

## Features

- Ultra High Efficiency (Up to 94.5%)
- Full Power at Wide Output Current Range (Constant Power)
- Thermal Sensing and Protection for LED Module
- 0-10V/PWM/Timer Dimmable (3 Timer Modes)
- Dim-to-Off with Standby Power  $\leq 1.5$  W
- Output Lumen Compensation
- Input Surge Protection: 6kV line-line, 10kV 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



## Description

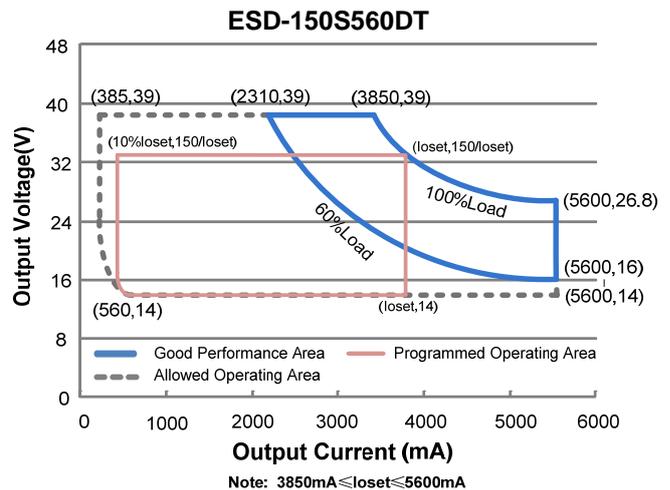
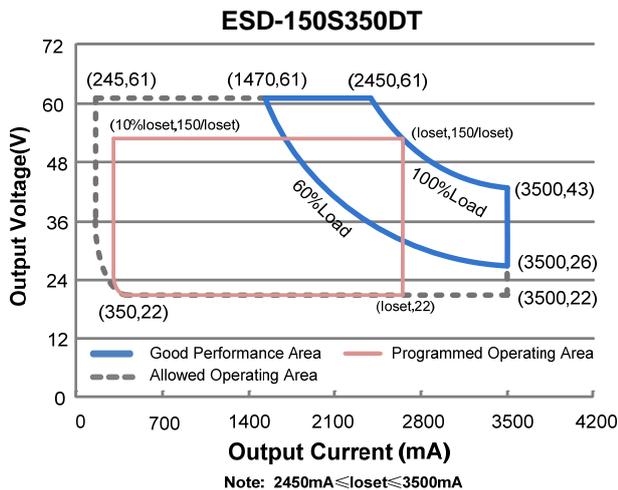
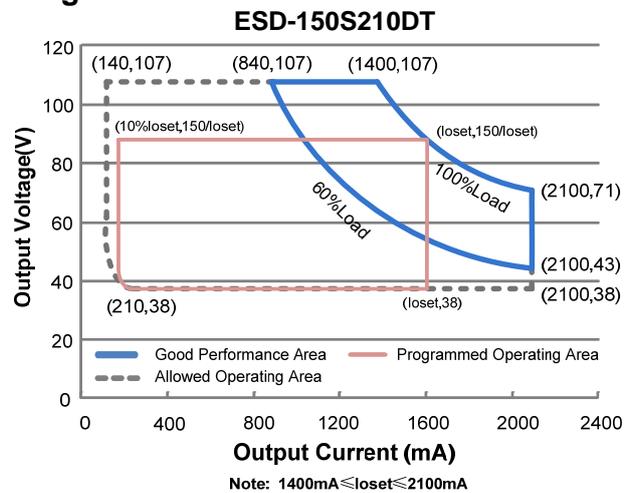
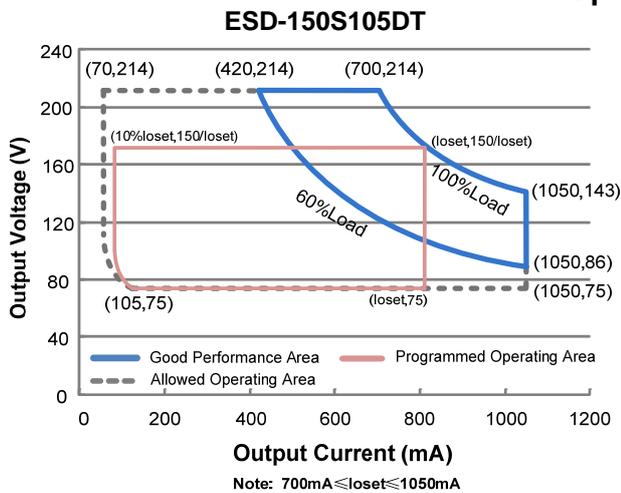
The ESD-150SxxxDT series is a 150W, constant-current, programmable LED driver that operates from 249-528 Vac input with excellent power factor. Created for high bay, tunnel and roadway lights, it provides a dim-off mode with low standby power. The high efficiency of these drivers and compact metal case 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
							277Vac	480Vac	
70-1050mA	700-1050mA	700 mA	249~528 Vac 352~600 Vdc	75~214Vdc	150 W	94.5%	0.96	0.95	ESD-150S105DT
140-2100mA	1400-2100mA	1400 mA	249~528 Vac 352~600 Vdc	38~107Vdc	150 W	94.0%	0.96	0.95	ESD-150S210DT
245-3500mA	2450-3500mA	2800 mA	249~528 Vac 352~600 Vdc	22 ~ 61Vdc	150 W	93.0%	0.96	0.95	ESD-150S350DT
385-5600mA	3850-5600mA	4200 mA	249~528 Vac 352~600 Vdc	14 ~ 39Vdc	150 W	93.0%	0.96	0.95	ESD-150S560DT

