



Test Report: LRS-150F-12

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

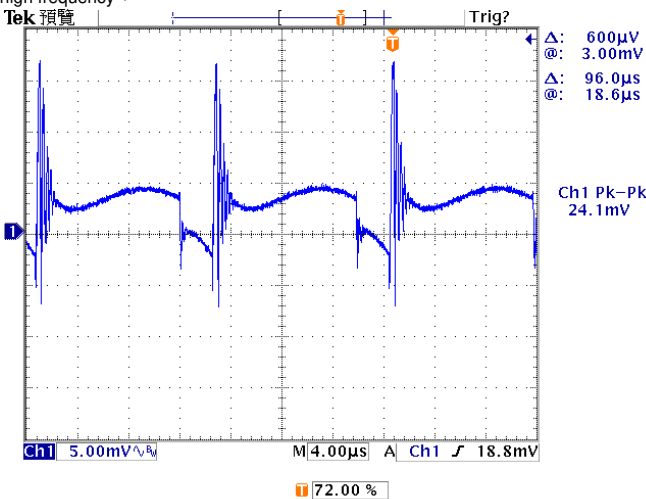
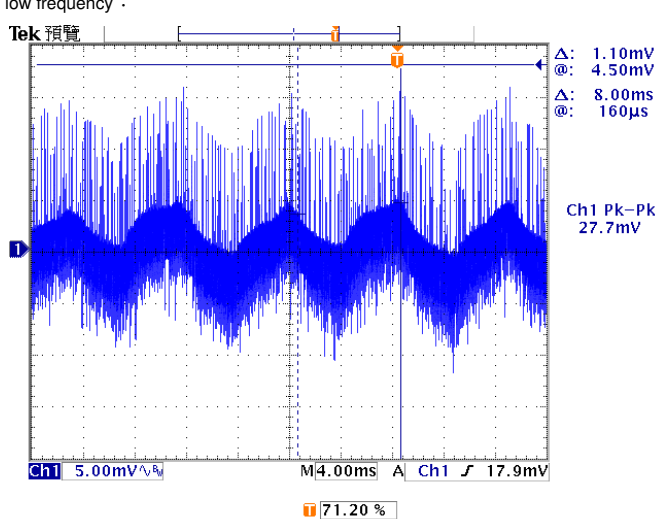
E.M.C. Test

