

## Features

- Ultra High Efficiency (Up to 94%)
- Full Power at 70-100% Max Current (Constant Power)
- 0-10V/PWM/Timer Dimmable and Dim-to-Off
- Standby Power  $\leq 1.5W$
- 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-240SxxxDT series is a 240W, constant-current, programmable 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 over voltage, short circuit, and over temperature.

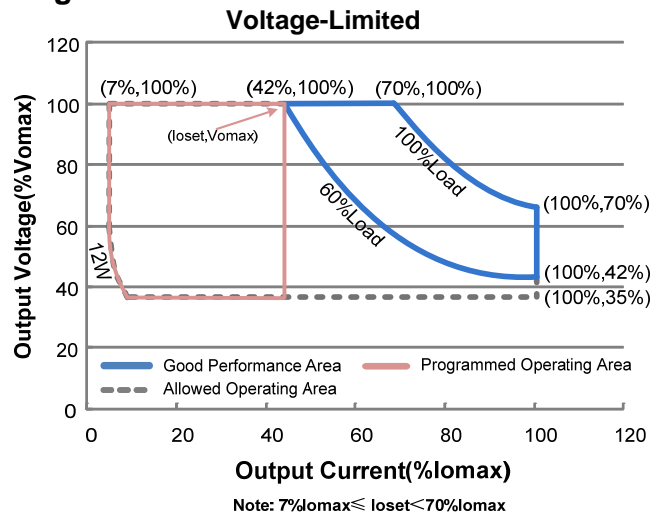
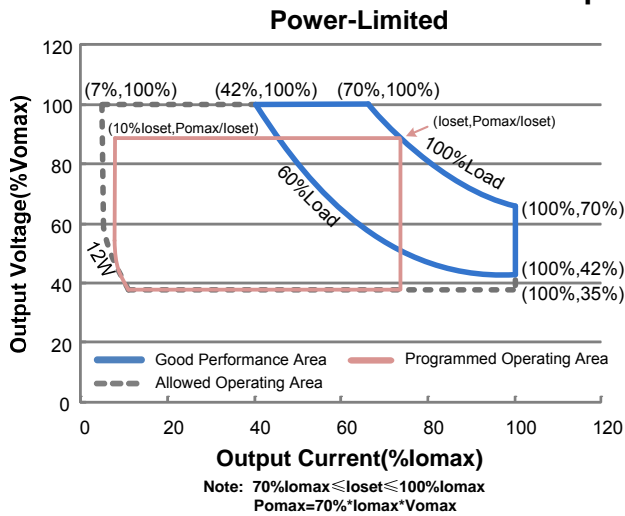
## Models

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	
70-1000mA	700-1000mA	700 mA	249~528 Vac	120~343Vdc	240 W	94.0%	0.96	0.95	ESD-240S100DT
105-1500mA	1050-1500mA	1400 mA	249~528 Vac	80~229Vdc	240 W	93.5%	0.96	0.95	ESD-240S150DT
154-2200mA	1540-2200mA	2100 mA	249~528 Vac	55~156Vdc	240 W	93.0%	0.96	0.95	ESD-240S220DT
224-3200mA	2240-3200mA	2800 mA	249~528 Vac	38~107Vdc	240 W	93.0%	0.96	0.95	ESD-240S320DT
322-4600mA	3220-4600mA	4200 mA	249~528 Vac	27~75Vdc	240 W	93.0%	0.96	0.95	ESD-240S460DT
462-6600mA	4620-6600mA	4900 mA	249~528 Vac	19~52Vdc	240 W	92.5%	0.96	0.95	ESD-240S660DT

**Notes:** (1) Output current range with constant power at 240W

(2) Measured at a 480Vac input with 70% maximum output current and 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	-	-	0.75 MIU	UL8750; 480Vac/ 60Hz
Input AC Current	-	-	1.1 A	Measured at full load and 277 Vac input.
	-	-	0.6 A	Measured at full load and 480 Vac input.
Inrush Current(I <sup>2</sup> t)	-	-	2.9 A <sup>2</sup> s	At 480Vac input, 25°C Cold Start, Duration=1.43 ms, 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 (144-240W)
THD	-	-	20%	

## Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%I <sub>oset</sub>	-	5%I <sub>oset</sub>	At full load condition
Output Current Setting(I <sub>oset</sub> ) Range	7%I <sub>omax</sub>	-	100%I <sub>omax</sub>	
Output Current Setting Range with Constant Power	70%I <sub>omax</sub>	-	100%I <sub>omax</sub>	
Output Current Ripple(pk-pk)	-	5%I <sub>omax</sub>	10%I <sub>omax</sub>	At full load condition
Startup Overshoot Current	-	-	10%I <sub>omax</sub>	At full load condition

