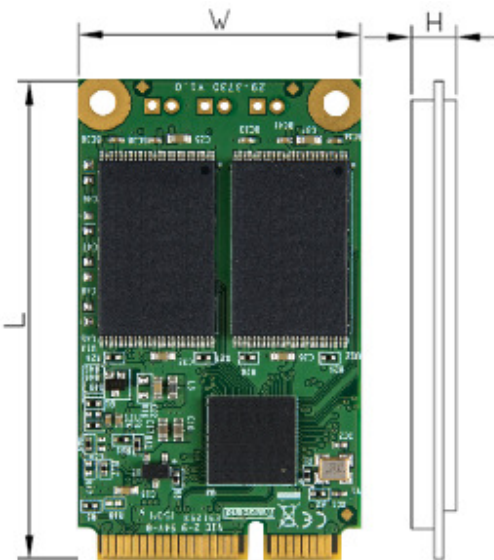


## Description

Transcend's MSA520 series are mSATA SSD devices 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. These products are designed specifically for various applications such as Ultrabook, PC, vehicle PC and road surveillance record.

## Placement



## Features

- RoHS compliant
- Advanced Global Wear-Leveling and Block management for reliability
- Built-in ECC (Error Correction Code) functionality
- Advanced Garbage Collection
- Supports Enhanced S.M.A.R.T. function
- Supports Security Command
- Hardware Purge and Write Protect
- Supports Transcend SSD Scope Pro (Optional)
- Power Supply: 3.3V±5%
- Fully compatible with devices and OS that support the SATA II 3.0Gb/s standard
- Non-volatile Flash Memory for outstanding data retention
- Compliant with JEDEC MO-300A

## Dimensions

Side	Millimeters	Inches
A	29.85 ± 0.15	1.175 ± 0.006
B	50.80 ± 0.15	2.000 ± 0.006
C	3.7 ± 0.10	0.146 ± 0.004

## Specifications

Physical Specification		
<b>Form Factor</b>	MO-300A	
<b>Storage Capacities</b>	1GB/4GB/8GB	
<b>Dimensions (mm)</b>	<b>Length</b>	50.8 ± 0.15
	<b>Width</b>	29.85 ± 0.15
	<b>Height</b>	3.7 ± 0.1
<b>Input Voltage</b>	3.3V ± 5%	
<b>Weight</b>	10g	
<b>Connector</b>	PCI Express Mini Card Connector	

Environmental Specifications		
<b>Operating Temperature</b>	0 °C to 70 °C	
<b>Storage Temperature</b>	-40 °C to 85 °C	
<b>Humidity</b>	<b>Operating</b>	0% to 95% (Non-condensing)
	<b>Non-Operating</b>	0% to 95% (Non-condensing)

Performance						
Model P/N	Sequential Read*	Sequential Write*	Random Read (4KB QD32)*	Random Write (4KB QD32)*	IOPS Random Read (4KB QD32)**	IOPS Random Write (4KB QD32)**
<b>TS1GMSA520</b>	50	15	12	1.2	3200	520
<b>TS4GMSA520</b>	51	45	12	1.6	3572	632
<b>TS8GMSA520</b>	97	87	13	2.1	3412	619

Note: Maximum transfer speed recorded

\* 25 °C, test on ASUS P5Q-Pro, 2GB, Windows® XP Version SP3 with AHCI mode, benchmark utility CrystalDiskMark (version 3.0), copied file 1000MB, unit MB/s

\*\* Random read/write performance based on 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
<b>TS1GMSA520</b>	1,932,336	1,917	16	63
<b>TS4GMSA520</b>	7,835,184	7,773	16	63
<b>TS8GMSA520</b>	15,649,200	15,525	16	63

Power Requirements		
<b>Input Voltage</b>		3.3V ± 5% @25°C
<b>Mode P/N / Power Consumption</b>		<b>Typical (mA)</b>
<b>TS1GMSA520</b>	<b>Read</b>	119
	<b>Write</b>	115
	<b>Idle</b>	95
<b>TS4GMSA520</b>	<b>Read</b>	125.3
	<b>Write</b>	188.5
	<b>Idle</b>	94.3
<b>TS8GMSA520</b>	<b>Read</b>	169.4
	<b>Write</b>	263.6
	<b>Idle</b>	95.9

Reliability		
<b>Data Reliability</b>		Supports BCH ECC 72 bits in 1024 bytes
<b>MTBF</b>		1,000,000 hours
<b>Endurance (Terabytes Written)</b>	1GB	11 TBW
	4GB	44TBW
	8GB	88TBW

Note: Based on JEDEC JESD218A specification, Client Application Class. And based on the following scenario: Active use: 40°C, 8hrs/day; Retention use: 30°C 1year

