



EBR Series

EBR010
EBR015
EBR020

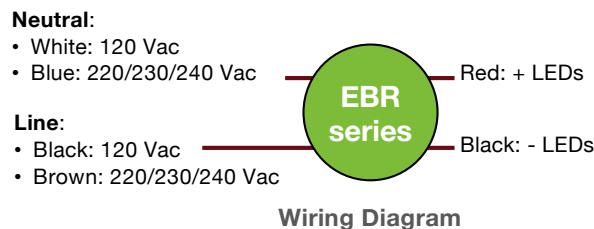
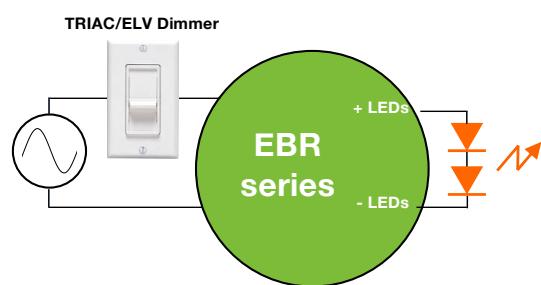
6-10 W
11-15 W
16-21 W

Constant Current LED Drivers with Deep TRIAC/ELV Dimming (1 - 100%) and with Fast Startup Time

| Nominal Input Voltage | Max. Output Power | Output Voltage | Output Current | Efficiency | Max. Case Temperature | THD | Power Factor | Dimming Method | Dimming Range | Startup Time |
|-----------------------|-------------------|----------------|----------------|-------------------|---------------------------------|-------|--------------|------------------------------|---------------|--------------|
| 120 Vac | 21 W | 16 to 42 Vdc | 200 to 700 mA | up to 85% typical | 90°C (measured at the hot spot) | < 20% | > 0.9 | Forward-Phase, Reverse-Phase | 1 - 100% | 200 ms |



Plastic Case:
Diameter: 58 mm (2.28 in)
Height: 31.7 mm (1.25 in)



FEATURES

- Compatible with industry standard phase-cut dimmers: TRIAC (forward-phase or leading-edge) and ELV (reverse-phase or trailing-edge)
- Lifetime: 50,000 hours at 70°C case hot spot temperature (some models have higher lifetime. Check lifetime curves in page 6)
- 90°C maximum case hot spot temperature
- Low acoustic noise of 20 dBA
- Class 2 power supply
- Protections: output open load, over-current and short-circuit (hiccup), and over-temperature with auto recovery
- Conducted and radiated EMI: Compliant with FCC CFR Title 47 Part 15 Class B at 120 Vac
- Complies with ENERGY STAR®, DLC (DesignLight Consortium®), CA Title 24, and SSL-1-2016 technical requirements
- IP20-rated case with silicon-based potting
- Worldwide Safety approvals

APPLICATIONS

- Recessed lighting (downlights)
- Commercial & Residential lighting
- Architectural lighting





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1 - ORDERING INFORMATION - MODEL DESCRIPTION

EBR□□□□□-□□□□-□□
 Series Nominal Vin Iout Vout Max.
•010 (6 - 10 W) •U (120 Vac) •
•015 (11 - 15 W) •E (230 Vac) •
•020 (16 - 21 W) •

| ERP Part Number | Nominal Input Voltage (Vac) | Iout (mA) | Max Output Power (W) | Vout Min (Vdc) | Vout Nom (Vdc) | Vout Max (Vdc) | Open Loop (no load) Voltage (Vdc) |
|----------------------------|-----------------------------|-----------|----------------------|----------------|----------------|----------------|-----------------------------------|
| EBR010U: 8 to 10 W | | | | | | | |
| EBR010U-0200-42 | 120 | 200 | 8.4 | 30 | 37.8 | 42 | 50 |
| EBR010U-0250-42 | 120 | 250 | 10.5 | 30 | 37.8 | 42 | 50 |
| EBR015U: 11 to 15 W | | | | | | | |
| EBR015U-0300-42 | 120 | 300 | 12.6 | 30 | 37.8 | 42 | 50 |
| EBR015U-0350-42 | 120 | 350 | 14.7 | 30 | 37.8 | 42 | 50 |
| EBR020U: 16 to 21 W | | | | | | | |
| EBR020U-0400-42 | 120 | 400 | 16.8 | 30 | 37.8 | 42 | 50 |
| EBR020U-0500-32 | 120 | 500 | 16.0 | 21 | 28.8 | 32 | 41.6 |
| EBR020U-0500-37 | 120 | 500 | 18.5 | 25 | 32.4 | 37 | 46.8 |
| EBR020U-0500-42 | 120 | 500 | 21.0 | 30 | 37.8 | 42 | 50 |