## Output Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
No Load Output Voltage				
ESD-240S100DT	-	-	355 V	
ESD-240S150DT	-	-	248 V	
ESD-240S220DT	-	-	170 V	
ESD-240S320DT	-	-	120 V	
ESD-240S460DT	-	-	90 V	
ESD-240S660DT	-	-	60 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 I <sub>o</sub> set	-	0.03%/°C	-	Case temperature = 0°C ~T <sub>c</sub> 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-240S100DT				
I <sub>o</sub> =700 mA	90.0%	92.0%	-	
I <sub>o</sub> =1000mA	89.5%	91.5%	-	
ESD-240S150DT				
I <sub>o</sub> =1050mA	90.0%	92.0%	-	
I <sub>o</sub> =1500mA	89.0%	91.0%	-	
ESD-240S220DT				
I <sub>o</sub> =1540mA	89.5%	91.5%	-	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> =2200mA	89.5%	91.5%	-	
ESD-240S320DT				
I <sub>o</sub> =2240mA	89.5%	91.5%	-	
I <sub>o</sub> =3200mA	88.5%	90.5%	-	
ESD-240S460DT				
I <sub>o</sub> =3220mA	89.5%	91.5%	-	
I <sub>o</sub> =4600mA	88.0%	90.0%	-	
ESD-240S660DT				
I <sub>o</sub> =4620mA	89.0%	91.0%	-	
I <sub>o</sub> =6600mA	88.0%	90.0%	-	

## General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes		
Efficiency at 347 Vac input: ESD-240S100DT Io=700 mA Io=1000mA ESD-240S150DT Io=1050mA Io=1500mA ESD-240S220DT Io=1540mA Io=2200mA ESD-240S320DT Io=2240mA Io=3200mA ESD-240S460DT Io=3220mA Io=4600mA ESD-240S660DT Io=4620mA Io=6600mA	91.0% 90.5% 91.0% 90.0% 90.0% 90.0% 89.5% 90.0% 89.0% 90.0% 89.0%	93.0% 92.5% 93.0% 92.0% 92.0% 92.0% 91.5% 92.0% 91.0% 92.0% 91.0%	- - - - - - - - - - -	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-240S100DT Io=700 mA Io=1000mA ESD-240S150DT Io=1050mA Io=1500mA ESD-240S220DT Io=1540mA Io=2200mA ESD-240S320DT Io=2240mA Io=3200mA ESD-240S460DT Io=3220mA Io=4600mA ESD-240S660DT Io=4620mA Io=6600mA	92.0% 91.0% 91.5% 91.5% 91.0% 91.0% 91.0% 90.0% 91.0% 89.5% 90.5% 89.5%	94.0% 93.0% 93.5% 93.5% 93.0% 93.0% 93.0% 92.0% 93.0% 91.5% 92.5% 91.5%	- - - - - - - - - - - -		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	-	209,000 Hours	-			Measured at 480Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	114,000 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	-	+89°C			
Operating Case Temperature for Warranty Tc_w	-40°C	-	+75°C			Case temperature for 5 years warranty
Storage Temperature	-40°C	-	+85°C			
Dimensions Inches (L × W × H) Millimeters (L × W × H)	9.49 × 2.66 × 1.56 241 × 67.5 × 39.5					With mounting ear 10.32 × 2.66 × 1.56 262 × 67.5 × 39.5
Net Weight	-	1400 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	10%I <sub>oSet</sub>	-	I <sub>oSet</sub>	70%I <sub>oMax</sub> ≤ I <sub>oSet</sub> ≤ 100%I <sub>oMax</sub>
	7%I <sub>oMax</sub>	-	I <sub>oSet</sub>	7%I <sub>oMax</sub> ≤ I <sub>oSet</sub> < 70%I <sub>oMax</sub>
Recommended Dimming Input Range	0 V	-	10 V	Default 0-10V dimming mode.
Dim off Voltage	0.2 V	0.4 V	0.6 V	
Dim on Voltage	0.4 V	0.6 V	0.8 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%	4%	7%	
PWM Dimming on (Positive Logic)	4%	6%	9%	
PWM Dimming off ( Negative Logic)	93%	96%	98%	
PWM Dimming on ( Negative Logic)	91%	94%	96%	
Hysteresis	-	2%	-	

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

## Safety & EMC Compliance

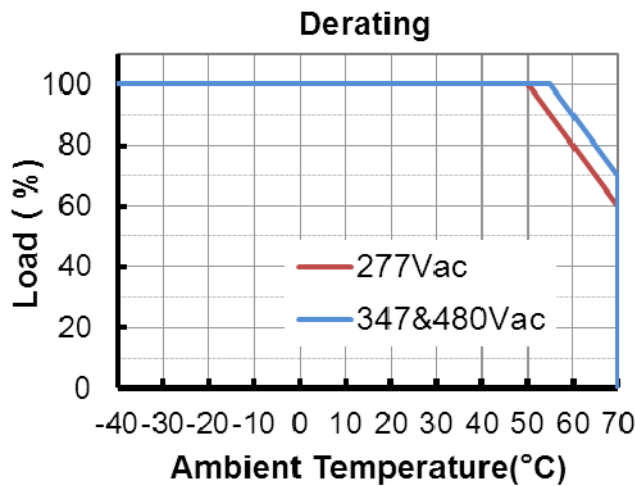
Safety Category	Standard
UL/CUL	UL8750,CAN/CSA-C22.2 No. 250.13
EMI Standards	Notes
FCC Part 15 <sup>(1)</sup>	ANSI C63.4 Class B
	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: [1] this device may not cause harmful interference, and (2) this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

