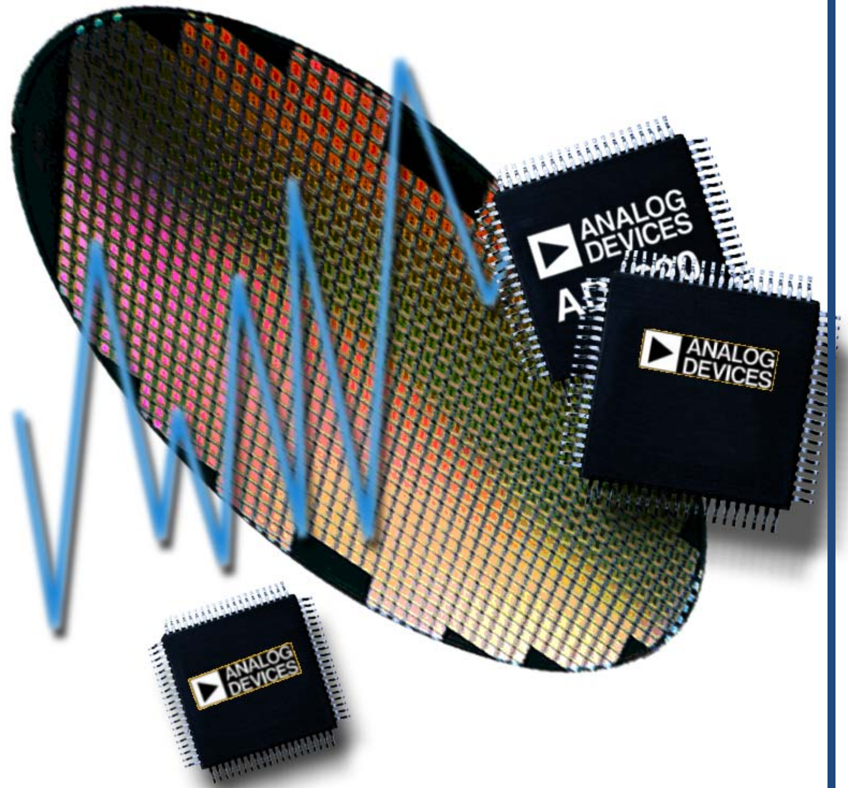


Reliability Report

Report Title: iMEMS2 Wilmington Fab Transfer

Report Number: 7410

Revision: A

Date: 19 March 2009

Summary

This report documents the successful completion of the reliability qualification requirements for transfer of the iMEMS 2 process to Analog Devices Wilmington Wafer Fabrication facility. The qualification vehicle chosen for this qualification was the ADXL203 product in an 8-LCC package.

iMEMS2 is an integrated BiMOS and MEMS process currently being fabricated at Analog Devices Cambridge Wafer Fabrication facility and being transferred to the Wilmington Wafer Fabrication facility . iMEMS2 features complimentary MOS devices with minimum feature sizes of 3 um, vertical NPN, PNP and lateral PNP bipolar devices as well as MOSCAPS. The process is rated at 24V. The surface micro machined structures are composed of a 4 um thick amorphous silicon separated from the patterned polysilicon ground plane by 2.0 um.

Table 1: ADXL203 Product Characteristics

Die/Fab

Maximum Power Dissipation (W)	0.035
Device / Die ID	XL203A
Die Size (mm)	2.30 x 2.30
Wafer Fabrication Site	I_WILM1B06
Wafer Fabrication Process	iMEMS2
Transistor Count	258
Passivation Layer	doped-oxide/SiN
Bond Pad Metal Composition	AlCu

Package/Assembly

Available Package	8-LCC
Body Size (mm)	5.00 x 5.00 x 1.80
Operating Temperature Range	-40°C ≤ TA ≤ +105°C
Assembly Location	Amkor-P
Wire Type	Aluminum
Wire Diameter (mils)	1.25
Die Attach	IS700
Lead Finish	Gold
Moisture Sensitivity Level	1
Maximum Peak Reflow Temperature (°C)	260°C

Description / Results of Tests Performed

Tables 2 and 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: Package Qualification Test Results

