



# Test Report: NPB-360-48

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360W 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	57.6V±0.5 V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	57.66V
2	FLOAT CHARGE VOLTAGE	55.2V± 0.5V	I/P: 230 VAC O/P:NO LOAD Ta:25°C	55.40V
3	OUTPUT CURRENT	6A±3%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	6.048A
4	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25°C	0.161mA
5	CHARGE VOLTAGE RANGE	42~60.8V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	40.251V~64.61V
6	CURRENT ADJUSTABLE RANGE	50%~100%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	45.56%~107.33%

### 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) 77.09V~264V (2) 105.85Vdc~370Vdc/FULL LOAD 105.85Vdc~370Vdc/50% LOAD (3) 105.87Vdc~370Vdc/FULL LOAD 105.82Vdc~370Vdc/50% 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°C	TEST: OK
3	INPUT CURRENT (TYP)	230 V/ 2.2 A 115 V/ 4.5 A	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	I = 1.65A/ 230VAC I = 3.34A/ 115VAC

4	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= 0.978/ 230VAC PF= 0.992/ 115VAC
5	EFFICIENCY (TYP)	92.5%	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	92.55%
6	INRUSH CURRENT (TYP)	230 V/ 50 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	I =41.0A
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)</p> <p>Ch2: 200 V, Ch4: 10.0 A, 400µs scale, 17.0 A range. Annotations: Ch4 Max 41.0 A, 1.40 A @ 1.06ms, 20.4 A @ 1.06ms.</p>				
7	GAIN-PHASE MARGIN TEST	GAIN MARGIN < -10dB PHASE MARGIN >=60  Gain Curve slope: -10dB/dec~-40dB/dec	(1) CV MODE(Vmax)/264Vac (2) CV MODE(Vmax)/90Vac (3) CV MODE(Min)/264Vac (4) CV MODE(Min)/90Vac Ta:25°C	(1) 103.7 ° / -17.6 dB / -13.9 dB/dec (2) 103.2 ° / -17.2 dB / -16.4dB/dec (3) 88.7 ° / -14.2 dB / -31.4 dB/dec (4) 89.2 ° / -14.1 dB / -31dB/dec
8	NO LOAD POWER CONSUMPTION	230V/0.15W	I/P: 230 VAC O/P:NO LOAD ( AC S.W OFF ) Ta:25°C	0.077 W

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1:64V~75V 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	68.8V/ 264VAC 68.8V/ 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 : ≤72V	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>48V</td> <td>55.2V</td> <td>55.29V</td> <td>6A</td> <td>6.013A</td> </tr> </tbody> </table> <p>3 Stage</p>	Mode	Constant voltage (Vfloat)		Constant current		Specification	Result	Specification	Result	48V	55.2V	55.29V	6A	6.013A		
Mode	Constant voltage (Vfloat)			Constant current														
	Specification	Result	Specification	Result														
48V	55.2V	55.29V	6A	6.013A														

			NPB-360-48	55.2V(±0.5V) 0<io<6%±4%	57.6V(±0.5V) io≥14%±4%	
			Io (A)	0.4106A	0.759A	
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 /OUTPUT SHORT/OLP		
		<b>Green Flash</b>		OTP		
		I/P: 230V O/P:TESTING LOAD Ta:25°C				
3	FAN CONTROL (Typ.)	RTH3≥50±5°C FAN ON Ta:25°C				TEST : <u>OK</u>

**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 /18A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV(max)=60.8V (2)CV(min)=42V (3)no load (4)OUTPUT SHORT Ta:25°C	Q5 Q6 VDS : VDS : (1) 438V (1) 434V (2) 442V (2) 438V (3) 422V (3) 411V (4) 475V (4) 458V
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q 1/Q2 Rated : 600V /18 A	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV(max)=60.8V (2)CV(min)=42V (3)no load (4)OUTPUT SHORT Ta:25°C	Q1 VDS : (1) 438V (2) 438V (3) 394V (4) 426V
3	P.F.C DIODE	D 4 Rated : 6A/ 650 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) 465V (2) 465V (3) 424V (4) 452V
4	Transistor Peak Voltage	Q210/Q211 Rated : 150V /30 A	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) 143V (1) 142.6V (2) 108.8V (2) 106.4V (3) 132.9V (3) 141.8V (4) 142V (4) 142V (5)142V (5)142V
5	Input Capacitor Voltage	C 5 Rated : 180u /420 V	I/P:High-Line +3V =267 V O/P: (1)CV(max) (2)CV(min) (3)no load	(1) 410V (2) 410V (3) 406V (4) 410V

			(4)OUTPUT SHORT Ta:25°C		
6	Control IC Voltage Test	PWM IC U1 Rated 10V~20V  PFC IC U2 Rated 9.75V~20V  O/P IC U102 Rated 3V~30V	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) 15.9V (2) 15.9V (3) 15.9V (4) 15.9V  U2 (1) 15.3V (2) 15.3V (3) 15.3V (4) 15.3V	U102 (1) 14.7V (2) 14.7V (3) 14.7V (4) 14.7V

