



Agilent HCPL-4100 Optically Coupled 20 mA Current Loop

Reliability Data Sheet

Description

The reliability data shown includes Agilent 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 (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 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 _{CC} = 20 V I _{in} = 20 mA I _o = 29 mA	480	404,000	0	> 404,000	< 2,500

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)

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	441,000	2268	175,000	5,700
120	135	511,000	1956	203,000	4,900
110	125	695,000	1439	276,000	3,600
100	115	959,000	1042	382,000	2,600
90	105	1,347,000	742	536,000	1,870
80	95	1,928,000	519	767,000	1,300
70	85	2,814,000	355	1,120,000	890
60	75	4,198,000	238	1,670,000	599
50	65	6,412,000	156	2,551,000	390
40	55	10,050,000	100	3,999,000	250
30	45	16,204,000	62	6,448,000	155
25	40	20,812,000	48	8,282,000	120

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

Test Name	MIL-STD-883 Reference	Test Conditions	Units Tested	Units Failed
Temp. Cycle	1010 Cond. B	-55 to 125°C Transfer = 5 mins Dwell = 15 mins, 1000 cycles	160	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 min/cycle, 4 times/axis	139	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)	397	0
Physical Dimension	2009	Dev. profile @ 10X	220	0

Table 4. Environmental Testing

Test Name	MIL-STD-883 Reference	Test Conditions	Units Tested	Units Failed
Temp. and Humidity Bias	N/A	T _A = 85°C, RH = 85% See Table 1 for bias condition. Time = 1000 hours	40	0
Salt Atmosphere	1009, Cond. A	T _A = 35°C mist	80	0
Resistance to Solvents	2015	3 one-minute immersion. Brush after solvent soak.	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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