

- Installation from below, wall to wall
- Up/down lighting
- Easy maintenance
- Possibility to use current modules with efficiency up to 190lm/W and CRI>90. Available upon request.
- Possibility to obtain UGR < 19

### APPLICATION

- main and decorative lighting

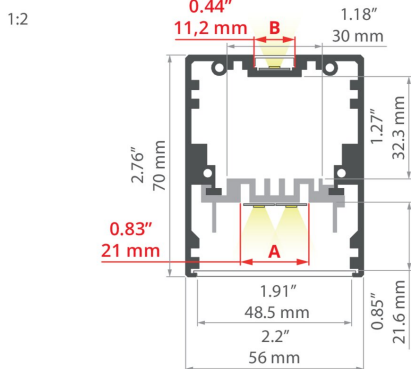
### MOUNTING

- suspended, using dedicated accessories

### ADDITIONAL INFORMATION

- the luminous efficiency can be increased by 20% with the use of REFLEX 16-60 reflectors
- both LED strips and LED current modules can be used
- safety due to high vibration resistance
- when choosing a different length of profiles / covers than available in the standard, you should additionally choose the cutting service at KLUŚ
- NCS Premium paint option - minimum order quantity 30pcs - available on order within 14 days

### TECHNICAL DRAWING



### TECHNICAL SPECIFICATIONS

Material	aluminum
Possible fixture IP	20
Possible fixture shapes	linear, polygonal
Profile cross-section	rectangular
Width	2.2"
Height	2.8"
LED gluing width A	0.8"
LED gluing width B	0.4"
Number of LED strips A (0.31" wide)	1
Width of the glow	49.45 mm
Max power of a single KLUŚ LED strip	7.3 W/ft
Dedicated space for power supply	yes
Possibility of obtaining a line of light	yes
Building type	Commercial, Retail, Entertainment/ Arts, Hotel / Restaurant
Facility zone	office, lobby / foyer
The cover is cut to the length of the profile	yes

Color	Length	Ref
■ silver anodized	39.4"	A18047A_1
	78.9"	A18047A_2
□ white lacquered	39.4"	A18047L10OD_1
	78.9"	A18047L10OD_2

# MOD-50 Extrusion

Ref. A18047

Can be easily connected into runs	yes
Wire out back of extrusion	yes
Two directional lighting for suspended fixtures	yes

## LINE OF LIGHT TABLE

LED tape	HSP-49 frosted
K-2400-24	✓ (2)
K-CR-1220-24	✓ (2)
K-CR-1275-24	✓ (2)
K-CRHD-1820-24	✓ (2)
K-CRHD-1910-24	✓ (2)
K-HEHD-0480-24	✓ (2)
K-HEHD-0960-24	✓ (2)
K-HEHD-1440-24	✓ (2)
K-HEHD-1920-24	✓ (2)
K-HEHD-0320-24	✓ (2)
K-CRHD-0530-24	✓ (2)
K-HEHD-1440-24-40C	✓ (2)

### Description

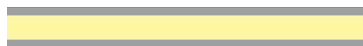
✓ - Line of Light for a number (X) of rows - Pixel free imaging

X - Visible Dotting from Diodes

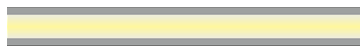
HL - Centered Line of Light - Concentrated in middle

HL (X) - Centered Line of Light for a number (X) of rows - Concentrated in middle

## Line of Light Guide



Clean Line of Light (Pixel free imaging)

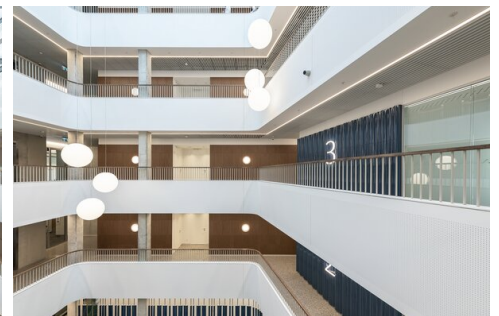


Centered Line of Light

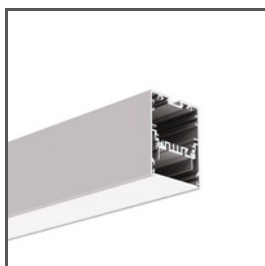


Visible Dotting from Diodes

## SAMPLE PROJECTS



## PROFILE PODOBNE > SUSPENDED



**MOD-50**  
A18047

## RELATED ACCESSORIES > COVERS

NAME	MATERIAL	MATERIAL TRANSMITTANCE	COLOR	REF.
HS-11 Cover	PC	59 %	frosted	B17208F
		88 %	clear	B17208C
KA-11 Cover	PC	67 %	frosted	B17064F
		89 %	clear	B17064C
LIGER-11 Cover	PC	21 %	black	B17037B
		59 %	satın	B17037S
HSP-49 Cover	PC	70 %	frosted	B17058F
		82 %	microprism	B17058M

## RELATED ACCESSORIES > END CAPS

NAME	MATERIAL	COLOR	REF.
End cap MOD-50	ABS	■ black	C28024C07
		■ gray	C28024C02
		□ white	C28024C10

## RELATED ACCESSORIES > RELATED LED > HIGH EFFICACY

Name	Stopień ochrony IP	Moc	Ref.
LED tape K-HEHD-0480-24	20	1.5 W/ft	K-HEHD-0480-24
LED tape K-HEHD-0960-24	20	2.9 W/ft	K-HEHD-0960-24

Name	Stopień ochrony IP	Moc	Ref.
LED tape K-HEHD-1440-24	20	4.4 W/ft	K-HEHD-1440-24
LED tape K-HEHD-1920-24	20	5.9 W/ft	K-HEHD-1920-24
LED tape K-HEHD-0320-24	20	1 W/ft	K-HEHD-0320-24

#### RELATED ACCESSORIES > RELATED LED > CRI 95+

Name	Stopień ochrony IP	Moc	Ref.
LED tape K-CR-1210-24	20	1.5 W/ft	K-CR-1210-24
LED tape K-CR-1220-24	20	2.9 W/ft	K-CR-1220-24
LED tape K-CR-1275-24	20	4.4 W/ft	K-CR-1275-24
LED tape K-CRHD-1820-24	20	5.6 W/ft	K-CRHD-1820-24
LED tape K-CRHD-1910-24	20	2.8 W/ft	K-CRHD-1910-24
LED tape K-HEHD-1440-24-40C	20	4.4 W/ft	K-HEHD-1440-24-40C
LED tape K-CRHD-0530-24	20	1.6 W/ft	K-CRHD-0530-24

#### RELATED ACCESSORIES > RELATED LED > CRI 90+

Name	Stopień ochrony IP	Moc	Ref.
LED tape K-2400-24	20	7.3 W/ft	K-2400-24


#### RELATED ACCESSORIES > RELATED LED > ADJUSTABLE WHITE / DIM TO WARM

Name	Stopień ochrony IP	Moc	Ref.
LED tape KWP-30/18-1770-010-24	65	3.5 W/ft	KWP-30/18-1770-010-24
LED tape K-30/18-1770-010V-24V	20	3.5 W/ft	K-30/18-1770-010V-24V
LED tape KWP-G30/18-1770-010-24	65	3.5 W/ft	KWP-G30/18-1770-010-24

#### RELATED ACCESSORIES > OTHER ACCESSORIES > ADDITIONAL ITEMS

Name	Material	Ref.
Gland M8x1	brass	C42265N00
Reflector REFLEX 16-60	PC	C24536

#### RELATED ACCESSORIES > OTHER ACCESSORIES > FASTENERS AND HEADS FOR EXTRUSIONS

Name	Material	Kolor	Ref.
Fastener M4-12	stainless steel, brass, nylon	 silver	C28118

#### RELATED ACCESSORIES > OTHER ACCESSORIES > SUSPENSION AND MOUNTING SETS

Name	Material	Kolor	Ref.
Fastener set RG-1	brass		C28230

## RELATED ACCESSORIES > OTHER ACCESSORIES > CANOPIES

Name	Materiał	Kolor	Ref.
Canopy Fi-60mm	steel	lacquered	C24540

## RELATED ACCESSORIES > OTHER ACCESSORIES > CONNECTORS

Name	Materiał	Kolor	Ref.
Connector ZM	stainless steel	 silver	
Connector ZM-PION	stainless steel	 silver	

## RELATED ACCESSORIES > ELECTRONICS > CONTROLLERS

Name	Stopień ochrony IP	Ref.
Controller LED Casambi CBU-PWM4	20	E62148
Controller LED MONO, Wlightboxs	20	E60228

## RELATED ACCESSORIES > ELECTRONICS > SWITCHES

Name	Stopień ochrony IP	Ref.
Proximity switch UNI	20	E61579

Fixture build code

pdf.kod	Finish	Cover	Color	LED output	24	Length	Mounting	Wire length	IP
<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>	<input style="width: 80%;" type="text"/>

<p><b>Extrusion Finish</b></p> <p><b>B</b> - black, anodized caramel (NCSS3030-Y60R), lacquered light sage (NCSS2010-G50Y), lacquered pastel blue, lacquered sand (NCSS2010-Y30R), lacquered <b>A</b> - silver, anodized <b>W</b> - white, lacquered</p>	<p><b>Cover Type</b></p> <p><b>FC</b> - HSP-49 frosted, 70%* <b>JUN</b> - HSP-49 microprism, 82%</p>	<p><b>LED tapes Color</b></p> <p><b>22</b> - 2200 <b>25</b> - 2500 <b>27</b> - 2700 <b>30</b> - 3000 <b>35</b> - 3500 <b>40</b> - 4000 <b>50</b> - 5000 <b>DIM</b> - D2W</p>	<p><b>LED output LOW</b></p> <p><b>0320</b> - 0320, 1.94W/ft, 221lm/ft <b>0480</b> - 0480, 2.93W/ft, 307lm/ft <b>0530</b> - 0530, 3.23W/ft, 273lm/ft <b>1210</b> - 1210, 2.93W/ft, 185lm/ft</p> <p><b>LED output MEDIUM</b></p> <p><b>0480</b> - 0480, 2.93W/ft, 396lm/ft <b>0960</b> - 0960, 5.85W/ft, 793lm/ft <b>1770</b> - 1770, 7.01W/ft, 584lm/ft <b>1910</b> - 1910, 5.55W/ft, 544lm/ft</p> <p><b>LED output HIGH</b></p> <p><b>1275</b> - 1275, 8.78W/ft, 960lm/ft <b>1440</b> - 1440, 8.78W/ft, 928lm/ft <b>1820</b> - 1820, 11.13W/ft, 947lm/ft <b>1920</b> - 1920, 11.71W/ft, 1568lm/ft <b>2400</b> - 2400, 14.63W/ft, 2297lm/ft</p>	<p><b>Type</b></p> <p><b>ROD78</b> - Rod 78" <b>ROD+78</b> - Rod (conductive) 78" <b>C36</b> - Cable 36" <b>C78</b> - Cable 78" <b>C+36</b> - Cable (conductive) 36" <b>C+78</b> - Cable (conductive) 78" <b>TBD</b> - TBD Custom length - add to notes</p>	<p><b>IP protection rating</b></p> <p><b>IP20</b> - IP20</p>
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<p><b>Mounting method</b></p> <p><input type="checkbox"/> suspended mount</p>	<p><b>Wire out</b></p> <p><input type="checkbox"/> back of extrusion <input type="checkbox"/> end cap <input type="checkbox"/> TBD</p>	<p><b>Wire type</b></p> <p><input type="checkbox"/> FC - Female connector <input type="checkbox"/> MC - Male connector <input type="checkbox"/> Plenum Rated <input type="checkbox"/> TBD</p>	<p><b>POWER SUPPLY TYPE</b></p> <p><input type="checkbox"/> DMX SYSTEM <input type="checkbox"/> RF SYSTEM (Handheld remote) <input type="checkbox"/> Non-dimming <input type="checkbox"/> MAX5 Series (Forward/Reverse Phase, 0-10V, PWM, Resistance) <input type="checkbox"/> MLV (TRIAC / Forward Phase) <input type="checkbox"/> PWM <input type="checkbox"/> ULTRA Series (Forward/Reverse Phase, 0-10V)</p>
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# ULTRA

Constant Voltage LED Drivers  
3-in-1 Universal Dimming

## Specification Sheet

The ULTRA is a Constant Voltage Class 2 rated UL Listed driver. The drivers with enclosures have a built-in junction box on both the input and output. These drivers are IP66 and UL2043 plenum rated and are suitable for both indoor and outdoor installations. With universal input voltage ranging from 120 to 277VAC, the ULTRA driver is designed for residential, commercial and industrial applications. The dimmers deliver smooth flicker-free dimming down to 1% with most LEDs and compatible with a wide variety of dimmers.

