

## Features

- Full Power at Wide Output Current Range (Constant Power)
- Adjustable Output Current (AOC) with NFC
- Isolated 0-10V/PWM/3-Timer-Modes Dimmable
- INV Digital Dimming, UART Based Communication Protocol Compliant with T/CSA-051
- Dim-to-Off with Standby Power  $\leq 0.5$  W
- Always-on Auxiliary Power: 12Vdc, 250mA, 3W (Transient Peak Power up to 10W)
- Integrated Power Monitoring with High Accuracy up to  $\pm 1\%$
- Output Lumen Compensation
- End-of-Life Indicator
- Thermal Sensing and Protection for LED Module
- Input Surge Protection: DM 6kV, CM 10kV
- All-Around Protection: IUPV, IOVP, OVP, SCP, OTP
- IP66 / IP67 and UL Dry / Damp / Wet Location
- TYPE HL, for Use in a Class I, Division 2 Hazardous (Classified) Location
- 7 Years Warranty



## Description

The EUM-200SxxxLx series is a 200W, constant-current, NFC programmable and IP66/IP67 rated LED driver that operates from 90-305Vac input with excellent power factor. Created for smart lighting and health monitoring applications, this family provides integrated AC power monitoring with an auxiliary voltage and dim-to-off functionality for powering low voltage, wireless controls. The dimming control supports 0-10V dimming as well as two-way communication via Digital Dimming, a UART based communication protocol that complies with T/CSA-051. The high efficiency of these drivers and compact metal case enables them to run cooler, significantly improving reliability and extending product life. To ensure trouble-free operation, protection is provided against input surge, input under voltage, input over voltage, output over voltage, short circuit, and over temperature.

## 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) | Typical Power Factor |        | Model Number (5)             |
|---------------------------------|-----------------------------|------------------------|------------------------|----------------------|-------------------|------------------------|----------------------|--------|------------------------------|
|                                 |                             |                        |                        |                      |                   |                        | 120Vac               | 220Vac |                              |
| 70-1050mA                       | 700-1050mA                  | 700 mA                 | 90~305 Vac/127~300 Vdc | 95~286 Vdc           | 200 W             | 93.5%                  | 0.99                 | 0.96   | EUM-200S105Lx                |
| 105-1500mA                      | 1050-1500mA                 | 1050 mA                | 90~305 Vac/127~300 Vdc | 67~190 Vdc           | 200 W             | 93.5%                  | 0.99                 | 0.96   | EUM-200S150Lx                |
| 180-2800mA                      | 1800-2800mA                 | 2100 mA                | 90~305 Vac/127~300 Vdc | 36~111 Vdc           | 200 W             | 93.0%                  | 0.99                 | 0.96   | EUM-200S280Lx <sup>(4)</sup> |
| 350-5600mA                      | 3500-5600mA                 | 4200 mA                | 90~305 Vac/127~300 Vdc | 18 ~ 57 Vdc          | 200 W             | 92.0%                  | 0.99                 | 0.96   | EUM-200S560Lx <sup>(4)</sup> |

**Notes:** (1) Output current range with constant power at 200W

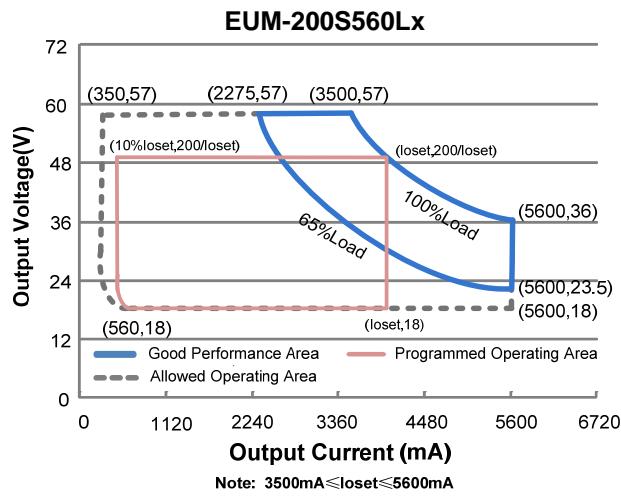
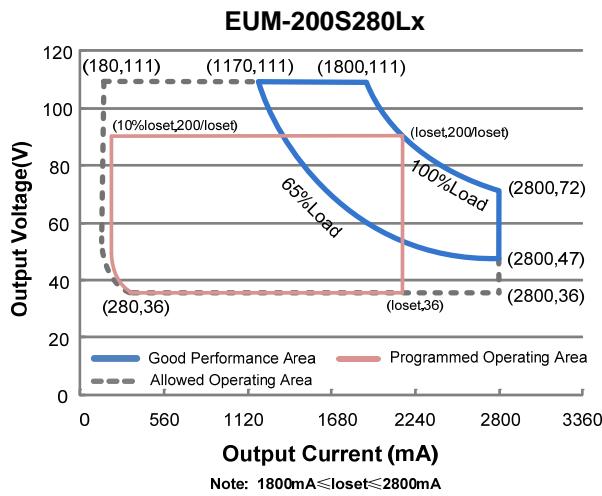
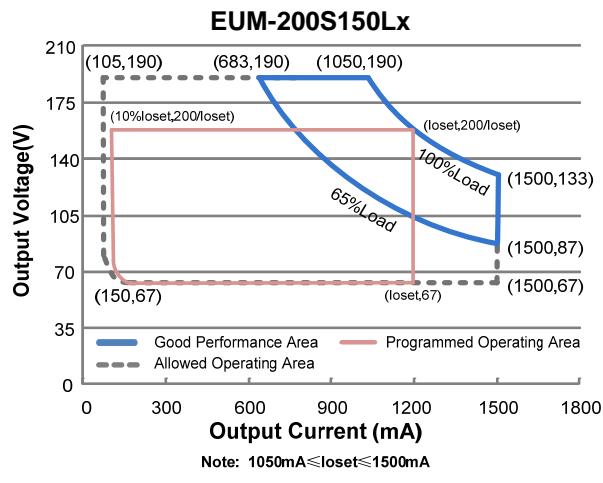
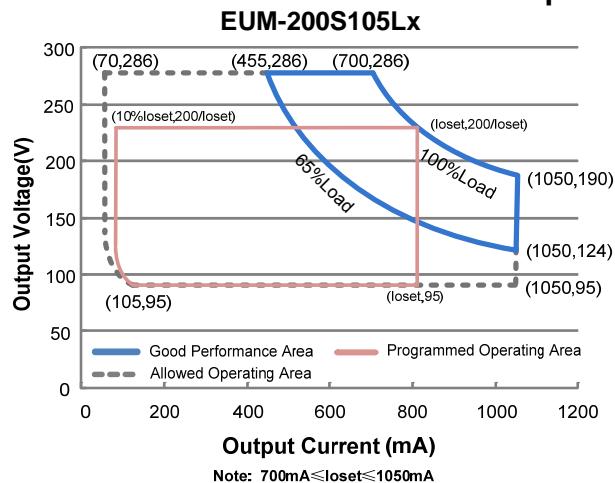
(2) Certified input voltage range: UL, FCC 100-277Vac; otherwise 100-240Vac.

