

RELIABILITY REPORT
FOR
MAX1406CWE+
PLASTIC ENCAPSULATED DEVICES

April 14, 2009

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX1406CWE+ 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 MAX1406 is an RS-232 IC designed to meet the stringent electrostatic discharge (ESD) requirements of the European community. All transmitter outputs and receiver inputs are protected to $\pm 15\text{kV}$ using IEC1000-4-2 Air-Gap Discharge, $\pm 8\text{kV}$ using IEC 1000-4-2 Contact Discharge, and $\pm 15\text{kV}$ using the Human Body Model. The MAX1406 has three RS-232 transmitters and three RS-232 receivers, and is optimized for operation in printer, modem, and telecom applications. It is guaranteed to run at data rates up to 230kbps, providing compatibility with popular software for communicating with personal computers. Power-supply current is less than 500 μA for IDD and ISS, and less than 1mA for ICC. The MAX1406 is pin and functionally compatible with the industry-standard MC145406, so existing designs can instantly become Electromagnetic Compatibility (EMC) compliant. The MAX1406 is available in DIP and SO packages, and in a tiny SSOP that reduces board space.

II. Manufacturing Information

A. Description/Function:	±15kV ESD-Protected, EMC Compliant, 230kbps, 3 Tx/3 Rx RS-232 IC
B. Process:	M5
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Unisem Malaysia (Pb), ATP Philippines and Carsem Malaysia (Pb-Free)
F. Date of Initial Production:	Pre 1997

III. Packaging Information

A. Package Type:	16-pin SOIC (W)
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:	#05-1901-0160
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:	105°C/W
K. Single Layer Theta Jc:	22°C/W
L. Multi Layer Theta Ja:	69.1°C/W
M. Multi Layer Theta Jc:	22°C/W

IV. Die Information

A. Dimensions:	94 X 153 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/0.5% Cu
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:	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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 160 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 6.7 \times 10^{-9}$$

$$\lambda = 6.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 M5 Process results in a FIT Rate of 3.2 @ 25C and 54.8 @ 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 RS44 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX1406CWE+

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	160	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