



LED Lumen Maintenance and Life Test System (LEDLM-80PL) Brochure

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[Leader in Lighting & Electrical Test Instruments](#)

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System Principle

Rated Lumen Maintenance Life, the elapsed operating time over which the LED light source will maintain the percentage, p , of its initial light output e.g:

- L70 (hours): Time to 70% lumen maintenance
- L50 (hours): Time to 50% lumen maintenance

The LED life is predicted according to the Arrhenius model, the formula as following:

1. $P=P_0 \exp(-\beta t)$
2. $\beta=\beta_0 IF \exp(-E_a/KT_j)$

Note: P_0 is initial lumen; P is lumen under heat and electricity; β is recession coefficient in a certain temperature; t is the time to electricity in a certain temperature; β_0 is constant value; E_a is activation energy; K is Boltzmann's constant; IF is working current; T_j is junction temperature.

Firstly, we predict the LED life per 10000hours. For example, we suppose the optical decay rate is $n\%$ in 1000hours, then:

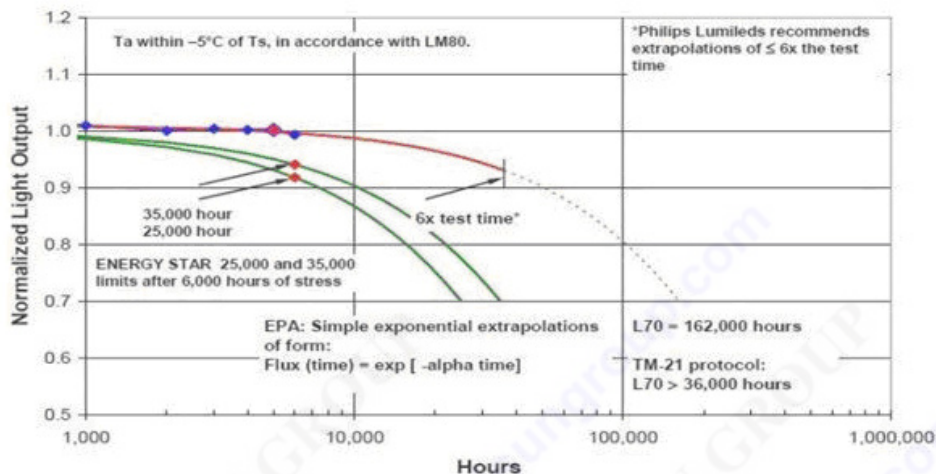
Base on formula 1, L50 is: $t=1000*\ln 0.5/\ln(1-n\%)$

Base on formula 1, L30 is: $t=1000*\ln 0.7/\ln(1-n\%)$

So we can get:

Item	Optical decay rate	L50(h)	L30(h)
85°C	8%	8312.950414	4277.62127
70°C	3%	22756.57306	11709.922

The temperature T_j (the contact surface temperature between LED and circuit board, or ambient temperature providing the heat-sink is complete, but the junction temperature will be 15°C higher than ambient temperature in 350mA) will greatly affect the test result. We can predict the LED life under varies temperature according to formula 2. Suppose the time t_1 is the LED life under T_1 temperature, time t_2 is the LED life under T_2 temperature, then we can calculate the time t_3 under T_3 temperature: $t_3=t_1*\exp \{(\ln(t_2/t_1))/[1/(T_2+15+273)-1/(T_1+15+273)] * [1/(T_3+15+273)-1/(T_1+15+273)]\}$



LED Attenuation Exponential Curve

1. System Configuration

Refer to LM-80, the LED typically exhibit very long operational life characteristics and, depending on drive current and use conditions, can be in use for 50,000 hours or longer.

The LED Lumen Maintenance and Life Test System include two parts of function: LED lumen maintenance life and also measure the LED colorimetric parameters maintenance curve such as CCT, Chromaticity and spectrum.

Design according to IES LM-80,
IES LM-82 and TM-21



PS. The customer needs to prepare the PC and Printer

The full system of LEDLM-80PL includes the following items:

- **LED Aging Control System with Arrhenius Software (LM-80PL):** it measure total 16 channels on the following curve: **photometric VS colorimetric VS power VS temperature VS time**. The aging time can be max 10K hours. It can calculate the life according to TM-21.
- **Multiplex Temperature Tester (TMP-16):** To measure temperature for 16 channels samples, it can communicate with PC via LM-80PL software
- **Photometric & Colorimetric & Electric Parameters Measurement System:** To measure photometric, colorimetric and electric parameters for 16 channels, all the instruments can communicate with PC via LM-80PL software
- **Multi-Channel Power Switch System:** to control the power for the test lamp
- **Lamp adapter in High and Low Temperature Chamber:** design according to customer's request, max 16pcs.

