



# Test Report: OWA-90E-24

---

90W Single Output Switching Power 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                                   | VERDICT |
|----|--------------------------|---|---|--|---------|
| 1  | RIPPLE & NOISE           | V1 : 150 mVp-p (Max)                          | I/P : 230VAC<br>O/P : 95% LOAD<br>Ta : 25°C   | V1 : 20 mVp-p (Max)                      | PASS    |
| 2  | OUTPUT VOLTAGE TOLERANCE | V1 : -3%~ 3% (Max)                            | I/P : 100 VAC / 264 VAC<br>O/P : 95% / NO LOAD<br>Ta : 25°C   | V1 : -0.550 %~ 0.248 %                   | PASS    |
| 3  | LINE REGULATION          | V1 : -0.5%~ 0.5 % (Max)                       | I/P : 100 VAC ~ 264 VAC<br>O/P : 95% LOAD<br>Ta : 25°C  | V1 : 0 %~ 0 %                            | PASS    |
| 4  | LOAD REGULATION          | V1 : -0.5%~ 0.5 % (Max)                       | I/P : 230 VAC<br>O/P : 95%~NO LOAD<br>Ta : 25°C   | V1 : -0.248 %~ 0.248 %                   | PASS    |
| 5  | SET UP TIME              | 230VAC : 500 ms (Max)<br>115VAC : 500 ms(Max) | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : 95% LOAD<br>Ta : 25°C   | 230VAC/ 351.214 ms<br>115VAC/ 347.732 ms | PASS    |
| 6  | RISE TIME                | 230VAC : 80 ms (Max)<br>115VAC : 80 ms (Max)  | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : 95% LOAD<br>Ta : 25°C   | 230VAC/ 61.541 ms<br>115VAC/ 59.092 ms   | PASS    |
| 7  | 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/ 20.051 ms<br>115VAC/ 19.129 ms   | PASS    |
| 8  | OVER/UNDERSHOOT TEST     | < ±5%   | I/P : 230 VAC<br>O/P : 95% LOAD<br>Ta : 25°C  | TEST : < 5 %                             | PASS    |
| 9  | DYNAMIC LOAD             | V1 : 2400 mVp-p                               | I/P : 230 VAC<br>(1).O/P : 95% /NO LOAD 90%DUTY/<br>1KHZ<br>(2).O/P : 95% /NO LOAD 50%DUTY/<br>120HZ<br>Ta : 25°C | (1) 536 mVp-p<br>(2) 932 mVp-p           | PASS    |

**INPUT FUNCTION TEST**

| NO | TEST ITEM                 | SPECIFICATION   | TEST CONDITION   | RESULT   | VERDICT |
|----|---------------------------|---|--|--|---------|
| 1  | INPUT VOLTAGE RANGE       | 90VAC~264 VAC   | I/P : TESTING<br>O/P : 95% LOAD<br>Ta : 25°C   | 87 V~264V  | PASS    |
|    |                           |   | I/P :<br>LOW-LINE=3V=87 V<br>HIGH-LINE=264 V<br>O/P : 95%/NO LOAD<br>ON : 30 Sec . OFF : 30 Sec 10MIN<br>( AC POWER ON/OFF NO DAMAGE ) | TEST : OK  |         |
| 2  | INPUT FREQUENCY RANGE     | 47HZ ~63 HZ<br>NO DAMAGE OSC  | I/P : 90 VAC ~ 264 VAC<br>O/P : 95% ~NO LOAD<br>Ta : 25°C  | TEST : OK  | PASS    |
| 3  | POWER FACTOR              | 0.96 / 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= 0.977 / 100%<br>PF= 0.997 / 100%                   | PASS    |
| 4  | EFFICIENCY                | 90%   | I/P : 230 VAC<br>O/P : 95% LOAD<br>Ta : 25°C   | 91.27%   | PASS    |
| 5  | INPUT CURRENT             | 230V/ 0.5 A (TYP)<br>115V/ 0.95 A (TYP)                                   | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : 95% LOAD<br>Ta : 25°C  | I = 0.433 A/ 230 VAC<br>I = 0.862 A/ 115 VAC           | PASS    |
| 6  | INRUSH CURRENT            | 230V/ 60 A (TYP)<br>Twidth =550 us measured at 50%<br>Ipeak<br>COLD START | I/P : 230 VAC<br>O/P : 95% LOAD<br>Ta : 25°C   | I = 57.671 A/ 230 VAC<br><br>Twidth = 444 us           | PASS    |
| 7  | LEAKAGE CURRENT           | < 0.25 mA / 240 VAC   | I/P : 240 VAC<br>O/P : NO LOAD<br>Ta : 25°C  | L-CASE : 0.003 mA /240VAC<br>N-CASE : 0.003 mA /240VAC | PASS    |
| 8  | NO LOAD POWER CONSUMPTION | < 0.15 W  | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : NO LOAD<br>Ta : 25°C   | 0.113W / 230VAC<br>0.114W / 115VAC                     | PASS    |

