RELIABILITY REPORT

FOR

MAX17007AGTI+

PLASTIC ENCAPSULATED DEVICES

December 3, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX17007AGTI+ 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.

Table of Contents

I. Device Description

A. General

The MAX17007A/MAX17008 are dual Quick-PWM(tm) step-down controllers intended for general power generation in battery-powered systems. The two switched-mode power supplies (SMPSs) can also be combined to operate in a two-phase single-output mode. Constant on-time Quick-PWM operation provides fast response to load transients and handles wide input/output (I/O) voltage ratios with ease, while maintaining a relatively constant switching frequency. The switching frequency can be individually adjusted between 200kHz and 600kHz with external resistors. Differential output current sensing allows output sense-resistor sensing for an accurate current limit, or lossless inductor direct-current resistance (DCR) current sensing for lower power dissipation while maintaining 0.7% output accuracy. Overvoltage (MAX17007A only), undervoltage protection, and accurate user-selectable current limits (15mV, 30mV, 45mV, and 60mV) ensure robust operations. The SMPS outputs can operate in skip mode or in ultrasonic mode for improved light-load efficiency. The ultrasonic mode eliminates audible noises by maintaining a minimum switching frequency of 25kHz in pulse-skipping mode. The output voltage of SMPS1 can be dynamically adjusted by changing the voltage at the REFIN1 pin. The device includes a 0.5% accurate reference output that can be used to set the REFIN1 voltage. An external 5V bias supply is required to power the internal circuitry and its gate drivers. Independent on/off controls with well-defined logic thresholds and independent open-drain power-good outputs provide flexible system configurations. To prevent current surges at startup, the internal voltage target is slowly ramped up from zero to the final target with a slew rate of 1.3mV/µs for SMPS1 at CSL1 and 0.65mV/µs for SMPS2 at FB2. To prevent the output from ringing off below ground in shutdown, the internal voltage target is ramped down from its previous value to zero with the same respective slew rates. Integrated bootstrap switches eliminate the need for external bootstrap diodes. The MAX17007A/MAX17008 are available in a space-saving, 28-pin, 4mm x 4mm, thin QFN package with an exposed backside pad.

II. Manufacturing Information

A. Description/Function:	Dual and Combinable QPWM Graphics Core Controllers for Notebook Computers
B. Process:	S4
C. Number of Device Transistors:	13089
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	Pre 1997

III. Packaging Information

A. Package Type:	28-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	48°C/W
K. Single Layer Theta Jc:	2.7°C/W
L. Multi Layer Theta Ja:	35°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	67 X 98 mils
B. Passivation:	Si_3N_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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 0 \times 2}$$ (Chi square value for MTTF upper limit)

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

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

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

This low failure rate represents data collected from Maxim"s reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. #) shows the static Burn-In circuit. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (RR-1N). Current monitor data for the S4 Process results in a FIT Rate of 0.14 @ 25C and 2.42 @ 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 PE25-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of I-Test of +/-100 mA and V-Test of +/-1.5 VccMax.

Table 1

Reliability Evaluation Test Results

MAX17007AGTI+

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	0	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