## Safety & EMC Compliance (Continued)

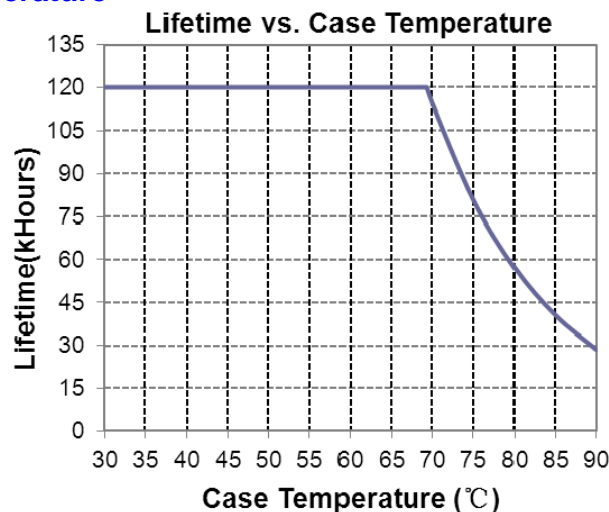
EMS Standards	Notes
EN 61000-4-5	Surge Immunity Test: AC Power Line: line to line 4 kV, line to earth 6 kV
EN 61000-4-6	Conducted Radio Frequency Disturbances Test-CS
EN 61000-4-8	Power Frequency Magnetic Field Test
EN 61000-4-11	Voltage Dips
EN 61547	Electromagnetic Immunity Requirements Applies To Lighting Equipment

**Notes:** (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.

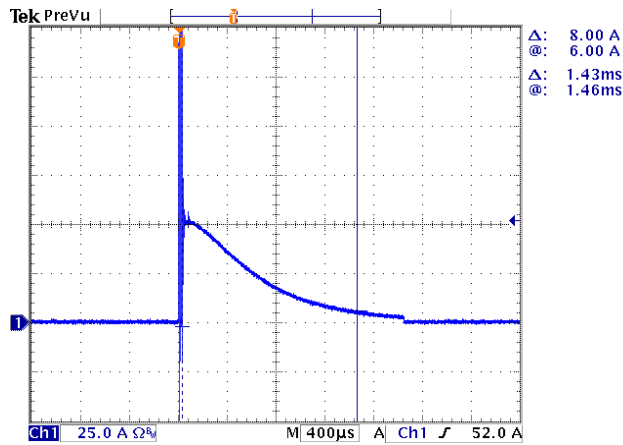
## Derating



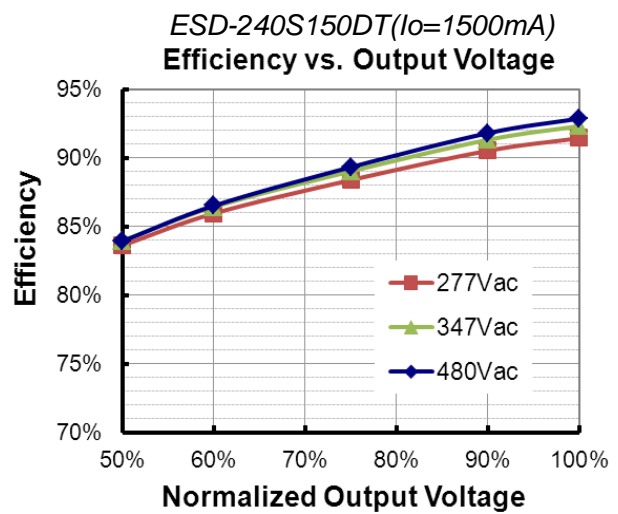
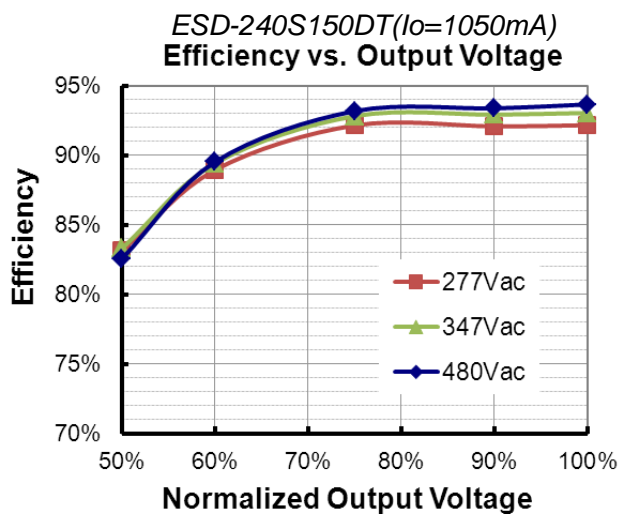
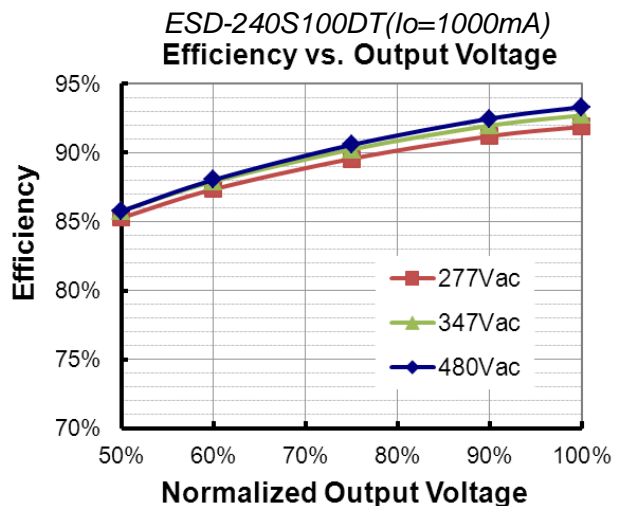
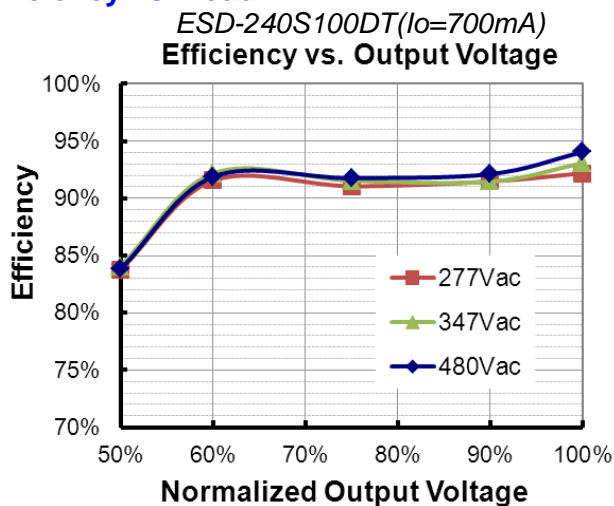
## Lifetime vs. Case Temperature

