

# Intel® NUC Board NUC5PGYH Technical Product Specification

October 2016  
Order Number: H78081-008

The Intel NUC Board NUC5PGYH may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Current characterized errata are documented in the Intel NUC Board NUC5PGYH Specification Update.

# Revision History

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| Revision | Revision History                                                               | Date           |
|----------|--------------------------------------------------------------------------------|----------------|
| 001      | First release of the Intel® NUC Board NUC5PGYH Technical Product Specification | September 2015 |
| 002      | Specification Clarification                                                    | October 2015   |
| 003      | Specification Clarification                                                    | November 2015  |
| 004      | Specification Clarification                                                    | March 2016     |
| 005      | Specification Change                                                           | May 2016       |
| 006      | Specification Clarification                                                    | June 2016      |
| 007      | Specification Clarification                                                    | August 2016    |
| 008      | Specification Change                                                           | October 2016   |

## Disclaimer

This product specification applies to only the standard Intel® NUC Board with BIOS identifier PYBSWCEL.86A.

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## Board Identification Information

### Basic Intel® NUC Board NUC5PGYH Identification Information

| AA Revision | BIOS Revision | Notes |
|-------------|---------------|-------|
| H78168-100  | PYBSWCCEL.86A | 1,2   |

Notes:

1. The AA number is found on a small label on the component side of the board.
2. Intel® Pentium® processor N3700, used on this AA revision, consists of the following component:

| Device                        | Stepping | S-Spec Numbers |
|-------------------------------|----------|----------------|
| Intel Pentium processor N3700 | C0       | SR29E          |

## Specification Changes or Clarifications

The table below indicates the Specification Changes or Specification Clarifications that apply to the Intel NUC Board NUC5PGYH.

### Specification Changes or Clarifications

| Date          | Type of Change     | Description of Changes or Clarifications                                                                                                                                                                                                                     |
|---------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| October 2015  | Spec Clarification | Removed all reference to the Front Panel Header as it was not stuffed on the board.                                                                                                                                                                          |
| November 2015 | Spec Clarification | Updated the operating temperature in Table 22. Environmental Specifications.                                                                                                                                                                                 |
| March 2016    | Spec Clarification | Added a Note to Section 2.2.4.4 to clarify what the Auxiliary Power Connector is used for.                                                                                                                                                                   |
| May 2016      | Spec Change        | <ul style="list-style-type: none"><li>• Deleted the Near Field Communication (NFC) header and all related text.</li><li>• Added Section 2.2.4.5 Front Panel Header (2.0 mm Pitch).</li></ul>                                                                 |
| June 2016     | Spec Clarification | <ul style="list-style-type: none"><li>• Update SATA speed to 6.0 Gb/s.</li></ul>                                                                                                                                                                             |
| August 2016   | Spec Change        | <ul style="list-style-type: none"><li>• Added 1.5.1.4 Analog Display (VGA)</li><li>• Added information to section 1.5.1.1 Intel® High Definition (Intel® HD) Graphics</li><li>• In Section 1.11.1 Hardware Monitoring, changed info to ITE IT8607D</li></ul> |
| October 2016  | Spec Change        | <ul style="list-style-type: none"><li>• Added information about supported 8 GB to 128 GB SD Card Sizes to SDXC Card Reader section</li></ul>                                                                                                                 |

## Errata

Current characterized errata, if any, are documented in a separate Specification Update. See <http://www.intel.com/content/www/us/en/nuc/overview.html> for the latest documentation.



# Preface

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This Technical Product Specification (TPS) specifies the board layout, components, connectors, power and environmental requirements, and the BIOS for Intel® NUC Board NUC5PGYH.

## Intended Audience

The TPS is intended to provide detailed technical information about Intel NUC Board NUC5PGYH and its components to the vendors, system integrators, and other engineers and technicians who need this level of information. It is specifically *not* intended for general audiences.

## What This Document Contains

| Chapter | Description                                                          |
|---------|----------------------------------------------------------------------|
| 1       | A description of the hardware used on Intel NUC Board NUC5PGYH       |
| 2       | A map of the resources of the Intel NUC Board                        |
| 3       | The features supported by the BIOS Setup program                     |
| 4       | A description of the BIOS error messages, beep codes, and POST codes |
| 5       | Regulatory compliance and battery disposal information               |

## Typographical Conventions

This section contains information about the conventions used in this specification. Not all of these symbols and abbreviations appear in all specifications of this type.

## Notes, Cautions, and Warnings



### NOTE

*Notes call attention to important information.*



### CAUTION

*Cautions are included to help you avoid damaging hardware or losing data.*

## Other Common Notation

|       |                                                                                                                |
|-------|----------------------------------------------------------------------------------------------------------------|
| #     | Used after a signal name to identify an active-low signal (such as USBP0#)                                     |
| GB    | Gigabyte (1,073,741,824 bytes)                                                                                 |
| GB/s  | Gigabytes per second                                                                                           |
| Gb/s  | Gigabits per second                                                                                            |
| KB    | Kilobyte (1024 bytes)                                                                                          |
| Kb    | Kilobit (1024 bits)                                                                                            |
| kb/s  | 1000 bits per second                                                                                           |
| MB    | Megabyte (1,048,576 bytes)                                                                                     |
| MB/s  | Megabytes per second                                                                                           |
| Mb    | Megabit (1,048,576 bits)                                                                                       |
| Mb/s  | Megabits per second                                                                                            |
| TDP   | Thermal Design Power                                                                                           |
| xxh   | An address or data value ending with a lowercase h indicates a hexadecimal value.                              |
| x.x V | Volts. Voltages are DC unless otherwise specified.                                                             |
| *     | This symbol is used to indicate third-party brands and names that are the property of their respective owners. |

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# 1 Product Description

## 1.1 Overview

### 1.1.1 Feature Summary

Table 1 summarizes the major features of the board.

**Table 1. Feature Summary**

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Form Factor</b>           | 4.0 inches by 4.0 inches (101.60 millimeters by 101.60 millimeters)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Processor</b>             | <ul style="list-style-type: none"><li>• Soldered-down quad-core Intel® Pentium® processor N3700 with up to 6 W TDP<ul style="list-style-type: none"><li>— Integrated graphics</li><li>— Integrated memory controller</li><li>— Integrated PCH</li></ul></li></ul>                                                                                                                                                                                                                                                                                                   |
| <b>Memory</b>                | <ul style="list-style-type: none"><li>• 2 GB DDR3L 1600 MHz SO-DIMM pre-installed</li><li>• Support for 1066 MHz/1666 MHz memory speeds<br/>Note: If you install 1333 MHz, it will run at 1066 MHz.</li><li>• Support for up to 8 GB of system memory with one SO-DIMM using 4 Gb memory technology</li><li>• Support for non-ECC memory</li><li>• Support for 1.35 V low voltage JEDEC memory</li></ul>                                                                                                                                                            |
| <b>Graphics</b>              | <ul style="list-style-type: none"><li>• Integrated graphics support with Intel® Graphics Technology:<ul style="list-style-type: none"><li>— High Definition Multimedia Interface* (HDMI*)</li><li>— VGA</li></ul></li></ul>                                                                                                                                                                                                                                                                                                                                         |
| <b>Audio</b>                 | <ul style="list-style-type: none"><li>• Intel® High Definition (Intel® HD) Audio via the HDMI v1.4b interface through the processor</li><li>• Realtek HD Audio via a stereo microphone/headphone 3.5 mm jack on the front panel</li><li>• Compressed 5.1/7.1 digital audio through a Mini-TOSLINK jack on the back panel</li></ul>                                                                                                                                                                                                                                  |
| <b>Peripheral Interfaces</b> | <ul style="list-style-type: none"><li>• USB 3.0 ports:<ul style="list-style-type: none"><li>— Two ports are implemented with external front panel connectors (one blue and one orange charging capable)</li><li>— Two ports are implemented with external back panel connectors (blue)</li></ul></li><li>• USB 2.0 ports:<ul style="list-style-type: none"><li>— Two ports via one dual-port internal 1x8 1.25 mm pitch header (white)</li><li>— One port is reserved for an M.2 2230 for the Wireless module</li></ul></li><li>• Consumer Infrared (CIR)</li></ul> |
| <b>Storage</b>               | <ul style="list-style-type: none"><li>• One SATA 6.0 Gb/s port (black)<ul style="list-style-type: none"><li>- Supports one 2.5" SSD or HDD up to 9.5mm</li></ul></li><li>• One full sized SDXC slot</li><li>• 32 GB Embedded MultiMediaCard (e-MMC) onboard storage module</li></ul>                                                                                                                                                                                                                                                                                |

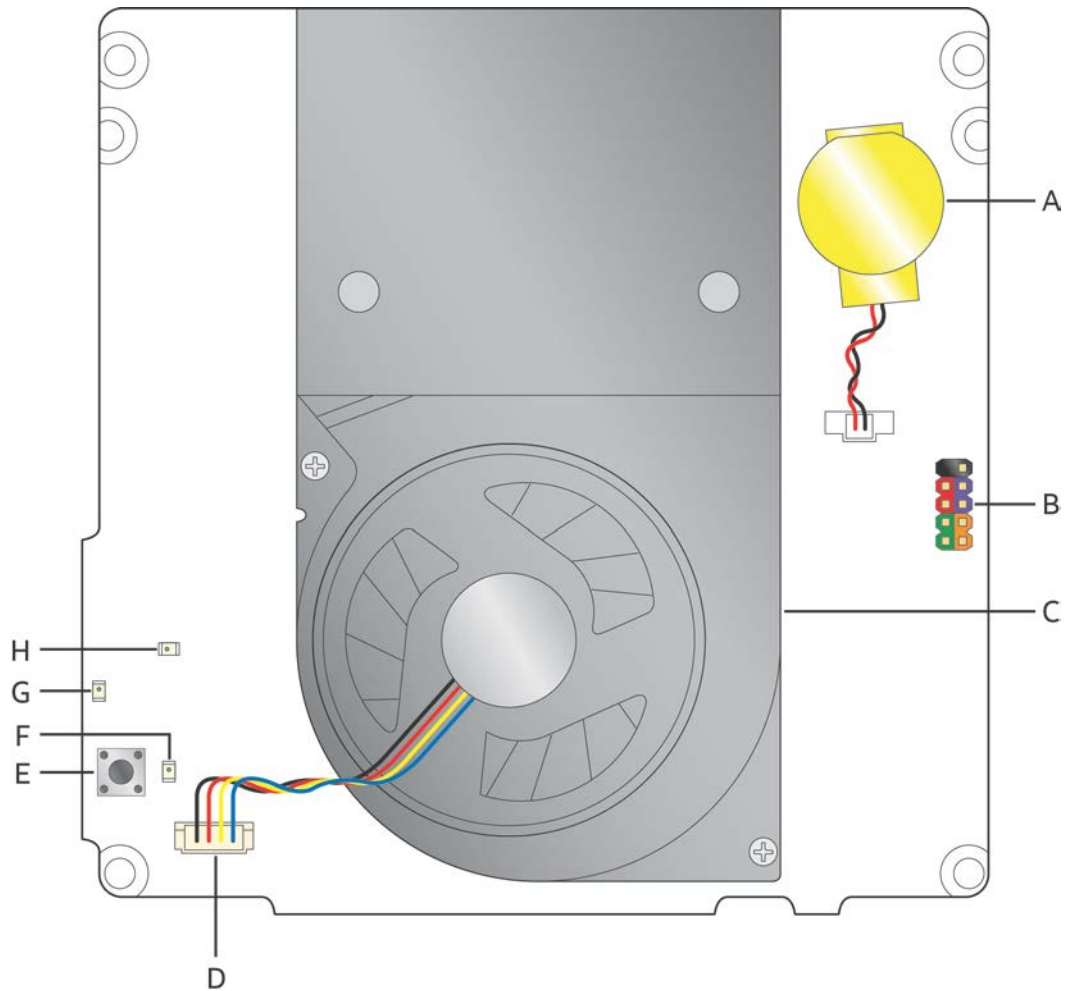
continued

**Table 1. Feature Summary** (continued)

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Expansion Capabilities</b>     | One M.2 Module supporting M.2 2230 cards (key type E)                                                                                                                                                                                                                                                                                                                                                       |
| <b>BIOS</b>                       | <ul style="list-style-type: none"> <li>• Intel® BIOS resident in the Serial Peripheral Interface (SPI) Flash device</li> <li>• Support for Advanced Configuration and Power Interface (ACPI), Plug and Play, and System Management BIOS (SMBIOS)</li> </ul>                                                                                                                                                 |
| <b>LAN Support</b>                | Gigabit (10/100/1000 Mb/s) LAN subsystem using the Realtek® 8111HN Gigabit Ethernet Controller                                                                                                                                                                                                                                                                                                              |
| <b>Hardware Monitor Subsystem</b> | <p>Hardware monitoring subsystem, based on an ITE IT8607D embedded controller, including:</p> <ul style="list-style-type: none"> <li>• Voltage sense to detect out of range power supply voltages</li> <li>• Thermal sense to detect out of range thermal values</li> <li>• One processor fan header</li> <li>• Fan sense input used to monitor fan activity</li> <li>• Simple fan speed control</li> </ul> |
| <b>Wireless</b>                   | <ul style="list-style-type: none"> <li>• Intel® Dual Band Wireless-AC 3165 module</li> <li>• 2nd Gen 802.11ac, Dual Band, 1x1 Wi-Fi + Dual Mode Bluetooth® 4.0</li> <li>• Maximum Transfer speed up to 433Mbps</li> <li>• Supports Intel® Wireless Display (WiDi)</li> <li>• Supports Intel® Smart Connect Technology</li> <li>• Pre-installed in M.2 2230 slot</li> </ul>                                  |

### 1.1.2 Board Layout (Top)

Figure 1 shows the location of the major components on the top-side of Intel NUC Board NUC5PGYH.



24171A

**Figure 1. Major Board Components (Top)**

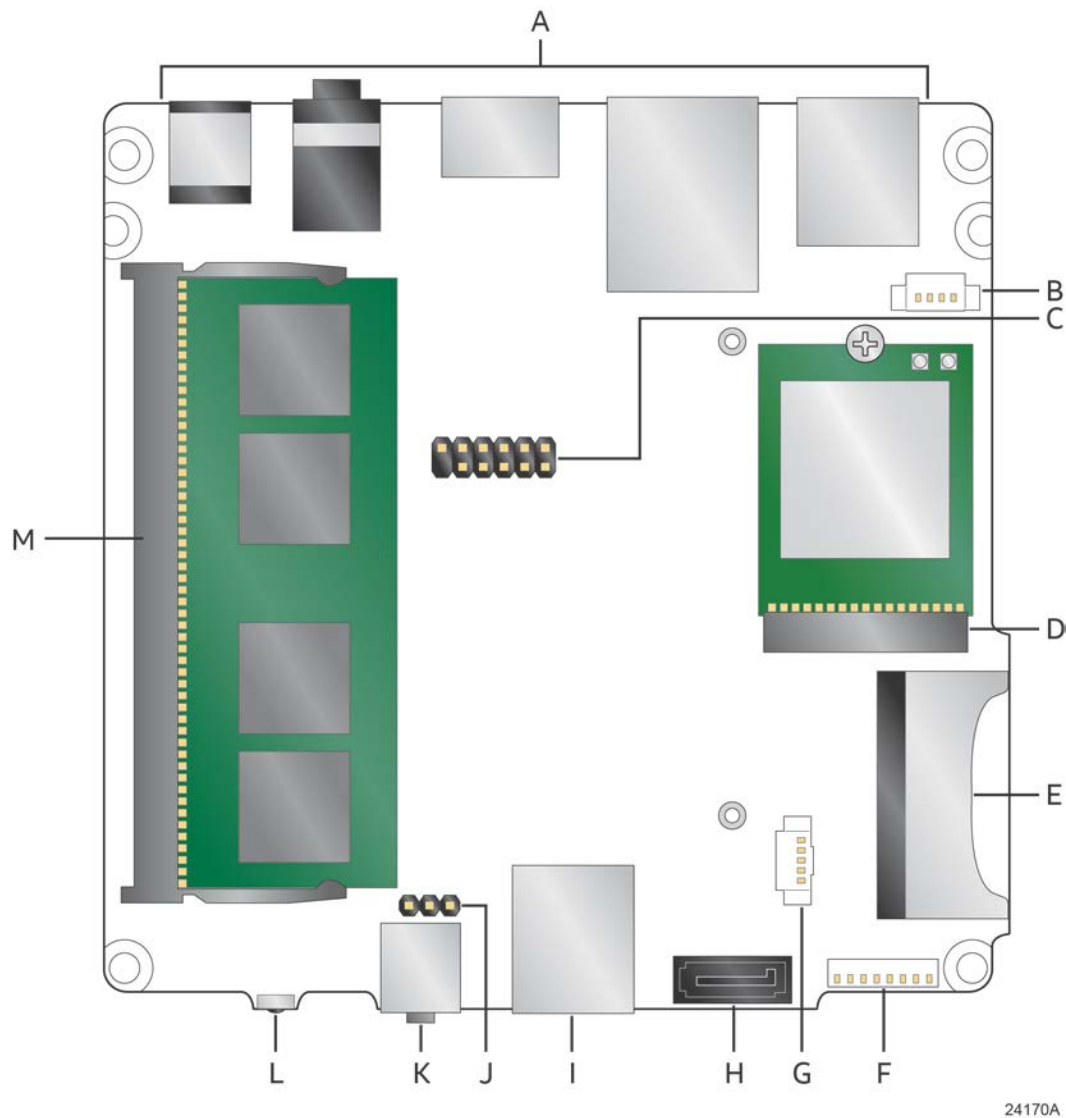
Table 2 lists the components identified in Figure 1.

