



# Test Report: NPF-120D-54

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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

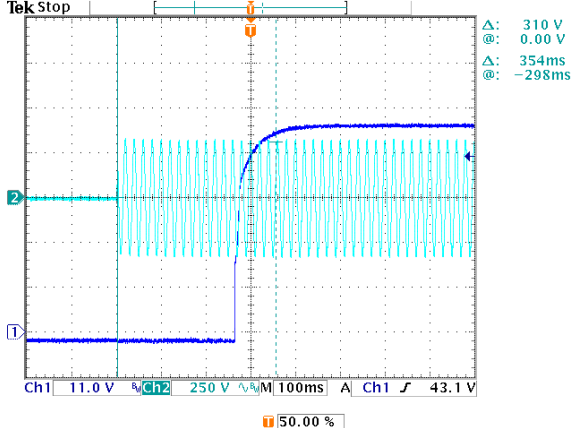
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	32.4~54V	I/P: 230VAC O/P: LED MODE Ta: 25°C	23.2 V~53 V
2	CURRENT RIPPLE	5% max@rated current	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	1.06 %
3	CURRENT TOLERANCE	±5%	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	1.02 %
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	11.90V
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/ 354 ms 115VAC/ 364 ms

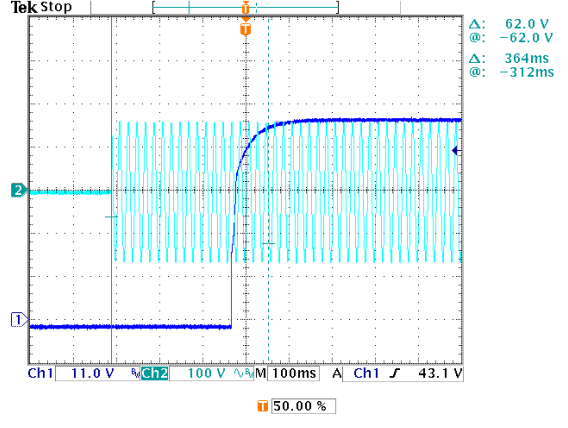
INPUT=230VAC/50HZ @ 95% LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



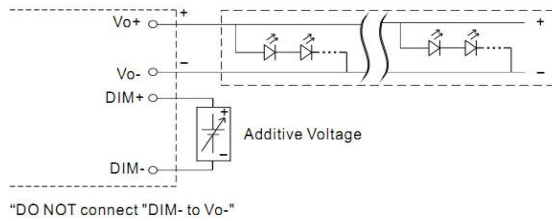
INPUT=115VAC/50HZ @ 95% LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

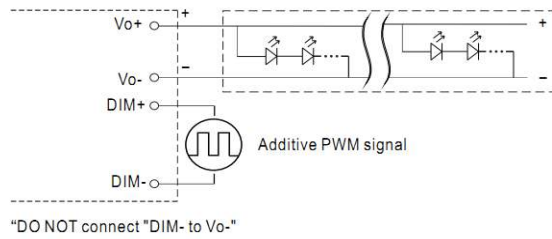


7 DIMMING TEST

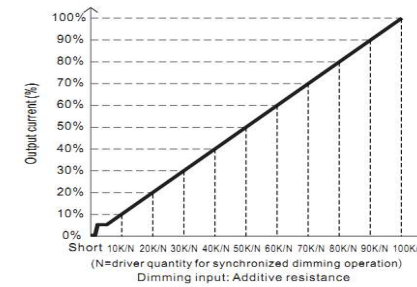
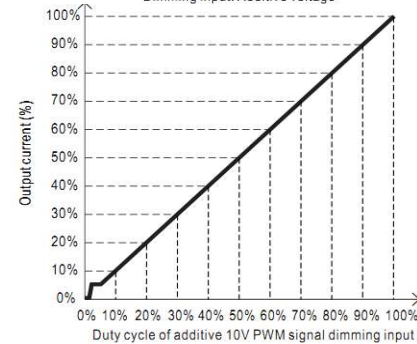
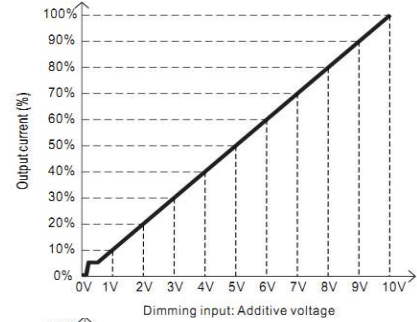
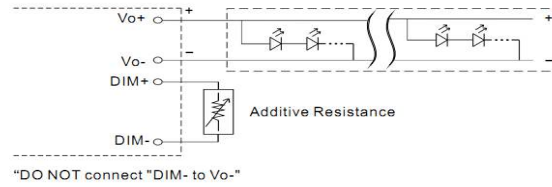
- Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-:
  - 0 ~ 10Vdc, or 10V PWM signal or resistance.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: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

