

HCPL-316J

2.0 Amp Gate Drive Optocouplers with Integrated (V_{CE}) Desaturation Detection and Fault Status Feedback



Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the past two 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 Avago Technologies devices using internal Avago 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 Avago 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) @ $T_A = +125^\circ\text{C}$	Demonstrated FITs @ $T_A = +125^\circ\text{C}$
$T_A = +125^\circ\text{C}$ $V_{CC1} = 5.0\text{ V}$ $V_{CC2} = 20\text{ V}$ $V_{EE} = 10\text{ V}$ $V_{in} = 5\text{ V}, V_{out} = 0$	360	360,000	0	> 360,000	< 2,778

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.

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	392,889	2,545	156,346	6,396
120	135	455,491	2,195	181,258	5,517
110	125	619,069	1,615	246,352	4,059
100	115	854,806	1,170	340,161	2,940
90	105	1,200,634	833	477,779	2,093
80	95	1,717,799	582	683,580	1,463
70	85	2,507,405	399	997,795	1,002
60	75	3,740,386	267	1,488,446	672
50	65	5,713,287	175	2,273,541	440
40	55	8,955,158	112	3,563,609	281
30	45	14,438,977	69	5,745,835	174
25	40	18,545,527	54	7,379,992	136

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	240	0
Solderability	2003	Sn60 Pb40 Solder Temp. = 230°C (2 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 condition. Time = 1000 hours	220	0
Unbiased Pressure Pot	N/A	T _A = 121°C, RH = 100% Unbiased Time = 168 hours	140	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 = 165°C
Mold Compound Hydrolyzable Chlorine	< 15 ppm

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5988-4128EN - June 6, 2006

