



# Test Report: EPP-120S-12

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120W 3"X2" Green Open Frame Power Supply

## ■ 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

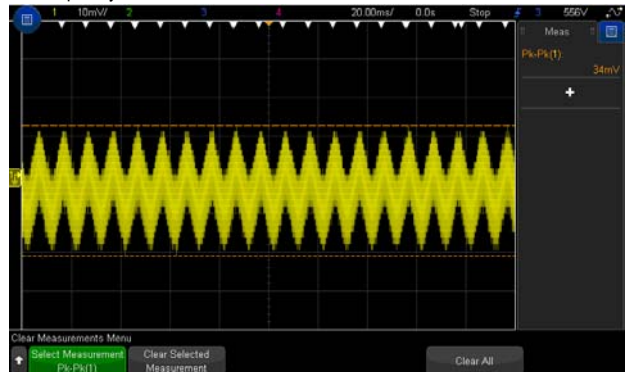
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 11.4 V~12.6 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	10.71V~13.25V/230VAC 10.71V~13.25V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -2%~ 2 %	I/P: 80VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.02 %~0.02%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5 %	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.01 %~0.01%
4	LOAD REGULATION(Max)	V1: -1 %~1 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.02 %~ 0.02 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	0.33 %
6	RIPPLE & NOISE(Max )	V1: 100 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 34mVp-p

high frequency :



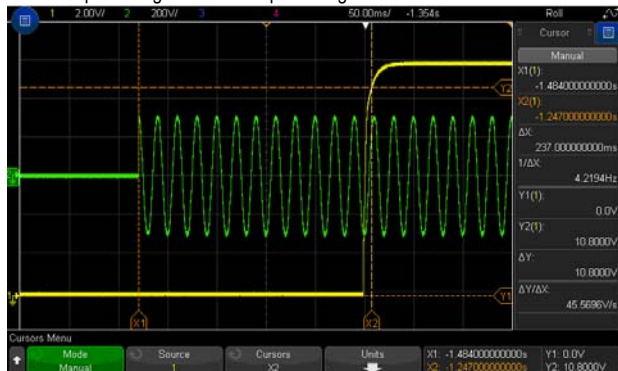
low frequency :



7	SET UP TIME(Max)	600ms/ 230VAC 600ms /115VAC/	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 237 ms 115VAC/ 199ms
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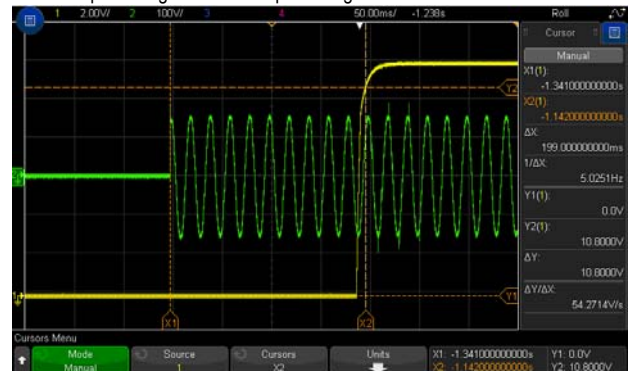
INPUT=230VAC/50HZ @ FULL LOAD

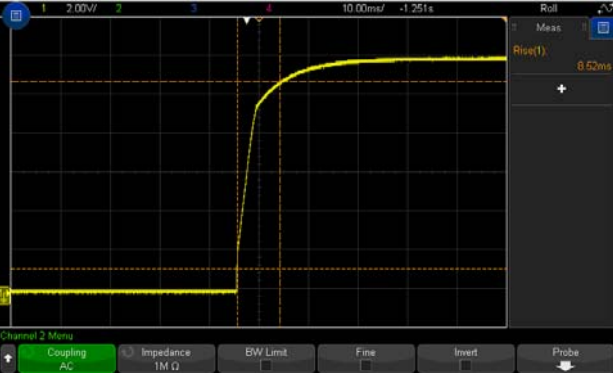
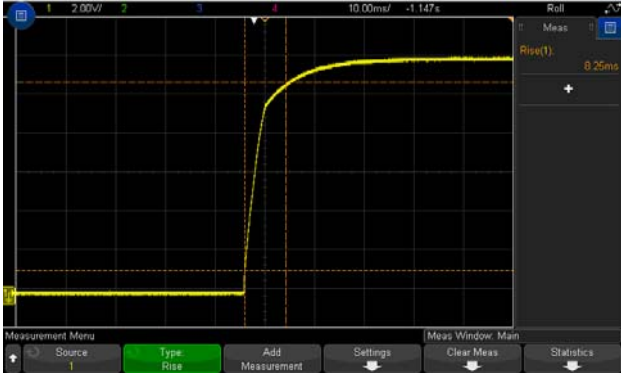
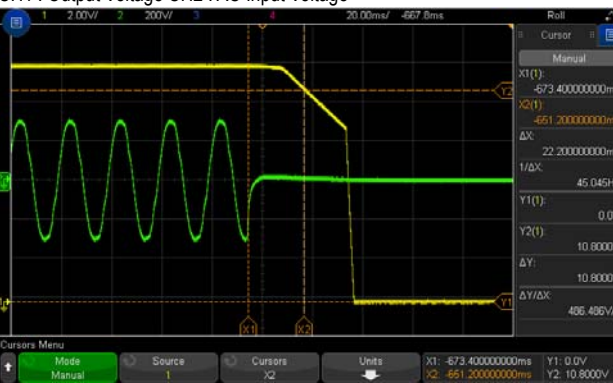



CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

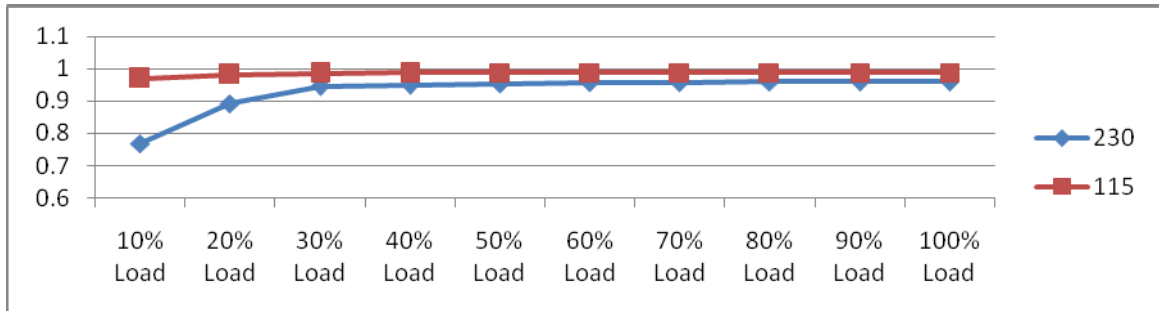


<p><b>8</b> RISE TIME (Max)</p>	<p>30ms/ 230VAC 30ms/ 115VAC/</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 8.52 ms 115VAC/ 8.25 ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> 	
<p><b>9</b> HOLD UP TIME (Typ.)</p>	<p>15ms/ 230VAC/ 15ms /115VAC/</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 22.2 ms 115VAC/ 22.4 ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> 	
<p><b>10</b> DYNAMIC LOAD</p>	<p>V1: 1200 mVp-p</p>	<p>I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C</p>	<p>191mVp-p 173mVp-p</p>
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p> 		<p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> 	

### INPUT FUNCTION TEST

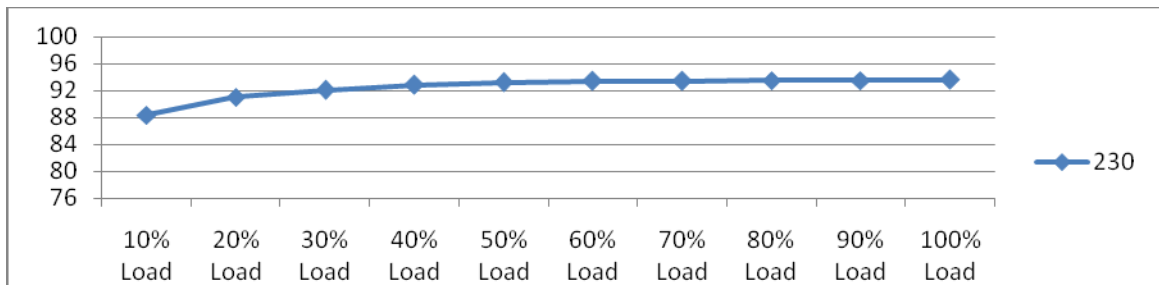
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	75V~264V
			I/P: LOW-LINE-3V=77 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:80 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/1.1A 115V/2.3A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I=0.56A/ 230VAC I=1.10A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.059 mA
5	NO LOAD CONSUMPTION	< 0.3W	I/P : 240VAC O/P : NO LOAD Ta : 25°C	0.281W
6	POWER FACTOR (Typ.)	0.94/ 230VAC 0.98/115VAC	I/P : 230 VAC	PF=0.960/230VAC PF=0.988/115VAC
			I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	

