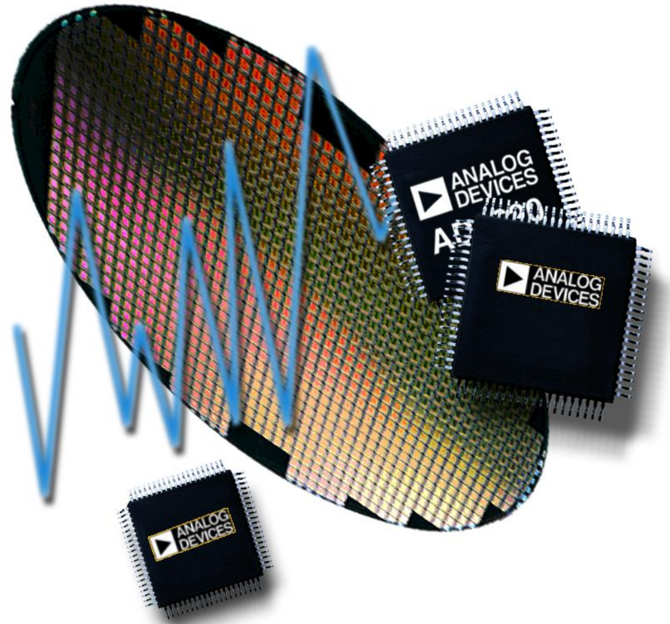

Reliability Report

Report Title: Bond Wire Change from Gold to Copper Wire Qualification for LTC Products at UTAC

Report Number: 23615

Revision: A

Date: 6 February 2025

Summary

This report documents the successful completion of the reliability qualification requirements of Bond Wire change from Gold to Copper wire for LTC products at UTAC for LFCSP/SO/TSSOP/TSOT/SC70 package family.

The products listed below were selected to cover the bond wire change for this project:

The LT3755 in a 16- MINI_SO_EP package DC/DC is a controller designed to operate as a constant-current source for driving high current LEDs.

The LT8603 in a 40-LFCSP package is a highly flexible, quad output regulator combining two high input voltage capable monolithic step-down switching regulators, one low input voltage capable monolithic step-down regulator, and a boost controller to satisfy a wide range of applications while occupying minimal board space.

The LT8620 in a 16- MINI_SO_EP package is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator that accepts a wide input voltage range up to 65V and consumes only 2.5µA of quiescent current.

The LT1914 in a 16-MINI_SO_EP package is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator that consumes only 1.7µA of non-switching quiescent current. The LT1914 can deliver 3A of continuous current. The LT1914 is available with an adjustable output or a fixed 3.3V output.

The LT3752 in a 16-MINI_SO_EP package is a current mode PWM controller optimized for an active clamp forward converter topology. A DC/DC housekeeping controller is included for improved efficiency and performance. The LT3752 allows operation up to 100V input and the LT3752-1 is optimized for applications with input voltages greater than 100V.

The LTC4412 in a 6-TSOT package controls an external P-channel MOSFET to create a near ideal diode function for power switchover or load sharing. This permits highly efficient OR'ing of multiple power sources for extended battery life and low self-heating. When conducting, the voltage drop across the MOSFET is typically 20mV.

The LTC7000 in a 16-MINI_SO_EP package is a fast high side N-channel MOSFET gate driver that operates from input voltages up to 135V. It contains an internal charge pump that fully enhances an external N-channel MOSFET switch, allowing it to remain on indefinitely.

Die/Fab Product Characteristics

Table 1: Die/Fab Product Characteristics- <2.5um^2 Bipolar

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	LT3755
Die Id	L3755+2 A
Die Size (mm)	1.52 x 1.19
Wafer Fabrication Site	I_WILM1B06
Wafer Fabrication Process	<2.5um^2 Bipolar
Die Substrate	Si
Metallization / # Layers	AlSi(1.0%)Cu(0.5%)/2
Polyimide	Yes
Passivation	doped-oxide/OxyNitride

Table 1.2: Die/Fab Product Characteristics- 0.35um BCDMOS

Product Characteristics	Product(s) to be qualified	
Generic/Root Part #	LT8603	LT8620
Die Id	8603	8620
Die Size (mm)	2.55 x 2.9	2.83 x 1.66
Wafer Fabrication Site	E_VANG0108	E_VANG0108
Wafer Fabrication Process	0.35um BCDMOS	0.35um BCDMOS
Die Substrate	Si	Si
Metallization / # Layers	AlCu(0.5%)/2	AlCu(0.5%)/2
Polyimide	No	No
Passivation	doped-oxide/SiN	doped-oxide/SiN

Table 1.3: Die/Fab Product Characteristics- 0.35um DMOS

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	LT1914
Die Id	8609-1
Die Size (mm)	1.20 x 1.86
Wafer Fabrication Site	E_VANG0108
Wafer Fabrication Process	VP6687
Die Substrate	Si
Metallization / # Layers	AlCu(0.5%)/0
Polyimide	No
Passivation	undoped-oxide/SiN

