



# Test Report: LRS-100-3.3

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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

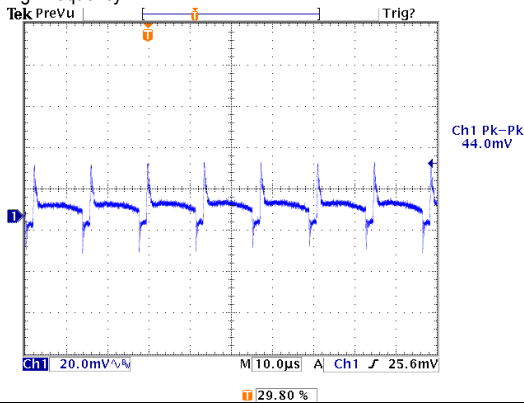
ENVIRONMENT TEST

## DESIGN VERIFY TEST

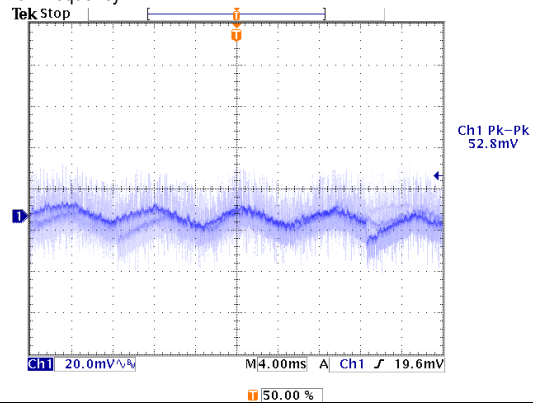
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:2.97 V~ 3.6V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	2.787V~3.793V/230VAC 2.793V~3.789V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -3%~3%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0%~0%
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: -2%~2%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0%~0%
5	OVER/UNDERSHOOT TEST	< +10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 100 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 52.8mVp-p

high frequency :



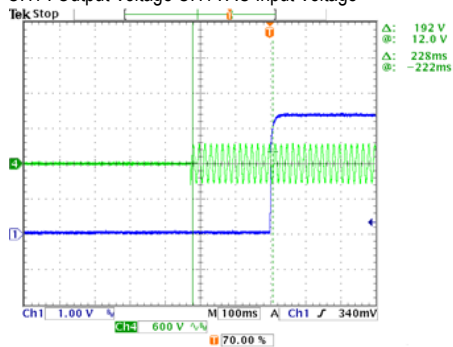
low frequency :



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/ 228ms 115VAC/ 236ms
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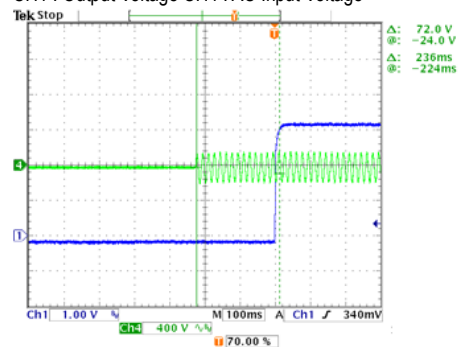
INPUT=230VAC/50HZ @ FULL LOAD

