

RELIABILITY REPORT
FOR
MAX4080xAUA+T / MAX4080xASA+T
PLASTIC ENCAPSULATED DEVICES

July 30, 2013

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX4080xAUA+T / MAX4080xASA+T did not meet the quality and reliability standards required of all Maxim Integrated products.

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I. Device Description

A. General

The MAX4080/MAX4081 are high-side, current-sense amplifiers with an input voltage range that extends from 4.5V to 76V making them ideal for telecom, automotive, backplane, and other systems where high-voltage current monitoring is critical. The MAX4080 is designed for unidirectional current-sense applications and the MAX4081 allows bidirectional current sensing. The MAX4081 single output pin continuously monitors the transition from charge to discharge and avoids the need for a separate polarity output. The MAX4081 requires an external reference to set the zero-current output level ($V_{SENSE} = 0V$). The charging current is represented by an output voltage from VREF to VCC, while discharge current is given from VREF to GND. For maximum versatility, the 76V input voltage range applies independently to both supply voltage (VCC) and common-mode input voltage (VRS+). High-side current monitoring does not interfere with the ground path of the load being measured, making the MAX4080/MAX4081 particularly useful in a wide range of high-voltage systems. The combination of three gain versions (5V/V, 20V/V, 60V/V = F, T, S suffix) and a user-selectable, external sense resistor sets the full-scale current reading and its proportional output voltage. The MAX4080/MAX4081 offer a high level of integration, resulting in a simple, accurate, and compact current-sense solution. The MAX4080/MAX4081 operate from a 4.5V to 76V single supply and draw only 75 μ A of supply current. These devices are specified over the automotive operating temperature range (-40°C to +125°C) and are available in a space-saving 8-pin μ MAX® or SO package.

II. Manufacturing Information

A. Description/Function:	76V, High-Side, Current-Sense Amplifiers with Voltage Output	
B. Process:	BCD8	
C. Number of Device Transistors:		
D. Fabrication Location:	USA	
E. Assembly Location:	Malaysia, Philippines and Thailand	Malaysia, Philippines and Thailand
F. Date of Initial Production:	July 27, 2002	

III. Packaging Information

A. Package Type:	8-pin uMAX	8-pin SOIC (N)
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:	#05-7001-0602	#05-7001-0601
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	170°C/W
K. Single Layer Theta Jc:	42°C/W	40°C/W
L. Multi Layer Theta Ja:	206.3°C/W	136°C/W
M. Multi Layer Theta Jc:	42°C/W	38°C/W

IV. Die Information

A. Dimensions:	61 X 80 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:	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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 93 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 11.8 \times 10^{-9}$$

$$\lambda = 11.8 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 0.71 @ 55C (0.8 eV, 60% UCL)

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

The OY07-2 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 200V per JEDEC JESD22-A114 (lot JF12DA073I, D/C 1102)
ESD-CDM:	+/- 750V per JEDEC JESD22-C101 (lot JF10DA102F, D/C 1108)

Latch-Up testing has shown that this device withstands a current of +/- 100mA per JEDEC JESD78, except pin 8 (RS-) which passes -25mA/+100mA and pin 1 (RS+) which fails -25mA/passes +100mA (lot JF11D3037D, D/C 0938).

Table 1
Reliability Evaluation Test Results
MAX4080xAUA+T/ MAX4080xASA+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	46	0	NF13C2005A, D/C 0426
	Biased	& functionality	47	0	JF13D2003D, D/C 0708
	Time = 192 hrs.				

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