



# Test Report: LRS-350-48

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350W Single Output Switching Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY TEST

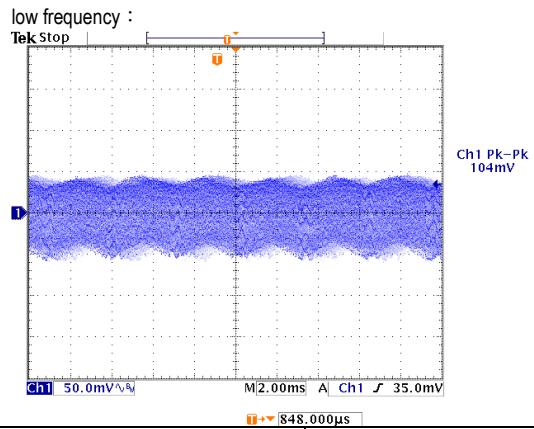
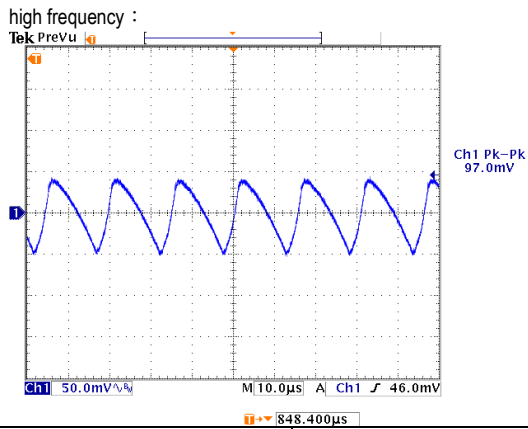
## ■ RELIABILITY TEST

ENVIRONMENT TEST

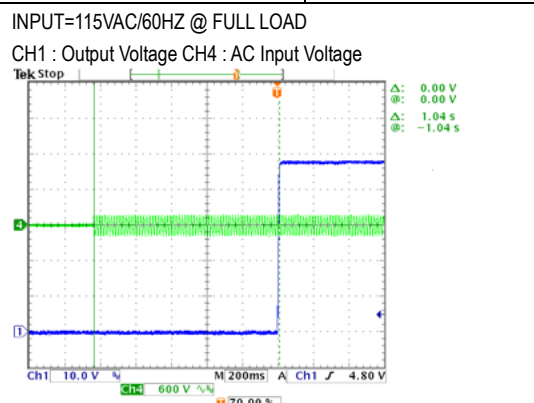
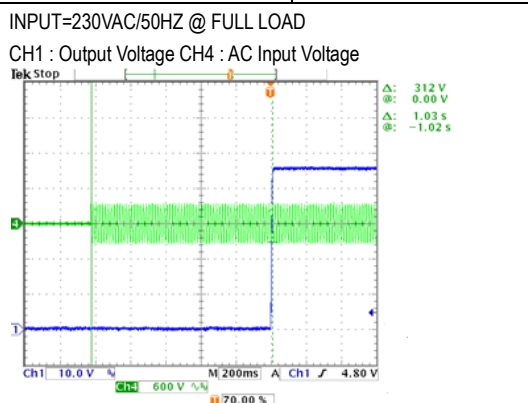
## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43.2V~ 52.8V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	42.491V~55.803/230VAC 42.451V~55.802V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1%~ 1%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.09%~ 0.09%
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: 0.5%~ -0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.02%~ 0.02%
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: 104mVp-p



