

MI991

**Intel® 7th / 6th Generation Core
C236/Q170/H110 PCH
Mini ITX Motherboard**

USER'S MANUAL

Version 1.1

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Introduction

Product Description

The MI991 Mini ITX motherboard is based on the latest Intel® C236/Q170/H110 chipset. The platform supports 7th / 6th Generation Intel® Core processor family with LGA1151 packing and features an integrated dual-channel DDR4 memory controller as well as a graphics core.

The latest Intel® processors provide advanced performance in both computing and graphics quality. This meets the requirement of customers in the gaming, POS, digital signage and server market segment.

The C236/Q170/H110 platform is made with 14-nanometer technology that supports Intel's first processor architecture to unite the CPU and the graphics core on the transistor level. The MI991 Mini ITX board utilizes the dramatic increase in performance provided this Intel's latest cutting-edge technology. Measuring 170mm x 170mm, the MI991 offers fast 6Gbps SATA support (4 ports), USB3.0 (6 ports) and interfaces for DVI-D, HDMI and DP displays. MI991AF-C236 and MI991AF features Intel® Active Management Technology 11.0.

MI991 FEATURES:

- Supports Intel® 7th / 6th Generation Core i7/i5/i3 QC/DC desktop processors
- Two DDR4 SO-DIMM, 2133MHz, Max. 32GB memory
- Dual Intel® PCI-Express Gigabit LAN
- Integrated Graphics for DVI-D/DP/HDMI displays
- 4x SATA 3.0, 8x USB 2.0, USB 3.0 (6 ports)
- 4x COM, Watchdog timer
- 1x PCI-E (x16), 2x Mini PCI-E
- Optional AMT (MI991AF-C236 and MI991AF only)

Checklist

Your MI991 package should include the items listed below.

- The MI991 Mini ITX motherboard
- This User's Manual
- 1 DVD containing chipset drivers and flash memory utility
- Serial ATA cable
- USB cable
- COM port cable
- I/O shield
- Audio Chassis Front Panel cable (Optional)

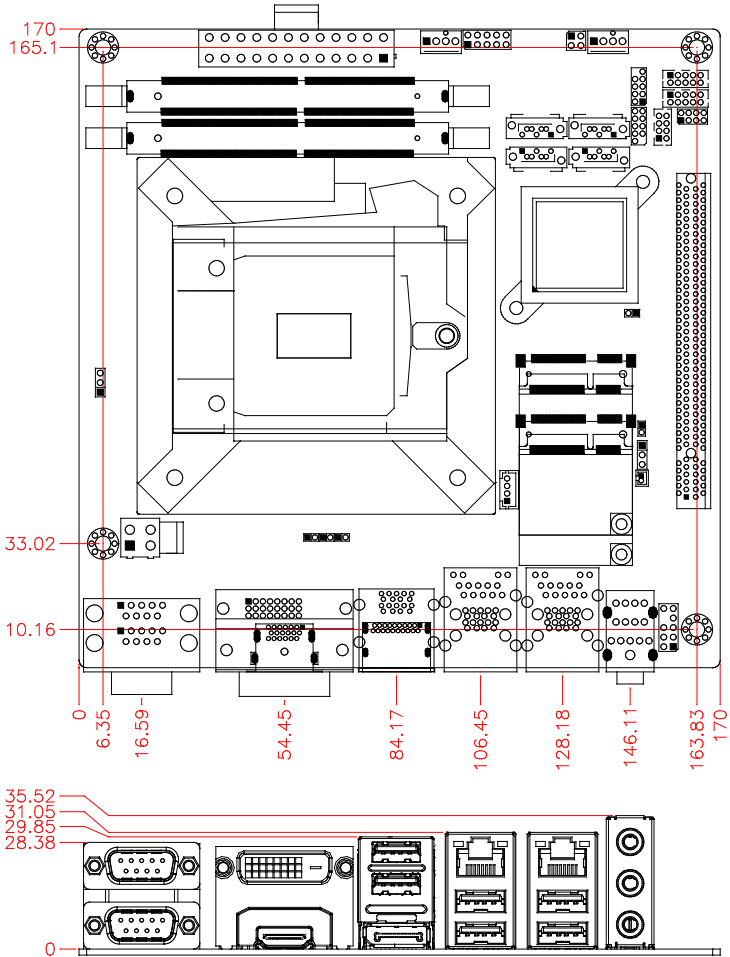
MI991 Specifications

| | |
|-----------------------|---|
| Product Name | MI991AF [Intel Q170 PCH onboard] MI991EF [Intel H110 PCH onboard] MI991AF-C236 [Intel C236 PCH onboard] **MI991AF will be the model name printed on PCB surface** |
| Form Factor | Mini-ITX |
| BIOS | AMI BIOS |
| CPU Type | Intel 7 th / 6 th Generation Intel® Xeon®/Core™ i7/i5/i3/Pentium DT processor FCLGA1151 package [37.5 mm x 37.5mm], TDP: 80W/65W/47W/35W Xeon® E3-1275 V5 (3.6GHz ~ 4GHz) @ 80W Xeon® E3-1225 V5 (3.3GHz ~ 3.7GHz) @ 80W Xeon® E3-1268L V5 (2.4GHz ~ 3.4GHz) @35W Core™ i7-6700 (3.4GHz ~ 4GHz) @65W Core™ i7-6700TE (2.4GHz ~ 3.4GHz) @35W Core™ i5-6500 (3.2GHz ~ 3.6GHz) @65W Core™ i5-6500TE (2.3GHz ~ 3.3GHz) @35W Core™ i3-6100 (3.7GHz) @47W Core™ i3-6100TE (2.7GHz @35W Pentium® G4400 (3.3GHz) @47W Pentium® G4400TE (2.4GHz) @35W Celeron® G3900 (2.8GHz) @65W Celeron® G3900TE (2.6GHz) @35W |
| Cache Size | Up to 8MB |
| CPU Socket | LGA1151 |
| Chipset | Intel® C236/Q170/H110 PCH, Package =23 mm x 23 mm, TDP=6W |
| Memory | Intel® 7 th / 6 th Generation DT processors integrated memory controller, - DDR4 SO-DIMM x 2, Max. =32GB [Vertical type] DDR4-2133 MHz with 1.2V, ECC supported by CPU sku |
| VGA | Intel® 7 th / 6 th Generation DT processor integrated HD Gfx, supports 3 independent displays, DirectX 12, OpenGL 4.4 - DisplayPort x 1 (DP++, Thru port D, supports DP1.3) **Resolution up to 4096x2304 @ 60 Hz** - HDMI X 1 (Thru port B, with level shifter ASM1442K, supports HDMI 1.4) ** Resolution up to 4096x2160 @ 24 Hz** - DVI-D x 1 (Thru port C, with level shifter ASM1442K) ** Resolution up to 4096x2160 @ 24 Hz** |
| LAN | 1. Intel® Jacksonville I219LM GbE PHY (C236 / Q170) [PCIe port #4] Intel® Jacksonville I219V GbE PHY (H110) [PCIe port #4] 2. Intel® Pearsonville I211AT as 2nd GbE [PCIe port #12] |
| USB | USB 3.0 host controller [PCH Integrated], support 6 ports - 4 ports via rear panel I/O [USB3 port #1~#4] - Extra 2 ports via rear I/O panel [USB3 port #5~#6] (**MI991AF only**) USB 2.0 host controller [PCH Integrated], support 6 ports - 2 ports via rear panel I/O (**MI991EF only) - 2 ports via MiniPCIe socket - 2 ports via onboard pin header |
| Serial ATA | Intel® SKL-H PCH built-in SATA controller - 4 x SATA 3.0 for MI991AF (C236/ Q170) [PCIe port #14~#17] - 3 x SATA 3.0 for MI991EF (H110) [PCIe port #14~#16] |
| Storage Device | mSATA x 1 thru Mini-PCIe slot [full-sized] [PCIe port #13] |
| Audio | Intel® SKL-H PCH built-in High Definition Audio controller + Realtek ALC662 w/ 5.1 channels |