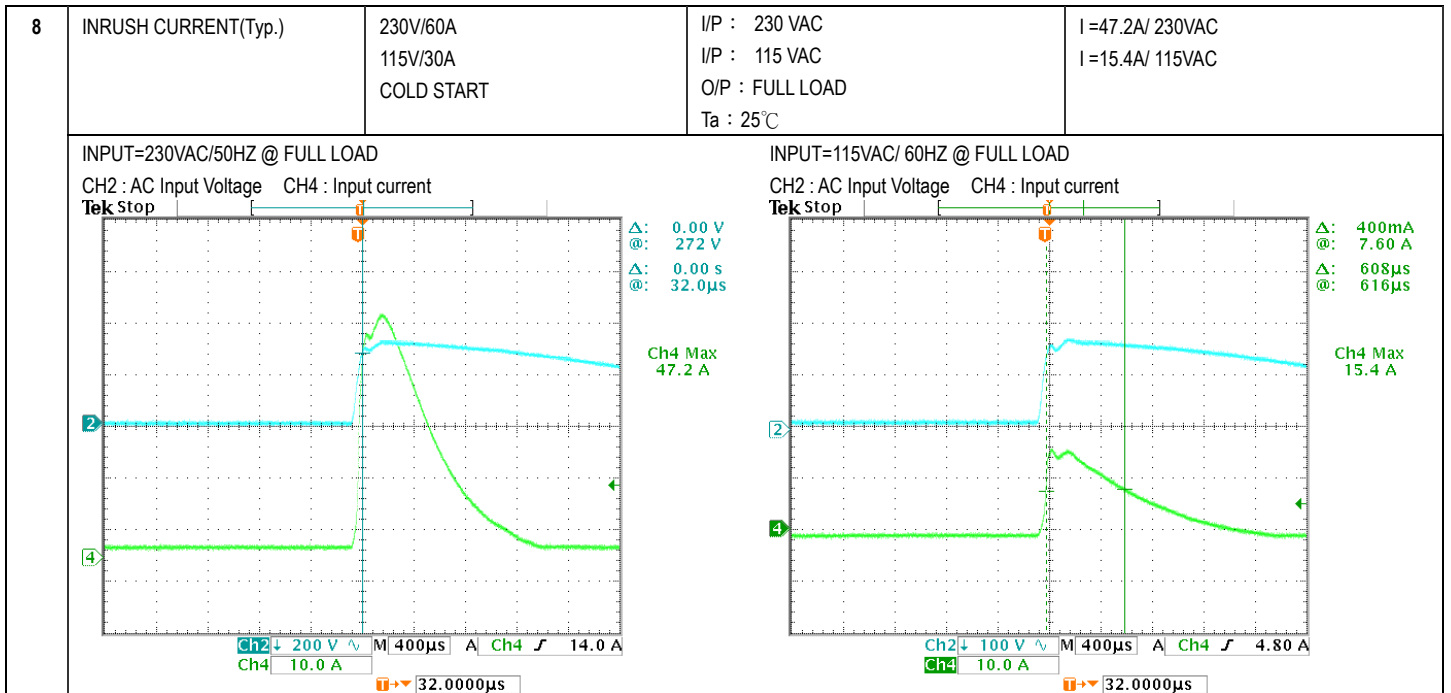
P.F vs LOAD



7	EFFICIENCY(Typ.)	91%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	93.6%
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EFFICIENCY vs LOAD





### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	130 %~160%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	146.1%/ 264VAC 146.1%/ 230VAC 145.6%/115VAC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	13.2V~15.6V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD Ta:25°C	14.81V/ 264VAC 14.57V/ 230VAC 14.57V/ 80VAC PROTECTION TYPE : Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down O/P voltage,re-power on to recover	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD	O.T.P. Active Protection type : Shut down O/P voltage,re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q3 Rated : 12A/ 600 V Q4 Rated : 12A/ 600 V	AC ON/OFF I/P: High-Line +3V =267V VDS: O/P: (1)Full Load	Q3 Q4 VDS: VDS: (1) 418V (1) 418V



