

Features

- **Industry Standard ATA / IDE Bus Interface**
 - Host Interface: 16-bit access
 - Supports up to PIO Mode-6 ¹⁾
 - Supports up to Multi-Word DMA Mode-4 ²⁾
 - Supports up to Ultra DMA Mode-6
- **Performance**
 - Sustained sequential data read -
Up to 26 MByte/sec
 - Sustained sequential data write -
Up to 5 MByte/sec
- **Power Management**
 - 3.3V power supply
 - Immediate disabling of unused circuitry without
Host intervention
 - Zero wake-up latency
- **Power Specification**
 - Active mode - 115mA typical
 - Sleep mode - 700µA typical
- **Integrated Voltage Detector**
 - Prevents inadvertent Write operations due to
unexpected power-down or brownout

- **Expanded Data Protection**
 - WP#/PD# pin configurable by firmware
for prevention of data overwrites
 - Data security through user-selectable
protection zones
 - Security Erase feature
- **20-Byte Unique ID for Enhanced Security**
 - Factory pre-programmed 10-Byte unique ID
 - User-programmable 10-Byte ID
- **Pre-programmed Embedded Firmware**
 - Executes industry standard ATA/IDE commands
 - Implements advanced wear-leveling algorithms
to substantially increase the longevity of
flash media
 - Embedded Flash File System
- **Robust Built-in ECC**
- **Commercial Temperature Range**
 - 0°C to 70°C
- **91-ball LBGA Package**
 - 12.0 mm x 24.0 mm x 1.40 mm
- **All Devices are RoHS Compliant**

Product Description

The GLS85LP1002A Commercial Grade PATA NANDrive™ device (referred to as "PATA NANDrive" in this datasheet) is a high-performance, fully integrated, embedded flash solid state drive. It combines an integrated ATA NAND flash memory controller and 2 GByte of NAND flash in a multi-chip package. This product is ideal for solid state mass storage in embedded and portable applications that require smaller form factor and more reliable data storage.

ATA-based solid state mass storage technology is 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.

The PATA NANDrive supports standard ATA/IDE protocol with up to PIO Mode-6 ¹⁾, Multi-Word DMA Mode-4 ²⁾ and Ultra DMA Mode-6 interface. The PATA NANDrive device provides complete IDE hard disk drive functionality and compatibility 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 ATA protocol. It does not require any additional or proprietary software such as the Flash File System (FFS) and Memory Technology Driver (MTD).

The PATA NANDrive provides a WP#/PD# pin to protect critical information stored in the flash media from unauthorized overwrites. The PATA 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.

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

¹⁾ PATA NANDrive is capable of supporting PIO Mode-6, but Identify-Drive information report will show PIO Mode-4

²⁾ PATA NANDrive is capable of supporting Multi-Word DMA Mode-4, but Identify-Drive information report will show MWDMA Mode-2

1.0 GENERAL DESCRIPTION

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

1.1 Optimized PATA NANDrive

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

1.1.1 Microcontroller Unit (MCU)

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

1.1.2 Internal Direct Memory Access (DMA)

The PATA 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 PATA NANDrive. The PMU dramatically reduces the power consumption of the PATA 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 PATA NANDrive firmware integrity. For regular power management, the Host must send an IDLE_IMMEDIATE command and wait for command ready before powering down the PATA NANDrive.

1.1.4 SRAM Buffer

A key contributor to the PATA NANDrive performance is an SRAM buffer. The buffer optimizes the Host's data transfer to and from the flash media.

1.1.5 Embedded Flash File System

The embedded flash file system is an integral part of the PATA 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

5. Stores the data in flash media upon completion of a Write command (The PATA NANDrive does not perform Post-Write operations, except for when the write cache is enabled)

1.1.6 Error Correction Code (ECC)

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

1.1.7 Serial Communication Interface (SCI)

The Serial Communication Interface (SCI) is designed for manufacturing error reporting. During the design process, always provide access to the SCI port in the PCB design to aid in design validation.