INTRODUCTION

| | |
|----------------------------------|---|
| LPC I/O | Fintek F81846AD-I (128-pin LQFP [14mm x 14 mm]) - COM #1 (RS232/422/485) w/Fintek F81439 transceiver for jumper-less selection - COM #2~COM #4 (RS232 only) Hardware Monitor (2 thermal inputs, 4 voltage monitor inputs) CPU Fan x 1(PWM type, 4-pin) + SYS FAN x 1(PWM type, 4-pin) |
| Digital IO | 4 in & 4 out |
| IAMT 11.0 | Intel® C236/ Q170 PCH built-in (MI991AF only) |
| TPM 1.2 | Infineon SLB9660 [C01Z9660TT1207000P] for MI991AF series Co-lay with ATMEL AT97SC3204-X4A14-10 [C01Z97SC3204X4000P] **Meet FIPS 140-2 certification** |
| Expansion Slots | - PCI-Express (16x) x1 [Gen 3.0 PEG] ** Support bifurcation to 2x(8x) and 1x (8x) + 2 x (4x)** - Mini PCIe x 2 w/ USB 2.0 signal [1 x Full-sized, 1 x Half-sized] [PCIe port #5~#6] - Supports mSATA thru Full-sized mini PCIe slot |
| Edge Connectors | Dual DB9 stack connector for COM #1 / COM #2 DVI-D + HDMI stack connector x 1 DP + dual USB (3.0) [Blue color] stack connector x 1 RJ-45 (I219LM/V PHY)+ dual USB (3.0)[Blue color] stack connector x 1 RJ-45 (I211AT GbE)) + dual USB (3.0) [Blue color] stack connector x 1 Or RJ-45 (I211AT GbE)+ dual USB (2.0) stack connector x 1 [MI991EF] Triplet type jack 3 x 1 for HD audio port [Line-in / Line-out / Mic-in] |
| Onboard Header/ Connector | 4 ports x SATA III [Blue color] or 3 ports (H110 only) DF-11 2x4 pin-header x 1 for 2 ports USB 2.0 DF-11 2x5 box header x 2 for COM3/4 (RS232 only) 2x5 pin-header x 1 for front Audio (2.54 pitch) 2x5 pin-header x1 for Digital IO 2 x 4 pin header x 1 for front panel I/O (2.0 pitch) 2 x 2 pins ATX power connector x 1 2 x 2 pin header x 1 (Reserved for O company) 1 x ATX standard 24 pins type for power connector 2-pin connector for RTC battery (Refer to MI991) |
| Watchdog Timer | Yes (256 segments, 0, 1, 2...255 sec./min) |
| System Voltage | ATX standard 24-pins type & 4 pin type (+12V only) |
| iSMART Ver. 3.x | Yes |
| RAID | RAID function (0,1,5) ** MI991AF only** |
| Others | LAN Wakeup RTC battery by wiring type |
| Environment | Operation Temperature: 0~60 degree C Storage Temperature: -20~80 degree C Relative humidity: 0~90%, non-condensing |
| OS supporting | Windows 8.1(64b) / Embedded Industry 8.1(64b) Windows 10 (64b) Linux Fedora (64b) / Ubuntu (64b) Windows 7 Pro (64b/32b) |
| Certification | CE (EN55032: 2012) FCC Class B LVD |
| Board Size | 170mm x 170mm |
| RoHS | Yes |

Board Dimensions



Installations

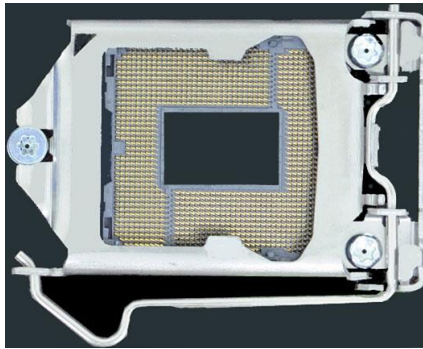
This section provides information on how to use the jumpers and connectors on the MI991 in order to set up a workable system. The topics covered are:

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Installing the CPU

The MI991 board supports an LGA1151 Socket (shown below) for Intel 7th / 6th Generation Core processors.

To install the CPU, unlock first the socket by pressing the lever sideways, then lift it up to a 90-degree. Then, position the CPU above the socket such that the CPU corner aligns with the gold triangle matching the socket corner with a small triangle. Carefully insert the CPU into the socket and push down the lever to secure the CPU. Then, install the heat sink and fan.



NOTE: *Ensure that the CPU heat sink and the CPU top surface are in total contact to avoid CPU overheating problem that would cause your system to hang or be unstable.*

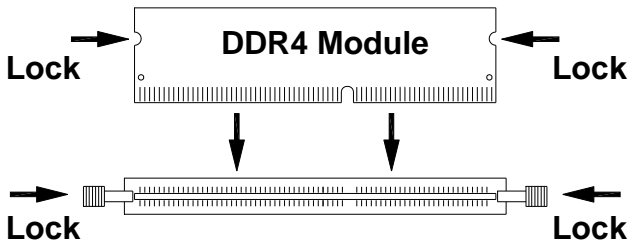
Installing the Memory

The MI991 board supports two DDR4 memory socket for a maximum total memory of 32GB in DDR4 SO-DIMM 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.

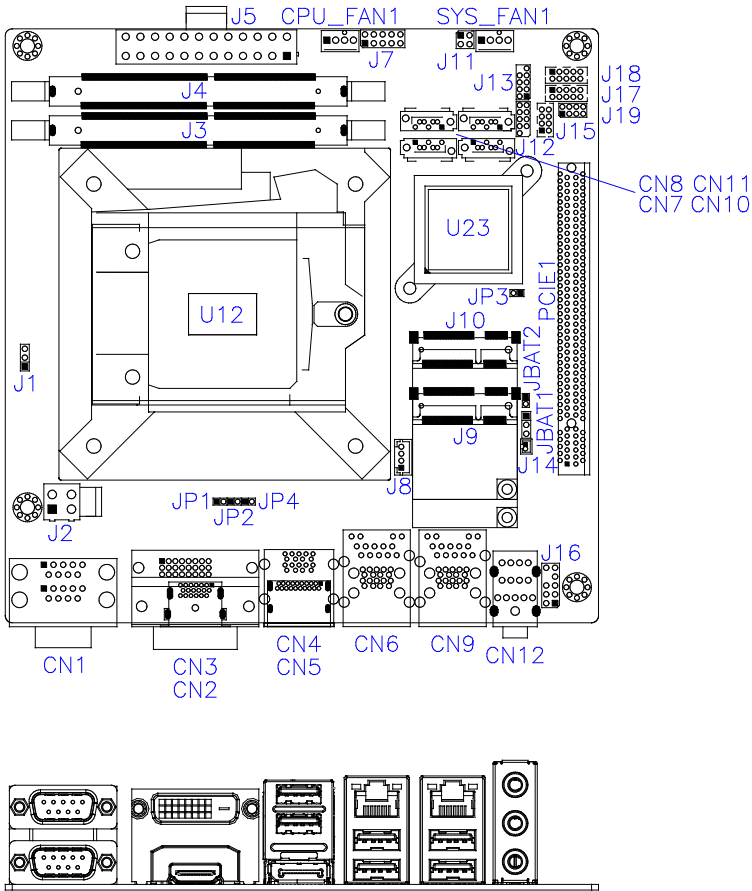


Setting the Jumpers

Jumpers are used on MI991 to select various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your needs. The following lists the connectors on MI991 and their respective functions.

