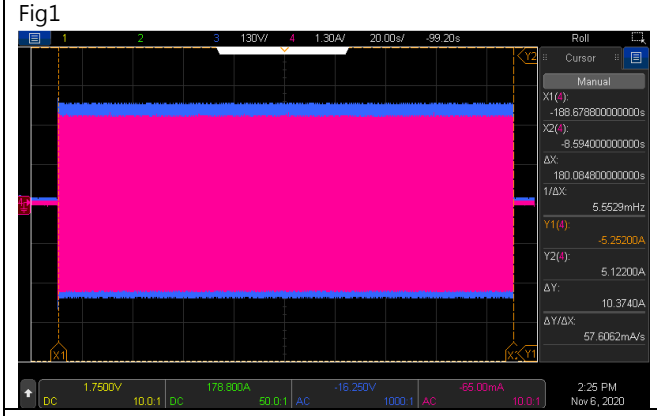
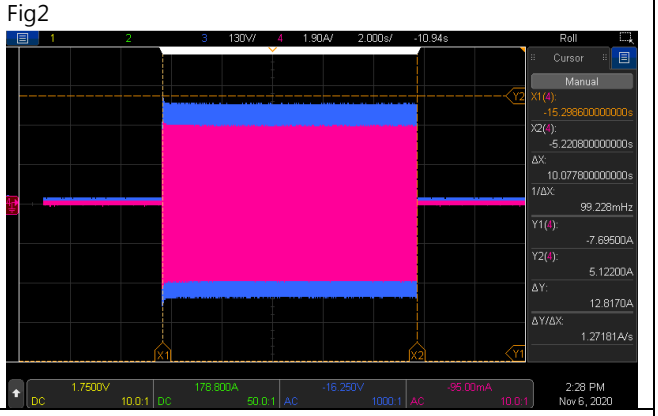
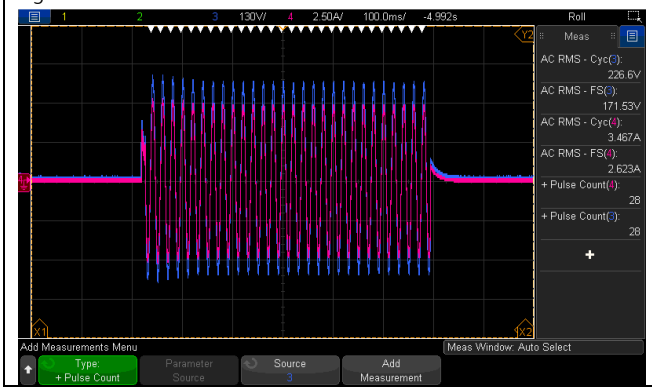
Test Report: NTS-400P-224

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: 24VDC 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: 25VDC OP:TESTING LOAD Ta:25℃	(1) 227.8 V/ 1.979 A/ 180.08 Sec (2) 227.4 V/ 2.578 A/ 10.07 Sec (3) 226.6V/ 3.481 A / 28 Cycle
	CH3:O/P VAC CH4:O/P IAC			
	Fig1 			
	Fig2 			
	Fig3 			
	Fig4			
3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25℃	DIP S.W 200VAC: 198.2 V DIP S.W 220VAC: 218.2 V DIP S.W 230VAC: 228.0 V DIP S.W 240VAC: 238.4 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC 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: 25VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 1.17 % / Vo(min) /FULL LOAD (2) 1.22 % / Vo(nor) /FULL LOAD (3) 1.49 % / Vo(max) /FULL LOAD

