



LM-80 Test Report

6,000 hours (Final)

Description of LED light sources

Part Number: NS6x183-H3 (NS6L183-H3, NS6W183-H3)
 Part Name: Nichia Chip Type 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]	700 mA	700 mA	700 mA
Actual Case Temp. [T_S]	53.6°C	83.5°C	104.2°C
Actual Ambient Temp. [T_A]	51.7°C	82.2°C	102.2°C
$\Delta[T_S - T_A]$	1.9°C	1.3°C	2.0°C
Average Lumen Maintenance at 6,000 hours	99.3%	100.1%	97.8%
Ave. Chromaticity Shift ($\Delta u'v'$) at 6,000 hours	0.0012	0.0012	0.0006

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I. 55°C - LM-80 Required Temperature

Part Number: NS6x183-H3 (NS6L183-H3,NS6W183-H3)
 Actual Temperature: $T_S = 53.6^\circ\text{C}$, $T_A = 51.7^\circ\text{C}$
 Drive Current: $I_F = 700\text{ mA}$
 Measurement Current: $I_F = 700\text{ mA}$
 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
NS6L183-H3	146	3.43	102.6	103.0	102.5	101.5	101.5	100.8	0.0014	0.0012	0.0012	0.0011	0.0011	0.0009
	146	3.41	101.8	101.7	100.6	99.1	98.4	97.1	0.0012	0.0010	0.0008	0.0008	0.0007	0.0003
	147	3.44	101.9	101.9	101.4	100.2	100.1	99.1	0.0015	0.0013	0.0012	0.0013	0.0013	0.0010
	145	3.41	102.1	102.2	101.5	100.5	100.7	99.8	0.0014	0.0012	0.0012	0.0012	0.0011	0.0010
	145	3.42	100.7	100.8	100.2	99.1	99.1	98.0	0.0009	0.0007	0.0008	0.0007	0.0007	0.0006
	147	3.44	101.8	101.8	101.2	100.2	100.1	99.4	0.0011	0.0011	0.0010	0.0011	0.0010	0.0009
	147	3.43	102.0	102.4	101.6	100.9	101.0	100.2	0.0013	0.0011	0.0014	0.0011	0.0011	0.0010
	146	3.43	101.9	102.0	101.4	100.4	100.4	99.5	0.0014	0.0011	0.0012	0.0012	0.0011	0.0009
	146	3.41	101.5	101.4	100.6	99.6	99.4	98.5	0.0012	0.0010	0.0011	0.0010	0.0011	0.0007
	147	3.41	101.7	101.6	100.9	99.9	99.9	99.1	0.0012	0.0009	0.0011	0.0011	0.0010	0.0008
	144	3.43	102.4	102.6	102.0	100.9	100.8	99.7	0.0014	0.0012	0.0013	0.0012	0.0013	0.0010
