

Features

- Ultra High Efficiency (Up to 94%)
- Full Power at Wide Output Current Range (Constant Power)
- Thermal Sensing and Protection for LED Module
- 0-10V/PWM/Timer Dimmable (3 Timer Modes)
- Dim-to-Off with Standby Power ≤ 0.5 W
- Output Lumen Compensation
- Long Lifetime Over 100k Hours at 75°C Case Temperature
- Input Surge Protection: DM 6 kV, CM 10 kV
- All-Around Protection: OVP, SCP, OTP
- IP20 Design and Suitable for Outdoor Applications in Luminaires with IP>54
- Suitable for Luminaires with Protection Class I and II
- Complies with Zhaga Interface Specification Book 13



Description

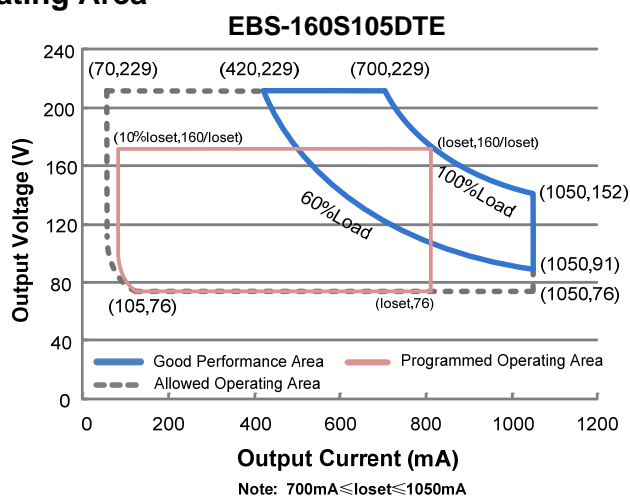
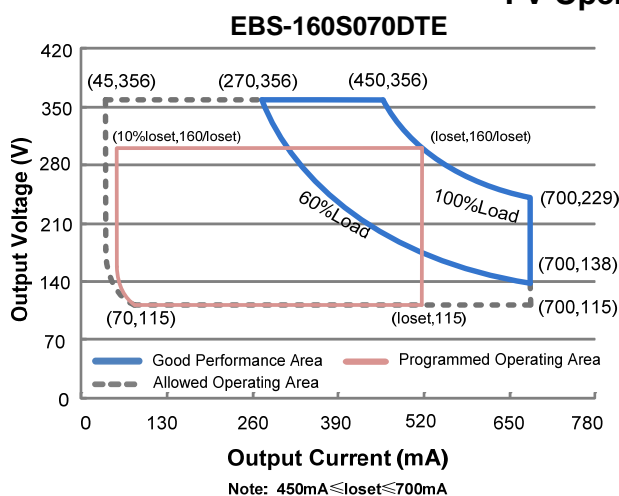
The *EBS-160SxxxDTE* series is a 160W, constant-current, programmable LED driver that operates from 176-305 Vac input with excellent power factor. Created for street, area and industrial lights, it provides a dim-to-off mode with low standby power. The high efficiency of these drivers and better thermal design enable them to run cooler, significantly improving reliability and extending product life. To ensure trouble-free operation, protection is provided against input surge, output over voltage, short circuit, and over temperature of both the driver and the external LED array.

Models

| Adjustable Output Current Range | Full-Power Current Range(1) | Default Output Current | Input Voltage Range(2) | Output Voltage Range | Max. Output Power | Typical Efficiency (3) | Power Factor (3) | Model Number |
|---------------------------------|-----------------------------|------------------------|--------------------------|----------------------|-------------------|------------------------|------------------|----------------|
| 45-700mA | 450-700mA | 530 mA | 176~305Vac 190~250Vdc | 115~356Vdc | 160 W | 93.5% | 0.98 | EBS-160S070DTE |
| 70-1050mA | 700-1050mA | 700 mA | 176~305Vac 190~250Vdc | 76~229Vdc | 160 W | 94.0% | 0.98 | EBS-160S105DTE |

Notes: (1) Output current range with constant power at 160W
 (2) Certified input voltage range: 200-240Vac or 190-250Vdc (except CCC)
 (3) Measured at full load and 220Vac input (see below "General Specifications" for details).