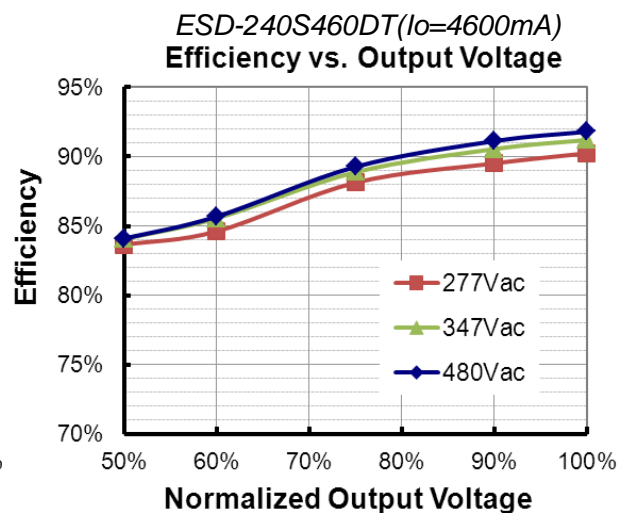
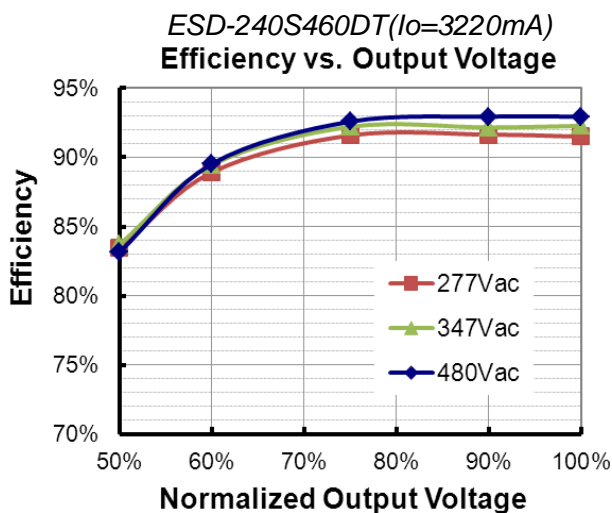
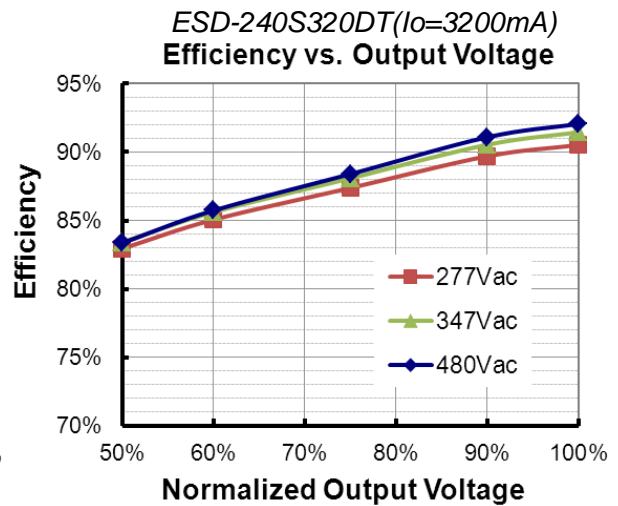
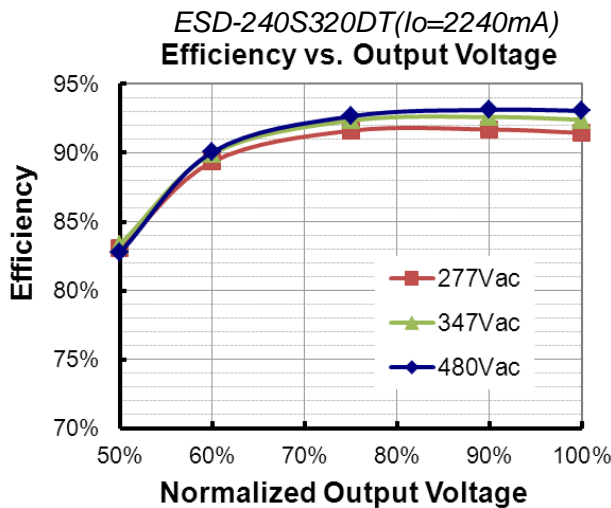
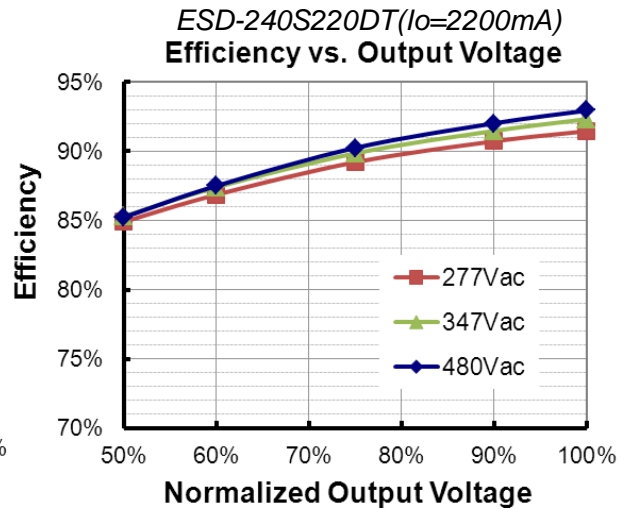
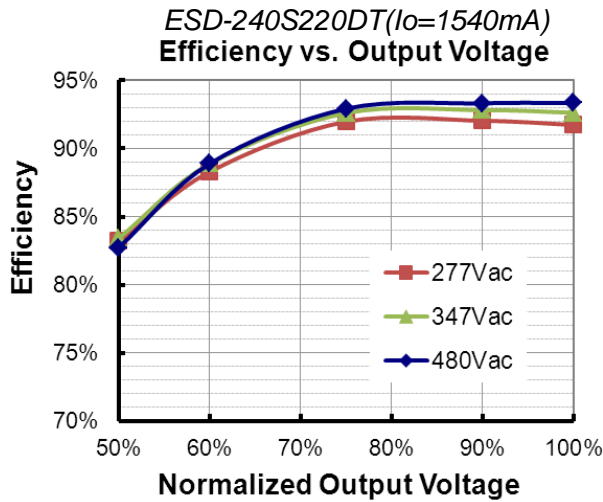


