



RELIABILITY REPORT
FOR
MAX9406ETJ+
PLASTIC ENCAPSULATED DEVICES

August 31, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Conclusion

The MAX9406ETJ+ 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 MAX9406 high-speed, low-skew, quad differential input to current-mode logic (CML) translator features high-speed signal conversion of the DisplayPort(tm) (DP) to High-Definition Multimedia Interface (HDMI(tm)) technology. This device features ultra-low propagation delay of 350ps and channel-to-channel skew of less than 20ps. The MAX9406 supports typical data rates of 2Gbps. The MAX9406 provides the level shift for HDMI's Display Data Channel (DDC) and hot-plug detection (HPD), which converts the 5V single-ended logic to 3.3V single-ended logic. The MAX9406 operates from a 3V to 3.6V core supply and is specified over the -40°C to +85°C extended temperature range. This device is available in 48-pin, 7mm x 7mm thin QFN and 32-pin, 5mm x 5mm thin QFN packages.

II. Manufacturing Information

A. Description/Function:	DisplayPort to DVI(tm)/HDMI Level Shifter
B. Process:	GST2
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	10/26/2007

III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3000
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:	47°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	1.7°C/W

IV. Die Information

A. Dimensions:	72 X 68 mils
B. Passivation:	Si ₃ N ₄ (Silicon nitride)
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	2 microns (as drawn)
F. Minimum Metal Spacing:	2 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 150°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 46 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.3 \times 10^{-9}$$

$$\lambda = 23.3 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 GST2 Process results in a FIT Rate of 0.06 @ 25C and 1.10 @ 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 EC01-4 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX9406ETJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	46	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