

Features

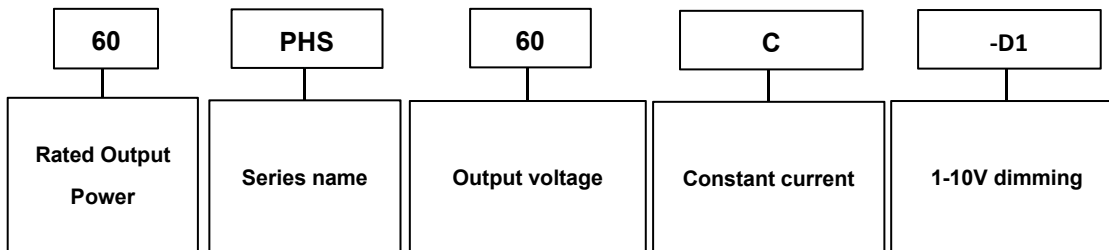
- Super compact design
- Dimming port programming without driver power on
- Constant current output
- High efficiency (Typical 90%), active power factor correction
- Ultra low THD at light load
- Isolated 1~10V/ PWM / Resistor dimming

Description

60W LED Drivers offers digital programmable drivers with wide-range adjustable output current, together with dim to off function for smart lighting.

The output current of this series are programmable, and designed for 1-10V/PWM/Resistor dimming applications.

Model Name Definition



Specifications

Part Number	Max. Output Power	Constant Power Output Voltage Range	Programmable Constant Current Region	Efficiency typical @220VAC	Output current ripple
60PHS60C-D1	60W	30-60V	0.57-1.43A	90%	60%
60PHS60CL-D1	60W	30-60V	0.57-1.1A	88%	15%

Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Rated Input AC Voltage	100Vac	-	277Vac	
Limit Input AC Voltage	90Vac	-	305Vac	
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.75mA	At 277Vac / 60Hz input , grounding effectively
Input AC Current	-	-	0.28A	Measured at full load and 277 Vac input.
	-	-	0.6A	Measured at full load and 120 Vac input.
Inrush Current	-	-	65A	At 220Vac input, 25°C cold start
PF	0.9	-	-	At 100-277Vac, 80%-100% load
THD	-	-	20%	

Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%Io set	-	5%Io set	At 25°C and full load condition
Total Output Current Ripple (pk-pk)	-	-	60%Io max	At 25°C and full load condition, 200Hz BW, for 60PHS60C-D1
	-	-	15%Io max	At 25°C and full load condition, 200Hz BW, for 60PHS60CL-D1
Startup Overshoot Current	-	-	10%Io max	At 25°C and full load condition
No Load Output Voltage	-	-	75V	
Line Regulation	-	-	±3%	Measured at 25°C and full load
Load Regulation	-	-	±8%	At 25°C condition
Turn-on Delay Time	-	0.8 s	1.5 s	Measured at 120Vac and 220Vac input.
Temperature Coefficient of Io set	-0.05%/°C	-	0.05%/°C	Case temperature = 0°C ~Tc max
OTP Tc	90°C	-	100°C	1.Input voltage is 120~277Vac; 2.Output current is reduced by 50% when triggered.
SCP				Hiccup mode, Auto recover

General Specifications

Parameter	Min.	Typ.	Max.	Notes
MTBF	234,000 Hours	-	-	Measured at 220Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK- 217F)
Lifetime	50,000 Hours	-	-	Measured at 220Vac input, 80%Load and 75°C case temperature; See lifetime vs. Tc curve for the details
Operating Case Temperature Tc	-40°C	-	90°C	
Operating Ambient Temperature Ta	-40°C	-	60°C	At 120-277Vac input.
Storage Temperature	-40°C	-	85°C	Humidity: 5%RH to 100%RH
Dimensions	Inches (L × W × H) 4.09 × 2.04 × 1.25 Millimeters (L × W × H) 104 × 51.8 × 31.8			
Net Weight	-	317g	-	

Dimming Specifications

Parameter	Min.	Typ.	Max.	Notes
Absolute Maximum Voltage on the Vdim (+) Pin	-1 V	-	15 V	
Source Current on Vdim (+)Pin	90 uA	100 uA	110 uA	
Dimming Output Range	-	10%Io set	Io set	80%Io max ≤ Io set ≤ 100%Io max
	-	8%Io max	Io set	Io set < 80%Io max
Recommended Dimming Input Range	0 V	-	10 V	Default 1-10V dimming mode.