## Inrush Current Waveform

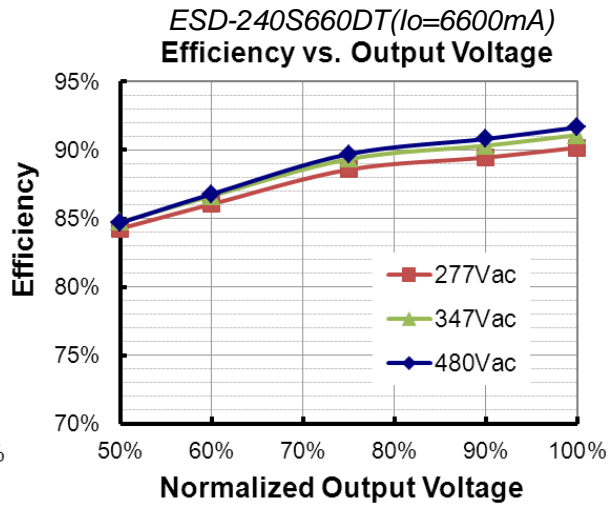
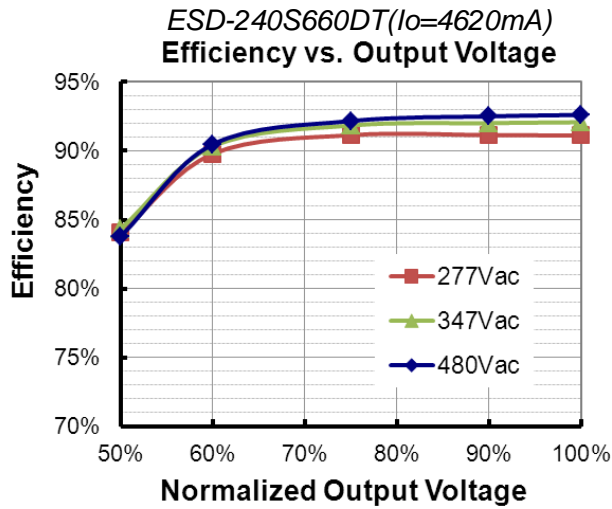