(3) Measured at 100% load and 220Vac input (see below "General Specifications" for details).

(4) SELV output.

(5) x = G are UL Recognized, ENEC and CCC, etc. models; x = T are UL Class P models; x = B are BIS models.

## I-V Operation Area



## Input Specifications

| Parameter                | Min.    | Typ. | Max.                  | Notes   |
|--------------------------|---------|------|-----------------------|---|
| Input AC Voltage         | 90 Vac  | -    | 305 Vac               |   |
| Input DC Voltage         | 127 Vdc | -    | 300 Vdc               |   |
| Input Frequency          | 47 Hz   | -    | 63 Hz                 |   |
| Leakage Current          | -       | -    | 0.75 MIU              | UL8750; 277Vac/ 60Hz  |
|                          | -       | -    | 0.70 mA               | IEC60598-1; 240Vac/ 60Hz,   |
| Input AC Current         | -       | -    | 2.07 A                | Measured at 100% load and 120 Vac input.  |
|                          | -       | -    | 1.1 A                 | Measured at 100% load and 220 Vac input.  |
| Inrush Current( $I^2t$ ) | -       | -    | 4.61 A <sup>2</sup> s | At 220Vac input, 25°C cold start, duration=776 $\mu$ s, 10%Ipk-10%Ipk. See Inrush Current Waveform for the details. |
| PF                       | 0.9     | -    | -                     | At 100-277Vac, 50-60Hz, 65%-100% load (130-200W)  |

## Input Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes  |
|-----------|------|------|------|--|
| THD       | -    | -    | 20%  | At 100-277Vac, 50-60Hz, 65%-100% load (130-200W) |
| THD       | -    | -    | 10%  | At 220-240Vac, 50-60Hz, 75%-100% load (150-200W) |

## Output Specifications

| Parameter  | Min.     | Typ.     | Max.     | Notes  |
|--|----------|----------|----------|--|
| Output Current Tolerance                         | -5%loset | -        | 5%loset  | At 100% load condition   |
| Output Current Setting(losest) Range             |          |          |          |  |
| EUM-200S105Lx                                    | 70 mA    | -        | 1050 mA  |  |
| EUM-200S150Lx                                    | 105 mA   | -        | 1500 mA  |  |
| EUM-200S280Lx                                    | 180 mA   | -        | 2800 mA  |  |
| EUM-200S560Lx                                    | 350 mA   | -        | 5600 mA  |  |
| Output Current Setting Range with Constant Power |          |          |          |  |
| EUM-200S105Lx                                    | 700 mA   | -        | 1050 mA  |  |
| EUM-200S150Lx                                    | 1050 mA  | -        | 1500 mA  |  |
| EUM-200S280Lx                                    | 1800 mA  | -        | 2800 mA  |  |
| EUM-200S560Lx                                    | 3500 mA  | -        | 5600 mA  |  |
| Total Output Current Ripple (pk-pk)              | -        | 5%lomax  | 10%lomax | At 100% load condition. 20 MHz BW  |
| Output Current Ripple at < 200 Hz (pk-pk)        | -        | 2%lomax  | -        | At 100% load condition. Only this component of ripple is associated with visible flicker.                            |
| Startup Overshoot Current                        | -        | -        | 10%lomax | At 100% load condition   |
| No Load Output Voltage                           |          |          |          |  |
| EUM-200S105Lx                                    | -        | -        | 360 V    |  |
| EUM-200S150Lx                                    | -        | -        | 240 V    |  |
| EUM-200S280Lx                                    | -        | -        | 120 V    |  |
| EUM-200S560Lx                                    | -        | -        | 75 V     |  |
| Line Regulation                                  | -        | -        | ±0.5%    | Measured at 100% load  |
| Load Regulation                                  | -        | -        | ±3.0%    |  |
| Turn-on Delay Time                               | -        | -        | 0.5 s    | Measured at 120-277Vac input, 65%-100%load   |
| Temperature Coefficient of losest                | -        | 0.03%/°C | -        | Case temperature = 0°C ~Tc max   |
| 12V Auxiliary Output Voltage                     | 10.8 V   | 12 V     | 13.2 V   |  |
| 12V Auxiliary Output Source Current              | 0 mA     | -        | 250 mA   | Return terminal is "Dim-"  |
| 12V Auxiliary Output Transient Peak Current@6W   | -        | -        | 500 mA   | 500mA peak for a maximum duration of 2.2 ms in a 6.0ms period during which time the average should not exceed 250mA. |
| 12V Auxiliary Output Transient Peak Current@10W  | -        | -        | 850 mA   | 850mA peak for a maximum duration of 1.3 ms in a 5.2ms period during which time the average should not exceed 250mA. |

**General Specifications**

| Parameter   | Min.           | Typ.           | Max.   | Notes   |
|---|----------------|----------------|--------|---|
| Efficiency at 120 Vac input:<br>EUM-200S105Lx<br>Io= 700 mA<br>Io=1050 mA | 88.5%<br>89.0% | 90.5%<br>91.0% | -<br>- |   |
| EUM-200S150Lx<br>Io=1050 mA<br>Io=1500 mA                                 | 88.5%<br>88.5% | 90.5%<br>90.5% | -<br>- | Measured at 100% load and steady-state temperature in 25°C ambient;<br>(Efficiency will be about 2.0% lower if measured immediately after startup.) |
| EUM-200S280Lx<br>Io=1800 mA<br>Io=2800 mA                                 | 88.0%<br>88.0% | 90.0%<br>90.0% | -<br>- |   |
| EUM-200S560Lx<br>Io=3500 mA<br>Io=5600 mA                                 | 87.0%<br>87.0% | 89.0%<br>89.0% | -<br>- |   |
| Efficiency at 220 Vac input:<br>EUM-200S105Lx<br>Io= 700 mA<br>Io=1050 mA | 91.5%<br>91.5% | 93.5%<br>93.5% | -<br>- |   |
| EUM-200S150Lx<br>Io=1050 mA<br>Io=1500 mA                                 | 91.5%<br>91.5% | 93.5%<br>93.5% | -<br>- | Measured at 100% load and steady-state temperature in 25°C ambient;<br>(Efficiency will be about 2.0% lower if measured immediately after startup.) |
| EUM-200S280Lx<br>Io=1800 mA<br>Io=2800 mA                                 | 91.0%<br>91.0% | 93.0%<br>93.0% | -<br>- |   |
| EUM-200S560Lx<br>Io=3500 mA<br>Io=5600 mA                                 | 90.0%<br>89.5% | 92.0%<br>91.5% | -<br>- |   |
| Efficiency at 277 Vac input:<br>EUM-200S105Lx<br>Io= 700 mA<br>Io=1050 mA | 92.0%<br>92.0% | 94.0%<br>94.0% | -<br>- |   |
| EUM-200S150Lx<br>Io=1050 mA<br>Io=1500 mA                                 | 92.0%<br>92.0% | 94.0%<br>94.0% | -<br>- | Measured at 100% load and steady-state temperature in 25°C ambient;<br>(Efficiency will be about 2.0% lower if measured immediately after startup.) |
| EUM-200S280Lx<br>Io=1800 mA<br>Io=2800 mA                                 | 91.5%<br>91.5% | 93.5%<br>93.5% | -<br>- |   |
| EUM-200S560Lx<br>Io=3500 mA<br>Io=5600 mA                                 | 90.5%<br>90.0% | 92.5%<br>92.0% | -<br>- |   |
| Power Monitoring Accuracy   | -1%            | -              | +1%    | Measured at 220Vac input and 100%load   |
| Standby Power   | -              | -              | 0.5 W  | Measured at 230Vac/50Hz; Dimming off  |
| MTBF  | -              | 205,000 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 70°C case temperature; See lifetime vs. Tc curve for the details  |
| Operating Case Temperature for Safety Tc_s                                | -40°C          | -              | +90°C  |   |
| Operating Case Temperature for Warranty Tc_w                              | -40°C          | -              | +75°C  | Case temperature for 7 years warranty<br>Humidity: 10% RH to 95% RH;  |
| Storage Temperature   | -40°C          | -              | +85°C  | Humidity: 5%RH to 95%RH   |

