



Test Report: LRS-200-12

200W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY TEST

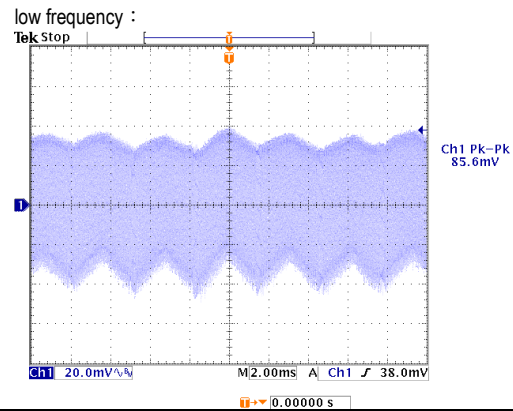
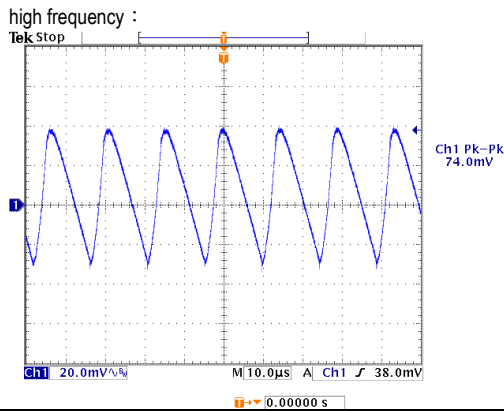
■ RELIABILITY TEST

ENVIRONMENT TEST

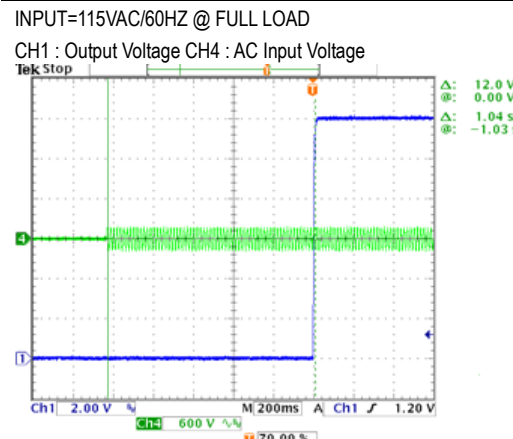
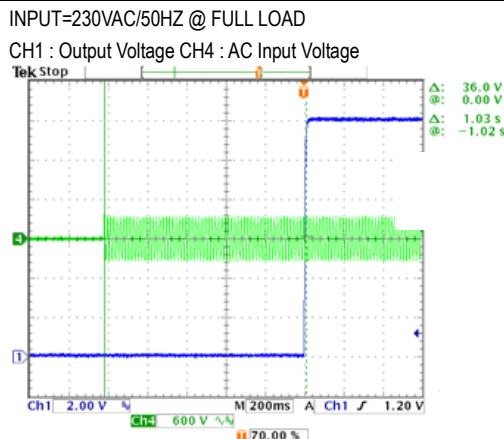
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.2~ 13.8V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	9.860V~14.124V/230VAC 9.000V~14.126V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.5%~ 1.5%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.01%~ 0.01%
3	LINE REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.01%~ -0.01%
4	LOAD REGULATION(Max)	V1: -1%~ 1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.0%~ 0%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 85.6mVp-p



