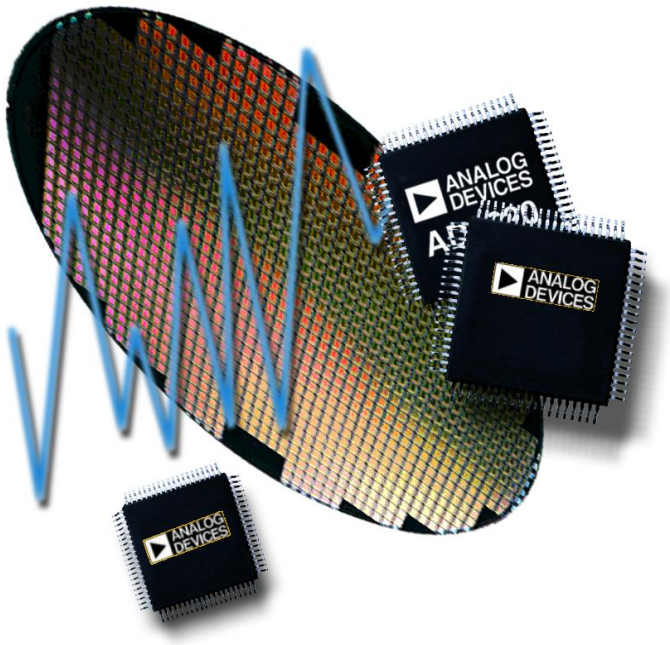

Reliability Report

Report Title: ADBMS6830M (Lion-16) LQFP_EP Cu Wire at AET Automotive Grade 1 Qualification

Report Number: 21426

Revision: A

Date: 02 April 2025

Summary

This report documents the successful completion of the reliability qualification requirements for the release of ADBMS6830M LQFP_EP using copper wire at ASE Taiwan (AET). The ADBMS6830 is a multicell battery stack monitor that measures up to 16 series connected battery cells with a lifetime total measurement error (TME) of less than 2 mV over the full temperature range.

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 1.1: Die/Fab Product Characteristics - >2.5um^2 Bipolar

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data	
Generic/Root Part #	ADBMS6830M	ADBMS6816	ADBMS6815
Die Id	6L815PV-F 11	W815	6L815PV-F 10
Die Size (mm)	1.47 x 0.74	1.47 x 0.74	1.47 x 0.74
Wafer Fabrication Site	ADI-Camas	ADI Camas	ADI Camas
Wafer Fabrication Process	>2.5um^2 Bipolar	>2.5um^2 Bipolar	>2.5um^2 Bipolar
Die Substrate	Si	Si	Si
Metallization / # Layers	AlSi(1.0%)Cu(0.5%)/1	AlCu/1	AlSi(1.0%)Cu(0.5%)/1
Polyimide	No	No	No
Passivation	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN

Table 1.2: Die/Fab Product Characteristics - 0.13um DMOS

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data
Generic/Root Part #	ADBMS6830M	ADBMS6815
Die Id	ADI_LION.07 G	SCOUT_B D
Die Size (mm)	4.32 x 3.1	2.87 x 3.12
Wafer Fabrication Site	E_GLBL0712	E_GLBL0712
Wafer Fabrication Process	0.13um DMOS	0.13um DMOS
Die Substrate	Si	Si
Metallization / # Layers	AlCu(0.5%)/5	AlCu(0.5%)/5
Polyimide	No	No
Passivation	doped-oxide/OxyNitride	undoped-oxide/SiN

