



# Test Report: LRS-200-5

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200W Single Output Switching Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY TEST

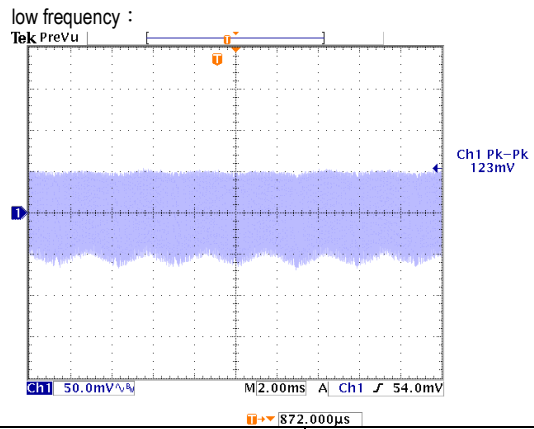
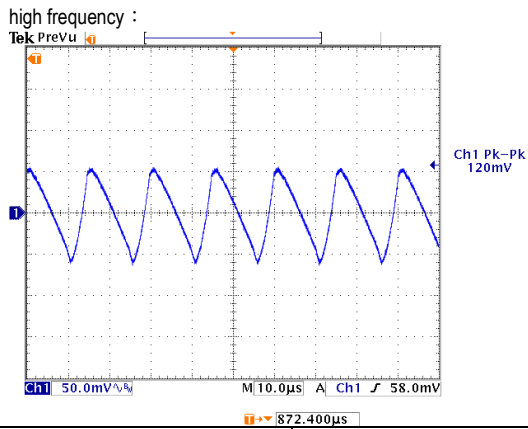
## ■ RELIABILITY TEST

ENVIRONMENT TEST

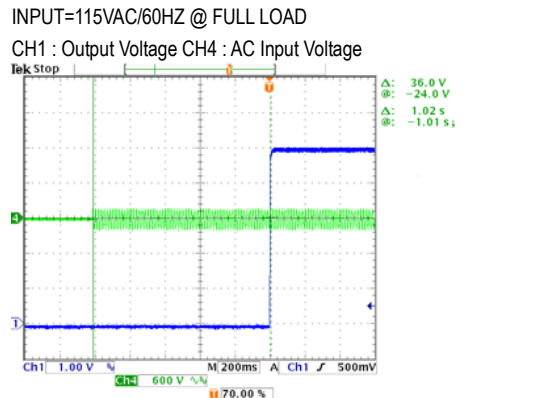
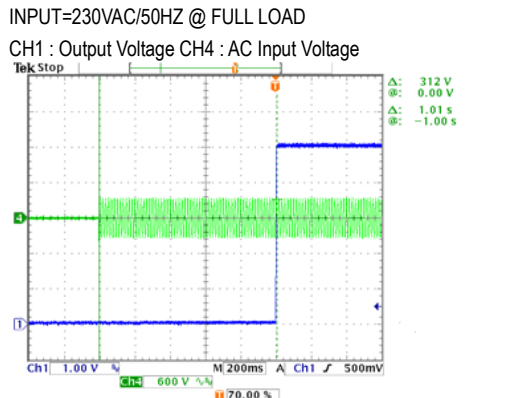
## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.5 V~ 5.5 V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	4.33V~5.79V/230VAC 4.33V~5.79V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 3 %~ -3 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.5 %~ -0.5%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0.05 %~ -0.05%
4	LOAD REGULATION(Max)	V1: 2 %~ -2 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.2 %~ -0.2 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 150 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 123mVp-p



