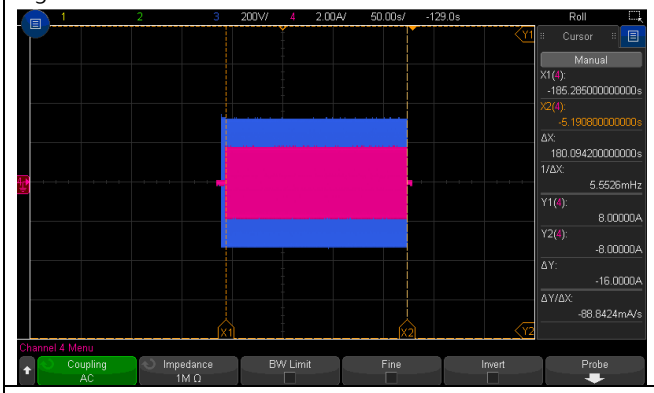
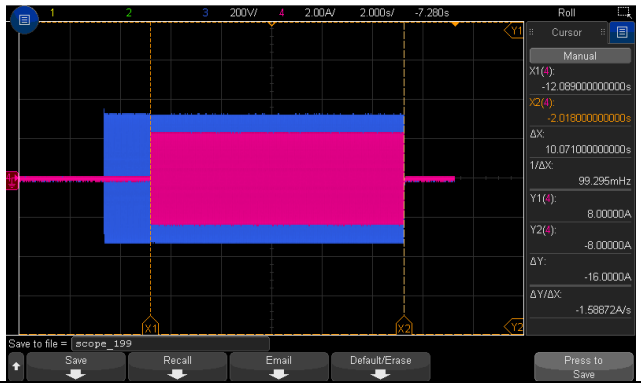
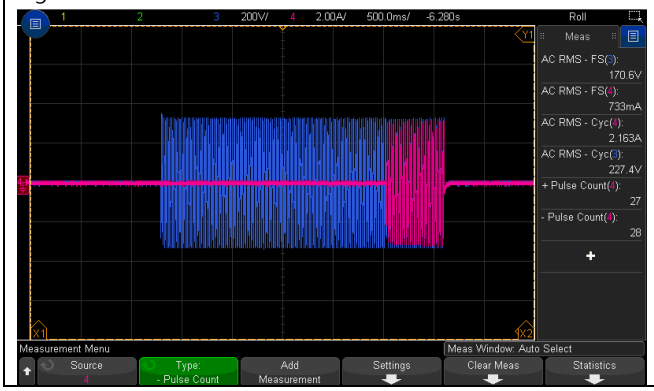
Test Report: NTS-250P-212

250W 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	250W	IP: 12VDC Ta:25℃	255.86 W
2	MAXIMUM OUTPUT POWER (TYP)	(1) 285W/180sec. (2) 375w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 12.5VDC OP:TESTING LOAD Ta:25℃	(1) 229.28 V/ 1.24A/ 180.09 Sec (2)229.16 V/1.62 A/10.07Sec (3) 227.4V/2.163 A/ 27 Cycle
	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 200VAC: 199.38 V DIP S.W 220VAC: 219.42 V DIP S.W 230VAC: 229.52 V DIP S.W 240VAC: 239.58 V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25℃	DIP S.W 50HZ: 50.042 HZ DIP S.W 60HZ: 59.959 HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25℃	(1) 0.961 % / Vo(min) /FULL LOAD (2) 0.855 % / Vo(nor) /FULL LOAD (3) 0.812 % / Vo(max) /FULL LOAD

