

RELIABILITY REPORT
FOR
MAX8680ETL+
PLASTIC ENCAPSULATED DEVICES

February 6, 2009

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX8680ETL+ 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.

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I. Device Description

A. General

The MAX8680 highly efficient complete power-supply solution is designed for digital still cameras (DSCs) and digital video cameras (DVCs). The device integrates seven on-chip power MOSFET DC-DC converters with up to 95% efficiency to power all critical power supplies in DSC systems. Each converter also features True Shutdown(tm), as well as internal compensation to minimize external component count. The seven DC-DC converter outputs are:

- Step-up synchronous-rectified DC-DC converter (SU). The MAX8680 is bootstrapped from VSU.
- MAIN synchronous-rectified step-down DC-DC converter (M) for DSP I/O supply voltage.
- DDRZ synchronous-rectified step-down DC-DC converter (Z) for DSP DDR supply voltage.
- Low-voltage (down to 1V) synchronous-rectified step-down DC-DC converter (SD) for DSP core supply voltage.
- High-voltage, step-up DC-DC converter with current regulation and PWM dimming control (LEDBST) for white LEDs (WLED).
- High-voltage step-up DC-DC converter (CCDBST) for CCD imagers or positive LCD bias supplies.
- Transformerless inverting DC-DC converter (CCDINV) for CCD imagers or negative LCD bias supplies. The MAX8680 has an independent/simultaneous power-on sequence of the CCDBST and CCDINV converters. For a preset power-on sequence of CCDBST before CCDINV, contact the factory. The MAX8680 operates with 1-cell lithium-ion (Li+) battery, two-AA cell, or dual-battery designs and is available in a 5mm x 5mm, 40-pin thin QFN package. The MAX8680 operates over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	Smallest, All-Internal MOSFET, 7-Channel DSC PMIC in Tiny 5mm x 5mm Thin QFN
B. Process:	S4
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	January 08, 2007

III. Packaging Information

A. Package Type:	40-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2605
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:	45°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1.7°C/W

IV. Die Information

A. Dimensions:	140 X 110 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
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:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

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:

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

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

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

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the S4 Process results in a FIT Rate of 0.28 @ 25C and 4.85 @ 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 PP72 die type has been found to have all pins able to withstand a HBM transient pulse of +/-800 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX8680ETL+

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) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	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