

## Features

- High Efficiency (Up to 90%)
- Full Power at 70-100% Max Current (Constant Power)
- Thermal Sensing and Protection for LED Panel/Strings
- 0-10V/PWM Dimmable and Dim off
- Low Dimming Level to 1% with Good Accuracy
- Standby Power  $\leq 0.5$  W
- All-Around Protection: OVP, SCP, OTP
- Class II, SELV and Class 2



## Description

The LUD-060SxxxDSF series is a 60W, constant-current, programmable indoor LED driver that operates from 90-305 Vac input with excellent power factor. Created for dimmable panel lights and linear lights, it provides good dimming accuracy down to 1% output, plus a dim-off mode with low standby power. The high efficiency of these drivers and slim 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 of both the driver and the external LED array.

## Models

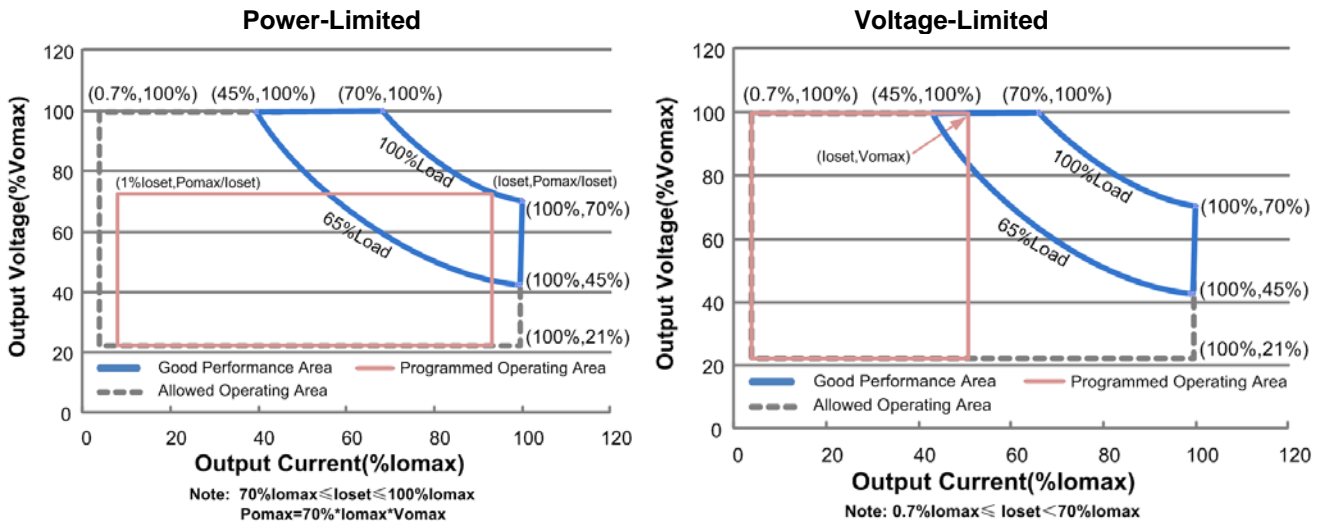
Output Current Range	Full-Power Current Range (1)	Default Output Current	Input Voltage Range(2)	Output Voltage Range	Max. Output Power	Typical Efficiency (3)	Power Factor		Model Number
							120Vac	220Vac	
3.85-550mA	385-550 mA	530mA	90 ~ 305 Vac 127~300 Vdc	31~156 Vdc	60 W	90%	0.99	0.96	LUD-060S055DSF
5.46-780mA	546-780 mA	700mA	90 ~ 305 Vac 127~300 Vdc	22~110 Vdc	60 W	90%	0.99	0.96	LUD-060S078DSF (SELV)
7.7-1100mA	770-1100 mA	1050mA	90 ~ 305 Vac 127~300 Vdc	16 ~78 Vdc	60 W	90%	0.99	0.96	LUD-060S110DSF (SELV)
10.5-1500mA	1050-1500mA	1400mA	90 ~ 305 Vac 127~300 Vdc	12 ~57 Vdc	60 W	90%	0.99	0.96	LUD-060S150DSF (Class2 & SELV)
14.7-2100mA	1470-2100mA	2100mA	90 ~ 305 Vac 127~300 Vdc	8 ~40 Vdc	60 W	89%	0.99	0.96	LUD-060S210DSF (Class2 & SELV)

**Notes:** (1) Output current range with constant power at 60W

(2) UL, FCC certified input voltage range: 100-277Vac or 127-300Vdc; other certified input voltage range except UL & FCC: 100-240Vac /127-250Vdc

(3) Measured at a 220Vac input with 70% output current and 100% output voltage.

