



# Test Report: LRS-150F-5

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150W 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

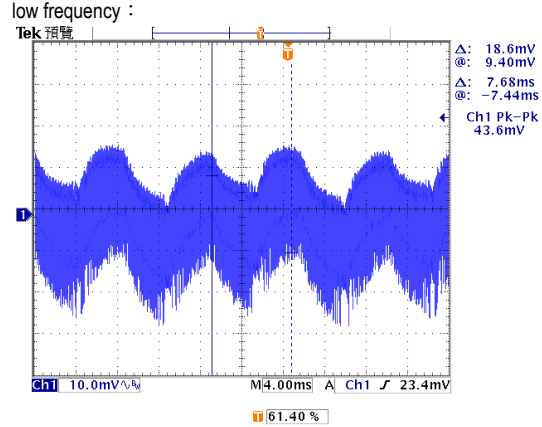
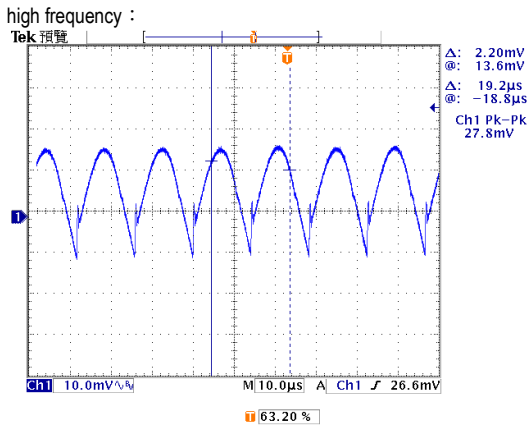
## ■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.5 V~ 5.5 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.29V~5.77V/230VAC 4.29V~5.77V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 2 %~ -2 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.2%~-0.2%
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: 1 %~ -1 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.2%~-0.2%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<10%
6	RIPPLE & NOISE(Max)	V1: 100 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 43.6mVp-p



7	SET UP TIME(Max)	230VAC/500ms 115VAC/500ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/224ms 115VAC/218ms
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INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage

INPUT=115VAC/60HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage

8	<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/3.36ms 115VAC/4.4ms</p>
	<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> <p>Tek 預覽</p>	<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> <p>Tek Run</p>	
9	<p>HOLD UP TIME (Typ.)</p> <p>230VAC/16ms 115VAC/12ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/103ms 115VAC/20.4ms</p>
	<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>Tek Run</p>	<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>Tek Run</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	378mVp-p 336mVp-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	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	63V~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/ 1.6A 115V/ 2.8A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =0.948A/ 230VAC I =1.78A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.47mA N-FG : 0.47mA
5	NO LOAD CONSUMPTION	< 0.5W	I/P : 115VAC	< 0.298W
			I/P : 230VAC O/P : NO LOAD Ta : 25°C	< 0.430W

6	EFFICIENCY(Typ.)	85%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	85.51%																																	
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>230V 50HZ (%)</th> <th>115V 60HZ (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>86.5</td><td>87.8</td></tr> <tr><td>20%</td><td>87.8</td><td>87.5</td></tr> <tr><td>30%</td><td>87.8</td><td>87.0</td></tr> <tr><td>40%</td><td>87.5</td><td>86.5</td></tr> <tr><td>50%</td><td>87.0</td><td>86.0</td></tr> <tr><td>60%</td><td>86.8</td><td>85.5</td></tr> <tr><td>70%</td><td>86.5</td><td>85.0</td></tr> <tr><td>80%</td><td>86.5</td><td>84.5</td></tr> <tr><td>90%</td><td>86.5</td><td>84.0</td></tr> <tr><td>100%</td><td>85.5</td><td>83.5</td></tr> </tbody> </table>					Load (%)	230V 50HZ (%)	115V 60HZ (%)	10%	86.5	87.8	20%	87.8	87.5	30%	87.8	87.0	40%	87.5	86.5	50%	87.0	86.0	60%	86.8	85.5	70%	86.5	85.0	80%	86.5	84.5	90%	86.5	84.0	100%	85.5	83.5
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7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I=20.2A/ 230VAC T50=2010us/230V																																	
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)</p> <p>Ch2 Max 338 V Ch4 Max 20.2 A</p>																																					

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~ 140 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25°C	122.7%/ 264VAC 124.5%/ 230VAC 127.7%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	5.75V~6.75V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25°C	6.17V/ 264VAC 6.14V/ 230VAC 8.18V/ 85VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to

				recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 264VAC I/P: 85VAC O/P: FULL LOAD	O.T.P Active PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
4	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 :13A/600V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. Ta:25°C	VDS: (1) 588V (2) 564V (3) 590V (4) 590V
2	<b>Diode Peak Voltage</b>	Q101 Rated : 95A/ 60 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. (5).NO LOAD Ta:25°C	Q101: VDS: (1) 44.0V (2) 43.4V (3) 44.0V (4) 44.6V (5) 44.6V
3	<b>Input Capacitor Voltage</b>	C5 Rated: : 120 μ /400 V 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) 364V (2) 368V (3) 370V
4	<b>Control IC Voltage Test</b>	PWM IC U1 Rated : 28V 10.5V(MIN.)  O/P IC U100 Rated :1: 24V 8V(MIN.)	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. 14.4V 2. 19.4V 3. 21.8V 4. 18.0V 5. 14.4V

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P: 4.125 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C	I/P-O/P:3.44 mA I/P-FG: 3.91mA O/P-FG: 3.23m A 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	28mΩ

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:80%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-150F-5 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=27.2°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=40.6°C																																																						
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 118% 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= -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%/°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=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) 70605HRS (2) 15768HRS (3) 88914HRS (4) 158118HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE : 648.6KHRS	
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