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Intel® NUC
Board D53427RKE
Technical Product Specification

Revision History

Revision	Revision History	Date
001	First release of the Intel® NUC Board D53427RKE Technical Product Specification	May 2013

Disclaimer

This product specification applies to only the standard Intel® NUC Board with BIOS identifier RKPPT10H.86A.

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Board Identification Information

Basic Intel® NUC Board D53427RKE Identification Information

AA Revision	BIOS Revision	Notes
G87790-400	RKPPT10H.86A.0017	1,2

Notes:

1. The AA number is found on a small label on the component side of the board.

2. The Intel® QS77 PCH and Intel® Core™ i5-3427U processor used on this AA revision consists of the following components:

Device	Stepping	S-Spec Numbers
Intel Core i5-3427U	L1	SR0N7
Intel BD82QS77	C1	5A002U

Errata

Current characterized errata, if any, are documented in a separate Specification Update. See www.intel.com/nextunitofcomputing for the latest documentation.

Preface

This Technical Product Specification (TPS) specifies the board layout, components, connectors, power and environmental requirements, and the BIOS for Intel® NUC Board D53427RKE.

Intended Audience

The TPS is intended to provide detailed, technical information about Intel NUC Board D53427RKE and its components to the vendors, system integrators, and other engineers and technicians who need this level of information. It is specifically *not* intended for general audiences.

What This Document Contains

Chapter	Description
1	A description of the hardware used on Intel NUC Board D53427RKE
2	A map of the resources of the Intel NUC Board
3	The features supported by the BIOS Setup program
4	A description of the BIOS error messages, beep codes, and POST codes
5	Regulatory compliance and battery disposal information

Typographical Conventions

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

Notes, Cautions, and Warnings

NOTE

Notes call attention to important information.

CAUTION

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

Other Common Notation

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

Contents

Figures

Tables

1 Product Description

1.1 Overview

1.1.1 Feature Summary

Table 1 summarizes the major features of the board.

Table 1. Feature Summary

Form Factor	4.0 inches by 4.0 inches (101.60 millimeters by 101.60 millimeters)
Processor	• Soldered-down Intel® Core™ i5-3427U processor with up to 17 W TDP — Integrated graphics — Integrated memory controller
Memory	• Two 204-pin DDR3 SDRAM Small Outline Dual Inline Memory Module (SO-DIMM) sockets • Support for DDR3 1600 MHz and DDR3 1333 MHz SO-DIMMs • Support for 1 Gb, 2 Gb, and 4 Gb memory technology • Support for up to 16 GB of system memory with two SO-DIMMs using 4 Gb memory technology • Support for non-ECC memory • Support for 1.35 V low voltage JEDEC memory
Chipset	Intel® QS77 Express Chipset consisting of the Intel® QS77 Express Platform Controller Hub (PCH)
Graphics	• Integrated graphics support for processors with Intel® Graphics Technology: — One High Definition Multimedia Interface* (HDMI*) back panel connector — Two mini DisplayPort* back panel connectors
Audio	Intel® High Definition Audio via the HDMI v1.4a and DisplayPort 1.1a interfaces through the PCH
Peripheral Interfaces	• USB 2.0 ports: — Two front panel ports are implemented through one dual-port internal header — Two ports are implemented with vertical back panel connectors — One port is reserved for the PCI Express* Half-Mini Card — One port is reserved for the PCI Express Full-Mini Card • One front panel USB 3.0 port is implemented through an external connector (blue)
Expansion Capabilities	• One PCI Express Half-Mini Card connector • One PCI Express Full-Mini Card connector
Intel® Visual BIOS	• Intel® Visual BIOS resident in the Serial Peripheral Interface (SPI) Flash device • Support for Advanced Configuration and Power Interface (ACPI), Plug and Play, and System Management BIOS (SMBIOS)

Table 1. Feature Summary (continued)

LAN Support	Gigabit (10/100/1000 Mb/s) LAN subsystem using the Intel® 82579LM Gigabit Ethernet Controller
Hardware Monitor Subsystem	Hardware monitoring subsystem, based on a Nuvoton NCT5577D embedded 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 • Simple fan speed control
Intel® Security and Manageability Technologies	• Intel® Active Management Technology (Intel® AMT) 8.0 • Intel® Virtualization (Intel® VT) • Intel® Virtualization for Directed I/O (Intel® VT-d) • Intel® Trusted Execution Technology (Intel® TXT) • Intel® Identity Protection Technology (Intel® IPT) • Intel® Anti-Theft Technology (Intel® AT) • Trusted Platform Module (TPM) • Intel® Small Business Technology (Intel® SBT)

1.1.2 Board Layout (Top)

Figure 1 shows the location of the major components on the top-side of Intel NUC Board D53427RKE.
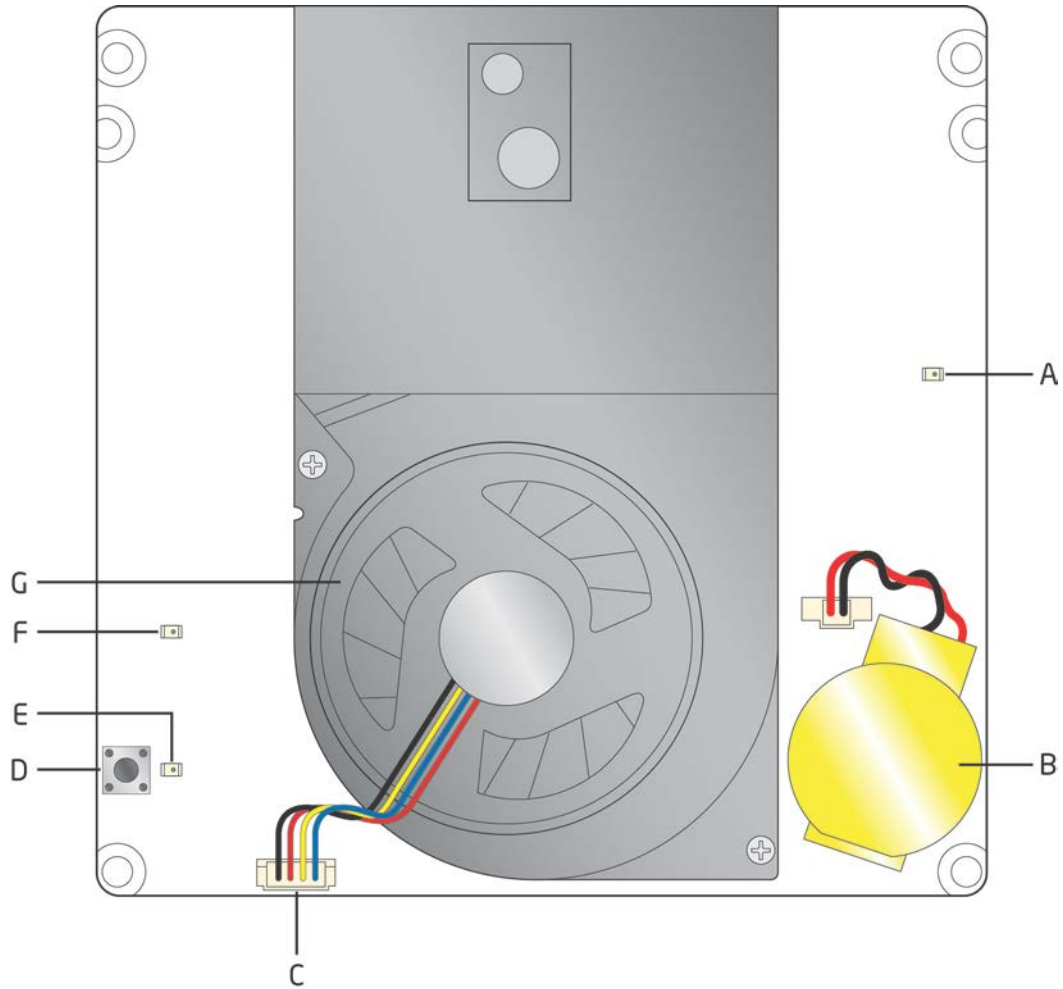
OM23996

Figure 1. Major Board Components (Top)

Table 2 lists the components identified in Figure 1.

Table 2. Components Shown in Figure 1

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

1.1.3   Board Layout (Bottom)

Figure 2 shows the location of the major components on the bottom-side of Intel NUC Board D53427RKE.
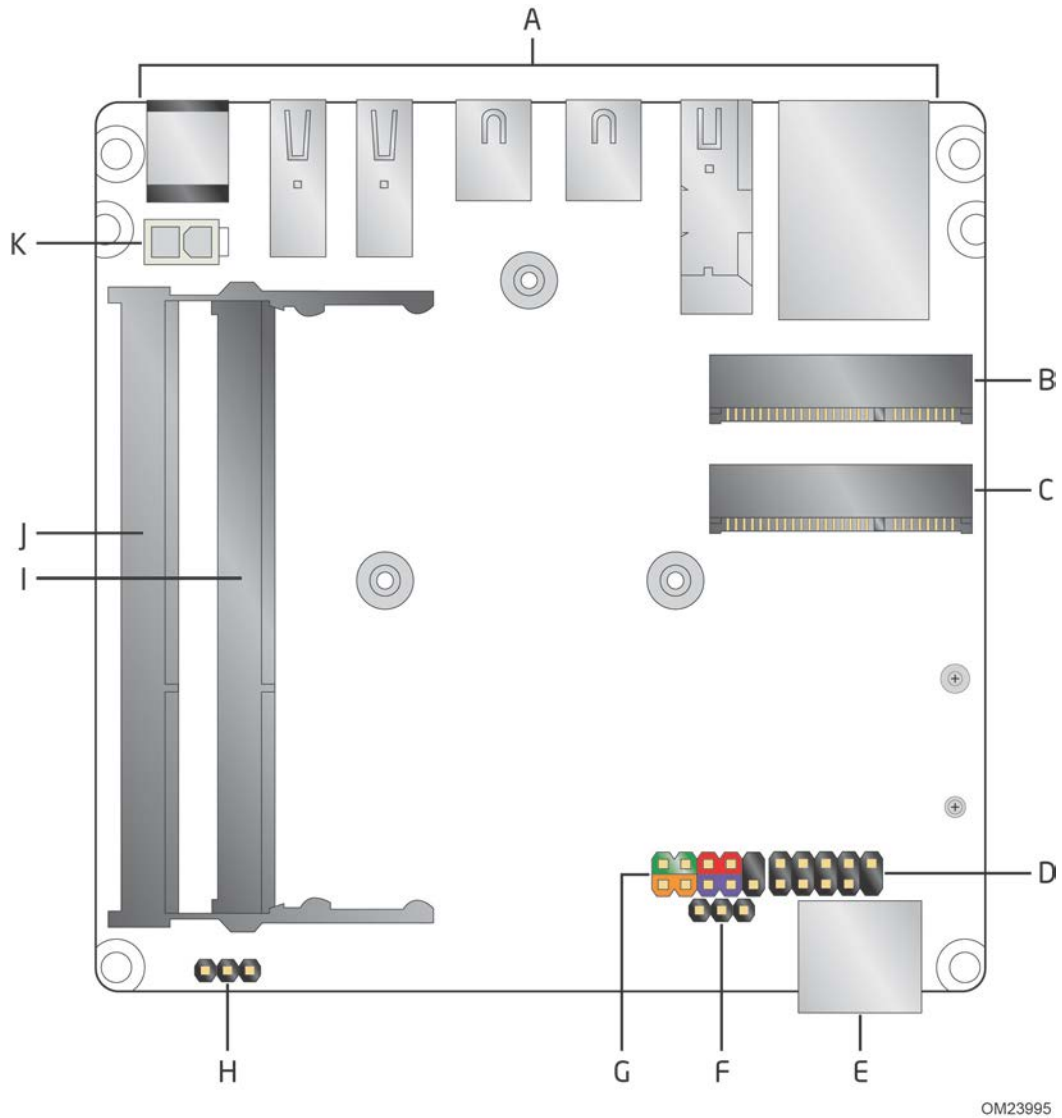
Figure 2. Major Board Components (Bottom)

Table 3. Components Shown in Figure 2

Item from Figure 2	Description
A	Back panel connectors
B	PCI Express Full-Mini Card connector
C	PCI Express Half-Mini Card connector
D	Front panel dual-port USB 2.0 header
E	Front panel USB 3.0 port
F	BIOS setup configuration jumper
G	Front panel header
H	Intel® Management Engine BIOS Extension (Intel® MEBX) Reset header
I	DDR3 SO-DIMM 2 socket
J	DDR3 SO-DIMM 1 socket
K	Internal DC power connector

1.1.4   Block Diagram

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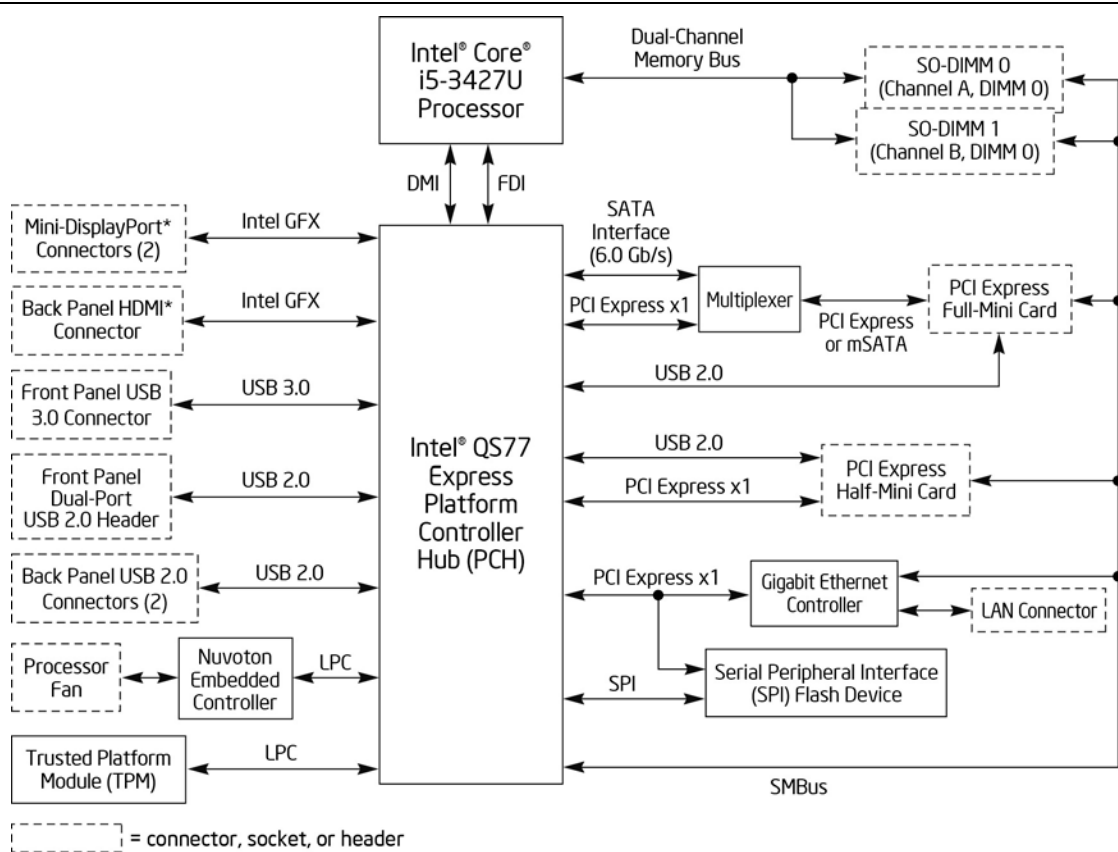
Figure 3. Block Diagram

1.2   Online Support

To find information about...	Visit this World Wide Web site:
Intel NUC Board D53427RKE	http://www.intel.com/products/motherboard/index.htm
NUC Board Support	http://www.intel.com/p/en_US/support?iid=hdr+support
Available configurations for Intel NUC Board D53427RKE	http://ark.intel.com
Chipset information	https://www-ssl.intel.com/content/www/us/en/chipsets/performance-chipsets/chipsets.html
BIOS and driver updates	http://downloadcenter.intel.com
Tested memory	http://www.intel.com/support/motherboards/desktop/sb/CS-025414.htm
Integration information	http://www.intel.com/support/go/buildit

1.3   Processor

The board has a soldered-down Intel Core i5-3427 processor with Integrated Graphics Technology and integrated memory controller.

NOTE

This board has specific requirements for providing power to the processor. Refer to Section 2.5.1 on page 56 for information on power supply requirements for this board.

1.4   System Memory

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

- 1.5 V DDR3 SDRAM SO-DIMMs with gold plated contacts
- Support for 1.35 V Low Voltage DDR3 (new JEDEC specification)
- 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). Refer to Section 2.1.1 on page 41 for information on the total amount of addressable memory.
- Minimum recommended total system memory: 1024 MB
- Non-ECC SO-DIMMs
- Serial Presence Detect
- DDR3 1600 MHz and DDR3 1333 MHz SDRAM SO-DIMMs

NOTE

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

Table 4 lists the supported SO-DIMM configurations.

Table 4. Supported Memory Configurations

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

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

For information about...	Refer to:
Tested Memory	http://support.intel.com/support/motherboards/desktop/sb/CS-025414.htm

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 channel bandwidth operation for real world applications. This mode is used when only a single SO-DIMM is installed or the memory capacities are unequal. Technology 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 used.

For information about…	Refer to:
Memory Configuration Examples	http://www.intel.com/support/motherboards/desktop/sb/cs-011965.htm

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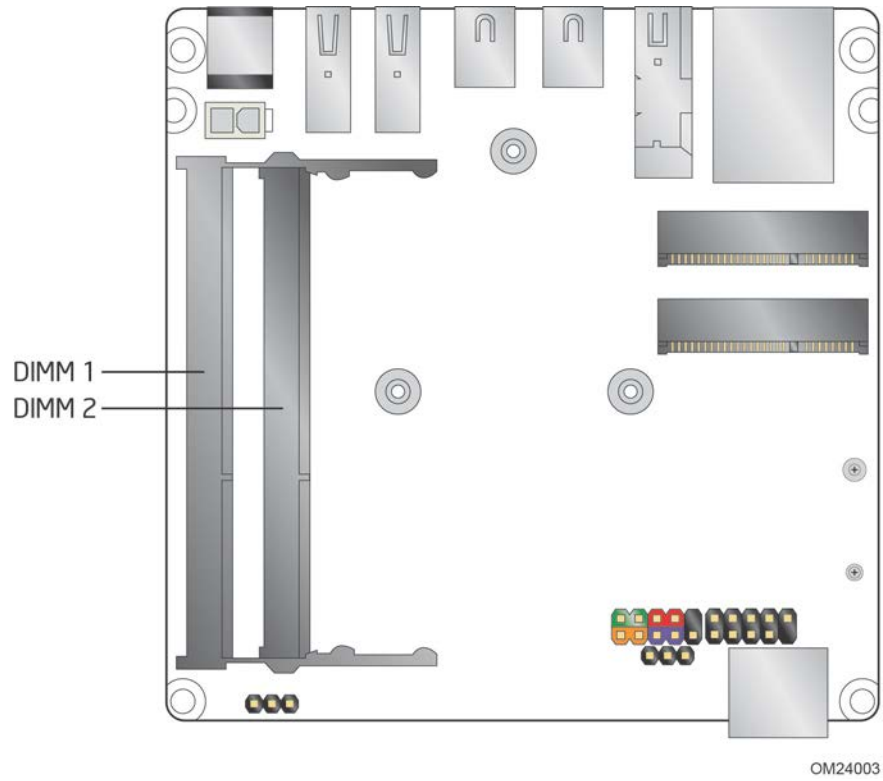
Figure 4. Memory Channel and SO-DIMM Configuration

1.5   Intel® QS77 Express Chipset

Intel QS77 Express Chipset with Direct Media Interface (DMI) interconnect provides interfaces to the processor and the USB, SATA, LPC, LAN, and PCI Express interfaces. The Intel QS77 Express Chipset is a centralized controller for the board's I/O paths.

For information about	Refer to
The Intel QS77 chipset	http://www.intel.com/products/desktop/chipsets/index.htm
Resources used by the chipset	Chapter 2

1.5.1   Direct Media Interface (DMI)

Direct Media Interface (DMI) is the chip-to-chip connection between the processor and PCH. This high-speed interface integrates advanced priority-based servicing allowing for concurrent traffic and true isochronous transfer capabilities.

1.5.2   Display Interfaces

Display is divided between the processor and the PCH. The processor houses the memory interface, display planes, and pipes while the PCH has transcoder and display interface or ports. The PCH receives the display data over Intel® Flexible Display Interface (Intel® FDI) and transcodes the data as per the display technology protocol and sends the data through the display interface.

1.5.2.1   Intel® Flexible Display Interconnect (Intel® FDI)

Intel FDI connects the display engine in the processor with the display interfaces on the PCH. The display data from the frame buffer is processed in the display engine of the processor and sent to the PCH over the Intel FDI where it is transcoded as per the display protocol and driven to the display monitor.