- Notes:** (1) Output current range with constant power at 150W  
 (2) Certified input voltage range: 277-480Vac or 352-600Vdc  
 (3) Measured at full load and 480Vac input (see below "General Specifications" for details).

## I-V Operating Area



## Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	249 Vac	-	528 Vac	352-600 Vdc
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	1.0 MIU	At 480Vac/60Hz input , grounding effectively
Input AC Current	-	-	0.70 A	Measured at full load and 277 Vac input.
	-	-	0.40 A	Measured at full load and 480 Vac input.
Inrush Current(I <sup>2</sup> t)	-	-	7.6 A <sup>2</sup> s	At 480Vac input, 25°C Cold Start, Duration=680 μs, 10%I <sub>pk</sub> -10%I <sub>pk</sub> . See Inrush Current Waveform for the details.
PF	0.90	-	-	At 277-480Vac, 50-60Hz, 60%-100% Load (90-150W)
THD	-	-	20%	

## Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%loset	-	5%loset	At full load condition
Output Current Setting(loset) Range				
ESD-150S105DT	70 mA	-	1050 mA	
ESD-150S210DT	140 mA	-	2100 mA	
ESD-150S350DT	245 mA	-	3500 mA	
ESD-150S560DT	385 mA	-	5600 mA	
Output Current Setting Range with Constant Power				
ESD-150S105DT	700 mA	-	1050 mA	
ESD-150S210DT	1400 mA	-	2100 mA	
ESD-150S350DT	2450 mA	-	3500 mA	
ESD-150S560DT	3850 mA	-	5600 mA	
Total Output Current Ripple (pk-pk)	-	5%lomax	10%lomax	At full load condition, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	2%lomax	-	At full load condition. Only this component of ripple is associated with visible flicker.
Startup Overshoot Current	-	-	10%lomax	At full load condition
No Load Output Voltage				
ESD-150S105DT	-	-	223 V	
ESD-150S210DT	-	-	116 V	
ESD-150S350DT	-	-	64 V	
ESD-150S560DT	-	-	43 V	
Line Regulation	-	-	±0.5%	Measured at full load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	0.8 s	1.5 s	Measured at 277Vac and 480Vac input, 60%-100% Load
Temperature Coefficient of loset	-	0.03%/°C	-	Case temperature = 0°C ~Tc max
12V Auxiliary Output Voltage (Vaux)	10.8 V	12 V	13.2 V	
12V Auxiliary Output Source Current (Iaux)	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-150S105DT				
I <sub>o</sub> = 700mA	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.)
I <sub>o</sub> =1050mA	89.5%	91.5%	-	
ESD-150S210DT				
I <sub>o</sub> =1400mA	91.0%	93.0%	-	
I <sub>o</sub> =2100mA	90.0%	92.0%	-	
ESD-150S350DT				
I <sub>o</sub> =2450mA	91.0%	93.0%	-	
I <sub>o</sub> =3500mA	89.0%	91.0%	-	
ESD-150S560DT				
I <sub>o</sub> =3850mA	90.5%	92.5%	-	
I <sub>o</sub> =5600mA	88.0%	90.0%	-	

