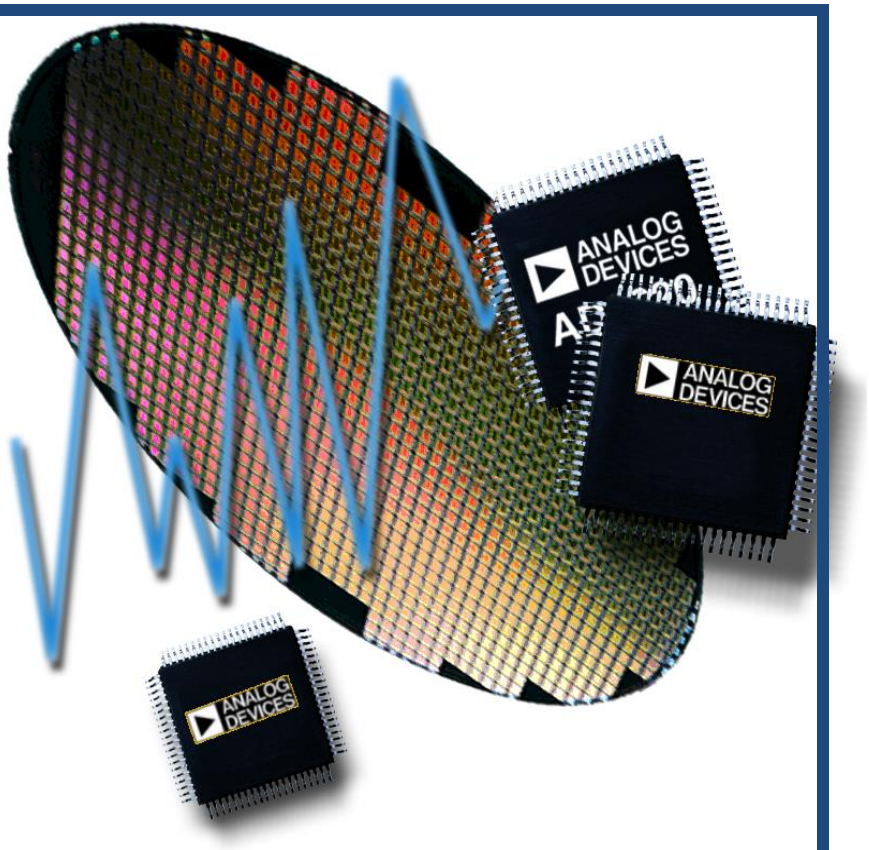

Reliability Report

Report Title: AD8422 Die Revision F Qualification

Report Number: 18957

Revision: B

Date: 3 August 2022

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the AD8422 Die Revision F in an 8-LFCSP, 8-MINI_SO, 8-SOIC_N package. Die revision F changed metals and connections for capacitor and resistor to eliminate signal oscillation. This change improves the device input common-mode levels, reference voltages, and outputs.

The AD8422 is a high precision, low noise, very low power instrumentation amplifier that is ideally suited for a broad spectrum of high precision signal conditioning applications.

Table 1: AD8422 Product Characteristics

Die/Fab

Die Id	8YM36 / F
Die Size (mm)	1.29 x 1.87
Wafer Fabrication Site	ADI-Limerick
Wafer Fabrication Process	40V Bipolar
Approximate Transistor Count	224
Passivation Layer	doped-oxide/OxyNitride
Bond Pad Metal Composition	AlSi(1.0%)Cu(0.5%)

Package/Assembly

Package	8-SOIC_N
Body Size (mm)	4.00 x 5.00 x 1.50
Assembly Location	ASE (AEP)
Molding Compound	Hitachi CEL 9240HF10AK
Wire Type	Tanaka GPG-2 2N Gold
Wire Diameter (mils)	0.8
Die Attach	Hitachi EN 4900GC conductive
Lead Frame Material	Copper
Lead Finish	100Sn
Moisture Sensitivity Level	1
Maximum Peak Reflow Temperature (°C)	260

Table 2: AD8422 Product Characteristics

Die/Fab

Die Id	8YM36 / F
Die Size (mm)	1.29 x 1.87
Wafer Fabrication Site	ADI-Limerick
Wafer Fabrication Process	40V Bipolar
Approximate Transistor Count	224
Passivation Layer	doped-oxide/OxyNitride
Bond Pad Metal Composition	AlSi(1.0%)Cu(0.5%)

Package/Assembly

Package	8-MINI_SO
Body Size (mm)	3.00 x 3.00 x 0.75
Assembly Location	ASE (AET)
Molding Compound	Sumitomo G700LYT
Wire Type	MKE R 2N Gold
Wire Diameter (mils)	0.8
Die Attach	Hitachi EN 4900GC conductive
Lead Frame Material	Copper
Lead Finish	100Sn
Moisture Sensitivity Level	1
Maximum Peak Reflow Temperature (°C)	260

