

Features

- Ultra High Efficiency (Up to 95%)
- Full Power at Wide Output Current Range (Constant Power)
- Thermal Sensing and Protection for LED Module
- Isolated 0-10V/PWM/3-Timer-Modes Dimmable
- Dim-to-Off with Standby Power \leq 1.5W
- Output Lumen Compensation
- Input Surge Protection: DM 6kV, CM 10kV
- All-Around Protection: OVP, SCP, OTP
- IP67
- SELV Output
- 5 Years Warranty



Description

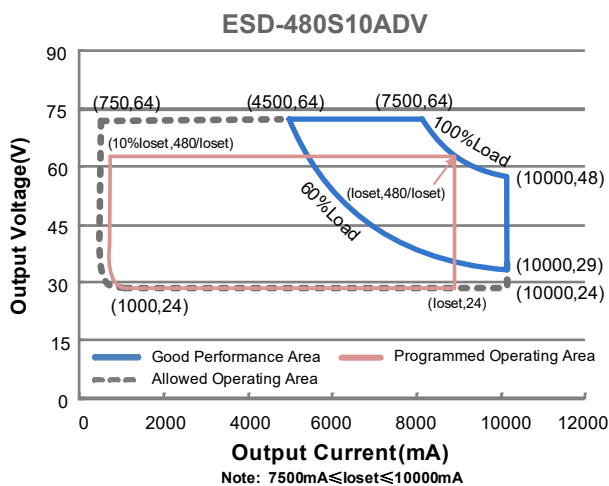
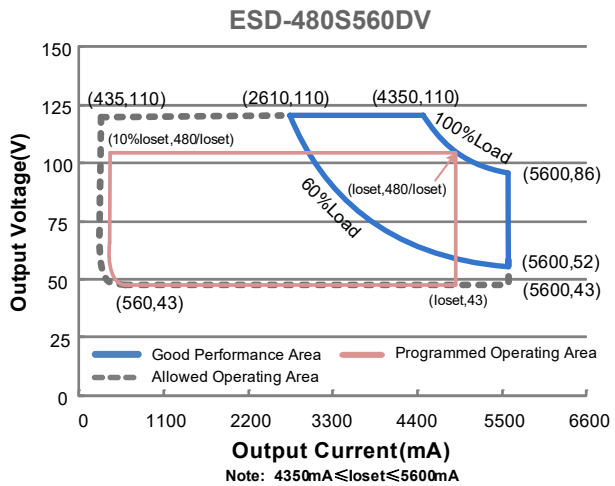
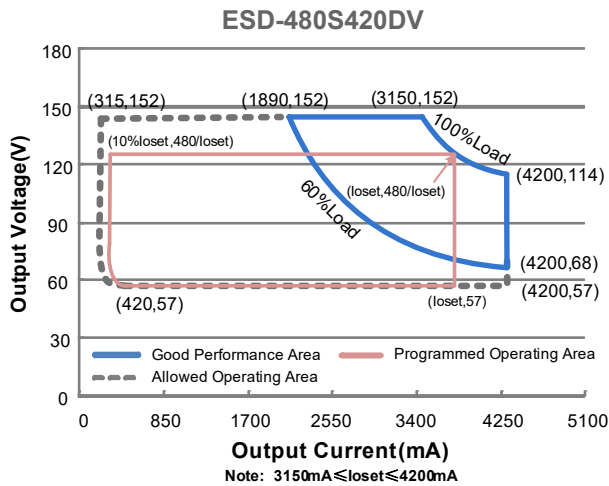
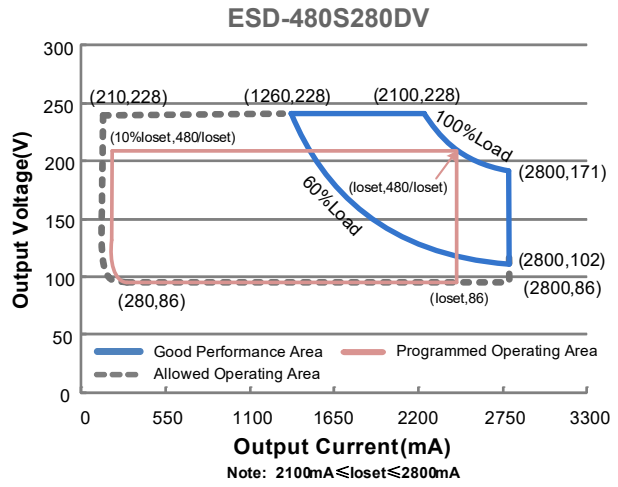
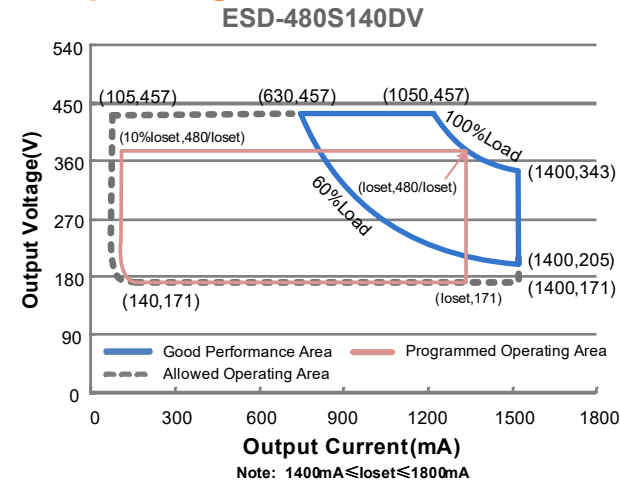
The ESD-480SxxxDV series is a 480W, constant-current, programmable LED driver that operates from 249-528 Vac input with excellent power factor. It is created for many lighting applications including high bay, high mast, aquaculture and sports, etc, it provides a dim-to-off mode with low standby power. 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(A) | Full-Power Current Range(A) ⁽¹⁾ | Default Output Current(A) | Output Voltage Range(Vdc) | Max. Output Power(W) | Typical Efficiency ⁽²⁾ | Typical Power Factor | | Model Number ⁽³⁾ |
|------------------------------------|--|---------------------------|---------------------------|----------------------|-----------------------------------|----------------------|--------|------------------------------|
| | | | | | | 277Vac | 480Vac | |
| 0.105-1.40 | 1.05A-1.40 | 1.4 | 171-457 | 480 | 95.0% | 0.96 | 0.95 | ESD-480S140DV |
| 0.210-2.80 | 2.10-2.80 | 2.8 | 86-228 | 480 | 94.5% | 0.96 | 0.95 | ESD-480S280DV |
| 0.315-4.20 | 3.15-4.20 | 4.2 | 57-152 | 480 | 94.0% | 0.96 | 0.95 | ESD-480S420DV |
| 0.435-5.60 | 4.35-5.60 | 5.6 | 43-110 | 480 | 93.5% | 0.96 | 0.95 | ESD-480S560DV ⁽⁴⁾ |
| 0.750-10.0 | 7.50-10.0 | 10.0 | 24-64 | 480 | 93.5% | 0.96 | 0.95 | ESD-480S10ADV ⁽⁴⁾ |