## I-V Operating Curve



## Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	90 V	-	305 V	127~300 Vdc
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.75 mA	At 277Vac 60Hz input
Input AC Current	-	-	0.8 A	Measured at full load and 100 Vac input.
	-	-	0.36 A	Measured at full load and 220 Vac input.
Inrush Current(I <sup>2</sup> t)	-	-	2 A <sup>2</sup> s	At 220Vac input, 25°C Cold Start, Duration =0.44 mS, 10%I <sub>pk</sub> -10%I <sub>pk</sub> . See Inrush Current Waveform for the details.
PF	0.90	-	-	At 100-277Vac, 65%-100% load(39-60W)
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	0.7%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				
LUD-060S055DSF	-	-	180 V	
LUD-060S078DSF	-	-	120 V	
LUD-060S110DSF	-	-	90 V	
LUD-060S150DSF	-	-	59.5 V	
LUD-060S210DSF	-	-	50 V	
Line Regulation	-	-	±0.5%	Measured at full load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	0.8 s	1.2 s	Measured at 120Vac input.
	-	0.6 s	1.0 s	Measured at 220Vac input.
Temperature Coefficient of I <sub>o</sub> set	-	-	0.02%/°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 120 Vac input:				
LUD-060S055DSF				
I <sub>o</sub> =385 mA	86.0%	88.0%	-	Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
I <sub>o</sub> =550 mA	85.0%	87.0%	-	
LUD-060S078DSF				
I <sub>o</sub> =546 mA	86.0%	88.0%	-	
I <sub>o</sub> =780 mA	85.0%	87.0%	-	
LUD-060S110DSF				
I <sub>o</sub> =770 mA	86.0%	88.0%	-	
I <sub>o</sub> =1100 mA	84.0%	86.0%	-	
LUD-060S150DSF				
I <sub>o</sub> =1050 mA	86.0%	88.0%	-	
I <sub>o</sub> =1500 mA	84.0%	86.0%	-	
LUD-060S210DSF				
I <sub>o</sub> =1470 mA	85.0%	87.0%	-	
I <sub>o</sub> =2100 mA	83.0%	85.0%	-	
Efficiency at 220 Vac input:				
LUD-060S055DSF				
I <sub>o</sub> =385 mA	88.0%	90.0%	-	Measured at full load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
I <sub>o</sub> =550 mA	86.5%	88.5%	-	
LUD-060S078DSF				
I <sub>o</sub> =546 mA	88.0%	90.0%	-	
I <sub>o</sub> =780 mA	87.0%	89.0%	-	
LUD-060S110DSF				
I <sub>o</sub> =770 mA	88.0%	90.0%	-	
I <sub>o</sub> =1100 mA	86.0%	88.0%	-	
LUD-060S150DSF				
I <sub>o</sub> =1050 mA	88.0%	90.0%	-	
I <sub>o</sub> =1500 mA	87.0%	89.0%	-	
LUD-060S210DSF				
I <sub>o</sub> =1470 mA	87.0%	89.0%	-	
I <sub>o</sub> =2100 mA	85.0%	87.0%	-	

## General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 277 Vac input: LUD-060S055DSF				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> =385 mA	88.0%	90.0%	-	
I <sub>o</sub> =550 mA	86.5%	88.5%	-	
LUD-060S078DSF				
I <sub>o</sub> =546 mA	88.0%	90.0%	-	
I <sub>o</sub> =780 mA	87.0%	89.0%	-	
LUD-060S110DSF				
I <sub>o</sub> =770 mA	88.0%	90.0%	-	
I <sub>o</sub> =1100 mA	86.0%	88.0%	-	
LUD-060S150DSF				
I <sub>o</sub> =1050 mA	88.0%	90.0%	-	
I <sub>o</sub> =1500 mA	87.0%	89.0%	-	
LUD-060S210DSF				
I <sub>o</sub> =1470 mA	87.0%	89.0%	-	
I <sub>o</sub> =2100 mA	85.0%	87.0%	-	
Standby Power	-	-	0.5 W	Measured at 230Vac/50Hz; Dimming off
MTBF	-	204,000 Hours	-	Measured at 220Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	120,000 Hours	-	Measured at 120Vac input, 80%Load and 60°C case temperature; See lifetime vs. T <sub>c</sub> curve for the details
Case Temperature	-	-	90°C	
Dimensions Inches (L × W × H) Millimeters (L × W × H)	16.46 × 1.18 × 0.83 418 × 30 × 21			
Net Weight	-	380 g	-	