	146	3.44	102.1	102.3	101.4	100.3	100.3	99.2	0.0013	0.0013	0.0011	0.0013	0.0013	0.0011
	146	3.42	102.2	102.1	101.4	100.5	100.3	99.6	0.0013	0.0011	0.0009	0.0009	0.0009	0.0008
	146	3.43	102.1	102.2	101.5	100.7	100.4	99.6	0.0012	0.0010	0.0010	0.0010	0.0010	0.0008
	146	3.43	102.2	102.4	101.6	101.1	101.2	100.4	0.0013	0.0012	0.0013	0.0012	0.0011	0.0010
145	3.42	102.2	102.3	101.4	100.7	100.6	99.9	0.0013	0.0009	0.0010	0.0009	0.0010	0.0009	
NS6W183-H3	163	3.41	102.5	102.2	101.2	99.4	98.5	97.3	0.0023	0.0017	0.0017	0.0017	0.0015	0.0015
	165	3.41	102.9	103.3	102.6	101.1	100.8	99.6	0.0024	0.0019	0.0021	0.0020	0.0019	0.0014
	160	3.39	103.1	103.4	102.2	100.6	100.2	99.3	0.0023	0.0018	0.0018	0.0021	0.0020	0.0018
	165	3.41	102.9	103.0	102.3	100.8	100.4	99.3	0.0026	0.0023	0.0021	0.0021	0.0023	0.0021
	160	3.39	102.8	103.1	102.1	100.3	99.9	98.5	0.0024	0.0023	0.0021	0.0020	0.0021	0.0017
	160	3.39	102.7	102.7	101.8	100.3	99.9	98.9	0.0024	0.0019	0.0021	0.0018	0.0020	0.0017
	164	3.42	102.8	102.8	101.6	100.3	99.7	98.9	0.0024	0.0022	0.0019	0.0022	0.0020	0.0014
	161	3.42	104.6	104.9	104.3	102.9	102.9	101.9	0.0029	0.0026	0.0028	0.0025	0.0030	0.0027
163	3.41	102.9	102.9	102.1	100.4	100.0	98.8	0.0021	0.0018	0.0017	0.0017	0.0018	0.0013	
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ave.	152	3.417	102.3	102.4	101.7	100.5	100.3	99.3	0.0017	0.0014	0.0014	0.0014	0.0014	0.0012
Med.	147	3.415	102.2	102.3	101.5	100.4	100.3	99.3	0.0014	0.0012	0.0012	0.0012	0.0011	0.0010
σ	8.15	0.014	0.714	0.798	0.805	0.770	0.916	1.022	0.0006	0.0005	0.0005	0.0005	0.0006	0.0005
min.	144	3.388	100.7	100.8	100.2	99.1	98.4	97.1	0.0009	0.0007	0.0008	0.0007	0.0007	0.0003
max.	165	3.439	104.6	104.9	104.3	102.9	102.9	101.9	0.0029	0.0026	0.0028	0.0025	0.0030	0.0027