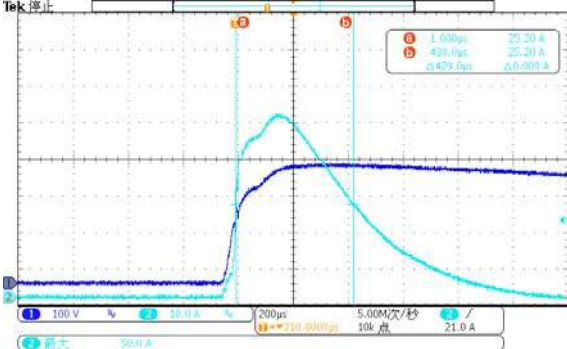
※ Auxiliary DC operation (for BE-type)  
 - AUX+, with mark \*\*\*, is added for BE-Type, used as the Auxiliary DC output with respect to DIM-.

I/P: 230 VAC  
 O/P: DIMMING TEST  
 Ta: 25°C

1	v	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output Current	0	0.259	0.484	0.71	0.934	1.159	1.383	1.606	1.828	2.05	2.273	2.358
%	0%	11.26%	21.04%	30.87%	40.61%	50.39%	60.13%	69.83%	79.48%	89.13%	98.83%	102.52%	
2	PWM(100Hz)	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output Current	0	0.263	0.489	0.706	0.935	1.157	1.388	1.612	1.833	2.058	2.278	2.358
%	0%	11.43%	21.26%	30.70%	40.65%	50.30%	60.35%	70.09%	79.70%	89.48%	99.04%	102.52%	
3	R	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	Output Current	0	0.257	0.48	0.705	0.928	1.153	1.375	1.599	1.822	2.044	2.243	2.358
%	0%	11.17%	20.87%	30.65%	40.35%	50.13%	59.78%	69.52%	79.22%	88.87%	97.52%	102.52%	

TEST RESULT: OK

INPUT FUNCTION TEST

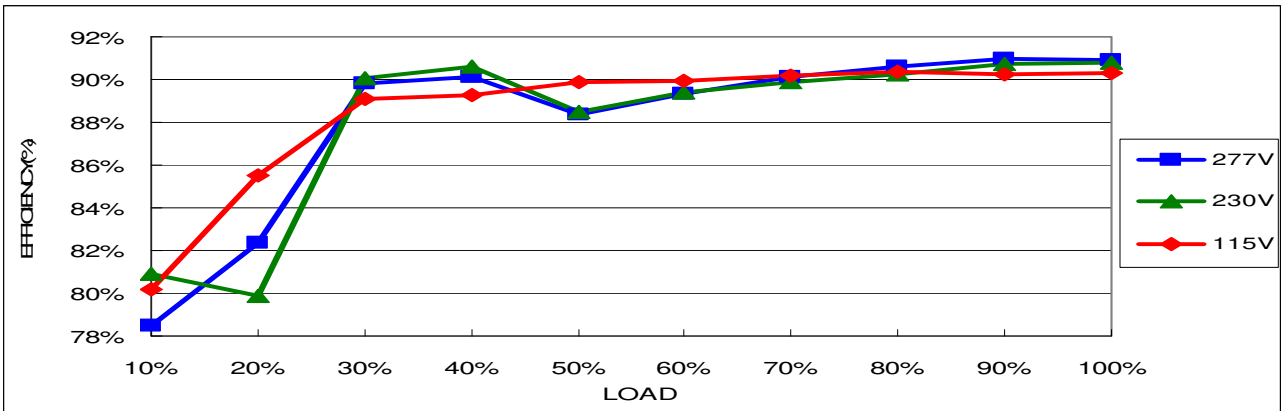
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	87V~305V
			I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230VAC ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230VAC ON: 3Sec OFF: 3Sec 12HOURS (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 = 1.112A/ 115VAC I = 0.566A/ 230VAC I = 0.480A/ 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	0.408 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= 50.0A/ 230VAC Twidth = 429.0 us
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH2: Input current CH1: AC Input Voltage</p> 				
7	EFFICIENCY(Typ)	90.0% (BLANK-TYPE) 89.0% (BE-TYPE)	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	90.66% (BLANK-TYPE) 89.42% (BE-TYPE)



