



Test Report: NPB-1200-24

1200W 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)	28.8V± 0.24 V	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	28.87V
2	FLOAT CHARGE VOLTAGE (default)	27.6V± 0.24 V	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	27.66V
3	MAX. OUTPUT CURRENT	36A±0.365A	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	35.86A
4	MAX. POWER	1209.6W	I/P: 230 VAC O/P: C.V =33.6V Ta:25°C	1210.2W
5	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P: BAT. LOAD Ta:25°C	0.26mA
6	OUTPUT CURRENT RANGE	50%~100%Io	I/P: 230 VAC O/P: CV =33.6V Ta:25°C	16.81~35.86A

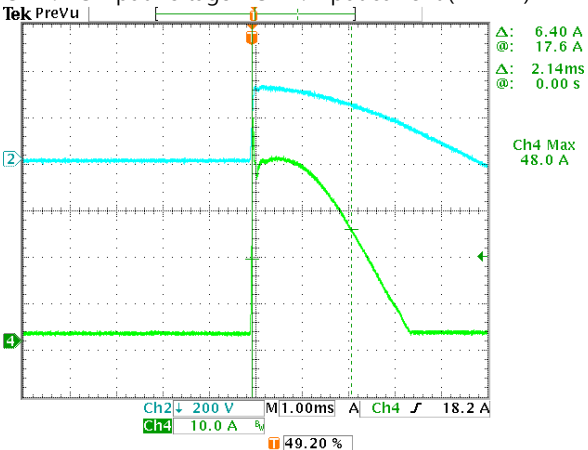
INPUT FUNCTION TEST

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: 80% LOAD (3) I/P: DC TESTING (L: - N: +) O/P: FULL LOAD Ta:25°C	(1) 173V~264V/FULL LOAD 84.5V~264V/80% LOAD" (2) 118Vdc~370Vdc/80%LOAD (3) 160Vdc~370Vdc/FULLLOAD
			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 (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°C	TEST: OK



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3	LEAKAGE CURRENT	< 1 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25°C	0.191mA
4	INPUT CURRENT (TYP)	230 V/6.5 A 115 V/ 12A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta:25°C	I =5.61A/ 230VAC I =9.86A/ 115VAC
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°C	PF= 0.989/ 230VAC PF= 0.995/ 115VAC
6	EFFICIENCY (TYP)	93%	I/P: 230 VAC O/P: BAT. LOAD (C.V =33.6V) Ta:25°C	94. 0%
7	INRUSH CURRENT (TYP)	230 V/ 50 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	I =48A/ 230VAC T50= 2.14 ms/230V
INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)  Ch2 200 V 10.0 A 5V M 1.00ms A Ch4 18.2 A 49.20 % Δ: 6.40 A @: 17.6 A Δ: 2.14ms @: 0.00 s Ch4 Max 48.0 A				
8	GAIN-PHASE MARGIN TEST	GAIN MARGIN < -10dB PHASE MARGIN > =60 Gain Curve slope: -10dB/dec~-40dB/dec	(1) CV MODE(Vboost)/264Vac (2) CV MODE(Vboost)/90Vac	(1)82.99° /-11.411dB/ -12.5dB/dec (2)81.876° /-11.545dB/-12.9dB/dec

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1:43V~52V 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°C	49.0V/ 264VAC 49.0V/ 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover.



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2	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE Shut down o/p voltage, recover automatically after temperature goes down.	I/P: 264 VAC I/P: 90 VAC O/P: BAT. LOAD	O.T.P. Active OK 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: 34.2~37.8A Constant current limiting ,charger will shut down after 5 sec, re-power on to recover.	I/P: 264 VAC O/P: BAT. LOAD Ta:25°C	NO DAMAGE Constant current Range: 35.7 A PROTECTION TYPE : 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°C	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°C	PROTECTION TYPE : Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	FAN SPEED CONTROL	FAN control mosfet duty: 30% (±2%) @RTH5<55°C FAN control mosfet duty : 100% (-2%) @RTH5>70°C	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	28.9% @RTH5<55°C 99.836% @RTH5>70°C
2	REMOTE CONTROL	Rc+ / Rc- OPEN : (-0.5~0.5V) Charger stop charging SHORT : (10.8~13.2V) Charger normal work	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	TEST: OPEN/ -0.5~2.5V SHORT/ 2.6~13.2V (1) Remote off Pin= 4.35 W (2) Remote off Vo= 0.041 V
3	AUX POWER	OUTPUT VOLTAGE RANGE : 10.8~13.2V OUTPUT RIPPLE&NOISE: 150mVp-p	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	TEST: 11.33 V 31 mVp-p



