LDP40 SERIES AC-DC LED DRIVER

Application Note V14 MAR 2015

LDP40 SERIES
LED Power Supply Application Note

Approved By:

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Content

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1. Introduction

This application note describes the features and functions of Cincon's LDP40 series of LED Driver driver, Isolated AC-DC power supply. These are highly efficient, reliable and compact power supply with high power density, The drivers are fully protected against short circuit and over-voltage conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program; ensure that all LDP40 series converters are extremely reliable.

2. LDP40 Series LED Driver Features

- Universal Input : 90 ~ 305Vac
- High Active PFC, > 0.9
- Low Inrush Current < 5A
- Fully Isolated Plastic Case
- Dimming Function with DALI/PWM/1-10Vdc/potentiometer (Optional)
- Short Circuit / Over Voltage / Over Current / Over Temperature Protection
- Active PFC Meets EN6100-3-2
- Conductive EMI Meets FCC PART 15/EN55015 Class B
- IP67 design for indoor installations

3. General Description

The LDP40 series topology is based on an isolated one stage flyback converter. The control loop is optimized for unconditional stability, a very tight line and load regulation.

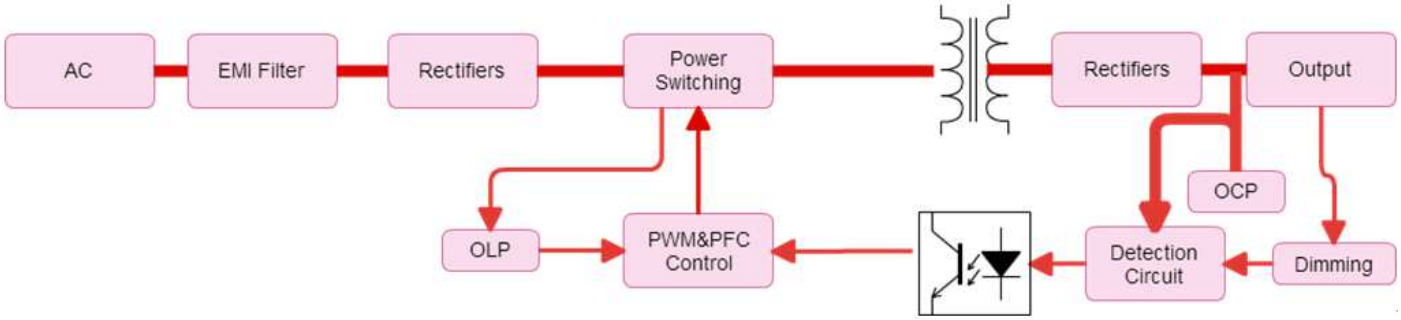


Figure 1. Electrical Block Diagram

4. Technical Specifications

(All specifications are typical at nominal input, full load at 25℃ unless otherwise noted.)

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
ABSOLUTE MAXIMUM RATINGS						
Input Voltage			90		305	Vac
			127		420	Vdc
Operating Temperature	see derating curve		-40		+70	℃
Storage Temperature			-40		+85	℃
INPUT CHARACTERISTICS						
Operating Voltage Range			100		277	Vac
Input Frequency Range			50		60	Hz
Maximum Input Current	100% output current, @115Vac			0.45		A
	100% output current, @230Vac			0.22		
Power factor correction	115Vac/230Vac at 75%~100%Load		0.9			
Leakage Current	Maximum Input voltage is 277Vac				0.75	mA
Inrush Current	@Vin=240Vac, cold start at 25^{0}C after 100uS.				5	A
OUTPUT CHARACTERISTIC						
Output Voltage	Vin=Nominal Vin, No Load Tc=25^{0}C	LDP40X240 LDP40X360 LDP40X480			29 43 56	Vdc
Output Current		LDP40X240 LDP40X360 LDP40X480		1700 1110 840		mA
Output Constant Current Accuracy			-5		+5	%
Load Regulation	measured minimum to maximum of the constant Current region		-5		+5	%
		LDP40X240-XXXXB LDP40X240-XXXXBR	16 9		24 24	V
		LDP40X360-XXXXB LDP40X360-XXXXBR	24 9		36 36	V
		LDP40X480-XXXXB LDP40X480-XXXXBR	32 9		48 48	V
Line Regulation	measured from High Line to Low Line with full load		-5		+5	%
Output Voltage Ripple and Noise Peak-to-Peak	20MHz bandwidth , Full load, 0.1uF ceramic and 10uF aluminum capacitor with 100% output current	LDP40X240-XXXXXR LDP40X360-XXXXXR LDP40X480-XXXXXR			240 360 480	mV
Start-Up Time	Vin=90Vac				0.5	s
Standby power Consumption	@DALI OFF or D+- OFF				0.5	W
No load Consumption					1	
EFFICIENCY						
100% Load		LDP40X240-C140B LDP40X240-C170B LDP40X360-C105B LDP40X360-C111B LDP40X480-C070B LDP40X480-C084B LDP40X240-C140BR LDP40X240-C170BR LDP40X360-C105BR LDP40X360-C111BR LDP40X480-C070BR LDP40X480-C084BR LDP40X240-P140BR LDP40X240-P170BR LDP40X360-P105BR		88 89 88 89 88 90 85 86 85 86 86 88 85 86 85		%

