



# Test Report: EPP-500-48

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500W 5"×3" Green Open Frame Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Control Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

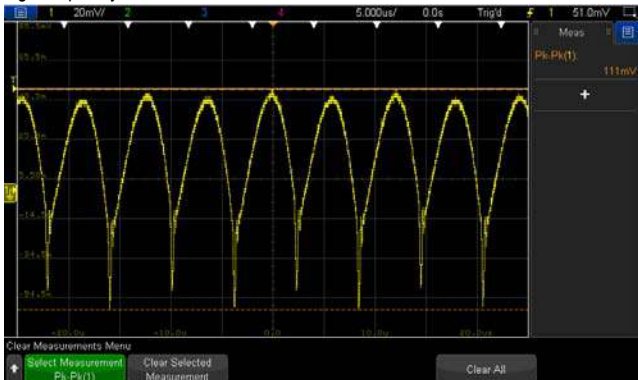
ENVIRONMENT TEST

DESIGN VERIFY TEST

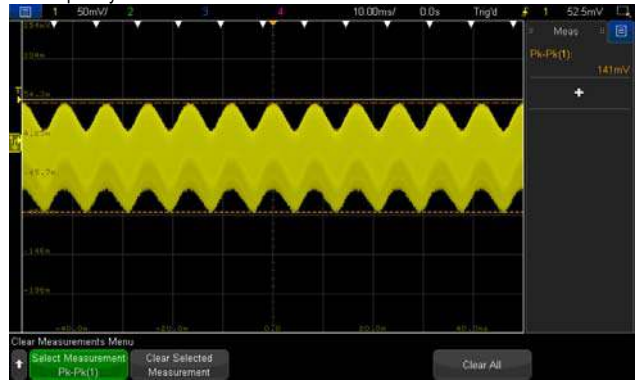
OUTPUT FUNCTION TEST

| NO | TEST ITEM                     | SPECIFICATION    | TEST CONDITION                                       | RESULT            |
|----|-------------------------------|------------------|--|-------------------|
| 1  | OUTPUT VOLTAGE ADJUST RANGE   | CH1: 45.6V~50.4V | I/P : 230 VAC<br>O/P : MIN LOAD<br>Ta : 25°C         | 43.2V~51.4V       |
| 2  | OUTPUT VOLTAGE(Max) TOLERANCE | V1: -1.0%~1.0%   | I/P: 80VAC /264VAC<br>O/P:FULL/ MIN. LOAD<br>Ta:25°C | V1 : -0.08%~0.05% |
| 3  | LINE REGULATION (Max)         | V1: -0.5%~0.5%   | I/P: 80VAC~ 264VAC<br>O/P:FULL LOAD<br>Ta:25°C       | V1 : -0.02%~0.07% |
| 4  | LOAD REGULATION(Max)          | V1: -1.0%~1.0%   | I/P: 230VAC<br>O/P:FULL ~MIN LOAD<br>Ta:25°C         | V1 : -0.08%~0.05% |
| 5  | OVER/UNDERSHOOT TEST          | < ±5%            | I/P: 230VAC<br>O/P:FULL LOAD<br>Ta:25°C              | 0.4%              |
| 6  | RIPPLE & NOISE(Max )          | V1: 200mVp-p     | I/P:230VAC<br>O/P:FULL LOAD<br>Ta:25°C               | V1: 141mVp-p      |

high frequency (V1) :



low frequency (V1):



|   |                  |                                |  |                                |
|---|------------------|--------------------------------|--|--------------------------------|
| 7 | SET UP TIME(Max) | 230VAC/1000ms<br>115VAC/1500ms | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C | 230VAC/ 586ms<br>115VAC/ 710ms |
|---|------------------|--------------------------------|--|--------------------------------|

