

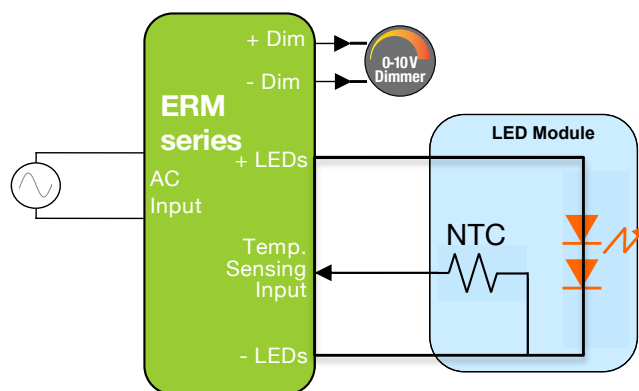
## High Power Density Constant Current LED Drivers with 0-10 V pp

| Input Voltage         | Max. Output Power | Output Voltage | Output Current     | Efficiency    | Max. Case Temperature       | THD   | Power Factor | Dimming Method | Dimming Range |
|-----------------------|-------------------|----------------|--------------------|---------------|-----------------------------|-------|--------------|----------------|---------------|
| 120 & 277 Vac nominal | 70 W              | 21 to 82 Vdc   | 700 mA to 2.1 A CC | ≥ 90% typical | 90°C (measured at hot spot) | < 20% | > 0.9        | 0-10 V         | 10 - 100%     |



GC: Constant Current

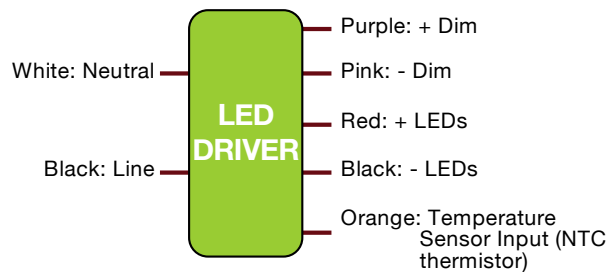
**METAL CASE:**  
L 81.5 x W 56.2 x H 31.5 mm  
(L 3.21 x W 2.21 x H 1.24 in)



APPLICATION DIAGRAM

### FEATURES

- Very high efficiency of ≥ 90% and high power density of 8.2W/in<sup>3</sup>
- Compatible with 0-10 V dimmers
- 120 to 277 Vac nominal input voltage
- Protections: output open load, over-current and short-circuit (hiccup), and over-temperature with auto recovery
- Conducted and radiated EMI: FCC CFR Title 47 Part 15 compliant with Class B at 120 Vac and Class A at 277 Vac
- Enables ENERGY STAR® and DLC (DesignLight Consortium®) luminaire compliance
- IP64-rated metal case with silicone-based potting
- 90°C maximum case hot spot temperature
- 50,000 hours lifetime
- Class 2 power supply
- Double-insulated power supply between input and output (class II) 
- Worldwide safety approvals



WIRING DIAGRAM

### APPLICATIONS

- High Bay Lights
- Troffers
- Outdoor LED Lighting
- Office LED Lighting
- Industrial LED Lighting

## High Power Density Constant Current LED Drivers with 0-10 V Dimming

### 1 - ORDERING INFORMATION - MODEL DESCRIPTION

ERM    W -     -

Series  
• 050 (40-50 W)  
• 060 (51-70 W)

Nominal Vin  
• 120 & 277 Vac

Iout

Vout Max.

| ERP Part Number                | Nominal Input Voltage (Vac) | Iout (mA) | Max Output Power (W) | Vout Min (Vdc) | Vout Nom (Vdc) | Vout Max (Vdc) | No Load Voltage (Vdc) |
|--------------------------------|-----------------------------|-----------|----------------------|----------------|----------------|----------------|-----------------------|
| <b>ERM050: 40 to 50 W</b>      |                             |           |                      |                |                |                |                       |
| ERM050W-1800-28                | 120 & 277                   | 1800      | 50.4                 | 21             | 25.2           | 28             | 33.6                  |
| <b>ERM060: 51 to 70 W</b>      |                             |           |                      |                |                |                |                       |
| ERM060W-0700-82 <sup>[1]</sup> | 120 & 277                   | 700       | 57.4                 | 62             | 73.8           | 82             | 98.4                  |
| ERM060W-1400-42                | 120 & 277                   | 1400      | 58.8                 | 32             | 37.8           | 42             | 50                    |
| ERM060W-1600-42                | 120 & 277                   | 1600      | 67.2                 | 32             | 37.8           | 42             | 50                    |
| ERM060W-1750-40                | 120 & 277                   | 1750      | 70                   | 30             | 36             | 40             | 48                    |

