



# Small Outline High Speed, High CMR Optocouplers

## Reliability Data Sheet

Agilent  
 HCPL-0600 / 0601 / 0611  
 HCPL-0630 / 0631 / 0661  
 HCPL-M600 / M601 / M611

### 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 <sub>A</sub> = +125°C	Demonstrated FITs @ T <sub>A</sub> = +125°C
T <sub>A</sub> = +125°C V <sub>CC</sub> = 5.5 V I <sub>in</sub> = 20 mA I <sub>out</sub> = 50 mA	480	660,000	0	> 660,000	< 1,515

### 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.



**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> hr)	MTTF (hr/fail)	FITs (fail/10 <sup>9</sup> hr)
125	140	721,000	1,386	487,000	2,053
120	135	836,000	1,197	565,000	1,770
110	125	1,134,000	882	768,000	1,302
100	115	1,564,000	639	1,061,000	943
90	105	2,193,000	456	1,491,000	671
80	95	3,132,000	319	2,134,000	469
70	85	4,564,000	219	3,117,000	321
60	75	6,796,000	147	4,653,000	215
50	65	10,360,000	97	7,112,000	141
40	55	16,205,000	62	11,155,000	90
30	45	26,072,000	38	17,998,000	56
25	40	33,448,000	30	23,126,000	43

**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	240	0
Moisture Storage Plus Solder Heat	N/A	T <sub>A</sub> = 85°C, RH = 85% Time = 168 hours Temp. = 260°C (10 sec.)	40	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. Environmental Testing**

Test Name	MIL-STD-883	Test Conditions	Units Tested	Units Failed
Temp. and Humidity Bias	N/A	T <sub>A</sub> = 85°C, RH = 85% See Table 1 for bias condition Time = 1000 hours	120	0
Unbiased Pressure Pot	N/A	T <sub>A</sub> = 121°C, RH = 100% Time = 96 hours	79	0

**Table 5. Basic Material Properties**

Material Property	Test Result
Mold Compound Flammability Classification	UL 94V-0
Mold Compound Oxygen Index	32%
Mold Compound Glass Transition Temperature	T <sub>g</sub> = 160°C
Mold Compound Hydrolyzable Chlorine	< 30 ppm

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Data subject to change.

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