



Test Report: NTS-300-212

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

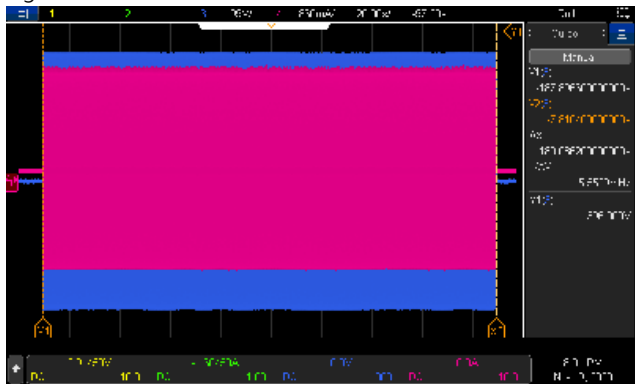
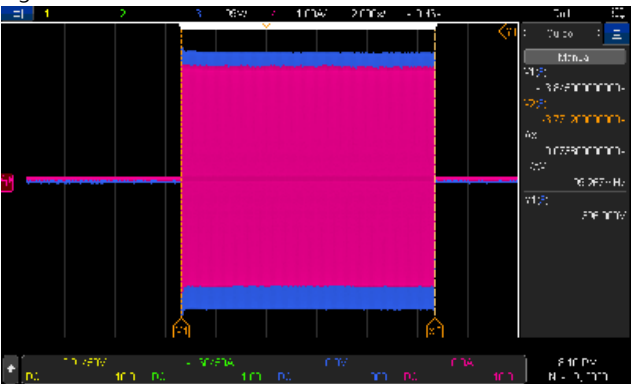
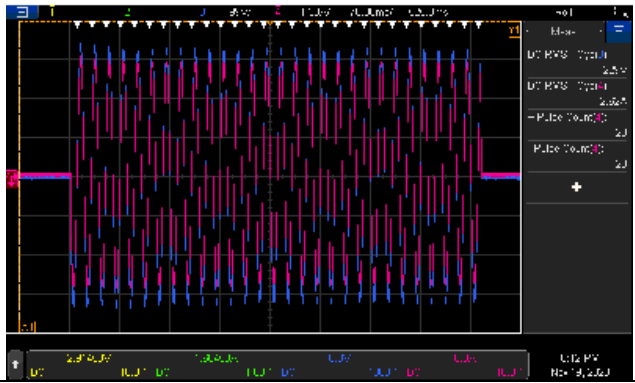
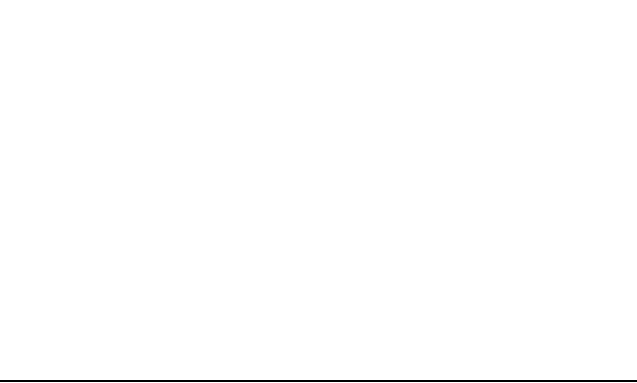
- E.M.C. Test

- **RELIABILITY TEST**

- ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	300W	IP: 12VDC 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: 12.5VDC OP: TESTING LOAD Ta:25°C	(1) 228.1V/ 1.48 A/ 180.08 Sec (2) 227.7 V/ 1.89 A/ 10.07 Sec (3) 229 V/ 2.62 A/ 28 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: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.6 V</u> DIP S.W 220VAC: <u>218.3 V</u> DIP S.W 230VAC: <u>228.2 V</u> DIP S.W 240VAC: <u>238.3 V</u>
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.04 HZ</u> DIP S.W 60HZ: <u>59.95 HZ</u>
5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 0.59 % / Vo(min) /FULL LOAD (2) 0.58 % / Vo(nor) /FULL LOAD (3) 0.58 % / Vo(max) /FULL LOAD

