

RELIABILITY REPORT  
FOR  
MAX9141EKA+  
PLASTIC ENCAPSULATED DEVICES

December 13, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

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|----------------------|
| <b>Approved by</b>   |
| Sokhom Chum          |
| Quality Assurance    |
| Reliability Engineer |

## Conclusion

The MAX9141EKA+ 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 MAX9140/MAX9141 are single and the MAX9142/MAX9144 are dual/quad high-speed comparators optimized for systems powered from a 3V or 5V supply. The MAX9141 features latch enable and device shutdown. These devices combine high speed, low power, and rail-to-rail inputs. Propagation delay is 40ns, while supply current is only 150 $\mu$ A per comparator. The input common-mode range of the MAX9140/MAX9141/MAX9142/MAX9144 extends beyond both power-supply rails. The outputs pull to within 0.3V of either supply rail without external pullup circuitry, making these devices ideal for interface with both CMOS and TTL logic. All input and output pins can tolerate a continuous short-circuit fault condition to either rail. Internal hysteresis ensures clean output switching, even with slow-moving input signals. The MAX9140/MAX9141/MAX9142/MAX9144 are higher-speed, lower-power, and lower-cost upgrades to industry-standard comparators MAX941/MAX942/MAX944. The MAX9140 are offered in tiny 5-pin SC70 and SOT23 packages. The MAX9141 and MAX9142 are available in 8-pin SOT23 and SO packages, while the MAX9144 is available in both 14-pin SO and TSSOP packages.

## II. Manufacturing Information

|                                  |                                                                |
|----------------------------------|----------------------------------------------------------------|
| A. Description/Function:         | 40ns, Low-Power, 3V/5V, Rail-to-Rail Single-Supply Comparators |
| B. Process:                      | CB3                                                            |
| C. Number of Device Transistors: |                                                                |
| D. Fabrication Location:         | Oregon                                                         |
| E. Assembly Location:            | Malaysia                                                       |
| F. Date of Initial Production:   | June 01, 2001                                                  |

## III. Packaging Information

|                                                                          |                          |
|--------------------------------------------------------------------------|--------------------------|
| A. Package Type:                                                         | 8-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:                                                     | #05-1501-0234            |
| H. Flammability Rating:                                                  | Class UL94-V0            |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1                  |
| J. Single Layer Theta Jb:                                                | 110°C/W                  |
| K. Single Layer Theta Jc:                                                | 80°C/W                   |
| L. Multi Layer Theta Ja:                                                 | N/A                      |
| M. Multi Layer Theta Jc:                                                 | N/A                      |

## IV. Die Information

|                            |                                                                |
|----------------------------|----------------------------------------------------------------|
| A. Dimensions:             | 65 X 24 mils                                                   |
| B. Passivation:            | Si <sub>3</sub> N <sub>4</sub> (Silicon nitride)               |
| C. Interconnect:           | Au                                                             |
| 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 <sub>2</sub>                                               |
| I. Die Separation Method:  | Wafer Saw                                                      |

**V. Quality Assurance Information**

- A. Quality Assurance Contacts: 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 150°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) 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)

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 CB3 Process results in a FIT Rate of 0.25 @ 25C and 4.38 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot N41AA4001D D/C 0107)

The CM68 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX9141EKA+**

| TEST ITEM                        | TEST CONDITION                          | FAILURE IDENTIFICATION           | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS             |
|----------------------------------|-----------------------------------------|----------------------------------|-------------|--------------------|----------------------|
| <b>Static Life Test</b> (Note 1) | Ta = 135°C<br>Biased<br>Time = 192 hrs. | DC Parameters<br>& functionality | 80          | 0                  | N41AA4001D, D/C 0107 |

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