

Flash Storage for Automotive

EFTech

Elixir Flash Technology

Proposal by 2017 . 10 .

Do not distribute without permission



10년 수명

- High Endurance & High data retention

장기간 미사용 : 2년? 5년?

- High data retention without power

Cold data의 처리

- High data retention

고온 / 저온 등 가혹한 열환경

- High working temperature, over 85C

고안정성

- Data redundancy or internal capacity of eMMC

2000 Max Erase/Write
Cycle

Data Retention

- 0% Cycle : 5Y
- 10% Cycling : 3Y
- 95% Cycling : 6 Month

NAND	10nm-class MLC	10nm-class TLC	3D TLC
Die density (Gb)	64	128	128
Page Size (Byte)	8K + 768	8K + 1024	16K + 2048
Block Size (Byte)	1M + 96K	6M + 768K	6M + 768K
Page Program Time (<u>tPROG</u> , ms)	1.3	1.65	0.8
Block Erase Time (<u>tBERS</u> , ms)	5	5	3.5
P/E Cycles (K) @ 85 deg C	18	4.5	20

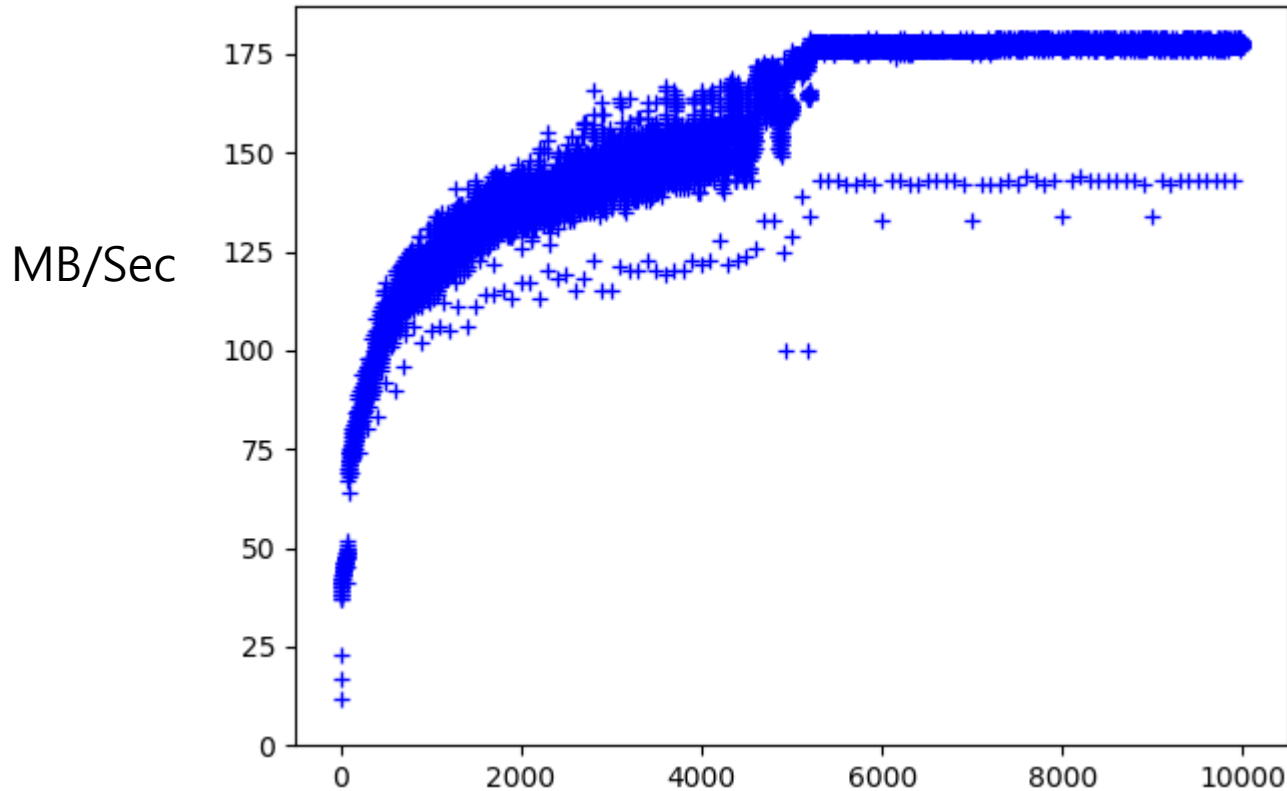
Retention : 50% cycling 1Y \Leftrightarrow 10 Y

Retention : 2000 E/W cycling \Leftrightarrow Connected Car,
자율주행, 대량영상처리

High operating temperature...