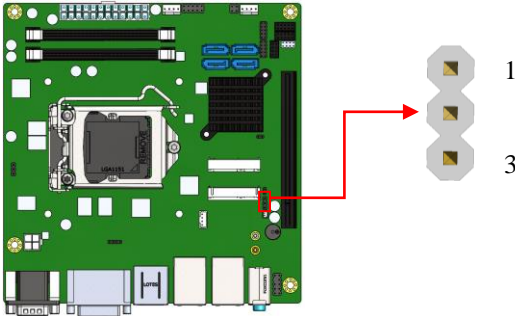
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| JP1, JP2: PCI-E x16 Mode Selection | 12 |
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Jumper Locations on MI991



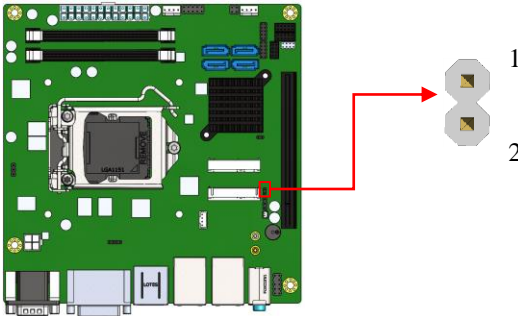
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|--|------|
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JBAT1: Clear CMOS Contents (E-CALL 0125-01-203-030)



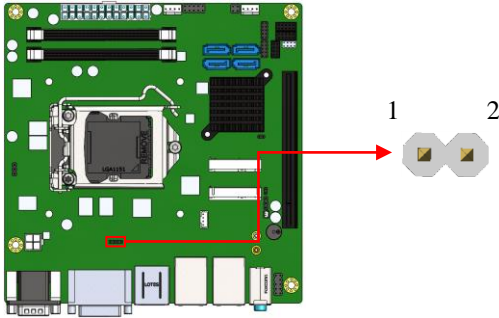
| JBAT1 | Setting | Function |
|-----------|-------------------------|------------|
| 1 2 3 | Pin 1-2 Short/Closed | Normal |
| 1 2 3 | Pin 2-3 Short/Closed | Clear CMOS |

JBAT2: Clear RTC Contents (0195-01-200-020)



| JBAT2 | Flash Descriptor Security Override |
|-------|------------------------------------|
| Open | Normal (Default) |
| Close | Clear RTC |

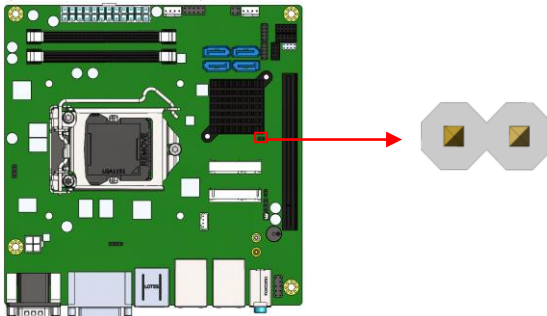
JP1, JP2: PCI-E x16 Mode Selection (0195-01-200-020)



| JP1, JP2 | Function |
|------------------------|-----------------|
| JP1/Open JP2/Open | 1 x16 (Default) |
| JP1/Open JP2/Short | 2 x8 |
| JP1/Short JP2/Short | 1 x8, 2 x4 |

Note: MI991AF-C236 and MI991AF used only

JP3: Flash Descriptor Security Override (Factory use only) (0195-01-200-020)

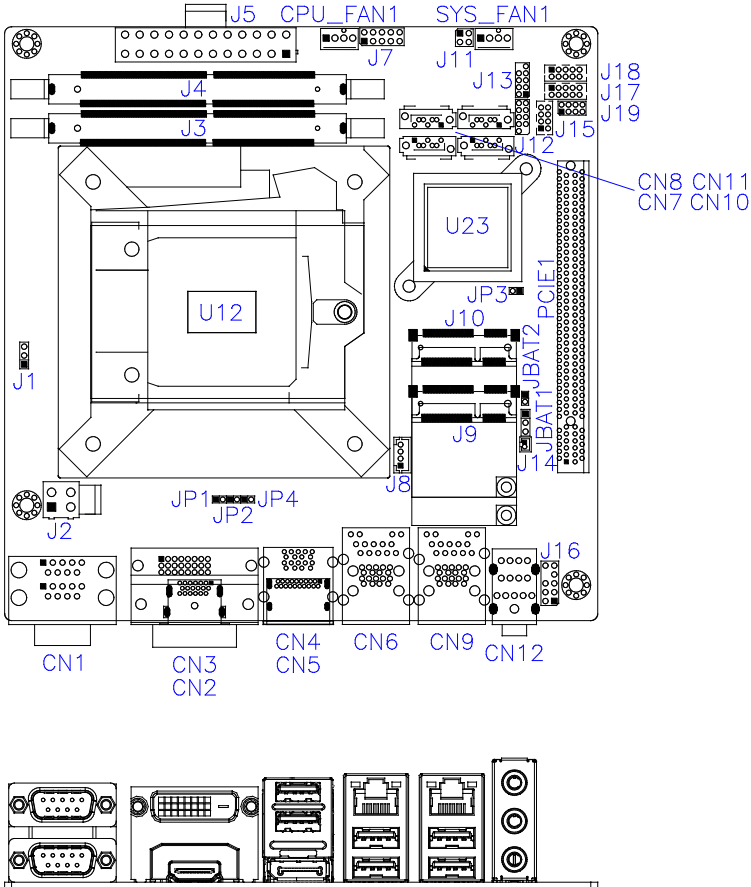


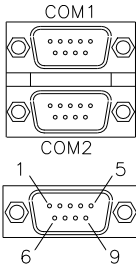
| JP3 | Flash Descriptor Security Override |
|-------|------------------------------------|
| Open | Disabled (Default) |
| Close | Enabled |

Connectors on MI991

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| SYS_FAN1: System Fan1 Power Connector..... | 23 |
| PCIE1: PCI-E X16 Slot | 24 |

Connector Locations on MI991



CN1: COM1 and COM2 Serial Ports (40909AANSABR)

| 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 |

Note: COM2 Support RS-232 only.

CN2, CN3: DVI-D and HDMI Connector

CN4, CN5: Display Port + USB3.0 0/1 Connector

CN6: Gigabit LAN (Intel I219LM/I219V) + USB3.0 2/3

CN7, CN8, CN10, CN11: SATA Connectors

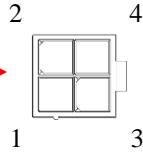
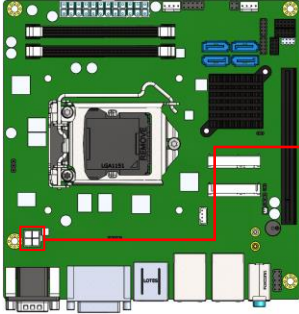
CN9: Gigabit LAN (Intel I211AT) + USB3.0 4/5

CN12: HD Audio Connector

INSTALLATIONS

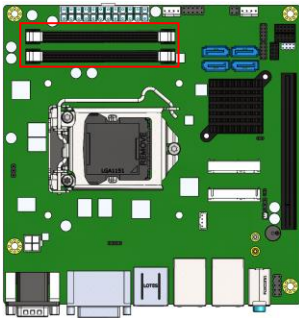
J2: ATX 12V Power Connector (HAOGUO ATX4PT-NY46)

This connector supplies the CPU operating voltage.

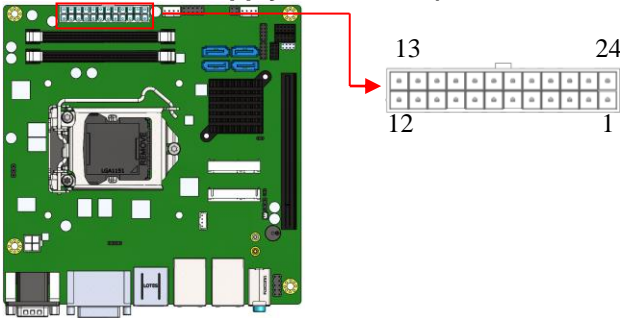


| Pin # | Signal Name |
|-------|-------------|
| 1 | Ground |
| 2 | Ground |
| 3 | +12V |
| 4 | +12V |

J3, J4: DDR4 SO-DIMM Connector (LOTES DDR0075-P001C)



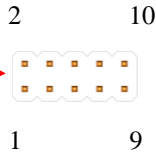
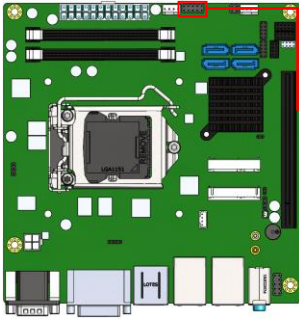
J5: ATX Power Supply Connector (HAOGUO 01-0018-03)



| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|-------------|
| 3.3V | 13 | 1 | 3.3V |
| -12V | 14 | 2 | 3.3V |
| Ground | 15 | 3 | Ground |
| PS-ON | 16 | 4 | +5V |
| Ground | 17 | 5 | Ground |
| Ground | 18 | 6 | +5V |
| Ground | 19 | 7 | Ground |
| -5V | 20 | 8 | Power good |
| +5V | 21 | 9 | 5VSB |
| +5V | 22 | 10 | +12V |
| +5V | 23 | 11 | +12V |
| Ground | 24 | 12 | +3.3V |