Test Name	Specification	Conditions	Device	Package	Lot #	Sample Size	Qty. Failures
High Temperature Storage Life (HTSL)	JESD22-A103	150°C 1,000 hours	ADXL203	Amkor-P 8-LCC	Q7410.07	77	0
Temperature Cycling (TC)[1]	JESD22-A104	-55°C / +125°C 1,000 cycles	ADXL203	Amkor-P 8-LCC	Q7410.01	77	0
					Q7410.02	77	0
					Q7410.03	77	0
Group D	Mil-Std 883 Method 5005	Sub 4, Shock/Vib./ Cent./Seal	ADXL203	Amkor-P 8-LCC	Q7410.32	42	0
					Q7410.33	42	0
					Q7410.34	42	0
Mechanical Shock - Powered	IEC 68 Part 2-27 Testgroup Ea	2500g, 5 shock pulses, 0.5ms	ADXL203	Amkor-P 8-LCC	Q7410.27	10	0
					Q7410.28	10	0
					Q7410.29	10	0
Random Drop	CAM0091	5 drops from 1.2m	ADXL203	Amkor-P 8-LCC	Q7410.24	10	0
					Q7410.25	10	0
					Q7410.26	10	0

1) These Samples were subjected to preconditioning prior to the start of the stress test. The preconditioning consisted of Reflow: 3 passes through an oven with a peak temperature of 260ºC.

2) Complete Post Temperature Cycle Bond Pull results are presented in Appendix A of this report.

3) HTSL, TC, tested at Room and Hot Temperatures. Group D, Mech Shock Powered and Random Drop tested at Room Temperature.

Table 3: Process Qualification Test Results

Test Name	Specification	Conditions	Device	Fab Process	Lot #	Sample Size	Qty. Failures
Early Life Failure Rate (ELFR)	MIL-STD-883, Method 1015	TA = 125°C 125°C 48 hours	ADXL203	I_WILM1B06 BiCMOS	Q7410.081	290	0
					Q7410.082	290	0
					Q7410.083	240	0
					Q7410.091	290	0
					Q7410.092	290	0
					Q7410.093	240	0
					Q7410.101	290	0
					Q7410.102	290	0
					Q7410.103	230	0
High Temperature Operating Life (HTOL)[1]	JESD22-A108	TA = 125°C 125°C ‹ Tj ‹ 135°C, Biased 1,000 hrs.	ADXL203	I_WILM1B06 BiCMOS	Q7410.04	77	0
					Q7410.05	77	0
					Q7410.06	77	0

1) These Samples were subjected to preconditioning prior to the start of the stress test. The preconditioning consisted of Reflow: 3 passes through an oven with a peak temperature of 260ºC.

2) ELFR tested at room and hot temperatures. HTOL 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), Machine Model (MM), 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 in Table 4. 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 http://www.analog.com).

Table 4: ESD Test Results

ESD Model	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM	8-LCC	ANSI/ESD STM5.3.1-1999	1Ω, Cpkg	±250V	±500V	C3
HBM	8-LCC	ESD Assoc. STM5.1-2007	1.5kΩ, 100pF	±2000V	±2500	2
MM	8-LCC	ANSI/ESD STM5.2-1999	0Ω, 200pF	±200V	±400	M3

Latch-Up Test Results

Six samples of the ADXL203 were Latch-up tested at Ta=125ºC per JEDEC Standard JESD78, Class II, Level A. All six devices passed.

Approvals

Reliability Engineer: Denis Belisle
This report has been approved by electronic means (4.0)

Additional Information

Data sheets and other additional information are available on Analog Devices' web site:
http://www.analog.com

Appendix A: Bond Pull Data

Bond Pull Data Post 1000 Temperature Cycles

Minimum Pull Strength after Temperature Cycle > 3 grams

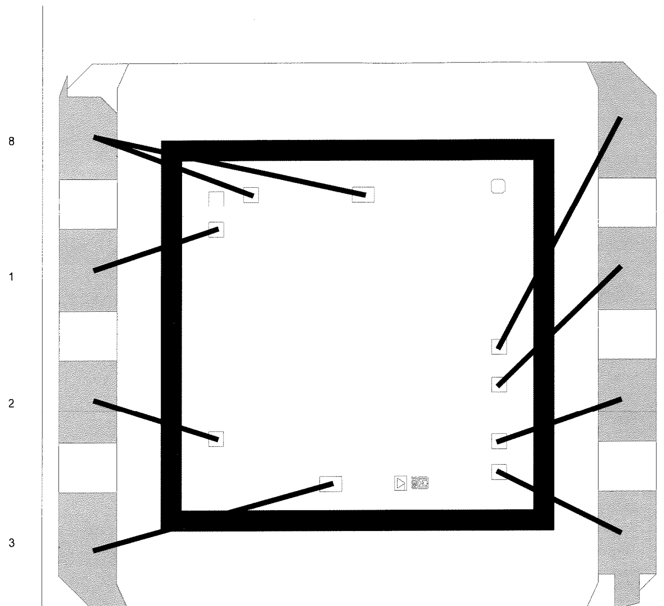
Pull Readings are in Gram Force units.

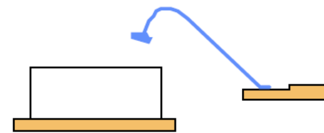
	ADXL203 Lot No. 274525.1									
Unit	1		2		3		4		5	
Ball	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode
1	6.80	C	6.35	D	8.05	C	6.85	C	6.70	D
2	7.80	D	7.75	D	7.95	D	7.80	D	8.25	D
3	6.95	D	8.55	D	6.35	D	7.85	D	8.30	D
4	6.05	C	7.00	D	6.30	C	6.85	C	6.45	C
5	6.45	D	7.35	C	7.80	D	7.25	D	7.95	D
6	5.80	C	7.20	D	6.70	D	5.65	D	5.95	D
Min	5.80		6.35		6.30		5.65		5.95	
Max	7.80		8.55		8.05		7.85		8.30	
Ave	6.64		7.37		7.19		7.04		7.27	
Stdev	0.72		0.74		0.83		0.81		1.02	

	ADXL203 Lot No. 273897.1									
Unit	1		2		3		4		5	
Ball	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode
1	5.75	B	5.90	D	5.45	D	4.55	D	5.50	D
2	7.25	B	7.50	D	6.85	D	6.85	D	7.40	D
3	8.85	D	7.70	C	6.15	D	6.90	D	7.40	D
4	6.30	D	6.50	C	5.85	D	4.80	D	6.35	D
5	7.50	C	7.40	D	7.60	D	7.15	D	6.55	D
6	6.05	D	6.50	D	5.25	D	5.45	D	6.90	D
Min	5.75		5.90		5.25		4.55		5.50	
Max	8.85		7.70		7.60		7.15		7.40	
Ave	6.95		6.92		6.19		5.95		6.68	
Stdev	1.16		0.72		0.89		1.16		0.72	

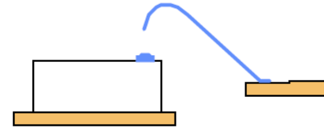
	ADXL203 Lot No. 273899.1									
Unit	1		2		3		4		5	
Ball	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode
1	4.50	D	6.65	D	5.75	D	5.85	D	5.85	D
2	7.80	D	7.90	D	7.40	D	8.30	B	6.25	D
3	7.40	D	8.40	B	6.60	C	7.50	D	8.50	D
4	5.80	D	6.00	D	5.80	D	4.35	D	7.55	B
5	7.45	D	7.20	C	7.85	D	7.85	C	7.10	D
6	5.95	D	6.30	D	5.70	D	5.15	D	6.55	D
Min	4.50		6.00		5.70		4.35		5.85	
Max	7.80		8.40		7.85		8.30		8.50	
Ave	6.48		7.08		6.52		6.50		6.97	
Stdev	1.28		0.94		0.93		1.61		0.96	

WIRE PULL FAILURE MODES

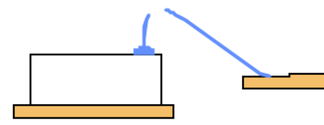




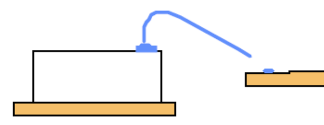
Mode A - Lifted Bond



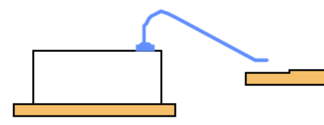
Mode B - Break at Neck



Mode C - Break within Wire Span



Mode D - Break at Heel



Mode E - Lifted Second Bond