D-SERIES GENERAL PURPOSE CONSTANT CURRENT LED DRIVERS

Features

- Up to 91% IC efficiency with switch-mode power electronics
- Wide input voltage range:
  9-40V AC/DC
- AC/DC operation*
- 350/500/700/1000/1400mA constant current options
- PWM dimming
- Potentiometer dimming
- 0-10V dimming
- Soft-start to prevent any harm to the LEDs during start-up
- Reverse polarity protection at the inlet*
  (to prevent confusion between + and -)
- Connection pins for easy integration to other circuitry *(optional)* **NEW**
- On-board mini-trimpot for sensitive current adjustment *(optional)* **NEW**
- Small size: 4.2cm x 3.2cm x 1.2cm
- Cool operation** *additional heatsink not required-*
- Screw terminals for easy assembly *(optional)*
- 3mm mounting holes
- Custom design&production option

* This feature is removed for ACG-D1400. AC voltage can not be used, (+) and (–) terminals must be connected in order.

** ACG-D1400 may need a heatsink depending on where it is used.

Applications

- General lighting
- Signage and decorative lighting
- Automotive
- Medical
- Advertising and backlighting
- Solar and other low voltage applications

PRODUCT DESCRIPTION –*minimum recommended input voltages-*

ACG-D350

350mA constant current driver

- 9V AC/DC, 1 LED
- 16V AC/DC, 2 LEDs in series
- 21V AC/DC, 3 LEDs in series
- 27V AC/DC, 4 LEDs in series
- 33V AC/DC, 5 LEDs in series
- 40V AC/DC, 6 LEDs in series

ACG-D500

500mA constant current driver

- 9V AC/DC, 1 LED
- 17V AC/DC, 2 LEDs in series
- 23V AC/DC, 3 LEDs in series
- 30V AC/DC, 4 LEDs in series
- 36V AC/DC, 5 LEDs in series

ACG-D700

700mA constant current driver

- 9V AC/DC, 1 LED
- 18V AC/DC, 2 LEDs in series
- 25V AC/DC, 3 LEDs in series
- 33V AC/DC, 4 LEDs in series
- 40V AC/DC, 5 LEDs in series

ACG-D1000

1000mA *constant current driver*

- 9V AC/DC, 1 LED
- 19V AC/DC, 2 LEDs in series
- 27V AC/DC, 3 LEDs in series
- 34V AC/DC, 4 LEDs in series
- 40V AC/DC, 5 LEDs in series

ACG-D1400 (NEW)

1400mA *constant current driver*

- 9V AC/DC, 1 LED
- 19V AC/DC, 2 LEDs in series
- 27V AC/DC, 3 LEDs in series
- 34V AC/DC, 4 LEDs in series
- 40V AC/DC, 5 LEDs in series

* *If the input voltage is lower than the specified values, the output current will be affected.*

PRODUCT DESCRIPTION

D-Series constant current drivers are designed to operate 1W, 3W and 5W (or even higher) high power LEDs with a stable current that is independent of the input voltage.

For instance, most LED manufacturers recommend 350mA drive current for 1W LEDs. ACG-D350 has an output current of 350mA for that purpose. Similarly ACG-D500, D700, D1000 and D1400 will output 500mA, 700mA, 1000mA and 1400mA respectively. Depending on the LED manufacturers data, the suitable driver must be used.

If the LEDs are connected to the circuit in parallel rows, the output current will be divided. For example if 2 LEDs are connected to ACG-D700:

i. in series, the LED current will be 700mA
ii. in parallel, the LED current will be 700/2=350mA

So it is possible to drive higher number of LEDs by using a higher current driver and connecting LEDs in parallel rows. Description of series and parallel connection is given in detail and can be reached from “connection diagrams” section. Advantages of D-Series drivers can be given as:

1. Constant current

D-Series drivers are designed to power LEDs with constant current (cc), independent of the input voltage.

For example to drive 2 high power LEDs, connecting the driver to any input voltage between 12-40V will suffice. Normally the maximum voltage ripple at the output is 2%.

For the situations that the distance between the power supply and the LEDs is 10-15m or higher, the input voltage may drop significantly because of the resistance of the cable. If constant current drivers are not used, the brightness and colors/color temperatures of the LEDs may vary and this can be easily noticed.

Constant current drivers, which are also recommended by LED manufacturers, will protect the LEDs from voltage transients and helps to design long-life, reliable systems.

2. High efficiency

The most known and used method to drive ultra-bright LEDs is connecting a resistor in series to the LEDs to limit the current. However by improvements in LED industry, the LED currents are increasing rapidly. Some high power LEDs are rated up to 2800mA while the old fashioned LEDs are still being driven at 20mA. Using resistors at

PRODUCT DESCRIPTION

that current levels may cause the resistor to overheat dangerously and most of the energy to turn into heat instead of light.

D-Series constant current drivers are one of the highest efficiency products in the market with 91% IC efficiency.

3. AC/DC operation

Some conventional lighting systems use 12V AC input as default. For the cases that those systems will be replaced with LEDs, D-Series drivers can be used without any modification of the electrical wiring.

Additionally while designing a product, a simple transformer can be used to reduce the voltage from the mains supply(110/220V AC) to 9-40V AC and a D-Series drivers can be operated with AC.

4. Reverse polarity protection

Wrong wiring of (+) and (-) input voltage is a common problem during the assembly many lighting fixtures to a single line. This may not only increases the assembly durations, but also increases the cost and may even cause system failures.

The reverse polarity protection at the inlet of D-Series drivers helps to overcome that problem. (+) and (-) can be connected in any order.

** Only for D1400 model, the input rectifier is removed to increase the overall efficiency. (+) and (-) must be connected carefully. Check connection diagrams section (series connection) for details.*

5. PWM dimming

For some systems the on/off control of the LEDs by the user is enough, while for some cases it may be desirable to control light output with a microcontroller (or by a distant user). This is the case for RGB (color-changing) systems. Most color controller circuits are not capable of giving high currents at their outputs, but only generate PWM (pulse width modulation) signals.

