



Test Report: NTU-3200-148

3200W High Reliable True Sine Wave with UPS 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	3000W	IP: 48VDC Ta:25°C	<u>3078</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)3450W/180sec. (2)4500w/10sec (3)SURGE POWER 6000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 50VDC OP:TESTING LOAD Ta:25°C	(1) <u>108.6</u> V / <u>31.42</u> A / <u>180.1</u> Sec (2) <u>108.2</u> V / <u>40.85</u> A / <u>10.1</u> Sec (3) <u>107.0</u> V / <u>60.1</u> A / <u>34</u> Cycle

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

Fig1

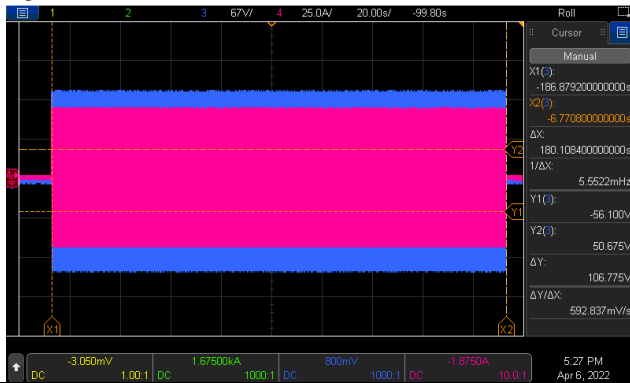


Fig2

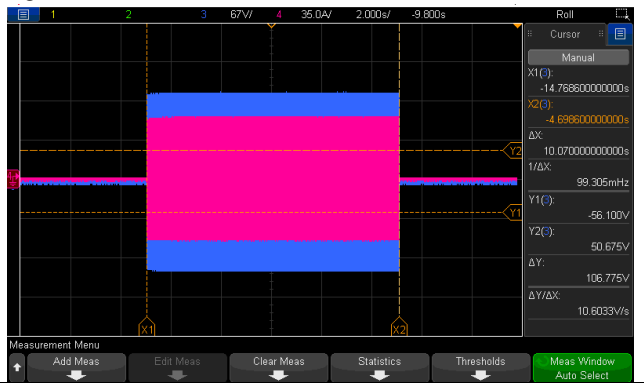
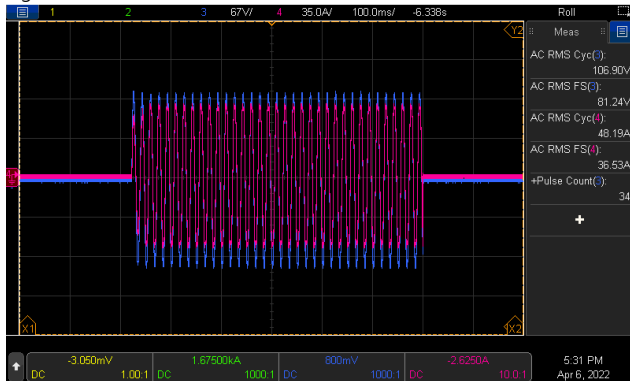


Fig3



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>99.12</u> V DIP S.W 110VAC: <u>109.25</u> V DIP S.W 115VAC: <u>114.29</u> V DIP S.W 120VAC: <u>119.28</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>50.04</u> HZ DIP S.W 60HZ: <u>59.96</u> HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 50VDC OP: 2400W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>1.49</u> % / Vo(min) (2) <u>1.27</u> % / Vo(nor) (3) <u>1.39</u> % / Vo(max)

CH3:O/P VAC CH4:O/P IAC				
<div style="display: flex; justify-content: space-around;"> <div style="width: 48%;"> <p>Fig1</p> </div> <div style="width: 48%;"> <p>Fig2</p> </div> </div> <div style="margin-top: 10px;"> <p>Fig3</p> </div>				
6	AC REGULATION	±3%	IP: 50VDC OP: 2400W Ta:25°C	<u> -0.55 </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> -5.1 </u> % (2) <u> 1.4 </u> % (3) <u> -5.2 </u> %
8	O/P voltage DC offset	Vin(nor)= <u> 48 </u> V · Vo<200mV · no load : <u> 55 </u> mV / full load: <u> 85 </u> mV		

