RELIABILITY REPORT

FOR

MAX406BESA+

PLASTIC ENCAPSULATED DEVICES

September 24, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX406BESA+ successfully 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 MAX406/MAX407/MAX417-MAX419 are single, dual, and quad low-voltage, micropower, precision op amps designed for battery-operated systems. They feature a supply current of less than 1.2µA per amplifier that is relatively constant over the entire supply range, which represents a 15 to 20 times improvement over industry-standard micropower op amps. A unique output stage enables these op amps to operate at ultra-low supply current while maintaining linearity under loaded conditions. In addition, the output is capable of sourcing 1.8mA when powered by a 9V battery. The common-mode input-voltage range extends from the negative rail to within 1.1V of the positive supply (for the singes, 1.2V for the duals and quads), and the output stage swings rail-to-rail. The entire family is designed to maintain good DC characteristics over the operating temperature range, minimizing the input referred errors. The MAX406 is a single op amp with two modes of operation: compensated mode and decompensated mode. Floating BW (pin 8) or connecting it to V- internally compensates the amplifier. In this mode, the MAX406 is unity-gain stable with a 5V/ms typical slew rate and an 8kHz gain bandwidth. Connecting BW to V+ puts the MAX406 into decompensated mode with a 20V/ms typical slew rate and a 40kHz gain bandwidth (AVCL >= 2V/V). The dual MAX407 and quad MAX418 are internally compensated to be unity-gain stable. The MAX409/MAX417/MAX419 single/dual/quad op amps feature 150kHz typical bandwidth, 75V/ms slew rate, and stability for gains of 10V/V or greater.

II. Manufacturing Information

A. Description/Function:	Single, Dual, Quad, 1.2µA Max, Single-Supply Op Amps
B. Process:	SG5
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines, Thailand, Malaysia
F. Date of Initial Production:	Pre 1997

III. Packaging Information

A. Package Type:	8-pin SOIC (N)
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0601-0174
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	136°C/W
M. Multi Layer Theta Jc:	38°C/W

IV. Die Information

A. Dimensions:	71 X 73 mils
B. Passivation:	Si_3N_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:	5.0 microns (as drawn)
F. Minimum Metal Spacing:	5.0 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:	Ken Wendel (Director, Reliability Engineering) Bryan Preeshl (Managing Director 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 13.4 \times 10^{-9}$

$\lambda = 13.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the SG5 Process results in a FIT Rate of 0.12 @ 25C and 2.04 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The OA23 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-50 mA.

Table 1
Reliability Evaluation Test Results

MAX406BESA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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