96 Watt - LP96W-XX-PCXXXX-RD

FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

Model: LP96W Series

- Drive Mode: Flicker Free Programmable Constant Current
- Technology: PFC Corrected 2-Stage Switch Mode
- Output Power: 96W Max.
- Input Voltage: 120 to 277VAC, 50/60Hz
- Output Voltage: 12 - 55VDC or 24-110VDC
- Output Current: Set by resistor value (Rset) or GUI
- Programmable Output Current (POC): 200 - Per Table mA
- 0-10V Linear or LOG Dimming 0% - 100%
- Auxiliary Output: 12V @ 200mA Max.

Environmental

1. Operating temperature: Tc 90C Maximum. Reference -30 to +50°C ambient
2. UL Class P
3. Storage temperature range: -40 to +85°C
4. Humidity (non-condensing): 5% - 90%RH
5. Cooling: Convection
6. Vibration Frequency: 5-55Hz/2g, 30 minutes
7. Impact resistance: 1g/s
8. MTBF@ 25°C: 350,000 hours @ Full Load per MIL-217F Notice 2.

Safety and Compliance

1. UL8750, EN61347, CSA 22.2 safety listed, UL Class P
2. FCC, 47CFR Part 15 Class A compliant
3. Damp & Dust resistant design IP20 NEMA1, for Dry & Damp Locations.
4. Rectangular style metal case.
5. Safety Isolation between Primary and Secondary
6. Meets EN61000-3-2 & EN61000-3-3 Class C
7. Protection: output over-voltage, output over-current, output short circuit, auto-recovery.
8. EN61000-4-5: 2kV/4kV 8/20 μsec transient protection.

Electrical Specifications at 25°C

- Input voltage range: 120-277Vac (Full range 108 to 305Vac)
- Frequency: 47 - 63HZ
- Power Factor: > 0.90 at > 60% Output Power, 120Vac/230Vac/277Vac 50/60Hz
- THD%: < 20% at > 60% Output Power, 120Vac/230Vac/277Vac 50/60Hz
- Inrush current: <75A at 25C, 277Vac, cold start, Max. Load
- Input current: 0.95A Maximum @ 120Vac
- Efficiency: 88% typical at 230Vac Full Load
- Constant Current regulation: + 2% Over Input Line Variation
- Load regulation accuracy: + 3%
- Leakage current: <750uA Max.

Programmable Parameters

Programmable Parameter		Programmable Minimum Value	Programmable Maximum Value	Factory Default 110V/55V	GUI Programmable	RSET Programmable
Output Constant Current (Iout)		200 mA	Per Table	1250 mA/2500 mA	YES	YES
Disable Dimming?		NO	YES	NO	YES	N/A
Dimming Curve	LINEAR	0%	N/A Fixed 100%	0%	YES	N/A
	LOG	0%	N/A Fixed 100%	0%	YES	N/A
NTC Minimum Ohms		1K Ω	10K Ω	2K Ω	YES	N/A
NTC Minimum %Iout		~ 0%	100%	~ 10%	YES	N/A
NTC Maximum Ohms		2K Ω	10K Ω	6.3K Ω	YES	N/A

Output Current: Set by Resistor Value "Rset" or using EP Programmer USB interface & EPtronics PC based GUI Software.
When Rset is open (no resistor present) then GUI setting controls programmed output current.
Programmable Output Current (POC): 200 - Table Max mA Power limited to 96W maximum by Voltage foldback.

c UL LISTED E325626   CLASS P   CE   FCC FEDERAL COMMUNICATIONS COMMISSION · USA ·   IP20   RoHS Compliant

Programmable Constant Current Version

Part Number	US Class 2	CN Class 2	Output Voltage Range	Output Constant Current [2]	Current Accuracy	Output Power Maximum [2]	Typical Efficiency [1]
LP96W-110-PC1250-RD	NO	NO	24 - 110 VDC	200 mA to 1250 mA	+ 5%	96W	88%
LP96W-55-PC2500-RD	YES	YES	12 - 55 VDC	200 mA to 2500 mA	+ 5%	96W	88%

Notes

1. Typical efficiency measured at 230VAC input, Vout Max @ Rated Iout, full load.
2. Keep POC (Programmable Output Current) within 96W Power Operating Windows. Refer to Power Operating Window graphs on page 7 & 8. Part will fold-back output Voltage to maintain power limits.
3. See page 7 & 8 for programmable output current (POC) graphs vs. Rset resistor.
4. See page 9 for NTC graphs.
5. See page 10 for GUI programming feature.

Custom designs available. Please consult with the factory.

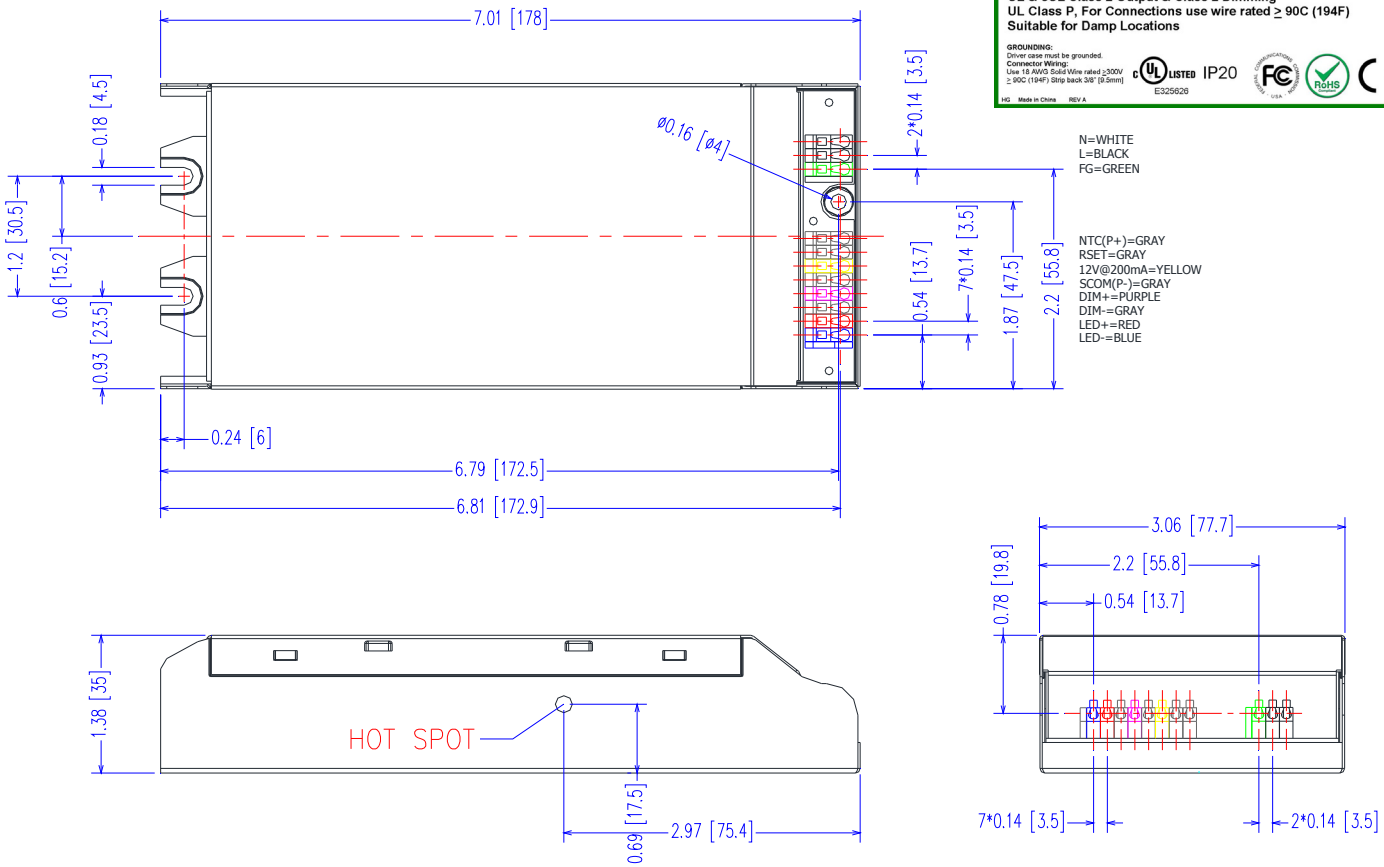Specifications subject to change without notice