- Notes:** (1) Output current range with constant power at 480W.
 (2) Measured at 100% load and 480Vac input (see below "General Specifications" for details).
 (3) Certified input voltage range: 277-480Vac or 352-500Vdc.
 (4) SELV output.

I-V Operating 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 | - | - | 0.70 mA | IEC 60598-1; 480Vac/60Hz |
| Input AC Current | - | - | 2.09 A | Measured at 100% load and 277 Vac input. |
| | - | - | 1.21 A | Measured at 100% load and 480 Vac input. |
| Inrush Current(I ² t) | - | - | 13.8 A ² s | At 480Vac input, 25°C cold start, duration=840 μs, 10%I _{pk} -10%I _{pk} . See Inrush Current Waveform for the details. |
| PF | 0.90 | - | - | At 277-480Vac, 50-60Hz, 60%-100% load (288-480W) |
| 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 | | | | |
| ESD-480S140DV | 105 mA | - | 1400 mA | |
| ESD-480S280DV | 210 mA | - | 2800 mA | |
| ESD-480S420DV | 315 mA | - | 4200 mA | |
| ESD-480S560DV | 435 mA | - | 5600 mA | |
| ESD-480S10ADV | 750 mA | - | 10000 mA | |
| Output Current Setting Range with Constant Power | | | | |
| ESD-480S140DV | 1050 mA | - | 1400 mA | |
| ESD-480S280DV | 2100 mA | - | 2800 mA | |
| ESD-480S420DV | 3150 mA | - | 4200 mA | |
| ESD-480S560DV | 4350 mA | - | 5600 mA | |
| ESD-480S10ADV | 7500 mA | - | 10000 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 | | | | |
| ESD-480S140DV | - | - | 500 V | |
| ESD-480S280DV | - | - | 280 V | |
| ESD-480S420DV | - | - | 190 V | |
| ESD-480S560DV | - | - | 120 V | |
| ESD-480S10ADV | - | - | 80 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 |
| 12V Auxiliary Output Voltage | 10.8 V | 12 V | 13.2 V | |
| 12V Auxiliary Output Source Current | 0 mA | - | 200 mA | Return terminal is "Dim" |
| 12V Auxiliary Output Transient Peak Current | - | - | 400 mA | 400mA peak for a maximum duration of 300ms in a 2s period during which time the average should not exceed 200mA. |

General Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|------------------------------|-------|-------|------|-------|
| Efficiency at 277 Vac input: | | | | |
| ESD-480S140DV | | | | |
| I _o = 1050 mA | 92.0% | 94.0% | - | |
| I _o = 1400 mA | 91.5% | 93.5% | - | |
| ESD-480S280DV | | | | |
| I _o = 2100 mA | 91.5% | 93.5% | - | |
| I _o = 2800 mA | 90.5% | 92.5% | - | |
| ESD-480S420DV | | | | |
| I _o = 3150 mA | 91.0% | 93.0% | - | |
| I _o = 4200 mA | 90.5% | 92.5% | - | |
| ESD-480S560DV | | | | |
| I _o = 4350 mA | 90.5% | 92.5% | - | |
| I _o = 5600 mA | 90.0% | 92.0% | - | |
| ESD-480S10ADV | | | | |
| I _o = 7500 mA | 90.5% | 92.5% | - | |
| I _o = 10000 mA | 89.0% | 91.0% | - | |
| Efficiency at 347 Vac input: | | | | |
| ESD-480S140DV | | | | |
| I _o = 1050 mA | 92.5% | 94.5% | - | |
| I _o = 1400 mA | 92.0% | 94.0% | - | |
| ESD-480S280DV | | | | |
| I _o = 2100 mA | 92.0% | 94.0% | - | |
| I _o = 2800 mA | 91.0% | 93.0% | - | |
| ESD-480S420DV | | | | |
| I _o = 3150 mA | 91.5% | 93.5% | - | |
| I _o = 4200 mA | 91.0% | 93.0% | - | |
| ESD-480S560DV | | | | |
| I _o = 4350 mA | 91.0% | 93.0% | - | |
| I _o = 5600 mA | 90.5% | 92.5% | - | |
| ESD-480S10ADV | | | | |
| I _o = 7500 mA | 91.0% | 93.0% | - | |
| I _o = 10000 mA | 89.5% | 91.5% | - | |

General Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes |
|--|--|--|--|--|
| Efficiency at 480 Vac input: ESD-480S140DV I _o = 1050 mA I _o = 1400 mA ESD-480S280DV I _o = 2100 mA I _o = 2800 mA ESD-480S420DV I _o = 3150 mA I _o = 4200 mA ESD-480S560DV I _o = 4350 mA I _o = 5600 mA ESD-480S10ADV I _o = 7500 mA I _o = 10000 mA | 93.0% 92.0% 92.5% 91.5% 92.0% 91.0% 91.5% 91.0% 91.5% 89.5% | 95.0% 94.0% 94.5% 93.5% 94.0% 93.0% 93.5% 93.0% 93.5% 91.5% | - - - - - - - - - - | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| Standby Power | - | - | 1.5 W | Measured at 480Vac/50Hz; Dimming off |
| MTBF | - | 210,000 Hours | - | Measured at 480Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F) |
| Lifetime | - | 102,000 Hours | - | Measured at 480Vac input, 80%Load and 70°C case temperature; See lifetime vs. T _c curve for the details |
| Operating Case Temperature for Safety T _{c_s} | -40°C | - | +85°C | |
| Operating Case Temperature for Warranty T _{c_w} | -40°C | - | +75°C | |
| Storage Temperature | -40°C | - | +85°C | Humidity: 5%RH to 100%RH |
| Dimensions Inches (L × W × H) Millimeters (L × W × H) | 9.25 x 4.92 x 1.71 235 x 125 x 43.5 | | | With mounting ear 10.3 x 4.92 x 1.71 262 x 125 x 43.5 |
| Net Weight | - | 2650 g | - | |

Dimming Specifications

| Parameter | Min. | Typ. | Max. | Notes | |
|--|---|--|--------|----------------------------|---|
| Absolute Maximum Voltage on the V _{dim} (+) Pin | -20 V | - | 20 V | | |
| Source Current on V _{dim} (+)Pin | 200 μA | 300 μA | 450 μA | V _{dim} (+) = 0 V | |
| Dimming Output Range | ESD-480S140DV ESD-480S280DV ESD-480S420DV ESD-480S560DV ESD-480S10ADV | 10%I _o set | - | I _o set | 1050mA ≤ I _o set ≤ 1400mA 2100mA ≤ I _o set ≤ 2800mA 3150mA ≤ I _o set ≤ 4200mA 4350mA ≤ I _o set ≤ 5600mA 7500mA ≤ I _o set ≤ 10000mA |
| | ESD-480S140DV ESD-480S280DV ESD-480S420DV ESD-480S560DV ESD-480S10ADV | 105 mA 210 mA 315 mA 435 mA 750 mA | - | I _o set | 105mA ≤ I _o set < 1050mA 210mA ≤ I _o set < 2100mA 315mA ≤ I _o set < 3150mA 435mA ≤ I _o set < 4350mA 750mA ≤ I _o set < 7500mA |

Dimming Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes |
|-----------------------------------|--------|-------|--------|---|
| 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 Inventronics programming software. |
| 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) | 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 |
|-----------------------------|--|
| CE | EN 61347-1, EN 61347-2-13 |
| CB | IEC 61347-1, IEC 61347-2-13 |
| EMI Standards | Notes |
| EN IEC 55015 ⁽¹⁾ | Conducted emission Test & Radiated emission Test |
| EN IEC 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 |
| 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 ⁽²⁾ |
| EN 61000-4-6 | Conducted Radio Frequency Disturbances Test-CS |

