



Test Report: LRS-50-24

50W 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

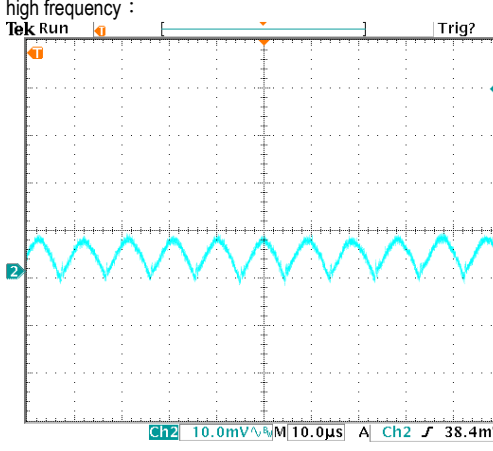
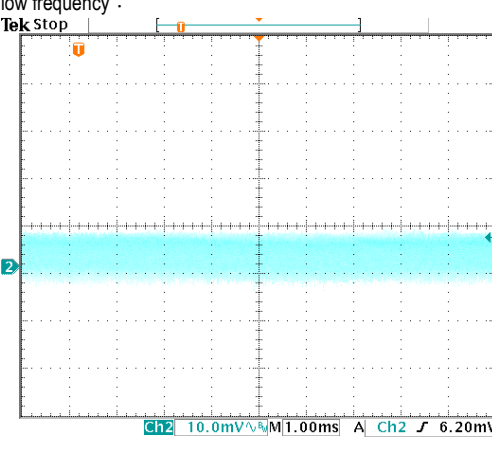
E.M.C. Test

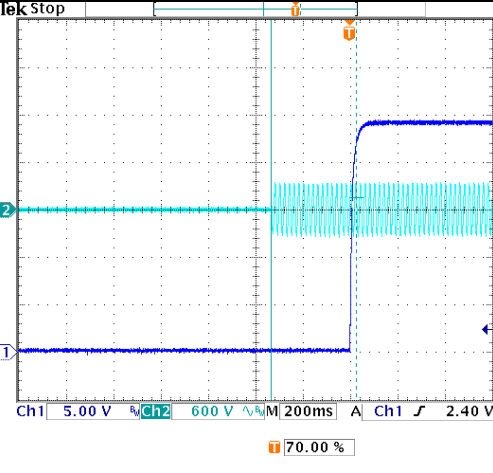
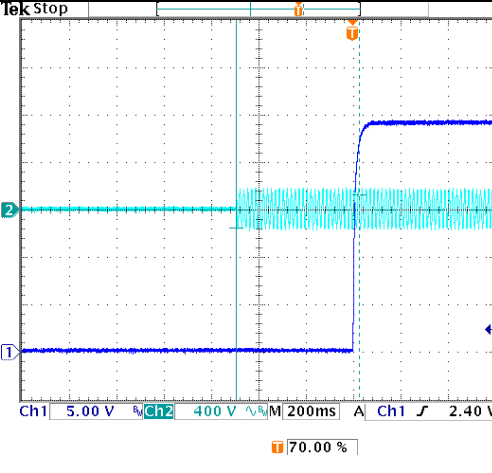
RELIABILITY TEST

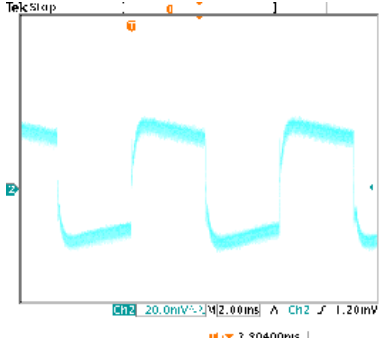
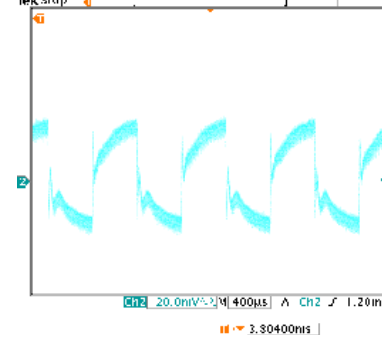
ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

