GLS85VM1008C (100-ball)
Industrial Temp **eMMC NANDrive™** MX Series

Features

- **Industry Standard Embedded MultiMediaCard (eMMC) Host Interface**
  - JEDEC/MMC Standard Version 5.1 JESD84-B51 compliant
  - Backward compatible with previous eMMC standards
- **Performance**
  - eMMC clock speed: Up to 200MHz
  - eMMC data bus width: x1/x4/x8
  - Supports Dual Data Rate mode
  - Supports HS200 / HS400 modes
  - Sequential data read: Up to 145 MByte/sec*
  - Sequential data write: Up to 31 MByte/sec*
    * Measured in HS400 enhanced mode using 1 MByte transfer size
- **Power Management**
  - 3.3V power supply (V_{CC})
  - 3.3V or 1.8V eMMC IO voltage (V_{CCQ})
  - Immediate disabling of unused circuitry without host intervention
- **Power Consumption**
  - Active mode: 471mW (typical)
  - Sleep mode: 0.5mW (typical)

- **Integrated Voltage Detector**
  - Detects supply voltage fluctuations and generates reset during power-up and power-down to prevent inadvertent writes
- **Expanded Data Protection**
  - Hardware Write Protection pin
  - Data sanitization
- **Latency Management**
  - Reduces latency due to background operation during time critical read/write operations
- **Supports SMART and TRIM Commands**
- **Robust Built-in ECC**
- **NAND Configuration**
  - 2 bits per cell (MLC)
- **Endurance**
  - 5K program/erase (P/E) cycles
- **Operating Temperature Range**
  - Industrial: -40°C to 85°C
- **100-ball LBGA Package**
  - 14.0 mm x 18.0 mm x 1.40 mm, 1.0 mm ball pitch, LFWE
- **All Devices are RoHS Compliant**

Product Description

The GLS85VM1008C eMMC NANDrive™ MX Series devices (referred to as "eMMC NANDrive" in this factsheet) are fully integrated solid state drives. They combine an advanced Greenliant NAND controller and 8 GBytes of NAND flash memory in a multi-chip package. These products are ideal for solid state mass storage in embedded and portable applications that require small form-factor, energy efficient and reliable data storage.

eMMC solid state drives are widely used in GPS and telematics, in-vehicle infotainment, portable and industrial computers, handheld data collection scanners, point-of-sale terminals, networking and telecommunications equipment, robotics, audio and video recorders, monitoring devices and set-top boxes.

eMMC NANDrive provides complete eMMC solid state drive (SSD) functionality and compatibility in a 14mm x 18mm BGA package for easy, space saving mounting to a system motherboard. With its small size, low power consumption, strong security, reliability and ruggedness, eMMC NANDrive surpasses removable storage and discrete NAND-based products.

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

eMMC NANDrive's advanced NAND management technology enhances data security, improves endurance and accurately tracks the usage of the NAND flash. This innovative technology combines robust error correction capabilities with advanced wear-leveling algorithms and bad block management to extend the life of the product.

eMMC NANDrive supports Single Data Rate (SDR) and Dual Data Rate (DDR) modes, HS200 mode, HS400 mode, boot, multiple partitions, permanent and partial write protect, Replay Protected Memory Block (RPMB) access, Sanitize and TRIM, hardware reset and other features detailed in the eMMC 5.1 standard specification. It is backward compatible with previous eMMC standards.

GLS85VM1008C (100-ball)
Industrial Temp **eMMC NANDrive™** MX Series

1.0 GENERAL DESCRIPTION

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

1.1 Optimized eMMC NANDrive

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

1.1.1 Microcontroller Unit (MCU)

The MCU transfers the eMMC commands into data and control signals required for flash media operation.

1.1.2 Internal Direct Memory Access (DMA)

The eMMC 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 the eMMC NANDrive. The PMU dramatically reduces the power consumption of the eMMC 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 the eMMC NANDrive's data integrity.

