# Product/Process Change Notice - PCN 24_0002 Rev. -

Analog Devices, Inc. One Analog Way, Wilmington, MA 01887, USA

This notice is to inform you of a change that will be made to certain ADI products (see Appendix A) that you may have purchased in the last 2 years. **Any inquiries or requests with this PCN (additional data or samples) must be sent to ADI within 30 days of publication date.** ADI contact information is listed below.

| | |
|---|---|
| **PCN Title:** | Qualification of New Mold Compound, SMT Paste and Pillar Diameter Change for LT8645S, LT8645S-2, LT8646S |
| **Publication Date:** | 06-Feb-2024 |
| **Effectivity Date:** | 10-May-2024 *(the earliest date that a customer could expect to receive changed material)* |
| **Revision Description:** | Initial Release |

## Description Of Change:

Following changes will be made:

1. SMT attach material from SnSb5 to SAC305
2. Cu pillar size from 85um to 100um
3. Molding compound Sumitomo E670E to Sumitomo G311E

## Reason For Change:

Improve manufacturability.

## Impact of the change (positive or negative) on fit, form, function & reliability:

No impact on form, fit, function and reliability.

## Product Identification *(this section will describe how to identify the changed material)*

The date code will be provided to the customer upon implementation.

## Summary of Supporting Information:

Qualification has been performed per AEC-Q100, Stress Test Qualification for Integrated Circuits. See the attached Qualification Results Summary.

## Supporting Documents

**Attachment 1: Type**: Qualification Results Summary

ADI_PCN_24_0002_Rev_-_LT8645S_Relibility Report.pdf...

---

**Attachment 2: Type**: Delta Qualification Matrix

ADI_PCN_24_0002_Rev_-_PCN-Delta-Qualification-Matrix-ZVEI-5_0_14 1.xls...

---

**Attachment 3: Type**: Other

ADI_PCN_24_0002_Rev_-_Thermal analysis summary LT8645S_20240118.xlsx...

Note: If applicable, the device material declaration will be updated due to material change.

## ADI Contact Information:

For questions on this PCN, please send an email to the regional contacts below or contact your local ADI sales representatives.

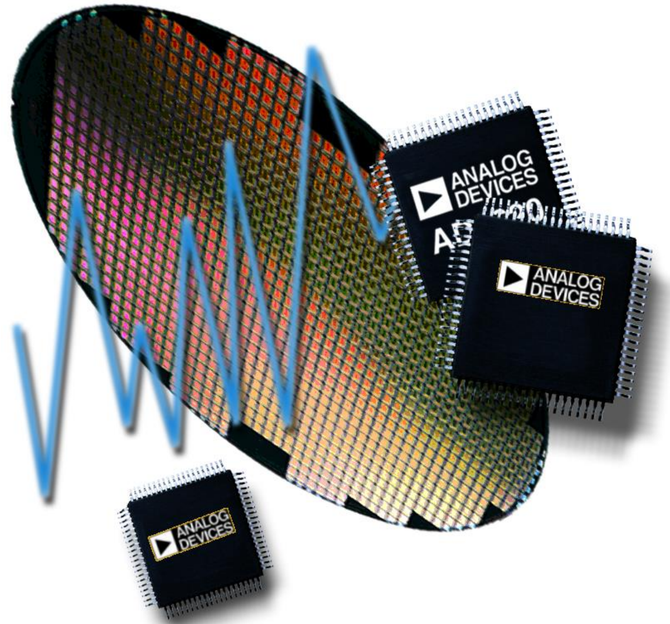
| Americas: | Europe: | Japan: | Korea: | Rest of Asia: |
| --- | --- | --- | --- | --- |
| PCN_Americas@analog.com | PCN_Europe@analog.com | PCN_Japan@analog.com | PCN_Korea@analog.com | PCN_ROA@analog.com |

## Appendix A - Affected ADI Models:

| Added Parts On This Revision - Product Family / Model Number (29) | | | | |
|---|---|---|---|---|
| LT8645S / LT8645SEV#PBF | LT8645S / LT8645SEV#TRPBF | LT8645S / LT8645SEV#WPBF | LT8645S / LT8645SEV#WTRPBF | LT8645S / LT8645SIV#PBF |
| LT8645S / LT8645SIV#TRPBF | LT8645S / LT8645SIV#WPBF | LT8645S / LT8645SIV#WTRPBF | LT8645S-2 / LT8645SEV-2#PBF | LT8645S-2 / LT8645SEV-2#TRMPBF |
| LT8645S-2 / LT8645SEV-2#TRPBF | LT8645S-2 / LT8645SEV-2#WPBF | LT8645S-2 / LT8645SHV-2#3ZZPBF | LT8645S-2 / LT8645SHV-2#PBF | LT8645S-2 / LT8645SHV-2#TRMPBF |
| LT8645S-2 / LT8645SHV-2#TRPBF | LT8645S-2 / LT8645SHV-2#WPBF | LT8645S-2 / LT8645SJV-2#PBF | LT8645S-2 / LT8645SJV-2#TRMPBF | LT8645S-2 / LT8645SJV-2#TRPBF |
| LT8645S-2 / LT8645SJV-2#WPBF | LT8646S / LT8646SEV#PBF | LT8646S / LT8646SEV#TRPBF | LT8646S / LT8646SEV#WPBF | LT8646S / LT8646SEV#WTRPBF |
| LT8646S / LT8646SIV#PBF | LT8646S / LT8646SIV#TRPBF | LT8646S / LT8646SIV#WPBF | LT8646S / LT8646SIV#WTRPBF | |