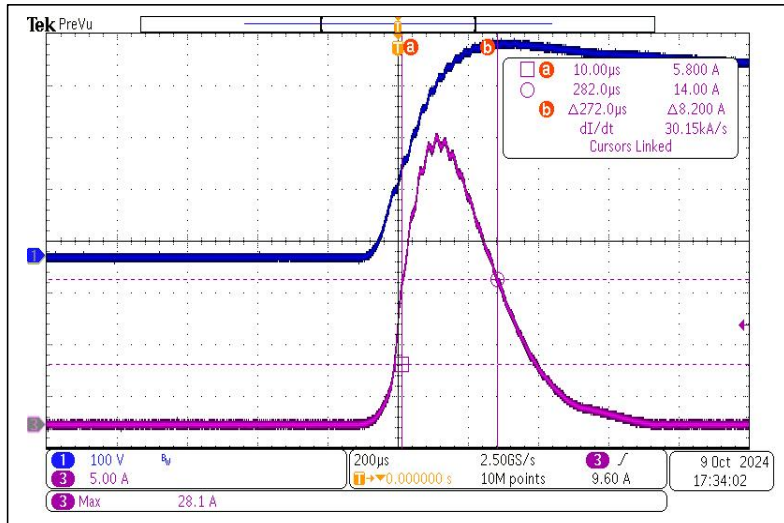
PWM_in High Level	9.8 V	10V	10.2 V
PWM_in Low Level	-0.3 V	-	0.6 V
PWM_in Frequency Range	500 Hz	-	3 KHz
PWM_in Duty Cycle	1%	-	100%

Safety & EMC Compliance

Safety Category	Standard
UL/CUL	UL8750,CAN/CSA-C22.2 No. 250.13-12
Dielectric Strength(Hi-pot)	Primary to Secondary: 3750Vac 10mA max
	Primary to Earth: 1600Vac 10mA max.
	Secondary to Earth: 1600Vac 10mA max.
	Dimming to Output: 500Vac 10mA max.
Insulation Resistance	50Mohm min.@ primary to secondary add 500Vdc test voltage
Grounded Resistance	0.1Ω max. @ 25A, 1 minute
ENEC&CE	EN61347-1, EN 61347-2-13
CB	IEC 61347-1, IEC 61347-2-13
CCC	GB19510.1, GB19510.14
EMI Standards	Notes
EN55015	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, Criteria B
EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test-RS, Criteria A
EN 61000-4-4	Electrical Fast Transient / Burst-EFT: level 3, Criteria A
EN 61000-4-5	Surge Immunity Test: AC Power Line: line to line 6kV, line to earth 10kV, Criteria B
EN 61000-4-6	Conducted Radio Frequency Disturbances Test-CS, Criteria A
EN 61000-4-8	Power Frequency Magnetic Field Test, Criteria A
EN 61000-4-11	Voltage Dips Criteria B
EN 61547	Electromagnetic Immunity Requirements Applies To Lighting Equipment

