Intel® Desktop Board DG45FC

Specification Update

Revision History

Revision	Revision History	Date
-001	This document is the first Specification Update for the Intel® Desktop Board DG45FC	June 2008
-002	Updated the General Information and Specification Changes Sections	September 2008
-003	Updated the General Information Section	March 2009
-004	Updated the Specification Changes Section	July 2009
-005	Updated the General Information Section	August 2009
-006	Updated the General Information Section	May 2010
-007	Updated the General Information Section	July 2010

Contents

Specification Update for the Intel® Desktop Board DG45FC

This document is an update to the specifications contained in the *Intel® Desktop Board DG45FC Technical Product Specification* (Order Number E35964). It is intended for hardware system manufacturers and software developers of applications, operating systems, or tools. It will contain Specification Changes, Errata, Specification Clarifications, and Documentation Changes.

For specification updates concerning the Intel processor that may apply to this desktop board, refer to the following:

- *Intel® Core™2 Duo Processor E8000Δ and E7000Δ Series Datasheet* (Order Number 318733)
- *Intel® Core™2 Extreme Processor X6800Δ and Intel® Core™2 Duo Desktop Processor E6000Δ and E4000Δ Sequences Datasheet* (Order Number 313279)
- *Intel® Pentium® Dual-Core Desktop Processor E2000Δ Series Datasheet* (Order Number 316982)
- *Intel® Celeron® Dual-Core Processor E1000Δ Series Specification Update* (Order Number 318925)
- *Intel® Celeron® Processor 400Δ Sequence Specification Update* (Order Number 316964)
- *Dual-Core Intel® Xeon® Desktop Processor E3110Δ Series Datasheet* (Order Number 319006)
- *Dual-Core Intel® Xeon® Desktop Processor E3000Δ Series Datasheet* (Order Number 314916)

Unless otherwise noted in this document, it should be assumed that any processor errata for a given stepping are applicable to the Altered Assembly (AA) revision(s) associated with that stepping.

Refer to the *Intel® 4 Series Chipset Family Specification Update* (Order Number 319971) for specification updates concerning the 82G45 GMCH Controller and that may apply to the desktop board DG45FC. Unless otherwise noted in this document, it should be assumed that any MCH errata for a given stepping are applicable to the Altered Assembly (AA) revision(s) associated with that stepping.

Refer to the *Intel® I/O Controller Hub (ICH10R) Family Specification Update* (Order Number 319974) for specification updates concerning the 82801JIR I/O Controller Hub and that may apply to the desktop board DG45FC. Unless otherwise noted in this document, it should be assumed that any ICH10R errata for a given stepping are applicable to the Altered Assembly (AA) revision(s) associated with that stepping.

Terminology

Specification Changes are modifications to the current published specifications. These changes will be incorporated in the next release of the specifications.

Errata are design defects or errors. Characterized errata may cause the desktop board behavior to deviate from published specifications. Hardware and software designed to be used with any given Altered Assembly (AA) and BIOS revision level must assume that all errata documented for that AA and BIOS revision level are present on all desktop boards.

Specification Clarifications describe a specification in greater detail or further highlight a specification's impact to a complex design situation. These clarifications will be incorporated in the next release of the specifications.

Documentation Changes include typos, errors, or omissions from the current published specifications. These changes will be incorporated in the next release of the specifications.

General Information

Basic Desktop Board DG45FC Identification Information

AA Revision	BIOS Revision	Notes
E27730-305	IDG4510H.86A.0075	1,2
E27730-306	IDG4510H.86A.0075	1,2
E27730-307	IDG4510H.86A.0075	1,2
E27730-308	IDG4510H.86A.0097	1,2
E27730-309	IDG4510H.86A.0127	1,2
E27730-310	IDG4510H.86A.0127	1,2

Notes:

1. The AA number is found on a small label on the component side of the board.
2. The X48 Chipset kit used on this AA revision consists of two components as follows:

Device	Stepping	S-Spec Numbers
82G45	A3	LB84
82801JIR	A0	LB8S

Summary Table of Changes

The following table indicates the Specification Changes, Errata, Specification Clarifications, or Documentation Changes that apply to the Intel® Desktop Board DG45FC. Intel intends to fix some of the errata in a future revision of the desktop board, and to account for the other outstanding issues through documentation or specification changes as noted. This table uses the following notations:

Codes Used in Summary Table

Doc:	Document change or update that will be implemented.
PlanFix:	This erratum may be fixed in a future revision of the desktop board, driver, or BIOS.
Fixed:	This erratum has been previously fixed.
NoFix:	There are no plans to fix this erratum.
Shaded:	This erratum is either new or modified from the previous version of the document.

No.	Plans	Specification Changes
1	Doc	Added a *Caution* statement to Section 2.6 Thermal Considerations
2	Doc	Added changes to the *Thermal Considerations for Components* table and added text and a new table, *Tcontrol Values for Components* in Section 2.6 Thermal Considerations.
3	Doc	Support for up to 4 GB system memory has been changed to support for up to 8 GB system memory.
No.	**Plans**	**Errata**
		There are no characterized erratum for this product

Specification Changes

The Specification Changes listed in this section apply to the *Intel® Desktop Board DG45FC Technical Product Specification* (Order Number E35964).

