



# AEC-Q100 可靠性认证报告

产品名称: CA-IF1021X-Q1

版    本: V1.1

参考标准: AEC-Q100-REV-H

认证单位: 苏试宜特（上海）检测技术股份有限公司

# 目录

1 概述 .....	3
2 群族产品料号表.....	3
3 产品信息表 .....	3
3.1 产品 Fab 基本信息.....	3
3.2 产品封装基本信息.....	3
4 产品可靠性认证计划.....	4
5 产品可靠性测试结果.....	6
6 MTBF&FIT .....	7
7 结论 .....	7
附录 1 : EMC 测试结果 .....	9
附录 2 : MSL1 前后 SAT 测试结果(SOIC8 package) .....	10
附录 3 : MSL1 前后 SAT 测试结果(DFN8 package) .....	11

## 1 概述

川土微电子产品的质量与可靠性测试是一个风险缓解过程，旨在确保设备在客户应用中的使用寿命。半导体晶圆制造工艺和封装级可靠性的评估方法多种多样，可能包括加速环境试验条件，随后降低到实际使用条件。芯片的可制造性评估包括验证稳健的装配流程，产品生产的连续性，确保供货能力。根据汽车电子委员会（AEC）标准和程序，川土微电子的产品评估符合行业标准测试方法。

## 2 群族产品料号表

封装类型	料号名称
SOIC8(S)	CA-IF1021S-Q1
DFN8(D)	CA-IF1021D-Q1

备注：根据 AEC-Q100 附录 1 规范，相同 Fab 工厂、Fab 工艺、相同的封装工厂、封装工艺生产的料号可以使用相似的通用数据进行认证。

## 3 产品信息表

### 3.1 产品 Fab 基本信息

晶圆工厂	DB HiTek
晶圆名称	LEO
晶圆工艺	BCDXXX

### 3.2 产品封装基本信息

封装厂	UNIMOS	JCET-D3
测试厂	UNIMOS	JCET-D3
封装形式	SOIC8 (S)	DFN8(D)
Lead Frame	Cu	Cu
Bond wire	20um Au	20um Au
湿敏等级	MSL1	MSL1
工作温度等级	Grade 1 (-40°C - 125°C)	Grade 1 (-40°C - 125°C)

## 4 产品可靠性认证计划

分组	项目	参考标准	测试条件	测试数量	备注
<b>Test Group A – Accelerated Environment Stress Tests</b>					
A1	PC	J-STD-020 JESD22-A113	Preconditioning: (Test @ Rm) SMD only; Moisture Preconditioning for THB/HAST, AC/UHST, TC, &PTC; Peak Reflow Temp =260°C	Min. MSL = 3	Use 3 lot CA-IF1042S- Q1/CA- IF1044VD-Q1 as generic data
A2	THB/BHAST	JESD22-A101 JESD22-A110	THB: 85°C, 85%RH 1000hrs. (Test @ Rm/Hot) BHAST: 130°C, 85%RH 96hrs. (Test @ Rm/Hot)	1*77pcs	
A3	AC/TH/UHAST	JESD22-A102 JESD22-A118 JESD22-A101	AC: 121°C, 100%RH 96hrs. (Test @ Rm) TH: 85°C, 85%RH 1000hrs. (Test @ Rm) UHAST: 130°C, 85%RH 96hrs. (Test @ Rm)	1*77pcs	
A4	TC	JESD22-A104	TC: -65°C-150°C, 500cycles (Test @Rm/ Hot)	1*77pcs	
A5	PTC	JESD22-A105	PTC: -65°C-125°C, 1000cycles (Test @ Rm/Hot)	NA	Not Applicable
A6	HTSL	JESD22-A103	HTSL: Ta=150°C, 1000hrs (Test @ Rm/Hot)	1*45pcs	
<b>Test Group B – Accelerated Lifetime Simulation Tests</b>					
B1	HTOL	JESD22-A108	HTOL: Ta=125°C, Vcc=5V, 1000hrs (Test @ Rm/Cold/Hot)	3*77pcs	
B2	ELFR	AEC-Q100-008	ELFR: Ta=125°C, Vcc=5V, 48hrs (Test @ Rm/Hot)	3*800pcs	
B3	EDR	AEC-Q100-005	EDR: (Test @ Rm/Hot)	NA	Not Applicable
<b>Test Group C – Package Assembly Integrity Tests</b>					
C1	WBS	AEC-Q100-001 AEC-Q003	Wire Bond Shear Test: (Cpk > 1.67)	30wire from 5pcs	Use CA-IF1042S- Q1/ CA- IF1044VD-Q1 as generic data
C2	WBP	MIL-STD883 AEC-Q003	Wire Bond Pull: (Cpk > 1.67); Each bonder used	30wire from 5pcs	
C3	SD	JESD22-B102 JSTD-002D	Solderability: (>95% coverage) 8hr steam aging prior to testing	1*15pcs	
C4	PD	JESD22-B100 JESD22-B108 AEC-Q003	Physical Dimensions: (Cpk > 1.67)	3*10pcs	
C5	SBS	AEC-Q100-010 AEC-Q003	Solder Ball Shear: (Cpk > 1.67); 5 balls from min. of 10 devices	NA	Not Applicable
C6	LI	JESD22 B105	Lead Integrity: (No lead cracking or breaking); Through-hole only; 10 leads from each of 5 devices	NA	Not Applicable

