
HPMX-2006, HPMX-2007

Integrated Circuits

Reliability Data

HPMX-2006
HPMX-2007

Description

The following cumulative test results have been obtained from testing performed at Hewlett-Packard Company. Data was gathered from the product

qualification, reliability monitor, and engineering evaluation.

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

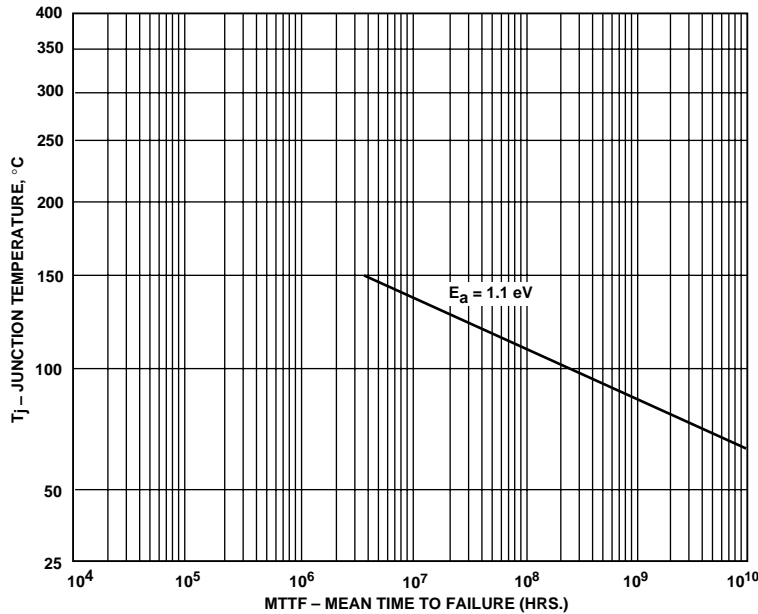
| Test Name | Test Conditions | Units Tested | Total Device Hrs. | Total Failed | Failure Rate (%/1K Hours) |
|--|----------------------------------|--------------|-------------------|--------------|---------------------------|
| High Temperature Operating Life (O.L.) | T _J = 150°C, 1000 hr. | 44 | 44,000 | 0 | 0 |
| High Temperature Operating Life (O.L.) | T _J = 150°C, 974 hr. | 45 | 43,830 | 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 1.1 eV, and is listed in the following table.

| Junction Temp. T _J (°C) | Point(1) | | 90% Confidence Level(2) | |
|------------------------------------|------------------------|--------|-------------------------|--------|
| | MTTF* (hours) | FIT(3) | MTTF (hours) | FIT(3) |
| 150 | 3.84 x 10 ⁶ | 260 | 2.93 x 10 ⁶ | 341 |
| 125 | 2.55 x 10 ⁷ | 39 | 1.97 x 10 ⁷ | 51 |
| 100 | 2.19 x 10 ⁸ | 4.6 | 1.67 x 10 ⁸ | 6.0 |
| 75 | 2.56 x 10 ⁹ | < 1 | 1.95 x 10 ⁹ | < 1 |

*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. This 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:

$$\% \text{ Utilization} = (8 \text{ hours/day}) \times (5 \text{ days/week}) \div 168 \text{ hours/week} = 25\%$$

Then the point failure rate per year is:

$$(4.6 \times 10^{-9} / \text{hr.}) \times (0.25) \times (8760 \text{ hours/year}) = 1.0 \times 10^{-3} \% \text{ per year}$$

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

$$(6.0 \times 10^{-9} / \text{hr.}) \times (0.25) \times (8760 \text{ hours/year}) = 1.3 \times 10^{-3} \% \text{ per year}$$

2. Environmental Tests

| Test Name | Test Conditions | Units Tested | Units Failed |
|---------------------|---|--------------|--------------|
| Thermal Shock | -65°C to +150°C; 5 min. dwell, 200 cycles | 75 | 0 |
| Temperature Cycle | -65°C to +150°C; 10 min. dwell, 200 cycles | 151 | 0 |
| Moisture Resistance | 85°C / 85% RH, Biased; 1000 hours | 80 | 0 |

3. Flammability Test

(MIL-STD-202, Method 111):

Meets Needle Flame test per UL

Category D (Flaming Time

<3 sec.) under Material

Classification 94VO.

4. DOD-HDBK-1686 ESD

Classification: Class I

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Data Subject to Change

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