

RELIABILITY REPORT
FOR
MAXM17544ALJ+T
PLASTIC ENCAPSULATED DEVICES

March 19, 2015

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAXM17544ALJ+T 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 Himalaya series of voltage regulator ICs and power modules enable cooler, smaller, and simpler power supply solutions. The MAXM17544 is an easy-to-use, step-down power module that combines a switching power supply controller, dual n-channel MOSFET power switches, fully shielded inductor, and the compensation components in a low-profile, thermally-efficient, system-in-package (SiP). The device operates over a wide input voltage range of 4.5V to 42V and delivers up to 3.5A continuous output current with excellent line and load regulation over an output voltage range of 0.9V to 12V. The device only requires five external components to complete the total power solution. The high level of integration significantly reduces design complexity, manufacturing risks, and offers a true plug-and-play power supply solution, reducing time-to-market. The device can be operated in the pulse-width modulation (PWM), pulse-frequency modulation (PFM), or discontinuous conduction mode (DCM) control schemes. The MAXM17544 is available in a low-profile, highly thermal-emissive, compact, 29-pin 9mm x 15mm x 2.8mm SiP package that reduces power dissipation in the package, while enhancing efficiency. The package is easily soldered onto a printed circuit board and suitable for automated circuit board assembly. The device can operate over the industrial temperature range from -40°C to +125°C.

II. Manufacturing Information

A. Description/Function:	4.5V to 42V, 3.5A High-Efficiency, DC-DC Step-Down Power Module with Integrated Inductor
B. Process:	S18
C. Fabrication Location:	USA
D. Assembly Location:	Taiwan
E. Date of Initial Production:	December 18, 2014

III. Packaging Information

A. Package Type:	32-pad Dual layer substrate
B. Lead Frame:	Copper
C. Lead Finish:	AuNi
D. Die Attach:	Conductive
E. Bondwire:	N/A (N/A mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#31-4944
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	N/A°C/W
M. Multi Layer Theta Jc:	N/A°C/W

IV. Die Information

A. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
B. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
C. Backside Metallization:	None
D. Minimum Metal Width:	0.23 microns (as drawn)
E. Minimum Metal Spacing:	0.23 microns (as drawn)
F. Bondpad Dimensions:	
G. Isolation Dielectric:	SiO ₂
H. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 160 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 1.3 \times 10^{-9}$$

$$\lambda = 1.3 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 @ 25°C and 0.93 @ 55°C (0.8 eV, 60% UCL)

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

The PI28-4 die type has been found to have all pins able to withstand an 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
MAXM17544ALJ+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	160	0	

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