■ RELIABILITY TEST

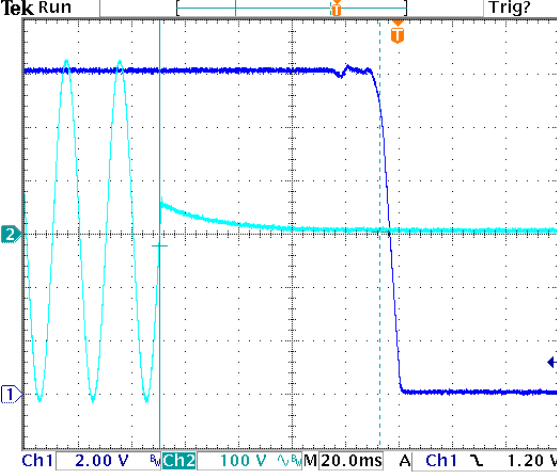
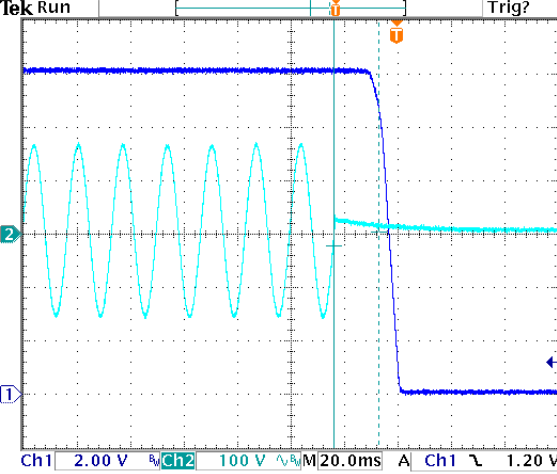
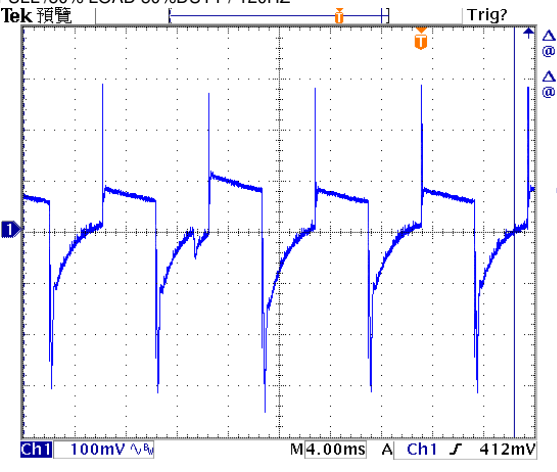
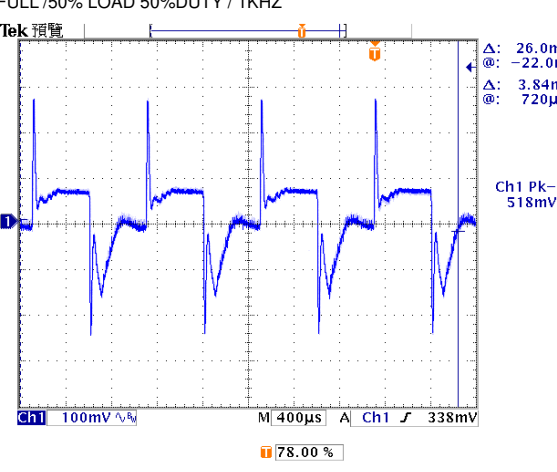
ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.2V~ 13.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25℃	9.77V~14.26V/230VAC 9.77V~14.26V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0%~-0.08%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0%~0%
4	LOAD REGULATION(Max)	V1: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0%~-0.08%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	<5%
6	RIPPLE & NOISE(Max)	V1: 150 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 27.7mVp-p
high frequency :  Ch1 Pk-Pk 24.1mV low frequency :  Ch1 Pk-Pk 27.7mV				
7	SET UP TIME(Max)	230VAC/500ms 115VAC/500ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25℃	230VAC/230ms 115VAC/202ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	

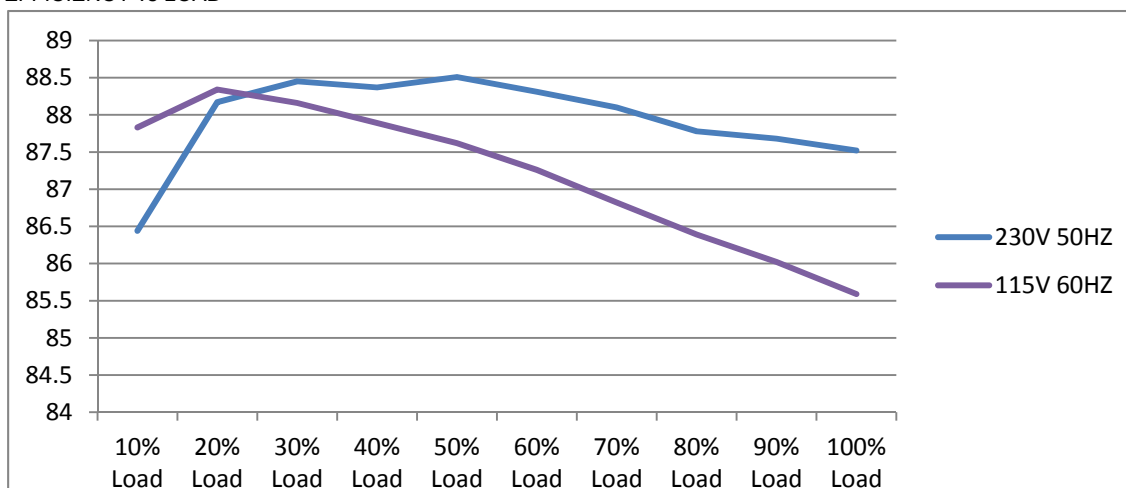
Tek Stop Δ: 144 V @: 12.0 V Δ: 230ms @: -224ms Ch1 2.00 V Ch2 600 V M 100ms A Ch1 1.20 V 70.00 %		Tek 執行 Δ: 11.6 V @: 11.7 V Δ: 202ms @: 2.00ms Ch1 2.00 V Ch2 500 V M 100ms A Ch1 10.3 V 60.80 %		
8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/6ms 115VAC/8.2ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage Tek Run		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage Tek Run		
Δ: 720mV @: 6.04 V Δ: 6.00ms @: 0.00 s Ch1 2.00 V M 10.0ms A Ch1 1.20 V 30.00 %		Δ: 8.12 V @: 1.28 V Δ: 8.20ms @: 0.00 s Ch1 2.00 V M 10.0ms A Ch1 1.20 V 30.00 %		
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/82.4ms 115VAC/16.8ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		

