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 ≤ 1.5 W
- 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.

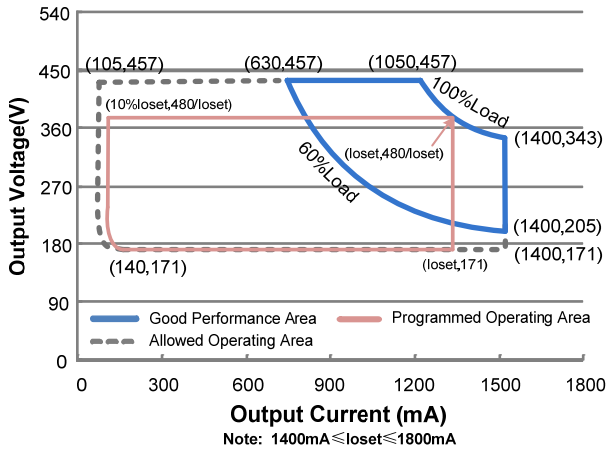
Models

Adjustable Output Current Range	Full-Power Current Range(1)	Default Output Current	Input Voltage Range(2)	Output Voltage Range	Max. Output Power	Typical Efficiency (3)	Power Factor		Model Number (5)
							277Vac	480Vac	
0.105-1.40A	1.05A-1.40A	1.4 A	249~528Vac 352~500Vdc	171 ~ 457Vdc	480 W	95.0%	0.96	0.95	ESD-480S140DV
0.210-2.80A	2.10-2.80A	2.8 A	249~528Vac 352~500Vdc	86 ~ 228Vdc	480 W	94.5%	0.96	0.95	ESD-480S280DV
0.315-4.20A	3.15-4.20A	4.2 A	249~528Vac 352~500Vdc	57 ~ 152Vdc	480 W	94.0%	0.96	0.95	ESD-480S420DV
0.435-5.60A	4.35-5.60A	5.6 A	249~528Vac 352~500Vdc	43 ~ 110Vdc	480 W	93.5%	0.96	0.95	ESD-480S560DV(4)
0.750-10.0A	7.50-10.0A	10.0 A	249~528Vac 352~500Vdc	24 ~ 64Vdc	480 W	93.5%	0.96	0.95	ESD-480S10ADV(4)

Notes: (1) Output current range with constant power at 480W.
(2) Certified input voltage range: 277-480Vac or 352-500Vdc.
(3) Measured at 100% load and 480Vac input (see below “General Specifications” for details).
(4) SELV output.
(5) All the models are certificated to Global Mark, except ESD-480S560DV and ESD-480S10ADV.

