Hermetically Sealed, Wide Supply Voltage Optocouplers

Reliability Data Sheet

Agilent
5962-8876901PX, 5962-8876904KPX
HCPL-5231, HCPL-523K
5962-8876801PX, 5962-8876802KPX
HCPL-5201, HCPL-520K
5962-88769022A, 5962-8876905K2A
HCPL-6231, HCPL-623K
5962-8876903FC, 5962-8876906KFC
HCPL-6251, HCPL-625K

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-5201 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-5231

Stress Test Condition	Total Devices Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr)@ T_A = +125°C	Demonstrated FITs @ T_A = +125°C
I_f = 8 mA I_{out} = -15 mA V_{CC} = 20 V T_A = +125°C T_j = +155°C	430	1,747,000	1	1,747,000	572

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

		Typical (60% Confidence)		90% Confidence	
Ambient Temperature (°C)	Junction Temperature (°C)	MTTF (hr/fail)	FITs (fail/10^9hr)	MTTF (hr/fail)	FITs (fail/10^9hr))
125	155	865,000	1,157	449,000	2,227
120	150	992,000	1,009	515,000	1,941
110	140	1,317,000	759	686,000	1,458
100	130	1,774,000	564	925,000	1,081
90	120	2,427,000	412	1,268,000	789
80	110	3,374,000	296	1,767,000	566
70	100	4,774,000	209	2,505,000	399
60	90	6,886,000	145	3,622,000	276
50	80	10,141,000	99	5,346,000	187
40	70	15,274,000	65	8,073,000	124
30	60	23,580,000	42	12,496,000	80
25	55	29,589,000	34	15,703,000	64

Table 3. Reliability Projections for Single Channel Devices Listed in Title

		Typical (60% Confidence)		90% Confidence	
Ambient Temperature (°C)	Junction Temperature (°C)	MTTF (hr/fail)	FITs (fail/10^9hr)	MTTF (hr/fail)	FITs (fail/10^9hr))
125	145	1,297,000	771	674,000	1,484
120	140	1,498,000	668	778,000	1,285
110	130	2,018,000	496	1,051,000	952
100	120	2,759,000	362	1,440,000	695
90	110	3,836,000	261	2,006,000	499
80	100	5,429,000	184	2,844,000	352
70	90	7,830,000	128	4,111,000	243
60	80	11,531,000	87	6,069,000	165
50	70	17,369,000	58	9,164,000	109
40	60	26,814,000	37	14,186,000	70
30	50	42,522,000	24	22,560,000	44
25	45	54,133,000	18	28,763,000	35

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
5962-8876904KPX, HCPL-523K	3
5962-8876901PX, HCPL-5231	3
5962-8876802KPX, HCPL-520K	1
5962-8876801PX, HCPL-5201	1
5962-8876905K2A, HCPL-623K	1
5962-88769022A, HCPL-6231	1
5962-8876906KFC, HCPL-625K	3
5962-8876903FC, HCPL-6251	3

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Data subject to change.

Obsoletes 5967-6008E
5968-9397E (2/00)

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