Test Report: LRS-150F-5

150W 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

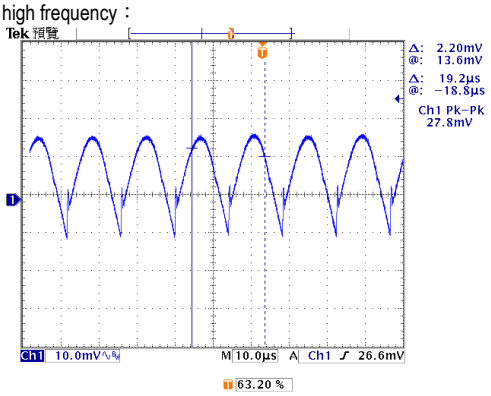
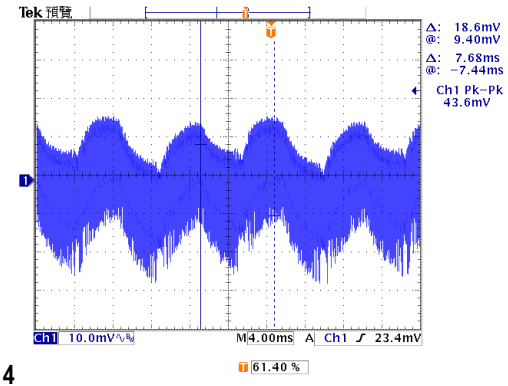
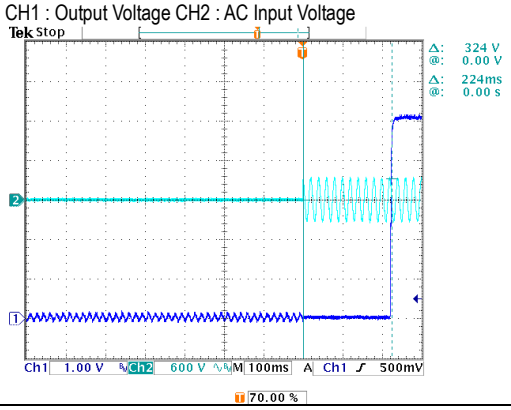
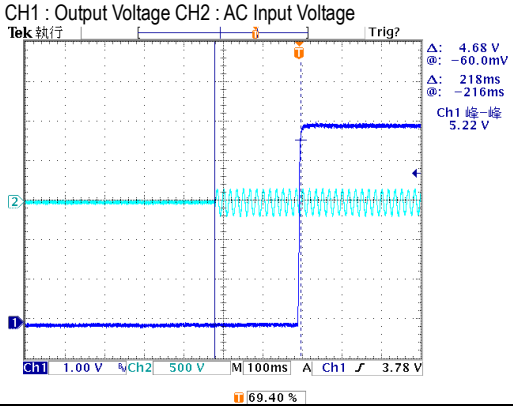
Safety Test
E.M.C. Test