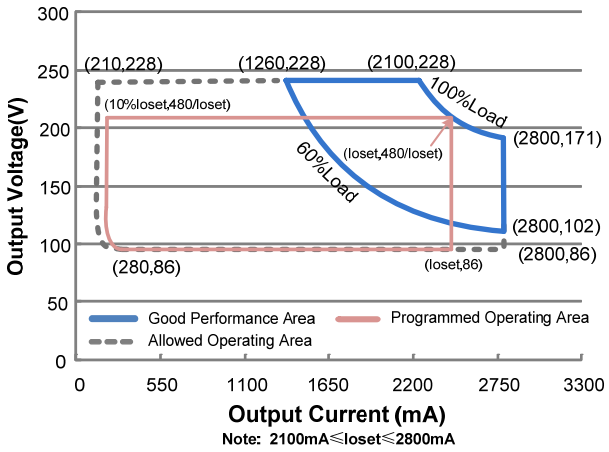
I-V Operating Area

ESD-480S140DV



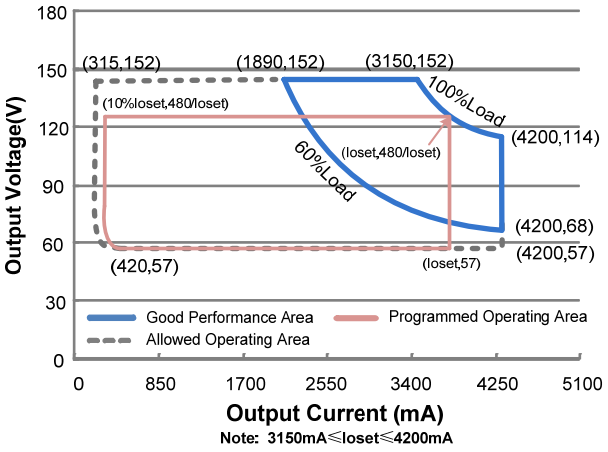
Note: 1400mA≤Ioset≤1800mA

ESD-480S280DV



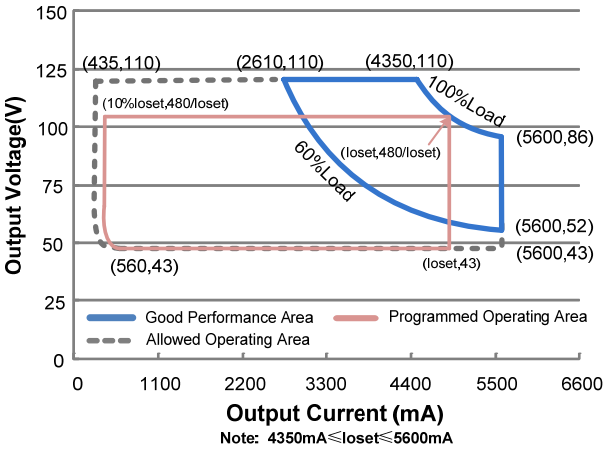
Note: 2100mA≤Ioset≤2800mA

ESD-480S420DV



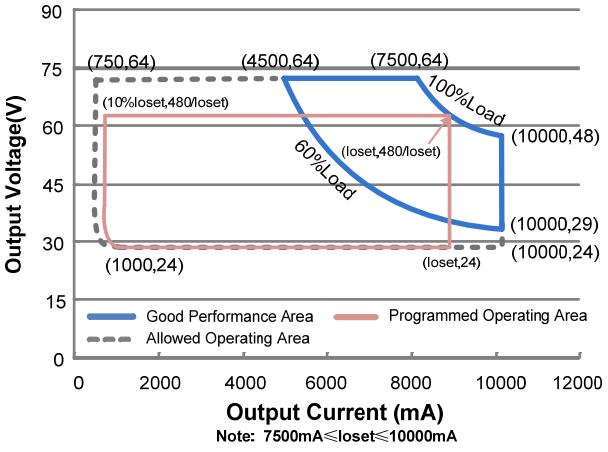
Note: 3150mA≤Ioset≤4200mA

ESD-480S560DV



Note: 4350mA≤Ioset≤5600mA

ESD-480S10ADV



Note: 7500mA≤Ioset≤10000mA

Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	249 Vac	-	528 Vac	352-500Vdc
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.70 mA	IEC60598-1; 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^2t)	-	-	13.8 A^2s	At 480Vac input, 25℃ cold start, duration=840 μs, 10%Ipk-10%Ipk. 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%Ioset	-	5%Ioset	At 100% load condition
Output Current Setting(Ioset) 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%Iomax	10%Iomax	At 100% load condition, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	2%Iomax	-	At 100% load condition. Only this component of ripple is associated with visible flicker.
Startup Overshoot Current	-	-	10%Iomax	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 loset	-	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	-	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.

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

General Specifications

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 277 Vac input:				
ESD-480S140DV				
Io= 1050 mA	92.0%	94.0%	-	
Io= 1400 mA	91.5%	93.5%	-	
ESD-480S280DV				
Io= 2100 mA	91.5%	93.5%	-	
Io= 2800 mA	90.5%	92.5%	-	Measured at 100% load and steady-state temperature in 25°C ambient;
ESD-480S420DV				
Io= 3150 mA	91.0%	93.0%	-	(Efficiency will be about 2.0% lower if
Io= 4200 mA	90.5%	92.5%	-	measured immediately after startup.)
ESD-480S560DV				
Io= 4350 mA	90.5%	92.5%	-	
Io= 5600 mA	90.0%	92.0%	-	
ESD-480S10ADV				
Io= 7500 mA	90.5%	92.5%	-	
Io= 10000 mA	89.0%	91.0%	-	
Efficiency at 347 Vac input:				
ESD-480S140DV				
Io= 1050 mA	92.5%	94.5%	-	
Io= 1400 mA	92.0%	94.0%	-	
ESD-480S280DV				
Io= 2100 mA	92.0%	94.0%	-	
Io= 2800 mA	91.0%	93.0%	-	Measured at 100% load and steady-state temperature in 25°C ambient;
ESD-480S420DV				
Io= 3150 mA	91.5%	93.5%	-	(Efficiency will be about 2.0% lower if
Io= 4200 mA	91.0%	93.0%	-	measured immediately after startup.)
ESD-480S560DV				
Io= 4350 mA	91.0%	93.0%	-	
Io= 5600 mA	90.5%	92.5%	-	
ESD-480S10ADV				
Io= 7500 mA	91.0%	93.0%	-	
Io= 10000 mA	89.5%	91.5%	-	

