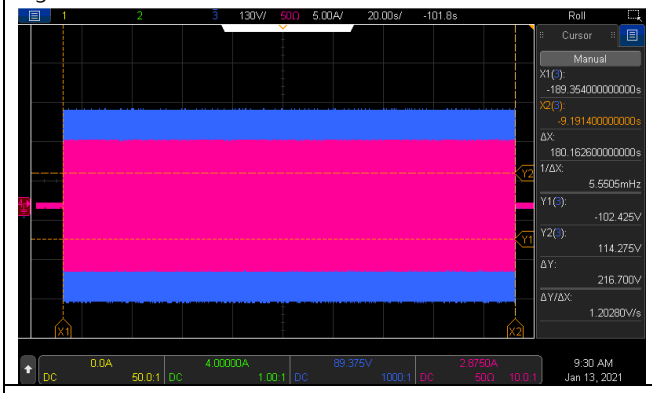
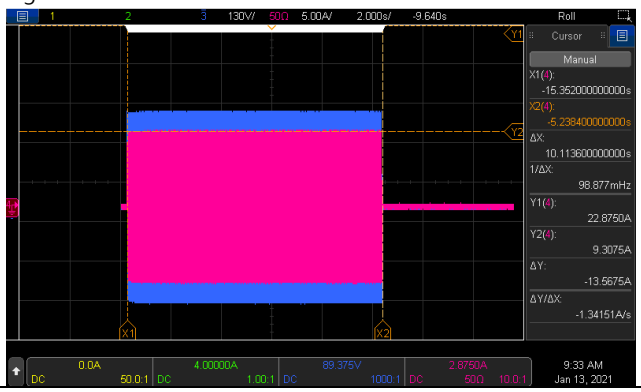
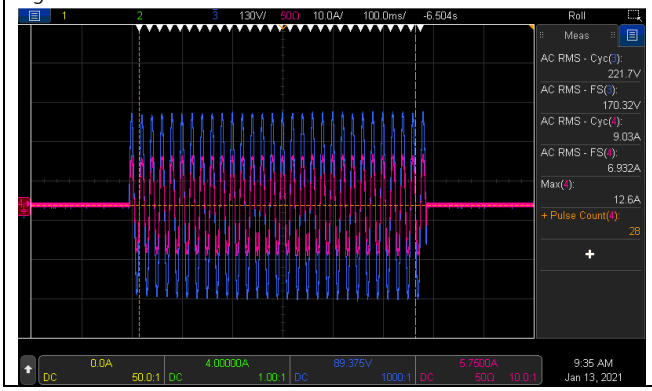
Test Report: NTU-1200-212

1200W High Reliable True Sine Wave with UPS 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	1200W	IP: 12VDC Ta:25℃	1225 W
2	MAXIMUM OUTPUT POWER (TYP)	(1)1380W/180sec. (2)1800w/10sec (3)SURGE POWER 2000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 12.5VDC OP:TESTING LOAD Ta:25℃	(1) 228.02 V/ 5.95 A/ 180.1 Sec (2) 227.7 V/ 7.72 A/ 10.1 Sec (3) 222.8 V/ 9.09 A/ 28 Cycle
	CH3:O/P VAC CH4:O/P IAC Fig1  Fig2  Fig3 			
3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 200VAC: 198.3 V DIP S.W 220VAC: 218.1 V DIP S.W 230VAC: 228.1 V DIP S.W 240VAC: 238.1 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 50HZ: 50.041 HZ DIP S.W 60HZ: 59.959 HZ

5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP:75% LOAD(900W) (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 2.11 % / Vo(min)/75% LOAD (2) 1.98% / Vo(nor) /75% LOAD (3) 2.04 % / Vo(max) /75% LOAD

