



# ***Reliability Report***

**Report Title:** ADBMS6815M (Sentry) Automotive Grade 1 Cu-wire Qualification

**Report Number:** 17951

**Revision:** A

**Date:** 19 April 2022

## Summary

This report documents the successful completion of the reliability qualification requirements for the release to automotive application of the ADBMS6815M product in a 48-LFCSP\_SS package with copper wire. The ADBMS6815M is a multicell battery stack monitor that measures up to 12 series connected battery cells with a lifetime total measurement error (TME) of less than 1.9 mV. The cell measurement range of 0 V to 5 V makes the ADBMS6815M suitable for most battery chemistries. All 12 cells can be measured in 304μs, and lower data acquisition rates can be selected for high noise reduction.

**Table 1: ADBMS6815M Product Characteristics**

### Die/Fab

Die Id	SENTRY 01	6L815PV-F 08
Die Size (mm)	0.74 x 1.47	2.87 x 3.12
Wafer Fabrication Site	E_GLBL0712	I_CAMA0106
Wafer Fabrication Process	0.13um DMOS	BIPOLAR
Passivation Layer	doped-oxide/OxyNitride	doped-oxide/SiN
Bond Pad Metal Composition	AlSi(1.0%)Cu(0.5%)	AlCu(0.5%)

### Package/Assembly

Package	48-LFCSP_SS
Body Size (mm)	7.00 x 7.00 x 0.75
Assembly Location	UTAC (UT2)
Operating Temperature Range	-40°C to +125°C
Molding Compound	Sumitomo G700LTD
Die Attach Material	Ablestik 8600 conductive
Wire Type	PdCuAu 4N
Wire Diameter (mil)	1.0
Lead Frame Material	Copper
Lead Finish	100Sn
Moisture Sensitivity Level	3
Maximum Peak Reflow Temperature (°C)	260

## Description / Results of Tests Performed

Tables 2 through 4 provide a description of the qualification tests conducted and the associated test results for products manufactured on the same technologies as described in Table 1. All devices were electrically tested before and after each stress. Any device that did not meet all electrical data sheet limits following stressing would be considered a valid (stress-attributable) failure unless there was conclusive evidence to indicate otherwise.

**Table 2: LFCSP\_SS at UTAC (UT2) Package Qualification Test Results**

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1,3</sup>	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LT8374	Q17806.2BHAST	77	0
			LT8391D	Q17987.2PC.BHAST	77	0
		130C 85%RH 33.3 psia, Biased, P192	LT8640A	Q17048.1BHAST	77	0
				Q17048.2BHAST	77	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>2,3</sup>	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6815M	Q17978.1.HASenG	77	0
			ADBMS6822	Q18113.3.HA3DIA-AU	77	0
		130C 85%RH 33.3 psia, Biased, P192	LT8356-1	Q18058.1BHAST	77	0
Temperature Cycling (TC) <sup>2,5,6,7</sup>	JESD22-A104	-55C/+150C, 2,000 Cycles	ADBMS6815M	Q17951.1.TC1SenCu	77	0
				Q17951.2.TC2SenCu	77	0
				Q17951.3.TC3SenCu	77	0
Temperature Humidity Bias (THB) <sup>2,3,6,7</sup>	JESD22-A101	85°C, 85%RH, Biased, 2,000 Hours	ADBMS6815M	Q17951.1.TH1SenCu	77	0
				Q17951.2.TH2SenCu	77	0
				Q17951.3.TH3SenCu	77	0
Unbiased HAST (UHST) <sup>1,4</sup>	JESD22-A118	130C 85%RH 33.3 psia, 168 Hours	LT8253	Q18870.2.UH2	77	0
				Q18870.3.UH3	77	0
		130C 85%RH 33.3 psia, 96 Hours	LT8374	Q17806.2UHAST	77	0
			LTC7802	Q17135.1UHAST	77	0
			LT8390	Q19204.1UHAST	77	0
				Q19204.2UHAST	77	0
			LTC3304	Q18124.1UHAST	77	0
				Q18124.2UHAST	77	0
			ADBMS6815M	Q17951.1.UH1SenCu	77	0
				Q17951.2.UH2SenCu	77	0
Q17951.3.UH3SenCu	77	0				
High Temperature	JESD22-A103	150°C, 2,000 Hours	ADBMS6815M	Q17951.1.HS1SenCu	45	0
				Q17951.2.HS2SenCu	45	0
				Q17951.3.HS3SenCu	45	0

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Storage Life (HTSL) <sup>3,7</sup>						

<sup>1</sup> These samples were subjected to preconditioning (per J-STD-020 Level 1) prior to the start of the stress test. Level 1 preconditioning consists of the following: Bake: 24 hrs @ 125°C, Unbiased Soak: 168 hrs @ 85°C, 85%RH, Reflow: 3 passes through an oven with a peak temperature of 260°C.

