



Test Report: NSP-320-24

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

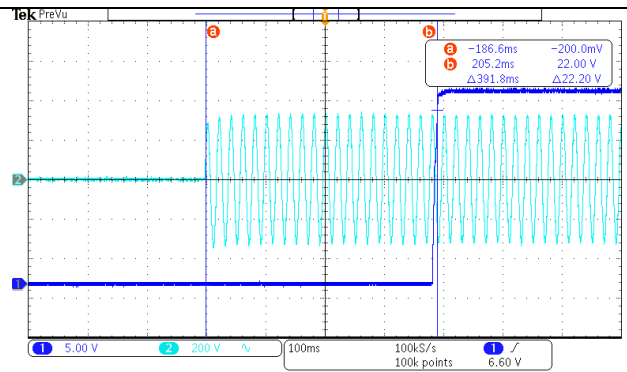
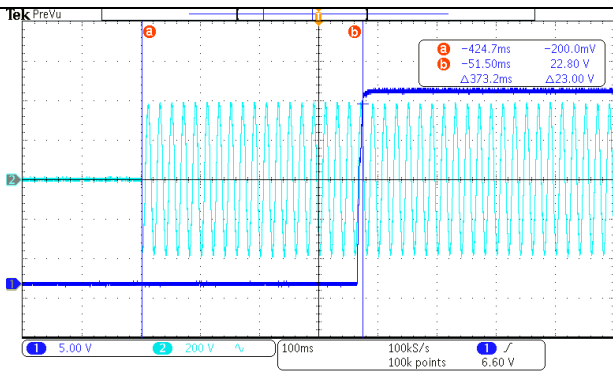
■ RELIABILITY TEST

ENVIRONMENT TEST

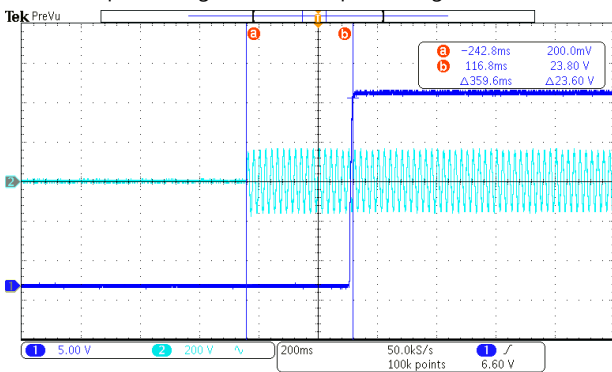
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:21V~26V	I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	20.36V~27.49V/230VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1.0%~ 1.0%	I/P: 85VAC /305VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.12%~0.21%
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: -0.04%~0.04%
5	OVER/UNDERSHOOT TEST	< ± 5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.33%
6	RIPPLE & NOISE (Max)	V1:240mVp-p	I/P: 230 VAC O/P: FULL LOAD Ta:25°C	V1: 100mVp-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/373.2ms 230VAC/391.8ms 115VAC/ 359.6ms
		INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	

