



RELIABILITY REPORT
FOR
MAXM17502ALI+T
PLASTIC ENCAPSULATED DEVICES

September 12, 2017

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAXM17502ALI+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 MAXM17502 is a high-voltage, step-down power module in a family of pin-to-pin compatible modules with built-in thermally efficient system-in-packages (SiPs). The device includes a switch mode power supply controller, MOSFETs, an inductor, as well as the compensation components. The device operates from a 4.5V to 60V input supply voltage and supports adjustable output voltage from 0.9V to 5.0V with an output current of 1A. The high level of integration significantly reduces design complexity, manufacturing risks, and offers a true plug-and-play power supply solution to reduce time to market. The pin-to-pin compatibility within this family of modules allows design flexibility as the design requirements change. For sequencing purpose, the device features adjustable soft-start time, programmable EN/UVLO threshold, and a power-good indicator (Active-Low RESET pin). The MAXM17502 is available in a thermally enhanced, compact, 28-pin, 6.5mm x 10mm x 2.8mm SiP package. It operates over the -40°C to +125°C industrial temperature range.

II. Manufacturing Information

A. Description/Function:	1A, 60V High-Efficiency, DC-DC Step-Down Power Module with Integrated Inductor
B. Process:	S18
C. Fabrication Location:	USA
D. Assembly Location:	Taiwan, China
E. Date of Initial Production:	January 12, 2017

III. Packaging Information

A. Package Type:	28-pad LGA (SiP)
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	Da_crm1525d
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-100404
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	30°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. Isolation Dielectric:	SiO ₂
G. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Eric Wright (Reliability Engineering)
Brian Standley (Manager, Reliability)
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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 79 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 14.1 \times 10^{-9}$$

$$\lambda = 14.1 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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

The PI45-0 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM: +/- 2500V per JEDEC JESD22-A114

ESD-CDM: +/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78

With the following exception:

EN pin passes +100mA/-30mA per JEDEC JESD78

Table 1
Reliability Evaluation Test Results

MAXM17502ALI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	79	0	

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