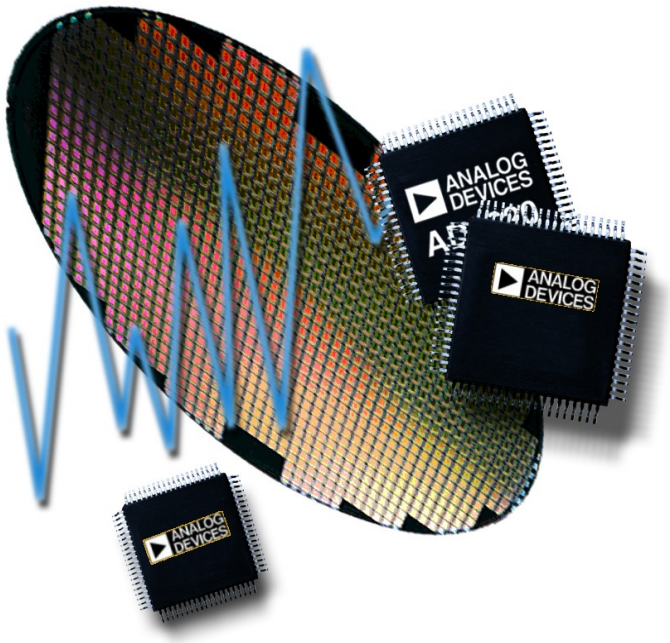

Reliability Report

Report Title: AD8604 Automotive Grade 1 Material Set Change at AP1 Qualification

Report Number: 22740

Revision: A

Date: 13 June 2025

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the AD8604 product in a 14-SOIC_N package using Copper Wire Bonding.

The AD8604 is a quad rail-to-rail, input and output, single-supply amplifiers featuring very low offset voltage and wide signal bandwidth. This amplifier uses a new, patented trimming technique that achieves superior performance without laser trimming. All are fully specified to operate on a 3 V to 5 V single supply.

AECQ100 Qualification Test Methods and Summary

AEC Test Group	AEC Stress Test Name	Abbreviation	AEC Test #	Reference
Group A ACCELERATED ENVIRONMENT STRESS TESTS	Preconditioning	PC	A1	Table 2 and Table 4
	Temperature Humidity Bias or Biased-HAST	THB or HAST	A2	
	Autoclave or Unbiased HAST or Temperature Humidity (without Bias)	AC, UHST, or TH	A3	
	Temperature Cycle	TC	A4	
	Power Temperature Cycling	PTC	A5	
	High Temperature Storage Life	HTSL	A6	
Group B ACCELERATED LIFETIME SIMULATION TESTS	High Temperature Operating Life	HTOL	B1	Table 2 and Table 4
	Early Life Failure Rate	ELFR	B2	
	NVM Endurance, Data Retention, and Operational Life	EDR	B3	
Group C PACKAGE ASSEMBLY INTEGRITY TESTS	Wire Bond Shear	WBS	C1	• Test C2 (and C1 for Cu Wire) are shown in Table 4. • Tests C3-6 are qualified and controlled with inline monitors and may be viewed on-site at Analog Devices.
	Wire Bond Pull Strength	WBP	C2	
	Solderability	SD	C3	
	Physical Dimensions	PD	C4	
	Solder Ball Shear	SBS	C5	
	Lead Integrity	LI	C6	
Group D DIE FABRICATION RELIABILITY TESTS	Electromigration	EM	D1	Die Fabrication Reliability data may be viewed on-site at Analog Devices.
	Time Dependent Dielectric Breakdown	TDDB	D2	
	Hot Carrier Injection	HCI	D3	
	Negative Bias Temperature Instability	BTI	D4	
	Stress Migration	SM	D5	
Group E ELECTRICAL VERIFICATION TESTS	Pre- and Post-Stress Electrical Test	TEST	E1	Table 5
	Electrostatic Discharge Human Body Model	HBM	E2	
	Electrostatic Discharge Charged Device Model	CDM	E3	
	Latch-Up	LU	E4	
	Electrical Distributions	ED	E5	
	Fault Grading	FG	E6	
	Characterization	CHAR	E7	For Tests E5, E6 and E7, ADI New Product Yield Analysis Testing Guidelines meet AEC Q100 requirements. • Results for Tests E7-E11 are available as applicable on a case-by-case basis. • Test E12 results may be viewed on-site at Analog Devices
	Electromagnetic Compatibility	EMC	E9	
	Short Circuit Characterization	SC	E10	
	Soft Error Rate	SER	E11	
	Lead (Pb) Free	LF	E12	
Group F DEFECT SCREENING TESTS	Process Average Test	PAT	F1	ADI New Product Yield Analysis Testing Guidelines meet AECQ100 Requirements.
	Statistical Bin/Yield Analysis	SBA	F2	
Group G CAVITY PACKAGE INTEGRITY TESTS	Mechanical Shock	MS	G1	<Applicable only for Cavity Packages>
	Variable Frequency Vibration	VFV	G2	
	Constant Acceleration	CA	G3	
	Gross/Fine Leak	GFL	G4	
	Package Drop	DROP	G5	
	Lid Torque	LT	G6	
	Die Shear	DS	G7	
	Internal Water Vapor	IWV	G8	

