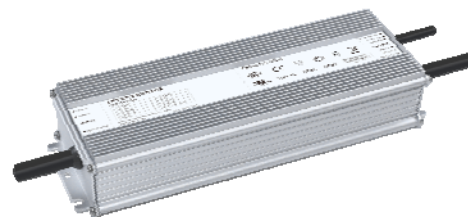


Features

- Full Power at Wide Output Current Range (Constant Power)
- Adjustable Output Current (AOC) with Programmability
- Isolated 1-10V/10V PWM/3-Timer-Modes Dimmable
- Output Lumen Compensation
- End-of-Life Indicator
- Input Surge Protection: DM 6kV, CM 10kV
- All-Around Protection: OVP, SCP, OTP
- IP66 / IP67 and UL Dry / Damp / Wet Location
- TYPE HL, for Use in a Class I, Division 2 Hazardous (Classified) Location
- 5 Year Warranty



Description

The ESM-320SxxxDx series is a 320W, constant-current, programmable and IP66/IP67 rated LED driver that operates from 249-528Vac input with excellent power factor. It is created for many lighting applications including high bay, high mast, aquaculture and sport, etc. 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, 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) |
|---------------------------------|-----------------------------|------------------------|-----------------------------|----------------------|-------------------|------------------------|----------------------|--------|------------------------------|
| | | | | | | | 277Vac | 480Vac | |
| 70-1050mA | 700-1050mA | 700 mA | 249~528 Vac/ 352~500 Vdc | 153~457Vdc | 320 W | 95.0% | 0.99 | 0.96 | ESM-320S105Dx |
| 105-1500mA | 1050-1500mA | 1400 mA | 249~528 Vac/ 352~500 Vdc | 107~305Vdc | 320 W | 95.0% | 0.99 | 0.96 | ESM-320S150Dx |
| 175-2500mA | 1750-2500mA | 2100 mA | 249~528 Vac/ 352~500 Vdc | 64~183 Vdc | 320 W | 95.0% | 0.99 | 0.96 | ESM-320S250Dx |
| 285-5000mA | 2850-5000mA | 4900 mA | 249~528 Vac/ 352~500 Vdc | 32~112 Vdc | 320 W | 94.5% | 0.99 | 0.96 | ESM-320S500Dx ⁽⁴⁾ |
| 535-7600mA | 5350-7600mA | 6700 mA | 249~528 Vac/ 352~500 Vdc | 21 ~ 60 Vdc | 320 W | 93.5% | 0.99 | 0.96 | ESM-320S760Dx ⁽⁴⁾ |

Notes: (1) Output current range with constant power at 320W

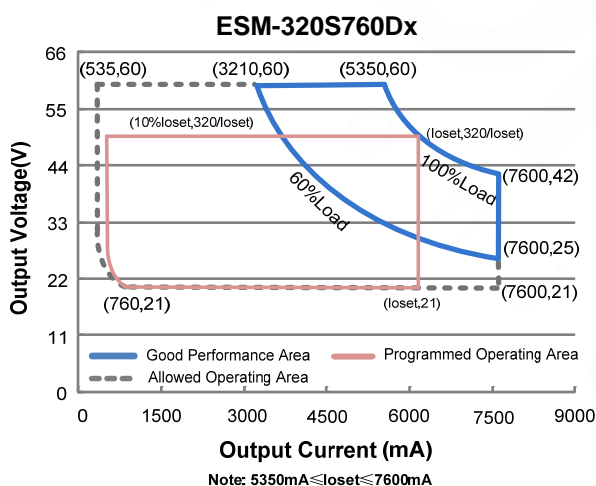
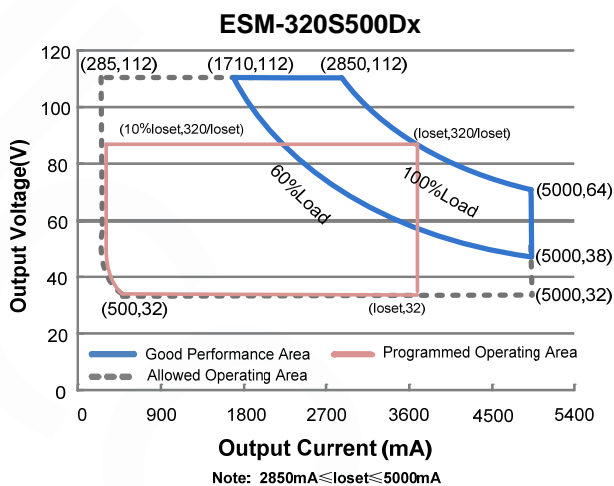
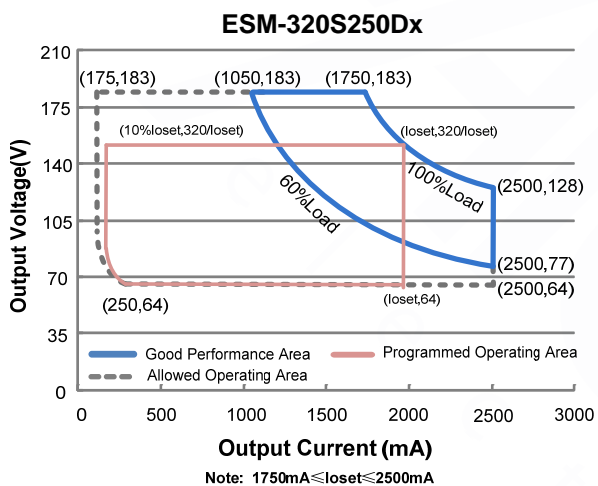
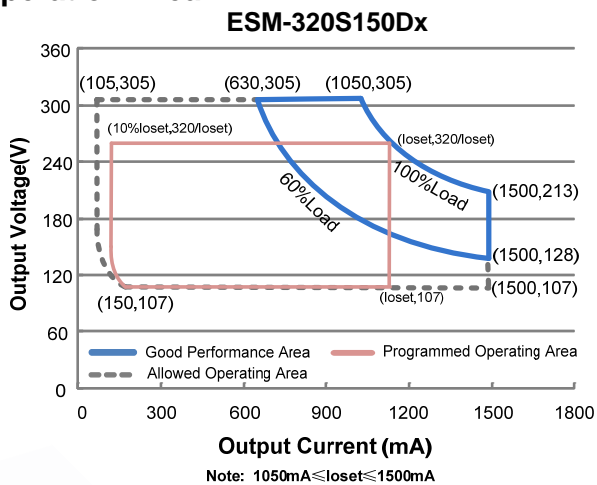
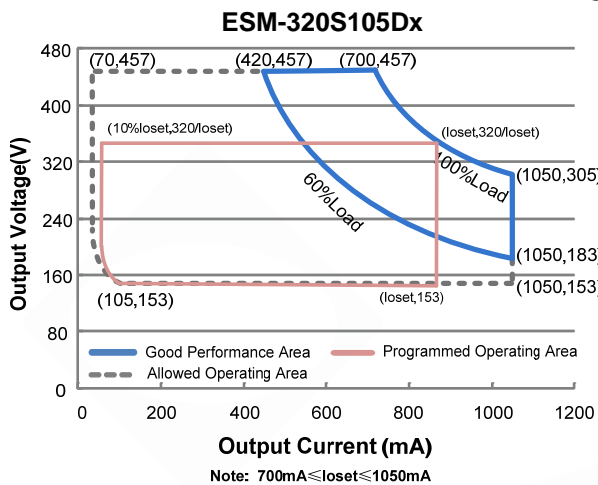
(2) Certified input voltage range: 277-480Vac.

