

# MI990

Intel® 6<sup>th</sup> generation Mobile platform  
Mini ITX Motherboard

## User's Manual

Version 1.0

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## Acknowledgments

AMI BIOS is a trademark of American Megatrends Inc.

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# Introduction

The MI990 Mini ITX motherboard features Intel Skylake support and comes with a range of features such support for 6th Generation Intel® Xeon® / Core™ i7/i5/i3 / Celeron® QC/DC processors, with speeds up to 3.7GHz and two DDR4 SO-DIMM for a maximum system memory of 32GB.

The MI990 supports graphics interface including DVI-D, HDMI (2.0), DisplayPort and 24-bit dual channel LVDS. It has two Intel® Gigabit LAN, 4x USB 2.0, 6x USB 3.0, 6x COM, 4x SATAIII, 1x PCI-E(x16), 2x Mini PCI-E and 1x M.2 expansion interface. Standard features also include Watchdog, Digital I/O, iAMT (11.0), TPM (2.0), vPro and iSMART 3.0 for auto scheduling and power saving features.

## MI990 Features

- Mini-ITX form factor
- Onboard 6th Generation Intel® Xeon® / Core™ i7/i5/i3 / Celeron® QC/DC processors, up to 3.7GHz
- 2x DDR4 SO-DIMM, Max. 32GB
- Intel® Processor integrated graphic device, supports DVI-D, HDMI (2.0), DisplayPort and 24-bit dual channel LVDS
- 2x Intel® Gigabit LAN
- 4x USB 2.0, 6x USB 3.0, 6x COM, 4x SATAIII
- 1x PCI-E(x16), 2x Mini PCI-E, 1x M.2
- Watchdog, Digital I/O, iAMT (11.0), TPM (2.0), vPro, iSMART 3.0

## **Checklist**

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Your MI990 package should include the items listed below.

- The MI990 motherboard
- This User's Manual
- 1 CD containing chipset drivers and flash memory utility
- Serial ATA cable
- COM port cable
- I/O shield

## MI990 Specifications

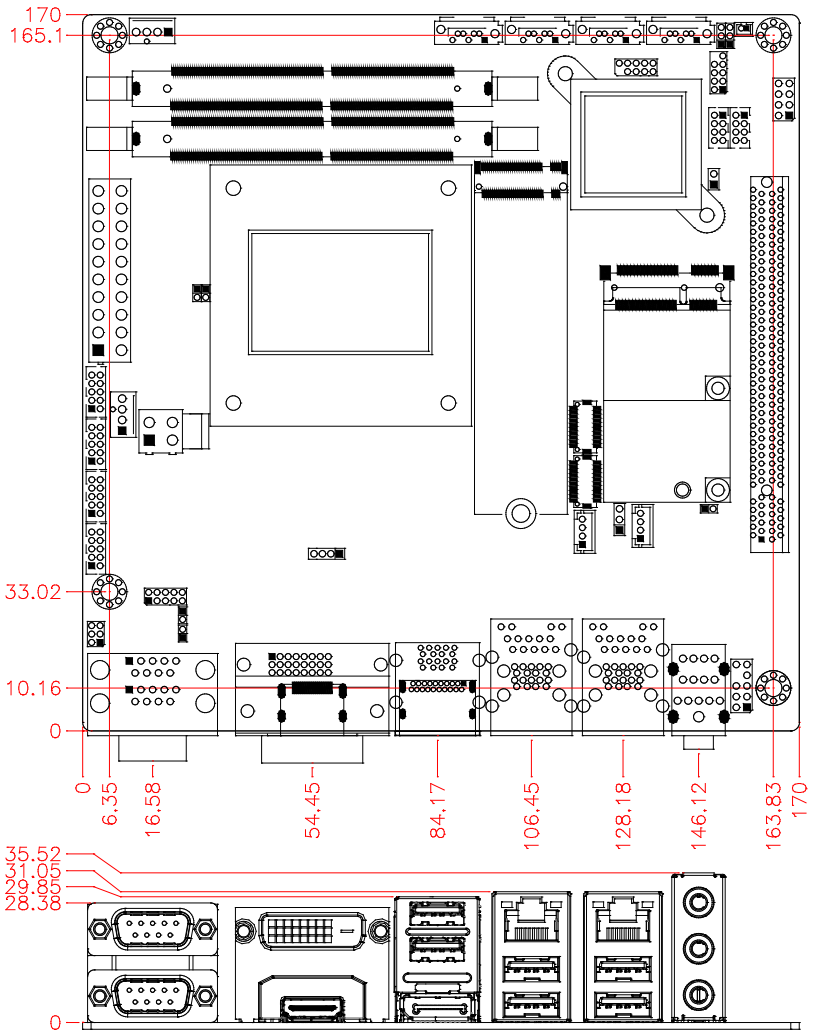
<b>Product Name</b>	MI990VF-X28 [Support iAMT 11.0 & vPro & ECC] MI990VF-6820 [Support iAMT 11.0 & vPro] MI990VF-6440 [Support iAMT 11.0 & vPro] MI990EF-6100 [Support EuP/ErP only]
<b>Form Factor</b>	Mini-ITX
<b>CPU Type</b>	- Intel® Skylake-H mobile processors (14 nm monolithic) - FCBGA1440 , Package= 42mmx28mmx1.49mm - TDP =45W/35W/25W (QC) ; 35W/ 25W (DC)
<b>CPU Speed</b>	Xeon E3-1505M v5 @ 2.8GHz, up to 3.7GHz Core i7-6820EQ @ 2.8GHz, up to 3.5GHz Core i5-6440EQ @ 2.7GHz, up to 3.4GHz Core i3-6100E @ 2.7GHz
<b>Cache</b>	Up to 8MB
<b>Chipset</b>	Intel® Skylake PCH-H CM236 for MI990VF (Support vPro, iAMT); HM170 for MI990EF Package =23 mm x 23 mm x 0.5mm
<b>BIOS</b>	AMI BIOS [16MB SPI ROM]
<b>Memory</b>	Intel® Skylake-H mobile processors integrated memory controller DDR4 -2133 MHz @ 1.2V SO-DIMM, Max. 32GB
<b>VGA</b>	Intel® Skylake-H mobile processor integrated HD Gfx, supports 3 independent displays, <ul style="list-style-type: none"> <li>● HDMI (Thru port B, support HDMI 2.0 Via DP to HDMI converter, Explore EP963C **Resolution up to 4096x2304 @ 60 Hz**</li> <li>● DVI-D x 1 (Thru port C, with level shifter NXP PTN3360D) **Resolution up to 4096x2304 @ 30 Hz**</li> <li>● DisplayPort x 1 (Thru port D) **Resolution up to 4096x2304 @ 60 Hz**</li> <li>● LVDS (Thru eDP, via NXP PTN3460 **Supports up to 1920x1200 @ 60 Hz**</li> </ul>
<b>LAN</b>	1.Intel® Jacksonville PHY ** Package = 6mm x 6mm, QFN48** I219LM GbE PHY for MI990VF; I219V GbE PHY for MI990EF 2.Intel® Pearsonville I211AT as 2 <sup>nd</sup> GbE
<b>USB</b>	USB <u>3.0</u> host controller [Skylake-H PCH integrated], supports <b>6</b> ports - 6 ports in the rear panel USB <u>2.0</u> host controller [Skylake-H PCH integrated] supports <b>6</b> ports - 2 ports via MiniPCIe sockets - 4 ports via onboard box header

<b>Serial ATA</b>	<ul style="list-style-type: none"> <li>- Intel® <b>CM236</b> PCH built-in SATA controller for <b>MI990VF</b> Support 7 x SATA 3.0(6Gbps) 4 x SATA III connector (PCIe#15~#18) 2 x mSATA (PCIe#14 , #19) 1x M.2 (PCIe#9)</li> <li>- Intel® <b>HM170</b> PCH built-in SATA controller for <b>MI990EF</b> Support 4 x SATA 3.0(6Gbps) 2 x SATA III connector (PCIe#15~#16) 1 x mSATA (PCIe#14) 1x M.2 (PCIe#9)</li> </ul>
<b>Audio</b>	Intel® [Skylake-H PCH integrated] built-in High Definition Audio controller + Realtek ALC892 w/ 7.1 channels
<b>LPC I/O</b>	<p>Fintek F81866AD-I (128-pin LQFP [14mm x 14 mm])</p> <ul style="list-style-type: none"> <li>▪ COM #1 (RS232/422/485)</li> </ul> <ol style="list-style-type: none"> <li>1. With Fintek F81439N transceiver x 1 for jumper-less</li> <li>2. Support ring-in with power @500 mA (selectable for 5V or 12V)             <ul style="list-style-type: none"> <li>▪ COM #2~COM #6 (RS232 only)</li> </ul> </li> </ol> <p>Hardware Monitor (2 thermal inputs,4 voltage monitor inputs &amp; 2 Fan headers)</p> <ul style="list-style-type: none"> <li>- CPU Fan x 1 (PWM Fan type, 4-pin connector)</li> <li>- SYS Fan x 1 (PWM/ DC Fan type, 4-pin connector)</li> </ul>
<b>Digital IO</b>	4 in & 4 out
<b>TPM 2.0</b>	Infineon SLB9665 (MI990VF series) **Meet FIPS 140-2 certification**
<b>iAMT</b>	Intel® Active Management Technology ver. 11.0 (MI990VF series)