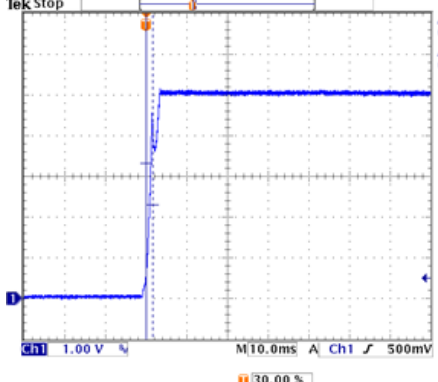
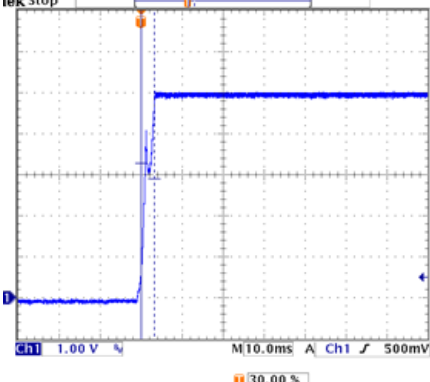
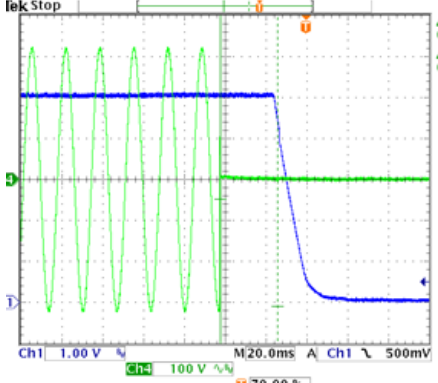
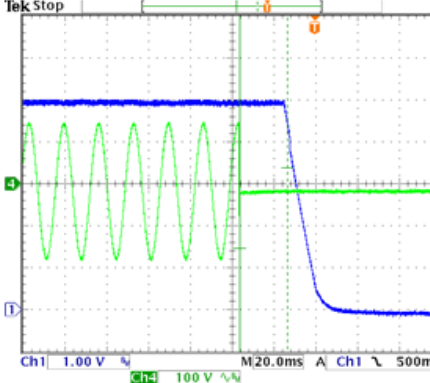
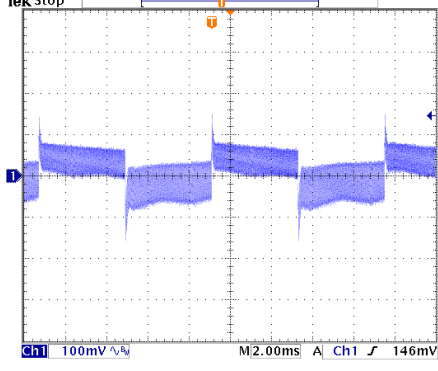
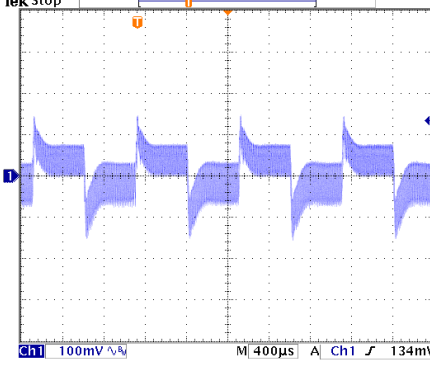
7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 1008ms 115VAC/ 1016ms
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200W Single Output Switching Power Supply

LRS-200 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/ 1.60ms 115VAC/3.2ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		
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/ 22.8ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH4 : AC Input Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH4 : AC Input Voltage</p> 		
10	DYNAMIC LOAD	V1: 1000 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	304mVp-p 300mVp-p
<p>FULL /50% LOAD 50%DUTY / 120HZ</p> 		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p> 		

