



# Test Report: NTU-2200-124

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2200W 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                | 2200W   | IP: 24VDC<br>Ta:25°C                    | <u>2248</u> W   |
| 2  | MAXIMUM OUTPUT POWER (TYP) | (1)2530W/180sec.<br>(2)3300w/10sec<br>(3)SURGE POWER 4400W FOR 30CYCLE Vin (30 ± 5 CYCLE) | IP: 25VDC<br>OP:TESTING LOAD<br>Ta:25°C | (1) <u>109.9</u> V / <u>22.8</u> A / <u>180.1</u> Sec<br>(2) <u>109.46</u> V / <u>29.43</u> A / <u>10.1</u> Sec<br>(3) <u>108.18</u> V / <u>39.20</u> A / <u>33</u> Cycle |

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

Fig1

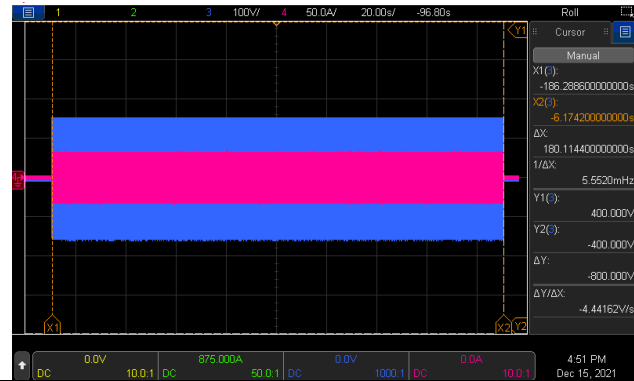


Fig2

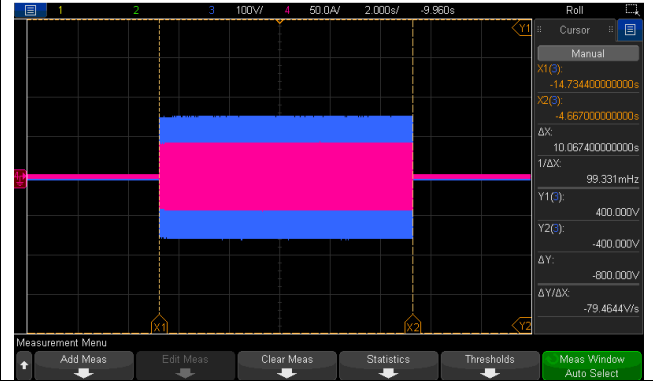
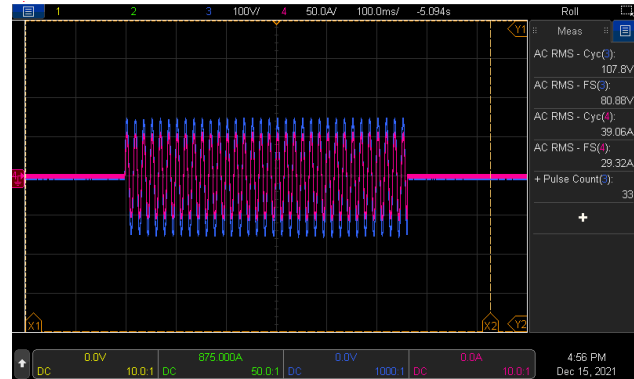


Fig3



|   |            |  |  |   |
|---|------------|--|--|---|
| 3 | AC Voltage | 100 / 110 / 115 / 120Vac selectable by DIP S.W | IP: 12VDC<br>OP: FULL LOAD<br>Ta:25°C  | DIP S.W 100VAC: <u>99.26</u> V<br>DIP S.W 110VAC: <u>109.31</u> V<br>DIP S.W 115VAC: <u>114.25</u> V<br>DIP S.W 120VAC: <u>119.26</u> V |
| 4 | FREQUENCY  | 50/60Hz (±0.1HZ) selectable by DIP S.W         | IP: 24VDC<br>OP: FULL LOAD<br>Ta:25°C  | DIP S.W 50HZ: <u>50.04</u> HZ<br>DIP S.W 60HZ: <u>59.96</u> HZ  |
| 5 | WAVEFORM   | True sine wave (THD<3%)                        | IP: 25VDC<br>OP: 1650W<br>(1) Vo(min)<br>(2) Vo(nor)<br>(3) Vo(max)<br>Ta:25°C | (1) <u>1.69</u> % / Vo(min) /1650W<br>(2) <u>1.72</u> % / Vo(nor) /1650W<br>(3) <u>1.82</u> % / Vo(max) /1650W                          |

