



Test Report: NTS-1200-212

1200W High Reliable True Sine Wave 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	1200W	IP: 12VDC Ta:25°C	<u>1225</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)1380W/180sec. (2)1800w/10sec (3)SURGE POWER 2000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 12.5VDC OP: TESTING LOAD Ta:25°C	(1) 228.02 V/ 5.95 A/ 180.1 Sec (2) 227.7 V/ 7.72 A/ 10.1 Sec (3) 222.8 V/ 9.09 A/ 28 Cycle

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

Fig1



Fig2

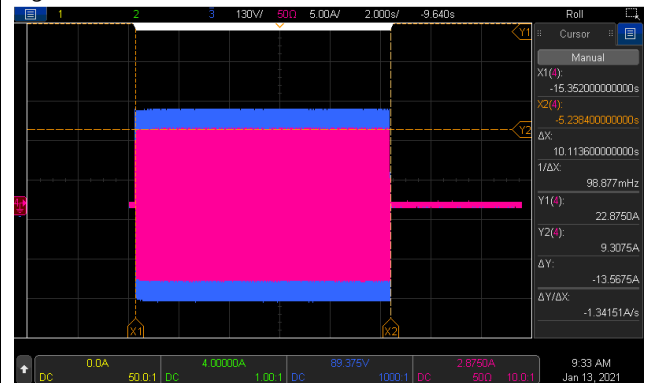
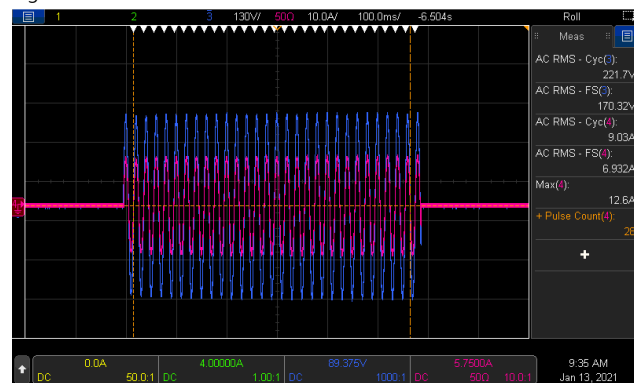


Fig3



3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.3</u> V DIP S.W 220VAC: <u>218.1</u> V DIP S.W 230VAC: <u>228.1</u> V DIP S.W 240VAC: <u>238.1</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>50.041</u> HZ DIP S.W 60HZ: <u>59.959</u> HZ

5	WAVEFORM	True sine wave (THD < 3%)	IP: 12.5VDC OP: 75% LOAD (900W) (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta: 25°C	(1) 2.11 % / Vo(min)/75% LOAD (2) 1.98% / Vo(nor) /75% LOAD (3) 2.04 % / Vo(max) /75% LOAD
CH3:O/P VAC CH4:O/P IAC				
6	AC REGULATION	±3%	IP: 12.5VDC OP: 75% LOAD (900W) Ta: 25°C	$\frac{-0.87}{\quad} \%$
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) $\frac{-2.09}{\quad} \%$ (2) $\frac{-1.22}{\quad} \%$ (3) $\frac{2.18}{\quad} \%$
8	O/P voltage DC offset	$V_{in(nor)} = \underline{12} \text{ v} \cdot V_o < 200\text{mV} \cdot \text{no load} : \underline{74.9} \text{ mV} / \text{full load} : \underline{66.2} \text{ mV}$		

