



Test Report: NTS-300-224

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

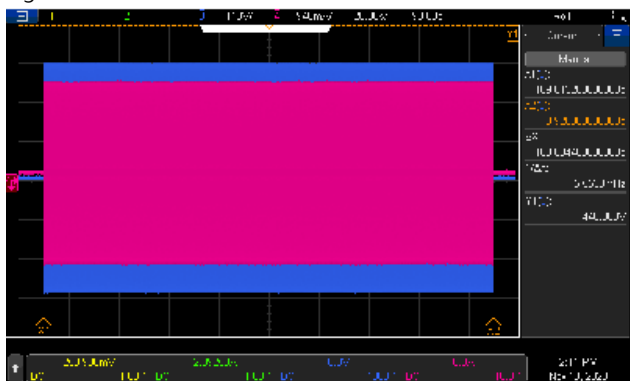
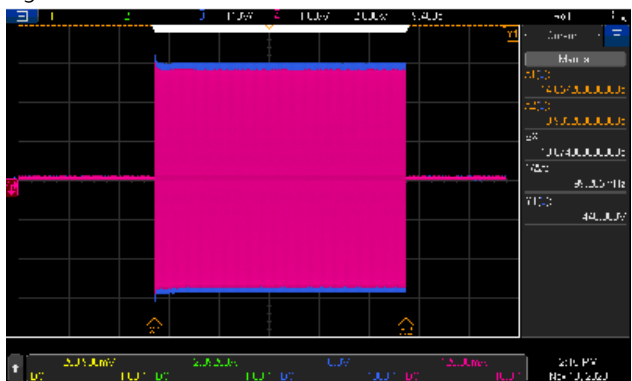
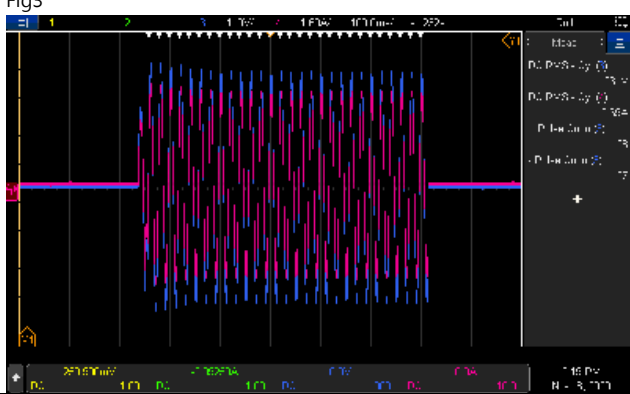
- E.M.C. Test

- **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</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)345W/180sec. (2)450 w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 25VDC OP:TESTING LOAD Ta:25°C	(1) 228.4 V/ 1.47 A/ 180.08 Sec (2) 227.9 V/ 1.92 A/ 10.07 Sec (3) 229 V/ 2.67 A/ 27 Cycle
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: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.8</u> V DIP S.W 220VAC: <u>218.8</u> V DIP S.W 230VAC: <u>228.7</u> V DIP S.W 240VAC: <u>238.8</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.04</u> HZ DIP S.W 60HZ: <u>59.957</u> HZ
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) 0.58 % / Vo(min) /FULL LOAD (2) 0.61 % / Vo(nor) /FULL LOAD (3) 0.58 % / Vo(max) /FULL LOAD

