



Test Report: LRS-100-5

100W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test

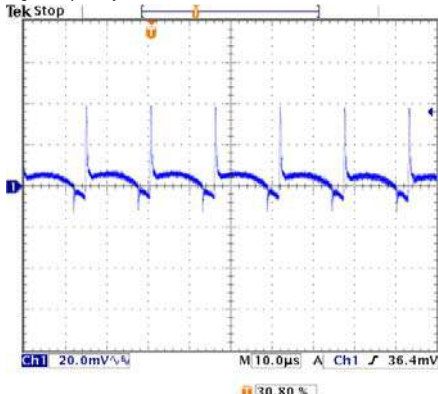
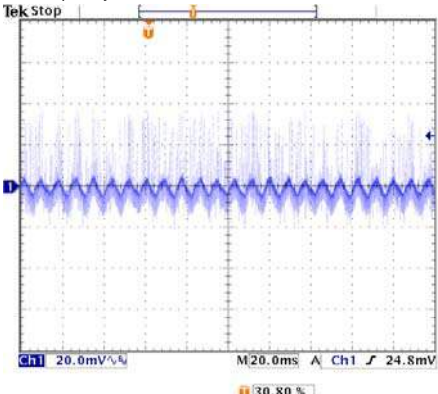
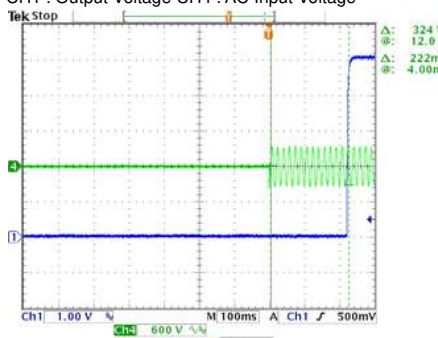
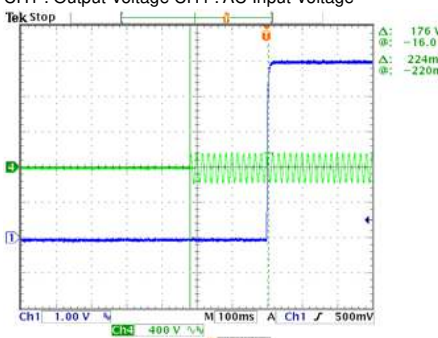
E.M.C. Test

