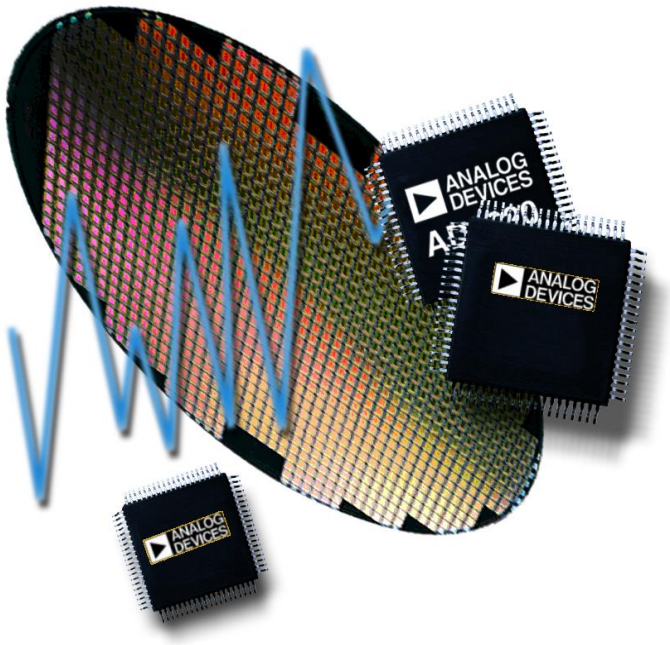

Reliability Report

Report Title: ADBMS6815 & ADBMS6817 Die Revision G Qualification

Report Number: 20350

Revision: A

Date: 15 June 2023

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the Die Revision G of the ADBMS6815 and ADBMS6817 products in a 48-LQFP_EP package. The ADBMS6815 and the ADBMS6817 are fabricated in ADI Camas using the 7um bipolar process and in Global Foundries using the 0.13um BCD process. These are assembled in a 48-LQFP_EP package at ASE. The ADBMS6815 and the ADBMS6817 are multicell battery stack monitors. The ADBMS6815 measures up to 12 series connected battery cells with a total measurement error of less than 1.2 mV and the ADBMS6817 measures up to 8 series connected battery cells with a total measurement error of less than 1.5 mV.

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- 0.13um DMOS

Product Characteristics	Product(s) to be qualified		Product(s) used for Substitution Data		
Generic/Root Part #	ADBMS6815	ADBMS6817	ADBMS6830	ADBMS6816	ADBMS2950
Die Id	SCOUT_B E	SCOUT_B E	ADI_LION_A4.04 D	ADBMS6816B	TIGER 03
Die Size (mm)	2.87 x 3.12	2.87 x 3.12	4.32 x 3.1	2.42 x 2.97	3.17 x 2.47
Wafer Fabrication Site	E_GLBL0712	E_GLBL0712	E_GLBL0712	E_GLBL0712	E_GLBL0712
Wafer Fabrication Process	0.13um DMOS	0.13um DMOS	0.13um DMOS	0.13um DMOS	0.13um DMOS
Die Substrate	Si	Si	Si	Si	Si
Metallization / # Layers	AlCu(0.5%)/5	AlCu(0.5%)/5	AlCu(0.5%)	AlCu/5	AlCu(0.5%)/5
Passivation	undoped-oxide/SiN	undoped-oxide/SiN	doped-oxide/OxyNitride	doped-oxide/OxyNitride	doped-oxide/OxyNitride

Table 1.2: Die/Fab Product Characteristics – 7um BIPOLAR

Product Characteristics	Product(s) to be qualified		Product(s) used for Substitution Data	
Generic/Root Part #	ADBMS6815	ADBMS6817	ADBMS6816	ADBMS6830
Die Id	6L815PV-F 10	6L815PV-F 10	W815	6L815PV-F 10
Die Size (mm)	0.74 x 1.47	0.74 x 1.47	0.74 x 1.47	0.74 x 1.47
Wafer Fabrication Site	ADI-Camas	ADI-Camas	ADI-Camas	ADI-Camas
Wafer Fabrication Process	BIPOLAR	BIPOLAR	BIPOLAR	BIPOLAR
Die Substrate	Si	Si	Si	Si
Metallization / # Layers	AlSi(1.0%)Cu(0.5%)/1	AlSi(1.0%)Cu(0.5%)/1	AlCu/1	AlSi(0.5%)
Passivation	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN

Die/Fab Test Results

Table 2: Die/Fab Test Results - 7um Bipolar at ADI-Camas, WA Return

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
High Temperature Operating Life (HTOL)	B1	JESD22-A108	Ta=125°C, 1,000 Hours	ADBMS6815	Q20350.1.HOBMS6815REVG	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
				ADBMS6830	Q17238.HO1_LION80L	0/77	RCH
					Q17238.HO2_LION80L	0/77	RCH
					Q17238.HO3_LION80L	0/77	RCH
Early Life Failure Rate (ELFR)	B2	AECQ100-008	Ta=125°C, 48 Hours	ADBMS6816	Q17013.EL1APION_NP-Au	0/300	RH
					Q17013.EL1BPION_NP-Au	0/300	RH
					Q17013.EL1CPION_NP-Au	0/200	RH
					Q17013.EL2APION_NP-Au	0/300	RH
					Q17013.EL2BPION_NP-Au	0/300	RH
					Q17013.EL2CPION_NP-Au	0/200	RH
					Q17013.EL3APION_NP-Au	0/300	RH
					Q17013.EL3BPION_NP-Au	0/300	RH
					Q17013.EL3CPION_NP-Au	0/200	RH

				ADBMS6830	Q17238.EL1A_LION80LQ	0/300	RH
					Q17238.EL1B_LION80LQ	0/300	RH
					Q17238.EL1C_LION80LQ	0/200	RH
					Q17238.EL2A_LION80LQ	0/300	RH
					Q17238.EL2B_LION80LQ	0/300	RH
					Q17238.EL2C_LION80LQ	0/200	RH
					Q17238.EL3A_LION80L	0/300	RH
					Q17238.EL3B_LION80L	0/300	RH
					Q17238.EL3C_LION80L	0/200	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6830	Q17238.HA1_LION80L	0/77	RH
					Q17238.HA2_LION80L	0/77	RH
					Q17238.HA3_LION80L	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
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	ADBMS6830M	Q18108.2.HS2-L16CU	0/45	RH
				AD3300	Q19317.1.HTS1	0/45	RH
			150°C, 1,000 Hours	ADBMS6816	Q17013.HS1PIONEER_NP-Au	0/45	RH

Table 2.1: Die/Fab Test Results - 0.13um DMOS at GlobalFoundries Fab-7

Return

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
High Temperature Operating Life (HTOL)	B1	JESD22-A108	Ta=125°C, 1,000 Hours	ADBMS6815	Q20350.1.HOBMS6815REVG	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
				ADBM6830	Q17238.HO1_LION80L	0/77	RCH
					Q17238.HO2_LION80L	0/77	RCH
					Q17238.HO3_LION80L	0/77	RCH
Early Life Failure Rate (ELFR)	B2	AECQ100-008	Ta=125°C, 48 Hours	ADBMS6816	Q17013.EL1APION_NP-Au	0/300	RH
					Q17013.EL1BPION_NP-Au	0/300	RH
					Q17013.EL1CPION_NP-Au	0/200	RH
					Q17013.EL2APION_NP-Au	0/300	RH
					Q17013.EL2BPION_NP-Au	0/300	RH
					Q17013.EL2CPION_NP-Au	0/200	RH
					Q17013.EL3APION_NP-Au	0/300	RH
					Q17013.EL3BPION_NP-Au	0/300	RH
					Q17013.EL3CPION_NP-Au	0/200	RH
				ADBM6830	Q17238.EL1A_LION80LQ	0/300	RH
					Q17238.EL1B_LION80LQ	0/300	RH
					Q17238.EL1C_LION80LQ	0/200	RH
					Q17238.EL2A_LION80LQ	0/300	RH
					Q17238.EL2B_LION80LQ	0/300	RH
					Q17238.EL2C_LION80LQ	0/200	RH
					Q17238.EL3A_LION80L	0/300	RH
					Q17238.EL3B_LION80L	0/300	RH
					Q17238.EL3C_LION80L	0/200	RH
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	ADBMS6830M	Q18108.2.HS2-L16CU	0/45	RH
				AD3300	Q19317.1.HTS1	0/45	RH
			150°C, 1,000 Hours	ADBMS6816	Q17013.HS1PIONEER_NP-Au	0/45	RH

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
Highly Accelerated Temperature and Humidity Stress Test (HAST)	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6830	Q17238.HA1_LION80L	0/77	RH
					Q17238.HA2_LION80L	0/77	RH
					Q17238.HA3_LION80L	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

Package/Assembly Product Characteristics

Table 3: Package/Assembly Product Characteristics - 48-LQFP_EP at ASE (AET)

