

## 96 Watt - LP96W480 Series

CONSTANT VOLTAGE OR CONSTANT CURRENT LED DRIVER WITH DIMMING



DIMMING  
LP96W480 Series  
**96W**

### Model: LP96W480 Series

- Drive Mode: Constant Current or Constant Voltage
- Technology: PFC Corrected 2-Stage Switch Mode
- Output Power: 96W Max.
- Input Voltage: 277 to 480VAC, 50/60Hz
- Number of Outputs: One
- Output Voltages: 6VDC - 274VDC
- Output Currents: 350mA - 5350mA
- Optional 0-10V or PWM Positive Dimming 10% ~ 100%

### Environmental

1. Operating temperature: Tc 90C Maximum. Reference -30 to +65°C ambient
2. For UL Type TL Recognized: (Tref Max/Meas. Tref): 90/66°C
3. Storage temperature range: -40 to +85°C
4. Humidity (non-condensing): 5% - 95%RH
5. Cooling: Convection
6. Vibration Frequency: 5-55Hz/2g, 30 minutes
7. Impact resistance: 1g/s
8. MTBF@ 40°C: 474,000 hours @ Full Load per MIL-217F Notice 2.

### Safety and Compliance

1. Class P: UL8750, EN61347, CSA 22.2 safety listed, UL Class P -or- Type TL: UL8750, EN61347, CSA 22.2, UL TL recognized
2. FCC, 47CFR Part 15 Class A certified
3. Water resistant and Dust Proof Design: IP66, NEMA6, for Dry, Damp, Wet Locations.
4. Meets EN61000-3-2 & EN61000-3-3 Class C
5. Protection: output over-voltage, output over-current, output short circuit, auto-recovery.
6. EN61000-4-5: 3kV/6kV 8/20 µsec surge protection.
7. Internal Thermal protection. Hick-up mode.  
Off if Tc reaches ~110C, On when Tc reaches ~65C

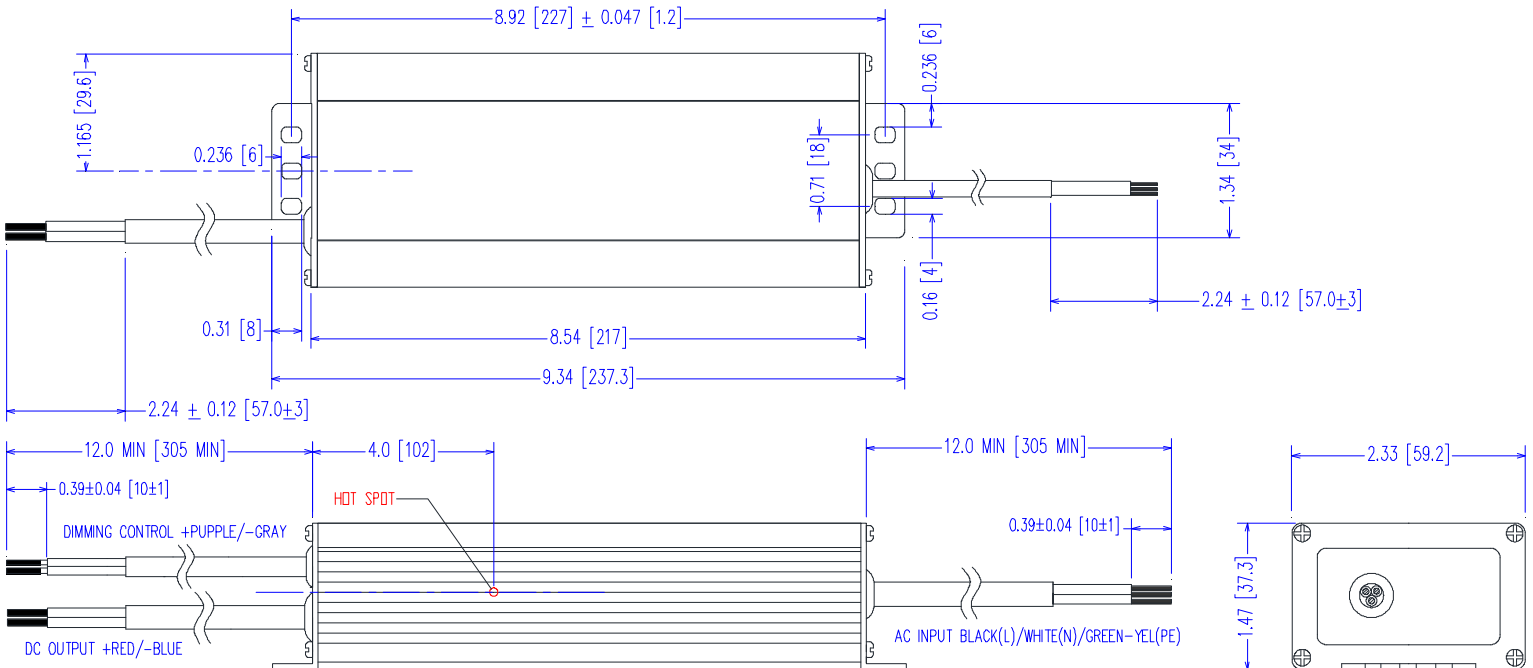
### Electrical Specifications at 25°C

- Input voltage range: 277 to 480VAC
- Frequency: 47- 63HZ
- Power Factor:  $\geq 0.90$  at  $\geq 50\%$  Load 277Vac/347Vac,  $\geq 60\%$  Load 480Vac
- THD%:  $\leq 20\%$  at  $\geq 60\%$  Load 277Vac/347Vac/480Vac
- Inrush current:  $<30A$  at 25C, 480Vac, cold start, Max. Load
- Input current: 0.45A Maximum
- Efficiency: Up to 88% typical at 480Vac Full Load
- Line regulation accuracy:  $\pm 3\%$
- Load regulation accuracy:  $\pm 4\%$
- Leakage current: 700uA typical; Hold up time: half cycle