		LDP40X360-P111BR LDP40X480-P070BR LDP40X480-P084BR LDP40X240-D140BR LDP40X240-D170BR LDP40X360-D105BR LDP40X360-D111BR LDP40X480-D070BR LDP40X480-D084BR		86 86 88 85 86 85 86 86 88		
ISOLATION CHARACTERISTICS						
Input to Output	1 minute				3750	Vac
Isolation Resistance			100			MΩ
Surge	EN6100-4-2 Criteria Line to line				±1	KV
FEATURE CHARACTERISTICS						
Switching Frequency				60		KHz
Harmonic	EN61000-3-2 Class C					
GENERAL SPECIFICATIONS						
Life time	Ambient temperature is 25℃		80			k hours
MTBF	Ambient temperature is 25℃ per MIL-HDBK-217F			200		k hours
Weight				350		g
Dimension	168.00x40.00x25.20mm ((W*L*H)					

5. Main Features and Functions

5.1 Operating Temperature Range

The LDP40 series led driver highly efficient converter design has resulted in its ability to operate ambient temperature environment (-40 ~ 70℃, see derating curve). Due consideration must be given to the de-rating curves when ascertaining maximum power that can be drawn from the converter. The maximum power drawn is influenced by a number of factors, such as:

- Input voltage range.
- Permissible Output load (per derating curve)

5.2 Over Temperature Protection

The LDP40 has an over temperature protection circuit to safeguard against thermal damage. When the JP3 temperature rises above 105℃ (typ.), the LDP40 will shut down to protect it from overheating.

5.3 Short Protection

All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed. In the event of an over current converter will go into a hiccup mode protection.

5.4 Over Voltage Protection

All different voltage models have over voltage protection. In the event of an over voltage converter will be clamped by a TVS component.

5.5 Dimming Function

Please refer to section 9.

6. Safety

- **CB Approval (IEC61347-1,EN61347-2-13)**
- **TUV Approval (EN61347-1,EN61347-2-13)**
- **UL Approval (UL8750)**

7. Applications

7.1 Power De-Rating Curves

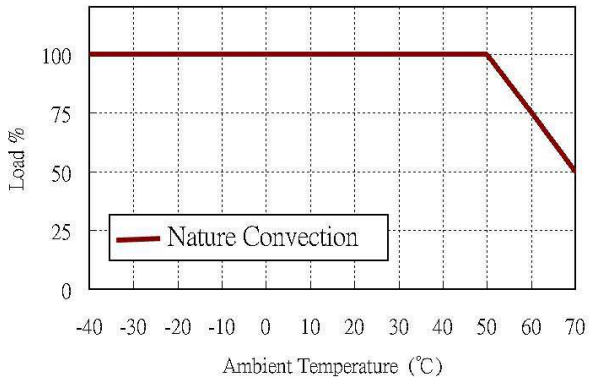
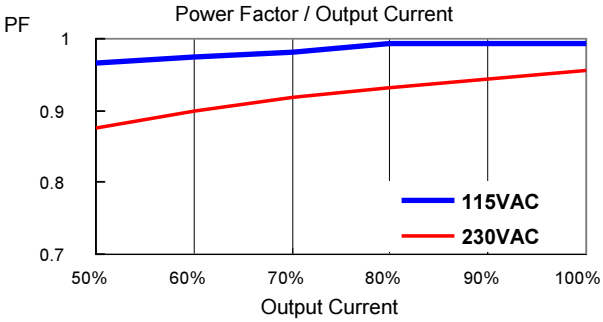
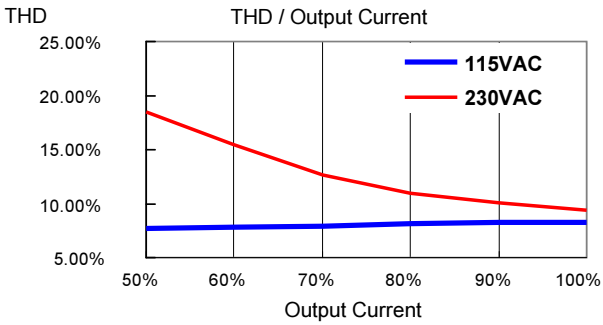


Figure 2. Typical Output power of LDP40

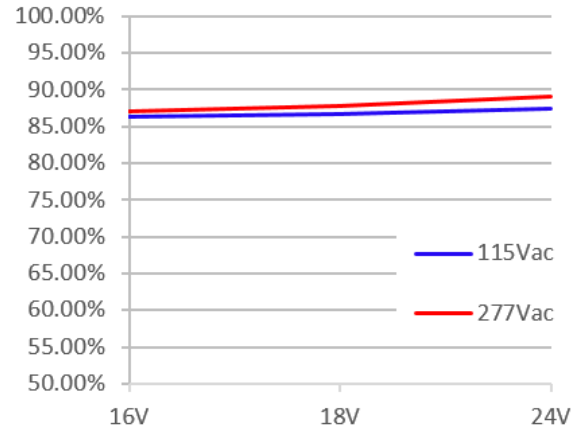
7.2 Power Factor & THD Vs. Output Voltage





