# Test Report： UHP-500-24

500W Slim Type with PFC Switching Supply

## ■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Component Stress Test

## ■ SAFETY & E.M.C. TEST

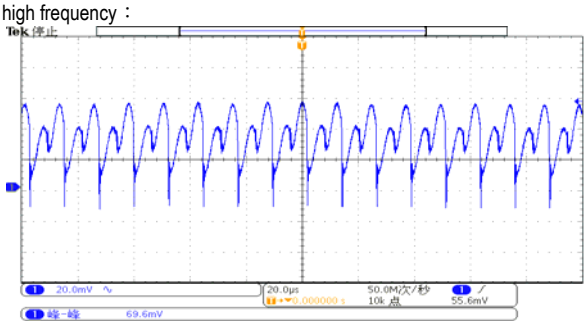
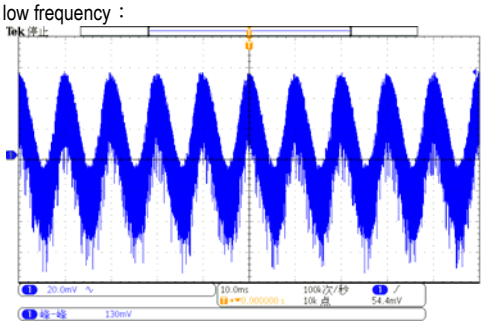
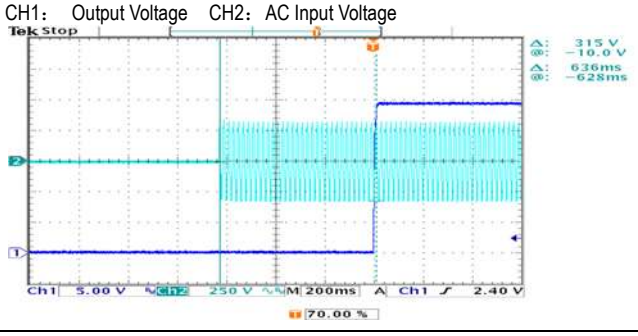
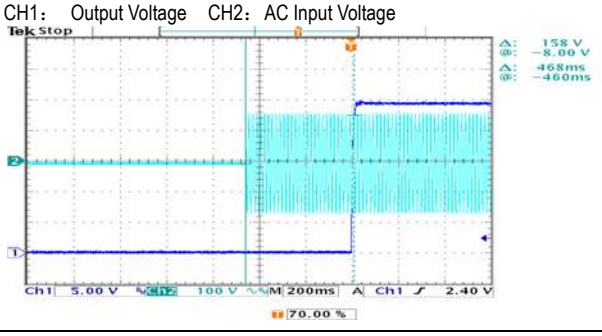
Safety Test
E.M.C. Test