If the frequency of the PWM signal is lower than or equals to 1000Hz, that signal can be easily

PRODUCT DESCRIPTION

connected to PWM input of D-Series drivers to dim the LEDs. The brightness of the LEDs will be controlled by the duty cycle in that case.

The recommended voltage for PWM signal is 5V (TTL), but it will still operate down to 2.7V. For PWM signals above 5V, a 50-100kΩ resistor must be connected in series before connecting the signal to PWM input of the driver.

**In order to use that feature, the PWM input of the driver must be activated on-board. Standard drivers are shipped with PWM disabled. To receive drivers with PWM input enabled, it must be stated in the order form. Standard drivers can be easily activated by removing a jumper. It is described in detail and can be found in connection diagrams section (PWM dimming).*

6. Dimming with potentiometer

D-Series drivers offers an easy solution when the brightness of the LEDs will be controlled by a potentiometer..

This feature can be used simply by connecting a 1kΩ potentiometer as described in connection diagrams section (potentiometer dimming).

**In order to use that feature, the DIM input of the driver must be activated on-board. Standard drivers are shipped with DIM disabled. To receive drivers with DIM input enabled, it must be stated in the order form. Standard drivers can be easily activated by removing a jumper. It is described in detail and can be found in connection diagrams section (potentiometer dimming).*

7. Dimming with 0-10V voltage input

Some lighting systems used for stage lighting are controlled by 0-10V analog voltage input. When the output of the controller is 0V the brightness of the lights are 0%, and when 10V is applied to the lighting equipment brightness is 100%.

D-Series drivers have the feature to dim the LEDs with 0-10V analog voltage input. The sample setup can be found in connection diagrams section (0-10V dimming).

**In order to use that feature, the DIM input of the driver must be activated on-board. Standard drivers are shipped with DIM disabled. To receive drivers with DIM input enabled, it must be stated in the order form. Standard drivers can be easily activated by removing a jumper. It is described in detail and can be found in connection diagrams section (0-10V dimming).*

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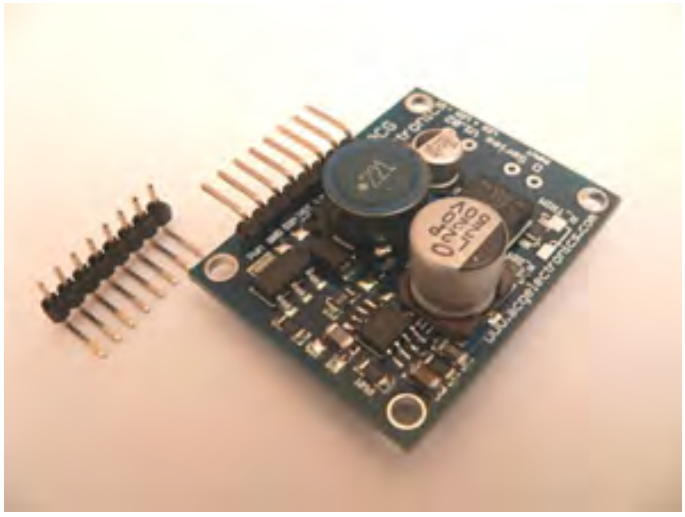
8. Soft-start

At the beginning of operation, power supllies may generate voltage transients which are normally harmful to the LEDs. Most light sources are turn on/off many times in a day, and LEDs are exposed to high voltage (high current) each time the power supply is turned on. The soft-start feature of D-Series drivers eliminates the voltage transients at the beginning of operation and prevents them to cause any harm to the LEDs.

9. Headers (NEW)



D-Series drivers can be used individually as well as being a part of another system or circuit. For the cases where it will be integrated to another circuit, I or L headers can be used as shown in the above photo.

10. 3mm mounting holes

The 3mm holes at the corners of D-Series drivers can be used to mount the circuits to a frame. They can also be screwed on plastic cable holders which have adhesive pads at the back.

Circuits may be screwed to cable holders.

11. On-board trimpot for accurate current adjustment (optional) (NEW)

For the cases where the current must be accurately adjusted to a specific level, the on-board potentiometer option can be used. Standard drivers

PRODUCT DESCRIPTION

does not have this option, but mini-trimpots can be requested for trial with sample orders and be mounted by the user. Or the drivers will be shipped with on-board trimpots if specified in the order form.

12. Screw terminals (optional)

Screw terminals can be used to connect/disconnect the input and output wires without soldering. If specified in the order form, suitable screw terminals will be shipped with the circuits.

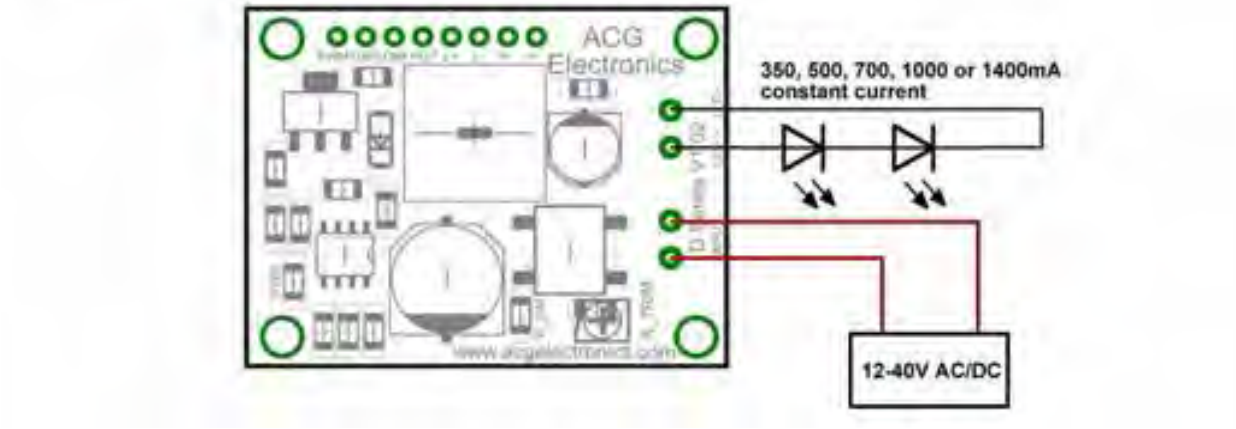
13. Paralel connection

- To drive "*more number of LEDs"*, it is possible to connect multiple rows of LEDs to the driver in parallel
- To drive "*LEDs with higher drive currents"*, it is possible to connect multiple drivers to the LEDs in parallel.