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II. 85°C - LM-80 Required Temperature

Part Number: NS6x183-H3 (NS6L183-H3,NS6W183-H3)
 Actual Temperature: $T_S = 83.5^\circ\text{C}$, $T_A = 82.2^\circ\text{C}$
 Drive Current: $I_F = 700 \text{ mA}$
 Measurement Current: $I_F = 700 \text{ mA}$
 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
NS6L183-H3	146	3.42	102.7	102.3	101.6	100.7	100.6	99.8	0.0013	0.0010	0.0011	0.0009	0.0011	0.0010
	146	3.43	102.8	102.5	101.8	101.1	101.1	100.6	0.0013	0.0010	0.0011	0.0011	0.0011	0.0009
	146	3.41	102.4	102.3	101.4	100.5	100.6	99.6	0.0011	0.0009	0.0009	0.0010	0.0007	0.0009
	146	3.43	102.3	102.0	101.2	100.4	100.4	99.7	0.0011	0.0010	0.0010	0.0008	0.0009	0.0009
	147	3.40	102.3	101.9	101.1	100.2	100.1	98.9	0.0012	0.0012	0.0012	0.0011	0.0012	0.0011
	145	3.41	102.8	102.7	101.6	101.0	101.0	100.4	0.0011	0.0008	0.0010	0.0009	0.0009	0.0009
	145	3.42	102.2	102.2	101.4	100.5	100.4	99.7	0.0011	0.0009	0.0010	0.0009	0.0010	0.0008
	146	3.43	102.2	102.1	101.2	100.4	100.4	99.7	0.0011	0.0009	0.0010	0.0010	0.0008	0.0008
	144	3.41	103.4	103.1	102.3	101.4	101.1	100.3	0.0015	0.0012	0.0013	0.0011	0.0011	0.0010
	147	3.43	102.6	102.2	101.6	100.8	100.8	100.0	0.0010	0.0009	0.0010	0.0008	0.0009	0.0008
	147	3.43	102.3	102.3	101.6	100.7	100.5	100.0	0.0013	0.0009	0.0011	0.0010	0.0009	0.0010
	145	3.41	102.4	102.0	101.1	100.2	99.9	98.9	0.0011	0.0008	0.0009	0.0009	0.0009	0.0007
	146	3.41	102.9	102.5	101.9	101.1	100.9	100.2	0.0013	0.0013	0.0013	0.0011	0.0013	0.0011
	145	3.44	102.9	102.7	102.0	101.2	100.9	100.0	0.0010	0.0009	0.0010	0.0010	0.0009	0.0009
146	3.41	102.2	102.1	101.3	100.4	100.4	100.0	0.0012	0.0010	0.0010	0.0008	0.0008	0.0008	
146	3.41	102.3	102.0	101.4	100.5	100.2	99.5	0.0011	0.0009	0.0008	0.0008	0.0009	0.0007	
NS6W183-H3	164	3.42	102.8	102.3	101.4	100.5	100.5	99.8	0.0024	0.0023	0.0021	0.0024	0.0023	0.0023
	166	3.41	102.9	102.7	102.1	101.3	101.3	100.5	0.0022	0.0019	0.0018	0.0020	0.0018	0.0016
	167	3.41	103.0	102.8	101.9	101.7	101.5	100.8	0.0019	0.0015	0.0016	0.0015	0.0017	0.0017
	162	3.43	102.8	102.4	101.6	100.6	100.5	99.5	0.0021	0.0018	0.0018	0.0015	0.0016	0.0012
	163	3.42	103.1	102.6	102.1	101.1	101.0	100.2	0.0022	0.0018	0.0016	0.0015	0.0017	0.0015
	161	3.42	104.4	104.3	103.7	103.0	103.0	102.3	0.0023	0.0018	0.0022	0.0019	0.0020	0.0023
	161	3.42	104.1	103.7	103.0	101.9	101.9	100.9	0.0021	0.0018	0.0015	0.0019	0.0018	0.0014
	164	3.40	102.9	102.7	102.0	101.1	100.9	99.9	0.0018	0.0016	0.0013	0.0017	0.0016	0.0014
161	3.43	104.1	103.8	103.1	102.1	101.5	100.5	0.0023	0.0021	0.0024	0.0021	0.0022	0.0020	
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ave.	152	3.417	102.8	102.6	101.8	101.0	100.8	100.1	0.0015	0.0013	0.0013	0.0013	0.0013	0.0012
Med.	146	3.415	102.8	102.4	101.6	100.8	100.8	100.0	0.0013	0.0010	0.0011	0.0011	0.0011	0.0010
σ	8.59	0.011	0.618	0.602	0.652	0.660	0.639	0.687	0.0005	0.0005	0.0004	0.0005	0.0005	0.0005
min.	144	3.398	102.2	101.9	101.1	100.2	99.9	98.9	0.0010	0.0008	0.0008	0.0008	0.0007	0.0007
max.	167	3.435	104.4	104.3	103.7	103.0	103.0	102.3	0.0024	0.0023	0.0024	0.0024	0.0023	0.0023

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III. 105°C - Nichia Specified Temperature

Part Number: NS6x183-H3 (NS6L183-H3,NS6W183-H3)
 Actual Temperature: $T_S = 104.2^\circ\text{C}$, $T_A = 102.2^\circ\text{C}$
 Drive Current: $I_F = 700\text{ mA}$
 Measurement Current: $I_F = 700\text{ mA}$
 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
NS6L183-H3	144	3.42	102.3	101.4	100.2	99.0	98.6	97.8	0.0011	0.0009	0.0008	0.0007	0.0006	0.0005
	146	3.43	101.3	100.2	99.2	97.9	97.6	96.8	0.0011	0.0007	0.0006	0.0006	0.0004	0.0004
	147	3.41	100.9	99.7	98.7	97.6	97.2	96.2	0.0008	0.0007	0.0007	0.0006	0.0005	0.0003
	146	3.41	100.4	99.4	98.2	96.9	96.5	95.7	0.0011	0.0006	0.0006	0.0004	0.0003	0.0003
	145	3.42	101.1	100.4	99.3	98.2	97.9	96.1	0.0012	0.0009	0.0007	0.0007	0.0006	0.0007
	146	3.41	101.3	100.5	99.4	98.4	98.1	97.2	0.0009	0.0005	0.0006	0.0005	0.0005	0.0002
	149	3.44	101.5	100.7	99.7	98.7	98.4	97.5	0.0010	0.0007	0.0006	0.0004	0.0006	0.0005
	144	3.42	101.5	100.7	99.7	98.6	98.2	97.4	0.0013	0.0009	0.0009	0.0007	0.0007	0.0007
	145	3.43	100.7	100.0	98.8	97.6	97.2	96.4	0.0011	0.0006	0.0007	0.0005	0.0005	0.0002
	146	3.42	101.4	100.8	99.6	98.4	98.0	97.3	0.0012	0.0010	0.0008	0.0005	0.0007	0.0004
	147	3.43	101.3	100.4	99.2	97.8	97.6	96.7	0.0008	0.0008	0.0005	0.0004	0.0003	0.0004
	146	3.43	101.3	100.6	99.3	98.1	97.7	96.9	0.0010	0.0007	0.0006	0.0006	0.0003	0.0003
	146	3.42	100.7	99.7	98.6	97.5	97.1	96.3	0.0010	0.0008	0.0006	0.0005	0.0004	0.0005
	145	3.43	101.9	101.3	100.2	99.2	98.7	97.8	0.0012	0.0008	0.0009	0.0007	0.0006	0.0006
145	3.39	101.2	100.3	99.4	98.4	97.9	97.0	0.0010	0.0008	0.0008	0.0005	0.0007	0.0004	
146	3.43	101.3	100.8	99.7	98.5	98.2	97.3	0.0009	0.0007	0.0005	0.0005	0.0005	0.0004	
NS6W183-H3	161	3.42	102.1	101.5	100.6	99.7	99.4	99.3	0.0016	0.0014	0.0013	0.0011	0.0011	0.0010
	165	3.42	102.0	101.4	100.7	99.8	99.7	99.4	0.0015	0.0012	0.0011	0.0009	0.0009	0.0007
	163	3.42	101.9	101.5	100.5	99.6	99.3	99.4	0.0016	0.0013	0.0008	0.0009	0.0008	0.0005
	164	3.41	101.4	100.8	100.1	99.1	99.0	98.7	0.0014	0.0008	0.0009	0.0007	0.0008	0.0006
	162	3.43	101.6	101.5	100.9	100.0	99.8	99.2	0.0016	0.0014	0.0013	0.0014	0.0014	0.0011
	163	3.44	103.5	102.8	101.9	101.1	100.8	100.3	0.0026	0.0022	0.0018	0.0020	0.0023	0.0019
	161	3.43	102.7	102.1	100.9	100.3	100.1	99.4	0.0019	0.0016	0.0018	0.0014	0.0016	0.0014
	161	3.42	103.0	102.6	101.9	101.1	100.9	100.3	0.0022	0.0016	0.0014	0.0012	0.0013	0.0014
164	3.44	101.0	100.4	99.5	98.5	98.2	97.7	0.0015	0.0009	0.0006	0.0009	0.0007	0.0005	
n	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Ave.	152	3.423	101.6	100.9	99.8	98.8	98.5	97.8	0.0013	0.0010	0.0009	0.0008	0.0008	0.0006
Med.	146	3.424	101.4	100.7	99.7	98.5	98.2	97.4	0.0012	0.0008	0.0008	0.0007	0.0006	0.0005
σ	8.39	0.011	0.731	0.860	0.944	1.095	1.145	1.356	0.0004	0.0004	0.0004	0.0004	0.0005	0.0004
min.	144	3.394	100.4	99.4	98.2	96.9	96.5	95.7	0.0008	0.0005	0.0005	0.0004	0.0003	0.0002
max.	165	3.440	103.5	102.8	101.9	101.1	100.9	100.3	0.0026	0.0022	0.0018	0.0020	0.0023	0.0019