



Test Report: LRS-150-15

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

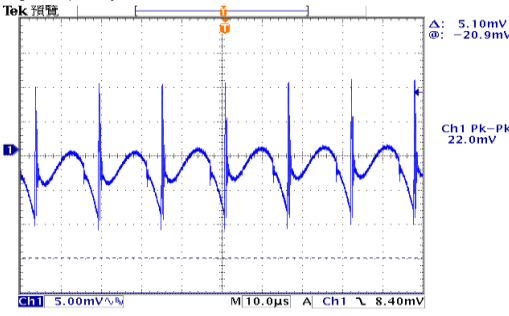
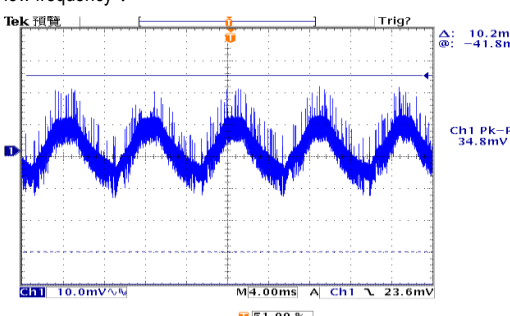
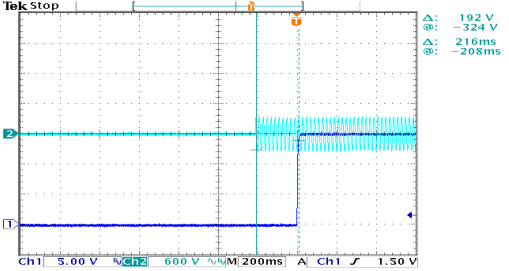
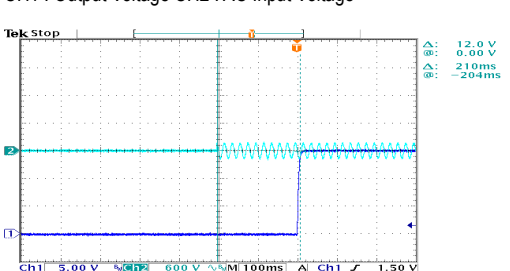
E.M.C. Test