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

## Dimming Specifications

Parameter	Min.	Typ.	Max.	Notes
Absolute Maximum Voltage on the V <sub>dim</sub> (+) Pin	-20 V	-	20 V	
Source Current on V <sub>dim</sub> (+)Pin	-	300 uA	450 uA	V <sub>dim</sub> (+) = 0 V
Dimming Output Range	1%I <sub>o</sub> set	-	I <sub>o</sub> set	70%I <sub>o</sub> max ≤ I <sub>o</sub> set ≤ 100%I <sub>o</sub> max
	0.7%I <sub>o</sub> max	-	I <sub>o</sub> set	0.7%I <sub>o</sub> max ≤ I <sub>o</sub> set < 70%I <sub>o</sub> max
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	-	

## 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	-	0.8 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.

## Environmental Specifications

Parameter	Min.	Typ.	Max.	Notes
Operating Ambient Temperature	-30°C	-	+70°C	Humidity: 10% RH to 90% RH; No Condensation See Derating Curve for more details
Storage Temperature	-40°C	-	+85°C	Humidity: 5% RH to 90% RH

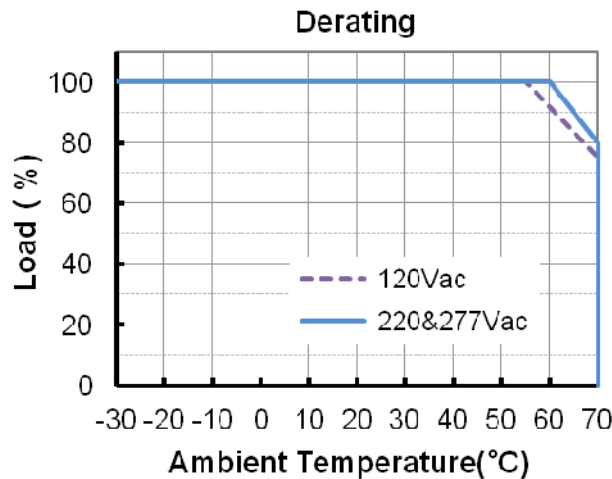
## Safety & EMC Compliance

Safety Category	Standard
UL/CUL	UL 8750,UL1310,CAN/CSA-C22.2 No. 250.13-12,CAN/CSA-C22.2 No. 223-M9
CE	EN61347-1, EN61347-2-13
EMI Standards	Notes
EN 55015	Conducted emission Test & Radiated emission Test
EN 61000-3-2	Harmonic current emissions Class C
EN 61000-3-3	Voltage Fluctuations & Flicker
FCC Part 15	ANSI C63.4:2009 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.

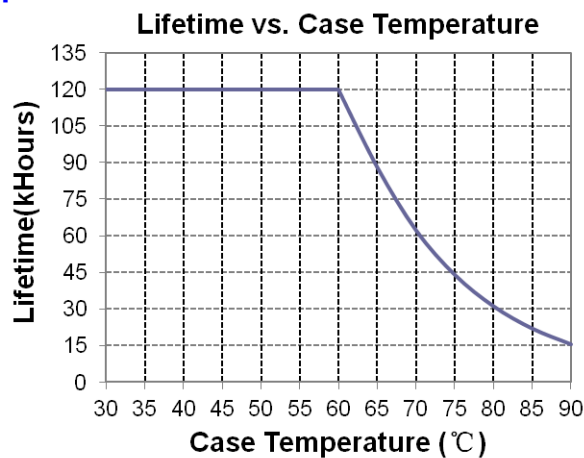
## Safety & EMC Compliance (Continued)

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 1 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