## Appendix B - Revision History:

| Rev | Publish Date | Effectivity Date | Rev Description |
|---|---|---|---|
| Rev. - | 06-Feb-2024 | 10-May-2024 | Initial Release |



# Reliability Report

**Report Title:** LT8645S Material Set Change Automotive Grade 1 Qualification

**Report Number:** 20778

**Revision:** A

**Date:** 4 December 2023

## Summary

This report documents the successful completion of the reliability qualification requirements for the release of the LT8645S product in a 32-LGA package. LT8645S is a 65V,8A synchronous step-down silent switcher 2. Following changes were made, SMD attach material from SnSb5 to SAC305, Cu pillar size from 85um to 100um and molding compound to Sumitomo G311E.

## 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 | • C1, C2 are only applicable for wire bond package.<br>• C5 is only applicable for BGA package.<br>• C3, C4 and C6 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 and Table 6 |
| | Electrostatic Discharge Human Body Model | HBM | E2 | |
| | Electrostatic Discharge Charged Device Model | CDM | E3 | |
| | Latch-Up | LU | E4 | |
| | Electrical Distributions | ED | E5 | • For Tests E5, E6 and E7, ADI New Product Yield Analysis Testing Guidelines meet AEC Q100 requirements.<br>• Results for Tests E7-E11 are available as applicable on a case by case basis.<br>• Test E12 results may be viewed on-site at Analog Devices |
| | Fault Grading | FG | E6 | |
| | Characterization | CHAR | E7 | |
| | 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- 0.35µm DMOS**

| Product Characteristics | Product(s) to be qualified | Product(s) used for Substitution Data | | | | | |
|---|---|---|---|---|---|---|---|
| Generic/Root Part # | LT8645S | LT8365 | LT8638S | LT8645S/SA | LT8650S | LT8648S | LT8686S |
| Die Id | 8645 | 8365 | 8638S | 8645 | 8650 | 8648 | 8686 |
| Die Size (mm) | 1.66 x 4.96 | 1.28 x 2.85 | 4.02 x 2.59 | 1.66 x 4.96 | 1.75 x 3.88 | 6.20 x 2.70 | 3.20 x 1.75 |
| Wafer Fabrication Site | Vanguard | Vanguard | Vanguard | Vanguard | Vanguard | Vanguard | Vanguard |
| Wafer Fabrication Process | 0.35um DMOS | 0.35µm DMOS | 0.35µm DMOS | 0.35µm DMOS | 0.35µm DMOS | 0.35µm DMOS | 0.35µm DMOS |
| Die Substrate | Si | Si | Si | Si | Si | Si | Si |
| Metallization / # Layers | AlCu/3 | AlCu/3 | AlCu/3 | AlCu/3 | AlCu/3 | AlCu/3 | AlCu/3 |
| Polyimide | No | No | No | No | No | No | No |
| Passivation | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN |

## Die/Fab Test Results

**Table 2: Die/Fab Test Results - 0.35µm DMOS at Vanguard**

| Test Name | AEC # | Spec | Conditions | Generic/Root Part # | Lot # | Fail/SS | eTest Temp |
|---|---|---|---|---|---|---|---|
| Early Life Failure Rate (ELFR) | B2 | AEC-Q100-008 | Ta=150C, 48 Hours | LT8365 | Q14979.1ELFR | 0/800 | RH |
| | | | | | Q14979.2ELFR | 0/800 | RH |
| | | | | LT8648S | EO9353.ELFR | 0/800 | RH |
| | | | | LT8650SP | Q17503.1ELFR | 0/800 | RH |
| High Temperature Operating Life (HTOL) | B1 | JESD22-A108 | Ta=125°C, Biased, 1,000 Hours | LT8645SA | Q19687.1HTOL | 0/77 | RCH |
| | | | | LT8645S | 980793.1 | 0/77 | RHC |
| | | | | LT8645S | 977832.1 | 0/77 | RHC |
| | | | Ta=125°C, Biased, 2,000 Hours | LT8645S | Q20778.1HTOL | 0/77 | RCH |
| | | | Ta=150°C, Biased, 1,000 Hours | LT8650S | Q20616.3HTOL | 0/77 | RHC |
| | | | | LT8638S | Q20120.4HTOL | 0/77 | RHC |
| | | | | LT8648S | Q20710.2HTOL | 0/77 | RHC |
| | | | | LT8686S | Q20395.1HTOL | 0/77 | RHC |
| High Temperature Storage Life (HTSL) | A6 | JESD22-A103 | 150°C, 2,000 Hours | LT8638S | Q20120.2HTS | 0/45 | RH |
| | | | | LT8648S | Q20710.2HTS | 0/45 | RH |
| | | | | LT8650S | Q20616.3HTS | 0/45 | RH |
| | | | 150°C, 3,000 Hours | LT8645S | Q20778.1HTS | 0/45 | RH |
| Highly Accelerated Temperature and Humidity Stress Test (HAST)[1] | A2 | JESD22-A110 | 130°C 85%RH 33.3 psia, Biased, 96 Hours | LT8645S | Q20778.1HAST | 0/77 | RH |
| | | | | | Q20778.2HAST | 0/77 | RH |
| | | | | LT8638S | Q20120.3HAST | 0/77 | RH |
| | | | | LT8650S | Q20616.2HAST | 0/77 | RH |
| | | | | | Q20616.3HAST | 0/77 | RH |
| | | | | | Q20616.4HAST | 0/77 | RH |
| | | | 130°C 85%RH 33.3 psia, Biased, 192 Hours | LT8648S | Q20710.1HAST | 0/77 | RH |
| | | | | | Q20710.2HAST | 0/77 | RH |

