ASMT-Mx00
High Power LED

Reliability Datasheet

Description

The following cumulative test results have been obtained from testing performed at Avago Technologies in accordance with the latest revision of MIL-STD-883/JEDEC standards.

Avago tests parts at the absolute maximum rated conditions recommended for the device. The actual performance you obtain from Avago parts depends on the electrical and environmental characteristics of your application but will probably be better than the performance outlined in Table 1.

Failure Rate Prediction

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 below using activation energy of 0.43eV.

Table 1. Life TestsDemonstrated Performance

Test Name	Stress Test Conditions	Total Device Hrs.	Units Tested	Units Failed [3]	Point Typical Performance	
					MTBF [1]	Failure Rate (%/1K Hours)
High Temperature Operating Life	T_b= 85 °C, 120mA	120,000	120	0	174,600	0.57

Table 2. Reliability Predictions (For White, Blue and Green)

	Point Typical Performance in Time [1] (60% Confidence)		Performance in Time [2] (90% Confidence)	
Board Temperature T_b (°C)	**MTBF[1]**	**Failure Rate (% / 1K Hours)**	**MTBF [2]**	**Failure Rate (% / 1K Hours)**
85	174,600	0.57	69,500	1.44
80	205,600	0.49	81,800	1.22
75	243,000	0.41	96,700	1.03
70	288,400	0.35	114,800	0.87
65	343,800	0.29	136,800	0.73
60	411,500	0.24	163,800	0.61
55	494,900	0.20	197,000	0.51
50	598,000	0.17	238,000	0.42
45	726,000	0.14	289,000	0.35
40	886,100	0.11	352,700	0.28
35	1,087,100	0.09	432,700	0.23
30	1,341,000	0.07	533,800	0.19
25	1,729,700	0.06	688,500	0.15

Notes:

[1] The 60% or 90% confidence MTBF represents the minimum level of reliability performance which is expected from 60% or 90% of all samples. The confidence level is established based on the chi-square distribution.

[2] Failure rate (%/1K hours) is 1/MTBF x 10^5, assuming the failures are exponentially distributed. MTBF is calculated based on the 85'C, 120mA data.

[3] Failure criteria: open, short, or dim.

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 55°C ambient temperature is:

(0.2% / 1K hours) x (0.25) x (8760 hours/year) = 0.44% per year

Similarly, 90% confidence level failure rate per year at 55°C:

(0.51% / 1K hours) x (0.25) x (8760 hours/year) = 1.12% per year

Table 3. Environmental Tests

Test Name	MIL-STD/JEDEC Reference	Test Conditions	Units Tested	Unit Failed
Temperature Cycle	JESDA104	-40°C/100°C, 15 min dwell, 5 min transfer, 100 cycles	2100	0
Low Temperature Operating Life	JESDA108	T_b=-40°C, If=350mA, 1000hrs	120	0
High Temperature Operating Life	JESDA108	T_b=30°C, If=350mA, 1000hrs	120	0
High Temperature Operating Life	JESDA108	T_b=45°C, If=50mA, 1000hrs	120	0
Temperature Humidity Operating Life	JESDA101	T_b= 85°C, RH = 85%RH, If= 120mA, 1000hrs	120	0
Temperature Humidity Storage Life	JESDA101	T_b= 85°C, RH = 85%RH, 1000hrs	120	0
High Temperature Storage Life	JESDA103	T_b = 100°C, 1000hrs	120	0
Low Temperature Storage Life	JESDA108	T_b = -40°C, 1000hrs	120	0
Pulse Test	Avago Req	T_b= 25°C, Ip= 500mA, Duty Cycle = 10%, 1000hrs	120	0

Table 4. Mechanical Tests

Test Name	MIL-STD/JEDEC Reference	Test Conditions	Units Tested	Unit Failed
Resistance to Solder heat	JESDB106	260+/- 5°C, 6+/-1 second, immersion depth 1.5 mm from case	30	0
Mechanical shock	JESDB104	5 shocks each X1, X2, Y1, Y2, Z1, Z2, 1500G, 0.5msec pulse	30	0
Vibration	JESDB103	4 cycles, 4 mins each X, Y and Z at 0.06inch @ 20Hz-100Hz, 50g @ 100Hz-2000Hz	30	0

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