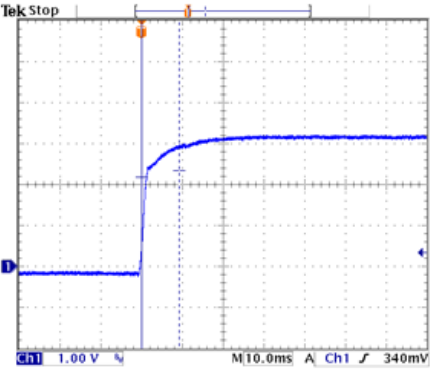
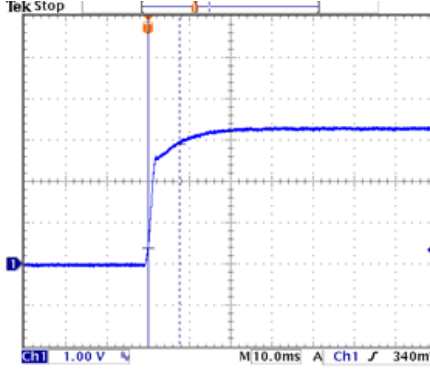
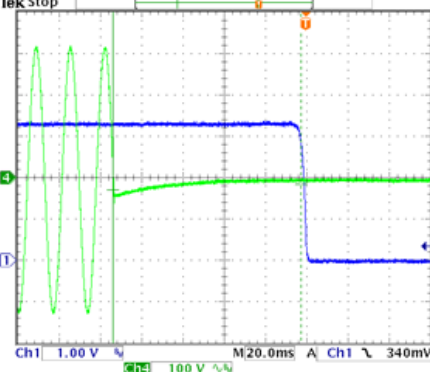
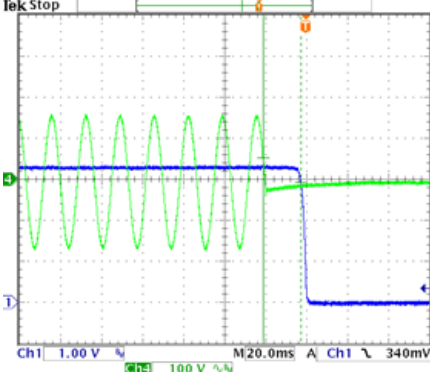
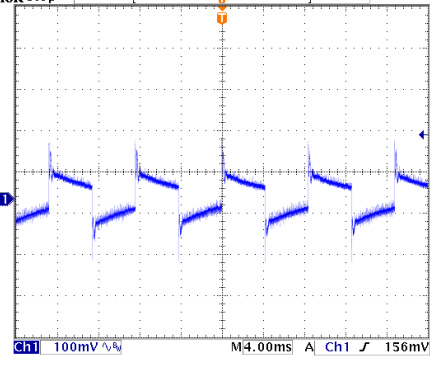
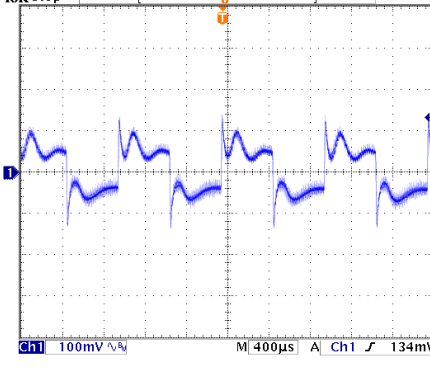
CH1 : Output Voltage CH4 : AC Input Voltage



