Test Report: NSP-320-48

320W AC/DC High Reliable Multi-Industries 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

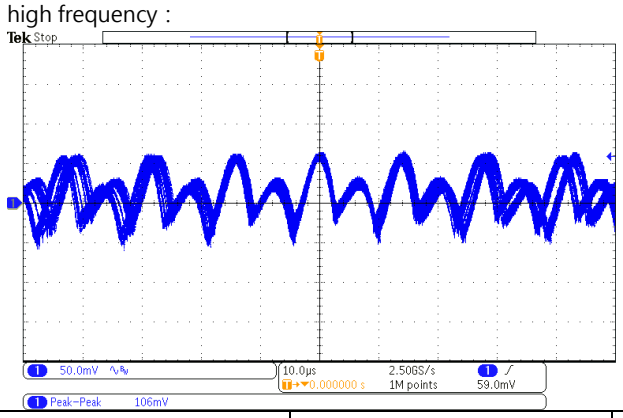
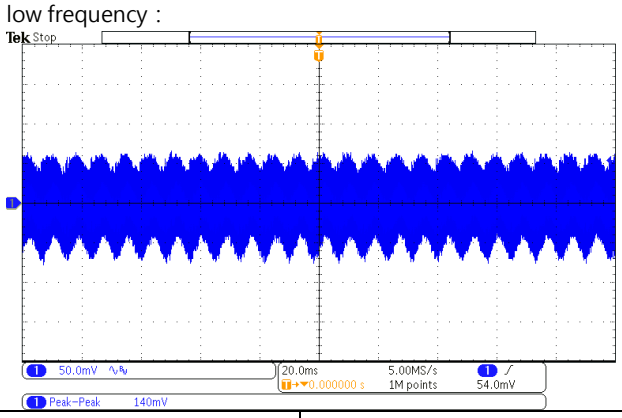
Safety Test
E.M.C. Test

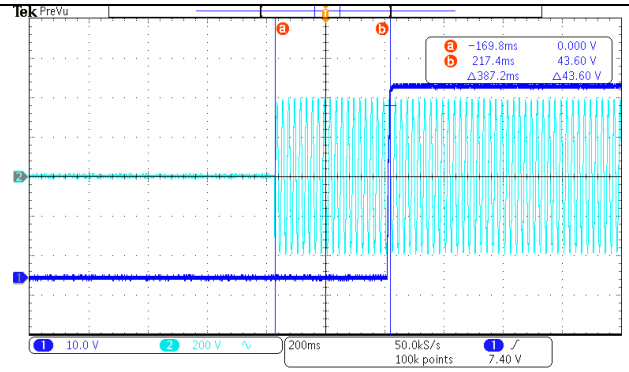
■ RELIABILITY TEST

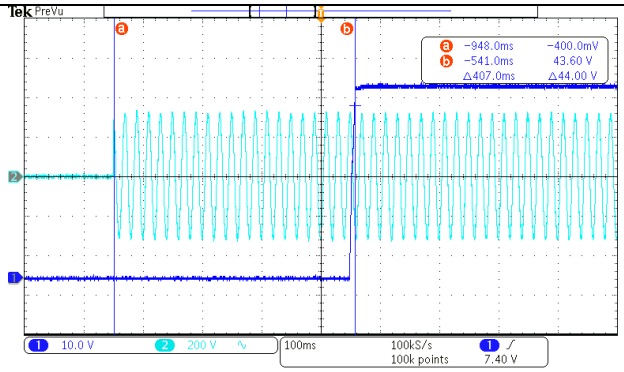
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

