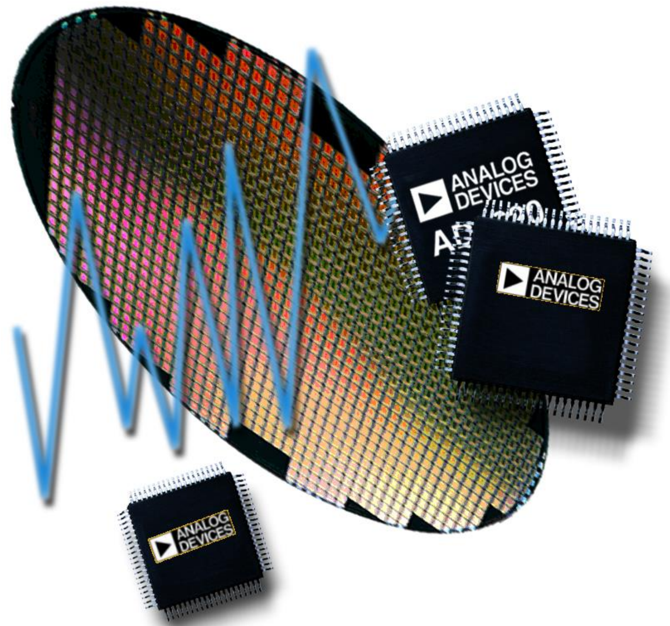

Reliability Report

Report Title: LTC3787 Automotive Grade 1 Fab Qualification in ADCS for Product Resiliency

Report Number: 22798

Revision: C

Date: 09 January 2025

Summary

This report documents the successful completion of the Automotive Grade 1 reliability qualification requirements for the release of the LTC3787 product at Analog Devices Camas (ADCS) from Vanguard Fab. The LTC3787 is a high performance PolyPhase single output synchronous boost converter controller that drives two N-channel power MOSFET stages out-of-phase.

AECQ100 Qualification Test Methods and Summary

AEC Test Group	AEC Stress Test Name	Abbreviation	AEC Test #	Reference
Group A ACCELERATED ENVIRONMENT STRESS TESTS	Preconditioniong	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 Cycle	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 is shown in Table 4 • Tests C3-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 RELIABILTIY 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	• Tests E5, E6, 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 ay 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 AEC-Q100 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	PD	G5	
	Lid Torque	LT	G6	
	Die Shear	DS	G7	
	Internal Water Vapor	IWV	G8	

Die/Fab Product Characteristics

Table 1: Die/Fab Product Characteristics- 0.6 BiCMOS @ ADCS

Product Characteristics	Product(s) to be qualified	Products used as substitution data		
Generic/Root Part #	LTC3787	LTC7801	LTC4079	LTC3871
Die Id	6L3787XV-F 01	6CL3895XV	6L4079XV	6CL3871PXV
Die Size (mm)	1.60 x 1.96	2.69 x 1.88	1.93 x 1.40	2.82 x 2.67
Wafer Fabrication Site	ADI Camas	ADI Camas	ADI Camas	ADI Camas
Wafer Fabrication Process	0.6 BiCMOS	0.6 BiCMOS	0.6 BiCMOS	0.6 BiCMOS
Die Substrate	Si	Si	Si	Si
Bond Pad Metal Composition	AlCu / 3	AlCu / 3	AlCu / 2	AlCu / 3
Polyimide	No	No	No	No
Passivation	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN

Product Characteristics	Product(s) to be qualified	Products used as substitution data		
Generic/Root Part #	LTC3787	LTC3639	LTC7000	LTC3784
Die Id	6L3787XV-F 01	L3639BXV	7000	3784
Die Size (mm)	1.60 x 1.96	2.69 x 1.65	1.778 x 1.575	1.60 x 1.96
Wafer Fabrication Site	ADI Camas	ADI Camas	ADI Camas	ADI Camas
Wafer Fabrication Process	0.6 BiCMOS	0.6 BiCMOS	0.6 BiCMOS	0.6 BiCMOS
Die Substrate	Si	Si	Si	Si
Bond Pad Metal Composition	AlCu / 3	AlCu / 3	AlCu / 3	AlCu / 3
Polyimide	No	No	No	No
Passivation	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN

Die/Fab Test Results

Table 2: Die/Fab Test Results - BiCMOS at ADI-Camas, WA

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
Early Life Failure (ELF)		AEC-Q100-008	Ta = 150C, 48 Hours	LTC3639	Z52442.ELFR	0/800	RH
					Z52464.ELFR	0/800	RH
					Z52502.ELFR	0/800	RH
				LTC7000	Z45229.1C_ELF	0/800	RH
					Z45296.1	0/800	RH
					Z45352.1	0/800	RH
High Temperature Operating Life (HTOL)	B1	JESD22-A108	Ta=150°C, 1,000 Hours	LTC3787[1]	Q22798.1.HO1_RES	0/40	RHC
					Q22798.2.HO2_RES	0/42	RHC
				LTC3871	Z52576.1a.HTOL	0/77	RHC
					Z52577.1a.HTOL	0/77	RHC
					Z52675.1a.HTOL	0/77	RHC
				LTC7000	Z45229.1	0/77	RHC
					Z45296.1	0/77	RHC
					Z45352.1	0/77	RHC
					Q16995.2HTOL	0/77	RHC
				LTC3639	Z52442.HTOL	0/77	RHC
					Z52464.HTOL	0/77	RHC
					Z52502.HTOL	0/77	RHC
				LTC3784	Q17762.1HTOL	0/77	RHC
				LTC7801	Z52429.HTOL	0/77	RHC
					Z52429.2c.htol	0/77	RHC
			Ta = 125C, 1000 Hours	LTC4079	Z52275.HTOL	0/77	RHC
					Z52302.HTOL_	0/77	RHC

[1]Pre-conditioned per J-STD-020, Level 1

Package/Assembly Product Characteristics

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

Product Characteristics	Product(s) to be qualified	Products used as substitution data			
Generic/Root Part #	LTC3787	LTC7801	LTC4079	LTC2945	LTC4020
Package	28-LFCSP	24-LFCSP	10-LFCSP	12-LFCSP	38-LFCSP
Body Size (mm)	4.00 x 5.00 x 0.75	4.00 × 5.00 × 0.75	3.00 x 3.00 x 0.75	3.00 × 3.00 × 0.75	5.00 × 7.00 × 0.75
Assembly Location	UTAC (UT2)	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	1 / 260°C
Mold Compound	Sumitomo G770HCD	Sumitomo G770HCD	Sumitomo G770HCD	Sumitomo G770HCD	Sumitomo G770HCD
Die Attach	Ablestik 8200T	Ablestik 8200T	Ablestik 8200T	Ablestik 8200T	Ablestik 8200T
Leadframe Material	Copper	Copper	Copper	Copper	Copper
Wire Bond Material / Diameter (mils)	Gold / 1.30	Gold / 1.00	Gold / 1.30	Gold / 1.00	Gold / 1.30

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
Solder Heat Resistance (SHR)	A1	J-STD-020	MSL-1	LTC3787	Q22798.1.SH1_RES	0/16	R
High Temperature Storage (HTS)	A6	JESD22-A103	150°C, 1,000 Hours	LTC4079	Z52275.HTS	0/45	RH
				LTC2945	Q17734.1HTS	0/45	RH
				LTC4020	Z52245.1a.HTS	0/45	RH
			150°C, 2,000 Hours	LT8374	Q17806.2HTS	0/45	RH
				LTC7801	Z52429.HTS	0/45	RH
Highly Accelerated Temperature and Humidity Stress (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC4079	Z52275.JHAST	0/77	RH
					Z52302.JHAST	0/77	RH
				LTC7801	Z52429.2.JHAST	0/77	RH
					Z52439.2a.JHAST	0/77	RH
					Z52452.1a.JHAST	0/77	RH
				LTC2945	Q17734.1BHAST	0/77	RH
				LTC4020	Z52245.1a-b.JHAST	0/77	RH
Unbiased HAST (UHAST)[1]	A3	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LTC4079	Z52275.JUHAST	0/77	R
					Z52302.JUHAST	0/77	R
				LTC7801	Z52429.JUHAST	0/77	R
					Z52439.2a.JUHAST	0/77	R
					Z52452.1a.JUHAST	0/77	R
				LTC2945	Q17734.1UHAST	0/77	RH
				LTC4270	Q18037.1.UH1	0/45	R
					Q18037.2.UH2	0/45	R
					Q18037.3.UH3	0/45	R
Temperature Cycling (TC)[1]	A4	JESD22-A104	-65°C/+150°C, 2000 Cycles	LTC7801	Z52429.JTC	0/77	RH
					Z52452.1a.JTC	0/77	RH
					Z52439.2a.JTC	0/77	RH
			-65°C/+150°C, 500 Cycles	LTC4079	Z52275.JTC	0/77	RH
					Z52302.JTC	0/77	RH
				LTC2945	Q17734.1TC	0/77	RH
				LTC4020	Z52245.1a.JTC	0/77	RH
Post-TCT Wire Bond Pull	C2	MIL-STD-883 METHOD 2011	NA	LTC4079	52302.WBP	0/5	NA
					Z52275.WBP	0/5	NA

[1]Pre-conditioned per J-STD-020, Level 1

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	LTC3787	28-LFCSP	AEC Q100-011	1Ω, Cpkg	±1250V	C3	RH
HBM	LTC3787	28-LFCSP	AEC-Q100-002	1.5kΩ, 100pF	±3500V	2	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	LTC3787	+150mA, -150mA	+6V	125°C	II	RH

Approvals

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