



Test Report : NPF-60-15

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 : 14 mVp-p (Max)	PASS
2	CONSTANT CURRENT REGION	V1: 9V ~ 15 V	I/P : 230VAC O/P:LED MODE Ta:25°C	OP= 9V / 4.014A OP= 14V / 4.027A	PASS
3	OUTPUT VOLTAGE TOLERANCE	V1 : -4%~ 4% (Max)	I/P : 90 VAC / 305 VAC O/P : FULL/ NO LOAD Ta : 25°C	V1 : -0.16 %~ 0.49 %	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%~ 1% (Max)	I/P : 230 VAC O/P : FULL~NO LOAD Ta : 25°C	V1 : -0.33 %~ 0.33 %	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/ 216 ms 115VAC/ 248 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/ 36 ms 115VAC/ 38 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/ 22 ms 115VAC/ 17 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 : 1500 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) 358 mVp-p (2) 676 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/ 0.97 (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= 0.981 / 230 VAC PF= 0.954 / 277 VAC	PASS
4	EFFICIENCY	87% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	89.26%	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 = 0.590 A / 115 VAC I = 0.294 A / 230 VAC I = 0.250 A / 277 VAC	PASS
6	INRUSH CURRENT	230V/ 50 A (TYP) Twidth =270 us measured at 50% Ipeak COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 45.2 A Twidth = 252 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	0.08 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 : 5.36% /115VAC THD : 13.33% /230VAC THD : 13.43% /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 101.3 %/ 230 VAC 101.3 %/ 305 VAC Constant current limiting, recovers automatically after fault condition is removed	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 17.5 V ~ 21 V	I/P : 90 VAC I/P : 230 VAC I/P : 305 VAC O/P : NO LOAD Ta : 25°C	19.1 V/ 90 VAC 19.1 V/ 230 VAC 19.1 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) 640 V (2) 496 V (3) 618 V	PASS
2	Diode Peak Voltage	D100 Rated 100 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) 69.6 V (2) 52.6 V (3) 67.6 V	PASS
3	Input Capacitor Voltage	C5 Rated 33uF / 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) 441 V (2) 447 V (3) 446 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) 17.3 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) 474 V (2) 452 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 : 2.589 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-60-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=33.0 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=52.2 °C			PASS																																																																
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 33.0 °C</th> <th>HIGH AMBIENT Ta= 52.2 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>L3</td><td>48.1°C</td><td>64.5°C</td></tr> <tr><td>2</td><td>Q1</td><td>57.0°C</td><td>74.4°C</td></tr> <tr><td>3</td><td>Q2</td><td>59.5°C</td><td>77.0°C</td></tr> <tr><td>4</td><td>D6</td><td>55.6°C</td><td>72.9°C</td></tr> <tr><td>5</td><td>C5</td><td>53.6°C</td><td>70.5°C</td></tr> <tr><td>6</td><td>T1</td><td>61.5°C</td><td>78.3°C</td></tr> <tr><td>7</td><td>C45</td><td>55.3°C</td><td>72.2°C</td></tr> <tr><td>8</td><td>D100</td><td>61.6°C</td><td>79.0°C</td></tr> <tr><td>9</td><td>C105</td><td>59.7°C</td><td>76.8°C</td></tr> <tr><td>10</td><td>C106</td><td>57.5°C</td><td>74.4°C</td></tr> <tr><td>11</td><td>R5</td><td>57.2°C</td><td>74.5°C</td></tr> <tr><td>12</td><td>U1</td><td>54.4°C</td><td>71.6°C</td></tr> <tr><td>13</td><td>U100</td><td>54.7°C</td><td>71.2°C</td></tr> <tr><td>14</td><td>RTH2</td><td>53.8°C</td><td>70.7°C</td></tr> <tr><td>15</td><td>Tc</td><td>53.3°C</td><td>70.1°C</td></tr> </tbody> </table>	NO	Position		ROOM AMBIENT Ta= 33.0 °C	HIGH AMBIENT Ta= 52.2 °C	1	L3	48.1°C	64.5°C	2	Q1	57.0°C	74.4°C	3	Q2	59.5°C	77.0°C	4	D6	55.6°C	72.9°C	5	C5	53.6°C	70.5°C	6	T1	61.5°C	78.3°C	7	C45	55.3°C	72.2°C	8	D100	61.6°C	79.0°C	9	C105	59.7°C	76.8°C	10	C106	57.5°C	74.4°C	11	R5	57.2°C	74.5°C	12	U1	54.4°C	71.6°C	13	U100	54.7°C	71.2°C	14	RTH2	53.8°C	70.7°C	15	Tc	53.3°C	70.1°C		
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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°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-60-12 : 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) 479020 HRS (2) 97900 HRS (3) 117313 HRS (4) 222002 HRS	PASS
9	MTBF	Conducted by Parts Stress Analysis Prediction 3082.1K hrs min. Telcordia SR-332 (Bellcore); 287.9K hrs min. MIL-HDBK-217F (25°C)		PASS
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50000 hours @ Tcase 70°C		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ ZHUOKB	SKY	LIUWY

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