### General Specifications (Continued)

| Parameter   | Min. | Typ.                                    | Max. | Notes  |
|---|------|---|------|--|
| Dimensions<br>Inches (L × W × H)<br>Millimeters (L × W × H) |      | 6.73 × 2.66 × 1.44<br>171 × 67.5 × 36.5 |      | With mounting ear<br>7.40 × 2.66 × 1.44<br>188 × 67.5 × 36.5 |
| Net Weight  | -    | 1000 g                                  | -    |  |

### Dimming Specifications

| Parameter                                    | Min.   | Typ.                                | Max.   | Notes   |
|--|--|-------------------------------------|--------|---|
| Absolute Maximum Voltage on the Vdim (+) Pin | -20 V  | -                                   | 20 V   |   |
| Source Current on Vdim (+)Pin                | 200 µA   | 300 µA                              | 450 µA | Vdim(+) = 0 V   |
| Dimming Output Range                         | EUM-200S105Lx<br>EUM-200S150Lx<br>EUM-200S280Lx<br>EUM-200S560Lx | 10%I <sub>set</sub>                 | -      | I <sub>set</sub><br>700 mA ≤ I <sub>set</sub> ≤ 1050 mA<br>1050 mA ≤ I <sub>set</sub> ≤ 1500 mA<br>1800 mA ≤ I <sub>set</sub> ≤ 2800 mA<br>3500 mA ≤ I <sub>set</sub> ≤ 5600 mA |
|  | EUM-200S105Lx<br>EUM-200S150Lx<br>EUM-200S280Lx<br>EUM-200S560Lx | 70 mA<br>105 mA<br>180 mA<br>350 mA | -      | I <sub>set</sub><br>70 mA ≤ I <sub>set</sub> < 700 mA<br>105 mA ≤ I <sub>set</sub> < 1050 mA<br>180 mA ≤ I <sub>set</sub> < 1800 mA<br>350 mA ≤ I <sub>set</sub> < 3500 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   |   |
| PWM_in Low Level                             | -0.3 V   | -                                   | 0.6 V  | Dimming mode set to PWM in PC interface.  |
| PWM_in Frequency Range                       | 200 Hz   | -                                   | 3 KHz  |   |
| PWM_in Duty Cycle                            | 1%   | -                                   | 99%    |   |
| PWM Dimming off (Positive Logic)             | 3%   | 5%                                  | 8%     |   |
| PWM Dimming on (Positive Logic)              | 5%   | 7%                                  | 10%    |   |
| PWM Dimming off ( Negative Logic)            | 92%  | 95%                                 | 97%    |   |
| PWM Dimming on ( Negative Logic)             | 90%  | 93%                                 | 95%    |   |
| Hysteresis                                   | -  | 2%                                  | -      |   |

### Safety & EMC Compliance

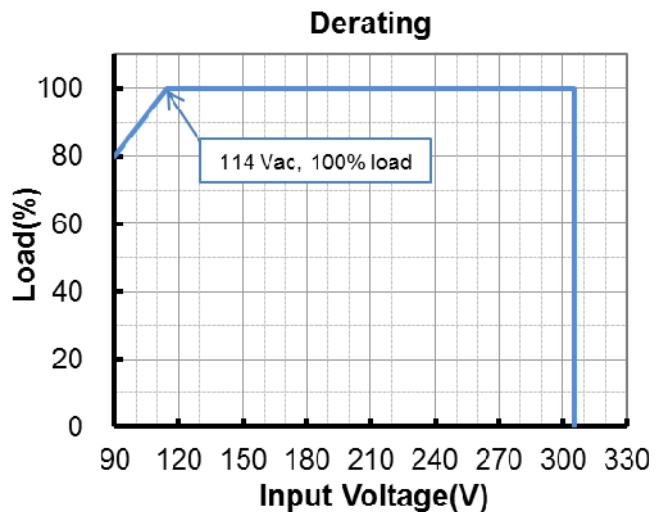
| Safety Category | Standard                        |
|-----------------|---------------------------------|
| UL/CUL          | UL8750,CAN/CSA-C22.2 No. 250.13 |
| ENEC & CE       | EN 61347-1, EN61347-2-13        |

**Safety & EMC Compliance (Continued)**

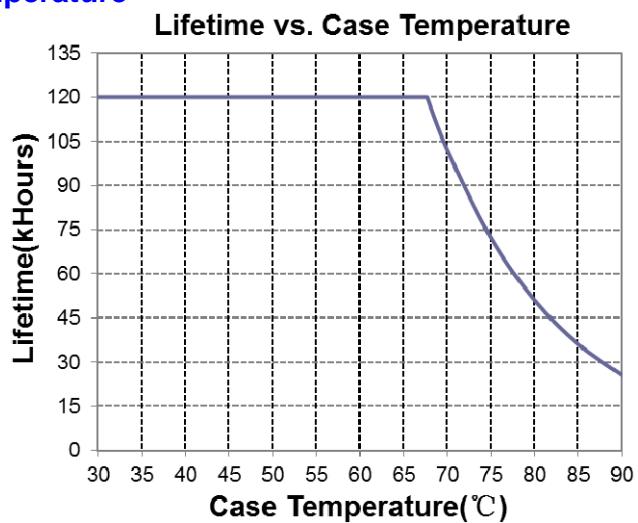
| <b>Safety Category</b>                 | <b>Standard</b>   |
|--|---|
| CB                                     | IEC 61347-1, IEC 61347-2-13   |
| CCC                                    | GB 19510.1, GB 19510.14   |
| PSE                                    | J 61347-1, J 61347-2-13   |
| BIS                                    | IS 15885(Part2/Sec13)   |
| KS                                     | KS C 7655   |
| <b>EMI Standards</b>                   | <b>Notes</b>  |
| EN 55015/GB 17743/KN 15 <sup>(1)</sup> | Conducted emission Test & Radiated emission Test  |
| EN 61000-3-2/GB 17625.1                | Harmonic current emissions  |
| EN 61000-3-3                           | Voltage fluctuations & flicker  |
| FCC Part 15 <sup>(1)</sup>             | ANSI C63.4 Class B  |
|  | This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: [1] this device may not cause harmful interference, and [2] this device must accept any interference received, including interference that may cause undesired operation. |
| <b>EMS Standards</b>                   | <b>Notes</b>  |
| 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  |
| EN 61000-4-4                           | Electrical Fast Transient / Burst-EFT: level 3, criteria A  |
| EN 61000-4-5                           | Surge Immunity Test: AC Power Line: line to line 6 kV, line to earth 10 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                               | Electromagnetic Immunity Requirements Applies To Lighting Equipment   |

