# LED Lumen Maintenance and Life Test System

# (LEDLM-80PL)

# Brochure


## Global Office of Lisun Electronics Inc.

http://www.Lisungroup.com

Lisun Group (Hong Kong) Limited
Add: Room 803, Chevalier House, 45-51 Chatham Road South, Tsim Sha Tsui, KL, HK
Tel: 00852-68852050 Fax: 00852-30785638
Email: SalesHK@Lisungroup.com

Lisun Electronics (Shanghai) Co., Ltd
Add: 113-114, No. 1 Building, Nanxiang Zhidi Industry Park, No. 1101, Huyi Road, Jiading District, Shanghai, 201802, China
Tel: +86(21)5108 3341 Fax: +86(21)5108 3342
Email: SalesSH@Lisungroup.com

Lisun Electronics Inc. (USA)
Add: 445 S. Figueroa Street, Los Angeles, CA 90071, U.S.A.
Email: Sales@Lisungroup.com

Lisun China Factory
Add: NO. 37, Xiangyuan Road, Hangzhou City, Zhejiang Province, China
Tel: +86-189-1799-6096
Email: Engineering@Lisungroup.com


Leader in Lighting & Electrical Test Instruments

Rev. 10/18/2019

# 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. $P=P0\ \exp(-\beta t)$
2. $\beta=\beta 0\ IF\exp(-Ea/KTj)$

Note: P0 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; β0 is constant value; Ea is activation energy; K is Boltzmann's constant; IF is working current; Tj is junction temperature.

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

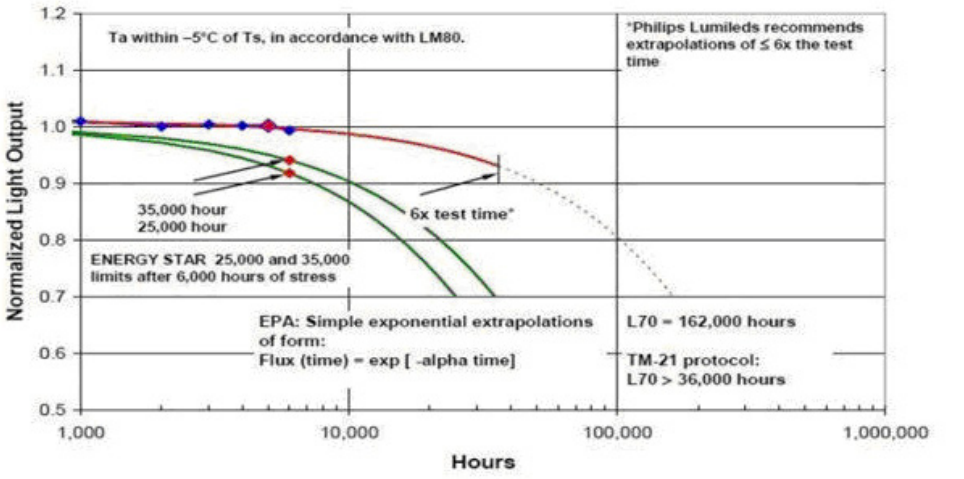
Base on formula 1, L50 is: $t=1000*\ln 0.5/\ln(1-n\%)$

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℃ | 8% | 8312.950414 | 4277.62127 |
| 70℃ | 3% | 22756.57306 | 11709.922 |

The temperature Tj (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℃ 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 t1 is the LED life under T1 temperature, time t2 is the LED life under T2 temperature, then we can calculate the time t3 under T3 temperature: $t3=t1*\exp\{(\ln(t2/t1)/[1/(T2+15+273)-1/(T1+15+273)]*[1/(T3+15+273)-1/(T1+15+273)]\}$




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.


**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:

LISUN GROUP

Lisun Electronics Inc.
http://www.Lisungroup.com
Tel: +86(21)51083341
Fax: +86(21)51083342



# 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 |

Lisun Electronics Inc.
http://www.Lisungroup.com
Tel: +86(21)51083341
Fax: +86(21)51083342



