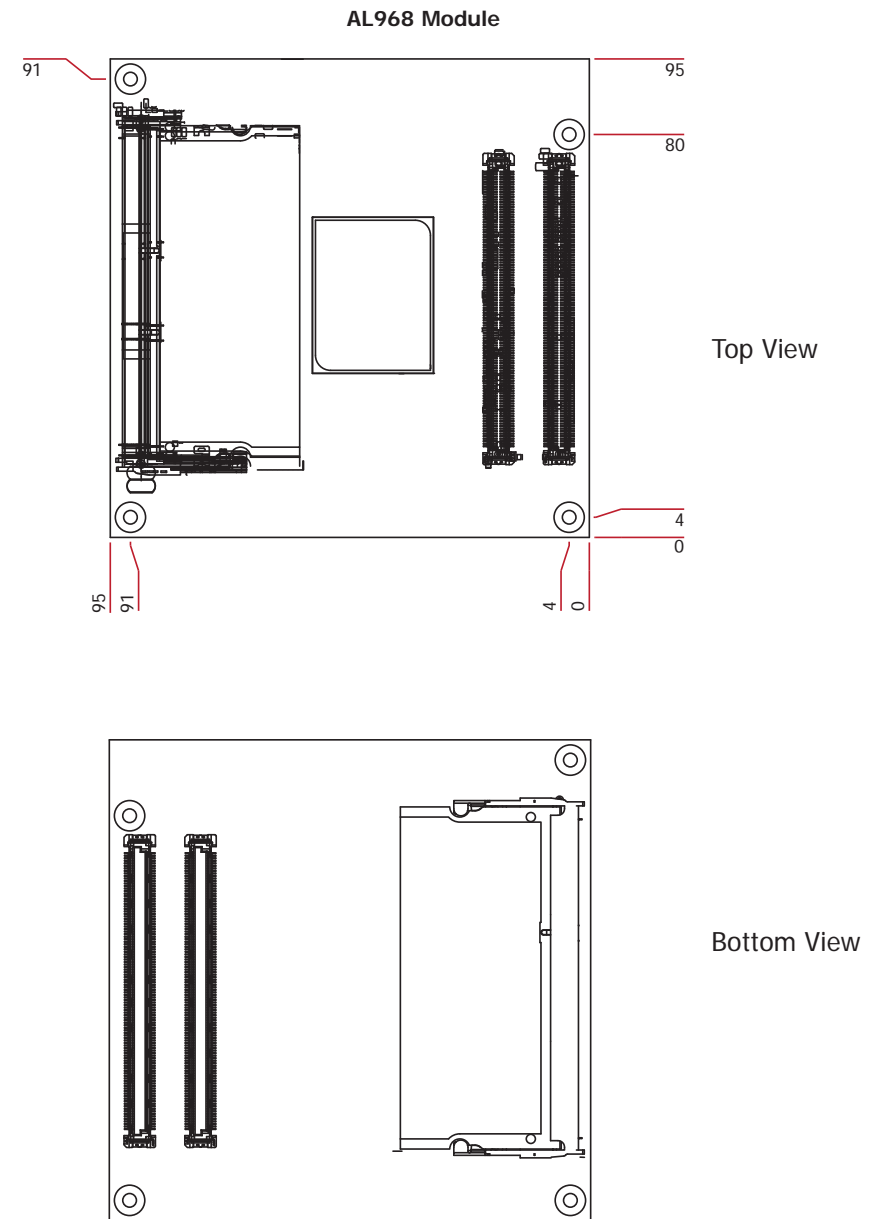
### Block Diagram



## Mechanical Diagram



Side View of the Module with Heat Sink and Carrier Board

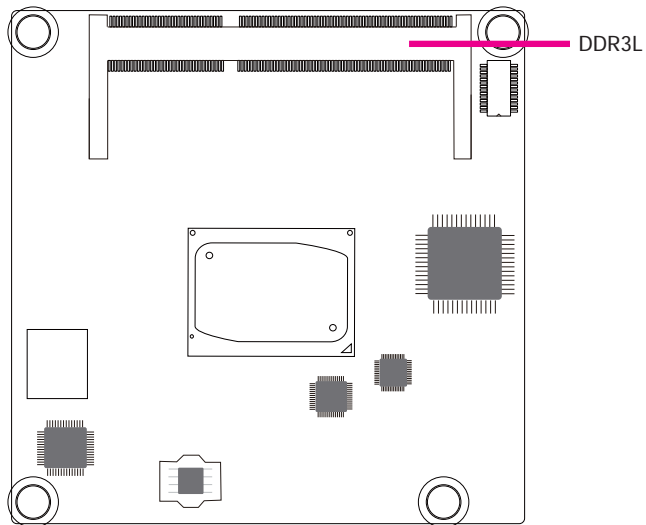


**Important:**

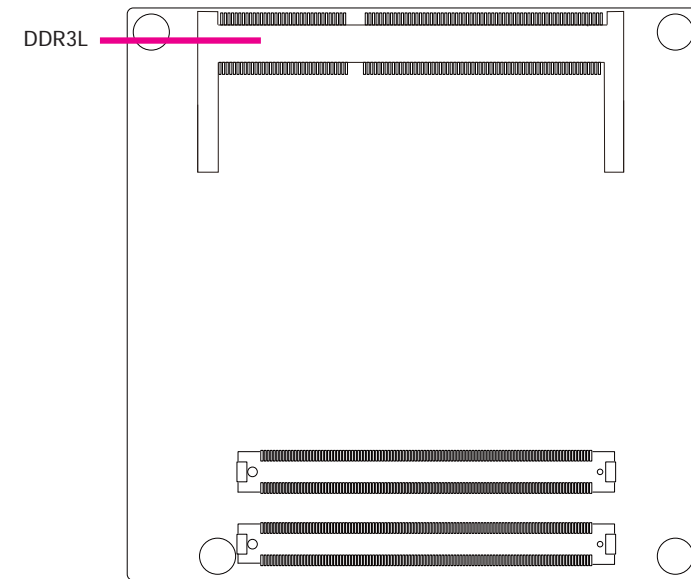
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to 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 up to 8GB DDR3L system memory onboard supporting 1866MHz, dual channel memory interface.



Top View



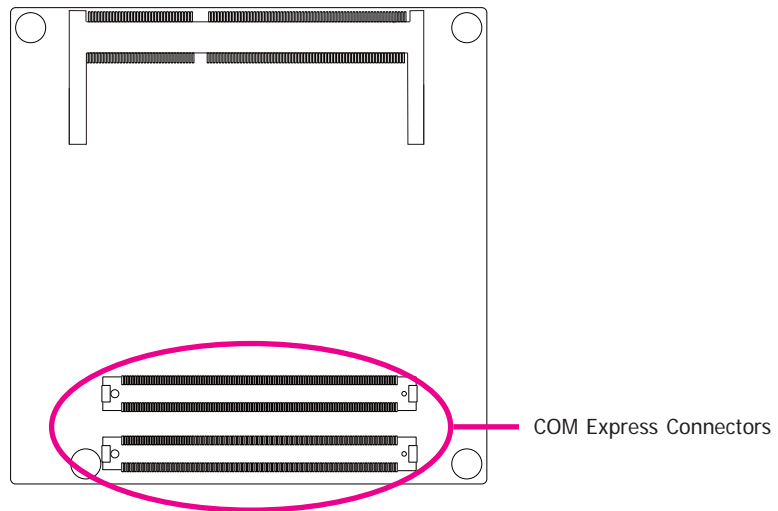
Bottom View

## Connectors

### COM Express Connectors

The COM Express connectors are used to interface the AL968 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 AL968 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	Row A	Row B
A1	GND (FIXED)	A56	NA
A2	GBE0_MDI3-	A57	GND
A3	GBE0_MDI3+	A58	PCIE_TX3+
A4	GBE0_LINK100#	A59	PCIE_TX3-
A5	GBE0_LINK1000#	A60	GND (FIXED)
A6	GBE0_MDI2-	A61	PCIE_TX2+
A7	GBE0_MDI2+	A62	PCIE_TX2-
A8	GBE0_LINK#	A63	GPI1
A9	GBE0_MDI1-	A64	PCIE_TX1+
A10	GBE0_MDI1+	A65	PCIE_TX1-
A11	GND (FIXED)	A66	GND
A12	GBE0_MDI0-	A67	GPI2
A13	GBE0_MDI0+	A68	PCIE_TX0+
A14	NA	A69	PCIE_TX0-
A15	SUS_S3#	A70	GND (FIXED)
A16	SATA0_TX+	A71	LVDS_A0+/eDP_TX2+*
A17	SATA0_TX-	A72	LVDS_A0-/eDP_TX2-*
A18	SUS_S4#	A73	LVDS_A1+/eDP_TX1+*
A19	SATA0_RX+	A74	LVDS_A1-/eDP_TX1-*
A20	SATA0_RX-	A75	LVDS_A2+/eDP_TX0+*
A21	GND (FIXED)	A76	LVDS_A2-/eDP_TX0-*
A22	NA	A77	LVDS/eDP_VDD_EN*
A23	NA	A78	LVDS_A3+
A24	SUS_S5#	A79	LVDS_A3-
A25	NA	A80	GND (FIXED)
A26	NA	A81	LVDS_A_CK+/eDP_TX3+*
A27	BATLOW#	A82	LVDS_A_CK-/eDP_TX3-*
A28	(S)ATA_ACT#	A83	LVDS_I2C_CK/eDP_AUX+*
A29	AC/HDA_SYNC	A84	LVDS_I2C_DAT/eDP_AUX-*
A30	AC/HDA_RST#	A85	GPI3
A31	GND (FIXED)	A86	RSVD
A32	AC/HDA_BITCLK	A87	RSVD/eDP_HPD*
A33	AC/HDA_SDOUT	A88	PCIE_CK_REF+
A34	BIOS_DIS0#	A89	PCIE_CK_REF-
A35	THRMTRIP#	A90	GND (FIXED)
A36	USB6-	A91	SPI_POWER
A37	USB6+	A92	SPI_MISO
A38	USB_6_7_OC#	A93	GPO0
A39	USB4-	A94	SPI_CLK
A40	USB4+	A95	SPI_MOSI
A41	GND (FIXED)	A96	TPM_PP
A42	USB2-	A97	NA
A43	USB2+	A98	SER0_TX
A44	USB_2_3_OC#	A99	SER0_RX
A45	USB0-	A100	GND (FIXED)
A46	USB0+	A101	SER1_TX
A47	VCC_RTC	A102	SER1_RX
A48	NA	A103	LID#
A49	NA	A104	VCC_12V
A50	LPC_SERIRO	A105	VCC_12V
A51	GND (FIXED)	A106	VCC_12V
A52	NA	A107	VCC_12V
A53	NA	A108	VCC_12V
A54	GPI0	A109	VCC_12V
A55	NA	A110	GND (FIXED)

\*: LVDS (default) eDP (optional)