Die/Fab Product Characteristics

Table 1: Die/Fab Product Characteristics- 0.60um CMOS

Product Characteristics	Product(s) to be qualified	Products used as Subdata	
Generic/Root Part #	AD8604	AD7401A	ADUM1201
Die Id	TMY076 A	N71	TMJ850D
Die Size (mm)	1.28 x 1.65	1.50 x 2.87	0.71 x 1.58
Wafer Fabrication Site	E_TSMC0908	E_TSMC0908	E_TSMC0908
Wafer Fabrication Process	0.60um CMOS	0.60um CMOS	0.60um CMOS
Metallization	AlCu	AlCu	AlCu
Polyimide	No	No	No
Passivation	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN

Die/Fab Test Results

Table 2: Die/Fab Test Results - 0.60um CMOS at TSMC Fab-9

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
Early Life Failure Rate (ELFR)	B2	AEC-Q100-008	Ta=125°C, 48 Hours	ADUM1201	Q11159.EL1	0/800	RH
					Q11159.EL2	0/800	RH
					Q11159.EL3	0/800	RH
High Temperature Operating Life (HTOL)	B1	JESD22-A108	125°C<Tj<135°C, Biased, 2,000 Hours	AD8604	Q22740.1.HTOL1_CuW	0/77	RCH
					Q22740.2.HTOL2_CuW	0/77	RCH
				AD7401A	Q10023.HO1	0/77	RCH
					Q10023.HO2	0/77	RCH
					Q10023.HO3	0/77	RCH
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	AD8604	Q22740.1.HTS1_CuW	0/77	RH
					Q22740.2.HTS2_CuW	0/77	RH
					Q22740.3.HTS3_CuW	0/77	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, P192	AD8604	Q22740.1.HA1_CuW	0/77	RH
					Q22740.2.HA2_CuW	0/77	RH
					Q22740.3.HA3_CuW	0/77	RH

[1] These samples were subjected to preconditioning at MSL 1 with 3x reflow peak temp of 260°C prior to the start of the stress test.

Package/Assembly Product Characteristics

Table 3: Package/Assembly Product Characteristics - 14-SOIC_N at AMKOR (AP1)

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	AD8604
Package	14-SOIC_N
Body Size (mm)	5.00 x 4.00 x 1.75
Assembly Location	AMKOR (AP1)
MSL/Peak Reflow Temperature(°C)	1 / 260°C
Mold Compound	Sumitomo G700LS
Die Attach/Underfill/TIM	Ablestik 8290A conductive
Leadframe Material	Copper
Lead Finish	100Sn
Wire Bond Material/Diameter (mils)	PdCuAu / 1.00

Package/Assembly Test Results

Table 4: Package/Assembly Test Results - SOIC_N at AMKOR (AP1)

