

Features

- Ultra High Efficiency (Up to 94.5%)
- Full Power at 70-100% Max Current (Constant Power)
- 0-10V/PWM/Timer Dimmable (3 Timer Modes)
- Dim-to-Off with Standby Power $\leq 1.5W$
- Output Lumen Compensation
- Input Surge Protection: 4kV line-line, 6kV line-earth
- All-Around Protection: OVP, SCP, OTP
- Suitable for UL Dry / Damp / Wet Location
- TYPE HL, for use in a Class I, Division 2 hazardous (Classified) location
- 5 Years Warranty



Description

The ESD-320SxxxDT series is a 320W, constant-current, programmable outdoor LED driver that operates from 249-528 Vac input with excellent power factor. Created for high bay, high mast, arena and roadway lights, 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.

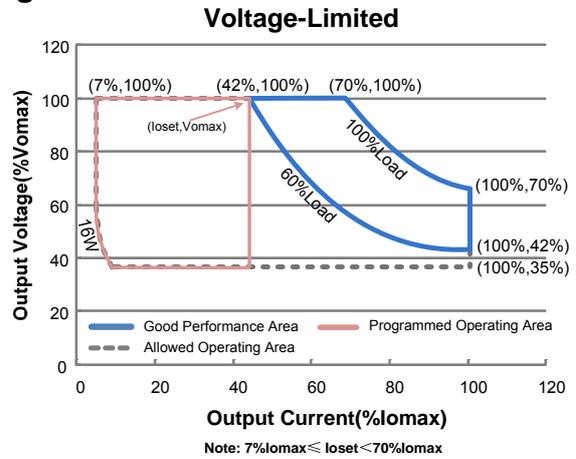
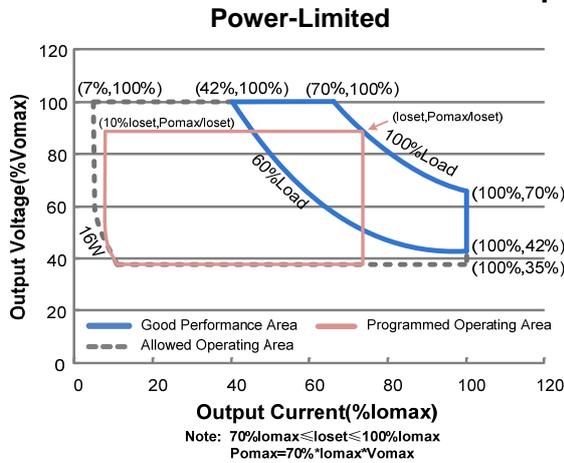
Models

Adjustable Output Current Range	Full-Power Current Range (1)	Default Output Current	Input Voltage Range	Output Voltage Range	Max. Output Power	Typical Efficiency (2)	Power Factor		Model Number
							277Vac	480Vac	
105-1500mA	1050-1500mA	1400 mA	249~528Vac	107~305Vdc	320 W	94.0%	0.96	0.95	ESD-320S150DT
154-2200mA	1540-2200mA	2100 mA	249~528Vac	73~208Vdc	320 W	94.5%	0.96	0.95	ESD-320S220DT
217-3100mA	2170-3100mA	2800 mA	249~528Vac	52~148Vdc	320 W	94.0%	0.96	0.95	ESD-320S310DT
308-4400mA	3080-4400mA	4200 mA	249~528Vac	37~104Vdc	320 W	94.0%	0.96	0.95	ESD-320S440DT
434-6200mA	4340-6200mA	4900 mA	249~528Vac	26 ~74Vdc	320 W	93.5%	0.96	0.95	ESD-320S620DT

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

(2) Measured at a 480Vac input with 70% maximum output current or 100% maximum output voltage.

I-V Operating Area



Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	249 Vac	-	528 Vac	
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	1.0 mA	At 480Vac 60Hz input; Grounding effectively.
Input AC Current	-	-	1.5 A	Measured at full load and 277 Vac input.
	-	-	0.8 A	Measured at full load and 480 Vac input.
Inrush Current(I ² t)	-	-	3.87 A ² s	At 480Vac input, 25°C Cold Start, Duration=1.77 ms, 10%I _{pk} -10%I _{pk} . See Inrush Current Waveform for the details.
PF	0.90	-	-	At 277-480Vac, 50-60Hz, 60%-100% Load (192-320W)
THD	-	-	20%	

Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%I _{oset}	-	5%I _{oset}	At full load condition
Output Current Setting(I _{oset}) Range	7%I _{omax}	-	100%I _{omax}	
Output Current Setting Range with Constant Power	70%I _{omax}	-	100%I _{omax}	
Total Output Current Ripple (pk-pk)	-	5%I _{omax}	10%I _{omax}	At full load condition, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	2%I _{omax}	-	At full load condition. Only this component of ripple is associated with visible flicker.
Startup Overshoot Current	-	-	10%I _{omax}	At full load condition

Output Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
No Load Output Voltage				
ESD-320S150DT	-	-	329V	
ESD-320S220DT	-	-	223V	
ESD-320S310DT	-	-	158V	
ESD-320S440DT	-	-	121V	
ESD-320S620DT	-	-	84V	
Line Regulation	-	-	±0.5%	Measured at full load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	1.0 s	2.0 s	Measured at 277Vac and 480Vac input, 60%-100% Load
Temperature Coefficient of Isolet	-	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"

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

General Specifications

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 277 Vac input:				
ESD-320S150DT				
Io=1050mA	90.5%	92.5%	-	Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Io=1500mA	89.5%	91.5%	-	
ESD-320S220DT				
Io=1540mA	91.0%	93.0%	-	
Io=2200mA	90.0%	92.0%	-	
ESD-320S310DT				
Io=2170mA	90.5%	92.5%	-	
Io=3100mA	90.0%	92.0%	-	
ESD-320S440DT				
Io=3080mA	91.0%	93.0%	-	
Io=4400mA	90.0%	92.0%	-	
ESD-320S620DT				
Io=4340mA	90.5%	92.5%	-	
Io=6200mA	89.5%	91.5%	-	
Efficiency at 347 Vac input:				
ESD-320S150DT				
Io=1050mA	91.5%	93.5%	-	Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Io=1500mA	90.5%	92.5%	-	
ESD-320S220DT				
Io=1540mA	92.0%	94.0%	-	
Io=2200mA	91.0%	93.0%	-	
ESD-320S310DT				
Io=2170mA	91.5%	93.5%	-	
Io=3100mA	90.5%	92.5%	-	
ESD-320S440DT				
Io=3080mA	91.5%	93.5%	-	
Io=4400mA	90.5%	92.5%	-	
ESD-320S620DT				
Io=4340mA	91.0%	93.0%	-	
Io=6200mA	90.0%	92.0%	-	

General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 480 Vac input: ESD-320S150DT I _o =1050mA I _o =1500mA ESD-320S220DT I _o =1540mA I _o =2200mA ESD-320S310DT I _o =2170mA I _o =3100mA ESD-320S440DT I _o =3080mA I _o =4400mA ESD-320S620DT I _o =4340mA I _o =6200mA	92.0% 91.0% 92.5% 91.5% 92.0% 91.0% 92.0% 91.0% 91.5% 90.5%	94.0% 93.0% 94.5% 93.5% 94.0% 93.0% 94.0% 93.0% 93.5% 92.5%	- - - - - - - - - -	Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Standby power	-	-	1.5 W	Measured at 480Vac/50Hz; Dimming off
MTBF	-	200,000 Hours	-	Measured at 480Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	120,000 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 T _{c_s}	-40°C	-	+87°C	
Operating Case Temperature for Warranty T _{c_w}	-40°C	-	+75°C	Case temperature for 5 years warranty
Storage Temperature	-40°C	-	+85°C	Humidity: 5%RH to 100%RH
Dimensions Inches (L × W × H) Millimeters (L × W × H)	9.21 × 3.86 × 1.75 234 × 98 × 44.5			With mounting ear 10.28 × 3.86 × 1.75 261 × 98 × 44.5
Net Weight	-	1915g	-	

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

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 uA	300 uA	450 uA	V _{dim} (+) = 0 V
Dimming Output Range	10%I _o set	-	I _o set	70%I _o max ≤ I _o set ≤ 100%I _o max
	7%I _o max	-	I _o set	7%I _o max ≤ I _o set < 70%I _o max
Recommended Dimming Input Range	0 V	-	10 V	Default 0-10V dimming mode.
Dim off Voltage	0.4 V	0.55V	0.7 V	
Dim on Voltage	0.6 V	0.75 V	0.9 V	
Hysteresis	-	0.2 V	-	

Dimming Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
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%	-	

