



Test Report: NTS-450-248

450W High Reliable Built-in Type True Sine Wave DC-AC Power Inverter

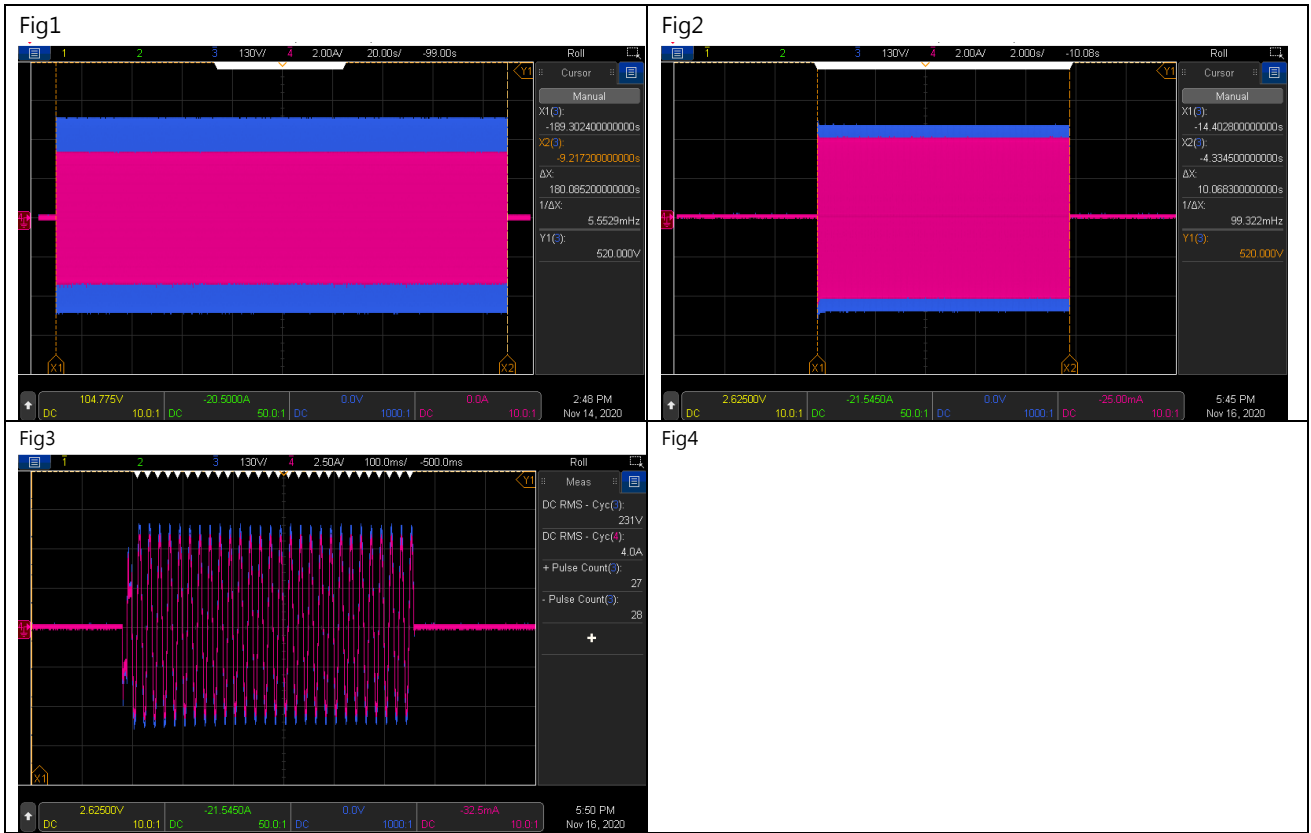
- **DESIGN VERIFY TEST**
 - Output Function Test
 - Input Function Test
 - Protection Function Test
 - Control Function Test
 - APPLICATION Test
 - Component Stress Test
- **SAFETY & E.M.C. TEST**
 - Safety Test
 - E.M.C. Test
- **RELIABILITY TEST**
 - ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	450W	IP: 48VDC Ta:25°C	460 W
2	MAXIMUM OUTPUT POWER (TYP)	(1) 517.5 W/180sec. (2)675W/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 50VDC OP:TESTING LOAD Ta:25°C	(1) 227.9 V/ 2.21 A/ 180.08 Sec (2) 228.7 V/ 2.86 A/ 10.06 Sec (3) 229 .0V/ 3.99 A/ 28 Cycle

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



3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: 197.9 V DIP S.W 220VAC: 217.9 V DIP S.W 230VAC: 227.8 V DIP S.W 240VAC: 238.1 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 48VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: 50.04 HZ DIP S.W 60HZ: 59.95 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) 0.75 % / Vo(min) /FULL LOAD (2) 0.77 % / Vo(nor) /FULL LOAD (3) 0.76 % / Vo(max) /FULL LOAD