**Table 2. Components Shown in Figure 1**

| Item from Figure 1 | Description          |
|--------------------|----------------------|
| A                  | Battery              |
| B                  | Front panel header   |
| C                  | Thermal solution     |
| D                  | Processor fan header |
| E                  | Onboard power button |
| F                  | Power LED            |
| G                  | Hard Disk Drive LED  |
| H                  | Standby Power LED    |

1.1.3 Board Layout (Bottom)

Figure 2 shows the location of the major components on the bottom-side of Intel NUC Board NUC5PGYH.



24170A

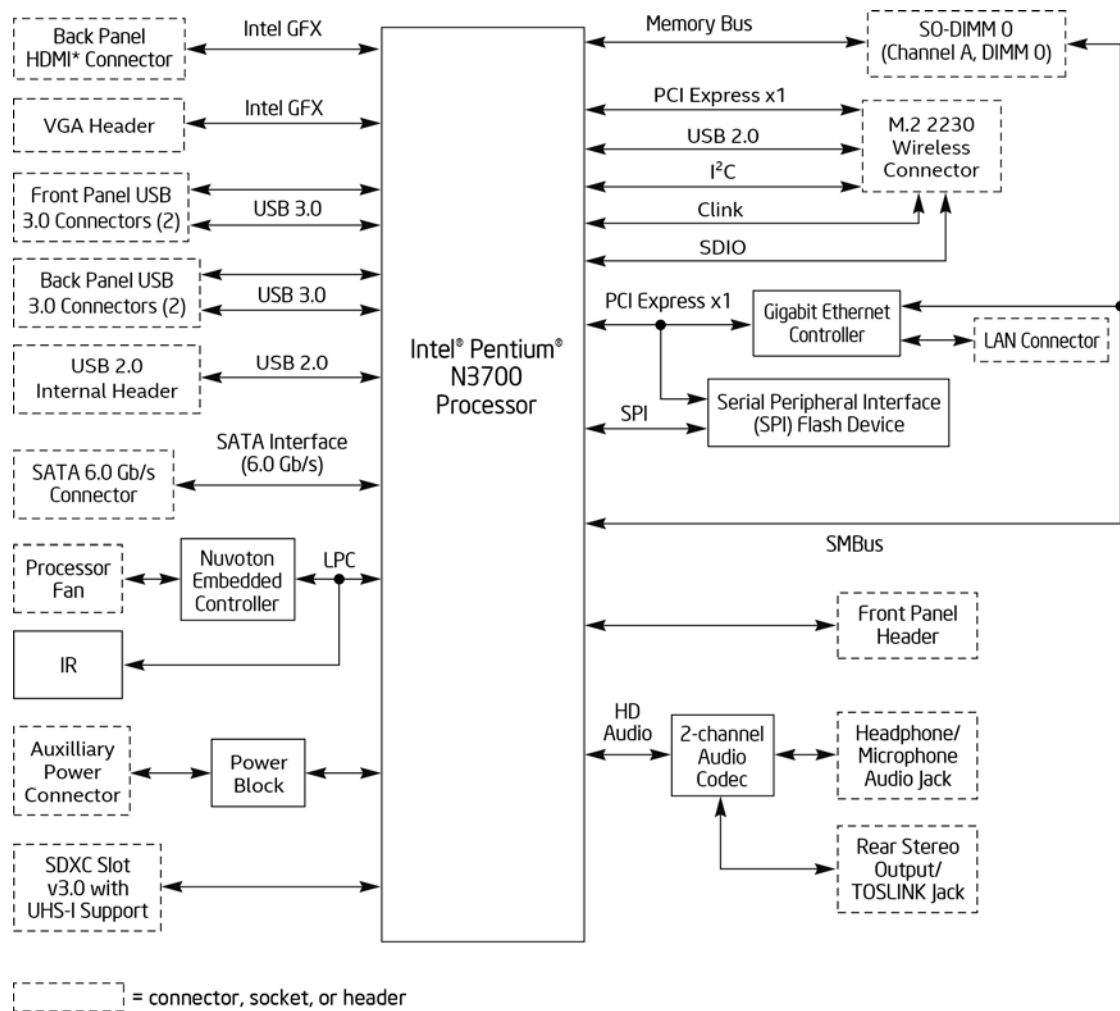
Figure 2. Major Board Components (Bottom)

**Table 3. Components Shown in Figure 2**

| <b>Item from<br/>Figure 2</b> | <b>Description</b>                                                        |
|-------------------------------|---------------------------------------------------------------------------|
| A                             | Back panel connectors                                                     |
| B                             | Auxiliary power connector (1.25 mm pitch)                                 |
| C                             | VGA connector                                                             |
| D                             | M.2 2230 Module connector                                                 |
| E                             | SDXC slot                                                                 |
| F                             | Front panel dual-port USB 2.0 header (1.25 mm pitch)                      |
| G                             | SATA power connector (1.25 mm pitch)                                      |
| H                             | SATA 6.0 Gb/s connector                                                   |
| I                             | Front panel USB 3.0 connectors (one blue and one orange charging capable) |
| J                             | BIOS security jumper                                                      |
| K                             | Front panel stereo microphone/headphone jack                              |
| L                             | Front panel Consumer Infrared sensor (CIR)                                |
| M                             | DDR3L SO-DIMM socket                                                      |

### 1.1.4 Block Diagram

Figure 3 is a block diagram of the major functional areas of the board.



24175B:

### Figure 3. Block Diagram

## 1.2 Online Support

### To find information about...

Intel NUC Board NUC5PGYH

NUC Board Support

Available configurations for Intel NUC Board NUC5PGYH

BIOS and driver updates

Tested memory

Integration information

### Visit this World Wide Web site:

<http://www.intel.com/NUC>

<http://www.intel.com/NUCSupport>

<http://ark.intel.com>

<http://downloadcenter.intel.com>

<http://www.intel.com/NUCSupport>

<http://www.intel.com/NUCSupport>

## 1.3 Processor

Intel NUC Board NUC5PGYH has a soldered-down System-on-a-Chip (SoC), which consists of a quad-core Intel Pentium processor N3700 with up to 6 W TDP.

- Integrated graphics
- Integrated memory controller
- Integrated PCH



### NOTE

*This board has specific requirements for providing power to the processor. Refer to Section 2.5.1 on page 53 for information on power supply requirements for this board.*

## 1.4 System Memory

The board has one 204-pin SO-DIMM socket and supports the following memory features:

- Pre-installed 2 GB DDR3L 1600 MHz SDRAM SO-DIMM (1.35 V) with gold plated contacts
- Support for 1066 MHz/1666 MHz memory speeds

Note: If you install 1333 MHz, it will run at 1066 MHz.

- One memory channel
- Unbuffered, single-sided or double-sided SO-DIMMs
- 8 GB maximum total system memory (with 4 Gb memory technology). Refer to Section 2.1.1 on page 37 for information on the total amount of addressable memory.
- Minimum recommended total system memory: 1024 MB
- Non-ECC SO-DIMMs
- Serial Presence Detect



### NOTE

*To be fully compliant with all applicable DDR SDRAM memory specifications, the board should be populated with SO-DIMMs that support the Serial Presence Detect (SPD) data structure. This allows the BIOS to read the SPD data and program the chipset to accurately configure memory settings for optimum performance. If non-SPD memory is installed, the BIOS will attempt to correctly configure the memory settings, but performance and reliability may be impacted or the SO-DIMMs may not function under the determined frequency.*

Table 4 lists the supported SO-DIMM configurations.

**Table 4. Supported Memory Configurations**

| SO-DIMM Capacity | Configuration <sup>(Note)</sup> | SDRAM Density | SDRAM Organization Front-side/Back-side | Number of SDRAM Devices |
|------------------|---------------------------------|---------------|-----------------------------------------|-------------------------|
| 1024 MB          | SS                              | 1 Gbit        | 128 M x8/empty                          | 8                       |
| 2048 MB          | DS                              | 1 Gbit        | 128 M x8/128 M x8                       | 16                      |
| 2048 MB          | SS                              | 2 Gbit        | 256 M x8/empty                          | 8                       |
| 4096 MB          | DS                              | 2 Gbit        | 256 M x8/256 M x8                       | 16                      |
| 4096 MB          | SS                              | 4 Gbit        | 512 M x8/empty                          | 8                       |
| 8192 MB          | DS                              | 4 Gbit        | 512 M x8/512 M x8                       | 16                      |

Note: "DS" refers to double-sided memory modules (containing two rows of SDRAM) and "SS" refers to single-sided memory modules (containing one row of SDRAM).

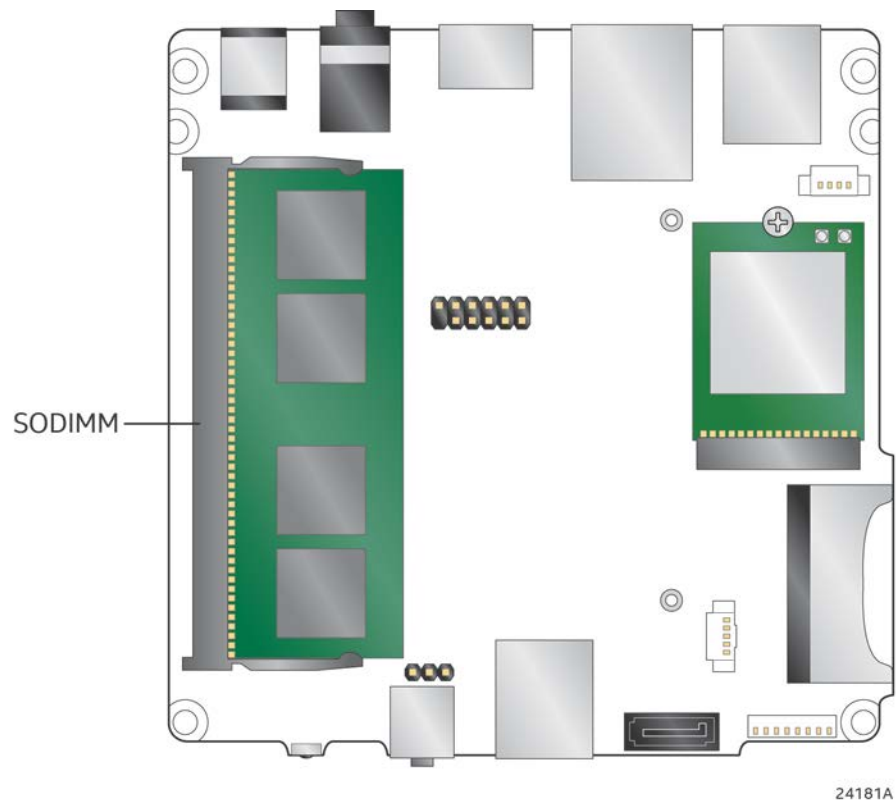
#### For information about...

Tested Memory

#### Refer to:

<http://www.intel.com/NUCSupport>

Figure 4 illustrates the memory channel and SO-DIMM configuration.



**Figure 4. Memory Channel and SO-DIMM Configuration**

## 1.5 Processor Graphics Subsystem

The board supports graphics through Intel HD Graphics.

### 1.5.1 Integrated Graphics

The board supports integrated graphics via the processor.

#### 1.5.1.1 Intel® High Definition (Intel® HD) Graphics

The Intel HD graphics controller features the following:

- HDMI 1.4b supports resolutions up to 3840 x 2160 (4K UHD) at 30Hz or 2560 x 1600 (WQXGA) at 60Hz
- VGA (via an ITE IT6515FN DP to VGA bridge) supports resolutions up to 1920 x 1200 (WUXGA) at 60Hz
- Dual independent display support
- 3D graphics hardware acceleration supporting DirectX\*11.1, OpenCL\* 1.2, OGL ES Haili/2.0/1.1, OpenGL\* 4.2
- Video decode hardware acceleration supporting H.265/HEVC @ Level 5, H.264 @ Level 5.2, MPEG2, MVC, VC-1, WMV9, JPEG and VP8 formats
- Video encode hardware acceleration supporting H.264 @ Level 5.1, JPEG and MVC formats
- High-Bandwidth Digital Content Protection (HDCP) 1.4/2.2 support for content protection

#### 1.5.1.2 Video Memory Allocation

Intel® Dynamic Video Memory Technology (DVMT) is a method for dynamically allocating system memory for use as graphics memory to balance 2D/3D graphics and system performance. If your computer is configured to use DVMT, graphics memory is allocated based on system requirements and application demands (up to the configured maximum amount). When memory is no longer needed by an application, the dynamically allocated portion of memory is returned to the operating system for other uses.

#### 1.5.1.3 High Definition Multimedia Interface\* (HDMI\*)

The HDMI port supports standard, enhanced, or high definition video, plus multi-channel digital audio on a single cable. The port is compatible with all ATSC and DVB HDTV standards and supports eight full range channels at 24-bit/96 kHz audio of lossless audio formats. The maximum supported resolution is 3840 x 2160 @ 30 Hz and 2560 x 1600 @ 60 Hz, 24 bpp (WUXGA). The HDMI port is compliant with the HDMI 1.4b specification.

##### 1.5.1.3.1 Integrated Audio Provided by the HDMI Interfaces

The following audio technologies are supported by the HDMI 1.4b interfaces directly from the SoC:

- AC3 - Dolby\* Digital
- Dolby Digital Plus

#### **1.5.1.4 Analog Display (VGA)**

The VGA port supports analog displays. The maximum supported resolution is 1920 x 1200 (WUXGA) at a 60 Hz refresh rate.

- LPCM, 192 kHz/24-bit, 8 Channel

## 1.6 USB

The USB port arrangement is as follows:

- USB 3.0 ports (maximum current is 900 mA for each blue port, 1.5 A for the orange charging port):
  - Two ports are implemented with external front panel connectors (one blue and one orange charging capable)
  - Two ports are implemented with external back panel connectors (blue)
- USB 2.0 ports (maximum current is 500 mA for each port of the white header (1 A total):
  - Two ports via one dual-port internal 1x8 1.25 mm pitch header (white)
  - One port is reserved for an M.2 2230 for the Wireless module

All the USB ports are high-speed, full-speed, and low-speed capable.



### NOTE

*Computer systems that have an unshielded cable attached to a USB port may not meet FCC Class B requirements, even if no device is attached to the cable. Use a shielded cable that meets the requirements for full-speed devices.*

| For information about                                | Refer to           |
|------------------------------------------------------|--------------------|
| The location of the USB connectors on the back panel | Figure 11, page 38 |
| The location of the USB connector on the front panel | Figure 2, page 15  |

## 1.7 SATA Interface

The SoC provides one SATA port with a theoretical maximum transfer rate of 6.0 Gb/s. A point-to-point interface is used for host to device connections.

The underlying SATA functionality is transparent to the operating system. The SATA controller can operate in both legacy and native modes. In legacy mode, standard IDE I/O and IRQ resources are assigned (IRQ 14 and 15). In Native mode, standard PCI Conventional bus resource steering is used. Native mode is the preferred mode for configurations using Windows\* operating systems.

### 1.7.1 AHCI Mode

The board supports AHCI storage mode.