I-V Operating Area



Input Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|--------------------------|---------|------|-----------------------|---|
| Input Voltage | 176 Vac | - | 305 Vac | 190~250 Vdc |
| Input Frequency | 47 Hz | - | 63 Hz | |
| Leakage Current | - | - | 0.70 mA | IEC60598-1; 240Vac/ 60Hz |
| Input AC Current | - | - | 0.88 A | Measured at full load and 220 Vac input. |
| Inrush Current(I^2t) | - | - | 1.93 A ² s | At 220Vac input, 25°C cold start, duration=1.14 ms, 10%lpk-10%lpk. See Inrush Current Waveform for the details. |
| PF | 0.9 | - | - | At 200-240Vac, 60%-100% Load (96-160W) |
| THD | - | - | 20% | |
| THD | - | - | 10% | At 220-240Vac, 50-60Hz, 70%-100% Load |

Output Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|--|----------|---------|----------|---|
| Output Current Tolerance | -5%loset | - | 5%loset | At full load condition |
| Output Current Setting(loset) Range | | | | |
| EBS-160S070DTE | 45 mA | - | 700 mA | |
| EBS-160S105DTE | 70 mA | - | 1050 mA | |
| Output Current Setting Range with Constant Power | | | | |
| EBS-160S070DTE | 450 mA | - | 700 mA | |
| EBS-160S105DTE | 700 mA | - | 1050 mA | |
| Total Output Current Ripple (pk-pk) | - | 5%lomax | 10%lomax | At full load condition, 20 MHz BW |
| Output Current Ripple at < 200 Hz (pk-pk) | - | 2%lomax | - | At full load condition. Only this component of ripple is associated with visible flicker. |

Output Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes |
|--|-------------|-------------|----------------------|--|
| Startup Overshoot Current | - | - | 10%I _{omax} | At full load condition |
| No Load Output Voltage EBS-160S070DTE EBS-160S105DTE | - - - | - - - | 400 V 270 V | |
| Line Regulation | - | - | ±0.5% | Measured at full load |
| Load Regulation | - | - | ±1.5% | |
| Turn-on Delay Time | - | - | 0.5 s | Measured at 220Vac input, 60%-100% Load |
| Temperature Coefficient of I _o set | - | - | 0.03%/°C | Case temperature = 0°C ~T _c max |
| 12V Auxiliary Output Voltage | 10.8 V | 12 V | 13.2 V | |
| 12V Auxiliary Output Source Current | 0 mA | - | 200 mA | Return terminal is "Return" |

Note: All specifications are typical at 25°C unless otherwise stated.

General Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|--|--|--|--------------------------|--|
| Efficiency at 220 Vac input: EBS-160S070DTE I _o = 450 mA I _o = 700 mA EBS-160S105DTE I _o = 700 mA I _o =1050 mA | 91.5% 90.5% 92.0% 90.5% | 93.5% 92.5% 94.0% 92.5% | - - - - | Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| Standby power | - | - | 0.5 W | Measured at 230Vac/50Hz; Dimming off |
| MTBF | - | 222,000 Hours | - | Measured at 220Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F) |
| Lifetime | - | 102,000 Hours | - | Measured at 220Vac input, 80%Load and 75°C case temperature; See lifetime vs. T _c curve for the details |
| Operating Case Temperature for Safety T _{c_s} | -40°C | - | +90°C | |
| Operating Case Temperature for Warranty T _{c_w} | -40°C | - | +75°C | Humidity: 5%RH to 85%RH; No condensation. |
| Storage Temperature | -40°C | - | +85°C | Humidity: 5%RH to 85%RH; No condensation. |
| Dimensions Inches (L × W × H) Millimeters (L × W × H) | 6.70 × 3.94 × 1.58 170 × 100 × 40 | | | |
| Net Weight | - | 700 g | - | |

Note: All specifications are typical at 25°C unless otherwise stated.

Dimming Specifications

| Parameter | | Min. | Typ. | Max. | Notes |
|--|----------------------------------|----------------|-------------|-------------|---|
| Absolute Maximum Voltage on the Vdim (+) Pin | | -20 V | - | 20 V | |
| Source Current on Vdim (+)Pin | | 200 μ A | 300 μ A | 450 μ A | Vdim(+) = 0 V |
| Dimming Output Range | EBS-160S070DTE EBS-160S105DTE | 10%loset | - | loset | 450 mA \leq loiset \leq 700 mA 700 mA \leq loiset \leq 1050 mA |
| | EBS-160S070DTE EBS-160S105DTE | 45 mA 70 mA | - | loset | 45 mA \leq loiset < 450 mA 70 mA \leq loiset < 700 mA |
| Recommended Dimming Input Range | | 0 V | - | 10 V | Default 0-10V dimming mode. |
| Dim off Voltage | | 0.35 V | 0.5 V | 0.65 V | |
| Dim on Voltage | | 0.55 V | 0.7 V | 0.85 V | |
| Hysteresis | | - | 0.2 V | - | |
| PWM_in High Level | | 3 V | - | 10 V | Dimming mode set to PWM in PC interface. |
| PWM_in Low Level | | -0.3 V | - | 0.6 V | |
| PWM_in Frequency Range | | 200 Hz | - | 3 KHz | |
| PWM_in Duty Cycle | | 1% | - | 99% | |
| PWM Dimming off (Positive Logic) | | 2% | 5% | 8% | |
| PWM Dimming on (Positive Logic) | | 4% | 7% | 10% | |
| PWM Dimming off (Negative Logic) | | 92% | 95% | 98% | |
| PWM Dimming on (Negative Logic) | | 90% | 93% | 96% | |
| Hysteresis | | - | 2% | - | |

