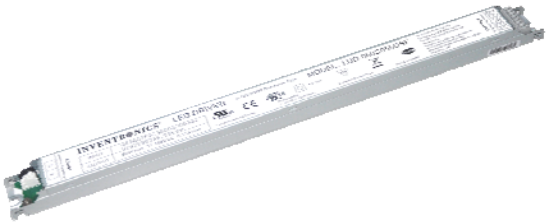
Features

- Dim-to-off with Standby Power≤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
- Dimmable to 1% by 0-10V and PWM
- Output Lumen Compensation
- Class II, SELV and Class 2
- Suitable for Built-in Use



Description

The *LUD-060SxxxDSF* series is a 60W, constant-current, programmable IP20 LED driver that operates from 90-305 Vac input with excellent power factor. It is created for many lighting applications including panel and linear, etc, it provides good dimming accuracy down to 1% output, plus a dim-to-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.

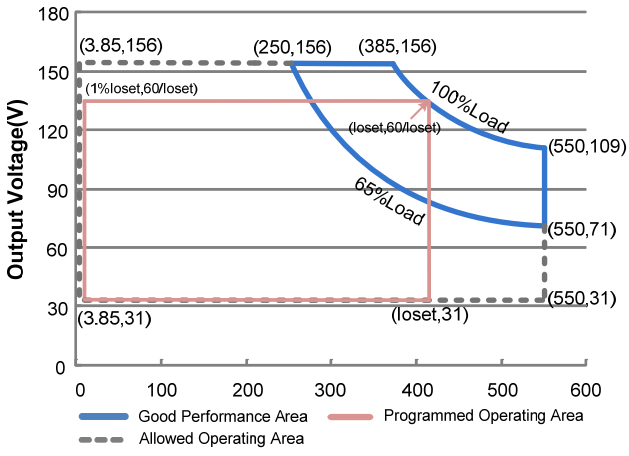
Models

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(4)
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(4)
10.5-1500mA	1050-1500mA	1400mA	90 ~ 305 Vac 127 ~ 300 Vdc	12 ~57 Vdc	60 W	90%	0.99	0.96	LUD-060S150DSF(5)
14.7-2100mA	1470-2100mA	2100mA	90 ~ 305 Vac 127 ~ 300 Vdc	8 ~40 Vdc	60 W	89%	0.99	0.96	LUD-060S210DSF(5)

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, or 127-250Vdc (except CCC and KS).
(3) Measured at a 220Vac input with 70% maximum output current and 100% maximum output voltage.
(4) SELV output.
(5) Class 2 & SELV output.

