GLS85LS1008B / 1016B / 1032B / 1064B

Industrial / Commercial Temp **SATA NANDrive™**

Features

- **Industry Standard Serial ATA (SATA) Host Interface**
  - SATA 1.5 Gb/s or SATA 3.0 Gb/s [1)]
  - ATA/ATAPI-8 compliant
  - Supports 48-bit address feature set
- **Performance**
  - Sequential data read - Up to 110 MByte/sec*
  - Sequential data write - Up to 60 MByte/sec*
    * measured using 128 KByte transfer size
- **Power Management**
  - 3.3V and 1.2Vpower supply
  - Host SATA interface power management
  - Immediate disabling of unused circuitry without host intervention
- **Power Specifications** [2)]
  - Active mode:
    820mW typical (GLS85LS1064B)
    565mW typical (GLS85LS1032B)
    440mW typical (GLS85LS1016B)
    360mW typical (GLS85LS1008B)
  - Idle mode: 210mW typical
  - Standby mode: 190mW typical
- **Expanded Data Protection**
  - Added data security through user-selectable protection zones

- **Integrated Voltage Detector**
  - Detects supply voltage fluctuations and generates reset during power-up and power-down to prevent inadvertent writes
- **Supports SMART Commands**
- **20-Byte Serial Number**
  - Factory pre-programmed 10-Byte unique ID
  - User-programmable 10-Byte ID
- **Robust Built-in ECC**
- **NAND Configuration**
  - 2 bits per cell (MLC)
- **Temperature Range**
  - Commercial: 0°C to 70°C
  - Industrial: -40°C to 85°C
- **FBGA package**
  - 14.0 mm x 24.0 mm x 1.95 mm, 145-ball, 1.0 mm ball pitch, FZJE
- **All Devices are RoHS Compliant**

[1)] Current product revision supports SATA Revision 1.x with host transfer rate of up to 1.5 Gb/s (i.e. SATA 1.5 Gb/s). SATA 3.0 Gb/s refers to SATA Revision 2.x and will be supported by our planned future product revisions.

[2)] For management of the Sleep Mode, refer to "SATA NANDrive Application Design Guide."

Product Description

The GLS85LS1008B / 1016B / 1032B / 1064B Industrial Temperature and Commercial Temperature SATA NANDrive™ devices (referred to as "SATA NANDrive" in this datasheet) are fully integrated solid state drives. They combine an advanced Greenliant NAND controller and 8, 16, 32 or 64 GByte of NAND flash in a multi-chip package. These products are ideal for embedded and portable applications that require smaller form factor and more reliable data storage.

SATA-interface solid state mass storage technology is widely used in portable and industrial computers, set-top boxes, multi-functional printers, point-of-sales terminals, video and audio recorders, medical instruments and car infotainment systems.

SATA NANDrive is a single device, solid state drive (SSD) that provides the functionality and compatibility of a complete SATA hard disk drive (HDD) in a 14 mm x 24 mm BGA package for easy, space saving mounting to a system motherboard. These products surpass traditional storage in their small size, security, reliability, ruggedness and low power consumption.

The integrated NAND flash controller with built-in advanced NAND management firmware communicates with the Host through the standard SATA protocol. It does not require any additional or proprietary software such as the Flash File System (FFS) and Memory Technology Driver (MTD).

SATA NANDrive is pre-programmed with a 10-Byte unique serial ID and has the option of programming an additional 10-Byte serial ID for even greater system security.

SATA NANDrive's advanced NAND management technology enhances data reliability and security, improves endurance and accurately estimates the remaining life of the NAND flash devices. This innovative technology combines robust NAND controller hardware error correction capabilities with advanced wear-leveling algorithms and bad block management to significantly extend the life of the product.

SATA NANDrive devices are offered in a 145-ball BGA, 1 mm ball pitch package. Refer to Figure 3-1 for the pin assignments.

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1.0   GENERAL DESCRIPTION

Each SATA NANDrive contains an integrated SATA NAND flash memory controller and up to eight discrete NAND flash die in a BGA package. Refer to Figure 2-1 for the SATA NANDrive block diagram.

1.1   Optimized SATA NANDrive

The heart of SATA NANDrive is the SATA NAND flash memory controller which translates standard SATA signals into flash media data and control signals. The following components contribute to SATA NANDrive's operation.

1.1.1   Microcontroller Unit (MCU)

The MCU translates SATA commands into data and control signals required for flash media operation.

1.1.2   Internal Direct Memory Access (DMA)

SATA NANDrive uses internal DMA allowing instant data transfer from/to buffer to/from flash media. This implementation eliminates microcontroller overhead associated with the traditional, firmware-based approach, thereby increasing the data transfer rate.

1.1.3   Power Management Unit (PMU)

The PMU controls the power consumption of SATA NANDrive. The PMU dramatically reduces the power consumption of SATA NANDrive by putting the part of the circuitry that is not in operation into sleep mode. [3]

The Flash File System handles inadvertent power interrupts and has auto-recovery capability to ensure SATA NANDrive firmware integrity. For regular power management, the Host must send an IDLE_IMMEDIATE command and wait for command ready before powering down SATA NANDrive.

[3]   For management of the Sleep Mode, refer to "SATA NANDrive Application Design Guide."

1.1.4   Embedded Flash File System

The embedded flash file system is an integral part of SATA NANDrive. It contains MCU firmware that performs the following tasks:

1. Translates host side signals into flash media writes and reads
2. Provides flash media wear leveling to spread the flash writes across all memory address space to increase the longevity of flash media
3. Keeps track of data file structures
4. Manages system security for the selected protection zones

1.1.5   Error Correction Code (ECC)

High performance is achieved through optimized hardware error detection and correction.

1.1.6   Serial Communication Interface (SCI)

The Serial Communication Interface (SCI) is designed for error reporting. During the product development stage, it is recommended to provide the SCI port on the PCB to aid in design validation.

1.1.7   Multi-tasking Interface

The multi-tasking interface enables fast, sequential write performance by allowing concurrent Read, Program and Erase operations to multiple flash media.

1.2   SMT Reflow Consideration

The SATA NANDrive family utilizes standard NAND flash for data storage. Because the high temperature in a surface-mount soldering reflow process may alter the content on NAND flash, it is recommended to program SATA NANDrive after the reflow process.

1.3   Advanced NAND Management

SATA NANDrive's integrated controller uses advanced wear-leveling algorithms to substantially increase the longevity of NAND flash media. Wear caused by data writes is evenly distributed in all or select blocks in the device that prevents "hot spots" in locations that are programmed and erased extensively. This effective wear-leveling technique results in optimized device endurance, enhanced data retention and higher reliability required by long-life applications.

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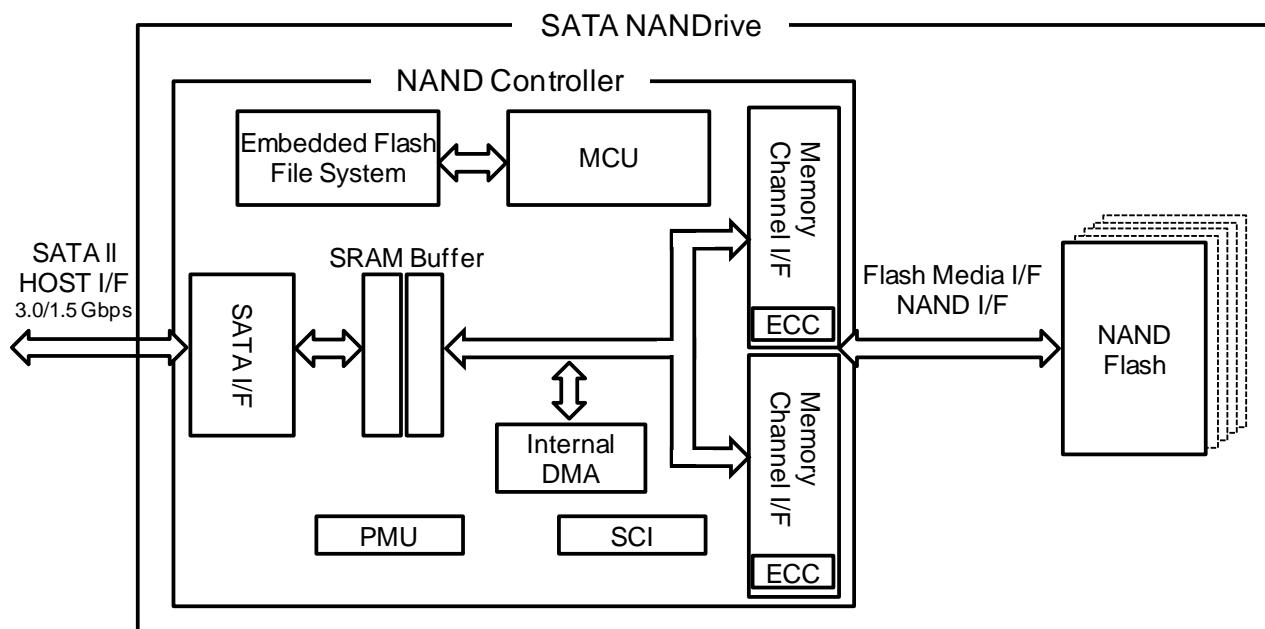
2.0   FUNCTIONAL BLOCKS