### Key Features

- Forward & Reverse Phase-Cut Dimming or 0-10V Dimming
- Smooth Flicker-Free Dimming, Down To 1%
- Universal Input Voltage – 120 to 277VAC
- UL Listed Enclosure – With Built-In Junction Boxes
- IP66 – For Both Indoor & Outdoor Use
- Class 2, Class P
- Hiccup Mode Protection For Short Circuit & Over-Temperature
- Overload Protection

**Product Name:** ULTRA

**Description:** Constant Voltage 3-in-1 Universal Dimming LED Driver

**Installation:** Can have integrated junction box with multiple 7/8" knock-outs or no junction box with wire leads

**Driver Type:** Class 2 Single Channel

**Dimming:** Phase-cut dimming down to 1% with Forward Phase (MLV/CL/LED+) and Reverse Phase (ELV) dimmers or 0-10V dimming

**Input Voltage:** Universal 120VAC to 277VAC, 50/60Hz

**Output Voltage:** 24VDC

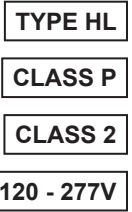
**Wattage:** 30W / 60W / 96W

**IP Rating:** IP66

**Listing:** UL Listed

**Certifications:** UL8750, UL2043 Plenum Rated

\*Min. Spacing between drivers – 5"



### ORDERING GUIDE

Part Numbers
ULTRA-30-24V
ULTRA-60-24V
ULTRA-96-24V

### PRODUCT MEASUREMENTS

Type	With Junction Box		Without Junction Box	
Length	12.10"	(307.9mm)	7.50"	(191.6mm)
Width	2.36"	(59.9mm)	2.36"	(59.9mm)
Height	1.40"	(35mm)	1.40"	(35mm)



### SPECIFICATIONS

#### Input

Input Voltage Range	100 to 277VAC $\pm$ 10%	100 to 277VAC $\pm$ 10%	100 to 277VAC $\pm$ 10%
Input Frequency	50 / 60Hz	50 / 60Hz	50 / 60Hz
Input Current	0.98A Max	0.98A Max	0.98A Max
Inrush Current	< 40A Max @ 120VAC	< 40A Max @ 120VAC	< 40A Max @ 120VAC
Efficiency	> 86% Max	> 86% Max	> 86% Max
Power Factor	277VAC, > 0.90 120VAC, > 0.95	277VAC, > 0.90 120VAC, > 0.95	277VAC, > 0.90 120VAC, > 0.95
THD	< 20%	< 20%	< 20%

#### Output

Output Voltage	24VDC	24VDC	24VDC
Max Load	30W	60W	96W
Output Current @ Max Load	1.3A	2.6A	4.1A
Output Ripple	< 10%	< 10%	< 10%
Line Regulation	$\pm$ 2.5%	$\pm$ 2.5%	$\pm$ 2.5%
Load Regulation	$\pm$ 5%	$\pm$ 5%	$\pm$ 5%
Turn On Delay Time	< 0.5 sec	< 0.5 sec	< 0.5 sec

#### Environmental

Env. Protection Rating	IP66	IP66	IP66
Ambient Operating Temp.	-25°C to +40°C (-13°F to 104°F)	-25°C to +40°C (-13°F to 104°F)	-25°C to +40°C (-13°F to 104°F)
Max. Case Temp. (Tcase)	80°C (176°F)	80°C (176°F)	80°C (176°F)
Storage Temperature	-40°C to +85°C (-40°F to 185°F)	-40°C to +85°C (-40°F to 185°F)	-40°C to +85°C (-40°F to 185°F)
Expected Lifetime	$\geq$ 50,000 hrs @Tc $\leq$ 75	$\geq$ 50,000 hrs @Tc $\leq$ 75	$\geq$ 50,000 hrs @Tc $\leq$ 75
Audible Noise	< 24 dB Class A	< 24 dB Class A	< 24 dB Class A

#### Dimming (Dimming Models Only)

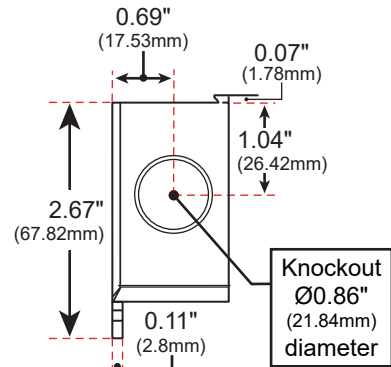
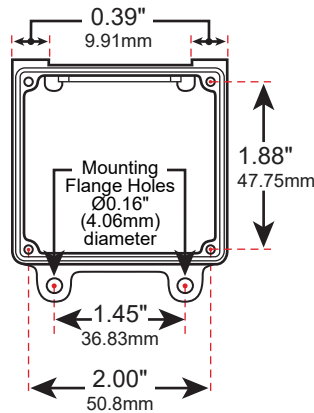
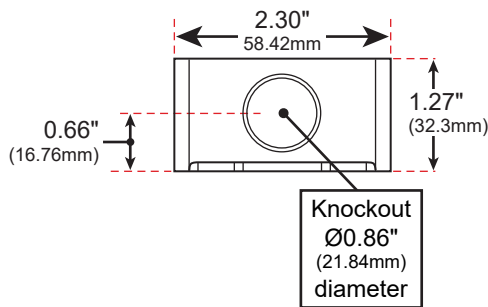
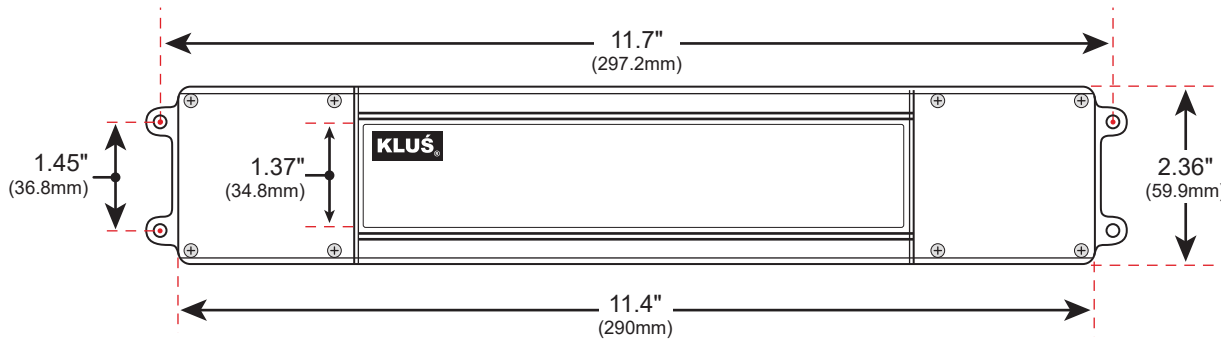
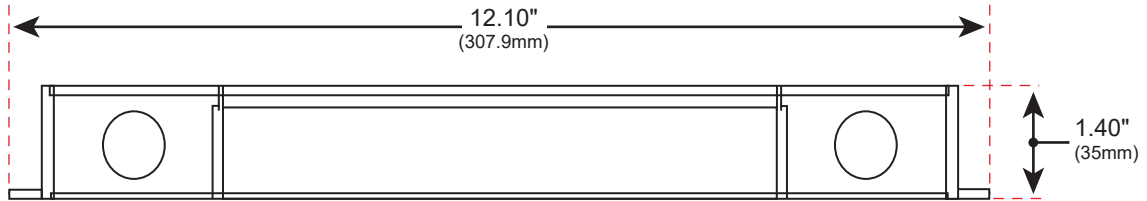
Dimming Style	Phase-Cut or 0-10V	Phase-Cut or 0-10V	Phase-Cut or 0-10V
Minimum Dimming Level	1%	1%	1%
Dimming Curve	Linear	Linear	Linear

#### Protection

Over Current Protection	Yes	Yes	Yes
Over Voltage Protection	Yes	Yes	Yes
Over Temp. Protection	Yes / Hiccup Mode	Yes / Hiccup Mode	Yes / Hiccup Mode
Overload Protection	Yes / Current Limit	Yes / Current Limit	Yes / Current Limit
Short Circuit Protection	Yes / Current Limit	Yes / Current Limit	Yes / Current Limit

### MECHANICAL DIAGRAMS

#### WITH Integrated Junction Box



# MAX5 Series

96W, 1-Channel, Class 2  
 288W, 3-Channel, Class 2  
 300W, 1-Channel, Class 1  
 5-Way Universal Dimming  
 24V LED Driver

## Specification Sheet

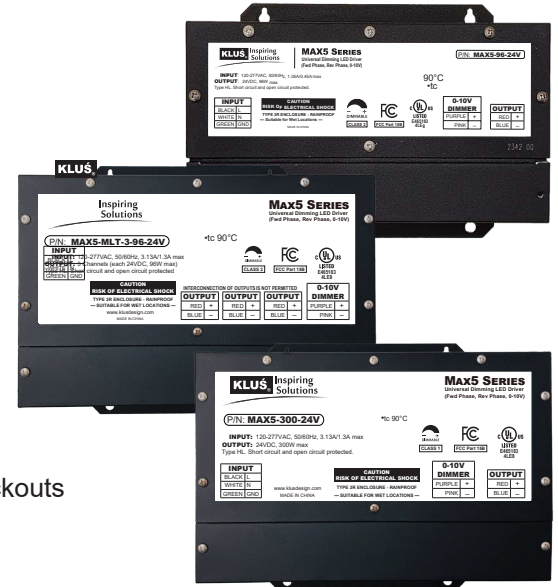
**96W P/N: MAX5-96-24V**  
**288W P/N: MAX5-MLT-3-96-24V**  
**300W P/N: MAX5-300-24V**

### Key Features

- ▶ 5-way universal dimming
- ▶ Smooth flicker-free dimming, down to 1%
- ▶ Compatible with high density LED & COB products
- ▶ Universal input voltage – 120 to 277VAC
- ▶ Constant power overload protection
- ▶ Wire connectors pre-installed
- ▶ UL rated for wet locations
- ▶ 5-year warranty

- Description:** Constant Voltage Dimmable LED Driver
- Installation:** Integrated junction box with multiple 7/8" knockouts
- 96W Driver Type:** 1-Channel, Class 2
- 288W Driver Type:** 3-Channel (96W per Channel), Class 2
- 300W Driver Type:** 1-Channel, Class 1
- Dimming:** 5-way dimming: forward phase (MLV), reverse phase (ELV), 0-10V, PWM, and potentiometer
- Output Dimming Method:** Uses Pulse Width Modulation (PWM) method for dimmed low voltage output
- Flicker:** Meets California Title 24 / JA8
- Input Voltage:** Universal 120VAC to 277VAC, 50/60Hz
- Output Voltage:** 24VDC
- Wattage:** 96W, 288W (3 x 96W), and 300W
- Enclosure Rating:** NEMA 3R
- Listing:** UL listed, wet location
- Certifications:** UL8750, FCC Consumer Limits (Class B)
- Warranty:** 5-Year

\*Min. Spacing between drivers – 5"



Dimensions			
96W	Width	8.1"	(206mm)
	Overall Height	5.6"	(142mm)
	Height	4.3"	(110mm)
	Depth	1.7"	(43mm)
288/300W	Width	9.9"	(252mm)
	Overall Height	7.6"	(193mm)
	Height	6.4"	(163mm)
	Depth	1.9"	(48.3mm)

ORDERING GUIDE				
1-Channel	Max Power	Listing	Output	Enclosure Type
MAX5-96-24V	96W	UL Listed	24VDC	NEMA 3R
MAX5-300-24V	300W			
3-Channel	Max Power			
MAX5-MLT-3-96-24V	288W (96W x 3)			

**RoHS Compliant** ✓

**DIMMABLE** - +

**FC**

**SELV**

**UL LISTED** US

**24VDC**

**120 to 277V**

**MEETS TITLE 24/JA8 REQUIREMENTS**

# MAX5 Series

96W, 1-Channel, Class 2  
288W, 3-Channel, Class 2  
300W, 1-Channel, Class 1  
5-Way Universal Dimming  
24V LED Drivers