## ■ 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: 2.599 mA I/P-FG: 2.525 mA O/P-FG: 1.920 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	<p>Test by certified Lab &amp; Test Report Prepare</p> <p>Any contradictions of the test results, please refer to the latest EMC test report</p>
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## ■ RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																																																				
1	TEMPERATURE RISE TEST	<p>MODEL : NPB-360-48</p> <p>1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 18.0 °C</p> <p>2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 45.9°C</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 18.0 °C</th> <th>HIGH AMBIENT Ta= 45.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>35.5°C</td><td>51.3°C</td></tr> <tr><td>2</td><td>ZNR1</td><td>34.1°C</td><td>48.8°C</td></tr> <tr><td>3</td><td>RTH1</td><td>40.9°C</td><td>52.8°C</td></tr> <tr><td>4</td><td>RY1</td><td>49.9°C</td><td>58.1°C</td></tr> <tr><td>5</td><td>RTH2</td><td>58.4°C</td><td>61.3°C</td></tr> <tr><td>6</td><td>LF2</td><td>46.6°C</td><td>55.6°C</td></tr> <tr><td>7</td><td>C2</td><td>40.5°C</td><td>51.3°C</td></tr> <tr><td>8</td><td>LF3</td><td>44.8°C</td><td>55.5°C</td></tr> <tr><td>9</td><td>L1</td><td>64.5°C</td><td>70.0°C</td></tr> <tr><td>10</td><td>BD1</td><td>54.9°C</td><td>63.8°C</td></tr> <tr><td>11</td><td>R10</td><td>54.1°C</td><td>59.6°C</td></tr> <tr><td>12</td><td>Q1</td><td>44.9°C</td><td>58.9°C</td></tr> <tr><td>13</td><td>D4</td><td>49.0°C</td><td>62.8°C</td></tr> <tr><td>14</td><td>C5</td><td>58.5°C</td><td>61.4°C</td></tr> <tr><td>15</td><td>U2</td><td>48.4°C</td><td>55.3°C</td></tr> <tr><td>16</td><td>U1</td><td>55.1°C</td><td>58.4°C</td></tr> <tr><td>17</td><td>Q15</td><td>66.7°C</td><td>68.0°C</td></tr> <tr><td>18</td><td>Q6</td><td>51.3°C</td><td>65.0°C</td></tr> <tr><td>19</td><td>C14</td><td>50.1°C</td><td>55.8°C</td></tr> <tr><td>20</td><td>C6</td><td>41.5°C</td><td>52.3°C</td></tr> <tr><td>21</td><td>T1coil</td><td>83.0°C</td><td>83.8°C</td></tr> <tr><td>22</td><td>T1core</td><td>59.7°C</td><td>70.4°C</td></tr> <tr><td>23</td><td>Q215</td><td>48.8°C</td><td>62.0°C</td></tr> <tr><td>24</td><td>Q210</td><td>59.7°C</td><td>72.2°C</td></tr> <tr><td>25</td><td>C102</td><td>60.0°C</td><td>68.2°C</td></tr> <tr><td>26</td><td>C104</td><td>50.2°C</td><td>61.3°C</td></tr> <tr><td>27</td><td>LF100</td><td>47.8°C</td><td>59.0°C</td></tr> <tr><td>28</td><td>RG100</td><td>57.0°C</td><td>75.2°C</td></tr> <tr><td>29</td><td>RTH3</td><td>47.4°C</td><td>56.8°C</td></tr> <tr><td>30</td><td>Q201</td><td>44.1°C</td><td>54.6°C</td></tr> <tr><td>31</td><td>U110</td><td>45.4°C</td><td>55.3°C</td></tr> <tr><td>32</td><td>C130</td><td>50.7°C</td><td>59.2°C</td></tr> <tr><td>33</td><td>J102</td><td>58.7°C</td><td>69.0°C</td></tr> <tr><td>34</td><td>R105</td><td>61.5°C</td><td>70.7°C</td></tr> <tr><td>35</td><td>D104</td><td>51.2°C</td><td>60.7°C</td></tr> <tr><td>36</td><td>Q10</td><td>61.7°C</td><td>67.8°C</td></tr> </tbody> </table>			NO	Position	ROOM AMBIENT Ta= 18.0 °C	HIGH AMBIENT Ta= 45.9 °C	1	LF1	35.5°C	51.3°C	2	ZNR1	34.1°C	48.8°C	3	RTH1	40.9°C	52.8°C	4	RY1	49.9°C	58.1°C	5	RTH2	58.4°C	61.3°C	6	LF2	46.6°C	55.6°C	7	C2	40.5°C	51.3°C	8	LF3	44.8°C	55.5°C	9	L1	64.5°C	70.0°C	10	BD1	54.9°C	63.8°C	11	R10	54.1°C	59.6°C	12	Q1	44.9°C	58.9°C	13	D4	49.0°C	62.8°C	14	C5	58.5°C	61.4°C	15	U2	48.4°C	55.3°C	16	U1	55.1°C	58.4°C	17	Q15	66.7°C	68.0°C	18	Q6	51.3°C	65.0°C	19	C14	50.1°C	55.8°C	20	C6	41.5°C	52.3°C	21	T1coil	83.0°C	83.8°C	22	T1core	59.7°C	70.4°C	23	Q215	48.8°C	62.0°C	24	Q210	59.7°C	72.2°C	25	C102	60.0°C	68.2°C	26	C104	50.2°C	61.3°C	27	LF100	47.8°C	59.0°C	28	RG100	57.0°C	75.2°C	29	RTH3	47.4°C	56.8°C	30	Q201	44.1°C	54.6°C	31	U110	45.4°C	55.3°C	32	C130	50.7°C	59.2°C	33	J102	58.7°C	69.0°C	34	R105	61.5°C	70.7°C	35	D104	51.2°C	60.7°C	36	Q10	61.7°C	67.8°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	±0.0051 %/°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 C102 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) 183455.1HRS (2) 179679.6HRS (3) 259047.6HRS (4) 367317.9HRS	
9	MTBF	Conducted by Parts Stress Analysis Prediction 1324.7K hrs min. Telcordia TR/SR-332 (Bellcore) ; 173.9K 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