Row C	Row D	Row C	Row D
C1	GND (FIXED)	C56	NA
C2	GND	C57	Type 1 #
C3	USB_SSRX0-	C58	NA
C4	USB_SSRX0+	C59	NA
C5	GND	C60	GND (FIXED)
C6	USB_SSRX1-	C61	NA
C7	USB_SSRX1+	C62	NA
C8	GND	C63	RSVD
C9	USB_SSRX2-	C64	RSVD
C10	USB_SSRX2+	C65	NA
C11	GND (FIXED)	C66	NA
C12	USB_SSRX3-	C67	RSVD
C13	USB_SSRX3+	C68	NA
C14	GND	C69	NA
C15	NA	C70	GND (FIXED)
C16	NA	C71	NA
C17	RSVD	C72	NA
C18	RSVD	C73	GND
C19	NA	C74	NA
C20	NA	C75	NA
C21	GND (FIXED)	C76	GND
C22	NA	C77	RSVD
C23	NA	C78	NA
C24	DDI1_HPD	C79	NA
C25	NA	C80	GND (FIXED)
C26	NA	C81	NA
C27	RSVD	C82	NA
C28	RSVD	C83	RSVD
C29	NA	C84	GND
C30	NA	C85	NA
C31	GND (FIXED)	C86	NA
C32	DDI2_CTRLCLK_AUX+	C87	GND
C33	DDI2_CTRLDATA_AUX-	C88	NA
C34	DDI2_DDC_AUX_SEL	C89	NA
C35	RSVD	C90	GND (FIXED)
C36	NA	C91	NA
C37	NA	C92	NA
C38	NA	C93	GND
C39	NA	C94	NA
C40	NA	C95	NA
C41	GND (FIXED)	C96	GND
C42	NA	C97	RSVD
C43	NA	C98	NA
C44	NA	C99	NA
C45	RSVD	C100	GND (FIXED)
C46	NA	C101	NA
C47	NA	C102	NA
C48	RSVD	C103	GND
C49	NA	C104	VCC_12V
C50	NA	C105	VCC_12V
C51	GND (FIXED)	C106	VCC_12V
C52	NA	C107	VCC_12V
C53	NA	C108	VCC_12V
C54	Type 0 #	C109	VCC_12V
C55	NA	C110	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 and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
AC/HDA_RST#	A30	O CMOS	3.3V Suspend/3.3V		Reset output to CODEC, active low.
AC/HDA_SYNC	A29	O CMOS	3.3V/3.3V		Sample-synchronization signal to the CODEC(s).
AC/HDA_BITCLK	A32	I/O CMOS	3.3V/3.3V		Serial data clock generated by the external CODEC(s).
AC/HDA_SDOUT	A33	O CMOS	3.3V/3.3V		Serial TDM data output to the CODEC.
AC/HDA_SDIN2	B28	I/O CMOS	3.3V Suspend/3.3V	NA	Serial TDM data inputs from up to 1 CODECs.
AC/HDA_SDIN1	B29	I/O CMOS	3.3V Suspend/3.3V	NA	
AC/HDA_SDINO	B30	I/O CMOS	3.3V Suspend/3.3V		

## Gigabit Ethernet Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
GBE0_MDIO+	A13	I/O Analog	3.3V max Suspend		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: <div style="text-align: right; padding-right: 20px;">           1000BASE-T    100BASE-TX    10BASE-T            MDI[0] +/-    B1_DA +/-    TX +/-    TX +/-            MDI[1] +/-    B1_DB +/-    RX +/-    RX +/-            MDI[2] +/-    B1_DC +/-            MDI[3] +/-    B1_DD +/-         </div>
GBE0_MDIO-	A12	I/O Analog	3.3V max Suspend		
GBE0_MD11+	A10	I/O Analog	3.3V max Suspend		
GBE0_MD11-	A9	I/O Analog	3.3V max Suspend		
GBE0_MD12+	A7	I/O Analog	3.3V max Suspend		
GBE0_MD12-	A6	I/O Analog	3.3V max Suspend		
GBE0_MD13+	A3	I/O Analog	3.3V max Suspend		
GBE0_MD13-	A2	I/O Analog	3.3V max Suspend		
GBE0_ACT#	B2	OD CMOS	3.3V Suspend/3.3V		Gigabit Ethernet Controller 0 activity indicator, active low.
GBE0_LINK#	A8	OD CMOS	3.3V Suspend/3.3V		Gigabit Ethernet Controller 0 link indicator, active low.
GBE0_LINK100#	A4	OD CMOS	3.3V Suspend/3.3V		Gigabit Ethernet Controller 0 100 Mbit / sec link indicator, active low.
GBE0_LINK1000#	A5	OD CMOS	3.3V Suspend/3.3V		Gigabit Ethernet Controller 0 1000 Mbit / sec link indicator, active low.

## SATA Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
SATA0_TX+	A16	O SATA	AC coupled on Module		Serial ATA or SAS Channel 0 transmit differential pair.
SATA0_TX-	A17	O SATA	AC coupled on Module		
SATA0_RX+	A19	I SATA	AC coupled on Module		Serial ATA or SAS Channel 0 receive differential pair.
SATA0_RX-	A20	I SATA	AC coupled on Module		
SATA1_TX+	B16	O SATA	AC coupled on Module	Default: SATA 3.0; Option: USB3.0	Serial ATA or SAS Channel 1 transmit differential pair.
SATA1_TX-	B17	O SATA	AC coupled on Module	Default: SATA 3.0; Option: USB3.0	
SATA1_RX+	B19	I SATA	AC coupled on Module	Default: SATA 3.0; Option: USB3.0	Serial ATA or SAS Channel 1 receive differential pair.
SATA1_RX-	B20	I SATA	AC coupled on Module	Default: SATA 3.0; Option: USB3.0	
SATA2_TX+	A22	O SATA	AC coupled on Module	NA	Serial ATA or SAS Channel 2 transmit differential pair.
SATA2_TX-	A23	O SATA	AC coupled on Module	NA	
SATA2_RX+	A25	I SATA	AC coupled on Module	NA	Serial ATA or SAS Channel 2 receive differential pair.
SATA2_RX-	A26	I SATA	AC coupled on Module	NA	
SATA3_TX+	B22	O SATA	AC coupled on Module	NA	Serial ATA or SAS Channel 3 transmit differential pair.
SATA3_TX-	B23	O SATA	AC coupled on Module	NA	
SATA3_RX+	B25	I SATA	AC coupled on Module	NA	Serial ATA or SAS Channel 3 receive differential pair.
SATA3_RX-	B26	I SATA	AC coupled on Module	NA	
(S)ATA_ACT#	A28	I/O CMOS	3.3V / 3.3V	PU 10K to 3.3V	ATA (parallel and serial) or SAS activity indicator, active low.

**PCI Express Lanes Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
PCIE_TX0+	A68	O PCIE	AC coupled on Module		PCI Express Differential Transmit Pairs 0
PCIE_TX0-	A69				
PCIE_RX0+	B68	I PCIE	AC coupled off Module		PCI Express Differential Receive Pairs 0
PCIE_RX0-	B69				
PCIE_TX1+	A64	O PCIE	AC coupled on Module		PCI Express Differential Transmit Pairs 1
PCIE_TX1-	A65				
PCIE_RX1+	B64	I PCIE	AC coupled off Module		PCI Express Differential Receive Pairs 1
PCIE_RX1-	B65				
PCIE_TX2+	A61	O PCIE	AC coupled on Module		PCI Express Differential Transmit Pairs 2
PCIE_TX2-	A62				
PCIE_RX2+	B61	I PCIE	AC coupled off Module		PCI Express Differential Receive Pairs 2
PCIE_RX2-	B62				
PCIE_TX3+	A58	O PCIE	AC coupled on Module		PCI Express Differential Transmit Pairs 3
PCIE_TX3-	A59				
PCIE_RX3+	B58	I PCIE	AC coupled off Module		PCI Express Differential Receive Pairs 3
PCIE_RX3-	B59				
PCIE_TX4+	A55	O PCIE	AC coupled on Module	NA	PCI Express Differential Transmit Pairs 4
PCIE_TX4-	A56			NA	
PCIE_RX4+	B55	I PCIE	AC coupled off Module	NA	PCI Express Differential Receive Pairs 4
PCIE_RX4-	B56			NA	
PCIE_TX5+	A52	O PCIE	AC coupled on Module	NA	PCI Express Differential Transmit Pairs 5
PCIE_TX5-	A53			NA	
PCIE_RX5+	B52	I PCIE	AC coupled off Module	NA	PCI Express Differential Receive Pairs 5
PCIE_RX5-	B53			NA	
PCIE_TX6+	D19	O PCIE	AC coupled on Module	NA	PCI Express Differential Transmit Pairs 6
PCIE_TX6-	D20			NA	
PCIE_RX6+	C19	I PCIE	AC coupled off Module	NA	PCI Express Differential Receive Pairs 6
PCIE_RX6-	C20			NA	
PCIE_TX7+	D22	O PCIE	AC coupled on Module	NA	PCI Express Differential Transmit Pairs 7
PCIE_TX7-	D23			NA	
PCIE_RX7+	C22	I PCIE	AC coupled off Module	NA	PCI Express Differential Receive Pairs 7
PCIE_RX7-	C23			NA	
PCIE_CK_REF+	A88	O PCIE	PCIE		Reference clock output for all PCI Express and PCI Express Graphics lanes.
PCIE_CK_REF-	A89				

**PEG Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
PEG_TX0+	D52	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 0
PEG_TX0-	D53			NA	
PEG_RX0+	C52	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 0
PEG_RX0-	C53			NA	
PEG_TX1+	D55	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 1
PEG_TX1-	D56			NA	
PEG_RX1+	C55	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 1
PEG_RX1-	C56			NA	
PEG_TX2+	D58	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 2
PEG_TX2-	D59			NA	
PEG_RX2+	C58	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 2
PEG_RX2-	C59			NA	



PEG_TX3+	D61	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 3
PEG_TX3-	D62			NA	
PEG_RX3+	C61	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 3
PEG_RX3-	C62			NA	
PEG_TX4+	D65	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 4
PEG_TX4-	D66			NA	
PEG_RX4+	C65	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 4
PEG_RX4-	C66			NA	
PEG_TX5+	D68	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 5
PEG_TX5-	D69			NA	
PEG_RX5+	C68	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 5
PEG_RX5-	C69			NA	
PEG_TX6+	D71	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 6
PEG_TX6-	D72			NA	
PEG_RX6+	C71	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 6
PEG_RX6-	C72			NA	
PEG_TX7+	D74	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 7
PEG_TX7-	D75			NA	
PEG_RX7+	C74	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 7
PEG_RX7-	C75			NA	
PEG_TX8+	D78	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 8
PEG_TX8-	D79			NA	
PEG_RX8+	C78	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 8
PEG_RX8-	C79			NA	
PEG_TX9+	D81	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 9
PEG_TX9-	D82			NA	
PEG_RX9+	C81	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 9
PEG_RX9-	C82			NA	
PEG_TX10+	D85	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 10
PEG_TX10-	D86			NA	
PEG_RX10+	C85	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 10
PEG_RX10-	C86			NA	
PEG_TX11+	D88	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 11
PEG_TX11-	D89			NA	
PEG_RX11+	C88	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 11
PEG_RX11-	C89			NA	
PEG_TX12+	D91	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 12
PEG_TX12-	D92			NA	
PEG_RX12+	C91	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 12
PEG_RX12-	C92			NA	
PEG_TX13+	D94	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 13
PEG_TX13-	D95			NA	
PEG_RX13+	C94	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 13
PEG_RX13-	C95			NA	

PEG_TX14+	D98	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 14
PEG_TX14-	D99			NA	
PEG_RX14+	C98	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 14
PEG_RX14-	C99			NA	
PEG_TX15+	D101	O PCIE	AC coupled on Module	NA	PCI Express Graphics transmit differential pairs 15
PEG_TX15-	D102			NA	
PEG_RX15+	C101	I PCIE	AC coupled off Module	NA	PCI Express Graphics receive differential pairs 15
PEG_RX15-	C102			NA	
PEG_LANE_RV#	D54	I CMOS	3.3V / 3.3V	PU 10K to 3.3V	PCI Express Graphics lane reversal input strap. Pull low on the Carrier board to reverse lane order. Be aware that the SDVO lines that share this interface do not necessarily reverse order if this strap is low.