In that way, it is possible to drive a 2800mA LED with 2 pcs. ACG-D1400. An example can be seen in connection diagrams section.

CONNECTION DIAGRAMS

1. SERIES CONNECTION



i. In series connection, input voltage must be selected according to the number of LEDs connected in series.

to drive 1-2 LEDs connected in series, 12V or higher

to drive 3-4 LEDs connected in series, 24V or higher

to drive 5 LEDs connected in series, 30V or higher

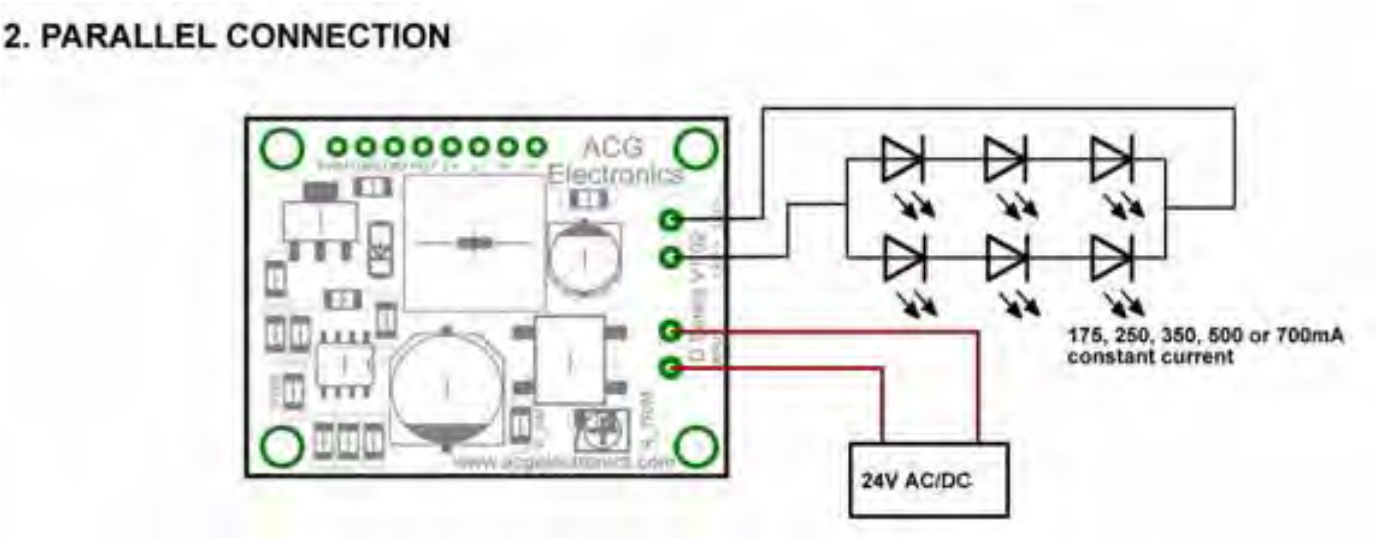
to drive 6 LEDs connected in series, 36V or higher

must be used. In the 2nd page of this document, recommended input voltages are specified for each drive current. It must be taken into account that with lower input voltages, the output current will be slightly affected. To drive more LEDs with a single driver, it is often recommended to use a higher input voltage.

ii. Because of the reverse polarity protection at the inlet, (+) and (–) input voltage can be connected in any order to the driver. But for ACG-D1400 model only, the input rectifier is canceled to obtain more efficiency. So one should pay attention to the order of V+ and V- for that model. The input voltage connections (in the above figure shown in red) : upper one must be V+, lower one must be V-. Because of the same reason, AC voltage input is also not possible for ACG-D1400. *Check page 4 for the Figure.*

