Phototransistor Optocoupler General Purpose Types:

4N25, 4N35, CNY17-1/2/3/4

AVAGO TECHNOLOGIES

Reliability Data Sheet

Description

The reliability data shown includes Avago Technologies reliability test data from the qualification of 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 (245°C peak temperature, 3X) and 20 temperature cycles (-55°C to +125°C, 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.

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 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= 10V Iin= 60 mA	370	305,000	0	> 305,000	< 3,300

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	333,000	3,000	132,000	7,500
120	135	386,000	2,600	154,000	6,500
110	125	524,000	1,900	209,000	4,800
100	115	724,000	1,400	288,000	3,500
90	105	1,017,000	980	405,000	2,500
80	95	1,456,000	690	579,000	1,700
70	85	2,124,000	470	845,000	1,200
60	75	3,169,000	320	1,261,000	790
50	65	4,840,000	200	1,926,000	520
40	55	7,587,000	130	3,019,000	330
30	45	12,233,000	80	4,868,000	200
25	40	15,712,000	60	6,252,000	160

Mechanical Tests (Testing done on a constructional basis)

Test Name	Mil-Std-883 Reference	Test Conditions	Units Tested	Units Failed
Temp Cycle	1010 Cond. B	-55°C to 125°C, 15 min dwell, 5 min transfer, 1000 cycles	480	0
Thermal Shock	1011 Cond. B	-55°C to 125°C, 5 min dwell, 200 cycles	120	0
Solderability	2003	Sn 60 Pb 40 Solder, Temp= 230°C (2 sec)	80	0

Environmental Testing

Test Name	Mil-Std-883 Reference	Test Conditions	Units Tested	Units Failed
Temp. and Humidity Bias	N/A	Ta= 85°C, RH= 85%, See Table 1 for bias cond, Time = 1000 hours	40	0
Autoclave	—	Ta= 121°C, RH= 100% Unbiased, Time = 168 hours	240	0

Basic Material Properties

Material Property	Test Result
Mold Compound Flammability Classification	UL 94V-0
Mold Compound Oxygen Index	37%
Mold Compound Glass Transition Temperature	Tg= 170°C
Mold Compound Hydrolizable Chlorine	<30 ppm

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

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