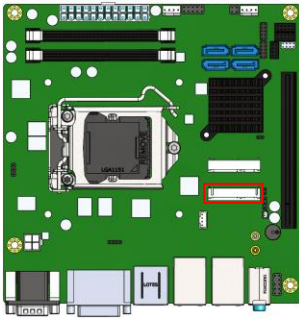
INSTALLATIONS

J7: Digital I/O Connector (E-CALL 0126-01-203-100)

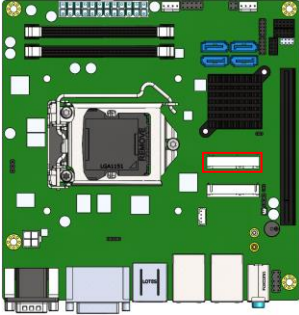


| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|-------------|
| GND | 1 | 2 | VCC |
| OUT3 | 3 | 4 | OUT1 |
| OUT2 | 5 | 6 | OUT0 |
| IN3 | 7 | 8 | IN1 |
| IN2 | 9 | 10 | IN0 |

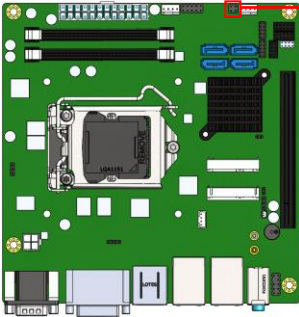
J9: Mini PCI-E Connector (Foxconn AS0B226-S56Q-7H)



**J10: Mini PCI-E Connector (Supports mSATA Function)
(Foxconn AS0B226-S99Q-7H)**



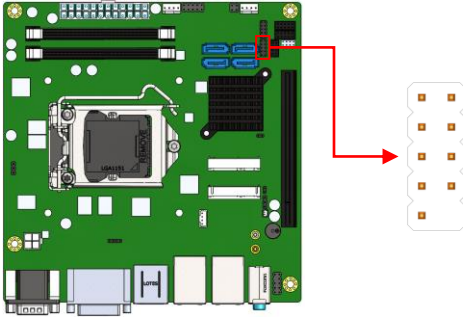
J11: ACPI Status LED (E-CALL 0126-01-203-040)



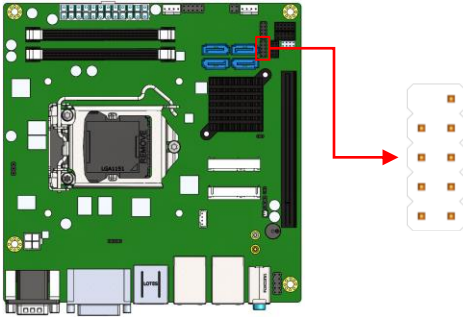
| Pin # | Signal Name |
|-------|-------------|
| 1 | +3VDUAL |
| 2 | GND |
| 3 | +VCC3 |
| 4 | GND |

INSTALLATIONS

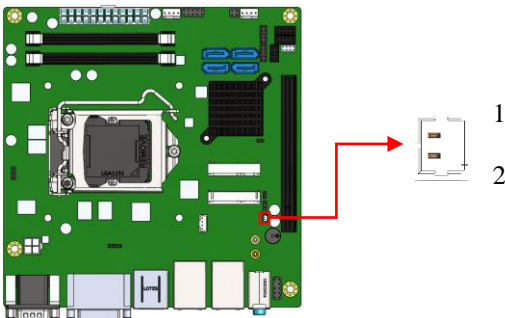
J12: SPI Flash Connector (Factory use only) (E-CALL 0196-01-2001009)



J13: Debug 80 Port Connector (Factory use only) (E-CALL 0196-01-2001009)

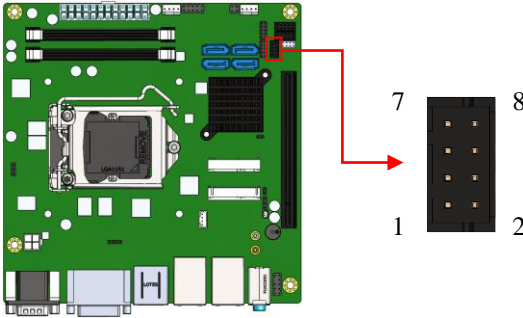


J14: Battery Connector (世均1252-WS2-02-LF)



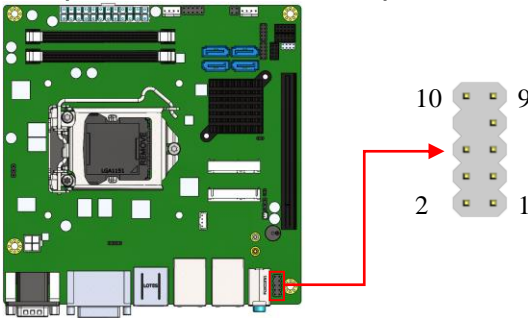
| Pin # | Signal Name |
|-------|-------------|
| 1 | Battery+ |
| 2 | GND |

J15: USB2.0 Connectors (HAOGUO DF11-8S-PA66H)



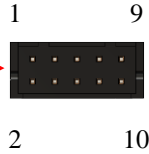
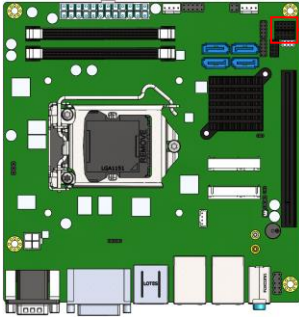
| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|-------------|
| VCC | 1 | 2 | Ground |
| D0- | 3 | 4 | D1+ |
| D0+ | 5 | 6 | D1- |
| Ground | 7 | 8 | VCC |

J16: Audio Pin Header for Chassis Front Panel (E-CALL 0126-01-2821009)



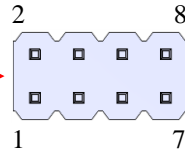
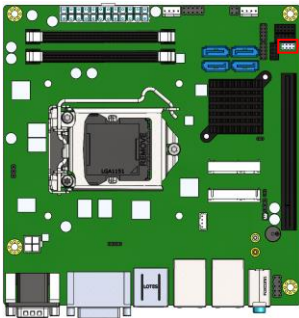
| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|--------------|
| MIC IN_L | 1 | 2 | Ground |
| MIC IN_R | 3 | 4 | DET |
| LINE_R | 5 | 6 | Sense Ground |
| Sense | 7 | 8 | Key |
| LINE_L | 9 | 10 | Sense Ground |

**J17, J18: COM3/4 RS232 Serial Ports
(HAOGUO DF11-10S-PA66H)**



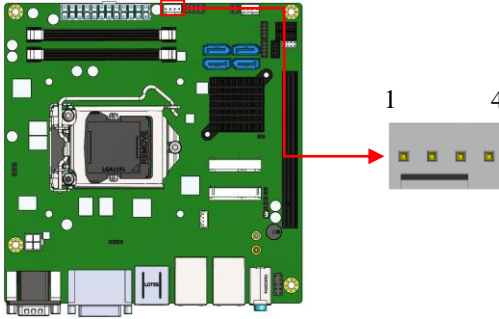
| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|-------------|
| DCD# | 1 | 6 | DSR# |
| SIN | 2 | 7 | RTS# |
| SOUT | 3 | 8 | CTS# |
| DTR# | 4 | 9 | RI# |
| GND | 5 | X | KEY |

J19: Front Panel Function Connector (0196-01-200-080)



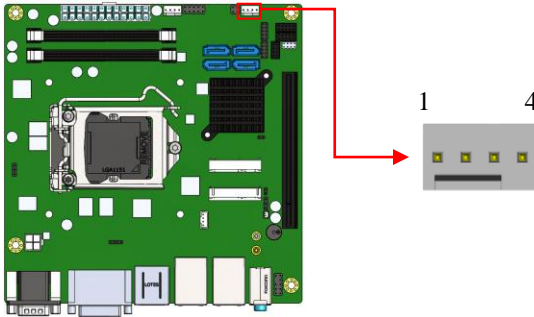
| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|---------------|
| Ground | 1 | 2 | PWR_SW |
| PWR_LED+ | 3 | 4 | PWR_LED-(GND) |
| HDD_LED+ | 5 | 6 | HDD_LED- |
| Ground | 7 | 8 | Reset |

