



Reliability Report

Report Title: HMC625BLP5E New Product Qualification
Report Number: 12286
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Summary

This report documents the successful completion of the reliability qualification requirements for the release of the HMC625BLP5E product in a 32-LFCSP package. The HMC625BLP5E is a digitally controlled variable gain amplifier which operates from DC to 5 GHz, and can be programmed to provide anywhere from 13.5 dB attenuation, to 18 dB of gain, in 0.5 dB steps.

Table 1: HMC625BLP5E Product Characteristics

Die/Fab

Die Id	93201	F1501	K2001
Die Size (mm)	0.51 x 0.94	1.60 x 1.07	0.76 x 0.48
Wafer Fabrication Site	TSMC Fab-11	WIN Semi	WIN Semi
Wafer Fabrication Process	0.35 μ m CMOS	0.5 μ m GaAs PHEMT	GaAs HBT
Approximate Transistor Count	850	210	7
Passivation Layer	undoped-oxide/SiN	SiN	SiN
Bond Pad Metal Composition	AlCu	Au	Au

Package/Assembly

Package	32-LFCSP
Body Size (mm)	5.00 x 5.00 x 0.85
Assembly Location	Unisem
Molding Compound	Sumitomo G770HCD
Wire Type	Gold
Wire Diameter (mils)	1.00
Die Attach	Sumitomo CRM1076DJ
Lead Frame Material	Copper
Lead Finish	Matte Sn
Moisture Sensitivity Level	3
Maximum Peak Reflow Temperature (°C)	260

Description / Results of Tests Performed

Tables 2 through 5 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: LFCSP at Unisem Package Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Solder Heat Resistance (SHR) ¹	J-STD-020	MSL-3	HMC625BLP5E	Q12286.2	25	0
Temperature Cycling (TC) ¹	JESD22-A104	-65°C/+150°C, 500 Cycles	HMC625BLP5E	Q12286.1	45	0
			HMC6409LP5E	Q12405.2	25	0
			HMC681LP5	QTR2010-00009	77	0
			HMC890LP5	QTR2013-00020	77	0
			HMC966LP4	QTR2012-00014	77	0
			HMC6445LP4B	QTR2012-00021	77	0
			HMC996LP4	QTR2012-00027	77	0
			HMC1020LP4	QTR2012-00276	77	0
			HMC700LP4	QTR2012-00326	77	0
			HMC472LP4	QTR2013-00013	77	0
HMC1056LP4B	QTR2014-00068	77	0			
HMC6409LP5E	Q12405.1	25	0			
Temperature Humidity Bias (THB) ¹	JESD22-A101	85°C, 85%RH, Biased, 1,000 Hours	HMC966LP4	QTR2012-00014	77	0
HAST ¹	JESD22-A110	130°C, 85%RH, Biased, 96 Hours	HMC996LP4	QTR2012-00027	77	0
			HMC6445LP4B	QTR2012-00021	77	0
			HMC681LP5	QTR2010-00009	77	0
uHAST ¹	JESD22-A118	130°C, 85%RH, 96 Hours	HMC890LP5	QTR2013-00020	77	0
			HMC996LP4	QTR2012-00027	77	0
			HMC1020LP4	QTR2012-00276	77	0
			HMC700LP4	QTR2012-00326	77	0
			HMC472LP4	QTR2013-00013	77	0
			HMC1056LP4B	QTR2014-00068	77	0
HTSL	JESD22-A103	150°C, 1000 Hours	HMC966LP4	QTR2012-00014	77	0
			HMC6445LP4B	QTR2012-00021	77	0
			HMC996LP4	QTR2012-00027	77	0
			HMC1020LP4	QTR2012-00276	77	0
			HMC700LP4	QTR2012-00326	77	0
HMC472LP4	QTR2013-00013	77	0			
HMC1056LP4B	QTR2014-00068	77	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 3: 0.35µm CMOS at TSMC Fab-11 Fab Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
Early Life Failure Rate (ELFR)	MIL-STD-883, M1015	125°C, 48 Hours	AD5816	Q8899.EL1a	250	0
				Q8899.EL1b	250	0
				Q8899.EL1c	50	0
				Q8899.EL2a	250	0
				Q8899.EL2b	250	0
			SSM2302	Q8899.EL2c	50	0
				Q8479.20	125	0
				Q8479.21	125	0
High Temperature Operating Life (HTOL)	JESD22-A108	125°C<Tj<135°C, Biased, 1,000 Hours	AD5816	Q8899.HO1	77	0
			AD5816	Q8899.HO2	77	0
			ADUX1001	Q9581.1	77	0
			SSM2302	Q7439.0510	50	0
				Q7499.1910	50	0
				Q7875.11	50	0
				Q8061.7	50	0
				Q8061.8	50	0
		Ta=130C, Biased, 500 Hours	SSM2356	Q8478.5	50	0
			SSM2356	Q8478.6	50	0
			SSM2801	Q7596.1	45	0
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	SSM2315	Q9391.4	77	0
				Q9391.5	77	0
				Q9391.6	77	0
		150°C, 500 Hours		Q11284.99	50	0
				Q9520.28	50	0
				Q9811.253	50	0
			SSM2375	Q10689.146	50	0
Highly Accelerated Temperature and Humidity Stress Test (HAST)	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	SSM2315	Q10097.270	25	0
				Q11284.98	50	0
				Q9811.256	50	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) ¹	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	ADP151	Q9518.5	77	0
				Q9518.6	77	0
				Q9577.20	77	0
				Q9577.21	77	0
				Q9577.23	77	0
			ADP160	Q9577.24	77	0
				Q9309.12	77	0
				Q9309.8	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.