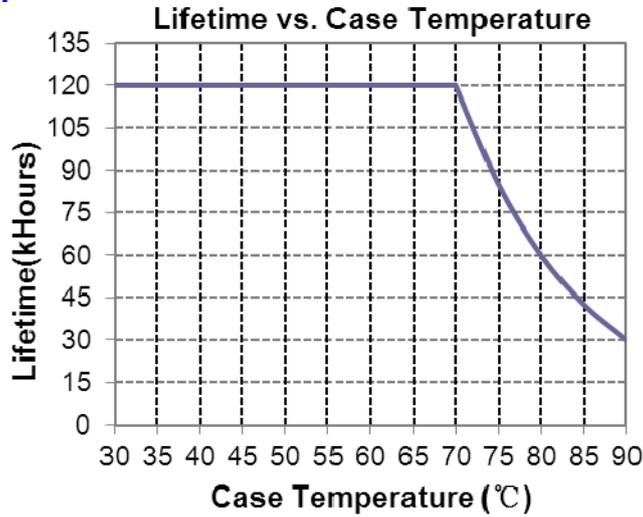
Note: All specifications are typical at 25 °C unless stated otherwise.

Safety & EMC Compliance

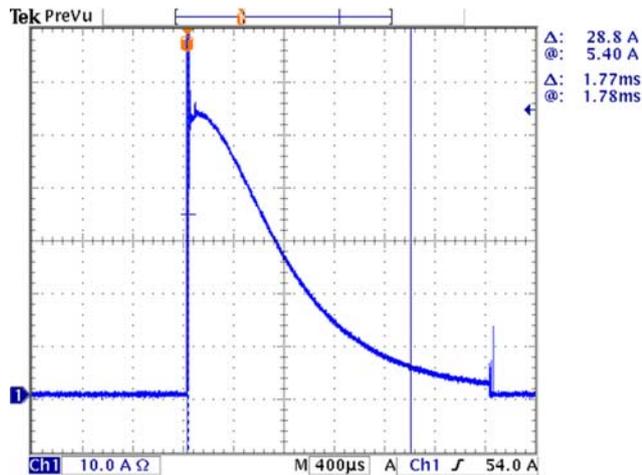
Safety Category	Standard
UL/CUL	UL8750,CAN/CSA-C22.2 No. 250.13
EMI Standards	Notes
FCC Part15 ⁽¹⁾	ANSI C63.4 Class B
	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: [1] this device may not cause harmful interference, and [2] this device must 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: line to line 4 kV, line to earth 6 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.

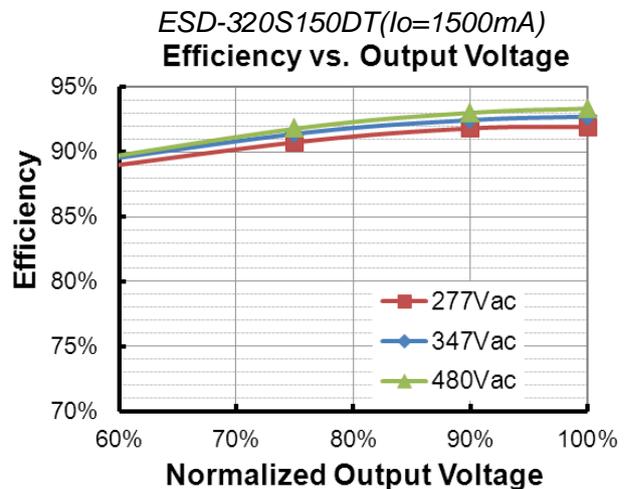
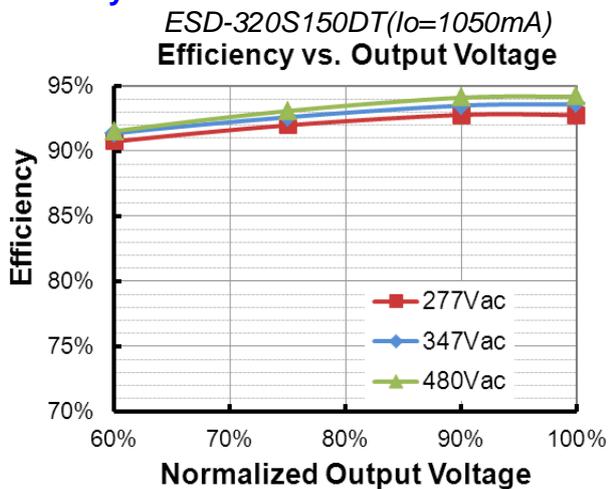
Lifetime vs. Case Temperature

