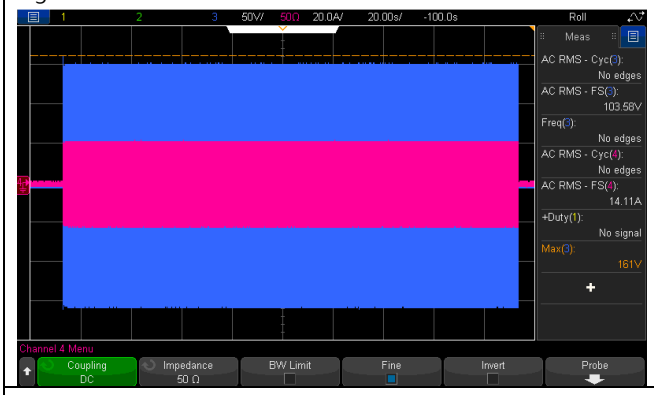
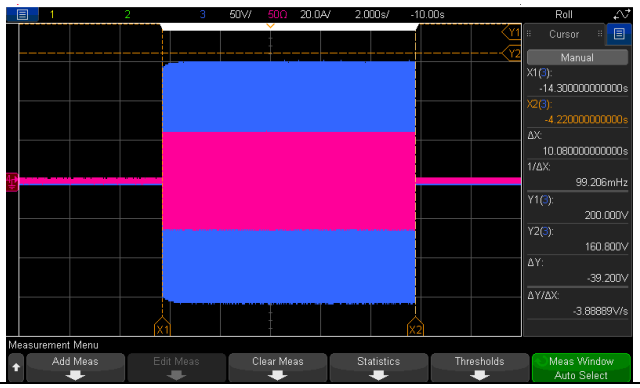
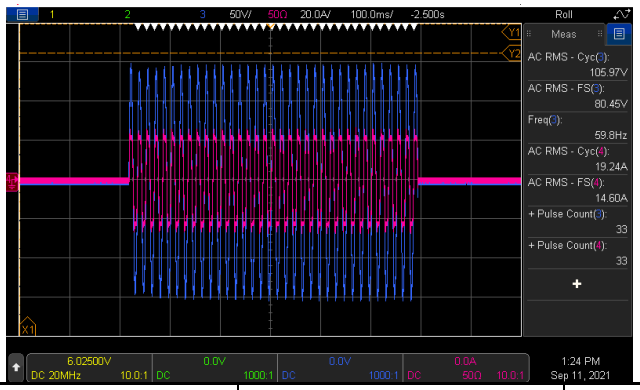
Test Report: NTS-1700-112

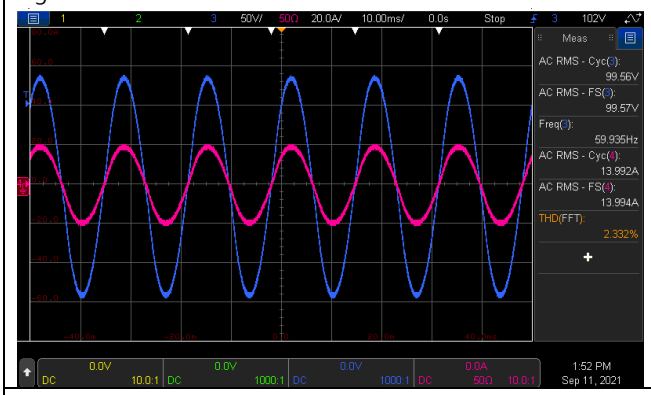
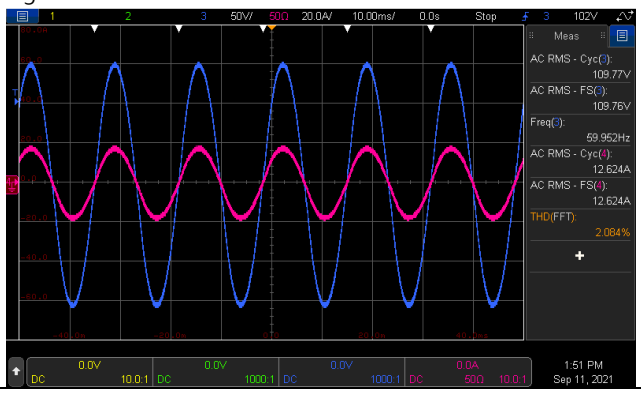
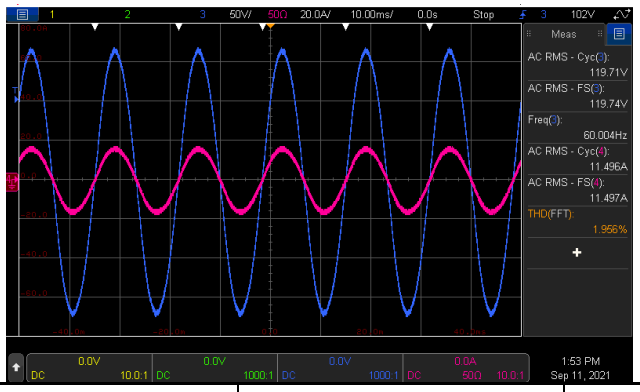
1700W High Reliable True Sine Wave DC-AC Power Inverter

