



Test Report: LRS-100-15

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

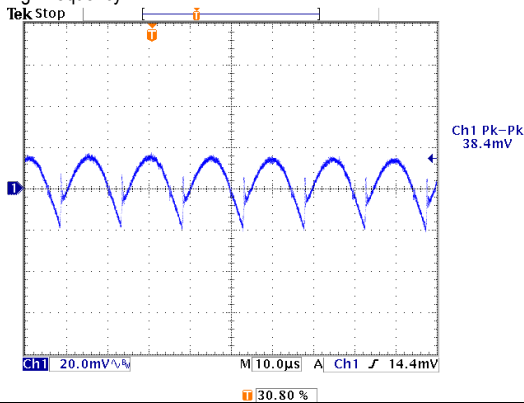
ENVIRONMENT TEST

DESIGN VERIFY TEST

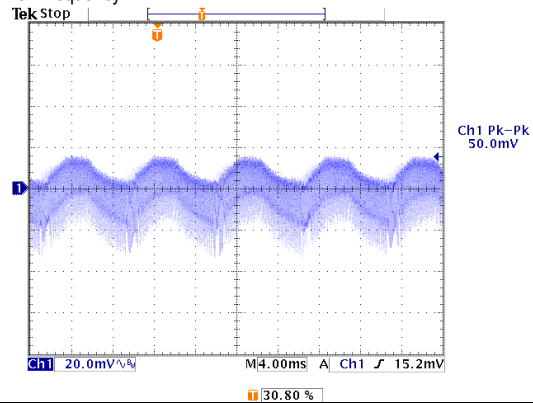
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 13.5 V~ 18 V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	12.589V~18.370V/230VAC 12.591V~18.200V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1%~ 1%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.03%~ 0.03%
3	LINE REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0%~0%
4	LOAD REGULATION(Max)	V1: -0.5%~0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:-0%~ 0%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 120 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 50mVp-p

high frequency :



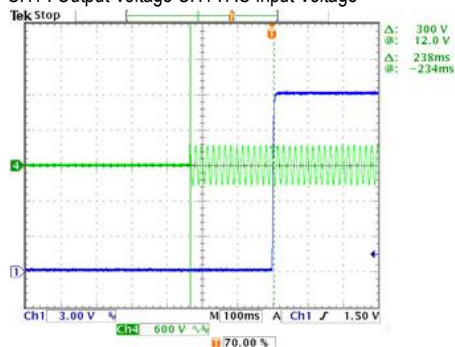
low frequency :



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/ 238ms 115VAC/ 240ms
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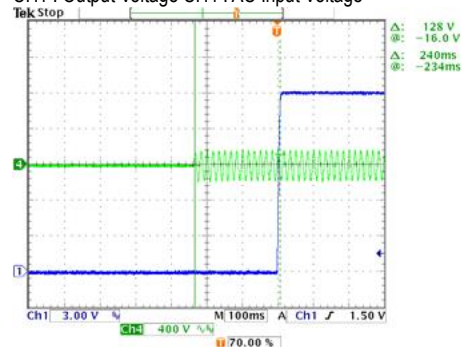
INPUT=230VAC/50HZ @ FULL LOAD

