

EPTDE –

SATA III 6Gb/s mSATA SSD

Transcend EPTDE series are mSATA Solid State Drives (SSDs) with high performance and quality Flash Memory assembled on a printed circuit board. These devices feature cutting-edge technology to enhance product life and data retention. EPTDE is designed specifically for various applications, such as Ultrabooks, industrial PCs, vehicle PCs and road surveillance recording.

- Power Supply: 3.3V±5%
- Fully compatible with devices and OS that support the SATA III 6.0Gb/s standard
- Non-volatile Flash Memory for outstanding data retention
- Supports Trim and NCQ command
- Compliant with JEDEC MO-300

Features

- RoHS compliant
- Advanced Global Wear-Leveling and Block management for reliability
- Built-in ECC (Error Correction Code) functionality
- Features a DDR3 DRAM Cache
- Supports Advanced Garbage Collection
- Supports Enhanced S.M.A.R.T. function
- Power Shield to prevent data loss in the event of a sudden power outage
- Supports partial and slumber mode
- Supports Security Command
- Supports DevSleep mode
- Supports Hardware Purge and Hardware Write Protect (Optional)
- Supports Transcend SSD Scope Pro (Optional)
- Real time full drive encryption with Advanced Encryption Standard (AES) (Optional)



Specifications

| Physical Specification | | | |
|------------------------|--------|---------------------------------|--------------------|
| Form Factor | | MO-300 | |
| Storage Capacities | | 16GB to 1TB | |
| Dimensions | Length | 50.8 ± 0.15 mm | 1.175 ± 0.006 inch |
| | Width | 29.85 ± 0.15 mm | 2.000 ± 0.006 inch |
| | Height | Max 4.85 mm | Max 0.111 inch |
| Input Voltage | | 3.3V ± 5% | |
| Weight | | 8g | |
| Connector | | PCI Express Mini Card Connector | |

| Environmental Specifications | | |
|------------------------------|---------------|----------------------------|
| Operating Temperature | | -40 °C to 85 °C |
| Storage Temperature | | -40 °C to 85 °C |
| Humidity | Operating | 0% to 95% (Non-condensing) |
| | Non-Operating | 0% to 95% (Non-condensing) |

| Performance | | | | | | | | |
|-----------------|---------------|----------------|-----------------------|------------------------|---------------------------------|----------------------------------|--|---|
| Model P/N | ATTO | | CrystalDiskMark | | | | IOMeter | |
| | Max Read * | Max Write * | Sequential Read ** | Sequential Write ** | Random Read (4KB QD32) ** | Random Write (4KB QD32) ** | IOPS Random Read (4KB QD32) *** | IOPS Random Write (4KB QD32) *** |
| TS16EPTDE0000A | 140 | 25 | 140 | 25 | 55 | 25 | 13K | 6K |
| TS32EPTDE0000A | 280 | 50 | 280 | 50 | 110 | 55 | 26K | 13K |
| TS64EPTDE0000A | 560 | 100 | 520 | 100 | 200 | 100 | 50K | 25K |
| TS128EPTDE0000A | 560 | 200 | 520 | 200 | 290 | 200 | 70K | 50K |
| TS256EPTDE0000A | 570 | 400 | 520 | 400 | 300 | 300 | 70K | 75K |
| TS512EPTDE0000A | 570 | 460 | 520 | 470 | 300 | 300 | 70K | 75K |
| TS000EPTDE0000A | 560 | 460 | 520 | 460 | 290 | 290 | 70K | 70K |

Note: Maximum transfer speed recorded

*25 °C, test on ASUS P8Z68-M PRO, 4GB, Windows[®] 7 Professional with AHCI mode, benchmark utility ATTO (version 2.41), unit MB/s

**25 °C, test on ASUS P8Z68-M PRO, 4GB, Windows[®] 7 Professional with AHCI mode, benchmark utility CrystalDiskMark (version 3.0.1), copied file 1000MB, unit MB/s

***25 °C, test on ASUS P8Z68-M PRO, 4GB, Windows[®] 7 Professional with AHCI mode, benchmark utility IOMeter2006 with 4K file size and queue depth of 32, unit IOPS