<b>Expansion Slots</b>	<ul style="list-style-type: none"> <li>- PCI-Express (16x) x1 [Gen 3.0 PEG]</li> <li>- Mini PCIe x 2 ports [Full-sized] , both w/USB 2.0 signal, <b>Single mSATA → MI990EF @ component side J18</b></li> <li><b>Dual mSATA → MI990VF series@ J18 &amp; J26</b></li> <li>- M.2 Type 2280 + Mechanical key M x1 [PCIe(x4)+SATA3.0]</li> </ul>
<b>Edge Connectors</b>	<ul style="list-style-type: none"> <li>Dual DB9 stack connector for COM #1 / #2</li> <li>DVI-D + HDMI stack connector x 1</li> <li>Dual USB (3.0) +DisplayPort stack connector x 1</li> <li>RJ-45 + dual USB (3.0) stack connector x 2</li> <li>Triple type Jack 3 x 1 for HD Audio</li> </ul>
<b>Onboard Header/Connector</b>	<ul style="list-style-type: none"> <li>4 ports x SATA <b>III</b> [Blue color] for MI990VF series</li> <li>2 ports x SATA <b>III</b> [Blue color] for MI990EF</li> <li>DF-11 8-pin box-header x 2 for 4 ports USB 2.0</li> <li>DF-20 20-pin connector x 2 for dual –channel LVDS</li> <li>4 pins box header x 1 for LCD backlight control</li> <li>2x5 pins pin-header x 1 for front panel audio [Support 7.1 Channel]</li> <li>DF-11 10-pin pin-header x 4 for COM3 ~ COM6</li> <li>2x5 pins pin-header x 1 for Digital IO</li> <li>M.2 socket x1+ Mini PCIe x 1 @ component side</li> <li>Mini PCIe x 1 @ solder side [MI990VF series only]</li> </ul>
<b>Watchdog Timer</b>	Yes (256 segments, 0, 1, 2...255 sec/min)
<b>System Voltage</b>	<ul style="list-style-type: none"> <li>ATX standard 20-pin type</li> <li>4 pin type (+12V only)</li> </ul>
<b>Others</b>	<ul style="list-style-type: none"> <li>- LAN Wakeup</li> <li>- iSMART 3.2</li> <li>- RAID</li> <li>- vPro [MI990VF series only]</li> </ul>
<b>OS support</b>	<ul style="list-style-type: none"> <li>- Windows 8.1(64-bit)</li> <li>- Windows 10 (64-bit)</li> <li>- Windows 7(32-bit / 64-bit)</li> <li>- Fedora (Installation)</li> <li>- Ubuntu (Installation)</li> </ul>
<b>Certification</b>	<ul style="list-style-type: none"> <li>CE (EN55032:2012)</li> <li>FCC Class B</li> <li>LVD</li> </ul>
<b>RoHS</b>	YES
<b>Board Size</b>	170mm x 170mm

# Board Dimensions



## Installations

This section provides information on how to use the jumpers and connectors on the MI990 in order to set up a workable system. The topics covered are:

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## Installing the Memory

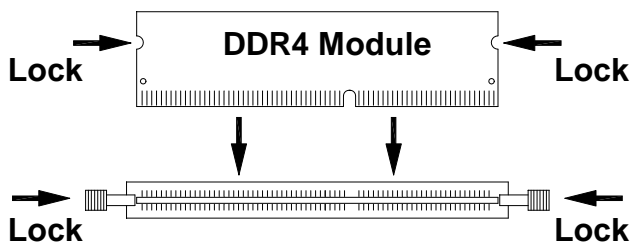
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The MI990 board supports two DDR4 memory socket for a maximum total memory of 16GB in DDR4 SODIMM memory type.

### Installing and Removing Memory Modules

To install the DDR4 modules, locate the memory slot on the board and perform the following steps:

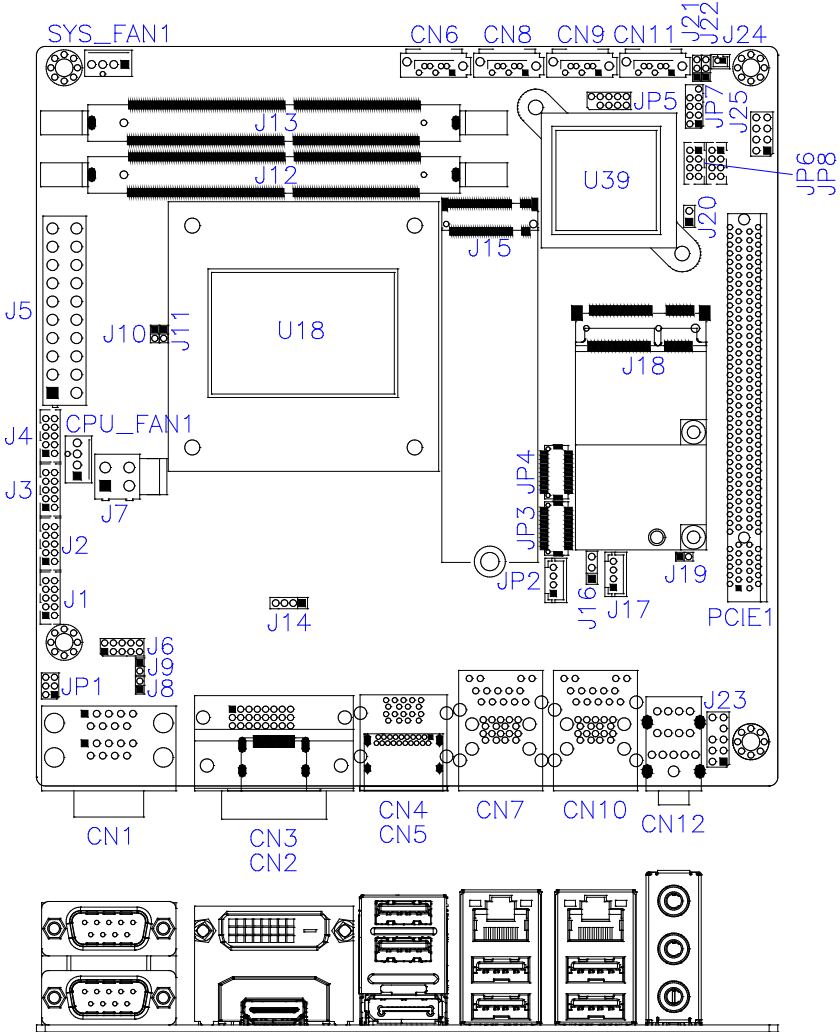
1. Hold the DDR4 module so that the key of the DDR4 module aligned with that on the memory slot.
2. Gently push the DDR4 module in an upright position until the clips of the slot close to hold the DDR4 module in place when the DDR4 module touches the bottom of the slot.
3. To remove the DDR4 module, press the clips with both hands.

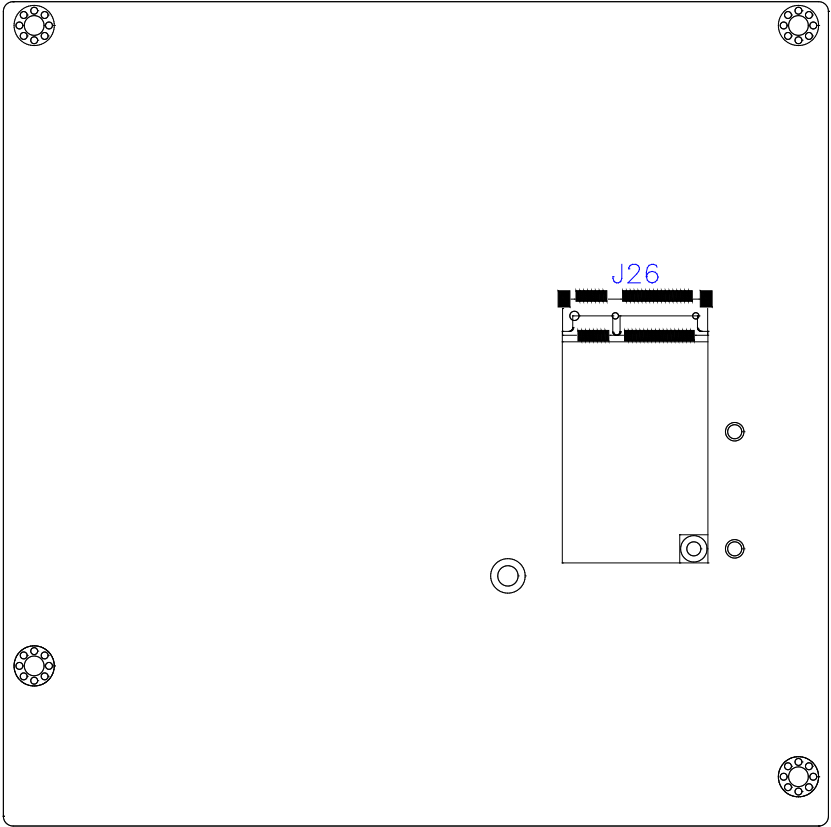


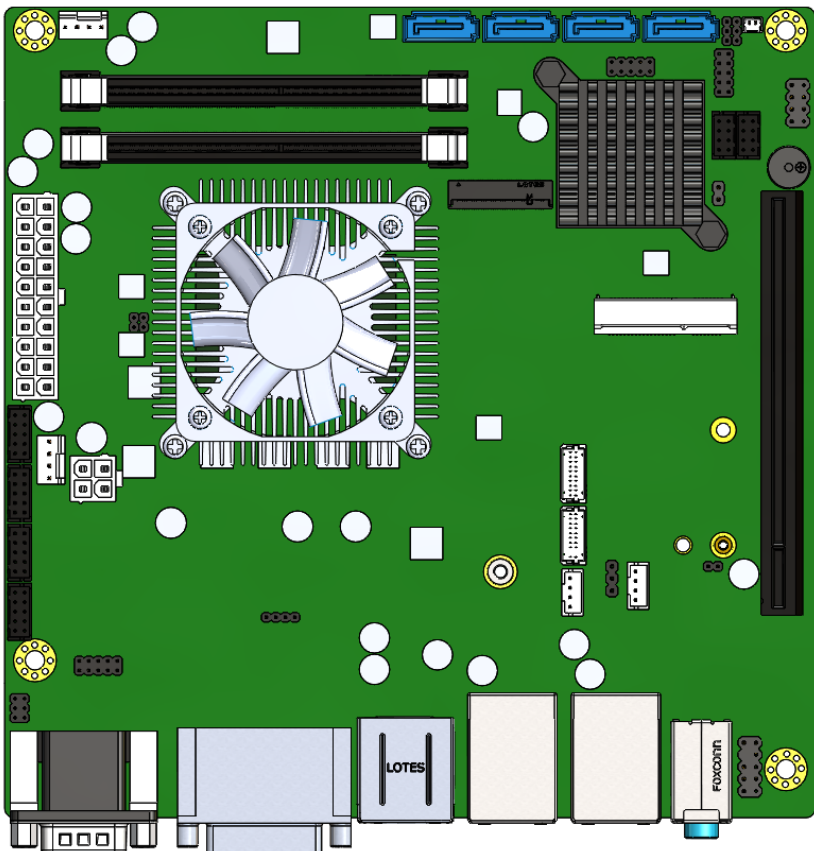
## Jumpers and Connectors

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### Jumper and Connector Locations on MI990

