Test Report: NPB-750-12

750W High Reliable Ultra Wide Output Range
Intelligent Battery Charger

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

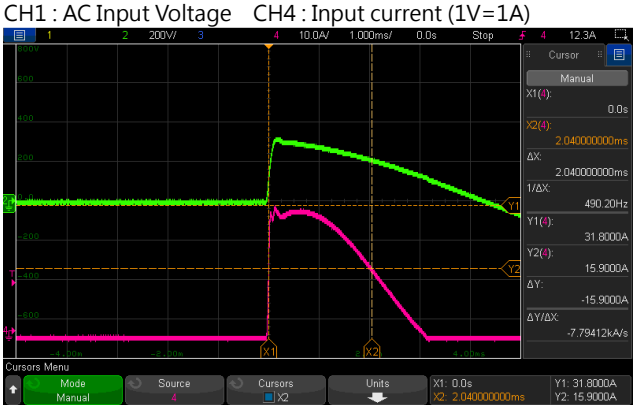
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BOOST CHARGE VOLTAGE	14.4V± 0.24 V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	14.268V
2	FLOAT CHARGE VOLTAGE	13.8V± 0.12 V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	13.761V
3	MAX. OUTPUT CURRENT	43A± 0.43A	I/P: 230 VAC O/P:C.V =13.4V Ta:25℃	43.215A
4	MAX. POWER	722.4W	I/P: 230 VAC O/P:C.V =16.8V Ta:25℃	724.1W
5	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25℃	0.081m A
6	OUTPUT CURRENT RANGE	50%~100%Io	I/P: 230 VAC O/P:C.V =16.8V Ta:25℃	20.412~ 43.376A

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC 127VDC~370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL LOAD Ta:25℃	(1) 86.2V~264V (2) 120Vdc~370Vdc/FULL LOAD (3) 120Vdc~370Vdc/FULL LOAD
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%= 300 V O/P:BAT. LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	LEAKAGE CURRENT	< 1 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25℃	0.432 mA
4	INPUT CURRENT (TYP)	230 V/ 4A 115 V/ 8.7A	I/P: 230 VAC I/P: 115 VAC	I =3.411A/ 230VAC I =7.145A/ 115VAC

			O/P:BAT. LOAD Ta:25℃	
5	POWER FACTOR (TYP)	0.95/ 230 VAC 0.98/ 115 VAC	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25℃	PF=0.9930 / 230VAC PF=0.9980/ 115VAC
6	EFFICIENCY (TYP)	92%	I/P: 230 VAC O/P:BAT LOAD(C.V =16.8V) Ta:25℃	92.47%
7	INRUSH CURRENT (TYP)	230 V/ 50 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	I =31.8A/ 230VAC T50=2.04ms/230V
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : AC Input Voltage CH4 : Input current (1V=1A) 			
8	GAIN-PHASE MARGIN TEST	GAIN MARGIN < -10dB PHASE MARGIN>=60 Gain Curve slope: -10dB/dec~-40dB/dec	(1) CC MODE(Vboost)/ 90% LOAD /264Vac (2) CC MODE(Vboost)/ 90% LOAD /90Vac Ta:25℃	(1)131.880°/-19.318dB/-34.3dB/dec (2) 126.360°/-18.315dB/ -32.9 dB/dec

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1:21.5V~26V PROTECTION RESULT Shut down and latch off o/p voltage, re-power on to recover.	I/P: 264 VAC I/P: 230 VAC I/P: 90 VAC O/P:TESTING Ta:25℃	24.1V/ 264VAC 24.1V/ 230VAC 24.1V / 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover.
2	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE Shut down o/p voltage, recover automatically after temperature goes on.	I/P: 264 VAC I/P: 90 VAC O/P:BAT. LOAD	O.T.P. Active PROTECTION TYPE : Shut down o/p voltage, recover automatically after temperature goes on.
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE 43A±10%	I/P: 264 VAC O/P: BAT. LOAD Ta:25℃	NO DAMAGE 42.999 A PRO TECTION TYPE :

