ACPM-7391-TR1 (UMTS 1700 & UMTS 1700/2100)

Reliability Data Sheet

Description

This document describes the reliability performance for ACPM-7391-TR1. This 4x4 device is a Wide-band Code Division Multiple Access (WCDMA) Power Amplifier (PA), fully matched 10-pin surface mount modules developed for WCDMA handset application. This power amplifier module operates in the 1710-1755MHz and 1750-1785MHz bandwidths.

The ACPM-7391 meets the stringent WCDMA linearity requirement for output power of up to 28dBm. They are also developed to meet the HSDPA specifications. Mode control pins are provided for high efficiency improvement of the low output power range; incorporating 50ohm input and output matching networks.

Reliability Prediction Model

Failure rate predictions are based on HTOL test results. The prediction uses an exponential cumulative failure function (constant failure rate) as the reliability prediction model to predict failure rate and mean time to failure (MTTF) at various temperatures as shown in Table 2. The wear out mechanisms is therefore not considered. The Arrhenius temperature de-rating equation is used. We assume no failure mechanism change between stresses 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. The failure rate prediction was calculated using activation energy of 1.191eV as a conservative estimate. Confidence intervals are based upon the chi-squared prediction method associated with exponential distribution.

Table 1. Life prediction:

Demonstrated Performance

TEST NAME	STRESS CONDITION	TOTAL UNITS TESTED	TOTAL DEVICE HOURS	NO OF FAILED UNITS
High Temperature Operating Life	$T_{junction}$=150°C	48	48,000	0

Table 2. Estimated for Various Channel Temperatures are as follows:

Channel Temp. (°C)	Point Typical Performance MTTF (yrs/failure)	90% Confidence MTTF (yrs)	Point Typical Performance FIT	90% Confidence FIT
150	5.48	2.37	20,833	48,020
125	42.6	18.49	2,675	6,167
100	437.16	189.66	260.95	601.5
85	2,064	895.8	55.24	127.3
60	$3.7x10^4$	$1.62 x10^4$	3.04	7.0
25	$4.9x10^6$	$2.12 x10^6$	0.02	0.1

Point typical MTTF is simply the total device hours divided by the number of failures. Since no failures were observed, the point estimate is calculated under the assumption that one unit failed. FIT rates shown are relatively high due to the limited device hours at product release.

Table 3. Environmental Tests & Mechanical Test Results:

MSL3 Preconditioning (JESD22-A113D): 125°C HTSL for 24hrs + 60°C/60%RH for 40hrs + 3XIR Reflow, 260°C max 3 lots minimum/stress test

Stress	Conditions	Duration	Failures / Number tested
High Temperature Storage	125°C	1000 hours	0/231
Unbiased Autoclave	121°C/100%RH	96 hours	0/231
Unbiased HAST	130°C/85%RH	96 hours	0/231
Thermal Cycle	-55°C/+125°C, 15min dwell, 10min transfer	1000 X	0/231
Thermal Shock	-65°C/+150°C, 10min dwell, 0min transfer	1000 X	0/231

Table 4. Operation Life Tests Results:

MSL3 Preconditioning (JESD22-A113D): 125°C HTS for 24hrs + 60°C/60%RH for 40hrs + 3XIR Reflow, 260°C max 3 lots minimum/stress test

Stress	Conditions	Duration	Failures / Number tested
RF-High Temperature Operating Life (Rf-HTOL)	Tj=150°C; Ta=100 C; Freq=1750Mhz Vcc= 3.4V; Ven= 2.6V; Vmode0=Vmode1= 0V	1000hrs	0/48
DC-Wet High Temperature Operating Life (DC-WHTOL)	85°C/85%RH; Vcc= 4.2V; Ven= 2.9V; Vmode0=Vmode1= 0V	1000hrs	0/48
DC-Highly-Accelerated Temperature and Humidity Stress Test (DC-HAST)	130°C/85%RH; 230kPa Vcc= 4.2V; Ven=Vmode0=Vmode1= 0V	96 hours	0/48

Table 5. Thermal Resistance Information:

Stress	Product	Theta Jc
Thermal Resistance	ACPM-7391 Freq=1750Mhz ; Vcc= 3.4V; Ven= 2.85V; Vmode0=Vmode1= 0V	27.87°C/W

Table 6. ESD Ratings:

ESD test	Reference	Results
Human Body Model	EIA/JESD22-A114-C.01	2000V min (Class 2)
Machine Model	EIA/JESD22-A115-A	200V min (Class B)
Charge Device Model	EIA/JESD22-C101-C	200V min (Class II)

Class 2: HBM voltage level 2000V to <4000V.
Class B: MM voltage level 200V to <400V.
Class II: CDM voltage level 200V to <500V.

Note: ESD Sensitivity Level for Human Body Model and Machine Model necessitate the following handling precautions:

1. Ensure Faraday cage or conductive shield bag is used during transportation processes,
2. If the static charge at SMT assembly station is above device sensitivity level, place an ionizer near to the device for charge neutralization purposes.
3. Personal grounding must be worn at all times when handling the devices.

Moisture Sensitivity Classification: Class 3
Preconditioning per JESD22-A113-D Class 3 was performed on all devices prior to reliability testing.

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

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