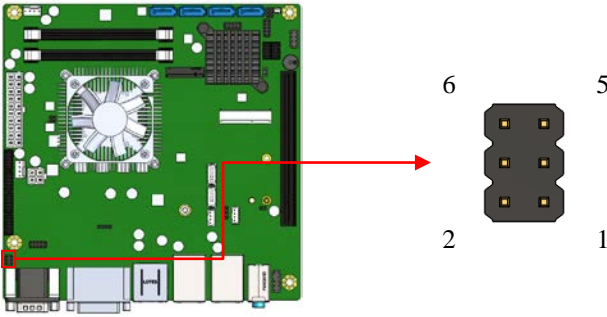






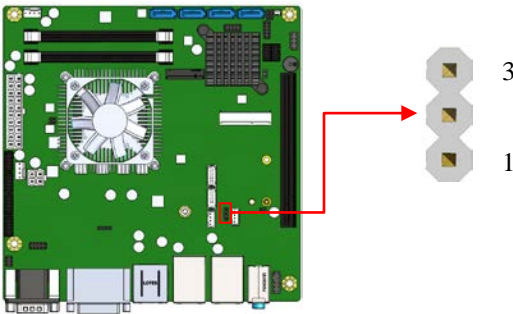


**JP1: COM1 RS232 RI/+5V/+12V Power Setting**



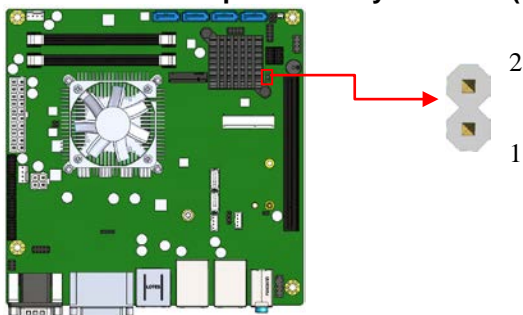
JP1	Setting	Function
	Pin 1-3	+12V
	Pin 3-4 (Default)	RI
	Pin 3-5	+5V

**J16: LVDS Power Select**



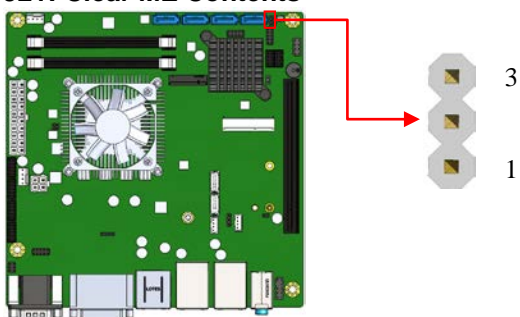
J16	LCD Panel Power
	3.3V(Default)
	5V

**J20: Flash Descriptor Security Override (Factory use only)**



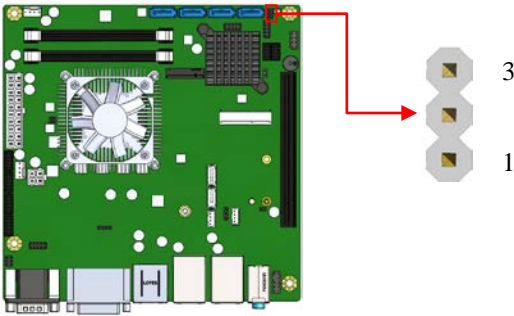
J20	Flash Descriptor Security Override
Open	Disabled (Default)
Close	Enabled

**J21: Clear ME Contents**



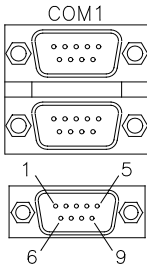
J21	Setting	Function
	Pin 1-2 Short/Closed	Normal
	Pin 2-3 Short/Closed	Clear ME

**J22: Clear CMOS Contents**



J22	Setting	Function
	Pin 1-2 Short/Closed	Normal
	Pin 2-3 Short/Closed	Clear CMOS

**CN1: COM1 and COM2 Serial Ports**  
COM1 (top) and COM2 (bottom)

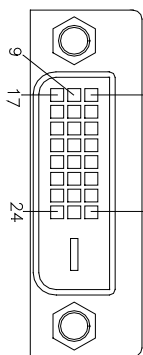


Pin #	Signal Name		
	RS-232	R2-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	TX	RX+	NC
4	DTR	RX-	NC
5	Ground	Ground	Ground
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC
10	NC	NC	NC

**CN2: HDMI Connector**

Signal Name	Pin #	Pin #	Signal Name
TMDS Data2+	1	10	TMDS Clock+
TMDS Data2 Shield	2	11	TMDS Clock Shield
TMDS Data2-	3	12	TMDS Clock-
TMDS Data1+	4	13	CEC
TMDS Data1 Shield	5	14	Reserved
TMDS Data1-	6	15	SCL
TMDS Data0+	7	16	SDA
TMDS Data0 Shield	8	17	GND
TMDS Data0-	9	18	+5V
		19	Hot Plug

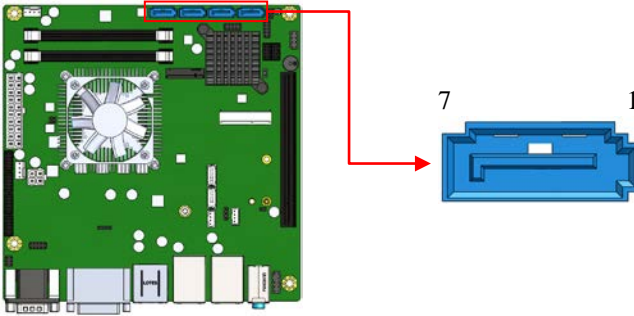
**CN3: DVI-D Connector**



Signal Name	Pin #	Pin #	Signal Name
DATA 2-	1	16	HOT POWER
DATA 2+	2	17	DATA 0-
Shield 2/4	3	18	DATA 0+
DATA 4-	4	19	SHIELD 0/5
DATA 4+	5	20	DATA 5-
DDC CLOCK	6	21	DATA 5+
DDC DATA	7	22	SHIELD CLK
N.C	8	23	CLOCK -
DATA 1-	9	24	CLOCK +
DATA 1+	10	C1	N.C.
SHIELD 1/3	11	C2	N.C.
DATA 3-	12	C3	N.C.
DATA 3+	13	C4	N.C.
DDC POWER	14	C5	N.C.
A GROUND 1	15	C6	N.C.

**CN4: USB3.0**

**CN5: Display Port**

**CN6, CN8, CN9, CN11: SATA Connectors**

Pin #	Signal Name
1	Ground
2	TX+
3	TX-
4	Ground
5	RX-
6	RX+
7	Ground

**CN7: Gigabit LAN (I219LM/V) + USB3 3/4**

**CN8: SATA Port 5**

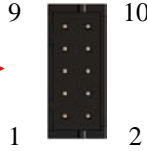
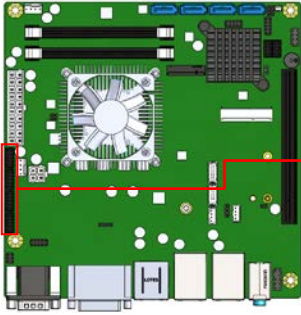
**CN9: SATA Port 2**

**CN10: Gigabit LAN (I211AT) + USB3 5/6**

**CN11: SATA #3**

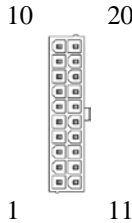
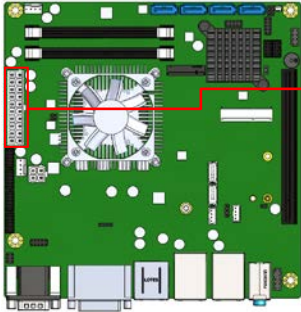
**CN12: HD Audio Connector**

**J1, J2, J3, J4: COM6, COM5, COM4, COM3 RS232 Serial Ports**



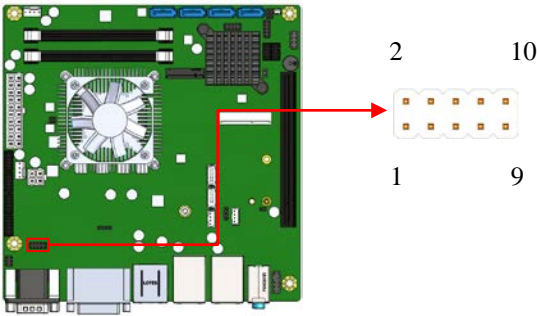
Signal Name	Pin #	Pin #	Signal Name
DCD#	1	6	DSR#
SIN#	2	7	RTS#
SOUT	3	8	CTS#
DTR#	4	9	RI#
GND	5	X	KEY

**J5: ATX Power Supply Connector**



Signal Name	Pin #	Pin #	Signal Name
3.3V	11	1	3.3V
-12V	12	2	3.3V
Ground	13	3	Ground
PS-ON	14	4	+5V
Ground	15	5	Ground
Ground	16	6	+5V
Ground	17	7	Ground
-5V	18	8	Power good
+5V	19	9	5VSB
+5V	20	10	+12V

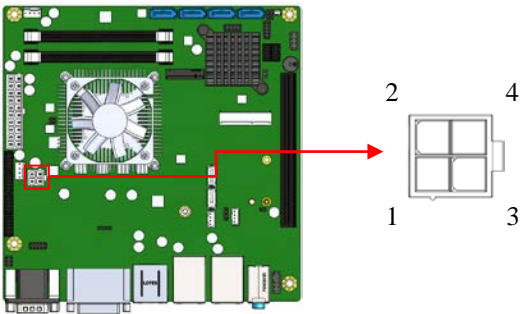
**J6: Digital I/O Connector (4 in, 4 out)**



Signal Name	Pin #	Pin #	Signal Name
Ground	1	2	+5V
Out3	3	4	Out1
Out2	5	6	Out0
IN3	7	8	IN1
IN2	9	10	IN0

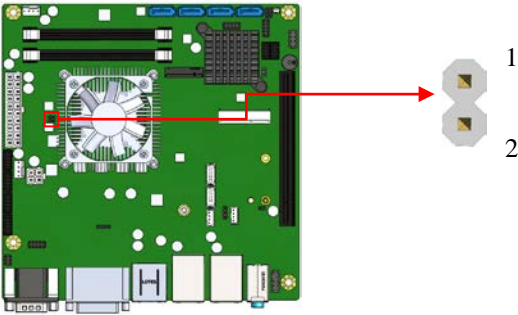
**J7: ATX 12V Power Connector**

This connector supplies the CPU operating voltage.



