Test Report: NTS-1200-112

1200W High Reliable True Sine Wave 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℃	1227 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) 109.4 V/ 12.29 A/ 180.2 Sec (2) 109.1 V/ 16.01 A/ 10.08 Sec (3) 109.2 V/ 17.98 A/ 35Cycle

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

Fig1

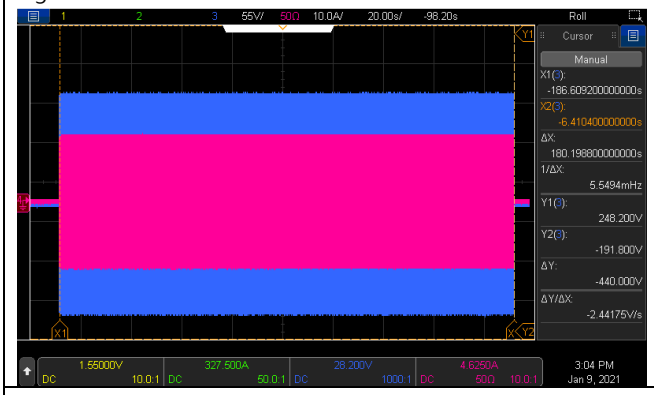


Fig2

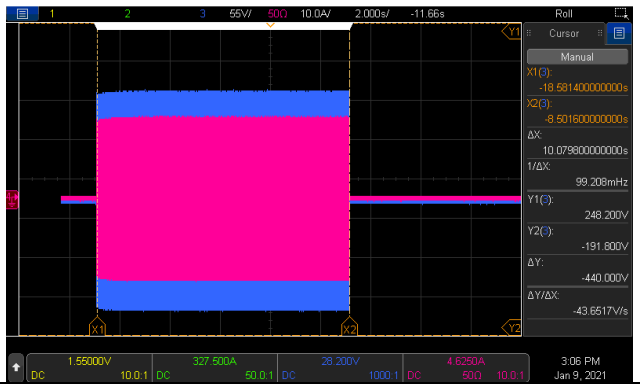
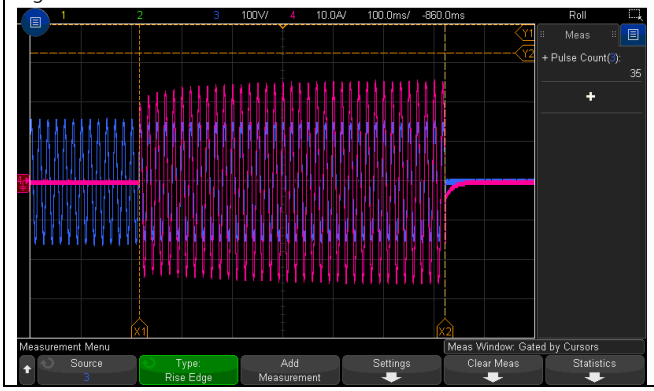
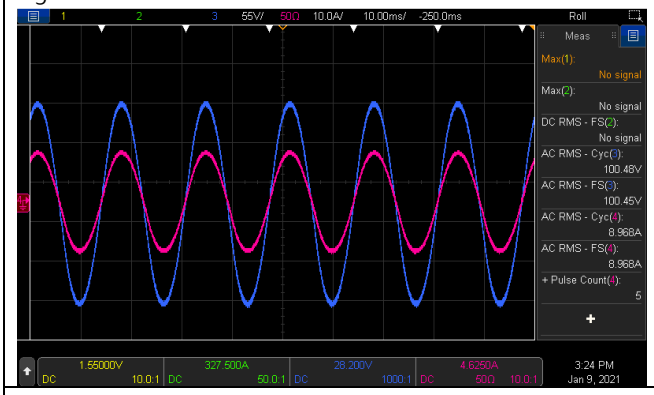
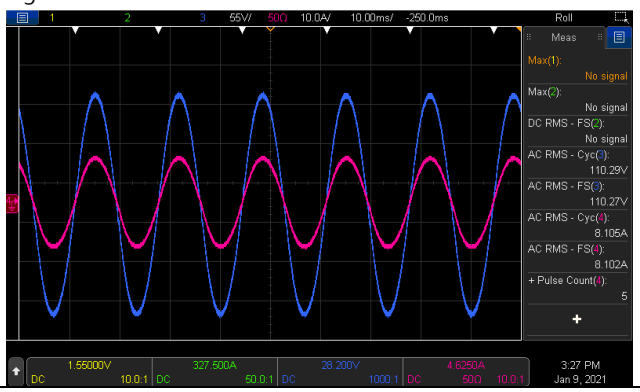
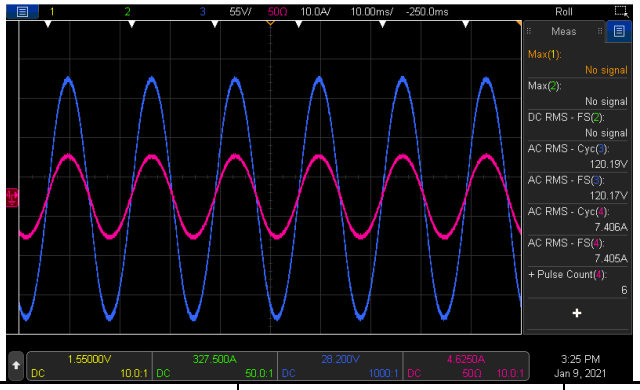


