



Test Report: NPB-360-12

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> <p>Ch2 Max 316 V Ch4 Max 42.6 A</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

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: NO LOAD Ta:25°C	NO DAMAGE 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 : ≤18V	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" style="width:100%; text-align:center;"> <tr> <td style="width:25%;"></td> <td style="width:25%;"></td> <td style="width:25%;"></td> <td style="width:25%;"></td> </tr> <tr> <td>Specification</td> <td>Result</td> <td>Specification</td> <td>Result</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>☉ Default 3 stage charging curve</p>					Specification	Result	Specification	Result						
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2.	LED INDICATOR	<table border="1"> <thead> <tr> <th>LED</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td>FLOATING/FULLY</td> </tr> <tr> <td>Red</td> <td>Charging (stage 1 or stage 2)</td> </tr> <tr> <td>Light off</td> <td>OVP /OUTPUT SHORT/OLP</td> </tr> <tr> <td>Green Flash</td> <td>OTP</td> </tr> </tbody> </table> <p>I/P: 230V O/P:TESTING LOAD Ta:25°C</p>	LED	Description	Green	FLOATING/FULLY	Red	Charging (stage 1 or stage 2)	Light off	OVP /OUTPUT SHORT/OLP	Green Flash	OTP		TEST : <u>OK</u>
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Green Flash	OTP													
3	FAN CONTROL (Typ.)	RTH3 \geq 50 \pm 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: \pm 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 VDS : (1) 439V (2) 435V (3) 415V (4) 468V Q6 VDS : (1) 423V (2) 427V (3) 415V (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 VDS : (1) 38.9V (2) 35.2V (3) 35.6V (4) 41.3V (5) 39.7V Q211 VDS : (1) 42.5V (2) 39.7V (3) 40.5V (4) 42.5V (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: 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
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■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																																																								
1	TEMPERATURE RISE TEST	MODEL : NPB-360-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.4 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 48.6 °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 434.8K 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

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