



# 3D v2 128Gb base 64GB eMMC5.1

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## Reliability Report

**Part number** H26M88002AMR

**Structure** 3D v2 128Gb MLC + Venus (eMMC5.1)

**Solution Quality Assurance Group**

## ◆ 3D v2 128GB ODP eMMC5.1 Venus

Product Device No.	Nand Flash	Controller
H26M88002AMR	3D v2 128Gb MLC *8	Venus (eMMC5.1)

# 3D v2 128Gb MLC Reliability Test Results

Confidential

2016-01-16 ~ 2017-01-15

Reliability Item	Stress Condition	Sample Size	Criteria	Duration	Result	Remark
EFR	Reflow 260°C 1Cycle + Erase/Program/Read @ 125°C, 3.7V	2,500	400ppm	48Hrs	PASS (0ppm)	
HTOL	Read Stress @ 125°C, 3.6V	116	0	1008Hrs	PASS	
LTOL	Read Stress @ -10°C, 3.6V	76	0	1008Hrs	PASS	
Endurance	Erase/Program @ 85°C, 3.6V	231	0	3K	PASS	
HTDR	Pre-E/W 300/3K cycle @ 85°C, 3.6V Retention Bake @ 125°C	231	0	100/10Hrs	PASS	
LTDR	Pre-E/W 3K cycle @ 25°C, 3.6V Retention Bake @ 25°C	116	0	504Hrs	PASS	
Read Disturb	Pre-E/W 300/3K cycle @ 85°C, 3.6V Read Stress(SPRD) @ 25°C, 3.6V	116	0	3K + 500K	PASS	

# 3D v2 128GB eMMC5.1 Test Results

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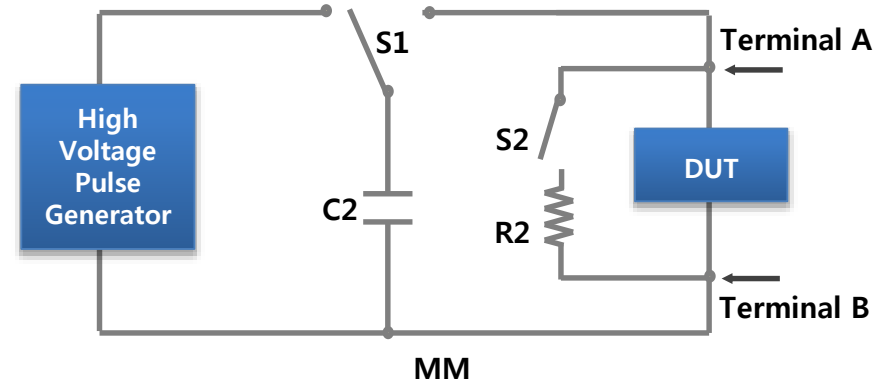
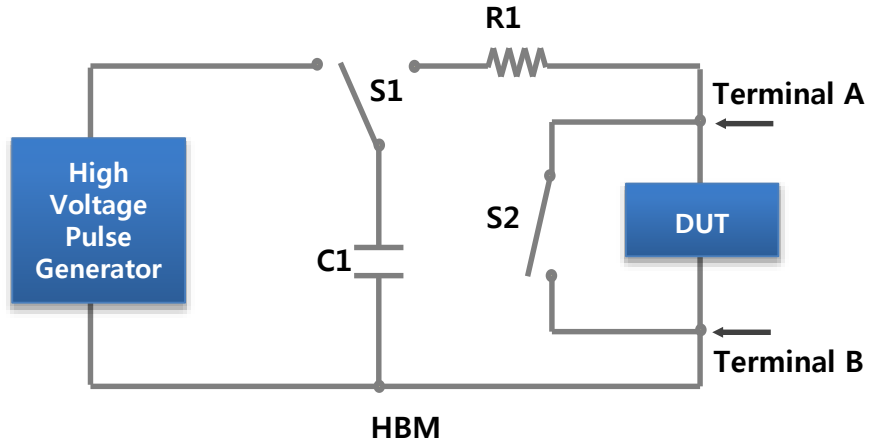
2016-01-16 ~ 2017-01-15

