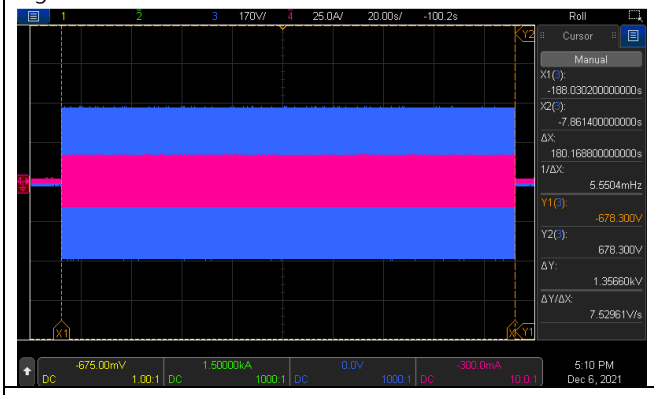
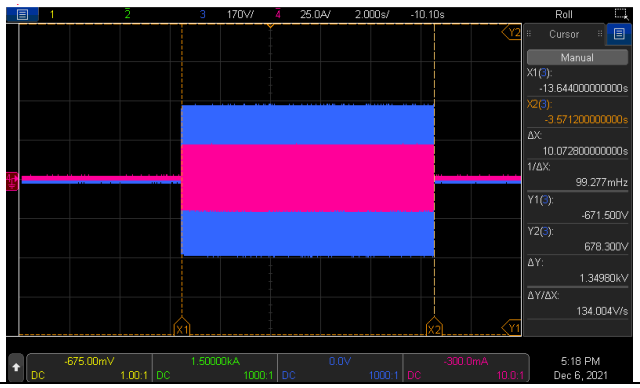
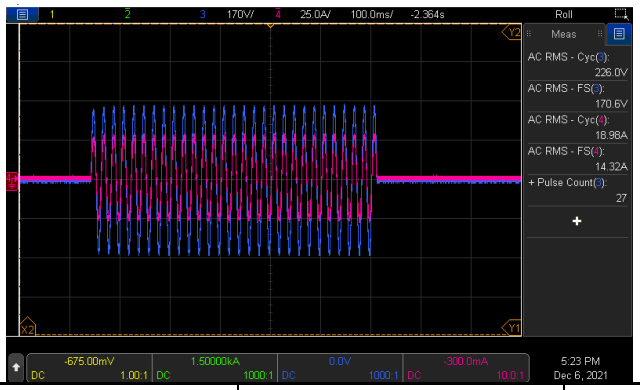
Test Report: NTS-2200-248

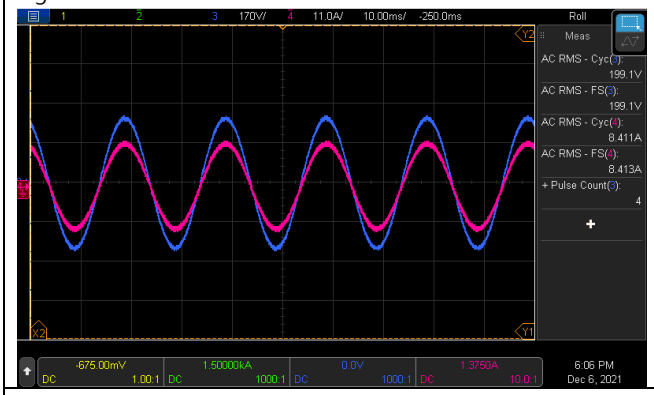
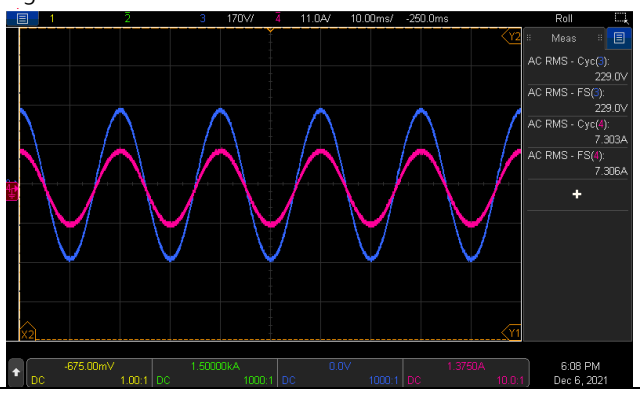
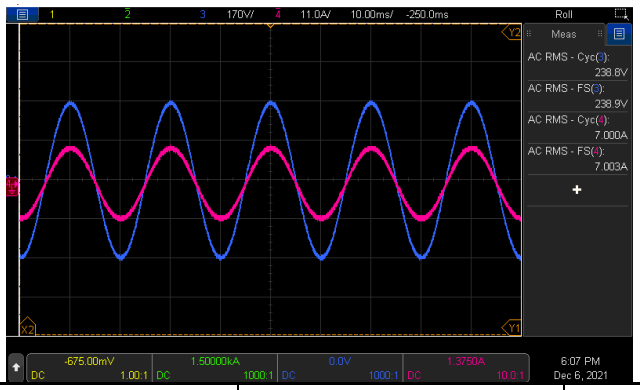
2200W High Reliable True Sine Wave DC-AC Power Inverter