1.1.4 Embedded Flash File System

The embedded flash file system is an integral part of the eMMC NANDrive. It is integrated in the controller's firmware that performs the following tasks:

1. Manages and optimizes the data access of flash media

2. Provides flash media wear leveling to spread flash writes across all memory address space to increase the longevity of flash media

3. Keeps track of the data file structure

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 SMT Reflow Consideration

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

1.3 Advanced NAND Management

eMMC 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.
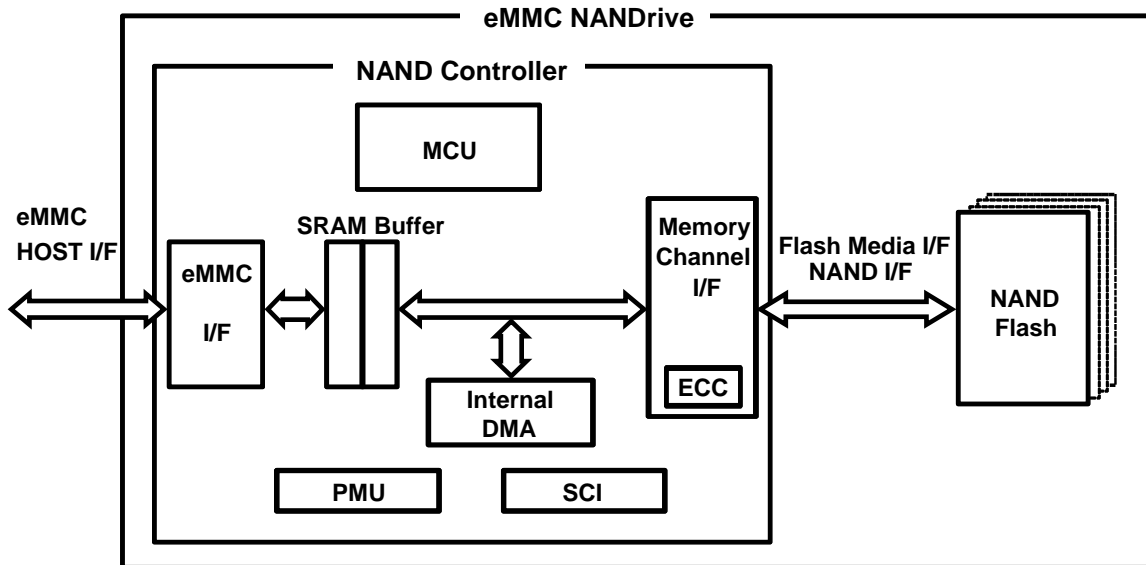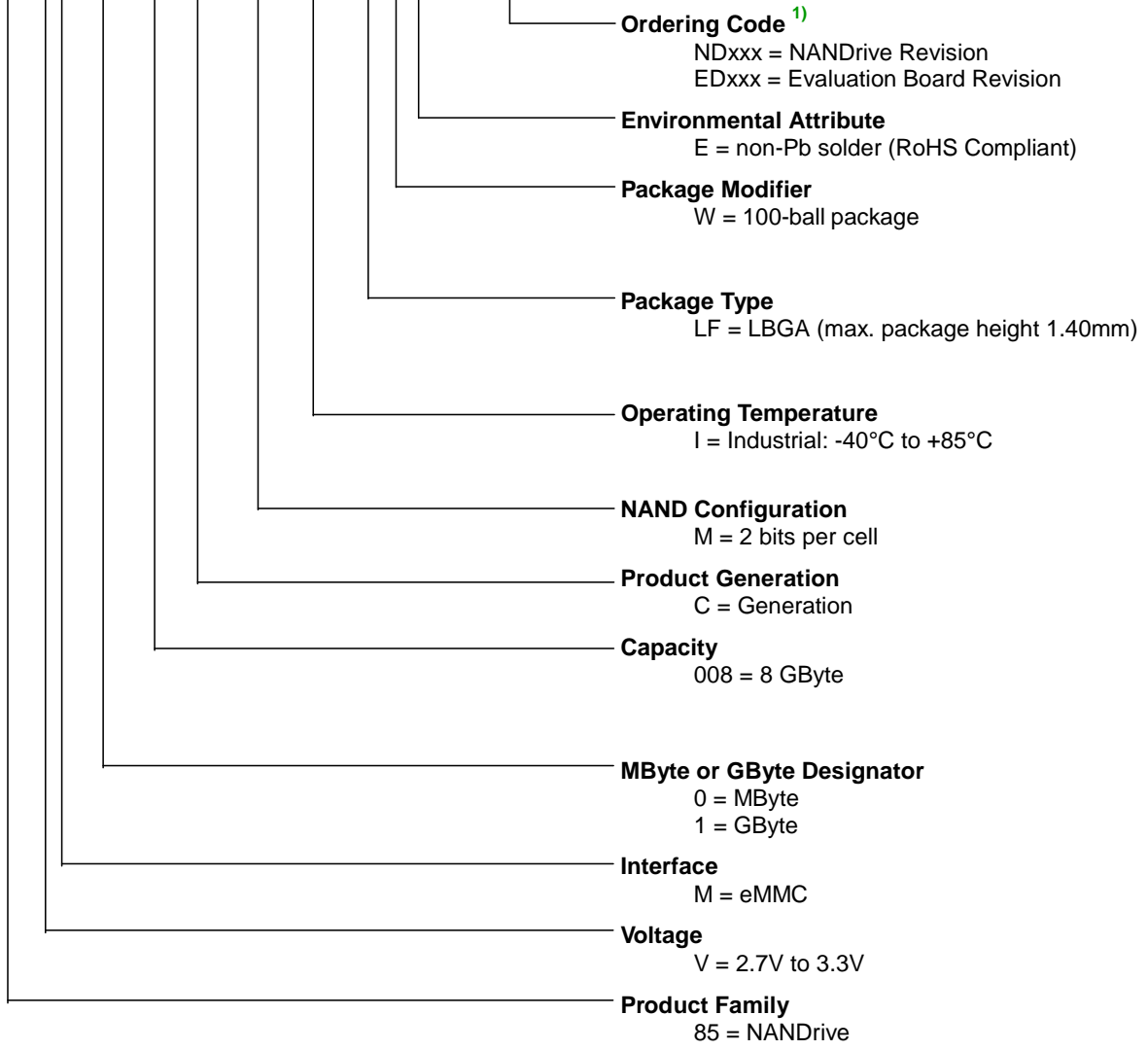
2.0 FUNCTIONAL BLOCKS