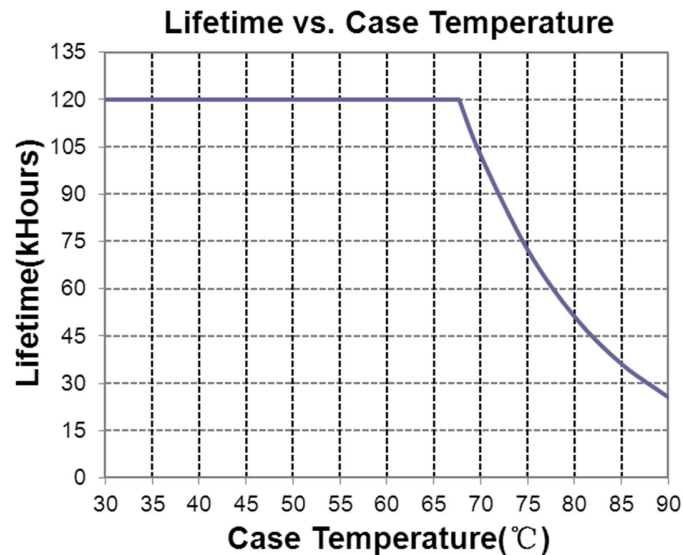
Safety & EMC Compliance (Continued)

| EMS Standards | Notes |
|---------------|---|
| EN 61000-4-8 | Power Frequency Magnetic Field Test |
| EN 61000-4-11 | Voltage Dips |
| EN 61547 | Electromagnetic Immunity Requirements Applies To Lighting Equipment |

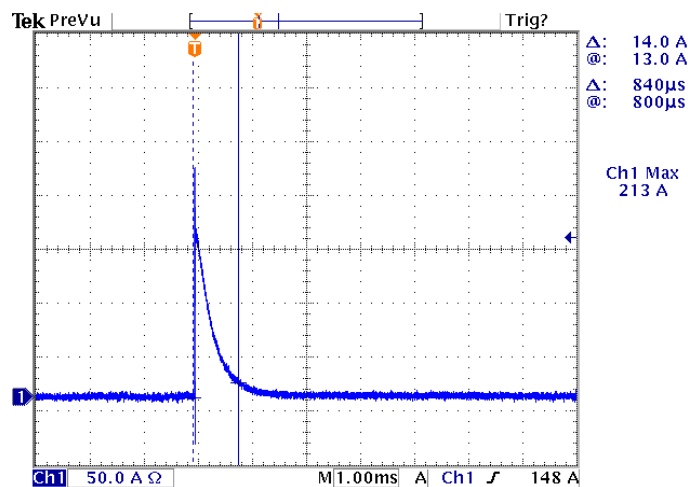
Note: (1) This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

(2) To perform electric strength (hi-pot) testing, the “GDT ground disconnect” (nut and metal lock sheet) on the driver end-cap should be removed temporarily to prevent the internal gas discharge tube from conducting (as allowed by IEC 60598-1 Clause 10.2). After testing is completed, these items must be reinstalled to restore line-to-earth surge protection and secure the end cap.

