

# Intel<sup>®</sup> NUC Board D54250WYB and Intel<sup>®</sup> NUC Board D34010WYB Technical Product Specification

# **Revision History**

Revision	Revision History	Date
001	First release of the Intel NUC Board D54250WYB and Intel NUC Board D34010WYB Technical Product Specification	September 2013
002	Specification Clarification	October 2013
003	Specification Clarification	November 2013
004	Specification Clarification	March 2014
005	Specification Clarification	April 2014
006	Specification Clarification	June 2014

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This product specification applies to only the standard Intel NUC Board with BIOS identifier WYLPT10H.86A.

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# **Board Identification Information**

#### **Basic Intel<sup>®</sup> NUC Board D54250WYB Identification Information**

AA Revision	BIOS Revision	Notes
H13922-303	WYLPT10H.86A.0021	1,2

Notes:

- 1. The AA number is found on a small label on the component side of the board.
- 2. The Intel<sup>®</sup> Core<sup>™</sup> i5-4250U processor is used on this AA revision consisting of the following component:

Device	Stepping	S-Spec Numbers		
Intel Core i5-4250U	CO	SR16M		

#### Basic Intel<sup>®</sup> NUC Board D34010WYB Identification Information

AA Revision	BIOS Revision	Notes
H14771-303	WYLPT10H.86A.0021	1,2

Notes:

- 1. The AA number is found on a small label on the component si  $\circ$  of t  $\circ$  board.
- 2. The Intel<sup>®</sup> Core<sup>™</sup> i3-4010U processor is used on this AA rev sion consisting of the following component:

Device	Stepping	S-Spec Numbers
Intel Core i3-4010U	СО	SR16Q

# **Specification Changes or Clarifications**

The table below indicates the Spec fication Changes or Specification Clarifications that apply to the Intel NUC Board D5 250WYB and Intel NUC Board D34010WYB.

Date	Type of Change	Description of Changes or Clarifications
October 2013	Spec Cla ification	Added Figure 9 to show the front panel connectors.
		<ul> <li>Added Figure 15 to show the location of the front panel Consumer Infrared (CIR) sensor</li> </ul>
		Updated the link for BIOS update utilities in Section 3.5.
		Updated the link for BIOS recovery in Section 3.6.
		• Added information about length and character restrictions for HDD passwords in Section 3.8.
		• Added Figure 5. 4-Pin 3.5 mm (1/8 inch) Audio Jack Pin Out.

**Specification Changes or Clarifications** 

continued

Date	Type of Change	Description of Changes or Clarifications
November 2013	Spec Clarification	<ul> <li>Updated Section 1.5.1.3 Mini High Definition Multimedia Interface* (Mini HDMI*)</li> </ul>
		<ul> <li>Updated Section 1.5.1.4 Mini DisplayPort*</li> </ul>
		Updated Section 1.5.1.5 Multiple DisplayPort and HDMI Configurations
February 2014	Spec Clarification	Updated the first Caution in Section 2.6 Thermal Considerations.
		Added Figure 18 Board Height Dimensions.
March 2014	Spec Clarification	Updated Section 2.2.4.5 System ID / Custom Solutio s Header (2.0 mm Pitch).
June 2014	Spec Clarification	Updated Section 2.2.4.3 Power Supply Connect rs.

#### Specification Changes or Clarifications (continued)

### Errata

Current characterized errata, if any, are documented in a separ te Specification Update. See <u>http://www.intel.com/content/www/us/en/motherboards/desktop-motherboards/motherboards.html?wapkw=desktop+boa\_ds</u> for the latest documentation. This Technical Product Specification (TPS) specifies the board layout, components, connectors, power and environmental requirements, and the BIOS for Intel<sup>®</sup> NUC Board D54250WYB and Intel<sup>®</sup> NUC Board D34010WYB.

# **Intended Audience**

The TPS is intended to provide detailed, technical information about Intel NUC Board D54250WYB and Intel NUC Board D34010WYB and their components to the endors, 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 D54250WYB and Intel NUC Board D34010WYB
2	A map of the resources of the Intel NUC Boa d
3	The features supported by the BIOS etup program
4	A description of the BIOS error me sages, beep codes, and POST codes
5	Regulatory compliance and b ttery 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

# 

Notes c II a tention to important information.

#### 

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

#	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 indicate a he adecimal 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.

### **Other Common Notation**

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# 1.1 Overview

### **1.1.1 Feature Summary**

Table 1 summarizes the major features of Intel NUC Board D54250WYB and Intel NUC Board D34010WYB.

Form Factor	4.0 inches by 4.0 inches (101.60 millimeters by 101.60 millime rs)		
Processor	<ul> <li>Intel NUC Board D54250WYB has a soldered-down Inte Co e<sup>™</sup> i5-4250U processor with up to 15 W TDP         <ul> <li>Integrated graphics</li> <li>Integrated memory controller</li> <li>Integrated PCH</li> </ul> </li> <li>Intel NUC Board D34010WYB has a solder d dow Intel<sup>®</sup> Core<sup>™</sup> i3-4010U processor with up to 15 W TDP         <ul> <li>Integrated graphics</li> <li>Integrated graphics</li> <li>Integrated graphics</li> <li>Integrated graphics</li> <li>Integrated memory controll</li> <li>Integrated PCH</li> </ul> </li> </ul>		
Memory	<ul> <li>Two 204-pin DDR3L SDRAM Small Outline Dual Inline Memory Module (SO-DIMM) sockets</li> <li>Support for DDR3L 1600 MHz and DDR3L 1333 MHz SO-DIMMs</li> <li>Support for 2 Gb and Gb memory technology</li> <li>Support for up to 16 GB of system memory with two SO-DIMMs using 4 Gb memory technology</li> <li>Support for n-ECC memory</li> <li>Support for 1.35 V low voltage JEDEC memory only</li> </ul>		
Graphics	<ul> <li>Integ ated graphics support for processors with Intel<sup>®</sup> Graphics Technology:         <ul> <li>One M ni High Definition Multimedia Interface* (Mini HDMI*) back panel c nnector</li> <li>One Mini DisplayPort* back panel connector</li> </ul> </li> </ul>		
Audio	<ul> <li>Intel<sup>®</sup> High Definition (Intel<sup>®</sup> HD) Audio via the Mini HDMI v1.4a and Mini DisplayPort 1.2 interfaces through the processor</li> <li>Intel HD Audio via a stereo microphone/headphone jack on the front panel</li> <li>Front panel audio jack (3.5 mm jack)</li> </ul>		
Peripheral Interfac s	<ul> <li>USB 3.0 ports:         <ul> <li>Two ports are implemented with external front panel connectors (blue)</li> <li>Two ports are implemented with external back panel connectors (blue)</li> </ul> </li> <li>USB 2.0 ports:         <ul> <li>Two ports via one dual-port internal 2.0 mm pitch header (black)</li> <li>One port is reserved for the PCI Express* Half-Mini Card</li> <li>One port is reserved for the PCI Express Full-Mini Card</li> </ul> </li> <li>SATA ports:         <ul> <li>One internal mSATA port (PCI Express Full-Mini Card) for SSD support</li> <li>One SATA 6.0 Gb/s port (blue)</li> </ul> </li> </ul>		

