LDM100S

LED Power Supply Application Note

LDM100S SERIES AC-DC LED DRIVER
Application Note

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Revision History

Revision Version	Date	Change Description	Signature
V10	10 SEP. 2013	Release	Calvin
V11	19 MAR. 2014	Add DC input & Life time & Setup up time& TC point	Calvin
V12	2 Apr. 2014	Add page4 230VAC input current & revise page4 Power Factor	Calvin
V13	12 Aug. 2014	Revise page4 nominal input	Calvin
V14	24 Aug. 2014	Revise hold time , No Load Consumption	Calvin

LDM100S SERIES AC-DC LED DRIVER
Application Note

1. Introduction

This application note describes the features and functions of Cincon's LDM100S 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 LDM100S series led drivers are extremely reliable.

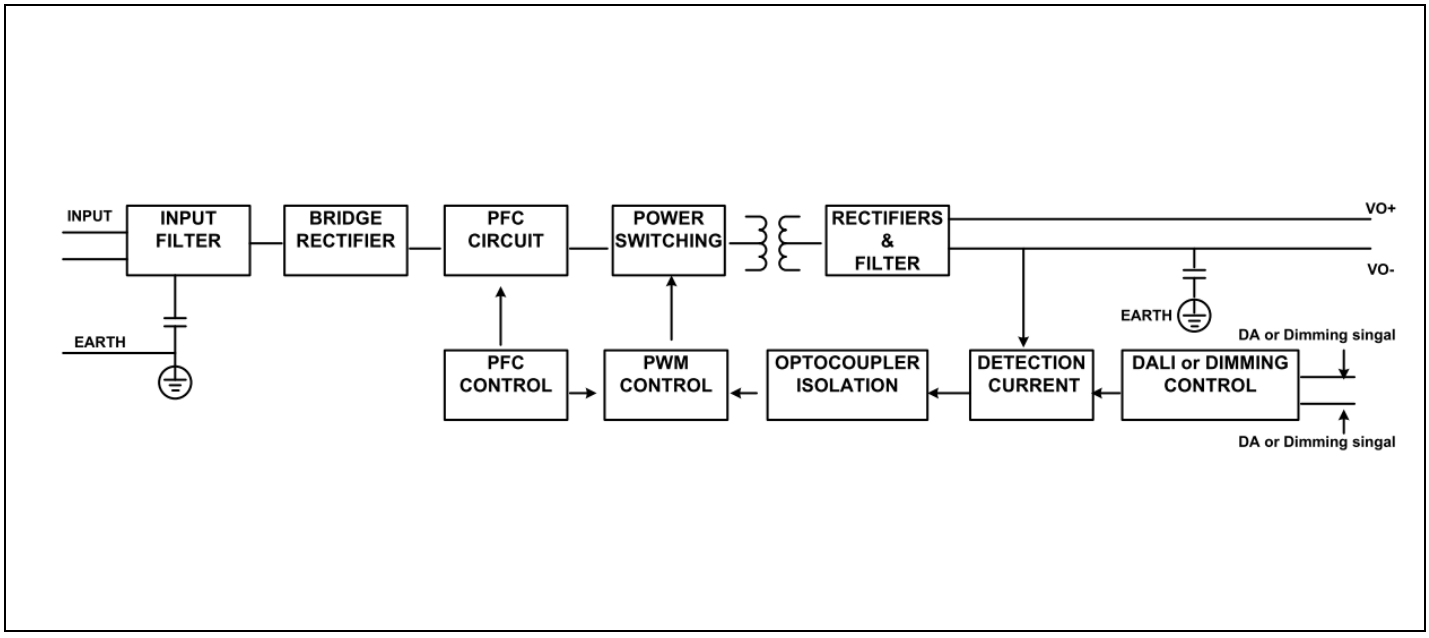
2. LDM100S LED Driver Features

- Universal Input : 90 ~ 305Vac or 127~420Vdc
- 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 / 10V PWM signal / DALI (optional)
- DALI Meets IEC62386-102 ,IEC62386-207 Standard
- Short Circuit / Over Voltage / Over Current / Over Temperature Protection
- IP67 / IP65 design for indoor or outdoor installations

3. General Description

A block diagram of the LDM100S 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 LDM100S 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. The output voltage can be adjusted from +10% to –10% and the output current can be adjusted from +100% to 60% by variable resistors for 02, 03A, and 04A version.

