

RELIABILITY REPORT
FOR
MAX2016ETI+
PLASTIC ENCAPSULATED DEVICES

February 2, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX2016ETI+ 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 MAX2016 dual logarithmic detector/controller is a fully integrated system designed for measuring and comparing power, gain/loss, and voltage standing-wave ratio (VSWR) of two incoming RF signals. An internal broadband impedance match on the two differential RF input ports allows for the simultaneous monitoring of signals ranging from low frequency to 2.5GHz. The MAX2016 uses a pair of logarithmic amplifiers to detect and compare the power levels of two RF input signals. The device internally subtracts one power level from the other to provide a DC output voltage that is proportional to the power difference (gain). The MAX2016 can also measure the return loss/VSWR of an RF signal by monitoring the incident and reflected power levels associated with any given load. A window detector is easily implemented by using the on-chip comparators, OR gate, and 2V reference. This combination of circuitry provides an automatic indication of when the measured gain is outside a programmable range. Alarm monitoring can thus be implemented for detecting high-VSWR states (such as open or shorted loads). The MAX2016 operates from a single +2.7V to +5.25V* power supply and is specified over the extended -40°C to +85°C temperature range. The MAX2016 is available in a space-saving, 5mm x 5mm, 28-pin thin QFN.

II. Manufacturing Information

A. Description/Function:	LF-to-2.5GHz Dual Logarithmic Detector/Controller for Power, Gain, and VSWR Measurements
B. Process:	G4
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Malaysia, Thailand
F. Date of Initial Production:	September 22, 2004

III. Packaging Information

A. Package Type:	28-pin TQFN 5x5
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:	#05-9000-1114
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:	47°C/W
K. Single Layer Theta Jc:	2.1°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2.1°C/W

IV. Die Information

A. Dimensions:	116 X 86 mils
B. Passivation:	Si ₃ N ₄
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	1.2 microns (as drawn) Metal 1, 2 & 3 5.6 microns (as drawn) Metal 4
F. Minimum Metal Spacing:	1.6 microns (as drawn) Metal 1, 2 & 3, 4.2 microns (as drawn) Metal 4
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:

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

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

$$\lambda = 22.4 \times 10^{-9}$$
$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 G4 Process results in a FIT Rate of 0.02 @ 25C and 0.37 @ 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 CR22 die type has been found to have all pins able to withstand a HBM transient pulse of +/-400 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX2016ETI+

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	48	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