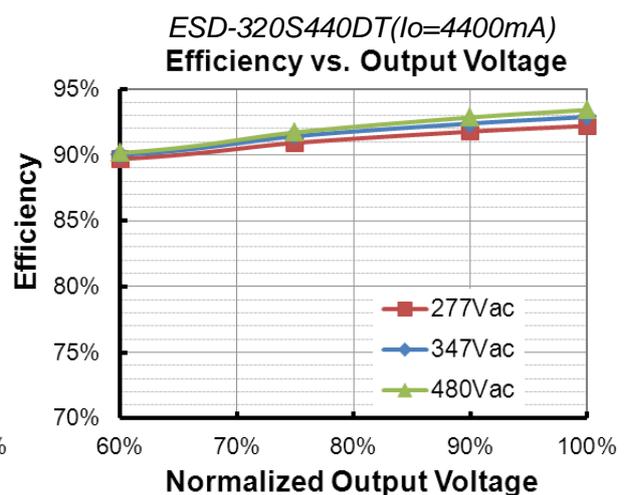
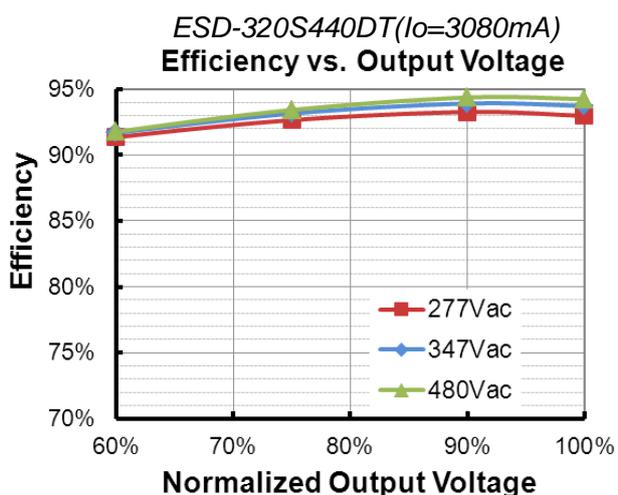
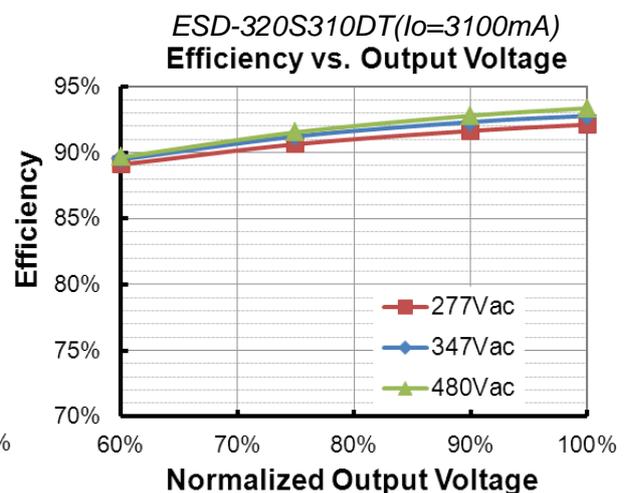
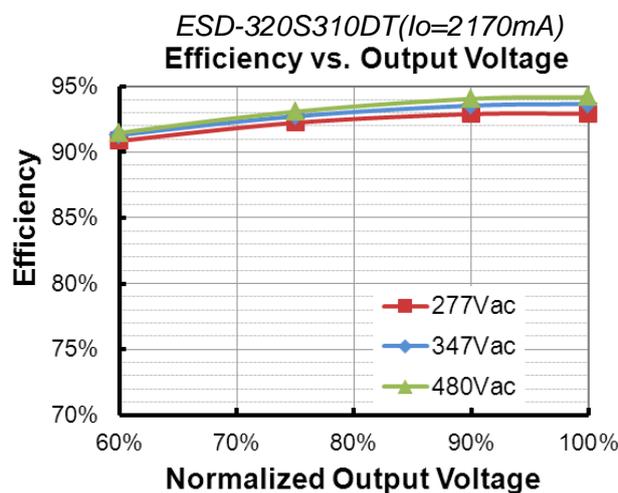
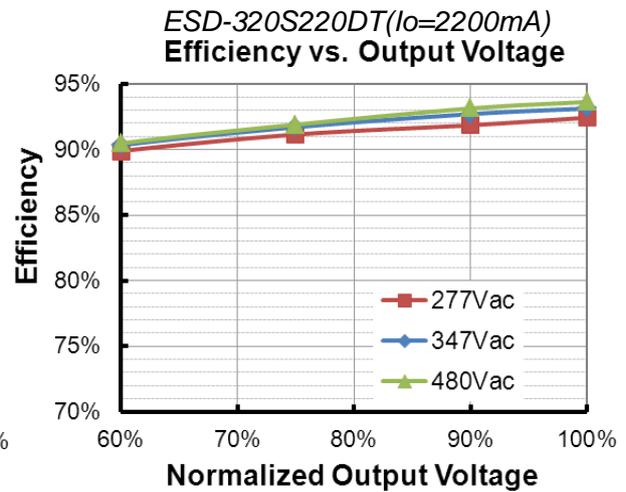
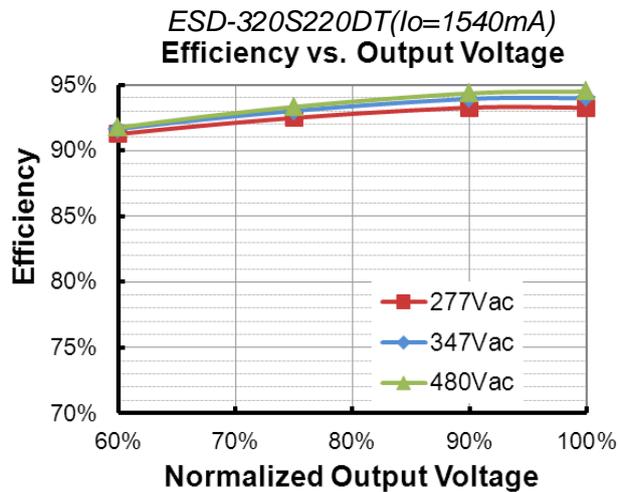