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

Fig1

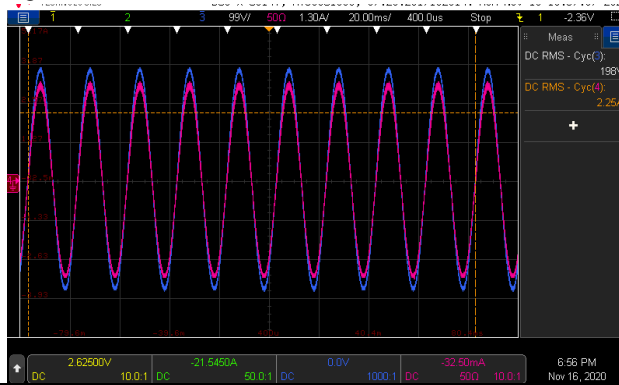


Fig2

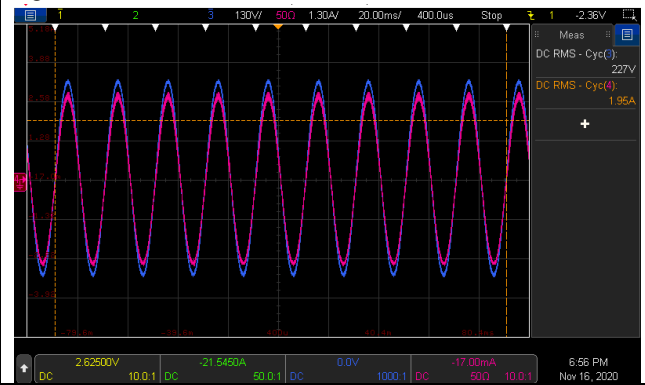
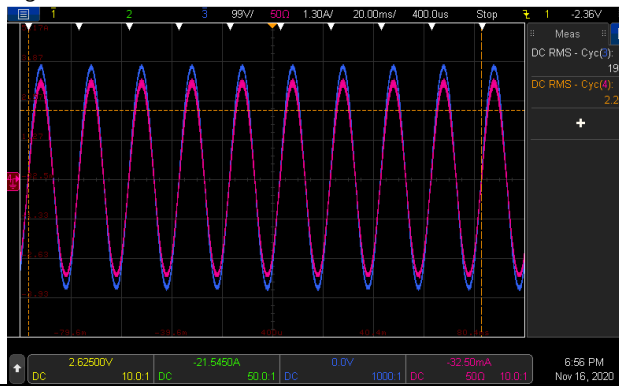


Fig3



6	AC REGULATION	±3%	IP: 50VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u>0.83</u> %
7	Overshoot /Undershoot	<±10%	IP: 48VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u>-1.39</u> % (2) <u>1.17</u> % (3) <u>1.74</u> %
8	O/P voltage DC offset	Vin(nor)= <u>48</u> v · Vo <200mv · no load : <u>61mv</u> / full load: <u>77mv</u>		

9	LED STATUS	<ul style="list-style-type: none"> • Status test 		
		LED	Status	RESULT
		Green	Inverter OK	OK
		Orange	Remote off Saving mode	OK
		Red	Abnormal Status (See SPEC)	OK
		<ul style="list-style-type: none"> • Battery test 		
		LED	Battery RANGE	RESULT
		Green	62.0V >Vdc> 50.0V±1v	61.99V>Vdc>49.03V
		Orange	50>Vdc>44VDC ±1v	50.01V>Vdc>44.13V
		Red	Vdc< 44.0V · Vdc> 62.0V±1v	Vdc< 44.12V · Vdc>62 V
		<ul style="list-style-type: none"> • Load test 		
		LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~ 41.44%		
Orange	40%±5% ~ 80%±5% LOAD	41.53%~81.33 %		
Red	80%±5%~ 105%±5%LOAD	81.44%~106.17%		

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>40.1 VDC~ 66.2 VDC/NO LOAD</u> <u>40.1 VDC~ 66.2 VDC/FULL LOAD</u> Test: <u>OK</u>

2	DC CURRENT (TYP)	14A	IP: 48VDC OP:FULL LOAD Ta:25°C	<u>10</u> A
3	NO LOAD DISSIPATION (Typ.)	≤ 1.5 @ Saving Mode ≤ 12 @NON-Saving Mode	IP: 48VDC OP:NO LOAD Ta:25°C	<u>0.964</u> W <u>9.28</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25$ W	IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>≥ 21</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10$ W	IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>≤ 12</u> W
6	OFF MODE CURRENT DRAW (Typ.)	≤ 1 mA	IP: 48VDC OP: Sw off Ta:25°C	0.73mA
7	EFFICIENCY(TYP)	450W/ 93%	IP: 50VDC OP: $P_o=450$ W 230V/50HZ (factory setting) Ta:25°C	93.6 %

