



# Test Report : NPF-90-36

---

90W 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 : 200 mVp-p (Max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	V1 : 35 mVp-p (Max)	PASS
2	CONSTANT CURRENT REGION	V1: 21.6 V ~ 36 V	I/P : 230VAC O/P:LED MODE Ta:25°C	OP= 21.6V / 2.493A OP= 25V / 2.516A	PASS
3	OUTPUT VOLTAGE TOLERANCE	V1 : -2%~ 2% (Max)	I/P : 90 VAC / 305 VAC O/P : FULL/ NO LOAD Ta : 25°C	V1 : -0.06 %~ 0.36 %	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 : -0.5%~ 0.5% (Max)	I/P : 230 VAC O/P : FULL~NO LOAD Ta : 25°C	V1 : -0.06 %~ 0.08 %	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/ 308 ms 115VAC/ 292 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/ 42 ms 115VAC/ 64 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/ 27 ms 115VAC/ 18 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 : 3600 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) 396 mVp-p (2) 1610 mVp-p	PASS

**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/ 0.98 (TYP) 230V/ 0.96 (TYP) 277V/ 0.94 (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= 0.972 / 230 VAC PF= 0.945 / 277 VAC	PASS
4	EFFICIENCY	90.5% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	91.11%	PASS
5	INPUT CURRENT	115V/ 0.95 A (TYP) 230V/ 0.5 A (TYP) 277V/ 0.4 A (TYP)	I/P : 115 VAC I/P : 230 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	I = 0.820 A / 115 VAC I = 0.416 A / 230 VAC I = 0.356 A / 277 VAC	PASS
6	INRUSH CURRENT	230V/ 60 A (TYP) Twidth =550 us measured at 50% Ipeak COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 52.6 A Twidth = 392 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	< 0.15 W	I/P : 230VAC O/P : NO LOAD Ta : 25°C	0.12 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 : 5.26% /115VAC THD : 14.11% /230VAC THD : 14.35% /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	100.5 %/ 100 VAC 101.1 %/ 230 VAC 101.2 %/ 305 VAC Constant current limiting, recovers automatically after fault condition is removed	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 41 V ~ 46 V	I/P : 90 VAC I/P : 230 VAC I/P : 305 VAC O/P : NO LOAD Ta : 25°C	43.7 V/ 90 VAC 43.7 V/ 230 VAC 43.6 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) 728 V (2) 510 V (3) 724 V	PASS
2	Diode Peak Voltage	Q101 Rated 150 V 30 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) 114 V (2) 73.6 V (3) 113 V	PASS
3	Input Capacitor Voltage	C5 Rated 82uF / 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) 444 V (2) 443 V (3) 442 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) 17.0 V (2) 17.3 V (3) 17.2 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) 482 V (2) 427 V (3) 470 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 : 2.608 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	EN55022 CLASS B	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	OK Test by certified Lab	PASS
3	RADIATION	EN55022 CLASS B	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-90-36 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=32.7 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=51.5 °C <table border="1" data-bbox="469 584 1145 1182"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 32.7 °C</th> <th>HIGH AMBIENT Ta= 51.5 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C5</td><td>67.6°C</td><td>85.7°C</td></tr> <tr><td>2</td><td>C105</td><td>65.2°C</td><td>83.4°C</td></tr> <tr><td>3</td><td>T1</td><td>70.0°C</td><td>88.4°C</td></tr> <tr><td>4</td><td>Q1</td><td>74.6°C</td><td>94.5°C</td></tr> <tr><td>5</td><td>Q2</td><td>75.9°C</td><td>95.9°C</td></tr> <tr><td>6</td><td>Q101</td><td>66.3°C</td><td>84.9°C</td></tr> <tr><td>7</td><td>L3</td><td>64.7°C</td><td>82.6°C</td></tr> <tr><td>8</td><td>BD1</td><td>70.1°C</td><td>88.8°C</td></tr> <tr><td>9</td><td>D6</td><td>72.2°C</td><td>91.3°C</td></tr> <tr><td>10</td><td>LF100</td><td>54.8°C</td><td>73.0°C</td></tr> <tr><td>11</td><td>C110</td><td>58.3°C</td><td>76.4°C</td></tr> <tr><td>12</td><td>RTH2</td><td>63.6°C</td><td>81.3°C</td></tr> <tr><td>13</td><td>C41</td><td>66.3°C</td><td>84.0°C</td></tr> <tr><td>14</td><td>C45</td><td>66.2°C</td><td>84.0°C</td></tr> <tr><td>15</td><td>C11</td><td>71.0°C</td><td>90.1°C</td></tr> <tr><td>16</td><td>ZNR2</td><td>68.9°C</td><td>87.7°C</td></tr> <tr><td>17</td><td>D5</td><td>65.5°C</td><td>84.2°C</td></tr> <tr><td>18</td><td>U1</td><td>64.7°C</td><td>83.0°C</td></tr> <tr><td>19</td><td>D10</td><td>77.3°C</td><td>97.0°C</td></tr> <tr><td>20</td><td>Tc</td><td>61.7°C</td><td>80.