Please note the following two items needs to prepare separately:

- **High Temperature Chamber:** depend on the test lamp size
- **AC Power Source:** depend on the test lamp power

3. Refer to the International Standard

IEC/PAS 62612 Self-ballasted LED-Lamps for General Lighting Services-Performance Requirements

IEC/PAS 62717 LED modules for general lighting – Performance requirements

IEC/PAS 62722-2-1 Luminaire Performance –Part 2-1: Particular requirements for LED luminaires

IES LM-80-08 Approved Method for Measuring Lumen Maintenance of LED Light Sources

IES TM-21-11 Projecting Long Term Lumen Maintenance of LED Packages

IESNA LM-82-12 Approved Method: Characterization of LED Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature

ENERGY STAR® Program Requirements Product Specification Eligibility Criteria

The Next Page Is The Test Report:

Lumen Maintenance Test Report**Client** : OSRAM Lighting**Address** : Jiading Shanghai**Description of the samples under test:**

Sample Name : White SMD LED
Model : YL-T3528W-AA-60C
Ratings : 20mA, 6.5lm, 75(Ra), 6000K
Manufacturer : OSRAM Lighting
Sample Quantity : 6
Sample Tested Date : 2014-11-12 ~ 2014-12-12

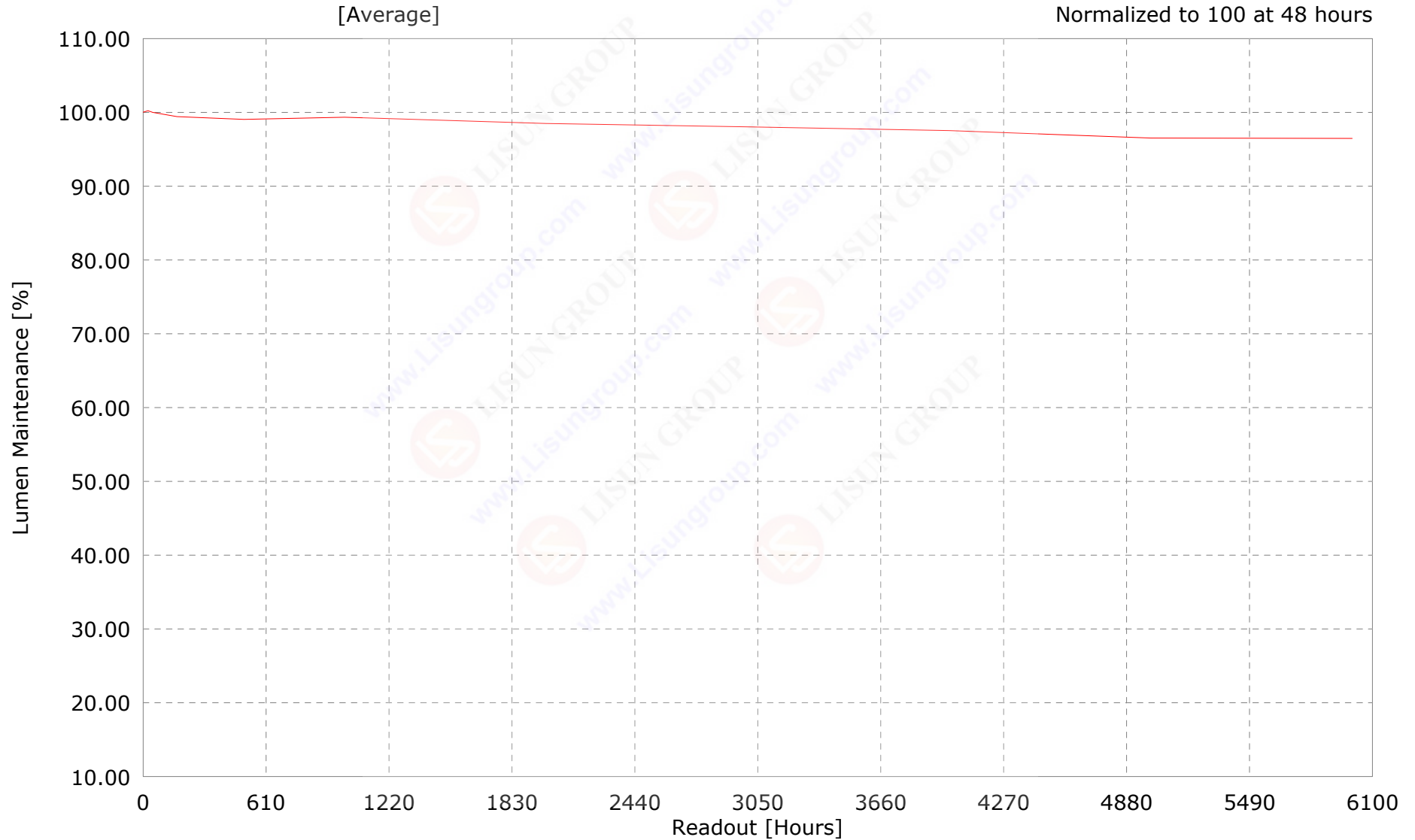
Equipment list:

Test Equipments	Model/SN
Photometer _Colorimter	LMS-4000/201201002
Digital Power Meter	LS2008R/201302005
Power Supply	LSP-500VAR/201403001
Thermometer	TMP-8/201403005
High Temperature Chamber	GDW-015A/201403002

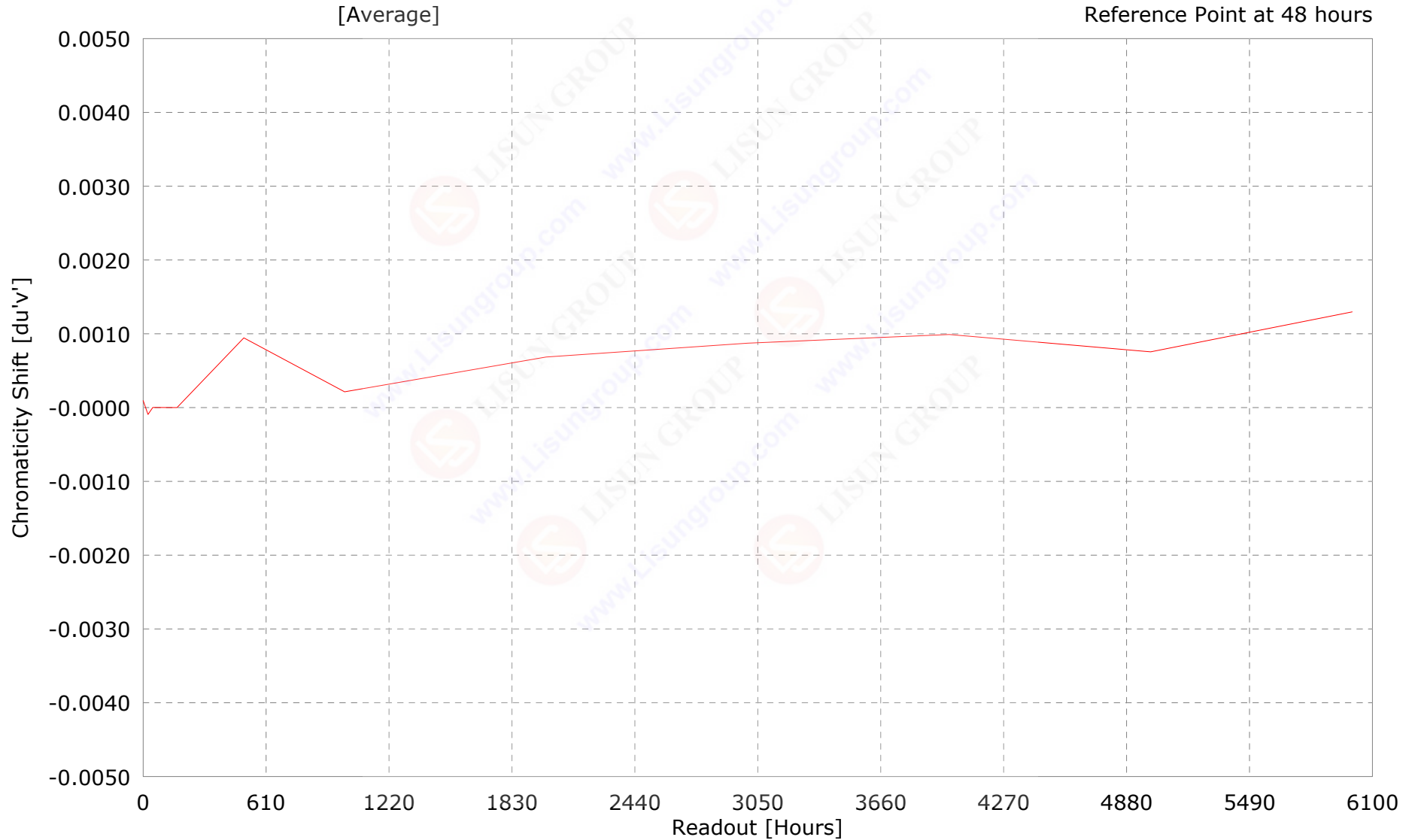
Lumen Maintenance Life Prediction(Based on TM-21)

