LDA100S SERIES AC-DC LED DRIVER

Application Note V10 June 2016

LDA100S SERIES
LED Power Supply APPLICATION NOTE



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1. Introduction

This application note describes the features and functions of Cincon's LDA100S series , Isolated AC-DC led driver. These are highly efficient, reliable and compact, high power density, single output AC/DC led driver. Ultra-high efficiency operation is achieved through the use of synchronous rectification and drive control techniques. The modules 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 LDA100S series led drivers are extremely reliable.

2. LDA100 Series LED Driver Features

- Active PFC
- Conductive EMI Meets EN55015, CISPR22
- High Efficiency at 90% Typical
- Dimming Input Range 1~100%, <10% The Output Will Shut Down
- Dimming Function 1~10V/10K~100K Resistance / DALI (Optional)
- DALI Meets IEC62386-102, IEC62386-207 Standard
- Short Circuit/Over Voltage/Over Current
  Over Temperature Protection
- IP67 design for indoor or outdoor installations
- Universal Input: 90 ~ 305Vac

3. General Description

A block diagram of the LDA100S series led driver is shown in Figure 1. Extremely high efficiency power conversion is achieved through the use of synchronous rectification and drive techniques. Essentially, the powerful LDA100S series topology is based on an isolated synchronous flyback converter. The control loop is optimized for unconditional stability, fast transient response and a very tight line and load regulation.

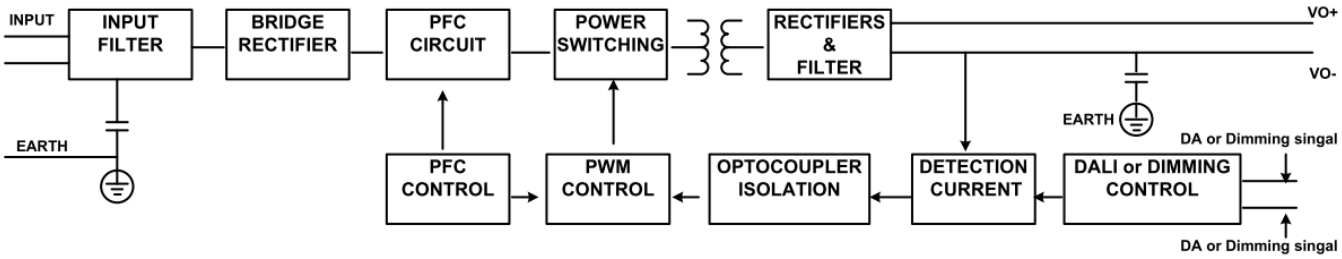


Figure 1. Electrical Block Diagram

4. Technical Specifications

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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input Voltage		All	90		305	Vac
Operating Temperature	see derating curve	All	-40		+70	℃
Storage Temperature		All	-40		+85	℃
Input/Output Isolation Voltage	1 minute	All	3750			Vac

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Operating Voltage Range		All	100		277	Vac
Input Frequency Range		All	50		60	Hz
Input Current	Input voltage is 110Vac, Pout=99W	All		1.1		A
	Input voltage is 230Vac, Pout=99W	All		0.55		
Power factor correction	see Section 7.2 Power Factor & THD V.S Output current	All	0.9			
Leakage Current	Maximum Input Voltage is 277Vac	All			0.75	mA
Inrush Current	Input voltage is 110Vac and 240Vac, cold start at 25℃	All			100	A

