



# Agilent HCPL-181 Phototransistor Optocoupler SMD Mini-Flat Type Reliability Data Sheet

## Description

The reliability data shown includes Agilent 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 Agilent 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 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.

## 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	360	300,000	0	> 300,000	< 3,300



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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 <sup>9</sup> h)	MTTF (Hr/fail)	FITs (Fail/10 <sup>9</sup> h)
125	140	330,000	3,000	130,000	7,700
120	135	380,000	2,600	151,000	6,600
110	125	516,000	1,900	205,000	4,900
100	115	712,000	1,400	283,000	3,500
90	105	1,000,000	1,000	398,000	2,500
80	95	1,431,000	700	570,000	1,800
70	85	2,090,000	480	831,000	1,200
60	75	3,117,000	300	1,240,000	800
50	65	4,761,000	200	1,895,000	500
40	55	7,463,000	130	2,970,000	300
30	45	12,032,000	80	4,788,000	200
25	40	15,455,000	65	6,150,000	160

**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 min Dwell = 15 mins, 1000 cycles	480	0
Thermal Shock	1011 Cond B	-55 to 125° C, Dwell = 5 mins, 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	Test Conditions	Units Tested	Units Failed
Autoclave	-	Ta = 121C, 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

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