

Low Voltage PWM Dimmer Modules, DIM11, DIM12, DIM13, DIM14

- 12V or 24V DC low voltage operation
- Up to 10A load – 240W 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 DIM11, DIM12, DIM13 and DIM14 are self-contained high-side dimmer modules designed to control the brightness of low-voltage incandescent (filament), halogen or LED lamps rated up to 10A. 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 sealed and potted in an ABS enclosure with epoxy resin, and the internal circuitry is fully protected against water and oils.

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 DIM11 uses a single switch for brightness control and lamp on/off; the DIM12 uses a potentiometer input to vary the brightness; the DIM13 uses two switches for ‘brightness up’ and ‘brightness down’; and the DIM14 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	DIM11	DIM12	DIM13	DIM14	Comment
Nominal Supply Voltage Range	12V or 24V DC (9 – 32V operational range)				
Peak Supply Voltage Range	5.5 – 40V DC				Operation not guaranteed
Quiescent Current, max	9mA				at maximum operating voltage
Maximum Output Current	10A				at <30°C ambient temperature
Maximum Load Power	120W at 12V supply, 240W 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	–30 – 70°C (–22 – 160°F)				
PWM Switching Frequency	240 Hz ±3%; 0% – 100% Duty Cycle				
Dimensions: Dimmer Module	52 × 52 × 31mm				L × W × H ±3% excl. fixing tab
Mechanical Fixing	2 × 5.0mm dia, 20mm pitch				Holes in fixing bracket
Electrical Connection	5 × 4mm ² Rising Clamp terminal block, nickel plated brass				

DIM12 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 ² 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 10A 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.

The dimmers will run warm when operating loads exceeding 5A, therefore it is important to securely bolt the metal fixing tab to a suitable metal surface to allow heat to be dissipated. The fixing bracket has two 5mm diameter holes drilled 20mm apart and is manufactured from zinc plated steel. The units should be mounted in a cool location, away from sources of heat.

Connection terminals are high quality rising-clamp terminal blocks capable of receiving up to 4mm² cable. The terminals are spaced 5mm pitch. To maximise the potential of the DIMxx 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 DIMxx 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 modules are sealed in epoxy resin in an ABS enclosure and are fully resistant to moisture and oils. The screw terminals are exposed however, and despite being nickel plated, could be susceptible to corrosion in extreme environments. It is recommended that exposure to acids and salts is minimised. For extreme applications corrosion-proof IP68-rated wire-ended modules are available, please contact Abeltronics for more information.

Fault Protection

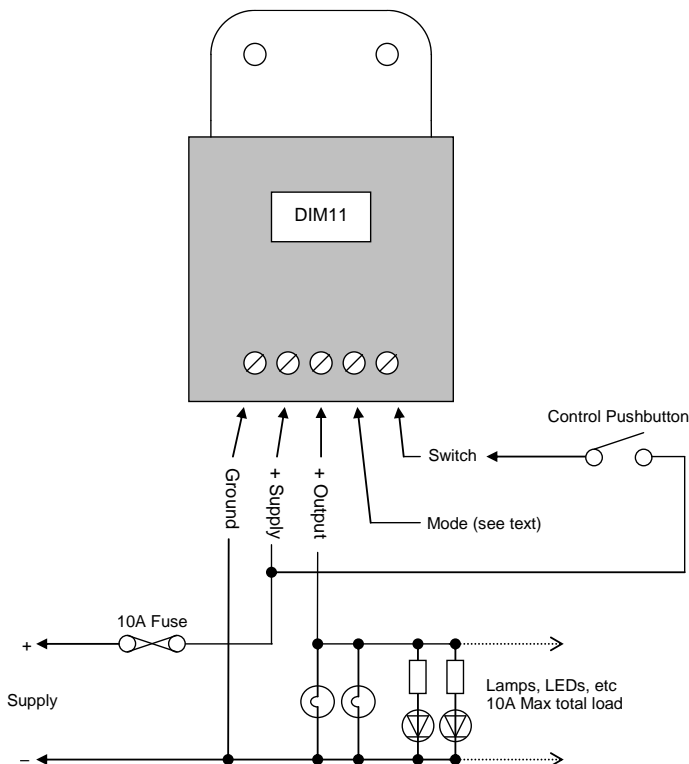
The DIMxx units feature rugged internal overcurrent and over-temperature protection. If the units detect a short-circuit load, the output will switch off for 30 seconds before trying again. The overcurrent detection response has been specifically designed to allow for the high inrush current of most 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.