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

Fig1

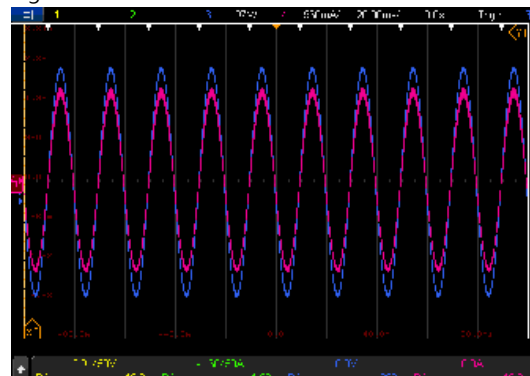


Fig2

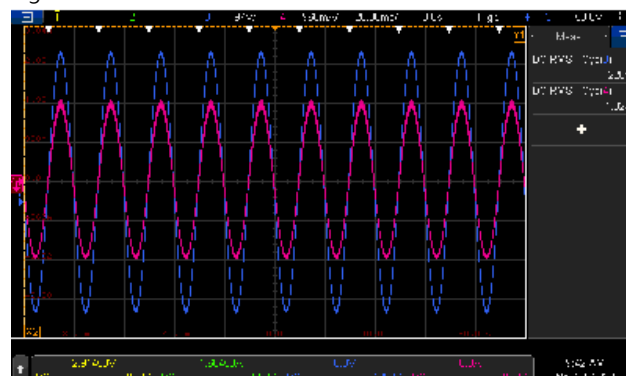
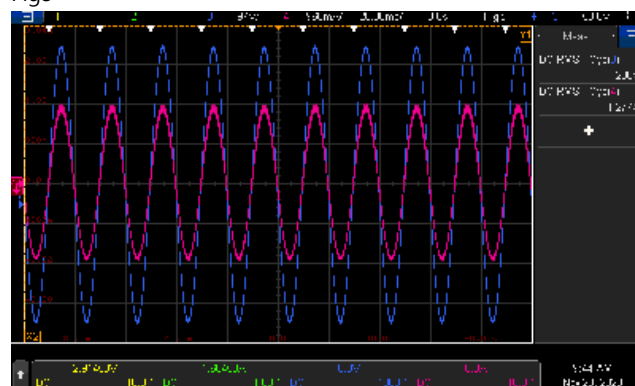


Fig3



6	AC REGULATION	$\pm 3\%$	IP: 12.5VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u>-0.74</u> %
7	Overshoot /Undershoot	$< \pm 10\%$	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u>-2.44</u> % (2) <u>-1.13</u> % (3) <u>-1.70</u> %
8	O/P voltage DC offset	Vin(nor)= <u>12</u> v · Vo <200mv · no load : <u>76mv</u> / full load: <u>75mv</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>15.5Vdc~ 12.50Vdc±0.3v</td><td>15.55Vdc~12.48Vdc</td></tr> <tr> <td> Orange</td><td>11~12.5Vdc ±0.3v</td><td>11.06Vdc~12.55Vdc</td></tr> <tr> <td> Red</td><td>Vdc< 11.0V · Vdc>15.5V±0.3v</td><td>Vdc< 11.14V · Vdc> 15.5</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 ~ 41.59%</td></tr> <tr> <td> Orange</td><td>40%±5% ~ 80%±5% LOAD</td><td>41.65 %~ 80.13%</td></tr> <tr> <td> Red</td><td>80%±5%~105%±5% LOAD</td><td>80.13%~105.3%</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	15.5Vdc~ 12.50Vdc±0.3v	15.55Vdc~12.48Vdc	 Orange	11~12.5Vdc ±0.3v	11.06Vdc~12.55Vdc	 Red	Vdc< 11.0V · Vdc>15.5V±0.3v	Vdc< 11.14V · Vdc> 15.5	LED	LOAD RANGE	RESULT	 Green	Min. load ~ 40%±5% LOAD	Min. load ~ 41.59%	 Orange	40%±5% ~ 80%±5% LOAD	41.65 %~ 80.13%	 Red	80%±5%~105%±5% LOAD	80.13%~105.3%
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	10VDC~16.2VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25℃ I/P: LOW-LINE=10.5V 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: 12V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	<u>10.2</u> VDC~ <u>16.3</u> VDC/NO LOAD <u>10.3</u> VDC~ <u>16.3</u> VDC/FULL LOAD Test: <u>OK</u> -