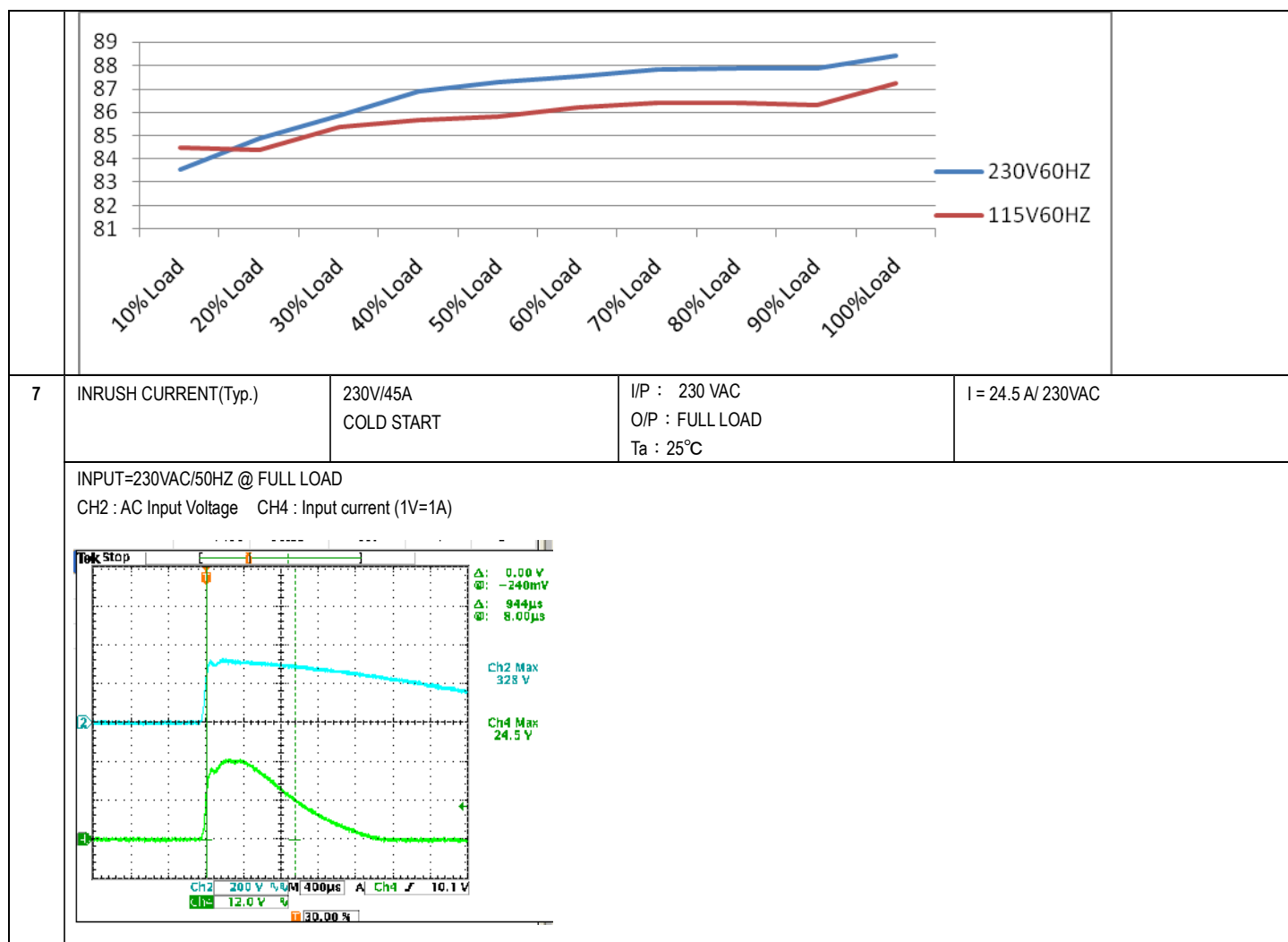
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6 V~ 28.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.925V~30.463V/230VAC 20.924V~30.463V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:-0.0414 %~0%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.0414 %~0%
4	LOAD REGULATION(Max)	V1: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0414 %~0%
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: 12.8 mVp-p
high frequency :  Ch2 Pk-Pk 11.2mV Ch2 10.0mV/V 10.0μs A Ch2 38.4mV 3.80400ms low frequency :  Ch2 Pk-Pk 12.8mV Ch2 10.0mV/V 1.00ms A Ch2 6.20mV 3.80400ms				
7	SET UP TIME(Max)	230VAC/1000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 360 ms 115VAC/ 520 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	

			Δ: 156 V @: 0.00 V Δ: 360ms @: -336ms Δ: 280 V @: -152 V Δ: 520ms @: -496ms
8	RISE TIME (Max) 230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 22.8 ms 115VAC/ 22.2 ms INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage Tek Run Δ: 1.50 V @: 15.1 V Δ: 22.8ms @: 200µs INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage Tek Run Δ: 19.2 V @: 2.60 V Δ: 22.2ms @: 0.00 s
9	HOLD UP TIME (Typ.) 230VAC/30ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/43.2ms 115VAC/16.8ms INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage Tek Run Δ: 622 V @: -312 V Δ: 43.2ms @: -33.2ms INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage Tek Run Δ: 110.0 V @: 2.00 V Δ: 16.8ms @: -28.8ms

10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	76.8mVp-p 64.8mVp-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	85VAC~264VAC 120VDC~373VDC	I/P:TESTING O/P:FULL LOAD Ta:25°C	78VAC~264VAC 113VDC~373VDC
			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/0.56A 115V/0.95A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I=0.487A/ 230VAC I=0.892A/ 115VAC
4	LEAKAGE CURRENT	<0.75 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.325 mA N-FG : 0.325 mA
5	NO LOAD CONSUMPTION	< 0.3W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	< 0.0498 W < 0.0729 W
6	EFFICIENCY(Typ.)	88%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	88.47%
	EFFICIENCY vs LOAD			