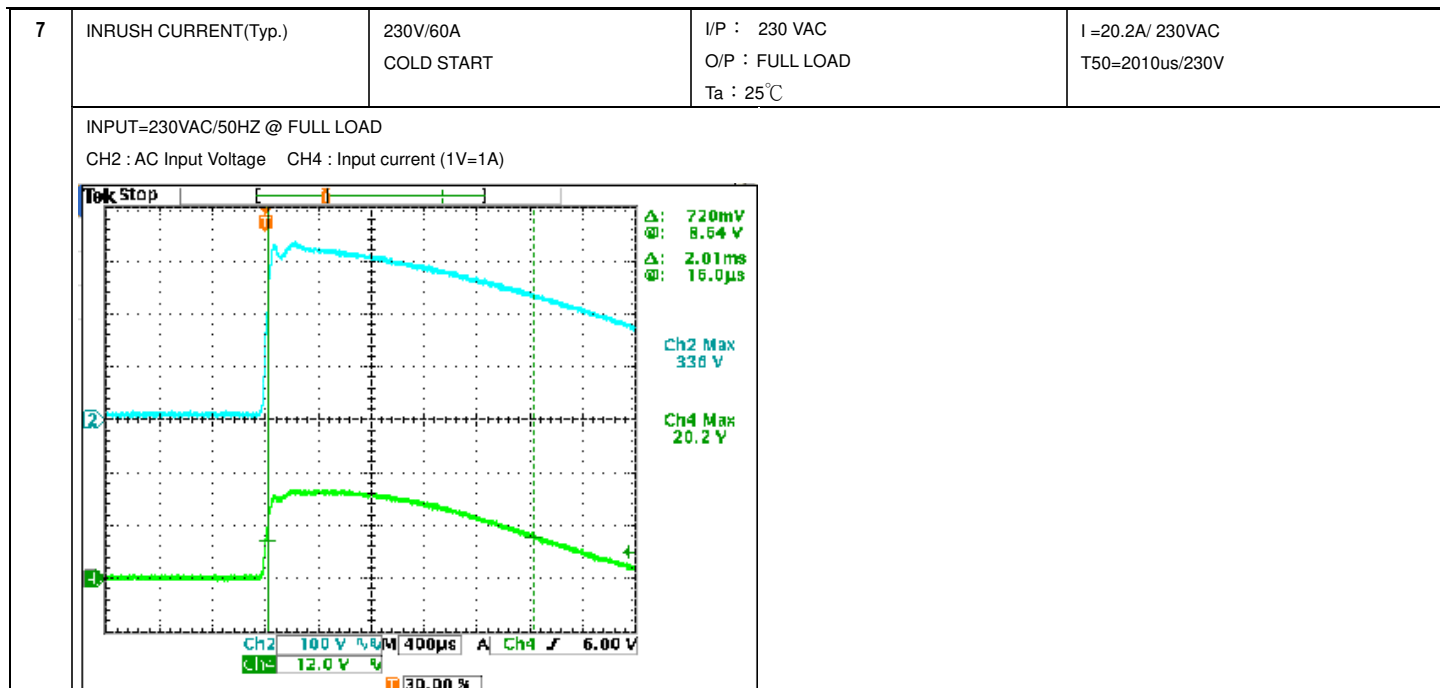
		Trig? Δ: 26.0 V @: -22.0 V Δ: 82.4ms @: -89.6ms Ch1 2.00 V Ch2 100 V M 20.0ms A Ch1 1.20 V 70.00 %		Trig? Δ: 26.0 V @: -22.0 V Δ: 16.8ms @: -24.0ms Ch1 2.00 V Ch2 100 V M 20.0ms A Ch1 1.20 V 70.00 %
10	DYNAMIC LOAD V1: 1200 mVp-p	I/P: 230VAC O/P: (1) FULL / 50% LOAD 50% DUTY / 120HZ (2) FULL / 50% LOAD 50% DUTY / 1KHZ Ta: 25°C	642mVp-p 518mVp-p	FULL / 50% LOAD 50% DUTY / 120HZ  Ch1 Pk-Pk 642mV FULL / 50% LOAD 50% DUTY / 1KHZ  Ch1 Pk-Pk 518mV
11	TRANSIENT RECOVERY TIME V1: 1200 mVp-p <500us	I/P: 230VAC O/P: 40% LOAD CHANGE 50% DUTY / 120HZ 1.25A/us	198mVp-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	74V~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 =1.24A/ 230VAC I =2.33A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.502mA N-FG : 0.502mA
5	NO LOAD CONSUMPTION	< 0.5W	I/P : 115VAC	<0.1737 W
			I/P : 230VAC O/P : NO LOAD Ta : 25°C	< 0.2687W
6	EFFICIENCY(Typ.)	87.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	87.58%

