

## Industrial 3D NAND mSATA SSD

# MSA350 SERIES

SATA III

6.0 Gbit/s

SLC Cache

3D NAND



## PRODUCT FEATURES

- High-Quality 3D NAND Flash Technology
- Global Wear Leveling and Early weak block retirement
- TRIM, NCQ, DEVSLP, ATA Security Feature Set supported
- Lifetime Enhancements
  - Direct-to-TLC and SLC Cache enhancement to ensure the optimized WAF
  - Block/Page RAID function to ensure data recovery
  - StaticDataRefresh to keep data integrity
- Reliable Industrial grade integrated Active PMU and complete protection design with OVP, OCP, surge rejection and Short protection
- External DRAM to achieve the optimal sustained read/write performance
- Power shielding firmware architecture to ensure power failure resilience
- AES256 Encryption and TCG Opal 2.0 compliant (by request)
- SP SMART Toolbox
- SP SMART Embedded and SMART IoT service (by request)

# PRODUCT SUMMARY

- Capacities : 32GB, 64GB, 128GB, 256GB, 512GB, 1TB
- Form Factor : mSATA Solid State Drive (51 mm x 30 mm x 3.5 mm)
- Compliance : SATA Revision 3.1 - 6 Gbit/s (3 Gbit/s and 1.5 Gbit/s backward compatible)
- Command Sets : Supports ATA/ATAPI-8 and ACS-2
- Performance :

	32GB	64GB	128GB	256GB	512GB	1TB
Sequential Read (MB/s Max.)	380	380	560	560	560	560
Sequential Write (MB/s Max.)	180	200	400	520	520	520
Random 4K Read (IOPS Max.)	25000	25000	47000	78000	72000	71000
Random 4K Write (IOPS Max.)	18000	18000	30000	57000	50000	60000

\* Actual performance may vary based on the specific model and capacity

- Operating Temperature Range :  
Normal : 0°C to 70°C  
Extended : -15°C to 85°C (by request)  
Wide : -40°C to 85°C (by request)
- Storage Temperature Range : -55°C to 95°C
- Operating Voltage : 3.3V ± 10%
- Power Consumption :

(Unit: mA)	32GB	64GB	128GB	256GB	512GB	1TB
Read (Max.)	445	445	505	510	540	480
Write (Max.)	435	405	540	580	630	580
Stand-by (Avg.)	160	160	160	160	170	170

\* Actual value may vary based on the specific model and capacity

- Data Retention @40 °C : 10 Years @ Life Begin; 1 Year @ Life End
- Endurance in Tera Bytes Written (TBW) : (Unit: TB)

Workload	32GB	64GB	128GB	256GB	512GB	1TB
Sequential	94	187	375	750	1500	3000
Enterprise	15	29	59	118	236	471

TBW is estimated by formula  $TBW = (\text{Capacity} \times \text{PE Cycles}) \times (1 + \text{OP}) \times (\text{WLE}) / (\text{WAF})$

**OP (Over Provision) = (Physical Capacity / Logical Capacity) - 1**

**WAF = Write Amplification Factor**

**WLE = Wear Leveling Efficiency** could be different depended on the workload or usage containing data size and access rate.

**Sequential workload:** Sequential write workload which is generated by VDBENCH script and tested by VDBENCH

**Enterprise workload:** Follow JESD219A enterprise workload which is generated by VDBENCH script and tested by VDBENCH.

- Mechanical (IEC-60068) :  
Vibration : 15G, 10 ~ 2001Hz  
Drop : 76cm  
Shock : 1,500G@0.6ms
- LDPC ECC engine and Block/Page RAID to ensure reliable 3K PE cycles
- Mean Time Between Failure : > 2,000,000 hours
- Data Reliability: Non-recover Read (UBER)  $\leq 10^{-16}$
- Serious quality control and assurance

100% NAND Flash screening

High endurance product design with 3D NAND and pSLC product offerings

Implement high/low temperature dynamic burn-in in each lot production to monitor production quality to meet design specification

Reliability criteria compliant with international standards IEC-60068/61000