## Specification Sheet

### SPECIFICATIONS

Input	▼ MAX5-96-24V	▼ MAX5-MLT-3-96-24V	▼ MAX5-300-24V
<b>Input Voltage Range</b>	120 to 277VAC ± 10%	120 to 277VAC ± 10%	120 to 277VAC ± 10%
<b>Input Frequency</b>	50 / 60Hz	50 / 60Hz	50 / 60Hz
<b>Input Current</b>	1.05A @ 120V, 0.45A @ 277V	3.0A @ 120V, 1.8A @ 277V	3.0A @ 120V, 1.8A @ 277V
<b>Inrush Current</b>	80A @ 277V	90A @ 277V	90A @ 277V
<b>Efficiency</b>	84% @120V, 87% @ 277V	91% @120V, 93% @ 277V	91% @120V, 93% @ 277V
<b>Power Factor</b>	277VAC, > 0.94 120VAC, > 0.94	277VAC, > 0.90 120VAC, > 0.90	277VAC, > 0.90 120VAC, > 0.90
<b>THD</b>	< 20%	< 20%	< 20%
<b>Output</b>			
<b>Output Voltage</b>	24VDC	24VDC per channel	24VDC
<b>Maximum Load</b>	96W	96W per channel (unloaded channels permitted)	300W
<b>Output Current @ Maximum Load</b>	4.1A	4.1A per channel	12.5A
<b>Output Dimming Method</b>	PWM	PWM	PWM
<b>Flicker</b>	California Title 24 / JA8	California Title 24 / JA8	California Title 24 / JA8
<b>Output Ripple (Peak-to-Peak)</b>	≤ 8%	< 5%	< 5%
<b>Line Regulation</b>	± 5%	± 5%	± 5%
<b>Load Regulation</b>	± 5%	± 5%	± 5%
<b>Current Output Tolerance @ Max. Load</b>	N/A	± 5% @ 100% Dim	N/A
<b>Channel-to-Channel</b>	N/A	± 5% @ 50% Dim	N/A
<b>Turn On Delay Time</b>	< 0.5 sec	< 0.5 sec	< 0.5 sec
<b>Environmental</b>			
<b>Ambient Operating Temperature</b>	-40°C to 50°C (-40°F to 125°F)	-40°C to 50°C (-40°F to 125°F)	-40°C to 50°C (-40°F to 125°F)
<b>Maximum Case Temp. (Tcase)</b>	90°C (194°F)	90°C (194°F)	90°C (194°F)
<b>Storage Temperature</b>	-40°C to +85°C (-40°F to 185°F)	-40°C to +85°C (-40°F to 185°F)	-40°C to +85°C (-40°F to 185°F)
<b>Enclosure</b>	NEMA 3R Rated	NEMA 3R Rated	NEMA 3R Rated
<b>Cover Screws</b>	Stainless Steel	Stainless Steel	Stainless Steel
<b>Expected Lifetime</b>	≥ 80,000 hrs @Tc ≤ 60°C	≥ 80,000 hrs @Tc ≤ 60°C	≥ 80,000 hrs @Tc ≤ 60°C
<b>Dimming</b>			
<b>Dimming Style</b>	Phase-Cut (120V) or 0-10V (120V to 277V)	Phase-Cut (120V) or 0-10V (120V to 277V)	Phase-Cut (120V) or 0-10V (120V to 277V)
<b>Minimum Dimming Level</b>	1%	1%	1%
<b>Minimum Load for Dimming</b>	8W	20W per Channel	40W
<b>Dimming Curve</b>	Linear	Linear	Linear
<b>Protection</b>			
<b>Over Current Protection</b>	Yes	Yes	Yes
<b>Over Voltage Protection</b>	Yes	Yes	Yes
<b>Over Temperature Protection</b>	Yes / Auto-Recovery	Yes / Auto-Recovery	Yes / Auto-Recovery
<b>Overload Protection</b>	Yes / Current Limit	Yes / Current Limit	Yes / Current Limit
<b>Short Circuit Protection</b>	Yes / Auto-Recovery	Yes / Auto-Recovery	Yes / Auto-Recovery
<b>Connectors</b>			
<b>Lever Style Connectors</b>	Pre-installed, all wire leads	Pre-installed, all wire leads	Pre-installed, all wire leads
<b>Listing</b>	UL Listed	UL Listed	UL Listed



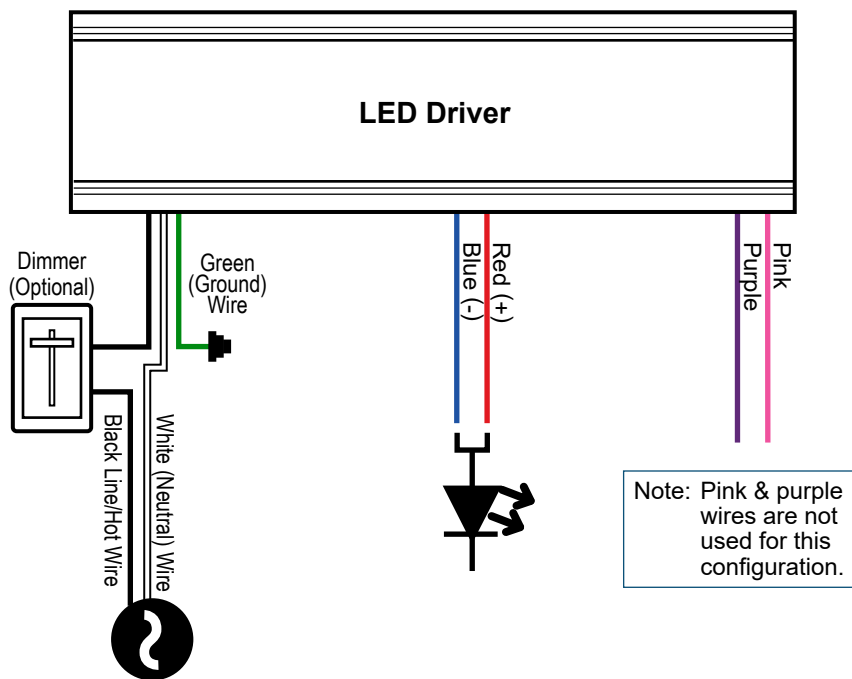
# MAX5 Series

96W, 1-Channel, Class 2  
288W, 3-Channel, Class 2  
300W, 1-Channel, Class 1  
5-Way Universal Dimming  
24V LED Drivers

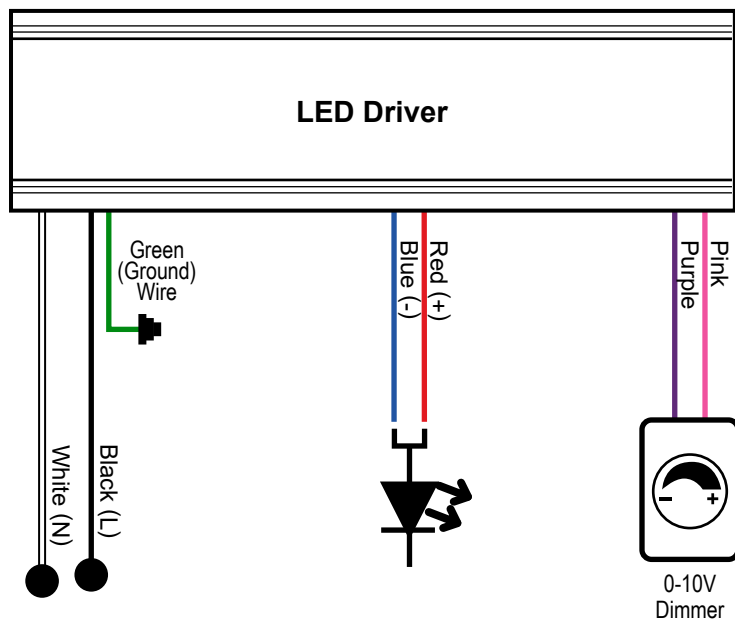
## Specification Sheet

### MAX5-96-24 (96W) WIRING DIAGRAMS

#### ↓ Phase-Cut Dimmable Configuration ↓



#### ↓ 0-10V Dimmable Configuration ↓



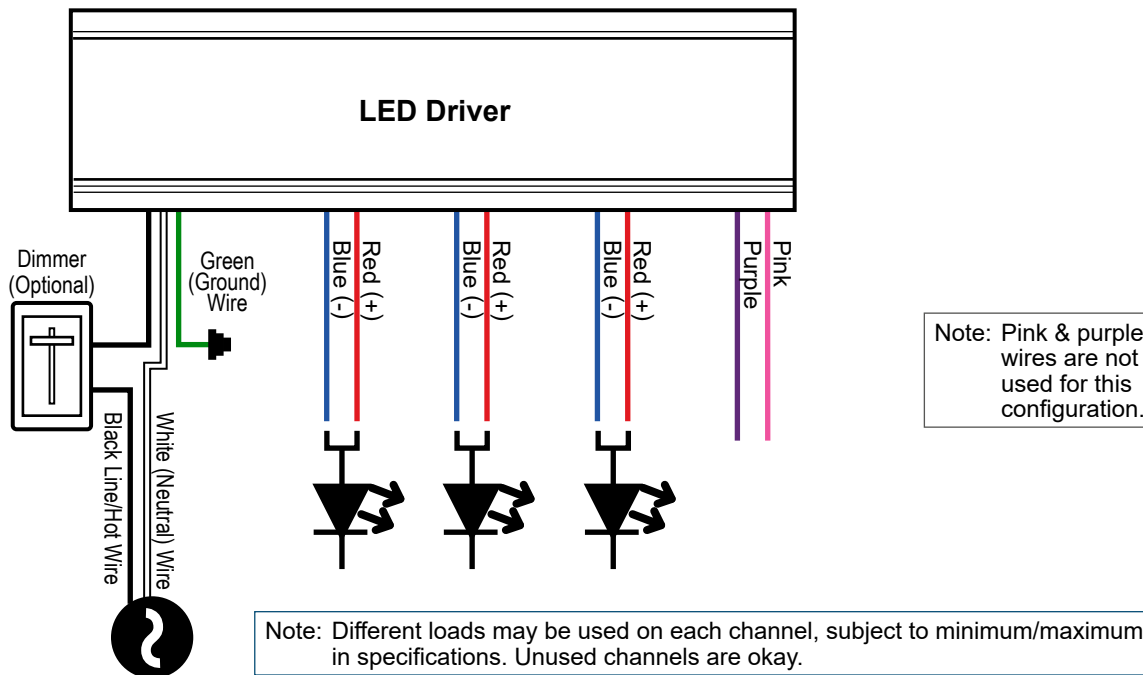
# MAX5 Series

96W, 1-Channel, Class 2  
288W, 3-Channel, Class 2  
300W, 1-Channel, Class 1  
5-Way Universal Dimming  
24V LED Drivers