Test Item	Stress Condition	Sample Size	Criteria	Duration	Result	Remark
Read Disturb	PGM + 200LBA Read + 20LBA Read	32	0	2K+2M	Pass	
Reflow DR	PGM + 260°C Reflow 3Times + Read + Retention Bake @125°C+ Read	231	0	100Hrs	Pass	
UCHTDR	260°C Reflow 3Times + PGM + Retention Bake @125°C+ Read	231	0	100Hrs	Pass	
HTS	150°C Storage	231	0	1008Hrs	Pass	
LTS	-65°C Storage	231	0	1008Hrs	Pass	
THB	85°C / 85%RH / 3.6V	231	0	1008Hrs	Pass	
T/C	-55 °C / 125 °C	231	0	1000cyc	Pass	
HAST	130°C / 85%RH / 3.6V	231	0	96Hrs	Pass	
Unbiased-HAST	110°C / 85%RH	231	0	264Hrs	Pass	
ESD	HBM/MM/CDM(3/Mode)	3ea/Mode	2,000V/200V/500V	-	Pass	
Latch Up	Vsupply overvoltage/I Test	5ea/Mode	> Vmax*1.5 > Imax 100mA	-	Pass	
Package Crack	Preconditioning	22	0	-	Pass	
Warpage	Room, Reflow	22	0	-	Pass	

Note(\*) : Preconditioning Condition Flow for Surface Mount Packages

T/C(-55°C/125°C, 5Cycles) + Bake (125°C, 24Hrs) + 85°C/85% (No Bias, 24Hrs) + Reflow (3Cycles, 260°C)

## 1. Test Circuit & Method

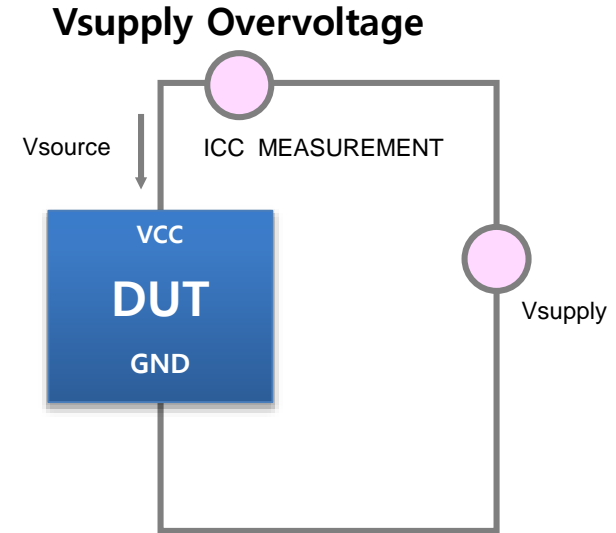
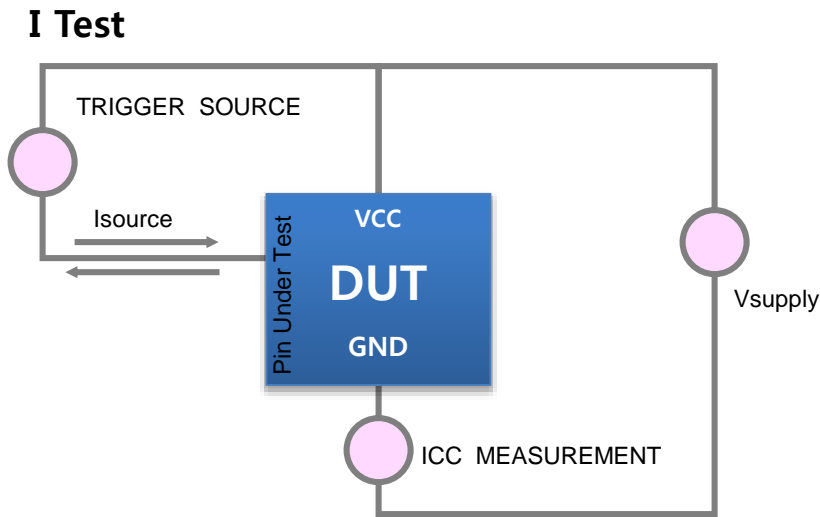