**Note:** (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.

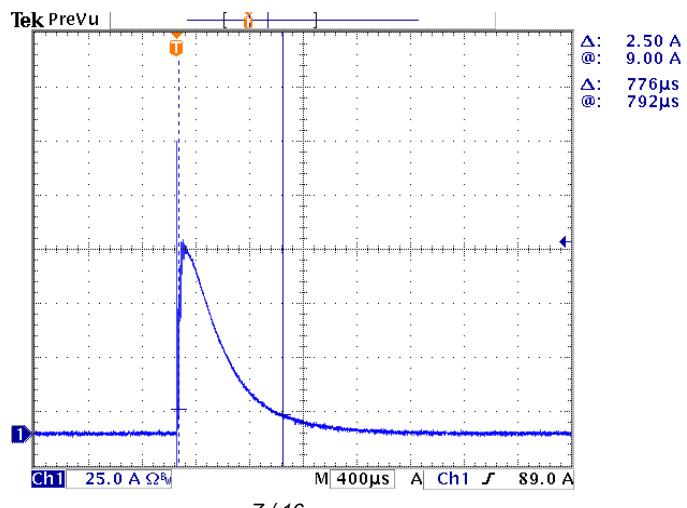
## Derating



## Lifetime vs. Case Temperature



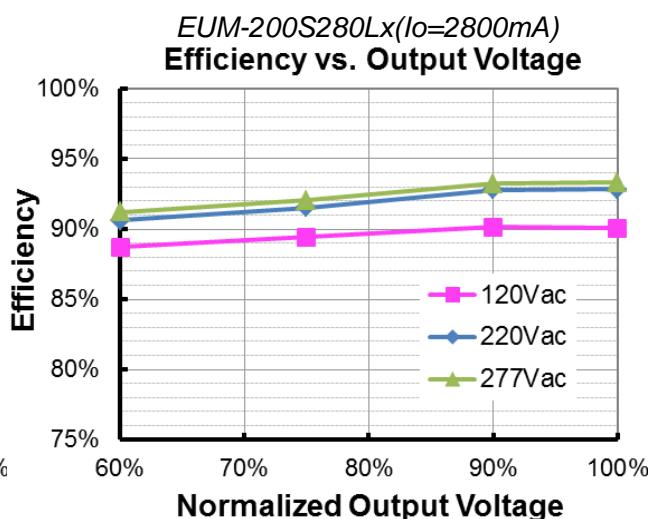
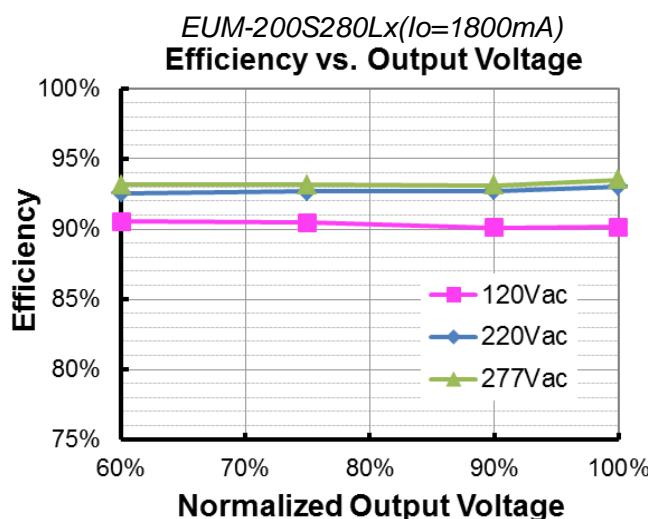
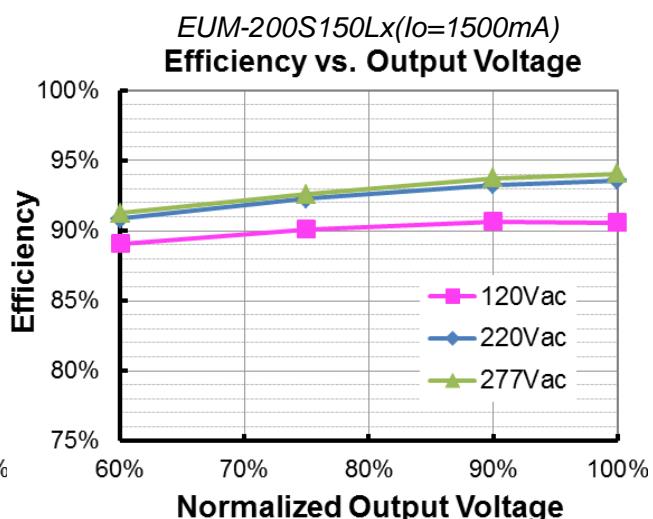
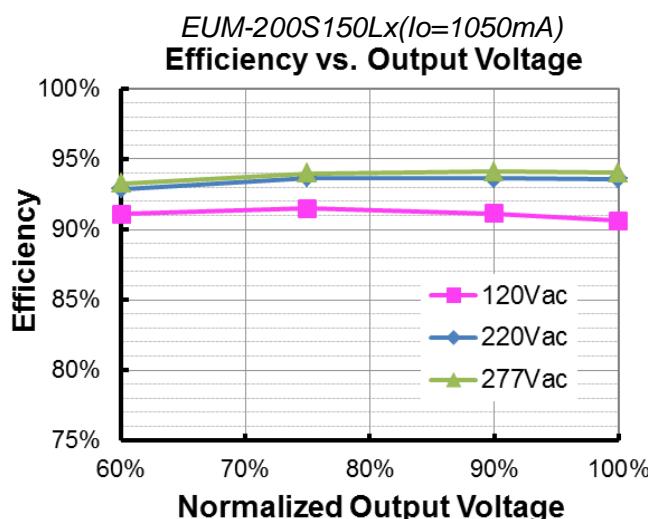
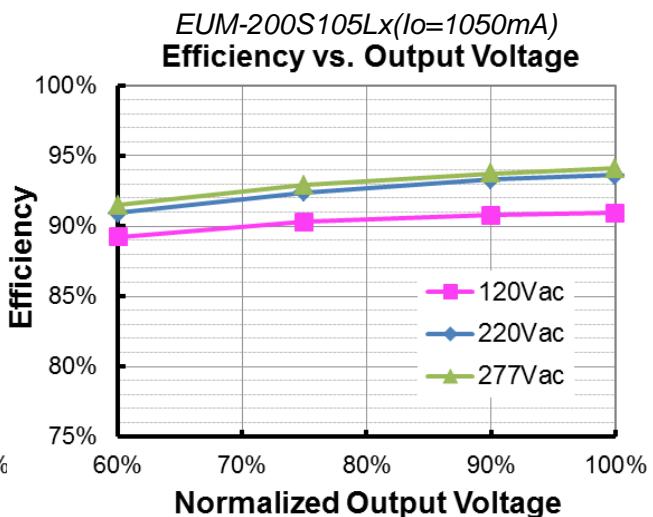
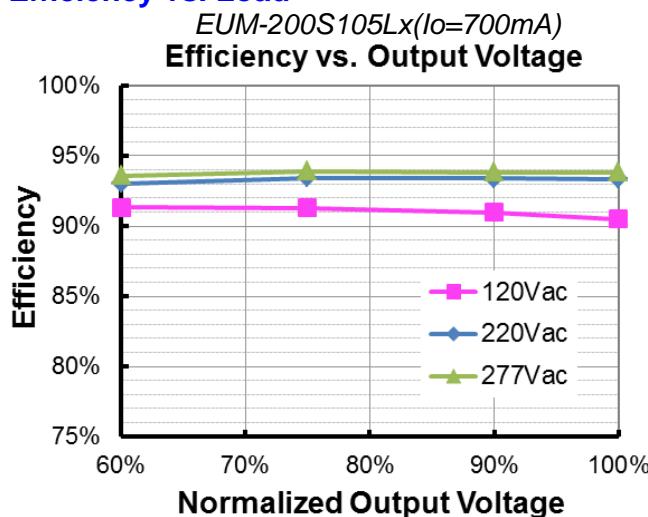
## Inrush Current Waveform

