VLM60/40 Series

60 & 40 W, Efficient, Compact Constant Voltage Class 2 LED Drivers

Aluminum Case:
L 130 x W 19.05 x H 19.05 mm
(L 5.12 x W 0.75 x H 0.75 in)

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>ERP Part Number</th>
<th>Nominal Input Voltage (Vac)</th>
<th>Pout Max (W)</th>
<th>Vout Nom (Vdc)</th>
<th>Iout Min (A)</th>
<th>Iout Max (A)</th>
<th>Open Loop Voltage (No Load Vout Max) (Vdc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLM40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VLM40W-12</td>
<td>120 to 277</td>
<td>40</td>
<td>12</td>
<td>0.1</td>
<td>3.3</td>
<td>12.84</td>
</tr>
<tr>
<td>VLM40W-24</td>
<td>120 to 277</td>
<td>40</td>
<td>24</td>
<td>0.05</td>
<td>1.67</td>
<td>25.68</td>
</tr>
<tr>
<td>VLM40W-48</td>
<td>120 to 277</td>
<td>40</td>
<td>48</td>
<td>0.025</td>
<td>0.83</td>
<td>51.36</td>
</tr>
<tr>
<td>VLM60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VLM60W-12</td>
<td>120 to 277</td>
<td>60</td>
<td>12</td>
<td>0.1</td>
<td>5</td>
<td>12.84</td>
</tr>
<tr>
<td>VLM60W-24</td>
<td>120 to 277</td>
<td>60</td>
<td>24</td>
<td>0.05</td>
<td>2.5</td>
<td>25.68</td>
</tr>
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<td>VLM60W-48</td>
<td>120 to 277</td>
<td>60</td>
<td>48</td>
<td>0.025</td>
<td>1.25</td>
<td>51.36</td>
</tr>
</tbody>
</table>

FEATURES
- Very high power density of 20 W/in³
- Class 2 power supply
- IP20-rated case with silicone-based potting
- 90°C maximum case hot spot temperature
- Complies with ENERGY STAR®, DLC (DesignLight Consortium®) and CA Title 24 technical requirements
- Lifetime: 50,000 hours min at 70°C case temperature
- UL Class P
- Worldwide safety approvals

TYPICAL APPLICATIONS
- Strip lights
- Pendants
- Linears
- Cove Lights
## 1 - INPUT SPECIFICATION (@25°C ambient temperature)

<table>
<thead>
<tr>
<th>Units</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage Range (Vin)</td>
<td>Vac</td>
<td>90</td>
<td>120, 230, 277</td>
<td>305 • The rated output voltage for each model is achieved at Vin≥105 Vac &amp; at Vin≥198 Vac • At maximum load</td>
</tr>
<tr>
<td>Input Frequency Range</td>
<td>Hz</td>
<td>47</td>
<td>50/60</td>
<td>63</td>
</tr>
<tr>
<td>Input Current (lin)</td>
<td>A</td>
<td>0.7 A @ 120 Vac</td>
<td>0.4 A @ 230 vac</td>
<td>0.3 A @ 277 Vac</td>
</tr>
<tr>
<td>Power Factor (PF)</td>
<td></td>
<td>0.9</td>
<td>&gt; 0.9</td>
<td></td>
</tr>
<tr>
<td>Inrush Current</td>
<td>A</td>
<td>400 μA @ 120 Vac</td>
<td>800 μA @ 230 Vac</td>
<td>920 μA @ 277 Vac</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>μA</td>
<td>20%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Input Harmonics</td>
<td></td>
<td>-</td>
<td>up to 90%</td>
<td>-</td>
</tr>
<tr>
<td>Total Harmonics Distortion (THD)</td>
<td>%</td>
<td>20%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>%</td>
<td>-</td>
<td>up to 90%</td>
<td>-</td>
</tr>
<tr>
<td>Isolation</td>
<td>The AC input to the main DC output is isolated and meets Class II reinforced/double insulation power supply</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 2 - MAIN OUTPUT SPECIFICATION (@25°C ambient temperature)

