Test Report: NTS-400P-212

400W 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	400W	IP: 12VDC Ta:25℃	408 W _
2	MAXIMUM OUTPUT POWER (TYP)	(1)460W/180sec. (2)600w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 12.5VDC OP:TESTING LOAD Ta:25℃	(1) 230.8 V/ 1.94 A/ 180.099 Sec (2) 230.8 V/ 2.62 A/ 10.078 Sec (3) 230.8 V/ 3.482 A/ 33 Cycle

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

Fig1

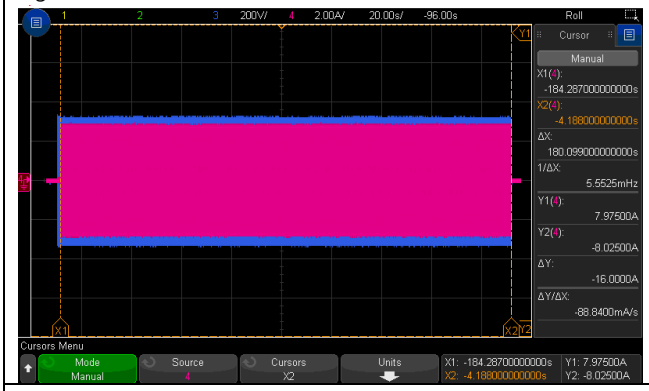


Fig2

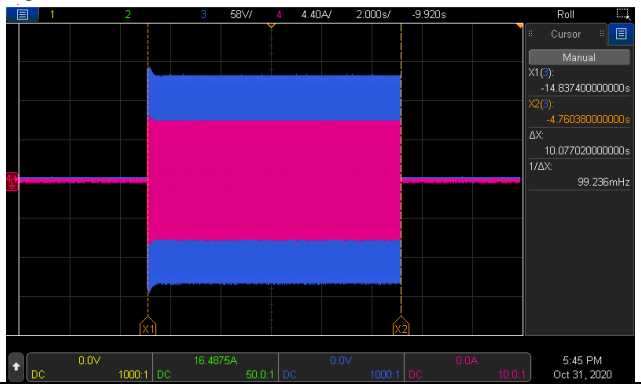


Fig3

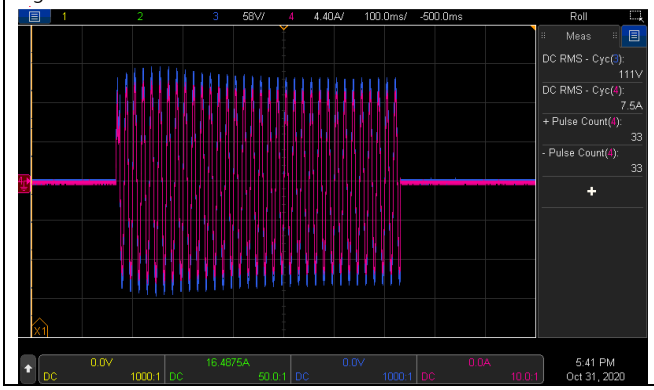


Fig4

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 200VAC: 200.4 V DIP S.W 220VAC: 220.7 V DIP S.W 230VAC: 230.8 V DIP S.W 240VAC: 241.7 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 50HZ: 50.042 HZ DIP S.W 60HZ: 59.959 HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 1.16% / Vo(min) /FULL LOAD (2) 1.44% / Vo(nor) /FULL LOAD (3) 1.66% / Vo(max) /FULL LOAD