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

Fig1

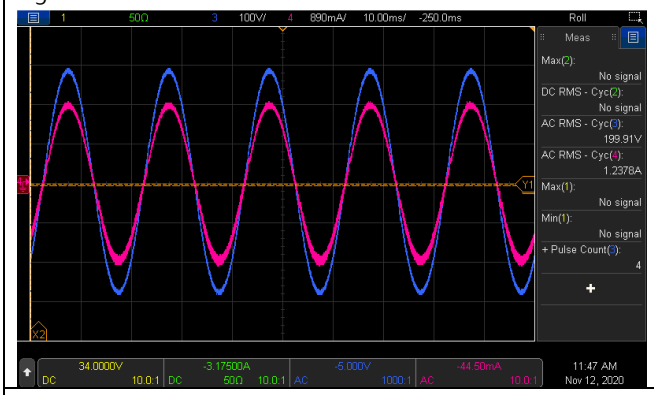


Fig2

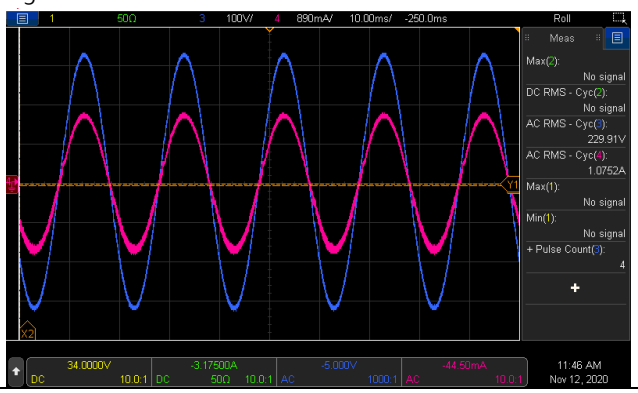
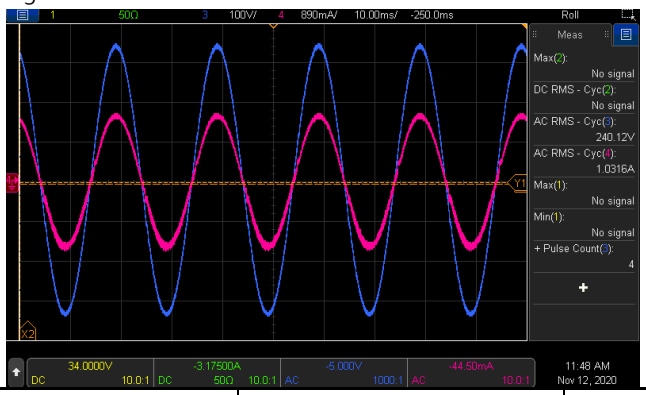


Fig3



6	AC REGULATION	±3%	IP: 12.5VDC OP: FULL LOAD/NO LOAD Ta:25℃	-0.252 %
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) -5.3 % (2) -5.96 % (3) -1.83 %
8	O/P voltage DC offset	Vin(nor)= 12 v · Vo<200mv · no load : 74.5mv / full load: 76.5 mv		

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

● Statas test

<table>
<tr><th>LED</th><th>Statas</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>12.5~15.5Vdc±0.3v</td><td>12.563V~15.539V</td></tr>
<tr><td>Orange</td><td>11~12.5Vdc ±0.3v</td><td>10.013V~12.488V</td></tr>
<tr><td>Red</td><td><11Vdc or >15.5Vdc ±0.3v</td><td><10.988V
>15.639</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 ~ 41.6%</td></tr>
<tr><td>Orange</td><td>40%±5% ~ 80%±5% LOAD</td><td>42%~80.8 %</td></tr>
<tr><td>Red</td><td>≧ 80%±5% LOAD</td><td>≧ 81.2 %</td></tr>
</table>

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

INPUT FUNCTION TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">VOLTAGE RANGE (TYP)</td><td rowspan="2">10VDC~16.2VDC</td><td>IP: TESTING
OP:NO LOAD/FULL LOAD
Ta:25℃</td><td>10.07 VDC~ 16.4 VDC/NO LOAD
10.12 VDC~ 16.48 VDC/FULL LOAD</td></tr>
<tr><td>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)</td><td>Test： OK</td></tr>
</table>

2	DC CURRENT (TYP)	25A	IP: 12VDC OP:FULL LOAD Ta:25℃	22.98 A
3	NO LOAD DISSPATION (Typ.)	≦ 1.2W @ saving mode ≤10W@NON-Saving Mode	IP: 12VDC OP:NO LOAD Ta:25℃	0.86 W 6.428 W
4	SAVING MODE TO NORMAL	Po≥25W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≥20.92 W
5	NORMAL TO SAVING MODE	Po≦ 10W	IP: 12VDC OP: TESTING LOAD Ta:25℃	≤14 W
6	OFF MODE CURRENT DRAW (Typ.)	≦ 1mA	IP: 12VDC OP: Sw off Ta:25℃	0mA
7	EFFICIENCY(TYP)	250W/ 92%	IP: 12.5VDC OP: Po= W 230V/50HZ (factory setting) Ta:25℃	92.67%

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℃	10.998 V
2	BAT LOW SHUT DOWN	10V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	10.16 V
3	BAT LOW RESTART	12.5V±0.3VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25℃	12.516 V
4	BAT HIGH ALARM	15.5V±0.3VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25℃	15.536 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℃	15.039 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). 105.4~114 % 180.0888 sec (2). 114.8~148 % 10.1552 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: 12VDC OP: FULL LOAD Ta:25℃	Open : Normal work Short : Remote off (1). TEST: Ok

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: 215 W · turn on OK LAMP: 315 W · turn on OK	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
2	INDUCTION MOTOR	0.12 HP	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
3	SWITCHING POWER SUPPLY	WITH PFC: EPP-500-48 · O/P= 255.32W	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: OK	
		NO PFC: LRS-350-36 · O/P= 254.83W	1. Vin=HIGH LINE 2. O/P= 230V/50Hz 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	Q102 Rated : 60V /60 A	I/P: high line O/P:V(max)/Freq 50HZ 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℃	(1) 37.0V (2) 37.0V (3) 35.8V (4) 37.0V (5) 37.0V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/10 A	I/P: high line O/P:V(max) /Freq 50HZ 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℃	(1)507V (2)523V (3)503V (4)507V (5)507V
3	DC BUS Capacitor Voltage	C118 Rated : 220u/ 265 V	I/P: high line O/P:V(max) /Freq 50HZ 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℃	C118 (1) 238V (2) 246V (3) 246V (4) 242V (5) 246V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 Rated : 650V / 40 A	I/P: high line O/P:V(max) /Freq 50HZ 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℃	(1)526V (2) 575V (3) 535V (4) 522V (5) 519V
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℃	Q504 (1) 43.1V (2) 43.1V (3) 43.5V (4) 43.5 V (5) 43.5V Q105 (1) 65.2V (2) 65.2V (3) 66.0V (4) 65.2V (5) 66.0V
6	Control IC Voltage Test	MCU IC U303 Rated 2.4 V~ 3.6 V AUX IC U501 Rated 8.2V~30V CHARGE IC U101 Rated -0.3V~20V Gate Driver IC U200 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 (4) NO LOAD Turn On (5) Saving mode Ta:25℃	U303 (1) 3.34 V (2) 3.38V (3) 3.34V (4) 3.34V (5) 3.34V U501 (1) 11.59V (2) 11.59V

		-0.3V~20V		(3)11.59V (4) 11.59V (5) 11.59V U101 (1) 12.79V (2) 12.71V (3) 12.63V (4) 12.63V (5) 12.63V U200 (1) 5.11V (2) 5.11V (3) 5.11V (4) 5.07V (5) 5.07V

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℃	BAT I/P-ACO/P: 1.90 mA AC O/P-FG: 2.21 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃	7mΩ

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℃	CLASS A
2	E.S.D	EN61000-4-2 AIR：15KV / Contact：8KV	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：NTS-250P-212
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 12.5VDC O/P： FULL LOAD Ta= 25 ℃
2. HIGH AMBIENT BURN-IN： 2 HRS
I/P： 12.5VDC O/P： FULL LOAD Ta= 40 ℃