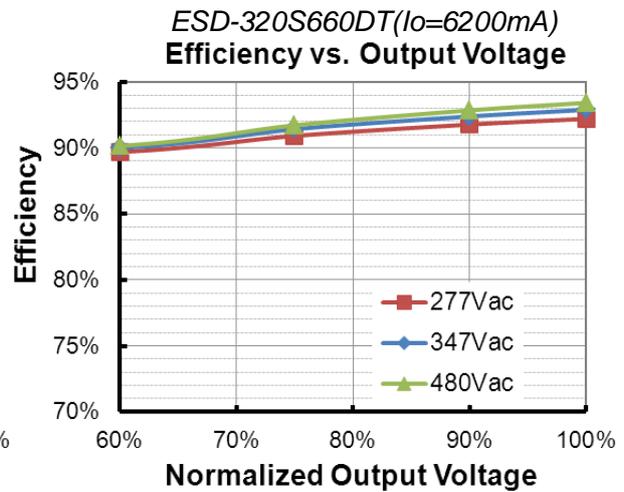
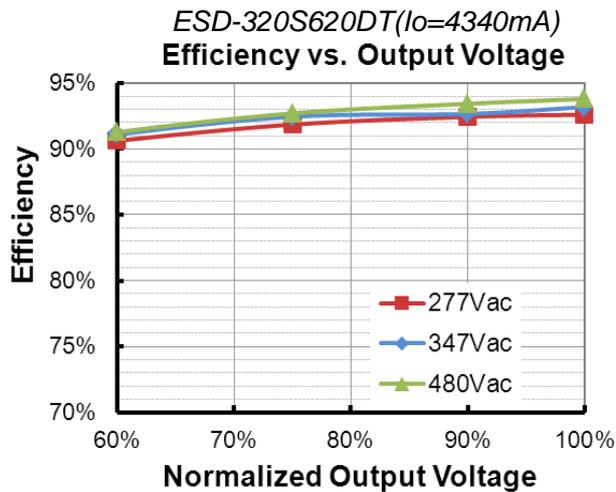
Inrush Current Waveform



