



Test Report: LRS-350-5

350W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY TEST

■ RELIABILITY TEST

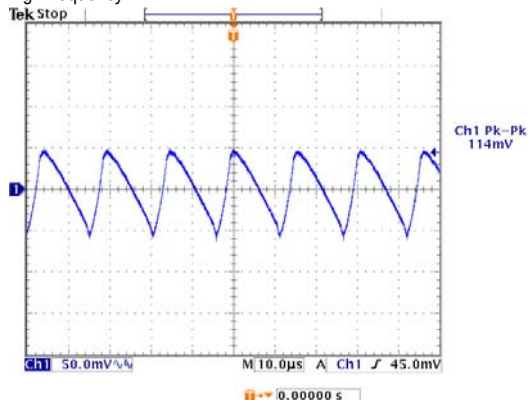
ENVIRONMENT TEST

DESIGN VERIFY TEST

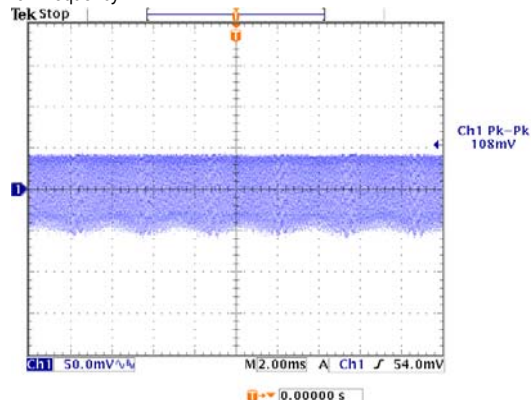
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.5V~ 5.5V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	4.343V~5.779V/230VAC 4.318V~5.764V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -3 %~ 3%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.0625 %~ 0.0625%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.0625 %~-0.0625%
4	LOAD REGULATION(Max)	V1: -2.0 %~ 2.0%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:- 0.0%~ 0%
5	OVER/UNDERSHOOT TEST	< +10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 114mVp-p

high frequency :



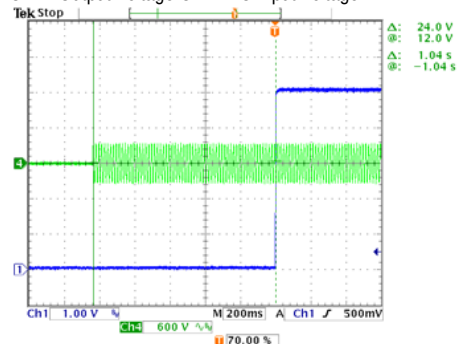
low frequency :



7	SET UP TIME(Max)	230VAC/1300ms 115VAC/ 1300ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 1036ms 115VAC/ 1048ms
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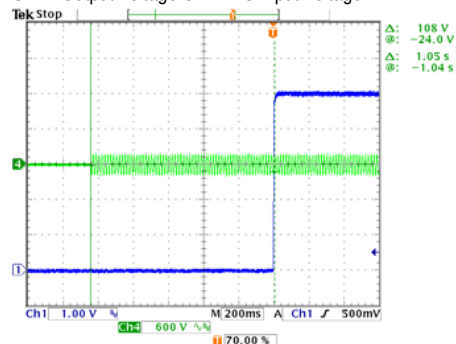
INPUT=230VAC/50HZ @ FULL LOAD