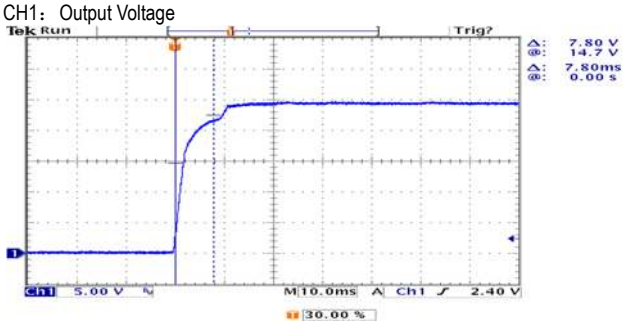
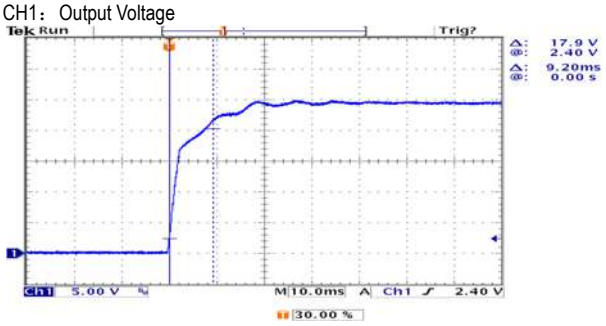
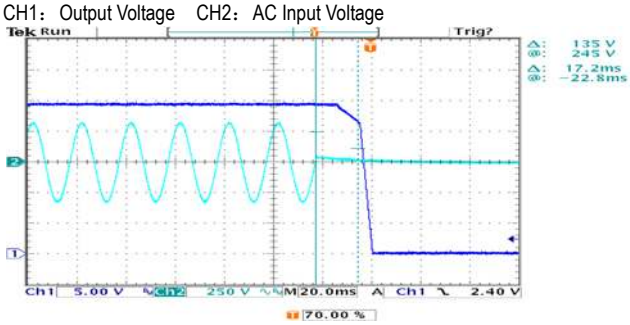
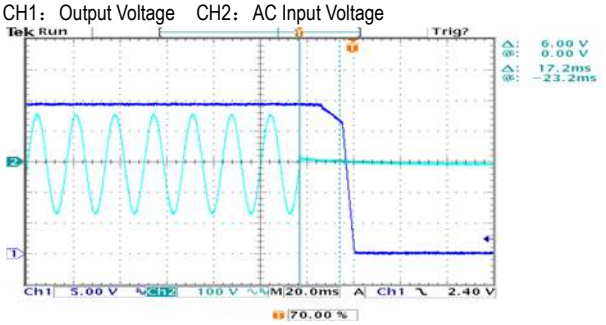
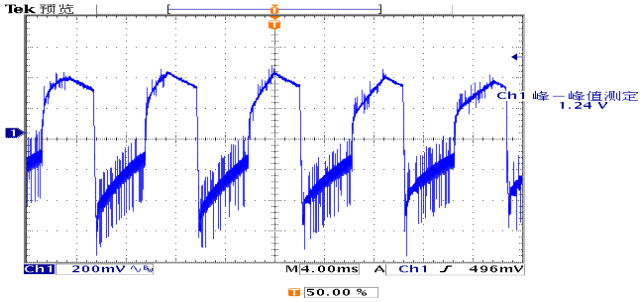
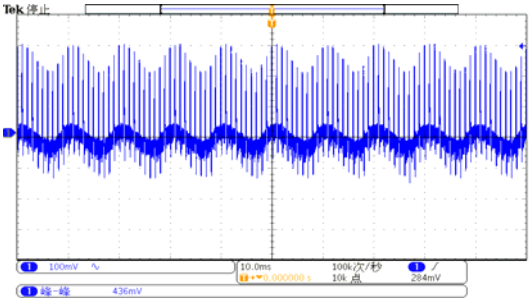
## ■ RELIABILITY TEST

Environment Test

# ■ DESIGN VERIFY TEST

## OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | OUTPUT VOLTAGE ADJUST RANGE | 22.8V~25.2V | I/P： 230VAC<br>O/P：NO LOAD<br>Ta：25℃ | 22.18V~25.98V |
| 2 | PEAK LOAD | 150% peak load capability(100ms) | I/P： 230VAC<br>O/P：150% LOAD<br>Ta：25℃ | TEST： OK |
| 3 | OUTPUT VOLTAGE TOLERANCE | -1%~+1% | I/P： 90VAC / 264VAC<br>O/P：FULL / NO LOAD<br>Ta：25℃ | －0%~＋0.45% |
| 4 | LINE REGULATION | -0.3%~+0.3% | I/P： 110VAC ~ 264VAC<br>O/P：FULL LOAD<br>Ta：25℃ | －0 %~＋0.04% |
| 5 | LOAD REGULATION | -0.5%~+0.5% | I/P： 230VAC<br>O/P：FULL ~NO LOAD<br>Ta：25℃ | －0%~＋0.04% |
| 6 | OVER/UNDERSHOOT TEST | <±5 % | I/P： 230VAC<br>O/P：FULL LOAD<br>Ta：25℃ | <5% |
| 7 | RIPPLE & NOISE (Max) | 240mVp-p | I/P： 230VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 130mVp-p |
| | high frequency：  | | low frequency：  | |
| 8 | SET UP TIME(Max) | 230VAC/ 1000ms<br>115VAC/1000ms | I/P： 230 VAC<br>I/P： 115 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 230VAC/636 ms<br>115VAC/468 ms |
| | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1： Output Voltage CH2：AC Input Voltage  | | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1： Output Voltage CH2：AC Input Voltage  | |