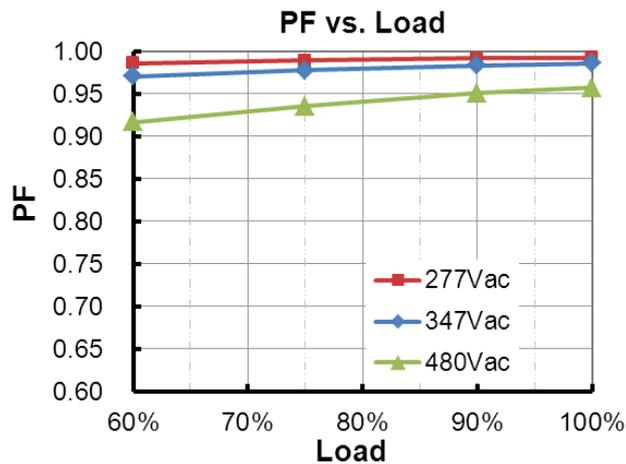
Efficiency vs. Load



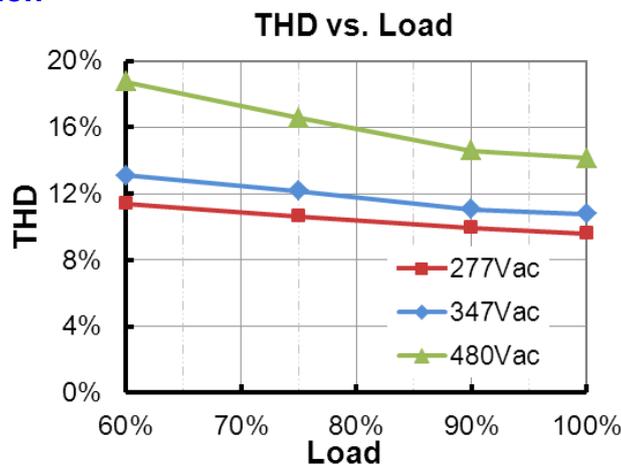




Power Factor



Total Harmonic Distortion



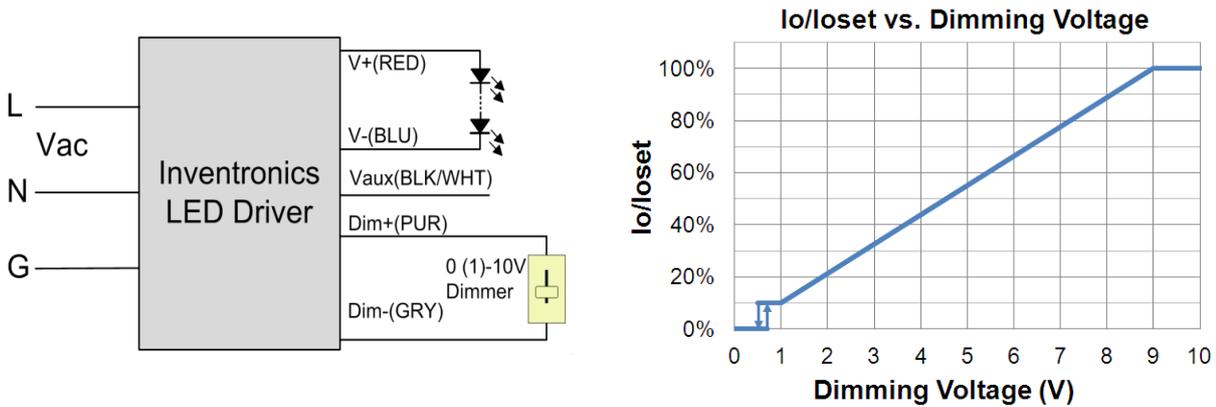
Protection Functions

Parameter	Notes
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.