### NOTE

*In order to use AHCI mode, AHCI must be enabled in the BIOS. Microsoft\* Windows 8 includes the necessary AHCI drivers without the need to install separate AHCI drivers during the operating system installation process. However, it is always good practice to update the AHCI drivers to the latest available by Intel.*

## 1.8 Real-Time Clock Subsystem

A coin-cell battery (CR2032) powers the real-time clock and CMOS memory. When the computer is not plugged into a wall socket, the battery has an estimated life of three years. When the computer is plugged in, the standby current from the power supply extends the life of the battery. The clock is accurate to  $\pm 13$  minutes/year at 25 °C with 3.3 VSB applied via the power supply 5 V STBY rail.



### NOTE

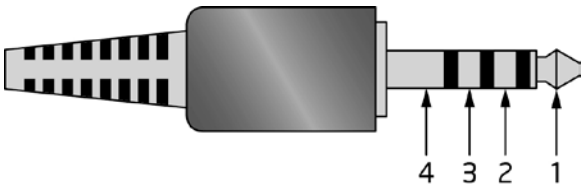
*If the battery and AC power fail, date and time values will be reset and the user will be notified during the POST.*

When the voltage drops below a certain level, the BIOS Setup program settings stored in CMOS RAM (for example, the date and time) might not be accurate. Replace the battery with an equivalent one. Figure 1 on page 13 shows the location of the battery.

## 1.9 Audio Subsystem

The board supports Intel HD Audio via the Realtek ALC283 audio codec. The audio subsystem supports the following features:

- Analog line-out/Analog Headphone/Analog Microphone jack on the front panel
- High Definition Audio via a stereo microphone/headphone jack on the back panel
- Support for 44.1 kHz/48 kHz/96 kHz/192 kHz sample rates on all analog outputs
- Support for 44.1 kHz/48 kHz/96 kHz sample rates on all analog inputs
- Back Panel Audio Jack Support (see Figure 5 for 3.5 mm audio jack pin out):
  - Speakers only
  - Headphones only
  - Microphone only
  - Combo Headphone/Microphone



| Pin Number | Pin Name | Description     |
|------------|----------|-----------------|
| 1          | Tip      | Left Audio Out  |
| 2          | Ring     | Right Audio Out |
| 3          | Ring     | Common/Ground   |
| 4          | Sleeve   | Audio In        |

Figure 5. 4-Pin 3.5 mm (1/8 inch) Audio Jack Pin Out



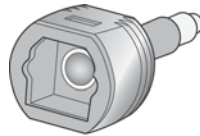
### NOTE

*The analog circuit of the back panel audio connector is designed to power headphones or amplified speakers only. Poor audio quality occurs if passive (nonamplified) speakers are connected to this output.*

## 1.9.1 Mini-TOSLINK Interface

The 3.5 mm audio jack also provides TOSLINK optical digital audio output.

- Mini-TOSLINK interface (back panel) plus analog audio out
  - PCM datastream support
  - S/PDIF datastream support
  - Mini-TOSLINK adaptor necessary to connect to standard TOSLINK cable
  - Stereo audio out



OM24169

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**Figure 6. Mini-TOSLINK Adaptor**

## 1.9.2 Audio Subsystem Software

Audio software and drivers are available from Intel's World Wide Web site.

| For information about                | Refer to                                                                      |
|--------------------------------------|-------------------------------------------------------------------------------|
| Obtaining Audio software and drivers | <a href="http://downloadcenter.intel.com">http://downloadcenter.intel.com</a> |

## 1.10 LAN Subsystem

The LAN subsystem consists of the following:

- Realtek 8111HN-CG Gigabit Ethernet Controller (10/100/1000 Mb/s)
- RJ-45 LAN connector with integrated status LEDs
- Intel® Dual Band Wireless-AC 3165 module

Additional features of the LAN subsystem include:

- CSMA/CD protocol engine
- Jumbo frame support 9K
- LAN connect interface between the SoC and the LAN controller
- Power management capabilities
  - ACPI technology support
  - LAN wake capabilities
- LAN subsystem software

### For information about

LAN software and drivers

### Refer to

<http://downloadcenter.intel.com>

### 1.10.1 Realtek\* 8111HN Gigabit Ethernet Controller

The Realtek 8111HN Gigabit Ethernet Controller supports the following features:

- 10/100/1000 BASE-T IEEE 802.3 compliant
- Energy Efficient Ethernet (EEE) IEEE802.3az support (Low Power Idle (LPI) mode)
- Dual interconnect between the Integrated LAN Controller and the Physical Layer (PHY):
  - PCI Express-based interface for active state operation (S0) state
  - SMBUS for host and management traffic (Sx low power state)
- Compliant to IEEE 802.3x flow control support
- 802.1p and 802.1q
- TCP, IP, and UDP checksum offload (for IPv4 and IPv6)
- Full device driver compatibility

### For information about

Full LAN Hardware feature set

### Refer to

<http://www.realtek.com.tw/>

### 1.10.2 LAN Subsystem Software

LAN software and drivers are available from Intel's World Wide Web site.

### For information about

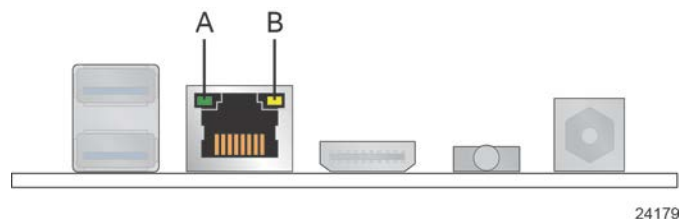
Obtaining LAN software and drivers

### Refer to

<http://downloadcenter.intel.com>

### 1.10.3 RJ-45 LAN Connector with Integrated LEDs

Two LEDs are built into the RJ-45 LAN connector (shown in Figure 7).



| Item | Description                  |
|------|------------------------------|
| A    | Link LED (Green)             |
| B    | Data Rate LED (Green/Yellow) |

**Figure 7. LAN Connector LED Locations**

Table 5 describes the LED states when the board is powered up and the LAN subsystem is operating.

**Table 5. LAN Connector LED States**

| LED           | LED Color    | LED State | Condition                        |
|---------------|--------------|-----------|----------------------------------|
| Link (A)      | Green        | Off       | LAN link is not established.     |
|               |              | On        | LAN link is established.         |
|               |              | Blinking  | LAN activity is occurring.       |
| Data Rate (B) | Green/Yellow | Off       | 10 Mb/s data rate is selected.   |
|               |              | Green     | 100 Mb/s data rate is selected.  |
|               |              | Yellow    | 1000 Mb/s data rate is selected. |

### 1.10.4 Wireless Network Module

The Intel Dual Band Wireless-AC 3165 module provides hi-speed wireless connectivity with the following capabilities:

- Intel® Dual Band Wireless-AC 3165 module
- 2nd Gen 802.11ac, Dual Band, 1x1 Wi-Fi + Dual Mode Bluetooth\* 4.0
- Maximum Transfer speed up to 433Mbps
- Supports Intel® Wireless Display (WiDi)
- Supports Intel® Smart Connect Technology
- Pre-installed in M.2 2230 slot

#### For information about

Obtaining WLAN software and drivers

Full Specifications

#### Refer to

<http://downloadcenter.intel.com>

<http://intel.com/wireless>

## 1.11 Hardware Management Subsystem

The hardware management features enable the board to be compatible with the Wired for Management (WfM) specification. The board has several hardware management features, including thermal and voltage monitoring.

| For information about                    | Refer to                                                                                   |
|------------------------------------------|--------------------------------------------------------------------------------------------|
| Wired for Management (WfM) Specification | <a href="http://www.intel.com/design/archives/wfm/">www.intel.com/design/archives/wfm/</a> |

### 1.11.1 Hardware Monitoring

The hardware monitoring and fan control subsystem is based on an ITE IT8607D embedded controller, which supports the following:

- Processor and system ambient temperature monitoring
- Chassis fan speed monitoring
- Voltage monitoring of +5 V, +3.3 V, Memory Vcc (SDRAM)
- SMBus interface

### 1.11.2 Fan Monitoring

Fan monitoring can be implemented using third-party software.

### 1.11.3 Thermal Solution

Figure 8 shows the location of the thermal solution and processor fan header.

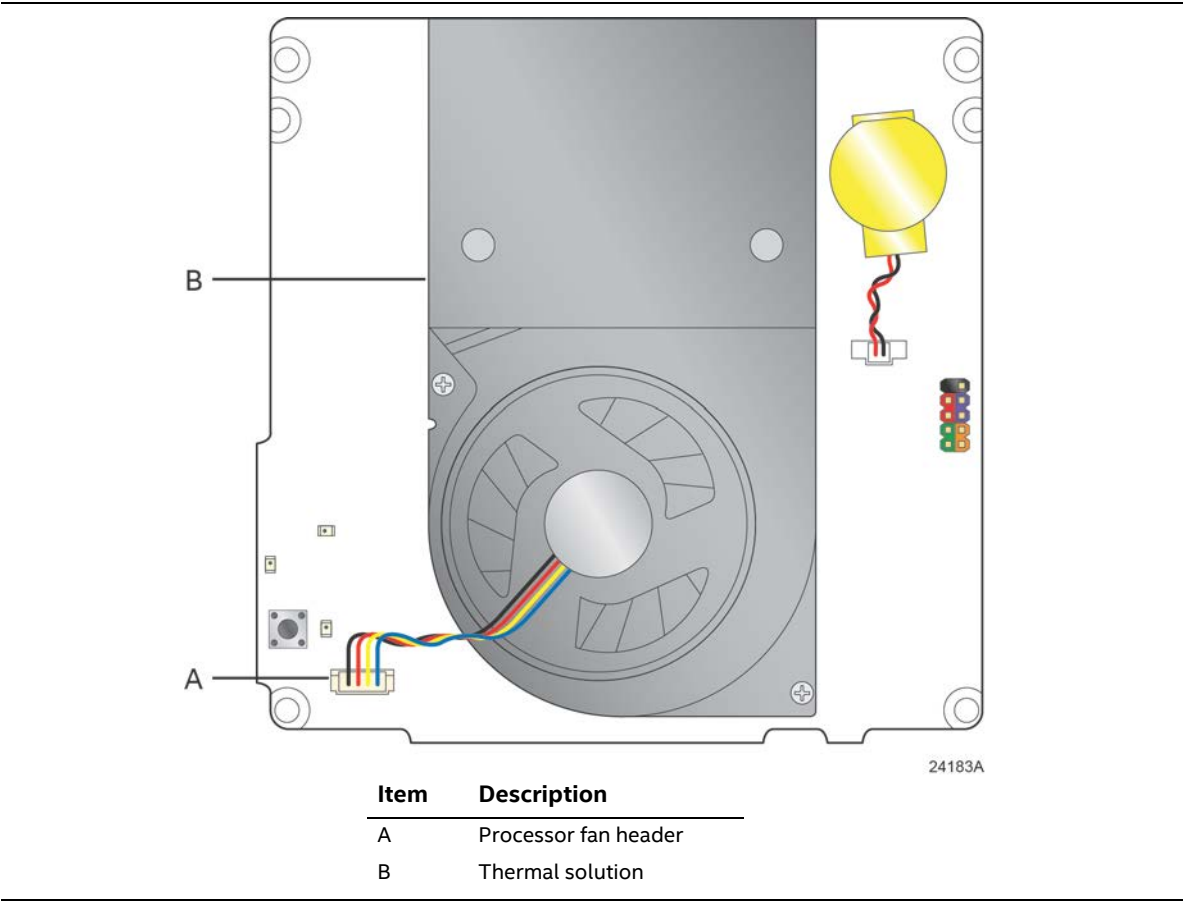


Figure 8. Thermal Solution and Fan Header

## 1.12 Power Management

Power management is implemented at several levels, including:

- Software support through Advanced Configuration and Power Interface (ACPI)
- Hardware support:
  - Power Input
  - Instantly Available PC technology
  - LAN wake capabilities
  - Wake from USB
  - WAKE# signal wake-up support
  - Wake from S5
  - Wake from CIR
  - +5 V Standby Power Indicator LED

### 1.12.1 ACPI

ACPI gives the operating system direct control over the power management and Plug and Play functions of a computer. The use of ACPI with this board requires an operating system that provides full ACPI support. ACPI features include:

- Plug and Play (including bus and device enumeration)
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), video displays, and disk drives
- Methods for achieving less than 15-watt system operation in the power-on/standby sleeping state
- A Soft-off feature that enables the operating system to power-off the computer
- Support for multiple wake-up events (see Table 8 on page 33)
- Support for a front panel power and sleep mode switch

Table 6 lists the system states based on how long the power switch is pressed, depending on how ACPI is configured with an ACPI-aware operating system.

**Table 6. Effects of Pressing the Power Switch**

| If the system is in this state...   | ...and the power switch is pressed for | ...the system enters this state                                |
|-------------------------------------|----------------------------------------|----------------------------------------------------------------|
| Off<br>(ACPI G2/G5 – Soft off)      | Less than four seconds                 | Power-on<br>(ACPI G0 – working state)                          |
| On<br>(ACPI G0 – working state)     | Less than four seconds                 | Soft-off/Standby<br>(ACPI G1 – sleeping state) <sup>Note</sup> |
| On<br>(ACPI G0 – working state)     | More than six seconds                  | Fail safe power-off<br>(ACPI G2/G5 – Soft off)                 |
| Sleep<br>(ACPI G1 – sleeping state) | Less than four seconds                 | Wake-up<br>(ACPI G0 – working state)                           |
| Sleep<br>(ACPI G1 – sleeping state) | More than six seconds                  | Power-off<br>(ACPI G2/G5 – Soft off)                           |

Note: Depending on power management settings in the operating system.

### 1.12.1.1 System States and Power States

Under ACPI, the operating system directs all system and device power state transitions. The operating system puts devices in and out of low-power states based on user preferences and knowledge of how devices are being used by applications. Devices that are not being used can be turned off. The operating system uses information from applications and user settings to put the system as a whole into a low-power state.

Table 7 lists the power states supported by the board along with the associated system power targets. See the ACPI specification for a complete description of the various system and power states.

**Table 7. Power States and Targeted System Power**

| Global States                                                      | Sleeping States                                          | Processor States | Device States                                                                        | Targeted System Power <sup>(Note 1)</sup>                |
|--------------------------------------------------------------------|----------------------------------------------------------|------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------|
| G0 – working state                                                 | S0 – working                                             | C0 – working     | D0 – working state.                                                                  | Full power                                               |
| G1 – sleeping state                                                | S3 – Suspend to RAM. Context saved to RAM.               | No power         | D3 – no power except for wake-up logic.                                              | Power < 5 W <sup>(Note 2)</sup>                          |
| G1 – sleeping state                                                | S4 – Suspend to disk. Context saved to disk.             | No power         | D3 – no power except for wake-up logic.                                              | Power < 5 W <sup>(Note 2)</sup>                          |
| G2/S5                                                              | S5 – Soft off. Context not saved. Cold boot is required. | No power         | D3 – no power except for wake-up logic.                                              | Power < 5 W <sup>(Note 2)</sup>                          |
| G3 – mechanical off<br>AC power is disconnected from the computer. | No power to the system.                                  | No power         | D3 – no power for wake-up logic, except when provided by battery or external source. | No power to the system. Service can be performed safely. |

Notes:

1. Total system power is dependent on the system configuration, including add-in boards and peripherals powered by the system chassis' power supply.
2. Dependent on the standby power consumption of wake-up devices used in the system.

### 1.12.1.2 Wake-up Devices and Events

Table 8 lists the devices or specific events that can wake the computer from specific states.

**Table 8. Wake-up Devices and Events**

| Devices/events that wake up the system... | ...from this sleep state           | Comments                                                              |
|-------------------------------------------|------------------------------------|-----------------------------------------------------------------------|
| Power switch                              | S3, S4, S5                         |                                                                       |
| RTC alarm                                 | S3, S4, S5 <sup>(Note 1)</sup>     | Monitor to remain in sleep state                                      |
| LAN                                       | S3, S4, S5 <sup>(Notes 1, 2)</sup> | "S5 WOL after G3" must be supported; monitor to remain in sleep state |
| USB                                       | S3, S4, S5 <sup>(Note 3, 4)</sup>  | Wake S4, S5 controlled by BIOS option                                 |
| PCIe via WAKE#                            | S3, S4, S5 <sup>(Note 1)</sup>     | Via WAKE; monitor to remain in sleep state                            |
| Consumer IR                               | S3, S4, S5 <sup>(Notes 3, 4)</sup> |                                                                       |
| Bluetooth                                 | N/A                                | Wake from Bluetooth is not supported                                  |

Notes:

1. Monitor will remain in "sleep" state
2. "S5 WoL after G3" supported w/Deep Sleep disabled
3. Wake from S4 and S5 only supported w/Deep Sleep disabled
4. Wake from device/event not supported immediately upon return from AC loss



#### NOTE

*The use of these wake-up events from an ACPI state requires an operating system that provides full ACPI support. In addition, software, drivers, and peripherals must fully support ACPI wake events.*

### 1.12.2 Hardware Support

The board provides several power management hardware features, including:

- Wake from Power Button signal
- Instantly Available PC technology
- LAN wake capabilities
- Wake from USB
- WAKE# signal wake-up support
- Wake from S5
- Wake from CIR
- +5 V Standby Power Indicator LED



#### NOTE

*The use of Wake from USB from an ACPI state requires an operating system that provides full ACPI support.*

### 1.12.2.1 Power Input

When resuming from an AC power failure, the computer may return to the power state it was in before power was interrupted (on or off). The computer's response can be set using the Last Power State feature in the BIOS Setup program's Boot menu.