120 VAC NOMINAL INPUT VOLTAGE



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

| | Units | Minimum | Typical | Maximum | Notes |
|--|-------|---|-----------|------------------|--|
| Input Voltage Range (Vin) - EBRxxU | Vac | 90 | 120 | 132 | •The rated output current for each model is achieved at Vin \geq 115 Vac for EBRxxU. •At nominal load |
| Input Frequency Range - EBRxxU | Hz | 57 | 60 | 63 | |
| Input Current (Iin) - EBRxxU | A | | | 0.27 A @ 120 Vac | |
| Power Factor (PF) | | 0.9 | > 0.9 | | At nominal input voltage and with nominal LED voltage and no dimmer |
| Inrush Current | A | | | 10 A peak | At any point on the sine wave and 25°C |
| Leakage Current | µA | | | 250 µA @ 120 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 voltage •Complies with DLC (DesignLight Consortium) technical requirements |
| Efficiency | | - | up to 85% | - | •Measured with nominal input voltage, a full sinusoidal wave form and without dimmer connected. •Models with power \leq 10W have an efficiency of \geq 83%. |
| Isolation | | The AC input to the main DC output is isolated and meets Class II reinforced/double insulation power supply | | | |

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

| | Units | Minimum | Typical | Maximum | Notes |
|----------------------------------|-------|--|---------|---------|---|
| Output Voltage (Vout) | Vdc | 16 | | 42 | See ordering information for details |
| Output Current (Iout) | mA | 200 | | 700 | •See ordering information for details •The rated output current for each model is achieved at Vin \geq 115 Vac for EBRxxU. |
| Output Current Regulation | % | -5 | | 5 | •At nominal AC line voltage •Includes load and current set point variations |
| Output Current Overshoot | % | - | - | 10 | The driver does not operate outside of the regulation requirements for more than 2 s during power on with nominal LED load and without dimmer. |
| Ripple Current | % | < 25% of rated output current for each model | | | • \leq 25% of the rated output current for all models with Vout max \geq 42 V • \leq 30% of the rated output current for all models with Vout max \leq 36 V •At nominal LED voltage and nominal input voltage without dimming •In accordance with the IES Lighting Handbook, 9th edition |
| Dimming Range | | 1% | | 100% | •The dimming range is dependent on each specific dimmer. It may not be able to achieve 1% dimming with some dimmers. •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. •Dimming performance is optimal when the driver is operated at its nominal output voltage matching the LED nominal Vf (forward voltage). Dimming performance may vary when the driver is operated near its minimum output voltage. |
| Start-up Time | ms | | | 200 | •With nominal LED voltage and without dimmer attached •Measured from application of AC line voltage to the time where light is visible (about 10% of rated output current) |
| | | | | 400 | •With nominal LED voltage, with an approved dimmer attached (see list of approved dimmers in page 5) and at the full dimming conduction angle •Measured from application of AC line voltage to 100% light output •Complies with California Title 24 and ENERGY STAR® luminaire specification |



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4 - ENVIRONMENTAL CONDITIONS

| | Units | Minimum | Typical | Maximum | Notes |
|--|--|-------------------|---------|---------|---|
| Operating Case Temperature (Tc) | °C | -30 | | +70 | Case temperature measured at the hot spot •tc (see label on page 9) |
| Maximum Case Temperature (Tc) | °C | | | +90 | Case temperature measured at the hot spot •tc (see label on page 9) |
| Storage Temperature | °C | -40 | | +85 | |
| Humidity | % | 5 | - | 95 | Non-condensing |
| Cooling | | Convection cooled | | | |
| Acoustic Noise | dBA | | | 20 | Measured at a distance of 1 foot, without and with approved dimmers |
| Mechanical Shock Protection | per EN60068-2-27 | | | | |
| Vibration Protection | per EN60068-2-6 & EN60068-2-64 | | | | |
| MTBF | > 300,000 hours when operated at nominal input and output conditions, and at Tc ≤ 70°C | | | | |
| Lifetime (see graphs "Lifetime vs. Case and Ambient Temperature" in section 6) | Hours | 50,000 | | | <ul style="list-style-type: none"> At Tc ≤ 70°C maximum case hot spot temperature (see hot spot •tc on label on page 9). Other models have a longer lifetime. For example, the EBR010U-0250-42 (10.5 W) has a 112,000-hour lifetime at Tc = 70°C. See details in section 7. |

