Samsung Class100 eMCP Solution

Nov, 2012

Memory Sales & Marketing

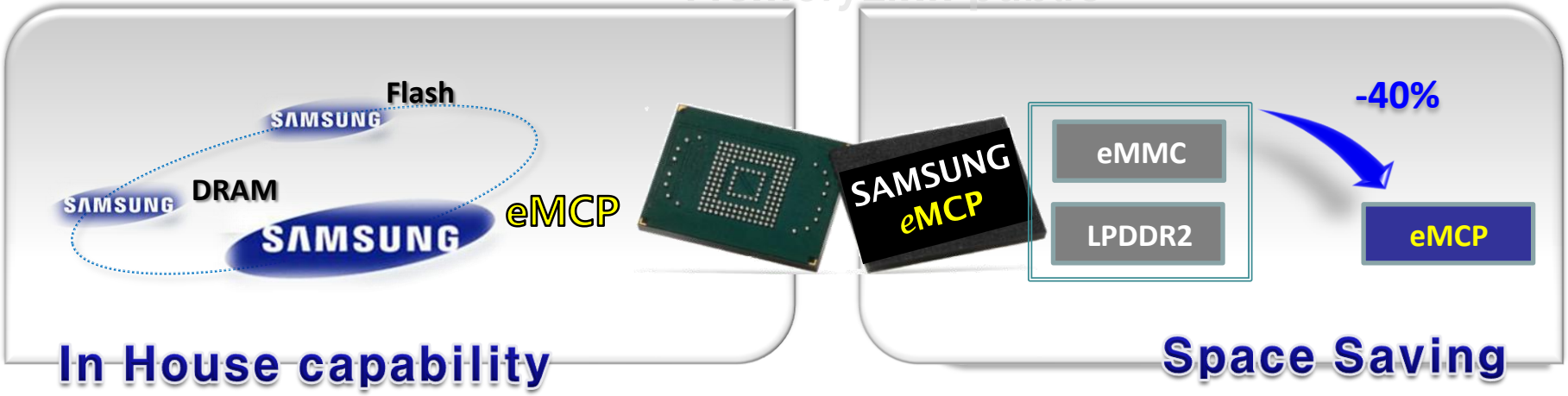
Samsung Memory

Class100 eMCP Introduction

Intro

What is eMCP?

- eMCP : Multi-Chip Package with eMMC
- Why Samsung eMCP?
  - Combine ROM and RAM : Single supplier (Samsung Flash, Samsung DRAM)
  - Small Space needed : Save up to 40% of space on memory b'd
- Which eMCP adoptable for Set Makers
  - ME : eMMC + LPDDR2 DRAM
  - MD : eMMC + LPDDR1 DRAM
  - Both chipsets that can support LPDDR1 and LPDDR2 can use Samsung eMCP by Full Line-up support



Samsung eMMC Class Line-up

What is Class ?

- **Samsung eMMC Line-up naming based on 'Random write IOPS'**
- **Random IOPS is KEY factor for system memory operation**
- **Samsung Test Condition**

Pre-condition	Test Environment & methodology
Dirty Condition	1) Platform : eMMC device level, x8 bus width, 50MHz DDR 2) Random read/write Chunk size : 4KB*, Total I/O (1GB, 1GB range)

* 4KB data chunk size is file system meta size and main chunk size for operating system

