DFI

GHF51

Embedded SBC 1.8"

User's Manual

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FCC and DOC Statement on Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio TV technician for help.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2. Shielded interface cables must be used in order to comply with the emission limits.

Table of Contents

About this Manual

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

Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequencial damages to the product that has been modified or altered.

Static Electricity Precautions

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

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.

2. Wear an antistatic wrist strap.

3. Do all preparation work on a static-free surface.

4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.

5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.

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

Safety Measures

- To avoid damage to the system, use the correct AC input voltage range.

- To reduce the risk of electric shock, unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

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

1 GHF51 board

1 Heat spreader (Height: 11mm) A71-808322-000G

1 Screw of Mini PCIe card A32-E12016-050G

Optional Items

Power adapter / 60W, 12V, DC jack

SMBus cable

Front panel cable

Heat sink for 0~60°C / Height: 29.66mm

Heat sink for -20~70°C / Height: 30.7mm

2-pole terminal to DC Jack cable

DIO cable

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

Before Using the System Board

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

· Storage device such as hard disk drive, CD-ROM, etc.

· Power adaptor

External system peripherals may also be required for navigation and display, including at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

▶ Specifications

SYSTEM	Processor	AMD® Ryzen™ Embedded Processors - R1606G, Dual Core, 1MB Cache, 3 CU, 2.6GHz, 12W - R1505G, Dual Core, 1MB Cache, 3 CU, 2.4GHz, 12W - R1305G, Dual Core, 3 CU, 1.5GHz, 8-10W - R1102G, Dual Core, 3 CU, 1.2GHz, 6W
	Memory	DDR4 Memory Down up to 4GB/8GB Single Channel DDR4 2400MHz
	BIOS	AMI SPI 64Mbit
GRAPHICS	Controller	AMD Radeon Vega GPU with up to 3 computing units.
	Feature	H.265 decode/encode support, VP9 decode
	Display	2 x Micro HDMI, resolution up to 4096x2160 @ 24Hz
EXPANSION	Interface	1 x Full-size Mini PCIe (PCIe Gen2/USB 2.0, optional USB 3.1 Gen2/USB 2.0)
ETHERNET	Controller	1 x Intel® I211AT PCIe (10/100/1000Mbps) or 1 x Intel® I210IT PCIe (10/100/1000Mbps) (available upon request)
REAR I/O	Ethernet	1 x GbE (RJ-45)
	USB	1 x Type C USB 3.1 Gen 2
	Display	2 x Micro HDMI (HDMI 1.4)
INTERNAL I/O	DIO	1 x 8-bit DIO
	SMBus	1 x SMBus
STORAGE	eMMC	1 x 16GB/32GB/64GB eMMC
WATCHDOG TIMER	Output & Interval	Software reset, Programmable via Software from 1 to 65535 Seconds
SECURITY	TPM	fTPM 2.0
POWER	Type	Single 12V +/-5% DC
	Connector	2-pin Terminal Block
	Consumption	Typical: R1505G: 12V @ 0.37A (4.44W) Max: R1505G: 12V @ 1.74A (20.88W)
	RTC Battery	CR2032 Coin Cell
OS SUPPORT (UEFI Only)	Microsoft/Linux	Windows 10 IoT Enterprise 64-bit Linux (Kernal 5.3)
ENVIRONMENT	Temperature	Operating: 0 to 60°C / -20 to 70°C Storage: -40 to 85°C
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
MECHANICAL	Dimensions	1.8" SBC Form Factor: 84mm (3.31") x 55mm (2.17")

The specifications listed here may be based on editions that do not resemble your actual products. Please visit the download page at go.dfi.com/GHF51, or via the QR code to the right for the latest datasheet.

▶ Features

Watchdog Timer

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

DDR4 Memory Down

DDR4 delivers increased system bandwidth and improves performance. The advantages of DDR4 provide an extended battery life and improve the performance at a lower power than DDR3/DDR2. The system features memory down instead of using memory sockets for optimal space reduction.

Graphics

The integrated AMD® Radeon™ graphics engine delivers an excellent blend of graphics performance and features to meet business needs. It provides excellent video and 3D graphics with outstanding graphics responsiveness. These enhancements deliver the performance and compatibility needed for today's and tomorrow's business applications.

Gigabit LAN

The Intel® I211AT Gigabit LAN controller features up to 1Gbps data transmission with support for Intel® Active Management Technology. It provides remote maintenance and manageability for networked computing assets in an enterprise environment.

Wake-On-LAN

This feature allows the network to remotely wake up a Soft Power Down (Soft-Off) PC. It is supported via the onboard LAN port or via a PCI LAN card that uses the PCI PME (Power Management Event) signal. However, if your system is in the Suspend mode, you can power-on the system only through an IRQ or DMA interrupt.

USB

The system board supports the new USB 3.1 Gen 2. It is capable of running at a maximum transmission speed of up to 10 Gbit/s (1.2 GB/s) and is faster than USB 3.1 Gen 1 (5 Gbit/s, or 625 MB/s), USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.1 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

ACPI STR

The system board is designed to meet the ACPI (Advanced Configuration and Power Interface) specification. ACPI has energy saving features that enables PCs to implement Power Management and Plug-and-Play with operating systems that support OS Direct Power Management. ACPI when enabled in the Power Management Setup will allow you to use the Suspend to RAM function.
With the Suspend to RAM function enabled, you can power-off the system at once by pressing the power button or selecting "Standby" when you shut down Windows® without having to go through the sometimes tiresome process of closing files, applications and operating system. This is because the system is capable of storing all programs and data files during the entire operating session into RAM (Random Access Memory) when it powers-off. The operating session will resume exactly where you left off the next time you power-on the system.

Power Failure Recovery

When power returns after an AC power failure, you may choose to either power-on the system manually or let the system power-on automatically.

Chapter 2 - Hardware Installation

▶ **Board Layout**

Top View ⌄

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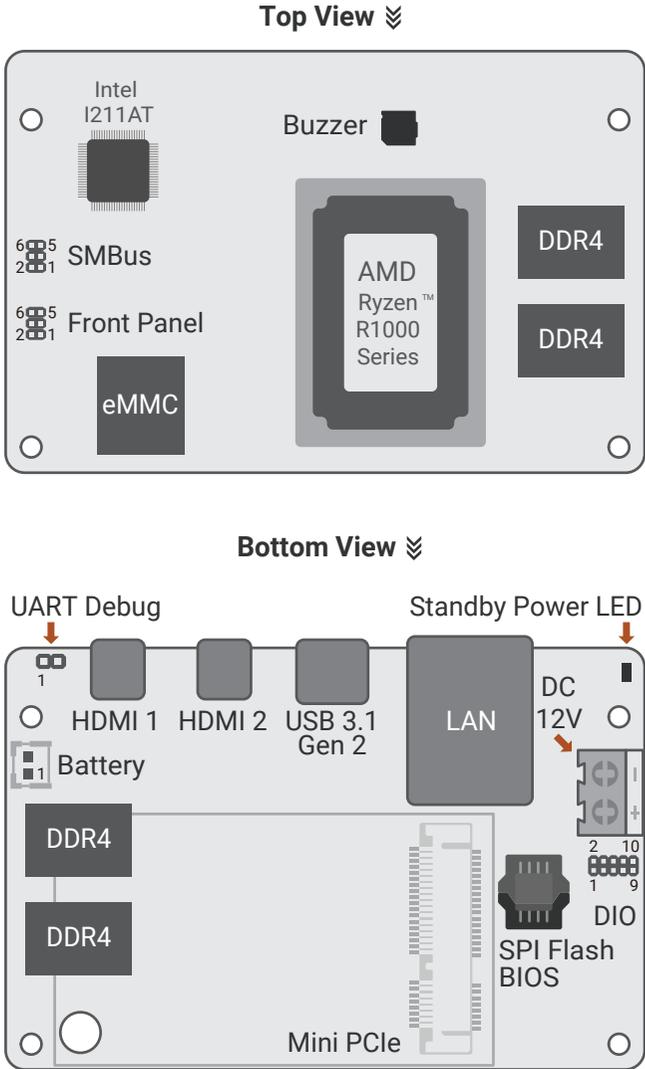
Important:
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching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