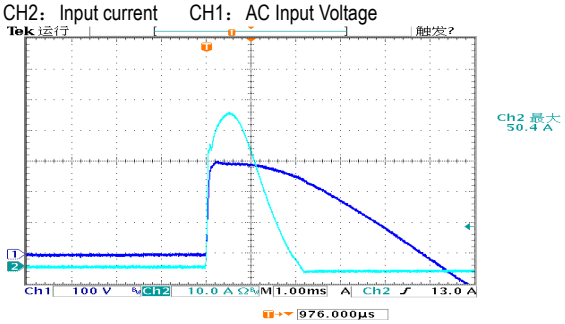
| | | | | |
|---|---|---|---|---|
| 9 | RISE TIME (Max) | 230VAC/ 50ms<br>115VAC/ 50ms | I/P： 230 VAC<br>I/P： 115 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 230VAC/7.8ms<br>115VAC/9.2 ms |
| | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1：Output Voltage<br>  | | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1：Output Voltage<br>  | |
| 10 | HOLD UP TIME(Typ ) | 230VAC/ 12ms<br>115VAC/ 12ms | I/P： 230 VAC<br>I/P： 115 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 230VAC/17.2ms<br>115VAC/17.2 ms |
| | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1：Output Voltage CH2：AC Input Voltage<br>  | | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1：Output Voltage CH2：AC Input Voltage<br>  | |
| 11 | DYNAMIC LOAD | V1： 2400 mVp-p | I/P： 230VAC<br>O/P：<br>(1)FULL/50% LOAD 50%DUTY / 120HZ<br>(2)FULL/50% LOAD 50%DUTY / 1KHZ<br>Ta：25℃ | (1) 1240mVp-p<br>(2) 436mVp-p |
| | FULL /50% LOAD 50%DUTY / 120HZ<br>  | | FULL /50% LOAD 50%DUTY / 1KHZ<br>  | |

## INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | INPUT VOLTAGE RANGE | 90VAC~264VAC | I/P：TESTING<br>O/P： FULL LOAD<br>Ta：25℃ | 87 V~300V |
| | | | I/P：<br>(1)LOW-LINE-3V=87 V<br>HIGH-LINE+15%=300 V<br>O/P：FULL/NO LOAD<br>ON：30 Sec OFF：30 Sec 10MIN<br>(2)230VAC<br>ON：0.5 Sec OFF：0.5 Sec 20MIN<br>( POWER ON/OFF NO DAMAGE ) | TEST： OK |
| 2 | Withstand 300VAC Surge | 300VAC input for 5 seconds<br>No damage | I/P： 300VAC<br>O/P：FULL LOAD<br>Ta：25℃ | TEST： OK |
| 3 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ<br>NO DAMAGE | I/P： 90 VAC ~264 VAC<br>O/P：FULL~NO LOAD<br>Ta：25℃ | TEST： OK |
| 4 | AC CURRENT | 4.85A/115VAC<br>2.6A/230VAC | I/P： 115 VAC<br>I/P： 230 VAC<br>O/P： FULL LOAD<br>Ta：25℃ | I = 4.71A/ 115VAC<br>I =2.34A/ 230VAC |
| 5 | LEAKAGE CURRENT | < 0.75mA / 240VAC | I/P： 240 VAC<br>O/P：NO LOAD<br>Ta：25℃ | L-FG：0.372mA<br>N-FG：0. 348mA |
| 6 | NO LOAD CONSUMPTION | --- | I/P：115VAC<br>I/P：230VAC<br>O/P：NO LOAD<br>Ta：25℃ | 1.27 W/115VAC<br>1.4 W/230VAC |
| 7 | INRUSH CURRENT(Typ) | 230V/60A<br>115V/30A<br>COLD START | I/P： 230VAC/115VAC<br>O/P：FULL LOAD<br>Ta：25℃ | I =50.4A/ 230VAC<br>I =12.3A/ 115VAC |

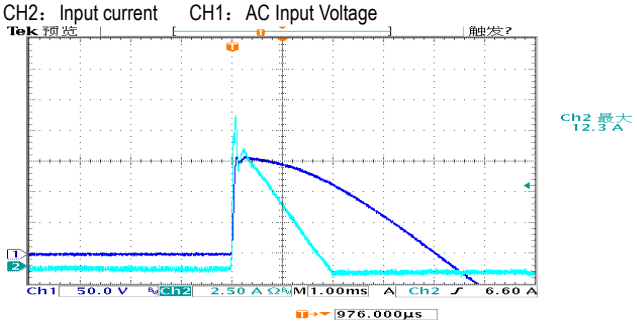
INPUT=230VAC/50HZ @ FULL LOAD

CH2：Input current CH1：AC Input Voltage



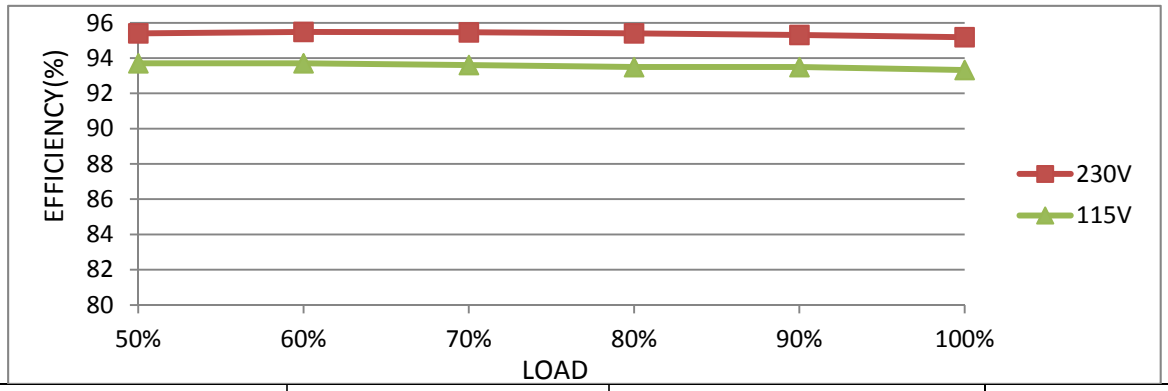

INPUT=115VAC/60HZ @ FULL LOAD

CH2：Input current CH1：AC Input Voltage



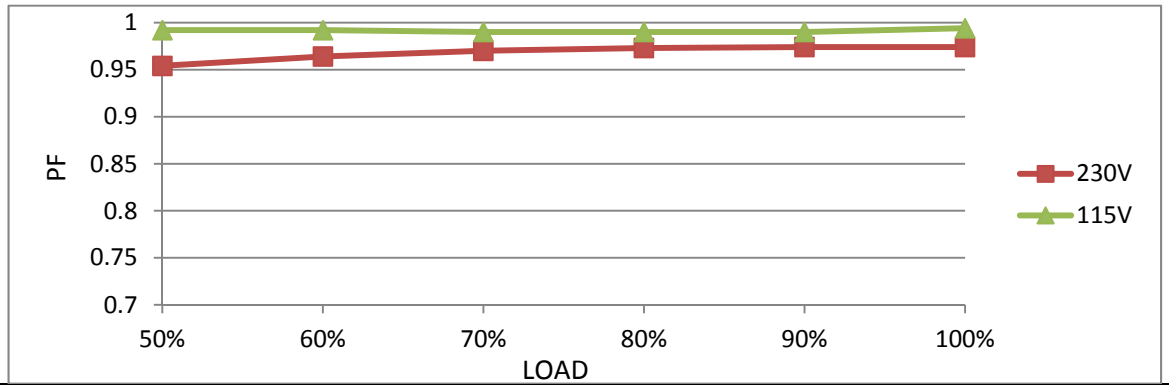
| | | | | |
|---|---|---|---|---|
| 8 | EFFICIENCY(Typ) | 94.5% | I/P： 230VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 95.1 % |