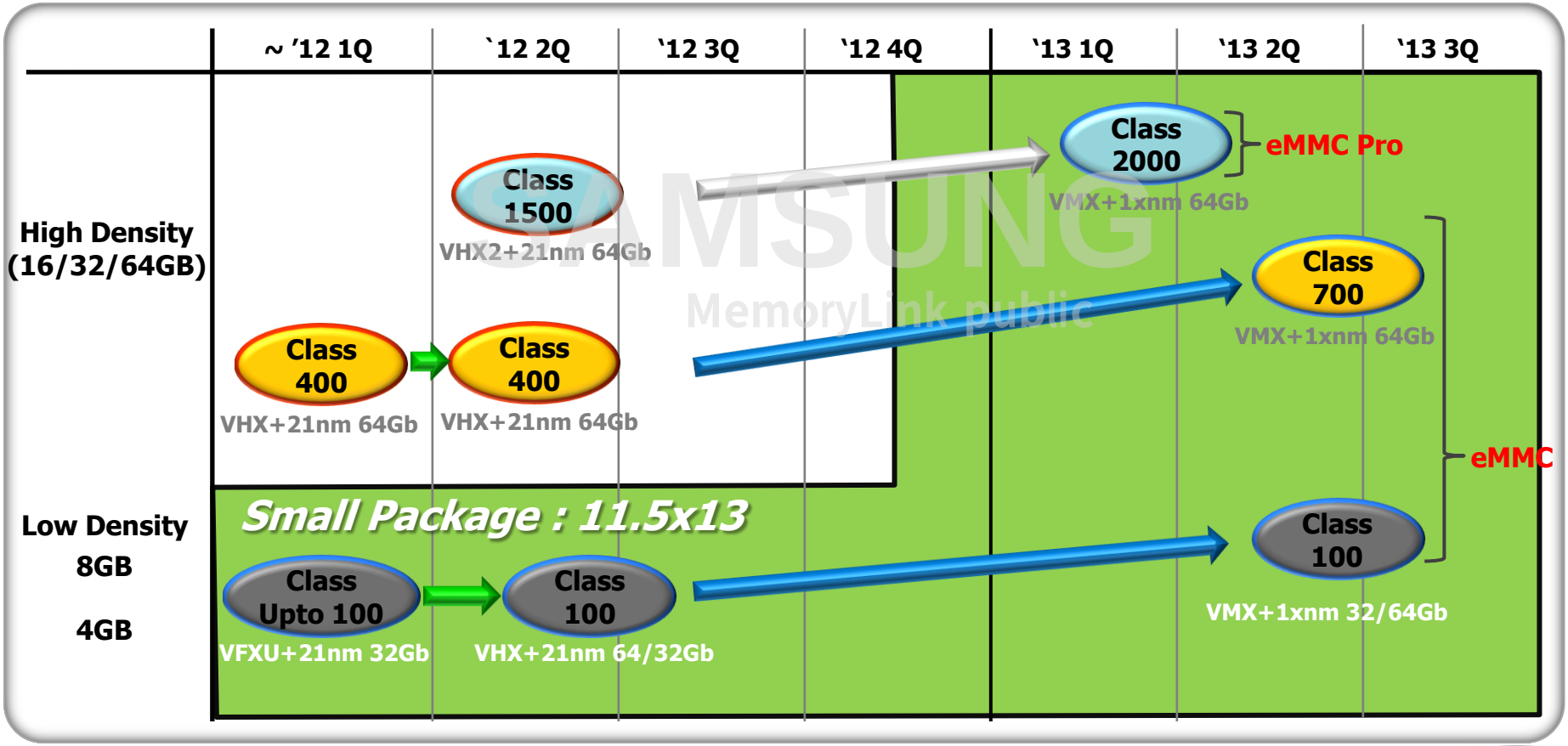
Suitable solution for each Segmentation (12' Q4~13'1H Model)

Item	Class100	Class400	Class1500	Class2000
Smart Phone Segment	ULC / Low-end	Mid-range	High-end (Flagship)	
	Single Core	Dual Core	Quad Core	
Major Functions (Example)	Basic Operation	Gaming, Multi-tasking, etc.	Burst shooting with high quality pixel, 3D Multimedia playing, etc.	
OS Requirement	Android*, Windows Phone		Android*, Windows Phone, **Window8**	

* Android doesn't have special specification for Memory

Samsung eMCP Class Roadmap

- **Samsung has wide range of eMMC solution based on performance requirements**
  - eMMC for Low-end to High-end with Class 100 to Class 700
  - eMMC Pro for Flagship/Win8 PJT with Class 1500 to Class 2000



