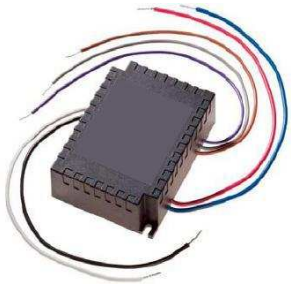
# EMERAL TECH

ELEDL-0700040-S

## Technical Specification

**ELED-0700120-S**

**ELED-0700040-S**



### 40W 700 mA Dimmable HV LED Driver Module

**PRODUCTION DATASHEET**

## Description

ELED-0700040-S is a fully enclosed compact solid-state LED lighting driver module. It operates from a universal AC input supply in the range of 347VAC to 480VAC, 60Hz to drive a string of LEDs with active power factor correction. LED string voltage can range from 40V to 57V at a constant current of 700mA.

Control terminal leads include a dimming input BRITE A with a dedicated RETURN lead. The amplitude of the output LED string current will vary from 10% to 100% corresponding to a 1VDC to 10VDC signal on the BRITE A input following the 0V to 10V ESTA E1.3-2001 Analog

Control Specification Standard. The BRITE A terminal when pulled down below minimum dimming will turn off the LEDs and enter a low power consumption mode. A second control terminal lead provides a FAULT indicator. In the case that there is an LED string short between OUTPUT(+) and OUTPUT(-), or string open, or a product over temperature condition the FAULT terminal will go low. The FAULT terminal includes an open collector device that can be pulled up to a maximum of 60V and will sink 8mA typical to 0.8V when a short or open fault occurs.

To reduce audible noise the internal switching frequency remains above 30kHz. Safety features include open output circuit protection, whole string short circuit protection. The maximum allowable hot spot case temperature is 90°C (above this temperature the module will be thermally self protected). The recommended operating ambient temperature range is -30°C to 70°C, as long as the maximum case temperature is not exceeded. The compact enclosure is rated to IP66, meets UL8750 and UL1310 class 2.

## Applications

- Residential and Commercial LED
- Lighting Fixtures such as:
- LED Down Lights
- LED Street Lights

**ELED Series**

# 40W 700mA Dimmable HV LED Driver Module

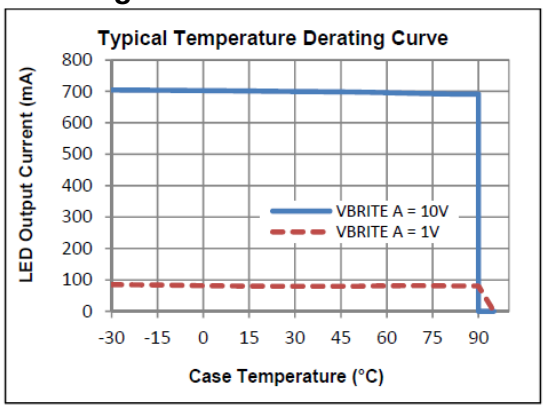
**EMERALTECH**

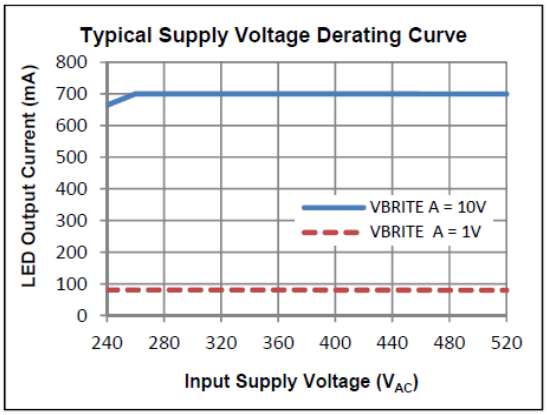
# ELED-0700040-S

## Key Features

- High Voltage AC Input: 347VAC to 480VAC
- High Efficiency
- Active Power Factor Correction
- Constant Current 700mA
- Dimming Input Provides 10% to 100% Range, Plus Shutdown
- Anode Supply Adjusts for String Voltage between 40V and 57V
- Small Compact Size
- Suitable for Damp Locations (IP66)
- UL8750 & UL1310
- UL File E337545
- FCC Class B
- Long Life Expectancy
- RoHS Compliant
- Full Protection: OVP, SCP, OTP, Maximum Power Limit
- Unique Fault Detection and Management

