

# Surface Mount Schottky Diodes

## Reliability Data

### HSMS-280X/1X/2X HSMS-280A/1A/2A

The following cumulative test results have been obtained from testing performed at Hewlett-Packard Communications Components Division 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)	$V_R = 80\% V_{BR}$ , $T_A = 150^\circ\text{C}$	804	828,045	0	0
Operating Life (O.L.)	$T_A = 25^\circ\text{C}$ , $P_{FM} = 250 \text{ mW}$ $V_R = 80\% V_{BR}$ , 60 Hz	1,068	999,884	0	0
High Temp. Operating Life (HTOL)	10 mA DC, $T_A = 150^\circ\text{C}$	250	251,900	0	0
High Temp. Storage (HTS)	$T_A = 150^\circ\text{C}$	2,917	1,836,660	0	0

### B. Failure Rate Prediction

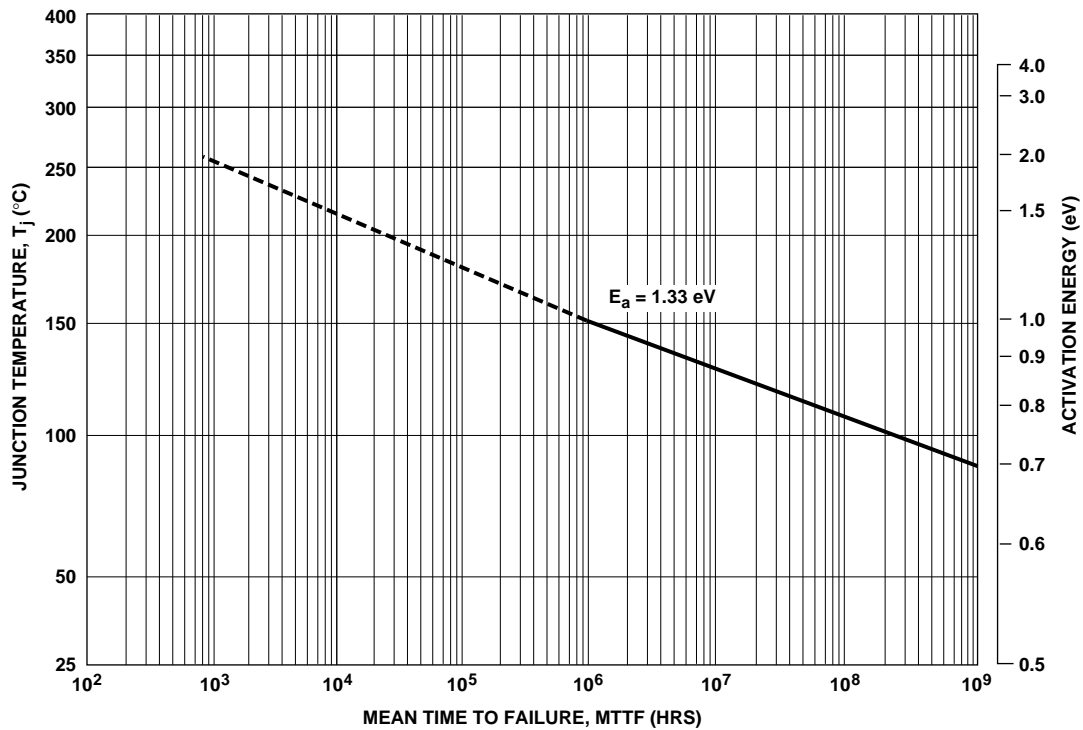
The failure rate will depend on the junction temperature of the device. The estimated life at different temperatures is calculated, using the Arrhenius plot with activation energy of 1.33 eV, and listed in the following table.

Junction Temp. $T_J^{**}$ ( $^\circ\text{C}$ )	Point <sup>[1]</sup>		90% Confidence Level <sup>[2]</sup>	
	MTTF* (Hours)	FIT <sup>[3]</sup>	MTTF (Hours)	FIT <sup>[3]</sup>
150	$1.8 \times 10^6$	556.0	$7.8 \times 10^5$	1282.0
140	$4.4 \times 10^6$	227.0	$1.9 \times 10^6$	526.0
130	$1.1 \times 10^6$	91.0	$4.8 \times 10^6$	208.0
120	$2.9 \times 10^7$	34.0	$1.3 \times 10^7$	77.0
100	$2.4 \times 10^8$	4.0	$1.0 \times 10^8$	10.0
75	$4.8 \times 10^9$	0.20	$2.1 \times 10^9$	0.48
50	$1.5 \times 10^{11}$	0.007	$6.5 \times 10^{10}$	0.015

\*MTTF data collected in Hermetic and Plastic Packages.

\*\* $T_J$  was calculated using a  $\theta_{JA}$  of  $500^\circ\text{C/W}$ .

(Notes on reverse side.)



**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:

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

Then the point failure rate per year is:

$$(7.0 \times 10^{-12}/\text{hr}) \times (25\%) \times (8760 \text{ hrs/yr}) = 1.5 \times 10^{-6}\% \text{ per year}$$

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

$$(1.5 \times 10^{-11}/\text{hr}) \times (25\%) \times (8760 \text{ hrs/yr}) = 3.3 \times 10^{-6}\% \text{ per year}$$

## 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	HP GSS 12-109	121°C, 15 PSIG, 96 hrs.	1204	0
Moisture Resistance	HP GSS 12-107, Method B	85°C/85% RH, biased, 1000 hrs.	311	0
Thermal Shock	1056	-65/150°C, 5 min dwell, 200 cycles	615	0
Temperature Cycle	1051	-65/150°C, 10 min dwell, 200 cycles	637	0
Lead Integrity		2.0 pounds minimum	140	0

## 3. Flammability Test (MIL-STD-202, Method 111):

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

## 4. DOD-HDBK-1686A ESD Classification:

HSMS-280X/1X/2X	Class I
HSMS-280A/1A/2A	Class I



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