



Choose the Right NAND Flash Solution for Your Embedded Application

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Agenda

- Embedded Market Overview
- Key Applications
- NAND Solutions
- Feature Comparison
- Conclusion

Embedded Market Trends

Automotive

Transition to a mobile living space; fully connected with autonomous driving

V2V/V2I communications

Accelerated adoption of new technologies



Industrial Multi-Market

Internet of Things (IoT) driving smarter connected devices

Distributed data analytics and storage

Adoption of mobile and PC derived platforms



Consumer

Adoption of UHD/4K expands across applications

Wearable applications are booming

Increased mobility and smaller form factors



Connected Home

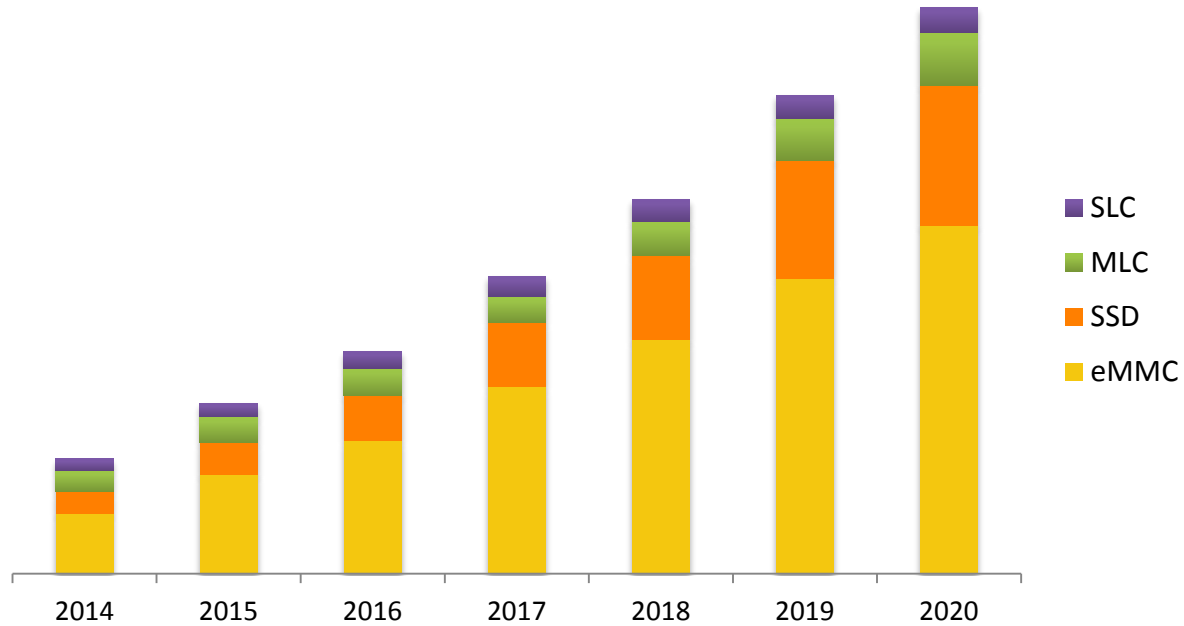
Smarter homes for entertainment, security, and energy management

Traditional set-top box (STB) market faces competition from over the top (OTT) and cloud-based networks

