

RELIABILITY REPORT
FOR
MAX1541ETL+
PLASTIC ENCAPSULATED DEVICES

August 4, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Conclusion

The MAX1541ETL+ 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 MAX1540A/MAX1541 dual pulse-width modulation (PWM) controllers provide the high efficiency, excellent transient response, and high DC-output accuracy necessary for stepping down high-voltage batteries to generate low-voltage chipset and RAM power supplies in notebook computers. The Maxim proprietary Quick-PWM(tm) controllers are free running, constant on-time with input feed forward. This configuration provides ultra-fast transient response, wide input-output (I/O) differential range, low supply current, and tight load-regulation characteristics. The controllers can accurately sense the inductor current across an external current-sense resistor in series with the output to ensure reliable overload and inductor saturation protection. Alternatively, the controllers can use the synchronous rectifier itself or lossless inductor current-sensing methods to provide overload protection with lower power dissipation. For a single step-down PWM controller with inductor-saturation protection, external-reference input voltage, and dynamically selectable output voltages, refer to the MAX1992/MAX1993 data sheet.

II. Manufacturing Information

A. Description/Function:	Dual Step-Down Controllers with Saturation Protection, Dynamic Output, and Linear Regulator
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	March 09, 2004

III. Packaging Information

A. Package Type:	40-pin TQFN 6x6
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0321
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:	38°C/W
K. Single Layer Theta Jc:	1.4°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1.4°C/W

IV. Die Information

A. Dimensions:	122 X 127 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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 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:	Ken Wendel (Director, Reliability Engineering) Bryan Preeshl (Managing Director 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 283 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 3.8 \times 10^{-9}$$

$$\lambda = 3.8 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the B8 Process results in a FIT Rate of 1.29 @ 25C and 15.6 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The PD18-1 die type has been found to have all pins able to withstand a transient pulse of:

HBM ESD: +/-200 V per JEDEC JESD22-A114.
CDM ESD: +/-750 V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX1541ETL+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	283	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data