DIM11 Applications Information

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 always initially 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.



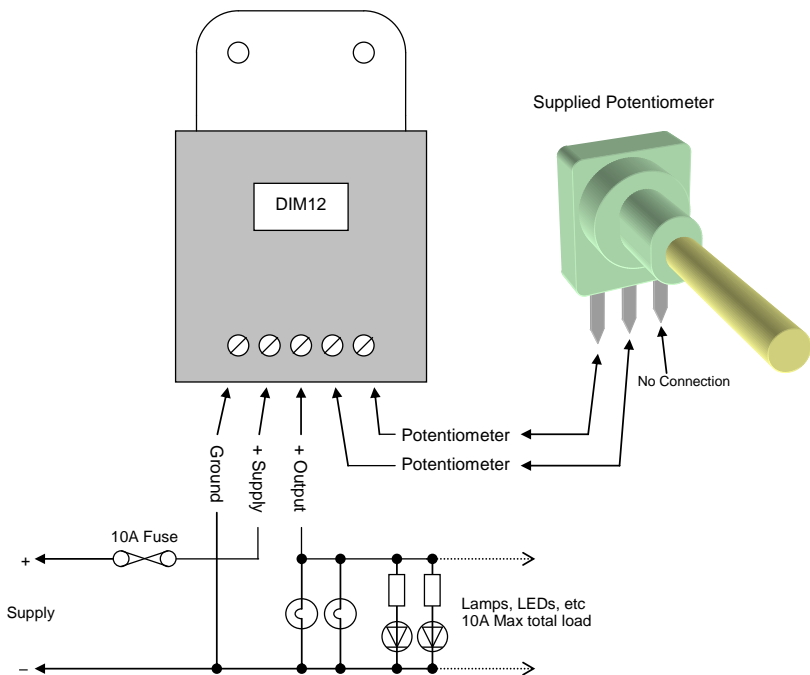
With the Mode input connected to the +Supply terminal, when the lamp is turned on, the previously stored brightness level is retrieved. The level can then be adjusted with a sustained press of the control switch. When the lamp is turned off, or when power to the module is lost, the current brightness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

Mode Input Connected to...	
Unconnected: Always full brightness at power-on	+Supply: 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 once stable power is restored.

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

The Control pushbutton can be any momentary pushbutton switch, or relay contact. The DIM11 is supplied without a switch; a selection of pushbuttons is available separately from Abeltronics.