General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 480 Vac input: ESD-480S140DV Io= 1050 mA Io= 1400 mA ESD-480S280DV Io= 2100 mA Io= 2800 mA ESD-480S420DV Io= 3150 mA Io= 4200 mA ESD-480S560DV Io= 4350 mA Io= 5600 mA ESD-480S10ADV Io= 7500 mA Io= 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. Tc curve for the details
Operating Case Temperature for Safety Tc_s	-40°C	-	+85°C	
Operating Case Temperature for Warranty Tc_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	-	

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 µA	300 µA	450 µA	Vdim(+) = 0 V
Dimming Output Range	ESD-480S140DV ESD-480S280DV ESD-480S420DV ESD-480S560DV ESD-480S10ADV	10%Ioset	-	Ioset	1050mA ≤ Ioset ≤ 1400mA 2100mA ≤ Ioset ≤ 2800mA 3150mA ≤ Ioset ≤ 4200mA 4350mA ≤ Ioset ≤ 5600mA 7500mA ≤ Ioset ≤ 10000mA
	ESD-480S140DV ESD-480S280DV ESD-480S420DV ESD-480S560DV ESD-480S10ADV	105 mA 210 mA 315 mA 435 mA 750 mA	-	Ioset	105mA ≤ Ioset < 1050mA 210mA ≤ Ioset < 2100mA 315mA ≤ Ioset < 3150mA 435mA ≤ Ioset < 4350mA 750mA ≤ Ioset < 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 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)	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%	-	

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

Safety &EMC Compliance

Safety Category	Standard
CE & ENEC	EN 61347-1, EN61347-2-13
CB	IEC 61347-1, IEC 61347-2-13
Global Mark	AS/NZS 61347.1, AS/NZS 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
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

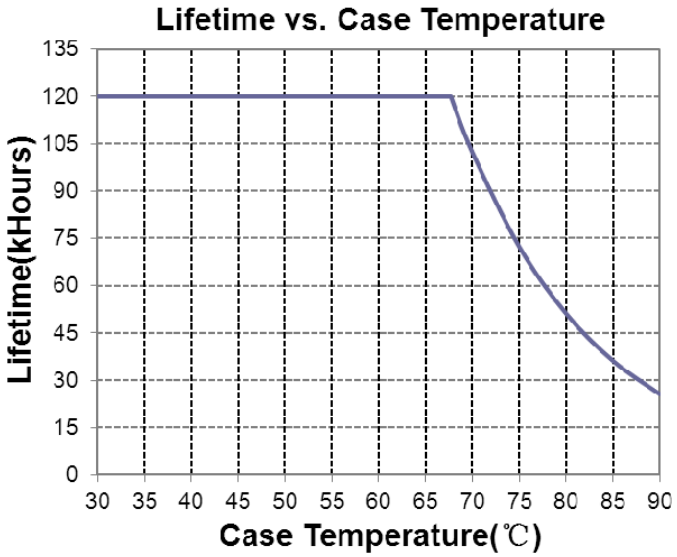
Safety &EMC Compliance (Continued)

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

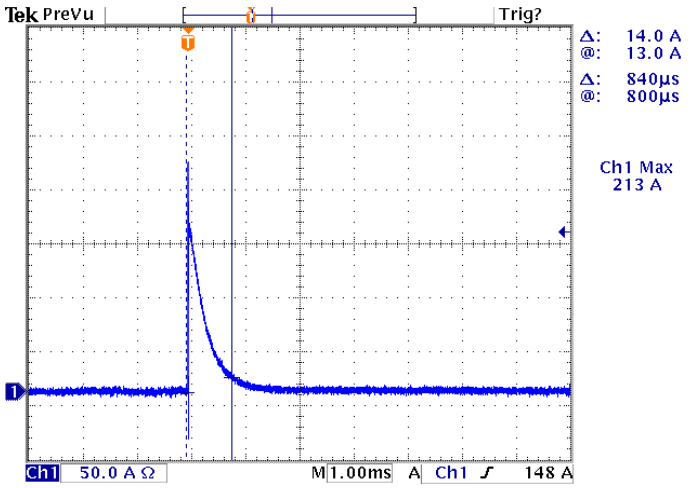
Note: (1) This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