1.1.8 Multi-tasking Interface

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

1.2 NAND Flash

The PATA NANDrive family utilizes standard NAND flash for data storage. Because the reflow process can alter the PATA NANDrive content, do not program the PATA NANDrive before the reflow process.

1.3 Advanced NAND Management

Advanced NAND management technology balances the wear on erased blocks with wear-leveling algorithms. When the Host updates data, higher priority is given to the less frequently written erase blocks, thereby evenly distributing host writes within the PATA NANDrive.

Advanced NAND management technology enhances PATA NANDrive's security with password protection and four independent protection zones that can be set to Read-only or Hidden.

2.0 FUNCTIONAL BLOCKS

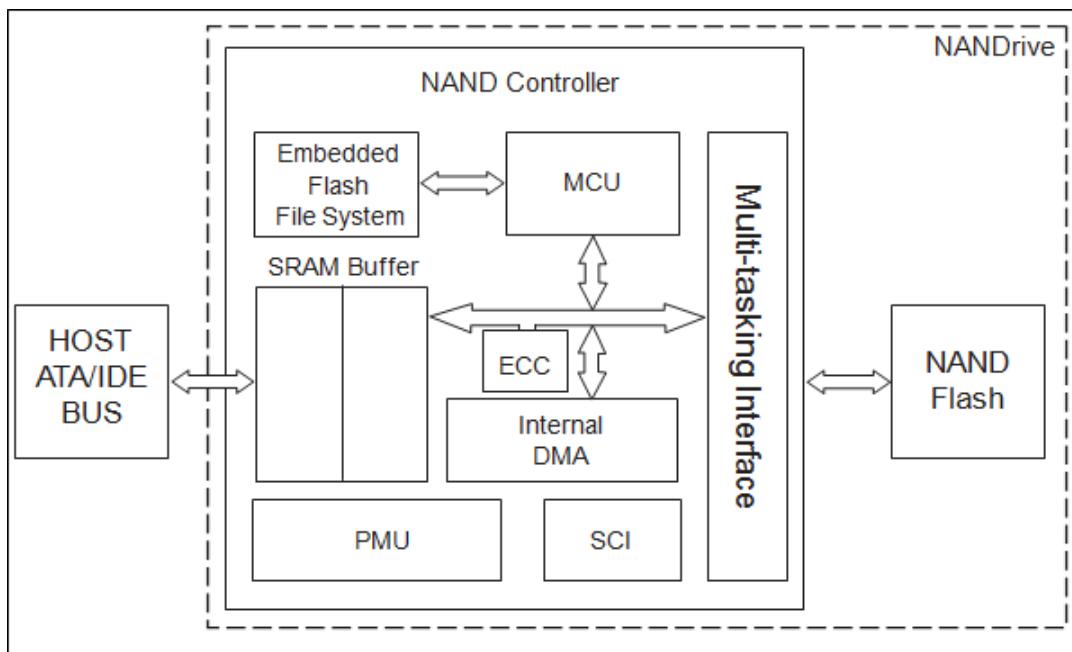


Figure 2-1: PATA NANDrive Block Diagram

3.0 PIN ASSIGNMENT

The signal/pin assignments are listed in Table 3-1. Low active signals have a “#” suffix. Pin types are Input, Output or Input/Output. Signals that the Host sources are designated as inputs, while signals that the PATA NANDrive sources are outputs.