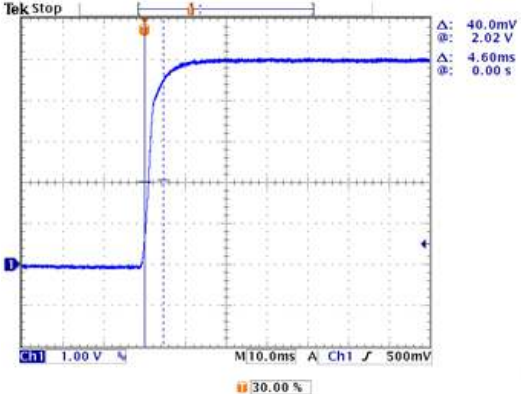
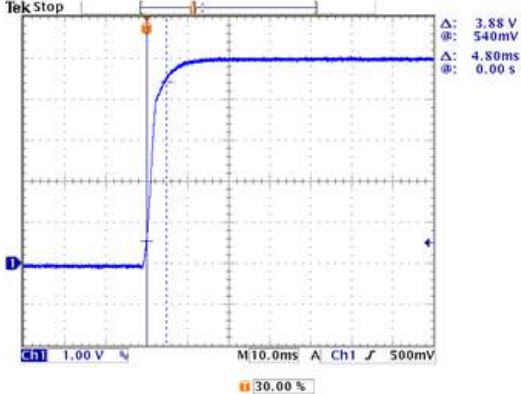
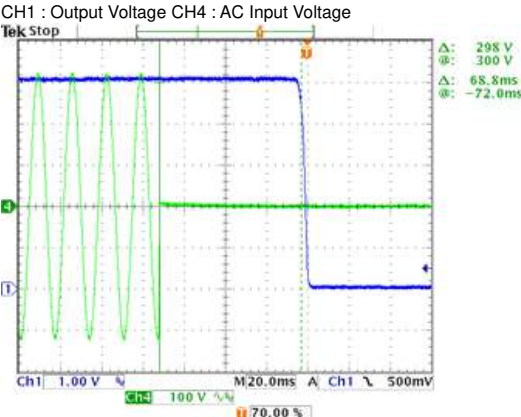
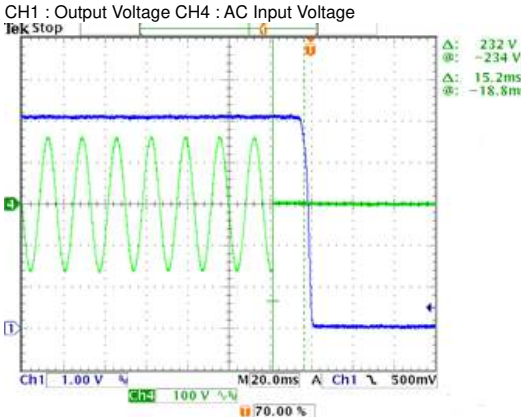
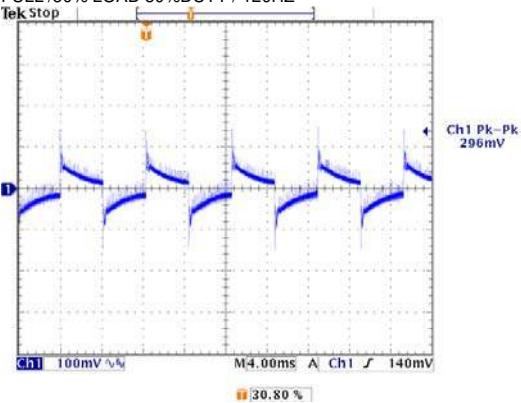
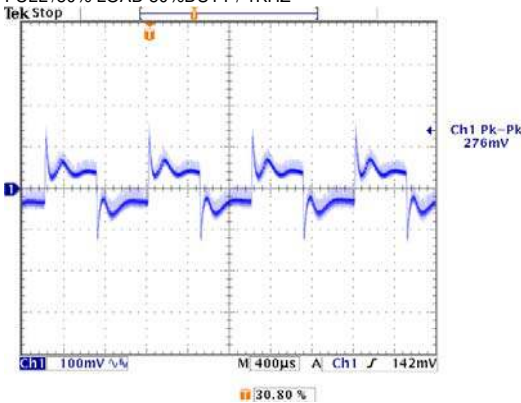
■ RELIABILITY TEST

ENVIRONMENT TEST

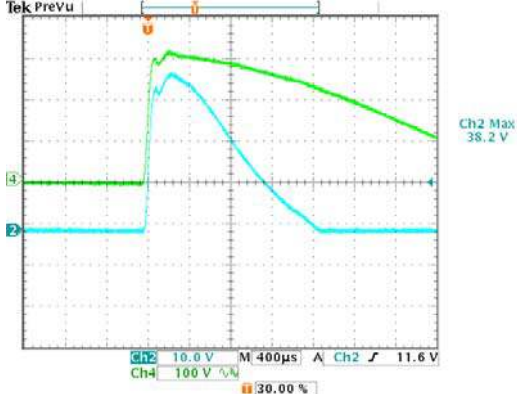
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