#### Notes

- 1): not Class 2
- For additional options of output current and output voltage, contact your sales representative or send an email to: [SaveEnergy@ERP-Power.com](mailto:SaveEnergy@ERP-Power.com)

# High Power Density Constant Current LED Drivers with 0-10 V Dimming

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

|                                  | Units                                                                                                                                                        | Minimum   | Typical    | Maximum                              | Notes                                                                                                                                                                                       |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Voltage Range (Vin)        | Vac                                                                                                                                                          | 90<br>240 | 120<br>277 | 132<br>305                           |                                                                                                                                                                                             |
| Input Frequency Range            | Hz                                                                                                                                                           | 57        | 60         | 63                                   |                                                                                                                                                                                             |
| Power Factor (PF)                |                                                                                                                                                              | 0.9       | > 0.9      |                                      | At nominal input voltage and nominal LED load (nominal Vout)                                                                                                                                |
| Input Current                    | A                                                                                                                                                            | -         | -          | 0.8 A @ 120 Vac<br>0.4 A @ 277 Vac   |                                                                                                                                                                                             |
| Inrush Current                   | A                                                                                                                                                            |           |            | 50 A peak                            | At any point on the sine wave and 25°C                                                                                                                                                      |
| Leakage Current                  | μA                                                                                                                                                           |           |            | 250 μA @ 120 Vac<br>600 μA @ 277 Vac | Measured per IEC60950-1                                                                                                                                                                     |
| Input Harmonics                  | Complies with IEC61000-3-2 for Class C equipment                                                                                                             |           |            |                                      |                                                                                                                                                                                             |
| Total Harmonics Distortion (THD) |                                                                                                                                                              |           |            | 20%                                  | <ul style="list-style-type: none"> <li>•At nominal input voltage and nominal LED load (nominal Vout)</li> <li>•Complies with DLC (DesignLight Consortium) technical requirements</li> </ul> |
| Efficiency                       |                                                                                                                                                              | -         | 90%        | -                                    | At nominal input voltage                                                                                                                                                                    |
| Isolation                        | Meets UL60950-1 for class II reinforced/double insulation power supply  |           |            |                                      |                                                                                                                                                                                             |

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

|                           | Units                                        | Minimum | Typical | Maximum | Notes                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------|----------------------------------------------|---------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage (Vout)     | Vdc                                          | 21      |         | 82.0    | See ordering information for details                                                                                                                                                                                                                                                                                                                                        |
| Output Current (Iout)     | mA                                           | 700     |         | 2100    | See ordering information for details                                                                                                                                                                                                                                                                                                                                        |
| Output Current Regulation | %                                            | -5      | ±2.5    | 5       | Includes AC line voltage, load, and current set point variations                                                                                                                                                                                                                                                                                                            |
| Output Current Overshoot  | %                                            | -       | -       | 10      | The driver does not operate outside of the regulation requirements for more than 500 ms during power on with nominal LED load (nominal Vout).                                                                                                                                                                                                                               |
| Ripple Current            | < 22.5% peak-to-peak of rated output current |         |         |         | <ul style="list-style-type: none"> <li>•At nominal input voltage, nominal LED load (nominal Vout) and with no dimming</li> <li>•Models with an output voltage greater than 60 V may have ripple currents up to 30% peak to peak of the rated current, depending on the LED load.</li> <li>•Calculated in accordance with the IES Lighting Handbook, 9th edition.</li> </ul> |
| Dimming Range (% of Iout) |                                              | 10%     |         | 100%    | <ul style="list-style-type: none"> <li>•The dimming range will be dependent on each specific dimmer.</li> <li>•When testing, if light is measured, dimming range is based on light output. If no light is measured, dimming range is based on percentage of output current.</li> </ul>                                                                                      |
| Start-up Time             | ms                                           |         |         | 500     | The output current is within the regulation band, within 500 ms of AC power being applied, without dimmer attached and at nominal input voltage and nominal load (nominal Vout).                                                                                                                                                                                            |
|                           |                                              |         |         | 1500    | The output current is within the regulation band, within 1500 ms of AC power being applied, with 10% dimming attached and at nominal input voltage and nominal load (nominal Vout).                                                                                                                                                                                         |