Die/Fab Test Results

Table 2.1: Die/Fab Product Characteristics - 2.5um^2 Bipolar

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
Early Life Failure Rate (ELFR)	B2	AEC-Q100-008	Ta=125°C Biased, 48 Hours	ADBMS6830M	Q17238.EL1X_LION80LQ	0/900	RH
					Q17238.EL2X_LION80LQ	0/900	RH
					Q17238.EL3X_LION80LQ	0/900	RH
				ADBMS6816	Q17013.EL1XAPION_NP-Au	0/800	RH
					Q17013.EL2XAPION_NP-Au	0/800	RH
					Q17013.EL3XAPION_NP-Au	0/800	RH
High Temperature Operating Life (HTOL)[1]	B1	JESD22-A108	Ta=125°C Biased, 1000 Hours	ADBMS6830M	Q17238.HO1_LION80L	0/77	RHC
					Q17238.HO2_LION80L	0/77	RHC
					Q17238.HO3_LION80L	0/77	RHC
					Q18108.1.HO3L16CU	0/77	RCH
					Q18108.2.HO3L16CU	0/77	RCH
					Q18108.3.HO3L16CU	0/77	RCH
				ADBMS6830	Q19131.1.HO_L16D	0/77	RCH
				ADBMS6815	Q18354.1HTOL	0/77	RCH
					Q18472.1HTOL	0/77	RCH
				ADBMS6816	Q17013.HO1PIONEER_NP-Au	0/77	RCH
					Q17013.HO2PIONEER_NP-Au	0/77	RCH
					Q17013.HO3PIONEER_NP-Au	0/77	RCH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 192 Hours	ADBMS6830M	Q21426.1.HALION16LQ-EP_S/LF	0/77	RH
					Q21426.2.HALION16LQ-EP_S/LF	0/77	RH
					Q21426.3.HALION16LQ-EP_S/LF	0/77	RH
			130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6830M	Q17238.HA1_LION80L	0/77	RH
					Q17238.HA2_LION80L	0/77	RH
					Q17238.HA3_LION80L	0/77	RH
				ADBMS6815	Q18424.1.HA1	0/77	RH
					Q18424.2.HA2	0/77	RH
					Q18424.3.HA2	0/77	RH
				ADBMS6816	Q17013.HA1PIONEER_NP-Au	0/77	RH

					Q17013.HA2PIONEER_NP-Au	0/77	RH
					Q17013.HA3PIONEER_NP-Au	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.

Table 2.2: Die/Fab Product Characteristics - 0.13um DMOS

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
Early Life Failure Rate (ELFR)	B2	AEC-Q100-008	Ta=125°C Biased, 48 Hours	ADBMS6830M	Q17238.EL1X_LION80LQ	0/900	RH
					Q17238.EL2X_LION80LQ	0/900	RH
					Q17238.EL3X_LION80LQ	0/900	RH
High Temperature Operating Life (HTOL)[1]	B1	JESD22-A108	Ta=125°C Biased, 1000 Hours	ADBMS6830M	Q17238.HO1_LION80L	0/77	RHC
					Q17238.HO2_LION80L	0/77	RHC
					Q17238.HO3_LION80L	0/77	RHC
					Q18108.1.HO3L16CU	0/77	RCH
					Q18108.2.HO3L16CU	0/77	RCH
					Q18108.3.HO3L16CU	0/77	RCH
				ADBMS6830	Q19131.1.HO_L16D	0/77	RCH
				ADBMS6815	Q18354.1HTOL	0/77	RCH
					Q18472.1HTOL	0/77	RCH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 192 Hours	ADBMS6830M	Q21426.1.HALION16LQ-EP_S/LF	0/77	RH
					Q21426.2.HALION16LQ-EP_S/LF	0/77	RH
					Q21426.3.HALION16LQ-EP_S/LF	0/77	RH

			130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6830M	Q17238.HA1_LION80L	0/77	RH
					Q17238.HA2_LION80L	0/77	RH
					Q17238.HA3_LION80L	0/77	RH
				ADBMS6815	Q18424.1.HA1	0/77	RH
					Q18424.2.HA2	0/77	RH
					Q18424.3.HA2	0/77	RH
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	ADBMS6830M	Q21426.1.HS-LION16LQ-EP_S/LF	0/45	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 – LQFP_EP at ASE (AET)

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data	
Generic/Root Part #	ADBMS6830M	ADBMS6815	ADRF8800
Package	80-LQFP_EP	48-LQFP_EP	48-LQFP_EP
Body Size (mm)	12.00 x 12.00 x 1.40	7.00 x 7.00 x 1.40	7.00 x 7.00 x 1.40
Assembly Location	ASE (AET)	ASE (AET)	ASE (AET)
MSL/Peak Reflow Temperature(°C)	3 / 260°C	3 / 260°C	3 / 260°C
Mold Compound	Sumitomo G631HAC	Sumitomo G700LA	Sumitomo G700LA
Die Attach/Underfill/TIM	Hitachi EN 4900G conductive	Hitachi EN 4900G conductive	Hitachi EN 4900G conductive
Leadframe Material	Copper	Copper	Copper
Lead Finish	100Sn	100Sn	100Sn
Wire Bond Material/Diameter (mils)	PdCuAu 4N / 1.0	PdCuAu 4N / 1.0	PdCuAu 4N / 0.8

Package/Assembly Test Results

Table 4: Package/Assembly Test Results – LQFP_EP at ASE (AET)