## General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 347 Vac input: ESD-150S105DT I <sub>o</sub> = 700mA I <sub>o</sub> =1050mA ESD-150S210DT I <sub>o</sub> =1400mA I <sub>o</sub> =2100mA ESD-150S350DT I <sub>o</sub> =2450mA I <sub>o</sub> =3500mA ESD-150S560DT I <sub>o</sub> =3850mA I <sub>o</sub> =5600mA	92.0% 90.5% 91.5% 90.5% 91.5% 89.5% 90.5% 88.5%	94.0% 92.5% 93.5% 92.5% 93.5% 91.5% 92.5% 90.5%	- - - - - - - -	Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Efficiency at 480 Vac input: ESD-150S105DT I <sub>o</sub> = 700mA I <sub>o</sub> =1050mA ESD-150S210DT I <sub>o</sub> =1400mA I <sub>o</sub> =2100mA ESD-150S350DT I <sub>o</sub> =2450mA I <sub>o</sub> =3500mA ESD-150S560DT I <sub>o</sub> =3850mA I <sub>o</sub> =5600mA	92.5% 91.0% 92.0% 91.0% 91.0% 90.0% 91.0% 89.0%	94.5% 93.0% 94.0% 93.0% 93.0% 92.0% 93.0% 91.0%	- - - - - - - -	
Standby power	-	-	1.5 W	Measured at 480Vac/50Hz; Dimming off
MTBF	-	203,000 Hours	-	Measured at 480Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	75,000 Hours	-	Measured at 480Vac input, 80%Load and 70°C case temperature with I <sub>aux</sub> =100mA; See lifetime vs. T <sub>c</sub> curve for the details
Operating Case Temperature for Safety T <sub>c_s</sub>	-40°C	-	+88°C	
Operating Case Temperature for Warranty T <sub>c_w</sub>	-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)	8.70 × 2.66 × 1.56 221 × 67.5 × 39.7			With mounting ear 9.53 × 2.66 × 1.56 242 × 67.5 × 39.7
Net Weight	-	1300 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 uA	300 uA	450 uA	Vdim(+) = 0 V
Dimming Output Range	ESD-150S105DT ESD-150S210DT ESD-150S350DT ESD-150S560DT	10%loset	-	loset	700mA ≤ loset ≤ 1050mA 1400mA ≤ loset ≤ 2100mA 2450mA ≤ loset ≤ 3500mA 3850mA ≤ loset ≤ 5600mA
	ESD-150S105DT ESD-150S210DT ESD-150S350DT ESD-150S560DT	70mA 140mA 245mA 385mA	-	loset	70mA ≤ loset < 700mA 140mA ≤ loset < 1400mA 245mA ≤ loset < 2450mA 385mA ≤ loset < 3850mA
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)		2%	5%	8%	
PWM Dimming on (Positive Logic)		4%	7%	10%	
PWM Dimming off ( Negative Logic)		92%	95%	98%	
PWM Dimming on ( Negative Logic)		90%	93%	96%	
Hysteresis		-	2%	-	

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

## Safety & EMC Compliance

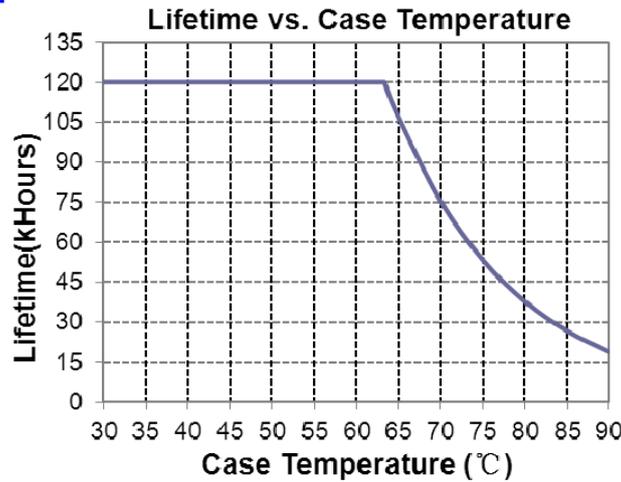
Safety Category	Standard
UL/CUL	UL8750,CAN/CSA-C22.2 No. 250.13
EMI Standards	Notes
FCC Part15 <sup>(1)</sup>	ANSI C63.4 Class B
	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: [1] this device may not cause harmful interference, and [2] this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

