HEWLETT PACKARD

Low Noise Gallium Arsenide FET

Reliability Data

ATF-10XXX
ATF-13XXX

Description

The following cumulative test results have been obtained from testing performed at Hewlett-Packard in accordance with the latest revision of MIL-STD-883. Data was gathered from the product qualification, reliability monitor, and engineering evaluation for the LYG GaAs process. For the purpose of this reliability data sheet, a failure is any part which fails to meet the electrical and/or mechanical specification listed in the Communications Components Designer's Catalog.

1. Life Test

A. Demonstrated Performance

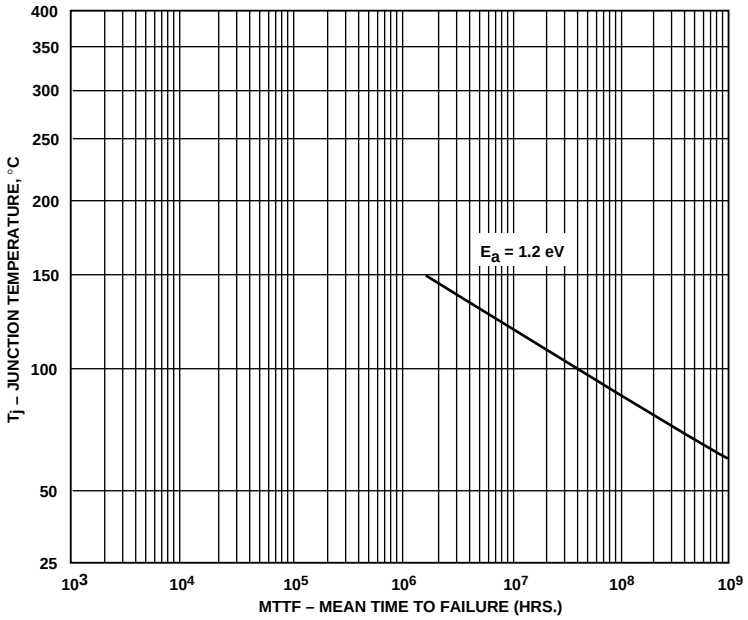
Test Name	Test Condition	Units Tested	Total Device Hrs.	Total Failed	Failure Rate (%/1K Hours)
High Temperature Operating Life (O.L.)	Nominal Bias at T_{ch} = 175°C, 1000 hrs.	150	15,000	0	0
High Temperature Storage (HTS)*	Ambient Temperature T_A = 150°C, 1000 hrs.	225	225,000	0	0

B. Failure Rate Prediction

The failure rate will depend on the junction temperature of the device. The estimated life at different temperatures is calculated, using the Arrhenius plot with activation energy of 1.2eV, and the device thermal resistance of the stress board is 130°C/W, and listed in the following table.

Junction Temp. T_J (°C)	Point(1)		90% Confidence Level(2)	
	MTTF* (hours)	MTTF FIT(3)	MTTF (hours)	FIT(3)
175	3×10^{-6}	333	0.5×10^{-6}	2000
150	2×10^{-7}	50	9.5×10^{-8}	105
100	2×10^{-9}	.05	9.5×10^{-8}	1.05
47	8×10^{-11}	.001	3.5×10^{-11}	.0003

*MTTF data calculated from high temperature Operating Life tests.



Notes:

1. The point MTTF is simply the total device hours divided by the number of failures.
2. The MTTF and failure rate represent the performance level for which there is a 90% probability of the device doing better than the stated value. The confidence level is based on the statistics of failure distribution. The assumed distribution is exponential. This particular distribution is commonly used in describing useful life failures.
3. FIT is defined as Failure in Time, or specifically, failures per billion hours. The relationship between MTTF and FIT is as follows: FIT = 10^9/(MTTF).

C. Example of Failure Rate Calculation:

At 100°C with a device operating 8 hours a day, 5 days a week, the percent utilization is:

% Utilization = (8 hrs/day x 5 days/wk) ÷ 168 hrs/wk = 25%

Then the point failure rate per year is:

(5×10^{-10}) x (25%) x (8760 hrs/yr) = 1.1×10^{-6} % per year

Likewise, the 90% confidence level failure rate per year is:

(1.0×10^{-9}/hr) x (25%) x (8760 hrs/yr) = 2.2×10^{-6}% per year

2. Environmental Tests

Test Name	MIL-STD-883 Reference	Test Conditions	Units Tested	Units Failed
Thermal Shock	1011	-65/150°C, 100 cycles	368	0
Temperature Cycle	1010	-65 to 150°C, 100 cycles	368	0
Moisture Resistance	—	+121°C, 100% RH, 96 hrs	290	0
Mechanical Shock*	2002	1500 G's, 0.5 msec. Pulse	135	0
Acceleration*	2001	20,000 G's, 1 min. all axis	135	0
Solderability	2003	245°C, 5 seconds dwell	245	0

* Applicable to ceramic packages only