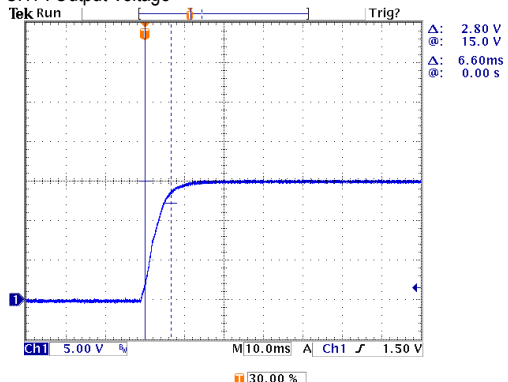
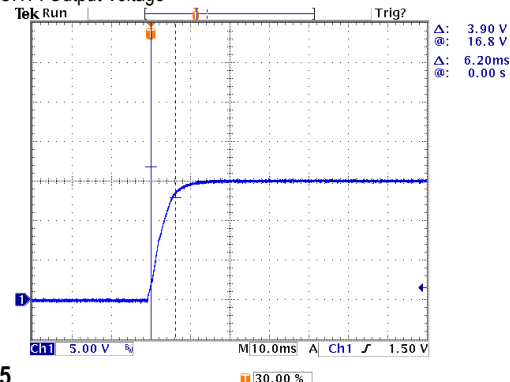
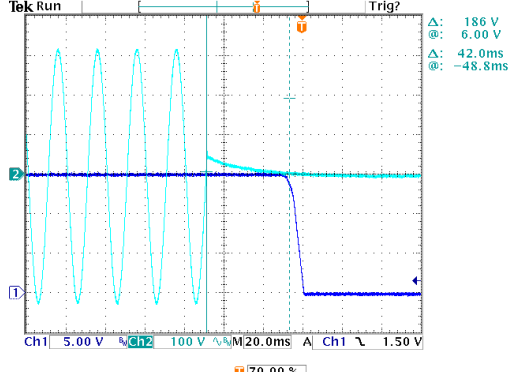
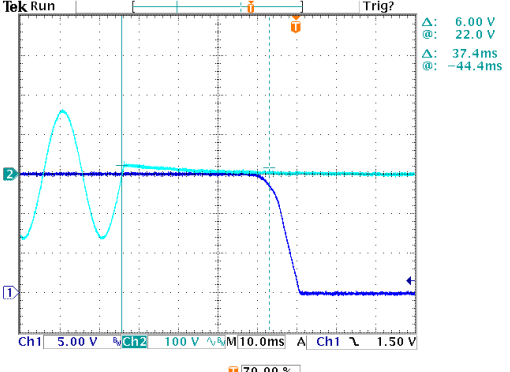
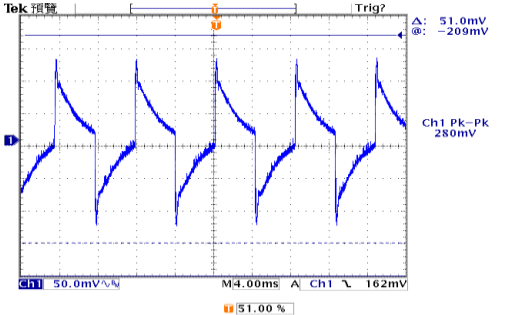
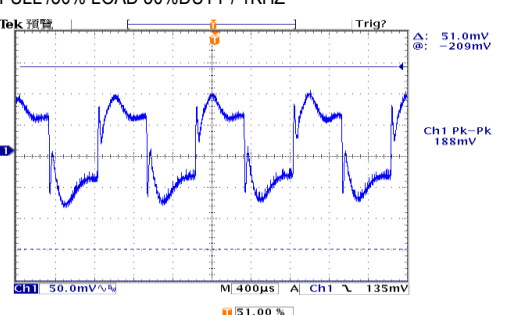
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

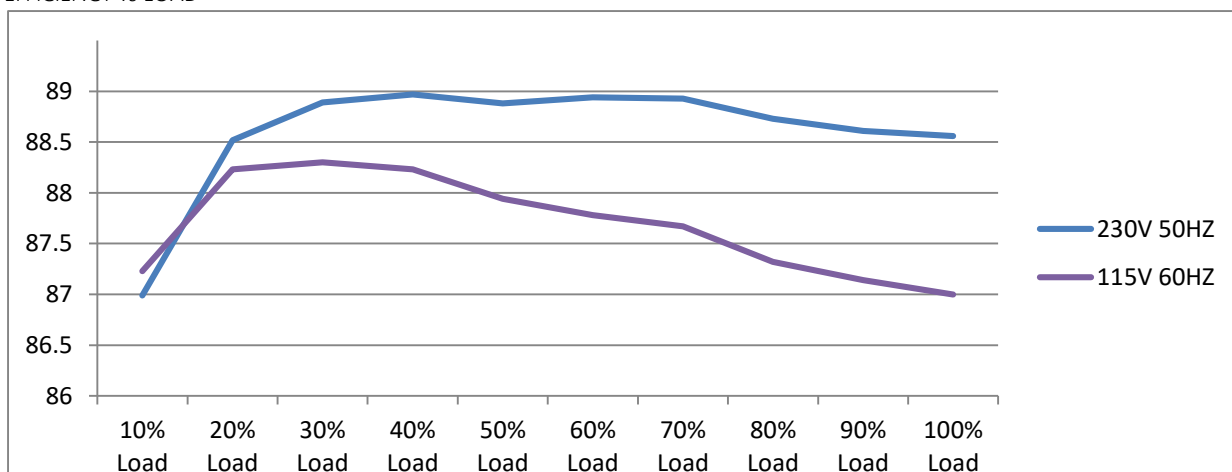
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 13.5 V~ 18 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	12.80V~18.50V/230VAC 12.80V~18.50V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100~132VAC/200~264VAC by switch O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0%~-0.066%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100~132VAC/200~264VAC by switch O/P:FULL LOAD Ta:25°C	V1: 0%~-0.066%
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: 34.8mVp-p
high frequency :  Δ: 5.10mV @: -20.9mV Ch1 Pk-Pk 22.0mV 5.00mV/div 10.0μs/div Ch1 8.40mV 51.00 % low frequency :  Δ: 10.2mV @: -41.8mV Ch1 Pk-Pk 34.8mV 10.0mV/div 4.00ms/div Ch1 23.6mV 51.00 %				
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/216 ms 115VAC/210 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  Δ: 19.2 V @: -324 V Δ: 216ms @: -205ms Ch1 5.00 V Ch2 600 V 200ms/div Ch1 1.50 V 70.00 % INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  Δ: 12.0 V @: 0.00 V Δ: 210ms @: -204ms Ch1 5.00 V Ch2 600 V 100ms/div Ch1 1.50 V 70.00 %				