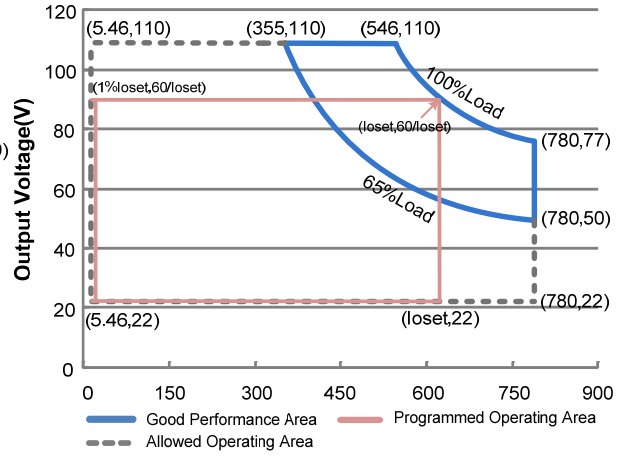
I-V Operating Area

LUD-060S055DSF



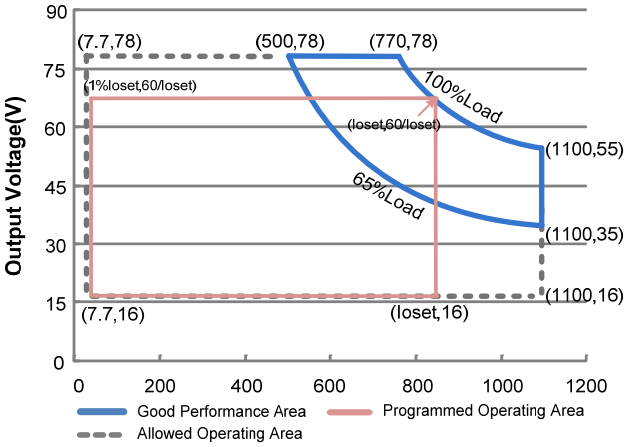
Note: 385mA≤ Ioset≤550mA

LUD-060S078DSF



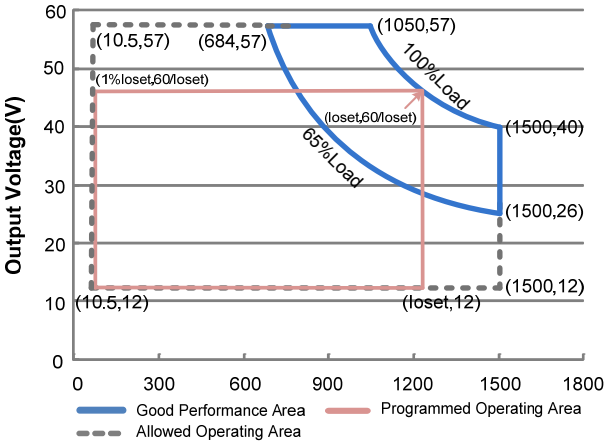
Note: 546mA≤ Ioset≤780mA

LUD-060S110DSF



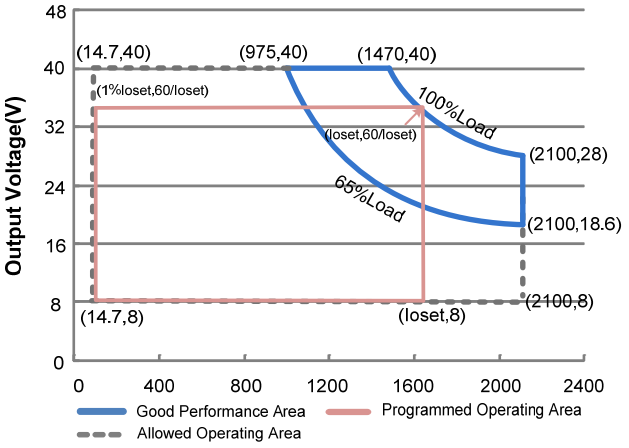
Note: 770mA≤ Ioset≤1100mA

LUD-060S150DSF



Note: 1050mA≤ Ioset≤1500mA

LUD-060S210DSF



Note: 1470mA≤ Ioset≤2100mA

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Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	90 Vac	-	305 Vac	127~300 Vdc
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.75 MIU	UL8750; 277Vac/ 60Hz
	-	-	0.70 mA	IEC60598-1; 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^2t)	-	-	2 A^2s	At 220Vac input, 25°C Cold Start, Duration =0.44 ms, 10%Ipk-10%Ipk. See Inrush Current Waveform for the details.
PF	0.90	-	-	At 100-277Vac, 50-60Hz,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 LUD-060S055BSF LUD-060S078BSF LUD-060S110BSF LUD-060S150BSF LUD-060S210BSF		 110 mA 156 mA 220 mA 300 mA 420 mA	 - - - - -	 550 mA 780 mA 1100 mA 1500 mA 2100 mA	
Output Current Setting Range with Constant Power		70%Iomax	-	100%Iomax	
Total Output Current Ripple (pk-pk)		-	5%Iomax	10%Iomax	At 100% load condition. 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)		-	1%Iomax	-	At 100% load condition. Only this component of ripple is associated with visible flicker.
PWM Frequency of Output Current	Dimming from 1% to 100%	-	250 Hz	-	(1%~6%)Ioset
		-	400 Hz	-	(6%~21%)Ioset
		-	1 kHz	-	(21%~100%)Ioset
	Dimming from 100% to 1%	-	1 kHz	-	(100%~19%)Ioset
		-	400 Hz	-	(19%~4%)Ioset
		-	250 Hz	-	(4%~1%)Ioset
Startup Overshoot Current		-	-	10%Iomax	At 100% load condition

Output Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
No Load Output Voltage LUD-060S055DSF LUD-060S078DSF LUD-060S110DSF LUD-060S150DSF LUD-060S210DSF	 - - - - -	 - - - - -	 180 V 120 V 90 V 59.5 V 50 V	
Line Regulation	-	-	±0.5%	Measured at 100% load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	0.8 s	1.2 s	Measured at 120Vac input, 65%-100%Load
	-	0.6 s	1.0 s	Measured at 220Vac input, 65%-100%Load
Temperature Coefficient of Ioset	-	-	0.02%/°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 “Return“

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 Io=385 mA Io=550 mA LUD-060S078DSF Io=546 mA Io=780 mA LUD-060S110DSF Io=770 mA Io=1100 mA LUD-060S150DSF Io=1050 mA Io=1500 mA LUD-060S210DSF Io=1470 mA Io=2100 mA	 86.0% 85.0% 86.0% 85.0% 86.0% 84.0% 86.0% 84.0% 85.0% 83.0%	 88.0% 87.0% 88.0% 87.0% 88.0% 86.0% 88.0% 86.0% 87.0% 85.0%	 - - - - - - - - - -	Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Efficiency at 220 Vac input: LUD-060S055DSF Io=385 mA Io=550 mA LUD-060S078DSF Io=546 mA Io=780 mA LUD-060S110DSF Io=770 mA Io=1100 mA LUD-060S150DSF Io=1050 mA Io=1500 mA LUD-060S210DSF Io=1470 mA Io=2100 mA	 88.0% 86.5% 88.0% 87.0% 88.0% 86.0% 88.0% 87.0% 87.0% 85.0%	 90.0% 88.5% 90.0% 89.0% 90.0% 88.0% 90.0% 89.0% 89.0% 87.0%	 - - - - - - - - - -	Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)

General Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 277 Vac input: LUD-060S055DSF Io=385 mA Io=550 mA LUD-060S078DSF Io=546 mA Io=780 mA LUD-060S110DSF Io=770 mA Io=1100 mA LUD-060S150DSF Io=1050 mA Io=1500 mA LUD-060S210DSF Io=1470 mA Io=2100 mA	 88.0% 86.5% 88.0% 87.0% 88.0% 86.0% 88.0% 87.0% 87.0% 85.0%	 90.0% 88.5% 90.0% 89.0% 90.0% 88.0% 90.0% 89.0% 89.0% 87.0%	 - - - - - - - - - -	Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
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	-	105,000 Hours	-	Measured at 120Vac input, 80%Load and 60°C case temperature; See lifetime vs. Tc curve for the details
Operating Case Temperature for Safety Tc_s	-30°C	-	+90°C	
Operating Case Temperature for Warranty Tc_w	-30°C	-	+70°C	Humidity: 10% RH to 90% RH No Condensation
Storage Temperature	-30°C	-	+85°C	Humidity: 5% RH to 90% RH
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 Vdim (+) Pin		-20 V	-	20 V	
Source Current on Vdim (+)Pin		200 μA	300 μA	450 μA	Vdim(+) = 0 V
Dimming Output Range	LUD-060S055BSF LUD-060S078BSF LUD-060S110BSF LUD-060S150BSF LUD-060S210BSF	1%Ioset	-	Ioset	385 mA ≤ Ioset ≤ 550 mA 546 mA ≤ Ioset ≤ 780 mA 770 mA ≤ Ioset ≤ 1100 mA 1050 mA ≤ Ioset ≤ 1500 mA 1470 mA ≤ Ioset ≤ 2100 mA
	LUD-060S055BSF LUD-060S078BSF LUD-060S110BSF LUD-060S150BSF LUD-060S210BSF	3.85 mA 5.46 mA 7.70 mA 10.5 mA 14.7 mA	-	Ioset	110 mA ≤ Ioset < 385 mA 156 mA ≤ Ioset < 546 mA 220 mA ≤ Ioset < 770 mA 300 mA ≤ Ioset < 1050 mA 420 mA ≤ Ioset < 1470 mA
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.

Standards 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(1), EN61347-2-13
CB	IEC 61347-1, IEC 61347-2-13
KS	KS C 7655

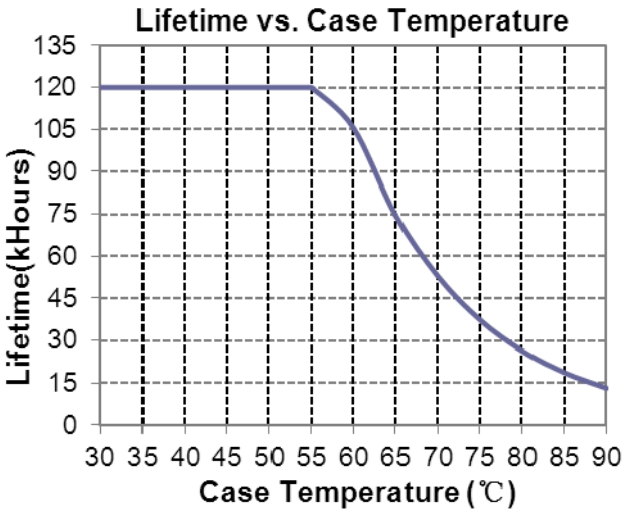
Standards Compliance (Continued)

EMI Standards	Notes
EN 55015(2)	Conducted emission Test &Radiated emission Test
EN 61000-3-2	Harmonic current emissions
EN 61000-3-3	Voltage Fluctuations & Flicker
FCC Part 15(2)	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: Differential Mode 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

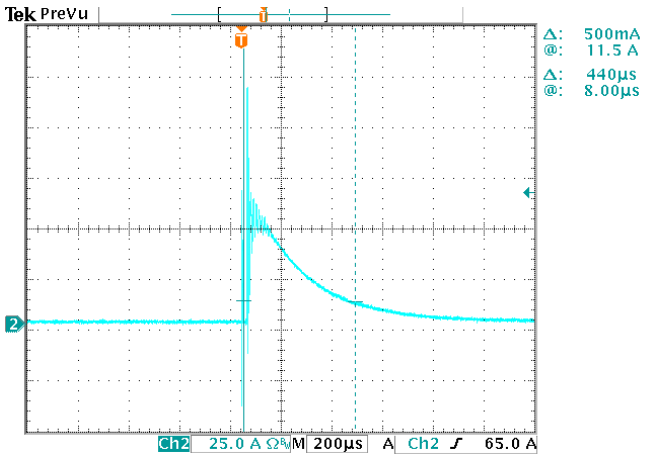
Notes: (1) This product meets all requirements for EN=61347-1, A2:2013 Annex O (Double insulation). When the driver is energized, the allowed leakage current is perceptible but harmless.

