

RELIABILITY REPORT
FOR
MAX17515ELI+T
WAFER LEVEL DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX17515ELI+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 MAX17515 is a fixed-frequency, step-down power module in a thermally efficient system-in-package (SiP) package that operates from a 2.4V to 5.5V input supply voltage and supports output currents up to 5A. The device includes switch-mode power-supply controller, dual n-channel MOSFET power switches, a fully shielded inductor, as well as compensation components. The device supports 0.75V to 3.6V programmable output voltage. The high level of integration significantly reduces design complexity, manufacturing risks, and offers a true plug-and-play power-supply solution, reducing the time to market. The device operates at a fixed 1MHz that requires smaller input and output capacitor size. The internal fixed constant gain at the error-amplifier output results in output-voltage positioning with respect to the load current. The fixed internal digital soft-start limits the input inrush current at startup. The device also operates in pulse-skipping mode at light loads to improve the light-load efficiency. The MAX17515 is available in a thermally enhanced, compact 28-pin, 10mm x 6.5mm x 2.8mm SiP package and can operate over the -40°C to +85°C industrial temperature range.

II. Manufacturing Information

A. Description/Function:	5A, 2.4V to 5.5V Input, High-Efficiency Power Module
B. Process:	S45
C. Fabrication Location:	USA
D. Assembly Location:	Taiwan
E. Date of Initial Production:	June 26, 2013

III. Packaging Information

A. Package Type:	28-pin, 10mm x 6.5mm x 2.8mm SiP
B. Lead Frame:	Copper
C. Lead Finish:	AuNi
D. Die Attach:	Conductive
E. Bondwire:	Au (2 mil dia.)
F. Mold Material:	None
G. Assembly Diagram:	#31-4927
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. Dimensions:	39.3701 X 39.3701 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.4 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 150 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 1.4 \times 10^{-9}$$

$$\lambda = 1.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S4 Process results in a FIT Rate of 0.04 @ 25°C and 0.69 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (TADI0Q003C D/C 1322)

The PI22-0 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

MAX17515ELI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality	150	0	P3110MHL0P, D/C 1113

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