(3) Measured at 100% load and 480Vac input (see below "General Specifications" for details).

(4) SELV output.

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

I-V Operation Area



Input Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|----------------------------------|---------|------|------------------------|---|
| Input AC Voltage | 249 Vac | - | 528 Vac | |
| Input DC Voltage | 352 Vdc | | 500 Vdc | |
| Input Frequency | 47 Hz | - | 63 Hz | |
| Leakage Current | - | - | 0.75 MIU | UL8750; 480Vac/60Hz |
| | - | - | 0.70 mA | IEC60598-1; 480Vac/60Hz, |
| Input AC Current | - | - | 1.38 A | Measured at 100% load and 277 Vac input. |
| | - | - | 0.81 A | Measured at 100% load and 480 Vac input. |
| Inrush Current(I ² t) | - | - | 1.409 A ² s | At 480Vac input, 25°C cold start, duration=4.56 ms, 10%Ipk-10%Ipk. See Inrush Current Waveform for the details. |
| PF | 0.9 | - | - | At 277-480Vac, 50-60Hz, 60%-100% Load (192-320W) |
| THD | - | - | 20% | |

Output Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|--|----------|---------|----------|---|
| Output Current Tolerance | -5%loset | - | 5%loset | At 100% load condition |
| Output Current Setting(loset) Range | | | | |
| ESM-320S105Dx | 70 mA | - | 1050 mA | |
| ESM-320S150Dx | 105 mA | - | 1500 mA | |
| ESM-320S250Dx | 175 mA | - | 2500 mA | |
| ESM-320S500Dx | 285 mA | - | 5000 mA | |
| ESM-320S760Dx | 535 mA | - | 7600 mA | |
| Output Current Setting Range with Constant Power | | | | |
| ESM-320S105Dx | 700 mA | - | 1050 mA | |
| ESM-320S150Dx | 1050 mA | - | 1500 mA | |
| ESM-320S250Dx | 1750 mA | - | 2500 mA | |
| ESM-320S500Dx | 2850 mA | - | 5000 mA | |
| ESM-320S760Dx | 5350 mA | - | 7600 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 | | | | |
| ESM-320S105Dx | - | - | 500 V | |
| ESM-320S150Dx | - | - | 340 V | |
| ESM-320S250Dx | - | - | 210 V | |
| ESM-320S500Dx | - | - | 120 V | |
| ESM-320S760Dx | - | - | 70 V | |
| Line Regulation | - | - | ±0.5% | Measured at 100% load |
| Load Regulation | - | - | ±1.5% | |

Output Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes |
|---|------|----------|-------|--|
| Turn-on Delay Time | - | - | 0.5 s | Measured at 277-480Vac input, 60%-100%load |
| Temperature Coefficient of I _o set | - | 0.03%/°C | - | Case temperature = 0°C~T _c max |

General Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|---|--|--|--|--|
| Efficiency at 277 Vac input: ESM-320S105Dx I _o = 700 mA I _o =1050 mA ESM-320S150Dx I _o =1050 mA I _o =1500 mA ESM-320S250Dx I _o =1750 mA I _o =2500 mA ESM-320S500Dx I _o =2850 mA I _o =5000 mA ESM-320S760Dx I _o =5350 mA I _o =7600 mA | 92.0% 91.0% 92.0% 92.0% 92.0% 91.0% 91.5% 90.0% 90.5% 90.0% | 94.0% 93.0% 94.0% 94.0% 94.0% 93.0% 93.5% 92.0% 92.5% 92.0% | - - - - - - - - - - | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| Efficiency at 400 Vac input: ESM-320S105Dx I _o = 700 mA I _o =1050 mA ESM-320S150Dx I _o =1050 mA I _o =1500 mA ESM-320S250Dx I _o =1750 mA I _o =2500 mA ESM-320S500Dx I _o =2850 mA I _o =5000 mA ESM-320S760Dx I _o =5350 mA I _o =7600 mA | 93.0% 92.0% 92.5% 92.5% 93.0% 92.0% 92.5% 90.5% 91.5% 90.5% | 95.0% 94.0% 94.5% 94.5% 95.0% 94.0% 94.5% 92.5% 93.5% 92.5% | - - - - - - - - - - | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| Efficiency at 480 Vac input: ESM-320S105Dx I _o = 700 mA I _o =1050 mA ESM-320S150Dx I _o =1050 mA I _o =1500 mA ESM-320S250Dx I _o =1750 mA I _o =2500 mA ESM-320S500Dx I _o =2850 mA I _o =5000 mA ESM-320S760Dx I _o =5350 mA I _o =7600 mA | 93.0% 92.0% 93.0% 92.5% 93.0% 92.0% 92.5% 90.5% 91.5% 91.5% | 95.0% 94.0% 95.0% 94.5% 95.0% 94.0% 94.5% 92.5% 93.5% 93.5% | - - - - - - - - - - | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |

General Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes |
|--|---------------------------------------|---------------|-------|--|
| MTBF | - | 296,000 Hours | - | Measured at 480Vac input, 80%load and 25°C ambient temperature (MIL-HDBK-217F) |
| Lifetime | - | 104,000 Hours | - | Measured at 480Vac 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 | - | +80°C | Case temperature for 5 years warranty Humidity: 10% RH to 95% RH; |
| Storage Temperature | -40°C | - | +85°C | Humidity: 5%RH to 95%RH; |
| Dimensions: Inches (L × W × H) Millimeters (L × W × H) | 8.82 × 3.15 × 1.75 224 × 80 × 44.5 | | | With mounting ear 9.57 × 3.15 × 1.75 243 × 80 × 44.5 |
| Net Weight | - | 1530 g | - | |

