Test Report: LRS-1200-36

1200W Low Profile Economical Encolsed Type Power Supply

■ DESIGN VERIFY TEST

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

■ SAFETY & E.M.C. TEST

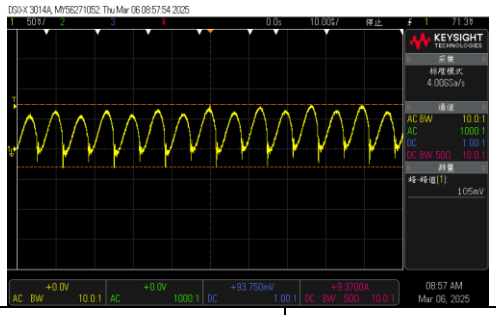
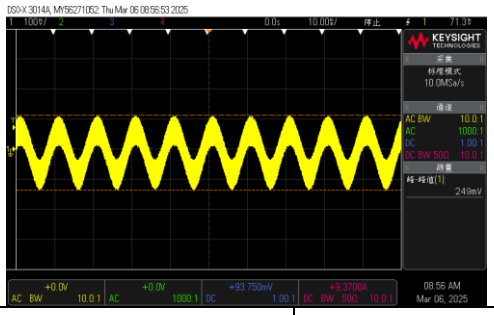
Safety Test
E.M.C. Test

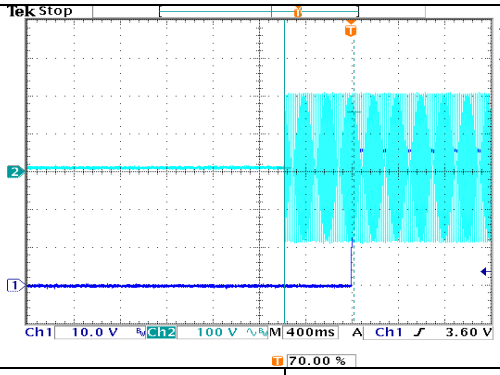
■ RELIABILITY TEST

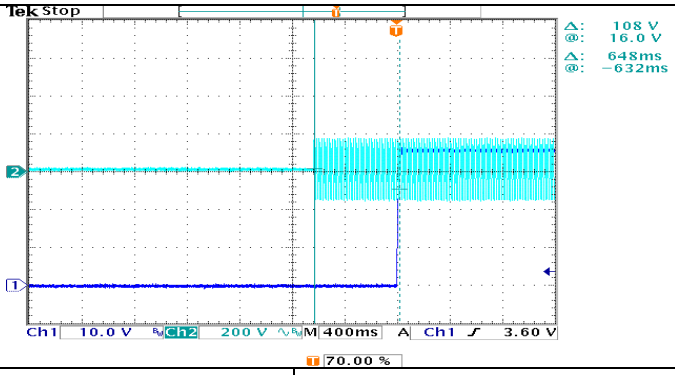
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

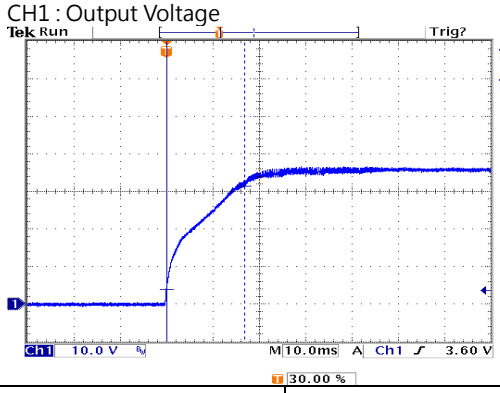
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 34V~ 40V	I/P： 230 VAC O/P：MIN LOAD Ta：25℃	32.89V~41.29V/230VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1%~ +1 %	I/P: 180VAC /305VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.03% ~ 0.28 %
3	LINE REGULATION	V1: -0.5%~ +0.5 %	I/P: 180VAC~ 305VAC O/P:FULL LOAD Ta:25℃	V1: -0.17%~ 0.11 %
4	LOAD REGULATION	V1: -0.5%~ +0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.06%~ +0.19 %
5	OVER/UNDERSHOOT TEST	<± 5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	3.6%
6	RIPPLE & NOISE (Max)	V1: 360 mVp-p	I/P: 230 VAC O/P: MIN LOAD—FULL LOAD Ta:25℃	V1: 249 mVp-p / 100% load
	high frequency： 		low frequency： 	
7	SET UP TIME(Max)	277VAC/1500ms 230VAC/1500ms	I/P： 277VAC I/P： 230 VAC O/P：FULL LOAD Ta：25℃	277VAC/ 600ms 230VAC/ 648ms
	INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	