▶ **Standby Power LED**
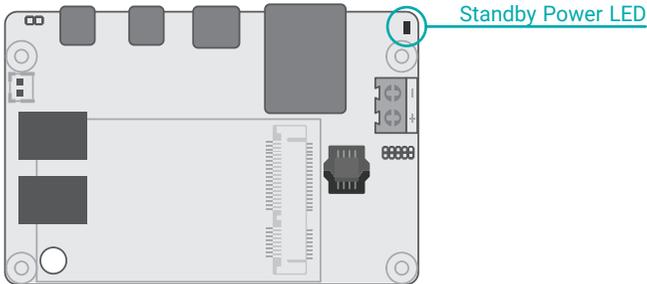
Standby Power LED

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

▶ System Memory

Top View ⊻

DDR4

Bottom View ⊻
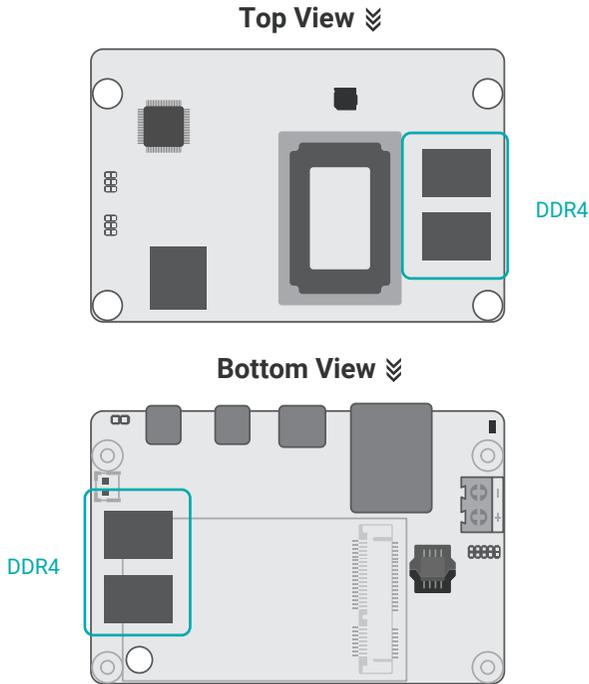
DDR4

The system board supports the following memory interface.

Single Channel (SC)
Data will be accessed in chunks of 64 bits from the memory channels. RAMs are on the same channel.

Features

- DDR4 2400MHz Single Channel

- Up to 4G or 8G Memory Down

▶ Assembly

A heat spreader is included in the standard package. The heat spreader and components required for mounting are illustrated below.

Screw * 4

Interface Metal
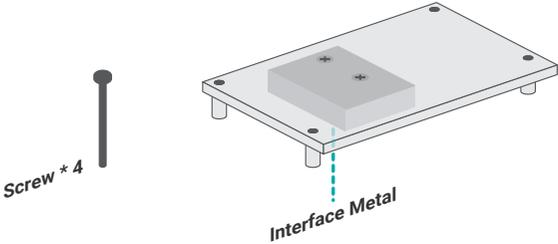
> **Important:**
> Please do not operate the system with solely the standard heat spreader as the cooling system. Please use a heatsink instead or add to the system a cooling fan for adequate cooling.

⊻ Interface Metal Side Down
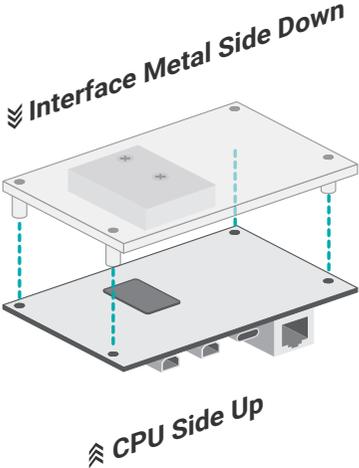
⊼ CPU Side Up

The heat spreader is designed to be mounted onto the module as illustrated below. Please make sure the contacting sides of the heat spreader and the module are correct — the CPU side of the module shall be facing the interface metal side and legs of the heat spreader. Rotate horozontally so the interface metal sits right on top of the CPU. Remove any plastic cover on the interface metal and apply thermal paste/adhesive if it is required.

▶ **Assembly**

Rotate the module and heat spreader combo so that the I/O is facing the desired side, and place the combo in the position of the chassis reserved for your module.

Align the screw holes of the combo to those on the chassis. The combo can be mounted onto the chassis in two manners — 1) module side to the chassis, or 2) heat spreader side to the chassis as illustrated below. This shall depend entirely on the design of the chassis with regard to interior spacing, thermal, and I/O.

Place the screws that come with the standard package into the screw holes, and use a screw driver to fasten the screws until the combo is securely fixed onto the chassis.
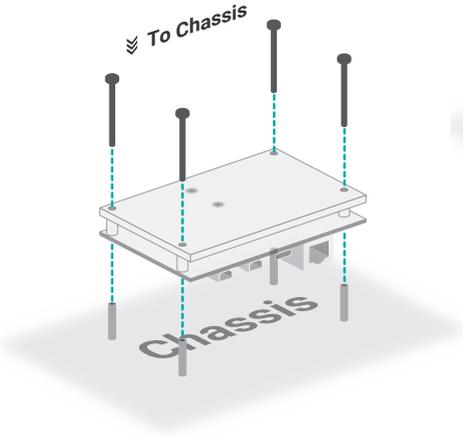
■ Module side to the chassis   ■ Heat spreader side to the chassis
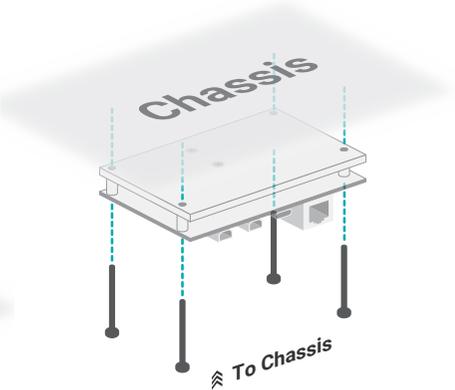
▶ **I/O Connectors**

Rear I/O Ports

Bottom View ⩔
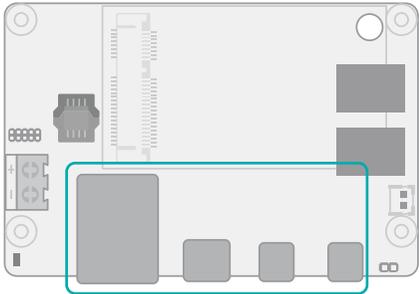
■ LAN

■ Micro HDMI 2

■ USB 3.1 Gen 2, Type C   ■ Micro HDMI 1

Features

- Intel® I211AT PCI Express Gigabit Ethernet controller (alternatively Intel® I210IT PCI Express Gigabit Ethernet controller)

- 2 x Micro HDMI with resolution up to 4096x2160 @ 24Hz

SMBus

Top View ☷

■ SMBus

6 5

2 1

Front Panel

Top View ☷

■ Front Panel

6 5

2 1
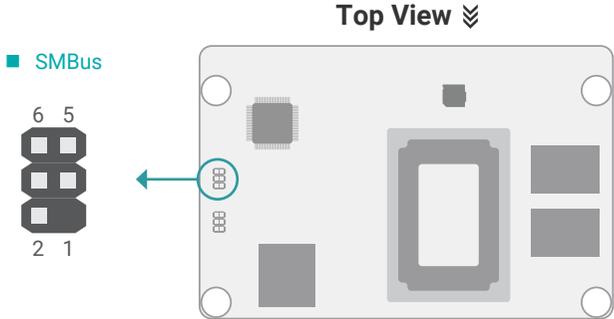
The SMBus (System Management Bus) connector is used to connect the SMBus device. It is a multiple device bus that allows multiple chips to connect to the same bus and enable each one to act as a master by initiating data transfer.

■ SMBus Pin Assignment

Pin	Assignment	Pin	Assignment
1	N.C.	2	SMBus_Alert
3	SMBus_DATA	4	SMBus_Clock
5	GND	6	3V3SB

RESET - Reset Switch
This switch allows you to reboot without having to power off the system.