Rapid growth into developing countries



Embedded Nand Market

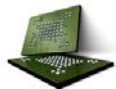


Source: Micron Marketing

Discrete vs. Managed NAND



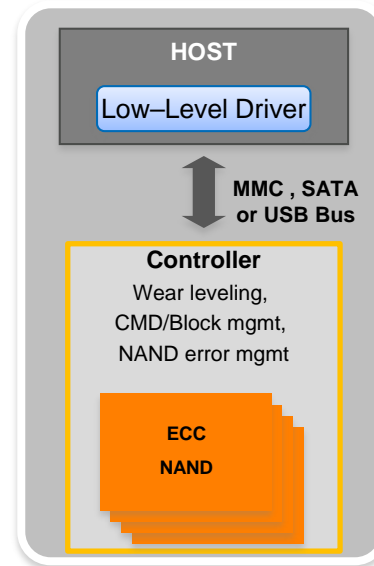
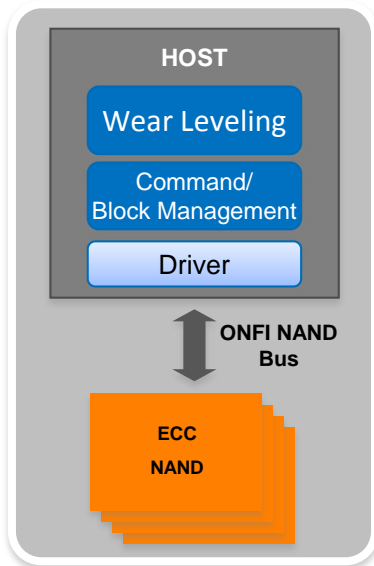
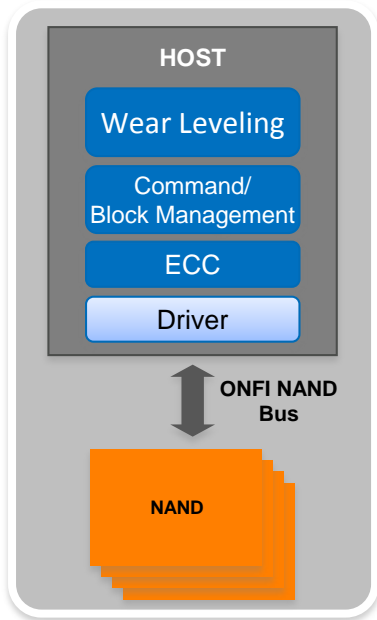
Discrete NAND
SLC, MLC, TLC



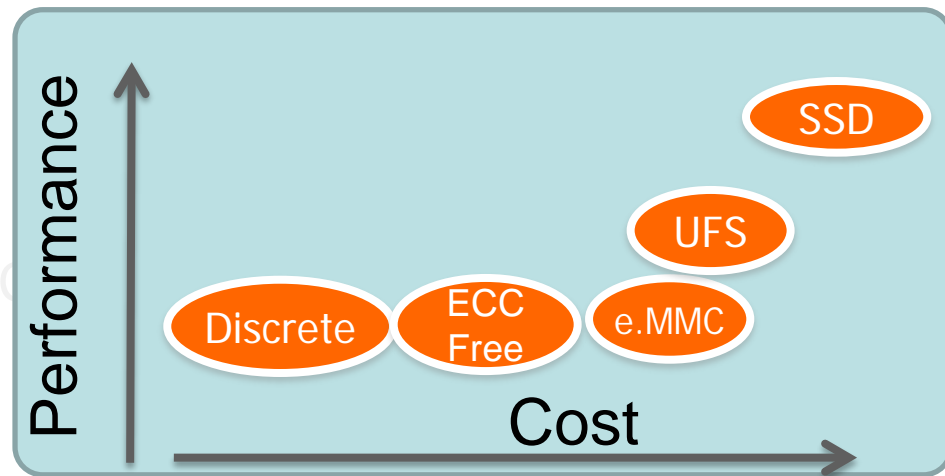
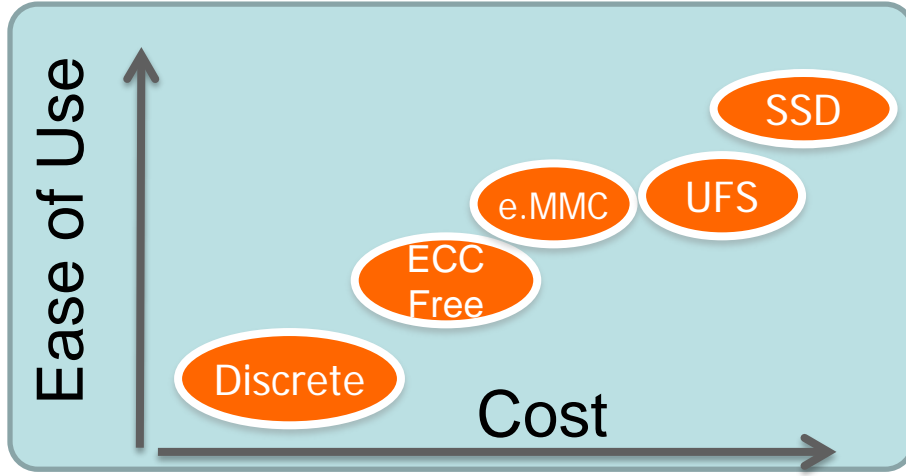
ECC FREE
Serial NAND, EC²NAND