### 1.12.2.2 Instantly Available PC Technology

Instantly Available PC technology enables the board to enter the ACPI S3 (Suspend-to-RAM) sleep-state. While in the S3 sleep-state, the computer will appear to be off (the power supply is off, and the front panel LED is amber if dual colored, or off if single colored.) When signaled by a wake-up device or event, the system quickly returns to its last known wake state. Table 8 on page 33 lists the devices and events that can wake the computer from the S3 state.

The use of Instantly Available PC technology requires operating system support and drivers for any installed PCI Express add-in card.

### 1.12.2.3 LAN Wake Capabilities

LAN wake capabilities enable remote wake-up of the computer through a network. The LAN subsystem monitors network traffic at the Media Independent Interface. Upon detecting a Magic Packet\* frame, the LAN subsystem asserts a wake-up signal that powers up the computer.

### 1.12.2.4 Wake from USB

USB bus activity wakes the computer from an ACPI S3, S4, and S5 states.



#### **NOTE**

*Wake from USB requires the use of a USB peripheral that supports Wake from USB.*

### 1.12.2.5 WAKE# Signal Wake-up Support

When the WAKE# signal on the PCI Express bus is asserted, the computer wakes from an ACPI S3, S4, or S5 state.

### 1.12.2.6 Wake from S5

When the RTC Date and Time is set in the BIOS, the computer will automatically wake from an ACPI S5 state.

### 1.12.2.7 Wake from Consumer IR

CIR activity wakes the computer from an ACPI S3, S4, or S5 state.

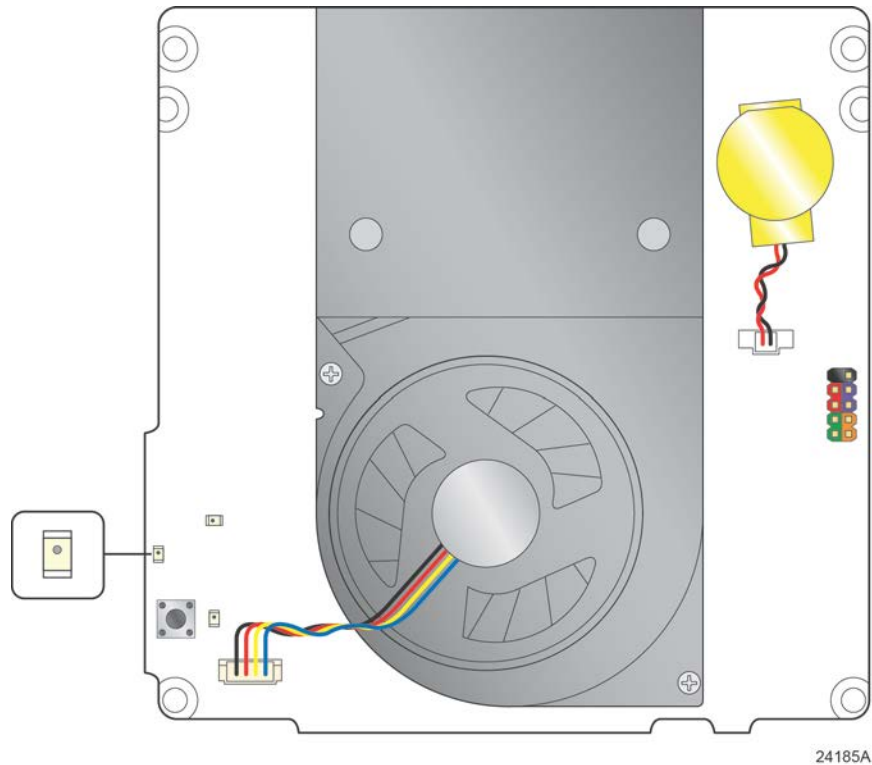
### 1.12.2.8 +5 V Standby Power Indicator LED

The standby power indicator LED shows that power is still present even when the computer appears to be off. Figure 9 shows the location of the standby power LED.



#### CAUTION

*If AC power has been switched off and the standby power indicator is still lit, disconnect the power cord before installing or removing any devices connected to the board. Failure to do so could damage the board and any attached devices.*



**Figure 9. Location of the Standby Power LED**



## 2 Technical Reference

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### 2.1 Memory Resources

#### 2.1.1 Addressable Memory

The board utilizes up to 8 GB of addressable system memory. Typically the address space that is allocated for PCI Conventional bus add-in cards, PCI Express configuration space, BIOS (SPI Flash device), and chipset overhead resides above the top of DRAM (total system memory). On a system that has 8 GB of system memory installed, it is not possible to use all of the installed memory due to system address space being allocated for other system critical functions. These functions include the following:

- BIOS/SPI Flash device (64 Mbit)
- Local APIC (19 MB)
- Direct Media Interface (40 MB)
- PCI Express configuration space (256 MB)
- SoC base address registers PCI Express ports (up to 256 MB)
- Memory-mapped I/O (I/O fabric) that is dynamically allocated for PCI Express add-in cards (256 MB)

The board provides the capability to reclaim the physical memory overlapped by the memory mapped I/O logical address space. The board remaps physical memory from the top of usable DRAM boundary to the 4 GB boundary to an equivalent sized logical address range located just above the 4 GB boundary. All installed system memory can be used when there is no overlap of system addresses.

### 2.2 Connectors and Headers



#### CAUTION

*Only the following connectors and headers have overcurrent protection: back panel and front panel USB.*

This section describes the board's connectors and headers. The connectors and headers can be divided into these groups:

- Front panel I/O connector
- Back panel I/O connectors

### 2.2.1 Front Panel Connectors

Figure 10 shows the location of the front panel connectors for the board.

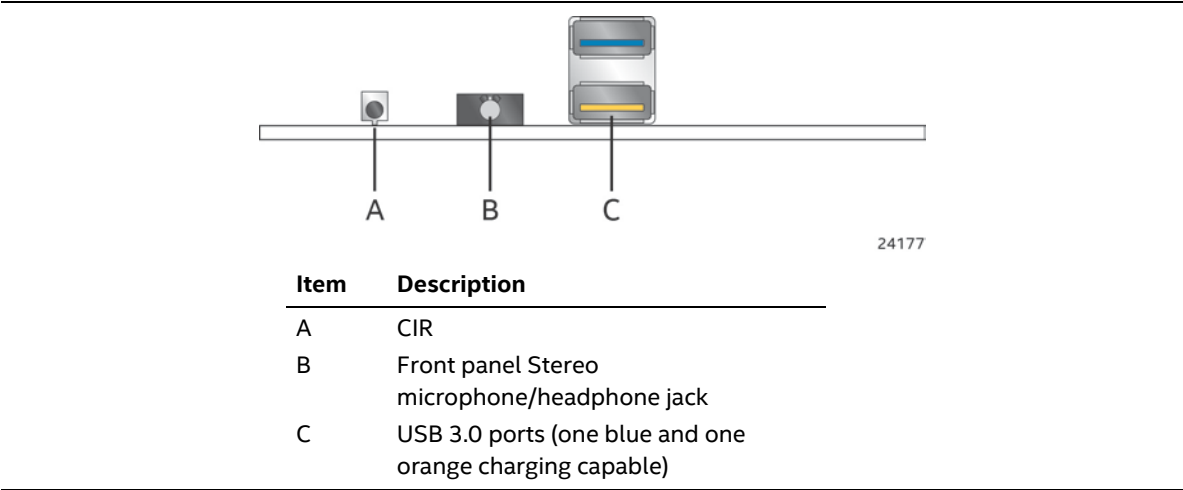


Figure 10. Front Panel Connectors

### 2.2.2 Back Panel Connectors

Figure 11 shows the location of the back panel connectors for the board.

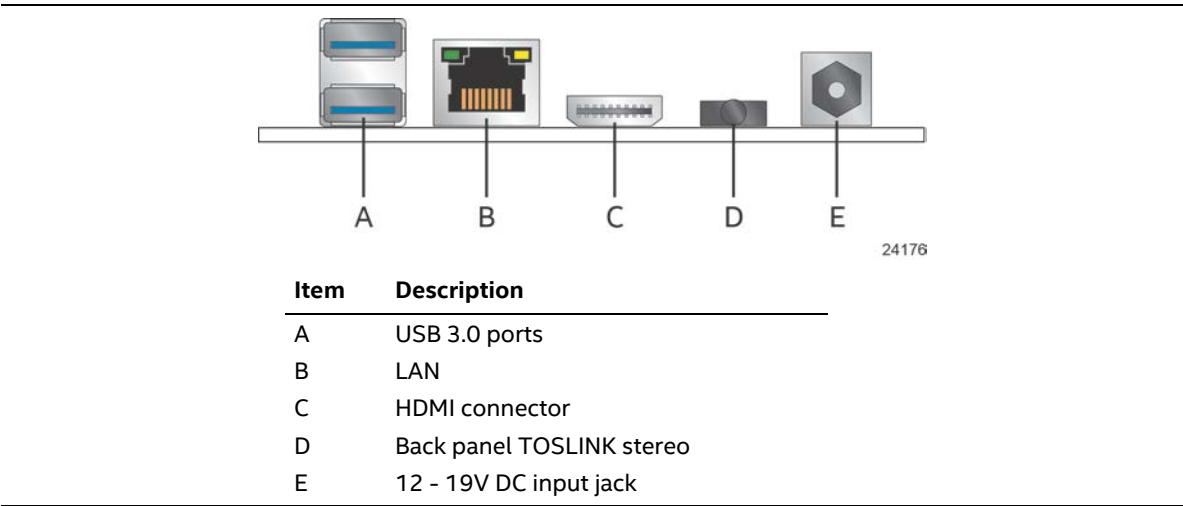


Figure 11. Back Panel Connectors

2.2.3 Headers and Connectors (Top)

Figure 12 shows the location of the headers and connectors on the top-side of the board.

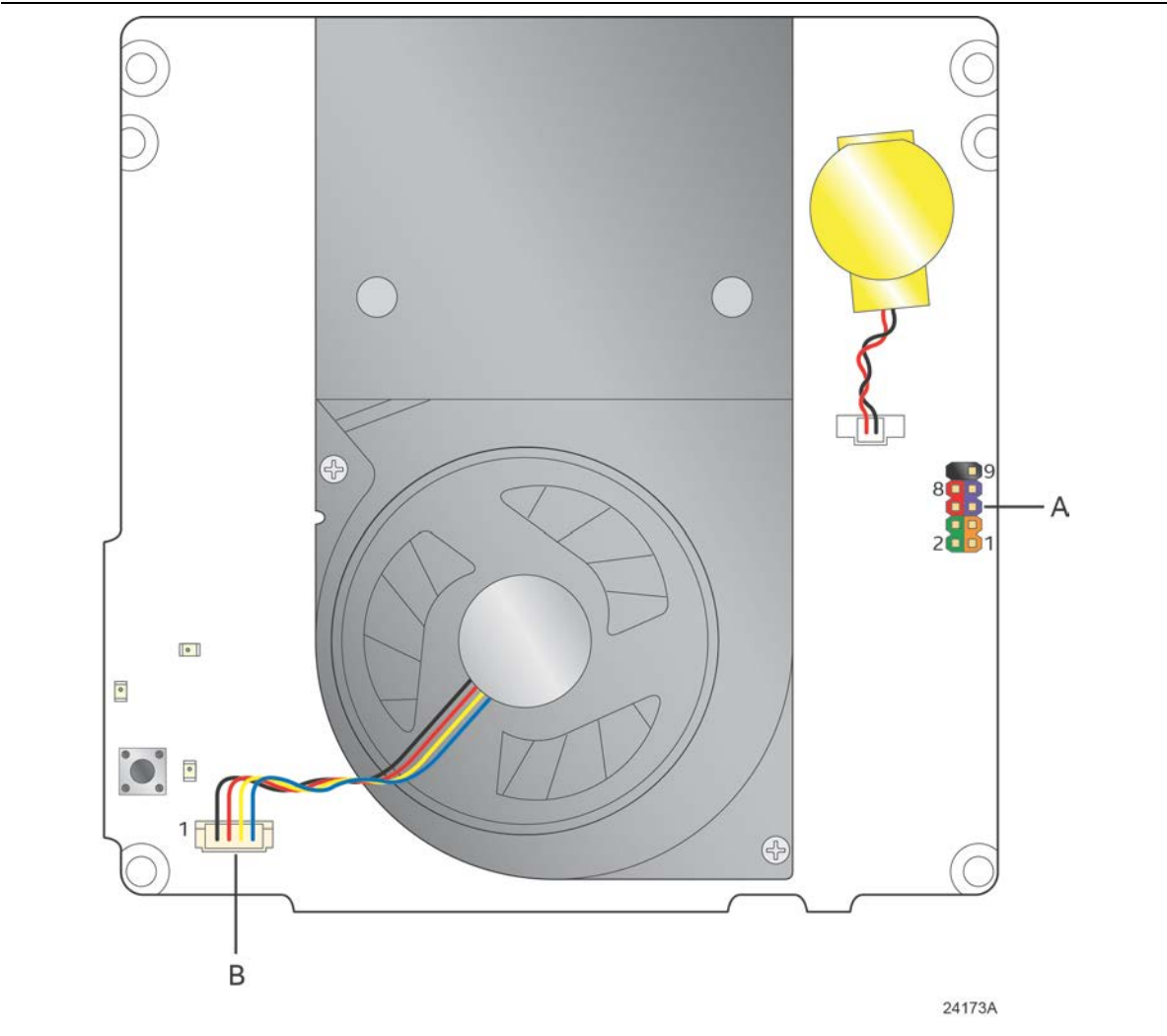


Figure 12. Headers and Connectors (Top)

Table 9 lists the headers and connectors identified in Figure 12.

Table 9. Headers and Connectors Shown in Figure 12

| Item from Figure 12 | Description          |
|---------------------|----------------------|
| A                   | Front panel header   |
| B                   | Processor fan header |

## 2.2.4 Connectors and Headers (Bottom)

Figure 13 shows the locations of the connectors and headers on the bottom-side of the board.

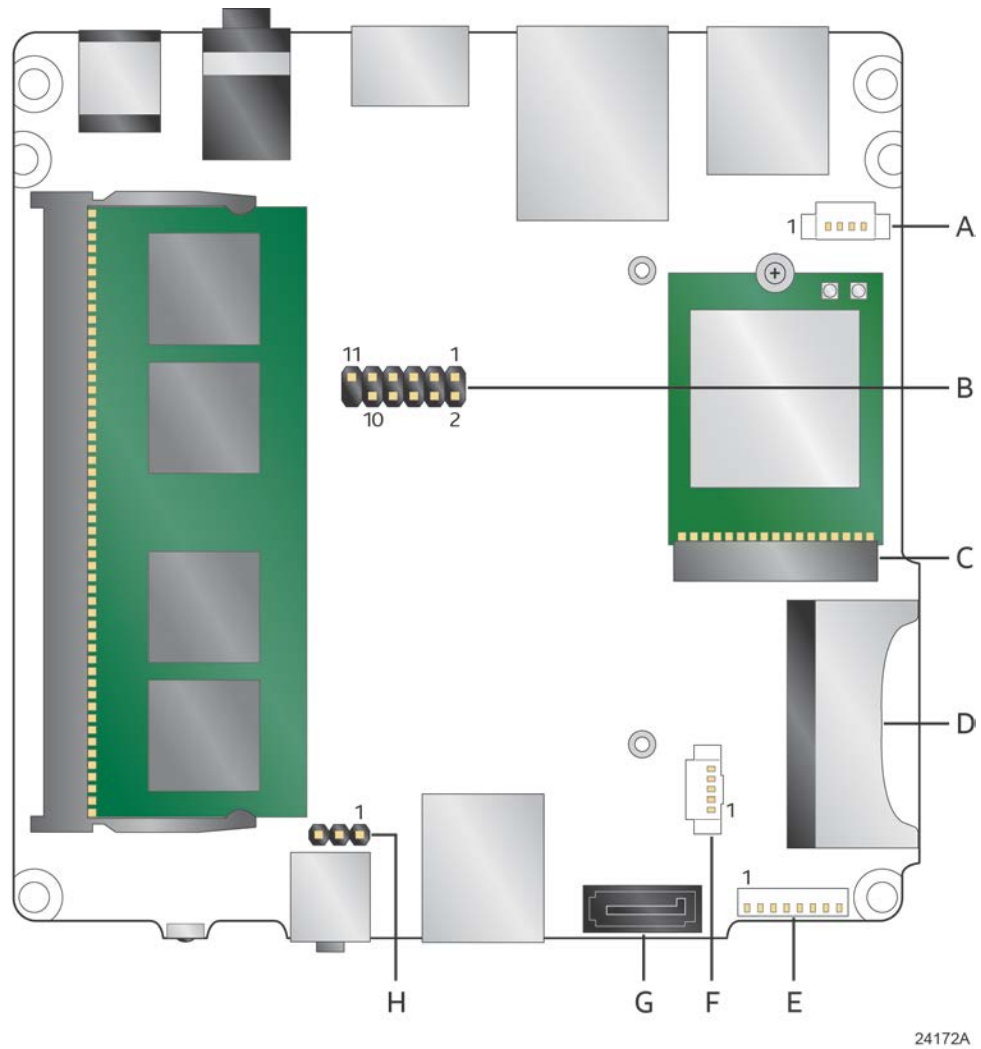


Figure 13. Connectors and Headers (Bottom)

Table 10 lists the connectors and headers identified in Figure 13.

