Test Report: LRS-350-4.2

350W 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

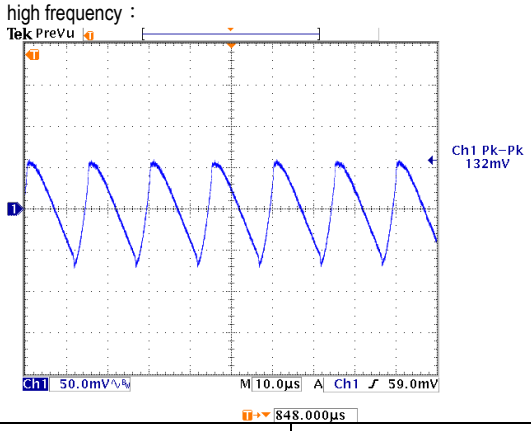
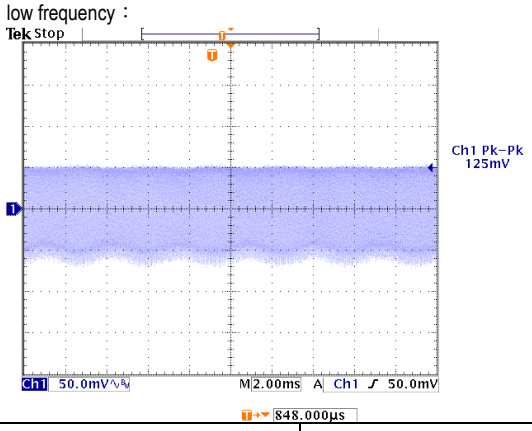
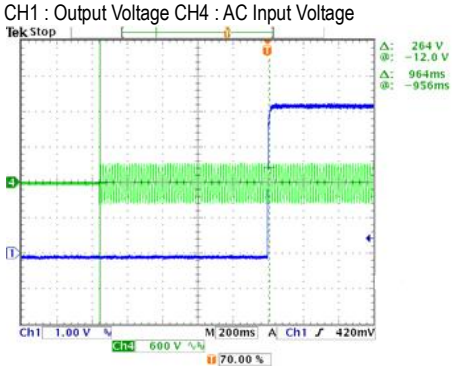
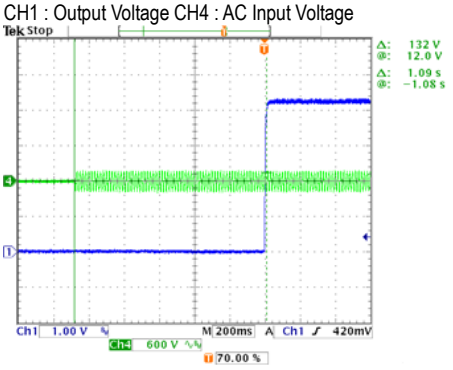
Safety Test
E.M.C. Test