- 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	1500W	IP: 12VDC Ta:25℃	1510 W
2	MAXIMUM OUTPUT POWER (TYP)	(1)1750W/180sec. (2)2250w/10sec (3)SURGE POWER 3000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 12.5VDC OP:TESTING LOAD Ta:25℃	(1) 108.4 V / 14.97 A / 180.1 Sec (2) 108.1 V / 20.60 A / 10.06 Sec (3) 107.7 V / 28.25 A/ 33 Cycle
	CH3:O/P VAC CH4:O/P IAC Fig1  Fig2  Fig3 			
3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 100VAC: 98.46 V DIP S.W 110VAC: 108.40 V DIP S.W 115VAC: 113.53 V DIP S.W 120VAC: 118.51 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC 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: 12.5VDC OP: 1350W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 2.346 % / Vo(min) (2) 2.078% / Vo(nor) (3) 1.898% / Vo(max)

	CH3:O/P VAC CH4:O/P IAC Fig1  Fig2  Fig3  			
6	AC REGULATION	±3%	IP: 12.5VDC OP: 1350W Ta:25℃	-1.273 %
7	Overshoot /Undershoot	<±10%	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25℃	(1) -8.01 % (2) -2.73 % (3) -4.36 %
8	O/P voltage DC offset	Vin(nor)= 12 V · Vo <200mV · no load : 95.8 mV / full load: 83 mV		

9	LED STATUS	● Status test

LED	Statas	RESULT
Green	Inverter OK	OK
Orange	Remote off	OK
Orange	Saving mode	OK
Red	Inverter Fail	OK

● Battery test

LED	Battery RANGE	RESULT
Green	12.5~15.5 Vdc±0.3v	12.588Vdc ~ 15.492Vdc
Orange	11~ 12.5Vdc ±0.3v	11.108Vdc ~ 12.51 Vdc
Red	<11.0 Vdc ±0.3v > 15.5vdc±0.3v	< 11.027 Vdc > 15.652 Vdc

● Load test

LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~41.00%
Orange	40%±5% ~ 80%±5% LOAD	41.06% ~80.4%
Red	≧ 80%±5% LOAD	≧ 80.53%

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	10VDC~16.5VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25℃	10.10 VDC~ 16.459 VDC/NO LOAD 10.19 VDC~ 16.492 VDC/FULL LOAD
			I/P: LOW-LINE=11V 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: 12VDC O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	10MIN Test： OK 12Hr Test： OK
2	DC CURRENT (TYP)	150A	IP: 12VDC OP:FULL LOAD Ta:25℃	145.84 A

