



RELIABILITY REPORT
FOR
MAX15066EWE+T
WAFER LEVEL PRODUCTS

December 10, 2010

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX15066EWE+T successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX15066 current-mode, synchronous, DC-DC buck converter delivers an output current up to 4A with high efficiency. The MAX15066 operates from an input voltage of 4.5V to 16V and provides an adjustable output voltage from 0.606V to 90% of the input voltage. The MAX15066 is ideal for distributed power systems, notebook computers, nonportable consumer applications, and preregulation applications.

The MAX15066 features a PWM mode operation with internally fixed 500kHz switching frequency capable of 90% maximum duty cycle. The MAX15066 automatically enters skip mode at light loads. The current-mode control architecture simplifies compensation design and ensures a cycle-by-cycle current limit and fast response to line and load transients. A high gain transconductance error amplifier allows flexibility in setting the external compensation, simplifying the design and allowing for an all-ceramic design.

The MAX15066 synchronous buck regulator features internal MOSFETs that provide better efficiency than asynchronous solutions, while simplifying the design relative to discrete controller solutions. In addition to simplifying the design, the integrated MOSFETs minimize EMI, reduce board space, and provide higher reliability by minimizing the number of external components.

Additional features include an externally adjustable soft-start, independent enable input and power-good output for power sequencing, and thermal shutdown protection. The MAX15066 offers overcurrent protection (high-side sourcing) with hiccup mode during an output short-circuit condition. The device ensures safe startup when powering into a prebiased output.

The MAX15066 is available in a 2mm x 2mm, 16-bump (4 x 4 array), 0.5mm pitch WLP package and is fully specified from -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	High-Efficiency, 4A, Step-Down DC-DC Regulator with Internal Power Switches
B. Process:	S45
C. Number of Device Transistors:	653
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Japan
F. Date of Initial Production:	September 17, 2010

III. Packaging Information

A. Package Type:	16-pin WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A (N/A mil dia.)
F. Mold Material:	N/A
G. Assembly Diagram:	#05-9000-4047
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:	°C/W
K. Single Layer Theta Jc:	°C/W
L. Multi Layer Theta Ja:	49°C/W
M. Multi Layer Theta Jc:	9°C/W

IV. Die Information

A. Dimensions:	83 X 83 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:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Operations) 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 46 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.9 \times 10^{-9}$$
$$\lambda = 23.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TI0ZAQ001A/B, D/C 1002)

The NQ58 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.

Table 1
Reliability Evaluation Test Results

MAX15066EWE+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	46	0	T10ZAQ001B, D/C 1002

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