



# Test Report: NPB-120-24

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120W Compact Size and Wide Output Range 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	28.8V± 0.3 V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	28.8 V
2	FLOAT CHARGE VOLTAGE	27.6V± 0.3 V	I/P: 230 VAC O/P:NO LOAD Ta:25°C	27.74V
3	OUTPUT CURRENT	4A±3%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	4.01A
4	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25°C	0.0799mA
5	CHARGE VOLTAGE RANGE	21~30.4V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	19.38V~32.26V
6	CURRENT ADJUSTABLE RANGE	50%~100%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	43.4%~106.5%

### 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 / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25°C	(1) 76.5V~264V (2) 105.77Vdc~370Vdc/FULL LOAD 105.77Vdc~370Vdc/50% LOAD (3)105.76Vdc~370Vdc/FULL LOAD 105.75Vdc~370Vdc/50% LOAD
			I/P: LOW-LINE-3V=97 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°C	TEST: OK
3	INPUT CURRENT (TYP)	230 V/ 0.8 A 115 V/ 1.5 A	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	I =0.59A/ 230VAC I =1.17A/ 115VAC

4	POWER FACTOR (TYP)	0.93/ 230 VAC 0.98/ 115 VAC	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	PF=0.949/ 230VAC PF=0.988/ 115VAC
5	EFFICIENCY (TYP)	89.5%	I/P: 230 VAC O/P:BAT. LOAD(CV= 28.8V) Ta:25°C	90.08%
6	INRUSH CURRENT (TYP)	230 V/ 55 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	I =49.6A
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)</p> <p>Ch2 Max 328 V Ch4 Max 49.6 A</p> <p>Ch2 200 V Ch4 10.0 A 278.000µs</p>				
7	GAIN-PHASE MARGIN TEST	GAIN MARGIN < -10dB PHASE MARGIN > =60  Gain Curve slope: <u>-10dB/dec~-40dB/dec</u>	(1) CV MODE(Vmax) /264Vac (2) CV MODE(Vmax)/90Vac (3) CV MODE(Min)/264Vac (4) CV MODE(Min)/90Vac Ta:25°C	(1) 74.4 ° / -18.9 dB / -32.2dB/dec (2) 74 ° / -19 dB / -32.5dB/dec (3) 96 ° / dB / -15 -18.5dB/dec (4) 96 ° / -15 dB / -18.3dB/dec
8	NO LOAD POWER CONSUMPTION	230V/0.15W	I/P: 230 VAC O/P:NO LOAD ( AC S.W OFF ) Ta:25°C	0.06 W

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1:32V~40V 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	37.4V/ 264VAC 37.4V/ 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover

2	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE Hiccup, recovers automatically after temperature goes down	I/P: 264 VAC I/P: 90 VAC O/P: BAT. LOAD	O.T.P. Active PROTECTION TYPE : Hiccup, recovers automatically after temperature goes down
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE 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 PROTECTION TYPE: Constant current limiting, charger will shut down after 5 sec, re-power on to recover
4	BATTERY REVERSE POLARITY	By internal fuse open	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	By internal fuse open
5	FLOW BACKWARD PROTECTION	BATTERY VOLTAGE : ≤36V	I/P: 230 VAC O/P: BAT. LOAD Ta:25°C	NO DAMAGE

CONTROL FUNCTION TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT														
1	CHARGE CURE	<p>I/P:230Vac O/P:TESTING Ta:25°C</p> <p>☉ Default 2 stage charging curve</p> <table border="1"> <thead> <tr> <th rowspan="2">Mode</th> <th colspan="2">Constant voltage (Vfloat)</th> <th colspan="2">Constant current</th> </tr> <tr> <th>Specification</th> <th>Result</th> <th>Specification</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>24V</td> <td>27.6V</td> <td>27.65V</td> <td>4A</td> <td>3.99A</td> </tr> </tbody> </table> <p>☉ Default 3 stage charging curve</p>	Mode	Constant voltage (Vfloat)		Constant current		Specification	Result	Specification	Result	24V	27.6V	27.65V	4A	3.99A		
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	Specification	Result	Specification	Result														
24V	27.6V	27.65V	4A	3.99A														