3	Power Saving Mode	≦ 1.2W @standby saving mode ≦ 16W@NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25℃	1.01 W @standby saving mode 10.8 W @NON- Saving Mode
4	SAVING MODE TO NORMAL	Po≥25W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≥ 14 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≤ 11.63 W
6	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 12VDC OP: Sw off Ta:25℃	0.483 mA
7	EFFICIENCY(TYP)	1350W /89%	IP:12.5VDC OP: Po=1350W 110V/60HZ Ta:25℃	90.6 %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	11.01 V
2	BAT LOW SHUT DOWN	10V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	10.14 V
3	BAT LOW RESTART	12.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	12.558 V
4	BAT HIGH ALARM	15.5V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	15.621 V
5	BAT HIGH SHUT DOWN	16.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	16.589 V
6	BAT HIGH RESTART	15V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	14.999 V
7	BAT. POLARITY	By internal fuse open	IP: BAT +/- OP: FULL LOAD Ta:25℃	TEST：OK

8	OVER TEMPERATURE	Shut down o/p voltage , re-power on to recover	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
9	OUTPUT SHORT	Shut down o/p voltage: re-power on	IP: 12VDC O/P: FULL LOAD SW:ON Ta:25℃	Shut down o/p voltage, re-power on to recover LED DISPLAY: OK
10	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℃	(1). 105.33 % ~ 114.33 % 180.1 sec (2). 114.87 % ~ 148.33 % 10.07 sec Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	(1).Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off (2).IRC3	IP: 12VDC OP: FULL LOAD Ta:25℃	(1).Open : Normal work Short : Remote off TEST: Vo= 2.88 mV，Pin= 5.76 W (2).TEST: OK

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 802 W · turn on OK LAMP: 1202 W · turn on OK LAMP: 1588 W · turn on OK	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
2	INDUCTION MOTOR	0.22 HP	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
3	SWITCHING POWER SUPPLY	WITH PFC: RSP-1600-48 O/P= 1265 W	1. Vin=HIGH LINE 2. 110V/60Hz	TEST: OK
		NO PFC: SE-1000-48 · O/P= 1161 W	1. Vin=HIGH LINE 2. 110V/60Hz	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	Q101/Q114 Rated: 60 V / 195 A	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(3000W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load	Q101 (1) 45.5V (2) 47.9 V (3) 49.9V (4) 43.9V (5) 45.9V (6) 45.9V (7) 33.5V	Q114 (1) 44.7V (2) 47.9V (3) 51.2V (4) 42.3 V (5) 42.3V (6) 45.1 V (7) 33.1V

			(7) bat=UVP full load Ta:25℃	
2	DC TO DC Diode Peak Voltage	D 151 Rated: 400V/20A	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(3000W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25℃	D151 (1) 274V (2) 292V (3) 276V (4) 278V (5) 278V (6) 272 V (7) 272 V
3	DC BUS Capacitor Voltage	C161 Rated: :1000 u/315 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(3000W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25℃	C161 (1) 272V (2) 274V (3) 272 V (4) 272 V (5) 272V (6) 272V (7) 272V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 650V/ 75 A	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(3000W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25℃	(1) 296V (2) 363V (3) 302V (4) 288 V (5) 286 V (6) 292V (7) 296 V
5	AUX PWM MOS	Q201 Rated : 80 A/ 100 V Q501 Rated : 65A/ 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(3000W) Turn On (4) NO LOAD Turn On (5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25℃	Q201 Q501 (1) 47.2V (1) 63.2V (2) 47.2V (2) 59.2V (3) 47.2 V (3) 60.8V/ (4) 46.8V (4) 59.2V (5) 46.8 V (5) 59.0V (6) 47.2V (6) 59.2V (7) 40.4V (7) 48.0V
6	Control IC Voltage Test	MCU IC U301 Rated 2.0 V~ 3.6 V AUX IC U201 Rated 8.2V~36V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(3000W) Turn On (4) NO LOAD Turn On	U301 U501 (1) 3.295V (1) 13.1V (2) 3.297V (2) 12.9V (3) 3.297V (3) 12.9V (4) 3.296V (4) 12.9V (5) 3.297V (5) 12.9V

		CHARGE IC U501 Rated 8.2V~36V Gate Driver IC U81 Rated -0.3V~20V	(5) Saving mode (6) bat=OVP full load (7) bat=UVP full load Ta:25℃	(6) 3.299V (7) 3.298V U201 (1) 15.9V (2) 15.7V (3) 15.7V (4) 15.7V (5) 15.7V (6) 15.9V (7) 11.9V	(6) 12.9V (7) 12.9V U81 (1) 4.99V (2) 4.99V (3) 4.99V (4) 4.99V (5) 4.99V (6) 4.99V (7) 4.99V

