

Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the past four 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, 5 sec. 2X) and 20 temperature cycles (-55°C to +125°C, 15 mins. dwell, 5 mins. 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 uses the Arrhenius acceleration relationship, where a 0.43 eV activation energy is used as in the hybrid section of MIL-HDBK-217.

Application Information

The data of Table 1 and 2 were obtained on devices with high temperature operating life duration up to 1000 hours. 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 Device Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr.) @ T _A = +125°C	Demonstrated FITs @ T _A = +125°C
T _A = 125°C V _{cc} = 5.5 V I _{in} = 20 mA I _o = 50 mA	160	160,000	0	>160,000	<6,250

Table 2. Reliability Projections for Device Listed in Title

Ambient Temperature (°C)	Junction Temperature (°C)	Typical (60% Confidence)		90% Confidence	
		MTTF (Hr./fail.)	FITs (Fail./10 ⁹ h)	MTTF (Hr./fail.)	FITs (Fail./10 ⁹ h)
125	140	347,653	2,876	138,345	7,228
120	135	403,047	2,481	160,389	6,235
110	125	547,792	1,826	217,988	4,587
100	115	756,388	1,322	300,997	3,322
90	105	1,062,399	941	422,771	2,365
80	95	1,520,019	658	604,877	1,653
70	85	2,218,714	451	882,915	1,133
60	75	3,309,735	302	1,317,076	759
50	65	5,055,485	198	2,011,780	497
40	55	7,924,102	126	3,153,317	317
30	45	12,776,540	78	5,084,296	197
25	40	16,410,280	61	6,530,307	153

Table 3. Mechanical Tests (Testing Done on a Constructional Basis)

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp. Cycle	1010 Cond. B	-55 to 125°C Transfer = 5 mins. Dwell = 15 mins. 1000 cycles	120	0
Mechanical Shock	2002 Cond. B	2 blows each axis, 1500 G, 0.5 ms pulse	20	0
Mechanical Vibration	2007 Cond. A	20 G, 20 – 2000 Hz 4 min./cycle, 4 times/axis	20	0
Terminal Strength	2004	2 lb. tension 8 oz. lead bend stress	20	0
Solderability (Pb-free Condition)	N/A	Steam Aging (8hrs at 93°C) prior Solder Dip (1x, 260°C)	20	0
Solderability (SnPb Condition)	N/A	Steam Aging (8hrs at 93°C) prior Solder Dip (1x, 245°C)	20	0
Solder Heat	N/A	Temp. = 260°C (10 sec.)	20	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 cond. Time = 1000 hours	80	0
Un-Biased Pressure Pot	N/A	T _A = 121°C, RH = 100% Time = 96 hours	40	0
Salt Atmosphere	1009 Cond. A	T _A = 35°C Mist	80	0
Resistance to Solvents	2015	3 one-min. immersion Brush after solvent	80	0

Table 5. Basic Material Properties

Material Property	Test Result
Mold Compound Flammability Classification	UL 94V-0
Mold Compound Oxygen Index	32%
Mold Compound Glass Transition Temperature	Tg = 160°C
Mold Compound Hydrolizable Chlorine	<30 ppm

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