INPUT=230VAC/50HZ @ FULL LOAD

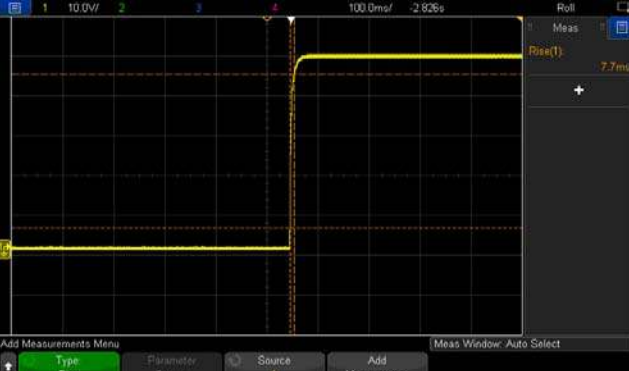
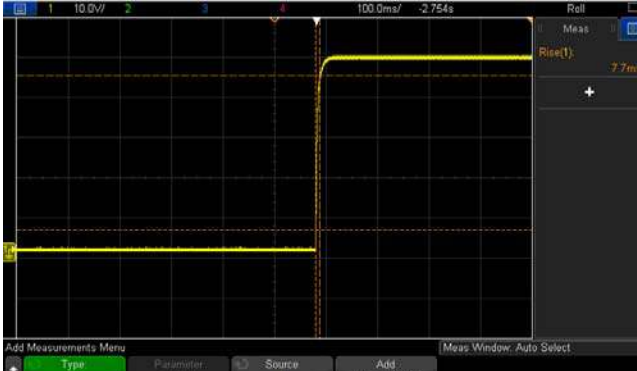
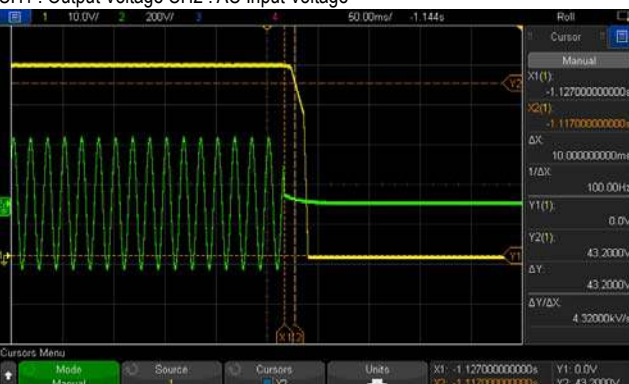
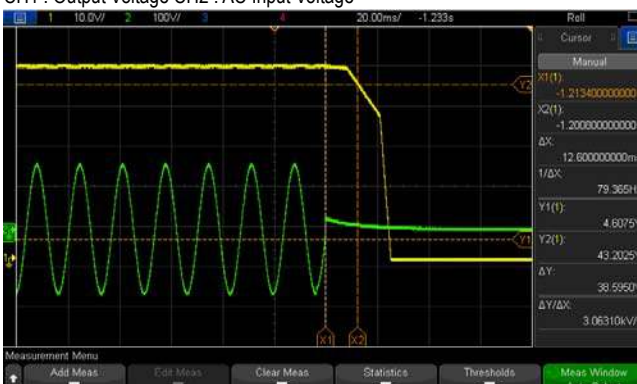
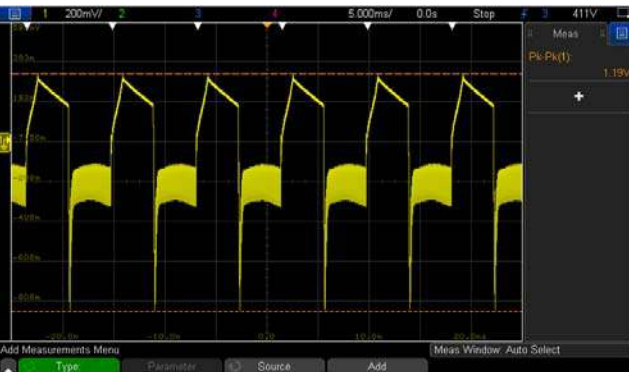
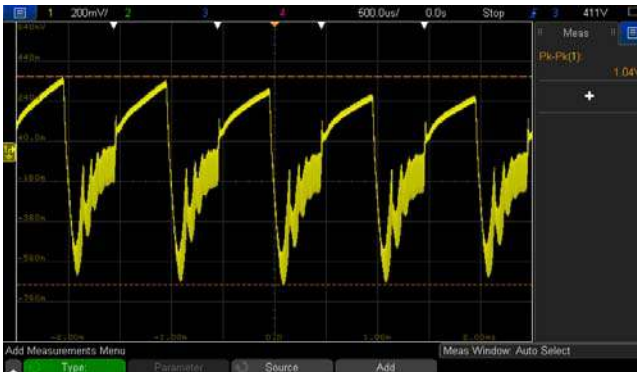
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