## Safety & EMC Compliance (Continued)

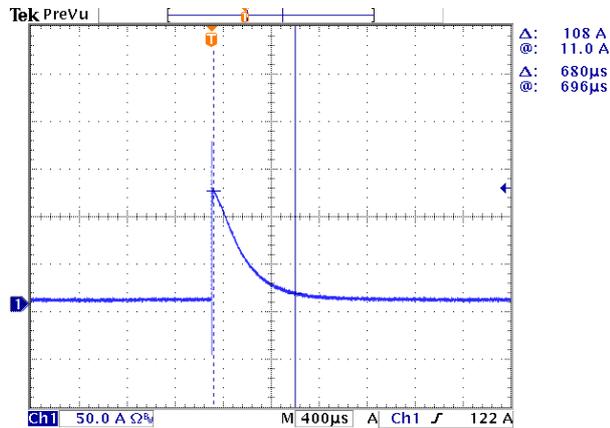
EMS Standards	Notes
EN 61000-4-2	Electrostatic Discharge (ESD): 8 kV air discharge, 4 kV contact discharge
EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test-RS
EN 61000-4-4	Electrical Fast Transient / Burst-EFT
EN 61000-4-5	Surge Immunity Test: AC Power Line: line to line 4 kV, line 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.

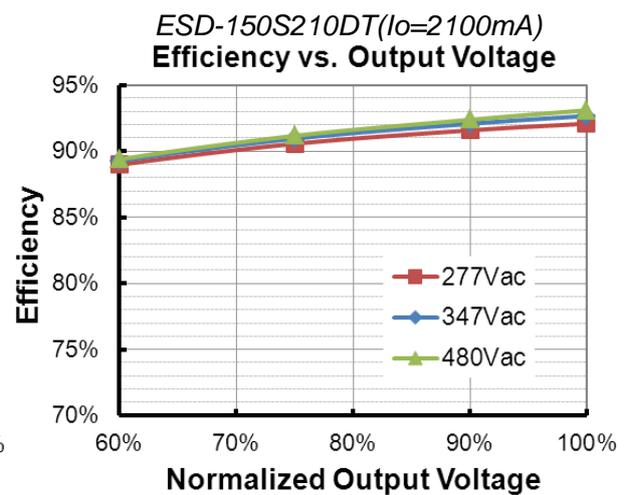
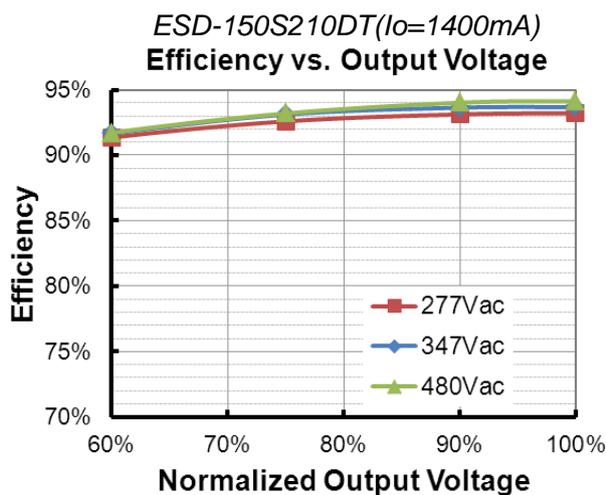
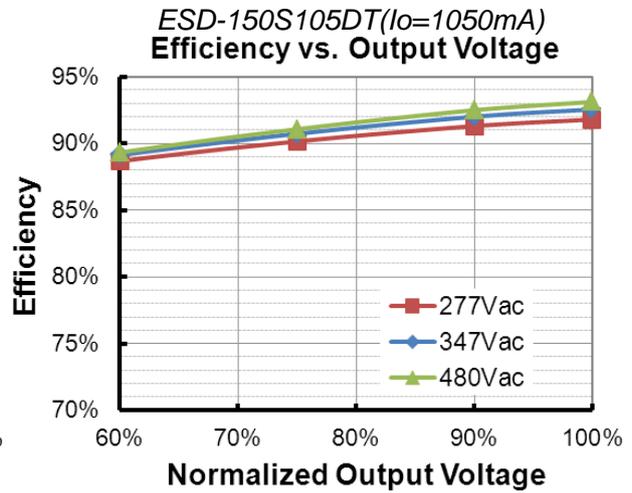
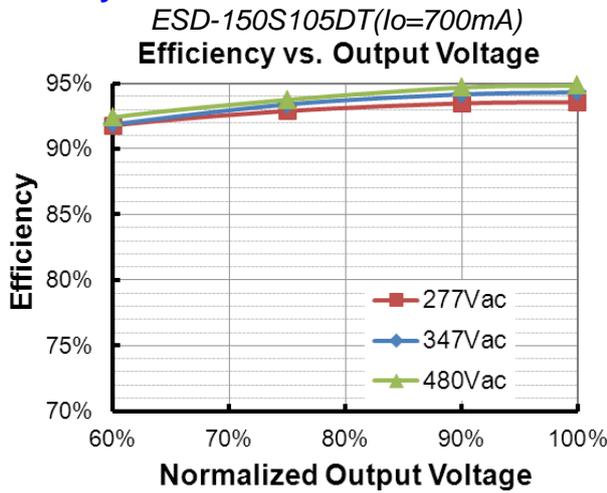
## Lifetime vs. Case Temperature