[1] These samples were subjected to preconditioning at MSL 3 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 - 32-LGA at ASE**

| Product Characteristics | Product(s) to be qualified | Product(s) used for Substitution Data | |
|---|---|---|---|
| Generic/Root Part # | LT8645S | LTC7151S | LTC3312S |
| Package | 32-LGA | 28-LGA | 22- LGA |
| Body Size (mm) | 6.00 x 4.00 x 0.94 | 5.00 x 4.00 x 0.95 | 4.00 x 3.00 x 0.95 |
| Assembly Location | ASE | ASE | ASE |
| MSL/Peak Reflow Temperature(°C) | 3 / 260°C | 3 / 260°C | 3 / 260°C |
| Mold Compound | Sumitomo G311E | Sumitomo G311E | Sumitomo G311E |
| Substrate Material | BT Resin | BT Resin | BT Resin |
| Lead Finish | Au | Au | Au |

## Package/Assembly Test Results

### Table 4: Package/Assembly Test Results - LGA at ASE

| 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 | LTC7151S | Q20802.1.HTS | 0/45 | RH |
| | | | 150°C, 3,000 Hours | LT8645S | Q20778.1HTS | 0/45 | RH |
| Highly Accelerated Temperature and Humidity Stress Test (HAST)[1] | A2 | JESD22-A110 | 130C 85%RH 33.3 psia, Biased, 96 Hours | LT8645S | Q20778.1HAST | 0/77 | RH |
| | | | | | Q20778.2HAST | 0/77 | RH |
| | | | | LTC7151S | Q20802.1HAST | 0/77 | RH |
| Solder Heat Resistance (SHR) | A1 | J-STD-020 | MSL-3 | LT8645S | Q20778.1SHR | 0/77 | R |
| | | | | | Q20778.2SHR | 0/77 | R |
| Temperature Cycling (TC)[1] | A4 | JESD22-A104 | -65°C/+150°C, 2,250 Cycles | LT8645S | Q20778.1TC | 0/77 | RH |
| | | | | | Q20778.2TC | 0/77 | RH |
| | | | -65°C/+150°C, 1,000 Cycles | LTC3312S | Q20857.1.TC1 | 0/77 | RH |
| | | | | | Q20857.1.TC1 | 0/77 | RH |
| | | | -65°C/+150°C, 2,000 Cycles | LTC7151S | Q20802.1.TC | 0/77 | RH |
| Unbiased HAST (UHST)[1] | A3 | JESD22-A118 | 130°C 85%RH 33.3 psia, 96 Hours | LT8645S | Q20778.1UHAST | 0/77 | R |
| | | | | | Q20778.2UHAST | 0/77 | R |
| | | | 110°C 85%RH 17.7 psia, 264 Hours | LTC7151S | Q20802.1.UHAST | 0/77 | R |

[1] These samples were subjected to preconditioning at MSL 3 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 | eTest Temp |
|---|---|---|---|---|---|---|---|
| FICDM | LT8645S | 32-LGA | JS-002 | 1Ω, Cpkg | ±1250V | C3 | RH |
| HBM | LT8645S | 32-LGA | ESDA/JEDEC JS-001-2011 | 1.5kΩ, 100pF | ±4000V | 3A | RH |

**Table 6: Latch Up Test Result**

| LU Test Spec | Generic/Root Part # | Passing Current | Passing Over-Voltage | Temperature ($T_A$) | Class | eTest Temp |
|---|---|---|---|---|---|---|
| **JESD78** | LT8645S | +150mA, -150mA* | +68V/+5.5V/+28V | 125°C | II | RH |

*Except SW pin, highest passing +50mA, -150mA

## Approvals

Reliability Engineer: Devraj Karthikeyan