### ExpressCard Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
EXCD0_CPPE#	A49	I CMOS	3.3V /3.3V	NA	PCI ExpressCard: PCI Express capable card request, active low, one per card
EXCD1_CPPE#	B48			NA	
EXCD0_PERST#	A48	O CMOS	3.3V /3.3V	NA	PCI ExpressCard: reset, active low, one per card
EXCD1_PERST#	B47			NA	

### DDI Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
DDI1_PAIR0+	D26	O PCIE	AC coupled off Module		DDI 1 Pair 0 differential pairs
DDI1_PAIR0-	D27				
DDI1_PAIR1+	D29	O PCIE	AC coupled off Module		DDI 1 Pair 1 differential pairs
DDI1_PAIR1-	D30				
DDI1_PAIR2+	D32	O PCIE	AC coupled off Module		DDI 1 Pair 2 differential pairs
DDI1_PAIR2-	D33				
DDI1_PAIR3+	D36	O PCIE	AC coupled off Module		DDI 1 Pair 3 differential pairs
DDI1_PAIR3-	D37				
DDI1_CTRLCLK_AUX+	D15	I/O PCIE	AC coupled on Module	PD 100K to GND	DP AUX+ function if DDI1_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PD 100K to GND	HDMI/DVI I2C CTRLCLK if DDI1_DDC_AUX_SEL is pulled high
DDI1_CTRLDATA_AUX-	D16	I/O PCIE	AC coupled on Module	PU 100K to 3.3V	DP AUX- function if DDI1_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 100K to 3.3V	HDMI/DVI I2C CTRLDATA if DDI1_DDC_AUX_SEL is pulled high
DDI1_HPD	C24	I CMOS	3.3V / 3.3V	PD 100K to GND	DDI Hot-Plug Detect
DDI1_DDC_AUX_SEL	D34	I CMOS	3.3V / 3.3V	PD 1M to GND	Selects the function of DDI1_CTRLCLK_AUX+ and DDI1_CTRLDATA_AUX-. DDI1[n]_DDC_AUX_SEL shall be pulled to 3.3V on the Carrier with a 100K Ohm resistor to configure the DDI1[n]_AUX pair as the DDC channel. Carrier DDI1[n]_DDC_AUX_SEL should be connected to pin 13 of the DisplayPort
DDI2_PAIR0+	D39	O PCIE	AC coupled off Module		DDI 2 Pair 0 differential pairs
DDI2_PAIR0-	D40				
DDI2_PAIR1+	D42	O PCIE	AC coupled off Module		DDI 2 Pair 1 differential pairs
DDI2_PAIR1-	D43				
DDI2_PAIR2+	D46	O PCIE	AC coupled off Module		DDI 2 Pair 2 differential pairs
DDI2_PAIR2-	D47				
DDI2_PAIR3+	D49	O PCIE	AC coupled off Module		DDI 2 Pair 3 differential pairs
DDI2_PAIR3-	D50				

DDI2_CTRLCLK_AUX+	C32	I/O PCIE	AC coupled on Module	PD 100K to GND	DP AUX+ function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PD 100K to GND	HDMI/DVI I2C CTRLCLK if DDI2_DDC_AUX_SEL is pulled high
DDI2_CTRLDATA_AUX-	C33	I/O PCIE	AC coupled on Module	PU 100K to 3.3V	DP AUX- function if DDI2_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	PU 100K to 3.3V	HDMI/DVI I2C CTRLDATA if DDI2_DDC_AUX_SEL is pulled high
DDI2_HPDP	D44	I CMOS	3.3V / 3.3V	PD 100K to GND	DDI Hot-Plug Detect
DDI2_DDC_AUX_SEL	C34	I CMOS	3.3V / 3.3V	PD 1M to GND	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	DDI 3 Pair 0 differential pairs
DDI3_PAIR0-	C40			NA	
DDI3_PAIR1+	C42	O PCIE	AC coupled off Module	NA	DDI 3 Pair 1 differential pairs
DDI3_PAIR1-	C43			NA	
DDI3_PAIR2+	C46	O PCIE	AC coupled off Module	NA	DDI 3 Pair 2 differential pairs
DDI3_PAIR2-	C47			NA	
DDI3_PAIR3+	C49	O PCIE	AC coupled off Module	NA	DDI 3 Pair 3 differential pairs
DDI3_PAIR3-	C50			NA	
DDI3_CTRLCLK_AUX+	C36	I/O PCIE	AC coupled on Module	NA	DP AUX+ function if DDI3_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	NA	HDMI/DVI I2C CTRLCLK if DDI3_DDC_AUX_SEL is pulled high
DDI3_CTRLDATA_AUX-	C37	I/O PCIE	AC coupled on Module	NA	DP AUX- function if DDI3_DDC_AUX_SEL is no connect
		I/O OD CMOS	3.3V / 3.3V	NA	HDMI/DVI I2C CTRLDATA if DDI3_DDC_AUX_SEL is pulled high
DDI3_HPDP	C44	I CMOS	3.3V / 3.3V	NA	DDI Hot-Plug Detect
DDI3_DDC_AUX_SEL	C38	I CMOS	3.3V / 3.3V	NA	Selects the function of DDI3_CTRLCLK_AUX+ and DDI3_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

### USB Signals and Descriptions

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
USB0+	A46	I/O USB	3.3V Suspend/3.3V		USB differential pairs 0
USB0-	A45				
USB1+	B46	I/O USB	3.3V Suspend/3.3V		USB differential pairs 1
USB1-	B45				
USB2+	A43	I/O USB	3.3V Suspend/3.3V		USB differential pairs 2
USB2-	A42				
USB3+	B43	I/O USB	3.3V Suspend/3.3V		USB differential pairs 3
USB3-	B42				
USB4+	A40	I/O USB	3.3V Suspend/3.3V		USB differential pairs 4
USB4-	A39				
USB5+	B40	I/O USB	3.3V Suspend/3.3V		USB differential pairs 5
USB5-	B39				
USB6+	A37	I/O USB	3.3V Suspend/3.3V		USB differential pairs 6
USB6-	A36				
USB7+	B37	I/O USB	3.3V Suspend/3.3V		USB differential pairs 7
USB7-	B36				
USB_0_1_OC#	B44	I CMOS	3.3V Suspend/3.3V	PU 10k to 3V3SB	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 3V3SB	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 3V3SB	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 3V3SB	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.
USB_SSTX0+	D4	O PCIE	AC coupled on Module	AC Coupling capacitor	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX0-	D3			AC Coupling capacitor	
USB_SSRX0+	C4	I PCIE	AC coupled off Modul		Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX0-	C3				
USB_SSTX1+	D7	O PCIE	AC coupled on Module	AC Coupling capacitor	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX1-	D6			AC Coupling capacitor	
USB_SSRX1+	C7	I PCIE	AC coupled off Modul		Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX1-	C6				
USB_SSTX2+	D10	O PCIE	AC coupled on Module	AC Coupling capacitor	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX2-	D9			AC Coupling capacitor	
USB_SSRX2+	C10	I PCIE	AC coupled off Modul		Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX2-	C9				
USB_SSTX3+	D13	O PCIE	AC coupled on Module	AC Coupling capacitor	Additional transmit signal differential pairs for the SuperSpeed USB data path.
USB_SSTX3-	D12			AC Coupling capacitor	
USB_SSRX3+	C13	I PCIE	AC coupled off Modul		Additional receive signal differential pairs for the SuperSpeed USB data path.
USB_SSRX3-	C12				

LVDS/eDP Signals and Descriptions					
Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968: LVDS (default)/eDP (optional)	Description
LVDS_A0+/eDP_TX2+	A71	O LVDS	LVDS		LVDS Channel A differential pairs Ther 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-/eDP_TX2-	A72				
LVDS_A1+/eDP_TX1+	A73	O LVDS	LVDS		
LVDS_A1-/eDP_TX1-	A74				
LVDS_A2+/eDP_TX0+	A75	O LVDS	LVDS		
LVDS_A2-/eDP_TX0-	A76				
LVDS_A3+	A78	O LVDS	LVDS		
LVDS_A3-	A79				
LVDS_A_CK+/eDP_TX3+	A81	O LVDS	LVDS		LVDS Channel A differential clock
LVDS_A_CK-/eDP_TX3-	A82				
LVDS_B0+	B71	O LVDS	LVDS		LVDS Channel B differential pairs Ther 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_B0-	B72				
LVDS_B1+	B73	O LVDS	LVDS		
LVDS_B1-	B74				
LVDS_B2+	B75	O LVDS	LVDS		
LVDS_B2-	B76				
LVDS_B3+	B77	O LVDS	LVDS		
LVDS_B3-	B78				
LVDS_B_CK+	B81	O LVDS	LVDS		LVDS Channel B differential clock
LVDS_B_CK-	B82				
LVDS_VDD_EN/eDP_VDD_EN	A77	O CMOS	3.3V / 3.3V	PD 100K to GND	LVDS panel power enable
LVDS/eDP_BKLT_EN	B79	O CMOS	3.3V / 3.3V	PD 100K to GND	LVDS panel backlight enable
LVDS/eDP_BKLT_CTRL	B83	O CMOS	3.3V / 3.3V	PD 100K to GND	LVDS panel backlight brightness control
LVDS_I2C_CK/eDP_AUX+	A83	I/O OD CMOS	3.3V / 3.3V	PU 4.7K to 3.3V	I2C clock output for LVDS display use
LVDS_I2C_DAT/eDP_AUX-	A84	I/O OD CMOS	3.3V / 3.3V	PU 4.7K to 3.3V	I2C data line for LVDS display use

**LPC Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
LPC_AD0	B4	I/O CMOS	3.3V / 3.3V		LPC multiplexed address, command and data bus
LPC_AD1	B5				
LPC_AD2	B6				
LPC_AD3	B7				
LPC_FRAME#	B3	O CMOS	3.3V / 3.3V		LPC frame indicates the start of an LPC cycle
LPC_DRQ0#	B8	I CMOS	3.3V / 3.3V	NC	LPC serial DMA request
LPC_DRQ1#	B9			NC	
LPC_SERIRQ	A50	I/O CMOS	3.3V / 3.3V		LPC serial interrupt
LPC_CLK	B10	O CMOS	3.3V / 3.3V		LPC clock output - 24MHz nominal

**SPI Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
SPI_CS#	B97	O CMOS	3.3V Suspend/3.3V	PU 47K to 3.3V	Chip select for Carrier Board SPI - may be sourced from chipset SPI0 or SPI1
SPI_MISO	A92	I CMOS	3.3V Suspend/3.3V		Data in to Module from Carrier SPI
SPI_MOSI	A95	O CMOS	3.3V Suspend/3.3V		Data out from Module to Carrier SPI
SPI_CLK	A94	O CMOS	3.3V Suspend/3.3V		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	I CMOS	NA	PU 10K to 3.3V	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			PU 10K to 3.3V	

JP6 (BIOS_DIS1#)	JP5 (BIOS_DIS0#)	Boot from
2-3 L	2-3 L	SPI0 on Module (Default)
2-3 L	1-2 H	SPI0 on Carrier
1-2 H	2-3 L	Carrier LPC_FWH
1-2 H	1-2 H	Module SPI

**VGA Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
VGA_RED	B89	O Analog	Analog	PD 150 to GND	Red for monitor. Analog output
VGA_GRN	B91	O Analog	Analog	PD 150 to GND	Green for monitor. Analog output
VGA_BLU	B92	O Analog	Analog	PD 150 to GND	Blue for monitor. Analog output
VGA_HSYNC	B93	O CMOS	3.3V / 3.3V		Horizontal sync output to VGA monitor
VGA_VSYNC	B94	O CMOS	3.3V / 3.3V		Vertical sync output to VGA monitor
VGA_I2C_CK	B95	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V	DDC clock line (I2C port dedicated to identify VGA monitor capabilities)
VGA_I2C_DAT	B96	I/O OD CMOS	3.3V / 3.3V	PU 2.2K to 3.3V	DDC data line.