分组	项目	参考标准	测试条件	测试数量	备注
<b>Test Group D - Die Fabrication Reliability Tests</b>					
D1	EM	JESD61	Electromigration		
D2	TDDDB	JESD35	Time Dependent Dielectric Breakdown		
D3	HCI	JESD60 & 28	Hot Carrier Injection		
D4	NBTI	JESD90	Negative Bias Temperature Instability		
D5	SM	JESD61, 87, & 202	Stress Migration		
<b>Test Group E- Electrical Verification</b>					
E1	TEST	per datasheet	Pre and Post Stress Electrical Test:	all	
E2	HBM	AEC Q100-002	HBM: 500V,1KV,2KV (Test @ Rm/Hot);	3pcs/voltage level	
E3	CDM	AEC-Q100-011	CDM: 250V,500V,750V,1KV,2KV(Test @ Rm/Hot);	3pcs/voltage level	
E4	LU	AEC-Q100-004	Latch-Up: (Test @ Rm/Hot)	1*6pcs	
E9	EMC	SAE J1752/3	Electromagnetic Compatibility (Radiated Emissions)	1*1pcs	

## 5 产品可靠性测试结果

分组	项目	测试条件	测试数量	样品批次	结果
<b>Test Group A - Accelerated Environment Stress Tests</b>					
A1	PC	MSL 1	Min. MSL = 3	DUJ02217B	Pass
A2	BHAST	130°C, 85%RH 96hrs, Vcc=5.5V	3*77pcs	DUJ02217B	Pass
A3	UHAST	130°C, 85%RH 96hrs	3*77pcs	DUJ02217B	Pass
A4	TC	-65°C-150°C, 500cycles	3*77pcs	DUJ02217B	Pass
A6	HTSL	Ta=150°C, 1000hrs	1*45pcs	DUJ02217B	Pass
<b>Test Group B - Accelerated Lifetime Simulation Tests</b>					
B1	HTOL	Ta=150°C, 1000hrs, Vcc=5.5V, Vbat=27V, TTL 信号输入, F=5Mbps.	3*77pcs	DUJ02217A	Pass
				DUJ02217B	Pass
				DUJ02224M	Pass
B2	ELFR	Ta=150°C, 24hrs, Vcc=5.5V, Vbat=27V, TTL 信号输入, F=5Mbps.	3*800pcs	DUJ02217A	Pass
				DUJ02217B	Pass
				DUJ02224M	Pass
<b>Test Group C - Package Assembly Integrity Tests</b>					
C1	WBS	Wire Bond Shear Test: (Cpk > 1.67)	30wire from 5pcs	149AC01	Pass, CPK=2.56
C2	WBP	Wire Bond Pull: (Cpk > 1.67); Each bonder used	30wire from 5pcs	149AC01	Pass, CPK=6.04
C3	SD	Solderability: (>95% coverage) 8hr steam aging prior to testing	1*15pcs	149AC01	Pass
C4	PD	Physical Dimensions: (Cpk > 1.67)	3*10pcs	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
<b>Test Group D - Die Fabrication Reliability Tests</b>					
D1	EM	Electromigration			
D2	TDDB	Time Dependant Dielectric Breakdown			
D3	HCI	Hot Carrier Injection			
D4	NBTI	Negative Bias Temperature Instability			
D5	SM	Stress Migration			
<b>Test Group E- Electrical Verification</b>					
E1	TEST	Pre and Post Stress Electrical Test:	all	all	Pass
E2	HBM	HBM: 500V,1KV,2KV,6KV (Test @ Rm/Hot);	3pcs/voltage level	DUJ02217B	Pass 2KV class 2
E3	CDM	CDM: 250V,500V,750V,1KV,2KV(Test @ Rm/Hot);	3pcs/voltage level	DUJ02217B	Pass 2KV class C6
E4	LU	Latch-Up: (Test @ Rm/Hot)	1*6pcs	DUJ02217B	Pass Class II.A
E9	EMC	Electromagnetic Compatibility (Radiated Emissions)	1*1pcs	DUJ02217B	参考附录 1