****The recorded performance is obtained while the SSD is not operating as an OS disk

| Actual Capacity | | | | |
|-----------------|---------------|----------|------|--------|
| Model P/N | User Max. LBA | Cylinder | Head | Sector |
| TS16EPTDE0000A | 31,277,232 | 16,383 | 16 | 63 |
| TS32EPTDE0000A | 62,533,296 | 16,383 | 16 | 63 |
| TS64EPTDE0000A | 125,045,424 | 16,383 | 16 | 63 |
| TS128EPTDE0000A | 250,069,680 | 16,383 | 16 | 63 |
| TS256EPTDE0000A | 500,118,192 | 16,383 | 16 | 63 |
| TS512EPTDE0000A | 1,000,215,216 | 16,383 | 16 | 63 |
| TS000EPTDE0000A | 2,000,409,264 | 16,383 | 16 | 63 |

| Power Consumption | | |
|-------------------------------|-----------|--------------|
| Input Voltage | | 3.3V ± 5% |
| Model P/N / Power Consumption | | Average (mA) |
| TS16EPTDE0000A | Max Read | 175 |
| | Max Write | 180 |
| | Idle | 80 |
| TS32EPTDE0000A | Max Read | 190 |
| | Max Write | 200 |
| | Idle | 85 |
| TS64EPTDE0000A | Max Read | 225 |
| | Max Write | 245 |
| | Idle | 85 |
| TS128EPTDE0000A | Max Read | 245 |
| | Max Write | 370 |
| | Idle | 85 |
| TS256EPTDE0000A | Max Read | 255 |
| | Max Write | 550 |
| | Idle | 85 |
| TS512EPTDE0000A | Max Read | 270 |
| | Max Write | 720 |
| | Idle | 90 |
| TS000EPTDE0000A | Max Read | 570 |
| | Max Write | 800 |
| | Idle | 120 |

*Tested with Iometer running sequential reads/writes and idle mode

| Reliability | | | |
|---|---------------------------------------|--------------|--|
| Data Reliability | Supports BCH ECC 42 bit per 1024 byte | | |
| MTBF | 1,500,000 hours | | |
| Endurance (TeraBytes Written)* | Capacity | * TBW | ** TBW (Base on JEDEC Standard) |
| | 16GB | 45TB | 23TB |
| | 32GB | 90TB | 45TB |
| | 64GB | 180TB | 90TB |
| | 128GB | 360TB | 180TB |
| | 256GB | 740TB | 370TB |
| | 512GB | 1480TB | 740TB |
| | 1TB | 2360TB | 1180TB |
| DWPD (Drive Writes Per Day for 3years) | 2.2 DWPD | | |

*Tested under burn-in tool, TBW value may vary due to host environment.

**Tested under JESD218A endurance test method and JESD219A endurance workloads specification.

| Vibration | |
|----------------------|-----------------|
| Operating | 3.0G, 5 - 800Hz |
| Non-Operating | 5.0G, 5 - 800Hz |

Reference to IEC 60068-2-6 Testing procedures; Operating-Sine wave, 5-800Hz/1 oct., 1.5mm, 3g, 0.5 hr./axis, total 1.5 hrs.