1

LED Optimized Drivers

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FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

Mechanical Dimensions: Inches [mm]

Material: Metal Housing
Weight: 27 oz (765 grams) Typical
Case must be grounded in end use application

Labeling Example

Programmable LED Optimized Driver
EPtronics, Inc.
www.EPtronics.com
800 643-0688/310 536-0700

AC INPUT
N = WHITE
L = BLACK
FG = GREEN

Part Number: LP96W-55-PC2500-RD
Input Voltage: 120-277VAC 50/60Hz
Input Current: 1.08 Amp Max
Output Voltage: 12-55 VDC
Output Current (POC): 200-2500 mA (Default 2500mA)
0-10V CCR Dimmable Output, Programmable
Programmable NTC and Dimming Curve
UL & cUL Class 2 Output & Class 2 Dimming
UL Class P, For Connections use wire rated ≥ 90C (194F)
Suitable for Damp Locations

GROUNDING:
Driver case must be grounded.
Connector Wiring:
Use 18 AWG Solid Wire rated ≥300V
≥ 90C (194F) Strip back 3/8" [9.5mm]

OUTPUT & CONTROLS
NTC (P+) = GRAY
RSET = GRAY
12V@200mA = YELLOW
SCOM (P-) = GRAY
DIM+ = PURPLE
DIM- = GRAY
LED+ = RED
LED- = BLUE

UL LISTED   IP20
E325626
FC   RoHS   CE
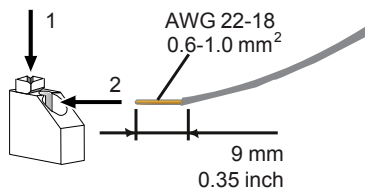
HG   Made in China   REV A

N=WHITE
L=BLACK
FG=GREEN

NTC(P+)=GRAY
RSET=GRAY
12V@200mA=YELLOW
SCOM(P-)=GRAY
DIM+=PURPLE
DIM-=GRAY
LED+=RED
LED-=BLUE

7.01 [178]
0.18 [4.5]
1.2 [30.5]
0.6 [15.2]
0.93 [23.5]
ø0.16 [ø4]
2*0.14 [3.5]
7*0.14 [3.5]
0.54 [13.7]
1.87 [47.5]
2.2 [55.8]
0.24 [6]
6.79 [172.5]
6.81 [172.9]

1.38 [35]
HOT SPOT
0.69 [17.5]
2.97 [75.4]

3.06 [77.7]
2.2 [55.8]
0.78 [19.8]
0.54 [13.7]
7*0.14 [3.5]
2*0.14 [3.5]

Case Parameter	Inches [mm]
Length	7.01 [178]
Width	3.06 [77.7]
Height	1.38 [35]
Connectors	UL, KF250-3.5, WAGO 250-402 Push Pin or equivalent.

LED wiring distance
Recommended maximum wiring distance at full load.

AWG	#22	#21	#20	#19	#18
Distance (m)	10	12	14	18	22
Distance (ft)	32.8	39.4	45.9	59	72.2

KF250-3.5 CONNECTORS

1
2
AWG 22-18
0.6-1.0 mm^2
9 mm
0.35 inch

Specifications subject to change without notice

Custom designs available. Please consult with the factory.

LED Optimized Drivers

96 Watt - LP96W-XX-PCXXXX-RD
FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

-RD, 0-10V & Resistance Dimming Scheme

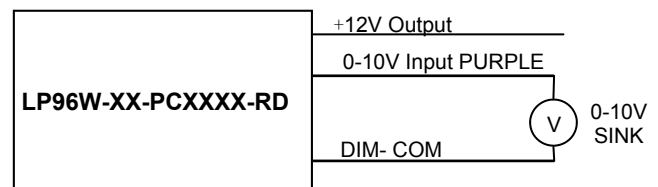| Parameters	Minimum	Typical	Maximum
12V Auxiliary Output	11V	12.0V	13.0V
12V Auxiliary Output Source Current	0mA	—	200mA
Absolute Voltage Range on 0-10V Input (Purple Wire)	-2.0V	—	+15V
Source Current out of 0-10V Input (Purple Wire)	0mA	—	1.0mA

