Test Report: NSP-320-5

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

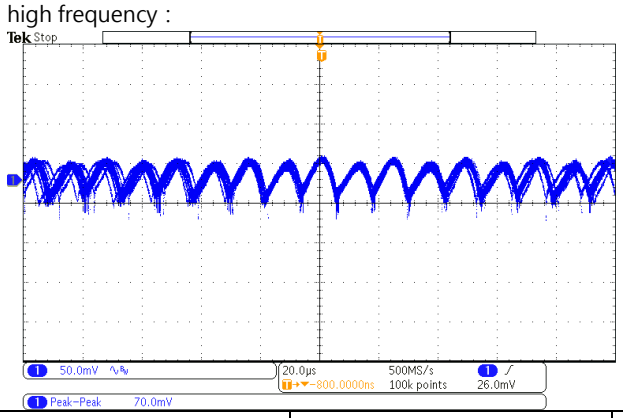
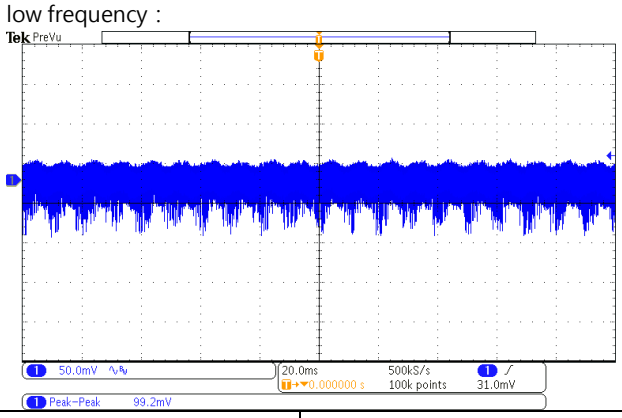
Safety Test
E.M.C. Test

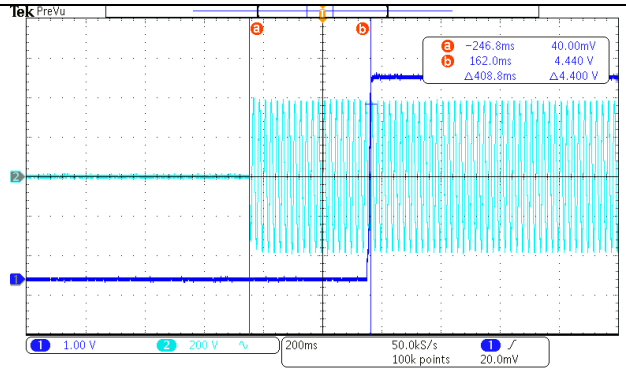
■ RELIABILITY TEST

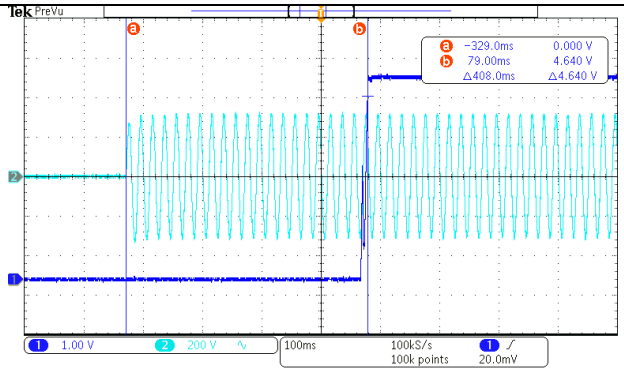
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