5 - EMC COMPLIANCE, STANDARD COMPLIANCE AND SAFETY APPROVALS

| EMC Compliance | | | |
|--------------------------------|---|---|---|
| Conducted and Radiated EMI | | FCC CFR Title 47 Part 15 Class B at 120 Vac | |
| Harmonic Current Emissions | | IEC61000-3-2 | |
| 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 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 | ± 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 |
| | | | ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave |
| | Conducted RF Disturbances | IEC61000-4-6 | 3V, 0.15-80 MHz, 80% modulated |
| | Voltage Dips | IEC61000-4-11 | >95% dip, 0.5 period; 30% dip, 25 periods; 95% reduction, 250 periods |

Standard Compliance and Safety Agency Approvals

| | |
|------|---|
| NEMA | SSL-1-2016 |
| UL | UL8750 recognized Class 2 |
| cUL | CAN/CSA C22.2 No. 250.13-14 LED equipment for lighting applications |

Safety

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



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■ 6 - PROTECTION FEATURES

Under-Voltage (Brownout)

The EBR series provides protection circuitry such that an application of an input voltage below the minimum stated in paragraph 1 (Input Specification) shall not cause damage to the driver.

Short Circuit

The EBR 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 EBR series incorporates circuitry that prevents internal damage due to an over temperature condition. An over temperature condition may be a result of an excessive ambient temperature or as a result of an internal failure. When the over temperature condition is removed, the driver shall automatically recover.

Output Open Load

When the LED load is removed, the output voltage of the EBR series is limited to 1.3 times the maximum output voltage of each model.

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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 ($\tan \delta$): 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

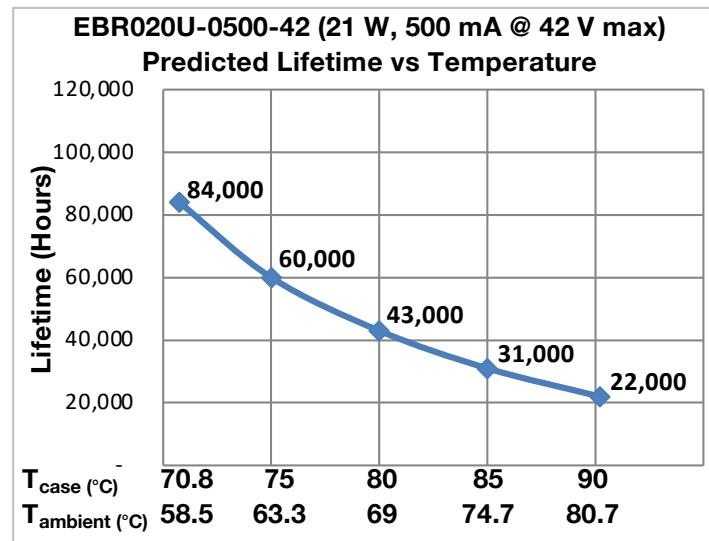
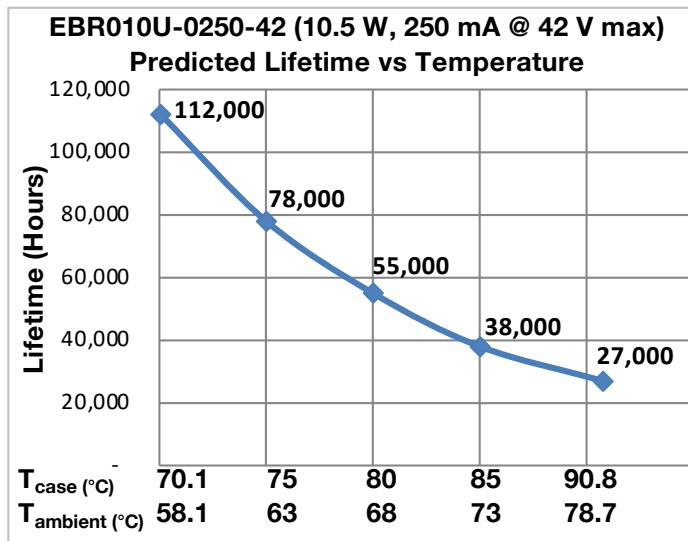


Figure 1

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.