Notes

1. Part comes with DIM+, DIM-, +12V & SCOM connectors. DIM+ and +12V return are connected to SCOM or DIM-
2. Part is compatible with most 0-10V Wall Slide dimmers and direct 0-10V analog signal. Recommended dimmer is Leviton IP710 or equivalent connected between Purple and DIM- wires. +12V auxiliary is not used for dimming.
3. Output current will be Minimum Programmed Value when Vdim ≤1.00V. If set to 0% then this is dim to zero operation.
4. Output will be 100% with DIM+/DIM- open and Minimum Programmed Value with DIM+/DIM- Shorted.
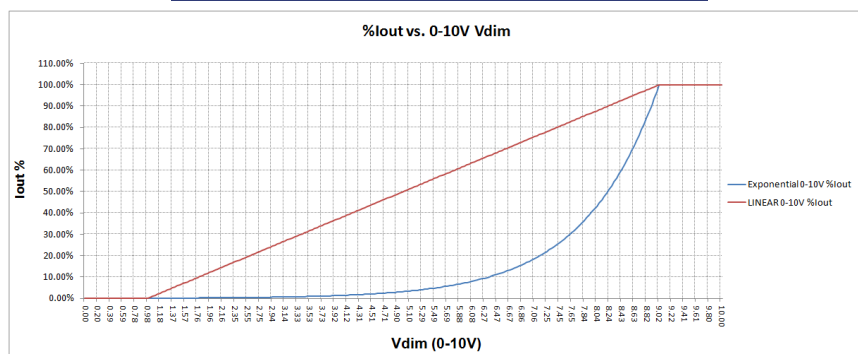5. Minimum dimming level is programmable with EP Programmer GUI.

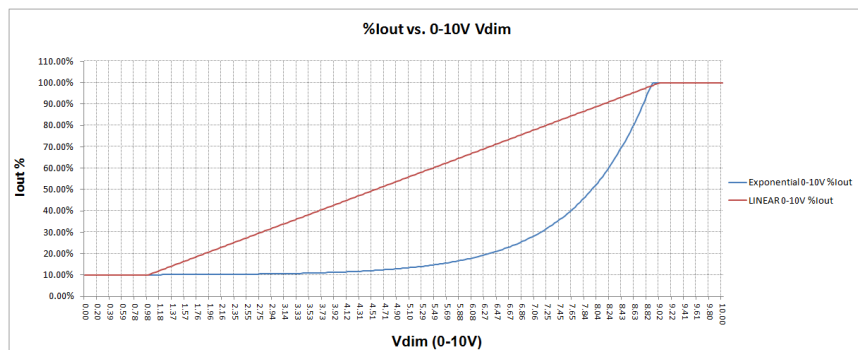### -RD 2-Wire Resistance Dimming Scheme
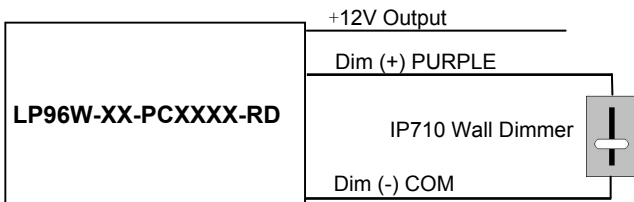
-RD 2-Wire 0-10V Dimming Scheme

Typical Dim Curves: Iout Min set to 0%

Typical Dim Curves: Iout Min set to 10%

Custom designs available. Please consult with the factory.

Specifications subject to change without notice

LED Optimized Drivers

Driven by Efficient Power

96 Watt - LP96W-XX-PCXXXX-RD
FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

Input Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
Input Voltage	108 Vac	——	305 Vac	120, 230, 240, 277 Vac Nominal Values
Input Frequency	47 Hz	——	63 Hz	50/60Hz Nominal
Input AC Current	——	——	0.95 A	Measured at 120Vac/60Hz Input, Output Full load.
	——	——	0.42 A	Measured at 277Vac/60Hz Input, Output Full load.
Inrush Current (Peak) Note: Ipk Pw ~760usec max	——	——	40A	Measured at 120Vac/60Hz Input, Output Full Load, Ta 25°C, Cold Start
	——	——	75A	Measured at 277Vac/60Hz Input, Output Full Load, Ta 25°C, Cold Start
Leakage Current	——	——	0.45mA	Measured at 120Vac/60Hz Input, Output Full load.
	——	——	0.70mA	Measured at 277Vac/60Hz Input, Output Full load.
THD	——	——	20%	Measured at 120, 230, 277Vac Input, Output Power $\geq$60%
Power Factor (PF)	0.90	——	——	Measured at 120, 230, 277Vac Input, Output Power $\geq$60%

Output Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
DC Output Voltage	Per Table	——	Per Table	Per Table on Page 1
DC Output Current (POC)	-5%	Per Table	+5%	Programmable Output Current (POC) POC is set using Rset resistor Per table on Page 5 or GUI
Output Power	——	——	96W	Voltage Foldback
Ripple & Noise (Vpk-pk)	——	——	3% Vo	20 MHz BW, Full load output in parallel with 0.1 µF ceramic & 10 µF Electrolytic.
Ripple (Ipk-pk)	——	——	4% Io	20 MHz BW, Full load output in parallel with 0.1 µF ceramic & 10 µF Electrolytic. 120 Hz component (Flicker Free)
Start-up Time	——	500 mS	750 mS	Measured at Vout 80%, 277Vac/60Hz Input, Output Full load.
Hold-up Time	——	30 mS	——	Typical @ 277Vac Input, Output Full load.

Environmental Specifications

Parameter	Min.	Typ.	Max.	Notes/Conditions
Case Temperature (Tc)	-20 ^{O}C	——	+90 ^{O}C	Measured at location specified on case.
Operating Temperature (Ta)	-20 ^{O}C	——	+50 ^{O}C	This is a reference range. Tc controls temperature range.
Storage Temperature (Ts)	-40 ^{O}C	——	+85 ^{O}C	Non operating temperature range.
Operating Humidity	——	——	90% 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	——	350,000 Hours	——	MIL-HDBK-217F Notice 2, Ta = 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% Io	Constant Current Limiting circuit.
Output Over Voltage (OVP)	——	——	105% Vo	No Damage, Auto recovery after fault is removed.
Output Power Limit (OPL)	——	——	96W	Voltage Foldback