**Table 10. Connectors and Headers Shown in Figure 13**

| <b>Item from<br/>Figure 13</b> | <b>Description</b>                                   |
|--------------------------------|------------------------------------------------------|
| A                              | Auxiliary power connector (1.25 mm pitch)            |
| B                              | VGA connector                                        |
| C                              | M.2 2230 Module connector                            |
| D                              | SDXC slot                                            |
| E                              | Front panel dual-port USB 2.0 header (1.25 mm pitch) |
| F                              | SATA power connector (1.25 mm pitch)                 |
| G                              | SATA 6.0 Gb/s connector                              |
| H                              | BIOS security jumper                                 |

### 2.2.4.1 Signal Tables for the Connectors and Headers

**Table 11. VGA Header**

| Pin | Signal Name | Pin | Signal Name |
|-----|-------------|-----|-------------|
| 1   | CLK         | 2   | DATA        |
| 3   | VCC         | 4   | VSYNC       |
| 5   | HSYNC       | 6   | GND         |
| 7   | RED         | 8   | GND         |
| 9   | GREEN       | 10  | GND         |
| 11  | BLUE        | 12  | KEY         |

**Table 12. SATA Power Header (1.25 mm Pitch)**

| Pin | Signal Name |
|-----|-------------|
| 1   | 5 V         |
| 2   | 5 V         |
| 3   | 3.3 V       |
| 4   | GND         |
| 5   | GND         |



#### NOTE

Connector is Molex\* part number 53398-0571, 1.25 mm pitch PicoBlade\* header, surface mount, vertical, lead-free, 5 circuits.

**Table 13. Dual-Port Internal USB 2.0 Header (1.25 mm Pitch)**

| Pin | Signal Name     | Pin | Signal Name     |
|-----|-----------------|-----|-----------------|
| 1   | +5 V DC         | 2   | Data (negative) |
| 3   | Data (positive) | 4   | Ground          |
| 5   | Ground          | 6   | Data (positive) |
| 7   | Data (negative) | 8   | +5 V DC         |



#### NOTE

Connector is Molex part number 53398-0571, 1.25 mm pitch PicoBlade header, surface mount, vertical, lead-free, 8 circuits.

**Table 14. M.2 2230 Module (Mechanical Key E) Connector**

| Pin | Signal Name               | Pin | Signal Name            |
|-----|---------------------------|-----|------------------------|
| 74  | 3.3V                      | 75  | GND                    |
| 72  | 3.3V                      | 73  | RESERVED               |
| 70  | RESERVED                  | 71  | RESERVED               |
| 68  | RESERVED                  | 69  | GND                    |
| 66  | RESERVED                  | 67  | RESERVED               |
| 64  | RESERVED                  | 65  | RESERVED               |
| 62  | ALERT# (I)(0/3.3)         | 63  | GND                    |
| 60  | I2C CLK (O)(0/3.3)        | 61  | RESERVED               |
| 58  | I2C DATA (I/O)(0/3.3)     | 59  | RESERVED               |
| 56  | W_DISABLE1# (O)(0/3.3V)   | 57  | GND                    |
| 54  | W_DISABLE2# (O)(0/3.3V)   | 55  | PEWAKE0# (I/O)(0/3.3V) |
| 52  | PERST0# (O)(0/3.3V)       | 53  | CLKREQ0# (I/O)(0/3.3V) |
| 50  | SUSCLK(32kHz) (O)(0/3.3V) | 51  | GND                    |
| 48  | RESERVED                  | 49  | REFCLKN0               |
| 46  | RESERVED                  | 47  | REFCLKP0               |
| 44  | RESERVED                  | 45  | GND                    |
| 42  | C-Link CLK (I/O)          | 43  | PERn0                  |
| 40  | C-Link DATA (I/O)         | 41  | PERp0                  |
| 38  | C-Link RESET (I) (0/3.3V) | 39  | GND                    |
| 36  | RESERVED                  | 37  | PETn0                  |
| 34  | RESERVED                  | 35  | PETp0                  |
| 32  | RESERVED                  | 33  | GND                    |
| 30  | Connector Key             | 31  | Connector Key          |
| 28  | Connector Key             | 29  | Connector Key          |
| 26  | Connector Key             | 27  | Connector Key          |
| 24  | Connector Key             | 25  | Connector Key          |
| 22  | RESERVED                  | 23  | RESERVED               |
| 20  | RESERVED                  | 21  | RESERVED               |
| 18  | GND                       | 19  | RESERVED               |
| 16  | RESERVED                  | 17  | RESERVED               |
| 14  | RESERVED                  | 15  | RESERVED               |
| 12  | RESERVED                  | 13  | RESERVED               |
| 10  | RESERVED                  | 11  | RESERVED               |
| 8   | RESERVED                  | 9   | RESERVED               |
| 6   | RESERVED                  | 7   | GND                    |
| 4   | 3.3V                      | 5   | USB_D-                 |
| 2   | 3.3V                      | 3   | USB_D+                 |
|     |                           | 1   | GND                    |

### 2.2.4.2 Add-in Card Connector

The board supports a M.2 2230 (key type E) module.

- Supports M.2 communication module

### 2.2.4.3 SDXC Card Reader

The board has a standard Secure Digital (SD) card reader that supports the Secure Digital eXtended Capacity (SDXC) format, 3.01 specification with UHS-I support. SD Card sizes supported from 8GB to 128GB.

**Table 15. SDXC Card Reader Connector**

| Pin | Signal Name | Descriptive Name |
|-----|-------------|------------------|
| 1   | CD          | Card Detection   |
| 2   | DATA2       | Serial Data 2    |
| 3   | DATA3       | Serial Data 3    |
| 4   | CMD         | Command          |
| 5   | VSS1        | Ground           |
| 6   | VDD         | Power (3.3 V)    |
| 7   | CLK         | Serial Clock     |
| 8   | VSS2        | Ground           |
| 9   | DATA0       | Serial Data 0    |
| 10  | DATA1       | Serial Data 1    |
| 11  | WP          | Write Protect    |



#### **NOTE**

*The SD card reader is not supported in Microsoft® Windows® 7*

### 2.2.4.4 Power Supply Connector

The board has the following power supply connector:

- **External Power Supply** – the board can be powered through a 12-19 V DC connector on the back panel. The back panel DC connector is compatible with a 5.5 mm/OD (outer diameter) and 2.5 mm/ID (inner diameter) plug, where the inner contact is +12 ( $\pm 10\%$ ) V DC and the shell is GND. The maximum current rating is 3 A.



#### NOTE

*External power voltage, 12-19 V DC, is dependent on the type of power brick used.*

**Table 16. Auxiliary Power Connector**

| Pin | Signal Name | Descriptive Name   |
|-----|-------------|--------------------|
| 1   | +5VSB       | 5V                 |
| 2   | PCH_GPIO24  | Power draw sensor  |
| 3   | GND         | Ground             |
| 4   | +VIN        | 12V – 19V DC input |



#### NOTE

*The Auxiliary Power Connector is a limited voltage source (output) for 5V Standby and the voltage supplied to the board (typically 19V DC) for use by expansion peripherals. The Auxiliary Power Connector is limited to 1.5A max (fused).*



#### NOTE

*JTE (JOINT TECH): A1250WV-S-04P A-Series (Wire to Board) Vertical SMT Connector, 1.25mm pitch, 1A rating. Mates with JTE A1250 Series Housing.*

#### For information about

Power supply considerations

#### Refer to

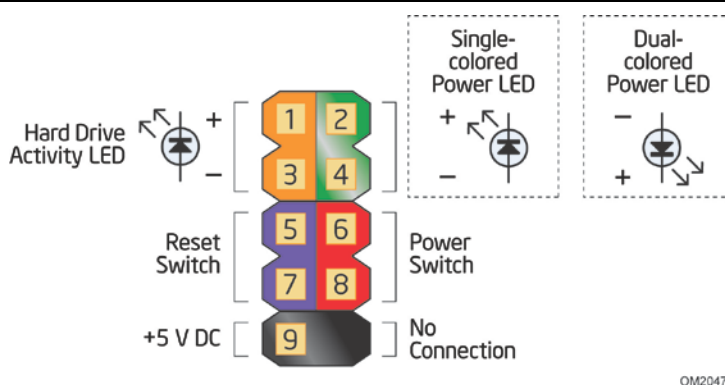
Section 2.5.1, page 53

### 2.2.4.5 Front Panel Header (2.0 mm Pitch)

This section describes the functions of the front panel header. Table 17 lists the signal names of the front panel header. Figure 14 is a connection diagram for the front panel header.

**Table 17. Front Panel Header (2.0 mm Pitch)**

| Pin | Signal Name   | Description                             | Pin | Signal Name    | Description                        |
|-----|---------------|-----------------------------------------|-----|----------------|------------------------------------|
| 1   | HDD_POWER_LED | Pull-up resistor (750 $\Omega$ ) to +5V | 2   | POWER_LED_MAIN | [Out] Front panel LED (main color) |
| 3   | HDD_LED#      | [Out] Hard disk activity LED            | 4   | POWER_LED_ALT  | [Out] Front panel LED (alt color)  |
| 5   | GROUND        | Ground                                  | 6   | POWER_SWITCH#  | [In] Power switch                  |
| 7   | RESET_SWITCH# | [In] Reset switch                       | 8   | GROUND         | Ground                             |
| 9   | +5V_DC        | Power (2A)                              | 10  | Key            | No pin                             |



**Figure 14. Connection Diagram for Front Panel Header (2.0 mm Pitch)**

#### 2.2.4.5.1 Hard Drive Activity LED Header

Pins 1 and 3 can be connected to an LED to provide a visual indicator that data is being read from or written to a hard drive. Proper LED function requires a SATA hard drive or optical drive connected to an onboard SATA connector.

#### 2.2.4.5.2 Reset Switch Header

Pins 5 and 7 can be connected to a momentary single pole, single throw (SPST) type switch that is normally open. When the switch is closed, the board resets and runs the POST.

2.2.4.5.3 Power/Sleep LED Header

Pins 2 and 4 can be connected to a one- or two-color LED. Table 18 and Table 19 show the possible LED states.

Table 18. States for a One-Color Power LED

| LED State | Description      |
|-----------|------------------|
| Off       | Power off        |
| Blinking  | Standby          |
| Steady    | Normal operation |

Table 19. States for a Dual-Color Power LED

| LED State                        | Description      |
|----------------------------------|------------------|
| Off                              | Power off        |
| Secondary color blinking (amber) | Standby          |
| Primary color steady (white)     | Normal operation |



**NOTE**

*The LED behavior shown in Table 18 is default – other patterns may be set via BIOS setup.*

2.2.4.5.4 Power Switch Header

Pins 6 and 8 can be connected to a front panel momentary-contact power switch. The switch must pull the SW\_ON# pin to ground for at least 50 ms to signal the power supply to switch on or off. (The time requirement is due to internal debounce circuitry on the board.) At least two seconds must pass before the power supply will recognize another on/off signal.

2.2.4.5.5 5V DC Power Header

Pin 6 can supply 2A of 5V DC (VCC) power. Any usage of power from this header should be considered when calculating the system's total power budget.

| For information about       | Refer to               |
|-----------------------------|------------------------|
| Power supply considerations | Section 2.5.1, page 53 |

2.2.4.6 Consumer Infrared (CIR) Sensor

The Consumer Infrared (CIR) sensor on the front panel provides features that are designed to comply with Microsoft Consumer Infrared usage models.

The CIR feature is made up of the receiving sensor. The receiving sensor consists of a filtered translated infrared input compliant with Microsoft CIR specifications.

Customers are required to provide their own media center compatible remote or smart phone application for use with the Intel NUC. Figure 15 shows the location of the CIR sensor.

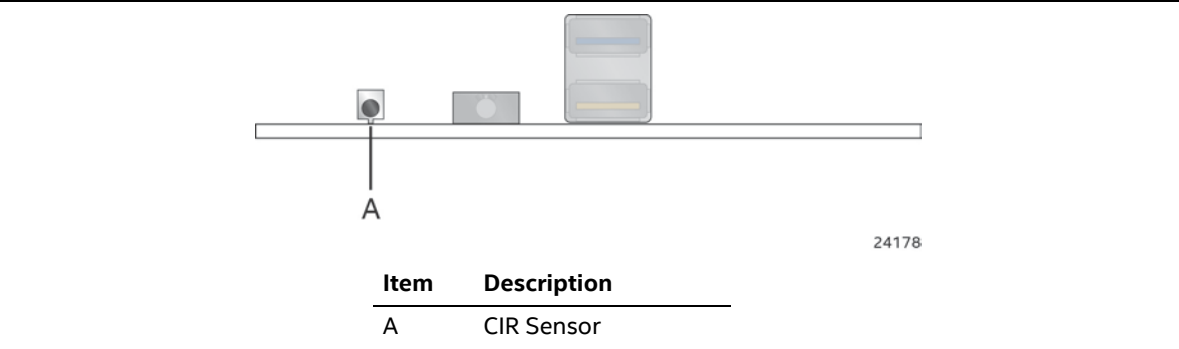


Figure 15. Location of the CIR Sensor

2.2.4.7 Internal USB 2.0 Dual-Port Header (1.25 mm Pitch)

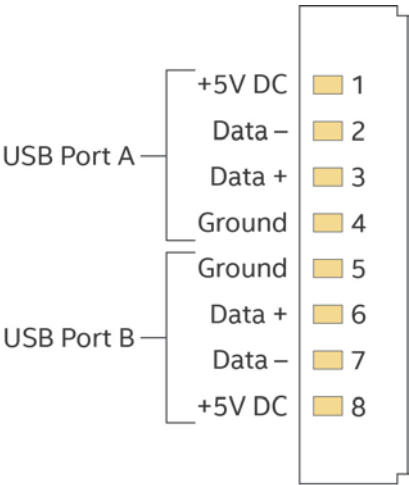
Figure 16 is a connection diagram for the internal USB header.

Connector is Molex part number 53398-0571, 1.25 mm pitch PicoBlade header, surface mount, vertical, lead-free, 8 circuits.



NOTE

- The +5 V DC power on the USB header is fused.
- Use only an internal USB connector that conforms to the USB 2.0 specification for high-speed USB devices.



