



Test Report: NPB-360-24

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

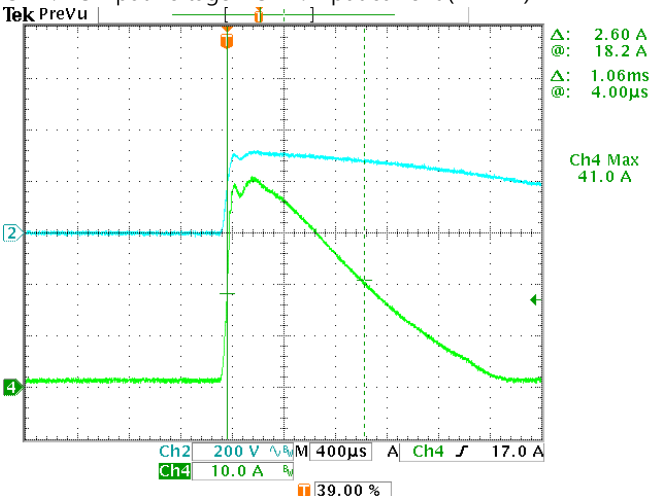
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BOOST CHARGE VOLTAGE	28.8V±0.3 V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	28.886V
2	FLOAT CHARGE VOLTAGE	27.6V± 0.3 V	I/P: 230 VAC O/P:NO LOAD Ta:25°C	27.89V
3	OUTPUT CURRENT	12A±3%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	12.169A
4	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25°C	0.0806mA
5	CHARGE VOLTAGE RANGE	21~30.4V	I/P: 230 VAC O/P: 90% LOAD Ta:25°C	19.178V~32.207V
6	CURRENT ADJUSTABLE RANGE	50%~100%	I/P: 230 VAC O/P:C.V MODE-1V Ta:25°C	45.69%~106.57%

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) 76.3V~264V (2) 104.93Vdc~370Vdc/FULL LOAD 104.94Vdc~370Vdc/50% LOAD (3) 104.97Vdc~370Vdc/FULL LOAD 104.93Vdc~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 =1.66A/ 230VAC I =3.35A/ 115VAC

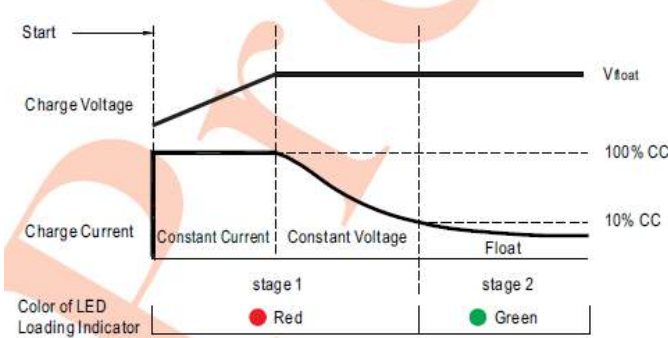
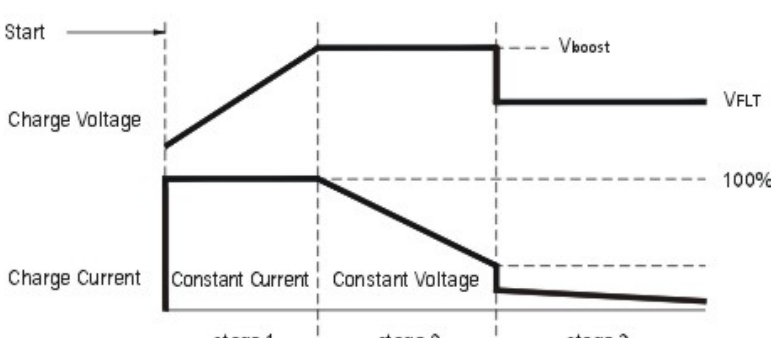
4	POWER FACTOR (TYP)	0.95/ 230 VAC 0.98/ 115 VAC	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	PF=0.978 / 230VAC PF=0.992/ 115VAC
5	EFFICIENCY (TYP)	92%	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	92.59%
6	INRUSH CURRENT (TYP)	230 V/ 50 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	I =41.0A
INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A) 				
7	GAIN-PHASE MARGIN TEST	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) 89.6 ° / -15.2 dB / -29dB/dec (2) 91 ° / dB / -12.4 -28.8dB/dec (3) 117.9 ° / -11.9 dB / -10.9dB/dec (4) 118 ° / -11 dB / -14.5dB/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	CH1:32V~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	37.2V/ 264VAC 37.2V/ 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	I/P:230Vac O/P:TESTING Ta:25°C ☉ Default 2 stage charging curve  <table><tr><td rowspan="2"></td><td colspan="2">2 stage charging curve</td><td colspan="2">3 stage charging curve</td></tr><tr><td>Specification</td><td>Result</td><td>Specification</td><td>Result</td></tr><tr><td>Charge Voltage</td><td>14.6V ~ 14.8V</td><td>14.6V ~ 14.8V</td><td>14.6V ~ 14.8V</td><td>14.6V ~ 14.8V</td></tr><tr><td>Charge Current</td><td>1.0A ~ 1.2A</td><td>1.0A ~ 1.2A</td><td>1.0A ~ 1.2A</td><td>1.0A ~ 1.2A</td></tr></table> 3 Stage 		2 stage charging curve		3 stage charging curve		Specification	Result	Specification	Result	Charge Voltage	14.6V ~ 14.8V	14.6V ~ 14.8V	14.6V ~ 14.8V	14.6V ~ 14.8V	Charge Current	1.0A ~ 1.2A	1.0A ~ 1.2A	1.0A ~ 1.2A	1.0A ~ 1.2A		
	2 stage charging curve			3 stage charging curve																			
	Specification	Result	Specification	Result																			
Charge Voltage	14.6V ~ 14.8V	14.6V ~ 14.8V	14.6V ~ 14.8V	14.6V ~ 14.8V																			
Charge Current	1.0A ~ 1.2A	1.0A ~ 1.2A	1.0A ~ 1.2A	1.0A ~ 1.2A																			

			輸入電圧範囲	出力電圧範囲 出力電流範囲	出力電流範囲 ≥ 出力電流範囲	
			△ ()	△ ()	△ ()	
2	LED INDICATOR		LED	Description	TEST : <u>OK</u>	
			Green	FLOATING/FULLY		
			Red	Charging (stage 1 or stage 2)		
			Light off	OVP /OUTPUT SHORT/OLP		
			Green Flash	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 : OK

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)=30.4V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	Q5 VDS : (1) 421V (2) 417V (3) 405V (4) 490V	Q6 VDS : (1) 413V (2) 413V (3) 397V (4) 490V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 600V /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) 438V (2) 438V (3) 397V (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) 470V (2) 466V (3) 426V (4) 454V	
4	Transistor Peak Voltage	Q210/Q211 Rated : 85V /140 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 VDS : (1) 72.2V (2) 62.8V (3) 69.2V (4) 76.5V	Q211 VDS : (1) 74.8V (2) 63.6V (3) 73.2V (4) 77.3V
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) 406V (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) 15.1V	U102 (1) 12.7V (2) 12.5V (3) 12.5V (4) 12.7V

■ 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: 2.605 mA I/P-FG: 2.544 mA O/P-FG: 1.910 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-360-48 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 18.0 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 45.9°C <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 18.0 °C</th><th>HIGH AMBIENT Ta= 45.9 °C</th></tr><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></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
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																																																																																																																																																					
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 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

2020.10.01 TAG-QA-009