**Serial Interface Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
SER0_TX	A98	O CMOS	3.3V/5V		General purpose serial port 0 transmitter (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
SER0_RX	A99	I CMOS	3.3V/5V	PU 10K 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	3.3V/5V		General purpose serial port 1 transmitter (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)
SER1_RX	A102	I CMOS	3.3V/5V	PU 10K to 3.3V	General purpose serial port 1 receiver (Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)

**Miscellaneous Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
SPKR	B32	O CMOS	3.3V / 3.3V	PU 10K to 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	PD 100K to GND	Output indicating that a watchdog time-out event has occurred.
FAN_PWMOUT	B101	O OD CMOS	3.3V / 3.3V	PD 100K to GND	Fan speed control. Uses the Pulse Width Modulation (PWM) technique to control the fan's RPM. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
FAN_TACHIN	B102	I OD CMOS	3.3V / 3.3V	PU 47K to 3.3V	Fan tachometer input for a fan with a two pulse output. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
TPM_PP	A96	I CMOS	3.3V / 3.3V		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 and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
PWRBTN#	B12	I CMOS	3.3V Suspend/3.3V	PU 10K to 3.3V	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
SYS_RESET#	B49	I CMOS	3.3V Suspend/3.3V	PU 3.3K to 3.3V	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		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	PU 10K to 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	PD 100K to GND	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	PD 100K to GND	Indicates system is in Suspend to Disk state. Active low output.
SUS_S5#	A24	O CMOS	3.3V Suspend/3.3V	PD 100K to GND	Indicates system is in Soft Off state.
WAKE0#	B66	I CMOS	3.3V Suspend/3.3V	PU 1K to 3.3V	PCI Express wake up signal.
WAKE1#	B67	I CMOS	3.3V Suspend/3.3V	PU 1K to 3.3V	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	PU 10K to 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 47K to 3.3V	LID switch. Low active signal used by the ACPI operating system for a LID switch. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>
SLEEP#	B103	I OD CMOS	3.3V Suspend/12V	PU 4.7K to 3.3V	Sleep button. Low active signal used by the ACPI operating system to bring the system to sleep state or to wake it up again. <b>(Recommend add Protecting Logic Level Signals on Pins Reclaimed from VCC_12V)</b>

**Thermal Protection Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
THRM#	B35	I CMOS	3.3V / 3.3V	PU 1K to 3.3V	Input from off-Module temp sensor indicating an over-temp situation.
THRMTRIP#	A35	O CMOS	3.3V / 3.3V		Active low output indicating that the CPU has entered thermal shutdown.

**SM Bus Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
SMB_CK	B13	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3V	System Management Bus bidirectional clock line.
SMB_DAT	B14	I/O OD CMOS	3.3V Suspend/3.3V	PU 2.2K to 3.3V	System Management Bus bidirectional data line.
SMB_ALERT#	B15	I CMOS	3.3V Suspend/3.3V	PU 10K to 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 and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	Description
GPO0	A93	O CMOS	3.3V / 3.3V		General purpose output pins. <b>Upon a hardware reset, these outputs should be low.</b>
GPO1	B54				
GPO2	B57				
GPO3	B63				
GPI0	A54	I CMOS	3.3V / 3.3V	PU 47K to 3.3V	General purpose input pins. <b>Pulled high internally on the Module.</b>
GPI1	A63			PU 47K to 3.3V	
GPI2	A67			PU 47K to 3.3V	
GPI3	A85			PU 47K to 3.3V	

**Power and GND Signals and Descriptions**

Signal	Pin#	Module Pin Type	Pwr Rail /Tolerance	AL968	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, D41, 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.



## Cooling Option

### Heat Sink


**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/paste designed to contact the corresponding components that are on AL968.


**Important:**

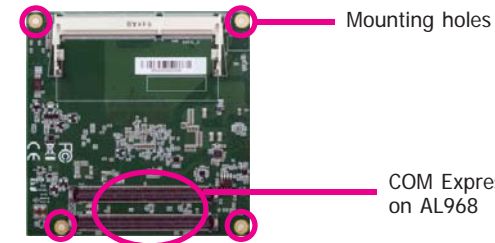
Remove the plastic covering from the thermal pads prior to mounting the heat sink onto AL968.

## Installing AL968 onto a Carrier Board


**Important:**

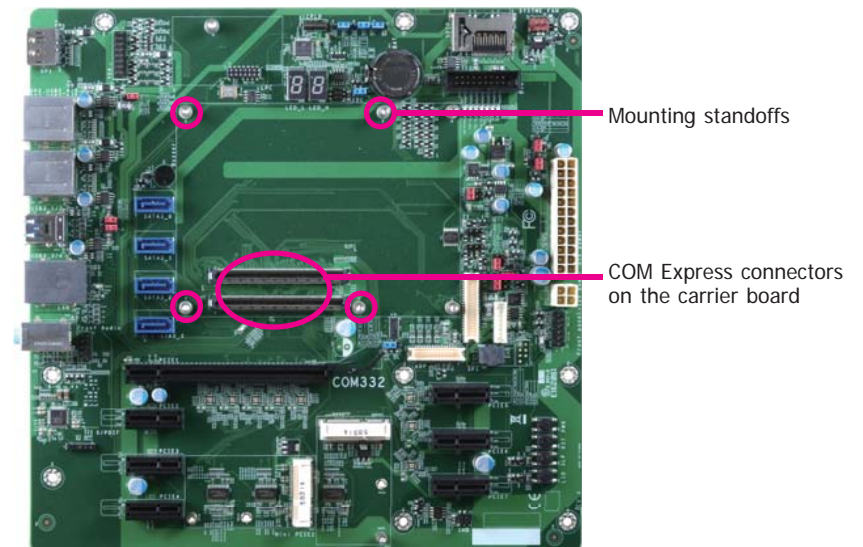
The carrier board (COM332-B) used in this section is for reference purpose only and may not resemble your carrier board. These illustrations are mainly to guide you on how to install AL968 onto the carrier board of your choice.

1. Grasp AL968 by its edges and position it on top of the carrier board with the mounting holes of AL968 aligning with the standoffs on the carrier board. This will also align the COM Express connectors of the two boards to each other.



Mounting holes

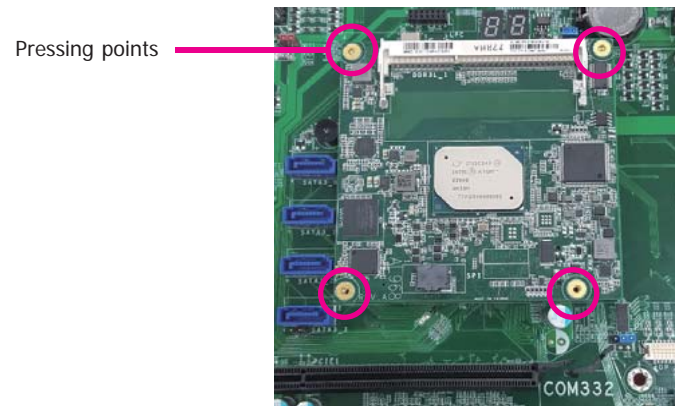
COM Express connectors on AL968



Mounting standoffs

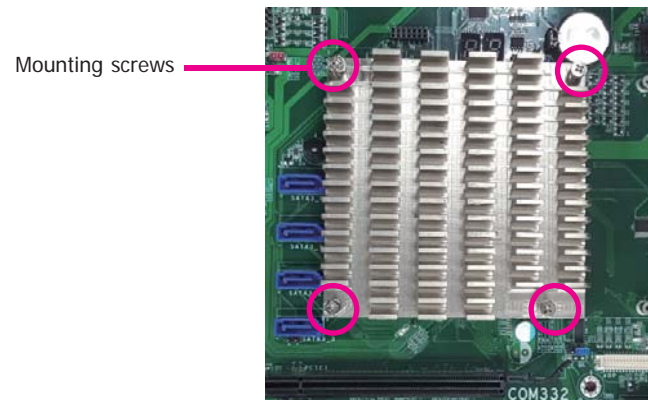
COM Express connectors on the carrier board

- Press AL968 down firmly to seat it in the COM Express connectors of the carrier board. Verify that AL968 is firmly seated in the COM Express connectors of the carrier board.

**Note:**

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

- Use the provided mounting screws to secure AL968 with heat sink to the carrier board.



## Installing the COM Express Debug Card

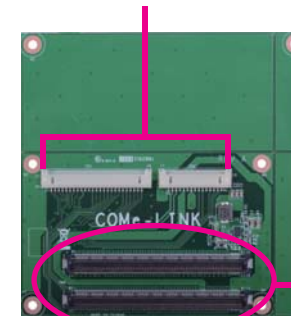
**Note:**

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

- 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.

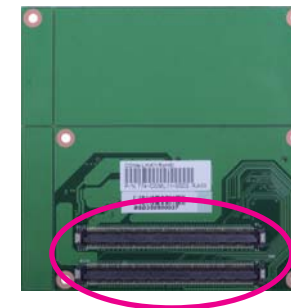
### COMe-LINK1

COMe-DEBUG Connector



COM Express Connectors

Top view

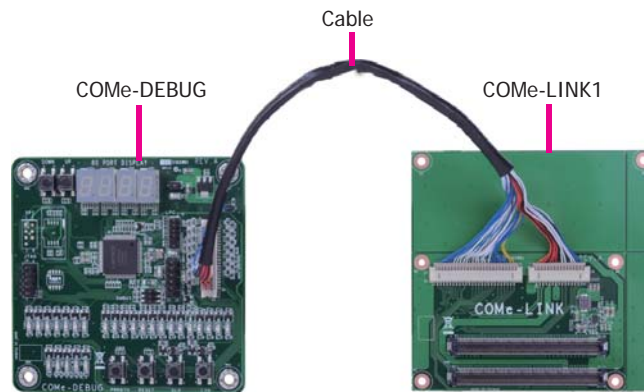
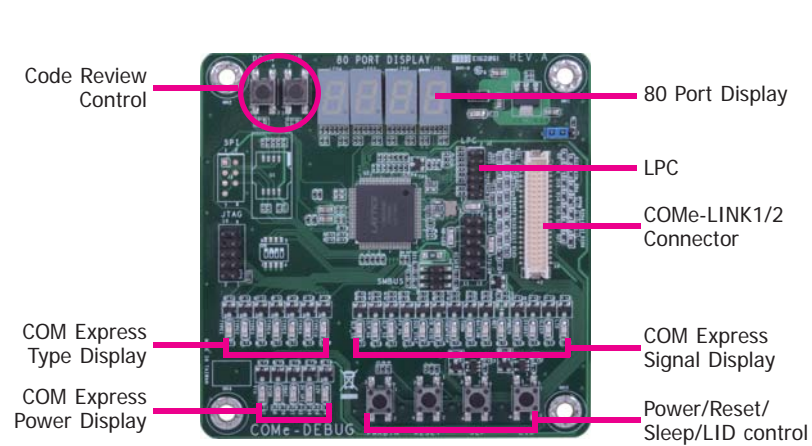


COM Express Connectors

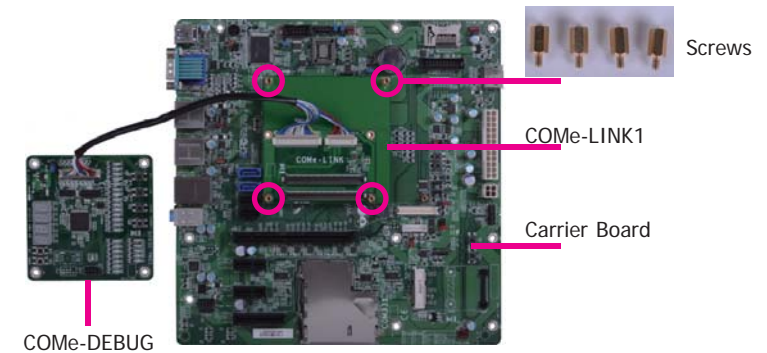
Bottom view

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

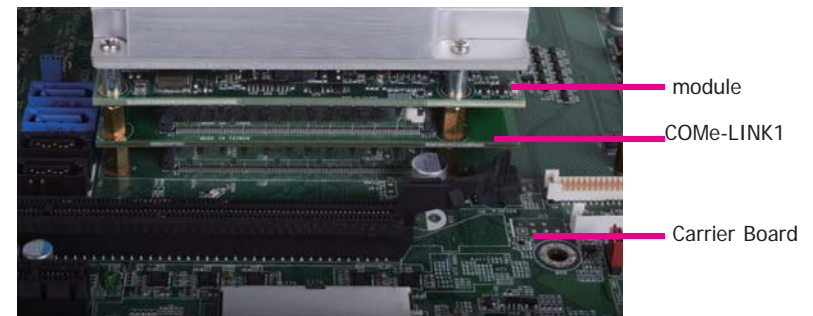
### COMe-DEBUG



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



5. Then use the instructions from the previous section to install module and heat sink on the top of the COMe-LINK1 debug card.



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 <Del> 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
<F9>	Optimized defaults
<F10>	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.