96 Watt - LP96W-XX-PCXXXX-RD
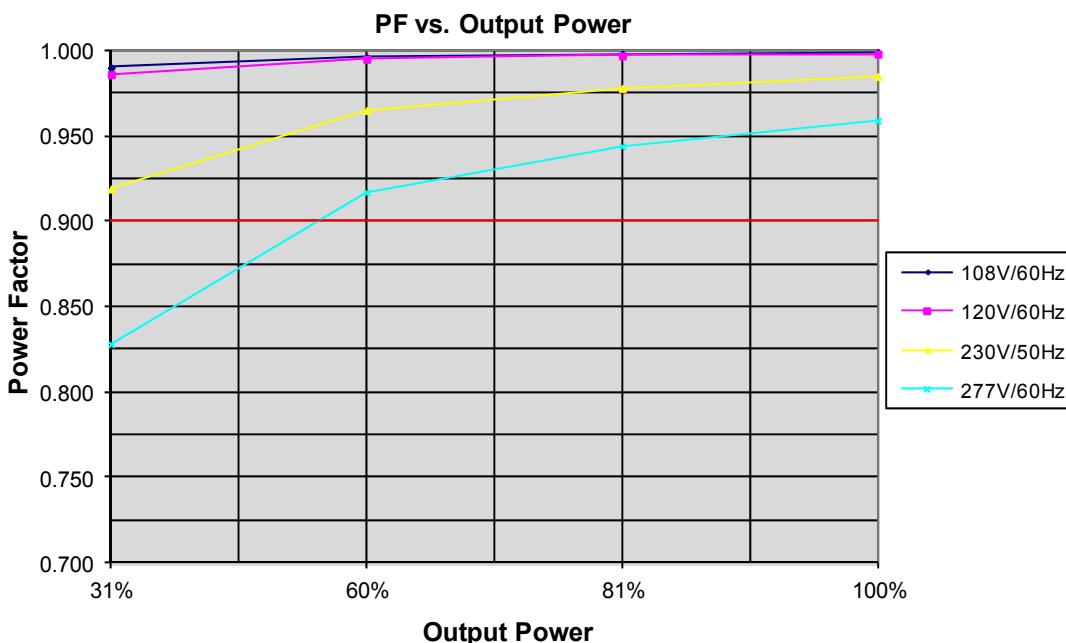FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

Safety Compliance

Safety	Notes/Standards
UL/CUL Listed UL Class P	UL8750 & CAN/CSA C22.2 No. 250.13, UL Class P
CE	EN61347-1, EN61347-2-13
Withstand Voltage	Input to Output: 3750 Vac
Isolation Resistance	Input to Output: >100 MΩ, 500VDC @ 25 ^{O}C, 70 % RH
0-10V Dimming Circuit	Dim+ Purple/Dim- Gray are considered part of the secondary circuit.
FG	The metal case of the driver must be connected to earth ground (FG) in the end-use application.
Sound Rating	Class A

EMC Compliance

Standard	Notes/Conditions
FCC, 47CFR Part 15	Class A
EN 55015	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
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, 2 kV L-N, 4 kV 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): Vout 38.5V @ Iout 2500mA

PF vs. Output Power
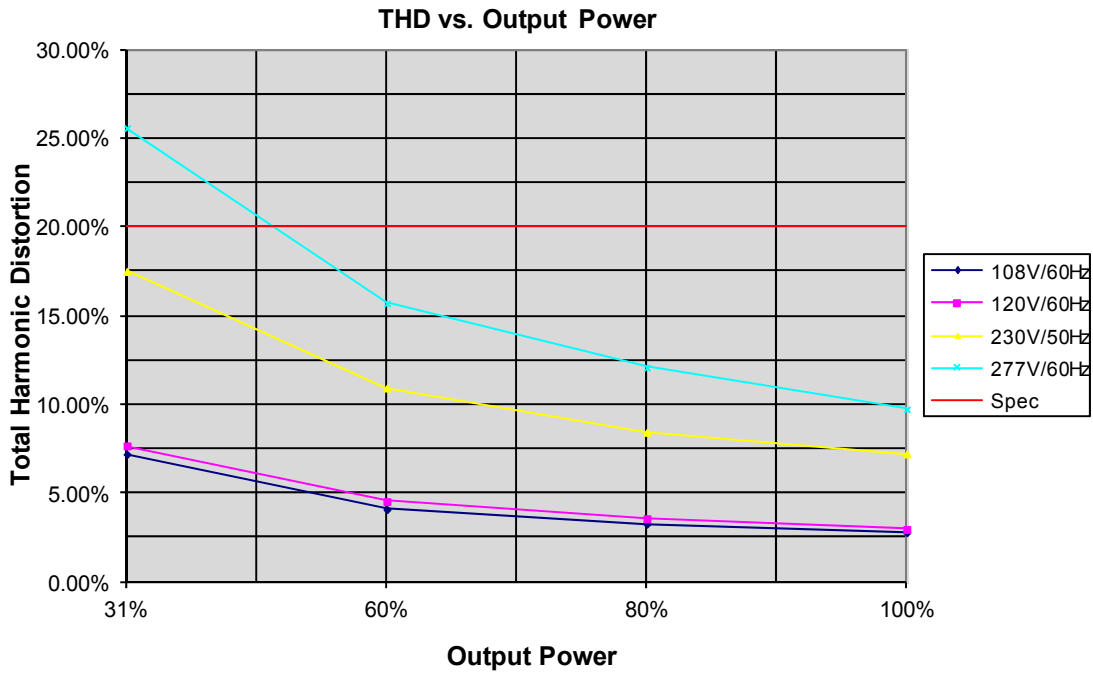
LED Optimized Drivers

THD Curves (Typical): Vout 38.5V @ Iout 2500mA

THD vs. Output Power

Legend: 108V/60Hz, 120V/60Hz, 230V/50Hz, 277V/60Hz, Spec

Efficiency Curves (Typical): Vout 38.5V @ Iout 2500mA

Efficiency vs. Output Power

Legend: 108V/60Hz, 120V/60Hz, 230V/50Hz, 277V/60Hz, Typ.

Specifications subject to change without notice

Custom designs available. Please consult with the factory.

