



# Test Report : NPF-90-20

---

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 : 150 mVp-p (Max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	V1 : 8 mVp-p (Max)	PASS
2	CONSTANT CURRENT REGION	V1: 12V ~ 20 V	I/P : 230VAC O/P:LED MODE Ta:25°C	OP= 12V / 4.414A OP= 19V / 4.472A	PASS
3	OUTPUT VOLTAGE TOLERANCE	V1 : -4%~ 4% (Max)	I/P : 90 VAC / 305 VAC O/P : FULL/ NO LOAD Ta : 25°C	V1 : -0.18 %~ 0.40 %	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 : -0.18 %~ 0.19 %	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/ 275 ms 115VAC/ 298 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/ 62 ms 115VAC/ 56 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/ 29 ms 115VAC/ 21 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 : 2000 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) 398 mVp-p (2) 956 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= 0.979 / 230 VAC PF= 0.948 / 277 VAC	PASS
4	EFFICIENCY	90.5% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	91.38%	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 = 0.813 A / 115 VAC I = 0.410 A / 230 VAC I = 0.350 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 = 53.4 A Twidth = 412 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	0.06 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 : 5.69% /115VAC THD : 14.50% /230VAC THD : 15.64% /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	99.2 %/ 100 VAC 99.4 %/ 230 VAC 99.4 %/ 305 VAC Constant current limiting, recovers automatically after fault condition is removed	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 23 V ~ 27 V	I/P : 90 VAC I/P : 230 VAC I/P : 305 VAC O/P : NO LOAD Ta : 25°C	24.8 V/ 90 VAC 24.8 V/ 230 VAC 24.8 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) 696 V (2) 550 V (3) 694 V	PASS
2	Diode Peak Voltage	Q101 Rated 100 V 62 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) 70.4 V (2) 48.4 V (3) 70.0 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) 442 V (3) 448 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) 17.2 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) 418 V (2) 438 V (3) 460 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 : 2.624 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-90-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=28.6 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=48.3 °C			PASS																																																																																								
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 28.6 °C</th> <th>HIGH AMBIENT Ta= 48.3 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C5</td><td>65.0°C</td><td>84.4°C</td></tr> <tr><td>2</td><td>C105</td><td>61.0°C</td><td>79.2°C</td></tr> <tr><td>3</td><td>T1</td><td>71.7°C</td><td>90.5°C</td></tr> <tr><td>4</td><td>Q1</td><td>74.9°C</td><td>96.0°C</td></tr> <tr><td>5</td><td>Q2</td><td>76.2°C</td><td>96.6°C</td></tr> <tr><td>6</td><td>Q101</td><td>62.0°C</td><td>80.4°C</td></tr> <tr><td>7</td><td>L3</td><td>63.1°C</td><td>83.8°C</td></tr> <tr><td>8</td><td>BD1</td><td>71.3°C</td><td>91.6°C</td></tr> <tr><td>9</td><td>D6</td><td>71.2°C</td><td>92.0°C</td></tr> <tr><td>10</td><td>LF100</td><td>53.0°C</td><td>71.2°C</td></tr> <tr><td>11</td><td>C110</td><td>56.1°C</td><td>74.4°C</td></tr> <tr><td>12</td><td>RTH2</td><td>62.9°C</td><td>82.4°C</td></tr> <tr><td>13</td><td>C205</td><td>59.1°C</td><td>77.7°C</td></tr> <tr><td>14</td><td>C41</td><td>64.3°C</td><td>83.4°C</td></tr> <tr><td>15</td><td>C45</td><td>64.0°C</td><td>83.3°C</td></tr> <tr><td>16</td><td>C11</td><td>71.5°C</td><td>92.4°C</td></tr> <tr><td>17</td><td>ZNR2</td><td>68.7°C</td><td>89.2°C</td></tr> <tr><td>18</td><td>D5</td><td>65.9°C</td><td>86.7°C</td></tr> <tr><td>19</td><td>U1</td><td>66.3°C</td><td>86.4°C</td></tr> <tr><td>20</td><td>D10</td><td>80.4°C</td><td>100.3°C</td></tr> <tr><td>21</td><td>TC</td><td>48.7°C</td><td>72.1°C</td></tr> </tbody> </table>	NO	Position		ROOM AMBIENT Ta= 28.6 °C	HIGH AMBIENT Ta= 48.3 °C	1	C5	65.0°C	84.4°C	2	C105	61.0°C	79.2°C	3	T1	71.7°C	90.5°C	4	Q1	74.9°C	96.0°C	5	Q2	76.2°C	96.6°C	6	Q101	62.0°C	80.4°C	7	L3	63.1°C	83.8°C	8	BD1	71.3°C	91.6°C	9	D6	71.2°C	92.0°C	10	LF100	53.0°C	71.2°C	11	C110	56.1°C	74.4°C	12	RTH2	62.9°C	82.4°C	13	C205	59.1°C	77.7°C	14	C41	64.3°C	83.4°C	15	C45	64.0°C	83.3°C	16	C11	71.5°C	92.4°C	17	ZNR2	68.7°C	89.2°C	18	D5	65.9°C	86.7°C	19	U1	66.3°C	86.4°C	20	D10	80.4°C	100.3°C	21	TC	48.7°C	72.1°C		
NO	Position	ROOM AMBIENT Ta= 28.6 °C	HIGH AMBIENT Ta= 48.3 °C																																																																																										
1	C5	65.0°C	84.4°C																																																																																										
2	C105	61.0°C	79.2°C																																																																																										
3	T1	71.7°C	90.5°C																																																																																										
4	Q1	74.9°C	96.0°C																																																																																										
5	Q2	76.2°C	96.6°C																																																																																										
6	Q101	62.0°C	80.4°C																																																																																										
7	L3	63.1°C	83.8°C																																																																																										
8	BD1	71.3°C	91.6°C																																																																																										
9	D6	71.2°C	92.0°C																																																																																										
10	LF100	53.0°C	71.2°C																																																																																										
11	C110	56.1°C	74.4°C																																																																																										
12	RTH2	62.9°C	82.4°C																																																																																										
13	C205	59.1°C	77.7°C																																																																																										
14	C41	64.3°C	83.4°C																																																																																										
15	C45	64.0°C	83.3°C																																																																																										
16	C11	71.5°C	92.4°C																																																																																										
17	ZNR2	68.7°C	89.2°C																																																																																										
18	D5	65.9°C	86.7°C																																																																																										
19	U1	66.3°C	86.4°C																																																																																										
20	D10	80.4°C	100.3°C																																																																																										
21	TC	48.7°C	72.1°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-90-24 : 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=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) 326013 HRS (2) 63879 HRS (3) 91668 HRS (4) 165292 HRS	PASS
9	MTBF	Conducted by Parts Stress Analysis Prediction 2749.4K hrs min. Telcordia SR-332 (Bellcore); 292.8K hrs min. MIL-HDBK-217F (25°C)		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