



Test Report: NSP-320-15

320W AC/DC High Reliable Multi-Industries Enclosed 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

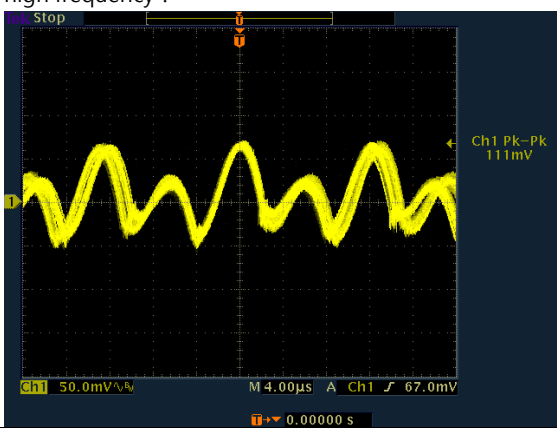
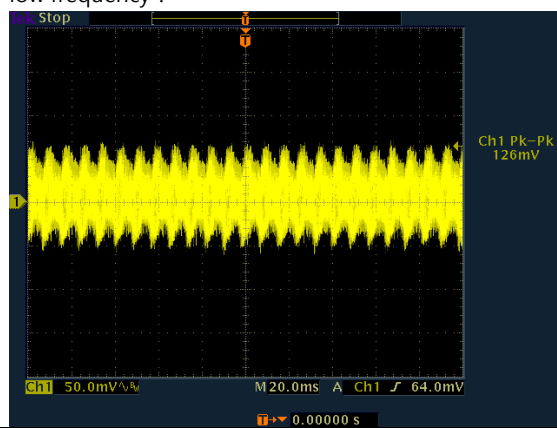
E.M.C. Test

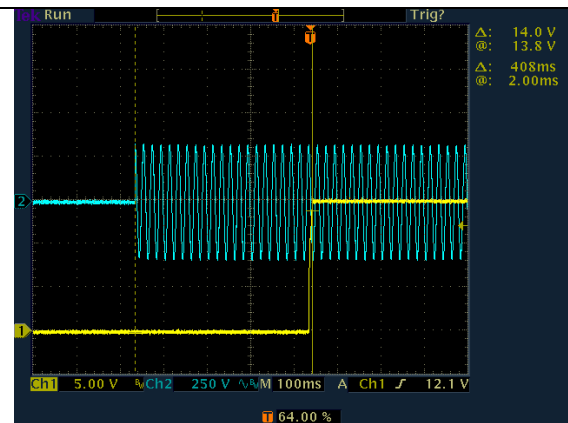
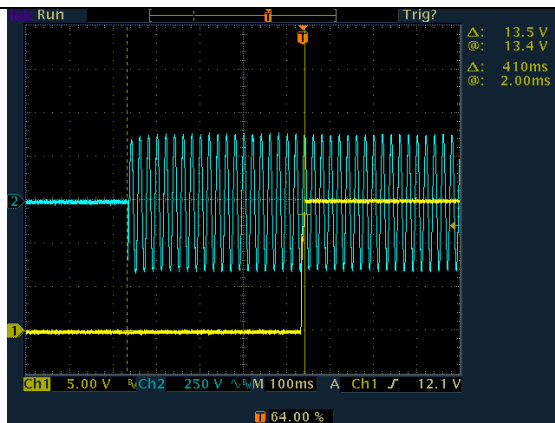
■ RELIABILITY TEST

