RELIABILITY REPORT

FOR

MAX3224EAAP+

PLASTIC ENCAPSULATED DEVICES

January 19, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX3224EAAP+ 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 MAX3224E/MAX3225E/MAX3226E/MAX3227E/MAX3244E/MAX3245E are 3V-powered EIA/TIA-232 and V.28/V.24 communications interfaces with automatic shutdown/wakeup features, high data-rate capabilities, and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver inputs are protected to ±15kV using IEC 1000-4-2 Air-Gap Discharge, ±8kV using IEC 1000-4-2 Contact Discharge, and ±15kV using the Human Body Model. All devices achieve a 1µA supply current using Maxim's revolutionary AutoShutdown Plus(tm) feature. These devices automatically enter a low-power shutdown mode when the RS-232 cable is disconnected or the transmitters of the connected peripherals are inactive, and the UART driving the transmitter inputs is inactive for more than 30 seconds. They turn on again when they sense a valid transition at any transmitter or receiver input. AutoShutdown Plus saves power without changes to the existing BIOS or operating system. The MAX3225E/MAX3227E/MAX3245E also feature MegaBaud(tm) operation, guaranteeing 1Mbps for high-speed applications such as communicating with ISDN modems. The MAX3224E/MAX3226E/MAX3244E guarantee 250kbps operation. The transceivers have a proprietary low-dropout transmitter output stage enabling true RS-232 performance from a +3.0V to +5.5V supply with a dual charge pump. The charge pump requires only four small 0.1µF capacitors for operation from a 3.3V supply. The MAX3224E-MAX3227E feature a logic-level output (READY) that asserts when the charge pump is regulating and the device is ready to begin transmitting. All devices are available in a space-saving TQFN, SSOP, and TSSOP (MAX3224E/MAX3225E/MAX3244E/MAX3245E) packages.

II. Manufacturing Information

A. Description/Function:	±15kV ESD-Protected, 1µA, 1Mbps, 3.0V to 5.5V, RS-232 Transceivers with AutoShutdown Plus
B. Process:	B3
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	ATP Philippines, Carsem Malaysia
F. Date of Initial Production:	January 24, 1998

III. Packaging Information

A. Package Type:	20-pin SSOP
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:	#05-1901-0189
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:	125°C/W
K. Single Layer Theta Jc:	33°C/W
L. Multi Layer Theta Ja:	83°C/W
M. Multi Layer Theta Jc:	33°C/W

IV. Die Information

A. Dimensions:	91 X 159 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 476 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 2.3 \times 10^{-9}$

$\lambda = 2.3$ 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 B8 Process results in a FIT Rate of 2.71 @ 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 RS60-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX3224EAAP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	476	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