RELIABILITY REPORT

FOR

MAX6966ATE+T

PLASTIC ENCAPSULATED DEVICES

February 15, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX6966ATE+T 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 MAX6966/MAX6967 serial-interfaced peripherals provide microprocessors with 10 I/O ports rated to 7V. Each port can be individually configured as either:

- A 20mA constant-current LED driver (static or pulsewidth modulated (PWM)).
- A 10mA constant-current LED driver (static or PWM).
- An open-drain logic output.
- An overvoltage-protected Schmitt logic input.

Analog and switching LED intensity control is built in:

- Individual 8-bit PWM control per output.
- Individual 1-bit analog control (half/full) per output.
- Global 3-bit analog control applies to all LED outputs.

PWM timing of the 10 port outputs may be optionally staggered, consecutively phased in 45° increments. This spreads the PWM load currents over time in eight steps, helping to even out the power-supply current and reduce the RMS current. The MAX6966/MAX6967 can be configured to awake from shutdown on receipt of a minimum 3ms pulse on the active-low CS input. This hardware-wakeup feature allows a power-management controller or similar ASIC to enable the MAX6966/MAX6967 with preconfigured LED intensity settings. Shutdown can be programmed to wait up to 4s, fade down the sink currents to zero for a period of 1/16s to 4s, and then shut down. A similar ramp-up from shutdown can be programmed for 1/16s to 4s. The MAX6966/MAX6967 support hot insertion. All port pins remain high impedance in power-down (V+ = 0V) with up to 8V asserted on them. The DOUT/OSC pin can be configured as either the serial interface data output or optional PWM clock input. The MAX6966 powers up defaulting as DOUT output. The MAX6967 defaults as OSC input. For a similar part without the constant-current controls, refer to the MAX7317 data sheet.

II. Manufacturing Information

A. Description/Function:	10-Port Constant-Current LED Drivers and I/O Expanders with PWM Intensity Control
B. Process:	S4
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	China, Malaysia, Taiwan, Thailand
F. Date of Initial Production:	October 23, 2004

III. Packaging Information

A. Package Type:	16-pin TQFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1276
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:	64°C/W
K. Single Layer Theta Jc:	6.9°C/W
L. Multi Layer Theta Ja:	48°C/W
M. Multi Layer Theta Jc:	6.9°C/W

IV. Die Information

A. Dimensions:	59 X 59 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
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:	Richard Aburano (Manager, Reliability Operations) Bryan Preeshl (Vice President 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 37 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 29.7 \times 10^{-9}$

λ = 29.7 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 S4 Process results in a FIT Rate of 0.05 @ 25C and 0.83 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The DW92 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114 (lot TTZ0CQ001A, D/C 0826). Latch-Up testing has shown that this device withstands a current of 250mA (lot STZ0AZ001E, D/C 0435).

Table 1
Reliability Evaluation Test Results

MAX6966ATE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	37	0	STZ0AZ001E, D/C 0435

Note 1: Life Test Data may represent plastic DIP qualification lots.