1. The following Caution statement was modified in the Technical Product Specification in Section 2.6 Thermal Considerations:

2.6 Thermal Considerations

⚠️ **CAUTION**

A chassis with a maximum internal ambient temperature of 38 ^{o}C at the processor fan inlet is a requirement. Intel recommends the use of a Thermally Advantaged Chassis (TAC) for this desktop board. Use a processor heat sink that provides omni-directional airflow to maintain required airflow across the processor voltage regulator area. For a list of Thermally Advantaged Chassis (TAC) please refer to the following website:

http://www.intel.com/go/chassis

2. Changes were made to the Thermal Considerations for Components table, as well as lead-in text and a new table, Tcontrol Values for Components in Section 2.6 Thermal Considerations.

Table 29 provides maximum case temperatures for the board 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 29. Thermal Considerations for Components

Component	Maximum Case Temperature
Processor	For processor case temperature, see processor datasheets and processor specification updates
Intel G45 Express Chipset	103 ^{o}C
Intel 82801JR (ICH10R)	111 ^{o}C

To ensure functionality and reliability, the component is specified for proper operation when Case Temperature is maintained at or below the maximum temperature listed in Table 29. This is a requirement for sustained power dissipation equal to Thermal Design Power (TDP is specified as the maximum sustainable power to be dissipated by the components). When the component is dissipating less than TDP, the case temperature should be below the Maximum Case Temperature. The surface temperature at the geometric center of the component corresponds to Case Temperature.

It is important to note that the temperature measurement in the system BIOS is a value reported by embedded thermal sensors in the components and does not directly correspond to the Maximum Case Temperature. Intel® Quiet System Technology (Intel® QST) monitors the embedded thermal sensor for system fan speed control. The upper operating limit when monitoring this thermal sensor is Tcontrol.

Table 30. Tcontrol Values for Components

Component	Tcontrol
Processor	For processor Tcontrol, see processor datasheets and processor specification updates
Intel G45 Express Chipset	99 ºC
Intel 82801JIR (ICH10R)	101 ºC

For more information regarding Thermal Design Guidelines please refer to:
http://developer.intel.com/Products/Desktop/Chipsets/G45/G45-technicaldocuments.htm

3. Support for up to 4 GB system memory has been changed to support for up to 8 GB system memory. Partial section of Table 1 shown below.

Table 1. Feature Summary

Form Factor	Mini-ITX (6.70 inches by 6.70 inches [170.18 millimeters by 170.18 millimeters])
Processor	Support for the following: • Intel® Core™2 Quad processor (65 W) in an LGA775 socket • Intel® Core™2 Duo processor in an LGA775 socket • Intel® Pentium® Dual-Core processor in an LGA775 socket • Intel® Celeron® Dual-Core processor in an LGA775 socket • Intel® Celeron® processor Sequence 400 in an LGA775 socket
Memory	• Two 240-pin DDR2 SDRAM Dual Inline Memory Module (DIMM) sockets • Support for DDR2 800 MHz or DDR2 667 MHz DIMMs • Support for up to 8 GB of system memory using DDR2 800 MHz or DDR2 667 MHz DIMMs

1.5 System Memory

The board has two DIMM sockets and support the following memory features:

- 1.8 V DDR2 SDRAM DIMMs with gold plated contacts, with the option to raise the voltage to support higher performance DDR2 SDRAM DIMMs
- Dual channel interleaved mode support
- Unbuffered, single-sided or double-sided DIMMs with the following restriction:

  Double-sided DIMMs with x16 organization are not supported.

- 8 GB maximum total system memory using DDR2 800 MHz or DDR2 667 MHz DIMMs; refer to Section 2.1.1 on page 47 for information on the total amount of addressable memory.
- Minimum recommended total system memory: 512 MB
- Non-ECC DIMMs
- Serial Presence Detect
- DDR2 800 MHz or DDR2 667 MHz SDRAM DIMMs
- DDR2 667 MHz DIMMs with SPD timings of only 5-5-5 (tCL-tRCD-tRP)
- DDR2 800 MHz DIMMs with SPD timings of only 5-5-5 or 6-6-6 (tCL-tRCD-tRP)

NOTE

To be fully compliant with all applicable DDR SDRAM memory specifications, the board should be populated with 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 DIMMs may not function under the determined frequency.