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 150 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C	133.63%/ 264VAC 132.72%/ 230VAC 130.9%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	28.8 V~33.6 V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C	31.2V/ 264VAC 31.2V/ 230VAC 31.2V/ 85VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	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	Q 1 Rated 10A/600V	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	VDS: (1)518V (2)430V (3)510V (4)516V (5)508V (6)546V (7)542V
2	Diode Peak Voltage	Q100 Rated 10A/200V	I/P:High-Line +3V =267 V AC ON/OFF 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. (8).NO LOAD Ta:25°C	Q100: VDS: (1)118V (2)94.0V (3)117V (4)118V (5)117V (6)117V (7)118V (8)118V
3	Input Capacitor Voltage	C5 Rated: 100u/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)372V (2)374V (3)374V
4	Control IC Voltage Test	PWM IC U1 Rated 10.8 V~30V	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. 16.6 V 2. 15.1 V 3. 16.7 V 4. 18.5 V 5. 14.9 V
5	Clamp Diode Peak Voltage	D5 Rated : 3A/600V	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)468 V (2)466 V

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: 2.152mA I/P-FG: 2.103mA O/P-FG: 2.091mA 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	8 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:100%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-50-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=31.0℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=50.9℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=31.0℃</th><th>HIGH AMBIENT Ta=50.9℃</th></tr><tr><td>1</td><td>LF1</td><td>59.5℃</td><td>76.3℃</td></tr><tr><td>2</td><td>BD1</td><td>58.9℃</td><td>74.7℃</td></tr><tr><td>3</td><td>C5</td><td>60.7℃</td><td>77.2℃</td></tr><tr><td>4</td><td>D5</td><td>78.7℃</td><td>96.0℃</td></tr><tr><td>5</td><td>Q1</td><td>73.7℃</td><td>89.8℃</td></tr><tr><td>6</td><td>C35</td><td>64.2℃</td><td>79.9℃</td></tr><tr><td>7</td><td>T1coil</td><td>67.1℃</td><td>82.6℃</td></tr><tr><td>8</td><td>T1core</td><td>69.9℃</td><td>84.7℃</td></tr><tr><td>9</td><td>C105</td><td>55.0℃</td><td>71.4℃</td></tr><tr><td>10</td><td>C106</td><td>64.2℃</td><td>80.0℃</td></tr><tr><td>11</td><td>L100</td><td>67.2℃</td><td>83.0℃</td></tr><tr><td>12</td><td>Q100</td><td>71.4℃</td><td>87.5℃</td></tr><tr><td>13</td><td>U1</td><td>54.1℃</td><td>71.1℃</td></tr><tr><td>14</td><td>D30</td><td>63.6℃</td><td>79.9℃</td></tr><tr><td>15</td><td>D40</td><td>58.2℃</td><td>74.3℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta=31.0℃	HIGH AMBIENT Ta=50.9℃	1	LF1	59.5℃	76.3℃	2	BD1	58.9℃	74.7℃	3	C5	60.7℃	77.2℃	4	D5	78.7℃	96.0℃	5	Q1	73.7℃	89.8℃	6	C35	64.2℃	79.9℃	7	T1coil	67.1℃	82.6℃	8	T1core	69.9℃	84.7℃	9	C105	55.0℃	71.4℃	10	C106	64.2℃	80.0℃	11	L100	67.2℃	83.0℃	12	Q100	71.4℃	87.5℃	13	U1	54.1℃	71.1℃	14	D30	63.6℃	79.9℃	15	D40	58.2℃	74.3℃
NO	Position	ROOM AMBIENT Ta=31.0℃	HIGH AMBIENT Ta=50.9℃																																																																	
1	LF1	59.5℃	76.3℃																																																																	
2	BD1	58.9℃	74.7℃																																																																	
3	C5	60.7℃	77.2℃																																																																	
4	D5	78.7℃	96.0℃																																																																	
5	Q1	73.7℃	89.8℃																																																																	
6	C35	64.2℃	79.9℃																																																																	
7	T1coil	67.1℃	82.6℃																																																																	
8	T1core	69.9℃	84.7℃																																																																	
9	C105	55.0℃	71.4℃																																																																	
10	C106	64.2℃	80.0℃																																																																	
11	L100	67.2℃	83.0℃																																																																	
12	Q100	71.4℃	87.5℃																																																																	
13	U1	54.1℃	71.1℃																																																																	
14	D30	63.6℃	79.9℃																																																																	
15	D40	58.2℃	74.3℃																																																																	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 132% LOAD Ta : 25℃	TEST : OK																																																																
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	1. I/P : 264VAC/ O/P : 100 % LOAD 2. I/P : 100VAC/ O/P : 75 % LOAD/75% 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	± 0.03 %/℃ (0~50℃)	I/P : 230 VAC O/P : FULL LOAD	±0.009%/℃ (0~50℃)																																																																
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40℃~ +85℃ 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 : -30℃~ 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°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) 292950HRS (2) 68809HRS (3) 182880HRS (4) 243002HRS
10	MTBF	3149.8K hrs min. Telcordia SR-332 (Bellcore) ; 561.6Khrs 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	

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ

2007/3/20 A50-S014