## Lumen Maintenance Life Prediction(Based on TM-21)

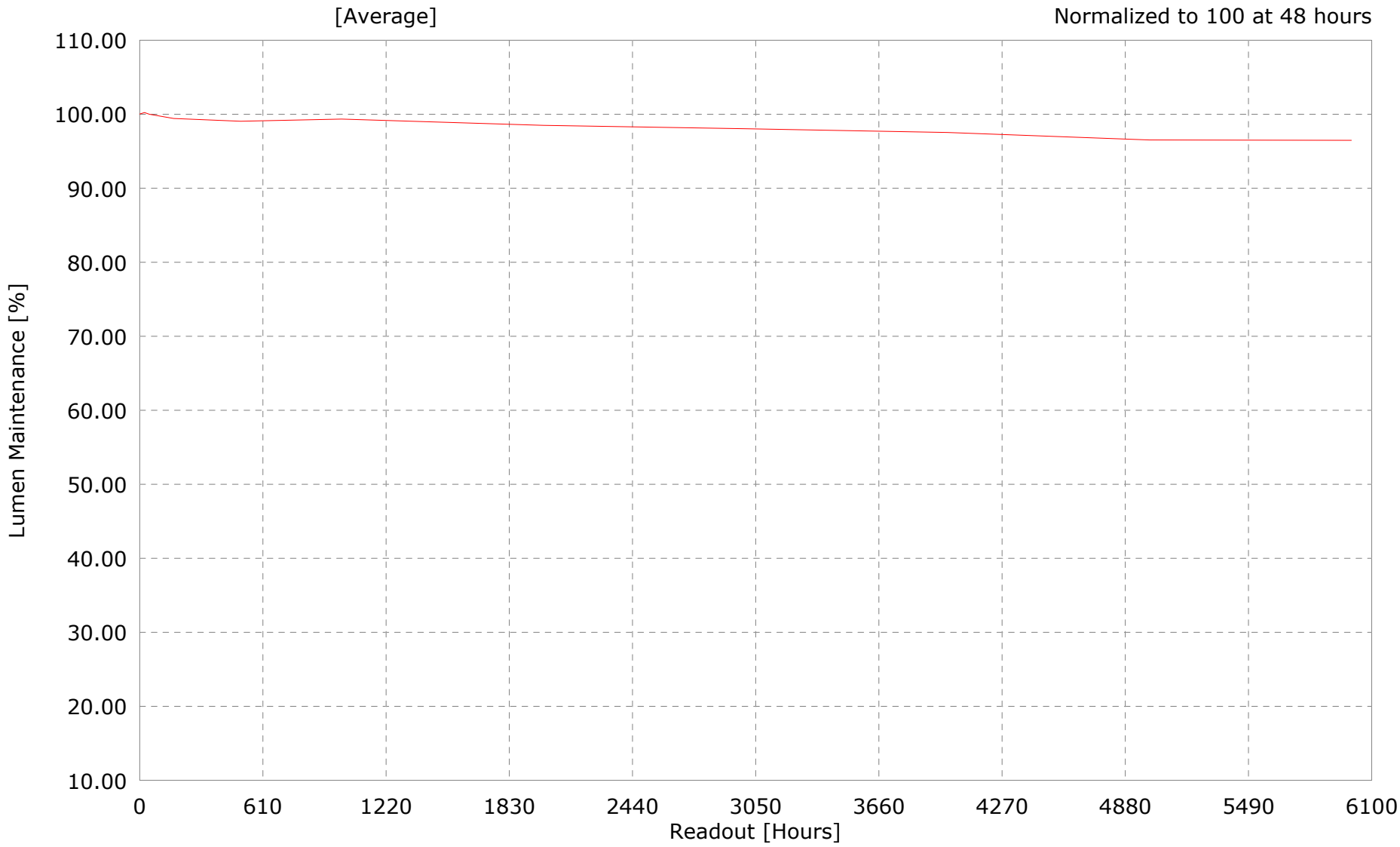
| Test Condition - 55℃ Case Temp | |
|---|---|
| Sample Name: White SMD LED<br>Model: YL-T3528W-AA-60C<br>Ratings: 20mA, 6.5lm, 75(Ra), 6000K<br>Manufacturer: OSRAM Lighting | |
| Sample Quantity | 6 |
| Number Of Failures | 0 |
| DUT drive voltage used in the test (V/Hz) | 220.1/50.02 |
| Test duration (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 |

LISUN GROUP

Lisun Electronics Inc.
http://www.Lisungroup.com
Tel: +86(21)51083341
Fax: +86(21)51083342