Figure 1. Electrical Block Diagra



4. Technical Specifications

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

PARAMETER	NOTES and CONDITIONS		Device	Min.	Typical	Max.	Units
ABSOLUTE MAXIMUM RATINGS							
Input Voltage				90 127		305 420	Vac Vdc
Operating Temperature				-40		+70	℃
Storage Temperature				-40		+85	℃
Input/Output Isolation Voltage	1 minute			3750			Vac
INPUT CHARACTERISTICS							
Operating Voltage Range				100		277	Vac
Input Frequency Range				50		60	Hz
Input Current	Input voltage is 110Vac,Pout=99W Input voltage is 230Vac,Pout=99W				1.1 0.55		A
Power factor correction	(see Section 7.2 Power Factor & THD V.S Output current)				0.9		
Leakage Current	Maximum Input voltage is 277Vac					0.75	mA
Inrush Current	Input voltage is 110Vac and 240Vac, cold start at 25^{0}C.					75	A
OUTPUT CHARACTERISTIC							
Output Voltage Set Point	Input Voltage is 115Vac and 230Vac , 90% output current at ambient temperature 25℃		LDM100S120 LDM100S240 LDM100S360 LDM100S480	11.88 23.76 35.64 47.52	12 24 36 48	12.12 24.24 36.36 48.48	Vdc
Output Voltage Adjustment	Output voltage*output current ≦ Rated output power(100W) (Model : LDM100SXXX-02, -03A, -04A.)		LDM100S120 LDM100S240 LDM100S360 LDM100S480	10.88 21.6 32.4 43.2	12 24 36 48	13.2 26.4 39.6 52.8	Vdc
Constant Current Region	Output Voltage		LDM100S120 LDM100S240 LDM100S360 LDM100S480	6.5 13 19 26		12 24 36 48	Vdc
Output Current	Constant voltage	CV LOAD=10V CV LOAD=20V CV LOAD=30V CV LOAD=40V	LDM100S120 LDM100S240 LDM100S360 LDM100S480		8.34 4.17 2.78 2.08		A
Output Current Adjustment	Output voltage*output current ≦ Rated output power(100W) Model : LDM100SXXX-02, -03A, -04A.		LDM100S120 LDM100S240 LDM100S360 LDM100S480	5.3 2.6 1.74 1.3		8.34 4.17 2.78 2.08	A
Output Constant Current Accuracy				-5		+5	%
No Load Consumption	Input Voltage is 230Vac					1.5	Watt
Start-up Time	Input Voltage is 90~305Vac					2	S
Rise Time	Input Voltage is 90~305Vac				50		mS
Holdup Time	Input Voltage is 115Vac				16		mS
Load Regulation	Input Voltage is 115Vac and 230Vac ,10% output current to 90% output current					±2.0	%
Line Regulation	Input Voltage is 90~305Vac with 90% output current					±1.0	%

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	LDM100S120 LDM100S240 LDM100S360 LDM100S480			120 120 120 120	mV
EFFICIENCY						
95% output current		LDM100S120 LDM100S240 LDM100S360 LDM100S480		88 89 90 90		%
ISOLATION CHARACTERISTICS						
Input to Output	1 minute				3750	Vac
Input to Earth	1 minute				1875	Vac
Output to Earth	1 minute				500	Vac
Isolation Resistance			100			MΩ
FEATURE CHARACTERISTICS						
Switching Frequency	100% Output Current				75	KHz
Surge	EN61000-4-2 Criteria A				±4	KV
Harmonic	EN61000-3-2 Class C(≧60% output current)					
GENERAL SPECIFICATIONS						
Life Time	Ambient temperature is 25℃				40000	Hour
MTBF	Ambient temperature is 25℃ per MIL-HDBK-217F			160		k hours
Weight				504		g
Dimension	40*232*28mm ((W*L*H)					

5. Main Features and Functions

5.1 Operating Temperature Range

The LDM100S 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 be clamped by a TVS component. The module will automatically restart after he fault condition is removed.