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8 - PHASE-CUT DIMMING

Dimming of the driver is possible with standard TRIAC-based incandescent dimmers that chop the AC voltage as shown in Figure 2, or with ELV dimmers. During the rapid rise time of the AC voltage when the dimmer turns on, the driver does not generate any voltage or current oscillations, and inrush current is controlled. During the on-time of the AC input, the driver regulates the output current based upon the conduction angle. The RMS value of the driver output current is proportional to the on-time of the AC input voltage. When operating with an incandescent dimmer, the RMS output current varies depending upon the conduction angle and RMS value of the applied AC input voltage. Figure 3 shows the typical output current versus conduction angle at nominal input voltage.

When using low power EBR models (specifically < 10 W) with a reverse-phase or forward-phase dimmer, always make sure the minimum required load is applied to the dimmer. Check the dimmer documentation for minimum load requirements.

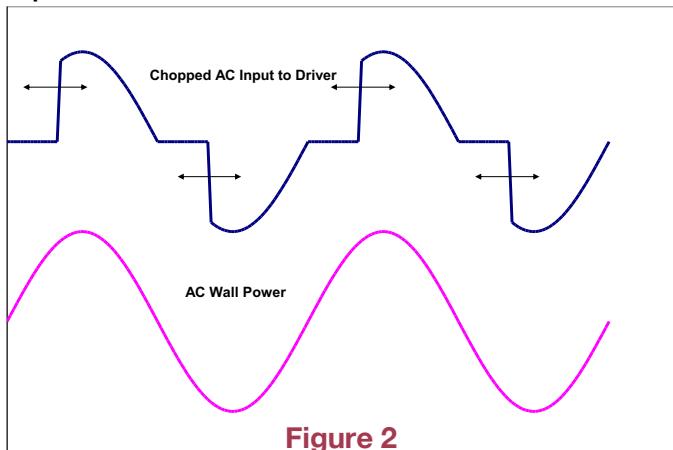


Figure 2

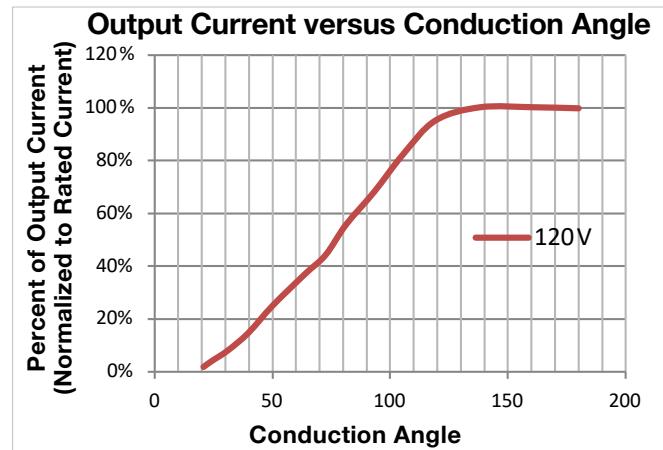


Figure 3

9 - COMPATIBLE PHASE-CUT DIMMERS & DIMMING RANGE

The dimming range represents typical values and may vary for the same dimmer model number when installed.

