



# Test Report: LRS-50-24

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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

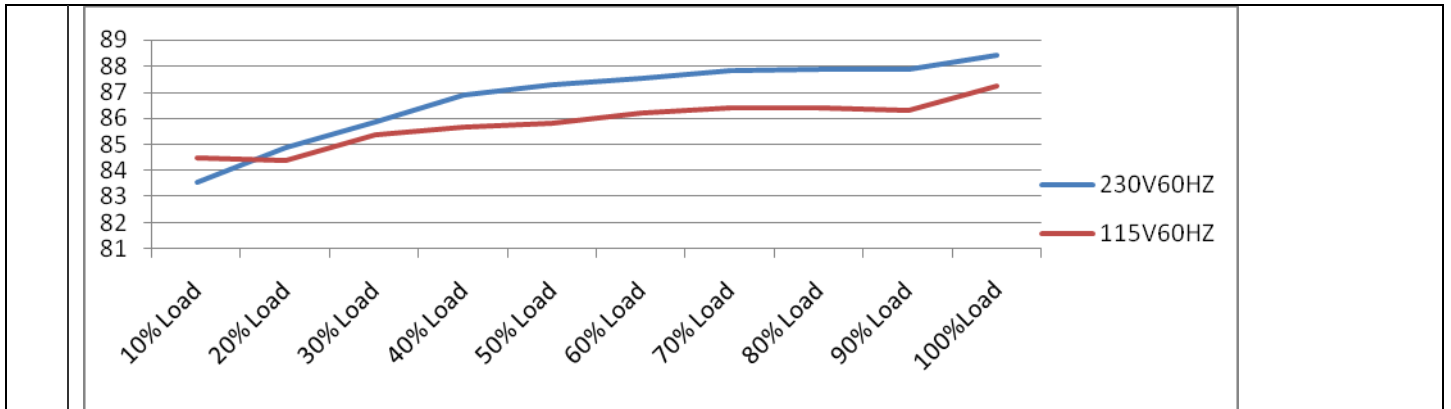
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6 V~ 28.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.925V~30.463V/230VAC 20.924V~30.463V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:-0.0414 %-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
		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>high frequency :</p> </div> <div style="text-align: center;"> <p>low frequency :</p> </div> </div>		
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
		<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		

	<p> <math>\Delta</math>: 156 V  <math>\textcircled{0}</math>: 0.00 V  <math>\Delta</math>: 360ms  <math>\textcircled{0}</math>: -336ms         </p>		<p> <math>\Delta</math>: 280 V  <math>\textcircled{0}</math>: -152 V  <math>\Delta</math>: 520ms  <math>\textcircled{0}</math>: -496ms         </p>
<p>8</p>	<p>RISE TIME (Max)</p> <p>230VAC/30ms 115VAC/30ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 22.8 ms 115VAC/ 22.2 ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>	<p> <math>\Delta</math>: 1.50 V  <math>\textcircled{0}</math>: 15.1 V  <math>\Delta</math>: 22.8ms  <math>\textcircled{0}</math>: 200µs         </p>	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>	<p> <math>\Delta</math>: 19.2 V  <math>\textcircled{0}</math>: 2.60 V  <math>\Delta</math>: 22.2ms  <math>\textcircled{0}</math>: 0.00 s         </p>
<p>9</p>	<p>HOLD UP TIME (Typ.)</p> <p>230VAC/30ms 115VAC/12ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/43.2ms 115VAC/16.8ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p> <math>\Delta</math>: 622 V  <math>\textcircled{0}</math>: -312 V  <math>\Delta</math>: 43.2ms  <math>\textcircled{0}</math>: -55.2ms         </p>	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p> <math>\Delta</math>: 10.0 V  <math>\textcircled{0}</math>: 2.00 V  <math>\Delta</math>: 16.8ms  <math>\textcircled{0}</math>: -28.8ms         </p>

