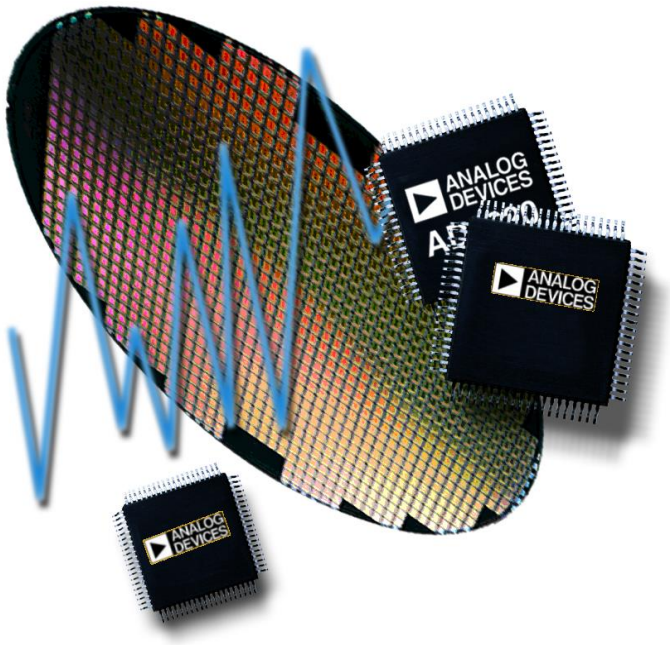

Reliability Report

Report Title: LT8692S Assembly Process Change Automotive Grade 1 Qualification

Report Number: 22180

Revision: B

Date: 17 April 2025

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the LT8692S product in a 20-LGA package with die thickness change from 450um to 200um, Cu pillar size of 85um, and SMT paste change from 95Sn_5Sb to SAC305. The LT8692S is a quad channel step-down, current mode, monolithic buck switching regulator.

AECQ100 Qualification Test Methods and Summary

AEC Test Group	AEC Stress Test Name	Abbreviation	AEC Test#	Reference
Group A ACCELERATED ENVIRONMENT STRESS TESTS	Preconditioning	PC	A1	Table 2, and Table 4
	Temperature Humidity Bias or Biased-HAST	THB or HAST	A2	
	Autoclave or Unbiased HAST or Temperature Humidity (without Bias)	AC, UHST, or TH	A3	
	Temperature Cycle	TC	A4	
	Power Temperature Cycling	PTC	A5	
	High Temperature Storage Life	HTSL	A6	
Group B ACCELERATED LIFETIME SIMULATION TESTS	High Temperature Operating Life	HTOL	B1	Table 2, and Table 4
	Early Life Failure Rate	ELFR	B2	
	NVM Endurance, Data Retention, and Operational Life	EDR	B3	
Group C PACKAGE ASSEMBLY INTEGRITY TESTS	Wire Bond Shear	WBS	C1	C1, C2 are only applicable for wire bond package. C5 is only applicable for BGA package. C3, C4 and C6 are qualified and controlled with inline monitors and may be viewed on site at Analog Devices.
	Wire Bond Pull Strength	WBP	C2	
	Solderability	SD	C3	
	Physical Dimensions	PD	C4	
	Solder Ball Shear	SBS	C5	
	Lead Integrity	LI	C6	
Group D DIE FABRICATION RELIABILITY TESTS	Electromigration	EM	D1	Die Fabrication Reliability data may be viewed on-site at Analog Devices.
	Time Dependent Dielectric Breakdown	TDDB	D2	
	Hot Carrier Injection	HCI	D3	
	Negative Bias Temperature Instability	BTI	D4	
	Stress Migration	SM	D5	
Group E ELECTRICAL VERIFICATION TESTS	Pre- and Post-Stress Electrical Test	TEST	E1	Table 5 and Table 6
	Electrostatic Discharge Human Body Model	HBM	E2	
	Electrostatic Discharge Charged Device Model	CDM	E3	
	Latch-Up	LU	E4	
	Electrical Distributions	ED	E5	• For Tests E5, E6 and E7, ADI New Product Yield Analysis Testing Guidelines meet AEC Q100 requirements. • Results for Tests E7-E11 are available as applicable on a case by case basis. • Test E12 results may be viewed on-site at Analog Devices
	Fault Grading	FG	E6	
	Characterization	CHAR	E7	
	Electromagnetic Compatibility	EMC	E9	
	Short Circuit Characterization	SC	E10	
	Soft Error Rate	SER	E11	
	Lead (Pb) Free	LF	E12	
Group F DEFECT SCREENING TESTS	Process Average Test	PAT	F1	ADI New Product Yield Analysis Testing Guidelines meet AECQ100 Requirements.
	Statistical Bin/Yield Analysis	SBA	F2	
Group G CAVITY PACKAGE INTEGRITY TESTS	Mechanical Shock	MS	G1	< Applicable only for Cavity-Packages>
	Variable Frequency Vibration	VFV	G2	
	Constant Acceleration	CA	G3	
	Gross/Fine Leak	GFL	G4	
	Package Drop	DROP	G5	
	Lid Torque	LT	G6	
	Die Shear	DS	G7	
	Internal Water Vapor	IWV	G8	

