



Test Report: NTS-2200-148

2200W High Reliable True Sine Wave DC-AC Power Inverter

- **DESIGN VERIFY TEST**
 - Output Function Test
 - Input Function Test
 - Protection Function Test
 - Control Function Test
 - APPLICATION 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	RATED POWER	2200W	IP: 48VDC Ta:25°C	<u>2245</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)2530W/180sec. (2)3300w/10sec (3)SURGE POWER 4400W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 50VDC OP:TESTING LOAD Ta:25°C	(1) <u>108.36</u> V / <u>22.12</u> A / <u>180.09</u> Sec (2) <u>108.06</u> V / <u>29.88</u> A / <u>10.07</u> Sec (3) <u>108.14</u> V / <u>39.4</u> A / <u>33</u> Cycle

CH3:O/P VAC CH4:O/P IAC

Fig1

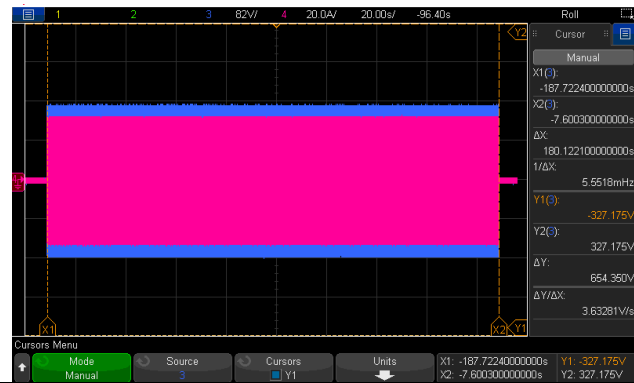


Fig2

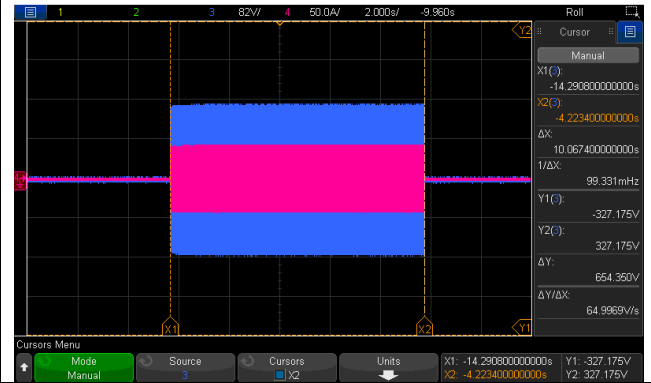
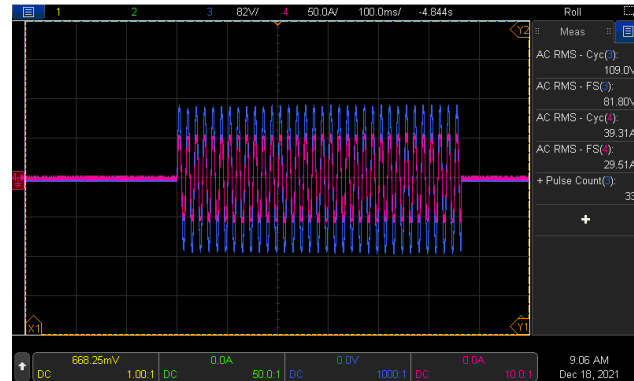


Fig3



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 100VAC: <u>98.48</u> V DIP S.W 110VAC: <u>108.38</u> V DIP S.W 115VAC: <u>113.68</u> V DIP S.W 120VAC: <u>118.36</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.06</u> HZ DIP S.W 60HZ: <u>59.95</u> HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 50VDC OP: 1650W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>1.85</u> % / Vo(min) /1650W (2) <u>2.13</u> % / Vo(nor) /1650W (3) <u>2.11</u> % / Vo(max) /1650W