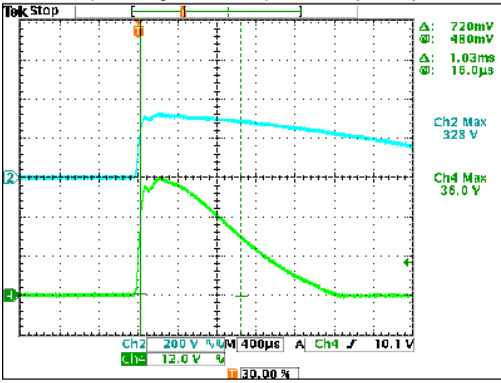
8	RISE TIME (Max)	230VAC/30ms 115VAC/30ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 6.6ms 115VAC/6.2ms
INPUT=230VAC/50HZ @ FULL LOAD				
CH1 : Output Voltage				
				
INPUT=115VAC/60HZ @ FULL LOAD				
CH1 : Output Voltage				
				
5				
9	HOLD UP TIME (Typ.)	230VAC/40ms 115VAC/35ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 42ms 115VAC/ 37.4ms
INPUT=230VAC/50HZ @ FULL LOAD				
CH1 : Output Voltage CH2 : AC Input Voltage				
				
INPUT=115VAC/60HZ @ FULL LOAD				
CH1 : Output Voltage CH2 : AC Input Voltage				
				
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	280mVp-p 188mVp-p
FULL /50% LOAD 50%DUTY / 120HZ				
				
FULL /50% LOAD 50%DUTY / 1KHZ				
				
11	TRANSIENT RECOVERY TIME	V1: 1500 mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	233mVp-p 0 us

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85~132VAC/170~264VAC by switch 240 ~ 370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25°C	69V~132V 130V~264V 230 ~ 370VDC (switch on 230VAC)
			I/P: (1)LOW-LINE-3V=82V 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/ 1.7A 115V/ 3.0 A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =1.17A/ 230VAC I =2.45A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.516mA N-FG : 0.516mA
5	NO LOAD CONSUMPTION	< 0.5 W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	< 0.2759W < 0.4493W
6	EFFICIENCY(Typ.)	88.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	88.57%

EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I=36A/ 230VAC T50=1030 us/230V
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%~ 140 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C	122.4%/ 264VAC 122.9%/ 230VAC 125.4%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	18.75 V~ 21.75 V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	20.34V/ 264VAC 20.31V/ 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: 90VAC 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: 90VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