**PROTECTION FUNCTION TEST**

| NO | TEST ITEM                   | SPECIFICATION                          | TEST CONDITION   | RESULT   | VERDICT |
|----|-----------------------------|--|--|--|---------|
| 1  | OVER LOAD PROTECTION        | 95 % ~ 108 %                           | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : TESTING<br>Ta : 25°C | 100.49 %/ 230 VAC<br>100.49 %/ 115 VAC<br>Constant current limiting ,recovers automatically after fault condition is removed | PASS    |
| 2  | OVER VOLTAGE PROTECTION     | CH1 : 28 V ~ 34 V                      | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : NO LOAD<br>Ta : 25°C | 31.327 V/ 230 VAC<br>31.318 V/ 115 VAC<br>Shut down o/p voltage, re-power on to recover                                      | PASS    |
| 3  | OVER TEMPERATURE PROTECTION | SPEC :<br>O.T.P.<br>NO DAMAGE          | I/P : 230 VAC<br>O/P : 95% LOAD                              | O.T.P. Active<br>Shut down o/p voltage, re-power on to recover   | PASS    |
| 4  | SHORT PROTECTION            | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P : 264 VAC<br>O/P : 95% LOAD<br>Ta : 25°C                 | NO DAMAGE<br>Hiccup mode, recovers automatically after fault condition is removed.   | PASS    |

**COMPONENT STRESS TEST**

| NO | TEST ITEM  | SPECIFICATION            | TEST CONDITION  | RESULT                                 | VERDICT |
|----|--|--------------------------|---|--|---------|
| 1  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q2 Rated<br>800 V 9.0A   | I/P : High-Line +3V = 267 V<br>O/P : (1)95% Load Turn on<br>(2) Output Short<br>(3) 95% load continue<br>Ta : 25°C                          | (1) 716 V<br>(2) 504 V<br>(3) 716 V    | PASS    |
| 2  | Diode Peak Voltage                                     | Q101 Rated<br>100 V 62 A | I/P : High-Line +3V = 267 V<br>O/P : (1) 95% Load Turn on<br>(2)Output Short<br>(3) 95% load continue<br>Ta : 25°C                          | (1) 77.2 V<br>(2) 46.4 V<br>(3) 76.0 V | PASS    |
| 3  | Input Capacitor Voltage                                | C5 Rated<br>82uF / 450 V | I/P : High-Line +3V = 267 V<br>O/P : (1) 95% Load Turn on /Off<br>(2) NO load Turn on /Off<br>(3) 95% Load /Min load<br>Change<br>Ta : 25°C | (1) 448 V<br>(2) 448 V<br>(3) 442 V    | PASS    |
| 4  | Control IC Voltage Test                                | U1 Rated<br>28V          | I/P : High-Line +3V = 267 V<br>O/P : (1) 95% Load Turn on /Off<br>(2) NO load Turn on /Off<br>(3) 95% Load /Min load<br>Change<br>Ta : 25°C | (1) 17.3 V<br>(2) 17.4 V<br>(3) 17.3 V | PASS    |
| 5  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q1 Rated<br>600 V/ 10 A  | I/P : High-Line +3V = 267 V<br>O/P : (1) 95% Load Turn on<br>(2) Output Short<br>(3) 95% load continue<br>Ta : 25°C                         | (1) 468 V<br>(2) 396 V<br>(3) 456 V    | PASS    |

■ SAFETY & E.M.C. TEST

**SAFETY TEST**

| NO | TEST ITEM            | SPECIFICATION           | TEST CONDITION                        | RESULT                          | VERDICT |
|----|----------------------|-------------------------|---------------------------------------|---------------------------------|---------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 3.75 KVAC/min | I/P-O/P : 4.2 KVAC/min<br>Ta : 25°C   | I/P-O/P : 2.343 mA<br>NO DAMAGE | PASS    |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ  | I/P-O/P : 500 VDC<br>Ta : 25°C/70% RH | I/P-O/P : >9999 MΩ<br>NO DAMAGE | PASS    |

