



# Hermetically Sealed, Very High Speed Logic Gate Optocoupler

## Reliability Data Sheet

### Agilent

5962-8957101PX, 5962-8957103KPX  
 HCPL-5431, HCPL-543K  
 5962-8957001PX, 5962-8957002KPX  
 HCPL-5401, HCPL-540K  
 5962-89571022A, 5962-8957104K2A  
 HCPL-6431, HCPL-643K

### Description

The reliability data shown includes Agilent reliability test data from the past three years on this product family. All of these products use the same LEDs, the same logic gate ICs, the same DSCC approved packaging materials, processes, stress conditions and testing.

The data in Tables 1 and 2 reflect actual test data on dual channel devices. The single channel HCPL-5401 data in Table 3 is inferred from the demonstrated life test data using the factor (1.5) found in the “Photodiode Detector Isolator” section of MIL-HDBK-217, combined with any single channel data obtained. This data

is taken from testing on Agilent Technologies devices using internal Agilent processes, material specifications, design standards, and statistical process controls. THEY ARE NOT TRANSFERABLE TO OTHER MANUFACTURERS’ SIMILAR PART TYPES.

### Operating Life Test

Table 1. Demonstrated Operating Life Test Performance, HCPL-6431

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
I <sub>f</sub> = 10 mA I <sub>out</sub> = -4 mA V <sub>CC</sub> = 5.25 V T <sub>A</sub> = +125°C T <sub>j</sub> = +155°C	245	725,000	2	362,500	2759

### 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 Tables 2

and 3 use the Arrhenius acceleration relationship, where a 0.43 eV activation energy is used as in the hybrid section of MIL-HDBK-217.

### Applications Information

The data of Tables 1, 2, and 3 were obtained on MIL-PRF-38534 screened devices with high temperature operating life duration up to 5000 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.

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 Tables 2 and 3 due to the 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 testing does. Thus, your application total power and duty cycle must be carefully

considered when comparing Tables 2 and 3 to predictions using MIL-HDBK-217.

**Table 2. Reliability Projections for Dual Channel 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	155	234,000	4,282	136,000	7,340
120	150	268,000	3,731	156,000	6,395
110	140	357,000	2,804	208,000	4,806
100	130	481,000	2,078	281,000	3,561
90	120	660,000	1,516	385,000	2,599
80	110	919,000	1,088	536,000	1,865
70	100	1,303,000	767	760,000	1,315
60	90	1,884,000	531	1,099,000	910
50	80	2,781,000	360	1,622,000	616
40	70	4,199,000	238	2,450,000	408
30	60	6,499,000	154	3,792,000	264
25	55	8,167,000	122	4,765,000	210

**Table 3. Reliability Projections for Single Channel 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	155	350,000	2,855	205,000	4,874
120	150	402,000	2,490	236,000	4,246
110	140	534,000	1,874	313,000	3,191
100	130	719,000	1,391	423,000	2,364
90	120	983,000	1,017	580,000	1,725
80	110	1,367,000	732	807,000	1,239
70	100	1,934,000	517	1,145,000	873
60	90	2,798,000	358	1,655,000	604
50	80	4,108,000	243	2,443,000	409
40	70	6,187,000	162	3,689,000	271
30	60	9,552,000	105	5,711,000	175
25	55	11,986,000	83	7,176,000	139

**Environmental Testing**

All high reliability hermetic optocouplers listed meet the 100% screening and quality conformance inspection testing of MIL-PRF-38534, class H or class K as applicable.

**Electrostatic Discharge Sensitivity**

**Table 4. ESDS Classification per Method 3015, MIL-STD-883**

Part Number	ESD Class
5962-8957103KPX, HCPL-543K	3
5962-8957101PX, HCPL-5431	3
5962-8957002KPX, HCPL-540K	2
5962-8957001PX, HCPL-5401	2
5962-8957104K2A, HCPL-643K	3
5962-89571022A, HCPL-6431	3

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