### Output Controls

|                           |                                                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| +Dim, -Dim                | A dimming input can be used to adjust the output setting via a standard commercial wall dimmer, an external control voltage source (0 to 10 Vdc), or a variable resistor when using the recommended number of LEDs. The dimming input permits 10% to 100% dimming. The voltage on the +Dim input must be ≤ 10V.                                                                              |  |  |  |  |
| Temperature Sensing Input | The temperature sensing input pin may be connected to a 100 kΩ NTC (negative temperature coefficient) thermistor. The thermistor should be located on the LED assembly to monitor its temperature. If the temperature exceeds a predetermined (80°C) set point, the output current of the LED driver module is automatically reduced to regulate the temperature of the LED at a safe level. |  |  |  |  |

# High Power Density Constant Current LED Drivers with 0-10 V Dimming

## 4 - PROTECTION FEATURES

Output Open Load, Over-Current and Short-Circuit Protection (hiccup), and Over-Temperature Protection with Auto Recovery

## 5 - ENVIRONMENTAL CONDITIONS

|                                 | Units                                                                                        | Minimum           | Typical | Maximum | Notes                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------|-------------------|---------|---------|------------------------------------------------------------------------------|
| Operating Case Temperature (Tc) | °C                                                                                           | -30               |         | +90     | Case temperature measured at the hot spot •tc on label (see label in page 9) |
| Storage Temperature             | °C                                                                                           | -40               |         | +85     |                                                                              |
| Humidity                        | %                                                                                            | 5                 | -       | 95      | Non-condensing                                                               |
| Cooling                         |                                                                                              | Convection cooled |         |         |                                                                              |
| Acoustic Noise                  | dBA                                                                                          |                   |         | 24      | Measured at a distance of 1 meter, without and with approved dimmers         |
| Mechanical Shock Protection     | per EN60068-2-27                                                                             |                   |         |         |                                                                              |
| Vibration Protection            | per EN60068-2-6 & EN60068-2-64                                                               |                   |         |         |                                                                              |
| MTBF                            | > 250,000 hours when operated at nominal input and output conditions, and at Tc ≤ 70°C       |                   |         |         |                                                                              |
| Lifetime                        | 50,000 hours at 70°C maximum case hot spot temperature (see hot spot •tc on label in page 9) |                   |         |         |                                                                              |

## 6 - 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 |                                                                                                                                                       |
| Harmonic Current Emissions     |                                         | IEC61000-3-2                                                       | For Class C equipment                                                                                                                                 |
| Voltage Fluctuations & Flicker |                                         | IEC61000-3-3                                                       |                                                                                                                                                       |
| 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 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                                                       | ± 1 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 |
|                                | Conducted RF Disturbances               | IEC61000-4-6                                                       | 3 V, 0.15-80 MHz, 80% modulated                                                                                                                       |
|                                | Voltage Dips                            | IEC61000-4-11                                                      | >95% dip, 0.5 period; 30% dip, 25 periods; 95% reduction, 250 periods                                                                                 |
| Transient Protection           | Ring Wave                               |                                                                    | ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave                                                                                  |

| Safety Agency Approvals |                      |                   |                             |
|-------------------------|----------------------|-------------------|-----------------------------|
| UL                      | UL60950-1 recognized | UL8750 recognized | Approved for damp locations |
| cUL                     | CSA C22.2 60950-1    |                   |                             |

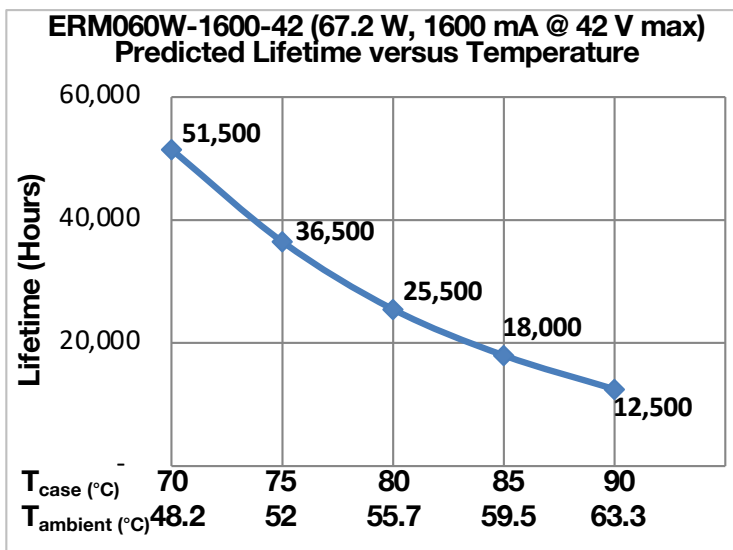
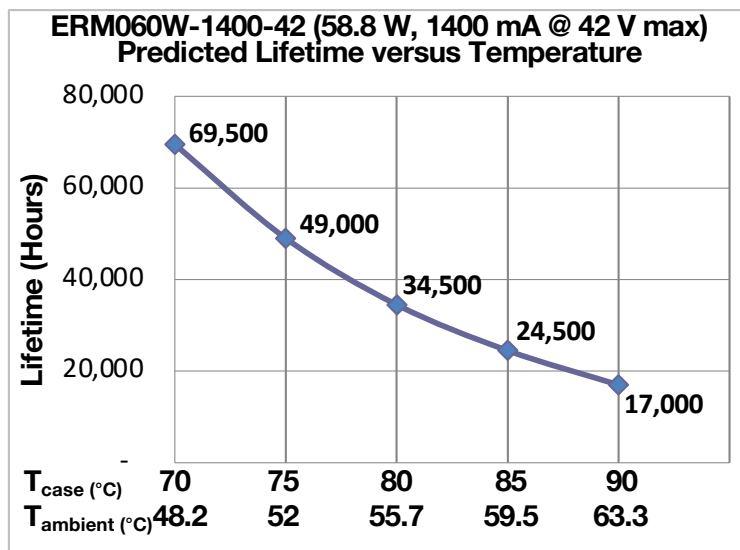
| Safety                                                  |       |         |         |         |                                                                                                                                                                                 |
|---------------------------------------------------------|-------|---------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | Units | Minimum | Typical | Maximum | Notes                                                                                                                                                                           |
| Hi Pot (High Potential) or Dielectric Voltage-Withstand | Vdc   | 4242    |         |         | <ul style="list-style-type: none"> <li>•Insulation between the input (AC line and Neutral) and the output</li> <li>•Tested at the RMS voltage equivalent of 3000 Vac</li> </ul> |

## High Power Density Constant Current LED Drivers with 0-10 V Dimming

### 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 graph in figure 1 is 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 ( $\tan \delta$ ): 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



**Figure 1**

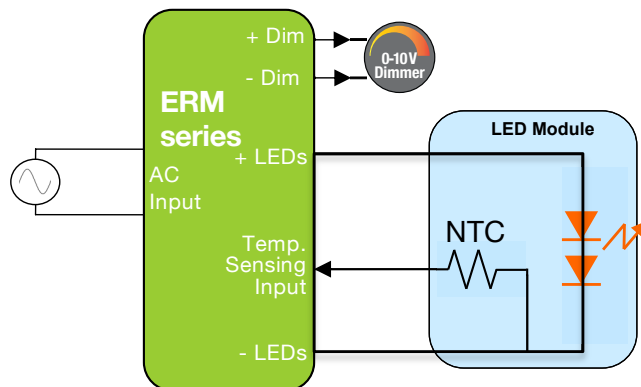
#### Notes:

- 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  $T_c$  point in the application should be used for reliability calculations.

## High Power Density Constant Current LED Drivers with 0-10 V Dimming

### 8 - TEMPERATURE SENSING

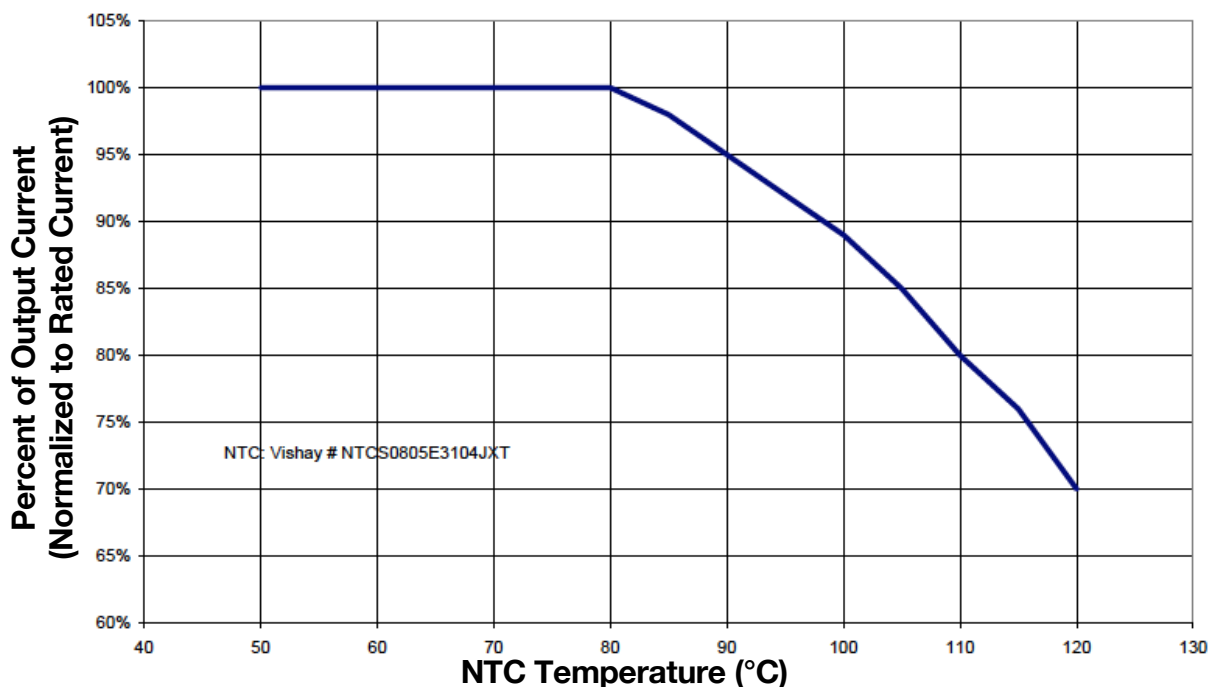
Figure 2 shows the connection of a simple NTC resistor connected to the temperature sense input of the ERM050/060 LED driver. For best performance, the NTC resistor should be located close to the LED. With this configuration, a degree of over temperature protection of the LED is possible.



**Figure 2**

The ERM050/060 LED driver has been designed to operate with a 100 kΩ NTC resistor to provide a knee in the output current regulation at approximately 80°C. The graph in figure 3 shows the reduction in output current as the temperature of the NTC rises above 80°C. For this example, the NTC is a surface-mount 100 kΩ device from Vishay, part number NTCS0805E3104JXT. Alternatively, Vishay offers a similar NTC resistor (Vishay part number NTCALUG02A104H) that is in a ring lug for use in non-SMD applications.

At temperatures less than 80°C, the temperature sense input has no effect on the driver's output current. As the temperature rises above 80°C, the output current of the driver begins to drop resulting in a reduction in the temperature at the LED. Many factors, predominately the thermal impedance of the LED heatsink, play a role in determining the ultimate thermal equalization.



**Figure 3**

## High Power Density Constant Current LED Drivers with 0-10 V Dimming

### 9 - OUTPUT DIMMING CONTROL

The ERM drivers operate only with 0-10V dimmers that sink current. They are not designed to operate with 0-10V control systems that source current, as used in theatrical/entertainment systems. Developed in the 1980's, the 0-10V sinking current control method is adopted by the International Electrotechnical Commission (IEC) as a part of their IEC Standard 60929 Annex E.

The method to dim the output current of the driver is done via the +Dim/-Dim signal pins. The +Dim/-Dim signal pins respond to a 0 to 10 V signal, delivering 10% to 100% of the output current based on rated current for each model. A pull-up resistor is included internal to the driver. When the +Dim input (purple) is short circuited to the -Dim wire (pink) or to the -LED wire (black), the output current is programmed to  $\leq 5\%$  of rated current. If the +Dim input is open circuited, the output current is programmed to 100% of rated current. The voltage on the +Dim input must be  $\leq 10V$ .

