



# Test Report: NPB-360-12

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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	14.4V± 0.3 V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	14.421V
2	FLOAT CHARGE VOLTAGE	13.8V± 0.3 V	I/P: 230 VAC O/P:NO LOAD Ta:25°C	14.083V
3	OUTPUT CURRENT	20A±3%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	20.188A
4	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25°C	0.0553mA
5	CHARGE VOLTAGE RANGE	10.5~15.2V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	9.546V~15.796V
6	CURRENT ADJUSTABLE RANGE	50%~100%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	43.64%~104.1%

### 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) 76.29 V~264V (2) 105.69Vdc~370Vdc/FULL LOAD 105.69Vdc~370Vdc/50% LOAD (3) 105.69Vdc~370Vdc/FULL LOAD 105.69Vdc~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/ 2.2A 115 V/ 4.5 A	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	I =1.4506A/ 230VAC I =2.9406A/ 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= 0.9748/ 230VAC PF=0.9918/ 115VAC
5	EFFICIENCY (TYP)	88.5%	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	89.09%
6	INRUSH CURRENT (TYP)	230 V/ 50 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	I =42.6A
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)</p>				
7	GAIN-PHASE MARGIN TEST 1.	GAIN MARGIN < -10dB PHASE MARGIN > =60  <u>Gain Curve slope:</u> <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) 73.5 ° / -19.6 dB / -33.4dB/dec (2) 73.6 ° / -19.8 dB / -38.4dB/dec (3) 104.2 ° / -14.7 dB / -16.7dB/dec (4) 105.1 ° / -14.6 dB / -17.0 dB/dec
8	NO LOAD POWER CONSUMPTION	230V/0.15W	I/P: 230 VAC O/P:NO LOAD ( AC S.W OFF ) Ta:25°C	0.084 W

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1:16V~ 20V 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	18.7V/ 264VAC 18.7V/ 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover



			NPB-360-12	13.8V(±0.3V) io<6%±4%	14.4V(±0.3V) io≥14%±4%	
			Io (A)	1.189A	2.059A	
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 : 600 V /18A VGS: ±20V	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) 439V (1) 423V (2) 435V (2) 427V (3) 415V (3) 415V (4) 468V (4) 468V
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 600 V /18 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°C	Q1 VDS : (1) 435V (2) 435V (3) 395V (4) 427V
3	P.F.C DIODE	D 4 Rated : 6 A/ 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) 475V (2) 467V (3) 431V (4) 467V
4	Transistor Peak Voltage	Q210/Q211 Rated : 60V /120 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 (5) FULL/NO LOAD Ta:25°C	Q210 Q211 VDS : VDS : (1) 38.9V (1) 42.5V (2) 35.2V (2) 39.7V (3) 35.6V (3) 40.5V (4) 41.3V (4) 42.5V (5) 39.7V (5) 42.5V
5	Input Capacitor Voltage	C 5 Rated : 180 u / 420 V	I/P:High-Line +3V =267 V O/P: (1)CV(max)	(1)410 V (2) 418V

			(2)CV(min) (3)no load (4)OUTPUT SHORT Ta:25°C	(3) 406V (4) 410V
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) 15.8V (2) 15.8V (3) 15.8V (4) 15.8V U2 (1) 15.2V (2) 15.2V (3) 15.2V (4) 15.2V U102 (1) 12.6V (2) 12.6V (3) 12.4V (4) 12.6V