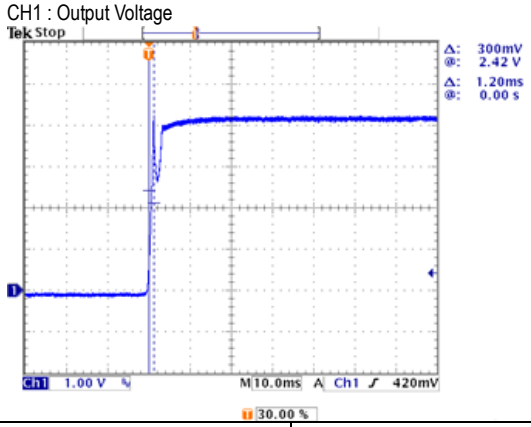
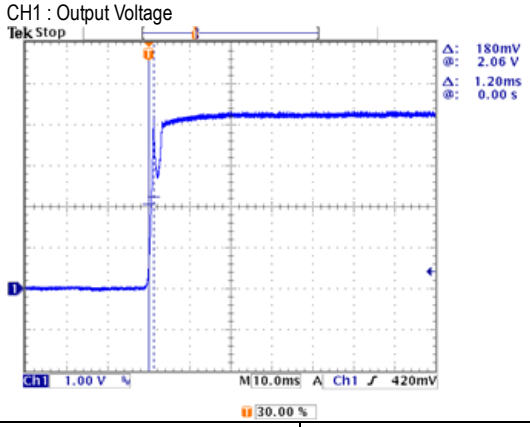
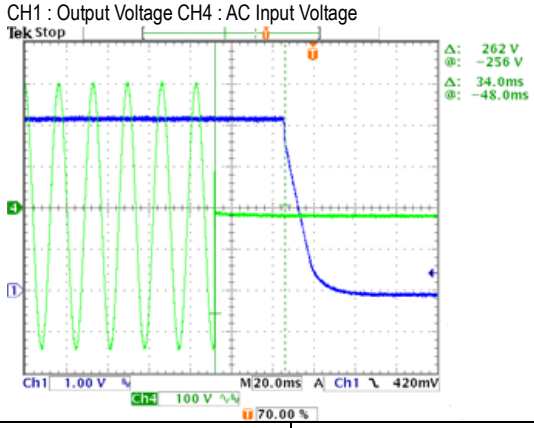
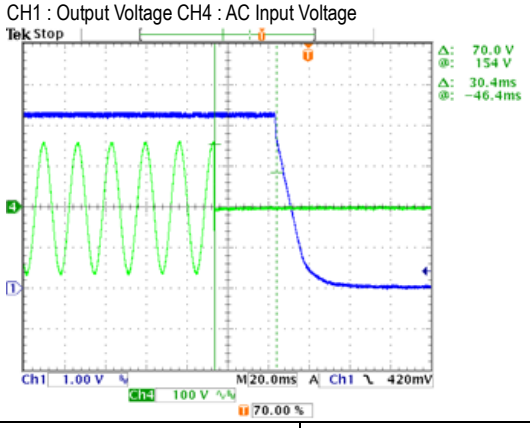
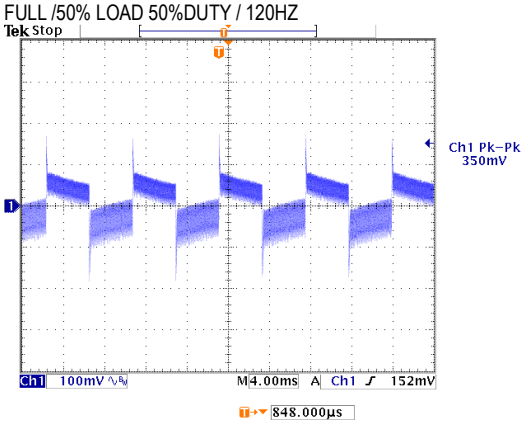
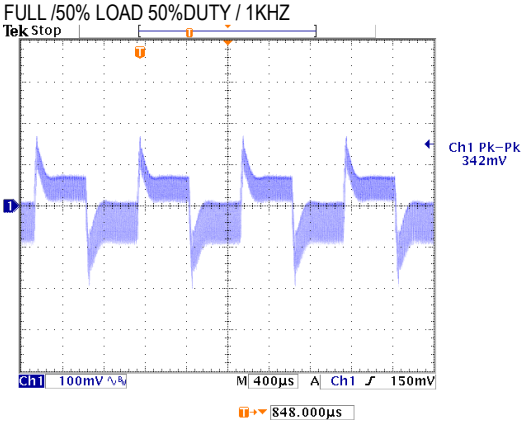
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 3.6V~ 4.4V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	3.500V~4.666V/230VAC 3.501V~4.669V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4 %~ 4%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1:- 0.12 %~ 0.12%
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: 2.5 %~ -2.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1:- 0%~ 0%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	<5%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 132mVp-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℃	230VAC/ 964ms 115VAC/ 1092ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 	

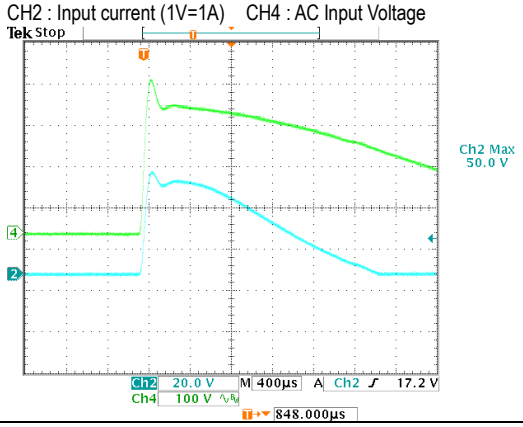
8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 1.20ms 115VAC/1.20ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME(Typ)	230VAC/ 16ms 115VAC/ 12ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/34.0ms 115VAC/ 30.4ms
	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: 840mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 350mVp-p 342mVp-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℃	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℃	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 3.4.A 115V/ 6.8A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =2.58A/ 230VAC I =4.76A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG：0.495mA N-FG：0.495mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	< 0.68W < 0.73 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℃	I =50.0A/ 230VAC I =45.6A/ 115VAC

