

RELIABILITY REPORT

FOR

MAX77504AAFC, MAX77504AAFC+T,  
MAX77504AAWE+, MAX77504AAWE+T,  
MAX77504BAWE+, MAX77504BAWE+T

September 21, 2020

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134



Sheena Karlyn Basinang  
Engineer, Reliability



Ryan Wall  
Manager, Reliability

## Conclusion

The MAX77504 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.

## Table of Contents

<b>I. ....Device Description</b>	<b>IV. ....Die Information</b>
<b>II. ....Manufacturing Information</b>	<b>V. ....Quality Assurance Information</b>
<b>III. ....Packaging Information</b>	<b>VI. ....Reliability Evaluation</b>
<b>.....Attachments</b>	

### I. Device Description

#### A. General

The MAX77504 is a synchronous 3A step-down DC-DC converter optimized for portable 2-cell and 3-cell battery operated applications. The converter operates on an input supply between 2.6V and 14V. Output voltage is adjustable between 0.6V and 6V with external feedback resistors. The device features a low-IQ SKIP mode that allows excellent efficiency at light loads. The MAX77504 can be synchronized by driving the FPWM pin with an external clock.

Dedicated enable, power-OK, and FPWM pins allow simple hardware control. The SEL input easily configures switching frequency, gain, and output active discharge option. Built-in undervoltage lockout (UVLO), output active discharge, cycle-by-cycle inductor current limit, thermal shutdown, and short-circuit protection ensure safe operation under abnormal operating conditions.

The MAX77504 is offered in a small 1.7mm x 1.7mm, 16-bump, 0.4mm pitch wafer-level package (WLP) or a 2.5mm x 2.5mm, 12-lead, 0.5mm pitch flip-chip QFN (FC2QFN).

## II. Manufacturing Information

A. Description/Function:	14V Input, 3A High-Efficiency Buck Converter in WLP or QFN
B. Process:	P90
C. Device Count:	200099
D. Fabrication Location:	Japan
E. Assembly Location:	China, Taiwan
F. Date of Initial Production:	October 8, 2019

## III. Packaging Information

A. Package Type:	FC2QFN	WLP
B. Lead Frame:	CU194	N/A
C. Lead Finish:	TACFLUX_026	SAC125
D. Die Attach:	N/A	N/A
E. Bondwire:	N/A	N/A
F. Mold Material:	CEL9220HF13CJ	N/A
G. Assembly Diagram:	05-101482	05-101226
H. Flammability Rating:	UL-94 (V-0 Rating)	N/A
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1
J. Single Layer Theta Ja:	N/A	N/A
K. Single Layer Theta Jc:	N/A	N/A
L. Multi Layer Theta Ja:	70.23 °C/W	57.93 °C/W
M. Multi Layer Theta Jc:	25.86 °C/W	N/A

## IV. Die Information

A. Dimensions:	67.7165X67.716 mils
B. Passivation:	SiO <sub>2</sub> /SiN

## 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  $\lambda$  is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{500 \times 2454 \times 80 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 9.33 \times 10^{-9}$$

$$\lambda = 9.33 \text{ FITs (60\% confidence level @25°C)}$$

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>.

P90 cumulative process Fit

$$\lambda = 0.11 \text{ FITs (60\% confidence level @25°C)}$$

$$\lambda = 1.28 \text{ FITs (60\% confidence level @55°C)}$$

### B. ESD and Latch-Up Testing

The MAX77504 has been found to have all pins able to withstand an HBM transient pulse of  $\pm 2500$  V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands  $\pm 250$  mA current injection and supply overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results  
**MAX77504AAWE+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 500 hrs.	DC parameters & functionality	80	0	

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