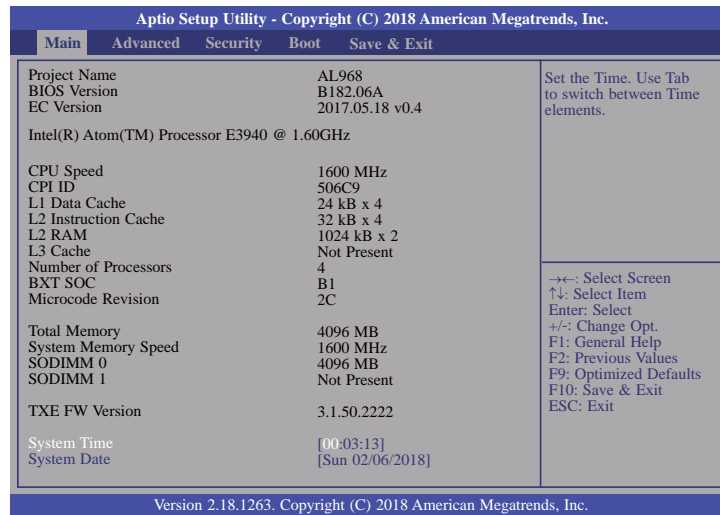
### Submenu

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 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.

## System Date

The date format is <day>, <month>, <date>, <year>. Day displays a day, from Sunday to Saturday. Month displays the month, from 01 to 12. Date displays the date, from 01 to 31. Year displays the year, from 2005 to 2099.

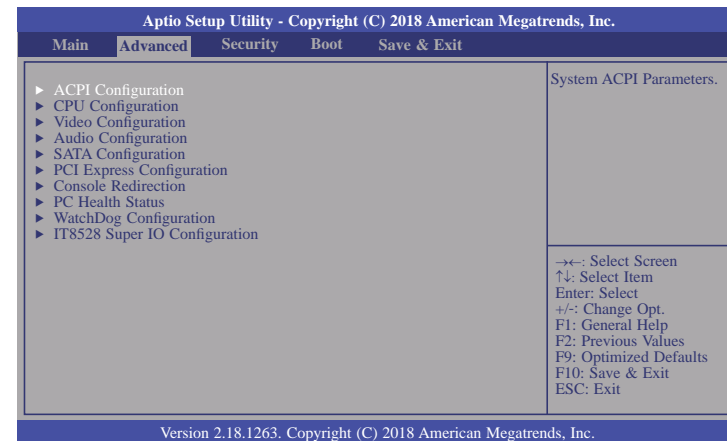
## Advanced

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:**

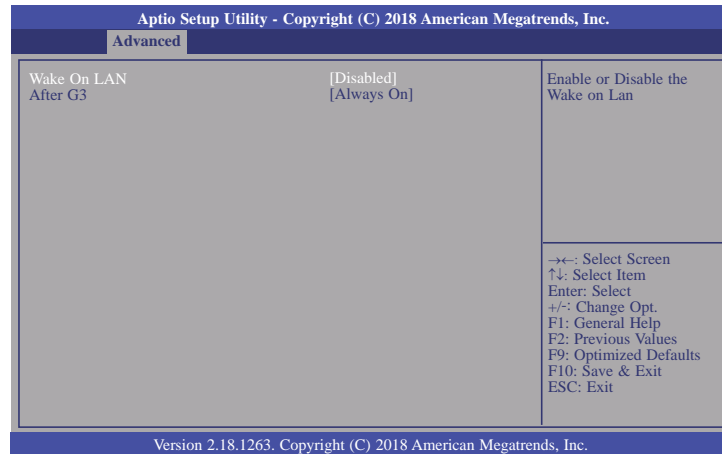
Setting incorrect field values may cause the system to malfunction.





## ACPI Configuration

This section is used to configure ACPI settings.



### Wake On LAN

Enable or Disable this field to use the LAN signal to wake up the system.

#### After G3

This field is to specify what state the system should be in when power is re-applied after a power failure (G3, the mechanical-off, state).

**Always On** The system is in working state.

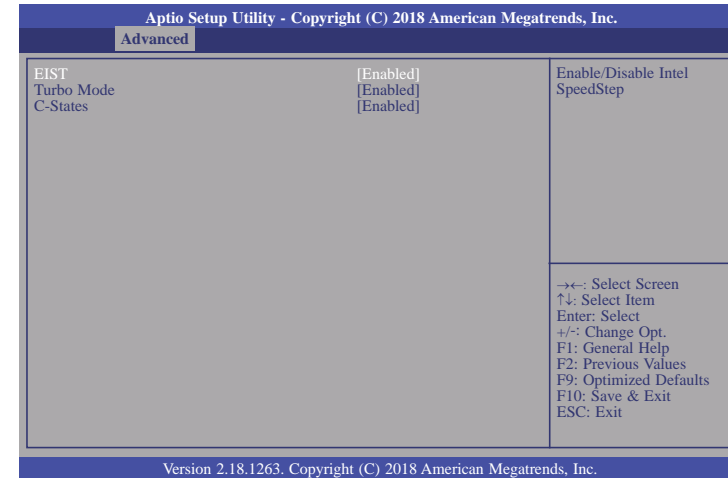
**Always Off** The system is in soft-off state, except for trickle current to devices such as the power button.

#### BGRT Logo

Enable or disable the display of an operating system logo or image during boot using the BGRT (Boot Graphics Resource Table) mechanism. This field only appears when Quiet Boot field of Boot menu is set to enabled.

## CPU Configuration

This section is used to configure the CPU.



### EIST

This field is used to enable or disable the Enhanced Intel SpeedStep® Technology, which helps optimize the balance between system's power consumption and performance. After it is enabled in the BIOS, you can enable the EIST feature using the operating system's power management.

### Turbo Mode

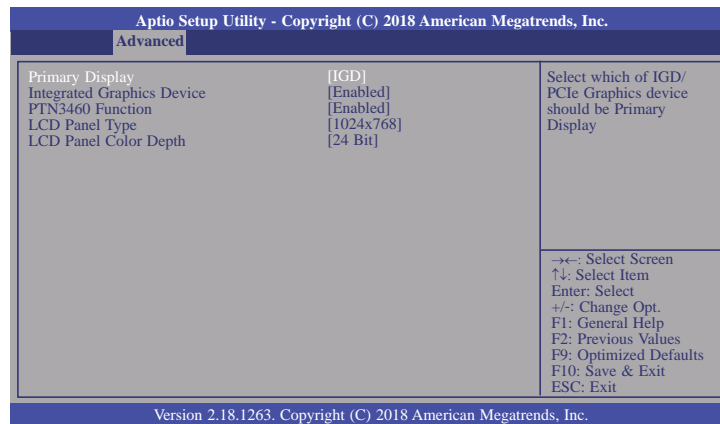
This field is used to enable or disable processor turbo mode (requires that EMTTM is enabled too), which allows the processor core to automatically run faster than the base frequency when the processor's power, temperature, and specification are within the limits of TDP.

### C-States

Enable or disable CPU Power Management. It allows CPU to go to C States when it's not 100% utilized.

## Video Configuration

This section configures the video settings.



### Primary Display

Select either IGD or PCIe Graphics device to be the primary display.

### Integrated Graphics Device

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

### PTN3460 Function

Enable or disable PTN3460 LCD features.

### LCD Panel Type

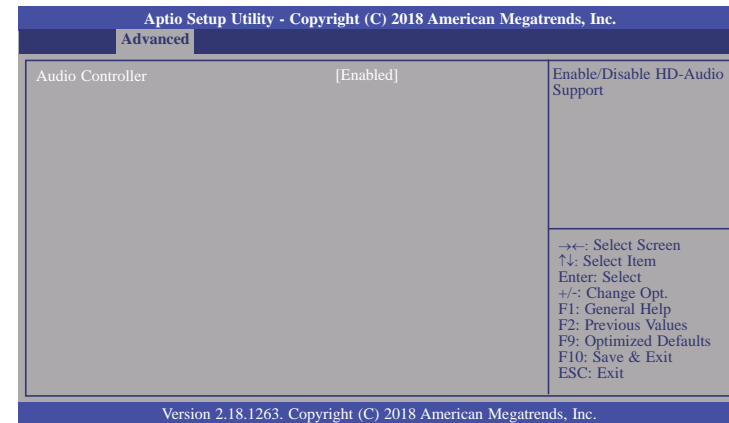
Select the type of LCD panel connected to the system's LCD connector: 800x480, 800x600, 1024x768, 1366x768, 1280x1024 or 1920x1080. Please check the specifications of your LCD monitor.

### LCD Panel Color Depth

Select the LCD panel color depth: 18 Bit, 24 Bit, 36 Bit or 48 Bit.

## Audio Configuration

This section configures the audio settings.



### Audio Controller

Control the detection of the high-definition audio device.

#### Disabled

HD Audio will be disabled.

#### Enabled

HD Audio will be enabled.

## SATA Configuration

This section configures the SATA controller.

Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.		
Advanced		
SATA Controller	[Enabled]	Enables or Disables the Chipset SATA Controller.
SATA Mode Selection	[AHCI]	
SATA Interface Speed	[Gen3]	
SATA Port 0	[Not Installed]	
Port 0	[Enabled]	
Hot Plug	[Disabled]	
SATA Port 1	[Not Installed]	
Port 1	[Enabled]	
Hot Plug	[Disabled]	
		→ ←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit
Version 2.18.1263. Copyright (C) 2018 American Megatrends, Inc.		

### SATA Controller

This field is used to enable or disable the Serial ATA controller.

### SATA Mode Selection

The mode selection determines how the SATA controller(s) operates.

#### AHCI Mode

This option allows the Serial ATA controller(s) to use AHCI (Advanced Host Controller Interface).

### SATA Interface Speed

Select Serial ATA controller(s) speed from Gen1 (1.5 Gbit/s), Gen2 (3 Gbit/s), or Gen 3 (6 Gbit/s).

### SATA Port 0 and 1/Hot Plug

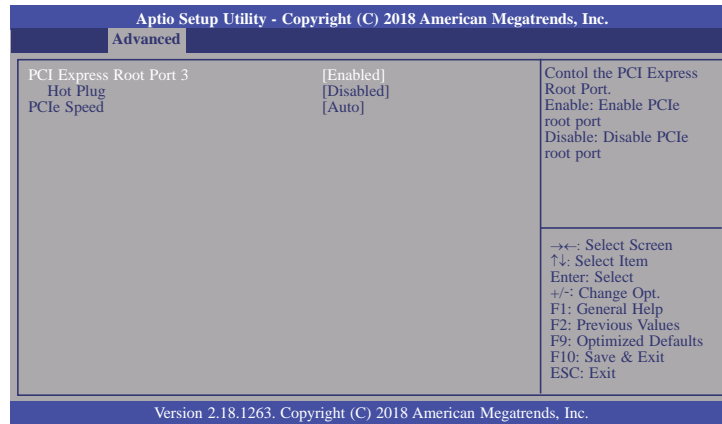
Enable or disable the Serial ATA port and its hot plug function.

## PCI Express Configuration

This section configures settings relevant to PCI Express devices.

Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.	
Advanced	
▶ PCI Express Root Port 1 ▶ PCI Express Root Port 3 ▶ PCI Express Root Port 4 ▶ PCI Express Root Port 5 ▶ PCI Express Root Port 6	Control the PCI Express Root Port. Enable: Enable PCIe root port Disable: Disable PCIe root port
	→ ←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F9: Optimized Defaults F10: Save & Exit ESC: Exit
Version 2.18.1263. Copyright (C) 2018 American Megatrends, Inc.	





### PCI Express Root Port

This field is used to enable or disable the PCI express root port.

