Test Report: LRS-150F-12

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

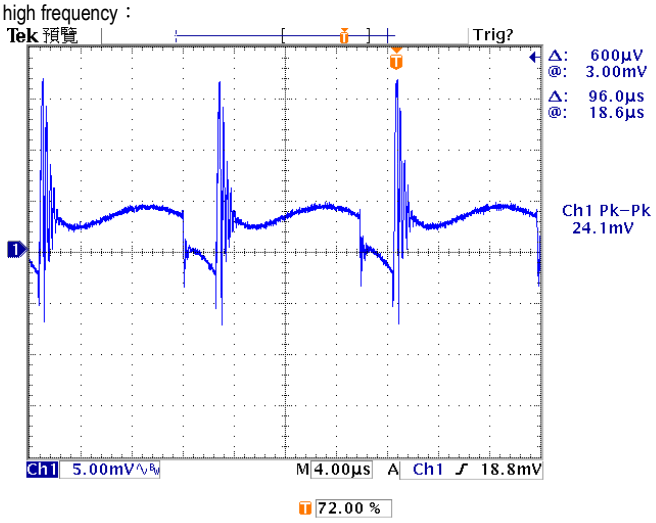
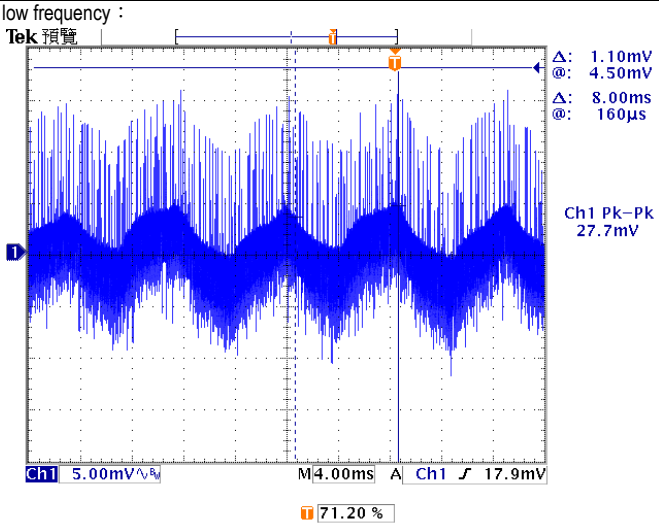
Safety Test
E.M.C. Test

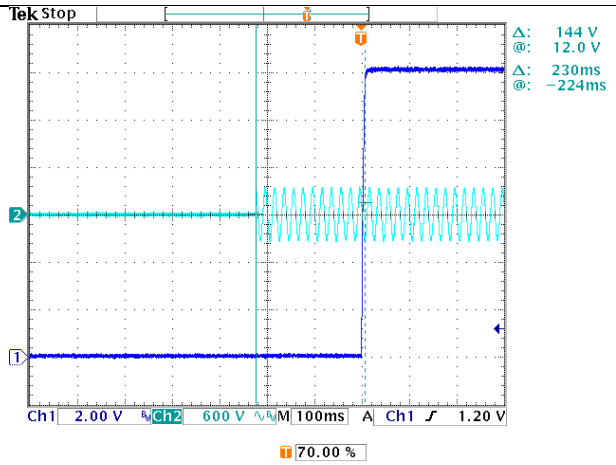
■ RELIABILITY TEST

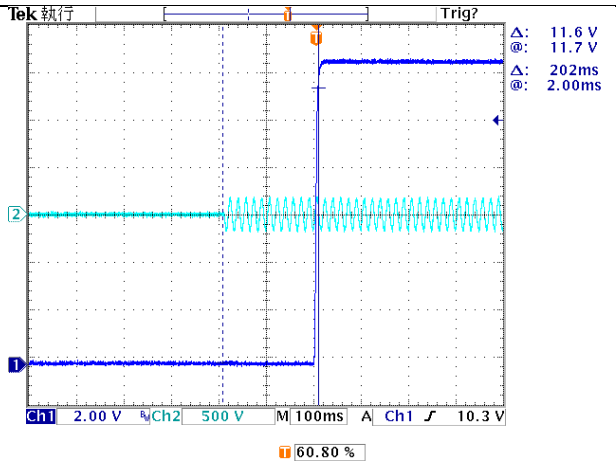
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.2V~ 13.8 V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	9.77V~14.26V/230VAC 9.77V~14.26V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0%~-0.08%
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: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0%~-0.08%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	<5%
6	RIPPLE & NOISE(Max)	V1: 150 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 27.7mVp-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℃	230VAC/230ms 115VAC/202ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	

