RELIABILITY REPORT

FOR

LMX393AxA+

PLASTIC ENCAPSULATED DEVICES

May 12, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

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Written by

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Conclusion

The LMX393H 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 LMX331/LMX393/LMX339 single/dual/quad comparators are drop-in, pin-for-pin-compatible replacements for the LMV331/LMV393/LMV339. The LMX331H/LMX393H/LMX339H offer the performance of the LMX331/LMX393/LMX339 with the added benefit of internal hysteresis to provide noise immunity, preventing output oscillations even with slow-moving input signals.

Advantages of the LMX331/LMX393/LMX339 series include low supply voltage, small package, and low cost. The LMX331 is available in both 5-pin SC70 and SOT23 packages, LMX393 is available in both 8-pin µMAX® and smaller SOT23 packages, and the LMX339 is available in 14-pin TSSOP and SO packages. They are manufactured using advanced submicron CMOS technology. Designed with the most modern techniques, the LMX331/LMX393/LMX339 achieve superior performance over BiCMOS or bipolar versions on the market.

The LMX331/LMX393/LMX339 offer performance advantages such as wider supply voltage range, wider operating temperature range, better CMRR and PSRR, improved response time characteristics, reduced offset, reduced output saturation voltage, reduced input bias current, and improved RF immunity.

II. Manufacturing Information

A. Description/Function:	General-Purpose, Low-Voltage, Dual, Tiny-Pack Comparator
B. Process:	TC05 (0.5 micron CMOS)
C. Number of Device Transistors:	211
D. Fabrication Location:	Taiwan, USA
E. Assembly Location:	Malaysia, Philipinnes or Thailand
F. Date of Initial Production:	January, 2001

III. Packaging Information

A. Package Type:	**8 Lead SOT-23**	**8 Lead Thin uMAX**
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Matte Sn Plate	Matte Sn Plate
D. Die Attach:	Non-Conductive Epoxy	Silver-Filled Epoxy
E. Bondwire:	Gold (1 mil dia.)	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	# 05-1501-0259	# 05-1501-0260
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	24 x 42 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/Si/Cu (Aluminum/ Silicon/ Copper)
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal 1: 0.9 microns; Metal 2: 0.9 microns (as drawn)
F. Minimum Metal Spacing:	Metal 1: 0.8 microns; Metal 2: 0.8 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 shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 79 \times 2}$$ (Chi square value for MTTF upper limit)

↳ Thermal acceleration factor assuming a 0.8eV activation energy

$\lambda = 13.92 \times 10^{-9}$ $\lambda = 13.92$ 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 TSMC 0.5um Process results in a FIT Rate of 4.5 @ 25C and 77.5 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

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

The CM84 die type has been found to have all pins able to withstand a transient pulse of ±2000V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

LMX393AxA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		79	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SOT SC70	77 77	0 0
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