Intel® Desktop Board DN2800MT

Technical Product Specification

October 2013

Order Number: G39091-009

The Intel Desktop Board DN2800MT may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Current characterized errata are documented in the Intel Desktop Board DN2800MT Specification Update.

Revision History

Revision	Revision History	Date
-001	First release of the Intel® Desktop Board DN2800MT Technical Product Specification	December 2011
-002	Updated the Board Identification Information section and added a spec clarification	April 2012
-003	Specification Clarification	June 2012
-004	Specification Clarification	August 2012
-005	Specification Clarification	October 2012
-006	Specification Clarification	March 2013
-007	Specification Clarification	May 2013
-008	Specification Clarification	July 2013
-009	Specification Clarification	October 2013

This product specification applies to only the standard Intel® Desktop Board with BIOS identifier MTCDT10N.86A.

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Board Identification Information

Basic Desktop Board DN2800MT Identification Information

AA Revision	BIOS Revision	Notes
G23738-600	MTCDT10N.86A.0146	1,2
G23738-800	MTCDT10N.86A.0152	1,2
G23738-801	MTCDT10N.86A.0152	1,2
G23738-802	MTCDT10N.86A.0159	1,2

Notes:

1. The AA number is found on a small label on the component side of the board.
2. The NM10 chipset used on this AA revision consists of the following component:

Device	Stepping	S-Spec Numbers
CG82NM10	B0	SLGXX

Specification Changes or Clarifications

The table below indicates the Specification Changes or Specification Clarifications that apply to the Intel® Desktop Board DN2800MT.

Specification Changes or Clarifications

Date	Type of Change	Description of Changes or Clarifications
April 2012	Spec Clarification	Updated Sections 1.6.1.1 Intel® High Definition (Intel® HD) Graphics, 1.6.2.1 LVDS Interface, and 1.6.2.2 Embedded DisplayPort (eDP) Interface to correct the max resolution from 1920 x 1200 to 1920 x 1080.
June 2012	Spec Clarification	• Corrected the orientation of the Custom Solutions header in Figure 1 and Figure 13. • Added a Note to Section 1.4 System Memory on page 20.
August 2012	Spec Clarification	Added Section 2.2.3.7 Custom Solutions Header.
October 2012	Spec Clarification	Updated Table 28 (default voltage option) and Table 29 (default board input voltage option).
March 2013	Spec Clarification	Updated to show the following: • Boards with AA number G23738-600 have a 3-wire system fan header. • Boards with AA number G23738-800 (and later) have 3-wire and 4-wire fan headers.
May 2013	Spec Clarification	Add ENERGY STAR Note to Section 5.1.5.
July 2013	Spec Clarification	Deleted references to ENERGY STAR.
October 2013	Spec Clarification	Added a Note to Section 1.13.1.2 and Section 5.1.5 regarding the ErP enablement header.

For information about	Refer to
3-wire and 4-wire fan headers	http://www.intel.com/support/motherboards/desktop/sb/cs-012074.htm
Product Change Notification	http://qdms.intel.com/dm/d.aspx/82B7ABB2-832F-410F-89D4-9FF096699E18/PCN111258-02.pdf

Errata

Current characterized errata, if any, are documented in a separate Specification Update. See http://www.intel.com/content/www/us/en/motherboards/desktop-motherboards/motherboards.html?wapkw=desktop+boards 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® Desktop Board DN2800MT.

Intended Audience

The TPS is intended to provide detailed, technical information about Intel Desktop Board DN2800MT 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 Desktop Board DN2800MT
2	A map of the resources of the Intel Desktop 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)
Kbit	Kilobit (1024 bits)
kbits/s	1000 bits per second
MB	Megabyte (1,048,576 bytes)
MB/s	Megabytes per second
Mbit	Megabit (1,048,576 bits)
Mbits/s	Megabits per second
TDP	Thermal Design Power
xxh	An address or data value ending with a lowercase h indicates a hexadecimal value.
x.x V	Volts. Voltages are DC unless otherwise specified.
*	This symbol is used to indicate third-party brands and names that are the property of their respective owners.

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1 Product Description

1.1 Overview

1.1.1 Feature Summary

Table 1 summarizes the major features of the board.

Table 1. Feature Summary

Form Factor	Mini-ITX (6.7 inches by 6.7 inches [170.18 millimeters by 170.18 millimeters])
Processor	Fanlessly-cooled, soldered-down Dual-Core Intel® Atom™ Processor N2800 with integrated graphics and integrated memory controller
Memory	• Two 204-pin DDR3 SDRAM Small Outline Dual Inline Memory Module (SO-DIMM) sockets • Support for DDR3 800 MHz and DDR3 1066 MHz SO-DIMMs Note: Higher speed SO-DIMMs supported at 1066 MHz if supported by the memory module. • Support for up to 4 GB of system memory on a single SO-DIMM (or two 2 GB SO-DIMMs)
Chipset	Intel® NM10 Express Chipset
Graphics	• Integrated graphics: — Digital displays (High Definition Multimedia Interface* (HDMI*)) — Analog displays (VGA) — Internal flat panel displays: ▪ LVDS ▪ eDP (Embedded DisplayPort*) • External graphics: — One PCI Express 1.0a x1 graphics add-in card connector
Audio	• 2+2 Intel® High Definition (Intel® HD) audio via the Realtek* ALC888S audio codec — Analog stereo line-out (back panel jack) — In-chassis stereo speakers support (3 W/3 Ω via internal header) — S/PDIF digital audio output (internal header) — DMIC digital microphone input (internal header) — Analog line-in (back panel jack) — Front panel Intel HD Audio/AC'97 headphones/mic support (internal header) • 8-channel (7.1) Intel High Definition Audio via the HDMI interface

continued

Table 1. Feature Summary (continued)

Peripheral Interfaces	• Ten USB 2.0 ports: — Four front panel ports (via two internal headers; one header supports an Intel® Z-U130 USB Solid-State Drive (or compatible device)) — Two ports are implemented with stacked back panel connectors (black) — Two high-current/fast-charging ports implemented through stacked back panel connectors (yellow) — One port implemented in the PCI Express Half-Mini Card slot — One port implemented in the PCI Express Full-/Half-Mini Card slot • Two SATA ports: — One internal SATA connector (black) — One internal SATA connector (multiplexed with mSATA port , routed to PCI Express Full-/Half-Mini Card slot) (gray)
Expansion Capabilities	• One PCI Express 1.0a x1 add-in card connector • One PCI Express Half-Mini Card slot • One PCI Express Full-/Half-Mini Card slot
BIOS	• Intel® 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)
LAN Support	Gigabit (10/100/1000 Mbits/s) LAN subsystem using the Intel® 82574L Gigabit Ethernet Controller
Legacy I/O Control	Nuvoton W83627DHG I/O controller for hardware management, serial ports and parallel port support
Hardware Monitor Subsystem	• Hardware monitoring through the Nuvoton I/O controller • Voltage sense to detect out of range power supply voltages • Thermal sense to detect out of range thermal values • System fan headers: — Boards with AA number G23738-600 have a 3-wire system fan header. — Boards with AA number G23738-800 (and later) have 3-wire and 4-wire fan headers. • Fan sense input used to monitor fan activity • Fan speed control

For information about	Refer to
3-wire and 4-wire fan headers	http://www.intel.com/support/motherboards/desktop/sb/cs-012074.htm
Product Change Notification	http://qdms.intel.com/dm/d.aspx/82B7ABB2-832F-410F-89D4-9FF096699E18/PCN111258-02.pdf

1.1.2 Board Layout (Top)

Figure 1 shows the location of the major components on the top-side of the Intel Desktop Board DN2800MT.

Figure 1. Major Board Components (Top)

Table 2 lists the components identified in Figure 1.

Table 2. Components Shown in Figure 1

Item/callout from Figure 1	Description
A	Debug connector
B	Battery
C	Back panel connectors
D	3-wire system fan header
E	Internal power connector
F	Intel NM10 Express Chipset
G	BIOS Setup configuration jumper block
H	SATA data connector
I	SATA power connector
J	PCI Express Half-Mini card slot
K	J26 header (ErP enablement)
L	SATA data connector
M	Intel Atom processor and heatsink
N	4-wire fan header
O	Flat panel display connectors
P	DDR3 SO-DIMM 0 socket
Q	DDR3 SO-DIMM 1 socket
R	Front panel header
S	Front panel audio header
T	Front panel dual-port USB headers
U	Standby power LED
V	Serial port headers
W	Parallel port header
X	DMIC header
Y	PCI Express Full-/Half-Mini Card slot
Z	Custom Solutions header
AA	PCI Express 1.0a x1 connector
BB	S/PDIF header
CC	Internal stereo speakers connector

1.1.3 Board Layout (Bottom)

Figure 2 shows the location of the major components on the bottom-side of the Intel Desktop Board DN2800MT.

Figure 2. Major Board Components (Bottom)

Table 3. Components Shown in Figure 2

Item/callout from Figure 2	Description
A	Embedded DisplayPort (eDP) 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 Desktop Board DN2800MT	http://www.intel.com/products/motherboard/index.htm
Desktop Board Support	http://www.intel.com/p/en_US/support?iid=hdr+support
Available configurations for Intel Desktop Board DN2800MT	http://ark.intel.com
Chipset information	http://www.intel.com/products/desktop/chipsets/index.htm
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 fanlessly-cooled, soldered-down dual-core Intel Atom processor N2800 with integrated graphics and integrated memory controller.

