# Wintec Slim SATA Solid State Drive

## SF-2281

WxESxxxG1TA-D41xxx



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# Product Introduction

## Wintec Embedded Slim SATA-III/II Solid State Drive SF-2281 Series

**WxESxxxG1TA-D41x**

The Wintec Industries SF-2281 Embedded Slim SATA SSD series of ROHS Compliant Solid State Drives are constructed with NAND-type flash memory devices paired with SandForce SF-2281 SSD controller for virtual-to-physical address mapping and other sophisticated flash management functions. The Wintec Flash Solid State Disk (SSD) provides major advantages over the traditional magnetic hard disk drive (HDD). Faster access time and transfer rate, silent operation and low power consumption, better shock and vibration resistance, and lower total cost of ownership make the Wintec SSDs an attractive choice as the next generation mass storage device.

The SF-2281 series SSD provides high-speed data transfer and reliability utilizing SLC or MLC NAND-flash in storage capacities ranging from 32GB* to 240GB, in a MO-297 form factor. Its robust design enables the SSD to achieve outstanding reliability and performance. Sustained reads at up to 550MB/s (SATA-III) / 270MB/s (SATA-II) and sustained writes at up to 505MB/s (SATA-III) / 250MB/s (SATA-II), are the best in its class. The Wintec Synchronous Flash Solid State Drives are best utilized on uncompressed data systems to provide impressive sequential and random performances.

With the proprietary DuraClass™ technology, the SF-2281 controller implements superior wear-leveling techniques and minimizes data write amplification to ensure that the NAND flash memory is not worn out prematurely. The controller also overcomes the flash memory 'Read Disturb' issues by tracking reads and refreshes data in proximity before the data is negatively impacted. The controller utilizes 55 bits/512 byte sector BCH ECC algorithms and embedded RAISE™ Internal redundant array to provide the protection and reliability of RAID on a single disk without any write overhead penalty to the host. Combining intelligent bad block management, wear leveling management, read disturb management, block consolidation and recycling, automatic data compression, AES-128 encryption, and multiple data hardening technologies, the Wintec SF-2281 series SSD guarantees maximum reliability and longevity of the SSD.

*Available capacities vary based on the Flash Type and drive configuration

**General Features**
- Density up to 240GB
- SandForce SF-2281 controller with internal cache buffer
- SATA-III (6.0 Gbps) interface
- SATA-II (3.0 Gbps) backwards compatible
- High-Performance Synchronous SLC or MLC NAND Flash memory

**Reliability**
- Data Integrity protection featuring DuraClass™ Technology
- Intelligent Block Management & Wear Leveling
- Intelligent Data Retention optimization
- Powerful ECC Engine: Up to 55 bits correctable per 512B sector
- Automatic encryption (AES-128) and optional password security
- MTTF: 1,000,000 operating hours

**Performance**

(SATA-III)
- Compressed Performance 550MB/s Seq. Read
- Compressed Performance 505MB/s Seq. Write
- Random Read: 10,000 IOPS at 4KB transfer
- Random Write: 7,000 IOPS at 4KB transfer

(SATA-II)
- Compressed Performance 270MB/s Seq. Read
- Compressed Performance 250MB/s Seq. Write
- Random Read: 8,000 IOPS at 4KB transfer
- Random Write: 5,000 IOPS at 4KB transfer

**Compatibility**
- Serial ATA Revision 2.6 Compliant
- ATA/ATAPI-7 Compliant
- Supports TRIM and S.M.A.R.T command Transport
- Windows Logo Certification

NOTE:
1. See Section 5.0 for Configuration & Ordering Guide

# Revision History

| Revision | Month | Year | History |
|---|---|---|---|
| 1.0 | December | 2013 | Initial release |

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# 1.0 General Product Specifications

For all the following specifications, values are defined at ambient temperature unless otherwise stated.