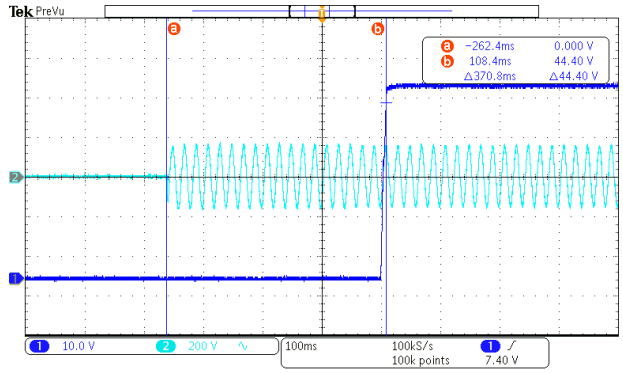
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 44V~ 57V	I/P : 230 VAC O/P : MIN LOAD Ta : 25℃	43.09V~58.50V/230VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1.0%~ 10%	I/P: 85VAC /305VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0.16%~ 0.25%
3	LINE REGULATION	V1: -0.5%~ 0.5%	I/P: 85VAC~ 305VAC O/P:FULL LOAD Ta:25℃	V1: 0%~0.02%
4	LOAD REGULATION	V1: -0.5%~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0.06%~0 %
5	OVER/UNDERSHOOT TEST	<± 5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	0.81%
6	RIPPLE & NOISE (Max)	V1: 240mVp-p	I/P: 230 VAC O/P: FULL LOAD Ta:25℃	V1:140mVp-p
	high frequency :  		low frequency :  	
7	SET UP TIME(Max)	277VAC/1000ms 230VAC/1000ms 115VAC/1500ms	I/P : 277 VAC I/P : 230 VAC I/P : 115VAC O/P : FULL LOAD Ta : 25℃	277VAC/387.2ms 230VAC/407ms 115VAC/370.8ms
	INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	



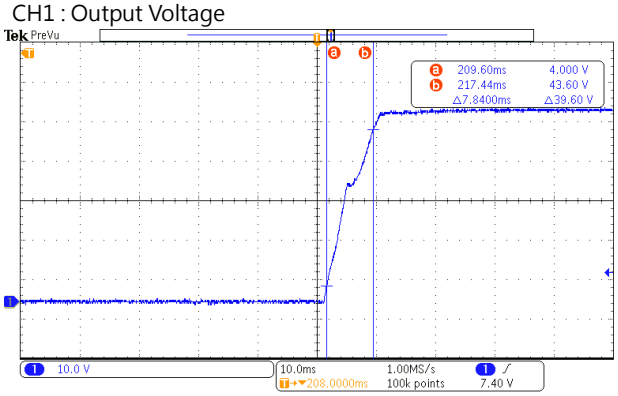


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

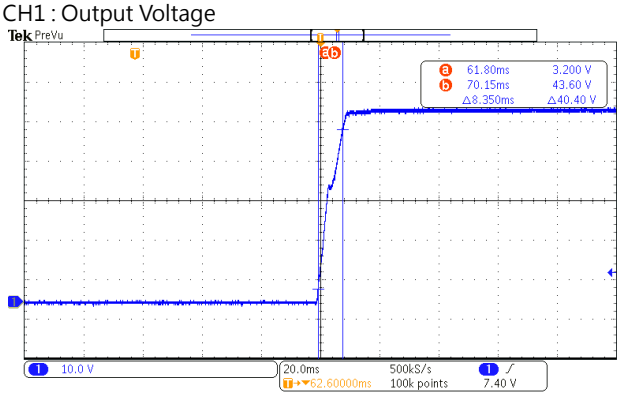


8	RISE TIME (Max)	277VAC/80ms 230VAC/80ms 115VAC/80ms	I/P： 277 VAC I/P： 230 VAC I/P： 115VAC O/P：FULL LOAD Ta：25℃	277VAC/7.84ms 230VAC/8.35ms 115VAC/8.24ms