(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



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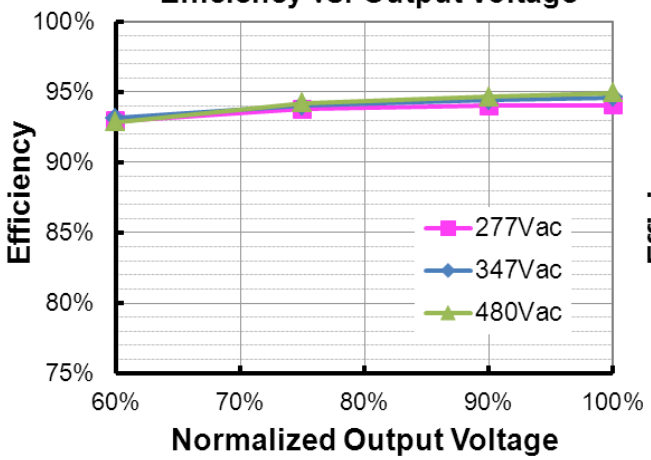
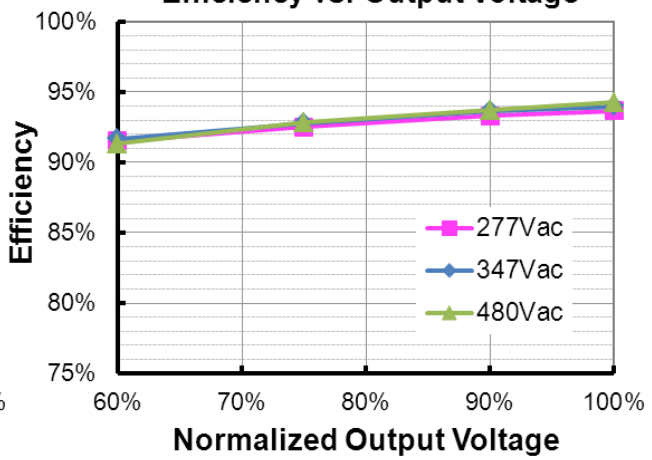
Efficiency vs. Load

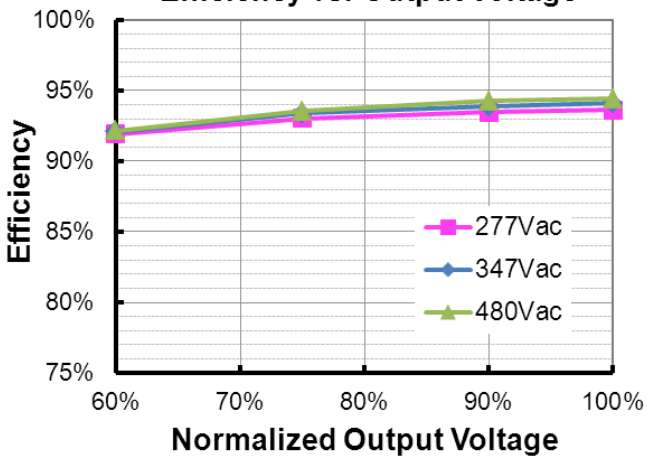
ESD-480S140DV(Io=1050mA)



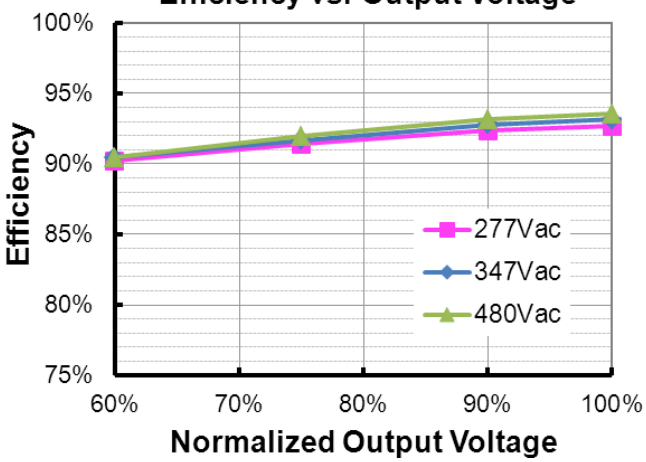
ESD-480S140DV(Io=1400mA)



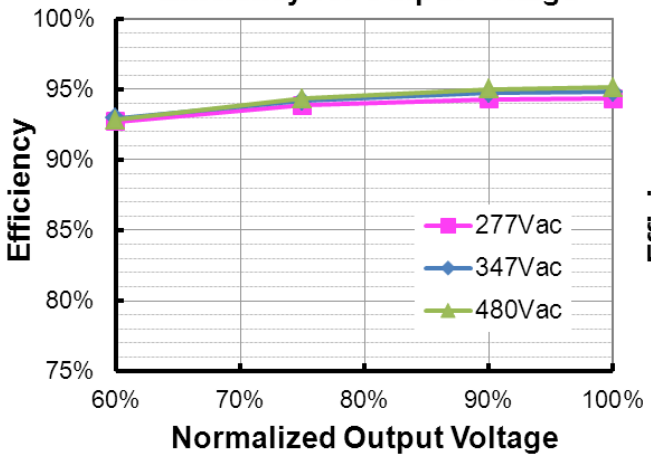
ESD-480S280DV(Io=2100mA)



