



# Test Report: EPP-100-15

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100W Single Output with PFC Function

## ■ 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  | VERDICT |
|----|-----------------------------|--|---|---|---------|
| 1  | RIPPLE & NOISE              | V1 : 150 mVp-p (Max)                             | I/P : 230VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | V1 : 39 mVp-p (Max)   | P       |
| 2  | OUTPUT VOLTAGE ADJUST RANGE | CH1 : 14.7 V ~ 15.75 V                           | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : MIN LOAD<br>Ta : 25°C   | 14.218 V ~ 16.10 V / 230 VAC<br>14.218 V ~ 16.10 V / 115 VAC  | P       |
| 3  | OUTPUT VOLTAGE TOLERANCE    | V1 : 2 % ~ -2 % (Max)                            | I/P : 100VAC / 264 VAC<br>O/P : FULL / MIN LOAD<br>Ta : 25°C  | V1 : 0.1 % ~ -0.1 %   | P       |
| 4  | LINE REGULATION             | V1 : 0.5 % ~ -0.5 % (Max)                        | I/P : 100VAC ~ 264 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | V1 : 0.04 % ~ -0.04 %   | P       |
| 5  | LOAD REGULATION             | V1 : 1 % ~ -1 % (Max)                            | I/P : 230 VAC<br>O/P : FULL ~ MIN LOAD<br>Ta : 25°C   | V1 : 0 % ~ 0 %  | P       |
| 6  | SET UP TIME                 | 230VAC : 1000 ms (Max)<br>115VAC : 2000 ms (Max) | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC / 302 ms<br>115VAC / 605 ms                            | P       |
| 7  | RISE TIME                   | 230VAC : 30 ms (Max)<br>115VAC : 30 ms (Max)     | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC / 15 ms<br>115VAC / 15 ms                              | P       |
| 8  | HOLD UP TIME                | 230VAC : 16 ms (TYP)<br>115VAC : 16 ms (TYP)     | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC / 21 ms<br>115VAC / 21 ms                              | P       |
| 9  | OVER/UNDERSHOOT TEST        | < ±5%  | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | TEST : <5 %   | P       |
| 10 | DYNAMIC LOAD                | V1 : 1500 mVp-p                                  | I/P : 230 VAC<br>(1).O/P : FULL / Min LOAD 90%DUTY / 1KHZ<br>(2).O/P : FULL / Min LOAD 90%DUTY / 3KHZ<br>(3).O/P : FULL / Min LOAD 90%DUTY / 5KHZ<br>(4).O/P : FULL / Min LOAD 50%DUTY / 120HZ<br>Ta : 25°C | (1)342 mVp-p<br>(2)340 mVp-p<br>(3)372 mVp-p<br>(4)1040 mVp-p | P       |

## INPUT FUNCTION TEST

| NO | TEST ITEM             | SPECIFICATION                              | TEST CONDITION  | RESULT                                     | VERDICT |
|----|-----------------------|--|---|--|---------|
| 1  | INPUT VOLTAGE RANGE   | 90VAC~264 VAC                              | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C<br><br>I/P :<br>LOW-LINE -3V= 87 V<br>HIGH-LINE+15%=300 V<br>O/P : FULL/MIN LOAD<br>ON : 30 Sec . OFF : 30 Sec 10MIN<br>( AC POWER ON/OFF NO DAMAGE ) | 60V~264V<br><br>TEST : OK                  | P       |
| 2  | INPUT FREQUENCY RANGE | 47HZ ~63 HZ<br>NO DAMAGE OSC               | I/P : 100 VAC ~ 264 VAC<br>O/P : FULL -MIN LOAD<br>Ta : 25°C  | TEST : OK                                  | P       |
| 3  | POWER FACTOR          | 0.94 / 230 VAC(TYP)<br>0.98 / 115 VAC(TYP) | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | PF= 0.946 / 230 VAC<br>PF= 0.995 / 115 VAC | P       |
| 4  | EFFICIENCY            | 91% (TYP)                                  | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | 92.34 %                                    | P       |
| 5  | INPUT CURRENT         | 230V/ 0.7 A (TYP)<br>115V/ 1.4 A (TYP)     | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | I = 0.53 A/ 230 VAC<br>I = 1 A/ 115 VAC    | P       |
| 6  | INRUSH CURRENT        | 230V/ 80 A (TYP)<br><br>COLD START         | I/P : 230 VAC<br><br>O/P : FULL LOAD<br>Ta : 25°C   | I = 65 A/ 230 VAC                          | P       |
| 7  | LEAKAGE CURRENT       | < 2 mA / 240 VAC                           | I/P : 264 VAC<br>O/P : Min LOAD<br>Ta : 25°C  | L-FG : 0.11 mA<br>N-FG : 0.11 mA           | P       |
| 8  | NO LOAD CONSUMPTION   | < 0.5 W                                    | I/P : 115VAC<br>I/P : 230VAC<br>O/P : NO LOAD<br>Ta : 25°C  | < 0.37 W<br>< 0.40 W                       | P       |

