



Solid State Drive Market Explosion: *Is the Customer Getting Confused?*

Wade Campbell
Storage Products
SMART Modular Technologies

Santa Clara, CA USA
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Topics

- Fast growing flash SSD market
- Examples
 - Industrial Grade
 - Enterprise storage
- How to get unconfused

Flash and SSDs Are HOT!

[Redacted] I don't care. The business is in its infancy. I think the stock is likely to move much higher as SSD growth significantly bolsters results.

Posted by Roy H [Redacted] 6/04/2008 10:39:00 AM

More on rapid SSD growth. XLR and EUV. Cymer!!!
The low power, high speed solution.
3 paradigm shifting lights in 4 years!!!

Investor Blogs



Industry Publications

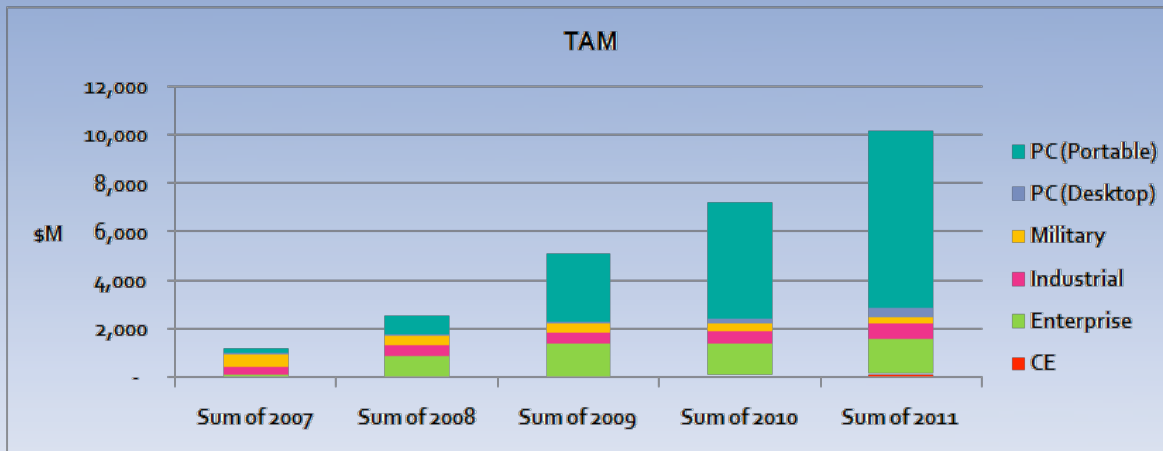


Tech Website



Flash SSD Market

- Flash SSD market is growing exponentially
- Market is flooded by many new vendors



Source: IDC, Webfeet, 4Q07

SSD Vendors



Confusion in the SSD Market



- Multiple product categories
- Technology differences
- Wildly different product, cost, and support requirements
- “Spec sheet” mentality



A Confusing Vernacular

SLC vs MLC

ECC vs EDC

Flash Management

Write Endurance

Dynamic vs Static
Wear Leveling

NAND vs NOR

Enterprise Class

Industrial Temperature

VS

Industrial Grade

Write Amplification

ONFI

IOPS

Product Categories



Major Target	Laptop Storage	Enterprise HDD Replacement	Defense, Industrial, Embedded
Optimized For	Lowest \$\$ / GB	TCO	Reliability, Rugged, Durability, Security
Applications	Mixed	OLTP, Office Productivity, Data Mining	Data Recording, Mission Media
Trend	Moving to MLC	Tier 0 Cache	Encryption



Application Class Optimization

	Low \$\$/GB	High Capacity	Large Block Perf (Sequential)	Small Block Perf (Random)	Security
Streaming (Video, Data Warehouse)		✓	✓		
Transactional (OLTP)				✓	
Data Server (Website, Email)		✓		✓	
Military Data Recorder		✓	✓		✓
General Purpose (Boot, Storage, Email ... for example, a laptop drive)	✓			✓	



Industrial Grade Requirements

More Than Industrial Temperature

- Who needs True Industrial Grade?
 - Applications that operate in rugged environments (shock, vibration, temperature, altitude)
 - Applications that have high need for reliability and durability
 - System down time is costly
 - Losing information is unacceptable
 - Life at risk
 - Long deployments
- Requires extensive design verification, testing, and manufacturing process
- Drives tested under operational conditions is key





There's Enterprise, and Enterprise

Table 4-2 Recommended drive types for common applications

Usage	Storage characteristics	Storage category	Disk type recommended
Archiving and data retention	Storage capacity, high density	Near-line	FATA
Backup and recovery (disk to disk)	Storage capacity, high density	Near-line	FATA
Database and data mining	Mix of performance and capacity	Online	Fibre Channel
Data warehouse	Storage capacity, high density, and good performance	Online	Fibre Channel
Document imaging and retention	Capacity, sequential performance	Near-line	FATA
e-mail	Good performance, availability, and capacity	Online	Fibre Channel
Enterprise eCommerce	Performance, capacity, and availability	Online	Fibre Channel
File serving	Performance, capacity, and availability	Online	Fibre Channel
Fixed content and reference data	Capacity	Near-line	FATA
Medical applications and Life Sciences imaging	Capacity, availability, and variable performance	Online	Fibre Channel
Multimedia (audio/video)	Capacity, availability, and variable performance	Online	Fibre Channel
Online transaction processing (OLTP)	High performance and availability	Online	Fibre Channel

Remote data protection	Good performance, availability, and capacity	Near-line, Offline	FATA
Scientific and geophysics	Performance, capacity	Online	Fibre Channel
Surveillance data	Capacity, availability	Near-line	FATA
Temporary storage, spool, and paging	High performance and good availability	Online	Fibre Channel

Source: IBM DS8000 Series - Architecture and Implementation



Conclusion

- SSD market growing rapidly
 - Many new SSD vendors, many new products
 - SSDs being applied to much broader range of applications
 - Confusing terminology
 - Customers confused as to how to select the best product/vendor

- Differentiation between Consumer/Client, Enterprise and Industrial SSD not clear
 - Need application-specific understanding of storage requirements
 - Review of design, testing, manufacturing, and support methods required to fully evaluate a product/vendor



Questions?

SMART is a leading independent designer, manufacturer and supplier of electronic subsystems to original equipment manufacturers. Major products areas are:

- Memory Products
- Storage Products
- Embedded Products
- Display Products

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www.smartm.com

www.adtron.com

Wade Campbell
Director, SSD Marketing

SMART Modular Technologies
4415 E. Cotton Center Blvd.
Phoenix, AZ 85040

marketing@smartm.com