<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=25 ℃</th><th>HIGH AMBIENT Ta= 40 ℃</th></tr>
<tr><td>1</td><td>TB</td><td>66.2℃</td><td>73.9℃</td></tr>
<tr><td>2</td><td>C100</td><td>79.6℃</td><td>97.4℃</td></tr>
<tr><td>3</td><td>C101</td><td>81.4℃</td><td>102.4℃</td></tr>
<tr><td>4</td><td>D110</td><td>82.5℃</td><td>100.2℃</td></tr>
<tr><td>5</td><td>Q104</td><td>71.0℃</td><td>88℃</td></tr>
<tr><td>6</td><td>Q103</td><td>69.8℃</td><td>86.7℃</td></tr>
<tr><td>7</td><td>RT300</td><td>63.7℃</td><td>80.3℃</td></tr>
<tr><td>8</td><td>U100</td><td>74.1℃</td><td>89.8℃</td></tr>
<tr><td>9</td><td>Q105</td><td>76.5℃</td><td>93.5℃</td></tr>
<tr><td>10</td><td>T100</td><td>77.4℃</td><td>92.3℃</td></tr>
<tr><td>11</td><td>T101</td><td>90.4℃</td><td>102℃</td></tr>
<tr><td>12</td><td>C112</td><td>57.3℃</td><td>73.4℃</td></tr>
<tr><td>13</td><td>D107</td><td>62.5℃</td><td>79.7℃</td></tr>
<tr><td>14</td><td>D108</td><td>66.4℃</td><td>84.8℃</td></tr>
<tr><td>15</td><td>C119</td><td>74.8℃</td><td>87.3℃</td></tr>
<tr><td>16</td><td>Q200</td><td>72.4℃</td><td>101.6℃</td></tr>
<tr><td>17</td><td>C118</td><td>71.4℃</td><td>84.8℃</td></tr>
<tr><td>18</td><td>T501</td><td>77.9℃</td><td>92.3℃</td></tr>
<tr><td>19</td><td>L200</td><td>70.2℃</td><td>86.6℃</td></tr>
<tr><td>20</td><td>RT100</td><td>67.3℃</td><td>83.5℃</td></tr>
<tr><td>21</td><td>Q202</td><td>70.6℃</td><td>86.7℃</td></tr>
<tr><td>22</td><td>ZNR200</td><td>42.4℃</td><td>58.7℃</td></tr>
<tr><td>23</td><td>L201</td><td>59.2℃</td><td>74.8℃</td></tr>
<tr><td>24</td><td>Q501</td><td>83.0℃</td><td>98.5℃</td></tr>
<tr><td>25</td><td>U501</td><td>89.4℃</td><td>84.8℃</td></tr>
<tr><td>26</td><td>U303</td><td>70.4℃</td><td>101.3℃</td></tr>
<tr><td>27</td><td>T501</td><td>75.1℃</td><td>90.6℃</td></tr>
<tr><td>28</td><td>Q504</td><td>81.4℃</td><td>96.4℃</td></tr>
<tr><td>29</td><td>C219</td><td>62.5℃</td><td>78.8℃</td></tr>
<tr><td>30</td><td>U500</td><td>62.6℃</td><td>78.1℃</td></tr>
<tr><td>31</td><td>U201</td><td>68.4℃</td><td>84.5℃</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>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 40 ℃
NO DAMAGE</td><td>I/P：16.1VDC
O/P：FULL LOAD
Ta= 40 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
</table>

5	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
7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -25℃~ +45℃ 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： 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℃	TEST：OK
9	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= 40 ℃ LIFE TIME	 (1) 88363.2HRS (2) 31897.5HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 836.9K hrs min. Telcordia SR-332 (Bellcore) ; 84.0K hrs min. MIL-HDBK-217F (25℃)	
11	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