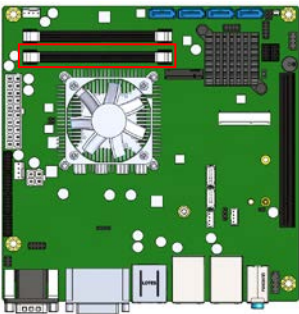
Pin #	Signal Name
1	Ground
2	Ground
3	+12V
4	+12V

**J10, J11: PCI Express (16x) Bifurcation**

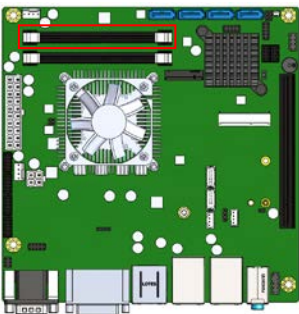


	<b>J10</b>	<b>J11</b>
X16 (Default)	Open	Open
X8,X8	Open	Close
X8, X4, X4	Close	Close

**J12: DDR4 SO-DIMM CHA**

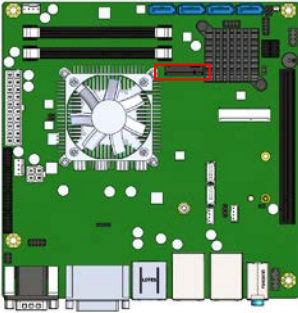


**J13: DDR4 SO-DIMM CHB**

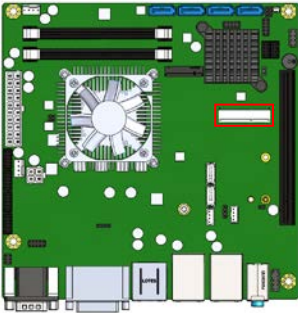




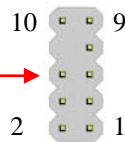
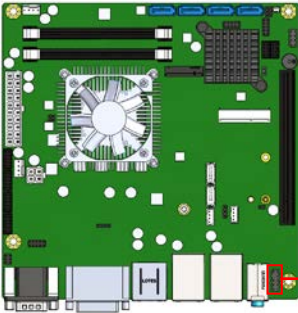
**J15: M.2 Socket M-Key (PCIe x4/SATA #0)**



**J18: mPCIe/mSATA (SATA #1)**

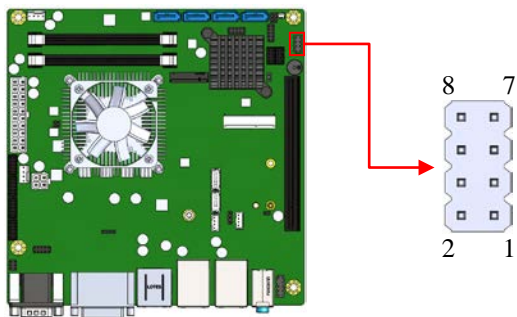


**J23: Audio Pin Header for Chassis Front Panel**



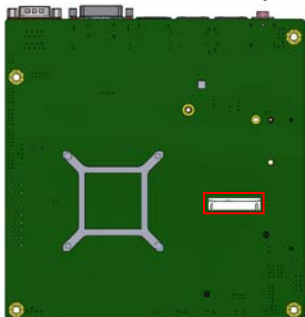
Signal Name	Pin	Pin	Signal Name
MIC IN_L	1	2	Ground
MIC IN_R	3	4	DET
LINE_R	5	6	Ground
Sense	7	8	KEY
LINE_L	9	10	Ground

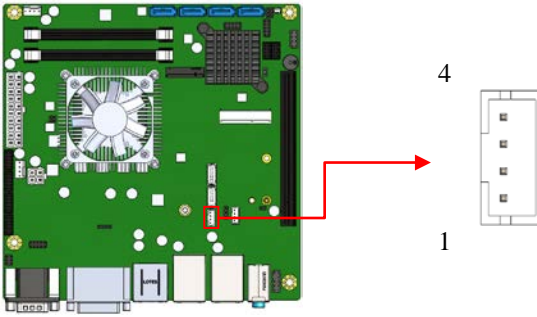
**J25: Front Panel Connector**



Signal Name	Pin #	Pin #	Signal Name
Power BTN	1	2	Power BTN
HDD LED+	3	4	HDD LED-
Reset BTN	5	6	Reset BTN
Power LED+	7	8	Power LED-

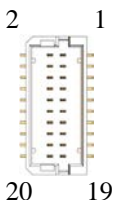
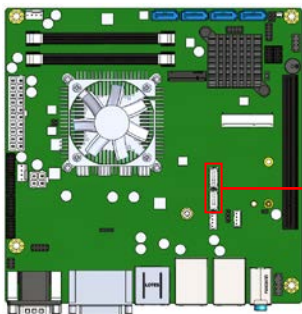
**J26: mPCIe/mSATA (SATA #6) (MI990VF series only)**



**JP2: LCD Backlight Connector**

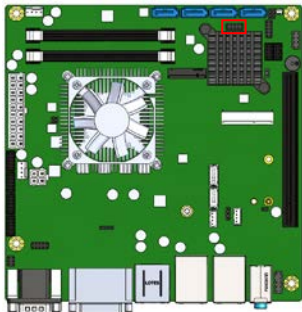
Pin #	Signal Name
1	+12V
2	Backlight Enable
3	Brightness Control
4	Ground

**JP4, JP3: LVDS Connectors**  
**JP3: LVDS CHB**  
**JP4: LVDS CHA**

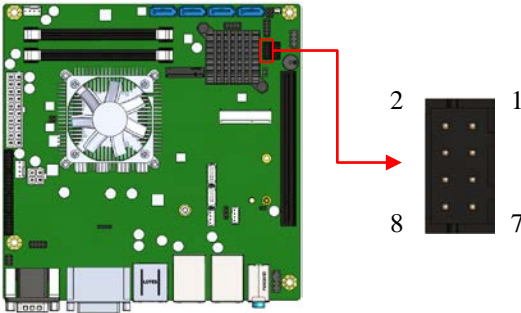


Signal Name	Pin #	Pin #	Signal Name
TX0-	2	1	TX0+
Ground	4	3	Ground
TX1-	6	5	TX1+
5V/3.3V	8	7	Ground
TX3-	10	9	TX3+
TX2-	12	11	TX2+
Ground	14	13	Ground
TXC-	16	15	TXC+
5V/3.3V	18	17	ENABKL
+12V	20	19	+12V

**JP5: SPI Flash Connector (Factory use only)**

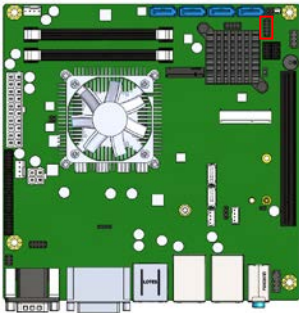


**JP6: USB7/USB8 Connector**

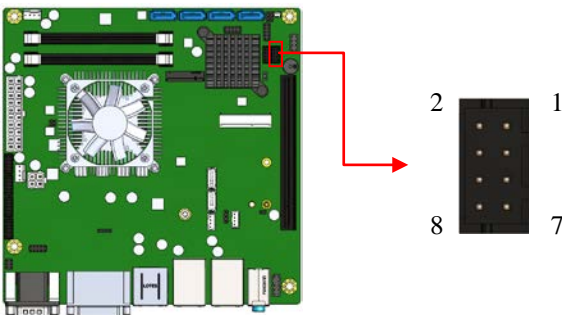


Signal Name	Pin #	Pin #	Signal Name
VCC	1	2	Ground
D0-	3	4	D1+
D0+	5	6	D1-
Ground	7	8	VCC

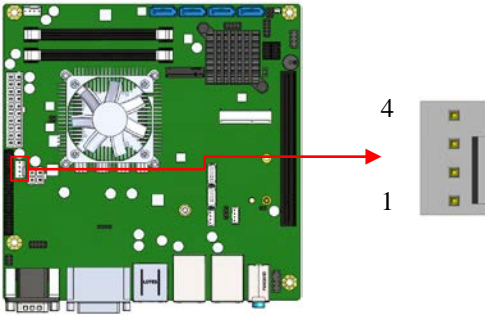
**JP7: LPC Debug Connector (Factory use only)**



**JP8: USB2 11/12 Connector**

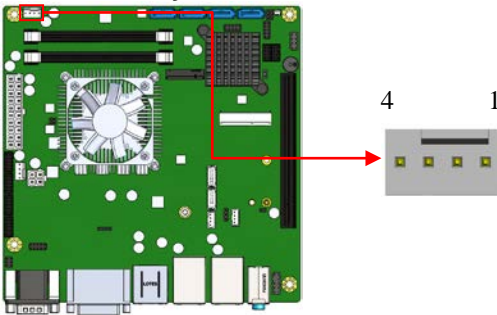


**CPU\_FAN1: CPU Fan Power Connector (PWM Only)**



Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection
4	Control

**SYS\_FAN1: System Fan Power Connector (PWM/DC Mode)**



Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection
4	Control

## **BIOS Setup**

This chapter describes the different settings available in the AMI BIOS that comes with the board. The topics covered in this chapter are as follows:

BIOS Introduction .....	28
BIOS Setup .....	28
Advanced Settings .....	30
CSM Configuration .....	38
Security Settings .....	44
Boot Settings .....	45
Save & Exit Settings .....	46

## BIOS Introduction

The BIOS (Basic Input/Output System) installed in your computer system's ROM supports Intel processors. The BIOS provides critical low-level support for a standard device such as disk drives, serial ports and parallel ports. It also provides password protection as well as special support for detailed fine-tuning of the chipset controlling the entire system.

## BIOS Setup

The BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS ROM of the system stores the Setup utility. When you turn on the computer, the BIOS is immediately activated. Pressing the <Del> key immediately allows you to enter the Setup utility. If you are a little bit late pressing the <Del> key, POST (Power On Self Test) will continue with its test routines, thus preventing you from invoking the Setup. If you still wish to enter Setup, restart the system by pressing the "Reset" button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys. You can also restart by turning the system Off and back On again. The following message will appear on the screen:

```
Press <DEL> or <ESC> to Enter Setup
```

In general, you press the arrow keys to highlight items, <Enter> to select, the <PgUp> and <PgDn> keys to change entries, <F1> for help and <Esc> to quit.

When you enter the Setup utility, the Main Menu screen will appear on the screen. The Main Menu allows you to select from various setup functions and exit choices.

**Warning:** *It is strongly recommended that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both AMI and your system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could cause the system to become unstable and crash in some cases.*



## Main Settings

Aptio Setup Utility – Copyright © 2011 American Megatrends, Inc.

Main	Advanced	Chipset	Security	Boot	Save & Exit
System Date			[Mon 01/11/2016]		Choose the system default language
System Time			[21:52:06]		→ ← Select Screen
					↑ ↓ Select Item
					Enter: Select
					+ - Change Field
					F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

### System Date

Set the Date. Use Tab to switch between Data elements.

### System Time

Set the Time. Use Tab to switch between Data elements.

## Advanced Settings

This section allows you to configure and improve your system and allows you to set up some system features according to your preference.

