



# Hermetically Sealed, Transistor Output Optocouplers

## Reliability Data Sheet

Agilent  
 5962-8767901EX, 5962-8767905KEX  
 4N55/883B, HCPL-257K  
 5962-8767902PX, 5962-8767906KPX  
 HCPL-5531, HCPL-553K  
 5962-9085401HPX, 5962-9085401KPX  
 HCPL-5501, HCPL-550K  
 5962-87679032A, 5962-8767907K2A  
 HCPL-6531, HCPL-653K  
 5962-8767904FC, 5962-8767908KFC  
 HCPL-6551, HCPL-655K

### 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-5501 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, 4N55/883B

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> = 20 mA I <sub>out</sub> = 25 mA V <sub>CC</sub> = 18 V T <sub>A</sub> = +125°C T <sub>j</sub> = +135°C	430	1,700,000	0	>1,700,000	<588

### 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



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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	135	1,855,000	539	738,000	1,354
120	130	2,159,000	463	859,000	1,164
110	120	2,959,000	338	1,177,000	849
100	110	4,122,000	243	1,640,000	610
90	100	5,845,000	171	2,326,000	430
80	90	8,450,000	118	3,362,000	297
70	80	12,474,000	80	4,964,000	201
60	70	18,837,000	53	7,496,000	133
50	60	29,157,000	34	11,603,000	86
40	50	46,370,000	22	18,452,000	54
30	40	75,964,000	13	30,229,000	33
25	35	98,403,000	10	39,158,000	26

**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	130	2,786,000	359	1,881,000	531
120	125	3,252,000	307	2,198,000	455
110	115	4,484,000	223	3,037,000	329
100	105	6,289,000	159	4,268,000	234
90	95	8,983,000	111	6,110,000	164
80	85	13,090,000	76	8,924,000	112
70	75	19,491,000	51	13,320,000	75
60	65	29,713,000	34	20,359,000	49
50	55	46,477,000	22	31,933,000	31
40	45	74,774,000	13	51,525,000	19
30	35	124,069,000	8	85,760,000	12
25	30	161,833,000	6	112,046,000	9

**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
5962-8767905KEX, HCPL-257K	1
5962-8767901EX, 4N55/883B	1
5962-8767906KPX, HCPL-553K	3
5962-8767902PX, HCPL-5531	3
5962-9085401KPX, HCPL-550K	1
5962-9085401HPX, HCPL-5501	1
5962-8767907K2A, HCPL-653K	1
5962-87679032A, HCPL-6531	1
5962-8767908KFC, HCPL-655K	3
5962-8767904FC, HCPL-6551	3

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 Obsoletes 5967-6010E  
 5968-9394E (2/00)



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传真：0755-83376182 (0) 13823648918 MSN: SUNS8888@hotmail.com

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