GLS85LS1002E/1004E/1008E/1016E/1032E/1064E
Industrial Grade **SATA NANDrive™** EX Series

Greenliant®

Features

- **Industry Standard Serial ATA (SATA) Host Interface**
  - SATA 1.5Gb/s, 3Gb/s and 6Gb/s
  - SATA Revision 3.2
  - ATA/ATAPI-8 compliant
  - Supports 48-bit address feature set
  - Native Command Queuing (NCQ) up to 32 commands
- **Performance**
  - Sequential data read: Up to 470 MByte/sec
  - Sequential data write: Up to 340 MByte/sec (measured using 128 KByte transfer size tested in VDBench on Linux
- **Power Management**
  - 3.3V and 1.0V power supply
- **Power Consumption**
  - Active mode:
    64GB: Up to 2180mW
    32GB: Up to 1800mW
    16GB: Up to 1980mW
    8GB: Up to 1540mW
    4GB: Up to 1200mW
    2GB: Up to 1200mW
  - Idle / Standby mode: <355mW (typical)
  - DevSleep mode: <70mW (typical)

- **Expanded Data Protection**
  - Added data security through user-selectable protection zones
  - Secure erase / Data sanitization
- **20-Byte Serial Number**
  - Factory pre-programmed 10-Byte unique ID
  - User-programmable 10-Byte ID
- **Supports SMART and TRIM Commands**
- **Robust Built-in ECC**
- **Thermal Throttling**
- **NAND Configuration**
  - 1 bit per cell (SLC)
  - Designed with Greenliant's advanced EnduroSLC™ Technology
- **Ultra High Endurance**
  - 250K P/E cycles
- **Operating Temperature Range**
  - Industrial: -40°C to 85°C
- **BGA package**
  - 14.0 mm x 24.0 mm x 1.40 mm, 145-ball, 1.0 mm ball pitch, LBJE (LFBGA)
  - 14.0 mm x 24.0 mm x 1.55 mm, 145-ball, 1.0 mm ball pitch, LFJE (LBGA)
- **All Devices are RoHS Compliant**

Product Description

The GLS85LS10xxE Industrial Grade SATA NANDrive™ EX Series devices (referred to as "SATA NANDrive" in this datasheet) are fully integrated solid state drives. They combine an advanced Greenliant NAND controller and 2, 4, 8, 16, 32, or 64 GBytes of NAND flash in a multi-chip package. These products are ideal for embedded and portable applications that require small form factor, ultra-high endurance and reliable data storage.

SATA-interface solid state mass storage technology is widely used in industrial PCs, single board computers, servers, networking appliances, HMI and digital signage displays, test and measurement instrumentation, multi-functional printers, robotics, video equipment and security 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.

1.0   GENERAL DESCRIPTION

Each SATA NANDrive contains an integrated SATA NAND flash memory controller and 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.

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 a STANDBY_IMMEDIATE (E0h), IDLE_IMMEDIATE (E1h), STANDBY (E2h) or IDLE (E3h) command and wait for the command-ready before powering down SATA NANDrive.

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)

The ECC technology uses advanced algorithms to detect and correct errors, ensuring data integrity and extending the SSD lifespan.

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   EnduroSLC™ Technology

EnduroSLC™ is a proprietary 3D NAND management technology developed by Greenliant for high reliability applications requiring ultra-high endurance and superior data retention. Using 1-bit-per-cell (SLC) NAND configuration, EnduroSLC enabled SSDs are ideal for write-intensive applications used in extreme temperature, high stress environments. EnduroSLC enabled solid state drives offer a high reliability flash storage solution with ultra-high write endurance that exceeds capabilities of legacy, planar SLC NAND based products.

1.3   SMT Reflow Consideration

Preprogrammed NAND devices have temperature limits due to data retention. The EnduroSLC SATA NANDrive family can withstand multiple passes of SMT high temperature process without losing data. Using Greenliant's recommended reflow profile during production will help prevent damage to the device and ensure better retention of any preprogrammed data through the surface-mount soldering process. See the relevant datasheet section describing the recommended reflow temperature limits.