Class100 eMCP Introduction

Line-up

Samsung Class100 eMCP Line-up

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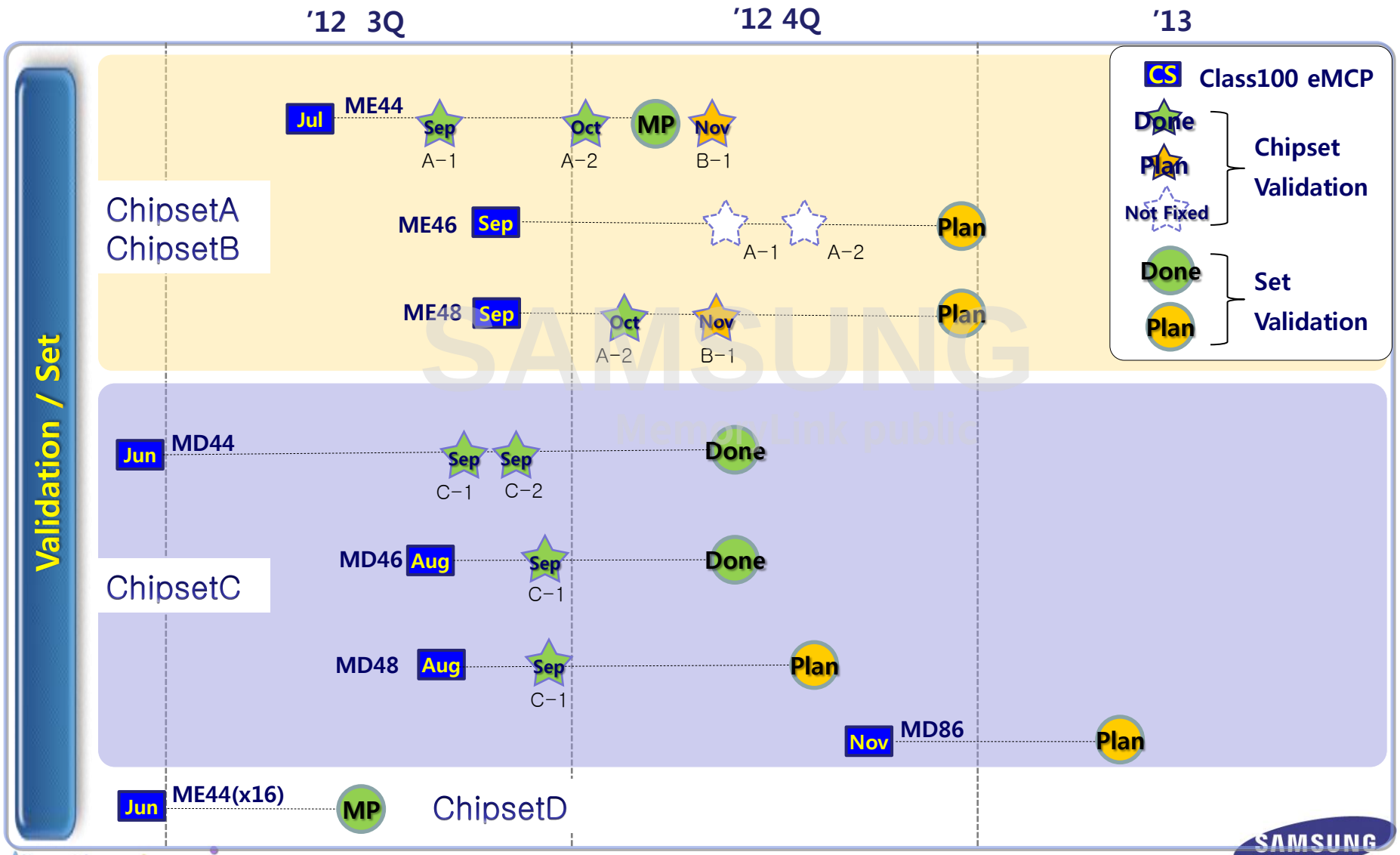
IF	eMCP	Package	Part#	Patch	Status	Validation on Chipset
MDDR based	MD4GB_4G	153B, 11.5x13x1.0mmt	KMS5U000KM-B308	02	CS	Done
	MD4GB_6G	153B, 11.5x13x1.0mmt	KMJ5U000WA-B409	02	CS	Done
	MD4GB_8G	153B, 11.5x13x1.2mmt	KML5U000HM-B505	02	CS	Done
	MD8GB_6G	153B, 11.5x13x1.2mmt		02	CS : Nov. '12	(Not Planned Yet)
LPDDR2 based	ME4GB_4G (x16)	162B, 11.5x13x1.0mmt	KMN5U000FM-B203	00	MP	Done
	ME4GB_4G (x32)	162B, 11.5x13x1.0mmt	KMN5U000ZM-B203	02	MP	Done
	ME4GB_6G (x32)	162B, 11.5x13x1.0mmt	KMK5U000YM-B309	02	CS	(Not Planned Yet)
	ME4GB_8G (x32)	162B, 11.5x13x1.0mmt	KMK5U000VM-B309	02	CS	Done
	ME8GB_8G (x32)	162B, 11.5x13x1.0mmt	-	-	CS : Feb. '12	(Not Planned Yet)