24182

Figure 16. Connection Diagram for Internal USB 2.0 Dual-Port Header (1.25 mm Pitch)

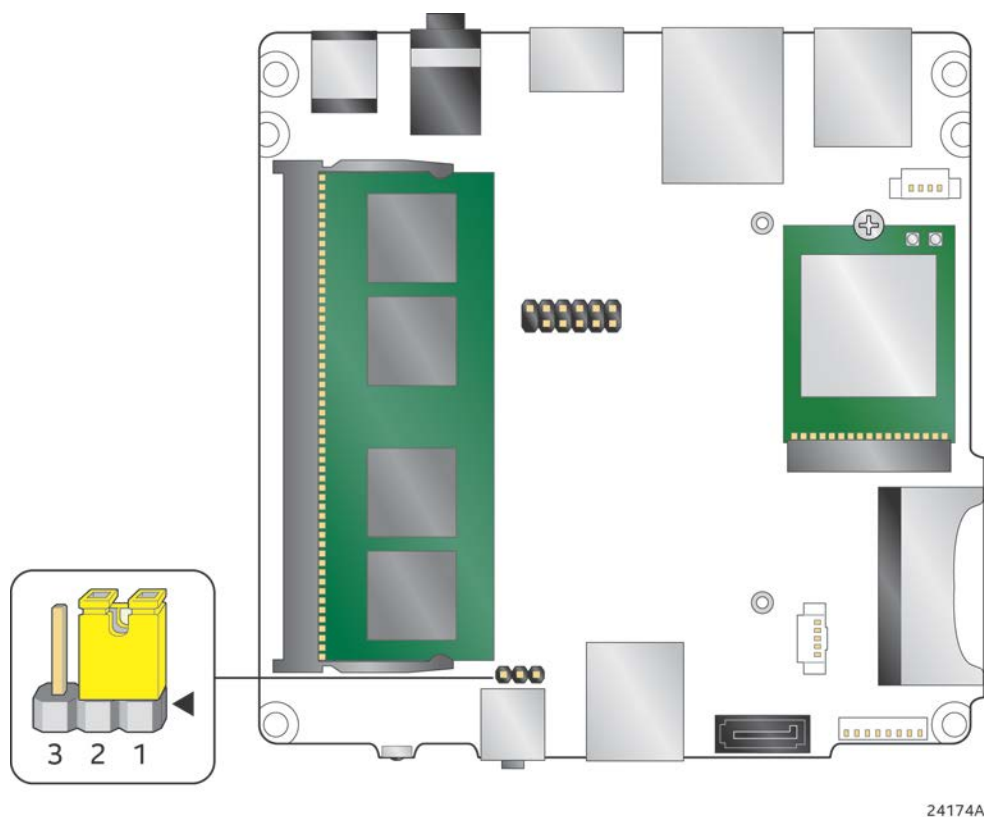
## 2.3 BIOS Security Jumper



### CAUTION

*Do not move a jumper with the power on. Always turn off the power and unplug the power cord from the computer before changing a jumper setting. Otherwise, the board could be damaged.*

Figure 17 shows the location of the BIOS security jumper. The 3-pin jumper determines the BIOS Security program's mode. Table 20 describes the BIOS security jumper settings for the three modes: normal, lockdown, and configuration.



**Figure 17. Location of the BIOS Security Jumper**

Table 20 lists the settings for the jumper.

**Table 20. BIOS Security Jumper Settings**

| Function/Mode | Jumper Setting | Configuration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Normal        | 1-2            | The BIOS uses current configuration information and passwords for booting.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Lockdown      | 2-3            | <p>The BIOS uses current configuration information and passwords for booting, except:</p> <ul style="list-style-type: none"> <li>• All POST Hotkeys are suppressed (prompts are not displayed and keys are not accepted. For example, F2 for Setup, F10 for the Boot Menu).</li> <li>• Power Button Menu is not available (see Section 3.7.4 Power Button Menu).</li> </ul> <p>BIOS updates are not available except for automatic Recovery due to flash corruption.</p>                                                   |
| Configuration | None           | <p>BIOS Recovery Update process if a matching *.bio file is found. Recovery Update can be cancelled by pressing the Esc key.</p> <p>If the Recovery Update was cancelled or a matching *.bio file was not found, a Config Menu will be displayed. The Config Menu consists of the following (followed by the Power Button Menu selections):</p> <p>[1] Suppress this menu until the BIOS Security Jumper is replaced.</p> <p>[2] Clear BIOS User and Supervisor Passwords.</p> <p>See Section 3.7.4 Power Button Menu.</p> |

## 2.4 Mechanical Considerations

### 2.4.1 Form Factor

The board is designed to fit into a custom chassis. Figure 18 illustrates the mechanical form factor for the board. Dimensions are given in millimeters. The outer dimensions are 101.60 millimeters by 101.60 millimeters [4.0 inches by 4.0 inches].

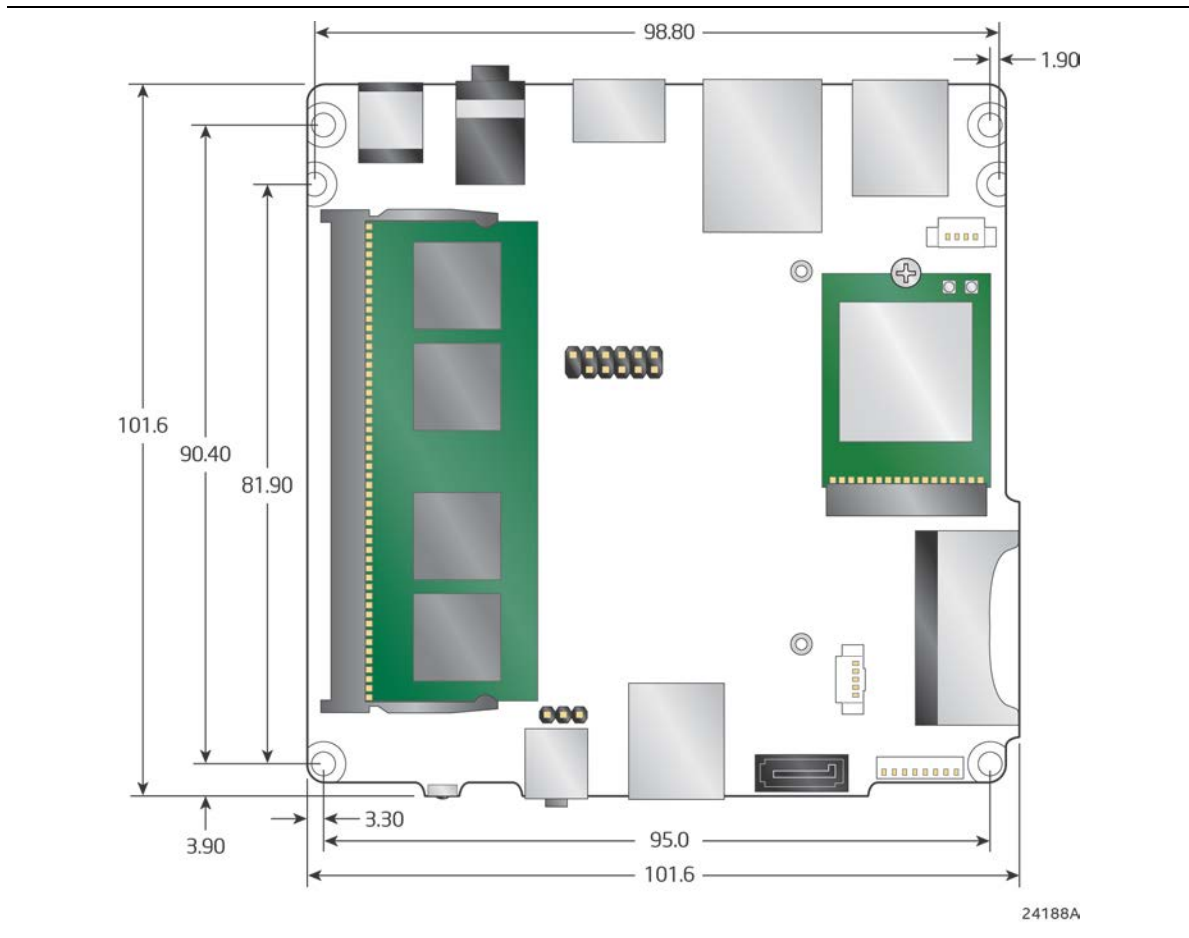


Figure 18. Board Dimensions

Figure 19 shows the height dimensions of the board.

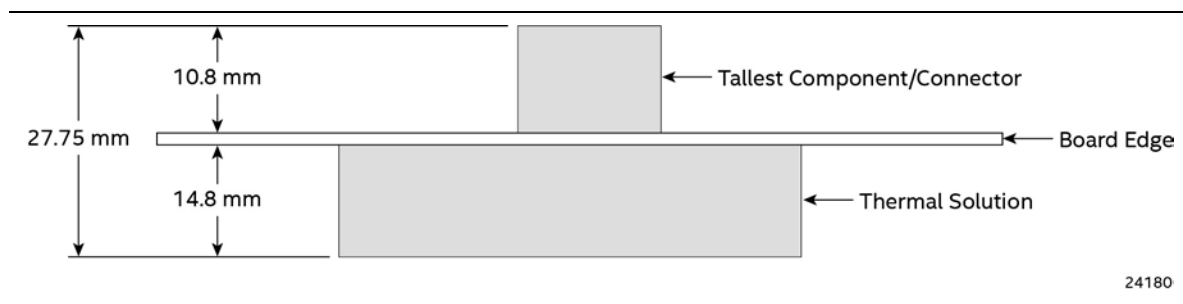


Figure 19. Board Height Dimensions

## 2.5 Electrical Considerations

### 2.5.1 Power Supply Considerations

System power requirements will depend on actual system configurations chosen by the integrator, as well as end user expansion preferences. It is the system integrator's responsibility to ensure an appropriate power budget for the system configuration is properly assessed based on the system-level components chosen.

### 2.5.2 Fan Header Current Capability

Table 21 lists the current capability of the fan header.

Table 21. Fan Header Current Capability

| Fan Header    | Maximum Available Current |
|---------------|---------------------------|
| Processor fan | .25 A                     |

## 2.6 Thermal Considerations



### CAUTION

A chassis with a maximum internal ambient temperature of 58 °C at the processor fan inlet is recommended. If the internal ambient temperature exceeds 58 °C, further thermal testing is required to ensure components do not exceed their maximum case temperature.



### CAUTION

Failure to ensure appropriate airflow may result in reduced performance of both the processor and/or voltage regulator or, in some instances, damage to the board.

All responsibility for determining the adequacy of any thermal or system design remains solely with the system integrator. Intel makes no warranties or representations that merely following the instructions presented in this document will result in a system with adequate thermal performance.



**CAUTION**

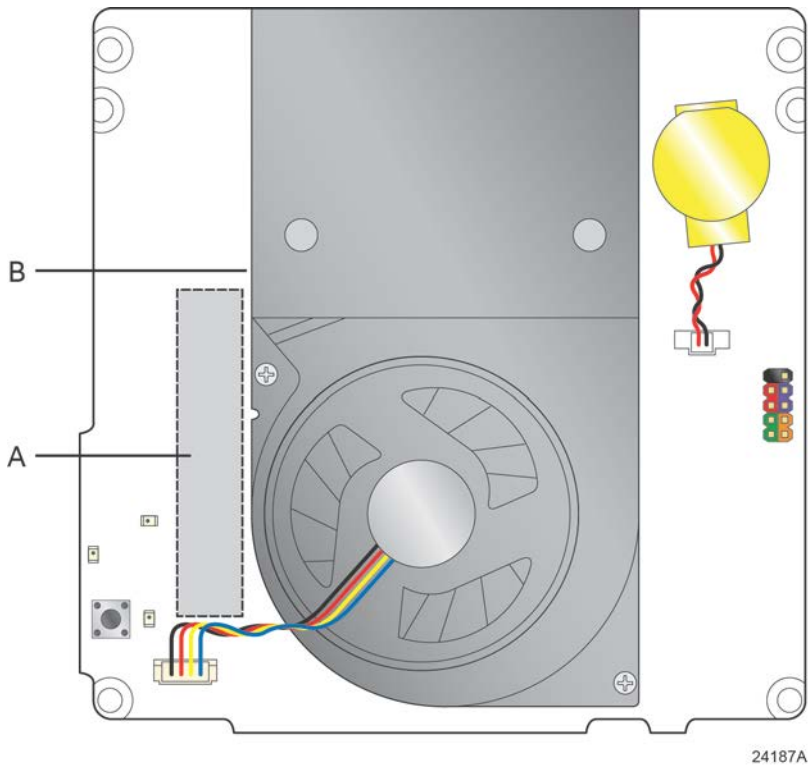
Ensure that the ambient temperature does not exceed the board's maximum operating temperature. Failure to do so could cause components to exceed their maximum case temperature and malfunction. For information about the maximum operating temperature, see the environmental specifications in Section 2.8.



**CAUTION**

The processor voltage regulator area (shown in Figure 20) can reach a temperature of up to 97.5 °C in an open chassis. Ensure that proper airflow is maintained in the processor voltage regulator circuit. Failure to do so may result in shorter than expected product lifetime.

Figure 20 shows the locations of the localized high temperature zones.



| Item | Description                      |
|------|----------------------------------|
| A    | Processor voltage regulator area |
| B    | Thermal solution                 |

**Figure 20. Localized High Temperature Zones**

Table 22 provides maximum case temperatures for the components that are sensitive to thermal changes. The operating temperature, current load, or operating frequency could affect case temperatures. Maximum case temperatures are important when considering proper airflow to cool the board.

**Table 22. Thermal Considerations for Components**

| Component | Maximum Case Temperature                                                                     |
|-----------|----------------------------------------------------------------------------------------------|
| Processor | For processor case temperature, see processor datasheets and processor specification updates |

To ensure functionality and reliability, the component is specified for proper operation when Case Temperature is maintained at or below the maximum temperature listed in Table 23. This is a requirement for sustained power dissipation equal to Thermal Design Power (TDP is specified as the maximum sustainable power to be dissipated by the components). When the component is dissipating less than TDP, the case temperature should be below the Maximum Case Temperature. The surface temperature at the geometric center of the component corresponds to Case Temperature.

It is important to note that the temperature measurement in the system BIOS is a value reported by embedded thermal sensors in the components and does not directly correspond to the Maximum Case Temperature. The upper operating limit when monitoring this thermal sensor is Tcontrol.

**Table 23. Tcontrol Values for Components**

| Component | Tcontrol                                                                                     |
|-----------|----------------------------------------------------------------------------------------------|
| Processor | For processor case temperature, see processor datasheets and processor specification updates |

| For information about                          | Refer to             |
|------------------------------------------------|----------------------|
| Processor datasheets and specification updates | Section 1.2, page 18 |

## 2.7 Reliability

The Mean Time Between Failures (MTBF) prediction is calculated using component and subassembly random failure rates. The calculation is based on the Telcordia SR-332-2 Issue 2, Method I, Case 3, 55 °C ambient. The MTBF prediction is used to estimate repair rates and spare parts requirements. The MTBF for the board is 64,688 hours.

## 2.8 Environmental

Table 24 lists the environmental specifications for the board.

**Table 24. Environmental Specifications**

| Parameter          | Specification                                                                                                                                                                                                                                    |                    |                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------|
| <b>Temperature</b> |                                                                                                                                                                                                                                                  |                    |                                          |
| Non-Operating      | -40 °C to +60 °C                                                                                                                                                                                                                                 |                    |                                          |
| Operating          | 0 °C to +40 °C<br>The operating temperature of the board may be determined by measuring the air temperature from the junction of the heatsink fins and fan, next to the attachment screw, in a closed chassis, while the system is in operation. |                    |                                          |
| <b>Shock</b>       |                                                                                                                                                                                                                                                  |                    |                                          |
| Unpackaged         | 50 g trapezoidal waveform                                                                                                                                                                                                                        |                    |                                          |
|                    | Velocity change of 170 inches/s <sup>2</sup>                                                                                                                                                                                                     |                    |                                          |
| Packaged           | Half sine 2 millisecond                                                                                                                                                                                                                          |                    |                                          |
|                    | Product Weight (pounds)                                                                                                                                                                                                                          | Free Fall (inches) | Velocity Change (inches/s <sup>2</sup> ) |
|                    | <20                                                                                                                                                                                                                                              | 36                 | 167                                      |
|                    | 21-40                                                                                                                                                                                                                                            | 30                 | 152                                      |
|                    | 41-80                                                                                                                                                                                                                                            | 24                 | 136                                      |
|                    | 81-100                                                                                                                                                                                                                                           | 18                 | 118                                      |
| <b>Vibration</b>   |                                                                                                                                                                                                                                                  |                    |                                          |
| Unpackaged         | 5 Hz to 20 Hz: 0.01 g <sup>2</sup> Hz sloping up to 0.02 g <sup>2</sup> Hz                                                                                                                                                                       |                    |                                          |
|                    | 20 Hz to 500 Hz: 0.02 g <sup>2</sup> Hz (flat)                                                                                                                                                                                                   |                    |                                          |
| Packaged           | 5 Hz to 40 Hz: 0.015 g <sup>2</sup> Hz (flat)                                                                                                                                                                                                    |                    |                                          |
|                    | 40 Hz to 500 Hz: 0.015 g <sup>2</sup> Hz sloping down to 0.00015 g <sup>2</sup> Hz                                                                                                                                                               |                    |                                          |

Note: Before attempting to operate this board, the overall temperature of the board must be above the minimum operating temperature specified. It is recommended that the board temperature be at least room temperature before attempting to power on the board. The operating and non-operating environment must avoid condensing humidity.