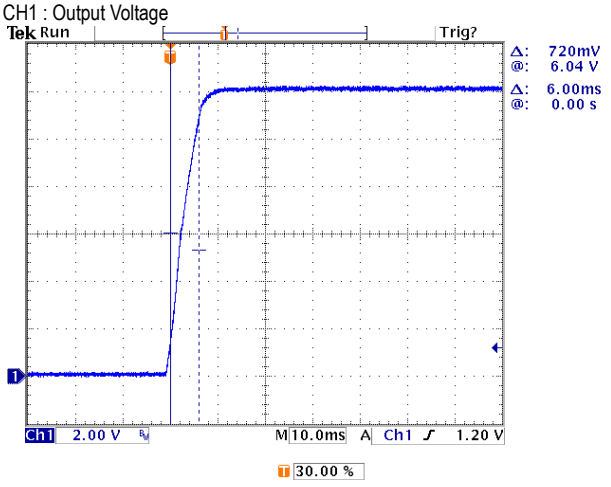




8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/6ms 115VAC/8.2ms

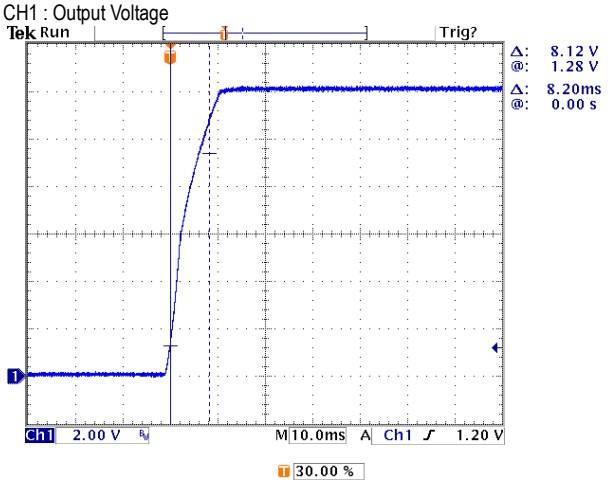
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

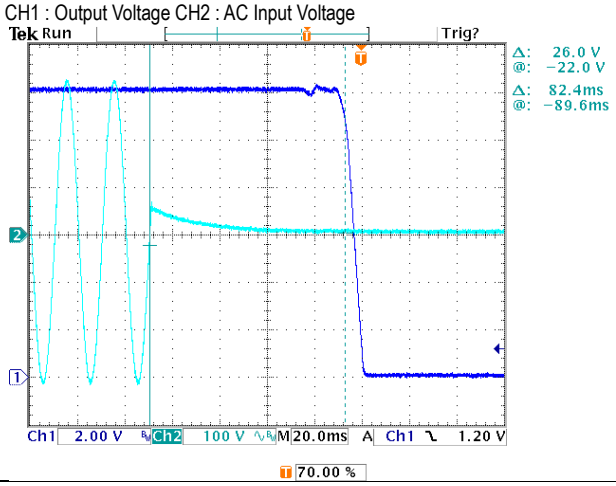
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/12ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/82.4ms 115VAC/16.8ms

