Test Report: LRS-200-3.3

200W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Component Stress Test

■ SAFETY TEST

■ RELIABILITY TEST

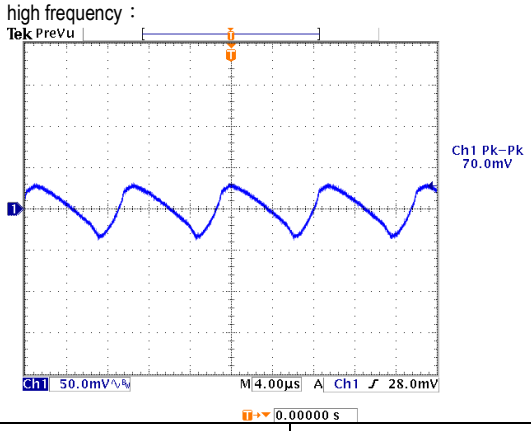
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

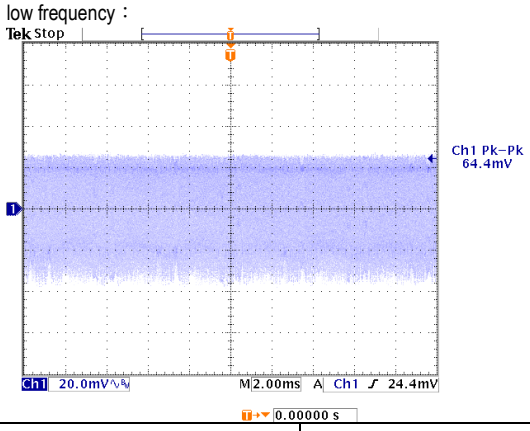
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 2.97~ 3.6V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	2.862V~3.803V/230VAC 2.866V~3.807V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -3%~3%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1:- 0.3 %~ 0.3%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: -0. 3%~-0.3%
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	＜±5%	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: 70.0mVp-p