Samsung Class100 Validation Status

- Class100 eMCP is validated by Chipset and Set Makers



Smart Phone with eMMC Class100

ICS Smart Phone MP with eMCP ME4GB4G(eMMC Class100)

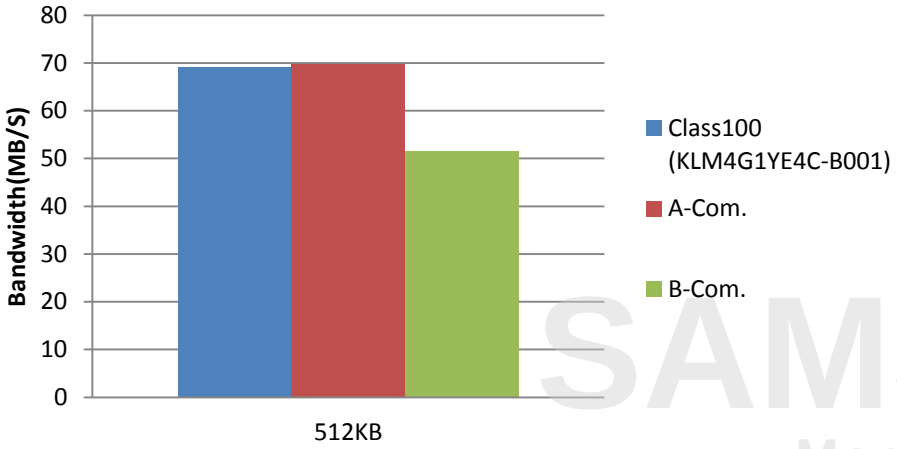
Galaxy Chat Specifications	
Maker	Samsung Mobile
Chipset	BCM21654
OS	Android 4.0 ICS
DRAM	Samsung eMCP ME4G4G (Samsung eMMC Class100 4GB)
Flash	
LCD Size	3.0 Inch
Resolution	QVGA(240X320), 2MPixel
Launching	'12 July

Performance

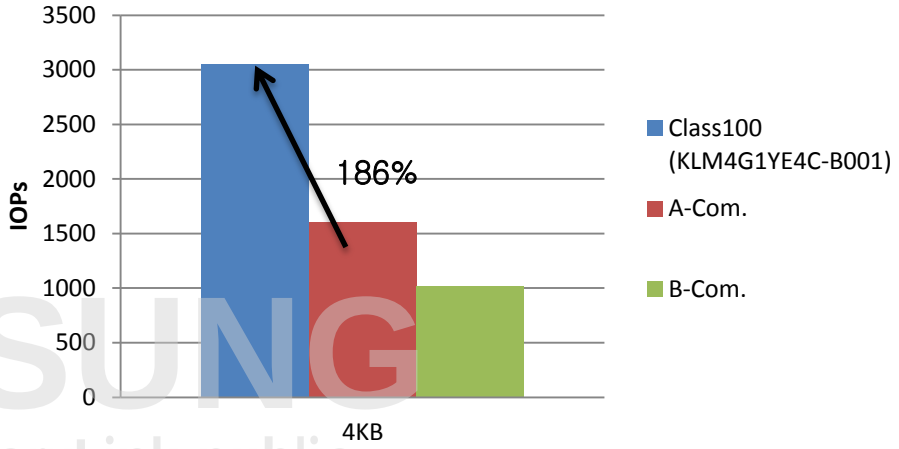
eMCP Level Performance of eMMC Class100 4GB

