Reliability Data Sheet

HCPL-0900/0930/0931, HCPL-9000/9030/9031, HCPL-900J/901J/902J, HCPL-090J/091J/092J

High-Speed Digital Isolators Operating Life Test Performance and Failure Rate Projection

Description

The reliability data shown includes Broadcom® reliability test data from the qualification of this product family. All of these products use similar IC, and the same packaging materials, processes, stress conditions, and testing. The data in Table 2 and Table 3 reflects actual test data for devices on a per-channel basis. Before stress, all devices are preconditioned using a solder reflow process (245°C peak temperature, 2X) and 20 temperature cycles (–55°C to +125°C, 15 minutes dwell, 5 minutes transfer). This data is taken from testing devices using internal Broadcom 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 3 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 as Broadcom testing does. Thus, your application total power and duty cycle must be carefully considered when comparing Table 3 to predictions using MIL-HDBK-217.

Definition of Failure

The inability to switch, that is "functional failure", is the definition of failure in this data sheet. Specifically, failure occurs when the device fails to switch ON with twice the minimum recommended drive current (but not exceeding the maximum 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 3 uses the Arrhenius acceleration relationship and activation energy of 0.7 eV as in the hybrid section of MIL-HDBK-217.

Application Information

The data of Table 2 and Table 3 was 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: List of HCPL-9xxx/09xx Digital Isolators

SO8 Package	300-mil DIP8 Package	SO16 Widebody Package	SO16 Narrowbody Package
HCPL-0900	HCPL-9000	HCPL-900J	HCPL-090J
HCPL-0930	HCPL-9030	HCPL-901J	HCPL-091J
HCPL-0931	HCPL-9031	HCPL-902J	HCPL-092J

Test Results

Table 2: Demonstrated Operating Life Test Performance

Stress Test Condition	Total Devices Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hours) at T_A = +125°C	Demonstrated FITs at T_A = +125°C
T_A = 125°C, Vcc = 5.0V, Input pulse at 50 MHz	491	579,000	0	>579,000	<1,727

Table 3: Reliability Projection for Devices Listed in Title

Ambient Temperature (°C)	Junction Temperature (°C)	Typical (60% Confidence)		90% Confidence	
		MTTF (Hours/fail)	FITs (Fail/10^9 hours)	MTTF (Hours/fail)	FITs (Fail/10^9 hours)
125	140	631,896	1583	251,457	3977
120	135	803,846	1244	319,883	3126
110	125	1,324,669	755	527,139	1897
100	115	2,239,875	446	891,336	1122
90	105	3,894,126	257	1,549,629	645
80	95	6,976,696	143	2,776,307	360
70	85	12,913,295	77	5,138,717	195
60	75	24,762,325	40	9,853,920	101
50	65	49,348,821	20	19,637,870	51
40	55	102,570,732	10	40,816,998	24
30	45	223,230,841	4	88,832,483	11
25	40	335,515,166	3	133,514,908	7