Product Characteristics	Product(s) to be qualified		Product(s) used for Substitution Data			
Generic/Root Part #	ADBMS6815	ADBMS6817	ADBMS6830	ADBMS6816	LT8708	LTC7871
Package	48-LQFP_EP	48-LQFP_EP	80-LQFP_EP	48-LQFP_EP	64-LQFP_EP	64-LQFP_EP
Body Size (mm)	7.00 x 7.00 x 1.40	7.00 x 7.00 x 1.40	12.00 x 12.00 x 1.40	7.00 x 7.00 x 1.40	10.00 x 10.00 x 1.40	10.00 x 10.00 x 1.40
Assembly Location	ASE (AET)	ASE (AET)	ASE (AET)	ASE (AET)	ASE (AET)	ASE (AET)
MSL/Peak Reflow Temperature(°C)	3 / 260	3 / 260	3/260	3 / 260	3 / 260	3 / 260
Mold Compound	Sumitomo G700LA	Sumitomo G700LA	Sumitomo G700LTD	Sumitomo G700LA	Sumitomo G700LA	Sumitomo G700LA
Die Attach	Hitachi EN 4900G conductive	Hitachi EN 4900G conductive	Ablestik 8600 conductive	Hitachi EN 4900G conductive	Hitachi EN 4900G conductive	Hitachi EN 4900G conductive
Leadframe Material	Copper	Copper	Copper	Copper	Copper	Copper
Lead Finish	100Sn	100Sn	100Sn	100Sn	100Sn	100Sn
Wire Bond Material/Diameter (mils)	2N Gold / 1.00	2N Gold / 1.00	GMG 4N Gold / 1.00	2N Gold / 1.00	2N Gold / 1.30	2N Gold / 1.00

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
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6830	Q17238.HA1_LION80L	0/77	RH
					Q17238.HA2_LION80L	0/77	RH
					Q17238.HA3_LION80L	0/77	RH
				LTC833	Q17136.1BHAST	0/77	RH
					Q17136.2BBHAST	0/77	RH
					Q17136.3BHAST	0/77	RH
				ADBMS6830	Q17013.HA1PIONEER_NP-Au	0/77	RH
					Q17013.HA2PIONEER_NP-Au	0/77	RH
					Q17013.HA2PIONEER_NP-Au	0/77	RH
Temperature Cycling (TC)[1]	A4	JESD22-A104	-65°C/+150°C, 500 Cycles	ADBMS6816	Q17013.TC1PIONEER_NP-Au	0/77	H
					Q17013.TC2PIONEER_NP-Au	0/77	H
					Q17013.TC3PIONEER_NP-Au	0/77	H
				ADBMS6830	Q17238.TC1_LION80LQ	0/77	H
					Q17238.TC2_LION80LQ	0/77	H
					Q17238.TC3_LION80LQ	0/77	H
			-65°C/+150°C, 2000 Cycles	LT8708	Q17136.1TC	0/77	H
					Q17136.2TC	0/77	H
					Q17136.3TC	0/77	H
Unbiased HAST (UHST)[1]	A3	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	ADBMS6815	Q19925.1.UH-SCT-CU	0/77	R
					Q19925.2.UH-SCT-CU	0/77	R
					Q19925.3.UH-SCT-CU	0/77	R
				ADBMS6816	Q17013.UH1PIONEER_NP-Au	0/77	R
					Q17013.UH2PIONEER_NP-Au	0/77	R
					Q17013.UH3PIONEER_NP-Au	0/77	R
				ADBMS6830	Q17238.UH1_LION80L	0/77	R
					Q17238.UH2_LION80L	0/77	R
					Q17238.UH3_LION80L	0/77	R

High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 1,000 Hours	ADBMS6830	Q17238.HS_LION80L	0/45	RH
				ADBMS6816	Q17013.HS1PIONEER_NP-Au	0/45	RH
				ADBMS6815	Q19925.1.HS-SCT-CU	0/77	RH
			150°C, 2,000 Hours	LTC7871	Q18815.1HTS	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.

ESD and Latch-Up Test Results

Table 5: ESD Test Result Return

ESD Model	Generic/Root Part #	Package	ESD Test Spec	RC Network	Highest Pass Level	Class	eTest Temp
HBM	ADBMS6815	48-LQFP_EP	JS-001	1.5kΩ, 100pF	±2500V	2	RH
FICDM	ADBMS6815	48-LQFP_EP	AEC Q100-011	1Ω, Cpkg	±500V	C2A	RH

Table 6: Latch Up Test Result Return

LU Test Spec	Generic/Root Part #	Passing Current	Passing Over-Voltage	Temperature (T_A)	Class	eTest Temp
JESD78	ADBMS6815	+200mA, -200mA	+6.3/75.3V	125°C	II	RH

Approvals

Reliability Engineer: Ryan Quintin