



# Test Report: NTU-3200-112

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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: 12VDC Ta:25°C	<u>3060</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)3500W/180sec. (2)4500w/10sec (3)SURGE POWER 6000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 12.5VDC OP: TESTING LOAD Ta:25°C	(1) <u>108.7 V / 31.3 A / 180.09</u> Sec (2) <u>109.0 V / 39.9 A / 10.1</u> Sec (3) <u>106.4 V / 54.4 A / 34</u> Cycle

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

Fig1

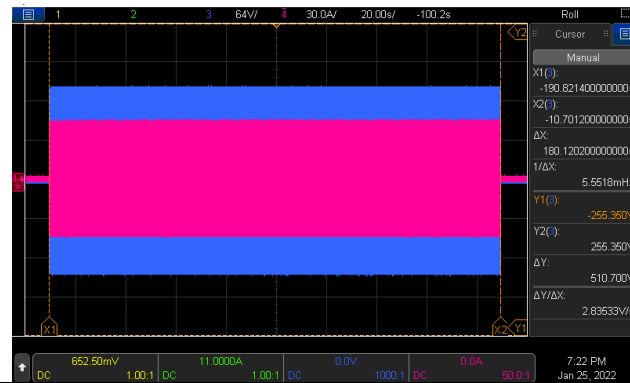


Fig2

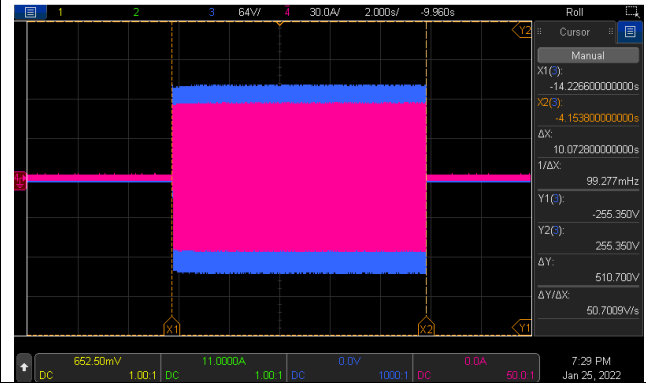
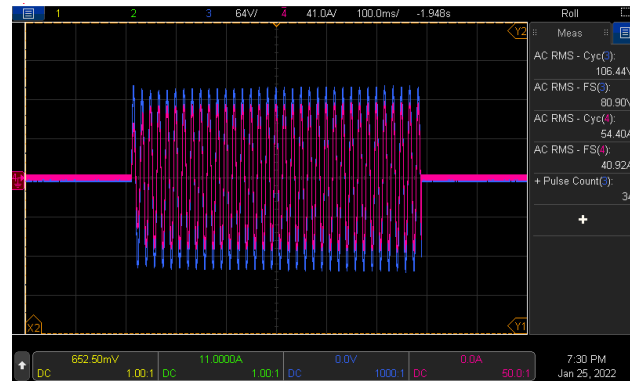


Fig3



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 100VAC: <u>98.8</u> V DIP S.W 110VAC: <u>108.9</u> V DIP S.W 115VAC: <u>113.9</u> V DIP S.W 120VAC: <u>118.9</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC 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: 12.5VDC OP: 2400W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>2.39</u> % / Vo(min) /2400W (2) <u>1.93</u> % / Vo(nor) /2400W (3) <u>2.04</u> % / Vo(max) /2400W