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

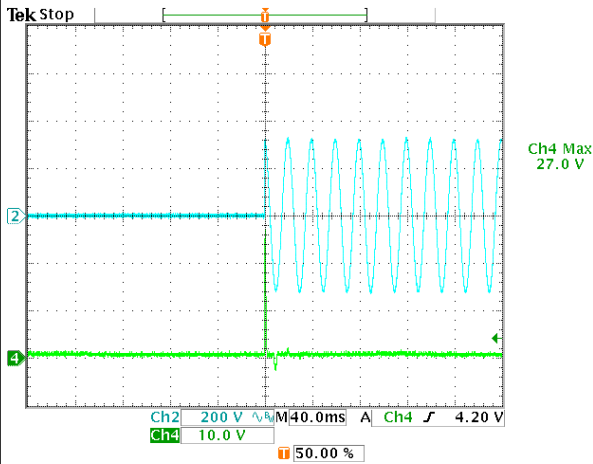
## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	78V~264V
			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	< 0.2W	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				



7	INRUSH CURRENT(Typ.)	230V/40A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 27.0 A / 230VAC
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INPUT=230VAC/50HZ @ FULL LOAD  
CH2 : AC Input Voltage CH4 : Input current (1V=1A)



### 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) <b>Peak Voltage</b>	Q1 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 <b>Voltage</b>	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	<b>Input Capacitor Voltage</b>	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	<b>Control IC Voltage Test</b>	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	16.6V 15.1V 16.7V 18.5V 14.9V
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°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=50.9°C																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=31.0°C</th> <th>HIGH AMBIENT Ta=50.9°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>59.5°C</td><td>76.3°C</td></tr> <tr><td>2</td><td>BD1</td><td>58.9°C</td><td>74.7°C</td></tr> <tr><td>3</td><td>C5</td><td>60.7°C</td><td>77.2°C</td></tr> <tr><td>4</td><td>D5</td><td>78.7°C</td><td>96.0°C</td></tr> <tr><td>5</td><td>Q1</td><td>73.7°C</td><td>89.8°C</td></tr> <tr><td>6</td><td>C35</td><td>64.2°C</td><td>79.9°C</td></tr> <tr><td>7</td><td>T1coil</td><td>67.1°C</td><td>82.6°C</td></tr> <tr><td>8</td><td>T1core</td><td>69.9°C</td><td>84.7°C</td></tr> <tr><td>9</td><td>C105</td><td>55.0°C</td><td>71.4°C</td></tr> <tr><td>10</td><td>C106</td><td>64.2°C</td><td>80.0°C</td></tr> <tr><td>11</td><td>L100</td><td>67.2°C</td><td>83.0°C</td></tr> <tr><td>12</td><td>Q100</td><td>71.4°C</td><td>87.5°C</td></tr> <tr><td>13</td><td>U1</td><td>54.1°C</td><td>71.1°C</td></tr> <tr><td>14</td><td>D30</td><td>63.6°C</td><td>79.9°C</td></tr> <tr><td>15</td><td>D40</td><td>58.2°C</td><td>74.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=31.0°C	HIGH AMBIENT Ta=50.9°C	1	LF1	59.5°C	76.3°C	2	BD1	58.9°C	74.7°C	3	C5	60.7°C	77.2°C	4	D5	78.7°C	96.0°C	5	Q1	73.7°C	89.8°C	6	C35	64.2°C	79.9°C	7	T1coil	67.1°C	82.6°C	8	T1core	69.9°C	84.7°C	9	C105	55.0°C	71.4°C	10	C106	64.2°C	80.0°C	11	L100	67.2°C	83.0°C	12	Q100	71.4°C	87.5°C	13	U1	54.1°C	71.1°C	14	D30	63.6°C	79.9°C	15	D40	58.2°C	74.3°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 132% LOAD Ta : 25°C	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°C	TEST : OK																																																																
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40 °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 (0-50°C)																																																																
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40°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=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	MIL-HDBK-217F TOTAL FAILURE RATE : 645KHRS	
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