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
High Temperature Storage Life (HTSL)	A6	AEC Q100-005	150°C, 2,000 Hours	ADBMS6830M	Q21426.1.HS-LION16LQ-EP_S/LF	0/45	RH
				ADRF8800	Q18625.1.3	0/77	RH
					Q18625.2.3	0/77	RH
					Q18625.3.3	0/77	RH
				ADBMS6815	Q19925.1.HS-SCT-CU	0/77	RH
Preconditioning[1]	A1	J-STD-020	MSL-3	ADBMS6830M	Q21426.1.SH-LION16LQ-EP_S/LF	0/11	RH
					Q21426.2.SH-LION16LQ-EP_S/LF	0/11	RH
					Q21426.3.SH-LION16LQ-EP_S/LF	0/11	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130°C 85%RH 33.3 psia, Biased, 192 Hours	ADBMS6830M	Q21426.1.HALION16LQ-EP_S/LF	0/77	RH
					Q21426.2.HALION16LQ-EP_S/LF	0/77	RH
					Q21426.3.HALION16LQ-EP_S/LF	1/77[2]	RH
Unbiased HAST (UHST)[1]	A3	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	ADBMS6830M	Q21426.1.uH-LION16LQ-EP_S/LF	0/77	R
					Q21426.2.uH-LION16LQ-EP_S/LF	0/77	R
					Q21426.3.uH-LION16LQ-EP_S/LF	0/77	R
Temperature Cycling (TC)[1]	A4	JESD22-A104	-65°C/+150°C, 1000 Cycles	ADBMS6830M	Q21426.1.TC-LION16LQ-EP_S/LF	0/77	RH
					Q21426.2.TC-LION16LQ-EP_S/LF	0/77	RH
					Q21426.3.TC-LION16LQ-EP_S/LF	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.

[2] FA#274477 Si dislocation. Refer to CAPA#2025090166.

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
FICDM	ADBMS6830M	80-LQFP_EP	AEC Q100-011	1Ω, Cpkg	±500V	C2A	RH
HBM	ADBMS6830M	80-LQFP_EP	AEC-Q100-002	1.5kΩ, 100pF	±2000V	2	RH

Table 6: Latch Up Test Result

LU Test Spec	Generic/Root Part #	Passing Current	Passing Over-Voltage	Temperature (T_A)	Class	eTest
JESD78	ADBMS6830M	+200mA, -200mA	+86V	125C	II	RH

Approvals

Reliability Engineer: Alota, Ronnel

Appendix

AEC-Q006 - 80-LQFP_EP at ASE (AET) Package/Assembly Test Results

REL Lot number		Q21426.1 .TC	Q21426.1 .HA	Q21426.1 .HS	Q21426.2 .TC	Q21426.2 .HA	Q21426.3 .TC	Q21426.3 .HA	Q18625. 1.3	Q18625. 2.3	Q18625. 3.3
AEC #	**Test**	TC	HAST	HTS	TC	HAST	TC	HAST	HTS	HTS	HTS
		Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
1	Initial Sampling (T0)	0/77	0/77	0/45	0/77	0/77	0/77	0/77	0/77	0/77	0/77
2	CSAM @T0	0/16	--	--	0/16	--	0/16	--	--	--	--
3	Preconditioning to MSL	0/77	0/77	--	0/77	0/77	0/77	0/77	--	--	--
4	CSAM after PC	0/16	--	--	0/16	--	0/16	--	--	--	--
5	ATE Test	0/77	0/77	0/45	0/77	0/77	0/77	0/77	0/45	0/45	0/45
6	Stress 1x	0/77	--	0/45	0/77	--	0/77	--	0/45	0/45	0/45
7	ATE Test	0/77	--	0/45	0/77	--	0/77	--	0/45	0/45	0/45
8	CSAM post-1x stress	0/16	--	--	0/16	--	0/16	--	--	--	--
9a	Ball + Stitch/Wedge Pull	0/5	--	--	0/5	--	0/5	--	--	--	--
9b	Ball Shear	0/5	--	--	0/5	--	0/5	--	--	--	--
10	Cross-section	--	--	--	--	--	--	--	0/1	0/1	0/1
11	Stress 2x	0/77	0/77	0/45	0/77	0/77	0/77	0/77	0/45	0/45	0/45
12	ATE Test	0/77	0/77	0/45	0/77	0/77	0/77	1/77[1]	0/45	0/45	0/45
13	CSAM post-2x stress	0/16	0/77	--	0/16	0/77	0/16	0/77	--	--	--
14a	Ball + Stitch/Wedge pull	0/5	0/5	--	0/5	0/5	0/5	0/5	--	--	--
14b	Ball shear	0/5	0/5	--	0/5	0/5	0/5	0/5	--	--	--
15	Cross-section	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

[1] FA#274477 Si dislocation. Refer to CAPA#2025090166.