Power/Standby LED
When the system's power is on, this LED will light up. When the system is in the S1 (POS - Power On Suspend) state, it will blink at 1-second intervals. When the system is in the S3 (STR - Suspend To RAM) state, it will blink at 4-second intervals.

Power Button
This switch is used to power on or off the system.

■ Front Panel Pin Assignment

Pin	Assignment	Pin	Assignment
1	N.C.	2	Reset
3	Power LED	4	GND
5	Power LED (3V3SB)	6	Power Button

▶ **I/O Connectors**

Front Panel Cable Installation

Top View ⩣

■ Front Panel

6 5

2 1
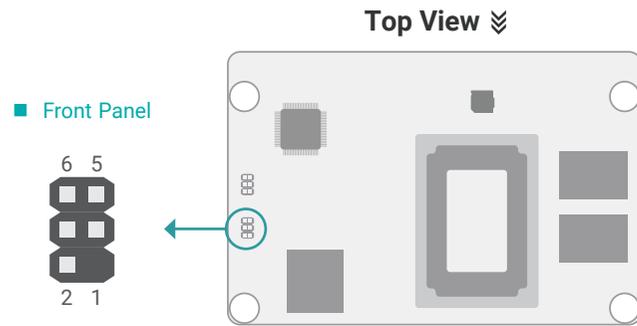
The **Pin 1** of Front Panel cable should be connected to Front Panel **Pin 6** on the motherboard. Due to Pin definition on GHF51 different from other boards, the HDD_LED (Red) doesn't function.

Battery

Bottom View ⩔

2 ⬛ GND
1 ⬛ 3.3V

■ **Battery**

Connect to board
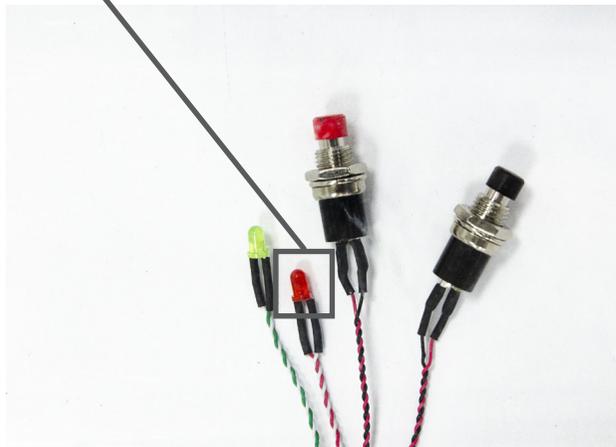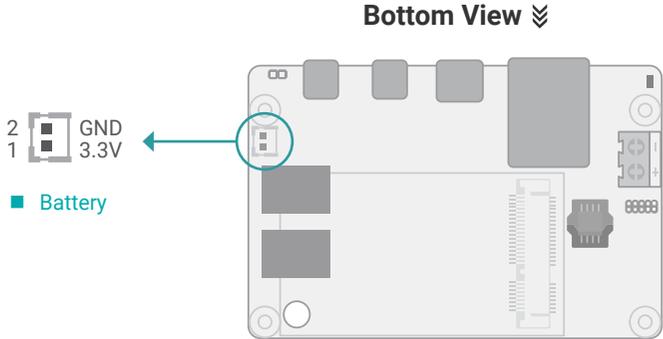
■ **External Battery**

The external lithium ion battery supplies power to the real-time clock and CMOS memory as an auxiliary source of power when the main power is shut off.

Safety Measures

• There exists explosion hazard if the battery is incorrectly installed.

• Replace only with the same or equivalent type recommended by the manufacturer.

• Dispose of used batteries according to local ordinances.

12V DC Terminal Block

Bottom View ⩔

2 (-) : GND

1 (+) : +12V
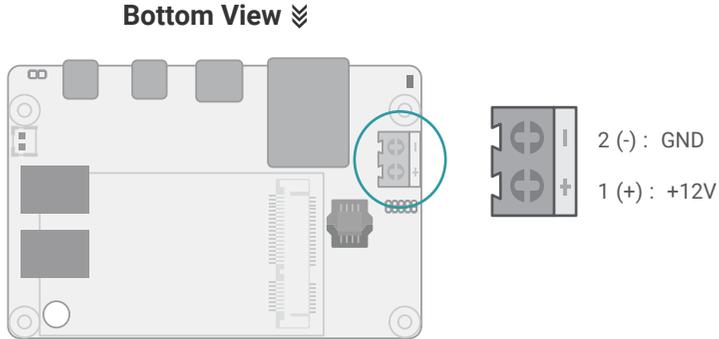
This 2-pin terminal block is considered a low power solution. Connect a DC power cord to this terminal block by inserting the wire into the block and then screw tight the screw on top to secure the wire in place. Please make sure the positive and negative wires are installed correctly. Using a voltage more than the recommended range may fail to boot the system or cause damage to the system board.

Note:
An optional DC cable converter can be purchased to convert the 2-pin terminal block to a coaxial DC jack.

Important:
Insufficient power supplied to the system may result in instability or malfunction of the add-in boards and peripherals. Calculating the system's approximate power usage is important to ensure that the power supply meets the system's consumption requirements.

Digital I/O

Bottom View ⍖

■ DIO
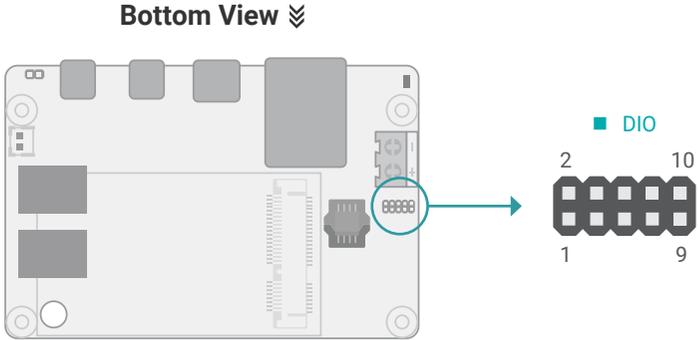
The 8-bit Digital I/O (DIO) connector allows for input/output signals of digital logical states defined by voltage levels.

■ Digital I/O Pin Assignment

Pin	Assignment
1	GND
2	5VSB
3	DIO_0
4	DIO_1
5	DIO_2
6	DIO_3
7	DIO_4
8	DIO_5
9	DIO_6
10	DIO_7

Expansion Slots

Bottom View ⍖

Mini PCIe

Mini PCIe
The Mini PCIe socket allows for a full-size Mini PCIe module, and supports PCIe x1 (Gen3) and USB 2.0 signals.

Note:
A 10-pin cable can be purchased as an optional item for DIO connection.

Installing the Mini PCIe Module

Before installing the Mini PCIe module into the Mini PCIe socket, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.