Class100 has competitive edge comparing to others

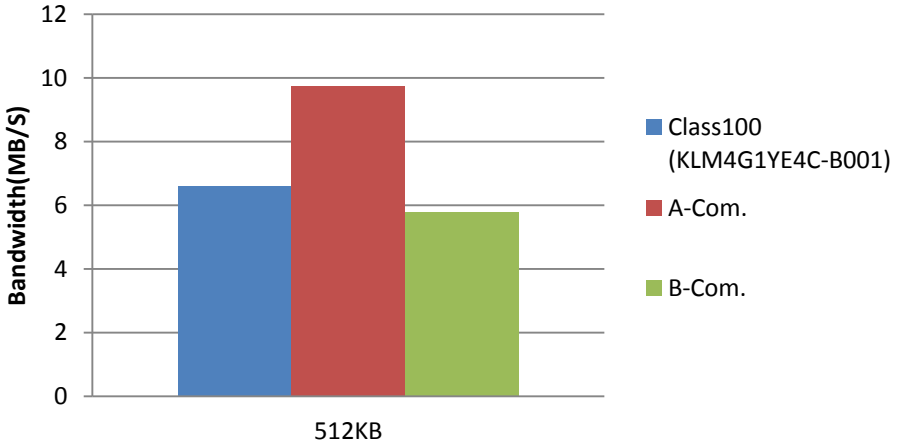
Seq. Read



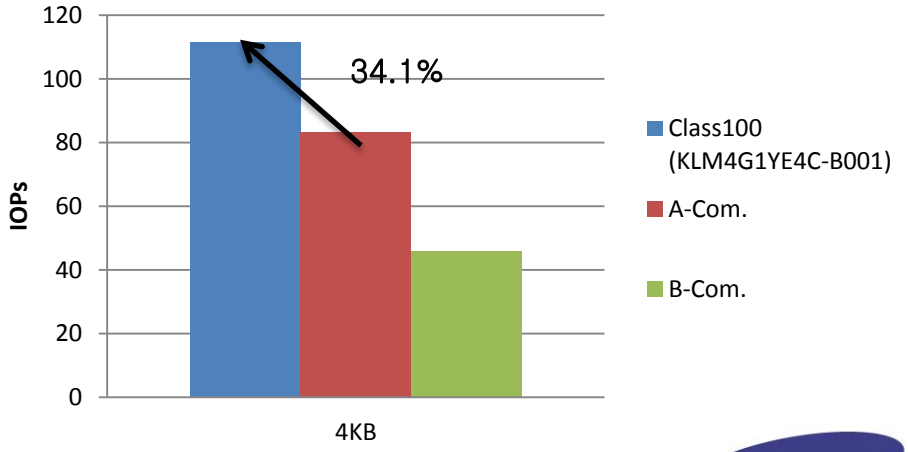
Rand. Read



Seq. Write



Rand. Write



* Test Condition : 50MHz DDR, X8, without OS overhead, 1GB Address Range after full density filling,

Set Level Performance Comparison Result

Test Condition

	AP	Memory	OS
A Smart Phone	A-CPU	MD4GB4Gb	GB

Test Result

	Test Item	Description	`11Year [sec]	`12Year [sec]	Performance Gap	Test Environment
Performance **Clean** Precondition	File copy Write	Small file copy(Sec) Write (PC → eMMC)	47.2	29.6	**37.3%**	225MB
		Big file copy(Sec) Write (PC → eMMC)	49.6	33.0	**33.5%**	316MB
	File copy Read	Small file copy(Sec) Read (eMMC → PC)	21.2	19.4	**8.5%**	225MB
		Big file copy(Sec) Read (eMMC → PC)	22.7	23.4	**-3.1%**	316MB
	App	Application install(Sec)	22.9	15.8	**31.0%**	101MB
Performance **Dirty** Precondition (62 % Filled) 600MB remained	File copy Write	Small file copy(Sec) Write (PC → eMMC)	55.1	56.3	**-2.2%**	225MB
		Big file copy(Sec) Write (PC → eMMC)	63.9	57.0	**10.8%**	316MB
	File copy Read	Small file copy(Sec) Read (eMMC → PC)	16.4	14.8	**9.8%**	225MB
		Big file copy(Sec) Read (eMMC → PC)	16.4	18.3	**-11.6%**	316MB
	App	Application install(Sec)	52.8	49.9	**5.5%**	101MB