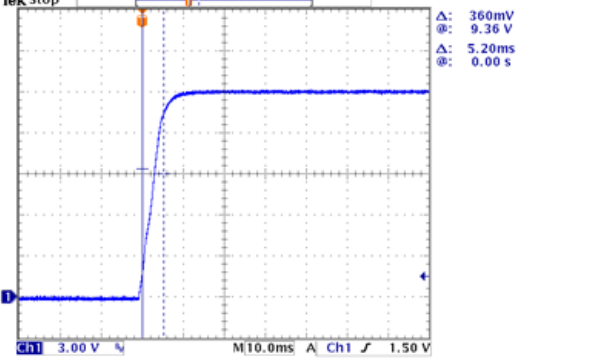
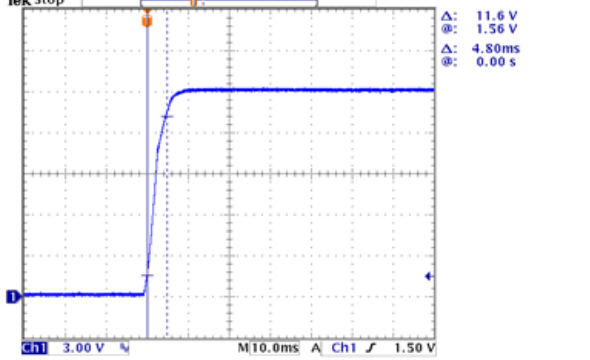
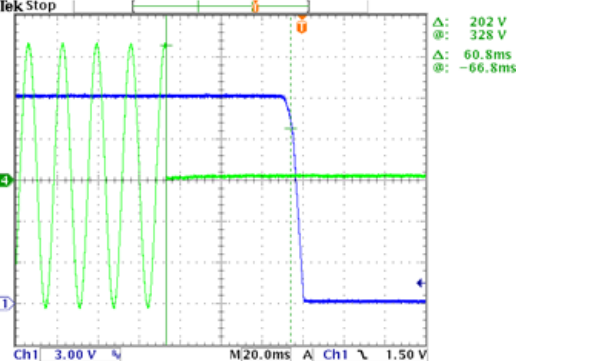
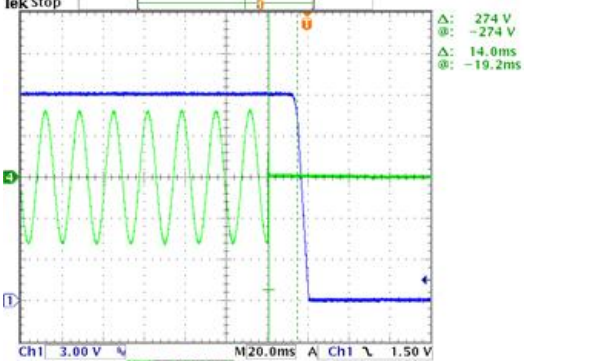
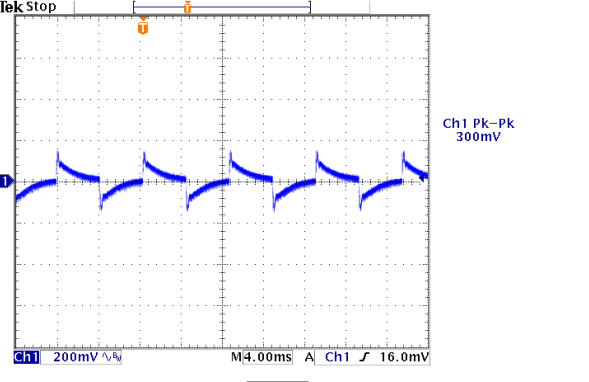
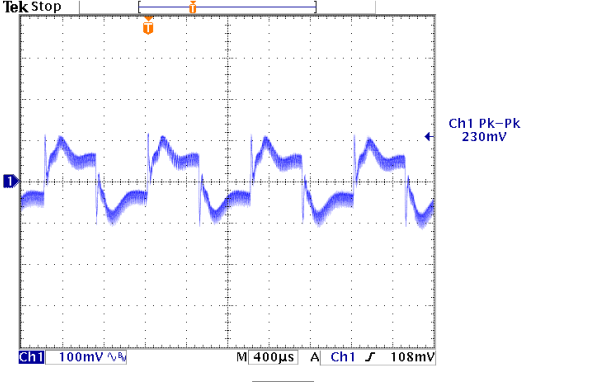
CH1 : Output Voltage CH4 : AC Input Voltage



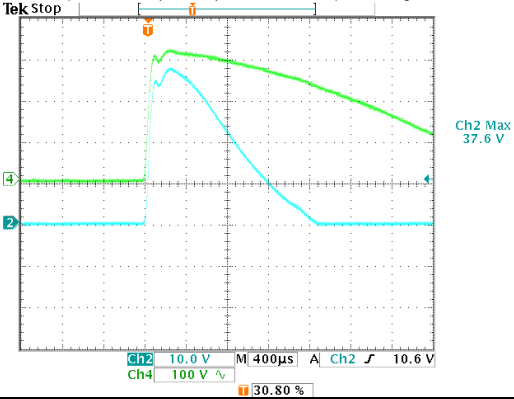
INPUT=115VAC/60HZ @ FULL LOAD

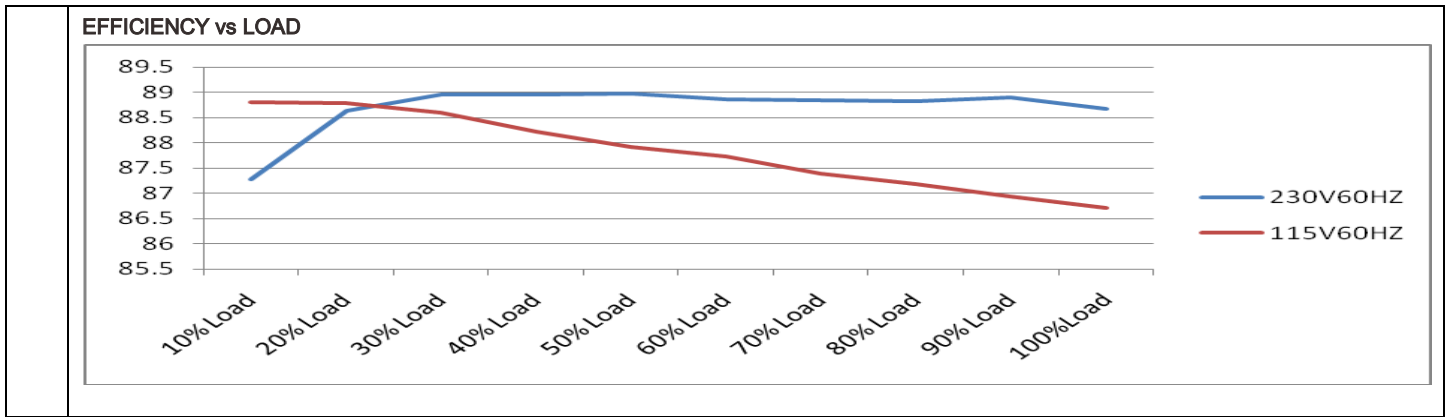
CH1 : Output Voltage CH4 : AC Input Voltage