注: Group A&C use CA-IF1042S-Q1 result as generic data for SOIC8 package;  
Group A&C use CA-IF1044VD-Q1 result as generic data for DFN8 package.

## 6 MTBF&FIT

支撑数据									MTBF(Hrs.)	FIT
实验温度	实验电压	实验时间	样本数量	故障数量	使用温度	使用电压	活化能 (eV)	置信度		
150°C	5.5V/27V	1000hrs	231	0	55°C	5V/27V	0.7	60%	1.35E+08	7.39
150°C	5.5V/27V	24hrs	2400	0	55°C	5V/27V	0.7	60%		

## 7 结论

以上测试项目遵循 AEC-Q100 测试规范，由第三方实验室苏试宜特执行认证，CA-IF1021X-Q1 系列产品可靠性测试认证结果全部通过。

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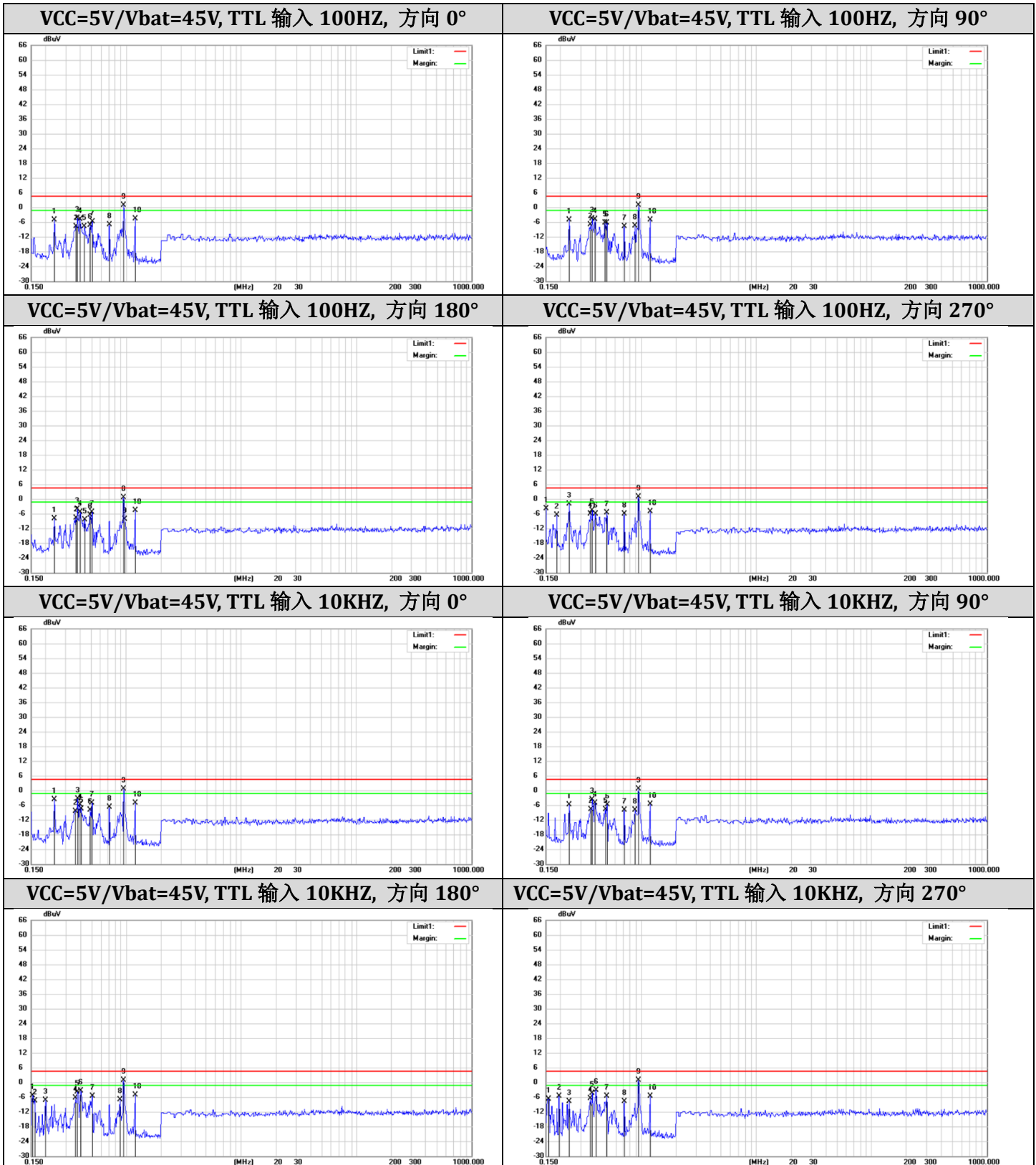
