



Test Report: NSP-1600-24

1600W Power Supply with Single Output

■ 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

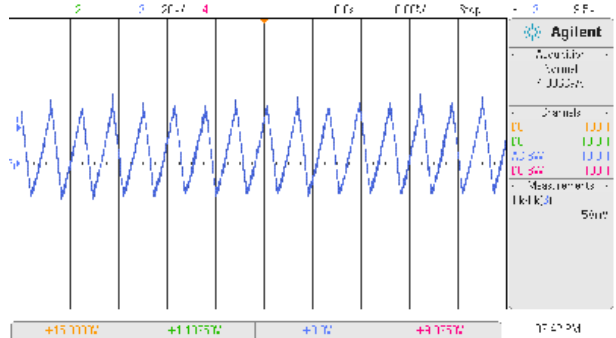
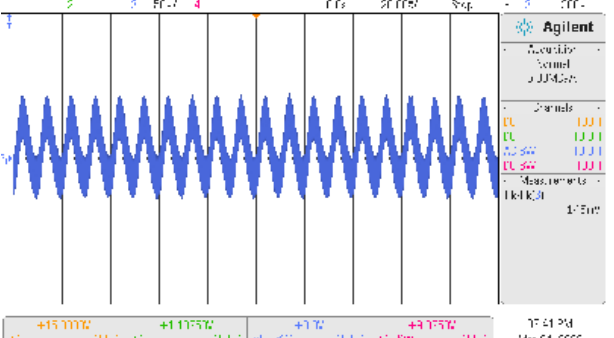
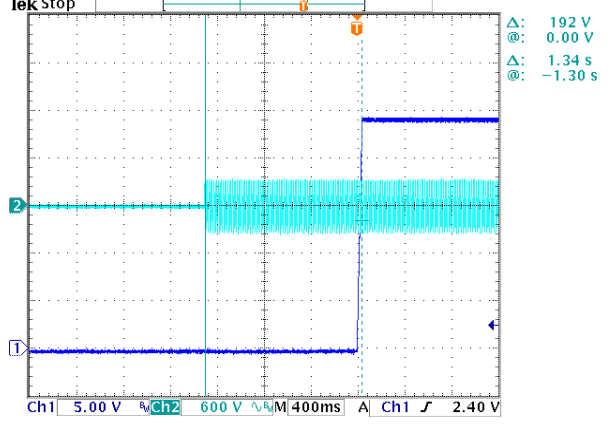
E.M.C. Test

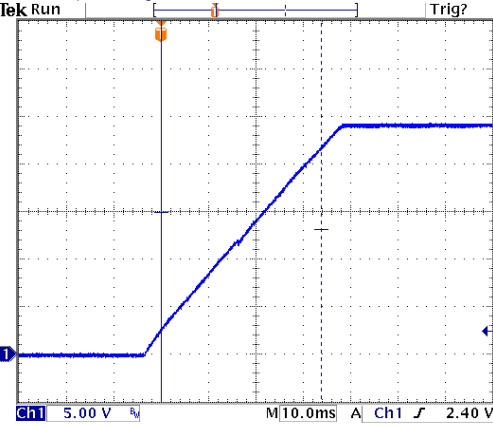
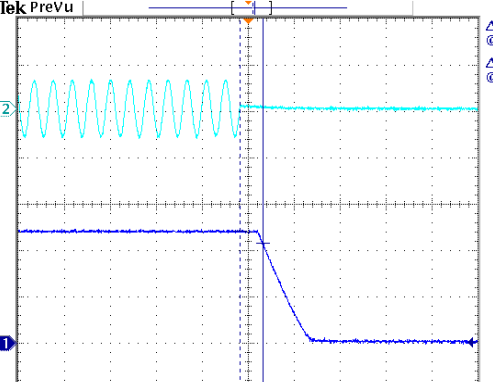
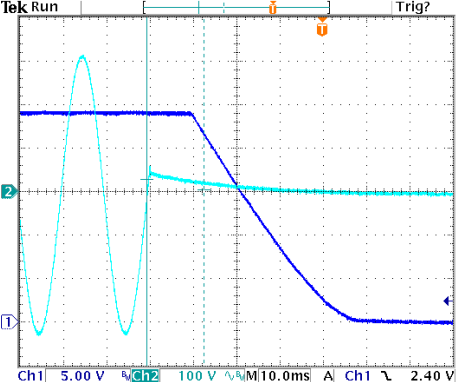
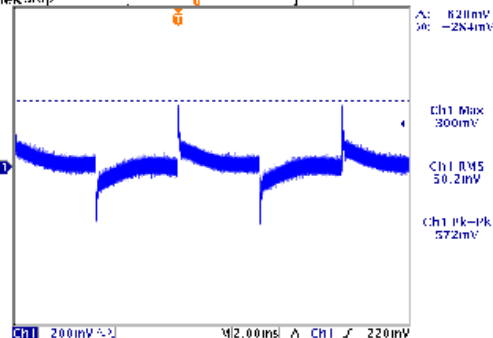
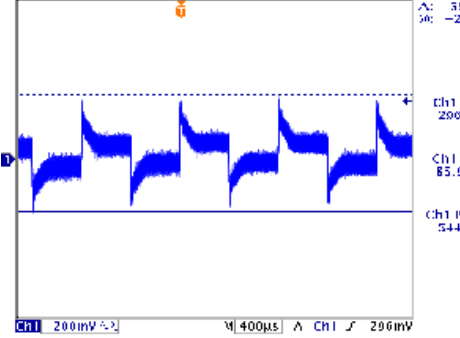
■ RELIABILITY TEST