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

Fig1

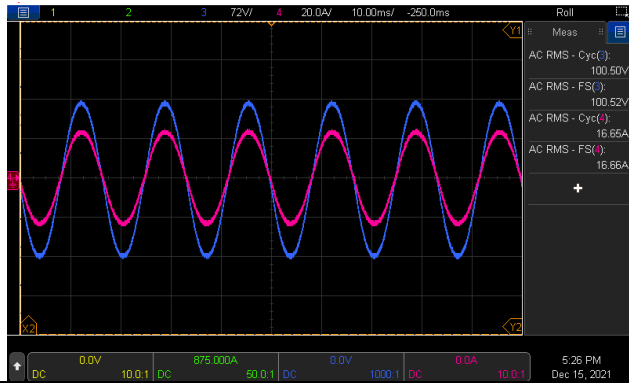


Fig2

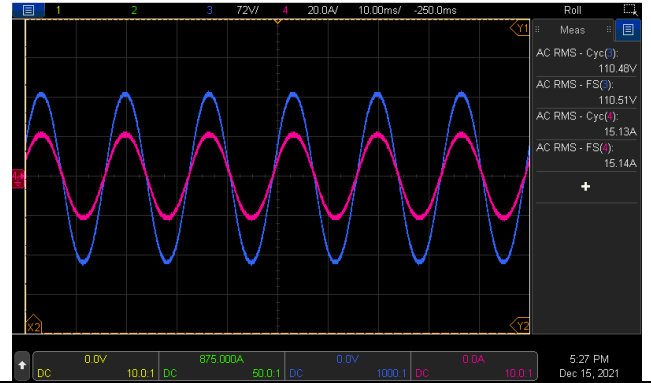
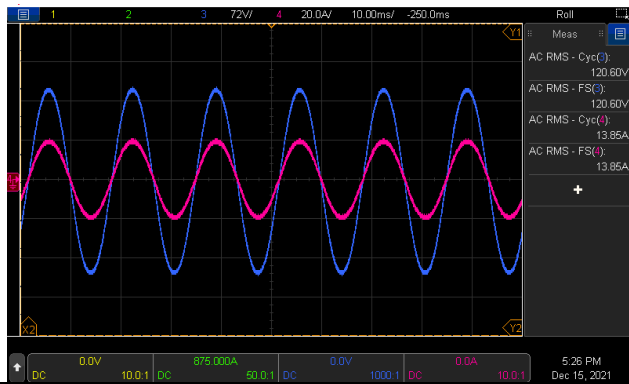


Fig3



|   |                       |  |   |  |
|---|-----------------------|--|---|--|
| 6 | AC REGULATION         | ±3%  | IP: 25VDC<br>OP: 1650W<br>Ta:25°C   | -0.52 %                                  |
| 7 | Overshoot /Undershoot | <±10%  | IP: 24VDC<br>OP:<br>(1) full load turn on<br>(2) no load turn on<br>(3) full /no load change<br>Ta:25°C | (1) -5.04 %<br>(2) 1.49 %<br>(3) -1.85 % |
| 8 | O/P voltage DC offset | Vin(nor)= 24 V · Vo<200mV · no load : 55.6 mV / full load: 57.2 mV |   |  |

| 9           | LED STATUS           | <ul style="list-style-type: none"> <li> <b>Status test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Status</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Inverter OK</td> <td>OK</td> </tr> <tr> <td>Orange ●</td> <td>Remote off</td> <td>OK</td> </tr> <tr> <td>Orange ☀</td> <td>No AC Output at Saving mode</td> <td>OK</td> </tr> <tr> <td>Red ●</td> <td>Inverter Fail</td> <td>OK</td> </tr> </tbody> </table> </li> <li> <b>DC Input test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>25.0~31.0 Vdc±0.5v</td> <td>24.98Vdc ~ 30.75 Vdc</td> </tr> <tr> <td>Orange ●</td> <td>22.0~25.0Vdc ±0.5v</td> <td>21.98Vdc ~ 24.79 Vdc</td> </tr> <tr> <td>Red ●</td> <td>&lt;22.0 Vdc ±0.5v<br/>&gt; 31.0vdc±0.5v</td> <td>&lt; 21.88Vdc<br/>&gt; 30.96Vdc</td> </tr> </tbody> </table> </li> <li> <b>Load test</b> <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Min. load ~ 40%±5% LOAD</td> <td>Min. load ~ 38.2%</td> </tr> <tr> <td>Orange ●</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>40.9% ~ 77.7%</td> </tr> <tr> <td>Red ●</td> <td>≥ 80%±5% LOAD</td> <td>≥ 80.5 %</td> </tr> </tbody> </table> </li> <li> <b>AC Input</b> <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green ●</td> <td>Utility OK</td> <td>OK</td> </tr> <tr> <td>Green ☀</td> <td>Utility error</td> <td>OK</td> </tr> <tr> <td>Colorless ○</td> <td>Utility disconnected</td> <td>OK</td> </tr> </tbody> </table> </li> </ul> | LED                               | Status                   | RESULT | Green ● | Inverter OK | OK | Orange ● | Remote off | OK | Orange ☀ | No AC Output at Saving mode | OK | Red ● | Inverter Fail | OK | LED | Battery RANGE | RESULT | Green ● | 25.0~31.0 Vdc±0.5v | 24.98Vdc ~ 30.75 Vdc | Orange ● | 22.0~25.0Vdc ±0.5v | 21.98Vdc ~ 24.79 Vdc | Red ● | <22.0 Vdc ±0.5v<br>> 31.0vdc±0.5v | < 21.88Vdc<br>> 30.96Vdc | LED | LOAD RANGE | RESULT | Green ● | Min. load ~ 40%±5% LOAD | Min. load ~ 38.2% | Orange ● | 40%±5% ~ 80%±5% LOAD | 40.9% ~ 77.7% | Red ● | ≥ 80%±5% LOAD | ≥ 80.5 % | LED | LOAD RANGE | RESULT | Green ● | Utility OK | OK | Green ☀ | Utility error | OK | Colorless ○ | Utility disconnected | OK |
|-------------|----------------------|---|-----------------------------------|--------------------------|--------|---------|-------------|----|----------|------------|----|----------|-----------------------------|----|-------|---------------|----|-----|---------------|--------|---------|--------------------|----------------------|----------|--------------------|----------------------|-------|-----------------------------------|--------------------------|-----|------------|--------|---------|-------------------------|-------------------|----------|----------------------|---------------|-------|---------------|----------|-----|------------|--------|---------|------------|----|---------|---------------|----|-------------|----------------------|----|
|             |                      | LED   | Status                            | RESULT                   |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Green ●   | Inverter OK                       | OK                       |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Orange ●  | Remote off                        | OK                       |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Orange ☀  | No AC Output at Saving mode       | OK                       |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Red ●   | Inverter Fail                     | OK                       |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | LED   | Battery RANGE                     | RESULT                   |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Green ●   | 25.0~31.0 Vdc±0.5v                | 24.98Vdc ~ 30.75 Vdc     |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Orange ●  | 22.0~25.0Vdc ±0.5v                | 21.98Vdc ~ 24.79 Vdc     |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Red ●   | <22.0 Vdc ±0.5v<br>> 31.0vdc±0.5v | < 21.88Vdc<br>> 30.96Vdc |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | LED   | LOAD RANGE                        | RESULT                   |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Green ●   | Min. load ~ 40%±5% LOAD           | Min. load ~ 38.2%        |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Orange ●  | 40%±5% ~ 80%±5% LOAD              | 40.9% ~ 77.7%            |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | Red ●   | ≥ 80%±5% LOAD                     | ≥ 80.5 %                 |        |         |             |    |          |            |    |          |                             |    |       |               |    |     |               |        |         |                    |                      |          |                    |                      |       |                                   |                          |     |            |        |         |                         |                   |          |                      |               |       |               |          |     |            |        |         |            |    |         |               |    |             |                      |    |
|             |                      | LED   | LOAD RANGE                        | 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) | 20VDC~33VDC   | IP: TESTING<br>OP:NO LOAD/FULL LOAD<br>Ta:25°C | <u>20.00</u> VDC~ <u>32.96</u> VDC/NO<br>LOAD<br><u>20.02</u> VDC~ <u>32.98</u> VDC/FULL<br>LOAD |

|   |                              |   |  |  |
|---|------------------------------|---|--|--|
|   |                              |   | I/P:<br>LOW-LINE=21V<br>HIGH-LINE=32.5V<br>O/P:FULL/MIN LOAD<br>(PLEASE CHECK DERATING CURVE)<br>ON:30Sec OFF:30Sec<br>10MIN<br>(POWER ON/OFF NO DAMAGE)<br>I/P: 24VDC<br>O/P:FULL LOAD<br>ON:30ec OFF:30ec 12Hr<br>(POWER ON/OFF NO DAMAGE) | 10MIN Test: <u>OK</u><br>12Hr Test: <u>OK</u>                |
| 2 | DC CURRENT (TYP)             | 120A  | IP: 24VDC<br>OP:FULL LOAD<br>Ta:25°C   | <u>100.2</u> A   |
| 3 | NO LOAD DISSIPATION          | $\leq 15W$ @ saving mode<br>$\leq 25W$ @NON-Saving Mode | IP: 24VDC<br>OP:NO LOAD<br>Ta:25°C   | <u>5.59W</u> @ saving mode<br><u>22.9W</u> @NON- Saving Mode |
| 4 | SAVING MODE TO NORMAL        | $P_o \geq 25W$  | IP: 24VDC<br>OP: TESTING LOAD<br>Ta:25°C   | $\geq$ <u>15</u> W   |
| 5 | NORMAL TO SAVING MODE        | $P_o \leq 10W$  | IP: 24VDC<br>OP: TESTING LOAD<br>Ta:25°C   | $\leq$ <u>12</u> W   |
| 6 | OFF MODE CURRENT DRAW (Typ.) | $\leq 2mA$  | IP: 24VDC<br>OP: Sw off<br>Ta:25°C   | <u>0.99</u> mA   |
| 7 | EFFICIENCY(TYP)              | 1650W /90%  | IP:25VDC<br>OP: $P_o=1650W$<br>110V/60HZ<br>Ta:25°C  | (1) <u>93.2</u> %  |

AC UPS MODE(Only for NTU)

| 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         |
|                              |                        | 110V                                   | High limit (To INV mode)             | $V_{ac} > 128V \pm 4V$ | <u>127.3</u> V |
|                              |                        |  | Recovery to high (To AC mode)        | $V_{ac} < 124V \pm 4V$ | <u>122.5</u> V |
|                              |                        |  | Low limit (To INV mode)              | $V_{ac} < 92V \pm 4V$  | <u>91.2</u> V  |
| Recovery to low (To AC mode) | $V_{ac} > 96V \pm 4V$  |  | <u>96.3</u> V                        |                        |                |
| 2                            | FREQUENCY RANGE        | 45 ~ 65Hz                              | IP:24VDC<br>OP: FULL LOAD<br>Ta:25°C | TEST: <u>OK</u>        |                |

|   |                     |                                |   |  |
|---|---------------------|--------------------------------|---|--|
| 3 | TRANSFER TIME (TYP) | t<10ms±3ms<br>inverter→by pass | IP: 24VDC<br>OP:<br>(1) no load<br>(2) full load<br>Ta:25°C | (1) no load<br>a. INTER→BY PASS <u>3.46</u> ms<br>b. BY PASS-INVERTER <u>8.4</u> ms<br>(2) full load<br>c. INTER→BY PASS <u>1.12</u> ms<br>d. BY PASS-INVERTER <u>7.6</u> ms |
|---|---------------------|--------------------------------|---|--|

**PROTECTION TEST**

| NO | TEST ITEM          | SPECIFICATION  | TEST CONDITION   | RESULT  |
|----|--------------------|--|--|---|
| 1  | BAT LOW ALARM      | 22V±0.5VDC   | IP: TESTING<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C          | <u>21.97</u> V  |
| 2  | BAT LOW SHUT DOWN  | 20V±0.5VDC   | IP: TESTING<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C          | <u>20.09</u> V  |
| 3  | BAT LOW RESTART    | 25V±0.5VDC   | IP: TESTING<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C          | <u>25.00</u> V  |
| 4  | BAT HIGH ALARM     | 31V±0.5VDC   | IP: TESTING<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C          | <u>30.95</u> V  |
| 5  | BAT HIGH SHUT DOWN | 33V±0.5VDC   | IP: TESTING<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C          | <u>32.95</u> V  |
| 6  | BAT HIGH RESTART   | 30V±0.5VDC   | IP: TESTING<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C          | <u>29.96</u> V  |
| 7  | BAT. POLARITY      | By internal fuse open  | IP: BAT +/- (Reverse)<br>OP: FULL LOAD<br>Ta:25°C          | TEST: <u>OK</u>   |
| 8  | OVER TEMPERATURE   | Shut down o/p voltage:<br>re-power on.   | IP: HI LINE/LOW-LINE<br>OP: FULL LOAD<br>SW: ON<br>Ta:25°C | Shut down o/p voltage, re-power on<br>to recover<br>LED DISPLAY: <u>OK</u>  |
| 9  | OUTPUT SHORT       | Shut down o/p voltage:<br>re-power on  | IP: 24VDC<br>O/P: FULL LOAD<br>SW: ON<br>Ta:25°C           | Shut down o/p voltage, re-power on<br>to recover<br>LED DISPLAY: <u>OK</u>  |
| 10 | OVER LOAD (typ.)   | 105%~115%LOAD 180sec<br>115%~150%LOAD 10 sec<br>Shut down o/p voltage,<br>re-power on to recover | IP: 24VDC<br>OP: TESTING<br>SW: ON<br>Ta:25°C              | (1). <u>106.0</u> % ~ <u>114.0</u> % <u>180.1</u> sec<br>(2). <u>116.0</u> % ~ <u>148.0</u> % <u>10.1</u> sec<br>Shut down o/p voltage, re-power on<br>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)<br>Open : Normal work<br>Short : Remote off<br>(2) IRC3 | IP: 24VDC<br>OP: FULL LOAD<br>Ta:25°C | Open : <u>Normal work</u><br>Short : <u>Remote off</u><br>(1). TEST: Vo= <u>0.002</u> V Pin= <u>6.13</u> W<br>(2).TEST: <u>OK</u> |

**APPLICATION TEST**

| NO | TEST ITEM              | SPECIFICATION  | TEST CONDITION                   | RESULT          |
|----|------------------------|--|----------------------------------|-----------------|
| 1  | LAMP                   | LAMP: <u>833</u> · turn on <u>OK</u><br>LAMP: <u>1242</u> · turn on <u>OK</u><br>LAMP: <u>1647</u> · turn on <u>OK</u> | 1. Vin=HIGH LINE<br>2. 110V/60Hz | TEST: <u>OK</u> |
| 2  | INDUCTION MOTOR        | <u>0.22</u> HP   | 1. Vin=HIGH LINE<br>2. 110V/60Hz | TEST: <u>OK</u> |
| 3  | SWITCHING POWER SUPPLY | WITH PFC: <u>RSP-3000-48</u><br>O/P= <u>2140</u> W   | 1. Vin=HIGH LINE<br>2. 110V/60Hz | TEST: <u>OK</u> |
|    |                        | NO PFC: <u>SE-1000-48</u><br>O/P= <u>1152</u> W  | 1. Vin=HIGH LINE<br>2. 110V/60Hz | 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 | Q106 /Q116/Q126/Q132<br><br>Rated: 100 V / 120 A | I/P: high line<br>O/P: V(max)/Freq 60HZ<br>VDS:<br>O/P: (1)Full Load Turn On<br>(2) Output Short<br>(3)O.L.P(4400W) Turn On<br>(4) NO LOAD Turn On<br>(5) Saving mode<br>Ta:25°C | Q116                      Q106<br>VDS:                      VDS:<br>(1) 85.7V                      (1) 91.3V<br>(2) 83.3V                      (2) 89.7V<br>(3) 84.1V                      (3) 90.5V<br>(4) 84.9V                      (4) 90.1V<br>(5) 84.1V                      (5) 90.5V<br><br>Q126                      Q132<br>VDS:                      VDS:<br>(1) 91.1V                      (1) 83.3V<br>(2) 91.1V                      (2) 83.3V<br>(3) 84.7V                      (3) 90.6V<br>(4) 84.7V                      (4) 83.9V<br>(5) 83.9V                      (5) 83.9V |