9	LED STATUS	<ul style="list-style-type: none"> • Status test 		
		LED	Status	RESULT
		Green ●	Inverter OK	OK
		Orange ●	Remote off	OK
		Orange ☀	No AC Output at Saving mode	OK
		Red ●	Inverter Fail	OK
		<ul style="list-style-type: none"> • DC Input test 		
		LED	Battery RANGE	RESULT
		Green ●	50.0~62.0 Vdc±1V	50.3Vdc ~62.12Vdc
		Orange ●	44.0~50.0Vdc ±1V	44.23Vdc ~ 50.25Vdc
		Red ●	<44.0 Vdc ±1V > 62.0Vdc±1V	< 44.17Vdc > 62.34Vdc
		<ul style="list-style-type: none"> • Load test 		
		LED	LOAD RANGE	RESULT
		Green ●	Min. load ~ 40%±5% LOAD	Min. load ~ 38.7%
		Orange ●	40%±5% ~ 80%±5% LOAD	41.7 % ~ 78.7 %
Red ●	≥ 80%±5% LOAD	≥ 81.7%		
<ul style="list-style-type: none"> • AC Input 				
LED	LOAD RANGE	RESULT		
Green ●	Utility OK	OK		
Green ☀	Utility error	OK		
Colorless ○	Utility disconnected	OK		

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>40.21</u> VDC~ <u>66.25</u> VDC/NO LOAD <u>40.24</u> VDC~ <u>66.25</u> VDC/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: <u>OK</u> 12Hr Test: <u>OK</u>
2	DC CURRENT (TYP)	75A	IP: 48VDC OP:FULL LOAD Ta:25°C	<u>68.7</u> A
3	NO LOAD DISSIPATION	$\leq 15W$ @ saving mode $\leq 25W$ @NON-Saving Mode	IP: 48VDC OP:NO LOAD Ta:25°C	<u>6.14</u> W @ saving mode <u>23.5</u> W @NON- Saving Mode
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 48VDC OP: TESTING LOAD Ta:25°C	\geq <u>18.5</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 48VDC OP: TESTING LOAD Ta:25°C	\leq <u>12.3</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 2mA$	IP: 48VDC OP: Sw off Ta:25°C	<u>1.22</u> mA
7	EFFICIENCY(TYP)	2400W /91%	IP:50VDC OP: $P_o=2400W$ Ta:25°C	<u>92.27</u> %

AC UPS MODE(Only for NTU)

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	AC Taper Voltage Range	AC input high / low line limit:No Load			
		AC Voltage	limit	Voltage Range	RESULT
		110V	High limit (To INV mode)	$V_{ac} > 128V \pm 4V$	<u>126.9</u> V
			Recovery to high (To AC mode)	$V_{ac} < 124V \pm 4V$	<u>122.7</u> V
			Low limit (To INV mode)	$V_{ac} < 92V \pm 4V$	<u>90.9</u> V
Recovery to low (To AC mode)	$V_{ac} > 96V \pm 4V$		<u>95.8</u> V		
2	FREQUENCY RANGE	45 ~ 65Hz	IP:48VDC OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>	

3	TRANSFER TIME (TYP)	$t < 10\text{ms} \pm 3\text{ms}$ inverter \rightarrow by pass	IP: 48VDC OP: (1) no load (2) full load Ta:25°C	(1) no load a. INTER \rightarrow BY PASS <u>3.52</u> ms b. BY PASS \rightarrow INVERTER <u>8.2</u> ms (2) full load c. INTER \rightarrow BY PASS <u>3.42</u> ms d. BY PASS \rightarrow INVERTER <u>7.7</u> ms
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PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	44V \pm 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>44.17</u> V
2	BAT LOW SHUT DOWN	40V \pm 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>40.24</u> V
3	BAT LOW RESTART	50V \pm 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>50.28</u> V
4	BAT HIGH ALARM	62V \pm 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>62.34</u> V
5	BAT HIGH SHUT DOWN	66V \pm 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>66.25</u> V
6	BAT HIGH RESTART	60V \pm 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>60.26</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>106% ~ 116% 180.1</u> sec (2). <u>118% ~ 148% 10.1</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>0.0025V</u> Pin= <u>5.76 W</u> (2).TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>812</u> W · turn on <u>OK</u> LAMP: <u>1646</u> W · turn on <u>OK</u> LAMP: <u>2488</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
2	INDUCTION MOTOR	<u>0.22</u> 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>2588</u> W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
		NO PFC: <u>SE-1000-48</u> O/P= <u>1194</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	Q107 /Q111/Q127/Q131 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(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q107 Q111 VDS: VDS: (1) 168V (1) 168V (2) 168V (2) 168V (3) 168V (3) 169V (4) 170V (4) 170V (5) 170V (5) 170V Q127 Q131 VDS: VDS: (1) 168V (1) 166V (2) 168V (2) 166V (3) 168V (3) 165V (4) 170V (4) 168V (5) 169V (5) 169V