#### Table 1. Feature Summary

continued

Expansion       • Une PCI Express Full-Mini Card connector         BIOS       • Intel® BIOS resident in the Serial Peripheral Interface (SPI) Plash device         BIOS       • Support for Advanced Configuration and Power Interface (ACPI), Plug and Play, and System Management BIOS (SMBIDS)         Instantly Available       PC Technology       • Suspend to RAM support         PC Technology       • Suspend to RAM support       • Suspend to RAM support         USB ports       • Suspend to RAM support       • Wake on PCI Express JLAN, front panel, Consumer Infrared (CIR), and USB ports         Capabilities       • One processor fan Header       • Interface (NOT/1000 Mb/s) LAN subsystem using the Intel® I218V Gigabit Ethernet Controller         Hardware Monitor       Subsystem, including:       • Voltage sense to detect out of range power supply voltages         • Voltage sense to detect out of range thermal values       • One processor fan header       • Fan sense input used to monitor fan activity         • Fan speed control       • Fan speed control       • Fan speed control		
Lapabilities       • Une PLI Express Pull-Minit Land connector         BLOS       • Unter PLI Express Pull-Minit Land connector         PC Technology       • Support for PCI Express *         PC Technology       • Support for PCI Express *         LAN Support       • Glaphit (10/100/1000 Mls/s) LMX subsystem using the Intel® L218V Glaphit (EXPress *         Not the PCI Express *       • Voltage sense to detect out of range power supply voltages         * Tore processor for header       • Voltage sense to detect out of range thermal values         • Or processor for header       • For sense input used to monitor fan activity         • For sense input used to monitor fan activity       • For sense input used to monitor fan activity	Expansion	One PCI Express Half-Mini Card connector
BIOS       • Intel® BIOS resident in the Serial Perpheral Interface (SPI), Plug and Play, and System Management BIOS (SMBIOS)         Instantly Available       PC Technology       • Suspent to RAM support         Vake on PCI Express.       • Suspent to RAM subport       • Wake on PCI Express.         IAN Support       • Gaphet (D/D/DOO Mb/s) LAM subsystem using the Intel® 1218V Gigab t         Ethernet Controller       • Hardware Monitor         Subsystem       based on table subsystem, based on a Nuvoton NCT5577 em edded controller.         • Voltage sense to detect out of range tower supply voltages       • Themal sense to detect out of range tower supply voltages         • Fan speed control       • Fan speed control       • Fan speed control	Capabilities	One PCI Express Full-Mini Card connector
Support for Advanced Configuration and Power Interface (ACPI), Plug and PC Technology     Support for PCI Express*     Support Read Support     Gigabit (10/100/1000 Mb/s) LAN subsystem using the Intel® I218V Gigab t Hardware Monitor Subsystem     Subsystem and the subsystem, based on a Nuvoton NCT5577 em edded controller, including: Or ap processor in header Fan sense to detect out of range power supply voltages Thermal sense to detect out of range thermal values One processor in header Fan sense input used to monitor fan activity Fan speed control	BIOS	Intel <sup>™</sup> BIOS resident in the Serial Peripheral Interface (SPI) Flash device
Instantiy Availabi       e       Support for PCI Express, LAN, front panel, Consumer Infrared (CIR), and USB ports         VB ports       Clipabit (10/100/1000 Mb/s) LAN subsystem using the Intel <sup>®</sup> I218V Gigabit (Infrared controller, including:         Voltage sense to detect out of range power supply voltages       Thermal sense to detect out of range thermal values         One processor fan header       0 noncorr fan header         F an sense input used to monitor fan activity       F an sense input used to monitor fan activity		Support for Advanced Configuration and Power Interface (ACPI), Plug and Play, and System Management BIOS (SMBIOS)
PC Technology       • Suspend to RAM support.         • Wake on PCI Express, LAN, front panel, Consumer Infrared (CIR), and USB ports         Cligabit (10/1000 Mb/s) LAN subsystem using the Intel® 1218V Gligab t Ethernat Controller.         Hardware Monitor:         Subsystem         • Voltage sense to detect out of range power supply voltages         • Thermal sense to detect out of range thermal values         • One processor fan header         • Fan sense Input used to monitor fan activity         • Fan sense Input used to monitor fan activity         • Fan sense Input used to monitor fan activity         • Fan sense Input used to monitor fan activity	Instantly Available	Support for PCI Express*
Wake on PCI Express, LAN, front panel, Consumer Infrared (CIR), and USB ports Gigabit (10/100/1000 Mb/s) LAN subsystem using the Intel® 1218V Gigabit Ethernet Controller Hardware Monitori Subsystem Voltage esses to detect out of range power supply voltages • Thermal sense to detect out of range thermal values • One processor fan header • Fan sanse input used to monitor fan activity • Fan speed control	PC Technology	Suspend to RAM support
LAN Support       Gigabit (10/100/1000 Mb/s) LAN subsystem using the Intel® 1218V Gigab t Ethernet Controller         Hardware Monitor Subsystem       Hardware monitoring subsystem, based on a Nuvoton NCT5577 em edded controller, including:         Voltage sense to detect out of range power supply voltages       • Voltage sense to detect out of range thermal values         • One processor fan header       • Fan sense input used to monitor fan activity         • Fan sense input used to monitor fan activity       • Fan speed control		Wake on PCI Express, LAN, front panel, Consumer Infrared (CIR), and USB ports
Hardware Monitor Subsystem       Hardware monitoring subsystem, based on a Nuvoton NCT5577 em edded controller, including:         • Voltage sense to detect out of range power supply voltages       • Thermal sense to detect out of range thermal values         • One processor fan header       • Fan sense input used to monitor fan activity         • Fan sense input used to monitor fan activity       • Fan speed control	LAN Support	Gigabit (10/100/1000 Mb/s) LAN subsystem using the Intel <sup>®</sup> I218V Gigab t Ethernet Controller
Voltage sense to detect out of range power supply voltages     Thermal sense to detect out of range thermal values     One processor fan header     Fan sense input used to monitor fan activity     Fan speed control	Hardware Monitor	Hardware monitoring subsystem, based on a Nuvoton NCT5577 em edded
<ul> <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>Fan speed control</li> </ul>	Subsystem	Voltage sense to detect out of range power supply voltages
<ul> <li>Preprocessor frame internal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame trianal volues</li> <li>Pren sense input used to monitor frame t</li></ul>		Thermal conse to detect out of range thermal values
Fan speed control		One processor fan header
• Fan speed control		Che processor fait fleduer
		Fan sense input used to monitor fan activity
		• ran speed control

Table 1. Feature Summary (continued)

### **1.1.2 Board Layout (Top)**

Figure 1 shows the location of the major components on the top-side of Intel NUC Board D54250WYB and Intel NUC Board D34010WYB.



Figure 1. Major Board Components (Top)

Table 2 lists the components identified in Figure 1.

	Item from Figure 1	Description
-	A	Battery
	В	Custom Solutions header (2.0 mm pitch)
	С	Processor fan header
	D	Onboard power button
	E	Power LED
_	F	Standby power LED
-	G	Hard Disk Drive LED
-	Н	Thermal solution

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

### **1.1.3 Board Layout (Bottom)**

Figure 2 shows the location of the major components on the bottom-side of Intel NUC Board D54250WYB and Intel NUC Board D34010WYB.



Figure 2. Major Board Components (Bottom)

Item from Figure 2	Description
A	Back panel connectors
В	PCI Express Full-Mini Card connector
С	PCI Express Half-Mini Card connector
D	SATA 6.0 Gb/s connector
E	Front panel dual-port USB 2.0 header (2.0 mm pitch)
F	Front panel USB 3.0 connector
G	Front panel USB 3.0 connector
Н	Front panel header (2.0 mm pitch)
I	SATA power connector
J	Front panel stereo microphone/headphone jack
К	BIOS setup configuration jumper
L	Consumer Infrared (CIR) sensor
М	DDR3L SO-DIMM 2 socket
Ν	DDR3L SO-DIMM 1 socket
0	Internal DC power connector

Table 3. Components Shown in Figure 2

### 1.1.4 Block Diagram

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



Figure 3. Block Diagram

# 1.2 Online Support

#### To find information about...

Intel NUC Board D54250WYB and Intel NUC Board D34010WYB

Intel NUC Board Support

Available configurations for Intel NUC Board D54250WYB and Intel NUC Board D34010WYB

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# 1.3 Processor

- Intel NUC Board D54250WYB has a soldered-down I tel<sup>®</sup> Core<sup>™</sup> i5-4250U processor with up to 15 W TDP
  - Integrated graphics
  - Integrated memory controller
  - Integrated PCH
- Intel NUC Board D34010WYB has a soldered-down Intel<sup>®</sup> Core<sup>™</sup> i3-4010U processor with up to 15 W TDP
  - Integrated graphics
  - Integrated memory contr ller
  - Integrated PCH

# ΝΟΤΕ

There are specific requirements for providing power to the processor. Refer to Section 2.5. on page 52 for information on power supply requirements.

