



# Test Report: NTS-1200-124

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1200W High Reliable True Sine Wave Power Inverter

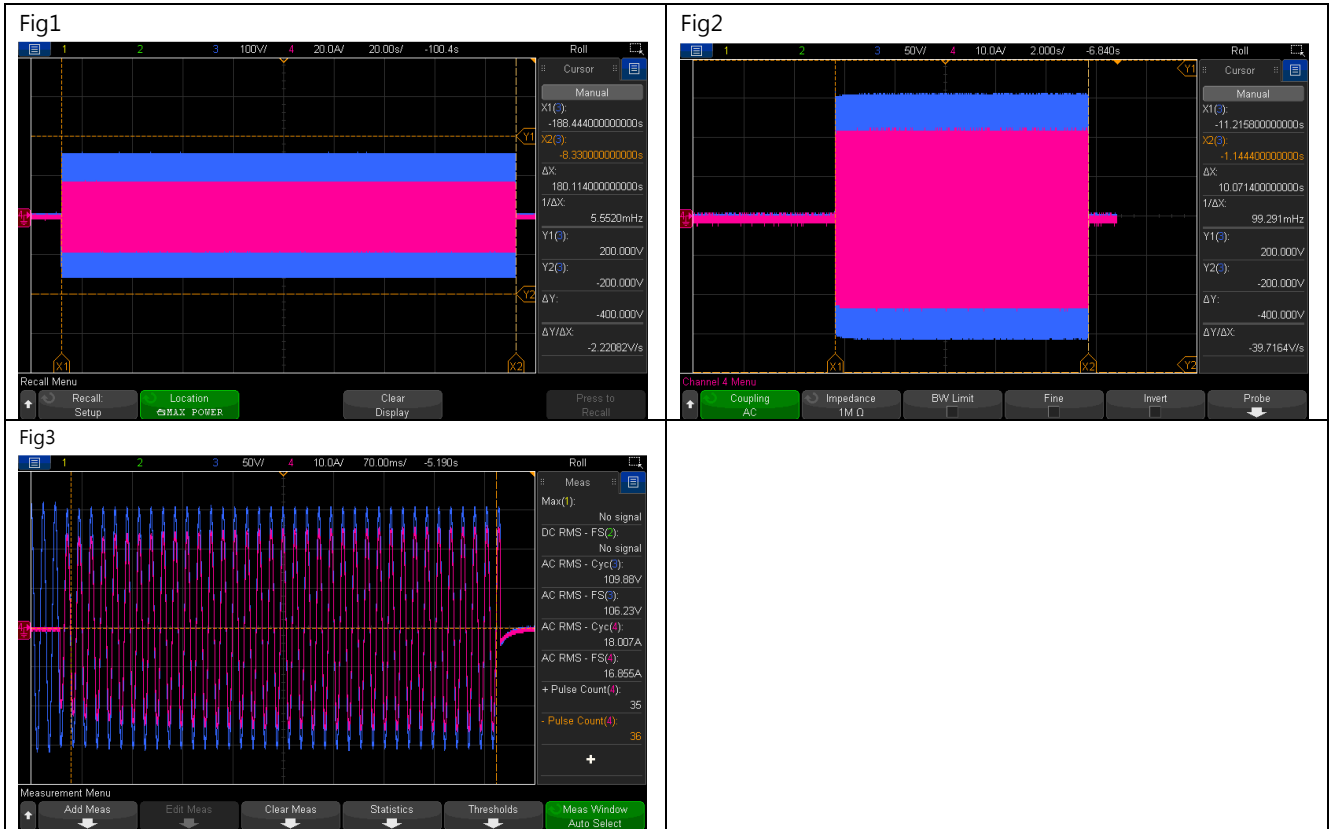
- **DESIGN VERIFY TEST**
  - Output Function Test
  - Input Function Test
  - Protection Function Test
  - Control Function Test
  - APPLICATION Test
  - Component Stress Test
- **SAFETY & E.M.C. TEST**
  - Safety Test
  - E.M.C. Test
- **RELIABILITY TEST**
  - ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST































NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	1200W	IP: 24VDC Ta:25°C	<u>1224</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)1380W/180sec. (2)1800w/10sec (3)SURGE POWER 2000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 25VDC OP:TESTING LOAD Ta:25°C	(1) 110.62 V/ 12.41A/180.11 Sec (2) 110.44V/16.17A/10.07 Sec (3) 109.3 V/17.87A/ 35 Cycle