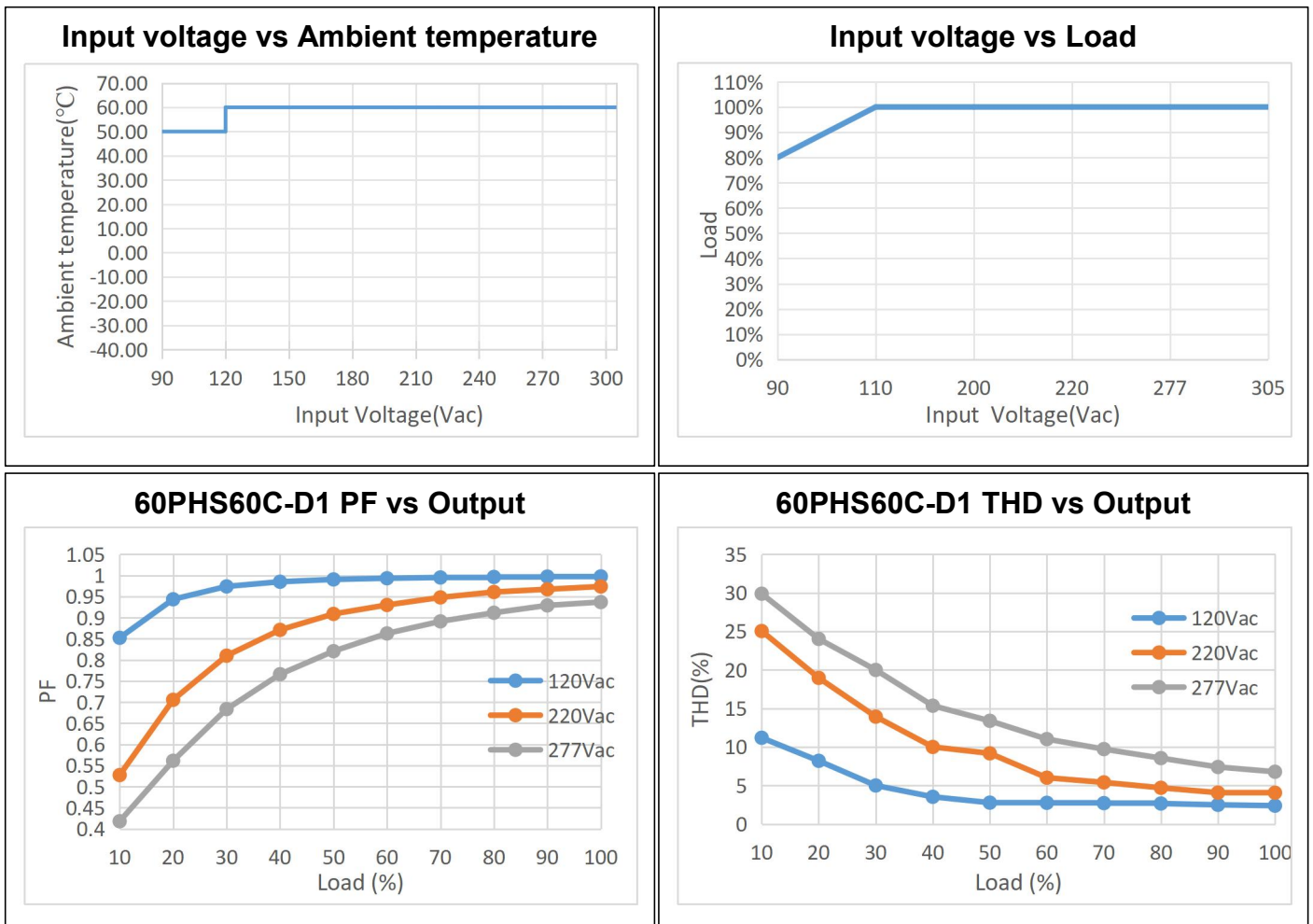
Note: This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

Inrush Current Curve

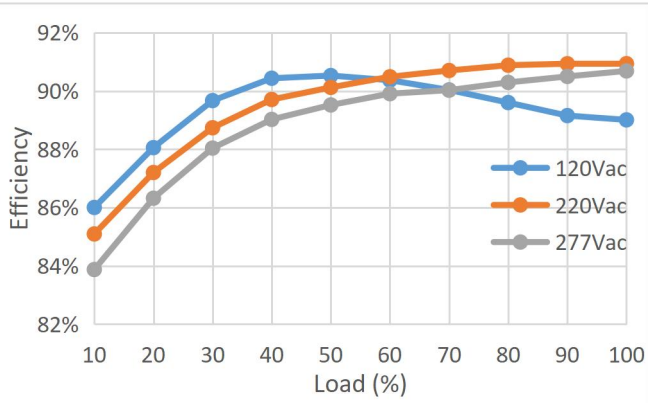


Vin(Vac)	Fin(Hz)	Ipeak(A)	T duration(us)	I ² t(A ² s)
120	60	12.5	254	0.040
220	50	22.5	254	0.128
277	60	28.1	272	0.215