CH3:O/P VAC CH4:O/P IAC

Fig1

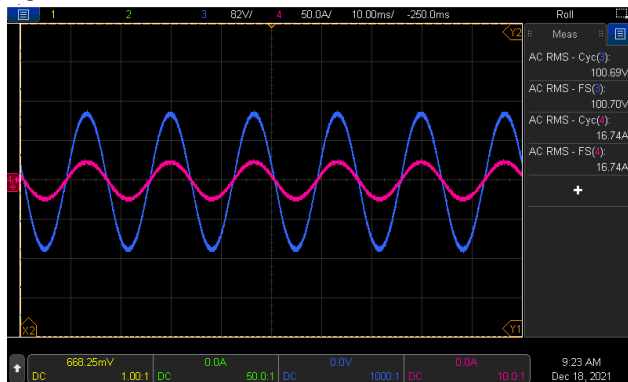


Fig2

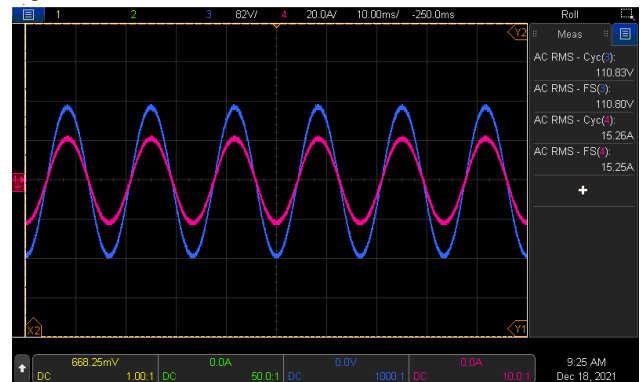
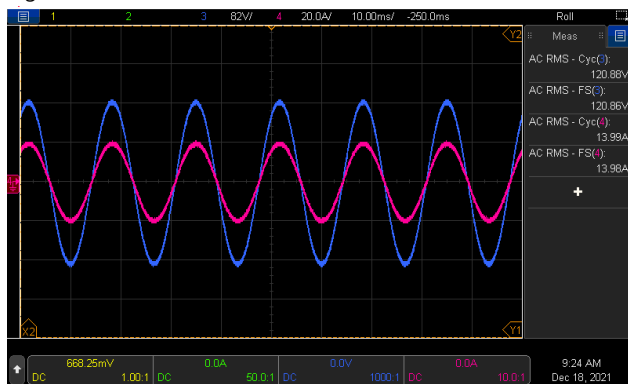


Fig3



6	AC REGULATION	±3%	IP: 50VDC OP: 1650W Ta:25°C	<u> -1.38 </u> %
7	Overshoot /Undershoot	<±10%	IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u> -6.36 </u> % (2) <u> 1.82 </u> % (3) <u> -6.54 </u> %
8	O/P voltage DC offset	Vin(nor)= <u> 48 </u> V · Vo<200mV · no load : <u> 66.7 </u> mV / full load: <u> 86.7 </u> mV		

9	LED STATUS	<ul style="list-style-type: none"> • Statas test 																	
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	40VDC~66VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	<u>40.183</u> VDC~ <u>66.06</u> VDC/NO LOAD <u>40.187</u> VDC~ <u>66.02</u> VDC/FULL LOAD