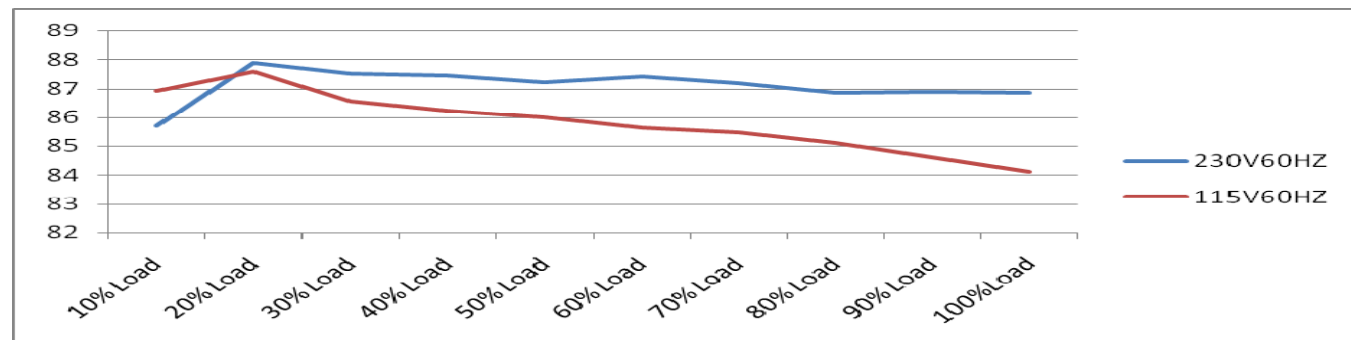
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.5 V~ 5.5 V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	4.205V~5.793V/230VAC 4.207V~5.791V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -2 %~ 2 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.1 %~ 0.1%
3	LINE REGULATION (Max)	V1: 0.5 %~ 0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.1 %~1%
4	LOAD REGULATION(Max)	V1: -1 %~ 1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0 %~ 0%
5	OVER/UNDERSHOOT TEST	< $\pm 10\%$	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 100 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 57.6mVp-p
high frequency :  Ch1 Pk-Pk 51.6mV Ch1 20.0mV/div M 10.0μs A Ch1 36.4mV 30.80 % low frequency :  Ch1 Pk-Pk 57.6mV Ch1 20.0mV/div M 20.0ms A Ch1 24.8mV 30.80 %				
7	SET UP TIME(Max)	230VAC/500ms 115VAC/ 500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 222ms 115VAC/ 224ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage  Δ: 324 V Φ: 12.0 V Δ: 222ms Φ: 4.00ms Ch1 1.00 V M 100ms A Ch1 500mV 600 V/div 70.00 % INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage  Δ: 176 V Φ: 16.0 V Δ: 224ms Φ: 220ms Ch1 1.00 V M 100ms A Ch1 500mV 400 V/div 70.00 %				

8	RISE TIME (Max)	230VAC/ 30ms 115VAC/ 30ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 4.60ms 115VAC/4.80ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME(Typ)	230VAC/ 55ms 115VAC/ 10ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/68.8ms 115VAC/ 15.2ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 	
10	DYNAMIC LOAD	V1: 1000 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	296mVp-p 276mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	75V~264V
			I/P: (1)LOW-LINE-3V=167 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:170 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 1.2A 115V/ 1.9A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =0.96A/ 230VAC I =1.64A/ 115VAC
4	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.328 mA N-FG: 0.328 mA
5	NO LOAD CONSUMPTION	< 0.3 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.264 W < 0.27 W
6	INRUSH CURRENT(Typ)	230V/50A COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I =38.2A/ 230VAC
INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage 				
7	EFFICIENCY(Typ)	86%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	86.85%

EFFICIENCY vs LOAD



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~ 150%	I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25℃	128.39%/ 230VAC 123.33%/115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	CH:5.75V~6.75V	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25℃	6.53V/ 230VAC 6.56V/115VAC Shut down Re- power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 11A/650V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25℃	(1) 574V (2) 588V (3) 574V (4) 576V (5) 574V (6) 608V (7) 614V (
2	Diode Peak Voltage	Q101 Rated 75A/60V	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/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25℃	Q101: (1)54.2V (2)51.6V (3)58.6V (4)57.8V (5)58.6V (6)57.8V (7)54.6V (8)54.6V
3	Input Capacitor Voltage	C5 Rated: 150 μ /400V 105℃	I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change Ta:25℃	(1)372V (2)372V (3)372V
4	Control IC Voltage Test	PWM IC U1 Rated 28 V(MAX) 9.5V(MIN)	I/P:High-Line +3V =267 V AC ON/OFF O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR MIN. LOW LINE Ta:25℃	(1) 18.5V (2) 12.6V (3) 17.2V (4) 19.0V (5) 12.3V
5	Clamp Diode Peak Voltage	D 5 Rated: 800 V 2 A	I/P: High-Line +3V = 267 V AC ON/OFF O/P: (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta: 25℃	(1) 490V (2) 490V