Dimming Specifications

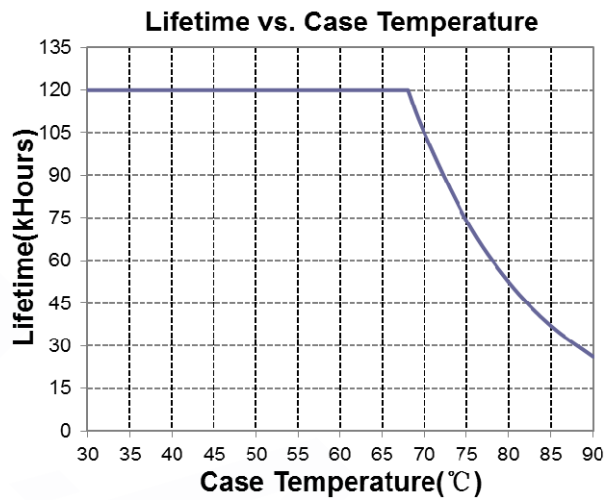
| Parameter | Min. | Typ. | Max. | Notes | |
|--|---|---|--------|---|--|
| Absolute Maximum Voltage on the Vdim (+) Pin | -20 V | - | 20 V | | |
| Source Current on Vdim (+)Pin | 200 µA | 300 µA | 450 µA | Vdim(+) = 0 V | |
| Dimming Output Range | ESM-320S105Dx ESM-320S150Dx ESM-320S250Dx ESM-320S500Dx ESM-320S760Dx | 10%loset | - | loset | 700 mA ≤ loset ≤ 1050 mA 1050 mA ≤ loset ≤ 1500 mA 1750 mA ≤ loset ≤ 2500 mA 2850 mA ≤ loset ≤ 5000 mA 5350 mA ≤ loset ≤ 7600 mA |
| | ESM-320S105Dx ESM-320S150Dx ESM-320S250Dx ESM-320S500Dx ESM-320S760Dx | 70 mA 105 mA 175 mA 285 mA 535 mA | - | loset | 70 mA ≤ loset < 700 mA 105 mA ≤ loset < 1050 mA 175 mA ≤ loset < 1750 mA 285 mA ≤ loset < 2850 mA 535 mA ≤ loset < 5350 mA |
| Recommended Dimming Range for 1-10V | 1 V | - | 9 V | Default 1-10V dimming mode with positive logic. | |
| PWM_in High Level | - | 10 V | - | | |
| PWM_in Low Level | - | 0 V | - | | |
| PWM_in Frequency Range | 200 Hz | - | 2 KHz | | |
| PWM_in Duty Cycle | 0% | - | 100% | | |

Safety & EMC Compliance

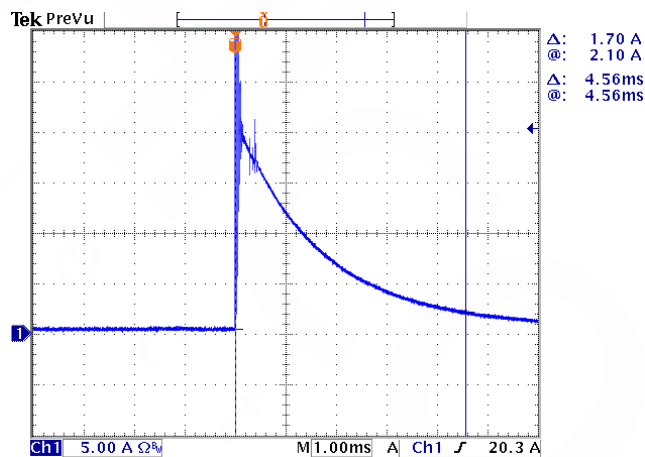
| Safety Category | Standard |
|----------------------------|---|
| UL/CUL | UL8750,CAN/CSA-C22.2 No. 250.13 |
| ENEC & CE | EN 61347-1, EN61347-2-13 |
| CB | IEC 61347-1, IEC 61347-2-13 |
| EMI Standards | Notes |
| EN 55015 ⁽¹⁾ | Conducted emission Test & Radiated emission Test |
| EN 61000-3-2 | Harmonic current emissions |
| EN 61000-3-3 | Voltage fluctuations & flicker |
| FCC Part 15 ⁽¹⁾ | 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. |
| 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 |
| 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 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.