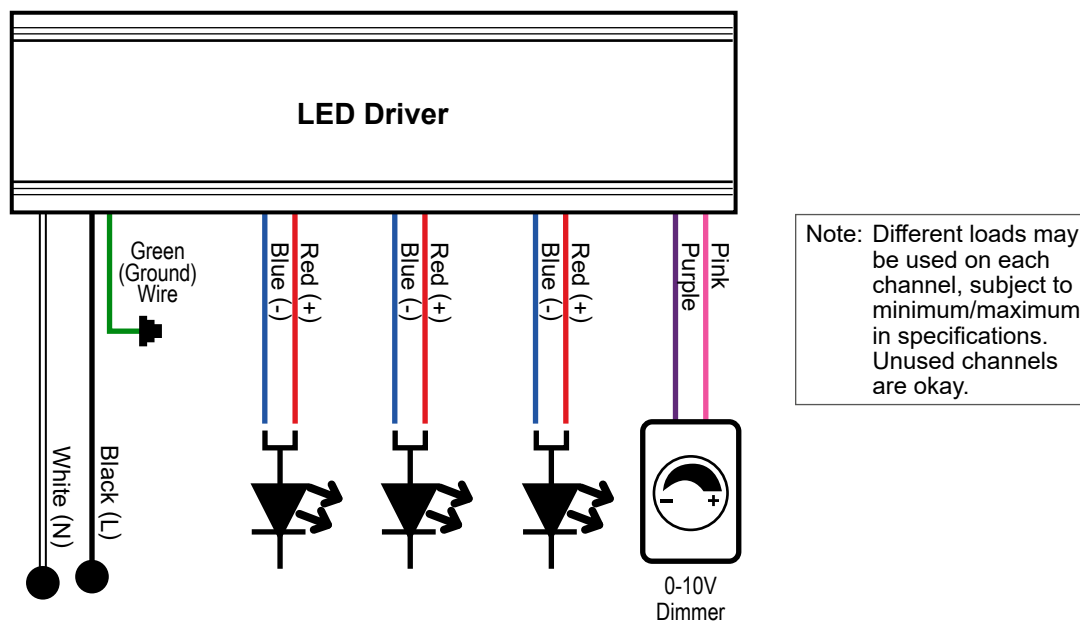
## Specification Sheet

### MAX5-MLT-3-96-24V (96W per Channel) WIRING DIAGRAMS

#### Phase-Cut Dimmable Configuration



#### 0-10V Dimmable Configuration



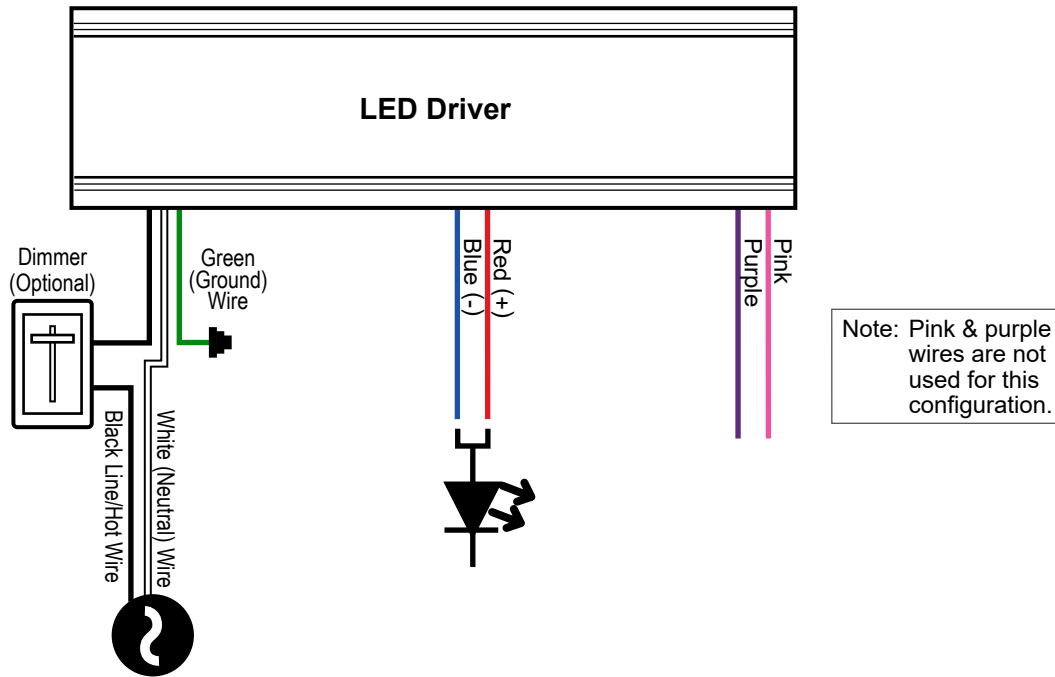
# MAX5 Series

96W, 1-Channel, Class 2  
288W, 3-Channel, Class 2  
300W, 1-Channel, Class 1  
5-Way Universal Dimming  
24V LED Drivers

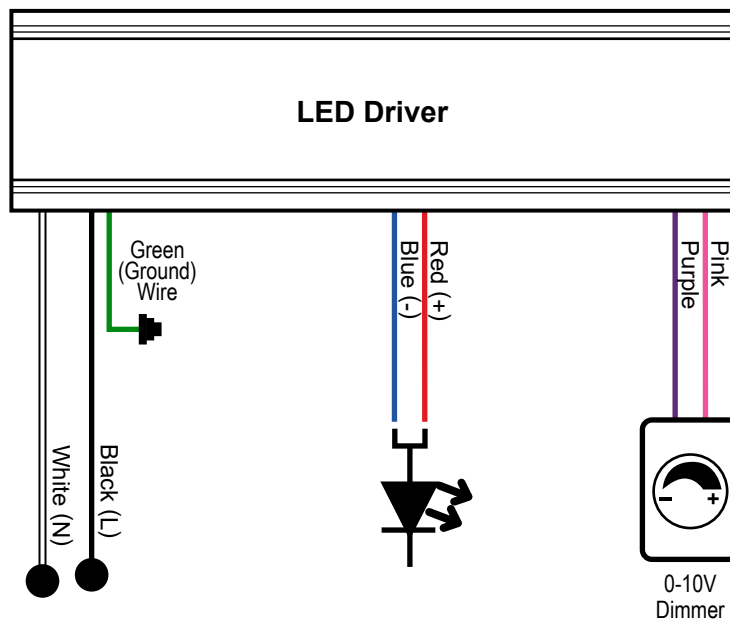
## Specification Sheet

### MAX5-300-24V (300W) WIRING DIAGRAMS

#### ↓ Phase-Cut Dimmable Configuration ↓



#### ↓ 0-10V Dimmable Configuration ↓



# MD-SERIES

## MAGNETIC DIMMABLE CLASS 2 LED DRIVER



CLASS 2

12V DC

P/N: MD-20-12

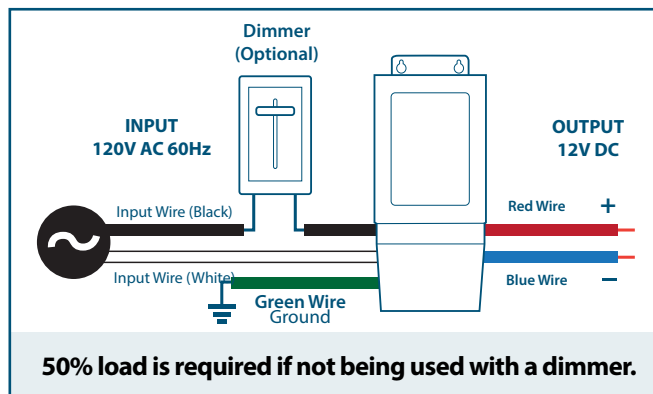


KLUS - MD-20-12 is the most compact LED driver on the market with a magnetic transformer core. It is equipped with two auto-reset breakers, one on the input and one on the output, which protect both the load and driver. The driver is encased in a coated metal box that includes 2 knock-outs, one on each side, to enable easy installation that complies with electrical code requirements.

### QUICK SPECS

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Envir. Protection Rating	Weight
120VAC	20W	12VDC	1.9 A	> 74%	> 0.81	NEMA 3R	35oz

### WIRING DIAGRAM

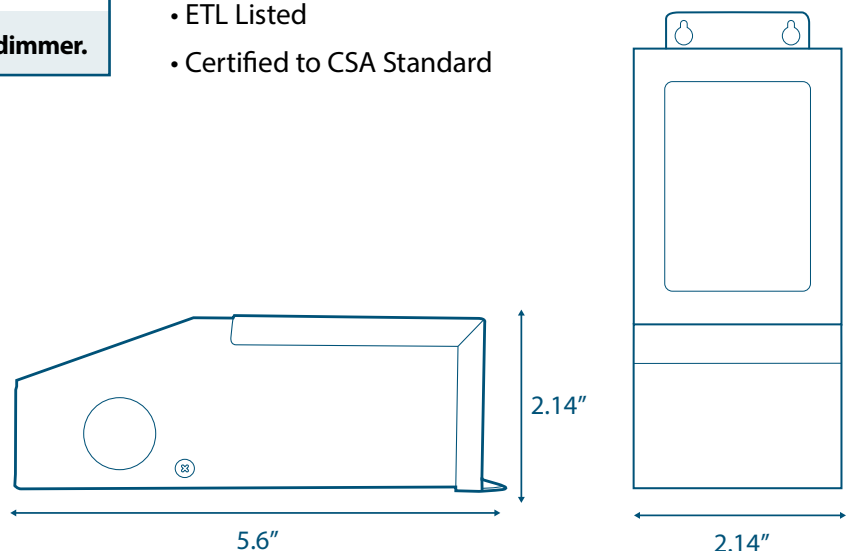


### FEATURES

- Dimmable with any standard MLV/Incandescent TRIAC- (Leading edge) dimmer switch
- Dual protection - primary and secondary auto-reset circuit breakers
- Nema 3R - Outdoor Use
- Two knock-outs one on each side
- Class 2
- ETL Listed
- Certified to CSA Standard

### ENCLOSURE DETAILS In. (mm)

Length	5.6 (142.2)
Width	2.14 (54.3)
Height	2.14 (54.3)



# MD-SERIES MAGNETIC DIMMABLE CLASS 2 LED DRIVER

## SPECIFICATIONS

### Input

Input Voltage 120VAC

Input Current @ Max Load 0.31 A

Power Factor 0.81

Efficiency > 74%

### Output

Max Load 20W

Output Voltage 11.6 VDC

Output Current @ Max Load 1.9 A

Coil Former Double Section Bobbin

### Environmental

Operating Temperature -30°C - 45°C (-22°F - 113°F)

Min Installation space between drivers 5" Inch

Thermal Class B130°C

### Protections

Circuit Breaker Primary and secondary auto-reset

### Mechanical & Housing

Leads Primary PVC 600V #20

Leads Secondary PVC 300V #16

Length 5.6" (142.2mm)

Width 2.14" (54.3mm)

Height 2.14" (54.3mm)

Weight 9oz (255grams)

Housing Material Coated metal

Housing Color Black

Junction Box Yes

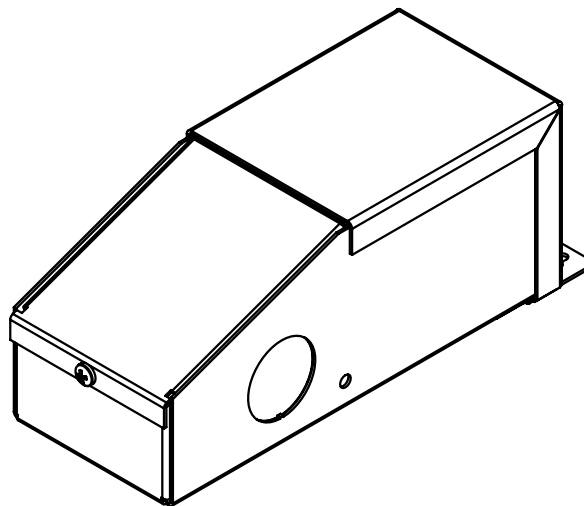
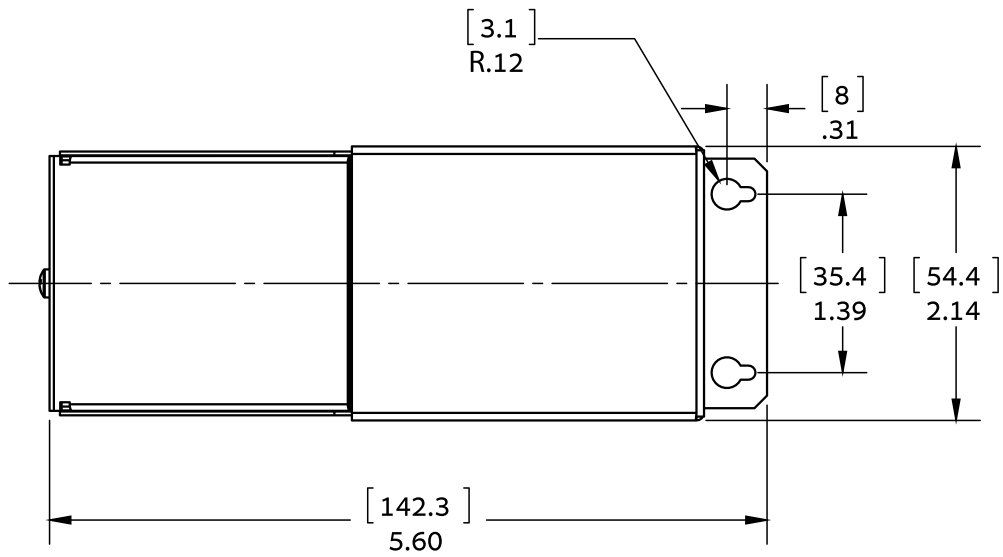
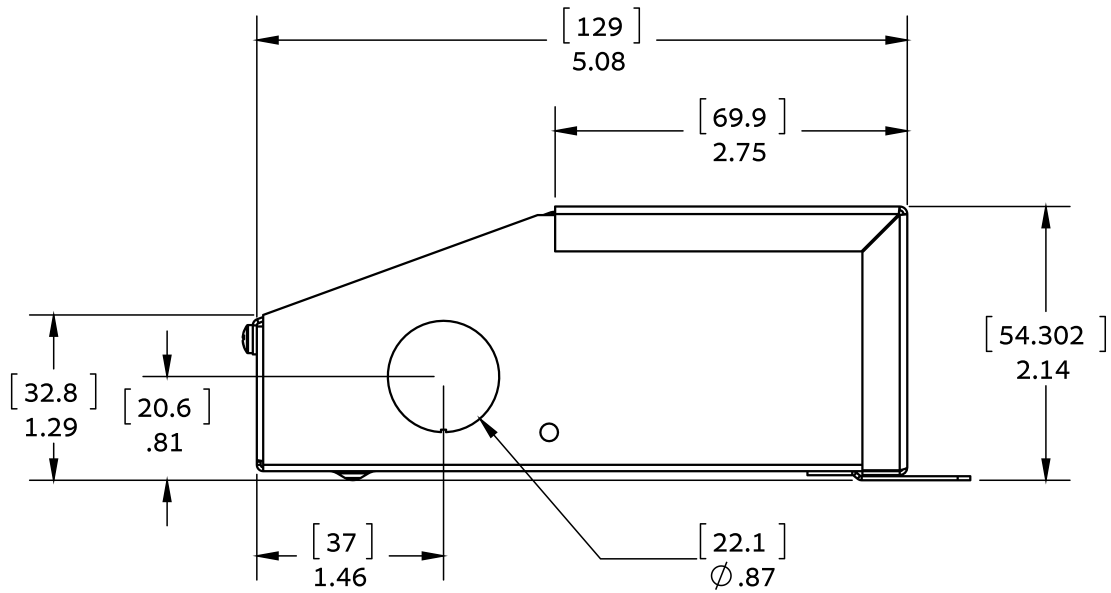
Mounting Two Hole flange mounting