Managed NAND
SSD, e.MMC, eUSB, CF



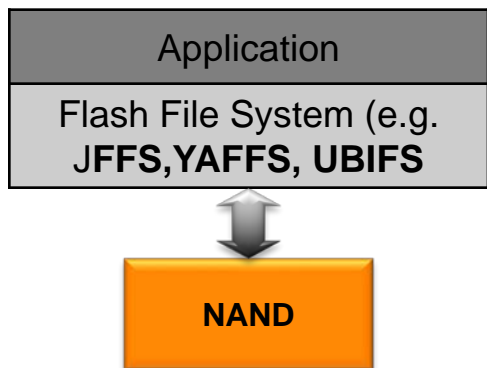
NAND Solution Comparison



- Managed NAND easy to design but more expensive
 - uC and package adders (MCP, caps) large portion of BOM cost vs. discrete NAND at low densities
- Discrete NAND can achieve similar/higher performance vs. e.MMC with optimized software

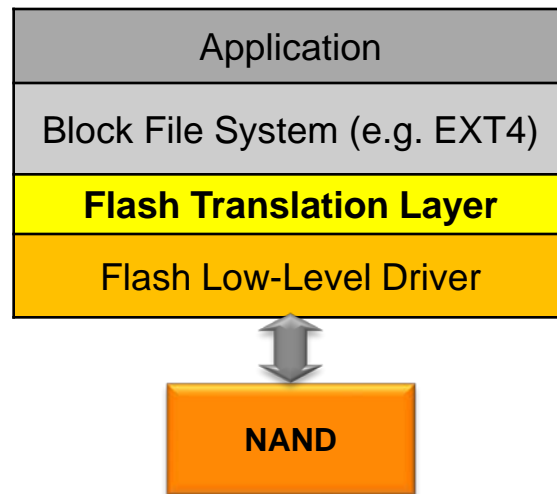
Discrete Nand Software Options

NAND FS



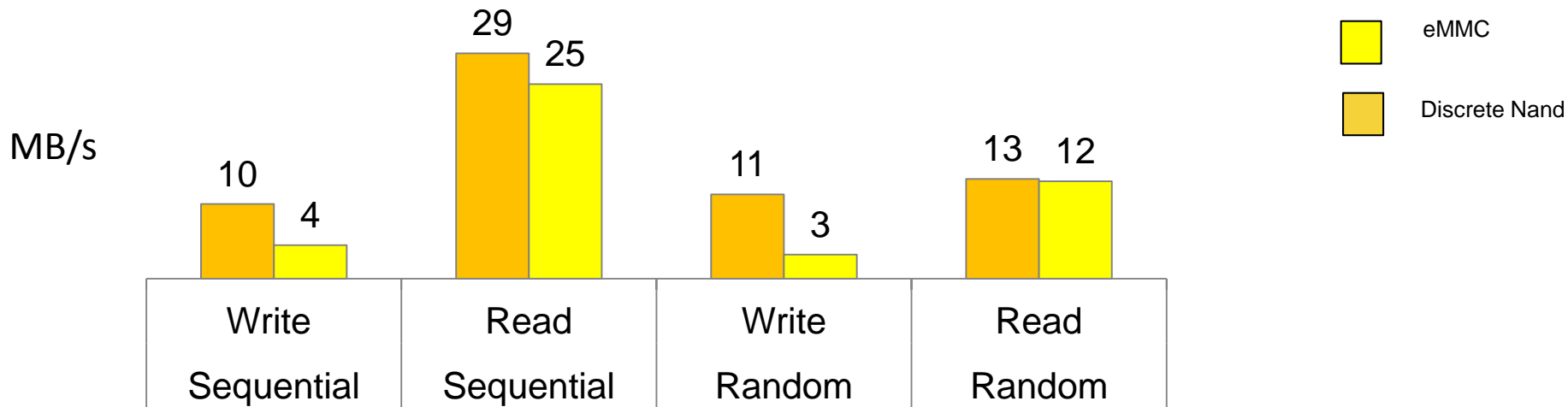
Flash wear leveling, bad block management, power loss managed by file system

Block FS



Requires FTL and LLD
Same software stack for managed and discrete NAND

Performance



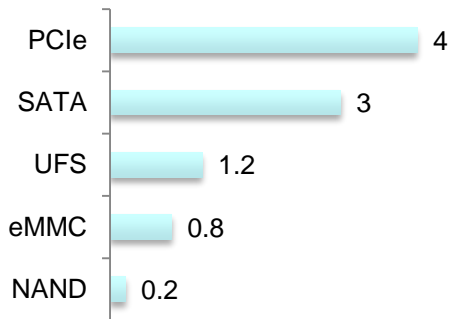
- Comparable performance between discrete NAND and eMMC if software is optimized and host can manage ECC