CONNECTION DIAGRAMS

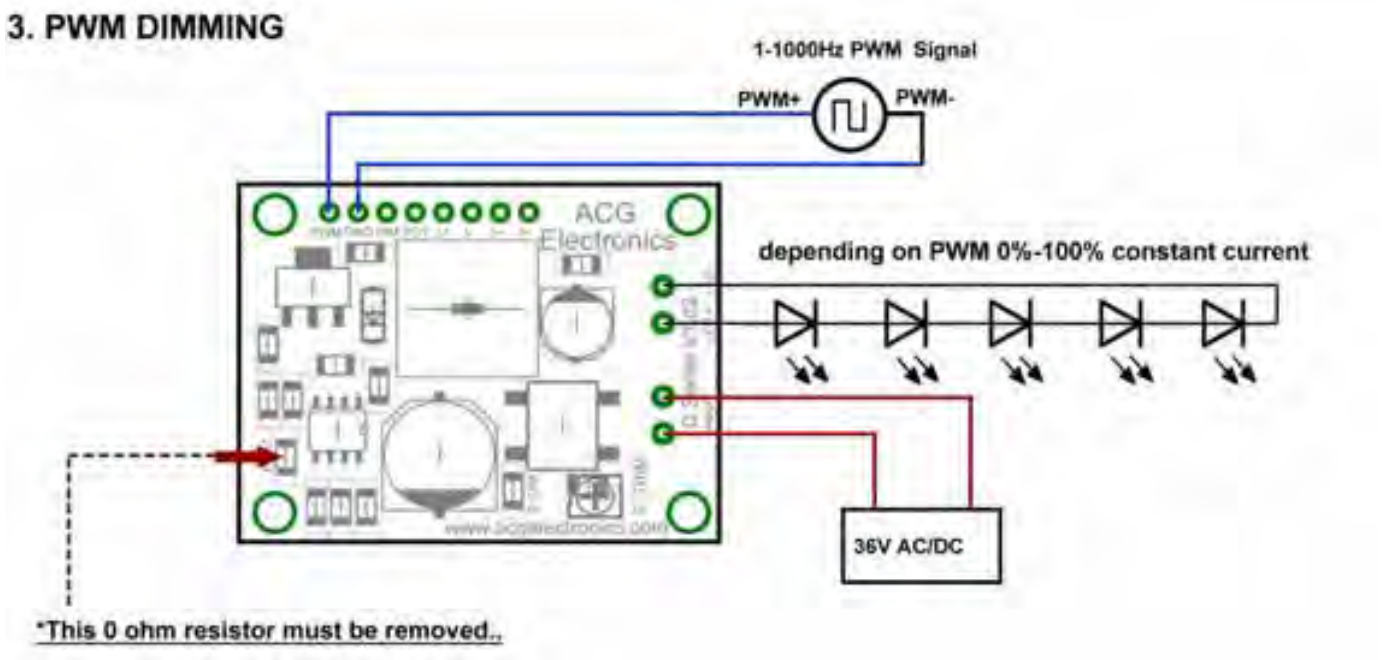
2. PARALLEL CONNECTION



i. Input voltage must be determined according to the number of LEDs connected in series. In the figure 24V is used for 3 LEDs are connected in series.

ii. In parallel connection, output current is divided into multiple rows. In the above figure, current is divided into 2 rows. In that case if a ACG-D700 is used, the 700mA at the output of the driver will be divided into 2 rows and supply 350mA to the LEDs. So 6 LEDs can be powered with 24V instead of 3. It is also possible to divide the output current into 3 or more rows. But each row must contain same number of LEDs with same properties (the total LED voltages must be same for each row). Otherwise the current will not be divided equally.

CONNECTION DIAGRAMS



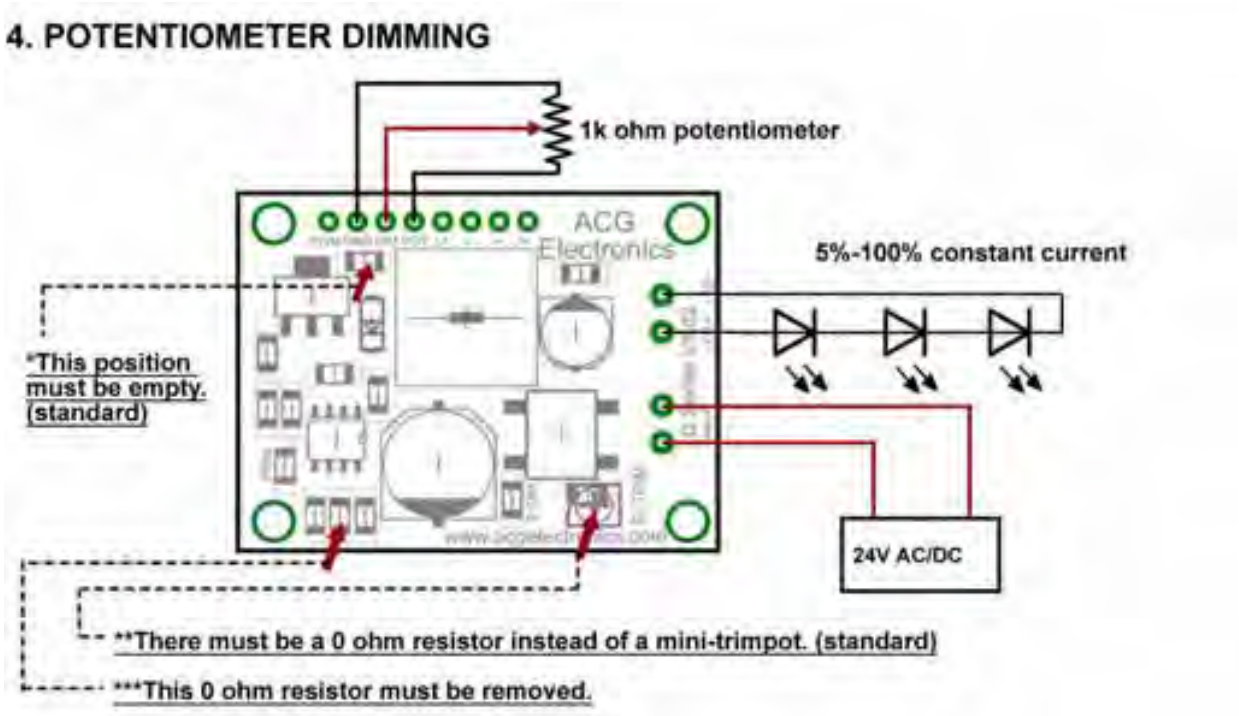
i. Input voltage must be determined according to the number of LEDs connected in series.

ii. The recommended frequency for PWM dimming is 0-1000Hz.

iii. Standard drivers are sold with PWM input disabled, it must be activated (on-board) to use that feature. PWM input can be activated simply by removing the jumper (R0 resistor) shown with red arrow. In that case the LEDs will not light up until a PWM signal is applied to the PWM pin (blue connections).

iv. The recommended voltage that should be applied to the PWM pin is 5V TTL. The driver will continue operation until the PWM signal voltage drops down to 2.7V. To use a higher voltage for PWM dimming, a 50-100 kΩ resistor must be connected in series to the PWM signal before it is connected to the driver.