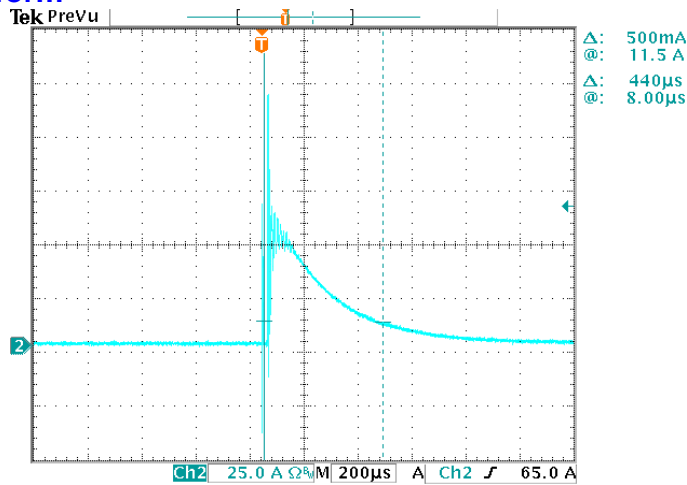
## Derating



## Lifetime vs. Case Temperature

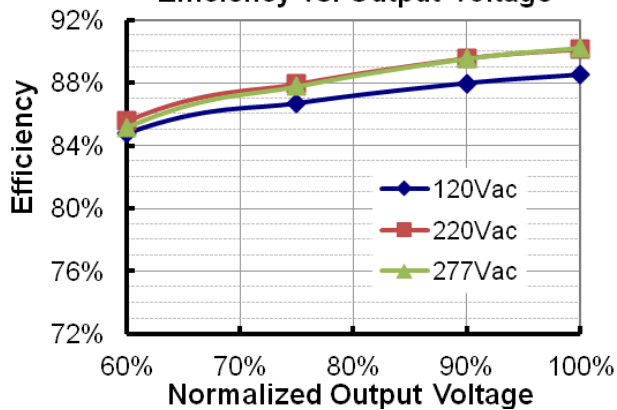


## Inrush Current Waveform

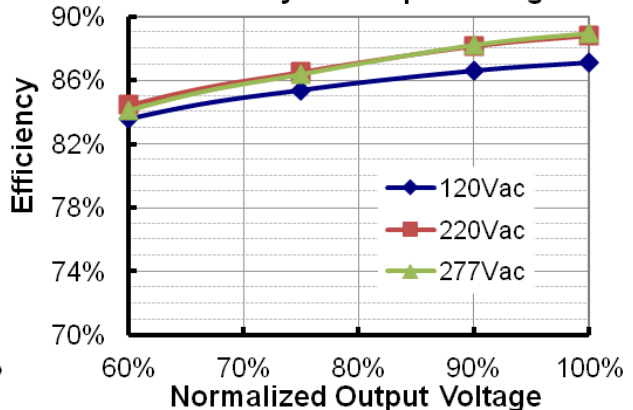


## Efficiency vs. Load

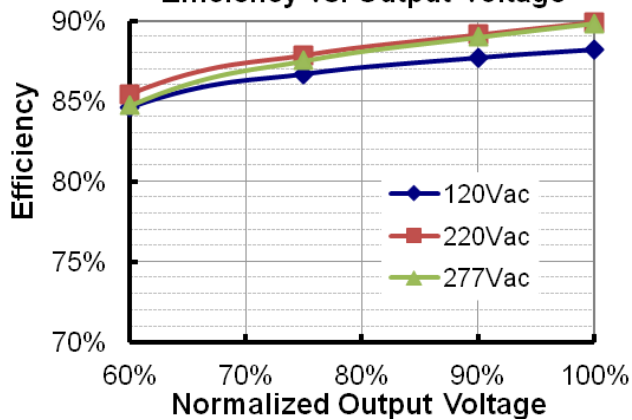
LUD-060S055DSF (I<sub>o</sub>=385mA)  
Efficiency vs. Output Voltage



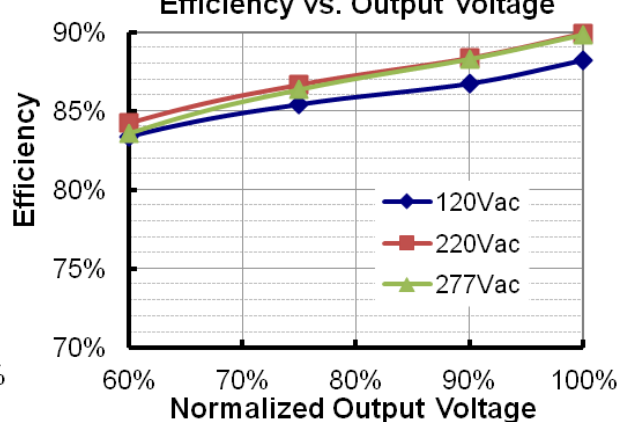
LUD-060S055DSF (I<sub>o</sub>=550mA)  
Efficiency vs. Output Voltage