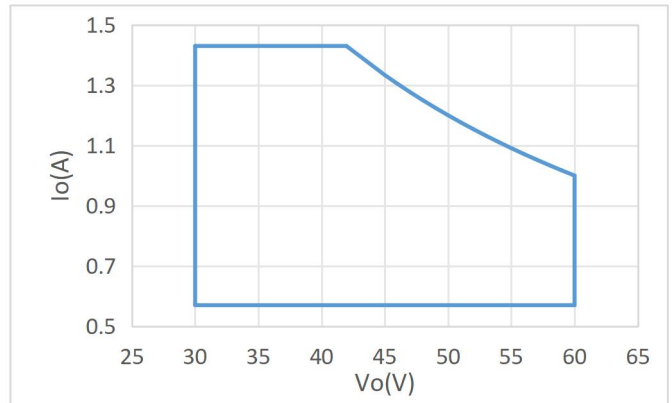
Performance Curve



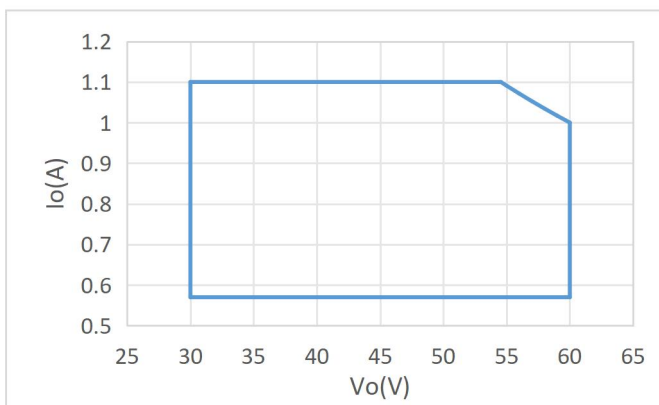
60PHS60C-D1 Efficiency vs Output



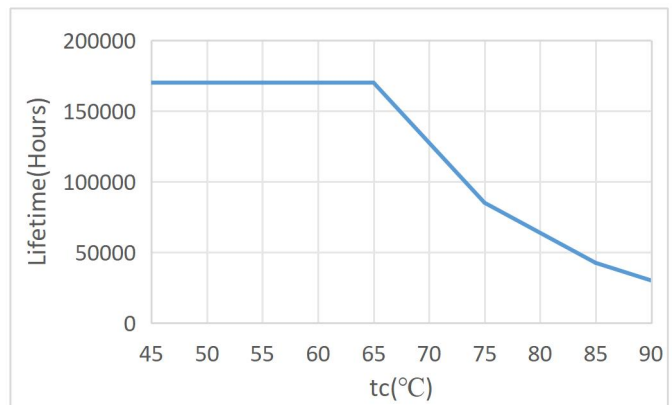
60PHS60C-D1 I/V Operating Area



60PHS60CL-D1 I/V Operating Area

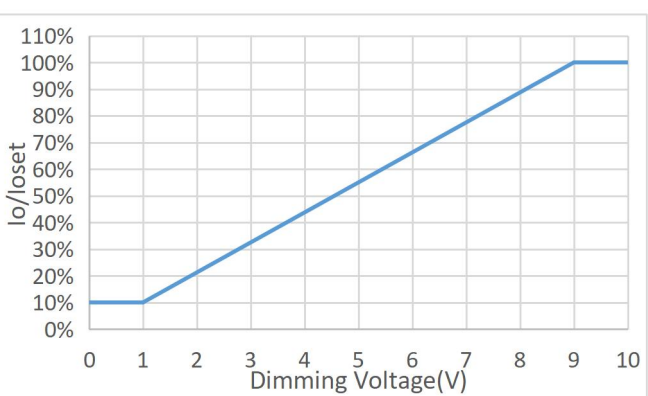


Life Vs Case Temperature

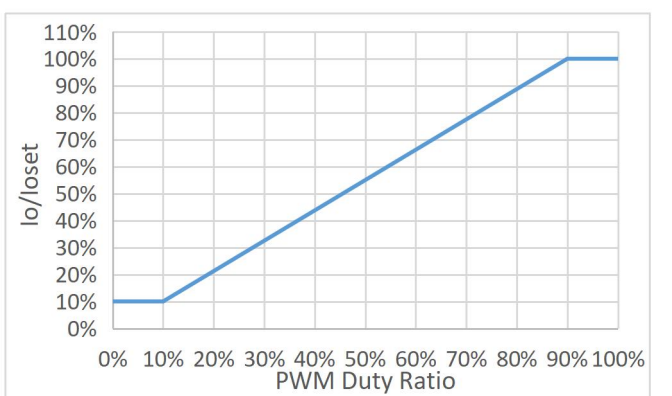


1-10V Analog Dimming

Io/IoSet vs Dimming Voltage



Io/IoSet vs PWM Duty Ratio



Revision History

Change Date	Rev.	Description of Change		
		Item	From	To
2024/3/12	V1.0			
2024/9/5	V1.1	Update THD/PF/EFF curve		
		Efficiency typical@220VAC	60PHS60C-D1:91% 60PHS60CL-D1:91%	60PHS60C-D1:90% 60PHS60CL-D1:88%
			line to line 4kV, line to earth 6kV	line to line 6kV, line to earth 10kV
		Add Life Vs Case Temperature/I/V Operating Area		
		Output current ripple	60PHS60C-D1:50% 60PHS60CL-D1:10%	60PHS60C-D1:60% 60PHS60CL-D1:15%
2024/10/17	V1.2		Static Characteristics curve	Input voltage vs Load curve
			Derating Characteristics curve	Input voltage vs Ambient temperature curve
		Line Regulation	Max: $\pm 1\%$	Max: $\pm 3\%$
		Load Regulation	Max: $\pm 1\%$	Max: $\pm 5\%$
		Input AC Current	Max: 0.25(Measured at full load and 277 Vac input.)	Max: 0.27(Measured at full load and 277 Vac input.)
		Total Output Current Ripple (pk-pk)	Max: 15%Io max	Max: 60%Io max