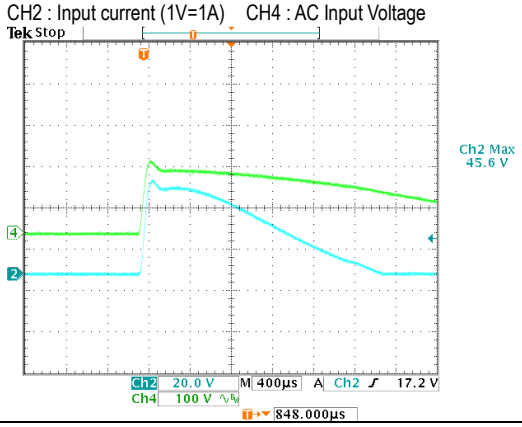
INPUT=230VAC/50HZ @ FULL LOAD

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



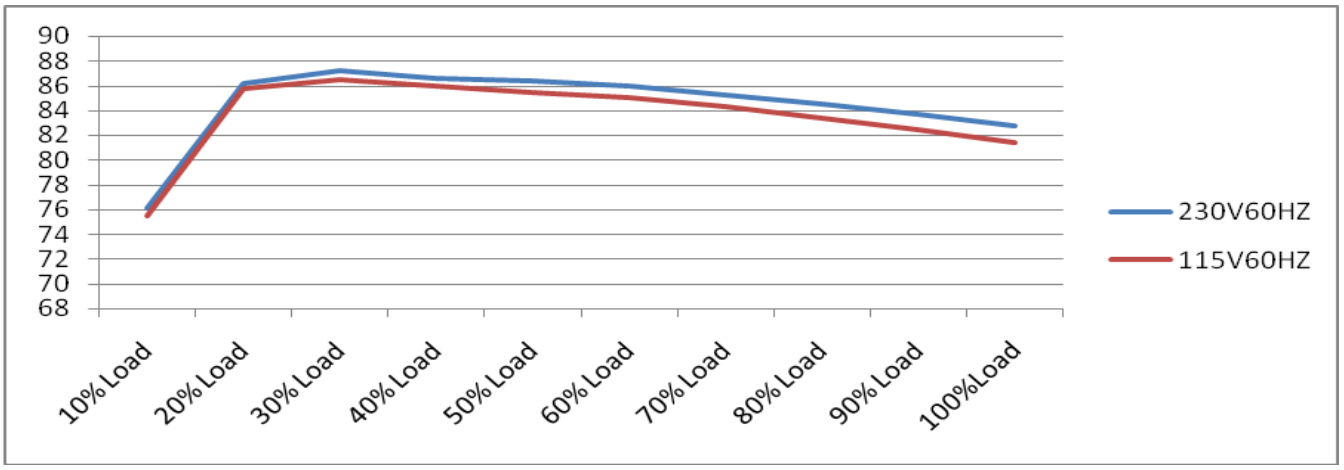
INPUT=115VAC/50HZ @ FULL LOAD

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



7	EFFICIENCY(Typ)	81.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	82.8%

EFFICIENCY vs LOAD



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℃	126.80%/ 230VAC 126.61%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 4.6V~5.4V	I/P: 230VAC I/P: 115VAC O/P:MIN LOAD Ta:25℃	5.32V/ 230VAC 5.32V/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℃	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**	Q 1 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)440V (2)440V (3)434V
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)39.4V (2)39.6V (3)32.8V Q103: (1)31.4V (2)31.6V (3)27.8V
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)188V (2)184V (3)187V
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) 19.4V (2) 19.4V (3) 19.2V

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: 2.38mA I/P-FG: 3.40mA O/P-FG:2.68 m 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℃	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℃	26 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	E.S.D	EN61000-4-2 INDUSTRY AIR:8KV / Contact:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
2	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A

3	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
4	Test by certified Lab & Test Report Prepare			

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℃		

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℃

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