



Test Report: NTS-400P-248

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: 48VDC Ta:25°C	<u>408 W</u>
2	MAXIMUM OUTPUT POWER (TYP)	(1)460W/180sec. (2)600w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 50VDC OP:TESTING LOAD Ta:25°C	(1) 228.4 V/ 1.99 A/ 180.0 Sec (2) 228.00 V/ 2.59 A/ 10.07 Sec (3) 227.7 V/ 3.48A/ 27 Cycle

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

Fig1

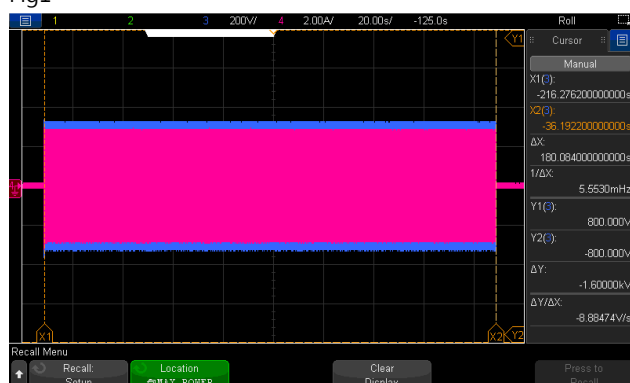


Fig2

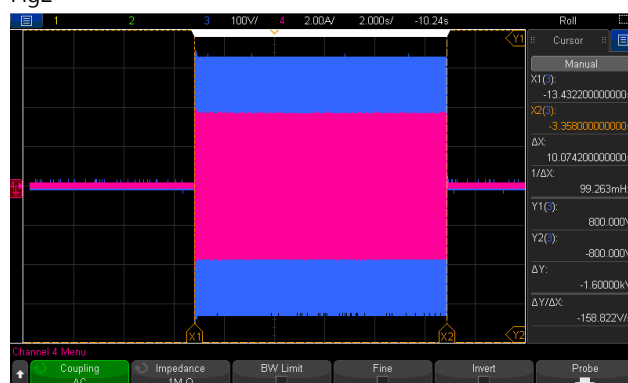


Fig3

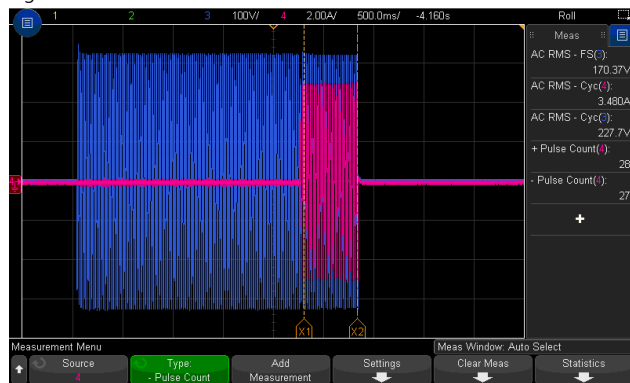


Fig4

3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.5 V</u> DIP S.W 220VAC: <u>218.7 V</u> DIP S.W 230VAC: <u>228.7 V</u> DIP S.W 240VAC: <u>238.7 V</u>
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.042 HZ</u> DIP S.W 60HZ: <u>59.958 HZ</u>
5	WAVEFORM	True sine wave (THD<3%)	IP: 50VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 0.949% / Vo(min) /FULL LOAD (2) 1.01% / Vo(nor) /FULL LOAD (3) 0.965% / Vo(max) /FULL LOAD