(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

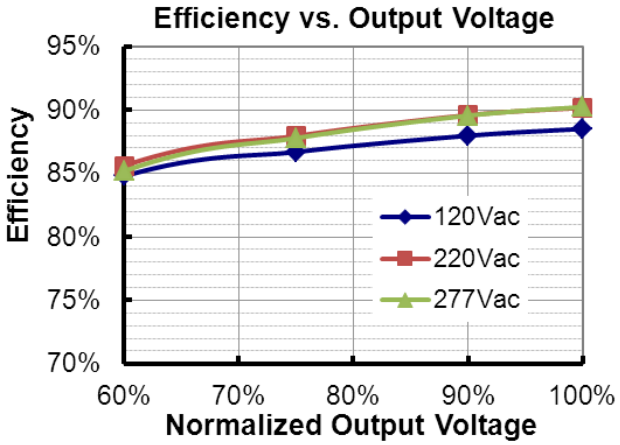


Inrush Current Waveform

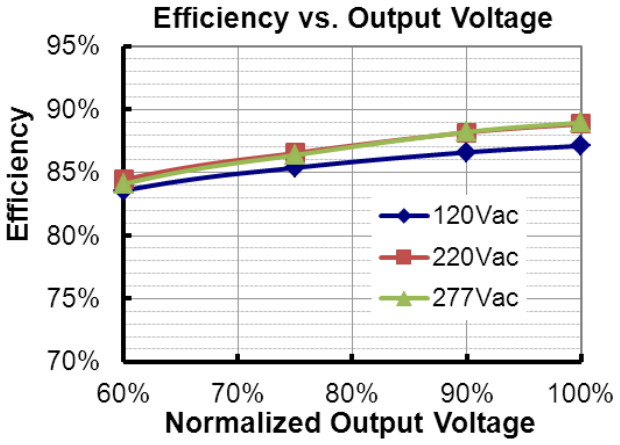


Efficiency vs. Load

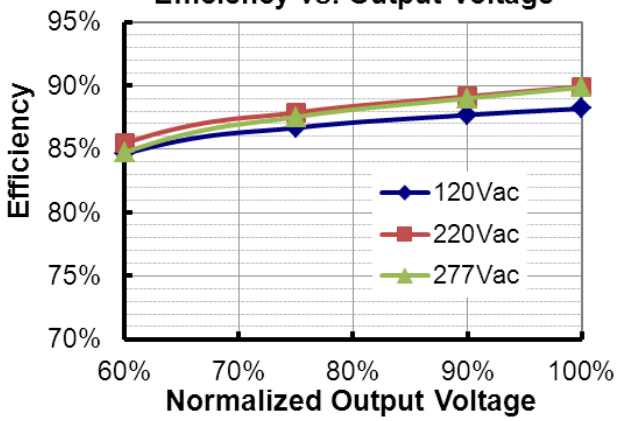
LUD-060S055DSF(Io=385mA)



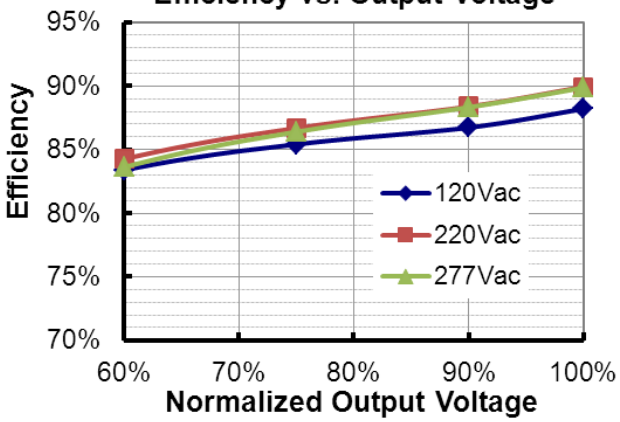
LUD-060S055DSF(Io=550mA)



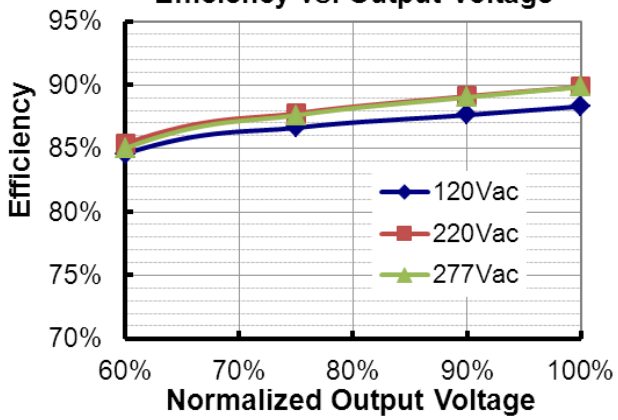
LUD-060S078DSF(Io=545mA)



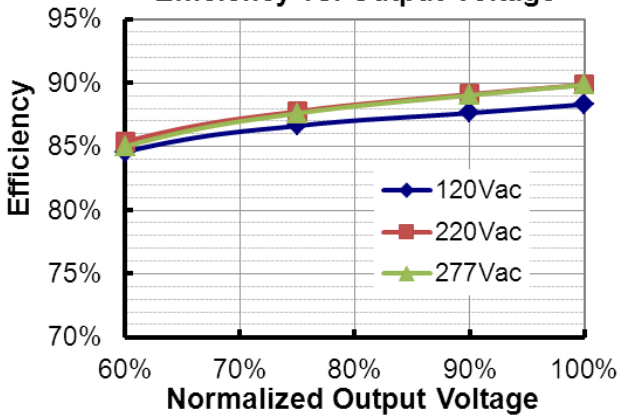
LUD-060S078DSF(Io=780mA)