## 3 Overview of BIOS Features

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### 3.1 Introduction

The board uses an Intel Visual BIOS that is stored in the Serial Peripheral Interface Flash Memory (SPI Flash) and can be updated using a disk-based program. The SPI Flash contains the Visual BIOS Setup program, POST, the PCI auto-configuration utility, LAN EEPROM information, and Plug and Play support. The initial production BIOSs are identified as PYBSWCEL.86A.

The Visual BIOS Setup program can be used to view and change the BIOS settings for the computer, and to update the system BIOS. The BIOS Setup program is accessed by pressing the <F2> key after the Power-On Self-Test (POST) memory test begins and before the operating system boot begins.



#### NOTE

*The maintenance menu is displayed only when the board is in configuration mode. Section 2.3 on page 50 shows how to put the board in configuration mode.*

### 3.2 BIOS Flash Memory Organization

The Serial Peripheral Interface Flash Memory (SPI Flash) includes a 64 Mb (8192 KB) flash memory device.

### 3.3 System Management BIOS (SMBIOS)

SMBIOS is a Desktop Management Interface (DMI) compliant method for managing computers in a managed network.

The main component of SMBIOS is the Management Information Format (MIF) database, which contains information about the computing system and its components. Using SMBIOS, a system administrator can obtain the system types, capabilities, operational status, and installation dates for system components. The MIF database defines the data and provides the method for accessing this information. The BIOS enables applications such as third-party management software to use SMBIOS. The BIOS stores and reports the following SMBIOS information:

- BIOS data, such as the BIOS revision level
- Fixed-system data, such as peripherals, serial numbers, and asset tags
- Resource data, such as memory size, cache size, and processor speed
- Dynamic data, such as event detection and error logging

Non-Plug and Play operating systems require an additional interface for obtaining the SMBIOS information. The BIOS supports an SMBIOS table interface for such operating systems. Using this support, an SMBIOS service-level application running on a non-Plug and Play operating system

can obtain the SMBIOS information. Additional board information can be found in the BIOS under the Additional Information header under the Main BIOS page.

## 3.4 Legacy USB Support

Legacy USB support enables USB devices to be used even when the operating system's USB drivers are not yet available. Legacy USB support is used to access the BIOS Setup program, and to install an operating system that supports USB. By default, Legacy USB support is set to Enabled.

Legacy USB support operates as follows:

1. When you apply power to the computer, legacy support is disabled.
2. POST begins.
3. Legacy USB support is enabled by the BIOS allowing you to use a USB keyboard to enter and configure the BIOS Setup program and the maintenance menu.
4. POST completes.
5. The operating system loads. While the operating system is loading, USB keyboards and mice are recognized and may be used to configure the operating system. (Keyboards and mice are not recognized during this period if Legacy USB support was set to Disabled in the BIOS Setup program.)
6. After the operating system loads the USB drivers, all legacy and non-legacy USB devices are recognized by the operating system, and Legacy USB support from the BIOS is no longer used.
7. Additional USB legacy feature options can be access by using Intel® Integrator Toolkit.

To install an operating system that supports USB, verify that Legacy USB support in the BIOS Setup program is set to Enabled and follow the operating system's installation instructions.

## 3.5 BIOS Updates

The BIOS can be updated using either of the following utilities, which are available on the Intel World Wide Web site:

- Intel® Express BIOS Update utility, which enables automated updating while in the Windows environment. Using this utility, the BIOS can be updated from a file on a hard disk, a USB drive (a flash drive or a USB hard drive), or a CD-ROM, or from the file location on the Web.
- Intel® Flash Memory Update Utility, which requires booting from DOS. Using this utility, the BIOS can be updated from a file on a hard disk, a USB drive (a flash drive or a USB hard drive), or a CD-ROM.
- Intel F7 switch during POST allows a user to select where the BIOS .bio file is located and perform the update from that location/device. Similar to performing a BIOS Recovery without removing the BIOS configuration jumper.
- Intel Visual BIOS allows the user to select the BIOS .bio file from the internet, USB device, hard disk drive, or other media.

All utilities verify that the updated BIOS matches the target system to prevent accidentally installing an incompatible BIOS.

**NOTE**

*Review the instructions distributed with the upgrade utility before attempting a BIOS update.*

**For information about**

BIOS update utilities

**Refer to**

<http://www.intel.com/support/motherboards/desktop/sb/CS-034499.htm>

### 3.5.1 Language Support

The BIOS Setup program and help messages are supported in US English. Check the Intel web site for support.

### 3.5.2 Custom Splash Screen

During POST, an Intel® splash screen is displayed by default. This splash screen can be augmented with a custom splash screen. The Intel Integrator's Toolkit that is available from Intel can be used to create a custom splash screen.

**NOTE**

*If you add a custom splash screen, it will share space with the Intel branded logo.*

**For information about**

Intel Integrator Toolkit

Additional Intel® software tools

**Refer to**

<http://developer.intel.com/design/motherbd/software/itk/>

<http://developer.intel.com/design/motherbd/software.htm>

## 3.6 BIOS Recovery

It is unlikely that anything will interrupt a BIOS update; however, if an interruption occurs, the BIOS could be damaged. Table 25 lists the drives and media types that can and cannot be used for BIOS recovery. The BIOS recovery media does not need to be made bootable.

**Table 25. Acceptable Drives/Media Types for BIOS Recovery**

| Media Type <sup>(Note)</sup>                | Can be used for BIOS recovery?                         |
|---------------------------------------------|--------------------------------------------------------|
| Hard disk drive (connected to SATA or USB)  | Yes                                                    |
| CD/DVD drive (connected to SATA or USB)     | Yes                                                    |
| USB flash drive                             | Yes                                                    |
| USB diskette drive (with a 1.4 MB diskette) | No (BIOS update file is bigger than 1.4 MB size limit) |



### NOTE

*Supported file systems for BIOS recovery:*

- *NTFS (sparse, compressed, or encrypted files are not supported)*
- *FAT32*
- *FAT16*
- *FAT12*
- *ISO 9660*

#### For information about

BIOS recovery

#### Refer to

<http://www.intel.com/support/motherboards/desktop/sb/CS-034524.htm>

## 3.7 Boot Options

In the BIOS Setup program, the user can choose to boot from a hard drive, optical drive, removable drive, or the network. The default setting is for the optical drive to be the first boot device, the hard drive second, removable drive third, and the network fourth.

### 3.7.1 Network Boot

The network can be selected as a boot device. This selection allows booting from the onboard LAN or a network add-in card with a remote boot ROM installed.

Pressing the <F12> key during POST automatically forces booting from the LAN. To use this key during POST, the User Access Level in the BIOS Setup program's Security menu must be set to Full.

### 3.7.2 Booting Without Attached Devices

For use in embedded applications, the BIOS has been designed so that after passing the POST, the operating system loader is invoked even if the following devices are not present:

- Video adapter
- Keyboard
- Mouse

### 3.7.3 Changing the Default Boot Device During POST

Pressing the <F10> key during POST causes a boot device menu to be displayed. This menu displays the list of available boot devices. Table 26 lists the boot device menu options.

**Table 26. Boot Device Menu Options**

| Boot Device Menu Function Keys | Description                                                                        |
|--------------------------------|------------------------------------------------------------------------------------|
| <↑> or <↓>                     | Selects a default boot device                                                      |
| <Enter>                        | Exits the menu, and boots from the selected device                                 |
| <Esc>                          | Exits the menu and boots according to the boot priority defined through BIOS setup |

### 3.7.4 Power Button Menu

The Power Button Menu is accessible via the following sequence:

1. System is in S4/S5 (not G3)
2. User pushes the power button and holds it down
3. The system will emit three short beeps from the PC speaker or headphones, if installed, then stop to signal the user to release the power button (approximately 3 seconds) or the power button LED to its alternate color. Release immediately.
4. User releases the power button before the 4-second shutdown override

If this boot path is taken, the BIOS will use default settings, ignoring settings in VPD where possible.

At the point where Setup Entry/Boot would be in the normal boot path, the BIOS will display the following prompt and wait for a keystroke:

[ESC] Normal Boot  
[F2] Intel Visual BIOS  
[F3] Disable Fast Boot  
[F4] BIOS Recovery  
[F7] Update BIOS  
[F10] Enter Boot Menu  
[F12] Network Boot

**[F3] Disable Fast Boot** is only displayed if at least one Fast Boot optimization is enabled.

If an unrecognized key is hit, then the BIOS will beep and wait for another keystroke. If one of the listed hotkeys is hit, the BIOS will follow the indicated boot path. Password requirements must still be honored.

If Disable Fast Boot is selected, the BIOS will disable all Fast Boot optimizations and reset the system.

## 3.8 Hard Disk Drive Password Security Feature

The Hard Disk Drive Password Security feature blocks read and write accesses to the hard disk drive until the correct password is given. Hard Disk Drive Passwords are set in BIOS SETUP and are prompted for during BIOS POST. For convenient support of S3 resume, the system BIOS will automatically unlock drives on resume from S3. Valid password characters are A-Z, a-z, and 0-9. Passwords may be up to 20 characters in length.

The User hard disk drive password, when installed, will be required upon each power-cycle until the Master Key or User hard disk drive password is submitted.

The Master Key hard disk drive password, when installed, will not lock the drive. The Master Key hard disk drive password exists as an unlock override in the event that the User hard disk drive password is forgotten. Only the installation of the User hard disk drive password will cause a hard disk to be locked upon a system power-cycle.

Table 27 shows the effects of setting the Hard Disk Drive Passwords.

**Table 27. Master Key and User Hard Drive Password Functions**

| Password Set        | Password During Boot |
|---------------------|----------------------|
| Neither             | None                 |
| Master only         | None                 |
| User only           | User only            |
| Master and User Set | Master or User       |

During every POST, if a User hard disk drive password is set, POST execution will pause with the following prompt to force the user to enter the Master Key or User hard disk drive password:

Enter Hard Disk Drive Password:

Upon successful entry of the Master Key or User hard disk drive password, the system will continue with normal POST.

If the hard disk drive password is not correctly entered, the system will go back to the above prompt. The user will have three attempts to correctly enter the hard disk drive password. After the third unsuccessful hard disk drive password attempt, the system will halt with the message:

Hard Disk Drive Password Entry Error

A manual power cycle will be required to resume system operation.



### NOTE

*The passwords are stored on the hard disk drive so if the drive is relocated to another computer that does not support Hard Disk Drive Password Security feature, the drive will not be accessible.*

## 3.9 BIOS Security Features

The BIOS includes security features that restrict access to the BIOS Setup program and who can boot the computer. A supervisor password and a user password can be set for the BIOS Setup program and for booting the computer, with the following restrictions:

- The supervisor password gives unrestricted access to view and change all the Setup options in the BIOS Setup program. This is the supervisor mode.
- The user password gives restricted access to view and change Setup options in the BIOS Setup program. This is the user mode.
- If only the supervisor password is set, pressing the <Enter> key at the password prompt of the BIOS Setup program allows the user restricted access to Setup.
- If both the supervisor and user passwords are set, users can enter either the supervisor password or the user password to access Setup. Users have access to Setup respective to which password is entered.
- Setting the user password restricts who can boot the computer. The password prompt will be displayed before the computer is booted. If only the supervisor password is set, the computer boots without asking for a password. If both passwords are set, the user can enter either password to boot the computer.
- For enhanced security, use different passwords for the supervisor and user passwords.
- Valid password characters are A-Z, a-z, and 0-9. Passwords may be up to 20 characters in length.
- To clear a set password, enter a blank password after entering the existing password.

Table 28 shows the effects of setting the supervisor password and user password. This table is for reference only and is not displayed on the screen.

**Table 28. Supervisor and User Password Functions**

| Password Set            | Supervisor Mode               | User Mode                              | Setup Options                         | Password to Enter Setup | Password During Boot |
|-------------------------|-------------------------------|----------------------------------------|---------------------------------------|-------------------------|----------------------|
| Neither                 | Can change all options (Note) | Can change all options (Note)          | None                                  | None                    | None                 |
| Supervisor only         | Can change all options        | Can change a limited number of options | Supervisor Password                   | Supervisor              | None                 |
| User only               | N/A                           | Can change all options                 | Enter Password<br>Clear User Password | User                    | User                 |
| Supervisor and user set | Can change all options        | Can change a limited number of options | Supervisor Password<br>Enter Password | Supervisor or user      | Supervisor or user   |

Note: If no password is set, any user can change all Setup options.

## 4 Error Messages and Blink Codes

### 4.1 Front-panel Power LED Blink Codes

Whenever a recoverable error occurs during POST, the BIOS causes the board's front panel power LED to blink an error message describing the problem (see Table 29).

**Table 29. Front-panel Power LED Blink Codes**

| Type                          | Pattern                                                                                                                                                                   | Note                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| BIOS update in progress       | Off when the update begins, then on for 0.5 seconds, then off for 0.5 seconds. The pattern repeats until the BIOS update is complete.                                     |                                  |
| Video error <sup>(Note)</sup> | On-off (1.0 second each) two times, then 2.5-second pause (off), entire pattern repeats (blink and pause) until the system is powered off.                                | When no VGA option ROM is found. |
| Memory error                  | On-off (1.0 second each) three times, then 2.5-second pause (off), entire pattern repeats (blinks and pause) until the system is powered off.                             |                                  |
| Thermal trip warning          | Each beep will be accompanied by the following blink pattern: .25 seconds on, .25 seconds off, .25 seconds on, .25 seconds off. This will result in a total of 16 blinks. |                                  |

Note: Disabled per default BIOS setup option.

### 4.2 BIOS Error Messages

Table 30 lists the error messages and provides a brief description of each.

**Table 30. BIOS Error Messages**

| Error Message            | Explanation                                                                                      |
|--------------------------|--------------------------------------------------------------------------------------------------|
| CMOS Battery Low         | The battery may be losing power. Replace the battery soon.                                       |
| CMOS Checksum Bad        | The CMOS checksum is incorrect. CMOS memory may have been corrupted. Run Setup to reset values.  |
| Memory Size Decreased    | Memory size has decreased since the last boot. If no memory was removed, then memory may be bad. |
| No Boot Device Available | System did not find a device to boot.                                                            |



## 5 Regulatory Compliance and Battery Disposal Information

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### 5.1 Regulatory Compliance

This section contains the following regulatory compliance information for Intel NUC Board NUC5PGYH:

- Safety standards
- European Union Declaration of Conformity statement
- Product Ecology statements
- Electromagnetic Compatibility (EMC) standards
- Product certification markings

#### 5.1.1 Safety Standards

Intel NUC Board NUC5PGYH complies with the safety standards stated in Table 31 when correctly installed in a compatible host system.

**Table 31. Safety Standards**

| Standard       | Title                                                                                     |
|----------------|-------------------------------------------------------------------------------------------|
| CSA/UL 60950-1 | Information Technology Equipment – Safety - Part 1: General Requirements (USA and Canada) |
| EN 60950-1     | Information Technology Equipment – Safety - Part 1: General Requirements (European Union) |
| IEC 60950-1    | Information Technology Equipment – Safety - Part 1: General Requirements (International)  |

## 5.1.2 European Union Declaration of Conformity Statement

We, Intel Corporation, declare under our sole responsibility that the product Intel NUC Board NUC5PGYH is in conformity with all applicable essential requirements necessary for CE marking, following the provisions of the European Council Directive 2004/108/EC (EMC Directive), 2006/95/EC (Low Voltage Directive), and 2002/95/EC (ROHS Directive).

The product is properly CE marked demonstrating this conformity and is for distribution within all member states of the EU with no restrictions.



This product follows the provisions of the European Directives 2004/108/EC, 2006/95/EC, and 2002/95/EC.

**Čeština** Tento výrobek odpovídá požadavkům evropských směrnic 2004/108/EC, 2006/95/EC a 2002/95/EC.

**Dansk** Dette produkt er i overensstemmelse med det europæiske direktiv 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Dutch** Dit product is in navolging van de bepalingen van Europees Directief 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Eesti** Antud toode vastab Euroopa direktiivides 2004/108/EC, ja 2006/95/EC ja 2002/95/EC kehtestatud nõuetele.