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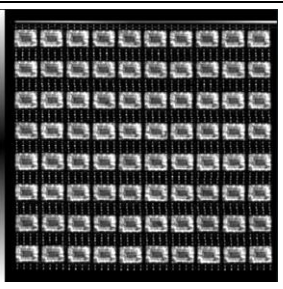
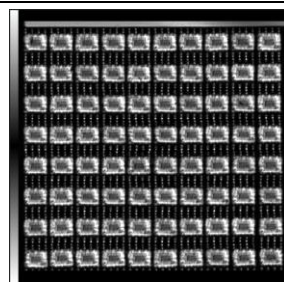
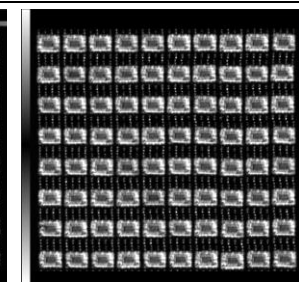
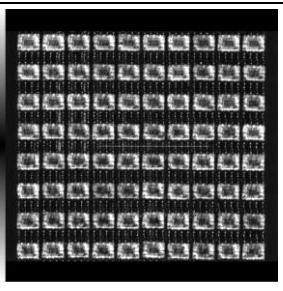
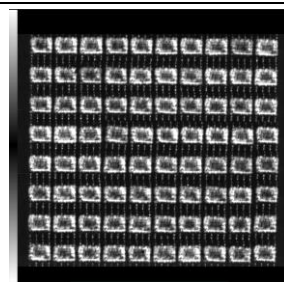
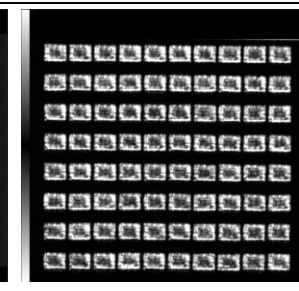
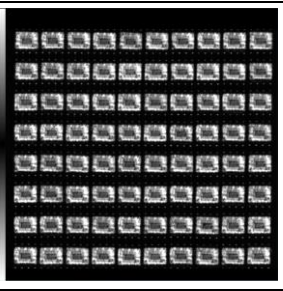
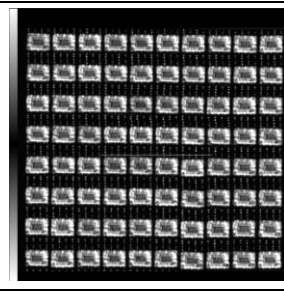
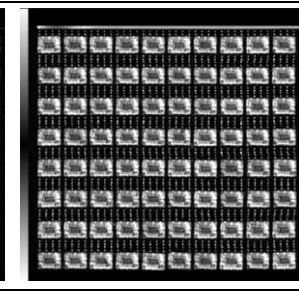
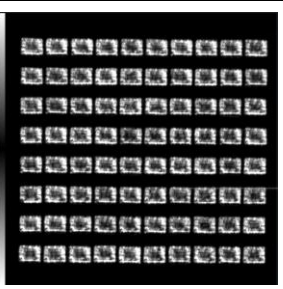