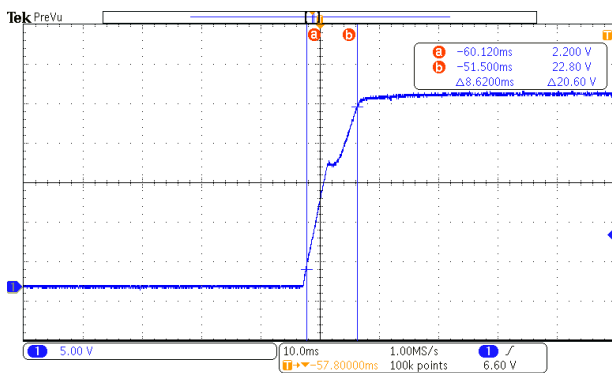


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

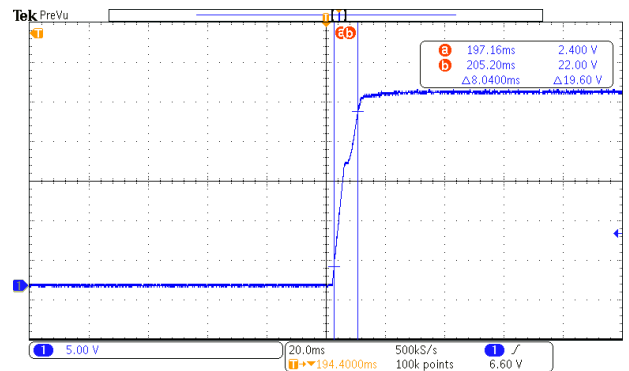


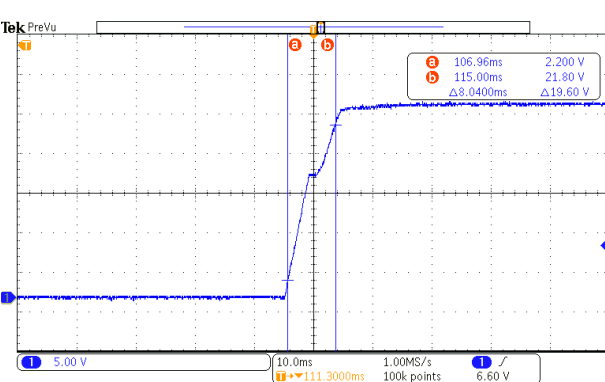
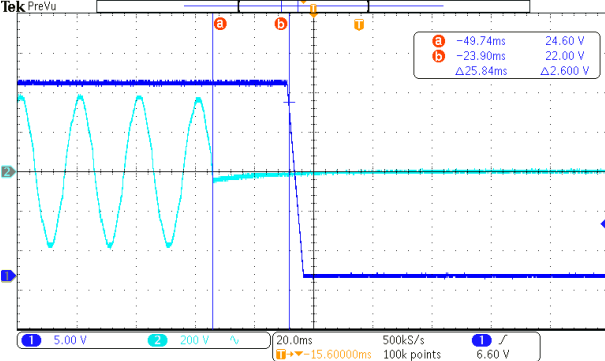
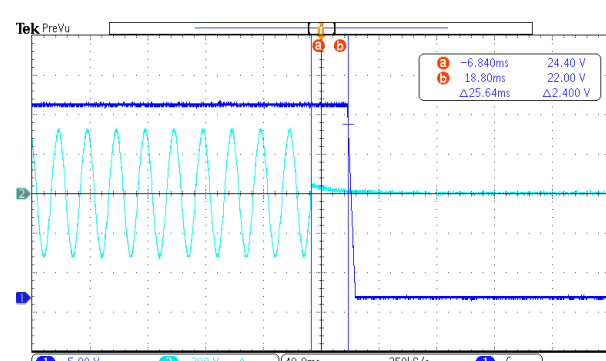
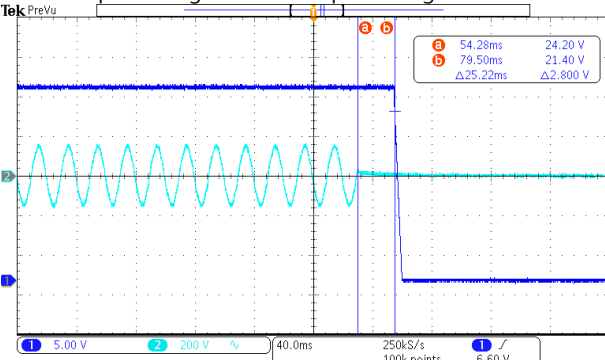
8	RISE TIME (Max)	277VAC/80ms	I/P : 277 VAC	277VAC/8.62ms
		230VAC/80ms	I/P : 230 VAC	230VAC/8.04ms
		115VAC/80ms	I/P : 115VAC	115VAC/8.04ms
			O/P : FULL LOAD	
			Ta : 25°C	