9	LED STATUS	<ul style="list-style-type: none"> Status test <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 Saving mode</td> <td>OK</td> </tr> <tr> <td>Red</td> <td> Abnormal Status (See SPEC)</td> <td>OK</td> </tr> </tbody> </table> Battery test <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>12.5~15.5 Vdc±0.3v</td> <td>12.55Vdc ~ 15.56Vdc</td> </tr> <tr> <td> Orange</td> <td>11~ 12.5Vdc ±0.3v</td> <td>11.02Vdc ~12.50Vdc</td> </tr> <tr> <td> Red</td> <td><11.0 Vdc ±0.3v > 15.5vdc±0.3v</td> <td>< 11.01 Vdc > 15.61 Vdc</td> </tr> </tbody> </table> Load test <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>Min. load ~ 40%±5% LOAD</td> <td>Min. load ~38.8%</td> </tr> <tr> <td> Orange</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>40.8%~ 78.3%</td> </tr> <tr> <td> Red</td> <td>≥ 80%±5% LOAD</td> <td>≥ 79.2%</td> </tr> </tbody> </table> 	LED	Status	RESULT	Green	Inverter OK	OK	Orange	Remote off Saving mode	OK	Red	Abnormal Status (See SPEC)	OK	LED	Battery RANGE	RESULT	Green	12.5~15.5 Vdc±0.3v	12.55Vdc ~ 15.56Vdc	Orange	11~ 12.5Vdc ±0.3v	11.02Vdc ~12.50Vdc	Red	<11.0 Vdc ±0.3v > 15.5vdc±0.3v	< 11.01 Vdc > 15.61 Vdc	LED	LOAD RANGE	RESULT	Green	Min. load ~ 40%±5% LOAD	Min. load ~38.8%	Orange	40%±5% ~ 80%±5% LOAD	40.8%~ 78.3%	Red	≥ 80%±5% LOAD	≥ 79.2%
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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 I/P: LOW-LINE=10.5V 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: 12V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	<u>10.18</u> VDC~ <u>16.54</u> VDC/NO LOAD <u>10.07</u> VDC~ <u>16.54</u> VDC/FULL LOAD Test: <u>OK</u>

2	DC CURRENT (TYP)	120A	IP: 12VDC OP: FULL LOAD Ta: 25°C	<u>114.4</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.2W$ standby saving mode $\leq 25W@NON$ -Saving Mode	IP: 12VDC OP: NO LOAD Ta: 25°C	<u>1.153</u> W <u>20.34</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 12VDC OP: TESTING LOAD Ta: 25°C	<u>≥ 20</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 12VDC OP: TESTING LOAD Ta: 25°C	<u>≤ 11</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 12VDC OP: Sw off Ta: 25°C	<u>0.58</u> mA
7	EFFICIENCY(TYP)	900W/90%	IP: 12.5VDC OP: $P_o=900W$ 230V/50HZ (factory setting) Ta: 25°C	<u>90.3</u> %

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>11.01</u> V
2	BAT LOW SHUT DOWN	10V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>10.11</u> V
3	BAT LOW RESTART	12.5V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>12.55</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>16.52</u> V
6	BAT HIGH RESTART	15V \pm 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>15.04</u> V

7	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>
8	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> (1).TEST: <u>OK</u>
9	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>107</u> %~ <u>113</u> % <u>180.1</u> sec (2). <u>117</u> %~ <u>146</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	Open : Normal work Short : Remote off (1).TEST: <u>OK</u> (2).TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>841</u> W · turn on <u>OK</u> LAMP: <u>1264</u> W · turn on <u>OK</u> LAMP: <u>1465</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.5</u> HP	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: RSP-1600-48 O/P= <u>1190</u> W	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
		NO PFC: SE-1000-48 O/P= <u>505</u> W	1. Vin=HIGH LINE 2. O/P=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	Q101 Rated : 60V /195 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q101 (1) 44.4V (2) 37.1V (3) 45.2V (4) 37.1V (5) 36.3V	Q105 (1) 40.4V (2) 36.3V (3) 42.4V (4) 40.8V (5) 37.9V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 600V/ 20A	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	D151 (1) 529V (2) 533V (3) 545V (4) 557V (5) 532V	D152 (1) 545V (2) 557V (3) 553V (4) 549V (5) 553V
3	DC BUS Capacitor Voltage	C161/C162 Rated : 680 u/ 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C161 (1) 251V (2) 251V (3) 251V (4) 255V (5) 251V	C162 (1) 259V (2) 259V (3) 259V (4) 259V (5) 259V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 30A / 650 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q1 (1)556V (2)568V (3)560V (4)552V (5)548V	Q4 (1)556V (2)572V (3)556V (4)556V (5)560V
5	AUX PWM MOS	Q201 Rated : 80 A/ 100 V Q501 Rated : 120 A/ 60 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q201 (1) 58.0V (2) 58.0V (3) 58.0V (4) 58.0V (5) 57.2V	Q501 (1) 49.2V (2) 49.2V (3) 49.2V (4) 49.2V (5) 49.2V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4 V~ 3.6 V AUX IC U201 Rated	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On	U301 (1) 3.35V (2) 3.31V (3) 3.35V (4) 3.31V	U501 (1) 12.40V (2) 12.48V (3) 12.48V (4) 12.48V