- **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℃	2215 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℃	(1) 227.97 V / 10.68 A / 180.1 Sec (2) 227.34 V / 14.36 A / 10.07 Sec (3) 226.8 V / 19.05 A/ 27 Cycle
	CH3:O/P VAC CH4:O/P IAC Fig1  Fig2  Fig3 			
3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25℃	DIP S.W 200VAC: 197.18 V DIP S.W 220VAC: 216.89 V DIP S.W 230VAC: 226.86 V DIP S.W 240VAC: 236.69 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25℃	DIP S.W 50HZ: 50.08 HZ DIP S.W 60HZ: 59.93 HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 50VDC OP: 1650W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 1.47 % / Vo(min) /1650W (2) 1.71 % / Vo(nor) /1650W (3) 1.53 % / Vo(max) /1650W

	CH3:O/P VAC CH4:O/P IAC Fig1  Fig2  Fig3 			
6	AC REGULATION	±3%	IP: 50VDC OP: 1650W Ta:25℃	-1.39 %
7	Overshoot /Undershoot	<±10%	IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25℃	(1) -4.39 % (2) -3.13 % (3) -4 %
8	O/P voltage DC offset	Vin(nor)= 48 V · Vo<200mV · no load : 90.6 mV / full load: 100.8 mV		

<table>
<tr><td>9</td><td>LED STATUS</td><td>

● Statas test

LED	Statas	RESULT
Green ●	Inverter OK	OK
Orange ●	Remote off	OK
Orange ☀	No AC Output at Saving mode	OK
Red ●	Inverter Fail	OK

● DC Input test

LED	Battery RANGE	RESULT
Green ●	50.0~62.0 Vdc±1V	50.315Vdc ~ 62.11Vdc
Orange ●	44.0~50.0Vdc ±1V	44.262Vdc ~ 50.195Vdc
Red ●	<44.0Vdc ±1V > 62.0Vdc±1V	< 44.132Vdc > 62.32Vdc

● Load test

LED	LOAD RANGE	RESULT
Green ●	Min. load ~ 40%±5% LOAD	Min. load ~ 38.41%
Orange ●	40%±5% ~ 80%±5% LOAD	41.04% ~ 78.68%
Red ●	≧ 80%±5% LOAD	≧ 81.31 %

</td></tr>
</table>

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℃	40.26 VDC~ 66.18 VDC/NO LOAD 40.28VDC~ 66.17VDC/FULL LOAD