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

Fig1

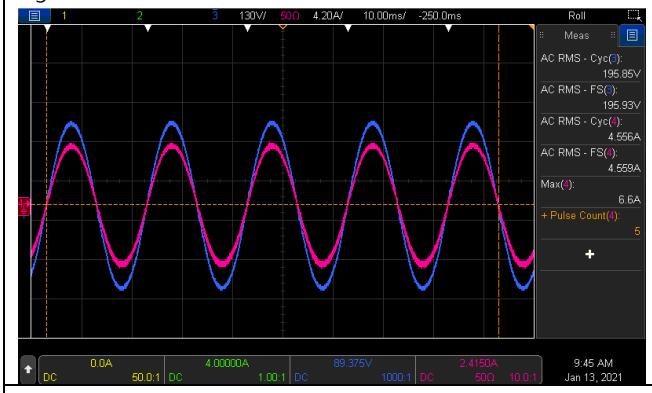


Fig2

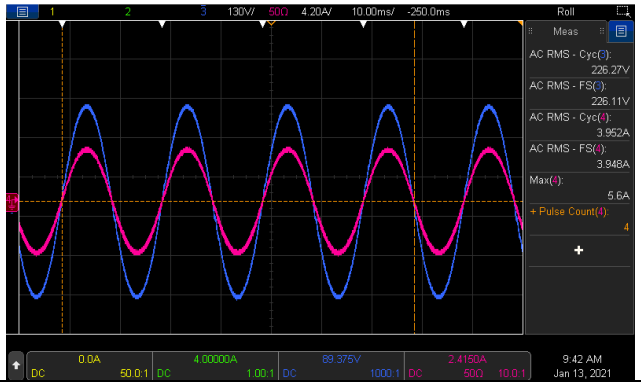
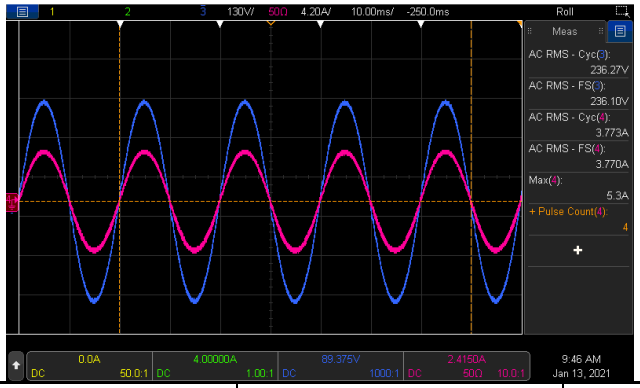


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP:75% LOAD(900W) Ta:25℃	-0.87 %
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) -2.09 % (2) -1.22 % (3) 2.18 %
8	O/P voltage DC offset	Vin(nor)= 12 v · Vo< 200mV · no load : 74.9 mV / full load: 66.2 mV		

9 LED STATUS

- Statas test

LED	Statas	RESULT
Green	Inverter OK	OK
Orange	Remote off Saving mode	OK
Red	Abnormal Status (See SPEC)	OK

- Battery test

LED	Battery RANGE	RESULT
Green	12.5~15.5 Vdc±0.3v	12.55Vdc ~ 15.56Vdc
Orange	11~ 12.5Vdc ±0.3v	11.02Vdc ~12.50Vdc
Red	<11.0 Vdc ±0.3v > 15.5vdc±0.3v	< 11.01 Vdc > 15.61 Vdc

- Load test

LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~38.8%
Orange	40%±5% ~ 80%±5% LOAD	40.8%~ 78.3%
Red	≧ 80%±5% LOAD	≧ 79.2%

- AC Input

LED	AC INPUT	RESULT
Green	Utility OK	OK
Green	Utility error	OK
Colorless	Utility disconnected	OK

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℃	10.18 VDC~ 16.54 VDC/NO LOAD 10.07 VDC~ 16.54 VDC/FULL LOAD
			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)	Test： OK
2	DC CURRENT (TYP)	120A	IP: 12VDC OP:FULL LOAD Ta:25℃	114.4 A
3	NO LOAD DISSPATION (Typ.)	≦ 8W@standby saving mode ≦ 25W@NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25℃	5.64 W 19.91 W
4	SAVING MODE TO NORMAL	Po≥25W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≥ 20 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≦ 11 W
6	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 12VDC OP: Sw off Ta:25℃	0.58 mA
7	EFFICIENCY(TYP)	900W/90%	IP: 12.5VDC OP: Po=900W 230V/50HZ (factory setting) Ta:25℃	90.9 %

