



Test Report: NPF-120D-24

120W Single Output LED Driver

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

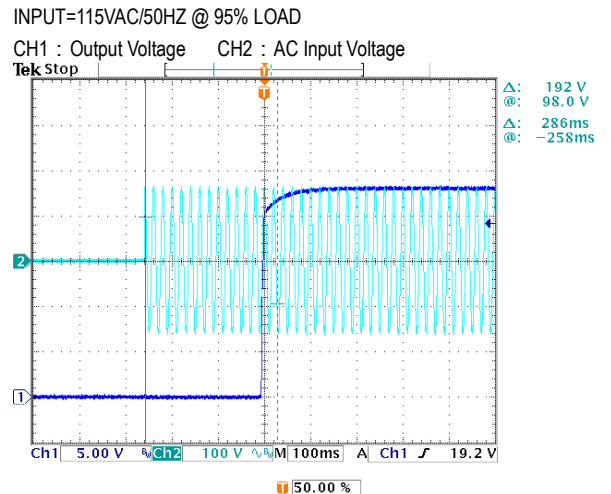
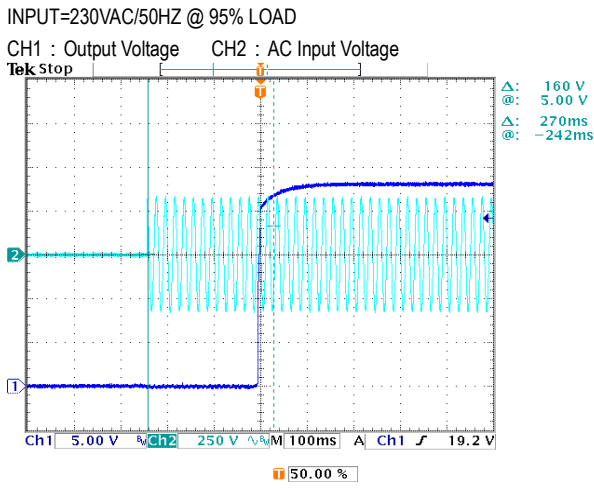
■ RELIABILITY TEST

Environment Test

DESIGN VERIFY TEST

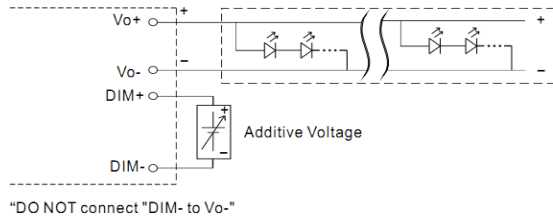
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	14.4~24V	I/P: 230VAC O/P: LED MODE Ta: 25°C	11.2 V~23.5 V
2	CURRENT RIPPLE	5% max@rated current	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	1.67 %
3	CURRENT TOLERANCE	±5%	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	1.61 %
4	OVER/UNDERSHOOT TEST	< ± 5 %	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	< 5 %
5	AUXILIARY DC OUTPUT (For BE-Type only)	Nominal 12V (deviation 11.4~12.6) @0.2A for BE-Type only	I/P: 230 VAC O/P: FULL LOAD	11.85V
6	SET UP TIME(Max)	230VAC/ 500ms 115VAC/ 500ms	I/P: 230 VAC I/P: 115 VAC O/P: 95% LOAD Ta: 25°C	230VAC/ 270 ms 115VAC/ 286 ms