NOTE

The board is designed to be fanlessly cooled in a properly ventilated chassis. Chassis venting locations are recommended above and next to the processor area for maximum heat dissipation effectiveness.

1.4 System Memory

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

- 1.5 V DDR3-800 and DDR3-1066 SO-DIMMs with gold-plated contacts
- Unbuffered, non-ECC, Raw Card B (1Rx8) and Raw Card-F (2Rx8) SO-DIMMs only
- Single-sided or double-sided modules
- 4 GB maximum total system memory
- Serial Presence Detect
- DDR3 800 MHz and DDR3 1066 MHz SO-DIMMs
  (Higher speed SO-DIMMs supported at 1066 MHz if supported by the memory module.)

NOTES

- *Due to fanless thermal constraints, system memory must have an operating temperature rating of 85 °C.*

  The board is designed to be fanlessly cooled in a properly ventilated chassis. Chassis venting locations are recommended above the system memory area for maximum heat dissipation effectiveness.
- *If you are installing only one SO-DIMM, it must be installed in the bottom socket (SO-DIMM 1).*
- *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

Raw Card Version	SO-DIMM Capacity	DRAM Device Technology	DRAM Organization	# of DRAM Devices
B	1 GB	1 Gb	128 M x 8	8
	2 GB	2 Gb	256 M x 8	8
F	2 GB	1 Gb	128 M x 8	16
	4 GB	2 Gb	256 M x 8	16

Note: System memory configurations are based on availability and are subject to change.

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

Figure 4 illustrates the SO-DIMM configuration.

Figure 4. SO-DIMM Configuration

1.5 Intel® NM10 Express Chipset

Intel NM10 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 NM10 Express Chipset is a centralized controller for the board's I/O paths.

For information about	Refer to
The Intel NM10 chipset	http://www.intel.com/products/desktop/chipsets/index.htm
Resources used by the chipset	Chapter 2

1.6 Graphics Subsystem

The board supports graphics through Intel Graphics Technology.

1.6.1 Integrated Graphics

The board supports integrated graphics through the Intel® Flexible Display Interface (Intel® FDI) for processors with Intel Graphics Technology.

NOTE

The board can simultaneously support up to two of the three integrated graphics interfaces: VGA, HDMI, and Flat Panel Display.

Flat Panel Display is supported by eDP and LVDS interfaces, however only one can be used at a time.

1.6.1.1 Intel® High Definition (Intel® HD) Graphics

The Intel® GMA graphics controller features the following:

- 640 MHz core frequency
- Video
  - Blu-ray* 2.0
  - PAVP 1.1c
  - HDCP 1.3
- Display
  - Supports VGA displays up to 1920 x 1200 (WUXGA) at 60 Hz
  - Supports HDMI displays up to 1920 x 1200 (WUXGA) at 60 Hz
  - Supports eDP or LVDS internal flat panel displays up to 1920 x 1080 at 60 Hz
  - Dual independent display support

For information about	Refer to
Obtaining graphics software and utilities	Section 1.2, page 19

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. It is compatible with all ATSC and DVB HDTV standards and supports eight full range channels at 24-bit/96 kHz audio. The maximum supported resolution is 1920 x 1200 (WUXGA). The HDMI port is compliant with the HDMI 1.3a specification.

Depending on the type of add-in card installed in the PCI Express x1 connector, the HDMI port will behave as described in Table 5.

Table 5. HDMI Port Status Conditions

PCI Express x1 Connector Status	HDMI Port Status
No add-in card installed	Enabled
Non-video PCI Express x1 add-in card installed	Enabled
Video PCI Express x1 add-in card installed	Disabled

1.6.1.4 Analog Display (VGA)

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

1.6.2 Flat Panel Display Interfaces

The board supports flat panel display via the LVDS and Embedded DisplayPort interfaces. Figure 5 shows the flat panel connectors.

Item	Description
A	Backlight inverter voltage selection header
B	Flat panel voltage selection header
C	FPD brightness connector
D	LVDS connector
E	Embedded DisplayPort connector

Figure 5. Flat Panel Connectors

1.6.2.1 LVDS Interface

The LVDS flat panel display interface supports the following:

- 1920 x 1080 @ 60 Hz resolution
- Single-channel and dual-channel interface, up to 135 MHz clock rate 18 bpp and 24 bpp (VESA* and JEIDA mappings) color depth support
- Multiple EDID data source capability (panel, predefined, and custom payloads)
- 3.3 V, 5 V, and 12 V flat panel display voltage flexibility, with up to 3 A current
- 5 V, 12 V and Vin backlight inverter voltage flexibility, with up to 3 A current
- Backlight inverter signal redundancy on dedicated header as well as on LVDS connector (for discrete inverter or panel-integrated inverter support using a single cable)
- Flat panel brightness control via front panel button input as well as Windows* 7 "Screen brightness" adjustment slider
- Spread-spectrum control

NOTE

Backlight inverter voltage option "Vin" refers to board input voltage as provided to board power input connector.

1.6.2.2 Embedded DisplayPort (eDP) Interface

The eDP (Embedded DisplayPort) flat panel display interface supports the following:

- 1920 x 1080 @ 60 Hz resolution
- 1-lane, 2-lane, and 4-lane bandwidth at 1.62 Gb/s or 2.7 Gb/s
- Multiple EDID data source capability (panel, predefined, and custom payloads)
- 3.3 V, 5 V, and 12 V flat panel display voltage flexibility, with up to 3 A current
- 5 V, 12 V and Vin backlight inverter voltage flexibility, with up to 3 A current
- Backlight inverter signal redundancy on a dedicated header as well as on eDP connector (for discrete inverter or panel-integrated inverter support using a single cable)
- Flat panel brightness control via front panel button input as well as Windows 7 "Screen brightness" adjustment slider

NOTE

Backlight inverter voltage option "Vin" refers to board input voltage as provided to board power input connector.

1.6.2.3 Configuration Modes

Video mode configuration for eDP/LVDS displays is supported as follows:

- Automatic panel identification via Extended Display Identification Data (EDID) for panels with onboard EDID support
- Panel selection from common predefined panel types (without onboard EDID)
- Custom EDID payload installation for ultimate parameter flexibility, allowing custom definition of EDID data on panels without onboard EDID

In addition, BIOS setup provides the following configuration parameters for internal flat panel displays:

- Screen Brightness: allows the end user to set the screen brightness for the display effective through the Power-On Self Test stage (such as while showing the splash screen image and BIOS setup). Windows 7 will ignore this setting in favor of the native "screen brightness" control provided by the operating system.
- Flat Panel Configuration Changes Lock: allows the system integrator to "lock" critical settings of the LVDS configuration to avoid end users potentially rendering the display unusable.
- Brightness Steps: allows the system integrator to configure the brightness steps for the operating system's "screen brightness" control (such as the "Screen brightness" adjustment slider under the Windows 7 "Power Options" control panel).
- LVDS Interface Type: allows the system integrator to select whether the LVDS panel is a single-channel or dual-channel display.
- Swap LVDS Channels 0/1: allows the system integrator to swap the EVEN/ODD LVDS channel assignments shall the cable be wired opposite the panel pinout.
- Color Depth: allows the system integrator to select whether the panel is 24 bpp with VESA color mapping (eDP and LVDS), 24 bpp with JEIDA color mapping (LVDS only), or 18 bpp (eDP and LVDS).
- eDP Interface Type: allows the system integrator to select whether the eDP panel is a 1-lane, 2-lane, or 4-lane display.
- eDP Data Rate: allows the system integrator to select whether the eDP panel runs at 1.62 Gb/s or 2.7 Gb/s.
- Inverter Frequency and Polarity: allows the system integrator to set the operating frequency and polarity of the panel inverter board.
- Maximum and Minimum Inverter Current Limit (%): allows the system integrator to set maximum PWM%, as appropriate, according to the power requirements of the internal flat panel display and the selected inverter board.
- Panel Power Sequencing: allows the system integrator to adjust panel sequencing parameters, if necessary.
- LVDS Spread Spectrum Control: allows the system integrator to adjust spread spectrum for the LVDS interface.

NOTE

Support for flat panel display configuration complies with the following:

1. *Internal flat panel display connectivity is disabled (and all parameters hidden) by default.*
2. *Internal flat panel display settings are not exposed through Intel® Integrator Toolkit or Intel® Integrator Assistant GUIs.*
3. *Internal flat panel display settings will not be overwritten by loading BIOS setup defaults.*
4. *Internal flat panel display settings will be preserved across BIOS updates.*

1.6.3 USB

The board supports up to ten USB ports. The port arrangement is as follows:

- Four front panel ports (via two internal headers; one header supports an Intel® Z-U130 USB Solid-State Drive (or compatible device))
- Two ports are implemented with stacked back panel connectors (black)
- Two high-current/fast-charging ports are implemented through stacked back panel connectors (yellow)
- One port implemented in the PCI Express Half–Mini Card slot
- One port implemented in the PCI Express Full-/Half-Mini Card slot

The USB controller on the Intel NM10 Express Chipset provides a direct logical connection to the USB ports on the back panel as well as on the PCI Express Mini Card slots, and an indirect connection (through onboard USB hub) to the internal USB headers. All ten USB ports are high-speed, full-speed, and low-speed capable.

NOTE

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

For information about	Refer to
The location of the USB connectors on the back panel	Figure 12, page 46
The location of the front panel USB headers	Figure 13, page 47

1.7 SATA Interfaces

The board provides two SATA ports through the PCH, which support one device per port:

- One internal SATA connector (black)
- One internal SATA connector (multiplexed with mSATA port , routed to PCI Express Full-/Half-Mini Card slot) (gray)

The PCH provides independent SATA ports with a theoretical maximum transfer rate of 3 Gb/s. A point-to-point interface is used for host to device connections.