Test Name	AEC #	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS	eTest Temp
High Temperature Storage Life (HTSL)	A6	JESD22-A103	150°C, 2,000 Hours	AD8604	Q22740.1.HTS1_CuW	0/77	RH
					Q22740.2.HTS2_CuW	0/77	RH
					Q22740.3.HTS3_CuW	0/77	RH
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	A2	JESD22-A110	130C 85%RH 33.3 psia, Biased, P192	AD8604	Q22740.1.HA1_CuW	0/77	RH
					Q22740.2.HA2_CuW	0/77	RH
					Q22740.3.HA3_CuW	0/77	RH
Solder Heat Resistance (SHR)	A1	J-STD-020	MSL-1	AD8604	Q22740.1.SH1_CuW	0/11	R
					Q22740.2.SH2_CuW	0/11	R
					Q22740.3.SH3_CuW	0/11	R
Temperature Cycling (TC)[1]	A4	JESD22-A104	-65°C/+150°C, 2,000 Cycles	AD8604	Q22740.1.TC1_CuW	0/77	RH
					Q22740.2.TC2_CuW	0/77	RH
					Q22740.3.TC3_CuW	0/77	RH
Unbiased HAST (UHST)[1]	A3	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	AD8604	Q22740.1.UH1_CuW	0/77	R
					Q22740.2.UH2_CuW	0/77	R
					Q22740.3.UH3_CuW	0/77	R

[1] These samples were subjected to preconditioning at MSL 1 with 3x reflow peak temp of 260°C prior to the start of the stress test.

ESD and Latch-Up Test Results

Table 5: ESD Test Result

ESD Model	Generic/Root Part #	Package	ESD Test Spec	RC Network	Highest Pass Level	Class
FICDM	AD8604	8-SOIC_N	JS-002	1Ω, Cpkg	±1250V	C3

Approvals

Reliability Engineer: Pernell Marc Mosuela

Appendix

AEC -Q006 – Qualification Requirements for Products using Cu Wire Interconnections

Step	Stress Tests / Qualification Step	TC (-55°C to 125°C) JESD22-A104	HAST (130°C/85%RH) JESD22-A101	HTSL (150°C) JESD22-A103
1	Initial Sampling (T0)[1]	Sample size as required		
2	CSAM @ T0	Sample size as required		
3	Preconditioning to MSLx	3x77	3x77	--
4	CSAM after PC	3x22	3x22	--
5	ATE Test[1]	3x77	3x77	3x45
6	Stress 1x	3x77	3x77	3x45
7	ATE Test[1]	3x77	3x77	3x45
8	CSAM post-1x stress	3x22	3x22	--
9a	Ball + Stitch/Wedge Pull	3x3	3x3	--
9b	Ball Shear	3x3	3x3	--
10	Cross-section	3x1	3x1	3x1
11	Stress 2x	3x70	3x70	3x44
12	ATE Test[1]	3x70	3x70	3x44
13	CSAM post-2x Stress	3x22	3x22	--
14a	Ball + Stitch/Wedge Pull	3x2	3x2	--
14b	Ball Shear	3x2	3x2	--
15	Cross-section	3x1	3x1	3x1

[1] These samples were tested at the ATE in Ambient and Hot temperature

		Qual Lot 1, Q22740.1			Qual Lot 2, Q22740.2			Qual Lot 3, Q22740.3		
AEC #	**Test**	**TCT**	**HAST**	**HTS**	**TCT**	**HAST**	**HTS**	**TCT**	**HAST**	**HTS**
1[1]	**Initial Sampling (T0) [1]**	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77
2	**CSAM @ T0**	0/77	0/77	- -	0/77	0/77	- -	0/77	0/77	- -
3	**Preconditioning to MSL 1**	0/77	0/77	- -	0/77	0/77	- -	0/77	0/77	- -
4	**CSAM after PC**	0/77	0/77	- -	0/77	0/77	- -	0/77	0/77	- -
5[1]	**ATE Test**	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77
6	**Stress 1x**	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77
7[1]	**ATE Test**	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77
8	**CSAM post-1x stress**	0/77	0/77	- -	0/77	0/77	- -	0/77	0/77	- -
9a	**Ball + Stich/Wedge Pull**	- -	- -	- -	- -	- -	- -	- -	- -	- -
9b	**Ball Shear**	- -	- -	- -	- -	- -	- -	- -	- -	- -
10	**Cross-section**	- -	- -	- -	- -	- -	- -	- -	- -	- -
11	**Stress 2x**	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77
12[1]	**ATE Test**	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77	0/77
13	**CSAM post-2x stress**	0/77	0/77	- -	0/77	0/77	- -	0/77	0/77	- -
14a	**Ball + Stich/Wedge Pull**	0/3	0/3	- -	0/3	0/3	- -	0/3	0/3	- -
14b	**Ball Shear**	0/3	0/3	- -	0/3	0/3	- -	0/3	0/3	- -
15	**Cross-section**	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

[1] These samples were tested at the ATE in Ambient and Hot temperature.