

RELIABILITY REPORT
FOR
MAX6163AESA+
PLASTIC ENCAPSULATED DEVICES

November 4, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

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| Approved by |
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| Quality Assurance |
| Reliability Engineer |

Conclusion

The MAX6163AESA+ 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 MAX6161-MAX6168 are precision, low-dropout, micropower voltage references. These three-terminal devices operate with an input voltage range from (V_{OUT} + 200mV) to 12.6V and are available with output voltage options of 1.25V, 1.8V, 2.048V, 2.5V, 3V, 4.096V, 4.5V, and 5V. They feature a proprietary curvature-correction circuit and laser-trimmed thin-film resistors that result in a very low temperature coefficient of 5ppm/°C (max) and an initial accuracy of ±2mV (max). Specifications apply to the extended temperature range (-40°C to +85°C). The MAX6161-MAX6168 typically draw only 100µA of supply current and can source 5mA (4mA for MAX6161) or sink 2mA of load current. Unlike conventional shunt-mode (two-terminal) references that waste supply current and require an external resistor, these devices offer a supply current that is virtually independent of the supply voltage (8µA/V variation) and do not require an external resistor. Additionally, the internally compensated devices do not require an external compensation capacitor. Eliminating the external compensation capacitor saves valuable board area in space-critical applications. Low dropout voltage and supply independent, ultra-low supply current make these devices ideal for battery-operated, high-performance, low-voltage systems. The MAX6161-MAX6168 are available in 8-pin SO packages.

II. Manufacturing Information

| | |
|----------------------------------|----------------------------------------------------------------------------------|
| A. Description/Function: | Precision, Micropower, Low-Dropout, High-Output-Current, SO-8 Voltage References |
| B. Process: | B12 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | California |
| E. Assembly Location: | Thailand |
| 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: | #05-9000-1537 / 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: | 136°C/W |
| M. Multi Layer Theta Jc: | 38°C/W |

IV. Die Information

| | |
|----------------------------|-------------------------------------------------------------------------------------|
| A. Dimensions: | 45 X 45 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: | 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 160 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 6.9 \times 10^{-9}$$

$$\lambda = 6.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 B12 Process results in a FIT Rate of 0.06 @ 25C and 1.06 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot I5HDAQ001C D/C 0001)

The RF24-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V 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

MAX6163AESA+

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|----------------------------------|-----------------|------------------------|-------------|--------------------|----------------------|
| Static Life Test (Note 1) | Ta = 135°C | DC Parameters | 80 | 0 | I5HABQ002B, D/C 0122 |
| | Biased | & functionality | 80 | 0 | I5HBAQ001A, D/C 0001 |
| | Time = 192 hrs. | | | | |

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