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 32.7 °C	HIGH AMBIENT Ta= 51.5 °C	1	C5	67.6°C	85.7°C	2	C105	65.2°C	83.4°C	3	T1	70.0°C	88.4°C	4	Q1	74.6°C	94.5°C	5	Q2	75.9°C	95.9°C	6	Q101	66.3°C	84.9°C	7	L3	64.7°C	82.6°C	8	BD1	70.1°C	88.8°C	9	D6	72.2°C	91.3°C	10	LF100	54.8°C	73.0°C	11	C110	58.3°C	76.4°C	12	RTH2	63.6°C	81.3°C	13	C41	66.3°C	84.0°C	14	C45	66.2°C	84.0°C	15	C11	71.0°C	90.1°C	16	ZNR2	68.9°C	87.7°C	17	D5	65.5°C	84.2°C	18	U1	64.7°C	83.0°C	19	D10	77.3°C	97.0°C	20	Tc	61.7°C	80.3°C			PASS
NO	Position	ROOM AMBIENT Ta= 32.7 °C	HIGH AMBIENT Ta= 51.5 °C																																																																																						
1	C5	67.6°C	85.7°C																																																																																						
2	C105	65.2°C	83.4°C																																																																																						
3	T1	70.0°C	88.4°C																																																																																						
4	Q1	74.6°C	94.5°C																																																																																						
5	Q2	75.9°C	95.9°C																																																																																						
6	Q101	66.3°C	84.9°C																																																																																						
7	L3	64.7°C	82.6°C																																																																																						
8	BD1	70.1°C	88.8°C																																																																																						
9	D6	72.2°C	91.3°C																																																																																						
10	LF100	54.8°C	73.0°C																																																																																						
11	C110	58.3°C	76.4°C																																																																																						
12	RTH2	63.6°C	81.3°C																																																																																						
13	C41	66.3°C	84.0°C																																																																																						
14	C45	66.2°C	84.0°C																																																																																						
15	C11	71.0°C	90.1°C																																																																																						
16	ZNR2	68.9°C	87.7°C																																																																																						
17	D5	65.5°C	84.2°C																																																																																						
18	U1	64.7°C	83.0°C																																																																																						
19	D10	77.3°C	97.0°C																																																																																						
20	Tc	61.7°C	80.3°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	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	±0.004 %(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°C	TEST : OK	PASS
8	CAPACITOR LIFE CYCLE	NPF-90-36 : 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=50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=50 °C LIFE TIME	(1) 227551 HRS (2) 41941 HRS (3) 55725 HRS (4) 71537 HRS	PASS
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 292.8KHRS		PASS
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50000 hours @ Tcase 75°C		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHOUB/ ZHUOKB	SKY	LIUWY

2009/08/04 A50-G058