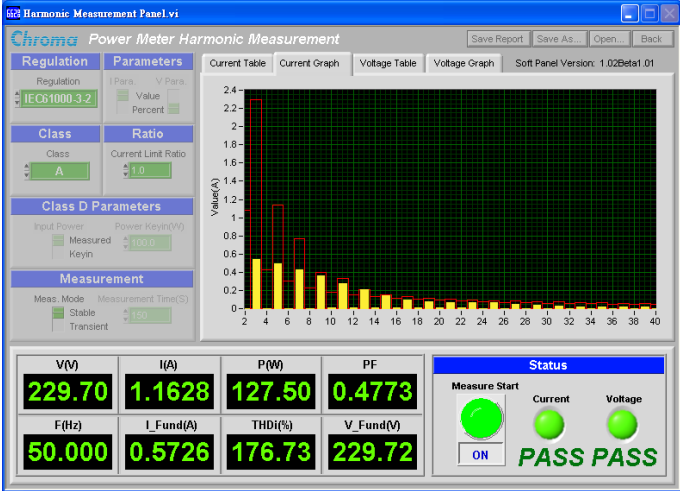
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated :13 A/600V VGS :± 25 V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. I/P:Low-Line -3V = 97V O/P: (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) 578V (2) 502V (3) 564V (4) 588V VDS: (1) 466V (2) 406V (3) 466V (4) 492V
4	Diode Peak Voltage	Q101 Rated : 20 A/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) 96.8V (2) 89.6V (3) 94.8V (4) 98.0V (5) 92.0V
5	Input Capacitor Voltage	C5 Rated: : 330 μ/200 V 105 °C Suger Voltage=230V	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) 180V (2)181 V (3) 182V
6	Control IC Voltage Test	PWM IC U1 Rated NCP1236B: 28 V(MAX.) 10.5 V(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) 20.0V (2) 12.2V (3) 18.2V (4) 24.7V (5) 15.5V

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: 3.42mA I/P-FG: 4.70mA O/P-FG: 3.21m 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	27mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P: 75% 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-150-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=25.5℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=45.3℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 25.5 °C</th><th>HIGH AMBIENT Ta=45.3 °C</th></tr><tr><td>1</td><td>D5</td><td>87.8℃</td><td>100.6℃</td></tr><tr><td>2</td><td>C35</td><td>63.3℃</td><td>79.4℃</td></tr><tr><td>3</td><td>Q1</td><td>80.9℃</td><td>99.3℃</td></tr><tr><td>4</td><td>BD1</td><td>72.3℃</td><td>88.2℃</td></tr><tr><td>5</td><td>Q100</td><td>86.3℃</td><td>105.3℃</td></tr><tr><td>6</td><td>C106</td><td>68.5℃</td><td>85.9℃</td></tr><tr><td>7</td><td>LF1</td><td>60.3℃</td><td>77.0℃</td></tr><tr><td>8</td><td>RTH10</td><td>60.5℃</td><td>76.5℃</td></tr><tr><td>9</td><td>R14</td><td>79.2℃</td><td>95.1℃</td></tr><tr><td>10</td><td>T1</td><td>82.2℃</td><td>97.8℃</td></tr><tr><td>11</td><td>TA</td><td>25.5℃</td><td>45.3℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 25.5 °C	HIGH AMBIENT Ta=45.3 °C	1	D5	87.8℃	100.6℃	2	C35	63.3℃	79.4℃	3	Q1	80.9℃	99.3℃	4	BD1	72.3℃	88.2℃	5	Q100	86.3℃	105.3℃	6	C106	68.5℃	85.9℃	7	LF1	60.3℃	77.0℃	8	RTH10	60.5℃	76.5℃	9	R14	79.2℃	95.1℃	10	T1	82.2℃	97.8℃	11	TA	25.5℃	45.3℃
NO	Position	ROOM AMBIENT Ta= 25.5 °C	HIGH AMBIENT Ta=45.3 °C																																																	
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10	T1	82.2℃	97.8℃																																																	
11	TA	25.5℃	45.3℃																																																	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 120 % 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= -25 °C	TEST : OK																																																
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK																																																
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~50℃)	I/P : 230 VAC O/P : FULL LOAD	±0.006%/℃(0~50℃)																																																



150W Single Output Switching Power Supply

LRS-150series

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 C106 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) 146770HRS (2) 30596HRS (3) 54079HRS (4) 92239HRS
10	MTBF	2707.7K hrs min. Telcordia SR-332 (Bellcore) ; 558.2Khrs min. MIL-HDBK-217F (25°C)	
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