|   |  |   |  |   |
|---|--|---|--|---|
| 2 | DC TO DC Diode Peak Voltage                                  | D 901 Rated : 400V/ 20 A  | I/P: high line<br>O/P: V(max) /Freq 60HZ<br>O/P: (1)Full Load Turn On<br>(2) Output Short<br>(3) O.L.P(4400W) Turn On<br>(4) NO LOAD Turn On<br>(5) Saving mode<br>Ta:25°C       | (1) 268V<br>(2) 272V<br>(3) 270V<br>(4) 274V<br>(5) 277V  |
| 3 | DC BUS Capacitor Voltage                                     | C905<br>Rated: 680u/315V  | I/P: high line<br>O/P: V(max) /Freq 60HZ<br>O/P: (1)Full Load Turn On<br>(2) Output Short<br>(3) O.L.P(4400W) Turn On<br>(4) NO LOAD Turn On<br>(5) Saving mode<br>Ta:25°C       | C905<br>(1) 272V<br>(2) 272V<br>(3) 272V<br>(4) 272V<br>(5) 272V  |
| 4 | DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage | Q 1<br>Rated : 650 V/ 40 A  | I/P: high line<br>O/P:V(max)/Freq 60HZ<br>VDS:<br>O/P: (1)Full Load Turn On<br>(2) Output Short<br>(3) O.L.P(4400W) Turn On<br>(4) NO LOAD Turn On<br>(5) Saving mode<br>Ta:25°C | Q1: VDS:<br>(1) 296V<br>(2) 349V<br>(3) 304V<br>(4) 283V<br>(5) 283V<br>Q3: VDS:<br>(1) 292V<br>(2) 343V<br>(3) 294V<br>(4) 283V<br>(5) 283V  |
| 5 | AUX PWM MOS  | Q201 Rated: 65 A/ 200 V<br><br>Q504 Rated : 46 A/ 250 V   | I/P: high line<br>O/P:V(max) /Freq 60HZ<br>O/P: (1)Full Load Turn On<br>(2) Output Short<br>(3) O.L.P(4400W) Turn On<br>(4) NO LOAD Turn On<br>(5) Saving mode<br>Ta:25°C        | Q201<br>(1) 103.5V<br>(2) 103.5V<br>(3) 103.5V<br>(4) 103.5V<br>(5) 103.5V<br>Q504<br>(1) 70.9V<br>(2) 70.9V<br>(3) 70.9V<br>(4) 70.9V<br>(5) 70.9V   |
| 6 | Control IC Voltage Test                                      | MCU IC U301 Rated 2.4 V~ 3.6 V<br><br>AUX IC U201 Rated 8.2V~30V<br><br>CHARGE IC U501 Rated 8.4V~30V<br><br>Gate Driver IC U1 Rated 3V~18V | I/P: high line<br>O/P:V(max) /Freq 60HZ<br>O/P: (1)Full Load Turn On<br>(2) Output Short<br>(3) O.L.P(4400W) Turn On<br>(4) NO LOAD Turn On<br>(5) Saving mode<br>Ta:25°C        | U301<br>(1) 3.30V<br>(2) 3.34V<br>(3) 3.30V<br>(4) 3.30V<br>(5) 3.30V<br>U501<br>(1) 12.64V<br>(2) 12.64V<br>(3) 12.64V<br>(4) 12.64V<br>(5) 12.64V<br><br>U201<br>(1) 12.1V<br>(2) 12.1V<br>(3) 12.1V<br>(4) 12.1V<br>(5) 12.2V<br>U1<br>(1) 5.04V<br>(2) 5.04V<br>(3) 5.04V<br>(4) 5.04V<br>(5) 5.04V |



## SAFETY & EMC TEST

### SAFETY TEST

| NO | TEST ITEM            | SPECIFICATION   | TEST CONDITION   | RESULT   |
|----|----------------------|---|--|--|
| 1  | WITHSTAND VOLTAGE    | BAT I/P-AC O/P: 3 KVAC/min<br>BAT I/P-AC I/P: 3 KVAC/min<br>AC O/P-FG: 1.5 KVAC/min | BAT I/P-AC O/P 3.6 KVAC/min<br>BAT I/P-AC I/P: 3.6 KVAC/min<br>AC O/P-FG:1.8 KVAC/min<br>Ta:25°C | BAT I/P-ACO/P: 11.79 mA<br>AC O/P-FG: 11.62mA<br>AC O/P-FG: 7.56 mA<br>NO DAMAGE |
| 2  | GROUNDING CONTINUITY | EN 60950<br>FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ                                  | 40 A / 2min<br>Ta:25°C   | 6mΩ  |