	8.2V~30V	(4) NO LOAD Turn On (5) Saving mode Ta:25°C	(5) 3.31V	(5) 12.48V
	CHARGE IC U501 Rated -0.3V~20V		U201	U81
	Gate Driver IC U81 Rated -0.3V~20V		(1) 12.32V	(1) 5.08V
			(2) 12.32V	(2) 5.08V
			(3) 12.32V	(3) 5.08V
			(4) 12.32V	(4) 5.08V
			(5) 12.32V	(5) 5.08V

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°C	BAT I/P-AC O/P: 7.09 mA AC O/P-FG: 5.95 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	3mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CISPR32 (except for Type-UN) CLASS A	I/P:12 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P: 12VDC O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
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-1200-212 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 25.0 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 35.0 °C																																																																																																																																																		
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		19	Q201	34.8°C	47.0°C																																																																																																																																															
		20	D154	43.8°C	55.2°C																																																																																																																																															
		21	C161	35.5°C	47.4°C																																																																																																																																															
		22	L10	39.7°C	51.7°C																																																																																																																																															
		23	C2	28.0°C	39.6°C																																																																																																																																															
		24	T202	30.8°C	43.0°C																																																																																																																																															
		25	RY1	34.4°C	45.2°C																																																																																																																																															
		26	ZNR1	32.1°C	43.1°C																																																																																																																																															
		27	LF1	30.8°C	41.9°C																																																																																																																																															
		28	C1	32.7°C	43.7°C																																																																																																																																															
		29	R213	46.6°C	56.6°C																																																																																																																																															
		30	U501	36.4°C	47.6°C																																																																																																																																															
		31	R24	45.5°C	72.2°C																																																																																																																																															
		32	U81	34.9°C	45.8°C																																																																																																																																															
		33	D501	35.5°C	45.6°C																																																																																																																																															
		34	R501	39.1°C	49.5°C																																																																																																																																															
		35	U201	44.8°C	55.1°C																																																																																																																																															
		36	C104	67.0°C	79.6°C																																																																																																																																															
		37	TC	35.1°C	46.5°C																																																																																																																																															
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC O/P : 100%LOAD Ta= -25 °C	TEST : OK																																																																																																																																																

3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 35 °C NO DAMAGE	I/P : 16.2VDC O/P : FULL LOAD Ta= 35 °C HUMIDITY= 95 %R.H	TEST : OK
4	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 : 5 CYCLE 5. Input/Output condition : STATIC		TEST : OK
5	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°C~ +40°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 : 12.5VDC/Full Load		TEST : OK
6	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
7	CAPACITOR LIFE CYCLE	SUPPOSE C104 IS THE MOST CRITICAL COMPONENT (1) I/P: 12.5VDC O/P: FULL LOAD Ta= 25 °C LIFE TIME (2) I/P: 12.5VDC O/P: FULL LOAD Ta= 35 °C LIFE TIME		(1) 166424.9HRS (2) 69489.7HRS
8	MTBF	Conducted by Parts Stress Analysis Prediction 596.7K hrs min. Telcordia TR/SR-332 (Bellcore) ; 62.0K hrs min. MIL-HDBK-217F (25°C)		
9	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

2018.4.30 GP-A50-F010