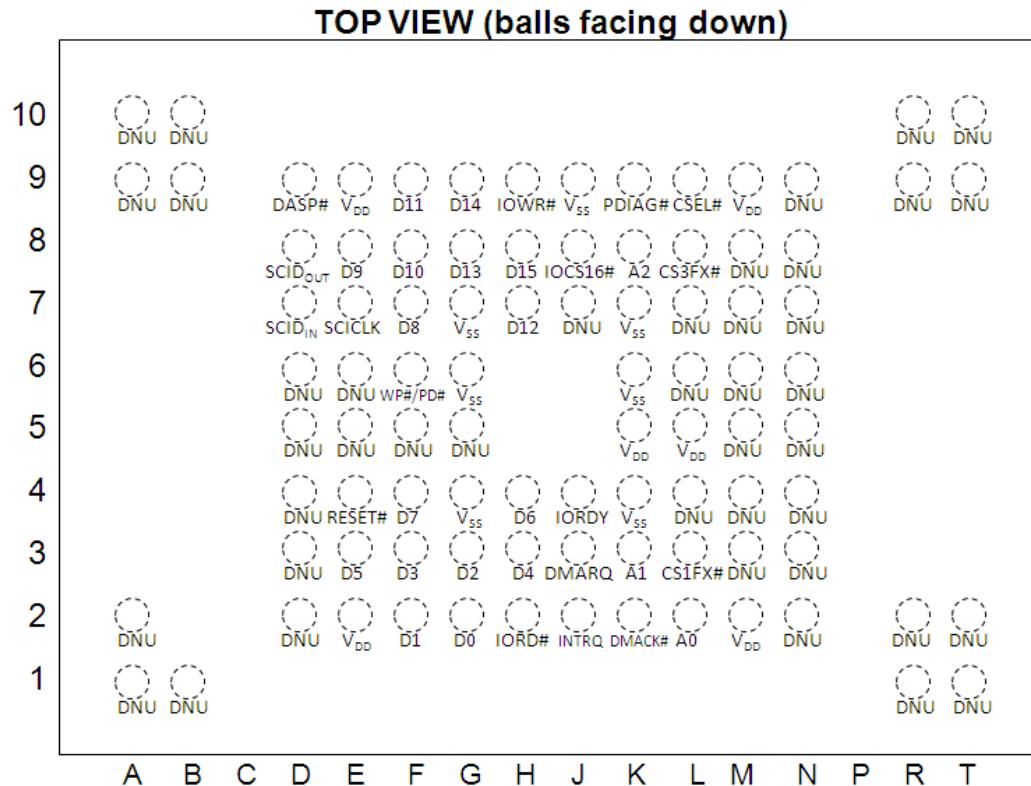


Figure 3-1: Pin Assignments for 91-Ball BGA / LBGA

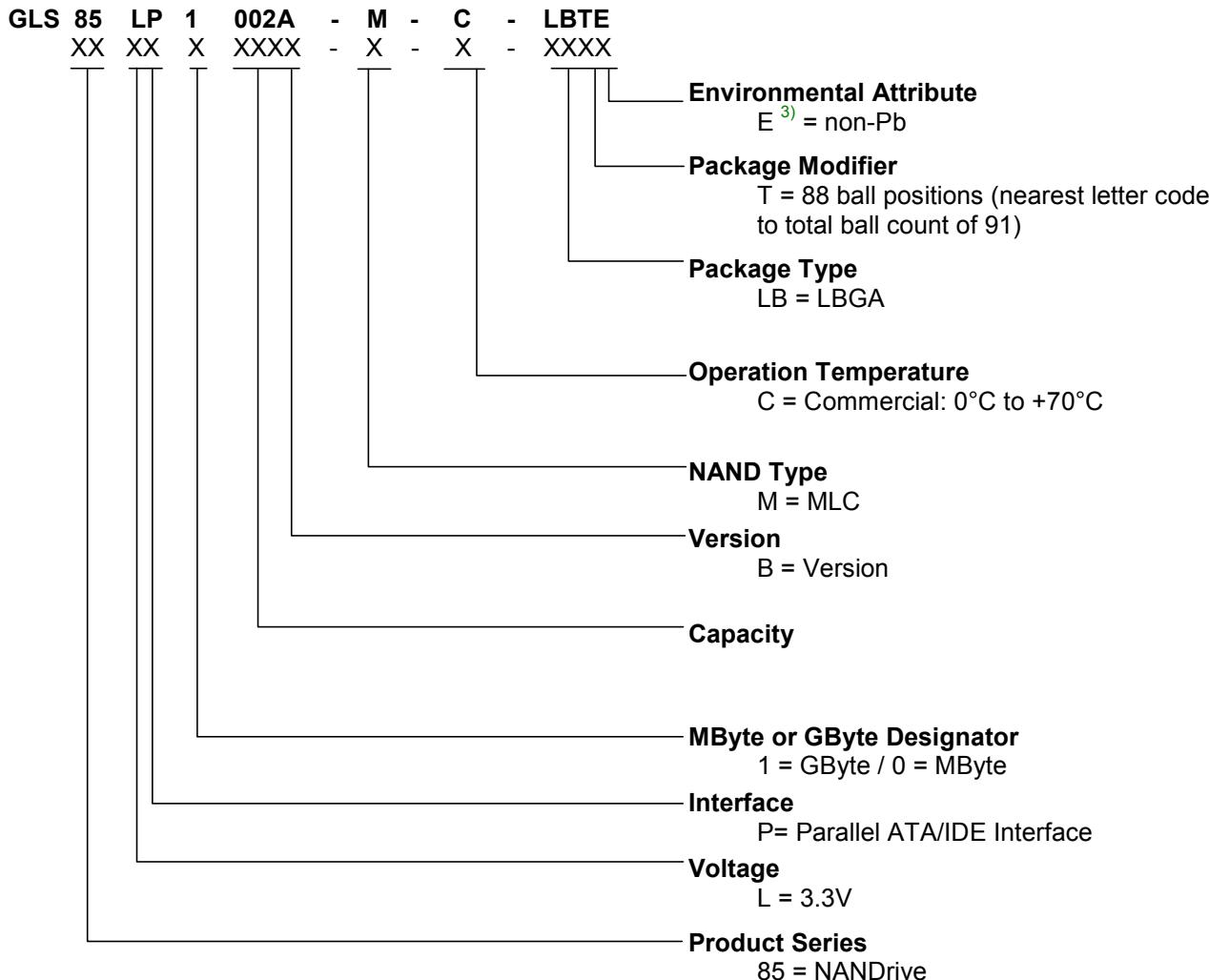
Table 3-1: Pin Assignments (1 of 2)

Symbol	Pin No. 91-Ball	Pin Type	I/O Type	Name and Functions	
Host Side Interface					
A2	K8				
A1	K3	I	I1Z	A[2:0] are used to select one of eight registers in the Task File.	
A0	L2				
D15	H8				
D14	G9				
D13	G8				
D12	H7				
D11	F9				
D10	F8				
D9	E8				
D8	F7				
D7	F4	I/O	I1Z/O2	D[15:0] Data bus	
D6	H4				
D5	E3				
D4	H3				
D3	F3				
D2	G3				
D1	F2				
D0	G2				
DMACK#	K2	I	I2U	DMA Acknowledge - input from Host	
DMARQ	J3	O	O2	DMA Request to Host	
CS1FX#	L3			CS1FX# is the chip select for the task file registers	
CS3FX#	L8	I	I2Z	CS3FX# is used to select the alternate status register and the Device Control register.	
CSEL	L9	I	I1U	This internally pulled-up signal is used to configure this device as a Master or a Slave. When this pin is grounded, this device is configured as a Master. When the pin is open, this device is configured as a Slave. The pin setting should remain the same from Power-on to Power-down.	
IORD#	H2	I	I2Z	IORD#: This is an I/O Read Strobe generated by the Host. When Ultra DMA mode is not active, this signal gates I/O data from the device. (This pin supports three functions)	
				HDMARDY#: In Ultra DMA mode when DMA Read is active, this signal is asserted by the Host to indicate that the Host is ready to receive Ultra DMA data-in bursts. The Host may negate HDMARDY# to pause an Ultra DMA transfer.	
				HSTROBE: When DMA Write is active, this signal is the data-out strobe generated by the Host. Both the rising and falling edges of HSTROBE cause data to be latched by the device. The Host may stop generating HSTROBE edges to pause an Ultra DMA data-out burst.	
IOWR#	H9	I	I2Z	IOWR#: This is an I/O Write Strobe generated by the Host. When Ultra DMA mode is not active, this signal is used to clock I/O data into the device. (This pin supports two functions)	
				STOP: When Ultra DMA mode protocol is active, the assertion of this signal causes the termination of the Ultra DMA burst	

