Surface Mount Schottky Diodes

Reliability Data

HSMS-8002/12
HSMS-8101
HSMS-820X
HSMS-286A/6X

The following cumulative test results have been obtained from testing performed at Hewlett-Packard in accordance with the latest revision of MIL-STD-750. 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 Hewlett-Packard Communications Components Designer's Catalog.

1. Life Test

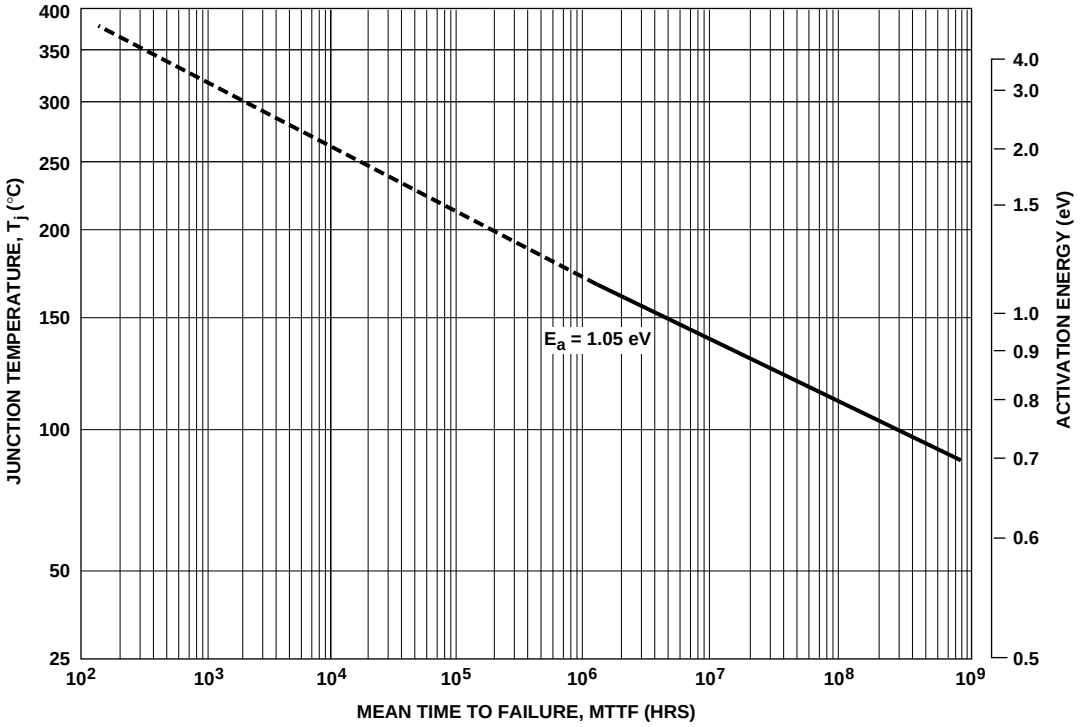
A. Demonstrated Performance

Test	Test Conditions	Units Tested	Total Device Hrs.	Total Failed	Failure Rate 1%/1K Hrs.
High Temp. Rev. Bias (HTRB)	$V_R = 80\% V_{BR}$, $T_A = 150°C$	127	127,000	0	0
High Temp. Operating Life (HTOL)	$P_{fm} = 75$ mW, $T_A = 65°C$ $V_R = 80\% V_{BR}$	129	129,000	0	0
High Temp. Storage (HTS)	$T_A = 150°C$	129	129,000	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 1.05 eV, and 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	3.6×10^6	278.0	1.6×10^6	625.0
140	7.3×10^6	137.0	3.2×10^6	312.0
130	1.5×10^7	67.0	6.5×10^6	153.0
120	3.2×10^7	31.0	1.4×10^7	71.0
100	1.7×10^8	6.0	7.4×10^7	14.0
75	1.8×10^9	0.56	7.8×10^8	1.3
50	2.6×10^{10}	0.04	1.1×10^{10}	0.09



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 50°C with a device operating 8 hours a day, 5 days a week, the percent utilization is:

$$\%\,\text{Utilization} = (8\,\text{hrs/day} \times 5\,\text{days/wk}) \div 168\,\text{hrs/wk} = 25\%$$

Then the point failure rate per year is:

$$(4.0 \times 10^{-11}/1000\,\text{hrs.}) \times (25\%) \times (8760\,\text{hrs/yr}) = 8.76 \times 10^{-6}\%\,\text{per year}$$

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

$$(9.0 \times 10^{-11}/1000\,\text{hrs.}) \times (25\%) \times (8760\,\text{hrs/yr}) = 1.97 \times 10^{-5}\%\,\text{per year}$$

2. Environmental and Mechanical Tests

Test	MIL-STD-750 Reference	Test Conditions	Units Tested	Total Failed
Solderability	2026	215°C, 5 seconds	500	0
Solder Heat	2031	260°C, 10 seconds	426	0
Resistance to Solvent	1022	4 solvent groups	98	0
Autoclave		121°C, 15 PSIG, 96 hrs.	116	0
Moisture Resistance		85°C/85% RH, biased, 1000 hrs.	118	0
Thermal Shock	1056	-65/150°C, 5 min dwell, 200 cycles	163	0
Temperature Cycle	1051	-65/150°C, 10 min dwell, 200 cycles	169	0
Lead Integrity			140	0

3. Flammability Test:

Meets Needle Flame Test Category D (Flaming Time <3 sec.) under material classification 94V0.

4. DOD-HDBK-1686A ESD Classification:

HSMS-8002/8012/8101/820X/286X/286A Class I