RELIABILITY REPORT

FOR

MAX1680ESA+

PLASTIC ENCAPSULATED DEVICES

October 22, 2015

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX1680ESA+ 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 MAX1680/MAX1681 inductorless switched-capacitor voltage converters either invert an input voltage of +2.0V to +5.5V or double it while supplying up to 125mA output current. They have a selectable-frequency option that allows the use of small capacitors: 4.7µF (MAX1680), 1µF (MAX1681). With their high output current capability, these charge-pump devices are suitable replacements for inductor-based regulators, which require more expensive external components and additional board space. The devices' equivalent output resistance (typically 3.5) allows them to deliver as much as 125mA with only a 440mV drop. A shutdown feature reduces quiescent current to less than 1µA. The MAX1680/MAX1681 are available in 8-pin SO packages. For devices that deliver up to 50mA in smaller µMAX® packages, refer to the MAX860/MAX861 data sheet.

II. Manufacturing Information

A. Description/Function:	125mA, Frequency-Selectable, Switched-Capacitor Voltage Converters
B. Process:	S3
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines, Thailand
F. Date of Initial Production:	July 11, 1997

III. Packaging Information

A. Package Type:	8-pin SOIC (N)
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:	#05-1101-0033
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	128.4°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	74X134 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:	
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 160 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 6.87 \times 10^{-9}$

$\lambda = 6.87$ 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 S3 Process results in a FIT Rate of 0.03 @ 25C and 0.5 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NI4ABQ002B, D/C 9904)

The PX32 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500v per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1

Reliability Evaluation Test Results

MAX1680ESA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	80	0	XI4BBO001A, DC 9810
	Biased	& functionality	80	0	XI4AAX001A, DC 9718
	Time = 192 hrs.				

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