Aptio Setup Utility					
Main	Advanced	Chipset	Security	Boot	Save & Exit
<ul style="list-style-type: none"> <li>▶ Trusted Computing</li> <li>▶ ACPI Settings</li> <li>▶ iSmart Controller</li> <li>▶ AMT Configuration</li> <li>▶ F81866 Super IO Configuration</li> <li>▶ H/W Monitor</li> <li>▶ CPU Configuration</li> <li>▶ SATA Configuration</li> <li>▶ CSM Configuration</li> <li>▶ Trusted Computing</li> <li>▶ USB Configuration</li> </ul>				→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit	

## Trusted Computing

Aptio Setup Utility					
Main	Advanced	Chipset	Security	Boot	Save & Exit
TPM Configuration TPM SUPPORT			Disabled		→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit
Current TPM Status Information TPM SUPPORT OFF					

## TPM Support

This configuration is supported only with MI990VF. Enables or Disables TPM support. O.S. will not show TPM. Reset of platform is required.

## ACPI Settings

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
ACPI Settings					
Enable Hibernation					Enabled
ACPI Sleep State					S3 (Suspend to R...)
Lock Legacy Resources					Disabled
S3 Video Repost					Disabled
					→ ← Select Screen
					↑ ↓ Select Item
					Enter: Select
					+ - Change Field
					F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

### Enable Hibernation

Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.

### ACPI Sleep State

Select ACPI sleep state the system will enter, when the SUSPEND button is pressed.

### Lock Legacy Resources

Enabled or Disabled Lock of Legacy Resources.

### S3 Video Repost

Enable or disable S3 Video Repost.

**iSmart Controller**

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
iSmart Controller					
	Power-On after Power failure		Disable		→ ← Select Screen
	Temperature Guardian		Disable		↑ ↓ Select Item
	Schedule Slot 1		None		Enter: Select
	Schedule Slot 2		None		+ - Change Field
					F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

**Power-On after Power failure**

This field sets the system power status whether *Disable* or *Enable* when power returns to the system from a power failure situation.

**Temperature Guardian**

Generate the reset signal when system hangs up on POST

**Schedule Slot 1 / 2**

Setup the hour/minute for system power on.

## AMT Configuration

### Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
			Intel AMT	Enabled	
			BIOS Hotkey Pressed	Disabled	
			MEBx Selection Screen	Disabled	
			Hide Un-Configure ME Confirmation Prompt	Disabled	
			Un-Configure ME	Disabled	
			Amt Wait Timer	0	
			Activate Remote Assistance Process	Disabled	→ ← Select Screen
			USB Configure	Enabled	↑ ↓ Select Item
			PET Progress	Enabled	Enter: Select
			AMT CIRA Timeout	0	+ - Change Field
			Watchdog	Disabled	F1: General Help
			OS Timer	0	F2: Previous Values
			BIOS Timer	0	F3: Optimized Default
					F4: Save ESC: Exit

## AMT Configuration

This configuration is supported only with MI990VF (with iAMT function). Options are Enabled and Disabled.

Note: iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device.

## Unconfigure ME

This configuration is supported only with MI990VF (with iAMT function). Perform AMT/ME unconfigure without password operation.

## Amt Wait Timer

Set timer to wait before sending ASF\_GET\_BOOT\_OPTIONS.

## Activate Remote Assistance Process

Trigger CIRA boot.

## PET Progress

User can Enable/Disable PET Events progress to receive PET events or not.

## Watchdog Timer

This configuration is supported only with MI990VF (with iAMT function). Enable/Disable Watchdog Timer.

## F81866 Super IO Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
F81866 Super IO Configuration					
Super IO Chip		F81866			
Standby Power on S5		All Enable			
<ul style="list-style-type: none"> <li>▶ Serial Port 1 Configuration</li> <li>▶ Serial Port 2 Configuration</li> <li>▶ Serial Port 3 Configuration</li> <li>▶ Serial Port 4 Configuration</li> <li>▶ Serial Port 5 Configuration</li> <li>▶ Serial Port 6 Configuration</li> </ul>					→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save   ESC: Exit

### Standby Power on S5

This configuration is supported only with MI990EF.

### Serial Port Configuration

Set Parameters of Serial Ports. User can Enable/Disable the serial port and Select an optimal settings for the Super IO Device.

**H/W Monitor**

## Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
PC Health Status					
CPU Fan smart fan control			Disabled		
SYS Fan smart fan control			Disabled		
CPU temperature			+33 C		
SYS temperature			+34 C		
CPU FAN Speed			6849 RPM		
SYS FAN Speed			0 RPM		
V CORE			+0.992 V		→ ← Select Screen
+5V			+5.087 V		↑ ↓ Select Item
+12V			+12.408 V		Enter: Select
Memory Voltage			+1.208 V		+ - Change Field
VCC3V			+3.376V		F1: General Help
CPU Shutdown Temperature			Disabled		F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

**CPU/SYS smart fan control**

This field enables or disables the smart fan feature.

Disabled (default)

50 °C

60 °C

70 °C

80 °C

90 °C

**Temperatures/Voltages**

These fields are the parameters of the hardware monitoring function feature of the motherboard. The values are read-only values as monitored by the system and show the PC health status.

**CPU Shutdown Temperature**

The default setting is Disabled.

## CPU Configuration

This section shows the CPU configuration parameters.

Aptio Setup Utility - Copyright © 2012 American Megatrends, Inc.

Main	Advanced	Chipset	Security	Boot	Save & Exit
CPU Configuration					
Intel(R) CPU Core(TM)i5-6440EQ CPU @ 2.70GHz					
CPU Signature			506E3		
Microcode Patch			39		
Processor Cores			4		
Hyper Threading Technology			Not Supported		→ ← Select Screen
Intel VT-x Technology			Supported		↑ ↓ Select Item
Intel SMX Technology			Supported		Enter: Select
64-bit			Supported		+ - Change Field
EIST Technology			Supported		F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit
Intel(R) SpeedStep(tm)			Enabled		
Turbo Mode			Enabled		

### Intel(R) SpeedStep(tm)

Allows more than two frequency ranges to be supported.



## SATA Configuration

### SATA Devices Configuration.

Aptio Setup Utility - Copyright © 2012 American Megatrends, Inc.

Main	Advanced	Chipset	Security	Boot	Save & Exit
	SATA Controller(s)		Enabled		
	SATA Mode Selection		AHCI		
	SATA Port0		Empty		
	Software Preserve		Unknown		
	Hot Plug		Disabled		
	SATA Port1		Empty		
	Software Preserve		Unknown		
	Hot Plug		Disabled		
	SATA Port2		Empty		
	Software Preserve		Unknown		
	Hot Plug		Disabled		→ ← Select Screen
	SATA Port3		Empty		↑ ↓ Select Item
	Software Preserve		Unknown		Enter: Select
	Hot Plug		Disabled		+ - Change Opt.
	SATA Port4		Empty		F1: General Help
	Software Preserve		Unknown		F2: Previous Values
	Hot Plug		Disabled		F3: Optimized Defaults
	SATA Port5		Empty		F4: Save & Exit
	Software Preserve		Unknown		ESC: Exit
	Hot Plug		Disabled		

### SATA Controller(s)

Enable or disable SATA Device.

### SATA Mode Selection

Determines how SATA controller(s) operate.

- (1) AHCI Mode.
- (2) RAID Mode. (MI990VF seriesonly)

### Hot Plug

Designates this port as Hot Pluggable.

## CSM Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
Option ROM execution					→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit
Network Do not launch					

### Network

Controls the execution of UEFI and Legacy PXE OpROM

## USB Configuration

Aptio Setup Utility - Copyright © 2012 American Megatrends, Inc.

Main	Advanced	Chipset	Boot	Security	Save & Exit
USB Configuration					
USB Module Version			12		
USB Controllers: 1 XHCI					
USB Devices: 2 Keyboards, 1 Mouse, 2 Hubs					
Legacy USB Support			Enabled		
XHCI Hand-off			Enabled		
USB Mass Storage Driver Support			Enabled		
Port 60/64 Emulation			Disabled		
USB hardware delays and time-outs:					
USB Transfer time-out			20 sec		
Device reset time-out			20 sec		
Device power-up delay			Auto		
					→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

### Legacy USB Support

Enables Legacy USB support.

AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.

**XHCI Hand-off**

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

**USB Mass Storage Driver Support**

Enable/Disable USB Mass Storage Driver Support.

**Port 60/64 Emulation**

Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OSES.

**USB Transfer time-out**

The time-out value for Control, Bulk, and Interrupt transfers.

**Device reset time-out**

USB mass Storage device start Unit command time-out.

**Device power-up delay**

Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken from Hub descriptor.

## Chipset Settings

This section allows you to configure and improve your system and allows you to set up some system features according to your preference.

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
		<ul style="list-style-type: none"><li>▶ System Agent (SA) Configuration</li><li>▶ LCD Control</li><li>▶ PCH-IO Configuration</li></ul>			→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

## System Agent (SA) Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
			System Agent Bridge Name SA PCIe Code Version VT-d VT-d	Skylake 1.5.0.0 Supported Enabled	→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit
		<ul style="list-style-type: none"><li>▶ Graphics Configuration</li><li>▶ Memory Configuration</li></ul>			

### VT-d

Check to enable VT-d function on MCH.

## Graphics Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
Graphics Configuration					
IGFX VBIOS Version			1032		
Graphics Turbo IMON Current			31		
Skip Scanning of External Gfx Card			Disabled		
Primary Display			Auto	→ ← Select Screen	
Primary PEG			Auto	↑ ↓ Select Item	
Primary PCIE			Auto	Enter: Select	
Internal Graphics			Auto	+- Change Field	
GTT Size			8MB	F1: General Help	
Aperture Size			256MB	F2: Previous Values	
DVMT Pre-Allocated			32M	F3: Optimized Default	
DVMT Total Gfx Mem			256MB	F4: Save ESC: Exit	

### Graphics Turbo IMON Current

Graphics turbo IMON current values supported (14-31)

### Skip Scanning of External Gfx Card

If Enable, it will not scan for External Gfx Card on PEG and PCH PCIE ports.

### Primary Display

Select which of IGFX/PEG/PCI graphics device should be primary display or select SG for switchable Gfx.

### Primary PEG

Select PEGO/PEG1/PEG2/PEG3 Graphics device should be Primary PEG.

### Primary PCIE

Select PCIE0/PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6/PCIE7 Graphics device should be primary PCIE.

### Internal Graphics

Keep IGD enabled based on the setup options.

### DVMT Pre-Allocated

Select DVMT 5.0 Pre-Allocated (Fixed) graphics memory size used by the internal graphics device.

### DVMT Total Gfx Mem

Select DVMT 5.0 total graphics memory size used by the internal graphics device.

