

RELIABILITY REPORT
FOR
MAX6316LUK31BX+
PLASTIC ENCAPSULATED DEVICES

November 19, 2013

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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

Conclusion

The MAX6316LUK31BX+ successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX6316-MAX6322 family of microprocessor (μ P) supervisory circuits monitors power supplies and microprocessor activity in digital systems. It offers several combinations of push/pull, open-drain, and bidirectional (such as Motorola 68HC11) reset outputs, along with watchdog and manual reset features. The *Selector Guide* below lists the specific functions available from each device. These devices are specifically designed to ignore fast negative transients on VCC. Resets are guaranteed valid for VCC down to 1V. These devices are available in 26 factory-trimmed reset threshold voltages (from 2.5V to 5V, in 100mV increments), featuring four minimum power-on reset timeout periods (from 1ms to 1.12s), and four watchdog timeout periods (from 6.3ms to 25.6s). Thirteen standard versions are available with an order increment requirement of 2500 pieces (see *Standard Versions* table in the full data sheet); contact the factory for availability of other versions, which have an order increment requirement of 10,000 pieces. The MAX6316-MAX6322 are offered in a miniature 5-pin SOT23 package.

II. Manufacturing Information

| | |
|----------------------------------|---|
| A. Description/Function: | 5-Pin μ P Supervisory Circuits with Watchdog and Manual Reset |
| B. Process: | S12 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | Oregon, California or Texas |
| E. Assembly Location: | Malaysia, Philippines, or Thailand |
| F. Date of Initial Production: | January 23, 1998 |

III. Packaging Information

| | |
|--|--------------------------|
| A. Package Type: | 5-pin SOT23 |
| 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: | #05-1601-0034 |
| 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: | 324.3 °C/W |
| K. Single Layer Theta Jc: | 82 °C/W |
| L. Multi Layer Theta Ja: | 255.9 °C/W |
| M. Multi Layer Theta Jc: | 81 °C/W |

IV. Die Information

| | |
|----------------------------|---|
| A. Dimensions: | 43X38 mils |
| B. Passivation: | $\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Al/0.5%Cu with Ti/TiN Barrier |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 1.2 microns (as drawn) |
| F. Minimum Metal Spacing: | 1.2 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 2.6 \times 10^{-9}$$

$$\lambda = 2.6 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the S12 Process results in a FIT Rate of 0.03 @ 25C and 0.51 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot JQLAIQ001B, D/C 1144)

The MS13 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

MAX6316LUK31BX+

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|----------------------------------|--|----------------------------------|-------------|--------------------|----------------------|
| Static Life Test (Note 1) | Ta = 135°C Biased Time = 1000 hrs. | DC Parameters & functionality | 80 | 0 | JQLAIQ001B, D/C 1144 |

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