



Test Report: RS-150-12

150W Single Output Switching 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

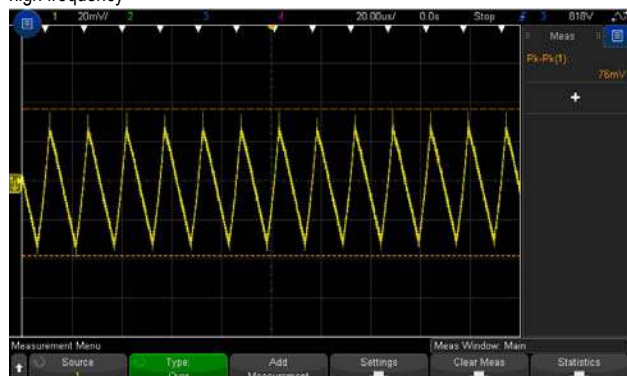
ENVIRONMENT TEST

DESIGN VERIFY TEST

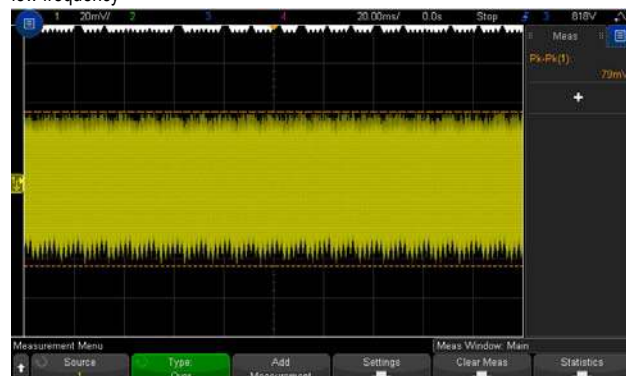
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 11.4 V~13.2 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	10.62V~13.65V/230VAC 10.62V~13.65V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1%~ 1 %	I/P: 88VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.33%~ 0.34 %
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5 %	I/P: 88VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.01 %~0.07%
4	LOAD REGULATION(Max)	V1: -0.5 %~0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.33%~ 0.34 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.5 %
6	RIPPLE & NOISE(Max)	V1: 120 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	79mVp-p

high frequency :



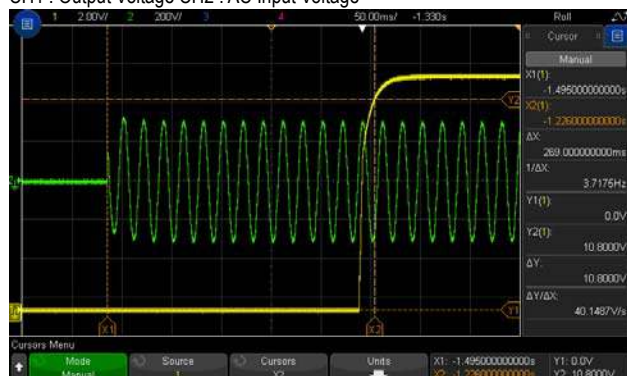
low frequency :



7	SET UP TIME(Max)	800ms /230VAC 1200ms /115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 269 ms 115VAC/ 268ms
---	------------------	---------------------------------	--	---------------------------------