2	DC TO DC Diode Peak Voltage	D 901 Rated : 400V/ 20 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(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 271V (2) 277V (3) 273V (4) 275V (5) 275V
3	DC BUS Capacitor Voltage	C905 Rated: 820u/315V	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(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C905 (1) 269V (2) 269V (3) 269V (4) 271V (5) 271V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated: 650 V/ 75A	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(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q1: VDS: (1) 301V (2) 410V (3) 324V (4) 283V (5) 281V
5	AUX PWM MOS	Q201 Rated: IRFB4227PbF 65 A/ 200 V Q504 Rated : IRFB4229PbF 46A/250 V	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(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q201 (1) 158V (2) 158V (3) 158V (4) 158V (5) 158V Q504 (1) 124V (2) 115V (3) 118V (4) 119V (5) 117V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4V~ 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 VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(6000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	U301 (1) 3.32V (2) 3.32V (3) 3.37V (4) 3.32V (5) 3.32V U501 (1) 12.59V (2) 12.59V (3) 12.59V (4) 12.59V (5) 12.59V U201 (1) 12.18V (2) 12.18V (3) 12.18V (4) 12.18V (5) 12.18V U1 (1) 5.10V (2) 5.10V (3) 5.14V (4) 5.10V (5) 5.10V

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-AC O/P: 11.8mA BAT I/P-AC I/P: 11.67mA AC O/P-FG: 7.69mA 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: 48 VDC O/P: FULL LOAD/50% LOAD Ta:25°C	PASS
2	RADIATION	FCC CLASS A	I/P:48 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-3200-124 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																																																														
			<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25 °C</th> <th>HIGH AMBIENT Ta= 40 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>R275</td><td>71.3°C</td><td>85.3°C</td></tr> <tr><td>2</td><td>U102</td><td>51.1°C</td><td>66.9°C</td></tr> <tr><td>3</td><td>R155</td><td>45.9°C</td><td>61.9°C</td></tr> <tr><td>4</td><td>R136</td><td>46.9°C</td><td>63.4°C</td></tr> <tr><td>5</td><td>U201</td><td>48.1°C</td><td>64.5°C</td></tr> <tr><td>6</td><td>RTH7</td><td>41.9°C</td><td>57.4°C</td></tr> <tr><td>7</td><td>Q135</td><td>42.6°C</td><td>58.3°C</td></tr> <tr><td>8</td><td>Q122</td><td>36.2°C</td><td>51.5°C</td></tr> <tr><td>9</td><td>R68</td><td>57.9°C</td><td>74.4°C</td></tr> <tr><td>10</td><td>T202</td><td>49.5°C</td><td>65.4°C</td></tr> <tr><td>11</td><td>U1</td><td>36.3°C</td><td>52.4°C</td></tr> <tr><td>12</td><td>R58</td><td>49.8°C</td><td>65.4°C</td></tr> <tr><td>13</td><td>Q201</td><td>60.0°C</td><td>77.0°C</td></tr> <tr><td>14</td><td>C145</td><td>47.3°C</td><td>63.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 40 °C	1	R275	71.3°C	85.3°C	2	U102	51.1°C	66.9°C	3	R155	45.9°C	61.9°C	4	R136	46.9°C	63.4°C	5	U201	48.1°C	64.5°C	6	RTH7	41.9°C	57.4°C	7	Q135	42.6°C	58.3°C	8	Q122	36.2°C	51.5°C	9	R68	57.9°C	74.4°C	10	T202	49.5°C	65.4°C	11	U1	36.3°C	52.4°C	12	R58	49.8°C	65.4°C	13	Q201	60.0°C	77.0°C	14	C145	47.3°C	63.7°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= 39.7 °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 C140 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) 647614.3HRS (2) 207791.3HRS (3) 373535.1HRS (4) 652327.7HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 319.3K hrs min. Telcordia SR-332 (Bellcore) ; 30.3K 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