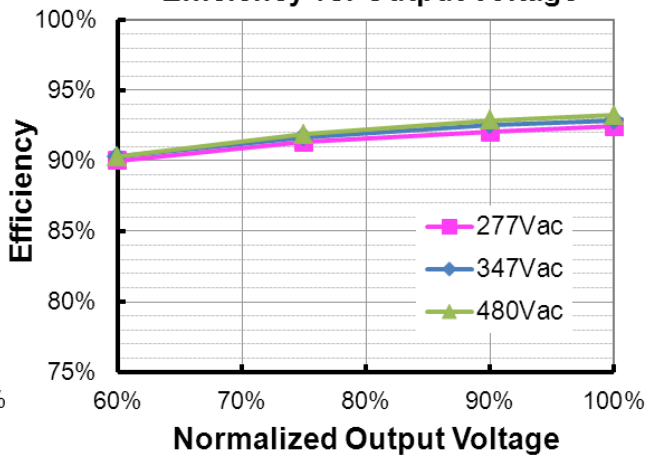
ESD-480S280DV(Io=2800mA)



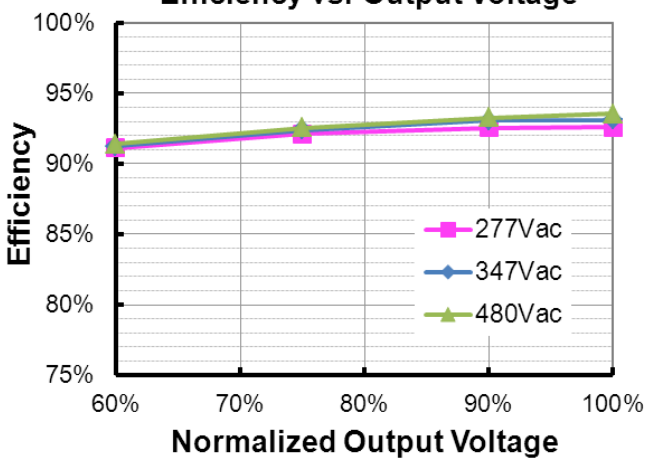
ESD-480S420DV(Io=3150mA)



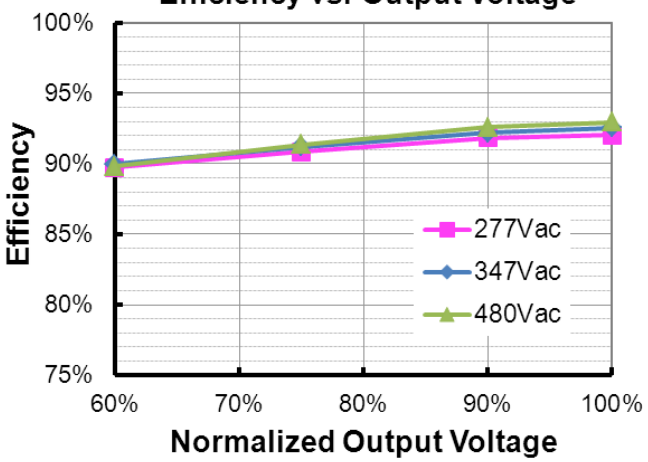
ESD-480S420DV(Io=4200mA)



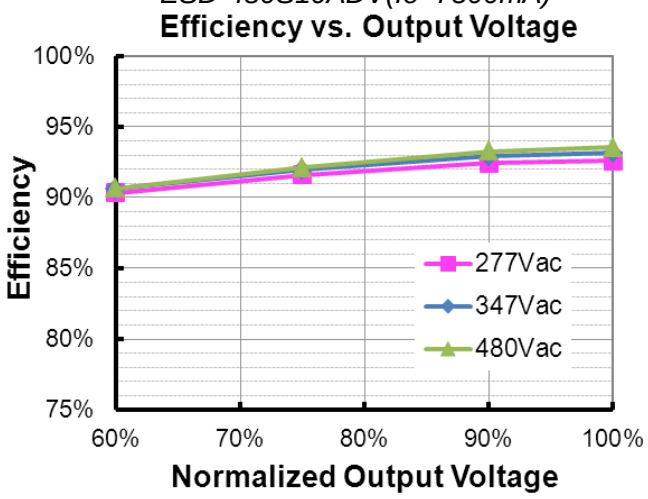
ESD-480S560DV(Io=4350mA)