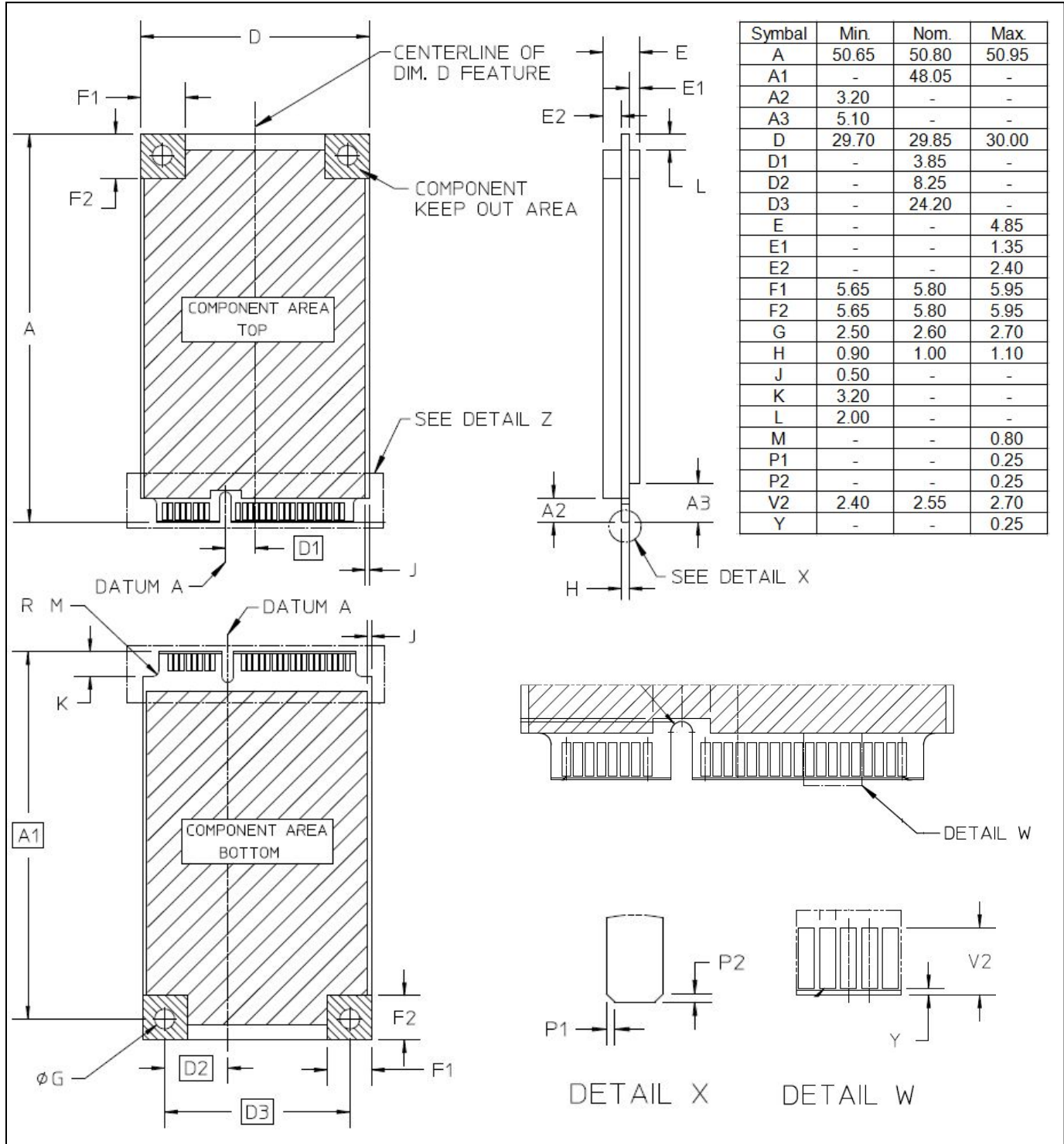
| Shock | |
|----------------------|--------------|
| Operating | 1500G, 0.5ms |
| Non-Operating | 1500G, 0.5ms |

Reference to IEC 60068-2-27 Testing procedures; Operating-Half-sine wave, 1500G, 0.5ms, 3 times/dir., total 18 times.

| Regulations | |
|-------------------|------------------|
| Compliance | CE, FCC and BSMI |

Package Dimensions

The figure below illustrates the Transcend mSATA Solid State Disk product. All dimensions are in mm.



