



Test Report : NPF-60D-12

60W Single Output Switching Power Supply

■ 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	VERDICT
1	RIPPLE & NOISE	V1 : 150 mVp-p (Max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	V1 : 12 mVp-p (Max)	PASS
2	CONSTANT CURRENT REGION	V1: 7.2V ~ 12 V	I/P : 230VAC O/P:LED MODE Ta:25°C	OP= 7.2V / 5.006A OP= 11V / 5.018A	PASS
3	OUTPUT VOLTAGE TOLERANCE	V1 : -4 %~ 4 % (Max)	I/P : 90 VAC / 305 VAC O/P : FULL/ NO LOAD Ta : 25°C	V1 : -0.62 %~ 0.53 %	PASS
4	LINE REGULATION	V1 : -0.5 %~ 0.5 % (Max)	I/P : 100 VAC ~ 305 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %	PASS
5	LOAD REGULATION	V1 : -1.5 %~ 1.5 % (Max)	I/P : 230 VAC O/P : FULL~NO LOAD Ta : 25°C	V1 : -0.48 %~ 0.53 %	PASS
6	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : 95% LOAD Ta : 25°C	230VAC/ 222 ms 115VAC/ 244 ms	PASS
7	RISE TIME	230VAC : 80 ms (Max) 115VAC : 80 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : 95% LOAD Ta : 25°C	230VAC/ 35 ms 115VAC/ 36 ms	PASS
8	HOLD UP TIME	230VAC : 16 ms (TYP) 115VAC : 16 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 19 ms 115VAC/ 19 ms	PASS
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : < 5 %	PASS
10	DYNAMIC LOAD	V1 : 1200 mVp-p	I/P : 230 VAC (1).O/P : FULL /NO LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /NO LOAD 50%DUTY/ 120HZ Ta : 25°C	(1) 352 mVp-p (2) 480 mVp-p	PASS

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DIMMER TEST

SPEC:

*Output constant current level can be adjusted through output cable by connecting a resistance or 0 ~ 10Vdc or 10V PWM signal between DIM + and DIM - .

*Reference resistance value for output current adjustment (Typical)

Resistance value	Single driver	Short	10 K Ω	20 K Ω	30 K Ω	40 K Ω	50 K Ω	60 K Ω	70 K Ω	80 K Ω	90 K Ω	100 K Ω	OPEN
	Multiple drives (N=driver quantity for synchronized dimming operation)	Short	10 K Ω /N	20 K Ω /N	30 K Ω /N	40 K Ω /N	50 K Ω /N	60 K Ω /N	70 K Ω /N	80 K Ω /N	90 K Ω /N	100 K Ω /N	
Percentage of rated current		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%~108%

*0 ~ 10V dimming function for output current adjustment (Typical)

Dimming value	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
Percentage of rated current	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%~108%

*10V PWM signal for output current adjustment (Typical): Frequency range: 100Hz~3KHz

Duty value	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
Percentage of rated current	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%~108%

PASS

TEST RESULT: I/P : 230 VAC; Ta : 25°C

1	Resistance value	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
	Output current	0A	0.518A	1.033A	1.550A	2.062A	2.575A	3.092A	3.604A	4.113A	4.631A	5.127A	5.292A
	%	0%	10.36%	20.66%	31.00%	41.24%	51.50%	61.84%	72.08%	82.26%	92.62%	102.54%	105.84%
2	Dimming value	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output current	0A	0.521A	1.034A	1.526A	2.037A	2.542A	3.066A	3.572A	4.075A	4.581A	5.082A	5.294A
	%	0%	10.42%	20.68%	30.52%	40.74%	50.84%	61.32%	71.44%	81.50%	91.62%	101.64%	105.88%
3	Duty value	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	Output current	0A	0.519A	1.009A	1.502A	1.992A	2.486A	2.976A	3.464A	3.964A	4.449A	4.895A	5.292A
	%	0%	10.38%	20.18%	30.04%	39.84%	49.72%	59.52%	69.28%	79.28%	88.98%	97.90%	105.84%