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

Fig1

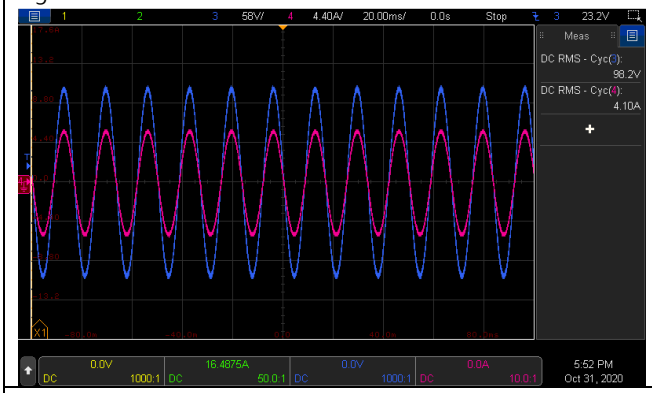


Fig2

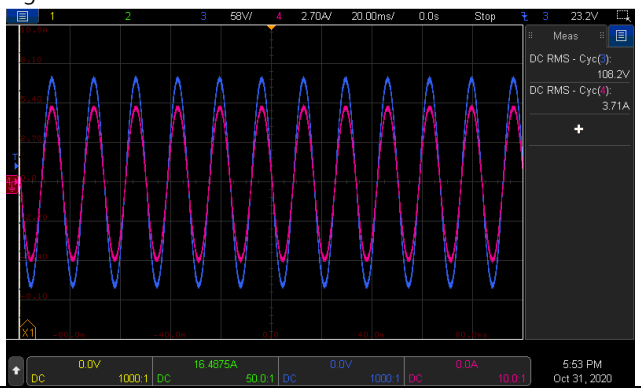
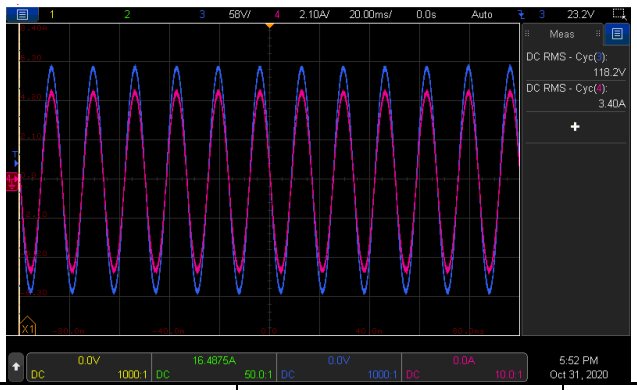


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP: FULL LOAD/NO LOAD Ta:25℃	0.22 %
7	Overshoot /Undershoot	<±10%	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25℃	(1) 1.74 % (2) 0.87 % (3) 1.35 %
8	O/P voltage DC offset	Vin(nor)= 12 v · Vo<200mv · no load : 76.5mv / full load: 83.2 mv		

10	LED STATUS	● Statas test

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

● Battery test

LED	Battery RANGE	RESULT
Green	12.5~15.5Vdc±0.3v	12.52vdc ~15.58V
Orange	11~12.5Vdc ±0.3v	10.95~12.51 V
Red	<11Vdc or >15.5Vdc ±0.3v	< 10.94 V Vdc>15.59V

● Load test

LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~ 42.4%
Orange	40%±5% ~ 80%±5% LOAD	42.5%~ 82%
Red	≧ 80%±5% LOAD	≧ 82.725%

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	10VDC~16.2VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25℃	10.06 VDC~ 16.49 VDC/NO LOAD 10.11 VDC~ 16.45 VDC/FULL LOAD
			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)	Test: OK –

2	DC CURRENT (TYP)	40A	IP: 12VDC OP:FULL LOAD Ta:25℃	36.6 A
3	NO LOAD DISSPATION (Typ.)	NON-Saving Mode=10W	IP: 12VDC OP:NO LOAD Ta:25℃	6.3 W
		SAVING MODE (1) Po： Default disable, auto detect AC output load ≦ 10W will be changed to saving mode (2) Pi ： ≦1.2 W	IP: 12VDC OP: TESTING LOAD Ta:25℃	NORMAL TO SAVING MODE: ≦ 16.65 W
			IP: 12VDC OP: TESTING LOAD Ta:25℃	0.848 W
4	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 12VDC OP: Sw off Ta:25℃	0mA
5	EFFICIENCY(TYP)	400W/91%	IP: 12.5VDC OP: Po=400W 110V/60HZ (factory setting) Ta:25℃	91.7%

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	11.03 V
2	BAT LOW SHUT DOWN	10V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	10.11 V
3	BAT LOW RESTART	12.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	12.52 V
4	BAT HIGH ALARM	15.5V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	15.52 V
5	BAT HIGH SHUT DOWN	16.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	16.50 V
6	BAT HIGH RESTART	15V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	15.02 V

7	OVER TEMPERATURE	Shut down o/p voltage: re-power on	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK
8	,OUTPUT SHORT	Shut down o/p voltage: re-power on	IP: 10.3VDC/16.2V O/P: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK (1).TEST: OK
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℃	(1). 107.5%~116.75% 180.24 sec (2). 117%~150.5% 10.59 sec Shut down o/p voltage, re-power on to recover

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: 12VDC OP: FULL LOAD Ta:25℃	Open : Normal work Short : Remote off TEST: OK