## Derating Curve




## ABSOLUTE MAXIMUM RATINGS

Input Voltage (VIN) ..... 0VAC to 528VAC
Input Power ..... 50W (Internally Limited)
Input Frequency (VIN) ..... 57Hz to 63Hz
Peak Output LED String Current .....810mA (Internally Limited)
Peak Output String Voltage .....59.5V (Internally Limited)
Output Power ..... 44W (Internally Limited)
Input Signal Voltage (BRITE A Input) .....-0.3V to greater of 10V or OUTPUT(+)
Output Signal Voltage (FAULT) ..... -0.3V to 60V
Cold Start Temperature ..... -30°C
Hot Spot Case Temperature, zero airflow ..... 90°C
Storage Temperature Range ..... -40°C to 85°C
Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

## Part Number and Selection Information

| Part Number | Input Voltage | Output Voltage | Efficiency |
|---|---|---|---|
| **ELEDL221D-0700040-D2F** | **347VAC to 480VAC 60Hz** | **700mA Dimmable Current Source 40V to 57V Anode Voltage** | > 91 |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# 40W 700mA Dimmable HV LED Driver Module ELEDL221D-0700040-S

| Parameter | Symbol | Min | R.C. | Max | Units |
|---|---|---|---|---|---|
| Input Voltage | VIN | 347 | | 480 | VAC |
| Linear BRITE A Control Input Voltage Range | VBRITE A | 0 | | 10 | V |
| Linear BRITE A Control PWM Frequency Range (Open Collector) | VBRITE_PWM | 0.2 | | 10 | kHz |
| Linear BRITE A Control PWM Amplitude Range(Totem Pole) | VBRITE_PWM | 10 | | VOUTPUT(+) | V |
| Linear BRITE A Control PWM Frequency Range (Totem Pole) | VBRITE_PWM | 0.2 | | 25 | kHz |
| LED String Voltage (at 700mA) | VLED | 40 | | 57 | V |
| OUTPUT(-) Sink Current | OUTPUT(-)ISINK | | 700 | mA | mA |
| Maximum Allowable Case Temperature | TC | | | 90 | °C |
| Cold Start Temperature | TCOLD | -30 | | | °C |

## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the recommended operating condition except where otherwise
noted; VIN = 347VAC to 480VAC , 60Hz; BRITE A = 8kΩ to RETURN; FAULT = 1kΩ pull up to 10V Full Load condition uses an LED load with 57VDC @ 700mA unless otherwise noted. Case temperature range: -30°C to 90ºC; production tested at 25ºC.