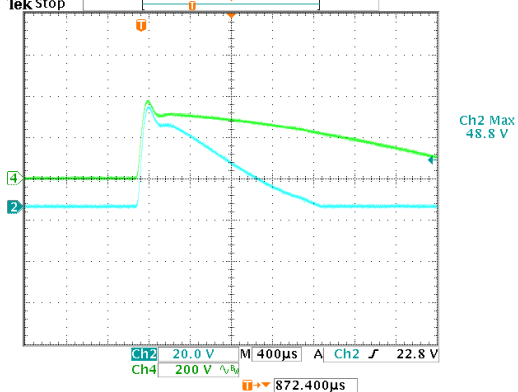


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 240 ~ 370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25°C	81V~132V 137V~264V 231VDC ~ 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/ 2.2A 115V/ 4A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =2.02A/ 230VAC I =3.30A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.409 mA N-FG: 0.409 mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.58 W < 0.56 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 =48.8A/ 230VAC I =45.6A/ 115VAC

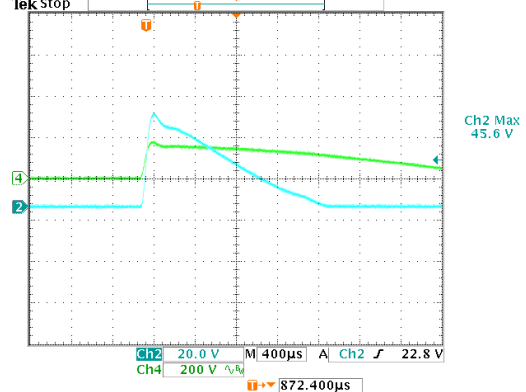
INPUT=230VAC/50HZ @ FULL LOAD

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

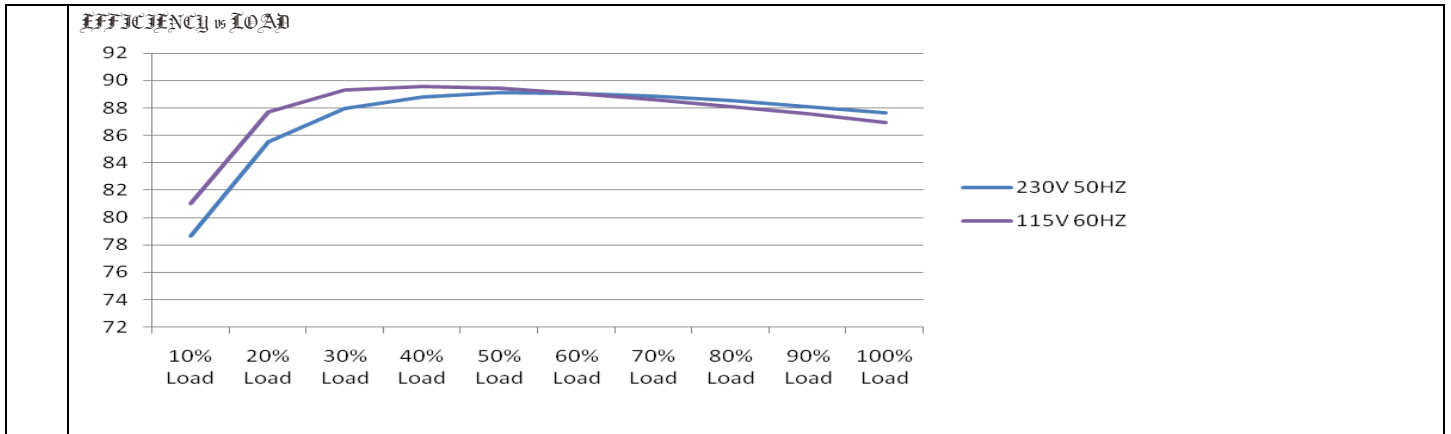


INPUT=115VAC/50HZ @ FULL LOAD

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



7	EFFICIENCY(Typ)	87%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	87.7%
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### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 140 %	I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	128.33%/ 230VAC 128.13%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 5.75V~6.75V	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	6.25V/ 230VAC 6.25V/115VAC Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Hiccup mode, recovers automatically after fault condition is removed
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE 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	Q 2 Rated 600V/13A	I/P: High-Line +3V =267V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta:25°C	(1) 464 V (2) 504V (3) 380V
2	Diode Peak Voltage	Q101 Rated 120 A/40 V  Q103 Rated 120A/ 40 V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output Short Ta:25°C	Q101: (1) 34.2V (2) 33.4V  Q103: (1) 33.2V (2) 27.2V
3	Input Capacitor Voltage	C5 Rated: 330 μ / 200V	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) 183V (2) 183V (3) 183V