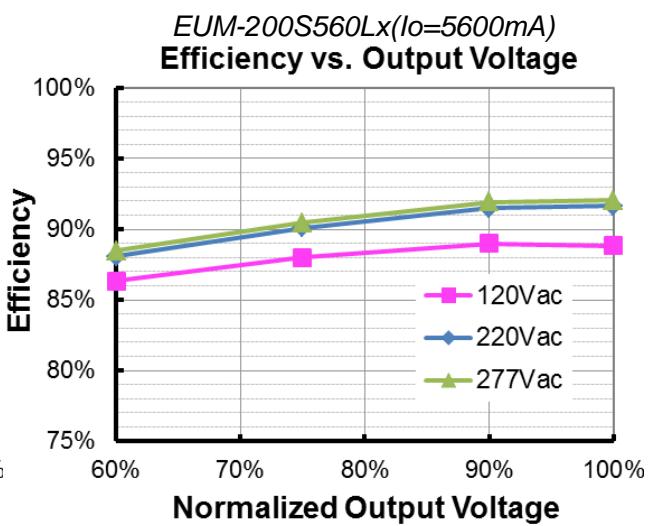
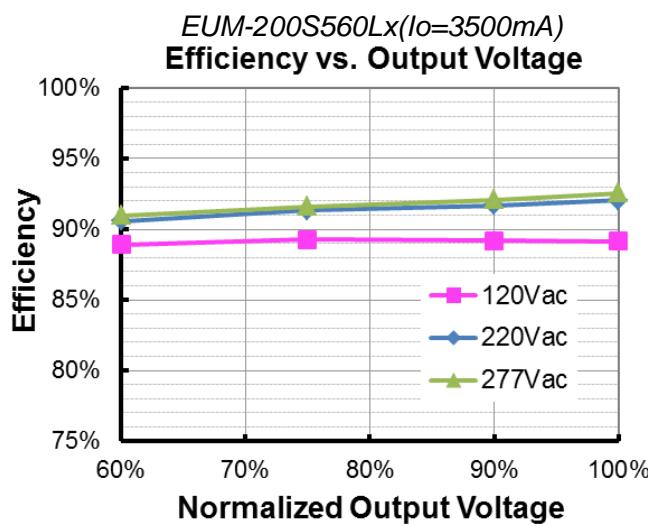


Specifications are subject to changes without notice.

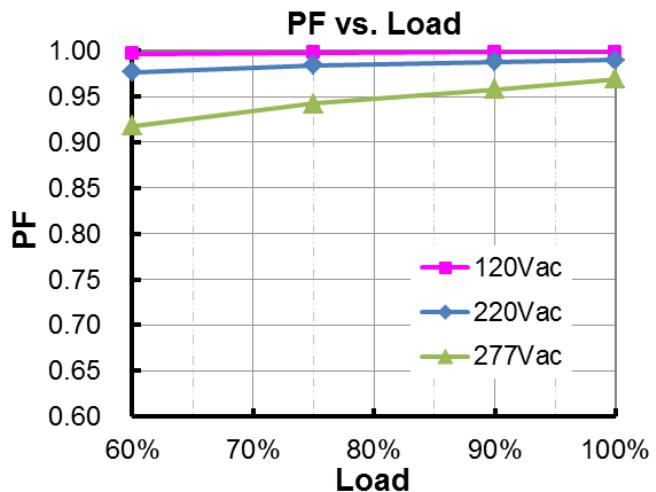
All specifications are typical at 25°C unless otherwise stated.

