



# ***Reliability Report***

**Report Title:** LTC6820 at Camas, UTAC  
Automotive Grade 1 Qualification

**Report Number:** 20202

**Revision:** A

**Date:** 20 April 2023

## Summary

This report documents the successful completion of the automotive Grade 1 reliability qualification requirements for the release of the LTC6820 product in a 16-MINI\_SO package. The LTC6820 is a isoSPI Isolated Communications Interface.

## AECQ100 Qualification Test Methods and Summary

AEC Test Group	AEC Stress Test Name	Abbreviation	AEC Test #	Reference
<b>Group A</b> 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	
<b>Group B</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	
<b>Group C</b> PACKAGE ASSEMBLY INTEGRITY TESTS	Wire Bond Shear	WBS	C1	<ul style="list-style-type: none"> <li>• Test C2 (and C1 for Cu Wire) are shown in Table 4.</li> <li>• Tests C3-6 are qualified and controlled with inline monitors and may be viewed on-site at Analog Devices.</li> </ul>
	Wire Bond Pull Strength	WBP	C2	
	Solderability	SD	C3	
	Physical Dimensions	PD	C4	
	Solder Ball Shear	SBS	C5	
	Lead Integrity	LI	C6	
<b>Group D</b> DIE FABRICATION RELIABILITY TESTS	Electromigration	EM	D1	Die Fabrication Reliability data may be viewed on-site at Analog Devices.
	Time Dependent Dielectric Breakdown	TDDDB	D2	
	Hot Carrier Injection	HCI	D3	
	Negative Bias Temperature Instability	BTI	D4	
	Stress Migration	SM	D5	
<b>Group E</b> 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	<ul style="list-style-type: none"> <li>• For Tests E5, E6 and E7, ADI New Product Yield Analysis Testing Guidelines meet AEC Q100 requirements.</li> <li>• Results for Tests E7-E11 are available as applicable on a case by case basis.</li> <li>• Test E12 results may be viewed on-site at Analog Devices</li> </ul>
	Electrical Distributions	ED	E5	
	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	
	<b>Group F</b> DEFECT SCREENING TESTS	Process Average Test	PAT	
Statistical Bin/Yield Analysis		SBA	F2	
<b>Group G</b> 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- BiCMOS**

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data					
		LTC3875	LTC4079	LTC6115	LTC7000	LTC3851A	LTC3639
Generic/Root Part #	LTC6820	LTC3875	LTC4079	LTC6115	LTC7000	LTC3851A	LTC3639
Die Id	6820	3875B	4079	6115	7000	3851A	3639B
Die Size (mm)	1.45 x 1.22	2.24 x 2.64	1.93 x 1.40	0.79 x 1.27	1.78 x 1.58	1.45 x 1.12	2.69 x 1.65
Wafer Fabrication Site	ADI Camas	ADI Camas	ADI Camas	ADI Camas	ADI Camas	ADI Camas	ADI Camas
Wafer Fabrication Process	BiCMOS	BiCMOS	BiCMOS	BiCMOS	BiCMOS	BiCMOS	BiCMOS
Die Substrate	Si	Si	Si	Si	Si	Si	Si
Metallization / # Layers	AlCu /2	AlCu /3	AlSiCu /2	AlCu /3	AlCu /3	AlSiCu /2	AlCu /3
Polyimide	No	No	No	No	No	No	No
Passivation	oxide/SiN	oxide/SiN	oxide/SiN	oxide/SiN	oxide/SiN	oxide/SiN	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 Rate (ELFR)	B2	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
					Z45296.1C_ELF	0/800	RH
					Z45352.1C_ELF	0/800	RH
				LTC6115	899282.1	0/800	RH
					935916.1	0/800	RH
					956561.1	0/800	RH
High Temperature Operating Life (HTOL)	B1	JESD22-A108	Ta=125°C, Biased, 1,000 Hours	LTC3875	Q16447.1HTOL	0/77	RHC
				LTC4079	Z52302.HTOL	0/77	RHC
			Tj=150C, Biased, 1,000 Hours	LTC3871	Z52576.1a.HTOL	0/77	RHC
					Z52577.1a.HTOL	0/77	RHC
					Z52675.1a.HTOL	0/77	RHC
			Ta=150C, Biased, 1,000 Hours	LTC3639	Z52442.HTOL	0/77	RHC
					Z52464.HTOL	0/77	RHC
					Z52502.HTOL	0/77	RHC
			Ta=150C, Biased, 2,000 Hours	LTC7000	Q16995.2HTOL	0/77	RHC
			High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 1,000 Hours	LTC2949
LTC3639	Z52464.HTS	0/45					RH
150°C, 2,000 Hours	LTC7810	Q17143.1HTS				0/45	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC3639	Z52442.JHAST	0/77	RH
					Z52464.JHAST	0/77	RH
					Z52502.JHAST	0/77	RH
				LTC3871	Z52675.JHAST	0/77	RH
				LTC4079	Z52275.JHAST	0/77	RH
					Z52302.JHAST	0/77	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1</sup>	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC3851A	Q19568.1HAST	0/77	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>2</sup>	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC2949	EO9389K.BHAST	0/77	RH
					EO9423K.BHAST	0/77	RH

<sup>1</sup> 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.