OUTPUT CHARACTERISTIC

PARAMETER	NOTES and CONDITIONS		Device	Min.	Typical	Max.	Units
Output Voltage	Input Voltage is 115Vac and 230Vac, 90% output current at ambient temperature 25℃	142V=0.7A	LDA100S142	140.8	142	143.42	Vdc
		214V=0.5A	LDA100S214	211.86	214	216.14	
		214V=0.35A	LDA100S214A	211.86	214	216.14	
Constant Current Region	Output Voltage		LDA100S142	71		140	Vdc
			LDA100S214	107		211	
			LDA100S214A	107		211	
Output Current	Constant current	CV Load=71-140V	LDA100S142		0.7		A
		CV Load=107-211V	LDA100S214		0.5		
		CV Load=107-211V	LDA100S214A		0.35		
Temperature Coefficient			All			±0.05	%/℃
Output Constant Current Accuracy			All			±5	%
Load Regulation	Input Voltage is 115Vac and 230Vac, 10% output current to 90% output current		All			±2.0	%
Line Regulation	Input Voltage is 90~305Vac with 90% output current		All			±1.0	%
No Load Consumption	Input Voltage is 230Vac		All			1.5	W
Standby power	Input Voltage is 230Vac		All			0.5	W
Start up Time	Input Voltage is 90~305Vac		All			0.5	s
Rise Time	Input Voltage is 90~305Vac		All		50		ms
Hold Time	Input Voltage is 115Vac		All		12		ms

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Ripple and Noise Peak-to-Peak	20MHz bandwidth, full load, 0.1uF ceramic and 10uF E.L capacitor with 95% output current	LDA100S142			710	mV
		LDA100S214			1070	
		LDA100S214A			1070	

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
95% Output Current		LDA100S142		90		%
		LDA100S214		90		
		LDA100S214A		87		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			3750	Vac
Input to Earth	1 minute	All			1870	Vac
Output to Earth	1 minute	All			500	Vac
Isolation Resistance		All	100			MΩ

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency	100% Output Current	All		65		KHz
Surge	EN61000-4-5Criteria A	All			±4	KV
Harmonic	EN61000-3-2 Class C(≧60% output current)	All				
Life Time	Ambient temperature is 50℃/75% load	All		60		K hours
MTBF	Ambient temperature is 25℃ per MIL-HDBK-217F	All		180		K hours
Weight		All		750		grams

5. Main Features and Functions

5.1 Operating Temperature Range

The LDA100S series led driver highly efficient converter design has resulted in its ability to operate ambient temperature environment (-40 ℃ to 70 ℃). 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 current Protection & over voltage protection

The power modules provide 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 will operate normally once the fault condition is removed. The output voltage will decrease when the output current is above its constant current point. When the output current is continue increase the power module will go to hiccup mode if the output voltage is lower than 50% of rated output voltage.

All different voltage models have a full continuous over voltage protection. The power module will supply up to 115%~135% of rated voltage. In the event of an over voltage converter will go to hiccup mode. The module will automatically restart after he fault condition is removed.

5.3 Over Temperature Protection

The LDA100S has an over temperature protection circuit to safeguard against thermal damage. When the TH2 temperature rises above 110℃, the LDA100S will shut down (latch) to protect it from overheating.

5.4 CC and CV Mode

The latest design from LDA100S takes the two mode of operation and combines them onto one design. Figure2 you can see how the unit will initially behave as a constant voltage unit. Once the max output current is reached, the control loop will then hold the supply current at a constant value and reduce the output voltage accordingly. This type of approach has many benefits to the end designer in that if chosen correctly both CC and CV mode designs can be achievable with one supply

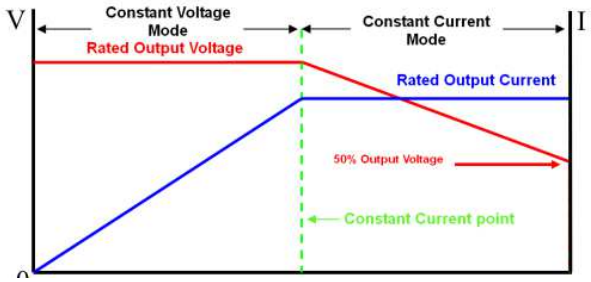


Figure 2 CC/CV mode

5.5 Dimming Interface

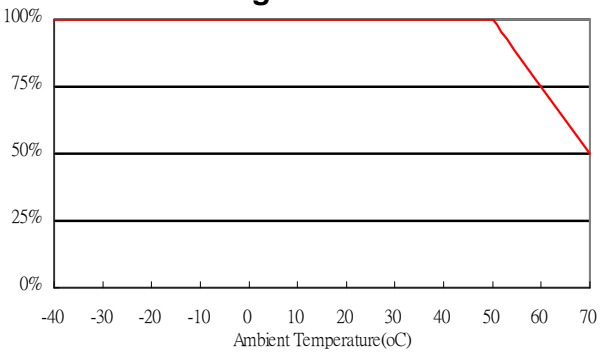
Dimming controller is capable of driving 03 version, require 0.15mA each unit.

