

RELIABILITY REPORT
FOR
MAX490ESA+
PLASTIC ENCAPSULATED DEVICES

July 24, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

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| Approved by |
| Sokhom Chum |
| Quality Assurance |
| Reliability Engineer |

Conclusion

The MAX490ESA+ 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 MAX481, MAX483, MAX485, MAX487-MAX491, and MAX1487 are low-power transceivers for RS-485 and RS-422 communication. Each part contains one driver and one receiver. The MAX483, MAX487, MAX488, and MAX489 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 MAX481, MAX485, MAX490, MAX491, and MAX1487 are not limited, allowing them to transmit up to 2.5Mbps. These transceivers draw between 120 μ A and 500 μ A of supply current when unloaded or fully loaded with disabled drivers. Additionally, the MAX481, MAX483, and MAX487 have a low-current shutdown mode in which they consume only 0.1 μ 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 the driver 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 MAX487 and MAX1487 feature quarter-unit-load receiver input impedance, allowing up to 128 MAX487/MAX1487 transceivers on the bus. Full-duplex communications are obtained using the MAX488-MAX491, while the MAX481, MAX483, MAX485, MAX487, and MAX1487 are designed for half-duplex applications.

II. Manufacturing Information

| | |
|----------------------------------|---|
| A. Description/Function: | Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers |
| B. Process: | B3 |
| C. Number of Device Transistors: | 562 |
| D. Fabrication Location: | Oregon |
| E. Assembly Location: | Philippines |
| F. Date of Initial Production: | Pre 1997 |

III. Packaging Information

| | |
|--|--------------------------|
| A. Package Type: | 150 mil 8L SOIC |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive |
| E. Bondwire: | Au (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-1901-0036 / B |
| 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: | 136°C/W |
| M. Multi Layer Theta Jc: | 38°C/W |

IV. Die Information

| | |
|----------------------------|---|
| A. Dimensions: | 76X54 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 479 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

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

$$\lambda = 2.3 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 (lot NIKDDA992D D/C 0529)

The RS29-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX490ESA+

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|----------------------------------|---|----------------------------------|-------------|--------------------|----------------------|
| Static Life Test (Note 1) | Ta = 135°C Biased Time = 192 hrs. | DC Parameters & functionality | 79 | 0 | NIKADA477A, D/C 0427 |
| | | | 80 | 0 | NIKHCN021D, D/C 9817 |
| | | | 80 | 0 | NIKFCQ001A, D/C 9651 |
| | | | 80 | 0 | XIKIBY001A, D/C 9546 |
| | | | 80 | 0 | XIKABY001A, D/C 9546 |
| | | | 80 | 0 | XIKCBY001A, D/C 9546 |

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