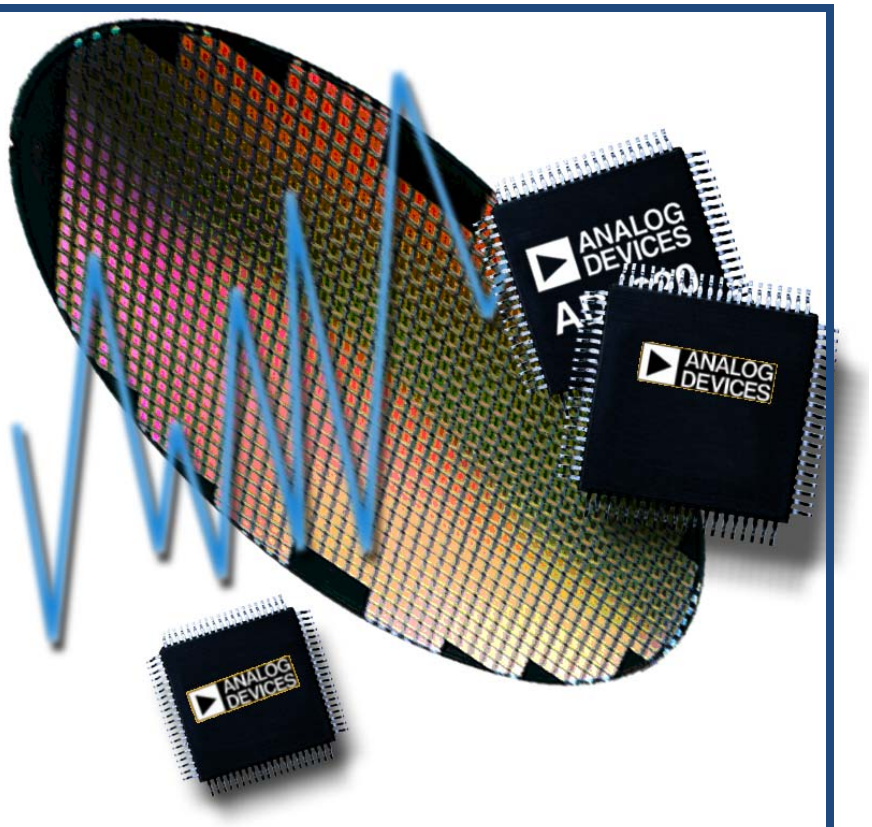


Reliability Report

Report Title: iMEMS1 Wilmington Fab Transfer

Report Number: 7320

Revision: C

Date: 9 March 2009

Summary

This report documents the successful completion of the reliability qualification requirements for transfer of the iMEMS 1 process to Analog Devices Wilmington Wafer Fabrication facility. The qualification vehicle chosen for this qualification was the ADXL278 product in an 8-LCC package.

iMEMS1 is an integrated BiMOS and MEMS process currently being fabricated at Analog Devices Wilmington. iMEMS1 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 3 um thick amorphous silicon separated from the patterned polysilicon ground plane by 1.6 um.

Table 1: ADXL278 Product Characteristics

Die/Fab

Maximum Power Dissipation (W)	0.015
Device / Die ID	ADXL278A
Die Size (mm)	2.30 x 2.30
Wafer Fabrication Site	I_WILM1B06
Wafer Fabrication Process	iMEMS1
Passivation Layer	doped-oxide/SiN
Bond Pad Metal Composition	AlCu
Polyimide Layer	No