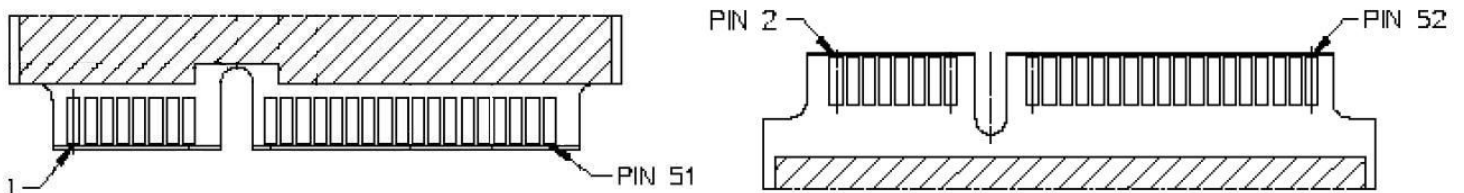
Pin Assignments

| Pin No. | Pin Name | Pin No. | Pin Name |
|---------|----------------------|---------|----------|
| 01 | NC | 02 | 3.3V |
| 03 | NC | 04 | GND |
| 05 | NC | 06 | NC |
| 07 | NC | 08 | NC |
| 09 | GND | 10 | NC |
| 11 | NC | 12 | NC |
| 13 | NC | 14 | NC |
| 15 | GND | 16 | NC |
| 17 | NC | 18 | GND |
| 19 | NC | 20 | NC |
| 21 | GND | 22 | NC |
| 23 | TX+ | 24 | 3.3V |
| 25 | TX- | 26 | GND |
| 27 | GND | 28 | NC |
| 29 | GND | 30 | NC |
| 31 | RX- | 32 | NC |
| 33 | RX+ | 34 | GND |
| 35 | GND | 36 | NC |
| 37 | GND | 38 | NC |
| 39 | 3.3V | 40 | GND |
| 41 | 3.3V | 42 | NC |
| 43 | NC | 44 | DEVSLP |
| 45 | NC | 46 | NC |
| 47 | NC | 48 | NC |
| 49 | DAS/DSS* | 50 | GND |
| 51 | Presence Detection** | 52 | 3.3V |

* Device Activity Signal / Disable Staggered Spin-up

** Connect to GND internally

Pin Layout



Block Diagram



Features

- **Global Wear Leveling – Advanced algorithms to enhance wear-leveling efficiency**

Global wear leveling ensures every block has an even erase count. By ensuring all spare blocks in the SSD's flash chips are managed in a single pool, each block can then have an even erase count. This helps to extend the lifespan of a SSD and to provide the best possible endurance.

There are three main processes in global wear -leveling:

- (1) Record the block erase count and save this in the wear-leveling table.
- (2) Finds the static-block and saves this in the wear-leveling pointer.
- (3) Checks the erase count when a block is pulled from the pool of spare blocks. If the erased block count is larger than the Wear Count (WEARCNT), then the static blocks are leveraged against the over-count blocks.

- **ECC Algorithm**

The controller uses a BCH 42 Bit ECC algorithm per 1024 bytes depending on the structure of the flash. BCH42 may correct up to 42 random bit errors within 1024 data bytes. With the help of BCH42 ECC, the endurance of the Transcend SSD is greatly improved.

- **Bad Block Management**

When the flash encounters an ECC, program or erase failure, the controller will mark the block as a bad block to prevent use of this block and cause data loss in the future.

- **Advanced Garbage Collection**

Transcend's Garbage Collection mechanism improves SSD performance. Advanced Garbage Collection can efficiently improve memory management to ensure stable SSD performance. Transcend's advanced flash management can maintain the drive's high performance even after an extended operating time.

- **Enhanced S.M.A.R.T. function**

Transcend's SSDs support the innovative S.M.A.R.T. command (Self-Monitoring, Analysis, and Reporting Technology) which allows users to evaluate the health status of their SSD efficiently.

- **Hardware Purge and Hardware Write Protect (Optional)**

The SSDs have optional features such as hardware trigger for quick data erase and write protection. These features may be enabled by simply connecting a switch to the designated pins.

- **StaticDataRefresh Technology**

Normally, the ECC engine corrections take place without affecting normal host operations. Over time, the number of bit errors accumulated in the read transaction exceeds the correcting capacity of the ECC engine, which results in corrupted data being sent to the host. To prevent this, the controller monitors the bit error levels during each read operation; when the number of bit errors reaches the preset threshold value, the controller automatically performs a data refresh to "restore" the correct charge levels in the cell. Implementation of StaticDataRefresh Technology reinstates the data to its original, error-free state, and hence, lengths the data's lifespan.

