



# Test Report: NTS-250P-212

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250W High Reliable Built-in Type True Sine Wave DC-AC Power Inverter

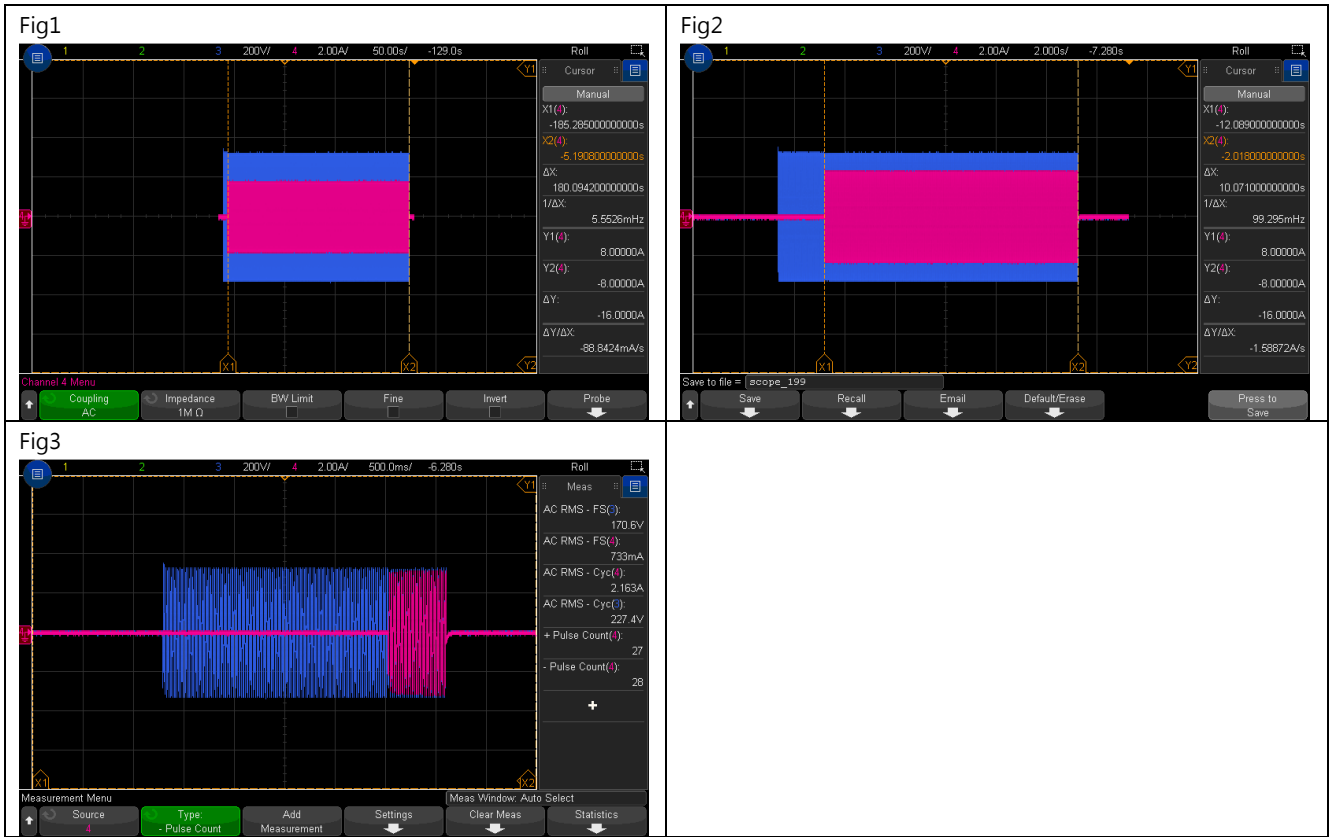
- **DESIGN VERIFY TEST**
  - Output Function Test
  - Input Function Test
  - Protection Function Test
  - Control Function Test
  - APPLICATION Test
  - Component Stress Test
- **SAFETY & E.M.C. TEST**
  - Safety Test
  - E.M.C. Test
- **RELIABILITY TEST**
  - ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	250W	IP: 12VDC Ta:25°C	<u>255.86</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1) 285W/180sec. (2) 375w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 12.5VDC OP:TESTING LOAD Ta:25°C	(1) 229.28 V/ 1.24A/ 180.09 Sec (2)229.16 V/1.62 A/10.07Sec (3) 227.4V/2.163 A/ 27 Cycle