		60PHS60CL-D1: Programmable Constant Current Region	0.57-1.43A	0.57-1.1A
		Update Life Vs Case Temperature		
		Update Mechanical Specification		
		Net Weight	288g	317g
		Add Inrush Current Curve		
Add Io/Iomax vs Rx				
2024/11/18	V1.3	Update I/V Operating Area		
		Constant Power Output Voltage Range	25-60V	30-60V
		Input AC Current(Measured at full load and 277 Vac input.)	Max: 0.27A	Max: 0.28A
		Load Regulation	Max: $\pm 5\%$	Max: $\pm 8\%$ (Notes: At 25°C condition)
		EN 61000-4-4	Criteria B	Criteria A
		OTP Tc	Min: 85°C, Typ: 90°C Notes: Output current will drop to 50%	Min: 90°C, Typ: - Notes: 1.Input voltage is 120~277Vac; 2.Output current is reduced by 50% when triggered.
		Operating Ambient Temperature Ta		Notes: At 120-277Vac input.
2024/11/28	V1.4	Dielectric Strength(Hi-pot)	Dimming to Secondary: 1600Vac 10mA max.	Dimming to Secondary: 500Vac 10mA max.
2025/1/8	V1.5	Line Regulation	Note: Measured at full load	Note: Measured at 25°C and full load

		Total Output Current Ripple (pk-pk)		Add max: 15%Io max(At 25°C and full load condition, 200Hz BW, for 60PHS60CL-D1)
		Temperature Coefficient of Isot	±0.03%/°C	±0.05%/°C
		EN 61000-4-2	Criteria A	Criteria B
		Dielectric Strength(Hi-pot)	Dimming to Secondary: 500Vac 10mA max.	Dimming to Output: 500Vac 10mA max.