



Agilent HLMP-LDxx, -SDxx, -MDxx, -RLxx, -RDxx, -SLxx High Performance 4 mm Oval LED Lamps Reliability Data Sheet

Description

The following cumulative test results have been obtained from testing performed at Agilent Technologies in accordance with the latest revisions of JIS C 7021.

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 Hrs.	Units Tested	Units Failed	Point Typical Performance	
					MTBF	Failure Rate (% /1K Hours)
TS/AS AlInGaP Red/Amber	$T_A = 55^{\circ}\text{C}$, $I_F = 30\text{ mA}$	224,000	224	0	224,000	0.446
TS/AS AlInGaP Red	$T_A = -40^{\circ}\text{C}$, $I_F = 30\text{ mA}$	56,000	56	0	56,000	1.785

Failure Rate Prediction

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

$$T_J (^{\circ}\text{C}) = T_A (^{\circ}\text{C}) + \theta_{JA} P_{AVG}$$

where

T_A = ambient temperature in $^{\circ}\text{C}$

θ_{JA} = thermal resistance of junction-to-ambient in $^{\circ}\text{C}/\text{watt}$

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).



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Table 2. Environmental Tests

Test Name	MIL-STD-883 Reference	JIS C 7021 Reference	Test Conditions	Units Tested	Units Failed
Temperature Cycle	1010	Method A-4	A/I, wave solder (250°C ± 10°C for 5 sec) and TMCL (-40°C to 120°C; 15 min. dwell, 5 min. transfer) for 100 cycles	14,900	0
Air to Air Thermal Soaking	1011	Agilent req.	-40/110°C at dwell, 15 min transfer, 15 min. 5 ~ 10 sec (VDO), 200 cycles	112	0
High Humidity Temperature Operating Life	Agilent req.	Agilent req.	85°C, 85% RH, 1000 hours	56	0

