

RELIABILITY REPORT  
FOR  
MAX17509ATJ+  
PLASTIC ENCAPSULATED DEVICES

August 3, 2015

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

<b>Approved by</b>
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## Conclusion

The MAX17509ATJ+ 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 MAX17509 integrates two 3A internal switch step-down regulators with programmable features. The device can be configured as two single-phase independent, 3A power supplies or as a dual-phase, single-output 6A power supply. The device operates from 4.5V to 16V input and generates independently adjustable output voltage in the ranges of 0.904V to 3.782V and 4.756V to 5.048V, with  $\pm 2\%$  system accuracy. This device provides maximum flexibility to the end-user by allowing to choose multiple programmable options by connecting resistors to the configuration pins. Two key highlights of the device are the self-configured compensation for any output voltage and the ability to program the slew rate of LX switching nodes to mitigate noise concerns. In noise-sensitive applications, such as high-speed multi-gigabit transceivers in FPGAs, RF, and audio benefit from this unique slew rate control. SYNC input is provided for synchronized operation of multiple devices with system clocks. MAX17509 offers output overvoltage (OV) and undervoltage (UV) protection, as well as overcurrent (OC) and undercurrent (UC) protection with a selectable hiccup/latch option. It operates over the  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range, with thermal sensing and shutdown provided for overtemperature (OT) protection. The device is available in a 32-pin 5mm x 5mm TQFN package.

## II. Manufacturing Information

A. Description/Function:	4.5V-16V, Dual 3A, High-Efficiency, Synchronous Step-Down DC-DC Converter with Resistor Programmability
B. Process:	S18
C. Number of Device Transistors:	91124
D. Fabrication Location:	California
E. Assembly Location:	Taiwan
F. Date of Initial Production:	March 9, 2015

## III. Packaging Information

A. Package Type:	32L TQFN-CU
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Cu (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-5497
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	47°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	1.7°C/W

## IV. Die Information

A. Dimensions:	124.8031X107.0866 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.18um
F. Minimum Metal Spacing:	0.18um
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- |                                   |   |
|-----------------------------------|---|
| A. Quality Assurance Contacts:    | 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the S18 Process results in a FIT Rate of 0.05 @ 25C and 0.93 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot EATK3Q001C, D/C 1441)

The PI25-0 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

**MAX17509ATJ+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	EATK3Q001C, D/C 1441

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