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

Fig1

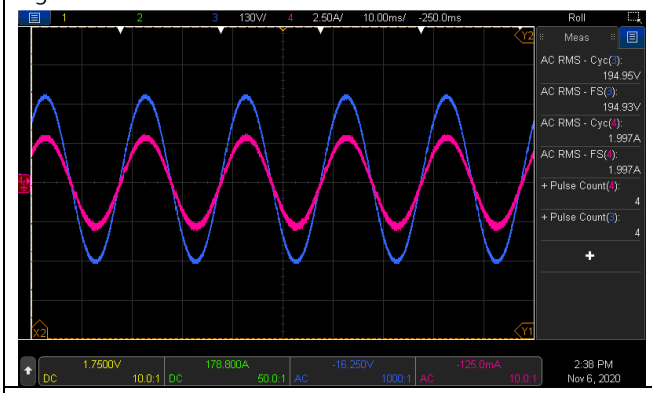


Fig2

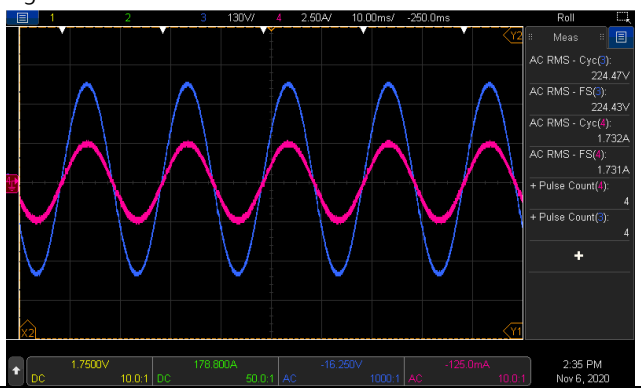
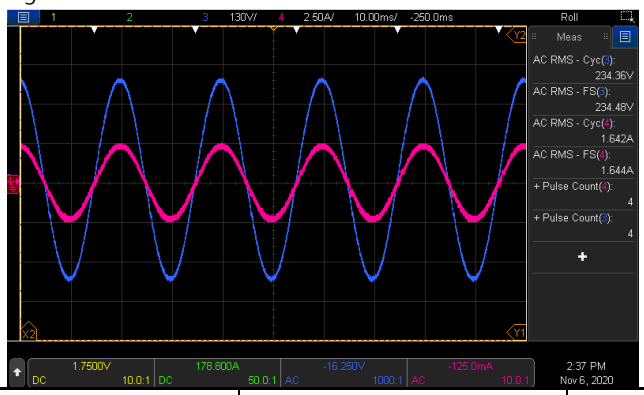


Fig3



6	AC REGULATION	±3%	IP: 25VDC OP: FULL LOAD/NO LOAD Ta:25℃	-0.74 %
7	Overshoot /Undershoot	<±10%	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25℃	(1) -5.61 % (2) -6.26 % (3) -1.74 %
8	O/P voltage DC offset	Vin(nor)= 24 v · Vo<200mv · no load : 88.6mv / full load: 160mv		

9	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	25~31VDC±0.5v	>24.86 Vdc
Orange	22~25VDC ±0.5v	21.89Vdc ~ 24.75dc
Red	<22 Vdc ±0.5v >31 Vdc ±0.5v	<21.85Vdc >30.95 Vdc

● Load test

LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~ 40.75%
Orange	40%±5% ~ 80%±5% LOAD	41% ~80.0 %
Red	≧ 80%±5% LOAD	≧ 80. 25%

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℃	19.95 VDC~ 32.78 VDC/NO LOAD 19.99 VDC~ 32.72 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) 加测： I/P: 24V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	Test： OK –

2	DC CURRENT (TYP)	20A	IP: 24VDC OP:FULL LOAD Ta:25℃	17.79 A
3	NO LOAD DISSPATION (Typ.)	NON-Saving Mode=10W	IP: 24VDC OP:NO LOAD Ta:25℃	6.40 W
		SAVING MODE (1) Po： Default disable, auto detect AC output load ≦ 10W will be changed to saving mode (2) Pi ： ≦1.3 W	IP: 24VDC OP: TESTING LOAD Ta:25℃	NORMAL TO SAVING MODE: ≦ 12 W
			IP: 24VDC OP: TESTING LOAD Ta:25℃	0.95 W
4	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 24VDC OP: Sw off Ta:25℃	0 mA
5	EFFICIENCY(TYP)	400W/93%	IP: 25VDC OP: Po=400W 230V/50HZ (factory setting) Ta:25℃	93.88 %

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℃	21.87 V
2	BAT LOW SHUT DOWN	20V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	19.97 V
3	BAT LOW RESTART	25V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	24.84 V
4	BAT HIGH ALARM	31V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	30.83 V
5	BAT HIGH SHUT DOWN	33V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	32.79 V
6	BAT HIGH RESTART	30V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	29.91 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: 24VDC 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: 24VDC OP: TESTING SW:ON Ta:25℃	(1). 104.5%~ 112.5 % 180.08 sec (2). 113.25 %~ 146.25 % 10.07 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: 24VDC 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: 207 W · turn on OK LAMP: 408 W · turn on OK LAMP: 510 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= 400.85W	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
		NO PFC: LRS-350-36 · O/P= 360 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 :100 V /80 A	I/P: high line O/P:V(max)/Freq 50HZ 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) 78.9V (2) 79.7V (3) 78.9V (4) 79.7V (5) 78.9V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/10 A	I/P: high line O/P:V(max) /Freq 50HZ 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℃	 (1)521V (2)533V (3)521V (4)521V (5)525V
3	DC BUS Capacitor Voltage	C118 Rated : 270u/ 265 V	I/P: high line O/P:V(max) /Freq 50HZ 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) 248V (2)242 V (3) 236V (4) 238V (5) 240V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 IKP15N65H5 Rated : 650V / 15 A	I/P: high line O/P:V(max) /Freq 50HZ 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) 515V (2) 563V (3) 551V (4) 515V (5) 515V
5	AUX PWM MOS	Q504 Rated : 18A/ 200 V Q105 Rated : 40A/ 200 V	I/P: high line O/P:V(max) /Freq 50HZ 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℃	 Q504 (1) 71.6V (2) 71.6V (3) 70.8V (4) 72.4V (5) 72.4V Q105 (1)91.7 V (2) 91.7V (3) 90.9V (4) 90.9V (5) 91.7V
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 50HZ 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) 3.34V (2)3.42V (3) 3.46V (4) 3.34V (5) 3.34V U501 (1) 11.67V

		Gate Driver IC U200 Rated -0.3V~20V		(2) 11.67V (3) 11.67V (4) 11.67V (5) 11.67V U101 (1)12.63 V (2) 12.71V (3)12.63V (4) 12.71V (5) 12.63V U200 (1) 5.03V (2) 5.11V (3) 5.11V (4) 5.03V (5) 5.03V

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: 2.62 mA AC O/P-FG: 6.1 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	8mΩ

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: 24VDC 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