Figure 2-1: eMMC NANDrive Block Diagram

3.0   Product Ordering Information

```
GLS 85 VM 1  xxx  C - M - I - LFWE - NDxxx
    XX XX X XXXX - X - X - XXXX - XXXXX
```

Ordering Code [1)]
ND xxx = NANDrive Revision
ED xxx = Evaluation Board Revision

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

Package Modifier
W = 100-ball package

Package Type
LF = LBGA (max. package height 1.40mm)

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

NAND Configuration
M = 2 bits per cell

Product Generation
C = Generation

Capacity
008 = 8 GByte

MByte or GByte Designator
0 = MByte
1 = GByte

Interface
M = eMMC

Voltage
V = 2.7V to 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 custom specification (C-SPEC) required by the end-customer to be marked on the device.

Valid Combinations

Valid product combinations are those that are in mass production or will be in 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: eMMC NANDrive Product Valid Ordering Number

Capacity	Operating Temperature	Part Number	Package
8GB	Industrial (-40°C to 85°C)	GLS85VM1008C-M-I-LFWE-ND210	LFWE, 14x18x1.40mm
8GB	Industrial (-40°C to 85°C)	GLS85VM1008C-M-I-LFWE-ND225	LFWE, 14x18x1.40mm
8GB	Industrial (-40°C to 85°C)	GLS85VM1008C-M-I-LFWE-ND230	LFWE, 14x18x1.40mm

Table 3-2: eMMC NANDrive Evaluation Board Valid Ordering Number

Capacity	Operating Temperature	Part Number	Package [2]
8GB	Industrial (-40°C to 85°C)	GLS85VM1008C-M-I-E2-ED230	JEDEC MO-277

[2] The evaluation board with the form factor MO-277 supports up to 52MHz with x1/x4/x8 bus and Dual Data Rate mode. Use it for comprehensive functional testing. If the end-user's system has support for 200MHz bus speed it can be tested only with eMMC 5.1 NANDrive devices soldered down on the user's board.