2. Disconnect all power cords and cables.

3. Locate the Mini PCIe socket on the system board

4. Make sure the notch on card is aligned to the key on the socket.

⫸ Mini PCIe Full Size   **⫸ Mini PCIe Socket**

Stand-off

Notch ➡   Key ➡
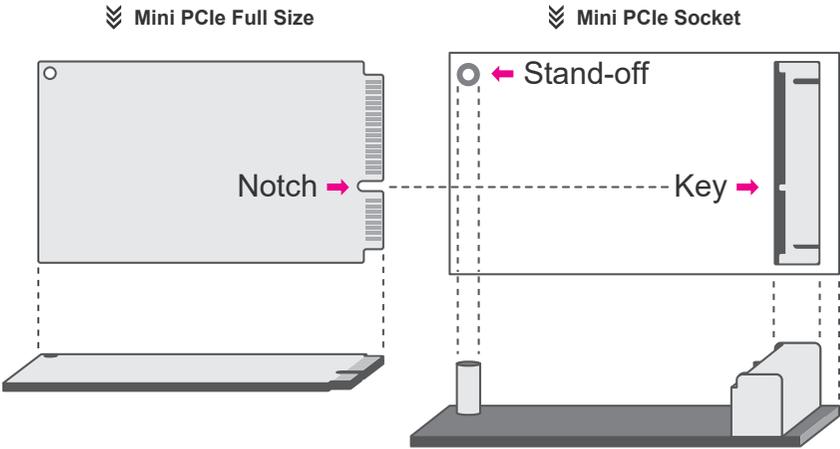
Please follow the steps below to install the card into the socket.
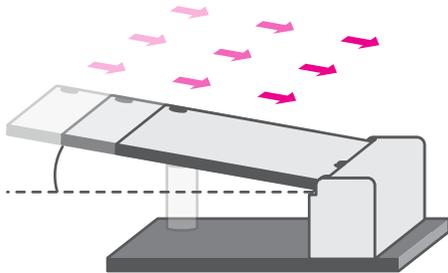
Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.
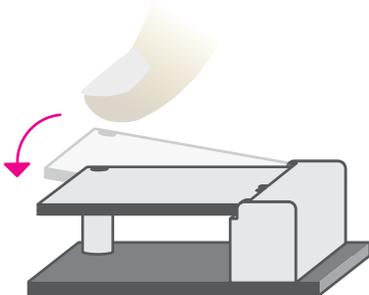
Step 2:
Press the end of the card far from the socket down until against the stand-off.
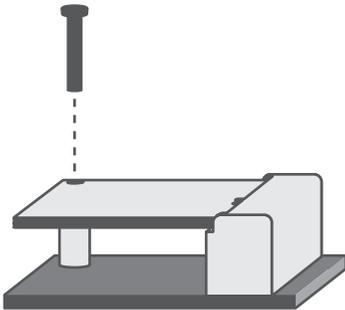
Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

Chapter 3 - BIOS Settings

▶ Overview

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

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

Default Configuration

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

Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.
The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and <Del> keys simultaneously.

Legends

Keys	Function
Right / Left arrow	Move the highlight left or right to select a menu
Up / Down arrow	Move the highlight up or down between submenus or fields
<Enter>	Enter the highlighted submenu
+ (plus key)/F6	Scroll forward through the values or options of the highlighted field
- (minus key)/F5	Scroll backward through the values or options of the highlighted field
<F1>	Display general help
<F2>	Display previous values
<F9>	Optimized defaults
<F10>	Save and Exit
<Esc>	Return to previous menu

Scroll Bar

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

Submenu

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

▶ Main

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

```
Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
Main   Advanced   Chipset   Security   Boot   Save & Exit

BIOS Information                                      Set the Date. Use Tab to
Project Name              GHF51                       switch between Date ele-
BIOS Version              B201.17A                    ments.
                                                      Default Ranges:
Memory Information                                    Year: 2005-2099
Total Memory              4096 MB (DDR4)              Months: 1-12
Memory Speed              2400 MHz                    Days: dependent on month
DIMM 0                    4096 MB

Processor Information
Name                      AMD Ryzen Embedded
                          R1606G with Radeon Vega
                          Gfx                         →←: Select Screen
Speed                     2600 MHz                    ↑↓: Select Item
ID                        00810F81                    Enter: Select
Number of Processors      4                           +/- : Change Opt.
                                                      F1: General Help
System Date               [Mon 05/07/2020]            F2: Previous Values
System Time               [00:00:00]                  F9: Optimized Defaults
                                                      F10: Save & Exit
                                                      ESC: Exit

            Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

System Date

The date format is <month>, <date>, <year>. Press "Tab" to switch to the next field and press "-" or "+" to modify the value.

System Time

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

▶ Advanced

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

> **Important:**
> Setting incorrect field values may cause the system to malfunction.

```
Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
Main   Advanced   Chipset   Security   Boot   Save & Exit

▶ AMD CHIPSET Setting                                 AMD CBS Setup Page
▶ AMD Platform Setting
▶ Trusted Computing
▶ ACPI Configuration
▶ CPU Configuration
▶ PC Health Status
▶ WatchDog Configuration
▶ USB Configuration
▶ Network Stack Configuration
▶ CSM Configuration
                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/- : Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F9: Optimized Defaults
                                                      F10: Save & Reset
                                                      ESC: Exit

            Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

▶ **Advanced**

AMD CHIPSET Setting

```
        Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  ┌──────────┐
  │ Advanced │
  └──────────┘
   AMD CHIPSET Setting                                       Select Ac Loss Control
                                                             Method
   Ac Loss Control                   [Always On]
  ►GFX Configuration                 [Disabled]
  ►SB USB Configuration


                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/- : Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Reset
                                                             ESC: Exit

        Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

Ac Loss Control

Select among Always On, Always Off, and Last State. This field is used to specify what state the system is set to return to when power is re-applied after AC power failure or loss (G3 state).

Always On	The system automatically powers on after power failure.
Always Off	The system enters soft-off state after power failure. Power-on signal input is required to power up the system.
Last State	The system returns to the last state right before power failure.

▶ GFX Configuration

```
        Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  ┌──────────┐
  │ Advanced │
  └──────────┘
   GFX Configuration                                         Enable Integrated Graphics
                                                             controller
   Integrated Graphics Controller   [Auto]
   UMA Mode                          [Auto]
   UMA Frame buffer Size             [Auto]


                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/- : Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Reset
                                                             ESC: Exit

        Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

Integrated Graphics Controller

Configure the integrated graphics controller — Disabled, Forces, or Auto for auto-detection.

UMA Mode

Configure the Unified Memory Architecture (UMA) mode — Auto or UMA_SOECIFIED.

UMA Frame buffer Size

Specify the amount of memory allocation to the integrated GFX — 64M, 128M, 256M, 384M, 512M, 1G, 2G, 3G, or select auto for auto allocation. Please make sure "UMA Mode" is set to "Auto" when a specific size is to be configured.

▶ **Advanced** ▶ **AMD CHIPSET Setting**

► **SB USB Configuration**

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.	
Advanced	

SB USB Configuration		Enable or disable USB3 controller.
XHCIO Port 0	[Enabled]	

→←: Select Screen
↑↓: Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F9: Optimized Defaults
F10: Save & Reset
ESC: Exit

Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
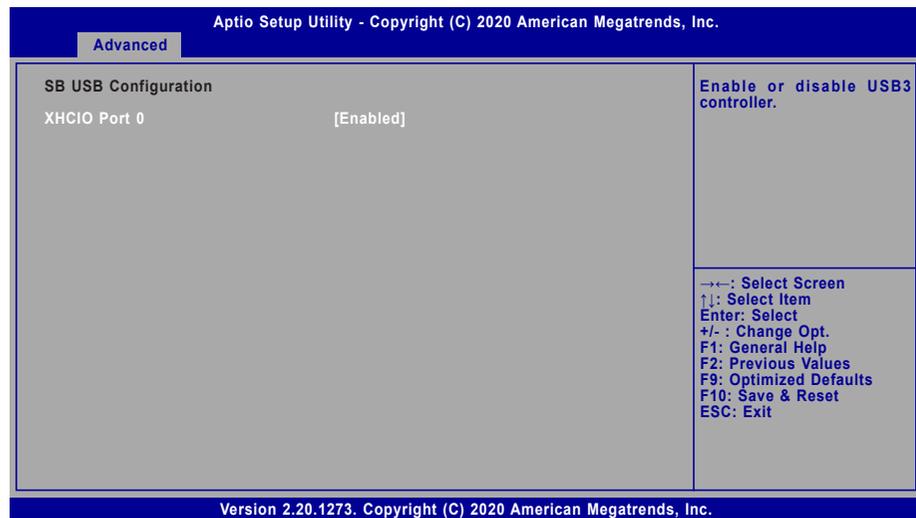
XHCIO Port 0

Enable or disable the on-board USB 3.0 controller.

