RELIABILITY REPORT

FOR

MAX14525ETA+T

PLASTIC ENCAPSULATED DEVICES

April 1, 2012

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
|---|
| Richard Aburano |
| Quality Assurance |
| Manager, Reliability Engineering |

**Conclusion**

The MAX14525ETA+T successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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**I. Device Description**

A. General

The MAX14525 features a low $R_{ON}$ 35mΩ (typ) load switch with four unique enable inputs. The MAX14525 is ideal for disconnecting the lithium-ion (Li+) battery from the loads in portable devices such as cell phones. The MAX14525 operates from a +2.2V to +5.5V supply voltage.

The MAX14525 features an extremely low 0.8µA (typ) quiescent supply current to maximize battery life in portable devices. It is enabled from four possible inputs: external charger connection capable of high voltage up to +28V, travel adapter (TA), on key (ON_K), factory mode enable (JIG), and switch enable (S_EN). The S_EN input is internally ANDed with the switched battery connection (IN).

The MAX14525 is available in a small 8-pin, 2mm x 2mm TDFN package and operates over the -40°C to +85°C extended temperature range.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Battery Switch with Four Enables |
| B. Process: | S45 |
| C. Number of Device Transistors: | 1021 |
| D. Fabrication Location: | USA |
| E. Assembly Location: | Malaysia, Taiwan and Thailand |
| F. Date of Initial Production: | October 25, 2008 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 8-pin TDFN 2x2 |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive |
| E. Bondwire: | Au (1.3 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-9000-3344 |
| H. Flammability Rating: | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1 |
| J. Single Layer Theta Ja: | 110°C/W |
| K. Single Layer Theta Jc: | 37°C/W |
| L. Multi Layer Theta Ja: | 83.9°C/W |
| M. Multi Layer Theta Jc: | 37°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 35 X 63 mils |
| B. Passivation: | $Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Al/0.5%Cu with Ti/TiN Barrier |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn) |
| F. Minimum Metal Spacing: | Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn) |
| G. Bondpad Dimensions: | |
| H. Isolation Dielectric: | $SiO_2$ |
| I. Die Separation Method: | Wafer Saw |

## V. Quality Assurance Information

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|---|---|
| A. Quality Assurance Contacts: | Richard Aburano (Manager, Reliability Engineering)<br>Don Lipps (Manager, Reliability Engineering)<br>Bryan Preeshl (Vice President of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>0.1% For all Visual Defects. |
| C. Observed Outgoing Defect Rate: | < 50 ppm |
| D. Sampling Plan: | Mil-Std-105D |

## VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 22.9 \times 10^{-9}$

$\lambda = 22.9$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.06 @ 25C and 1.00 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TQSZAQ001E, D/C 0825)

The AJ66 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

**Table 1**
Reliability Evaluation Test Results

**MAX14525ETA+T**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|---|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | | |
| | Ta = 135C<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 48 | 0 | TQSZAQ001E, D/C 0825 |

Note 1: Life Test Data may represent plastic DIP qualification lots.