## Memory Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
Memory Information					→ ← Select Screen
Memory RC Version					↑ ↓ Select Item
Memory Frequency					Enter: Select
Total Memory					+ - Change Field
					F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

## LCD Control

Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
LCD Control					→ ← Select Screen
LCD Control					↑ ↓ Select Item
Disabled					Enter: Select
					+ - Change Field
					F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

## LCD Control

Configuring LFP usage

## PCH-IO Configuration

This section allows you to configure the North Bridge Chipset.

### Aptio Setup Utility

Main	Advanced	Chipset	Security	Boot	Save & Exit
		Intel PCH RC Version	1.5.0.0		
		Intel PCH SKU Name	Server SKU Intel	CM236	
		Intel PCH Rev ID	31/D1		→ ← Select Screen
		PCH LAN Controller	Enabled		↑ ↓ Select Item
		Wake on LAN	Disabled		Enter: Select
					+ - Change Field
					F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

## PCH LAN Controller

Enable or disable onboard NIC.

## Wake on LAN

Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)

## Security Settings

This section allows you to configure and improve your system and allows you to set up some system features according to your preference.

Aptio Setup Utility					
Main	Advanced	Chipset	Security	Boot	Save & Exit
Password Description					
<p>If ONLY the Administrator's password is set, then this only limit access to Setup and is only asked for when entering Setup.</p> <p>If ONLY the User's password is set, then this is a power on password and must be entered to boot or enter Setup. In Setup the User will have Administrator rights</p> <p>The password length must be in the following range:</p>					
Minimum length		3			
Maximum length		20			
Administrator Password					
User Password					
		<p>→ ← Select Screen</p> <p>↑ ↓ Select Item</p> <p>Enter: Select</p> <p>+ - Change Field</p> <p>F1: General Help</p> <p>F2: Previous Values</p> <p>F3: Optimized Default</p> <p>F4: Save ESC: Exit</p>			

### Administrator Password

Set Setup Administrator Password.

### User Password

Set User Password.



## Boot Settings

This section allows you to configure the boot settings.

Aptio Setup Utility					
Main	Advanced	Chipset	Security	Boot	Save & Exit
Boot Configuration					
Setup Prompt Timeout			1		
Bootup NumLock State			Off		
Quiet Boot			Disabled		
Fast Boot			Disabled		
New Boot Option Policy			Default		
Boot mode Select			LEGACY		
FIXED BOOT ORDER Priorities					
Boot Option #1			Hard Disk		
Boot Option #2			CD/DVD		→ ← Select Screen
Boot Option #3			USB Hard Disk		↑ ↓ Select Item
Boot Option #4			USB CD/DVD		Enter: Select
Boot Option #5			USB Key		+ - Change Field
Boot Option #6			USB Floppy		F1: General Help
Boot Option #7			USB Lan		F2: Previous Values
Boot Option #8			Network		F3: Optimized Default
					F4: Save ESC: Exit

### Setup Prompt Timeout

Number of seconds to wait for setup activation key.

65535(0xFFFF) means indefinite waiting.

### Bootup NumLock State

Select the keyboard NumLock state.

### Quiet Boot

Enables/Disables Quiet Boot option.

### Fast Boot

Enables/Disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

### New Boot Option Policy

Controls the placement of newly detected UEFI boot option.

### FIXED BOOT ORDER Priorities

Sets the system boot order.

## Save & Exit Settings

Aptio Setup Utility					
Main	Advanced	Chipset	Security	Boot	Save & Exit
Save Changes and Exit					
Discard Changes and Exit					
Save Changes and Reset					
Discard Changes and Reset					
Save Options					→ ← Select Screen
Save Changes					↑ ↓ Select Item
Discard Changes					Enter: Select
Restore Defaults					+ - Change Field
Save as User Defaults					F1: General Help
Restore User Defaults					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

### Save Changes and Exit

Exit system setup after saving the changes.

### Discard Changes and Exit

Exit system setup without saving any changes.

### Save Changes and Reset

Reset the system after saving the changes.

### Discard Changes and Reset

Reset system setup without saving any changes.

### Save Changes

Save Changes done so far to any of the setup options.

### Discard Changes

Discard Changes done so far to any of the setup options.

### Restore Defaults

Restore/Load Defaults values for all the setup options.

### Save as User Defaults

Save the changes done so far as User Defaults.

### Restore User Defaults

Restore the User Defaults to all the setup options.

## Drivers Installation

This section describes the installation procedures for software and drivers. The software and drivers are included with the motherboard. If you find the items missing, please contact the vendor where you made the purchase. The contents of this section include the following:

Intel Chipset Software Installation Utility .....	48
VGA Drivers Installation.....	50
Realtek HD Audio Driver Installation.....	53
LAN Drivers Installation .....	55
Intel® Management Engine Interface .....	58
Intel® USB 3.0 Drivers .....	60

### **IMPORTANT NOTE:**

After installing your Windows operating system, you must install first the Intel Chipset Software Installation Utility before proceeding with the drivers installation.

## Intel Chipset Software Installation Utility

The Intel Chipset Drivers should be installed first before the software drivers to enable Plug & Play INF support for Intel chipset components. Follow the instructions below to complete the installation.

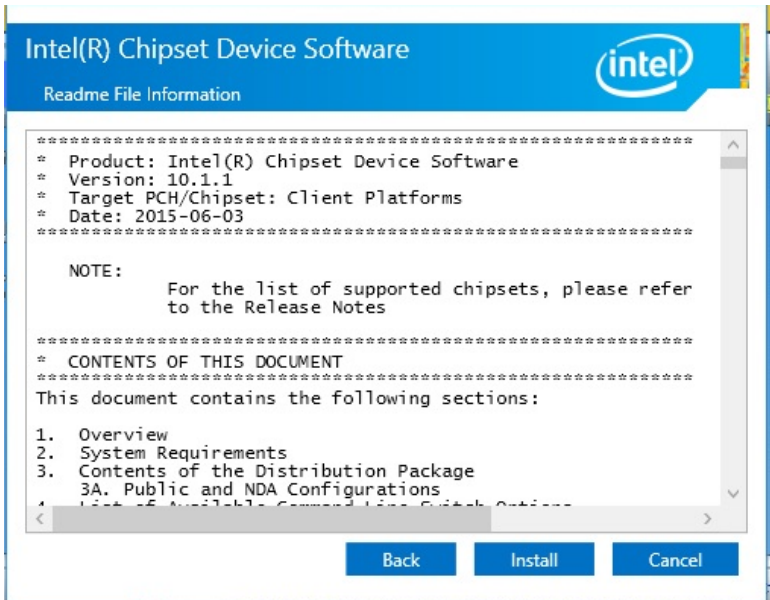
1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.



2. Click **Intel(R) Chipset Software Installation Utility**.



3. When the Welcome screen to the Intel® Chipset Device Software appears, click *Next* to continue.
4. Click *Yes* to accept the software license agreement and proceed with the installation process.
5. On the Readme File Information screen, click *Install* to continue the installation.



6. The Setup process is now complete. Click *Finish* to restart the computer and for changes to take effect.

## VGA Drivers Installation

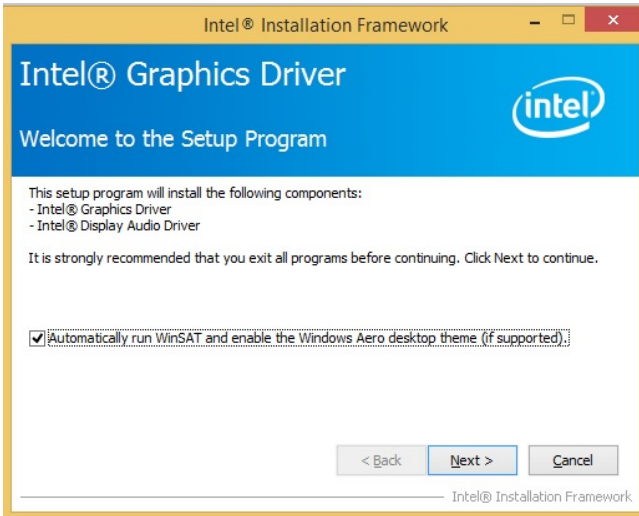
1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.



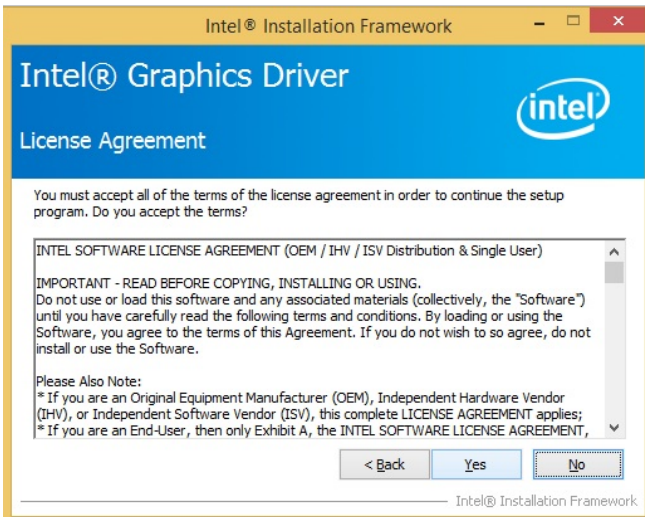
2. Click **Intel(R) HD Graphics Driver**.



3. When the Welcome screen appears, click *Next* to continue.



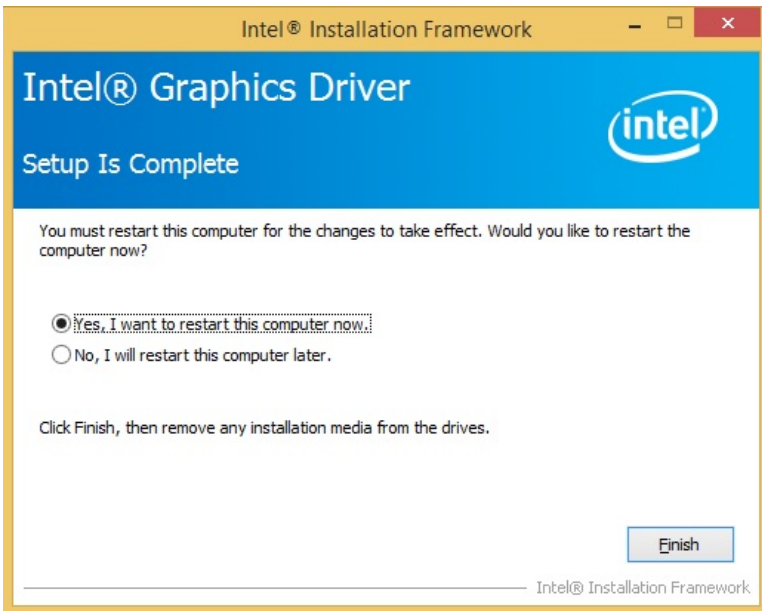
4. Click *Yes* to agree with the license agreement and continue the installation.