ENVIRONMENT TEST

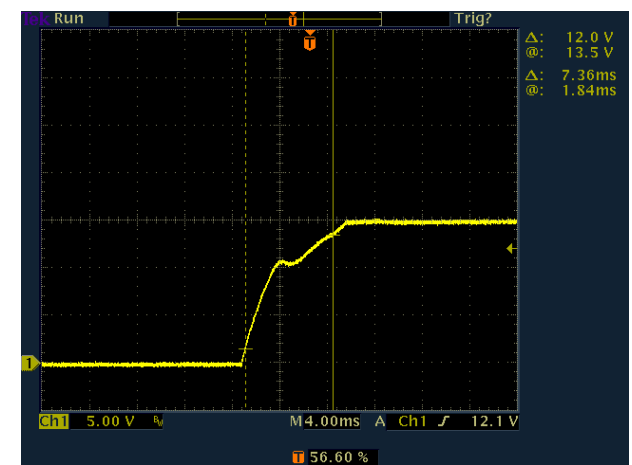
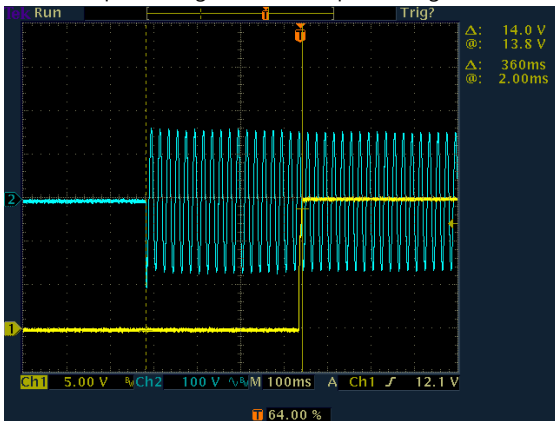
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 15V~19V	I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	14.27V~20.05V/230VAC
2	OUTPUT VOLTAGE TOLERANCE	V1:-2%~2%	I/P: 85VAC /305VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.06%~ 0.4%
3	LINE REGULATION	V1: -0.5%~ 0.5%	I/P: 85VAC~ 305VAC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0%
4	LOAD REGULATION	V1: -0.5%~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.02%~0.03%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	2.26%
6	RIPPLE & NOISE (Max)	V1:200mVp-p	I/P: 230 VAC O/P: FULL LOAD Ta:25°C	V1: 126mVp-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°C	277VAC/ 410ms 230VAC/ 408ms 115VAC/360ms
INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	



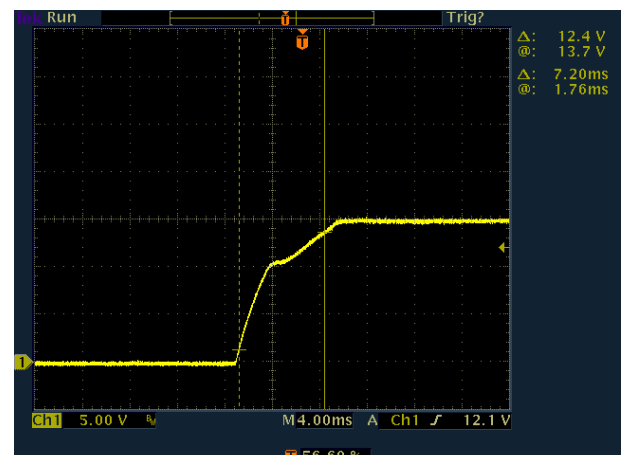
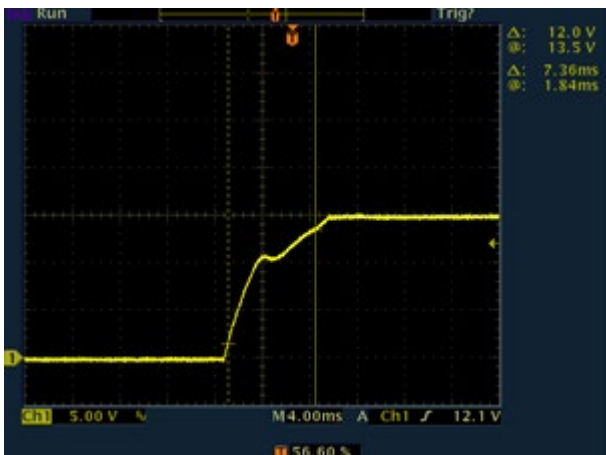
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



