



# Test Report: LRS-150F-15

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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

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 13.5V- 18 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	13.09V~18.45V/230VAC 13.09V~18.45V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.066%-0%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0.066%-0%
4	LOAD REGULATION(Max)	V1: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0%-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: 39.4mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>high frequency : Tek 預覽</p> </div> <div style="width: 45%;"> <p>low frequency : Tek 停止</p> </div> </div>				
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/218ms 115VAC/194ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	



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<p>Tek Stop</p> <p>CH1: 5.00 V, CH2: 600 V, M: 100ms, A: Ch1, 1.50 V</p> <p>70.00 %</p> <p>Δ: 156 V @: 12.0 V Δ: 218ms @: -212ms</p>		<p>Tek 執行</p> <p>CH1: 5.00 V, CH2: 500 V, M: 100ms, A: Ch1, 10.3 V</p> <p>60.80 %</p> <p>Δ: 14.2 V @: -100mV Δ: 194ms @: -190ms</p>	
<p><b>8</b> 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/6.2ms 115VAC/6.4ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> <p>Tek Run</p> <p>CH1: 5.00 V, M: 10.0ms, A: Ch1, 1.50 V</p> <p>30.00 %</p> <p>Δ: 600mV @: 15.1 V Δ: 6.20ms @: 0.00 s</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> <p>Tek Run</p> <p>CH1: 5.00 V, M: 10.0ms, A: Ch1, 1.50 V</p> <p>30.00 %</p> <p>Δ: 12.0 V @: 1.50 V Δ: 6.40ms @: -200μs</p>	
<p><b>9</b> 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/81.2ms 115VAC/16.8ms</p>
<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>	



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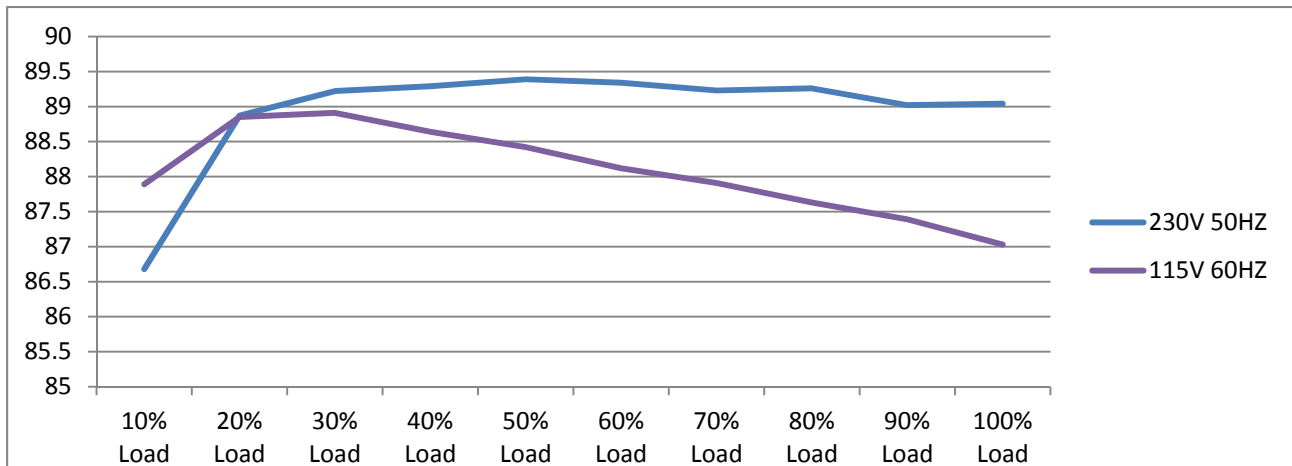
	<p> <math>\Delta</math>: 58.0 V  <math>@</math>: -34.0 V  <math>\Delta</math>: 81.2ms  <math>@</math>: -88.8ms         </p>		<p> <math>\Delta</math>: 42.0 V  <math>@</math>: -34.0 V  <math>\Delta</math>: 16.8ms  <math>@</math>: -22.8ms         </p>	
10	DYNAMIC LOAD	V1: 1500 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	334mVp-p 258mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ <p> <math>\Delta</math>: 122mV  <math>@</math>: -52.0mV  <math>\Delta</math>: 19.6ms  <math>@</math>: -10.8ms          Ch1 Pk-Pk 334mV       </p>		FULL /50% LOAD 50%DUTY / 1KHZ <p> <math>\Delta</math>: 0.00 V  <math>@</math>: -42.0mV  <math>\Delta</math>: 1.96ms  <math>@</math>: -1.08ms          Ch1 Pk-Pk 258mV       </p>	
11	TRANSIENT RECOVERY TIME	V1: 1500 mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	282mVp-p 0 us