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

The board has an internal SATA power connector and ships with a power cable for powering internal SATA storage devices. The power cable includes:

- Right-angled 15-pin SATA female connector (for motherboard connectivity)
- 1 x 4 Molex female connector (for slim optical drive adapter connectivity)
- 15-pin SATA female connector (for storage connectivity)
- Vertical 15-pin SATA female connector (for storage connectivity)

NOTE

Board power supplied through the SATA power connector is rated at a maximum of:

- *1.0 A from 12 V rail*
- *2.5 A from 5 V rail*
- *0.5 A from 3.3 V rail*

For information about	Refer to
The location of the SATA connectors	Figure 13, page 47

1.7.1 AHCI Mode

The board supports AHCI storage mode via the Intel NM10 Express Chipset.

NOTE

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

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 ± 13 minutes/year at 25 ºC 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 15 shows the location of the battery.

1.9 Legacy I/O Controller

The I/O controller provides the following features:

- Two serial port headers
- One parallel port header with output only, bi-directional and Enhanced Parallel Port (EPP) support
- Serial IRQ interface compatible with serialized IRQ support for PCI systems
- Intelligent power management, including a programmable wake-up event interface

The BIOS Setup program provides configuration options for the I/O controller.

1.9.1 Serial Ports

The serial ports, are implemented as two 10-pin headers on the board. The serial ports support data transfers at speeds up to 115.2 kbits/sec with BIOS support.

For information about	Refer to
The location of the serial port headers	Figure 13, page 47

1.9.2 Parallel Port

The parallel port is implemented as a 26-pin header on the board. Use the BIOS Setup program to set the parallel port mode.

For information about	Refer to
The location of the parallel port header	Figure 13, page 47

1.10 Audio Subsystem

The board supports Intel HD Audio via the Realtek ALC888S audio codec and the HDMI interface. The audio subsystem supports the following features:

- Analog line-out (back panel jack)
- Analog line-in (back panel jack)
- In-chassis stereo speakers support (3 W/3 Ω via internal header)
- Signal-to-noise ratios (SNR) of 97 dB for the DACs and 90 dB for the ADCs
- Support for 44.1 kHz/48 kHz/96 kHz/192 kHz sample rates on all analog outputs
- Support for 44.1 kHz/48 kHz/96 kHz sample rates on all analog inputs
- S/PDIF digital audio output (internal header)
- Support for 44.1 kHz/48 kHz/88.2 kHz/96 kHz/192 kHz sample rates at 16-bit, 20-bit or 24-bit resolution on SPDIF outputs
- DMIC interface (internal header), with support for mono and stereo digital microphones
- Front panel HD Audio/AC'97 headphones/microphone support (internal header)
- Advanced jack sense for the back panel line-out jack that enables the audio codec to recognize the connected device
- Microphone input jack that supports a single dynamic, condenser, or electret microphone
- Windows 7 Ultimate certification

Table 6 lists the supported functions of the front panel and back panel audio jacks.

Table 6. Audio Jack Support

Audio Jack	Microphone	Headphones	Line Out	Line In
FP Green Jack	Default			
FP Pink Jack		Default		
Rear Green Jack			Jack detect	
Rear Pink Jack				Default
Internal Stereo Speaker			Default	

1.10.1 Audio Subsystem Software

The latest audio software and drivers are available from Intel's World Wide Web site.

For information about	Refer to
Obtaining audio software and drivers	Section 1.2, page 19

1.10.2 Audio Subsystem Components

The audio subsystem includes the following components:

- Intel NM10 Express Chipset
- Realtek ALC888S audio codec
- Two ports for analog line-in and analog line-out on the back panel
- Front panel audio header that supports Intel HD audio and AC'97 audio (a 2 x 5-pin header that provides microphone in and headphones signals for front panel audio connectors)
- Internal S/PDIF header (1 x 4-pin header)
- Internal DMIC header (1 x 5-pin header)
- Internal stereo speakers connector (1 x 4-pin, shrouded)

The back panel audio connectors are configurable through the audio device drivers. The available configurable back panel audio connectors are shown in Figure 6.

Item	Description
A	Analog line out
B	Analog line-in

Figure 6. Back Panel Audio Connectors

NOTE

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

Figure 5 shows the location of the internal audio headers.

Item	Description
A	Front panel audio header
B	DMIC header
C	S/PDIF header
D	Internal stereo speakers connector

Figure 7. Internal Audio Headers

For information about	Refer to
The signal names of the audio headers	Section 2.2.3.1, page 50

1.11 LAN Subsystem

The LAN subsystem consists of the following:

- Intel 82574L Gigabit Ethernet Controller (10/100/1000 Mbits/s)
- Intel NM10 Express Chipset
- RJ-45 LAN connector with integrated status LEDs

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

1.11.1 Intel® 82574L Gigabit Ethernet Controller

The Intel 82574L Gigabit Ethernet Controller supports the following features:

- 10/100/1000 BASE-T (IEEE 802.3, 802.3u and 802.3ab) compliant
- IEEE 802.3ab auto negotiation support
- IEEE 802.3x flow control and Auto MDI, MDI-X crossover at all speeds
- Full wake-up support (APM and ACPI 2.0) (Magic Packet* wake-up capable)
- Smart power down at S0 no link and Sx no link
- Jumbo (9kB) frame support
- TimeSync offload (IEEE1588 and 802.1as) compliant
- Quality of Service (QoS) (802.1p) compliant
- VLAN (802.1q) compliant
- TCP, IP, and UDP checksum offload (for IPv4 and IPv6)
- Full device driver compatibility

1.11.2 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

1.11.3 RJ-45 LAN Connector with Integrated LEDs

Two LEDs are built into the RJ-45 LAN connector (shown in Figure 8).

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

Figure 8. LAN Connector LED Locations

Table 7 describes the LED states when the board is powered up and the LAN subsystem is operating.

Table 7. 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 Mbits/s data rate is selected.
		Green	100 Mbits/s data rate is selected.
		Yellow	1000 Mbits/s data rate is selected.

1.12 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/

1.12.1 Hardware Monitoring

The hardware monitoring and fan control subsystem is based on the Nuvoton W83627DHG device, which supports the following:

- Processor and system ambient temperature monitoring
- System fan speed monitoring
- Voltage monitoring of +12 V, +5 V, +3.3 V, PCH Vcc, Memory Vcc, Processor Vcc and +3.3V Standby
- SMBus interface

1.12.2 Fan Monitoring

Fan monitoring can be implemented using Intel® Desktop Utilities or third-party software.

For information about	Refer to
The functions of the fan header	Section 1.13.2.2, page 40

1.12.3 Thermal Monitoring

Figure 9 shows the locations of the thermal sensor and fan headers.

Item	Description
A	3-wire system fan header
B	Thermal diode, located on the processor die
C	4-wire fan header

Figure 9. Thermal Sensor and Fan Headers

NOTE

Boards with AA number G23738-600 have a 3-wire system fan header. Boards with AA number G23738-800 (and later) have 3-wire and 4-wire fan headers.

For information about	Refer to
3-wire and 4-wire fan headers	http://www.intel.com/support/motherboards/desktop/sb/cs-012074.htm
Product Change Notification	http://qdms.intel.com/dm/d.aspx/82B7ABB2-832F-410F-89D4-9FF096699E18/PCN111258-02.pdf

1.13 Power Management

Power management is implemented at several levels, including:

- Software support through Advanced Configuration and Power Interface (ACPI)
- Hardware support:
  - Power connector
  - Fan header
  - LAN wake capabilities
  - Instantly Available PC technology
  - Wake from USB
  - Wake from serial port
  - PCI Express WAKE# signal support

1.13.1 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 10 on page 39)
- Support for a front panel power and sleep mode switch

Table 8 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 8. 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.

1.13.1.1 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 9 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 9. 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.

1.13.1.2 Wake-up Devices and Events

Table 10 lists the devices or specific events that can wake the computer from specific states.

Table 10. 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 (Note 1)	G1, G2 (Note 3)
USB	S3	G1
WAKE#	S3, S4, S5 (Note 1)	G1, G2 (Note 3)
Serial port	S3	G1

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.

NOTE

Boards with AA# G81515-900 or higher support ErP Lot 6, Tier 2 requirements through the 2-pin header at position J26. ErP Lot 6, Tier 2 support will disable all wake events in the S4 sleep state (hibernate) and the S5 sleep state except for the power button. The system will only wake from the S4 sleep state or the S5 sleep state with the power button. Removing the jumper from the header at position J26 will disable ErP Lot 6, Tier 2 support and will re-enable wake events.

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.

1.13.2 Hardware Support

The board provides several power management hardware features, including:

- Instantly Available PC technology
- Fan headers
- LAN wake capabilities
- Wake from USB
- WAKE# signal wake-up support
- Wake from serial port
- Wake from Power Button signal
- Standby Power Indicator LED

NOTE

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

1.13.2.1 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 13, page 47
The signal names of the internal power connector	Table 34, page 58

1.13.2.2 Fan Headers

The function/operation of the fan headers are as follows:

- The fan is on when the board is in the S0 state
- The fan is off when the board is off or in the S3, S4, or S5 state.
- The fan header is wired to a fan tachometer input of the hardware monitoring and fan control ASIC.
- The fan header supports closed-loop fan control that can adjust the fan speed as needed.
- The fan header has a +12 V DC connection.
- Supports 3-wire (voltage controlled) and 4-wire (Pulse Width Modulation controlled) fans.
  - Boards with AA number G23738-600 have a 3-wire system fan header.
  - Boards with AA number G23738-800 (and later) have 3-wire and 4-wire fan headers.

