

## Features

- Dim-to-off with Standby Power  $\leq 0.5$  W
- Always-on Auxiliary Power: 12Vdc, 200mA
- Thermal Sensing and Protection for LED Module
- Full Power at 70-100% Max. Current (Constant Power)
- Flicker-Free
- 0-10V/PWM/3 Timer-Modes Dimmable
- Output Lumen Compensation
- 69,000 Hour Lifetime at 70°C Case Temperature
- Class II, Class 2 & SELV
- Suitable for Built-in Use
- Class P, UL Listed Versions Available (See Note 4)
- 5 Years Warranty



## Description

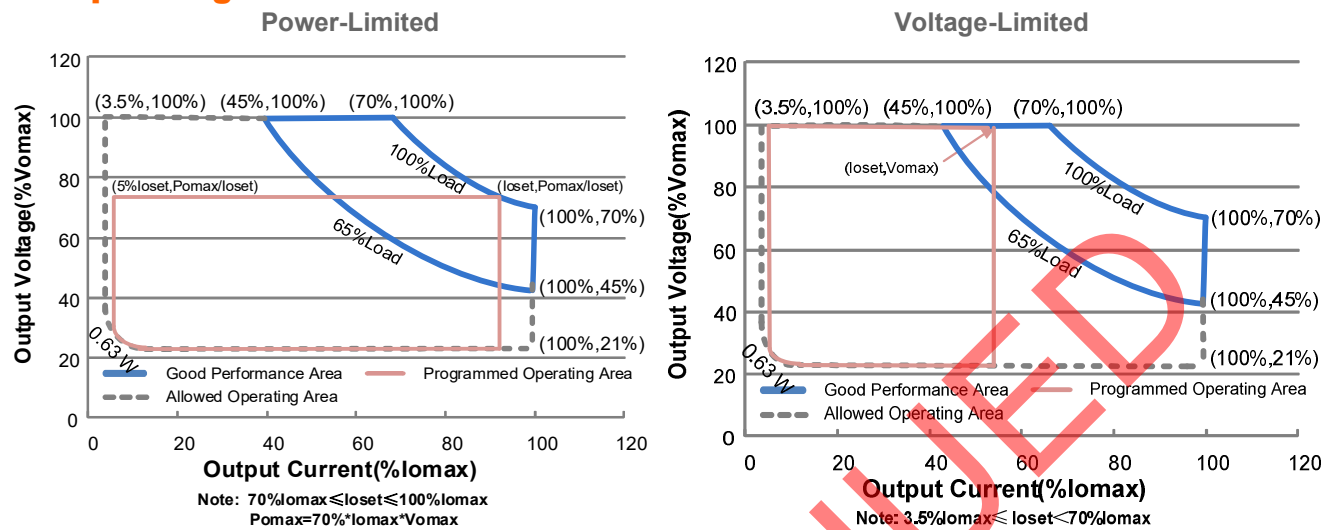
The LUD-060SxxxDS2 series is a 60W, constant-power, programmable IP20 LED driver that operates from 90-305Vac input with excellent power factor. Created for dimmable panel lights and linear lights, it provides good dimming accuracy down to 5% output, plus a dim-off mode with low standby power. The high 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(mA)	Full-Power Current Range (mA) <sup>(1)</sup>	Default Output Current (mA)	Output Voltage Range(Vdc)	Max. Output Power(W)	Typical Efficiency <sup>(2)</sup>	Power Factor		Model Number <sup>(3)(4)</sup>
						120Vac	220Vac	
19.3-550	385-550	530	31-156	60	90.5%	0.99	0.96	LUD-060S055DS2
27.3-780	546-780	700	22-110	60	90.5%	0.99	0.96	LUD-060S078DS2 <sup>(5)</sup>
38.5-1100	770-1100	1050	16-78	60	90.5%	0.99	0.96	LUD-060S110DS2 <sup>(5)</sup>
52.5-1500	1050-1500	1400	12-57	60	89.5%	0.99	0.96	LUD-060S150DS2 <sup>(6)</sup>
73.5-2100	1470-2100	2100	8-40	60	88.0%	0.99	0.96	LUD-060S210DS2 <sup>(6)</sup>

- Notes:** (1) Output current range with constant power at 60W.  
 (2) Measured at a 220Vac input with 70% maximum output current and 100% maximum output voltage.  
 (3) Certified input voltage range: UL, FCC 100-277Vac or 127-300Vdc; otherwise 100-240Vac or 127-250Vdc (except KS).  
 (4) For UL Listed Class P models add suffix -00C0 (certified input voltage range: 120-277Vac or 127-250Vdc).  
 (5) SELV output.  
 (6) Class 2 & SELV output.

