6N138/6N139

Low Input Current, High Gain Optocoupler

AVAGO TECHNOLOGIES

Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the past four 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 (245ºC peak temperature, 2X) and 20 temperature cycles (-55 ºC to +125 ºC, 15 mins dwell, 5 mins 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 Device Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr) @ Ta = +125 °C	Demonstrated FITs @ Ta = +125 °C
Ta = 125 °C Vcc = 15V If = 20mA Iout = 60mA	120	240,000	0	>240,000	<4,167

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 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

		Typical (60% Confidence)		(90% Confidence)	
Ambient Temperature (°C)	**Junction Temperature (°C)**	**MTTF (Hr/fail)**	**FITs (Fail/10^9h)**	**MTTF (Hr/fail)**	**FITs (Fail/10^9h)**
125	140	261,926	3,818	104,231	9,594
110	125	303,660	3,293	120,830	8,276
100	115	569,871	1,755	226,774	4,410
90	105	800,422	1,249	318,520	3,140
80	95	1,145,198	873	455,720	2,194
70	85	1,671,602	598	665,197	1,503
60	75	2,493,589	401	992,299	1,008
50	65	3,808,855	263	1,515,696	660
40	55	5,970,101	168	2,375,742	421
30	45	9,625,978	104	3,830,562	261
25	40	12,363,676	81	4,920,001	203

Mechanical Tests (Testing done on a constructional basis)

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp Cycle	1010 Cond. B	-55 to 125 °C Transfer = 5 mins Dwell = 15 mins 1000 cycles	320	0
Physical Dimension	2009	Dev profile @ 10X	120	0
Solder Heat Resistance	N/A	Temp = 260C, 10 sec	50	0
Solderability	Method 2003	Steam Aging (93 °C,8hrs) & solder dip (245 °C, 5sec)	50	0

Environmental Testing

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp. and Humidity Bias	N/A	Ta = 85 °C, RH = 85% Vcc = 18V, Vin=-5V Time = 1000 hours	80	0
Unbiased Pressure Pot	N/A	Ta=121C, RH=100% Time = 168 hours	120	0

Basic Material Properties

Material Property	Test Results
Mold Compound Flammability Classification	UL 94 V-0
Mold Compound Oxygen Index	32%
Mold Compound Glass Transition Temperature	Tg = 160°C
Mold Compound Hydrolizable Chlorine	<30ppm
CTI of Mold Compound	>275

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

AV01-0489EN - October 9, 2006