<table>
<thead>
<tr>
<th>Units</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage (Vout)</td>
<td>Vdc</td>
<td>12, 24, 48</td>
<td>12 Vdc: 5.0 A</td>
<td>24 Vdc: 2.5 A</td>
</tr>
<tr>
<td>Output Current (Iout)</td>
<td>A</td>
<td>12 Vdc: 5.0 A</td>
<td>24 Vdc: 2.5 A</td>
<td>48 Vdc: 1.25 A</td>
</tr>
<tr>
<td>Output Voltage Regulation</td>
<td>%</td>
<td>-5</td>
<td>5</td>
<td>• At nominal AC line voltage • Includes load and current set point variations.</td>
</tr>
<tr>
<td>Output Voltage Overshoot</td>
<td>%</td>
<td>-</td>
<td>-</td>
<td>10 • The driver does not operate outside of the regulation requirements for more than 500 ms during power on with maximum load.</td>
</tr>
<tr>
<td>Ripple Voltage</td>
<td>≤ 5% of rated output voltage for each model</td>
<td>• Measured at maximum load and nominal input voltage • Calculated in accordance with the IES Lighting Handbook, 9th edition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start-up Time</td>
<td>ms</td>
<td>500</td>
<td>-</td>
<td>• Measured from application of AC line voltage to 100% light output • Complies with California Title 24 and ENERGY STAR® luminaire specification.</td>
</tr>
</tbody>
</table>
## 3 - ENVIRONMENTAL CONDITIONS

<table>
<thead>
<tr>
<th>Units</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Ambient Temperature (Ta)</td>
<td>°C</td>
<td>-20</td>
<td>50</td>
<td>50°C is the non-derated temperature (Refer to section 6 “Output power de-rating at higher temperatures”.</td>
</tr>
<tr>
<td>Maximum Case Temperature (Tc)</td>
<td>°C</td>
<td>-40</td>
<td>+90</td>
<td>Case temperature measured at the hot spot • tc (see label in page 9)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>°C</td>
<td>-40</td>
<td>+85</td>
<td>Non-condensing</td>
</tr>
<tr>
<td>Humidity</td>
<td>%</td>
<td>5</td>
<td>95</td>
<td>Non-condensing</td>
</tr>
<tr>
<td>Cooling</td>
<td></td>
<td>Convection cooled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acoustic Noise</td>
<td>dBA</td>
<td>22</td>
<td></td>
<td>Measured at a distance of 1 foot (30 cm)</td>
</tr>
<tr>
<td>Mechanical Shock Protection</td>
<td></td>
<td></td>
<td>per EN60068-2-27</td>
<td></td>
</tr>
<tr>
<td>Vibration Protection</td>
<td></td>
<td></td>
<td>per EN60068-2-6 &amp; EN60068-2-64</td>
<td></td>
</tr>
<tr>
<td>MTBF</td>
<td></td>
<td>&gt; 200,000 hours when operated at nominal input and output conditions, and at Tc ≤ 70°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifetime</td>
<td></td>
<td>50,000 hours at Tc ≤ 70°C maximum case hot spot temperature (see hot spot • tc on label in page 9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 4 - EMC COMPLIANCE AND SAFETY APPROVALS

### EMC Compliance

- Conducted and Radiated EMI
  - •FCC CFR Title 47 Part 15 Class B at 120 Vac and Class A at 277 Vac
  - •EN55015 (CISPR 15) compliant at 220, 230, and 240 Vac
- Harmonic Current Emissions
  - IEC61000-3-2
  - IEC61000-3-3
- Voltage Fluctuations & Flicker
  - For Class C equipment
- Immunity Compliance
  - ESD (Electrostatic Discharge)
    - IEC61000-4-2
    - 6 kV contact discharge, 8 kV air discharge, level 3
  - RF Electromagnetic Field Susceptibility
    - IEC61000-4-3
    - 3 V/m, 80 - 1000 MHz, 80% modulated at a distance of 3 meters
  - Electrical Fast Transient
    - IEC61000-4-4
    - ± 2 kV on AC power port for 1 minute, ±1 kV on signal/control lines
  - Surge
    - IEC61000-4-5
    - ± 2 kV line to line (differential mode) / ± 2 kV line to common mode ground (tested to secondary ground) on AC power port, ±0.5 kV for outdoor cables
    - • Higher surge is available. Please contact your ERP representative or send an email to SaveEnergy@erp-power.com.
  - ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave
- Conducted RF Disturbances
  - IEC61000-4-6
  - 3V, 0.15-60 MHz, 80% modulated
- Voltage Dips
  - IEC61000-4-11
  - >95% dip, 0.5 period; 30% dip, 25 periods; 95% reduction, 250 periods

### Safety Agency Approvals

- UL
  - UL8750 listed Class 2
- cUL
  - CAN/CSA C22.2 No. 250.13-14 LED equipment for lighting applications
- CE
  - IEC61347-2-13 electronic control gear for LED Modules & EN55015 (EMC compliance)

### Safety

<table>
<thead>
<tr>
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<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Hi Pot (High Potential) or Dielectric voltage-withstand | Vdc | 2500 | | • Insulation between the input (AC line and Neutral) and the output
  • Tested at the RMS voltage equivalent of 1767 Vac
5 - PROTECTION FEATURES

Under-Voltage (Brownout)
The VLM60/40 series provides protection circuitry such that an application of an input voltage below the minimum stated in section 1 (Input Specification) shall not cause damage to the driver.