Figure 2-1: SATA NANDrive Block Diagram

3.0   PIN ASSIGNMENTS

Low active signals have a "#" suffix. Pin types are Input, Output or Input/Output.
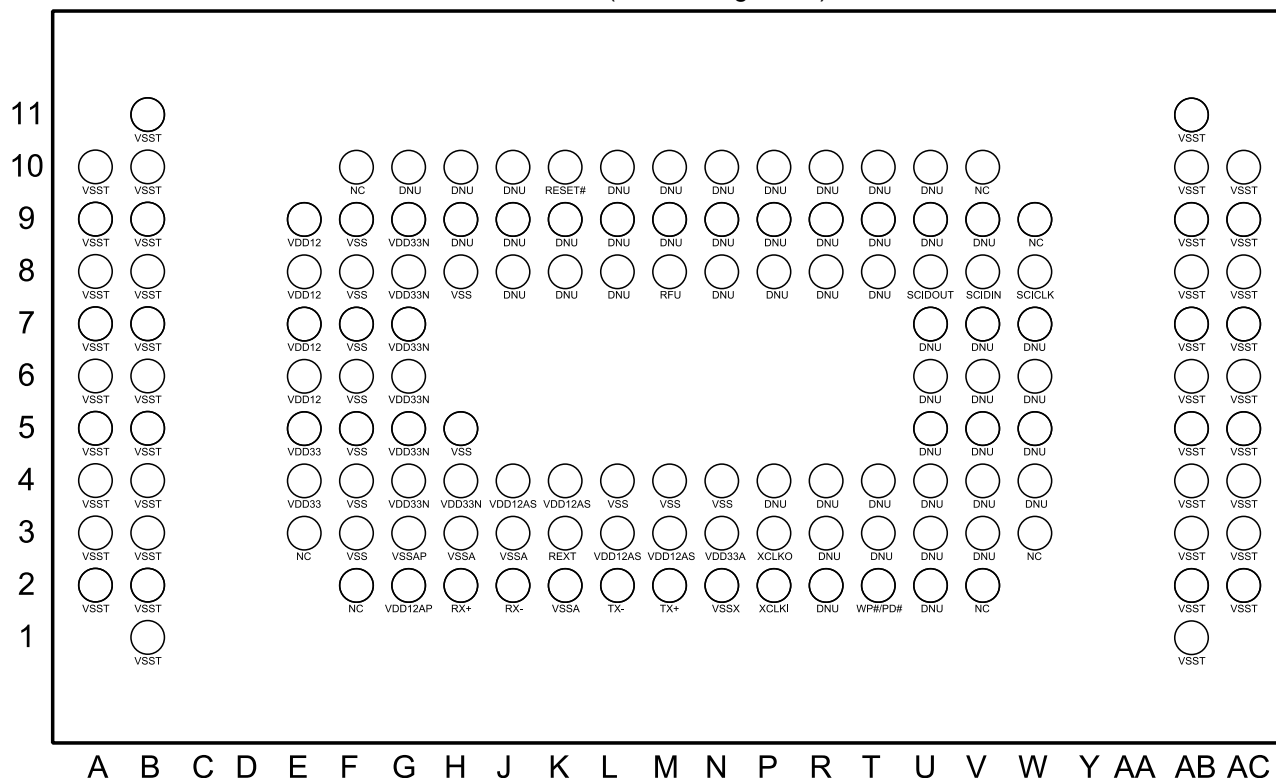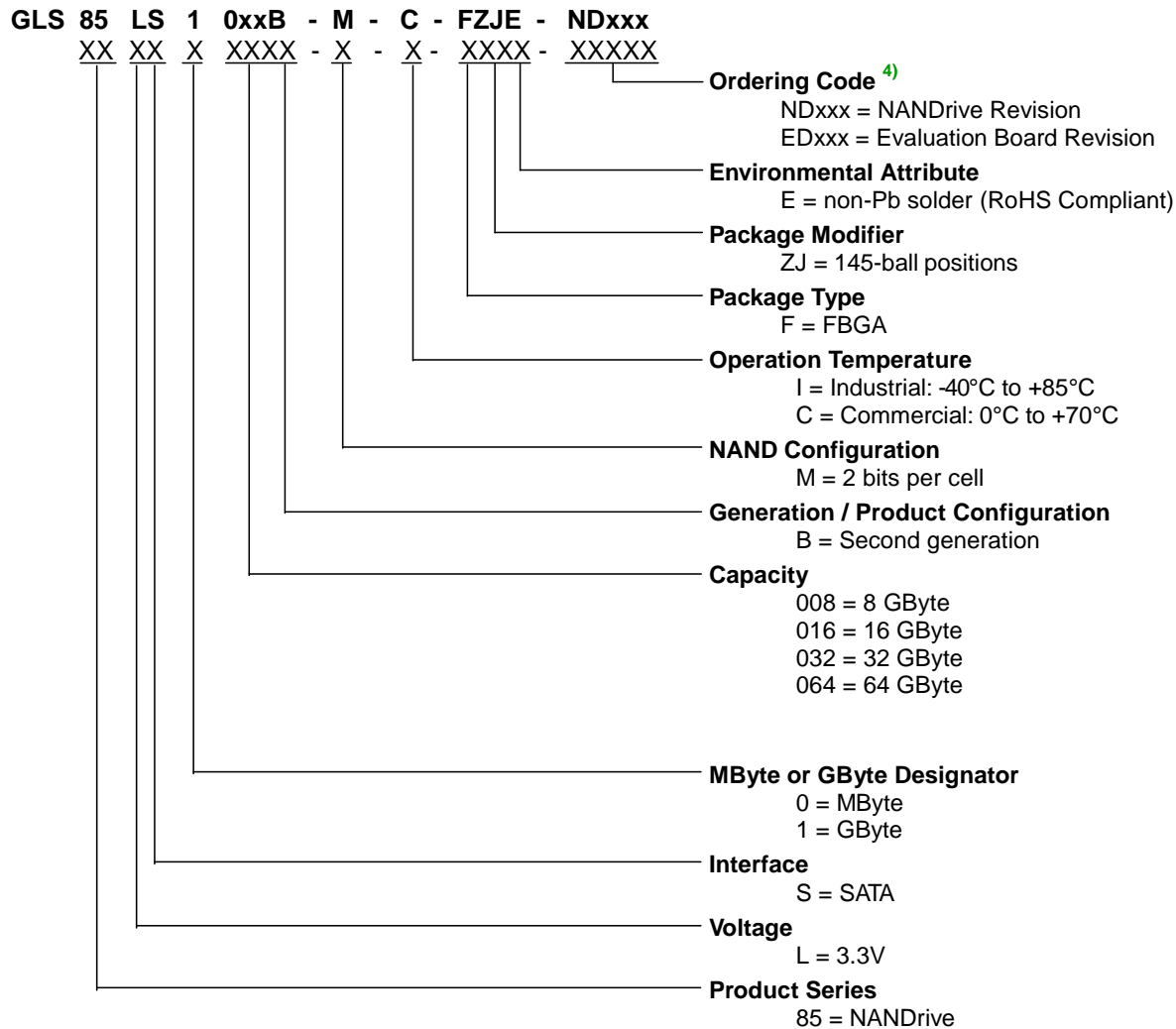
TOP VIEW (balls facing down)

