



Test Report: LRS-150F-36

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

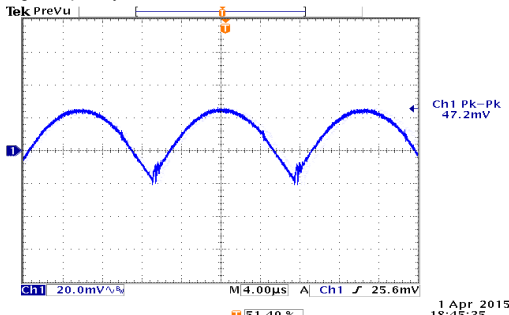
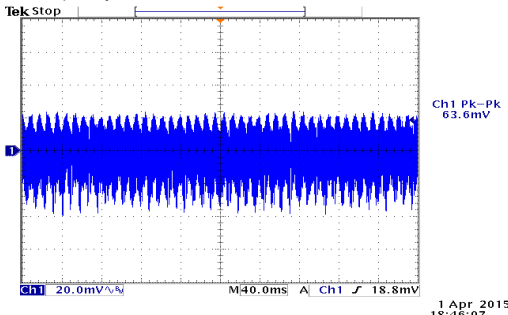
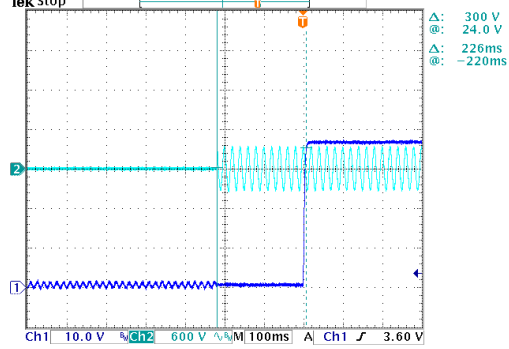
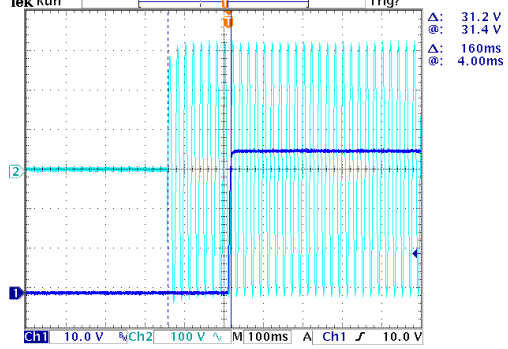
E.M.C. Test

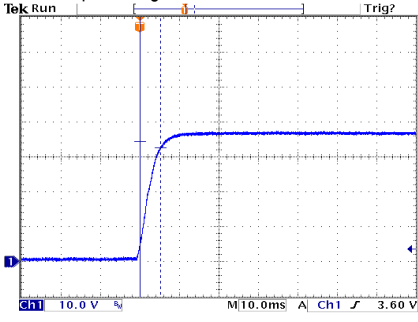
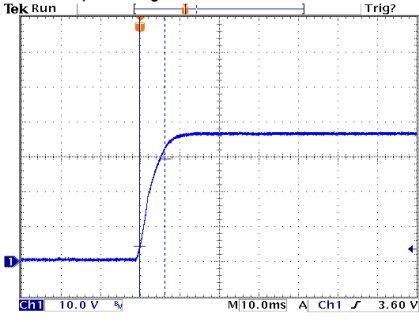
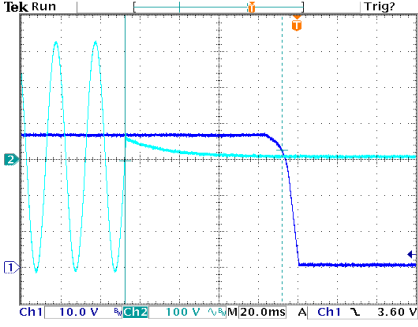
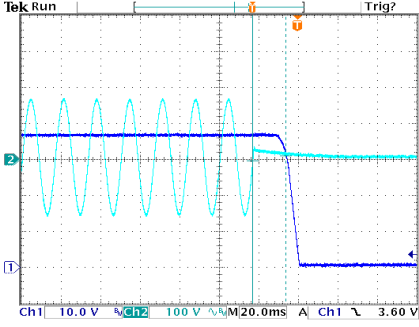
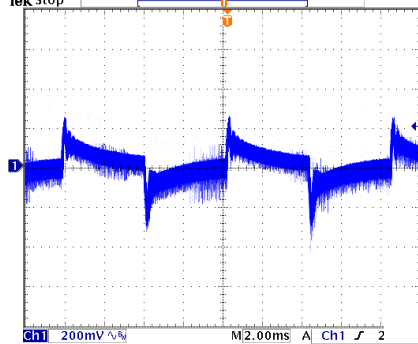
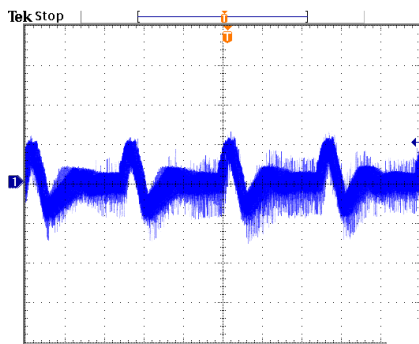
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

