



Low Voltage PWM Lamp and LED Dimmers, DIM11, DIM12, DIM13, DIM14

- 9 – 32V 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
- Flickerless dimming of LEDs (240Hz operation)
- Drives the lamp on the high (positive) side
- Voltage controlled, switch controlled or potentiometer controlled
- 16-bit resolution high-accuracy PWM, 256 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 9 to 32V 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, pond lighting, 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). The units are hermetically sealed and potted in an ABS enclosure with epoxy resin, and are fully protected against water and oils.

The modules also feature our unique cube-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 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	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	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	–5 – 70°C (23 – 160°F)				DIMxx
	–40 – 70°C (–40 – 160°F)				DIMxxE
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 Potentiometer Specifications

Parameter	DIM12 Supplied Pot	Optional ENCPOT10K	Comment
Dimensions	21 × 17 × 9mm	31 × 21 × 23mm	L × W × H ±3% excl. pot. bush and shaft
Electrical Connection	Solder tag terminals	2 × 4mm ² Rising Clamp	
Threaded Bush	10mm dia. × 6mm long		
Shaft	6mm dia. × ~30mm long		plastic shaft can be cut to required length
Resistance	10 kΩ ±20%		
Rotational Indexing	275° ±5°		

Mounting and Connection Guidelines

The power supply to the units typically comes from a suitably rated low-voltage DC supply in the range 9 – 32V 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.

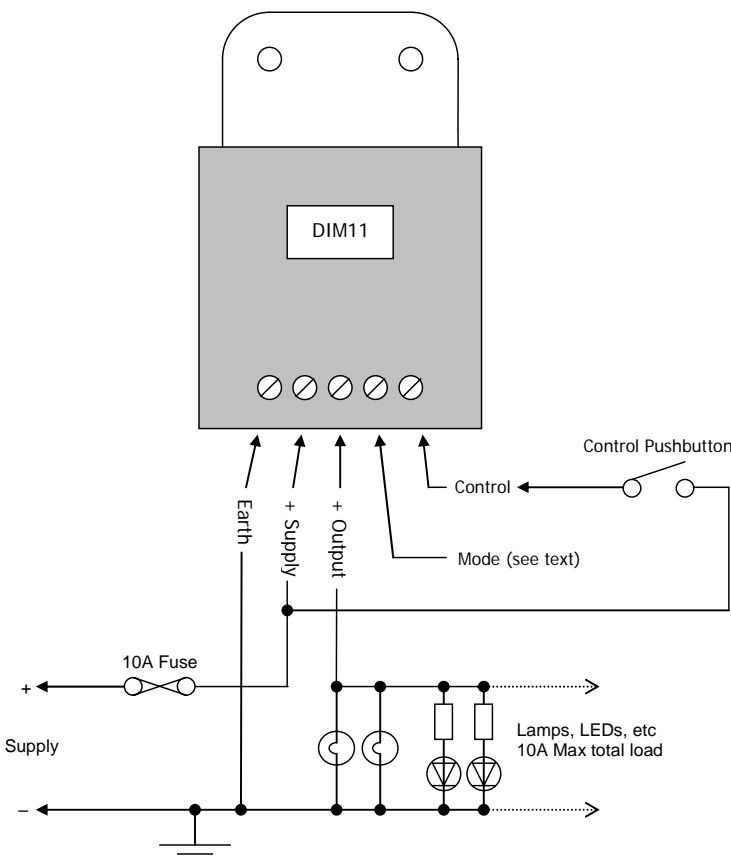
The dimmers will run warm when operating loads exceeding 5A, therefore it is important to securely bolt the metal fixing tab to a suitable metal surface to allow heat to be dissipated. The fixing bracket has two 5mm diameter holes drilled 20mm apart and is manufactured from zinc plated steel. The units 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 connectors are spaced 5mm pitch. To maximise the potential of the DIM modules, cable rated at currents exceeding the lamp load by 1.5

Applications Information – DIM11

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.



times should be used to connect the modules, and the use of a bootlace ferrule at the DIMxx terminals is recommended.

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. Corrosion-proof IP68 rated wire-ended modules are available, please contact ABELtronics for more information.