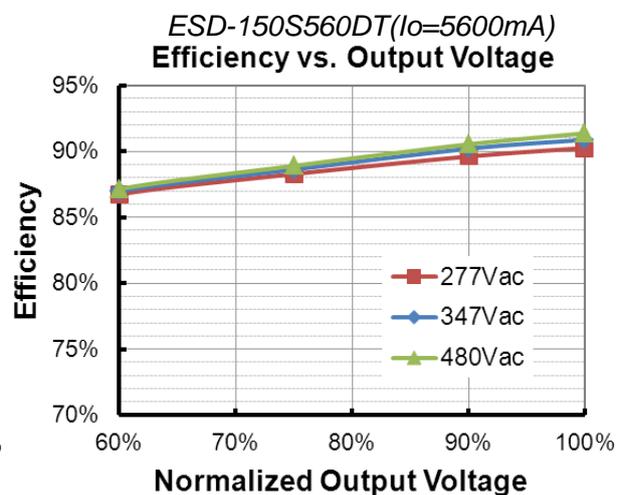
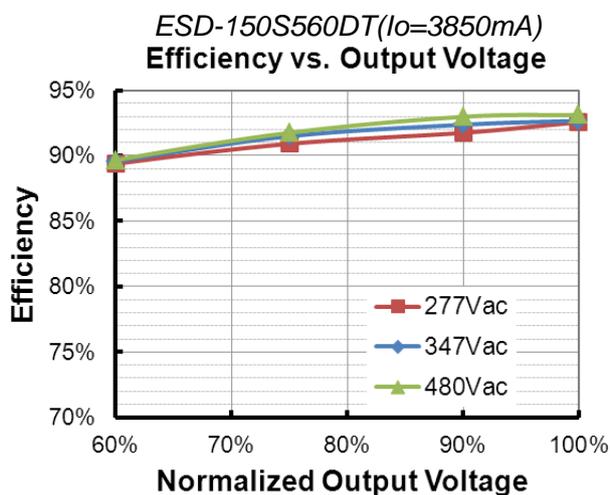
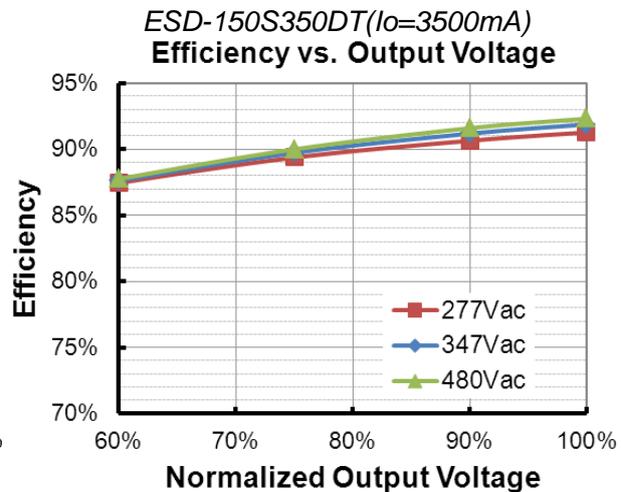
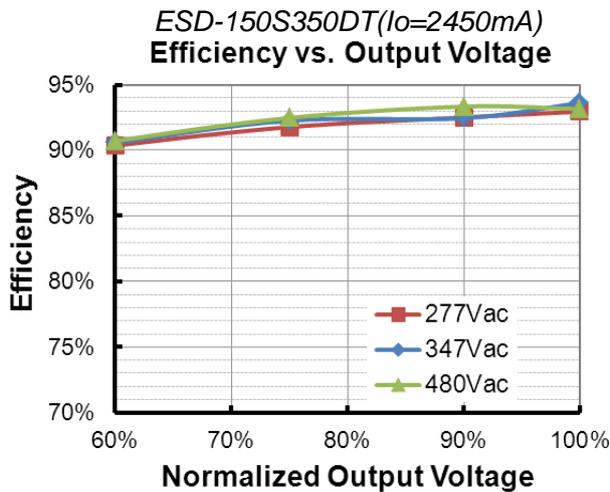