LED Optimized Drivers

96 Watt - LP96W-XX-PCXXXX-RD
FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX
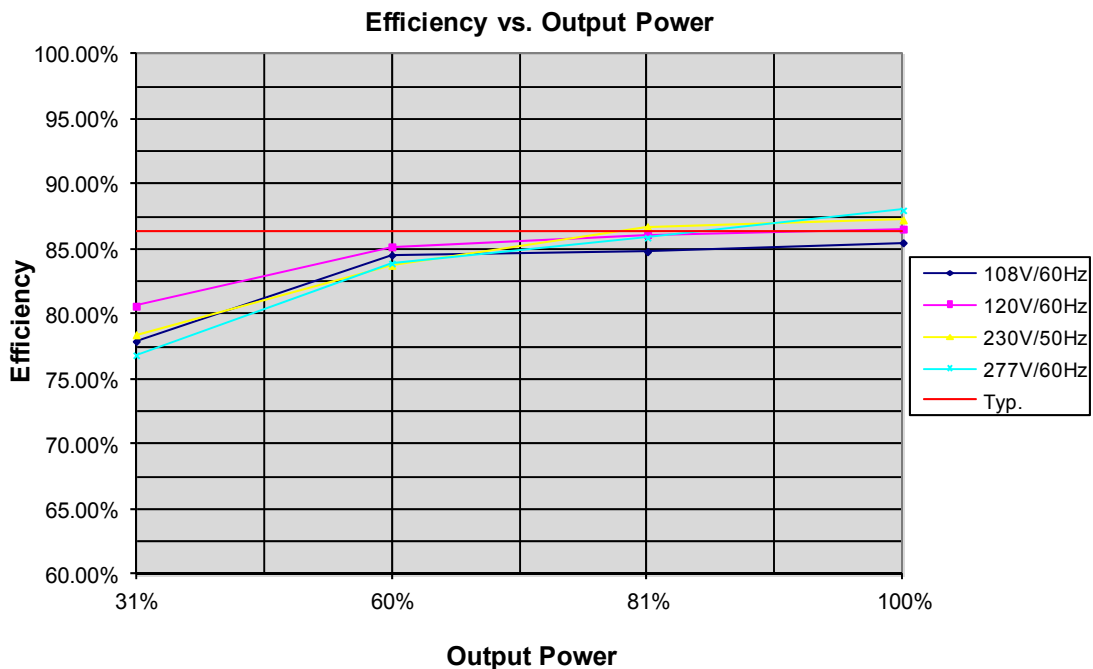
LP96W-55-PC2500-RD Power Operating Window

LP96W-55-PC2500-RD OPERATING WINDOW
Vout (Vdc) vs. Output Current (mA)
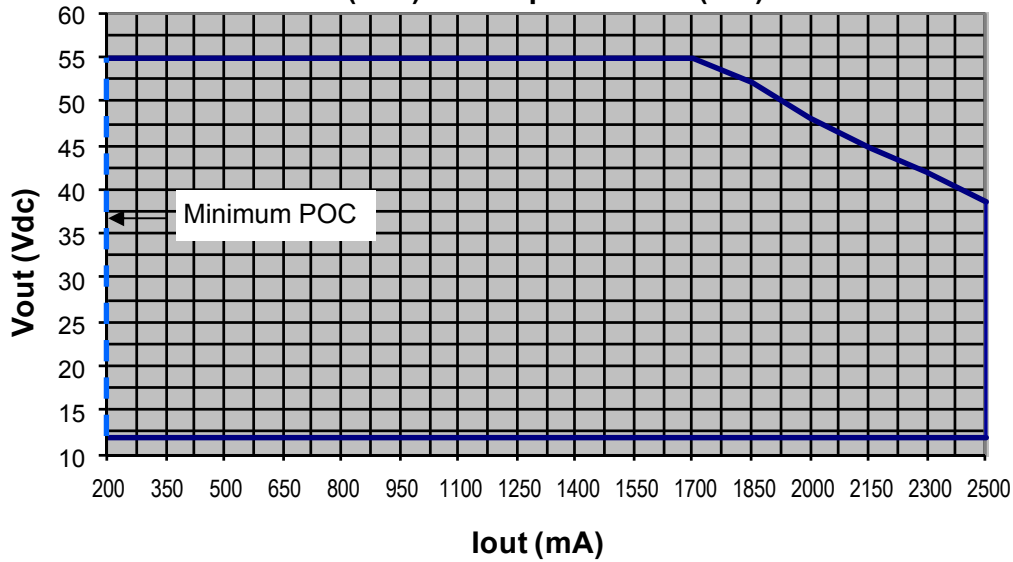
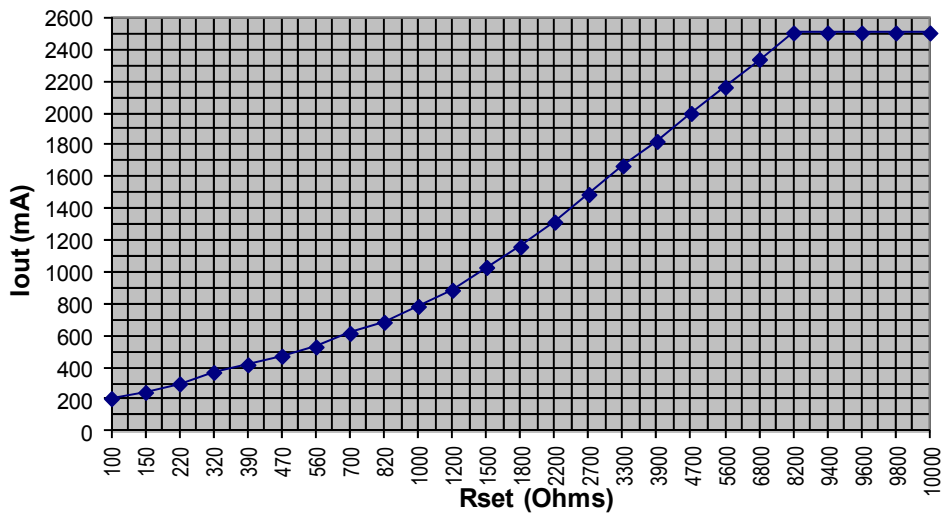### LP96W-55-PC2500-RD POC (Programmable Output Current)

Rset [1] (Ohms)	Iout (mA)
100	200
163	250
228	300
269	330
297	350
368	400
442	450
518	500
678	600
850	700
940	750
1130	850
1438	1000
1900	1200
2292	1350
2735	1500
3060	1600
3415	1700
4705	2000
5240	2100
5835	2200
6515	2300
7295	2400
8200	2500
9000 [1]	GUI SET [1]

POC Setting: If Rset is open, EP Programmer GUI can be used to set Iout.
Output Current vs. Rset or GUI value is within + 5%
Rset can be any >1/4W, + 1%, >20V rated resistor
[1] **Rset >8500 Ohms will default Iout to GUI setting.**

LP96W-55-PC2500-RD Output Current (mA) vs. Rset (Ohms)

Custom designs available. Please consult with the factory.   Specifications subject to change without notice