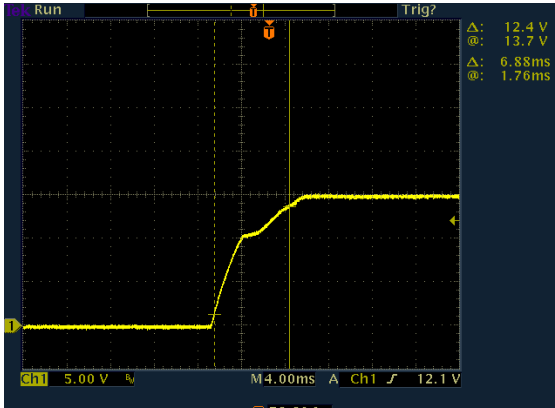
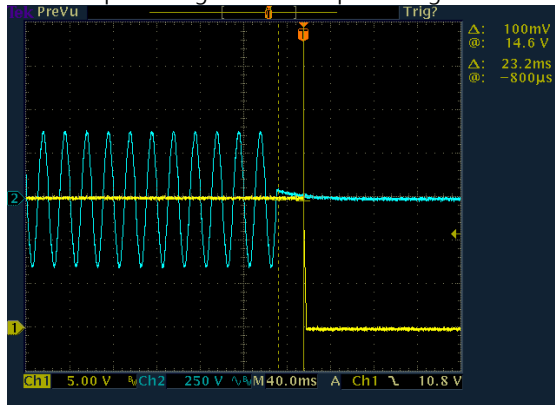
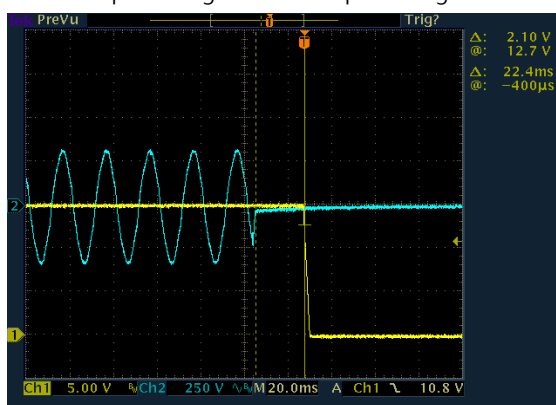
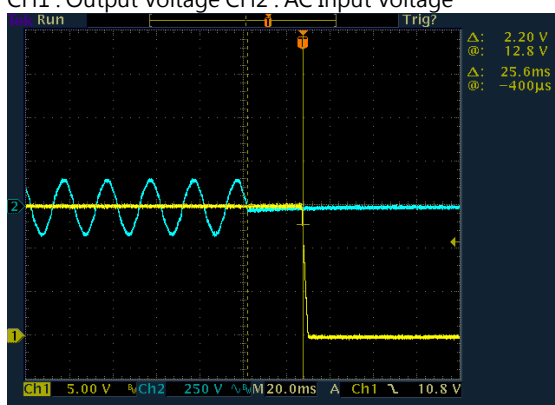
8	RISE TIME (Max)	277VAC/80ms	I/P : 277 VAC	277VAC/7.36ms
		230VAC/80ms	I/P : 230 VAC	230VAC/7.2ms
		115VAC/80ms	I/P : 115VAC	115VAC/ 6.88ms
			O/P : FULL LOAD	
			Ta : 25°C	

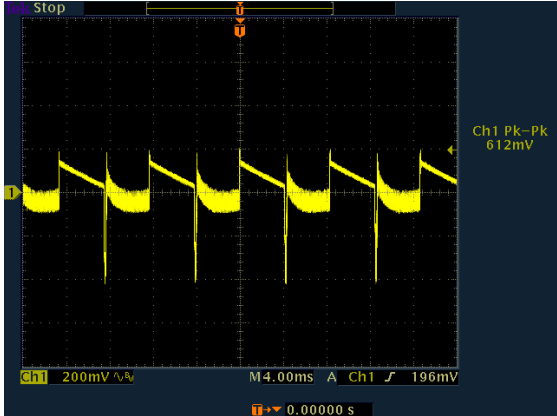
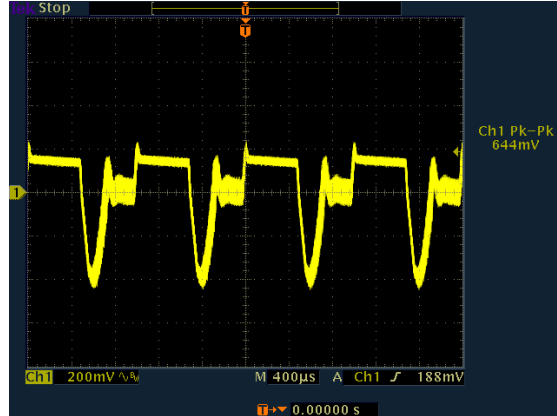
INPUT=277VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