**E.M.C TEST**

| NO | TEST ITEM                                   | SPECIFICATION          | TEST CONDITION   | RESULT                        | VERDICT |
|----|---|------------------------|--|-------------------------------|---------|
| 1  | HARMONIC                                    | EN61000-3-2<br>CLASS C | I/P:115VAC/230VAC<br>O/P:95%, 60%LOAD<br>Ta:25°C           | PASS                          | PASS    |
| 2  | CONDUCTION                                  | FCC Part15<br>Class B  | I/P: 230 VAC (50HZ)/115V[60HZ]<br>O/P: 95% LOAD<br>Ta:25°C | PASS<br>Test by certified Lab | PASS    |
| 3  | RADIATION                                   | FCC Part15<br>Class B  | I/P: 230 VAC (50HZ)/115V[60HZ]<br>O/P: 95% LOAD<br>Ta:25°C | PASS<br>Test by certified Lab | PASS    |
| 4  | Test by certified Lab & Test Report Prepare |                        |  |                               |         |

■ RELIABILITY TEST

**ENVIRONMENT TEST**

| NO | TEST ITEM             | SPECIFICATION  | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------|--|----------------|--------|---------|
| 1  | TEMPERATURE RISE TEST | MODEL : OWA-90E-12<br>1. ROOM AMBIENT BURN-IN : 2 HRS<br>I/P : 230VAC O/P : 95% LOAD Ta=28.1 °C<br>2. HIGH AMBIENT BURN-IN : 2 HRS<br>I/P : 230VAC O/P : 95% LOAD Ta=50.0 °C |                |        | PASS    |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |
|    |                       |  |                |        |         |

|    |   |  |  |  |      |
|----|---|--|--|--|------|
| 2  | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR   | I/P : 264VAC/100VAC<br>O/P : 95% LOAD<br>Ta= -40/-25℃            | TEST : OK  | PASS |
| 3  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 50 ℃<br>NO DAMAGE   | I/P : 272 VAC<br>O/P : 95% LOAD<br>Ta= 50 ℃<br>HUMIDITY= 95 %R.H | TEST : OK  | PASS |
| 4  | TEMPERATURE<br>COEFFICIENT  | ±0.03 %(0-50℃)   | I/P : 230 VAC<br>O/P : 95% LOAD                                  | ±0.005 %(0-50℃)  | PASS |
| 5  | STORAGE TEMPERATURE TEST  | 1. Thermal shock Temperature : -45℃~ +85℃<br>2. Temperature change rate : 25℃ / 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   | PASS |
| 6  | THERMAL SHOCK TEST  | 1. Thermal shock Temperature : -45℃~ +55℃<br>2. Temperature change rate : 25℃ / 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/95% Load AC ON/OFF TEST<br>turn on 58sec ; turn off 2sec |  | OK   | PASS |
| 7  | 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 : 5G<br>(5) Test Time : 72min in each axis (X.Y.Z)<br>(6) Ta : 25℃  |  | TEST : OK  | PASS |
| 8  | CAPACITOR<br>LIFE CYCLE   | OWA-90E-12: SUPPOSE C105 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 230VAC O/P : 95% LOAD Ta=25 ℃ LIFE TIME<br>(2) I/P : 230VAC O/P : 95% 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) 341985.6 HRS<br>(2) 75510.6 HRS<br>(3) 87964.8 HRS<br>(4) 122634.6 HRS | PASS |
| 9  | MTBF  | Conducted by Parts Stress Analysis Prediction<br>3044.3K hrs min. Telcordia SR-332 (Bellcore) ; 292.9K hrs min. MIL-HDBK-217F (25℃)  |  |  | PASS |
| 10 | DMTBF/Accelerated Life Test                                       | Demonstration Mean Time Between Failure(Expected Life) :<br>50000 hours @ Tcase 75℃  |  |  | PASS |

| TEST RESULT | TESTER        | APPROVAL |
|-------------|---------------|----------|
| PASS        | ZHOUB/ ZHUOKB | LIUWY    |

2009/08/04 A50-G058