Model EBR020U-0500-42 (21 W, 500 mA @ 42 V max)

| Dimmer List | | | Dimming Range (% Iout) | | |
|--------------|------------|--------------|------------------------|------|----------------|
| Manufacturer | Series | Model Number | Max | Min | Flicker Result |
| Cooper | Aspire | 9573WS | 100 | 24.2 | PASS |
| Cooper | Devine | DI06P-A-K | 100 | 9.5 | PASS |
| Legrand | Paddle | ADPD453L-W2 | 100 | 22 | PASS |
| Leviton | Illumatech | IPI06 | 100 | 4.1 | PASS |
| Leviton | Sureslide | 6631-LW | 100 | 0.6 | PASS |
| Leviton | Sureslide | 6613-PL | 100 | 7.1 | PASS |
| Lutron | Skylark | S-603PG (1) | 81 | 6 | PASS |
| Lutron | Diva | DVCL-153PR | 95.4 | 1.2 | PASS |
| Lutron | Ariadni | AY-600P-AL | 100 | 10.7 | PASS |
| Lutron | Maestro | MRF2-600M-WH | 96.2 | 3 | PASS |
| Lutron | Skylark | S-600P-AL | 98.2 | 4.5 | PASS |
| Lutron | Diva | DV-600P-WH | 98.2 | 5.8 | PASS |
| Lutron | Nova | N-600 | 100 | 5.6 | PASS |
| Lutron | Skylark | SLV-600-WH | 100 | 8 | PASS |
| Lutron | Glyder | GLV-600-WH | 100 | 3.8 | PASS |

Note (1): All models exhibit limited range with this dimmer

Dimming compatibility charts are available for each model on the EBR series page at: erp-power.com

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■ 10 - MECHANICAL DETAILS

- Packaging Options:** Plastic case
- I/O Connections:** Flying leads, 18 AWG on power leads, 152 mm (6 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. Only models in the EBR020 (16-20 W power range) have potting.
- Flammability Rating:** UL94 V-0
- Mounting Instructions:** The EBR driver case must be secured on a flat surface through the two mounting tabs, shown here below in the case outline drawings.

■ 11 - OUTLINE DRAWINGS

Dimensions: Diameter: 58 mm (2.6 in), Height: 31.7 mm (1.25 in)

Volume: 83.7 cm³ (5.1 in³)

Weight: 170.5 g (6 oz)

