RELIABILITY REPORT

FOR

MAX77960EFV+, MAX77960EFV+T

March 19, 2020

MAXIM INTEGRATED

160 RIO ROBLES

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Conclusion

The MAX77960 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 MAX77960/MAX77961 are high-performance wide input 3A (MAX77960)/6A (MAX77961) buck-boost chargers with Smart Power Selector™ and operate as a reverse buck converter without an additional inductor, allowing the ICs to power USB on-the-go (OTG) accessories. The devices integrate low-loss power switches and provide high efficiency, low heat, and fast battery charging in a small solution size. The reverse buck has true load disconnect and is protected by an adjustable output current limit. The devices are highly flexible and programmable through I2C configuration or autonomously through resistor configuration.

The battery charger includes the Smart Power Selector to accommodate a wide range of battery sizes and system loads. The Smart Power Selector allows the system to start up smoothly when an input source is available even when the battery is deeply discharged (dead battery) or missing. When power is applied to the charger input, the battery charging can start automatically.

II. Manufacturing Information

A. Description/Function:	25VIN 3A/6AOUT USB-C Buck-Boost Charger with Integrated FETs for 2S/3S Li-Ion Batteries
B. Process:	P90
C. Device Count:	548764
D. Fabrication Location:	Japan
E. Assembly Location:	China
F. Date of Initial Production:	November 15, 2019

III. Packaging Information

A. Package Type:	FCQFN
B. Lead Frame:	CU194
C. Lead Finish:	Matte Tin
D. Die Attach:	N/A
E. Bondwire:	N/A
F. Mold Material:	CEL9220HF13CJ
G. Flammability Rating:	UL-94 (V-0 Rating)
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
I. Single Layer Theta Ja:	N/A
J. Single Layer Theta Jc:	N/A
K. Multi Layer Theta Ja:	24.77 °C/W
L. Multi Layer Theta Jc:	1.67 °C/W

IV. Die Information

A. Dimensions:	133.07X131.10 mils
B. Passivation:	SiN/SiO2

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ryan Wall (Manager, Reliability) Michael Cairnes (Executive Director, 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192\ x\ 2454\ x\ 77\ x\ 2}$$ (Chi square value for MTTF upper limit)

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 25.2\ x\ 10^{-9}$$

$$\lambda = 25.2\ FITs\ (60\%\ confidence\ level\ @25°C)$$

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.

P90 cumulative process data:

$$\lambda = 0.12\ FITs\ (60\%\ confidence\ level\ @25°C)$$
$$\lambda = 1.45\ FITs\ (60\%\ confidence\ level\ @55°C)$$

B. ESD and Latch-Up Testing

The MAX77960 has been found to have all pins able to withstand an HBM transient pulse of ±2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands ±100 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX77960EFV+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	77	0	

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