▶ **Advanced**

AMD Platform Setting

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.	
Advanced	

Primary Video Adaptor	[Int Graphics (IGD)]	Select Internal/External Graphics

→←: Select Screen
↑↓: Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F9: Optimized Defaults
F10: Save & Reset
ESC: Exit

Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
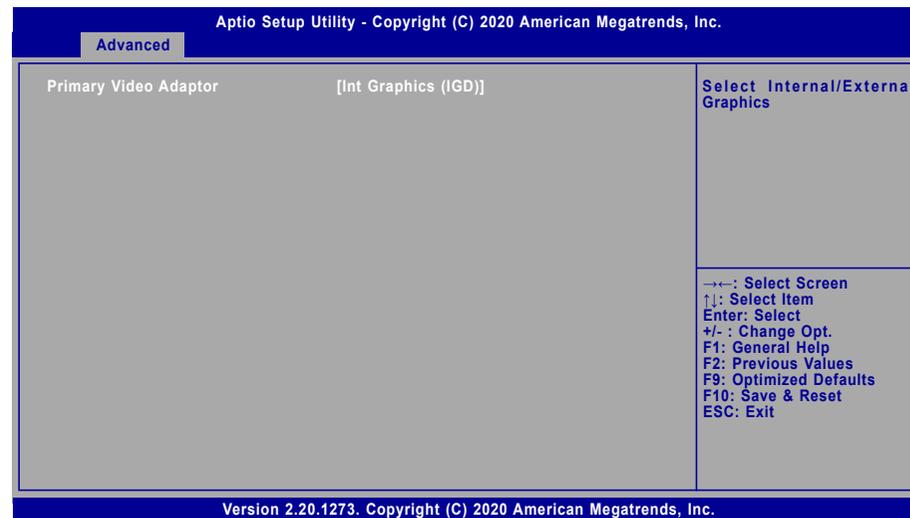
Primary Video Adaptor

Select which graphics controller will be the primary video adaptor — Int Graphics (IGD) or Ext Graphics (PEG).

▶ **Advanced**

Trusted Computing

```
                 Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
    ┌─────────────┐
    │  Advanced   │
    └─────────────┘

    TPM20 Device Found                                          Enables or Disables BIOS
    Firmware Version             3.34                           support for security de-
    Vendor:                      AMD                            vice. O.S will not show
                                                                Security Device. TCG EFI
    Security Device Support      [Enable]                       protocol and INT1A inter-
    TPM State                    [Enabled]                      face will not be available.
    Pending operation            [None]


                                                                →←: Select Screen
                                                                ↑↓: Select Item
                                                                Enter: Select
                                                                +/- : Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F9: Optimized Defaults
                                                                F10: Save & Reset
                                                                ESC: Exit


                  Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```
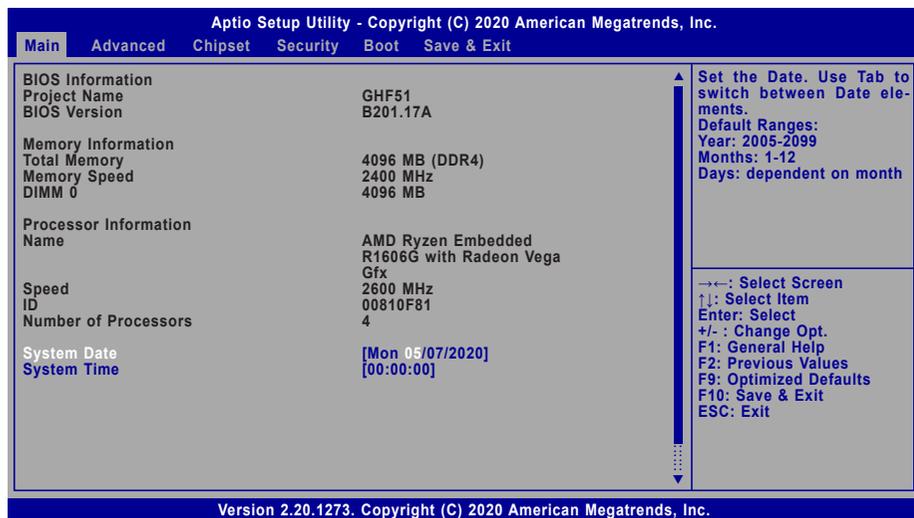
Security Device Support

This field is used to enable or disable BIOS support for the security device such as an TPM 2.0 to achieve hardware-level security via cryptographic keys.

TPM State

Enable or disable the TPM security device. NOTE: Your Computer will rboot during restart in order to change State of the Device.

Pending operation

To clear the existing TPM encryption, select "TPM Clear" and restart the system. This field is not available when "Security Device Support" is disabled.

▶ **Advanced**

ACPI Configuration

```
                 Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
    ┌─────────────┐
    │  Advanced   │
    └─────────────┘

    Wake On PCIE                 [Disabled]                     Enable/Disable integrated
    Wake on RTC                  [Enabled]                      LAN to wake the system.
    Wake up hour                 0
    Wake up mimute               0
    Wake up second               0




                                                                →←: Select Screen
                                                                ↑↓: Select Item
                                                                Enter: Select
                                                                +/- : Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F9: Optimized Defaults
                                                                F10: Save & Reset
                                                                ESC: Exit


                  Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

Wake On PCIE

Enable or disable Wake-on-LAN function for the integrated LAN to wake up the system.

Wake on RTC

When Enabled, the system will automatically wake up from S5 state at a designated time every day. Once it's switched to [Enabled], please set up the time of day — hour, minute, and second — for the system to wake up.

▶ **Advanced**

CPU Configuration

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.		
Advanced		
PSS Support [Enable]		Enable/disable the genera-
NX Mode [Enable]		tion of ACPI _PPC, _PSS,
SVM Mode [Enable]		and _PCT objets.
		→←: Select Screen
		↑↓: Select Item
		Enter: Select
		+/- : Change Opt.
		F1: General Help
		F2: Previous Values
		F9: Optimized Defaults
		F10: Save & Reset
		ESC: Exit
Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.		

PSS Support

Enable or disable the power, performance, and speed related ACPI functions of the CPU.

NX Mode

Enable or disable the protection function that keeps no-execute codes from being executed by the CPU.

SVM Mode

Enable or disable Secure Virtual Machine (SVM) for CPU virtualization.

▶ **Advanced**

PC Health Status

Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.		
Advanced		
System Hardware Monitor		Enable/Disable CPU Smart-Fan
System temperature	: +63 C	
CPU Temperature	: +68 C	
VBAT	: +3.032 V	
VCore	: +0.958 V	
VDDQ	: +1.208 V	
		→←: Select Screen
		↑↓: Select Item
		Enter: Select
		+/- : Change Opt.
		F1: General Help
		F2: Previous Values
		F9: Optimized Defaults
		F10: Save & Reset
		ESC: Exit
Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.		

This section displays the system's health information, i.e. voltage readings, CPU and system temperatures, and VCC voltage readings.

▶ **Advanced**

WatchDog Configuration

```
                    Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  ┌──────────┐
  │ Advanced │
  └──────────┘
  WatchDog Confifuration                                         Enable/Disable WatchDog
                                                                 Timer.
  WatchDog1 function              [Enabled]
  WatchDog1 Timer                 20




                                                                 →←: Select Screen
                                                                 ↑↓: Select Item
                                                                 Enter: Select
                                                                 +/- : Change Opt.
                                                                 F1: General Help
                                                                 F2: Previous Values
                                                                 F9: Optimized Defaults
                                                                 F10: Save & Reset
                                                                 ESC: Exit


                    Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

WatchDog1 function

Enable or disable WatchDog function. Once it is enabled, please configure the following field.

SuperIO WatchDog Timer

Set the WatchDog Timer timeout value, ranging from 1 to 255 (second).

▶ **Advanced**

USB Configuration

```
                    Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  ┌──────────┐
  │ Advanced │
  └──────────┘
  USB Configuration                                              Enables Legacy USB sup-
                                                                 port. AUTO option disables
  USB Module Version                                             legacy support if no USB
                                                                 devices are connected.
  USB Controllers:                                               DISABLE option will keep
          1 XHCI                                                 USB devices available only
  USB Devices:                                                   for EFI applications.
          1 Keyboard, 1 Mouse, 2 Hubs

  USB Support
  Legacy USB Support              [Enabled]
  XHCI Hand-off                   [Enabled]
  USB Mass Storage Driver Support [Enabled]                      →←: Select Screen
                                                                 ↑↓: Select Item
                                                                 Enter: Select
                                                                 +/- : Change Opt.
                                                                 F1: General Help
                                                                 F2: Previous Values
                                                                 F9: Optimized Defaults
                                                                 F10: Save & Reset
                                                                 ESC: Exit