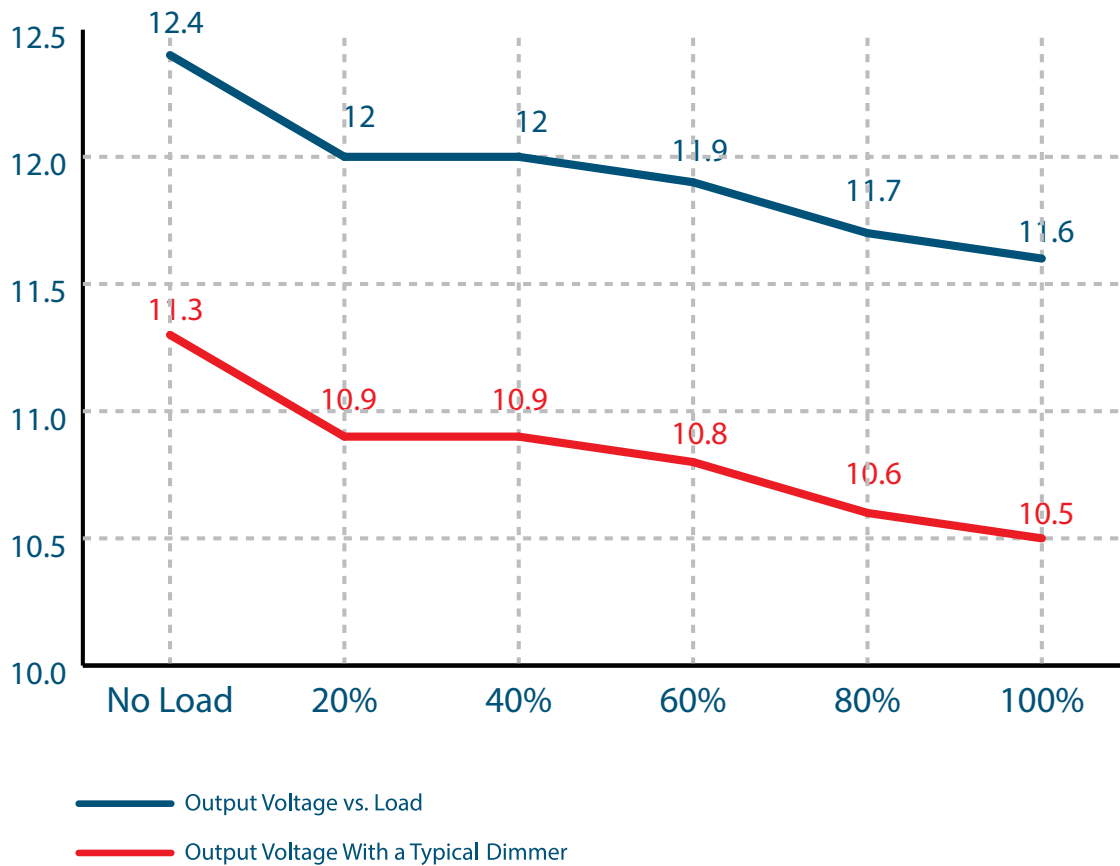
### Approval Markings

Certificates / Approval Signs UL 8750, class 2

# MD-SERIES MAGNETIC DIMMABLE CLASS 2 LED DRIVER

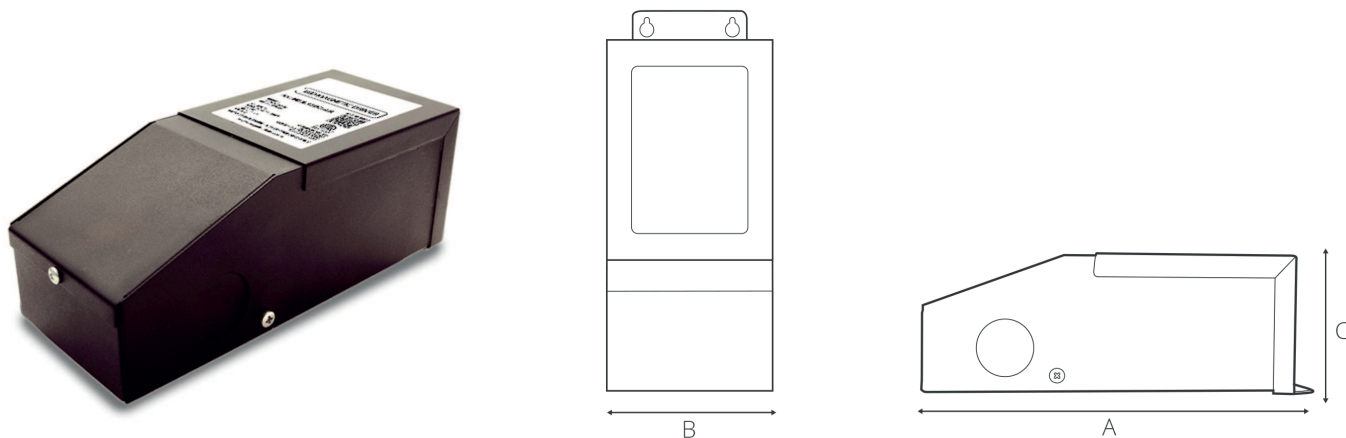
## MECHANICAL DIAGRAM





FEATURES

- Dimmable with any standard MLV/Incandescent TRIAC- (Leading edge) dimmer switch
- Dual protection - primary and secondary auto-reset circuit breakers
- Nema 3R - Outdoor Use with Two knock-outs, one on each side
- ETL Listed, Certified to CSA Standard



TECHNICAL DATA

MD-20-24

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C) Height In / (mm)
120VAC	20W	24VDC	0.97A	>76%	>0.92	35oz	5.6" (142.2)	2.14" (54.3)	2.14" (54.3)

MD-40-24

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C) Height In / (mm)
120VAC	40W	24VDC	3.9A	>82%	>0.89	35oz	5.6" / (142.2)	2.14" / (54.3)	2.14" / (54.3)

MD-60-24

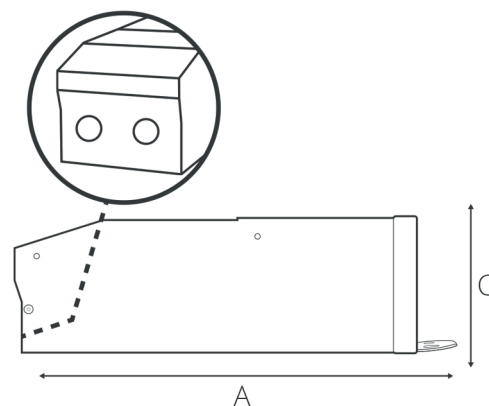
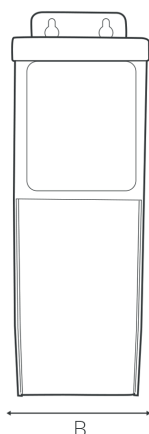
Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C) Height In / (mm)
120VAC	60W	24VDC	2.56A	>85%	>0.82	50oz	6.62" / (168)	2.58" / (65.6)	2.33" / (59.1)

MD-96-24

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C) Height In / (mm)
120VAC	96W	12VDC	4A	>85%	>0.89	50oz	6.62" / (168)	2.58" / (65.6)	2.33" / (59.1)

FEATURES

- Dimmable with any standard MLV/Incandescent TRIAC- (Leading edge) dimmer switch
- Dual protection - primary and secondary auto-reset circuit breakers
- Nema 3R - Outdoor Use with Two knock-outs, one on each side
- ETL Listed, Certi-fied to CSA Standard



TECHNICAL DATA

MD-150-24

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C)Height In / (mm)
120VAC	150W	24VDC	6.5A	>85%	>0.93	87oz	10.06" / (255.5)	3.09" / (78.5)	2.84" / (72.1)

MD-200-24

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C)Height In / (mm)
120VAC	200W	24VDC	10.9A	>87%	>0.93	87oz	10.06" / (255.5)	3.09" / (78.5)	2.84" / (72.1)

MD-300-24

Input Voltage	Max Output Power	Output Voltage	Output Current	Efficiency @ Max Load	Power Factor @ Max. Load	Weight	(A) Length In / (mm)	(B) Width In / (mm)	(C)Height In / (mm)
120VAC	300W	24VDC	20.8A	>90%	>0.93	140oz	10.04" / (255.1)	4.21" / (107)	3.5" / (88.8)

Voltage Drop Chart

ON SPEC SHEET MAX DIST.  
(based on max capacity)

	20 AWG wire	18 AWG wire	14 AWG wire
MLV			
300W	11 ft	18 ft	45 ft
200W	17 ft	28 ft	71 ft
150W	22 ft	36 ft	95 ft
96W	45 ft	55 ft	143 ft
60W	55 ft	90 ft	175 ft+
40W	90 ft	150 ft	175 ft+
20W	125 ft	140 ft	175 ft+



## Constant Voltage Non-Dimmable LED Driver

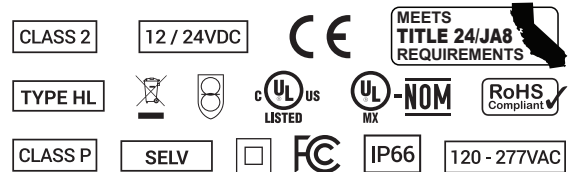
The KLUŠ Constant Voltage Driver is an electronic Class 2, non-dimmable LED driver with an integrated junction box, making it the perfect choice for tape lighting, tube lighting, linear lighting and multiple other commercial lighting applications.

The UL enclosure is rated IP66 for indoor or outdoor installations and includes a separate input and output wiring compartment, each with three 7/8" knockouts for easy installation. The driver features hiccup mode, over current and short circuit protection, as well as an efficiency over >84% resulting in low operating case temperature.



UL Enclosure with Integrated Junction Box  
(12.1" L x 2.36" W x 1.40" H)

- Installation:** Has an integrated junction box with multiple 7/8" knockouts
- Driver Type:** Class 2 Single Channel
- Input Voltage:** Universal 120VAC to 277VAC, 50/60Hz
- Output Voltage:** 12VDC & 24VDC
- IP Rating:** IP66
- Listing:** Available in UL Listed, Class P, Type HL
- Certifications:** UL8750, UL2043 Plenum Rated
- Warranty:** 5-Year

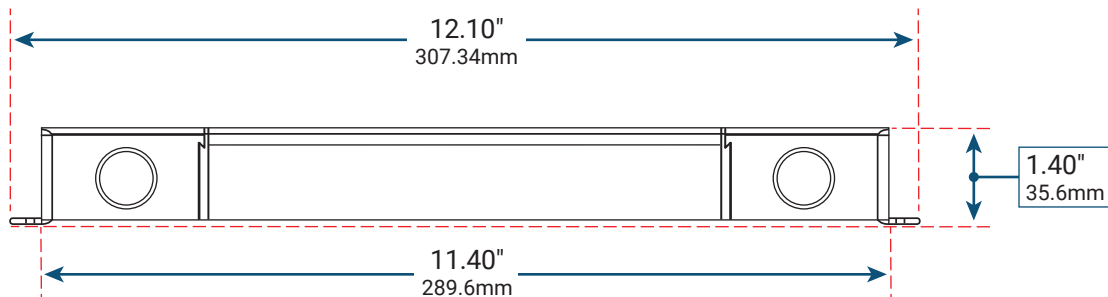


\*Recommended Spacing between drivers – 5"

### Ordering Guide

Part #	Maximum Power	Output	Dimensions
ND-30-24	30 Watt Max	24VDC	<b>Length:</b> 12.10" (307.34mm)
ND-60-24	60 Watt Max	24VDC	<b>Width:</b> 2.36" (59.94mm)
ND-96-24	96 Watt Max	24VDC	<b>Height:</b> 1.40" (35.6mm)
ND-50-12	50 Watt Max	12VDC	

### Integrated Junction Box (Drawing Not to Scale)



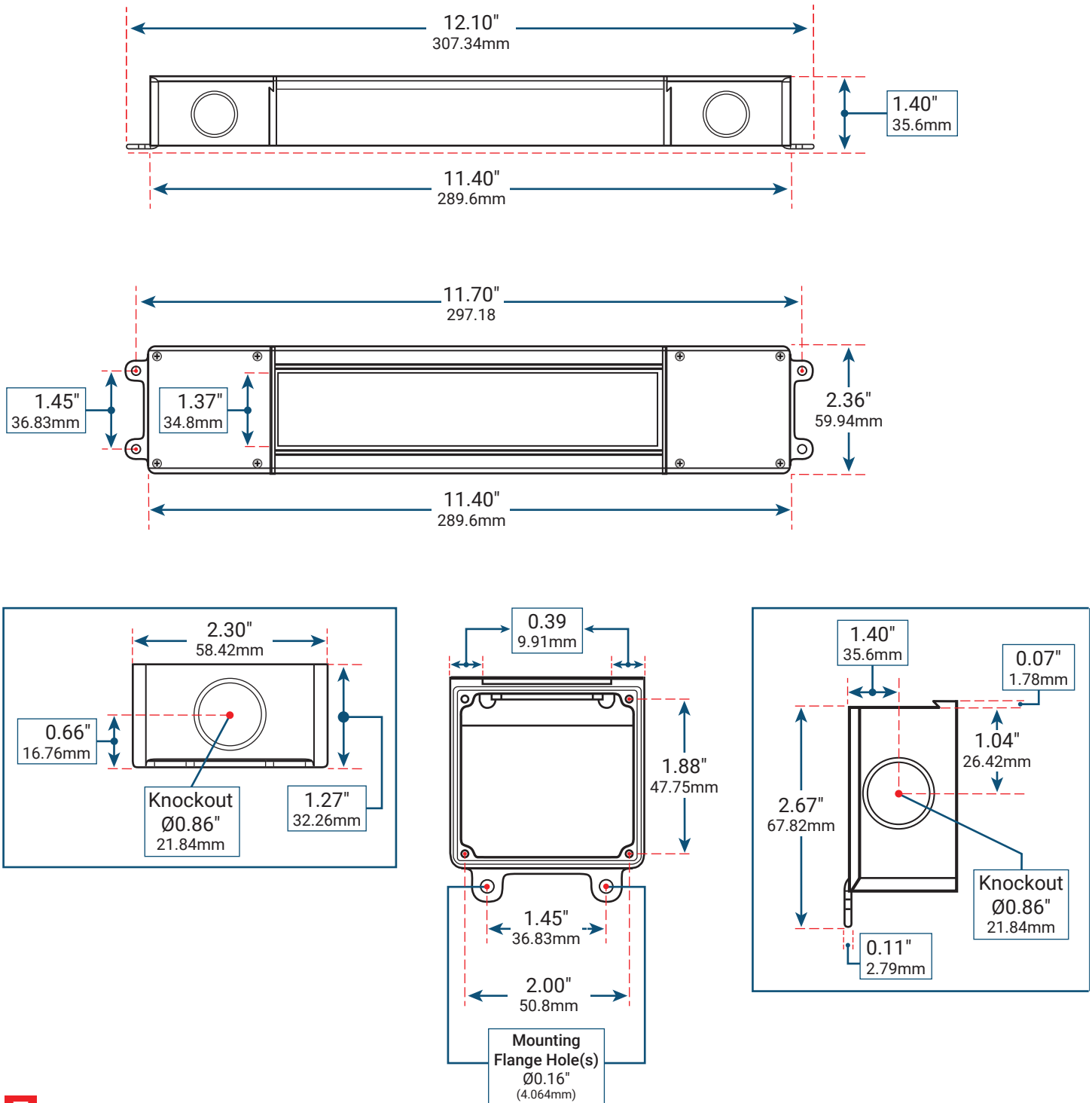


# Constant Voltage Non-Dimmable LED Driver

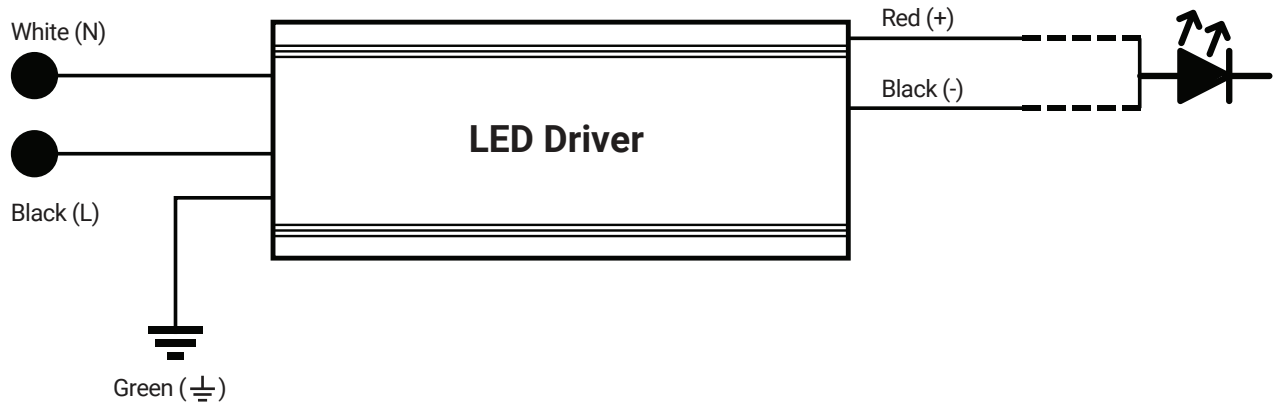
## Specifications

Part Numbers:	ND-30-24V	ND-50-12V	ND-60-24V	ND-96-24V
<b>Input</b>				
Input Voltage Range	120 - 277VAC $\pm$ 10%			
Input Frequency	50 / 60Hz	50 / 60Hz	50 / 60Hz	50 / 60Hz
Input Current	0.96A Max	0.96A Max	0.96A Max	0.96A Max
Inrush Current	5A Max@120VAC 30A Max@277VAC	5A Max@120VAC 30A Max@277VAC	5A Max@120VAC 30A Max@277VAC	5A Max@120VAC 30A Max@277VAC
Efficiency	> 84% Max	> 80% Max	> 84% Max	> 84% Max
Power Factor	> 0.91	> 0.95	> 0.95	> 0.95
THD	< 20%	< 20%	< 20%	< 20%
<b>Output</b>				
Output Voltage	24VDC	12VDC	24VDC	24VDC
Max Load	30W	50W	60W	96W
Output Current @ Max Load	1.3A	4.2A	2.6A	4.1A
Output Ripple	< 3%	< 3%	< 3%	< 3%
Line Regulation	< 2%	< 2%	< 2%	< 2%
Load Regulation	< 3%	< 5%	< 3%	< 3%
Turn-On Delay Time	< 0.3 Sec	< 0.3 Sec	< 0.3 Sec	< 0.3 Sec
<b>Environmental</b>				
Env. Protection Rating	IP66	IP66	IP66	IP66
Ambient Operating Temp.	-25°C - +40°C (-13°F - 104°F)	-25°C - +40°C (-13°F - 104°F)	-25°C - +40°C (-13°F - 104°F)	-25°C - +40°C (-13°F - 104°F)
Max Case Temp. (Tcase)	80°C (176°F)	80°C (176°F)	80°C (176°F)	80°C (176°F)
Storage Temperature	-40°C - +85°C (-40°F - 185°F)	-40°C - +85°C (-40°F - 185°F)	-40°C - +85°C (-40°F - 185°F)	-40°C - +85°C (-40°F - 185°F)
Expected Lifetime	50k hours (>65°C) Tc	50k hours (>65°C) Tc	50k hours (>65°C) Tc	50k hours (>65°C) Tc
Audible Noise	<24dB Class A	<24dB Class A	<24dB Class A	<24dB Class A
<b>Protection</b>				
Over Current Protection	Yes	Yes	Yes	Yes
Over Voltage Protection	Yes	Yes	Yes	Yes
Over Temp. Protection	Yes/Hiccup Mode	Yes/Hiccup Mode	Yes/Hiccup Mode	Yes/Hiccup Mode
Over Load Protection	Yes/Current Limit	Yes/Current Limit	Yes/Current Limit	Yes/Current Limit
Short Circuit Protection	Yes/Current Limit	Yes/Current Limit	Yes/Current Limit	Yes/Current Limit

# Constant Voltage Non-Dimmable LED Driver



# Constant Voltage Non-Dimmable LED Driver





(for DA-Type only)



IS 15885(Part 2/Sec13)

R-41027766

(for 12,24,48  
Blank Type only)

E320521

(for 12,24  
Blank Type only)

Type HL

(except for DA-Type)



## Features

- Constant Voltage PWM style output with frequency 1.47kHz
- Plastic housing with class II design
- Built-in active PFC function
- Class 2 power unit
- No load power consumption <0.5W
- Fully encapsulated with IP67 level
- Function: 3 in 1 dimming(dim-to-off); DALI
- Typical lifetime>50000 hours
- 5 years warranty

## Applications

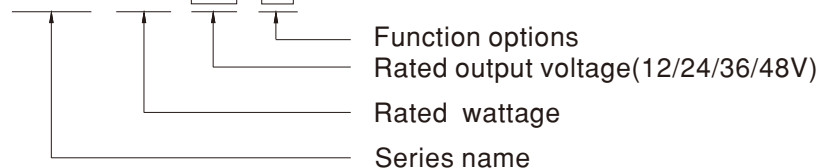
- LED strip lighting
- Indoor LED lighting
- LED decorative lighting
- LED architecture lighting
- Type "HL" for use in Class I, Division 2 hazardous (Classified) location.

## Description

PWM-60 series is a 60W LED AC/DC LED driver featuring the constant voltage mode with PWM style output, which is able to maintain the brightness homogeneity when driving all kinds of LED strips. PWM-60 operates from 90~305VAC and offers models with different rated voltage ranging between 12V and 48V. Thanks to the high efficiency up to 90%, with the fanless design, the entire series is able to operate for -40°C ~ +85°C case temperature under free air convection. The entire series is rated with IP67 ingress protection level and is suitable to work for dry, damp or wet locations. PWM-60 is equipped with dimming function that varies the duty cycle of the output, providing great flexibility for LED strips applications.

## Model Encoding

PWM - 60 - 24 □

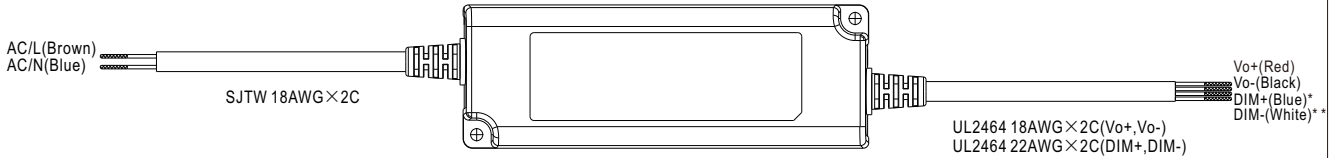


Type	IP Level	Function	Note
Blank	IP67	3 in 1 dimming function (0~10Vdc, 10V PWM signal and resistance)	In stock
DA	IP67	DALI control technology.(for 12V/24V with DA type only)	In stock

