

RELIABILITY REPORT
FOR
MAX2659ELT+
PLASTIC ENCAPSULATED DEVICES

November 10, 2008

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX2659ELT+ 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.

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I. Device Description

A. General

The MAX2659 high-gain, low-noise amplifier (LNA) is designed for GPS, Galileo, and GLONASS applications. Designed in Maxim's advanced SiGe process, the device achieves a 20.5dB gain and an ultra-low-noise figure of 0.8dB while maximizing the input-referred 1dB compression point and the 3rd-order intercept point at -12dBm and -5dBm, respectively. The MAX2659 operates from a +1.6V to +3.3V single supply and consumes only 4.1mA. The shutdown feature in the device reduces the supply current to be less than 1 μ A. The MAX2659 is available in a very small, lead-free, RoHS-compliant, 1.5mm x 1.0mm x 0.75mm, 6-pin μ DFN package.

II. Manufacturing Information

A. Description/Function:	GPS/GNSS Low-Noise Amplifier
B. Process:	MB3HB
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	Hana Thailand
F. Date of Initial Production:	April 20, 2007

III. Packaging Information

A. Package Type:	6-pin uDFN
B. Lead Frame:	Substrate C.
Lead Finish:	Gold
D. Die Attach:	Non-conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2587
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Multi Layer Theta Ja:	477°C/W

IV. Die Information

A. Dimensions:	30 X 30 mils
B. Passivation:	BCB
C. Interconnect:	2 x Aluminum/Cu (Cu = 0.5%), top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35 um
F. Minimum Metal Spacing:	0.35 um
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	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 biased (static) life test are pending. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$$\lambda = 22.4 \times 10^{-9}$$

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the MB3HB Process results in a FIT Rate of 0.7 @ 25C and 11.5 @ 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 WV15 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of 250 mA.

Table 1
Reliability Evaluation Test Results

MAX2659ELT+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-55°C/125°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