### Mechanical Dimensions: Inches [mm]

Material: Black Aluminum Housing  
Fully Encapsulated  
Weight: 32.1 oz (910 grams) Typical

### Labeling Example





**IP66**



**96 Watt - LP96W480 Series**

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**UL Class P Constant Current Versions**

Part Number <sup>(2)</sup>	US Class 2	CN Class 2	UL Types	Output Voltage Range	Output Constant Current	Current Accuracy	Output Power Maximum	Typical Efficiency <sup>(1)</sup>
LP96W480-274-C0350-P	NO	NO	HL	92 - 274 VDC	350 mA	± 5%	96W	88%
LP96W480-213-C0450-P	NO	NO	HL	71 - 213 VDC	450 mA	± 5%	96W	88%
LP96W480-137-C0700-P	NO	NO	HL	46 - 137 VDC	700 mA	± 5%	96W	86%
LP96W480-92-C1050-P	NO	NO	HL	31 - 92 VDC	1050 mA	± 5%	96W	86%
LP96W480-69-C1400-P	NO	NO	HL	23 - 69 VDC	1400 mA	± 5%	96W	86%
LP96W480-54-C1750-P	YES	NO	HL	18 - 54 VDC	1750 mA	± 5%	96W	85%
LP96W480-48-C2000-P	YES	NO	HL	16 - 48 VDC	2000 mA	± 5%	96W	85%
LP96W480-46-C2100-P	YES	NO	HL	16 - 46 VDC	2100 mA	± 5%	96W	85%
LP96W480-39-C2450-P	YES	YES	HL	14 - 39 VDC	2450 mA	± 5%	96W	84%
LP96W480-36-C2660-P	YES	YES	HL	12 - 36 VDC	2660 mA	± 5%	96W	84%
LP96W480-34-C2800-P	YES	YES	HL	12 - 34 VDC	2800 mA	± 5%	96W	84%
LP96W480-30-C3150-P	YES	YES	HL	10 - 30 VDC	3150 mA	± 5%	96W	84%
LP96W480-27-C3500-P	YES	YES	HL	9 - 27 VDC	3500 mA	± 5%	96W	83%
LP96W480-25-C3840-P	YES	YES	HL	9 - 25 VDC	3840 mA	± 5%	96W	83%
LP96W480-24-C4000-P	YES	YES	HL	8 - 24 VDC	4000 mA	± 5%	96W	81%
LP96W480-20-C4800-P	YES	YES	HL	7 - 20 VDC	4800 mA	± 5%	96W	81%
LP96W480-18-C5350-P	NO	NO	HL	6 - 18 VDC	5350 mA	± 5%	96W	81%

**UL Class P Constant Voltage Versions**

Part Number	US Class 2	CN Class 2	UL Types	Output Constant Voltage	Output Current Range	Voltage Accuracy	Output Power Maximum	Typical Efficiency <sup>(1)</sup>
LP96W480-274-P	NO	NO	HL	274 VDC	88 - 350 mA	± 5%	96W	88%
LP96W480-213-P	NO	NO	HL	213 VDC	113 - 450 mA	± 5%	96W	88%
LP96W480-137-P	NO	NO	HL	137 VDC	175 - 700 mA	± 5%	96W	86%
LP96W480-92-P	NO	NO	HL	92 VDC	263 - 1050 mA	± 5%	96W	86%
LP96W480-69-P	NO	NO	HL	69 VDC	350 - 1400 mA	± 5%	96W	86%
LP96W480-54-P	YES	YES	HL	54 VDC	438 - 1750 mA	± 5%	96W	85%
LP96W480-48-P	YES	YES	HL	48 VDC	500 - 2000 mA	± 5%	96W	85%
LP96W480-46-P	YES	YES	HL	46 VDC	525 - 2100 mA	± 3%	96W	85%
LP96W480-39-P	YES	YES	HL	39 VDC	613 - 2450 mA	± 5%	96W	84%
LP96W480-36-P	YES	YES	HL	36 VDC	665 - 2660 mA	± 5%	96W	84%
LP96W480-34-P	YES	YES	HL	34 VDC	700 - 2800 mA	± 5%	96W	84%
LP96W480-30-P	YES	YES	HL	30 VDC	788 - 3150 mA	± 5%	96W	84%
LP96W480-27-P	YES	YES	HL	27 VDC	875 - 3500 mA	± 5%	96W	83%
LP96W480-25-P	YES	YES	HL	25 VDC	960 - 3840 mA	± 5%	96W	83%
LP96W480-24-P	YES	YES	HL	24 VDC	1000 - 4000 mA	± 5%	96W	81%
LP96W480-20-P	YES	YES	HL	20 VDC	1200 - 4800 mA	± 5%	96W	81%
LP96W480-18-P	NO	NO	HL	18 VDC	1338 - 5350 mA	± 5%	96W	81%

