

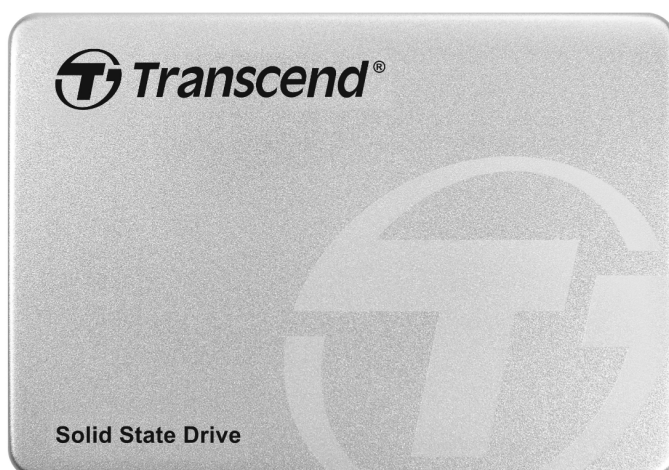
SSD370S – SATA III 6Gb/s SSD

Due to Ultra-slim (fit the standard dimensions of 2.5" SATA Hard Disk Drives), huge capacity, SATA 6Gb/s speed, and low power consumption, Solid State Drive is the perfect replacement storage device for Ultrabooks, PCs, Laptops, gaming systems, and handheld devices.

- 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

Features

- Advanced Global Wear-Leveling and Block management for reliability
- Supports Advanced Garbage Collection
- Features a DDR3 DRAM cache
- Built-in ECC (Error Correction Code) functionality
- Advanced power shield to prevent data loss in the event of a sudden power outage
- Supports DEVSLP mode
- Supports Enhanced S.M.A.R.T. Function
- Real time full drive encryption with Advanced Encryption Standard (AES) (Optional)
- RoHS compliant
- Provides great shock resistance
- Slim, elegant, light design and aluminum case



Specifications

| Physical Specification | | | |
|---------------------------|---------------|------------------------|--------------------|
| Form Factor | | 2.5 inch HDD | |
| Storage Capacities | | 32 GB to 1TB | |
| Dimensions | Length | 100.00 ± 0.25 mm | 3.937 ± 0.01 inch |
| | Width | 69.85 ± 0.25 mm | 2.750 ± 0.01 inch |
| | Height | 6.8 ± 0.2 mm | 0.268 ± 0.008 inch |
| Input Voltage | | 5V ± 5% | |
| Weight | | 58 ± 2 g | |
| Connector | | SATA 22 pins connector | |

| Environmental Specifications | | |
|------------------------------|----------------------|------------------------------|
| Operating Temperature | | 0 °C to 70 °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) *** |
| TS32GSSD370S | 230 | 40 | 230 | 40 | 90 | 40 | 20K | 10K |
| TS64GSSD370S | 450 | 80 | 440 | 80 | 170 | 80 | 40K | 20K |
| TS128GSSD370S | 550 | 170 | 520 | 170 | 270 | 170 | 70K | 40K |
| TS256GSSD370S | 560 | 320 | 520 | 320 | 300 | 300 | 70K | 70K |
| TS512GSSD370S | 560 | 460 | 520 | 460 | 300 | 300 | 75K | 75K |
| TS1TSSD370S | 560 | 460 | 520 | 460 | 300 | 300 | 75K | 75K |

Note: Maximum transfer speed recorded

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

** 25 °C, test on ASUS P8Z68-M PRO, 4 GB, 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, 4 GB, 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 | LBA | Cylinder | Head | Sector |
| TS32GSSD370S | 62,533,296 | 16,383 | 16 | 63 |
| TS64GSSD370S | 125,045,424 | 16,383 | 16 | 63 |
| TS128GSSD370S | 250,069,680 | 16,383 | 16 | 63 |
| TS256GSSD370S | 500,118,192 | 16,383 | 16 | 63 |
| TS512GSSD370S | 1,000,215,216 | 16,383 | 16 | 63 |
| TS1TSSD370S | 2,000,409,264 | 16,383 | 16 | 63 |