**Table 1: User Capacity Specifications**

| Model Number[1] (typ)[2,3] | NAND Flash | NAND Flash Total Capacity (user) | Over-provision[4] |
|---|---|---|---|
| **W*v*ES032G1TA-D41*wxx-yyy.zz*** | SLC/MLC | 32 GB (32GB) | **0%** |
| **W*v*ES060G1TA-D41*wxx-yyy.zz*** | SLC/MLC | 64 GB (60GB) | **7%** |
| **W2ES080G1TA-D41*wxx-yyy.zz*** | MLC | 96 GB (80GB) | **16** |
| **W2ES120G1TA-D41*wxx-yyy.zz*** | MLC | 128 GB (120GB) | **7%** |
| **W2ES240G1TA-D41wxx-yyy.zz** | MLC | 256 GB (240GB) | **7%** |

**Note:**

1. See Section 5.0 for Configuration & Ordering Guide
2. 1GB = 1,000,000,000 Bytes
3. Capacity available to end-user is less than "Total Capacity" due to flash controller overhead, and may vary with flash configuration.
4. Over-provision allotted on the drive for controller/flash specific operations.

**Table 2: Typical Performance Specifications**

| Parameter | Typical Performance[5,6,7] |
|---|---|
| **Sustained Sequential Read (compressed)** | **Up to 550MB/s (SATA-III), 270MB/s (SATA-II)** |
| **Sustained Sequential Write (compressed)** | **Up to 505MB/s (SATA-III), 250MB/s (SATA-II)** |
| **Sustained IOPS Random Read (compressed)** | **Up to 10,000 IOPS (SATA-III), 8,000 IOPS (SATA-II)** |
| **Sustained IOPS Random Write (compressed)** | **Up to 7,000 IOPS (SATA-III), 5,000 (SATA-II)** |

**Note:**

5. Bandwidth measured on high-performance desktop system. Note that performance may also vary depending on host system, drive capacity, and drive configuration. Measured at QD=32.
6. Performance is based on Sync. SLC drives
7. Compressed performance is measure using ATTO (FOB), IOMeter'08 using QD=32

**Table 3: Flash Endurance**

| Parameter | Spec |
|---|---|
| **Program/Erase Cycles** | **Up to 60,000 cycles for SLC*** |
| | **Up to 3,000 cycles for MLC*** |
| **Data Retention** | **5 Years (Min.)** |
| **MTTF** | **2,000,000 Hours** |

*P/E cycles vary based on specific NAND devices used

**Table 4: SSD Data Reliability**

| Parameter | Spec |
|---|---|
| **Non-Recoverable Errors** | **< 1 in $10^{16}$ Bytes Read** |
| **Raw ECC Correctability** | **Up to 55 bits / 512 Bytes data** |

**Table 5: Environmental Specifications**

| Parameter | | Operating | Non-Operating |
|---|---|---|---|
| **Temperature** | **Commercial Temp.** | **0°C to 70°C** | **-55°C to 95°C** |
| **Humidity (Non-Condensing)** | | **5% to 95%** | **5% to 95%** |
| **Vibration** | | **20 G RMS** | **N/A** |
| **Shock (Operating)** | | **1,500 G (Max.)** | |
| **Noise** | | **0 dB** | **0 dB** |