ENVIRONMENT TEST

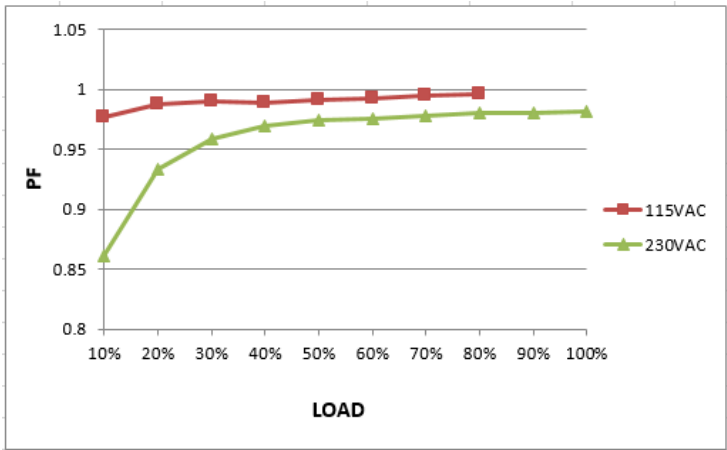
DESIGN VERIFY TEST

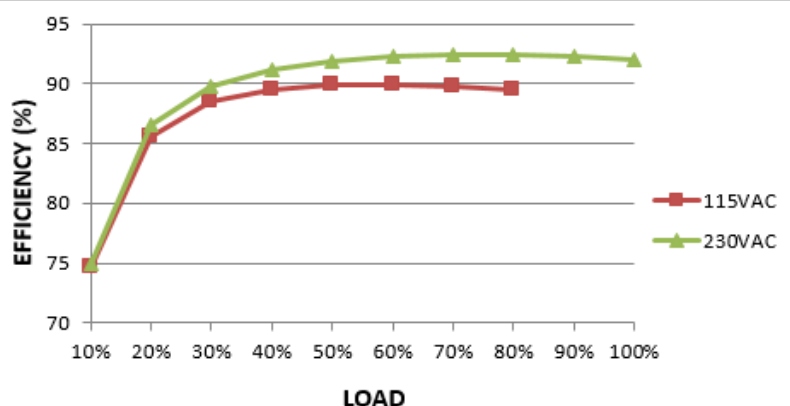
OUTPUT FUNCTION TEST

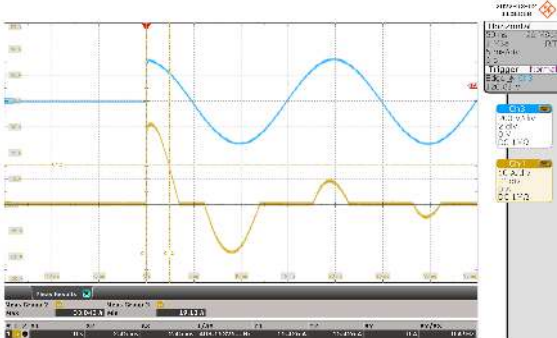
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 23.5 V~ 30V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	22.480V~30.663V/230VAC 22.486V~30.663V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 180VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.13 %~ -0.13 %
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 180VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0.05%~ -0.05 %
4	LOAD REGULATION(Max)	V1: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.05%~ -0.05 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5 %
6	RIPPLE & NOISE(Max)	V1: 200 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 145 mVp-p
high frequency :  low frequency : 				
7	SET UP TIME(Max)	230VAC/1500ms	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 1336 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 				

8	RISE TIME (Max)	230VAC/60ms	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 33.8 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 			
9	HOLD UP TIME (Typ.)	230VAC 70%/ 16ms 230VAC 100%/ 10ms	I/P : 230 VAC O/P : 70% LOAD O/P : 100% LOAD Ta : 25°C	20ms (70% load) 13.2ms (100% load)
	INPUT=230VAC/50HZ @ 70% LOAD CH1 : Output Voltage CH2 : AC Input Voltage 			
			INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	620mVp-p 592mVp-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	90VAC~264VAC 127VDC~ 370VDC	(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 (PLEASE CHECK DERATING CURVE) Ta:25°C	(1) 170 V~ 264 V 87V~264V (2) 127VDC~370VDC (3) 127VDC~370VDC																																	
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%=300 V 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:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK																																	