| Power Requirements | | |
|-------------------------------------|-------------------|---------------------|
| Input Voltage | | 5V ± 5% @ 25 °C |
| Mode P/N / Power Consumption | | Typical (mA) |
| TS32GSSD370S | Max Write* | 180 |
| | Max Read* | 175 |
| | Idle* | 61 |
| TS64GSSD370S | Max Write* | 255 |
| | Max Read* | 238 |
| | Idle* | 61 |
| TS128GSSD370S | Max Write* | 384 |
| | Max Read* | 241 |
| | Idle* | 61 |
| TS256GSSD370S | Max Write* | 621 |
| | Max Read* | 255 |
| | Idle* | 64 |
| TS512GSSD370S | Max Write* | 643 |
| | Max Read* | 285 |
| | Idle* | 65 |
| TS1TSSD370S | Max Write* | 692 |
| | Max Read* | 352 |
| | Idle* | 67 |

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

| Reliability | | |
|--------------------------------------|--------------------------------|-----------|
| Data Reliability | Supports 60 bits in 1024 bytes | |
| MTBF | 1,500,000 hours | |
| Endurance (Terabytes Written) | 32 GB | 45 (TB) |
| | 64 GB | 80 (TB) |
| | 128 GB | 150 (TB) |
| | 256 GB | 280 (TB) |
| | 512 GB | 550 (TB) |
| | 1 TB | 1180 (TB) |

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

| Vibration | |
|----------------------|---------------------------------|
| Operating | 5 G (peak-to-peak), 5 - 800 Hz |
| Non-Operating | 20 G (peak-to-peak), 5 - 800 Hz |

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

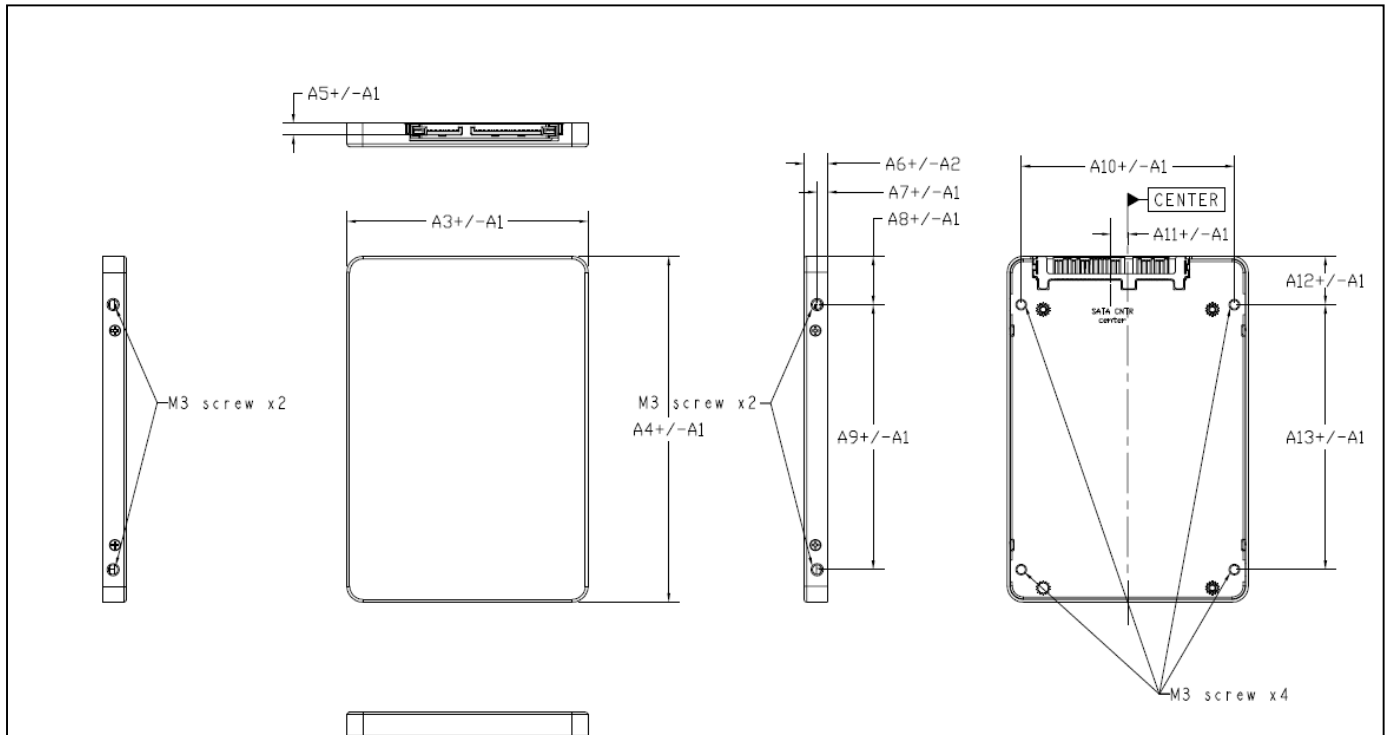
| Shock | |
|----------------------|----------------|
| Operating | 1500 G, 0.5 ms |
| Non-Operating | 1500 G, 0.5 ms |