## 1.1 Block Diagram

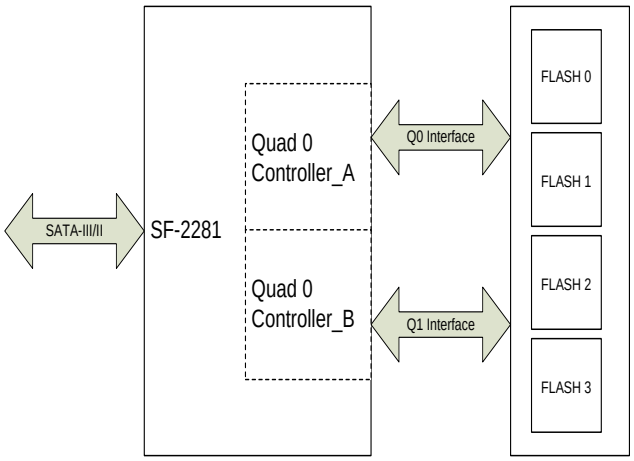


**Figure 1: Block Diagram**

## 1.2 Architecture

The Wintec SF-2281 series SSD utilizes a single flash controller chip with 4 parallel channels of flash memory interface. The flash controller also simultaneously manages the file read and write interface with the host system via a single SATA-III/II interface. By utilizing 4 parallel channels of SLC flash memory, combined with internal NAND die redundancy, the Wintec SSD can provide both high performance and reliability, while maintaining a minimal unit cost. While other SSDs rely only upon the ECC spare area within the NAND chips to correct inevitable bit errors within the data, the SF-2281 series SSD has additional error correction mechanisms, and can maintain data integrity even after complete loss of an entire NAND flash die.

## 1.3 Queue Depth

In order to maximize the performance potential of the Wintec SF-2281 series SSD, a queue depth of 32 commands is enabled when used in AHCI mode. This allows multi-threaded disk IO requests from the host to be serviced in parallel within the drive, as well as combining small write requests in the SF-2281 controller's internal buffer to minimize write amplification effects.

## 1.4 Data compression and Write amplification

The SF-2281 series SSD contains an internal data compression algorithm that is processed inside the controller's internal processing buffer. The internal cache buffer allows for efficient data compression without any involvement from the host or user. This data compression allows for the actual amount of data written to the flash cells to be less than the data written to the drive from the host, greatly extending the reliability and lifetime of the drive beyond our competitors' SSD products.

## 1.5 AES-128 Data Encryption and Secure Erase

Upon initialization of the SF-2281 series SSD, an internal randomly generated AES-128 encryption key is generated in the controller. This encryption key is not externally accessible, which ensures integrity of the encryption key and the data that it protects. This key is then used to encrypt all data being written to the flash. Only encrypted data is written to the physical NAND flash chips, which ensures that any data pulled straight from the NAND flash chips is undecipherable to unauthorized parties. When an ATA Secure Erase command is sent to the drive, the controller erases and resets the internal encryption key, rendering the data in the NAND flash undecipherable. The data allocation map data, all LBAs and SMART logs are also erased. The Secure Erase process takes less than 4 seconds to complete, regardless of capacity. After the Secure Erase is completed, the drive is still functional, but the old existing data is unrecoverable.

## 1.6 Read disturb data loss mitigation

In typical flash read situations, reading of data in nearby cells will cause an accelerated loss of charge from neighboring flash storage cells. The SF-2281 series SSD tracks the number of reads to locations within the flash and will dynamically move data that is at a higher risk of error accumulation and data loss. If other SSD solutions do not actively manage for read disturb effects, this will lead to much shorter data retention times.

## 1.7 Flash cell wear leveling

The SSD tracks the number of PE (program/erase) cycles that each block in the SSD goes through, and will dynamically remap logical sectors written from the host to different physical pages and blocks within the NAND flash memory. This ensures that the flash cells will wear evenly, and that no premature wear out or data loss will occur in any portions of the drive.

## 1.8 Error correction and data integrity

The SF-2281 series SSD incorporates multiple levels of error correction and data redundancy to maintain data integrity. The SF-2281 series uses ECC correction from the spare area on the NAND itself, a dedicated redundant NAND flash die for parity information, as well as a data path CRC check to ensure that data errors are detected and correctable. The redundant NAND flash die can maintain data integrity even after the loss of an entire NAND die. These multiple error detection and correction mechanisms allow the SF-2281 series SSD to maintain lower Uncorrectable Bit Error Rates (UBER) than traditional HDD drives, throughout their entire service lifetime.