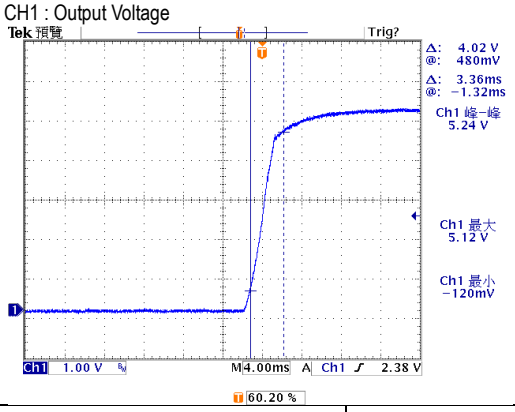
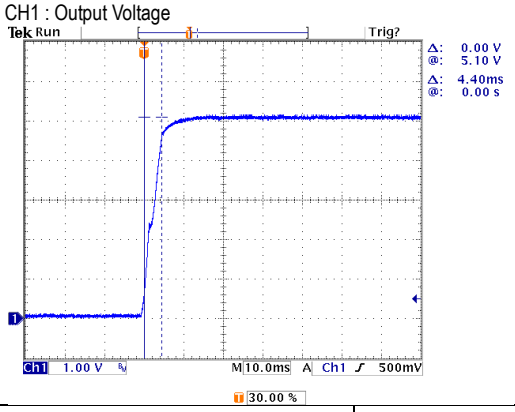
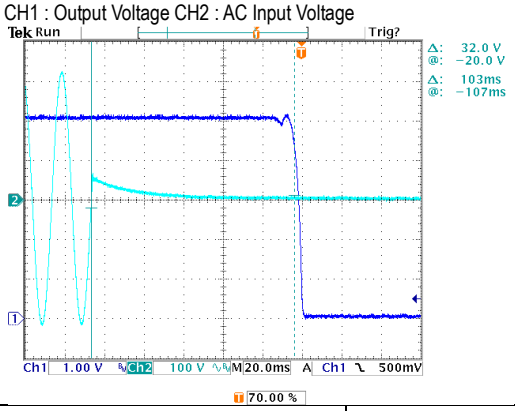
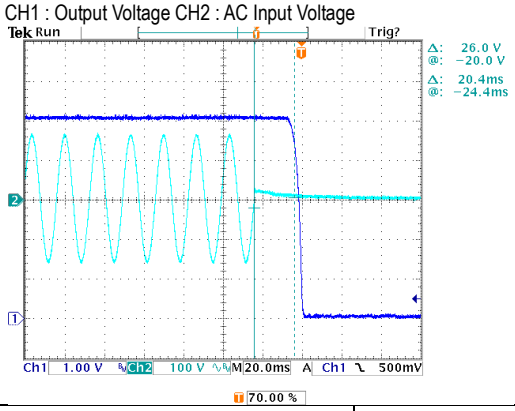
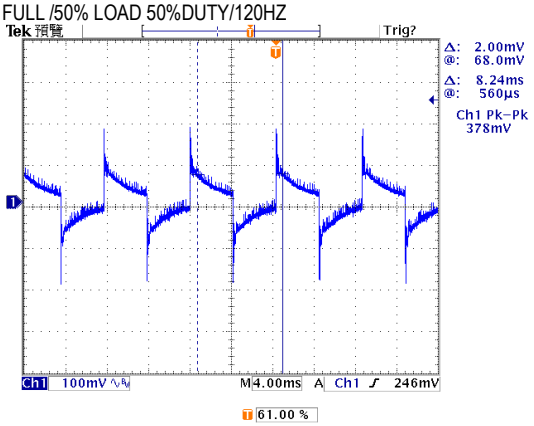
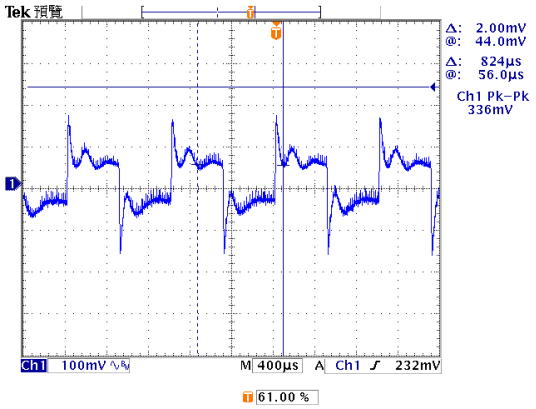
■ RELIABILITY TEST

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℃	4.29V~5.77V/230VAC 4.29V~5.77V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1:2%~-2 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1:0.2%~-0.2%
3	LINE REGULATION(Max)	V1:0.5%~-0.5 %	I/P: 100VAC~264VAC O/P:FULL LOAD Ta:25℃	V1:0%~0%
4	LOAD REGULATION(Max)	V1:1%~-1 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1:0.2%~-0.2%
5	OVER/UNDERSHOOT TEST	<±10%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	<10%
6	RIPPLE & NOISE(Max)	V1:100mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1:43.6mVp-p
	high frequency：  		low frequency：  4	
7	SET UP TIME(Max)	230VAC/500ms 115VAC/500ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/224ms 115VAC/218ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  	