1.4   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 across all or select blocks in the device to prevent "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.
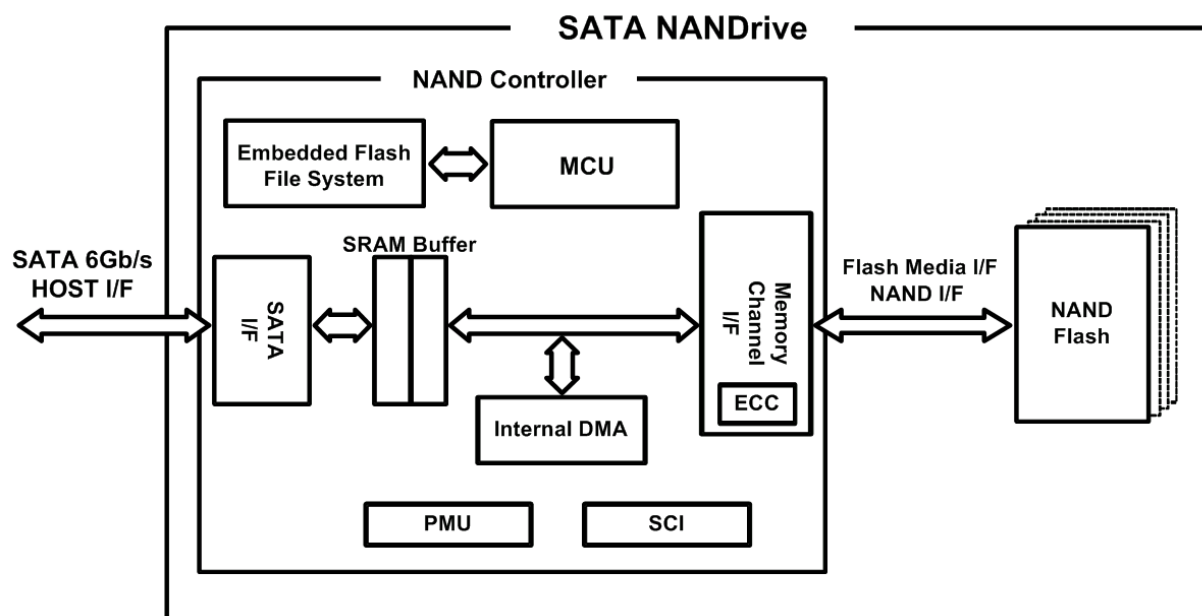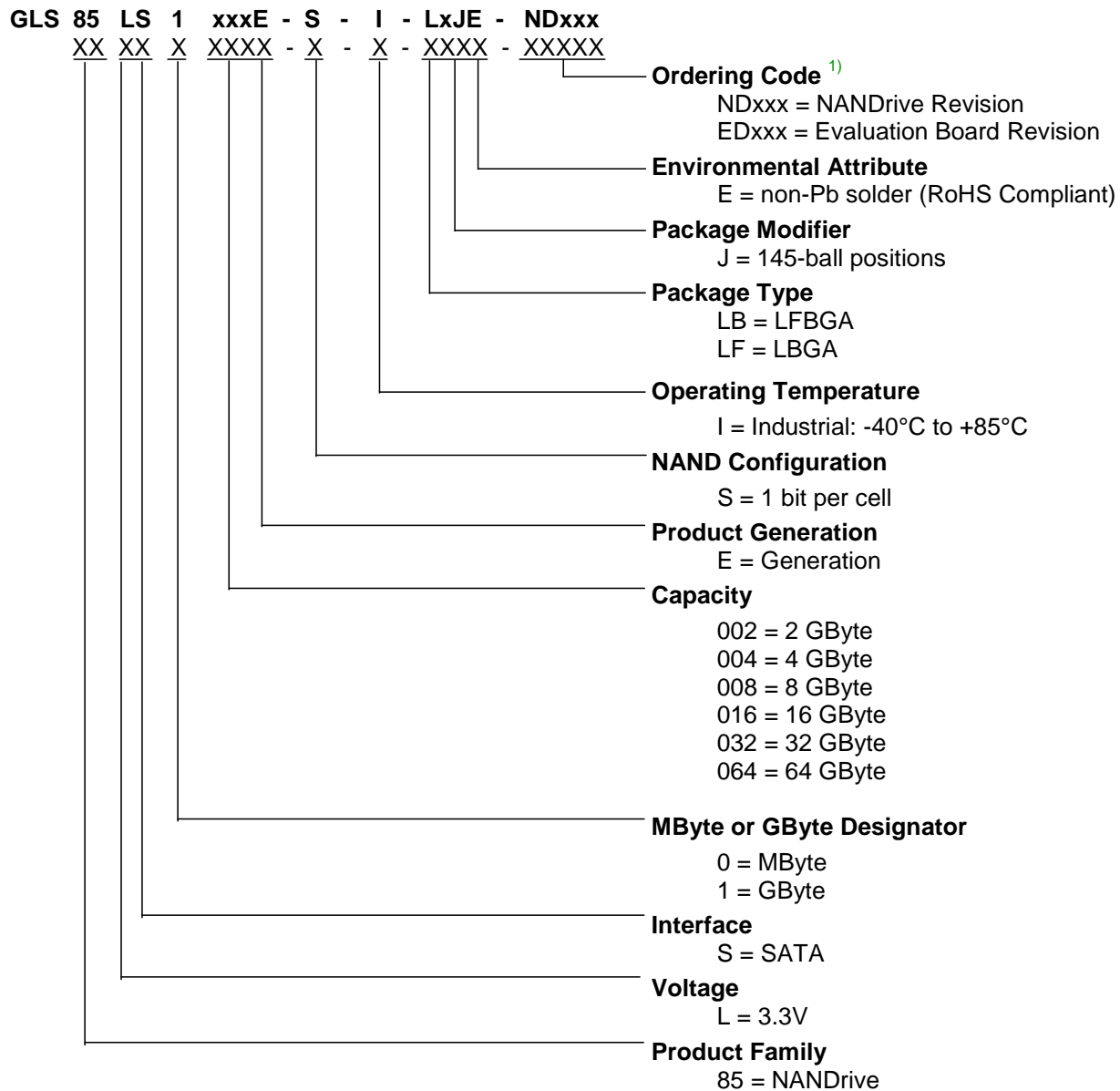
2.0   FUNCTIONAL BLOCKS