For information about	Refer to
The location of the fan headers	Figure 13, page 47
The location of the fan headers and sensor for thermal monitoring	Figure 9, page 36
3-wire and 4-wire fan headers	http://www.intel.com/support/motherboards/desktop/sb/cs-012074.htm
Product Change Notification	http://qdms.intel.com/dm/d.aspx/82B7ABB2-832F-410F-89D4-9FF096699E18/PCN111258-02.pdf

1.13.2.3 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.

1.13.2.4 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 10 on page 39 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.

1.13.2.5 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.

1.13.2.6 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.

1.13.2.7 Wake from Serial Port

Serial Port activity wakes the computer from an ACPI S3 state.

1.13.2.8 Wake from S5

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

1.13.2.9 Standby Power Indicator LED

The standby power indicator LED shows that power is still present even when the computer appears to be off. Figure 10 shows the location of the standby power LED.

CAUTION

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

Figure 10. Location of the Standby Power LED

2 Technical Reference

2.1 Memory Resources

2.1.1 Addressable Memory

The board utilizes 4 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 4 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 (2 Mbit)
- 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 11 shows a schematic of the system memory map. All installed system memory can be used when there is no overlap of system addresses.

Figure 11. Detailed System Memory Address Map

2.1.2 Memory Map

Table 11 lists the system memory map.

Table 11. System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
1024 K - 4194304 K	100000 - FFFFFFFF	4095 MB	Extended memory
960 K - 1024 K	F0000 - FFFFF	64 KB	Runtime BIOS
896 K - 960 K	E0000 - EFFFF	64 KB	Reserved
800 K - 896 K	C8000 - DFFFF	96 KB	Potential available high DOS memory (open to the PCI bus). Dependent on video adapter used.
640 K - 800 K	A0000 - C7FFF	160 KB	Video memory and BIOS
639 K - 640 K	9FC00 - 9FFFF	1 KB	Extended BIOS data (movable by memory manager software)
512 K - 639 K	80000 - 9FBFF	127 KB	Extended conventional memory
0 K - 512 K	00000 - 7FFFF	512 KB	Conventional memory

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 47 and page 49)

2.2.1 Back Panel Connectors

Figure 12 shows the location of the back panel connectors for the board.

Item	Description
A	DC input jack
B	USB ports
C	LAN connector
D	VGA connector
E	High-current/fast charging USB ports
F	HDMI connector
G	Analog line out
H	Microphone in

Figure 12. Back Panel Connectors

2.2.2 Connectors and Headers (Top)

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

Figure 13. Connectors and Headers (Top)

Table 12 lists the connectors and headers identified in Figure 13.

Table 12. Connectors and Headers Shown in Figure 13

Item/callout from Figure 13	Description	Connector Information	
		Board Connector	Mating Plug
A	Debug connector	1x11, 1.25mm-pitch	
B	System fan header	3-wire fan	
C	Internal power connector	Molex* 5566-2	Molex 5557-02R
D	SATA data connector	7-pin SATA (male)	7-pin SATA (female)
E	SATA power connector	15-pin SATA (male)	15-pin SATA (female)
F	PCI Express Half-Mini Card slot		
G	SATA data connector	7-pin SATA (male)	7-pin SATA (female)
H	Fan header	4-wire fan	
I	LVDS connector	ACES* 88341-40	ACES 88441-40 Starconn* 107F40
J	FPD brightness connector	Foxconn* HF5508	JWT* A2001H02-8P
K	Flat panel voltage selection header	2x3, 2.54mm-pitch	Jumper
L	Backlight inverter voltage selection header	2x3, 2.54mm-pitch	Jumper
M	Front panel header	2x5, 2.54mm-pitch	
N	Front panel audio header	2x5, 2.54mm-pitch	
O	Front panel dual-port USB header	2x5, 2.54mm-pitch	
P	Front panel dual-port USB header	2x5, 2.54mm-pitch	
Q	Serial port header	2x5, 2.54mm-pitch	
R	Serial port header	2x5, 2.54mm-pitch	
S	Parallel port header	2x13, 2.54mm-pitch	
T	DMIC header	1x5, 2.54mm-pitch	
U	PCI Express Full-/Half-Mini Card slot		
V	Custom Solutions header	2x4, 2.00mm-pitch	
W	PCI Express 1.0a x1 connector		
X	S/PDIF header	1x4, 2.54mm-pitch	
Y	Internal stereo speakers header	JS*-1125-04	JWT* A2001H02-4P

2.2.3 Connectors and Headers (Bottom)

Figure 14 shows the locations of the connectors and headers on the bottom-side of the board.

Figure 14. Connectors and Headers (Bottom)

Table 13 lists the connectors and headers identified in Figure 14.

Table 13. Connectors and Headers Shown in Figure 14

Item/callout from Figure 14	Description	Connector Information	
		Board Connector	Mating Plug
A	eDP connector	ACES 50203-040	ACES 88441-40 Starconn 107F40

2.2.3.1 Signal Tables for the Connectors and Headers

Table 14. Front Panel Audio Header for Intel HD Audio

Pin	Signal Name	Description
1	PORT_1L	Analog Port 1 – Left channel (Microphone)
2	GND	Ground
3	PORT_1R	Analog Port 1 – Right channel (Microphone)
4	PRESENCE#	Active low signal that signals BIOS that an Intel HD Audio dongle is connected to the analog header. PRESENCE#=0 when an Intel HD Audio dongle is connected
5	PORT_2R	Analog Port 2 – Right channel (Headphone)
6	SENSE1_RETURN	Jack detection return for front panel (JACK1)
7	SENSE_SEND	Jack detection sense line from the Intel HD Audio CODEC jack detection resistor network
8	KEY	No pin
9	PORT_2L	Analog Port 2 – Left channel (Headphone)
10	SENSE2_RETURN	Jack detection return for front panel (JACK2)

Table 15. Front Panel Audio Header for AC'97 Audio

Pin	Signal Name	Description
1	MIC	Front panel microphone input signal (biased when supporting stereo microphone)
2	AUD_GND	Ground used by analog audio circuits
3	MIC_BIAS	Microphone power / additional MIC input for stereo microphone support
4	PRESENCE#	Active low signal that signals BIOS that an Intel HD Audio dongle is connected to the analog header. PRESENCE#=0 when an Intel HD Audio dongle is connected
5	FP_OUT_R	Right channel audio signal to front panel (headphone drive capable)
6	AUD_GND	Ground used by analog audio circuits
7	RESERVED	Reserved
8	KEY	No pin
9	FP_OUT_L	Left channel audio signal to front panel (headphone drive capable)
10	AUD_GND	Ground used by analog audio circuits

Table 16. Internal Stereo Speakers Header

Pin	Signal Name	Description
1	Front_L−	Analog front left (differential negative)
2	Front_L+	Analog front left (differential positive)
3	Front_R+	Analog front right (differential positive)
4	Front_R−	Analog front right (differential negative)

Table 17. Internal S/PDIF Header

Pin	Signal Name	Description
1	GND	Ground
2	SPDIF_OUT	SPDIF signal from the codec
3	Key (no pin)	Key (no pin)
4	+5V_DC	5 V power (for optical/TOSLINK module)

Table 18. Internal DMIC Header

Pin	Signal Name	Description
1	+3.3 V	3.3 V power (for DMIC module)
2	DMIC_DATA	DMIC data signal
3	GND	Ground
4	DMIC_CLK	DMIC clock signal
5	Key (no pin)	Key (no pin)

Table 19. Front Panel USB Dual-Port 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

Table 20. Front Panel USB Dual-Port Header (with support for Intel Z-U130 USB Solid-State Drive or compatible device)

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	LED#

Table 21. Serial Port Headers

Pin	Signal Name	Pin	Signal Name
1	DCD (Data Carrier Detect)	2	RXD# (Receive Data)
3	TXD# (Transmit Data)	4	DTR (Data Terminal Ready)
5	Ground	6	DSR (Data Set Ready)
7	RTS (Request To Send)	8	CTS (Clear To Send)
9	RI (Ring Indicator)	10	Key (no pin)

Table 22. Parallel Port Header

Pin	Standard Signal Name	EPP Signal Name
1	STROBE#	WRITE#
2	AUTOFD#	DATASTB#
3	PD0	PD0
4	FAULT#	FAULT#
5	PD1	PD1
6	INT#	RESET#
7	PD2	PD2
8	SLCTIN#	ADDRSTB#
9	PD3	PD3
10	GROUND	GROUND
11	PD4	PD4
12	GROUND	GROUND
13	PD5	PD5
14	GROUND	GROUND
15	PD6	PD6
16	GROUND	GROUND
17	PD7	PD7
18	GROUND	GROUND
19	ACK#	INTR
20	GROUND	GROUND
21	BUSY	WAIT#
22	GROUND	GROUND
23	PERROR	PE
24	GROUND	GROUND
25	SELECT	SELECT
26	KEY (no pin)	KEY (no pin)

Table 23. SATA Connectors

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

Table 24. SATA Power Connector

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	12 V DC
14	12 V DC
15	12 V DC

Table 25. Custom Solutions Header

Pin	Signal Name
1	Watch Dog Timer
2	Ground
3	Key (no pin)
4	SMB_CLK_RESUME
5	3.3 V standby
6	SMB_DATA_RESUME
7	PWRBT#
8	HDMI CEC

Table 26. 3-Wire System Fan Header

Pin	Signal Name
1	Ground
2	+12 V (voltage controlled)
3	TACH

Table 27. 4-Wire Fan Header

Pin	Signal Name
1	Ground (Note)
2	+12 V
3	FAN_TACH
4	FAN_CONTROL

NOTE

Boards with AA number G23738-600 have a 3-wire system fan header. Boards with AA number G23738-800 (and later) have 3-wire and 4-wire fan headers.