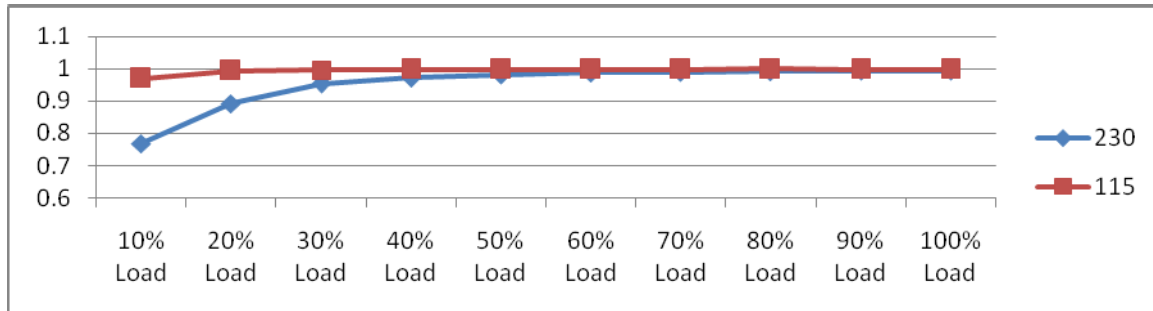


|  |   |   |                                    |
|--|---|---|------------------------------------|
| 8  | RISE TIME (Max)<br>230VAC/30ms<br>115VAC/30ms     | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC/ 7.7ms<br>115VAC/ 7.7ms     |
| <p>INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage</p>                           |   | <p>INPUT=115VAC/60HZ @ FULL LOAD<br/>CH1 : Output Voltage</p>                           |                                    |
| 9  | HOLD UP TIME (Typ.)<br>230VAC/10ms<br>115VAC/10ms | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC/ 10ms<br>115VAC/ 12.6ms     |
| <p>INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage</p>  |   | <p>INPUT=115VAC/60HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage</p>  |                                    |
| 10   | DYNAMIC LOAD<br>V1: 4800 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°C   | (1) (2)<br>V1: 1190mVp-p 1040mVp-p |
| <p>FULL /50% LOAD 50%DUTY / 120HZ (V1)</p>    |   | <p>FULL /50% LOAD 50%DUTY / 1KHZ (V1)</p>   |                                    |

INPUT FUNCTION TEST

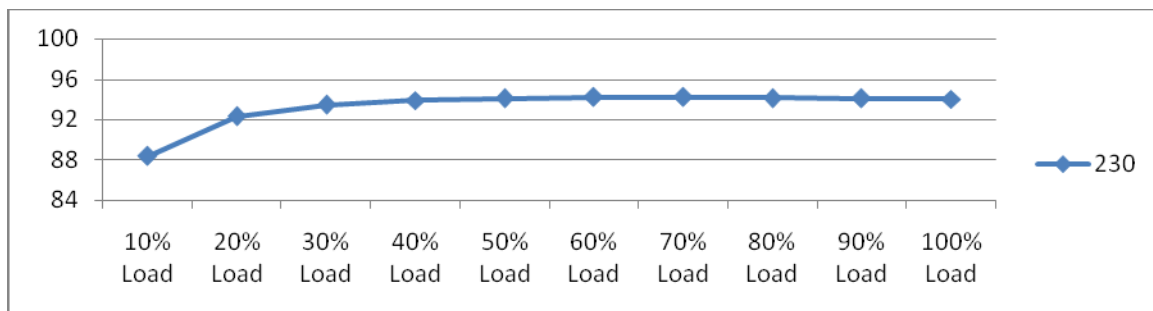
| NO | TEST ITEM                 | SPECIFICATION                 | TEST CONDITION  | RESULT                                 |
|----|---------------------------|-------------------------------|---|--|
| 1  | INPUT VOLTAGE RANGE       | 80VAC~264VAC<br>113VDC~370VDC | I/P:TESTING<br>O/P:FULL LOAD<br>Ta:25°C   | 73V~264V                               |
|    |                           |                               | I/P:<br>LOW-LINE-3V=77 V<br>HIGH-LINE+15%=300 V<br>O/P:FULL/MIN LOAD<br>(PLEASE CHECK DERATING CURVE)<br>ON: 30 Sec OFF: 30 Sec 10MIN<br>(POWER ON/OFF NO DAMAGE) | TEST:OK                                |
| 2  | INPUT FREQUENCY RANGE     | 47HZ ~63 HZ<br>NO DAMAGE      | I/P:80 VAC ~264 VAC<br>O/P:FULL~MIN LOAD<br>Ta:25°C   | TEST: OK                               |
| 3  | INPUT CURRENT (Typ.)      | 230V/ 2.9A<br>115V/5.8A       | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | I = 2.31A/ 230VAC<br>I = 4.80A/ 115VAC |
| 4  | LEAKAGE CURRENT           | <0.75mA/240VAC                | I/P : 264 VAC<br>O/P : Min LOAD<br>Ta : 25°C  | 0.21mA                                 |
| 5  | NO LOAD POWER CONSUMPTION | < 0.5W                        | I/P : 230 VAC<br>O/P : Min LOAD<br>Ta : 25°C  | 0.44W                                  |
| 6  | POWER FACTOR (Typ.)       | 0.94/ 230VAC<br>0.98/115VAC   | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | PF=0.993/230VAC<br>PF=0.998/115VAC     |