**Notes**

1. Typical efficiency measured at 480VAC input, full load
2. For dimmable versions add appropriate designator to the end of the part number: For Example: LP96W480-24-C4000-PRD is 0-10V or resistance dimmable version, LP96W480-24-C4000-PPD is PWM dimmable version.  
-PRD 0-10V & Resistance dimmable version comes with an extra two wires +Purple/-Grey on the output side.  
-PPD PWM Dimmable version comes with an extra two wires +Purple/-Grey on the output side.
3. -PRD 0-10V Dimming is compatible with most quality 0-10V wall dimmers and direct 0-10V analog signal. See page 4 for details.
4. -PPD PWM version is PWM Dimmable via a positive 10% to 100% Duty Cycle, 400Hz to 1KHz, 0-10V Pulse. See page 5 for details.

Specifications subject to change without notice

Custom designs available. Please consult with the factory.



# LED Optimized Drivers

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IP66



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### Constant Current Versions

Part Number <sup>(2)</sup>	US Class 2	CN Class 2	UL Types	Output Voltage Range	Output Constant Current	Current Accuracy	Output Power Maximum	Typical Efficiency <sup>(1)</sup>
LP96W480-274-C0350	NO	NO	TL & HL	92 - 274 VDC	350 mA	± 5%	96W	88%
LP96W480-213-C0450	NO	NO	TL & HL	71 - 213 VDC	450 mA	± 5%	96W	88%
LP96W480-137-C0700	NO	NO	TL & HL	46 - 137 VDC	700 mA	± 5%	96W	86%
LP96W480-92-C1050	NO	NO	TL & HL	31 - 92 VDC	1050 mA	± 5%	96W	86%
LP96W480-69-C1400	NO	NO	TL & HL	23 - 69 VDC	1400 mA	± 5%	96W	86%
LP96W480-54-C1750	YES	NO	TL & HL	18 - 54 VDC	1750 mA	± 5%	96W	85%
LP96W480-48-C2000	YES	NO	TL & HL	16 - 48 VDC	2000 mA	± 5%	96W	85%
LP96W480-46-C2100	YES	NO	TL & HL	16 - 46 VDC	2100 mA	± 5%	96W	85%
LP96W480-39-C2450	YES	YES	TL & HL	14 - 39 VDC	2450 mA	± 5%	96W	84%
LP96W480-36-C2660	YES	YES	TL & HL	12 - 36 VDC	2660 mA	± 5%	96W	84%
LP96W480-34-C2800	YES	YES	TL & HL	12 - 34 VDC	2800 mA	± 5%	96W	84%
LP96W480-30-C3150	YES	YES	TL & HL	10 - 30 VDC	3150 mA	± 5%	96W	84%
LP96W480-27-C3500	YES	YES	TL & HL	9 - 27 VDC	3500 mA	± 5%	96W	83%
LP96W480-25-C3840	YES	YES	TL & HL	9 - 25 VDC	3840 mA	± 5%	96W	83%
LP96W480-24-C4000	YES	YES	TL & HL	8 - 24 VDC	4000 mA	± 5%	96W	81%
LP96W480-20-C4800	YES	YES	TL & HL	7 - 20 VDC	4800 mA	± 5%	96W	81%
LP96W480-18-C5350	NO	NO	TL & HL	6 - 18 VDC	5350 mA	± 5%	96W	81%

### Constant Voltage Versions

Part Number	US Class 2	CN Class 2	UL Types	Output Constant Voltage	Output Current Range	Voltage Accuracy	Output Power Maximum	Typical Efficiency <sup>(1)</sup>
LP96W480-274	NO	NO	TL & HL	274 VDC	88 - 350 mA	± 5%	96W	88%
LP96W480-213	NO	NO	TL & HL	213 VDC	113 - 450 mA	± 5%	96W	88%
LP96W480-137	NO	NO	TL & HL	137 VDC	175 - 700 mA	± 5%	96W	86%
LP96W480-92	NO	NO	TL & HL	92 VDC	263 - 1050 mA	± 5%	96W	86%
LP96W480-69	NO	NO	TL & HL	69 VDC	350 - 1400 mA	± 5%	96W	86%
LP96W480-54	YES	YES	TL & HL	54 VDC	438 - 1750 mA	± 5%	96W	85%
LP96W480-48	YES	YES	TL & HL	48 VDC	500 - 2000 mA	± 5%	96W	85%
LP96W480-46	YES	YES	TL & HL	46 VDC	525 - 2100 mA	± 3%	96W	85%
LP96W480-39	YES	YES	TL & HL	39 VDC	613 - 2450 mA	± 5%	96W	84%
LP96W480-36	YES	YES	TL & HL	36 VDC	665 - 2660 mA	± 5%	96W	84%
LP96W480-34	YES	YES	TL & HL	34 VDC	700 - 2800 mA	± 5%	96W	84%
LP96W480-30	YES	YES	TL & HL	30 VDC	788 - 3150 mA	± 5%	96W	84%
LP96W480-27	YES	YES	TL & HL	27 VDC	875 - 3500 mA	± 5%	96W	83%
LP96W480-25	YES	YES	TL & HL	25 VDC	960 - 3840 mA	± 5%	96W	83%
LP96W480-24	YES	YES	TL & HL	24 VDC	1000 - 4000 mA	± 5%	96W	81%
LP96W480-20	YES	YES	TL & HL	20 VDC	1200 - 4800 mA	± 5%	96W	81%
LP96W480-18	NO	NO	TL & HL	18 VDC	1338 - 5350 mA	± 5%	96W	81%