### Hot Plug

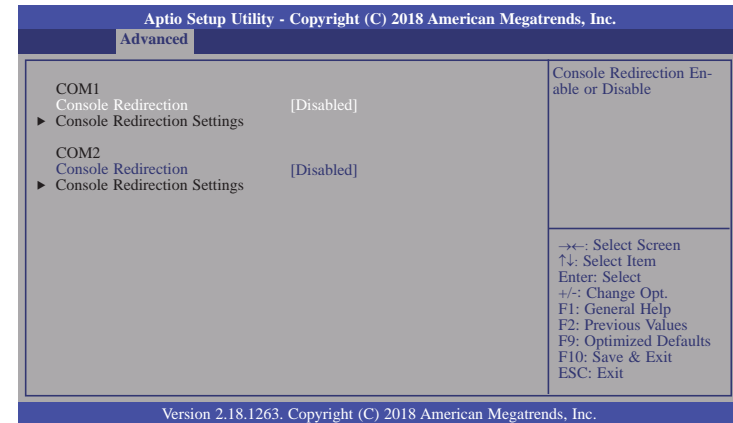
Enable or disable the hot plug function of the PCI Express root port.

### PCIe Speed

Select the speed of the PCI Express root port: Auto, Gen1 or Gen2.

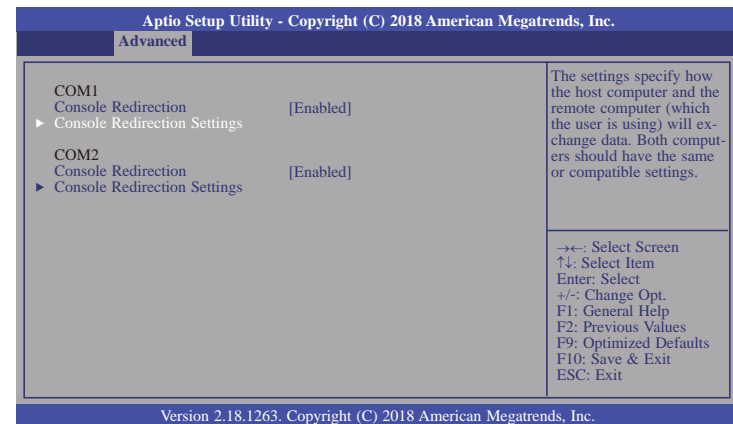
### Console Redirection

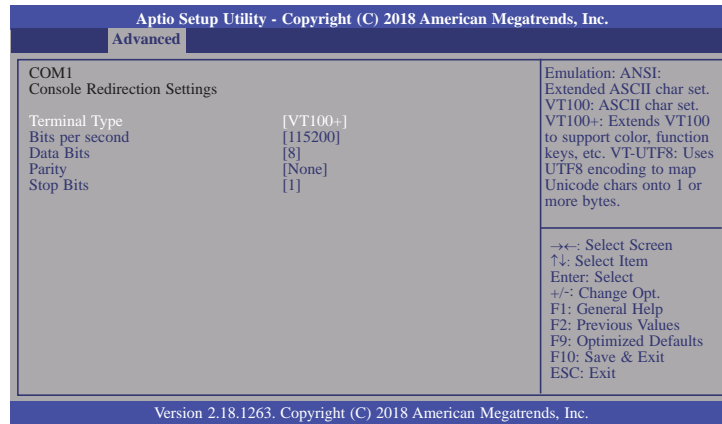
This section configures settings relevant to console redirection.



### Console Redirection

This field is used to enable or disable the console redirection function. When console redirection is set to enabled, console redirection settings are available like below screen.





### Terminal Type

Select terminal type: VT100, VT100+, VT-UTF8 or ANSI.

### Bits per second

Select serial port transmission speed: 9600, 19200, 38400, 57600 or 115200.

### Data Bits

Select data bits: 7 bits or 8 bits.

### Parity

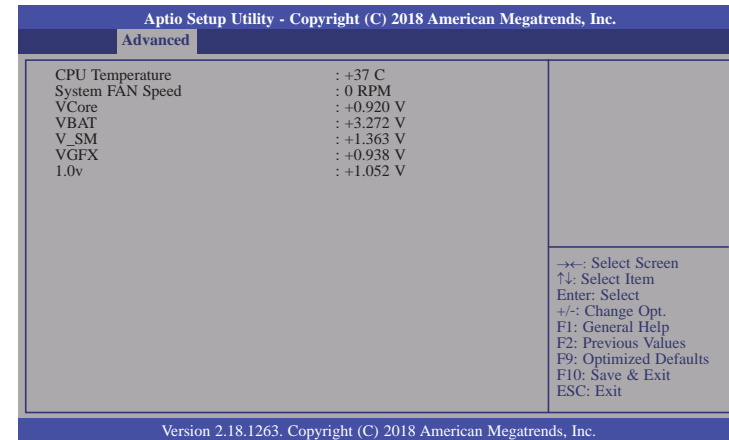
Select parity bits: none, even or odd.

### Stop Bits

Select stop bits: 1 bit or 2 bits.

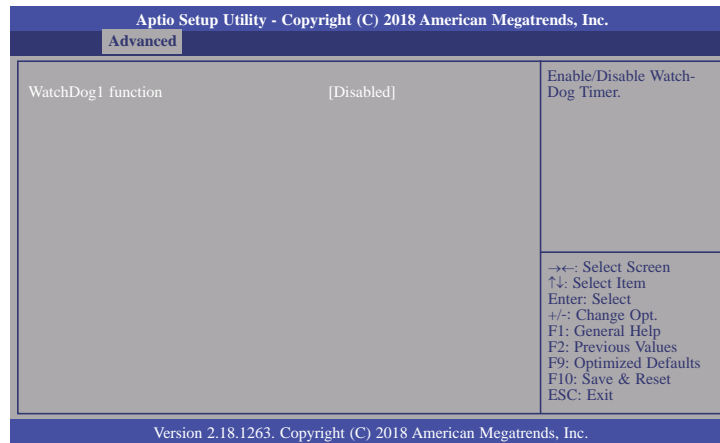
## PC Health Status

This section only displays the hardware health monitor.



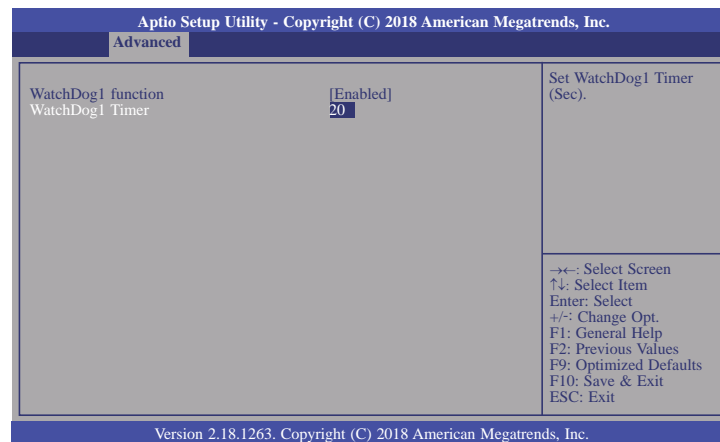
## WatchDog Configuration

This section is used to configure WatchDog parameters.



### WatchDog1 function

This field is used to enable or disable the Watchdog timer function. When enabled, WatchDog1 Timer is available for setting.

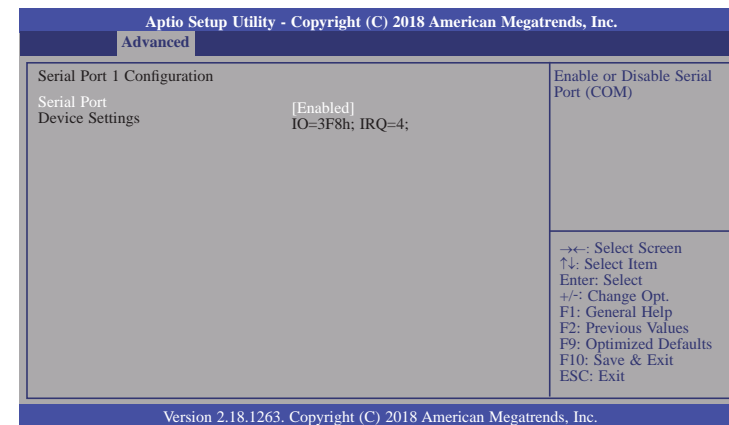
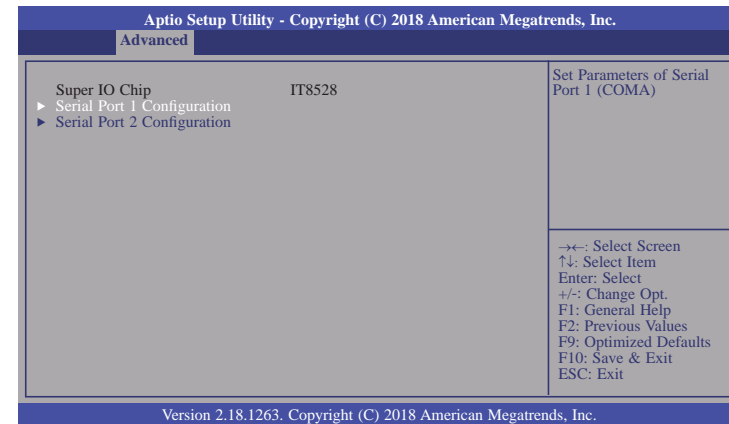


### WatchDog1 Timer

This field is used to set WatchDog time in seconds. Input any value between 1 to 255 seconds.

## IT8528 Super IO Configuration

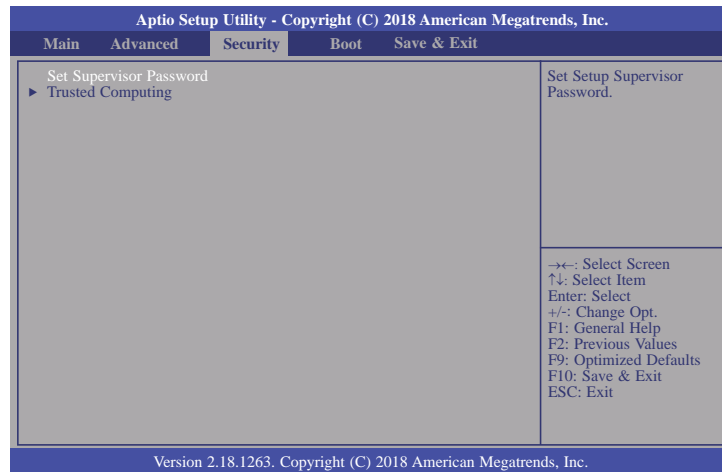
This section configures the system super I/O chip parameters.



### Serial Port 1 and 2

This field is used to enable or disable the serial port (COM).

## Security

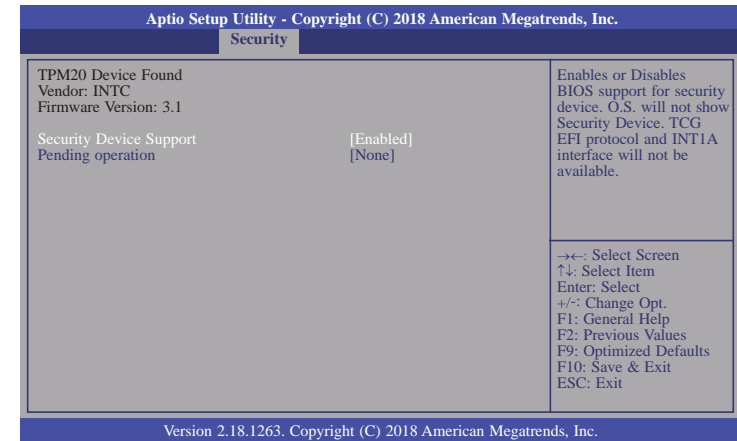


### Set Supervisor Password

Set the supervisor password.

