ENERGY RECOVERY PRODUCTS™

ERM050 40-50 W
ERM060 51-70 W

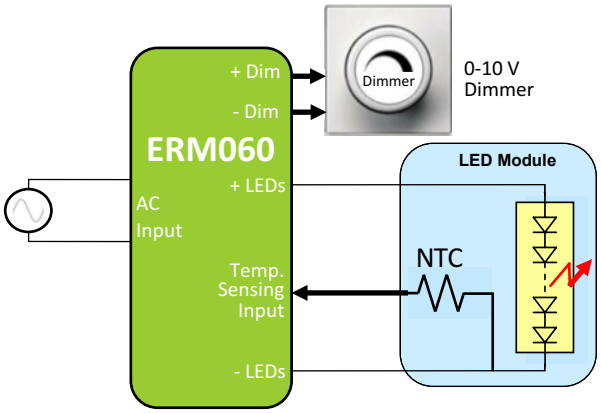
High Power Density Constant Current LED Drivers with 0-10 V Dimming

Input Voltage	Max. Output Power	Output Voltage	Output Current	Efficiency	Max. Case Temperature	THD	Power Factor	Diming Method	Dimming Range
120 & 277 Vac nominal	72 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% (% of Iout)

CC: Constant Current

PRODUCT DESCRIPTION

The ERM series of LED drivers is ideally suited for new commercial, office, industrial and outdoor LED lighting applications. These extremely compact and efficient devices feature flicker-free dimming using a 0-10 V control signal, universal AC input with power factor correction, and worldwide safety approvals



APPLICATION DIAGRAM

FEATURES

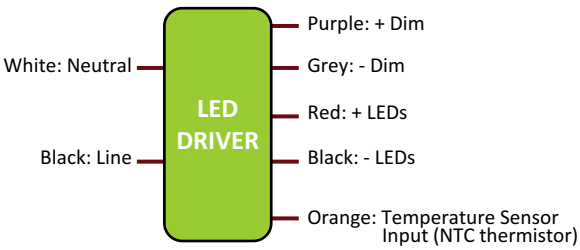
- Very high efficiency of ≥ 90% and high power density of 8.2W/in^3
- Compatible with 0-10 V dimmers
- 120 and 277 Vac nominal input voltage
- Protections: output open load, over-current and short-circuit (hiccup), and over-temperature with auto recovery
- Conducted and radiated EMI: FCC CFR Title 47 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

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)

APPLICATIONS

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

5 Year Warranty - 5 Year Warranty



WIRING DIAGRAM

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

1 - INPUT SPECIFICATION (@25° C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Input Voltage Range (Vin)	Vac	90 240	120 277	132 305	
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 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 600 µA @ 277 Vac	Measured per IEC60950-1
Input Harmonics	Complies with IEC61000-3-2 for Class C equipment				
Total Harmonics Distortion (THD)				20%	• At nominal input voltage and nominal LED load (nominal Vout) • Complies with DLC (DesignLight Consortium) technical requirements
Efficiency		-	90%	-	At nominal input voltage
Isolation	Meets UL60950-1 for class II reinforced/double insulation power supply ☐				

2 - 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				• At nominal input voltage, nominal LED load (nominal Vout) and with no dimming • 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. • Calculated in accordance with the IES Lighting Handbook, 9th edition.
Dimming Range (% of Iout)		10%		100%	The dimming range will be dependent on each specific dimmer.
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

3 - PROTECTION FEATURES

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

4 - 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)				

5 - EMC COMPLIANCE AND SAFETY

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			•Insulation between the input (AC line and Neutral) and the output •Tested at the RMS voltage equivalent of 3000 Vac