			<p>I/P: LOW-LINE=42V HIGH-LINE=65V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 48V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)</p>	<p>10MIN Test: <u>OK</u> 12Hr Test: <u>OK</u></p>
2	DC CURRENT (TYP)	60A	<p>IP: 48VDC OP:FULL LOAD Ta:25°C</p>	<u>50.2</u> A
3	NO LOAD DISSIPATION	<p>≤ 1.7W@ saving mode ≤ 25W@NON-Saving Mode</p>	<p>IP: 48VDC OP:NO LOAD Ta:25°C</p>	<p><u>1.43</u> W@ saving mode <u>19.43</u> W@NON- Saving Mode</p>
4	SAVING MODE TO NORMAL	Po ≥ 25W	<p>IP: 48VDC OP: TESTING LOAD Ta:25°C</p>	≥ <u>15</u> W
5	NORMAL TO SAVING MODE	Po ≤ 10W	<p>IP: 48VDC OP: TESTING LOAD Ta:25°C</p>	≤ <u>11</u> W
6	OFF MODE CURRENT DRAW (Typ.)	≤ 2mA	<p>IP: 48VDC OP: Sw off Ta:25°C</p>	<u>1.06</u> mA
7	EFFICIENCY(TYP)	1650W /91%	<p>IP:50VDC OP: Po=1650W 110V/60HZ Ta:25°C</p>	<u>91.8</u> %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	44V±1VDC	<p>IP: TESTING OP:FULL LOAD SW:ON Ta:25°C</p>	<u>43.983</u> V
2	BAT LOW SHUT DOWN	40V±1VDC	<p>IP: TESTING OP: FULL LOAD SW:ON Ta:25°C</p>	<u>40.10</u> V

3	BAT LOW RESTART	50V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>50.143</u> V
4	BAT HIGH ALARM	62V±1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>62.12</u> V
5	BAT HIGH SHUT DOWN	66V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>66.08</u> V
6	BAT HIGH RESTART	60V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>60.06</u> V
7	BAT. POLARITY	By internal fuse open	IP: BAT +/- (Reverse) OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>
8	OVER TEMPERATURE	Shut down o/p voltage: re-power on.	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25°C	Shut down o/p voltage, re-power on to recover LED DISPLAY: <u>OK</u>
9	OUTPUT SHORT	Shut down o/p voltage: re-power on	IP: 48VDC O/P: FULL LOAD SW:ON Ta:25°C	Shut down o/p voltage, re-power on to recover LED DISPLAY: <u>OK</u>
10	OVER LOAD (typ.)	105%~115%LOAD 180sec 115%~150%LOAD 10 sec Shut down o/p voltage, re-power on to recover	IP: 48VDC OP: TESTING SW:ON Ta:25°C	(1). <u>105.72 % ~ 114.55%</u> <u>180.09</u> sec (2). <u>115.23% ~ 148.3%</u> <u>10.066</u> sec Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	(1) Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off (2) IRC3	IP: 48VDC OP: FULL LOAD Ta:25°C	Open : <u>Normal work</u> Short : <u>Remote off</u> (1). TEST: Vo= <u>0.002</u> V Pin= <u>6.27W</u> (2).TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>839</u> · turn on <u>OK</u> LAMP: <u>1222</u> · turn on <u>OK</u> LAMP: <u>1622</u> · turn on <u>OK</u>	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>



2	INDUCTION MOTOR	0.22 HP	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
3	SWITCHING POWER SUPPLY	WITH PFC: <u>RSP-3000-48</u> O/P= <u>1743</u> W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
		NO PFC: <u>SE-1000-48</u> O/P= <u>1188</u> W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>

COMPONENT WEAFORM TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	DC TO DC Power Transistor (D to S) or (C to E) Peak Voltage	Q106 /Q112/Q126/Q132 Rated: 200 V / 65 A	I/P: high line O/P: V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q112 Q126 VDS: VDS: (1) 166V (1) 169V (2) 164V (2) 168V (3) 165V (3) 169V (4) 166V (4) 170V (5) 165V (5) 170V Q106 Q132 VDS: VDSS: (1) 166V (1) 170V (2) 165V (2) 170V (3) 166V (3) 170V (4) 168V (4) 171V (5) 168V (5) 171V
2	DC TO DC Diode Peak Voltage	D 901 Rated : 400V/ 20 A	I/P: high line O/P: V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 273V (2) 276V (3) 276V (4) 281V (5) 281V
3	DC BUS Capacitor Voltage	C905 Rated: 680u/315V	I/P: high line O/P: V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C905 (1) 273V (2) 292V (3) 279V (4) 273V (5) 273V

