



LM-80 Test Report

Up to 6,000 hours

Description of LED light sources

Part Number: NS3L183-H3
 Part Name: Nichia Chip Type Warm White LED

Description of auxiliary equipment

Active cooling life test system
 Consisting of small enclosed boxes for devices under test and water-cooled heat sinks to control device temperature.
 LED Tester
 Consisting of an integrating sphere, programmable current-source meter, and polychromator.

Case and ambient temperature

The case temperature T_S is the cathode lead temperature of the LED mounted on a reliability test board; the ambient temperature T_A is the temperature of the air at a distance of 50 mm above the reliability test board.

Test Summary

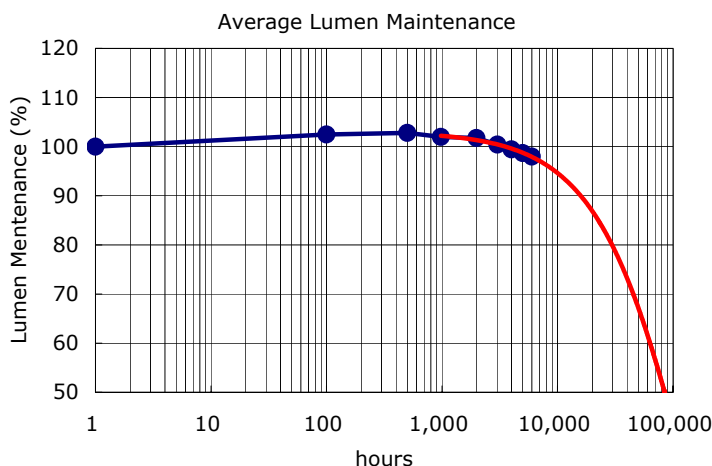
	LM-80 Required Temperature		Nichia Specified Temperature
	I. 55°C	II. 85°C	III. 105°C
Number of LED tested	25	25	25
Drive Current [I_F]	350 mA	350 mA	350 mA
Actual Case Temp. [T_S]	54.5°C	84.2°C	103.6°C
Actual Ambient Temp. [T_A]	51.8°C	82.3°C	101.5°C
$\Delta[T_S - T_A]$	2.7°C	1.9°C	2.1°C
Average Lumen Maintenance at 6,000 hours	98.0%	99.6%	98.0%
Ave. Chromaticity Shift ($\Delta u'v'$) at 6,000 hours	0.0009	0.0008	0.0007

LM-80 Test Report

I. 55°C - LM-80 Required Temperature

Part Number: NS3L183-H3
 Actual Temperature: $T_S = 54.5^\circ\text{C}$, $T_A = 51.8^\circ\text{C}$
 Drive Current: $I_F = 350\text{ mA}$
 Measurement Current: $I_F = 350\text{ mA}$
 Air flow: Minimal air flow
 Comments: No failure observed

