



# Test Report: EPP-120S-15

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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

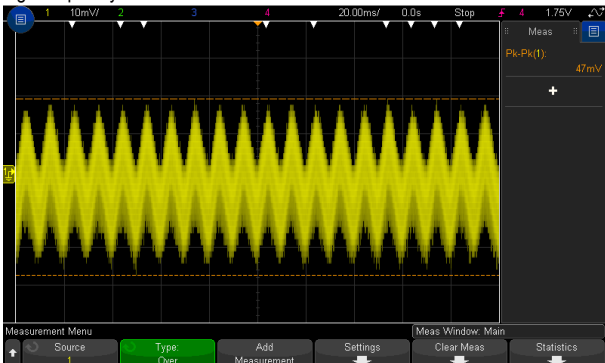
- ENVIRONMENT TEST

DESIGN VERIFY TEST

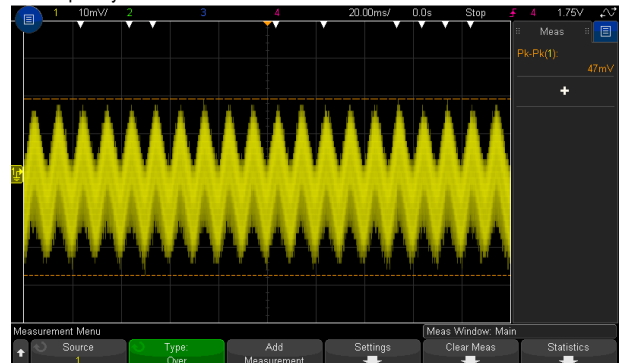
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 14.3 V~ 15.8V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	13.37V~16.72V/230VAC 13.31V~16.681V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -2%~ 2 %	I/P: 80VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.2 %~ 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: -0.2 %~ 0.02%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.0%
6	RIPPLE & NOISE(Max)	V1: 120 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 47mVp-p

high frequency :



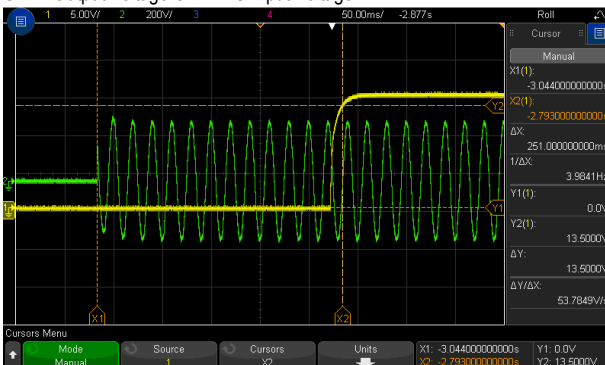
low frequency :



7	SET UP TIME(Max)	230VAC/600ms 115VAC/600ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 251 ms 115VAC/ 276 ms
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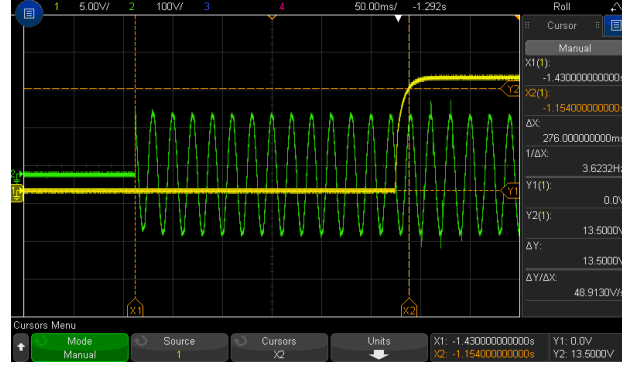
INPUT=230VAC/50HZ @ FULL LOAD