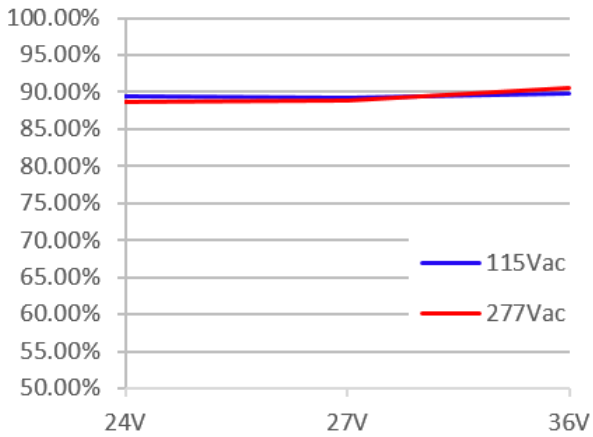
7.3 Efficiency

LDP40S240-CB



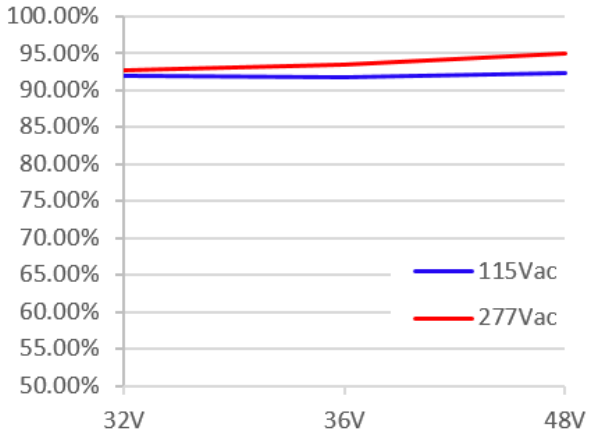
Efficiency V.S Output Voltage

LDP40S360-CB



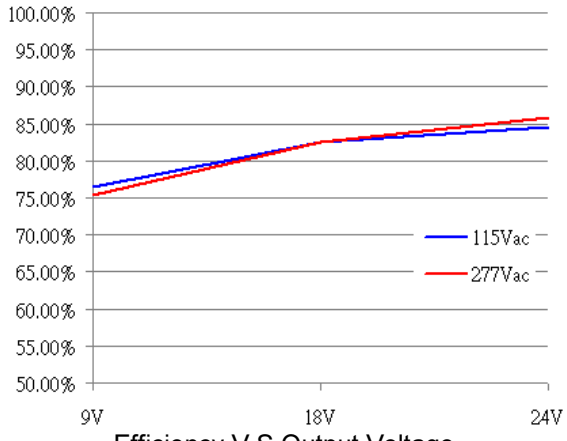
Efficiency V.S Output Voltage

LDP40S480-CB



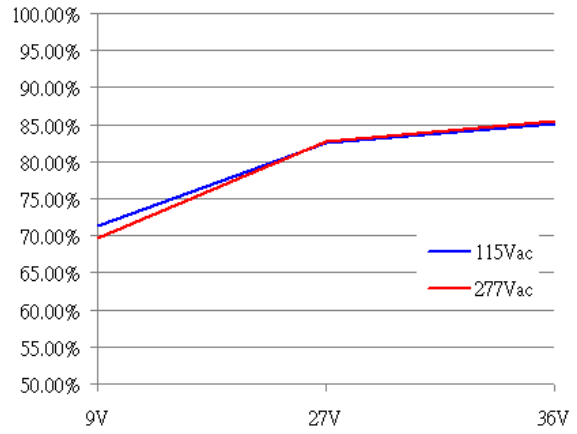
Efficiency V.S Output Voltage

LDP40S240-PBR



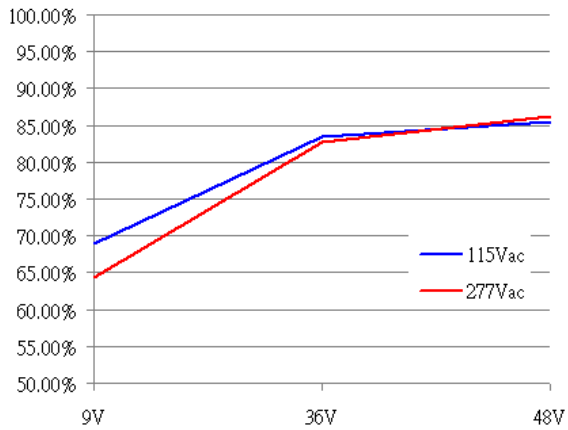
Efficiency V.S Output Voltage

LDP40S360-PBR



Efficiency V.S Output Voltage

LDP40S480-PBR



Efficiency V.S Output Voltage

7.4 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 3. When testing the Cincon's LDP series under any transient conditions please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate the

- Efficiency
- Load regulation and line regulation

The value of efficiency is defined as:

$$\eta = \frac{Vo \times Io}{Pin} \times 100\%$$

Where: Vo is output voltage,
Io is output current,
Pin is input power,

The value of load regulation is defined as:

$$Load.reg = \frac{I_{\max} - I_{\min}}{I_{\min}} \times 100\%$$

Where: I_{max} is the output current at maximum rated output voltage
I_{min} is the output current at minimum rated output voltage

The value of line regulation is defined as:

$$Line.reg = \frac{I_{HL} - I_{LL}}{I_{LL}} \times 100\%$$

Where: I_{HL} is the output current of maximum input voltage at full load.
I_{LL} is the output current of minimum input voltage at full load.

