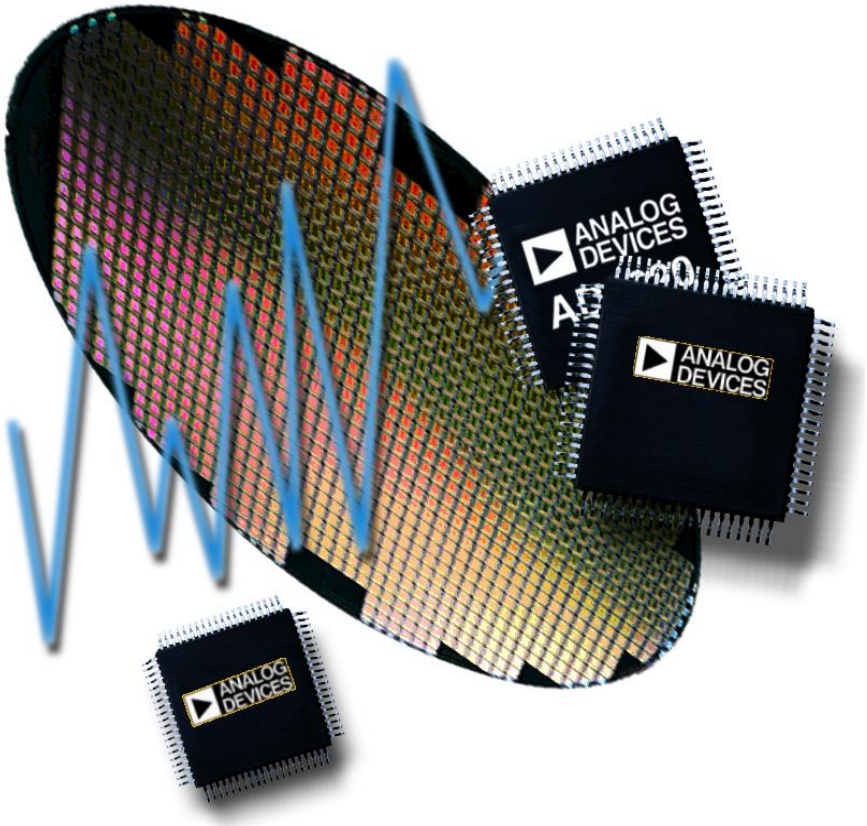

Reliability Report

Report Title: ADXL312 XC312 Sensor Fab Site Transfer from TSMC to ADWL

Report Number: 20048

Revision: B

Date: 16 November 2022

Summary

This report documents the successful completion of the reliability qualification requirements for AEC-Q100 Automotive Grade 2 release of the ADXL312 product in a 32-LFCSP package and the ADXL345 product in 14-LGA package. The ADXL312 is a 3 Axis Low g accelerometer with digital output, including a ADI Wilmington MEMS only die and a TSMC ASIC, Rev C. The ADXL345 is a Low-g Std Sensor.

Table 1: ADXL312 Product Characteristics

Die/Fab

Die ID	XL345/TMZ285	XC312A	XC312+C
Die Size (mm)	2.25 x 1.40	1.29 x 1.52	1.29 x 1.52
Wafer Fabrication Site	TSMC 11 8"	I_WILM1B06	I_WILM1B06
Wafer Fabrication	0.35um CMOS	MEMS-Only	Cap
Approximate Transistor Count	80,200	0	0
Passivation Layer	undoped-oxide/SiN	doped-oxide/SiN	None
Bond Pad Metal	AlCu	AlCu	AlCu

Package/Assembly

Available Package	32-LFCSP
Body Size (mm)	5.00 x 5.00 x 1.45
Lead Pitch (mm)	0.5
Assembly Location	Amkor-P
Molding Compound	Sumitomo G770HCD
Wire Type	Gold
Wire Diameter (mils)	1.00
Die Attach	QMI 536
Moisture Sensitivity Level	3
Maximum Peak Reflow Temperature (°C)	260

Table 2: ADXL345 Product Characteristics

Die/Fab

Die ID	XL345/TMZ285	XC345	XC345+C
Die Size (mm)	2.25 x 1.40	1.29 x 1.52	1.29 x 1.52
Wafer Fabrication Site	TSMC 11 8"	I_WILM1B06	I_WILM1B06
Wafer Fabrication	0.35um CMOS	MEMS-Only	Cap
Approximate Transistor Count	80,200	0	0
Passivation Layer	undoped-oxide/SiN	doped-oxide/SiN	None
Bond Pad Metal	AlCu	AlCu	AlCu

Package/Assembly

Package	14-LGA
Body Size (mm)	3.00 x 5.00 x 0.95
Assembly Location	Amkor-P
Molding Compound	Sumitomo G770
Wire Type	Gold Tanaka GPG
Wire Diameter (mils)	1.00
Die Attach	Ablestik 2300