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

Fig1

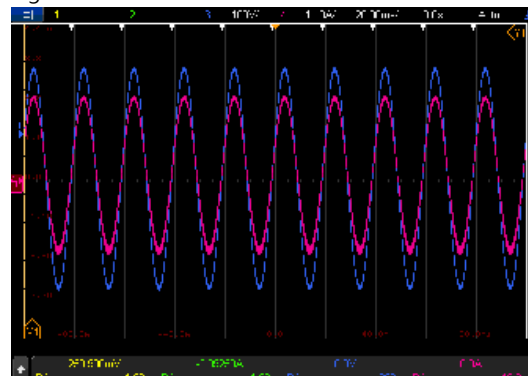


Fig2

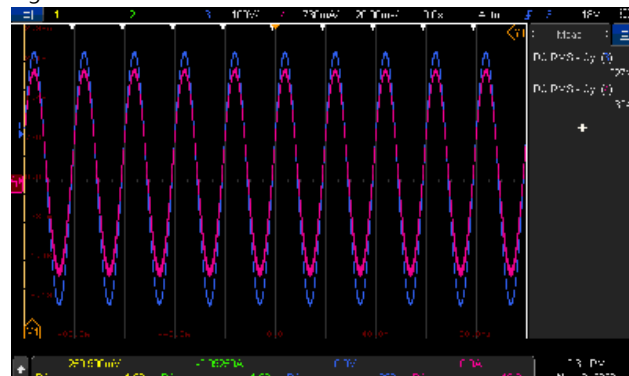
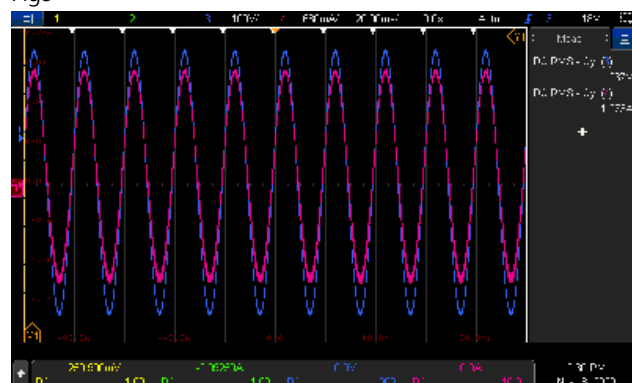


Fig3



6	AC REGULATION	$\pm 3\%$	IP: 25VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u> -0.55 </u> %
7	Overshoot /Undershoot	$< \pm 10\%$	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u> -2.3 </u> % (2) <u> -0.7 </u> % (3) <u> -1.1 </u> %
8	O/P voltage DC offset	Vin(nor)= <u> 24 </u> v · Vo <200mv · no load : <u> 68.4mv </u> / full load: <u> 65mv </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>31.0V> Vdc> 25.0V±0.5V</td><td>30.98> Vdc>24.9V</td></tr> <tr> <td>Orange </td><td>22V<Vdc<25.0V±0.5V</td><td>22.06<Vdc<25.01</td></tr> <tr> <td>Red </td><td>Vdc< 22.0V · Vdc>31.0V ±0.5v</td><td>Vdc< 22.05V · Vdc> 31.04</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%±5% LOAD</td><td>Min. load ~ 42.03%</td></tr> <tr> <td>Orange </td><td>40%±5% ~ 80%±5% LOAD</td><td>42.03 %~ 80.4%</td></tr> <tr> <td>Red </td><td>≥ 80%±5% LOAD</td><td>≥ 80.53%</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 	31.0V> Vdc> 25.0V±0.5V	30.98> Vdc>24.9V	Orange 	22V<Vdc<25.0V±0.5V	22.06<Vdc<25.01	Red 	Vdc< 22.0V · Vdc>31.0V ±0.5v	Vdc< 22.05V · Vdc> 31.04	LED	LOAD RANGE	RESULT	Green 	Min. load ~ 40%±5% LOAD	Min. load ~ 42.03%	Orange 	40%±5% ~ 80%±5% LOAD	42.03 %~ 80.4%	Red 	≥ 80%±5% LOAD	≥ 80.53%
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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 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)	<u>20.2</u> VDC~ <u>33.3</u> VDC/NO LOAD <u>20.3</u> VDC~ <u>33.2</u> VDC/FULL LOAD Test: <u>OK</u> -