## Inrush Current Waveform

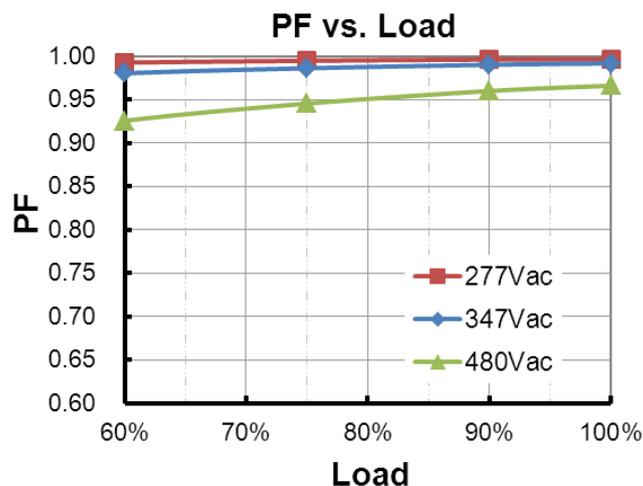


## Efficiency vs. Load

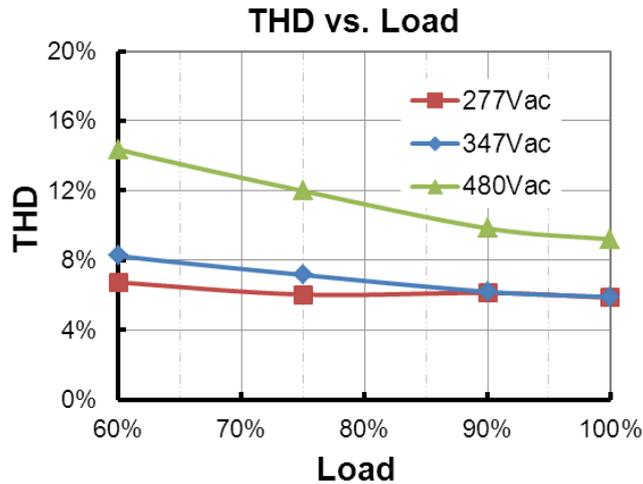




## Power Factor



## Total Harmonic Distortion



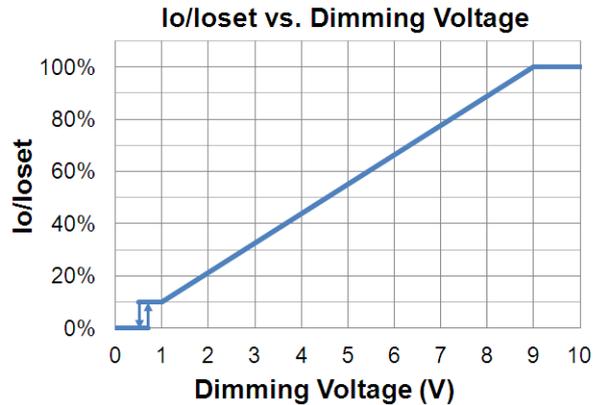
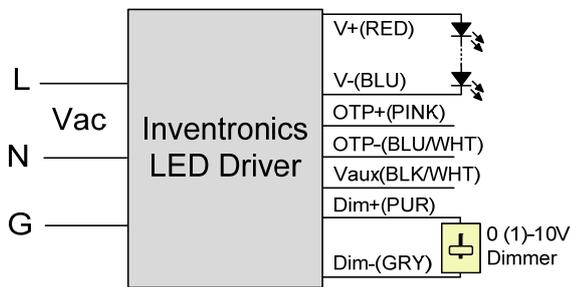
## Protection Functions

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.			
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 > I <sub>omin</sub> (default setting is 60%)
		I <sub>omin</sub>	60%loset	100%loset	10%loset ≤ I <sub>omin</sub> (default setting is 60%)

## Dimming

### ● 0-10V Dimming

The recommended implementation of the dimming control is provided below.

