RELIABILITY REPORT

FOR

**MAX6900ETT**

PLASTIC ENCAPSULATED DEVICES

May 13, 2003

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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**Conclusion**

The MAX6900 sucessfully 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.

**Table of Contents**



## I. Device Description

### A. General

The MAX6900, I²C™-bus-compatible real-time clock (RTC) in a 6-pin SOT23 package contains a real-time clock/calendar and 31-byte x 8-bit wide of static random access memory (SRAM). The real-time clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap year up to the year 2100. The clock operates in either the 24hr or 12hr format with an AM/PM indicator.

### B. Absolute Maximum Ratings

| Item | Rating |
|---|---|
| VCC to GND | -0.3V to +6V |
| All Other Pins to GND | -0.3V to (VCC + 0.3V) |
| Input Current (All Pins) | 20mA |
| Output Current (All Pins) | 20mA |
| Rate of Rise, VCC | 100V/us |
| Storage Temp. | -65°C to +150°C |
| Lead Temp. (10 sec.) | +300°C |
| Continuous Power Dissipation (TA = +70°C) | |
| 6-Pin QFN (3x3) | 1951mW |
| Derates above +70°C | |
| 6-Pin QFN (3x3) | 24.4mW/°C |

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | $I^2C$-Bus-Compatible Real-Time Clock |
| B. Process: | TC05 |
| C. Number of Device Transistors: | 19,307 |
| D. Fabrication Location: | Taiwan |
| E. Assembly Location: | Malaysia |
| F. Date of Initial Production: | January, 2001 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | **6-Lead QFN (3x3)** |
| B. Lead Frame: | Copper |
| C. Lead Finish: | Solder Plate |
| D. Die Attach: | Silver-Filled Epoxy |
| E. Bondwire: | Gold (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | Buildsheet # 05-9000-0530 |
| H. Flammability Rating: | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112: | Level 1 |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 70 x 44 mils |
| B. Passivation: | $Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Al/Si/Cu (Aluminum/ Silicon/ Copper) |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | Metal 1: 0.9 microns; Metal 2: 0.9 microns (as drawn) |
| F. Minimum Metal Spacing: | Metal 1: 0.8 microns; Metal 2: 0.8 microns (as drawn) |
| G. Bondpad Dimensions: | 5 mil. Sq. |
| H. Isolation Dielectric: | $SiO_2$ |
| I. Die Separation Method: | Wafer Saw |

## V. Quality Assurance Information

A. Quality Assurance Contacts: Jim Pedicord (Reliability Lab Manager)
Bryan Preeshl (Executive Director of QA)
Kenneth Huening (Vice President)

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 135°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 160 \times 2}$$

(Chi square value for MTTF upper limit)

↳ Thermal acceleration factor assuming a 0.8eV activation energy

$\lambda = 6.79 \times 10^{-9}$ $\lambda = 6.79$ F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure the reliability of its processes. The reliability required for lots which receive a burn-in qualification is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. The Burn-In Schematic #06-5635 shows the static circuit used for this test Maxim performs failure analysis on lots exceeding this level. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Report (**RR-1M**).

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

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

The DW04 die type has been found to have all pins able to withstand a transient pulse of ±1000V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

**Table 1**
Reliability Evaluation Test Results

**MAX6900ETT**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta = 135°C<br>Biased<br>Time = 192 hrs. | DC Parameters<br>& functionality | 160 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| Pressure Pot | Ta = 121°C<br>P = 15 psi.<br>RH= 100%<br>Time = 168hrs. | DC Parameters<br>& functionality | 77 | 0 |
| 85/85 | Ta = 85°C<br>RH = 85%<br>Biased<br>Time = 1000hrs. | DC Parameters<br>& functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C<br>1000 Cycles<br>Method 1010 | DC Parameters<br>& functionality | 77 | 0 |

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process Data.

Attachment #1

TABLE II. Pin combination to be tested. 1/ 2/

| | Terminal A (Each pin individually connected to terminal A with the other floating) | Terminal B (The common combination of all like-named pins connected to terminal B) |
|---|---|---|
| 1. | All pins except $V_{PS1}$ 3/ | All $V_{PS1}$ pins |
| 2. | All input and output pins | All other input-output pins |