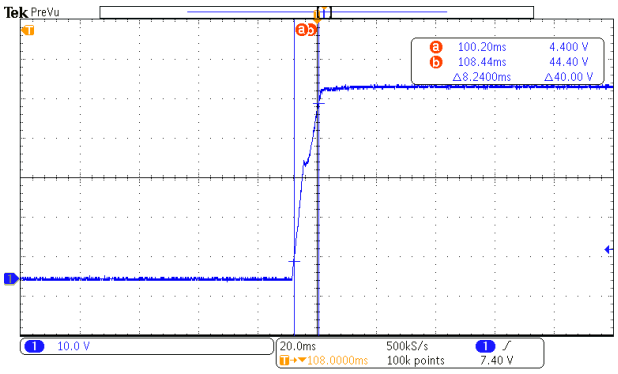
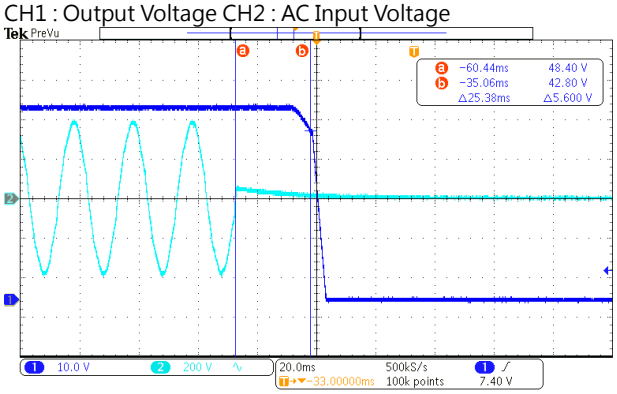
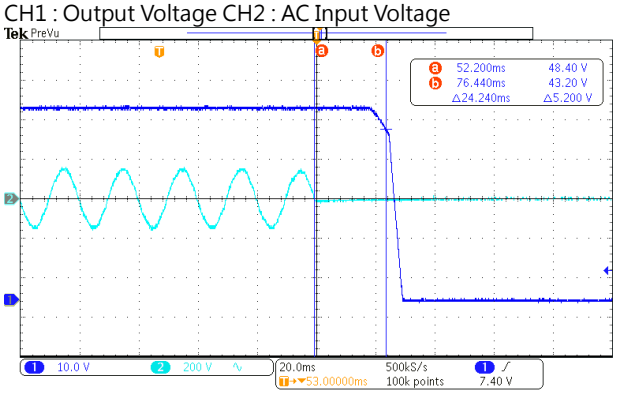
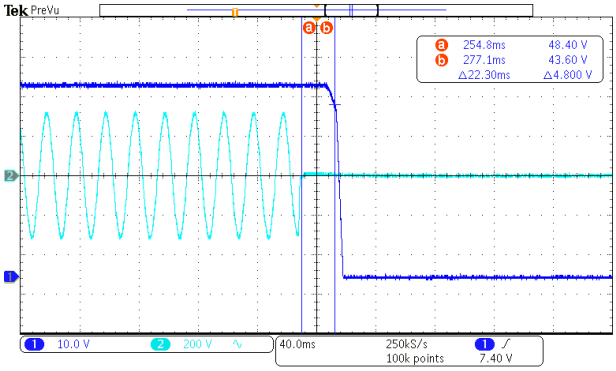
INPUT=277VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

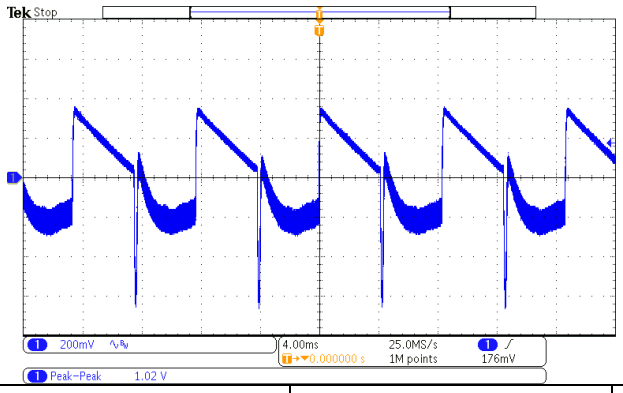
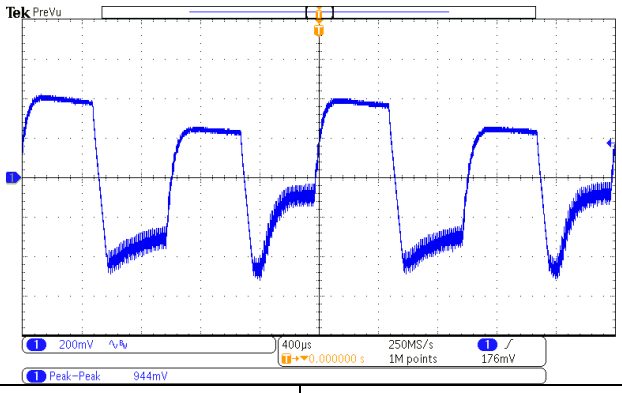


INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage



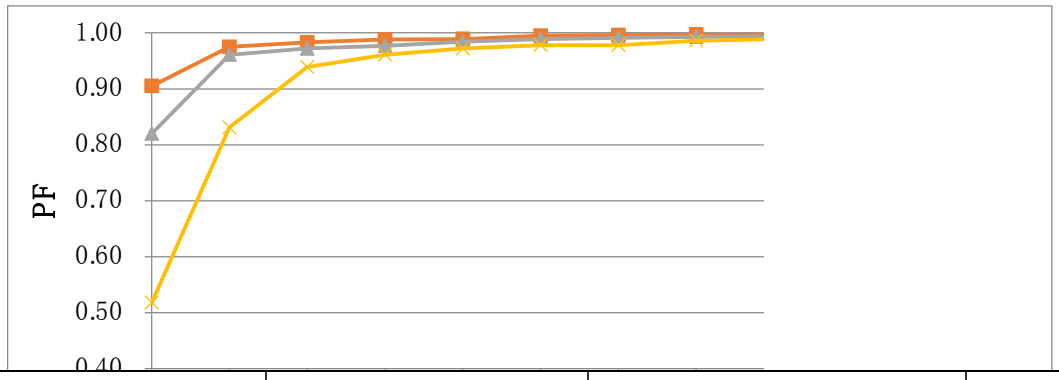
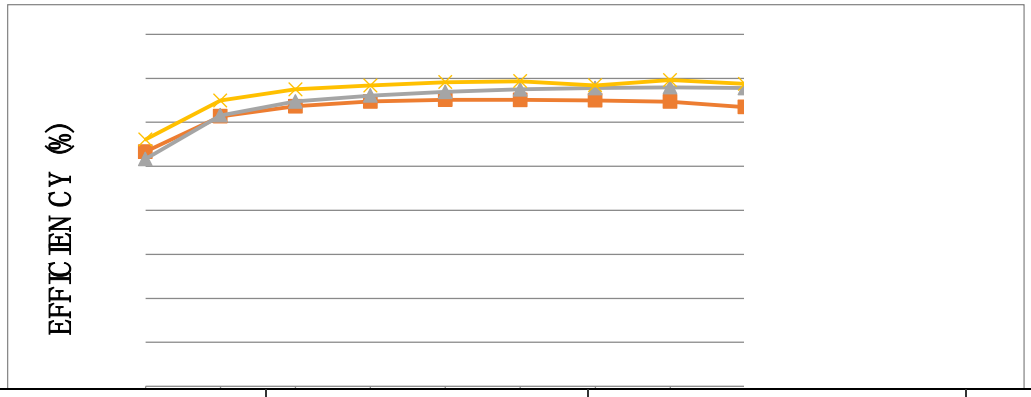
INPUT=115VAC/60HZ @ FULL LOAD

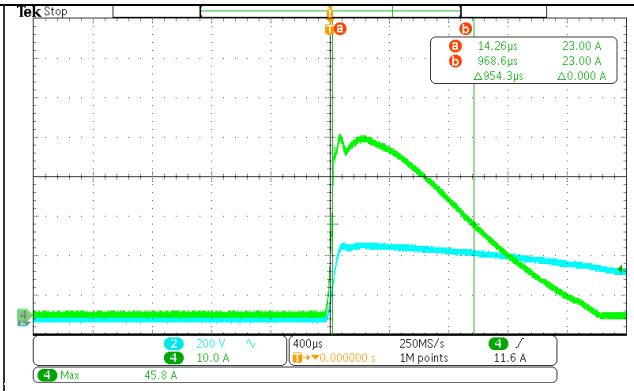
	CH1 : Output Voltage  			
9	HOLD UP TIME (Typ.)	277VAC/16ms 230VAC/16ms 115VAC/16ms	I/P： 277VAC I/P： 230 VAC I/P： 115VAC O/P：FULL LOAD Ta：25℃	277VAC/ 25.38ms 230VAC/22.3ms 115VAC/24.24ms
	INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  	
10	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	1010mVp-p 944mVp-p

