



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

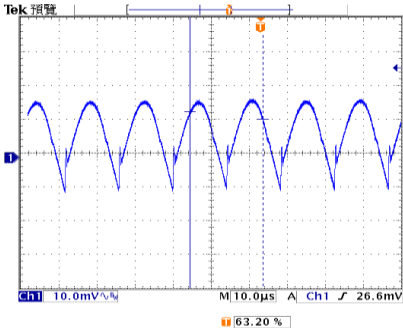
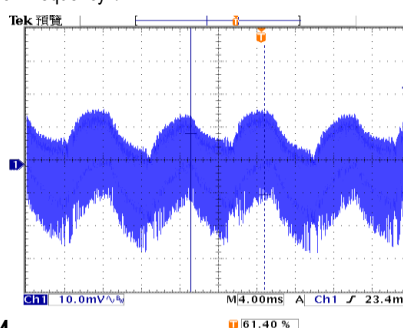
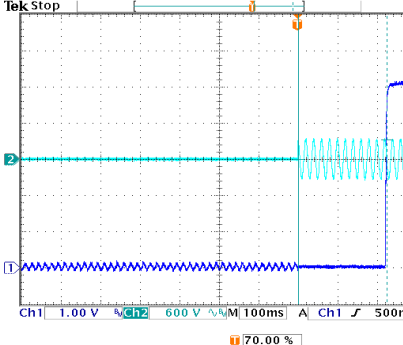
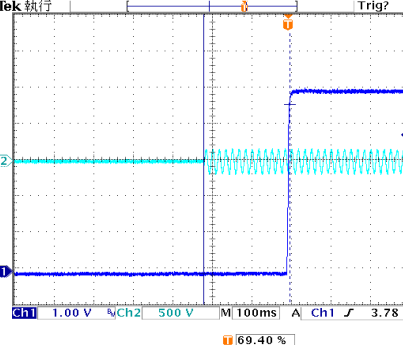
E.M.C. Test

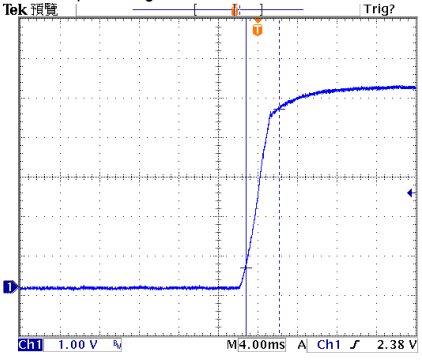
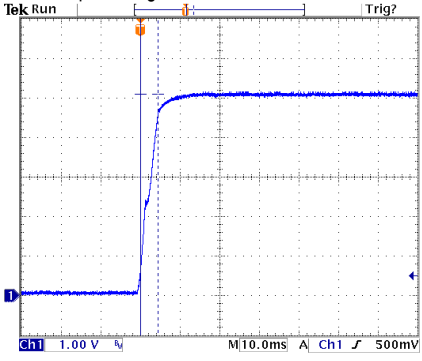
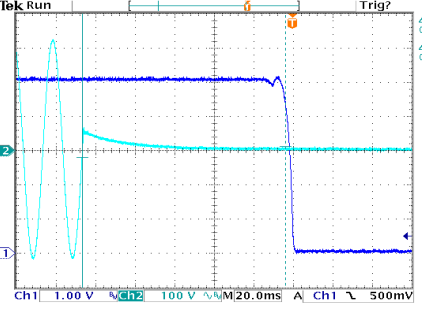
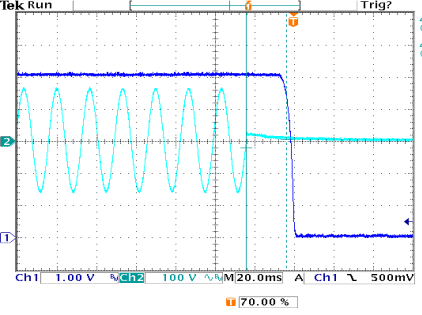
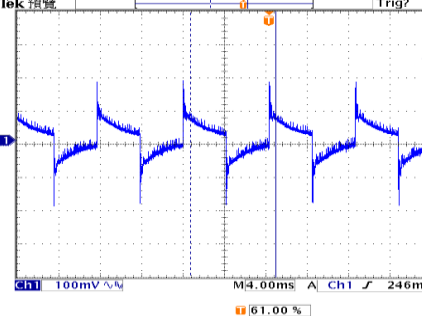
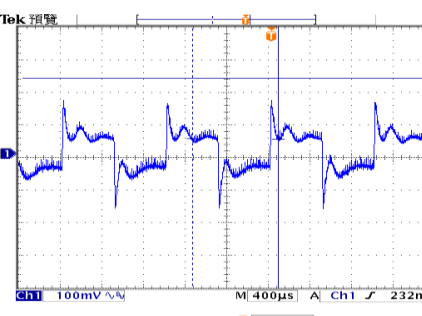
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