## I-V Operating Area



## Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input AC Voltage	90 Vac	-	305 Vac	
Input DC Voltage	127 Vdc	-	300 Vdc	
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.75 mIU	UL 8750; 277Vac/ 60Hz
	-	-	0.70 mA	IEC 60598-1; 240Vac/ 60Hz
Input AC Current	-	-	0.8 A	Measured at 100% load and 100 Vac input.
	-	-	0.36 A	Measured at 100% load and 220 Vac input.
Inrush Current(I <sup>2</sup> t)	-	-	0.9 A <sup>2</sup> s	At 220Vac input, 25°C Cold Start, Duration =560 μS, 10%Ipk-10%Ipk. 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%Ioset	-	5%Ioset	At 100% load condition
Output Current Setting (Ioset) Range	7%Iomax	-	100%Iomax	
Output Current Setting Range with Constant Power	70%Iomax	-	100%Iomax	

## Output Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Total Output Current Ripple (pk-pk)	-	5%I <sub>omax</sub>	10%I <sub>omax</sub>	At 100% load condition, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	3%I <sub>omax</sub>	5%I <sub>omax</sub>	At 100% load condition. Only this component of ripple is associated with visible flicker.
Startup Overshoot Current	-	-	10%I <sub>omax</sub>	At 100% load condition
No Load Output Voltage				
LUD-060S055DS2	-	-	180 V	
LUD-060S078DS2	-	-	120 V	
LUD-060S110DS2	-	-	90 V	
LUD-060S150DS2	-	-	59.5 V	
LUD-060S210DS2	-	-	50 V	
Line Regulation	-	-	±0.5%	Measured at 100% load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	0.40 s	0.75 s	Measured at 120Vac input, 65%-100% load.
	-	-	0.50 s	Measured at 220Vac input, 65%-100% load.
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 "Return-"

## General Specifications

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 120 Vac input:				
LUD-060S055DS2				
I <sub>o</sub> =385 mA	86.5%	88.5%	-	
I <sub>o</sub> =550 mA	86.5%	88.5%	-	
LUD-060S078DS2				
I <sub>o</sub> =546 mA	86.5%	88.5%	-	
I <sub>o</sub> =780 mA	86.5%	88.5%	-	
LUD-060S110DS2				
I <sub>o</sub> =770 mA	86.5%	88.5%	-	
I <sub>o</sub> =1100 mA	86.5%	88.5%	-	
LUD-060S150DS2				
I <sub>o</sub> =1050 mA	85.5%	87.5%	-	
I <sub>o</sub> =1500 mA	85.5%	87.5%	-	
LUD-060S210DS2				
I <sub>o</sub> =1470 mA	84.0%	86.0%	-	
I <sub>o</sub> =2100 mA	83.0%	85.0%	-	

## General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 220 Vac input: LUD-060S055DS2				Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Io=385 mA	88.5%	90.5%	-	
Io=550 mA	88.5%	90.5%	-	
LUD-060S078DS2				
Io=546 mA	88.5%	90.5%	-	
Io=780 mA	88.5%	90.5%	-	
LUD-060S110DS2				
Io=770 mA	88.5%	90.5%	-	
Io=1100 mA	88.5%	90.5%	-	
LUD-060S150DS2				
Io=1050 mA	87.5%	89.5%	-	
Io=1500 mA	87.5%	89.5%	-	
LUD-060S210DS2				
Io=1470 mA	86.0%	88.0%	-	
Io=2100 mA	85.0%	87.0%	-	
Efficiency at 277 Vac input: LUD-060S055DS2				Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Io=385 mA	88.5%	90.5%	-	
Io=550 mA	88.5%	90.5%	-	
LUD-060S078DS2				
Io=546 mA	88.5%	90.5%	-	
Io=780 mA	88.5%	90.5%	-	
LUD-060S110DS2				
Io=770 mA	88.5%	90.5%	-	
Io=1100 mA	88.5%	90.5%	-	
LUD-060S150DS2				
Io=1050 mA	87.5%	89.5%	-	
Io=1500 mA	87.5%	89.5%	-	
LUD-060S210DS2				
Io=1470 mA	86.0%	88.0%	-	
Io=2100 mA	85.0%	87.0%	-	
Standby Power	-	-	0.5 W	Measured at 230Vac/50Hz; Dimming off
MTBF	-	217,000 Hours	-	Measured at 220Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	69,000 Hours	-	Measured at 120Vac input, 80%Load and 70°C case temperature; See lifetime vs. Tc curve for the details
Operating Case Temperature for Safety Tc_s	-30°C	-	+85°C	
Operating Case Temperature for Warranty Tc_w	-30°C	-	+75°C	Case temperature for 5 years warranty. Humidity: 10% RH to 90% RH. No condensation
Storage Temperature	-30°C	-	+85°C	Humidity: 5% RH to 90% RH No condensation
Dimensions				
Inches (L × W × H)	14.88 × 1.18 × 0.83			
Millimeters (L × W × H)	378 × 30 × 21			
Net Weight	-	370 g	-	

