RELIABILITY REPORT

FOR

MAX15041ETE+T

PLASTIC ENCAPSULATED DEVICES

September 25, 2015

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX15041ETE+T 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.

Table of Contents

I. Device Description

A. General

The MAX15041 low-cost, synchronous DC-DC converter with internal switches delivers an output current up to 3A. The MAX15041 operates from an input voltage of 4.5V to 28V and provides an adjustable output voltage from 0.606V to 90% of VIN, set with two external resistors. The MAX15041 is ideal for distributed power systems, preregulation, set-top boxes, television, and other consumer applications. The MAX15041 features a peak-current-mode PWM controller with internally fixed 350kHz switching frequency and a 90% maximum duty cycle. 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 by using a type II compensation scheme, thereby allowing the use of all ceramic capacitors. This 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. The MAX15041 also features thermal shutdown and overcurrent protection (high-side sourcing and low-side sinking), and an internal 5V LDO with undervoltage lockout. In addition, this device ensures safe startup when powering into a prebiased output. Other features include an externally adjustable soft-start that gradually ramps up the output voltage and reduces inrush current. Independent enable control and power-good signals allow for flexible power sequencing. The MAX15041 is available in a space-saving, high-power, 3mm x 3mm, 16-pin TQFN-EP package and is fully specified from -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	Low-Cost, 3A, 4.5V to 28V Input, 350kHz, PWM Step-Down DC-DC Regulator with Internal Switches
B. Process:	S45
C. Number of Device Transistors:	4796
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Philippines, China, Thailand, Malaysia
F. Date of Initial Production:	July 24, 2009

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 (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3579
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:	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:	61X61 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:	Metal1 = 0.5 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 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:	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 135C 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)

$\lambda = 22.9 \times 10^{-9}$

$\lambda = 22.9$ 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 S45 Process results in a FIT Rate of 0.13 @ 25C and 2.31 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot TUKZCQ002B D/C 0927, Latch-Up lot TUKZEQ003B D/C1026)

The NQ36 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.

Table 1

Reliability Evaluation Test Results

MAX15041ETE+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	48	0	TUKZCQ002B, DC 0927

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