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



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>199.38</u> V DIP S.W 220VAC: <u>219.42</u> V DIP S.W 230VAC: <u>229.52</u> V DIP S.W 240VAC: <u>239.58</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.042</u> HZ DIP S.W 60HZ: <u>59.959</u> 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°C	(1) 0.961 % / Vo(min) /FULL LOAD (2) 0.855 % / Vo(nor) /FULL LOAD (3) 0.812 % / Vo(max) /FULL LOAD

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

Fig1

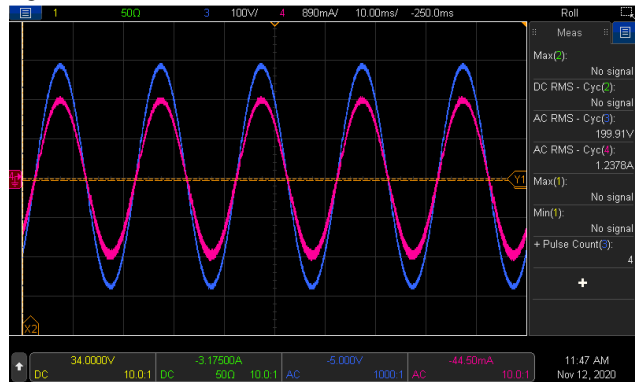


Fig2

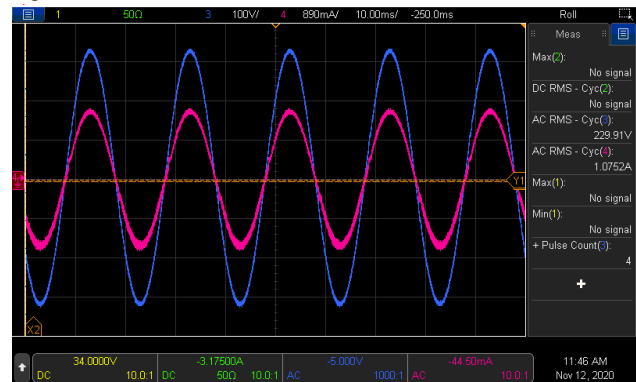
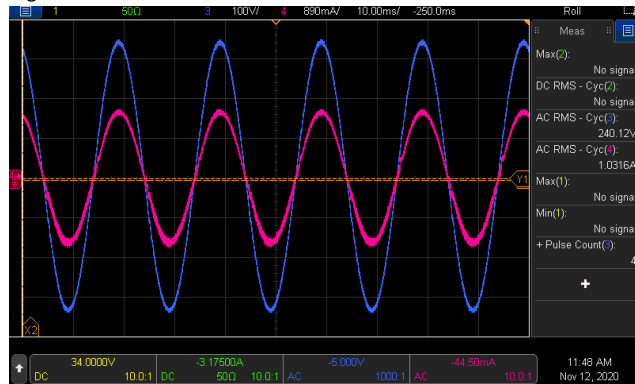


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP: FULL LOAD/NO LOAD Ta:25°C	-0.252 %
7	Overshoot /Undershoot	< ±10%	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) -5.3 % (2) -5.96 % (3) -1.83 %
8	O/P voltage DC offset	Vin(nor)= 12 v · Vo<200mv · no load : 74.5mv / full load: 76.5 mv		

9	LED STATUS	<ul style="list-style-type: none"> <li> <b>Status test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Status</th> <th>RESULT</th> </tr> </thead> <tbody> <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> </tbody> </table> </li> <li> <b>Battery test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>12.5~15.5Vdc±0.3v</td> <td>12.563V~15.539V</td> </tr> <tr> <td> Orange</td> <td>11~12.5Vdc ±0.3v</td> <td>10.013V~12.488V</td> </tr> <tr> <td> Red</td> <td>&lt;11Vdc or &gt;15.5Vdc ±0.3v</td> <td>&lt;10.988V &gt;15.639</td> </tr> </tbody> </table> </li> <li> <b>Load test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>Min. load ~ 40%±5% LOAD</td> <td>Min. load ~ 41.6%</td> </tr> <tr> <td> Orange</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>42%~80.8 %</td> </tr> <tr> <td> Red</td> <td>≥ 80%±5% LOAD</td> <td>≥ 81.2 %</td> </tr> </tbody> </table> </li> </ul>			LED	Status	RESULT	Green	Inverter OK	OK	Orange	Remote off Saving mode	OK	Red	Abnormal Status (See SPEC)	OK	LED	Battery RANGE	RESULT	Green	12.5~15.5Vdc±0.3v	12.563V~15.539V	Orange	11~12.5Vdc ±0.3v	10.013V~12.488V	Red	<11Vdc or >15.5Vdc ±0.3v	<10.988V >15.639	LED	LOAD RANGE	RESULT	Green	Min. load ~ 40%±5% LOAD	Min. load ~ 41.6%	Orange	40%±5% ~ 80%±5% LOAD	42%~80.8 %	Red	≥ 80%±5% LOAD	≥ 81.2 %
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**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°C  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)	<u>10.07</u> VDC~ <u>16.4</u> VDC/NO LOAD <u>10.12</u> VDC~ <u>16.48</u> VDC/FULL LOAD  Test: <u>OK</u>