AC UPS MODE

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	AC Taper Voltage RANGE	AC input high / low line limit:No Load		

AC Voltage	limit	Voltage RANGE	RESULT
230V	High limit (To INV mode)	Vac>230V +16%±3%	264.5 V
	Recovery to high (To AC mode)	Vac <230V+13%±3%	255.8 V
	Low limit (To INV mode)	Vac <230V-16%±3%	192.9 V
	Recovery to low (To AC mode)	Vac >230V-13%±3%	199.6 V

AC Voltage	limit	Voltage RANGE	RESULT
200V	High limit (To INV mode)	Vac >200V+16%±3%	230.8 V
	Recovery to high (To AC mode)	Vac <200V+13%±3%	223.7 V
	Low limit (To INV mode)	Vac <200V-16%±3%	166.3 V
	Recovery to low (To AC mode)	Vac >200V-13%±3%	171.7 V
AC Voltage	limit	Voltage RANGE	RESULT
220V	High limit (To INV mode)	Vac >220V+16%±3%	251.8 V
	Recovery to high (To AC mode)	Vac <220V+13%±3%	245.2 V
	Low limit (To INV mode)	Vac <220V-16%±3%	183.1 V
	Recovery to low (To AC mode)	Vac >220V-13%±3%	189.5 V
AC Voltage	limit	Voltage RANGE	RESULT
240V	High limit (To INV mode)	Vac >240V+16%±3%	277.8 V
	Recovery to high (To AC mode)	Vac <240V+13%±3%	268.6 V
	Low limit (To INV mode)	Vac <240V-16%±3%	199.9 V
	Recovery to low (To AC mode)	Vac >240V-13%±3%	206.6 V

2	FREQUENCY RANGE	45 ~ 65Hz	IP:12VDC OP: FULL LOAD Ta:25℃	TEST: OK
3	TRANSFER TIME (TYP)	t<10ms±3ms inverter↔by pass	IP: 12VDC OP: (1) no load (2) full load Ta:25℃	(1) no load a. INTER→BY PASS 3.58 ms b.BY PASS→INVERTER 7.8 ms (2) full load c. INTER→BY PASS 3.52 ms d.BY PASS→INVERTER 12.1 ms

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℃	10.11 V

3	BAT LOW RESTART	12.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	12.55 V
4	BAT HIGH ALARM	15.5V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	15.65 V
5	BAT HIGH SHUT DOWN	16.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	16.52 V
6	BAT HIGH RESTART	15V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	15.04 V
7	OVER TEMPERATURE	Shut down o/p voltage: re-power on	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
8	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 (1).TEST: OK
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℃	(1). 107 %~ 113 % 180.1 sec (2). 117 %~ 146 % 10.1 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℃	Open : Normal work Short : Remote off (1).TEST: OK (2).TEST: OK

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 841 W · turn on OK LAMP: 1264 W · turn on OK LAMP: 1465 W · turn on OK	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: OK	
2	INDUCTION MOTOR	0.5 HP	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: OK	

3	SWITCHING POWER SUPPLY	WITH PFC: RSP-1600-48 , O/P= 1190 W	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: OK
		NO PFC: SE-1000-48 , O/P= 505 W	1. Vin=HIGH LINE 2. O/P=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 Rated : 60V /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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q101 (1) 44.4V (2) 37.1V (3) 45.2V (4) 37.1V (5) 36.3V	Q105 (1) 40.4V (2) 36.3V (3) 42.4V (4) 40.8V (5) 37.9V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 600V/ 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(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	D151 (1) 529V (2) 533V (3) 545V (4) 557V (5) 532V	D152 (1) 545V (2) 557V (3) 553V (4) 549V (5) 553V
3	DC BUS Capacitor Voltage	C161/C162 Rated : 680 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℃	C161 (1) 251V (2) 251V (3) 251V (4) 255V (5) 251V	C162 (1) 259V (2) 259V (3) 259V (4) 259V (5) 259V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 30A / 650 V	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℃	Q1 (1)556V (2)568V (3)560V (4)552V (5)548V	Q4 (1)556V (2)572V (3)556V (4)556V (5)560V