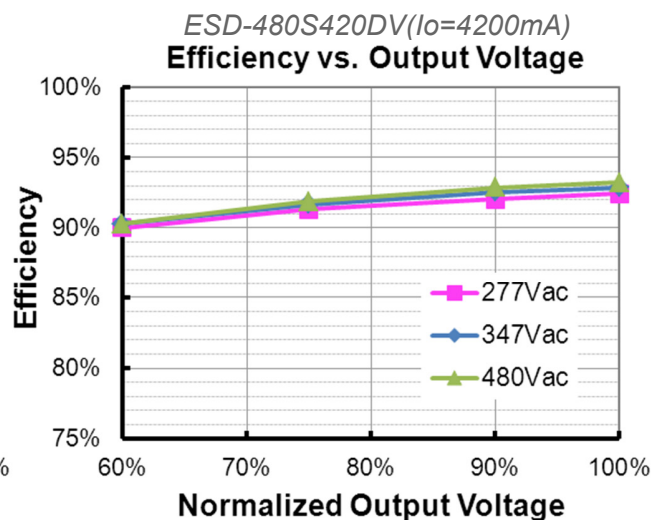
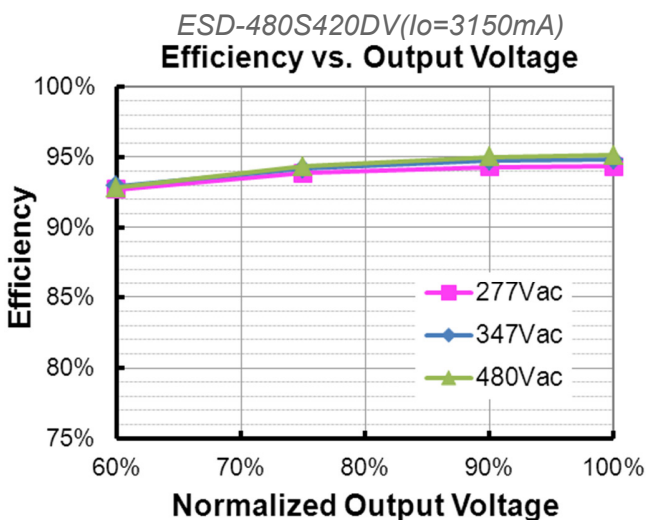
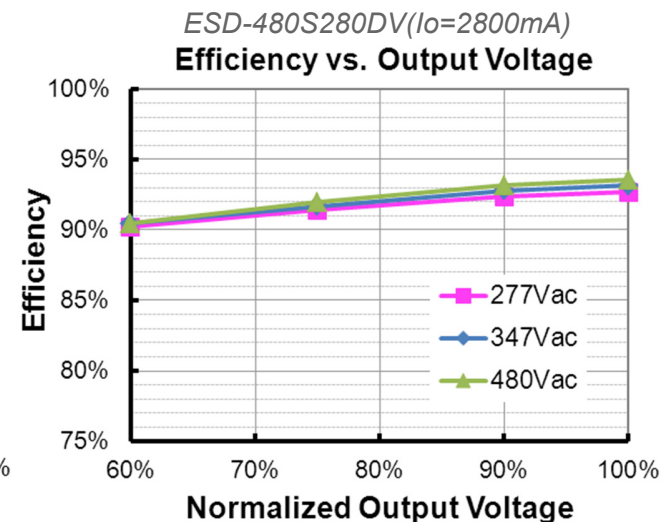
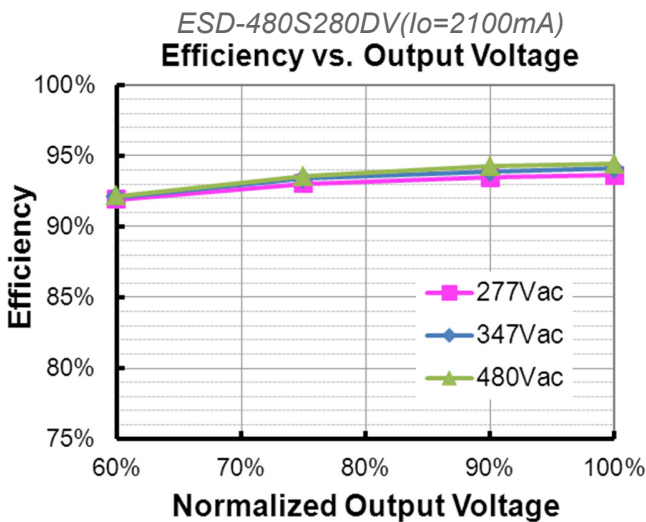
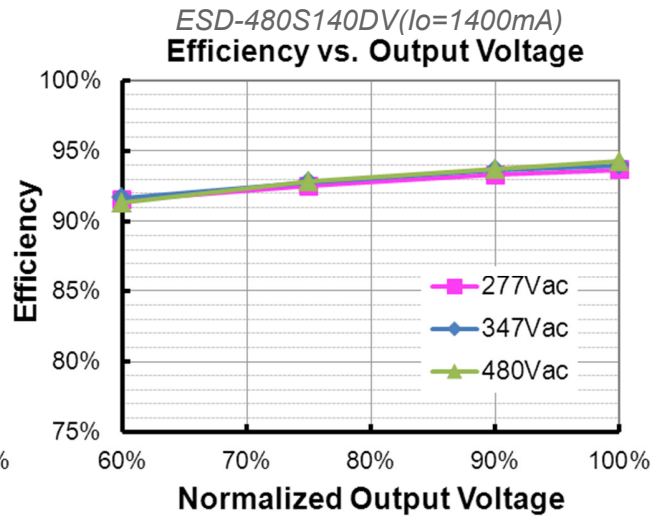
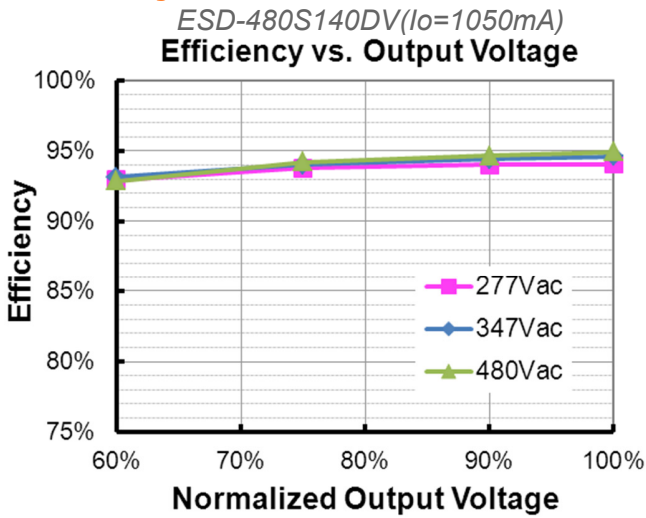
Lifetime vs. Case Temperature



