ALM -2812

Reliability Data Sheet

Description

Avago Technologies' ALM-2812 is a dual band low noise amplifier, which is fabricated using Avago's PHEMT C process. The ALM-2812 was tested at various stress intervals for DC and RF functionality i.e. Vdd, Vcontrol, Idd, Icontrol, IIP3, IIP3L, NF, Gain. The following data was gathered from the product qualification test results. (See Table 1. Life Tests)

Reliability Prediction Model

An exponential cumulative failure function (constant failure rate) was used as the reliability prediction model to predict failure rate and mean time to failure (MTTF) at various temperatures as shown in Table 2. The wearout mechanisms are therefore not considered. The Arrhenius temperature de-rating equation is used. Avago assumes no failure mechanism change between stress and use conditions. Bias and temperature are alterable stresses and must be considered with the thermal resistance of the devices when determining the stress condition. The failure rate will have a direct relationship to the life stress. Using bare PHEMT die, the process was tested to determine activation energy of 2.2eV. Confidence intervals are based upon the chi-squared prediction method associated with exponential distribution.

Table 1. Life Tests

Demonstrated Performance

Test Name	Stress Test Condition	Total Units Tested	Total Device Hours	No. of Failed Units
High Temperature Operating Life	Tch = 150°C DC Bias	72	72,000	0

Failure criteria: Electrical parameter drifts of Idd>20% IIP3>+3dBm IIP3L>+3dBm NF>+0.5dB Gain>+0.5dB

Table 2. Estimates for various channel temperatures are as follows:

Channel Temp. (°C)	Point Typical Performance MTTF hours [1]	90% Confidence MTTF hours	Point Typical Performance FIT	90% Confidence FIT
150	7.2×10^4	3.12×10^4	13889	32014
125	3.19×10^6	1.38×10^6	313	722
100	2.35×10^8	1.02×10^8	4.3	9.8
85	4.14×10^9	1.79×10^9	0.2	0.6

[1] Point MTTF is simply the total device hours divided by the number of failures. However, in cases for which no failures are observed, the point estimate is calculated under the assumption that one unit failed.

Table 3. Product Qualification – Operational Life Test Results

Stress	Conditions	Duration	Failures/number tested
High Temperature Operating Life (HTOL)	Vd 3.3V, Vcontrol 3.3V, Id 15mA(2GHz) and Id 23.4mA(5GHz) with junction temperature of 150°C.	1000 hours	0/72
Wet & High Temperature Operating Life (WHTOL)	85°C/85% RH, Vd 3.3V, Vcontrol 3.3V Id 15mA(2GHz) and Id 23.4mA(5GHz)	1000 hours	0/72

Note : Both 2GHz and 5GHz bands are turned on during burn-in process

Table 4. Product Qualification – Environment Stress Results

Stress	Conditions	Duration	Failures/number tested
Thermal Cycle	-55/125°C, 15 minutes dwell, 10 minutes transfer.	1000 cycles	0/80
Thermal Shock	-65/150°C, 5 minutes dwell, 10 sec transfer.	1000 cycles	0/80
High Temperature Storage Life (HTSL)	Ta=125°C	1000 hours	0/80
Low Temperature Storage Life (LTSL)	Ta=-40°C	1000 hours	0/80

Table 5. Product Qualification – Mechanical Test Results

Stress	Conditions	Duration	Failures/number tested
Drop Test	(Weight = 150g, Height = 1.8m) 2X on each 6 sides, 2X on each 8 corners, 1X on each 6 side. Total = 34 drops	34 drops	0/30
Cycle bending test	MCI Amplitude 1.0mm, total displacement 2.0mm. Bending rate 80mm per min.	5x	0/20
Shear test	10N, 60 sec	4 sides	0/20
Bending test	Bending up to 7 mm with drop in resistance below 10% of original value. Maintained in bend state for 5 +/- 1s	7x	0/20
Solderability	Solder Dip and Look Test 245°C, 5sec	2x	0/22

Note : All mechanical tests are tested on daisy chain device except solderability

Table 6. Thermal Resistance Information

Stress	Conditions	Theta Jc (θjc)
Thermal Resistance	Vdd=3.3V	29.9°C/Watt

Table 7. Electrostatic Discharge (ESD) Test Results

ESD Test	Reference:	Results
Human Body Model	EIA/JESD22-A114-B	250 V(Class 1A)
Machine Model	EIA/JESD22-A115-A	50V(Class A)

HBM

Class 0 is ESD voltage level < 240V, Class 1A is voltage level between 250V and 500V, Class 1B is voltage level between 500V and 1000V, Class 1C is voltage level between 1000V and 2000V, Class 2 is voltage level between 2000V and 4000V, Class 3A is voltage level between 4000V and 8000V, Class 3B is voltage level > 8000V.

MM

Class A is ESD voltage level <200V, Class B is voltage level between 200V and 400V, Class C is voltage level > 400V.

Note: The device is classified as ESD sensitive. Pre-caution has to be taken as follow:

1) Ensure Faraday cage or conductive shield bag is used when the device is transported from one destination to another.
2) At SMT assembly station, if the static charge is above the device sensitivity level, place an ionizer near to the device for charge neutralization purpose.
3) Personal grounding has to be worn at all time when handling the device.

Moisture Sensitivity Classification: Class 2

Preconditioning per JESD22-A113-D class 2 was performed on all devices prior to reliability testing except for ESD classification, solderability and mechanical daisy chain test

MSL 2 Preconditioning (JESD22-A113D): 125°C HTSL for 24hrs + 85°C/60%RH for 168hrs + 3x PbFree Reflow, 260°C max.

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

Avago, Avago Technologies, and the A logo are trademarks of Avago Technologies, Limited in the United States and other countries.
Data subject to change. Copyright © 2007 Avago Technologies Limited. All rights reserved.
AV02-0635EN - July 30, 2007