## Efficiency vs. Load

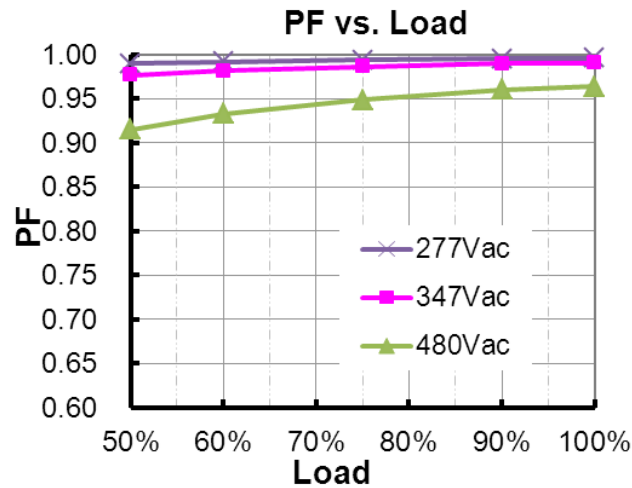




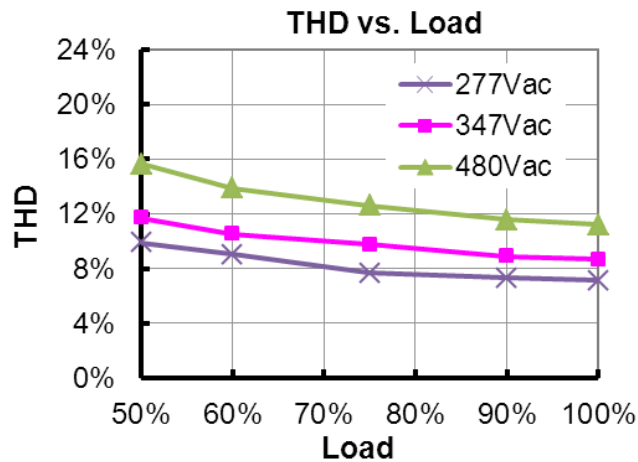




## Power Factor



## Total Harmonic Distortion



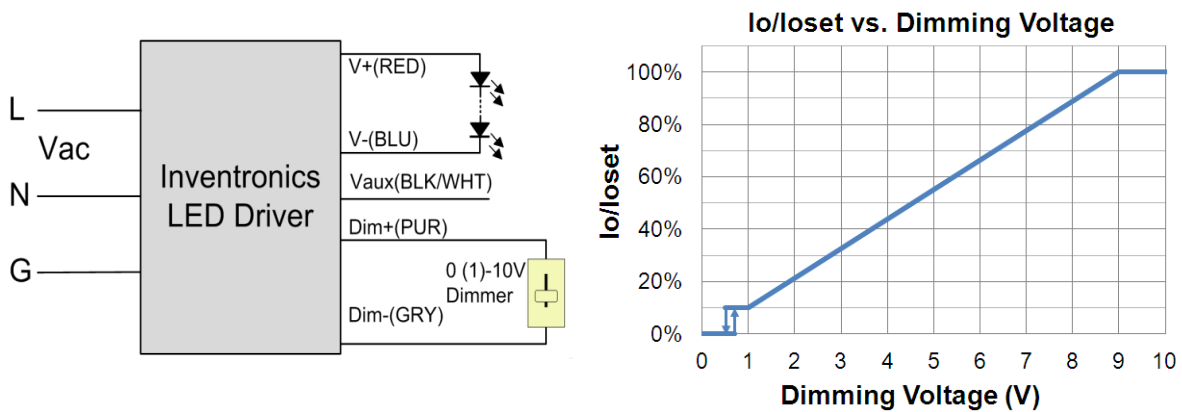
## Protection Functions

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.

