ACPL-M71U, ACPL-M72U

Wide Operating Temperature High Speed, Low Power CMOS Digital Optocoupler with R^{2}Coupler^{TM} Isolation

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 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.

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 = 150 °C Vcc = 5.5V Iin = 20mA Io = 10mA	350	350,000	0	> 696,831	< 1,435

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	760,492	1,315	302,630	3,304
120	135	881,666	1,134	350,850	2,850
110	125	1,198,296	835	476,850	2,097
100	115	1,654,599	604	658,431	1,519
90	105	2,323,997	430	924,811	1,081
80	95	3,325,042	301	1,323,167	756
70	85	4,853,437	206	1,931,377	518
60	75	7,240,046	138	2,881,104	347
50	65	11,058,874	90	4,400,768	227
40	55	17,333,974	58	6,897,882	145
30	45	27,948,680	36	11,121,898	90
25	40	35,897,487	28	14,285,047	70

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

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	-65 to 150 °C Transfer = 1 min, Dwell = 15 mins 1000 cycles	410	0
Physical Dimensions	JESD-B100	Conformance to datasheet package drawings	30	0
Solderability (Non RoHS condition)	JESD-B102	8hrs steam aging (93 °C), followed by solder dip (245 °C,5sec)	10	0
Solderability (RoHS condition)	JESD-B102	8hrs steam aging (93 °C), followed by solder dip (260 °C,5sec)	10	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	1228	0
Mechanical Vibration	Mil Std 883, Method 2007	20G, 20-2000Hz, 10 min/cycle, 4times/direction	20	0

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

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Highly Accelerated Stress Test	JESD-A110	Ta = 130 °C, RH=85% Vin=5V Vo=Vcc=5.5V Time = 96 hours	456	0
Unbiased Autoclave	JESD-A102	Ta = 121 °C, RH = 100% 15psig Unbiased Time = 96 hours	231	0
High Temperature Bake	JESD-A103	Ta = 175°C Unbiased Time = 500 hours	90	0

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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