Lifetime vs. Case Temperature

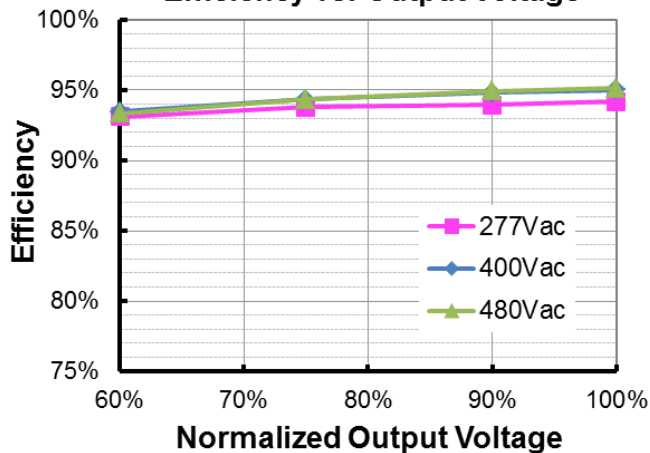


Inrush Current Waveform

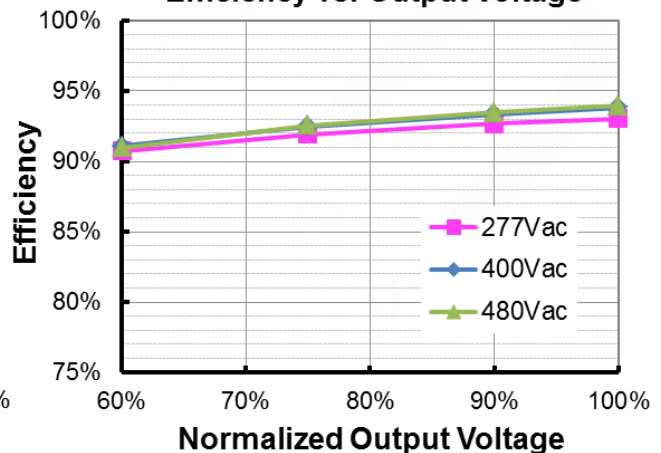


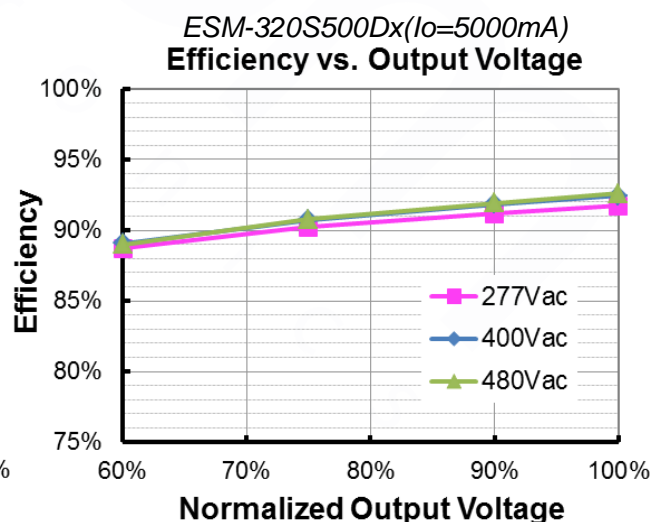
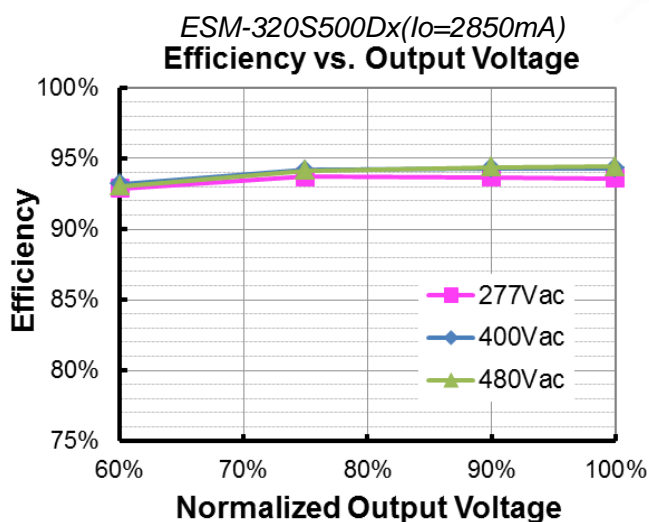
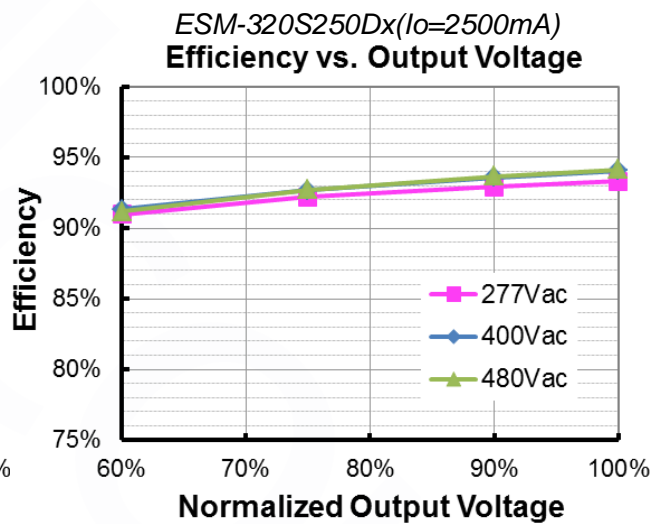
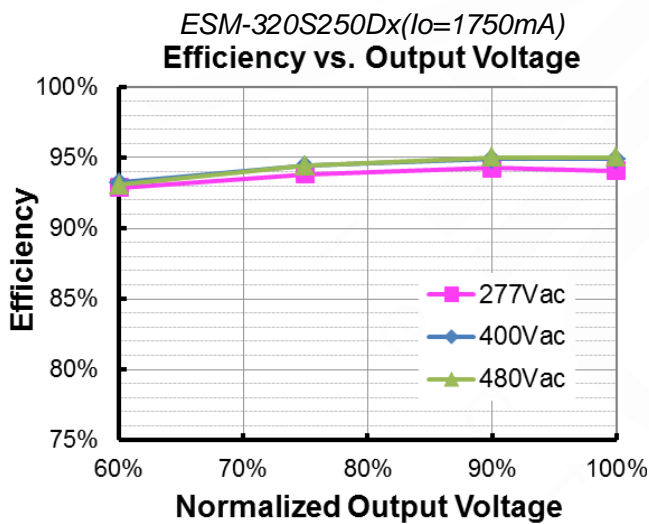
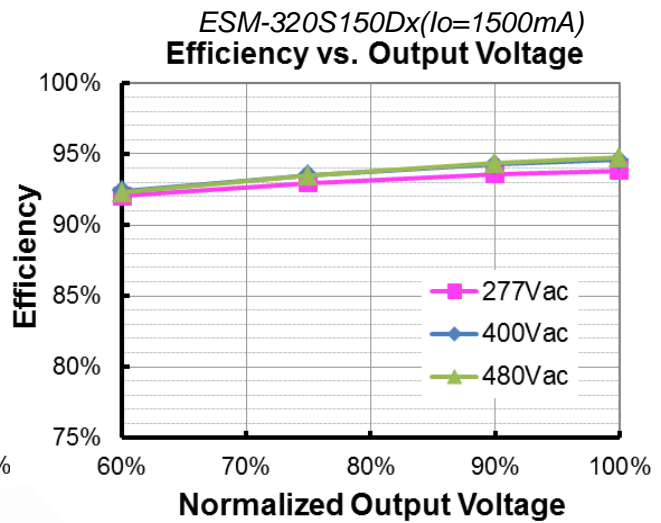
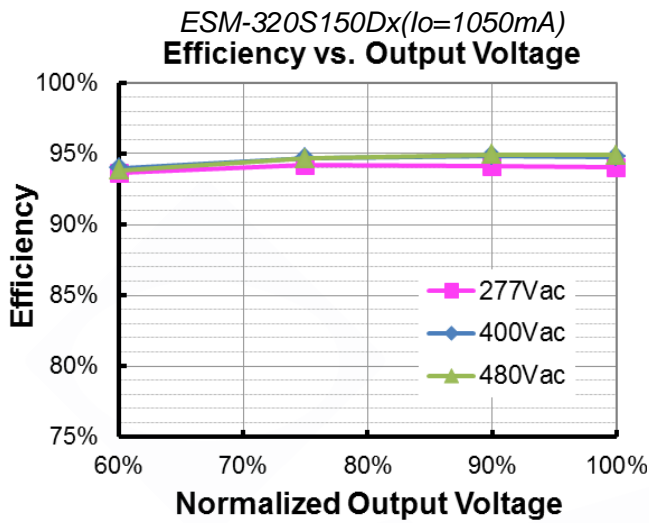
Efficiency vs. Load