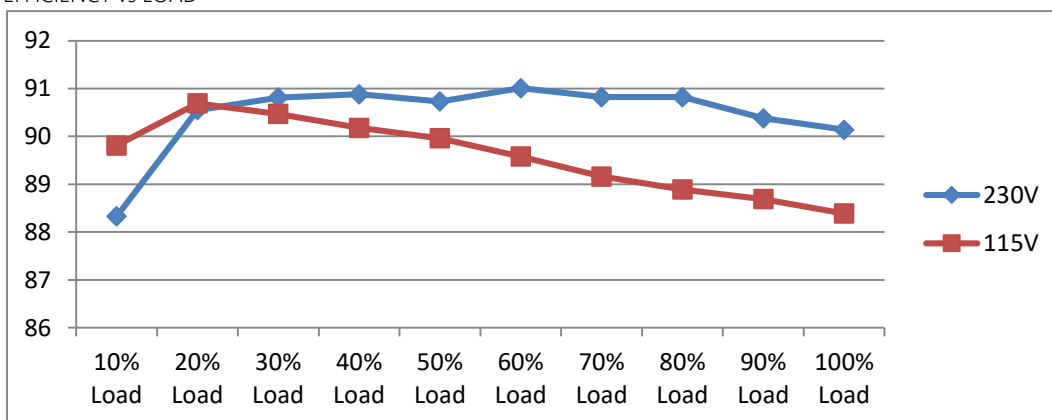
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:32.4V~ 39.6 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	31.20V~41.08V/230VAC 31.20V~41.08V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1:1%~1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:0.02%~-0.02%
3	LINE REGULATION(Max)	V1:0.5%~0.5 %	I/P: 100VAC~264VAC O/P:FULL LOAD Ta:25°C	V1:0%~-0.03%
4	LOAD REGULATION(Max)	V1:0.5%~0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:0.02%~0%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<±5%
6	RIPPLE & NOISE(Max)	V1:200mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1:63.6mVp-p
high frequency :  Ch1 Pk-Pk 47.2mV 1 Apr 2015 18:45:35 low frequency :  Ch1 Pk-Pk 63.6mV 1 Apr 2015 18:46:07				
7	SET UP TIME(Max)	230VAC/5 115VAC/500ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	2 115VAC/160ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  Δ: 300 V @: 24.0 V Δ: 226ms @: -220ms 1 Apr 2015 18:12:01 INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  Δ: 31.2 V @: 31.4 V Δ: 160ms @: 4.00ms 1 Apr 2015 18:12:01				

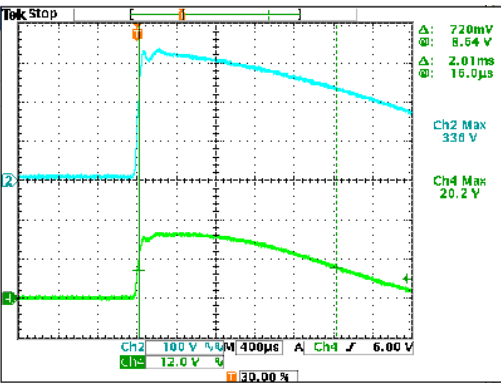
8	RISE TIME (Max) 230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/5.2ms 115VAC/6.4ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME(Typ.) 230VAC/16ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/79.6ms 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 V1:3600mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY/120HZ (2)FULL /50% LOAD 50%DUTY/ 1KHZ Ta:25°C	572mVp-p 504mVp-p
FULL /50% LOAD 50%DUTY/120HZ 		FULL /50% LOAD 50%DUTY/ 1KHZ 	
11	TRANSIENT RECOVERY TIME V1:3600mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	392mVp-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	70V~264V 98.9V~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 =1.21A/ 230VAC I =2.39A/ 115VAC
4	LEAKAGE CURRENT	<0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.225mA N-FG : 0.225mA
5	NO LOAD CONSUMPTION	<0.5W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	<0.1257W <0.4554W
6	EFFICIENCY(Typ.)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	90.03%