CPU_FAN1: CPU Fan Power Connector (HF27040-M1)



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

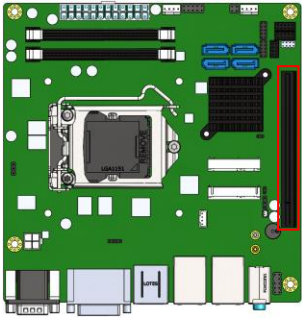
SYS_FAN1: System Fan1 Power Connector (HF27040-M1)



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

INSTALLATIONS

PCIE1: PCI-E X16 Slot (2EG08211-D2D-DF)



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 | 26 |
| BIOS Setup | 26 |
| Advanced Settings | 錯誤! 尚未定義書籤。 |
| CSM Configuration | 錯誤! 尚未定義書籤。 |
| Chipset Settings..... | 錯誤! 尚未定義書籤。 |
| Security Settings | 錯誤! 尚未定義書籤。 |
| Boot Settings | 錯誤! 尚未定義書籤。 |
| Save & Exit Settings..... | 錯誤! 尚未定義書籤。 |

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 key immediately allows you to enter the Setup utility. If you are a little bit late pressing the 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 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 |
|------------------|----------|---------|------------------|------|------------------------------------|
| Total Memory | | | 4096 MB | | Choose the system default language |
| Memory Frequency | | | 2133 MHz | | → ← Select Screen |
| | | | | | ↑ ↓ Select Item |
| System Date | | | [Tue 01/20/2009] | | Enter: Select |
| System Time | | | [21:52:06] | | + - 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"> ▶ CPU Configuration ▶ Power & Performance ▶ PCH-FW Configuration ▶ Trusted Computing ▶ ACPI Settings ▶ iSmart Controller ▶ F81846 Super IO Configuration ▶ Hardware Monitor ▶ CSM Configuration ▶ USB Configuration | | | | → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit |

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 | | | | |
| Type | | Intel(R) Core(TM)i5-7500 | | CPU @ | |
| | | 2.40GHz | | | |
| ID | | 0x906E9 | | | |
| Speed | | 3400 MHz | | | |
| VMX | | Supported | | | |
| SMX/TXT | | Supported | | | |
| | Intel (VMX) Virtualization Technology | Enabled | | | → ← Select Screen |
| | Active Processor Cores | All | | | ↑ ↓ Select Item |
| | AES | Enabled | | | Enter: Select |
| | Intel Trusted Execution Technology | Disabled | | | + - Change Field |
| | | | | | F1: General Help |
| | | | | | F2: Previous Values |
| | | | | | F3: Optimized Default |
| | | | | | F4: Save ESC: Exit |

Intel (VMX) Virtualization Technology

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Active Processor Cores

Number of cores to enable in each processor package.

AES

Enable/Disable AES (Advanced Encryption Standard).

Power & Performance

Aptio Setup Utility

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

CPU - Power Management Control

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|--------------------------------|---------------------------------|---------|----------|------|---|
| CPU - Power Management Control | | | | | → ← Select Screen |
| | Intel(R) SpeedStep(tm) | | Enabled | | ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit |
| | Intel(R) Speed Shift Technology | | Enabled | | |
| | Turbo Mode | | Enabled | | |

Intel(R) SpeedStep(tm)

Allows more than two frequency ranges to be supported.

Intel(R) Speed Shift Technology

Enable/Disable Intel(R) Speed Shift Technology Support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

Turbo Mode

Enable/Disable processor Turbo Mode (requires EMTTM enabled too). Auto means enabled, unless max turbo ratio is bigger than 16 – SKL A0 W/A.

PCH-FW Configuration

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|--------------------------------|----------|---------|---------------|------|--|
| ME Firmware Version | | | 11.6.10.1196 | | → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit |
| ME Firmware Mode | | | Normal Mode | | |
| ME Firmware SKU | | | Corporate SKU | | |
| ME File System Integrity Value | | | 2 | | |
| ME Firmware Status 1 | | | 0x90000245 | | |
| ME Firmware Status 2 | | | 0x80108306 | | |
| AMT BIOS Features | | | Enabled | | |

AMT BIOS Features

This configuration is supported only with MI991AF-C236 and MI991AF. When disabled AMT BIOS Features are no longer supported and user is no longer able to access MEBx setup.

Trusted Computing

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|--------------------------|----------|---------|----------|------|--|
| Configuration | | | | | → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit |
| Security Device Support | | | Disabled | | |
| No Security Device Found | | | Disabled | | |

Security Device Support

This configuration is supported only with MI991AF-C236 and MI991AF. 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 | | | | | → ← Select Screen |
| Enable Hibernation | | | | | ↑ ↓ Select Item |
| ACPI Sleep State | | | | | 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.

iSmart Controller

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|------------------------------|----------|---------|----------|------|-----------------------|
| iSmart Controller | | | | | → ← Select Screen |
| Power-On after Power failure | | | Disable | | ↑ ↓ Select Item |
| Temperature Guardian | | | Disable | | Enter: Select |
| Schedule Slot 1 | | | None | | + - Change Field |
| Schedule Slot 2 | | | None | | 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.

F81846 Super IO Configuration

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|-------------------------------|----------|------------|----------|------|-----------------------|
| F81846 Super IO Configuration | | | | | |
| Super IO Chip | | F81866 | | | → ← Select Screen |
| Standby Power on S5(Eup) | | All Enable | | | ↑ ↓ Select Item |
| ▶ Serial Port 1 Configuration | | | | | Enter: Select |
| ▶ Serial Port 2 Configuration | | | | | + - Change Field |
| ▶ Serial Port 3 Configuration | | | | | F1: General Help |
| ▶ Serial Port 4 Configuration | | | | | F2: Previous Values |
| | | | | | F3: Optimized Default |
| | | | | | F4: Save ESC: Exit |

Standby Power on S5(Eup)

This configuration is supported only with MI991EF.

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.

Hardware Monitor

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|--------------------------|----------|-----------|----------|------|-----------------------|
| PC Health Status | | | | | |
| CPU smart fan control | | Disabled | | | |
| System smart fan control | | Disabled | | | |
| CPU temperature | | +33 C | | | |
| System temperature | | +34 C | | | |
| CPU FAN Speed | | 2170 RPM | | | |
| SYS FAN Speed | | N/A | | | |
| VCORE | | +1.112 V | | | → ← Select Screen |
| +5V | | +5.087 V | | | ↑ ↓ Select Item |
| +12V | | +12.408 V | | | Enter: Select |
| Memory Voltage | | +1.560 V | | | + - Change Field |
| +3.3V | | +3.376V | | | F1: General Help |
| CPU Shutdown Temperature | | Disabled | | | F2: Previous Values |
| | | | | | F3: Optimized Default |
| | | | | | F4: Save ESC: Exit |

CPU/System 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.

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 | | | 17 | | |
| USB Controllers: | | | | | |
| 1 XHCI | | | | | |
| USB Devices: | | | | | |
| 1 Keyboard | | | | | |
| Legacy USB Support | | | Enabled | | → ← Select Screen |
| XHCI Hand-off | | | Enabled | | ↑ ↓ Select Item |
| USB Mass Storage Driver Support | | | Enabled | | Enter: Select |
| Port 60/64 Emulation | | | Disabled | | +– Change Opt. |
| USB hardware delays and time-outs: | | | | | F1: General Help |
| USB Transfer time-out | | | 20 sec | | F2: Previous Values |
| Device reset time-out | | | 20 sec | | F3: Optimized Defaults |
| Device power-up delay | | | Auto | | 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.

EHCI Hand-off

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

USB Mass Storage Driver Support

Enable/Disable USB Mass Storage Driver Support.

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"> ▶ System Agent (SA) Configuration ▶ PCH-IO Configuration | | | → ← 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 (SA) Configuration | | | → ← Select Screen | | |
| SA PCIe Code Version | | | 1.5.0.0 | ↑ ↓ Select Item | |
| VT-d | | | Supported | Enter: Select | |
| ▶ Graphics Configuration | | | +- Change Field | | |
| VT-d | | | Enabled | F1: General Help | |
| | | | F2: Previous Values | | |
| | | | F3: Optimized Default | | |
| | | | F4: Save ESC: Exit | | |

VT-d

Check to enable VT-d function on MCH.