Description / Results of Tests Performed

Tables 3 provides a description of the qualification tests conducted and the associated test results for products manufactured on the same technologies as described in Tables 1 and 2. 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 3: ADXL312 Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Unbiased HAST (UHST) [2,3]	JESD22-A118	130°C, 85%RH, 2atm, 96 Hours	ADXL313	Q10157.UH1	77	0
				Q10157.UH2	77	0
				Q10157.UH3	77	0
Temperature Cycling (TC) [2,3]	JESD22-A104	-65°C/+150°C, 1,000 Cycles	ADXL313	Q10157.TC1	77	0
				Q10157.TC2	77	0
				Q10157.TC3	77	0
				Q10262.TC1	77	0
Wire Bond Pull	AEC-Q100	Post TC Wire Bond Pull	ADXL313	Q10157	5	0

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
		Corner Bonds and One Mid Bond Per Side				
Group D [1]	MIL-STD-883, M5005	Sub 4, Shock/Vib./Cent., Single Duration	ADXL316	Q11514.GD1	15	0
Mechanical Shock Powered [1]	IEC 68 Part 2-27 Testgroup Ea	10,000g, 5 Shock Pulses, 0.5ms, Single Duration	ADXL316	Q11514.MS1	15	0
Guided Drop [1]	IEC 60068-2-32	1X6 axes- 1.2m concrete, Single Duration	ADXL316	Q11514.GDR1	5	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [2,3]	JESD22-A110	130°C, 85%RH, 2atm, Biased, 96 Hours	ADXL313	Q10157.HA1	77	0
				Q10157.HA2	77	0
				Q10157.HA3	77	0
Temperature Cycling (TC)[1,2,4]	JESD22-A104	-65°C / +150°C 500 cycles	ADXL312	Q7850.7	77	0
				Q7850.8	77	0
				Q7850.9	77	0
High Temperature Storage Life (HTSL)[3]	JESD22-A103	150°C 1,000 hours	ADXL312	Q7850.16	77	0
				Q7850.17	77	0
				Q7850.18	77	0
Solderability	JESD22-B22	Soldering Temp of 260°C	ADXL312	Q7850.33	10	0
High Temperature Operating Life (HTOL)[2,3]	JESD22-A108	150°C ‹ Tj ‹ 175°C, Biased 500 hours	ADXL312	Q7850.4	77	0
				Q7850.5	77	0
				Q7850.6	77	0

[1] Electrical test was performed at room temperature.

[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.

[3] Pre- and post-stress electrical test was performed at room and hot temperatures.

[4] Refer to Appendix A for post temperature cycle wire pull test results.

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 Charge Device Model (FICDM) ESD testing are summarized in the ESD Results Table. All parts were electrically tested at room and hot temperatures pre- and post-stress. 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 at the Analog Devices' web site).

Table 4: ESD Test Results

ESD Model	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM[1]	32-LFCSP	JESD22-C101	1Ω, Cpkg	±750V[2]	NA	NA
				±1500V	NA	C6
HBM[1]	32-LFCSP	ANSI/ESDA/JEDEC JS-001-2010	1.5kΩ, 100pF	±2000V	NA	2

1) Pre- and post-stress electrical test was performed at ambient and hot temperatures.
2) Only corner pins. Tested at 750V to prove minimum requirements per AEC-Q100.

Latch-Up Test Results

Six samples of the ADXL312 were Latch-up tested at T_A=125ºC per JEDEC Standard JESD78, Class II, Level A. Pre- and post-stress electrical test was performed at ambient and hot temperatures. All six devices passed.

Approvals

Reliability Engineer: Michael Walornyj

Additional Information

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

Appendix A - Wire Pull Test Results

TCT Lot 1909878, Post 500 cycles										
Wire	Test Load (gf)					Fail Code				
	Unit #1	Unit #2	Unit #3	Unit #4	Unit #5	Unit #1	Unit #2	Unit #3	Unit #4	Unit #5
1	12.05	11.25	11.60	13.10	10.25	2	1	1	1	1
2	16.35	12.65	17.00	16.35	13.35	4	1	4	4	1
3	16.95	13.05	14.45	18.05	14.15	4	1	1	4	1
4	11.55	13.05	11.90	12.80	10.15	2	1	2	1	1
5	11.60	10.60	11.00	9.25	8.95	2	1	1	1	1
6	7.15	6.90	7.25	6.95	6.45	2	2	2	2	2
7	11.10	10.05	11.20	9.70	9.70	2	2	2	1	1

Fail Code Description	
1	Neck Break
2	Span Break
3	Die Interface Break
4	Sub Interface Break
5	Sub Metal Lift
6	Die Fracture
7	Sub Fracture
10	Error - Voided Test