5.3 Over Temperature Protection

The LDM100S has an over temperature protection circuit to safeguard against thermal damage. When the TH2 temperature rises above 110℃, the LDM100S will shut down (latch) to protect it from overheating.

5.4 CC and CV mode

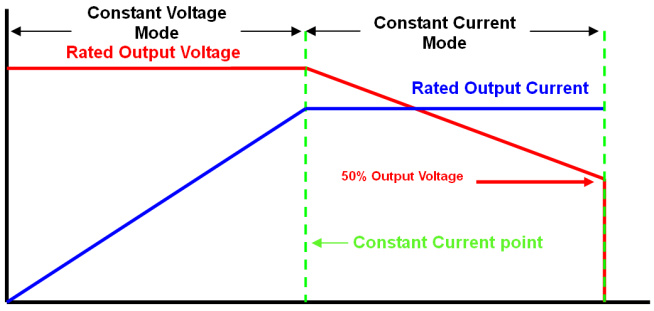


Figure 2 CC/CV mode

The latest design from LDM100S 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.

5.5 Dimming Interface

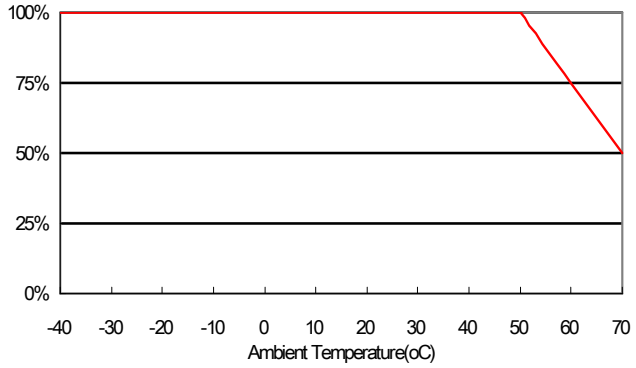
Dimming controller is capable of driving 03 or 03A version, require 0.15mA each unit.

6. Safety

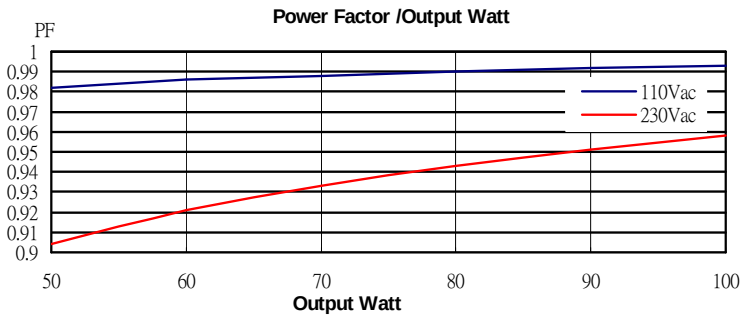
- **CB Approval (IEC/EN61347-1,IEC/EN61347-2-13)**
- **VDE Approval**
- **UL Approval (UL8750)**

