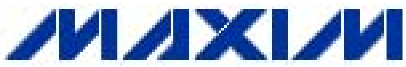

RELIABILITY REPORT

FOR

MAX1968EUI+

PLASTIC ENCAPSULATED DEVICES

April 12, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Don Lipps
Quality Assurance
Manager, Reliability Engineering

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Conclusion

The MAX1968EUI+ 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 MAX1968/MAX1969 are highly integrated and cost-effective, high-efficiency, switch-mode drivers for Peltier thermoelectric cooler (TEC) modules. Both devices utilize direct current control to eliminate current surges in the TEC. On-chip FETs minimize external components while providing high efficiency. A 500kHz/1MHz switching frequency and a unique ripple cancellation scheme reduce component size and noise. The MAX1968 operates from a single supply and provides bipolar ±3A output by biasing the TEC between the outputs of two synchronous buck regulators. Bipolar operation allows for temperature control without "dead zones" or other nonlinearities at low load currents. This arrangement ensures that the control system does not hunt when the set point is very close to the natural operating point, requiring a small amount of heating or cooling. An analog control signal precisely sets the TEC current. The MAX1969 provides unipolar output up to 6A. Reliability is optimized with settable limits for both TEC voltage and current, with independently set limits for heating and cooling current. An analog output also monitors TEC current. The MAX1968/MAX1969 are available in a low-profile 28-pin TSSOP-EP package and is specified over the -40°C to +85°C temperature range. The thermally-enhanced TSSOP-EP package with exposed metal pad minimizes operating junction temperature. An evaluation kit is available to speed designs.

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II. Manufacturing Information

A. Description/Function:	Power Drivers for Peltier TEC Modules
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	Philippines, Thailand
F. Date of Initial Production:	April 27, 2002

III. Packaging Information

A. Package Type:	28-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-3501-0019
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:	2°C/W
L. Multi Layer Theta Ja:	37°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	108 X 207 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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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V. Quality Assurance Information

A. Quality Assurance Contacts: Don Lipps (Manager, 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 134 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 8.2 \times 10^{-9}$

λ = 8.2 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim"s reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 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 PM29-4 die type has been found to have all pins able to withstand a HBM transient pulse of +/-200V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-200mA.

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Table 1
Reliability Evaluation Test Results

MAX1968EUI+

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	134	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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

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