Figure 2-1: SATA NANDrive Block Diagram

3.0 Product Ordering Information

GLS 85 LS 1 xxxE - S - I - LxJE - NDxxx
XX XX X XXXX - X - X - XXXX - XXXXX

Ordering Code [1]
NDxxx = NANDrive Revision
EDxxx = Evaluation Board Revision

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

Package Modifier
J = 145-ball positions

Package Type
LB = LFBGA
LF = LBGA

Operating Temperature
I = Industrial: -40°C to +85°C

NAND Configuration
S = 1 bit per cell

Product Generation
E = Generation

Capacity
002 = 2 GByte
004 = 4 GByte
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 Family
85 = NANDrive

1) 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 3-1: SATA NANDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Package
2GB	Industrial (-40°C to 85°C)	GLS85LS1002E-S-I-LBJE-ND110	LBJE, 14x24x1.40mm
2GB	Industrial (-40°C to 85°C)	GLS85LS1002E-S-I-LBJE-ND133	LBJE, 14x24x1.40mm
4GB	Industrial (-40°C to 85°C)	GLS85LS1004E-S-I-LBJE-ND110	LBJE, 14x24x1.40mm
4GB	Industrial (-40°C to 85°C)	GLS85LS1004E-S-I-LBJE-ND126	LBJE, 14x24x1.40mm
8GB	Industrial (-40°C to 85°C)	GLS85LS1008E-S-I-LBJE-ND110	LBJE, 14x24x1.40mm
8GB	Industrial (-40°C to 85°C)	GLS85LS1008E-S-I-LBJE-ND126	LBJE, 14x24x1.40mm
16GB	Industrial (-40°C to 85°C)	GLS85LS1016E-S-I-LBJE-ND110	LBJE, 14x24x1.40mm
16GB	Industrial (-40°C to 85°C)	GLS85LS1016E-S-I-LFJE-ND126	LFJE, 14x24x1.55mm
32GB	Industrial (-40°C to 85°C)	GLS85LS1032E-S-I-LBJE-ND118	LBJE, 14x24x1.40mm
32GB	Industrial (-40°C to 85°C)	GLS85LS1032E-S-I-LBJE-ND129	LBJE, 14x24x1.40mm
64GB	Industrial (-40°C to 85°C)	GLS85LS1064E-S-I-LBJE-ND118	LBJE, 14x24x1.40mm
64GB	Industrial (-40°C to 85°C)	GLS85LS1064E-S-I-LBJE-ND129	LBJE, 14x24x1.40mm

Table 3-2: SATA NANDrive Evaluation Board Valid Ordering Numbers

| Capacity	Operating Temperature	Part Number	Form Factor
2GB	Industrial (-40°C to 85°C)	GLS85LS1002E-S-I-1S-ED110	Module with SATA connector
2GB	Industrial (-40°C to 85°C)	GLS85LS1002E-S-I-1S-ED133	Module with SATA connector
4GB	Industrial (-40°C to 85°C)	GLS85LS1004E-S-I-1S-ED110	Module with SATA connector
4GB	Industrial (-40°C to 85°C)	GLS85LS1004E-S-I-1S-ED126	Module with SATA connector
8GB	Industrial (-40°C to 85°C)	GLS85LS1008E-S-I-1S-ED110	Module with SATA connector
8GB	Industrial (-40°C to 85°C)	GLS85LS1008E-S-I-1S-ED126	Module with SATA connector
16GB	Industrial (-40°C to 85°C)	GLS85LS1016E-S-I-1S-ED110	Module with SATA connector
16GB	Industrial (-40°C to 85°C)	GLS85LS1016E-S-I-1S-ED126	Module with SATA connector
32GB	Industrial (-40°C to 85°C)	GLS85LS1032E-S-I-1S-ED118	Module with SATA connector
32GB	Industrial (-40°C to 85°C)	GLS85LS1032E-S-I-1S-ED129	Module with SATA connector
64GB	Industrial (-40°C to 85°C)	GLS85LS1064E-S-I-1S-ED118	Module with SATA connector
64GB	Industrial (-40°C to 85°C)	GLS85LS1064E-S-I-1S-ED129	Module with SATA connector