| Parameter | Symbol | Test Conditions / Comment | Min | Type | Max | Units |
|---|---|---|---|---|---|---|
| Input Voltage | VIN | Line Frequency 57 to 63 Hz | 312 | | 528 | VAC |
| Off Power | PIN(MIN) | BRITE A ≤ 0.5V, VIN = 480VAC | | | 0.5 | W |
| Input AC Current | I347 | Measured at Full Load and 347VAC Input | | | 175 | mA |
| | I480 | Measured at Full Load and 480VAC Input | | | 125 | mA |
| Maximum Inrush Current | IINRUSH | Measure at 480VAC Peak AC Line; Maximum Duration 10µs | | | 60 | A |
| | | Measure at 480VAC Peak AC Line Measured after 10µs | | | 5 | A |
| Power Factor | | Full Load, 347VAC to 480VAC | 0.9 | | | PF |
| Efficiency | η | Full Load, VLED = 57V, VIN = 480VAC | 88 | 91 | | % |
| Total Harmonic Distortion | THD | Full load, 347VAC to 480VAC | | | 15 | % |
| ***OUTPUTS*** | | | | | | |
| Average Sink Current | $I_{OUT-}$ | $T_A$ = 25°C | 665 | 700 | 735 | mA |
| LED String Peak Voltage | $V_{OUTΔ}$ | Rated LED current | 40 | | 57 | V |
| Ripple (pk-pk) | $V_{OUTΔ}$ | Full Load, $V_{LED}$ = 57V, (pk to pk)/Average | | | 2 | % |
| Line Regulation | $I_{OUT-}$ | $V_{IN}$ = Nominal ± 10% (i.e. 480$V_{AC}$ ± 10%) | | | 1 | % |
| Load Regulation | IOUT- | OUTPUT(+) 40V to 57V | | | 1 | % |
| Turn-on Time | $t_{TURN\_ON}$ | Cold Start, Power ON | | 0.2 | 0.5 | Sec |
| Output Overshoot / | $I_{OUT+}$ | Turning Power On or Off | | | 10 | % |

| | | | | | | |
|---|---|---|---|---|---|---|
| Undershoot | | | | | | |
| ***Dimming*** | | | | | | |
| BRITE A Voltage Setting | VBRITE A | For maximum brightness | 9.5 | 19 | 10.5 | V |
| | | For Minimum brightness | 0.95 | 1 | 1.04 | |
| BRITE A Output Current | IBRITE A | BRITE A to RETURN | 1.19 | 1.25 | 1.37 | mA |
| Minimum Output Current | IMIN | BRITE A = 0.95V | | 10 | | % of Max |
| Output Current Dim Range (Analog Dimming) | | LED = 700mA, BRITE A = 0.95V Versus BRITE A ≥ 10V | | 10.1 | | RATIO |
| Shutdown Voltage | VBRITE A | | | | 0.6 | V |
| ***FAULT*** | | | | | | |
| Output Voltage Low | VFAULT | Short OUTPUT(+) to OUT(-), FAULT = 8mA | | | 0.8 | V |
| Leakage Current | IFAULT | No fault, VFAULT = 57V | | | 10 | μA |
| ***Protection*** | | | | | | |
| Overvoltage Protection | Vov | Maximum OUT(+) | 57.5 | 58.5 | 59.5 | V |
| Over Temperature Shutdown | TOT | Over Case Temperature Protection Hot Spot | 90 | 95 | | °C |

| ***Safety & EMC Compliance*** | |
|---|---|
| UL | Compliance to UL8750 & UL1310 Class 2 File E337545 |
| FCC Title 47, Part 15 | Conducted and Radiated Emission, Class B |
| EN 61000-3-3 | Voltage fluctuations and flicker |
| EN 61000-4-2 | Electrostatic Discharge Immunity |
| EN 61000-4-3 | Radiated Susceptibility test |
| EN 61000-4-4 | Electrical Fast Transient |
| EN 61000-4-5 | Surge Immunity Test, AC Power Line, Class3 (2kV |
| EN 61000-4-6 | Conducted Susceptibility Immunity test |
| EN 61000-4-8 | Power Frequency Magnetic Field Immunity Test |
| EN 61000-4-11 | Voltage Dips and Interruption Immunity |
| Life Expectancy | 5 years / 50,000 hours @ 100% duty at maximum case temperature 55° |
| MTBF | 221,569 hours, case temperature 55°; 121,565 hours case temperature 70°C Bellcore TR-NWT-332, Issue 6; Method 1, Case 3, Ground Benign |
| Environmental Standards | EU RoHS, REACH |