2	DC CURRENT (TYP)	30A	IP: 12VDC OP:FULL LOAD Ta:25°C	<u>27.0</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.2\text{W}$ @ Saving Mode $\leq 10\text{W}$ @NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25°C	<u>0.78</u> W <u>7.84</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25\text{W}$	IP: 12VDC OP: TESTING LOAD Ta:25°C	<u>≥ 21</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10\text{W}$	IP: 12VDC OP: TESTING LOAD Ta:25°C	<u>≤ 10.56</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1\text{mA}$	IP: 12VDC OP: Sw off Ta:25°C	0.48mA
7	EFFICIENCY(TYP)	300W/ 92%	IP: 12.5VDC OP: $P_o = 300\text{W}$ 230V/50HZ (factory setting) Ta:25°C	93.01 %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V $\pm$ 0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>10.9</u> V
2	BAT LOW SHUT DOWN	10V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>10.2</u> V
3	BAT LOW RESTART	12.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>12.4</u> V
4	BAT HIGH ALARM	15.5V $\pm$ 0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>15.5</u> V
5	BAT HIGH SHUT DOWN	16.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>16.4</u> V
6	BAT HIGH RESTART	15V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>14.9</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: 12VDC 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: 12VDC OP: TESTING SW:ON Ta:25°C	(1). <u>106%~112.3 %</u> <u>180.08 sec</u> (2). <u>116%~143 %</u> <u>10.07 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: 12VDC 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>207</u> W · turn on <u>OK</u> LAMP: <u>310</u> W · turn on <u>OK</u> LAMP: <u>415.8</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>301.5</u>	1. Vin=HIGH LINE 2. O/P=230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>300</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 : 60V /60 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)35.2V (2) 35.2V (3) 35.6V (4) 35.6V (5) 34.8V

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 (5)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1)512V (2)540V (3)528V (4)512V (5)516V
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)254 V (2) 246V (3) 246V (4) 250V (5) 250V C119 (1)246V (2) 246V (3) 250V (4) 246V (5) 246V
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) 531V (2) 607V (3) 566V (4) 530V (5) 530V
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 (5)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q504 (1) 51.0V (2) 51.0V (3) 51.0V (4) 51.0V (5) 51.0V Q105 (1) 37.3V (2) 37.3V (3) 37.3V (4) 37.3V (5) 37.7V
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) 3.36V (2) 3.4V (3) 3.38V (4) 3.36V

		CHARGE IC U101 Rated -0.3V~20V Gate Driver IC U200 Rated -0.3V~20V	(5) Saving mode Ta:25°C	(5) 3.34 V U501 (1) 11.62V (2) 11.62V (3) 11.62V (4) 11.62V (5) 11.62V U101 (1) 12.43V (2) 12.43V (3) 12.43V (4) 12.43V (5) 12.43V U200 (1) 5.09 V (2) 5.09V (3) 5.09V (4) 5.09V (5) 5.09V
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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: 2.227 mA AC O/P-FG: 1.695 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	3mΩ

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: 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-300-212 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 21.4 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 40.8 °C		
		NO	Position	ROOM AMBIENT Ta=21.4 °C
		1	C100	74.2°C
		2	C101	78.2°C
		3	Q101	58.0°C
		4	Q103	56.2°C
		5	RT300	58.7°C
		6	T101	78.6°C
		7	C112	60.5°C
		8	D106	52.5°C
		9	D105	53.9°C
		10	Q200	58.0°C
		11	U101	67.7°C
		12	C119	61.8°C
		13	U501	82.3°C
		14	L201	60.4°C
		15	Q202	57.4°C
		16	C219	59.0°C
		17	L200	64.3°C
		18	C118	62.7°C
		19	TSW1	63.6°C
		20	ZR200	55.5°C
		21	T100	60.2°C
		22	Q105	62.2°C
		23	U303	62.3°C
		24	T501	67.1°C
		25	Q504	73.5°C
		26	Q501	75.9°C
		27	TC2	45.1°C
		28	U201	59.2°C
		29	U500	60.0°C
		30	U100	58.7°C
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC 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 : 16.1VDC 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 : 12VDC/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 : 12.5VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 12.5VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME		(1) 84640.2HRS (2) 29924.8HRS
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 : 12.5VDC 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