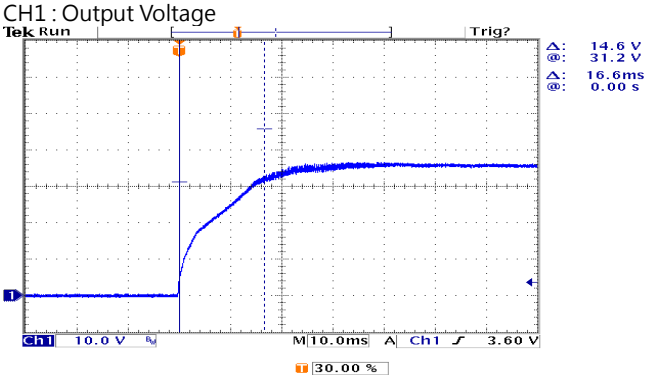


8	RISE TIME (Max)	277VAC/70ms 230VAC/70ms	I/P : 277VAC I/P : 230 VAC O/P : FULL LOAD Ta : 25℃	277VAC/ 16.8ms 230VAC/16.6ms

INPUT=277VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

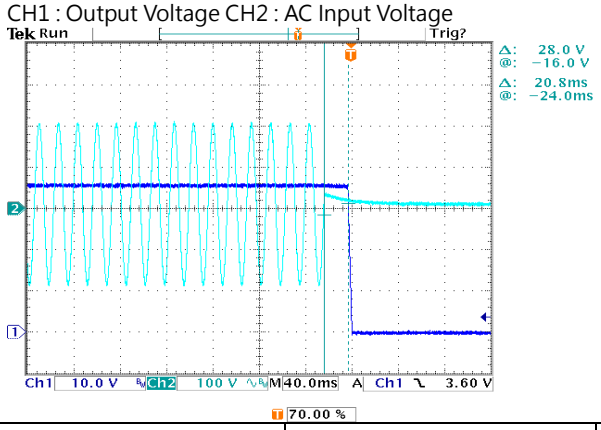


INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage

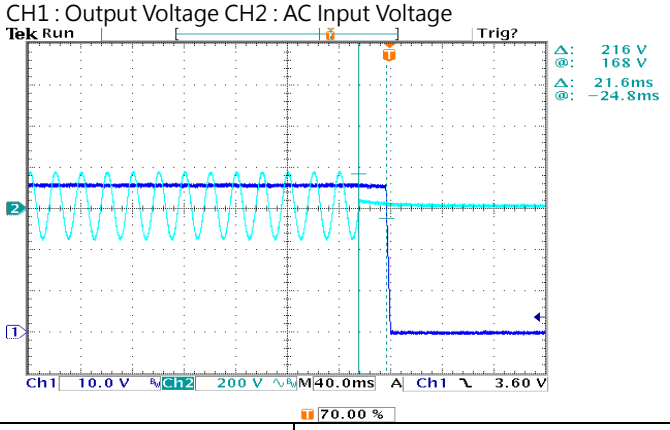


9	HOLD UP TIME (Typ.)	277VAC/10ms 230VAC/10ms	I/P : 277VAC I/P : 230 VAC O/P : FULL LOAD Ta : 25℃	277VAC/ 20.8ms 230VAC/ 21.6ms