Figure 3-1: Pin Assignments for 145-Ball BGA

04/17/2013
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April 2013

4.0 PRODUCT ORDERING INFORMATION

GLS 85 LS 1 0xxB - M - C - FZJE - NDxxx
XX XX X XXXX - X - X - XXXX - XXXXX

Ordering Code [4)]
NDxxx = NANDrive Revision
EDxxx = Evaluation Board Revision

Environmental Attribute
E = non-Pb solder (RoHS Compliant)

Package Modifier
ZJ = 145-ball positions

Package Type
F = FBGA

Operation Temperature
I = Industrial: -40°C to +85°C
C = Commercial: 0°C to +70°C

NAND Configuration
M = 2 bits per cell

Generation / Product Configuration
B = Second generation

Capacity
008 = 8 GByte
016 = 16 GByte
032 = 32 GByte
064 = 64 GByte

MByte or GByte Designator
0 = MByte
1 = GByte

Interface
S = SATA

Voltage
L = 3.3V

Product Series
85 = NANDrive

4) Note that the top side marking on the package typically does not include ordering codes (e.g. NDxxx), unless it is a special C-SPEC (custom specification) which is required by the end-customer to be marked on the device.

Valid Combinations

Valid product combinations are those that are in the mass production or will be in the mass production. Consult your Greenliant sales representative to confirm availability of the valid combinations and to determine availability of new product combinations.

Table 4-1: SATA NANDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Package
8GB	Commercial (0°C to 70°C)	GLS85LS1008B-M-C-FZJE-ND102	FZJE, 14x24x1.95mm
	Industrial (-40°C to 85°C)	GLS85LS1008B-M-I-FZJE-ND102	FZJE, 14x24x1.95mm
16GB	Commercial (0°C to 70°C)	GLS85LS1016B-M-C-FZJE-ND102	FZJE, 14x24x1.95mm
	Industrial (-40°C to 85°C)	GLS85LS1016B-M-I-FZJE-ND102	FZJE, 14x24x1.95mm
32GB	Commercial (0°C to 70°C)	GLS85LS1032B-M-C-FZJE-ND102	FZJE, 14x24x1.95mm
	Industrial (-40°C to 85°C)	GLS85LS1032B-M-I-FZJE-ND102	FZJE, 14x24x1.95mm
64GB	Commercial (0°C to 70°C)	GLS85LS1064B-M-C-FZJE-ND102	FZJE, 14x24x1.95mm
	Industrial (-40°C to 85°C)	GLS85LS1064B-M-I-FZJE-ND102	FZJE, 14x24x1.95mm

Table 4-2: SATA NANDrive Evaluation Board Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
8GB	Industrial (-40°C to 85°C)	GLS85LS1008B-M-I-1S-ED102	Module with SATA connector
16GB	Industrial (-40°C to 85°C)	GLS85LS1016B-M-I-1S-ED102	Module with SATA connector
32GB	Industrial (-40°C to 85°C)	GLS85LS1032B-M-I-1S-ED102	Module with SATA connector
64GB	Industrial (-40°C to 85°C)	GLS85LS1064B-M-I-1S-ED102	Module with SATA connector