## 1.9 Block recycling and Garbage collection

As data is written to the SSD from the host, the Logical LBAs do not match with the page or erase block sizes within the NAND flash chips, which means that as the user data fills the drive there is always some amount of data fragmentation or non-contiguous logical LBA mapping to adjacent flash cells. This also means that invalid data is mixed into a block with valid data. By moving and combining valid data from multiple blocks within the device, and then writing that data to an empty block, free space can be made into whole free blocks. This maximizes performance within the SF-2281 series SSD, and is done internally within the drive.

## 1.10 TRIM Support

The SF-2281 series SSD supports the TRIM command. Data that has been deleted from the host can be marked as free space by the host issuing the TRIM command to the drive. This allows the drive to more efficiently reclaim free space and maintain performance.

# 2.0 Electrical Specification

## 2.1 General

**Table 6: Absolute Maximum Ratings**

| Symbol | Parameter | Min | Max | Units |
|---|---|---|---|---|
| $V_{cc}$ | $V_{cc}$ With Respect to GND | -0.5 | 6.0 | V |

**Table 7: Typical Operating Conditions (VCC=5V ± 10%)**

| Symbol | Parameter | Min | Max | Units |
|---|---|---|---|---|
| $V_{cc}$ | $V_{cc}$ With Respect to GND | 4.5 | 5.5 | V |
| $T_A$ | Operating Temperature (Commercial Temp) | 0 | 70 | °C |
| H | Humidity | 5 | 95 | % |

**Table 8: Power Consumption**

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $P_i$ | Idle Power consumption | 0.3 | Watts |
| $P_T$ | Typical operating power consumption | 1.9 | Watts |
| $P_{max}$ | Maximum operating power consumption | 2.1 | Watts |

## 2.2 SATA Pin Assignment and Description

The SATA connectors are compliant with standard SATA power specifications. As is standard, power may be supplied to all of the power pins. However, only the 5V power pins are utilized to provide power to the SSD. Therefore, where non-standard power supplies and connections are utilized, the power supply does not need to supply the SSD with power to the 3.3V or 12V power pins.

**Table 9: SATA Pin Assignment**

| | No. | Plug Connector | Pin Definition |
|---|---|---|---|
| Signal | S1 | GND | Ground |
| | S2 | A+ | Differential signal A |
| | S3 | A- | |
| | S4 | GND | Ground |
| | S5 | B- | Differential signal B |
| | S6 | B+ | |
| | S7 | GND | Ground |
| Key and spacing separate signal and power segments | | | |
| Power | P1 | V33 | 3.3V power (Not Used) |
| | P2 | V33 | 3.3V power (Not Used) |
| | P3 | V33 | 3.3V power, pre-charge (Not Used) |
| | P4 | GND | Ground |
| | P5 | GND | Ground |
| | P6 | GND | Ground |
| | P7 | V5 | 5V power, pre-charge |
| | P8 | V5 | 5V power |
| | P9 | V5 | 5V power |
| | P10 | GND | Ground |
| | P11 | DAS/DSS | Device Present |
| | P12 | GND | Ground |
| | P13 | V12 | 12V power, pre-charge (Not Used) |
| | P14 | V12 | 12V power (Not Used) |
| | P15 | V12 | 12V power (Not Used) |

# 3.0 Software Interface

## 3.1 ATA Command Set

The Wintec Industries SSD drive complies with ATA-8/ACS-2. All mandatory, and many optional commands and features are supported. The following tables summarize the ATA feature set and commands.

