

RELIABILITY REPORT
FOR
MAX16052AUT+T
PLASTIC ENCAPSULATED DEVICES

August 12, 2016

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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| Approved by |
| Eric Wright |
| Quality Assurance |
| Reliability Engineer |

Conclusion

The MAX16052AUT+T 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 MAX16052/MAX16053 are a family of small, low-power, high-voltage monitoring circuits with sequencing capability. These miniature devices offer very wide flexibility with an adjustable voltage threshold and an external capacitor-adjustable time delay. These devices are ideal for use in power-supply sequencing, reset sequencing, and power switching applications. Multiple devices can be cascaded for complex sequencing applications.

A high-impedance input (IN) with a 0.5V threshold allows an external resistive divider to set the monitored threshold. The output (OUT) asserts high when the input voltage rises above the 0.5V threshold and the enable input (EN) is asserted high. When the voltage at IN falls below 0.495V or when the enable input is deasserted (EN = low), the output deasserts (OUT = low). The MAX16052/MAX16053 provide a capacitor programmable delay time from when the voltage at IN rises above 0.5V to when the output is asserted.

The MAX16052 offers an active-high open-drain output while the MAX16053 offers an active-high push-pull output. Both devices operate from a 2.25V to 28V supply voltage and feature an active-high enable input. The MAX16052/MAX16053 are available in a tiny 6-pin SOT23 package and are fully specified over the automotive temperature range (-40°C to +125°C).

II. Manufacturing Information

| | |
|----------------------------------|--|
| A. Description/Function: | High-Voltage, Adjustable Sequencing/Supervisory Circuits |
| B. Process: | B8 |
| C. Number of Device Transistors: | 347 |
| D. Fabrication Location: | USA |
| E. Assembly Location: | Thailand |
| F. Date of Initial Production: | April 23, 2008 |

III. Packaging Information

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|--|--------------------------|
| A. Package Type: | 6-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: | #05-9000-3061 |
| 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: | N/A°C/W |
| K. Single Layer Theta Jc: | N/A°C/W |
| L. Multi Layer Theta Ja: | 115°C/W |
| M. Multi Layer Theta Jc: | 80°C/W |

IV. Die Information

| | |
|----------------------------|---|
| A. Dimensions: | 32X40 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: | 0.8 microns (as drawn) |
| F. Minimum Metal Spacing: | 0.8 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: Eric Wright (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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.4 \times 10^{-9}$$

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The MT10 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 and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX16052AUT+T

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|----------------------------------|--|----------------------------------|-------------|--------------------|----------|
| Static Life Test (Note 1) | Ta = 135C Biased Time = 192 hrs. | DC Parameters & functionality | 48 | 0 | |

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