5	AUX PWM MOS	Q201 Rated : 80 A/ 100 V Q501 Rated : 120 A/ 60 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℃	Q201 (1) 58.0V (2) 58.0V (3) 58.0V (4) 58.0V (5) 57.2V	Q501 (1) 49.2V (2) 49.2V (3) 49.2V (4) 49.2V (5) 49.2V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4 V~ 3.6 V AUX IC U201 Rated 8.2V~30V CHARGE IC U501 Rated -0.3V~20V Gate Driver IC U81 Rated -0.3V~20V	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℃	U301 (1) 3.35V (2) 3.31V (3) 3.35V (4) 3.31V (5) 3.31V U201 (1) 12.32V (2) 12.32V (3) 12.32V (4) 12.32V (5) 12.32V	U501 (1) 12.40V (2) 12.48V (3) 12.48V (4) 12.48V (5) 12.48V U81 (1) 5.08V (2) 5.08V (3) 5.08V (4) 5.08V (5) 5.08V

SAFETY &EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-AC I/P: 3 KVAC/min BAT I/P-AC O/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-AC I/P: 3.6 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 I/P : 7.13 mA BAT I/P-AC O/P: 7.03 mA AC O/P-FG: 5.83 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	3mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CISPR32 (expect for Type-UN) CLASS A	I/P:12 VDC O/P: :FULL/50% LOAD Ta:25℃	CLASS A
2	E.S.D	EN61000-4-2 AIR：8KV / Contact：4KV	I/P: 12VDC O/P:FULL LOAD Ta:25℃	PASS
3	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS
4	CONDUCTION	EN55032 CISPR32 (expect for Type-UN) CLASS A	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS
5	E.F.T	EN61000-4-4 INPUT： 1KV	I/P： 230 VAC/50HZ O/P：FULL LOAD	CRITERIA A

			Ta：25℃	
6	SURGE	IEC61000-4-5 L-N ：1KV L,N-PE：2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
7	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-1200-212 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 12.5VDC O/P： FULL LOAD Ta= 25.0 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 12.5VDC O/P： FULL LOAD Ta= 35.0 ℃		

NO	Position	ROOM AMBIENT Ta=25.0 ℃	HIGH AMBIENT Ta= 35.0 ℃
1	C101	62.4℃	76.5℃
2	T101	59.5℃	71.4℃
5	D151	44.9℃	56.2℃
6	RTH6	56.3℃	69.8℃
7	Q105	49.9℃	62.7℃
8	Q104	48.6℃	60.8℃
9	C531	28.3℃	41.3℃
10	T501	31.2℃	42.6℃
11	Q501	33.5℃	45.3℃
12	U301	34.5℃	46.7℃
13	U361	31.9℃	44.8℃
14	TSW1	37.3℃	49.3℃
15	Q1	58.1℃	70.3℃
16	Q4	44.3℃	56.5℃
17	R223	35.1℃	47.5℃
18	C222	34.7℃	46.7℃
19	Q201	34.8℃	47.0℃
20	D154	43.8℃	55.2℃
21	C161	35.5℃	47.4℃
22	L10	39.7℃	51.7℃
23	C2	28.0℃	39.6℃
24	T202	30.8℃	43.0℃
25	RY1	34.4℃	45.2℃
26	ZNR1	32.1℃	43.1℃
27	LF1	30.8℃	41.9℃
28	C1	32.7℃	43.7℃
29	R213	46.6℃	56.6℃
30	U501	36.4℃	47.6℃
31	R24	45.5℃	72.2℃
32	U81	34.9℃	45.8℃
33	D501	35.5℃	45.6℃
34	R501	39.1℃	49.5℃
35	U201	44.8℃	55.1℃
36	C104	67.0℃	79.6℃
37	TC	35.1℃	46.5℃

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 : 16.2VDC O/P : FULL LOAD Ta= 35 ℃ 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 : -25℃~ +40℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 12.5VDC/Full Load		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 C104 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) 166424.9HRS (2) 69489.7HRS
8	MTBF	Conducted by Parts Stress Analysis Prediction 166.3K hrs min. Telcordia TR/SR-332 (Bellcore) ; 58.3K 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

2018.4.30 GP-A50-F010