### Notes

- Typical efficiency measured at 480VAC input, full load
- For dimmable versions add appropriate designator to the end of the part number: For Example: LP96W480-24-C4000-RD is 0-10V or resistance dimmable version, LP96W480-24-C4000-PD is PWM dimmable version.  
-RD 0-10V & Resistance dimmable version comes with an extra two wires +Purple/-Grey on the output side.  
-PD PWM Dimmable version comes with an extra two wires +Purple/-Grey on the output side.
- RD 0-10V Dimming is compatible with most quality 0-10V wall dimmers and direct 0-10V analog signal. See page 4 for details.
- PD PWM version is PWM Dimmable via a positive 10% to 100% Duty Cycle, 400Hz to 1KHz, 0-10V Pulse. See page 5 for details.

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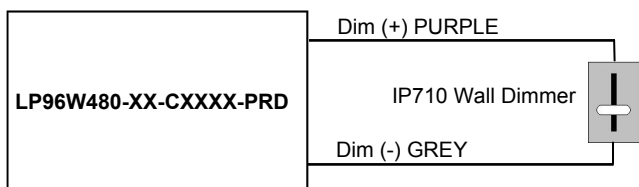
## -RD 2-Wire 0-10V CCR Dimming Scheme

Parameters	Minimum	Typical	Maximum
Source Current out of 0-10V Purple Wire	0mA	—	2mA
Absolute Voltage Range on 0-10V (+) Purple Wire	-2.0V	—	+15V
Sink Current into 0-10V Purple Wire	0mA	—	1.2mA

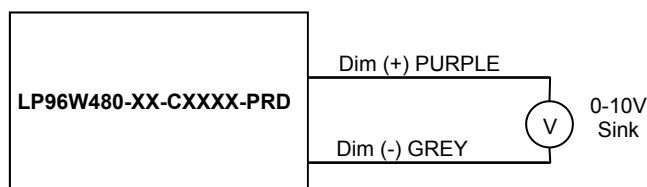
## Notes

1. -RD 0-10V dimmable version comes with an extra two wires +Purple/-Grey on the output side.
2. -RD version is compatible with most 0-10V Wall Slide dimmers and direct 0-10V analog signal.  
Recommended wall slide dimmer is Leviton IP710 or equivalent
3. -RD 0-10V dimmable version is not intended to dim below about 5% @ 0V or 10% @ 1.0V
4. -RD 0-10V dimmable version output will be 100% with Purple/Grey open and minimum with Purple/Grey Shorted.

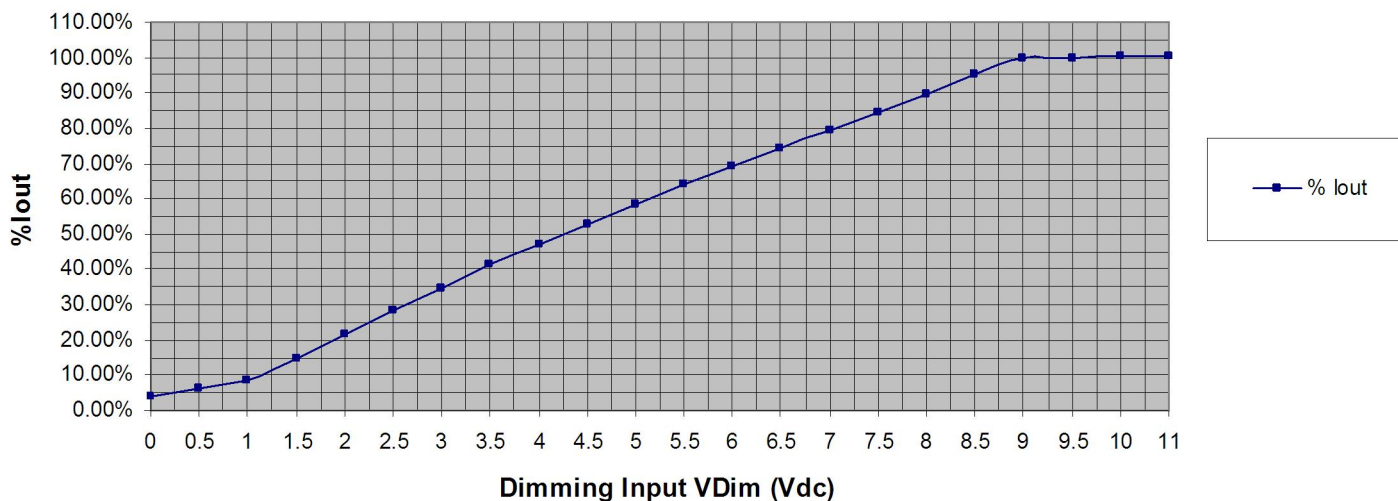
## -RD 2-Wire Resistance Dimming Scheme



## -RD 2-Wire 0-10V Analog Dimming Scheme



**% Output Current vs. 0-10VDC Dimming Input**



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**96W**

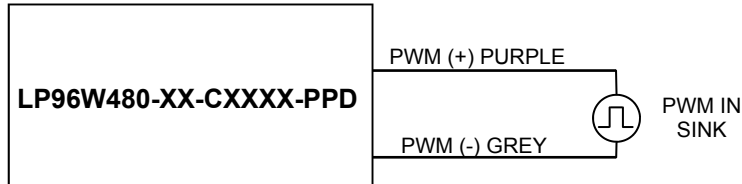
### -PD 2-Wire CCR PWM Positive Dimming Scheme