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5	LED INDICATOR	<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°C; 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°C	LED	Description	Green	Float(stage 3) or Battery full	Orange	Charging (stage 1 or stage 2)	Orange (Flashing)	Auto ranging for charging	Red	Abnormal status (OTP,OVP, Short circuit, Reverse polarity, Charging timeout.)	Red (Flashing)	The LED will flash with the red light when the internal temperature reaches 95°C; 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)	TEST : <u>OK</u>			
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5	TEMPERATURE COMPENSATION	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C <table><tr><th colspan="4">Constant Voltage</th></tr><tr><td rowspan="2">SPEC:</td><td>Ta=0°C (17K Ω)</td><td>Ta=25°C (5K Ω)</td><td>Ta=50°C (1.7K Ω)</td></tr><tr><td>29.7±0.24V</td><td>28.8±0.24V</td><td>28.26±0.24V</td></tr><tr><td>TEST RESULT:</td><td>29.643V</td><td>28.757V</td><td>28.132V</td></tr></table>	Constant Voltage				SPEC:	Ta=0°C (17K Ω)	Ta=25°C (5K Ω)	Ta=50°C (1.7K Ω)	29.7±0.24V	28.8±0.24V	28.26±0.24V	TEST RESULT:	29.643V	28.757V	28.132V	
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TEST RESULT:	29.643V	28.757V	28.132V															
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°C TEST: Charger OK = <u>5.19</u> V; Charger failure=<u>0.018</u> V Charger protection=<u>0.018</u> 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°C TEST: Battery full = <u>5.20</u> V Charging = <u>0.018</u> V															

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/40A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV(max)=41V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	Q901 Q903 VDS : VDS : (1) 481V (1) 485V (2) 421V (2) 437V (3) 469V (3) 477V (4) 485V (4) 489V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rate: 600V/34A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)=41V (2)CV(min)=21V (3)no load	Q1 VDS : (1) 481V (2) 401V (3) 469V (4) 493V



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			(4)OUTPUT SHORT Ta:25°C	
3	AUX MOS	U600 Rate: : 800V /4.9 A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)=41V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	VDS : (1) 584V (2) 532V (3) 580V (4) 592V
4	P.F.C DIODE	D8 Rated : 6 A/ 650V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)CV(max)=41V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	(1) 495V (2) 455V (3) 483V (4) 495V
5	Diode Peak Voltage	Q210/Q214/Q218/Q222 Rated :120V/98 A —	AC ON/OFF I/P:Low-Line -3V = 267 V O/P: (1)CV(max)=41V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	Q210 VDS : (1) 95. 2V (2) 71. 1V (3) 95. 2V (4) 96. 0V Q214 VDS : (1) 95. 2V (2) 70. 3V (3) 94. 4V (4) 98. 4V Q218 VDS : (1) 96. 8V (2) 70. 3V (3) 97. 6V (4) 99. 2V Q222 VDS : (1) 96. 8V (2) 70. 3V (3) 94. 4V (4) 99. 2V
6	Input Capacitor Voltage	C 5 Rated : 220u /450V	I/P:High-Line +3V =267 V O/P: (1)CV(max)=41V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	(1) 447V (2) 395V (3) 443V (4) 445V
8	Control IC Voltage Test	PWM IC U800Rated 8.9V~15.5V PFC IC U1Rated 11V~26V O/P IC U801 Rated 4.5V~36V U250 Rated -0.3V~37V MCU IC U701 Rated	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)CV(max)=41V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	U800 (1) 13. 2V (2) 13.2V (3) 13.4V (4) 13.2V U1 (1) 13. 8V (2) 13.8V (3) 13.8V (4) 13.8V U250 (1) 13. 6V (2) 13. 6V (3) 13. 6V (4) 13. 6V U701 (1) 3. 31V (2) 3. 31V (3) 3. 31V (4) 3. 31V