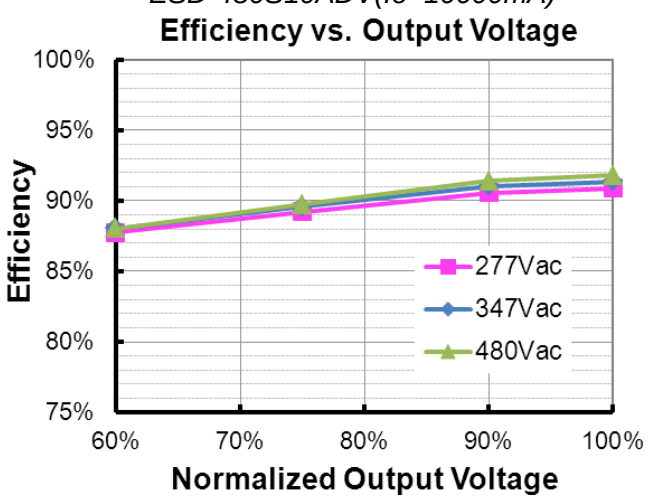
ESD-480S560DV(Io=5600mA)



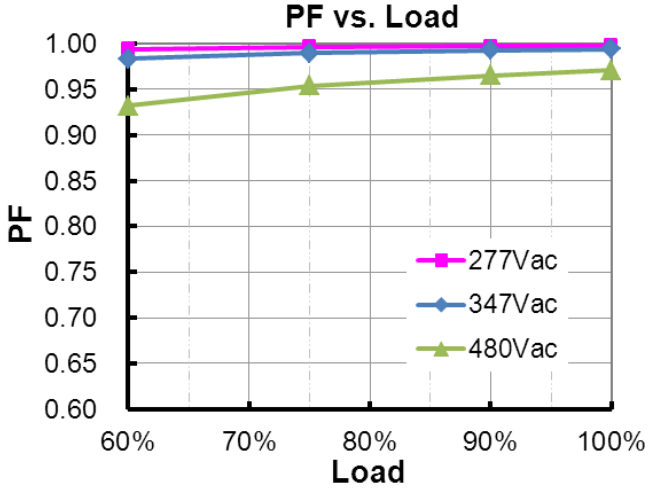
ESD-480S10ADV(Io=7500mA)



ESD-480S10ADV(Io=10000mA)



Power Factor



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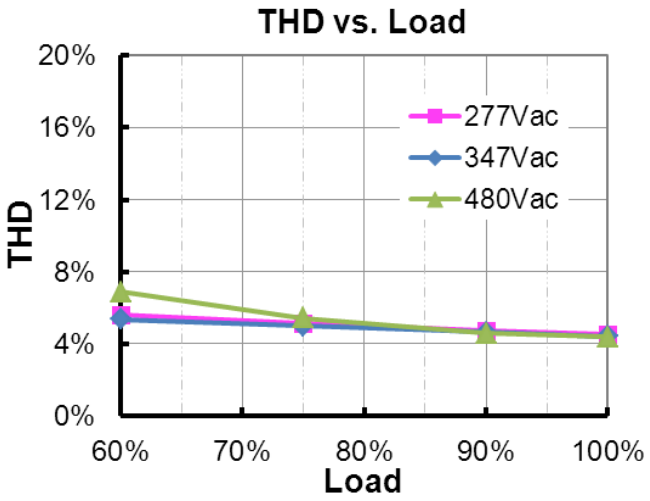
Total Harmonic Distortion



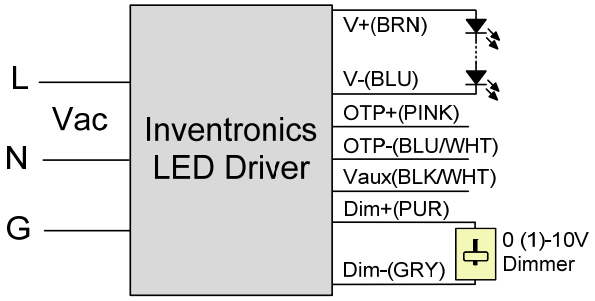
Protection Functions

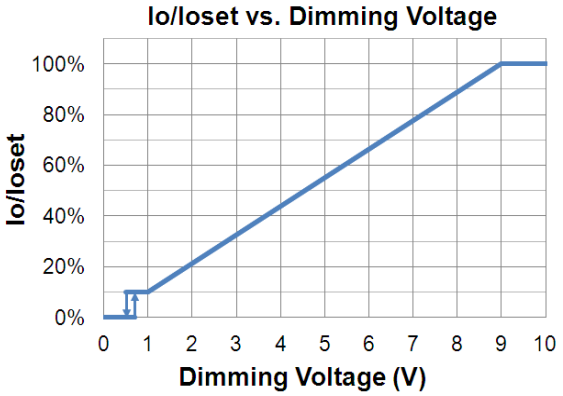
Parameter		Min.	Typ.	Max.	Notes
External Thermal Protection NTC	R1	-	7.81 kOhm	-	When R_NTC falls below R1, External Thermal Protection is triggered, reducing output current until R2 is reached.
	R2	-	4.16 kOhm	-	When R_NTC is less than R2, output current is reduced to the programmed "Protection Current Floor."
	Protection Current Floor	10%Ioset	60%Ioset	100%Ioset	10%Ioset>Iomin (default setting is 60%)
		Iomin	60%Ioset	100%Ioset	10%Ioset≤Iomin (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.