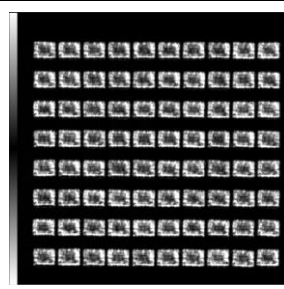
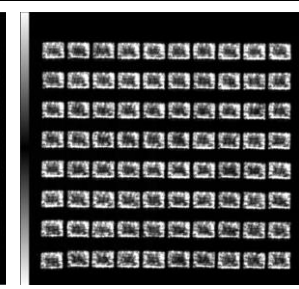
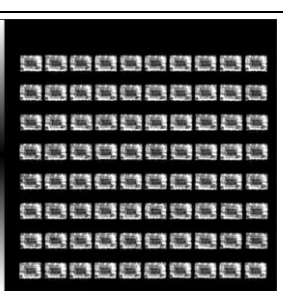
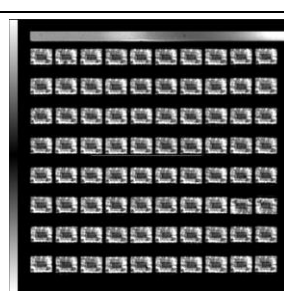
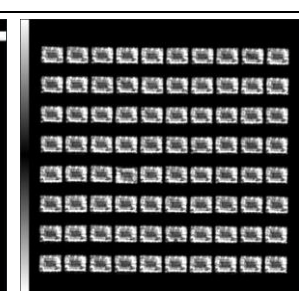
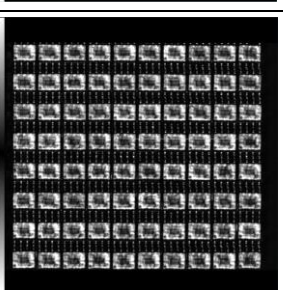
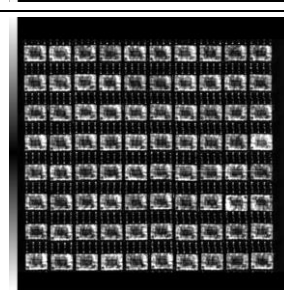
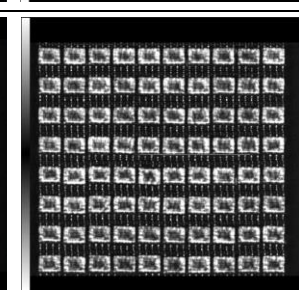
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Draft	草稿版	Aug. 2022
V1.0	正式版初版发布	Nov. 2022
V1.1	增加 CA-IF1021D-Q1 相关信息及可靠性结果	Jan. 2023



