



## Low Voltage DIN-mount PWM Dimmer Modules, DIM11DIN, DIM12DIN, DIM13DIN, DIM14DIN

- 12V or 24V DC low voltage operation
- Up to 5A load – 120W at 24V
- No minimum load requirement
- Lamp saving soft-start function
- Works with LEDs, incandescent or halogen lamps
- Drives the lamp on the high (positive) side
- Voltage controlled, switch controlled or potentiometer controlled
- 16-bit resolution high-accuracy PWM, >30,000 dimming steps.
- Fully protected and ruggedized



The DIM11DIN, DIM12DIN, DIM13DIN and DIM14DIN are self-contained high-side dimmer modules designed to control the brightness of low-voltage incandescent (filament), halogen or LED lamps rated up to 5A. Operating from 12 or 24V DC, and offering a positive output, the modules can be used in a wide variety of applications where DC low-voltage brightness control is desired, such as 12V or 24V automotive or marine dash-panels, low voltage architectural lighting, electronic signage, advertising backlighting, hazardous area lighting, etc.

The units employ a very efficient PWM (pulse-width modulation) switching technique to provide excellent operation for high power loads, and are fully protected from intermittent output short-circuits, over-temperature, reverse polarity, and input over/under voltage. Unlike other dimmers on the market, the modules will control lamp brightness from 0% (fully off) to 100% (fully on) and have no minimum load requirement. The units are presented in a 1-module wide (18mm) ventilated DIN enclosure suitable for mounting to standard 35mm DIN rail.

The modules also feature our unique cubic-law dimming curve which allows finer control of low brightness levels and compensates for the non-linear response of the human eye. The

result is an extremely smooth transition between dimming levels with no visible steps in the dimming response, and the brightness ramp-up and ramp-down is perceived by the eye to be completely linear. In addition, the modules utilise a soft-start feature at power-on, where the lamp brightness increases gradually to the preset brightness setting. This preserves the life of incandescent lamps as the filament is not ‘slammed’ on. The soft-start takes less than half a second.

The DIM11DIN uses a single switch for brightness control and lamp on/off; the DIM12DIN uses a potentiometer input to vary the brightness; the DIM13DIN uses two switches for ‘brightness up’ and ‘brightness down’; and the DIM14DIN has a 0-10V control input designed for connecting to universal analogue control interfaces. Please see the applications information section on the following pages for details.

Please note that the PWM dimming technique may not be suitable for some encapsulated LED lamps containing internal driver circuitry, such as low-energy replacements for dichroic lamps. Also, the modules are not suitable for connection to standard household lighting transformers as these supply AC and not DC voltage.

| Parameter                    | DIM11DIN                                                              | DIM12DIN      | DIM13DIN       | DIM14DIN | Comment                            |
|------------------------------|-----------------------------------------------------------------------|---------------|----------------|----------|------------------------------------|
| Nominal Supply Voltage Range | 9 – 32 V DC                                                           |               |                |          |                                    |
| Peak Supply Voltage Range    | 5.5 – 40V DC                                                          |               |                |          | Operation not guaranteed           |
| Quiescent Current, max       | 9mA                                                                   |               |                |          | at maximum operating voltage       |
| Maximum Output Current       | 5A                                                                    |               |                |          | at <30°C ambient temperature       |
| Maximum Load Power           | 60W at 12V supply, 120W at 24V supply                                 |               |                |          | at <30°C ambient temperature       |
| Peak Output Current          | 30A                                                                   |               |                |          | <3sec at nominal operating voltage |
| Control Input Type           | Single Switch                                                         | Potentiometer | Up/Down Switch | 0-10V    |                                    |
| Control Input Impedance      | 10 kΩ                                                                 |               |                |          | Impedance of control inputs        |
| Efficiency                   | > 97 %                                                                |               |                |          |                                    |
| Operating Temperature Range  | -40 – 70°C (-40 – 160°F)                                              |               |                |          |                                    |
| PWM Switching Frequency      | 240 Hz ±3%; 0% – 100% Duty Cycle                                      |               |                |          |                                    |
| Dimensions: Dimmer Module    | 90 × 18 × 58mm (1-module wide DIN enclosure)                          |               |                |          | L × W × H ±3% excl. fixings        |
| Mechanical Fixing            | 35mm DIN rail clips, or surface mount                                 |               |                |          |                                    |
| Electrical Connection        | 6 × 4mm <sup>2</sup> Rising Clamp terminal block, nickel plated brass |               |                |          |                                    |