		Constant current limiting ,charger will shut down after 5 sec, re-power on to recover.		Constant current limiting ,charger will shut down after 5 sec ,re-power on to recover.
4	BATTERY REVERSE POLARITY	Protected internal reverse detection, No damage, re-power on to recover after conduction is removed.	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	Protected internal reverse detection, No damage, re-power on to recover after conduction is removed
5	ERROR INPUT HIGH VOLTAGE BATTERY	Shut down o/p voltage, re-power on to recover	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	PROTECTION TYPE : Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>FAN SPEED CONTROL</td><td>FAN control mosfet duty：
30%（-1%）@RTH5＜35℃
FAN control mosfet duty：
100%（-1%）@RTH5＞50℃</td><td>I/P: 230 VAC
O/P:BAT. LOAD
Ta:25℃</td><td>29.1% @RTH5＜35℃
100% @RTH5＞50℃</td></tr>
<tr><td>2</td><td>REMOTE CONTROL</td><td>Rc+ / Rc-
OPEN/(-0.5~0.5V):
Charger stop charging
SHORT/(10.8~13.2V) :
Charger normal work</td><td>I/P: 230 VAC
O/P:BAT. LOAD
Ta:25℃</td><td>TEST:
OPEN/ -0.5~ 2.4V
SHORT/2.7 ~ 13.2V
(1) Remote off Pin=2.82W
(2) Remote off Vo= 0.05V</td></tr>
<tr><td>3</td><td>AUX POWER</td><td>OUTPUT VOLTAGE RANGE：
10.8~13.2V
OUTPUT RIPPLE&NOISE：
150mVp-p</td><td>I/P: 230 VAC
O/P:BAT. LOAD
Ta:25℃</td><td>TEST: 11.883 V
24 mVp-p</td></tr>
<tr><td>4</td><td>LED INDICATOR</td><td>
<table>
<tr><th>LED</th><th>Description</th></tr>
<tr><td>Green</td><td>Float(stage 3) or Battery full</td></tr>
<tr><td>Orange</td><td>Charging (stage 1 or stage 2)</td></tr>
<tr><td>Orange (Flashing)</td><td>Auto sensing for charging</td></tr>
<tr><td>Red</td><td>Abnormal status (OTP,OVP, Short, Reverse polarity, Charging timeout.)</td></tr>
<tr><td>Red (Flashing)</td><td>The LED will flash with the red light when the internal temperature reaches 95℃; under this condition, the unit still operates normally without entering OTP.</td></tr>
</table>
I/P: TESTING VAC
O/P:TESTING LOAD
Ta:25℃
</td><td>TEST： OK</td></tr>
<tr><td>5</td><td>TEMPERATURE COMPENSATION</td><td colspan="3">I/P: 230 VAC
O/P:BAT. LOAD
Ta:25℃
<table>
<tr><td colspan="4">Constant Voltage</td></tr>
<tr><td rowspan="2">SPEC:</td><td>Ta=0℃（17KΩ）</td><td>Ta=25℃（5KΩ）</td><td>Ta=50℃（1.7KΩ）</td></tr>
<tr><td>14.85±0.24V</td><td>14.4±0.24V</td><td>14.13±0.24V</td></tr>
<tr><td>TEST RESULT:</td><td>14.802V</td><td>14.341V</td><td>14.068V</td></tr>
</table>
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</table>

6	CHARGE OK	The TTL signal out, Charger OK = 4.5 ~ 5.5V; Charger failure or protection = -0.5 ~ 0.5V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	TEST： Charger OK = 5.173 V; Charger failure = 22.57 mV; Charger protection= 22.43 mV
7	BATTERY OK	The TTL signal out, Battery full = 4.5 ~ 5.5V ; Charging = -0.5 ~ 0.5V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	TEST： Battery full = 5.183 V Charging = 22.68 mV

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 5/Q6 Rated : 600V/25 A	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1) CV(max) =20V (2) CV(min) =10.5V (3) no load (4) OUTPUT SHORT （5）CV(nor) =16.8V Ta:25℃	Q5 VDS : (1) 524V (2) 492V (3) 508V (4) 512V (5) 524V	Q6 VDS : (1) 524V (2) 500V (3) 512V (4) 528V (5) 516V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rate: 600V /18 A	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1) CV(max) =20V (2) CV(min) =10.5V (3) no load (4) OUTPUT SHORT （5）CV(nor) =16.8V Ta:25℃	VDS : (1) 496V (2) 455V (3) 492V (4) 459V (5) 496V	
3	AUX MOS	U600 Rate: 725V/ 1.04A	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1) CV(max) =20V (2) CV(min) =10.5V (3) no load (4) OUTPUT SHORT （5）CV(nor) =16.8V Ta:25℃	VDS : (1) 616V (2) 572V (3) 604V (4) 600V (5) 616V	
4	P.F.C DIODE	D19 Rated : 650 V/ 6 A	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1)CV(max) =20V (2) CV(min) =10.5V (3)no load (4)OUTPUT SHORT (5)CV(nor) =16.8V Ta:25℃	(1) 467V (2) 423V (3) 447V (4) 455V (5) 469V	
5	Diode Peak Voltage	Q211/ Q214 Rated :80V/ 100A	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1)CV(max) =20V (2) CV(min) =10.5V (3)no load (4)OUTPUT SHORT	Q210 VDS : (1) 53.6V (2) 36.3V (3) 52.0V (4) 52.8V	Q214 VDS : (1) 53.2V (2) 36.3V (3) 52.1V (4) 52.4V