## Lumen Maintenance Graph [%]

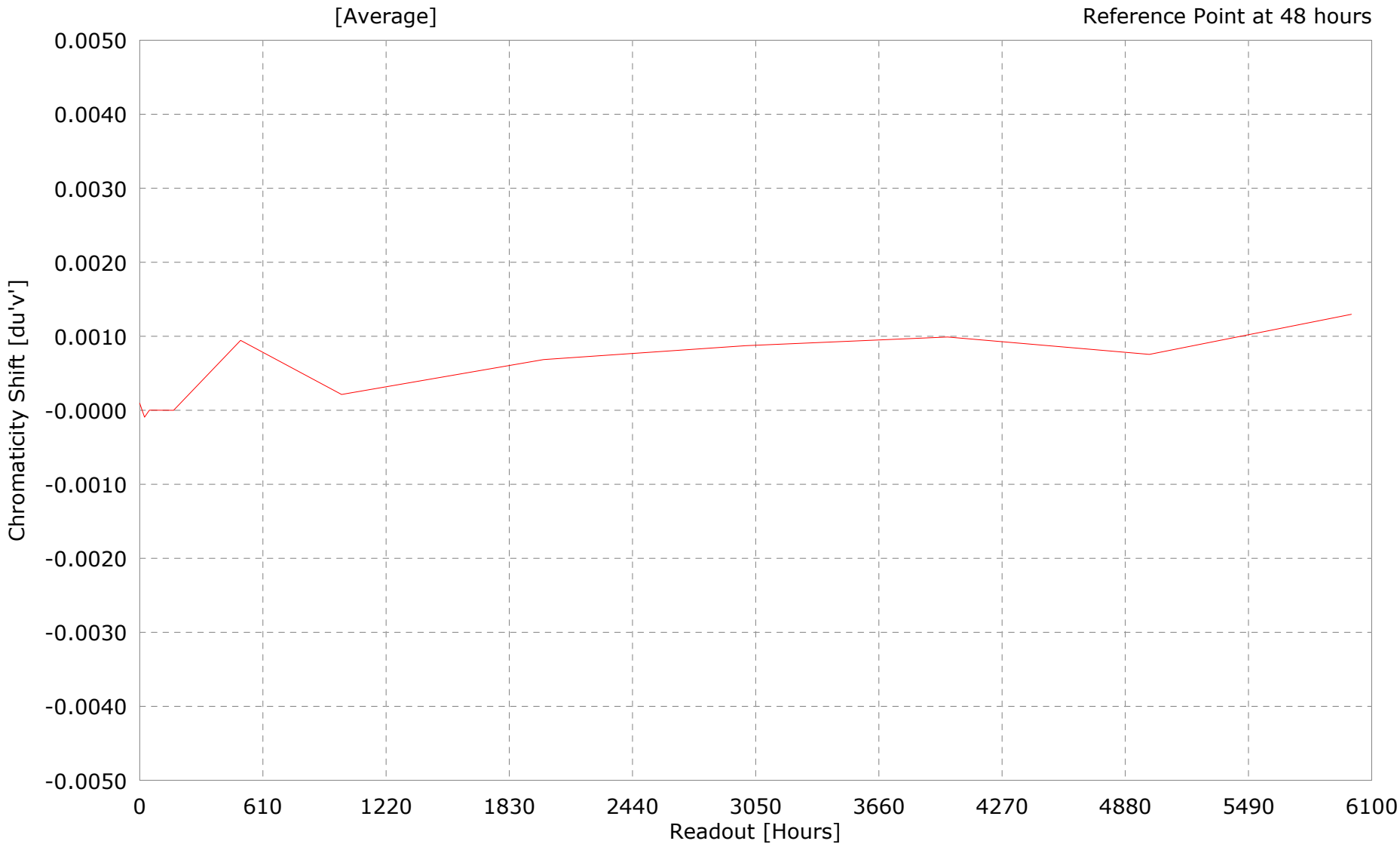


LISUN GROUP

Lisun Electronics Inc.
http://www.Lisungroup.com
Tel: +86(21)51083341
Fax: +86(21)51083342



## Chromaticity Shift Graph [du'v']



LISUN GROUP

Lisun Electronics Inc.
http://www.Lisungroup.com
Tel: +86(21)51083341
Fax: +86(21)51083342



## Lumen Maintenance Table [%]

Model : YL-T3528W-AA-60C
Actual Temperature : Ta = 55.0℃, Ts = 65.0℃
Number Of Failures : 0
Drive Voltage : U = 220.1V, Freq. = 50.02Hz

Ratings : 20mA, 6.5lm, 75(Ra), 6000K
Humidity : R.H. = 60%
Uncertainty : 4%

| 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 |

LISUN GROUP

Lisun Electronics Inc.
http://www.Lisungroup.com
Tel: +86(21)51083341
Fax: +86(21)51083342



## Chromaticity Shift Table [du'v']

Model : YL-T3528W-AA-60C
Ratings : 20mA, 6.5lm, 75(Ra), 6000K
Actual Temperature : Ta = 55.0℃, Ts = 65.0℃
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 |