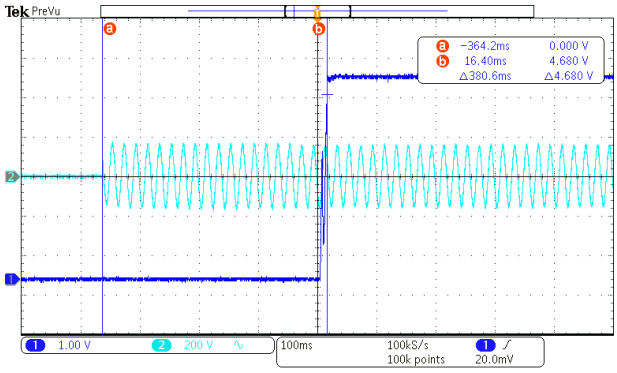
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 4.7V~5.5V	I/P： 230 VAC O/P：MIN LOAD Ta：25℃	4.59V~5.69V/230VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -2.0%~2.0%	I/P: 85VAC /305VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0.2%~0.4 %
3	LINE REGULATION	V1: -0.5%~0.5%	I/P: 85VAC~ 305VAC O/P:FULL LOAD Ta:25℃	V1: 0%~0%
4	LOAD REGULATION	V1: -1.0%~1.0%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0%~0.2%
5	OVER/UNDERSHOOT TEST	<± 10%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	6.4%
6	RIPPLE & NOISE (Max)	V1: 200mVp-p	I/P: 230 VAC O/P: FULL LOAD Ta:25℃	V1: 99.2mVp-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/408.8ms 230VAC/408ms 115VAC/380.6ms
	INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	



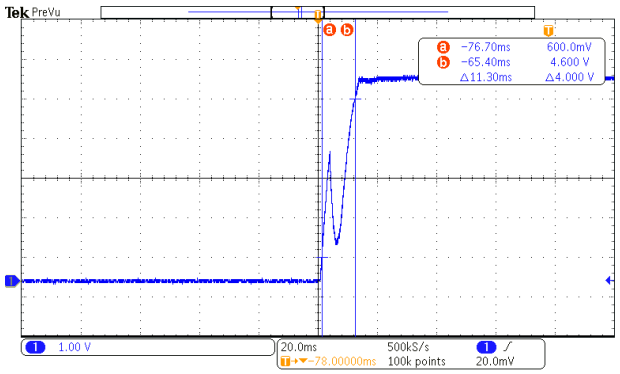


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

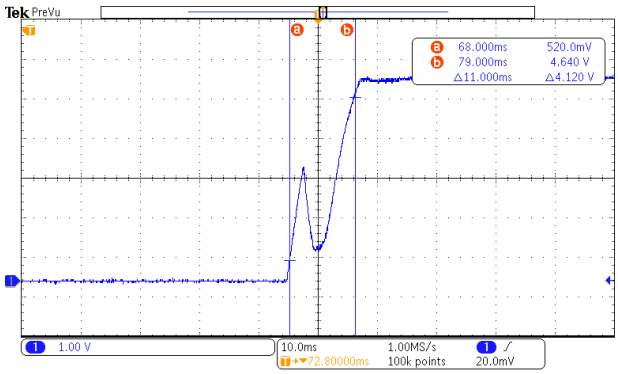


8	RISE TIME (Max)	277VAC/80ms 230VAC/80ms 115VAC/80ms	I/P： 277 VAC I/P： 230 VAC I/P： 115VAC O/P：FULL LOAD Ta：25℃	277VAC/11.3ms 230VAC/11ms 115VAC/10.9ms