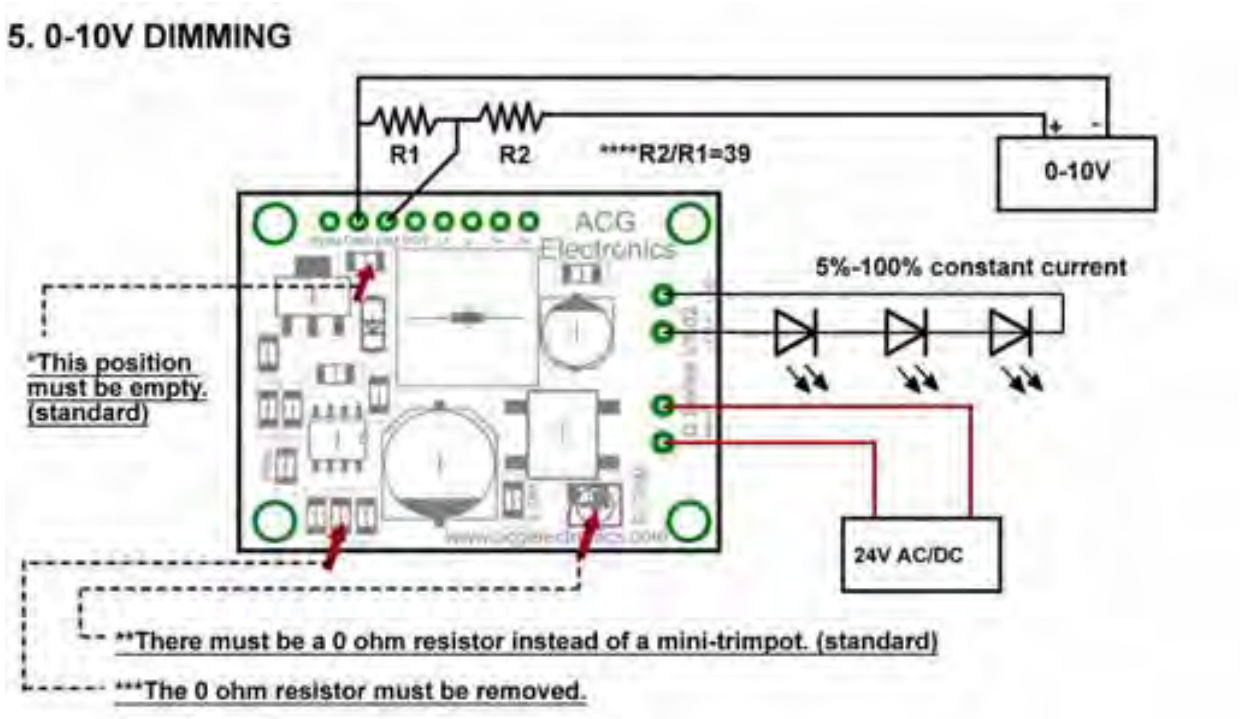
CONNECTION DIAGRAMS



i. Input voltage must be determined according to the number of LEDs connected in series.

ii. Standard drivers are sold with DIM input disabled, it must be activated (on-board) to use that feature. DIM input can be activated simply by removing the jumper (R0 resistor) shown with red arrow (left hand side bottom corner). 0-10V dimming can not be done without removing this jumper.

CONNECTION DIAGRAMS

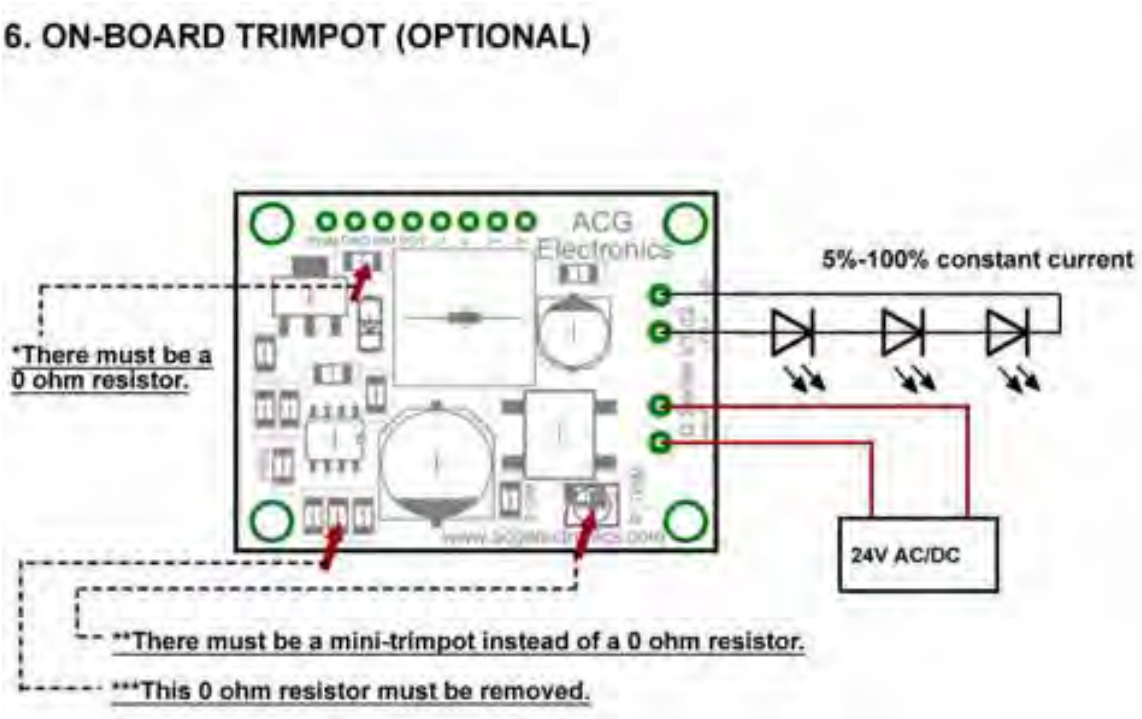


i. Input voltage must be determined according to the number of LEDs connected in series.

ii. Standard drivers are sold with DIM input disabled, it must be activated (on-board) to use that feature. DIM input can be activated simply by removing the jumper (R0 resistor) shown with red arrow (left hand side bottom corner). 0-10V dimming can not be done without removing this jumper.

iii. In this connection type two resistors, R1 and R2, must be connected externally as shown in the figure. The ratio of the two resistors must be selected so that R2/R1=30-40. For instance if R1 is selected as 1 kohm, R2 should be 33 kohm or 39 kohm.