4.0   Package Diagram
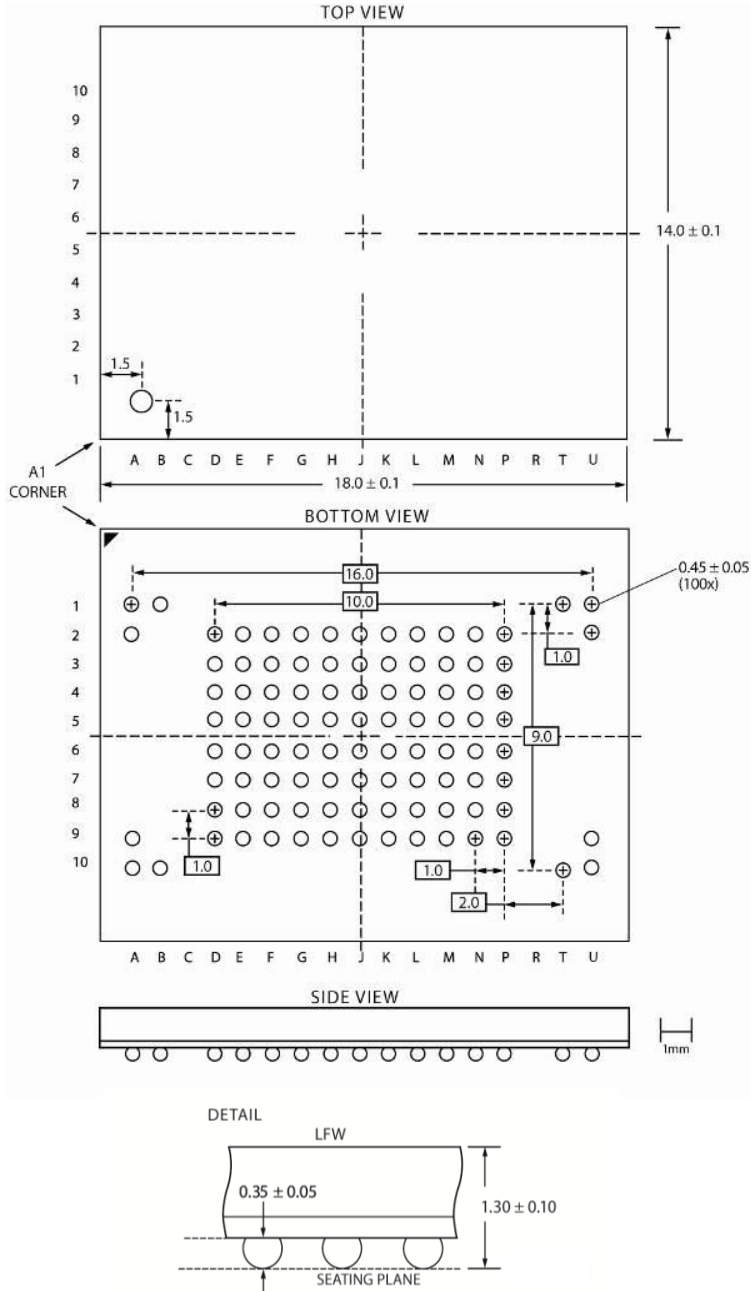
GLS85VM1008C-M-I-LFWE

Figure 4-1: eMMC NANDrive 100-Ball, Ball Grid Array (BGA) Greenliant Package Code: LFWE

Revision History

Number	Description	Date
01.000	Initial release of Factsheet	August 15, 2018
01.001	Added Endurance on page 1	April 30, 2019
02.000	Added product revision BB1; Updated Features on page 1, section 1.1.5, and tables 3-1 and 3-2	October 25, 2019
02.100	Updated Features on page 1	March 12, 2020
03.000	Updated Features on page 1, and tables 3-1 and 3-2	February 12, 2021

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