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



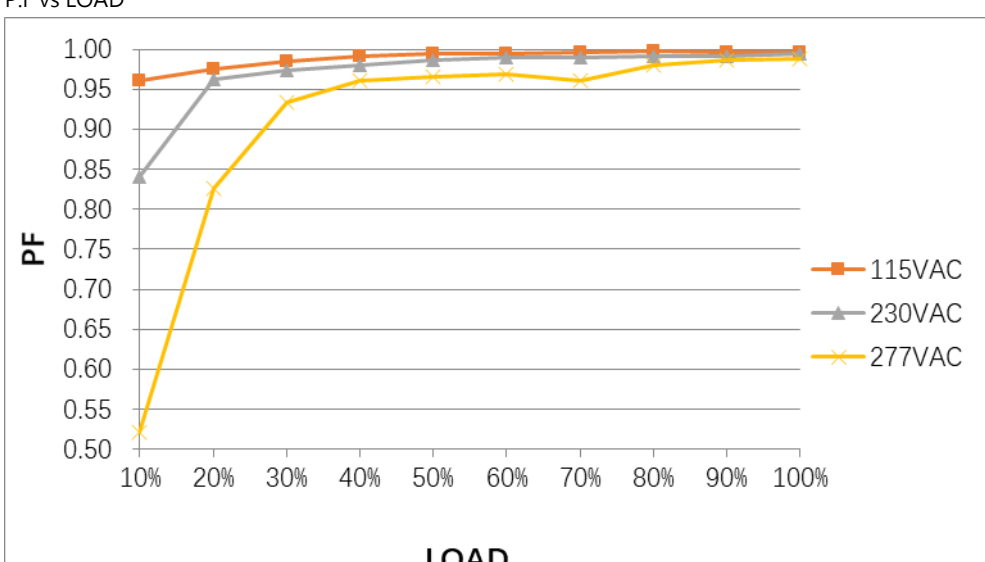
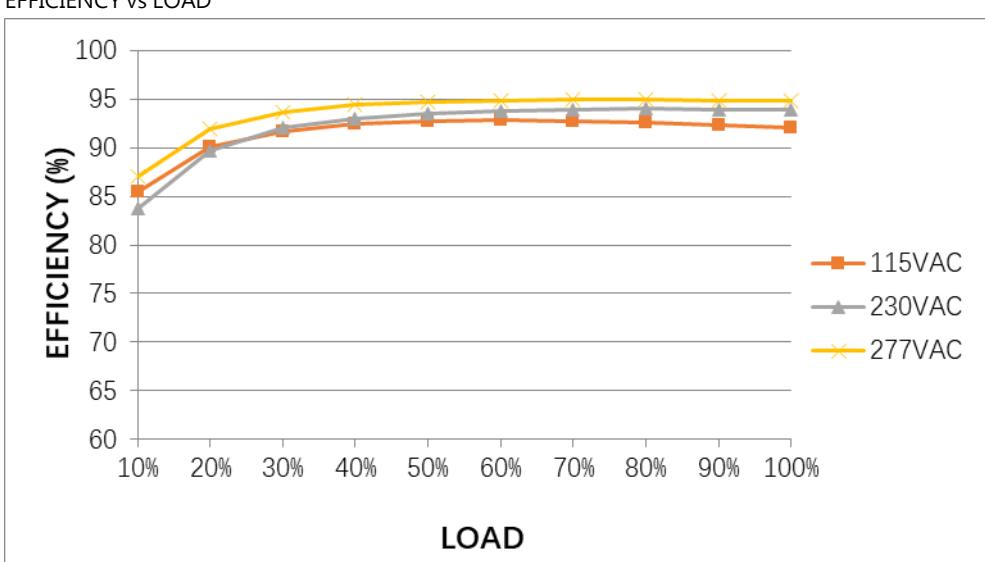
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