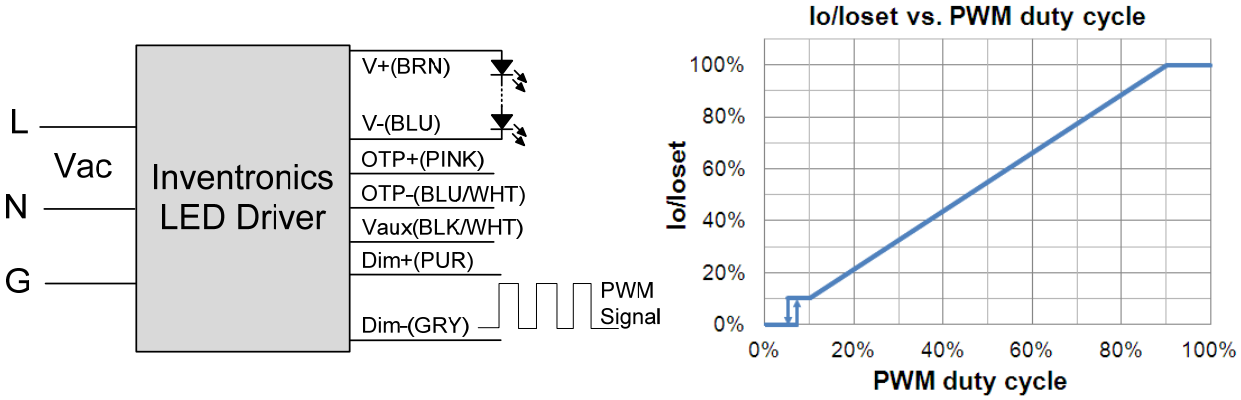




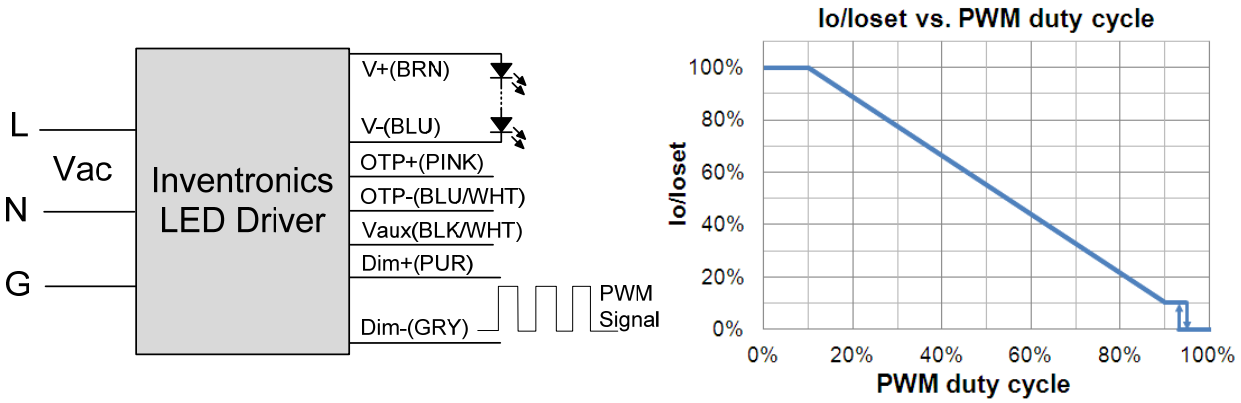
Implementation 1: DC Input

Notes:
1. The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like resistors and zener.
2. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
3. If 0-10V dimming is not used, Dim + should be open.