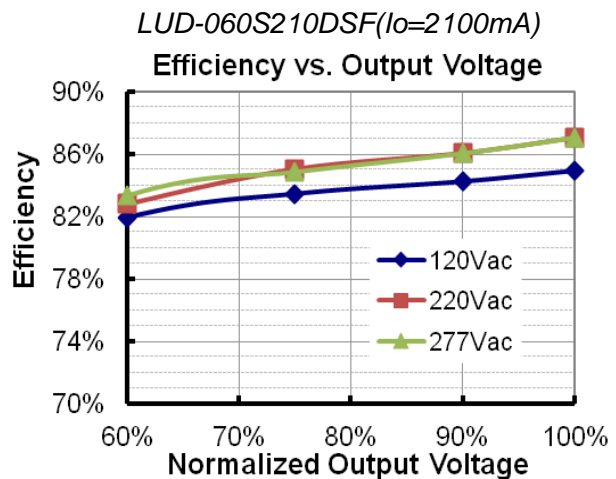
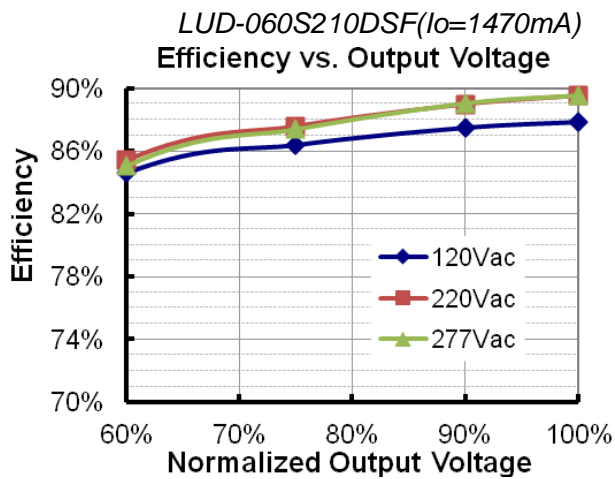
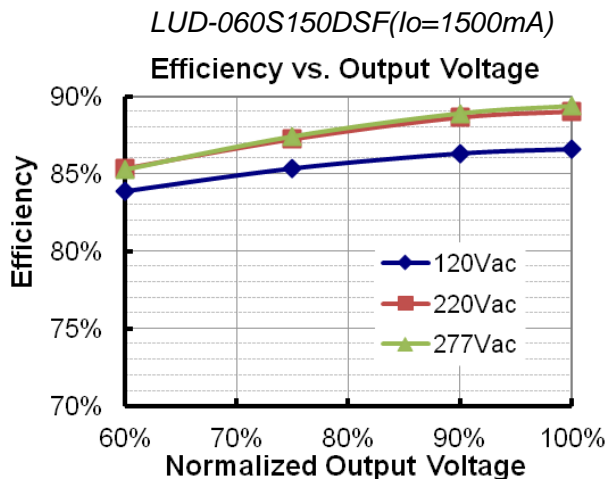
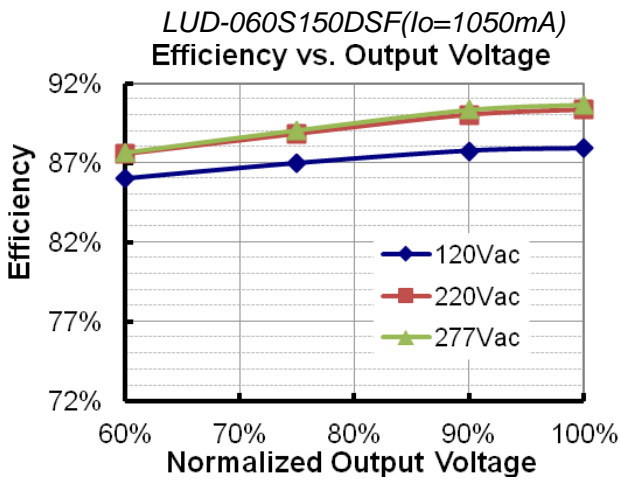
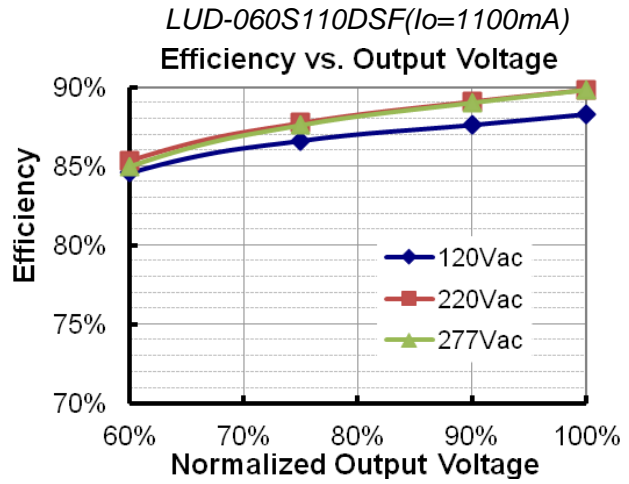
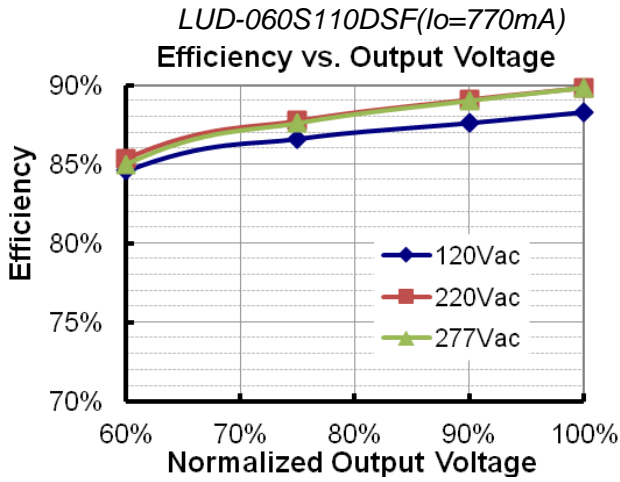


