



Test Report: NTS-250P-124

250W High Reliable Built-in Type 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	250W	IP: 24VDC Ta:25°C	255.89 W
2	MAXIMUM OUTPUT POWER (TYP)	(1) 286W/180sec. (2) 368w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 25VDC OP:TESTING LOAD Ta:25°C	(1) 109.86 V/ 2.62A/ 180.08 Sec (2) 109.65V/3.372 A/ 10.07 Sec (3)109.6 V/ 4.51 A/ 33 Cycle

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

Fig1

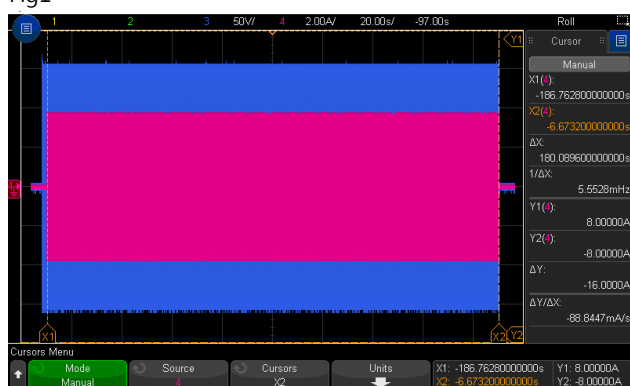


Fig2

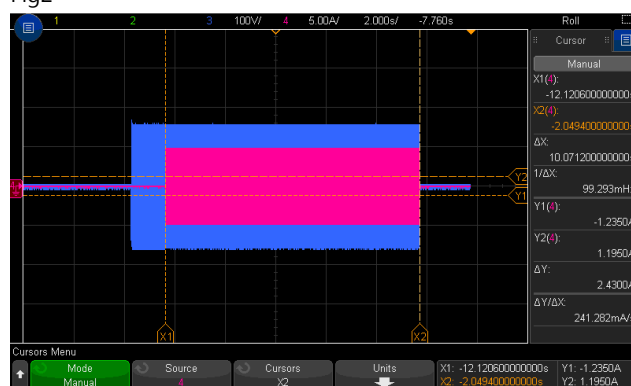
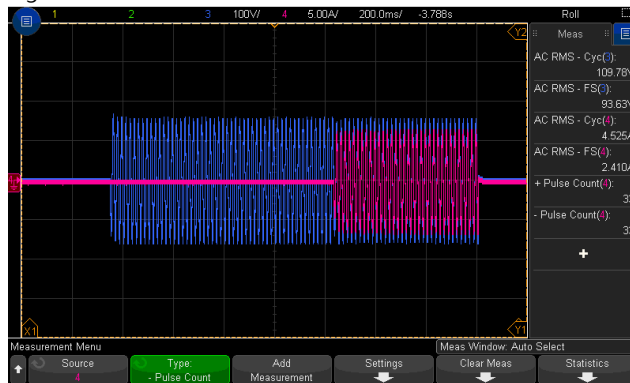


Fig3



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 100VAC: 99.85 V DIP S.W 110VAC: 109.96 V DIP S.W 115VAC: 114.38 V DIP S.W 120VAC: 120.06 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: 50.042 HZ DIP S.W 60HZ: 59.959 HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 25VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 1.1251 % / Vo(min) /FULL LOAD (2) 1.0288 % / Vo(nor) /FULL LOAD (3) 0.969 % / Vo(max) /FULL LOAD