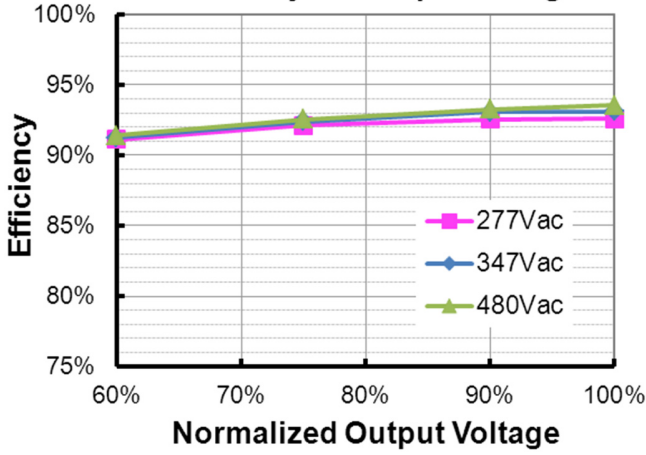
Inrush Current Waveform



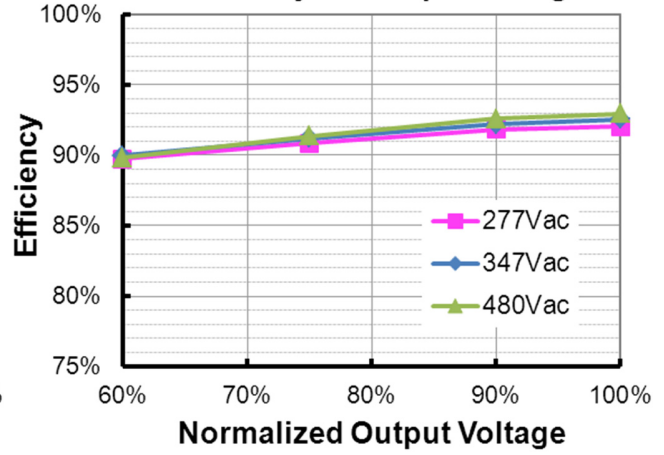
Efficiency vs. Load



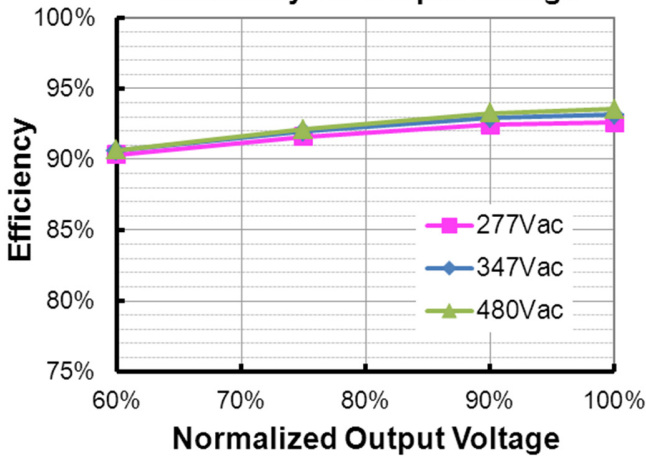
ESD-480S560DV($I_o=4350mA$)
Efficiency vs. Output Voltage



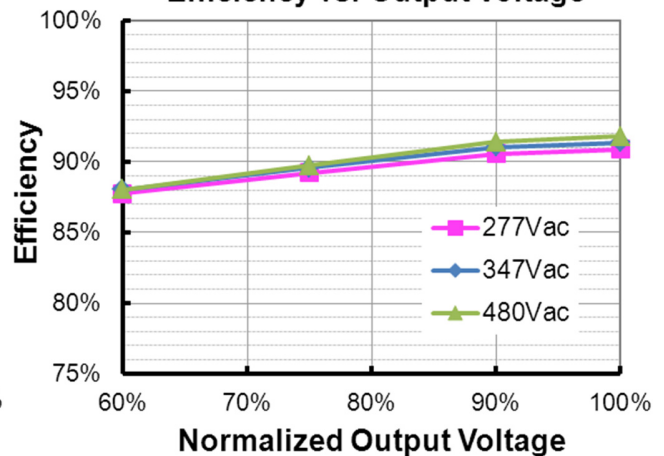
ESD-480S560DV($I_o=5600mA$)
Efficiency vs. Output Voltage



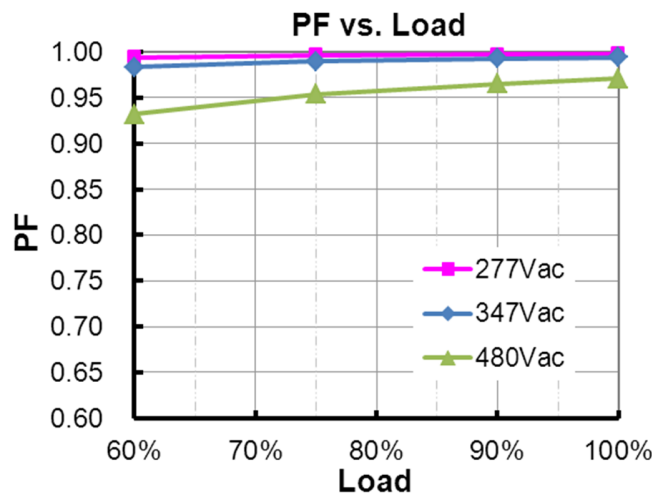
ESD-480S10ADV($I_o=7500mA$)
Efficiency vs. Output Voltage