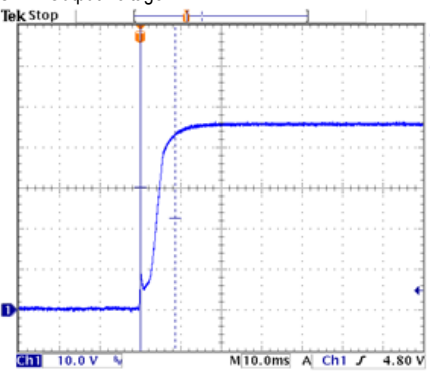
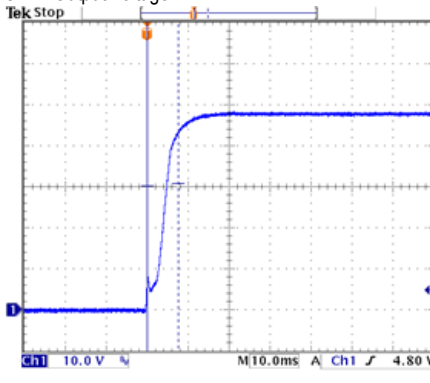
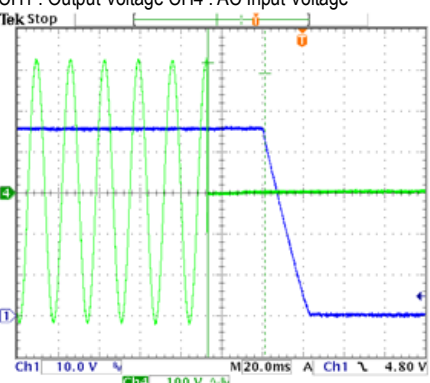
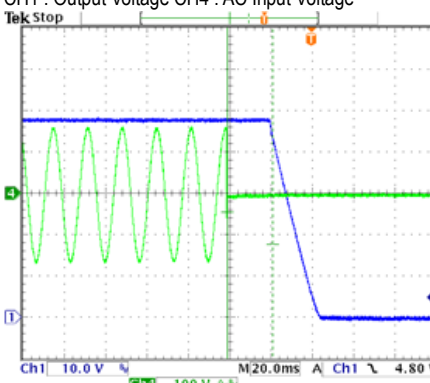
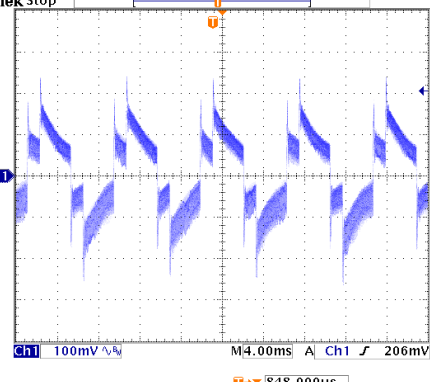
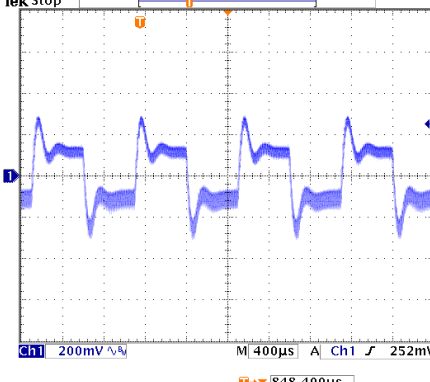
7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 1032ms 115VAC/ 1044ms
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# 350W Single Output Switching Power Supply

# LRS-350 series

8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 8.60ms 115VAC/7.60ms
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/28.0ms 115VAC/ 22.0ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		
10	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	504mVp-p 588mVp-p
FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 		

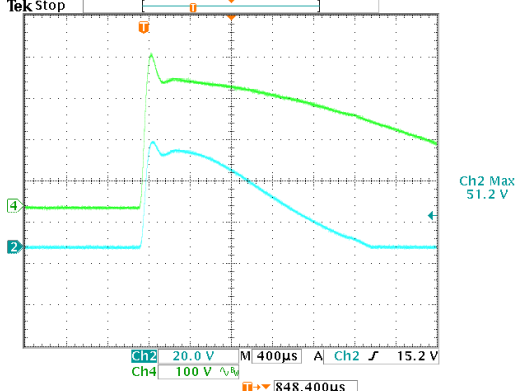


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 240VDC~370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25°C	82V~132V 161V~264V 229VDC ~ 370VDC(switch on 230VAC)
			I/P: (1)LOW-LINE-3V=87 V 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: 180 VAC ~264 VAC 90 VAC ~132 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 3.4A 115V/ 6.8A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =3.28A/ 230VAC I =5.97A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.490mA N-FG: 0.490mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.70W < 0.74 W
6	INRUSH CURRENT(Typ)	230V/ 60A 115V/ 60A COLD START	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =51.2A/ 230VAC I =48.4A/ 115VAC