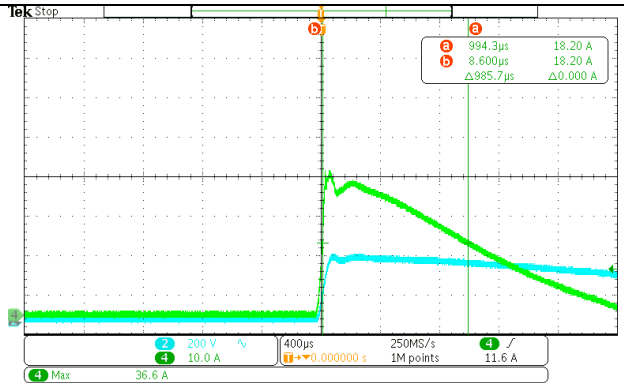
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	
11	TRANSIENT RECOVERY TIME	V1: 4800mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	576mVp-p 446us

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~305VAC 120VDC~ 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) 80V~308V (2) 117Vdc~434Vdc/FULL LOAD 117Vdc~434Vdc/50% LOAD (3) 117Vdc~434Vdc/FULL LOAD 117Vdc~434Vdc/50% LOAD
			I/P: LOW-LINE-3V=82 V HIGH-LINE+10V=315 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:PASS
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:85VAC ~305VAC O/P:FULL~MIN LOAD Ta:25℃	TEST:PASS
3	INPUT CURRENT (Typ.)	277VAC/ 1.4A 230VAC/1.6A 115VAC/3.2A	I/P： 277 VAC I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.23A/ 277VAC I =1.49A/ 230VAC I =3.03A/ 115VAC
4	LEAKAGE CURRENT	<350µA / 277 VAC touch current<100µA (Peak)/ 277 VAC	I/P： 277 VAC O/P：Min LOAD Ta：25℃	262µA for Earth 28µA for touch
5	POWER FACTOR (Typ.)	0.90/ 277VAC 0.93/ 230VAC 0.98/115VAC	I/P： 277 VAC I/P： 230 VAC I/P： 115 VAC	PF=0.991/277VAC PF=0.995/230VAC PF=0.998/115VAC

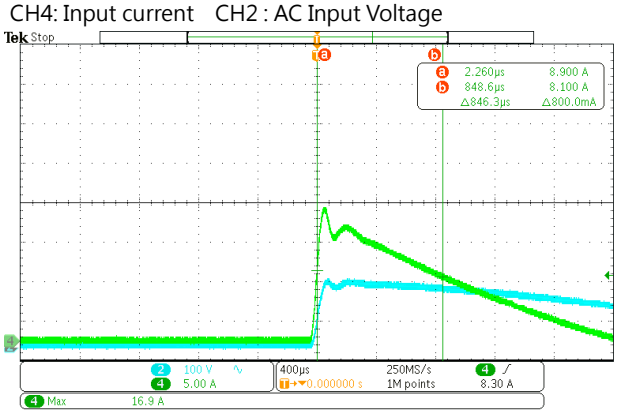
			O/P：FULL LOAD Ta：25℃	
	P.F vs LOAD  			
6	EFFICIENCY(Typ.)	93.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	93.93%
	EFFICIENCY vs LOAD  			
7	NO LOAD POWER CONSUMPTION(Typ.)	Remote Power ON： 3W/277VAC 3W/230VAC 3W/115VAC Remote Power OFF： 0.5W/277VAC 0.5W/230VAC 0.3W/115VAC	I/P： 277 VAC I/P： 230 VAC I/P： 115 VAC O/P：RC ON/RC OFF Ta：25℃	Remote Power ON： 1.95W/277VAC 2.03W/230VAC 2.21W/115VAC Remote Power OFF： 0.40W/277VAC 0.31W/230VAC 0.14W/115VAC
8	INRUSH CURRENT(Typ.)	277VAC/50A 230VAC/40A 115VAC/20A COLD START	I/P： 277 VAC I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =45.8A/ 277VAC T50= 954.3us/277VAC I =36.6A/ 230VAC T50=985.7us/230VAC I =16.9A/ 115VAC T50=846.3us/115VAC
	INPUT=277VAC/60HZ @ FULL LOAD CH4: Input current CH2 : AC Input Voltage		INPUT=230VAC/50HZ @ FULL LOAD CH4: Input current CH2 : AC Input Voltage	