For information about	Refer to
3-wire and 4-wire fan headers	http://www.intel.com/support/motherboards/desktop/sb/cs-012074.htm
Product Change Notification	http://qdms.intel.com/dm/d.aspx/82B7ABB2-832F-410F-89D4-9FF096699E18/PCN111258-02.pdf

Table 28. Flat Panel Voltage Selection Header

Pin	Signal Name	Description
1	Key	No pin
2	3.3 V	3.3 V option
3	12 V	12 V option
4	LCD_VCC	Send voltage to connector
5	Key	No pin
6	5 V	5 V option (default)

Table 29. Backlight Inverter Voltage Selection Header

Pin	Signal Name	Description
1	Key	No pin
2	5 V	5 V option
3	Vin	Board input voltage option (default)
4	BKLT_PWR	Send voltage to connector
5	Key	No pin
6	12 V	12 V option

Table 30. 40-Pin LVDS Connector

Pin	Signal Name	Pin	Signal Name
1	ODD_Lane3_P	21	N/C
2	ODD_Lane3_N	22	EDID_3.3 V
3	ODD_Lane2_P	23	LCD_GND
4	ODD_Lane2_N	24	LCD_GND
5	ODD_Lane1_P	25	LCD_GND
6	ODD_Lane1_N	26	ODD_CLK_P
7	ODD_Lane0_P	27	ODD_CLK_N
8	ODD_Lane0_N	28	BKLT_GND
9	EVEN_Lane3_P	29	BKLT_GND
10	EVEN_Lane3_N	30	BKLT_GND
11	EVEN_Lane2_P	31	EDID_CLK
12	EVEN_Lane2_N	32	BKLT_ENABLE
13	EVEN_Lane1_P	33	BKLT_PWM_DIM
14	EVEN_Lane1_N	34	EVEN_CLK_P
15	EVEN_Lane0_P	35	EVEN_CLK_N
16	EVEN_Lane0_N	36	BKLT_PWR
17	EDID_GND	37	BKLT_PWR
18	LCD_VCC	38	BKLT_PWR
19	LCD_VCC	39	N/C
20	LCD_VCC	40	EDID_DATA

NOTE

Single-channel LVDS panels must be wired to the "EVEN" channel of the LVDS connector on initial revisions of the Intel Desktop Board DN2800MT (G23738-600 and earlier), as opposed to the "ODD" channel expected by single-channel LVDS designs.

A future motherboard revision (G23738-800 and later) is planned to support single-channel LVDS connectivity out of the "ODD" channel.

Intel recommends that customers planning to use single-channel LVDS panels ensure cable wiring matches the target board revision.

Table 31. 40-Pin eDP Connector

Pin	Signal Name	Pin	Signal Name
1	NC_Reserved	21	LCD_VCC
2	High-speed_GND	22	LCD_Self_Test-or-NC
3	Lane3_N (DDPD_[3]N)	23	LCD_GND
4	Lane3_P (DDPD_[3]P)	24	LCD_GND
5	High-speed_GND	25	LCD_GND
6	Lane2_N (DDPD_[2]N)	26	LCD_GND
7	Lane2_P (DDPD_[2]P)	27	HPD (DDPD_HPD)
8	High-speed_GND	28	BKLT_GND
9	Lane1_N (DDPD_[1]N)	29	BKLT_GND
10	Lane1_P (DDPD_[1]P)	30	BKLT_GND
11	High-speed_GND	31	BKLT_GND
12	Lane0_N (DDPD_[0]N)	32	BKLT_ENABLE
13	Lane0_P (DDPD_[0]P)	33	BKLT_PWM_DIM
14	High-speed_GND	34	NC_Reserved
15	AUX_CH_P (DDPD_AUXP)	35	NC_Reserved
16	AUX_CH_N (DDPD_AUXN)	36	BKLT_PWR
17	High-speed_GND	37	BKLT_PWR
18	LCD_VCC	38	BKLT_PWR
19	LCD_VCC	39	BKLT_PWR
20	LCD_VCC	40	NC_Reserved

Table 32. 8-Pin FPD Brightness Connector

Pin	Signal Name	Description
1	BKLT_EN	Backlight enable
2	BKLT_PWM	Backlight control
3	BKLT_PWR	Backlight inverter power
4	BKLT_PWR	Backlight inverter power
5	BKLT_GND/Brightness_GND	Ground (shared)
6	BKLT_GND/Brightness_GND	Ground (shared)
7	Brightness_Up	Panel brightness increase
8	Brightness_Down	Panel brightness decrease

Table 33. 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	(mSATA) GND
38	USB_D+	

continued

Table 33. PCI Express Full-/Half-Mini Card Connector (continued)

Pin	Signal Name	Additional Signal Name
39	+3.3 V aux	(mSATA) 3.3 V
40	GND	
41	+3.3 V aux	(mSATA) 3.3 V
42	LED_WWAN#	
43	Reserved	NC (mSATA indicator)
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	+3.3 V aux	

2.2.3.2 Add-in Card Connectors

The board has the following add-in card connectors:

- One PCI Express 1.0a x1 connector. The x1 interface supports simultaneous transfer speeds up to 250 MB/s of peak bandwidth per lane, per direction, for up to 500 MB/s concurrent and bi-directional bandwidth.
- One PCI Express Half-Mini Card slot
- One PCI Express Full-/Half-Mini Card slot (removable stand-offs in full-length keep out zone allows repurposing of Full-Mini Card slot into Half-Mini Card slot)

2.2.3.3 Power Supply Connectors

The board supports wide-range voltage input by either of the following power supply types:

- **External Power Supply** – the board can be powered with an 8 - 19 VDC external power supply though the DC jack on the back panel. This connector accepts dual-barrel plugs with an inner diameter (ID) of 2.5 mm and an outer diameter (OD) of 5.5 mm, where the inner contact is +8 (±10%) through +19 (±10%) VDC and the shell is GND. The maximum current rating for this connector is 8 A.
- **Internal Power Supply** – the board can alternatively be powered via the internal 1 x 2 power connector, where pin 1 is GND and pin 2 is +8 (±10%) through +19 (±10%) VDC. The maximum current rating for this connector is 10 A.

Table 34. Internal Power Supply Connector Pinout

Pin	Signal Name
1	Ground
2	DC input: +8 (±10%) through +19 (±10%) VDC

For information about	Refer to
Power supply considerations	Section 2.6.1, page 69

2.2.3.4 Front Panel Header

This section describes the functions of the front panel header. Table 35 lists the signal names of the front panel header. Figure 15 is a connection diagram for the front panel header.

Table 35. 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 15. Connection Diagram for Front Panel Header

2.2.3.4.1 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.

2.2.3.4.2 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.

2.2.3.4.3 Power/Sleep LED Header

Pins 2 and 4 can be connected to a one- or two-color LED. Table 36 shows the possible LED states.

Table 36. 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 36 is default – other patterns may be set via BIOS setup.

2.2.3.4.4 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 switch on or off. (The time requirement is due to internal debounce circuitry on the board.) At least two seconds must pass before the board will recognize another on/off signal.

2.2.3.5 Front Panel USB Headers

Figure 16 is a connection diagram for the front panel USB headers.

NOTE

- *The +5 V DC power on the USB headers is fused.*
- *Use only a front panel USB connector that conforms to the USB 2.0 specification for high-speed USB devices.*

Figure 16. Connection Diagram for Front Panel USB Dual-Port Header

Figure 17. Connection Diagram for Front Panel USB Dual-Port Header (with Intel Z-U130 USB Solid-State Drive, or Compatible Device, Support)

2.2.3.6 Debug Header

During the POST, the BIOS generates diagnostic progress codes (POST codes) to I/O port 80h. If the POST fails, execution stops and the last POST code generated is left at port 80h. This code is useful for determining the point where an error occurred.

Displaying the POST codes requires a POST card that can interface with the Debug header. The POST card can decode the port and display the contents on a medium such as a seven-segment display.

Table 37. Debug Header

Pin	Signal Name
1	VCC3
2	VCC3
3	PLTRST#
4	LPC_CLK
5	LAD0/FWH0
6	LAD1/FWH1
7	LAD2/FWH2
8	LAD3/FWH3
9	LFRAME/FWH4#
10	GND
11	GND

2.2.3.7 Custom Solutions Header

The Customs Solution header is provided to aid customers in developing unique applications.

- WDTO#: indicates when the Watchdog Timer in the Super I/O device has expired. This is a general purpose implementation that can be wired to external systems (i.e., industrial control, etc.) or to the reset pin on the board (if the intended use is to reset the board). Intel can provide sample code for customers who write their own applications that require Watchdog Timer support.
- SMB_CLK and SMB_DATA: SMBus interface, reserved for Intel use. General SMBus information can be found on the platform EDS and at http://smbus.org/specs/.
- 3.3 V Standby: can be used to monitor the presence of 3.3 V standby power (functions in the same manner as the 3.3 V standby power LED).
- PWRBT#: power button signal (functions in the same manner as the power button pin on the front panel header).
- HDMI Consumer Electronics Control (CEC): standard communication signal from the HDMI connector (http://www.hdmi.org/) - the signal is exposed through the Custom Solutions header for third party solutions to monitor/control CEC activity between multiple HDMI devices.