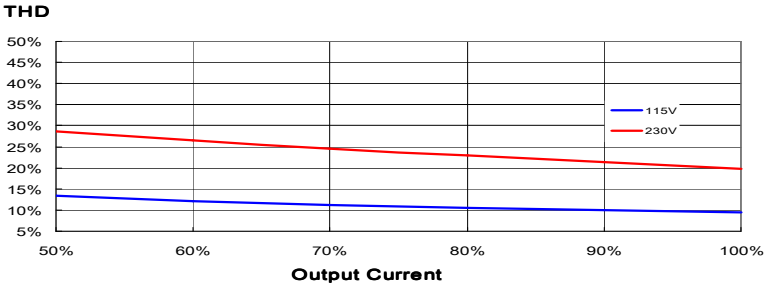
7. Applications

7.1 Power De-Rating Curves

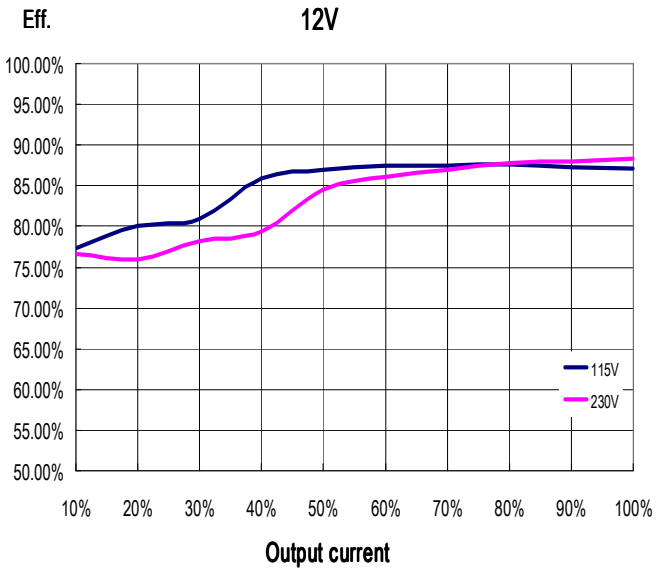


7.2 Power Factor & THD V.S Output current

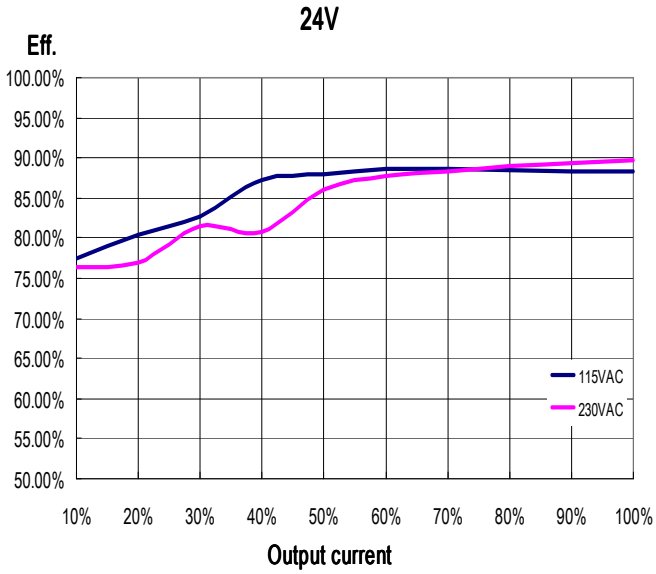




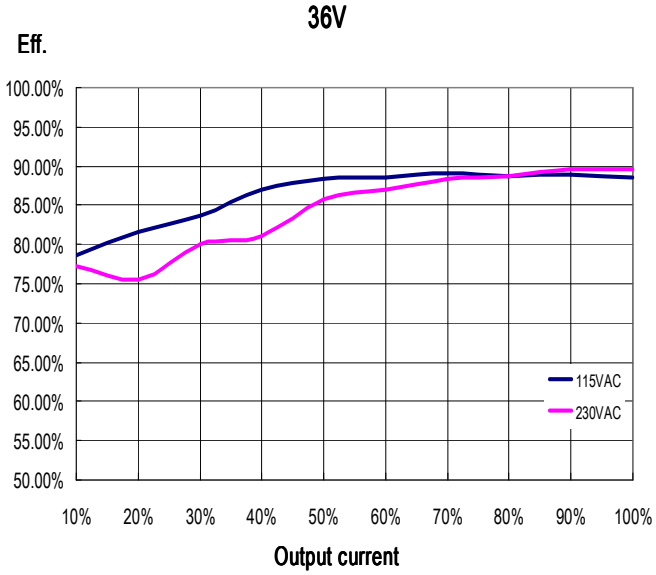
7.3 Efficiency vs. Output current Curves



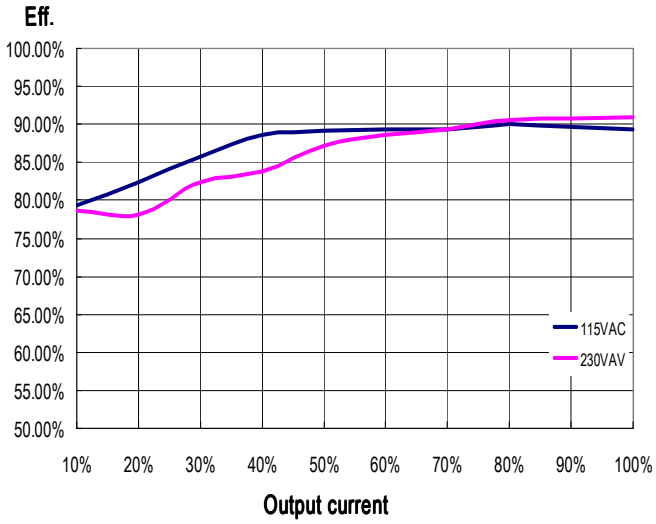
LDM100S120



LDM100S240



LDM100S360



LDM100S480

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 LDM100S 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 the real input power, (Pin=Vin x Iin x PF)