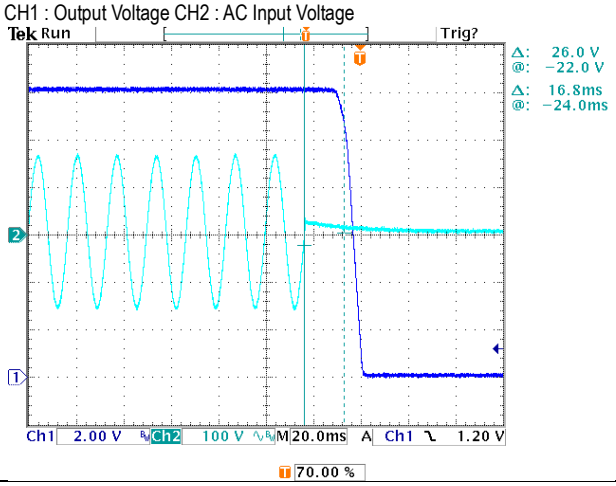
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



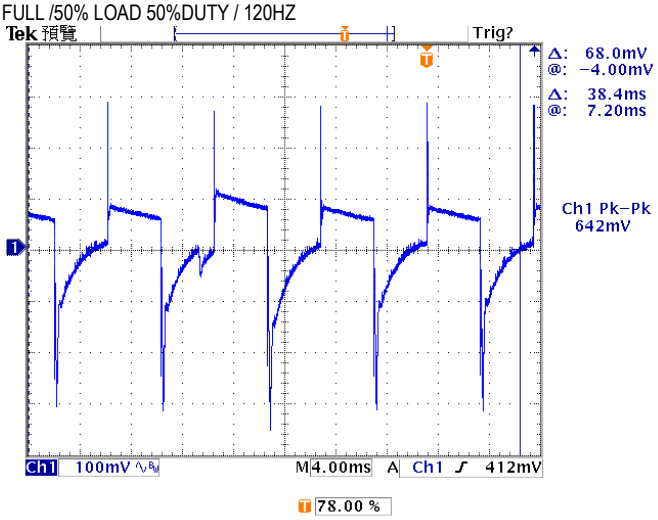
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