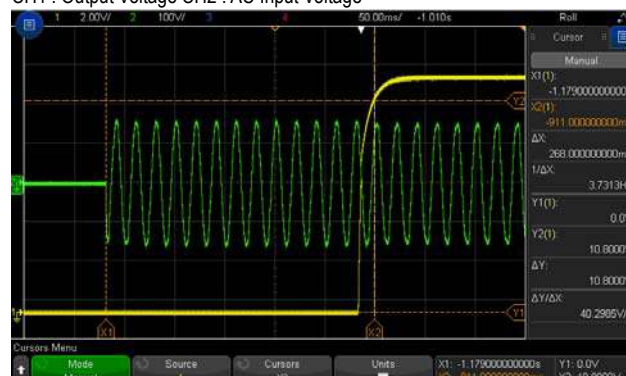
INPUT=230VAC/50HZ @ FULL LOAD

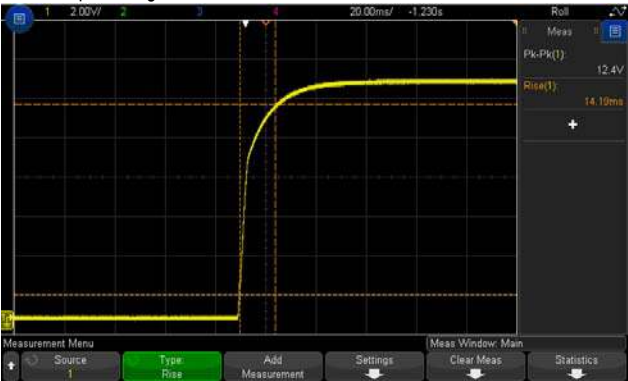
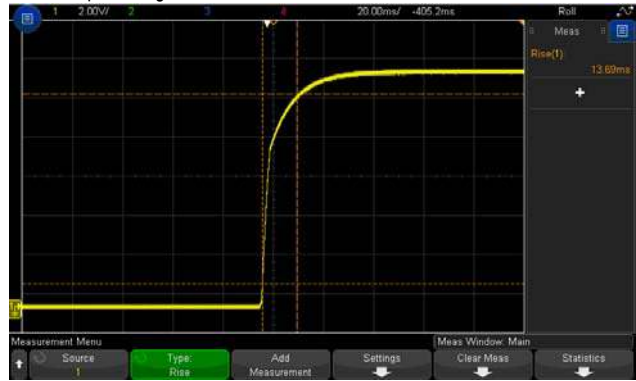
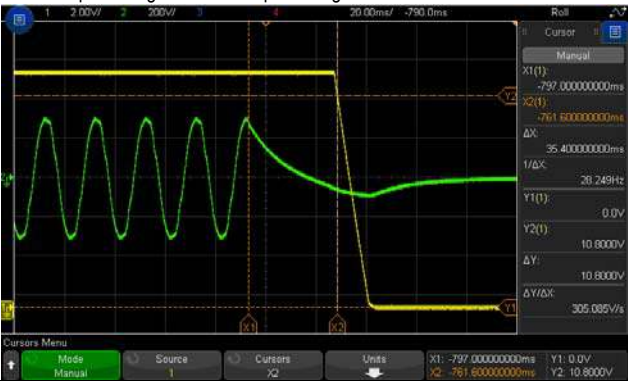
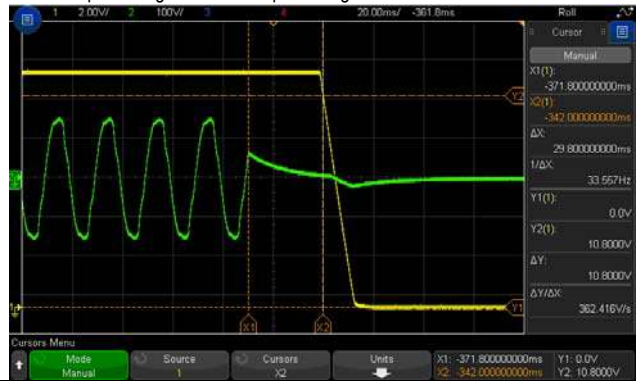
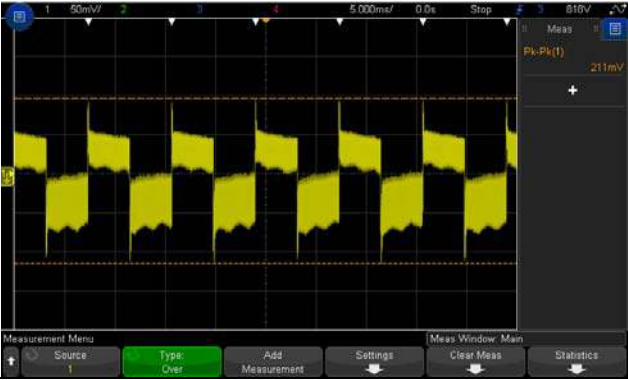
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

