



# Test Report: NTS-300-124

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300W High Reliable Built-in Type True Sine Wave DC-AC Power Inverter

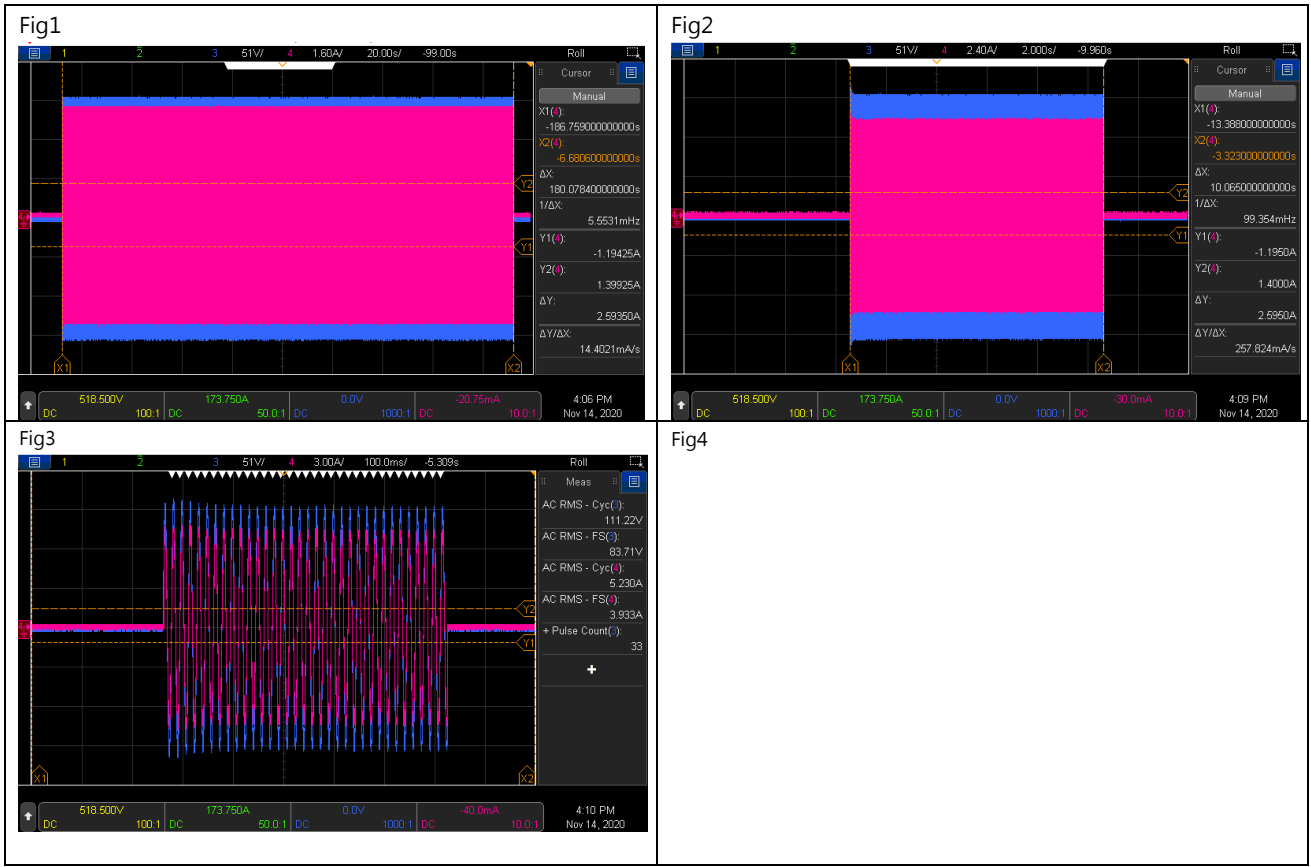
- **DESIGN VERIFY TEST**
  - Output Function Test
  - Input Function Test
  - Protection Function Test
  - Control Function Test
  - APPLICATION Test
  - Component Stress Test
- **SAFETY & E.M.C. TEST**
  - Safety Test
  - E.M.C. Test
- **RELIABILITY TEST**
  - ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	300W	IP: 24VDC Ta:25°C	<u>306 W</u>
2	MAXIMUM OUTPUT POWER (TYP)	(1) 345W/180sec. (2) 450W/10sec (3) SURGE POWER 600W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 25VDC OP: TESTING LOAD Ta:25°C	(1) 110.3 V/ 3.13 A/180.07 Sec (2) 110.1 V/ 4.02 A/ 10.06 Sec (3) 110.57 V/ 5.198A/ 33 Cycle