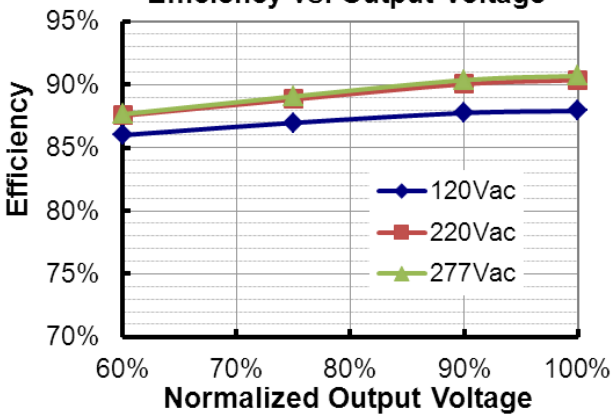
LUD-060S110DSF(Io=770mA)



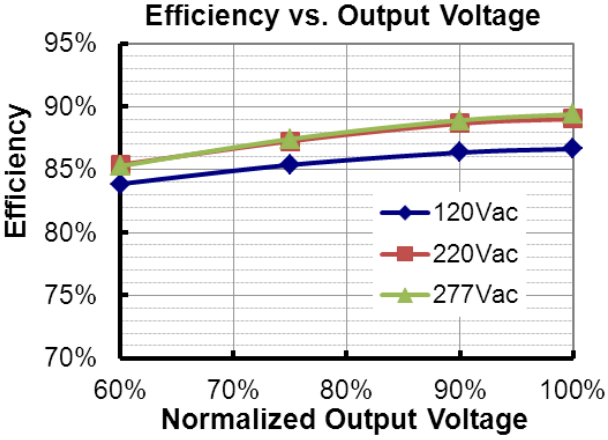
LUD-060S110DSF(Io=1100mA)



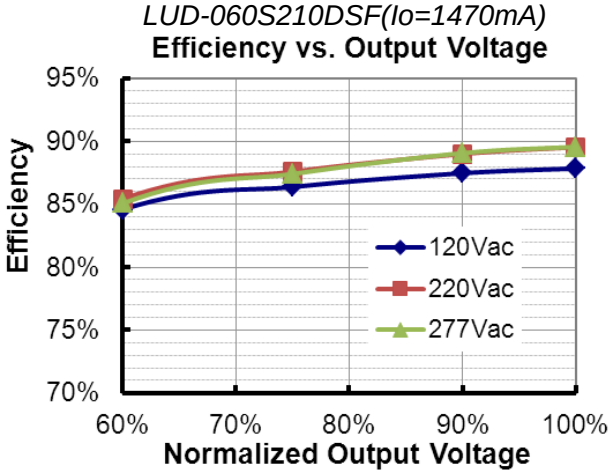
LUD-060S150DSF(Io=1050mA)



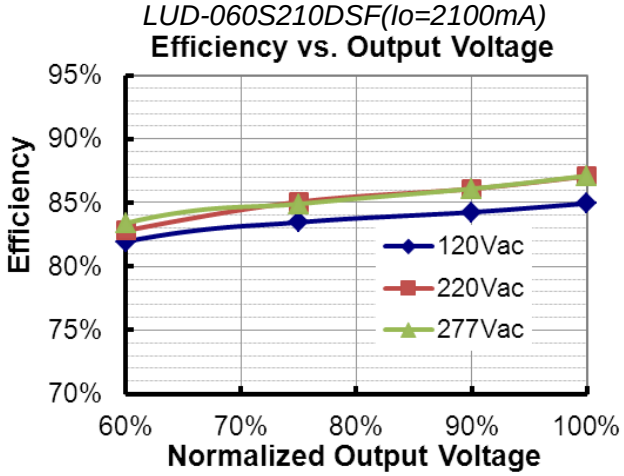
LUD-060S150DSF(Io=1500mA)



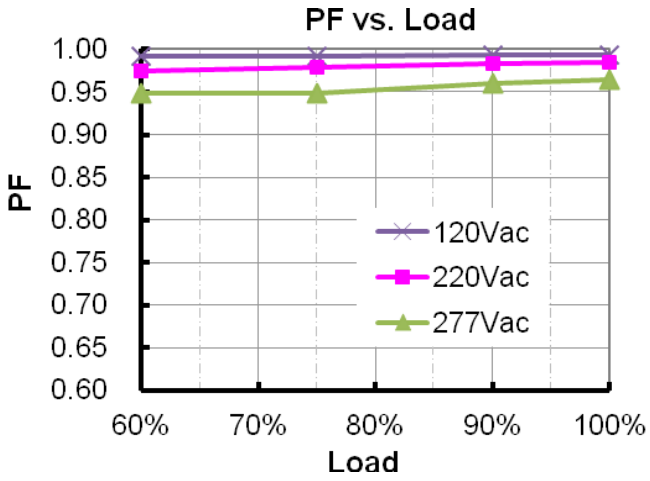
LUD-060S210DSF(Io=1470mA)