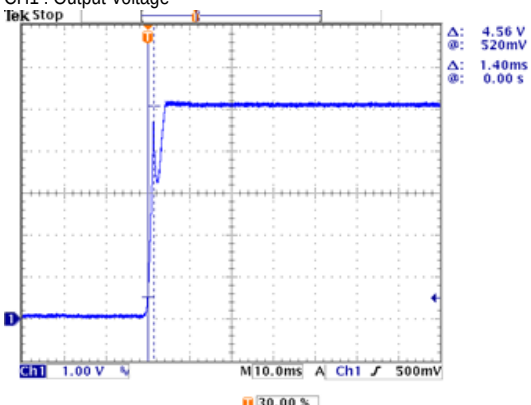
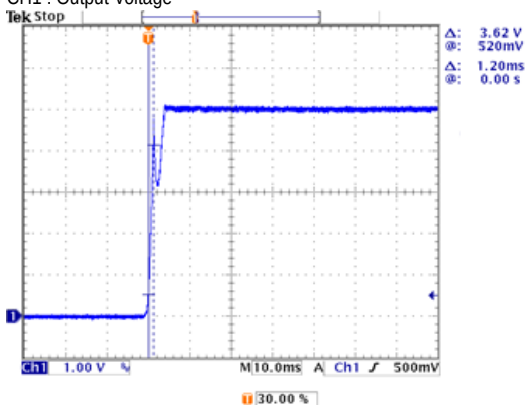
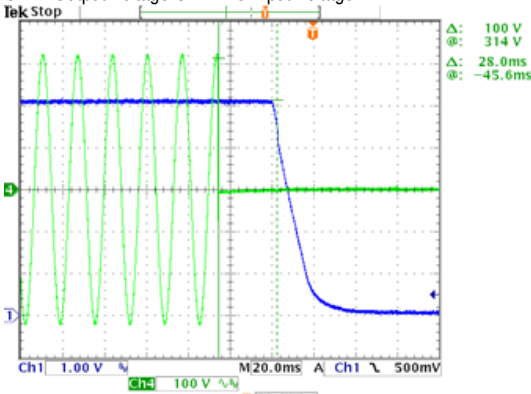
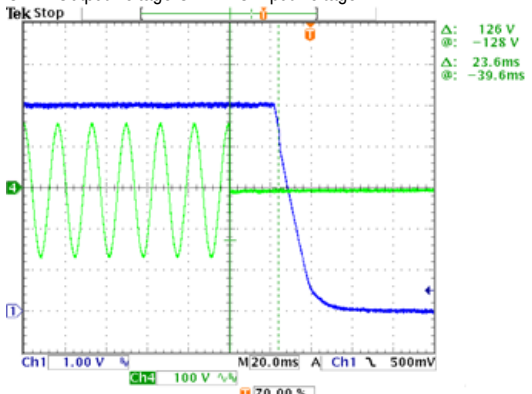
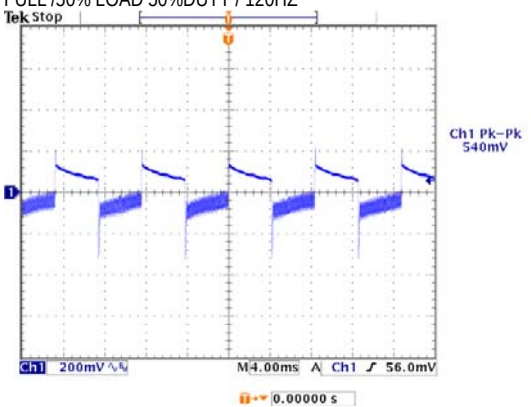
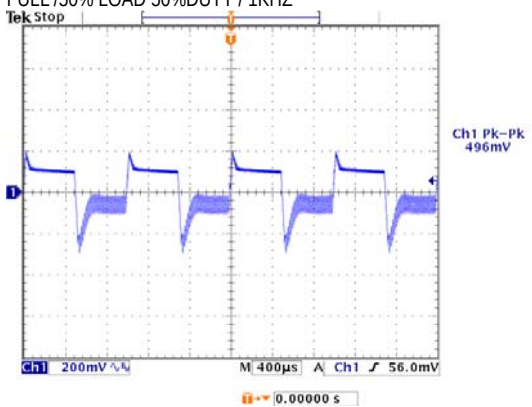
CH1 : Output Voltage CH4 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH4 : AC Input Voltage



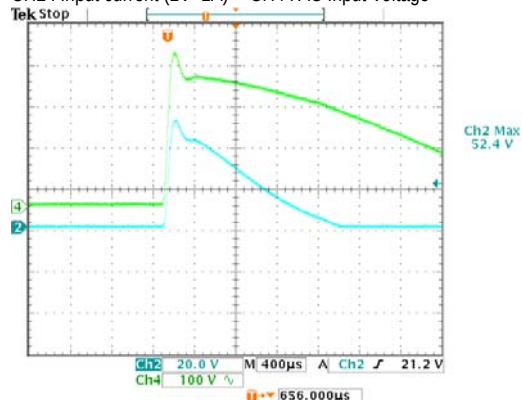
8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/1.40ms 115VAC/1.20ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 			
	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 			
9	HOLD UP TIME(Typ)	230VAC/ 16ms 115VAC/ 12ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/28.0ms 115VAC/ 23.6ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 			
	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 			
10	DYNAMIC LOAD	V1: 1000mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	540mVp-p 496mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 			
	FULL /50% LOAD 50%DUTY / 1KHZ 			

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~264VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	134V~264V
			I/P: (1) LOW-LINE-3V=167 V HIGH-LINE+15%=300 V O/P: FULL/MIN LOAD 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: 170 VAC ~264 VAC O/P: FULL~MIN LOAD Ta: 25°C	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 3.4A 115V/ 6.8A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I = 2.57A/ 230VAC I = 4.76A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.483mA N-FG: 0.483mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.68W < 0.74 W
6	INRUSH CURRENT(Typ)	230V/ 60A 115V/ 60A COLD START	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I = 52.4A/ 230VAC I = 46.8A/ 115VAC