Fig3



3	AC Voltage	100 / 110 / 115 / 120Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 100VAC: 99.2 V DIP S.W 110VAC: 119.5 V DIP S.W 115VAC: 114.5 V DIP S.W 120VAC: 119.4 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: 59.958 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) 1.91 % / Vo(min)/75% LOAD (2) 1.91 % / Vo(nor) /75% LOAD (3) 1.62 % / 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℃	0.56 %
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) -6.64 % (2) 1.2 % (3) -3.28 %
8	O/P voltage DC offset	Vin(nor)= 12 v · Vo< 200mV · no load : 119.1 mV / full load: 122.2mV		

<table>
<tr><td>9</td><td>LED STATUS</td><td>

● 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	12.57Vdc ~ 15.52Vdc
Orange	11~ 12.5Vdc ±0.3v	11.07Vdc ~ 12.51Vdc
Red	<11.0 Vdc ±0.3v > 15.5vdc±0.3v	< 11.1 Vdc > 15.67 Vdc

● Load test

LED	LOAD RANGE	RESULT
Green	Min. load ~ 40%±5% LOAD	Min. load ~38.2%
Orange	40%±5% ~ 80%±5% LOAD	41.1%~ 77.2%
Red	≧ 80%±5% LOAD	≧ 79.3%

</td></tr>
</table>

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE R ANGE (TYP)	10VDC~16.5VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25℃	10.09 VDC~ 16.56 VDC/NO LOAD 10.11 VDC~16.56 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℃	115.3 A
3	NO LOAD DISSPATION (Typ.)	≦ 1.2W @standby saving mode ≦ 15W@NON-Saving Mode	IP: 48VDC OP:NO LOAD Ta:25℃	1.149 W 10.44 W
4	SAVING MODE TO NORMAL	Po≥25W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≥ 19 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≦ 12.5
6	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 12VDC OP: Sw off Ta:25℃	0.42 mA
7	EFFICIENCY(TYP)	900W/89%	IP: 12.5VDC OP: Po=900W 110V/60HZ (factory setting) Ta:25℃	89.5 %

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℃	12.56 V
4	BAT HIGH ALARM	15.5V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	15.57 V
5	BAT HIGH SHUT DOWN	16.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	16.57 V
6	BAT HIGH RESTART	15V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	15.09 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). 105 %~ 112 % 180.2 sec (2). 118 %~ 145.3 % 10.08 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: 696 W · turn on OK LAMP: 1126 W · turn on OK LAMP: 1272 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= 1224 W	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: OK	
		NO PFC: SE-1000-48 · O/P= 502 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q101 (1) 39.9V (2) 38.3V (3) 49.2V (4) 38.3V (5) 38.7V	Q105 (1) 44.7V (2) 40.3V (3) 53.8V (4) 37.9V (5) 37.5V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 300V/ 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	D151 (1) 267V (2) 293V (3) 269V (4) 275V (5) 271V	D152 (1) 275V (2) 291V (3) 275V (4) 289V (5) 287V
3	DC BUS Capacitor Voltage	C161 Rated : 680 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	C161 (1) 266V (2) 266V (3) 266V (4) 266V (5) 266V	
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 IKP15N65H5 Rated : 40A / 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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q1 (1)283V (2)313V (3)303V (4)283V (5)289V	Q4 (1)316V (2)332V (3)320V (4)324V (5)316V
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(2000W) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25℃	Q201 (1) 65.7V (2) 65.7V (3) 65.7V (4) 65.7V (5) 65.7V	Q501 (1) 34.4V (2) 34.4V (3) 34.4V (4) 34.4V (5) 34.4V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4 V~ 3.6 V AUX IC U201 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(2000W) Turn On	U301 (1) 3.39V (2) 3.39V (3) 3.39V (4) 3.39V	U501 (1) 12.56V (2) 12.56V (3) 12.56V (4) 12.56V

		8.2V~30V CHARGE IC U501 Rated -0.3V~20V Gate Driver IC U81 Rated -0.3V~20V	(4) NO LOAD Turn On (5) Saving mode Ta:25℃	(5) 3.39V U201 (1) 12.32V (2) 12.32V (3) 12.32V (4) 12.32V (5) 12.32V	(5) 12.56V 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 O/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: 6.98 mA AC O/P-FG: 5.98 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	▓ FCC (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℃	■ 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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：NTU-1200-112
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 ℃</td></tr>
<tr><td colspan="5">
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=25.0 ℃</th><th>HIGH AMBIENT Ta= 35.0 ℃</th></tr>
<tr><td>1</td><td>C101</td><td>65.9℃</td><td>78.0℃</td></tr>
<tr><td>2</td><td>Q108</td><td>63.5℃</td><td>76.1℃</td></tr>
<tr><td>3</td><td>RTH6</td><td>59.4℃</td><td>71.3℃</td></tr>
<tr><td>4</td><td>Q101</td><td>54.4℃</td><td>66.5℃</td></tr>
<tr><td>5</td><td>T501</td><td>32.4℃</td><td>43.2℃</td></tr>
<tr><td>6</td><td>C531</td><td>34.3℃</td><td>44.5℃</td></tr>
<tr><td>7</td><td>Q501</td><td>37.2℃</td><td>47.1℃</td></tr>
<tr><td>8</td><td>Q141</td><td>35.6℃</td><td>46.1℃</td></tr>
<tr><td>9</td><td>T101 CORE</td><td>72.4℃</td><td>85.6℃</td></tr>
<tr><td>10</td><td>T101 COIL</td><td>84.4℃</td><td>102.6℃</td></tr>
<tr><td>11</td><td>LF1</td><td>50.0℃</td><td>60.4℃</td></tr>
<tr><td>12</td><td>CT1</td><td>38.3℃</td><td>48.4℃</td></tr>
<tr><td>13</td><td>C161</td><td>43.3℃</td><td>54.1℃</td></tr>
<tr><td>14</td><td>Q1</td><td>79.0℃</td><td>89.2℃</td></tr>
<tr><td>15</td><td>RY1</td><td>44.8℃</td><td>56.7℃</td></tr>
<tr><td>16</td><td>C2</td><td>32.1℃</td><td>41.9℃</td></tr>
<tr><td>17</td><td>Q2</td><td>73.7℃</td><td>83.5℃</td></tr>
<tr><td>18</td><td>D151</td><td>69.5℃</td><td>79.4℃</td></tr>
<tr><td>19</td><td>T202</td><td>34.1℃</td><td>43.7℃</td></tr>
<tr><td>20</td><td>Q201</td><td>37.5℃</td><td>47.8℃</td></tr>
<tr><td>21</td><td>L10</td><td>58.2℃</td><td>69.2℃</td></tr>
<tr><td>22</td><td>R223</td><td>49.8℃</td><td>61.3℃</td></tr>
<tr><td>23</td><td>C222</td><td>40.3℃</td><td>51.4℃</td></tr>
<tr><td>24</td><td>D152</td><td>62.4℃</td><td>72.8℃</td></tr>
<tr><td>25</td><td>TSW1</td><td>53.3℃</td><td>61.2℃</td></tr>
<tr><td>26</td><td>R213</td><td>54.2℃</td><td>67.4℃</td></tr>
<tr><td>27</td><td>U201</td><td>46.7℃</td><td>58.2℃</td></tr>
<tr><td>28</td><td>Q203</td><td>40.0℃</td><td>51.5℃</td></tr>
<tr><td>29</td><td>U81</td><td>38.9℃</td><td>50.1℃</td></tr>
<tr><td>30</td><td>R501</td><td>38.3℃</td><td>48.0℃</td></tr>
<tr><td>31</td><td>U501</td><td>36.4℃</td><td>46.7℃</td></tr>
<tr><td>32</td><td>D501</td><td>36.7℃</td><td>46.8℃</td></tr>
<tr><td>33</td><td>R24</td><td>65.1℃</td><td>74.6℃</td></tr>
<tr><td>34</td><td>U301</td><td>36.5℃</td><td>47.1℃</td></tr>
<tr><td>35</td><td>U361</td><td>35.1℃</td><td>46.1℃</td></tr>
<tr><td>36</td><td>TC1</td><td>40.9℃</td><td>51.3℃</td></tr>
<tr><td>37</td><td>TC2</td><td>39.8℃</td><td>50.2℃</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>LOW TEMPERATURE TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 12.5VDC
O/P： 100%LOAD
Ta= -25 ℃</td><td>TEST：OK</td></tr>
</table>

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 C101 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) 141598.4HRS (2) 66517.5HRS
8	MTBF	Conducted by Parts Stress Analysis Prediction 596.7K hrs min. Telcordia TR/SR-332 (Bellcore) ; 62.0K 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