

RELIABILITY REPORT  
FOR  
MAX5054BATA+  
(MAX5055-MAX5057)  
PLASTIC ENCAPSULATED DEVICES

November 14, 2008

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

<b>Approved by</b>
Ken Wendel
Quality Assurance
Director, Reliability Engineering

## Conclusion

The MAX5054BATA+ 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

<b>I. ....Device Description</b>	<b>V. ....Quality Assurance Information</b>
<b>II. ....Manufacturing Information</b>	<b>VI. ....Reliability Evaluation</b>
<b>III. ....Packaging Information</b>	<b>IV. ....Die Information</b>
<b>.....Attachments</b>	

### I. Device Description

#### A. General

The MAX5054-MAX5057 dual, high-speed MOSFET drivers source and sink up to 4A peak current. These devices feature a fast 20ns propagation delay and 20ns rise and fall times while driving a 5000pF capacitive load. Propagation delay time is minimized and matched between the inverting and noninverting inputs and between channels. High sourcing/sinking peak currents, low propagation delay, and thermally enhanced packages make the MAX5054-MAX5057 ideal for high-frequency and high-power circuits. The MAX5054-MAX5057 operate from a 4V to 15V single power supply and consume 40 $\mu$ A (typ) of supply current when not switching. These devices have internal logic circuitry that prevents shoot-through during output state changes to minimize the operating current at high switching frequency. The logic inputs are protected against voltage spikes up to +18V, regardless of the VDD voltage. The MAX5054A is the only version that has CMOS input logic levels while the MAX5054B/MAX5055/MAX5056/MAX5057 have TTL input logic levels. The MAX5055-MAX5057 provide the combination of dual inverting, dual noninverting, and inverting/noninverting input drivers. The MAX5054 feature both inverting and noninverting inputs per driver for greater flexibility. They are available in 8-pin TDFN (3mm x 3mm), standard SO, and thermally enhanced SO packages. These devices operate over the automotive temperature range of -40°C to +125°C.

**II. Manufacturing Information**

A. Description/Function:	4A, 20ns, Dual MOSFET Drivers
B. Process:	0.35 um CMOS 2P 3M
C. Number of Device Transistors:	
D. Fabrication Location:	Dallas TX
E. Assembly Location:	ISPL Philippines, UTL Thailand, Unisem Malaysia
F. Date of Initial Production:	July 23, 2004

**III. Packaging Information**

A. Package Type:	8-pin TDFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0708
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:	54°C/W
K. Single Layer Theta Jc:	8.3°C/W
L. Multi Layer Theta Ja:	41°C/W
M. Multi Layer Theta Jc:	8.3°C/W

**IV. Die Information**

A. Dimensions:	45 X 74 mils
B. Passivation:	SiO <sub>2</sub> /Si <sub>3</sub> N <sub>4</sub>
C. Interconnect:	Al/Cu(0.5%)
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35 um (as drawn)
F. Minimum Metal Spacing:	0.35 um (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
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 125 biased (static) life test are pending. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 93 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 11.5 \times 10^{-9}$$

$\lambda = 11.5$  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 E35X Process results in a FIT Rate of 0.28 @ 25C and 17.30 @ 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 NP59 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 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

**MAX5054BATA+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 125 Biased Time = 192 hrs.	DC Parameters & functionality	93	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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