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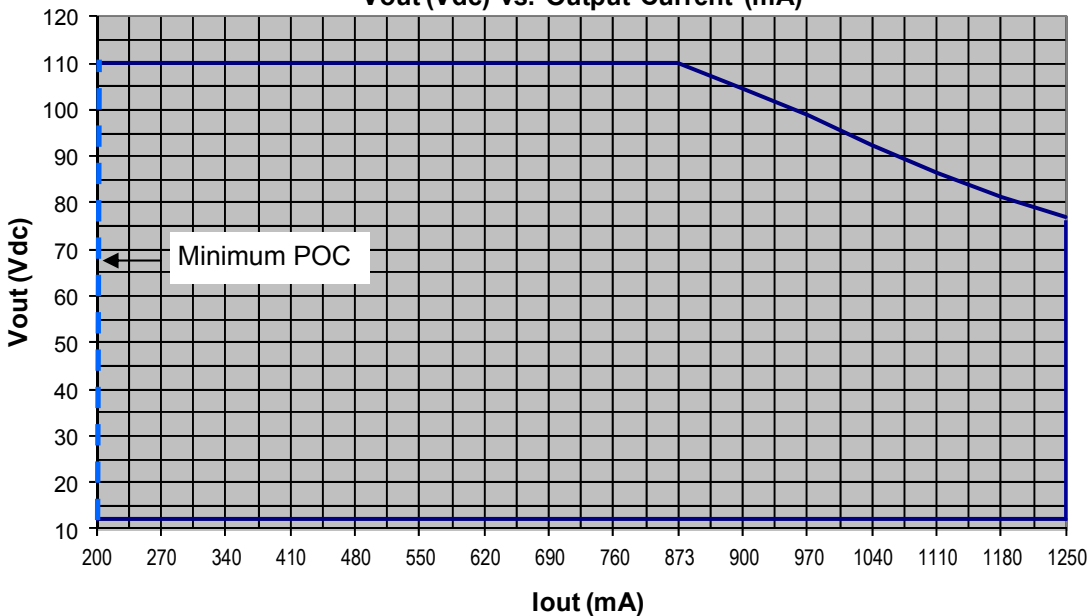
LED Optimized Drivers

96 Watt - LP96W-XX-PCXXXX-RD
FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

LP96W-110-PC1250-RD Power Operating Window

LP96W-110-PC1250-RD OPERATING WINDOW
Vout (Vdc) vs. Output Current (mA)

LP96W-110-PC1250-RD POC (Programmable Output Current)

Rset [1] (Ohms)	Iout (mA)
100	200
190	232
290	266
390	298
500	332
610	364
730	397
855	430
985	462
1125	496
1420	562
1575	594
1740	626
2100	692
2290	724
2500	758
2940	823
3190	856
3730	922
4340	987
5060	1053
5910	1118
6950	1185
8200	1250
9000 [1]	GUI SET [1]

POC Setting: If Rset is open, EP Programmer GUI can be used to set Iout.
Output Current vs. Rset or GUI value is within $\pm$ 5%
Rset can be any $\geq$1/4W, $\pm$ 1%, $\geq$20V rated resistor
[1] **Rset >8500 Ohms will default Iout to GUI setting.**

LP96W-110-PC1250-RD Output Current (mA) vs. Rset (Ohms)
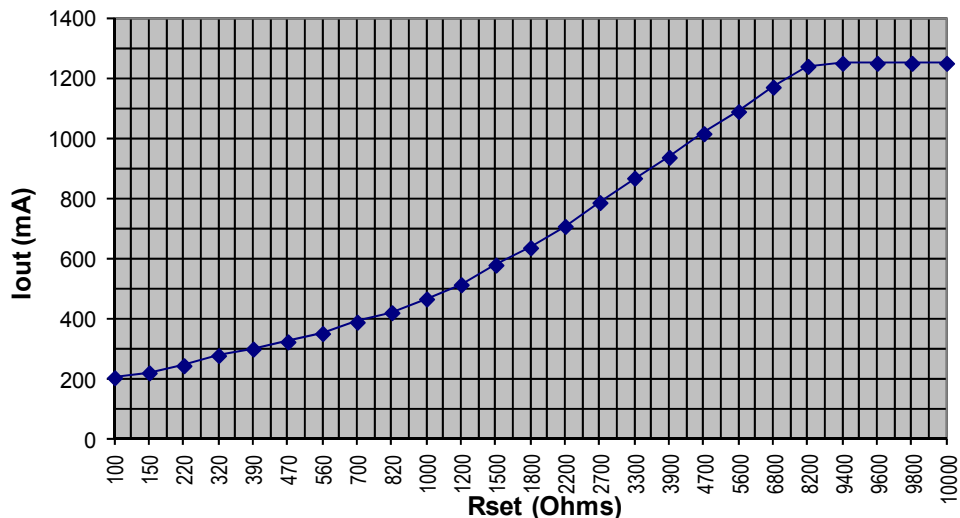
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96 Watt - LP96W-XX-PCXXXX-RD
FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

Module Temperature Protection using External NTC

Example: NTC High, NTC Low and NTC Minimum Iout% can be programmed using EP Programmer USB interface & EPtronics PC based GUI Software.
Factory Default Settings: NTC Low = 2.0K ~ 10% Iout, NTC High = 6.3K, 100% Iout
Programmable settings: NTC Minimum Level (%), NTC Minimum Ohms, NTC Maximum Ohms.
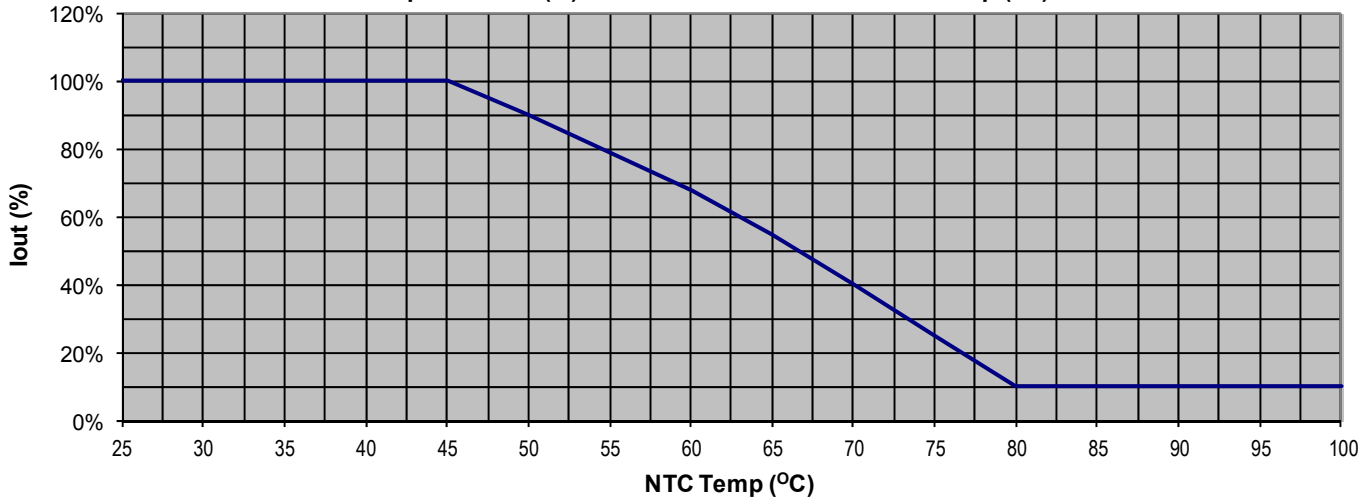

