

RELIABILITY REPORT
FOR
MAX16998xAUA+T
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Quality Assurance
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Conclusion

The MAX16998AAUA+T/MAX16998BAUA+T/MAX16998DAUA+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 MAX16997/MAX16998 are microprocessor (μ P) supervisory circuits for high-input-voltage and low-quiescent-current applications. These devices detect downstream circuit failures and provide switchover to redundant circuitry. See the *Selector Guide* in the full data sheet for the different versions of this product family. The MAX16997/MAX16998 family has four independent inputs for reset and watchdog functions. SWT and SRT inputs independently set the timeout periods of watchdog and reset timers through external capacitors. RESETIN/EN monitor voltages at respective inputs. A resistive voltage-divider sets the reset threshold. The MAX16998A/B/D generate two output signals, active-low RESET and active-low ENABLE. Active-low RESET asserts whenever RESETIN drops below its threshold voltage or when the watchdog timer detects a timing fault at WDI. Once asserted, and after all reset conditions are removed, active-low RESET remains low for the reset timeout period, tRESET, and then goes high. The MAX16997A generates one output signal (active-low ENABLE) based on the voltage level at EN and the signal at WDI. The MAX16997A does not have an active-low RESET output. The watchdog is disabled if the voltage at EN is below its threshold. The MAX16997A watchdog timer starts timing when the voltage at EN becomes higher than the preset threshold voltage level. Each time EN rises above the preset threshold voltage, the initial watchdog timeout period is 8 times the normal watchdog timeout period (tWP). The MAX16997/MAX16998 are available in 8-pin lead-free μ MAX® packages and are fully specified over the -40°C to $+125^{\circ}\text{C}$ automotive temperature range.

II. Manufacturing Information

A. Description/Function:	High-Voltage Watchdog Timers with Adjustable Timeout Delay
B. Process:	BCD8
C. Number of Device Transistors:	1265
D. Fabrication Location:	USA
E. Assembly Location:	Malaysia, Philippines and Thailand
F. Date of Initial Production:	January 26, 2008

III. Packaging Information

A. Package Type:	8-pin uMAX
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:	#05-9000-3594
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:	221°C/W
K. Single Layer Theta Jc:	42°C/W
L. Multi Layer Theta Ja:	206.3°C/W
M. Multi Layer Theta Jc:	42°C/W

IV. Die Information

A. Dimensions:	73 X 57 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:	1 micron (as drawn)
F. Minimum Metal Spacing:	2 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: Richard Aburano (Manager, Reliability Engineering)
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

(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 BCD8 Process results in a FIT Rate of 0.04 @ 25C and 0.7 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot JGKZD4003B, D/C 0847)

The NR03 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
ESD-CDM:	+/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX16998xAUA+T

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

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