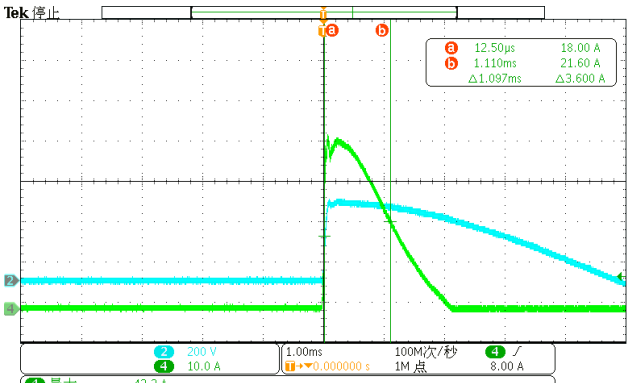
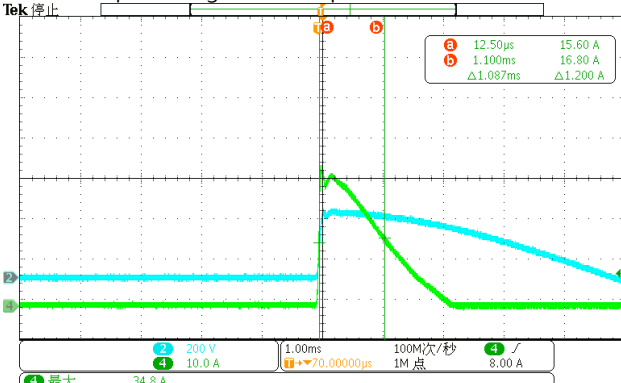
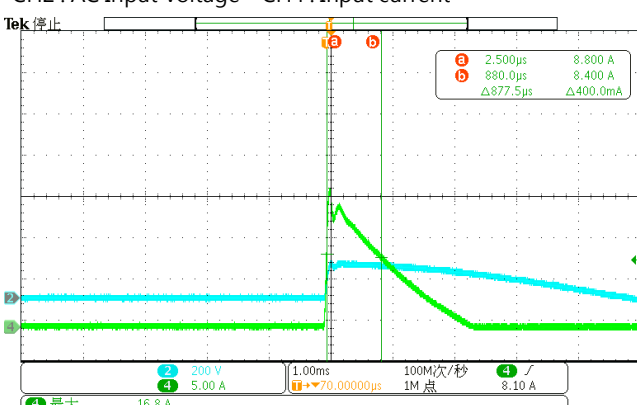
			
9	HOLD UP TIME (Typ.)	277VAC/16ms 230VAC/16ms 115VAC/16ms	I/P : 277VAC I/P : 230 VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C
	INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 
10	DYNAMIC LOAD	V1: 1500mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ

			Ta:25°C	
	FULL /50% LOAD 50%DUTY / 120HZ  FULL /50% LOAD 50%DUTY / 1KHZ 			
11	TRANSIENT RECOVERY TIME	V1:1500mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	259mVp-p 144 us

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°C	(1) 80V~308V (2) 117Vdc~ 424Vdc/FULL LOAD 117Vdc~ 424Vdc/50% LOAD (3) 117Vdc~424Vdc/FULL LOAD 117Vdc~424Vdc/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 ~305 VAC O/P:FULL~MIN LOAD Ta:25°C	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°C	I =1.22A/ 277VAC I =1.48A/ 230VAC I =3.01A/ 115VAC
4	LEAKAGE CURRENT	<350μA / 277 VAC touch current<100μA (Peak)/	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	282μA for Earth 52μA for touch

