



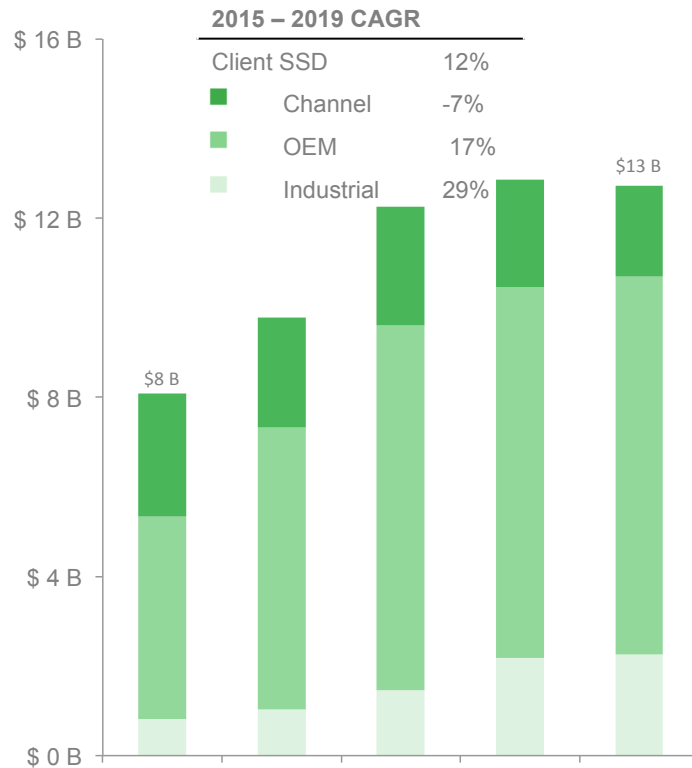
Memory Needs for Industrial Applications

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Industrial SSD Market



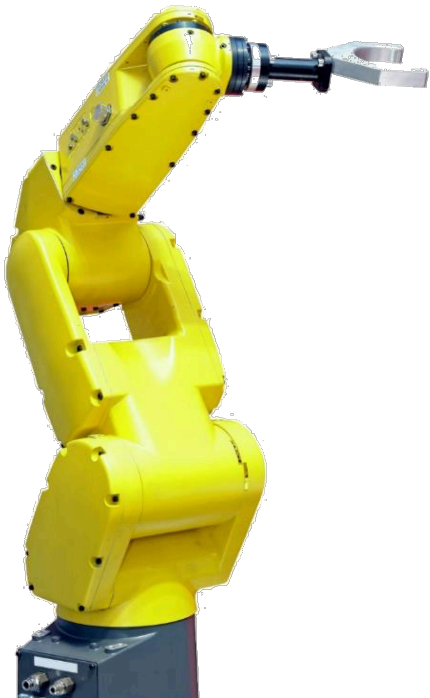
- Market Driver:

- Conversion of Hard Disk Drive (HDD) to Solid State Drives (SSD)
 - Better performance
 - Better reliability
- Industrial SSD growing rapidly
 - Cost/value ratio justifying transition





Industrial Trends



- Market transitioning from HDD to SSD due to:
 - Durability
 - High Shock and Vibration spec, withstands harsher environmental conditions than HDD
 - Lower replacement rate as compare to HDD
 - Performance
 - Higher read/write speeds as compare to HDD
 - Longevity
 - 3+ years support
 - Capacities
 - 80% to 85% 32GB or lower





Industrial Requirements

Wide Operating Temperature

Potential outdoor locations which need to operate from -40°C to $+85^{\circ}\text{C}$

Reliability

High MTTF and UBER for longer time between replacement



Durability

SSDs have ruggedized characteristic like no moving parts, lightweight, low-power consumption to provide lower failure rate, lower heat dissipation, and high vibration spec, with underfill on major components.

Longevity

3+ years product life cycle





Industrial Requirements by Application

Specification	Wide Operating Temp.	High Reliability	Durability	Longevity
Automation	✓		✓	✓
Medical		✓		✓
Instrumentation	✓	✓		
Industrial Systems	✓	✓	✓	
Transportation	✓	✓	✓	
Military	✓	✓	✓	
Surveillance		✓		
Communication	✓	✓		
Automotive	✓		✓	



Flash Memory **High Reliability**

SUMMIT

- Products in remote locations, needing low replacement rate or systems collecting critical data
 - High Mean Time To Failure (MTTF)
 - Low Uncorrectable Bit Error Rate (UBER)
- Applications
 - Medical, Instrumentations, Industrial Systems, Transportation, Military, Surveillance, and Communication





Durability

- Ability to withstand high vibration environment
 - No moving parts
 - 20G@ 7-2000Hz
- Applications
 - Industrial Systems, Transportation, Military, and Automotive



Flash Memory **Longevity**

SUMMIT

- 3+ years product life cycle
 - No BOM changes
 - Long design cycles, due to extensive certification
 - Expensive qualification requirements
- Application: Medical and Automation





Wide Operating Temperature

- Application where equipment are exposed to outside environmental temperature influence
 - Instrumentation, Industrial Systems, Transportation, Military, Communication, and Automotive
- In constraint location near heat source, with little to no air flow
 - Automation and Military





X-temp Evaluation

- Industrial temperature (IT) rated SSDs does not mean just testing read/write/erase at extreme temperatures
- IT SSDs need to be X-temp tested, meaning:
 - Program in cold (-40oC) and Read in hot (+85oC), and vis versa
 - Storage states (Vt distribution) varies/shifts at different temperatures
 - Cycle testing temperature from -40oC to +85oC (back and forth), at the same time during your company's SSD reliability tests





Summary

- Industrial markets adopting SSDs quickly
- The market is split into many different segments
 - Each having a slightly different set of requirements
- Other non-application specific requirements
 - 2.5" and mSATA form factor and SATA III interface
 - Main stream majority are/will be M.2 and PCIe
 - IMM segments should consider moving interface and form factor to main stream





Micron SSD Portfolio

Aftermarket Upgrades

Client

Data Center

Enterprise



PERFORMANCE + ENDURANCE

SATA MX300	PCIe 2100	PCIe 7100	PCIe 9200
SATA BX200	SATA 1100	SATA 5100	PCIe 9100
SATA BX100	SATA M600	SATA M500DC	SAS S600 Series
SATA MX200	SATA M500IT	SATA M510DC	

SOFTWARE

STORAGE EXECUTIVE





Micron® M500IT SSD



- Optimized performance, power, and security
- Designed for industrial/embedded segments, M500IT is ideal for system integrators and value add resellers who require design-in support, BOM control, and long lifecycle management (5 years).
- Key Features and Benefits
 - Industrial Temperature: -40°C to +85°C; with special X-temp testing
 - Performance and Endurance:
 - Optimized performance and endurance across industrial temperature range
 - 60GB: 60TB TBW, 120GB: 120TB TBW, 240GB: 240TB TBW
 - Wide Range of Options: 60GB/120GB/240GB in 2.5" and mSATA form factors
 - MTTF: 3 Million device hours
 - Vibration: 20G@7-2000Hz
 - Components: All industrial temp rated
 - Encryption: 256 AES Encryption and TCG Opal 2.0



