**TEST**

**PRODUCT**

**QUALIFICATION**

**REPORT**

**TITLE:**

LT86xx Test Site Transfer from Analog Devices Singapore to UTAC Thailand

**PCN Number:**

PCN

**REVISION:**

A

**DATE:**

31 Aug, 2020

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**PROJECT BACKGROUND:**

The LT86xx family is currently undergoing production testing at the Analog Devices Singapore (ADSG). As ADSG is closing in Apr2021, it is a business strategic decision to qualify UTAC Thailand (UTL) to be test site to ensure continuity in supply.

**SUMMARY:**

The LT86xx step-down regulator features Silent Switcher architecture designed to minimize EMI emissions while delivering high efficiency at frequencies up to 3MHz. Assembled in a 3mm × 4mm QFN, the monolithic construction with integrated power switches and inclusion of all necessary circuitry yields a solution with a minimal PCB footprint. An ultralow 2.5μA quiescent current—with the output in full regulation— enables applications requiring highest efficiency at very small load currents.

This report documents the successful completion of the product test transfer requirements for the release of LT86xx family in UTAC Thailand.

**TEST AND PRODUCT INFORMATION:**

Device: LT8614 / LT8640 / LT8641

Package: QFN (3mm x 4mm)

Leads: 18 leads

|  |  |
| --- | --- |
| Generics | FGs |
| LT8614 | LT8614IUDC#PBF |
| LT8614IUDC#TRPBF |
| LT8614HUDC#PBF |
| LT8614HUDC#TRPBF |
| LT8640 | LT8640IUDC#PBF |
| LT8640IUDC#TRPBF |
| LT8640HUDC#PBF |
| LT8640HUDC#TRPBF |
| LT8641 | LT8641IUDC#PBF |
| LT8641IUDC#TRPBF |
| LT8641HUDC#PBF |
| LT8641HUDC#TRPBF |

Affected products:

Tester Platform: ETS364B

Handler: RASCO1000

The LT86xx is planned to be tested in UTAC Thailand using exactly same test design as ADSG, details shown in the Table 1 below:

***Table 1****: LT86xx Test Details*

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters** | **ADSG** | **UTL** | **Remarks** |
| Tester Platform | ETS364B | ETS364B | No change |
| Handler | RASCO1000 | RASCO1000 | No Change |
| Test Flow | FT – QAR – QAH - QAC | FT – QAR – QAH - QAC | No Change |
| Contactor | 18L JTI socket D#9037 | 18L JTI socket D#9037 | No Change |
| Performance Board | LT8614/LT8640 DIB | LT8614/LT8640 DIB | No change |
| Test Program | LT8614\_03  LT8640\_01  LT8641\_00 | LT8614\_03  LT8640\_01  LT8641\_00 | No change |

There is no change to the form, fit and function of the product.

**DESCRIPTION AND TEST RESULTS:**

Below tables provide description of the qualification tests conducted and corresponding test results for LT86xx family, among which LT8614 is selected to be representative of performing detailed parametric correlation analysis and GR&R analysis. All the units have undergone electrical tests on both the sending and receiving sites on the same test platform. Any device that will not meet the electrical qualification requirements will mean failure of the qualification and require solid corrective actions and a repeat of the qualification process. Qualification activities performed, and acceptance criteria is shown on Table 2 below:

**Table 2:** *Qualification Activities and Acceptance Criteria*

|  |  |  |
| --- | --- | --- |
| **Qualification Activity** | **Sample Quantity** | **Accept Criteria** |
| Correlation device run | 5 correlation device units | \*100% Passing correlation devices |
| Parametric Correlation | Minimum of 300 known Bin1 units tested in full product test flow (ALL temperature passes) in Sending site (ADSG) and Receiving site (UTL). | \*CpK≥1.67 \* For tightened limits, Mean Shift Criteria and sigma-spread criteria to apply - Mean Shift Criteria   (ABS (SS\_mean - RS\_Mean) / Limit Range ) x 100 ≤ 5% - Sigma-spread criteria  (RS\_Sigma / SS\_Sigma ) ≤ 1.3 |
|
| Validation Lot Run | Minimum of 2,500 fresh units in full product test flow (ALL temperature passes) | yield between receiving site vs. historical yield of sending site should be comparable |
| Untrimmed/Fresh unit verification using QA program | 5 Fresh (Untrimmed) unit tested in QA Program. | QC program must detect untrimmed or fresh parts |
| GR&R | 10 Bin 1 units tested on 1 board and 3 testers |  |
| R&R % =<10% |
|  |

