

RELIABILITY REPORT
FOR
MAX8655ETN+
PLASTIC ENCAPSULATED DEVICES

January 27, 2009

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX8655ETN+ 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 MAX8655 synchronous-PWM buck regulator operates from a 4.5V to 25V input and generates an output voltage adjustable from 0.7V to 5.5V at loads up to 25A. Integrated power MOSFETs provide a small footprint, ease of layout, and reduced EMI. Removing the board trace inductances ensures the highest efficiency at high frequency. The MAX8655 uses peak current-mode control architecture with an adjustable (200kHz to 1MHz), constant-switching frequency, which is externally synchronizable. The MAX8655's adjustable current limit uses the inductor's DC resistance to improve efficiency or an external sense resistor for higher accuracy. Foldback type current limit is available to reduce the power dissipation under severe-overload or short-circuit conditions. A reference input is provided for use with a high-accuracy external reference or for DDR and tracking applications. Monotonic startup provides safe starting into a prebiased output, where traditional step-down regulators discharge the output capacitor during soft-start, creating a negative voltage at the output and possibly damaging the load. A 180° out-of-phase synchronization output is available for synchronizing with another MAX8655. An enable input is provided for on/off control and to facilitate output sequencing. Output-voltage sensing for programmable overvoltage protection is provided and is independent of the feedback network to further enhance the output overvoltage protection. Overall, the MAX8655 provides enough flexibility for the experienced user, as well as simplicity and ease of use for non-power-supply engineers.

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II. Manufacturing Information

A. Description/Function:	Highly Integrated, 25A, Wide-Input, Internal MOSFET, Step-Down Regulator
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	UTL Thailand, Carsem Malaysia
F. Date of Initial Production:	July 28, 2007

III. Packaging Information

A. Package Type:	56-pin TQFN 8x8
B. Lead Frame:	
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#31-4792
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3

IV. Die Information

A. Dimensions:	mils
B. Passivation:	Si ₃ N ₄ (Silicon nitride)
C. Interconnect:	Poly / Au
D. Backside Metallization:	None
E. Minimum Metal Width:	2 microns (as drawn)
F. Minimum Metal Spacing:	2 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 45 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.9 \times 10^{-9}$$

$$\lambda = 23.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 GST3 Process results in a FIT Rate of 1.0 @ 25C and 17.8 @ 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 PP36-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 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

MAX8655ETN+

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	45	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