SAFETY &EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-AC O/P: 3 KVAC/min BAT I/P-AC I/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-AC O/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25℃	BAT I/P-AC O/P: 8.63 mA AC O/P-FG: 5.99 mA NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	FCC (expect for Type-UN) CLASS A	I/P:12 VDC O/P: :FULL/50% LOAD Ta:25℃	CLASS A
2	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：NTU-1700-112 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 12.5VDC O/P： FULL LOAD Ta= 26.6 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 12.5VDC O/P： FULL LOAD Ta= 36.6 ℃		

NO	Position	ROOM AMBIENT Ta=26.6℃	HIGH AMBIENT Ta=36.6℃
1	ZNR1	31.2℃	41.2℃
2	C1	39.7℃	50.3℃
3	LF1	59.3℃	69.9℃

NO	Position	ROOM AMBIENT Ta=26.6℃	HIGH AMBIENT Ta=36.6℃
4	C9	40.8℃	51.4℃
5	RY2	40.8℃	50.2℃
6	LF2	26.8℃	36.9℃
7	C50	27.0℃	37.2℃
8	TSW3	39.1℃	48.3℃
9	Q1	83.4℃	94.1℃
10	Q4	84.9℃	94.8℃
11	C162	42.1℃	51.1℃
12	L11	54.3℃	63.3℃
13	D154	54.0℃	64.6℃
14	D156	56.8℃	67.4℃
15	CC56	33.7℃	44.5℃
16	L100	50.5℃	62.3℃
17	L1	49.4℃	59.2℃
18	TSW2	60.1℃	69.8℃
19	Q201	61.5℃	71.3℃
20	T202	53.7℃	63.6℃
21	C103	60.8℃	72.5℃
22	C107	69.7℃	80.7℃
23	T101core	75.7℃	86.8℃
24	T101coil	84.8℃	95.2℃
25	Q102	62.5℃	72.9℃
26	U301	42.7℃	53.1℃
27	T501	40.1℃	50.0℃
28	Q501	41.8℃	51.7℃
29	U361	41.2℃	51.4℃
30	D261	51.6℃	60.3℃
31	U132	54.1℃	63.5℃
32	Q107	59.8℃	70.2℃
33	Q114	66.1℃	76.7℃
34	Q110	59.0℃	69.2℃
35	R25	56.0℃	64.8℃
36	U81	42.5℃	52.3℃
37	R11	68.4℃	79.3℃
38	R213	67.5℃	77.5℃
39	U201	56.6℃	67.1℃
40	FS15	63.0℃	74.8℃
41	R131	66.1℃	78.0℃
42	PCB	79.2℃	90.1℃
43	RTH6	53.3℃	63.5℃

2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC O/P : 100%LOAD Ta= -25 ℃	TEST : OK

3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 35 ℃ NO DAMAGE	I/P：16.5VDC O/P：FULL LOAD Ta= 35.3 ℃ HUMIDITY= 95 %R.H	TEST：OK
4	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
5	THERMAL SHOCK TEST	1. Thermal shock Temperature： -30℃~ +40℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：16 CYCLE 5. Input/Output condition： 15cycle:12V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:12V/ FULL LOAD Burn In Test		TEST：OK
6	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
7	CAPACITOR LIFE CYCLE	SUPPOSE C107 IS THE MOST CRITICAL COMPONENT (1) I/P：12.5VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P：12.5VDC O/P：FULL LOAD Ta= 35 ℃ LIFE TIME		(1) 178333.8HRS (2) 83195.7HRS
8	MTBF	Conducted by Parts Stress Analysis Prediction 475.5K hrs min. Telcordia TR/SR-332 (Bellcore) ; 46.2K hrs min. MIL-HDBK-217F (25℃)		
9	Ongoing Reliability Test	I/P：12.5VDC O/P：80% LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009