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

Fig1

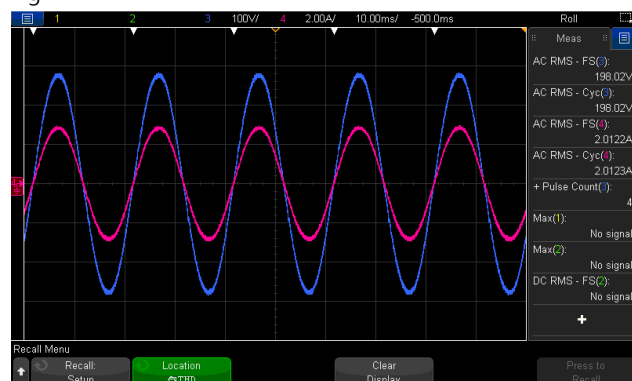


Fig2

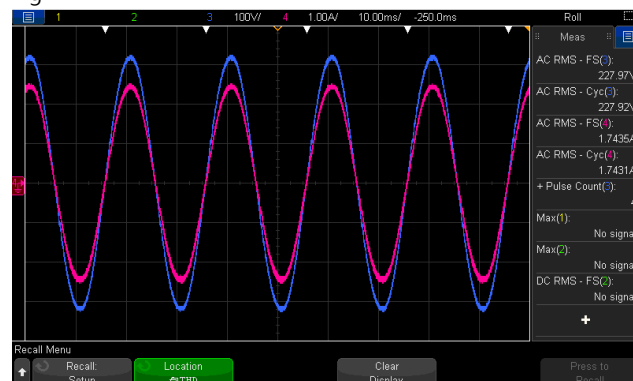
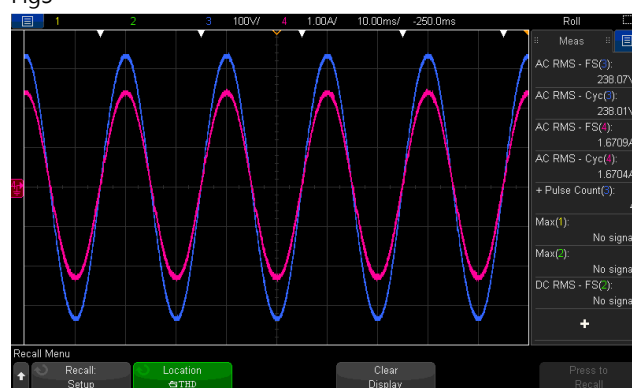


Fig3



6	AC REGULATION	$\pm 3\%$	IP: 50VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u> -0.70 </u> %
7	Overshoot /Undershoot	$< \pm 10\%$	IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u> -8.13 </u> % (2) <u> -6.30 </u> % (3) <u> -2.30 </u> %
8	O/P voltage DC offset	Vin(nor)= <u> 48 </u> v · Vo<200mv · no load : <u> 81.6 mv </u> / full load: <u> -77.8mv </u>		

9	LED STATUS	Status test <table> <tr> <th>LED</th><th>Status</th><th>RESULT</th></tr> <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> </table> Battery test <table> <tr> <th>LED</th><th>Battery RANGE</th><th>RESULT</th></tr> <tr> <td> Green</td><td>50.0~62.0 Vdc±1v</td><td>50.103~ 62.23vdc</td></tr> <tr> <td> Orange</td><td>44.0~50.0Vdc ±1v</td><td>44.073 ~ 50.043 vdc</td></tr> <tr> <td> Red</td><td><44.0 Vdc ±1v > 62.0vdc±1v</td><td>< 44.063vdc > 62.24vdc</td></tr> </table> Load test <table> <tr> <th>LED</th><th>LOAD RANGE</th><th>RESULT</th></tr> <tr> <td> Green</td><td>Min. load ~ 40%±5% LOAD</td><td>Min. load ~ 42%</td></tr> <tr> <td> Orange</td><td>40%±5% ~ 80%±5% LOAD</td><td>42.25%~81.75 %</td></tr> <tr> <td> Red</td><td>≥ 80%±5% LOAD</td><td>≥ 82 %</td></tr> </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	50.0~62.0 Vdc±1v	50.103~ 62.23vdc	 Orange	44.0~50.0Vdc ±1v	44.073 ~ 50.043 vdc	 Red	<44.0 Vdc ±1v > 62.0vdc±1v	< 44.063vdc > 62.24vdc	LED	LOAD RANGE	RESULT	 Green	Min. load ~ 40%±5% LOAD	Min. load ~ 42%	 Orange	40%±5% ~ 80%±5% LOAD	42.25%~81.75 %	 Red	≥ 80%±5% LOAD	≥ 82 %
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	40VDC~66VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C I/P: LOW-LINE=42V HIGH-LINE=65V 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>40.189 VDC~ 66.03 VDC/NO LOAD</u> <u>40.199 VDC~ 66.04 VDC/FULL LOAD</u> Test: <u>OK</u> -