### E.M.C TEST

| NO | TEST ITEM   | SPECIFICATION  | TEST CONDITION                                    | RESULT |
|----|---|----------------|---|--------|
| 1  | CONDUCTION  | FCC<br>CLASS A | I/P: 24 VDC<br>O/P: FULL LOAD/50% LOAD<br>Ta:25°C | PASS   |
| 2  | RADIATION   | FCC<br>CLASS A | I/P:24 VDC<br>O/P: :FULL/50% LOAD<br>Ta:25°C      | PASS   |
| 3  | Test by certified Lab & Test Report Prepare<br>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-2200-124<br>1. ROOM AMBIENT BURN-IN : 2 HRS<br>I/P : 24 VDC O/P : FULL LOAD Ta= 25 °C<br>2. HIGH AMBIENT BURN-IN : 2 HRS<br>I/P : 24 VDC O/P : FULL LOAD Ta= 40 °C |   |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
|    |                       |  | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25 °C</th> <th>HIGH AMBIENT Ta= 40 °C</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>C140</td> <td>53.3°C</td> <td>62.6°C</td> </tr> <tr> <td>2</td> <td>C144</td> <td>52.4°C</td> <td>61.8°C</td> </tr> <tr> <td>3</td> <td>T102 Coil1</td> <td>61.3°C</td> <td>70.0°C</td> </tr> <tr> <td>4</td> <td>T102 Core</td> <td>57.2°C</td> <td>65.4°C</td> </tr> <tr> <td>5</td> <td>C100</td> <td>55.5°C</td> <td>64.0°C</td> </tr> <tr> <td>6</td> <td>C105</td> <td>53.0°C</td> <td>61.9°C</td> </tr> <tr> <td>7</td> <td>T102 NTC</td> <td>54.3°C</td> <td>63.8°C</td> </tr> <tr> <td>8</td> <td>T101 Coil1</td> <td>65.4°C</td> <td>73.7°C</td> </tr> <tr> <td>9</td> <td>T101 Core</td> <td>59.0°C</td> <td>67.4°C</td> </tr> <tr> <td>10</td> <td>Q104</td> <td>49.3°C</td> <td>59.4°C</td> </tr> <tr> <td>11</td> <td>Q115</td> <td>42.9°C</td> <td>53.3°C</td> </tr> <tr> <td>12</td> <td>D902</td> <td>64.0°C</td> <td>71.2°C</td> </tr> <tr> <td>13</td> <td>D912</td> <td>61.4°C</td> <td>70.1°C</td> </tr> <tr> <td>14</td> <td>D908</td> <td>67.6°C</td> <td>74.8°C</td> </tr> </tbody> </table> | NO     | Position | ROOM AMBIENT Ta= 25 °C | HIGH AMBIENT Ta= 40 °C | 1 | C140 | 53.3°C | 62.6°C | 2 | C144 | 52.4°C | 61.8°C | 3 | T102 Coil1 | 61.3°C | 70.0°C | 4 | T102 Core | 57.2°C | 65.4°C | 5 | C100 | 55.5°C | 64.0°C | 6 | C105 | 53.0°C | 61.9°C | 7 | T102 NTC | 54.3°C | 63.8°C | 8 | T101 Coil1 | 65.4°C | 73.7°C | 9 | T101 Core | 59.0°C | 67.4°C | 10 | Q104 | 49.3°C | 59.4°C | 11 | Q115 | 42.9°C | 53.3°C | 12 | D902 | 64.0°C | 71.2°C | 13 | D912 | 61.4°C | 70.1°C | 14 | D908 | 67.6°C | 74.8°C |  |
| NO | Position              | ROOM AMBIENT Ta= 25 °C   | HIGH AMBIENT Ta= 40 °C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 1  | C140                  | 53.3°C   | 62.6°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 2  | C144                  | 52.4°C   | 61.8°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 3  | T102 Coil1            | 61.3°C   | 70.0°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 4  | T102 Core             | 57.2°C   | 65.4°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 5  | C100                  | 55.5°C   | 64.0°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 6  | C105                  | 53.0°C   | 61.9°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 7  | T102 NTC              | 54.3°C   | 63.8°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 8  | T101 Coil1            | 65.4°C   | 73.7°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 9  | T101 Core             | 59.0°C   | 67.4°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 10 | Q104                  | 49.3°C   | 59.4°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 11 | Q115                  | 42.9°C   | 53.3°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 12 | D902                  | 64.0°C   | 71.2°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 13 | D912                  | 61.4°C   | 70.1°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |
| 14 | D908                  | 67.6°C   | 74.8°C  |        |          |                        |                        |   |      |        |        |   |      |        |        |   |            |        |        |   |           |        |        |   |      |        |        |   |      |        |        |   |          |        |        |   |            |        |        |   |           |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |  |