## Efficiency vs. Load

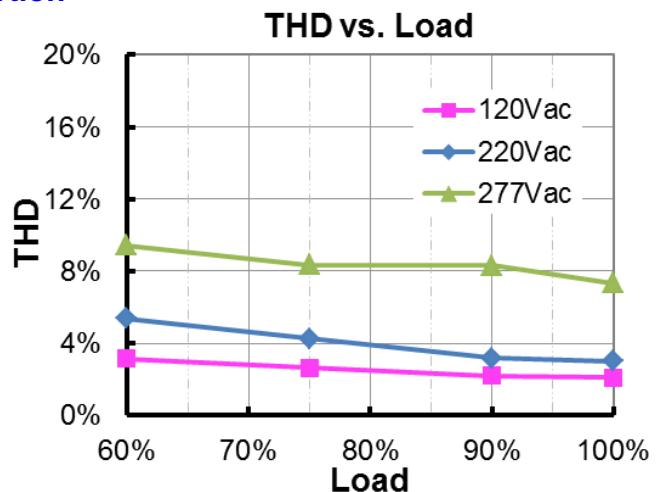




## Power Factor



## Total Harmonic Distortion

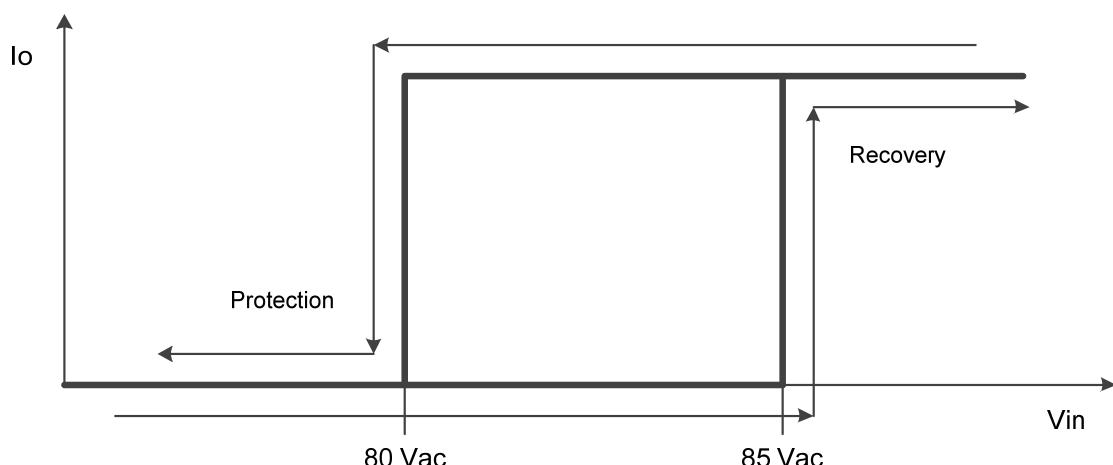


## Protection Functions

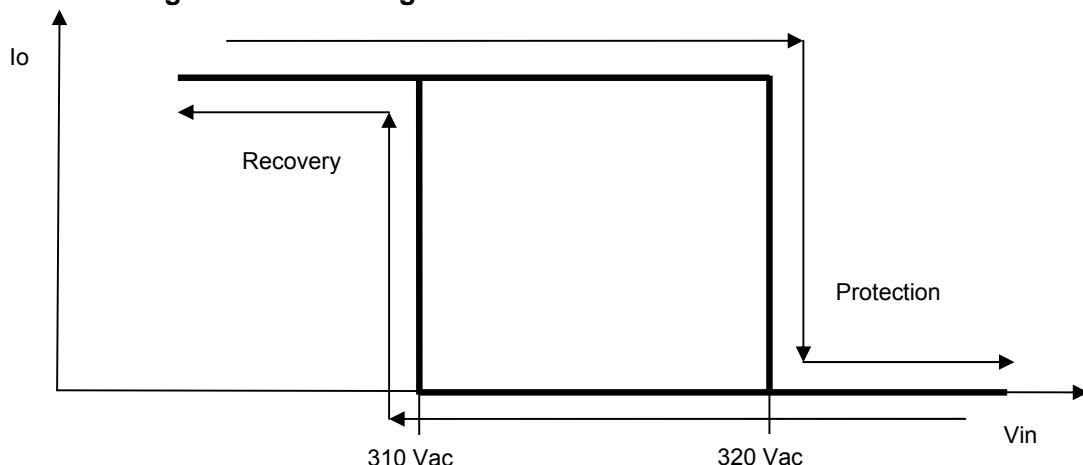
| Parameter                             |                                | Min.   | Typ.              | Max.               | Notes   |
|---------------------------------------|--------------------------------|--|-------------------|--------------------|---|
| External Thermal Protection           | R1 (Start derating)            | -  | 1.67 kΩ           | -                  | The output current starts to decrease linearly when the actual NTC resistance value is lower than R1, until R2 is reached.      |
|                                       | R2 (Stop derating)             | -  | 1.27 kΩ           | -                  | When the actual NTC resistance value is lower than R2, the output current will stay at the programmed Protection Current Floor. |
|                                       | Protection Current Floor       | 10% <i>Io</i> set  | 20% <i>Io</i> set | 100% <i>Io</i> set | 10% <i>Io</i> set > <i>Io</i> min (default setting is 20%)  |
| Over Voltage Protection               |                                | Limits output voltage at no load and in case the normal voltage limit fails.   |                   |                    |   |
| 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 Temperature Protection           |                                | Decreases output current, returning to normal after over temperature is removed.   |                   |                    |   |
| Input Under Voltage Protection (IUPV) | Input Under Voltage Protection | 70 Vac   | 80 Vac            | 90 Vac             | Turn off the output when the input voltage falls below protection voltage.  |
|                                       | Input Under Voltage Recovery   | 75 Vac   | 85 Vac            | 95 Vac             | Auto Recovery. The driver will restart when the input voltage exceeds recovery voltage.   |
| Input Over Voltage Protection (IOVP)  | Input Over Voltage Protection  | 310 Vac  | 320 Vac           | 330 Vac            | Turn off the output when the input voltage exceeds protection voltage.  |
|                                       | Input Over Voltage Recovery    | 300 Vac  | 310 Vac           | 320 Vac            | Auto Recovery. The driver will restart when the input voltage falls below recovery voltage.                                     |
|                                       | Max. of Input Over Voltage     | -  | -                 | 350 Vac            | The driver can survive stabilized input over voltage conditions up to 350Vac for a total of 8 hours.                            |

Note: (1) The recommended NTC type is 10kΩ NTC, Murata NCP18XH103J03RB.

### ● Input Under Voltage Protection Diagram



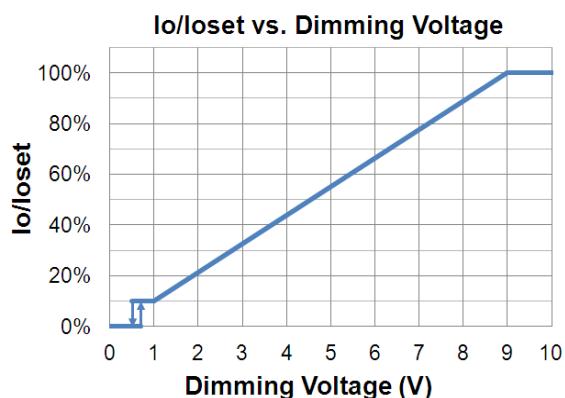
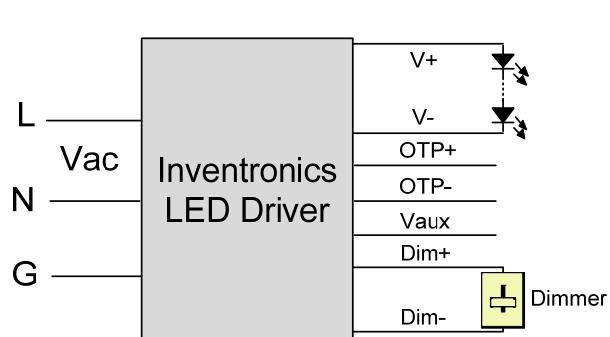
## ● Input Over Voltage Protection Diagram



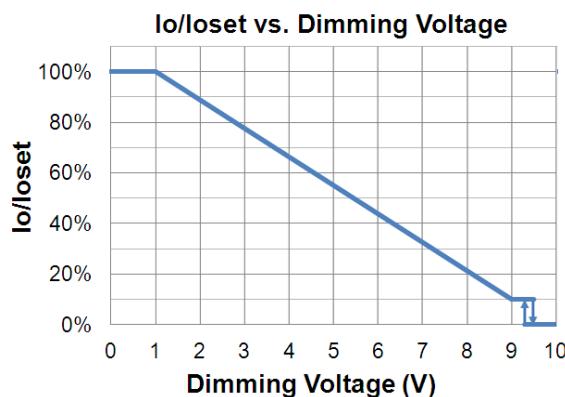
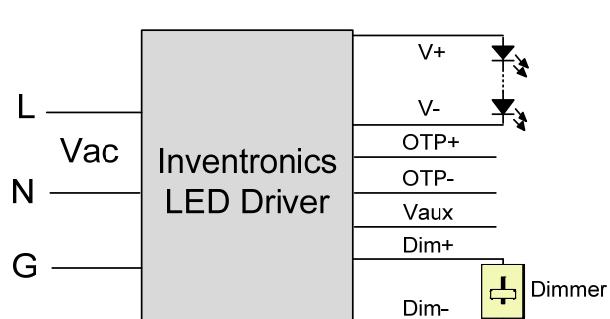
## Dimming

### ● 0-10V Dimming

The recommended implementation of the dimming control is provided below.