<sup>2</sup> These samples were subjected to preconditioning (per J-STD-020 Level 3) prior to the start of the stress test. Level 3 preconditioning consists of the following: Bake: 24 hrs @ 125°C, Unbiased Soak: 192 hrs @ 30°C, 60%RH, Reflow: 3 passes through an oven with a peak temperature of 260°C.

<sup>3</sup> Samples were tested at Room and Hot temperatures.

<sup>4</sup> Samples were tested at Room temperature only.

<sup>5</sup> Samples were tested at Hot temperature only.

<sup>6</sup> Samples taken from these lots at post-2000 hours (THB) or cycles (TCT) were subjected to wirebond pull test and wirebond shear test. The samples passed as per the AEC-Q006 requirement.

<sup>7</sup> Samples taken from these lots at post-2000 hours (THB and HTS) or cycles (TCT) were subjected cross-section and SEM inspection. The samples passed as per the AEC-Q006 requirement.

**Table 3: >2.5um Bipolar at ADI-Camas, WA Fab Qualification Test Results**

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Early Life Failure Rate (ELFR) <sup>2</sup>	AEC-Q100-008	Ta=125°C, 48 Hours	ADBMS6816	Q17013.EL1APION_NP-Au	300	0
				Q17013.EL2APION_NP-Au	300	0
				Q17013.EL3APION_NP-Au	300	0
			ADBMS6830	Q17238.EL1A_LION80LQ	300	0
				Q17238.EL2A_LION80LQ	300	0
				Q17238.EL3A_LION80L	300	0
High Temperature Operating Life (HTOL) <sup>3</sup>	JESD22-A108	Ta=125°C, Biased, 1,000 Hours	ADBMS6815	Q17170.1HTOL	77	0
				Q18472.1HTOL	77	0
			ADBMS6816	Q17013.HO1PIONEER_NP-Au	77	0
				Q17013.HO2PIONEER_NP-Au	77	0
				Q17013.HO3PIONEER_NP-Au	77	0
			ADBMS6815 M	Q17951.1.HO3SenCu	77	0
		ADBMS6830	Q17238.HO1_LION80L	77	0	
			Q17238.HO2_LION80L	77	0	
			Q17238.HO3_LION80L	77	0	
		High Temperature Storage Life (HTSL) <sup>2</sup>	JESD22-A103	150°C, 1,000 Hours	ADBMS6816	Q17013.HS1PIONEER_NP-Au
ADBMS6830	Q17238.HS_LION80L				45	0
150°C, 2,000 Hours	ADBMS6815 M			Q17951.1.HS1SenCu	45	0
				Q17951.2.HS2SenCu	45	0
				Q17951.3.HS3SenCu	45	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1,2</sup>	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6815	Q18424.2.HA2	77	0
			ADBMS6815 M	Q17978.1.HASenG	77	0
			ADBMS6816	Q17013.HA1PIONEER_NP-Au	77	0
				Q17013.HA2PIONEER_NP-Au	77	0
				Q17013.HA3PIONEER_NP-Au	77	0
			ADBMS6830	Q17238.HA1_LION80L	77	0
				Q17238.HA2_LION80L	77	0
				Q17238.HA3_LION80L	77	0
			Temperature Humidity Bias (THB) <sup>1,2</sup>	JESD22-A101	85°C, 85%RH, Biased, 2,000 Hours	ADBMS6815 M
Q17951.2.TH2SenCu	77	0				
Q17951.3.TH3SenCu	77	0				

<sup>1</sup> These samples were subjected to preconditioning (per J-STD-020 Level 3) prior to the start of the stress test. Level 3 preconditioning consists of the following: Bake: 24 hrs @ 125°C, Unbiased Soak: 192 hrs @ 30°C, 60%RH, Reflow: 3 passes through an oven with a peak temperature of 260°C.

<sup>2</sup> Samples were tested at Room and Hot temperatures.

<sup>3</sup> Samples were tested at Room, Hot and Cold temperatures.