1.5.2.2   High-bandwidth Digital Content Protection (HDCP)

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

1.6   Graphics Subsystem

The board supports graphics through Intel Graphics Technology.

1.6.1   Integrated Graphics

The board supports integrated graphics through Intel FDI.

1.6.1.1   Intel® High Definition (Intel® HD) Graphics

The Intel HD graphics controller features the following:

- 3D Features
    — DirectX* 10.1 and OpenGL* 3.0 compliant
    — DirectX 11.0 CS4.0 only
    — Shader Model 4.0
- Video
    — High-Definition content at up to 1080p resolution
    — Hardware accelerated MPEG-2, VC-1/WMV and H.264/AVC Hi-Definition video formats
    — Intel HD Technology with Advanced Hardware Video Transcoding
    — Blu-ray* S3D via HDMI 1.4a
    — Dynamic Video Memory Technology (DVMT) 5.0 support
    — Support of up to 1.7 GB Video Memory with 4 GB and above system memory configuration

1.6.1.2   Video Memory Allocation

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

1.6.1.3   High Definition Multimedia Interface* (HDMI*)

The HDMI port supports standard, enhanced, or high definition video, plus multi-channel digital audio on a single cable. Each port is compatible with all ATSC and DVB HDTV standards and supports eight full range channels at 24-bit/96 kHz audio of lossless audio formats such as Dolby* TrueHD or DTS* HD Master Audio. The maximum supported resolution is 1920 x 1200 (WUXGA). The HDMI port is compliant with the HDMI 1.4a specification.

1.6.1.3.1   Integrated Audio Provided by the HDMI Interface

The following audio technologies are supported by the HDMI 1.4a interface directly from the PCH:

- AC-3 - Dolby* Digital
- Dolby Digital Plus
- DTS-HD*
- Dolby TrueHD, DTS-HD Master Audio*, (Lossless Blu-ray Disc* Audio Format
- LPCM, 192 kHz/24-bit, 8 Channel

1.6.1.4   DisplayPort*

DisplayPort is a digital communication interface that utilizes differential signaling to achieve a high bandwidth bus interface designed to support connections 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 DisplayPort interface supports the 1.1a specification. There are two mini DisplayPort connectors on the back panel.

DisplayPort's maximum supported display resolution is 2560 x 1600 @ 60 Hz refresh rate with a 16:10 aspect ratio (WQXGA).

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

1.6.1.4.1   Integrated Audio Provided by the DisplayPort Interfaces

The mini DisplayPort interfaces support LPCM 96 KHz/24-bit, 2-channel audio directly through the PCH.

NOTE

The PCH only supports one audio stream at a time over DisplayPort. Dual audio signals are not supported.

1.6.1.4.2   Triple Display Configurations

For triple display configurations, at least two displays must be connected to native DisplayPort monitors. Use of DisplayPort converters will not allow triple display outputs.

Table 5. Triple Display Configuration Resolutions

Active Display	Active Display	Active Display
DisplayPort 2560 x 1600 at 60 Hz	DisplayPort 1920 x 1200 at 60 Hz	HDMI* 1080P at 60 Hz

1.6.1.5 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 1.4 for content protection over wired displays (HDMI and DisplayPort).

1.6.2 USB

The board supports USB 2.0/3.0 ports. The port arrangement is as follows:

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

All USB 2.0/3.0 ports are high-speed, full-speed, and low-speed capable.

NOTE

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

For information about	Refer to
The location of the USB connectors on the back panel	Figure 9, page 43
The location of the front panel USB headers	Figure 2, page 15

1.6.3 AHCI Mode

The board supports AHCI storage mode via the Intel QS77 Express Chipset.

NOTE

In order to use AHCI mode, AHCI must be enabled in the BIOS. Microsoft Windows 7 and Windows 8 include the necessary AHCI drivers without the need to install separate AHCI drivers during the operating system installation process, however, it is always good practice to update the AHCI drivers to the latest available by Intel.

1.7 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 ± 13 minutes/year at 25 °C with 3.3 VSB applied via the power supply 5 V STBY rail.

NOTE

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

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

1.8 LAN Subsystem

The LAN subsystem consists of the following:
- Intel 82579LM Gigabit Ethernet Controller (10/100/1000 Mb/s)
- Intel QS77 Express Chipset
- RJ-45 LAN connector with integrated status LEDs

Additional features of the LAN subsystem include:
- CSMA/CD protocol engine
- Jumbo frame support
- LAN connect interface between the PCH 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

1.8.1   Intel® 82579LM Gigabit Ethernet Controller

The Intel 82579LM Gigabit Ethernet Controller supports the following features:

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

1.8.2   LAN Subsystem Software

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

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

1.8.3   RJ-45 LAN Connector with Integrated LEDs

Two LEDs are built into the RJ-45 LAN connector (shown in Figure 5).
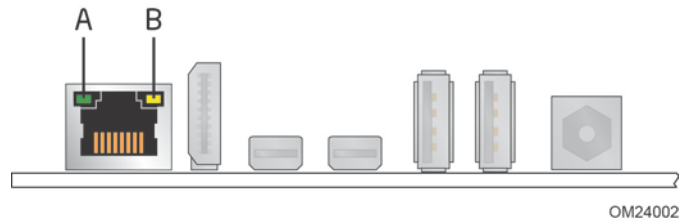
Item	Description
A	Link LED (Green)
B	Data Rate LED (Green/Yellow)

Figure 5. LAN Connector LED Locations

Table 6 describes the LED states when the board is powered up and the LAN subsystem is operating.

Table 6. LAN Connector LED States

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

1.9   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/

1.9.1   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

1.9.2   Fan Monitoring

Fan monitoring can be implemented using third-party software.

1.9.3   Thermal Solution

Figure 6 shows the location of the thermal solution and processor fan header.
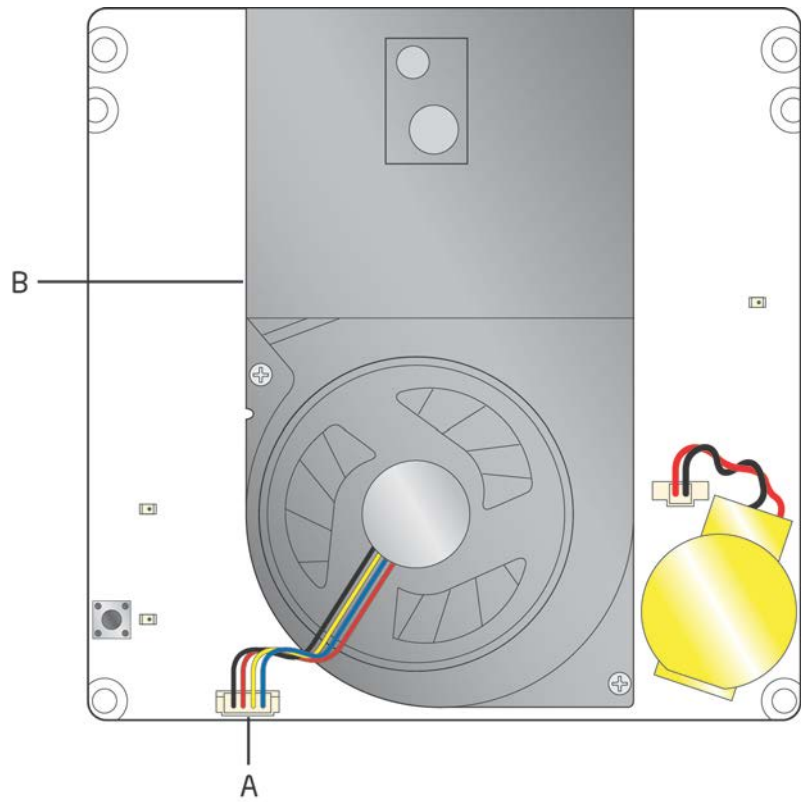
Item	Description
A	Processor fan header
B	Thermal solution

Figure 6. Thermal Solution and Fan Header

1.10 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
    — +5 V Standby Power Indicator LED

1.10.1   ACPI

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

- Plug and Play (including bus and device enumeration)
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), video displays, and 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 operating system to power-off the computer
- Support for multiple wake-up events (see Table 9 on page 33)
- Support for a front panel power and sleep mode switch

Table 7 lists the system states based on how long the power switch is pressed, depending on how ACPI is configured with an ACPI-aware operating system.

Table 7. Effects of Pressing the Power Switch

If the system is in this state...	...and the power switch is pressed for	...the system enters this state
Off (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) [Note]
On (ACPI 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)

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

1.10.1.1   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 8 lists the power states supported by the board along with the associated system power targets. See the ACPI specification for a complete description of the various system and power states.

Table 8. Power States and Targeted System Power

Global States	Sleeping States	Processor States	Device States	Targeted System Power (Note 1)
G0 – working state	S0 – working	C0 – working	D0 – working state.	Full power > 30 W
G1 – sleeping state	S3 – Suspend to RAM. Context saved to RAM.	No power	D3 – no power except for wake-up logic.	Power < 5 W (Note 2)
G1 – sleeping state	S4 – Suspend to disk. Context saved to disk.	No power	D3 – no power except 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.	No power	D3 – no power for wake-up logic, except when provided by battery or external source.	No power to the system. Service can be performed safely.

Notes:

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

2.   Dependent on the standby power consumption of wake-up devices used in the system.

1.10.1.2   Wake-up Devices and Events

Table 9 lists the devices or specific events that can wake the computer from specific states.

Table 9. Wake-up Devices and Events

Devices/events that wake up the system…	…from this sleep state	…from this global state
Power switch	S3, S4, S5 (Note 1)	G1, G2, G3
RTC alarm	S3, S4, S5 (Note 1)	G1, G2 (Note 3)
LAN	S3, S4, S5 (Notes 1 and 3)	G1, G2 (Note 3)
USB	S3	G1
WAKE#	S3, S4, S5 (Note 1)	G1, G2 (Note 3)

Notes:

1.   S4 implies operating system support only.
2.   Wake from S4 and S5 is recommended by Microsoft.
3.   Wake from device/event not supported immediately upon return from AC loss.
4.   Wake on LAN is only supported from sleep (S3) or hibernate (S4) in Windows 8.

NOTE

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

1.10.2   Hardware Support

The board provides several power management hardware features, including:

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

NOTE

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

1.10.2.1 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 49

1.10.2.2 Instantly Available PC Technology

Instantly Available PC technology enables the board to enter the ACPI S3 (Suspend-to-RAM) sleep-state. While in the S3 sleep-state, the computer will appear to be off (the power supply is off, and the front panel LED is amber if dual colored, or off if single colored.) When signaled by a wake-up device or event, the system quickly returns to its last known wake state. Table 9 on page 33 lists the devices and events that can wake the computer from the S3 state.

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

1.10.2.3 LAN Wake Capabilities

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

1.10.2.4 Wake from USB

USB bus activity wakes the computer from an ACPI S3 state.

NOTE

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

1.10.2.5 WAKE# Signal Wake-up Support

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

1.10.2.6 Wake from S5

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

1.10.2.7   +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 7 shows the location of the standby power LED.

⚠ CAUTION

If AC power has been switched off and the standby power indicator is still lit, disconnect the power cord before installing or removing any devices connected to the board. Failure to do so could damage the board and any attached devices.
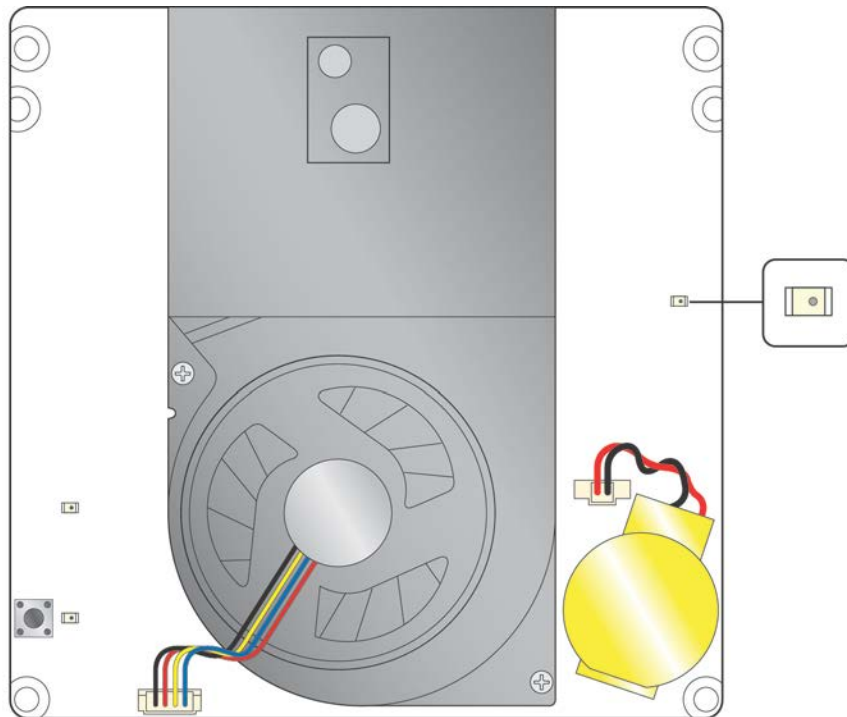
OM24007

Figure 7. Location of the Standby Power LED

1.11 Intel® Security and Manageability Technologies

Intel® Security and Manageability Technologies provides tools and resources to help small business owners and IT organizations protect and manage their assets in a business or institutional environment.

NOTE

Software with security and/or manageability capability is required to take advantage of Intel platform security and/or management technologies.

1.11.1 Intel® vPro™ Technology

Intel® vPro™ Technology is a collection of platform capabilities that support enhanced manageability, security, virtualization and power efficiency. The key platform capabilities include:

- Intel® Active Management Technology (Intel® AMT) 8.0
- Intel® Virtualization (Intel® VT)
- Intel® Virtualization for Directed I/O (Intel® VT-d)
- Intel® Trusted Execution Technology (Intel® TXT)
- Intel® Identity Protection Technology (Intel® IPT)
- Intel® Anti-Theft Technology (Intel® AT)
- Trusted Platform Module (TPM)

For information about	Refer to
Intel vPro Technology	http://support.intel.com/support/vpro/

1.11.1.1 Intel® Active Management Technology

When used with third-party management and security applications, Intel Active Management Technology (Intel AMT) allows business owners and IT organizations to better discover, heal, and protect their networked computing assets.

Some of the features of Intel AMT include:

- Out-of-band (OOB) system access, to discover assets even while PCs are powered off
- Remote trouble-shooting and recovery, which allows remote diagnosis and recovery of systems after OS failures
- Hardware-based agent presence checking that automatically detects and alerts when critical software agents have been stopped or are missing
- Proactive network defense, which uses filters to block incoming threats while isolating infected clients before they impact the network
- Remote hardware and software asset tracking, helping to track computer assets and keep virus protection up-to-date

- Keyboard, video and mouse (KVM) remote control, which allows redirection of a managed system's video to a remote console which can then interact with it using the console's own mouse and keyboard

NOTE

Intel AMT requires the computer system to have an Intel AMT-enabled chipset, network hardware and software, as well as connection with a power source, a corporate network connection, and an Intel AMT-enabled remote management console. Setup requires additional configuration of the platform.

For information about	Refer to
Intel Active Management Technology	http://www.intel.com/technology/platform-technology/intel-amt/index.htm

1.11.1.2 Intel® Virtualization Technology

Intel® Virtualization Technology (Intel® VT) is a hardware-assisted technology that, when combined with software-based virtualization solutions, provides maximum system utilization by consolidating multiple environments into a single server or client.

NOTE

A processor with Intel VT does not guarantee that virtualization will work on your system. Intel VT requires a computer system with a chipset, BIOS, enabling software and/or operating system, device drivers, and applications designed for this feature.

For information about	Refer to
Intel Virtualization Technology	http://www.intel.com/technology/virtualization/technology.htm

1.11.1.3 Intel® Virtualization Technology for Directed I/O

Intel® Virtualization Technology for Directed I/O (Intel® VT-d) allows addresses in incoming I/O device memory transactions to be remapped to different host addresses. This provides Virtual Machine Monitor (VMM) software with:

- Improved reliability and security through device isolation using hardware assisted remapping.
- Improved I/O performance and availability by direct assignment of devices.

For information about	Refer to
Intel Virtualization Technology for Directed I/O	http://www.intel.com/technology/itj/2006/v10i3/2-io/4-virtualization-techniques.htm

1.11.1.4   Intel® Trusted Execution Technology

Intel® Trusted Execution Technology (Intel® TXT) is a hardware security solution that protects systems against software-based attacks by validating the behavior of key components at startup against a known good source. It requires that Intel VT be enabled and the presence of a TPM.

For information about	Refer to
Intel Trusted Execution Technology	http://www.intel.com/content/www/us/en/architecture-and-technology/trusted-execution-technology/malware-reduction-general-technology.html

1.11.1.5   Intel® Identity Protection Technology

Intel® Identity Protection Technology (Intel® IPT) provides a simple way for websites and enterprises to validate that a user is logging in from a trusted computer. This is accomplished by using the Intel Manageability Engine embedded in the chipset to generate a six-digit number that, when coupled with a user name and password, will generate a One-Time Password (OTP) when visiting Intel IPT-enabled websites. Intel IPT eliminates the need for the additional token or key fob required previously for two-factor authentication.

For information about	Refer to
Intel Identity Protection Technology	http://ipt.intel.com

1.11.1.6   Intel Anti-Theft Technology

Intel® Anti-Theft (Intel® AT) provides local, tamper-resistant defense that works like a poison pill that disables the computer and access to its data even if the operating system (OS) is reimaged, a new hard drive is installed, or the computer is disconnected from the network.

📝 NOTE

No computer system can provide absolute security under all conditions. Intel AT requires the computer system to have an Intel® AT-enabled chipset, BIOS, firmware release, software, and an Intel AT-capable Service Provider/ISV application and service subscription. The detection (triggers), response (actions), and recovery mechanisms only work after the Intel® AT functionality has been activated and configured. Certain functionality may not be offered by some ISVs or service providers and may not be available in all countries. Intel assumes no liability for lost or stolen data and/or systems or any other damages resulting thereof.

For information about	Refer to
Intel Anti-Theft	http://antitheft.intel.com/welcome.aspx

1.11.1.7 Trusted Platform Module (TPM)

The ST Micro ST33ZP24AR28PVSP version 1.2 revision 116 component is specifically designed to enhance platform security above-and-beyond the capabilities of today's software by providing a protected space for key operations and other security critical tasks. Using both hardware and software, the TPM protects encryption and signature keys at their most vulnerable stages—operations when the keys are being used unencrypted in plain-text form. The TPM shields unencrypted keys and platform authentication information from software-based attacks.

For information about	Refer to
ST Micro TPM version 1.2	http://www.st.com/web/en/home.html

1.11.2 Intel® Small Business Technology

Intel® Small Business Technology (Intel® SBT) provides small businesses with security and productivity capabilities to help keep their PCs up-to-date, protected and running well. Intel SBT is the firmware component of Intel® Small Business Advantage (Intel® SBA) and includes this hardware functionality:

- Local Maintenance Timer – Enables applications to "wake-up" the host platform when it is powered down or in a sleep state.
- Local Software Monitor – Provides a common reporting mechanism to monitor applications running on the host operating system.

For information about	Refer to
Intel Small Business Advantage	http://www.intel.com/go/SBA

2   Technical Reference

2.1   Memory Resources

2.1.1   Addressable Memory

The board utilizes 16 GB of addressable system memory. Typically the address space that is allocated for PCI Conventional bus add-in cards, PCI Express configuration space, BIOS (SPI Flash device), and chipset overhead resides above the top of DRAM (total system memory). On a system that has 16 GB of system memory installed, it is not possible to use all of the installed memory due to system address space being allocated for other system critical functions. These functions include the following:

- BIOS/SPI Flash device (128 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 allocated for PCI Express add-in cards (256 MB)

The board provides the capability to reclaim the physical memory overlapped by the memory mapped I/O logical address space. The board remaps physical memory from the top of usable DRAM boundary to the 4 GB boundary to an equivalent sized logical address range located just above the 4 GB boundary. Figure 8 shows a schematic of the system memory map. All installed system memory can be used when there is no overlap of system addresses.