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

6 - PREDICTED LIFETIME VERSUS CASE AND AMBIENT TEMPERATURE

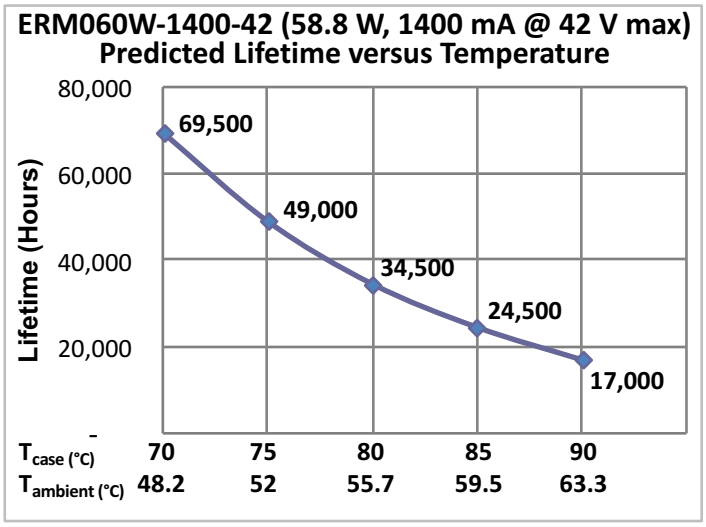
Lifetime is defined by the measurement of the temperatures of all the electrolytic capacitors whose failure would affect light output under the nominal LED load and worst case AC line voltage. The graph in figure 1 is determined by the electrolytic capacitor with the shortest lifetime, among all electrolytic 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 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



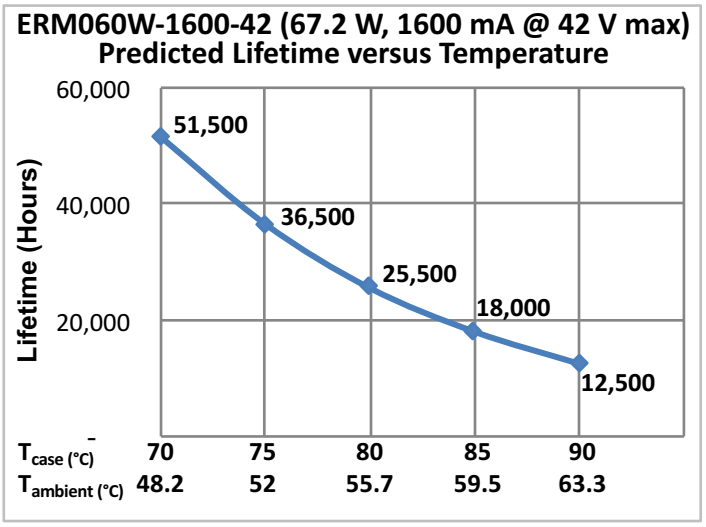


Figure 1

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 Tc point in the application should be used for reliability calculations.*

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

7 - 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.

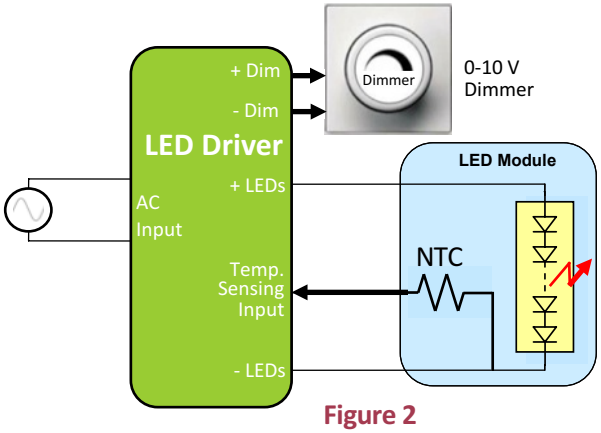


Figure 2

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.