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# LRS-200 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) 19.5V (2) 19.4V (3) 19.6V
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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:2.396mA I/P-FG:3.06mA O/P-FG:2.73mA 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-200-5 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=24.7°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=40.1°C																																																																										
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 24.7 °C</th> <th>HIGH AMBIENT Ta=40.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U1</td><td>63.9°C</td><td>76.7°C</td></tr> <tr><td>2</td><td>U100</td><td>71.1°C</td><td>82.8°C</td></tr> <tr><td>3</td><td>LF1</td><td>55.4°C</td><td>69.6°C</td></tr> <tr><td>4</td><td>BD1</td><td>59.2°C</td><td>72.1°C</td></tr> <tr><td>5</td><td>ZNR5</td><td>59.0°C</td><td>73.0°C</td></tr> <tr><td>6</td><td>C5</td><td>59.2°C</td><td>73.3°C</td></tr> <tr><td>7</td><td>C6</td><td>57.7°C</td><td>71.9°C</td></tr> <tr><td>8</td><td>T2</td><td>62.2°C</td><td>76.2°C</td></tr> <tr><td>9</td><td>Q1</td><td>66.7°C</td><td>82.4°C</td></tr> <tr><td>10</td><td>Q2</td><td>66.9°C</td><td>82.6°C</td></tr> <tr><td>11</td><td>D11</td><td>63.2°C</td><td>77.8°C</td></tr> <tr><td>12</td><td>D10</td><td>65.3°C</td><td>82.2°C</td></tr> <tr><td>13</td><td>T1coil</td><td>95.4°C</td><td>109.3°C</td></tr> <tr><td>14</td><td>T1core</td><td>78.2°C</td><td>91.8°C</td></tr> <tr><td>15</td><td>C36</td><td>61.7°C</td><td>76.6°C</td></tr> <tr><td>16</td><td>RTH3</td><td>88.5°C</td><td>102.7°C</td></tr> <tr><td>17</td><td>L100</td><td>90.2°C</td><td>104.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 24.7 °C	HIGH AMBIENT Ta=40.1 °C	1	U1	63.9°C	76.7°C	2	U100	71.1°C	82.8°C	3	LF1	55.4°C	69.6°C	4	BD1	59.2°C	72.1°C	5	ZNR5	59.0°C	73.0°C	6	C5	59.2°C	73.3°C	7	C6	57.7°C	71.9°C	8	T2	62.2°C	76.2°C	9	Q1	66.7°C	82.4°C	10	Q2	66.9°C	82.6°C	11	D11	63.2°C	77.8°C	12	D10	65.3°C	82.2°C	13	T1coil	95.4°C	109.3°C	14	T1core	78.2°C	91.8°C	15	C36	61.7°C	76.6°C	16	RTH3	88.5°C	102.7°C	17	L100	90.2°C	104.4°C
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200W Single Output Switching Power Supply

**LRS-200 series**

		18	C106	79.7℃	95.5℃
		19	C201	67.8℃	80.2℃
		20	L101	77.6℃	89.7℃
		21	Q101	77.2℃	91.9℃
		22	Q103	69.3℃	83.5℃
		23	Q104	64.7℃	78.9℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P: 230 VAC O/P: 125% 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= -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	±0.008%/°C (0~50°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 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 : -25℃~ 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 C106 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) 65146HRS (2) 22444HRS (3) 81836HRS (4) 207180HRS
10	MTBF	2346.6K hrs min. Telcordia SR-332 (Bellcore) ; 279.4Khrs min. MIL-HDBK-217F (25℃)			
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