DIM12 Applications Information

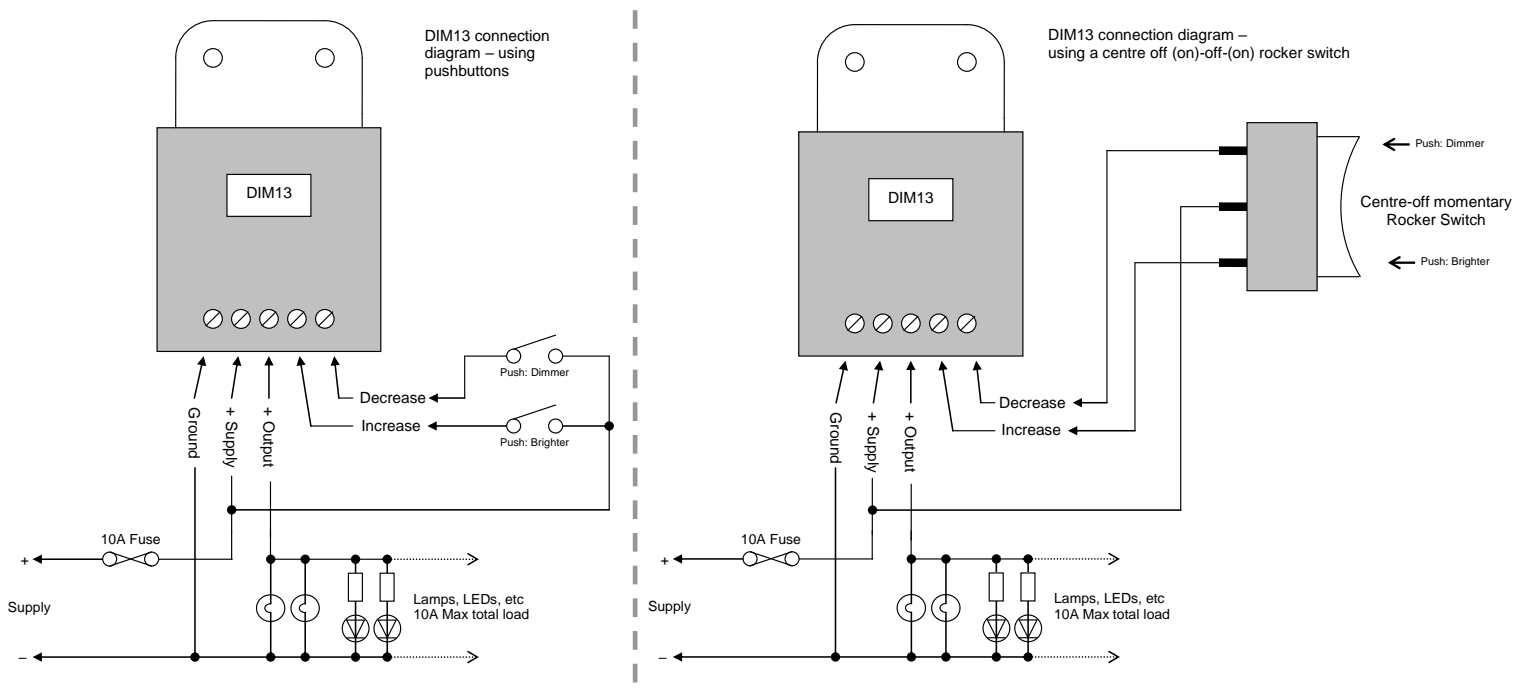
The DIM12 is controlled by means of the supplied rotary potentiometer. The potentiometer is mounted remotely from the DIM12 and is connected using 2-core cable. The terminals of the potentiometer should be soldered to one end of the 2-core cable; the other end of the cable is connected to the DIM12 as shown. Turning the potentiometer shaft clockwise will increase the lamp brightness, anti-clockwise will decrease the lamp brightness. The DIM12 features a fail-safe feature whereby in the event of an open circuit between the DIM12 and the potentiometer module, the output will default to full brightness.

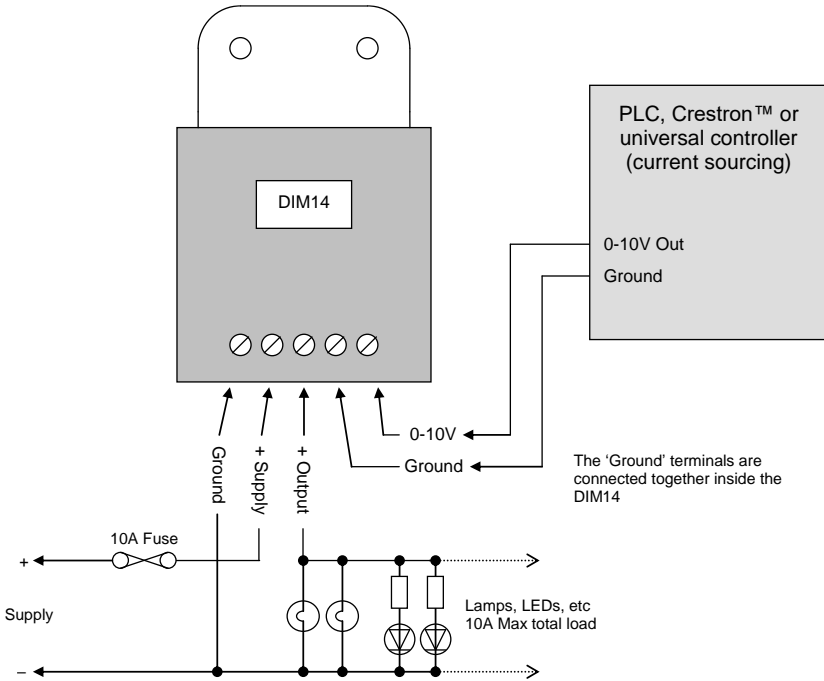
The DIM12 can be used with any 10kΩ linear potentiometer, other than the supplied potentiometer. Only two terminals of the potentiometer need to be connected to the DIM12: the wiper (central) terminal and left-most terminal with the shaft facing you. An optional fully enclosed potentiometer module is available separately featuring screw terminals for easier connection. Please see www.abeltronics.co.uk/products/encpot10k.

