

Data Sheet

Description

The following cumulative test results have been obtained from testing performed at Avago Technologies in accordance with the latest revision of JEDEC. Avago Technologies tests parts at the absolute maximum rated conditions recommended for the device. The actual performance you obtain from Avago Technologies parts depends on the electrical and environmental characteristics of your application but will probably be better than the performance outlined in Table 1.

Failure Rate Prediction

The junction temperature of the device determines the failure rate of semiconductor devices. The relationship between ambient temperature and actual junction temperature is given by the following:

$$T_J(^{\circ}\text{C}) = T_A(^{\circ}\text{C}) + \theta_{JA}P_{\text{AVG}}$$

where:

T_A = ambient temperature in $^{\circ}\text{C}$

θ_{JA} = thermal resistance of junction-to-ambient in $^{\circ}\text{C}/\text{Watt}$

P_{AVG} = average power dissipated in Watt

The estimated MTBF and failure rate at temperatures lower than the actual stress temperature can be determined by using an Arrhenius model for temperature acceleration. Results of such calculations are shown in the table below using activation energy of 0.7eV.

Table 1. Life Tests

Demonstrated Performance

Test Name	Stress Test Conditions	Total Device Hrs	Units Tested	Units Failed	Performance in Time (60% confidence)	
					MTBF [1]	Failure Rate [2] (FIT)
High Temperature Operating Life	$T_A = 85^{\circ}\text{C}$, $AV_{\text{dd}} = 5.5\text{V}$, $DV_{\text{dd}} = 5.5\text{V}$	231,000	231	0	2.52×10^5	3968

Table 2.

Ambient Temperature (°C)	Junction Temperature (°C) [3]	Performance in Time (60% Confidence)		Performance in Time (90% Confidence)	
		MTBF [1] (hrs)	Failure Rate [2] (FIT)	MTBF (hrs)	Failure Rate (FIT)
85	87	2.52×10^5	3968	1.00×10^5	9970
75	82	4.81×10^5	2080	1.91×10^5	5225
65	77	9.52×10^5	1050	3.79×10^5	2638
55	57	1.97×10^6	508	7.83×10^5	1277
45	47	4.25×10^6	235	1.69×10^6	591
35	37	9.65×10^6	104	3.84×10^6	260
25	27	2.32×10^7	43	9.22×10^6	108

Notes:

1. The 60% or 90% confidence MTBF represents the minimum level of reliability performance which is expected from 60% or 90% of all samples. The confidence level is established based on the chi-square distribution.
2. Failure rate (FIT) is $1/\text{MTBF} \times 10^9$, assuming the failures are exponentially distributed.
3. Calculated from data generated at 85°C biased at DVdd 5.5V, AVdd 5.5V and $\theta_{JA} = 45^\circ\text{C}/\text{watt}$

Table 3. Environmental Tests

Test Name	Test Conditions	Units Tested	Units Failed
Temperature Cycle	-65°C/+150°C, 500 cycles	231	0
HAST	130°C/85%RH, 96 hrs	231	0
Autoclave	121°C, 15psig, 96 hrs	231	0
High Temperature Storage	150°C, 1000hrs	45	0

Table 4. Electrostatic Discharge (ESD) Classification Test Results:

Test Name	Reference	Results
ESD Human Body Model	MILSTD 883, Method 3015	2000V
ESD Machine Model	MILSTD 883, Method 3015	200V
Latch up at 125°C	AEC-Q100-004	Pass (+/-100mA)

Moisture Sensitivity Classification: Class 3

Pre-conditioning per JESD22-A113-A class 3 was performed on all devices prior to reliability testing except for High Temperature Operating Life and electrical verification test.

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