Die/Fab Product Characteristics

Table 1: Die/Fab Product Characteristics- 0.35µm BCDMOS at Vanguard Fab1

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data					
Generic/Root Part #	LT8692S	LT8365	LT8638S	LT8645S/SA	LT8648S	LT8686S	LT8650S/SP/SPA
Die Id	8692	8365	8638S	8645	8648	8686	8650
Die Size (mm)	2.15 x 2.30	1.28 x 2.85	4.02 x 2.59	1.66 x 4.96	6.20 x 2.70	3.20 x 1.75	1.75 x 3.88
Wafer Fabrication Site	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1	Vanguard Fab 1	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1
Wafer Fabrication Process	0.35µm BCDMOS	0.35µm BCDMOS	0.35µm BCDMOS	0.35µm BCDMOS	0.35µm BCDMOS	0.35µm BCDMOS	0.35µm BCDMOS
Die Substrate	Si	Si	Si	Si	Si	Si	Si
Metallization / # Layers	AlCu/3	AlCu/3	AlCu/3	AlCu/3	AlCu/3	AlCu/3	AlCu/3
Polyimide	No	No	No	No	No	No	No
Passivation	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN

Die/Fab Test Results

Table 2: Die/Fab Test Results - 0.35µm BCDMOS at Vanguard-Taiwan

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
Early Life Failure Rate (ELFR)	B2	AEC-Q100-008	Ta=150C, 48 Hours	LT8365	Q14979.1ELFR	0/820	RH
					Q14979.2ELFR	0/800	RH
					Q14979.ELFR	0/800	RH
				LT8648S	EO9353.ELFR	0/800	RH
				LT8650SP	Q17503.1ELFR	0/800	RH
High Temperature Operating Life (HTOL)	B1	JESD22-A108	Ta=125C, 1,000 Hours	LT8645SA	Q19687.1HTOL	0/77	RCH
				LT8692S	Q17415.1HTOL	0/77	RHC
			Ta=150C, 1,000 Hours	LT8650S	Q20616.3HTOL	0/77	RHC
				LT8638S	Q20120.4HTOL	0/77	RHC
				LT8648S	Q20710.2HTOL	0/77	RHC
				LT8650SP	Q17503.1HTOL	0/77	RHC
				LT8686S	Q20395.1HTOL	0/77	RHC
			Ta=150C, 2,000 Hours	LT8650SPA	Q20156.1HTOL	0/77	RCH
			Ta=125C, 2,000 Hours	LT8645S	Q20778.1HTOL	0/77	RCH
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	LT8638S	Q20120.2HTS	0/45	RH
				LT8648S	Q20710.2HTS	0/45	RH
				LT8650S	Q20616.3HTS	0/45	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LT8638S	Q20120.1HAST	0/77	RH
				LT8650S	Q20616.2HAST	0/77	RH
					Q20616.3HAST	0/77	RH
					Q20616.4HAST	0/77	RH
				LT8650SPA	Q20156.1HAST	0/77	RH
					Q20156.2HAST	0/77	RH
				LT8686S	Q20395.1HAST	0/77	RH
				LT8645S	Q20778.1HAST	0/77	RH
					Q20778.2HAST	0/77	RH

[1] These samples were subjected to preconditioning at MSL 3 with 3x reflow peak temp of 260°C prior to the start of the stress test.