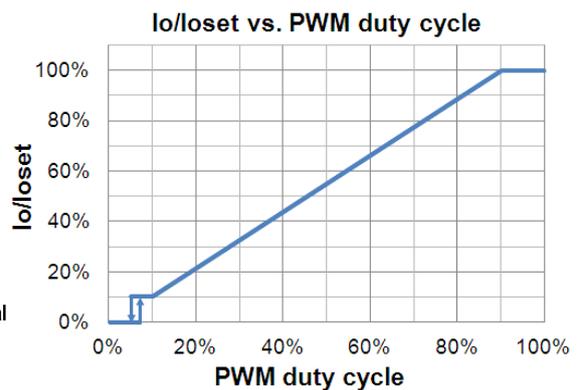
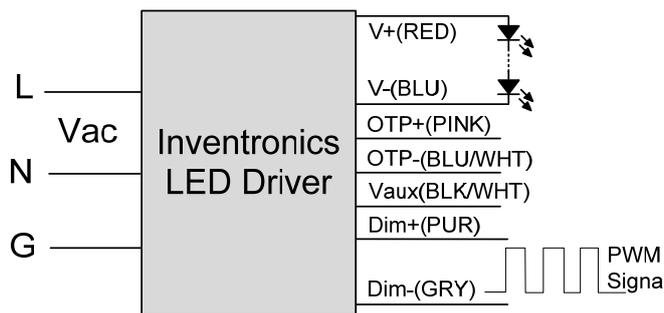


### Implementation 1: DC Input

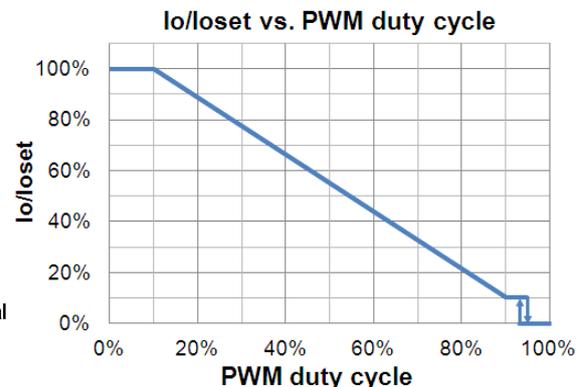
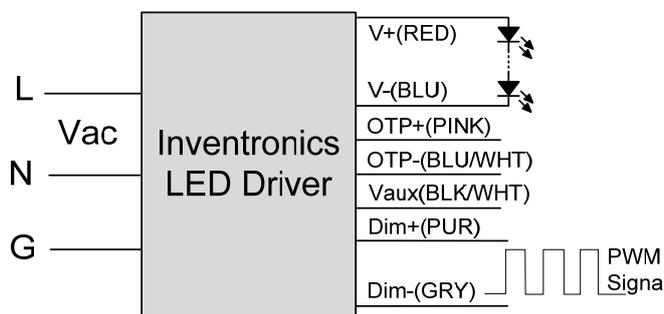
**Notes:**