	Φ_v [lm]	V_F [V]	Lumen Maintenance [%]						Chromaticity Shift $\Delta u'v'$					
	0 h (Initial)		980 h	1984 h	3016 h	4000 h	5000 h	6000 h	980 h	1984 h	3016 h	4000 h	5000 h	6000 h
NS3L183-H3	81.0	3.38	101.1	100.9	99.7	98.8	98.2	97.7	0.0011	0.0007	0.0009	0.0004	0.0008	0.0009
	81.7	3.38	101.5	101.2	99.9	98.9	98.1	97.3	0.0012	0.0007	0.0006	0.0005	0.0005	0.0006
	80.0	3.38	102.2	102.0	100.8	99.7	99.1	98.3	0.0011	0.0008	0.0007	0.0004	0.0008	0.0007
	79.2	3.39	102.6	102.3	101.0	100.0	99.1	98.4	0.0013	0.0010	0.0009	0.0006	0.0008	0.0009
	81.4	3.38	101.3	101.0	99.5	98.5	97.7	97.1	0.0011	0.0006	0.0008	0.0005	0.0008	0.0009
	79.9	3.38	102.5	102.3	101.0	100.0	99.3	98.0	0.0011	0.0009	0.0008	0.0006	0.0007	0.0010
	80.3	3.39	101.2	100.9	99.7	98.9	98.4	98.2	0.0016	0.0011	0.0011	0.0010	0.0012	0.0013
	80.5	3.38	102.2	101.8	100.4	99.6	99.0	98.5	0.0013	0.0009	0.0010	0.0007	0.0011	0.0009
	80.1	3.38	101.6	101.2	99.9	99.0	98.3	97.6	0.0010	0.0006	0.0007	0.0004	0.0007	0.0006
	80.0	3.38	102.1	101.9	100.6	99.8	99.1	98.4	0.0015	0.0009	0.0011	0.0008	0.0010	0.0011
	79.2	3.38	102.4	102.2	100.8	99.7	99.0	98.1	0.0015	0.0008	0.0008	0.0005	0.0007	0.0008
	80.6	3.38	101.6	101.2	100.0	98.7	97.7	96.7	0.0013	0.0009	0.0009	0.0004	0.0008	0.0007
	80.7	3.38	101.5	101.1	99.8	98.9	98.1	97.3	0.0012	0.0009	0.0009	0.0005	0.0006	0.0007
	80.3	3.38	102.2	101.8	100.2	99.0	98.2	97.2	0.0011	0.0007	0.0009	0.0003	0.0007	0.0007
	80.4	3.38	102.4	102.3	101.3	100.3	99.7	98.9	0.0014	0.0010	0.0010	0.0007	0.0008	0.0009
	79.0	3.38	102.7	102.5	101.1	99.9	99.3	98.7	0.0014	0.0009	0.0009	0.0005	0.0007	0.0009
	79.6	3.38	102.7	102.5	100.9	100.0	99.1	98.5	0.0014	0.0008	0.0008	0.0007	0.0006	0.0008
	79.7	3.39	102.3	102.2	100.8	99.7	99.0	98.1	0.0011	0.0006	0.0008	0.0005	0.0005	0.0009
	81.3	3.36	101.0	101.0	99.7	98.9	98.3	97.8	0.0010	0.0007	0.0007	0.0006	0.0006	0.0008
	79.8	3.38	101.9	101.7	100.4	99.4	98.7	98.2	0.0012	0.0010	0.0009	0.0005	0.0007	0.0007
79.5	3.38	102.1	101.4	100.0	99.0	98.7	98.0	0.0012	0.0011	0.0011	0.0007	0.0006	0.0009	
80.1	3.38	101.6	101.5	100.0	98.9	97.9	97.0	0.0012	0.0008	0.0007	0.0005	0.0006	0.0007	
78.4	3.38	103.1	103.4	101.9	101.1	99.9	99.3	0.0017	0.0012	0.0012	0.0008	0.0011	0.0013	
80.3	3.39	101.7	101.7	100.5	99.5	98.9	98.3	0.0011	0.0008	0.0007	0.0005	0.0006	0.0009	
79.7	3.38	101.9	102.0	100.8	99.7	99.0	98.3	0.0017	0.0011	0.0012	0.0007	0.0010	0.0010	
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ave.	80.1	3.379	102.0	101.8	100.4	99.4	98.7	98.0	0.0013	0.0009	0.0009	0.0006	0.0008	0.0009
Med.	80.1	3.379	102.1	101.8	100.4	99.5	98.9	98.1	0.0012	0.0009	0.0009	0.0005	0.0007	0.0009
σ	0.76	0.006	0.549	0.628	0.612	0.629	0.598	0.631	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
min.	78.4	3.358	101.0	100.9	99.5	98.5	97.7	96.7	0.0010	0.0006	0.0006	0.0003	0.0005	0.0006
max.	81.7	3.390	103.1	103.4	101.9	101.1	99.9	99.3	0.0017	0.0012	0.0012	0.0010	0.0012	0.0013



L70 Extrapolation

$$L = L_{max}e^{at}$$

$$L70 = \ln(0.7/L_{max})/a$$

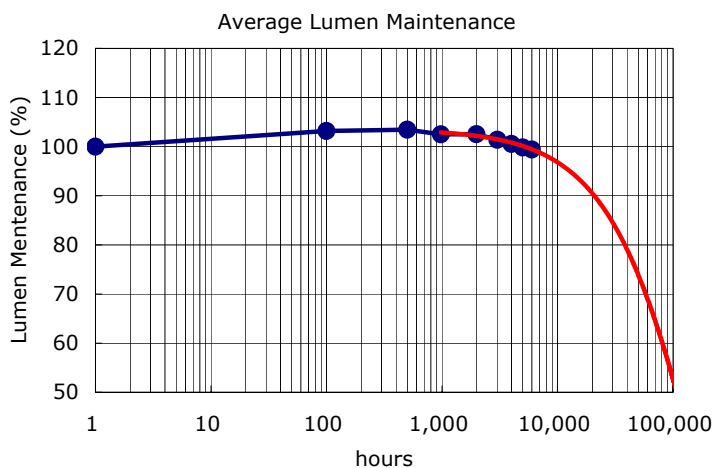
L_{max}	1.0307
a	-8.5437E-06
L70	45290
R^2	0.9794