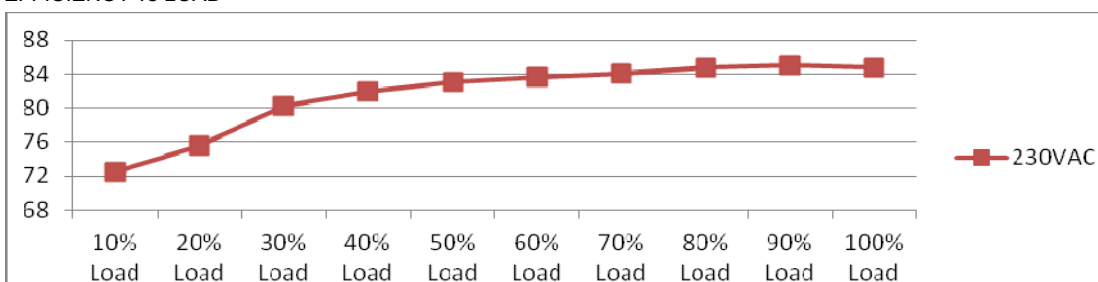


8	RISE TIME (Max)	20ms/ 230VAC 30ms/ 115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 14.19 ms 115VAC/ 13.69 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage  INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 				
9	HOLD UP TIME (Typ.)	28ms/ 230VAC 20ms /115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 35.4 ms 115VAC/ 29.8 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 				
10	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	211mVp-p 201mVp-p
FULL /MIN LOAD 50%DUTY / 120HZ  FULL /MIN LOAD 50%DUTY / 1KHZ 				

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	88VAC~264VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	81V~264V
			I/P: LOW-LINE-3V=85 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: 88 VAC ~264 VAC O/P: FULL~MIN LOAD Ta: 25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/2A 115V/3A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I=1.15A/ 230VAC I=2.12A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.6mA
5	EFFICIENCY(Typ.)	83%	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	84.8%

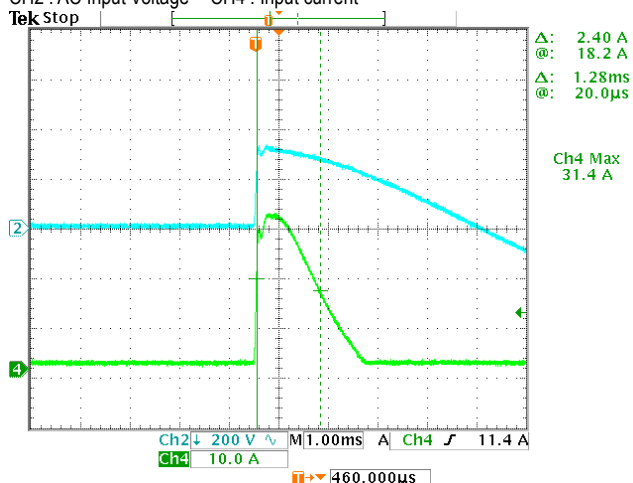
EFFICIENCY vs LOAD



6	INRUSH CURRENT(Typ.)	230V/40A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	31.4A
---	----------------------	------------------------	---	-------

INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~150%	I/P: 264VAC I/P: 230VAC I/P: 88VAC O/P: TESTING Ta:25°C	118.1%/ 264VAC 122.1%/ 230VAC 128.1%/88VAC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	13.8V~16.2V	I/P: 264VAC I/P: 230VAC I/P: 88VAC O/P: MIN LOAD Ta:25°C	14.8V/ 264VAC 14.8V/ 230VAC 14.6V/ 88VAC PROTECTION TYPE : Hiccup mode ,recovers automatically after fault condition is removed
3	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	Q1 Rated : 9A/ 900 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	VDS: (1) 714V (2) 827V (3) 698V
2	O/P DIODE	D60 Rated : 20A/ 100 V	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	(1) 76.7V (2) 77.5V (3) 55.0V
3	Input Capacitor Voltage	C5 Rated: : 330 μ / 200 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) 188V (2) 186V (3) 186V (4) 184V
4	Control IC Voltage Test	U1 Rated : 8.4V~ 21 V	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	(1) 15.6V (2) 15.2V (3) 15.4V (4) 14.6V (5) 13.1V
5	Clamp Diode	D1 Rated : 2A/ 1000 V	AC ON/OFF I/P : High-Line +3V = 267 V O/P : (1) Dynamic Load 90%Duty/1KHz (2) Full load continue Ta : 25°C	(1) 755V (2) 610V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG:2 KVAC/min O/P-FG: 0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P- FG: 2.4 KVAC/min O/P - FG: 0.6 KVAC/min Ta:25°C	I/P-O/P:3.56mA I/P-FG:2.14mA O/P-FG:1.67mA 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 Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta: 25°C/70%RH	7mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	☒ PASS ☐ FAIL
2	CONDUCTION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 ☐ LIGHT INDUSTRY AIR: 8KV / Contact: 4KV ☒ INDUSTRY AIR: 8KV / Contact: 4KV ☐ Din rail Model : AIR: 15KV / Contact: 8KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 ☐ LIGHT INDUSTRY INPUT : 1KV ☐ MEDICAL ☒ INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV L/N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
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 : RS-150-24 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 28.9 ℃ 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 51.8℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 28.9 ℃</th><th>HIGH AMBIENT Ta=51.8 ℃</th></tr><tr><td>1</td><td>LF1</td><td>63.2℃</td><td>84.2℃</td></tr><tr><td>2</td><td>BD1</td><td>83.0℃</td><td>101.9℃</td></tr><tr><td>3</td><td>C5</td><td>69.3℃</td><td>88.0℃</td></tr><tr><td>4</td><td>T1</td><td>91.2℃</td><td>108.8℃</td></tr><tr><td>5</td><td>D60</td><td>82.3℃</td><td>101.1℃</td></tr><tr><td>6</td><td>ZD1</td><td>82.7℃</td><td>102.2℃</td></tr><tr><td>7</td><td>Q1</td><td>74.4℃</td><td>95.5℃</td></tr><tr><td>8</td><td>R2</td><td>110.8℃</td><td>128.7℃</td></tr><tr><td>9</td><td>C65</td><td>62.0℃</td><td>81.8℃</td></tr><tr><td>10</td><td>L60</td><td>91.2℃</td><td>110.6℃</td></tr><tr><td>11</td><td>ZD2</td><td>77.1℃</td><td>95.7℃</td></tr><tr><td>12</td><td>R57</td><td>85.5℃</td><td>104.2℃</td></tr><tr><td>13</td><td>U1</td><td>85.4℃</td><td>104.9℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 28.9 ℃	HIGH AMBIENT Ta=51.8 ℃	1	LF1	63.2℃	84.2℃	2	BD1	83.0℃	101.9℃	3	C5	69.3℃	88.0℃	4	T1	91.2℃	108.8℃	5	D60	82.3℃	101.1℃	6	ZD1	82.7℃	102.2℃	7	Q1	74.4℃	95.5℃	8	R2	110.8℃	128.7℃	9	C65	62.0℃	81.8℃	10	L60	91.2℃	110.6℃	11	ZD2	77.1℃	95.7℃	12	R57	85.5℃	104.2℃	13	U1	85.4℃	104.9℃
NO	Position	ROOM AMBIENT Ta= 28.9 ℃	HIGH AMBIENT Ta=51.8 ℃																																																									
1	LF1	63.2℃	84.2℃																																																									
2	BD1	83.0℃	101.9℃																																																									
3	C5	69.3℃	88.0℃																																																									
4	T1	91.2℃	108.8℃																																																									
5	D60	82.3℃	101.1℃																																																									
6	ZD1	82.7℃	102.2℃																																																									
7	Q1	74.4℃	95.5℃																																																									
8	R2	110.8℃	128.7℃																																																									
9	C65	62.0℃	81.8℃																																																									
10	L60	91.2℃	110.6℃																																																									
11	ZD2	77.1℃	95.7℃																																																									
12	R57	85.5℃	104.2℃																																																									
13	U1	85.4℃	104.9℃																																																									
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 122% LOAD Ta : 25℃	TEST : OK																																																								
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/88VAC O/P : 100 % LOAD Ta= -25℃	TEST : OK																																																								
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL50℃ /95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta=50 ℃ HUMIDITY= 95 %R.H	TEST : OK																																																								
5	TEMPERATURE COEFFICIENT	± 0.03%/℃ (0~50℃)	I/P : 230 VAC O/P : FULL LOAD	± 0.0081%/℃ (0~50℃)																																																								
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC		TEST : OK																																																								
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30℃~ +55℃ 2. Temperature change rate : 25℃ / 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		TEST : OK																																																								

8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 5G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C65 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) 263421.1HRS (2) 57729.1HRS (3) 65942.7 HRS (4) 81662.8HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 244K 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