

RELIABILITY REPORT  
FOR  
MAX1193ETI+  
PLASTIC ENCAPSULATED DEVICES

February 11, 2016

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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

## Conclusion

The MAX1193ETI+ 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 MAX1193 is an ultra-low-power, dual, 8-bit, 45Mps analog-to-digital converter (ADC). The device features two fully differential wideband track-and-hold (T/H) inputs. These inputs have a 440MHz bandwidth and accept fully differential or single-ended signals. The MAX1193 delivers a typical signal-to-noise and distortion (SINAD) of 48.5dB at an input frequency of 5.5MHz and a sampling rate of 45Mps while consuming only 57mW. This ADC operates from a 2.7V to 3.6V analog power supply. A separate 1.8V to 3.6V supply powers the digital output driver. In addition to ultra-low operating power, the MAX1193 features three power-down modes to conserve power during idle periods. Excellent dynamic performance, ultra-low power, and small size make the MAX1193 ideal for applications in imaging, instrumentation, and digital communications. An internal 1.024V precision bandgap reference sets the full-scale range of the ADC to  $\pm 0.512V$ . A flexible reference structure allows the MAX1193 to use its internal reference or accept an externally applied reference for applications requiring increased accuracy. The MAX1193 features parallel, multiplexed, CMOS-compatible tri-state outputs. The digital output format is offset binary. A separate digital power input accepts a voltage from 1.8V to 3.6V for flexible interfacing to different logic levels. The MAX1193 is available in a 5mm x 5mm, 28-pin thin QFN package, and is specified for the extended industrial (-40°C to +85°C) temperature range. For higher sampling frequency applications, refer to the [MAX1195-MAX1198](#) dual 8-bit ADCs. [See a parametric table of the complete family of pin-compatible, 8-bit high-speed ADCs.](#)

## II. Manufacturing Information

|                                  |   |
|----------------------------------|---|
| A. Description/Function:         | Ultra-Low-Power, 45Msps, Dual 8-Bit ADC |
| B. Process:                      | TS35                                    |
| C. Number of Device Transistors: |   |
| D. Fabrication Location:         | Taiwan                                  |
| E. Assembly Location:            | China, Thailand, Malaysia               |
| F. Date of Initial Production:   | April 25, 2003                          |

## III. Packaging Information

|  |                          |
|--|--------------------------|
| A. Package Type:   | 28-pin TQFN 5x5          |
| 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:   | #05-9000-0412            |
| 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:  | 47°C/W                   |
| K. Single Layer Theta Jc:  | 2.1°C/W                  |
| L. Multi Layer Theta Ja:   | 29°C/W                   |
| M. Multi Layer Theta Jc:   | 2.1°C/W                  |

## IV. Die Information

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 100X126 mils  |
| B. Passivation:            | Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide) |
| C. Interconnect:           | Al/0.5%Cu with Ti/TiN Barrier   |
| D. Backside Metallization: | None  |
| E. Minimum Metal Width:    | 0.35um  |
| F. Minimum Metal Spacing:  | 0.35um  |
| G. Bondpad Dimensions:     |   |
| 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{261 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 16.8 \times 10^{-9}$$

$$\lambda = 16.8 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 TS35 Process results in a FIT Rate of 0.09 @ 25C and 1.56 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot QEH2BQ001B, D/C 0326)

The CA03-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-600V 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

**MAX1193ETI+**

| 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 = 261 hrs. | DC Parameters<br>& functionality | 48          | 0                  | QEH1BA007M, D/C 0945 |

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