

DRAM-less SSD – The New Trend for Embedded System

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Embedded System are Everywhere

Embedded Segments



- **Industrial / Semi-Industrial**
- **Military / Defense**
- **Aviation / Automation / Automobile**
- **Medical / Tele-communication**

Example Applications

IPC, Panel PC, Thin Client, POS, STB,
Digital Signage, Gaming Machine,
Digital Video Recorder, Secure System,
ATM, Vending Machine



Typical Storage Form Factor of Choice

		<i>Application</i>	<i>Storage Function</i>
1-32GB		Automotive, medical devices,	Booting, data logging, preloaded contents
32GB – 256GB+		IPC, Panel PC, Thin Client POS, STB, Digital Signage	Feature-rich O/S, compute power, larger transactional data

Different Application, Different Focus Driven



Problem Statement:

Why is DRAM needed in SSD Design?

Short Answer:

Performance boost

Cost Driven



Reliability Driven



Power Driven



Performance Driven

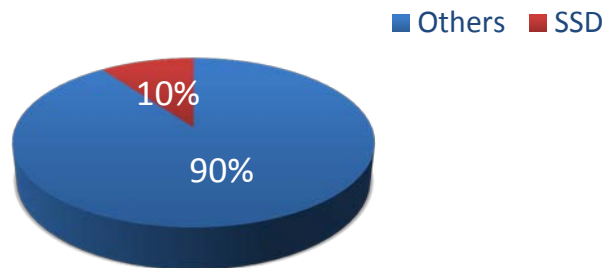


Embedded
SSD

DRAM-less SSD Design has lower

Power

Examples of Power budget of SSD in Portable Devices



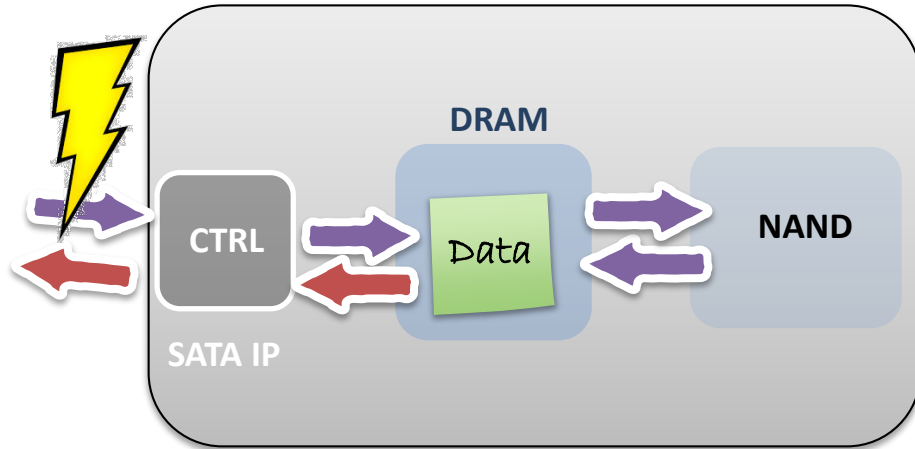
		DRAM-less Design	DRAM Design
32GB (2 die)	Active	X	3X
	Idle	X	1.5X
64GB (4 die)	Active	X	3X
	Idle	X	1.5X

DRAM-less design shows power advantages.

- In the portable device category, power consumption are key to long usage life.
- The major contribution of the power consumption still comes from screen, however, SSD can take up as much as 10% of the power budget of SSD.
- DRAM-less SSD design shows 3X lower power when in active and 1.5X lower when in idle.

DRAM-less SSD Design is more

Reliable



DRAM's inflight data at risk during the sudden power loss.

- The risk of data loss is great concern for embedded devices.
- On SSD design with external DRAM, the in-flight data will be loss during the event of SPL.
- This is the motivation behind PLP circuit of SSD w/ DRAM design.

DRAM-less SSD Design saves

Cost

DRAM Density	Added Cost
256MB	~ \$1
512MB	~ \$2
1GB	~ \$4

Added Cost of DRAM component in SSD BOM.

- On a 32/64GB, \$1 added cost of DRAM contribute to up to 5-7% of the SSD BOM cost
- In semi-industrial SSD market, this is the entire margin of the product.
- Every penny counts – DRAM-less SSD design wins.

DRAM-less SSD Design saves

Size



- DRAM-less SSD has enabled small form factor designs.
- M.2 2242 easily fits 2 NANDs without external DRAM.
- BGA SSD perfect candidate for DRAM-less SSD controller – less stacking complexity.

Key Takeaway

SSD w/ DRAM

DRAM-less SSD

Size

Reliable

Power

Cost

Performance



But, still 10-20 times faster than HDD

Some Facts on Phison...



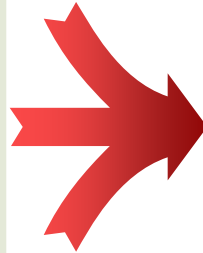
seconds?



Phison SSD Market Segments

Market Leadership

- ✓ In-house SATA III, PCIe Gen 3 IP
- ✓ Process node 40nm & 28nm
- ✓ S10 & E7 for enabling hyperscale



Hyperscale

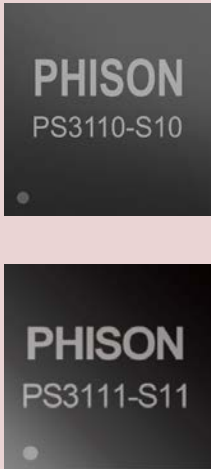
Industrial

High-end Client

Entry-Level Client

Phison SSD Solution Line-Ups

Client SSD

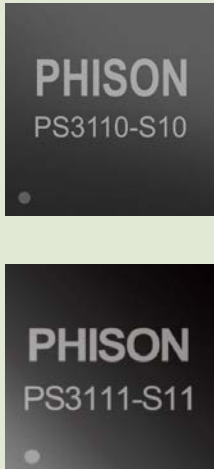


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PS3110-S10

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PS3111-S11

DRAM-less

Embedded SSD

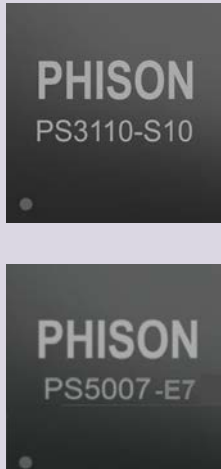


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DRAM-less

Hyperscale SSD



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PS3110-S10

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PS5007-E7

For more information on Phison SSD solution,
please visit *Booth #712 & #714.*

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Knows What You Need

THANK YOU FOR YOUR TIME & ATTENTION!