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



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



	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> 		
9	<p>HOLD UP TIME (Typ.)</p>	<p>277VAC/16ms 230VAC/16ms 115VAC/16ms</p>	<p>I/P : 277VAC I/P : 230 VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C</p>
<p>INPUT=277VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> 		<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> 	
<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> 			
10	<p>DYNAMIC LOAD</p>	<p>V1: 2400mVp-p</p>	<p>I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C</p>

11	TRANSIENT RECOVERY TIME	V1:2400mVp-p <500us	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	236mVp-p 440us

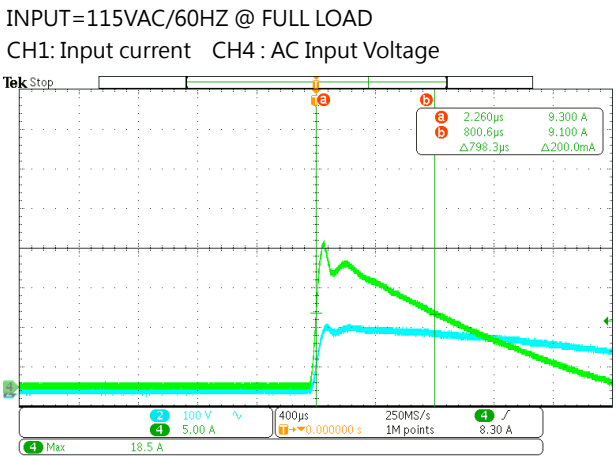
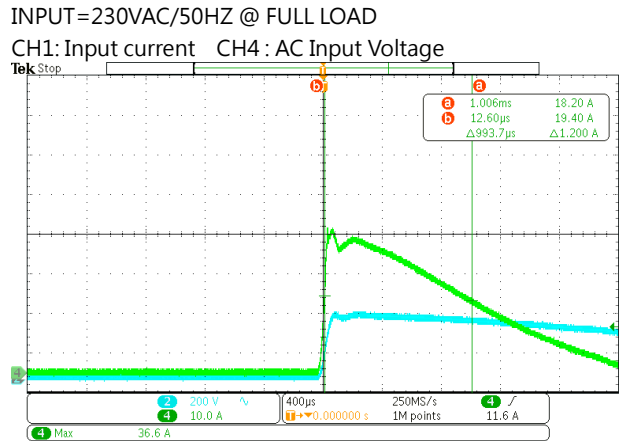
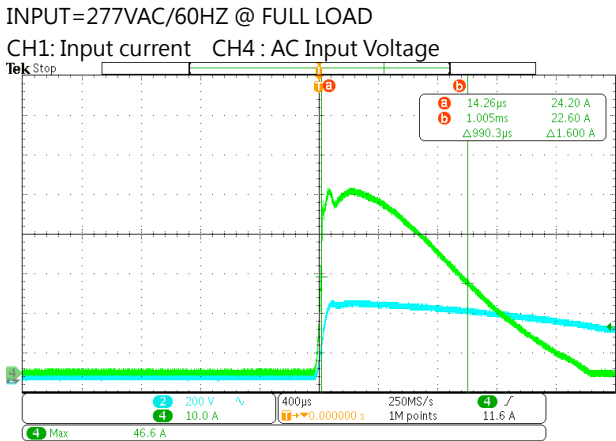
INPUT FUNCTION TEST

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~ 434Vdc/FULL LOAD 117 Vdc~ 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°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 =1.23A/ 277VAC I =1.47A/ 230VAC I =3.01A/ 115VAC
4	LEAKAGE CURRENT	<350μA / 277 VAC touch current<100μA (Peak)/ 277 VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	261μA for Earth 28μA for touch
5	POWER FACTOR (Typ.)	0.90/ 277VAC 0.93/ 230VAC	I/P : 277 VAC I/P : 230 VAC	PF=0.987/277VAC PF=0.994/230VAC