Table 4: 0.5µm GaAs PHEMT at WinSemi Fab 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	HMC545A	Q11832.2	77	0
			HMC642ALC5	Q11916.1	45	0
			HMC649ALP6E	Q11919.2	45	0
			HMC349A	QTR2012-00017	45	0
			HMC273A	QTR2012-00042	77	0
			HMC284A	QTR2012-00461	77	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) ¹	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	HMC349A	QTR2014-00445	25	0
			HMC253A	Q11833.9	77	0
uHAST ¹	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	HMC545A	Q11832.10	77	0
			HMC284A	QTR2012-00461	77	0
Temperature Humidity Bias (THB) ¹	JESD22-A101	85°C, 85%RH, Biased, 1,000 Hours	HMC349A	QTR2014-00445	25	0
			HMC284A	QTR2012-00461	77	0
High Temperature Operating Life (HTOL)	JESD22-A108	150°C<T _j <175°C, Biased, 1,000 Hours	HMC1190A	Q11869	45	0
			HMC349A	QTR2012-00017	77	0
			HMC349A	QTR2014-00445	77	0
			HMC273A	QTR2012-00042	77	0
			HMC284A	QTR2012-00461	160	0
		168 hours	HMC1190A	Q11869	45	0
			HMC472A	QTR2013-00524	1134	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: GaAs HBT at WinSemi Fab Qualification Test Results

Test Name	Specification	Conditions	Device	Lot #	Sample Size	Qty. Failures
High Temperature Operating Life (HTOL)	JESD22-A108	150°C<T _j <175°C, Biased, 1,000 Hours	HMC589AST89E	Q12223.4	77	0
				Q12223.6	77	0
				Q12223.7	77	0
			HMC789	QTR10004	77	0
			HMC2172	QTR2013-00339	77	0
Highly Accelerated Temperature and Humidity Stress Test (HAST) ¹	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	HMC589AST89E	Q12223.1	77	0
				Q12223.13	77	0
				Q12223.8	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.

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 Charged Device Model (FICDM) ESD testing are summarized in Table 6. 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 6: HMC625BLP5E ESD Test Results

ESD Model	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM	32-LFCSP	JESD22-C101	1Ω, Cpkg	±500V	±750V	III
HBM	32-LFCSP	ESDA/JEDEC JS-001-2011	1.5kΩ, 100pF	±250V	±500V	1A

Approvals

Reliability Engineer: Carl Bunis

Additional Information

Data sheets and other additional information are available on [Analog Devices' web site](#)