		277 VAC																																														
5	POWER FACTOR (Typ.)	0.9/ 277VAC 0.93/ 230VAC 0.98/115VAC	I/P : 277 VAC I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF=0.988/277VAC PF=0.994/230VAC PF=0.996/115VAC																																												
P.F vs LOAD  <table><caption>Approximate Power Factor (PF) vs Load Data</caption><thead><tr><th>Load (%)</th><th>115VAC</th><th>230VAC</th><th>277VAC</th></tr></thead><tbody><tr><td>10%</td><td>0.95</td><td>0.85</td><td>0.50</td></tr><tr><td>20%</td><td>0.97</td><td>0.95</td><td>0.82</td></tr><tr><td>30%</td><td>0.98</td><td>0.97</td><td>0.93</td></tr><tr><td>40%</td><td>0.99</td><td>0.98</td><td>0.96</td></tr><tr><td>50%</td><td>0.99</td><td>0.99</td><td>0.97</td></tr><tr><td>60%</td><td>0.99</td><td>0.99</td><td>0.97</td></tr><tr><td>70%</td><td>0.99</td><td>0.99</td><td>0.97</td></tr><tr><td>80%</td><td>0.99</td><td>0.99</td><td>0.98</td></tr><tr><td>90%</td><td>0.99</td><td>0.99</td><td>0.99</td></tr><tr><td>100%</td><td>0.99</td><td>0.99</td><td>0.99</td></tr></tbody></table>					Load (%)	115VAC	230VAC	277VAC	10%	0.95	0.85	0.50	20%	0.97	0.95	0.82	30%	0.98	0.97	0.93	40%	0.99	0.98	0.96	50%	0.99	0.99	0.97	60%	0.99	0.99	0.97	70%	0.99	0.99	0.97	80%	0.99	0.99	0.98	90%	0.99	0.99	0.99	100%	0.99	0.99	0.99
Load (%)	115VAC	230VAC	277VAC																																													
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100%	0.99	0.99	0.99																																													
6	EFFICIENCY(Typ.)	93.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	93.94%																																												
EFFICIENCY vs LOAD  <table><caption>Approximate Efficiency (%) vs Load Data</caption><thead><tr><th>Load (%)</th><th>115VAC</th><th>230VAC</th><th>277VAC</th></tr></thead><tbody><tr><td>10%</td><td>85</td><td>85</td><td>85</td></tr><tr><td>20%</td><td>90</td><td>90</td><td>90</td></tr><tr><td>30%</td><td>92</td><td>92</td><td>93</td></tr><tr><td>40%</td><td>93</td><td>93</td><td>94</td></tr><tr><td>50%</td><td>93</td><td>93</td><td>94</td></tr><tr><td>60%</td><td>93</td><td>93</td><td>94</td></tr><tr><td>70%</td><td>93</td><td>93</td><td>94</td></tr><tr><td>80%</td><td>93</td><td>93</td><td>94</td></tr><tr><td>90%</td><td>93</td><td>93</td><td>94</td></tr><tr><td>100%</td><td>93</td><td>93</td><td>94</td></tr></tbody></table>					Load (%)	115VAC	230VAC	277VAC	10%	85	85	85	20%	90	90	90	30%	92	92	93	40%	93	93	94	50%	93	93	94	60%	93	93	94	70%	93	93	94	80%	93	93	94	90%	93	93	94	100%	93	93	94
Load (%)	115VAC	230VAC	277VAC																																													
10%	85	85	85																																													
20%	90	90	90																																													
30%	92	92	93																																													
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50%	93	93	94																																													
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80%	93	93	94																																													
90%	93	93	94																																													
100%	93	93	94																																													
7	NO LOAD POWER CONSUMPTION(Typ.)	Remote Power ON : 3W/277VAC 3W/230VAC 3W/115VAC	I/P : 277 VAC I/P : 230 VAC I/P : 115 VAC O/P : RC ON/RC OFF	Remote Power ON : 1.86W/277VAC 1.90W/230VAC 2.06W/115VAC																																												

		Remote Power OFF : 0.5W/277VAC 0.5W/230VAC 0.3W/115VAC	Ta : 25°C	Remote Power OFF : 0.41W/277VAC 0.31W/230VAC 0.13W/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°C	I =43.2A/ 277VAC T50=1097us/277VAC I =34.8A/ 230VAC T50=1087us/230VAC I =16.8A/ 115VAC T50=877.5 us/115VAC
INPUT=277VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current  43.2 A INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current  34.8 A INPUT=115VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current  16.8 A				

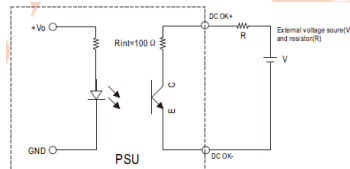
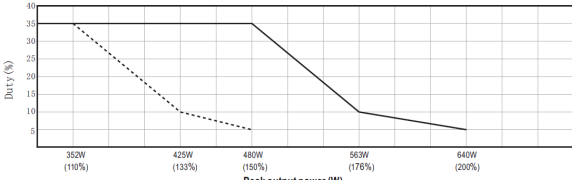
PROTECTION FUNCTION TEST