### DIM12DIN Optional Potentiometer Module – ENCPOT10K

|                                  |                                   |                                             |
|----------------------------------|-----------------------------------|---------------------------------------------|
| Dimensions: Potentiometer module | 31 × 21 × 23mm                    | L × W × H ±3% excl. pot. bush and shaft     |
| Resistance                       | 10 kΩ ±20%                        |                                             |
| Electrical Connection            | 2 × 4mm <sup>2</sup> Rising Clamp |                                             |
| Bush                             | 10mm dia. × 6mm long              | fixing nut and washer supplied              |
| Shaft                            | 6mm dia. × ~30mm long             | plastic shaft can be cut to required length |
| Rotational Indexing              | 280°                              | ±10%                                        |

## Mounting and Connection Guidelines

The power supply to the dimmers typically comes from a suitably rated low-voltage 12-24V DC supply which must be fused at 5A or less to protect the modules. If using a switched-mode power supply with the modules, we recommend the supply be rated at 1.5 times the expected maximum lamp current.

The dimmers use the PWM dimming technique and do not change the system voltage. The power supply voltage, therefore, must be matched to the load. If using 12V LEDs or lamps, use a 12V power supply. If using 24V LEDs or lamps, use a 24V power supply.

Connection terminals are high quality rising-clamp terminal blocks capable of receiving up to 4mm<sup>2</sup> cable. The terminals are spaced 5mm pitch. To maximise the potential of the DIMxxDIN modules, cable rated at currents exceeding the lamp load by 1.5 times should be used to connect the modules, and the use of a bootlace ferrule at the DIMxxDIN terminals is recommended. The dimmers are capable of controlling high currents and it is important to ensure the screw terminals are very tight to prevent them overheating.

The dimmers are presented in a standard 1-module (18mm) wide DIN-mount polycarbonate case, and must be fitted in a well

ventilated enclosure if operating at loads exceeding 3A. The vent holes on the top and bottom of the dimmer must not be obstructed during operation. The units should be mounted in a cool location, away from sources of heat. The dimmers can be chassis mounted by partly pulling out the white and black fixing clips revealing a hole through which a mounting screw can be driven.

## Fault Protection

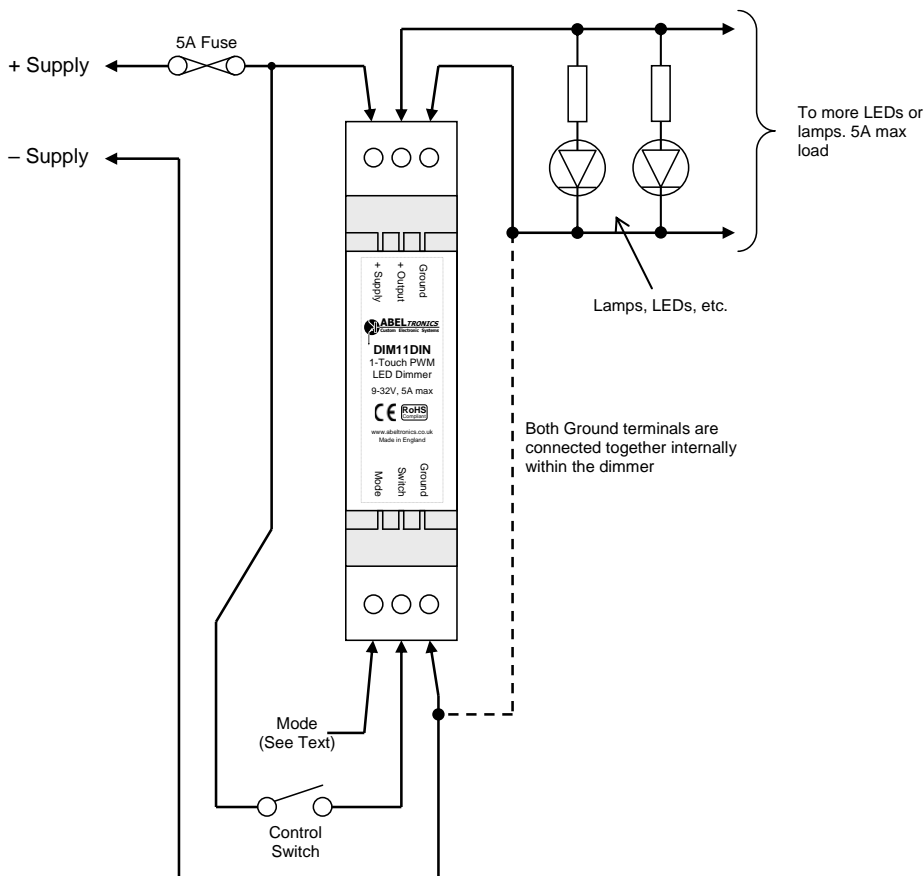
The DIMxxDIN units feature rugged internal overcurrent and over-temperature protection. If the units detect a short-circuit load, the output will switch off for 30 seconds before trying again. The overcurrent detection response has been specifically designed to allow for the high inrush current of most incandescent lamps, but certain large lamps may cause false triggering of the protection. It is recommended that the load be de-rated under these circumstances.