Model	Capacitor	Resister	Reference
HBM	C1=100pF	R1=1500 OHM	JEDEC
MM	C2=200pF	R2=10K to 10M OHM	JEDEC

## 2. Test Result

Method	Target	Result	Remark
HBM (Human Body Model)	$\geq 2,000V$	$\geq 3,000V$	
MM (Machine Model)	$\geq 200V$	$\geq 200V$	
CDM (Charged Device Model)	$\geq 500V$	$\geq 500V$	

## 3. Test Circuit & Method



## 4. Test Result

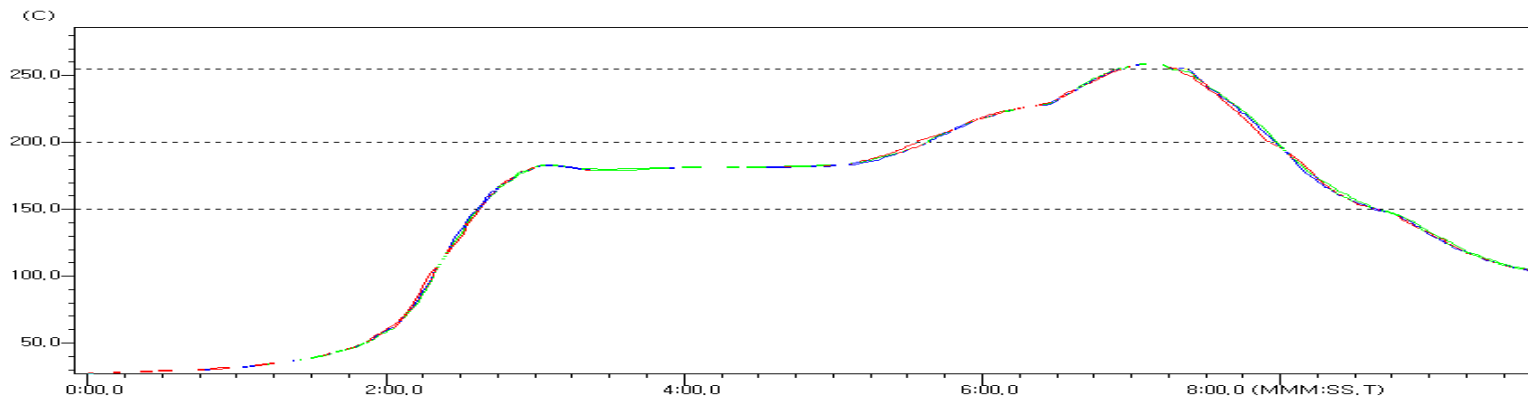
Method	Target	Result	Remark
I Test (Positive / Negative )	$\geq \pm 100\text{mA}$	$\geq \pm 100\text{mA}$	JEDEC
Vsupply Overvoltage	$\geq (1.5 \times V_{dd})$	$\geq 5.4\text{V}$	

# Reflow Profile for Qualification

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2016-01-16 ~ 2017-01-15

## Reflow profile



DATAFAQ 2199

Options...	Time Above 217.0C	Time Above 255.0C	Max and Min Temperatures in C			
			Max Temp	Max Time	Min Temp	Min Time
1	1:50.0	0:24.0	259.0	7:03.0	27.0	- 0:04.0
2	1:52.0	0:22.0	259.0	7:03.0	27.0	- 0:04.0
3	1:51.0	0:20.0	259.0	7:06.0	27.0	- 0:04.0

Profile Feature	J-STD020C	SK Hynix ( Actual Value )
Solder (SnAgCu) Melting Point	217°C	217°C
Average ramp-up rate	3.0 °C/ sec max.	2.0 °C / sec
Preheat	150 ~ 200 °C : 60 ~ 180 sec	150 ~ 200 °C : 150 sec
Time maintained above	217 °C : 60 ~ 150 sec	217 °C : 100 sec
Peak Temperature	255 ~ 260 °C : 20 ~ 40 sec	255 ~ 260 °C : 24 sec
Ramp-down rate	6 °C / sec max	1.3 °C / sec
Time 25°C to peak temperature	8 minutes max	7 minutes