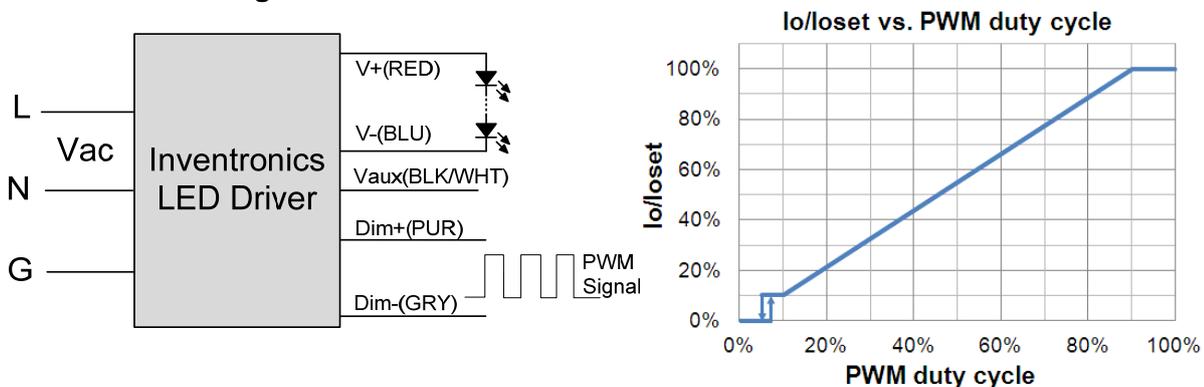


Implementation 1: DC Input

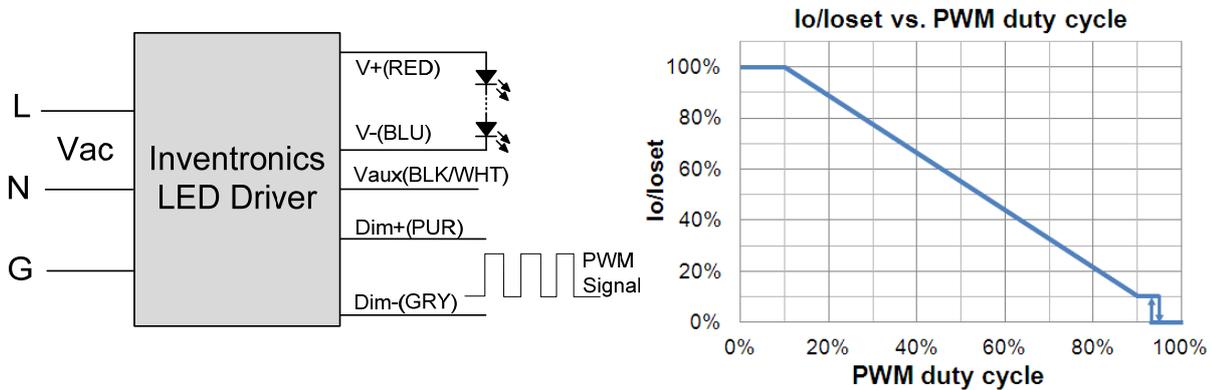
Notes:

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**

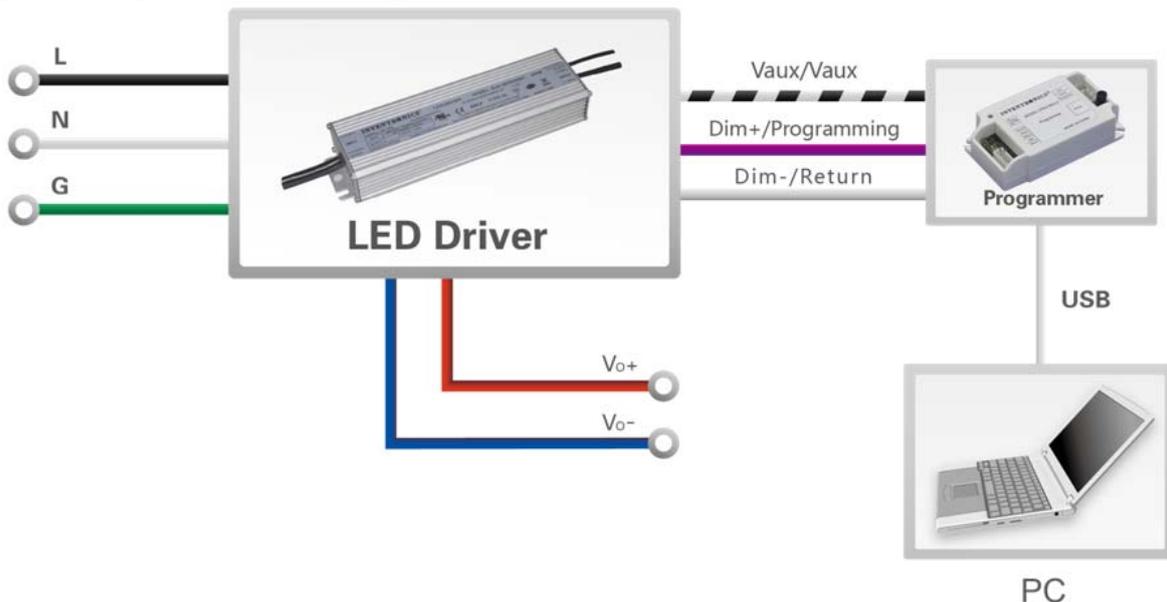
Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

- **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.