<sup>2</sup> 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 - 16-MINI\_SO at UTAC**

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data		
		LTC7804	LTC2311	LT3990-5
Generic/Root Part #	LTC6820	LTC7804	LTC2311	LT3990-5
Package	16-MINI_SO	16-MINI_SO_EP	16-MINI_SO_EP	16-MINI_SO_EP
Body Size (mm)	4.04 x 3.00 x 0.86	3.00 x 4.04 x 0.86	3.00 x 3.00 x 0.86	4.00 x 3.00 x 0.86
Assembly Location	UTAC	UTAC	UTAC	UTAC
MSL/Peak Reflow Temperature(°C)	1 / 260°C	1 / 260°C	1 / 260°C	1 / 260°C
Mold Compound	Sumitomo E670C	Sumitomo E670C	Sumitomo E670C	Sumitomo E670C
Die Attach	Ablestik 8290	Ablestik 8290	Ablestik 8290	Ablestik 8290
Leadframe Material	Copper	Copper	Copper	Copper
Lead Finish	100Sn	100Sn	100Sn	100Sn
Wire Bond Material/Diameter (mils)	Gold / 1.00	Gold / 1.00	Gold / 1.00	Gold / 1.00

**Package/Assembly Test Results**
**Table 4: Package/Assembly Test Results - MINI\_SO at UTAC**

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	LTC7804	Q16620.1HTS	0/45	RH	
			150°C, 1,000 Hours	LTC2311	Q18459.1HTS	0/45	RH	
					Z44356.1	0/45	RH	
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1</sup>	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC7804	Q16620.1BHAST	0/77	RH	
					Q16620.2BHAST	0/77	RH	
				LTC2311	Q18459.1BHAST	0/77	RH	
					Z44182.1	0/77	RH	
					Z44356.1	0/77	RH	
				LTC2311	Z44234.1	0/77	RH	
					LT3990-5	Q19385.1.HA1	0/77	RH
						Q19385.3.HA2	0/77	RH
				Q19385.3.HA3		0/77	RH	
Temperature Cycling (TC) <sup>1</sup>	A4	JESD22-A104	-65°C/+150°C, 2,000 Cycles	LTC7804	Q16620.1TC	0/77	RH	
					Q16620.2TC	0/77	RH	
					Q16620.3TC	0/77	RH	
			-65°C/+150°C, 500 Cycles	LTC2311	Q18459.1TC	0/77	RH	
					Z44182.1	0/77	RH	
					Z44356.1	0/77	RH	
			LTC2311	Z44234.1	0/77	RH		
				LT3990-5	Q19385.1.TC1	0/77	H	
					Q19385.2.TC2	0/77	H	
Q19385.3.TC3	0/77	H						
Unbiased HAST (UHST) <sup>1</sup>	A3	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LTC7804	Q16620.1UHAST	0/77	R	
					Q16620.2UHAST	0/77	R	
					Q16620.3UHAST	0/77	R	
				LT3990-5	Q19385.1.UH1	0/77	R	
					Q19385.2.UH2	0/77	R	
Autoclave (AC) <sup>1</sup>	A3	JESD22-A102	121C 100%RH 33.3 psia, 168 Hours	LTC2311	Q18459.1PCT	0/77	R	
					Z44182.1	0/77	R	
					Z44356.1	0/77	R	
					Z44234.1	0/77	R	
Wire Bond Pull	C2	MIL-STD-883 M2011	Post TCT, Single Duration	LTC7804	Q16620.1WBP	0/5	NA	
				LTC2311	Q18459.1WBP	0/5	NA	
					Z44182.1	0/5	NA	
Solder Heat Resistance (SHR)	A1	J-STD-020	MSL-1	LTC6820	Q20202.1SHR	0/30	R	

<sup>1</sup> 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	LTC6820	16-MINI_SO	JS-002	1Ω, Cpkg	±1250V	C3	RH
HBM	LTC6820	16-MINI_SO	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 <sub>A</sub> )	Class	eTest Temp
JESD78	LTC6820	+100mA, -100mA	+7V	125°C	II	RH

## Approvals

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