# 40W 700mA Dimmable HV LED Driver Module ELEDL221D-0700040-S

## LEAD DESCRIPTION

| Name | Pin # | Description |
|---|---|---|
| **INPUT TERMINAL LEADS (18AWG)** | | |
| BLACK | AC LINE | Main Input Power Supply Line 347VAC to 480VAC |
| WHITE | AC NEUTRAL | Main Input Power Supply Neutral |
| **CONTROL TERMINAL LEADS (22AWG)** | | |
| PURPLE | BRITE A | Analog Dimming Input (Full Brightness if Open |
| GRAY | RETURN | RETURN |
| BROWN | FAULT | Fault Signal (Low During Whole LED String Short or Open |
| **OUTPUT TERMINAL LEADS (18AWG)** | | |
| RED | OUTPUT(+) | LED String Anode Voltage (High Side) |
| BLUE | OUTPUT(-) | OUTPUT (-) LED Cathode Voltage (Low Side) 700mA |

## FAULT TABLE

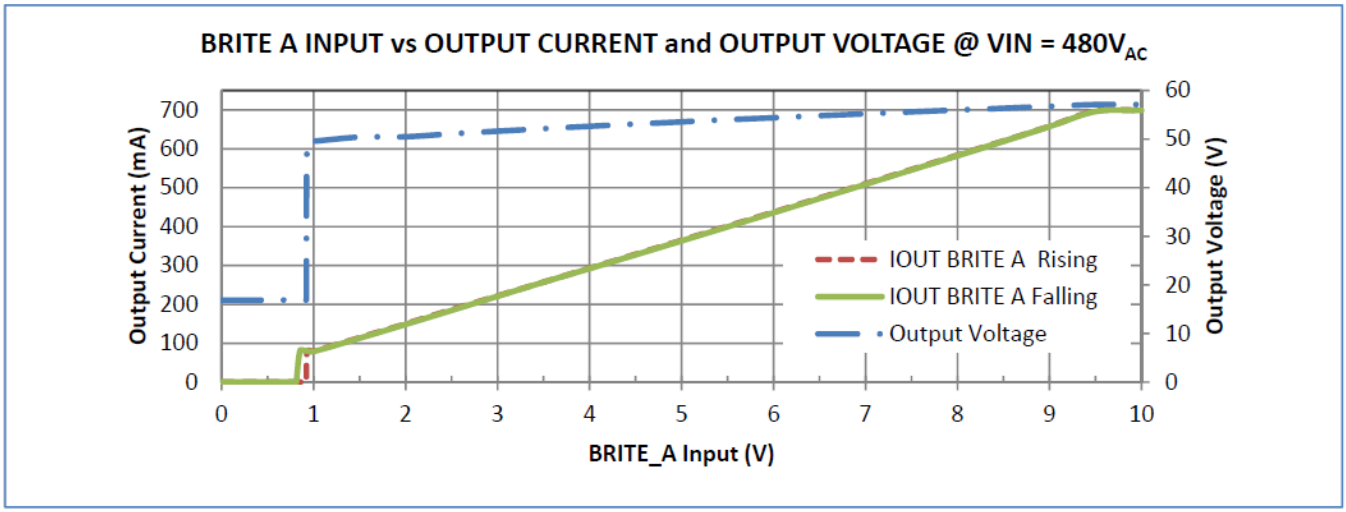
| CONDITION | OUTPUT(-) | FAULT | DRIVER STATUS | COMMENT |
|---|---|---|---|---|
| OUTPUT(+) String OUTPUT (-) (700mA) | ON | Hi-Z | ON | |
| OUTPUT(+) OPEN OUT(-) | OPEN | LOW | OUTPUT(+) Max Voltage | |
| OUTPUT(+) Short OUT(-) | OPEN | LOW | SHUTDOWN | |
| OUTPUT(+) String OUTPUT (-) w/ 1 or more LED short | ON | Hi-Z | ON | STAYLIT™, OUTPUT(+) ≥ 20V |
| Over Temperature at the Case Hot Spot | OPEN | LOW | SHUTDOWN | When the temperature goes down, the module turns on again (no user intervention) |
| Power Loss (Blackout) Event | OPEN | LOW | SHUTDOWN | When Power comes back, the module turns on again (no user intervention) |
| BRITE A Shorted TO RETURN or OUTPUT(-) | OPEN | Hi-Z | SHUTDOWN | |
| BRITE A OPEN (or Resistor > 12kOhm) | ON | Hi-Z | ON | |

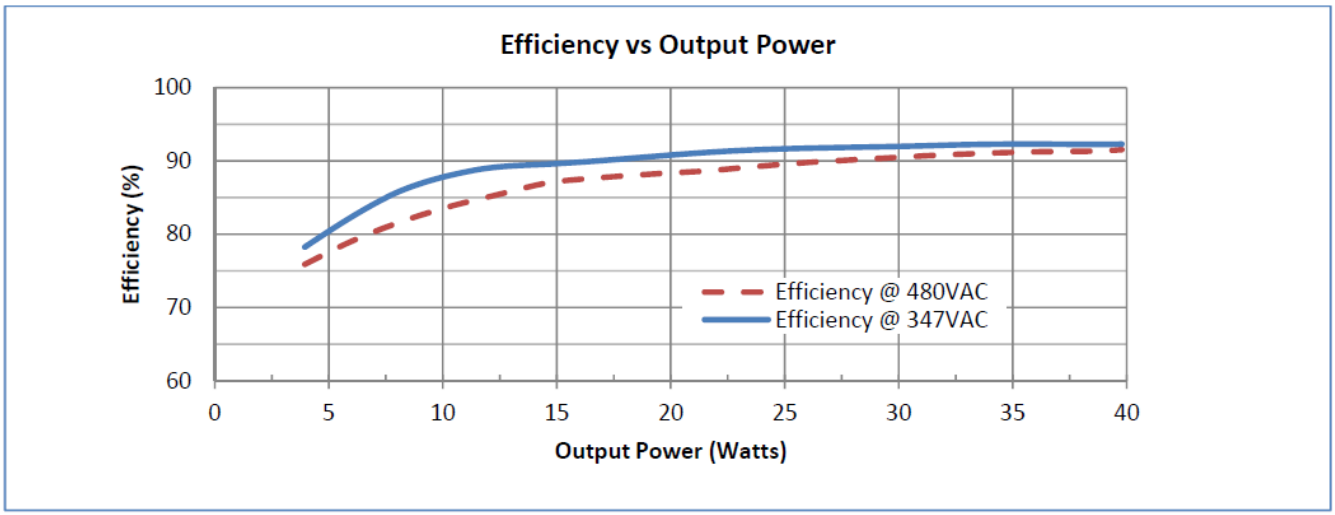
## CONDITIONS OF ACCEPTABILITY

| |
|---|
| The components have been judged on the basis of the required spacings in the Standard for Class 2 Power Units, UL 1310. |
| The input and output leads are 18 AWG, rated 600V, 105ºC, VW-1. The suitability of the leads shall be determined in each enduse application. The leads are suitable for factory wiring only, and additional investigation will be required for field wiring. |
| The polymeric housing is rated V-0 and has been subjected to a ball-impact test. The need for a suitable enclosure shall be considered in the end product. |
| The component has been evaluated for dry and damp locations, where the humidity conditioning and dielectric tests |

| |
|---|
| were conducted per UL 8750. |
| The maximum temperature measured on housing outside surface was 61.3°C during the Temperature Test when shifted to Ambient Temperature 40°C. The necessity of repeated Temperature Test shall be determined in each end use application. |
| A proper mechanical, electrical and fire enclosure shall be provided in the end-use application that is in compliance with all the applicable requirements of the end-use application. |
| Testing was on a 20 A branch circuit. If used on a branch circuit greater than this, additional testing may be necessary. |
| The LED driver is rated as noted in the Electrical Ratings Table above, and the outputs comply with the requirements for Class 2. The need for additional evaluation shall be considered in the end product if used beyond these ratings. |
| The LED driver is provided with dimmer leads for connecting an external 0-10 VDC source for dimming the output current. The leads colors are shown in box below. The dimmer circuit is considered as Class 2 circuit |