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	128%/ 264VAC 126.4%/ 230VAC 123.68%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	13.8V~16.2V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C	15.40V/ 264VAC 15.39V/ 230VAC 15.36V/ 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

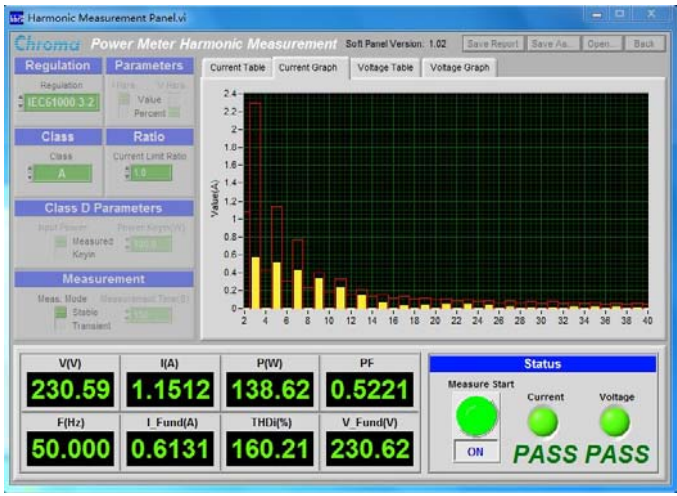
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated :13A/600V	I/P: High-Line +3V =267V AC ON/OFF VDS:	VDS:

			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℃	(1) 562V (2) 566V (3) 560V (4) 570V VDS: (1) 376V (2) 326V (3) 380V (4) 380V
2	Diode Peak Voltage	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℃	Q101: VDS: (1) 84.8V (2) 80.0V (3) 85.2V (4) 98.8V (5) 92.0V
3	Input Capacitor Voltage	C5 Rated: : 120 μ /400 V 105 ℃	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℃	(1) 374V (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℃	1. 16.7V 2. 12.2V 3. 16.0V 4. 19.1V 5. 12.0V

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℃	I/P-O/P:3.38 mA I/P-FG: 4.00mA O/P-FG: 3.20m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M Ω I/P-FG: 500VDC>100M Ω O/P-FG:500VDC>100M Ω	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25℃	I/P-O/P:9999M Ω I/P-FG: 9999M Ω O/P-FG:9999M Ω NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m Ω	40A / 2min Ta:25℃	28m Ω

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

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= 27.2 ℃</th><th>HIGH AMBIENT Ta=40.6 ℃</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></table>			NO	Position	ROOM AMBIENT Ta= 27.2 ℃	HIGH AMBIENT Ta=40.6 ℃	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℃
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7	C106	77.9℃	89.5℃																																																	
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9	RTH10	75.4℃	86.7℃																																																	
10	R14	73.7℃	86.1℃																																																	
11	T1	82.4℃	92.4℃																																																	
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= 45 ℃ HUMIDITY= 95 %R.H	TEST : OK																																																
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃ (0~50℃)	I/P : 230 VAC O/P : FULL LOAD	±0%/℃ (0~40℃)																																																



150W Single Output Switching Power Supply

LRS-150F series

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
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 ℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=45 ℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 ℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 ℃ 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