3	INPUT CURRENT (Typ.)	230V/ 8.5 A 115V/ 15 A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD (PLEASE CHECK DERATING CURVE) Ta : 25°C	I =7.86A/ 230VAC I =12.89A/ 115VAC (80% LOAD)																																	
4	LEAKAGE CURRENT	<2 mA / 230 VAC	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.6 mA N-FG : 0.6 mA																																	
5	POWER FACTOR (Typ.)	0.97 / 230VAC	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	PF=0.98/230VAC																																	
P.F vs LOAD																																					
<table><caption>Approximate data points from P.F vs LOAD graph</caption><thead><tr><th>Load (%)</th><th>115VAC P.F.</th><th>230VAC P.F.</th></tr></thead><tbody><tr><td>10%</td><td>0.98</td><td>0.86</td></tr><tr><td>20%</td><td>0.99</td><td>0.94</td></tr><tr><td>30%</td><td>0.99</td><td>0.96</td></tr><tr><td>40%</td><td>0.99</td><td>0.97</td></tr><tr><td>50%</td><td>0.99</td><td>0.975</td></tr><tr><td>60%</td><td>0.99</td><td>0.975</td></tr><tr><td>70%</td><td>0.99</td><td>0.975</td></tr><tr><td>80%</td><td>0.99</td><td>0.98</td></tr><tr><td>90%</td><td>0.99</td><td>0.98</td></tr><tr><td>100%</td><td>0.99</td><td>0.98</td></tr></tbody></table>					Load (%)	115VAC P.F.	230VAC P.F.	10%	0.98	0.86	20%	0.99	0.94	30%	0.99	0.96	40%	0.99	0.97	50%	0.99	0.975	60%	0.99	0.975	70%	0.99	0.975	80%	0.99	0.98	90%	0.99	0.98	100%	0.99	0.98
Load (%)	115VAC P.F.	230VAC P.F.																																			
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80%	0.99	0.98																																			
90%	0.99	0.98																																			
100%	0.99	0.98																																			
6	EFFICIENCY(Typ.)	91%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	92.09 %																																	
	EFFICIENCY vs LOAD																																				