ESM-320S105Dx (I_o=700mA)
Efficiency vs. Output Voltage

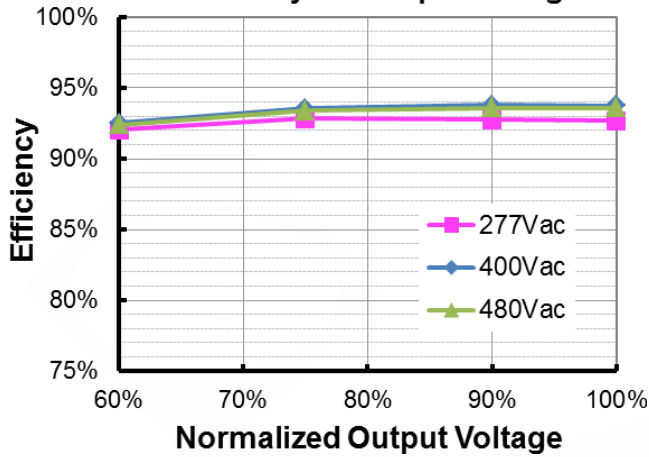


ESM-320S105Dx (I_o=1050mA)
Efficiency vs. Output Voltage

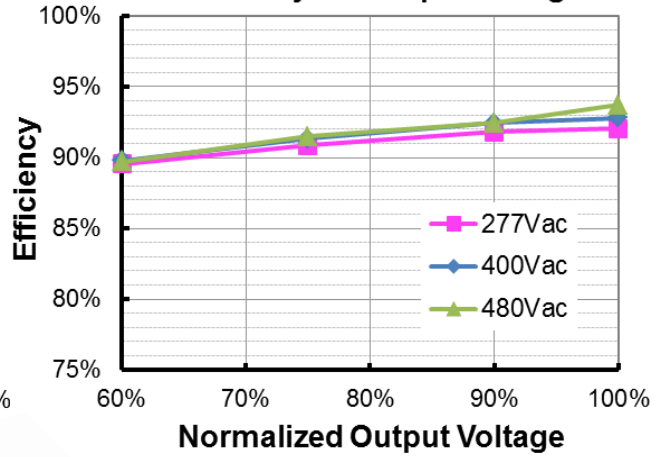




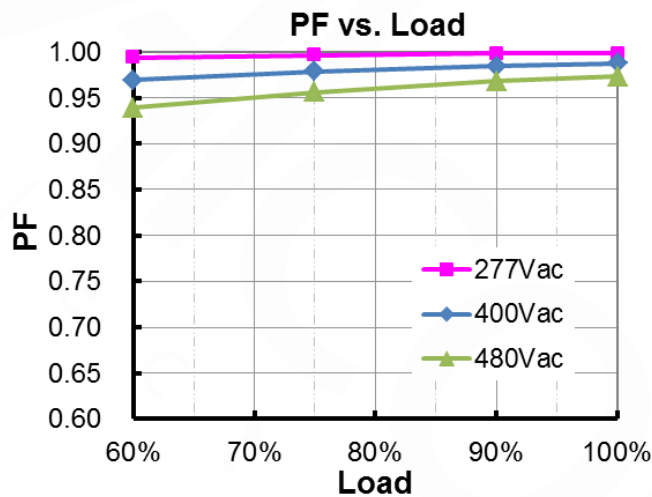
ESM-320S760Dx(Io=5350mA)
Efficiency vs. Output Voltage



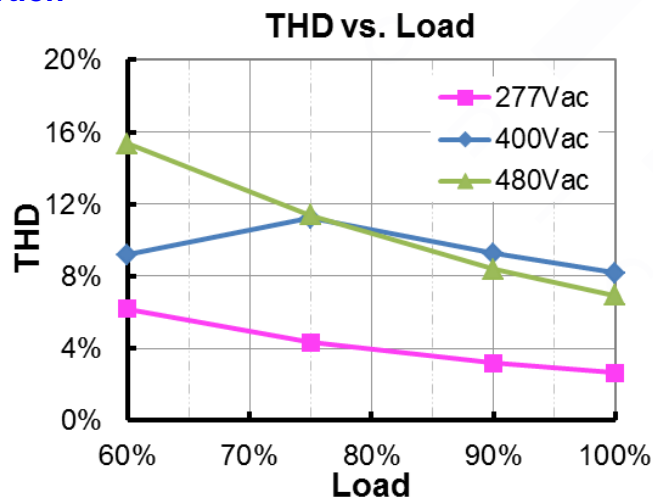
ESM-320S760Dx(Io=7600mA)
Efficiency vs. Output Voltage



Power Factor



Total Harmonic Distortion



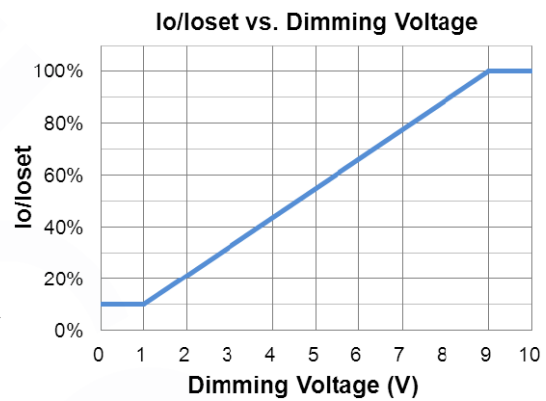
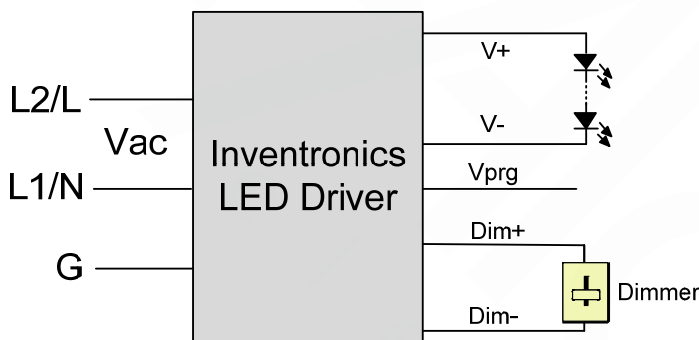
Protection Functions

| Parameter | Notes |
|-----------------------------|--|
| 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. |

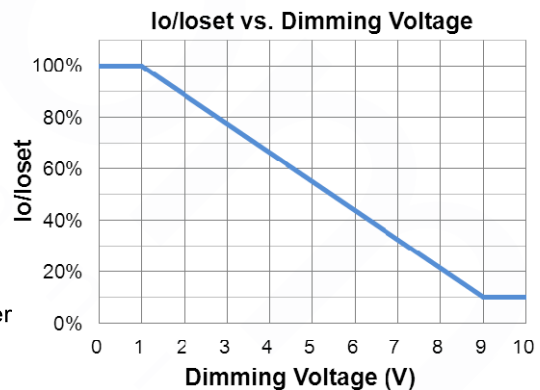
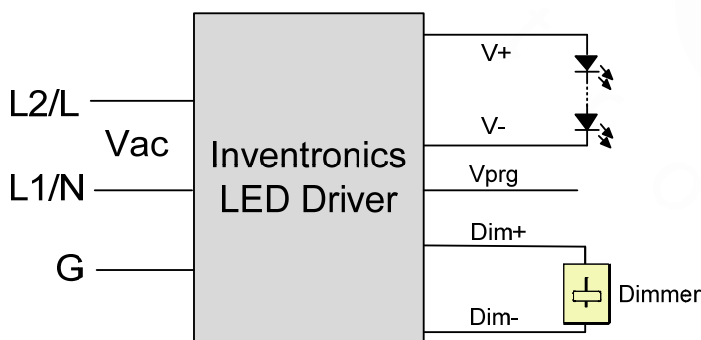
Dimming

● 1-10V Dimming

The recommended implementation of the dimming control is provided below.