* 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 2.5" SATA Solid State Drive. All dimensions are in mm.



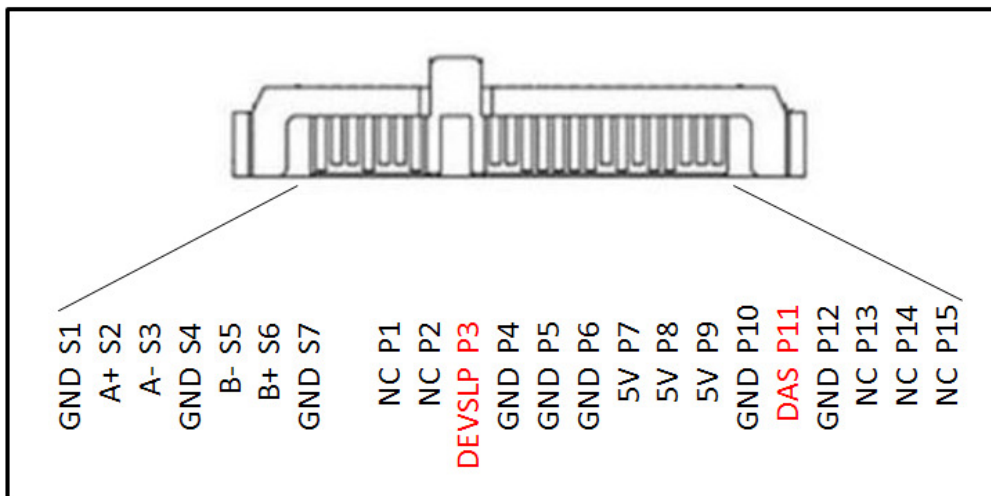
| Item | Milimeter | Item | Milimeter |
|------|-----------|------|-----------|
| A1 | 0.25 | A11 | 4.8 |
| A2 | 0.2 | A12 | 14.0 |
| A3 | 69.85 | A13 | 76.6 |
| A4 | 100.0 | | |
| A5 | 3.5 | | |
| A6 | 6.8 | | |
| A7 | 3.0 | | |
| A8 | 14.0 | | |
| A9 | 76.6 | | |
| A10 | 61.72 | | |

*Note: Tighten mounting screws with no more than 2 Kgf-cm of torque.