2.3 I/O Shields

Two I/O shields are provided with the board:

- Half-height I/O shield
- Standard-height I/O shield

The half-height I/O shield allows access to all back panel connectors while being specifically designed for thin mini-ITX chassis, compliant with version 2.0 of the *Mini-ITX Addendum to the microATX Motherboard Interface Specification*.

The standard-height I/O shield provides access to all the same connectors as the half-height I/O shield while being compatible with standard mini-ITX and microATX chassis. In addition to the F-type pre-cut hole, the standard-height I/O shield also provides pre-cut holes for user installation of two external wireless antennas for system configurations with wireless PCI Express Mini Card solutions.

Figure 18 and Figure 19 are I/O shield reference diagrams.

Figure 18. Half-Height Back Panel I/O Shield

Figure 19. Standard-Height Back Panel I/O Shield

For more information about	Refer to
Thin mini-ITX form factor	http://www.formfactors.org/developer%5Cspecs%5CMini_ITX_Spec_V2_0.pdf

2.4 Jumper Block

CAUTION

Do not move the 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 20 shows the location of the jumper block. The 3-pin jumper block determines the BIOS Setup program's mode. Table 38 describes the 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 20. Location of the Jumper Block

Table 38. 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.

2.5 Mechanical Considerations

2.5.1 Form Factor

The board is designed to fit into a Mini-ITX form-factor chassis. Figure 21 illustrates the mechanical form factor for the board. Dimensions are given in inches [millimeters]. The outer dimensions are 6.7 inches by 6.7 inches [170.18 millimeters by 170.18 millimeters]. Location of the I/O connectors and mounting holes are in compliance with the ATX specification.

NOTE

The board is designed to have a total height of less than 20 mm from the underside of the board to the top of its tallest components, including all back panel I/O ports, internal connectors, installed system memory, and factory-installed thermal solutions, in compliance with thin mini-ITX requirements per version 2 of the Mini-ITX Addendum to the microATX Motherboard Interface Specification.

For more information about	Refer to
Thin mini-ITX form factor	http://www.formfactors.org/developer%5Cspecs%5CMini_ITX_Spec_V2_0.pdf

Figure 21. Board Dimensions

2.5.2 Board 3D View

The Intel Desktop Board DN2800MT has a 3D view as shown in Figure 22.

Figure 22. 3D View of Intel Desktop Board DN2800MT

NOTE

Adobe Acrobat* Pro or Adobe Reader, version 8.1 or later, is required for interactive 3D view. Use mouse controls in the 3D view to manipulate the drawing, as follows:*

- *mouse wheel for zoom in/out*
- *click-and-drag for rotation*
- *right-click and "Full Screen Multimedia" for full-screen mode*
- *right-click for other tools…*

2.6 Electrical Considerations

2.6.1 Power Supply Considerations

CAUTION

The external DC jack is the primary power input connector of Intel Desktop Board DN2800MT. However, the desktop board also provides an internal 1 x 2 power connector that can be used in custom-developed systems that have an internal power supply.

There is no isolation circuitry between the external 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 DC jack is covered if the internal 1 x 2 power connector is to be used. A plastic lid for the external DC jack is provided in the accessories box shall it be useful to the system integrator for this purpose.

Simultaneous connection of both external and internal power supply units could result in potential damage to the desktop 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. Table 39 lists example power consumption from both the board and typical system-level components.

Table 39. Typical System-Level Power Consumption Figures

	Max Power Rating (W)	Power Req[1] (W)	Entry-Level Slim Desktop		Entry-Level AiO	
			Util	Budget (W)	Util	Budget (W)
6.5 W processor	6.5	8.1	95%	7.7	95%	7.7
PCH	5	6.3	75%	4.7	75%	4.7
LCD w/LED backlight	25	31.3			95%	29.7
2 x SODIMM[2]	4	5.0	95%	4.8	95%	4.8
2 x USB2 (high current)[3]	10	12.5	58%	7.2	58%	7.2
6 x USB2 (std current)[4]	15	18.8	30%	5.6	30%	5.6
PCIe* HMC[5]	5	6.3	10%	0.6	10%	0.6
PCIe FMC[6]	5	6.3	5%	0.3	5%	0.3
PCIe x1	10	12.5				
SATA power[7]	26.2	32.7	29%	9.4	29%	9.4
LAN, audio, other ICs	5	6.3	95%	5.9	95%	5.9
Speakers	6	7.5			100%	7.5
System fan	3.6	4.5	100%	4.5	100%	4.5
Total System Power				**50.7**		**87.9**

NOTE

1. Power requirement estimated for 80% VR efficiency.
2. 4W assumption based on varying memory sizes/power consumption (typical for board max of 4GB).
3. 58% utilization for back panel USB (high current) refers to current draw of 500 mA on port 3 and 1.0 A on port 4.
4. 30% utilization for USB (std current) refers to current draw of 100 mA on backpanel ports 1-2 and internal header ports 5-6, as well as 250 mA on internal header ports 7-8.
5. 10% utilization for Half-Mini Card refers to ~500 mW Wi-Fi card power consumption.
6. 5% utilization for Full-Mini Card refers to ~250 mW mSATA power consumption.
7. 29% utilization for SATA refers to ~5 W slim ODD and ~2.5 W HDD (2.5”) power consumption.

2.6.2 Fan Header Current Capability

Table 40 lists the current capability of the fan header.

Table 40. Fan Header Current Capability

Fan Header	Maximum Available Current
3-wire system fan	1.5 A
4-wire fan	2.0 A

2.6.3 PCI Express* Add-in Card Considerations

The motherboard is designed to provide up to 10 W to the PCI Express x1 slot. The total power consumption from add-in boards on this slot must not exceed this rating.

2.7 Thermal Considerations

CAUTION

For fanless operation, a chassis with adequate venting holes to enable fanless cooling of all board- and system-level components is required.

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 and especially the internal chassis temperatures do not exceed the board's maximum operating temperatures. Failure to do so could cause components to exceed their maximum case temperature and malfunction. For information about the maximum operating temperatures, see the environmental specifications in Section 2.9.

CAUTION

Ensure that proper airflow is maintained in the processor voltage regulator circuit. Failure to do so may result in damage to the voltage regulator circuit. The processor voltage regulator area (shown in Figure 23) can reach a temperature of up to 85 °C in an open chassis.

Figure 23 shows the locations of the localized high temperature zones.

Item	Description
A	Intel NM10 Express Chipset
B	Processor voltage regulator area
C	Processor socket

Figure 23. Localized High Temperature Zones

Table 41 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 41. Thermal Considerations for Various Components and Subsystems

Component	Maximum Case Temperature
Processor	For processor case temperature, see processor datasheets and processor specification updates
Intel NM10 Express Chipset	115 °C
Voltage regulator subsystem	85 °C
Serial port transceivers	85 °C
mSATA/PCIe multiplexer	85 °C
SuperIO device	85 °C
Audio codec device	85 °C
LAN subsystem	85 °C
eDP/LVDS subsystem	85 °C
DC-to-DC subsystem	85 °C
USB subsystem	85 °C
SO-DIMMs (typical)	85 °C

2.7.1 Chassis Design Guideline

The pin fin heatsink design used on this board will be able to dissipate up to 6.5 W of processor power in most fanless chassis. This board is targeted for 1-3 liters volumetric or larger in slim desktop or All-in-One configurations, vertically or horizontally oriented thin mini-ITX chassis

For best thermal performance, it is recommended to have a system fan providing reasonable airflow directly over all the major components on the board. The pin fin heatsink is designed to have the best thermal performance when airflow direction is parallel to the heatsink fins. It is highly recommended that cables and chassis hardware do not block the direction of the airflow towards the processor, memory or other components.

The processor on the board will generate the highest amount of heat, leading to high ambient temperature within the chassis. If available, the system fan should be located near the board region in order to effectively regulate airflow (see Figure 24). A system fan located further away from the board region, i.e., at the optical disk drive or hard disk drive region, will be less effective in controlling the local ambient temperature. Regardless of where the system fan is located, maximum inner chassis temperature must not exceed the maximum operating temperature as defined in the environmental specifications in Section 2.9. Chassis inlet vents should also provide adequate openings for airflow to pass through. By using the built-in pin fin heatsink, most chassis with a system fan should have inner chassis temperature safely below the specified limit.

Figure 24. Fan Location Guide for Chassis Selection (Chassis Orientation is Not Restricted)

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 ºC ambient. The MTBF prediction is used to estimate repair rates and spare parts requirements. The MTBF for the board is 319,009 hours.

2.9 Environmental

Table 42 lists the environmental specifications for the board.

Table 42. Environmental Specifications

Parameter	Specification		
Temperature			
Non-Operating	-20 °C to +70 °C		
Operating (ambient, outside chassis)	0 °C to +35 °C		
Operating (inside chassis)	0 °C to +55 °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		

NOTE

Maximum operating temperatures based on fanless chassis configuration (tests performed with Morex T-1620 thin-mITX chassis).*

3 Overview of BIOS Features

3.1 Introduction

The board uses an Intel 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 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.

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 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. The menu bar is shown below.

Maintenance	**Main**	**Configuration**	**Security**	**Power**	**Boot**	**Exit**

NOTE

The maintenance menu is displayed only when the board is in configure mode. Section 2.4 on page 64 shows how to put the board in configure mode.