6. Safety

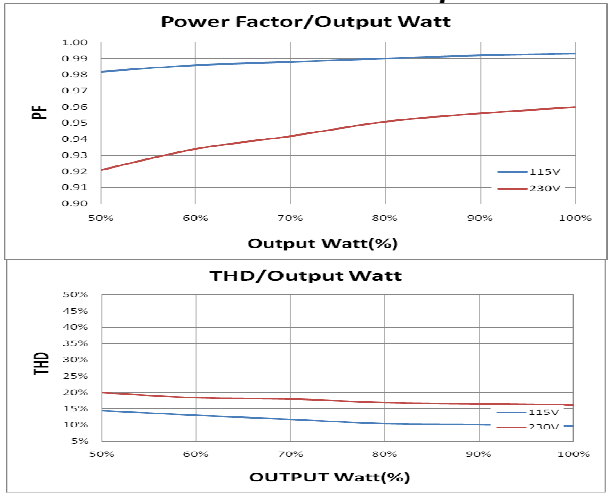
- CB Approval
  (IEC/EN61347-1, IEC/EN61347-2-13, EN62384)
- UL Approval (UL8750)

7. Applications

7.1 Power De-Rating Curves

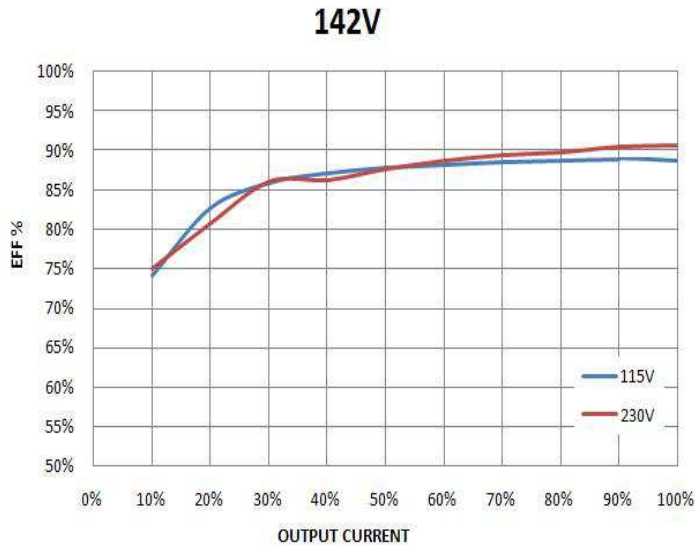


7.2 Power Factor & THD vs. Output Current

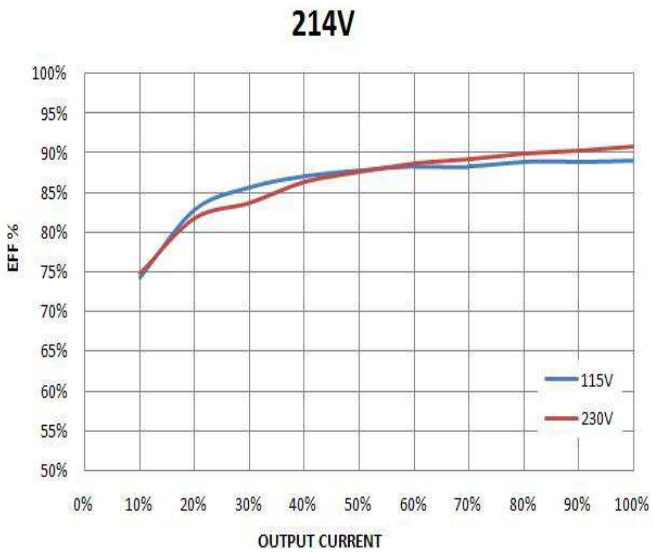


7.3 Efficiency vs. Output Current Curves

LDA100S142



LDA100S214



LDA100S214A



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 LDA100S 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 (Pin=Vin x Iin x PF)

The value of load regulation is defined as:

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

Where: V_{FL} is the output voltage at 90% output current

V_{NL} is the output voltage at 10% output current

The value of line regulation is defined as:

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

Where: V_{HL} is the output voltage of maximum input voltage at 90% output current.