附录 1 : EMC 测试结果

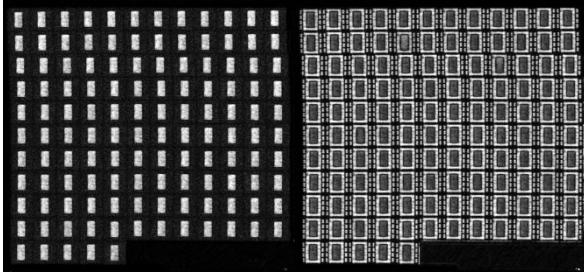
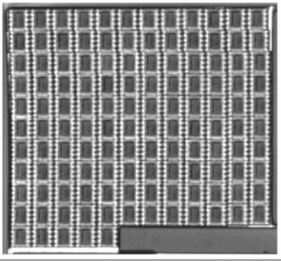
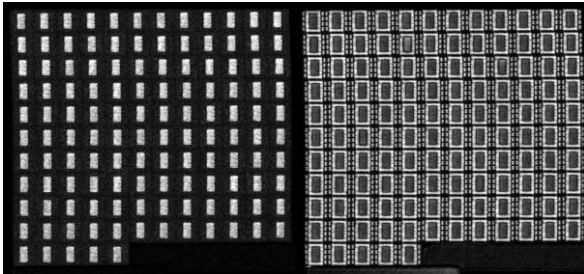
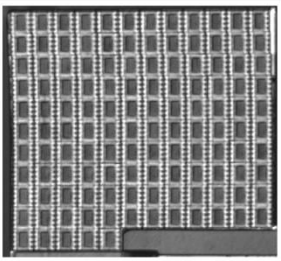
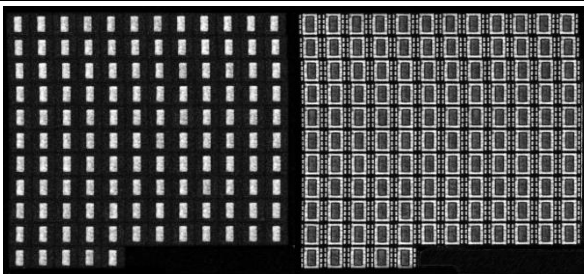
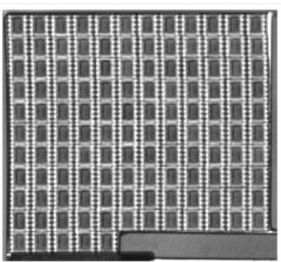
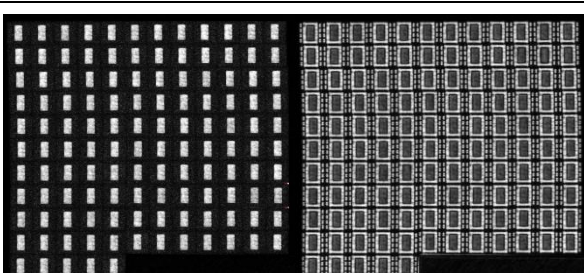
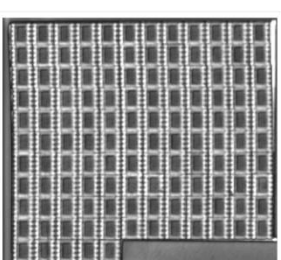
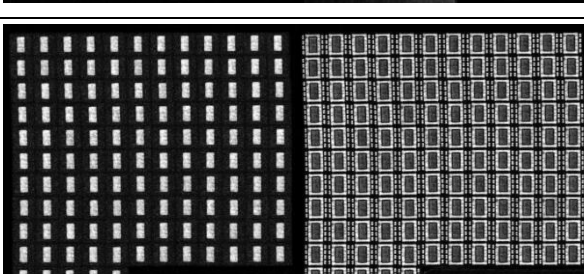
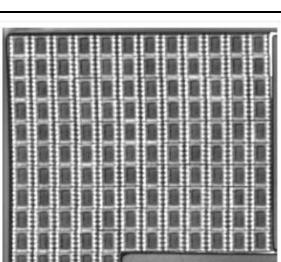


附录 2 : MSL1 前后 SAT 测试结果(SOIC8 package)

<p><b>Lot 1 pre-MSL</b></p>					
<p><b>Lot 1 post-MSL</b></p>					
<p><b>Lot 2 pre-MSL</b></p>					
<p><b>Lot 2 post-MSL</b></p>					
<p><b>Lot 3 pre-MSL</b></p>					
<p><b>Lot 3 post-MSL</b></p>					



附录 3 : MSL1 前后 SAT 测试结果(DFN8 package)

<p>Lot 1 pre-MSL</p>		
<p>Lot 1 post-MSL</p>		
<p>Lot 2 pre-MSL</p>		
<p>Lot 2 post-MSL</p>		
<p>Lot 3 pre-MSL</p>		
<p>Lot 3 post-MSL</p>	