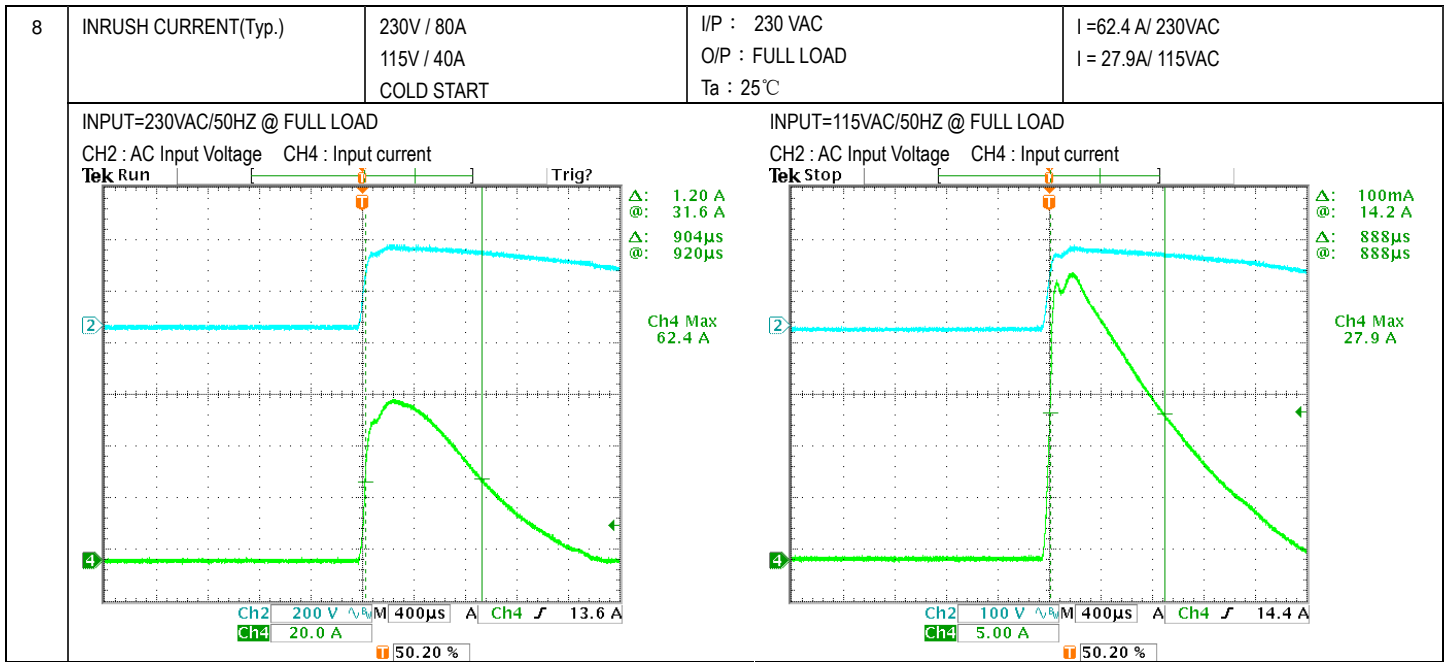
P.F vs LOAD



|   |                  |     |   |       |
|---|------------------|-----|---|-------|
| 7 | EFFICIENCY(Typ.) | 94% | I/P:230 VAC<br>O/P:FULL LOAD<br>Ta:25°C | 94.2% |
|---|------------------|-----|---|-------|