2.2 Connectors and Headers

⚠ **CAUTION**

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

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:

- Back panel I/O connectors
- On-board I/O connectors and headers (see page 44)

2.2.1   Back Panel Connectors

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

Item	Description
A	LAN connector
B	HDMI connector
C	Mini DisplayPort connector #1
D	Mini DisplayPort connector #2
E	USB 2.0 port
F	USB 2.0 port
G	19 V DC input jack
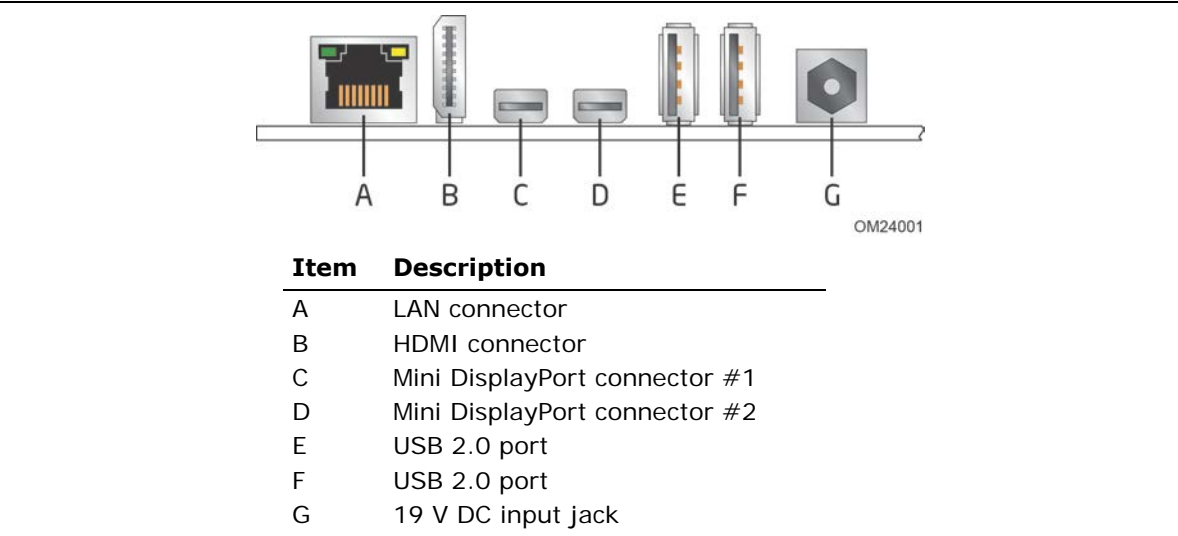
Figure 8. Back Panel Connectors

2.2.2 Connectors and Headers (Bottom)

Figure 10 shows the locations of the connectors and headers on the bottom-side of the board.
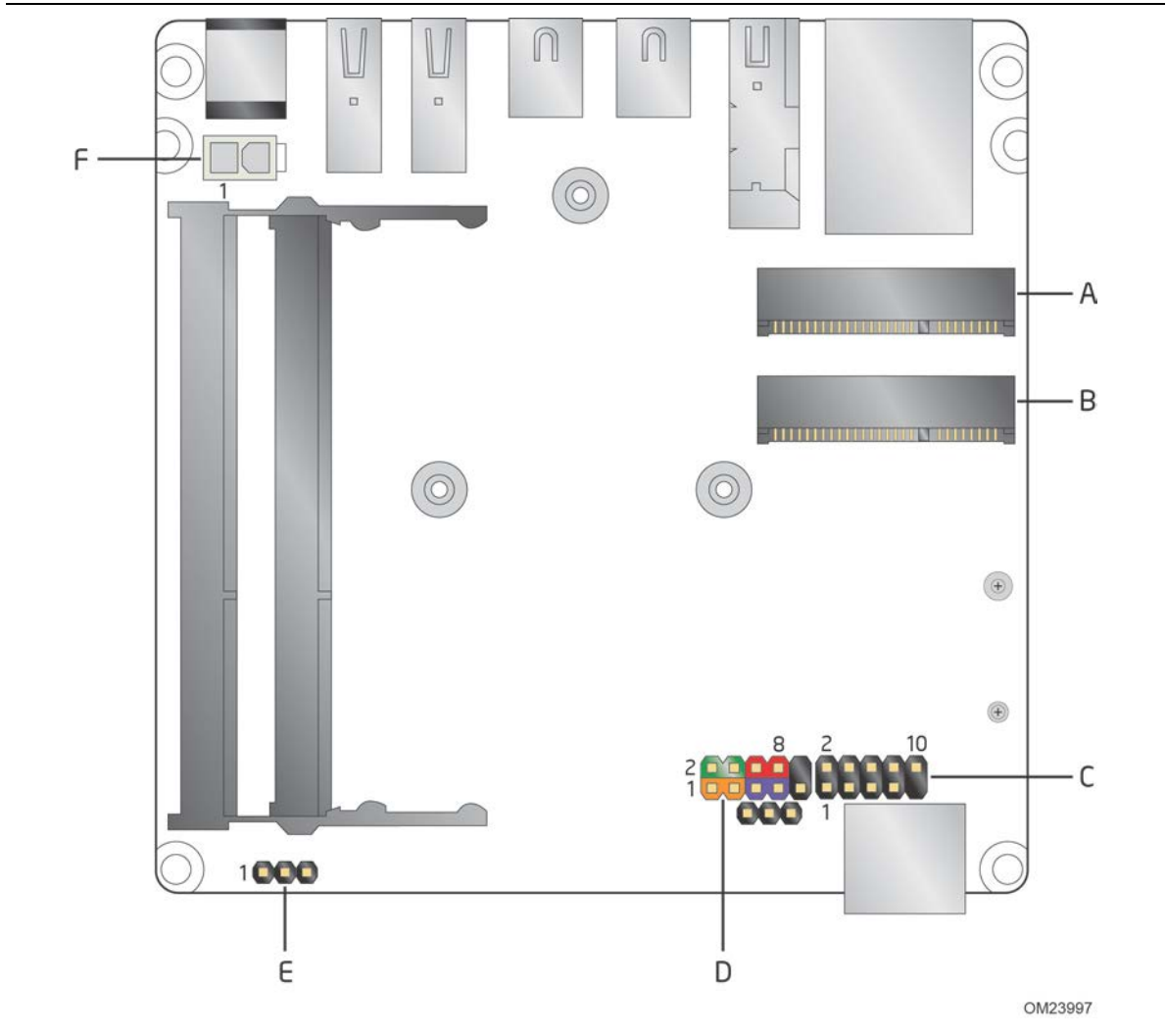
Figure 9. Connectors and Headers (Bottom)

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

Table 10. Connectors and Headers Shown in Figure 10

Item from Figure 10	Description
A	PCI Express Full-Mini Card connector
B	PCI Express Half-Mini Card connector
C	Front panel dual-port USB 2.0 header
D	Front panel header
E	Intel MEBX Reset header
F	Internal DC power connector

2.2.2.1   Signal Tables for the Connectors and Headers

Table 11. PCI Express Full-/Half-Mini Card Connector

Pin	Signal Name	Additional Signal Name
1	WAKE#	
2	+3.3 V aux	
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 V	
29	GND	
30	SMB_CLK	
31	PETn0	
32	SMB_DATA	
33	PETp0	
34	GND	
35	GND	
36	USB_D-	
37	GND	
38	USB_D+	

Table 11. PCI Express Full-/Half-Mini Card Connector (continued)

Pin	Signal Name	Additional Signal Name
39	+3.3 V aux	
40	GND	
41	+3.3 V aux	
42	LED_WWAN#	
43	GND	(mSATA) NC
44	LED_WLAN#	
45	Reserved	(Intel AMT) C-Link_CLK*
46	LED_WPAN#	
47	Reserved	(Intel AMT) C-Link_DAT*
48	+1.5V	
49	Reserved	(Intel AMT) C-Link_RST*
50	GND	
51	Reserved	(mSATA) mSATA SEL
52	+3.3 V aux	

NOTE

The mSATA signals are routed only to the PCIe full-mini card connector and not to the half-mini card connector. These signals are required to support mSATA modules.

NOTE

The Intel AMT C-Link signals are routed only to the PCIe half-mini card connector and not to the full-mini card connector. These signals are required to support Intel AMT Wake-on-LAN for wireless cards.

Table 12. Dual-Port Front Panel USB 2.0 Header

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 pin)	10	No Connect

2.2.2.2   Add-in Card Connectors

The board has the following add-in card connectors:

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

2.2.2.3   Power Supply Connectors

The board has the following power supply connectors:

- **External Power Supply** – the board can be powered through a 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 +19 (±10%) V DC and the shell is GND. The maximum current rating is 10 A.
- **Internal Power Supply** – the board can alternatively be powered via the internal 19 V DC 1 x 2 power connector, where pin 1 is GND and pin 2 is +19 (±10%) VDC. The internal 1 x 2 power connector is a Molex 5566-2 header which accepts a Molex 5557-02R connector from the power supply.

Table 13. 19 V Internal Power Supply Connector

Pin	Signal Name
1	Ground
2	+19 V (±10%)

For information about	Refer to
Power supply considerations	Section 2.5.1, page 56

2.2.2.4   Front Panel Header

This section describes the functions of the front panel header. Table 14 lists the signal names of the front panel header. Figure 11 is a connection diagram for the front panel header.

Table 14. Front Panel Header

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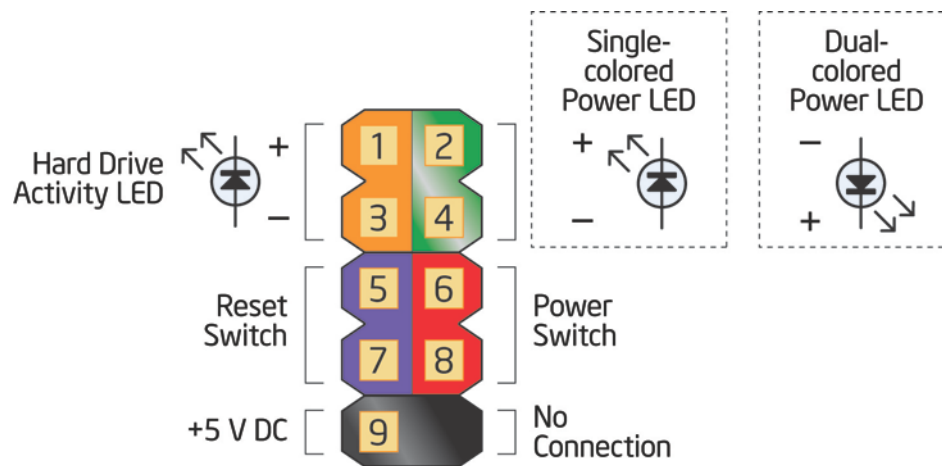
Figure 10. Connection Diagram for Front Panel Header

2.2.2.4.1 Hard Drive Activity LED Header

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

2.2.2.4.2 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.

2.2.2.4.3 Power/Sleep LED Header

Pins 2 and 4 can be connected to a one- or two-color LED. Table 15 shows the possible LED states.

Table 15. States for a One-Color Power LED

LED State	Description
Off	Power off
Blinking	Standby
Steady	Normal operation

NOTE

The LED behavior shown in Table 15 is default – other patterns may be set via BIOS setup.