Temperature Ranges

The DIMxx series operate from –5 to +70 Celsius. Extended temperature range modules are available operating from –40 to +70 Celsius – add the suffix ‘E’ to the part number. For example DIM14E is an extended temperature range DIM14 unit.

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.

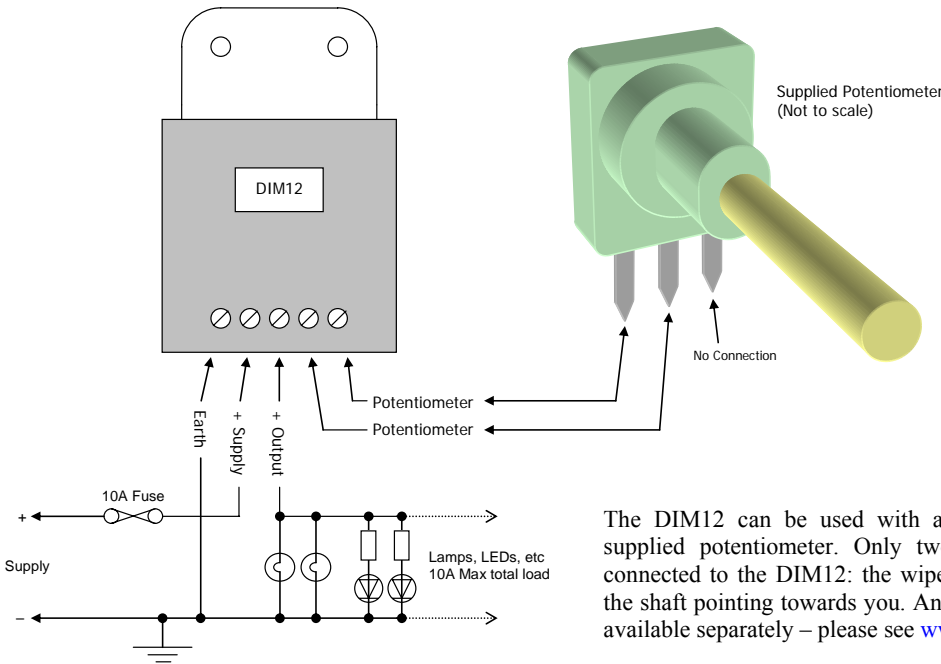
Mode Input Connected to...	
Unconnected: Always full brightness at power-on	+Supply: Recall last saved brightness at power-on

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.

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 DIM11 is supplied without a switch, and selection of pushbuttons is available separately from ABELtronics.

Applications Information – DIM12



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 turns the lamp fully off when the potentiometer is in the fully anti-clockwise position.