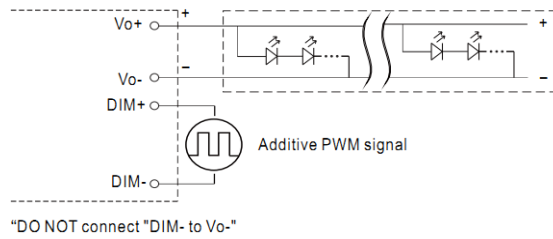


7 DIMMING TEST

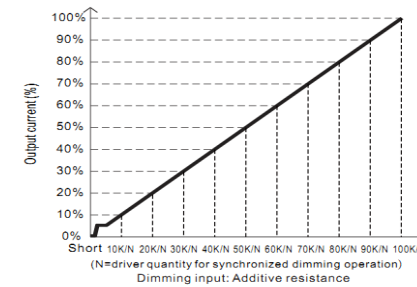
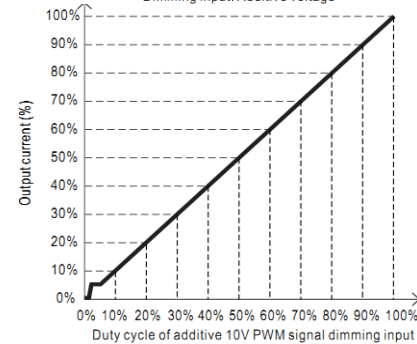
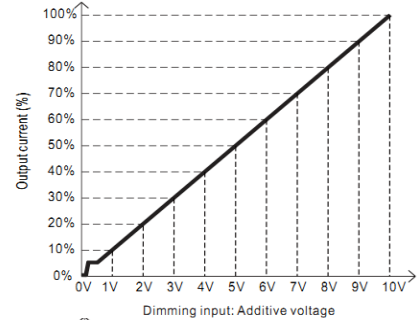
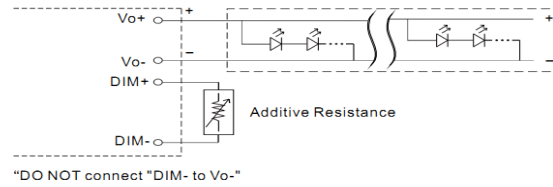
- Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10Vdc, or 10V PWM signal or resistance.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: 100uA (typ.)
- © Applying additive 0 ~ 10VDC



© Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



© Applying additive resistance:



Note : 1. Min. dimming level is about 6% and the output current is not defined when $0% < I_{out} < 6%$.
 2. The output current could drop down to 0% when dimming input is about $0k\Omega$ or 0Vdc, or 10V PWM signal with 0% duty cycle.

※ Auxiliary DC operation (for BE-type)

• AUX+, with mark ***, is added for BE-Type, used as the Auxiliary DC output with respect to DIM-.

I/P: 230 VAC

O/P: DIMMING TEST

Ta: 25°C

		Dimming Input											
		V	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
1	Output Current	0	0.663	1.153	1.651	2.147	2.651	3.154	3.665	4.177	4.691	4.989	5.00
	%	0%	13.26%	23.06%	33.02%	42.94%	53.02%	63.08%	73.30%	83.54%	93.82%	99.78%	100%
	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
2	Output Current	0	0.64	1.108	1.579	2.049	2.52	2.99	3.459	3.931	4.412	4.872	5.00
	%	0%	12.80%	22.16%	31.58%	40.98%	50.40%	59.80%	69.18%	78.62%	88.00%	97.44%	100%
	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
3	Output Current	0	0.64	1.108	1.579	2.049	2.52	2.99	3.459	3.931	4.412	4.872	5.00
	%	0%	12.80%	22.16%	31.58%	40.98%	50.40%	59.80%	69.18%	78.62%	88.00%	97.44%	100%