Table 3. Supported Memory Configurations

DIMM Type	SDRAM Technology	Smallest usable DIMM (one x16 Single-sided DIMM)	Largest usable DIMM (one x8 Double-sided DIMM)	Maximum capacity with four identical x8 Double-sided DIMMs
DDR2 667	512 Mbit	256 MB	1 GB	2 GB
DDR2 667	1 Gbit	512 MB	2 GB	4 GB
DDR2 667	2 Gbit	1 GB	4 GB	8 GB
DDR2 800	512 Mbit	256 MB	1 GB	2 GB
DDR2 800	1 Gbit	512 MB	2 GB	4 GB
DDR2 800	2 Gbit	1 GB	4 GB	8 GB

2.1.1 Addressable Memory

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

- BIOS/ SPI Flash (32 Mbits)
- Local APIC (19 MB)
- Direct Media Interface (40 MB)
- Front side bus interrupts (17 MB)
- PCI Express configuration space (256 MB)
- GMCH base address registers, internal graphics ranges, PCI Express ports (up to 512 MB)
- Memory-mapped I/O that is dynamically allocated for PCI Express add-in cards
- Base graphics memory support (1 MB or 8 MB)
- Intel® Management Engine Interface (Intel® MEI) single channel (8 MB) or dual channel (16 MB)

The amount of installed memory that can be used will vary based on add-in cards and BIOS settings and operating system installed. Figure 8 shows a schematic of the system memory map. All installed system memory can be used when there is no overlap of system addresses.
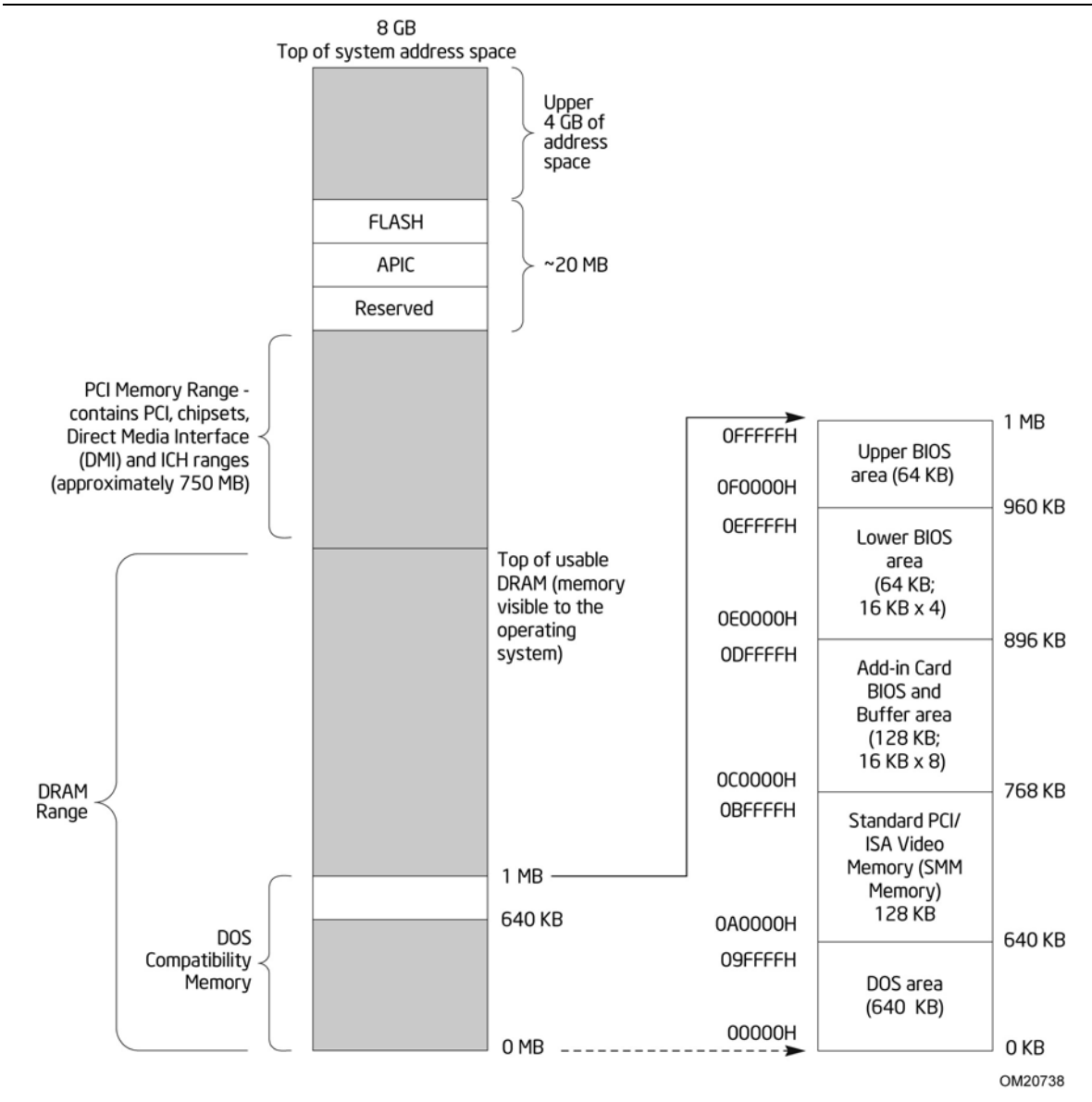

Figure 8. Detailed System Memory Address Map

Table 10 lists the system memory map.

Table 10. System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
1024 K - 8388608 K	100000 - 1FFFFFFFF	8191 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