Implementation 1: Positive logic



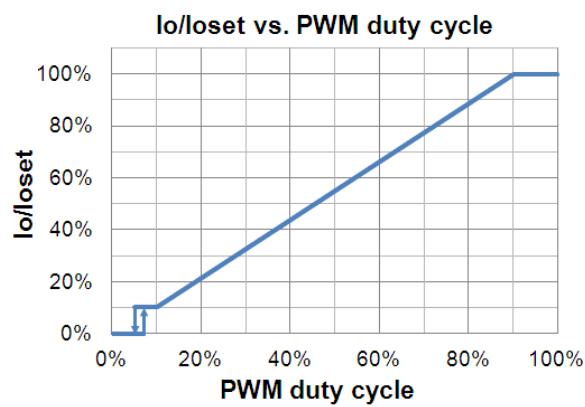
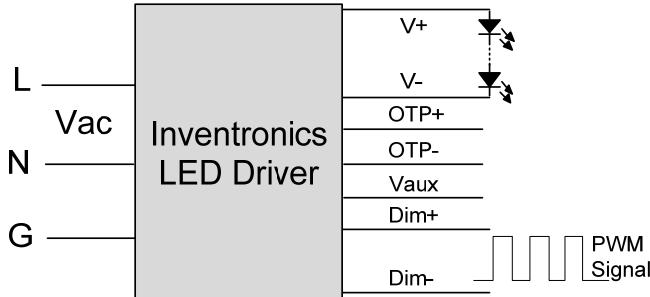
Implementation 2: Negative logic

**Notes:**

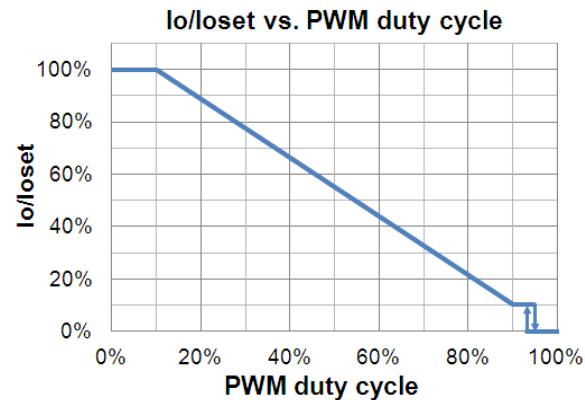
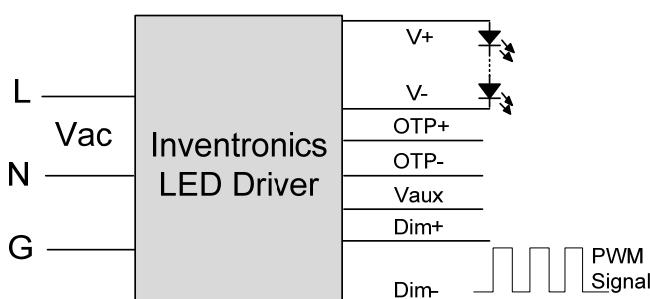
1. The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like resistors and zener.
2. If 0-10V dimming is not used, Dim + should be open.

● **PWM Dimming**

The recommended implementation of the dimming control is provided below.



Implementation 3: Positive logic



Implementation 4: Negative logic

**Note:**

1. If PWM dimming is not used, Dim + should be open.

● **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.

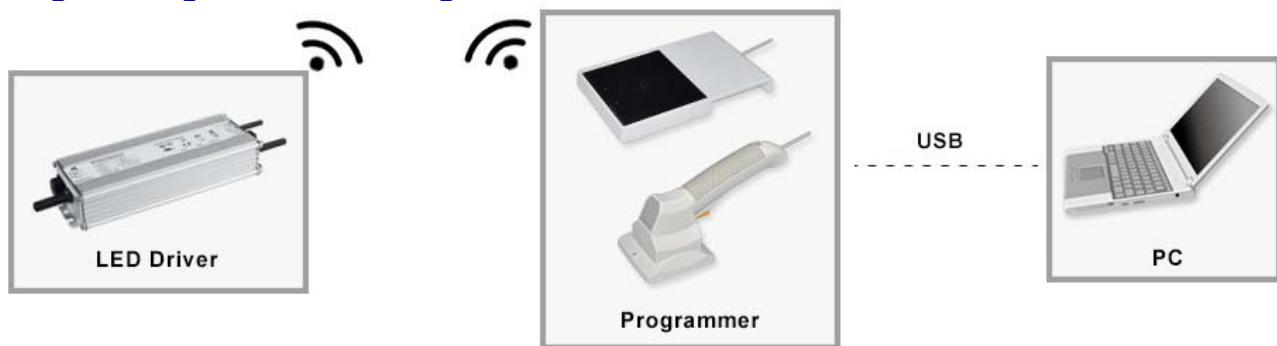
- **End Of Life**

End-of-Life (EOL) is providing a visual notification to a user that the LED module has reached the end of manufacturer-specified life and that the replacement is recommended. Once active, an indication is given at each power-up of the driver, which the driver indicates this through a lower light output during the first 1 minute before normal operation is continued.

- **Digital Dimming**

Inventronics Digital Dimming is a UART (Universal Asynchronous Receive Transmitter) based communication protocol and is compliant with T/CSA-051 standard. Please refer to [Inventronics Digital Dimming](#) file for details.