## SPECIFICATION

MODEL		PWM-60-12□	PWM-60-24□	PWM-60-36□	PWM-60-48□
OUTPUT	DC VOLTAGE	12V	24V	36V	48V
	RATED CURRENT	5A	2.5A	1.67A	1.25A
	RATED POWER	60W	60W	60.12W	60W
	DIMMING RANGE	0 ~ 100%			
	PWM FREQUENCY (Typ.)	1.47kHz			
	SETUP, RISE TIME Note.2	500ms, 80ms/ 115AC or 230VAC			
	HOLD UP TIME (Typ.)	16ms/115VAC or 230VAC			
INPUT	VOLTAGE RANGE Note.3	90 ~ 305VAC      127 ~ 431VDC (Please refer to "STATIC CHARACTERISTIC" section)			
	FREQUENCY RANGE	47 ~ 63Hz			
	POWER FACTOR (Typ.)	PF>0.97/115VAC, PF>0.95/230VAC, PF>0.92/277VAC @ full load (Please refer to "POWER FACTOR (PF) CHARACTERISTIC" section)			
	TOTAL HARMONIC DISTORTION	THD< 20%(@load≥60%/115VAC, 230VAC; @load≥75%/277VAC) (Please refer to "TOTAL HARMONIC DISTORTION" section)			
	EFFICIENCY (Typ.)	86%	89%	90%	90%
	AC CURRENT (Typ.)	0.8A / 115VAC      0.4A / 230VAC      0.32A / 277VAC			
	INRUSH CURRENT (Typ.)	COLD START 50A(twidth=270μs measured at 50% Ipeak) at 230VAC; Per NEMA 410			
	MAX. NO. of PSUs on 16A CIRCUIT BREAKER	9 units (circuit breaker of type B) / 16 units (circuit breaker of type C) at 230VAC			
	LEAKAGE CURRENT	<0.25mA / 277VAC			
	NO LOAD POWER CONSUMPTION	<0.5W			
PROTECTION	OVERLOAD	108 ~ 130% rated output power Hiccup mode, recovers automatically after fault condition is removed			
	SHORT CIRCUIT	Shut down o/p voltage, re-power on to recover			
	OVER VOLTAGE	15 ~ 17V	28 ~ 34V	41 ~ 46V	54 ~ 60V
	OVER TEMPERATURE	Shut down o/p voltage, re-power on to recover			
ENVIRONMENT	WORKING TEMP.	Tcase=-40 ~ +85°C (Please refer to "OUTPUT LOAD vs TEMPERATURE" section)			
	MAX. CASE TEMP.	Tcase=+85°C			
	WORKING HUMIDITY	20 ~ 95% RH non-condensing			
	STORAGE TEMP., HUMIDITY	-40 ~ +80°C, 10 ~ 95% RH			
	TEMP. COEFFICIENT	±0.03%/°C (0 ~ 50°C)			
	VIBRATION	10 ~ 500Hz, 5G 12min./1cycle, period for 72min. each along X, Y, Z axes			
SAFETY & EMC	SAFETY STANDARDS Note.5	UL8750( type "HL" )( except for DA-Type), UL879( for 12V,24V Blank Type only), CSA C22.2 No. 250.13-12; ENEC EN61347-1, EN61347-2-13 independent, EN62384, IP67, BIS IS15885(for 12,24,48 Blank Type only), EAC TP TC 004, GB19510.1, GB19510.14 approved; Design refer to EN60335-1			
	DALI STANDARDS	Comply with IEC62386-101, 102, 207 for DA-Type only, Device type 6(DT6)			
	WITHSTAND VOLTAGE	I/P-O/P:3.75KVAC			
	ISOLATION RESISTANCE	I/P-O/P:100M Ohms / 500VDC / 25°C / 70% RH			
	EMC EMISSION Note.6	Compliance to EN55015, EN61000-3-2 Class C (@load≥60%) ; EN61000-3-3, GB17743 and GB17625.1, EAC TP TC 020			
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; EN61547, light industry level (surge immunity Line-Line 2KV), EAC TP TC 020			
OTHERS	MTBF	996K hrs min. Telcordia SR-332 (Bellcore) ;      271.03K hrs min. MIL-HDBK-217F (25°C)			
	DIMENSION	150*53*35mm (L*W*H)			
	PACKING	0.49Kg;30pcs/15.7Kg/1.0CUFT			
NOTE	<ol style="list-style-type: none"> <li>All parameters NOT specially mentioned are measured at 230VAC input, rated current and 25°C of ambient temperature.</li> <li>De-rating may be needed under low input voltages. Please refer to "STATIC CHARACTERISTIC" sections for details.</li> <li>Length of set up time is measured at first cold start. Turning ON/OFF the driver may lead to increase of the set up time.</li> <li>The driver is considered as a component that will be operated in combination with final equipment. Since EMC performance will be affected by the complete installation, the final equipment manufacturers must re-qualify EMC Directive on the complete installation again.</li> <li>This series meets the typical life expectancy of &gt;50,000 hours of operation when Tcase, particularly (C) point (or TMP, per DLC), is about 75°C or less.</li> <li>Please refer to the warranty statement on MEAN WELL's website at <a href="http://www.meanwell.com">http://www.meanwell.com</a></li> <li>The ambient temperature derating of 3.5°C/1000m with fanless models and of 5°C/1000m with fan models for operating altitude higher than 2000m(6500ft).</li> <li>For any application note and IP water proof function installation caution, please refer our user manual before using. <a href="https://www.meanwell.com/Upload/PDF/LED_EN.pdf">https://www.meanwell.com/Upload/PDF/LED_EN.pdf</a></li> </ol>				

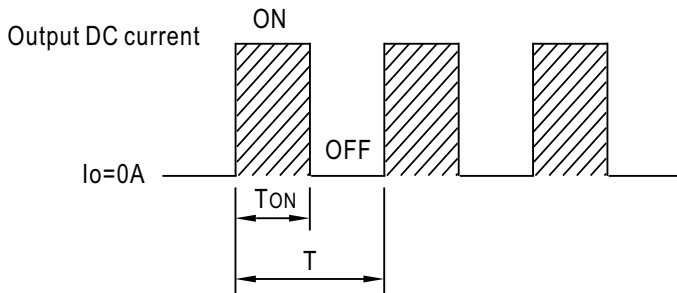
**■ DIMMING OPERATION**



※ **Dimming principle for PWM style output**

- Dimming is achieved by varying the duty cycle of the output current.

\* DIM+ for Blank-Type  
 DA+ for DA-type  
 \* DIM- for Blank-Type  
 DA- for DA-type  
 NOTE: DA Type is no distinction between "+" and "-" poles



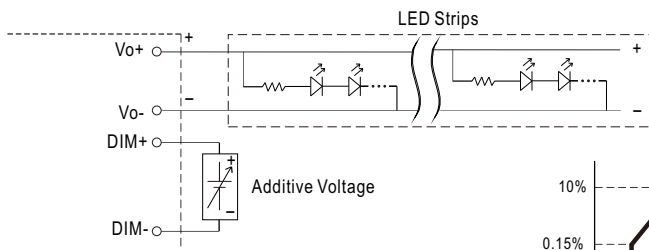
$$\text{Duty cycle(\%)} = \frac{T_{ON}}{T} \times 100\%$$

Output PWM frequency : 1.47kHz fixed (Typ.)

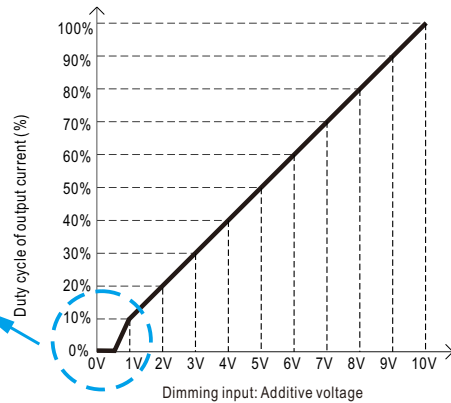
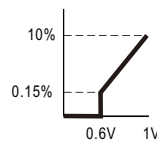
※ **3 in 1 dimming function (for Blank-Type)**

- Apply one of the three methodologies between DIM+ and DIM-: 0 ~ 10VDC, or 10V PWM signal or resistance.
- Dimming source current from power supply: 100µA (typ.)

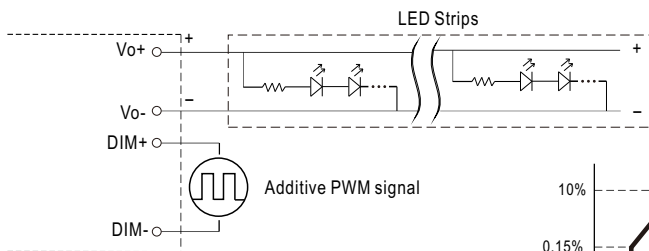
◎ Applying additive 0 ~ 10VDC



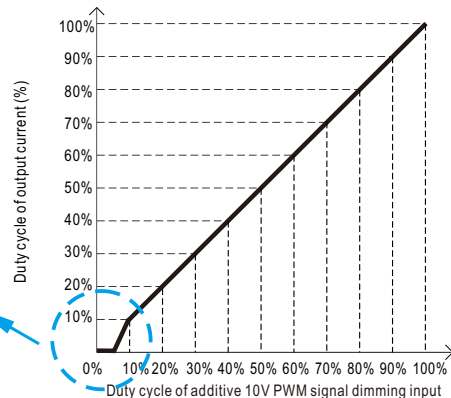
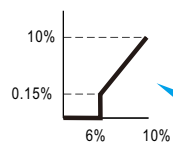
"DO NOT connect "DIM- to Vo-"



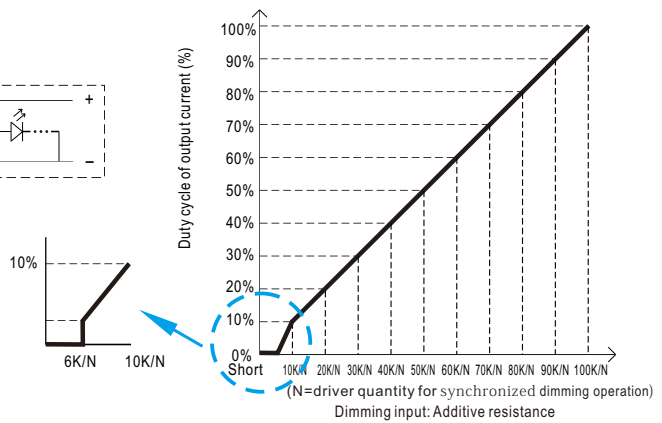
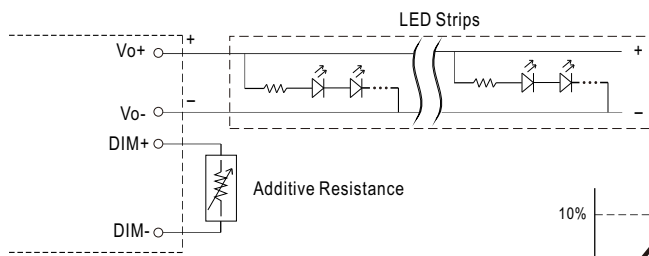
◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



"DO NOT connect "DIM- to Vo-"



© Applying additive resistance:

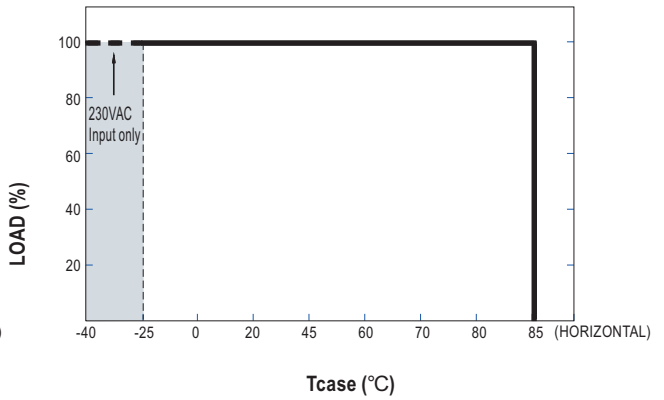
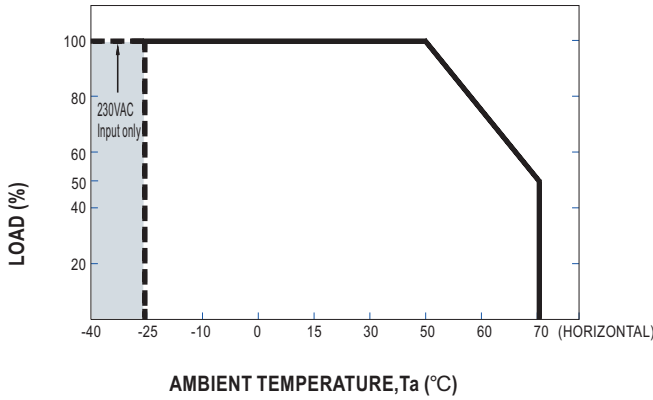


Note : 1. Min. duty cycle of output current is about 6% and the output current is not defined when  $0\% < I_{out} < 6\%$ .  
 2. The duty cycle of output current could drop down to 0% when dimming input is about  $0k\Omega$  or 0Vdc, or 10V PWM signal with 0% duty cycle.