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90 VAC~305 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	87 V~305 V	PASS
			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 : (1) OK (2) OK (3) OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 90 VAC ~ 305 VAC O/P : FULL ~NO LOAD Ta : 25°C	TEST : OK	PASS
3	POWER FACTOR	115V/ 0.97 (TYP) 230V/ 0.95 (TYP) 277V/ 0.92 (TYP)	I/P : 115 VAC I/P : 230 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.997 / 115 VAC PF= 0.982 / 230 VAC PF= 0.955 / 277 VAC	PASS
4	EFFICIENCY	86% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	88.78%	PASS
5	INPUT CURRENT	115V/ 0.8 A (TYP) 230V/ 0.4 A (TYP) 277V/ 0.32 A (TYP)	I/P : 115 VAC I/P : 230 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	I = 0.596 A / 115 VAC I = 0.296 A / 230 VAC I = 0.252 A / 277 VAC	PASS
6	INRUSH CURRENT	230V/ 50 A (TYP) Twidh =270 us measured at 50% Ipeak COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 48.2 A Twidh = 256 us	PASS
7	LEAKAGE CURRENT	< 0.25 mA / 277 VAC	I/P : 305 VAC O/P : NO LOAD Ta : 25°C	L-CASE : 0.003 mA N-CASE : 0.003 mA	PASS
8	NO LOAD CONSUMPTION	< 0.5 W	I/P : 230VAC O/P : NO LOAD Ta : 25°C	0.17 W	PASS
9	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 60% or higher at 230V/115VAC Total harmonic distortion will be lower than 20% when output loading is 75% or higher at 277VAC	I/P : 115 VAC I/P : 230 VAC O/P : 60% LOAD I/P : 277 VAC O/P : 75%LOAD Ta : 25°C	THD : 5.91% /115VAC THD : 14.08% /230VAC THD : 14.21% /277VAC	PASS

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P : 100 VAC I/P : 230 VAC I/P : 305 VAC O/P : TESTING Ta : 25°C	101.3 %/ 100 VAC 101.0 %/ 230 VAC 101.0 %/ 305 VAC Constant current limiting, recovers automatically after fault condition is removed	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 15 V ~ 17 V	I/P : 90 VAC I/P : 230 VAC I/P : 305 VAC O/P : NO LOAD Ta : 25°C	16.1 V/ 90 VAC 16.1 V/ 230 VAC 16.1 V/ 305 VAC Shut down o/p voltage , re-power on to recover	PASS
3	OVER TEMPERATURE PROTECTION	SPEC : O.T.P. NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	O.T.P. Active Shut down o/p voltage , re-power on to recover	PASS
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 305 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup mode , recovers automatically after fault condition is removed	PASS

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q2 Rated 800 V 9A	I/P : High-Line +3V = 308 V O/P : (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta : 25°C	(1) 652 V (2) 504 V (3) 640 V	PASS
2	Diode Peak Voltage	D100 Rated 60 V 40 A	I/P : High-Line +3V = 308 V O/P : (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta : 25°C	(1) 50.8 V (2) 38.0 V (3) 50.0 V	PASS
3	Input Capacitor Voltage	C5 Rated 47uF / 450 V	I/P : High-Line +3V = 308 V O/P : (1) FULL LOAD Turn on /Off (2) NO LOAD Turn on /Off (3) FULL LOAD /Min load Change Ta : 25°C	(1) 448 V (2) 446 V (3) 444 V	PASS
4	Control IC Voltage Test	U1 Rated 28V	I/P : High-Line +3V = 308 V O/P : (1) FULL LOAD Turn on /Off (2) NO LOAD Turn on /Off (3) FULL LOAD /Min load Change Ta : 25°C	(1) 17.2 V (2) 17.4 V (3) 17.3 V	PASS
5	PFC Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 600 V 10A	I/P : High-Line +3V = 308 V O/P : (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta : 25°C	(1) 485 V (2) 458 V (3) 466 V	PASS