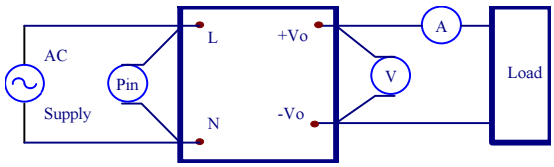


Figure 3. LDP Series Test Setup

7.5 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 4.
Measured method :
Add a 0.1 uF ceramic capacitor and a 10uF aluminum capacitor to output at 20 MHz Band Width for LDP Series

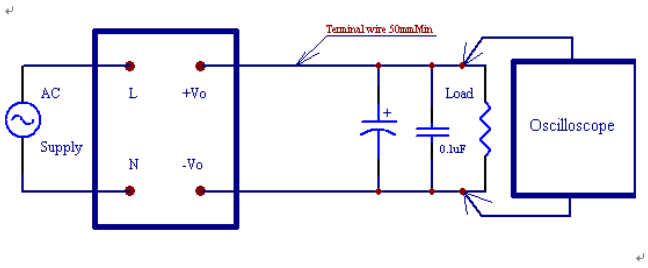


Figure 4. Output Voltage Ripple and Noise Measurement Set-Up

7.6 EMI

- **Conductive EMI meets**
- **FCC PART 15**
- **EN55015 Class B**

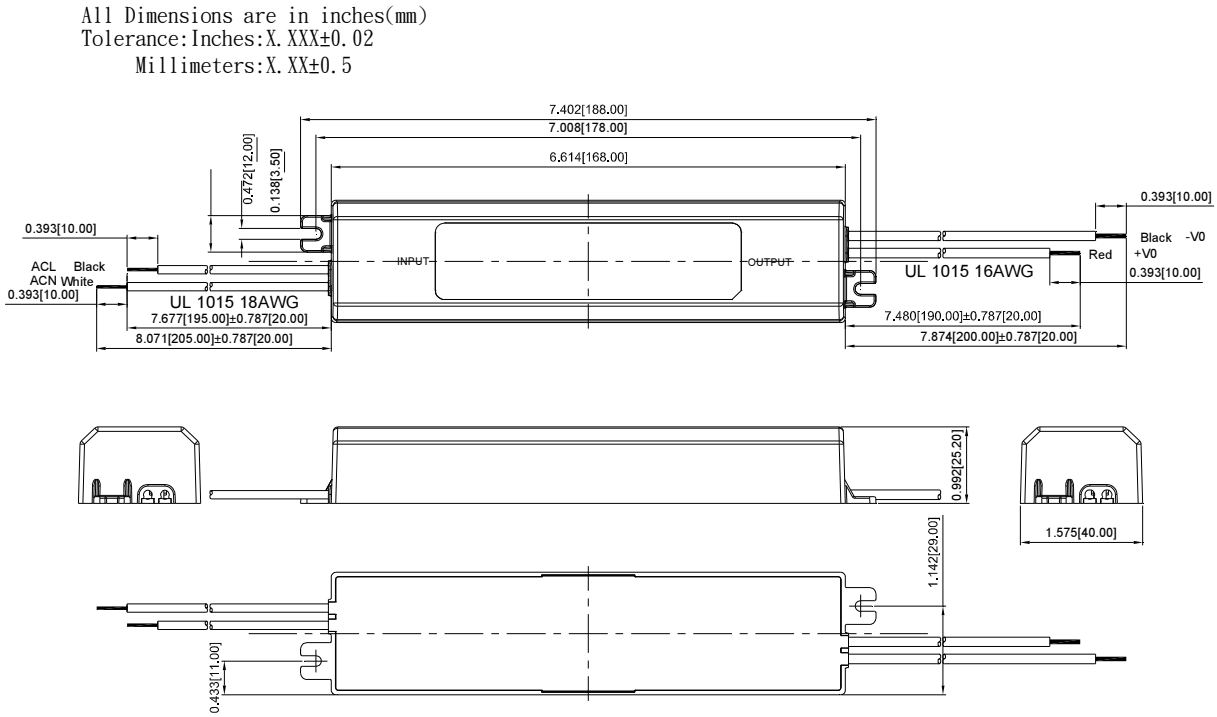
8. Mechanical Outline Diagrams

8.1 LDP40 Mechanical Outline Diagrams

Dimensions are in inches (mm)
Tolerance :Inches:X.XXX±0.02 Millimeters:X.XX±0.5, unless otherwise noted

