



Agilent HCPL-050L, HCPL-053L LVTTTL/LVCMOS Compatible 3.3V Optocoupler Reliability Data Sheet

Description

The reliability data shown includes Agilent Technologies reliability test data from the reliability qualification done 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 (245 °C peak temp) and 20 temperature cycles (-55 °C to +125 °C, 15 mins dwell, 5 mins transfer). These data are taken from testing on Agilent Technologies devices using internal Agilent 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 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.

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) @ Ta = +125 °C	Demonstrated FITs @ Ta = +125 °C
Ta = 125 °C Vcc = 3.3 V If = 20mA Io = 10mA	117	117,000	0	> 117,000	< 8,500

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 h)	MTTF (Hr/fail)	FITs (Fail/10 ⁹ h)
125	140	128,000	7,800	51,000	19,700
120	135	148,000	6,800	59,000	17,000
110	125	201,000	5,000	80,000	12,000
100	115	278,000	3,600	111,000	9,000
90	105	390,000	2,600	155,000	6,400
80	95	558,000	1,800	222,000	4,500
70	85	815,000	1,200	324,000	3,100
60	75	1,216,000	820	484,000	2,100
50	65	1,857,000	540	739,000	1,400
40	55	2,910,000	340	1,158,000	860
30	45	4,693,000	210	1,867,000	540
25	40	6,027,000	170	2,398,000	400

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	440	0
Terminal Strength	2004	2 lb tension 8 oz lead bend stress	150	0
Solderability	2003	Sn 60 Pb 40 Solder Temp = 230 °C (2 sec)	110	0
Physical Dimension	2009	Dev. profile @ 10X	60	0

Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp and Humidity Bias	N/A	Ta=85C, RH=85% See Table 1 for bias condition Time=1000 hours	440	0
Unbiased Pressure Pot	N/A	Ta=121C, RH=100% Time=168 hours	140	0

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 Hydrolyzable Chlorine	<30 ppm

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