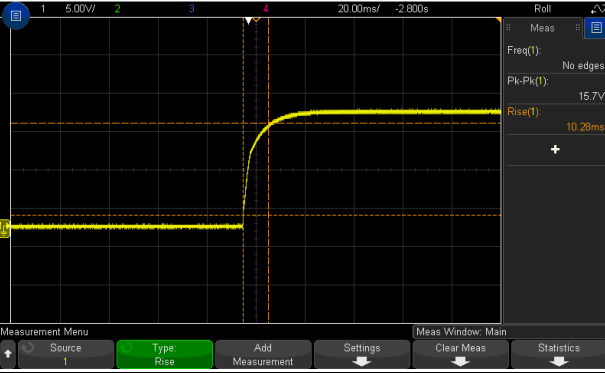
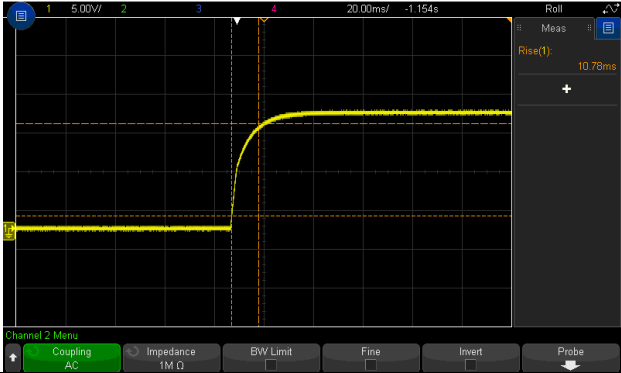
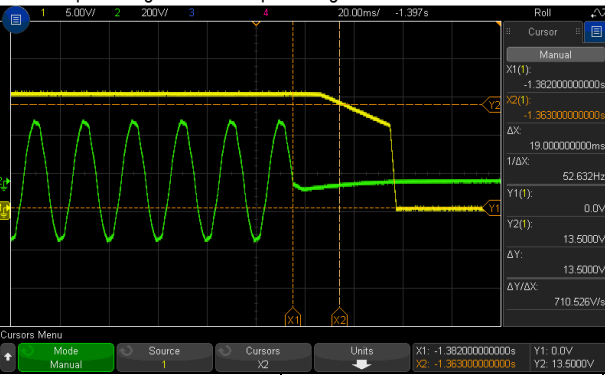
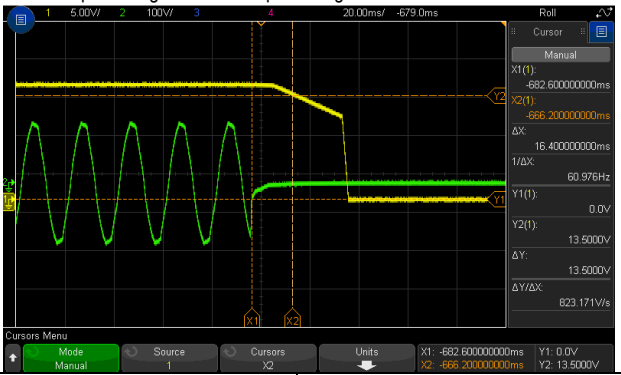
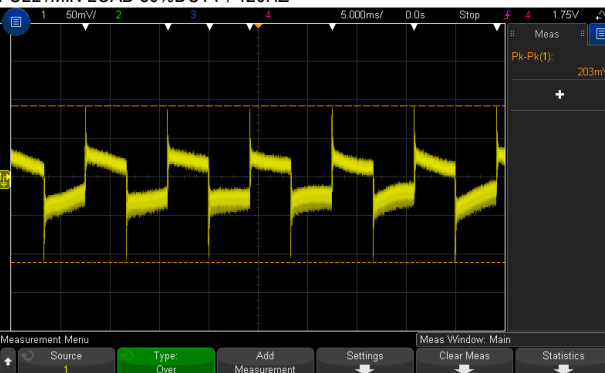

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

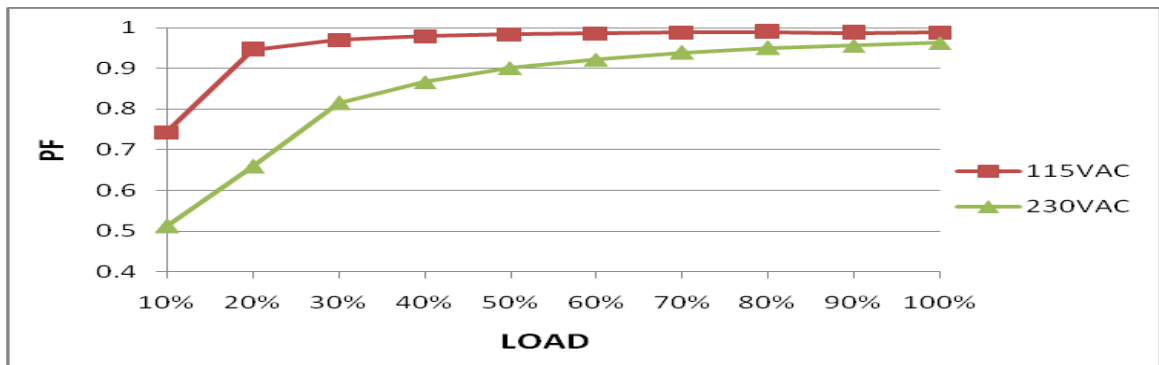


<p><b>8</b></p> <p>RISE TIME (Max)</p>	<p>230VAC/30ms 115VAC/30ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 10.28ms 115VAC/ 10.78 ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> 	
<p><b>9</b></p> <p>HOLD UP TIME (Typ.)</p>	<p>230VAC/15ms 115VAC/15ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 19 ms 115VAC/ 16.4ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage</p> 	
<p><b>10</b></p> <p>DYNAMIC LOAD</p>	<p>V1: 1500 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>203mVp-p 191mVp-p</p>
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p> 		<p>FULL /MIN LOAD 50%DUTY / 1KHZ</p> 	

