



40 ns Propagation Delay CMOS Optocouplers

Reliability Data Sheet

Agilent
HCPL-7710
HCPL-7720
HCPL-7721

Description

The reliability data shown includes Agilent Technologies reliability test data from the qualification of 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

Agilent Technologies devices using internal Agilent 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 Agilent 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.

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 _{dd} = 5.5 V I _{out} = 25 mA	80	80,000	0	> 80,000	< 12,500

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.



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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	87,309	11,454	34,744	28,782
120	135	101,220	9,879	40,279	24,827
110	125	137,571	7,269	54,745	18,267
100	115	189,957	5,264	75,591	13,229
90	105	266,808	3,748	106,173	9,419
80	95	381,733	2,620	151,907	6,583
70	85	557,201	1,795	221,732	4,510
60	75	831,197	1,203	330,766	3,023
50	65	1,269,619	788	505,231	1,979
40	55	1,990,035	503	791,913	1,263
30	45	3,208,662	312	1,276,852	783
25	40	4,121,228	243	1,639,998	610

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	100	0
Mechanical Shock	2002 Cond. B	2 blows each axis, 1500 G, 0.5 ms pulse	139	0
Mechanical Vibration	2007 Cond. A	20 G, 20 - 2000 Hz 4 mins/cycle, 4 times/axis	139	0
Terminal Strength	2004	2 lb tension 8 oz lead bend stress	150	0
Solderability	2003	Sn60 Pb40 Solder Temp. = 260°C (5 sec, 2X)	397	0
Physical Dimension	2009	Dev. profile @ 10X	220	0

Table 4. Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
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	T _g = 160°C
Mold Compound Hydrolizable Chlorine	< 30 ppm

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