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|----|---|--|--|-----------|----------|------------------------|------------------------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|-----|--------|--------|----|------|--------|--------|----|----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|----|--------|--------|----|------|--------|--------|----|-----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|----|--------|--------|----|-----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|
| NO | Position  | ROOM AMBIENT Ta= 25 °C   | HIGH AMBIENT Ta= 40 °C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 15 | L100  | 55.4°C   | 65.8°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 16 | T501  | 32.7°C   | 43.8°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 17 | Q504  | 31.4°C   | 43.4°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 18 | D530  | 29.7°C   | 42.3°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 19 | U501  | 32.2°C   | 44.3°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 20 | LF1   | 44.5°C   | 56.1°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 21 | ZNR1  | 35.4°C   | 46.9°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 22 | C6  | 35.4°C   | 46.6°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 23 | LF26  | 44.7°C   | 55.1°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 24 | CC53  | 51.2°C   | 60.2°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 25 | T201  | 50.3°C   | 61.2°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 26 | T202  | 52.5°C   | 63.6°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 27 | Q201  | 58.2°C   | 65.6°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 28 | U301  | 38.7°C   | 49.6°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 29 | R79   | 66.3°C   | 74.0°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 30 | Q8  | 85.9°C   | 94.1°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 31 | Q3  | 81.0°C   | 89.6°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 32 | C906  | 44.3°C   | 53.9°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 33 | L10   | 42.4°C   | 53.2°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 34 | R275  | 63.1°C   | 75.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 35 | R115  | 55.3°C   | 64.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 36 | U201  | 57.5°C   | 67.3°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 37 | U102  | 52.2°C   | 61.9°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 38 | TSW3  | 44.6°C   | 54.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 39 | TSW2  | 64.2°C   | 73.8°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 40 | U1  | 43.7°C   | 52.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 41 | R70   | 67.0°C   | 75.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 42 | Q133  | 51.8°C   | 61.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 43 | Q123  | 43.2°C   | 52.7°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 44 | RTH7  | 50.4°C   | 60.4°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 45 | Q125  | 42.1°C   | 52.5°C   |           |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 2  | OVER LOAD BURN-IN TEST  | NO DAMAGE<br>1 HOUR ( MIN )  | I/P : 24VDC<br>O/P : 102%LOAD<br>Ta : 25°C                           | TEST : OK |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 3  | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2<br>HOUR  | I/P : 24VDC<br>O/P : 100%LOAD<br>Ta= -30 °C                          | TEST : OK |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 40 °C<br>NO DAMAGE  | I/P : 32.5VDC<br>O/P : FULL LOAD<br>Ta= 38.7 °C<br>HUMIDITY= 95 %R.H | TEST : OK |          |                        |                        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |     |        |        |    |    |        |        |    |    |        |        |    |      |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |     |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |

|    |                          |   |  |
|----|--------------------------|---|--|
| 5  | STORAGE TEMPERATURE TEST | 1. Thermal shock Temperature : -45°C~ +90°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 10 CYCLE<br>5. Input /Output condition : STATIC   | TEST : OK  |
| 6  | THERMAL SHOCK TEST       | 1. Thermal shock Temperature : -30°C~ +45°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 16 CYCLE<br>5. Input /Output condition :<br>15cycle:24VDC/ FULL LOAD DC ON 11sec/DC OFF 1sec TEST<br>1cycle:24VDC/ FULL LOAD Burn In Test | TEST : OK  |
| 7  | VIBRATION TEST           | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(3) Sweep Time : 10min/sweep cycle<br>(4) Acceleration : 4G<br>(5) Test Time : 60min in each axis (X.Y.Z)<br>(6) Ta : 25°C  | TEST : OK  |
| 8  | CAPACITOR LIFE CYCLE     | SUPPOSE C100 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME<br>(2) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME<br>(3) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME<br>(4) I/P : 24VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME   | (1) 455777.6HRS<br>(2) 252858.4HRS<br>(3) 432600.8HRS<br>(4) 675704.3HRS |
| 9  | MTBF                     | Conducted by Parts Stress Analysis Prediction<br>344.9K hrs min. Telcordia SR-332 (Bellcore) ; 34.8K hrs min. MIL-HDBK-217F (25°C)  |  |
| 10 | Ongoing Reliability Test | I/P : 25VDC O/P : 80% LOAD TA=50°C<br>Demonstration Mean Time Between Failure : 30,000 hours  |  |

| TEST RESULT | TESTER | REVIEW | APPROVAL |
|-------------|--------|--------|----------|
| PASS        | Liutt  |        | Wangdz   |

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