Note: All specifications are typical at 25 °C unless stated otherwise.

Safety & EMC Compliance

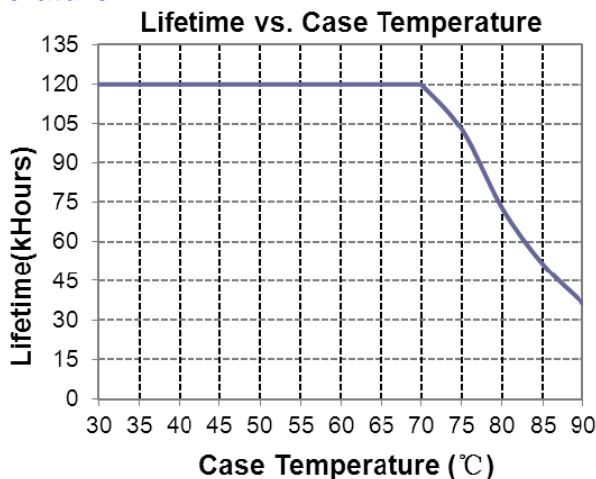
| Safety Category | Standard |
|-------------------------|---|
| ENEC & CE | EN 61347-1, EN61347-2-13 |
| Performance | Standard |
| ENEC | EN 62384 |
| EMI Standards | Notes |
| EN 55015 ⁽¹⁾ | Conducted emission Test & Radiated emission Test |
| EN 61000-3-2 | Harmonic current emissions |
| EN 61000-3-3 | Voltage fluctuations & flicker |
| EMS Standards | Notes |
| EN 61000-4-2 | Electrostatic Discharge (ESD): 8 kV air discharge, 4 kV contact discharge |
| EN 61000-4-3 | Radio-Frequency Electromagnetic Field Susceptibility Test-RS |

Safety & EMC Compliance (Continued)

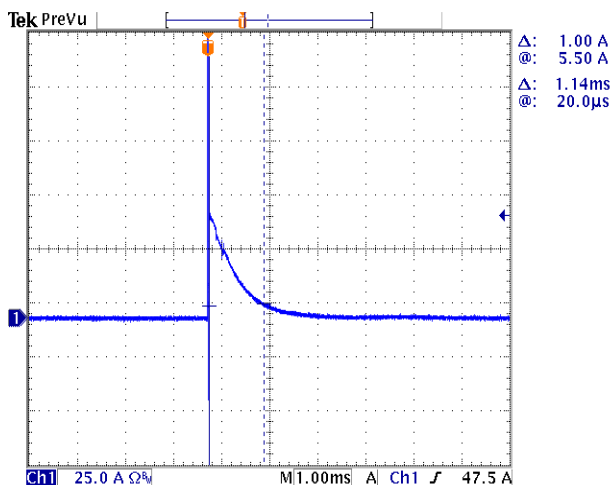
| EMS Standards | Notes |
|---------------|---|
| EN 61000-4-4 | Electrical Fast Transient / Burst-EFT |
| EN 61000-4-5 | Surge Immunity Test: AC Power Line: Differential Mode 6 kV, Common Mode 8 kV |
| EN 61000-4-6 | Conducted Radio Frequency Disturbances Test-CS |
| EN 61000-4-8 | Power Frequency Magnetic Field Test |
| EN 61000-4-11 | Voltage Dips |
| EN 61547 | Surge Immunity Test: AC Power Line: Differential Mode 6 kV, Common Mode 10 kV |
| | Electromagnetic Immunity Requirements Applies To Lighting Equipment |