Short Circuit and Over Current Protection
The VLM60/40 series is protected against short-circuit such that a short from any output to return shall not result in a fire hazard or shock hazard. The driver shall hiccup as a result of a short circuit or over current fault. Removal of the fault will return the driver to within normal operation. The driver shall recover, with no damage, from a short across the output for an indefinite period of time.

Internal Over temperature Protection
The VLM60/40 is equipped with an internal temperature sensor on the primary power train. Failure to stay within the convection power rating will cause the driver to shut down. The main output current will be resumed when the temperature of the built-in temperature sensor cools adequately.

Output Open Load
A no load condition will not damage the VLM60/40 or cause a hazardous condition. The driver will remain stable and operate normally after application of a load. When the LED load is removed, the output voltage of the VLM60/40 series is limited to 7% about the output voltage of each model.

Over Power Protection
The VLM60/40 will shut down and auto recover when its input power exceeds approximately 110% of 96 W. This condition will cause no damage to the power supply.

Input Over Current Protection
The VLM60/40 series incorporates a primary AC line fuse for input over current protection.

6 - OUTPUT POWER DE-RATING AT ELEVATED TEMPERATURES

The VLM60/40 series can be operated with cooling air temperatures above 50°C by linearly de-rating the total maximum output power (or current) by 2.5%/°C from 50°C to 70°C (see figure 1).
60 & 40 W, Efficient, Compact Constant Voltage Class 2 LED Drivers

7 - PREDICTED LIFETIME VERSUS CASE AND AMBIENT TEMPERATURE

Lifetime is defined by the measurement of the temperatures of all the electrolytic capacitors whose failure would affect light output under the nominal LED load and worst case AC line voltage. The graphs in figure 1 are determined by the electrolytic capacitor with the shortest lifetime, among all electrolytic capacitors. It represents a worst case scenario in which the LED driver is powered 24 hours/day, 7 days/week. The lifetime of an electrolytic capacitor is measured when any of the following changes in performance are observed:

1) Capacitance changes more than 20% of initial value
2) Dissipation Factor (tan δ): 150% or less of initial specified value
3) Equivalent Series Resistance (ESR): 150% or less of initial specified value
4) Leakage current: less of initial specified value

Notes:
• The ambient temperature $T_{ambient}$ and the differential between $T_{ambient}$ and $T_{case}$ mentioned in the above graphs are relevant only as long as both the driver and the light fixture are exposed to the same ambient room temperature. If the LED driver is housed in an enclosure or covered by insulation material, then the ambient room temperature is no longer valid. In this situation, please refer only to the case temperature $T_{case}$.
• It should be noted the graph “Lifetime vs. Ambient Temperature” may have an error induced in the final application if the mounting has restricted convection flow around the case. For applications where this is evident, the actual case temperature measured at the Tc point in the application should be used for reliability calculations.
60 & 40 W, Efficient, Compact Constant Voltage Class 2 LED Drivers

**VLM60/40 Series**

VLM60 60 W
VLM40 40 W

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**8 – EFFICIENCY VERSUS LOAD (@ Tc = 70°C)**

**Figure 4**

**Figure 5**

**Figure 6**
Packaging Options: Aluminum case
I/O Connections: Flying leads, 18 AWG on all leads, 203mm (8 in) long, 105°C rated, stranded, stripped by approximately 9.5mm, and tinned. All the wires, on both input and output, have a 300 V insulation rating.
Ingress Protection: IP20 rated
Mounting Instructions: The VLM60/40 driver case must be secured on a flat surface through the two mounting tabs, shown here below in the case outline drawings. We recommended mounting the VLM60/40 on a base plate with dimensions of 150 x 60 x 2 mm (5.91 x 2.36 x 0.08 in.)

Dimensions: L 130 x W 19.05 x H 19.05 mm (L 5.12 x W 0.75 x H 0.75 in)
Volume: 47.2cm³ (2.88 in³)
Weight: All dimensions are in mm

Figure 7
60 & 40 W, Efficient, Compact Constant Voltage Class 2 LED Drivers

All dimensions are in mm

Figure 8
The VLM60-24 is used in figure 9 as an example to illustrate a typical label.

Figure 9