## ■ 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: 2.620 mA I/P-FG: 2.550 mA O/P-FG: 1.911 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: 10G Ω 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-360-12</p> <p>1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.4 °C</p> <p>2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 48.6 °C</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25.4 °C</th> <th>HIGH AMBIENT Ta= 48.6 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>32.9°C</td><td>56.3°C</td></tr> <tr><td>2</td><td>ZNR1</td><td>31.3°C</td><td>54.7°C</td></tr> <tr><td>3</td><td>RTH1</td><td>34.0°C</td><td>57.3°C</td></tr> <tr><td>4</td><td>RY1</td><td>39.7°C</td><td>63.0°C</td></tr> <tr><td>5</td><td>RTH2</td><td>48.8°C</td><td>71.4°C</td></tr> <tr><td>6</td><td>LF2</td><td>39.6°C</td><td>63.6°C</td></tr> <tr><td>7</td><td>C2</td><td>29.6°C</td><td>52.8°C</td></tr> <tr><td>8</td><td>LF3</td><td>29.9°C</td><td>51.7°C</td></tr> <tr><td>9</td><td>L1</td><td>41.8°C</td><td>65.6°C</td></tr> <tr><td>10</td><td>BD1</td><td>44.2°C</td><td>66.9°C</td></tr> <tr><td>11</td><td>R10</td><td>36.7°C</td><td>59.5°C</td></tr> <tr><td>12</td><td>Q1</td><td>45.0°C</td><td>67.0°C</td></tr> <tr><td>13</td><td>D4</td><td>44.1°C</td><td>67.0°C</td></tr> <tr><td>14</td><td>C5</td><td>45.0°C</td><td>68.6°C</td></tr> <tr><td>15</td><td>U2</td><td>33.2°C</td><td>55.7°C</td></tr> <tr><td>16</td><td>U1</td><td>40.2°C</td><td>62.6°C</td></tr> <tr><td>17</td><td>Q15</td><td>52.6°C</td><td>75.7°C</td></tr> <tr><td>18</td><td>Q6</td><td>46.6°C</td><td>70.0°C</td></tr> <tr><td>19</td><td>C14</td><td>40.3°C</td><td>62.7°C</td></tr> <tr><td>20</td><td>C6</td><td>29.7°C</td><td>51.7°C</td></tr> <tr><td>21</td><td>T1coil</td><td>73.1°C</td><td>99.4°C</td></tr> <tr><td>22</td><td>T1core</td><td>69.8°C</td><td>96.6°C</td></tr> <tr><td>23</td><td>Q215</td><td>53.7°C</td><td>78.6°C</td></tr> <tr><td>24</td><td>Q210</td><td>49.5°C</td><td>73.4°C</td></tr> <tr><td>25</td><td>C102</td><td>69.0°C</td><td>95.8°C</td></tr> <tr><td>26</td><td>C104</td><td>44.1°C</td><td>67.6°C</td></tr> <tr><td>27</td><td>LF100</td><td>56.3°C</td><td>80.5°C</td></tr> <tr><td>28</td><td>RG100</td><td>51.2°C</td><td>74.6°C</td></tr> <tr><td>29</td><td>RTH3</td><td>40.2°C</td><td>64.0°C</td></tr> <tr><td>30</td><td>Q201</td><td>51.9°C</td><td>74.6°C</td></tr> <tr><td>31</td><td>U110</td><td>40.9°C</td><td>63.9°C</td></tr> <tr><td>32</td><td>C130</td><td>46.6°C</td><td>70.2°C</td></tr> <tr><td>33</td><td>J102</td><td>79.1°C</td><td>103.8°C</td></tr> <tr><td>34</td><td>R105</td><td>68.0°C</td><td>93.8°C</td></tr> <tr><td>35</td><td>D104</td><td>53.2°C</td><td>77.0°C</td></tr> <tr><td>36</td><td>Q10</td><td>46.5°C</td><td>70.7°C</td></tr> <tr><td>37</td><td>U100</td><td>61.8°C</td><td>86.3°C</td></tr> </tbody> </table>			NO	Position	ROOM AMBIENT Ta= 25.4 °C	HIGH AMBIENT Ta= 48.6 °C	1	LF1	32.9°C	56.3°C	2	ZNR1	31.3°C	54.7°C	3	RTH1	34.0°C	57.3°C	4	RY1	39.7°C	63.0°C	5	RTH2	48.8°C	71.4°C	6	LF2	39.6°C	63.6°C	7	C2	29.6°C	52.8°C	8	LF3	29.9°C	51.7°C	9	L1	41.8°C	65.6°C	10	BD1	44.2°C	66.9°C	11	R10	36.7°C	59.5°C	12	Q1	45.0°C	67.0°C	13	D4	44.1°C	67.0°C	14	C5	45.0°C	68.6°C	15	U2	33.2°C	55.7°C	16	U1	40.2°C	62.6°C	17	Q15	52.6°C	75.7°C	18	Q6	46.6°C	70.0°C	19	C14	40.3°C	62.7°C	20	C6	29.7°C	51.7°C	21	T1coil	73.1°C	99.4°C	22	T1core	69.8°C	96.6°C	23	Q215	53.7°C	78.6°C	24	Q210	49.5°C	73.4°C	25	C102	69.0°C	95.8°C	26	C104	44.1°C	67.6°C	27	LF100	56.3°C	80.5°C	28	RG100	51.2°C	74.6°C	29	RTH3	40.2°C	64.0°C	30	Q201	51.9°C	74.6°C	31	U110	40.9°C	63.9°C	32	C130	46.6°C	70.2°C	33	J102	79.1°C	103.8°C	34	R105	68.0°C	93.8°C	35	D104	53.2°C	77.0°C	36	Q10	46.5°C	70.7°C	37	U100	61.8°C	86.3°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	±0.0063 %/°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) 192333.6HRS (2) 37464.9HRS (3) 212037.7HRS (4) 600072.3HRS	
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