2.2.2.4.4　　　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.

2.2.2.5　　Front Panel USB 2.0 Header

Figure 12 is a connection diagram for the front panel USB 2.0 header.

NOTE
- *The +5 V DC power on the USB header is fused.*
- *Use only a front panel USB connector that conforms to the USB 2.0 specification for high-speed USB devices.*
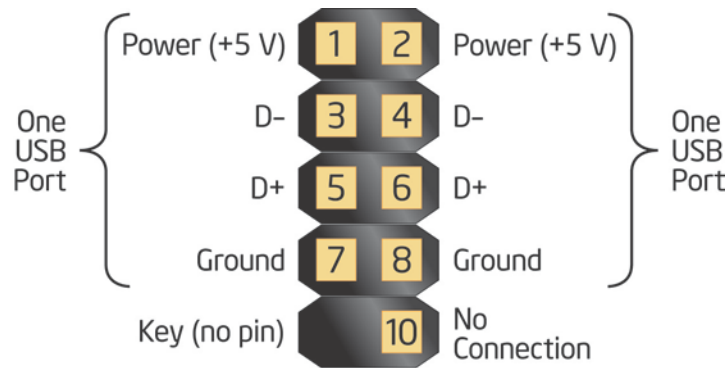
**Figure 11. Connection Diagram for Front Panel
USB 2.0 Dual-Port Header**

2.3   BIOS Setup Configuration Jumper

⚠ CAUTION

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

Figure 13 shows the location of the BIOS Setup Configuration jumper.

Table 16 describes the BIOS Setup configuration jumper settings for the three modes: normal, configure, and recovery. When the jumper is set to configure mode and the computer is powered-up, the BIOS compares the processor version and the microcode version in the BIOS and reports if the two match.

Figure 12. Location of the BIOS Configuration Setup Jumper

Table 16 lists the settings for the jumper.

Table 16. BIOS Setup Configuration Jumper Settings

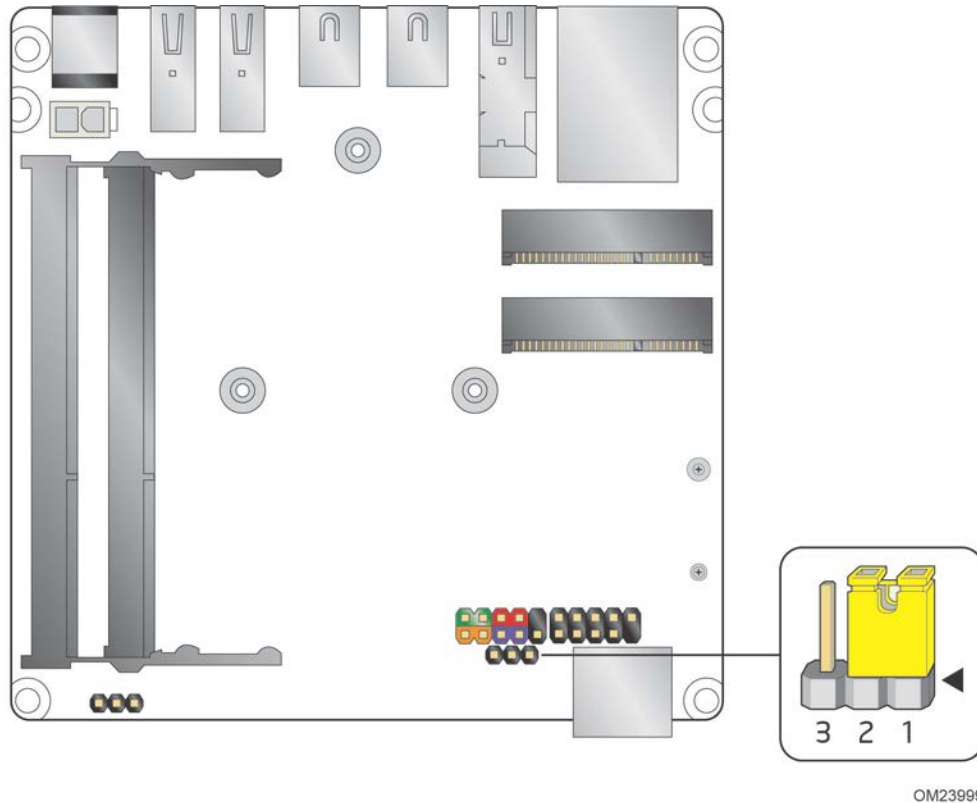| Function/Mode	Jumper Setting	Configuration
Normal	1-2	The BIOS uses current configuration information and passwords for booting.
Configure	2-3	After the POST runs, Setup runs automatically. The maintenance menu is displayed. Note that this Configure mode is the only way to clear the BIOS/CMOS settings. Press F9 (restore defaults) while in Configure mode to restore the BIOS/CMOS settings to their default values.
Recovery	None	The BIOS attempts to recover the BIOS configuration. A recovery CD or flash drive is required.

2.4   Intel® Management Engine BIOS Extension (Intel® MEBX) Reset Header

The Intel® MEBX reset header (see Figure 13) allows you to reset the Intel ME configuration to the factory defaults. Momentarily shorting pins 1 and 2 with a jumper (not supplied) will accomplish the following:

* Return all Intel ME parameters to their default values.
* Reset the Intel MEBX password to the default value (admin).

⚠ CAUTION

Always turn off the power and unplug the power cord from the computer before installing an MEBX reset jumper. The jumper must be removed before reapplying power. The system must be allowed to reach end of POST before reset is complete. Otherwise, the board could be damaged.

📝 NOTE

After using the MEBX Reset, a "CMOS battery failure" warning will occur during the next POST. This is expected and does not indicate a component failure.
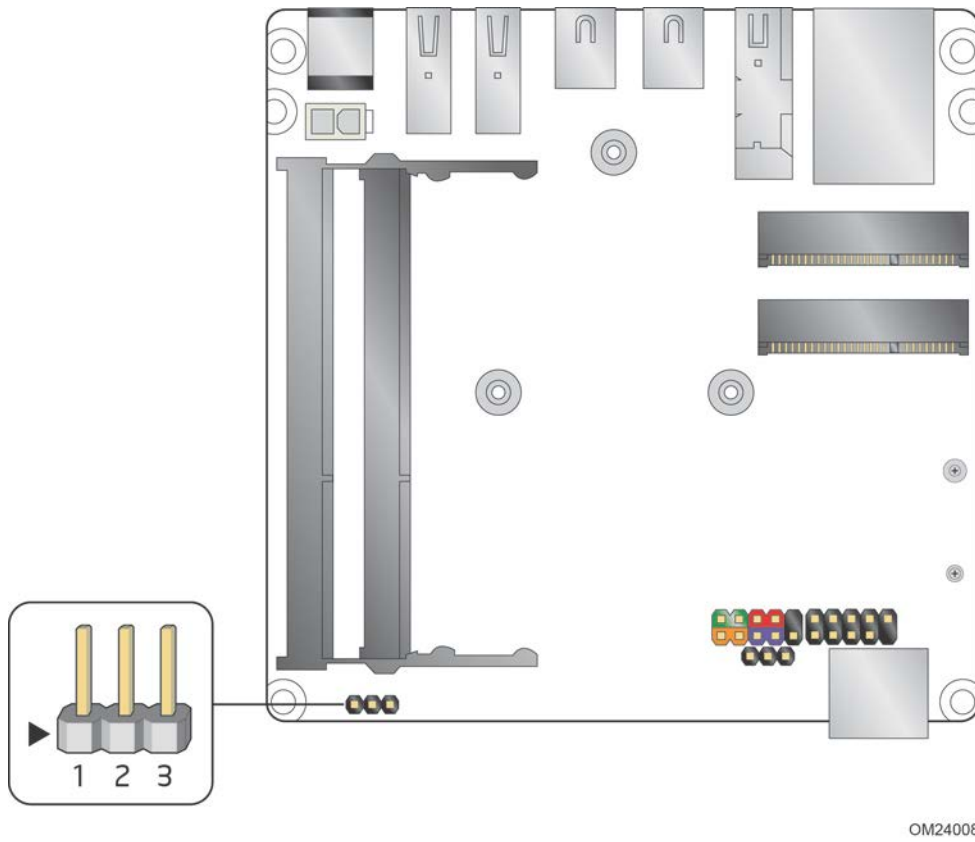
Figure 13. Intel MEBX Reset Header

Table 17. Intel MEBX Reset Header Signals

Pin	Function
1	PCH_RTCRST_PULLUP
2	Ground
3	No connection

2.5   Mechanical Considerations

2.5.1   Form Factor

The board is designed to fit into a custom chassis. Figure 14 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].
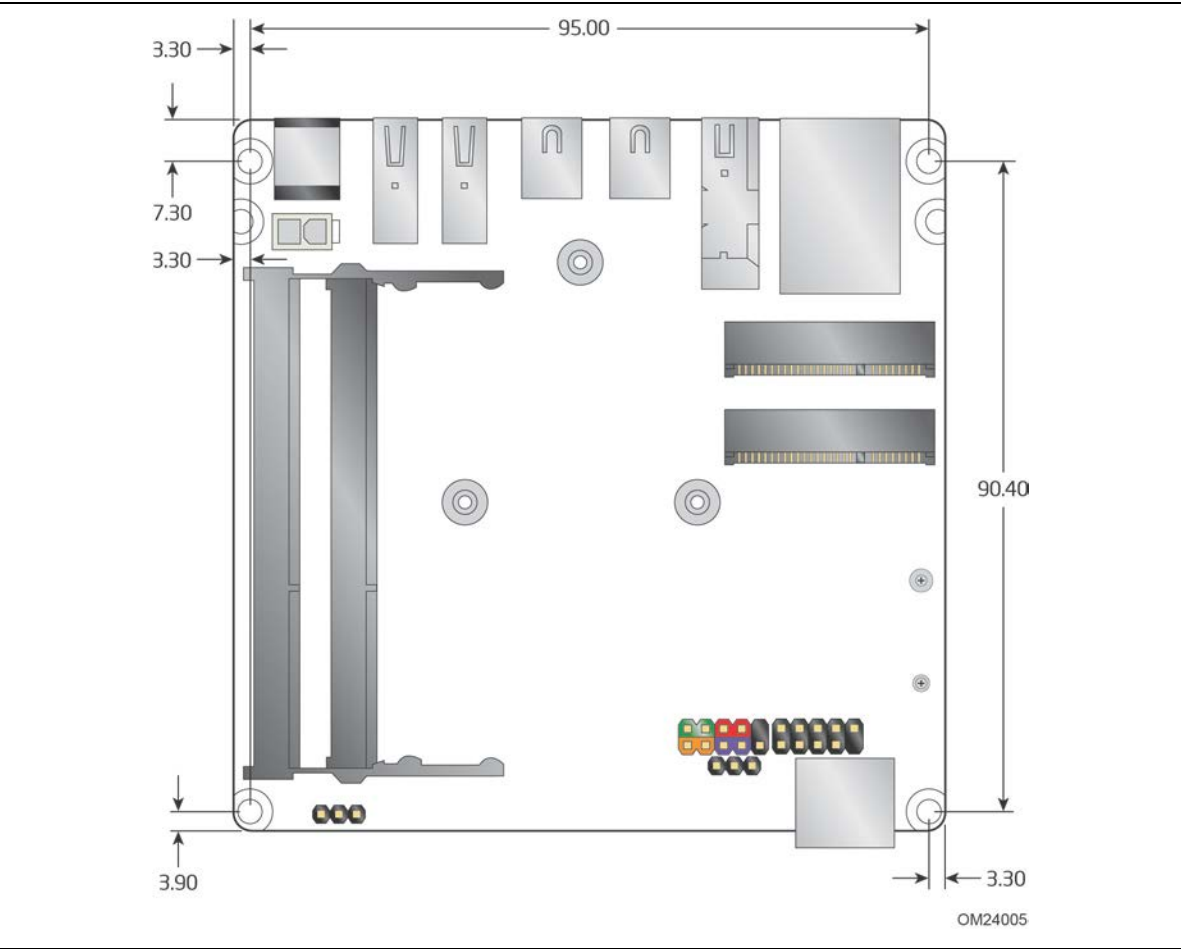
Figure 14. Board Dimensions