                    Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```
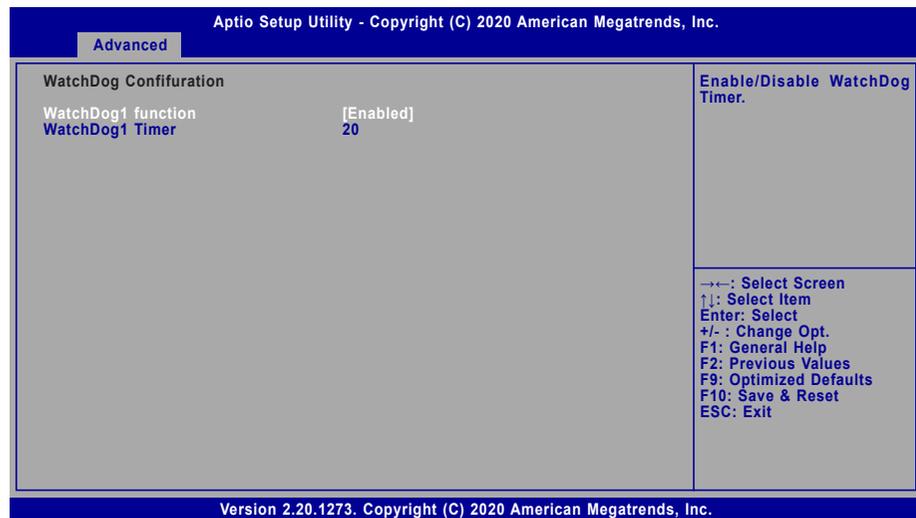
Legacy USB Support

Enabled	Enable Legacy USB support.
Disabled	Keep USB devices available only for EFI applications.
Auto	Disable Legacy support if no USB devices are connected.

XHCI Hand-off

Enable or disable XHCI Hand-off.

USB Mass Storage Driver Support

Enable or disable USB Mass Storage Driver Support.

▶ **Advanced**

Network Stack Configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
   Advanced

 Network Stack              [Enabled]                    Enable/Disable UEFI Net-
 Ipv4 PXE Support           [Disabled]                   work Stack
 Ipv6 PXE Support           [Disabled]
 PXE boot wait time         0
 Media detect count         1




                                                        →←: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/- : Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F9: Optimized Defaults
                                                        F10: Save & Reset
                                                        ESC: Exit


              Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```
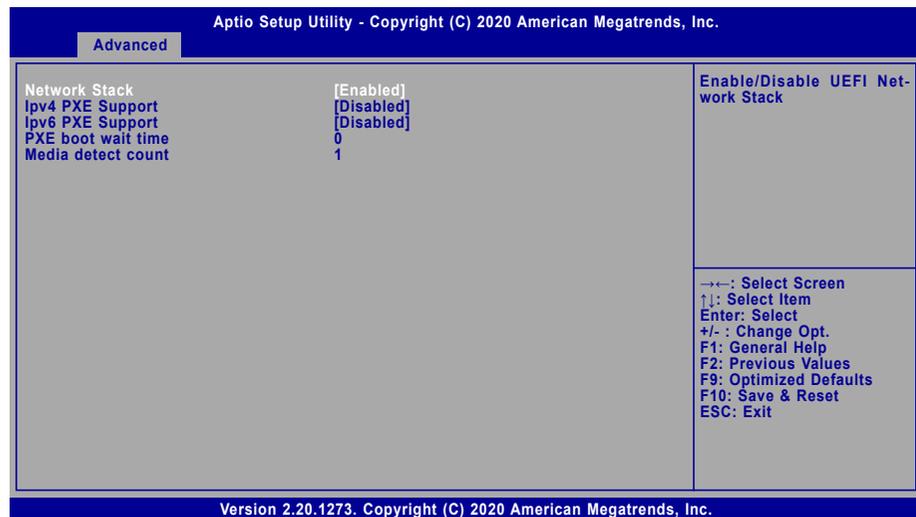
Network Stack

Enable or disable UEFI network stack. The following fields will appear when this field is enabled.

Ipv4 PXE Support

Enable or disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

Ipv6 PXE Support

Enable or disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.
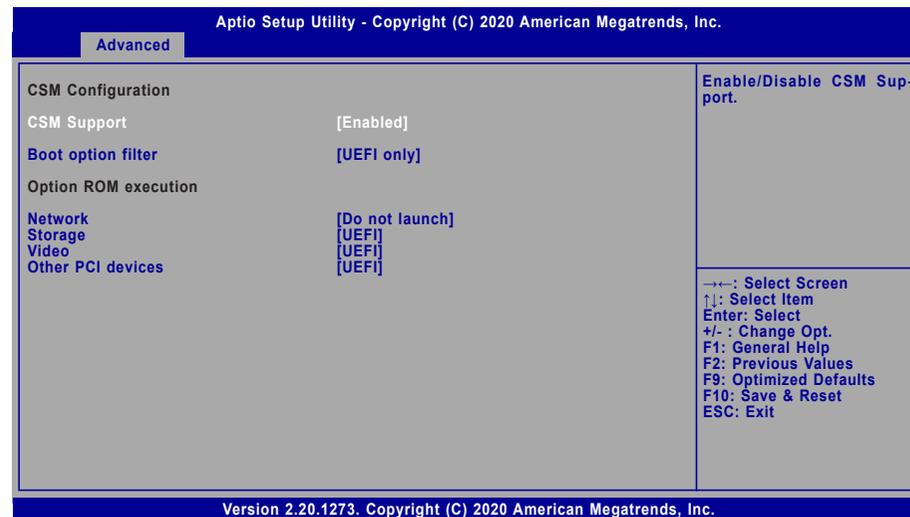
PXE boot wait time

Set the wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

Media detect count

Set the number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

▶ **Advanced**

CSM Configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
   Advanced

 CSM Configuration                                       Enable/Disable CSM Sup-
                                                        port.
 CSM Support                [Enabled]

 Boot option filter         [UEFI only]

 Option ROM execution

 Network                    [Do not launch]
 Storage                    [UEFI]
 Video                      [UEFI]
 Other PCI devices          [UEFI]
                                                        →←: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/- : Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F9: Optimized Defaults
                                                        F10: Save & Reset
                                                        ESC: Exit


              Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

CSM Support

This section is used to enable or disable CSM Support. The following fields are only available when "CSM Support" is enabled.

Boot option filter

This field controls Legacy/UEFI ROMs priority — UEFI and Legacy, Legacy only, UEFI only.

Network

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

Storage

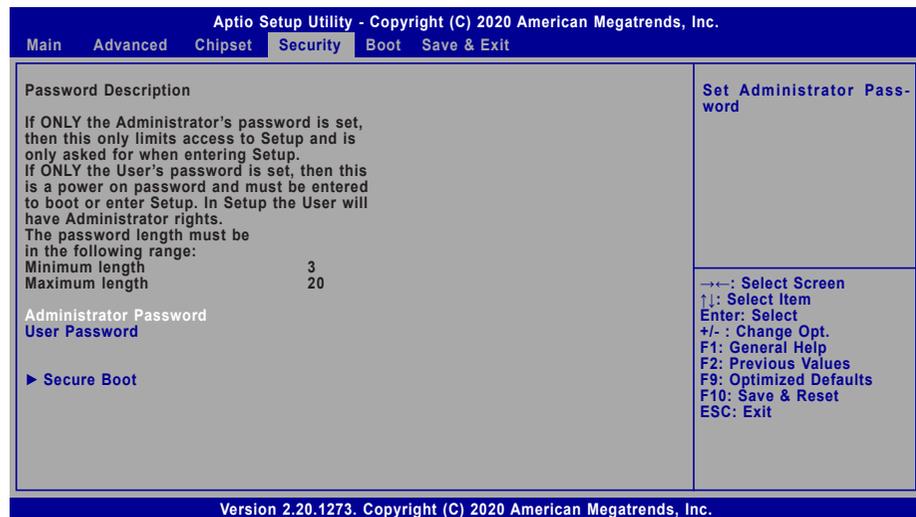This field controls the execution of UEFI and Legacy Storage OpROM.

Video

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

Other PCI devices

This field determines OpROM execution policy for devices other than Network, Storage or Video.

