HCPL-0710 and HCPL-0720 / 0721

40 ns Propagation Delay, CMOS Optocouplers

Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the past three 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 (peak temperature 260°C, 3X) 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 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 Conndition	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_{CC} = 5.5 V I_O = 25 mA	160	160,000	0	> 160,000	< 6,250

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

		Typical (60% Confidence)		90% Confidence	
Ambient Temperature (°C)	Junction Temperature (°C)	MTTF (hr/fail)	FITs (fail/10^9hr)	MTTF (hr/fail)	FITs (fail/10^9hr))
125	140	174,617	5,727	69,487	14,391
120	135	202,440	4,940	80,559	12,413
110	125	275,142	3,634	109,490	9,133
100	115	379,914	2,632	151,183	6,615
90	105	533,615	1,874	212,346	4,709
80	95	763,466	1,310	303,813	3,291
70	85	1,114,402	897	443,464	2,255
60	75	1,662,394	602	661,532	1,512
50	65	2,539,239	394	1,010,463	990
40	55	3,980,070	251	1,583,826	631
30	45	6,417,323	156	2,553,705	392
25	40	8,242,456	121	3,279,997	305

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

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temperature Cycle	1010 Cond. B	-55 to 125°C Transfer = 5 mins Dwell = 15 mins 1000 cycles	80	0
Solderability After Steam Aging	N/A	Sn60 Pb40 Solder Temp. = 245°C 8 hours steam aging	10	0
Physical Dimension	2009	Dev. profile @ 10X	60	0

Table 4. Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Un-Biased Pressure Pot	N/A	T_A = 121°C, RH = 100% Time = 96 hours	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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