Set Level Performance Comparison Result

Test Condition

	AP	Memory	OS
A Smart Phone	B-CPU	ME4GB4Gb	ICS

Test Result

	Test Item	Description	`11Year [sec]	`12Year [sec]	Performance Gap	Test Environment
Performance **Clean** Precondition	File copy Write	Small file copy(Sec) Write (PC → eMMC)	43.7	36.0	**17.6%**	225MB
		Big file copy(Sec) Write (PC → eMMC)	41.8	37.3	**10.8%**	316MB
	File copy Read	Small file copy(Sec) Read (eMMC → PC)	33.4	29.9	**10.3%**	225MB
		Big file copy(Sec) Read (eMMC → PC)	30.2	27.2	**9.8%**	316MB
	App	Application install(Sec)	25.2	14.0	**44.5%**	101MB

Performance **Dirty** Precondition (62 % Filled) 600MB remained	File copy Write	Small file copy(Sec) Write (PC → eMMC)	43.9	39.4	**10.3%**	225MB
		Big file copy(Sec) Write (PC → eMMC)	44.1	44.4	**- 0.8%**	316MB
	File copy Read	Small file copy(Sec) Read (eMMC → PC)	33.2	29.9	**9.9%**	225MB
		Big file copy(Sec) Read (eMMC → PC)	29.6	27.9	**5.7%**	316MB
	App	Application install(Sec)	22.5	15.5	**31.1%**	Racing Game (101MB)

Class100 eMCP Technical Review

Endurance

User Scenario base Life Time of 4GB Class100

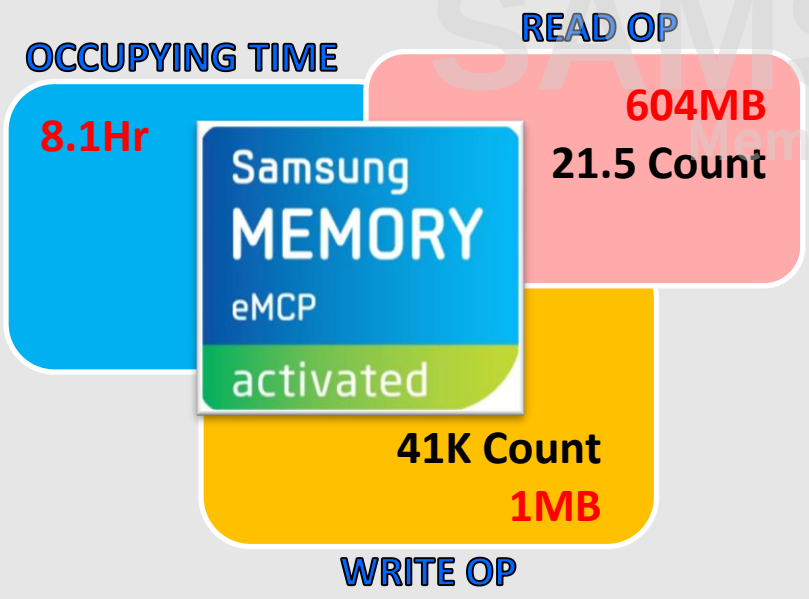
Class100 eMCP can Endure for 3years following Simulation

- **User Scenario**

Simulation Result

4.6yr Life time for Heavy User (1MB/day write)

[User Scenario from SetMakerA]