Implementation 1: Positive logic



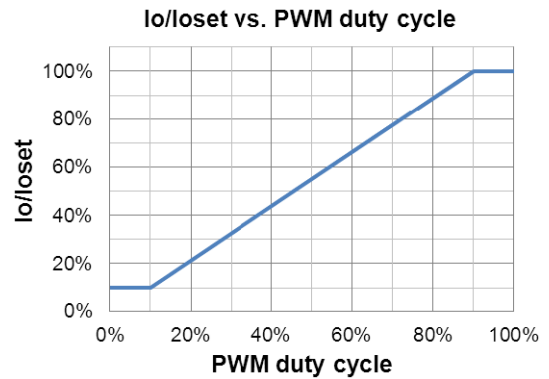
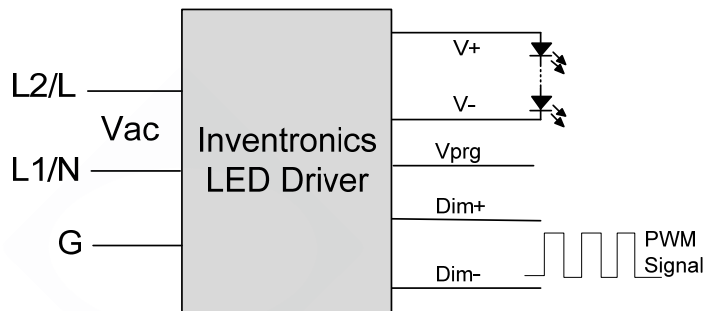
Implementation 2: Negative logic

Notes:

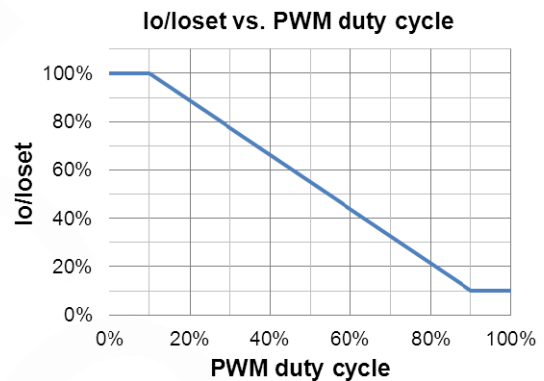
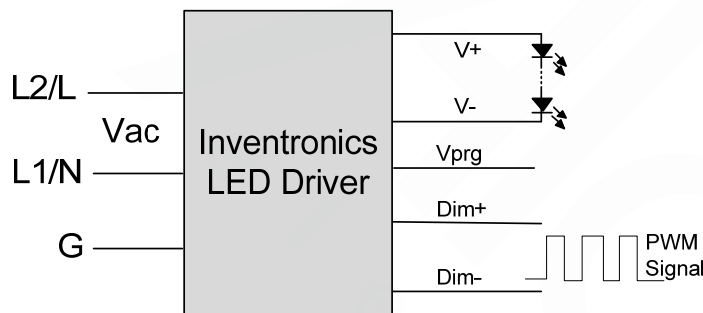
1. Do NOT connect Dim- to the output V- or V+, otherwise the driver will not work properly.
2. The dimmer can also be replaced by an active 1-10V voltage source signal or passive components like zener.
3. When 1-10V negative logic dimming mode and Dim+ is open, the driver will output minimum current.

● 10V PWM Dimming

The recommended implementation of the dimming control is provided below.



Implementation 3: Positive logic



Implementation 4: Negative logic

Notes:

1. Do NOT connect Dim- to the output V- or V+, otherwise the driver will not work properly.
2. When PWM negative logic dimming mode and Dim+ is open, the driver will output minimum current.

● 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

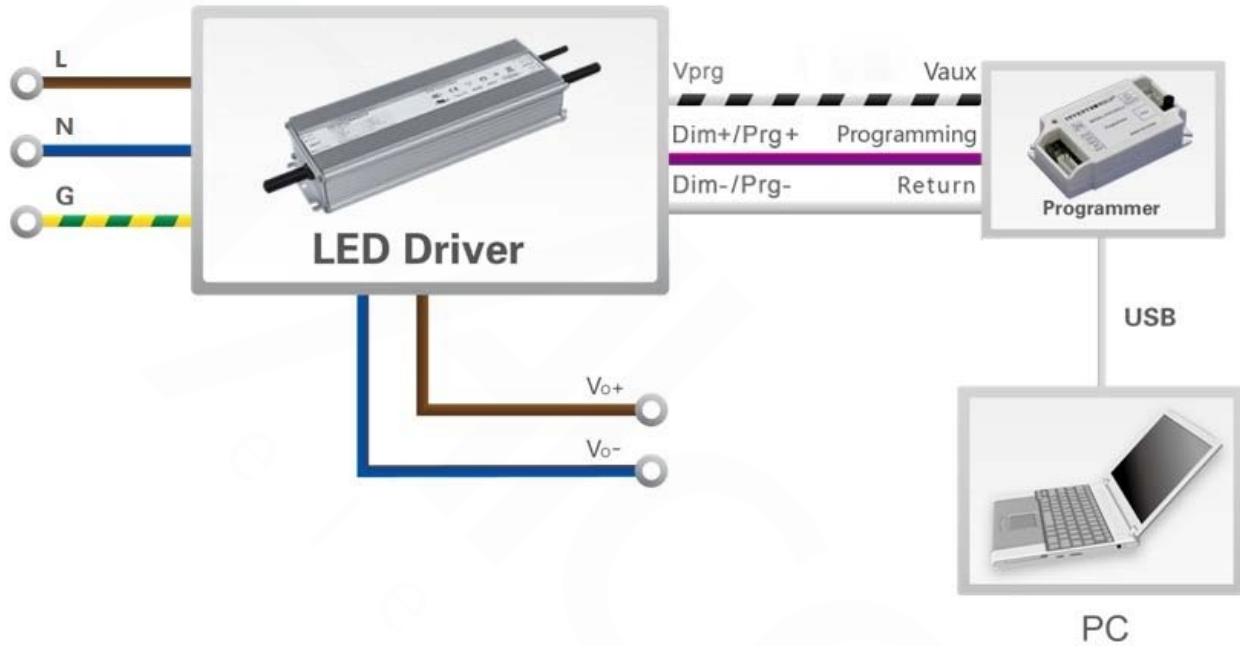
Output Lumen Compensation (OLC) may be used to maintain constant light output over the life of the LEDs by driving them at a reduced current when new, then gradually increasing the drive current over time to counteract LED lumen degradation.