1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground

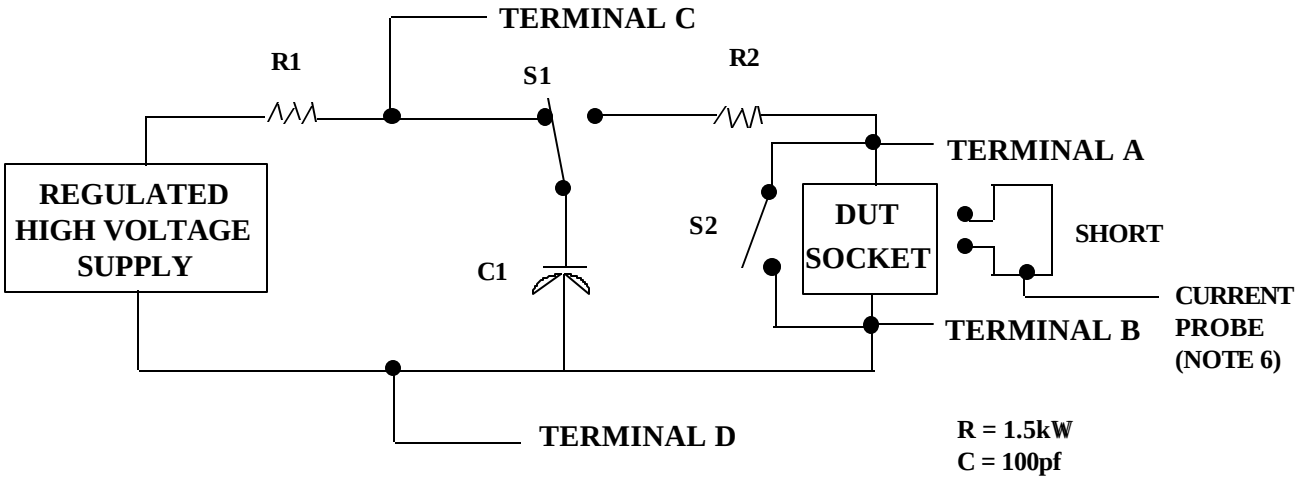
(e.g., where $V_{PS1}$ is $V_{DD}$, $V_{CC}$, $V_{SS}$, $V_{BB}$, GND, $+V_S$, $-V_S$, $V_{REF}$, etc).

3.4 Pin combinations to be tested.

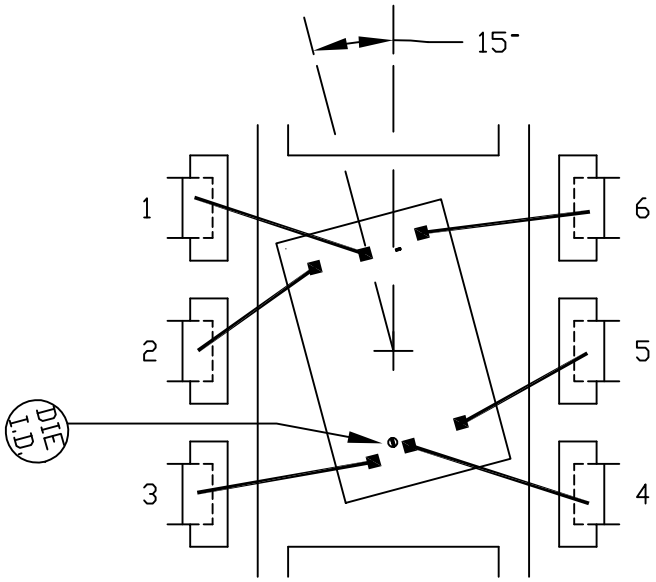
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., $V_{SS1}$, or $V_{SS2}$ or $V_{SS3}$ or $V_{CC1}$, or $V_{CC2}$) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.

c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



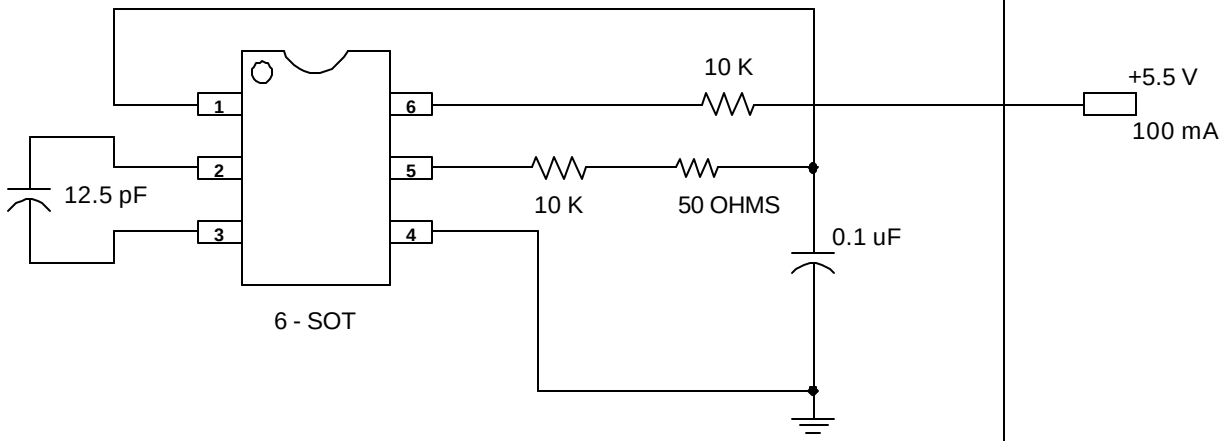
3x3x0.8 MM QFN THIN PKG. EXPOSED PAD PKG.




| PKG. CODE: T633-1 | | SIGNATURES | DATE | MAXIM CONFIDENTIAL & PROPRIETARY | |
|---|---|---|---|---|---|
| CAV./PAD SIZE: 71×102 | PKG. | | | BOND DIAGRAM #: 05-9000-0530 | REV: A |
| | DESIGN | | | | |

ONCE PER SOCKET

ONCE PER BOARD




**DEVICES: MAX 6900**

**MAX. EXPECTED CURRENT = 100mA**

DRAWN BY: HAK TAN

NOTES: