



Test Report: NTS-250P-248

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: 48VDC Ta:25°C	<u>255.64</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)287.5W/180sec. (2)372w/10sec (3)SURGE POWER 500W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 50VDC OP:TESTING LOAD Ta:25°C	(1) 229.12 V/1.2587A/ 180.09 Sec (2) 228.9 V/ 1.6295 A/ 10.06 Sec (3) 227.3V/ 2.173 A/ 27Cycle

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

Fig1

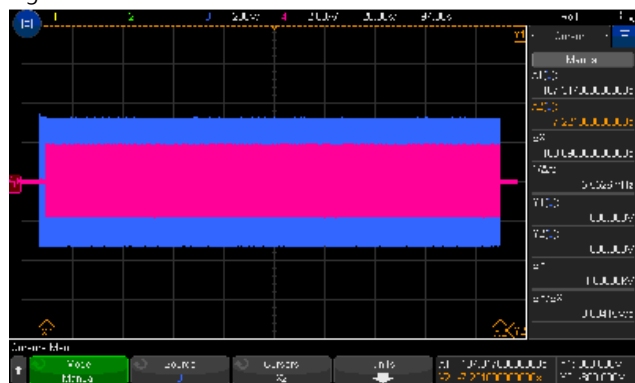


Fig2

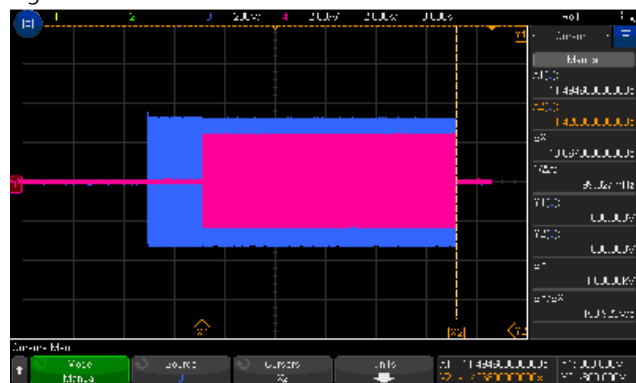


Fig3

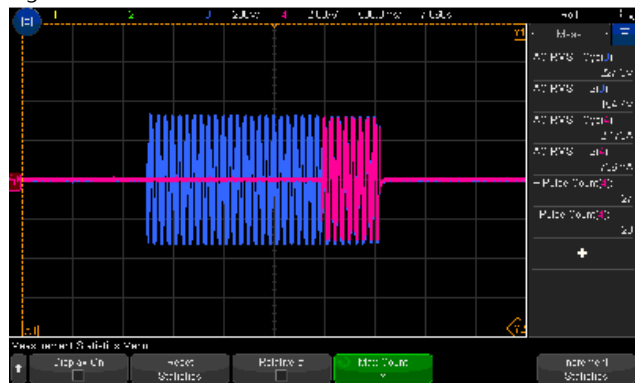


Fig4

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>199.28</u> V DIP S.W 220VAC: <u>219.26</u> V DIP S.W 230VAC: <u>229.18</u> V DIP S.W 240VAC: <u>239.32</u> V
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</u> HZ DIP S.W 60HZ: <u>59.958</u> HZ
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) 0.852% / Vo(min) /FULL LOAD (2) 0.896% / Vo(nor) /FULL LOAD (3) 1..19% / Vo(max) /FULL LOAD

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

Fig1

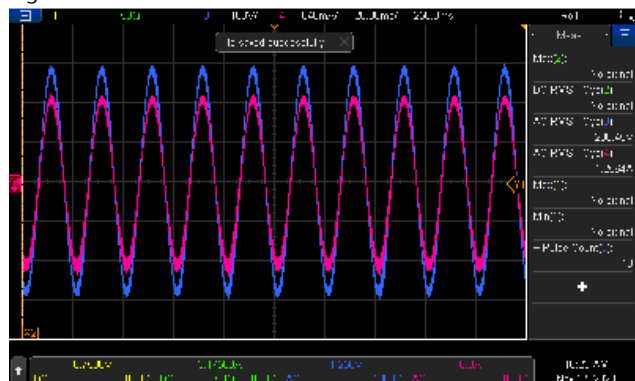


Fig2

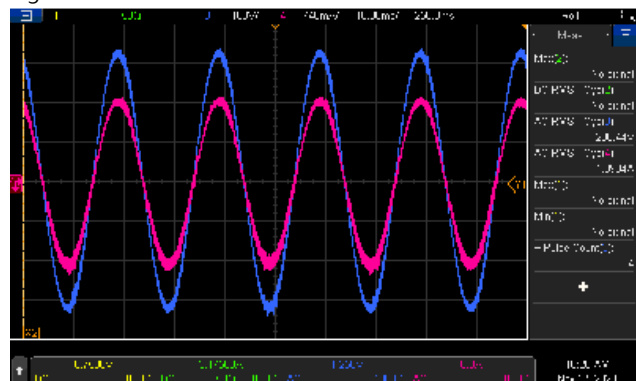
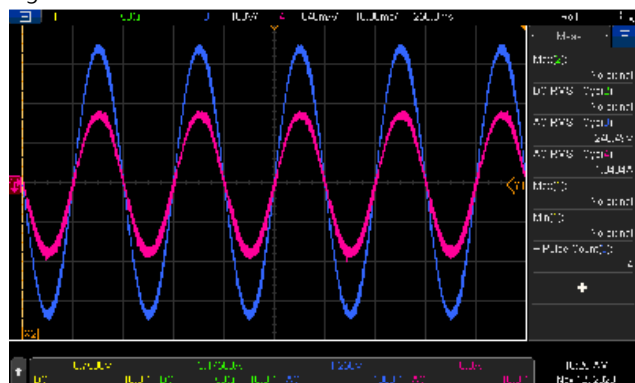


Fig3



6	AC REGULATION	$\pm 3\%$	IP: 50VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u> -0.39 </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> -4.52 % </u> (2) <u> -6.04 % </u> (3) <u> -1.83 % </u>
8	O/P voltage DC offset	Vin(nor)= <u> 48 </u> v · Vo<200mv · no load : <u> 83.5mV </u> / full load: <u> 140mV </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~ 62Vdc $\pm$1v</td><td>49.971Vdc ~ 61.92Vdc</td></tr> <tr> <td> Orange</td><td>44~ 50Vdc $\pm$1v</td><td>44.019Vdc ~ 49.923Vdc</td></tr> <tr> <td> Red</td><td><44 Vdc $\pm$1v >62Vdc$\pm$1v</td><td><43.928 Vdc >61.98Vdc</td></tr> </table> Load test <table> <tr> <th>LED</th><th>LOAD RANGE</th><th>RESULT</th></tr> <tr> <td> Green</td><td>Min. load ~ 40%$\pm$5% LOAD</td><td>Min. load ~ 42.4%</td></tr> <tr> <td> Orange</td><td>40%$\pm$5% ~ 80%$\pm$5% LOAD</td><td>42.8%~ 81.6%</td></tr> <tr> <td> Red</td><td>$\geq$ 80%$\pm$5% LOAD</td><td>$\geq$ 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~ 62Vdc $\pm$ 1v	49.971Vdc ~ 61.92Vdc	 Orange	44~ 50Vdc $\pm$ 1v	44.019Vdc ~ 49.923Vdc	 Red	<44 Vdc $\pm$ 1v >62Vdc $\pm$ 1v	<43.928 Vdc >61.98Vdc	LED	LOAD RANGE	RESULT	 Green	Min. load ~ 40% $\pm$ 5% LOAD	Min. load ~ 42.4%	 Orange	40% $\pm$ 5% ~ 80% $\pm$ 5% LOAD	42.8%~ 81.6%	 Red	$\geq$ 80% $\pm$ 5% LOAD	$\geq$ 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>40.143</u> VDC~ <u>65.89</u> VDC/NO LOAD <u>40.098</u> VDC~ <u>65.44</u> VDC/FULL LOAD Test: <u>OK</u> -