The value of load regulation is defined as:

$$Load.reg = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

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:

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

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.

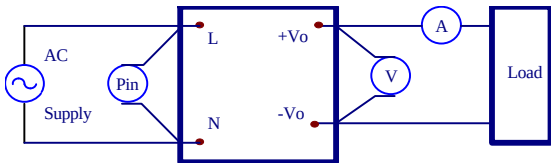


Figure 3. LDM100S Series Test Setup

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

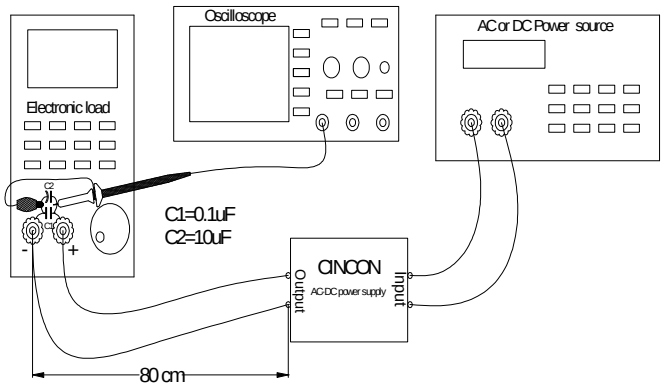