High Temp Data-Retention (1)

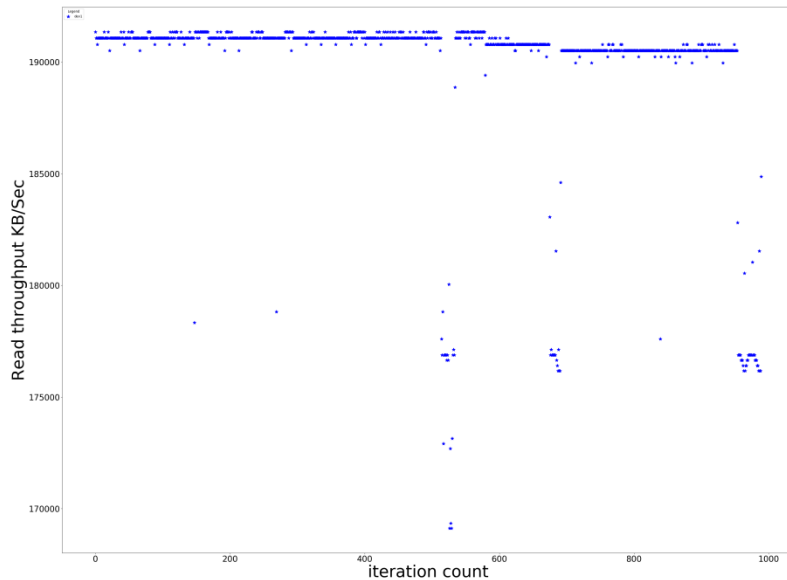
- Test case : Reading same LBAs
 - Read test @ 85 after 125C 48Hour bias



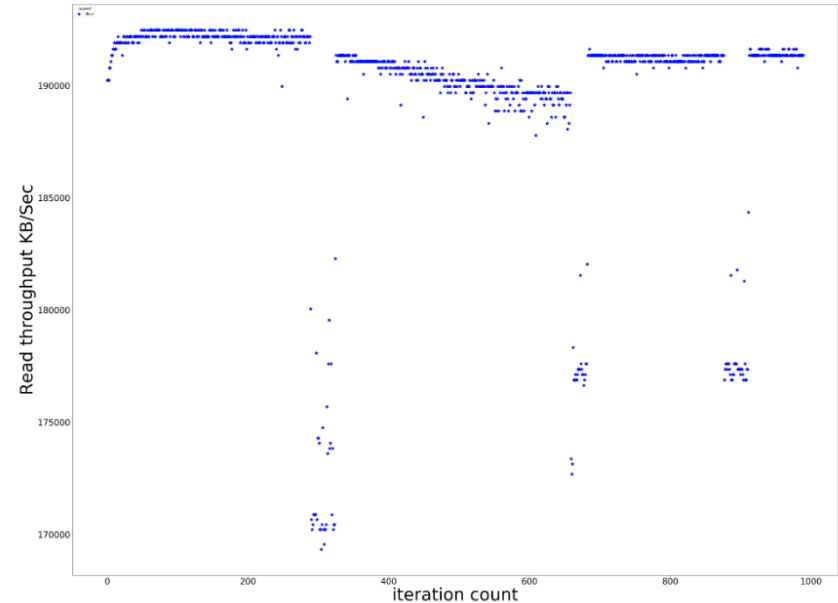
High Temp Data-Retention (3)

- Test case : Reading same LBAs
 - one model on 85 vs 25

Read 1000 times @25C

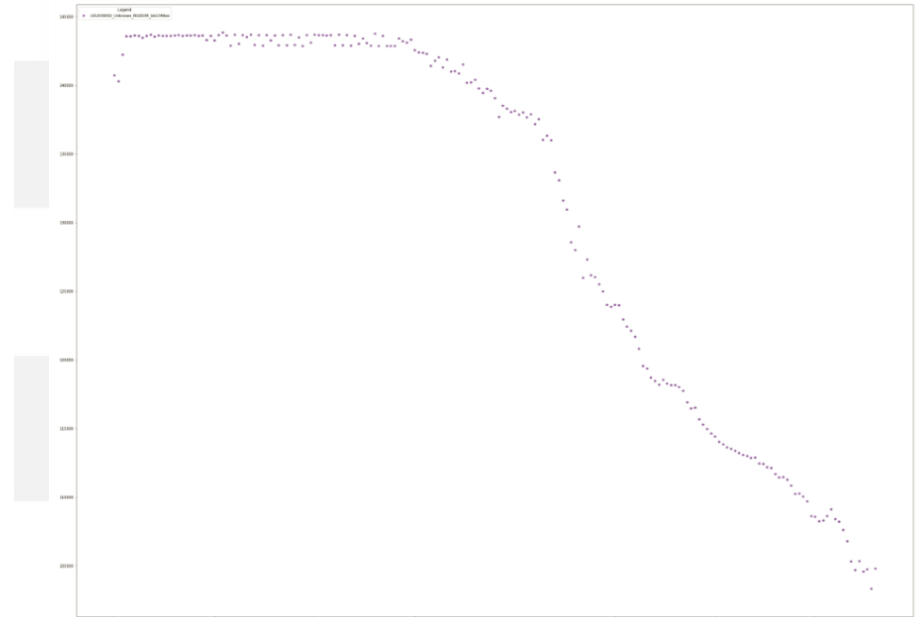
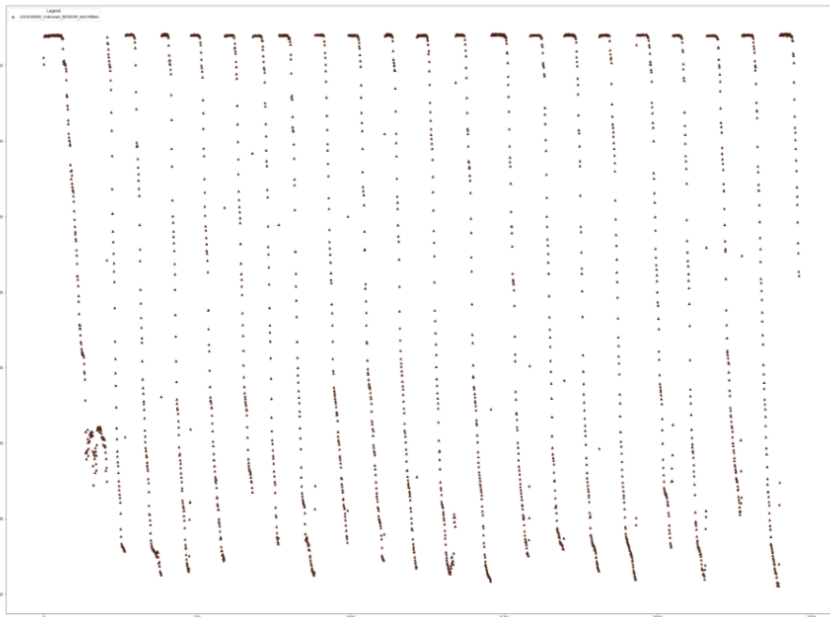