V_{LL} is the output voltage of minimum input voltage at 90% output current.

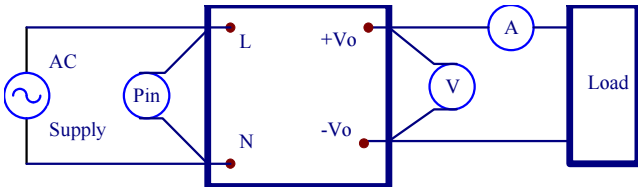


Figure 3. LDA100S Series Test Setup

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 10 uF electrolytic capacitor to output at 20 MHz Band Width

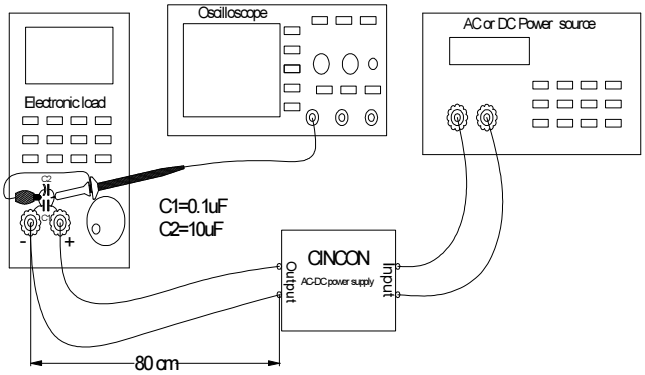


Figure 4. Output Voltage Ripple and Noise Measurement Set-Up

7.6 EMI

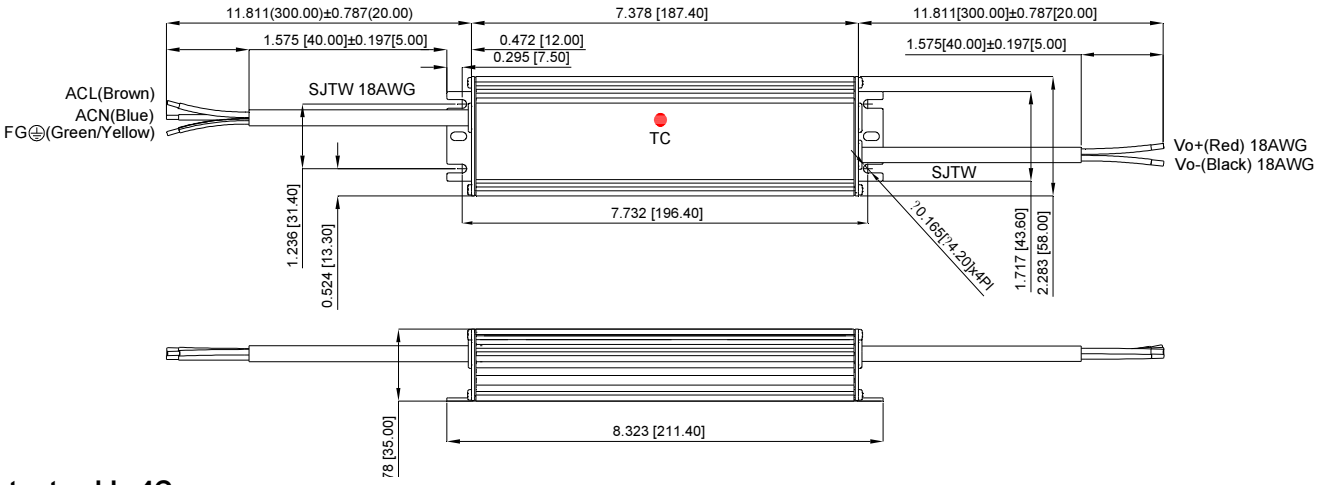
- EN55015 CISPR22

8. Mechanical Outline Diagrams

8.1 LDA100S Mechanical Outline Diagrams