LM-80 Test Report

II. 85°C - LM-80 Required Temperature

Part Number: NS3L183-H3
 Actual Temperature: $T_S = 84.2^\circ\text{C}$, $T_A = 82.3^\circ\text{C}$
 Drive Current: $I_F = 350\text{ mA}$
 Measurement Current: $I_F = 350\text{ mA}$
 Air flow: Minimal air flow
 Comments: No failure observed

	Φ_v	V_F	Lumen Maintenance [%]						Chromaticity Shift $\Delta u'v'$					
	[lm]	[V]	0 h (Initial)	980 h	1984 h	3016 h	4000 h	5000 h	6000 h	980 h	1984 h	3016 h	4000 h	5000 h
NS3L183-H3	78.1	3.38	104.0	104.1	102.6	101.9	101.4	100.5	0.0011	0.0008	0.0011	0.0009	0.0009	0.0010
	78.5	3.38	102.4	102.4	101.0	100.2	99.8	98.7	0.0011	0.0007	0.0009	0.0005	0.0007	0.0009
	78.6	3.35	102.6	102.8	101.3	100.7	100.2	99.4	0.0012	0.0008	0.0010	0.0006	0.0008	0.0009
	78.8	3.38	102.5	103.0	101.7	100.9	100.5	100.1	0.0006	0.0004	0.0006	0.0001	0.0003	0.0004
	80.1	3.38	102.0	102.1	100.6	99.9	99.5	99.0	0.0011	0.0006	0.0008	0.0004	0.0006	0.0007
	80.3	3.38	102.7	102.7	101.2	100.4	99.8	99.3	0.0010	0.0010	0.0009	0.0004	0.0007	0.0009
	80.9	3.38	102.0	102.2	100.9	100.1	99.6	99.0	0.0009	0.0007	0.0007	0.0004	0.0007	0.0007
	81.0	3.38	101.9	101.9	100.8	100.0	99.6	99.1	0.0010	0.0009	0.0010	0.0006	0.0007	0.0009
	79.3	3.38	102.7	102.7	101.4	100.6	99.9	99.4	0.0008	0.0006	0.0007	0.0004	0.0007	0.0007
	81.5	3.38	101.8	101.8	100.7	99.8	99.1	98.3	0.0009	0.0007	0.0007	0.0005	0.0007	0.0007
	81.0	3.37	101.8	102.0	100.8	99.9	99.3	98.5	0.0010	0.0007	0.0008	0.0005	0.0007	0.0007
	79.8	3.38	102.8	102.9	101.6	100.9	100.5	99.7	0.0010	0.0009	0.0009	0.0006	0.0007	0.0007
	79.1	3.38	103.2	103.2	102.2	101.2	101.0	100.8	0.0010	0.0007	0.0009	0.0007	0.0008	0.0009
	78.9	3.38	104.3	104.4	103.4	102.3	102.0	101.7	0.0013	0.0011	0.0011	0.0010	0.0010	0.0010
	80.2	3.39	102.4	102.5	101.4	100.4	100.2	99.8	0.0009	0.0007	0.0006	0.0005	0.0007	0.0009
	79.5	3.38	103.0	103.0	102.0	100.9	100.5	99.9	0.0011	0.0008	0.0007	0.0005	0.0006	0.0008
	78.8	3.39	103.8	103.8	102.6	101.5	101.0	100.9	0.0011	0.0009	0.0011	0.0009	0.0009	0.0012
	81.6	3.37	101.8	101.7	100.7	99.9	99.3	99.2	0.0011	0.0009	0.0009	0.0007	0.0008	0.0010
	80.6	3.38	102.5	102.5	101.6	100.7	100.2	99.9	0.0012	0.0008	0.0008	0.0008	0.0009	0.0010
	79.1	3.37	102.9	102.8	101.8	100.9	100.4	100.3	0.0012	0.0009	0.0009	0.0007	0.0008	0.0010
80.1	3.38	102.4	102.4	101.5	100.6	99.7	99.4	0.0008	0.0006	0.0009	0.0005	0.0008	0.0005	
80.3	3.38	103.0	102.8	101.8	100.7	100.1	99.9	0.0011	0.0011	0.0011	0.0008	0.0007	0.0008	
80.7	3.38	102.5	102.3	101.1	100.3	99.2	98.9	0.0011	0.0009	0.0008	0.0004	0.0006	0.0008	
79.5	3.39	102.5	102.3	101.2	100.0	98.8	98.1	0.0012	0.0010	0.0009	0.0005	0.0006	0.0006	
79.8	3.39	102.3	102.3	101.3	100.2	99.8	99.6	0.0010	0.0007	0.0009	0.0006	0.0007	0.0006	
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ave.	79.8	3.378	102.6	102.7	101.5	100.6	100.1	99.6	0.0010	0.0008	0.0009	0.0006	0.0007	0.0008
Med.	79.8	3.380	102.5	102.5	101.4	100.6	99.9	99.4	0.0011	0.0008	0.0009	0.0005	0.0007	0.0008
σ	0.97	0.008	0.668	0.670	0.685	0.651	0.748	0.851	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002
min.	78.1	3.349	101.8	101.7	100.6	99.8	98.8	98.1	0.0006	0.0004	0.0006	0.0001	0.0003	0.0004
max.	81.6	3.389	104.3	104.4	103.4	102.3	102.0	101.7	0.0013	0.0011	0.0011	0.0010	0.0010	0.0012