INPUT=115VAC/60HZ @ FULL LOAD

CH4: Input current CH2 : AC Input Voltage

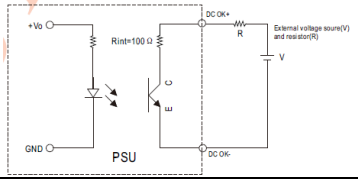


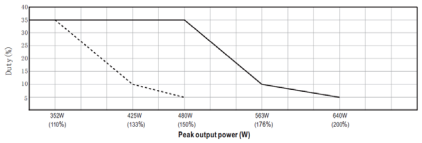
PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~200%	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P:TESTING Ta:25℃	123.6%/ 305VAC 123.1%/ 230VAC 123.12%/85VAC Protection type : 1、Normally works within 105 ~ 200% rated output power for more than 5 seconds and then constant current limiting without shutdown(Vout>30%), recovers automatically after fault condition is removed, or shut down o/p voltage when Vout<30%,AC re-power on to recover 2、>200% rated power, constant current limiting (Vout>30%)with auto-recovery after fault condition is removed,

2	OVER VOLTAGE PROTECTION	58V~70V Protection type : Shut down o/p voltage, AC re-power on to recover	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25℃	64.2V/ 305VAC 64.2V/ 230VAC 64.2V/ 85VAC Protection type : Shut down o/p voltage, AC re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down o/p voltage, AC re-power on to recover	I/P: 305VAC I/P: 85VAC O/P:FULL LOAD	O.T.P. Active Protection type : Shut down o/p voltage, AC re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC I/P: 85VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE Protection type : Constant current limiting for more than 5 seconds (Vout<30%) and then shut down a/p voltage, AC re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	Power ON: Pin5 and Pin6 open or keep 0~0.8Vdc Power OFF: Pin5 and Pin6 keep 3.3~10Vdc	I/P:230VAC O/P:FULL LOAD Ta:25℃	TEST: OK
2	REMOTE SENSE	S+ / S- The remote sensing compensates voltage drop on the load wiring up to 0.3V	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	TEST: OK
3	DC OK SIGNAL	15Vdc/10mA resistive load PSU Vo Status / Photo transistor POWER ON / Conduct(Low impedance) POWER OFF / Open(High impedance) Optocoupler Rating(max.) 15Vdc/10mA resistive load 	I/P:230VAC O/P:FULL LOAD Ta:25℃	TEST: OK
4	FAN CONTROL & NOISE	(1)Fan ON/OFF control : RTH4≥50℃±10℃ FAN ON RTH4≤40℃±10℃ FAN OFF (2) FAN NOISE : ＜40dB@100% load with Ta=25℃	I/P:230VAC O/P: FULL LOAD	TEST: (1) ok (2) 39.8 dB Ta:25℃