* *SS = Sending Site*
* *RS = Receiving Site*

To validate full set-up functionality such as hardware, software, test paraphernalia and tester platform, 5 correlation devices of LT86xx were tested both in ADSG and UTL. Data between sites were analyzed and summarized in Table 3.

**Table 3:** *Correlation Device Run result*

|  |  |  |  |
| --- | --- | --- | --- |
| Generic | Package | No. of correlation device | ALL correlation devices passed? |
| LT8614 | 18L QFN | 5 units | YES |
| LT8640 | 18L QFN | 5 units | YES |
| LT8641 | 18L QFN | 5 units | YES |

The LT8614 was further analyzed by testing a sample of minimum 300 known-good-units in both ADSG and UTL. This is to capture variation in tester and set-up condition thru mean shift and sigma spread analysis, to ensure the parameter measurement are still within the accepted range of variations. Data between sites were analyzed and summarized in Table 4.

**Table 4:** *Product Site Transfer Correlation*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Temperature | Generic | Package | Lot Number | Lot Size | Sending Site | Receiving Site | Total No. of Correlation Parameters | Result |
| Ambient | LT8614 | 18L QFN | 1012692.1 | 310 | ADSG | UTL | 153 | ALL PASSED |
| Hot | LT8614 | 18L QFN | 1012692.1 | 310 | ADSG | UTL | 153 | ALL PASSED |
| Cold | LT8614 | 18L QFN | 1012692.1 | 310 | ADSG | UTL | 153 | ALL PASSED |

The LT86xx was qualified by running a validation lot with minimum 2,500 units in UTL and was compared to ADSG historical yield. Comparison result is summarized in Table 5.

**Table 5:** *Manufacturing Validation Lot Run*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Generic | Package | FT lot number | Lot Size | Test Site | lot yield comparison between ADSG and UTL |
| LT8614 | 18L QFN | 1061103.1 | 26716 | UTL | MATCHED |
| LT8640 | 18L QFN | 1055316.1 | 21273 | UTL |
| LT8641 | 18L QFN | 1022523.1 | 11504 | UTL |

To ensure QA Program does not trim untrimmed/fresh parts, samples of untrimmed or fresh parts were tested using QA Program. Results were analyzed and summarized in Table 6.

**Table 6:** *Untrimmed/Fresh unit verification using QA program*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Generic | Package | Lot Number | No. of Untrimmed/Fresh units tested on QC program | QA Program detected untrimmed or fresh parts? |
| LT8614 | 18L QFN | 1012692.1 | 5 | YES |
| LT8640 | 18L QFN | Z46713.1 | 5 | YES |
| LT8641 | 18L QFN | 1019270.1 | 5 | YES |

GR&R was performed on LT8614 to confirm ATE repeatability and reproducibility performance, 10 serialized units were repeatedly tested on 1 test board and 3 test systems. GR&R result was analyzed and summarized in Table 7.

**Table 7:** *GR&R Result*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Generic | Package | Lot Number | No. of Units | No. of Test Boards | No. of Testers | All parameters passed R&R % =<10%? |
| LT8614 | 18L QFN | 1012692.1 | 10 | 1 | 3 | Yes – ALL PASSED |

**APPROVALS:**

Technical Review Board No. TRB-61507 - ADSG to UTL Test Transfer

**ADDITIONAL INFORMATION:**

Homepage: <https://www.analog.com/en/index.html>

Customer Service: <https://www.analog.com/en/support/technical-support.html>