3.1   Package Diagrams
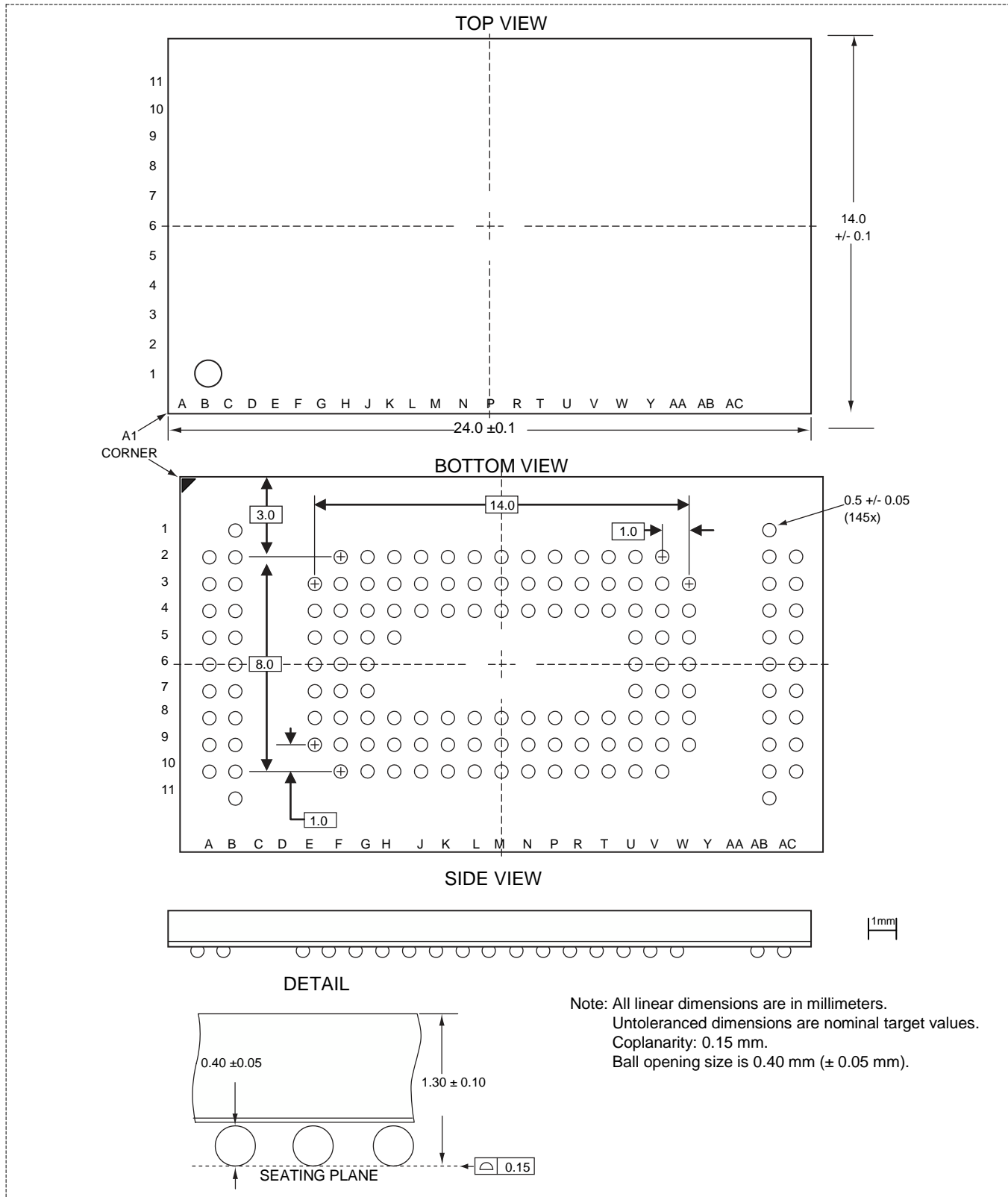
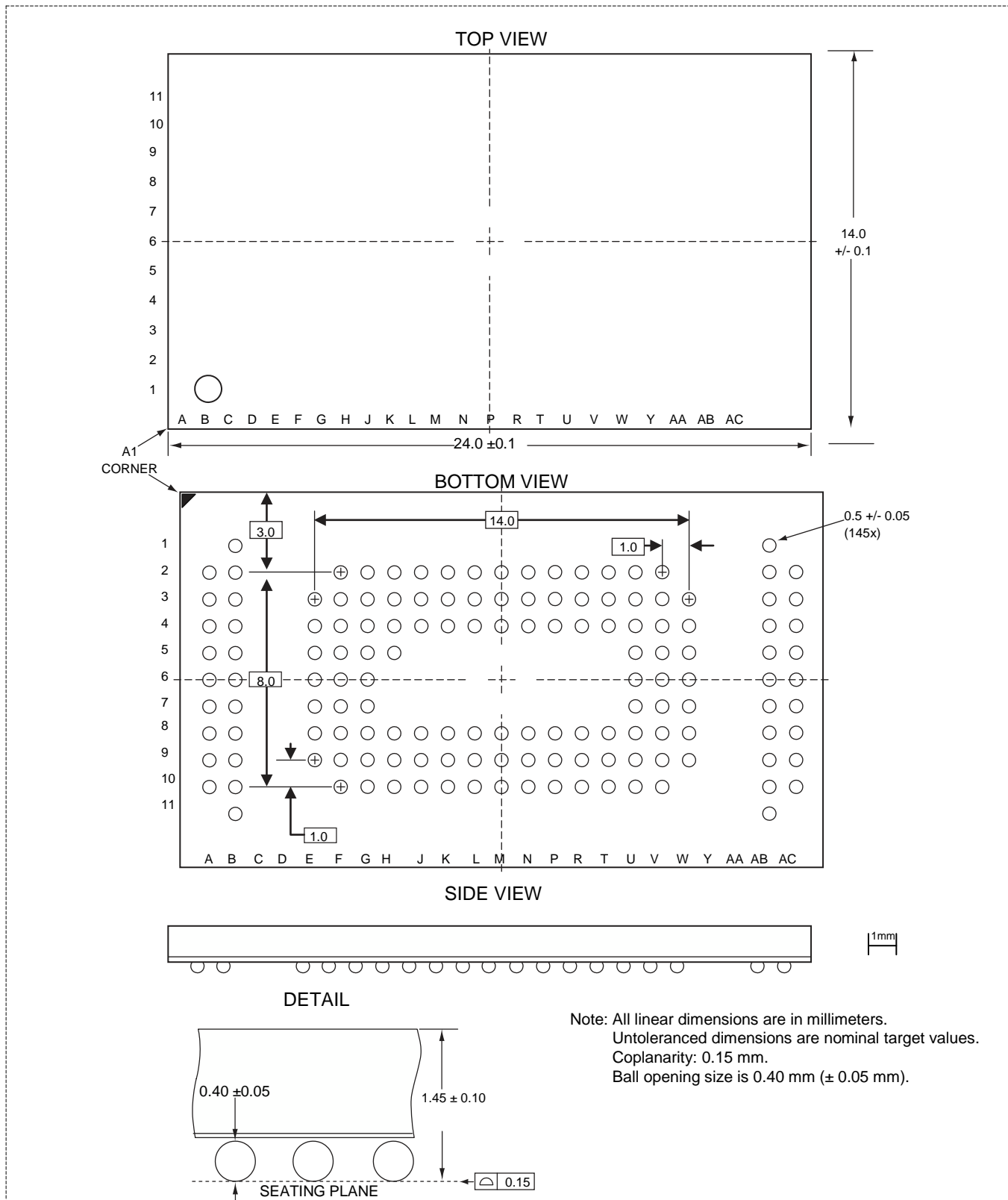**Figure 3-1: SATA NANDrive 145-Ball, Ball Grid Array (BGA) Greenliant Package Code: LBJ**