## 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	5%loset	-	loset	70%lomax ≤ loiset ≤ 100%lomax
	3.5%lomax	-	loiset	3.5%lomax ≤ loiset < 70%lomax
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%	-	

## Safety & EMC Compliance

Safety Category	Standard
UL/CUL	UL 8750, UL1310,CAN/CSA-C22.2 No. 250.13,CAN/CSA-C22.2 No. 223-M91
ENEC & CE	EN 61347-1 <sup>(1)</sup> , EN 61347-2-13
CB	IEC 61347-1, IEC 61347-2-13
KS	KS C 7655
Performance	Standard
ENEC	EN IEC 62384
EMI Standards	Notes
EN IEC 55015 <sup>(2)</sup>	Conducted emission Test &Radiated emission Test

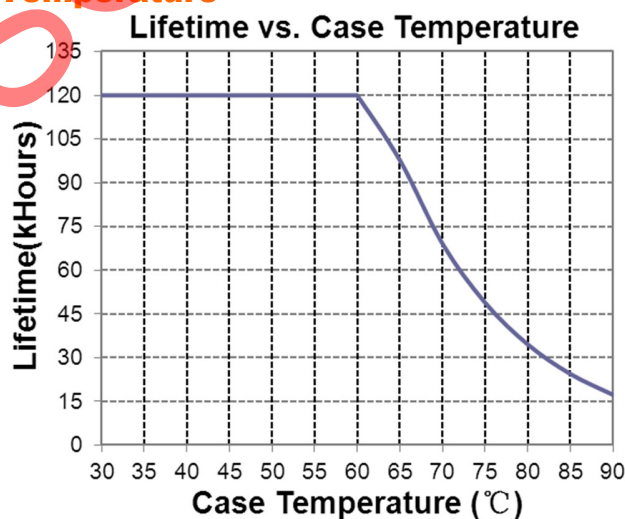
## Safety & EMC Compliance (Continued)

EMI Standards	Notes
EN IEC 61000-3-2	Harmonic Current Emissions
EN IEC 61000-3-3	Voltage Fluctuations & Flicker
FCC Part 15 <sup>(2)</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
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

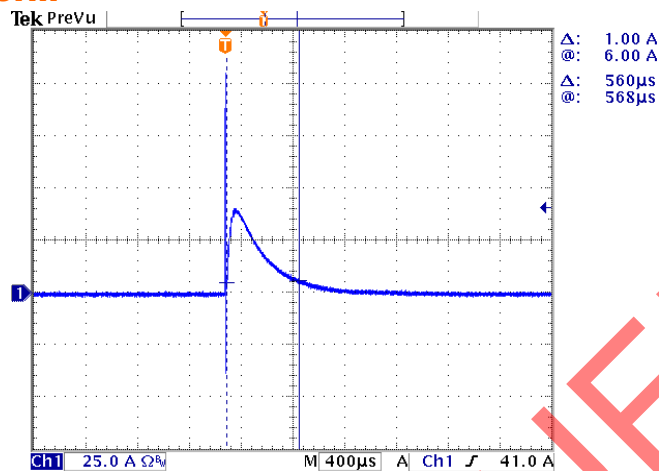
**Notes:** (1) This product meets all requirements for EN-61347-1, Annex O (Double insulation). When the driver is energized, the allowed leakage current is perceptible but harmless.

(2) 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



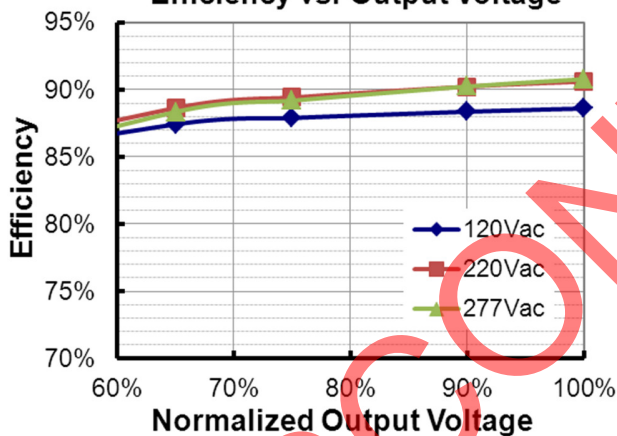
## Inrush Current Waveform



## Efficiency vs. Load

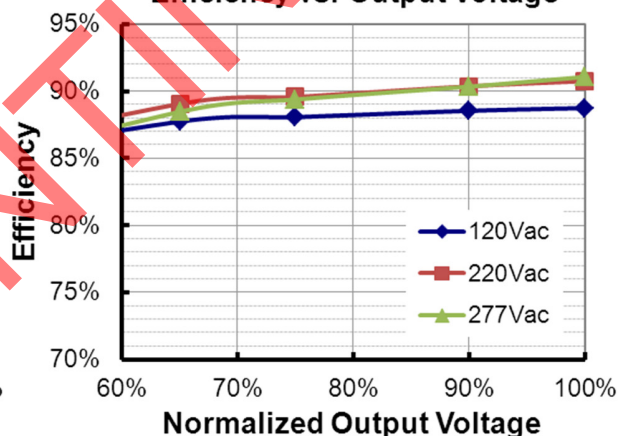
LUD-060S055DS2( $I_o=385mA$ )