# **1.4 System Memory**

The board has two 204-pin SO-DIMM sockets and support the following memory features:

- 1.35 V DDR3L SDRAM SO-DIMMs with gold plated contacts
- Two independent memory channels with interleaved mode support
- Unbuffered, single-sided or double-sided SO-DIMMs
- 16 GB maximum total system memory (with 4 Gb memory technology). Re er o 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
- DDR3L 1600 MHz and DDR3L 1333 MHz SDRAM SO-DIMMs

#### ΝΟΤΕ

To be fully compliant with all applicable DDR SDRAM mem ry specifications, the board should be populated with SO-DIMMs that support the S ria Presence Detect (SPD) data structure. This allows the BIOS to read the SPD da a and program the chipset to accurately configure memory settings for optim m performance. If non-SPD memory is installed, the BIOS will attempt to correctly c nfigure 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 c igurations.

	DIMM		SDRAM	SDRAM Organization	Number of SDRAM	
	Capacity	Configurati n (Note)	Density	Front-side/Back-side	Devices	
	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	

Table 4.	Supported	Memory	onfigurations
----------	-----------	--------	---------------

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

For inf rmation about	Refer to:
Tested Me ry	http://www.intel.com/NUCSupport

### **1.4.1** Memory Configurations

The processor supports the following types of memory organization:

- **Dual channel (Interleaved) mode**. This mode offers the highest throughput for real world applications. Dual channel mode is enabled when the installed memory capacities of both SO-DIMM channels are equal. Technology and device width can vary from one channel to the other but the installed memory capacity for each channel must be equal. If different speed SO-DIMMs are used between channels, the slowest memory timing will be used.
- **Single channel (Asymmetric) mode**. This mode is equivalent to single ch nnel bandwidth operation for real world applications. This mode is used wh n o ly a single SO-DIMM is installed or the memory capacities are unequal. Tech ology and device width can vary from one channel to the other. If different speed SO-DIMMs are used between channels, the slowest memory timing will be sed

For information about	Refer to:
Memory Configuration Examples	http://www.intel.com/NUCS_ppo_t



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<sup>®</sup> High Definition (Intel<sup>®</sup> HD) Graphics

The Intel HD graphics controller features the following:

- 3D Features
  - DirectX\* 11 support
  - OpenGL\* 4.0 support
- Video
- Next Generation Intel<sup>®</sup> Clear Video Technology HD support is a collection of video playback and enhancement features that improve the end us r's viewing experience
- Encode/transcode HD content
- Playback of high definition content including Blu ray\* disc
- Superior image quality with sharper, more co orf 1 images
- Playback of Blu-ray disc S3D content using Min HDMI (v1.4a spec compliant with 3D)
- DirectX\* Video Acceleration (DXVA) su por for accelerating video processing
- Full AVC/VC1/MPEG2 HW Decode
- Intel HD Graphics with Advanced H rdware Video Transcoding (Intel<sup>®</sup> Quick Sync Video)

Intel Quick Sync Video is nabled by an appropriate software application.

### 1.5.1.2 Video Memory Allocation

Intel<sup>®</sup> Dynam c Video Memory Technology (DVMT) is a method for dynamically allocati g s stem memory for use as graphics memory to balance 2D/3D graphics and system p formance. If your computer is configured to use DVMT, graphics memory is allocated based on system requirements and application demands (up to the onf gured 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** Mini High Definition Multimedia Interface\* (Mini HDMI\*)

The Mini High-Definition Multimedia Interface (Mini HDMI) is provided for transmitting uncompressed digital audio and video signals to television sets, projectors and other video displays. It can carry high quality multi-channel audio data and all standard and high-definition consumer electronics video formats. The Mini HDMI display interface connecting the processor and display devices utilizes transition minimized differential signaling (TMDS) to carry audio visual information through the same Mini HDMI cable. The processor HDMI interface is designed according to the High-Definition Multim dia Interface Specification with 3D, Deep Color, and x.v.Color. The maximum supp rted resolution is 1920 x 1200 @ 60 Hz, 24bpp. The Mini HDMI port is compliant the HDMI 1.4a specification.

#### 1.5.1.4 Mini DisplayPort\*

DisplayPort is a digital communication interface that utilizes differential signaling to achieve a high bandwidth bus interface designed to support on ections between PCs and monitors, projectors, and TV displays. DisplayPort is suitable for display connections between consumer electronics devices such as high definition optical disc players, set top boxes, and TV displays. The maximum su ported resolution is 3840 x 2160 @ 30 Hz, 24bpp. The Mini DisplayPort int rfa e supports the 1.2 specification.

The DisplayPort output supports Multi-Stream Tran port (MST) which allows for multiple independent video streams (daisy-hain onnection with multiple monitors) over a single DisplayPort. This will requir the use of displays that support DisplayPort 1.2 and allow for this feature

For information about	Refer to
DisplayPort technology	http://www.displayport.org

#### 1.5.1.4.1 DisplayPort 1.2 Multi-Stream Transport Daisy-Chaining

Table 5 lists the maximum resolutions available when using DisplayPort 1.2 Multi-Stream Transport.

DisplayPort Usage Models	Monitor 1	Monitor 2	Monitor 3
3 Monitors	1920 x 1200 @ 60 Hz	1920 x 1080 @ 60 Hz	1920 x 1080 @ 60 Hz
2 Monitors	2560 x 1600 @ 60 Hz	2560 x 1600 @ 60 Hz	
3 Monitors (with DisplayPort 1.2 hub)	1920 x 1080 @ 60 Hz	1920 x 1080 @ 60 Hz	1920 x 1080 @ 60 H

Table 5. DisplayPort Multi-Streaming Resolutions

#### 1.5.1.5 Multiple DisplayPort and HDMI Configurations

Multiple DisplayPort and HDMI configurations feature the following:

- Two independent displays
- Single HDMI 1.4a with 1080P support
- Single DisplayPort 1.2 with 4K support
- Collage Display

#### Table 6. Multiple Display Configuratio Maximum Resolutions

Single Display	Dual Display	Single Display
HDMI	DisplayPo and HDMI	DisplayPort
1920 x 1200 @ 60 Hz	3840 x 2160 @ 30 Hz (DisplayPort) 1920 x 1 00 @ 60 Hz (HDMI)	3840 x 2160 @ 30 Hz

Note: Higher resolutions may be a leva le but have not been tested on Intel NUC.

For information about	Refer to
Multiple display maximum resolutions	https://www- ssl.intel.com/content/www/us/en/processors/core/CoreTechnicalResou rces.html (Generic link)
	https://www-ssl.intel.com/content/www/us/en/processors/core/4th- gen-core-family-desktop-vol-1-datasheet (Specific Link)

### 1.5.1.6 High-bandwidth Digital Content Protection (HDCP)

HDCP is the technology for protecting high definition content against unauthorized copy or interception between a source (computer, digital set top boxes, etc.) and the sink (panels, monitor, and TVs). The PCH supports HDCP 1.4a for content protection over wired displays (Mini HDMI and Mini DisplayPort).

#### **1.5.1.7 Integrated Audio Provided by the Mini HDMI and** Mini DisplayPort Interfaces

The Mini HDMI and Mini DisplayPort interfaces from the PCH support audio. The processor supports two High Definition audio streams on two digital ports simultaneously.

Table 7 shows the specific audio technologies supported by the PCH.

#### Table 7. Audio Formats Supported by the Mini HDMI and Mini DisplayPort Interfaces

Audio Formats	Mini HDMI	Mini Di playPort
AC-3 – Dolby* Digital	Yes	Yes
Dolby Digital Plus	Yes	Yes
DTS-HD*	Yes	Υs
LPCM , 192 kHz/24 bit, 8 channel	Yes	Yes
Dolby True HD, DTS-HD Master Audio* (Lossless Blu-ray Disc Audio Format)	Yes	Yes

# 1.6 USB

The board supports eight USB ports. All eight ports are high-speed, full-speed, and low-speed capable. The port arrangement i as follows:

- USB 3.0 ports:
  - Two front panel USB 3.0 ports are implemented through an external connector (blue)
  - Two ports are implemented with vertical back panel connectors (blue)
- USB 2.0 ports:
  - Two ports via one dual-port internal 2.0 mm pitch header (black)
  - One port is reserved for the PCI Express Half-Mini Card
  - One port s reserved for the PCI Express Full-Mini Card

### NOTE

Compu er s stems 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 cab e that meets the requirements for full-speed devices.