Based on Amlogic M8 Platform; 50 MHz async mode

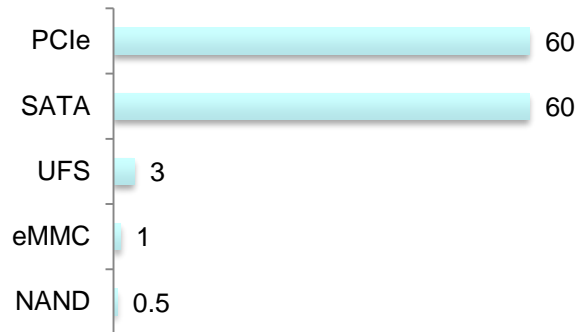
Sequential Performance @ 128K chunk size and Random Performance @ 4K chunk size

Power Consumption

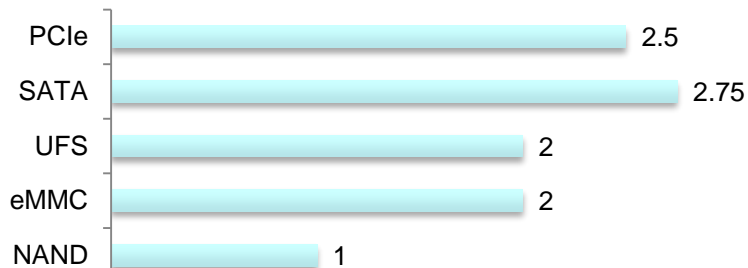
Active (W)



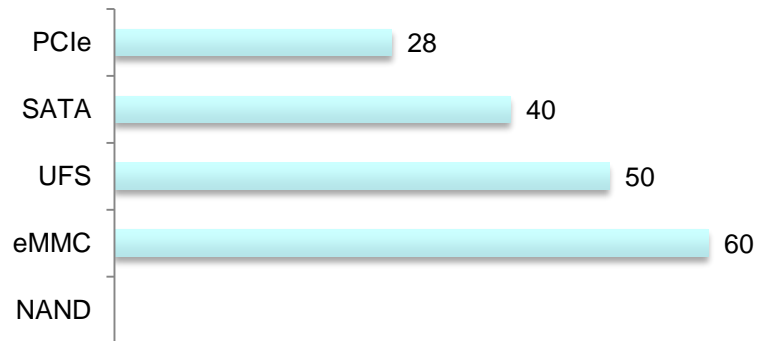
Standby (mW)

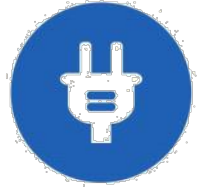


Seq Write (nj/bit)



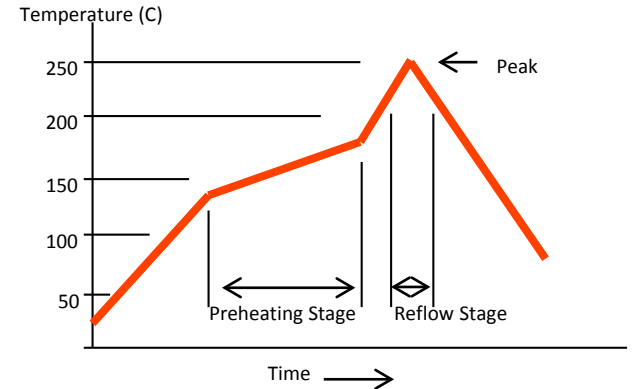
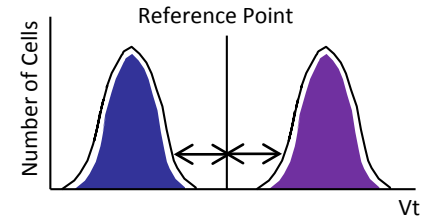
Random Write (mj/KIOPS)





- Power Loss Recovery
- SLC mode
- Reflow Data retention

SLC: One bit per cell



Summary

- Discrete NAND is a good option for cost-sensitive applications
- Managed NAND is better for ease of design/time to market
- Discrete NAND performance is equal to managed NAND if software is optimized
 - Robust power-loss protection, SLC mode, and reflow capability needed to use discrete NAND