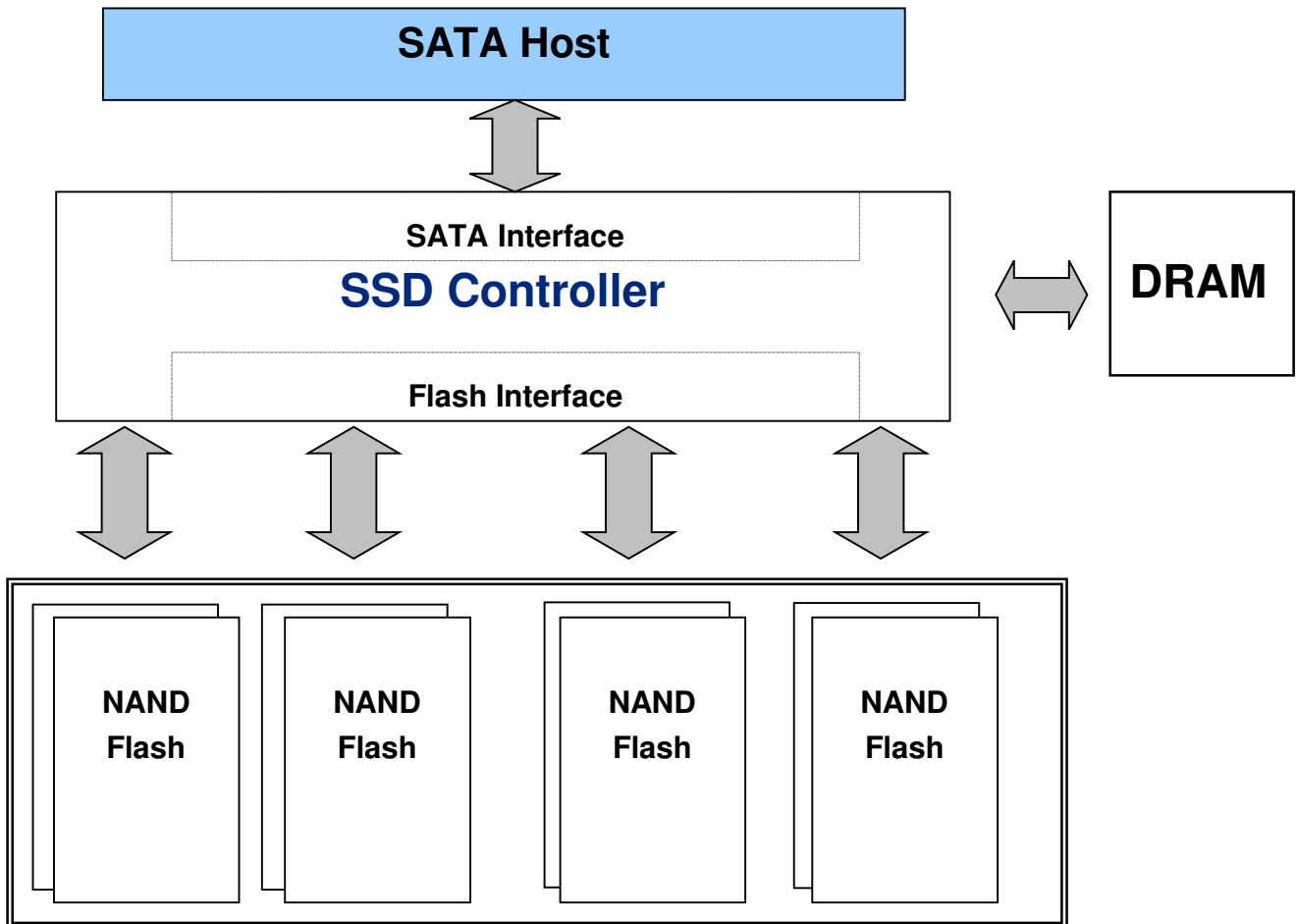
Pin Assignments

| Pin No. | Pin Name | Pin No. | Pin Name |
|---------|----------|---------|----------|
| S1 | GND | S2 | A+ |
| S3 | A- | S4 | GND |
| S5 | B- | S6 | B+ |
| S7 | GND | P1 | NC |
| P2 | NC | P3 | DEVSLP |
| P4 | GND | P5 | GND |
| P6 | GND | P7 | 5V |
| P8 | 5V | P9 | 5V |
| P10 | GND | P11 | DAS |
| P12 | GND | P13 | NC |
| P14 | NC | P15 | NC |

Pin Layout



Block Diagram



*The quantity of NAND flash varies by capacity.

Features

Wear-Leveling algorithm

The controller supports static/dynamic wear leveling. When the host writes data, the controller will find and use the block with the lowest erase count among the free blocks. This is known as dynamic wear leveling. When the free blocks 'erase count is higher than the data blocks', it will activate the static wear leveling, replacing the not so frequently used user blocks with the high erase count free blocks.