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
Die Attach	IS700
Wire Type	Aluminum
Wire Diameter (mils)	1.25
Molding Compound	NA
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 process 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	ADXL278	Amkor-P 8-LCC	Q7320.3	77	0
Temperature Cycling (TC)[2]	JESD22-A104	-55°C/+125°C 1,000 cycles	ADXL278	Amkor-P 8-LCC	Q7320.1	77	0
					Q7320.2	77	0
					Q7320.5	77	0
Group D	Mil-Std 883 Method 5005	Sub 4, Shock/Vib./ Cent./Seal	ADXL278	Amkor-P 8-LCC	Q7320.23	42	0
					Q7320.24	42	0
					Q7320.25	42	0
Mechanical Shock - Powered	IEC 68 Part 2-27 Testgroup Ea	2500g, 5 shock pulses, 0.5ms	ADXL278	Amkor-P 8-LCC	Q7320.17	10	0
					Q7320.18	10	0
					Q7320.19	10	0
Random Drop	CAM0091	5 drops from 1.2m	ADXL278	Amkor-P 8-LCC	Q7320.17	10	0
					Q7320.18	10	0
					Q7320.19	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	ADXL278	iMEMS1	Q7320.71	800	0
					Q7320.72	290	0
					Q7320.73	220	0
					Q7320.81	800	0
					Q7320.82	290	0
					Q7320.83	220	0
					Q7320.91	800	0
					Q7320.92	290	0
					Q7320.93	220	0
High Temperature Operating Life (HTOL)[1]	JESD22-A108	TA = 125°C 125°C‹Tj‹135°C, Biased 1,000 hours	ADXL278	iMEMS1	Q7320.16	77	0
					Q7320.4	77	0
					Q7320.6	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.

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. STM5.1-2001	1.5kΩ, 100pF	±2000V	±2500V	2
MM	8-LCC	ANSI/ESD STM5.2-1999	0Ω, 200pF	±100V	±200V	M2

Latch-Up Test Results

Six samples of the ADXL278 were Latch-up tested at Ta=125ºC per JEDEC Standard JESD78, Class II, Level B. 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

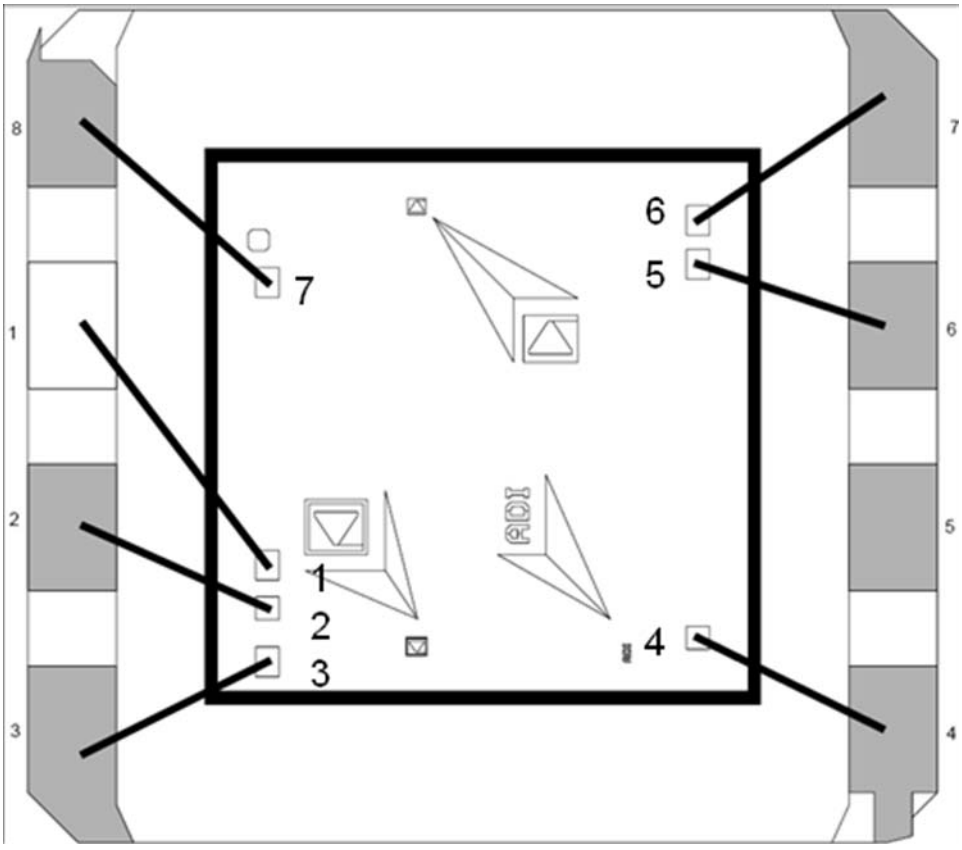
Appendix

Bond Pull Data Post 1000 Temperature Cycles

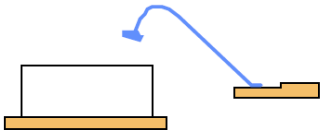
	ADXL278 Lot No. 274528.1.1									
Unit	1		2		3		4		5	
Ball	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode
1	6.85	D	6.30	D	5.95	D	6.65	D	6.80	D
2	7.40	C	8.75	C	7.35	D	7.15	D	6.40	D
3	6.50	D	6.65	D	9.00	D	6.05	D	5.90	D
4	6.05	D	5.40	D	7.25	D	6.70	D	6.45	D
5	7.10	D	7.60	C	7.30	B	7.70	B	6.70	D
6	5.90	D	5.70	D	5.90	D	4.50	D	7.05	D
7	7.20	D	6.75	D	6.30	D	7.25	D	7.35	D
Min	5.90		5.40		5.90		4.50		5.90	
Max	7.40		8.75		9.00		7.70		7.35	
Ave	6.71		6.74		7.01		6.57		6.66	
Stdev	0.58		1.14		1.09		1.05		0.47	

	ADXL278 Lot No. 274340.1									
Unit	1		2		3		4		5	
Ball	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode
1	7.05	C	6.70	D	6.80	D	6.50	D	6.95	D
2	7.45	D	6.65	D	7.40	D	7.00	D	6.00	D
3	6.70	D	7.25	C	7.65	C	6.90	D	6.40	D
4	6.10	D	7.40	D	6.70	D	7.65	D	6.60	D
5	7.80	C	7.10	D	6.75	C	7.95	C	7.40	D
6	6.85	D	7.45	D	6.00	D	8.20	C	6.75	C
7	7.65	D	8.15	C	5.65	D	6.85	D	6.05	D
Min	6.10		6.65		5.65		6.50		6.00	
Max	7.80		8.15		7.65		8.20		7.40	
Ave	7.09		7.24		6.71		7.29		6.59	
Stdev	0.60		0.51		0.71		0.64		0.50	

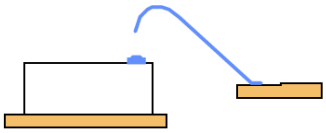
	ADXL278 Lot No. 274997.1									
Unit	1		2		3		4		5	
Ball	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode	Pull	Mode
1	6.25	D	4.35	D	7.10	D	5.25	D	3.05	D
2	7.35	D	5.50	D	7.35	D	4.50	D	7.25	D
3	7.60	D	6.40	D	9.05	C	5.10	D	4.55	D
4	6.50	D	4.70	D	7.85	D	5.50	D	4.40	D
5	6.30	D	4.25	D	7.30	D	4.95	D	4.20	D
6	7.20	D	4.60	D	8.65	D	5.90	D	4.85	D
7	6.70	D	4.60	D	7.70	D	5.35	D	4.70	D
Min	6.25		4.25		7.10		4.50		3.05	
Max	7.60		6.40		9.05		5.90		7.25	
Ave	6.84		4.91		7.86		5.22		4.71	
Stdev	0.54		0.77		0.73		0.44		1.27	



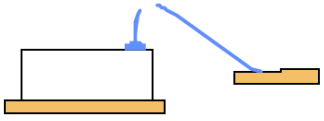
WIRE PULL FAILURE MODES



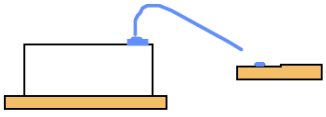
Mode A - Lifted Bond



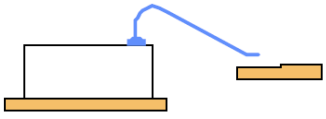
Mode B - Break at Neck



Mode C - Break within Wire Span



Mode D - Break at Heel



Mode E - Lifted Second Bond