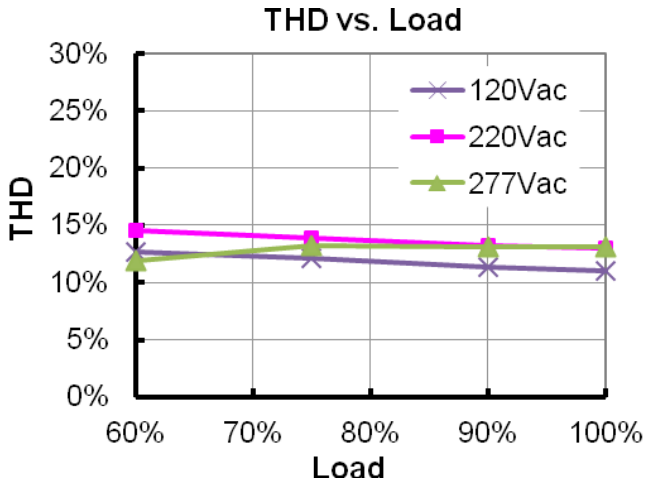
LUD-060S210DSF(Io=2100mA)



Power Factor



Total Harmonic Distortion



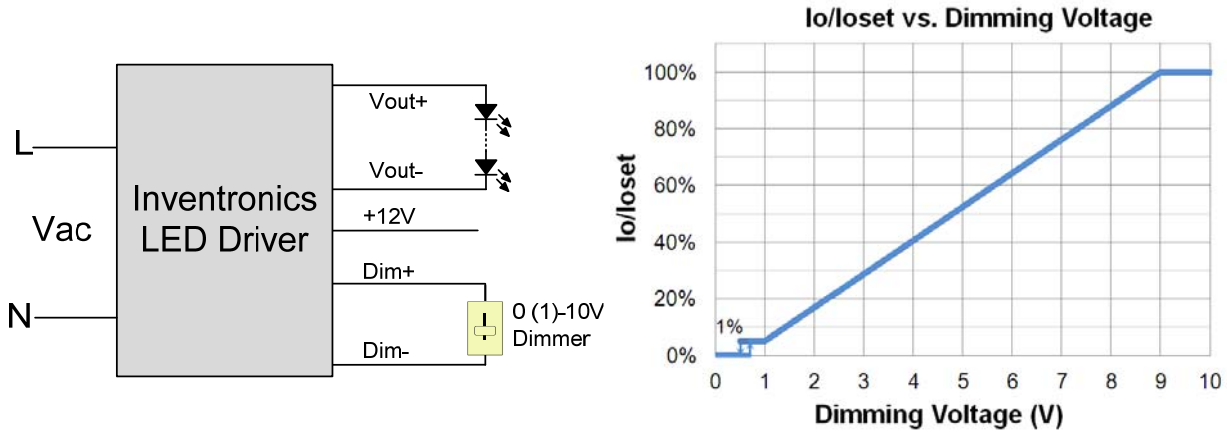
Protection Functions

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	-	7.91 kOhm	-	When R_NTC falls below R1, External Thermal Protection is triggered, reducing output current until R2 is reached.
	R2	-	4.26 kOhm	-	When R_NTC is less than R2, output current is reduced to the programmed "Protection Current Floor."
	Protection Current Floor	10%Ioset	60%Ioset	100%Ioset	10%Ioset>Iomin (default setting is 60%)
		Iomin	60%Ioset	100%Ioset	10%Ioset≤Iomin (default setting is 60%)

Dimming

- **0-10V Dimming**

The recommended implementation of the dimming control is provided below.

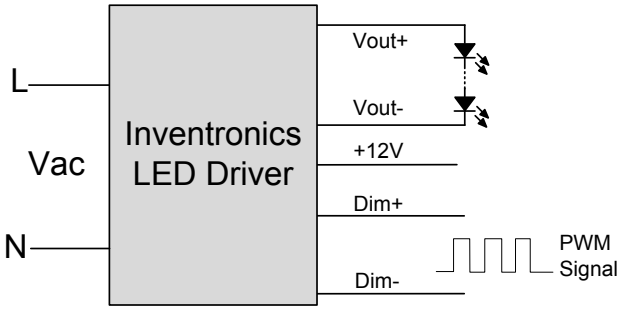


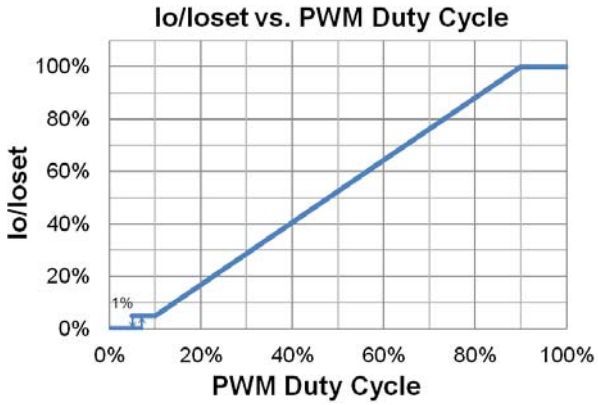
Implementation 1: DC Input

Notes:

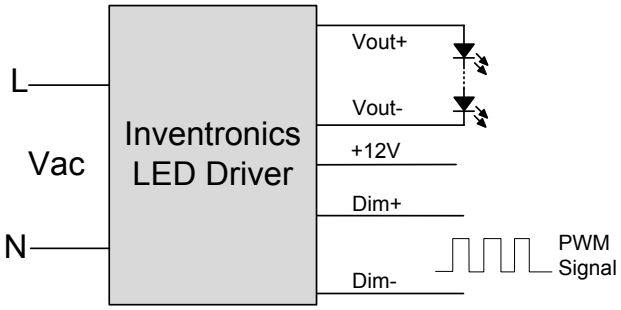
1. The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like resistors and zener.
2. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
3. If 0-10V dimming is not used, Dim + should be open.