LUD-060S078DSF (I<sub>o</sub>=545mA)  
Efficiency vs. Output Voltage



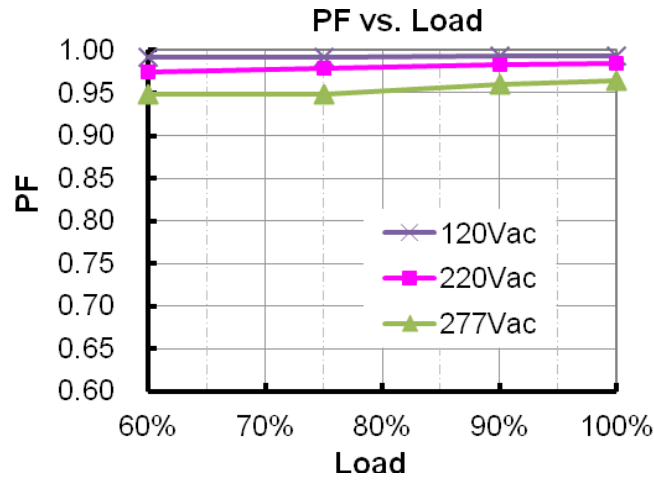
LUD-060S078DSF (I<sub>o</sub>=780mA)  
Efficiency vs. Output Voltage



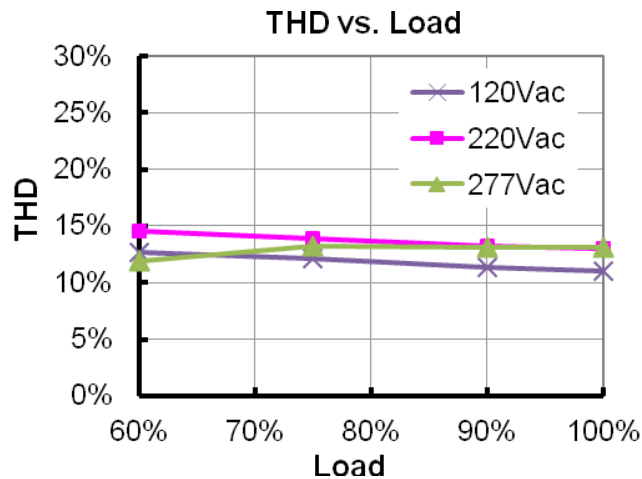




## Power Factor



## Total Harmonic Distortion



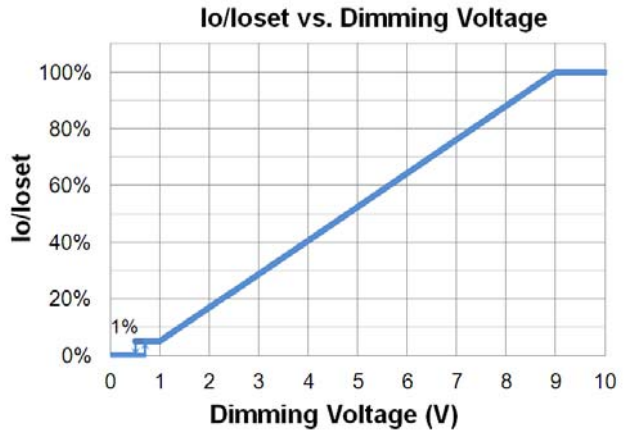
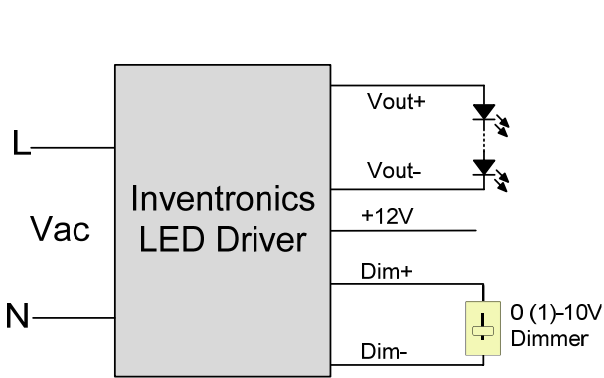
## Protection Functions

Parameter	Min.	Typ.	Max.	Notes
Over Temperature Protection	Decreases output current, returning to normal after over temperature is removed.			
External Thermal Protection NTC	-	4.26 kOhm	-	The default of NTC is 4.26 kOhm. When NTC is lower than 4.26 kOhm, External Thermal Protection will be triggered.
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.