The units also feature two levels of thermal protection. If the internal temperature rises above approximately 80°C the unit will switch off for 30 seconds. If the internal temperature continues to rise above 125°C, the internal thermal fuse will permanently trip and the dimmer will need to be replaced.

## Applications Information – DIM11DIN

A single momentary switch completely controls the dimmer operation: a brief press of the switch will toggle the lamp on or off, and a sustained press will cause the lamp brightness to ramp up or down for as long as the switch is held, repeating until the switch is released at the desired brightness level.

The Mode input controls the operating behaviour of the unit and should be connected during installation. Leaving the Mode terminal unconnected, when the lamp is turned on by a brief press of the control switch it will operate at full brightness. The brightness level can then be changed by a sustained press of the control switch. The lamp will revert to full brightness when the lamp is turned off and back on again.



With the Mode input connected to the +Supply terminal, when the lamp is turned on, the previously stored brightness level is retrieved. The level can then be adjusted with a sustained press of the control switch. When the lamp is turned off, or when power to the module is lost, the current brightness setting is stored for retrieval next time.

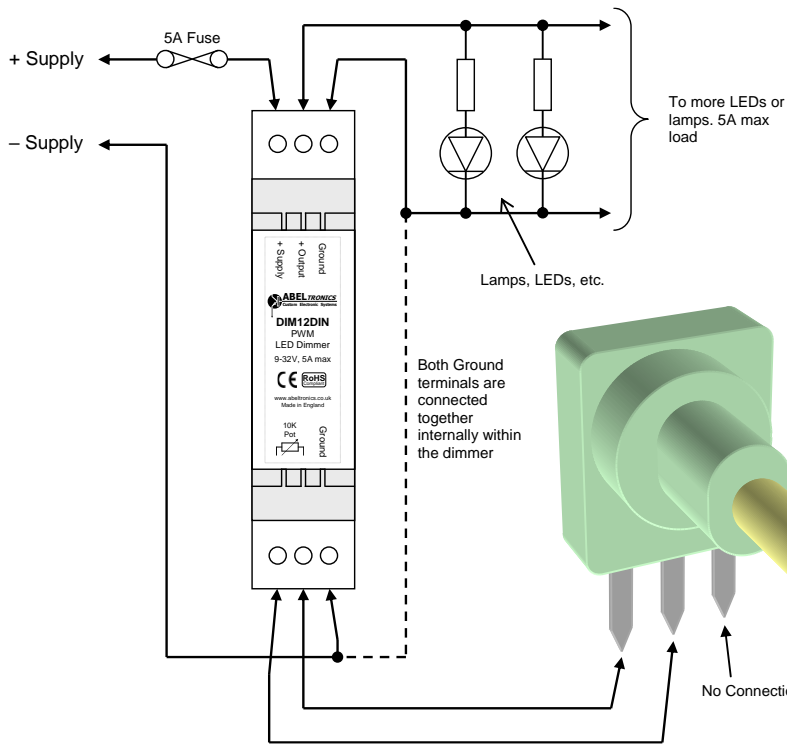
| Mode Input Connected to...                                |                                                             |
|-----------------------------------------------------------|-------------------------------------------------------------|
| <b>Unconnected:</b><br>Always full brightness at power-on | <b>+Supply:</b><br>Recall last saved brightness at power-on |