120W Single Output LED Driver

NPF-120D series

EFFICIENCY vs LOAD



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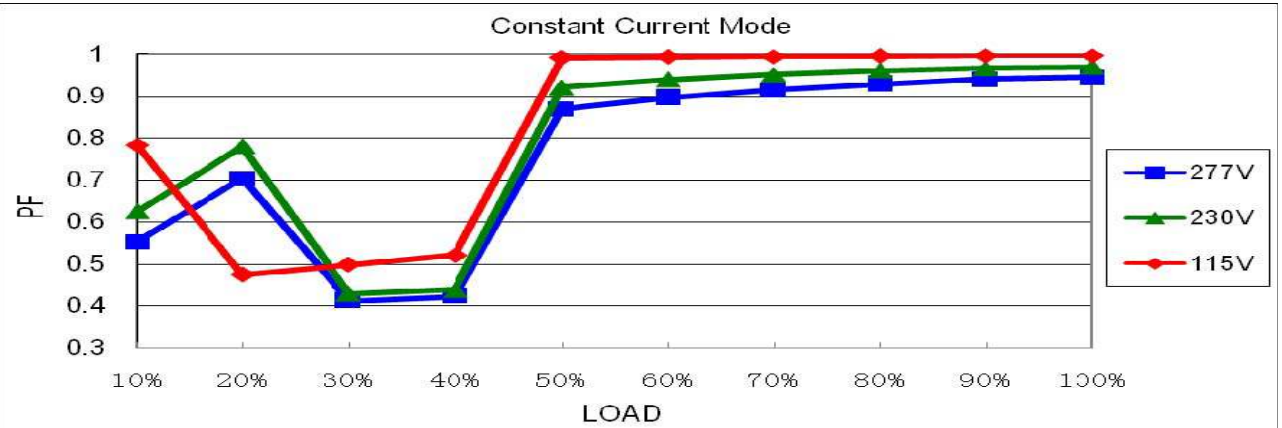
POWER FACTOR

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=0.992/ 115VAC  
PF=0.974/ 230VAC  
PF=0.954/ 277VAC

P.F vs LOAD



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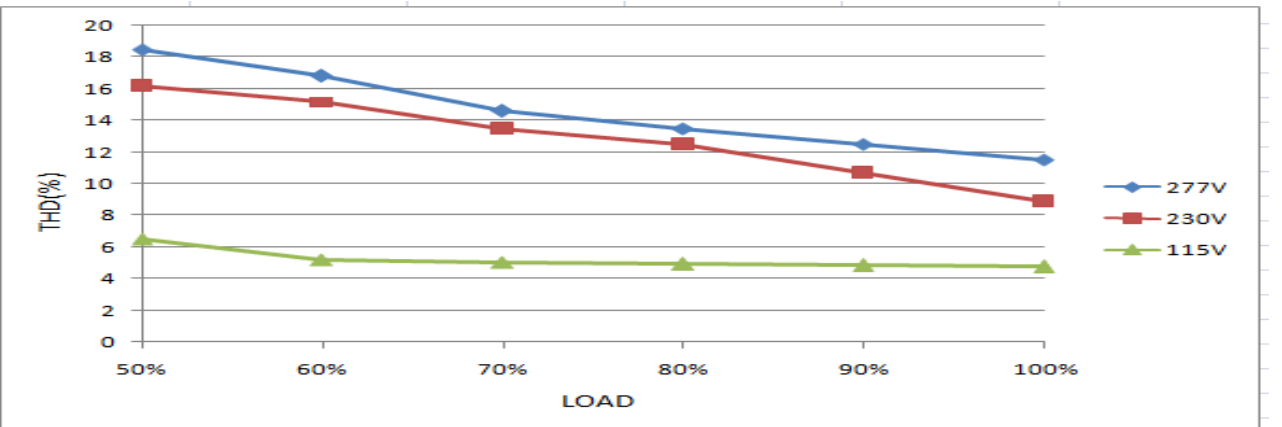
TOTAL HARMONIC DISTORTION

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=5.25% @60% load /115VAC  
THD=15.22% @60% load /230VAC  
THD=14.29% @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	59V~66V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	62.1V/ 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) <b>Peak Voltage</b>	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) 664V (2) 504V (3) 648V
2	<b>Diode Peak Voltage</b>	Q101 Rated 300V/20A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 252V (2) 177V (3) 235V
3	<b>Input Capacitor Voltage</b>	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) 446V
4	<b>Control IC Voltage Test</b>	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) 17.6V (2) 17.6V (3) 17.5V
5	PFC Transistor ( D to S) or (C to E) <b>Peak Voltage</b>	Q 1 Rated 600V/11A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 498V (2) 438V (3) 470V