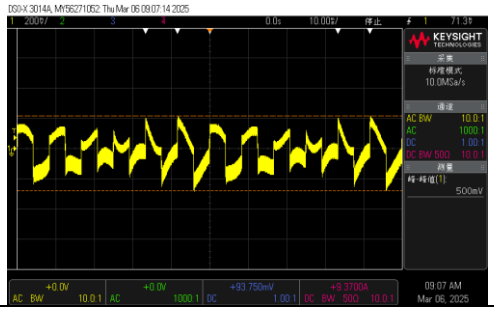
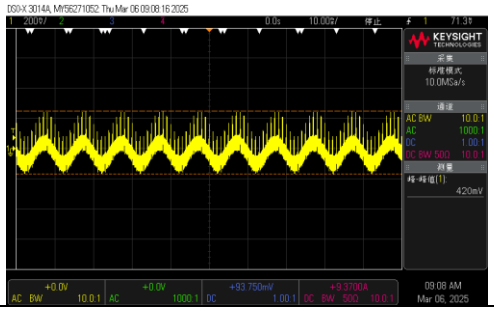
INPUT=277VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

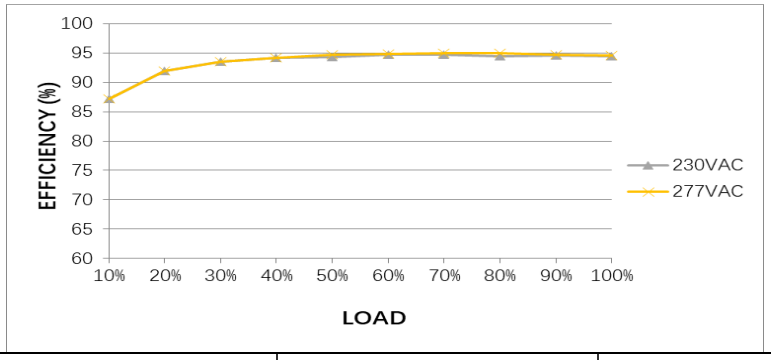
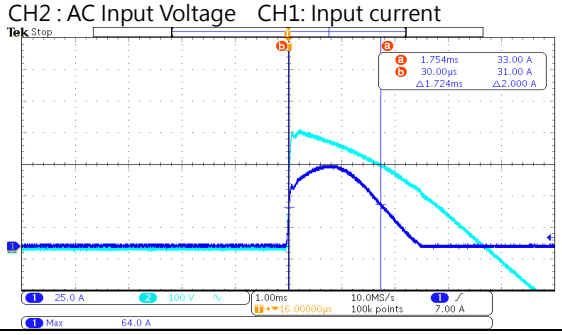
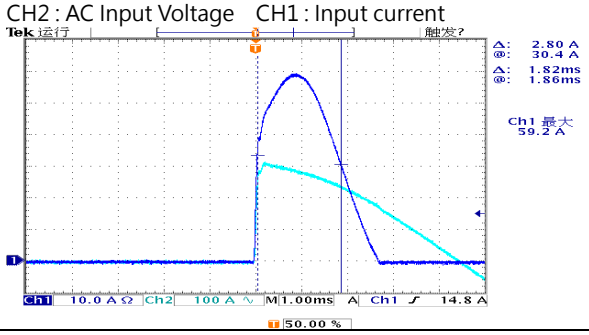


10	DYNAMIC LOAD	V1: 3600mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 500mVp-p 420mVp-p

	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~305VAC 255VDC~ 431VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25℃	(1) 177V~300V (2) 255 Vdc~ 431Vdc/FULL LOAD 255Vdc~431 Vdc/50% LOAD (3) 255Vdc~ 431Vdc/FULL LOAD 255Vdc~ 431Vdc/50% LOAD
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=315V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:180 VAC ~305 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	277V/5A 230V/7A	I/P： 277VAC I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =4.69A/ 277VAC I =5.56A/ 230VAC
4	LEAKAGE CURRENT	< 2mA / 277 VAC < 7.07mA (Peak)/ 277 VAC < 2mA / 240 VAC < 7.07mA (Peak)/ 240 VAC	I/P： 277 VAC I/P： 240 VAC O/P：Min LOAD Ta：25℃	277VAC: L-FG：0.351 mA N-FG：0.352mA L-FG： 0.713mA(Peak) N-FG：0.708 mA(Peak) 240VAC: L-FG：0.293 mA N-FG：0.292 mA L-FG： 0.572mA(Peak) N-FG：0.564 mA(Peak)