When not used, the -Dim wire (pink) and to the +Dim wire (purple) can be capped or cut off. In this configuration, no dimming is possible and the driver delivers 100% of its rated output current.

A fixed or variable resistor can be also used from the +Dim signal pin to the -Dim pin to adjust the output current. Figure 4 shows the relationship of the output current to a resistor connected across the 0-10V dimming input.

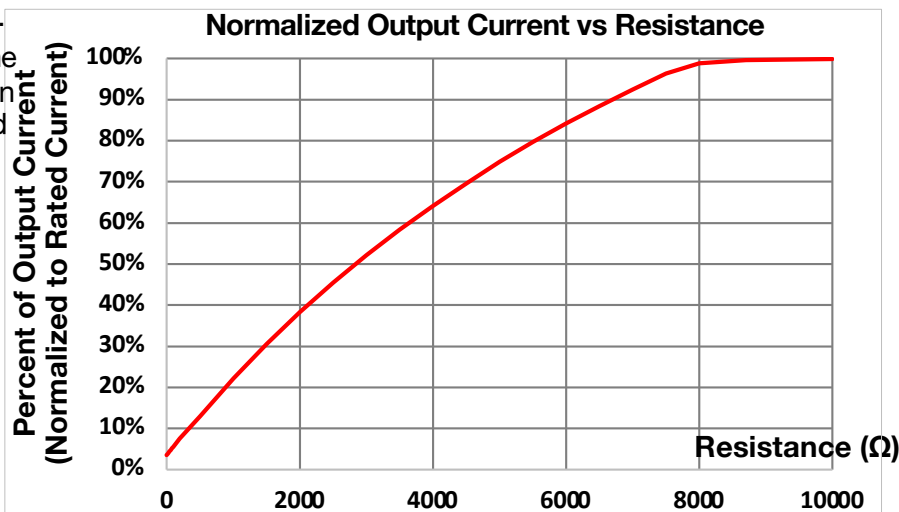


Figure 4

The maximum current supplied by the +Dim signal pin is  $\leq 2.5$  mA. Figure 5 shows the relationship of the output current to the dimming input voltage.

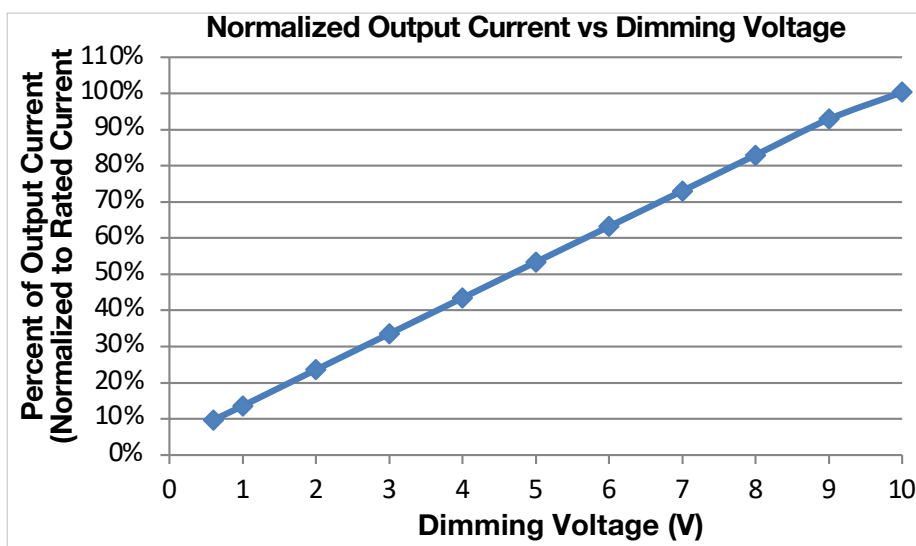


Figure 5

### 10 - COMPATIBLE 0-10 V DIMMERS

- Lutron, Nova series (part number NFTV)
- Lutron, Diva series (part number DVTV)



## High Power Density Constant Current LED Drivers with 0-10 V Dimming

### 11 - MECHANICAL DETAILS

**Packaging Options:** Partially Encapsulated with metal body enclosure

**I/O Connections:** Flying leads, 18 AWG on power leads, 22 AWG on 0-10V dimming wires, 203 mm (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:** IP64 rated