Parameters	Minimum	Typical	Maximum
Absolute Maximum Voltage Range on PWM Input (Purple Wire)	-2.0V	10V	+15V
Input LOW Level Voltage Range (Purple Wire)	-2.0V	0V	+5.5V
Input HIGH Level Voltage Range (Purple Wire)	+9.0V	10V	+15V
Current into PWM Input (Purple Wire)	0mA	—	1.2mA
Source Current out of PWM Input (Purple Wire)	0mA	—	2mA
PWM Input Signal Frequency	500Hz	—	1500Hz
PWM Input Signal Positive Duty Cycle	0%	10-90%	100%

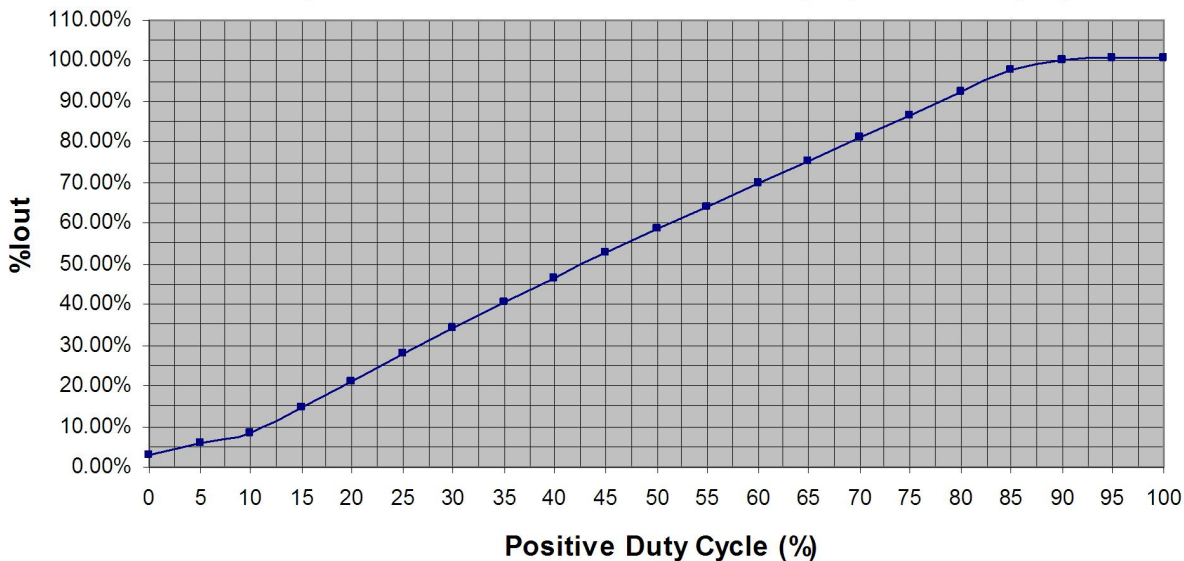
### Notes

1. -PD PWM Dimmable version comes with an extra 2 wires +Purple/-Grey on the output side.
2. -PD PWM Dimmable version is not intended to dim below about 5% @ 0% Duty Cycle or 10% @ 10% Duty Cycle
3. -PD PWM dimmable version output will be 100% with Purple/Grey open and minimum with Purple/Grey Shorted.

### -PD 2-Wire PWM Positive Dimming Scheme



**% Output Current vs. 1.0 kHz, Positive Duty Cycle Dimming Input**



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## Input Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
Input Voltage	250 Vac	—	528 Vac	277, 347, 380, 460, 480 Vac Nominal Values
Input Frequency	47 Hz	—	63 Hz	50/60Hz Nominal
Input AC Current	—	—	0.31 A	Measured at 347Vac/60Hz Input, Output Full load.
	—	—	0.23 A	Measured at 480Vac/60Hz Input, Output Full load.
Inrush Current (Peak)	—	20A	30A	Measured at 480Vac/60Hz Input, Output Full Load, Ta 25°C, Cold Start 50% I <sub>peak</sub> duration $\approx$ 750 $\mu$ sec (1/2*I <sub>p</sub> <sup>2</sup> *t)
Inrush Current (I <sup>2</sup> t)	—	—	0.34 A <sup>2</sup> s	
Leakage Current	—	—	0.68mA	Measured at 277Vac/60Hz Input, Output Full load.
	—	—	0.75mA	Measured at 480Vac/60Hz Input, Output Full load.
THD	—	—	20%	Measured at 277Vac, 347Vac, 380Vac, 460Vac, 480Vac $\geq$ 60% Load
Power Factor (PF)	—	—	0.90	Measured at 277Vac, 347Vac $\geq$ 50% Load, 480Vac $\geq$ 60% Load

