RELIABILITY REPORT

FOR

MAX9210EUM+
(MAX9212, MAX9214, MAX9216, MAX9220, MAX9222)

PLASTIC ENCAPSULATED DEVICES

October 29, 2008

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
| --- |
| Ken Wendel |
| Quality Assurance |
| Director, Reliability Engineering |

Maxim Integrated Products. All rights reserved.

**Conclusion**

The MAX9210EUM+ 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**

A. General

The MAX9210/MAX9214/MAX9220/MAX9222 deserialize three LVDS serial data inputs into 21 single-ended LVCMOS/LVTTL outputs. A parallel rate LVDS clock received with the LVDS data streams provides timing for deserialization. The outputs have a separate supply, allowing 1.8V to 5V output logic levels.

The MAX9210/MAX9214/MAX9220/MAX9222 feature programmable DC balance, which allows isolation between a serializer and deserializer using AC-coupling. Each deserializer decodes data transmitted by one of MAX9209/MAX9213 serializers.

The MAX9210/MAX9214 have rising-edge output strobes, and when DC balance is not programmed, are compatible with non-DC-balanced 21-bit deserializers such as the DS90CR216A and DS90CR218A. The MAX9220/MAX9222 have falling-edge output strobes.

Two frequency versions and two DC-balance default conditions are available for maximum replacement flexibility and compatibility with popular non-DC-balanced deserializers. The transition time of the single-ended outputs is increased on the low-frequency version parts (MAX9210/MAX9220) for reduced EMI. The LVDS inputs meet IEC 61000-4-2 Level 4 ESD specification, Â±15kV for Air Discharge and Â±8kV Contact Discharge.

The MAX9210/MAX9214/MAX9220/MAX9222 are available in a TSSOP package, and operate over the -40°C to +85°C temperature range.

Maxim Integrated Products. All rights reserved.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | 4-Port LVDS and LVTTL-to-LVDS Repeaters |
| B. Process: | 0.35UM 2 Poly 3 Metal CMOS |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | TSMC |
| E. Assembly Location: | Carsem Malaysia, NSEB/UTL Thailand, Unisem Malaysia |
| F. Date of Initial Production: | October 25, 2002 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 48-pin TSSOP |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Ag Filled Epoxy |
| E. Bondwire: | 1.0 ( mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | # |
| H. Flammability Rating: | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1 |
| J. Multi Layer Theta Ja: | 91.0°C/W |
| K. Multi Layer Theta Jc: | 20.0°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 92 x 108 mils |
| B. Passivation: | Silicon Dioxide/Silicon Nitride |
| C. Interconnect: | Al/Cu |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 0.35 um |
| F. Minimum Metal Spacing: | 0.35 um |
| G. Bondpad Dimensions: | 5 mil. Sq. |
| H. Isolation Dielectric: | Silicon Dioxide |
| I. Die Separation Method: | Saw |

Maxim Integrated Products. All rights reserved.

**V. Quality Assurance Information**

| | |
|---|---|
| A. Quality Assurance Contacts: | Ken Wendel (Director, Reliability Engineering)<br>Bryan Preeshl (Managing Director of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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 biased (static) life test are pending. Using these results, the Failure Rate ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.37 \times 10^{-9}$

$\lambda = 22.37$ 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 TS352P3M Process results in a FIT Rate of 0.43 @ 25C and 7.50 @ 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 HS31Z die types have shown the following ESD performance per pin:

| | |
|---|---|
| HBM | 5KV |
| IEC Contact | 8KV |
| IEC Air | 15KV |

Latch-Up testing has shown that this device withstands a current of 250 mA.

Maxim Integrated Products. All rights reserved.

**Table 1**
Reliability Evaluation Test Results

**MAX9210EUM+**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta =<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 48 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| 85/85 | Ta = 85°C<br>RH = 85%<br>Biased<br>Time = 1000hrs. | DC Parameters & functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C<br>1000 Cycles<br>Method 1010 | DC Parameters & functionality | 77 | 0 |

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

Maxim Integrated Products. All rights reserved.