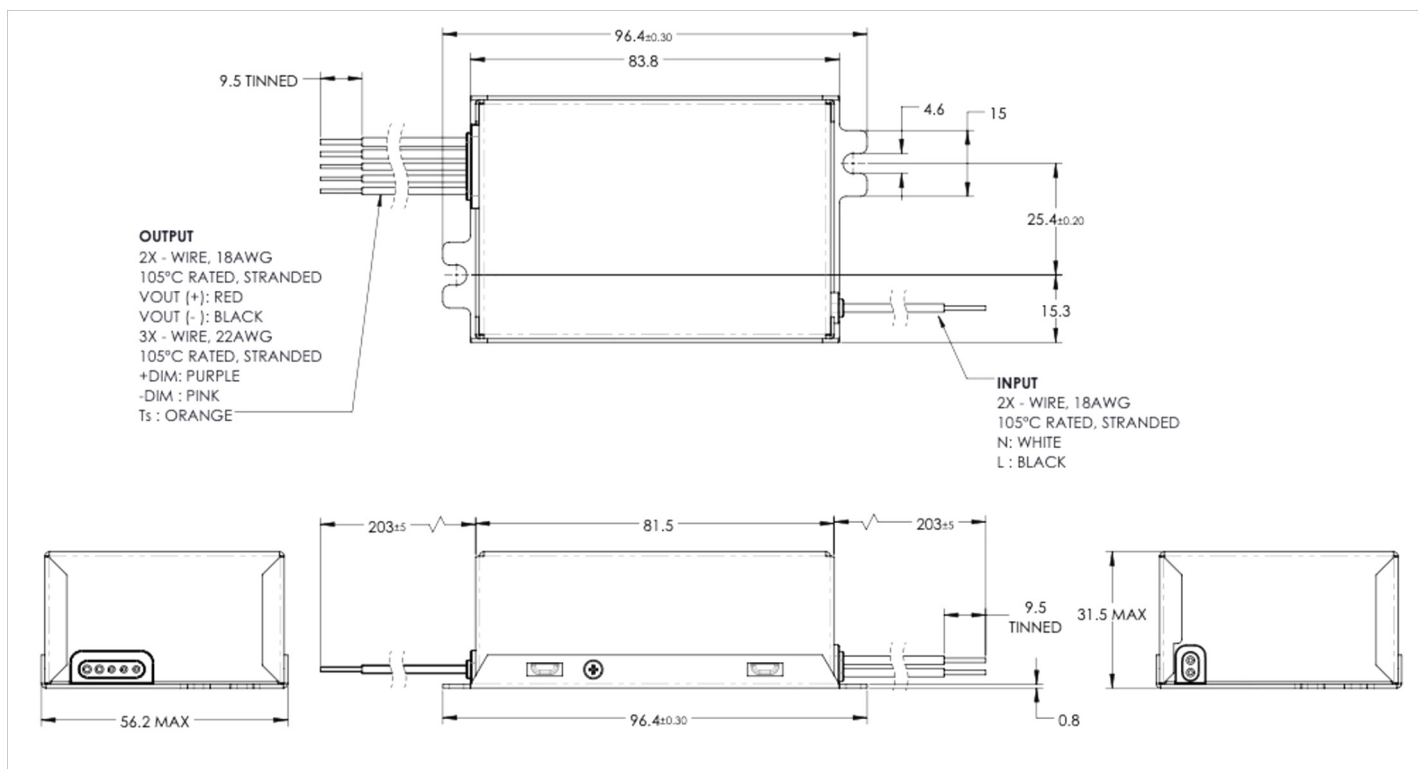
**Mounting Instructions:** The ERM driver case must be secured on a flat surface through the two mounting feet, shown here below in the case outline drawings

### 12 - OUTLINE DRAWINGS

**Dimensions:** L 81.5 x W 56.2 x H 31.5 mm (3.21 x 2.21 x 1.24 in)

**Volume:** 144.3 cm<sup>3</sup> (8.8 in<sup>3</sup>)

**Weight:** 280 g (9.88 oz)



**Figure 6**



## High Power Density Constant Current LED Drivers with 0-10 V Dimming

### 13 - LABELING

There are two labels on the case of each model in the ERM series: one on the top face and one on the bottom face. The ERM060W-2100-28 is used as an example to illustrate a typical label.