### INPUT FUNCTION TEST

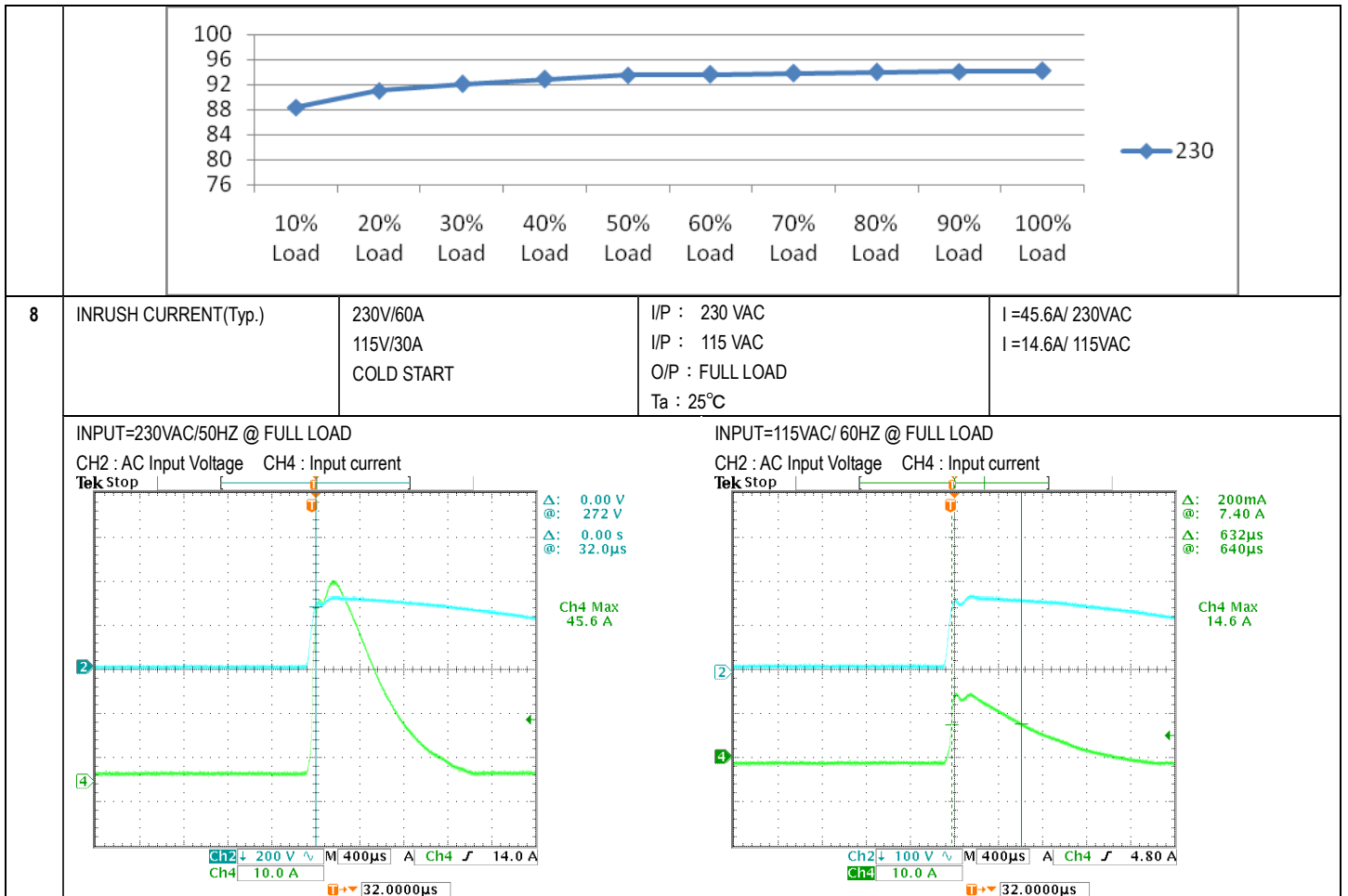
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC~264VAC 113VDC ~ 370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25°C	(1) 72V~264V (2) 104.7Vdc~370Vdc/FULL LOAD 104.6Vdc~370Vdc/50% LOAD (3) 104.7Vdc~370Vdc/FULL LOAD 104.7Vdc~370Vdc/50% LOAD
			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=0.55A/ 230VAC I=0.96A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.11 mA
5	NO LOAD CONSUMPTION	< 0.3W	I/P : 240VAC O/P : NO LOAD Ta : 25°C	<0.23W
6	POWER FACTOR (Typ.)	0.94/ 230VAC 0.98/115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF=0.959/230VAC PF=0.989/115VAC