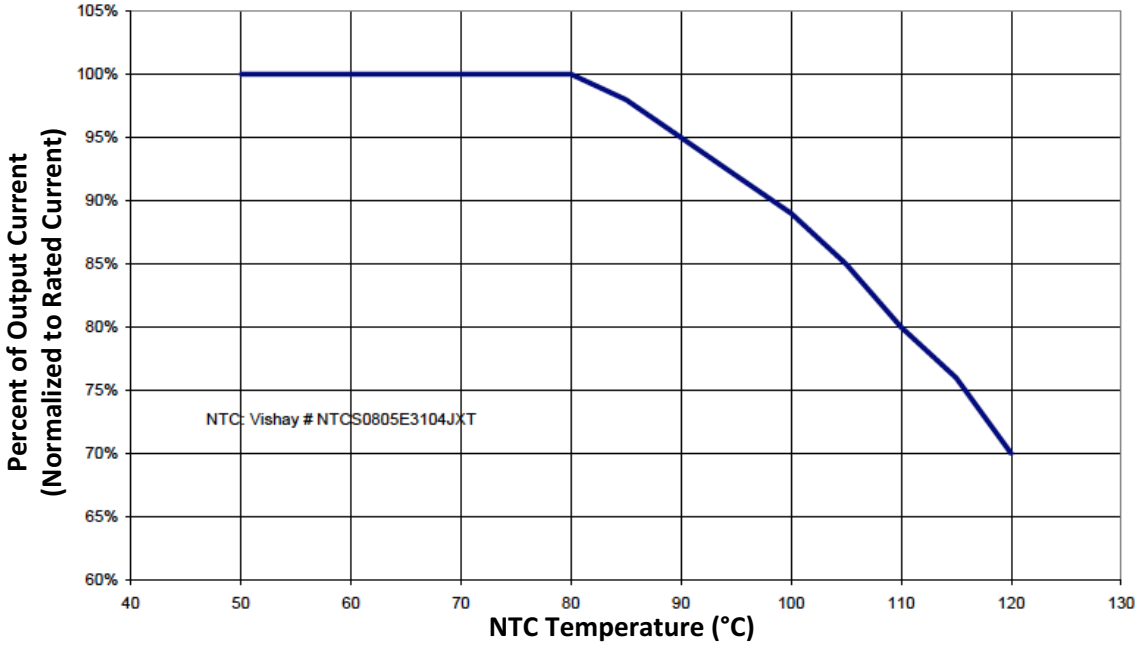


Figure 3

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

8 - 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 apart 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 (grey) or to the –LED wire (black), the output current is programmed to ≤ 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 ≤ 10V. When not used, the –Dim wire (grey) 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 show the relationship of the output current to a resistor connected across the 0-10V dimming input.

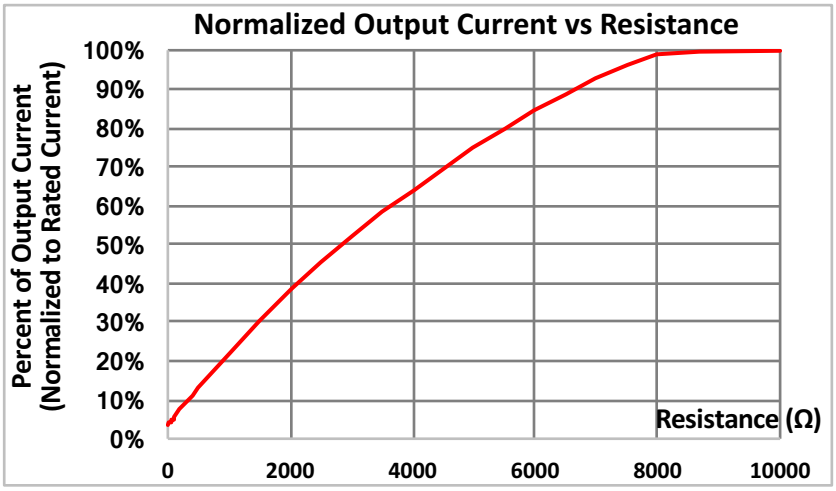


Figure 4

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

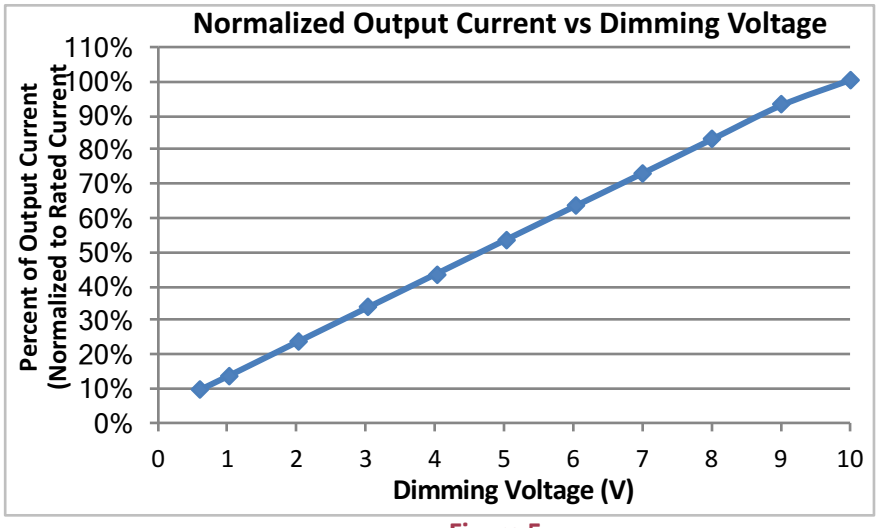


Figure 5

9 - COMPATIBLE 0-10 V DIMMERS

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

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10 - 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