● **End Of Life**

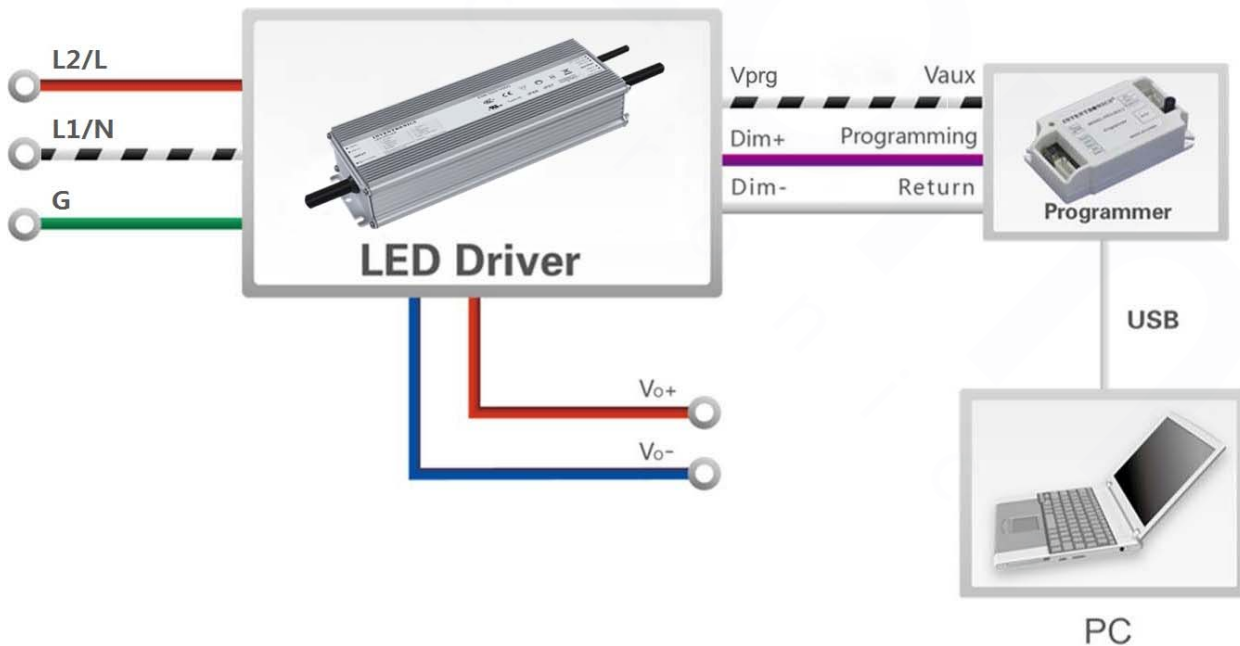
End-of-Life (EOL) is providing a visual notification to a user that the LED module has reached the end of manufacturer-specified life and that the replacement is recommended. Once active, an indication is given at each power-up of the driver, which the driver indicates this through a lower light output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

Programming Connection Diagram

ESM-320SxxxDG



ESM-320SxxxDT



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

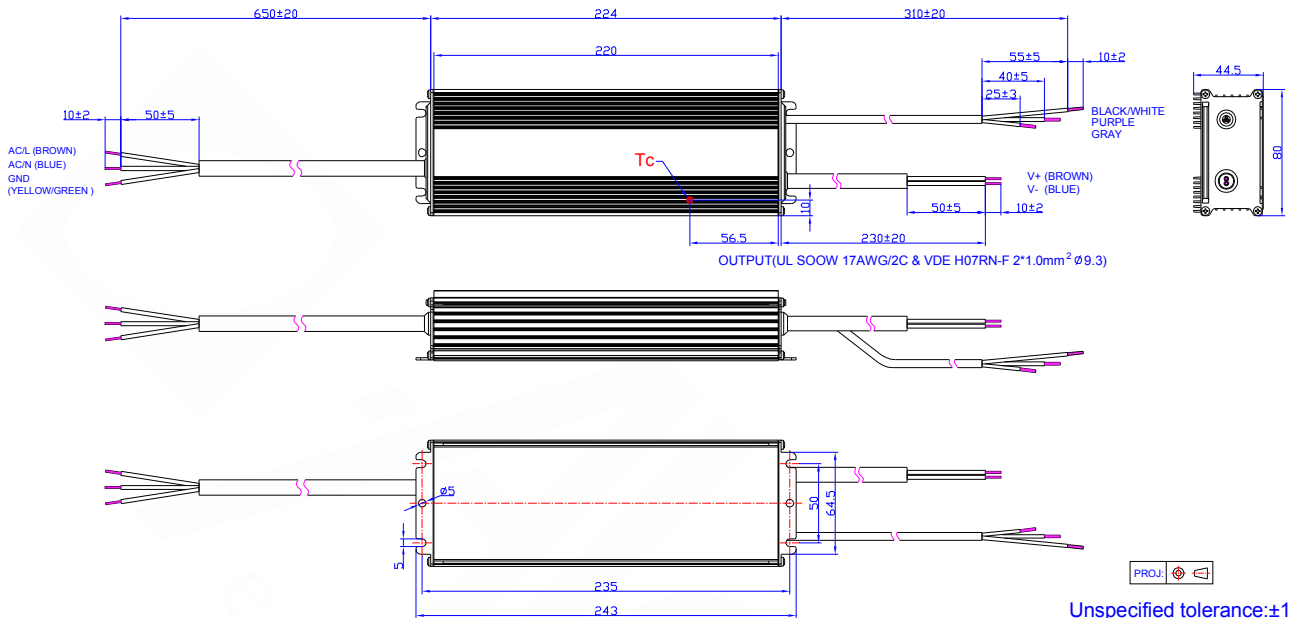
● Please refer to [PRG-MUL2](#) (Programmer) datasheet for details.

Mechanical Outline

ESM-320S105/150DG

INPUT(UL SOOW 17AWG/3C & VDE H07RN-F 3*1.0mm² Ø9.8)

Dimming Wire(UL21996 22AWG/3C Ø5.0)