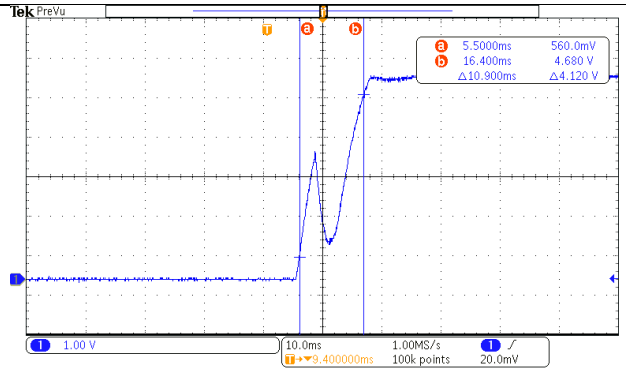
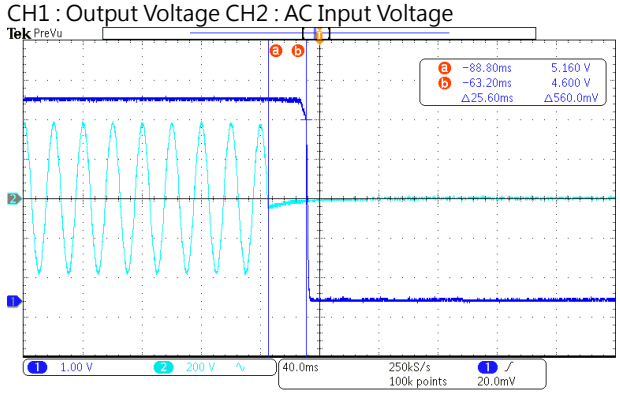
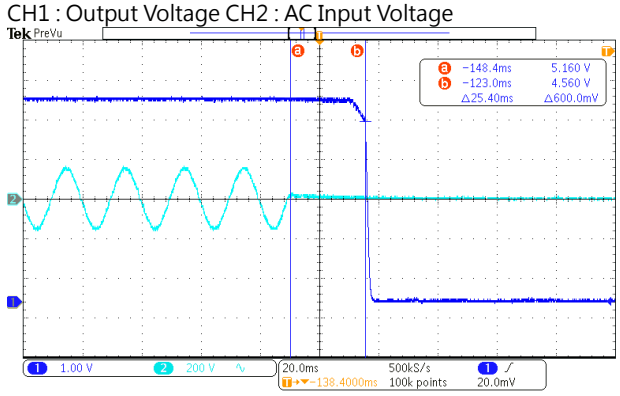
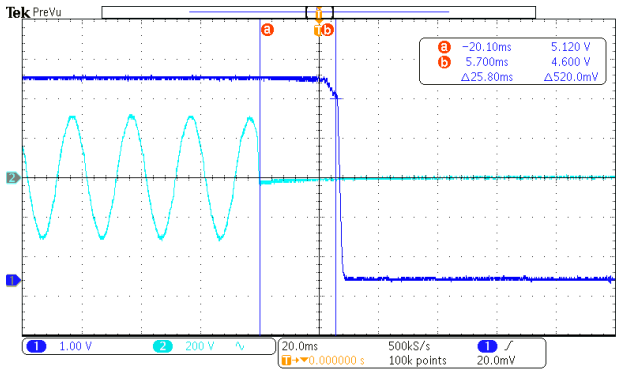
INPUT=277VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

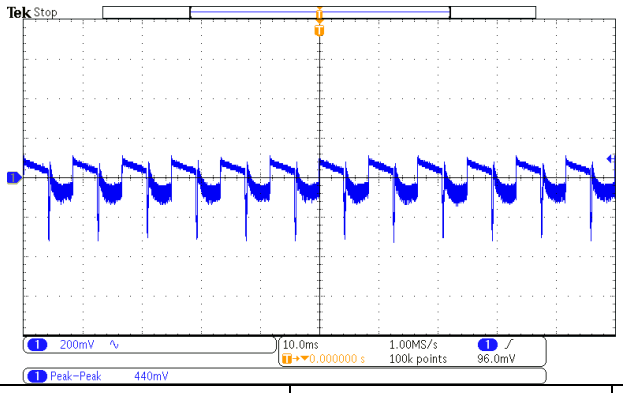
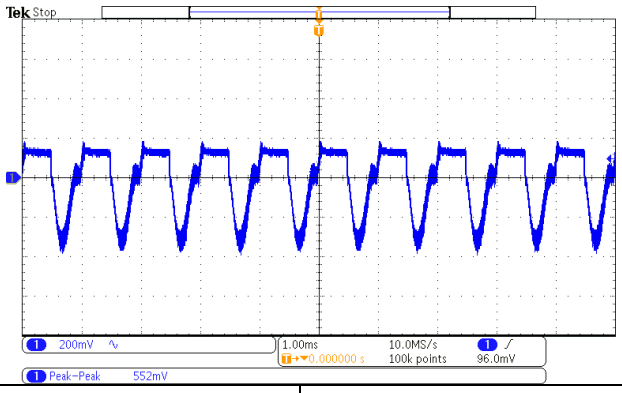


INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage



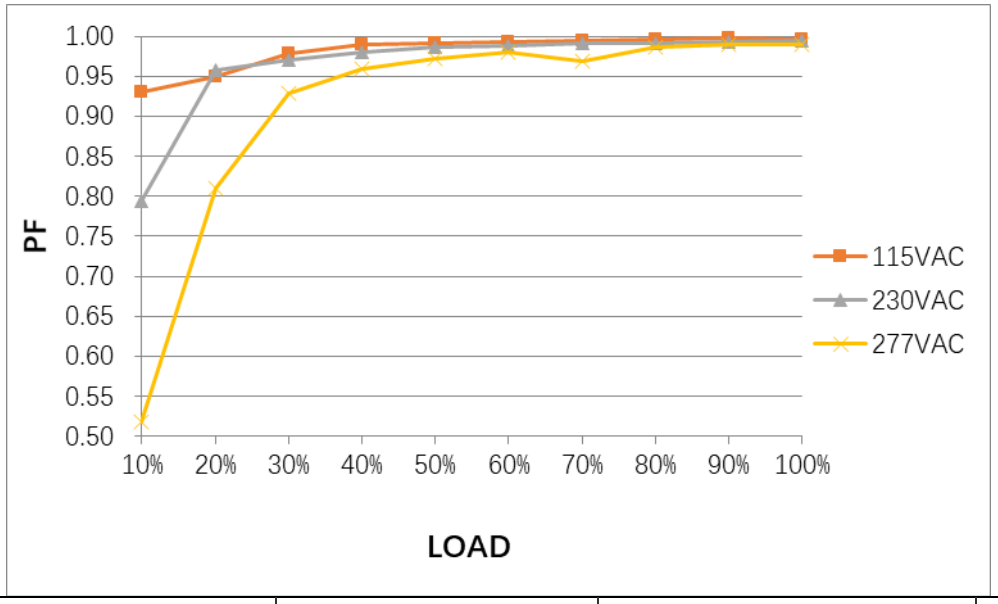
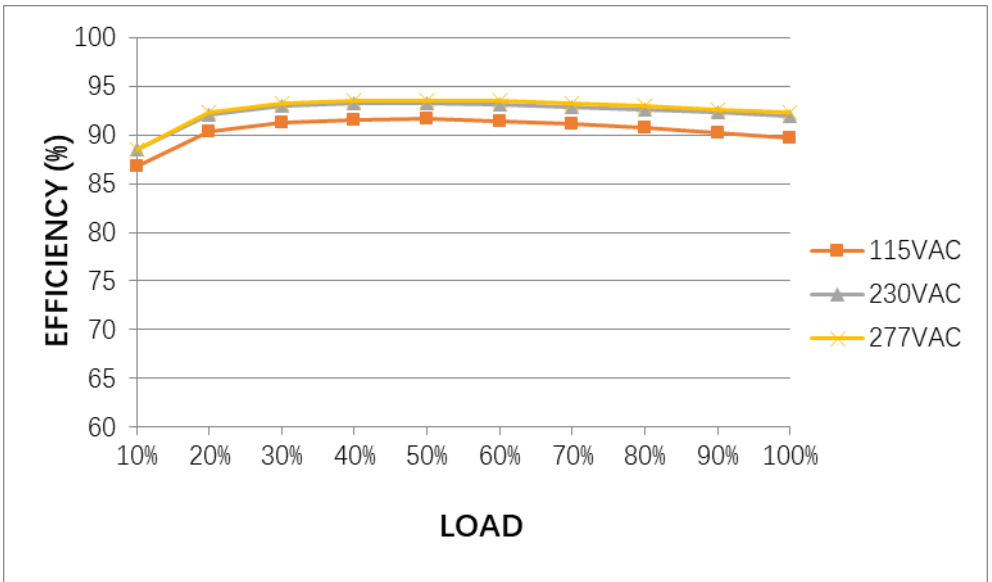
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

				
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/ 25.6ms 230VAC/ 25.8ms 115VAC/25.4ms
	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: 1000mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	440mVp-p 552mVp-p

	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	
11	TRANSIENT RECOVERY TIME	V1: 1000mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	200mVp-p 195us

