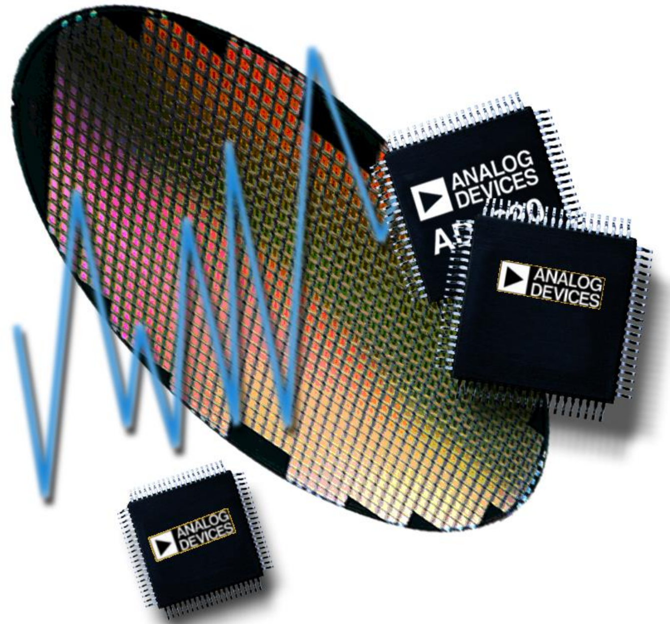

Reliability Report

Report Title: LTC9101 LFCSP Material Set Change (Copper Wire) Qualification

Report Number: 22038

Revision: A

Date: 5 September 2024

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the LTC9101 product in a 24-LFCSP package with copper wire. The LTC9101 chipset is an 8/16-port power sourcing equipment (PSE) controller and power manager designed for use in IEEE 802.3at compliant Power over Ethernet (PoE) systems. The LTC9101 manages a user-defined system-level power budget across all ports. Port power is automatically assigned based on system power availability, initial physical classification, and after power up, port dynamic power consumption. This also covers the LTC9101 generics LTC9101-1, LTC9101-2, LTC9101-2A, LTC9101-2B, and LTC9101-3.

Die/Fab Product Characteristics

Table 1: Die/Fab Product Characteristics - 90nm CMOS

Product Characteristics	Product(s) to be qualified	Product(s) used for Substitution Data		
Generic/Root Part #	LTC9101	ADuCM3029	ADuCM4150	ADuCM355
Die Id	TMLU94 A	TMHG23/A-T1	TMID66/A0001A	TMHG23-T1
Die Size (mm)	1.90 x 2.58	2.68 x 2.68	3.62 x 3.20	2.80 x 2.80
Wafer Fabrication Site	TSMC	TSMC	TSMC	TSMC
Wafer Fabrication Process	90nm CMOS	90nm CMOS	90nm CMOS	90nm CMOS
Die Substrate	Si	Si	Si	Si
Metallization / # Layers	AlCu/6	AlCu/6	AlCu/6	AlCu/6
Passivation	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN	undoped-oxide/SiN

Die/Fab Test Results

Table 2: Die/Fab Test Results - 90nm CMOS at TSMC Fab-14

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
Early Life Failure Rate (ELFR)	MIL-STD-883, M1015	Ta=125°C, 48 Hours	LTC9101	Q16659.2ELFA/2ELFB	0/667
				Q16659.3ELF.A/3ELF.B	0/667
				Q16659.4ELF_A/4ELF_B	0/667
			ADuCM355	Q12914.EL1	0/660
				Q12914.EL3	0/800
			ADuCM4150	QL12865ELF01/02/03	0/667
				QL12865EL04/05/06	0/667
				QL12865EL07/08/09	0/667
			ADuCM3029	QL12316ELF01/02/03	0/667
				QL12316ELF04/05/06/07	0/667
				QL12316ELLF08/09/10	0/667
High Temperature Operating Life (HTOL)	JESD22-A108	125°C<Tj<135°C, Biased, 1,000 Hours	LTC9101	Q16659.1HTOL	0/77
				Q16659.2HTOL	0/77
				Q16659.3HTOL	0/77
			ADuCM355	Q12914.HO1	0/45
				Q12914.HO2	0/45
				Q12914.HO3	0/45
				Q12914.HO4	0/45
				Q12914.HO5	0/45
			ADuCM4150	QL12865HTL01	0/45
				QL12865HTL02	0/45
				QL12865HTL03	0/45
			ADuCM3029	QL12316HTL01	0/77
				QL12316HTL02	0/77
				QL12316HTL03	0/77
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	LTC9101	Q16659.1HTS	0/45
				Q16659.2HTS	0/45
				Q16659.3HTS	0/45

			ADuCM355	Q12914.HS1	0/45
		150°C, 2,000 Hours	LTC9101	Q22038.1.HS-0.8milCUWi	0/45
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	JESD22-A110	130C 85%RH 33.3 psia, Biased, 96 Hours	LTC9101	Q16659.2BHAST	0/77
				Q16659.3BHAST	0/77
				Q16659.4BHAST	0/77
			ADuCM355	Q12914.HA2	0/45
				Q12914.HA3	0/45
				Q12914.HA4	0/45
Temperature, Humidity, and Bias Test (THB)[1]	JESD22-A101	85C 85%RH, Biased, 1000 Hours	ADuCM4150	QL12865THB01	0/45
				QL12865THB02	0/45
				QL12865THB03	0/45
			ADuCM3029	QL12316THB01	0/77
				QL12316THB02	0/77
				QL12316THB03	0/77

[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 - 24-LFCSP at UTAC (UT2)

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	LTC9101
Package	24-LFCSP
Body Size (mm)	4.00 x 4.00 x 0.75
Assembly Location	UTAC (UT2)
MSL/Peak Reflow Temperature(°C)	1 / 260°C
Mold Compound	Sumitomo G770SHC
Die Attach	Ablestik 8200T Conductive
Leadframe Material	Copper
Lead Finish	100 Sn
Wire Bond Material/Diameter (mils)	PdCuAu 2N / 0.80

Package/Assembly Test Results

Table 4: Package/Assembly Test Results - LFCSP at UTAC (UT2)

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 2,000 Hours	LTC9101	Q22038.1.HS-0.8milCUWi	0/45
Temperature Cycling (TC)[1]	JESD22-A104	-65°C/+150°C, 2,000 Cycles	LTC9101	Q22038.1.TC-0.8milCUWi	0/77
				Q22038.2.TC-0.8milCUWi	0/77
				Q22038.3.TC-0.8milCUWi	0/77
Unbiased HAST (UHST)[1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LTC9101	Q22038.1.UH-0.8milCUWi	0/77
				Q22038.2.UH-0.8milCUWi	0/77
				Q22038.3.UH-0.8milCUWi	0/77
Wirebond Pull Test	MIL-STD-883, M2011	Post – Temperature Cycling	LTC9101	Q22038.2.TCWPT-0.8milCUWi	0/5

[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 Results

ESD Model	Generic/Root Part #	Package	ESD Test Spec	RC Network	Highest Pass Level	First Fail Level	Class
FICDM	LTC9101	24-LFCSP	JS-002	1Ω, Cpkg	±2000V	NA	C3
HBM		24-LFCSP	JS-001	1.5kΩ, 100pF	±4000V	NA	3A

Table 6: Latch-Up Test Results

LU Test Spec	Generic/Root Part #	Passing Current	Passing Over-Voltage	Temperature (Ta)	Class
JESD78	LTC9101	+200mA, -200mA	+3.6V / +3.6V	125C	I

Approvals

Reliability Engineer: Ryan Quintin