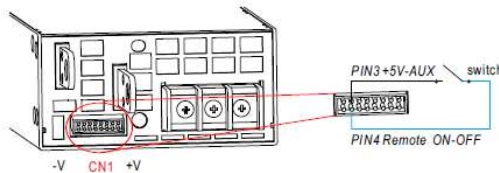
7	INRUSH CURRENT(Typ.)	230V/35 A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I =33A/ 230VAC T50= 2450 us/230V
INPUT=230VAC/50HZ @ FULL LOAD CH4 : Input current CH3: Input AC 				

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~ 115 % PROTECTION TYPE : Constant current limiting, unit will shut down o/p voltage after 5 sec. re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 180VAC O/P: TESTING Ta:25°C	108%/ 264VAC 108.2%/ 230VAC 107.9%/180VAC PROTECTION TYPE : Constant current limiting, unit will shut down o/p voltage after 5 sec. re-power on to recover
2	OVER VOLTAGE PROTECTION	31.5 V~ 37.5 V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	34.5V/ 264VAC 34.5V/ 230VAC 34.5V/ 90VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE PROTECTION TYPE : Shut down o/p voltage, recovers automatically after temperature goes down	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD	O.T.P. Active PROTECTION TYPE : Shut down o/p voltage, recovers automatically after temperature goes down

4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Constant current limiting, unit will shut down o/p voltage after 5 sec. re-power on to recover	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting, unit will shut down o/p voltage after 5 sec. re-power on to recover
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CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT						
1	AUXILIARY POWER (AUX)	12V±10%@0.8A ripple:250mVp-p	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	11.6V 0.8 A ; ripple 136mvp-p						
2	REMOTE ON/OFF CONTROL	3. Remote ON-OFF Control ※ The power supply can be turned ON/OFF individually or along with other units by using the "Remote ON-OFF" function .  I/P: 230 VAC O/P:FULL LOAD Ta:25°C Test Result : <table><tr><th>Between Remote ON-OFF and +5V-AUX</th><th>Power Supply Status</th></tr><tr><td>Switch Short</td><td>ON</td></tr><tr><td>Switch Open</td><td>OFF</td></tr></table>			Between Remote ON-OFF and +5V-AUX	Power Supply Status	Switch Short	ON	Switch Open	OFF
Between Remote ON-OFF and +5V-AUX	Power Supply Status									
Switch Short	ON									
Switch Open	OFF									
3	REMOTE SENSE	S+ / S- >0.5V Compensate voltage drop on the load wiring up to 0.5V.	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	> 0.5 V						
4	ALARM SIGNAL	1. DC OK SIGNAL High (3.5 ~ 5.5V) : When the $V_{out} \leq 77\% \pm 5\%$. Low (-0.5 ~ 0.5V) : When $V_{out} \geq 80\% \pm 5\%$. The maximum sourcing current is 10mA and only for output. (Note.2) I/P: 230 VAC O/P:FULL LOAD Ta:25°C Test Result : <table><tr><th>Vout</th><th>DC OK SIGNAL</th></tr><tr><td>$V_{out} \leq 72\%$</td><td>5V</td></tr><tr><td>$V_{out} \geq 85\%$</td><td>-0.09V</td></tr></table>			Vout	DC OK SIGNAL	$V_{out} \leq 72\%$	5V	$V_{out} \geq 85\%$	-0.09V
Vout	DC OK SIGNAL									
$V_{out} \leq 72\%$	5V									
$V_{out} \geq 85\%$	-0.09V									

2. T-ALARM

PSU STATUS	Vo	T-ALARM
NORMAL	100%±2%	-0.5 ~0.5V
OTP OR FAN LOCK	0V	3.5~5.5V

I/P: 230 VAC

O/P:FULL LOAD

Ta:25°C

Test Result :

P.S.U STATUS	T-ALARM
NORMAL	-0.09 V
OTP OR FAN LOCK	4.936V

5

OUTPUT VOLTAGE
PROGRAMMABLE(PV)

2. Output Voltage Programming (or, PV / remote voltage programming / remote adjust / margin programming / dynamic voltage trim)

※ In addition to the adjustment via the built-in potentiometer, the output voltage can be trimmed by applying EXTERNAL VOLTAGE.