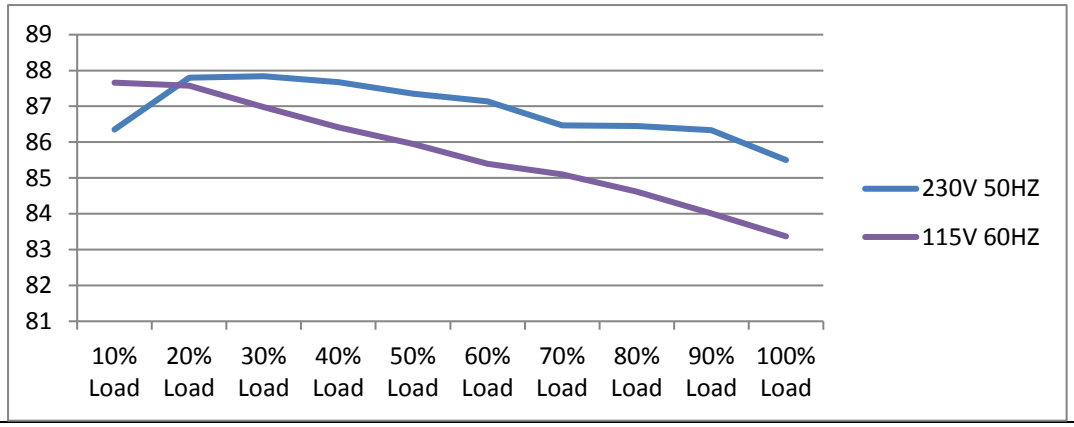
8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/3.36ms 115VAC/4.4ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 		
9	HOLD UP TIME(Typ.)	230VAC/16ms 115VAC/12ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/103ms 115VAC/20.4ms
	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	V1:1000mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY/120HZ (2)FULL /50% LOAD 50%DUTY/ 1KHZ Ta:25℃	 378mVp-p 336mVp-p
	FULL /50% LOAD 50%DUTY/120HZ 	FULL /50% LOAD 50%DUTY/ 1KHZ 		

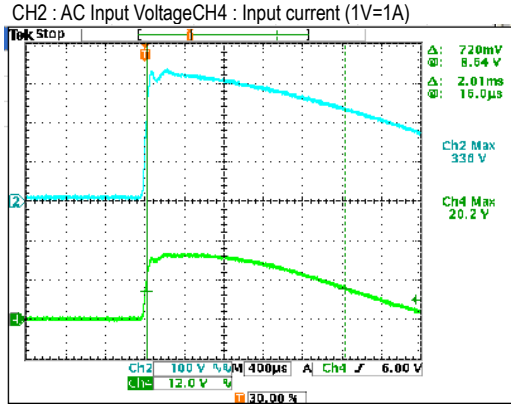
11	TRANSIENT RECOVERY TIME	V1:1000mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	243mVp-p

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC 120VDC ~ 370VDC	I/P:TESTING O/P:FULL LOAD Ta:25℃	63V~264V 99.08VDC~370VDC
			I/P: (1)LOW-LINE-3V=82 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec20MIN (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:100 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT(Typ.)	230V/ 1.7A 115V/ 3.0A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =0.948A/ 230VAC I =1.78A/ 115VAC
4	LEAKAGE CURRENT	<0.75mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG：0.47mA N-FG：0.47mA
5	NO LOAD CONSUMPTION	<0.5W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	<0.298W <0.430W
6	EFFICIENCY(Typ.)	85%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	85.51%

EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P ： 230 VAC O/P ：FULL LOAD Ta ：25℃	I =20.2A/230VAC T50=2010us/230V
	INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input VoltageCH4 : Input current (1V=1A) 			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOADPROTECTION	110%~ 140 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25℃	122.7%/ 264VAC 124.5%/ 230VAC 127.7%/100VAC PROTECTION TYPE： Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	5.75V~6.75V	I/P: 264VAC I/P: 230VAC I/P:85VAC O/P:MIN LOAD Ta:25℃	6.17V/264VAC 6.14V/ 230VAC 8.18V/85VAC PROTECTION TYPE： Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 264VAC I/P: 85VAC 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 I/P: 85VAC O/P: FULL LOAD Ta:25℃	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 :13A/600V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. I/P:Low-Line -3V = 97V	VDS: (1) 588V (2)564V (3)590V (4) 590V