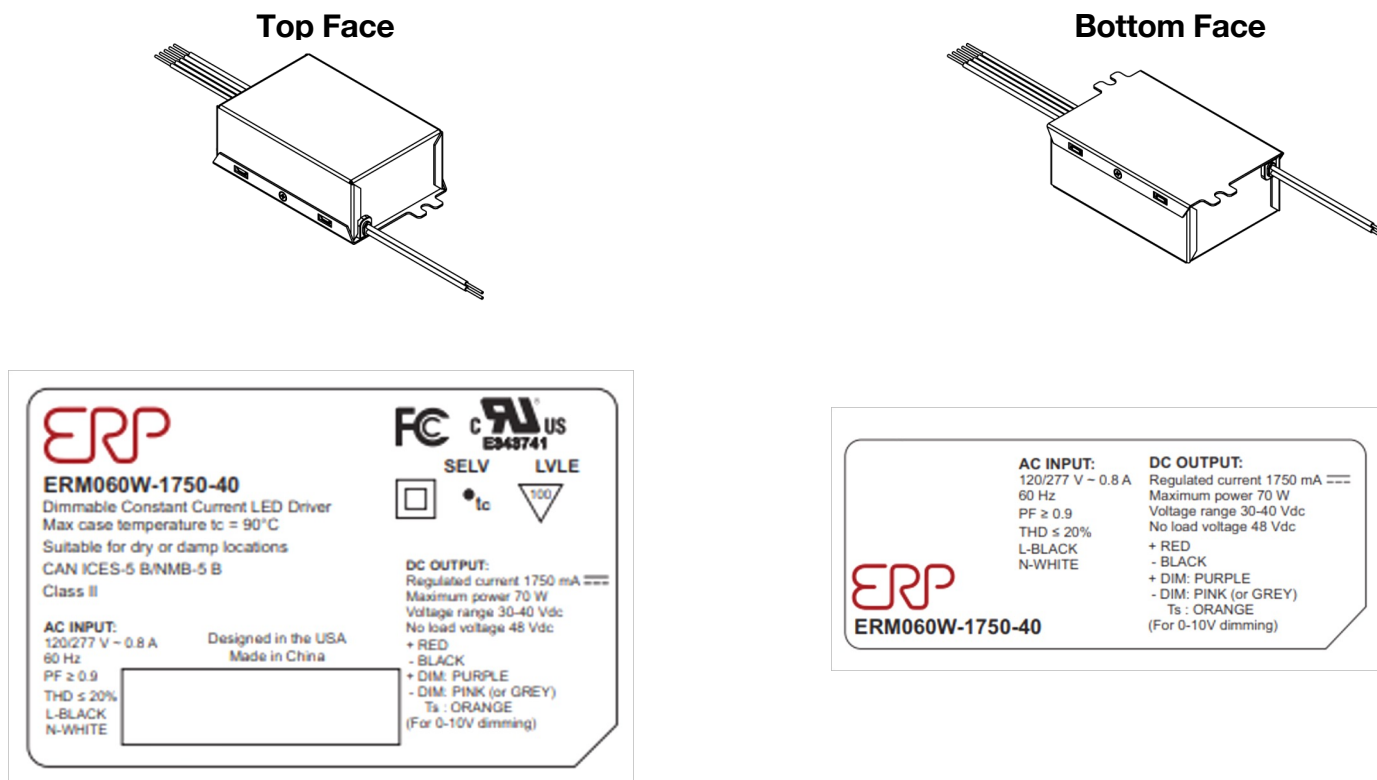


Figure 7

### USA Headquarters

Tel: +1-805-517-1300  
Fax: +1-805-517-1411  
893 Patriot Drive, Suite E,  
Moorpark, CA 93021, USA

### CHINA Operations

Tel: +86-756-6266298  
Fax: +86-756-6266299  
No. 8 Pingdong Road 2  
Zhuhai, Guangdong, China 519060

ERP Power, LLC (ERP) reserves the right to make changes without further notice to any products herein. ERP makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ERP assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in ERP data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ERP does not convey any license under its patent rights nor the rights of others. ERP products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the ERP product could create a situation where personal injury or death may occur. Should Buyer purchase or use ERP products for any such unintended or unauthorized application, Buyer shall indemnify and hold ERP and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ERP was negligent regarding the design or manufacture of the part. ERP is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.