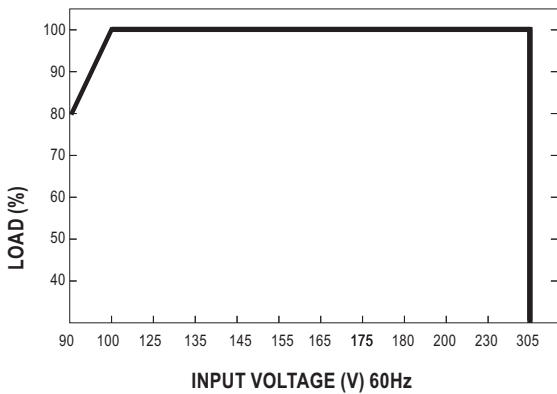
※ DALI Interface (primary side; for DA-Type)

- Apply DALI signal between DA+ and DA-.
- DALI protocol comprises 16 groups and 64 addresses.
- First step is fixed at 0.2% of output

**OUTPUT LOAD vs TEMPERATURE**



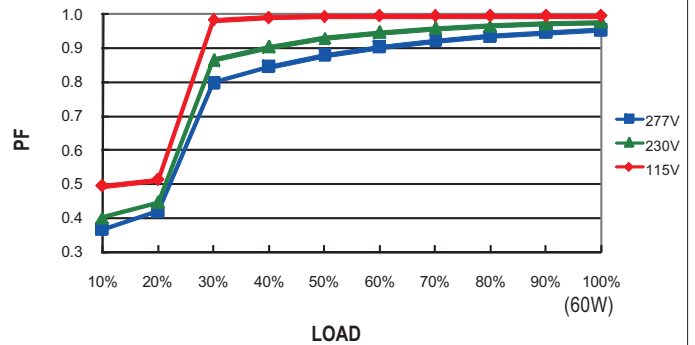
**STATIC CHARACTERISTIC**



※ De-rating is needed under low input voltage.

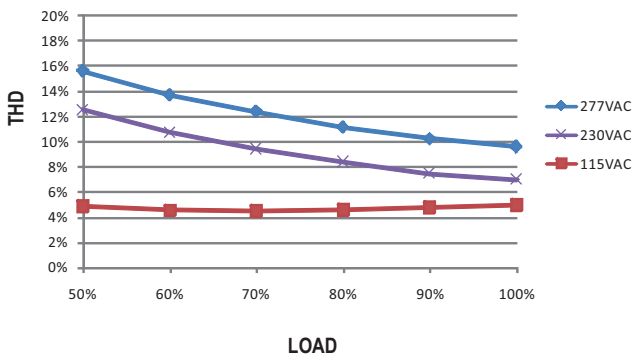
**POWER FACTOR (PF) CHARACTERISTIC**

※  $T_{case}$  at 75°C



**TOTAL HARMONIC DISTORTION (THD)**

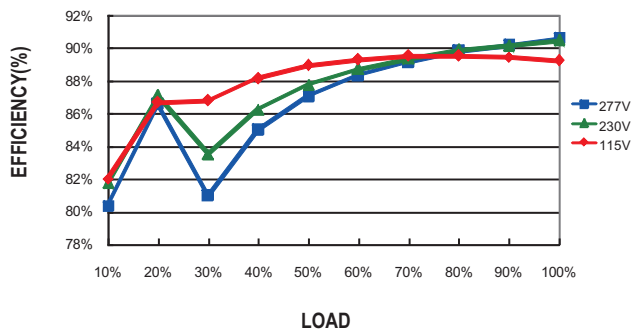
※ 48V Model,  $T_{case}$  at 75°C



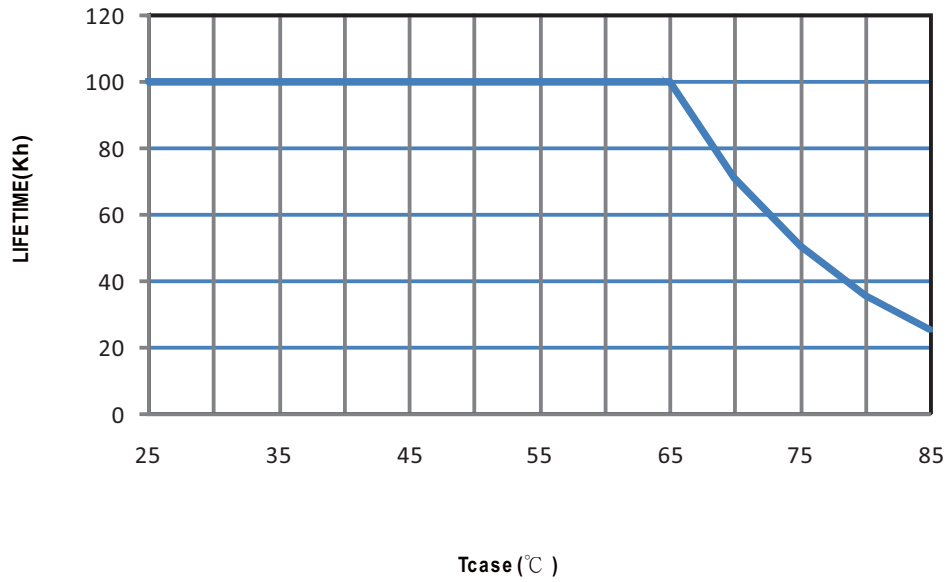
**EFFICIENCY vs LOAD**

PWM-60 series possess superior working efficiency that up to 90% can be reached in field applications.

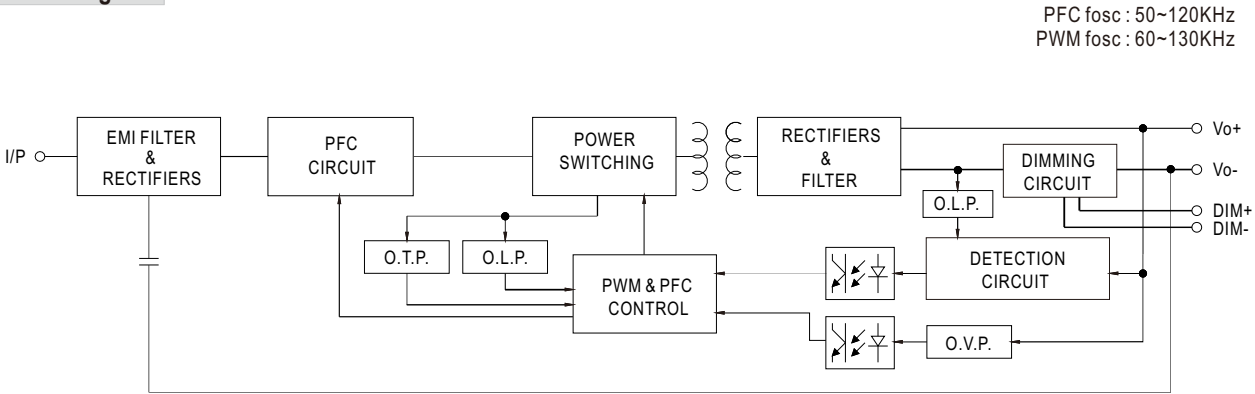
※ 48V Model,  $T_{case}$  at 75°C



■ LIFE TIME

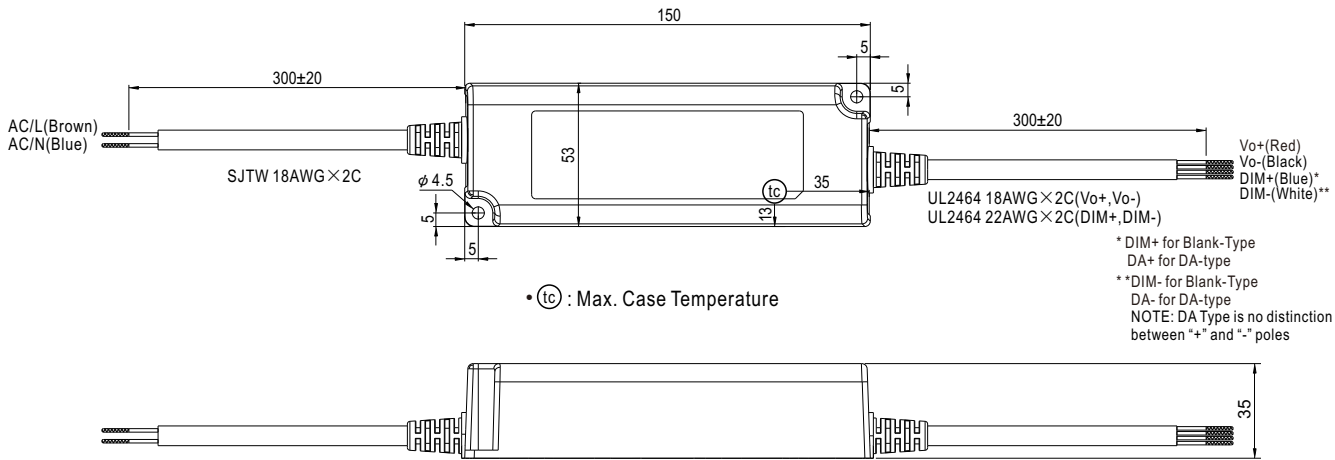


■ **Block Diagram**

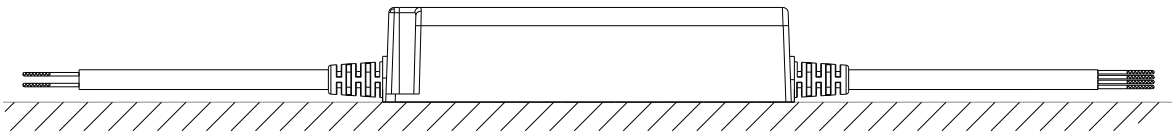


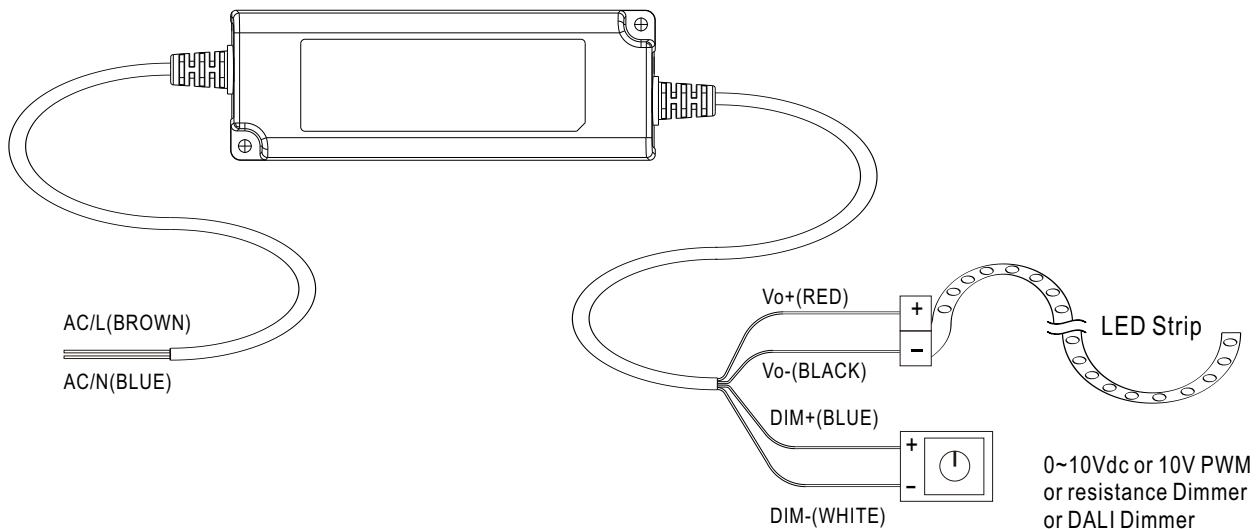
■ **Mechanical Specification**

Case No. NPF-60A Unit:mm



■ **Recommend Mounting Direction**



**■ Installation Manual****◎ Connection for Blank-type****◎ Cautions**

- Before commencing any installation or maintenance work, please disconnect the power supply from the utility. Ensure that it cannot be re-connected inadvertently!
- Keep proper ventilation around the unit and do not stack any object on it. Also a 10-15 cm clearance must be kept when the adjacent device is a heat source.
- Mounting orientations other than standard orientation or operate under high ambient temperature may increase the internal component temperature and will require a de-rating in output current.
- Current rating of an approved primary /secondary cable should be greater than or equal to that of the unit. Please refer to its specification.
- For LED drivers with waterproof connectors, verify that the linkage between the unit and the lighting fixture is tight so that water cannot intrude into the system.
- For dimmable LED drivers, make sure that your dimming controller is capable of driving these units. PWM series require 0.15mA each unit.
- Tc max. is identified on the product label. Please make sure that temperature of Tc point will not exceed limit.
- DO NOT connect "DIM- to Vo-".
- Suitable for indoor use or outdoor use without direct sunlight exposure. Please avoid immerse in the water over 30 minutes.
- The power supply is considered as a component that will be operated in combination with final equipment. Since EMC performance will be affected by the complete installation, the final equipment manufacturers must re-qualify EMC Directive on the complete installation again.
- For more information about installation, Please refer to : <http://www.meanwell.com/manual.html> for details.