Table 4-3: SATA NANDrive miniSATA Evaluation Board Valid Ordering Numbers

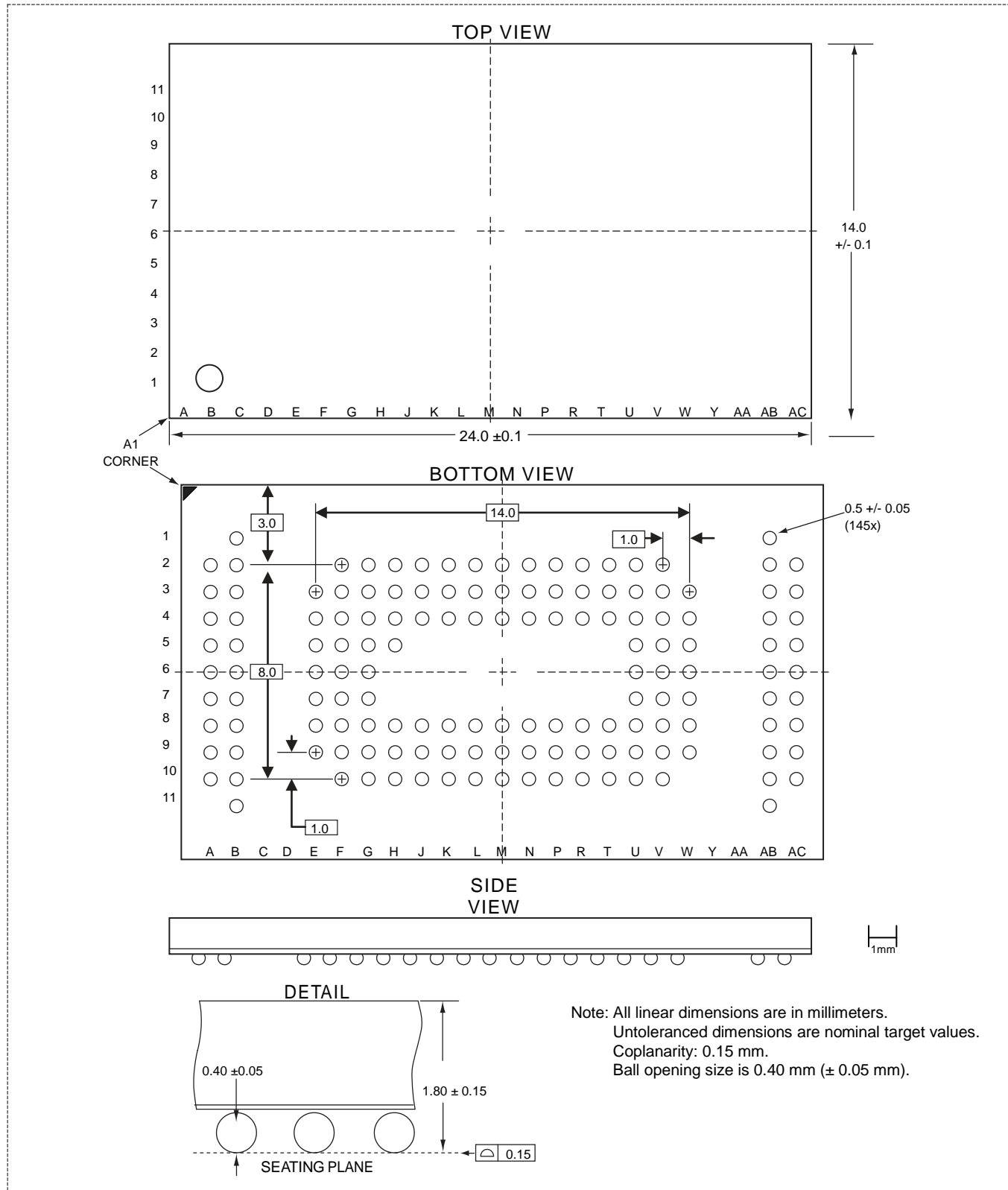| Capacity	Operating Temperature	Part Number	Form Factor
8GB	Industrial (-40°C to 85°C)	GLS85LS1008B-M-I-1MS-ED102	JEDEC MO-300
16GB	Industrial (-40°C to 85°C)	GLS85LS1016B-M-I-1MS-ED102	JEDEC MO-300
32GB	Industrial (-40°C to 85°C)	GLS85LS1032B-M-I-1MS-ED102	JEDEC MO-300
64GB	Industrial (-40°C to 85°C)	GLS85LS1064B-M-I-1MS-ED102	JEDEC MO-300

4.1   Package Diagram

Figure 4-2: SATA NANDrive 145-Ball, Ball Grid Array (BGA) Greenliant Package Code: FZJ

Revision History

Revision	Description	Date
01.000	Initial release of Fact Sheet	April 5, 2012
01.001	Updated Section 1.2	April 26, 2012
01.002	Updated Ordering Information in Section 4.0 Updated IO type of SCICLK in Table 3-1	August 16, 2012
02.000	Updated Valid Combinations in Section 4.0	October 25, 2012
02.001	Updated Ordering Information in Section 4.0	November 21, 2012
02.002	Placed Valid Combinations into table format in Section 4.0	February 25, 2013
02.003	Removed Table 3-1	April 17, 2013

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