Vibration	
<b>Operating</b>	3.0G, 5 - 800Hz
<b>Non-Operating</b>	5.0G, 5 - 800Hz

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

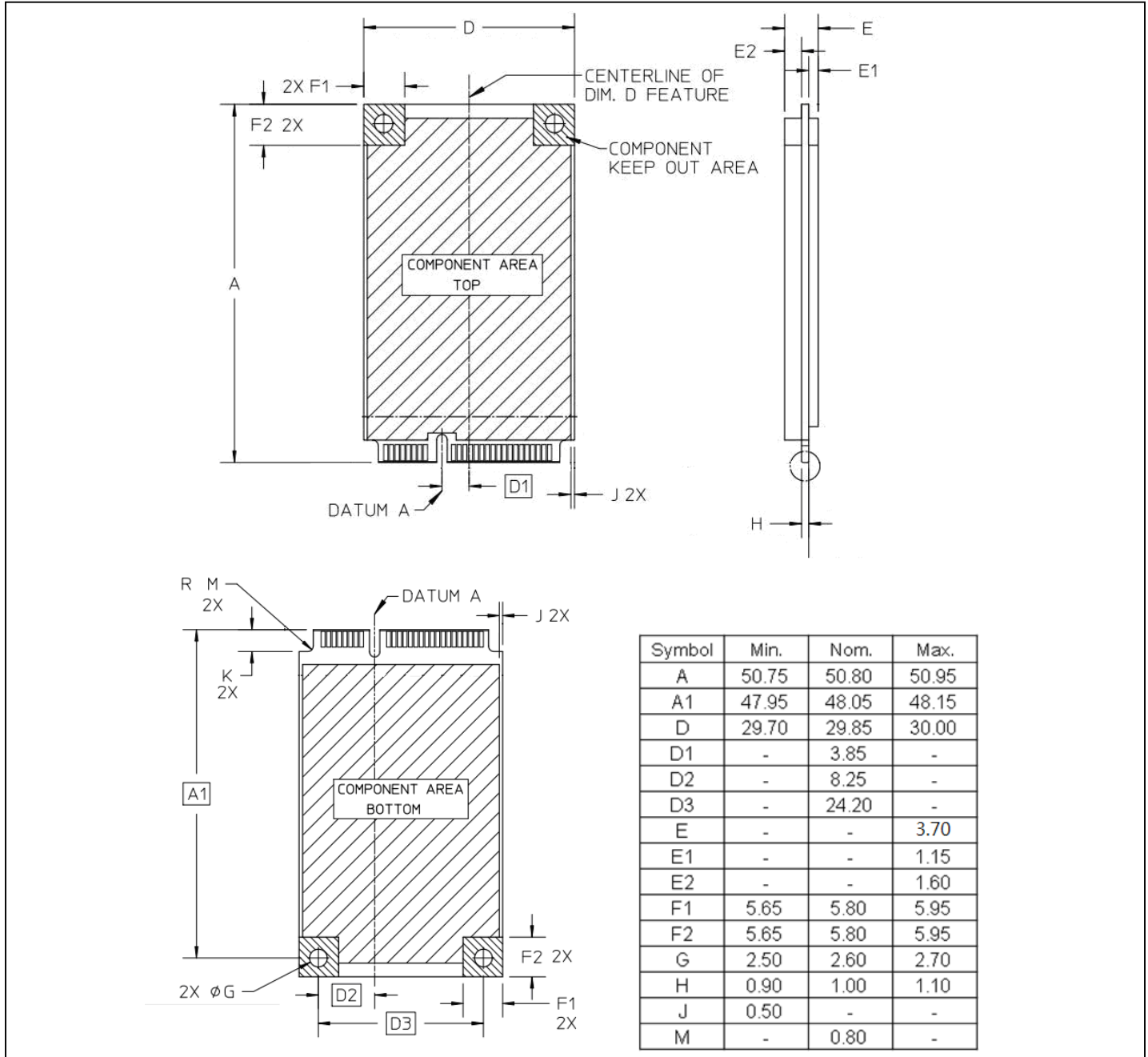
Shock	
<b>Operating</b>	1500G, 0.5ms
<b>Non-Operating</b>	1500G, 0.5ms

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

Regulations	
<b>Compliance</b>	CE,FCC and BSMI

## Package Dimensions

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



\*Note: Tighten mounting screws with no more than 1.0kgf-cm (0.07LB-ft) of torque.