5	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	94.4%
	EFFICIENCY vs LOAD 			
6	INRUSH CURRENT(Typ.)	277V/75A 230V/60A COLD START	I/P： 277 VAC I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =64A/ 277VAC T50=1724us/277VAC I =59.2A/ 230VAC T50=1820us/277VAC
	INPUT=277VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH1: Input current 		INPUT=277VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH1 : Input current 	

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	Protection type : 1 、 Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover 2、Constant current limiting for output power >150% rated for more than 5 seconds and then shut down o/p voltage, re-power on to recover	I/P: 305VAC I/P: 230VAC I/P: 180VAC O/P:TESTING Ta:25℃	1、 114.41%/ 305VAC 114.41%/ 230VAC 114.41%/180VAC Protection type : 1、Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover 2、Constant current limiting for output power >150% rated for more than 5 seconds and then shut down o/p voltage, re-power on to recover

2	OVER VOLTAGE PROTECTION	41V~50V	I/P: 305VAC I/P: 230VAC I/P: 180VAC O/P:MIN LOAD Ta:25℃	47.5V/ 305VAC 47.5V/ 230VAC 47.5V/ 180VAC Protection type : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 305VAC I/P: 180VAC O/P:FULL LOAD	**O.T.P. Active** Protection type : Shut down o/p voltage, re-power on to recover

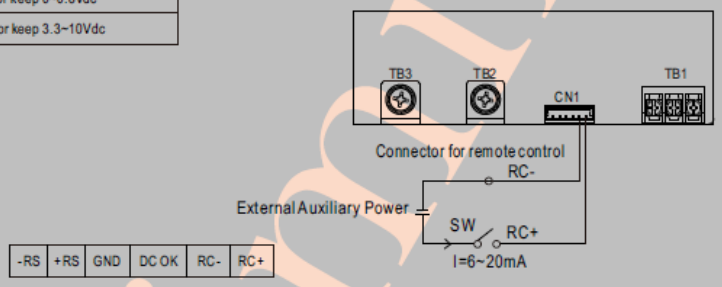
CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL			

2. Remote Control

The PSU can be turned ON/OFF by using the "Remote Control" function with external switch and auxiliary power.

PSU Vo status	Between RC-(pin5) and RC+(pin6)
Power ON	SW open or keep 0~0.8Vdc
Power OFF	SW short or keep 3.3~10Vdc



I/P: 230 VAC

O/P:FULL LOAD

Ta:25℃

Test Result：

Between ON/OFF	Power Output Status
SW OFF（0~0.8V）	ON
SW ON （3.3~10V）	OFF

2	PEAK POWER			

4. Peak Power

$$P_{av} = \frac{P_{pk} \times t + P_{npk} \times (T-t)}{T} \leqslant P_{rated}$$

$$Duty = \frac{t}{T} \times 100\% \leqslant 35\%$$

$t \leqslant 5$ sec

P_{av}: Average output power (W)

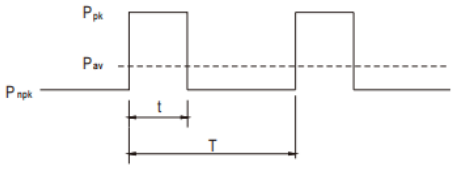
P_{pk} : Peak output power (W)

