



RELIABILITY REPORT
FOR
MAX6964AEG+
PLASTIC ENCAPSULATED DEVICES

October 31, 2008

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX6964AEG+ 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	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX6964 I²C-compatible serial interfaced peripheral provides microprocessors with 17 output ports. Each output is an open-drain current-sinking output rated at 50mA and 7V. The outputs are capable of driving LEDs, or providing logic outputs with external resistive pullup up to 7V. Eight-bit PWM current control is also integrated. Four of the bits are global control and apply to all LED outputs to provide coarse adjustment of current from fully off to fully on with 14 intensity steps. Additionally, each output has an individual 4-bit control, which further divides the globally set current into 16 more steps. Alternatively, the current control can be configured as a single 8-bit control that sets all outputs at once. Each output has independent blink timing with two blink phases. LEDs can be individually set to be either on or off during either blink phase, or to ignore the blink control. The blink period is controlled by an external clock (up to 1kHz) on BLINK or by a register. The BLINK input can also be used as a logic control to turn the LEDs on and off, or as a general-purpose input (GPI). The MAX6964 supports hot insertion. The SDA, SCL, RST-bar, BLINK, and the slave address input ADO remain high impedance in power-down ($V_+ = 0V$) with up to 6V asserted upon them. The output ports remain high impedance with up to 8V asserted upon them. The MAX6964 is controlled through a 2-wire I²C serial interface, and can be configured to one of four I²C addresses.

II. Manufacturing Information

A. Description/Function:	17-Output LED Driver/GPO with Intensity Control and Hot-Insertion Protection
B. Process:	S4
C. Number of Device Transistors:	0
D. Fabrication Location:	Texas
E. Assembly Location:	Carsem Malaysia, ATP Philippines, UTL Thailand
F. Date of Initial Production:	January 24, 2004

III. Packaging Information

A. Package Type:	24-pin QSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0795
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:	105°C/W
K. Single Layer Theta Jc:	34°C/W
L. Multi Layer Theta Ja:	88°C/W
M. Multi Layer Theta Jc:	34°C/W

IV. Die Information

A. Dimensions:	72 X 69 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 pending. 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 4.6 @ 25C and 79.2 @ 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 DW65 die type has been found to have all pins able to withstand a HBM transient pulse of 1500 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 250 mA.

Table 1
Reliability Evaluation Test Results

MAX6964AEG+

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