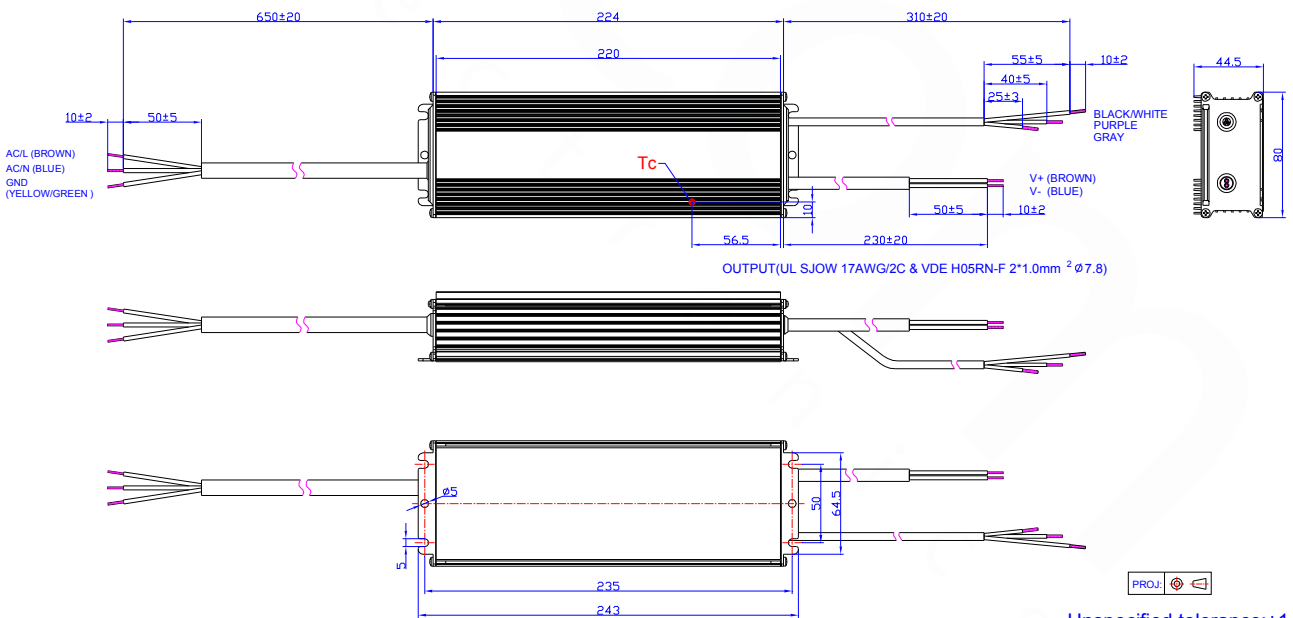


Unspecified tolerance: ±1

ESM-320S250/500/760DG

INPUT(UL SOOW 17AWG/3C & VDE H07RN-F 3*1.0mm² Ø9.8)

Dimming Wire(UL21996 22AWG/3C Ø5.0)

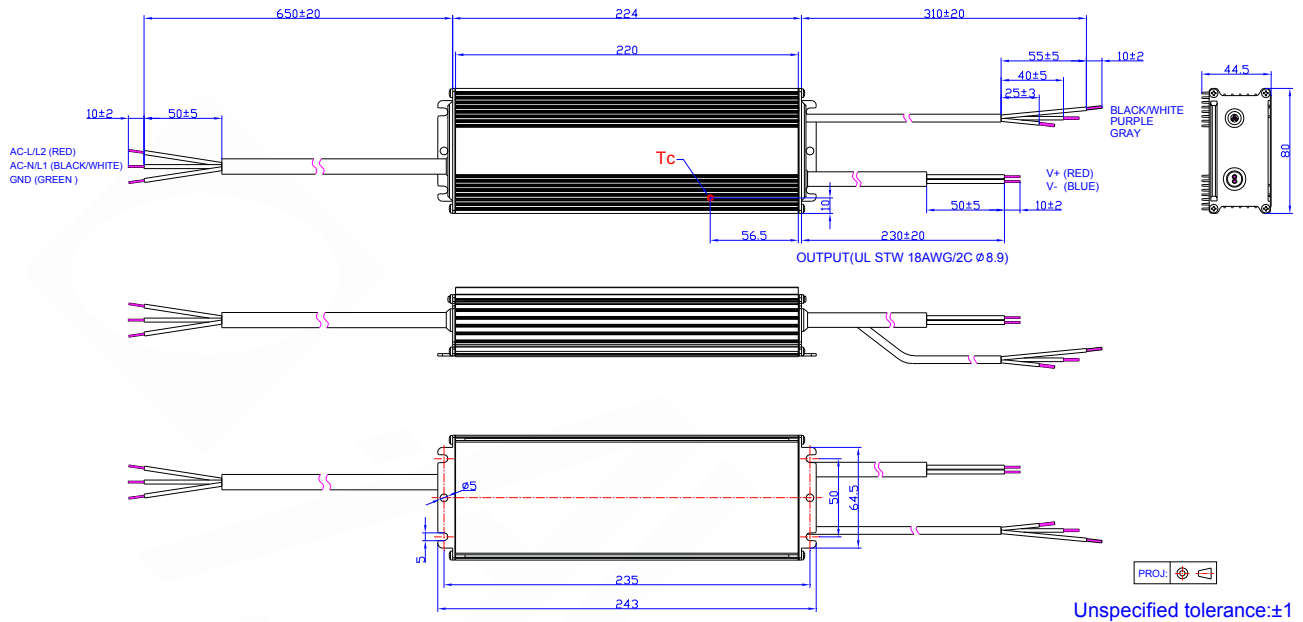


Unspecified tolerance: ±1

ESM-320S105/150DT

INPUT(UL STW 18AWG/3C Ø9.5)

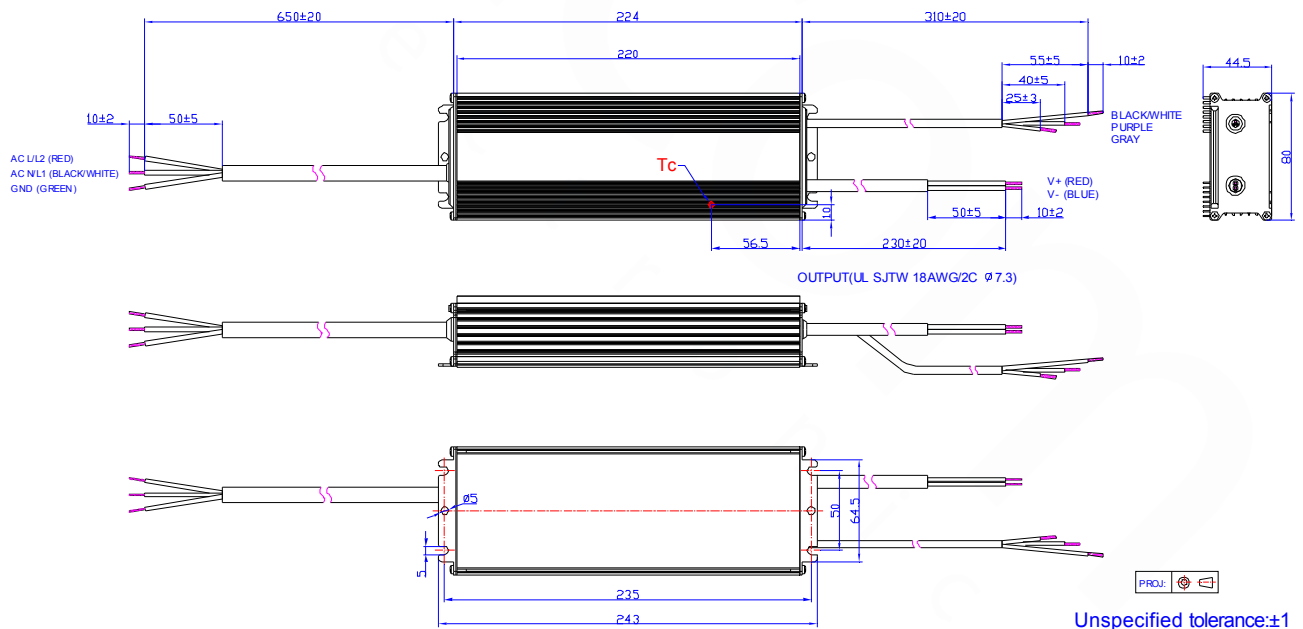
Dimming Wire(UL21996 22AWG/3C Ø5.0)



ESM-320S250/500/760DT

INPUT(UL STW 18AWG/3C Ø9.5)

Dimming Wire(UL21996 22AWG/3C Ø5.0)



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 |
| 2020-08-17 | A | Datasheet Release | / | / |