HCPL-7800, HCPL-7800A, HCPL-7840

High CMR Isolation Amplifier Optocouplers

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, 5 sec. 2X) and 20 temperature cycles (-55°C to +125°C, 15 minutes dwell, 5 minutes 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 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 Devices 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 $V_{DD1} = V_{DD2}$ = 5.5 V V_{in+} = 0.5 V V_{in-} = Ground	1092	1092,000	0	> 1,092,000	< 915

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/10^9hr)	MTTF (hr/fail)	FITs (fail/10^9hr)
125	140	1,191,761	839	474,250	2,109
120	135	1,381,654	724	549,815	1,819
110	125	1,877,841	533	747,268	1,338
100	115	2,592,911	386	1,031,823	969
90	105	3,641,921	275	1,449,266	690
80	95	5,210,653	192	2,073,527	482
70	85	7,605,790	131	3,026,648	330
60	75	11,345,830	88	4,514,960	221
50	65	17,330,290	58	6,896,416	145
40	55	27,163,960	37	10,809,627	93
30	45	43,798,199	23	17,429,056	57
25	40	56,254,724	18	22,386,006	45

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

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp Cycling	Mil Std 883 1010 Cond. B	-55 to 125 °C Transfer = <5 mins Dwell = 15 mins 1000 cycles	480	0
Solderability	Method 2003	8hrs steam aging (93 °C), followed by solder dip (245 °C,5sec)	20	0
Physical Dimensions	Method 2009	Device Profile @ 10X	20	0

Table 4. Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp and Humidity Bias	N/A	Ta = 85°C, RH=85% Refer to Table 1 for Bias Condition Time = 1000hrs	298	0
Biased Pressure Pot	N/A	Ta = 121°C, RH = 100% 15psig Time = 168 hours	160	0
Biased Pressure Pot	2015	3 one-min. immersion. Brush after solvent.	20	0
Temp and Humidity Bias	N/A	Ta = 150°C, RH=85% Refer to Table 1 for Bias Condition Time = 168hrs	248	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 = 165°C
Mold Compound Hydrolizable Chlorine	< 15 ppm

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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