		0.98/115VAC	I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF=0.997/115VAC																																												
	<p>P.F vs LOAD</p> <table border="1"> <caption>Power Factor 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>0.96</td><td>0.81</td><td>0.50</td></tr> <tr><td>20%</td><td>0.97</td><td>0.96</td><td>0.81</td></tr> <tr><td>30%</td><td>0.98</td><td>0.97</td><td>0.93</td></tr> <tr><td>40%</td><td>0.985</td><td>0.975</td><td>0.96</td></tr> <tr><td>50%</td><td>0.99</td><td>0.98</td><td>0.965</td></tr> <tr><td>60%</td><td>0.99</td><td>0.985</td><td>0.965</td></tr> <tr><td>70%</td><td>0.99</td><td>0.985</td><td>0.965</td></tr> <tr><td>80%</td><td>0.99</td><td>0.985</td><td>0.97</td></tr> <tr><td>90%</td><td>0.99</td><td>0.985</td><td>0.975</td></tr> <tr><td>100%</td><td>0.99</td><td>0.985</td><td>0.98</td></tr> </tbody> </table>				LOAD (%)	115VAC	230VAC	277VAC	10%	0.96	0.81	0.50	20%	0.97	0.96	0.81	30%	0.98	0.97	0.93	40%	0.985	0.975	0.96	50%	0.99	0.98	0.965	60%	0.99	0.985	0.965	70%	0.99	0.985	0.965	80%	0.99	0.985	0.97	90%	0.99	0.985	0.975	100%	0.99	0.985	0.98
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6	EFFICIENCY(Typ.)	93.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.65%																																												
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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°C	Remote Power ON : 2.55W/277VAC 2.54W/230VAC 2.61W/115VAC Remote Power OFF : 0.415W/277VAC 0.31W/230VAC 0.13W/115VAC																																												

8	INRUSH CURRENT(Typ.)	277VAC/50A	I/P : 277 VAC	I =46.6A/ 277VAC
		230VAC/40A	I/P : 230 VAC	T50= 990.3us/277VAC
		115VAC/20A	I/P : 115 VAC	I =36.6A/ 230VAC
	COLD START		O/P : FULL LOAD	T50= 993.7us/230VAC
			Ta : 25°C	I =18.5A/ 115VAC
				T50=798.3us/115VAC

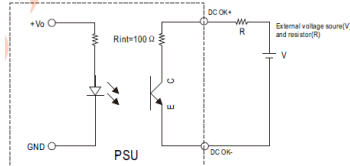


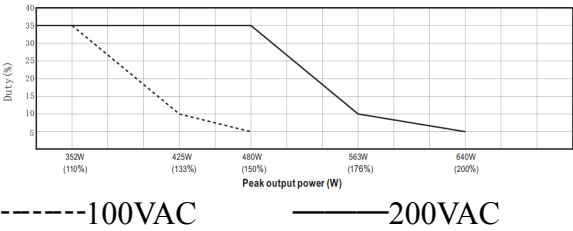
PROTECTION FUNCTION TEST

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	115.1%/ 305VAC 114.9%/ 230VAC 115.1%/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 $V_{out} < 30\%$, 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	28V~36V 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°C	31.1V/ 305VAC 31.1V/ 230VAC 31.1V/ 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 <table border="1" data-bbox="523 1749 837 1839"> <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> <p>Optocoupler Rating(max.) 15Vdc/10mA resistive load</p> 	PSU Vo Status	Photo transistor	POWER ON	Conduct(Low impedance)	POWER OFF	Open(High impedance)	I/P:230VAC O/P:FULL LOAD Ta:25°C	TEST: <u>OK</u>
PSU Vo Status	Photo transistor									
POWER ON	Conduct(Low impedance)									
POWER OFF	Open(High impedance)									

4	FAN CONTROL & NOISE	<p>(1)Fan ON/OFF control : RTH4\geq50°C\pm10°C FAN ON RTH4\leq40°C\pm10°C FAN OFF</p> <p>(2) FAN NOISE : < 40dB@100% load with Ta=25°C</p>	<p>I/P:230VAC O/P: FULL LOAD</p>	<p>TEST: (1) <u>ok</u> (2) <u>39.4</u> dB Ta:25°C</p>
5	PEAK Power	<p>I/P: 100/305VAC O/P:</p>  <p>-----100VAC ————200VAC</p>		<p>TEST: <u>OK</u></p>