L70 Extrapolation

$$L = L_{max}e^{at}$$

$$L70 = \ln(0.7/L_{max})/a$$

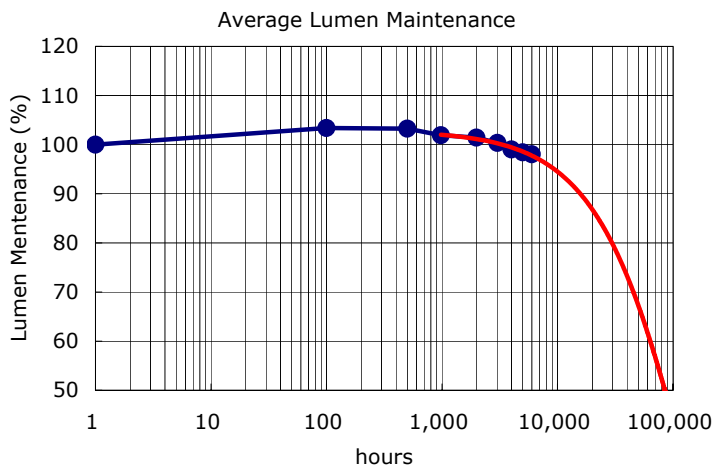
L_{max}	1.0358
a	-6.7457E-06
L70	58084
R^2	0.9592

LM-80 Test Report

III. 105°C - Nichia Specified Temperature

Part Number: NS3L183-H3
 Actual Temperature: $T_S = 103.6^\circ\text{C}$, $T_A = 101.5^\circ\text{C}$
 Drive Current: $I_F = 350\text{ mA}$
 Measurement Current: $I_F = 350\text{ mA}$
 Air flow: Minimal air flow
 Comments: No failure observed