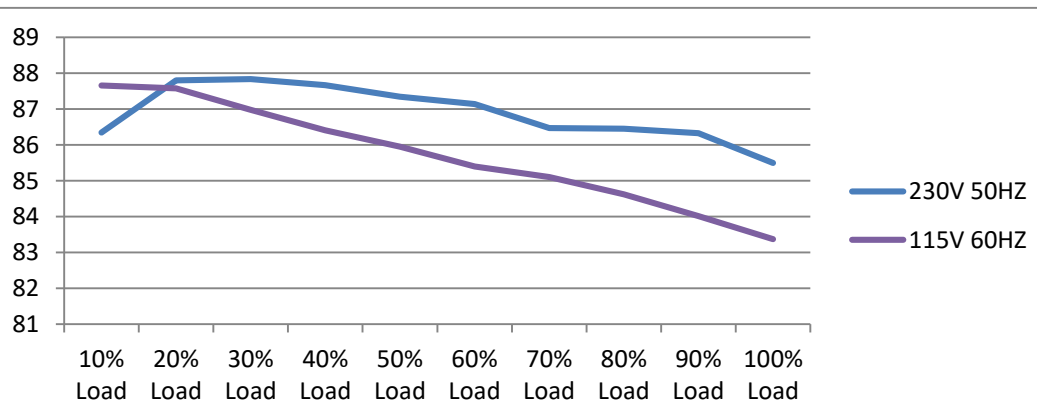
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:4.5 V~ 5.5 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.29V~5.77V/230VAC 4.29V~5.77V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1:2%~-2 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:0.2%~-0.2%
3	LINE REGULATION(Max)	V1:0.5%~-0.5 %	I/P: 100VAC~264VAC O/P:FULL LOAD Ta:25°C	V1:0%-0%
4	LOAD REGULATION(Max)	V1:1%~-1 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:0.2%~-0.2%
5	OVER/UNDERSHOOT TEST	<+10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<10%
6	RIPPLE & NOISE(Max)	V1:100mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1:43.6mVp-p
high frequency :  Δ: 2.20mV @: 13.6mV Δ: 19.2μs @: -18.8μs Ch1 Pk-Pk 27.8mV 63.20 % low frequency :  Δ: 18.6mV @: 9.40mV Δ: 7.68ms @: -7.44ms Ch1 Pk-Pk 43.6mV 61.40 %				
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/224ms 115VAC/218ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage Tek Stop  Δ: 324 V @: 0.00 V Δ: 224ms @: 0.00 s 70.00 % INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage Tek 執行  Δ: 4.68 V @: -60.0mV Δ: 218ms @: -216ms Ch1 峰-峰 5.22 V 69.40 %				

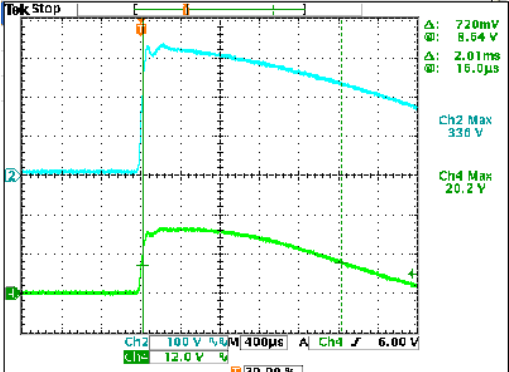
8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/3.36ms 115VAC/4.4ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME(Typ.)	230VAC/16ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/103ms 115VAC/20.4ms
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°C	378mVp-p 336mVp-p
	FULL /50% LOAD 50%DUTY/120HZ CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
	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°C	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 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°C	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°C	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°C	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°C	<0.298W <0.4722W
6	EFFICIENCY(Typ.)	85%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	85.51%

EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	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°C	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°C	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°C	NO DAMAGE PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