Notes: (1) This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

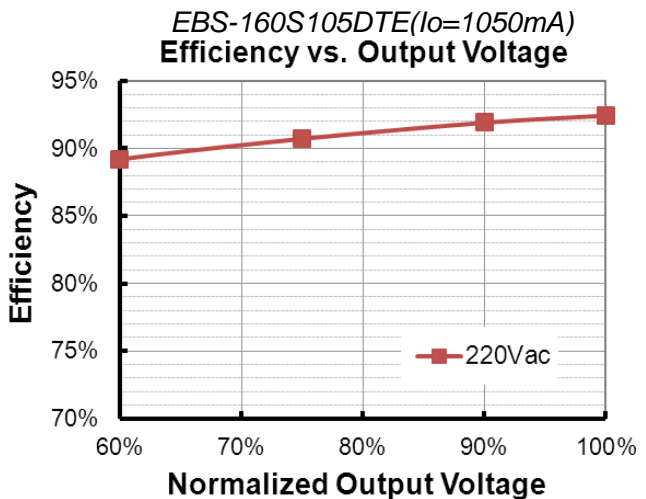
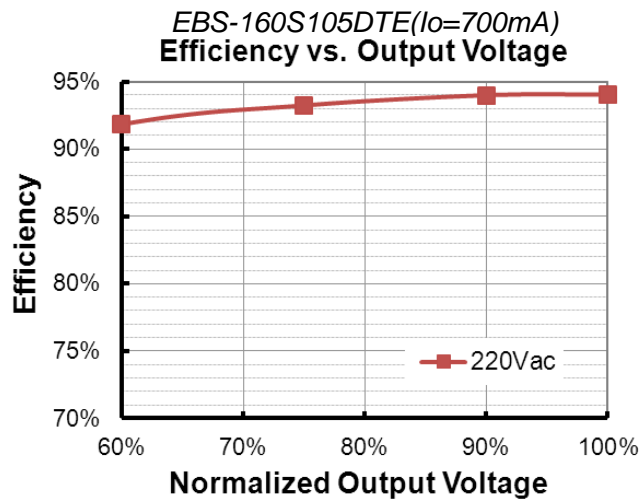
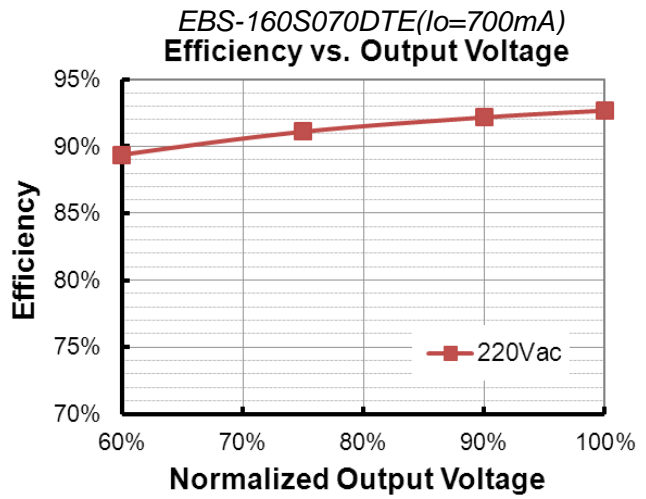
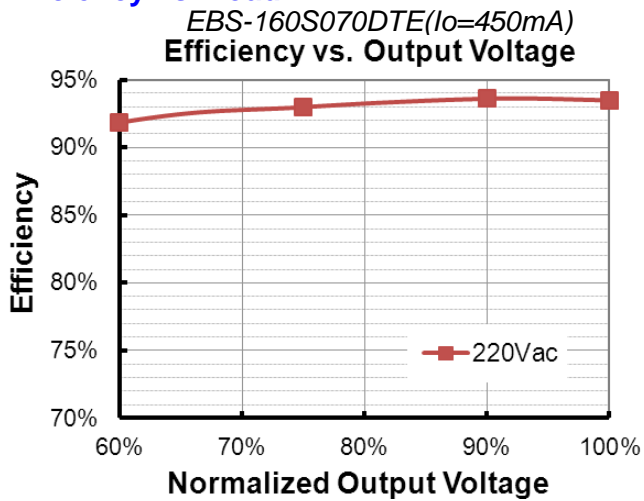
Lifetime vs. Case Temperature