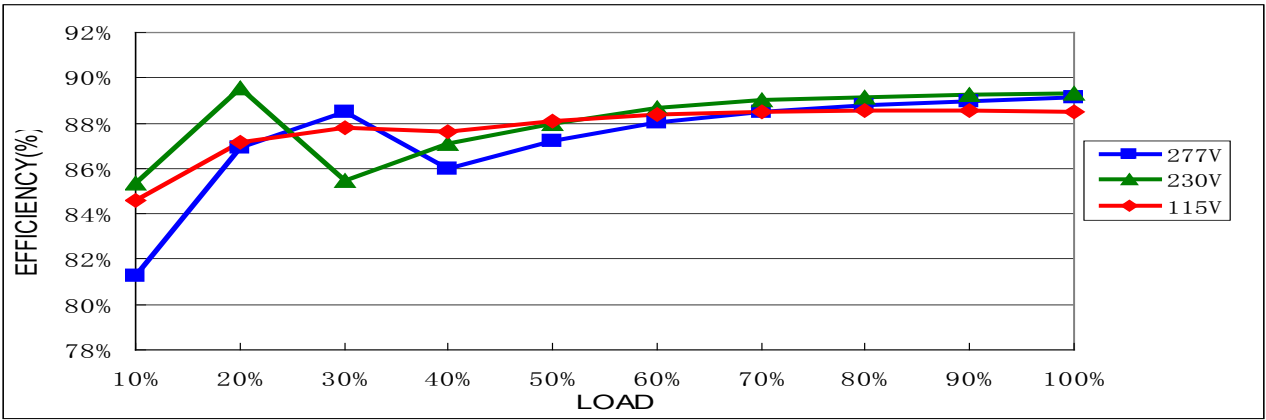
TEST RESULT: OK



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	87V~305V
			I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230VAC ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230VAC ON: 3Sec OFF: 3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 90 VAC ~305 VAC O/P: FULL~MIN LOAD Ta: 25°C	TEST: OK
3	AC CURRENT	1.3A/115VAC 0.65A/230VAC 0.55A/277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	I=1.135A/ 115VAC I=0.587A/ 230VAC I=0.505A/ 277VAC
4	LEAKAGE CURRENT	< 0.25mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.003 mA N-FG: 0.003 mA
5	STANDBY POWER CONSUMPTION	< 0.5W	I/P: 230VAC O/P: NO LOAD Ta: 25°C	0.392 W
6	INRUSH CURRENT(Typ)	60A/230VAC Twidth =520 us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I= 43.8 A/ 230VAC Twidth =512 us
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH2: Input current CH1: AC Input Voltage</p> <p>Ch2 Max 43.8 A</p> <p>Δ: 200mA @: 22.6 A Δ: 512us @: -12.0us</p> <p>Ch1 200mV V Ch2 10.0 A Ω/M 200us A Ch2 J 34.6 A</p> <p>40.00 %</p>				
7	EFFICIENCY(Typ)	89.5% (BLANK-TYPE) 89.0% (BE-TYPE)	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	89.86% (BLANK-TYPE) 89.32% (BE-TYPE)

EFFICIENCY vs LOAD



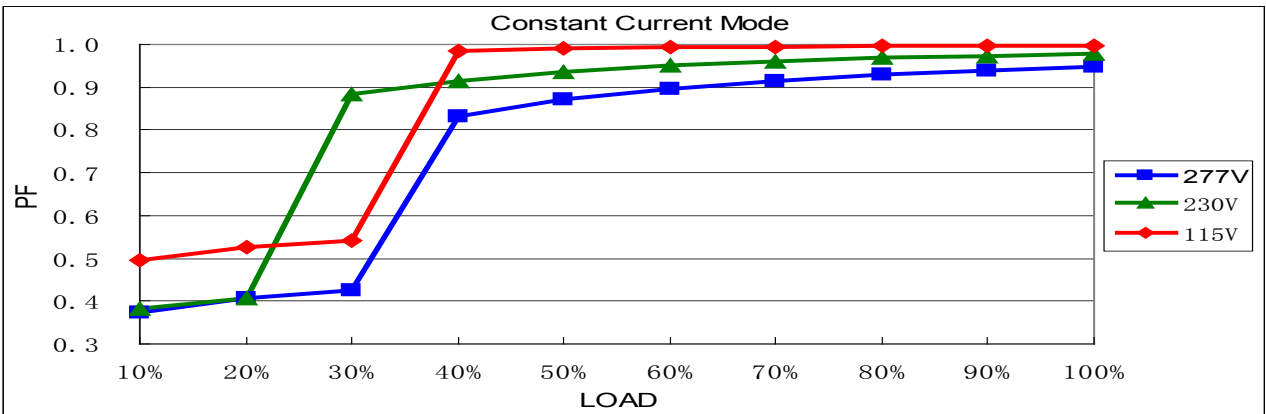
8 POWER FACTOR

0.97/ 115VAC
0.96/ 230VAC
0.94/ 277VAC

I/P: 115 VAC
I/P: 230 VAC
I/P: 277 VAC
O/P: FULL LOAD
Ta: 25°C

PF=0.994/ 115VAC
PF=0.975/ 230VAC
PF=0.946/ 277VAC

P. F vs LOAD



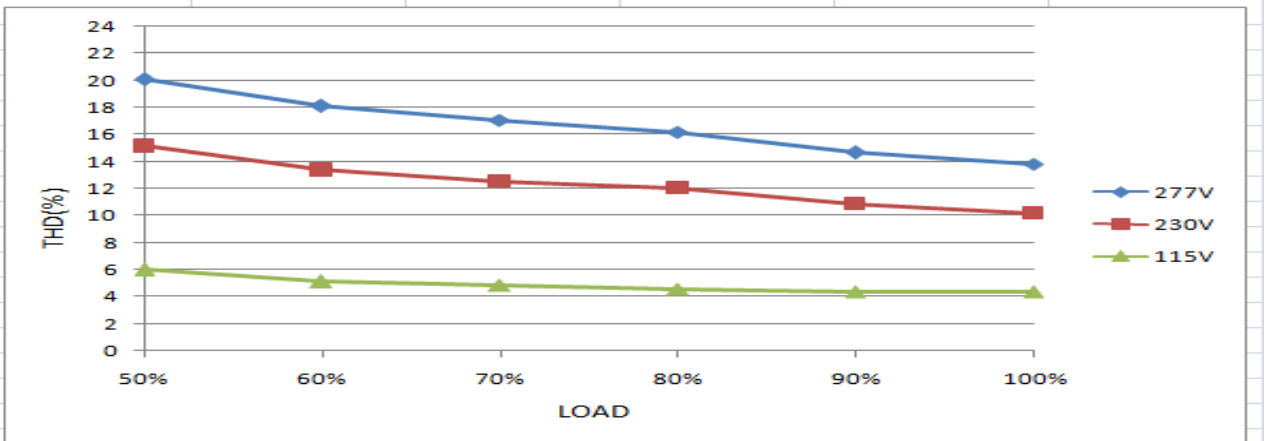
9 TOTAL HARMONIC DISTORTION

THD < 20%
(@load ≥ 60%/115VAC, 230VAC;
@load ≥ 75%/277VAC)