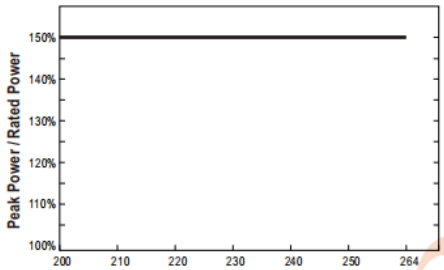
P_{npk} : Non-peak output power (W)

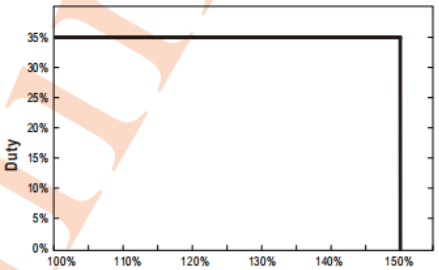
P_{rated} : Rated output power (W)

t : Peak power width (sec)

T: Period (sec)







I/P: 200/305 VAC

O/P:PEAK LOAD (1Hour NO DAMGE)

Ta:25℃

Test Result：OK

Preliminary

3	REMOTE SENSE	S+ / S- Compensate voltage drop on the load wiring up to 0.3V.	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	> 0.3 V
4	DC_OK Signal	1. PSU ON 3.3V~5.6V 2. PSU OFF 0V~1V	I/P:230VAC O/P:FULL LOAD Ta:25℃	TEST : OK
5	FAN NOISE(Typ.)	Built-in intelligent fan speed control detect by PSU'S internal temperature 10% load with Ta=25℃ 45dB 70% load with Ta=25℃ 53dB I/P:230VAC O/P:10%Load/70%Load Ta:25℃ TEST : 43.08dB/10%load 46.51dB/70%load		

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q4 Rated 41A/ 600V	AC ON/OFF I/P:High-Line +3V =308V VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. I/P:Low-Line -3V = 177V O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25℃	 VDS: (1) 491V (2) 503V (3) 487V (4) 487V (5) 481V (6) 491V (7) 503V VDS: (1) 487V (2) 511V (3) 483V (4) 483V (5) 483V (6) 487V (7) 503V

2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 41A/ 600V	I/P:High-Line +3V =308 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. I/P:Low-Line -3V =177V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25℃	 VDS: (1)473V (2)449V (3)473V (4)473V (5)473V (6)469V (7)449V VDS: (1)473V (2)477V (3)473V (4)473V (5)473V (6)473V (7)473V
3	P.F.C DIODE	D3 Rated 10 A/ 650V	I/P:High-Line +3V =308 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz I/P:Low-Line -3V = 177V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25℃	 308VAC (1) 445V (2) 445V (3) 449V (4) 449V 177VAC (1) 449V (2) 453V (3) 449V (4) 449V

4	Diode Peak Voltage	Q100 Rated 88A/ 150V	AC ON/OFF I/P:High-Line +3V =308V O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25℃	Q100: VDS: (1) 105.9V (2) 18.8V (3) 105.9V (4) 105.1V (5) 105.9V (6) 105.1V (7) 121.2V (8) 97.10V Q104: VDS: (1) 103.5V (2) 16.00V (3) 103.5V (4) 103.5V (5) 104.3V (6) 109.2V (7) 123.6V (8) 95.50V
5	Input Capacitor Voltage	C5 Rated: 330μ/ 450 V Surge voltage:500 V	I/P:High-Line +3V =308V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25℃	(1)441V (2)437V (3)449V (4)441V
6	Control IC Voltage Test	PWM IC U2 Rated 8.9 V~ 15.5 V PFC IC U1 Rated -0.3V~ 26V O/P IC U102 Rated 3V~ 32V AUX IC U300 Rated 0V~50V	AC ON/OFF I/P:High-Line +3V =308 V O/P(1)Full Load (2) Output Short (3)O.L.P (4)O.V.P. (5)No Load VR min (Low Line) Ta:25℃	U2 (1) 14.1V (2) 13.9V (3) 13.9V (4) 13.9V (5) 13.9V U1 (1) 14.1V (2) 13.9V (3) 13.9V (4) 13.9V (5) 13.9V