## TYPICAL CHARACTERISTIC CHARTS 25°C



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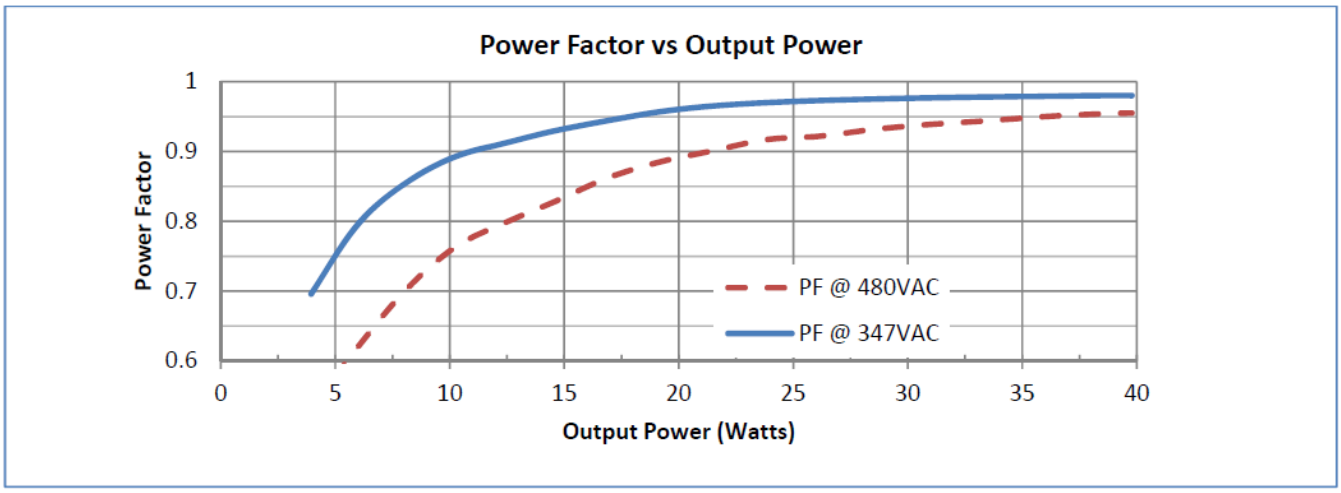
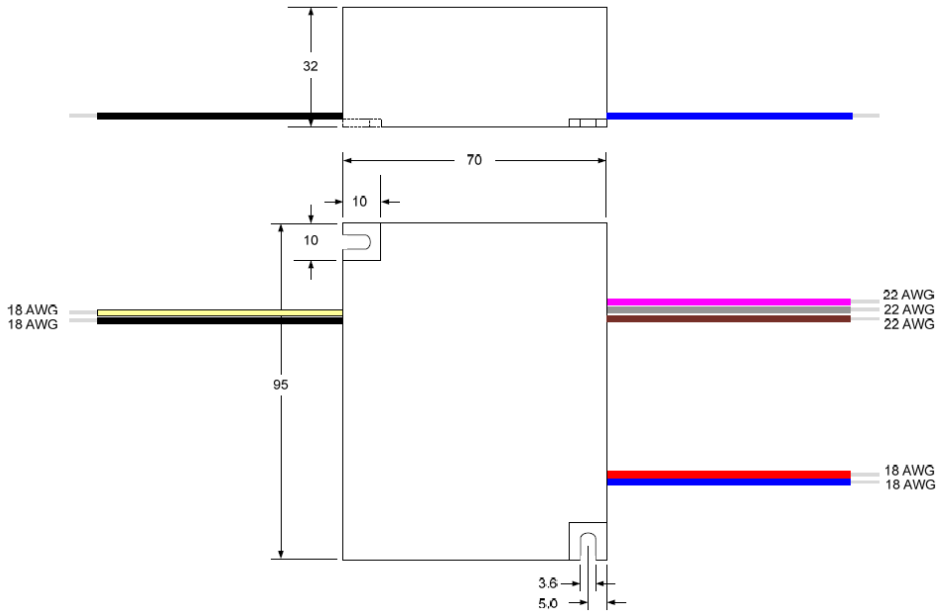