5	PEAK Power	I/P: 100/305VAC O/P:  ----100VAC ——200VAC	TEST: OK

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q6Rated : 650V15A	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. Ta:25℃	VDS: (1) 487V (2) 487V (3) 475V (4) 483V (5) 475V (6) 483V (7) 491V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 650V/15A	I/P:High-Line +3V =308V AC ON/OFF O/P: (1)Full Load (2)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (3)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. Ta:25℃	VDS: (1) 511V (2) 492V (3) 489V (4) 462V
3	Diode Peak Voltage	D101 Rated : 20A/200V	AC ON/OFF I/P:High-Line +3V =308 V O/P: (1)Full Load (2)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (3)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. Ta:25℃	D101: VDS: (1) 141V (2) 137V (3) 135V (4) 59V
4	Control IC Voltage Test	PFC/PWM IC U2 Rated 9.6V~ 36 V	AC ON/OFF I/P:High-Line +3V =308 V O/P(1)FULL LOAD	U2 U100 (1) 19.2V (1) 12.2V (2) 18.8V (2) 11.3V

		O/P IC U101 Rated 3V~ 30 V	(2) Output Short (3)O.L.P Ta:25℃	(3) 19.2V (3) 12.2V

■ 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: 1.5 KVAC/min	I/P-O/P: 4.6 KVAC/min I/P-FG: 2.5 KVAC/min O/P-FG: 1.8 KVAC/min Ta:25℃	I/P-O/P: 2.364 mA I/P-FG: 2.455 mA O/P-FG: 1.852 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℃	11 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	■□PASS □FAIL
2	CONDUCTION	BS EN/EN55032(CISPR32),CNS 15936 EN/EN55014-1(CISPR14-1) EN/EN55011(CISPR11)	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032(CISPR32),CNS 15936 EN/EN55014-1(CISPR14-1) EN/EN55011(CISPR11)	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR：15KV / Contact：8KV	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	IEC61000-4-5 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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL : NSP-320-48
1. ROOM AMBIENT BURN-IN : 2HRS
I/P : 230VAC O/P : FULL LOAD Ta= 24.5℃
2. HIGH AMBIENT BURN-IN : 2HRS
I/P : 230VAC O/P : FULL LOAD Ta=62.8 ℃</td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P : 230 VAC
O/P : 123.1%LOAD
Ta : 25℃</td><td>TEST : OK</td></tr>
</table>

NO	Position	ROOM AMBIENT Ta=24.5℃	HIGH AMBIENT Ta=62.8℃
1	C1	27.7℃	68.3℃
2	LF1	33.8℃	74.9℃
3	LF2	32.5℃	73.4℃
4	C2	32.6℃	73.7℃
5	C10	31.9℃	73.2℃
6	ZNR1	31.9℃	72.7℃
7	RY1	39.3℃	81.7℃
8	L1	45.1℃	89.2℃
9	BD1	41.9℃	82.2℃
10	C5	35.7℃	75.8℃
11	Q1	42.7℃	83.3℃
12	Q2	42.7℃	83.1℃
13	D8	43.2℃	83.4℃
14	C14	36.5℃	78.9℃
15	Q5	40.4℃	81.8℃
16	Q6	39.2℃	80.3℃
17	U2	41.2℃	82.4℃
18	C36	39.3℃	79.7℃
19	T1CORE	48.7℃	89.9℃
20	T1COIL	55.3℃	96.3℃
21	RG200	37.9℃	78.1℃
22	C201	33.4℃	73.1℃
23	U121	40.8℃	79.7℃
24	D102	52.9℃	90.9℃
25	D103	54.9℃	93.1℃
26	C105	42.5℃	83.0℃
27	C107	41.4℃	80.3℃
28	RTH3	45.1℃	84.7℃
29	TSW1	39.9℃	81.9℃

3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 305VAC/100VAC 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 60℃/95 %R.H NO DAMAGE	I/P： 315 VAC O/P：FULL LOAD Ta= 60℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.05 %/℃(0~60℃)	I/P： 230 VAC O/P：FULL LOAD	± 0.0049%/℃(0~60℃)
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	-30~60℃	1. Thermal shock Temperature： -35℃~ +65℃ 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, 2G 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：3G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃	
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= 60℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 60℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 60℃ LIFE TIME	(1) 973684.5HRS (2) 73890.2HRS (3) 97777.2HRS (4) 138406.8HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 1699.1K hrs min. Telcordia SR-332 (Bellcore) ; 257.1K hrs min. MIL-HDBK-217F (25℃)		
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 50,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Hanxr	Liutt	Wangzd

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