



RELIABILITY REPORT
FOR
MAX1480ECCPI+
PLASTIC ENCAPSULATED DEVICES

December 7, 2009

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX1480ECCPI+ 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	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX1480EA/MAX1480EC/MAX1490EA/MAX1490EB are complete, electrically isolated, RS-485/RS-422 data communications interface solutions in a hybrid microcircuit. The RS-485/RS-422 I/O pins are protected against $\pm 15\text{kV}$ electrostatic discharge (ESD) shocks, without latchup. Transceivers, optocouplers, and a transformer provide a complete interface in a standard DIP package. A single +5V supply on the logic side powers both sides of the interface. The MAX1480EC/MAX1490EB feature reduced-slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission at data rates up to 160kbps. The MAX1480EA/MAX1490EA driver slew rate is not limited, allowing transmission rates up to 2.5Mbps. The MAX1480EA/MAX1480EC are designed for half-duplex communication, while the MAX1490EA/MAX1490EB feature full-duplex communication. Drivers are short-circuit current limited and protected against excessive power dissipation by thermal shutdown circuitry that places the driver outputs into a high-impedance state. The receiver input has a fail-safe feature that guarantees a known output (RO low for the MAX1480EA/MAX1480EC, active-low RO high for the MAX1490EA/ MAX1490EB) if the input is open circuit. The MAX1480EA/MAX1480EC/MAX1490EA/MAX1490EB withstand 1260VRMS (1min) or 1520VRMS (1s). Their isolated outputs meet all RS-485/RS-422 specifications. The MAX1480EA/MAX1480EC are available in a 28-pin DIP package, and the MAX1490EA/MAX1490EB are available in a 24-pin DIP package.

II. Manufacturing Information

A. Description/Function:	±15kV ESD-Protected, Isolated RS-485/RS-422 Data Interfaces
B. Process:	Hybrid
C. Number of Device Transistors:	0
D. Fabrication Location:	NA
E. Assembly Location:	Philippines
F. Date of Initial Production:	January 27, 2001

III. Packaging Information

A. Package Type:	28-pin PDIP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#31-4766
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:	70°C/W
K. Single Layer Theta Jc:	21°C/W

IV. Die Information

A. Dimensions:	Hybrid (transceiver, transformers, optical sensors)
B. Passivation:	NA
C. Interconnect:	NA
D. Backside Metallization:	None
E. Minimum Metal Width:	NA
F. Minimum Metal Spacing:	NA
G. Bondpad Dimensions:	NA
H. Isolation Dielectric:	NA
I. Die Separation Method:	NA

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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.4 \times 10^{-9}$$
$$\lambda = 13.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 Hybrid Process results in a FIT Rate of 0.05 @ 25C and 0.91 @ 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 RT15-RT15P die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V 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

MAX1480ECCPI+

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	80	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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