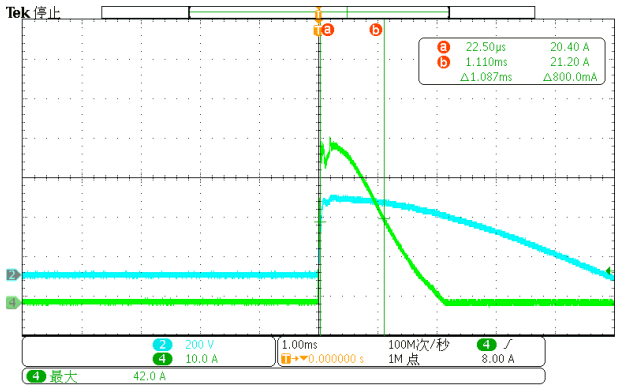
INPUT FUNCTION TEST

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) 78Vac~ 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:85 VAC ~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 =1.16A/ 277VAC I =1.41A/ 230VAC I =2.85A/ 115VAC
4	LEAKAGE CURRENT	Earth leakage current <350μA(rms)@277Vac, touch current<100μA(rms) @ 277Vac	I/P： 277 VAC O/P：Min LOAD Ta：25℃	262μA for Earth 24μA 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=0.988/277VAC PF=0.994/230VAC PF=0.997/115VAC

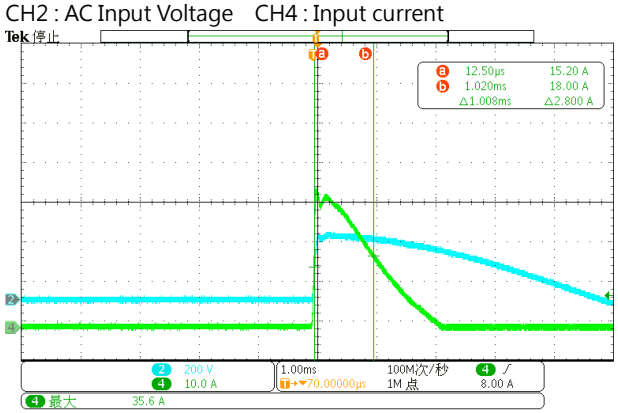
			O/P：FULL LOAD Ta：25℃	
	P.F vs LOAD 			
6	EFFICIENCY(Typ.)	91%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	92%
	EFFICIENCY vs LOAD 			
7	NO LOAD POWER CONSUMPTION(Typ.)	Remote Power ON： 3W/277VAC 3W/230VAC 3W/115VAC Remote Power OFF： 0.5W/277VAC 0.5W/230VAC 0.3W/115VAC	I/P： 277 VAC I/P： 230 VAC I/P： 115 VAC O/P：RC ON/RC OFF Ta：25℃	Remote Power ON： 2.29W/277VAC 2.05W/230VAC 2.38W/115VAC Remote Power OFF： 0.39W/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 =42A/ 277VAC T50=1087us/277 VAC I =35.6A/ 230 VAC T50=1008us/230 VAC I =15.8A/ 115 VAC T50=947us/115 VAC

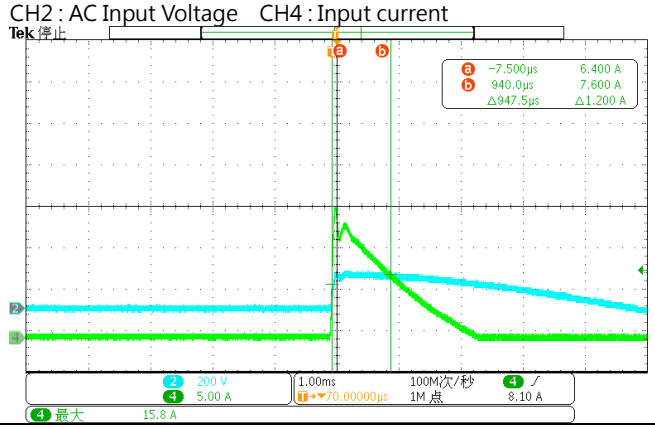
INPUT=277VAC/50HZ @ FULL LOAD
CH2 : AC Input Voltage CH4 : Input current



