RELIABILITY REPORT
FOR
ICM7212MIPL+
PLASTIC ENCAPSULATED DEVICES

September 29, 2009

MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The ICM7212MIPL+ 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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The Maxim ICM7211 (LCD) and ICM7212 (LED) four digit, seven segment display drivers include input data latches, BCD to segment decoders, and all level translation and timing circuits needed to drive non-multiplexed displays. Both the ICM7211 and ICM7212 are available in two data input configurations: a multiplexed BCD interface version and a microprocessor interface version. The multiplexed BCD interface version has four BCD data inputs and four separate digit strobes. The microprocessor interface versions, designated by an "M" suffix, have four chip selects or WRITE inputs. The ICM7211 and ICM7212 decode the BCD data via an onboard character font ROM. There are two different character fonts available, hexadecimal and Code B.
II. Manufacturing Information

A. Description/Function: Four Digit Display Decoder/Drivers
B. Process: M6
C. Number of Device Transistors: 
D. Fabrication Location: Oregon
E. Assembly Location: Malaysia
F. Date of Initial Production: Pre 1997

III. Packaging Information

A. Package Type: 40-pin PDIP
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: #05-0501-0133
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: 60°C/W
K. Single Layer Theta Jc: 20°C/W

IV. Die Information

A. Dimensions: 112 X 123 mils
B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect: Al/1.0%Si
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: SiO₂
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 ($\lambda$) is calculated as follows:

$$\frac{1}{\text{MTTF}} = 10.47$$  
(Chi square value for MTTF upper limit)

$$\lambda = 2.6 \times 10^{-9}$$  
$\lambda = 2.6$ 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 M6 Process results in a FIT Rate of 0.22 @ 25°C and 3.73 @ 55°C (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 DD01-4 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 +/-100 mA.
<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static Life Test</strong> (Note 1)</td>
<td>Ta = 135°C, Biased, Time = 192 hrs.</td>
<td>DC Parameters &amp; functionality</td>
<td>2400</td>
<td>4</td>
</tr>
<tr>
<td><strong>Moisture Testing</strong> (Note 2)</td>
<td>Ta = 130°C, RH = 85%, Biased, Time = 96 hrs.</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td><strong>Mechanical Stress</strong> (Note 2)</td>
<td>Temperature Cycle -65°C/150°C, 1000 Cycles, Method 1010</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
</tbody>
</table>

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