Efficiency vs. Output Voltage



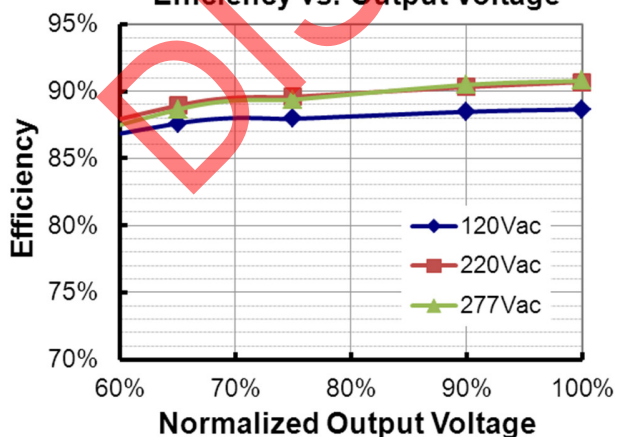
LUD-060S055DS2( $I_o=550mA$ )

Efficiency vs. Output Voltage



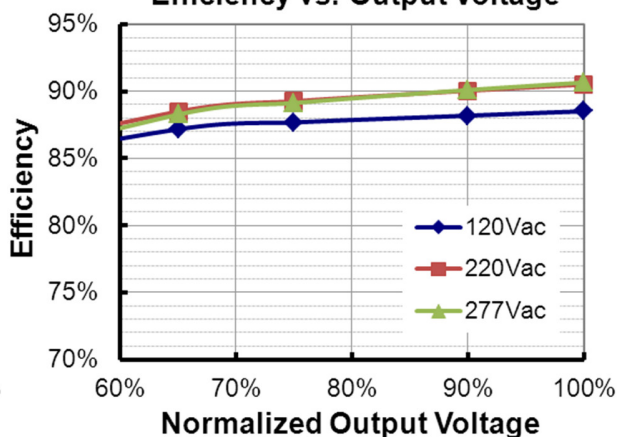
LUD-060S078DS2( $I_o=546mA$ )

Efficiency vs. Output Voltage



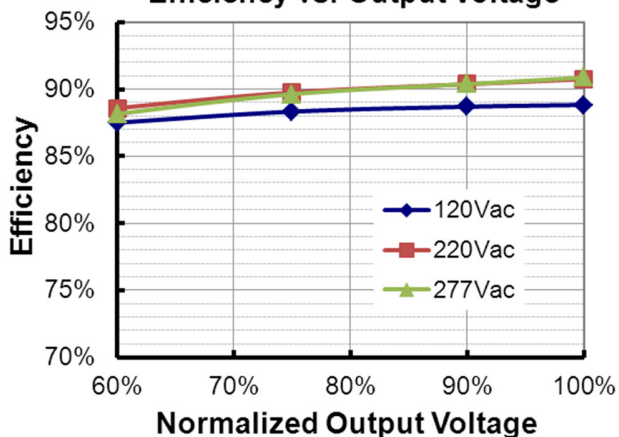
LUD-060S078DS2( $I_o=780mA$ )

Efficiency vs. Output Voltage

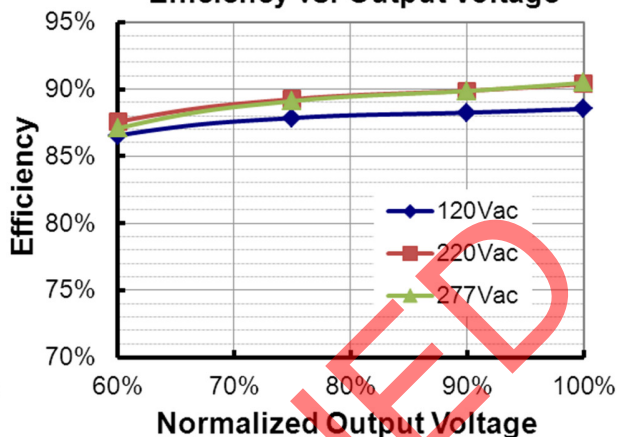




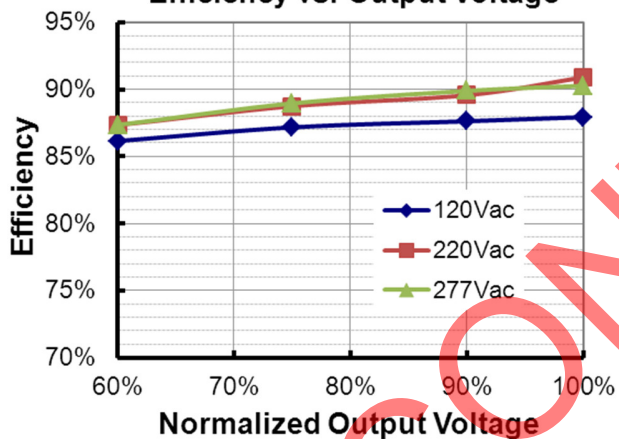
LUD-060S110DS2( $I_o=770\text{mA}$ )  
Efficiency vs. Output Voltage