▶ **Security**

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
   Main   Advanced   Chipset   Security   Boot   Save & Exit

   Password Description                              Set Administrator Pass-
   If ONLY the Administrator's password is set,      word
   then this only limits access to Setup and is
   only asked for when entering Setup.
   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.
   The password length must be
   in the following range:
   Minimum length              3
   Maximum length             20                     →←: Select Screen
                                                     ↑↓: Select Item
   Administrator Password                            Enter: Select
   User Password                                     +/- : Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
   ▶ Secure Boot                                     F9: Optimized Defaults
                                                     F10: Save & Reset
                                                     ESC: Exit


                Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```
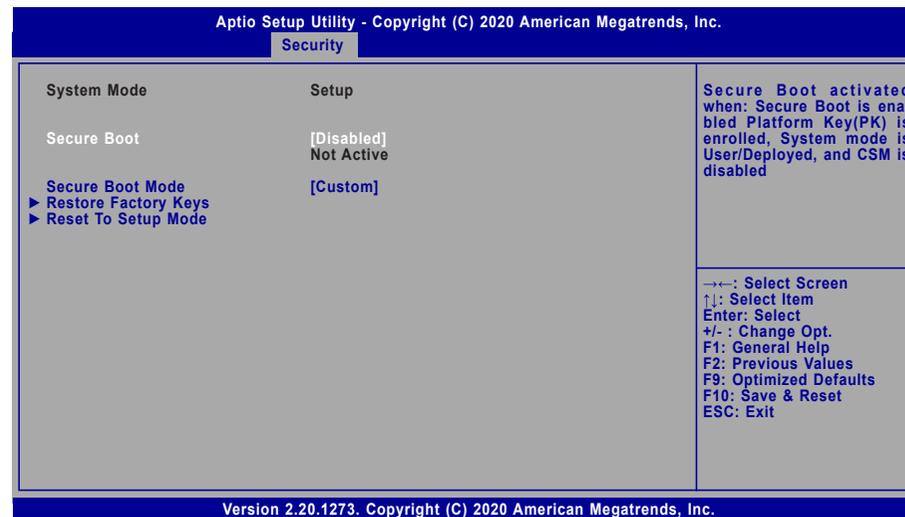
Administrator Password

Set the administrator password. To clear the password, input nothing and press enter when a new password is asked. Administrator Password will be required when entering the BIOS.

User Password

Set the user password. To clear the password, input nothing and press enter when a new password is asked. User Password will be required when powering up the system.

▶ Security

Secure Boot

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                                                  Security

   System Mode             Setup                    Secure Boot activated
                                                    when: Secure Boot is ena-
   Secure Boot             [Disabled]               bled Platform Key(PK) is
                           Not Active               enrolled, System mode is
                                                    User/Deployed, and CSM is
   Secure Boot Mode        [Custom]                 disabled
   ▶ Restore Factory Keys
   ▶ Reset To Setup Mode
                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/- : Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F9: Optimized Defaults
                                                     F10: Save & Reset
                                                     ESC: Exit


                Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

Secure Boot

The Secure Boot store a database of certificates in the firmware and only allows the OSes with authorized signatures to boot on the system. To activate Secure Boot, please make sure that "Secure Boot" is "[Enabled]", Platform Key (PK) is enrolled, "System Mode" is "User", and CSM is disabled. After enabling/disabling Secure Boot, please save the configuration and restart the system. When configured and activated correctly, the Secure Boot status will be "Active".

Secure Boot Mode

Select the secure boot mode — Standard or Custom. When set to Custom, the following fields will be configurable for the user to manually modify the key database.
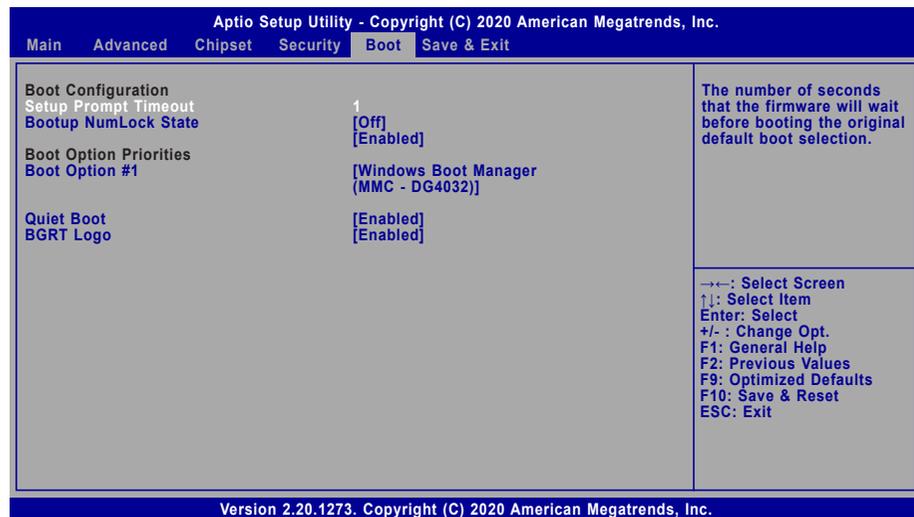
Restore Factory Keys

Force system to User Mode. Load OEM-defined factory defaults of keys and databases onto the Secure Boot. Press Enter and a prompt will show up for you to confirm.

Reset To Setup Mode

Clear the database from the NVRAM, including all the keys and signatures installed in the Key Management menu. Press Enter and a prompt will show up for you to confirm.

▶ **Boot**

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  Main    Advanced   Chipset    Security    Boot   Save & Exit

  Boot Configuration                                          The number of seconds
  Setup Prompt Timeout           1                            that the firmware will wait
  Bootup NumLock State           [Off]                        before booting the original
                                 [Enabled]                    default boot selection.
  Boot Option Priorities
  Boot Option #1                 [Windows Boot Manager
                                 (MMC - DG4032)]

  Quiet Boot                     [Enabled]
  BGRT Logo                      [Enabled]

                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/- : Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Reset
                                                              ESC: Exit

            Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

Setup Prompt Timeout

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

Bootup NumLock State

Select the keyboard NumLock state: On or Off.

Quiet Boot

This section is used to enable or disable quiet boot option.

Boot Option Priorities

Rearrange the system boot order of available boot devices. Please enable the devices that you wish to set as boot devices in the "Advanced > CSM Configuration" submenu.

BGRT Logo

It is used to enable or disable the support of display logo with ACPI BGRT table.

> **Note:**
> If "Boot option filter" of "CSM Configuration" is set to "UEFI and Legacy" or "UEFI only", and "Quiet Boot" is set to enabled, "BGRT Logo" will show up for configuration. Refer to the Advanced > CSM Configuration submenu for more information.

▶ **Save & Exit**

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  Main    Advanced   Chipset    Security    Boot   Save & Exit

  Save Options                                                Reset the system after
  Save Changes and Reset                                      saving the changes
  Discard Changes and Reset

  Default Options
  Restore Defaults

                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/- : Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Reset
                                                              ESC: Exit