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

Fig1

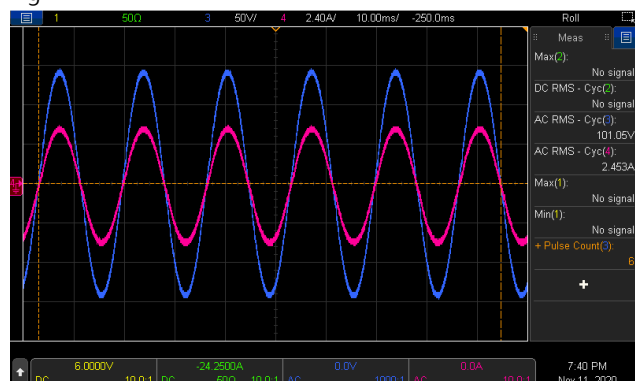


Fig2

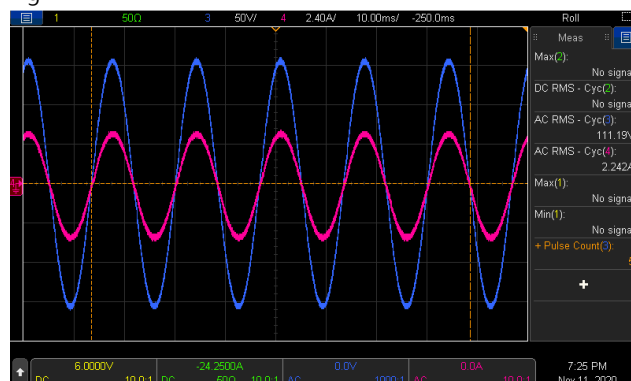
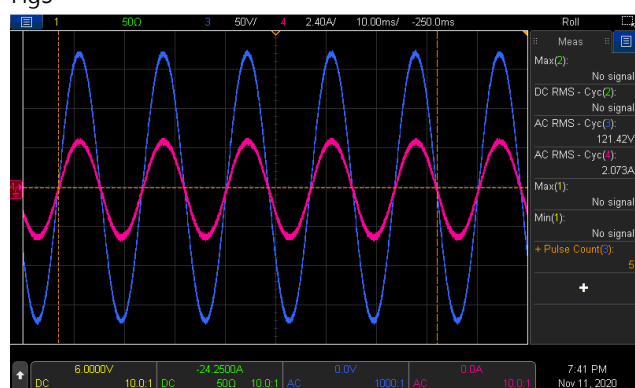


Fig3



6	AC REGULATION	$\pm 3\%$	IP: 25VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u>0.073</u> %
7	Overshoot /Undershoot	$< \pm 10\%$	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u>-7.19</u> % (2) <u>-4.82</u> % (3) <u>1</u> %
8	O/P voltage DC offset	Vin(nor)= <u>24</u> v · Vo<200mv · no load : <u>42.3mv</u> / full load: <u>52.1mv</u>		

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LED STATUS

●

Status test

LED	Status	RESULT
Green	 Inverter OK	OK
Orange	 Remote off  Saving mode	OK
Red	 Abnormal Status (See SPEC)	OK

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Battery test

LED	Battery RANGE	RESULT
Green 	25~31Vdc±0.5v	25.021~31.015 Vdc
Orange 	22~25Vdc ±0.5v	21.984 ~ 24.89Vdc
Red 	<22 Vdc ±0.5v >31 Vdc ±0.5v	<22.048 Vdc >31.023 Vdc

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Load test

LED	LOAD RANGE	RESULT
Green 	Min. load ~ 40%±5% LOAD	Min. load ~42.8 %
Orange 	40%±5% ~ 80%±5% LOAD	43.2 %~81.6 %
Red 	≥ 80%±5% LOAD	≥ 82.0 %

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	20.08 VDC~ 32.89 VDC/NO LOAD 20.08 VDC~32.81 VDC/FULL LOAD
			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: 24V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	Test: <u>OK</u>

2	DC CURRENT (TYP)	13A	IP: 24VDC OP:FULL LOAD Ta:25°C	<u>11.32</u> A
3	NO LOAD DISSIPATION (Typ.)	NON-Saving Mode=10W	IP: 24VDC OP:NO LOAD Ta:25°C	<u>5.76</u> W
		SAVING MODE (1) Po: Default disable, auto detect AC output load $\leq 10W$ will be changed to saving mode	IP: 24VDC OP: TESTING LOAD Ta:25°C	NORMAL TO SAVING MODE: <u>≤ 13</u> W
		(2) Pi : ≤ 1.3 W	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>0.23</u> W
4	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 24VDC OP: Ta:25°C	0 mA
5	EFFICIENCY(TYP)	250W/ 91%	IP: 25VDC OP: Po= W 110V/60HZ (factory setting) Ta:25°C	93.08%

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	22V $\pm$ 0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>21.988</u> V
2	BAT LOW SHUT DOWN	20V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>20.093</u> V
3	BAT LOW RESTART	25V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>25.013</u> V
4	BAT HIGH ALARM	31V $\pm$ 0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>31.025</u> V
5	BAT HIGH SHUT DOWN	33V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>32.96</u> V
6	BAT HIGH RESTART	30V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>30.014</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	Shut down o/p voltage, re-power on to recover (1). <u>106.4~114.4</u> % <u>180.08</u> sec (2). <u>115.2~147.2</u> % <u>10.07</u> sec