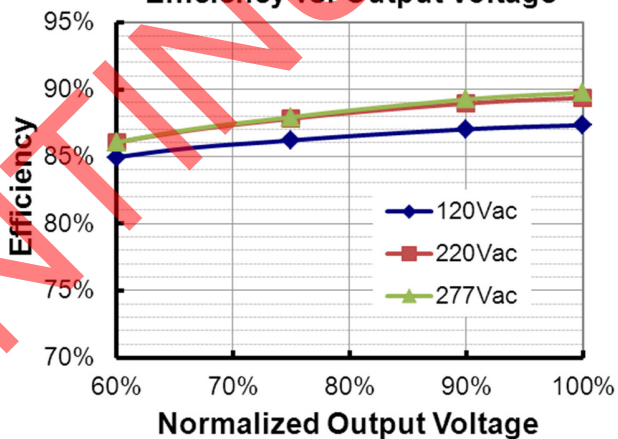
LUD-060S110DS2( $I_o=1100\text{mA}$ )  
Efficiency vs. Output Voltage



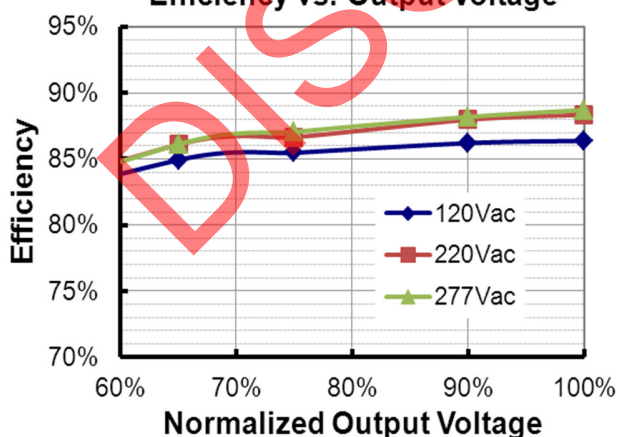
LUD-060S150DS2( $I_o=1050\text{mA}$ )  
Efficiency vs. Output Voltage



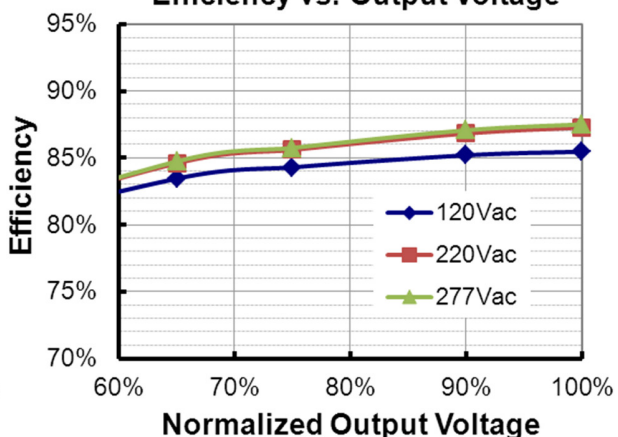
LUD-060S150DS2( $I_o=1500\text{mA}$ )  
Efficiency vs. Output Voltage



