LUMILEDS

Reliability Data Sheet
SnapLED 70 Emitter

Agilent HPWT-TH00/FH00/TL00/FL00

Description

The following cumulative test results have been obtained from testing performed at Agilent Technologies in accordance with the latest revision of MIL-STD-883. Agilent tests parts at the absolute maximum rated conditions recommended for the device. The actual performance you obtain from Agilent parts depends on the electrical and environmental characteristics of your application, but will probably be better than the performance outlined in Table 1.

Table 1: Life Tests

Demonstrated Performance

Colors	Stress Test Conditions	Total Device Hours	Units Tested	Units Failed	Point Typical Performance MTBF	Point Typical Performance Failure Rate (% /1K Hours)
TS AlInGaP Amber and Red-Orange	T_A = 55°C, I_F = 70 mA	70,000	70	0	70,000	≤ 1.429
TS AlInGaP Amber and Red-Orange	T_A = 85°C, I_F = 70 mA	42,000	42	0	42,000	≤ 2.381
TS AlInGaP Amber and Red-Orange	T_A = 25°C, I_F = 70 mA	42,000	42	0	42,000	≤ 2.381
TS AlInGaP Amber and Red-Orange	T_A = 85°C, 85% RH I_F = 70 mA	42,000	42	0	42,000	≤ 2.381

Failure Rate Prediction

The failure rate of semiconductor devices is determined by the junction temperature of the device. The relationship between ambient temperature and 2 actual junction temperature is given by the following:

$$T_J\ (°C) = T_A\ (°C) + \theta_{JA}\ P_{AVG}$$

where:

T_A = ambient temperature in °C

θ_{JA} = thermal resistance of junction-to-ambient in °C/watt

P_{AVG} = average power dissipated in watts

The estimated MTBF and failure rate at temperatures lower than the actual stress temperature can be determined by using an Arrhenius model for temperature acceleration. Results of such calculations are shown in the table on the following page using an activation energy of 0.43 eV (reference MIL-HDBK-217).

Table 2: Failure Rate Prediction (IF - 70mA)

Ambient Temperature (°C)	Junction Temperature (°C)	Point Typical Performance in Time [1] (60% Confidence)		Performance in Time [2] (90% Confidence)	
		MTBF [1]	Failure Rate (%/1K Hours)	MTBF [2]	Failure Rate (%/1K Hours)
85	110	23,000	4.314	10,000	9.932
75	100	33,000	3.044	14,000	7.009
65	90	47,000	2.107	21,000	4.852
55	80	70,000	1.429	30,000	3.289
45	70	106,000	0.947	46,000	2.180
35	60	163,000	0.612	71,000	1.410
25	50	259,000	0.385	113,000	0.887

Notes:

[1] The point typical MTBF (which represents 60% confidence level) is the total device hours divided by the number of failures. In the case of zero failures, one failure is assumed for this calculation.

[2] The 90% Confidence MTBF represents the minimum level of reliability performance which is expected from 90% of all samples. This confidence interval is based on the statistics of the distribution of failures. The assumed distribution of failures is exponential. This particular distribution is commonly used in describing useful life failures. Refer to MIL-STD-690B for details on this methodology.

[3] A failure is any LED which does not emit light and max. % I_V degradation is > 50%.

[4] Assuming 115°C/W of θ_{JA}

Example of Failure Rate Calculation

Assume a device operating 8 hours/day, 5 days/week. The utilization factor, given 168 hours/week is:

(8 hours/day) x (5 days/week) / (168 hours/week) = 0.25

The point failure rate per year (8760 hours) at 25°C ambient temperature is:

(0.060% / 1K hours) x (0.25) x (8760 hours/year) = 0.131% per year

Similarly, 90% confidence level failure rate per year at 25°C:

(0.137% / 1K hours) x (0.25) x (8760 hours/year) = 0.300% per year

Table 3: Environmental Tests

Test Name	Reference	Test Conditions	Units Tested	Units Failed
Temperature Cycle	MIL-STD-883 Method 1010	-55°C to 100°C, 15 min. dwell, 5 min. transfer		
		20 cycles	6090	0
		100 cycles	6090	0
Temperature Cycle	MIL-STD-883 Method 1010	-40°C to 120°C, 15 min. dwell, 5 min. transfer		
		20 cycles	1071	0
		100 cycles	1071	0
Power Temperature Cycle	Internal Reference	-40°C to 85°C, 18 min. dwell, 42 min. transfer, 70 mA, 5 min on/off		
		100 cycles	98	0

Lumileds

Company Information

Lumileds is a world-class supplier of Light Emitting Diodes (LEDs) producing billions of LEDs annually. Lumileds is a fully integrated supplier, producing core LED material in all three base colors (Red, Green, Blue) and White. Lumileds has R&D development centers in San Jose, California and Best, The Netherlands. Production capabilities in San Jose, California and Malaysia.

Lumileds is pioneering the high-flux LED technology and bridging the gap between solid state LED technology and the lighting world. Lumileds is absolutely dedicated to bringing the best and brightest LED technology to enable new applications and markets in the lighting world.

Lumileds may make process or materials changes affecting the performance or other characteristics of our products. These products supplied after such changes will continue to meet published specifications, but may not be identical to products supplied as samples or under prior orders.

www.luxeon.com
www.lumileds.com

For technical assistance or the location of your nearest Lumileds sales office, call:

Worldwide: +1 408.435.6044
US toll free: 877.298.9455
Europe: +31 499.339.439
Asia: +65 6248.4759
Japan: +81 426.60.8532
Fax: +1 408.435.6855
Email us at info@lumileds.com

Lumileds Lighting, LLC
370 W. Trimble Road
San Jose, CA 95131