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.75 KVAC/min	I/P-O/P : 4.2 KVAC/min Ta : 25°C	I/P-O/P : 2.620 mA NO DAMAGE	PASS
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P : 500 VDC Ta : 25°C /70%RH	I/P-O/P : >9999 MΩ NO DAMAGE	PASS

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
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	OK	PASS
2	CONDUCTION	EN55015	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	OK Test by certified Lab	PASS
3	RADIATION	EN55015	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	OK Test by certified Lab	PASS
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	PASS
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	PASS
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	PASS
7	Test by certified Lab & Test Report Prepare				

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																
1	TEMPERATURE RISE TEST	MODEL : NPF-60D-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=32.9 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=52.5 °C <table><thead><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 32.9 °C</th><th>HIGH AMBIENT Ta= 52.5 °C</th></tr></thead><tbody><tr><td>1</td><td>RTH1</td><td>52.2°C</td><td>68.5 °C</td></tr><tr><td>2</td><td>L1</td><td>57.6°C</td><td>74.0 °C</td></tr><tr><td>3</td><td>D6</td><td>63.3°C</td><td>79.7 °C</td></tr><tr><td>4</td><td>C5</td><td>61.8°C</td><td>77.9 °C</td></tr><tr><td>5</td><td>Q1</td><td>64.6°C</td><td>81.1 °C</td></tr><tr><td>6</td><td>Q2</td><td>67.5°C</td><td>84.1 °C</td></tr><tr><td>7</td><td>T1</td><td>70.3°C</td><td>86.4 °C</td></tr><tr><td>8</td><td>C11</td><td>62.6°C</td><td>79.0 °C</td></tr><tr><td>9</td><td>D100</td><td>74.9°C</td><td>92.2 °C</td></tr><tr><td>10</td><td>C105</td><td>70.7°C</td><td>87.3 °C</td></tr><tr><td>11</td><td>U1</td><td>61.3°C</td><td>77.6 °C</td></tr><tr><td>12</td><td>C45</td><td>63.3°C</td><td>79.4 °C</td></tr><tr><td>13</td><td>U100</td><td>63.7°C</td><td>80.1 °C</td></tr><tr><td>14</td><td>RTH2</td><td>61.3°C</td><td>77.6 °C</td></tr><tr><td>15</td><td>Tc</td><td>61.5°C</td><td>77.4 °C</td></tr></tbody></table>			NO	Position	ROOM AMBIENT Ta= 32.9 °C	HIGH AMBIENT Ta= 52.5 °C	1	RTH1	52.2°C	68.5 °C	2	L1	57.6°C	74.0 °C	3	D6	63.3°C	79.7 °C	4	C5	61.8°C	77.9 °C	5	Q1	64.6°C	81.1 °C	6	Q2	67.5°C	84.1 °C	7	T1	70.3°C	86.4 °C	8	C11	62.6°C	79.0 °C	9	D100	74.9°C	92.2 °C	10	C105	70.7°C	87.3 °C	11	U1	61.3°C	77.6 °C	12	C45	63.3°C	79.4 °C	13	U100	63.7°C	80.1 °C	14	RTH2	61.3°C	77.6 °C	15	Tc	61.5°C	77.4 °C	PASS
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15	Tc	61.5°C	77.4 °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	PASS																																																																
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 315 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95% R.H	TEST : OK	PASS																																																																
4	TEMPERATURE COEFFICIENT	±0.03 %(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	±0.008 %(0~50°C)	PASS																																																																
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +85°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		OK	PASS																																																																
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +55°C 2. Temperature change rate : 25°C / 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 58sec : turn off 2sec		OK	PASS																																																																

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 : 90min in each axis (X.Y.Z) (6) Ta : 25℃	TEST : OK	PASS
8	CAPACITOR LIFE CYCLE	NPF-60D-12 : SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta=25℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=50℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=50℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=50℃ LIFE TIME	(1) 213241 HRS (2) 46446 HRS (3) 59602 HRS (4) 132132 HRS	PASS
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 314.05KHRS		PASS
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50000 hours @ Tcase 70℃		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ ZHUOKB	SKY	LIUWY

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