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:1.25KVAC/min	I/P-O/P: 4.4KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25℃	I/P-O/P:2.426mA I/P-FG:2.151mA O/P-FG:1.778m A 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: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25℃	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	40A / 2min Ta:25℃	5mΩ

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℃	PASS
2	CONDUCTION	EN55022 CLASS B	I/P: 230 VAC (50HZ) O/P: FULL/50% LOAD Ta: 25℃	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR: 8KV / Contact: 4KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25℃	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℃	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																												
1	TEMPERATURE RISE TEST	MODEL: LRS-100-5 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=18.6℃ 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=42.1℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 18.6 ℃</th><th>HIGH AMBIENT Ta=42.1 ℃</th></tr><tr><td>1</td><td>U100</td><td>79.3℃</td><td>105.1℃</td></tr><tr><td>2</td><td>U1</td><td>52.7℃</td><td>77.6℃</td></tr><tr><td>3</td><td>LF1</td><td>47.5℃</td><td>73.3℃</td></tr><tr><td>4</td><td>BD1</td><td>54.3℃</td><td>78.8℃</td></tr><tr><td>5</td><td>C5</td><td>46.7℃</td><td>69.7℃</td></tr><tr><td>6</td><td>D5</td><td>62.0℃</td><td>89.9℃</td></tr><tr><td>7</td><td>Q1</td><td>55.5℃</td><td>83.9℃</td></tr><tr><td>8</td><td>C35</td><td>59.5℃</td><td>85.4℃</td></tr><tr><td>9</td><td>D31</td><td>61.9℃</td><td>90.1℃</td></tr><tr><td>10</td><td>T1coil</td><td>73.7℃</td><td>101.9℃</td></tr><tr><td>11</td><td>C105</td><td>67.3℃</td><td>95.3℃</td></tr><tr><td>12</td><td>Q100</td><td>70.3℃</td><td>98.6℃</td></tr><tr><td>13</td><td>Q101</td><td>70.5℃</td><td>98.6℃</td></tr><tr><td>14</td><td>L100</td><td>63.4℃</td><td>90.9℃</td></tr><tr><td>15</td><td>RTH1</td><td>83.0℃</td><td>96.0℃</td></tr><tr><td>16</td><td>C107</td><td>64.9℃</td><td>93.0℃</td></tr><tr><td>17</td><td>R7</td><td>74.7℃</td><td>101.0℃</td></tr><tr><td>18</td><td>R15</td><td>59.2℃</td><td>88.4℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 18.6 ℃	HIGH AMBIENT Ta=42.1 ℃	1	U100	79.3℃	105.1℃	2	U1	52.7℃	77.6℃	3	LF1	47.5℃	73.3℃	4	BD1	54.3℃	78.8℃	5	C5	46.7℃	69.7℃	6	D5	62.0℃	89.9℃	7	Q1	55.5℃	83.9℃	8	C35	59.5℃	85.4℃	9	D31	61.9℃	90.1℃	10	T1coil	73.7℃	101.9℃	11	C105	67.3℃	95.3℃	12	Q100	70.3℃	98.6℃	13	Q101	70.5℃	98.6℃	14	L100	63.4℃	90.9℃	15	RTH1	83.0℃	96.0℃	16	C107	64.9℃	93.0℃	17	R7	74.7℃	101.0℃	18	R15	59.2℃	88.4℃
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 230 VAC O/P: 125 %LOAD Ta: 25℃	TEST: OK																																																																												
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 264VAC/100VAC O/P: 100 %LOAD Ta= -20 ℃	TEST: OK																																																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 ℃ NO DAMAGE	I/P: 272 VAC O/P: FULL LOAD Ta= 45℃ HUMIDITY= 95 %R.H	TEST: OK																																																																												
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃ (0~50℃)	I/P: 230 VAC O/P: FULL LOAD	±0.009%/℃ (0~40℃)																																																																												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +85℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK																																																																												
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30℃~ 70℃ 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 : 230VAC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec		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: 60min in each axis (X.Y.Z) (6) Ta: 25℃	TEST: OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 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) 157680HRS (2) 39885HRS (3) 99776HRS (4) 175200HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE: 720.6 KHRS	
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50℃	

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ

2007/3/20 A50-S014