**Table 10: ATA Feature Set**

| Feature Set | ATA-8 Reference | Mandatory/Optional |
|---|---|---|
| General feature set | 4.2 | M |
| 48-Bit Address feature set | 4.4 | O |
| General Purpose Logging (GPL) feature set | 4.10 | O |
| Host Protected Area (HPA) feature set | 4.11 | O |
| Native Command Queuing (NCQ) feature set | 4.15 | O |
| Power Management feature set | 4.18 | M |
| Advanced Power Management (APM) feature set | 4.5 | O |
| Power-Up In Standby (PUIS) feature set | 4.19 | O |
| Security feature set | 4.20 | O |
| S.M.A.R.T feature set | 4.21 | O |
| Software Settings Preservation (SSP) feature set | 4.22 | O |
| Write-Read-Verify feature set | 4.26 | O |

**Table 11: ATA Command**

| | Command | OpCode |
|---|---|---|
| General Feature Set | | |
| | NOP | 00h |
| | Data Set Management EXT ( I.E. TRIM) | 06h |
| | Recalibrate | 10h |
| | Read Sector(s) | 20h |
| | Read Sector(s) w/o retry | 21h |
| | Read Long | 22h |
| | Read Long w/o retry | 23h |
| | Read Sector(s) EXT | 24h |
| | Read DMA EXT | 25h |
| | Read Native Max Address EXT | 27h |
| | Read Multiple EXT | 29h |
| | Read Log EXT | 2Fh |
| | Write Sector(s) | 30h |
| | Write Sector(s) (w/o retry) | 31h |
| | Write Long | 32h |
| | Write Long w/o retry | 33h |
| | Write Sector(s) EXT | 34h |
| | Write DMA EXT | 35h |
| | Set Max Address EXT | 37h |
| | Write Multiple EXT | 39h |
| | Write DMA FUA EXT | 3Dh |
| | Write Log EXT | 3Fh |

| | | |
|---|---|---|
| | Read Verify Sector(s) | 40h |
| | Read Verify Sector(s) (w/o retry) | 41h |
| | Read Verify Sector(s) EXT | 42h |
| | Read Log DMA EXT | 47h |
| | Write Log DMA EXT | 57h |
| | Read FPDMA Queued | 60h |
| | Write FPDMA Queued | 61h |
| | SEEK | 70h |
| | Execute Device Diagnostic | 90h |
| | Initialize Device Parameters | 91h |
| | Download Microcode | 92h |
| | Download Microcode DMA | 93h |
| | Read Multiple | C4h |
| | Write Multiple | C5h |
| | Set Multiple Mode | C6h |
| | Read DMA | C8h |
| | Read DMA (w/o retry) | C9h |
| | Write DMA | CAh |
| | Write DMA (w/o retry) | CBh |
| | Write Multiple FUA EXT | CEh |
| | Read Buffer | E4h |
| | Flush Cache | E7h |
| | Write Buffer | E8h |
| | Flush Cache EXT | EAh |
| | Identify Device | ECh |
| | Set Feature [Enable/Disable - Write Cache, Look-ahead, Automatic Acoustic mgmt., Reverting to power-on defaults, DMA setup FIS auto-activate optimization, Device-initiated interface power state transitions, software settings preservations] Set transfer mode ( based on value in sector count register) | EFh |
| Power Management Feature Set | | |
| | Standby Immediate | E0h |
| | Idle Immediate | E1h |
| | Standby | E2h |
| | Idle | E3h |
| | Check Power Mode | E5h |
| | Sleep | E6h |
| Security Mode Feature Set | | |
| | Security Set Password | F1h |
| | Security Unlock | F2h |
| | Security Erase Prepare | F3h |
| | Security Erase Unit | F4h |
| | Security Freeze Lock | F5h |
| | Security Disable Password | F6h |
| S.M.A.R.T Feature Set | | |
| | SMART Execute Off-Line Routine | B0h |
| | SMART Execute Short Self-test Routine | B0h |

| | | |
|---|---|---|
| | SMART Execute Extended Self-test Routine | B0h |
| | SMART Execute Selective Self-test Routine | B0h |
| | SMART Abort Off-Line Routine | B0h |
| | SMART Execute Short Self-test Routine (captive) | B0h |
| | SMART Execute Extended Self-test Routine (captive) | B0h |
| | SMART Execute Selective Self-test Routine (captive) | B0h |
| | SMART Execute Conveyance Self-test Routine (offline) | B0h |
| | SMART Execute Conveyance Self-test Routine (captive) | B0h |
| | SMART SCT ( SMART Command transport) Command/Status | B0h |
| | SMART Data Transfer | B0h |
| | SMART SCT Control: Forced Write Cache Enable/Disable | B0h |
| | SMART SCT Data Tables: Read Table:(HAD)Temperature History | B0h |
| | SMART Read Data | B0h/D0h |
| | SMART Enable/Disable Autosave | B0h/D2h |
| | SMART Execute Off-line Immediate | B0h/D4h |
| | SMART Read Log | B0h/D5h |
| | SMART Write Log | B0h/D6h |
| | SMART Enable Operations | B0h/D8h |
| | SMART Disable Operations | B0h/D9h |
| | SMART Return Status | B0h/DAh |
| | SMART Read Threshold | B0h/D1h |
| | SMART Save ATB Threshold | B0h/D3h |
| Host Protected Area Feature Set | | |
| | Read Native Max Address | F8h |
| | Read Native Max Address EXT | 27h |
| | Set Max Address | F9h |
| | Set Max Address EXT | 37h |
| | Set Max Set Password | F9h/01h |
| | Set Max Lock | F9h/02h |
| | Set Max unLock | F9h/03h |
| | Set Max Freeze Lock | F9h/04h |

## 3.2 SMART Command Support

The Wintec Industries SSD drive supports SMART command Set is used to define some vendor-specific data to report spare/bad block numbers in each memory management unit.

### Table 12: SMART Command Set

| Value | Command | Value | Command |
|---|---|---|---|
| **00-CF** | Reserved | **D6h** | Write Log sector |
| **D0h** | Read Data attributes | **D7h*** | Write attribute threshold |
| **D1h*** | Read attribute Threshold | **D8h** | Enable SMART operation |
| **D2h** | Enable/Disable attribute autosave | **D9h** | Disable SMART operation |
| **D3h*** | Save attribute Values | **DAh** | Smart Return Status |
| **D4h** | Execute OFF-LINE Immediate | **DBh** | Enable / disable automatic off-line |
| **D5h** | Read Log sector | **DC-FFh** | Reserved |

*Note the D1, D3, and D7 are supported, but have been made obsolete in the ATA-8/ACS-2 specifications

### 3.2.1 SMART Attribute Sector

The following 512 bytes defines the SMART format. Users can obtain the data using the "Read Data" command.

**Table 13: SMART Attribute Data Structure**

| Byte | Description |
|---|---|
| **0-1** | SMART structure version code |
| **2** | 1st Stored Attribute Number |
| **3-4** | Status |
| **5** | Nominal value |
| **6** | Worst value since SSD was deployed |
| **7-12** | Raw Data |
| **13** | Reserved |
| **14-25** | Next Stored Attribute Number |
| **26-361** | Next Stored Attribute Numbers |
| **362** | Off-line data collection status |
| **363** | Self-test execution status byte |
| **364-365** | Total time in seconds to complete off-line data collection activity |
| **366** | Reserved |
| **367** | Off-line data collection capability |
| **368-369** | SMART capability |
| **370** | Error Logging capability<br>• bit 0 1 = Device error logging supported |
| **371** | Next Self-Test Step |
| **372** | Short self-test routine recommended polling time ( in minutes) |
| **373** | Extended self-test routine recommended polling time ( in minutes) |
| **374** | Conveyance self-test routine recommended polling time ( in minutes) |
| **375-376** | Time for Extended Self-Test if > 255 ( ie, 373 to FFh) |
| **377-385** | Reserved |
| **386-510** | Vendor specific |
| **511** | Checksum of Data structure ( generated on retrieval of stored data ) |

### 3.2.2 Supported SMART Attributes

The following table summarizes the SMART attribute Menu.