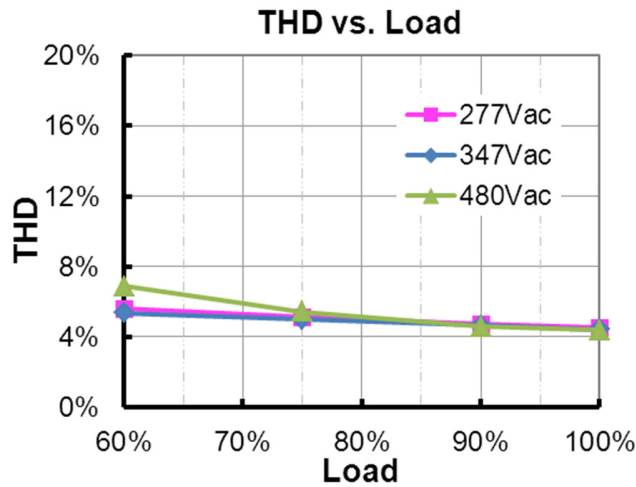
ESD-480S10ADV($I_o=10000mA$)
Efficiency vs. Output Voltage



Power Factor



Total Harmonic Distortion



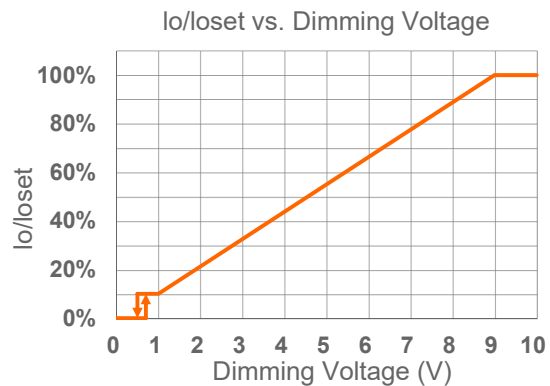
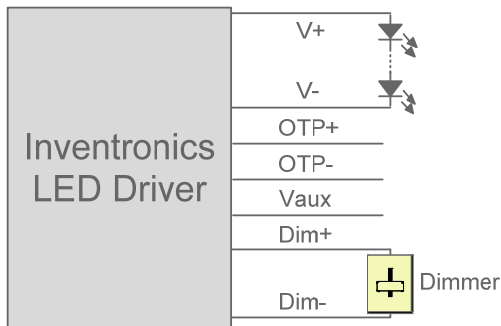
Protection Functions

| 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.



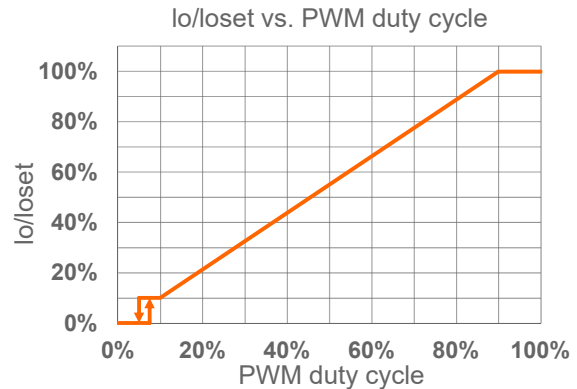
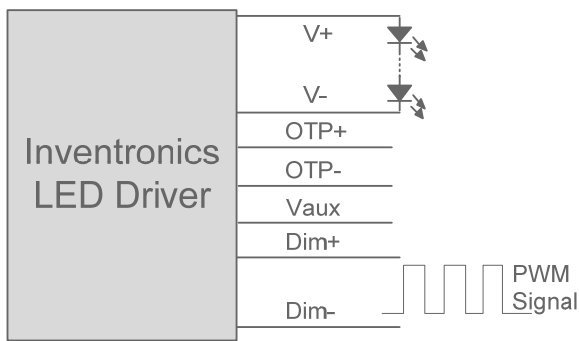
Implementation 1: DC Input

Notes:

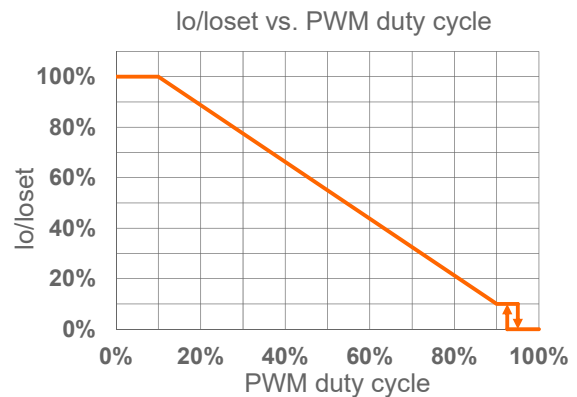
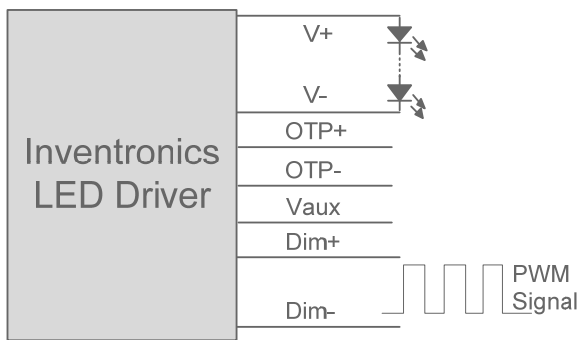
1. Do NOT connect Dim- to the output V- or V+, otherwise the driver will not work properly.
2. The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like zener.