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

Fig1

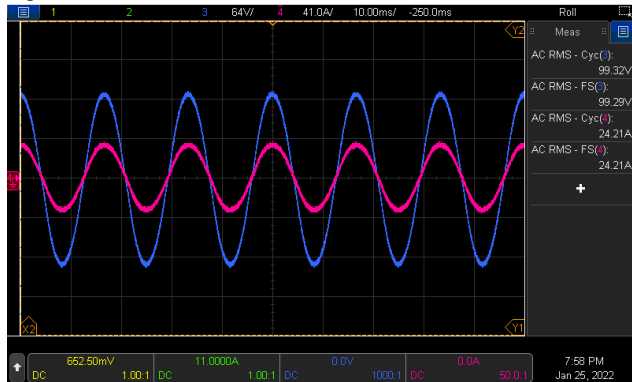


Fig2

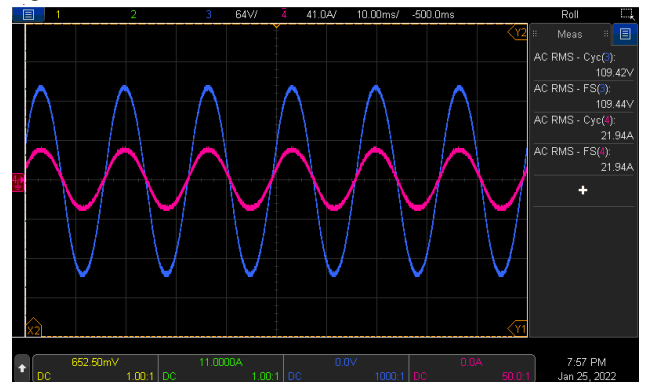
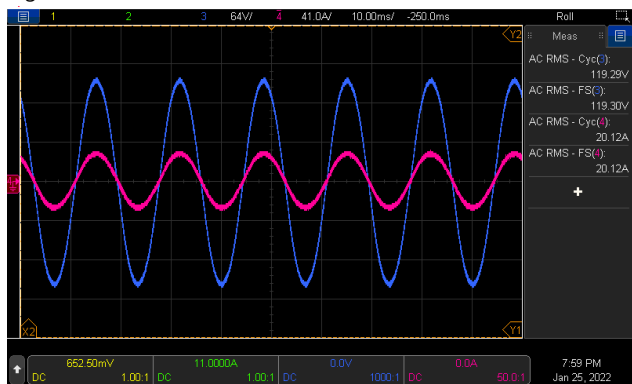


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP: 2400W Ta:25°C	-0.8 %
7	Overshoot /Undershoot	<±10%	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) -6.2 % (2) 0.5 % (3) 2.9 %
8	O/P voltage DC offset	Vin(nor)= 12 V · Vo<200mV · no load : 66.6 mV / full load: 53.7 mV		

9	LED STATUS	<ul style="list-style-type: none"> <li>Status test</li> </ul>															
		<table border="1"> <thead> <tr> <th>LED</th> <th>Status</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Inverter OK</td> <td>OK</td> </tr> <tr> <td>Orange ●</td> <td>Remote off</td> <td>OK</td> </tr> <tr> <td>Orange ☀</td> <td>Saving mode</td> <td>OK</td> </tr> <tr> <td>Red ●</td> <td>Inverter Fail</td> <td>OK</td> </tr> </tbody> </table>	LED	Status	RESULT	Green ●	Inverter OK	OK	Orange ●	Remote off	OK	Orange ☀	Saving mode	OK	Red ●	Inverter Fail	OK
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	10VDC~16.5VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	<u>10.02</u> VDC~ <u>16.53</u> VDC/NO LOAD <u>10.11</u> VDC~ <u>16.53</u> VDC/FULL LOAD



			I/P: LOW-LINE=11V HIGH-LINE=16.2V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec/OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 12VDC 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)	300A	IP: 12VDC OP:FULL LOAD Ta:25°C	<u>288.5</u> A
3	NO LOAD DISSIPATION	$\leq 15W$ @ saving mode $\leq 25W$ @NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25°C	<u>6.03</u> W @ saving mode <u>22.94</u> W @NON- Saving Mode
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 12VDC OP: TESTING LOAD Ta:25°C	$\geq$ <u>16</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 12VDC OP: TESTING LOAD Ta:25°C	$\leq$ <u>12</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 2mA$	IP: 12VDC OP: Sw off Ta:25°C	<u>0.47</u> mA
7	EFFICIENCY(TYP)	2400W /89%	IP:12.5VDC OP: $P_o=2400W$ 110V/60HZ Ta:25°C	<u>89.4</u> %