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off	IP: 24VDC OP: FULL LOAD Ta:25°C	Open : Normal work Short : Remote off (1).TEST: <u> OK </u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>160 W</u> · turn on <u>OK</u> LAMP: <u>240 W</u> · turn on <u>OK</u> LAMP: <u>320 W</u> · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u> OK </u>	
2	INDUCTION MOTOR	<u>0.12</u> HP	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u> OK </u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>EPP-500-48</u> O/P= <u>250.21W</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u> OK </u>	
		NO PFC: <u>LRS-350-36</u> O/P= <u>249.97 W</u>	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	Q102 Rated : 100V / 80A	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	(1) 85.4 V (2) 84.6 V (3) 84.6V (4) 85.4V (5) 84.6V

2	DC TO DC Diode Peak Voltage	D 105 Rated 600 V/ 10A	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (5)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1)299V (2)303V (3)303V (4)303V (5)304V
3	DC BUS Capacitor Voltage	C118/C119 Rated : 270u/ 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C118 (1) 298V (2) 298V (3) 298V (4) 298 V (5)298V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 Rated : 600V / 20A	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	(1) 312V (2) 371V (3) 323V (4) 311V (5) 311V
5	AUX PWM MOS	Q504 Rated : 18 A/ 200 V Q105 Rated : 40 A/ 200 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q504 (1) 71.5V (2) 71.5V (3) 71.5V (4) 71.5V (5) 71.5V Q105 (1) 123.7V (2) 122.9 V (3) 125.4V (4) 126.4V (5) 125.4V
6	Control IC Voltage Test	MCU IC U303 Rated 2.4 V~ 3.6 V AUX IC U501 Rated 8.2V~30V CHARGE IC U101 Rated -0.3V~20V	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	U303 (1) 3.49V (2) 3.41V (3)3.49V (4) 3.37V (5) 3.41V U501 (1) 11.57V

		Gate Driver IC U200 Rated -0.3V~20V		(2) 11.65V (3) 11.65V (4) 11.65V (5) 11.65V U101 (1) 14.37V (2)14.45 V (3) 14.45V (4) 14.45V (5) 14.45V U200 (1) 5.18V (2) 5.30V (3) 5.06V (4) 5.06V (5) 5.14V
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SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-ACO/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-ACO/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-ACO/P: 1.89 mA AC O/P-FG: 2.23 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC 62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	4mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	FCC CLASS A	I/P:24 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 15KV / Contact : 8KV	I/P: 12VDC O/P:FULL LOAD Ta:25°C	☒ CRITERIA A ☐ 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 : NTS-250P-124			
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 26 °C			
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 41.2 °C			
		NO	Position	ROOM AMBIENT Ta=26 °C	HIGH AMBIENT Ta= 41.2 °C
		1	RT300	62.2°C	76.7°C
		2	Q103	65.3°C	80.5°C
		3	Q104	65.1°C	80.3°C
		4	T101	84.8°C	99.5°C
		5	C100	67.3°C	81.9°C
		6	C101	72.5°C	87.2°C
		7	L100	58.2°C	71.8°C
		8	TB1	51.3°C	65.5°C
		9	C112	71.8°C	86.3°C
		10	D105	72.1°C	89.4°C
		11	C119	74.5°C	88.8°C
		12	D107	68.2°C	84.4°C
		13	Q201	80.7°C	98.9°C
		14	L200	71.3°C	88.1°C
		15	ZR200	42.5°C	58.4°C
		16	Q203	78.6°C	95.4°C
		17	L201	58.2°C	73.6°C
		18	C219	66.3°C	82.3°C
		19	TSW1	68.5°C	84.4°C
		20	C118	74.2°C	88.7°C
		21	U201	70.6°C	84.4°C
		22	T501	75.4°C	88.4°C
		23	Q504	79.1°C	91.9°C
		24	U501	86.7°C	99.4°C
		25	U100	69.6°C	83.9°C
		26	Q501	78.6°C	91.8°C
		27	T100	74.4°C	87.5°C
		28	Q105	72.3°C	86.2°C
29	U303	72.9°C	86.9°C		
30	U500	65.7°C	80.2°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 40 °C NO DAMAGE	I/P : 32.5VDC O/P : FULL LOAD Ta= 40 °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 : 5 CYCLE 5. Input/Output condition : STATIC	TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°C~ +45°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 : 24VDC/Full Load	TEST : OK
8	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
9	CAPACITOR LIFE CYCLE	SUPPOSE C101 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= 40 °C LIFE TIME	(1) 148173.8HRS (2) 54234.8HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 836.9K hrs min. Telcordia SR-332 (Bellcore) ; 84.0K hrs min. MIL-HDBK-217F (25°C)	
11	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

2018.4.30 GP-A50-F010