



Small Outline, 5 Lead Intelligent Power Module Optocouplers

Reliability Data Sheet

Agilent
HCPL-M456

Description

The reliability data shown includes Agilent Technologies reliability test data from the past three 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. Note single channel device hours are equal to 1.5X dual channel device hours according to MIL-HDBK-217. Before stress, all devices are preconditioned using a IR reflow process (EIAJ Profile, 3X) and 20 temperature cycles

(-55°C to +125°C, 15 minutes dwell, 5 minutes transfer). These data are taken from testing on Agilent Technologies devices using internal Agilent 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 Agilent 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 Devices Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr) @ T _A = +125°C	Demonstrated FITs @ T _A = +125°C
T _A = +125°C V _{CC} = 30.0 V I _{in} = 16 mA I _{out} = 11 mA	90	90,000	0	> 90,000	< 11,111

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 use the Arrhenius acceleration relationship, where a 0.43eV activation energy is used as in the hybrid section of MIL-HDBK-217.

Application Information

The data of Tables 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.



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Table 2. Reliability Projections (per channel) for Devices Listed in Title

Ambient Temperature (°C)	Junction Temperature (°C)	Typical (60% Confidence)		90% Confidence	
		MTTF (hr/fail)	FITs (fail/10 ⁹ hr)	MTTF (hr/fail)	FITs (fail/10 ⁹ hr)
125	140	98,222	10,181	39,086	25,584
120	135	113,873	8,782	45,314	22,068
110	125	154,767	6,461	61,588	16,237
100	115	213,702	4,679	85,040	11,759
90	105	300,159	3,332	119,445	8,372
80	95	429,450	2,329	170,895	5,852
70	85	626,851	1,595	249,449	4,009
60	75	935,097	1,069	372,112	2,687
50	65	1,428,322	700	568,385	1,759
40	55	2,238,790	447	890,902	1,122
30	45	3,609,744	277	1,436,459	696
25	40	4,636,382	216	1,844,998	542

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

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temperature Cycle	1010 Cond. B	-55 to 125°C Transfer = 5 mins Dwell = 15 mins 500 cycles	360	0
Terminal Strength	2004	2 lb tension 8 oz lead bend stress	150	0
Solderability After Steam Aging	2003	Sn60 Pb40 Solder Temp. = 260°C (5 sec, 2X) 8 hours steam aging	10	0
Physical Dimension	2009	Dev. profile @ 10X	220	0

Table 4. Basic Material Properties

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

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