● **PWM Dimming**

The recommended implementation of the dimming control is provided below.



Implementation 2: Positive logic



Implementation 3: Negative logic

● **Time Dimming**

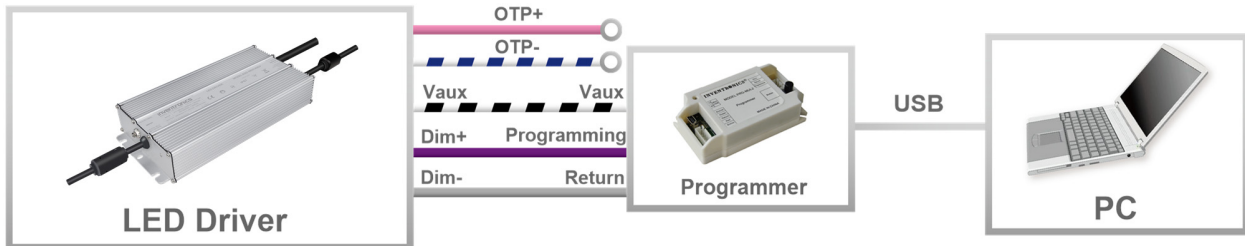
Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

- **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.

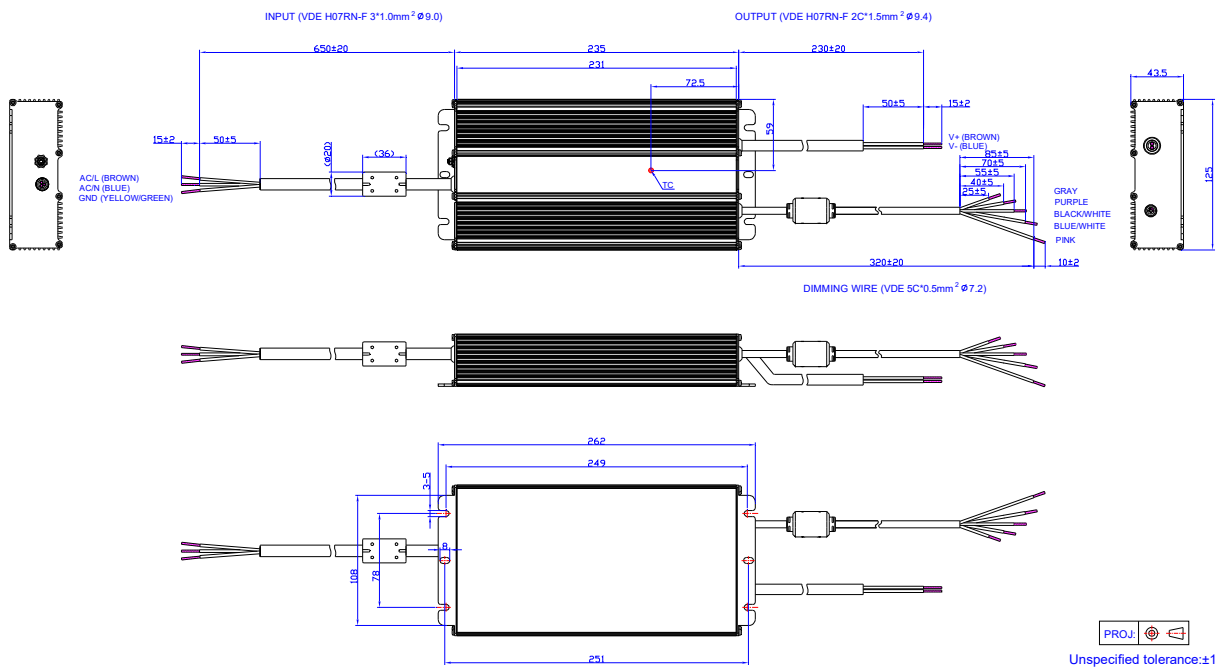
Programming Connection Diagram



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



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 |
| 2019-04-02 | A | Datasheet Release | / | / |
| 2019-12-02 | B | Global Mark Logo | / | Added |
| | | Independent Logo | / | Added |
| | | Features | 6kV line-line, 10kV line-earth | DM 6kV, CM 10kV |
| | | Features | Waterproof (IP67) | IP67 |
| | | Features | Suitable for Independent Use | Deleted |
| | | Models- Notes(5) | / | Added |
| | | I-V Operating Area- ESD-480S280DV | / | Updated |
| | | Safety &EMC Compliance | Global Mark | Added |
| | | Safety &EMC Compliance | EN 61000-4-5 | Updated |
| | | RoHS Compliance | / | Updated |
| 2024-04-02 | C | Product Photograph | / | Updated |
| | | ENEC logo | / | Deleted |
| | | global mark logo | / | Updated |
| | | Input Specifications | / | Updated |
| | | Safety &EMC Compliance | / | Updated |
| | | Programming Connection Diagram | / | Updated |
| 2024-08-14 | D | Format | / | Updated |
| | | global-mark logo | / | Deleted |
| | | Models | Notes(5) | Deleted |
| | | Safety &EMC Compliance | global-mark | Deleted |