INPUT=230VAC/50HZ @ FULL LOAD
CH2 : AC Input Voltage CH4 : Input current



INPUT=115VAC/50HZ @ FULL LOAD
CH2 : AC Input Voltage CH4 : Input current

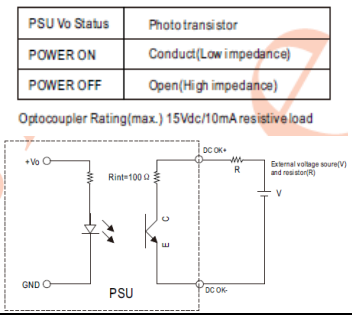


PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~170 %	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P:TESTING Ta:25℃	144.8%/ 305VAC 144.6%/ 230VAC 144.5%/85VAC Protection type : 105%-170%rated Output power; Hiccup mode, recovers automatically after fault condition is removed

2	OVER VOLTAGE PROTECTION	5.8V~7.5V	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25℃	6.13V/ 305VAC 6.13V/ 230VAC 6.13V/ 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 : Hiccup mode, recovers automatically after fault condition is removed

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 	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) 37.9 dB Ta:25℃

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q6 Rated 650V 15A@TC=25℃	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) 471V (2) 459V (3) 475V (4) 467V (5) 475V (6) 471V (7) 479V
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) 544V (2) 540V (3) 500V (4) 536V
3	Diode Peak Voltage	Q101 Rated 160 A/ 30V	AC ON/OFF I/P:High-Line +3V =308 V O/P: (1)Full Load (2) Dynamic Load 100% Load/ Min. Load 90%Duty/5KHz (3)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. Ta:25℃	Q101: VDS: (1) 14.6V (2) 14.8V (3) 14.2V (4) 13.8V
4	Control IC Voltage Test	PFC/PWM IC U2 Rated 9.6V~ 36 V O/P IC U101 Rated 3V~ 30 V	AC ON/OFF I/P:High-Line +3V =308 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P Ta:25℃	U2 (1) 19.2V (2) 19.2V (3) 19.2V U100 (1) 12.4V (2) 12.6V (3) 12.6V

■ 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: 4.62 KVAC/min I/P-FG: 2.52 KVAC/min O/P-FG: 1.8 KVAC/min Ta:25℃	I/P-O/P: 2.528 mA I/P-FG: 2.437 mA O/P-FG: 1.951 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℃	11mΩ

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-320-5
1. ROOM AMBIENT BURN-IN : 2HRS
I/P : 230VAC O/P : FULL LOAD Ta=36.8℃
2. HIGH AMBIENT BURN-IN : 2HRS
I/P : 230VAC O/P : FULL LOAD Ta= 63.8℃</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 : 144.6 % LOAD
Ta : 25℃</td><td>TEST : OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P : 305VAC/100VAC
O/P : 100 % LOAD
Ta= -35 ℃</td><td>TEST : OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 60 ℃/95 %R.H
NO DAMAGE</td><td>I/P : 315 VAC
O/P : FULL LOAD
Ta= 60℃
HUMIDITY= 95 %R.H</td><td>TEST : OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.05 %/℃(0~60℃)</td><td>I/P : 230 VAC
O/P : FULL LOAD</td><td>± 0.033 %/℃(0~60℃)</td></tr>
</table>

NO	Position	ROOM AMBIENT Ta=36.8℃	HIGH AMBIENT Ta=63.8℃
1	C1	44.6℃	75.1℃
2	LF1	52.2℃	79.3℃
3	C2	50.2℃	79.9℃
4	C10	52.9℃	82.0℃
5	R5	62.7℃	92.8℃
6	L1	67.6℃	96.9℃
7	C5	54.2℃	85.4℃
8	Q1	61.3℃	94.5℃
9	Q2	63.1℃	94.5℃
10	C14	59.7℃	90.6℃
11	Q5	59.7℃	94.1℃
12	U2	59.9℃	90.8℃
13	T1coil	82.8℃	103.0℃
14	Tcore	79.4℃	110.1℃
15	U100	83.7℃	111.6℃
16	Q102	86.4℃	113.8℃
17	C105	74.9℃	104.1℃
18	RTH3	73.4℃	99.5℃
19	TSW1	63.9℃	92.8℃

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 C109 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) 3767298HRS (2) 27927HRS (3) 202316HRS (4) 693474HRS
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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