

RELIABILITY REPORT
FOR
MAX15059BETE+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
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Approved by
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Conclusion

The MAX15059BETE+ 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 MAX15059 constant-frequency pulse-width modulating (PWM) step-up DC-DC converter features an internal switch and a high-side current monitor with high-speed adjustable current limiting. This device is capable of generating output voltages up to 76V (300mW for the MAX15059A and 200mW for the MAX15059B) and provides current monitoring up to 4mA. The MAX15059 operates from 2.8V to 5.5V. The constant-frequency (400kHz) current-mode PWM architecture provides low-noise-output voltage that is easy to filter. A high-voltage internal power MOSFET allows this device to boost output voltages up to 76V. Internal soft-start circuitry limits the input current when the boost converter starts. The MAX15059 features a shutdown mode to save power. The MAX15059 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 (UVLO), and thermal shutdown if the die temperature reaches +125°C. The MAX15059 is available in a thermally enhanced, lead-free, 16-pin TQFN-EP package and operates over the -40°C to +125°C temperature range.

II. Manufacturing Information

A. Description/Function:	76V, 300mW Boost Converter and Current Monitor for APD Bias Applications
B. Process:	S4
C. Number of Device Transistors:	4460
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Taiwan and Thailand
F. Date of Initial Production:	January 23, 2010

III. Packaging Information

A. Package Type:	16-pin TQFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (0.8 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4004
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	64 °C/W
K. Single Layer Theta Jc:	6.9 °C/W
L. Multi Layer Theta Ja:	48 °C/W
M. Multi Layer Theta Jc:	6.9°C/W

IV. Die Information

A. Dimensions:	60 X 56 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:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)
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 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 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 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SF2YAQ001B, D/C 1008)

The NQ49-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX15059BETE+

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	SF2YAQ001B, D/C 1008

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