			(2)Output Short (3)Full load continue Ta:25°C	(2) 398V (3) 410V	(2) 430V (3) 406V
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : 18A/ 600V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full load continue Ta:25°C	VDS: (1) 430V (2) 402V (3) 414V	
3	P.F.C DIODE	D1 Rated : 9A/ 600 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	(1) 490V (2) 430V (3) 498V (4) 498V	
4	Diode Peak Voltage	Q101 Rated : 110A/40 V Q102 Rated : 110A/ 40 V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3)Full load continue Ta:25°C	Q101: VDS: (1) 29.9V (2) 11.3V (3) 28.8V	Q102 VDS (1) 32.2V (2) 8.3V (3) 30.0V
5	Input Capacitor Voltage	C5 Rated: : 100 $\mu$ / 420 V	I/P:High-Line +3V =267V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25°C	(1) 414V (2) 414V (3) 418V (4) 402V	
6	Control IC Voltage Test	PWM IC U1 Rated -0.3 V~ 30 V  PFC IC U2 Rated -0.3V~30V  O/P IC U101 Rated -0.3V~38V	AC ON/OFF I/P:High-Line +3V =267 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(LOW LINE) Ta:25°C	U1 (1) 11.6V (2) 11.6V (3) 11.6V (4) 11.6V (5) 11.6V  U101 (1) 12.2V (2) 1.0V (3) 11.2V (4) 14.6V (5) 11.0V	U2 (1) 26.0V (2) 25.8V (3) 25.8V (4) 26.0V (5) 25.8V

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min I/P-FG :2KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 4.4KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.8KVAC/min Ta:25°C	I/P-O/P:1.8mA I/P-FG:1.2mA O/P-FG:1.04m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25°C	I/P-O/P: 9999M $\Omega$ I/P-FG: 9999M $\Omega$ O/P-FG: 9999M $\Omega$ NO DAMAGE

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 <input checked="" type="checkbox"/> CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL
2	CONDUCTION	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	<input checked="" type="checkbox"/> EN55032 <input type="checkbox"/> EN55011 CLASS I: CLASS B CLASS II: CLASS A	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 <input type="checkbox"/> MEDICAL <u>AIR : 15KV / Contact : 8KV</u> <input type="checkbox"/> LIGHT INDUSTRY <u>AIR : 8KV / Contact : 4KV</u> <input checked="" type="checkbox"/> INDUSTRY AIR: 8KV / Contact: 4KV <input type="checkbox"/> Din rail Model : AIR: 15KV / Contact: 8KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
5	E.F.T	EN61000-4-4 <input type="checkbox"/> LIGHT INDUSTRY INPUT : 1KV <input type="checkbox"/> MEDICAL <input checked="" type="checkbox"/> INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
6	SURGE	IEC61000-4-5 <input type="checkbox"/> MEDICAL <input type="checkbox"/> LIGHT INDUSTRY L-N : 1KV L,N-PE : 2KV <input checked="" type="checkbox"/> INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> 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 : RPS-120S-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 22.7 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 53.4 °C		

		NO	Position	ROOM AMBIENT Ta= 22.7 °C	HIGH AMBIENT Ta= 53.4 °C
		1	PCB	53.1°C	82.4°C
		2	LF1	48.1°C	76.1°C
		3	L2	67.4°C	92.5°C
		4	BD1	71.0°C	95.7°C
		5	Q1	75.9°C	97.7°C
		6	L1	77.0°C	98.4°C
		7	C5	57.2°C	79.8°C
		8	T1 COIL	93.2°C	106.4°C
		9	TI CORE	79.8°C	103.7°C
		10	RTH2	49.6°C	74.5°C
		11	C101	60.9°C	87.5°C
		12	C100	60.6°C	75.8°C
		13	L100	60.4°C	82.9°C
		14	U1	64.1°C	90.3°C
		15	U2	70.9°C	88.9°C
		16	D1	79.4°C	83.6°C
		17	Q3	82.9°C	102.3°C
		18	Q4	66.6°C	97.9°C
		19	Q101	81.2°C	105.3°C
		20	Q102	73.9°C	102.3°C
		21	C103	71.6°C	90.4°C
		22	R101	73.0°C	96.4°C
		23	R40	66.3°C	91.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P : 230 VAC O/P : 142% LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -35°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C /95 %R.H NO DAMAGE		I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03%/°C (0~50°C)		I/P : 230 VAC O/P : FULL LOAD	±0.0001%/°C (0~50°C)
6	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 : 10 CYCLE 5. Input/Output condition : STATIC	
7	THERMAL SHOCK TEST	-30~50°C		1. Thermal shock Temperature : -35°C~ +55°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	





8	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
9	CAPACITOR LIFE CYCLE	SUPPOSE C100 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=50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME	(1) 201512.6 HRS (2) 47660.6 HRS (3) 63599.3 HRS (4) 136254.7 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 468K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

2018.4.30 GP-A50-F010