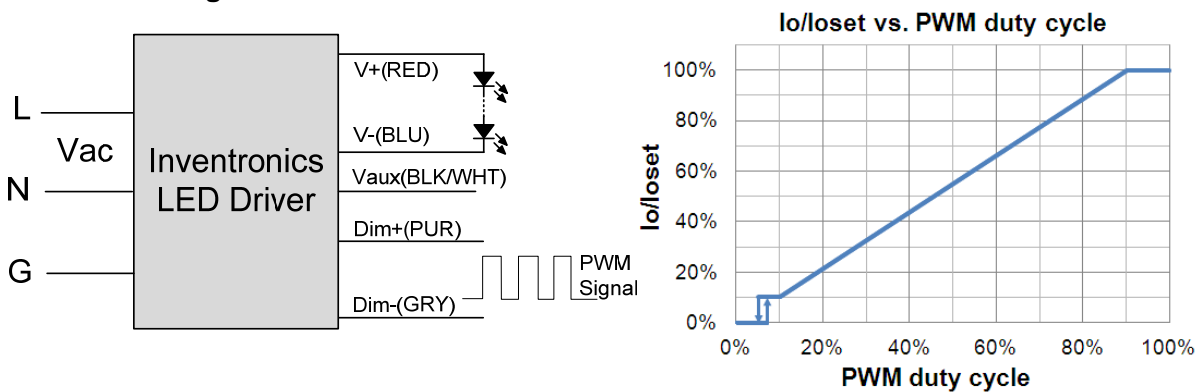


**Implementation 1: DC Input**

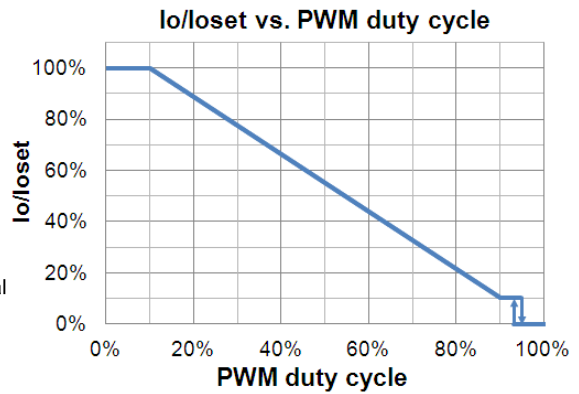
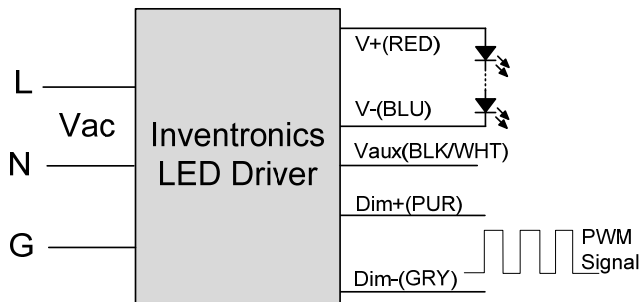
#### Notes:

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**

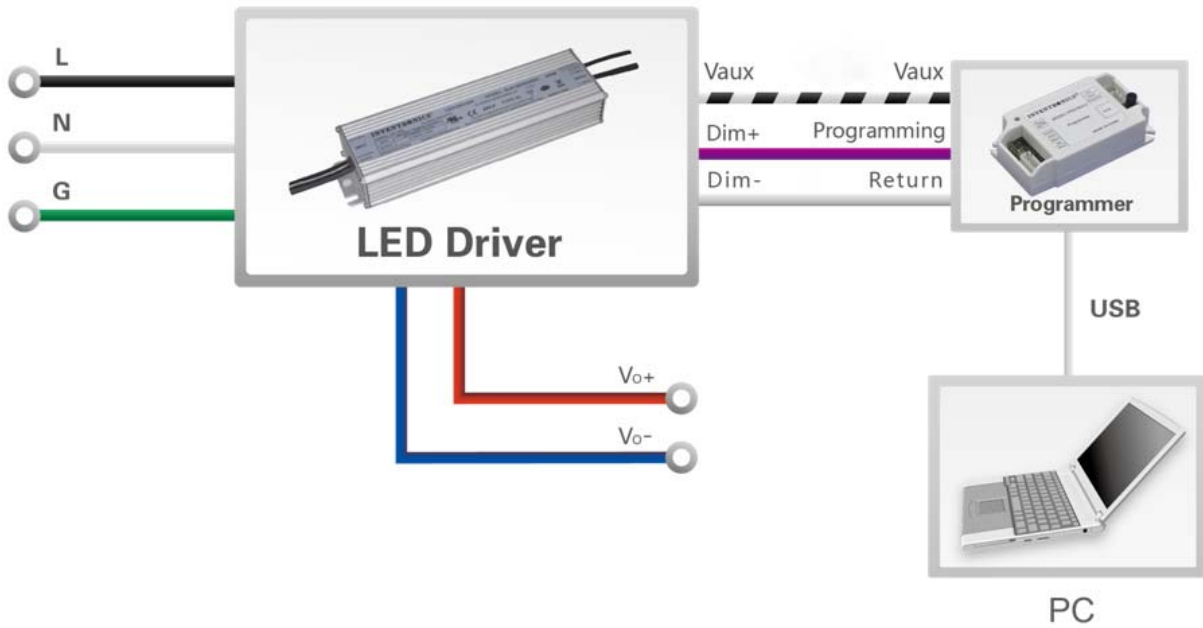


Implementation 3: Negative logic

● Time Dimming

Set the timing curve by pulling the sliders.