Table 3: AD8422 Product Characteristics

Die/Fab

Die Id	8YM36 / F
Die Size (mm)	1.29 x 1.87
Wafer Fabrication Site	ADI-Limerick
Wafer Fabrication Process	40V Bipolar
Approximate Transistor Count	224
Passivation Layer	doped-oxide/OxyNitride
Bond Pad Metal Composition	AlSi(1.0%)Cu(0.5%)

Package/Assembly

Package	8-LFCSP
Body Size (mm)	3.00 x 3.00 x 0.75
Assembly Location	ASE (AEK)
Molding Compound	Sumitomo G700LYT
Wire Type	MKE R 2N Gold
Wire Diameter (mils)	0.8
Die Attach	Hitachi EN 4900GC conductive
Lead Frame Material	Copper
Lead Finish	Matte Sn
Moisture Sensitivity Level	3
Maximum Peak Reflow Temperature (°C)	260

Description / Results of Tests Performed

Tables 4 through 6 provide a description of the qualification tests conducted and the associated test results for products manufactured on the same technologies as described in Tables 1 through 3. 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 4: LFCSP at ASE (AEK) 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	ADIN1100	Q17003.1.HS	45	0
			ADIN1102	Q18153.1.HS1	45	0
			ADUX1201	Q16904.1.4	45	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	AD3552R	Q18019.1.2	77	0
				Q18019.2.3	77	0
				Q18019.3.4	77	0
			AD5391	Q17266.1.HA1	45	0
				Q17266.2.HA2	45	0
				Q17266.3.HA3	45	0
Solder Heat Resistance (SHR) [1]	J-STD-020	MSL-3	AD8422	Q18957.1.SH1	30	0
Temperature Cycling (TC) [1]	JESD22-A104	-65°C/+150°C, 500 Cycles	AD3552R	Q18019.1.3	77	0
				Q18019.2.2	77	0
				Q18019.3.3	77	0
			ADIN2111	Q17566.1.3	45	0
				Q17566.1.4	45	0
				Q17566.2.2	45	0
			ADN4693E	Q17278.1.TC1	77	0
				Q17278.2.TC2	77	0
				Q17278.3.TC3	77	0
Temperature Humidity Bias (THB) [1]	JESD22-A101	85°C, 85%RH, Biased, 1,000 Hours	ADN4693E	Q17278.1.TH1	77	0
				Q17278.2.TH2	77	0
				Q17278.3.TH3	77	0
Unbiased HAST (UHST) [1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	AD3552R	Q18019.1.5	77	0
				Q18019.2.5	77	0
				Q18019.3.5	77	0
			ADIN1102	Q18153.1.UH1	45	0
				Q18153.2.UH2	45	0
				Q18153.3.UH3	45	0
			ADIN2111	Q17566.1.1	45	0
				Q17566.1.2	45	0
				Q17566.2.1	45	0

[1] 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.

Table 5: MINI_SO at ASE (AET) Package Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Autoclave (AC) [1]	JESD22-A102	121C 100%RH 33.3 psia, 96 Hours	AD620	Q11131.6	45	0
			AD712	Q11284.68	45	0
				Q11382.1	45	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	AD627	Q17993.40	45	0
			AD823	Q17984.1.HA1	77	0
			ADA4665-2	Q8663.200	77	0
				Q8663.201	77	0
				Q8663.202	77	0
			OP282	Q8289.200	77	0
				Q8289.201	77	0
				Q8289.202	77	0
			OP297	Q12848.58	45	0
Solder Heat Resistance (SHR) [1]	J-STD-020	MSL-1	AD8422	Q18957.1.SH2	30	0
Temperature Cycling (TC) [1]	JESD22-A104	-65°C/+150°C, 500 Cycles	AD8007	Q18641.58	45	0
			AD8052	Q9107.TC1	77	0
				Q9107.TC2	77	0
				Q9107.TC3	77	0
			AD823	Q17984.1.TC1	77	0
			AD8273	Q19140.37	45	0
			OP27	Q8965.TC1	77	0
				Q8965.TC2	77	0
				Q8965.TC3	77	0
Unbiased HAST (UHST) [1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	AD620	Q11582.33	45	0
			AD629	Q13535.137	45	0
			AD8007	Q18641.59	45	0
			AD823	Q17984.1.UH1	77	0
			AD8273	Q19140.38	45	0
			AD8628	Q17318.31_A	45	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 6: SOIC_N at ASE (AEP) Package Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Autoclave (AC) [1]	JESD22-A102	121C 100%RH 33.3 psia, 96 Hours	AD620	Q11131.6	45	0
			AD712	Q11284.68	45	0
				Q11382.1	45	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	AD627	Q17993.40	45	0
			AD823	Q17984.1.HA1	77	0
			ADA4665-2	Q8663.200	77	0
				Q8663.201	77	0
				Q8663.202	77	0
			OP282	Q8289.200	77	0
				Q8289.201	77	0
				Q8289.202	77	0
			OP297	Q12848.58	45	0
Solder Heat Resistance (SHR) [1]	J-STD-020	MSL-1	AD8422	Q18957.1.SH3	30	0
Temperature Cycling (TC) [1]	JESD22-A104	-65°C/+150°C, 500 Cycles	AD8007	Q18641.58	45	0
			AD8052	Q9107.TC1	77	0
				Q9107.TC2	77	0
				Q9107.TC3	77	0
			AD823	Q17984.1.TC1	77	0
			AD8273	Q19140.37	45	0
			OP27	Q8965.TC1	77	0
				Q8965.TC2	77	0
				Q8965.TC3	77	0
Unbiased HAST (UHST) [1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	AD620	Q11582.33	45	0
			AD629	Q13535.137	45	0
			AD8007	Q18641.59	45	0
			AD823	Q17984.1.UH1	77	0
			AD8273	Q19140.38	45	0
			AD8628	Q17318.31_AUTO	45	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 7: 40V Bipolar at ADI-Limerick Fab Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
High Temperature Operating Life (HTOL) [1]	JESD22-A108	125°C<Tj<135°C, Biased, 1,000 Hours	AD8422	Q18957.1.HO1	77	0
		150°C<Tj<175°C, Biased, 500 Hours	ADA4077-2	Q9268.7	77	0
				Q9268.8	77	0
				Q9268.9	77	0
			ADA4096-2	Q8934.16	77	0
				Q8934.17	77	0
				Q8934.18	77	0
			ADA4610-2	Q8697.16	77	0
				Q8697.17	77	0
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	AD8229	Q8837.11	77	0
			AD8450	Q13813.HS2	77	0
			AD8452	Q13744.HS1	77	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) [1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADA4077-2	Q12531.HA1	77	0
				Q12531.HA2	77	0
				Q12531.HA3	77	0
			ADA4610-2	Q9975.HA7	77	0
				Q9975.HA8	77	0
				Q9975.HA9	77	0
			AD8229	Q8837.13	77	0
				Q8837.6	77	0
				Q8837.9	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.