Regardless of the Mode input, the last-saved brightness level and on/off state are recalled when power to the unit is first applied. This ensures the current brightness level is not lost when power is removed, and any power glitches to the unit will not cause the lamp to suddenly change brightness or on/off state.

In addition, the brightness ramp direction swaps between switch presses – that is, if the brightness is currently increasing, the next sustained press of the control switch will cause the brightness to decrease. This allows the user to adjust the brightness accurately and quickly.

The Control pushbutton can be any momentary pushbutton switch, or relay contact. The DIM11DIN is supplied *without* a switch to allow the user to customise the switch to his/her application.

### Applications Information – DIM12DIN

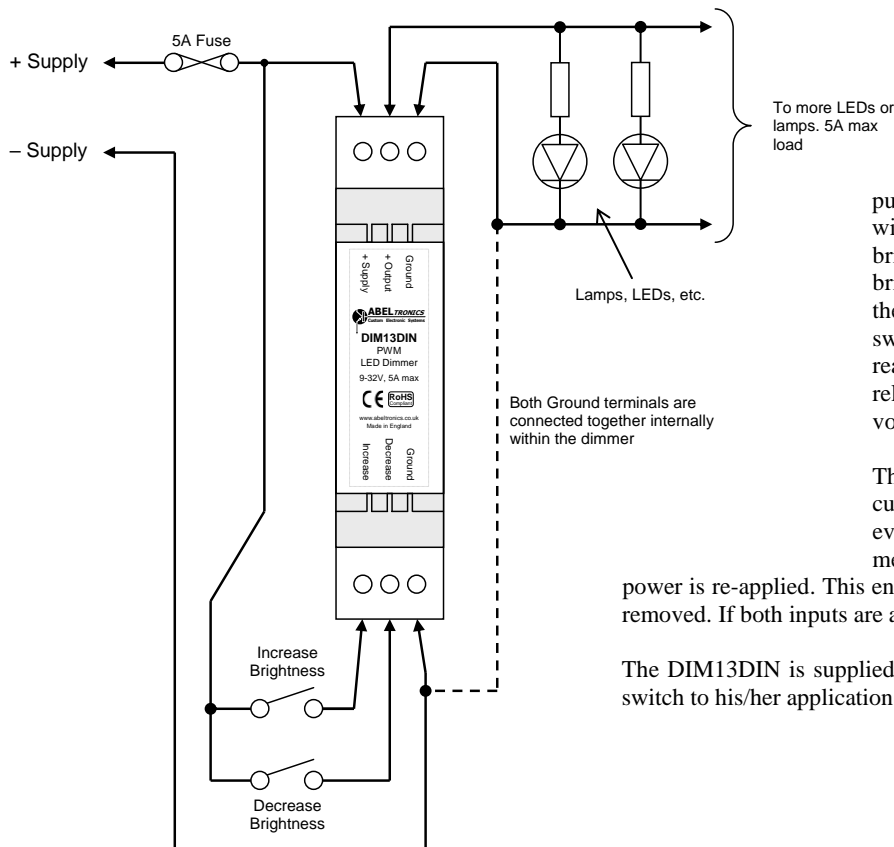


The DIM12DIN is controlled by means of the supplied rotary potentiometer. The potentiometer is mounted remotely from the DIM12DIN and is connected using 2-core cable. The terminals of the potentiometer should be soldered to one end of the 2-core cable; the other end of the cable is connected to the DIM12DIN as shown. Turning the potentiometer shaft clockwise will increase the lamp brightness, anti-clockwise will decrease the lamp brightness. The DIM12DIN features a fail-safe feature whereby in the event of an open circuit between the DIM12DIN and the potentiometer module, the output will default to full brightness.