2	DC CURRENT (TYP)	25A	IP: 12VDC OP:FULL LOAD Ta:25°C	<u>22.98</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.2W$ @ saving mode $\leq 10W$ @NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25°C	<u>0.86</u> W <u>6.428</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 12VDC OP: TESTING LOAD Ta:25°C	<u><math>\geq 20.92</math></u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 12VDC OP: TESTING LOAD Ta:25°C	<u><math>\leq 14</math></u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 12VDC OP: Sw off Ta:25°C	0mA
7	EFFICIENCY(TYP)	250W/ 92%	IP: 12.5VDC OP: $P_o = W$ 230V/50HZ (factory setting) Ta:25°C	92.67%

**PROTECTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V $\pm$ 0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>10.998</u> V
2	BAT LOW SHUT DOWN	10V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>10.16</u> V
3	BAT LOW RESTART	12.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>12.516</u> V
4	BAT HIGH ALARM	15.5V $\pm$ 0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>15.536</u> V
5	BAT HIGH SHUT DOWN	16.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>16.52</u> V
6	BAT HIGH RESTART	15V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>15.039</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: 12VDC 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: 12VDC OP: TESTING SW:ON Ta:25°C	(1). <u>105.4~114</u> % <u>180.0888</u> sec (2). <u>114.8~148</u> % <u>10.1552</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: 12VDC 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>215</u> W · turn on <u>OK</u> LAMP: <u>315</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.12</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>255.32W</u>	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>254.83W</u>	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 : 60V /60 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) 37.0V (2) 37.0V (3) 35.8V (4) 37.0V (5) 37.0V

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°C	(1)507V (2)523V (3)503V (4)507V (5)507V
3	DC BUS Capacitor Voltage	C118 Rated : 220u/ 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) 238V (2) 246V (3) 246V (4) 242V (5) 246V
4	DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage	Q 200 Rated : 650V / 40 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)526V (2) 575V (3) 535V (4) 522V (5) 519V
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) 43.1V (2) 43.1V (3) 43.5V (4) 43.5 V (5) 43.5V  Q105 (1) 65.2V (2) 65.2V (3) 66.0V (4) 65.2V (5) 66.0V
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°C	U303 (1) 3.34 V (2) 3.38V (3) 3.34V (4) 3.34V (5) 3.34V  U501 (1) 11.59V (2) 11.59V

		-0.3V~20V		(3)11.59V (4) 11.59V (5) 11.59V  U101 (1) 12.79V (2) 12.71V (3) 12.63V (4) 12.63V (5) 12.63V  U200 (1) 5.11V (2) 5.11V (3) 5.11V (4) 5.07V (5) 5.07V
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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	BATI/P-ACO/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-ACO/P: 1.90 mA AC O/P-FG: 2.21 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	7mΩ

**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	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> 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-212 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 40 °C																																																																																																																																		
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27	T501	75.1°C	90.6°C																																																																																																																																	
28	Q504	81.4°C	96.4°C																																																																																																																																	
29	C219	62.5°C	78.8°C																																																																																																																																	
30	U500	62.6°C	78.1°C																																																																																																																																	
31	U201	68.4°C	84.5°C																																																																																																																																	
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC 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 : 16.1VDC 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 : 12VDC/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: 12.5VDC O/P: FULL LOAD Ta= 25 °C LIFE TIME (2) I/P: 12.5VDC O/P: FULL LOAD Ta= 40 °C LIFE TIME	(1) 88363.2HRS (2) 31897.5HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 279K hrs min. Telcordia SR-332 (Bellcore) ; 84K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 12.5VDC 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