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°C	130.2%/ 305VAC 130.1%/ 230VAC 130.2%/85VAC Protection type : 1、Normally works within 105 ~ 200% rated output power for more

				than 5 seconds and then constant current limiting without shutdown($V_{out}>30\%$), recovers automatically after fault condition is removed, or shut down o/p voltage when $V_{out}<30\%$, AC re-power on to recover 2、$>200\%$ rated power, constant current limiting ($V_{out}>30\%$) with auto-recovery after fault condition is removed,
2	OVER VOLTAGE PROTECTION	20V~25V	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta: 25°C	23.5V/ 305VAC 23.5V/ 230VAC 23.5V/ 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°C	NO DAMAGE Protection type : Constant current limiting for more than 5 seconds ($V_{out}<30\%$) 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°C	TEST: <u>OK</u>
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°C	TEST: <u>OK</u>
3	DC OK SIGNAL	15Vdc/10mA resistive load	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	TEST: <u>OK</u>

		<table><tr><td>PSU Vo Status</td><td>Photo transistor</td></tr><tr><td>POWER ON</td><td>Conduct(Low impedance)</td></tr><tr><td>POWER OFF</td><td>Open(High impedance)</td></tr></table> Optocoupler Rating(max.) 15Vdc/10mA resistive load 	PSU Vo Status	Photo transistor	POWER ON	Conduct(Low impedance)	POWER OFF	Open(High impedance)		
PSU Vo Status	Photo transistor									
POWER ON	Conduct(Low impedance)									
POWER OFF	Open(High impedance)									
4	FAN CONTROL & NOISE	(1)Fan ON/OFF control : RTH4≥50°C±10°C FAN ON RTH4≤40°C±10°C FAN OFF (2) FAN NOISE : < 40dB@100% load with Ta=25°C	I/P:230VAC O/P: FULL LOAD	TEST: (1) <u>ok</u> (2) <u>39.8</u> dB Ta:25°C						
5	PEAK Power	I/P: 100/305VAC O/P:  -----100VAC ————200VAC		TEST: <u>OK</u>						

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	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. $T_a: 25^{\circ}\text{C}$	VDS: (1) 482V (2) 478V (3) 486V (4) 486V (5) 490V (6) 482V (7) 490V
2	Diode Peak Voltage	Q101 Rated 80A/ 100V	AC ON/OFF I/P: High-Line +3V = 308 V O/P: (1) Full Load (2) Dynamic Load Full Load/	Q101: VDS: (1) 44.6V (2) 45V

			Min. Load 90%Duty/5KHz (3)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4)0%→400% Load. Ta:25°C	(3) 45V (4) 7.6V
3	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°C	U2 (1) 19.5V (2) 19.5V (3) 19.5V U101 (1) 12.8V (2) 12.8V (3) 12.8V

■ 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°C	I/P-O/P: 2.458 mA I/P-FG: 2.236 mA O/P-FG: 1.852 mA 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°C	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°C	10mΩ

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°C	■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°C	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°C	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°C	NA

5	E.F.T	EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	NA
6	SURGE	IEC61000-4-5 L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	NA
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 : NSP-320-12 1. ROOM AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta=25.5 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta=62.3°C																																																																																						
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 130.1%LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 100%LOAD Ta= -35 °C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60°C/95 %R.H NO DAMAGE	I/P : 315 VAC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.05 %/°C(0~60°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.0067%/°C(0~60°C)
6	STORAGE TEMPERATURE TEST	-40~85°C	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / 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°C	1. Thermal shock Temperature : -35°C~ +65°C 2. Temperature change rate : 25°C / 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°C	
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 60°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 60°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 60°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 60°C LIFE TIME		(1) 564504.5HRS (2) 51298.4HRS (3) 98473.1HRS (4) 170307.3HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1699.1K hrs min. Telcordia SR-332 (Bellcore) ; 257.1K hrs min. MIL-HDBK-217F (25°C)		
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 50,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Hanxr	Liutt	Wangzd

2020.10.1 TAG-QA-009