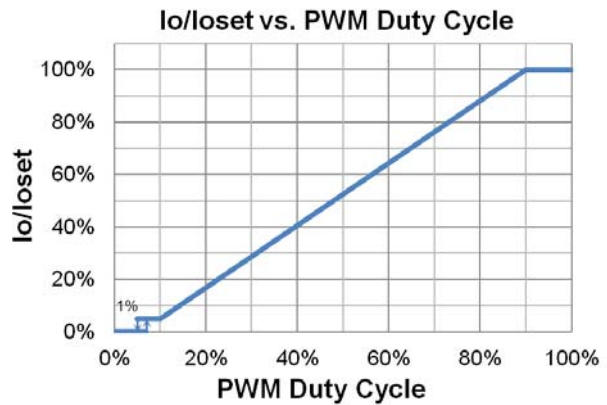
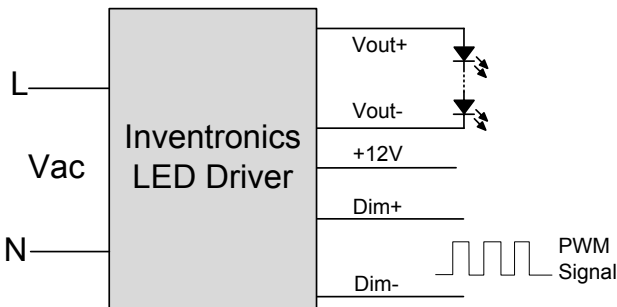


**Implementation 1: DC Input**

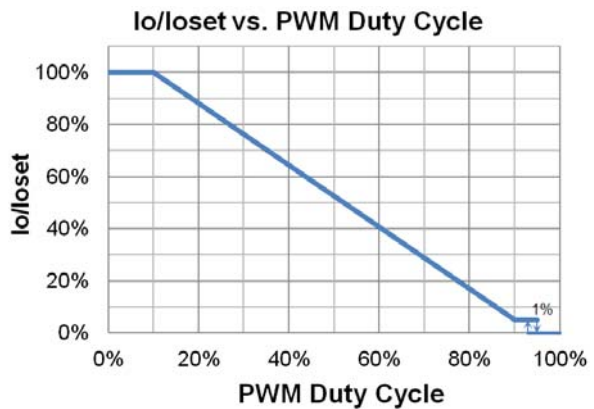
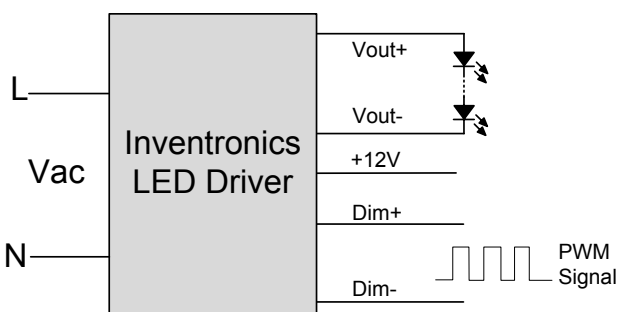
**Notes:**