Test Condition - 55°C Case Temp	
Sample Name: White SMD LED	
Model: YL-T3528W-AA-60C	
Ratings: 20mA, 6.5lm, 75(Ra), 6000K	
Manufacturer: OSRAM Lighting	
Sample Quantity	6
Number Of Failures	0
DUT drive voltage used in the test (V/Hz)	220.1/50.02
Test duration (hours)	6000
Test duration used for projection (hour to hour)	1000 - 6000
Tested case temperature (°C)	55
α	6.081E-006
B	0.998
Calculated L70(6k) (hours)	815715
Reported L70(6k) (hours)	> 33000
Calculated L50(6k) (hours)	871049
Reported L50(6k) (hours)	> 33000

Lumen Maintenance Graph [%]



Chromaticity Shift Graph [du'v']



Lumen Maintenance Table [%]

Model : YL-T3528W-AA-60C

Ratings : 20mA, 6.5lm, 75(Ra), 6000K

Actual Temperature : Ta = 55.0°C, Ts = 65.0°C

Humidity : R.H. = 60%

Number Of Failures : 0

Uncertainty : 4%

Drive Voltage : U = 220.1V, Freq. = 50.02Hz

No.	0H	24H	48H	168H	500H	1000H	2000H	3000H	4000H	5000H	6000H
1	100.45	100.36	100.00	99.46	97.21	99.01	98.01	97.47	96.75	95.85	95.74
2	99.91	100.09	100.00	99.28	98.01	99.36	98.54	98.08	97.63	96.53	96.53
3	99.82	100.27	100.00	99.65	98.31	99.55	98.74	98.38	97.92	96.92	96.83
4	100.09	100.27	100.00	99.54	100.27	99.72	98.99	98.62	98.16	97.15	97.15
5	100.00	100.18	100.00	99.50	100.20	99.44	98.52	97.96	97.50	96.38	96.31
6	99.91	100.18	100.00	99.15	100.32	98.99	98.17	97.71	97.25	96.24	96.25
Median	99.95	100.23	100.00	99.48	99.25	99.40	98.53	98.02	97.56	96.46	96.42
Average	100.03	100.23	100.00	99.43	99.05	99.34	98.49	98.03	97.53	96.51	96.47
Std. deviation	0.2260	0.0948	0.0000	0.1829	1.3750	0.2941	0.3587	0.4215	0.4998	0.4715	0.4893
Min.	99.82	100.09	100.00	99.15	97.21	98.99	98.01	97.47	96.75	95.85	95.74
Max.	100.45	100.36	100.00	99.65	100.32	99.72	98.99	98.62	98.16	97.15	97.15

Chromaticity Shift Table [du'v']

Model : YL-T3528W-AA-60C Ratings : 20mA, 6.5lm, 75(Ra), 6000K
 Actual Temperature : Ta = 55.0°C, Ts = 65.0°C Humidity : R.H. = 60%
 Number Of Failures : 0
 Drive Voltage : U = 220.1V, Freq. = 50.02Hz

No.	0H	24H	48H	168H	500H	1000H	2000H	3000H	4000H	5000H	6000H
1	0.0001	-0.0001	0.0000	-0.0001	0.0008	0.0001	0.0006	0.0007	0.0008	0.0006	0.0011
2	0.0003	0.0000	0.0000	0.0001	0.0014	0.0004	0.0008	0.0010	0.0011	0.0008	0.0016
3	0.0000	-0.0001	0.0000	0.0000	0.0001	0.0001	0.0006	0.0007	0.0008	0.0007	0.0013
4	0.0000	-0.0001	0.0000	-0.0001	0.0011	0.0000	0.0006	0.0007	0.0008	0.0007	0.0011
5	0.0000	-0.0001	0.0000	0.0001	0.0018	0.0001	0.0007	0.0010	0.0010	0.0007	0.0013
6	0.0001	0.0000	0.0000	0.0000	0.0004	0.0004	0.0008	0.0011	0.0013	0.0010	0.0014
Median	0.0001	-0.0001	0.0000	0.0000	0.0010	0.0001	0.0006	0.0008	0.0009	0.0007	0.0013
Average	0.0001	-0.0001	0.0000	-0.0000	0.0009	0.0002	0.0007	0.0009	0.0010	0.0008	0.0013
Std. deviation	0.00012	0.00007	0.00000	0.00013	0.00064	0.00017	0.00014	0.00019	0.00018	0.00015	0.00017
Min.	0.0000	-0.0001	0.0000	-0.0001	0.0001	0.0000	0.0006	0.0007	0.0008	0.0006	0.0011
Max.	0.0003	0.0000	0.0000	0.0001	0.0018	0.0004	0.0008	0.0011	0.0013	0.0010	0.0016