**Table 14: SMART Attribute Menu Summary**

| ID | Hex | Attribute Name | Description |
|---|---|---|---|
| 1 | 01h | Raw Read Error Rate | Raw error rate related to ECC errors. Correctable and uncorrectable errors are included in error event count |
| 5 | 05h | Retired Block Count | Tracks the total number of retired blocks. |
| 9 | 09h | Power-On Hours (POH) | Total count of hours in power-on state. |
| 12 | 0Ch | Device Power Cycle Count | The count of full disk power on/off cycles. |
| 171 | ABh | Program Fail Count | Counts the number of flash program failure |
| 172 | ACh | Erase Fail Count | Counts the number of flash erase failure |
| 174 | AEh | Unexpected Power loss count | Counts the number of unexpected power loss events since the drive was deployed |
| 177 | B1h | Wear Range Delta | Return the percent difference in wear between the most-worn block and least-worn block |
| 181 | B5h | Program Fail Count | (Identical to attribute 171) |
| 182 | B6h | Erase Fail count | (Identical to attribute 172) |

| | | | |
|---|---|---|---|
| 187 | BBh | Reported Uncorrectable Errors | This attribute tracks the number of uncorrectable errors reported back to the host for all data access commands |
| 194 | C2h | Temperature | Reads the temperature in degrees C |
| 195 | C3h | On-the-fly ECC Uncorrectable Error Count | This attribute tracks the number of uncorrectable errors. (UECC) |
| 196 | C4h | Reallocation Even Count | This attribute tracks the number of blocks that fail programming which are reallocated as a result |
| 201 | C9h | Uncorrectable Soft Read Error Rate | Number of soft read errors that cannot be fixed on-the-fly and requires deep recovery via RAISE ™ (ieUECC) |
| 204 | CCh | Soft ECC correction Rate | Number of errors corrected by RAISE ™ |
| 230 | E6h | Life Curve Status | A life curve used to help predict life in terms of the endurance based on the number of writes to flash |
| 231 | E7h | SSD Life left | Indicates the approximate percentage of SDD life left |
| 233 | E9 | Internal Reserved (LSI) | Reserved for Controller Vendor |
| 234 | EA | Internal Reserved (LSI) | Reserved for Controller Vendor |
| 241 | F1h | Lifetime Writes from Host | Indicates the total amount of data written from hosts since the drive was deployed |
| 242 | F2h | Lifetime Reads from Host | Indicates the total amount of data read to hosts since the drive was deployed |

# 4.0 Physical Specifications

## 4.1 Physical Specifications

**Table 15: Physical Specifications**

| | Common Dimensions (mm) | | |
|---|---|---|---|
| **Symbol** | **Min** | Nom | Max |
| A | - | 39.00 | - |
| B | 53.85 | 54.00 | 54.15 |
| C | - | 49.40 | - |
| D | - | 25.00 | - |
| E | 2.15 | 2.30 | 2.45 |
| F | - | 0.80 | - |
| G | - | 33.39 | - |
| H | - | - | 4.00 |
| I | 3.85 | 4.00 | 4.15 |