Table 3-1: Pin Assignments (2 of 2)

Symbol	Pin No. 91-Ball	Pin Type	I/O Type	Name and Functions
IORDY	J4	O	O2	IORDY: When in PIO mode, the device is not ready to respond to a data transfer request. This signal is negated to extend the Host transfer cycle from the assertion of IORD# or IOWR#. However, it is never negated by this controller. (This pin supports three functions)
				DDMARDY#: When Ultra DMA mode DMA Write is active, this signal is asserted by the device to indicate that the device is ready to receive Ultra DMA data-out bursts. The device may negate DDMARDY# to pause an Ultra DMA transfer.
				DSTROBE: When Ultra DMA mode DMA Read is active, this signal is the data-in strobe generated by the device. Both the rising and falling edges of DSTROBE cause data to be latched by the Host. The device may stop generating DSTROBE edges to pause an Ultra DMA data-in burst.
IOCS16#	J8	O	O3	This output signal is asserted low when the device is indicating a Word data transfer cycle.
INTRQ	J2	O	O2	This signal is the active high Interrupt Request to the Host.
PDIAG#	K9	I/O	I1U/O2	The Pass Diagnostic signal in the Master/Slave handshake protocol.
DASP#	D9	I/O	I1U/O4	The Drive Active/Slave Present signal in the Master/Slave handshake protocol.
RESET#	E4	I	I2U	This input pin is the active low hardware reset from the Host.
Serial Communication Interface (SCI)				
SCIDOUT	D8	O	O2	SCI data output. No external pull-up or pull-down resistor should connect to this signal.
SCIDIN	D7	I	I1U	SCI data input
SCICLK	E7	I	I1D	SCI clock
Miscellaneous				
WP#/PD#	F6	I	I2U	The WP#/PD# pin can be used for either the Write Protect mode or Power-down mode, but only one mode is active at any time. The Write Protect or Power-down modes can be selected through the host command. The Write Protect mode is the factory default setting.
V _{SS}	G4, G6, G7, K4, K6, K7, J9	PWR		Ground
V _{DD}	E2, E9, K5, L5, M2, M9	PWR		VDD (3.3V)
DNU	A1, A2, A9, A10, B1, B9, B10, D2, D3, D4, D5, D6, E5, E6, F5, G5, J7, L4, L6, L7, M3, M4, M5, M6, M7, M8, N2, N3, N4, N5, N6, N7, N8, N9, R1, R2, R9, R10, T1, T2, T9, T10			Do not use. All these pins should not be connected.

4.0 Product Ordering Information



³⁾ Environmental suffix "E" denotes non-Pb solder.
Greenliant non-Pb solder devices are "RoHS Compliant."

Valid Combinations ⁴⁾

PATA NANDrive Product
GLS85LP1002A-M-C-LBTE

PATA NANDrive Evaluation Board (xxCN: xx-pin ATA Interface EVB, K: Kit)
GLS85LP1002A-M-C-40CN-K, GLS85LP1002A-M-C-44CN-K

⁴⁾ 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.