Figure 4. Output Voltage Ripple and Noise Measurement Set-Up

7.6 EMI

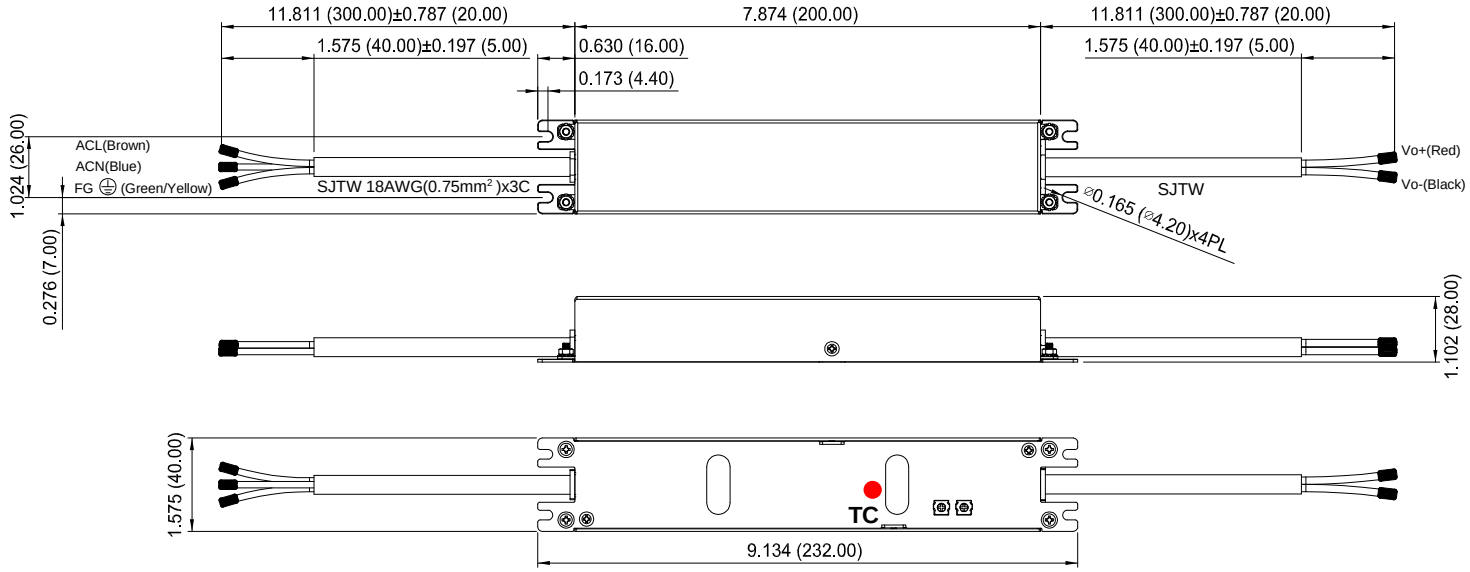
EN55015 CISPR22

8. Mechanical Outline Diagrams

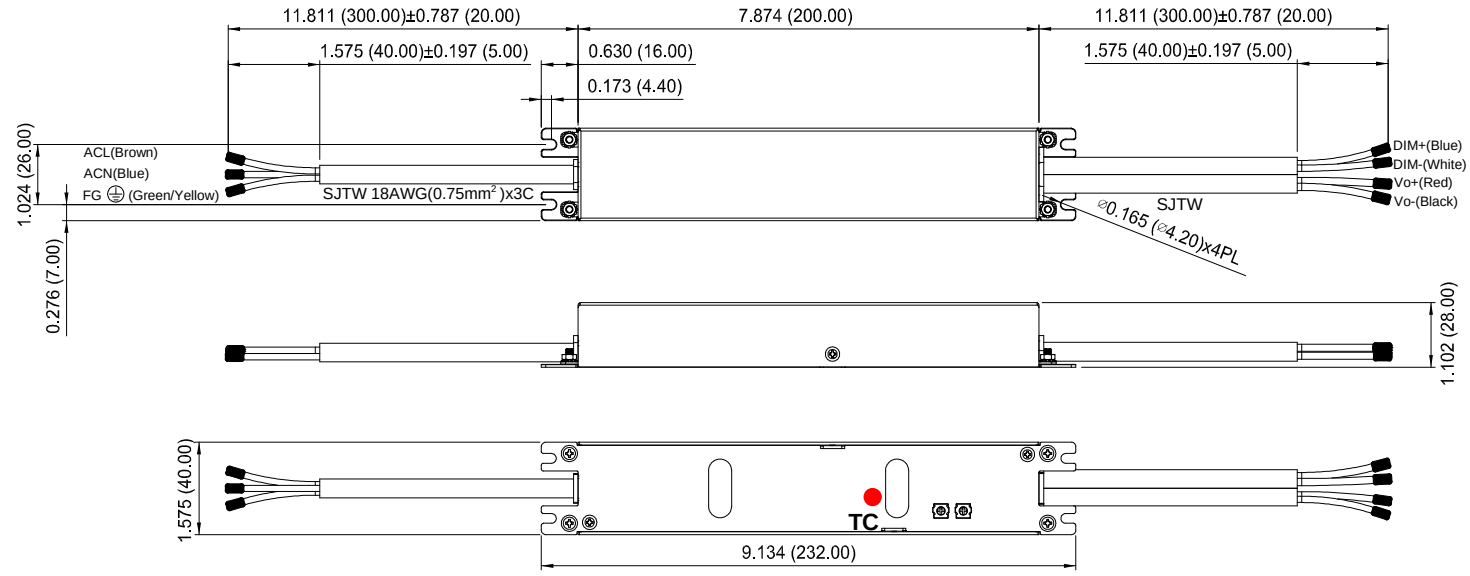
8.1 LDM100S Mechanical Outline Diagrams

All Dimensions in inches(mm)
Tolerance: inches x.xxx= ±0.02, Millimeters : x.xxx= ±0.5, unless otherwise noted

Output cable 2C:



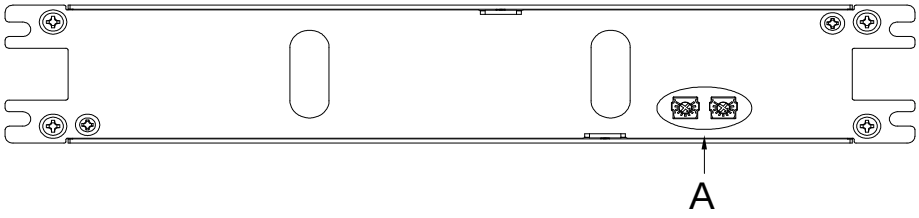
Output cable 4C:



∗T case:Max. Case Temperature

9. Potentiometer for Output voltage/Output current adjustment

The LDM100SXXX-02,03A,04A have output voltage & output current adjustment(Output voltage*output current ≦ Rated output power(100W)) . There are two potentiometers for every driver. Each of potentiometers has 11 tick marks. Tables with values for potentiometers tick marks as follows:



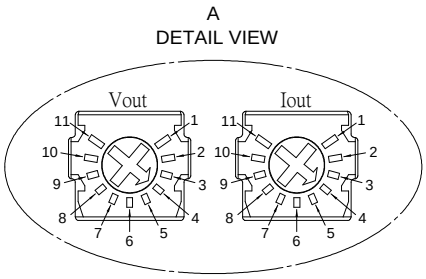


table for output Voltage(typical)

	Output Voltage(Vout)			
Tick marks for potentiometer	LDM100S120 -02,03A,04A	LDM100S240 -02,03A,04A	LDM100S360 -02,03A,04A	LDM100S480 -02,03A,04A
1	10.6V	21.3V	32.1V	42.2V
2	10.6V	21.3V	32.1V	42.2V
3	10.8V	21.6V	32.7V	43.4V
4	11.0V	22.0V	33.5V	44.3V
5	11.4V	22.7V	34.5V	45.5V
6	11.7V	23.5V	35.4V	47.4V
7	12.1V	24.2V	36.7V	49.0V
8	12.5V	25.0V	37.6V	50.0V
9	12.8V	25.6V	38.6V	51.2V
10	13.3V	26.6V	40.0V	53.5V
11	13.3V	26.6V	40.0V	53.5V

table for output current (typical)

	Output current(Iout)			
Tick marks for potentiometer	LDM100S120 -02,03A,04A	LDM100S240 -02,03A,04A	LDM100S360 -02,03A,04A	LDM100S480 -02,03A,04A
1	8.5A	4.3A	2.9A	2.2A
2	8.5A	4.3A	2.9A	2.2A
3	8.1A	4.2A	2.8A	2.1A
4	7.7A	4.0A	2.7A	2.0A
5	7.4A	3.7A	2.5A	1.9A
6	6.8A	3.4A	2.3A	1.8A
7	6.5A	3.1A	2.1A	1.6A
8	6.0A	2.9A	2A	1.5A
9	5.7A	2.7A	1.8A	1.4A
10	5.2A	2.4A	1.5A	1.3A
11	5.2A	2.4A	1.5A	1.3A

10. Installation Instruction

10.1 The maximum number of the LDM100S that can be connected to a circuit breaker at 240V is shown as below.

LDM100S series calculated values are based on MCB S200 series manufactured by ABB.

Breaker type	B10	B16	C10	C16
Amount	2	4	4	7

10.2 Direct Driving Link Diagrams

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

10.3 Dimming Function Link Diagrams

※Output constant current can be adjusted through output cable by connecting 0~100k resistance or 1~10VDC or 10V PWM signal between DIM+ and DIM- .
※Please DO NOT connect "DIM-" to "V-" .
※DIM <1Vdc , <10K Ohms ,<10% PWM Duty. 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%

0~100% 10VDC PWM Signal 

(typical) Frequency Range:250Hz~1KHz

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%	95%~105%

10.4 DALI Function Link Diagrams

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

11. Ordering information

LDM100SXXX - XX

01: Constant Current Mode (IP67)
No dimming
No adjustment for output voltage and output current

02: Constant Current Mode (IP65)
No dimming
With adjustment for output voltage and output current

03: Constant Current Mode (IP67)
Dimming:1~10Vdc or PWM and Resistance
No adjustment for output voltage and output current

03A: Constant Current Mode (IP65)
Dimming:1~10Vdc or PWM and Resistance
With adjustment for output voltage and output current

04: Constant Current Mode (IP67)
Dimming: DALI
No adjustment for output voltage and output current

04A: Constant Current Mode (IP65)
Dimming: DALI
With adjustment for output voltage and output current

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