**Table 4: 0.13um BCD at GlobalFoundries Fab-7 Fab Qualification Test Results**

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures			
Early Life Failure Rate (ELFR) <sup>2</sup>	AEC-Q100-008	Ta=125°C, 48 Hours	ADBMS6816	Q17013.EL1APION_NP-Au	300	0			
				Q17013.EL2APION_NP-Au	300	0			
				Q17013.EL3APION_NP-Au	300	0			
			ADBMS6830	Q17238.EL1A_LION80LQ	300	0			
				Q17238.EL2A_LION80LQ	300	0			
				Q17238.EL3A_LION80L	300	0			
High Temperature Operating Life (HTOL) <sup>3</sup>	JESD22-A108	Ta=125°C, Biased, 1,000 Hours	ADBMS6815	Q17170.1HTOL	77	0			
				Q18472.1HTOL	77	0			
			ADBMS6816	Q17013.HO1PIONEER_NP-Au	77	0			
				Q17013.HO2PIONEER_NP-Au	77	0			
				Q17013.HO3PIONEER_NP-Au	77	0			
		ADBMS6815M	Q17951.1.HO3SenCu	77	0				
		ADBMS6830	Ta=125°C, Biased, 2,000 Hours	Q17238.HO1_LION80L	77	0			
			Q17238.HO2_LION80L	77	0				
			Q17238.HO3_LION80L	77	0				
		High Temperature Storage Life (HTSL) <sup>2</sup>	JESD22-A103	150°C, 1,000 Hours	ADBMS6816	Q17013.HS1PIONEER_NP-Au	45	0	
ADBMS6830	Q17238.HS_LION80L				45	0			
ADBMS6815M	Q17951.1.HS1SenCu				45	0			
	Q17951.2.HS2SenCu				45	0			
	Q17951.3.HS3SenCu				45	0			
Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1,2</sup>	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADBMS6815	Q18424.2.HA2	77	0			
			ADBMS6815M	Q17978.1.HASenG	77	0			
			ADBMS6816	Q17013.HA1PIONEER_NP-Au	77	0			
				Q17013.HA2PIONEER_NP-Au	77	0			
				Q17013.HA3PIONEER_NP-Au	77	0			
			ADBMS6830	Q17238.HA1_LION80L	77	0			
				Q17238.HA2_LION80L	77	0			
				Q17238.HA3_LION80L	77	0			
			Temperature Humidity Bias (THB) <sup>1,2</sup>	JESD22-A101	85°C, 85%RH, Biased, 2,000 Hours	ADBMS6815M	Q17951.1.TH1SenCu	77	0
							Q17951.2.TH2SenCu	77	0
Q17951.3.TH3SenCu	77	0							

<sup>1</sup> These samples were subjected to preconditioning (per J-STD-020 Level 3) prior to the start of the stress test. Level 3 preconditioning consists of the following: Bake: 24 hrs @ 125°C, Unbiased Soak: 192 hrs @ 30°C, 60%RH, Reflow: 3 passes through an oven with a peak temperature of 260°C.

<sup>2</sup> Samples were tested at Room and Hot temperatures.

<sup>3</sup> Samples were tested at Room, Hot and Cold temperatures.

Samples of the many devices manufactured with these package and process technologies are continuously undergoing reliability evaluation as part of the ADI Reliability Monitor Program. Additional qualification data is available on [Analog Devices' web site](#).

## ESD Test Results

The results of Human Body Model (HBM) and Field-Induced Charged Device Model (FICDM) ESD testing are summarized in Table 5. ADI measures ESD results using stringent test procedures based on the specifications listed. Any comparison with another supplier's results should ensure that the same ESD test procedures have been used. For further details, please see the EOS/ESD chapter of the ADI Reliability Handbook (available via the 'Quality and Reliability' link on [Analog Devices' web site](#)).

**Table 5: ADBMS6815M ESD Test Results**

ESD Model	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM	88-LFCSP	JS-002	1Ω, Cpkg	±1250V	±1500V	C3
HBM	88-LFCSP	ESDA/JEDEC JS-001	1.5kΩ, 100pF	±2000V	N/A	2

\*All samples were tested at Room and Hot temperatures.

## Latch-Up Test Results

Six samples of the ADBMS6815M were latch-up tested at T<sub>A</sub>=25°C per JEDEC Standard JESD78, Class I, Level A. All samples were tested at Room and Hot temperatures.

Passing Positive Current	Passing Negative Current	Passing Over-Voltage
200 mA	200 mA	+6.3 V / +75.3 V

## Approvals

Reliability Engineer: Ryan Quintin

## Additional Information

Data sheets and other additional information are available on [Analog Devices' web site](#)