**Suomi** Tämä tuote noudattaa EU-direktiivin 2004/108/EC, 2006/95/EC & 2002/95/EC määräyksiä.

**Français** Ce produit est conforme aux exigences de la Directive Européenne 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Deutsch** Dieses Produkt entspricht den Bestimmungen der Europäischen Richtlinie 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Ελληνικά** Το παρόν προϊόν ακολουθεί τις διατάξεις των Ευρωπαϊκών Οδηγιών 2004/108/EC, 2006/95/EC και 2002/95/EC.

**Magyar** E termék megfelel a 2004/108/EC, 2006/95/EC és 2002/95/EC Európai Irányelv előírásainak.

**Icelandic** Þessi vara stendst reglugerð Evrópska Efnahags Bandalagsins númer 2004/108/EC, 2006/95/EC, & 2002/95/EC.

**Italiano** Questo prodotto è conforme alla Direttiva Europea 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Latviešu** Šis produkts atbilst Eiropas Direktīvu 2004/108/EC, 2006/95/EC un 2002/95/EC noteikumiem.

**Lietuvių** Šis produktas atitinka Europos direktyvų 2004/108/EC, 2006/95/EC, ir 2002/95/EC nuostatas.

**Malti** Dan il-prodott hu konformi mal-provvedimenti tad-Direttivi Ewropej 2004/108/EC, 2006/95/EC u 2002/95/EC.

**Norsk** Dette produktet er i henhold til bestemmelsene i det europeiske direktivet 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Polski** Niniejszy produkt jest zgodny z postanowieniami Dyrektyw Unii Europejskiej 2004/108/EC, 206/95/EC i 2002/95/EC.

**Portuguese** Este produto cumpre com as normas da Diretiva Europeia 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Español** Este producto cumple con las normas del Directivo Europeo 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Slovensky** Tento produkt je v súlade s ustanoveniami európskych direktív 2004/108/EC, 2006/95/EC a 2002/95/EC.

**Slovenščina** Izdelek je skladen z določbami evropskih direktiv 2004/108/EC, 2006/95/EC in 2002/95/EC.

**Svenska** Denna produkt har tillverkats i enlighet med EG-direktiv 2004/108/EC, 2006/95/EC & 2002/95/EC.

**Türkçe** Bu ürün, Avrupa Birliği'nin 2004/108/EC, 2006/95/EC ve 2002/95/EC yönergelerine uyar.

### 5.1.3 Product Ecology Statements

The following information is provided to address worldwide product ecology concerns and regulations.

#### 5.1.3.1 Disposal Considerations

This product contains the following materials that may be regulated upon disposal: lead solder on the printed wiring board assembly.

### 5.1.4 EMC Regulations

Intel NUC Board NUC5PGYH complies with the EMC regulations stated in Table 32 when correctly installed in a compatible host system.

**Table 32. EMC Regulations**

| Regulation                    | Title                                                                                                                         |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| FCC 47 CFR Part 15, Subpart B | Title 47 of the Code of Federal Regulations, Part 15, Subpart B, Radio Frequency Devices. (USA)                               |
| ICES-003                      | Interference-Causing Equipment Standard, Digital Apparatus. (Canada)                                                          |
| EN55022                       | Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (European Union) |
| EN55024                       | Information Technology Equipment – Immunity Characteristics Limits and methods of measurement. (European Union)               |
| EN55022                       | Australian Communications Authority, Standard for Electromagnetic Compatibility. (Australia and New Zealand)                  |
| CISPR 22                      | Limits and methods of measurement of Radio Disturbance Characteristics of Information Technology Equipment. (International)   |
| CISPR 24                      | Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement. (International)              |
| VCCI V-3, V-4                 | Voluntary Control for Interference by Information Technology Equipment. (Japan)                                               |
| KN-22, KN-24                  | Korean Communications Commission – Framework Act on Telecommunications and Radio Waves Act (South Korea)                      |
| CNS 13438                     | Bureau of Standards, Metrology, and Inspection (Taiwan)                                                                       |



### **FCC Declaration of Conformity**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions related to the EMC performance of this product, contact:

Intel Corporation, 5200 N.E. Elam Young Parkway, Hillsboro, OR 97124  
1-800-628-8686

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 in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 to an outlet on a circuit other than the one to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications to the equipment not expressly approved by Intel Corporation could void the user's authority to operate the equipment.

Tested to comply with FCC standards for home or office use.

### **Canadian Department of Communications Compliance Statement**

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

### Japan VCCI Statement

Japan VCCI Statement translation: This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。  
取扱説明書に従って正しい取り扱いをして下さい。

### Korea Class B Statement

Korea Class B Statement translation: This equipment is for home use, and has acquired electromagnetic conformity registration, so it can be used not only in residential areas, but also other areas.

이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

### 5.1.5 e-Standby and ErP Compliance

Intel NUC Board NUC5PGYH meets the following program requirements in an adequate system configuration, including appropriate selection of an efficient power supply:

- EPEAT\*
- Korea e-Standby
- European Union Energy-related Products Directive 2013 (ErP) Lot 6

| For information about                                       | Refer to                                                                                                                                                                                                                                    |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electronic Product Environmental Assessment Tool (EPEAT)    | <a href="http://www.epeat.net/">http://www.epeat.net/</a>                                                                                                                                                                                   |
| Korea e-Standby Program                                     | <a href="http://www.kemco.or.kr/new_eng/pg02/pg02100300.asp">http://www.kemco.or.kr/new_eng/pg02/pg02100300.asp</a>                                                                                                                         |
| European Union Energy-related Products Directive 2009 (ErP) | <a href="http://ec.europa.eu/enterprise/policies/sustainable-business/sustainable-product-policy/ecodesign/index_en.htm">http://ec.europa.eu/enterprise/policies/sustainable-business/sustainable-product-policy/ecodesign/index_en.htm</a> |

## 5.1.6 Regulatory Compliance Marks (Board Level)

Intel NUC Board NUC5PGYH has the regulatory compliance marks shown in Table 33.

**Table 33. Regulatory Compliance Marks**

| Description                                                                                                                                                                                                                                                                                                      | Mark                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| UL joint US/Canada Recognized Component mark. Includes adjacent UL file number for Intel NUC Boards: E210882.                                                                                                                                                                                                    |    |
| FCC Declaration of Conformity logo mark for Class B equipment.                                                                                                                                                                                                                                                   |    |
| CE mark. Declaring compliance to the European Union (EU) EMC directive, Low Voltage directive, and RoHS directive.<br>For CE Mark-Related Questions:<br>Intel Corporation<br>Attn: Corporate Quality<br>2200 Mission College Blvd.<br>Santa Clara, CA 95054-1549<br>USA                                          |    |
| Australian Communications Authority (ACA) and New Zealand Radio Spectrum Management (NZ RSM) C-tick mark. Includes adjacent Intel supplier code number, N-232.                                                                                                                                                   |    |
| Japan VCCI (Voluntary Control Council for Interference) mark.                                                                                                                                                                                                                                                    |  |
| Korea Certification mark. Includes an adjacent KCC (Korean Communications Commission) certification number: KCC-REM-CPU-NUC5PGYH.                                                                                                                                                                                |  |
| Taiwan BSMI (Bureau of Standards, Metrology and Inspections) mark. Includes adjacent Intel company number, D33025.                                                                                                                                                                                               |  |
| Printed wiring board manufacturer's recognition mark. Consists of a unique UL recognized manufacturer's logo, along with a flammability rating (solder side).                                                                                                                                                    | V-0                                                                                   |
| China RoHS/Environmentally Friendly Use Period Logo: This is an example of the symbol used on Intel NUC Boards and associated collateral. The color of the mark may vary depending upon the application. The Environmental Friendly Usage Period (EFUP) for Intel NUC Boards has been determined to be 10 years. |  |

## 5.2 Battery Disposal Information



### CAUTION

*Risk of explosion if the battery is replaced with an incorrect type. Batteries should be recycled where possible. Disposal of used batteries must be in accordance with local environmental regulations.*



### PRÉCAUTION

*Risque d'explosion si la pile usagée est remplacée par une pile de type incorrect. Les piles usagées doivent être recyclées dans la mesure du possible. La mise au rebut des piles usagées doit respecter les réglementations locales en vigueur en matière de protection de l'environnement.*



### FORHOLDSREGEL

*Eksplodingsfare, hvis batteriet erstattes med et batteri af en forkert type. Batterier bør om muligt genbruges. Bortskaffelse af brugte batterier bør foregå i overensstemmelse med gældende miljølovgivning.*



### OBS!

*Det kan oppstå eksplosjonsfare hvis batteriet skiftes ut med feil type. Brukte batterier bør kastes i henhold til gjeldende miljølovgivning.*



### VIKTIGT!

*Risk för explosion om batteriet ersätts med felaktig batterityp. Batterier ska kasseras enligt de lokala miljövårdsbestämmelserna.*



### VARO

*Räjähdysvaara, jos pariston tyyppi on väärä. Paristot on kierrätettävä, jos se on mahdollista. Käytetyt paristot on hävitettävä paikallisten ympäristömääräysten mukaisesti.*



### VORSICHT

*Bei falschem Einsetzen einer neuen Batterie besteht Explosionsgefahr. Die Batterie darf nur durch denselben oder einen entsprechenden, vom Hersteller empfohlenen Batterietyp ersetzt werden. Entsorgen Sie verbrauchte Batterien den Anweisungen des Herstellers entsprechend.*



### AVVERTIMENTO

*Esiste il pericolo di un esplosione se la pila non viene sostituita in modo corretto. Utilizzare solo pile uguali o di tipo equivalente a quelle consigliate dal produttore. Per disfarsi delle pile usate, seguire le istruzioni del produttore.*



### PRECAUCIÓN

*Existe peligro de explosión si la pila no se cambia de forma adecuada. Utilice solamente pilas iguales o del mismo tipo que las recomendadas por el fabricante del equipo. Para deshacerse de las pilas usadas, siga igualmente las instrucciones del fabricante.*



### WAARSCHUWING

*Er bestaat ontploffingsgevaar als de batterij wordt vervangen door een onjuist type batterij. Batterijen moeten zoveel mogelijk worden gerecycled. Houd u bij het weggooien van gebruikte batterijen aan de plaatselijke milieuwetgeving.*



### ATENÇÃO

*Haverá risco de explosão se a bateria for substituída por um tipo de bateria incorreto. As baterias devem ser recicladas nos locais apropriados. A eliminação de baterias usadas deve ser feita de acordo com as regulamentações ambientais da região.*



### AŚCIAROŽZNAŚĆ

*Існуе рызыка выбуху, калі заменены акумулятар непраўльнага тыпу. Акумулятары павінны, па магчымасці, перепрацоўвацца. Пазбаўляцца ад старых акумулятараў патрэбна згодна з мясцовымі заканадаўствам па экалогіі.*



### UPOZORNĚNÍ

*V případě výměny baterie za nesprávný druh může dojít k výbuchu. Je-li to možné, baterie by měly být recyklovány. Baterie je třeba zlikvidovat v souladu s místními předpisy o životním prostředí.*



### Προσοχή

*Υπάρχει κίνδυνος για έκρηξη σε περίπτωση που η μπαταρία αντικατασταθεί από μία λανθασμένου τύπου. Οι μπαταρίες θα πρέπει να ανακυκλώνονται όταν κάτι τέτοιο είναι δυνατό. Η απόρριψη των χρησιμοποιημένων μπαταριών πρέπει να γίνεται σύμφωνα με τους κατά τόπο περιβαλλοντικούς κανονισμούς.*



### VIGYÁZAT

*Ha a telepet nem a megfelelő típusú telepre cseréli, az felrobbanhat. A telepeket lehetőség szerint újra kell hasznosítani. A használt telepeket a helyi környezetvédelmi előírásoknak megfelelően kell kiselejtezni.*



### 注意

**異なる種類の電池を使用すると、燃焼の危険があります。リサイクルが可能な地域であれば、電池をリサイクルしてください。使用後の電池を破棄する際には、地域の環境規制に従ってください。**

**AWAS**

*Risiko letupan wujud jika bateri digantikan dengan jenis yang tidak betul. Bateri sepatutnya diktir semula jika boleh. Pelupusan bateri terpakai mestilah mematuhi peraturan alam sekitar tempatan.*

**OSTRZEŻENIE**

*Istnieje niebezpieczeństwo wybuchu w przypadku zastosowania niewłaściwego typu baterii. Zużyte baterie należy w miarę możliwości utylizować zgodnie z odpowiednimi przepisami ochrony środowiska.*

**PRECAUȚIE**

*Risc de explozie, dacă bateria este înlocuită cu un tip de baterie necorespunzător. Bateriile trebuie reciclate, dacă este posibil. Depozitarea bateriilor uzate trebuie să respecte reglementările locale privind protecția mediului.*

**ВНИМАНИЕ**

*При использовании батареи несоответствующего типа существует риск ее взрыва. Батареи должны быть утилизированы по возможности. Утилизация батарей должна проводиться по правилам, соответствующим местным требованиям.*

**UPOZORNENIE**

*Ak batériu vymeníte za nesprávny typ, hrozí nebezpečenstvo jej výbuchu. Batérie by sa mali podľa možnosti vždy recyklovať. Likvidácia použitých batérií sa musí vykonávať v súlade s miestnymi predpismi na ochranu životného prostredia.*

**POZOR**

*Zamenjava baterije z baterijo drugačnega tipa lahko povzroči eksplozijo. Če je mogoče, baterije reciklirajte. Rabljene baterije zavrzite v skladu z lokalnimi okoljevarstvenimi predpisi.*

**คำเตือน**

*ระวังการระเบิดที่เกิดจากเปลี่ยนแบตเตอรี่ผิดประเภท หากเป็นไปได้ ควรนำแบตเตอรี่ไปรีไซเคิล การทิ้งแบตเตอรี่ใช้แล้วต้องเป็นไปตามกฎข้อบังคับด้านสิ่งแวดล้อมของท้องถิ่น.*

**UYARI**

*Yanlış türde pil takıldığında patlama riski vardır. Piller mümkün olduğunda geri dönüştürülmelidir. Kullanılmış piller, yerel çevre yasalarına uygun olarak atılmalıdır.*

**ОСТОРОГА**

*Використовуйте батареї правильного типу, інакше існуватиме ризик вибуху. Якщо можливо, використані батареї слід утилізувати. Утилізація використаних батарей має бути виконана згідно місцевих норм, що регулюють охорону довкілля.*



## UPOZORNĚNÍ

*V případě výměny baterie za nesprávný druh může dojít k výbuchu. Je-li to možné, baterie by měly být recyklovány. Baterie je třeba zlikvidovat v souladu s místními předpisy o životním prostředí.*



## ETTEVAATUST

*Kui patarei asendatakse uue ebasobivat tüüpi patareiga, võib tekkida plahvatusoht. Tühjad patareid tuleb võimaluse korral viia vastavasse kogumispunkti. Tühjade patareide äraviskamisel tuleb järgida kohalikke keskkonnakaitse alaseid reegleid.*



## FIGYELMEZTETÉS

*Ha az elemet nem a megfelelő típusúra cseréli, felrobbanhat. Az elemeket lehetőség szerint újra kell hasznosítani. A használt elemeket a helyi környezetvédelmi előírásoknak megfelelően kell kiselejtezni.*



## UZMANĪBU

*Pastāv eksplozijas risks, ja baterijas tiek nomainītas ar nepareiza veida baterijām. Ja iespējams, baterijas vajadzētu nodot attiecīgos pieņemšanas punktus. Bateriju izmešanai atkritumos jānotiek saskaņā ar vietējiem vides aizsardzības noteikumiem.*



## DĒMESIO

*Naudojant netinkamo tipo baterijas įrenginys gali sprogti. Kai tik įmanoma, baterijas reikia naudoti pakartotinai. Panaudotas baterijas išmesti būtina pagal vietinius aplinkos apsaugos nuostatus.*



## ATTENZJONI

*Riskju ta' splużjoni jekk il-batterija tinbidel b'tip ta' batterija mhux korrett. Il-batteriji għandhom jiġu riċiklati fejn hu possibbli. Ir-rimi ta' batteriji użati għandu jsir skond ir-regolamenti ambjentali lokali.*



## OSTRZEŻENIE

*Ryzyko wybuchu w przypadku wymiany na baterie niewłaściwego typu. W miarę możliwości baterie należy poddać recyklingowi. Zużytych baterii należy pozbywać się zgodnie z lokalnie obowiązującymi przepisami w zakresie ochrony środowiska.*

