

RELIABILITY REPORT
FOR MAX2163AETL+
PLASTIC ENCAPSULATED DEVICES

April 2, 2010

MAXIM INTEGRATED PRODUCTS

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Approved by
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Quality Assurance
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Conclusion

The MAX2163AETL+ 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 MAX2163A low-IF tuner IC is designed for use in 1- and 3-segment ISDB-T applications. The MAX2163A directly converts VHF and UHF band signals to a low-IF using a broadband I/Q downconverter. The operating frequency range covers the VHF-L band from 90MHz to 108MHz, VHF-H band from 170MHz to 222MHz, and the UHF band from 470MHz to 806MHz. The MAX2163A includes LNAs, RF variable gain amplifiers, I and Q downconverting mixers, a baseband variable gain amplifier, and a low-IF filter. The MAX2163A's variable gain amplifiers provide in excess of 102dB of control range. The MAX2163A also includes fully monolithic VCOs as well as a complete frequency synthesizer including an on-chip crystal oscillator and output buffer. The device operates with a crystal from 32MHz to 36MHz. The MAX2163A features both 2-wire I²C and 4-wire SPI(™)/MICROWIRE(™)-compatible serial-control interfaces. A low-power standby mode is available that shuts down the signal path leaving the control interfaces and register circuits active. Additionally, an external pin can shut down the entire device. The MAX2163A is specified for operation in the extended -40°C to +85°C temperature range and is available in either a 2.85mm x 3.1mm, lead-free, wafer-level package (WLP) or a 6mm x 6mm x 0.8mm, 40-pin thin QFN, lead-free plastic package with exposed paddle (EP).

II. Manufacturing Information

A. Description/Function:	ISDB-T 1- and 3-Segment Tuner
B. Process:	MB3
C. Number of Device Transistors:	30667
D. Fabrication Location:	California
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	July 26, 2008

III. Packaging Information

A. Package Type:	40-pin TQFN 6x6
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:	#05-9000-3304
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:	38°C/W
K. Single Layer Theta Jc:	1.4°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1.4°C/W

IV. Die Information

A. Dimensions:	113 X 122 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35µm
F. Minimum Metal Spacing:	0.35µm
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:	Richard Aburano (Manager, Reliability Operations) 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 47 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.4 \times 10^{-9}$$
$$\lambda = 23.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 MB3 Process results in a FIT Rate of 0.08 @ 25C and 1.33 @ 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 WG40-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 1500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX2163AETL+

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	47	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