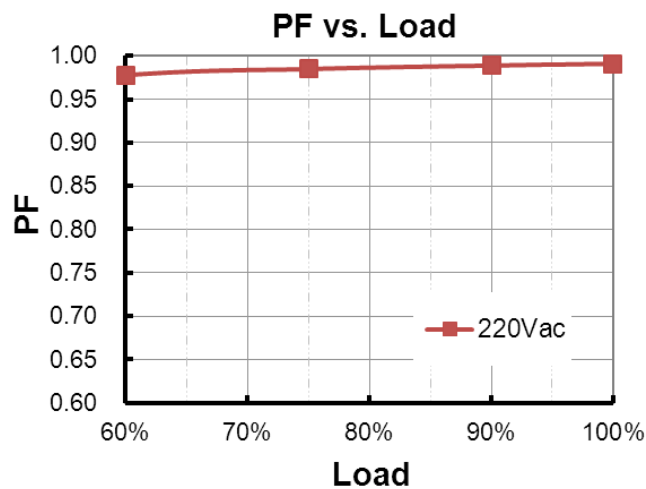
Inrush Current Waveform



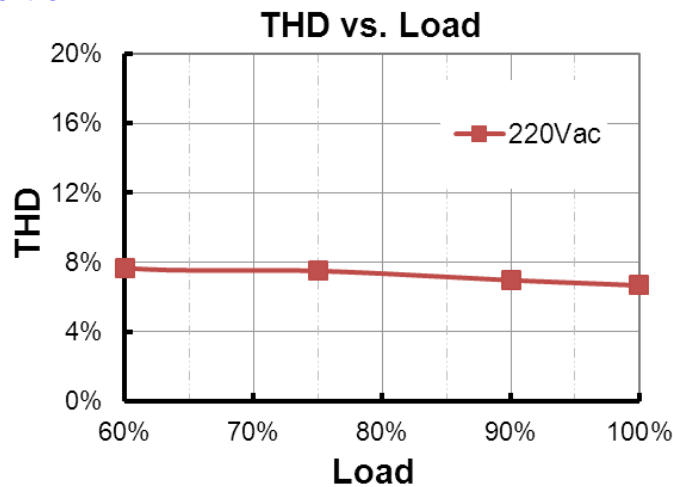
Efficiency vs. Load



Power Factor



Total Harmonic Distortion



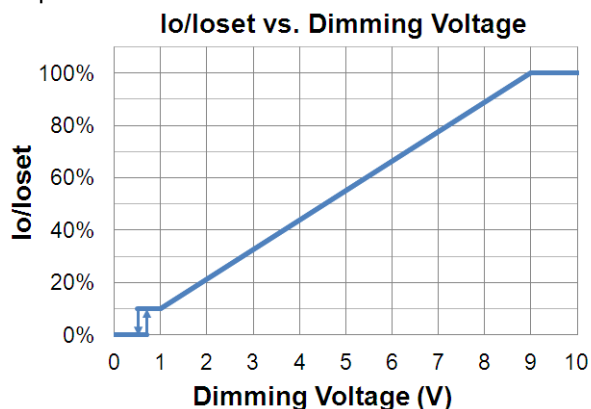
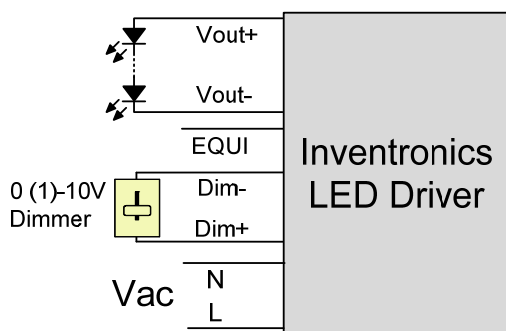
Protection Functions

| Parameter | | Min. | Typ. | Max. | Notes |
|---------------------------------|--------------------------|--|-----------|-----------|---|
| External Thermal Protection NTC | R1 | - | 7.81 kOhm | - | When R_NTC falls below R1, External Thermal Protection is triggered, reducing output current until R2 is reached. |
| | R2 | - | 4.16 kOhm | - | When R_NTC is less than R2, output current is reduced to the programmed “Protection Current Floor.” |
| | Protection Current Floor | 10%loset | 60%loset | 100%loset | 10%loset>lomin (default setting is 60%) |
| | | lomin | 60%loset | 100%loset | 10%loset≤lomin (default setting is 60%) |
| Over Temperature Protection | | Decreases output current, returning to normal after over temperature is removed. | | | |
| Short Circuit Protection | | Auto Recovery. No damage will occur when any output is short circuited. The output shall return to normal when the fault condition is removed. | | | |
| Over Voltage Protection | | Limits output voltage at no load and in case the normal voltage limit fails. | | | |