Graphics Configuration

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|---|----------|---------|----------|------|-----------------------|
| Graphics Configuration | | | | | |
| Skip Scanning of External Gfx Card | | | Disabled | | |
| Primary Display | | | Auto | | → ← Select Screen |
| Select PCIE Card | | | Auto | | ↑ ↓ Select Item |
| ▶ External Gfx Card Primary Display Configuration | | | | | 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 |
| Gfx Low Power Mode | | | Disabled | | |

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.

Select PCIE Card

Select the card used on the platform.

Auto : Skip GPIO based Power Enable to dGPU.

Elk Creek 4 : DGPU Power Enable = ActiveLow.

PEG Eval : DGPU Power Enable = ActiveHigh.

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.

Gfx Low Power Mode

This option is applicable for SFF only.

External Gfx Card Primary Display Configuration

Aptio Setup Utility

| Main | Advanced | Chipset | Security | Boot | Save & Exit |
|---|----------|--------------|----------|------|--|
| External Gfx Card Primary Display Configuration | | | | | |
| | | Primary PEG | Auto | | |
| | | Primary PCIE | Auto | | |
| | | | | | → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit |

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.

PCH-IO Configuration

This section allows you to configure the North Bridge Chipset.

| Aptio Setup Utility | | | |
|------------------------------|----------|---------|---------------------------|
| Main | Advanced | Chipset | Security Boot Save & Exit |
| PCH-IO Configuration | | | → ← Select Screen |
| ▶ SATA And RST Configuration | | | ↑ ↓ Select Item |
| PCH LAN Controller | | Enabled | Enter: Select |
| Wake on LAN Enable | | Enabled | + - 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.)

SATA And RST 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 | | |
| | SATA Port3 | | Empty | | |
| | Software Preserve | | Unknown | | |
| | Hot Plug | | Disabled | | |
| | SATA Port4 | | Empty | | |
| | Software Preserve | | Unknown | | |
| | Hot Plug | | Disabled | | |
| | | | | | → ← Select Screen |
| | | | | | ↑ ↓ Select Item |
| | | | | | Enter: Select |
| | | | | | + - Change Opt. |
| | | | | | F1: General Help |
| | | | | | F2: Previous Values |
| | | | | | F3: Optimized Defaults |
| | | | | | F4: Save & Exit |
| | | | | | ESC: Exit |

SATA Controller(s)

Enable or disable SATA Device.

SATA Mode Selection

Determines how SATA controller(s) operate.

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

Hot Plug

Designates this port as Hot Pluggable.

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 | | |
| Boot mode Select | | | LEGACY | | |
| FIXED BOOT ORDER Priorities | | | | | |
| Boot Option #1 | | | Hard Disk | | → ← Select Screen |
| Boot Option #2 | | | CD/DVD | | ↑ ↓ Select Item |
| Boot Option #3 | | | USB Hard Disk | | Enter: Select |
| Boot Option #4 | | | USB CD/DVD | | + - Change Field |
| Boot Option #5 | | | USB Key | | F1: General Help |
| Boot Option #6 | | | USB Floppy | | F2: Previous Values |
| Boot Option #7 | | | USB Lan | | F3: Optimized Default |
| Boot Option #8 | | | Network | | 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.

FIXED BOOT ORDER Priorities

Sets the system boot order.

Save & Exit Settings

| Aptio Setup Utility | | | | | |
|---|----------|---------|----------|------|--|
| Main | Advanced | Chipset | Security | Boot | Save & Exit |
| Save Options Save Changes and Exit Discard Changes and Exit Save Changes and Reset Discard Changes and Reset Save Changes Discard Changes Defaults Options Restore Defaults Save as User Defaults Restore User Defaults | | | | | → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help 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.

This page is intentionally left blank.

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.

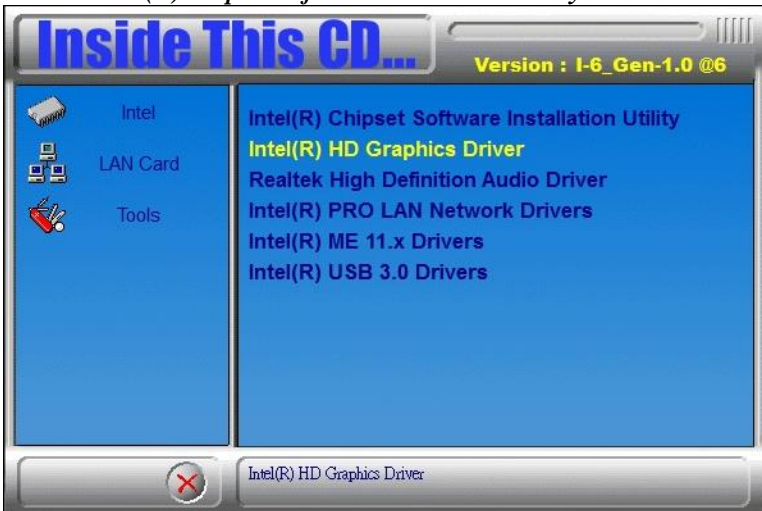
Intel Chipset Software Installation Utility

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.

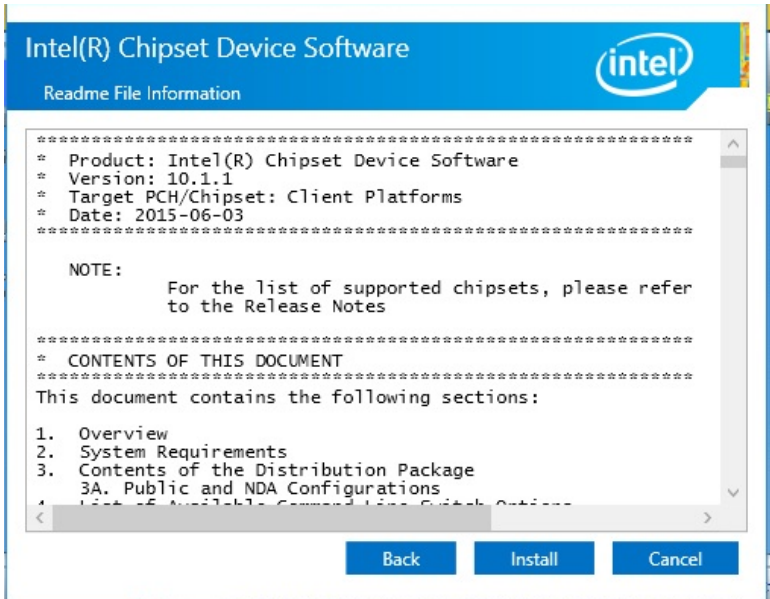
1. Insert the DVD that comes with the board. Click **Intel** and then **Intel(R) Skylake Chipset Drivers**.



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

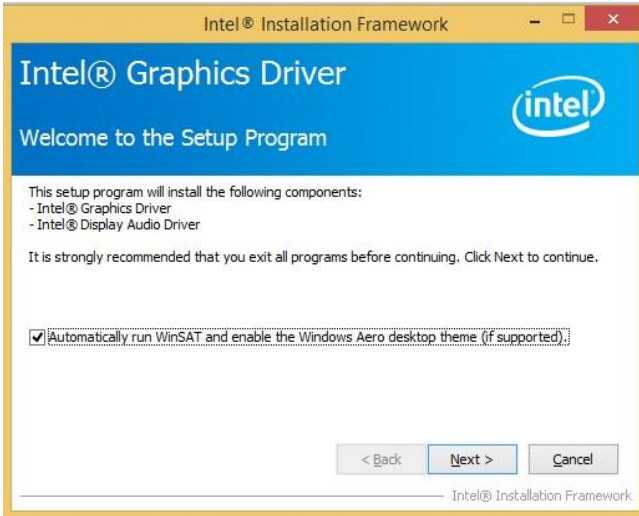
1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Skylake Chipset Drivers*.



