

Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the past two years on this product family. All of these products use the same LEDs, similar IC, and the same packaging materials, processes, stress conditions and testing. The data in Table 1 and Table 2 reflect actual test data for devices on a per channel basis. Before stress, all devices are preconditioned using a solder reflow process (260°C peak temp) and 20 temperature cycles (-55°C to +125°C, 15 minutes dwell, 1 minute transfer). These data are taken from testing on Avago Technologies devices using internal Avago Technologies process, material specifications, design standards, and statistical process controls. **THEY ARE NOT TRANSFERABLE TO OTHER MANUFACTURERS' SIMILAR PART TYPES.**

Operating Life Test

For valid system reliability calculations it is necessary to adjust for the time when the system is not in operation. Note that if you are using MIL-HDBK-217 for predicting component reliability, the results may not be comparable to those given in Table 2 due to different conditions and factors that have been accounted for in MIL-HDBK-217. For example, it is unlikely that your application will exercise all available channels at full rated power with the LED(s) always ON as Avago Technologies testing does. Thus, your application total power and duty cycle must be carefully considered when comparing Table 2 to predictions using MIL-HDBK-217.

Definition of Failure

Inability to switch, i.e., “functional failure”, is the definition of failure in this data sheet. Specifically, failure occurs when the device fails to switch ON with 2 times the minimum recommended drive current (but not exceeding the max. rating) or fails to switch OFF when there is no input current.

Failure Rate Projections

The demonstrated point mean time to failure (MTTF) is measured at the absolute maximum stress condition. The failure rate projections in Table 2 use the Arrhenius acceleration relationship, where a 0.43eV activation energy is used as in the hybrid section of MIL-HDBK-217.

Application Information

The data of Tables 1 and 2 were obtained on devices with high temperature operating life duration. An exponential (random) failure distribution is assumed, expressed in units of FIT (failures per billion device hours) are only defined in the random failure portion of the reliability curve.

Table 1. Demonstrated Operating Life Test Performance

Stress Test Condition	Total Devices Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr) @ $T_A = +125^\circ\text{C}$	Demonstrated FITs @ $T_A = +125^\circ\text{C}$
$T_A = +125^\circ\text{C}$ $V_{cc1} = 5.0\text{V}$ $V_{cc2} = 20\text{V}$ $V_{ee} = 10\text{V}$ $V_{in} = 5\text{V}, V_{out} = 0$	591	591,000	0	> 591,000	< 1,692

Table 2. Reliability Projections (per channel) for Devices Listed in Title

Ambient Temperature (°C)	Junction Temperature (°C)	Typical (60% Confidence)		90% Confidence	
		MTTF (hr/fail)	FITs (fail/10 ⁹ hr)	MTTF (hr/fail)	FITs (fail/10 ⁹ hr)
125	140	644,992	1,550	256,668	3,896
120	135	747,763	1,337	297,565	3,361
110	125	1,016,304	984	404,428	2,473
100	115	1,403,306	713	558,432	1,791
90	105	1,971,040	507	784,356	1,275
80	95	2,820,051	355	1,122,211	891
70	85	4,116,320	243	1,638,048	610
60	75	6,140,463	163	2,443,536	409
50	65	9,379,306	107	3,732,401	268
40	55	14,701,374	68	5,850,265	171
30	45	23,703,970	42	9,432,758	106
25	40	30,445,551	33	12,115,503	83

Table 3. Mechanical Tests (Testing done on a constructional basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JA104	-55 to 125 °C Transfer < 5 mins Dwell = 15 mins 1000 cycles	816	0
Solderability	-	8hrs steam aging (93 °C), followed by solder dip (245 °C, 5sec)	20	0
Solderability	-	8hrs steam aging (93 °C) followed by solder dip (260 °C, 5sec)	20	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	231	0

Table 4. Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp. and Humidity Bias	N/A	T _A = 85°C, RH = 85% See Table 1 for bias condition. Time = 1000 hours	441	0
Unbiased Highly Accelerated Stress Test	N/A	T _A = 130°C, RH = 85% Time = 96 hours	331	0
Unbiased Autoclave	JA102	T _A = 121°C, RH = 100%, 15psig Time = 168 hours	96	0

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