For information about	Refer to
The location of the USB connectors on the back panel	Figure 9, page 38
The location of the front panel USB headers	Figure 2, page 15

# 1.7 SATA Interface

The board provides the following SATA interfaces:

- One internal mSATA port (PCI Express Full-Mini Card) for SSD support
- One SATA 6.0 Gb/s port (blue)

The PCH provides independent SATA ports with a theoretical maximum transfer rate of 6 Gb/s. A point-to-point interface is used for host to device connections.

### 1.7.1 AHCI Mode

The board supports AHCI storage mode.

# DOTE

In order to use AHCI mode, AHCI must be enabled in the BIOS. Micro ft\* Windows\* 7 and 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 last a ailable by Intel.

## 1.7.2 Intel<sup>®</sup> Rapid Storage Technology / SATA RAID

The PCH supports Intel<sup>®</sup> Rapid Storage Technology providing both AHCI and integrated RAID functionality. The RAID capability provides high-performance RAID 0 and 1 functionality on all SATA ports. Othe RAID features include hot spare support, SMART alerting, and RAID 0 auto replace S ftware components include an Option ROM for pre-boot configuration and b ot f nctionality, a Microsoft Windows compatible driver, and a user interface for configuration and management of the RAID capability of the PCH.

# 1.7.3 Intel<sup>®</sup> Smart Response Technology

Intel<sup>®</sup> Smart Response Tec nology is a disk caching solution that can provide improved computer system pe formance with improved power savings. It allows configuration of a computer system with he advantage of having HDDs for maximum storage capacity with system performance at or near SSD performance levels.

For more information on Intel Smart Response Technology, go to <a href="http://www.intel.com/support/chipsets/sb/CS-032826.htm">http://www.intel.com/support/chipsets/sb/CS-032826.htm</a>

# NOTE

*In order to use supported RAID and Intel Smart Response Technology features, you must first enable RAID in the BIOS.* 

# **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

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 etti gs 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 loca ion of the battery.

# 1.9 Audio Subsystem

The audio subsystem supports the following features:

- Analog line-out/Analog Headphone/Analog Micropho e (front panel jack)
- DMIC interface (custom solutions header), wi h s pport for mono and stereo digital microphones
- Support for 44.1 kHz/48 kHz/96 kHz/192 kH ample rates on all analog outputs
- Support for 44.1 kHz/48 kHz/96 kHz s mpl rates on all analog inputs
- Front Panel Audio Jack Support (see Figu e 5 for 3.5 mm audio jack pin out):
  - Speakers only
  - Headphones only
  - Microphone only
  - Combo Headphone/Micro hone



		Description
1	Тір	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

### ΝΟΤΕ

The analog circuit of the front 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 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	http://downloadcenter.intel.com	

# 1.10 LAN Subsystem

The LAN subsystem consists of the following:

- Intel I218V Gigabit Ethernet Controller (10/100/1000 Mb/s)
- RJ-45 LAN connector with integrated status LEDs

Additional features of the LAN subsystem include:

- CSMA/CD protocol engine
- LAN connect interface between the Processor and the LAN controller
- Power management capabilities
  - ACPI technology support
  - LAN wake capabilities
- LAN subsystem software

For information about	Refer to	
LAN software and drivers	http://downloadcenter.intel.com	

# **1.10.1** Intel<sup>®</sup> I218V Gigabit Ethernet Controller

The Intel I218V Gigabit Ethern t C ntroller supports the following features:

- Compliant with the 1 Gb/s Ethernet 802.3, 802.3u, 802.3z, 802.3ab specifications
- Multi-speed operation: 10/100/1000 Mb/s
- Full-duplex operat on at 10/100/1000 Mb/s; Half-duplex operation at 10/100 Mb/s
- Flow control support compliant with the 802.3X specification as well as the specific operation of asymmetrical flow control defined by 802.3z

**Refer to** 

http://downloadcenter.intel.com

- VLAN sup rt compliant with the 802.3q specification
- MAC address filters: perfect match unicast filters, multicast hash filtering, broadcast filter, and promiscuous mode

### **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	

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

Two LEDs are built into the RJ-45 LAN connector (shown in Figure 6).



#### Figure 6. LAN Connector LED Locations

Table 8 describes the LED states when the board is powered up and the LAN subsystem is operating.

LED	LED Color	LED State	Condi on
		Off	LAN link s not established.
Link	Green	On	LA link is established.
		Blinking	AN activity is occurring.
		Off	10 Mb/s data rate is selected.
Data Rate	Green/Yellow	Gree	100 Mb/s data rate is selected.
		Y low	1000 Mb/s data rate is selected.

#### Table 8. LAN Connector LED States

# **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
 www.intel.com/design/archives/wfm/

### 1.11.1 Hardware Monitoring

The hardware monitoring and fan control subsystem is based on a Nuvoton NCT5577D embedded controller, which supports the following:

- Processor and system ambient temperature monitoring
- Chassis fan speed monitoring
- Voltage monitoring of +12 V, +5 V, +3.3 V, Memory Vcc (V SM), +Vccp, PCH Vcc
- SMBus interface

### **1.11.2 Fan Monitoring**

Fan monitoring can be implemented using third-part software.

### 1.11.3 Thermal Solution

Figure 7 shows the location of the thermal solution and processor fan header.



Figure 7. 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 fe tures include:

- Plug and Play (including bus and device enumer tion)
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), ideo displays, and hard 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 ope ating system to power-off the computer
- Support for multiple wake-up v nts (see Table 11 on page 33)
- Support for a front panel powe and sleep mode switch

Table 9 lists the system states based on how long the power switch is pressed, depending on how AC I is configured with an ACPI-aware operating system.

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

 Table 9. Effect
 of Pressing the Power Switch

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 10 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.

Global States	Sleeping States	Processor States	Device States	Targ ted System Power <sup>(Note 1)</sup>
G0 – working state	S0 – working	C0 – working	D0 – working state.	II power > 30 W
G1 – sleeping state	S3 – Suspend to RAM. Context saved to RAM.	No power	D3 – no powe excep for w ke p logic.	Power < 5 W (Note 2)
G1 – sleeping state	S4 – Suspend to disk. Context saved to disk.	No power	D3 no power xcept for wake-up logic.	Power < 5 W $^{(Note 2)}$
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 (Note 2)
G3 – mechanical off AC power is disconnected from the computer.	No power to the system.	N 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.

Table 10.	Power	States and	Targeted S	System	Power
	1 0000	States and	Turgeteu e	ystem	1 0 1 1 1

Notes:

1. Total system p we is dependent on the system configuration, including add-in boards and peripherals powered b the system chassis' power supply.

2. Depe dent o the standby power consumption of wake-up devices used in the system.

#### 1.12.1.2 Wake-up Devices and Events

Table 11 lists the devices or specific events that can wake the computer from specific states.

Devices/events that wake up the system	from this sleep state
Power switch	S3, S4, S5 <sup>(Note 1)</sup>
RTC alarm	S3, S4, S5 <sup>(Note 1)</sup>
LAN	S3, S4, S5 <sup>(Note 1)</sup>
USB	S3 <sup>(Note 2)</sup>
WAKE#	S3, S4, S5 <sup>(Note 1)</sup>
Consumer IR	S3, S4, S5 (Note 3)

Notes:

- 1. S4 implies operating system support only.
- 2. USB ports must be turned off during S4/S5 states.
- 3. When Deep S4/S5 is enabled only Wake from RTC and Power Switc is upported.

# ΝΟΤΕ

The use of these wake-up events from an ACPI state requires an operating system that provides full ACPI support. In addition, softw re, 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 chnology
- LAN wake capabilit es
- Wake from USB
- WAKE# signa wake-up support
- Wake from S5
- Wake from C R
- +5 V Standby Power Indicator LED

### NOTE

he 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 returns 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.