EFFICIENCY vs LOAD




| | | | | |
|---|---|---|---|---|
| 9 | POWER FACTOR | 0.95/ 230VAC<br>0.98/115VAC | I/P： 230 VAC<br>I/P： 115 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | PF=0.974/ 230VAC<br>PF=0.994/ 115VAC |

P.F vs LOAD




## PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | OVER LOAD PROTECTION | 110~140% | I/P： 110VAC<br>I/P： 230VAC<br>I/P： 264VAC<br>O/P：TESTING<br>Ta：25℃ | 113.5%/ 110VAC<br>120.5%/ 230VAC<br>120.5%/ 264VAC<br>Hiccup mode，recovers automatically after fault condition is removed |
| 2 | OVER VOLTAGE PROTECTION | 26.4V~31.2V | I/P： 90VAC<br>I/P： 230VAC<br>I/P： 264VAC<br>O/P：NO LOAD<br>Ta：25℃ | 28.231 V/ 90VAC<br>28.231V/ 230VAC<br>28.251V/ 264VAC<br>Shut down o/p voltage，re-power on to recovery |
| 3 | OVER TEMPERATURE PROTECTION | NO DAMAGE | I/P： 110VAC<br>I/P： 230VAC<br>I/P： 264VAC<br>O/P： FULL LOAD | O.T.P. Active<br>Shut down o/p voltage，recovers automatically after temperature goes dowm |
| 4 | SHORT PROTECTION | SHORT EVERY OUTPUT<br>1 HOUR<br>NO DAMAGE | I/P： 90VAC<br>I/P： 264VAC<br>O/P：FULL LOAD<br>Ta：25℃ | NO DAMAGE<br>Hiccup mode，recovers automatically after fault condition is removed |

## CONTROL FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | REDUNDANT CONTROL | For parallel connection protection:For parallel applications,when one PSU can not work,the another one will be automatically enabled.This can preven the system crash,and provide the reliability of system | I/P: 230 VAC<br>O/P:FULL LOAD | TEST： OK |
| 2 | DC OK CONTACT RATINGS | 30VDC/1A<br>RESISTIVE LOAD | I/P:230VAC<br>O/P:FULL LOAD<br>Ta:25℃ | TEST： OK |

## COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | PWM Power Transistor | Q10 Rated<br>22A/600V | I/P：High-Line +3V =267V<br>O/P： (1) FULL LOAD Turn on<br>(2) Output Short<br>(3) FULL LOAD continue<br>Ta：25℃ | <br>(1) 510 V<br>(2) 510 V<br>(3) 513 V |
| 2 | O/P Diode (MOSFET) | Q100 Rated<br>80V/74A | I/P：High-Line +3V =267V<br>O/P： (1) FULL LOAD Turn on<br>(2) Output Short<br>(3) FULL LOAD continue<br>Ta：25℃ | <br>(1) 56.0 V<br>(2) 20.2 V<br>(3) 57.3 V |
| 3 | Input Capacitor | C5 Rated<br>270 μ/ 420 V | I/P：High-Line +3V =267 V<br>O/P：(1) FULL LOAD input on/off<br>(2) NO LOAD input on /Off<br>(3) FULL LOAD /NO LOAD Change<br>Ta：25℃ | <br>(1) 418 V<br>(2) 418 V<br>(3) 418 V |
| 4 | Control IC | U1 Rated<br>20V (MAX.) | I/P：High-Line +3V =267 V<br>O/P：((1) FULL LOAD<br>(2) Output Short<br>(3) O.L.P<br>(4) O.V.P<br>(5) Low Line No Load Vo(min)<br>Ta：25℃ | <br>(1) 13.9 V<br>(2) 13.8 V<br>(3) 13.8 V<br>(4) 13.7 V<br>(5) 14.0 V |
| 5 | PFC Power Transistor | Q2 Rated<br>22A/600V | I/P：High-Line +3V =267V<br>O/P： (1) FULL LOAD Turn on<br>(2) Output Short<br>(3) FULL LOAD continue<br>Ta：25℃ | <br>(1) 536 V<br>(2) 448 V<br>(3) 539 V |

## SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | WITHSTAND VOLTAGE | I/P-O/P：3.75 KVAC/min<br>I/P-FG： 2.0 KVAC/min<br>O/P-FG：1.25 KVAC/min | I/P-O/P：4.125 KVAC/min<br>I/P-FG： 2.4 KVAC/min<br>O/P-FG：1.5 KVAC/min<br>Ta：25℃ | I/P-O/P：7.04 mA<br>I/P-FG： 3.809 mA<br>O/P-FG：3.538 mA<br>NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P：500VDC>100MΩ<br>I/P-FG： 500VDC>100MΩ<br>O/P-FG：500VDC>100MΩ | I/P-O/P： 500 VDC<br>I/P-FG： 500 VDC<br>O/P-FG： 500 VDC<br>Ta：25℃/70%RH | I/P-O/P：>9999 MΩ<br>I/P-FG： >9999 MΩ<br>O/P-FG：>9999 MΩ |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ | 40A / 2min<br>Ta：25℃ | 12mΩ |

## E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | HARMONIC | EN61000-3-2 | I/P：230VAC/50HZ<br>O/P：FULL LOAD<br>Ta：25℃ | PASS |
| 2 | CONDUCTION | EN55032 | I/P：230 VAC (50HZ)<br>O/P：FULL LOAD<br>Ta：25℃ | PASS<br>Test by certified Lab |
| 3 | RADIATION | EN55032 | I/P：230 VAC (50HZ)<br>O/P：FULL LOAD<br>Ta：25℃ | PASS<br>Test by certified Lab |
| 4 | E.S.D | EN61000-4-2<br>HEAVY INDUSTRY<br>AIR：8KV<br>Contact：4KV | I/P：230 VAC/50HZ<br>O/P：FULL LOAD<br>Ta：25℃ | PASS<br>CRITERIA A |
| 5 | E.F.T | EN61000-4-4<br>HEAVY INDUSTRY<br>INPUT：2KV | I/P： 230VAC/50HZ<br>O/P：FULL LOAD<br>Ta：25℃ | PASS<br>CRITERIA A |
| 6 | SURGE | EN61000-4-5<br>HEAVY INDUSTRY<br>L-N：2KV<br>L,N-PE：4KV | I/P： 230VAC/50HZ<br>O/P：FULL LOAD<br>Ta：25℃ | PASS<br>CRITERIA A |
| 7 | Test by certified Lab ＆ Test Report Prepare | | | |

