



# Hermetically Sealed, Low Current High Gain Optocouplers

## Reliability Data Sheet

Agilent  
8302401EX, 5962-9800201KEX  
6N140A/883B, HCPL-177K  
5962-8978501PX, 5962-8978503KPX  
HCPL-5731, HCPL-573K  
5962-8981001PX, 5962-8981002KPX  
HCPL-5701, HCPL-570K  
5962-89785022A, 5962-8978504K2A  
HCPL-6731, HCPL-673K  
8302401FC, 5962-9800201KFC  
HCPL-6751, HCPL-675K

### Description

The reliability data shown includes Agilent Technologies reliability test data from the past one year on this product family. All of these products use the same LEDs, ICs, and DSCC approved packaging materials, processes, stress conditions and testing. The data in Table 1 and Table 2 reflect actual

test data on dual channel devices. The single channel HCPL-5701 data in Table 3 is inferred from demonstrated life test using a factor (1.5) found in the "Photodiode Detector Isolator" section of MIL-HDBK-217, combined with any single channel data obtained. 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.**

Table 1. Demonstrated Operating Life Test Performance

Stress Test Condition	Total Devices Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr) @ $T_A = +125^\circ\text{C}$	Demonstrated FITs @ $T_A = +125^\circ\text{C}$
$T_A = +125^\circ\text{C}$ $V_{CC} = 18\text{ V}$ $I_f = 5\text{ mA}$ $I_{out} = 10\text{ mA}$ $T_j < 140^\circ\text{C}$	120	280,000	0	> 280,000	< 3,570

### 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 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.



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### Applications Information

The data of Tables 1, 2 and 3 were obtained on 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.

**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	140	306,000	3,270	122,000	8,220
120	135	354,000	2,820	141,000	7,090
110	125	481,000	2,080	192,000	5,220
100	115	665,000	1,500	265,000	3,780
90	105	934,000	1,070	372,000	2,690
80	95	1,336,000	748	532,000	1,880
70	85	1,950,000	513	776,000	1,290
60	75	2,909,000	344	1,158,000	864
50	65	4,444,000	225	1,768,000	566
40	55	6,965,000	144	2,772,000	361
30	45	11,230,000	89	4,469,000	224
25	40	14,424,000	69	5,740,000	174

**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	140	458,000	2,180	182,000	5480
120	135	531,000	1,880	211,000	4730
110	125	722,000	1,390	287,000	3480
100	115	997,000	1,000	397,000	2520
90	105	1,401,000	714	557,000	1790
80	95	2,004,000	499	798,000	1250
70	85	2,925,000	342	1,164,000	859
60	75	4,364,000	229	1,737,000	576
50	65	6,666,000	150	2,652,000	377
40	55	10,448,000	96	4,158,000	241
30	45	16,845,000	59	6,703,000	149
25	40	21,636,000	46	8,610,000	116

### 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.

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

Part Number	ESD Class
5962-9800201KEX, HCPL-177K	3
8302401EX, 6N140A/883B	3
5962-8978503KPX, HCPL-573K	3
5962-8978501PX, HCPL-5731	3
5962-8981002KPX, HCPL-570K	2
5962-8981001PX, HCPL-5701	2
5962-8978504K2A, HCPL-673K	2
5962-89785022A, HCPL-6731	2
5962-9800201KFC, HCPL-675K	3
8302401FC, HCPL-6751	3



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