For information about	Refer to
The location of the internal power connector	Figure 2, page 15
The signal names of the internal power connector	Table 13, page 4

#### 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 appea to be off (the power supply is off, and the front panel LED is amber if dual colored, off if single colored.) When signaled by a wake-up device or event, the sy tem quickly returns to its last known wake state. Table 11 on page 33 lists the dev ces ind events that can wake the computer from the S3 state.

The use of Instantly Available PC technology requires oper ting 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 traf c at the Media Independent Interface. Upon detecting a Magic Packet\* frame, the L N subsystem asserts a wake-up signal that powers up the computer.

#### 1.12.2.4 Wake from USB

USB bus activity wakes the c mputer from an ACPI S3 state.

# 🗒 ΝΟΤΕ

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

#### 1.12.2.5 WAKE# Signal Wake-up Support

Wh n 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 8 shows the location of the standby power LED.

### 

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 conn ted to the board. Failure to do so could damage the board and any attached devic s.



Figure 8. Location of the Standby Power LED
## 2.1 Memory Resources

#### 2.1.1 Addressable Memory

The board utilizes 32 GB of addressable system memory. Typically the address space that is allocated for PCI Conventional bus add-in cards, PCI Express configur tion space, BIOS (SPI Flash device), and chipset overhead resides above the top of DRAM (total system memory). On a system that has 32 GB of system memory ins alled, it is not possible to use all of the installed memory due to system addre s space being allocated for other system critical functions. These functions includ the following:

- BIOS/SPI Flash device (96 Mb)
- Local APIC (19 MB)
- Direct Media Interface (40 MB)
- PCI Express configuration space (256 MB)
- PCH base address registers PCI Express ports (up to 256 MB)
- Memory-mapped I/O that is dynamically alloc ted 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 overla of system addresses.

## 2.2 Connectors and Headers

## 

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

The other internal connectors and headers are not overcurrent protected and should connect only to devices inside the computer's chassis, such as fans and internal peripherals Do not use these connectors or headers to power devices external to the computer's chassis. A fault in the load presented by the external devices could cause damage to the computer, the power cable, and the external devices themselves.

*Furthermore, improper connection of USB header single wire connectors may eventually overload the overcurrent protection and cause damage to the board.* 

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

- Front panel I/O connectors
- Back panel I/O connectors
- On-board I/O connectors and headers (see pages 39 and 40)

#### 2.2.1 Front Panel Connectors

Figure 9 shows the location of the front panel connectors for the board.



Figure 9. Front Panel Connectors

#### 2.2.2 Back Panel Connectors

Figure 10 shows the location of th back panel connectors for the board.



#### Figure 10. Back Panel Connectors

### 2.2.3 Header (Top)

Figure 11 shows the location of the header on the top-side of the board.



Figure 11. Header (Top)

Table 12 lists the header identified in Figure 11.

Table 1	2. 1	Header	Shown	in	Figure	11
			•···•			

Item from Figure 12	Description
A	Custom Solutions header (2.0 mm pitch)

## 2.2.4 Connectors and Headers (Bottom)

Figure 12 shows the locations of the connectors and headers on the bottom-side of the board.



Figure 12. Connectors and Headers (Bottom)

Item from	onnectors and Headers Shown in Figure 10	
Figure 10	Description	
А	PCI Express Full-Mini Card connector	
В	PCI Express Half-Mini Card connector	
<u>C</u>	SATA 6.0 Gb/s connector through the PCH	
D	Front panel dual-port USB 2.0 header (2.0 mm pitch)	
 F	SATA power connector	
G	BIOS setup configuration jumper	
Н	Internal DC power connector	

#### 2.2.4.1 Signal Tables for the Connectors and Headers

Pin	Signal Name	Additional Signal Name
1	WAKE#	
2	3.3 V	
3	Reserved	
4	GND	
5	Reserved	
6	1.5 V	
7	CLKREQ#	
8	Reserved	
9	GND	
10	Reserved	
11	REFCLK-	
12	Reserved	
13	REFCLK+	
14	Reserved	
15	GND	
16	Reserved	
17	Reserved	
18	GND	
19	Reserved	
20	Reserved	
21	GND	
22	PERST#	
23	PERn0	
24	+3.3 V aux	
25	PERp0	
26	GND	
27	GND	
28	1 5	
29	GN	
30	SMB_CLK	
31	PETn0	
32	SMB_DATA	
3	PETp0	
34	GND	
35	GND	
36	USB_D-	
37	GND	(mSATA) Vendor
38	USB_D+	

Table 14. PCI Express Full-/Half-Mini Card Connector

continued

Pin	Signal Name	Additional Signal Name
39	+3.3 Vaux	(mSATA) Vendor
40	GND	
41	+3.3 Vaux	(mSATA) Vendor
42	LED_WWAN#	
43	Reserved	
44	LED_WLAN#	
45	Reserved	(mSATA) Vendor
46	LED_WPAN#	
47	Reserved	(mSATA) Vendor
48	+1.5V	
49	Reserved	(mSATA) DA/DSS
50	GND	
51	Reserved	(mSATA) Presence Detection
52	+3.3V	

 Table 14. PCI Express Full-/Half-Mini Card Connector (continued)



## NOTE

The mSATA signals are routed only to the PCI Express Full-Mini Card connector and not to the Half-Mini Card connector. These ignals are required to support mSATA modules.

Pin	Signal Name	Pin	Signal Name
1	+5 V DC	2	+5 V DC
3	D-	4	D-
5	D+	6	D+
7	Ground	8	Ground
9	KEY (no p )	10	No Connect

Table 15. Dual-Port Front Panel USB 2.0 Header

Pin	Signal Name
1	Ground
2	ТХР
3	TXN
4	Ground
5	RXN
6	RXP
7	Ground

Pin	Signal Name
1	3.3 V DC
2	3.3 V DC
3	3.3 V DC
4	Ground
5	Ground
6	Ground
7	5 V DC
8	5 V DC
9	5 V DC
10	Ground
11	Ground
12	Ground
13	N/A
14	N/A
15	N/A

 Table 17. SATA Power Connector

	Table 18. System	n ID / Custom	Solutions Heade	r (2.0 mm Pitch)
--	------------------	---------------	-----------------	------------------

Pin	Signal Name	Pin	Signal Name
1	Prog_LED	2	GND
3	HDMI_CEC	4	DMIC_CLK
5	3.3 Vsby	6	DMIC_DATA
7	Key (no pin)	8	SCI/SMI GPIO
9	5 Vsby (2A)	10	WDTO#/GPIO

#### 2.2.4.2 Add-in Card Connectors

The board hat the following add-in card connectors:

- One PCI Exp ess Half-Mini Card
- One PCI Express Full-Mini Card

#### 2.2.4.3 **Power Supply Connectors**

The board has the following power supply connectors:

**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 +12-19 (±10%) V DC and the shell is GND. The maximum curren rating is 10 A.



External power voltage, 12-19 V DC, is dependent on the type o p wer brick used.

**Internal Power Supply** – the board can alternatively be powe ed v a the internal 12-24 V DC 1 x 2 power connector, where pin 1 is GND and pin 2 is +12-24 (±10%) V DC.

Tuble 191 11 11 the filler offer ouppity connector	Table 19.	12-24 V	Internal	Power S	Supply	Connector
--	-----------	---------	----------	---------	--------	-----------

Pin	Signal Name	
1	Ground	
2	+12-24 V (±10%)	
For infor	mation about	Refer to
Power sup	oly considerations	Section 2.5.1, page 52

Power supply considerations

#### 2.2.4.4 Front Panel Header (2 0 mm Pitch)

This section describes the funct ons of the front panel header. Table 20 lists the signal names of the front panel head r. Figure 13 is a connection diagram for the front panel header.

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
	+5V_DC	Power	10	Кеу	No pin

Table 20. Front Panel Header (2.0 mm Pitch)



Figure 13. Connection Diagram for Front Panel Header (2.0 mm Pitch)

#### 2.2.4.4.1 Hard Drive Activity LED Header

Pins 1 and 3 can be connected to an LED to pro id 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.

#### 2.2.4.4.2 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.

#### 2.2.4.4.3 Power/Sleep ED Header

Pins 2 and 4 can be conne ted to a one- or two-color LED. Table 21 shows the possible LED states.

LED State	Description
Off	Power off
Blinking	Standby
Ste dy	Normal operation

#### Table 21. States for a One-Color Power LED

## NOTE

*The LED behavior shown in Table 21 is default – other patterns may be set via BIOS setup.* 

#### 2.2.4.4.4 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 System ID / Custom Solutions Header (2.0 mm Pitch)

The System ID / Customs Solution header is provided to aid customers in developing custom applications.

- Prog\_LED#: general purpose signal output that indicates when an event was triggered by the operating system. Signal is amplified by a transisto Intel can provide sample code for customers who may want to write their own applications leveraging this signal.
- DMIC\_CLK and DMIC\_DATA: clock output and data I/O for digital microphone interface.
- WDTO#: Watchdog timer that provides a general purp se implementation that can be wired to external systems (i.e., industrial controls) r to the rest pin on the board. Interested customers usually write their own software for watchdog timer support.
- 3.3 V Standby: can be used to monitor the pres nce of 3.3 V standby power.
- HDMI Consumer Electronics Control (CE): st ndard communication signal from the Mini HDMI connector (<u>http://www.dmi.org/</u>) - the signal is exposed through this header for third party solution t monitor/control CEC activity between multiple HDMI devices.
- 5 V Standby: can be used to mon tor the presence of 5 V Standby power or provide power from the 5 V Standby ra I (up to 2A current rating).
- SCI/SMI GPI: input sign | for direct connection to a front panel push-button to trigger a Windows com and. Intel will be adding BIOS support and accompanying Windows utility to ena le Direct Application Launch\* feature. General information about Direct Applic tion Launch can be found at:

http://msdn micro oft.com/en-us/windows/hardware/gg463078.aspx

#### 2.2.4.6 Internal USB 2.0 Dual-Port Header (2.0 mm Pitch)

Figure 14 is a connection diagram for the internal USB header.

Ӭ 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.



Figure 14. Connection Diagram for Internal USB 2.0 Dual-Port Header (2.0 mm Pitch)

#### 2.2.4.7 Consumer Infrared (CIR) Sensor

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

The CIR feature is male up of the receiving sensor. The receiving sensor consists of a filtered translated i fra ed input compliant with Microsoft CIR specifications.

Customers are r quired to provide their own media center compatible remote or smart phone applica on or use with the Intel NUC. Figure 15 shows the location of the CIR sensor.



Figure 15. Location of the CIR Sensor

## 2.3 BIOS Security Jumper

# 

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 16 shows the location of the BIOS Security Jumper. The 3-pin jumper determines the BIOS Security program's mode.

Table 22 describes the jumper settings for the three modes: normal, lo kdown, and configuration.



Figure 16. Location of the BIOS Security Jumper

Table 22 lists the settings for the jumper.

Function/Mode	Jumper Setting	Configuration
Normal	1-2	The BIOS uses current configuration information and passwords for booting.
Lockdown	2-3	The BIOS uses current configuration information and passwords for booting, except:
		<ul> <li>All POST Hotkeys are suppressed (prompts are not dis yed and keys are not accepted. For example, F2 for Set F10 for the Boot Menu).</li> </ul>
		Power Button Menu (see Section 3.7.4)
		BIOS updates are not available except for automatic Recovery due to flash corruption.
Configuration Mode	None	BIOS Recovery Update process if a match ng * bio file is found. Recovery Update can be cancelled by pressing the Esc key.
		If the Recovery Update was cancelle 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):
		[1] Suppress this menu u il the BIOS Security Jumper is replaced.
		[2] Clear BIOS User nd Supervisor Passwords.
		[3] Reset I el A to default factory settings.
		[4] Clear Trusted Platform Module.
		For fo m tion on the Power Button Menu, see Section 3.7.4.

Table 22. BIOS Security Jumper Settings

## 2.4 Mechanical Considerations

#### 2.4.1 Form Factor

The board is designed to fit into a custom chassis. Figure 17 illustrates the mechanical form factor for the board. Dimensions are given in inches [millimeters]. The outer dimensions are 4.0 inches by 4.0 inches [101.60 millimeters by 101.60 millimeters].



Figure 17. Board Dimensions

Figure 18 shows the height dimensions of the board.





## 2.5 Electrical Considerations

#### 2.5.1 Power Supply Considerations

## 

The external 12-19 V DC jack is the primary power nput connector of Intel NUC Board D54250WYB and Intel NUC Board D34010WYB However, the board also provides an internal 1 x 2 power connector that can be used in custom-developed systems that have an internal power supply. The inter al 1 x 2 power connector is a Molex 5566-2 header which accepts a Molex 5557-02R onnector from the power supply.

There is no isolation circuitry between the external 12-19 V DC jack and the internal 1 x 2 power connector. It is the system integrator's responsibility to ensure no more than one power supply uni is r can be attached to the board at any time and to ensure the external 12-19 V DC jack is covered if the internal 1 x 2 power connector is to be used. Simultaneous connection of both external and internal power supply units could result in poten ial damage to the board, power supplies, or other hardware.

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

- The back panel input range is 12-19 V DC
- The internal power connector input range is 12-24 V DC

#### **Fan Header Current Capability** 2.5.2

Table 23 lists the current capability of the fan headers.

#### Table 23. Fan Header Current Capability

Fan Header	Maximum Available Current
Processor fan	.25 A

#### **Thermal Considerations** 2.6

## 

A chassis with a maximum internal ambient temperature of 50 °C a the processor fan inlet is recommended. If the internal ambient temperature exceeds 50 °C, further thermal testing is required to ensure components do not exceed their maximum case temperature.

## **I** CAUTION

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

All responsibility for determining the adequa y of ny thermal or system design remains solely with the system integrator. Intel makes no warranties or representations that merely following the ins ructions presented in this document will result in a system with adequate thermal erformance.

### 

Ensure that the ambient tempera ure does not exceed the board's maximum operating temperature. Failure to do o could cause components to exceed their maximum case temperature and malfunc ion. For information about the maximum operating temperature, see t e envi onmental specifications in Section 2.8.

## 

Ensure that p oper airflow is maintained in the processor voltage regulator circuit. *Failure o do so may result in shorter than expected product lifetime.* 



Figure 19 shows the locations of the localized high temperature zones.

Figure 19 Localized High Temperature Zones

Table 24 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 24.	Thermal	<b>Considerations</b>	for Com	ponents
-----------	---------	-----------------------	---------	---------

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 temper tu e listed in Table 25. This is a requirement for sustained power dissipation equ I to Thermal Design Power (TDP is specified as the maximum sustainable power t be dissipated by the components). When the component is dissipating less than TDP the case temperature should be below the Maximum Case Temperatu e e surface temperature at the geometric center of the component co esp nds to Case Temperature.

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

Table 25.	Tcontrol	Values	for	Com	pon	ents
-----------	----------	--------	-----	-----	-----	------

Component	Tcontrol
Processor	or rocessor case temperature, see processor datasheets and p ocessor specification updates

For information abou	Refer to	
Processor datasheets a d sp fication upd	lates 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 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 Intel NUC Board D54250WYB and Intel NUC Board D34010WYB is 66,640 hours.

## 2.8 Environmental

Table 26 lists the environmental specifications for the board.

Parameter	Specification			
Temperature			0	
Non-Operating	-40 C to +60 C			
Operating	0 C to +50 C			
	The operating temperature air temperature from the ju attachment screw, in a clos	of the boa d may be uncti n o the heatsin sed c ass s, while the	determined by measuring the k fins and fan, next to the system is in operation.	
Shock				
Unpackaged	50 g trapezoidal wav f rm			
	Velocity change of 70 inch	nes/s²		
Packaged	Half sine 2 mil sec nd			
	Product W ght pounds)	Free Fall (inches)	Velocity Change (inches/s <sup>2</sup> )	
	<20	36	167	
	21-40	30	152	
	1-8	24	136	
	81 100	18	118	
Vibration		·		
Unpackag d	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)		
Package	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			

 Table 26. Environmental Specifications

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.

