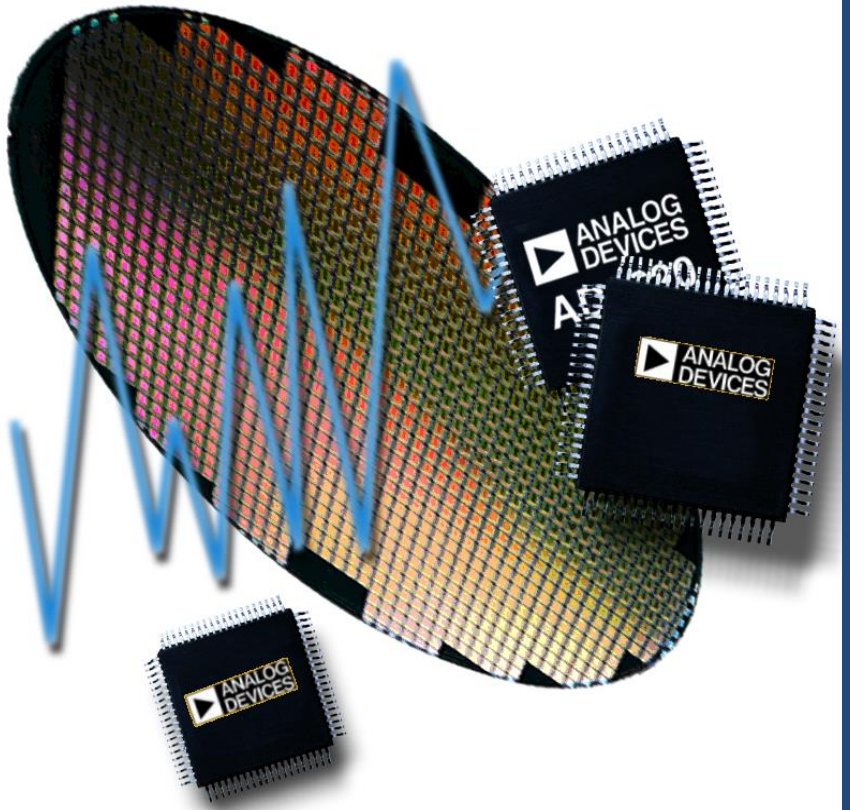

Reliability Report

Report Title: AD8417-2 New Product Qualification

Report Number: 14650

Revision: B

Date: 21 December 2022

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the AD8417-2 product in a 10-WLCSP package. The AD8417-2 is a high voltage, high resolution current sense amplifier and is composed of two side-by-side AD8417 dice with shorted biasing connections through RDL.

Table 1: AD8417-2 Product Characteristics

Die/Fab

Die Id	8YM80F03-IG
Die Size (mm)	1.92 x 1.01
Wafer Fabrication Site	ADI Limerick
Wafer Fabrication Process	0.35um DMOS
Approximate Transistor Count	5,480
Passivation Layer	HDPundoped oxide/Oxide&Nitride
Bond Pad Metal Composition	AlCu

Package/Assembly

Package	10-WLCSP
Bump Pitch (mm)	0.35
Bump Diameter (mm)	0.24
Bumping Foundry	STATS
RDL Layers	2
RDL Composition	Ti(0.1)/Cu(0.2)/Cu(5)
RDL Repassivation	Polyimide (7.5)/Polyimide (8.3)
Under Bump Metallization	Ti(0.1)/Cu(0.2)/Cu(8.6)
Bumping Process	Cu Bump/Redistribution
Bump Composition	95.5Sn_4.0Ag_0.5Cu
Moisture Sensitivity Level	1
Maximum Peak Reflow Temperature (°C)	260

Description / Results of Tests Performed

Tables 2 through 3 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: WLCSP at STATS Package Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	AD8417-2	Q14650.HS1	77	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	AD45316	Q14917.HA1	32	0
				Q14926.HA1x	32	0
			ADUCM413	Q13982.11	45	0
Temperature Cycling (TC)	JESD22-A104	-40°C/+125°C, 1 Cycles/Hour, 1,000 Cycles	AD8417-2	Q14650.TC1	77	0
				Q14650.TC2	77	0
				Q14650.TC3	77	0
Temperature Humidity Bias (THB)	JESD22-A101	85°C, 85%RH, Biased, 1,000 Hours	AD8417-2	Q14650.1.TH1	77	0
				Q14650.2.TH2	77	0
				Q14650.3.TH3	77	0
			ADP5202	Q14624.TH1	77	0
				Q14624.TH2	77	0
				Q14624.TH3	77	0
Unbiased HAST (UHST)	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	AD8417-2	Q14650.UH1	77	0
				Q14650.UH2	77	0
				Q14650.UH3	77	0

[1] 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.

Table 3: 0.35µm DMOS at ADI-Limerick Fab Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Early Life Failure Rate (ELFR)	MIL-STD-883, M1015	125°C, 48 Hours	ADG5208F	Q11144.EL1a	600	0
			ADG5412F	Q10718.EL2a	200	0
				Q10718.EL3a	200	0
	AEC-Q100-008	Ta=150C, 48 Hours	AD8418W	Q10083.27	87	0
				Q10083.28	77	0
				Q10083.29	111	0
				Q10083.EL1	800	0
High Temperature Operating Life (HTOL) [1]	JESD22-A108	150°C<Tj<175° C, Biased, 1,000 Hours	AD8418W	Q10083.2	77	0
				Q10083.5	77	0
				Q10083.8	77	0
High Temperature Operating Life (HTOL) [2]		125°C<Tj<135° C, Biased, 1,000 Hours	AD8417-2	Q14984.1.HO1	77	0
			AD5535B	Q12935.HO1b	77	0
			ADM1272	Q11624.35	77	0
		135°<Tj<150°C, 1,000 Hours	ADHV4702-1	Q13046.26	77	0
				Q13046.27	77	0
				Q13046.28	77	0
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	AD8417-2	Q14650.HS1	77	0
			ADHV4702-1	Q13046.20	77	0
			AD5535C	Q13575.HS1	77	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	AD8418W	Q10083.HA1	77	0
				Q10083.HA2	77	0
				Q10083.HA3	77	0
			ADG5412F	Q11444.HA1	77	0
				Q11444.HA2	77	0
				Q11444.HA3	77	0
			ADHV4702-1	Q13046.4	77	0
				Q13046.5	77	0
				Q13046.6	77	0
Temperature Humidity Bias (THB)	JESD22-A101	85°C, 85%RH, Biased, 1,000 Hours	AD8417-2	Q14650.1.TH1	77	0
				Q14650.2.TH2	77	0
				Q14650.3.TH3	77	0
			AD5535B	Q13930.12	32	0
				Q13930.13	32	0
				Q13930.14	32	0
Temperature Humidity Bias (THB) [2]			AD5535B	Q12445.TH1	32	0
				Q12445.TH2	32	0
				Q12445.TH3	32	0

[1] 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.

[2] 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.

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 4. 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 4: AD8417-2 ESD Test Results

ESD Model	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM	10-WLCSP	JS-002	1Ω, Cpkg	±1250V	NA	C3
HBM	10-WLCSP	ESDA/JEDEC JS-001	1.5kΩ, 100pF	±3000V	±3500V	2

Latch-Up Test Results

Three samples of the AD8417-2 were latch-up tested at T_A=25°C per JEDEC Standard JESD78, Class I. All pins passed.

Passing Positive Current	Passing Negative Current	Passing Over-Voltage
+200mA	-200mA	+8.25V

Approvals

Reliability Engineer: Leo Ouano

Additional Information

Data sheets and other additional information are available on Analog Devices' web site