- Ⓒ The rated current should change with the Output Voltage Programming accordingly.
- Ⓒ For Remote Sense / Local Sense, please refer to "Voltage Drop Compensation" section.

I/P: 230 VAC

O/P:FULL LOAD

Ta:25°C

Test Result :

MODEL \ PV	<0.4V	1V	4.7V	5V
SPEC	24V±5%	9.6V±5%	30V±5%	30V±5%
Vout	24.11V	9.47V	30.01V	30.52V

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q901 Rated 37A/600V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/	VDS: (1)469V (2)441V (3)425V (4)469V (5)469V

			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	(6)461V (7)453V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q52 Rated 52 A/600 V	I/P:High-Line +3V =267 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. Ta:25°C	VDS: (1)464V (2)464V (3)464V (4) 468V (5) 468V (6) 436V (7)420V
3	Diode Peak Voltage	Q101 Rated 104 A/150 V Q104 Rated 104 A/150 V	I/P:High-Line +3V =267 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. (8).NO LOAD Ta:25°C	Q101: VDS: (1)101.2V (2)98V (3)114.9V (4)99.6V (5)99.6V (6)114.9V (7)98V (8)95.6V Q104: VDS: (1)100.4V (2)92.4V (3)86.8V (4)96.4V (5)93.2V (6)109.3V (7)109.3 (8)106.1V
4	Input Capacitor Voltage	C5 Rated: 680μ/400V SURGE VOLTAGE:450V	I/P:High-Line +3V =267 V O/P: (1)Full Load Ta:25°C	(1)398V
5	Control IC Voltage Test	PWM IC U901 Rated 6.5 V~24V PFC IC U51 Rated 4.5V~ 16V	I/P:High-Line +3V =267 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	(1) 13.8V (2) 13.7V (3) 13.7V (4) 13.2V (1)12.8 V (2)12.3V (3)12.3V (4)12.2V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.8 KVAC/min Ta:25°C	I/P-O/P:6.77mA I/P-FG:7.63mA O/P-FG:5.84mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 30GΩ I/P-FG: 30GΩ O/P-FG: 30GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	17 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:100% LOAD Ta:25°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY 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-1600-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50°C		

NO	Position	ROOM AMBIENT Ta= 25℃	HIGH AMBIENT Ta= 50℃
1	BD1	44.7℃	71.0℃
2	Q52	56.9℃	84.6℃
3	D50	60.6℃	88.9℃
4	Q904	55.6℃	84.7℃
5	T1	71.4℃	103.7℃
6	Q101	66.7℃	97.7℃
7	T301	52.8℃	81.6℃
8	D321	58.6℃	88.9℃
9	U82	65.8℃	89.1℃
10	RTH21	52.6℃	79.0℃
11	C5	39.4℃	64.0℃
12	L100	78.0℃	102.3℃
13	RTH9	41.6℃	66.8℃
14	L900	64.6℃	90.0℃
15	RG301	23.7℃	50.0℃
16	L2	45.4℃	73.0℃
17	C104	32.3℃	59.1℃
18	D952	53.8℃	83.1℃
19	D301	71.1℃	99.0℃
20	U602	27.1℃	53.3℃
21	U901	46.3℃	72.7℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 109% LOAD Ta : 25℃	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230VAC/180VAC O/P : 100 % LOAD Ta= -25℃	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50℃)	I/P : 230 VAC O/P : FULL LOAD	± 0.002 %/°C (0~50℃)
6	STORAGE TEMPERATURE TEST	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 : 5 CYCLE 5. Input/Output condition : STATIC		OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25℃~ +55℃ 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 : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST(13500 TIMES) 1cycle:230V/ FULL LOAD Burn In Test		OK

8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C101 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= 50°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50°C LIFE TIME	(1) 2128159HRS (2) 332080HRS (3) 465662HRS (4) 543665HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 684.7K hrs min. Telcordia SR-332 (Bellcore) ; 69.2K 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	DANIEL GAO	SANFORD SU	VINCENT TSENG

2020.10.1 TAG-QA-009