

RELIABILITY REPORT
FOR
MAX77650xEWV+T
PLASTIC ENCAPSULATED DEVICES

June 25, 2018

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

A handwritten signature in black ink that reads 'Gerena'.

Norbert Paul Gerena
Engineer, Reliability

A handwritten signature in black ink that reads 'Standley'.

Brian Standley
Manager, Reliability

Conclusion

The MAX77650 successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX77650 provides highly-integrated battery charging and power supply solutions for low-power wearable applications where size and efficiency are critical. This device features a SIMO buck-boost regulator that provides three independently programmable power rails from a single inductor to minimize total solution size. A 150mA LDO provides ripple rejection for audio and other noise-sensitive applications. A highly configurable linear charger supports a wide range of Li+ battery capacities and includes battery temperature monitoring for additional safety (JEITA). The device includes other features such as current sinks for driving LED indicators and an analog multiplexer that switches several internal voltage and current signals to an external node for monitoring with an external ADC. A bidirectional I2C interface allows for configuring and checking the status of the devices. An internal on/off controller provides a controlled startup sequence for the regulators and provides supervisory functionality when the devices are on. Numerous factory programmable options allow the device to be tailored for many applications, enabling faster time to market.

II. Manufacturing Information

A. Description/Function:	Ultra-Low Power PMIC with 3-Output SIMO and Charger Optimized for Small Li+
B. Process:	S18
C. Device Count:	116357
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	June 22, 2016

III. Packaging Information

A. Package Type:	30-bump WLP
B. Lead Frame:	NA
C. Lead Finish:	NA
D. Die Attach:	NA
E. Bondwire:	NA
F. Mold Material:	None
G. Assembly Diagram:	05-100144
H. Flammability Rating:	UL-94 (V-0 Rating)
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	NA
K. Single Layer Theta Jc:	NA
L. Multi Layer Theta Ja:	49.38 °C/W
M. Multi Layer Theta Jc:	NA

IV. Die Information

A. Dimensions:	109.45x85.83 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)

V. Quality Assurance Information

- | | |
|-----------------------------------|--|
| A. Quality Assurance Contacts: | Norbert Gerena (Engineer, Reliability)
Brian Standley (Manager, Reliability)
Bryan Preeshl (SVP of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet.
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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 2452 \times 48 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

(where 2452 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 7.78 \times 10^{-9}$$

$$\lambda = 7.78 \text{ FITs (60\% confidence level @25°C)}$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html>.

S18 Quarterly Process FIT from Q1FY18

$$\lambda = 0.1 \text{ FITs (60\% confidence level @25°C)}$$

B. E.S.D. and Latch-Up Testing

The MAX77650 has been found to have all pins able to withstand an HBM transient pulse of +/- 2500 V per JEDEC / ESDA JS-001 and a CDM transient pulse of +/- 500V per JEDEC / ESDA JS-002. Latch-Up testing has shown that this device withstands +/- 250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX77650CEVV+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125C Biased Time = 1000 hrs.	DC Parameters & functionality	48	0	

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