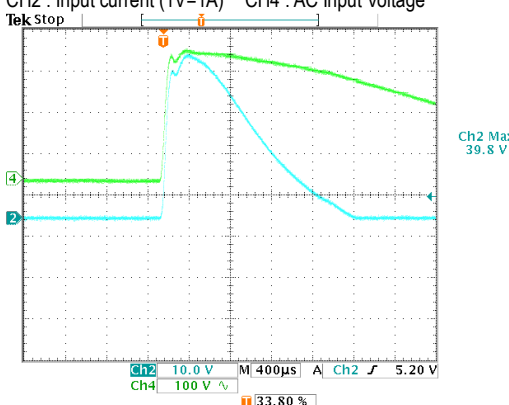
INPUT=115VAC/60HZ @ FULL LOAD

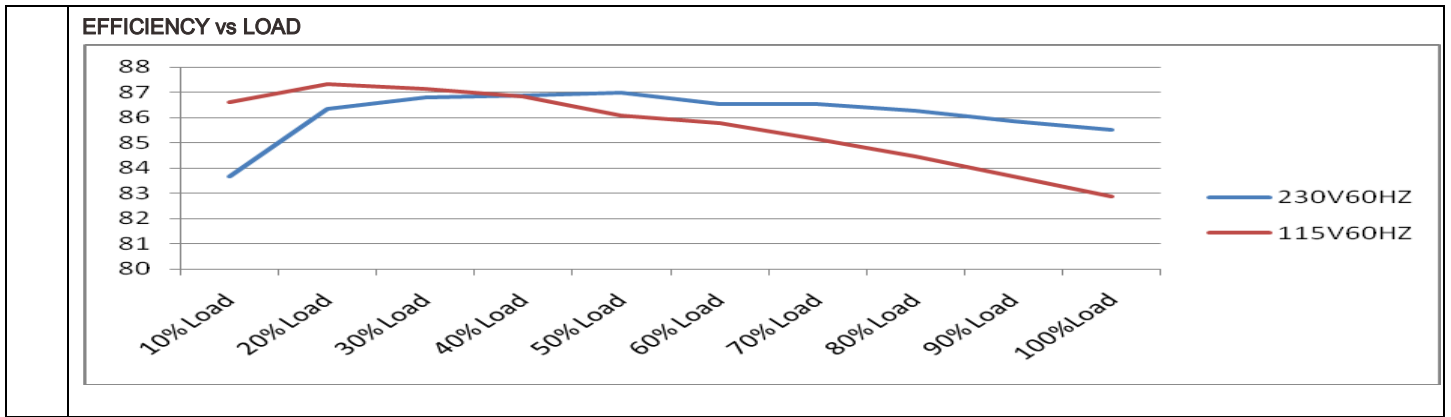
CH1 : Output Voltage CH4 : AC Input Voltage



8	RISE TIME (Max)  230VAC/ 30ms 115VAC/ 30ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 9.20ms 115VAC/7.60ms
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> 	
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/ 91.2ms 115VAC/ 18.4ms
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage</p> 	
10	DYNAMIC LOAD  V1: 660 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	296mVp-p 272mVp-p
<p>FULL /50% LOAD 50%DUTY / 120HZ</p> 		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p> 	

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC 120VDC~373VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	75V~264V 110VDC~373VDC
			I/P: (1)LOW-LINE-3V=82V 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 =0.71A/ 230VAC I =1.21A/ 115VAC
4	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.323 mA N-FG: 0.323 mA
5	NO LOAD CONSUMPTION	< 0.3 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.02 W < 0.25W
6	INRUSH CURRENT(Typ)	230V/50A COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I =39.8A/ 230VAC
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH2 : Input current (1V=1A) CH4 : AC Input Voltage</p>  <p>Ch2 Max 39.8 V</p> <p>Ch2 10.0 V M 400µs A Ch2 5.20 V</p> <p>Ch4 100 V V 33.80 %</p>				
7	EFFICIENCY(Typ)	84.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	85.53%



### 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	135%/ 230VAC 131%/115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	CH:3.8V~4.45V	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	4.34V/ 230VAC 4.38V/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 600 V/11A	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. Ta:25°C	(1)V 440V (2)V 452V (3)V 448V (4)V 452V (5)V 452V (6)V 456V (7)V 464V
2	Diode Peak Voltage	Q101 Rated 75A/60V	I/P: High-Line +3V =267 V AC ON/OFF O/P: (1) Full Load (2) Output Short	Q101: (1)49.8V (2)49.1V (3)49.4V

			(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	(4)49.8V (5)49.4V (6)49.8V (7)50V (8)49V
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)344V (2)348V (3)348V
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) 22.8V (2) 20.8V (3) 22.2V (4) 20.6V (5) 10.6V
5	Clamp Diode Peak Voltage	D 5 Rated: 800 V 2 A	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)420V (2)420V

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P: 4.4KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C	I/P-O/P:2.15mA I/P-FG:1.89mA O/P-FG:1.02mA 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: 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°C	7mΩ