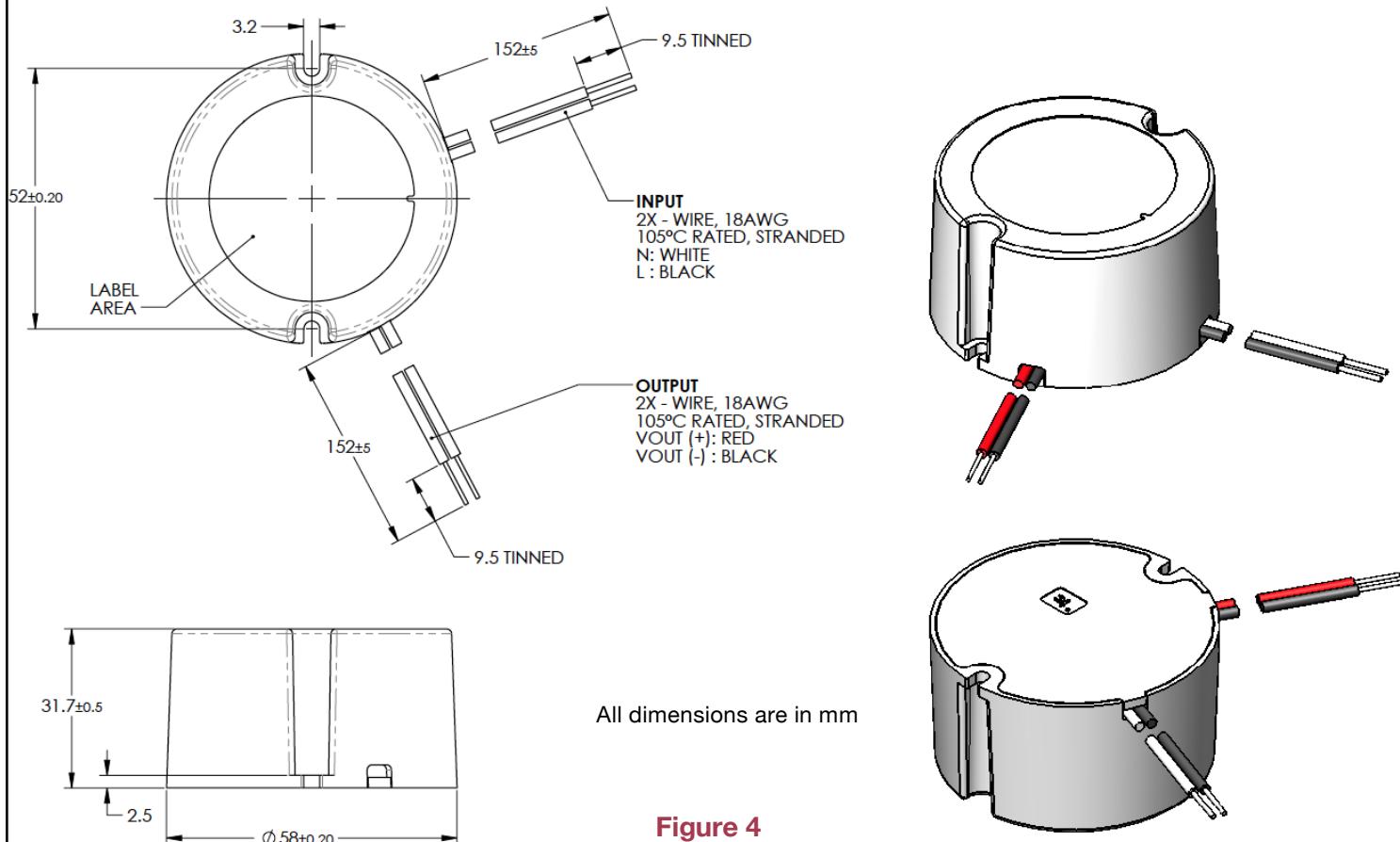


Figure 4



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12 – LABELING AND Tc POINT LOCATION

The EBR015U-0350-42 is used in figure 5 as an example to illustrate a typical label.

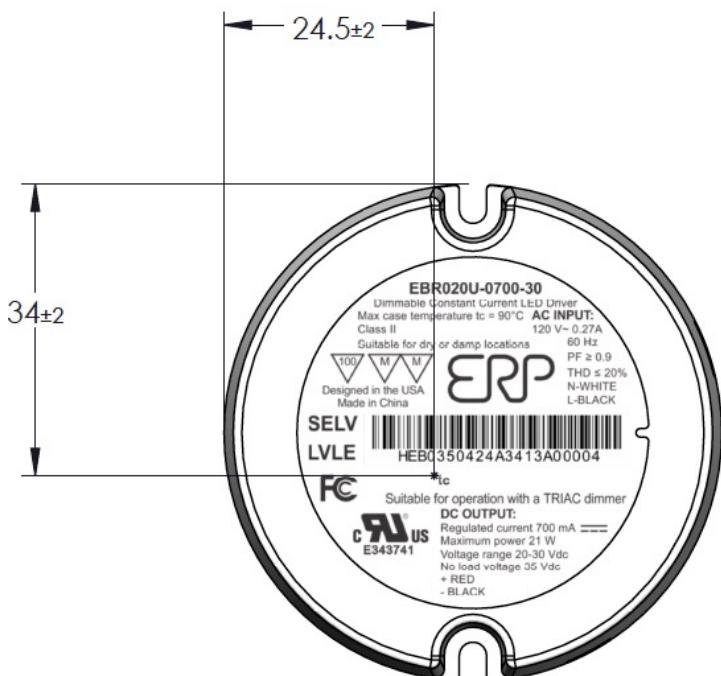
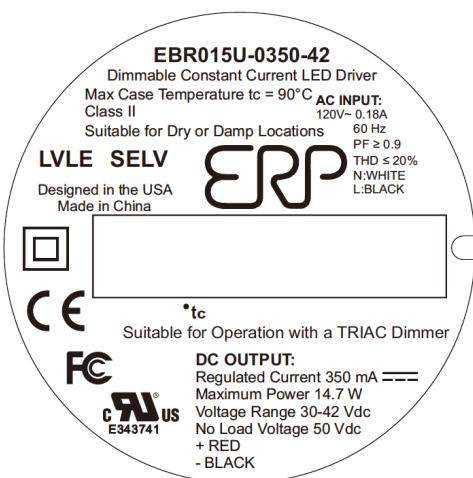


Figure 5

USA Headquarters

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