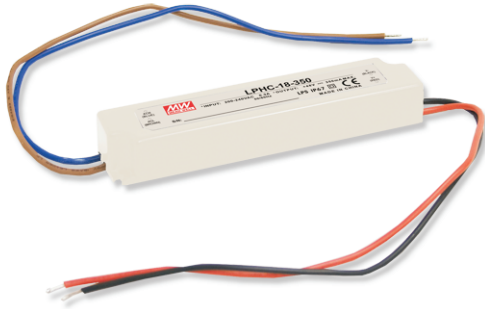




# 18W Single Output Switching Power Supply

# LPHC-18 series



### ■ Features :

- Constant current mode power supply
- 180-264VAC input only
- Fully encapsulated with IP67 level
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Cooling by free air convection
- Pass LPS
- 100% full load burn-in test
- Suitable for LED lighting and moving sign applications
- High reliability / Low cost
- 2 years warranty

LPS IP67 CE

### SPECIFICATION

| MODEL                 |  | LPHC-18-350   | LPHC-18-700   |
|-----------------------|--|---|---------------|
| OUTPUT                | RATED CURRENT  | 350mA   | 700mA         |
|                       | DC VOLTAGE RANGE   | 6~48V   | 6~25V         |
|                       | RATED POWER  | 16.8W   | 17.5W         |
|                       | RIPPLE & NOISE (max.) Note.2   | 300mVp-p  | 250mVp-p      |
|                       | VOLTAGE TOLERANCE Note.3   | ±5.0%   |               |
|                       | LINE REGULATION  | ±1.0%   |               |
|                       | LOAD REGULATION  | ±3.0%   |               |
|                       | SETUP, RISE TIME   | 3600ms, 100ms / 230VAC  |               |
| HOLD UP TIME (Typ.)   | 20ms/230VAC at full load   |   |               |
| INPUT                 | VOLTAGE RANGE  | 180 ~ 264VAC    254 ~ 370VDC  |               |
|                       | FREQUENCY RANGE  | 47 ~ 63Hz   |               |
|                       | EFFICIENCY(Typ.)   | 80%   | 80%           |
|                       | AC CURRENT   | 0.3A/230VAC   |               |
|                       | INRUSH CURRENT(max.)   | Cold start 50A/230VAC   |               |
|                       | LEAKAGE CURRENT  | 0.25mA / 240VAC   |               |
| PROTECTION            | CURRENT LIMIT  | ±5% rated output current<br>Protection type : Constant current limiting type  |               |
|                       | OVER VOLTAGE   | 50.4~ 60V   | 28.75~ 33.75V |
|                       | OVER TEMPERATURE   | Tj 170 t ypically (U1) Detect on main control IC<br>Protection type : Hiccup mode, recovers automatically after temperature goes down |               |
| ENVIRONMENT           | WORKING TEMP.  | -30 ~ 70°C (Refer to output load derating curve)  |               |
|                       | WORKING HUMIDITY   | 20 ~ 90% RH non-condensing  |               |
|                       | STORAGE TEMP., HUMIDITY  | -40 ~ +80°C, 10 ~ 95% RH  |               |
|                       | TEMP. COEFFICIENT  | ±0.2%/°C (0 ~ 50°C)   |               |
|                       | VIBRATION  | 10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes   |               |
| SAFETY & EMC (Note 5) | SAFETY STANDARDS   | IP67 approved; design refer to UL1310 Class 2, TUV EN60950-1, EN61347-2-13, CAN/CSA C22.2 No. 223-M91                                 |               |
|                       | WITHSTAND VOLTAGE  | I/P-O/P:3KVAC   |               |
|                       | ISOLATION RESISTANCE   | I/P-O/P:>100M Ohms / 500VDC / 25°C / 70% RH   |               |
|                       | EMI CONDUCTION & RADIATION   | Compliance to EN55022 (CISPR22) Class A   |               |
|                       | HARMONIC CURRENT   | Compliance to EN61000-3-2 Class A, EN61000-3-3  |               |
|                       | EMS IMMUNITY   | Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, Light industry level, criteria A   |               |
| OTHERS                | MTBF   | 1200.6K hrs min. MIL-HDBK-217F (25)   |               |
|                       | DIMENSION  | 140*30*22(L*W*H)  |               |
|                       | PACKING  | 0.175Kg; 70pcs/13.3Kgs/0.71CUFT   |               |
| NOTE                  | <ol style="list-style-type: none"> <li>1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.</li> <li>2. Ripple &amp; noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf &amp; 47uf parallel capacitor.</li> <li>3. Tolerance : includes set up tolerance, line regulation and load regulation.</li> <li>4. Derating may be needed under low input voltage. Please check the static characteristic for more details.</li> <li>5. The power supply is considered as a component that will be operated in combination with final equipment. Since EMC performance will be affected by the complete installation, the final equipment manufacturers must re-qualify EMC Directive on the complete installation again.</li> </ol> |   |               |





