Test Report: NPB-1700-12

1700W 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

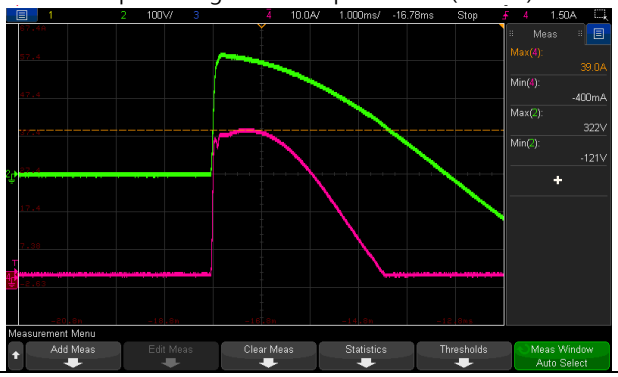
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BOOST CHARGE VOLTAGE （default）	14.4V± 0.12 V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	14.49V
2	FLOAT CHARGE VOLTAGE （default）	13.8V± 0.12 V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	13.83V
3	MAX. OUTPUT CURRENT	85A±0.85A	I/P: 230 VAC O/P: BAT. LOAD Ta:25℃	84.9A
4	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25℃	0.24m A
5	OUTPUT CURRENT RANGE	50%~100%Io	I/P: 230 VAC O/P:CV =16.8V Ta:25℃	40.0~84.9A
6	MAX. POWER	1428W	I/P: 230 VAC O/P:CV =16.8V Ta:25℃	1428.5W

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC 250VDC~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) 175.2V~264V/FULL LOAD 84.5V~264V/70% LOAD“ (2) 190Vdc~370Vdc/FULLLOAD 160Vdc~370Vdc/70% LOAD (3) 190Vdc~370Vdc/FULL LOAD 160Vdc~370Vdc/70% LOAD
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%= 300 V O/P: FULL LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN	TEST: NO DAMAGE
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	0.75mA/240VAC (60335-1/2-29), 1.5mAPeak/240VAC (62368-1)	I/P: 240 VAC O/P:Min LOAD Ta:25℃	**60335：** 0.097mA **62368：**1.40 mA

4	INPUT CURRENT (TYP)	230 V/9.3 A 115 V/ 14.8A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta:25℃	I =6.92A/ 230VAC I =10.98A/ 115VAC
5	POWER FACTOR (TYP)	0.95/ 230 VAC 0.98/ 115 VAC	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta:25℃	PF=0.9618 / 230VAC PF= 0.9950/ 115VAC
6	EFFICIENCY (TYP)	92%	I/P: 230 VAC O/P: CV =16.8V Ta:25℃	92.74%
7	INRUSH CURRENT (TYP)	230 V/ 50 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	I =39A/ 230VAC T50=2.54ms/230V
	INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A) 			

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: 90 VAC O/P:TESTING Ta:25℃	24.3V/ 264VAC 24.3V/ 90VAC PROTECTION TYPE： Shut down and latch off o/p voltage, re-power on to recover.
2	OVER TEMPERATURE PROTECTION	SPEC: Shut down o/p voltage, recover automatically after temperature goes down.	I/P: 264 VAC I/P: 90 VAC O/P:BAT. LOAD	PROTECTION TYPE： Shut down o/p voltage, recover automatically after temperature goes down.
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE Constant current Range： 80.75~89.25A Constant current limiting ,charger will shut down, re-power on to recover.	I/P: 264 VAC O/P: BAT. LOAD Ta:25℃	NO DAMAGE Constant current Range： 85.91 A PROTECTION TYPE： Constant current limiting ,charger will shut down, 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℃	TEST:OK 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%~40%@RTH3 ＜ 35 ℃ /RTH5＜55℃
FAN control mosfet duty：
95%~100%@ RTH3 ＞ 65 ℃ /RTH5＞85℃</td><td>I/P: 230 VAC
O/P:BAT. LOAD
Ta:25℃</td><td>34.5% @ RTH3 ＜ 35 ℃ /RTH5＜55℃

99.6% @ RTH3 ＞ 65 ℃ /RTH5＞85℃</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=7.22W
(2) Remote off Vo=0.142V</td></tr>
<tr><td>3</td><td>AUX POWER</td><td>OUTPUT VOLTAGE RANGE：
10.8~13.2V</td><td>I/P: 230 VAC
O/P:BAT. LOAD
Ta:25℃</td><td>TEST: 11.33 V</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 ranging for charging</td></tr>
<tr><td>Red</td><td>Abnormal status (OTP,OVP, Short circuit, 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.(In the meantime, an alarm signal will be sent out through the CANBus interface)</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=40℃（1.7KΩ）</td></tr>
<tr><td>14.85±0.12V</td><td>14.4±0.12V</td><td>14.13±0.12V</td></tr>
<tr><td>TEST RESULT:</td><td>14.751V</td><td>14.372V</td><td>14.054V</td></tr>
</table></td></tr>
</table>

6	CHARGE OK SIGNAL	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 = 5.178 V; Charger failure or protection = 0.023 V
7	BATTERY FULL SIGNAL	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 = 5.175 V Charging = 0.019V