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

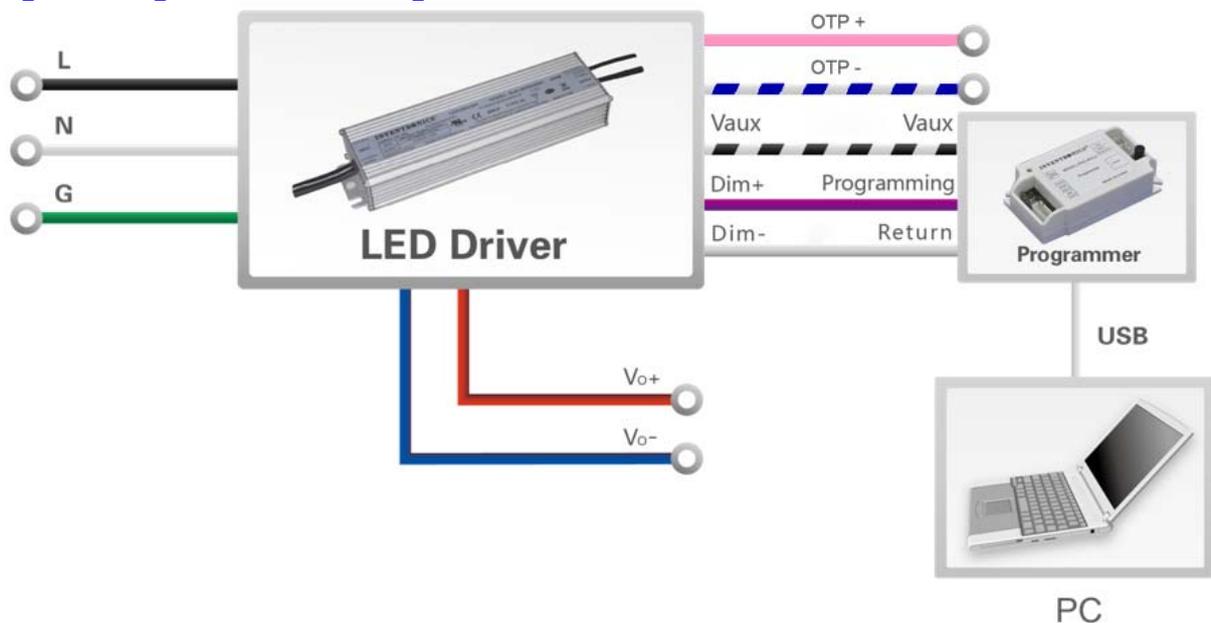
Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

- **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.

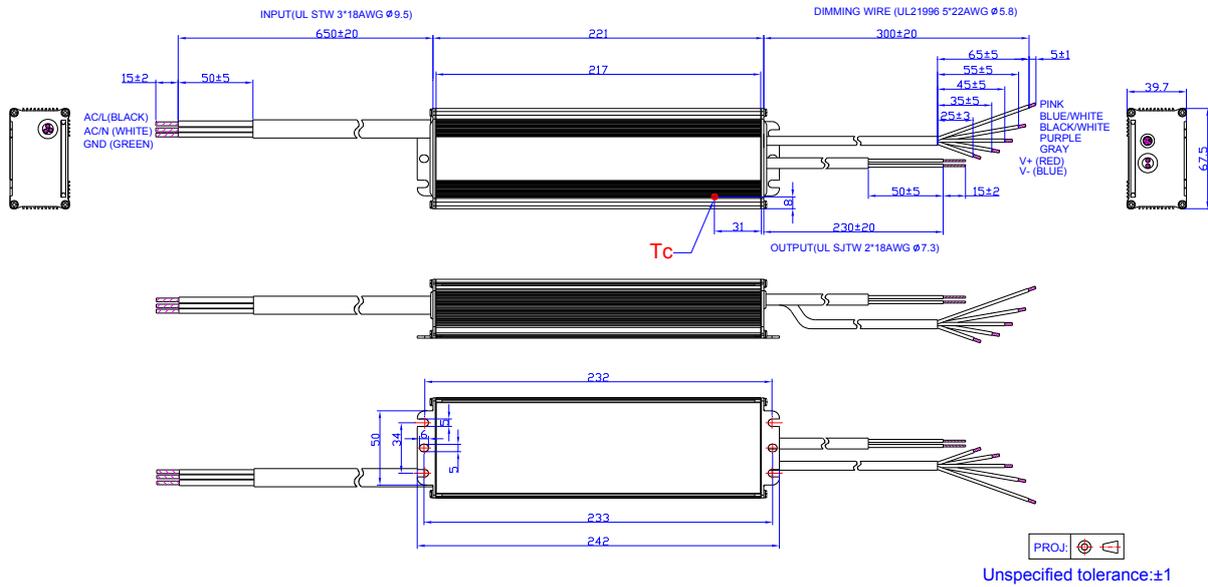
## Programming Connection Diagram



**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 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
2015-09-23	A	Datasheets Release	/	/
2016-06-02	B	Input AC Current	/	Updated
		General Specifications	With mounting ear	Added
		General Specifications	Net Weight	Added
		Safety & EMC Compliance	Notes	Added
		Programming Connection Diagram	/	Updated
		Mechanical Outline	/	Updated
2017-08-03	C	Features	/	Updated
		Input Specifications	PF/THD	Updated
		Output Specifications	Turn-on Delay Time	Updated
		Output Specifications	Temperature Coefficient of I <sub>oset</sub>	Updated
		Safety & EMC Compliance	/	Updated
		Mechanical Outline	/	Updated