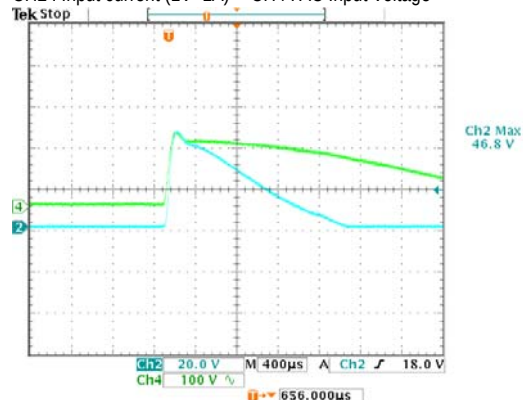
INPUT=230VAC/50HZ @ FULL LOAD

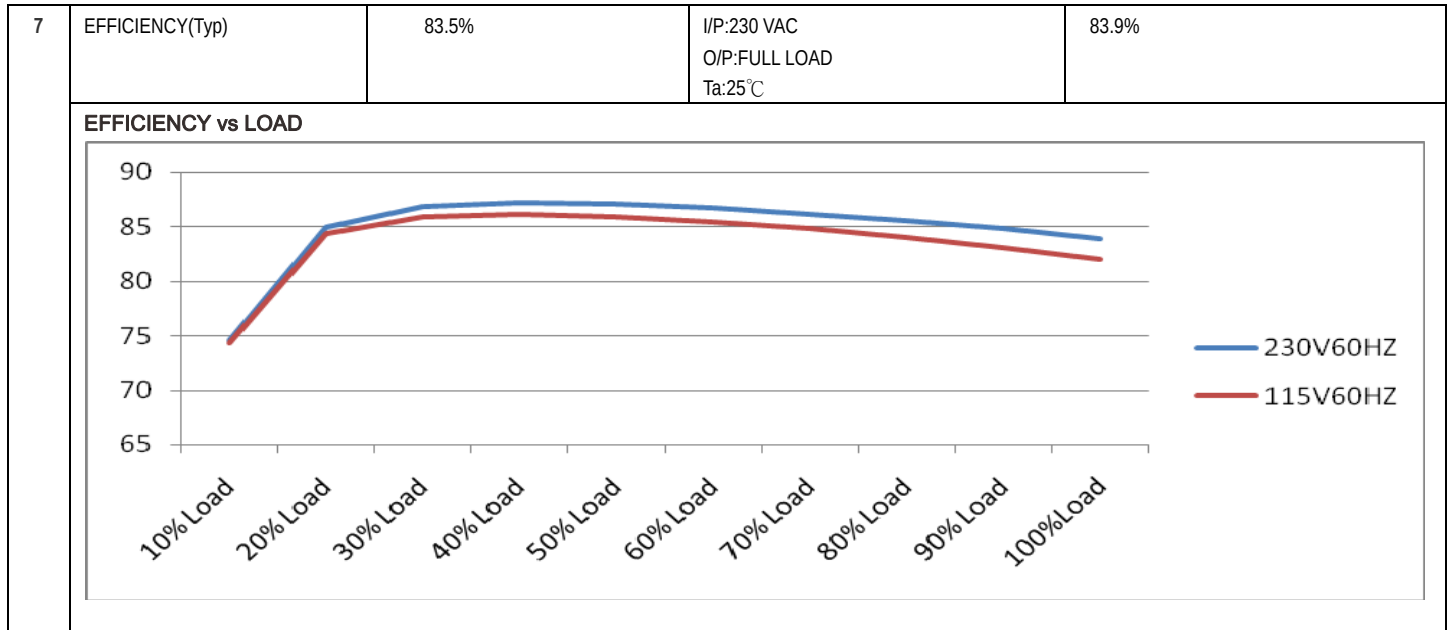
CH2 : Input current (1V=1A) CH4 : AC Input Voltage