## 3.1 Introduction

The board uses a 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 BIOS displays a message during POST identifying the type of BIOS nd revision code. The initial production BIOSs are identified as WYLPT10H.86A.

When the BIOS Setup configuration jumper is set to configure mode d the computer is powered-up, the BIOS compares the CPU version and the microcode version in the BIOS and reports if the two match.

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

# 

The maintenance menu is displayed o 1 when the board is in configure mode. Section 2.3 on page 49 shows how put the board in configure 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 i s components. Using SMBIOS, a system administrator can obtain the syst m types, capabilities, operational status, and installation dates for system compo ents. The MIF database defines the data and provides the method for accessing this information. The BIOS enables applications such as third-party management sof war 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 ize and processor speed
- Dynamic data, such as event detection and err r logging

Non-Plug and Play operating systems requir an dditional interface for obtaining the SMBIOS information. The BIOS supports n SMBIOS table interface for such operating systems. Using this support, an SMBIOS service-level application running on a non-Plug and Play operating system c n 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 ye 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 egacy 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<sup>®</sup> 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 ar available on the Intel World Wide Web site:

- Intel<sup>®</sup> Express BIOS Update utility, which enables automated updating while in the Windows environment. Using this utility, the BIOS can be pdated 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<sup>®</sup> Flash Memory Update Utility, which requires boo ing from DOS. Using this utility, the BIOS can be updated from a file on a har disk, a USB drive (a flash drive or a USB hard drive), or a CD-ROM.
- Intel<sup>®</sup> F7 switch during POST allows a user o se ect where the BIOS .bio file is located and perform the update from th t loc tion/device. Similar to performing a BIOS Recovery without removing the B OS onfiguration jumper.

Both 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	Refer to
BIOS update utilities	http://support.intel.com/support/motherboards/desktop/sb
	<u>/CS-034499.htm</u>

#### 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<sup>®</sup> 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.

#### 

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

For information about	Refer to	
Intel Integrator Toolkit	http://developer.intel.com/design/mothe bd/s ftware/itk	
Additional Intel <sup>®</sup> software tools	http://developer.intel.com/design/motherbd/software.htm	

## **3.6 BIOS Recovery**

It is unlikely that anything will interrupt a BIOS update; h wever, if an interruption occurs, the BIOS could be damaged. Table 27 lists th dri es and media types that can and cannot be used for BIOS recovery. The BIOS recovery media does not need to be made bootable.

#### Table 27. 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 US )	Yes
USB flash drive	Yes
USB diskette drive (with a 1.4 MB iske e)	No (BIOS update file is bigger than 1.4 MB size limit)

#### 

Supported file sy tems for BIOS recovery:

- NTFS (spa e, compressed, or encrypted files are not supported)
- FAT32
- FAT 6
- FAT12
- ISO 9660

For information about	Refer to
BIOS recovery	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 t e onboard LAN or a network add-in card with a remote boot ROM installed.

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

#### 3.7.2 Booting Without Attached Devices

For use in embedded applications, the BIOS has been de gned 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  $\langle F10 \rangle$  key during POST causes a boot device menu to be displayed. This menu displays the list of available boot devices. Table 28 lists the boot device menu options.

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

Table 28. Boot Devic Menu Options

#### 3.7.4 Power Button Menu

As an alternative to Back-to-BIOS Mode or normal POST Hotkeys, the user can use the power button to access a 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, then stop to signal the user to release the power button
- 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
- [F9] Remote Assistance
- [F10] Enter Boot Menu
- [F12] Network Boot

[F2] Enter Setup is displayed instead if Visual BIOS is not supported.

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

[F9] Remote Assistance is only displayed if Remote Assistance is supported.

If an unrecognized ey is hit, then the BIOS will beep and wait for another keystroke. If one of the listed ho keys 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 19 characters in length.

The User hard disk drive password, when installed, will be required upon each poercycle 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 29 shows the effects of setting the Hard Disk Drive ass ords.

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

Table 29. Master Key and User Hard Drive Passw rd Functions

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 dr ve password is not correctly entered, the system will go back to the above prompt T e user will have three attempts to correctly enter the hard disk drive password. Aft the third unsuccessful hard disk drive password attempt, the system will hal with the message:

```
Hard Disk Drive Password Entry Error
```

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

#### NOTE

As implemented on Intel NUC Board D54250WYB and Intel NUC Board D34010WYB, Hard Disk Drive Password Security is only supported on either SATA port 0 (mSATA) or SATA Port 1 (onboard SATA connector). 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 pa sword prompt of the BIOS Setup program allows the user restricted access to Setup.
- If both the supervisor and user passwords are set, users can ente eith r the supervisor password or the user password to access Setup. Use s h ve access to Setup respective to which password is entered.
- Setting the user password restricts who can boot the compu er. 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 o boot the computer.
- For enhanced security, use different passwo ds for the supervisor and user passwords.
- Valid password characters are A-Z, a-z, and 0-9. Passwords may be up to 16 characters in length.
- To clear a set password, enter a blank password after entering the existing password.

Table 30 shows the effects of setting the supervisor password and user password. This table is for reference only and i - n t displayed on the screen.

Password Set	Supervis r Mode	User Mode	Setup Options	Password to Enter Setup	Password During Boot
Neither	Can hange all o ions <sup>(Note)</sup>	Can change all options <sup>(Note)</sup>	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 Clear User Password	User	User
Supervisor and user set	Can change all options	Can change a limited number of options	Supervisor Password Enter Password	Supervisor or user	Supervisor or user

Table 30. Supervisor and U er Password Functions

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

#### **Front-panel Power LED Blink Codes** 4.1

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 31)

Туре	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.	0
Video error <sup>(Note)</sup>	On-off (1.0 second each) two times, then 2.5-second pause (off), entire pattern repe (blink and pause) until the system is powered off.	W n no VGA option ROM is f und.
Memory error	On-off (1.0 second each) three t mes the 2.5-second pause (off), entire p t n repeats (blinks and pause) until the sys em s powered off.	
Thermal trip warning	Each beep will be accomp nied by the following blink pattern: .25 seco ds o , .25 seconds off, .25 seconds on, .25 seco ds off. This will result in a total of 16 b ks.	

Table 31. Front-panel Power LED Blink Codes

Note: Disabled per default BIOS setup opt n.

#### **BIOS Error Messages** 4.2

Table 32 lists the er or essages and provides a brief description of each.

Table 32. BIOS Error Messages		
Error Message	Explanation	
CMOS B ttery Low	The battery may be losing power. Replace the battery soon.	
CMOS Che sum Bad	The CMOS checksum is incorrect. CMOS memory may have been corrupted. Run Setup to reset values.	
Mem ry Size Decreased	Memory size has decreased since the last boot. If no memory was removed, then memory may be bad.	

System did not find a device to boot.

No Boot Device Available

# 5 Regulatory Compliance and Battery Disposal Information

## 5.1 Regulatory Compliance

This section contains the following regulatory compliance information for Intel NUC Board D54250WYB and Intel NUC Board D34010WYB:

- 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 D54250WYB and Intel NUC Board D34010WYB comply with the safety standards stated in Table 33 when correctly insta ed in a compatible host system.

Standard	Title
CSA/UL 60950-1	Information Technology Equipment – Safety - Part 1: General Requients (USA and Canada)
EN 60950-1	In or ation Technology Equipment – Safety - Part 1: General Re uirements (European Union)
IEC 60950-1	I formation Technology Equipment – Safety - Part 1: General Requirements (International)

#### Table 33. Safety Standards

#### 5.1.2 European Union Declaration of Conformity Statement

We, Intel Corporation, declare under our sole responsibility that the products Intel<sup>®</sup> NUC Board D54250WYB and Intel<sup>®</sup> NUC Board D34010WYB are 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 2011/65/EU (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.

# Œ

This product follows the provisions of the European Directives 2004 108/EC, 2006/95/EC, and 2011/65/EU.

**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 eu pæ ke 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 direktiivide 20 4/108/EC, ja 2006/95/EC ja 2002/95/EC kehtestatud nõuetele.