2.6   Electrical Considerations

2.6.1   Power Supply Considerations

⚠ **CAUTION**

The external 19 V DC jack is the primary power input connector of Intel NUC Board D53427RKE. However, the board also provides an internal 1 x 2 power connector that can be used in custom-developed systems that have a custom internal power supply. The internal 1 x 2 power connector is a Molex 5566-2 header which accepts a Molex 5557-02R connector from the power supply.

There is no isolation circuitry between the external 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 unit is or can be attached to the board at any time and to ensure the external 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 potential damage to the board, power supplies, or other hardware.

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

2.6.2   Fan Header Current Capability

Table 18 lists the current capability of the fan headers.

Table 18. Fan Header Current Capability

Fan Header	Maximum Available Current
Processor fan	.1 A

2.7   Thermal Considerations

⚠ CAUTION

A chassis with a maximum internal ambient temperature of 58 $^\circ$C at the processor fan inlet is a requirement. Whenever possible, use of a processor heat sink that provides omni-directional airflow to maintain required airflow across the processor voltage regulator area is recommended.

⚠ CAUTION

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

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

⚠ CAUTION

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

⚠ CAUTION

The processor voltage regulator area (shown in Figure 15) can reach a temperature of up to 97.5 $^\circ$C in an open chassis. Ensure that proper airflow is maintained in the processor voltage regulator circuit. Failure to do so may result in shorter than expected product lifetime.

Figure 15 shows the locations of the localized high temperature zones.
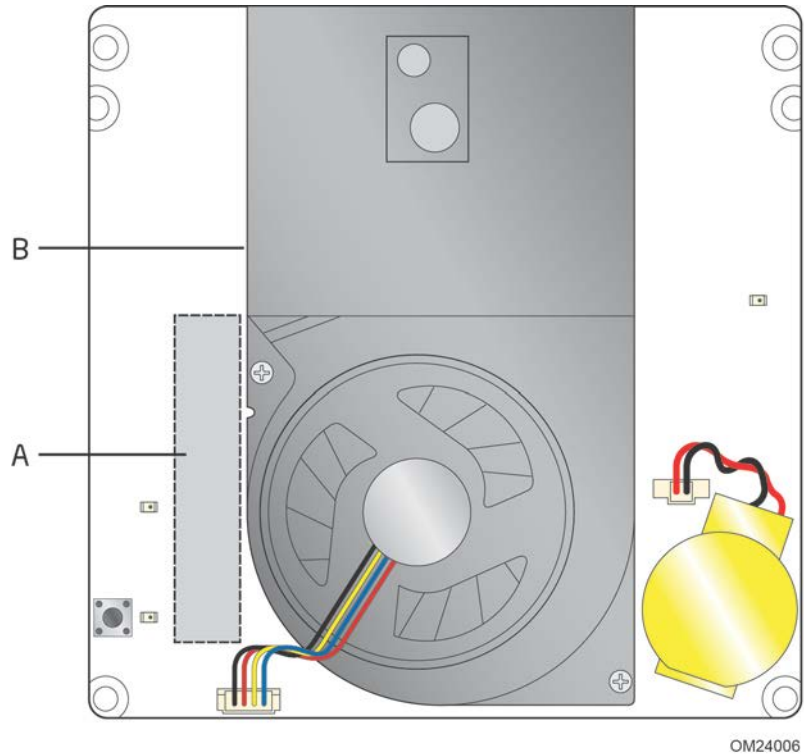
Item	Description
A	Processor voltage regulator area
B	Thermal solution

Figure 15. Localized High Temperature Zones

Table 19 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 19. Thermal Considerations for Components

Component	Maximum Case Temperature
Processor	For processor case temperature, see processor datasheets and processor specification updates
Intel QS77 Express Chipset	104 $^{\circ}$C

To ensure functionality and reliability, the component is specified for proper operation when Case Temperature is maintained at or below the maximum temperature listed in Table 20. This is a requirement for sustained power dissipation equal to Thermal Design Power (TDP is specified as the maximum sustainable power to be dissipated by the components). When the component is dissipating less than TDP, the case temperature should be below the Maximum Case Temperature. The surface temperature at the geometric center of the component corresponds to Case Temperature.

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

Table 20. Tcontrol Values for Components

Component	Tcontrol
Processor	For processor case temperature, see processor datasheets and processor specification updates
Intel QS77 Express Chipset	104 $^{\circ}$C

For information about	Refer to
Processor datasheets and specification updates	Section 1.2, page 18
Intel® 7 Series Chipset Thermal Mechanical Specifications and Design Guidelines	http://www.intel.com/Products/Desktop/Chipsets/ec-QS77/QS77-technicaldocuments.htm

2.8   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 the board is 71,537 hours.

2.9   Environmental

Table 21 lists the environmental specifications for the board.

Table 21. Environmental Specifications

Parameter	Specification		
Temperature			
Non-Operating	-40 °C to +60 °C		
Operating	0 °C to +50 °C		
Shock			
Unpackaged	50 g trapezoidal waveform		
	Velocity change of 170 inches/s²		
Packaged	Half sine 2 millisecond		
	Product Weight (pounds)	Free Fall (inches)	Velocity Change (inches/s²)
	<20	36	167
	21-40	30	152
	41-80	24	136
	81-100	18	118
Vibration			
Unpackaged	5 Hz to 20 Hz: 0.01 g² Hz sloping up to 0.02 g² Hz		
	20 Hz to 500 Hz: 0.02 g² Hz (flat)		
Packaged	5 Hz to 40 Hz: 0.015 g² Hz (flat)		
	40 Hz to 500 Hz: 0.015 g² Hz sloping down to 0.00015 g² Hz		

3 Overview of BIOS Features

3.1 Introduction

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

The BIOS displays a message during POST identifying the type of BIOS and a revision code. The initial production BIOSs are identified as RKPPT10H.86A.

When the BIOS Setup configuration jumper is set to configure mode and 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 pressing the <F2> key after the Power-On Self-Test (POST) memory test begins and before the operating system boot begins.
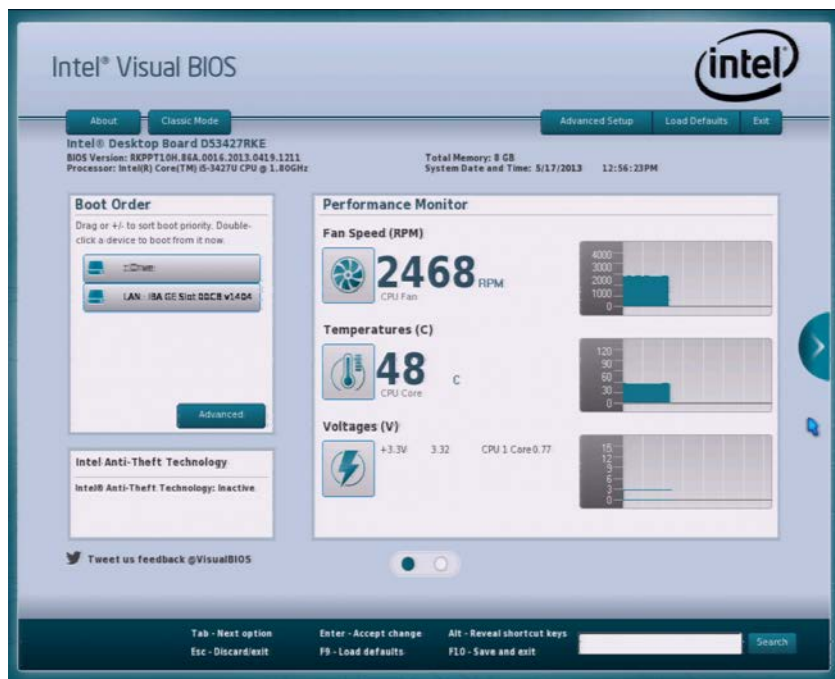

Figure 16. Intel Visual BIOS Home Screen

> **NOTE**
>
> *The maintenance menu is displayed only when the board is in configure mode.*
> *Section 2.3 on page 52 shows how to put the board in configure mode.*

3.2 BIOS Flash Memory Organization

The Serial Peripheral Interface Flash Memory (SPI Flash) includes a 128 Mb (16000 KB) flash memory device.

3.3 System Management BIOS (SMBIOS)

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

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

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

Non-Plug and Play operating systems require an additional interface for obtaining the SMBIOS information. The BIOS supports an SMBIOS table interface for such operating systems. Using this support, an SMBIOS service-level application running on a non-Plug and Play operating system can obtain the SMBIOS information. Additional board information can be found in the BIOS under the Additional Information header under the Main BIOS page.

3.4 Legacy USB Support

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

Legacy USB support operates as follows:

1. When you apply power to the computer, legacy support is disabled.
2. POST begins.
3. Legacy USB support is enabled by the BIOS allowing you to use a USB keyboard to enter and configure the BIOS Setup program and the maintenance menu.