Output Current (%) vs. NTC (Ohms)
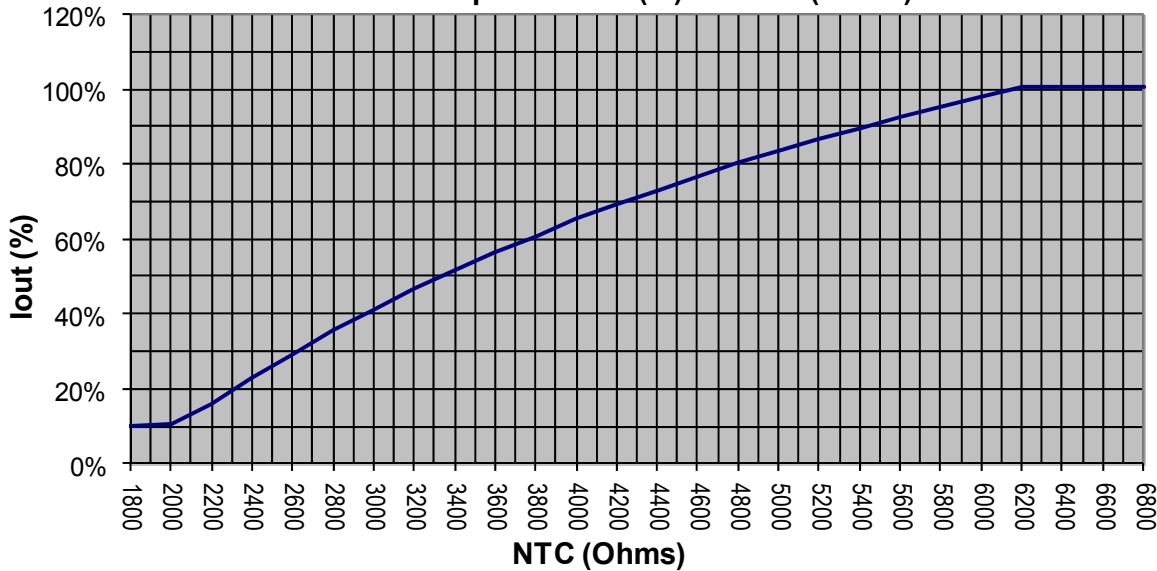
Module Temperature Protection Example

NTC = 805SMD, R_{25C} = 15K Ohm $\pm$ 2%, R_{64C} = 3700, Vishay Part#: NTCS0805E3153GMT
With part set: NTC Max = 6.3K, NTC MIN = 2.0K, Iout Min = 10%

Output Current (%) vs. NTCS0805E3153GMT NTC Temp (^{O}C)

Custom designs available. Please consult with the factory.   Specifications subject to change without notice

96 Watt - LP96W-XX-PCXXXX-RD
FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

EP Programmer PC Based Software , USB Interface

Programmable Output Current (POC): Programmable Iout Per table page 1
Programmable NTC settings: NTC Minimum Level (%), NTC Minimum Ohms, NTC Maximum Ohms.
Factory Default: NTC Minimum = 2.0K, ~ 10% Iout, NTC Maximum = 6.3K, 100% Iout
Programmable dimming curve: Linear or LOG
Factory Default: Linear Dimming Curve
Programmable Minimum Dim Level: 0% (OFF) to 100% Iout programmed value.
Factory Default: Min dim level 0%

EPtronics Programming Tool:
The EP Programmer is a programming and configuration tool for EPtronics intelligent programmable LED drivers. It consists of the EP programming Interface (EP-PRG-01) which is connected between the USB port of a computer and the LED driver being programmed, and the EP programmer software. The EP programmer software is a PC based graphical user interface that allows the user to program and configure the operating parameters of an EPtronics Programmable LED Driver. This interface allows the operator to set the LED drivers output current within its specified range, in the increments specified. It also provides the ability to enable/disable and control features like "Dimming", "Auxiliary Output", "NTC Thermal Protection", "Constant Lumen Module" & "End-of-life indicator" when available in the EPtronics intelligent LED driver being programmed.

EP Programming Interface: (EP-PRG-01)
Is the physical USB unit connected between the USB port of a computer and the LED driver being programmed. This unit also provides all power required to the LED driver being programmed. No connection to an AC power source is required for programming the LED driver.
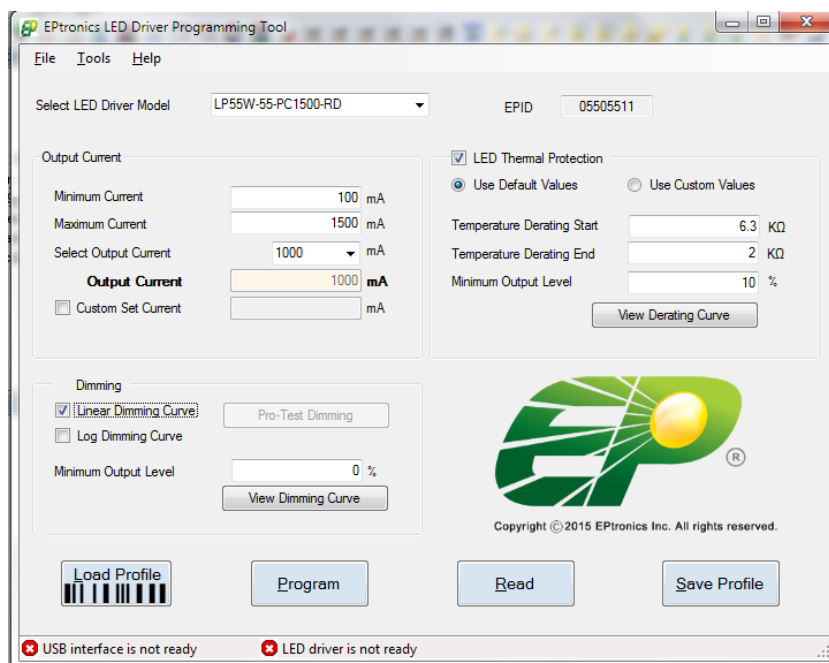
EP Programmer Software:
The EP Programmer software is the windows based GUI that allows the user to assign custom part number(s) to the LED driver being programmed. The user can then save the profile to a computer disk and recall as needed. The user can then use the "Auto Program" feature to quickly program as many LED drivers with the saved profile as is required. Each driver programming simply requires a click of the mouse to program in a single step.