11 - 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^3 (8.8 in^3)

Weight: 280 g (9.88 oz)

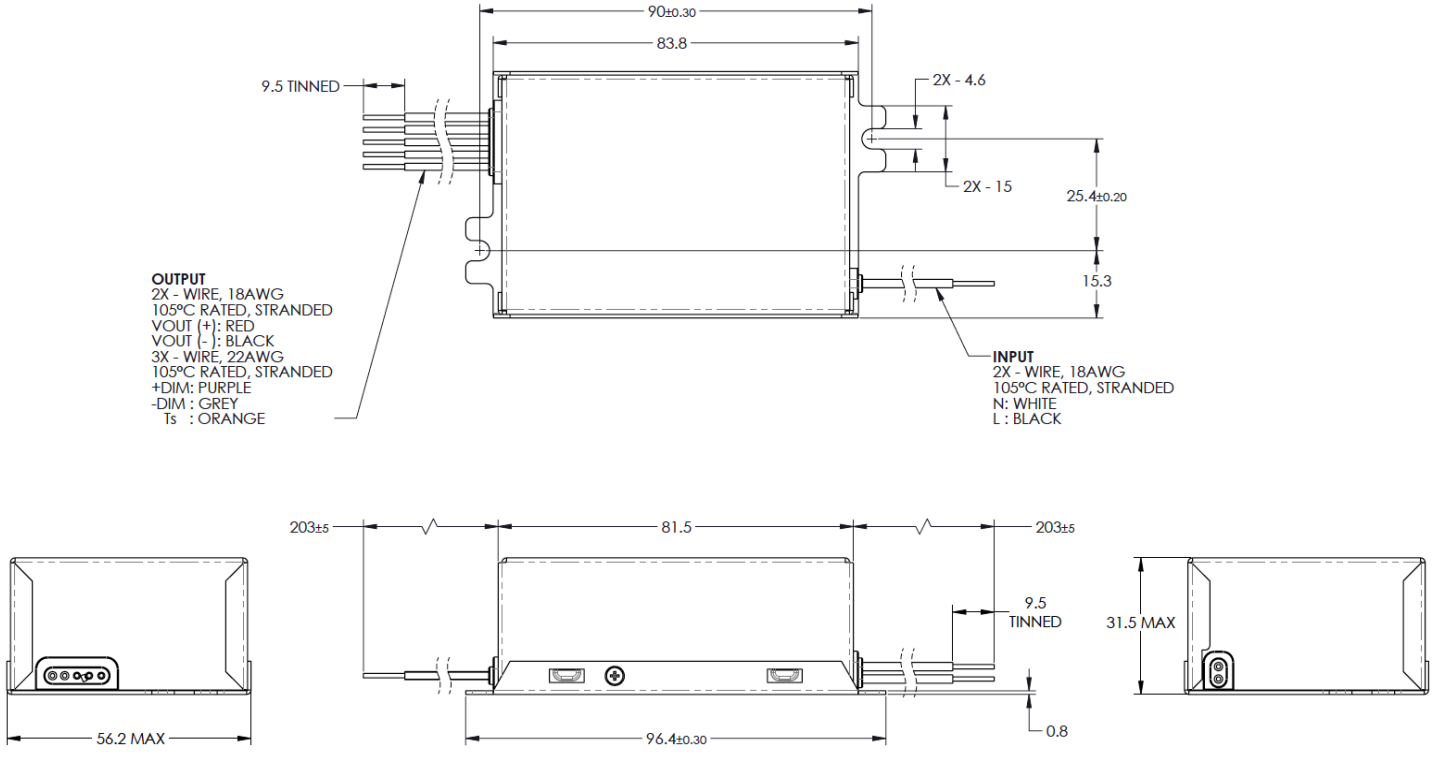

Figure 6

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

12 - 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)
ERM050: 40 to 50 W							
ERM050W-1050-42	120 & 277	1050	44.1	32	37.8	42	50
ERM050W-1200-42	120 & 277	1200	50.4	32	37.8	42	50
ERM050W-1800-28	120 & 277	1800	50.4	21	25.2	28	33.6
ERM060: 51 to 70 W							
ERM060W-0700-82 [1]	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
ERM060W-2100-28	120 & 277	2100	58.8	21	25.2	28	33.6

Notes
- *1]: not Class 2*
- *For additional options of output current and output voltage, contact your sales representative or send an email to: SaveEnergy@ERPPowerLLC.com*

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.