I/P: 115 VAC/60% LOAD
I/P: 230 VAC/60% LOAD
I/P: 277 VAC/75% LOAD
Ta: 25°C

THD=5.234% @60% load /115VAC
THD=13.52 % @60% load /230VAC
THD=16.29% @75% load /277VAC

THD vs LOAD





PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER CURRENT PROTECTION	95 %~ 108 %	I/P: 230VAC O/P: TESTING Ta: 25°C	101.28%/ 230VAC Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	28 V~34V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	31.56V/ 230VAC Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage, re-power on to recover
4	SHORT CIRCUIT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Hiccup mode, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 2 Rated 730V/10A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 710V (2) 610V (3) 678V
2	Diode Peak Voltage	Q101 Rated 120V/56A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 114V (2) 99.6V (3) 103V
3	Input Capacitor Voltage	C5 Rated 100u/ 450V	I/P: High-Line +3V =308 V O/P: (1) Full Load input on/off (2) Min load input on /Off (3) Full Load /Min load Change Ta: 25°C	(1) 448V (2) 444V (3) 448V
4	Control IC Voltage Test	U1 Rated 28V	I/P: High-Line +3V =308 V O/P: (1) Full Load input on/off (2) Min load input on /Off (3) Full Load /Min load Change Ta: 25°C	(1) 17.4V (2) 17.2V (3) 17.0V
5	PFC Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 600V/15A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 506V (2) 452V (3) 494V



SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min	I/P-O/P: 4.2KVAC/min Ta: 25°C	I/P-O/P: 1.998 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500VDC Ta: 25°C	I/P-O/P: > 9999MΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P: 115VAC/230VAC/50HZ O/P: 60%/FULL LOAD I/P: 277VAC/50HZ O/P: 75%/FULL LOAD Ta:25°C	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR: 8KV Contact: 4KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	CRITERIA A
6	SURGE	EN61000-4-5 INDUSTRY L-N: 2KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