The EP Programmer software supports bar code scanners. The barcode scanner can be used to automate the programming of the attached LED driver. This barcode scanner interface also provides an option to either enable or disable logging of the parameters to an excel file.

Note: *The programming of the LED driver does not require the input be connected to an AC power connection. The EP Programmer and the required LED driver circuitry will be powered from the EP Programmer module via the USB connection to a computer.*
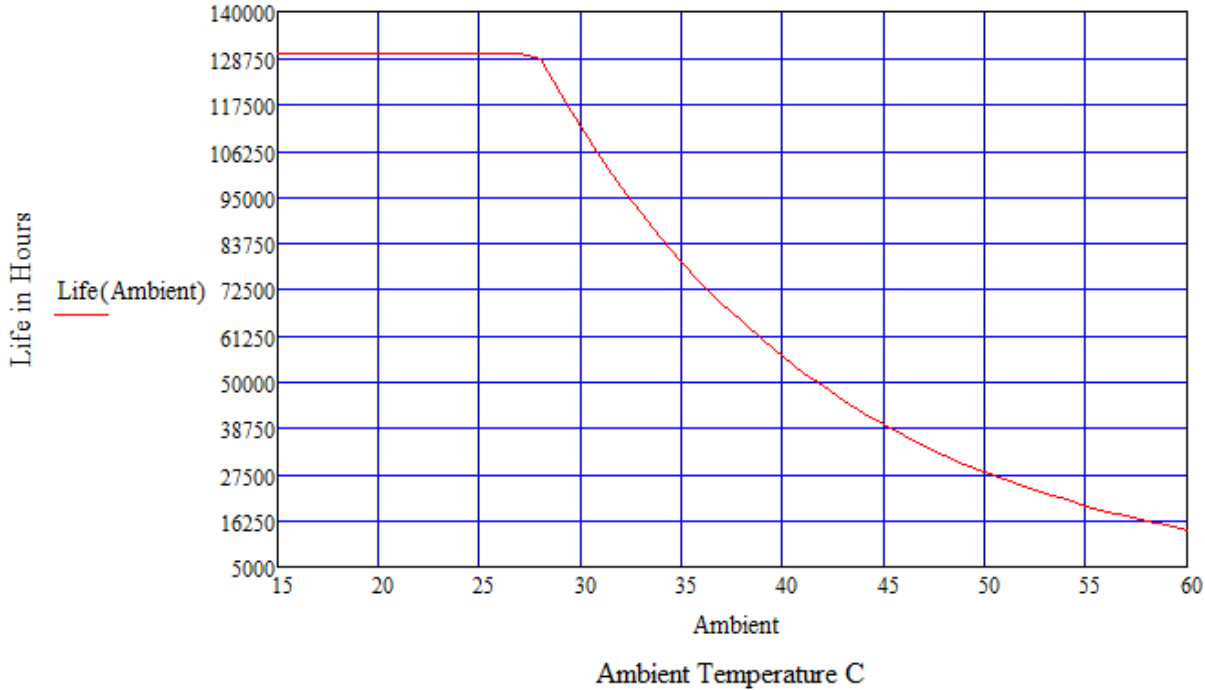***For new GUI settings to take effect the AC input must cycled off/on and the USB interface disconnected.***

Specifications subject to change without notice   Custom designs available. Please consult with the factory.

96 Watt - LP96W-XX-PCXXXX-RD
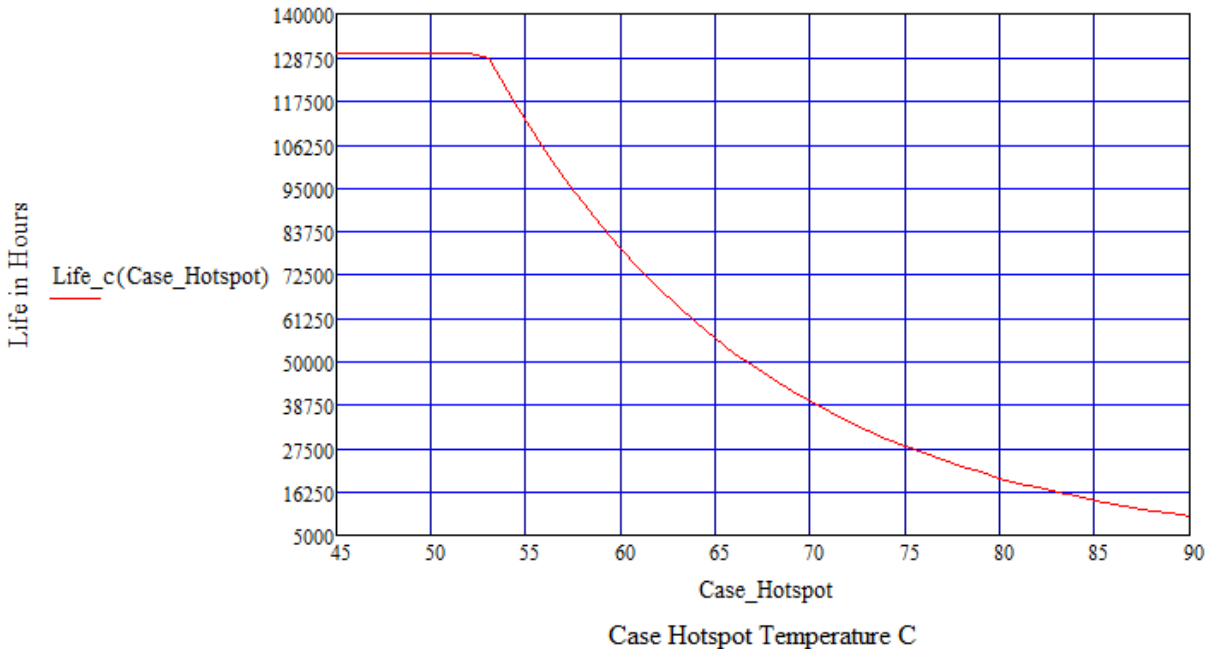FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

Life vs. Ambient Temperature

LP96W-XX-PCXXXX-RD Estimated Life Full Load @ 120Vac

Life vs. Case (Tc) Temperature

LP96W-XX-PCXXXX-RD Estimated Life Full Load @ 120Vac

Custom designs available. Please consult with the factory.

Specifications subject to change without notice

LED Optimized Drivers

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FLICKER FREE PROGRAMMABLE LED DRIVER WITH 0-10V DIMMING & 12V AUX

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