## Programming Connection Diagram

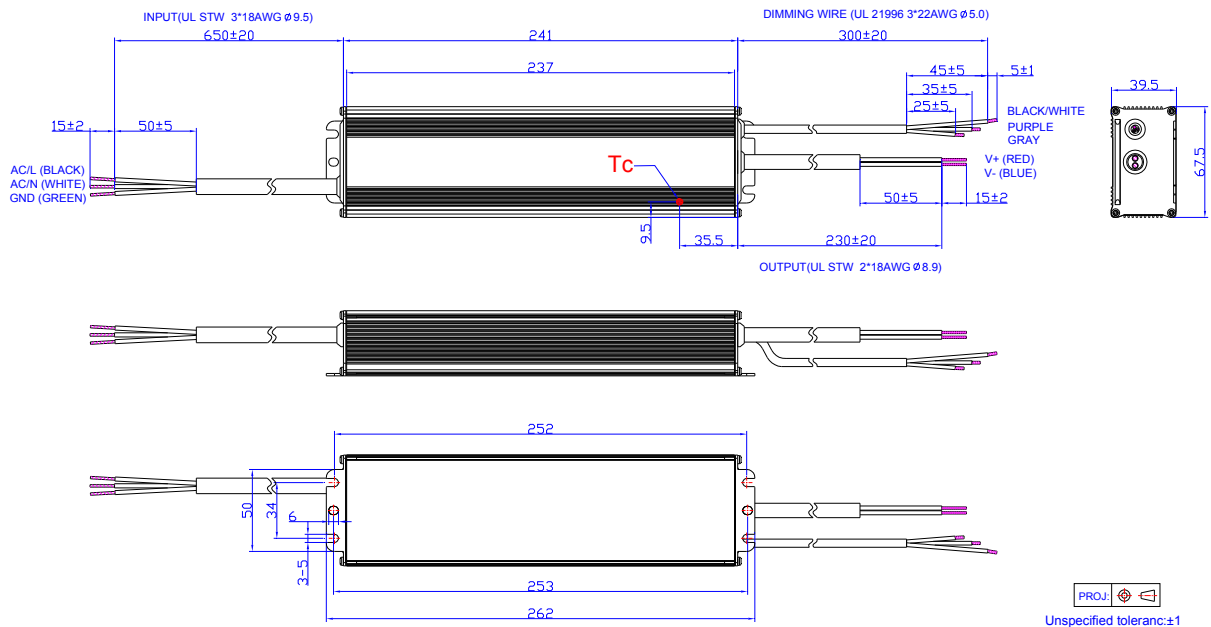


**Note:** The driver does not need to be powered on during the programming process.

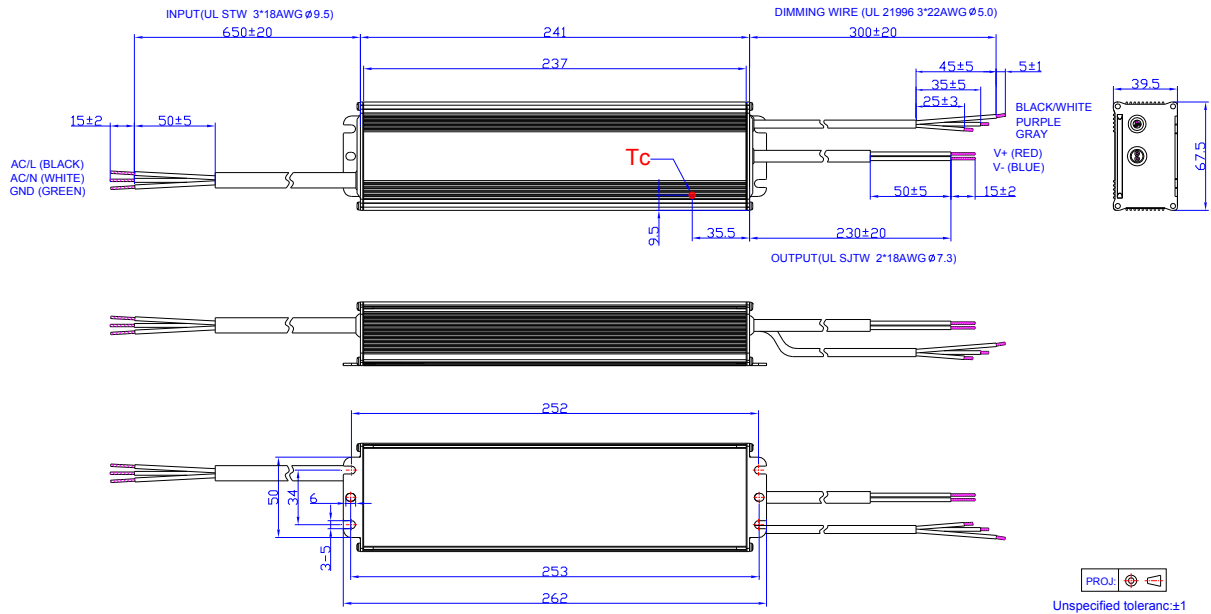
- Please refer to [PRG-MUL2](#) (Programmer) datasheet for details.

## Mechanical Outline

ESD-240S100DT



Other Models



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
2014-09-10	A	Datasheets Release	/	/
2016-5-30	B	General Specifications	Case Temperature	Operating Case Temperature for Safety
		General Specifications	Operating Case Temperature for Warranty Tc_w	Added
		General Specifications	Storage Temperature	Added
		General Specifications	With mounting ear	Added
		General Specifications	Net Weight	Added
		Environmental Specifications	/	Deleted
		Safety &EMC Compliance	Notes	Added
		Programming Connection Diagram	/	Updated
		Mechanical Outline	/	Updated
2017-11-21	C	Features	5 Years Warranty	Updated
		Input AC Current	/	Updated
		Input Specifications	Leakage Current	Updated
		Input Specifications	Inrush Current(I2t)	Updated
		Input Specifications	PF/THD(Note)	Updated
		Output Specifications	Turn-on Delay Time	Updated
		Output Specifications	Temperature Coefficient of Ioset	Updated
		General Specifications	Lifetime	Updated
		General Specifications	Operating Case Temperature for Warranty Tc_w	Updated
		Safety &EMC Compliance	/	Updated
		Lifetime vs. Case Temperature	/	Updated
Mechanical Outline	/	Updated		