CONNECTION DIAGRAMS

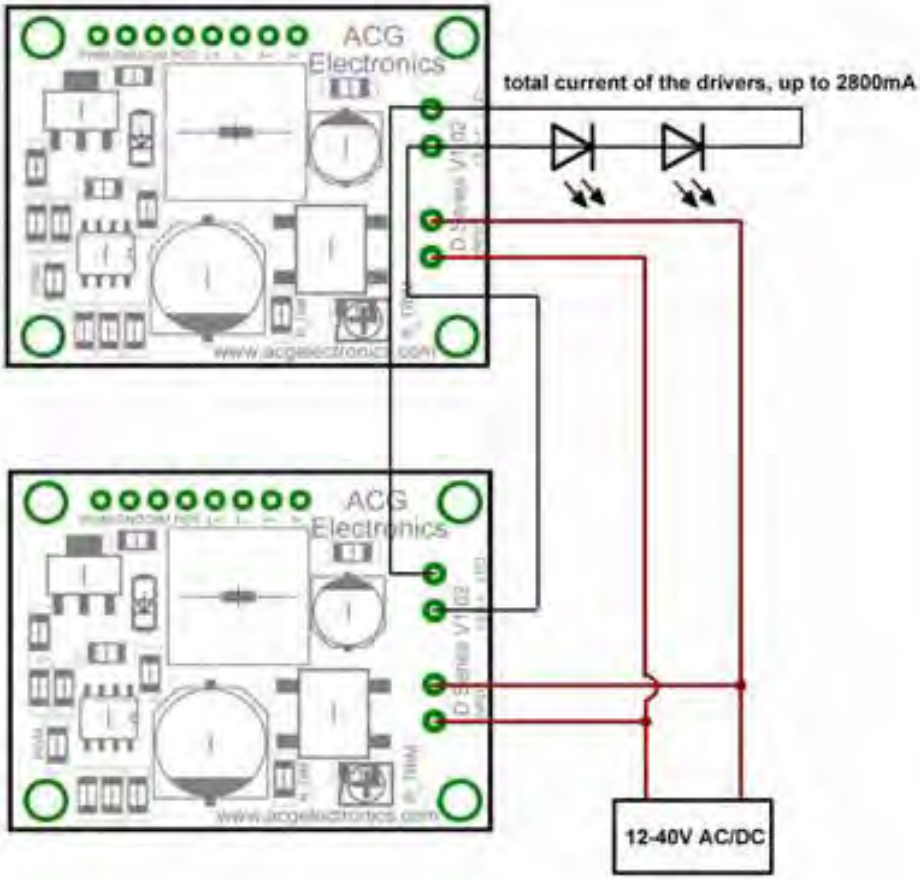


i. Input voltage must be determined according to the number of LEDs connected in series.

ii. Standard drivers are sold with DIM input disabled, it must be activated (on-board) to use that feature. DIM input can be activated simply by removing the jumper (R0 resistor) shown with red arrow (left hand side bottom corner). On-board trimpot dimming can not be done without removing this jumper.

CONNECTION DIAGRAMS

7. CONNECTING MULTIPLE DRIVERS IN PARALLEL

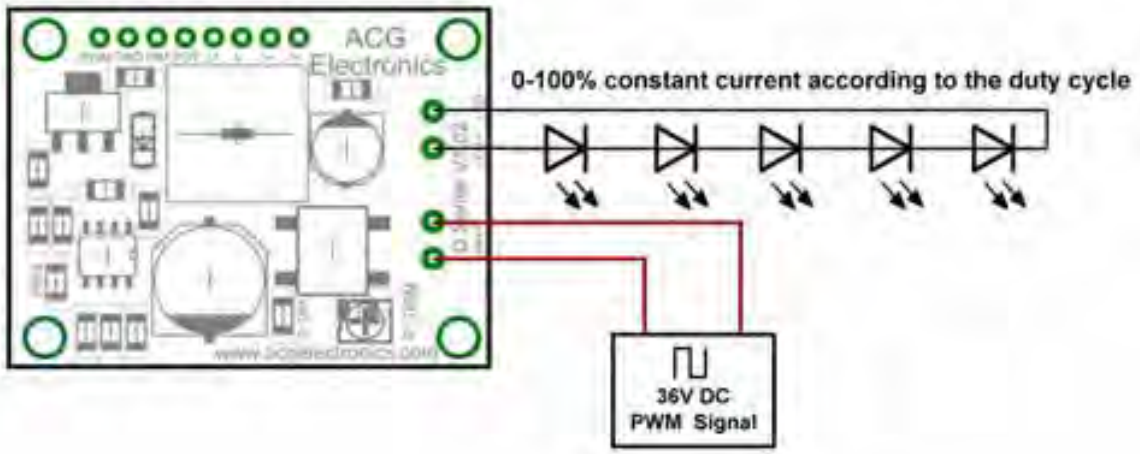


i. Input voltage must be determined according to the number of LEDs connected in series.

ii. The datasheet of the LED must be read carefully before deciding the current. Most datasheets have both "*peak pulse current*" and "*DC Forward current*". *Peak pulse current* is the amplitude of PWM signal at the output, and the duty cycle must be controlled (as manufacturers recommend). *DC forward current* is the limit at which the LED can be driven continuously (as soon as the junction temperature is below the limit).