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 308 W · turn on OK LAMP: 399.64 W · turn on OK LAMP: 239.22 W · turn on OK	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
2	INDUCTION MOTOR	0.15 HP	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
3	SWITCHING POWER SUPPLY	WITH PFC: EPP-500-48 · O/P= 400.85	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
		NO PFC: LRS-350-36 · O/P= 364.04 W	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	

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 : 60V /60A	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℃	(1)37.5V (2) 35.5V (3)37.9 V (4) 36.3V (5) 37.5V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/ 10A	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℃	(1)507V (2)507V (3)507V (4)507V (5)503V
3	DC BUS Capacitor Voltage	C118 Rated : 220u/ 265 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℃	C118 (1) 256V (2) 256V (3) 251V (4) 247V (5) 247V
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℃	(1)491V (2) 523V (3) 515V (4) 499V (5) 495V
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 (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q504 (1) 38.1V (2) 38.1V (3) 38.1V (4) 38.1V (5) 38.1V Q105 (1) 65.0V (2) 65.0V (3) 65.0V (4) 65.0V (5) 65.0V
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 Gate Driver IC U200 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 (4) NO LOAD Turn On (5) Saving mode Ta:25℃	U303 (1)3.33 V (2) 3.33V (3) 3.33V (4) 3.33V (5) 3.33V U501 (1) 11.49V (2) 11.57V

		-0.3V~20V		(3) 11.57V (4) 11.49V (5) 11.57V U101 (1) 12.45V (2) 12.45V (3) 12.45V (4) 12.45V (5) 12.45V U200 (1) 5.06V (2) 5.14V (3) 5.06V (4) 5.06V (5) 5.06V

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	BATI/P-ACO/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25℃	BAT I/P-ACO/P: 1.893mA AC O/P-FG: 6.02mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	4mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS A	I/P:24 VDC O/P: :FULL/50% LOAD Ta:25℃	CLASSA
2	E.S.D	EN61000-4-2 AIR：15KV / Contact：8KV	I/P: 12VDC O/P:FULL LOAD Ta:25℃	■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-400P-248 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 50VDC O/P： FULL LOAD Ta= 31.1 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 50VDC O/P： FULL LOAD Ta= 41.1 ℃		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 50VDC O/P： 100%LOAD Ta= -25 ℃	TEST：OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 ℃ NO DAMAGE	I/P：65VDC O/P：FULL LOAD Ta= 40 ℃ HUMIDITY= 95 %R.H	TEST：OK

NO	Position	ROOM AMBIENT Ta=31.1 ℃	HIGH AMBIENT Ta= 41.1 ℃
1	Q103	50.9℃	59.8℃
2	Q101	48.1℃	56.9℃
3	C100	41.4℃	49.6℃
4	TB1	32.3℃	42.5℃
5	C101	44.9℃	53.0℃
6	T101	62.7℃	70.4℃
7	RT300	45.6℃	54.1℃
8	L100	34.2℃	43.3℃
9	L201	54.5℃	60.7℃
10	ZR200	47.7℃	54.5℃
11	C219	45.4℃	51.6℃
12	Q203	55.0℃	61.7℃
13	L200	49.1℃	56.0℃
14	C112	38.2℃	46.3℃
15	D107	44.2℃	51.6℃
16	D105	47.2℃	54.3℃
17	C119	44.3℃	50.8℃
18	Q200	54.3℃	61.2℃
19	C118	43.9℃	50.4℃
20	U201	50.8℃	56.5℃
21	U500	60.1℃	66.3℃
22	TSW1	50.2℃	56.9℃
23	U303	51.1℃	59.2℃
24	Q105	44.3℃	52.2℃
25	U100	51.2℃	59.4℃
26	T100	48.6℃	55.5℃
27	U501	63.4℃	70.2℃
28	Q501	56.6℃	63.8℃
29	Q504	57.2℃	64.0℃
30	T501	50.6℃	57.3℃

5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature： -45℃~ +90℃ 2. Temperature change rate ：25℃ / 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℃~ +45℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：10 CYCLE 5. Input/Output condition： 48VDC/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℃	TEST：OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P： 50VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 50VDC O/P：FULL LOAD Ta= 40 ℃ LIFE TIME	(1) 1424805.8HRS (2) 574653.9HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 836.2K hrs min. Telcordia SR-332 (Bellcore) ; 84.0K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P：50VDC O/P：80% LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010