RELIABILITY REPORT

FOR

MAX77596ETBC+T

PLASTIC ENCAPSULATED DEVICES

March 25, 2016

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX77596ETBC+T successfully met 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 MAX77596 is a small, synchronous buck converter with integrated switches. The device is designed to deliver up to 300mA with input voltages from 3.5V to 24V, while using only 1.1A quiescent current at no load (fixed-output version). Voltage quality can be monitored by observing the active-low RESET signal. The device can operate near dropout by running at 98% duty cycle, making it ideal for battery-powered applications. The device offers fixed 3.3V and 5V output versions, as well as an adjustable version. The adjustable version allows the user to program the output voltage between 1V and 10V by using a resistor-divider. Frequency is fixed at 1.7MHz, which allows for small external components and reduced output ripple. The device offers both forced-PWM and skip modes of operation, with ultra-low quiescent current of 1.1A in skip mode. The MAX77596 is available in a small (2mm x 2.5mm) 10-pin TDFN package and operates across the -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	24V, 300mA, Buck Converter with 1.1µA IQ
B. Process:	S18
C. Number of Device Transistors:	12412
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	October 02, 2015

III. Packaging Information

A. Package Type:	10-pin TDFN
B. Lead Frame:	Copper
C. Lead Finish:	100% Matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Cu (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-100024
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:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	102°C/W
M. Multi Layer Theta Jc:	2.9°C/W

IV. Die Information

A. Dimensions:	57.874 X 53.937 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:	0.23 microns (as drawn)
F. Minimum Metal Spacing:	0.23 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:	Eric Wright (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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 240 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 4.58 \times 10^{-9}$

$\lambda = 4.58$ 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 S18 Process results in a FIT Rate of 0.40 @ 25°C and 6.96 @ 55°C (0.8 eV, 60% UCL)

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

The AP36-0 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 +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX77596ETBC+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	240	0	

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