LUD-060S210DS2( $I_o=1470\text{mA}$ )  
Efficiency vs. Output Voltage

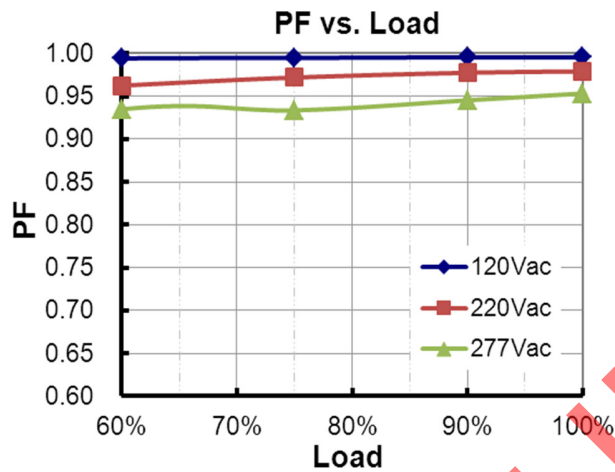


LUD-060S210DS2( $I_o=2100\text{mA}$ )  
Efficiency vs. Output Voltage

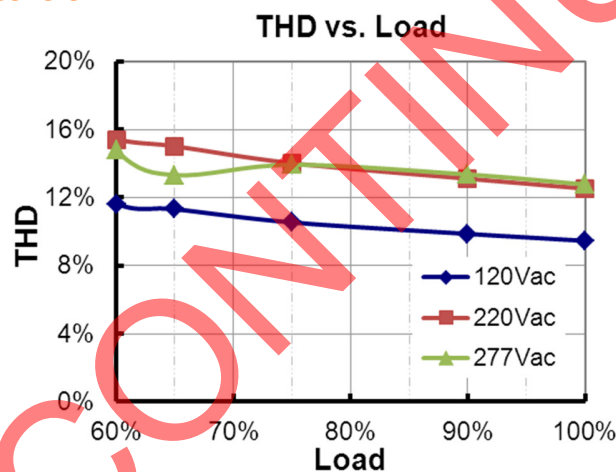




## Power Factor



## Total Harmonic Distortion



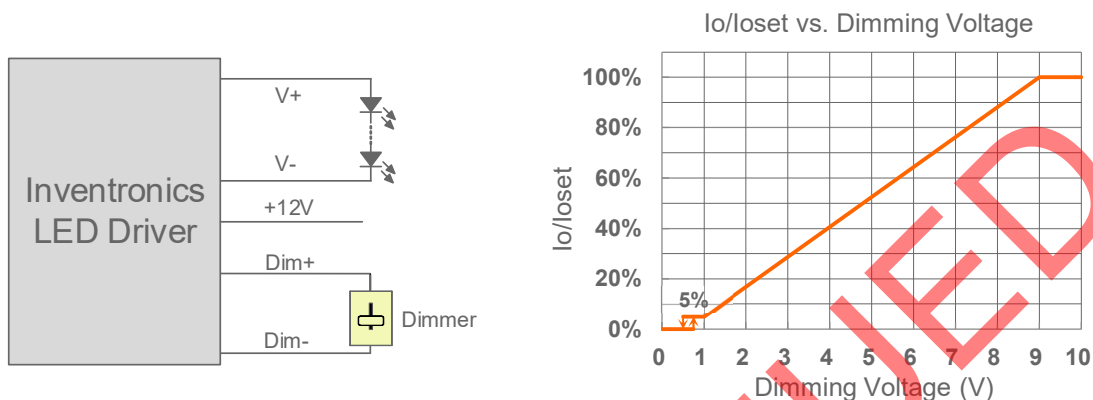
## Protection Functions

Parameter		Min.	Typ.	Max.	Notes
Over Temperature Protection		Decreases output current. Returning to normal after over temperature is removed.			
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 drops below R1, External Thermal Protection is triggered, reducing output current smoothly as a function of R_NTC.
	R2	-	4.16 kOhm	-	When R_NTC is less than R2, output current is held steady at the programmed "Protection Current Floor".
	Protection Current Floor	10%loset	60%loset	100%loset	10%loset>lomin (default setting is 60%)
		lomin	60%loset	100%loset	10%loset≤lomin (default setting is 60%)

## Dimming

### ● 0-10V Dimming

The recommended implementation of the dimming control is provided below.