Table 1.4: Die/Fab Product Characteristics- BiCMOS

Product Characteristics	Product(s) to be qualified		
Generic/Root Part #	LT3752	LTC4412	LTC7000
Die Id	6L3752-2XV-F 06	6L4412XV-F 12	7000
Die Size (mm)	1.98 x 2.57	1.47 x 0.81	1.58 x 1.78
Wafer Fabrication Site	ADI-Camas	ADI-Camas	I_CAMA0106
Wafer Fabrication Process	BiCMOS	BiCMOS	BiCMOS
Die Substrate	Si	Si	Si
Metallization / # Layers	AlCu(0.5%)/3	AlCu(0.5%)/3	AlCu(0.5%)/3
Polyimide	No	No	No
Passivation	undoped-oxide/SiN	doped-oxide/SiN	doped-oxide/SiN

Package/Assembly Product Characteristics

Table 2.1: Package/Assembly Product Characteristics - 16-MINI_SO_EP at UTAC (UT3)

Product Characteristics	Product(s) to be qualified			
Generic/Root Part #	LT1914	LT3755	LT8620	LTC7000
Package	16-MINI_SO_EP	16-MINI_SO_EP	16-MINI_SO_EP	16-MINI_SO_EP
Body Size (mm)	4.04 x 3.00 x 0.86	4.04 x 3.00 x 0.86	3.00 x 4.04 x 0.86	3.00 x 4.04 x 0.86
Assembly Location	UTAC (UT3)	UTAC (UT3)	UTAC (UT3)	UTAC (UT3)
MSL/Peak Reflow Temperature(°C)	1/260°C	1/260°C	1/260°C	1/260°C
Mold Compound	Sumitomo E670C	Sumitomo E670C	Sumitomo E670C	Sumitomo E670C
Die Attach/Underfill/TIM	Ablestik 8200T Conductive	Ablestik 8200T Conductive	Ablestik 8290 conductive	Ablestik 8200T Conductive
Leadframe Material	Copper	Copper	Copper	Copper
Lead Finish	100Sn	100Sn	100Sn	100Sn
Wire Bond Material/Diameter (mils)	PdCuAu 4N / 1.00	PdCuAu 4N / 1.00	PdCuAu 4N / 1.30	PdCuAu 4N / 1.00

Table 2.2: Package/Assembly Product Characteristics - 38-TSSOP_4.4_EP at UTAC (UT3)

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	LT3752
Package	38-TSSOP_4.4_EP
Body Size (mm)	6.40 x 9.80 x 1.20
Assembly Location	UTAC (UT3)
MSL/Peak Reflow Temperature(°C)	1/260°C
Mold Compound	Sumitomo G605L
Die Attach/Underfill/TIM	Atrox 558-2C31 electrically conductive and thermally high conductive
Leadframe Material	Copper
Lead Finish	100Sn
Wire Bond Material/Diameter (mils)	PdCuAu 4N / 1.00

Table 2.3: Package/Assembly Product Characteristics - 40-LFCSP at UTAC (UT2)

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	LT8603
Package	40-LFCSP
Body Size (mm)	6.00 x 6.00 x 0.75
Assembly Location	UTAC (UT2)
MSL/Peak Reflow Temperature(°C)	1/260°C
Mold Compound	Sumitomo G700LTD
Die Attach	Ablestik 8600 conductive
Leadframe Material	Copper
Lead Finish	100Sn
Wire Bond Material/Diameter (mils)	PdCuAu 4N / 1.30

Table 2.4: Package/Assembly Product Characteristics - 6-TSOT at UTAC (UT3)

Product Characteristics	Product(s) to be qualified
Generic/Root Part #	LTC4412
Package	6-TSOT
Body Size (mm)	2.90 x 1.75 x 0.90
Assembly Location	UTAC (UT3)
MSL/Peak Reflow Temperature(°C)	1/260°C
Mold Compound	Hitachi CEL 9220HF13
Die Attach	Ablestik 84-1 LMISR4 conductive
Leadframe Material	Copper
Lead Finish	100Sn
Wire Bond Material/Diameter (mils)	PdCuAu 4N / 1.00

Package/Assembly Test Results

Table 3.1: 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, 1,000 Hours	LT8603	Q23075.1.HT1	0/45
Solder Heat Resistance (SHR)	J-STD-020	MSL-1	LT8603	Q23400.1.SH1	0/11
				Q23400.2.SH2	0/11
				Q23400.3.SH3	0/11
		MSL-3		Q22711.1.SH1	0/11
				Q22711.2.SH2	0/11
				Q22711.4.SH4	0/11
Temperature Cycling (TC)[1]	JESD22-A104	-65°C/+150°C, 500 Cycles	LT8603	Q23401.1.TC1	0/45
				Q23401.2.TC2	0/45
				Q23401.3.TC3	0/45
Unbiased HAST (UHAST)[1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LT8603	Q23400.1.UH1	0/77
				Q23400.3.UH3	0/77
Highly Accelerated Temperature and Humidity Stress Test (HAST)1	JESD22- A110	130°C 85%RH 33.3 psia, Biased, 96 Hours	LT8603	Q23400.1.HA1	0/77
				Q23400.2.HA2	0/77
				Q23400.3.HA3	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.