4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 650 V/ 40 A	I/P: high line O/P:V(max)/Freq 60HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q1: VDS: (1) 305V (2) 366V (3) 316V (4) 300V (5) 300V
5	AUX PWM MOS	Q201 Rated: 65 A/ 200 V Q504 Rated : 46 A/ 250 V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q201 (1) 169V (2) 169V (3) 169V (4) 170V (5) 169V Q504 (1) 121V (2) 121V (3) 122V (4) 122V (5) 122V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4 V~ 3.6 V AUX IC U201 Rated 8.2V~30V CHARGE IC U501 Rated 8.4V~30V Gate Driver IC U1 Rated 3V~18V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(4400W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	U301 (1) 3.30V (2) 3.30V (3) 3.30V (4) 3.30V (5) 3.30V U201 (1) 12.2V (2) 12.2V (3) 12.2V (4) 12.2V (5) 12.2V U501 (1) 12.47V (2) 12.47V (3) 12.47V (4) 12.47V (5) 12.47V U1 (1) 5.07V (2) 5.07V (3) 5.07V (4) 5.07V (5) 5.07V

SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-AC O/P: 3 KVAC/min BAT I/P-AC I/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-AC O/P 3.6 KVAC/min BAT I/P-AC I/P: 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-ACO/P: 11.47 mA AC O/P-FG: 11.32 mA AC O/P-FG: 7.57 mA NO DAMAGE
2	GROUNDING CONTINUITY	EN 60950 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	6mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	FCC CLASS A	I/P: 24 VDC O/P: FULL LOAD/50% LOAD Ta:25°C	PASS

2	RADIATION	FCC CLASS A	I/P:24 VDC O/P: :FULL/50% LOAD Ta:25°C	PASS
3	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

Reliability Test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																												
1	TEMPERATURE RISE TEST	MODEL : NTU-2200-124 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 40 °C																																																																																																																														
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12	D902	64.0°C	71.2°C																																																																																																																													
13	D912	61.4°C	70.1°C																																																																																																																													
14	D908	67.6°C	74.8°C																																																																																																																													
15	L100	55.4°C	65.8°C																																																																																																																													
16	T501	32.7°C	43.8°C																																																																																																																													
17	Q504	31.4°C	43.4°C																																																																																																																													
18	D530	29.7°C	42.3°C																																																																																																																													
19	U501	32.2°C	44.3°C																																																																																																																													
20	LF1	44.5°C	56.1°C																																																																																																																													
21	ZNR1	35.4°C	46.9°C																																																																																																																													
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23	LF26	44.7°C	55.1°C																																																																																																																													
24	CC53	51.2°C	60.2°C																																																																																																																													
25	T201	50.3°C	61.2°C																																																																																																																													
26	T202	52.5°C	63.6°C																																																																																																																													
27	Q201	58.2°C	65.6°C																																																																																																																													
28	U301	38.7°C	49.6°C																																																																																																																													
29	R79	66.3°C	74.0°C																																																																																																																													
30	Q8	85.9°C	94.1°C																																																																																																																													

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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 24VDC O/P : 102%LOAD Ta : 25°C	TEST : OK																																																																	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 24VDC O/P : 100%LOAD Ta= -30 °C	TEST : OK																																																																	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 32.5VDC O/P : FULL LOAD Ta= 38.7 °C HUMIDITY= 95 %R.H	TEST : OK																																																																	
5	STORAGE TEMPERATURE TEST	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		TEST : OK																																																																	
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30°C~ +45°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:24VDC/ FULL LOAD DC ON 11sec/DC OFF 1sec TEST 1cycle:24VDC/ FULL LOAD Burn In Test		TEST : OK																																																																	
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 4G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK																																																																	



8	CAPACITOR LIFE CYCLE	SUPPOSE C100 IS THE MOST CRITICAL COMPONENT (1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME (3) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME (4) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME	(1) 455777.6HRS (2) 252858.4HRS (3) 432600.8HRS (4) 675704.3HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 364.7K hrs min. Telcordia SR-332 (Bellcore) ; 34.9K hrs min. MIL-HDBK-217F (25°C)	
10	Ongoing Reliability Test	I/P : 25VDC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009