RELIABILITY REPORT

FOR

MAX15004AAUE+

PLASTIC ENCAPSULATED DEVICES

January 13, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX15004AAUE+ 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.

Table of Contents

I. Device Description

A. General

The MAX15004A/B/MAX15005A/B high-performance, current-mode PWM controllers operate at an automotive input voltage range from 4.5V to 40V (load dump). The input voltage can go down as low as 2.5V after startup if VCC is supplied by an external bias voltage. The controllers integrate all the building blocks necessary for implementing fixed-frequency isolated/nonisolated power supplies. The general-purpose boost, flyback, forward, and SEPIC converters can be designed with ease around the MAX15004/MAX15005. The current-mode control architecture offers excellent line-transient response and cycle-by-cycle current limit while simplifying the frequency compensation. Programmable slope compensation simplifies the design further. A fast 60ns current-limit response time, low 300mV current-limit threshold makes the controllers suitable for high-efficiency, high-frequency DC-DC converters. The devices include an internal error amplifier and 1% accurate reference to facilitate the primary-side regulated, single-ended flyback converter or nonisolated converters. An external resistor and capacitor network programs the switching frequency from 15kHz to 500kHz (1MHz for the MAX15005A/B). The MAX15004A/B/MAX15005A/B provide a SYNC input for synchronization to an external clock. The maximum FET-driver duty cycle for the MAX15004A/B is 50%. The maximum duty cycle can be set on the MAX15005A/B by selecting the right combination of RT and CT. The input undervoltage lockout (ON/active-low OFF) programs the input-supply startup voltage and can be used to shutdown the converter to reduce the total shutdown current down to 10µA. Protection features include cycle-by-cycle and hiccup current limit, output overvoltage protection, and thermal shutdown. The MAX15004A/B/MAX15005A/B are available in space-saving 16-pin TSSOP and thermally enhanced 16-pin TSSOP-EP packages. All devices operate over the -40°C to +125°C automotive temperature range.

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II. Manufacturing Information

A. Description/Function:	4.5V to 40V Input Automotive Flyback/Boost/SEPIC Power-Supply Controllers
B. Process:	BCD8
C. Number of Device Transistors:	0
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines, Thailand
F. Date of Initial Production:	January 20, 2007

III. Packaging Information

A. Package Type:	16-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2426
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:	47°C/W
K. Single Layer Theta Jc:	3°C/W
L. Multi Layer Theta Ja:	38.3°C/W
M. Multi Layer Theta Jc:	3°C/W

IV. Die Information

A. Dimensions:	108 X 108 mils
B. Passivation:	Si_3N_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

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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:

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

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

$\lambda = 22.4 \times 10^{-9}$

λ = 22.4 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 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 NP96 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

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Table 1

Reliability Evaluation Test Results

MAX15004AAUE+

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

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