**PROTECTION FUNCTION TEST**

| NO | TEST ITEM                   | SPECIFICATION   | TEST CONDITION  | RESULT  | VERDICT |
|----|-----------------------------|---|---|---|---------|
| 1  | OVER LOAD PROTECTION        | 105% - 145 %  | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : TESTING<br>Ta : 25°C  | 124 %/ 230 VAC<br>124 %/ 115 VAC<br>Hiccup Mode   | P       |
| 2  | OVER VOLTAGE PROTECTION     | CH1 : 16.83V ~ 18.97 V  | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : MIN LOAD<br>Ta : 25°C | 17.816 V/ 230 VAC<br>17.851 V/ 115 VAC<br>Shut down Re- power ON                                  | P       |
| 3  | OVER TEMPERATURE PROTECTION | SPEC :<br>RTH2 : 110± 10°C<br>TSW1 : 110± 5°C O.T.P.<br>NO DAMAGE | I/P : 230 VAC<br>O/P : FULL LOAD                              | O.T.P. Active<br>Shut down o/p voltage , recovers<br>automatically after temperature<br>goes down | P       |
| 4  | SHORT PROTECTION            | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE                            | I/P : 264 VAC<br>O/P : FULL LOAD<br>Ta : 25°C                 | NO DAMAGE<br>Hiccup Mode  | P       |

**CONTROL FUNCTION TEST**

| NO | TEST ITEM             | SPECIFICATION   | TEST CONDITION                                | RESULT                 | VERDICT |
|----|-----------------------|---|---|------------------------|---------|
| 1  | AUXILIARY POWER (AUX) | <a href="#">12V@0.3A</a> for driver a fan,<br>tolerance ± 10% at main<br>output 100% load | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C | FAN VOLTAGE : 12.435 V | P       |

**COMPONENT STRESS TEST**

| NO | TEST ITEM  | SPECIFICATION   | TEST CONDITION   | RESULT   | VERDICT  |
|----|--|---|--|--|----------|
| 1  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q6 Rated :<br>STD10NM60N 8A/650V  | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C  | (1) 424 V<br>(2) 420 V<br>(3) 418 V  | <b>P</b> |
| 2  | Diode Peak Voltage                                     | Q100 Rated :<br>PFR40L45CT 40A/45V                                      | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on<br>(2)Output Short<br>(3)Full load continue<br>Ta : 25°C   | (1) 37.4 V<br>(2) 14.4 V<br>(3) 37.2 V                                       | <b>P</b> |
| 3  | Input Capacitor Voltage                                | C5 Rated :<br>82u/420V 105°C 18*25 PT                                   | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load<br>Change<br>Ta : 25°C   | (1) 402 V<br>(2) 404 V<br>(3) 404 V  | <b>P</b> |
| 4  | Control IC Voltage Test                                | U 1 Rated :<br>NCP1605 10V~20V<br><br>U900 Rated :<br>L6599AD 8.85V~16V | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load<br>(1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load<br><br>Change<br>Ta : 25°C | (1) 16.5 V<br>(2) 17 V<br>(3) 13.9 V<br>(4) 14 V<br>(5) 13.9 V<br>(6) 13.9 V | <b>P</b> |
| 5  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q 1 Rated :<br>STF28NM50N 21A/500V                                      | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C  | (1) 452 V<br>(2) 448 V<br>(3) 448 V  | <b>P</b> |

**SAFETY & E.M.C. TEST**
**SAFETY TEST**

| NO | TEST ITEM            | SPECIFICATION  | TEST CONDITION  | RESULT  | VERDICT |
|----|----------------------|--|---|---|---------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 3 KVAC/min<br>I/P-FG : 2 KVAC/min<br>O/P-FG : 0.5 KVAC/min     | I/P-O/P : 3.6 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 : 1.682 mA<br>I/P-FG : 0.791 mA<br>O/P-FG : 0.298 mA<br>NO DAMAGE | P       |
| 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°C / 70%RH        | I/P-O/P : 18.1 GΩ<br>I/P-FG : 30 GΩ<br>O/P-FG : 30 GΩ<br>NO DAMAGE        | P       |
| 3  | GROUNDING CONTINUITY | FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ                                   | 40 A / 2min<br>Ta : 25°C / 70%RH  | 27 mΩ   | P       |