2	DC CURRENT (TYP)	10A	IP: 48VDC OP: FULL LOAD Ta: 25°C	<u>8.92</u> A
3	NO LOAD DISSIPATION (Typ.)	NON-Saving Mode=12W	IP: 48VDC OP: NO LOAD Ta: 25°C	<u>7.94</u> W
		SAVING MODE (1) Po: Default disable, auto detect AC output load $\leq 10W$ will be changed to saving mode	IP: 48VDC OP: TESTING LOAD Ta: 25°C	NORMAL TO SAVING MODE: <u>≤ 15.44</u> W
		(2) Pi : ≤ 1.5 W	IP: 48VDC OP: TESTING LOAD Ta: 25°C	<u>1.14</u> W
4	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 48VDC OP: Sw off Ta: 25°C	0mA
5	EFFICIENCY(TYP)	400W/93%	IP: 50VDC OP: Po=400W 230V/50HZ (factory setting) Ta: 25°C	93.89%

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	44V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>44.075</u> V
2	BAT LOW SHUT DOWN	40V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>40.189</u> V
3	BAT LOW RESTART	50V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>50.155</u> V
4	BAT HIGH ALARM	62V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>61.8</u> V
5	BAT HIGH SHUT DOWN	66V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>65.8</u> V
6	BAT HIGH RESTART	60V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>59.8</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: 48VDC 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: 48VDC OP: TESTING SW:ON Ta:25°C	(1). <u>105.5~113.75</u> % <u>180.17</u> sec (2). <u>115~ 147.5</u> % <u>10.21</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	Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off	IP: 48VDC OP: FULL LOAD Ta:25°C	Open : Normal work Short : Remote off TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>312.14</u> W · turn on <u>OK</u> LAMP: <u>412.55</u> W · turn on <u>OK</u> LAMP: <u>517.9</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P = 230V/50Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.15</u> HP	1. Vin=HIGH LINE 2. O/P = 230V/50Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>EPP-500-48</u> · O/P= <u>402.78W</u>	1. Vin=HIGH LINE 2. O/P = 230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>314.96</u> W	1. Vin=HIGH LINE 2. O/P = 230V/50Hz 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 : 200V /75 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°C	(1)159 V (2) 159V (3) 159V (4) 155V (5) 153V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/ 10A	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°C	(1)532V (2)560V (3)560V (4)548V (5)540V
3	DC BUS Capacitor Voltage	C118 Rated : 270 u/ 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°C	C118 (1) 248V (2) 244V (3) 250V (4) 248V (5) 246V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 Rated : 15A / 650 V	I/P: high line O/P: (1)Full Load Turn On 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) 519V (2) 551V (3) 563V (4) 527V (5) 527V
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 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°C	Q504 (1) 129.5V (2) 129.5V (3) 129.5V (4) 129.5V (5) 129.5V Q105 (1) 143V (2) 141V (3) 139V (4) 137V (5) 137V
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 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°C	U303 (1) 3.46V (2) 3.42V (3) 3.42V (4) 3.42V (5) 3.42V U501 (1) 11.59V (2) 11.59V

		-0.3V~20V		(3) 11.59V (4) 11.59V (5) 11.59V U101 (1) 12.63V (2) 12.55V (3) 12.55V (4) 12.55V (5) 12.63V U200 (1) 5.27V (2) 5.27V (3) 5.19V (4) 5.19V (5) 5.19V
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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: 2.863mA AC O/P-FG: 6.22mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	5mΩ

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°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-400P-248			
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 31.1 °C			
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 41.1 °C			
		NO	Position	ROOM AMBIENT Ta=31.1 °C	HIGH AMBIENT Ta= 41.1 °C
		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℃		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 50VDC 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 : 65VDC 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 : 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°C	TEST : OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P : 50VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 50VDC O/P : FULL LOAD Ta= 40 °C 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°C)	
11	Ongoing Reliability Test	I/P : 50VDC 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