

RELIABILITY REPORT
FOR
MAX1487ECSA+
PLASTIC ENCAPSULATED DEVICES

October 5, 2011

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX1487ECSA+ 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 MAX481E, MAX483E, MAX485E, MAX487E-MAX491E, and MAX1487E are low-power transceivers for RS-485 and RS-422 communications in harsh environments. Each driver output and receiver input is protected against $\pm 15\text{kV}$ electro-static discharge (ESD) shocks, without latchup. These parts contain one driver and one receiver. The MAX483E, MAX487E, MAX488E, and MAX489E feature reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, thus allowing error-free data transmission up to 250kbps. The driver slew rates of the MAX481E, MAX485E, MAX490E, MAX491E, and MAX1487E are not limited, allowing them to transmit up to 2.5Mbps. These transceivers draw as little as $120\mu\text{A}$ supply current when unloaded or when fully loaded with disabled drivers (see Selector Guide). Additionally, the MAX481E, MAX483E, and MAX487E have a low-current shutdown mode in which they consume only $0.5\mu\text{A}$. All parts operate from a single +5V supply. Drivers are short-circuit current limited, and are protected against excessive power dissipation by thermal shutdown circuitry that places their outputs into a high-impedance state. The receiver input has a fail-safe feature that guarantees a logic-high output if the input is open circuit. The MAX487E and MAX1487E feature quarter-unit-load receiver input impedance, allowing up to 128 transceivers on the bus. The MAX488E-MAX491E are designed for full-duplex communications, while the MAX481E, MAX483E, MAX485E, MAX487E, and MAX1487E are designed for half-duplex applications. For applications that are not ESD sensitive see the pinand function-compatible MAX481, MAX483, MAX485, MAX487-MAX491, and MAX1487.

II. Manufacturing Information

A. Description/Function:	±15kV ESD-Protected, Slew-Rate-Limited, Low-Power, RS-485/RS-422 Transceivers
B. Process:	B3
C. Number of Device Transistors:	339
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	Pre 1997

III. Packaging Information

A. Package Type:	SOIC (N) 8L
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-1901-0137 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	128.4°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	124 X 85 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
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:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)
Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{4.04}{192 \times 4340 \times 480 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 5.0 \times 10^{-9}$$

$$\lambda = 5.0 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 B3 Process results in a FIT Rate of 0.51 @ 25C and 8.79 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot JIKIEQ001B D/C 0833, Latch-Up lot NIKGDA1AQA D/C 0535)

The RS29-8 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX1487ECSA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters & functionality	80	1	NIKADA477A, D/C 0427
	Biased		80	0	NIKHCN021D, D/C 9817
	Time = 192 hrs.		80	0	NIKFCQ001A, D/C 9651
			80	0	XIKIBY001A, D/C N/A
			80	0	XIKABY001A, D/C N/A
			80	0	XIKCBY001A, D/C N/A

Note 1: Life Test Data may represent plastic DIP qualification lots.