Read 1000 times @85C

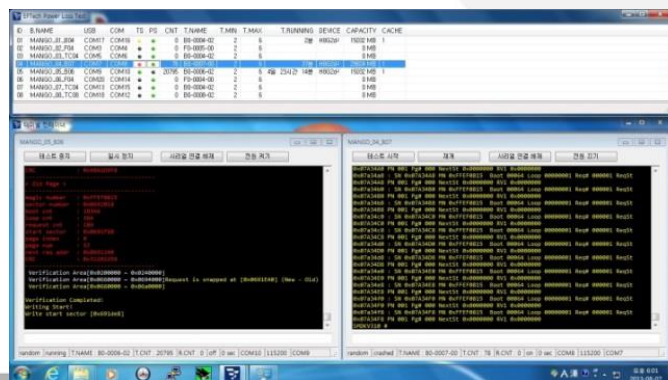
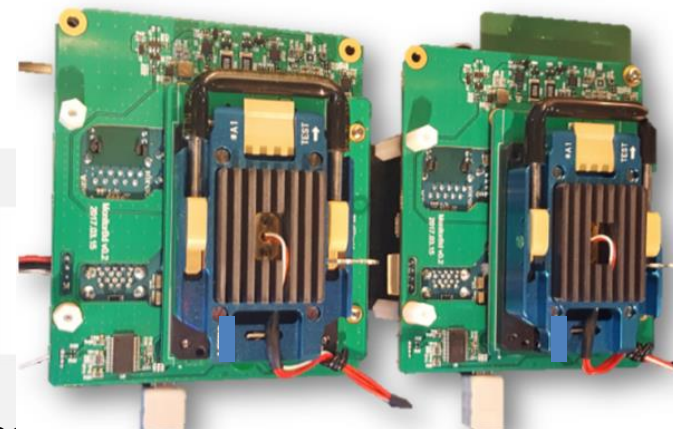


High Temp Data-Retention (2)

- Test case : Reading same LBAs
 - two models on 85C, 90% E/W cycling



- Self burn-in Test board
 - Self burn-in socket supports over 125C with Exynos AP and HS400
 - Run-time changing Temp during I/O
 - Internal power off to cut off only eMMC
- Tester overview
 - Retention/endurance test
 - Performance test for aged levels
 - Smart power-cycle test
- One-click execution with monitoring program
 - Execution and monitoring for maximum 64 devices
 - Analysis and display for damaged blocks
 - Easy development platform for new test cases



- Working Temperature 125C, 10¹³ cycling

FRAM Features (2) – High Endurance

■ High Endurance in Rewriting

- Up to 10¹³ = 10 trillion cycles
- Up to 10 million times more than EEPROM/Flash

■ Advantages

- Long life time possible with frequent logging
- Enable simultaneous data recording

Fujitsu FRAM	Write interval	Endurance (Max)	Theoretical life time based on 10 ¹³ write
	5msec	10 ¹³ times	1,585 years
	1msec		317 years
	0.1msec		32 years
	0.03msec		10 years



EEPROM	Write interval	Endurance (Max)	Theoretical life time based on 10 ⁶ write
	5min (300s)	10 ⁶ times	10 years
	5msec		1.4 hours



- eMMC with inside-capacity
- FRAM
 - 1 조 EW cycling and 125C Working temperature
- Rescanning cold data
 - Driven by Host
 - Driven by eMMC, using time stamp or other skill
- Reducing Write amplification by host
 - Host-side Tech : F2FS, Rescan, Hot/cold hints



Q&A : ef@elixirflash.com