High-Linearity Analog Optocouplers

Reliability Data Sheet

Agilent HCNR200 HCNR201

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 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_{in} = 6.5 V V_{out} = 0 V I_F = 25 mA	320	260,000	0	> 260,000	< 3,846

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

		Typical (60% Confidence)		90% Confidence	
Ambient Temperature (°C)	**Junction Temperature (°C)**	**MTTF (hr/fail)**	**FITs (fail/10⁹hr)**	**MTTF (hr/fail)**	**FITs (fail/10⁹hr))**
125	140	284,000	3,519	192,000	5,212
120	135	329,000	3,038	223,000	4,494
110	125	447,000	2,238	303,000	3,305
100	115	616,000	1,623	418,000	2,393
90	105	864,000	1,158	587,000	1,703
80	95	1,234,000	810	841,000	1,189
70	85	1,789,000	556	1,228,000	814
60	75	2,677,000	374	1,833,000	546
50	65	4,081,000	245	2,802,000	357
40	55	6,384,000	157	4,394,000	228
30	45	10,271,000	97	7,090,000	141
25	40	13,176,000	76	9,110,000	110

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, 20 cycles	140	0
Mechanical Shock	2002 Cond. B	2 blows each axis, 1500 G, 0.5 ms pulse	20	0
Mechanical Vibration	2007 Cond. A	20 G, 20 - 2000 Hz 4 mins/cycle, 4 times/axis	20	0
Terminal Strength	2004	2 lb tension 8 oz lead bend stress	20	0
Solderability	2003	Sn60 Pb40 Solder Temp. = 260°C (5 sec, 2X)	20	0
Solder Heat Resistance	NA	Temp. = 260°C (10 sec.)	20	0

Table 4. Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp. and Humidity Bias	N/A	T_A = 85°C, RH = 85% See Table 1 for bias conditions. Time = 500 hours	240	0
Biased Pressure Pot	N/A	T_A = 121°C, RH = 100% Same Bias as above. Time = 250 hours	60	0
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 4. 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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Data subject to change.

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