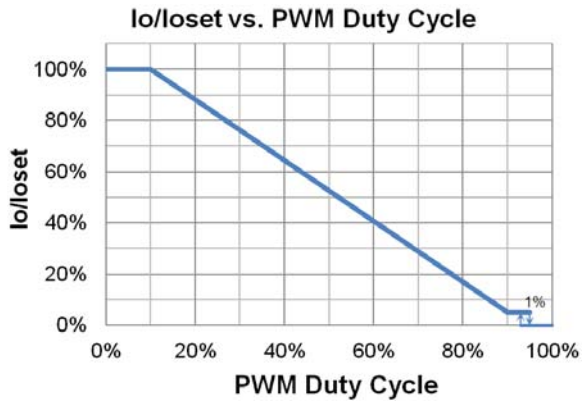
- **PWM Dimming**





Implementation 2: Positive logic



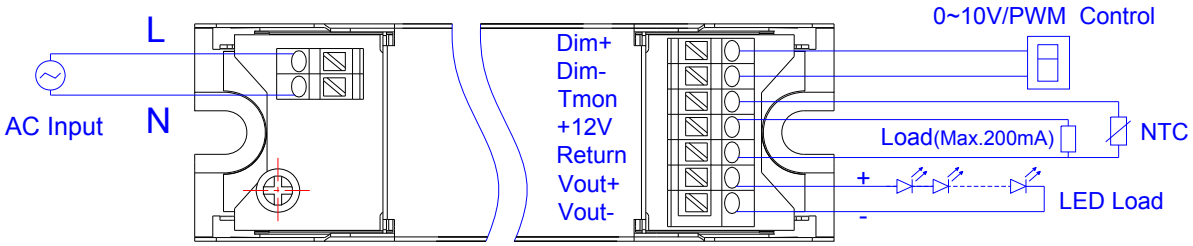


Implementation 3: Negative logic

- **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



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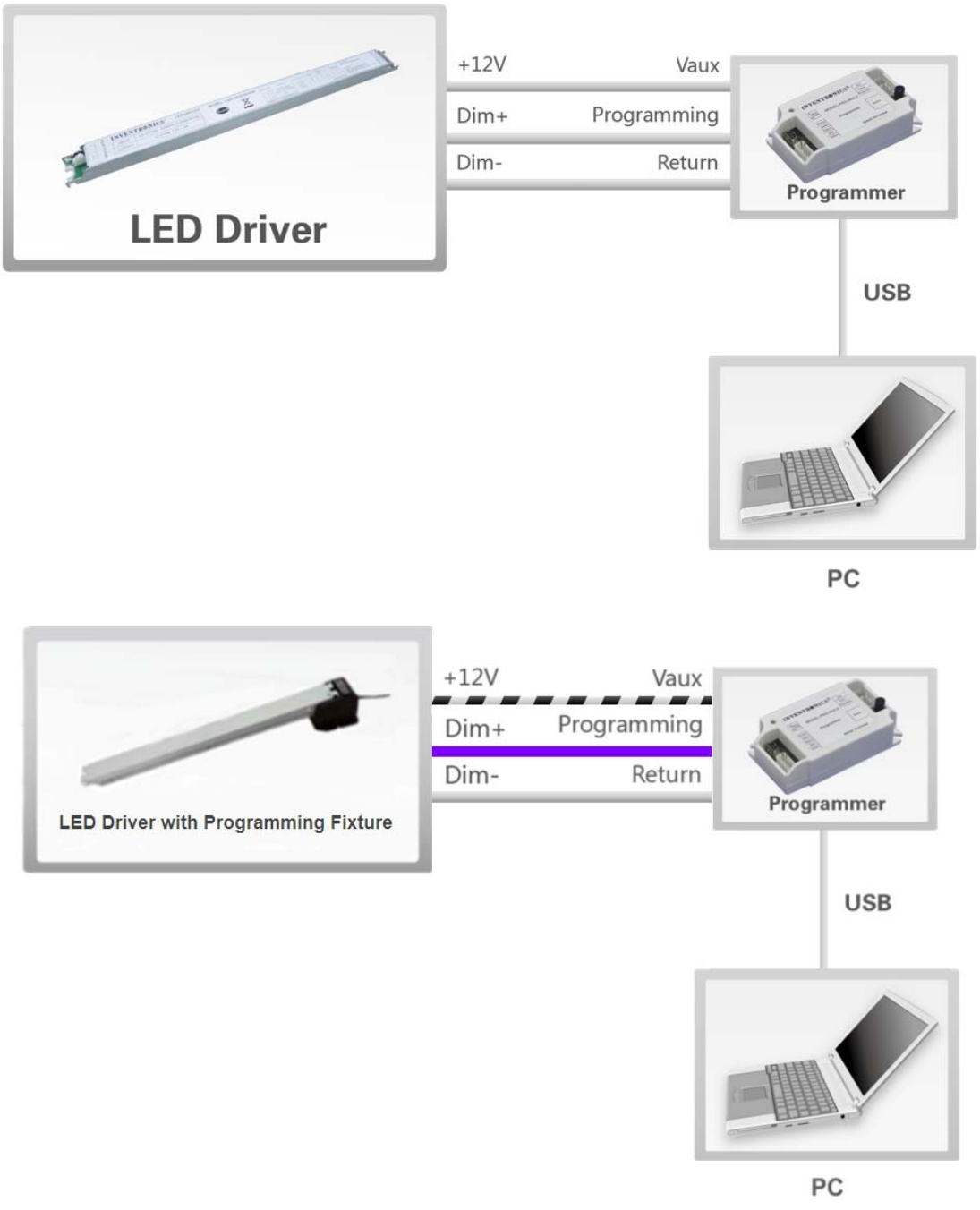
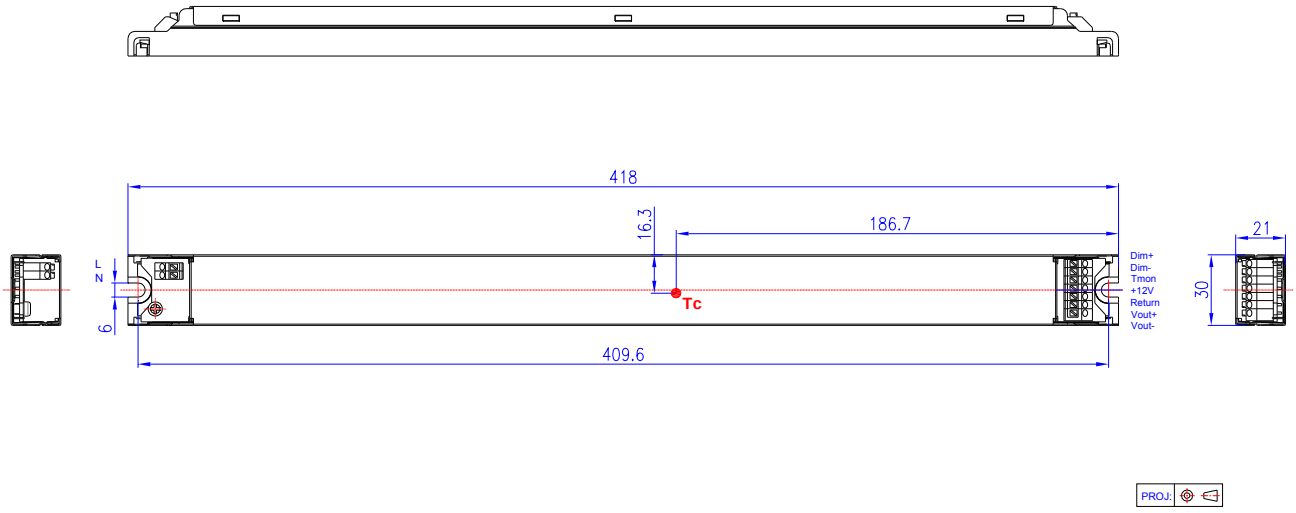
Programming Connection Diagram



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

- **Please refer to PRG-MUL2 (Programmer) and PRG-FIX-F (Programming Fixture) 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
2015-05-14	A	Datasheet Release	/	/
2015-08-31	B	CCC & Double circle	/	Added
		Features	/	Updated
		Description	/	Updated
		Input Specifications	Leakage Current	Updated
		Output Specifications	Output Current Setting(Ioset) Range	corrected
		Output Specifications	Output Current Ripple(pk-pk)	Total Output Current Ripple (pk-pk)
		Output Specifications	Output Current ipple at < 200 Hz (pk-pk)	Added
		General Specifications	Case Temperature	Operating Case Temperature for Safety Tc_s