## Output Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
DC Output Voltage	Per Table	—	Per Table	Per Tables on Page 2 & 3
DC Output Constant Current	-5%	Per Table	+5%	Per Tables on Page 2 & 3
Output Power	—	—	Per Table	Per Tables on Page 2 & 3
Ripple & Noise (V <sub>pk-pk</sub> )	—	—	3% V <sub>o</sub>	20 MHz BW, Full load output in parallel with 0.1 $\mu$ F ceramic & 10 $\mu$ F Electrolytic.
Ripple (I <sub>pk-pk</sub> )	—	—	5% I <sub>o</sub>	20 MHz BW, Full load output in parallel with 0.1 $\mu$ F ceramic & 10 $\mu$ F Electrolytic. 120 Hz component (Flicker Free)
Start-up Time	—	200 mS	500 mS	Measured at 480Vac/60Hz Input, Output Full load.
Hold-up Time	—	200 mS	—	Typical @ 480Vac Input, Output Full load.

## Environmental Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
Case Temperature (T <sub>c</sub> )	-30 °C	—	+90 °C	Measured at location specified on case.
Operating Temperature (T <sub>a</sub> )	-30 °C	—	+65 °C	This is a reference range. T <sub>c</sub> controls temperature range.
Storage Temperature (T <sub>s</sub> )	-40 °C	—	+85 °C	Non operating temperature range.
Operating Humidity	—	—	95% RH	Relative Humidity, non-condensing.
Vibration	5 Hz	—	55 Hz	2G, 10 minutes/1 cycle, period 30 minutes, each along X, Y, Z axis.
MTBF	474,000 Hours	—	—	MIL-HDBK-217F Notice 2, T <sub>a</sub> = 25C, Output Full Load.

## Protection Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
Output Short Circuit (SCP)	—	—	—	No Damage, Auto recovery after short is removed.
Output Over Current (OCP)	—	—	+8% I <sub>o</sub>	Constant Current Limiting circuit.
Output Over Voltage (OVP)	—	—	120% V <sub>o</sub>	No Damage, Auto recovery after fault is removed.
Over Temperature (OTP)	100 °C	105 °C	110 °C	Hick-up mode. Off if T <sub>c</sub> reaches $\approx$ 105C, On when T <sub>c</sub> reaches $\approx$ 65C

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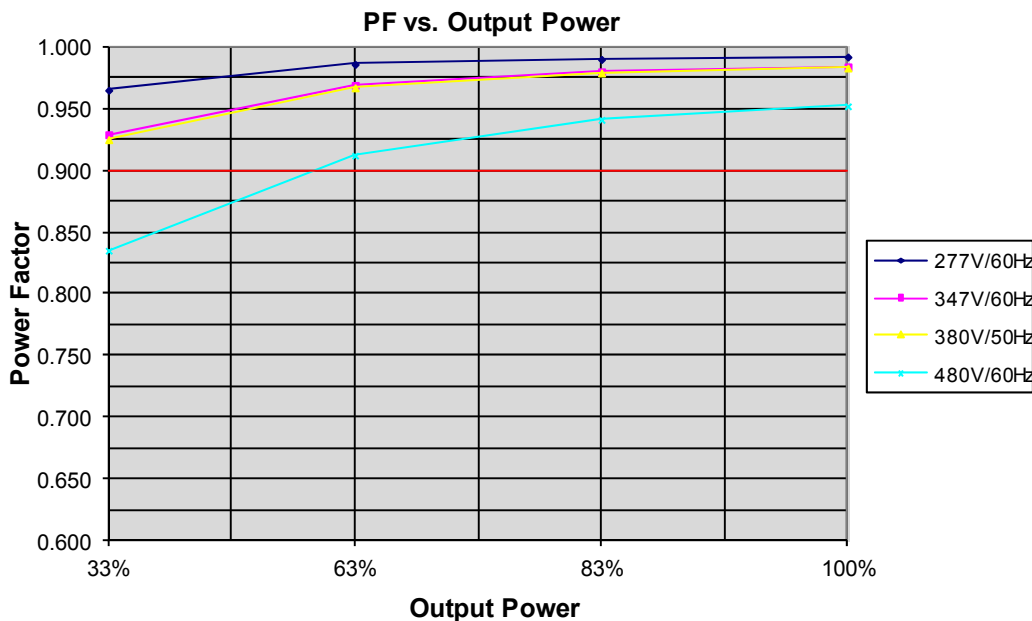
### Safety Certification

Safety	Notes/Standards
UL Class P UL/CUL Listed	UL8750 & CAN/CSA C22.2 No. 250.13, UL Class P, UL Type HL
UL Type TL UL/CUL Recognized	UL8750, UL1310 for UL Class 2 & CAN/CSA C22.2 No. 250.13, UL Type HL & TL 90/66°C
Withstand Voltage	Input to Output: 3750 Vac
Isolation Resistance	Input to Output: >100 MΩ, 500VDC @ 25 °C, 70 % RH
Dimming Circuit	Dim+ Purple/Dim- Grey are considered part of the secondary circuit.