CONNECTION DIAGRAMS

8. APPLYING PWM AT THE VOLTAGE INPUT

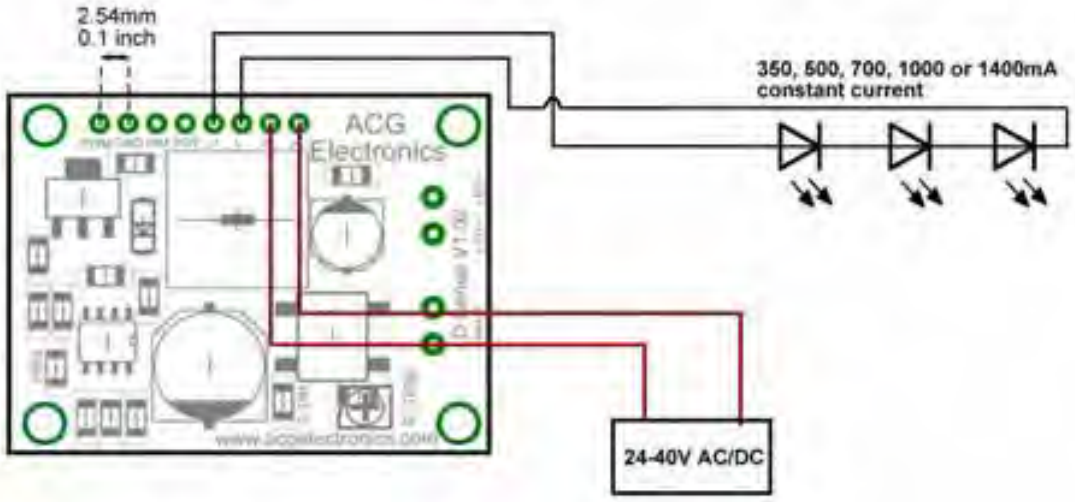


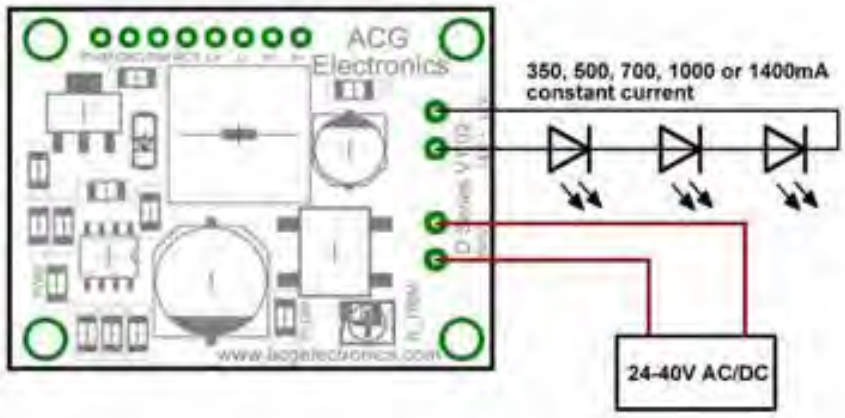
i. Input voltage must be determined according to the number of LEDs connected in series.

ii. PWM can be applied at the inlet of the driver for the cases where otherwise is not possible. It is normally recommended to do use the schematic #3 to do PWM dimming.

CONNECTION DIAGRAMS

9. USING THE CONNECTOR INPUT/OUTPUT





For input/output connections, one can either use the solder pads at the right hand side or solder pads at the top of the driver (intended to be used with connectors/headers). Integration to another system becomes easier with the upper pads.

ACCESSORIES AND OPTIONAL COMPONENTS

1. Plastic Enclosure

The plastic enclosure can be used where the circuit will operate outdoor and/or will be exposed to water, dust etc.

Dimensions: 7.0 cm x 4.0 cm x 2.0 cm

Note: Drilling cable holes, making connections and sealing the enclosure must be done by the user.

2. Screw Terminals

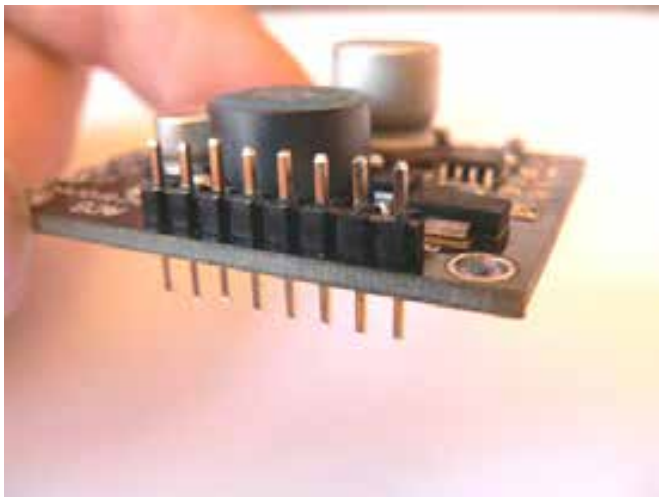
For input/output connections, screw terminals can be used instead of soldering.

Note: Two screw terminals are required for each driver. One will be used for input voltage connections, the other will be used for LED connections.