EFFICIENCY vs LOAD





**PROTECTION FUNCTION TEST**

| NO | TEST ITEM                   | SPECIFICATION                          | TEST CONDITION  | RESULT   |
|----|-----------------------------|--|---|--|
| 1  | OVER LOAD PROTECTION        | 105%~135%                              | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 115VAC<br>O/P: TESTING<br>Ta: 25°C | 119% / 264VAC<br>119% / 230VAC<br>119% / 115VAC<br>PROTECTION TYPE :<br>Hiccup mode, recovers automatically after fault condition is removed |
| 2  | OVER VOLTAGE PROTECTION     | 52.8V~62.4V                            | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 80VAC<br>O/P: MIN LOAD<br>Ta: 25°C | 56.8V / 264VAC<br>56.8V / 230VAC<br>56.8V / 80VAC<br>PROTECTION TYPE :<br>Shut down o/p voltage, repower on to recover                       |
| 3  | SHORT PROTECTION            | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD<br>Ta: 25°C               | NO DAMAGE<br>PROTECTION TYPE :<br>Hiccup mode, recovers automatically after fault condition is removed                                       |
| 4  | OVER TEMPERATURE PROTECTION | Protection type : Shut down            | I/P: 264VAC<br>I/P: 90VAC<br>O/P: FULL LOAD                           | O.T.P. Active<br>PROTECTION TYPE :<br>Shut down o/p voltage, recovers automatically after temperature goes down                              |

**Control Function Test**

| NO | TEST ITEM       | SPECIFICATION                     | TEST CONDITION                            | RESULT                  |
|----|-----------------|-----------------------------------|---|-------------------------|
| 1  | REMOTE SENSE    | >0.3V                             | I/P: 230VAC<br>O/P: FULL LOAD<br>Ta: 25°C | 0.5V                    |
| 2  | AUXILIARY POWER | O/P: 12V/0.5A<br>TOLERANCE: ± 10% | I/P: 230VAC<br>O/P: FULL LOAD<br>Ta: 25°C | TOLERANCE: -1.32%~1.13% |



|   |                    |  |   |  |
|---|--------------------|--|---|--|
| 3 | AUXILIARY POWER    | O/P:5V/0.6A<br>RIPPLE & NOISE:120 mVp-p<br>TOLERANCE: ±2%      | I/P: 230VAC<br>O/P: FULL LOAD<br>Ta:25°C                | RIPPLE & NOISE:50 mVp-p<br>TOLERANCE: -0.12%~0.14% |
| 4 | PS-ON INPUT SIGNAL | Power on: PS-ON=Hi or >2~5V<br>Power off: PS-ON=LOW or <0~0.5V | I/P: 230VAC<br>O/P: FULL LOAD<br>Ta:25°C                | TEST : OK  |
| 5 | POWER GOOD         | 10ms<PG<500ms  | I/P: 230VAC<br>I/P: 115VAC<br>O/P: FULL LOAD<br>Ta:25°C | 132ms/230VAC<br>148ms/115VAC                       |
| 6 | POWER FAIL         | > 1ms  | I/P: 230VAC<br>I/P: 115VAC<br>O/P: FULL LOAD<br>Ta:25°C | 7.8ms/230VAC<br>8.0ms/115VAC                       |