Bad-block management

When the flash encounters ECC fail, program fail or erase fail, the controller will mark the block as bad block to prevent using this block and cause data loss in the future.

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) that allows the users to evaluate the health information of their SSD in an efficient way.

StaticDataRefresh Technology

Normally, ECC engine corrections are taken place without affecting the host normal operations. As time passes by, the number of error bits accumulated in the read transaction exceeds the correcting capability of the ECC engine, resulting in corrupted data being sent to the host. To prevent this, the controller monitors the error bit levels at each read operation; when it reaches the preset threshold value, the controller automatically performs data refresh to "restore" the correct charge levels in the cell. This implementation practically restores the data to its original, error-free state, and hence, lengthening the life of the data.

ATA Command Register

This table with the following paragraphs summarizes 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.

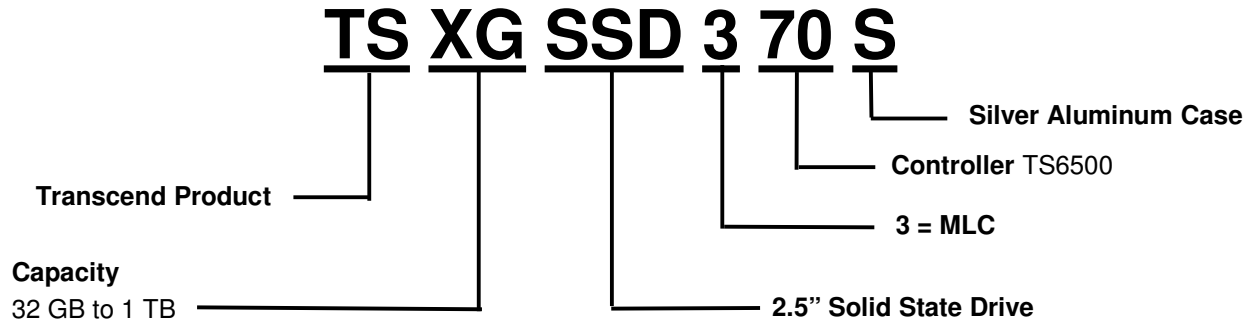
R= content (byte) is reserved and shall be zero.

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 |

Ordering Information



The technical information above is based on industry standard data and has been tested to be reliable. However, Transcend makes no warranty, either expressed or implied, as to its accuracy and assumes no liability in connection with the use of this product. Transcend reserves the right to make changes to the specifications at any time without prior notice.



TAIWAN

No.70, XingZhong Rd., NeiHu Dist., Taipei, Taiwan, R.O.C
TEL +886-2-2792-8000
Fax +886-2-2793-2222
E-mail: sales-tw@transcend-info.com
<http://tw.transcend-info.com>

USA

Los Angeles:
E-mail: sales-us@transcend-info.com
Maryland:
E-mail: sales-us@transcend-info.com
Florida:
E-mail: sales-us@transcend-info.com
Silicon Valley:
E-mail: sales-us@transcend-info.com
<http://www.transcend-info.com>

CHINA

Shanghai:
E-mail: sales-cn@transcendchina.com
Beijing:
E-mail: sales-cn@transcendchina.com
Shenzhen:
E-mail: sales-cn@transcendchina.com
<http://cn.transcend-info.com>

GERMANY

E-mail: vertrieb-de@transcend-info.com
<http://de.transcend-info.com>

HONG KONG

E-mail: sales-hk@transcend-info.com
<http://hk.transcend-info.com>

JAPAN

E-mail: sales-jp@transcend-info.com
<http://jp.transcend-info.com>

THE NETHERLANDS

E-mail: sales-nl@transcend-info.com
<http://nl.transcend-info.com>

United Kingdom

E-mail: sales-uk@transcend-info.com
<http://uk.transcend-info.com>

KOREA

E-mail: sales-kr@transcend-info.com
<http://kr.transcend-info.com>

Revision History

| Version | Date | Modification Content |
|----------------|-------------------|-----------------------------|
| 1.0 | 2015/04/20 | Initial release |