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>44.1</u> V
2	BAT LOW SHUT DOWN	40V \pm 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>40.1</u> V
3	BAT LOW RESTART	50V \pm 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>50.3</u> V
4	BAT HIGH ALARM	62V \pm 1VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>62.2</u> V
5	BAT HIGH SHUT DOWN	66V \pm 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>66.2</u> V
6	BAT HIGH RESTART	60V \pm 1VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>60.2</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%~111.5 %</u> <u>180.08 sec</u> (2). <u>117%~146.6 %</u> <u>10.06 sec</u> 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>318.1</u> W · turn on <u>OK</u> LAMP: <u>422.8</u> W · turn on <u>OK</u> LAMP: <u>465.9</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>433W</u>	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>350 W</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 / 40A	I/P: high line O/P:V(max)/Freq 60HZ 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)164V (2) 154V (3) 174V (4) 152V (5) 152V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/10 A	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	(1)532V (2)589V (3)540V (4)557V (5)553V
3	DC BUS Capacitor Voltage	C118/C119 Rated : 390 u/ 265 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	C118 (1) 245V (2) 245V (3) 245V (4) 245V (5) 249V C119 (1) 241V (2) 245V (3) 245V (4) 245V (5)245V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 Rated : 650V/ 20 A	I/P: high line O/P:V(min)/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) 553V (2) 625V (3) 589V (4) 549V (5) 540V
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)118.2 V (2) 115.0V (3) 118.2V (4) 119.8V (5) 119.8V Q105 (1) 140V (2) 140V (3) 140V (4) 139V (5) 139V
6	Control IC Voltage Test	MCU IC U303 Rated 2.4 V~ 3.6 V AUX IC U501 Rated 8.2V~30V	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	U303 (1) 3.4V (2) 3.48V (3) 3.52V (4) 3.4V (5) 3.36V

		<p>CHARGE IC U101 Rated -0.3V~20V</p> <p>Gate Driver IC U200 Rated -0.3V~20V</p>	<p>(5) Saving mode Ta:25°C</p>	<p>U501 (1) 11.7V (2) 11.7V (3)11.7 V (4) 11.7V (5) 11.7V</p> <p>U101 (1) 12.4V (2) 12.4V (3) 12.4V (4) 12.4V (5) 12.4V</p> <p>U200 (1) 5.08V (2) 5.12V (3) 5.12V (4) 5.04V (5) 5.14V</p>
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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: 2.041 mA AC O/P-FG: 1.173 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	2mΩ

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 : 8KV / Contact : 4KV	I/P: 48VDC 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-450-224					
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 25 °C					
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 40 °C					
				NO	Position	ROOM AMBIENT Ta=25 °C	HIGH AMBIENT Ta= 40 °C
				1	C100	57.7°C	67.1°C
				2	C101	57.5°C	67.1°C
				3	Q103	49.4°C	61.4°C
				4	Q104	49.6°C	61.4°C
				5	RT300	48.9°C	60.3°C
				6	T101	79.3°C	87.5°C
				7	C112	50.4°C	61.1°C
				8	L100	47.9°C	57.8°C
				9	D107	50.4°C	61.9°C
				10	D105	52.5°C	63.8°C
				11	C119	54.3°C	63.2°C
				12	C118	52.8°C	62.4°C
				13	Q200	57.9°C	69.0°C
				14	L201	47.3°C	58.1°C
				15	C219	54.0°C	64.3°C
				16	Q203	57.2°C	68.8°C
				17	L200	72.5°C	80.5°C
				18	RT100	51.3°C	60.3°C
				19	ZR200	35.4°C	47.7°C
				20	C115	41.1°C	52.2°C
				21	T100	42.8°C	53.4°C
				22	T501	54.8°C	63.0°C
				23	T501	47.1°C	56.7°C
				24	Q504	58.4°C	67.4°C
				25	Q105	45.7°C	55.7°C
				26	U501	66.4°C	75.3°C
				27	Q501	62.2°C	71.6°C
				28	U101	47.1°C	55.9°C
		29	U201	57.0°C	66.0°C		
		30	U500	54.9°C	64.7°C		
		31	U100	53.1°C	64.0°C		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 25VDC 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 : 32.5VDC 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 : 24VDC/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 : 25VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 25VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME		(1) 388630.8HRS (2) 199778.4HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 843.9K hrs min. Telcordia SR-332 (Bellcore) ; 85.0K hrs min. MIL-HDBK-217F (25°C)		
11	Ongoing Reliability Test	I/P : 25VDC 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