COMPONENT STRESS TEST

| NO | TEST ITEM   | SPECIFICATION  | TEST CONDITION   | RESULT   |
|----|---|--|--|--|
| 1  | PWM Transistor<br>(D to S) or (C to E) Peak Voltage | Q5 Rated<br>: 650 V<br><br>Q6 Rated<br>: 650 V       | AC ON/OFF<br>I/P:High-Line +3V =267V<br>VDS:<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load Continue<br>Ta:25°C                                    | Q5 Q6<br>VDS: VDS:<br>(1) 412V (1) 508V<br>(2) 420V (2) 504V<br>(3) 404V (3) 424V  |
| 2  | PWM Transistor<br>(D to S) or (C to E) Peak Voltage | U900 Rated<br>: 725 V                                | AC ON/OFF<br>I/P:High-Line +3V =267V<br>VDS:<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load Continue<br>Ta:25°C                                    | VDS:<br>(1) 541V<br>(2) 468V<br>(3) 537V   |
| 3  | O/P MOFET   | Q101 Rated<br>: 150 V<br><br>Q102 Rated<br>: 150 V   | AC ON/OFF<br>I/P:High-Line +3V =267 V<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load Continue<br>Ta:25°C   | Q101 Q102<br>VDS: VDS:<br>(1) 110.5V (1) 110.5V<br>(2) 17.4V (2) 17.6V<br>(3) 110.5V (3) 110.5V                          |
| 4  | Input Capacitor Voltage                             | C5 Rated<br>:270 μ / 400 V                           | I/P:High-Line +3V =267V<br>O/P: (1)Full Load input on/off<br>(2) Min load input on /Off<br>(3)Full Load /Min load Change<br>(4)Full load continue<br>Ta:25°C | (1) 392V<br>(2) 388V<br>(3) 398V<br>(4) 392 V  |
| 5  | Control IC Voltage Test                             | U1 Rated<br>: 0V~ 16 V<br><br>U2 Rated<br>: 0V~ 26 V | AC ON/OFF<br>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)NO LOAD VRmin(LOW LINE)<br>Ta:25°C              | U1 U2<br>(1) 14.2V (1) 16.2V<br>(2) 13.6V (2) 15.6V<br>(3) 10.9V (3) 15.4V<br>(4) 13.4V (4) 15.2V<br>(5) 13.6V (5) 16.2V |



|   |                  |                      |   |  |
|---|------------------|----------------------|---|--|
| 6 | P.F.C Transistor | Q1 Rated<br>: 650 V  | AC ON/OFF<br>I/P:High-Line +3V =267 V<br>O/P: (1)Full Load<br>(2)Output Short<br>(3) Full Load Continue<br>Ta:25°C  | VDS:<br>(1) 577V<br>(2) 424V<br>(3) 476V     |
| 7 | PFC Diode        | D10 Rated<br>: 650 V | AC ON/OFF<br>I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load<br>(2)Output Short<br>(3)Dynamic Load Full Load/<br>Min. Load 90%Duty/5KHz<br>(4)Dynamic Load 100% Load/<br>Min. Load 50%Duty/120Hz<br>Ta:25°C | (1) 408V<br>(2) 404V<br>(3) 408V<br>(4) 408V |

**SAFETY TEST**

| NO | TEST ITEM            | SPECIFICATION  | TEST CONDITION  | RESULT   |
|----|----------------------|--|---|--|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P: 4KVAC/min<br>I/P-FG:2 KVAC/min<br>O/P-FG: 0.5KVAC/min | I/P-O/P: 4.4 KVAC/min<br>I/P- FG: 2.4 KVAC/min<br>O/P - FG: 0.6 KVAC/min<br>Ta:25°C | I/P-O/P:1.45mA<br>I/P- FG:1.22 mA<br>O/P - FG:1.02 mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ<br>I/P- FG:500VDC>100MΩ                   | I/P-O/P: 600 VDC<br>I/P- FG: 600 VDC<br>Ta:25°C                                     | I/P-O/P: 9999MΩ<br>I/P- FG: 9999MΩ<br>NO DAMAGE                    |

**E.M.C TEST**

| NO | TEST ITEM  | SPECIFICATION  | TEST CONDITION   | RESULT  |
|----|--|--|--|---|
| 1  | HARMONIC   | EN61000-3-2<br>CLASS A   | I/P:230VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C              | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL |
| 2  | CONDUCTION   | EN55032<br>Class I: CLASS B<br>CNS13438<br>Class II : CLASS A  | I/P : 230 VAC (50HZ)<br>O/P : FULL/50% LOAD<br>Ta : 25°C | PASS<br>Test by certified Lab   |
| 3  | RADIATION  | EN55032/ CNS13438<br>CLASS A   | I/P : 230 VAC (50HZ)<br>O/P : FULL LOAD<br>Ta : 25°C     | PASS<br>Test by certified Lab   |
| 4  | E.S.D  | EN61000-4-2<br><input type="checkbox"/> LIGHT INDUSTRY<br>AIR: 8KV / Contact: 4KV<br><input checked="" type="checkbox"/> INDUSTRY<br>AIR: 8KV / Contact: 4KV | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | CRITERIA A  |
| 5  | E.F.T  | EN61000-4-4<br><input type="checkbox"/> LIGHT INDUSTRY<br>INPUT : 1KV<br><input checked="" type="checkbox"/> INDUSTRY<br>INPUT : 2KV                         | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | CRITERIA A  |
| 6  | SURGE  | IEC61000-4-5<br>INDUSTRY<br>L-N : 2KV  | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | CRITERIA A  |
| 7  | Test by certified Lab & Test Report Prepare<br>Any contradictions of the test results, please refer to the latest EMC test report. |  |  |   |

■ RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM   | SPECIFICATION   | TEST CONDITION   | RESULT                 |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
|----|---|---|--|------------------------|--------------------------|--------------------------|---|-----|--------|--------|---|----|--------|---------|---|-----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|---------|----|----|--------|---------|----|-----|--------|--------|----|----|--------|---------|----|----|--------|---------|----|----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|----|--------|--------|----|------|--------|--------|--|--|
| 1  | TEMPERATURE RISE TEST   | MODEL : EPP-500-48<br>1. ROOM AMBIENT BURN-IN : 1 HRS<br>I/P : 230VAC O/P : FULL LOAD Ta= 23.4 °C<br>2. HIGH AMBIENT BURN-IN : 1 HRS<br>I/P : 230VAC O/P : FULL LOAD Ta= 44.9 °C  |  |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
|    |   | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 23.4 °C</th> <th>HIGH AMBIENT Ta= 44.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>70.1°C</td><td>95.1°C</td></tr> <tr><td>2</td><td>L1</td><td>75.9°C</td><td>100.9°C</td></tr> <tr><td>3</td><td>LF3</td><td>45.3°C</td><td>71.9°C</td></tr> <tr><td>4</td><td>LF1</td><td>47.4°C</td><td>74.9°C</td></tr> <tr><td>5</td><td>C1</td><td>40.9°C</td><td>68.6°C</td></tr> <tr><td>6</td><td>C2</td><td>45.5°C</td><td>73.2°C</td></tr> <tr><td>7</td><td>D10</td><td>54.6°C</td><td>79.5°C</td></tr> <tr><td>8</td><td>Q1</td><td>58.8°C</td><td>83.8°C</td></tr> <tr><td>9</td><td>Q5</td><td>85.0°C</td><td>110.9°C</td></tr> <tr><td>10</td><td>Q6</td><td>85.2°C</td><td>111.1°C</td></tr> <tr><td>11</td><td>LF2</td><td>49.2°C</td><td>76.9°C</td></tr> <tr><td>12</td><td>T1</td><td>92.3°C</td><td>108.2°C</td></tr> <tr><td>13</td><td>L2</td><td>88.5°C</td><td>108.7°C</td></tr> <tr><td>14</td><td>C5</td><td>62.5°C</td><td>84.1°C</td></tr> <tr><td>15</td><td>Q101</td><td>63.6°C</td><td>90.1°C</td></tr> <tr><td>16</td><td>Q102</td><td>60.6°C</td><td>87.3°C</td></tr> <tr><td>17</td><td>T900</td><td>58.6°C</td><td>81.9°C</td></tr> <tr><td>18</td><td>D951</td><td>52.1°C</td><td>74.2°C</td></tr> <tr><td>19</td><td>U900</td><td>72.7°C</td><td>93.9°C</td></tr> <tr><td>20</td><td>C105</td><td>47.7°C</td><td>72.3°C</td></tr> <tr><td>21</td><td>C106</td><td>47.6°C</td><td>72.8°C</td></tr> <tr><td>22</td><td>U1</td><td>66.3°C</td><td>90.0°C</td></tr> <tr><td>23</td><td>TSW1</td><td>54.0°C</td><td>77.1°C</td></tr> </tbody> </table> | NO   | Position               | ROOM AMBIENT Ta= 23.4 °C | HIGH AMBIENT Ta= 44.9 °C | 1 | BD1 | 70.1°C | 95.1°C | 2 | L1 | 75.9°C | 100.9°C | 3 | LF3 | 45.3°C | 71.9°C | 4 | LF1 | 47.4°C | 74.9°C | 5 | C1 | 40.9°C | 68.6°C | 6 | C2 | 45.5°C | 73.2°C | 7 | D10 | 54.6°C | 79.5°C | 8 | Q1 | 58.8°C | 83.8°C | 9 | Q5 | 85.0°C | 110.9°C | 10 | Q6 | 85.2°C | 111.1°C | 11 | LF2 | 49.2°C | 76.9°C | 12 | T1 | 92.3°C | 108.2°C | 13 | L2 | 88.5°C | 108.7°C | 14 | C5 | 62.5°C | 84.1°C | 15 | Q101 | 63.6°C | 90.1°C | 16 | Q102 | 60.6°C | 87.3°C | 17 | T900 | 58.6°C | 81.9°C | 18 | D951 | 52.1°C | 74.2°C | 19 | U900 | 72.7°C | 93.9°C | 20 | C105 | 47.7°C | 72.3°C | 21 | C106 | 47.6°C | 72.8°C | 22 | U1 | 66.3°C | 90.0°C | 23 | TSW1 | 54.0°C | 77.1°C |  |  |
