ACPL-P456, ACPL-W456

Intelligent Power Module and Gate Drive Interface Optocoupler

Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the reliability qualification done 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 peak temp) and 20 temperature cycles (-55°C to +125°C, 15 mins dwell, 1 min transfer). These data are taken from testing on Avago Technologies devices using internal Agilent 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.

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 uses 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 Table 1 and 2 were obtained on devices with high temperature operating life duration. 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. Demonstrated Operating Life Test Performance

Stress Test Condition	Total Device Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF(hr) @ Ta = 125° C	Demonstrated FITs @ Ta =125° C
Ta = 125° C Vcc = 30 V, Iin = 16 mA, Io ~ 11 mA	90	90,000	0	> 90,000	< 11,111

Table 2. Reliability Projection for Device Listed in Title

Ambient Temperature (°C)	Junction Temperature (°C)	Typical (60% Confidence)		90% Confidence	
		MTTF (Hr/fail)	FITs (Fail/10^9h)	MTTF (Hr/fail)	FITs (Fail/10^9h)
125	140	98,222	10,181	39,087	25,584
120	135	113,873	8,782	45,314	22,068
110	125	154,767	6,461	61,588	16,237
100	115	213,701	4,679	85,040	11,759
90	105	300,158	3,332	119,445	8,372
80	95	429,449	2,329	170,895	5,852
70	85	626,851	1,595	249,449	4,009
60	75	935,096	1,069	372,112	2,687
50	65	1,428,321	700	568,386	1,759
40	55	2,238,788	447	890,903	1,122
30	45	3,609,742	277	1,436,461	696
25	40	4,636,378	216	1,845,000	542

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

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JA104	-55 to 125°C Transfer = 1 min Dwell = 15 mins 1000 cycles	60	0
Physical Dimensions	JB100	Conformance to datasheet package drawings	20	0
Solderability	–	8 hrs steam aging (93°C), followed by solder dip (245°C, 5 sec)	20	0
Solderability	–	8 hrs steam aging (93°C), followed by solder dip (260°C, 5 sec)	20	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	150	0

Table 4. Environmental Testing (Testing on a constructional basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Unbiased Autoclave	JA102	Ta = 121°C, RH = 100% 15psig Time = 168 hrs	60	0
Temperature and Humidity Bias	JA101	Ta = 85°C, RH = 85% See Table 1 for Bias Time = 1000hrs	40	0

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