				U102 (1) 10.9V (2) 10.9V (3) 10.9V (4) 10.9V (5) 10.9V U300 (1) 14.1V (2) 13.9V (3) 13.9V (4) 13.9V (5) 13.9V
7	TOP SWITCHING STAND BY POWER	U300 Rated 1.0A/ 730V	AC ON/OFF I/P:High-Line +3V =308V O/P: (1)Full Load (2)Remote On/Off I/P:Low-Line -3V =177 V O/P: (1)Full Load (2)Remote On/Off Ta:25℃	 308V (1) 533 V (2) 537V 177V (1) 533V (2) 541V

■ SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4.2 K VAC/min I/P-FG : 2.1 K VAC/min O/P-FG: 1.25 KVAC/min	I/P-O/P: 4.62 KVAC/min I/P-FG: 2.52 KVAC/min O/P-FG: 1.5 KVAC/min Ta:25℃	I/P-O/P: 2.86 mA I/P-FG: 2.78 mA O/P-FG: 2.49 m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500 VDC>100MΩ I/P-FG: 500 VDC>100MΩ O/P-FG: 500 VDC >100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25℃	I/P-O/P: >9999 MΩ I/P-FG: >9999 MΩ O/P-FG: >9999 MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	12mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS
2	CONDUCTION	EN55032 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	EN61000-6-2 L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
7	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : LRS-1200-48 1. ROOM AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta=30.9 ℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=51.8 ℃		

NO	Position	ROOM AMBIENT Ta=30.9 ℃	HIGH AMBIENT Ta=51.8 ℃
1	RTH1	36.2℃	57.0℃
2	BD1	53.7℃	73.0℃
3	Q1	70.8℃	91.2℃
4	D3	77.4℃	97.4℃
5	L1	62.0℃	80.7℃
6	U1	48.6℃	67.8℃
7	U2	46.6℃	66.9℃
8	C6	44.3℃	63.6℃
9	L3	63.7℃	82.7℃
10	Q3	74.9℃	100.5℃
11	Q4	78.3℃	104.7℃
12	C94	45.4℃	66.5℃
13	T1	62.8℃	84.6℃
14	T2	46.9℃	67.4℃
15	U300	58.3℃	77.6℃
16	C321	50.2℃	69.7℃
17	D320	55.8℃	75.7℃
18	C403	43.1℃	63.0℃
19	C104	45.6℃	66.7℃
20	U100	48.1℃	69.2℃
21	U101	36.7℃	57.9℃
22	U102	42.2℃	63.0℃
23	Q102	53.1℃	74.9℃
24	Q104	54.7℃	76.6℃
25	R125	75.6℃	93.7℃
26	J113	47.8℃	68.2℃
27	C106	44.2℃	64.5℃
28	C111	43.8℃	64.0℃
29	RTH3	44.9℃	65.7℃
30	RTH4	45.6℃	66.4℃
31	TC	49.9℃	70.0℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：114.5 % LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 305VAC/200VAC O/P： 100 % LOAD Ta= -35 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃/95 %R.H NO DAMAGE	I/P： 315 VAC O/P：FULL LOAD Ta=50 ℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~30℃)	I/P： 230 VAC O/P：FULL LOAD	± 0.0011 %/℃(0~30℃)
6	STORAGE TEMPERATURE TEST	-40~85℃	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：10 CYCLE 5. Input/output condition： STATIC	
7	THERMAL SHOCK TEST	-30~50℃	1. Thermal shock Temperature： -35℃~ +55℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：16 CYCLE 5. Input/output condition： 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test	
8	VIBRATION TEST	10 ~ 500Hz, 3G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：4G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃	
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=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) 1245604HRS (2) 229544HRS (3) 337782HRS (4) 426485HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 924.6K hrs min. Telcordia SR-332 (Bellcore) ; 93.2K hrs min. MIL-HDBK-217F (25℃)		
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	WUWQIN/ZHOUBIAO	WENF	WUWQ

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