## 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: 1.782 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**

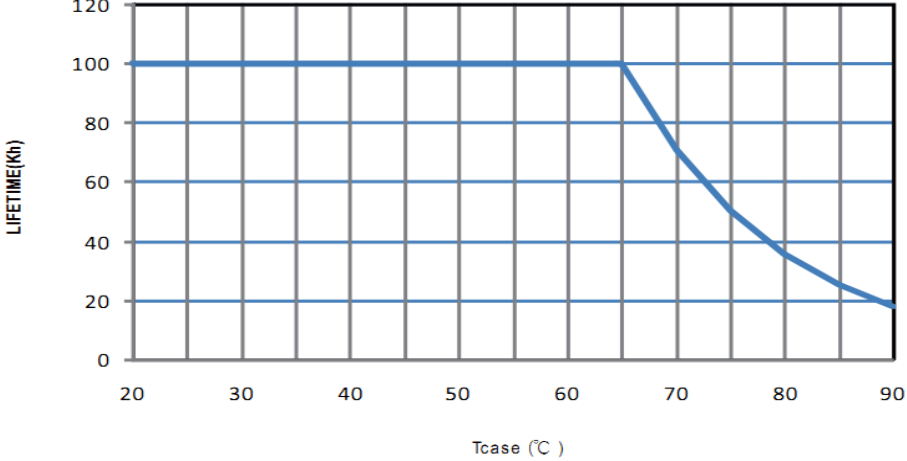
**ENVIRONMENT TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																												
1	TEMPERATURE RISE TEST	MODEL: NPF-120D-48 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 29.2℃ 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 51.1℃																																																														
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 29.2 ℃</th> <th>HIGH AMBIENT Ta=51.1 ℃</th> </tr> </thead> <tbody> <tr><td>1</td><td>C5</td><td>71.6℃</td><td>90.1℃</td></tr> <tr><td>2</td><td>C105</td><td>65.6℃</td><td>84.5℃</td></tr> <tr><td>3</td><td>T1</td><td>73.3℃</td><td>92.4℃</td></tr> <tr><td>4</td><td>Q1</td><td>76.3℃</td><td>95.8℃</td></tr> <tr><td>5</td><td>Q2</td><td>82.6℃</td><td>102.8℃</td></tr> <tr><td>6</td><td>Q101</td><td>68.4℃</td><td>86.7℃</td></tr> <tr><td>7</td><td>L3</td><td>77.4℃</td><td>96.9℃</td></tr> <tr><td>8</td><td>D6</td><td>86.1℃</td><td>106.7℃</td></tr> <tr><td>9</td><td>C45</td><td>67.3℃</td><td>85.9℃</td></tr> <tr><td>10</td><td>R7</td><td>84.3℃</td><td>104.1℃</td></tr> <tr><td>11</td><td>U1</td><td>66.7℃</td><td>85.4℃</td></tr> <tr><td>12</td><td>C106</td><td>61.9℃</td><td>80.6℃</td></tr> <tr><td>13</td><td>RTH3</td><td>64.9℃</td><td>83.4℃</td></tr> <tr><td>15</td><td>TC</td><td>68.4℃</td><td>87.3℃</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 29.2 ℃	HIGH AMBIENT Ta=51.1 ℃	1	C5	71.6℃	90.1℃	2	C105	65.6℃	84.5℃	3	T1	73.3℃	92.4℃	4	Q1	76.3℃	95.8℃	5	Q2	82.6℃	102.8℃	6	Q101	68.4℃	86.7℃	7	L3	77.4℃	96.9℃	8	D6	86.1℃	106.7℃	9	C45	67.3℃	85.9℃	10	R7	84.3℃	104.1℃	11	U1	66.7℃	85.4℃	12	C106	61.9℃	80.6℃	13	RTH3	64.9℃	83.4℃	15	TC	68.4℃	87.3℃		
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/100VAC O/P: FULL LOAD Ta= -45℃ / -30℃	TEST: OK																																																												
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 ℃ NO DAMAGE	I/P: 315VAC O/P: FULL LOAD Ta=45 ℃ HUMIDITY= 95% R.H	TEST: OK																																																												
4	TEMPERATURE COEFFICIENT	±0.03%/℃(0~50℃)	I/P: 230 VAC O/P: FULL LOAD	±0.002%/℃(0~50℃)																																																												
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -45℃~ +90℃ 2. Temperature change rate : 25℃ / 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: $25^{\circ}\text{C}$	TEST: OK
8	CAPACITOR LIFE CYCLE	NPF-120D-48: SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P: 230VAC O/P: FULL LOAD Ta= $25^{\circ}\text{C}$ LIFE TIME (2) I/P: 230VAC O/P: FULL LOAD Ta= $45^{\circ}\text{C}$ LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= $45^{\circ}\text{C}$ LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= $45^{\circ}\text{C}$ LIFE TIME	(1) 174464 HRS (2) 53707 HRS (3) 99512 HRS (4) 103761 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 877.8K hrs min. Telcordia SR-332 (Bellcore) 233.9K hrs min. MIL-HDBK-217F ( $25^{\circ}\text{C}$ )	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50000 hours @ TC $75^{\circ}\text{C}$ 	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHUOKB/CHENZH	SKY	LIUWY