high frequency：

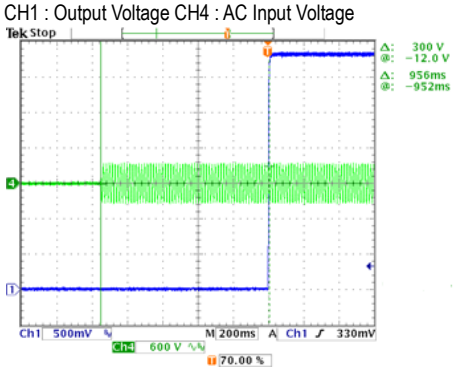


low frequency：

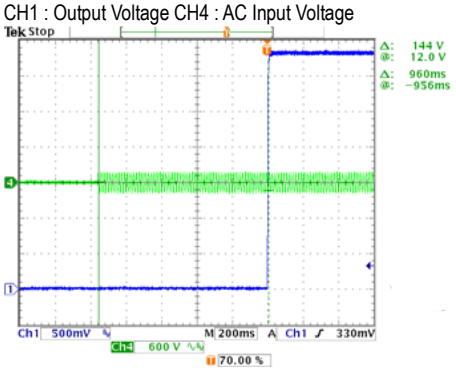


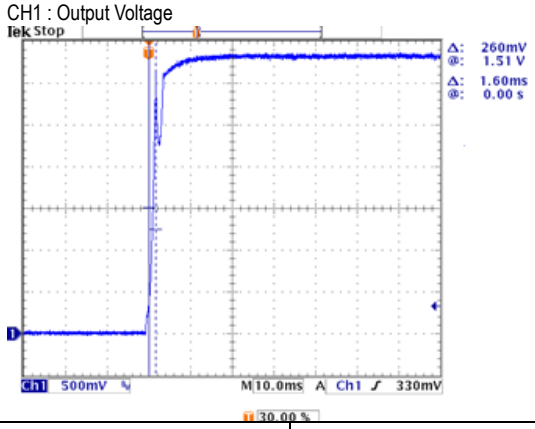
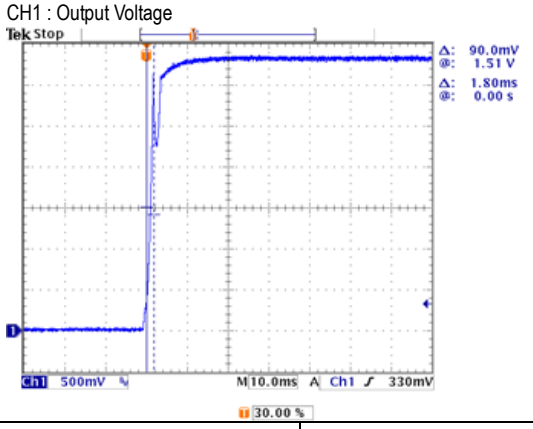
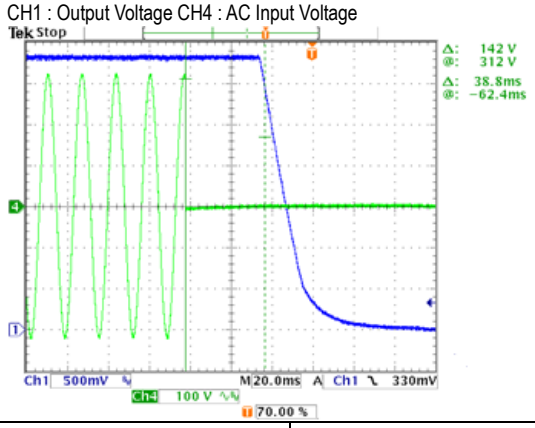
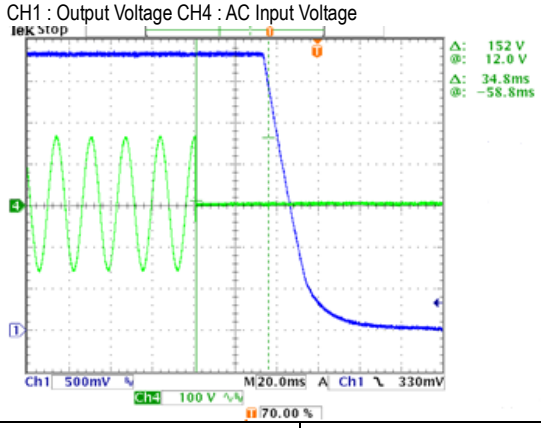
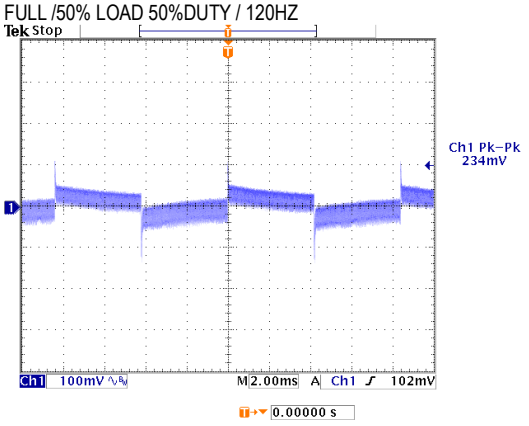
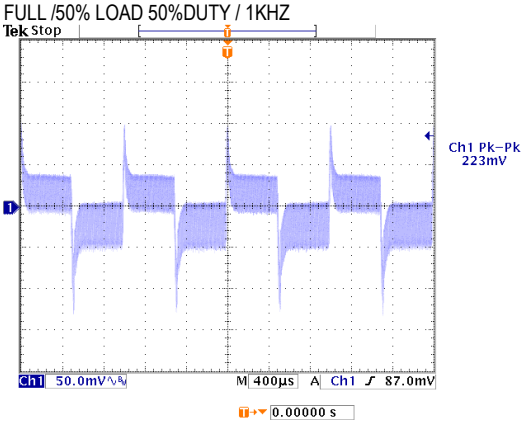
7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 956ms 115VAC/ 960ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH4 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH4 : AC Input Voltage



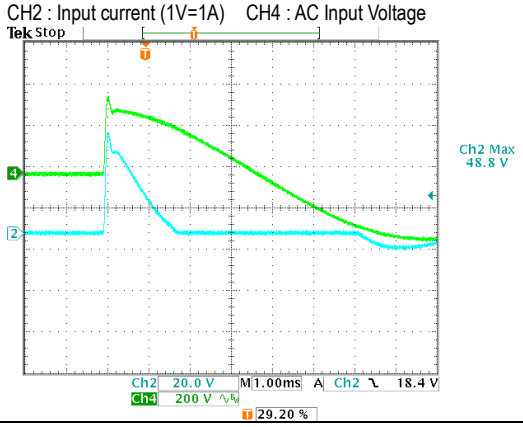
8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 1.60ms 115VAC/1.80ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME(Typ)	230VAC/ 16ms 115VAC/ 12ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 38.8ms 115VAC/ 34.8ms
	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: 660mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 234mVp-p 223mVp-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	90 ~ 132VAC / 180 ~ 264VAC by switch 240 ~ 370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25℃	78V~132V 147V~264V 230VDC ~ 370VDC(switch on 230VAC)
			I/P: (1)LOW-LINE-3V=87 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: 90 VAC ~132 VAC 180 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 2.2.A 115V/ 4A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.41A/ 230VAC I =2.60A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG：0.407mA N-FG：0.407mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	<0.44 W < 0.38 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 =48.8A/ 230VAC I =44.4A/ 115VAC