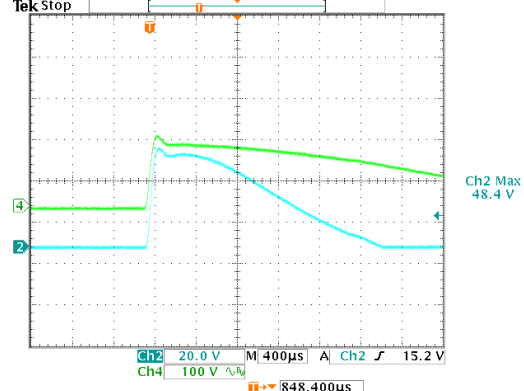
INPUT=230VAC/50HZ @ FULL LOAD

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

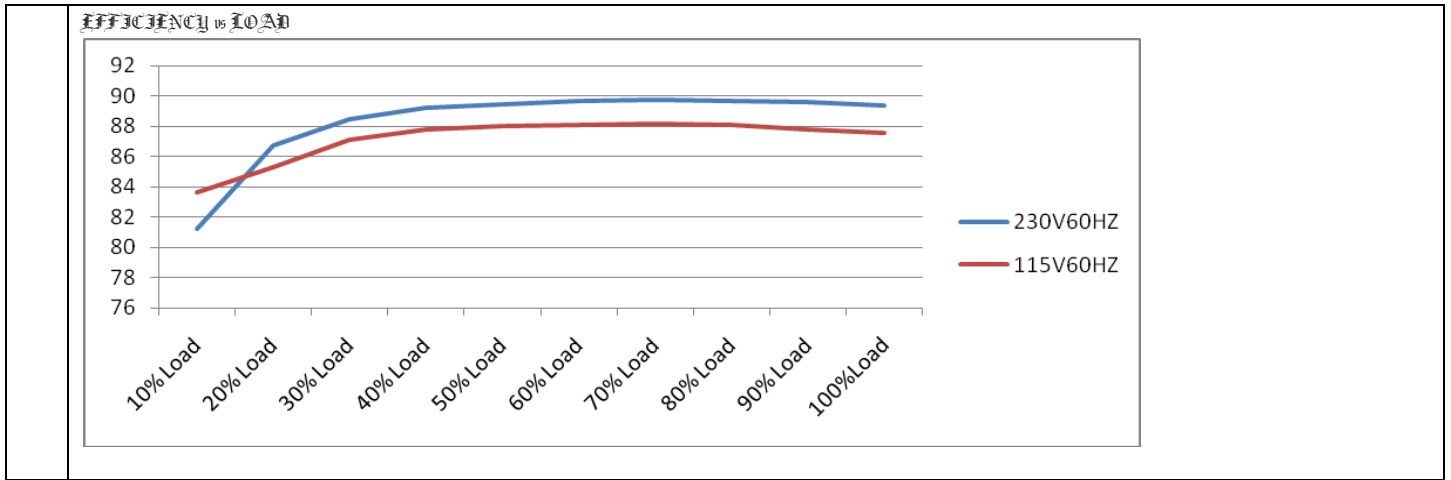


INPUT=115VAC/50HZ @ FULL LOAD

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



7	EFFICIENCY(Typ)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.3%
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### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 140 % Shut down and latch off o/p voltage, re-power on to recover.	I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	124.96%/ 230VAC 124.61%/115VAC Protection type : 110 %~ 140 % rated output power Shut down and latch off o/p voltage, re-power on to recover.
2	OVER VOLTAGE PROTECTION	CH: 55.2V~64.8 V Shut down and latch off o/p voltage, re-power on to recover.	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	61.2V/ 230VAC 62.4V/115VAC Protection type : Shut down and latch off o/p voltage, re-power on to recover.
3	OVER TEMPERATURE PROTECTION	NO DAMAGE Shut down and latch off o/p voltage, re-power on to recover.	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Shut down and latch off o/p voltage, re-power on to recover.
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE Shut down and latch off o/p voltage, re-power on to recover

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated 13 A/600V	I/P: High-Line +3V =267V O/P: (1) Full Load Turn on (2) Output Short (3) Full Load Continue Ta:25°C	(1)500V (2)536V (3)436V
2	Diode Peak Voltage	Q102 Rated 20 A/300V  Q103 Rated 10A/400V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output Short (3) Full Load Continue Ta:25°C	Q102 (1)288V (2)280V (3)262V  Q103: (1)378V (2)346V (3)358V
3	Input Capacitor Voltage	C5 Rated: 560 μ / 200V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) MinLoad input on /Off (3) Full Load /Min load Change Ta:25°C	(1)187V (2)184V (3)185V