Table 43 lists the BIOS Setup program menu features.

Table 43. BIOS Setup Program Menu Bar

Maintenance	Main	Configuration	Security	Power	Boot	Exit
Clears passwords and displays processor information	Displays processor and memory configuration	Configures advanced features available through the chipset	Sets passwords and security features	Configures power management features and power supply controls	Selects boot options	Saves or discards changes to Setup program options

Table 44 lists the function keys available for menu screens.

Table 44. BIOS Setup Program Function Keys

BIOS Setup Program Function Key	Description
<←> or <→>	Selects a different menu screen (Moves the cursor left or right)
<↑> or <↓>	Selects an item (Moves the cursor up or down)
<Tab>	Selects a field (Not implemented)
<Enter>	Executes command or selects the submenu
<F9>	Load the default configuration values for the current menu
<F10>	Save the current values and exits the BIOS Setup program
<Esc>	Exits the menu

3.2 BIOS Flash Memory Organization

The Serial Peripheral Interface Flash Memory (SPI Flash) includes a 16 Mbit (2048 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	http://developer.intel.com/design/motherbd/software/itk/
Additional Intel® software tools	http://developer.intel.com/design/motherbd/software.htm

3.6 BIOS Recovery

It is unlikely that anything will interrupt a BIOS update; however, if an interruption occurs, the BIOS could be damaged. Table 45 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 45. 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 Optical Drive Boot

Booting from the optical drive is supported in compliance to the El Torito bootable CD-ROM format specification. Under the Boot menu in the BIOS Setup program, the optical drive is listed as a boot device. Boot devices are defined in priority order. Accordingly, if there is not a bootable CD in the optical drive, the system will attempt to boot from the next defined drive.

3.7.2 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.

3.7.3 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

3.7.4 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 46 lists the boot device menu options.

Table 46. 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 Adjusting Boot Speed

These factors affect system boot speed:

- Selecting and configuring peripherals properly
- Optimized BIOS boot parameters
- Enabling the new Fast Boot feature

3.8.1 Peripheral Selection and Configuration

The following techniques help improve system boot speed:

- Choose a hard drive with parameters such as "power-up to data ready" in less than eight seconds that minimizes hard drive startup delays.
- Select a CD-ROM drive with a fast initialization rate. This rate can influence POST execution time.
- Eliminate unnecessary add-in adapter features, such as logo displays, screen repaints, or mode changes in POST. These features may add time to the boot process.
- Try different monitors. Some monitors initialize and communicate with the BIOS more quickly, which enables the system to boot more quickly.

3.9 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 16 characters in length.

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

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

Table 47 shows the effects of setting the Hard Disk Drive Passwords.

Table 47. 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 DN2800MT, 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 SATA port or computer that does not support Hard Disk Drive Password Security feature, the drive will not be accessible.

3.10 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 16 characters in length.

Table 48 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 48. 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 Beep Codes

4.1 Speaker

Audible error code (beep code) information during POST is routed to the audio codec and can be heard through attached speakers.

4.2 BIOS Beep Codes

Whenever a recoverable error occurs during POST, the BIOS causes the board's speaker to beep an error message describing the problem (see Table 49).

Table 49. BIOS Beep Codes

Type	Pattern	Frequency
BIOS update in progress	None	
Video error (Note)	On-off (1.0 second each) two times, then 2.5-second pause (off), entire pattern repeats (beeps and pause) once and the BIOS will continue to boot.	932 Hz 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 (beeps and pause) until the system is powered off.	932 Hz
Thermal trip warning	Alternate high and low beeps (1.0 second each) for eight beeps, followed by system shut down.	High beep 2000 Hz Low beep 1500 Hz

Note: Disabled per default BIOS setup option.

4.3 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 50).

Table 50. 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.

4.4 BIOS Error Messages

Table 51 lists the error messages and provides a brief description of each.

Table 51. 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.

4.5 Port 80h POST Codes

During the POST, the BIOS generates diagnostic progress codes (POST codes) to I/O port 80h. If the POST fails, execution stops and the last POST code generated is left at port 80h. This code is useful for determining the point where an error occurred.

Displaying the POST codes requires a POST card that can interface with the Debug header. The POST card can decode the port and display the contents on a medium such as a seven-segment display. Refer to the location of the Debug header in Figure 1.

The following tables provide information about the POST codes generated by the BIOS:

- Table 52 lists the Port 80h POST code ranges
- Table 53 lists the Port 80h POST codes themselves
- Table 54 lists the Port 80h POST sequence

NOTE

In the tables listed above, all POST codes and range values are listed in hexadecimal.

Table 52. Port 80h POST Code Ranges

Range	Subsystem
0x00 – 0x05	Entering SX states S0 to S5.
0x10, 0x20, 0x30	Resuming from SX states (0x10 –0x20 – S2, 0x30 – S3, etc.)
0x11 – 0x1F	PEI phase pre MRC execution
0x21 – 0x29	MRC memory detection
0x2A – 0x2F	PEI phase post MRC execution
0x31 – 0x35	Recovery
0x36 – 0x3F	Platform DXE driver
0x41 – 0x4F	CPU Initialization (PEI, DXE, SMM)
0x50 – 0x5F	I/O Buses: PCI, USB, ATA etc. 0x5F is an unrecoverable error. Start with PCI.
0x60 – 0x6F	BDS
0x70 – 0x7F	Output devices: All output consoles.
0x80 – 0x8F	For future use
0x90 – 0x9F	Input devices: Keyboard/Mouse.
0xA0 – 0xAF	For future use
0xB0 – 0xBF	Boot Devices: Includes fixed media and removable media. Not that critical since consoles should be up at this point.
0xC0 – 0xCF	For future use
0xD0 – 0xDF	For future use

Table 53. Port 80h POST Codes

Port 80 Code	Progress Code Enumeration
	ACPI S States
0x00,0x01,0x02,0x03,0x04,0x05	Entering S0, S2, S3, S4, or S5 state
0x10,0x20,0x30	Resuming from S2, S3, S4, or S5 state
	PEI Platform driver
0x11	Set boot mode, GPIO init
0x12	Early chipset register programming
0x13	Basic chipset init
0x14	LAN init
0x15	Exit early platform init driver
	PEI SMBUS
0x16	SMBUS driver init
0x17	Entry to SMBUS execute read/write
0x18	Exit SMBUS execute read/write
	Memory
0x21	MRC entry point
0x24	Detecting presence of memory DIMMs
0x25	Override Detected DIMM settings
0x27	Configuring memory
0x28	Testing memory
	PEIMs/Recovery
0x31	Crisis Recovery has initiated
0x33	Loading recovery capsule
0x34	Start recovery capsule / valid capsule is found
	CPU PEI Phase
0x41	Begin CPU PEI Init
0x42	XMM instruction enabling
0x43	End CPU PEI Init
	CPU PEI SMM Phase
0x44	Begin CPU SMM Init smm relocate bases
0x45	Smm relocate bases for APs
0x46	End CPU SMM Init
	CPU DXE Phase
0x47	CPU DXE Phase begin
0x48	Refresh memory space attributes according to MTRRs
0x49	Load the microcode if needed
0x4A	Initialize strings to HII database
0x4B	Initialize MP support
0x4C	CPU DXE Phase End

continued

Table 53. Port 80h POST Codes (continued)

Port 80 Code	Progress Code Enumeration
	CPU DXE SMM Phase
0x4D	CPU DXE SMM Phase begin
0x4E	Relocate SM bases for all APs
0x4F	CPU DXE SMM Phase end
	I/O BUSES
0x50	Enumerating PCI buses
0x51	Allocating resources to PCI bus
0x52	Hot Plug PCI controller initialization
	USB
0x58	Resetting USB bus
0x59	Reserved for USB
	ATA/ATAPI/SATA
0x5A	Resetting PATA/SATA bus and all devices
0x5B	Reserved for ATA
	BDS
0x60	BDS driver entry point initialize
0x61	BDS service routine entry point (can be called multiple times)
0x62	BDS Step2
0x63	BDS Step3
0x64	BDS Step4
0x65	BDS Step5
0x66	BDS Step6
0x67	BDS Step7
0x68	BDS Step8
0x69	BDS Step9
0x6A	BDS Step10
0x6B	BDS Step11
0x6C	BDS Step12
0x6D	BDS Step13
0x6E	BDS Step14
0x6F	BDS return to DXE core (should not get here)
	Keyboard (PS/2 or USB)
0x90	Resetting keyboard
0x91	Disabling the keyboard
0x92	Detecting the presence of the keyboard
0x93	Enabling the keyboard
0x94	Clearing keyboard input buffer
0x95	Instructing keyboard controller to run Self Test (PS/2 only)

continued

Table 53. Port 80h POST Codes (continued)

Port 80 Code	Progress Code Enumeration
	Mouse (PS/2 or USB)
0x98	Resetting mouse
0x99	Detecting mouse
0x9A	Detecting presence of mouse
0x9B	Enabling mouse
	Fixed Media
0xB0	Resetting fixed media
0xB1	Disabling fixed media
0xB2	Detecting presence of a fixed media (IDE hard drive detection etc.)
0xB3	Enabling/configuring a fixed media
	Removable Media
0xB8	Resetting removable media
0xB9	Disabling removable media
0xBA	Detecting presence of a removable media (IDE, CDROM detection etc.)
0xBC	Enabling/configuring a removable media
	DXE Core
0xE4	Entered DXE phase
	BDS
0xE7	Waiting for user input
0xE8	Checking password
0xE9	Entering BIOS setup
0xEB	Calling Legacy Option ROMs
	Runtime Phase/EFI OS Boot
0xF8	EFI boot service ExitBootServices ( ) has been called
0xF9	EFI runtime service SetVirtualAddressMap ( ) has been called