Dimming

● 0-10V Dimming

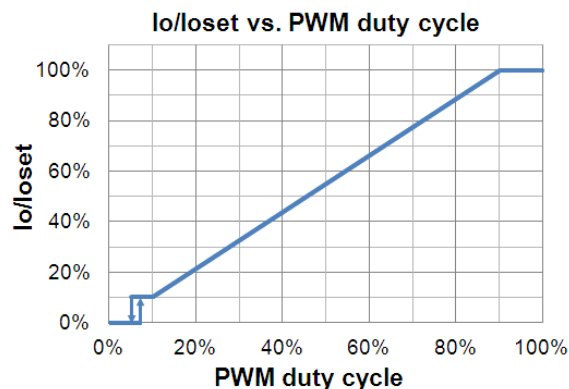
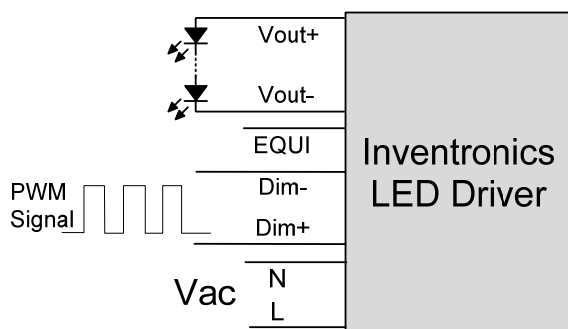
The recommended implementation of the dimming control is provided below.



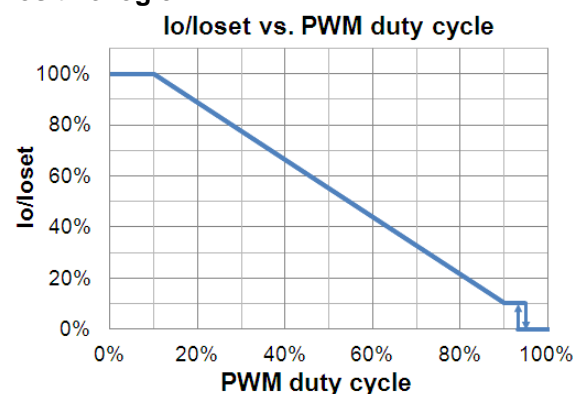
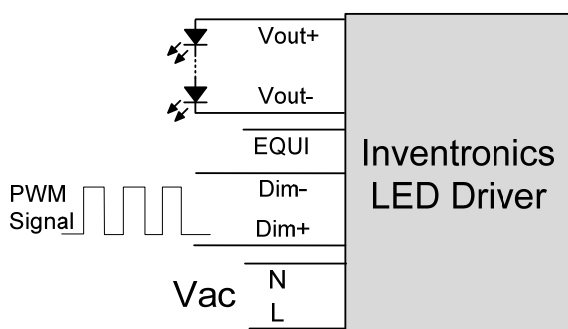
Implementation 1: DC Input

Note: The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like resistors and zener.

● PWM Dimming



Implementation 2: Positive logic



Implementation 3: Negative logic

● Time Dimming

Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

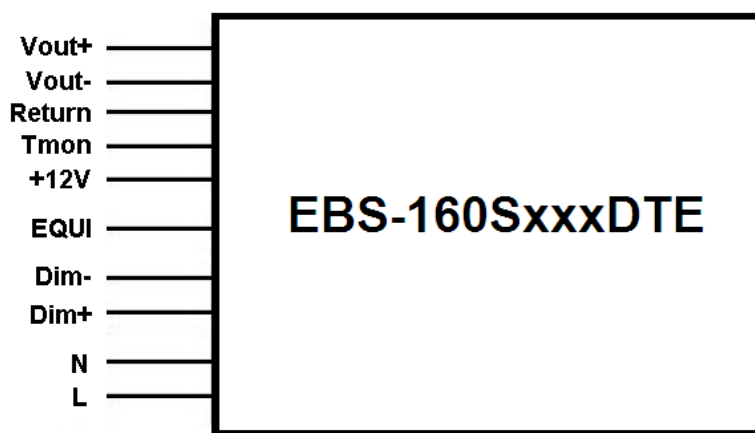
- **Self Adapting-Midnight:** Automatically adjusts the dimming curve based on the on-time of past two days (if difference <15 minutes), assuming that the center point of the dimming curve is midnight local time.
- **Self Adapting-Percentage:** Automatically adjusts the on-time of each step by a constant percentage = (actual on-time for the past 2 days if difference <15 min) / (programmed on-time from the dimming curve).
- **Traditional Timer:** Follows the programmed timing curve after power on with no changes.