2	DC CURRENT (TYP)	7A	IP: 48VDC OP:FULL LOAD Ta:25°C	<u>4.6</u> A
3	Power Saving Mode NON-Saving Mode	$\leq 1.5W$ @ saving mode $<12W$ @ non-saving mode	IP: 48VDC OP:NO LOAD Ta:25°C	<u>1.39</u> W <u>7.64</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>≥ 20.97</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>≤ 15</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 48VDC OP: Sw off Ta:25°C	<u>0</u> mA
7	EFFICIENCY(TYP)	250W/93 %	IP: 50VDC OP: $P_o = 250W$ 240V/60HZ (factory setting) Ta:25°C	93.94%

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>43.966</u> V
2	BAT LOW SHUT DOWN	40V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>40.067</u> V
3	BAT LOW RESTART	50V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>50.189</u> V
4	BAT HIGH ALARM	62V $\pm$ 1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>62.05</u> V
5	BAT HIGH SHUT DOWN	66V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>66.03</u> V
6	BAT HIGH RESTART	60V $\pm$ 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>59.98</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>106.4 %~ 115.2%</u> <u>180.096</u> sec (2). <u>115.6%~ 148.8%</u> <u>10.067</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 (1). TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>204.32</u> W · turn on <u>OK</u> LAMP: <u>309.22</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>250.163W</u>	1. Vin=HIGH LINE 2. O/P = 230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>250.12W</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 : 200V /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)159V (2) 153V (3)175V (4)155V (5)155V

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 (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 528V (2) 536V (3) 528V (4) 544V (5) 536V
3	DC BUS Capacitor Voltage	C118 /C119 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) 261V (2) 252V (3) 250V (4) 250V (5) 250V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 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°C	(1)517V (2) 537V (3) 521V (4) 529V (5) 525V
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°C	Q504 (1) 128.6V (2) 127.8V (3) 127.8V (4) 128.6V (5) 128.6V Q105 (1) 142V (2) 144V (3) 144V (4) 144V (5) 144V
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) 3.38V (2) 3.38V (3) 3.42V (4) 3.38V (5) 3.38V U501 (1) 11.66V (2) 11.66V

		-0.3V~20V		(3)11.90V (4)11.82V (5)11.90V U101 (1) 12.67V (2) 12.59V (3) 12.67V (4) 12.67V (5) 12.59V U200 (1) 5.19V (2) 5.19V (3) 5.15V (4) 5.15V (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: 2.16 mA AC O/P-FG: 3.22 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	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°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-250P-248			
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 25.9 °C			
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 40.5 °C			
		NO	Position	ROOM AMBIENT Ta=25.9 °C	HIGH AMBIENT Ta= 40.5 °C
		1	TB1	44.1°C	60.2°C
		2	C100	58.2°C	74.0°C
		3	C101	64.4°C	79.7°C
		4	Q101	60.3°C	76.0°C
		5	Q103	61.3°C	76.9°C
		6	T101	77.6°C	92.6°C
		7	C112	64.9°C	79.0°C
		8	L100	54.9°C	66.8°C
		9	D106	61.0°C	75.6°C
		10	D105	62.0°C	77.0°C
		11	C119	68.9°C	83.4°C
		12	Q200	67.4°C	82.7°C
		13	C118	66.3°C	80.8°C
		14	L200	64.7°C	80.6°C
		15	Q202	66.5°C	82.2°C
		16	C219	59.7°C	75.4°C
		17	ZR200	60.7°C	76.3°C
		18	L201	45.7°C	61.5°C
		19	U100	66.9°C	81.6°C
		20	U303	71.5°C	85.3°C
		21	RT300	58.5°C	73.4°C
		22	Q105	67.3°C	82.0°C
		23	T100	71.1°C	85.1°C
		24	T501	74.4°C	88.7°C
		25	Q504	78.6°C	92.3°C
		26	U501	85.1°C	99.0°C
		27	Q501	78.9°C	92.5°C
		28	C114	69.4°C	83.8°C
		29	U201	68.8°C	83.3°C
		30	U500	72.2°C	86.8°C
31	C225	61.1°C	76.6°C		
32	TSW1	63.2°C	78.9°C		
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) 261149.2HRS (2) 87957.2HRS
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 : 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