### 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.

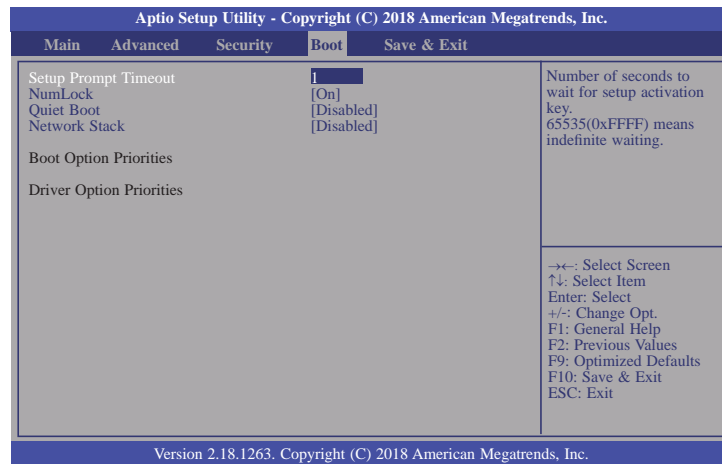
### Pending operation

Schedule an operation for the security device.


**Note:**

Your computer will reboot during restarting in order to change the security device state.

## Boot



### Setup Prompt Timeout

Select the number of seconds to wait for the setup activation key. 65535 (0xFFFF) denotes indefinite waiting.

### NumLock

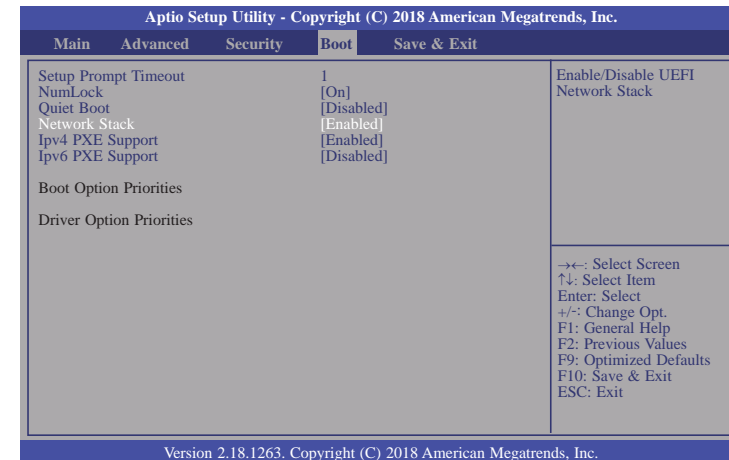
This allows you to determine the default state of the numeric keypad. By default, the system boots up with NumLock on wherein the function of the numeric keypad is the number keys. When set to Off, the function of the numeric keypad is the arrow keys.

### Quiet Boot

This allows you to enable or disable quiet boot option. If Quiet Boot is set to enabled, BGRT logo field will appear in the ACPI Configuration submenu.

### Network Stack

This section is used to enable or disable UEFI network stack. When Network Stack is set to enabled, it will display Ipv4 PXE Support and Ipv6 PXE Support.



### Ipv4 PXE Support

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

### Ipv6 PXE Support

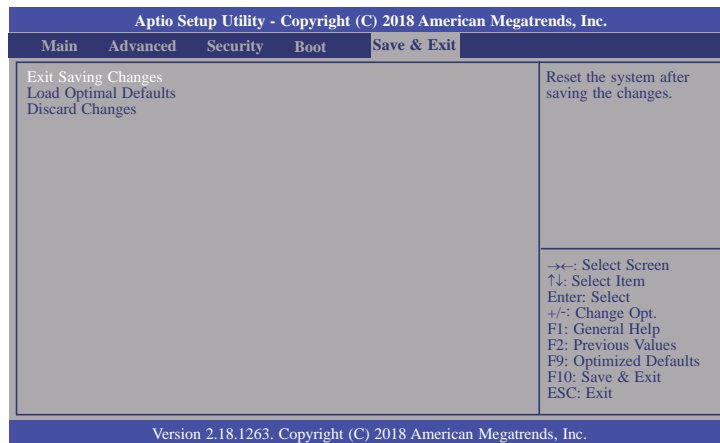
When enabled, Ipv6 PXE boot supports. When disabled, Ipv6 PXE boot option will not be created.



#### Note:

AL968 only supports UEFI boot, no Legacy boot.

## Save & Exit



### Exit Saving Changes

Select this field and then press <Enter> to exit the system setup and save your changes.

### Load Optimal Defaults

Select this field and then press <Enter> to load optimal defaults.

### Discard Changes

Select this field and then press <Enter> to exit the system setup without saving your changes.

## Updating the BIOS

To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files. For updating AMI BIOS in UEFI mode, you may refer to the how-to-video at <https://www.dfi.com/Knowledge/Video/5>.

### 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

Please download drivers, utilities and software applications required to enhance the performance of the system board at <https://www.dfi.com/DownloadCenter>.

### Intel Chipset Software Installation Utility

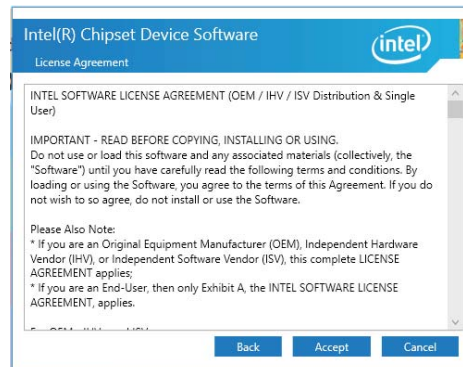
The Intel Chipset Software Installation Utility is used for updating Windows® INF files so that the Intel chipset can be recognized and configured properly in the system.

To install the utility, download "AL968 Chipset Driver" zip file at our website.

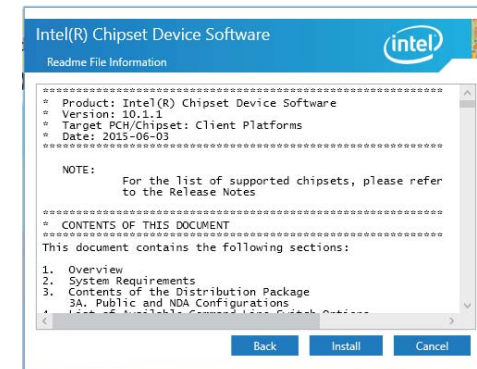
1. Setup is ready to install the utility. Click "Next".



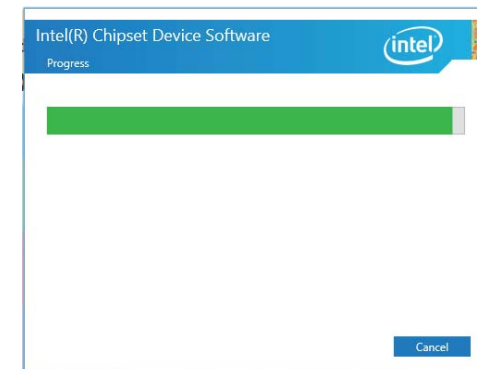
2. Read the license agreement then click "Accept".



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

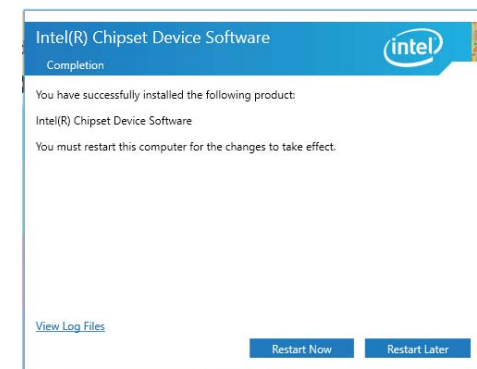


4. The step displays the installing status in the progress.



5. After completing installation, click "Restart Now" to exit setup.

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

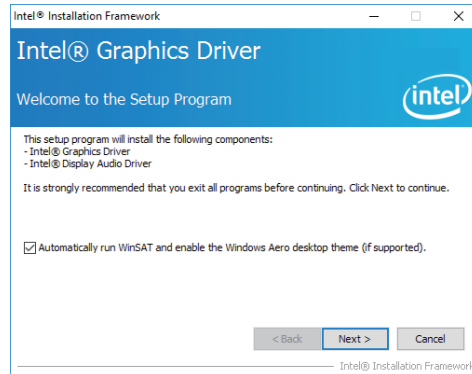




## Intel Graphics Drivers

To install the driver, download “AL968 Graphics Driver” zip file at our website.

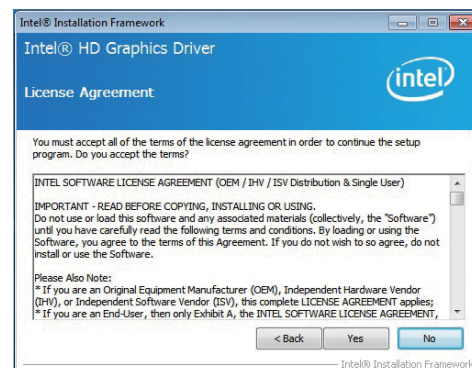
1. Setup is now ready to install the graphics driver. Click “Next”.



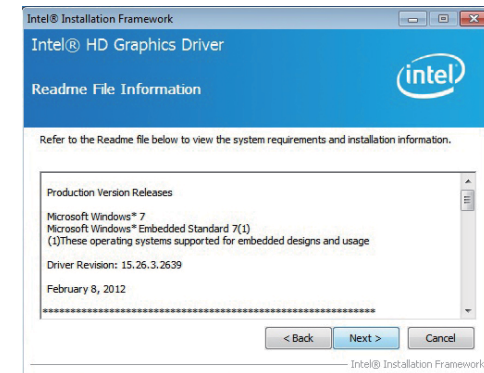
By default, the “Automatically run WinSAT and enable the Windows Aero desktop theme” is enabled. With this enabled, after installing the graphics driver and the system rebooted, the screen will turn blank for 1 to 2 minutes (while WinSAT is running) before the Windows 10 desktop appears. The “blank screen” period is the time Windows is testing the graphics performance.

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

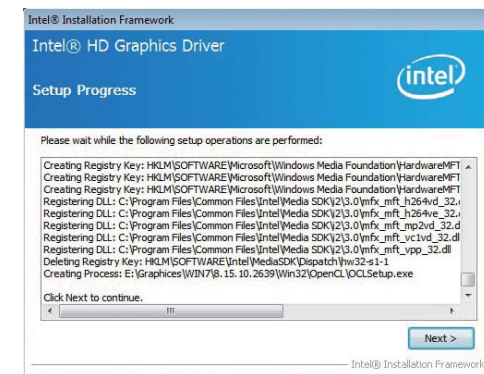
2. Read the license agreement then click “Yes”.



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

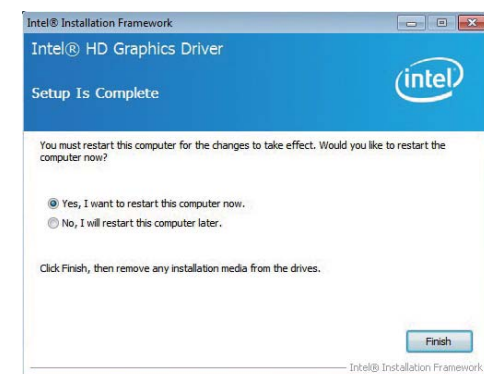


4. Setup is now installing the driver. Click “Next” to continue.



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

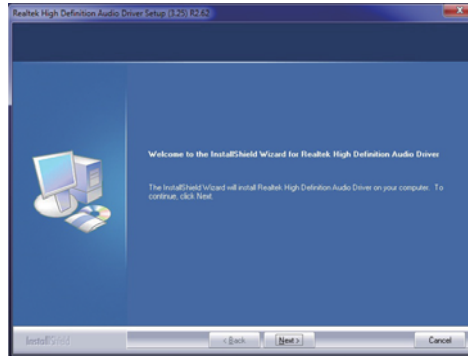
Restarting the system will allow the new software installation to take effect.



## Audio Drivers

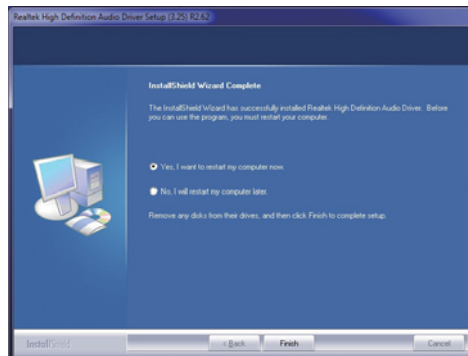
To install the driver, download “AL968 Audio Driver” zip file at our website.