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# LRS-350 series

4	Control IC Voltage Test	PWM IC U1 Rated 28 V (MAX.) 10V (MIN.)	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	U1 (1) 19.7V (2) 19.6V (3) 19.8V
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## SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P: 2. 434mA I/P-FG: 3. 34mA O/P-FG: 2. 70mA 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	24 mΩ

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																				
1	TEMPERATURE RISE TEST	MODEL: LRS-350-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=31.6°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=48.2°C																																																																						
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 31.6 °C</th> <th>HIGH AMBIENT Ta=48.2 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>46.0°C</td><td>63.6°C</td></tr> <tr><td>2</td><td>BD1</td><td>48.0°C</td><td>63.7°C</td></tr> <tr><td>3</td><td>ZNR5</td><td>40.0°C</td><td>58.2°C</td></tr> <tr><td>4</td><td>C5</td><td>42.9°C</td><td>59.4°C</td></tr> <tr><td>5</td><td>C6</td><td>40.1°C</td><td>56.9°C</td></tr> <tr><td>6</td><td>C36</td><td>36.4°C</td><td>53.4°C</td></tr> <tr><td>7</td><td>C37</td><td>34.4°C</td><td>52.5°C</td></tr> <tr><td>8</td><td>T2</td><td>39.5°C</td><td>57.6°C</td></tr> <tr><td>9</td><td>Q1</td><td>60.5°C</td><td>77.5°C</td></tr> <tr><td>10</td><td>D10</td><td>43.2°C</td><td>60.7°C</td></tr> <tr><td>11</td><td>Q2</td><td>53.9°C</td><td>69.5°C</td></tr> <tr><td>12</td><td>D11</td><td>37.8°C</td><td>55.5°C</td></tr> <tr><td>13</td><td>Q102</td><td>58.9°C</td><td>73.5°C</td></tr> <tr><td>14</td><td>Q103</td><td>67.6°C</td><td>87.8°C</td></tr> <tr><td>15</td><td>T1coil</td><td>72.3°C</td><td>92.4°C</td></tr> <tr><td>16</td><td>T1core</td><td>56.1°C</td><td>72.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 31.6 °C	HIGH AMBIENT Ta=48.2 °C	1	LF1	46.0°C	63.6°C	2	BD1	48.0°C	63.7°C	3	ZNR5	40.0°C	58.2°C	4	C5	42.9°C	59.4°C	5	C6	40.1°C	56.9°C	6	C36	36.4°C	53.4°C	7	C37	34.4°C	52.5°C	8	T2	39.5°C	57.6°C	9	Q1	60.5°C	77.5°C	10	D10	43.2°C	60.7°C	11	Q2	53.9°C	69.5°C	12	D11	37.8°C	55.5°C	13	Q102	58.9°C	73.5°C	14	Q103	67.6°C	87.8°C	15	T1coil	72.3°C	92.4°C	16	T1core	56.1°C	72.8°C
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350W Single Output Switching Power Supply

**LRS-350 series**

		17	C200	48.2°C	63.8°C
		18	L101	53.6°C	70.4°C
		19	C201	54.2°C	70.2°C
		20	RTH3	64.6°C	80.3°C
		21	L100	64.7°C	82.1°C
		22	C105	45.6°C	64.4°C
		23	C221	48.0°C	63.8°C
		24	U1	37.9°C	56.1°C
		25	D30	39.4°C	58.8°C
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= -25 °C	TEST: OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE		I/P: 272 VAC O/P: FULL LOAD Ta= 50 °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%/°C (0~50°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -45°C~ +90°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: -25°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= 50 °C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 50 °C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 50 °C LIFE TIME			(1) 1183522HRS (2) 183366HRS (3) 179584HRS (4) 1276086HRS
10	MTBF	2099.9K hrs min. Telcordia SR-332 (Bellcore) ; 328.6Khrs 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			

<b>TEST RESULT</b>	<b>TESTER</b>	<b>APPROVAL</b>
<b>PASS</b>	<b>FRANK</b>	<b>WANGDZ</b>