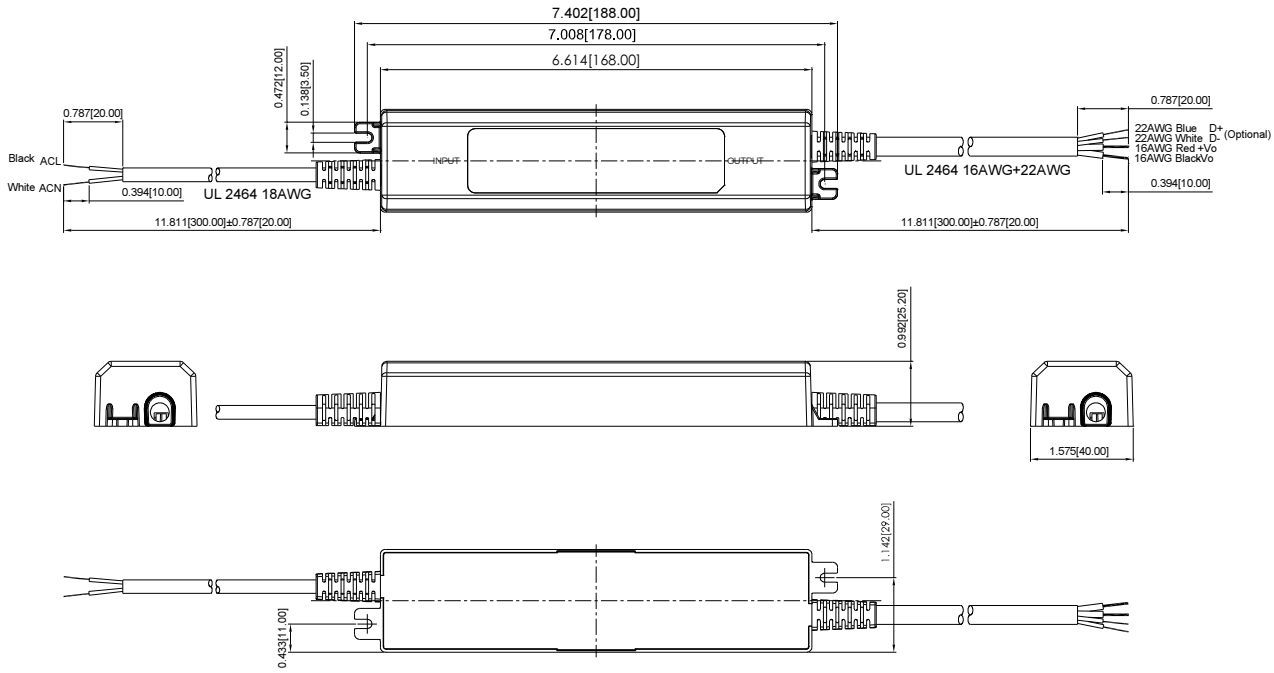
Annotations： LDP40 Series height does not exceed 25.5mm MAX .

Standard Cable for LDP40Sxxx-CxxxBx



Standard Cable for LDP40Sxxx-PxxxBR, LDP40Sxxx-DxxxBR, LDP40Axxx-xxxxBR

All Dimensions are in inches(mm)
Tolerance:Inches:X.XXX±0.02
Millimeters:X.XX±0.5



8.2 LDP40 Wire Color Description

DC OUTPUT WIRE COLOR			
COLOR	***NO DIMMING***	***PWM DIMMING***	***DALI DIMMING***
BLUE	*(N.A.)*	*D+*	*DA*
WHITE	*(N.A.)*	*D-*	*DA*
RED	*+VO*	*+VO*	*+VO*
BLACK	*-VO*	*-VO*	*-VO*