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



2. Click “Yes, I want to restart my computer now” then click “Finish”.

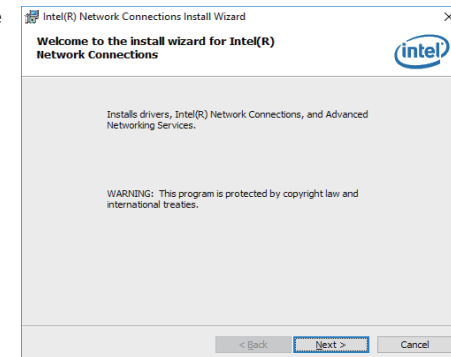
Restarting the system will allow the new software installation to take effect.



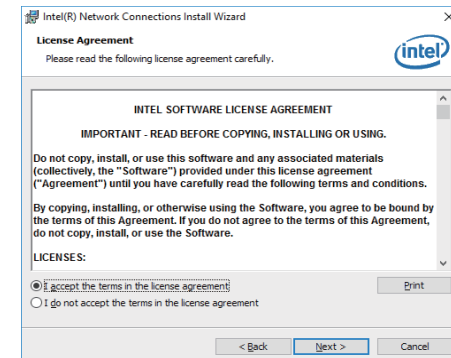
## Intel LAN Drivers

To install the driver, download “AL968 LAN Driver” zip file at our website.

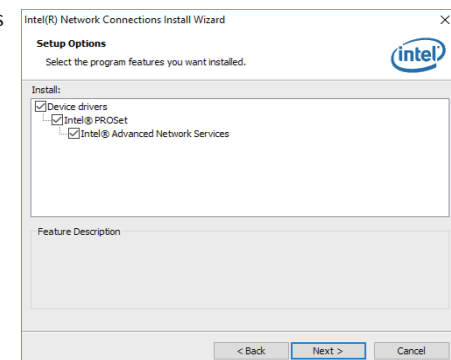
1. Setup is ready to install the driver. Click “Next”.



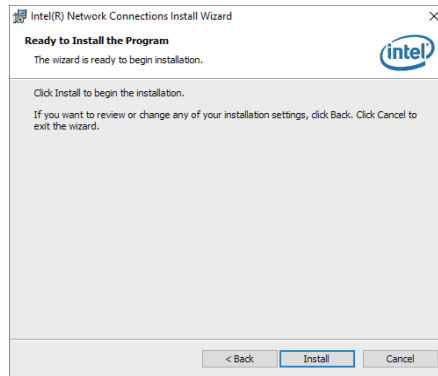
2. Click “I accept the terms in the license agreement” then click “Next”.



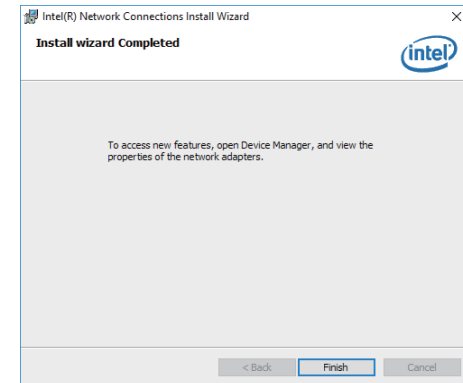
3. Select the program features you want installed then click “Next”.



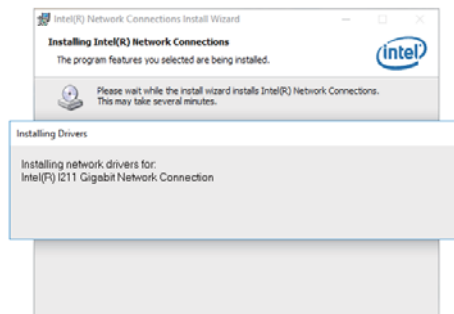
4. Click "Install" to begin the installation.



6. After completing installation, click "Finish".



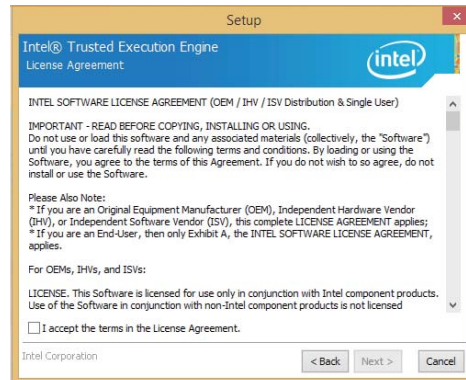
5. The step displays the installing status in the progress.



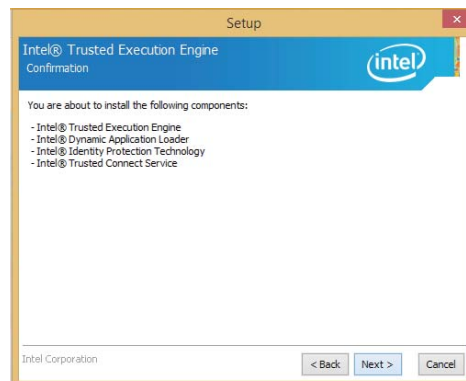
## Intel Trusted Execution Engine Driver

To install the driver, download “AL968 TXE Driver” zip file at our website.

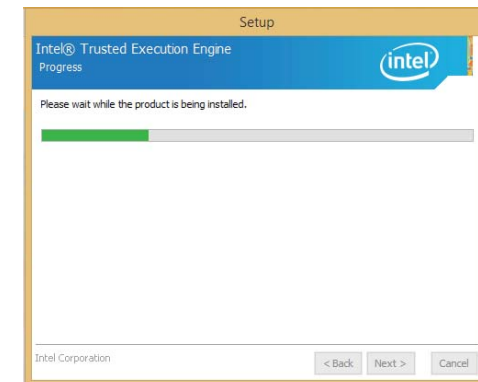
1. Tick “I accept the terms in the License Agreement” and then click “Next”.



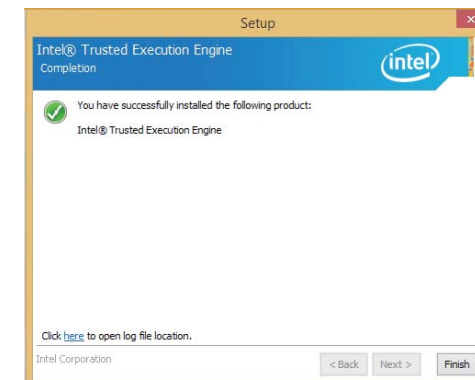
2. The step shows the components which will be installed. Then, Click “Next”.



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



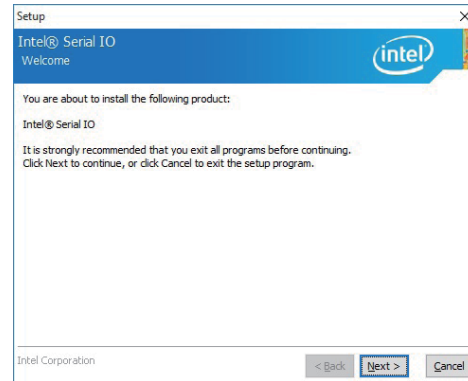
4. Click “Finish” when the installation is complete.



## IO Driver

To install the driver, download “AL968 SIO Driver” zip file at our website.

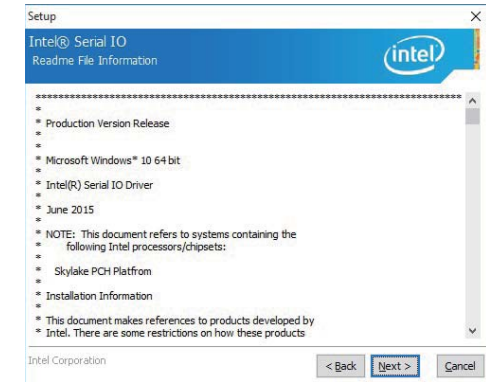
1. Setup is ready to install the driver.  
Click “Next”.



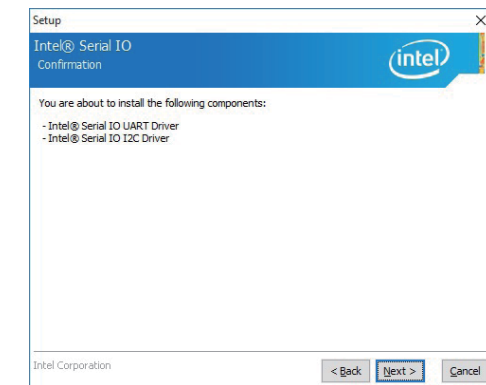
2. Read the license agreement carefully.  
Click “I accept the terms in the License Agreement” then click “Next”.



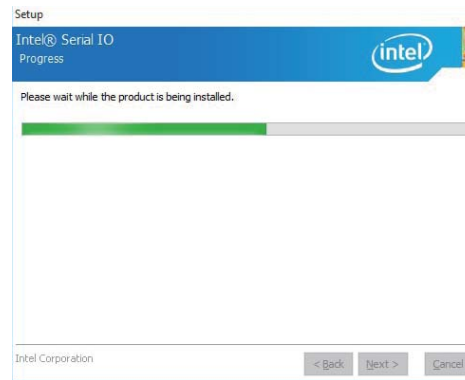
3. Read the file information then click “Next”.



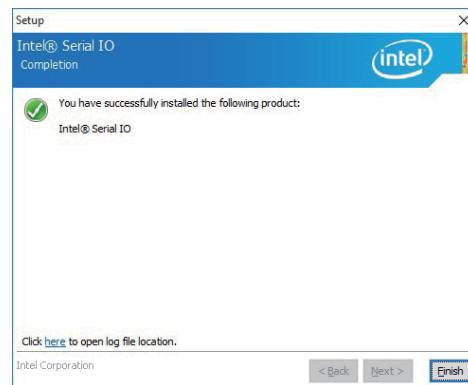
4. Setup is ready to install the driver.  
Click “Next”.



5. Setup is now installing the driver.



6. Click "Finish".



## Appendix A - 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.



## Appendix B - System Error Message

### Standard Status Codes

#### PEI Status Codes

0x11	Pre-memory CPU initialization is started
0x15	Pre-memory North Bridge initialization is started
0x19	Pre-memory South Bridge initialization is started
0x2A	OEM pre-memory initialization codes
0x2B	Memory initialization. Serial Presence Detect (SPD) data reading
0x2C	Memory initialization. Memory presence detection
0x2D	Memory initialization. Programming memory timing information
0x2E	Memory initialization. Configuring memory
0x2F	Memory initialization (other).

#### PEI Error Codes

0x50	Memory initialization error. Invalid memory type or incompatible memory speed
0x51	Memory initialization error. SPD reading has failed
0x52	Memory initialization error. Invalid memory size or memory modules do not match.
0x53	Memory initialization error. No usable memory detected

#### DXE Phase Codes

0x92	PCI Bus initialization is started
0x93	PCI Bus Hot Plug Controller Initialization
0x94	PCI Bus Enumeration
0x95	PCI Bus Request Resources
0x96	PCI Bus Assign Resources
0x99	Super IO Initialization
0x9A	USB initialization is started
0x9B	USB Reset
0x9C	USB Detect
0x9D	USB Enable
0xA0	IDE initialization is started
0xA1	IDE Reset
0xA2	IDE Detect
0xA3	IDE Enable
0xAE	Legacy Boot event
0xB4	USB hot plug
0xB6	Clean-up of NVRAM
0xB7	Configuration Reset (reset of NVRAM settings)

#### DXE Error Codes

0xD6	No Console Output Devices are found
0xD7	No Console Input Devices are found
0xD8	Invalid password

**ACPI Checkpoints**

0x03	System is entering S3 sleep state
0x04	System is entering S4 sleep state
0x05	System is entering S5 sleep state
0x30	System is waking up from the S3 sleep state
0x40	System is waking up from the S4 sleep state
0xAC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.
0xAA	System has transitioned into ACPI mode. Interrupt controller is in APIC mode.

**Beep Code**

6 beeps	Flash update is failed
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