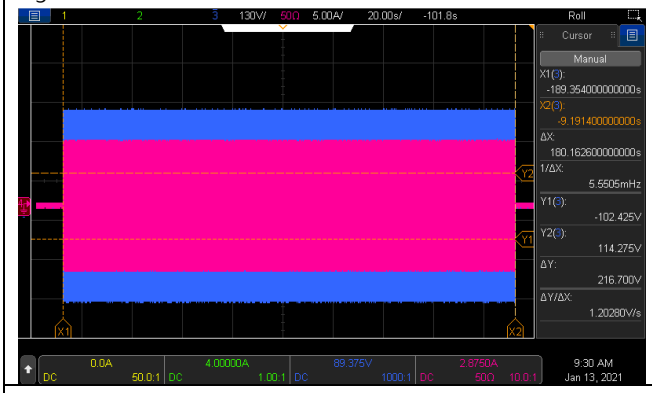
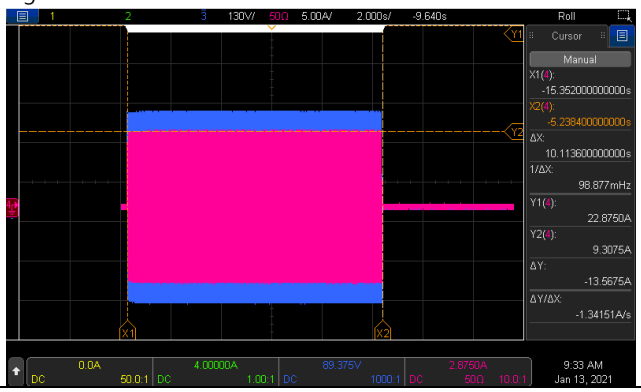
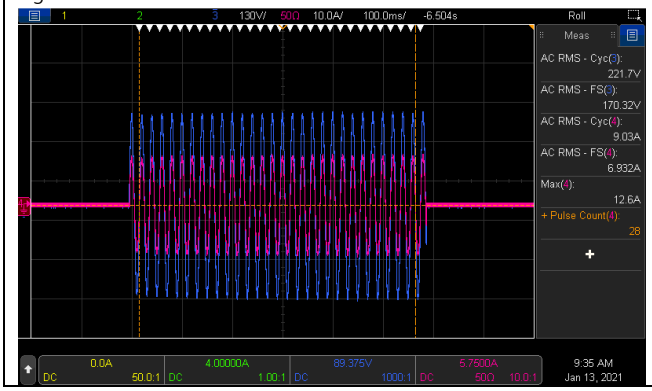
Test Report: NTS-1200-212

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℃	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

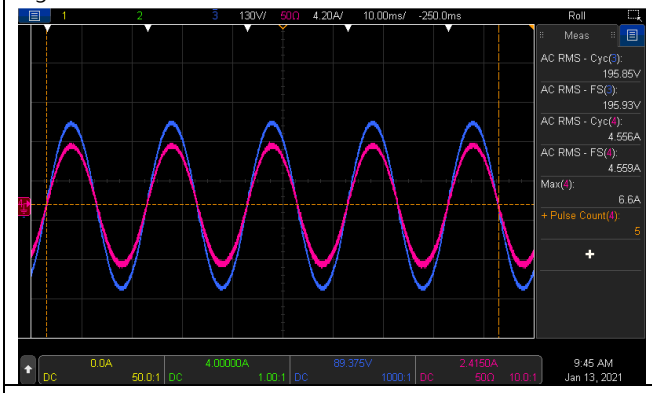


Fig2

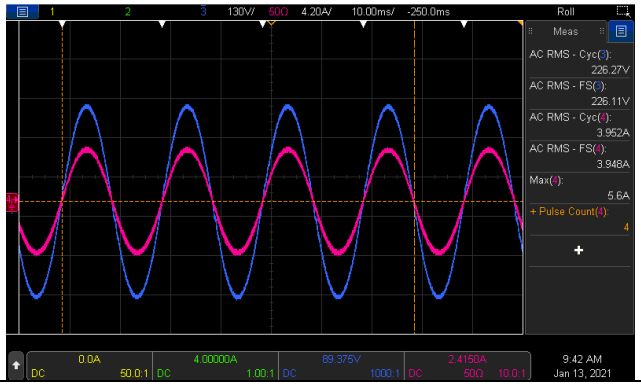
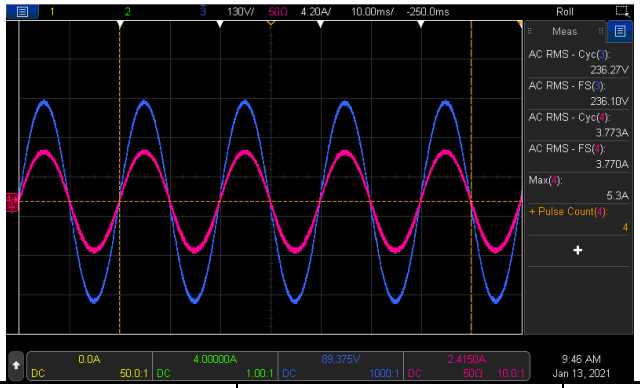


Fig3



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		

<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	12.55Vdc ~ 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%

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

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.)	≦ 1.2W standby saving mode ≦ 25W@NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25℃	1.153 W 20.34 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℃	90.3 %

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	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	U301 (1) 3.35V (2) 3.31V (3) 3.35V (4) 3.31V	U501 (1) 12.40V (2) 12.48V (3) 12.48V (4) 12.48V

		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) 3.31V U201 (1) 12.32V (2) 12.32V (3) 12.32V (4) 12.32V (5) 12.32V	(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 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: 7.09 mA AC O/P-FG: 5.95 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 (exppect 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-1200-212
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 ℃

<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>62.4℃</td><td>76.5℃</td></tr>
<tr><td>2</td><td>T101</td><td>59.5℃</td><td>71.4℃</td></tr>
<tr><td>5</td><td>D151</td><td>44.9℃</td><td>56.2℃</td></tr>
<tr><td>6</td><td>RTH6</td><td>56.3℃</td><td>69.8℃</td></tr>
<tr><td>7</td><td>Q105</td><td>49.9℃</td><td>62.7℃</td></tr>
<tr><td>8</td><td>Q104</td><td>48.6℃</td><td>60.8℃</td></tr>
<tr><td>9</td><td>C531</td><td>28.3℃</td><td>41.3℃</td></tr>
<tr><td>10</td><td>T501</td><td>31.2℃</td><td>42.6℃</td></tr>
<tr><td>11</td><td>Q501</td><td>33.5℃</td><td>45.3℃</td></tr>
<tr><td>12</td><td>U301</td><td>34.5℃</td><td>46.7℃</td></tr>
<tr><td>13</td><td>U361</td><td>31.9℃</td><td>44.8℃</td></tr>
<tr><td>14</td><td>TSW1</td><td>37.3℃</td><td>49.3℃</td></tr>
<tr><td>15</td><td>Q1</td><td>58.1℃</td><td>70.3℃</td></tr>
<tr><td>16</td><td>Q4</td><td>44.3℃</td><td>56.5℃</td></tr>
<tr><td>17</td><td>R223</td><td>35.1℃</td><td>47.5℃</td></tr>
<tr><td>18</td><td>C222</td><td>34.7℃</td><td>46.7℃</td></tr>
<tr><td>19</td><td>Q201</td><td>34.8℃</td><td>47.0℃</td></tr>
<tr><td>20</td><td>D154</td><td>43.8℃</td><td>55.2℃</td></tr>
<tr><td>21</td><td>C161</td><td>35.5℃</td><td>47.4℃</td></tr>
<tr><td>22</td><td>L10</td><td>39.7℃</td><td>51.7℃</td></tr>
<tr><td>23</td><td>C2</td><td>28.0℃</td><td>39.6℃</td></tr>
<tr><td>24</td><td>T202</td><td>30.8℃</td><td>43.0℃</td></tr>
<tr><td>25</td><td>RY1</td><td>34.4℃</td><td>45.2℃</td></tr>
<tr><td>26</td><td>ZNR1</td><td>32.1℃</td><td>43.1℃</td></tr>
<tr><td>27</td><td>LF1</td><td>30.8℃</td><td>41.9℃</td></tr>
<tr><td>28</td><td>C1</td><td>32.7℃</td><td>43.7℃</td></tr>
<tr><td>29</td><td>R213</td><td>46.6℃</td><td>56.6℃</td></tr>
<tr><td>30</td><td>U501</td><td>36.4℃</td><td>47.6℃</td></tr>
<tr><td>31</td><td>R24</td><td>45.5℃</td><td>72.2℃</td></tr>
<tr><td>32</td><td>U81</td><td>34.9℃</td><td>45.8℃</td></tr>
<tr><td>33</td><td>D501</td><td>35.5℃</td><td>45.6℃</td></tr>
<tr><td>34</td><td>R501</td><td>39.1℃</td><td>49.5℃</td></tr>
<tr><td>35</td><td>U201</td><td>44.8℃</td><td>55.1℃</td></tr>
<tr><td>36</td><td>C104</td><td>67.0℃</td><td>79.6℃</td></tr>
<tr><td>37</td><td>TC</td><td>35.1℃</td><td>46.5℃</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 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 198.9K 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