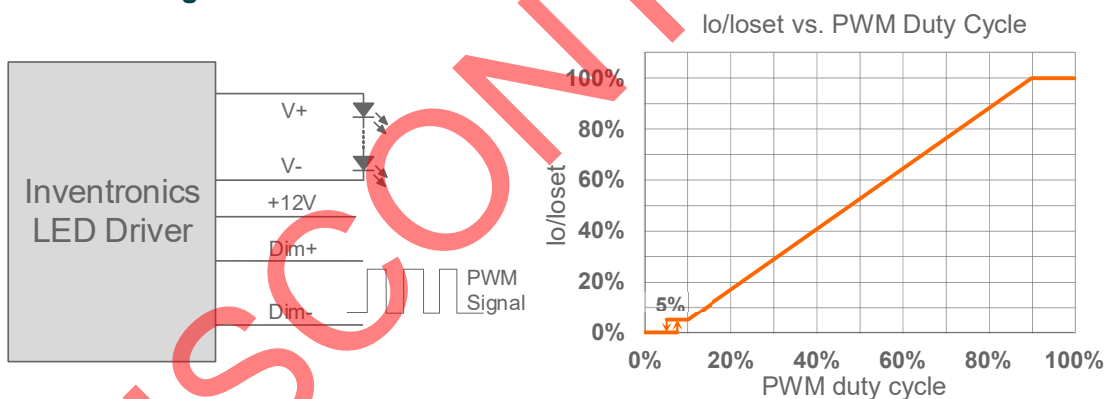


Implementation 1: DC Input

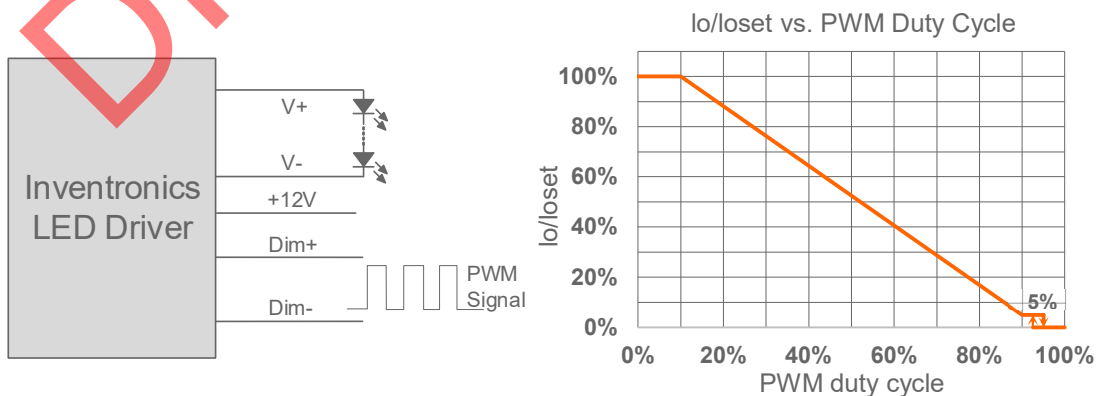
#### Notes:

1. Do not connect Dim- to the output V- or V+, otherwise the driver will not work properly.
2. The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like zener.

### ● PWM Dimming



Implementation 2: Positive logic



Implementation 3: Negative logic

## ● Timing Dimming

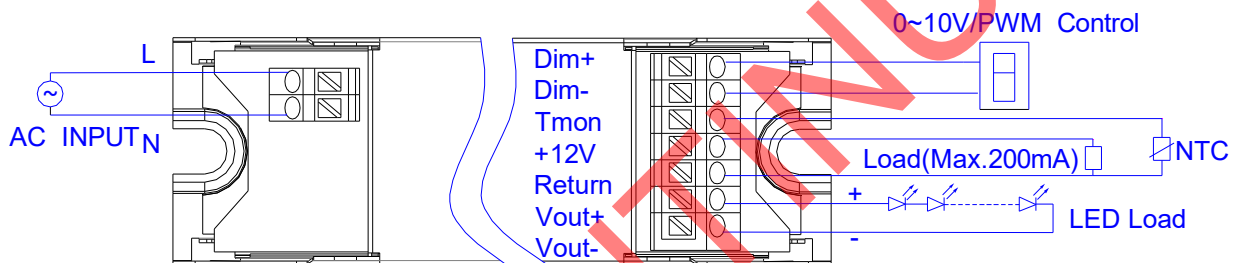
Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

- **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.