			（5）CV(nor) =16.8V Ta:25℃	(5) 44.8V	(5) 47.2V
6	Input Capacitor Voltage	C 5 Rated : 220u / 450 V	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1)CV(max) =20V (2) CV(min) =10.5V (3)no load (4)OUTPUT SHORT (5)CV(nor) =16.8V Ta:25℃	(1) 439V (2) 395V (3) 431V (4) 391V (5) 439V	
7	Control IC Voltage Test	PWM IC U3Rated 8.9V~15.5V PFC IC U2Rated 11V~26V O/P IC U801 Rated 4.5V~36V U100 Rated 6.5V~35V MCU IC U303 Rated 2.4V~ 3.6 V	AC ON/OFF I/P:High-Line +3V = 267 V O/P: (1)CV(max) =20V (2) CV(min) =10.5V (3)no load (4)OUTPUT SHORT (5)CV(nor) =16.8V Ta:25℃	U3 (1) 13.62V (2) 13.54V (3) 13.46V (4) 13.22V (5) 13.46V U2 (1) 14.54V (2) 14.29V (3) 13.97V (4) 13.81V (5) 14.37V U801 (1) 10.92V (2) 10.84 (3) 10.76V (4) 10.84V (5) 11.0V	U100 (1) 12.44V (2) 12.28V (3) 12.28V (4) 13.25V (5) 12.28V U303 (1) 3.47V (2) 3.47V (3) 3.41V (4) 3.41V (5) 3.47V

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P: 3 KVAC/min I/P-FG:2 KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25℃	I/P-O/P: 3.163 mA I/P-FG: 2.772 mA O/P-FG: 3.323 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25℃	I/P-O/P: 9999M Ω I/P-FG: 7791MΩ O/P-FG:9999M Ω NO DAMAGE
3	GROUNDING CONTINUITY	EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	19mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT

1	HARMONIC	BS EN/EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS
2	CONDUCTION	BS EN/EN 55032 (CISPR32), BS EN / EN55014-1 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
3	RADIATION	BS EN/EN 55032 (CISPR32), BS EN / EN55014-1 CLASS B	I/P:230VAC/50HZ O/P:FULL /50%LOAD Ta:25℃	PASS Test by certified Lab
4	E.S.D	BS EN/EN61000-4-2 AIR：8KV / Contact：4KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
5	E.F.T	BS EN/EN61000-4-4 INPUT: 1KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
6	SURGE	BS EN/EN 61000-4-5 L-N :1KV L,N-PE:2KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
7	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL：NPP-750-12 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 29.5 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 49.0 ℃		

NO	Position	ROOM AMBIENT Ta= 29.5 ℃	HIGH AMBIENT Ta=49.0℃
1	ZNR1	33.5℃	53.1℃
2	LF1	36.1℃	55.9℃
3	C2	40.9℃	60.9℃
4	LF3	40.1℃	59.8℃
5	BD1	51.3℃	70.2℃
6	R24	27.2℃	64.9℃
7	RY1	40.5℃	60.0℃
8	RTH1	40.6℃	60.2℃
9	RTH5	40.8℃	60.8℃
10	TSW1	37.0℃	56.6℃
11	L1	39.0℃	58.2℃
12	Q2	42.4℃	62.2℃
13	C5	40.0℃	59.3℃
14	C41	38.0℃	57.7℃
15	T1	57.2℃	76.7℃
16	Q211	47.2℃	67.1℃
17	Q214	50.8℃	71.0℃
18	T600	44.6℃	64.3℃
19	U150	38.3℃	57.8℃
20	C114	38.4℃	57.6℃
21	U3	40.7℃	60.4℃
22	L3	54.1℃	74.0℃
23	C115	40.9℃	60.8℃
24	C106	32.1℃	51.5℃
25	LF100	53.3℃	73.8℃
26	Q6	50.3℃	71.5℃
27	U600	52.3℃	72.1℃
28	U2	46.4℃	66.0℃
29	U100	60.8℃	81.3℃
30	D9	45.3℃	64.7℃
31	R228	53.4℃	73.9℃
32	D19	54.1℃	73.2℃
33	D651	42.7℃	62.3℃
34	PCB	47.4℃	66.7℃
35	U804	35.5℃	55.3℃
36	Q810	32.9℃	52.3℃
37	C8	39.6℃	59.2℃

2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 230VAC/100VAC O/P： 100 %LOAD Ta= -35℃	TEST：OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ NO DAMAGE	I/P： 272 VAC O/P：FULL LOAD Ta= 50.1 ℃ HUMIDITY= 95 %R.H	TEST：OK
4	TEMPERATURE COEFFICIENT	± 0.05%/ (0℃~50℃)	I/P： 230 VAC O/P：FULL LOAD	0.0061 %/℃(0~50℃)

5	STORAGE TEMPERATURE TEST	-40~85℃	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：10CYCLE 5. Input/Output condition： STATIC
6	THERMAL SHOCK TEST	-30~50℃	1. Thermal shock Temperature： -35℃~ +55℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：16 CYCLE 5. Input/Output condition： 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test
7	VIBRATION TEST	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：3G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃
8	CAPACITOR LIFE CYCLE	SUPPOSE C115 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) 1683605.1HRS (2) 289483.7HRS (3) 459302HRS (4) 628280.5HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 227.6K hrs min. Telcordia SR-332 (Bellcore) ; 67.7K hrs min. MIL-HDBK-217F (25℃)	
10	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2020.10.1 TAG-QA-009