

RELIABILITY REPORT  
FOR  
MAX6888CETE+  
PLASTIC ENCAPSULATED DEVICES

December 5, 2014

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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

## Conclusion

The MAX6888CETE+ 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 MAX6887/MAX6888 multivoltage supply supervisors provide several voltage-detector inputs, one watchdog input, and three outputs. Each voltage-detector input offers a factory-set undervoltage and overvoltage threshold. Manual reset and margin disable inputs offer additional flexibility. The MAX6887 offers six voltage-detector inputs, while the MAX6888 offers four inputs. Output active-low RESET asserts when any input voltage drops below its respective undervoltage threshold or manual reset active-low MR is asserted. Output active-low OV asserts when any input voltage exceeds its respective overvoltage threshold. Monitor standard supply voltages listed in the *Selector Guide* in the full datasheet. The MAX6887/MAX6888 offer a watchdog timer with an initial and normal timeout periods of 102.4s and 1.6s, respectively. Watchdog output active-low WDO asserts when the watchdog timer expires. Connect active-low WDO to manual reset input active-low MR to generate resets when the watchdog timer expires. RESET, OV, and WDO are active-low, open-drain outputs. The MAX6887/MAX6888 are available in a 5mm x 5mm x 0.8mm, 16-pin thin QFN package and operate over the extended -40°C to +85°C temperature range.

## II. Manufacturing Information

|                                  |   |
|----------------------------------|---|
| A. Description/Function:         | Hex/Quad, Power-Supply Supervisory Circuits |
| B. Process:                      | EB8   |
| C. Number of Device Transistors: | 54184                                       |
| D. Fabrication Location:         | California or Texas                         |
| E. Assembly Location:            | Taiwan, China, Thailand                     |
| F. Date of Initial Production:   | April 23, 2005                              |

## III. Packaging Information

|  |                          |
|--|--------------------------|
| A. Package Type:   | 16-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:   | #05-9000-1523            |
| 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:  | 48°C/W                   |
| K. Single Layer Theta Jc:  | 1.7°C/W                  |
| L. Multi Layer Theta Ja:   | 30°C/W                   |
| M. Multi Layer Theta Jc:   | 1.7°C/W                  |

## IV. Die Information

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 136X136 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:    | 0.8 microns (as drawn)  |
| F. Minimum Metal Spacing:  | 1.2 microns (as drawn)  |
| 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)<br>Bryan Preeshl (Vice President of QA)            |
| B. Outgoing Inspection Level:     | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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:

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

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 EB8 Process results in a FIT Rate of 0.12 @ 25C and 2.06 @ 55C (0.8 eV, 60% UCL).

### B. E.S.D. and Latch-Up Testing (lot SWG2BQ001B, D/C 0449)

The MS85-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX6888CETE+**

| 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 = 192 hrs. | DC Parameters<br>& functionality | 48          | 0                  | TWG0D6001J, D/C 0829 |

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