



Test Report: LRS-150F-36

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

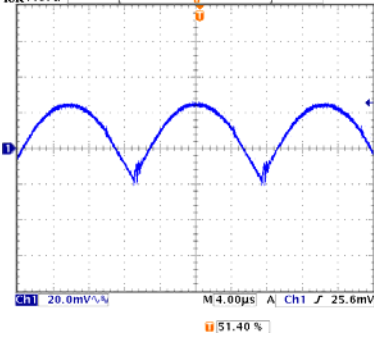
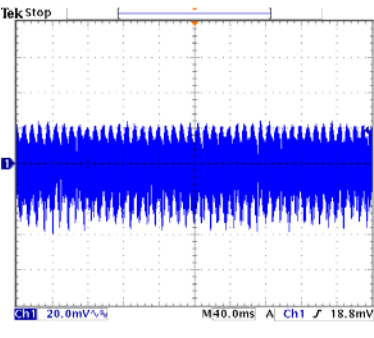
E.M.C. Test

■ RELIABILITY TEST

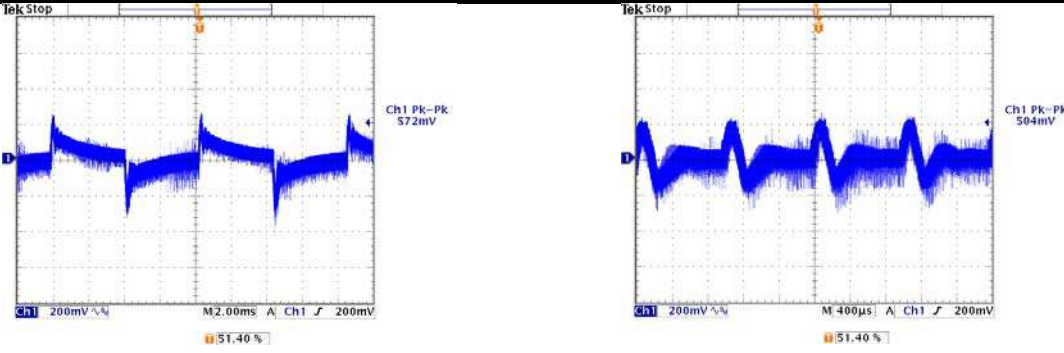
ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

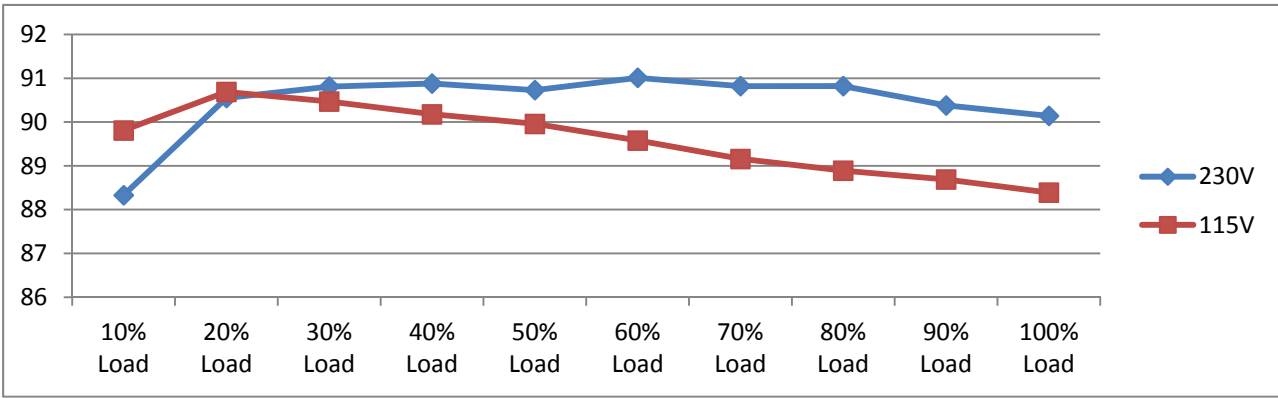
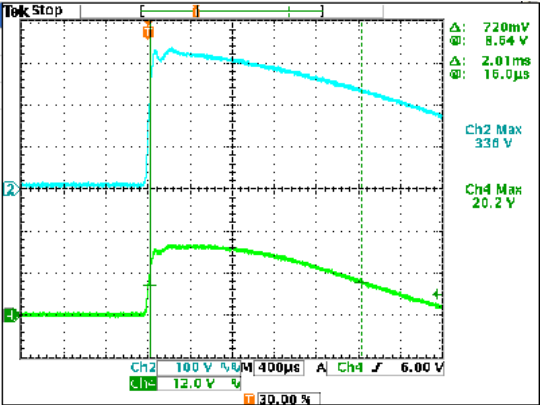
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 32.4V~ 39.6 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	31.20V~41.08V/230VAC 31.20V~41.08V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:0.02 %~-0.02%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1:0%~-0.03%
4	LOAD REGULATION(Max)	V1: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.02 %~0%
5	OVER/UNDERSHOOT TEST	< $\pm 5\%$	I/P: 230VAC O/P:FULL LOAD Ta:25°C	< $\pm 5\%$
6	RIPPLE & NOISE(Max)	V1: 200 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 63.6mVp-p
high frequency :  low frequency : 				
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/226ms 115VAC/160ms
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	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/5.2ms 115VAC/6.4ms
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/79.6ms 115VAC/16.8ms
10	DYNAMIC LOAD	V1: 3600 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	572mVp-p 504mVp-p