## Programming Connection Diagram

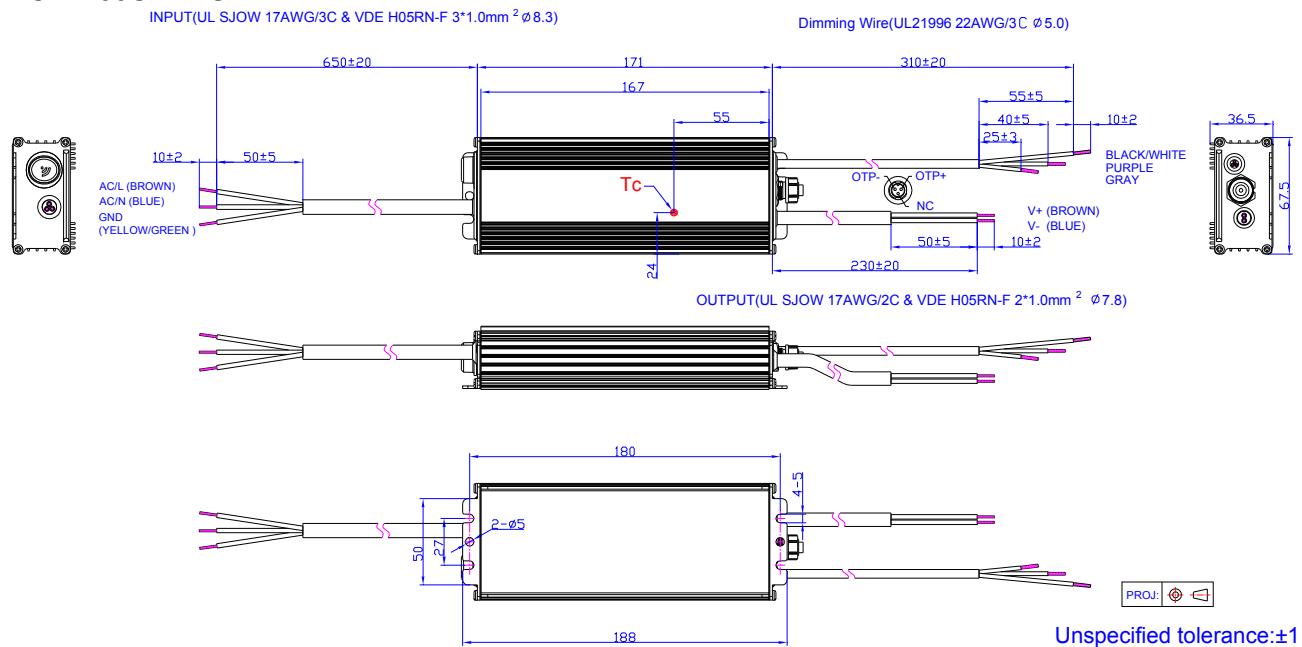


**Note:** The driver does not need to be powered on during the programming process.

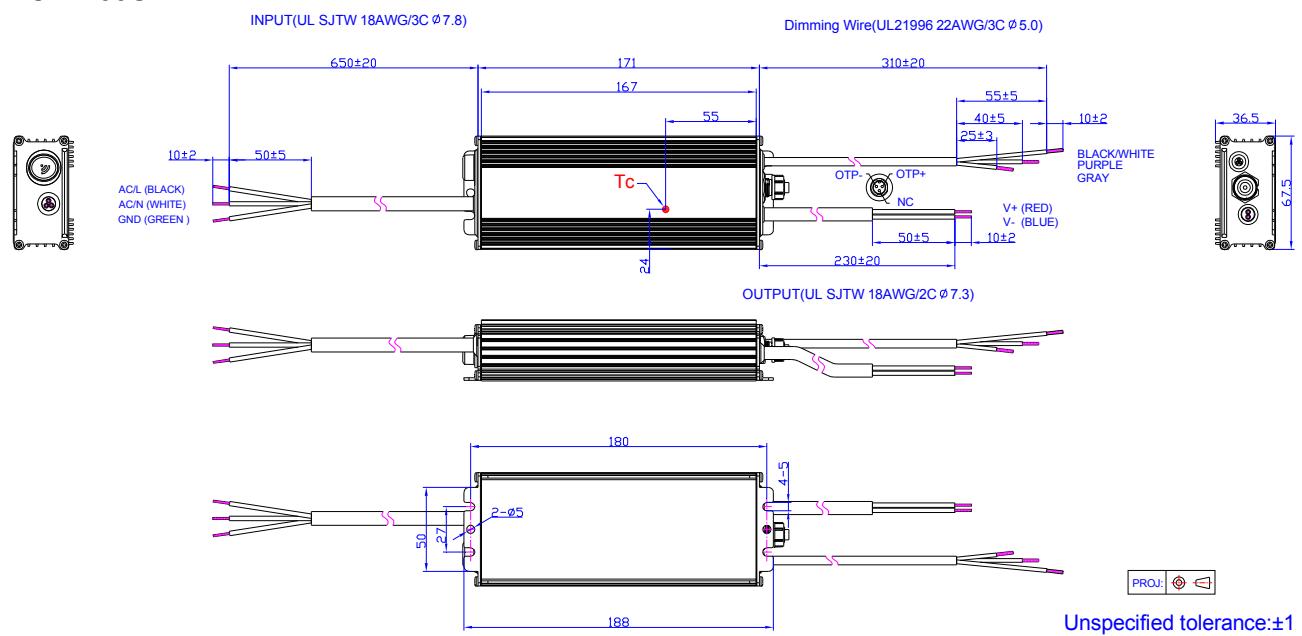
- Please refer to [PRG-NFC-H](#) or [PRG-NFC-D](#) (Programmer) datasheet for details.

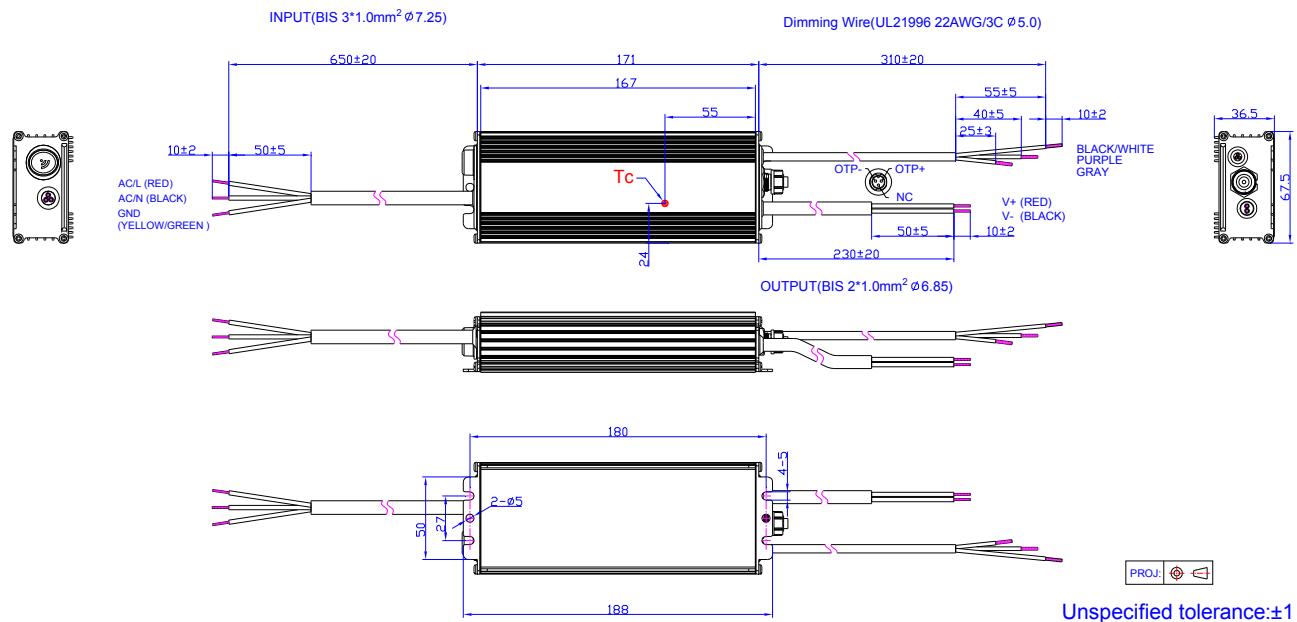
## Mechanical Outline

EUM-200SxxxLG



EUM-200SxxxLT



**EUM-200SxxxLB**

**RoHS Compliance**

Our products comply with reference to RoHS Directive (EU) 2015/863 amending 2011/65/EU, calling for the elimination of lead and other hazardous substances from electronic products.

## Revision History

| Change Date | Rev. | Description of Change |      |    |
|-------------|------|-----------------------|------|----|
|             |      | Item                  | From | To |
| 2020-06-29  | A    | Datasheet Release     | /    | /  |