2	DC CURRENT (TYP)	15A	IP: 24VDC OP:FULL LOAD Ta:25°C	<u>13.3</u> A
3	NO LOAD DISSIPATION (Typ.)	≤ 1.3 @ Saving Mode $\leq 10W$ @NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25°C	<u>0.85W</u> <u>8</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>≥ 21.2</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10W$	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>≤ 16.8</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1mA$	IP: 24VDC OP: Sw off Ta:25°C	0.78mA
7	EFFICIENCY(TYP)	300W/93 %	IP: 25VDC OP: $P_o=300$ W 230V/50HZ (factory setting) Ta:25°C	93.78%

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>22.1</u> V
2	BAT LOW SHUT DOWN	20V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>20.3</u> V
3	BAT LOW RESTART	25V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>25.05</u> V
4	BAT HIGH ALARM	31V $\pm$ 0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>31.17</u> V
5	BAT HIGH SHUT DOWN	33V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>33.1</u> V
6	BAT HIGH RESTART	30V $\pm$ 0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>29.9</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>106%~112%</u> <u>180.08</u> sec (2). <u>114%~145.5 %</u> <u>10.07</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>188.4</u> W · turn on <u>OK</u> LAMP: <u>292.6</u> W · turn on <u>OK</u> LAMP: <u>397.9</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u> OK </u>	
2	INDUCTION MOTOR	<u>0.12</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>301.1W</u>	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u> OK </u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>247.8</u> W	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 : 100V / 85A	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) 75.7V (2) 75.7V (3) 74.9V (4) 80.5V (5)74.9 V

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)533V (2)557V (3)553V (4)549V (5)533V
3	DC BUS Capacitor Voltage	C118/C119 Rated 330 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) 250V (2) 250V (3) 242V (4) 246V (5) 250V C119 (1) 239V (2) 239V (3)239V (4) 247V (5) 247V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 IKP15N65H5 Rated :650 V /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) 499V (2) 535V (3) 503V (4) 500 3V (5) 503V
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) 73.6V (2) 72.1V (3) 70.7V (4) 70.7V (5) 71.2V Q105 (1) 82.3V (2) 83.5V (3) 82.9V (4) 82.3V (5) 82.3V
6	Control IC Voltage Test	MCU IC U303 Rated 2.4 V~ 3.6 V	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short	U303 (1)3.4 V (2)3.38V (3)3.4 V

		AUX IC U501 Rated 8.2V~30V CHARGE IC U101 Rated -0.3V~20V Gate Driver IC U200 Rated -0.3V~20V	(3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(4) 3.38V (5) 3.38V U501 (1)11.6 V (2) 11.6V (3) 11.6V (4) 11.6V (5) 11.6V U101 (1) 12.5V (2) 12.5V (3) 12.5V (4) 12.5V (5) 12.5V U200 (1) 5.12V (2) 5.12V (3) 5.12V (4) 5.12V (5) 5.12V
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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: 2.829 mA AC O/P-FG: 6.27 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	5mΩ

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: 24VDC 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-300-224 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
		1	C100	58.0°C
		2	C101	60.3°C
		3	Q101	54.6°C
		4	Q103	54.7°C
		5	RT300	55.9°C
		6	T101	73.5°C
		7	U303	62.3°C
		8	L100	60.3°C
		9	D107	57.3°C
		10	D108	57.8°C
		11	C112	61.3°C
		12	C119	62.2°C
		13	Q200	61.8°C
		14	C118	64.1°C
		15	L201	67.2°C
		16	C219	62.5°C
		17	Q203	60.0°C
		18	L200	69.9°C
		19	TSW1	65.2°C
		20	ZR200	58.2°C
		21	T100	59.2°C
		22	T501	67.7°C
		23	Q105	60.9°C
		24	Q501	72.6°C
		25	U501	81.3°C
		26	U101	65.7°C
		27	Q504	74.4°C
		28	C114	59.0°C
		29	U500	66.2°C
		30	U201	63.5°C
		31	U100	56.3°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) 376133.5HRS (2) 119851.2HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 281.9K 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		

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
TEST RESULT		TESTER	REVIEW	APPROVAL
PASS		LIUTT		WANGDZ

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