			NPB-120-24	27.6V(±0.3V) 0<io<6%±4%	28.8V(±0.3V) io≥14%±4%	
			Io (A)	0.25A	0.43A	
2.	LED INDICATOR	<b>LED</b>		<b>Description</b>		TEST : <u>OK</u>
		<b>Green</b>		FLOATING/FULLY		
		<b>Red</b>		Charging (stage 1 or stage 2)		
		<b>Light off</b>		OVP /OLP/OUTPUT SHORT		
		<b>Green Flash</b>		OTP		
I/P: 230V O/P:TESTING LOAD Ta:25°C						

**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 : 600 V /11A	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°C	Q5 Q6 VDS : VDS : (1) 425V (1) 421V (2) 421V (2) 421V (3) 397V (3) 397V (4) 465V (4) 457V
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 600 V / 13A	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°C	Q1 VDS : (1) 465V (2) 465V (3) 397V (4) 437V
3	P.F.C DIODE	D 4 Rated : 9 A/ 600 V	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°C	(1) 469V (2) 437V (3) 417V (4) 441V
4	Transistor Peak Voltage	Q210/Q211 Rated : 100 V / 30A	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°C	Q210 Q211 VDS : VDS : (1) 69.80V (1) 71.4V (2) 56.1V (2) 56.9V (3) 69.0V (3) 69.8V (4) 75.4V (4) 75.4V
5	Input Capacitor Voltage	C 5 Rated : 82 u / 420 V	I/P:High-Line +3V =267 V O/P: (1)CV(max) (2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25°C	(1) 413V (2) 413V (3) 413V (4) 405V

6	Control IC Voltage Test	PWM IC U1 Rated 10V~20V	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°C	U1 (1) 15.7V (2) 15.7V (3) 15.7V (4) 15.7V	U102 (1) 12.7V (2) 12.7V (3) 12.7V (4) 12.7V
		PFC IC U2 Rated 9.75V~20V		U2 (1) 15.1V (2) 15.1V (3) 15.1V (4) 15.1V	
		O/P IC U102 Rated 3V~30V			

## ■ SAFETY & E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3 KVAC I/P-FG:2 KVAC O/P-FG:0.5KVAC	I/P-O/P: 3.6 KVAC I/P-FG: 1.8 KVAC O/P-FG: 0.6 KVAC Ta:25°C	I/P-O/P: 2.611 mA I/P-FG: 2.546 mA O/P-FG: 1.896 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°C	I/P-O/P: 10G Ω I/P-FG: 10 GΩ O/P-FG 10G Ω NO DAMAGE

### 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°C	■ PASS
2	CONDUCTION	BS EN/EN55032(CISPR32) 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) EN/EN55014-1 CLASS B	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	■ 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°C	■ CRITERIA A □ CRITERIA B
5	E.F.T	BS EN/EN61000-4-4 INPUT: 1KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	■ CRITERIA A □ CRITERIA B
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°C	■ CRITERIA A □ CRITERIA B
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-120-48 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 24.0 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 45.4 °C																																																																																																																																														
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : CV-1 Ta= -35°C	TEST : OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 45°C HUMIDITY= 95 %R.H	TEST : OK
4	TEMPERATURE COEFFICIENT	± 0.05 %/ (0°C~45°C)	I/P : 230 VAC O/P : FULL LOAD	±0.0081 %/°C(0~45°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	
6	THERMAL SHOCK TEST	-30~45°C	1. Thermal shock Temperature : -35°C~ +50°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	
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°C	
8	CAPACITOR LIFE CYCLE	SUPPOSE C101 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= 45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME	(1) 375825.8HRS (2) 112510.9HRS (3) 168528.2HRS (4) 184033.6HRS	
9	MTBF	Conducted by Parts Stress Analysis Prediction 1895.4K hrs min. Telcordia TR/SR-332 (Bellcore) ; 225.8K hrs min. MIL-HDBK-217F (25°C)		
10	Ongoing Reliability Test	I/P : 230VAC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2020.10.01 TAG-QA-009