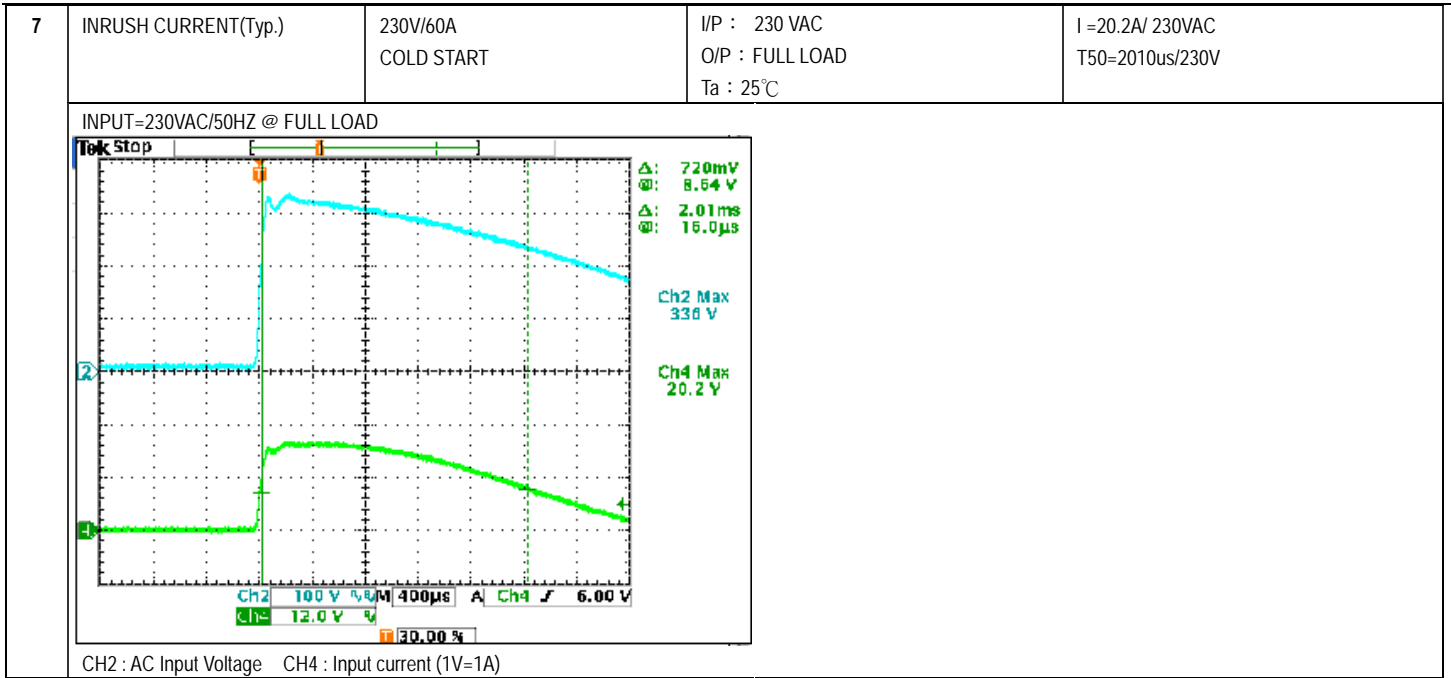


**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	71V~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 =1.21A/ 230VAC I =2.34A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.438mA N-FG : 0.438mA
5	NO LOAD CONSUMPTION	< 0.5W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	< 0.0621W < 0.3307W
6	EFFICIENCY(Typ.)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.08%

EFFICIENCY vs LOAD





## 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	116.5%/ 264VAC 118.1%/ 230VAC 119.8%/100VAC  PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	18.75V-21.75V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C	20.32V/ 264VAC 20.42V/ 230VAC 20.36V/ 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. I/P:Low-Line -3V = 97V 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)574V (2) 570V (3) 572V (4) 586V  VDS: (1) 370V (2) 312V (3) 374V (4) 372V
2	Diode <b>Peak Voltage</b>	Q101 Rated 20A/100V	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) 87.2V (2) 79.2V (3) 88.8V (4) 92.0V (5) 97.2V
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) 370V (3) 370V
4	<b>Control IC Voltage Test</b>	PWM IC U1 Rated : 28V 10.5V(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 下限.LOW LINE Ta:25°C	1. 19.9V 2. 13.0V 3. 19.2V 4. 24.9V 5. 15.8V

**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: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C	I/P-O/P: 3.50mA I/P-FG: 4.27mA O/P-FG: 3.20m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC	I/P-O/P:9999MΩ I/P-FG: 9999MΩ

		O/P-FG:500VDC>100MΩ	O/P-FG: 500 VDC Ta:25°C	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





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# LRS-150F series

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-12  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																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 27.2 °C</th> <th>HIGH AMBIENT Ta=40.6 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>D6</td><td>66.2°C</td><td>77.9°C</td></tr> <tr><td>2</td><td>C6</td><td>67.4°C</td><td>76.7°C</td></tr> <tr><td>3</td><td>Q1</td><td>84.7°C</td><td>96.6°C</td></tr> <tr><td>4</td><td>C35</td><td>66.3°C</td><td>76.3°C</td></tr> <tr><td>5</td><td>BD1</td><td>86.4°C</td><td>95.7°C</td></tr> <tr><td>6</td><td>Q100</td><td>96.9°C</td><td>107.0°C</td></tr> <tr><td>7</td><td>C106</td><td>77.9°C</td><td>89.5°C</td></tr> <tr><td>8</td><td>LF1</td><td>65.6°C</td><td>76.5°C</td></tr> <tr><td>9</td><td>RTH10</td><td>75.4°C</td><td>86.7°C</td></tr> <tr><td>10</td><td>R14</td><td>73.7°C</td><td>86.1°C</td></tr> <tr><td>11</td><td>T1</td><td>82.4°C</td><td>92.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 27.2 °C	HIGH AMBIENT Ta=40.6 °C	1	D6	66.2°C	77.9°C	2	C6	67.4°C	76.7°C	3	Q1	84.7°C	96.6°C	4	C35	66.3°C	76.3°C	5	BD1	86.4°C	95.7°C	6	Q100	96.9°C	107.0°C	7	C106	77.9°C	89.5°C	8	LF1	65.6°C	76.5°C	9	RTH10	75.4°C	86.7°C	10	R14	73.7°C	86.1°C	11	T1	82.4°C	92.4°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 113% 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= 45 °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 (0-40°C)																																																



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LRS-150F series

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 : -20°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=45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME	(1) 81305HRS (2) 33047HRS (3) 48975HRS (4) 93362HRS
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