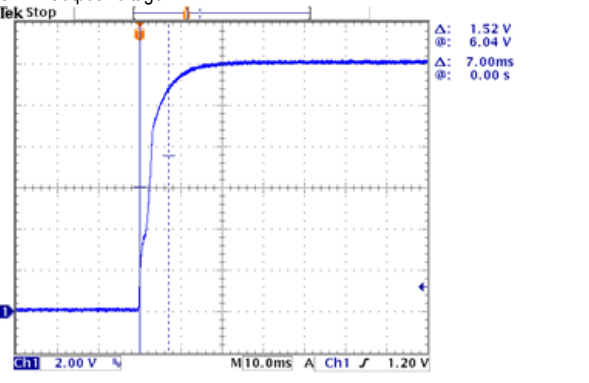
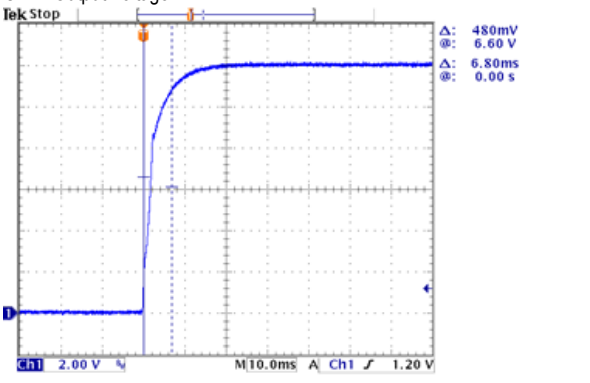
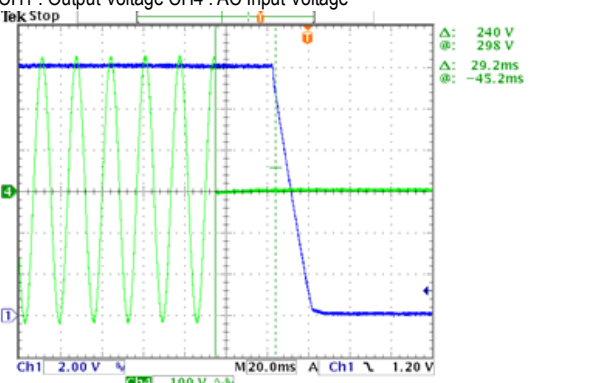
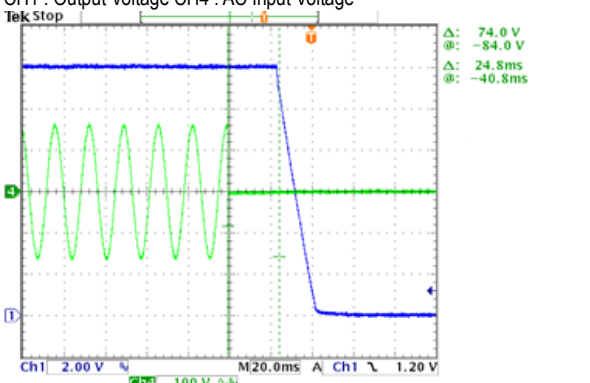
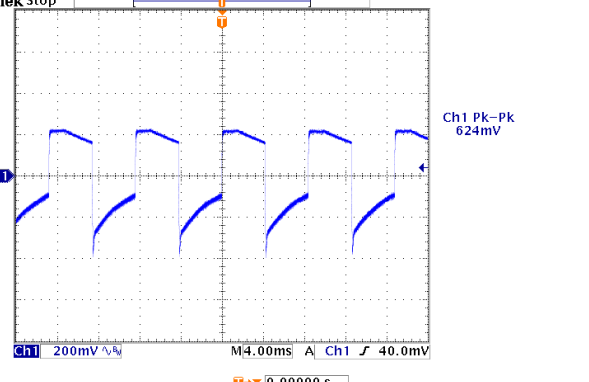
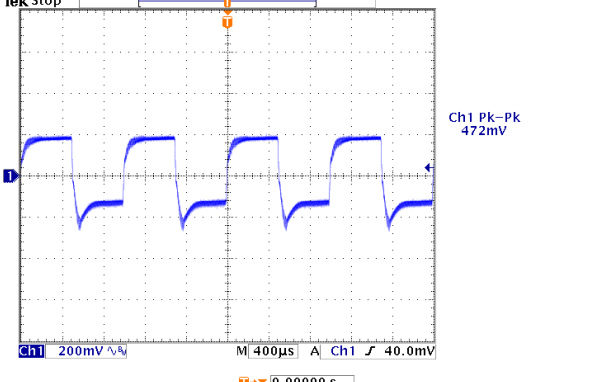
7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 1028ms 115VAC/ 1038ms
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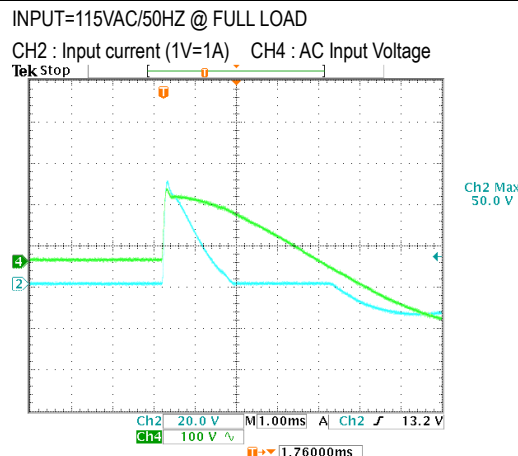
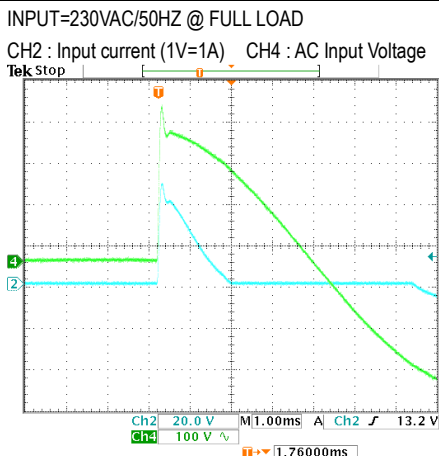
LRS-200 series