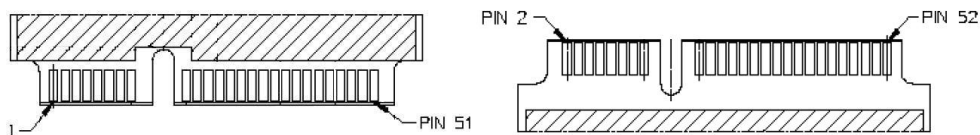
## Pin Assignments

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	NC
45	NC	46	NC
47	NC	48	NC
49	DAS/DSS*	50	GND
51	Presence Detection**	52	3.3V

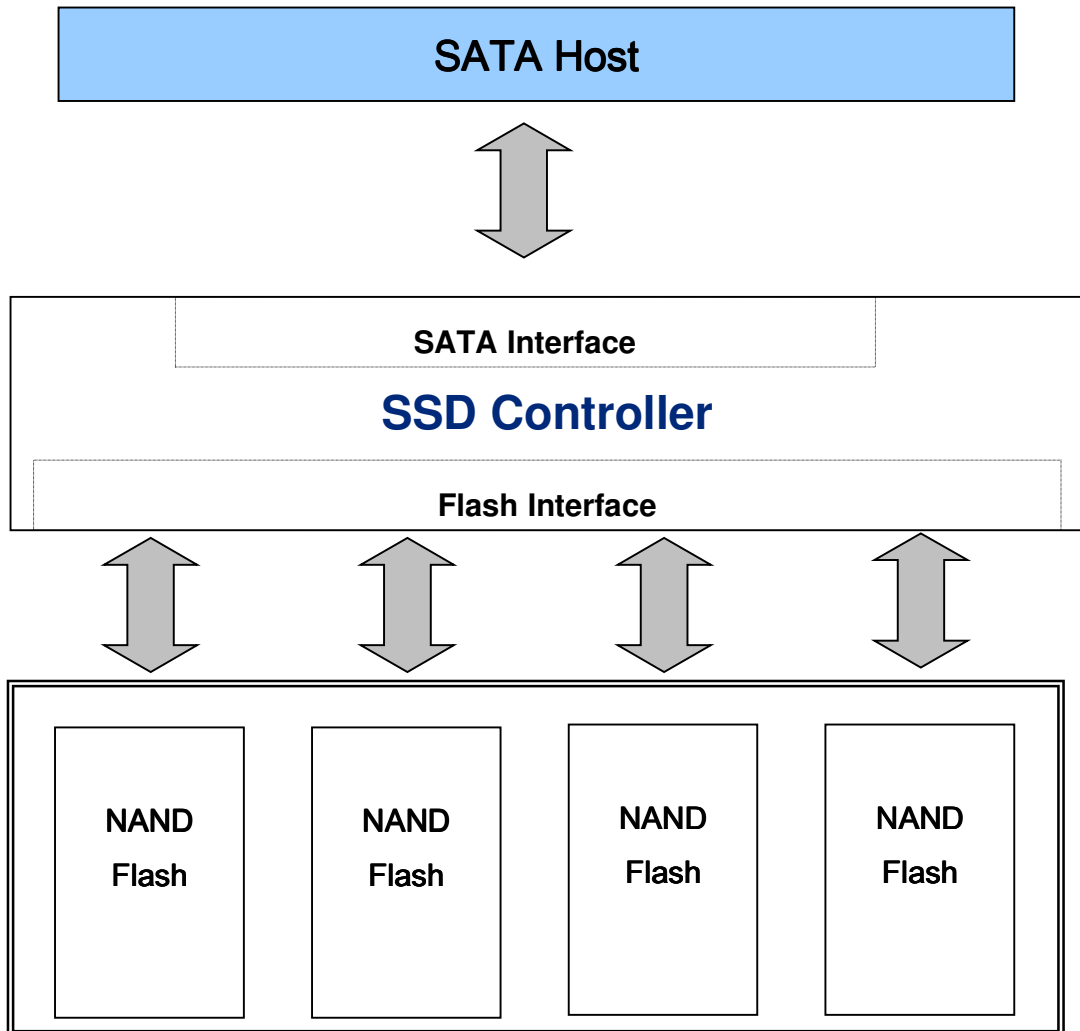
\* Device Activity Signal / Disable Staggered Spin-up

\*\* Connect to GND internally

## Pin Layout



## Block Diagram



## Features

- **Global Wear Leveling – Advanced algorithm to enhance the 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 BCH 72 Bit ECC algorithm per 1024 bytes depending on the structure of the flash. BCH72 may correct up to 72 random error bits per 1024 data bytes. With the help of BCH72 ECC, the endurance of 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 SSDs have a perfect garbage collection mechanism to help improve performance. Advanced Garbage collection can efficiently improve memory management to ensure the SSD's stable performance. With Transcend advanced flash management, the drive can still keep high performance even after a long operating time.