4. POST completes.

5. The operating system loads. While the operating system is loading, USB keyboards and mice are recognized and may be used to configure the operating system. (Keyboards and mice are not recognized during this period if Legacy USB support was set to Disabled in the BIOS Setup program.)

6. After the operating system loads the USB drivers, all legacy and non-legacy USB devices are recognized by the operating system, and Legacy USB support from the BIOS is no longer used.

7. Additional USB legacy feature options can be access by using Intel® Integrator Toolkit.

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

3.5   BIOS Updates

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

- Intel® Express BIOS Update utility, which enables automated updating while in the Windows environment. Using this utility, the BIOS can be updated from a file on a hard disk, a USB drive (a flash drive or a USB hard drive), or a CD-ROM, or from the file location on the Web.

- Intel® Flash Memory Update Utility, which requires booting from DOS. Using this utility, the BIOS can be updated from a file on a hard disk, a USB drive (a flash drive or a USB hard drive), or a CD-ROM.

- Intel® F7 switch during POST allows a user to select where the BIOS .bio file is located and perform the update from that location/device. Similar to performing a BIOS Recovery without removing the BIOS configuration jumper.

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/CS-022312.htm

3.5.1   Language Support

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

3.5.2　　Custom Splash Screen

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

NOTE

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

For information about	Refer to
Intel Integrator Toolkit	www.intel.com/go/itk
Additional Intel® software tools	www.intel.com/go/itk

3.6　BIOS Recovery

It is unlikely that anything will interrupt a BIOS update; however, if an interruption occurs, the BIOS could be damaged. Table 22 lists the drives and media types that can and cannot be used for BIOS recovery. The BIOS recovery media does not need to be made bootable.

Table 22. Acceptable Drives/Media Types for BIOS Recovery

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

NOTE

Supported file systems for BIOS recovery:

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

For information about	Refer to
BIOS recovery	http://www.intel.com/support/motherboards/desktop/sb/cs-023360.htm

3.7   Boot Options

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

3.7.1   Network Boot

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

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

3.7.2   Booting Without Attached Devices

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

* Video adapter
* Keyboard
* Mouse

3.7.3   Changing the Default Boot Device During POST

Pressing the <F10> key during POST causes a boot device menu to be displayed. This menu displays the list of available boot devices. Table 23 lists the boot device menu options.

Table 23. Boot Device Menu Options

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

3.8   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.

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

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

Table 24 shows the effects of setting the Hard Disk Drive Passwords.

Table 24. Master Key and User Hard Drive Password Functions

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

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

```
Enter Hard Disk Drive Password:
```

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

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

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

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

NOTE

As implemented on D53427RKE, Hard Disk Drive Password Security is only supported on SATA port 0. The passwords are stored on the hard disk drive so if the drive is relocated to another computer that does not support Hard Disk Drive Password Security feature, the drive will not be accessible.

3.9   BIOS Security Features

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

- The supervisor password gives unrestricted access to view and change all the Setup options in the BIOS Setup program. This is the supervisor mode.
- The user password gives restricted access to view and change Setup options in the BIOS Setup program. This is the user mode.
- If only the supervisor password is set, pressing the <Enter> key at the password prompt of the BIOS Setup program allows the user restricted access to Setup.
- If both the supervisor and user passwords are set, users can enter either the supervisor password or the user password to access Setup. Users have access to Setup respective to which password is entered.
- Setting the user password restricts who can boot the computer. The password prompt will be displayed before the computer is booted. If only the supervisor password is set, the computer boots without asking for a password. If both passwords are set, the user can enter either password to boot the computer.
- For enhanced security, use different passwords for the supervisor and user passwords.
- Valid password characters are A-Z, a-z, and 0-9. Passwords may be up to 19 characters in length.
- To clear a set password, enter a blank password after entering the existing password.

Table 25 shows the effects of setting the supervisor password and user password. This table is for reference only and is not displayed on the screen.

Table 25. Supervisor and User Password Functions

Password Set	Supervisor Mode	User Mode	Setup Options	Password to Enter Setup	Password During Boot
Neither	Can change all options (Note)	Can change all options (Note)	None	None	None
Supervisor only	Can change all options	Can change a limited number of options	Supervisor Password	Supervisor	None
User only	N/A	Can change all options	Enter Password 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

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

4 Error Messages and Blink Codes

4.1 Front-panel Power LED Blink Codes

Whenever a recoverable error occurs during POST, the BIOS causes the board's front panel power LED to blink an error message describing the problem (see Table 26).

Table 26. Front-panel Power LED Blink Codes

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

Note: Disabled per default BIOS setup option.

4.2 BIOS Error Messages

Table 27 lists the error messages and provides a brief description of each.

Table 27. BIOS Error Messages

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

5 Regulatory Compliance and Battery Disposal Information

5.1 Regulatory Compliance

This section contains the following regulatory compliance information for Intel NUC Board D53427RKE:

- 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 D53427RKE complies with the safety standards stated in Table 28 when correctly installed in a compatible host system.

Table 28. Safety Standards

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

5.1.2 European Union Declaration of Conformity Statement

We, Intel Corporation, declare under our sole responsibility that the products Intel® NUC Board D53427RKE is in conformity with all applicable essential requirements necessary for CE marking, following the provisions of the European Council Directive 2004/108/EC (EMC Directive), 2006/95/EC (Low Voltage Directive), and 2002/95/EC (ROHS Directive).

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

$C\epsilon$

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

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

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

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

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

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

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

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

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

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

Icelandic Þessi vara 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 Product Ecology Statements

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

5.1.3.1 Disposal Considerations

This product contains the following materials that may be regulated upon disposal: printed wiring board assembly and lithium battery.

5.1.4   EMC Regulations

Intel NUC Board D53427RKE complies with the EMC regulations stated in Table 29 when correctly installed in a compatible host system.

Table 29. EMC Regulations

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

FCC Declaration of Conformity

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

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

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

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

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit other than the one to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

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

Canadian Department of Communications Compliance Statement

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

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

Japan VCCI Statement

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

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

Korea Class B Statement

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

이 기기는 가정용(B급) 전자파적합기기로서 주 로 가정에서 사용하는 것을 목적으로 하며, 모 든 지역에서 사용할 수 있습니다.

5.1.5 ENERGY STAR* 5.2, e-Standby, and ErP Compliance

The US Department of Energy and the US Environmental Protection Agency have continually revised the ENERGY STAR requirements. Intel has worked directly with these two governmental agencies in the definition of new requirements.

Intel NUC Board D53427RKE allows for a compliant system built to meet the following program requirements, including appropriate selection of an efficient power supply:

- ENERGY STAR v5.2, category B
- EPEAT*
- Korea e-Standby
- European Union Energy-related Products Directive 2013 (ErP) Lot 6
- ENERGY STAR v6.0 draft 3

NOTE

ENERGY STAR denotes a system level energy specification, defined by the US Environmental Protection Agency, that relies upon all of the system's components, including processor, chipset, power supply, HDD, graphics controller, memory, etc. to meet the specification. For more information on ENERGY STAR Computers Program requirements version 5.2, go to:

http://www.energystar.gov

For information about	Refer to
ENERGY STAR requirements and recommended configurations	http://www.intel.com/go/energystar
Electronic Product Environmental Assessment Tool (EPEAT)	http://www.epeat.net/
Korea e-Standby Program	http://www.kemco.or.kr/new_eng/pg02/pg02100300.asp
European Union Energy-related Products Directive 2009 (ErP)	http://ec.europa.eu/enterprise/policies/sustainable-business/sustainable-product-policy/ecodesign/index_en.htm

5.1.6   Regulatory Compliance Marks (Board Level)

Intel NUC Board D53427RKE has the regulatory compliance marks shown in Table 30.

Table 30. Regulatory Compliance Marks

Description	Mark
UL joint US/Canada Recognized Component mark. Includes adjacent UL file number for Intel NUC Boards: E210882.	C UL® US
FCC Declaration of Conformity logo mark for Class B equipment.	FC
CE mark. Declaring compliance to the European Union (EU) EMC directive, Low Voltage directive, and RoHS directive.	CE
Australian Communications Authority (ACA) and New Zealand Radio Spectrum Management (NZ RSM) C-tick mark. Includes adjacent Intel supplier code number, N-232.	
Japan VCCI (Voluntary Control Council for Interference) mark.	VCI
Korea Certification mark. Includes an adjacent KCC (Korean Communications Commission) certification number: KCC-REM-CPU-D53427RKE.	KC
Taiwan BSMI (Bureau of Standards, Metrology and Inspections) mark. Includes adjacent Intel company number, D33025.	
Printed wiring board manufacturer's recognition mark. Consists of a unique UL recognized manufacturer's logo, along with a flammability rating (solder side).	V-0
China RoHS/Environmentally Friendly Use Period Logo: This is an example of the symbol used on Intel NUC Boards and associated collateral. The color of the mark may vary depending upon the application. The Environmental Friendly Usage Period (EFUP) for Intel NUC Boards has been determined to be 10 years.	10

5.2   Battery Disposal Information

⚠️ **CAUTION**

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

⚠️ PRÉCAUTION

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

⚠️ FORHOLDSREGEL

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

⚠️ OBS!

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

⚠️ VIKTIGT!

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

⚠️ VARO

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

⚠️ VORSICHT

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

⚠️ AVVERTIMENTO

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

⚠ PRECAUCIÓN

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

⚠ WAARSCHUWING

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

⚠ ATENÇÃO

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

⚠ AŚCIAROŽZNAŚĆ

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

⚠ UPOZORNÌNÍ

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

⚠ Προσοχή

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

⚠ VIGYÁZAT

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

⚠ 注意

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

⚠️ **AWAS**

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

⚠️ **OSTRZEŻENIE**

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

⚠️ **PRECAUŢIE**

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

⚠️ **ВНИМАНИЕ**

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

⚠️ **UPOZORNENIE**

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

⚠️ **POZOR**

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

⚠️ **คำเตือน**

ระวังการระเบิดที่เกิดจากเปลี่ยนแบตเตอรี่ผิดประเภท หากเป็นไปได้ ควรนำแบตเตอรี่ไปรีไซเคิล การ ทิ้งแบตเตอรี่ใช้แล้วต้องเป็นไปตามกฎข้อบังคับด้านสิ่งแวดล้อมของท้องถิ่น.

⚠️ **UYARI**

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

⚠️ **ОСТОРОГА**

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

⚠ UPOZORNĚNÍ

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

⚠ **ETTEVAATUST**

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

⚠ FIGYELMEZTETÉS

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

⚠ UZMANĪBU

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

⚠ DĖMESIO

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

⚠ ATTENZJONI

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

⚠ OSTRZEŻENIE

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