



Agilent HCPL-3120 / 3150 / T250 IGBT Gate Drive Optocouplers Reliability Data Sheet

Description

The reliability data shown includes Agilent 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 Tables 1 and 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).

This data is taken from testing on Agilent devices using internal Agilent processes, 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's 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 MTF (hr) @ T _A = +100 °C	Demonstrated FITs @ T _A = +100 °C
T _A = +100 °C V _{CC} = 35.0 V I _{in} = 25 mA I _o = 24 mA	400	400,000	0	>400,000	<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 0.43 eV 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)
100	115	437,000	2,291	174,000	5,756
90	105	613,000	1,631	244,000	4,098
80	95	877,000	1,140	349,000	2,865
70	85	1,281,000	781	510,000	1,962
60	75	1,910,000	524	760,000	1,316
50	65	2,918,000	343	1,161,000	861
40	55	4,573,000	219	1,820,000	549
30	45	7,374,000	136	2,934,000	341
25	40	9,471,000	106	3,769,000	265

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

Test Name	MIL-STD-883 Reference	Test Conditions	Units Tested	Units Failed
Temperature Cycle	1010 Cond B	-55 °C to +125 °C Transfer = 5 mins Dwell = 15 mins, 1000 cycles	1360	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	Sn60 Pb40 Solder Temperature = +230 °C (2 sec)	397	0
Physical Dimension	2008	Dev profile @ 10X	20	0

Table 4. Environmental Testing

Test Name	MIL-STD-883 Reference	Test Conditions	Units Tested	Units Failed
Temperature and Humidity Bias	N/A	T _A = +85 °C, RH = 85% See Table 1 for bias condition. Time = 1000 hours	360	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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