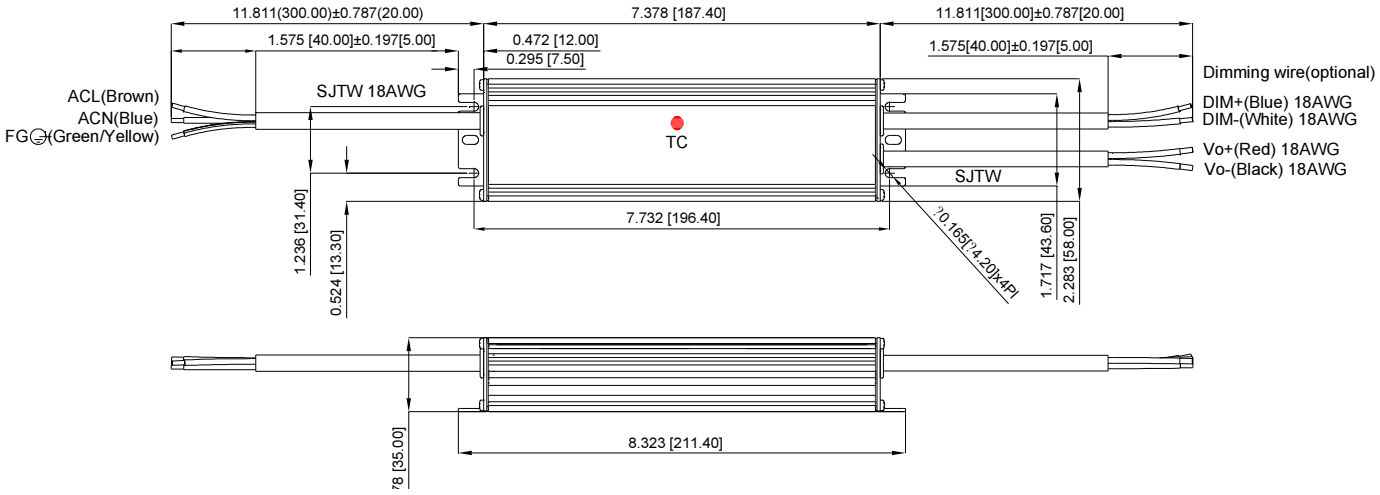
Output cable 2C:

All Dimensions In Inches[mm]
Tolerance Inches:x.xxx = ± 0.02
Millimeters:x.xx = ± 0.5



Output cable 4C:

All Dimensions In Inches[mm]
Tolerance Inches:x.xxx = ± 0.02
Millimeters:x.xx = ± 0.5



＊TC :Max. Case Temperature

9. Installation Instruction

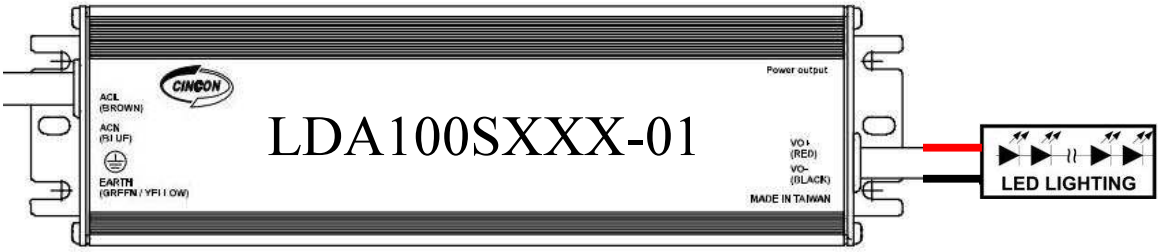
9.1 The maximum number of the DA100S hat can be connected to a circuit breaker at 240V is shown as below

LDA100S series calculated values are based on MCB S200 series manufactured by ABB.

