



RELIABILITY REPORT
FOR
MAX15031ATE+
PLASTIC ENCAPSULATED DEVICES

March 15, 2010

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX15031ATE+ 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 MAX15031 consists of a constant-frequency pulse-width modulating (PWM) step-up DC-DC converter with an internal switch and a high-side current monitor with high-speed adjustable current limiting. This device can generate output voltages up to 76V and provides current monitoring up to 4mA (up to 300mW). The MAX15031 can be used for a wide variety of applications such as avalanche photodiode biasing, PIN biasing, or varactor biasing, and LCD displays. The MAX15031 operates from 2.7V to 11V. The constant-frequency (400kHz), current-mode PWM architecture provides low-noise output voltage that is easy to filter. A high-voltage, internal power switch allows this device to boost output voltages up to 76V. Internal soft-start circuitry limits the input current when the boost converter starts. The MAX15031 features a shutdown mode to save power. The MAX15031 includes a current monitor with more than three decades of dynamic range and monitors current ranging from 500nA to 4mA with high accuracy. Resistor-adjustable current limiting protects the APD from optical power transients. A clamp diode protects the monitor's output from overvoltage conditions. Other protection features include cycle-by-cycle current limiting of the boost converter switch, undervoltage lockout, and thermal shutdown if the die temperature reaches +160°C. The MAX15031 is available in a thermally enhanced 4mm x 4mm, 16-pin TQFN package and operates over the -40°C to +125°C automotive temperature range.

II. Manufacturing Information

A. Description/Function:	80V, 300mW Boost Converter and Current Monitor for APD Bias Applications
B. Process:	BCD8
C. Number of Device Transistors:	2400
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	10/15/2008

III. Packaging Information

A. Package Type:	16-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3278
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:	59.3°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	40°C/W
M. Multi Layer Theta Jc:	5.7°C/W

IV. Die Information

A. Dimensions:	88 X 88 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.9 \times 10^{-9}$$
$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 BCD8 Process results in a FIT Rate of 0.06 @ 25C and 1.08 @ 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 NQ11 die type has been found to have all pins able to withstand a HBM transient pulse of 1500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results

MAX15031ATE+

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	48	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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