P.F vs LOAD



7	EFFICIENCY(Typ.)	92%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.2%
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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	143.3%/ 264VAC 143.4%/ 230VAC 144.2%/115VAC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	16.5V~19.5V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P:MIN LOAD Ta:25°C	18.3V/ 264VAC 18.3V/ 230VAC 18.3V/ 80VAC PROTECTION TYPE : Shut down O/P voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down o/p voltage, recovers automatically after temperature goes down	I/P: 264VAC I/P: 90VAC O/P:FULL LOAD	O.T.P.Active Protection type : Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 90VAC 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 : 11A/ 650 V Q4 Rated : 11A/ 650 V	AC ON/OFF I/P:High-Line +3V =267V VDS: O/P: (1)Full Load (2)Output Short (3)Full load continue Ta:25°C	Q3 VDS: (1) 410V (2) 390V (3) 402V Q4 VDS: (1)414V (2)410V (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) 483V (2) 430V (3) 446V
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) 426V (2) 406V (3) 426V (4) 430V
4	Diode Peak Voltage	Q101 Rated : 71 A/ 60 V Q102 Rated : 71 A/ 60 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) 35.6V (2) 11.9V (3) 35.6V Q102 VDS: (1) 37.6V (2) 5.1V (3) 37.6V
5	Input Capacitor Voltage	C5 Rated: : 100 μ / 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) 405V (2) 413V (3) 401V (4) 417V
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) 11.4V U2 (1) 25.9V (2) 25.9V (3) 25.9V (4) 25.9V (5) 25.7V U101 (1) 15.2V (2) 1.1V (3) 15.2V (4) 18.4V (5) 14.4V

### 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:1.0mA 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: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	BS EN/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	BS EN/EN55032 (CISPR32) 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) 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	BS EN/EN61000-4-2 <input type="checkbox"/> MEDICAL AIR : 15KV / Contact : 8KV <input type="checkbox"/> LIGHT INDUSTRY AIR : 8KV / Contact : 4KV <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	BS EN/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	BS EN/EN61000-4-5 <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																																																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 22.7 °C</th> <th>HIGH AMBIENT Ta= 53.4 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>PCB</td><td>53.1°C</td><td>82.4°C</td></tr> <tr><td>2</td><td>LF1</td><td>48.1°C</td><td>76.1°C</td></tr> <tr><td>3</td><td>L2</td><td>67.4°C</td><td>92.5°C</td></tr> <tr><td>4</td><td>BD1</td><td>71.0°C</td><td>95.7°C</td></tr> <tr><td>5</td><td>Q1</td><td>75.9°C</td><td>97.7°C</td></tr> <tr><td>6</td><td>L1</td><td>77.0°C</td><td>98.4°C</td></tr> <tr><td>7</td><td>C5</td><td>57.2°C</td><td>79.8°C</td></tr> <tr><td>8</td><td>T1 COIL</td><td>93.2°C</td><td>106.4°C</td></tr> <tr><td>9</td><td>TI CORE</td><td>79.8°C</td><td>103.7°C</td></tr> <tr><td>10</td><td>RTH2</td><td>49.6°C</td><td>74.5°C</td></tr> <tr><td>11</td><td>C101</td><td>60.9°C</td><td>87.5°C</td></tr> <tr><td>12</td><td>C100</td><td>60.6°C</td><td>75.8°C</td></tr> <tr><td>13</td><td>L100</td><td>60.4°C</td><td>82.9°C</td></tr> <tr><td>14</td><td>U1</td><td>64.1°C</td><td>90.3°C</td></tr> <tr><td>15</td><td>U2</td><td>70.9°C</td><td>88.9°C</td></tr> <tr><td>16</td><td>D1</td><td>79.4°C</td><td>83.6°C</td></tr> <tr><td>17</td><td>Q3</td><td>82.9°C</td><td>102.3°C</td></tr> <tr><td>18</td><td>Q4</td><td>66.6°C</td><td>97.9°C</td></tr> <tr><td>19</td><td>Q101</td><td>81.2°C</td><td>105.3°C</td></tr> <tr><td>20</td><td>Q102</td><td>73.9°C</td><td>102.3°C</td></tr> <tr><td>21</td><td>C103</td><td>71.6°C</td><td>90.4°C</td></tr> <tr><td>22</td><td>R101</td><td>73.0°C</td><td>96.4°C</td></tr> <tr><td>23</td><td>R40</td><td>66.3°C</td><td>91.3°C</td></tr> </tbody> </table>	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
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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	4071.1K hrs min. Telcordia SR-332 (Bellcore) ; 470.2K 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