9. Installation Instruction

9.1 The maximum number of circuit breakers

LDP40 Series calculated values are based on MCB S200 Series manufactures by ABB

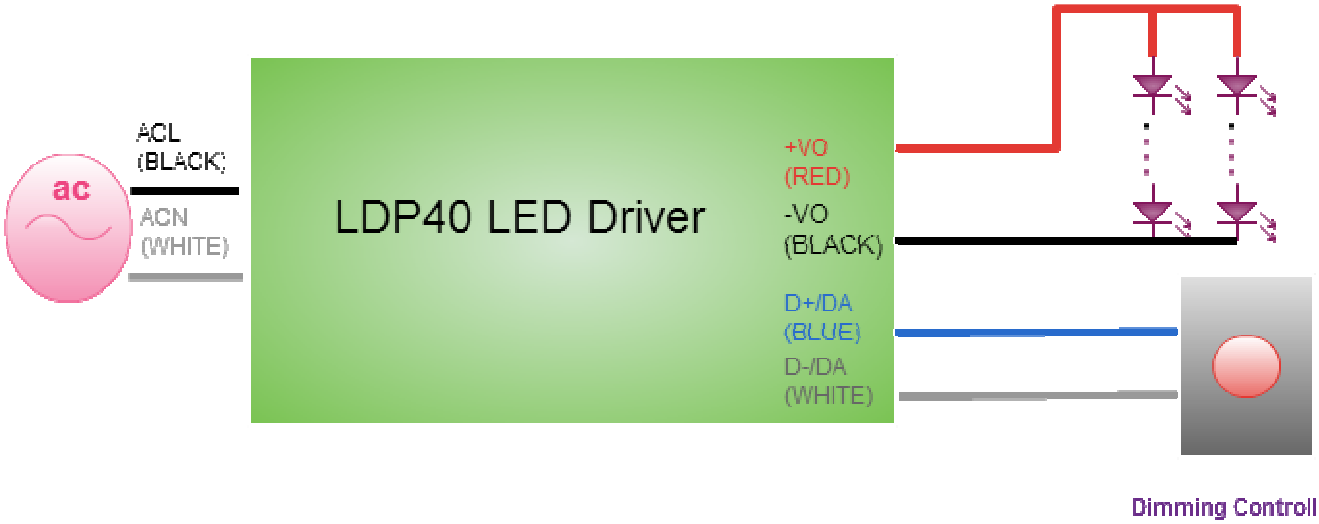
Application Area	Series	Max units connected to 10A Breaker used	Max units connected to 16A Breaker used
230Vac area	LDP40	31	51
115Vac area	LDP40	15	25

The maximum number of

$$230\text{VAC}\ \frac{\text{breaker rated current}}{\text{AC input current labeled (@90Vac)}}\ \text{*230Vac/90Vac*75\%(Safe margin ,TBD))}$$

$$115\text{VAC}\ \frac{\text{breaker rated current}}{\text{AC input current labeled (@90Vac)}}\ \text{*115Vac/90Vac*75\%(Safe margin ,TBD))}$$

9.2 Dimming Function (optional); needs the from dimming controller with DALI /PWM Or 1-10Vdc/Potentiometer



1. Potentiometer Dimming

Potentiometer	1K	2K	3K	4K	5K	6K	7K	8K	9K	10K(OPEN)
Output Current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

2. 1-10V Dimming

Voltage	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V(OPEN)
Output Current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

3. PWM Dimming @1kHz,10V

Duty Cycle	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%(Open)
Output Current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

4. DALI Dimming

Please set the DALI controller in “broadcast mode” when linking the LDP40 Series product, as the LDP40 product will not be addressed in the production.

10. Order Information

Series	Output(W)	IP Code	Output Voltage	Dimming Function	Rated Output Current		Input Voltage	Ripple Nosie
LDP	40	X	XXX	X	XXX		B	X
		S：Single O/P with IP64	240：24V	C：No dimming D：DALI dimming P：PWM /1-10V, Potentiometer	24V	170: 1700mA 140: 1400mA	B：100-277 Vac	R：1% output ripple and noise or Blank：10% output ripple and noise
			360：36V		36V	111: 1110mA 105: 1050mA		
			480：48V		48V	084: 840mA 070: 700mA		
		A：Single O/P with IP67	240：24V		24V	170: 1700mA 140: 1400mA		
			360：36V		36V	111: 1110mA 105: 1050mA		
			480：48V		48V	084: 840mA 070: 700mA		

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