8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 7.00ms 115VAC/6.80ms
<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/ 29.2ms 115VAC/ 24.8ms
<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: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	624mVp-p 472mVp-p
<p>FULL /50% LOAD 50%DUTY / 120HZ</p> 		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p> 		

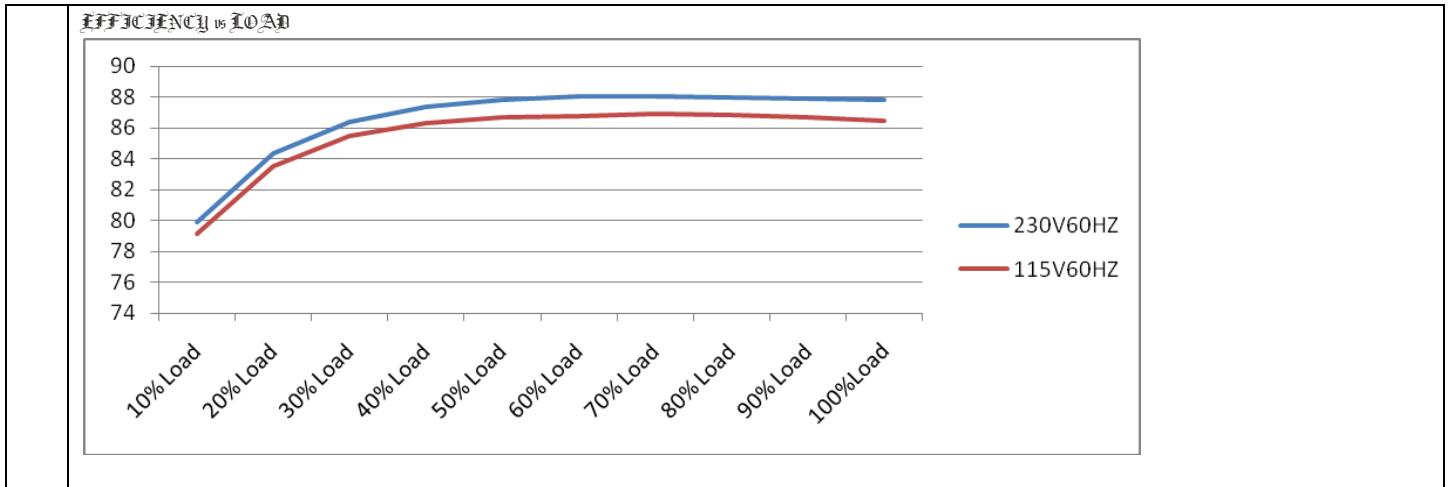


INPUT FUNCTION TEST

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	80V~132V 149V~264V 230VDC ~ 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=2.04A/ 230VAC I=3.69A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.463 mA N-FG: 0.463 mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.61W < 0.57 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=50.0A/ 115VAC



7	EFFICIENCY(Typ)	87.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	87.8%
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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	125.88%/ 230VAC 125.35%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH:13.8V~16.2V	15.0V/ 230VAC 14.9V/115VAC O/P: MIN LOAD Ta:25°C	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 1 Rated 13 A/600V	I/P: High-Line +3V =267V O/P: (1) Full Load Turn on (2) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	(1)452V (2)462V (3)460V
2	Diode Peak Voltage	Q102 Rated 20 A/100V Q103 Rated 20A/100V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output Short Ta:25°C	Q102: (1)91.2V (2)91.6V Q103: (1)82.0V (2)80.4V
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	(1)188V (2)188V (3)187V



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			(3)Full Load /Min load Change Ta:25°C	
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) Output short (3)No load VR (min) Ta:25°C	U1 (1) 19.9V (2) 19.9V (3) 19.9V

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 I/P-O/P: 2.43mA I/P-FG: 3.30mA O/P-FG:2.68 mA 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	20 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> </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
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		NO	Position	ROOM AMBIENT Ta= 24.7 °C	HIGH AMBIENT Ta=40.1 °C
		16	RTH3	88.5°C	102.7°C
		17	L100	90.2°C	104.4°C
		18	C106	79.7°C	95.5°C
		19	C201	67.8°C	80.2°C
		20	L101	77.6°C	89.7°C
		21	Q101	77.2°C	91.9°C
		22	Q103	69.3°C	83.5°C
		23	Q104	64.7°C	78.9°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	±0.008%/°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 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°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