The DIM12DIN can be used with any 10kΩ linear potentiometer, other than the supplied potentiometer. Only two terminals of the potentiometer need to be connected to the DIM12DIN: the wiper (central) terminal and left-most terminal with the shaft facing you.

The supplied potentiometer is an unsealed type, and requires soldering the two terminals to complete connection. An optional fully enclosed potentiometer module, part number ENCPOT10K, is available separately and includes terminal blocks for easier connection. For more information please visit [www.abeltronics.co.uk/products/encpot10k](http://www.abeltronics.co.uk/products/encpot10k).

### Applications Information – DIM13DIN

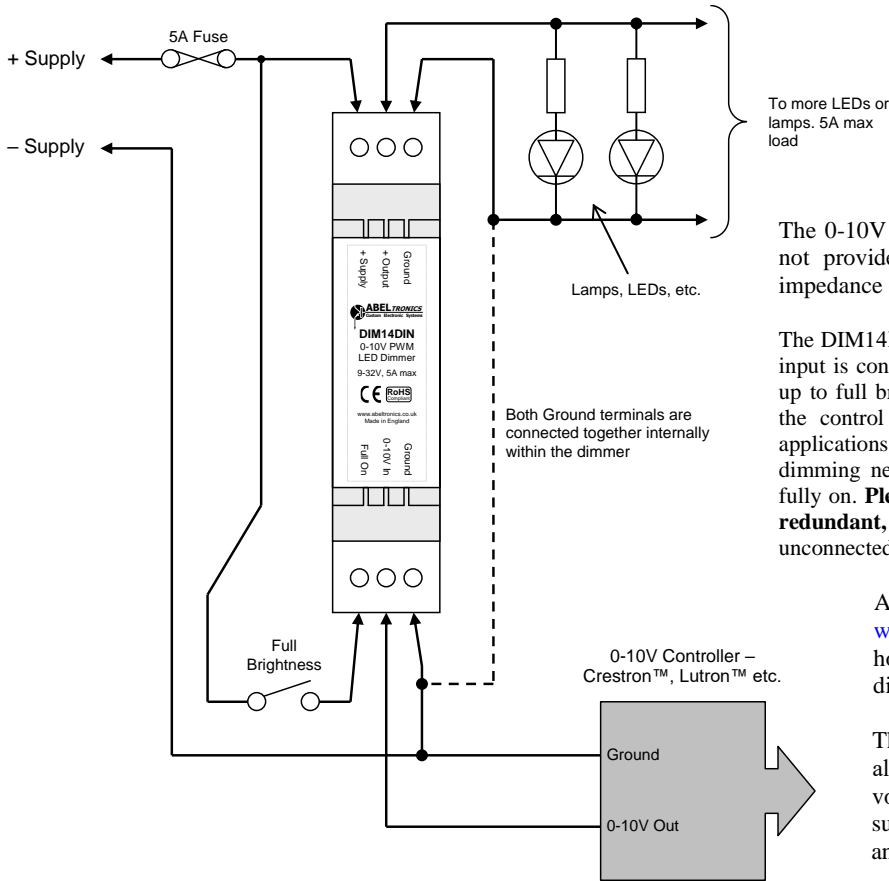


The DIM13DIN is controlled by a two position centre-off rocker switch or two pushbuttons. Connections to the DIM13DIN are shown to the left. The 'Brighter' and 'Dimmer' inputs should be switched to positive through a suitable rocker switch or pushbuttons. When the rocker or pushbutton is pressed in the 'Brighter' direction, the lamps will get brighter, conversely for the 'Dimmer' direction. A brief press of the switch will increase or decrease the brightness a small amount. If the switch is pressed and held, the brightness will increase or decrease for as long as the switch is held, until either the fully-on or fully-off state is reached. The 'switch' can be any kind of switch, including relay contacts, but it must be switched to the positive supply voltage.

The DIM13DIN also has a built-in function where the current brightness setting is saved into non-volatile memory every time it is changed. The brightness level remains in memory even when power is removed, and is restored when power is re-applied. This ensures the preset brightness level is not lost when power is removed. If both inputs are activated simultaneously, the brightness does not change.