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		2. 4V~ 3. 6V		U801 (1) 12. 8V (2) 12. 8V (3) 12. 8V (4) 12. 8V	
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■ 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°C	I/P-O/P: 3.81mA I/P-FG: 3.43mA O/P-FG: 4.10mA 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°C	I/P-O/P: 1GΩ I/P-FG: 1GΩ O/P-FG : 1GΩ NO DAMAGE
3	GROUNDING CONTINUITY	EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	31mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	BS EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	PASS
2	CONDUCTION	BS EN/EN55032(CISPR32), BS EN/EN55014-1 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032(CISPR32), BS EN/EN55014-1 CLASS A	I/P:230VAC/50HZ O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
4	E.S.D	BS EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	BS EN61000-4-4 INPUT: 1KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
6	SURGE	BS IEC61000-4-5 L-N :1KV L,N-PE:2KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	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-1200-48 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 26.9 °C 2. HIGH AMBIENT BURN-IN : HRS I/P : 230VAC O/P : FULL LOAD Ta= 52.4 °C			
		NO	Position	ROOM AMBIENT Ta=26.9 °C	HIGH AMBIENT Ta= 52.4 °C
		1	C2	48.0°C	64.9°C
		2	C10	51.5°C	66.3°C
		3	C7	49.0°C	64.4°C
		4	LF3	60.3°C	73.1°C
		5	C11	54.1°C	69.2°C
		6	Q1	57.0°C	75.2°C
		7	RY1	54.1°C	68.8°C
		8	L1	60.1°C	73.9°C
		9	BD1	68.0°C	86.2°C
		10	U1	49.5°C	66.0°C
		11	C921	45.7°C	62.8°C
		12	RT80	47.5°C	63.7°C
		13	RTH1	46.2°C	62.8°C
		14	Q903	68.9°C	82.1°C
		15	L3	75.3°C	85.3°C
		16	C113	38.7°C	58.8°C
		17	T2	65.5°C	79.3°C
		18	T1	61.8°C	74.3°C
		19	C116	40.0°C	59.6°C
		20	U600	82.6°C	91.2°C
		21	Q355	36.6°C	60.2°C
		22	C635	53.4°C	67.0°C
		23	T601	45.9°C	64.1°C
		24	LF100	39.6°C	63.9°C
		25	Q356	29.7°C	55.0°C
		26	U150	35.5°C	56.5°C
		27	RG5	44.6°C	64.8°C
		28	U701	37.1°C	58.2°C
		29	Q214	48.7°C	67.9°C
		30	U800	42.3°C	60.4°C
		31	J104	46.3°C	68.2°C
		32	R12	70.7°C	86.2°C
		33	U260	50.9°C	68.1°C
		34	Q219	48.8°C	67.7°C
		35	D8	58.6°C	77.3°C
		36	RTH5	47.4°C	65.1°C



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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230VAC/100VAC O/P : 100 % LOAD Ta= -35 °C	TEST : OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50.1°C HUMIDITY= 95 %R.H	TEST : OK
4	TEMPERATURE COEFFICIENT	+ 0.05 %/ (0°C~50°C)	I/P : 230 VAC O/P : FULL LOAD	+ 0.0073 %/°C(0~50°C)
5	STORAGE TEMPERATURE TEST	-40~85°C	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10CYCLE 5. Input/Output condition : STATIC	
7	THERMAL SHOCK TEST	-30~50°C	1. Thermal shock Temperature : -35°C~ +55°C 2. Temperature change rate : 25°C / 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	
8	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°C	
9	CAPACITOR LIFE CYCLE	SUPPOSE C116 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) 1243686.2HRS (2) 330935.6HRS (3) 409639.2HRS (4) 481488.4HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 172.5K hrs min. Telcordia SR-332 (Bellcore) ; 47.5K hrs min. MIL-HDBK-217F (25°C)		
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2018.4.30 GP-A50-F010