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



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 100VAC: <u>100.48</u> V DIP S.W 110VAC: <u>110.63</u> V DIP S.W 115VAC: <u>115.68</u> V DIP S.W120VAC: <u>120.76</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.038</u> HZ DIP S.W 60HZ: <u>59.958</u> HZ

5	WAVEFORM	True sine wave (THD < 3%)	IP:25VDC OP:75% LOAD( 900W ) (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 1.47 % / Vo(min)/75% LOAD (2) 1.36% / Vo(nor) /75% LOAD (3) 1.26% / Vo(max) /75% LOAD
CH3:O/P VAC CH4:O/P IAC				
6	AC REGULATION	±3%	IP: 25VDC OP:75% LOAD( 900W ) Ta:25°C	<u>1.09</u> %
7	Overshoot /Undershoot	< ±10%	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u>-6.82</u> % (2) <u>-3.73</u> % (3) <u>-5.45</u> %
8	O/P voltage DC offset	Vin(nor)= <u>24</u> v · Vo < 200mV · no load : <u>63.2</u> mV / full load: <u>64.8</u> mV		

9	LED STATUS	<ul style="list-style-type: none"> <li> <b>Status test</b> <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> </li> <li> <b>Battery test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>25.0~31.0 Vdc±0.5v</td> <td>25.135Vdc ~ 30.992Vdc</td> </tr> <tr> <td> Orange</td> <td>22.0~25.0Vdc ±0.5v</td> <td>22.095Vdc ~ 24.953Vdc</td> </tr> <tr> <td> Red</td> <td>&lt;22.0 Vdc ±0.5v &gt; 31.0vdc±0.5v</td> <td>&lt; 22.024 Vdc &gt; 31.176 Vdc</td> </tr> </tbody> </table> </li> <li> <b>Load test</b> <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 ~ 40.79 %</td> </tr> <tr> <td> Orange</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>40.88%~ 80.11 %</td> </tr> <tr> <td> Red</td> <td>≥ 80%±5% LOAD</td> <td>≥ 80.25 %</td> </tr> </tbody> </table> </li> </ul>			LED	Status	RESULT	Green	 Inverter OK	OK	Orange	 Remote off  Saving mode	OK	Red	 Abnormal Status (See SPEC)	OK	LED	Battery RANGE	RESULT	 Green	25.0~31.0 Vdc±0.5v	25.135Vdc ~ 30.992Vdc	 Orange	22.0~25.0Vdc ±0.5v	22.095Vdc ~ 24.953Vdc	 Red	<22.0 Vdc ±0.5v > 31.0vdc±0.5v	< 22.024 Vdc > 31.176 Vdc	LED	LOAD RANGE	RESULT	 Green	Min. load ~ 40%±5% LOAD	Min. load ~ 40.79 %	 Orange	40%±5% ~ 80%±5% LOAD	40.88%~ 80.11 %	 Red	≥ 80%±5% LOAD	≥ 80.25 %
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**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	20VDC~33VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C  I/P: LOW-LINE=21V HIGH-LINE=32.5V 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)	<u>20.156 VDC ~ 33.045 VDC/NO LOAD</u> <u>20.159 VDC ~ 32.953 VDC/FULL LOAD</u>  Test: <u>OK</u>

2	DC CURRENT (TYP)	60A	IP: 24VDC OP: FULL LOAD Ta:25°C	<u>57.24</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.4W$ @standby saving mode $\leq 15W$ @NTS-NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25°C	<u>1.228</u> W <u>10.64</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>17.4</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>11.5</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 24VDC OP: Sw off Ta:25°C	<u>0.797</u> mA
7	EFFICIENCY(TYP)	900W/91%	IP: 25VDC OP: $P_o=900W$ 110V/60HZ (factory setting) Ta:25°C	<u>91.2</u> %

**PROTECTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	22V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>22.057</u> V
2	BAT LOW SHUT DOWN	20V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>20.127</u> V
3	BAT LOW RESTART	25V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>25.116</u> V
4	BAT HIGH ALARM	31V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>31.153</u> V
5	BAT HIGH SHUT DOWN	33V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>33.111</u> V
6	BAT HIGH RESTART	30V±0.5VDC	IP: TESTING OP: FULL LOAD SW: ON Ta:25°C	<u>30.162</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: 24VDC 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: 24VDC OP: TESTING SW:ON Ta:25°C	(1). 105.6%~ 114.37 % <u>180.11</u> sec (2). 115.81%~ 148.87 % <u>10.07</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: 24VDC 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>316.34</u> W · turn on <u>OK</u> LAMP: <u>772.47</u> W · turn on <u>OK</u> LAMP: <u>1145.5</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: <u>RSP-1600-48</u> · O/P= <u>1294.6</u> W	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
		NO PFC: <u>SE-1000-48</u> · O/P= <u>657.66</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 : 100V /80 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q101 (1) 87.9V (2) 87.9V (3) 87.1V (4) 87.9V (5) 87.9V	Q105 (1)76.7V (2)77.5V (3)79.1V (4)75.9V (5)75.9V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 300V/ 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	D151 (1) 263 V (2) 279V (3) 263V (4) 271V (5) 269V	D152 (1)263V (2)277V (3)263V (4)267V (5)273V
3	DC BUS Capacitor Voltage	C161 Rated : 680 u/ 315 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C161 (1) 265V (2) 265V (3) 265V (4) 265V (5) 267V	
4	DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 40A / 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q1 (1) 277V (2) 287V (3) 275V (4) 271V (5)275V	Q3 (1)273V (2)298V (3)274V (4)270V (5)276V
5	AUX PWM MOS	Q201 Rated : 65 A/ 200 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 (5)O.L.P(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q201 (1) 109.7V (2) 109.7V (3) 108.9V (4) 109.7V (5) 109.7V	Q105 (1) 38.3V (2) 36.7V (3) 35.9V (4) 36.7V (5) 36.3V
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(2000W) Turn On	U301 (1) 3.39V (2) 3.43V (3) 3.39V (4) 3.39V	U501 (1) 12.41V (2) 12.41V (3) 12.41V (4) 12.41V

	8.2V~30V	(4) NO LOAD Turn On (5) Saving mode Ta:25°C	(5) 3.39V	(5) 12.41V
	CHARGE IC U501 Rated -0.3V~20V		U201	U81
	Gate Driver IC U81 Rated -0.3V~20V		(1) 12.17V	(1) 5.04V
			(2) 12.17V	(2) 5.04V
			(3) 12.17V	(3) 5.04V
			(4) 12.17V	(4) 5.04V
			(5) 12.17V	(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°C	BAT I/P-AC O/P: 7.09 mA AC O/P-FG: 6.06 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	FCC(except for Tyoe-UN) CLASS A	I/P:24 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P: 24VDC 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-1200-124					
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 25.0 °C					
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 35.0 °C					
				NO	Position	ROOM AMBIENT Ta=25.0 °C	HIGH AMBIENT Ta= 35.0 °C
				1	C101	70.5 °C	71.5 °C
				2	C104	70.9 °C	73.3 °C
				4	T101	93.4 °C	94.1 °C
				6	RTH6	66.9 °C	72.0 °C
				7	Q105	67.3 °C	72.5 °C
				8	Q104	64.3 °C	70.6 °C
				9	C531	34.1 °C	43.7 °C
				10	T501	33.4 °C	43.7 °C
				11	Q501	36.7 °C	46.6 °C
				12	Q141	37.6 °C	47.4 °C
				13	U301	38.1 °C	49.2 °C
				14	U361	37.1 °C	47.2 °C
				15	TSW1	52.7 °C	61.0 °C
				16	LF1	57.0 °C	66.0 °C
				17	RY1	42.5 °C	52.1 °C
				18	C2	35.5 °C	45.9 °C
				19	L10	73.7 °C	80.2 °C
				20	T202	33.8 °C	44.9 °C
				21	Q1	90.5 °C	99.9 °C
				22	Q3	80.7 °C	89.2 °C
				23	C222	35.8 °C	47.1 °C
				24	R223	41.8 °C	53.3 °C
				25	Q201	38.3 °C	48.4 °C
				26	D153	78.1 °C	82.7 °C
				27	D152	79.9 °C	84.1 °C
				28	C161	45.6 °C	54.0 °C
				29	TC1	38.2 °C	47.6 °C
				30	TC2	39.6 °C	49.4 °C
				31	U81	41.3 °C	50.6 °C
				32	R501	39.9 °C	49.3 °C
				33	R24	72.9 °C	80.6 °C
				34	U201	44.8 °C	56.0 °C
				35	R213	49.5 °C	64.6 °C
				36	U501	37.2 °C	46.7 °C
		37	D501	37.4 °C	46.8 °C		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 25VDC 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 : 32.5VDC 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 : 25VDC/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 : 25VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 25VDC O/P : FULL LOAD Ta= 35 °C LIFE TIME		(1) 149847.9HRS (2) 126883HRS
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 : 25VDC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