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	124%/ 264VAC 122%/ 230VAC 121%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	41.4V~48.6V	I/P: 264VAC I/P: 230VAC I/P:85VAC O/P:MIN LOAD Ta:25°C	46.03V/264VAC 46.20V/ 230VAC 45.88V/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) 558V (2)598V (3)562V (4) 588V VDS: (1) 332V (2)282V (3)328V (4) 340V
2	Diode Peak Voltage	Q101 Rated :20 A/300 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) 251V (2) 286V (3) 273V (4)272V (5) 200V
3	Input Capacitor Voltage	C5 Rated: : 120 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)370V (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 下限.LOW LINE Ta:25°C	(1)20.5V (2)12.9V (3)19.3V (4)24.6V (5)16.7V

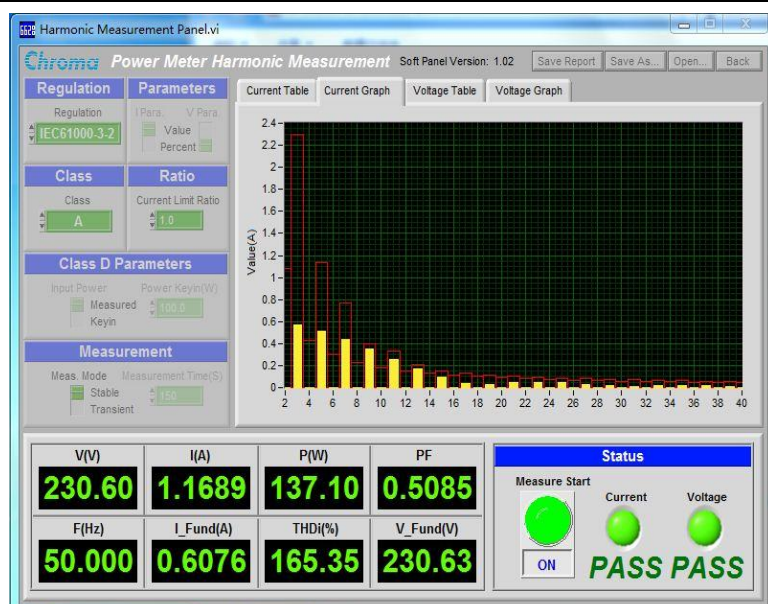
SAFETY TEST

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:2.67mA I/P-FG:2.02mA O/P-FG:1.86mA 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-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℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENTTa= 18.6℃</th><th>HIGH AMBIENT Ta=42.1℃</th></tr><tr><td>1</td><td>D6</td><td>66.2℃</td><td>77.9℃</td></tr><tr><td>2</td><td>C6</td><td>67.4℃</td><td>76.7℃</td></tr><tr><td>3</td><td>Q1</td><td>84.7℃</td><td>96.6℃</td></tr><tr><td>4</td><td>C35</td><td>66.3℃</td><td>76.3℃</td></tr><tr><td>5</td><td>BD1</td><td>86.4℃</td><td>95.7℃</td></tr><tr><td>6</td><td>Q100</td><td>96.9℃</td><td>107.0℃</td></tr><tr><td>7</td><td>C106</td><td>77.9℃</td><td>89.5℃</td></tr><tr><td>8</td><td>LF1</td><td>65.6℃</td><td>76.5℃</td></tr><tr><td>9</td><td>RTH10</td><td>75.4℃</td><td>86.7℃</td></tr><tr><td>10</td><td>R14</td><td>73.7℃</td><td>86.1℃</td></tr><tr><td>11</td><td>T1</td><td>82.4℃</td><td>92.4℃</td></tr><tr><td>12</td><td>TA</td><td>27.2℃</td><td>40.6℃</td></tr></table>			NO	Position	ROOM AMBIENTTa= 18.6℃	HIGH AMBIENT Ta=42.1℃	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℃	12	TA	27.2℃	40.6℃
NO	Position	ROOM AMBIENTTa= 18.6℃	HIGH AMBIENT Ta=42.1℃																																																					
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℃																																																					
12	TA	27.2℃	40.6℃																																																					
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 40℃ NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40℃ 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 : $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$ 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) 81305HRS (2) 23047HRS (3) 48975HRS (4) 93362HRS
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