            Version 2.20.1273. Copyright (C) 2020 American Megatrends, Inc.
```

Save Changes and Reset

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

Discard Changes and Reset

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

Restore Defaults

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

▶ Updating the BIOS

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

▶ Notice: BIOS SPI ROM

1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.

2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.

3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.

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

Chapter 4 - Supported Software

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

▶ Auto-run Menu

After inserting your DVD-ROM into your optical drive or executing your DVD image, the System Utility auto-run menu may pop up. Click on the utility or driver that is to be installed on the system. Please refer to the following sections that correspond to your selection for more information.

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

▶ AMD Chipset and VGA Drivers

1. Read the license agreement then click "Accept and Install".
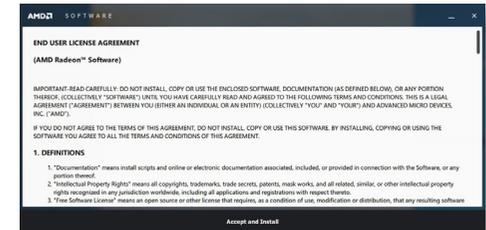
2. The step displays the installing status in the progress.

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

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

▶ **Intel LAN Driver**

1. Setup is ready to install the driver. Click "Next".
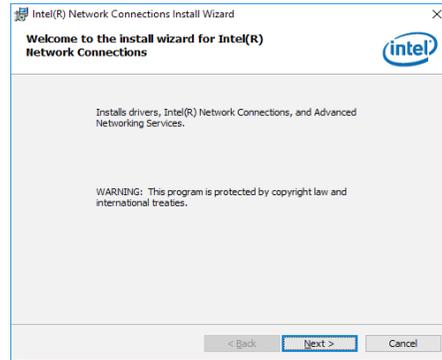
2. Click "I accept the terms in the license agreement" then click "Next".
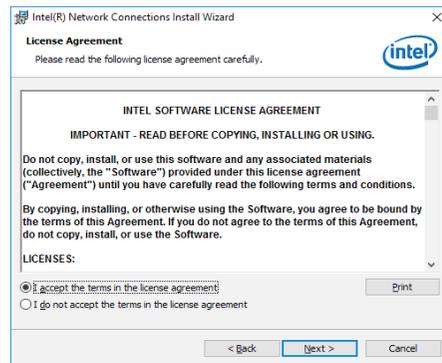
3. Select the program features you want installed then click "Next".
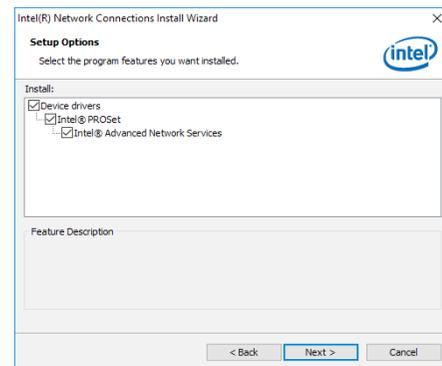
4. Click "Install" to begin the installation.
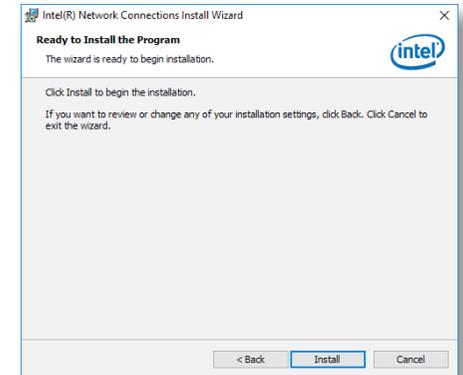
5. The step displays the installing status in the progress.
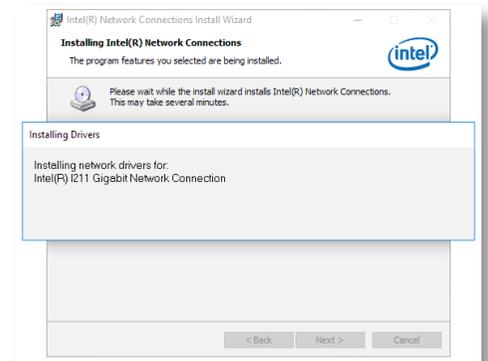
6. After completing installation, click "Finish".
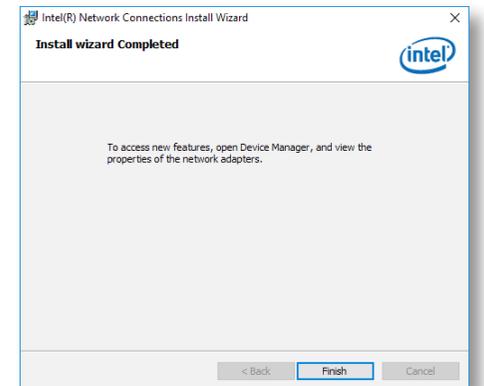
▶ **Gaming Drivers**
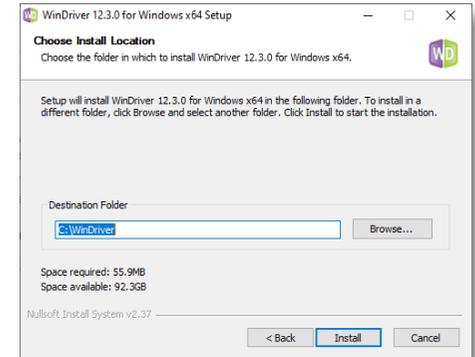
1. Setup is ready to install the driver. Click "Next".

2. Carefully read the agreement, and then press "I agree" to proceed.
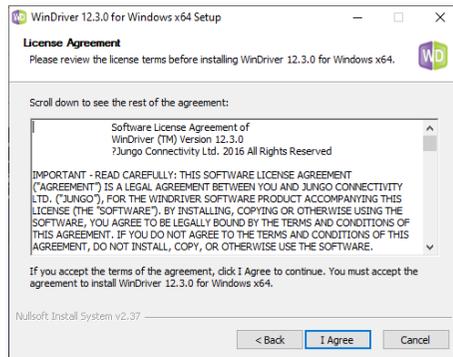
3. Choose the components to be installed.
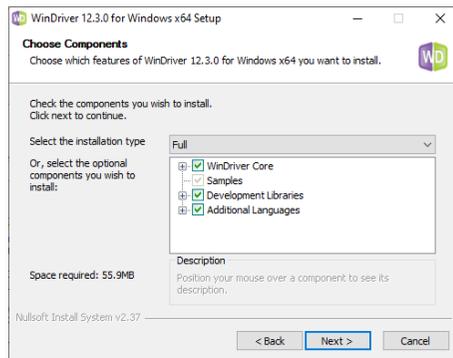
4. Designate a directory where the drivers will be installed, and then press "Install".
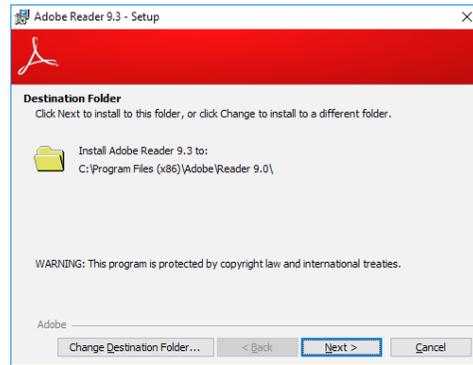
5. The installation is in progress.
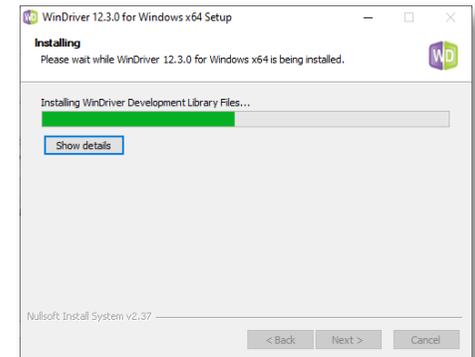
6. The setup is complete. Press "Finish" to close the setup utiility.
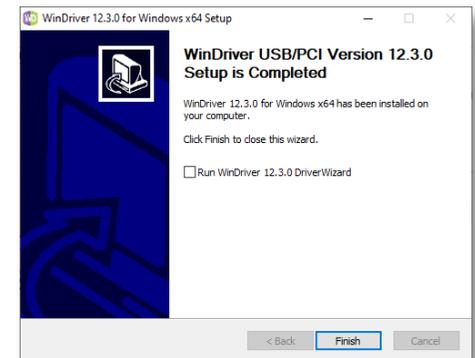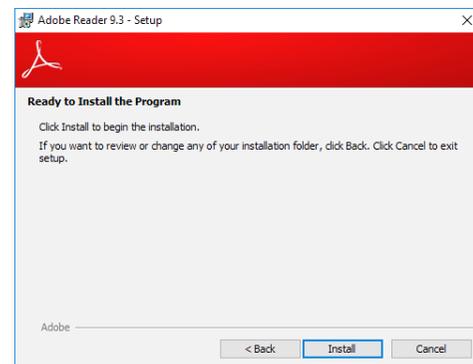
▶ **Adobe Acrobat Reader 9.3**

1. Click "Next" to install or click "Change Destination Folder" to select another folder.

3. Setup is now installing the driver.

2. Click "Install" to begin installation.

4. Click "Finish" to exit installation.