The DIM13DIN is supplied *without* any switches to allow the user to customise the switch to his/her application.

### Applications Information – DIM14DIN



The DIM14DIN is controlled by a universal 0-10V analogue voltage input. The control input is designed to accept an analogue 0-10V control signal from a PLC, lighting controller, Crestron™ or Lutron™ controller, or similar. As the input signal is varied between 0 and 10V the connected lamp changes in brightness. An input of less than 0.2V turns the lamp fully off, and more than 9.8V turns the lamp fully on.

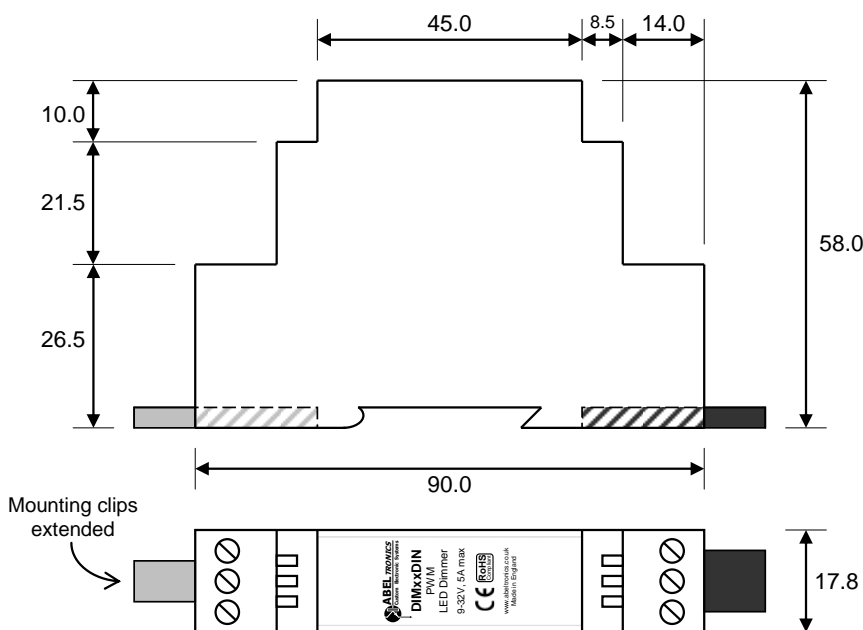
The 0-10V input is a current *sinking* type and the DIM14DIN does not provide any power back down the 0-10V line. The source impedance of the control voltage signal should be less than 100Ω.

The DIM14DIN features a 'Full Brightness' input connection. When this input is connected to a positive voltage above 4V the output is brought up to full brightness immediately, irrespective of the voltage present at the control voltage terminal. This is useful for emergency lighting applications where, in the event of a fire or other alarm trigger, all dimming needs to be overridden and the connected lamp needs to be fully on. **Please note, this is not a substitute for a suitably approved, redundant, emergency lighting system.** This terminal should be left unconnected if this feature is not required.

An application note is available at [www.abeltronics.co.uk/products/dim14](http://www.abeltronics.co.uk/products/dim14) which discusses how to obtain the best performance from our 0-10V dimmers.

The control input is protected against over-voltage, although it should never exceed the module's supply voltage. The control voltage input and the DIM14DIN supply voltage are not electrically isolated from each other and share a common ground.

### Dimensional Drawing



All dimensions in mm

### Further Information

For more information, links to other products and to download the most current datasheet, please visit [www.abeltronics.co.uk/dimmers](http://www.abeltronics.co.uk/dimmers). If you have any questions or queries, or require one of our dimmers to be modified to fit your application, please contact us by visiting [www.abeltronics.co.uk](http://www.abeltronics.co.uk).

### Also Available

These dimmers are available in epoxy-sealed enclosures, with 10A ratings, part numbers [DIM11](#), [DIM12](#), [DIM13](#) and [DIM14](#).

[DIM10](#) – Power booster for DIMxx Modules

[DIM13-2DIN](#) – Dual Output DIM13, DIN-Mount

Please visit [www.abeltronics.co.uk/dimmers](http://www.abeltronics.co.uk/dimmers) for more information.