**E.M.C TEST**

| NO | TEST ITEM                                   | SPECIFICATION   | TEST CONDITION   | RESULT                        | VERDICT |
|----|---|---|--|-------------------------------|---------|
| 1  | HARMONIC                                    | EN61000-3-2<br>CLASS A<br>CLASS D                     | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | PASS                          | P       |
| 2  | CONDUCTION                                  | EN55022<br>CLASS B                                    | I/P : 230 VAC (50HZ)<br>O/P : FULL/50% LOAD<br>Ta : 25°C | PASS<br>Test by certified Lab | P       |
| 3  | RADIATION                                   | EN55022<br>CLASS B                                    | I/P : 230 VAC (50HZ)<br>O/P : FULL LOAD<br>Ta : 25°C     | PASS<br>Test by certified Lab | P       |
| 4  | E.S.D                                       | EN61000-4-2<br>INDUSTRY<br>AIR : 8KV / Contact : 4KV  | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | CRITERIA A                    | P       |
| 5  | E.F.T                                       | EN61000-4-4<br>INDUSTRY<br>INPUT : 2KV                | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | CRITERIA A                    | P       |
| 6  | SURGE                                       | IEC61000-4-5<br>INDUSTRY<br>L-N : 2KV<br>L,N-PE : 4KV | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C       | CRITERIA A                    | P       |
| 7  | Test by certified Lab & Test Report Prepare |   |  |                               |         |

## RELIABILITY TEST

### ENVIRONMENT TEST

| NO | TEST ITEM   | SPECIFICATION   | TEST CONDITION   | RESULT                | VERDICT |
|----|---|---|--|-----------------------|---------|
| 1  | TEMPERATURE RISE TEST   | MODEL : EPP-100-12<br>1. ROOM AMBIENT BURN-IN : 12 HRS<br>I/P : 230VAC O/P : FULL LOAD Ta= 30.1 °C<br>2. HIGH AMBIENT BURN-IN : 4 HRS<br>I/P : 230VAC O/P : FULL LOAD Ta= 53.4 °C                                     |  |                       | P       |
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| 2  | OVER LOAD BURN-IN TEST  | NO DAMAGE<br>1 HOUR (MIN)   | I/P : 230 VAC<br>O/P : 124 % LOAD<br>Ta : 25°C                     | TEST : OK             | P       |
| 3  | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR  | I/P : 264VAC/100VAC<br>O/P : 100 % LOAD<br>Ta= -35 °C              | TEST : OK             | P       |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 50 °C<br>NO DAMAGE   | I/P : 272 VAC<br>O/P : FULL LOAD<br>Ta= 50 °C<br>HUMIDITY= 95 %R.H | TEST : OK             | P       |
| 5  | TEMPERATURE<br>COEFFICIENT  | ± 0.03 %/°C (0-50°C)  | I/P : 230 VAC<br>O/P : FULL LOAD                                   | ± 0.004 %/°C (0-50°C) | P       |
| 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 : 5 CYCLE<br>5. Input/Output condition : STATIC |  | OK                    | P       |

|    |                             |  |   |   |
|----|-----------------------------|--|---|---|
| 7  | THERMAL SHOCK TEST          | 1. Thermal shock Temperature : -35°C~ +55°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 : 230VAC/Full Load AC ON/OFF TEST<br>turn on 58sec ; turn off 2sec     | OK  | P |
| 8  | VIBRATION TEST              | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10-500Hz<br>(3) Sweep Time : 12min/sweep cycle<br>(4) Acceleration : 2G<br>(5) Test Time : 60min in each axis (X.Y.Z)<br>(6) Ta : 25°C   | TEST : OK   | P |
| 9  | CAPACITOR LIFE CYCLE        | EPP-100-12:SUPPOSE C105 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= 50 °C LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME | (1) 1934309HRS<br>(2) 316818HRS<br>(3) 366431HRS<br>(4) 412266HRS | P |
| 10 | MTBF                        | MIL-HDBK-217F NOTICE S2 PARTS COUNT<br>TOTAL FAILURE RATE : 249.6 KHRS   |   | P |
| 11 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C  |   | P |

| DATE      | SAMPLE         | TEST RESULT | TESTER     | APPROVAL      |
|-----------|----------------|-------------|------------|---------------|
| 2012/5/7  | RD SAMPLE      | PASS        | SANFORD SU | VINCENT TSENG |
| 2013/5/30 | PRODUCT SAMPLE | PASS        | SANFORD SU | VINCENT TSENG |

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