			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)	10MIN Test： OK 12Hr Test： OK
2	DC CURRENT (TYP)	60A	IP: 48VDC OP:FULL LOAD Ta:25℃	49.24 A
3	NO LOAD DISSPATION	≦ 1.7W@ saving mode ≦ 55W@NON-Saving Mode	IP: 48VDC OP:NO LOAD Ta:25℃	1.71 W @ saving mode 45.54 W @NON- Saving Mode
4	SAVING MODE TO NORMAL	Po≥25W	IP: 48VDC OP: TESTING LOAD Ta:25℃	≥ 19 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 48VDC OP: TESTING LOAD Ta:25℃	≤ 13 W
6	OFF MODE CURRENT DRAW (Typ.)	≦ 2mA	IP: 48VDC OP: Sw off Ta:25℃	1.068 mA
7	EFFICIENCY(TYP)	1650W /93%	IP:50VDC OP: Po=1650W/ 230V/50HZ Ta:25℃	93.02 %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	44V±1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	44.149 V
2	BAT LOW SHUT DOWN	40V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	40.264 V
3	BAT LOW RESTART	50V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	50.303 V

4	BAT HIGH ALARM	62V±1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	62.21 V
5	BAT HIGH SHUT DOWN	66V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	66.27 V
6	BAT HIGH RESTART	60V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	60.19 V
7	BAT. POLARITY	By internal fuse open	IP: BAT +/-（Reverse） OP: FULL LOAD Ta:25℃	TEST：OK
8	OVER TEMPERATURE	Shut down o/p voltage: re-power on.	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK
9	OUTPUT SHORT	Shut down o/p voltage: re-power on	IP: 48VDC O/P: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK
11	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℃	(1). 106.05 % ~ 115.22 % 180.1sec (2). 115.91 % ~ 149.54 % 10.07sec 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℃	(1).Open : Normal work Short : Remote off TEST: Vo= 0.002V Pin= 6.19 W (2).TEST: OK

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 1002 W · turn on OK LAMP: 1510 W · turn on OK LAMP: 2019 W · turn on OK	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
2	INDUCTION MOTOR	0.22 HP	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
3	SWITCHING POWER SUPPLY	WITH PFC: RSP-1600-48 O/P= 1198 W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
		NO PFC: SE-1000-48 · O/P= 910 W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK

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/65A	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(4400) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q112 Q126 VDS： VDS： (1) 174V (1) 174V (2) 175V (2) 173V (3) 175V (3) 173V (4) 175V (4) 175V (5) 175V (5) 175V Q106 Q132 VDS： VDS： (1) 166V (1) 161V (2) 167V (2) 160V (3) 167V (3) 160V (4) 168V (4) 162V (5) 167V (5) 162V
2	DC TO DC Diode Peak Voltage	D 901 Rated : 1000V/ 16 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℃	(1) 531V (2) 551V (3) 531V (4) 535V (5) 535V
3	DC BUS Capacitor Voltage	C905/C907 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℃	C905 C907 (1) 265V (1) 253V (2) 257V (2) 263V (3) 267V (3) 253V (4) 269V (4) 255V (5) 269V (5) 255V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 650 V/ 30A	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℃	Q1： VDS： (1) 555V (2) 607V (3) 555V (4) 555V (5) 559V

5	AUX PWM MOS	Q201 Rated: 65 A/ 200 V Q504 Rated : 46A/ 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℃	Q201 (1) 167V (2) 167V (3) 167V (4) 167V (5) 167V	Q504 (1) 137V (2) 137V (3) 137V (4) 137V (5) 137V
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~20V 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℃	U301 (1) 3.34V (2) 3.34V (3) 3.34V (4) 3.34V (5) 3.34V U201 (1) 12.17V (2) 12.17V (3) 12.17V (4) 12.17V (5) 12.17V	U501 (1) 12.6V (2) 12.6V (3) 12.6V (4) 12.6V (5) 12.6V U1 (1) 5.04V (2) 5.24V (3) 5.04V (4) 5.04V (5) 5.04V

SAFETY &EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-AC O/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-AC O/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25℃	BAT I/P-AC O/P: 11.44 mA AC O/P-FG: 7.98mA NO DAMAGE
2	GROUNDING CONTINUITY	EN 60950 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	6mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	▓ CE CLASS A	I/P: 48 VDC O/P: FULL LOAD/50% LOAD Ta:25℃	PASS
2	RADIATION	▓ CE CLASS A	I/P:48 VDC O/P: :FULL/50% LOAD Ta:25℃	PASS
3	E.S.D	EN61000-4-2 AIR：8KV / Contact：4KV	I/P: 48VDC O/P:FULL LOAD Ta:25℃	CRITERIA A
4	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-2200-248 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 48 VDC O/P： FULL LOAD Ta= 25 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 48VDC O/P： FULL LOAD Ta= 40 ℃		