# Test Report: LPHC-18-350

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18W 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 : 300 mVp-p (Max)    | I/P : 230VAC<br>O/P : FULL LOAD<br>Ta : 25°C                       | V1 : 100 mVp-p (Max) | P       |
| 2  | OUTPUT VOLTAGE TOLERANCE | V1 : 5 %~ -5 % (Max)    | I/P : 195 VAC / 264 VAC<br>O/P : FULL/ MIN LOAD<br>Ta : 25°C       | V1 : 0.21 %~ -0.21 % | P       |
| 3  | LINE REGULATION          | V1 : 1 %~ -1 % (Max) %~ | I/P : 195 VAC ~ 264 VAC<br>O/P : FULL LOAD<br>Ta : 25°C            | V1 : 0.03 %~ -0.03 % | P       |
| 4  | LOAD REGULATION          | V1 : 3 %~ -3 % (Max)    | I/P : 230 VAC<br>O/P : FULL ~MIN LOAD<br>Ta : 25°C                 | V1 : 0.21 %~ -0.21 % | P       |
| 5  | SET UP TIME              | 230VAC : 3600 ms (Max)  | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C                      | 230VAC/ 2504 ms      | P       |
| 6  | RISE TIME                | 230VAC : 100 ms (Max)   | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C                      | 230VAC/ 26 ms        | P       |
| 7  | HOLD UP TIME             | 230VAC : 20 ms (TYP)    | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C                      | 230VAC/ 75 ms        | P       |
| 8  | OVER/UNDERSHOOT TEST     | < ±5%                   | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C                      | TEST : < 5 %         | P       |
| 9  | DYNAMIC LOAD             | V1 : 4800 mVp-p         | I/P : 230VAC<br>O/P : FULL /Min LOAD 90%DUTY/<br>1KHZ<br>Ta : 25°C | 181 mVp-p            | P       |

## INPUT FUNCTION TEST

| NO | TEST ITEM             | SPECIFICATION                      | TEST CONDITION   | RESULT                           | VERDICT |
|----|-----------------------|------------------------------------|--|----------------------------------|---------|
| 1  | INPUT VOLTAGE RANGE   | 195VAC~264VAC                      | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C<br><br>I/P :<br>LOW-LINE-3V= 192 V<br>HIGH-LINE+15%=300V<br>O/P : FULL/MIN LOAD<br>ON : 30 Sec . OFF : 30 Sec 10MIN<br>( AC POWER ON/OFF NO DAMAGE ) | 85V~264V<br><br>TEST : OK        | P       |
| 2  | INPUT FREQUENCY RANGE | 47HZ ~63 HZ<br>NO DAMAGE OSC       | I/P : 195 VAC ~ 264 VAC<br>O/P : FULL -MIN LOAD<br>Ta : 25°C   | TEST : OK                        | P       |
| 3  | EFFICIENCY            | 80 % (TYP)                         | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 82.7 %                           | P       |
| 4  | INPUT CURRENT         | 230V/ 0.3 A (TYP)                  | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | I = 0.171 A/ 230 VAC             | P       |
| 5  | INRUSH CURRENT        | 230V/ 50 A (TYP)<br><br>COLD START | I/P : 230 VAC<br>I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | I = 40 A/ 230 VAC                | P       |
| 6  | LEAKAGE CURRENT       | < 0.25 mA / 240 VAC                | I/P : 264 VAC<br>O/P : Min LOAD<br>Ta : 25°C   | L-FG : 0.01 mA<br>N-FG : 0.01 mA | P       |