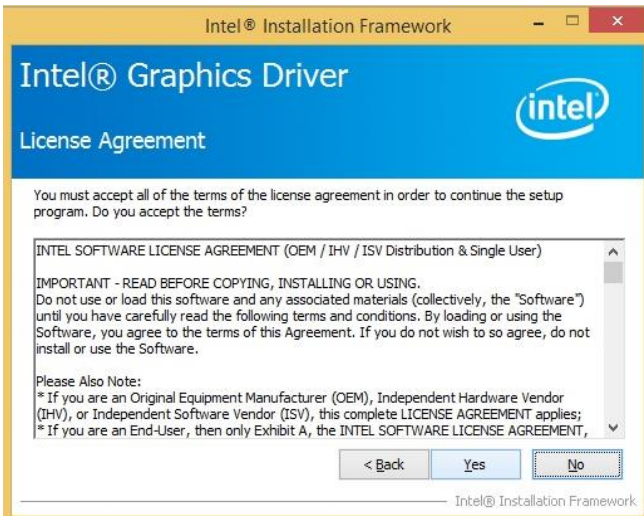
2. Click *Intel(R) HD Graphics Driver*.



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



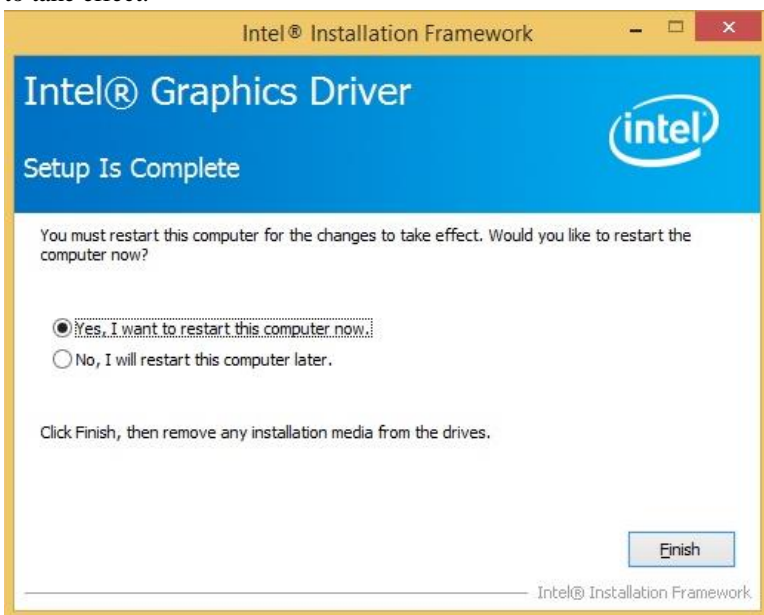
4. Click *Yes* to to agree with the license agreement and continue the installation.



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*.

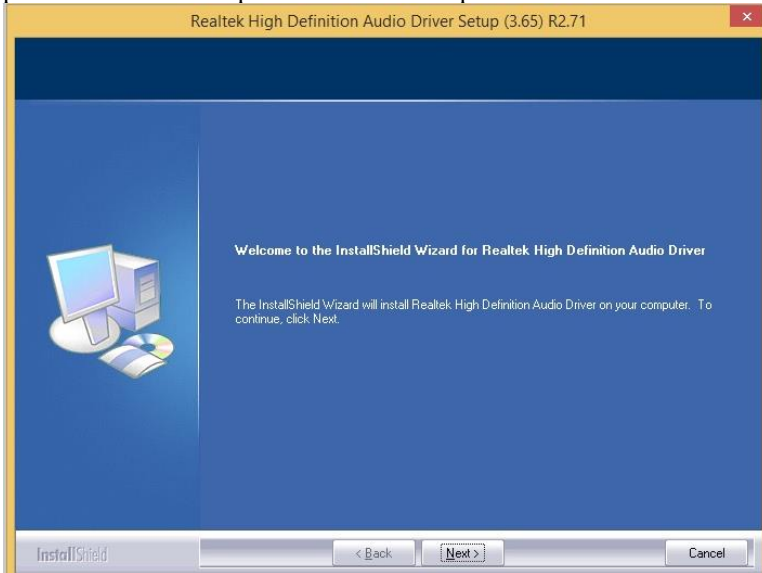


2. Click *Realtek High Definition Audio Driver*.

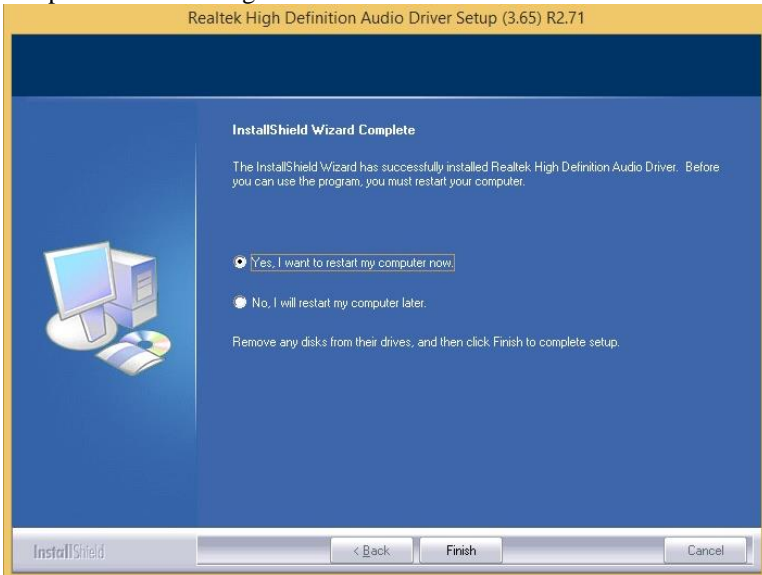


DRIVER INSTALLATION

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*.