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q6Rated 650V/15A	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°C	VDS: (1) 491V (2) 491V (3) 495V (4) 491V (5) 487V (6) 491V (7) 487V
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°C	VDS: VDS: (1) 508V (1) 536V (2) 483V (2) 540V (3) 487V (3) 536V (4) 447V (4) 491V
3	Diode Peak Voltage	Q102 Rated 80A/ 100V	AC ON/OFF I/P:High-Line +3V =308 V	Q102: VDS:

			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°C	(1) 71.3V (2) 70.4V (3) 69.6V (4) 12V
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°C	U2 (1) 19.4V (2) 19.4V (3) 19.2V U101 (1) 12.8V (2) 11V (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: 2.654 mA I/P-FG: 2.348 mA O/P-FG: 1.952 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	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°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> 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	CRITERIA A

5	E.F.T	EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	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°C	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 : NSP-320-24 1. ROOM AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta= 36.8°C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta= 63.8°C																																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=36.8°C</th> <th>HIGH AMBIENT Ta=63.8°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C1</td><td>38.8°C</td><td>69.1°C</td></tr> <tr><td>2</td><td>LF1</td><td>44.5°C</td><td>74.5°C</td></tr> <tr><td>3</td><td>C2</td><td>42.1°C</td><td>74.3°C</td></tr> <tr><td>4</td><td>C10</td><td>41.7°C</td><td>74.3°C</td></tr> <tr><td>5</td><td>R5</td><td>53.8°C</td><td>84.2°C</td></tr> <tr><td>6</td><td>L1</td><td>56.0°C</td><td>90.1°C</td></tr> <tr><td>7</td><td>C5</td><td>47.3°C</td><td>78.8°C</td></tr> <tr><td>8</td><td>Q1</td><td>54.8°C</td><td>86.1°C</td></tr> <tr><td>9</td><td>Q2</td><td>55.2°C</td><td>86.2°C</td></tr> <tr><td>10</td><td>C14</td><td>48.3°C</td><td>82.4°C</td></tr> <tr><td>11</td><td>Q5</td><td>52.2°C</td><td>88.2°C</td></tr> <tr><td>12</td><td>U2</td><td>50.9°C</td><td>82.7°C</td></tr> <tr><td>13</td><td>T1coil</td><td>56.8°C</td><td>87.7°C</td></tr> <tr><td>14</td><td>T1core</td><td>51.6°C</td><td>83.2°C</td></tr> <tr><td>15</td><td>U100</td><td>56.1°C</td><td>88.1°C</td></tr> <tr><td>16</td><td>Q102</td><td>52.9°C</td><td>87.8°C</td></tr> <tr><td>17</td><td>C105</td><td>46.7°C</td><td>78.0°C</td></tr> <tr><td>18</td><td>RTH3</td><td>52.5°C</td><td>83.6°C</td></tr> <tr><td>19</td><td>TSW1</td><td>52.1°C</td><td>86.0°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=36.8°C	HIGH AMBIENT Ta=63.8°C	1	C1	38.8°C	69.1°C	2	LF1	44.5°C	74.5°C	3	C2	42.1°C	74.3°C	4	C10	41.7°C	74.3°C	5	R5	53.8°C	84.2°C	6	L1	56.0°C	90.1°C	7	C5	47.3°C	78.8°C	8	Q1	54.8°C	86.1°C	9	Q2	55.2°C	86.2°C	10	C14	48.3°C	82.4°C	11	Q5	52.2°C	88.2°C	12	U2	50.9°C	82.7°C	13	T1coil	56.8°C	87.7°C	14	T1core	51.6°C	83.2°C	15	U100	56.1°C	88.1°C	16	Q102	52.9°C	87.8°C	17	C105	46.7°C	78.0°C	18	RTH3	52.5°C	83.6°C	19	TSW1	52.1°C	86.0°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : * 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	± 0.002 %/°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= 25°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) 1711137.4HRS (2) 110717.5HRS (3) 147368.8HRS (4) 175287.3HRS
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

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