8	RISE TIME (Max) 230VAC/ 30ms 115VAC/ 30ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 5.20ms 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/60.8ms 115VAC/ 14.0ms
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: 1500 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	300mVp-p 230mVp-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	73V~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 =1.07A/ 230VAC I =1.79A/ 115VAC
4	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.313mA N-FG: 0.313mA
5	NO LOAD CONSUMPTION	< 0.3 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.1145 W < 0.2106 W
6	INRUSH CURRENT(Typ)	230V/50A COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I =37.6A/ 230VAC
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage</p>  <p>Ch2 Max 37.6 V</p> <p>30.80 %</p>				
7	EFFICIENCY(Typ)	88.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	88.68%



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°C	130.0%/ 230VAC 126.0%/115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	CH:18.75V~21.75V	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	20.89V/ 230VAC 20.85V/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°C	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 11 A/ 600 V	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. ITa:25°C	(1)542V (2)522V (3)536V (4)540V (5)524V (6)564V (7)547V
2	Diode Peak Voltage	Q101 Rated 20A/ 120V	I/P: High-Line +3V =267 V AC ON/OFF	Q101: (1)94.0V

			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°C	(2)99.2V (3)94.0V (4)95.6V (5)94.8V (6)100V (7)97.2V (8)92.4V
3	Input Capacitor Voltage	C5 Rated: 150 μ /400V 105°C	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°C	(1)364V (2)362V (3)364V
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°C	(1) 19.8V (2) 14.1V (3) 20.0V (4) 24.7V (5) 11.8V
5	Clamp Diode Peak Voltage	D 5 Rated: GP20K 800 V 2A	I/P: High-Line +3V = 267 V AC ON/OFF O/P: (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta: 25°C	(1) 448V (2) 440V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P:4.125 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C	I/P-O/P:2.135mA I/P-FG:1.775mA O/P-FG:0.812m 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°C	I/P-O/P: MΩ I/P-FG: MΩ O/P-FG: MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	4mΩ

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

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																												
1	TEMPERATURE RISE TEST	MODEL: LRS-100-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=18.6°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=51.9°C																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 18.6 °C</th> <th>HIGH AMBIENT Ta=51.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U1</td><td>46.2°C</td><td>79.1°C</td></tr> <tr><td>2</td><td>D30</td><td>48.2°C</td><td>81.1°C</td></tr> <tr><td>3</td><td>LF1</td><td>44.3°C</td><td>78.5°C</td></tr> <tr><td>4</td><td>BD1</td><td>51.1°C</td><td>83.7°C</td></tr> <tr><td>5</td><td>C5</td><td>42.7°C</td><td>74.2°C</td></tr> <tr><td>6</td><td>D5</td><td>52.2°C</td><td>86.6°C</td></tr> <tr><td>7</td><td>Q1</td><td>51.6°C</td><td>86.6°C</td></tr> <tr><td>8</td><td>R15</td><td>51.7°C</td><td>86.1°C</td></tr> <tr><td>9</td><td>C35</td><td>43.0°C</td><td>76.2°C</td></tr> <tr><td>10</td><td>T1coil</td><td>56.3°C</td><td>89.4°C</td></tr> <tr><td>11</td><td>T1coil</td><td>60.9°C</td><td>93.7°C</td></tr> <tr><td>12</td><td>C105</td><td>46.1°C</td><td>78.9°C</td></tr> <tr><td>13</td><td>Q101</td><td>62.5°C</td><td>94.6°C</td></tr> <tr><td>14</td><td>L100</td><td>39.0°C</td><td>72.1°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 18.6 °C	HIGH AMBIENT Ta=51.9 °C	1	U1	46.2°C	79.1°C	2	D30	48.2°C	81.1°C	3	LF1	44.3°C	78.5°C	4	BD1	51.1°C	83.7°C	5	C5	42.7°C	74.2°C	6	D5	52.2°C	86.6°C	7	Q1	51.6°C	86.6°C	8	R15	51.7°C	86.1°C	9	C35	43.0°C	76.2°C	10	T1coil	56.3°C	89.4°C	11	T1coil	60.9°C	93.7°C	12	C105	46.1°C	78.9°C	13	Q101	62.5°C	94.6°C	14	L100	39.0°C	72.1°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 230 VAC O/P: 124 % 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= -30 °C	TEST: OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C 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%/°C (0~40°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40°C ~ +85°C 2. Temperature change rate : 25°C / 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°C ~ 70°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 : 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°C		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=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) 396481HRS (2) 72523HRS (3) 104095HRS (4) 156612HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE: 720.6KHRS		
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50 °C		

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ

2007/3/20 A50-S014