| NO | Position  | ROOM AMBIENT Ta= 23.4 °C  | HIGH AMBIENT Ta= 44.9 °C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 1  | BD1   | 70.1°C  | 95.1°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 2  | L1  | 75.9°C  | 100.9°C  |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 3  | LF3   | 45.3°C  | 71.9°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 4  | LF1   | 47.4°C  | 74.9°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 5  | C1  | 40.9°C  | 68.6°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 6  | C2  | 45.5°C  | 73.2°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 7  | D10   | 54.6°C  | 79.5°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 8  | Q1  | 58.8°C  | 83.8°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 9  | Q5  | 85.0°C  | 110.9°C  |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 10 | Q6  | 85.2°C  | 111.1°C  |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 11 | LF2   | 49.2°C  | 76.9°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 12 | T1  | 92.3°C  | 108.2°C  |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 13 | L2  | 88.5°C  | 108.7°C  |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 14 | C5  | 62.5°C  | 84.1°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 15 | Q101  | 63.6°C  | 90.1°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 16 | Q102  | 60.6°C  | 87.3°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 17 | T900  | 58.6°C  | 81.9°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 18 | D951  | 52.1°C  | 74.2°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 19 | U900  | 72.7°C  | 93.9°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 20 | C105  | 47.7°C  | 72.3°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 21 | C106  | 47.6°C  | 72.8°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 22 | U1  | 66.3°C  | 90.0°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 23 | TSW1  | 54.0°C  | 77.1°C   |                        |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 2  | OVER LOAD BURN-IN TEST  | NO DAMAGE<br>1 HOUR ( MIN )   | I/P : 230 VAC<br>O/P : 130% LOAD<br>Ta : 25°C                      | TEST : OK              |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 3  | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR  | I/P : 264VAC/115VAC<br>O/P : 100 % LOAD<br>Ta= -35 °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 45°C /95 %R.H<br>NO DAMAGE   | I/P : 272 VAC<br>O/P : FULL LOAD<br>Ta= 45 °C<br>HUMIDITY= 95 %R.H | TEST : OK              |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |
| 5  | TEMPERATURE<br>COEFFICIENT  | ± 0.03%/°C (0~50°C)   | I/P : 230 VAC<br>O/P : FULL LOAD                                   | ± 0.0019 %/°C (0~50°C) |                          |                          |   |     |        |        |   |    |        |         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |         |    |    |        |         |    |     |        |        |    |    |        |         |    |    |        |         |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |    |        |        |    |      |        |        |  |  |



|    |                          |   |  |
|----|--------------------------|---|--|
| 6  | 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  |
| 7  | THERMAL SHOCK TEST       | 1. Thermal shock Temperature : -35°C~ +50°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:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST<br>1cycle:230V/ FULL LOAD Burn In Test | TEST : OK  |
| 8  | 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 : 3G<br>(5) Test Time : 180min in each axis (X.Y.Z)<br>(6) Ta : 25°C   | TEST : OK  |
| 9  | CAPACITOR LIFE CYCLE     | SUPPOSE C106 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME<br>(2) I/P : 230VAC O/P : FULL LOAD Ta= 45 °C LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME                                     | (1) 691766.4 HRS<br>(2) 133755 HRS<br>(3) 210964.6 HRS<br>(4) 275126.4 HRS |
| 10 | MTBF                     | Conducted by Parts Stress Analysis Prediction<br>194.1K hrs min. MIL-HDBK-217F (25°C)   |  |
| 11 | Ongoing Reliability Test | I/P : 230VAC O/P : FULL 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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