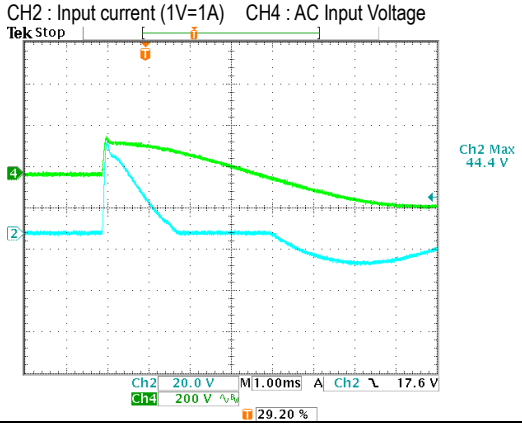
INPUT=230VAC/50HZ @ FULL LOAD

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



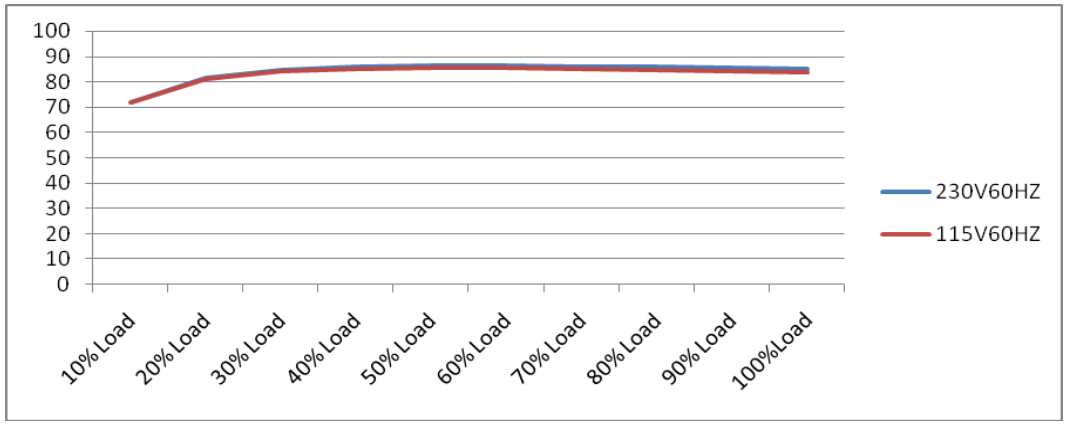
INPUT=115VAC/50HZ @ FULL LOAD

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



7	EFFICIENCY(Typ)	83%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	84.74%

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℃	125.60%/ 230VAC 125.05%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH:3.8V~4.45V	3.901V/ 230VAC 3.913V/115VAC O/P:MIN LOAD Ta:25℃	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	VERDICT
1	PWM Transistor (D to S) or (C to E) **Peak Voltage**	Q 2 Rated 12 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) 390V (2)404V (3)392 V	P
2	Diode Peak **Voltage**	Q102 Rated 120A/40V Q103 Rated 120A/40V	I/P:High-Line +3V =267V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta:25℃	Q102: (1)29.0V (2)28.5V (3)28.9 V Q103: (1)22.9V (2)23.0V (3)22.7V	P

3	**Input Capacitor Voltage**	C5 Rated: 330 μ / 200V	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)182V (2)182V (3)182V	**P**
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) 19.3V (3) 19.4V	**P**

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/P-O/P:2.369mA I/P-FG:3.03mA O/P-FG:2.70m 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

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL： LRS-200-5 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta=24.7℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD Ta=40.1℃		

NO	Position	ROOM AMBIENT Ta= 24.7 ℃	HIGH AMBIENT Ta=40.1 ℃
1	U1	63.9℃	76.7℃
2	U100	71.1℃	82.8℃
3	LF1	55.4℃	69.6℃
4	BD1	59.2℃	72.1℃
5	ZNR5	59.0℃	73.0℃
6	C5	59.2℃	73.3℃
7	C6	57.7℃	71.9℃
8	T2	62.2℃	76.2℃
9	Q1	66.7℃	82.4℃
10	Q2	66.9℃	82.6℃
11	D11	63.2℃	77.8℃
12	D10	65.3℃	82.2℃
13	T1coil	95.4℃	109.3℃
14	T1core	78.2℃	91.8℃

			NO	Position	ROOM AMBIENT Ta= 24.7 ℃	HIGH AMBIENT Ta=40.1 ℃
			15	C36	61.7℃	76.6℃
			16	RTH3	88.5℃	102.7℃
			17	L100	90.2℃	104.4℃
			18	C106	79.7℃	95.5℃
			19	C201	67.8℃	80.2℃
			20	L101	77.6℃	89.7℃
			21	Q101	77.2℃	91.9℃
			22	Q103	69.3℃	83.5℃
			23	Q104	64.7℃	78.9℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：125％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	±0.008%/℃ (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 C106 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=40 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 40 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 40 ℃ LIFE TIME	(1) 65146HRS (2) 22444HRS (3) 81836HRS (4) 207180HRS
10	MTBF	2346.6K hrs min. Telcordia SR-332 (Bellcore) ; 279.4Khrs min. MIL-HDBK-217F (25℃)	
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