ESD Test Results

The results of Human Body Model (HBM) and Field-Induced Charged Device Model (FICDM) ESD testing are summarized in Table 8. 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 8: AD8422 ESD Test Results

ESD Model	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM	8-LFCSP	JS-002	1Ω, Cpkg	±1250V	NA	C3
	8-MINI_SO			±1250V	NA	C3
	8-SOIC_N			±1250V	NA	C3
HBM	8-SOIC_N	ESDA/JEDEC JS-001-2011	1.5kΩ, 100pF	±2500V	±3000V	2

Latch-Up Test Results

Three samples of the AD8422 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	+28V, -28V

Approvals

Reliability Engineer: Leo Ouano

Additional Information

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

ANALOG DEVICES

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AD8422 Data Sheet Revision

Rev B to Rev C

AD8422 Data Sheet Change Description

- **Features (page1)**

FEATURES

- Low power: 368 µA maximum quiescent current
- Rail-to-rail output

- **Table 1 (page 6)**

POWER SUPPLY							
Operating Range	Dual-supply operation	±2.3		±18	±2.3		±18	V
	Single-supply operation	4.6		36	4.6		36	V
Quiescent Current			338	368		338	368	µA
Over Temperature	T = −40°C to +85°C			400			400	µA

Table 2 (Page 9)

POWER SUPPLY							
Operating Range	Dual-supply operation	±2.3		±18	±2.3		±18	V
	Single-supply operation	4.6		36	4.6		36	V
Quiescent Current			338	368		338	368	µA
Over Temperature	T = −40°C to +85°C			400			400	µA

Table 3 (page 12)

Table 3.

Parameter	Test Conditions/Comments	Min	Typ	Max	Unit
POWER SUPPLY					
Operating Range	Dual-supply operation	±2.3		±18	V
	Single-supply operation	4.6		36	V
Quiescent Current			338	368	µA
Over Temperature	T = −40°C to +125°C			450	µA

Table 7 (Page 14)

Table 7. Pin Function Descriptions

Pin No.	Mnemonic	Description
1	−IN	Negative Input Terminal.
2, 3	R_G	Gain Setting Terminals. Place resistor across the R_G pins to set the gain. G = 1 + (19.8 kΩ/R_G).
4	+IN	Positive Input Terminal.
5	$-V_S$	Negative Power Supply Terminal.
6	REF	Reference Voltage Terminal. Drive this terminal with a low impedance voltage source to level shift the output.
7	V_{OUT}	Output Terminal.
8	$+V_S$	Positive Power Supply Terminal.
	EPAD	Exposed Pad. Connect the exposed pad to $-V_S$ or leave it unconnected.

Final description should be:

"Gain Setting Terminals. Place resistor across the RG pins to set the gain. G = 1 + (19.8k/RG). Do not connect anything else to these pins. The minimum allowed value of RG is 19.8Ω."