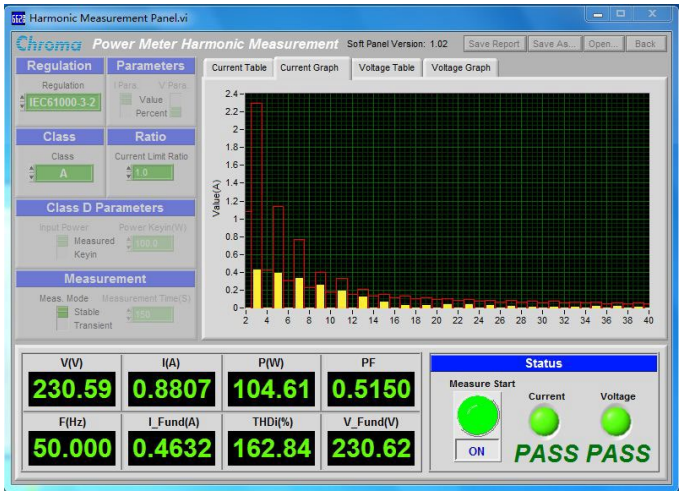
			O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. Ta:25℃	VDS: (1) 350V (2)328V (3)358V (4) 350V
2	Diode Peak**Voltage**	Q101 Rated : 95A/ 60 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. (5).NO LOAD Ta:25℃	Q101: VDS: (1) 44.0V (2) 43.4V (3) 44.0V (4)44.6V (5) 44.6V
3	**Input Capacitor Voltage**	C5 Rated: : 120 μ/400V	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)364V (2) 368V (3)370V
4	**Control IC Voltage Test**	PWM IC U1 Rated : 28V 10.5V(MIN.) O/P IC U100 Rated 24V 8V(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 下限.LOW LINE Ta:25℃	U1 U100 (1)14.4V (1)15.2V (2)19.4V (2)11.6V (3)21.8V (3)16.6V (4)18.0V (4)14.8V (5)14.4V (5)11.8V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTANDVOLTAGE	I/P-O/P: 4KVAC/min I/P-FG:2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25℃	I/P-O/P:3.44 mA I/P-FG:3.91mA O/P-FG:3.23m A NO DAMAGE
2	ISOLATIONRESISTANCE	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	GROUNDINGCONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	28mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:80%LOAD Ta:25℃	PASS

				
2	CONDUCTION	BS EN/EN55032 (CISPR32) CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032 (CISPR32) 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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：LRS-150F-5
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=27.2℃
2. HIGH AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=40.6℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENTTa= 27.2℃</th><th>HIGH AMBIENT Ta=40.6℃</th></tr>
<tr><td>1</td><td>D6</td><td>81.6℃</td><td>93.0℃</td></tr>
<tr><td>2</td><td>C6</td><td>67.0℃</td><td>75.0℃</td></tr>
<tr><td>3</td><td>Q1</td><td>83.3℃</td><td>95.6℃</td></tr>
<tr><td>4</td><td>C35</td><td>73.0℃</td><td>83.2℃</td></tr>
<tr><td>5</td><td>BD1</td><td>78.9℃</td><td>87.5℃</td></tr>
<tr><td>6</td><td>Q100</td><td>75.1℃</td><td>87.4℃</td></tr>
<tr><td>7</td><td>C106</td><td>83.7℃</td><td>95.0℃</td></tr>
<tr><td>8</td><td>LF1</td><td>58.8℃</td><td>69.0℃</td></tr>
<tr><td>9</td><td>RTH10</td><td>74.2℃</td><td>83.3℃</td></tr>
<tr><td>10</td><td>R7</td><td>87.2℃</td><td>101.4℃</td></tr>
<tr><td>11</td><td>R14</td><td>75.7℃</td><td>87.8℃</td></tr>
<tr><td>12</td><td>T1</td><td>82.8℃</td><td>92.7℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 230 VAC
O/P：118% LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P：264VAC/100VAC
O/P：100% LOAD
Ta= -30℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 40℃
NO DAMAGE</td><td>I/P： 272 VAC
O/P：FULL LOAD
Ta= 40℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>±0.03 %/℃(0~50℃)</td><td>I/P： 230VAC
O/P：FULL LOAD</td><td>±0%/℃(0~40℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -40℃~ +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</td><td>OK</td></tr>
</table>

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℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta=40℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 40℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 40℃ LIFE TIME	(1) 70605HRS (2) 15768HRS (3) 88914HRS (4) 158118HRS
10	MTBF	2761.8K hrs min. Telcordia SR-332 (Bellcore) ; 592.4Khrs min. MIL-HDBK-217F (25℃)	
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