## ■ RELIABILITY TEST

### ENVIRONMENT 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： UHP-500-24<br>1. ROOM AMBIENT BURN-IN：2 HRS<br>I/P： 230VAC O/P： FULL LOAD Ta=25.1℃<br>2. HIGH AMBIENT BURN-IN： 2 HRS<br>I/P： 230VAC O/P： FULL LOAD Ta=49℃</td></tr>
<tr><td colspan="5"><table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=25.1 ℃</th><th>HIGH AMBIENT Ta=49 ℃</th></tr>
<tr><td>1</td><td>LF1</td><td>41.3℃</td><td>63.1℃</td></tr>
<tr><td>2</td><td>C10</td><td>53.0℃</td><td>75.9℃</td></tr>
<tr><td>3</td><td>LF3</td><td>47.0℃</td><td>68.8℃</td></tr>
<tr><td>4</td><td>BD1</td><td>60.8℃</td><td>82.5℃</td></tr>
<tr><td>5</td><td>D8</td><td>60.9℃</td><td>91.2℃</td></tr>
<tr><td>6</td><td>D9</td><td>64.0℃</td><td>93.3℃</td></tr>
<tr><td>7</td><td>L3</td><td>62.4℃</td><td>96.1℃</td></tr>
<tr><td>8</td><td>Q2</td><td>51.6℃</td><td>75.4℃</td></tr>
<tr><td>9</td><td>Q4</td><td>49.0℃</td><td>73.0℃</td></tr>
<tr><td>10</td><td>D5</td><td>56.7℃</td><td>86.9℃</td></tr>
<tr><td>11</td><td>C5</td><td>49.7℃</td><td>71.5℃</td></tr>
<tr><td>12</td><td>Q10</td><td>109.6℃</td><td>116.4℃</td></tr>
<tr><td>13</td><td>Q11</td><td>110.9℃</td><td>115.8℃</td></tr>
<tr><td>14</td><td>C93</td><td>73.8℃</td><td>95.8℃</td></tr>
<tr><td>15</td><td>C36</td><td>71.7℃</td><td>91.8℃</td></tr>
<tr><td>16</td><td>U1</td><td>45.3℃</td><td>68.8℃</td></tr>
<tr><td>17</td><td>U2</td><td>46.8℃</td><td>71.9℃</td></tr>
<tr><td>18</td><td>C38</td><td>66.2℃</td><td>86.7℃</td></tr>
<tr><td>19</td><td>D30</td><td>56.9℃</td><td>88.2℃</td></tr>
<tr><td>20</td><td>T1</td><td>67.8℃</td><td>94.1℃</td></tr>
<tr><td>21</td><td>Q101</td><td>54.1℃</td><td>82.7℃</td></tr>
<tr><td>22</td><td>Q103</td><td>59.8℃</td><td>87.1℃</td></tr>
<tr><td>23</td><td>C115</td><td>45.4℃</td><td>68.8℃</td></tr>
<tr><td>24</td><td>C119</td><td>45.8℃</td><td>69.6℃</td></tr>
<tr><td>25</td><td>RTH2</td><td>49.9℃</td><td>73.0℃</td></tr>
<tr><td>26</td><td>TSW1</td><td>53.0℃</td><td>77.4℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>LOW TEMPERATURE<br>TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 264VAC/90VAC<br>O/P：FULL /80% LOAD<br>Ta= -35℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST</td><td>AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 50℃<br>NO DAMAGE</td><td>I/P： 264VAC<br>O/P：FULL LOAD<br>Ta=50℃<br>HUMIDITY= 95%R.H</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>TEMPERATURE<br>COEFFICIENT</td><td>±0.03 %/℃(0~50℃)</td><td>I/P： 230 VAC<br>O/P：FULL LOAD</td><td>±0.001%/℃(0~50℃)</td></tr>
</table>

| | | | |
|---|---|---|---|
| 5 | STORAGE TEMPERATURE TEST | 1. Thermal shock Temperature： -45℃~ +90℃<br>2. Temperature change rate ： 25℃ / MIN<br>3. Dwell time low and high temperature ： 30 MIN/EACH<br>4. Total test cycle： 100 CYCLE<br>5. Input/Output condition： STATIC | TEST：OK |
| 6 | THERMAL SHOCK TEST | 1. Thermal shock Temperature： -25℃~ +55℃<br>2. Temperature change rate ： 25℃ / MIN<br>3. Dwell time low and high temperature ： 30 MIN/EACH<br>4. Total test cycle： 16 CYCLE<br>5. Input/Output condition： 230VAC/FULL LOAD AC ON/OFF TEST<br>AC on 3 sec/AC off 1 sec 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： 5G<br>(5) Test Time： 180min in each axes (X.Y.Z)<br>(6) Ta： 25℃ | TEST：OK |
| 8 | CAPACITOR<br>LIFE CYCLE | UHP-500-24： SUPPOSE C105 IS THE MOST CRITICAL COMPONENT<br>(1) I/P： 230VAC O/P： FULL LOAD Ta= 25 ℃ LIFE TIME<br>(2) I/P： 230VAC O/P： FULL LOAD Ta= 50 ℃ LIFE TIME<br>(3) I/P： 230VAC O/P： 75% LOAD Ta= 50 ℃ LIFE TIME<br>(4) I/P： 230VAC O/P： 50% LOAD Ta= 50 ℃ LIFE TIME | (1) 177224 HRS<br>(2) 32875 HRS<br>(3) 128170 HRS<br>(4) 267187 HRS |
| 9 | MTBF | Conducted by Parts Stress Analysis Prediction<br>168K hrs min. MIL-HDBK-217F (25℃) | |
| 10 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure(Expected Life) ：<br>30,000 hours @ Ta 50℃ | |

| TEST RESULT | TESTER | REVIEW | APPROVAL |
|---|---|---|---|
| PASS | SHENJW/ZHUOKB | SKY | LIUWY |