## 1. Pre-con. test result : Electrical Test

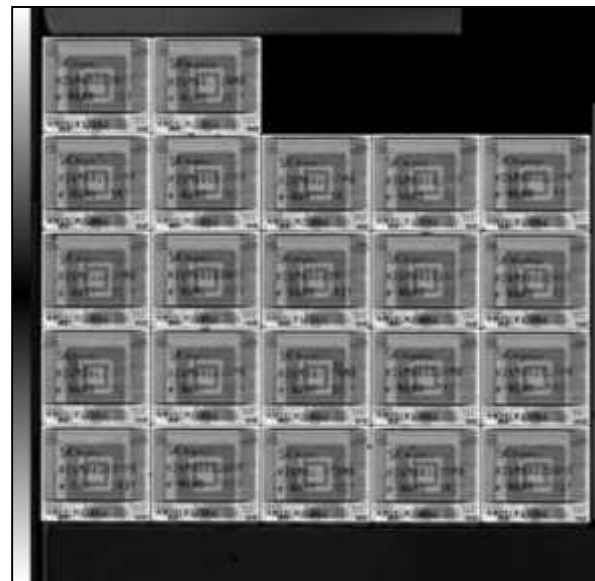
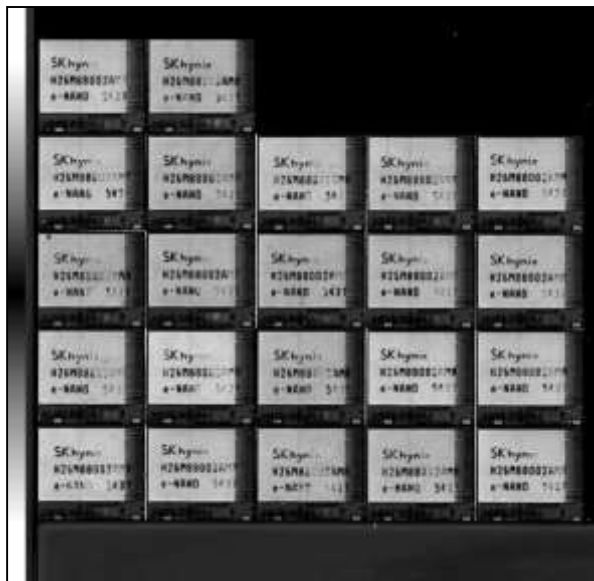
Sample Size	924 pcs
Test result	PASS
Remark	DC TEST (Open, Short, Pin leakage, ICC), Functional Test : Magnum, 25°C

## 2. Pre-con. test result : Internal Visual inspection

Sample Size	22 pcs
Test result	PASS
Remark	There is no crack or delamination.

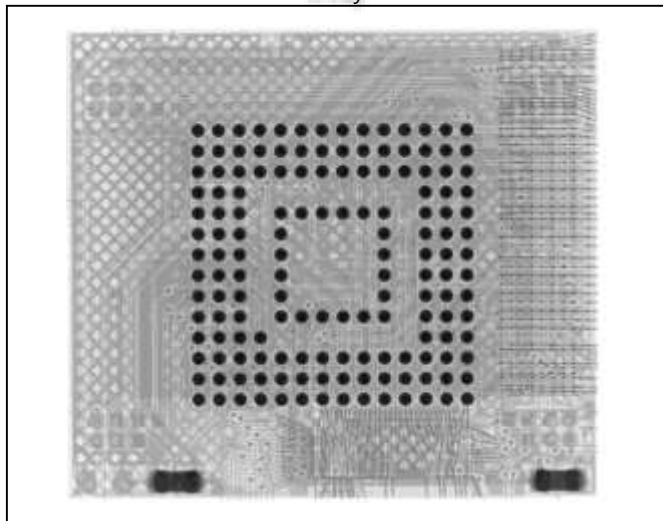
Note) SK hynix Preconditioning Flow :

T/C(-55°C~125 °C) 5Cycle + Bake(125 °C) 24Hours + 85 °C /85%RH 24Hours + Reflow (260 °C) 3Cycle

