

RELIABILITY REPORT
FOR
MAX4070AUA+T / MAX4070ATA+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 MAX4070AUA+T / MAX4070ATA+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 MAX4069-MAX4072 low-cost, bidirectional, high-side, current-sense amplifiers are ideal for monitoring battery charge and discharge currents in notebooks, cell phones, and other portable equipment. They feature up to 24V input common-mode voltage range, low 100 μ A supply current (which drops to only 10 μ A in shutdown), and a total output error of less than 1.5%. The wide 1.35V to 24V input common-mode range is independent of the supply voltage, ensuring that the current-sense feedback remains accurate even when connected to a battery pack in deep discharge. To achieve maximum flexibility, an external current-sense resistor is used along with a Gain Select pin to choose either 50V/V or 100V/V. A single output pin continuously monitors the transition from charge to discharge and avoids the need for a separate polarity output. The MAX4070 contains an internal 2.5V reference. The charging current is represented by an output voltage from 2.5V to VCC, while discharge current is given from 2.5V to GND. The MAX4071 is similar, but with a reference voltage of 1.5V. The MAX4069 has an adjustable reference voltage, set by two external resistors. The MAX4072 has an input for an external reference. The MAX4069/MAX4071/MAX4072 operate from a 2.7V to 24V single supply. The MAX4070 operates from a 3.6V to 24V single supply. All devices are specified over the automotive operating temperature range, -40°C to +125°C. The MAX4070/MAX4071/MAX4072 are available in 8-pin μ MAX® and 8-pin thin QFN packages. The MAX4069 is available in a 10-pin μ MAX package.

II. Manufacturing Information

A. Description/Function:	Bidirectional, High-Side, Current-Sense Amplifiers with Reference	
B. Process:	S12	
C. Number of Device Transistors:		
D. Fabrication Location:	USA	
E. Assembly Location:	Malaysia, Philippines and Thailand	China, Malaysia, Taiwan and Thailand
F. Date of Initial Production:	April 27, 2002	

III. Packaging Information

A. Package Type:	8-pin uMAX	8-pin TDFN 3x3
B. Lead Frame:	Copper	Copper
C. Lead Finish:	100% matte Tin	100% matte Tin
D. Die Attach:	Conductive	Conductive
E. Bondwire:	Au (1 mil dia.)	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	#05-2501-0206	#05-2501-0207
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1
J. Single Layer Theta Ja:	221°C/W	54°C/W
K. Single Layer Theta Jc:	42°C/W	8°C/W
L. Multi Layer Theta Ja:	206.3°C/W	41°C/W
M. Multi Layer Theta Jc:	42°C/W	8°C/W

IV. Die Information

A. Dimensions:	67 X 59 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.8 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: 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 44 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 25 \times 10^{-9}$$

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

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 S12 Process results in a FIT Rate of 0.03 @ 25C and 0.5 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot IA11BQ002C, D/C 0214)

The OX97-1 die type has been found to have all pins able to withstand a HBM transient pulse of 1000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 50mA.

Table 1
Reliability Evaluation Test Results
MAX4070AUA+T / MAX4070ATA+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	44	0	IA10BQ002C, D/C 0215

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