ATA Command Register

This table and the following paragraphs summarize the ATA command set.

Command Table

| Support ATA/ATAPI Command | Code | Protocol |
|--|------------|-------------------|
| General Feature Set | | |
| EXECUTE DIAGNOSTICS | 90h | Device diagnostic |
| FLUSH CACHE | E7h | Non-data |
| IDENTIFY DEVICE | ECh | PIO data-In |
| Initialize Drive Parameters | 91h | Non-data |
| READ DMA | C8h | DMA |
| READ LOG Ext | 2Fh | PIO data-In |
| READ MULTIPLE | C4h | PIO data-In |
| READ SECTOR(S) | 20h | PIO data-In |
| READ VERIFY SECTOR(S) | 40h or 41h | Non-data |
| SET FEATURES | EFh | Non-data |
| SET MULTIPLE MODE | C6h | Non-data |
| WRITE DMA | Cah | DMA |
| WRITE MULTIPLE | C5h | PIO data-out |
| WRITE SECTOR(S) | 30h | PIO data-out |
| NOP | 00h | Non-data |
| READ BUFFER | E4h | PIO data-In |
| WRITE BUFFER | E8h | PIO data-out |
| Power Management Feature Set | | |
| CHECK POWER MODE | E5h or 98h | Non-data |
| IDLE | E3h or 97h | Non-data |
| IDLE IMMEDIATE | E1h or 95h | Non-data |
| SLEEP | E6h or 99h | Non-data |
| STANDBY | E2h or 96h | Non-data |
| STANDBY IMMEDIATE | E0h or 94h | Non-data |
| Security Mode Feature Set | | |
| SECURITY SET PASSWORD | F1h | PIO data-out |
| SECURITY UNLOCK | F2h | PIO data-out |
| SECURITY ERASE PREPARE | F3h | Non-data |
| SECURITY ERASE UNIT | F4h | PIO data-out |
| SECURITY FREEZE LOCK | F5h | Non-data |
| SECURITY DISABLE PASSWORD | F6h | PIO data-out |
| SMART Feature Set | | |
| SMART Disable Operations | B0h | Non-data |
| SMART Enable/Disable Autosave | B0h | Non-data |
| SMART Enable Operations | B0h | Non-data |
| SMART Execute Off-Line Immediate | B0h | Non-data |
| SMART Read LOG | B0h | PIO data-In |
| SMART Read Data | B0h | PIO data-In |
| SMART Read THRESHOLD | B0h | PIO data-In |
| SMART Return Status | B0h | Non-data |
| SMART SAVE ATTRIBUTE VALUES | B0h | Non-data |
| SMART WRITE LOG | B0h | PIO data-out |
| Host Protected Area Feature Set | | |

| | | |
|-----------------------------------|-----|--------------|
| Read Native Max Address | F8h | Non-data |
| Set Max Address | F9h | Non-data |
| Set Max Set Password | F9h | PIO data-out |
| Set Max Lock | F9h | Non-data |
| Set Max Freeze Lock | F9h | Non-data |
| Set Max Unlock | F9h | PIO data-out |
| 48-bit Address Feature Set | | |
| Flush Cache Ext | Eah | Non-data |
| Read Sector(s) Ext | 24h | PIO data-in |
| Read DMA Ext | 25h | DMA |
| Read Multiple Ext | 29h | PIO data-in |
| Read Native Max Address Ext | 27h | Non-data |
| Read Verify Sector(s) Ext | 42h | Non-data |
| Set Max Address Ext | 37h | Non-data |
| Write DMA Ext | 35h | DMA |
| Write Multiple Ext | 39h | PIO data-out |
| Write Sector(s) Ext | 34h | PIO data-out |
| NCQ Feature Set | | |
| Read FPDMA Queued | 60h | DMA Queued |
| Write FPDMA Queued | 61h | DMA Queued |
| Other | | |
| Data Set Management | 06h | DMA |
| SEEK | 70h | Non-data |