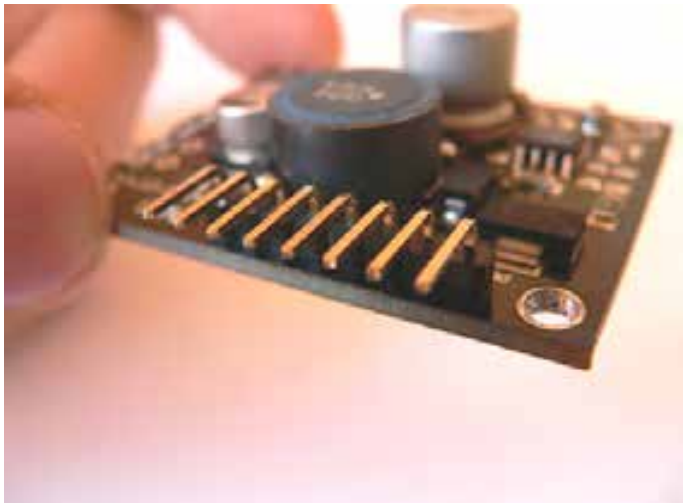
3. Headers

For the cases where the D-Series drivers will be integrated to another circuit, headers can be used. By using the male/female headers, connection without soldering is possible. L-headers and I-headers are both available.

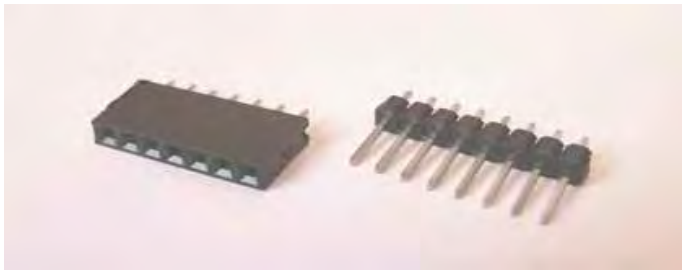
ACCESSORIES AND OPTIONAL COMPONENTS



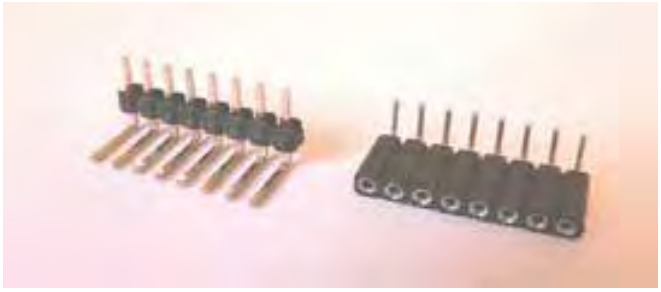
ACG-D1000 with I-header (longer leg size can be achieved by attaching from bottom)



ACG-D1000 with L-header



Female and male I-header



Male and female L-header

Note: Headers are sold in 40pcs. series. It must be broken/split into parts and soldered by the user. Considering the remaining parts and faulty splitting slightly higher purchase is recommended.

4. On-board mini-trimpot

For the cases where the current must be accurately adjusted to a specific level or it will be readjusted time to time, the on-board potentiometer option can be used.

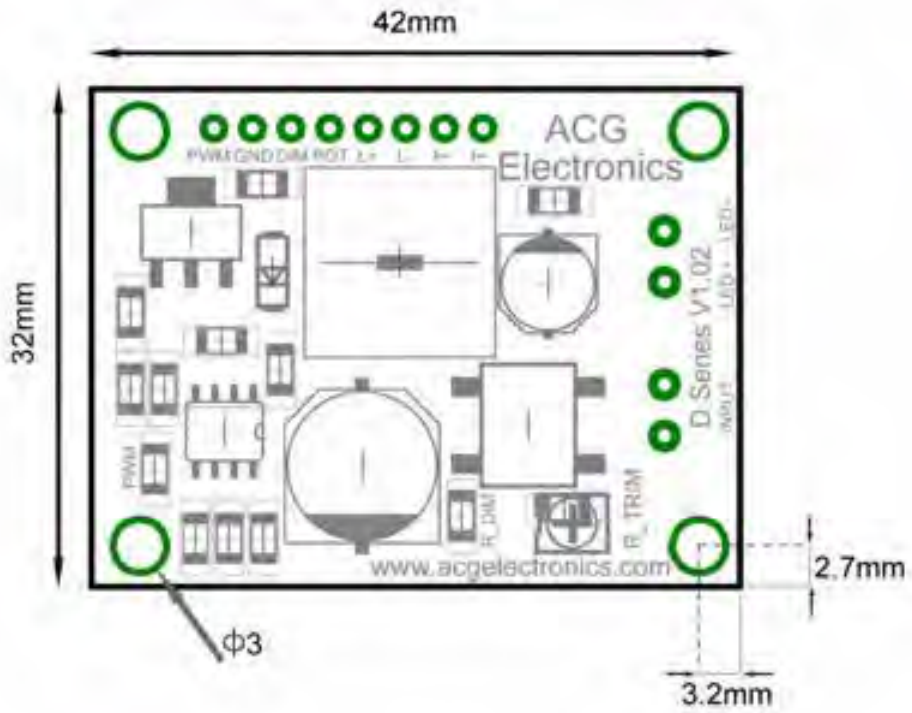
ACCESSORIES AND OPTIONAL COMPONENTS

Note: It must be specified in the order form that this option will be used. It is also possible to solder a trimpot and use that feature. A sample schematic can be found in connection diagrams section.

5. Spacer Ring

For the case where there is a risk of contact between the driver and a metal surface, spacer rings can be used to ensure the electrical insulation therefore eliminate short-circuit.

DIMENSIONS


42mm
32mm
ACG
Electronics
D Series V1.02
www.acgelectronics.com
2.7mm
3.2mm
Φ3

CUSTOM PRODUCTION

It is possible to order a custom driver if a specific output current, dimensions, your company name and logo etc. is required.

For custom prodution inquiries, please send an e-mail to shop@shoptronica.es o stating “input voltage, LED current, number of LEDs, driver dimensions and/or shape, order amount etc.”. You can either order a “constant current driver” or a “LED module with integrated (on-board) constant current driver”.

D-Series custom0014 *–custom production D-Series constant current driver-*

D-Series custom0018v4 *– custom production LED module with integrated D-Series constant current driver-*