● Output Lumen Compensation

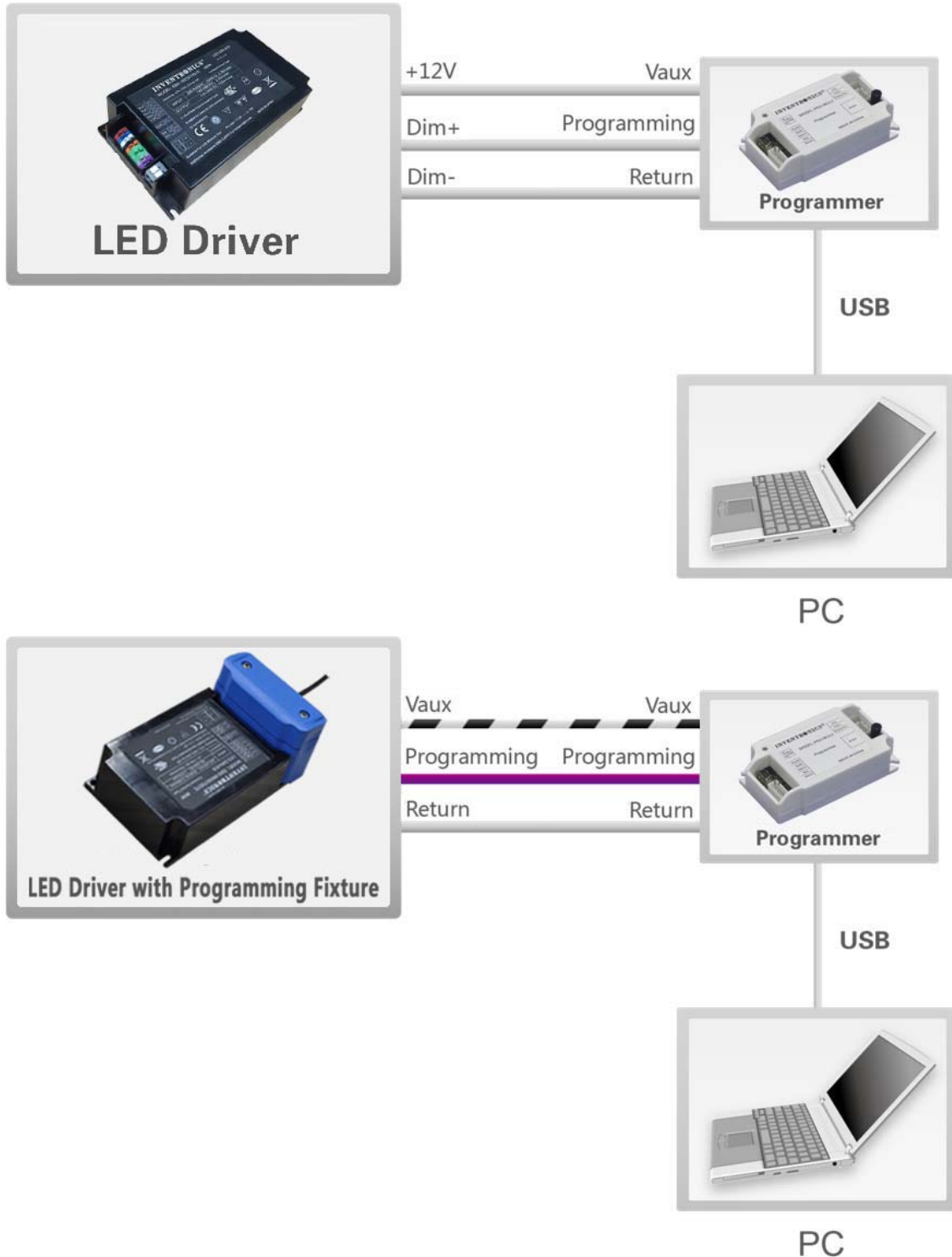
Output Lumen Compensation (OLC) may be used to maintain constant light output over the life of the LEDs by driving them at a reduced current when new, then gradually increasing the drive current over time to counteract LED lumen degradation.

Wire Connection

| Parameter | | Min. | Typ. | Max. | Notes |
|--|--------------------|---------------------|------|---------------------|---|
| L, N | Wire Cross-section | 0.4 mm ² | - | 2.5 mm ² | Push-in at 0° angle, solid and stranded wire |
| | | 20 AWG | - | 12 AWG | |
| | Strip Length | 10 mm | - | 11 mm | |
| EQUI | Wire Cross-section | 0.4 mm ² | - | 1.5 mm ² | Push-in at 45° angle, solid and stranded wire |
| | | 20 AWG | - | 16 AWG | |
| | Strip Length | 8.5 mm | - | 9.5 mm | |
| Vout+, Vout-, Return, Tmon, +12V, Dim-, Dim+ | Wire Cross-section | 0.2 mm ² | - | 1.5 mm ² | Push-in at 45° angle, solid and stranded wire |
| | | 22 AWG | - | 16 AWG | |
| | Strip Length | 8.5 mm | - | 9.5 mm | |