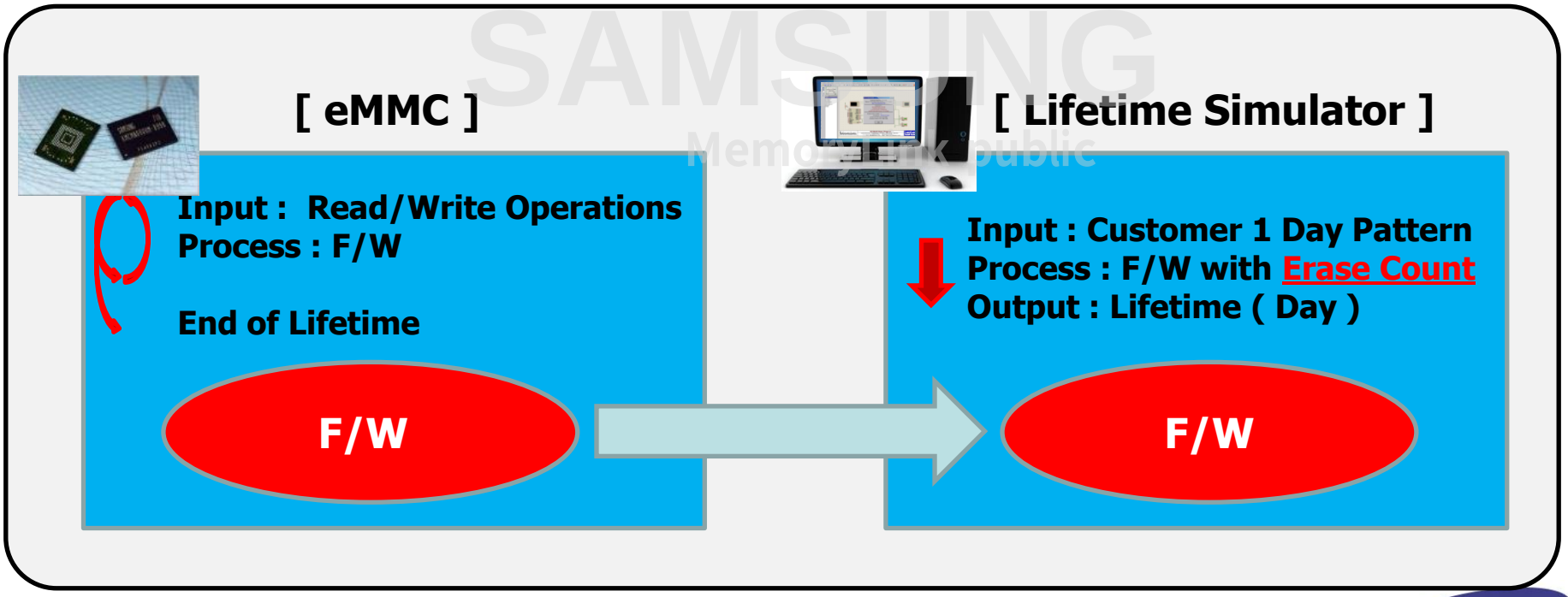


Samsung Class 100 guarantee a life of almost **3 years**

If the user scenario is much more severe or critical in nature, contact SEC HQ with respective scenario.

How to Simulate Lifetime

- Life time estimation of eMMC could be using Lifetime Simulator
- Simulator expects a day's work load pattern.
  - Lifetime of a third party vendor device cannot be simulated.
  - No Simulator for Other Vendor's or No Way to Know Erase Count



Solution for Each Display

Memory Recommendation : LPDDR1

- **Line-up for various smart phone specification**
  - **Without DRAM POP, eMCP will support various DRAM Density**
  - **POP Stack Process is not needed**

8Gb LP2 (4Gb*2)

POP

AP + BB Chipset

eMCP

LPDDR1 x32

MD 4GB **4G**

MD 4GB **6G**

MD 4GB **8G**

Popular Pairs

Memory Recommendation : LPDDR2

- **Line-up for various smart phone specification**
  - **Without DRAM POP, eMCP will support various DRAM Density**
  - **POP Stack Process is not needed**

8Gb LP2 (4Gb*2)

POP

AP + BB Chipset

eMCP

LPDDR2 x32

ME 4GB **4G**

ME 4GB **6G**

ME 4GB **8G**

Popular Pairs

Validation Result

Chipset Joint Validation Result (Class100 + ChipsetA)

- **eMCP Class100 4GB Validated on Popular platform (Chipset A)**
  - **Platform Info. : Chipset A + Android 4.0(ICS)**
- **By validating eMMC Class100 4GB on Chipset A, we've optimized performance related factors**

#	Validation Item	Reference	Analysis Results	Comments
1	**Basic Analysis**	AC/DC parameter	No issue	-
		Timing Parameter	No issue	-
		Power up Cycling	No issue	-
		Booting/initialize sequence	No issue	Unnecessary CMD optimization
		Transfer Mode check (R/W function)	No issue	Address misalign, chunk size optimization done
2	**Performance Analysis**	B/M Tool Test	No issue	Address discontinuity, chunk size optimization done
		User Scenario performance test	No issue	
3	**SI/PI Management**	SI Check	No issue	-
		PI Check	No issue	-

Contact US

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Contact for More about Class100

Contact window (@China region & Korea)

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Align with your imagination

Thank you

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