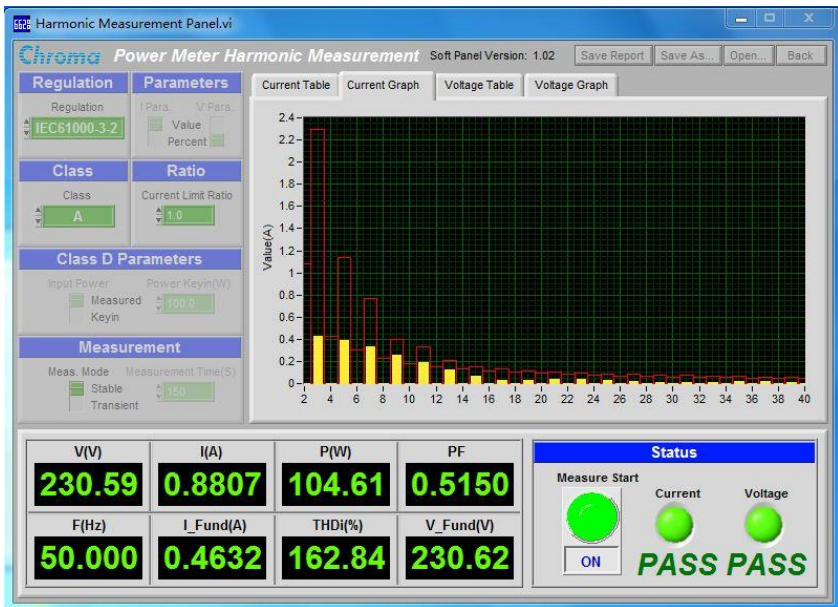
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated :13A/600V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. I/P:Low-Line -3V = 97V O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. Ta:25°C	VDS: (1) 588V (2)564V (3)590V (4) 590V 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°C	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°C	(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°C	U1 (1)14.4V (2)19.4V (3)21.8V (4)18.0V (5)14.4V U100 (1)15.2V (2)11.6V (3)16.6V (4)14.8V (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°C	I/P-O/P:3.44 mA I/P-FG:3.91mA O/P-FG:3.23mA 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°C	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°C	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°C	PASS
				
2	CONDUCTION	BS EN/EN55032 (CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032 (CISPR32) 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-150F-5 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=27.2°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=40.6°C <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENTTa= 27.2°C</th><th>HIGH AMBIENT Ta=40.6°C</th></tr><tr><td>1</td><td>D6</td><td>81.6°C</td><td>93.0°C</td></tr><tr><td>2</td><td>C6</td><td>67.0°C</td><td>75.0°C</td></tr><tr><td>3</td><td>Q1</td><td>83.3°C</td><td>95.6°C</td></tr><tr><td>4</td><td>C35</td><td>73.0°C</td><td>83.2°C</td></tr><tr><td>5</td><td>BD1</td><td>78.9°C</td><td>87.5°C</td></tr><tr><td>6</td><td>Q100</td><td>75.1°C</td><td>87.4°C</td></tr><tr><td>7</td><td>C106</td><td>83.7°C</td><td>95.0°C</td></tr><tr><td>8</td><td>LF1</td><td>58.8°C</td><td>69.0°C</td></tr><tr><td>9</td><td>RTH10</td><td>74.2°C</td><td>83.3°C</td></tr><tr><td>10</td><td>R7</td><td>87.2°C</td><td>101.4°C</td></tr><tr><td>11</td><td>R14</td><td>75.7°C</td><td>87.8°C</td></tr><tr><td>12</td><td>T1</td><td>82.8°C</td><td>92.7°C</td></tr></table>			NO	Position	ROOM AMBIENTTa= 27.2°C	HIGH AMBIENT Ta=40.6°C	1	D6	81.6°C	93.0°C	2	C6	67.0°C	75.0°C	3	Q1	83.3°C	95.6°C	4	C35	73.0°C	83.2°C	5	BD1	78.9°C	87.5°C	6	Q100	75.1°C	87.4°C	7	C106	83.7°C	95.0°C	8	LF1	58.8°C	69.0°C	9	RTH10	74.2°C	83.3°C	10	R7	87.2°C	101.4°C	11	R14	75.7°C	87.8°C	12	T1	82.8°C	92.7°C
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11	R14	75.7°C	87.8°C																																																					
12	T1	82.8°C	92.7°C																																																					
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 118 % 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 40°C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40°C HUMIDITY= 95 %R H	TEST : OK																																																				

5	TEMPERATURE COEFFICIENT	$\pm 0.03\%/^{\circ}\text{C}(0\sim 50^{\circ}\text{C})$	I/P : 230VAC O/P : FULL LOAD	$\pm 0\%/^{\circ}\text{C}(0\sim 40^{\circ}\text{C})$
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 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 : $-30^{\circ}\text{C} \sim 70^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 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= 40°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40°C 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°C)		
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