				
11	TRANSIENT RECOVERY TIME	V1: 3600 mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	392mVp-p 0us

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℃	70V~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℃	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℃	I =1.21A/ 230VAC I =2.39A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25℃	L-FG : 0.225mA N-FG : 0.225mA
5	NO LOAD CONSUMPTION	< 0.5W	I/P : 115VAC	< 0.1257W
			I/P : 230VAC O/P : NO LOAD Ta : 25℃	< 0.0832W

6	EFFICIENCY(Typ.)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	90.03%																																	
EFFICIENCY vs LOAD																																					
 <table><caption>Efficiency vs Load Data (Approximate)</caption><thead><tr><th>Load (%)</th><th>230V Efficiency (%)</th><th>115V Efficiency (%)</th></tr></thead><tbody><tr><td>10%</td><td>88.5</td><td>90.0</td></tr><tr><td>20%</td><td>90.5</td><td>91.0</td></tr><tr><td>30%</td><td>91.0</td><td>90.5</td></tr><tr><td>40%</td><td>91.0</td><td>90.0</td></tr><tr><td>50%</td><td>90.5</td><td>89.5</td></tr><tr><td>60%</td><td>91.0</td><td>89.0</td></tr><tr><td>70%</td><td>90.5</td><td>88.5</td></tr><tr><td>80%</td><td>90.5</td><td>88.0</td></tr><tr><td>90%</td><td>90.0</td><td>87.5</td></tr><tr><td>100%</td><td>90.5</td><td>88.5</td></tr></tbody></table>					Load (%)	230V Efficiency (%)	115V Efficiency (%)	10%	88.5	90.0	20%	90.5	91.0	30%	91.0	90.5	40%	91.0	90.0	50%	90.5	89.5	60%	91.0	89.0	70%	90.5	88.5	80%	90.5	88.0	90%	90.0	87.5	100%	90.5	88.5
Load (%)	230V Efficiency (%)	115V Efficiency (%)																																			
10%	88.5	90.0																																			
20%	90.5	91.0																																			
30%	91.0	90.5																																			
40%	91.0	90.0																																			
50%	90.5	89.5																																			
60%	91.0	89.0																																			
70%	90.5	88.5																																			
80%	90.5	88.0																																			
90%	90.0	87.5																																			
100%	90.5	88.5																																			
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																																	
INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)																																					
 Ch2 Max 336 V Ch4 Max 20.2 A Δ: 720mV Θ: 8.64 V Δ: 2.01ms Θ: 16.0μs Ch2 100 V 40ms Ch4 6.00 V 400μs Scale: 12.0 V 20.00 A																																					

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	124%/ 264VAC 122%/ 230VAC 121%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	41.4V~48.6V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C	46.03V/ 264VAC 46.20V/ 230VAC 45.88V/ 85VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover



150W Single Output Switching Power Supply

LRS-150F series

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) Peak Voltage	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) 558V (2) 598V (3) 562V (4) 588V VDS: (1) 332V (2) 282V (3) 328V (4) 340V
2	Diode Peak Voltage	Q101 Rated : 20 A/300 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) 251V (2) 286V (3) 273V (4) 272V (5) 200V
3	Input Capacitor Voltage	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) 370V (2) 374V (3) 374V
4	Control IC Voltage Test	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. 20.5V 2. 12.9V 3. 19.3V 4. 24.6V 5. 16.7V

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: 2.67mA I/P-FG: 2.02mA O/P-FG: 1.86m 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



150W Single Output Switching Power Supply

LRS-150F series

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-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=27.2℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=40.6℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 18.6 ℃</th><th>HIGH AMBIENT Ta=42.1 ℃</th></tr><tr><td>1</td><td>D6</td><td>66.2℃</td><td>77.9℃</td></tr><tr><td>2</td><td>C6</td><td>67.4℃</td><td>76.7℃</td></tr><tr><td>3</td><td>Q1</td><td>84.7℃</td><td>96.6℃</td></tr><tr><td>4</td><td>C35</td><td>66.3℃</td><td>76.3℃</td></tr><tr><td>5</td><td>BD1</td><td>86.4℃</td><td>95.7℃</td></tr><tr><td>6</td><td>Q100</td><td>96.9℃</td><td>107.0℃</td></tr><tr><td>7</td><td>C106</td><td>77.9℃</td><td>89.5℃</td></tr><tr><td>8</td><td>LF1</td><td>65.6℃</td><td>76.5℃</td></tr><tr><td>9</td><td>RTH10</td><td>75.4℃</td><td>86.7℃</td></tr><tr><td>10</td><td>R14</td><td>73.7℃</td><td>86.1℃</td></tr><tr><td>11</td><td>T1</td><td>82.4℃</td><td>92.4℃</td></tr><tr><td>12</td><td>TA</td><td>27.2℃</td><td>40.6℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 18.6 ℃	HIGH AMBIENT Ta=42.1 ℃	1	D6	66.2℃	77.9℃	2	C6	67.4℃	76.7℃	3	Q1	84.7℃	96.6℃	4	C35	66.3℃	76.3℃	5	BD1	86.4℃	95.7℃	6	Q100	96.9℃	107.0℃	7	C106	77.9℃	89.5℃	8	LF1	65.6℃	76.5℃	9	RTH10	75.4℃	86.7℃	10	R14	73.7℃	86.1℃	11	T1	82.4℃	92.4℃	12	TA	27.2℃	40.6℃
NO	Position	ROOM AMBIENT Ta= 18.6 ℃	HIGH AMBIENT Ta=42.1 ℃																																																					
1	D6	66.2℃	77.9℃																																																					
2	C6	67.4℃	76.7℃																																																					
3	Q1	84.7℃	96.6℃																																																					
4	C35	66.3℃	76.3℃																																																					
5	BD1	86.4℃	95.7℃																																																					
6	Q100	96.9℃	107.0℃																																																					
7	C106	77.9℃	89.5℃																																																					
8	LF1	65.6℃	76.5℃																																																					
9	RTH10	75.4℃	86.7℃																																																					
10	R14	73.7℃	86.1℃																																																					
11	T1	82.4℃	92.4℃																																																					
12	TA	27.2℃	40.6℃																																																					
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 113% LOAD Ta : 25℃	TEST : OK																																																				
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 % LOAD 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%/℃ (0~40℃)																																																				
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 : -20℃~ 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																																																				



150W Single Output Switching Power Supply

LRS-150F series

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℃	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) 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℃	

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ

2007/3/20 A50-S014