4.1 Packaging Diagram

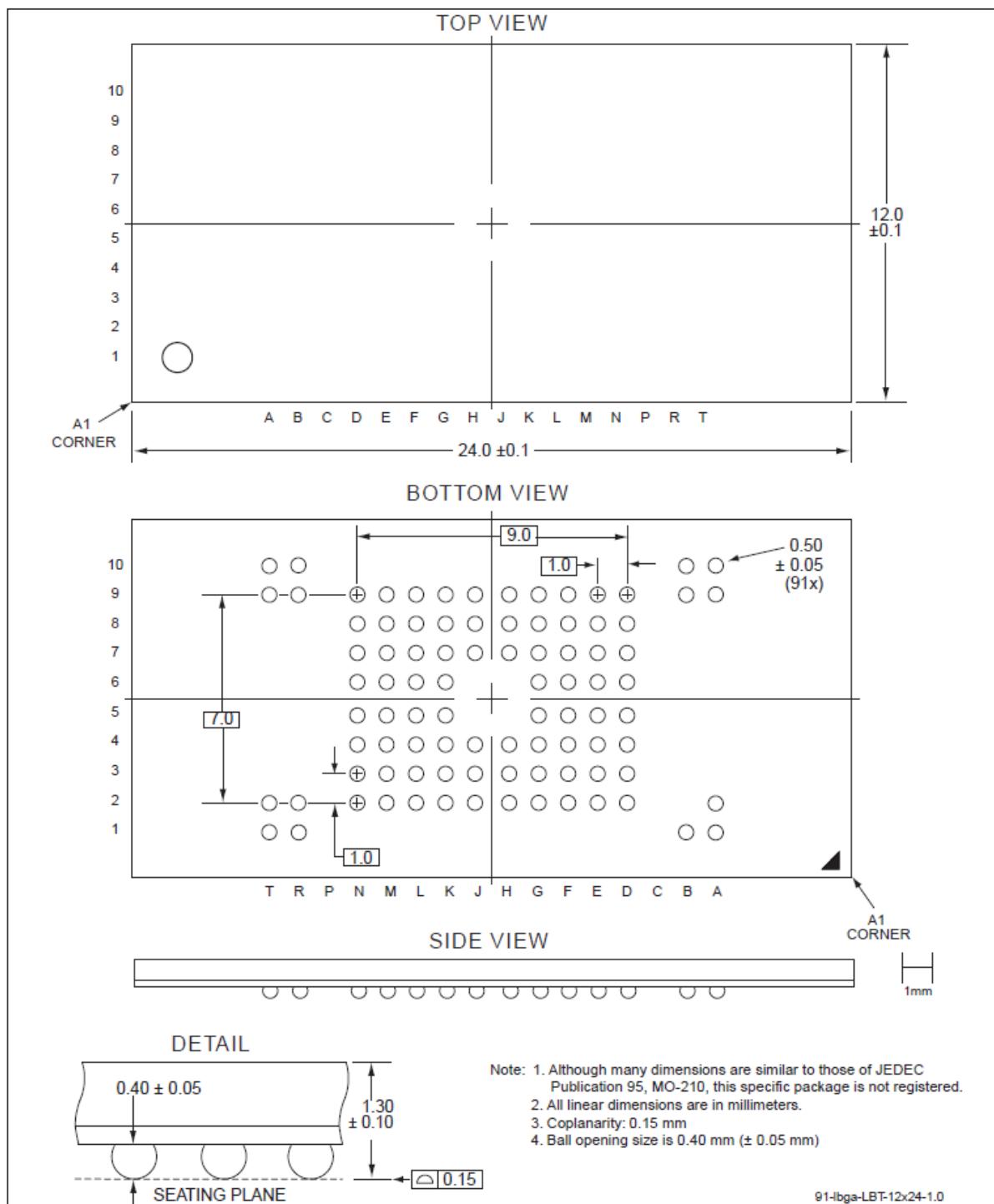


Figure 4-1: PATA NANDrive 91-Ball, Ball Grid Array (BGA) Greenliant Package Code: LBTE

Note:

- All linear dimensions are in millimeters.
- Un-tolerance dimensions are nominal target values.
- Co-planarity: 0.15 mm.
- Ball opening size is 0.40 mm (± 0.05 mm).

Revision History

Table 5-2: Revision History

Number	Description	Date
01.000	Initial release of fact sheet	Dec 10, 2011

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