INPUT=115VAC/50HZ @ FULL LOAD

CH2 : Input current (1V=1A) CH4 : AC Input Voltage





PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 140 %	I/P: 230VAC I/P: 115VAC O/P:TESTING Ta:25°C	118.56%/ 230VAC 116.67%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH:5.75V~6.75V	I/P: 230VAC I/P: 115VAC O/P:MIN LOAD Ta:25°C	6.52V/ 230VAC 6.50V/115VAC Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P:FULL LOAD	O.T.P. Active Hiccup mode, recovers automatically after fault condition is removed
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE 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	Q2 Rated 13 A/500V	I/P:High-Line +3V =267V O/P: (1)Full Load Turn on (2)Output Short (3)Full Load Continue Ta:25℃	(1)436V (2)436V (3)422V
2	Diode Peak Voltage	Q102 Rated 120 A/40V Q103 Rated 120A/40V	I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2)Output Short (3)Full Load Continue Ta:25℃	Q102 (1)34.2V (2)34.4V (3)34.6V Q103: (1)34.7V (2)33.1V (3)31.9V
3	Input Capacitor Voltage	C5 Rated: 560 μ / 200V	I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2) MinLoad input on /Off (3)Full Load /Min load Change Ta:25℃	(1)187V (2)182V (3)186V
4	Control IC Voltage Test	PWM IC U1 Rated 28 V (MAX.) 10V (MIN.)	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℃	U1 (1) 19.6V (2) 19.4V (3) 19.6V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25℃	I I/P-O/P: 2.42mA I/P-FG: 3.32mA O/P-FG:2.71 m 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℃	27 m Ω

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																								
1	TEMPERATURE RISE TEST	MODEL: LRS-350-5 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=23.5℃ 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=52.9℃ <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 23.5 ℃</th><th>HIGH AMBIENT Ta=52.9 ℃</th></tr><tr><td>1</td><td>LF1</td><td>41.5℃</td><td>72.0℃</td></tr><tr><td>2</td><td>L100</td><td>74.7℃</td><td>113.3℃</td></tr><tr><td>3</td><td>C105</td><td>57.2℃</td><td>90.9℃</td></tr><tr><td>4</td><td>T1</td><td>68.6℃</td><td>103.0℃</td></tr><tr><td>5</td><td>BD1</td><td>42.3℃</td><td>71.0℃</td></tr><tr><td>6</td><td>C5</td><td>35.7℃</td><td>62.7℃</td></tr><tr><td>7</td><td>T2</td><td>29.6℃</td><td>57.8℃</td></tr><tr><td>8</td><td>Q2</td><td>42.9℃</td><td>74.9℃</td></tr><tr><td>9</td><td>Q1</td><td>41.5℃</td><td>73.0℃</td></tr><tr><td>10</td><td>Q103</td><td>58.3℃</td><td>90.3℃</td></tr><tr><td>11</td><td>Q102</td><td>59.4℃</td><td>92.4℃</td></tr><tr><td>12</td><td>Q104</td><td>57.1℃</td><td>88.7℃</td></tr><tr><td>13</td><td>U1</td><td>29.9℃</td><td>58.6℃</td></tr><tr><td>14</td><td>U100</td><td>60.1℃</td><td>91.5℃</td></tr><tr><td>15</td><td>D10</td><td>35.7℃</td><td>65.1℃</td></tr><tr><td>16</td><td>C36</td><td>27.5℃</td><td>56.3℃</td></tr><tr><td>17</td><td>RTH3</td><td>50.9℃</td><td>80.3℃</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 23.5 ℃	HIGH AMBIENT Ta=52.9 ℃	1	LF1	41.5℃	72.0℃	2	L100	74.7℃	113.3℃	3	C105	57.2℃	90.9℃	4	T1	68.6℃	103.0℃	5	BD1	42.3℃	71.0℃	6	C5	35.7℃	62.7℃	7	T2	29.6℃	57.8℃	8	Q2	42.9℃	74.9℃	9	Q1	41.5℃	73.0℃	10	Q103	58.3℃	90.3℃	11	Q102	59.4℃	92.4℃	12	Q104	57.1℃	88.7℃	13	U1	29.9℃	58.6℃	14	U100	60.1℃	91.5℃	15	D10	35.7℃	65.1℃	16	C36	27.5℃	56.3℃	17	RTH3	50.9℃	80.3℃
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16	C36	27.5℃	56.3℃																																																																									
17	RTH3	50.9℃	80.3℃																																																																									
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= -25 ℃	TEST: OK																																																																								
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ NO DAMAGE	I/P: 272 VAC O/P: FULL LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H	TEST: OK																																																																								
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃ (0~50℃)	I/P: 230 VAC O/P: FULL LOAD	±0%/℃ (0~50℃)																																																																								
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 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 : -25℃~ 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																																																																								



350W Single Output Switching Power Supply

LRS-350series

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= 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) 276816HRS (2) 36335HRS (3) 108557HRS (4) 220246HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE: 327.9KHRS	
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50℃	

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDEZHAO