AEC-Q100 Reliability Qual Report

Product Series： CA-IF1042XX-Q1

Report Version： V1.2

Reference Doc.： AEC-Q100-REV-H

Qualification Lab： Chinaisti（Shanghai）Testing Technology Co., LT

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1 Summary

Chipanalog product quality and reliability test is a risk mitigation process designed to ensure the lifetime of device in customer application. There are a variety of methods for evaluating semiconductor wafer fabrication process and package-level reliability, which may include accelerated environmental test conditions followed by reduction to actual use conditions. The manufacturability assessment of chips includes verifying a robust assembly process, continuity of product production, and ensuring availability. According to the AEC-Q100 standards and procedures, the product evaluation of Chipanalog conforms to industry standard test methods.

2 Product Series List

Product Series	**CA-IF1042XX**
Package	SOIC8(S)
Part NO.	CA-IF1042S-Q1/CA-IF1042VS-Q1

Note：Based on AEC-Q100 Qualification family rule, the family qualification may be applied to similar components with the same fabrication process, design rules, and similar circuits.

3 Production Information

3.1 Fab information

Fab site	GF
Wafer ID	Earth
Die Tech.	BCDXXX

3.2 Package information

Assembly site	UNIMOS
FT site	UNIMOS
Package	SOIC8 (S)
Lead Frame	Cu
Bond wire	20um Au
MSL level	MSL1
Operation Temp.	Grade 1 (-40℃ - 125℃)

4 Reliability Qualification Plan

Group	Item	Refer.	Test condition	QTY	Remark
Test Group A – Accelerated Environment Stress Tests					
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	
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)	3*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)	3*77pcs	
A4	TC	JESD22-A104	TC: -65°C-150°C, 500cycles (Test @Rm/ Hot)	3*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	
Test Group B – Accelerated Lifetime Simulation Tests					
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
Group C – Package Assembly Integrity Tests					
C1	WBS	AEC-Q100-001 AEC-Q003	Wire Bond Shear Test: (Cpk > 1.67)	30wire from 5pcs	
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

Group	Item	Refer.	Test condition	QTY	Remark
Test Group D – Die Fabrication Reliability Tests					
D1	EM	JESD61	Electromigration		
D2	TDDB	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		
Group E- Electrical Verification					
E1	TEST	per datasheet	Pre and Post Stress Electrical Test:	all	
E2	HBM	AEC Q100-002	HBM: 500V,1KV,2KV,6KV(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 Reliability Test Report

Group	Item	Test Condition	QTY	Lot NO.	Result
Test Group A – Accelerated Environment Stress Tests					
A1	PC	MSL 1	Min. MSL = 3	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
A2	BHAST	130°C, 85%RH 96hrs. Vcc=5.5V	3*77pcs	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
	DPA-BHAST	DPA after BHAST 96hrs	1*10pcs	149AC01	Pass
	THB	85℃,85%RH 1000hrs, Vcc=5.5V	1*77pcs	149AC01	Pass
	DPA-THB	DPA after THB 1khrs	1*10pcs	149AC01	Pass
A3	UHAST	130°C, 85%RH 96hrs.	3*77pcs	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
A4	TC	-65°C-150°C, 500/1000cycles	3*77pcs	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
	DPA-TCT	DPA after TCT500/1000cycles	1*10pcs	149AC01	Pass
	SAT-TCT	SAT after TC1000cycles	3*77pcs	/	Pass
A6	HTSL	Ta=150°C, 1000hrs/2000hrs	1*45pcs	149AC01	Pass
Test Group B – Accelerated Lifetime Simulation Tests					
B1	HTOL	Ta=125°C, 1000hrs/2000hrs, Vcc=5.5V, TTL 信号输入, F=5Mbps.	3*77pcs	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
B2	ELFR	ELFR: Ta=150°C, Vcc=5.5V, 24hrs TTL 信号输入, F=5Mbps.	3*800pcs	149AC01	Pass
				149AC02	Pass
				149AC03	Pass
Group C – Package Assembly Integrity Tests					
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
TEST GROUP D – Die Fabrication Reliability Tests					
D1	EM	Electromigration	The Die Fabrication Reliability Tests are carried out for every fabrication site. The data, test method, calculations and internal criterial is available to the customer upon request.		
D2	TDDB	Time Dependant Dielectric Breakdown			
D3	HCI	Hot Carrier Injection			
D4	NBTI	Negative Bias Temperature Instability			
D5	SM	Stress Migration			
Group E- Electrical Verification					
E1	TEST	Pre and Post Stress Electrical Test:	all	all	Pass
E2	HBM	HBM: 500V,1KV,2KV,6KV (Test @ Rm/Hot);	3pcs/voltage level	149AC03	Pass 8KV class 3B
E3	CDM	CDM: 250V,500V,750V,1KV,2KV(Test @ Rm/Hot);	3pcs/voltage level	149AC03	Pass 2KV class C6
E4	LU	Latch-Up: (Test @ Rm/Hot)	1*6pcs	149AC03	Pass, class II A
E9	EMC	Electromagnetic Compatibility (Radiated Emissions)	1*1pcs	149AC03	参考附录 1

6 MTBF&FIT

Supporting Data									MTBF (Hrs.)	FIT
Test Temp.	Test Voltage	Duration	QTY	Fail QTY	Operation Temp	Operation Voltage	Active energy（eV)	Confidence level		
125℃	5.5V	2000hrs	240	0	55℃	5V	0.7	60%	9.43E+07	10.60
150℃	5.5V	24hrs	2400	0	55℃	5V	0.7	60%		

7 Conclusion

All above test items conform to AEC-Q100 standard and test execute by 3rd Lab Chinaisti（Shanghai）Testing Technology Co., LT. CA-IF1042XX-Q1 series products meet all test requirements, and all reliability test results are acceptable.

Statement

The above information is for reference only and used to support better design and development of Chipanalog's customer. Chipanalog reserves the right to change the above information due to technical innovation without prior notice.

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Version History

Version	Change reason	Release Date
V1.0	Initial	July. 2022
V1.1	Update robustness result： 1. HTOL 2khrs test result； 2. TCT 1000cycle test result； 3. HTSL 2khrs test result; 4. THB 1000hrs test result。	Sep. 2022
V1.2	1. Add DPA result post BHAST/THB/TCT1000； 2. Add SAT result post TCT1000.	Oct. 2022

Appendix1 ： EMC Test Result

VCC=5V, TTL Input 5KHZ, orientation 0°	VCC=5V, TTL 输入 5KHZ, orientation 90°
VCC=5V, TTL Input 5KHZ, orientation 180°	VCC=5V, TTL Input 5KHZ, orientation 270°
VCC=5V, TTL Input 2.5MHZ, orientation 0°	VCC=5V, TTL Input 2.5MHZ, orientation 90°
VCC=5V, TTL Input 2.5MHZ, orientation 180°	VCC=5V, TTL Input 2.5MHZ, orientation 270°

Appendix2 ： SAT result before and post MSL1

Lot 1 pre-MSL	
Lot 1 post-MSL	
Lot 2 pre-MSL	
Lot 2 post-MSL	
Lot 3 pre-MSL	
Lot 3 post-MSL	