Package/Assembly Product Characteristics

Table 3: Package/Assembly Product Characteristics - 20-LGA at ASE (AEK)

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data				
Generic/Root Part #	LT8692S	LT8638S	LT8648S	LT8650S	LT8685S	LT8686S
Package	20-LGA	28-LGA	36-LGA	36-LGA	36-LGA	32-LGA
Body Size (mm)	3.00 x 4.00 x 0.95	5.00 x 4.00 x 0.94	7.00 x 4.00 x 0.94	6.00 x 4.00 x 0.94	6.00 x 5.00 x 0.95	5.00 x 5.00 x 0.95
Assembly Location	ASE (AEK)	ASE (AEK)	ASE (AEK)	ASE (AEK)	ASE Korea	ASE (AEK)
MSL/Peak Reflow Temperature(°C)	3 / 260°C	3 / 260°C	3 / 260°C	3 / 260°C	3 / 260°C	3 / 260°C
Mold Compound	Sumitomo G311E	Sumitomo G311E	Sumitomo G311E	Sumitomo G311E	Sumitomo G311E	Sumitomo G311E
Substrate Material	BT Resin	BT Resin	BT Resin	BT Resin	BT Resin	BT Resin
Lead Finish	Au	Au	Au	Au	Au	Au

Package/Assembly Test Results

Table 4: Package/Assembly Test Results - LGA at ASE (AEK)

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	LT8638S	Q20120.2HTS	0/45	RH
				LT8648S	Q20710.2HTS	0/45	RH
				LT8650S	Q20616.3HTS	0/45	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LT8638S	Q20120.1HAST	0/77	RH
					Q20120.3HAST	0/77	RH
					Q20120.4HAST	0/77	RH
				LT8650S	Q20616.2HAST	0/77	RH
					Q20616.3HAST	0/77	RH
					Q20616.4HAST	0/77	RH
				LT8686S	Q20395.1HAST	0/77	RH
			130C 85%RH 33.3 psia, Biased, 192 Hours	LT8648S	Q20710.1HAST	0/77	RH
					Q20710.2HAST	0/77	RH
Solder Heat Resistance (SHR)	A1	J-STD-020	MSL-3	LT8692S	Q22180.1.SH1_POR	0/30	R
					Q22180.1.SH2_LOW	0/30	R
Temperature Cycling (TC)[1]	A4	JESD22-A104	-65C/150C, 1,000 Cycles	LT8692S	Q22180.1.TC1_POR	0/77	RH
					Q22180.1.TC2_LOW	0/77	RH
			-65/150C, 2,000 Cycles	LT8648S	Q20710.1TC	0/77	RH
					Q20710.2TC	0/77	RH
				LT8685S	Q21313.1.TC1	0/77	RH
					Q21313.1.TC2	0/77	RH
				LT8638S	Q20120.1TC	0/77	RH
					Q20120.3TC	0/77	RH
				LT8650S	Q20616.1TC	0/77	RH
					Q20616.2TC	0/77	RH
					Q20616.3TC	0/77	RH
Unbiased HAST (UHST)[1]	A3	JESD22-A118	110C 85%RH 17.7 psia, 264 Hours	LT8638S	Q20120.1UHAST	0/77	R
					Q20120.3UHAST	0/77	R
				LT8648S	Q20710.1UHAST_A	0/77	R

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
			130C 85%RH 33.3 psia, 96 Hours		Q20710.2UHAST	0/77	R
				LT8650S	Q20616.1UHAST	0/77	R
					Q20616.2UHAST	0/77	R
					Q20616.3UHAST	0/77	R
					Q20616.4UHAST	0/77	R
				LT8686S	Q20395.1UHAST	0/77	R

[1] These samples were subjected to preconditioning at MSL 3 with 3x reflow peak temp of 260°C prior to the start of the stress test.

ESD and Latch-Up Test Results

Table 5: ESD Test Result

ESD Model	Generic/Root Part #	Package	ESD Test Spec	RC Network	Highest Pass Level	Class	eTest Temp
FICDM	LT8692S	20-LGA	JS-002	1Ω, Cpkg	±1250V	C3	RH
HBM	LT8692S	20-LGA	ESDA/JEDEC JS-001	1.5kΩ, 100pF	±4000V	3A	RH

Table 6: Latch Up Test Result

LU Test Spec	Generic/Root Part #	Passing Current	Passing Over-Voltage	Temperature (T_A)	Class	eTest Temp
JESD78	LT8692S	+200mA, -200mA	+59V/+12V	125°C	II	RH

Approvals

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