DIM13 Applications Information

The DIM13 is controlled by a two position centre-off rocker switch or two pushbuttons. Connections to the DIM13 are shown below. The 'Increase' and 'Decrease' inputs should be switched to +Supply through a suitable momentary rocker switch or pushbuttons (not supplied) – a centre-off momentary rocker switch is shown below-right, and pushbuttons are shown below-left. 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 continuously, 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. Pressing both switches simultaneously has no effect on the brightness. The 'switch' can be any kind of switch, including relay contacts.

The DIM13 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.





DIM14 Applications Information

The DIM14 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 long as the controller is a current-sourcing type. 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.

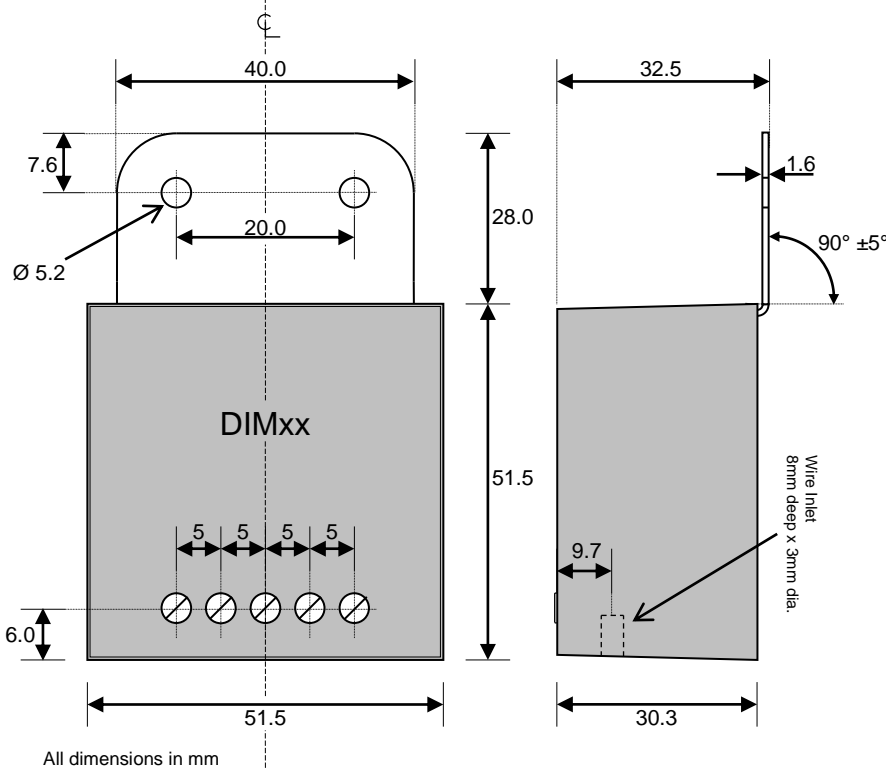
The 0-10V input is protected against over-voltage, although it should never exceed the module's supply voltage. The control voltage input and the DIM14 supply voltage are not electrically isolated from each other and share a common ground. The two ground terminals on the module are internally connected together.

Please see the DIM14 application note available at www.abeltronics.co.uk/products/dim14 for further information on how to reduce the likelihood of ground-loop noise affecting the dimmer's performance.

The 0-10V input is a current-sinking type which means it must be connected to a current-sourcing controller. (The controller must provide the 0-10V signal; the

DIM14 does not output any voltage back down the 0-10V line). Abeltronics does manufacture current-sourcing versions of the DIM14, but due to the wide variety of current-sinking controllers on the market we produce the units on an ad-hoc basis. Please contact us for further information.

Dimensional Drawing



Further Information

For more information, links to other products and to download the most current datasheet, please visit 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.

Also Available

These dimmers are available in DIN-rail mountable enclosures, part numbers [DIM11DIN](#), [DIM12DIN](#), [DIM13DIN](#) and [DIM14DIN](#).

[DIM10](#) – Power booster for DIMxx Modules to allow an unlimited load to be controlled

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

Multichannel dimmers in various configurations are available.

Please visit www.abeltronics.co.uk/dimmers for more information.