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 901/Q903 Rated : 600V/34 A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV(max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	Q901 Q903 VDS : VDS : (1) 459V (1) 439V (2) 447V (2) 415V (3) 427V (3) 421V (4) 459V (4) 451V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1/Q3 Rate:600 V /34 A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	Q1 Q3 VDS : VDS : (1) 459V (1) 491V (2) 423V (2) 435V (3) 467V (3) 467V (4) 467V (4) 491V
4	AUX MOS	U600 Rate: 800V /4.9 A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	VDS : (1) 575V (2) 534V (3) 567V (4) 583V
5	P.F.C DIODE	D14/D17 Rated: 6A/ 650V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)CV(max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	D14 D17 (1) 513V (1) 525V (2) 473V (2) 489V (3) 513V (3) 521V (4) 475V (4) 477V
6	Diode Peak Voltage	Q210/Q214/Q218/Q222 Rated :80V/ 100A	AC ON/OFF I/P:Low-Line -3V = 267 V O/P: (1)CV(max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	Q210 Q218 VDS : VDS : (1) 54.8V (1) 52.4V (2) 33.1V (2) 36.5V (3) 50.9V (3) 49.5V (4) 55.3V (4) 52.4V

				Q214 VDS : (1) 55.8V (2) 37.9V (3) 51.4V (4) 55.3V	Q222 VDS : (1) 53.8V (2) 37.9V (3) 51.9V (4) 54.8V
7	Input Capacitor Voltage	C 5 Rated : 220u /450V	I/P:High-Line +3V =267 V O/P: (1)CV(max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	(1) 437V (2) 413V (3) 437V (4) 443V	
8	Control IC Voltage Test	PWM IC U800Rated 8.9V~15.5V PFC IC U401Rated 10.6V~22V O/P IC U801 Rated 4.5V~36V U250 Rated -0.3V~37V MCU IC U701 Rated -0.3V~ 3.6V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)CV(max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25℃	U800 (1) 12.8V (2) 12.8V (3) 12.8V (4) 12.8V U401 (1) 13.6V (2) 13.6V (3) 13.6V (4) 13.4V U801 (1) 12.8V (2) 12.8V (3) 12.8V (4) 12.8V	U250 (1) 13.8V (2) 13.8V (3) 13.8V (4) 14.2V U701 (1) 3.37V (2) 3.37V (3) 3.33V (4) 3.37V

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	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: 7.68 mA I/P-FG: 7.26 mA O/P-FG: 3.23 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: 9999M Ω O/P-FG: 9999M Ω NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	7mΩ

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 A	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：NPB-1700-48 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 25.4 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 51.9 ℃		

NO	Position	ROOM AMBIENT Ta= 25.4 ℃	HIGH AMBIENT Ta=51.9℃
1	LF1	42.8℃	63.6℃
2	ZNR1	38.4℃	59.2℃
3	U800	35.3℃	58.3℃
4	C2	41.3℃	61.6℃
5	LF3	47.4℃	66.5℃
6	U401	40.5℃	61.7℃
7	BD2	60.3℃	76.8℃
8	BD1	53.7℃	72.1℃
9	Q2	56.9℃	78.2℃
10	Q4	55.1℃	76.8℃
11	T51	45.8℃	63.9℃
12	C927	37.8℃	59.5℃
13	L1	51.8℃	69.1℃
14	RTH3	42.5℃	61.5℃
15	RY1	43.7℃	62.7℃
16	T1coil	58.9℃	78.1℃
17	T1core	34.1℃	56.5℃
18	C113	37.4℃	58.5℃
19	LF10	30.5℃	55.3℃
20	C7	44.4℃	63.1℃
21	L3	64.0℃	78.6℃
22	U701	38.8℃	61.1℃
23	Q904	46.1℃	67.0℃
24	Q901	45.9℃	66.5℃
25	C620	38.2℃	60.0℃
26	T601	47.8℃	76.7℃
27	T2	62.0℃	80.7℃
28	J103	41.3℃	63.1℃
31	Q221	44.6℃	66.1℃
32	Q223	43.9℃	66.4℃
33	U270	46.7℃	66.8℃
34	D651	49.1℃	88.6℃
35	C124	34.7℃	56.9℃
36	RG51	37.4℃	59.5℃
37	Q365	39.7℃	62.6℃
38	RG5	44.7℃	68.2℃
39	U150	37.0℃	59.2℃
40	U600	52.2℃	73.0℃
41	RTH5	44.6℃	66.2℃
42	D14	56.9℃	77.2℃
43	C11	43.2℃	63.0℃

2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 230VAC/180VAC 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= 49 ℃ HUMIDITY= 95 %R.H	TEST：OK
4	TEMPERATURE COEFFICIENT	± 0.05%/ (0℃~50℃)	I/P： 230 VAC O/P：FULL LOAD	0.0085 %/℃(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 C113 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) 1249386.3HRS (2) 321127.8HRS (3) 425879.8HRS (4) 497524.9HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 190.0K hrs min. Telcordia SR-332 (Bellcore) ; 45.1K 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