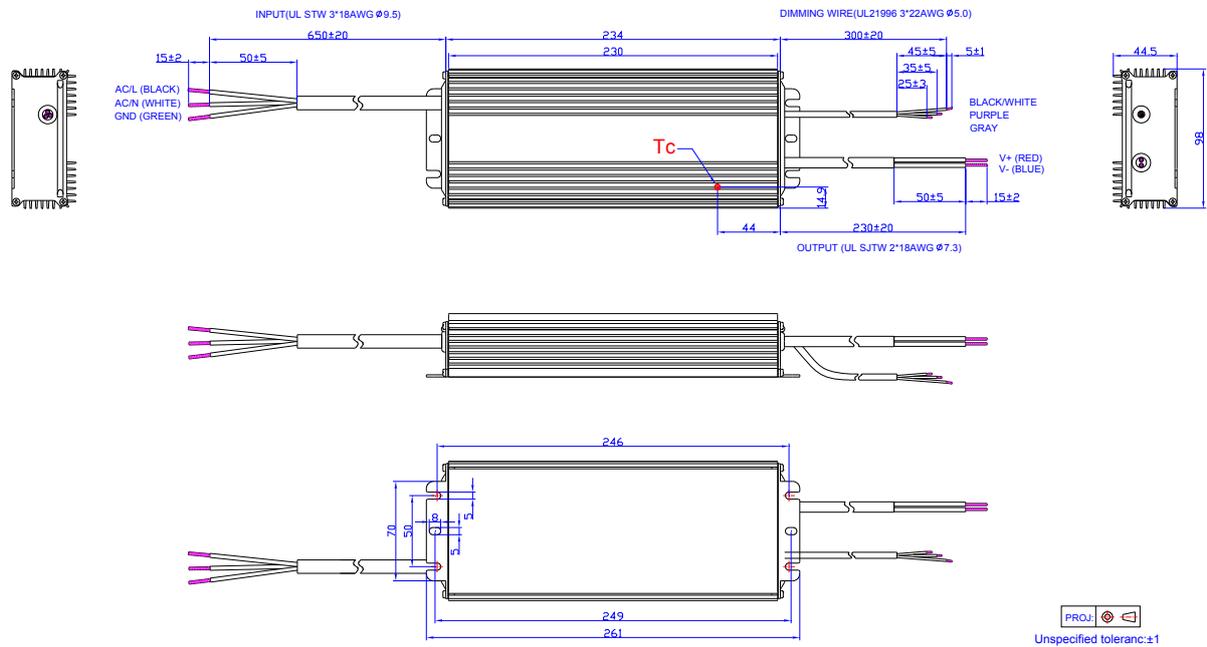
Programming Connection Diagram



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

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

Mechanical Outline



RoHS Compliance

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

Revision History

Change Date	Rev.	Description of Change		
		Item	From	To
2015-01-14	A	Datasheets Release	/	/
2015-03-09	B	Features	Input Surge Protection: 4kV line-line, 6kV line-earth	Added
		Model: ESD-320S150DT	/	Added
		Output Current Ripple(pk-pk)	Output Current Ripple(pk-pk)	Total Output Current Ripple (pk-pk)
		Output Current Ripple at < 200 Hz (pk-pk)	/	Added
		Operating Case Temperature for Safety Tc_s	/	Updated
		Operating Case Temperature for Warranty Tc_w	/	Updated
		General Specifications	Storage Temperature	Added
		Environmental Specifications	/	Delete
2016-01-28	C	Derating	/	Delete
		Features	/	Updated
		General Specifications	Net Weight	Updated
		Lifetime vs. Case Temperature	/	Updated
		Time Dimming	/	Updated
		Output Lumen Compensation	/	Added
2017-08-03	D	Programming Connection Diagram	/	Updated
		Input Specifications	PF/THD	Updated
		Output Specifications	Turn-on Delay Time	Updated
		Output Specifications	Temperature Coefficient of I _o set	Updated
		General Specifications	With mounting ear	Added
		Safety & EMC Compliance	/	Updated
2017-11-23	E	Mechanical Outline	/	Updated
		Features	5 Years Warranty	Updated
		Output Specifications	Turn-on Delay Time	Updated
		General Specifications	Lifetime	Updated
		General Specifications	Operating Case Temperature for Warranty Tc_w	Updated
Lifetime vs. Case Temperature	/	Updated		

