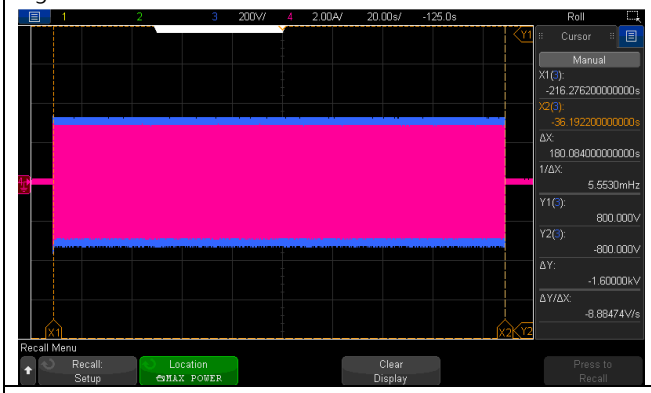
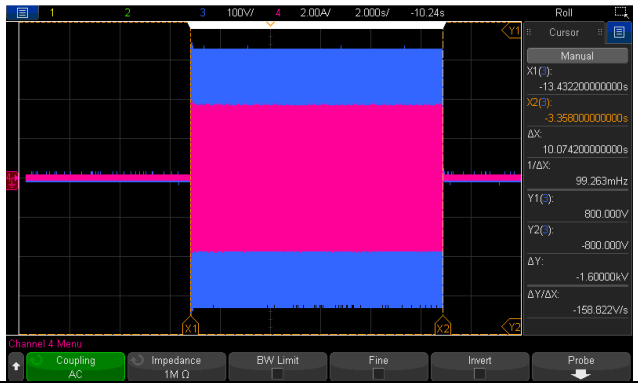
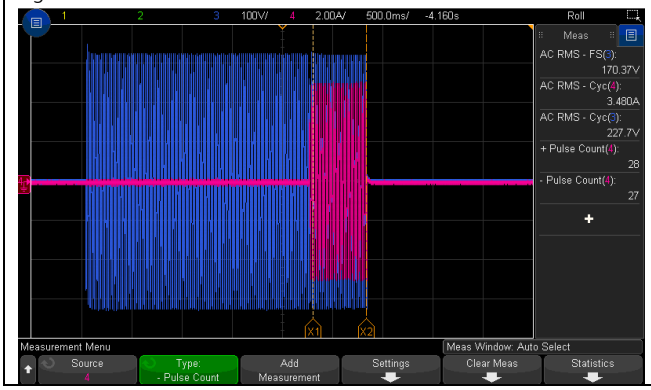
Test Report: NTS-400P-248

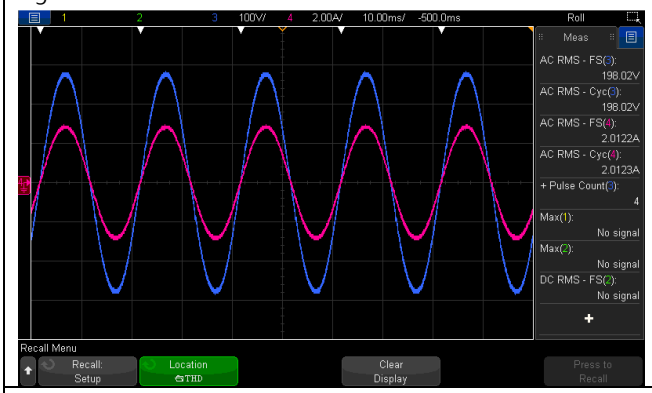
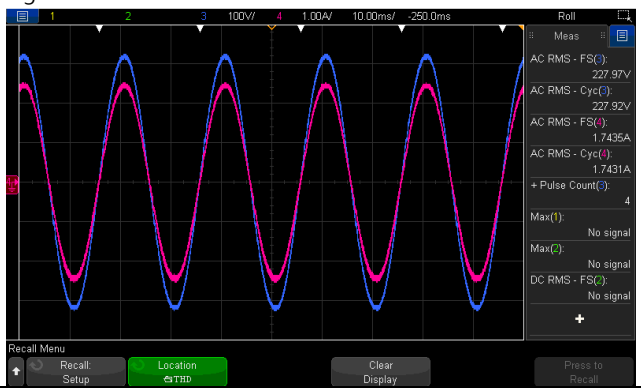
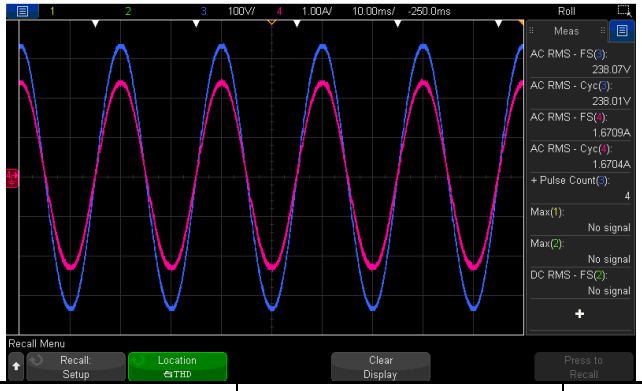
400W High Reliable Built-in Type True Sine Wave DC-AC Power Inverter

- **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℃	408 W
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℃	(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℃	DIP S.W 200VAC: 198.5 V DIP S.W 220VAC: 218.7 V DIP S.W 230VAC: 228.7 V DIP S.W 240VAC: 238.7 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25℃	DIP S.W 50HZ: 50.042 HZ DIP S.W 60HZ: 59.958 HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 50VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(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	±3%	IP: 50VDC OP: FULL LOAD/NO LOAD Ta:25℃	-0.70 %
7	Overshoot /Undershoot	<±10%	IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25℃	(1) -8.13 % (2) -6.30 % (3) -2.30 %
8	O/P voltage DC offset	Vin(nor)= 48 v · Vo<200mv · no load : 81.6 mv / full load: -77.8mv		