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 40 ℃
1	Q133	51.2℃	63.3℃
2	Q126	44.2℃	56.4℃
3	Q201	50.5℃	64.3℃
4	Q122	46.0℃	58.2℃
5	C140	44.2℃	56.4℃
6	C148	43.8℃	56.0℃
7	FS22	49.2℃	60.8℃
8	T102 Core	62.0℃	73.2℃
9	T102 Coil	54.3℃	65.8℃
10	D902	46.4℃	58.0℃
11	Q116	43.8℃	57.0℃
12	Q103	44.8℃	57.8℃
13	Q112	46.1℃	59.6℃
14	C108	46.3℃	57.4℃
15	C100	44.1℃	55.9℃
16	T101 Core	66.1℃	76.8℃
17	T101 Coil	54.1℃	65.3℃
18	D912	46.8℃	58.4℃
19	LF26	37.2℃	49.6℃
20	D905	45.3℃	57.1℃
21	U301	36.1℃	48.1℃
22	T202	42.8℃	56.0℃
23	R273	55.9℃	71.5℃
24	T201	42.1℃	54.3℃
25	Q7	66.4℃	76.7℃
26	R78	89.3℃	98.9℃
27	Q2	73.5℃	84.4℃
28	C907	38.6℃	50.5℃
29	TSW3	38.1℃	50.3℃
30	C2	35.8℃	48.8℃

NO	Position	ROOM AMBIENT Ta= 25 ℃	HIGH AMBIENT Ta= 40 ℃
31	ZNR1	28.8℃	42.9℃
32	LF1	32.8℃	46.6℃
33	C1	29.6℃	43.7℃
34	C6	30.2℃	44.3℃
35	Q504	28.5℃	42.5℃
36	T501	30.5℃	44.8℃
37	D530	27.6℃	41.8℃
38	U501	30.2℃	44.1℃
39	R510	30.3℃	44.2℃
40	R156	46.1℃	58.8℃
41	U201	54.3℃	67.6℃
42	D256	58.6℃	75.5℃
43	U1	39.0℃	50.7℃
44	RTH7	45.0℃	56.9℃
45	Q135	51.0℃	63.1℃
46	CC52	39.3℃	52.0℃
47	TSW2	57.7℃	65.8℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 48VDC O/P：102%LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 48VDC O/P：100%LOAD Ta= -30 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 ℃ NO DAMAGE	I/P：66VDC O/P：FULL LOAD Ta= 38.8 ℃ HUMIDITY= 95 %R.H	TEST：OK
5	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：10 CYCLE 5. Input /Output condition： STATIC		TEST：OK
6	THERMAL SHOCK TEST	1. Thermal shock Temperature： -30℃~ +45℃ 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:48VDC/ FULL LOAD DC ON 11sec/DC OFF 1sec TEST 1cycle:48VDC/ 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℃		TEST：OK

8	CAPACITOR LIFE CYCLE	SUPPOSE C108 IS THE MOST CRITICAL COMPONENT (1) I/P： 48VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 48VDC O/P：FULL LOAD Ta= 40 ℃ LIFE TIME (3) I/P： 48VDC O/P：FULL LOAD Ta= 40 ℃ LIFE TIME (4) I/P： 48VDC O/P：FULL LOAD Ta= 40 ℃ LIFE TIME	 (1) 863118.3HRS (2) 399877.6HRS (3) 563230.6HRS (4) 826318.2HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 364.7K hrs min. Telcordia SR-332 (Bellcore) ; 34.9K hrs min. MIL-HDBK-217F (25℃)	
10	Ongoing Reliability Test	I/P：50VDC O/P：80% LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009