### 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-100-5 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=42.1°C																																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 18.6 °C</th> <th>HIGH AMBIENT Ta=42.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td><b>U100</b></td><td>79.3°C</td><td>105.1°C</td></tr> <tr><td>2</td><td><b>U1</b></td><td>52.7°C</td><td>77.6°C</td></tr> <tr><td>3</td><td><b>LF1</b></td><td>47.5°C</td><td>73.3°C</td></tr> <tr><td>4</td><td><b>BD1</b></td><td>54.3°C</td><td>78.8°C</td></tr> <tr><td>5</td><td><b>C5</b></td><td>46.7°C</td><td>69.7°C</td></tr> <tr><td>6</td><td><b>D5</b></td><td>62.0°C</td><td>89.9°C</td></tr> <tr><td>7</td><td><b>Q1</b></td><td>55.5°C</td><td>83.9°C</td></tr> <tr><td>8</td><td><b>C35</b></td><td>59.5°C</td><td>85.4°C</td></tr> <tr><td>9</td><td><b>D31</b></td><td>61.9°C</td><td>90.1°C</td></tr> <tr><td>10</td><td><b>T1coil</b></td><td>73.7°C</td><td>101.9°C</td></tr> <tr><td>11</td><td><b>C105</b></td><td>67.3°C</td><td>95.3°C</td></tr> <tr><td>12</td><td><b>Q100</b></td><td>70.3°C</td><td>98.6°C</td></tr> <tr><td>13</td><td><b>Q101</b></td><td>70.5°C</td><td>98.6°C</td></tr> <tr><td>14</td><td><b>L100</b></td><td>63.4°C</td><td>90.9°C</td></tr> <tr><td>15</td><td><b>RTH1</b></td><td>83.0°C</td><td>96.0°C</td></tr> <tr><td>16</td><td><b>C107</b></td><td>64.9°C</td><td>93.0°C</td></tr> <tr><td>17</td><td><b>R7</b></td><td>74.7°C</td><td>101.0°C</td></tr> <tr><td>18</td><td><b>R15</b></td><td>59.2°C</td><td>88.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 18.6 °C	HIGH AMBIENT Ta=42.1 °C	1	<b>U100</b>	79.3°C	105.1°C	2	<b>U1</b>	52.7°C	77.6°C	3	<b>LF1</b>	47.5°C	73.3°C	4	<b>BD1</b>	54.3°C	78.8°C	5	<b>C5</b>	46.7°C	69.7°C	6	<b>D5</b>	62.0°C	89.9°C	7	<b>Q1</b>	55.5°C	83.9°C	8	<b>C35</b>	59.5°C	85.4°C	9	<b>D31</b>	61.9°C	90.1°C	10	<b>T1coil</b>	73.7°C	101.9°C	11	<b>C105</b>	67.3°C	95.3°C	12	<b>Q100</b>	70.3°C	98.6°C	13	<b>Q101</b>	70.5°C	98.6°C	14	<b>L100</b>	63.4°C	90.9°C	15	<b>RTH1</b>	83.0°C	96.0°C	16	<b>C107</b>	64.9°C	93.0°C	17	<b>R7</b>	74.7°C	101.0°C	18	<b>R15</b>	59.2°C	88.4°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P: 230 VAC O/P: 125% 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= -20 °C	TEST: OK																																																																												



4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C NO DAMAGE	I/P: 272 VAC O/P: FULL LOAD Ta= 45°C HUMIDITY= 95 %R.H	TEST: OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50°C)	I/P: 230 VAC O/P: FULL LOAD	±0.009%/°C (0~40°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°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=45 °C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 45 °C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 45 °C LIFE TIME		(1) 157680HRS (2) 19885HRS (3) 99776HRS (4) 175200HRS
10	MTBF	3348.9K hrs min. Telcordia SR-332 (Bellcore) ; 677.4Khrs 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