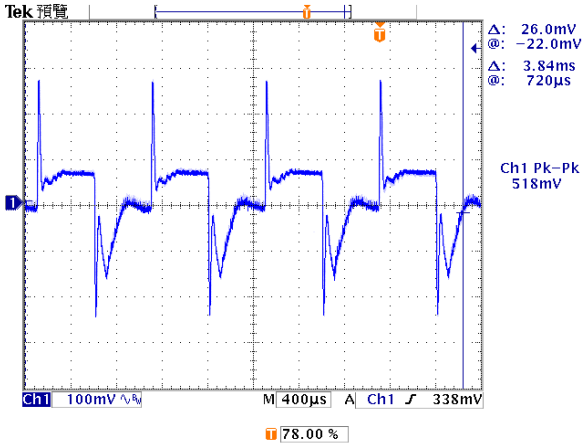


10	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 642mVp-p 518mVp-p

FULL /50% LOAD 50%DUTY / 120HZ



FULL /50% LOAD 50%DUTY / 1KHZ

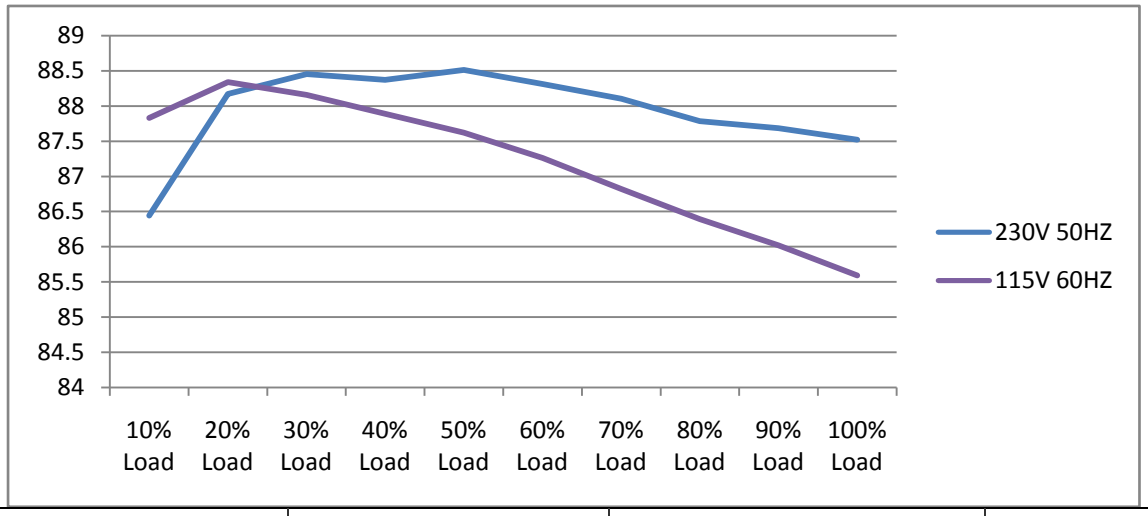


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	74V~264V
			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 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:100 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 1.6A 115V/ 2.8A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.24A/ 230VAC I =2.33A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG： 0.502mA N-FG： 0.502mA
5	NO LOAD CONSUMPTION	< 0.5W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	<0.1737 W < 0.2687W

6	EFFICIENCY(Typ.)	87.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	87.58%

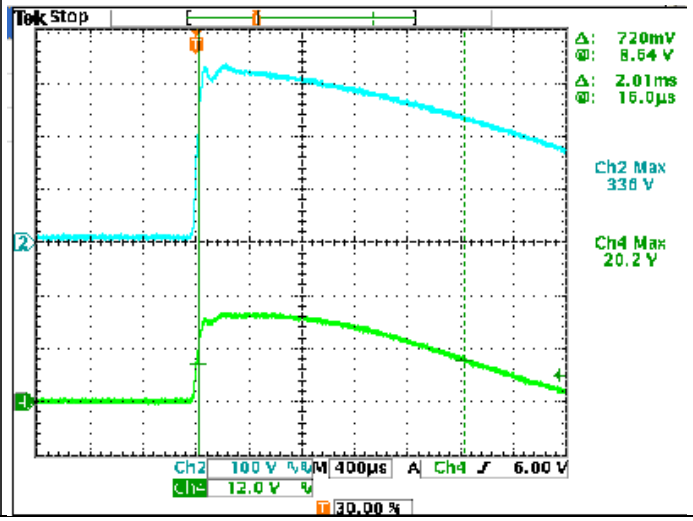
EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =20.2A/ 230VAC

INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current (1V=1A)



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~ 140 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25℃	128%/ 264VAC 126.4%/ 230VAC 123.68%/100VAC 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: 85VAC O/P:MIN LOAD Ta:25℃	15.40V/ 264VAC 15.39V/ 230VAC 15.36V/ 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. Ta:25℃	VDS: (1) 562V (2) 566V (3) 560V (4) 570V
2	Diode Peak **Voltage**	Q101 Rated 20A/100V	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) 84.8V (2) 80.0V (3) 85.2V (4) 98.8V (5) 92.0V
3	**Input Capacitor Voltage**	C5 Rated: : 120 μ/400 V 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) 374V (2) 374V (3) 374V
4	**Control IC Voltage Test**	PWM IC U1 Rated : 28V 10.5V(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. 16.7V 2. 12.2V 3. 16.0V 4. 19.1V 5. 12.0V

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℃	I/P-O/P:3.38 mA I/P-FG: 4.00mA O/P-FG: 3.20m 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℃	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	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-150F-12 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℃		

NO	Position	ROOM AMBIENT Ta= 27.2 ℃	HIGH AMBIENT Ta=40.6 ℃
1	**D6**	66.2℃	77.9℃
2	**C6**	67.4℃	76.7℃
3	**Q1**	84.7℃	96.6℃
4	**C35**	66.3℃	76.3℃
5	**BD1**	86.4℃	95.7℃
6	**Q100**	96.9℃	107.0℃
7	**C106**	77.9℃	89.5℃
8	**LF1**	65.6℃	76.5℃
9	**RTH10**	75.4℃	86.7℃
10	**R14**	73.7℃	86.1℃
11	**T1**	82.4℃	92.4℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：113% 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= -30 ℃	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%/℃(0~50℃)
6	STORAGE TEMPERATURE TEST	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		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 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta=45 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 45 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 45 ℃ LIFE TIME		(1) 81305HRS (2) 23047HRS (3) 48975HRS (4) 93362HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE：648.6KHRS		
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