- **PWM Dimming**



Implementation 2: Positive logic



Implementation 3: Negative logic

- **Time Dimming**

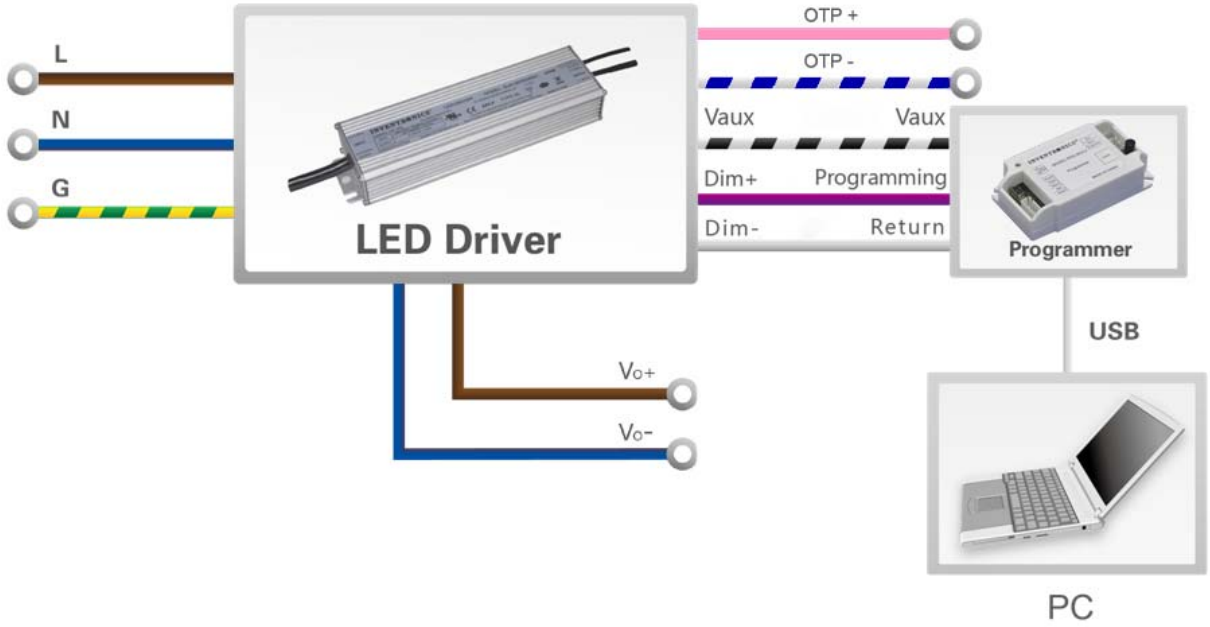
Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

- **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.

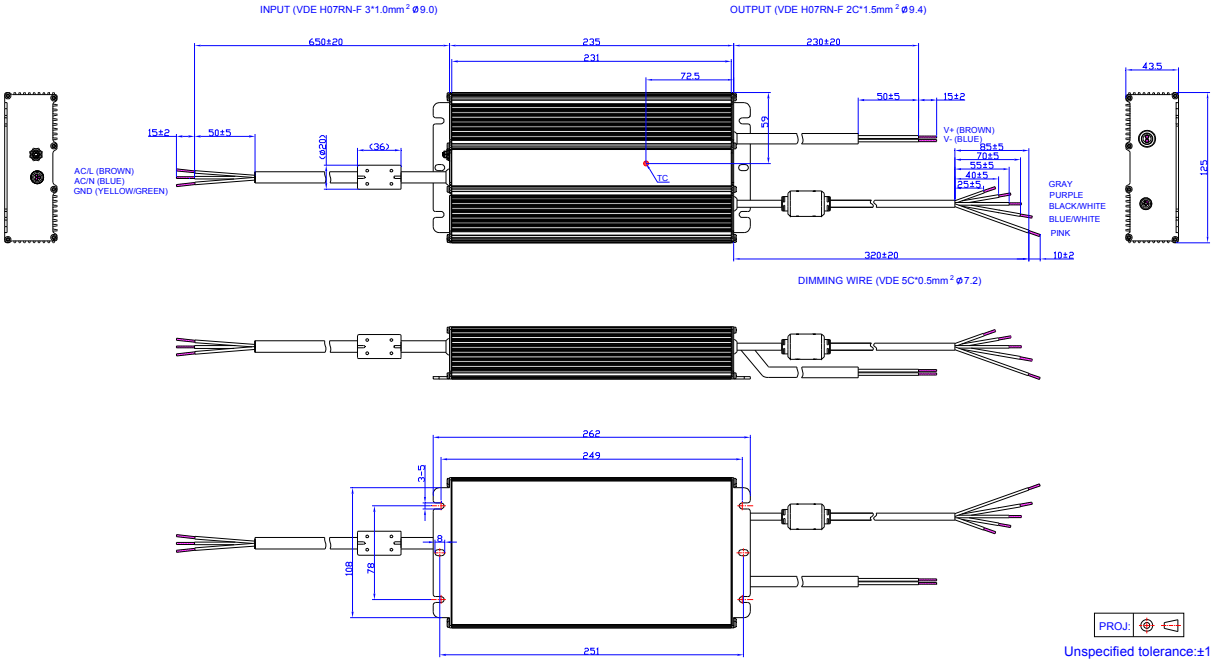
Programming Connection Diagram



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

- **Please refer to PRG-MUL2 Multi-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