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



3	AC Voltage	100 / 110 / 115 / 120VAC selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 100VAC: <u>100.2 V</u> DIP S.W 110VAC: <u>110.3 V</u> DIP S.W 115VAC: <u>114.1 V</u> DIP S.W 120VAC: <u>120.4 V</u>
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.041 HZ</u> DIP S.W 60HZ: <u>59.958 HZ</u>

5	WAVEFORM	True sine wave (THD<3%)	IP: 25VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 0.71 % / Vo(min) /FULL LOAD (2) 0.64 % / Vo(nor) /FULL LOAD (3) 0.59 % / Vo(max) /FULL LOAD
<p>CH3:O/P VAC CH4:O/P IAC</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="167 515 805 929"> <p>Fig1</p> </div> <div data-bbox="821 515 1460 929"> <p>Fig2</p> </div> <div data-bbox="167 940 805 1344"> <p>Fig3</p> </div> </div>				
6	AC REGULATION	±3%	IP: 25VDC OP: FULL LOAD/NO LOAD Ta:25°C	0.34 %
7	Overshoot /Undershoot	<±10%	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) -4.37 % (2) 1.64 % (3) -0.82 %
8	O/P voltage DC offset	$V_{in(nor)} = 24 \text{ v} \cdot V_o < 200\text{mv} \cdot \text{no load} : 61 \text{ mV} / \text{full load} : 75\text{mV} \cdot$		

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>25~31Vdc±0.5v</td> <td>25.03~31.01 Vdc</td> </tr> <tr> <td> Orange</td> <td>22~ 25Vdc ±0.5v</td> <td>22.08Vdc ~ 24.74Vdc</td> </tr> <tr> <td> Red</td> <td>&lt;22 Vdc ±0.5v &gt;31 Vdc ±0.5v</td> <td>&lt;22.04 Vdc &gt;31.03 Vdc</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 ~ 39%</td> </tr> <tr> <td> Orange</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>42 %~78 %</td> </tr> <tr> <td> Red</td> <td>≥ 80%±5% LOAD</td> <td>≥ 80.7 %</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	25~31Vdc±0.5v	25.03~31.01 Vdc	Orange	22~ 25Vdc ±0.5v	22.08Vdc ~ 24.74Vdc	Red	<22 Vdc ±0.5v >31 Vdc ±0.5v	<22.04 Vdc >31.03 Vdc	LED	LOAD RANGE	RESULT	Green	Min. load ~ 40%±5% LOAD	Min. load ~ 39%	Orange	40%±5% ~ 80%±5% LOAD	42 %~78 %	Red	≥ 80%±5% LOAD	≥ 80.7 %
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**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	20VDC~33VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	<u>20.1 VDC</u> ~ <u>32.9VDC</u> /NO LOAD <u>20.2 VDC</u> ~ <u>32.8 VDC</u> /FULL LOAD
			I/P: LOW-LINE=21V HIGH-LINE=32.5V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE ) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 24V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	Test: <u>OK</u>

2	DC CURRENT (TYP)	15A	IP: 24VDC OP:FULL LOAD Ta:25°C	<u>13.51</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.3W$ @ Saving Mode $\leq 10W$ @NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25°C	<u>0.822</u> W <u>6.56</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u><math>\geq 23</math></u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u><math>\leq 15W</math></u>
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 24VDC OP: Sw off Ta:25°C	<u>0.77</u> mA
7	EFFICIENCY(TYP)	300W/ 92%	IP: 25VDC OP: $P_o = 300W$ 110V/60HZ (factory setting) Ta:25°C	<u>92.5</u> %

**PROTECTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	22V $\pm$ 0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>21.9</u> V
2	BAT LOW SHUT DOWN	20V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>20.12</u> V
3	BAT LOW RESTART	25V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>24.96</u> V
4	BAT HIGH ALARM	31V $\pm$ 0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>30.95</u> V
5	BAT HIGH SHUT DOWN	33V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>32.92</u> V
6	BAT HIGH RESTART	30V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>29.98</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: 24VDC 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: 24VDC OP: TESTING SW:ON Ta:25°C	(1). <u>107% ~115%</u> <u>180.07</u> sec (2). <u>117% ~ 147 %</u> <u>10.06</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: 24VDC 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>241</u> W · turn on <u>OK</u> LAMP: <u>319</u> W · turn on <u>OK</u> LAMP: <u>466</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.12</u> HP	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>EPP-500-48</u> · O/P= <u>311</u> W	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>110</u> W	1 Vin=HIGH LINE 2 O/P=110V/60Hz 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 :100V /80A	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) 79.8V (2) 72.5V (3) 76.5V (4) 71.3V (5) 71.7V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/ 10A	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	(1)296V (2)296V (3)292V (4)296V (5)300V
3	DC BUS Capacitor Voltage	C118 Rated : 330 u/ 315V	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) 295V (2) 295V (3) 295V (4) 295V (5) 295V
4	DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage	Q 200 IKP15N65H5 Rated : 600V / 20 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1)322V (2) 354V (3) 334V (4) 310V (5) 310V
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) 68.5V (2) 69.3V (3) 68.5V (4) 68.5V (5) 68.5V  Q105 (1) 73.0V (2) 73.0V (3) 73.3V (4) 73.6V (5) 73.0V
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) 3.33V (2) 3.33V (3) 3.33V (4) 3.31V (5) 3.33V  U501 (1)11.6 V (2) 11.6V

		-0.3V~20V		(3) 11.6V (4) 11.6V (5) 11.6V  U101 (1) 12.29V (2) 12.29V (3) 12.29V (4) 12.29V (5) 12.29V  U200 (1) 5.14V (2) 5.14V (3) 5.14V (4) 5.14V (5) 5.14V
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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: 1.787 mA AC O/P-FG: 2.372 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	FCC 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: 24VDC 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-300-124					
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 23.9 °C					
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 25VDC O/P : FULL LOAD Ta= 41.9 °C					
				NO	Position	ROOM AMBIENT Ta=23.9 °C	HIGH AMBIENT Ta= 41.9 °C
				1	Q101	49.7°C	67.0°C
				2	Q103	50.7°C	68.0°C
				3	RT300	52.9°C	70.0°C
				4	C101	54.7°C	72.1°C
				5	C100	54.2°C	71.7°C
				6	T101	61.8°C	79.6°C
				7	L100	57.7°C	76.4°C
				8	C112	59.7°C	77.1°C
				9	D107	56.8°C	73.8°C
				10	D105	61.6°C	78.2°C
				11	Q201	67.7°C	84.2°C
				12	C119	61.0°C	78.1°C
				13	U501	75.4°C	92.2°C
				14	L201	61.7°C	78.9°C
				15	L200	68.3°C	86.3°C
				16	Q202	67.3°C	84.8°C
				17	C219	63.0°C	80.5°C
				18	C118	61.7°C	78.7°C
				19	ZR200	53.3°C	70.4°C
				20	C114	55.2°C	72.1°C
				21	T100	55.9°C	72.8°C
				22	TSW1	65.4°C	83.0°C
				23	T501	62.9°C	79.6°C
				24	U101	61.6°C	78.3°C
				25	Q105	58.1°C	74.8°C
				26	Q504	66.6°C	83.6°C
				27	Q501	68.1°C	85.0°C
				28	U303	60.1°C	76.6°C
		29	U201	58.3°C	74.7°C		
		30	U500	62.5°C	79.0°C		
		31	U100	55.3°C	72.1°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) 444039.8HRS (2) 163658.5HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 845.6K hrs min. Telcordia SR-332 (Bellcore) ; 85.3K 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