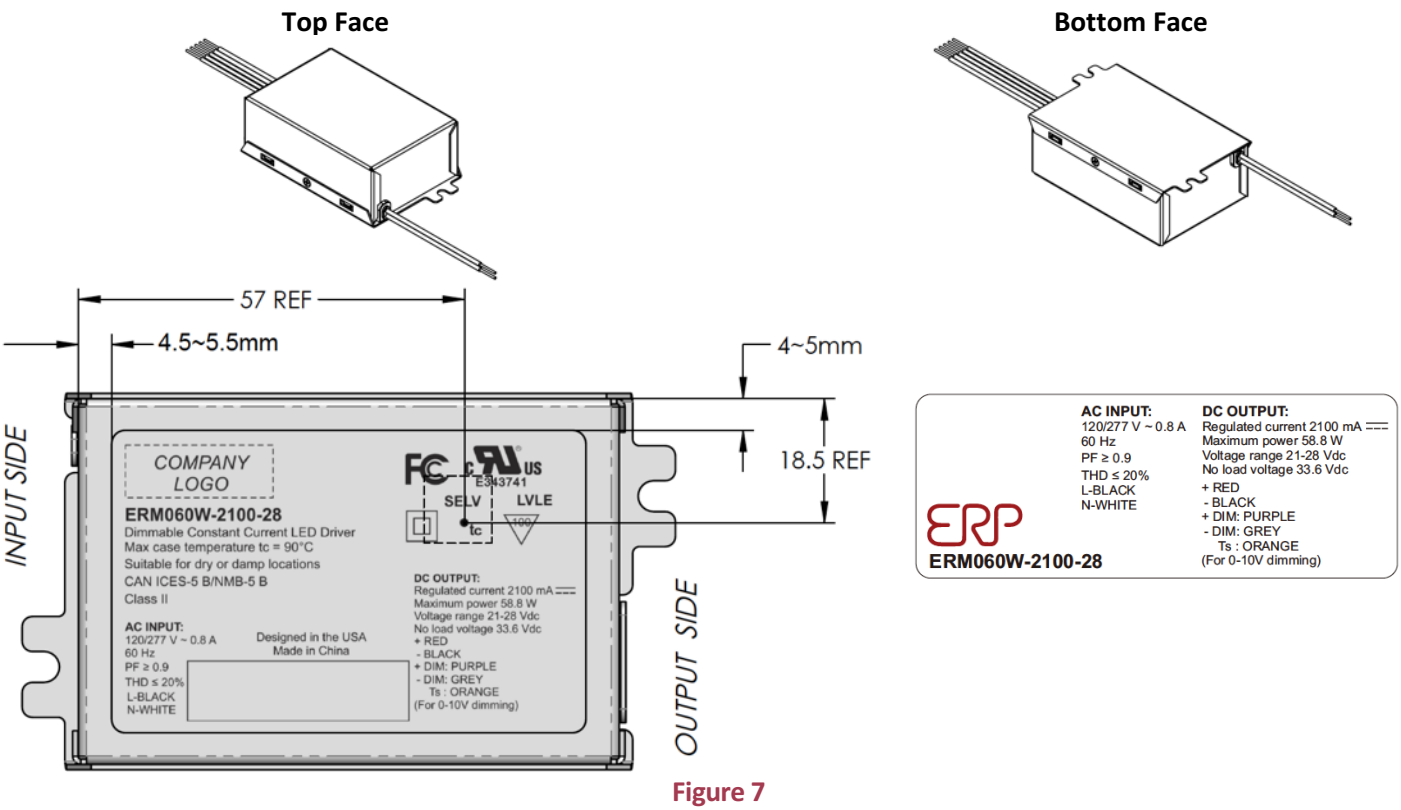

Figure 7

USA Headquarters
Tel: +1-805-517-1300
Fax: +1-805-517-1411
301 Science Drive, Suite 210
Moorpark, CA 93021, USA

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

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