5. On the screen shown below, click **Install** to continue.



6. Setup complete. Click **Finish** to restart the computer and for changes to take effect.





## Realtek HD Audio Driver Installation

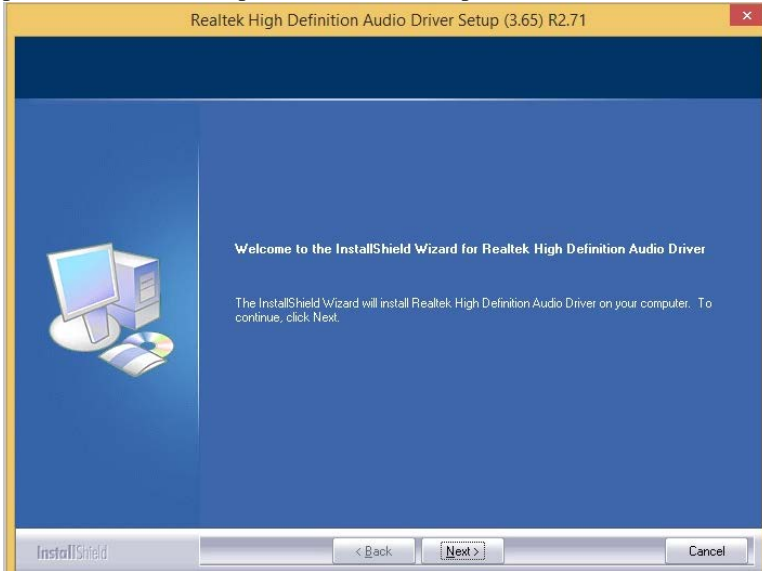
1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.



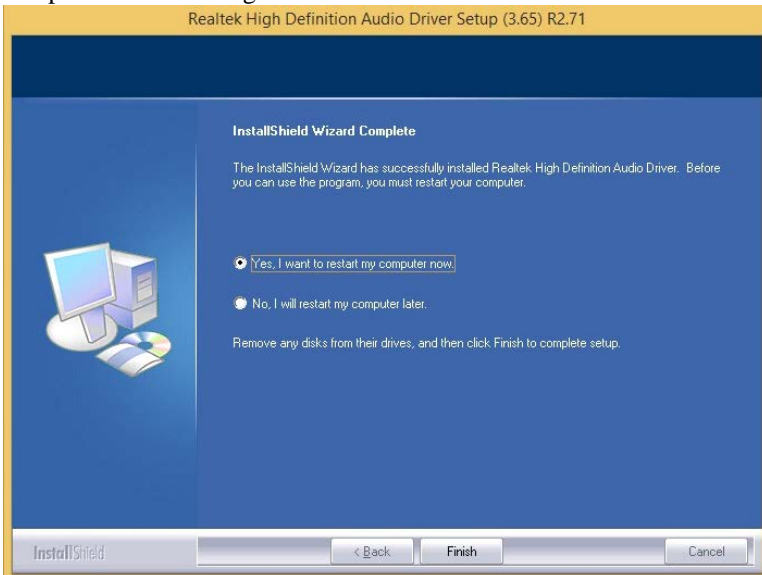
2. Click **Realtek High Definition Audio Driver**.



3. On the Welcome to the InstallShield Wizard screen, click **Next** to proceed with and complete the installation process.



4. The InstallShield Wizard Complete. Click **Finish** to restart the computer and for changes to take effect.



## LAN Drivers Installation

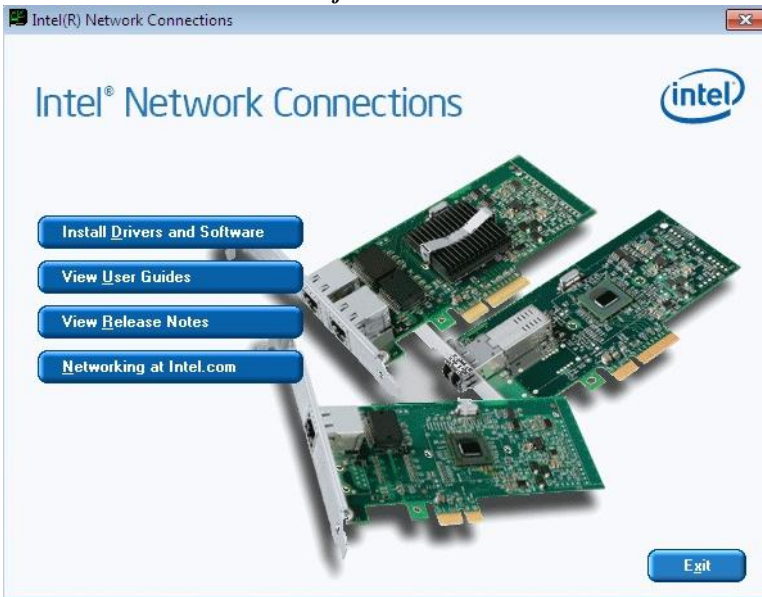
1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.



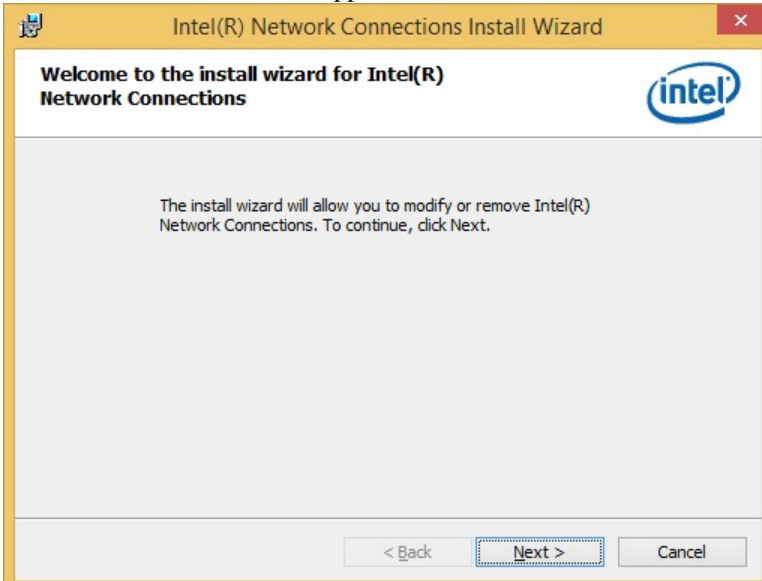
2. Click **Intel(R) PRO LAN Network Driver**.



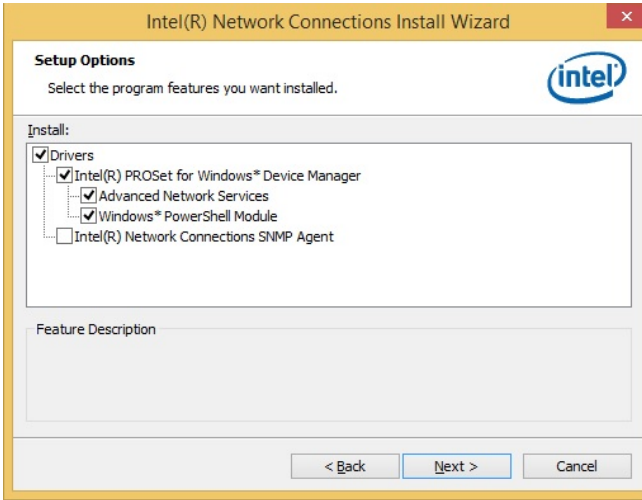
3. Click **Install Drivers and Software**.



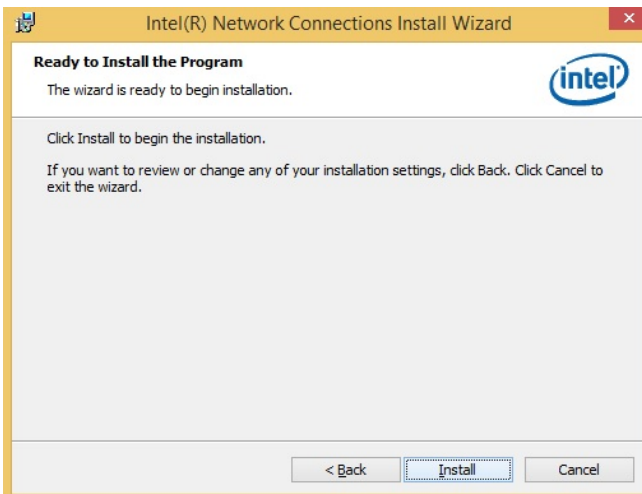
4. When the Welcome screen appears, click **Next**.



5. Click **Next** to agree with the license agreement.
6. Click the checkbox for **Drivers** in the Setup Options screen to select it and click **Next** to continue.



7. The wizard is ready to begin installation. Click **Install** to begin the installation.



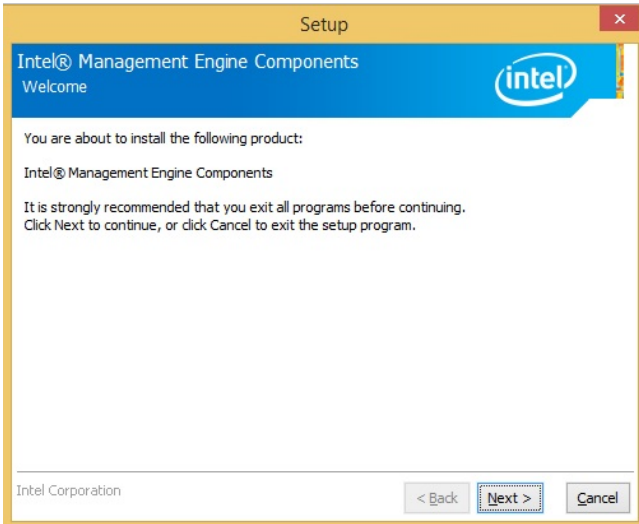
8. When InstallShield Wizard is complete, click **Finish**.

## Intel® Management Engine Interface

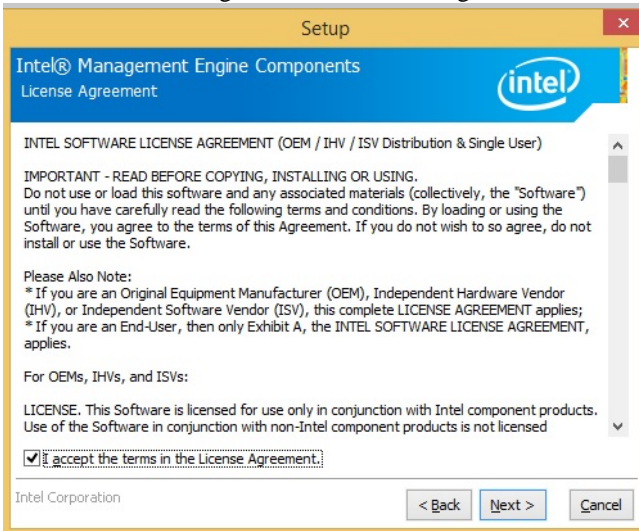
1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.