AC UPS MODE

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)	Vac >128V±4V	<u>126.8</u> V
			Recovery to high (To AC mode)	Vac <124V±4V	<u>123.1</u> V
			Low limit (To INV mode)	Vac <92V±4V	<u>90.9</u> V
Recovery to low (To AC mode)	Vac >96V±4V		<u>95.9</u> V		
2	FREQUENCY RANGE	45 ~ 65Hz	IP:12VDC 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: 12VDC OP: (1) no load (2) full load Ta:25°C	(1) no load a. INTER $\rightarrow$ BY PASS <u>2.6</u> ms b. BY PASS $\rightarrow$ INVERTER <u>9.6</u> ms (2) full load c. INTER $\rightarrow$ BY PASS <u>1.5</u> ms d. BY PASS $\rightarrow$ INVERTER <u>9.0</u> ms
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**PROTECTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>10.94</u> V
2	BAT LOW SHUT DOWN	10V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>10.09</u> V
3	BAT LOW RESTART	12.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>12.54</u> V
4	BAT HIGH ALARM	15.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>15.65</u> V
5	BAT HIGH SHUT DOWN	16.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>16.66</u> V
6	BAT HIGH RESTART	15V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>14.99</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: 12VDC 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: 12VDC OP: TESTING SW: ON Ta:25°C	(1). <u>106 % ~ 113 %</u> <u>180.1</u> sec (2). <u>115 % ~ 147 %</u> <u>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: 12VDC OP: FULL LOAD Ta:25°C	(1).Open : <u>Normal work</u> Short : <u>Remote off</u> TEST: Vo= <u>0.006V</u> Pin= <u>4.76 W</u> (2).TEST: <u>OK</u>

**APPLICATION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>862 W</u> · turn on <u>OK</u> LAMP: <u>1697 W</u> · turn on <u>OK</u> LAMP: <u>2699 W</u> · 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: RSP-3000-48 O/P= <u>2854</u> W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: <u>OK</u>
		NO PFC: SE-1000-48 O/P= <u>1161</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: 60 V / 195A	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) 46.1V                      (1) 44.9V (2) 38.7V                      (2) 38.2V (3) 56.5V                      (3) 56.1V (4) 40.5V                      (4) 39.2V (5) 38.0V                      (5) 37.2V  Q127                      Q131 VDS:                      VDS: (1) 45.6V                      (1) 46.2V (2) 38.2V                      (2) 39.8V (3) 55.9V                      (3) 58.1V (4) 39.4V                      (4) 40.6V (5) 39.4V                      (5) 40.2V

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) 268V (2) 284V (3) 270V (4) 273V (5) 272V
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) 271V (2) 271V (3) 271V (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) 300V (2) 374V (3) 312V (4) 283V (5) 286V Q3 VDS: (1) 293V (2) 365V (3) 296V (4) 280V (5) 280V
5	AUX PWM MOS	Q201 Rated: 130 A/ 100 V  Q504 Rated : 130A/100 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 VDS: (1) 56.2V (2) 56.2V (3) 56.2V (4) 56.2V (5) 56.2V Q504 VDS: (1) 33.6V (2) 33.6V (3) 33.6V (4) 33.6V (5) 33.6V
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 VDS: (1) 3.34V (2) 3.34V (3) 3.34V (4) 3.34V (5) 3.34V U501 VDS: (1) 12.61V (2) 12.61V (3) 12.61V (4) 12.61V (5) 12.61V  U201 VDS: (1) 16.7V (2) 16.4V (3) 16.9V (4) 15.7V (5) 15.7V U1 VDS: (1) 5.15V (2) 5.19V (3) 5.39V (4) 5.07V (5) 5.15V





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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 12VDC O/P : 102%LOAD Ta : 25°C	TEST : OK																																																																																																																																							
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12VDC 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 : 16.5VDC O/P : FULL LOAD Ta= 39 °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:12VDC/ FULL LOAD DC ON 11sec/DC OFF 1sec TEST 1cycle:12VDC/ 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 : 12VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 12VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME (3) I/P : 12VDC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 12VDC O/P : 50% LOAD Ta= 40 °C LIFE TIME	(1) 114120HRS (2) 33229.8HRS (3) 149108.6HRS (4) 504411.2HRS
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 : 12.5VDC 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