### EMC Certification

Standard	Notes/Conditions
FCC, 47CFR Part 15	Class A
EN 61000-3-2	Part 3-2: Limits for harmonic current emissions Class C, ≥80% Rated Power
EN 61000-3-3	Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker.
EN 61000-4-5	Part 4-5: Surge Immunity test, 3kV L-N, 6kV L-FG & N-FG
Energy Star	Energy Star transient protection: Ballast or driver shall comply with ANSI/IEEE C62.41.1-2002 and ANSI/IEEE C62.41.2-2002, Category A operation. The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode.

### Power Factor Curves (Typical)



96W

LP96W480 Series

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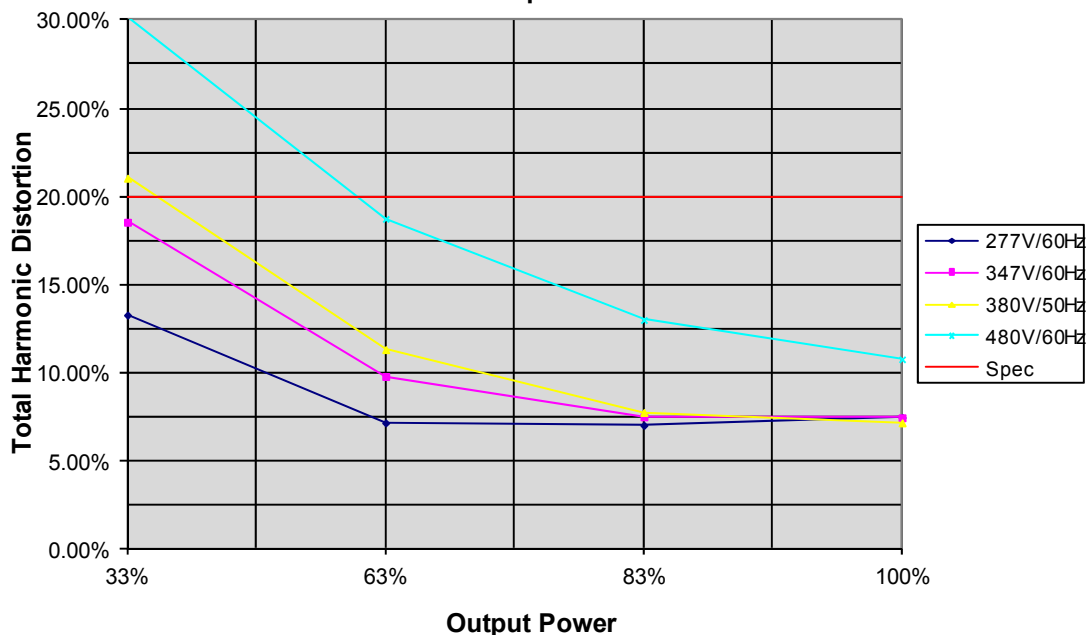
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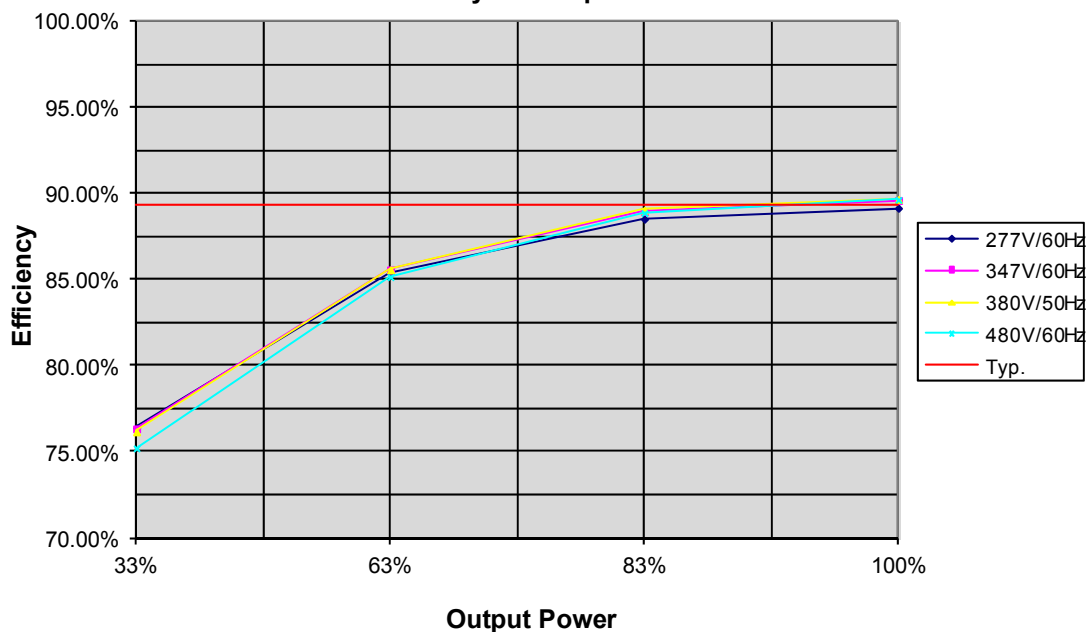
## THD Curves (Typical)