		General Specifications	Operating Case Temperature for Warrant Tc_w	Added
		Environmental Specifications	/	Delete
		Derating	/	Delete
		External Thermal Protection NTC	/	Detail
2016-08-11	C	Output Current Setting(Ioset) Range	Min.=7%Iomax	Min.=20%Iomax
		I-V Operation Area - Voltage-Limited	/	Updated
		KS Certification Regulation	/	Added
		Note of EMI Standard	/	Added
2016-12-16	D	I-V Operation Area	/	Updated
		Output Specifications - PWM frequency of output current	/	Added
		Programming Connection Diagram	/	Updated
2019-08-20	E	ENEC Logo	/	Updated
		CCC Logo	/	Deleted
		Description	/	Updated
		Models	Notes(2)	Updated
		Input Specifications(PF/THD)	50-60Hz	Added
		Safety &EMC Compliance	UL/CUL	Updated

Revision History (Continued)

Change Date	Rev.	Description of Change		
		Item	From	To
2019-08-20	E	Safety &EMC Compliance	ENEC	Added
		Safety &EMC Compliance	CB	Added
		Safety &EMC Compliance	KS	Updated
		Safety &EMC Compliance	FCC	Updated
		Safety &EMC Compliance	EN 61000-4-5	Updated
		RoHS Compliance	/	Updated