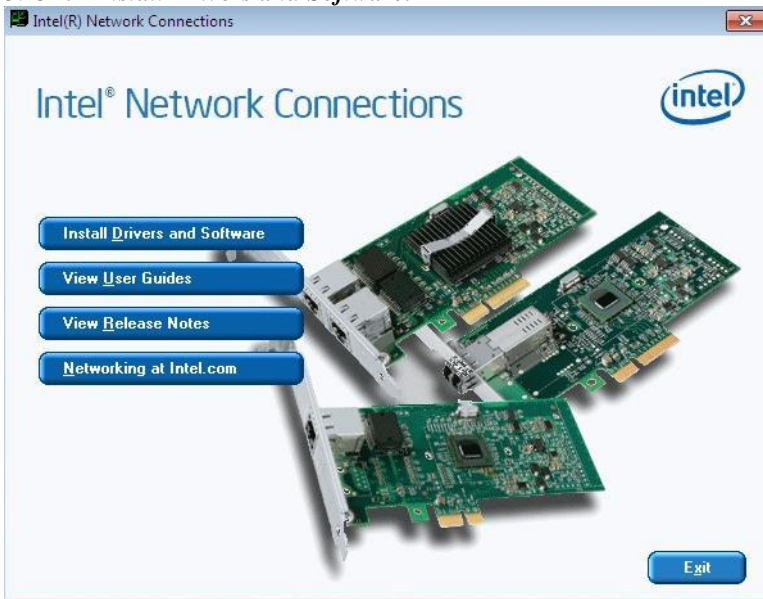


2. Click *Intel(R) PRO LAN Network Driver*.

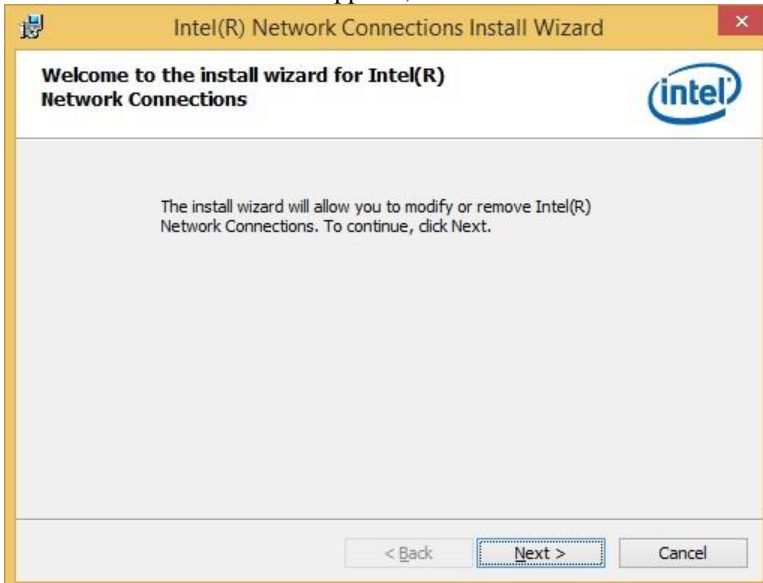


DRIVER INSTALLATION

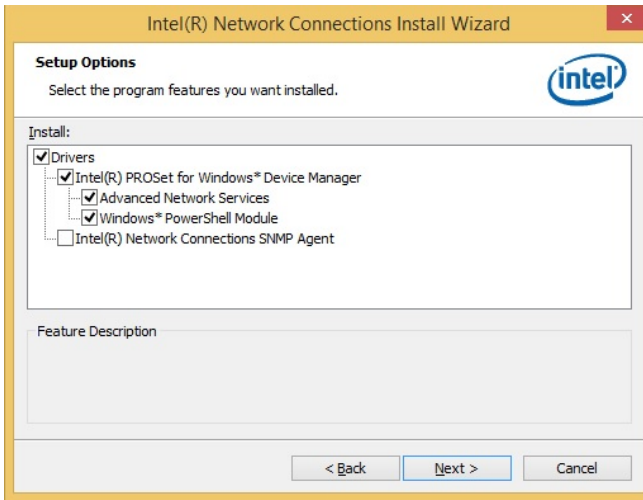
3. Click **Install Drivers and Software**.



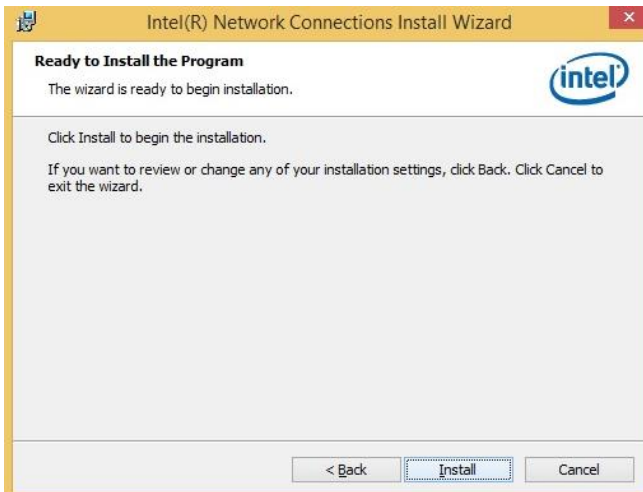
4. When the Welcome screen appears, click **Next**.



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.



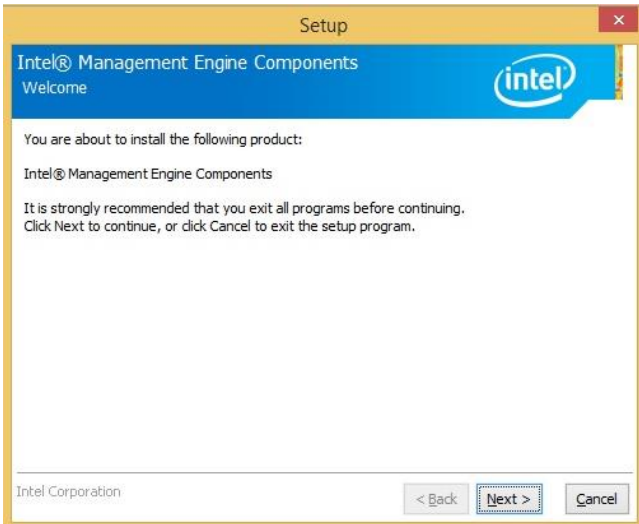
8. When InstallShield Wizard is complete, click **Finish**.

Intel® Management Engine Interface

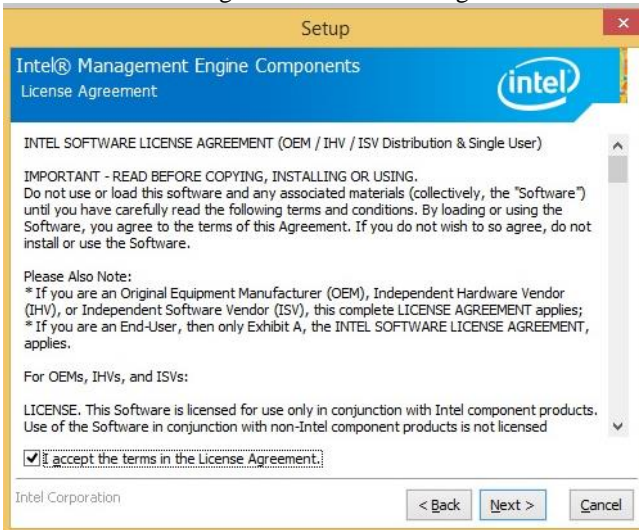
1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Skylake Chipset Drivers*.



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

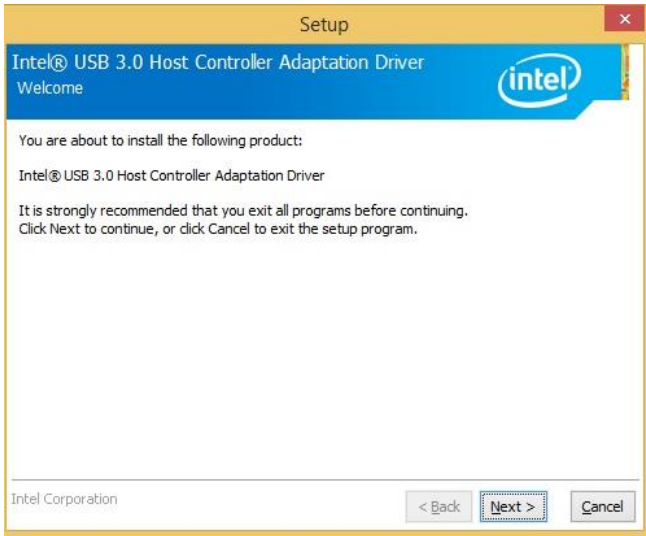
1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Skylake Chipset Drivers*.



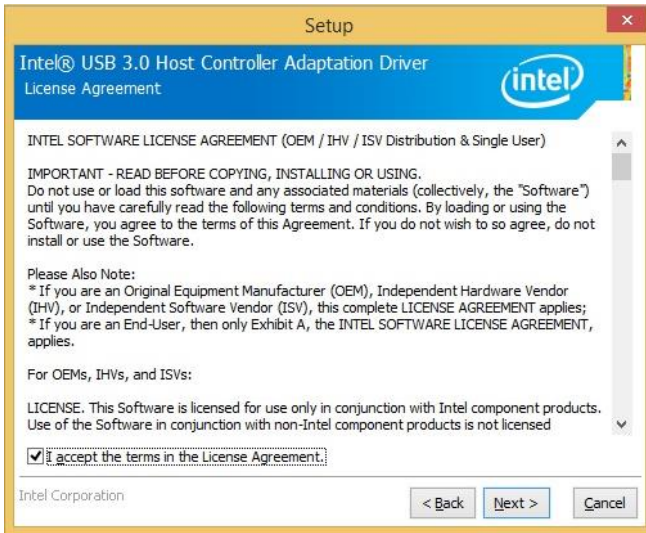
2. Click *Intel(R) USB 3.0 Drivers*.



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.



DRIVER 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 |
| 02E8h-02EFh | Communications Port (COM4) |
| 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-0E01h | 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 (COM5) |

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 11 | Intel(R) 100 Series/C230 Series Chipset Family Integrated Sensor Hub - A135 |
| IRQ 11 | Intel(R) 100 Series/C230 Series Chipset SMBus - A123 |
| IRQ 11 | Intel(R) 100 Series/C230 Series Chipset Thermal subsystem - A131 |
| IRQ 13 | Numeric data processor |
| IRQ 16 | High Definition Audio Controller |
| IRQ 16 | Standard SATA AHCI Controller |
| IRQ 19 | Intel(R) Active Management Technology - SOL (COM5) |

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;
    Set_F81866_Reg(0xF5, bBuf); //count mode is second

    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();
}
//-----
```

```
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
```