Breaker Type	B10	B16	C10	C16
Amount	2	4	4	7

9.2 Direct Driving Link Diagrams

Output voltage of power supply must be higher than total forward voltage of series connecting LED

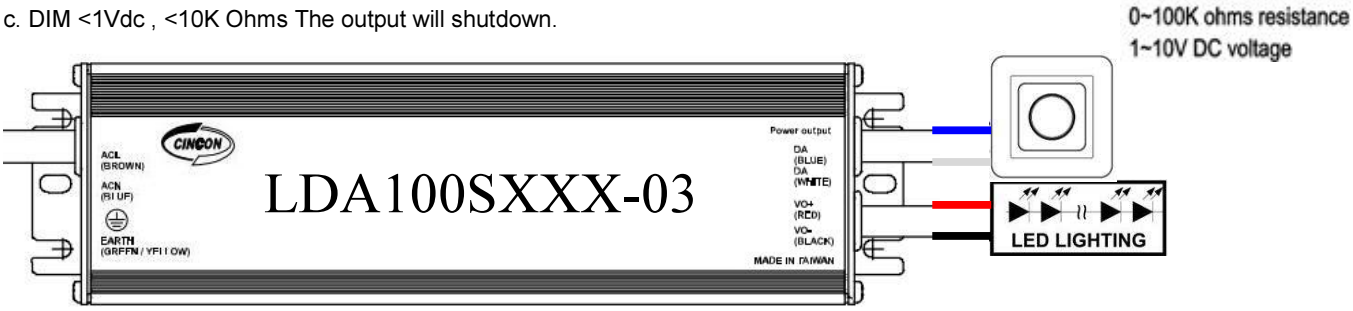


9.3 Dimming Function Diagrams

a. Output constant current can be adjusted through output cable by connecting 0~100k resistance between DIM+ and DIM- .

b. Please DO NOT connect “DIM-“ to “V-“ .

c. DIM <1Vdc , <10K Ohms The output will shutdown.



1~10VDC Dimming Function (typical)

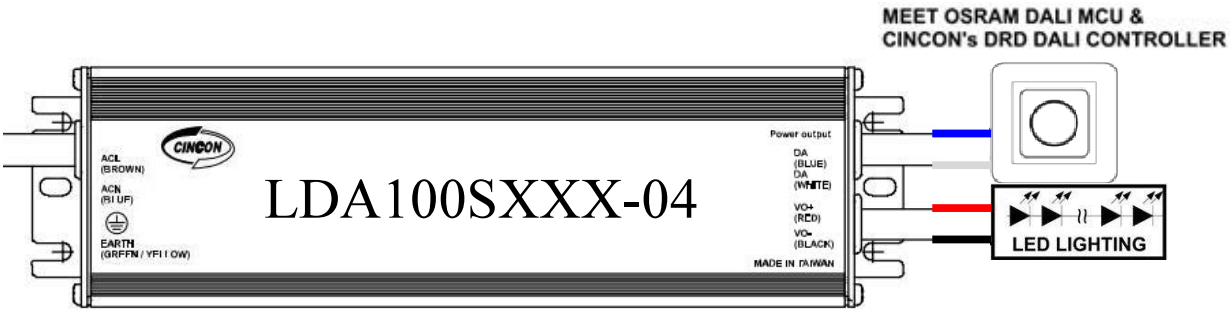
Voltage	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Open
Output Current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%-105%

10~100K Ohms Resistance Dimming Function (typical)

Resistance	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Open
Output Current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%-105%

9.4 DALI Function Link Diagrams

Output constant current can be adjusted through output cable by connecting DALI controller.



10. Ordering Information

Model No.	Optional type
LDA100SXXX	-XX
142: Output Voltage 142VDC	01: Constant Current Mode (IP67) No dimming
214: Output Voltage 214VDC	03: Constant Current Mode (IP67) Dimming: 1~10Vdc and Resistance
214A: Output Voltage 214VDC	04: Constant Current Mode (IP67) Dimming: DALI

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