Programming Connection Diagram

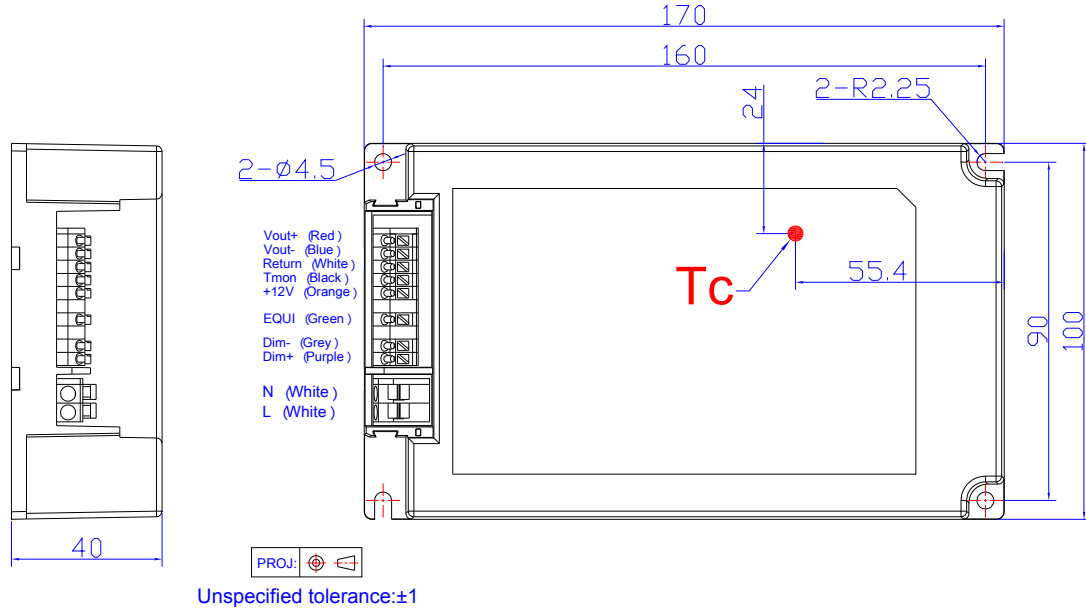


Note: The driver does not need to be powered on during the programming process.

- Please refer to [PRG-MUL2](#) (Programmer) and [PRG-FIX-E](#) (Programming Fixture) datasheet for details.

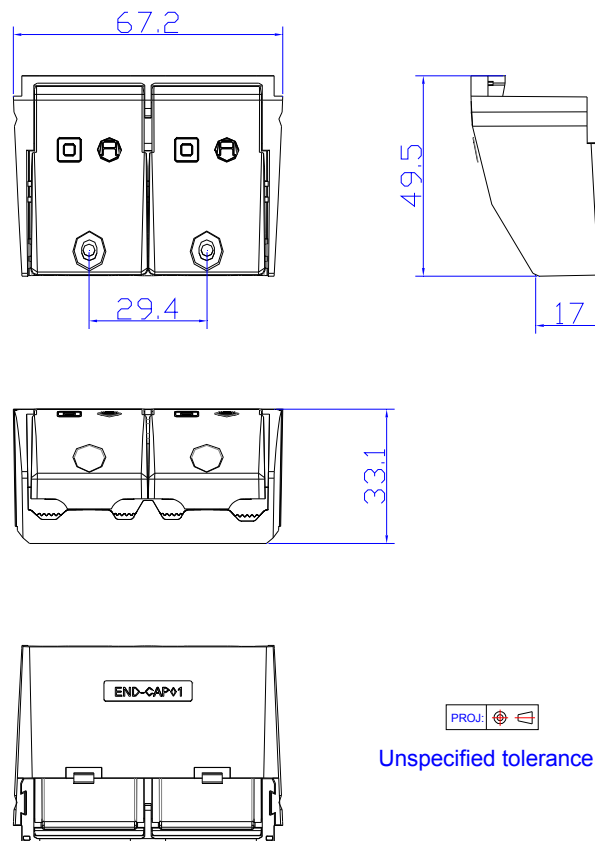
Mechanical Outline

EBS-160SxxxDTE



Optional Cable Clamp

END-CAP01



Note: The cable clamp is to be installed with EBS-160SxxxDTE drivers for independent application. Please refer to [END-CAP01](#) datasheet for details

RoHS Compliance

Our products comply with the European Directive 2011/65/EC, calling for the elimination of lead and other hazardous substances from electronic products.

Revision History

| Change Date | Rev. | Description of Change | | |
|-------------|------|-----------------------|------|----|
| | | Item | From | To |
| 2016-09-09 | A | Datasheets Release | / | / |