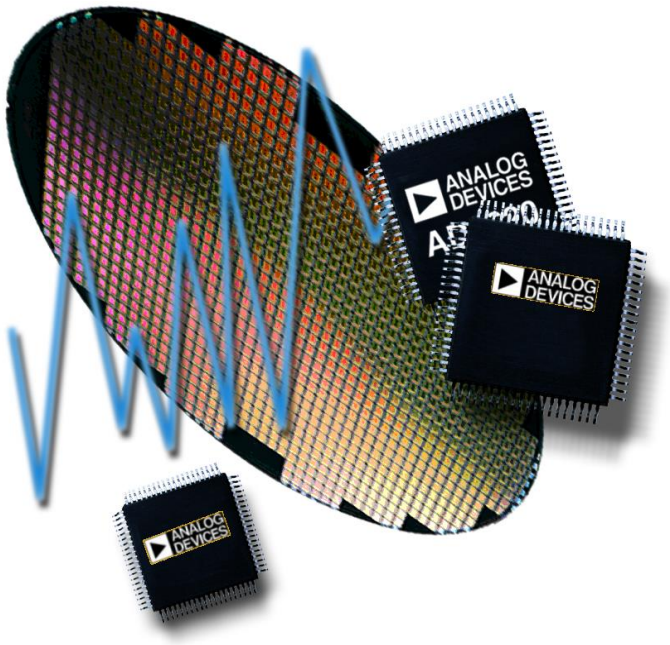

Reliability Report

Report Title: LTC3637 LFCSP Die Revision at UTAC Qualification

Report Number: 22232

Revision: A

Date: 13 November 2024

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the LTC3637 Automotive Grade 0 product in a 16-LFCSP package. The LTC3637 is a high efficiency step-down DC/DC regulator with an internal high side power switch that draws only 12µA DC supply current while maintaining a regulated output voltage at no load.

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	• Test C2 (and C1 for Cu Wire) are shown in Table 4. • Tests C3-6 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- 0.6µm BiCMOS at Vanguard

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data					
Generic/Root Part #	LTC3637	LTC3112	LTC3899	LTC3859AL	LTC3786	LTC3787	LTC3630A
Die Id	8VL3637XV VP8578B-C3LZT1NAZ1	3112	8VL3899XV	6HL3859ALXV	8VL3786XV	8VL3787XV	L3630AXV
Die Size (mm)	1.66x 2.55	1.71 x 4.35	2.30 x 2.80	1.56 x 2.65	1.46 x 1.48	1.61 x 1.97	1.66 x 2.55
Wafer Fabrication Site	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1	Vanguard Fab1
Wafer Fabrication Process	0.6µm BiCMOS	0.6µm BiCMOS	0.6µm BiCMOS	0.6µm BiCMOS	0.6µm BiCMOS	0.6µm BiCMOS	0.6µm BiCMOS
Bond Pad Metal Composition	AlCu(0.5%)	AlCu	AlCu	AlCu	AlCu	AlCu	AlCu
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 - 0.6µm BiCMOS at Vanguard

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	LTC3112	EO9424.ELFR	0/800	RH
					EO9425.ELFR	0/800	RH
					EO9433.ELFR	0/800	RH
		JESD22-A108 JESD74		LTC3630A	Z50055.ELFR	0/800	RH
					Z50156.ELFR	0/800	RH
					Z51555.ELFR	0/800	RH
				LTC3899	Z51551.ELFR	0/800	RH
					1076822.1.ELFR	0/800	RH
					Z51473.ELFR	0/800	RH
High Temperature Operating Life (HTOL)	B1	JESD22-A108	Ta=150C, Biased, 1,000 Hours	LTC3112	EO9424.HTOL	0/77	RHC
					EO9425.HTOL	0/77	RHC
					EO9433.HTOL	0/77	RHC
				LTC3630A	Z50156.HTOL	0/77	RHC
					Z51555.HTOL	0/77	RHC
				LTC3637	Q16825.1HTOL	0/77	RHC
				LTC3859AL	Z51542.HTOL	0/77	RHC
					Z51545.HTOL	0/77	RHC
					Z51778.1a.HTOL	0/77	RHC
			Ta=150C, Biased, 2,000 Hours	LTC3637	Z51607.HTOL	0/77	RHC
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 1,000 Hours	LTC3637	Q22232.1.HS-VANGUARD	0/77	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC3787	Z52074.JHAST	0/77	RH
					Z52233.JHAST	0/77	RH
					Z52670.JHAST	0/77	RH
				LTC3859AL	Z51542.JHAST	0/77	RH
					Z51545.JHAST	0/77	RH
					Z51778.1a.JHAST	0/77	RH
			130C 85%RH 33.3 psia, Biased, P192	LTC3112	EO9549K.BHAST	0/77	RH
					EO9550K.BHAST	0/77	RH
					EO9551K.BHAST	0/77	RH
			130C 85%RH 33.3 psia, Biased, 96 Hours	LTC3786	Z52672.2aJHAST	0/77	RH
					Z52705.1aJHAST	0/77	RH
					Z52784.3aJHAST	0/77	RH