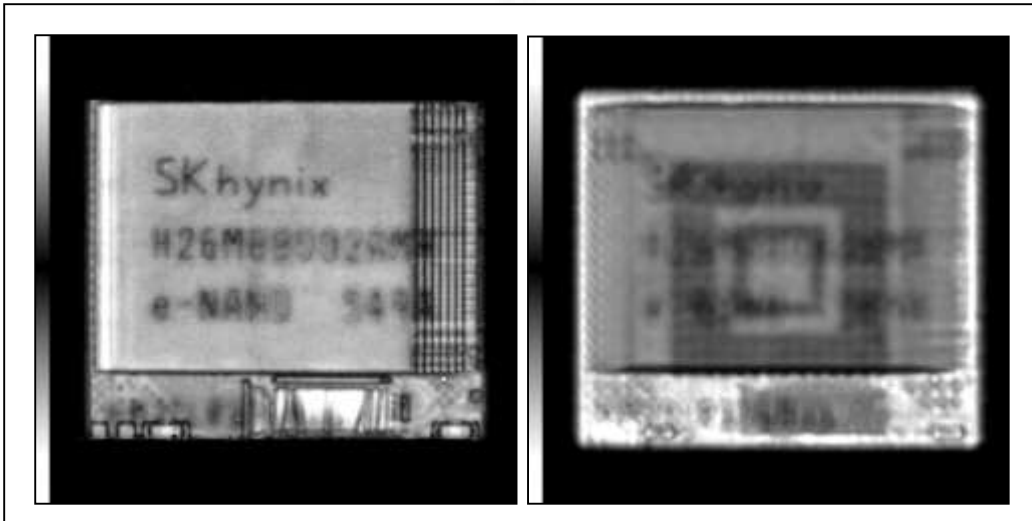




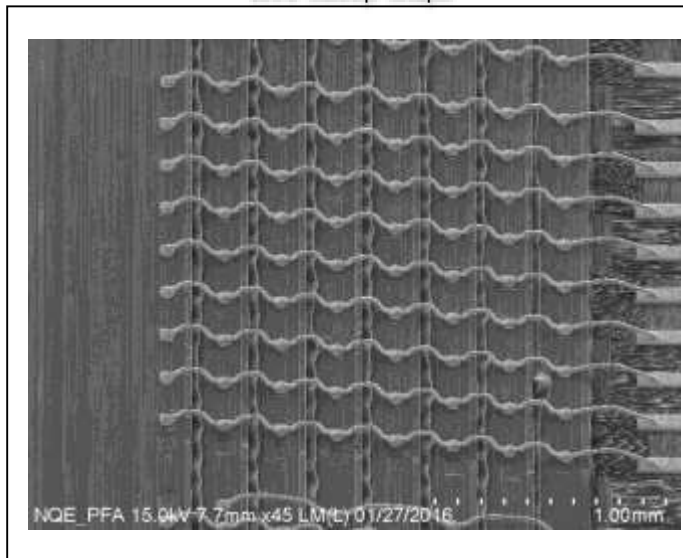
X-ray



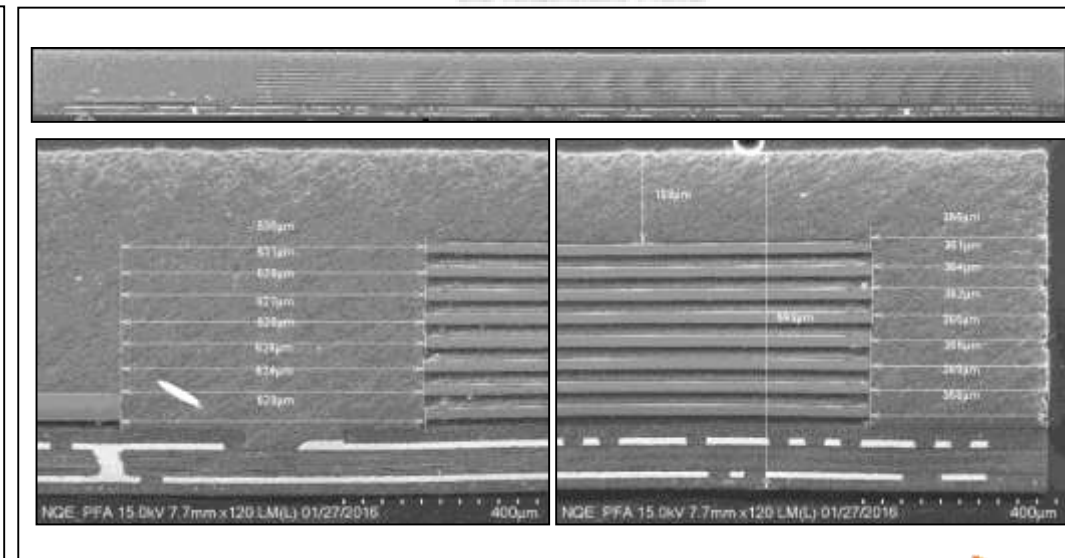
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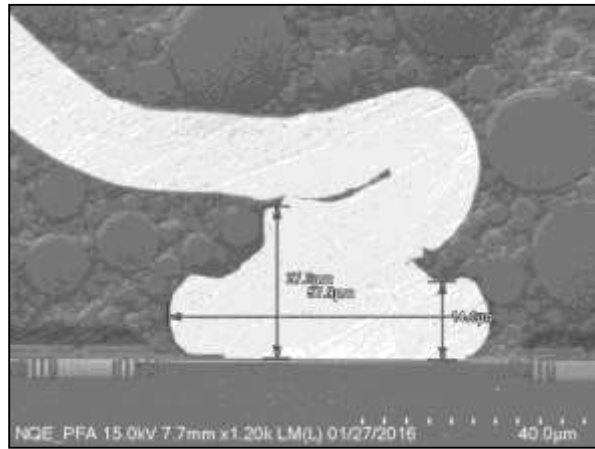
Wire Sweep Shape



Die Attachment Profile

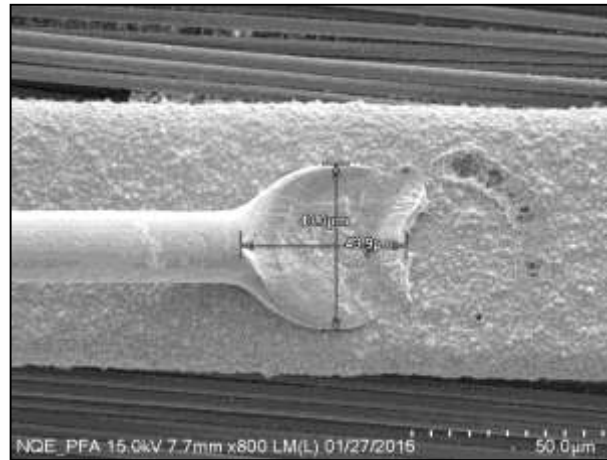


Ball Bonding Cross-Section



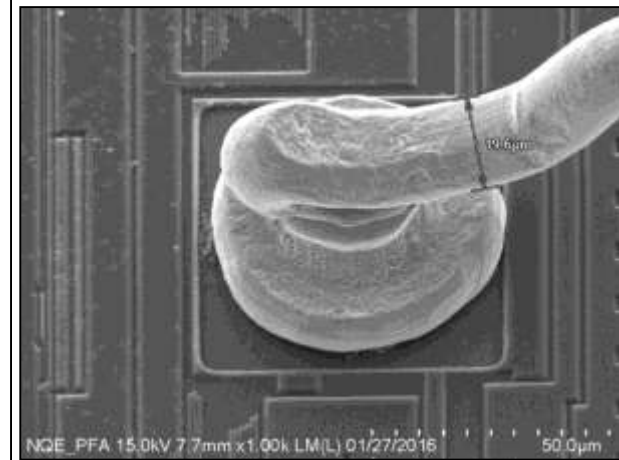
Ball Height	14.0 um
Bond Height	27.3 um
Ball Width	57.9 um

Stitch Bond Shape



X-Axis	43.9 um
Y-Axis	43.3 um

Ball Bonding Shape



Wire Diameter	19.6 um
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