	Φ_v [lm]	V_F [V]	Lumen Maintenance [%]						Chromaticity Shift $\Delta u'v'$					
	0 h (Initial)		980 h	1984 h	3016 h	4000 h	5000 h	6000 h	980 h	1984 h	3016 h	4000 h	5000 h	6000 h
NS3L183-H3	79.4	3.38	101.5	100.8	99.4	97.9	97.2	95.9	0.0009	0.0006	0.0005	0.0001	0.0002	0.0006
	81.0	3.38	101.7	101.0	99.8	98.6	97.9	97.8	0.0010	0.0006	0.0005	0.0002	0.0003	0.0004
	79.3	3.39	102.7	101.9	101.0	99.5	99.3	99.2	0.0011	0.0011	0.0010	0.0006	0.0009	0.0010
	78.9	3.38	103.3	102.7	101.6	100.1	99.6	99.3	0.0012	0.0009	0.0009	0.0004	0.0009	0.0008
	80.5	3.37	101.1	100.2	99.1	97.8	97.2	96.6	0.0014	0.0010	0.0007	0.0003	0.0007	0.0006
	80.7	3.37	101.8	101.2	100.1	98.8	98.2	98.0	0.0009	0.0005	0.0006	0.0002	0.0006	0.0007
	80.4	3.38	102.0	101.0	100.2	98.7	98.3	98.2	0.0010	0.0005	0.0005	0.0000	0.0007	0.0008
	80.7	3.37	101.7	101.1	100.0	98.8	98.2	97.8	0.0006	0.0002	0.0003	0.0004	0.0006	0.0004
	79.1	3.38	102.5	101.9	100.9	99.6	98.9	98.6	0.0011	0.0008	0.0008	0.0005	0.0006	0.0009
	80.5	3.39	101.6	101.2	100.2	98.9	98.3	98.1	0.0006	0.0005	0.0004	0.0000	0.0007	0.0007
	81.1	3.39	101.2	100.6	99.6	98.4	97.7	97.4	0.0009	0.0006	0.0006	0.0001	0.0006	0.0007
	80.3	3.38	101.4	101.1	100.1	98.9	98.2	97.9	0.0008	0.0007	0.0006	0.0002	0.0005	0.0006
	79.7	3.38	102.0	101.5	100.6	99.2	98.7	98.1	0.0011	0.0007	0.0007	0.0005	0.0008	0.0008
	80.5	3.36	101.6	101.4	100.4	99.2	98.6	98.3	0.0009	0.0005	0.0006	0.0002	0.0005	0.0005
	79.7	3.38	101.7	101.1	100.3	99.0	98.4	98.0	0.0010	0.0006	0.0005	0.0001	0.0006	0.0007
	80.8	3.38	101.1	100.8	99.7	98.3	97.6	96.7	0.0009	0.0007	0.0006	0.0002	0.0007	0.0005
	80.5	3.38	101.9	101.4	100.2	98.9	98.0	97.6	0.0008	0.0007	0.0006	0.0003	0.0007	0.0006
	81.4	3.38	101.6	101.2	100.2	98.8	98.3	98.0	0.0010	0.0008	0.0007	0.0003	0.0006	0.0007
	80.4	3.38	102.5	102.2	101.0	99.6	99.2	99.0	0.0011	0.0009	0.0008	0.0004	0.0006	0.0009
	80.4	3.39	102.2	101.5	100.4	98.8	98.3	97.7	0.0009	0.0005	0.0006	0.0001	0.0004	0.0004
81.4	3.37	101.3	101.1	99.9	98.6	97.9	97.5	0.0009	0.0006	0.0007	0.0003	0.0005	0.0009	
80.3	3.37	102.6	102.5	101.4	100.0	99.5	99.1	0.0009	0.0007	0.0006	0.0003	0.0006	0.0005	
79.7	3.38	102.5	102.3	101.4	100.1	99.6	99.1	0.0012	0.0008	0.0009	0.0005	0.0008	0.0007	
81.2	3.38	101.8	101.5	100.5	99.1	98.6	98.2	0.0010	0.0007	0.0008	0.0005	0.0008	0.0006	
78.9	3.38	103.0	102.7	101.5	100.1	99.3	98.8	0.0013	0.0009	0.0009	0.0004	0.0008	0.0009	
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ave.	80.3	3.379	101.9	101.4	100.4	99.0	98.4	98.0	0.0010	0.0007	0.0007	0.0003	0.0006	0.0007
Med.	80.4	3.380	101.8	101.2	100.2	98.9	98.3	98.0	0.0010	0.0007	0.0006	0.0003	0.0006	0.0007
σ	0.75	0.007	0.594	0.646	0.667	0.645	0.705	0.828	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
min.	78.9	3.361	101.1	100.2	99.1	97.8	97.2	95.9	0.0006	0.0002	0.0003	0.0000	0.0002	0.0004
max.	81.4	3.393	103.3	102.7	101.6	100.1	99.6	99.3	0.0014	0.0011	0.0010	0.0006	0.0009	0.0010



L70 Extrapolation

$$L = L_{max}e^{at}$$

$$L70 = \ln(0.7/L_{max})/a$$

L_{max}	1.0287
a	-8.4795E-06
L70	45398
R^2	0.9718