

RELIABILITY REPORT
FOR
MAX1672EEE+T
PLASTIC ENCAPSULATED DEVICES

October 14, 2016

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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

Conclusion

The MAX1672EEE+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.

Table of Contents

| | |
|--|---|
| I.Device Description | IV.Die Information |
| II.Manufacturing Information | V.Quality Assurance Information |
| III.Packaging Information | VI.Reliability Evaluation |
|Attachments | |

I. Device Description

A. General

The MAX1672 integrates a step-up DC-DC converter with a linear regulator to provide step-up/down voltage conversion. This device provides a constant output voltage for inputs that vary above and below the output voltage. It has a 1.8V to 11V input range and a preset 3.3V or 5V output. The output can also be set from 1.25V to 5.5V using two resistors. Typical efficiency is 85%. The MAX1672's step-up/linear-regulator configuration permits the use of a single, physically smaller inductor than can be used with competing SEPIC and flyback configurations. Switch current is also selectable, permitting the use of smaller inductors in low-current applications. The linear regulator also acts as a filter to reduce output ripple voltage. The MAX1672 has a low 85 μ A quiescent supply current, which is further reduced to 0.1 μ A in logic-controlled shutdown. The output voltage is disconnected from the input in shutdown. The MAX1672 also has a PGI/PGO-bar low-battery detector. The MAX1672 comes in a 16-pin QSOP package (same size as a standard 8-pin SO). For a larger device that delivers more output current, refer to the MAX710/MAX711. The preassembled MAX1672 evaluation kit is available to speed designs.

II. Manufacturing Information

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|--------------------------------|--|
| A. Description/Function: | Step-Up/Down DC-DC Converter in QSOP Package |
| B. Process: | S3 |
| C. Fabrication Location: | USA |
| D. Assembly Location: | Philippines, Thailand |
| E. Date of Initial Production: | November 10, 1997 |

III. Packaging Information

| | |
|--|--------------------------|
| A. Package Type: | 16-pin QSOP |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive |
| E. Bondwire: | Au (1.3 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-1101-0045 |
| 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: | 120°C/W |
| K. Single Layer Theta Jc: | 37°C/W |
| L. Multi Layer Theta Ja: | 105°C/W |
| M. Multi Layer Theta Jc: | 37°C/W |

IV. Die Information

| | |
|----------------------------|---|
| A. Dimensions: | 91X144 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: | 3.0 microns (as drawn) |
| F. Minimum Metal Spacing: | 3.0 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(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 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 S3 Process results in a FIT Rate of 0.04 @ 25C and 0.69 @ 55C (0.8 eV, 60% UCL)

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

The PX42 die type has been found to have all pins able to withstand an 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 and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX1672EEEE+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 | 80 | 0 | |

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