| Lead Function | Color |
|---|---|
| AC LINE | BLACK |
| AC NEUTRAL | WHITE |
| OUTPUT(+) | RED |
| OUTPUT(-) | BLUE |
| RETURN | GRAY |
| FAULT | BROWN |
| BRITE A | PURPLE |

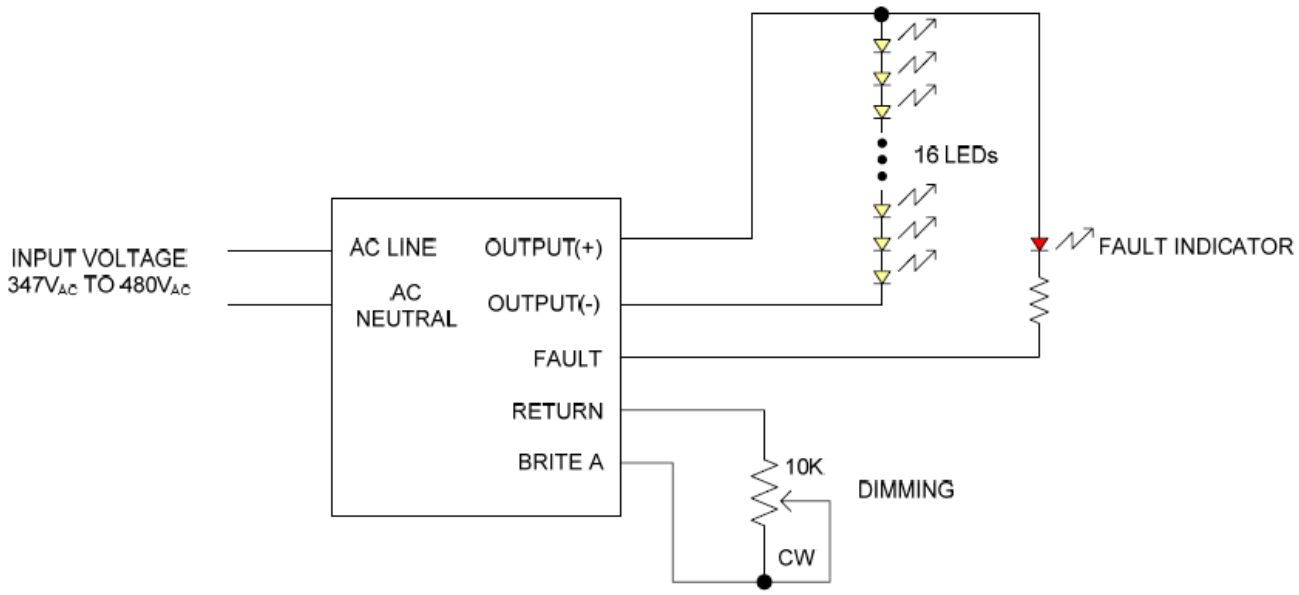
## MECHANICAL DRAWING



# 40W 700mA Dimmable HV LED Driver Module ELEDL221D-0700040-S

Wire length is 230mm ± 10mm, stripped 12mm ± 5mm UL1015 AWG#18 16/30 stranded 105°C Input & Output wires; AWG#22 7/30 stranded Control wires, all wires tinned. Please insure the wire nuts are installed correctly to prevent intermittent operation. Connecting the AC input to Control or Output wires will result in damage to the module.

## APPLICATION INFORMATION




## NOTES