SMART Data Structure

| BYTE | F / V | Description |
|---------|-------|--|
| 0-1 | X | Revision code |
| 2-361 | X | Vendor specific |
| 362 | V | Off-line data collection status |
| 363 | X | Self-test execution status byte |
| 364-365 | V | Total time in seconds to complete off-line data collection activity |
| 366 | X | Vendor specific |
| 367 | F | Off-line data collection capability |
| 368-369 | F | SMART capability |
| 370 | F | Error logging capability 7-1 Reserved 0 1=Device error logging supported |
| 371 | X | Vendor specific |
| 372 | F | Short self-test routine recommended polling time (in minutes) |
| 373 | F | Extended self-test routine recommended polling time (in minutes) |
| 374 | F | Conveyance self-test routine recommended polling time (in minutes) |
| 375-385 | R | Reserved |
| 386-395 | F | Firmware Version/Date Code |
| 396-397 | F | Reserved |
| 398-399 | V | Reserved |
| 400-406 | V | TS6500 |
| 407-415 | X | Vendor specific |
| 416 | F | Reserved |
| 417 | F | Program/write the strong page only |
| 418-419 | V | Number of spare block |
| 420-423 | V | Average Erase Count |
| 424-510 | X | Vendor specific |
| 511 | V | Data structure checksum |

F = content (byte) is fixed and does not change.

V= content (byte) is variable and may change depending on the state of the device or the commands executed by the device.

X= content (byte) is vendor specific and may be fixed or variable.

R= content (byte) is reserved and shall be zero.

SMART Attributes

The following table shows the vendor specific data in byte 2 to 361 of the 512-byte SMART data

| Attribute ID (hex) | Raw Attribute Value | | | | | | | Attribute Name |
|--------------------|---------------------|-----|----|-----|----|----|-----|---|
| 01 | MSB | 00 | 00 | 00 | 00 | 00 | 00 | Read Error Rate |
| 05 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Reallocated sectors count |
| 09 | LSB | - | - | MSB | 00 | 00 | 00 | Power-on hours |
| 0C | LSB | - | - | MSB | 00 | 00 | 00 | Power Cycle Count |
| A0 | LSB | - | - | MSB | 00 | 00 | 00 | Uncorrectable sectors count when read/write |
| A1 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Number of valid spare blocks |
| A3 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Number of initial invalid blocks |
| A4 | LSB | - | - | MSB | 00 | 00 | 00 | Total erase count |
| A5 | LSB | - | - | MSB | 00 | 00 | 00 | Maximum erase count |
| A6 | LSB | - | - | MSB | 00 | 00 | 00 | Minimum erase count |
| A7 | LSB | - | - | MSB | 00 | 00 | 00 | Average erase count |
| A8 | LSB | - | - | MSB | 00 | 00 | 00 | Max erase count of spec |
| A9 | LSB | - | - | MSB | 00 | 00 | 00 | Remain Life (percentage) |
| AF | LSB | - | - | MSB | 00 | 00 | 00 | Program fail count in worst die |
| B0 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Erase fail count in worst die |
| B1 | LSB | - | - | MSB | 00 | 00 | 00 | Total wear level count |
| B2 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Runtime invalid block count |
| B5 | LSB | - | - | MSB | 00 | 00 | 00 | Total program fail count |
| B6 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Total erase fail count |
| C0 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Power-off retract Count |
| C2 | MSB | 00 | 00 | 00 | 00 | 00 | 00 | Controlled temperature |
| C3 | LSB | - | - | MSB | 00 | 00 | 00 | Hardware ECC recovered |
| C4 | LSB | - | - | MSB | 00 | 00 | 00 | Reallocation event count |
| C5 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Current Pending Sector Count |
| C6 | LSB | - | - | MSB | 00 | 00 | 00 | Uncorrectable error count off-line |
| C7 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Ultra DMA CRC Error Count |
| E8 | LSB | MSB | 00 | 00 | 00 | 00 | 00 | Available reserved space |
| F1 | LSB | - | - | - | - | - | MSB | Total LBA written (each write unit = 32MB) |
| F2 | LSB | - | - | - | - | - | MSB | Total LBA read (each read unit = 32MB) |
| F5 | LSB | - | - | - | - | - | MSB | Flash write sector count |

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- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А