Table 3.2: Package/Assembly Test Results - MINI_SO_EP at UTAC (UT3)

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	LT1914	Q23070.1.HT1	0/45
			LT3755	Q23067.1.HT1	0/77
			LT8620	Q22703.1.HT1	0/77
			LTC7000	Q23071.1.HT1	0/77
Solder Heat Resistance (SHR)	J-STD-020	MSL-1	LT1914	Q22700.1.SH1	0/11
				Q22700.2.SH2	0/11
				Q22700.3.SH3	0/11
			LT3755	Q22701.1.SH1	0/11
				Q22701.2.SH2	0/11
				Q22701.3.SH3	0/11

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
			LT8620	Q22703.1.SH1	0/11
				Q22703.2.SH2	0/11
				Q22703.3.SH3	0/11
			LTC7000	Q22702.1.SH1	0/11
				Q22702.2.SH2	0/11
				Q22702.3.SH3	0/11
Temperature Cycling (TC)[1]	JESD22-A104	-65°C/+150°C, 500 Cycles	LT1914	Q23070.1.TC1	0/77
				Q23070.2.TC2	0/77
				Q23070.3.TC3	0/77
			LT3755	Q23067.1.TC1	0/77
				Q23067.2.TC2	0/77
				Q23067.3.TC3	0/77
			LT8620	Q22703.1.TC1	0/77
				Q22703.2.TC2	0/77
				Q22703.3.TC1	0/77
			LTC7000	Q23071.1.TC1	0/77
				Q23071.2.TC2	0/77
				Q23071.3.TC3	0/77
Unbiased HAST (UHAST)[1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LTC7000	Q22702.1.UH1	0/77
				Q22700.2.UH2	0/74[2]
				Q22702.3.UH3	0/77
			LT1914	Q22700.3.UH3	0/77
				Q22700.1.UH1	0/77
				Q22700.3.UH3	0/77
			LT3755	Q22701.1.UH1	0/77
				Q22701.2.UH2	0/77
			LT8620	Q22703.1.UH1	0/77
				Q22703.2.UH2	0/77
				Q22703.3.UH3	0/77
Highly Accelerated Temperature and Humidity Stress Test (HAST)[1]	JESD22-A110	130°C 85%RH 33.3 psia, Biased, 96 Hours	LT1914	Q22700.1.HA1	0/77
				Q22700.2.HA2	0/77
				Q22700.3.HA3	0/77

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
			LTC7000	Q22702.1.HA1	0/77
				Q22702.2.HA2	0/77
				Q22702.3.HA3	0/77
			LT3755	Q22701.1.HA1	0/77
				Q22701.2.HA2	0/77
				Q22701.3.HA3	0/77
			LT8620	Q22703.1.HA2	0/77
				Q22703.2.HA3	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.
[2] Sample size reduced due to missing/damaged unit

Table 3.3: Package/Assembly Test Results - TSOT at UTAC (UT3)

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	LTC4412	Q23104.1.HT1	0/45
Solder Heat Resistance (SHR)	J-STD-020	MSL-1	LTC4412	Q22699.1.SH1	0/45
				Q22699.2.SH2	0/45
				Q22699.3.SH3	0/45
Temperature Cycling (TC)[1]	JESD22-A104	-65°C/+150°C, 500 Cycles	LTC4412	Q23104.1.TC1	0/77
				Q23104.2.TC2	0/77
				Q23104.3.TC3	0/77
Unbiased HAST (UHAST)[1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LTC4412	Q22699.1.UH1	0/77
				Q22699.2.UH2	0/77
				Q22699.3.UH3	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.

Table 3.4: Package/Assembly Test Results - TSSOP_4.4_EP at UTAC (UT3)

Test Name	Spec	Conditions	Generic/Root Part #	Lot #	Fail/SS
High Temperature Storage Life (HTSL)	JESD22-A103	150°C, 1,000 Hours	LT3752	Q23074.1.HT1	0/45
Solder Heat Resistance (SHR)	J-STD-020	MSL-1	LT3752	Q22705.1.SH1	0/11
				Q22705.2.SH2	0/11
				Q22705.3.SH3	0/11
Temperature Cycling (TC)[1]	JESD22-A104	-65°C/+150°C, 500 Cycles	LT3752	Q23074.1.TC1	0/77
				Q23074.2.TC2	0/77
				Q23074.3.TC3	0/77
Unbiased HAST (UHAST)[1]	JESD22-A118	130C 85%RH 33.3 psia, 96 Hours	LT3752	Q22705.1.UH1	0/77
				Q22705.2.UH2	0/77
				Q22705.3.UH3	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.

Approvals

Reliability Engineer: Cyrus De Leon