Table 54. Typical Port 80h POST Sequence

POST Code	Description
24	Detecting presence of memory DIMMs
27	Configuring memory
28	Testing memory
33	Loading recovery capsule
E4	Entered DXE phase
50	Enumerating PCI buses
51	Allocating resourced to PCI bus
92	Detecting the presence of the keyboard
90	Resetting keyboard
94	Clearing keyboard input buffer
95	Keyboard Self Test
EB	Calling Video BIOS
58	Resetting USB bus
5A	Resetting PATA/SATA bus and all devices
92	Detecting the presence of the keyboard
90	Resetting keyboard
94	Clearing keyboard input buffer
5A	Resetting PATA/SATA bus and all devices
28	Testing memory
90	Resetting keyboard
94	Clearing keyboard input buffer
E7	Waiting for user input
00	Ready to boot

5 Regulatory Compliance and Battery Disposal Information

5.1 Regulatory Compliance

This section contains the following regulatory compliance information for Intel Desktop Board DN2800MT:

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

5.1.1 Safety Standards

Intel Desktop Board DN2800MT complies with the safety standards stated in Table 55 when correctly installed in a compatible host system.

Table 55. 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® Desktop Board DN2800MT is in conformity with all applicable essential requirements necessary for CE marking, following the provisions of the European Council Directive 2004/108/EC (EMC Directive), 2006/95/EC (Low Voltage Directive), and 2002/95/EC (ROHS Directive).

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

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

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

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

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

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

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

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

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

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

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

Icelandic Þessi vara 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: lead solder on the printed wiring board assembly.

5.1.3.2 Recycling Considerations

As part of its commitment to environmental responsibility, Intel has implemented the Intel Product Recycling Program to allow retail consumers of Intel's branded products to return used products to selected locations for proper recycling.

Please consult the http://www.intel.com/intel/other/ehs/product_ecology for the details of this program, including the scope of covered products, available locations, shipping instructions, terms and conditions, etc.

中文

作为其对环境责任之承诺的部分，英特尔已实施 Intel Product Recycling Program（英特尔产品回收计划），以允许英特尔品牌产品的零售消费者将使用过的产品退还至指定地点作恰当的重复使用处理。

请参考http://www.intel.com/intel/other/ehs/product_ecology
了解此计划的详情，包括涉及产品之范围、回收地点、运送指导、条款和条件等。

Deutsch

Als Teil von Intels Engagement für den Umweltschutz hat das Unternehmen das Intel Produkt-Recyclingprogramm implementiert, das Einzelhandelskunden von Intel Markenprodukten ermöglicht, gebrauchte Produkte an ausgewählte Standorte für ordnungsgemäßes Recycling zurückzugeben.

Details zu diesem Programm, einschließlich der darin eingeschlossenen Produkte, verfügbaren Standorte, Versandanweisungen, Bedingungen usw., finden Sie auf der http://www.intel.com/intel/other/ehs/product_ecology

Español

Como parte de su compromiso de responsabilidad medioambiental, Intel ha implantado el programa de reciclaje de productos Intel, que permite que los consumidores al detalle de los productos Intel devuelvan los productos usados en los lugares seleccionados para su correspondiente reciclado.

Consulte la http://www.intel.com/intel/other/ehs/product_ecology para ver los detalles del programa, que incluye los productos que abarca, los lugares disponibles, instrucciones de envío, términos y condiciones, etc.

Français

Dans le cadre de son engagement pour la protection de l'environnement, Intel a mis en œuvre le programme Intel Product Recycling Program (Programme de recyclage des produits Intel) pour permettre aux consommateurs de produits Intel de recycler les produits usés en les retournant à des adresses spécifiées.

Visitez la page Web http://www.intel.com/intel/other/ehs/product_ecology pour en savoir plus sur ce programme, à savoir les produits concernés, les adresses disponibles, les instructions d'expédition, les conditions générales, etc.

日本語

インテルでは、環境保護活動の一環として、使い終えたインテル
ブランド製品を指定の場所へ返送していただき、リサイクルを適切に行えるよう、インテル製品リサイクル
プログラムを発足させました。

対象製品、返送先、返送方法、ご利用規約など、このプログラムの詳細情報は、http://www.intel.com/intel/other/ehs/product_ecology（英語）をご覧ください。

Malay

Sebagai sebahagian daripada komitmennya terhadap tanggungjawab persekitaran, Intel telah melaksanakan Program Kitar Semula Produk untuk membenarkan pengguna-pengguna runcit produk jenama Intel memulangkan produk terguna ke lokasi-lokasi terpilih untuk dikitarkan semula dengan betul.

Sila rujuk http://www.intel.com/intel/other/ehs/product_ecology untuk mendapatkan butir-butir program ini, termasuklah skop produk yang dirangkumi, lokasi-lokasi tersedia, arahan penghantaran, terma & syarat, dsb.

Portuguese

Como parte deste compromisso com o respeito ao ambiente, a Intel implementou o Programa de Reciclagem de Produtos para que os consumidores finais possam enviar produtos Intel usados para locais selecionados, onde esses produtos são reciclados de maneira adequada.

Consulte o site http://www.intel.com/intel/other/ehs/product_ecology (em Inglês) para obter os detalhes sobre este programa, inclusive o escopo dos produtos cobertos, os locais disponíveis, as instruções de envio, os termos e condições, etc.

Russian

В качестве части своих обязательств к окружающей среде, в Intel создана программа утилизации продукции Intel (Product Recycling Program) для предоставления конечным пользователям марок продукции Intel возможности возврата используемой продукции в специализированные пункты для должной утилизации.

Пожалуйста, обратитесь на веб-сайт http://www.intel.com/intel/other/ehs/product_ecology за информацией об этой программе, принимаемых продуктах, местах приема, инструкциях об отправке, положениях и условиях и т.д.

Türkçe

Intel, çevre sorumluluğuna bağımlılığının bir parçası olarak, perakende tüketicilerin Intel markalı kullanılmış ürünlerini belirlenmiş merkezlere iade edip uygun şekilde geri dönüştürmesini amaçlayan Intel Ürünleri Geri Dönüşüm Programı'nı uygulamaya koymuştur.

Bu programın ürün kapsamı, ürün iade merkezleri, nakliye talimatları, kayıtlar ve şartlar v.s dahil bütün ayrıntılarını ögrenmek için lütfen http://www.intel.com/intel/other/ehs/product_ecology

Web sayfasına gidin.

5.1.4 EMC Regulations

Intel Desktop Board DN2800MT complies with the EMC regulations stated in Table 56 when correctly installed in a compatible host system.

Table 56. 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.

NOTE

Intel Desktop Board DN2800MT, with an LVDS interface enabled, has not yet been tested as part of a complete AiO system and has not passed the FCC's cover off test. The end user is responsible for obtaining the final EMC approvals for the end system in which the Intel Desktop Board DN2800MT is used.

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 e-Standby and ErP Compliance

Intel Desktop Board DN2800MT meets the following program requirements in an adequate system configuration, including appropriate selection of an efficient power supply:

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

NOTE

Boards with AA# G81515-900 or higher support ErP Lot 6, Tier 2 requirements through the 2-pin header at position J26. ErP Lot 6, Tier 2 support will disable all wake events in the S4 sleep state (hibernate) and the S5 sleep state except for the power button. The system will only wake from the S4 sleep state or the S5 sleep state with the power button. Removing the jumper from the header at position J26 will disable ErP Lot 6, Tier 2 support and will re-enable wake events.

For information about	Refer to
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 Desktop Board DN2800MT has the regulatory compliance marks shown in Table 57.

Table 57. Regulatory Compliance Marks

Description	Mark
UL joint US/Canada Recognized Component mark. Includes adjacent UL file number for Intel Desktop Boards: E210882.	
FCC Declaration of Conformity logo mark for Class B equipment.	
CE mark. Declaring compliance to the European Union (EU) EMC directive, Low Voltage directive, and RoHS directive.	
Australian Communications Authority (ACA) and New Zealand Radio Spectrum Management (NZ RSM) C-tick mark. Includes adjacent Intel supplier code number, N-232.	
Japan VCCI (Voluntary Control Council for Interference) mark.	
Korea Certification mark. Includes an adjacent KCC (Korean Communications Commission) certification number: KCC-REM-CPU-DN2800MT.	
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 Desktop Boards and associated collateral. The color of the mark may vary depending upon the application. The Environmental Friendly Usage Period (EFUP) for Intel Desktop Boards has been determined to be 10 years.	

5.2 Battery Disposal Information

CAUTION

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

PRÉCAUTION

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

FORHOLDSREGEL

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。使用後の電池を廃棄する際には、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 การทิ้งแบตเตอรี่ใช้แล้วต้องเป็นไปตามกฎข้อบังคับด้านสิ่งแวดล้อมของท้องถิ่น.

UYARI

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

ОСТОРОГА

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

UPOZORNĚNÍ

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

ETTEVAATUST

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

FIGYELMEZTETÉS

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

UZMANĪBU

Pastāv eksplozijas risks, ja baterijas tiek nomainītas ar nepareiza veida baterijām. Ja iespējams, baterijas vajadzētu nodot attiecīgos pieņemšanas 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.