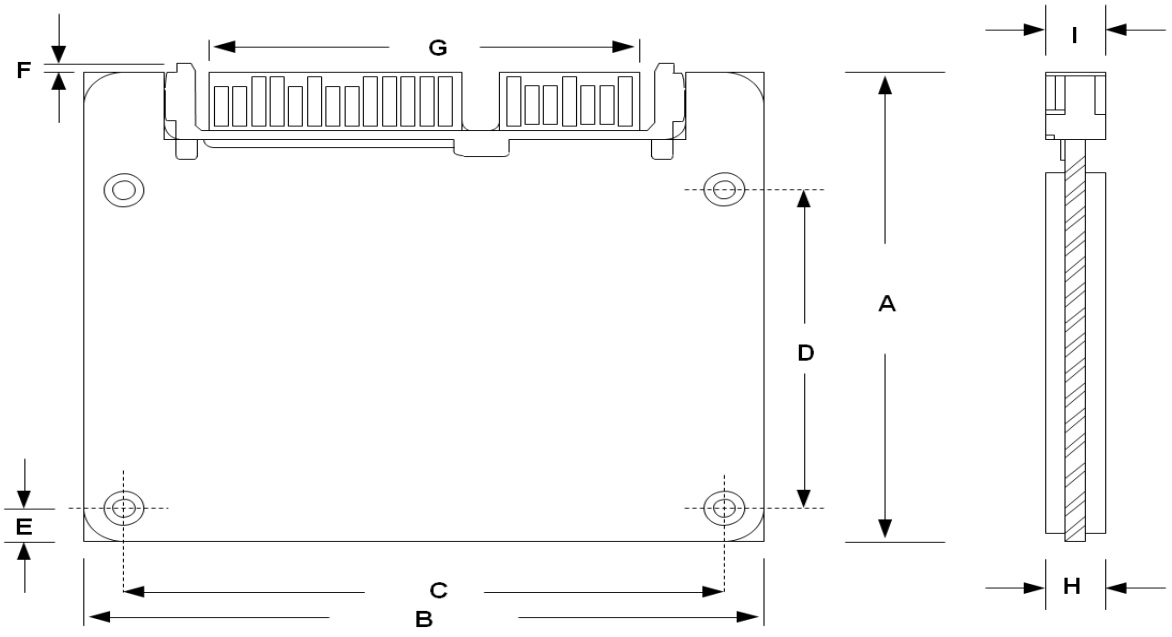


Figure 2: Physical Dimensions

# 5.0 Ordering Information

**Table 17:** Product Availability List & Naming

| Model Number | Nand Flash Type | Overprovision | User Capacity (typ) |
|---|---|---|---|
| **WvES032G1TA-D41wxx-yyy.zz** | SLC/MLC | 0% | 32GB |
| **WvES060G1TA-D41wxx-yyy.zz** | SLC/MLC | 7% | 60GB |
| **W2ES080G1TA-D41wxx-yyy.zz** | MLC | 16% | 80GB |
| **W2ES120G1TA-D41wxx-yyy.zz** | MLC | 7% | 120GB |
| **W2ES240G1TA-D41wxx-yyy.zz** | MLC | 7% | 240GB |

**(*v*) Flash Manufacturer and type**
2: MLC
7: SLC

**(*w*) Flash Manufacturer and type**
Contact the factory/Sales Rep. for the latest Flash MFG

**(*xx*) Die Revision and Process**
Contact the factory/Sales Rep for the latest

**(*yyy*) Component Flash type**
2D2: 2-Nand, Dual Die Package, 2-CE
4Q2: 4-Nand, Quad Die Package, 2-CE
4D2: 4-Nand, Dual Die Package, 2-CE
4Q4: 4-Nand, Quad Die Package, 4-CE

**(*zz*) Firmware Revision**
Contact the factory for the latest firmware rev. and/or custom labeling and programming identification.

# Contact Us (US & Int'l)

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http://www.wintecind.com/oem

**About Wintec Industries, Inc.:**
Wintec Industries, founded in 1988, is headquartered in Milpitas, California. Wintec, an ODM/OEM solution provider, specializes in product designs and manufacturing, including Flash modules (CF, SD, USB, embedded Flash, SSD, etc), DRAM modules (RDIMM, SODIMM, UDIMM), wireless products, modem products (embedded and USB), Advanced Digital Display products (ADD2 DVI, HDMI, digital signage), and so on. With experienced engineering team in Silicon Valley, Wintec provides a wide range of services and solutions for customers. Wintec is ISO9001-2000 certified.

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