**Suomi** Tämä tuote noudattaa EU-direktii n 2 04/108/EC, 2006/95/EC & 2002/95/EC määräyksiä.

*Français* Ce produit est conforme aux ex gences de la Directive Européenne 2004/108/EC, 2006/95/EC & 2002 5/EC.

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

**Ελληνικά** Το παρόν προϊόν α ολουθεί τις διατάξεις των Ευρωπαϊκών Οδηγιών 2004/108/EC, 2006/95/EC κα 2002/95/EC.

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

*Icelandic* Þessi vara stenst 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 Européia 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 EMC Regulations

Intel NUC Board D54250WYB and Intel NUC Board D34010WYB comply with the EMC regulations stated in Table 34 when correctly installed in a compatible host system.

Regulation	Title	
FCC 47 CFR Part 15, Subpart B	Title 47 of the Code of Fede I Re ula ons, Part 15, Subpart B, Radio Frequency Devices. (USA)	
ICES-003	Interference-Causing Equipent Standard, Digital Apparatus. (Canada)	
EN55022	Limits and methods me urement of Radio Interference Characteristics of Information Technol gy Equipment. (European Union)	
EN55024	Information Tec nolo y Equipment – Immunity Characteristics Limits and methods of eas ement. (European Union)	
EN55022	Australia Communications Authority, Standard for Electromagnetic Compa bility (Australia and New Zealand)	
CISPR 22	Limits and methods of measurement of Radio Disturbance Characteristics of Info mation Technology Equipment. (International)	
CISPR 24	In ormation Technology Equipment – Immunity Characteristics – Limits nd 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)	

 Table 34.
 EMC Regulations

#### FC 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

# Intel NUC Board D54250WYB and Intel NUC Board D34010WYB Technical Product Specification

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 a proved 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 Clas B imits for radio noise emissions from digital apparatus set out in the Radio Interfer nce Regulations of the Canadian Department of Communications.

Le présent appareil numerique német pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Réglement sur le broullage radioél ctrique édicté par le ministére des Communications du Canada.

70

#### 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 주 로 가정에서 사용하는 것을 목적으로 하며, 모 든 지역에서 사용할 수 있습니다.

#### 5.1.4 e-Standby and ErP Compliance

Intel NUC Board D54250WYB and Intel NUC Board D34010WYB meet 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)	http://www.epeat.net
Korea e-Standby Program	http://www.kemc .or.kr/new eng/pg02 /pg02100300.as
European Union Energy-related Products Directive 2009 (ErP)	http://ec.europa.eu/enterprise/policies/s ustainabl siness/sustainable- product policy/ecodesign/index en.htm
#### 5.1.5 **Regulatory Compliance Marks (Board Level)**

Intel NUC Board D54250WYB and Intel NUC Board D34010WYB have the regulatory compliance marks shown in Table 35.

#### Description Mark UL joint US/Canada Recognized Component mark. Includes adjacent UL file number for Intel NUC: E210882. **US** 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. For CE Mark-Related Questions: Intel Corporation Attn: Corporate Quality 2200 Mission College Blvd. Santa Clara, CA 95054-1549 USA Australian Communications Authority (ACA) and New Zea and Radio Spectrum Management (NZ RSM) C-tick mark. Inclu s adj cent Intel supplier code number, N-232. Japan VCCI (Voluntary Control Council for Int rf re ce) mark. Korea Certification mark. Includes a adja ent MSIP (Ministry of Science, ICT & Future Planning) certificati number: MSIP-REM-CPU-D54250WYB an MS P-REM-CPU -D34010WYB. Taiwan BSMI (Bureau of S anda ds, Metrology and Inspections) mark. Includes adjacent Intel om y number, D33025. Printed wiring board manufacturer's recognition mark. Consists of a unique UL recognized ma facturer's logo, along with a flammability rating (solder side). China R HS/Environmentally Friendly Use Period Logo: This is an example of the symb 1 sed on Intel NUC and associated collateral. The color of the m rk may vary depending upon the application. The Environmental Friendly Usa e Period (EFUP) for Intel NUC has been determined to be 10 years.

#### Table 35. Regulatory Compliance Marks

#### **Battery Disposal Information** 5.2

### 🗥 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 r but des piles usagées doit respecter les réglementations locales en vigueur en matière de protection de l'environnement.



#### FORHOLDSREGEL

Eksplosionsfare, hvis batteriet erstattes med et batteri af en ork rt type. Batterier bør om muligt genbruges. Bortskaffelse af brugte batterier bø fo e a i overensstemmelse med gældende miljølovgivning.

### OBS!

Det kan oppstå eksplosjonsfare hvis batteriet s ifte ut med feil type. Brukte batterier bør kastes i henhold til gjeldende miljølovgi ning.



### 🔼 VIKTIGT!

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



### VARO

Räjähdysvaara, jos pa st n tyyppi on väärä. Paristot on kierrätettävä, jos se on mahdollista. Käyte yt pari tot on hävitettävä paikallisten ympäristömääräysten mukaisesti.



### VORSICHT

Bei falschem Ensetzen einer neuen Batterie besteht Explosionsgefahr. Die Batterie darf nur du ch denselben oder einen entsprechenden, vom Hersteller empfohlenen Batterietyp ersetzt werden. Entsorgen Sie verbrauchte Batterien den Anweisungen des Her tellers 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.

## \rm 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.* 

### 

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

### 1 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 еправільнага тыпу. Акумулятары павінны, па магчымасці, перепрацоўв цца. Пазбаўляцца ад старых акумулятараў патрэбна згодна з мясцовым закан даўствам па экалогіі.

## 🚹 upozornìní

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

### <u> Π</u>ροσοχή

Υπάρχει κίνδυνος για έ ρηξη σε περίπτωση που η μπαταρία αντικατασταθεί από μία λανθασμένου τύπου Οι μ αταρίες θα πρέπει να ανακυκλώνονται όταν κάτι τέτοιο είναι δυνατό. Η απόρριψη ων χρησιμοποιημένων μπαταριών πρέπει να γίνεται σύμφωνα με τους κατά τόπο π ριβαλλοντικούς κανονισμούς.

### 🔨 VIGYÁZAT

Ha a te epet nem a megfelelő típusú telepre cseréli, az felrobbanhat. A telepeket lehetőség szerint újra kell hasznosítani. A használt telepeket a helyi környezetvédelmi előí ásoknak megfelelően kell kiselejtezni.

### 1

異なる機難の微絶を使用すると、繊発の危険があります。 リサイクル が可能な地域であれば、微絶をリサイクルしてください。使用後の微 池を確実する際には、地域の環境撤耕に従ってください。

# AWAS

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



#### 

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

### PRECAUȚIE

Risc de explozie, dacă bateria este înlocuită cu un tip de baterie nec respunzător. Bateriile trebuie reciclate, dacă este posibil. Depozitarea bateriilor u ate trebuie să respecte reglementările locale privind protecția mediului.

#### ВНИМАНИЕ

При использовании батареи несоответствующего типа с ществует риск ее взрыва. Батареи должны быть утилизированы по возможности Утилизация батарей должна проводится по правилам, соответствующим мес ным требованиям.



### 

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

# 🔔 pozor

Zamenjava baterije z bate ij drugačnega tipa lahko povzroči eksplozijo. Če je mogoče, baterije e iklirajte. Rabljene baterije zavrzite v skladu z lokalnimi okoljevarstvenimi predpisi

### 🔼 ดำเดือน

ระวังการระเบิดที่เกิดจากเปลี่ยนแบตเตอรี่ผิดประเภท หากเป็นไปได้ ควรนำแบดเตอรี่ไปรีไซเคิด การ ทิ้งแบตเดอรี่ใช้แล้วด้องเป็นไปตามกฎข้อบังคับด้านสิ่งแวดล้อมของท้องถิ่น.

# UYARI

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

### ΟCTOPOΓΑ

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 kiseleitezni.



#### UZMANĪBU

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

#### DÉMESIO

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

#### ATTENZJONI

Riskiu ta' splužioni jekk il-batterija tinbidel b'tip ta' batterija mhux korrett. Il-batteriji għandhom jiģu rićiklati 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.