### THD vs. Output Power



## Efficiency Curve (Typical)

### Efficiency vs. Output Power





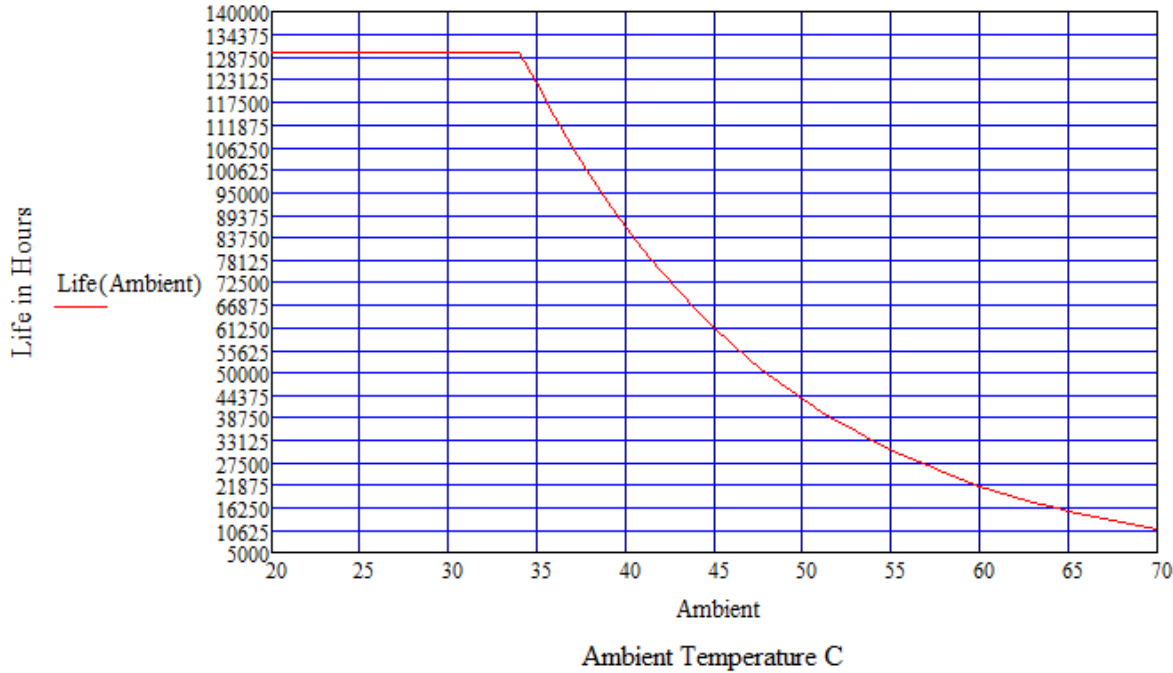
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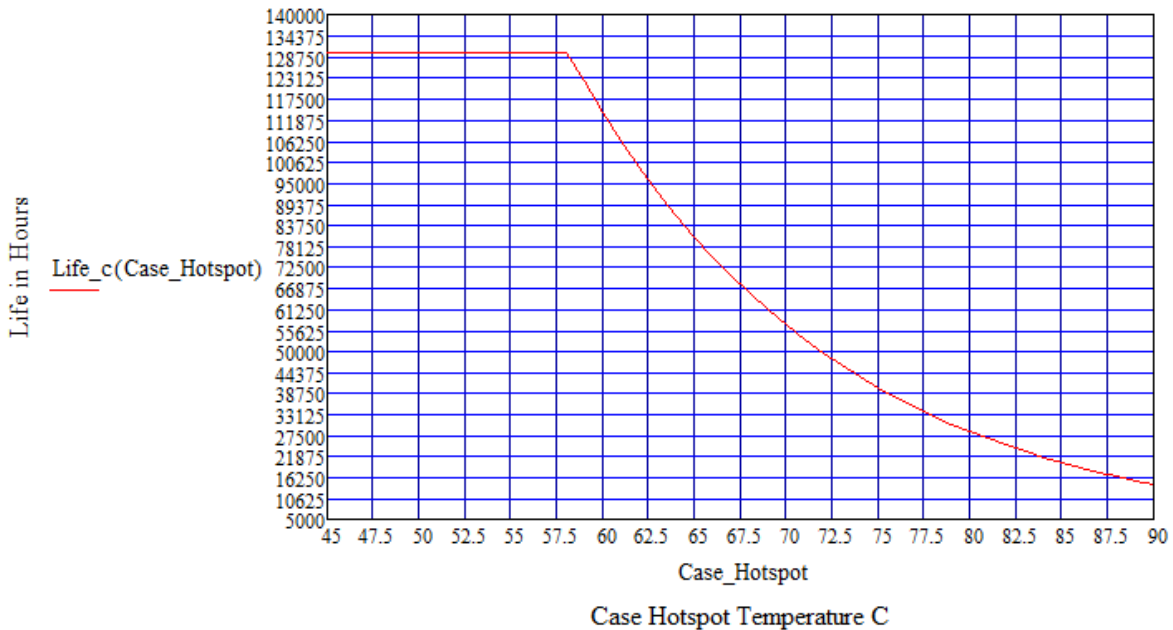
### Life vs. Ambient Temperature

LP96W480 Estimated Life Full Load @ 347Vac



### Life vs. Case (Tc) Temperature

LP96W480 Estimated Life Full Load @ 347Vac



96W

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