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

Transcend SSD supports the innovative S.M.A.R.T. command (Self-Monitoring, Analysis, and Reporting Technology) that allows the user to read the health information of the SSD in a much more efficient way.

## 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	'SMI2244LT'
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

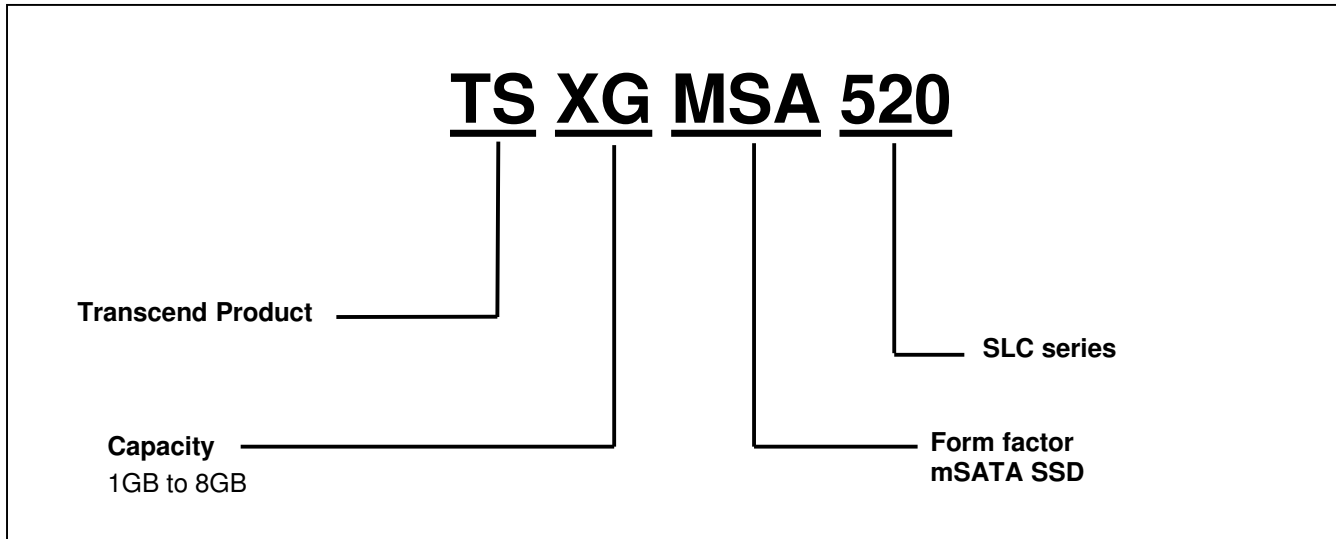
F=the content of the byte is fixed and does not change.  
V=the content of the byte is variable and may change depending on the state of the device or the commands executed by the device.  
X=the content of the byte is vendor specific and may be fixed or variable.  
R=the content of the byte is reserved and shall be zero.  
\* 4 Byte value : [MSB] [2] [1] [LSB]



## SMART Attributes

Attribute ID (hex)	Raw Attribute Value						Attribute Name
01	MSB	00	00	00	00	00	Read Error Rate
05	LSB	MSB	00	00	00	00	Reallocated sectors count
09	LSB	MSB	00	00	00	00	Reserved
0C	LSB	MSB	00	00	00	00	Power Cycle Count
A0	LSB			MSB	00	00	Uncorrectable sectors count when read/write
A1	LSB	MSB	00	00	00	00	Number of valid spare blocks
A2	LSB	MSB	00	00	00	00	Number of Child pair
A3	LSB	MSB	00	00	00	00	Number of initial invalid blocks
A4	LSB			MSB	00	00	Total erase count
A5	LSB			MSB	00	00	Maximum erase count
A6	LSB			MSB	00	00	Minimum erase count
A7	LSB			MSB	00	00	Average erase count
C0	LSB			MSB	00	00	Power-off retract Count
C2	MSB	00	00	00	00	00	Controlled temperature
C3	LSB			MSB	00	00	Hardware ECC recovered
C4	LSB			MSB	00	00	Reallocation event count
C6	LSB			MSB	00	00	Reserved
C7	LSB	MSB	00	00	00	00	UltraDMA CRC Error Count
F1	LSB			MSB	00	00	Total LBA written (each write unit = 32MB)
F2	LSB			MSB	00	00	Total LBA read (each read unit = 32MB)

## 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.



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Revision History			
Version	Date	Modification Content	Modified Page
V1.0	2014/11/27	Initial	
V1.1	2015/03/17	Add TS4G/8GMSA520 information	P2~P4