TOP VIEW

11
10
9
8
7
6
5
4
3
2
1

A B C D E F G H J K L M N P R T U V W Y AA AB AC

14.0 +/- 0.1

24.0 ±0.1

A1 CORNER

BOTTOM VIEW

3.0

14.0

1.0

0.5 +/- 0.05 (145x)

8.0

1.0

A B C D E F G H J K L M N P R T U V W Y AA AB AC

SIDE VIEW

1mm

DETAIL

0.40 ±0.05

1.45 ± 0.10

0.15

SEATING PLANE

Note: All linear dimensions are in millimeters.
Untoleranced dimensions are nominal target values.
Coplanarity: 0.15 mm.
Ball opening size is 0.40 mm (± 0.05 mm).

Figure 3-2: SATA NANDrive 145-Ball, Ball Grid Array (BGA) Greenliant Package Code: LFJ

Revision History

Revision	Description	Date
01.000	Initial release as Factsheet	August 08, 2019
02.000	Added product information for Ordering Code ND126, ND129, ND133 and ED126, ED129, ED133 Updated Features on page 1; Added EnduroSLC description (1.2)	November 23, 2020

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[GLS85LS1008E-S-I-LBJE-ND126](#)   [GLS85LS1016E-S-I-LFJE-ND126](#)   [GLS85LS1032E-S-I-LBJE-ND129](#)