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

Package/Assembly Product Characteristic

Table 3: Package/Assembly Product Characteristics - 16-LFCSP at UTAC (UT2)

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data		
Generic/Root Part #	LTC3637	LTC3899	LTC3859AL	LTC7801
Package	16-LFCSP	38-LFCSP	38-LFCSP	24-LFCSP
Body Size (mm)	5.00 x 3.00 x 0.75	5.00 x 7.00 x 0.75	5.00 x 7.00 x 0.75	4.00×5.00×0.75
Assembly Location	UTAC (UT2)	UTAC (UT2)	UTAC (UT2)	UTAC (UT2)
MSL/Peak Reflow Temperature(°C)	1 / 260°C	1 / 260°C	1 / 260°C	1 / 260°C
Mold Compound	Sumitomo G770HCD	Sumitomo G770HCD	Sumitomo G770HCD	Sumitomo G770HCD
Die Attach	Ablestik 8200T Conductive	Ablestik 8200T Conductive	Ablestik 8200T Conductive	Ablestik 8200T Conductive
Leadframe Material	Copper	Copper	Copper	Copper
Lead Finish	100Sn	100Sn	100Sn	100Sn
Wire Bond Materia l/Diameter (mils)	Tanaka GPG 2N Gold / 1.00	Gold / 1.00	Gold / 1.00	Gold / 1.00

Package/Assembly Test Results

Table 4: Package/Assembly Test Results - LFCSP at UTAC (UT2)

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 1,000 Hours	LTC3637	Q22232.1.HS-VANGUARD	0/77	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC3859AL	Z51542.JHAST	0/77	RH
					Z51545.JHAST	0/77	RH
					Z51778.1a.JHAST	0/77	RH
				LTC3899	1076822.JHAST	0/77	RH
					Z51551.JHAST	0/77	RH
					Z51473.JHAST	0/77	RH
				LTC7801	Z52429.2.JHAST	0/77	RH
					Z52439.2a.JHAST	0/77	RH
					Z52452.1a.JHAST	0/77	RH
Temperature Cycling (TC)[1]	A4	JESD22-A104	-65°C/+150°C, 500 Cycles	LTC3637	Q22232.1.TC-VANGUARD	0/77	RH
					Q22232.2.TC-VANGUARD	0/77	RH
					Q22232.3.TC-VANGUARD	0/77	RH
Unbiased HAST (UHST)[1]	A3	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LTC3859AL	Z51542.JUHAST	0/77	R
					Z51545.JUHAST	0/77	R
					Z51778.1a.JUHAST	0/77	R
				LTC3899	1076822.JUHAST	0/77	R
					Z51551.JUHAST	0/77	R
					Z51473.JUHAST	0/77	R
				LTC7801	Z52429.JUHAST	0/77	R
					Z52439.2a.JUHAST	0/77	R
					Z52452.1a.JUHAST	0/77	R

[1] These samples were subjected to preconditioning at MSL 1 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	LTC3637	16-LFCSP	AEC Q100-011	1Ω, Cpkg	±1250V	C3	RH
HBM	LTC3637	16-MINI_SO_EP	AEC-Q100-002	1.5kΩ, 100pF	±4000V	2A	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	LTC3637	+100mA, -100mA	+100V	150°C	II	RH

Approvals

Reliability Engineer: Princess Doctolero