2. When the Welcome screen to the InstallShield Wizard for Intel® Management Engine Components, click the checkbox for **Install Intel® Control Center** & click **Next**.



3. Click **Next** to agree with the license agreement.



4. When the Setup Progress screen appears, click **Next**. Then, click **Finish** when the setup progress has been successfully installed.

## Intel® USB 3.0 Drivers

1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.

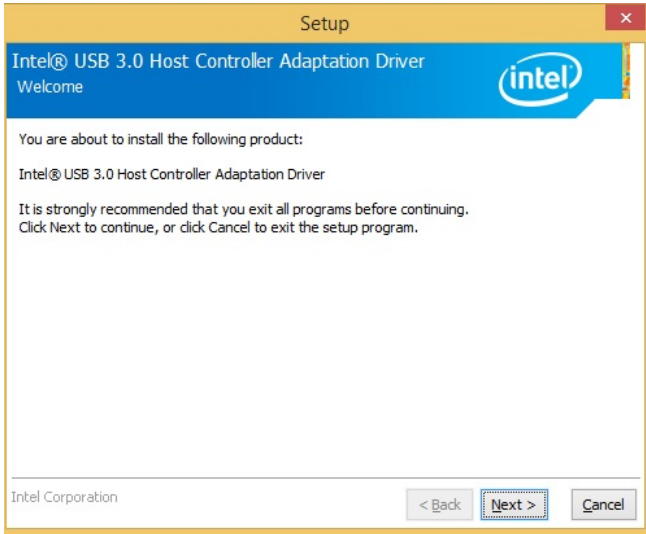


2. Click **Intel(R) USB 3.0 Drivers**.

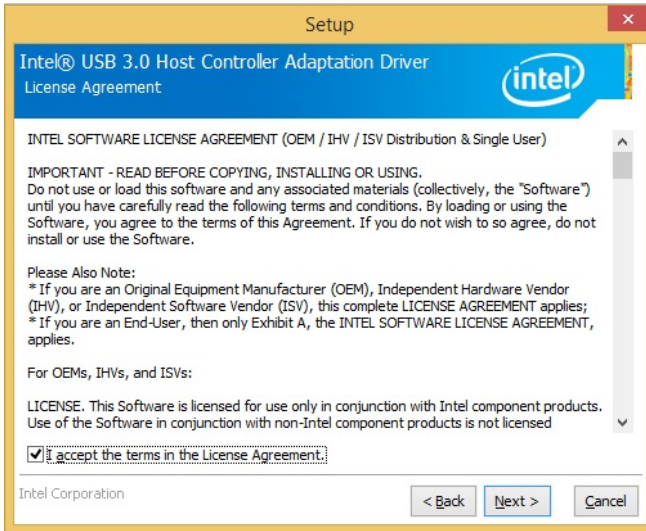




3. When the Welcome screen to the InstallShield Wizard for Intel® USB 3.0 eXtensible Host Controller Driver, click *Next*.



4. Click *Next* to agree with the license agreement and continue the installation.



5. On the Readme File Information screen, click **Next** to continue the installation of the Intel® USB 3.0 eXtensible Host Controller Driver.

6. Setup complete. Click **Finish** to restart the computer and for changes to take effect.



# Appendix

## A. I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device. The following table lists the I/O port addresses used.

Address	Device Description
0000h-0CF7h	PCI Express Root Complex
0040h-0043h	System timer
0050h-0053h	System timer
0070h-0070h	System CMOS/real time clock
00F0h-00F0h	Numeric data processor
02E0h-02E7h	Communications Port (COM6)
02E8h-02EFh	Communications Port (COM4)
02F0h-02F7h	Communications Port (COM5)
02F8h-02FFh	Communications Port (COM2)
03B0h-03BBh	Intel(R) HD Graphics 530
03C0h-03DFh	Intel(R) HD Graphics 530
03E8h-03EFh	Communications Port (COM3)
03F8h-03FFh	Communications Port (COM1)
0D00h-FFFFh	PCI Express Root Complex
E000h-EFFFh	Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 - A115
F000h-F03Fh	Intel(R) HD Graphics 530
F040h-F05Fh	Intel(R) 100 Series/C230 Series Chipset SMBus - A123
F060h-F07Fh	Standard SATA AHCI Controller
F080h-F083h	Standard SATA AHCI Controller
F090h-F097h	Standard SATA AHCI Controller
F0A0h-F0A7h	Intel(R) Active Management Technology - SOL (COM7)

## B. Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function
IRQ0	System Timer
IRQ3	Serial Port #2
IRQ4	Serial Port #1
IRQ5	Serial Port #3
IRQ7	Serial Port #4
IRQ8	Real Time Clock
IRQ 10	Serial Port #5
IRQ 11	Serial Port #6
IRQ 11	High Definition Audio Controller
IRQ 11	Intel(R) 100 Series/C230 Series Chipset Family Integrated Sensor Hub
IRQ 13	Numeric data processor
IRQ 19	Intel(R) Active Management Technology - SOL (COM7)

## C. Watchdog Timer Configuration

The WDT is used to generate a variety of output signals after a user programmable count. The WDT is suitable for use in the prevention of system lock-up, such as when software becomes trapped in a deadlock. Under these sorts of circumstances, the timer will count to zero and the selected outputs will be driven. Under normal circumstance, the user will restart the WDT at regular intervals before the timer counts to zero.

### SAMPLE CODE:

```
//-----
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//-----
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "F81866.H"
//-----
int main (int argc, char *argv[]);
void EnableWDT(int);
void DisableWDT(void);
//-----
int main (int argc, char *argv[])
{
    unsigned char bBuf;
    unsigned char bTime;
    char **endptr;

    char SIO;

    printf("Fintek 81866 watch dog program\n");

    SIO = Init_F81866();
    if (SIO == 0)
    {
        printf("Can not detect Fintek 81866, program abort.\n");
        return(1);
    }/if (SIO == 0)

    if (argc != 2)
    {
        printf(" Parameter incorrect!!\n");
        return (1);
    }

    bTime = strtol (argv[1], endptr, 10);
    printf("System will reset after %d seconds\n", bTime);

    if (bTime)
    {
        EnableWDT(bTime); }
    else
    {
        DisableWDT(); }

    return 0;
}
```

```

}
//-----
void EnableWDT(int interval)
{
    unsigned char bBuf;

    bBuf = Get_F81866_Reg(0x2B);
    bBuf &= (~0x20);
    Set_F81866_Reg(0x2B, bBuf); //Enable WDTO

    Set_F81866_LD(0x07); //switch to logic device 7
    Set_F81866_Reg(0x30, 0x01); //enable timer

    bBuf = Get_F81866_Reg(0xF5);
    bBuf &= (~0x0F);
    bBuf |= 0x52; //count mode is second
    Set_F81866_Reg(0xF5, bBuf);

    Set_F81866_Reg(0xF6, interval); //set timer

    bBuf = Get_F81866_Reg(0xFA);
    bBuf |= 0x01;
    Set_F81866_Reg(0xFA, bBuf); //enable WDTO output

    bBuf = Get_F81866_Reg(0xF5);
    bBuf |= 0x20;
    Set_F81866_Reg(0xF5, bBuf); //start counting
}
//-----
void DisableWDT(void)
{
    unsigned char bBuf;

    Set_F81866_LD(0x07); //switch to logic device 7

    bBuf = Get_F81866_Reg(0xFA);
    bBuf &= ~0x01;
    Set_F81866_Reg(0xFA, bBuf); //disable WDTO output

    bBuf = Get_F81866_Reg(0xF5);
    bBuf &= ~0x20;
    bBuf |= 0x40;
    Set_F81866_Reg(0xF5, bBuf); //disable WDT
}
//-----

```

```

//-----
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//-----
#include "F81866.H"
#include <dos.h>
//-----
unsigned int F81866_BASE;
void Unlock_F81866 (void);
void Lock_F81866 (void);
//-----
unsigned int Init_F81866(void)
{
    unsigned int result;
    unsigned char ucDid;

    F81866_BASE = 0x4E;
    result = F81866_BASE;

    ucDid = Get_F81866_Reg(0x20);
    if (ucDid == 0x07) //Fintek 81866
    {
        goto Init_Finish;
    }

    F81866_BASE = 0x2E;
    result = F81866_BASE;

    ucDid = Get_F81866_Reg(0x20);
    if (ucDid == 0x07) //Fintek 81866
    {
        goto Init_Finish;
    }

    F81866_BASE = 0x00;
    result = F81866_BASE;

Init_Finish:
    return (result);
}
//-----
void Unlock_F81866 (void)
{
    outportb(F81866_INDEX_PORT, F81866_UNLOCK);
    outportb(F81866_INDEX_PORT, F81866_UNLOCK);
}
//-----
void Lock_F81866 (void)
{
    outportb(F81866_INDEX_PORT, F81866_LOCK);
}
//-----
void Set_F81866_LD( unsigned char LD)
{
    Unlock_F81866();
    outportb(F81866_INDEX_PORT, F81866_REG_LD);
    outportb(F81866_DATA_PORT, LD);
    Lock_F81866();
}
//-----
void Set_F81866_Reg( unsigned char REG, unsigned char DATA)
{
    Unlock_F81866();
    outportb(F81866_INDEX_PORT, REG);
    outportb(F81866_DATA_PORT, DATA);
    Lock_F81866();
}
//-----

```

## APPENDIX

---

```
unsigned char Get_F81866_Reg(unsigned char REG)
{
    unsigned char Result;
    Unlock_F81866();
    outportb(F81866_INDEX_PORT, REG);
    Result = inportb(F81866_DATA_PORT);
    Lock_F81866();
    return Result;
}
//-----

//-----
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//-----
#ifndef __F81866_H
#define __F81866_H                1
//-----
#define F81866_INDEX_PORT        (F81866_BASE)
#define F81866_DATA_PORT        (F81866_BASE+1)
//-----
#define F81866_REG_LD            0x07
//-----
#define F81866_UNLOCK            0x87
#define F81866_LOCK              0xAA
//-----
unsigned int Init_F81866(void);
void Set_F81866_LD(unsigned char);
void Set_F81866_Reg(unsigned char, unsigned char);
unsigned char Get_F81866_Reg(unsigned char);
//-----
#endif //__F81866_H
```