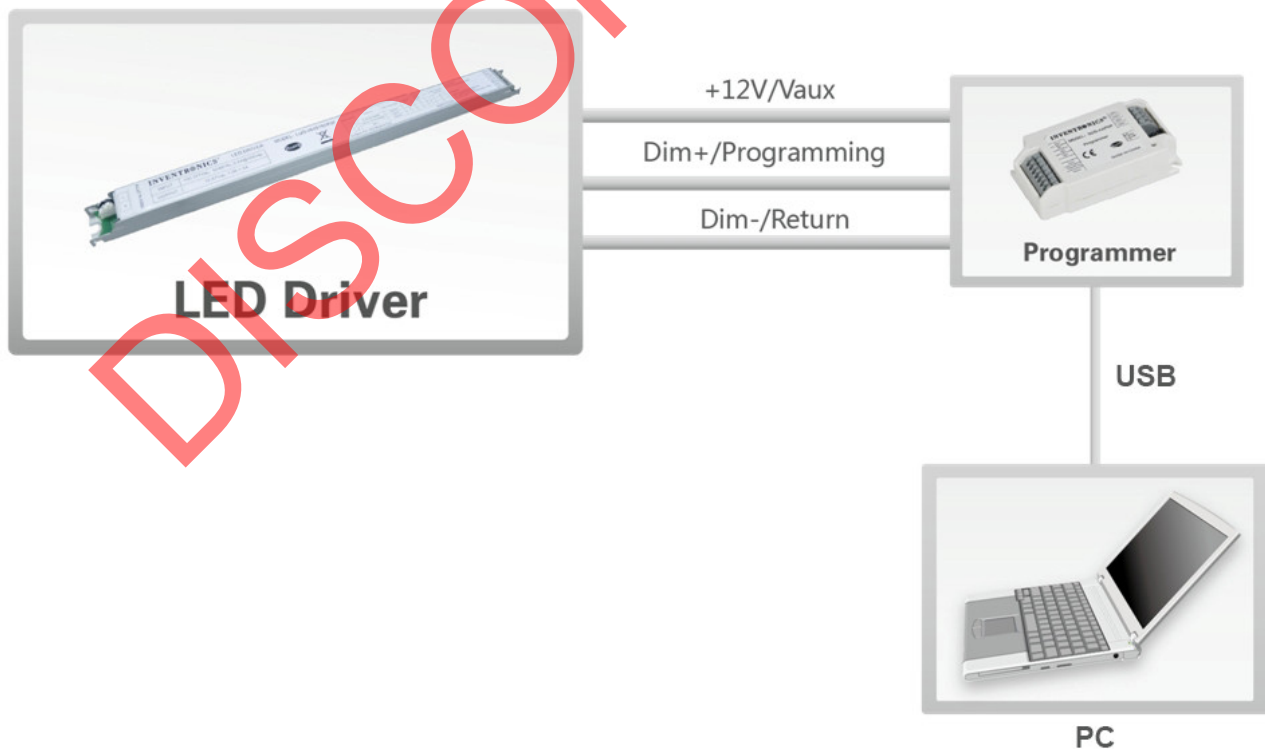
## ● Output Lumen Compensation

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.

## Wire Connection Diagram



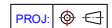
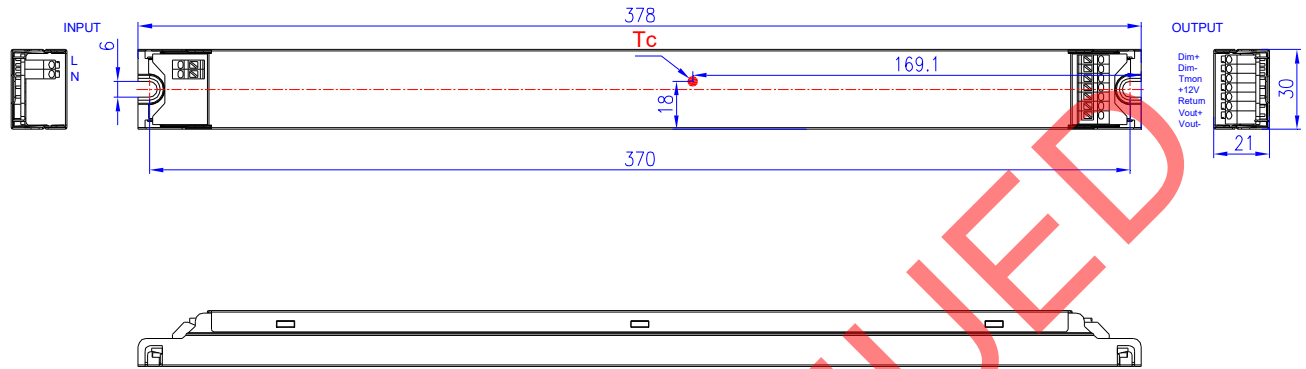
## Programming Connection Diagram



**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



Unspecified tolerance: ±1

## 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
2015-12-07	A	Datasheets Release	/	/
2016-01-13	B	Lifetime	Min.=120,000Hours@ Tc=60°C	Typ.= 69,000 Hours@ Tc=70°C
2016-02-25	C	KS Certificate Regulation	/	Added
		Notes of EMI Standard	/	Updated
2016-09-20	D	I-V Operating Area	3 W	0.63 W
2017-05-25	E	Turn-on Delay Time at 120Vac	Max.=1.2 s	Max.=0.75 s
2019-01-31	F	Features	Dimmable to 5% by 0-10V/PWM/Timer ( 3 Timer Modes )	0-10V/PWM/3 Timer-Modes Dimmable
		Features	Class II, Class 2 & SELV	Updated
		Features	Class P, UL Listed Versions Available (See Note 4)	Added
		Features	5 Years Warranty	Added
		Safety certification logo	/	Updated
		PSE certificate	/	Added
		Notes of Models	(2) Certified input voltage range: UL, FCC 100-277Vac or 127-300Vdc; otherwise 100-240Vac or 127-250Vdc.	(2) Certified input voltage range: UL, FCC 100-277Vac or 127-300Vdc; otherwise 100-240Vac or 127-250Vdc (except PSE and KS).
		Notes of Models	(4) For UL Listed Class P models add suffix - 00C0 (certified input voltage range: 120-277Vac or 127-250Vdc).	Added
		Note of Operating Case Temperature for Warranty Tc_w	/	Updated
		Safety & EMC Compliance	/	Updated
2024-12-12	G	Link in the datasheet	/	Updated
		Format	/	Updated
		Product Photograph	/	Updated
		TUV/PSE logo	/	Deleted
		Input Specifications	/	Updated
		Safety & EMC Compliance	/	Updated
		RoHS Compliance	/	Updated