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**

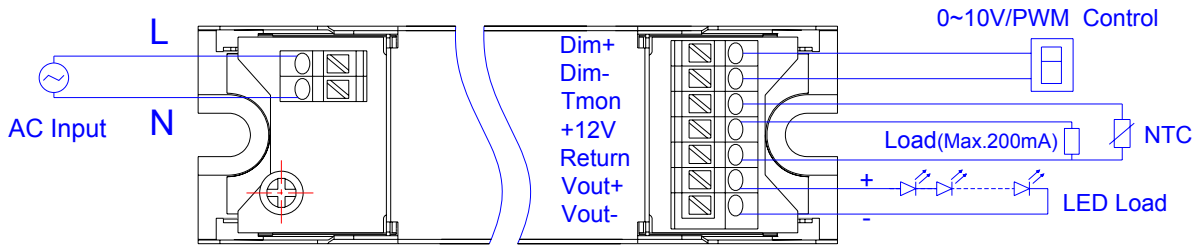


**Implementation 2: Positive logic**

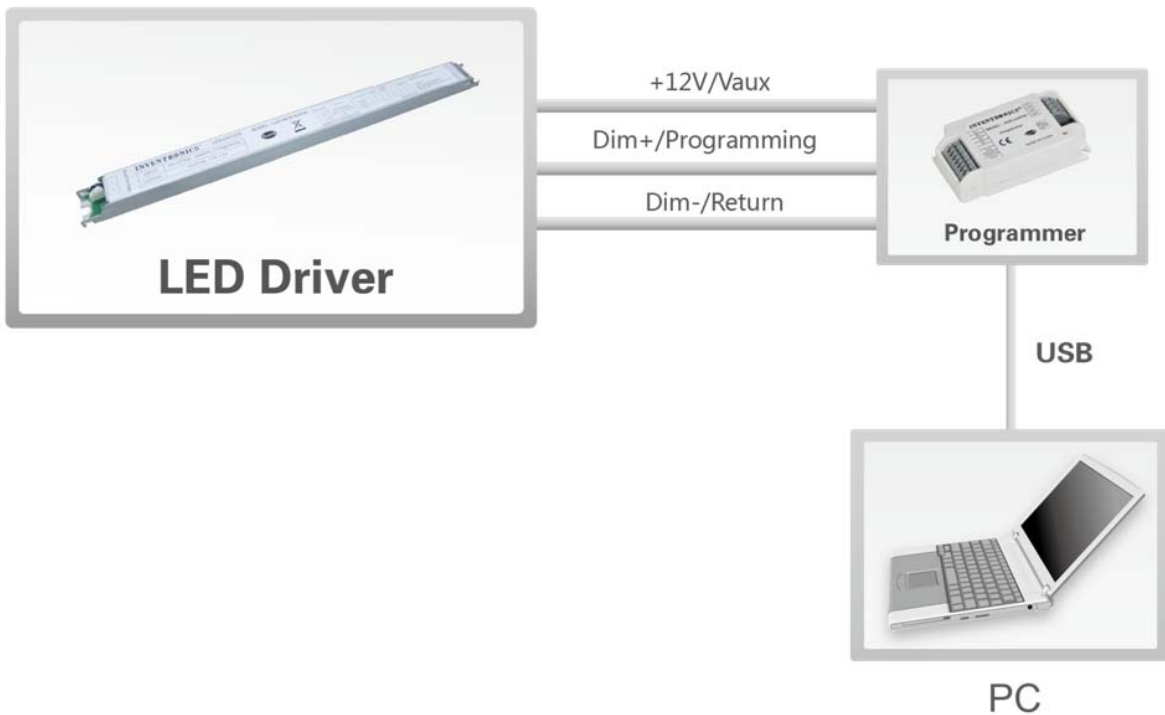


**Implementation 3: Negative logic**

## Wire Connection Diagram



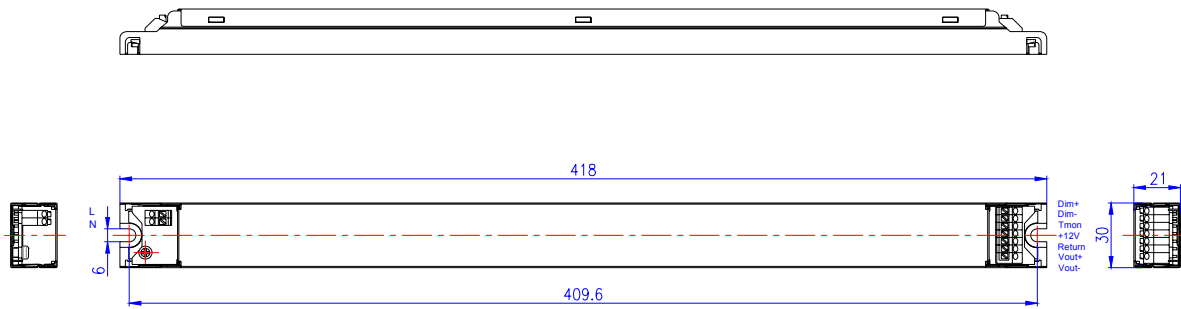
## Programming Connection Diagram



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

- Please refer to SDD-AAPNP(Programmer) datasheet for details.  
[http://www.inventronics-co.com/cp\\_det.aspx?c\\_kind=2&c\\_kind2=177&c\\_kind3=179&id=220&productName=SDD-AAPNP](http://www.inventronics-co.com/cp_det.aspx?c_kind=2&c_kind2=177&c_kind3=179&id=220&productName=SDD-AAPNP)

## Mechanical Outline



Unspecified tolerance: ±1

## 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
2014-08-13	A	Datasheets Release	/	/

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