## PROTECTION FUNCTION TEST

| NO | TEST ITEM                   | SPECIFICATION  | TEST CONDITION                                | RESULT  | VERDICT |
|----|-----------------------------|--|---|---|---------|
| 1  | OVER LOAD PROTECTION        | 95 %- 105 %  | I/P : 230 VAC<br>O/P : TESTING<br>Ta : 25°C   | 102.5%/ 230 VAC<br>Constant Current Limiting                                    | P       |
| 2  | OVER VOLTAGE PROTECTION     | CH1 : 50.4 V- 60 V   | I/P : 230 VAC<br>O/P : MIN LOAD<br>Ta : 25°C  | 57.3V/ 230 VAC<br>Shut off o/p voltage, clamping by zener diode                 | P       |
| 3  | OVER TEMPERATURE PROTECTION | SPEC :<br>Tj 170°C typically (U1) Detect<br>On main control IC | I/P : 230 VAC<br>O/P : FULL LOAD              | O.T.P. Active<br>Hiccup Mode recovers automatically after temperature 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>Constant Current Limiting  | 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 | U1 Rated :<br>VIPER22A 730V  | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>Ta : 25°C   | (1) 648 V<br>(2) 452 V                                 | P       |
| 2  | Diode Peak Voltage                                     | D 10 Rated :<br>3A/600V HER306<br><br>D 11 Rated :<br>1N4148 75V /0.2A | I/P : High-Line +3V = 267 V<br>O/P : (1)Full Load Turn on<br>(2)Output Short<br>Ta : 25°C  | (1) 266 V<br>(2) 258 V<br><br>(1) 28.4 V<br>(2) 19.4 V | P       |
| 3  | Clamp Diode Peak Voltage                               | D 1 Rated :<br>2A/800V GP20K   | I/P : High-Line +3V = 267 V<br>O/P : (1) Dynamic Load<br>90%Duty/1KHz<br>Ta : 25°C   | (1) 400 V  | P       |
| 4  | Input Capacitor Voltage                                | C5 Rated :<br>27uF/400V 105°C KF                                       | 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) 371 V<br>(2) 377.8 V<br>(3) 377.8 V                | P       |
| 5  | Control IC Voltage Test                                | U1 Rated :<br>VIPER22A 9V-38V  | 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) 30.6 V<br>(2) 25.56 V<br>(3) 25.41 V               | P       |

**■ 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                     | I/P-O/P : 3.6 KVAC/min<br>Ta : 25°C  | I/P-O/P : 0.777 mA<br><br>NO DAMAGE | P       |
| 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 : 30 GΩ<br><br>NO DAMAGE    | P       |
| 3  | APPROVAL             | TUV : Certificate NO :<br>UL : File NO : |                                      |                                     | N/A     |

**E.M.C TEST**

| NO | TEST ITEM                                   | SPECIFICATION   | TEST CONDITION  | RESULT                        | VERDICT |
|----|---|---|---|-------------------------------|---------|
| 1  | HARMONIC                                    | EN61000-3-2<br>CLASS A                                      | I/P : 240/230/220 VAC/50HZ<br>O/P : 100,75,50,25% LOAD<br>Ta : 25°C | PASS                          | P       |
| 2  | CONDUCTION                                  | EN55022<br>CLASS A  | 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 A  | 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>LIGHT 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>LIGHT INDUSTRY<br>INPUT : 1KV                | I/P : 230 VAC/50HZ<br>O/P : FULL LOAD<br>Ta : 25°C                  | CRITERIA A                    | P       |
| 6  | SURGE                                       | IEC61000-4-5<br>LIGHT INDUSTRY<br>L-N : 1KV<br>L,N-PE : 2KV | 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 : LPHC-18-350<br>1. ROOM AMBIENT BURN-IN : 1 HRS<br>I/P : 230VAC O/P : FULL LOAD Ta= 30.5 °C<br>2. HIGH AMBIENT BURN-IN : 2 HRS<br>I/P : 230VAC O/P : FULL LOAD Ta= 50.2 °C   |  |                   | P       |
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| 2  | LOW TEMPERATURE TURN ON TEST                                      | TURN ON AFTER 2 HOUR  | I/P : 264VAC<br>O/P : 100 % LOAD<br>Ta= -30 °C                     | TEST : OK         | P       |
| 3  | 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       |
| 4  | TEMPERATURE COEFFICIENT   | ± 0.2 % (0-50°C)  | I/P : 230 VAC<br>O/P : FULL LOAD                                   | ± 0.06 % (0-50°C) | P       |
| 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 : 5 CYCLE<br>5. Input/Output condition : STATIC            |  | OK                | P       |
| 6  | 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 |  | OK                | P       |



|   |                      |   |   |   |
|---|----------------------|---|---|---|
| 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 : 2G<br>(5) Test Time : 60min in each axis (X.Y.Z)<br>(6) Ta : 25°C                        | TEST : OK   | P |
| 8 | CAPACITOR LIFE CYCLE | LPHC-18-350:SUPPOSE C15 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>(2) I/P : 230VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME | (1) 524217.6HRS<br>(2) 107190.4HRS<br>(3) 113331.2HRS | P |
| 9 | MTBF                 | MIL-HDBK-217F NOTICES2 PARTS COUNT<br>TOTAL FAILURE RATE : 1200.6K HRS  |   | P |

| DATE     | SAMPLE    | TEST RESULT | TESTER     | APPROVAL      |
|----------|-----------|-------------|------------|---------------|
| 2009/8/7 | RD SAMPLE | PASS        | SANFORD SU | VINCENT TSENG |

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