■ **RELIABILITY TEST**

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																								
1	TEMPERATURE RISE TEST	MODEL: NPF-120D-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 29.2°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 51.1°C																																																																										
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 29.2 °C</th> <th>HIGH AMBIENT Ta=51.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C5</td><td>77.0°C</td><td>98.7°C</td></tr> <tr><td>2</td><td>C105</td><td>77.0°C</td><td>98.0°C</td></tr> <tr><td>3</td><td>T1</td><td>85.3°C</td><td>107.8°C</td></tr> <tr><td>4</td><td>Q1</td><td>82.1°C</td><td>105.6°C</td></tr> <tr><td>5</td><td>Q2</td><td>89.3°C</td><td>115.6°C</td></tr> <tr><td>6</td><td>Q101</td><td>91.6°C</td><td>112.6°C</td></tr> <tr><td>7</td><td>L3</td><td>70.9°C</td><td>92.1°C</td></tr> <tr><td>8</td><td>D6</td><td>83.5°C</td><td>106.8°C</td></tr> <tr><td>9</td><td>D10</td><td>93.4°C</td><td>119.1°C</td></tr> <tr><td>10</td><td>U101</td><td>76.4°C</td><td>97.4°C</td></tr> <tr><td>11</td><td>C45</td><td>74.2°C</td><td>95.4°C</td></tr> <tr><td>12</td><td>R7</td><td>91.7°C</td><td>116.1°C</td></tr> <tr><td>13</td><td>R15</td><td>84.5°C</td><td>108.4°C</td></tr> <tr><td>14</td><td>U1</td><td>71.5°C</td><td>92.7°C</td></tr> <tr><td>15</td><td>C106</td><td>77.6°C</td><td>98.3°C</td></tr> <tr><td>16</td><td>RTH3</td><td>71.8°C</td><td>92.7°C</td></tr> <tr><td>17</td><td>TC</td><td>66.1°C</td><td>86.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 29.2 °C	HIGH AMBIENT Ta=51.1 °C	1	C5	77.0°C	98.7°C	2	C105	77.0°C	98.0°C	3	T1	85.3°C	107.8°C	4	Q1	82.1°C	105.6°C	5	Q2	89.3°C	115.6°C	6	Q101	91.6°C	112.6°C	7	L3	70.9°C	92.1°C	8	D6	83.5°C	106.8°C	9	D10	93.4°C	119.1°C	10	U101	76.4°C	97.4°C	11	C45	74.2°C	95.4°C	12	R7	91.7°C	116.1°C	13	R15	84.5°C	108.4°C	14	U1	71.5°C	92.7°C	15	C106	77.6°C	98.3°C	16	RTH3	71.8°C	92.7°C	17	TC	66.1°C	86.3°C		
NO	Position	ROOM AMBIENT Ta= 29.2 °C	HIGH AMBIENT Ta=51.1 °C																																																																									
1	C5	77.0°C	98.7°C																																																																									
2	C105	77.0°C	98.0°C																																																																									
3	T1	85.3°C	107.8°C																																																																									
4	Q1	82.1°C	105.6°C																																																																									
5	Q2	89.3°C	115.6°C																																																																									
6	Q101	91.6°C	112.6°C																																																																									
7	L3	70.9°C	92.1°C																																																																									
8	D6	83.5°C	106.8°C																																																																									
9	D10	93.4°C	119.1°C																																																																									
10	U101	76.4°C	97.4°C																																																																									
11	C45	74.2°C	95.4°C																																																																									
12	R7	91.7°C	116.1°C																																																																									
13	R15	84.5°C	108.4°C																																																																									
14	U1	71.5°C	92.7°C																																																																									
15	C106	77.6°C	98.3°C																																																																									
16	RTH3	71.8°C	92.7°C																																																																									
17	TC	66.1°C	86.3°C																																																																									
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/100VAC O/P: FULL LOAD Ta= -45°C / -30°C	TEST: OK																																																																								
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C NO DAMAGE	I/P: 315VAC O/P: FULL LOAD Ta=45 °C HUMIDITY= 95% R.H	TEST: OK																																																																								
4	TEMPERATURE COEFFICIENT	±0.03%/°C (0~50°C)	I/P: 230 VAC O/P: FULL LOAD	±0.002%/°C (0~50°C)																																																																								
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle: 5 CYCLE 5. Input/Output condition: STATIC		TEST: OK																																																																								



120W Single Output LED Driver

NPF-120D series

6	THERMAL SHOCK TEST	1. Thermal shock Temperature: $-45^{\circ}\text{C} \sim +50^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle: 10 CYCLE 5. Input/Output condition: 230VAC/Full Load AC ON/OFF TEST turn on 58 sec, turn off 2 sec;	TEST: OK																				
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (3) Sweep Time: 12min/sweep cycle (4) Acceleration: 5G (5) Test Time: 72min in each axis (X.Y.Z) (6) Ta: 25°C	TEST: OK																				
8	CAPACITOR LIFE CYCLE	NPF-120D-24: SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P: 230VAC O/P: FULL LOAD Ta= 25°C LIFE TIME (2) I/P: 230VAC O/P: FULL LOAD Ta= 45°C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 45°C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 45°C LIFE TIME	(1) 111747 HRS (2) 29735 HRS (3) 74698 HRS (4) 87047 HRS																				
9	MTBF	Conducted by Parts Stress Analysis Prediction 2632.6K hrs min. Telcordia SR-332 (Bellcore) ; 233.9K hrs min. MIL-HDBK-217F (25°C)																					
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50000 hours @ TC 75°C <table border="1"> <caption>Approximate data points from the Lifetime vs Temperature graph</caption> <thead> <tr> <th>Tcase (°C)</th> <th>Lifetime (K1)</th> </tr> </thead> <tbody> <tr><td>20</td><td>100</td></tr> <tr><td>30</td><td>100</td></tr> <tr><td>40</td><td>100</td></tr> <tr><td>50</td><td>100</td></tr> <tr><td>60</td><td>100</td></tr> <tr><td>65</td><td>100</td></tr> <tr><td>70</td><td>70</td></tr> <tr><td>80</td><td>40</td></tr> <tr><td>90</td><td>20</td></tr> </tbody> </table>		Tcase (°C)	Lifetime (K1)	20	100	30	100	40	100	50	100	60	100	65	100	70	70	80	40	90	20
Tcase (°C)	Lifetime (K1)																						
20	100																						
30	100																						
40	100																						
50	100																						
60	100																						
65	100																						
70	70																						
80	40																						
90	20																						

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHUOKB/CHENZH	SKY	LIUWY