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	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

● Load test

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 %

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℃	40.189 VDC~ 66.03 VDC/NO LOAD 40.199 VDC~ 66.04 VDC/FULL LOAD
			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)	Test： OK –

2	DC CURRENT (TYP)	10A	IP: 48VDC OP:FULL LOAD Ta:25℃	8.92 A
3	Power Saving Mode NON-Saving Mode	≦ 1.5W @ saving mode ＜12W@ non-saving mode	IP: 48VDC OP:NO LOAD Ta:25℃	1.14 W 7.94 W
4	SAVING MODE TO NORMAL	Po≥25W	IP: 48VDC OP: TESTING LOAD Ta:25℃	≥ 20.94 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 48VDC OP: TESTING LOAD Ta:25℃	≤ 15.44 W
6	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 48VDC OP: Sw off Ta:25℃	0mA
7	EFFICIENCY(TYP)	400W/93%	IP: 50VDC OP: Po=400W 230V/50HZ (factory setting) Ta:25℃	93.89%

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	44V±1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	44.075 V
2	BAT LOW SHUT DOWN	40V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	40.189 V
3	BAT LOW RESTART	50V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	50.155 V
4	BAT HIGH ALARM	62V±1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	61.8 V
5	BAT HIGH SHUT DOWN	66V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	65.8 V
6	BAT HIGH RESTART	60V±1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	59.8 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: 48VDC 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: 48VDC OP: TESTING SW:ON Ta:25℃	(1). 105.5~113.75 % 180.17 sec (2). 115~ 147.5 % 10.21 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℃	Open : Normal work Short : Remote off TEST: OK

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 312.14 W · turn on OK LAMP: 412.55 W · turn on OK LAMP: 517.9 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= 402.78W	1. Vin=HIGH LINE 2. O/P = 230V/50Hz TEST: OK	
		NO PFC: LRS-350-36 · O/P= 314.96 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 : 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℃	(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℃	 (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℃	 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℃	 (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℃	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℃	 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

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: 2.863mA 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℃	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℃	CLASS A
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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">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 ℃

<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=31.1 ℃</th><th>HIGH AMBIENT Ta= 41.1 ℃</th></tr>
<tr><td>1</td><td>Q103</td><td>50.9℃</td><td>59.8℃</td></tr>
<tr><td>2</td><td>Q101</td><td>48.1℃</td><td>56.9℃</td></tr>
<tr><td>3</td><td>C100</td><td>41.4℃</td><td>49.6℃</td></tr>
<tr><td>4</td><td>TB1</td><td>32.3℃</td><td>42.5℃</td></tr>
<tr><td>5</td><td>C101</td><td>44.9℃</td><td>53.0℃</td></tr>
<tr><td>6</td><td>T101</td><td>62.7℃</td><td>70.4℃</td></tr>
<tr><td>7</td><td>RT300</td><td>45.6℃</td><td>54.1℃</td></tr>
<tr><td>8</td><td>L100</td><td>34.2℃</td><td>43.3℃</td></tr>
<tr><td>9</td><td>L201</td><td>54.5℃</td><td>60.7℃</td></tr>
<tr><td>10</td><td>ZR200</td><td>47.7℃</td><td>54.5℃</td></tr>
<tr><td>11</td><td>C219</td><td>45.4℃</td><td>51.6℃</td></tr>
<tr><td>12</td><td>Q203</td><td>55.0℃</td><td>61.7℃</td></tr>
<tr><td>13</td><td>L200</td><td>49.1℃</td><td>56.0℃</td></tr>
<tr><td>14</td><td>C112</td><td>38.2℃</td><td>46.3℃</td></tr>
<tr><td>15</td><td>D107</td><td>44.2℃</td><td>51.6℃</td></tr>
<tr><td>16</td><td>D105</td><td>47.2℃</td><td>54.3℃</td></tr>
<tr><td>17</td><td>C119</td><td>44.3℃</td><td>50.8℃</td></tr>
<tr><td>18</td><td>Q200</td><td>54.3℃</td><td>61.2℃</td></tr>
<tr><td>19</td><td>C118</td><td>43.9℃</td><td>50.4℃</td></tr>
<tr><td>20</td><td>U201</td><td>50.8℃</td><td>56.5℃</td></tr>
<tr><td>21</td><td>U500</td><td>60.1℃</td><td>66.3℃</td></tr>
<tr><td>22</td><td>TSW1</td><td>50.2℃</td><td>56.9℃</td></tr>
<tr><td>23</td><td>U303</td><td>51.1℃</td><td>59.2℃</td></tr>
<tr><td>24</td><td>Q105</td><td>44.3℃</td><td>52.2℃</td></tr>
<tr><td>25</td><td>U100</td><td>51.2℃</td><td>59.4℃</td></tr>
<tr><td>26</td><td>T100</td><td>48.6℃</td><td>55.5℃</td></tr>
<tr><td>27</td><td>U501</td><td>63.4℃</td><td>70.2℃</td></tr>
<tr><td>28</td><td>Q501</td><td>56.6℃</td><td>63.8℃</td></tr>
<tr><td>29</td><td>Q504</td><td>57.2℃</td><td>64.0℃</td></tr>
<tr><td>30</td><td>T501</td><td>50.6℃</td><td>57.3℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 50VDC
O/P： 100%LOAD
Ta= -25 ℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 40 ℃
NO DAMAGE</td><td>I/P：65VDC
O/P：FULL LOAD
Ta= 40 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
</table>

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 278.7K hrs min. Telcordia SR-332 (Bellcore) ; 84K 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