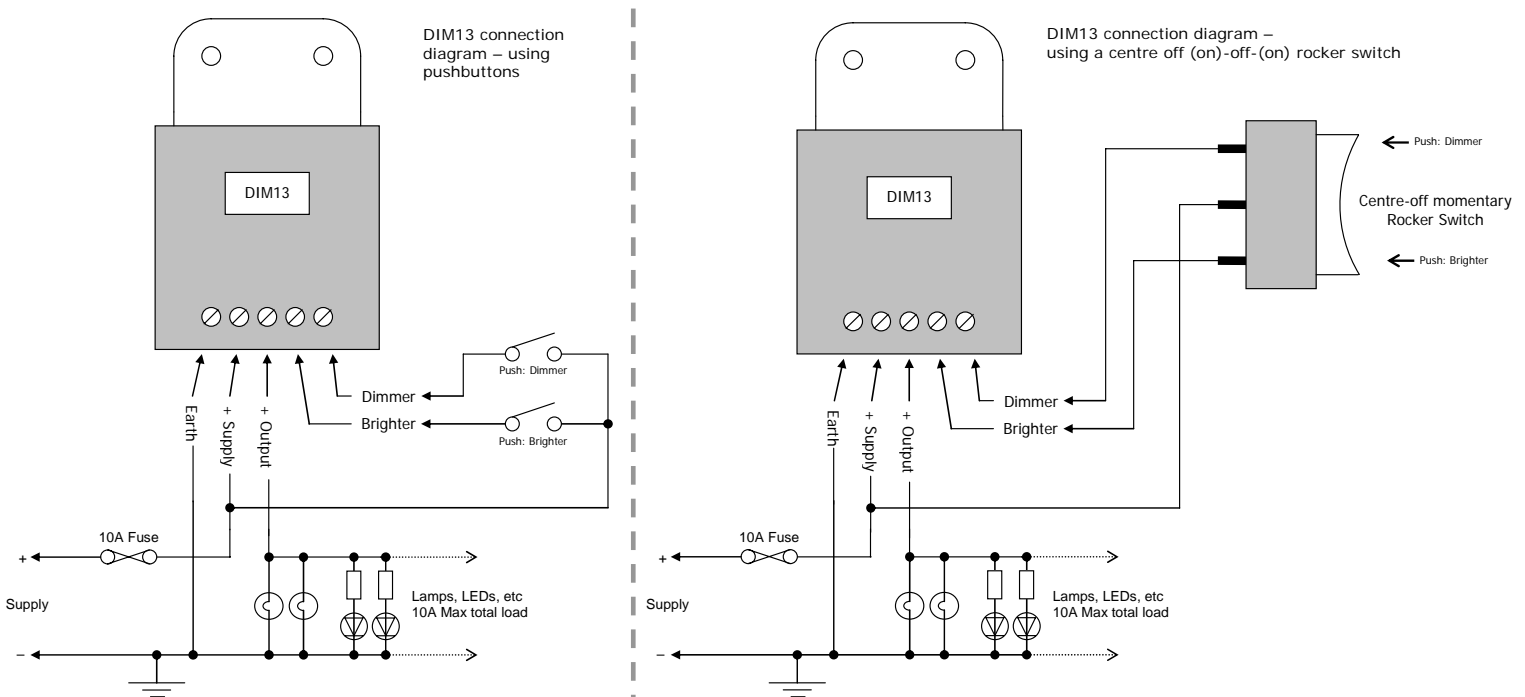
The DIM12 can be used with any 10kΩ linear potentiometer, other than the supplied potentiometer. Only two terminals of the potentiometer need to be connected to the DIM12: the wiper (central) terminal and left-most terminal with the shaft pointing towards you. An optional fully enclosed potentiometer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

Applications Information – DIM13

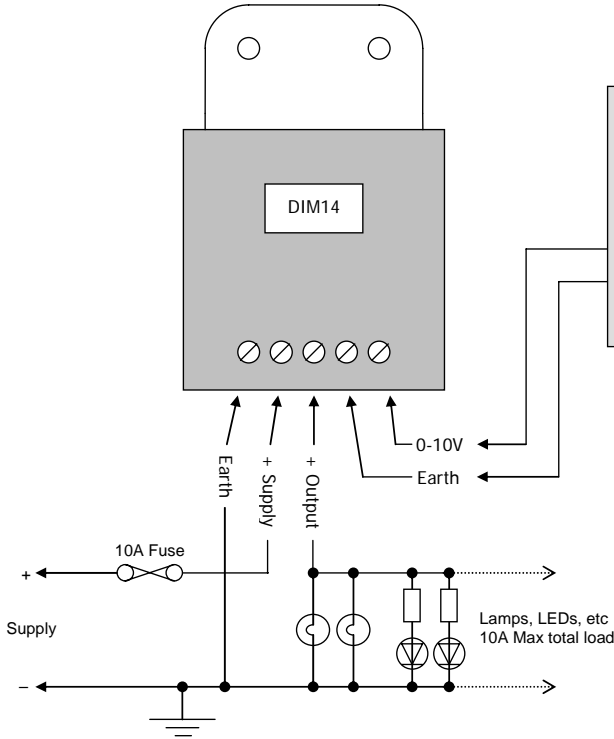
The DIM13 is controlled by a two position centre-off rocker switch or two pushbuttons. Connections to the DIM13 are shown below. The 'Brighter' and 'Dimmer' inputs should be switched to positive through a suitable rocker switch or pushbuttons (not supplied) – a centre-off momentary rocker switch is shown 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. The 'switch' can be any kind of switch, including relay contacts, but it must be switched to the positive supply voltage.

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.



Applications Information – DIM14

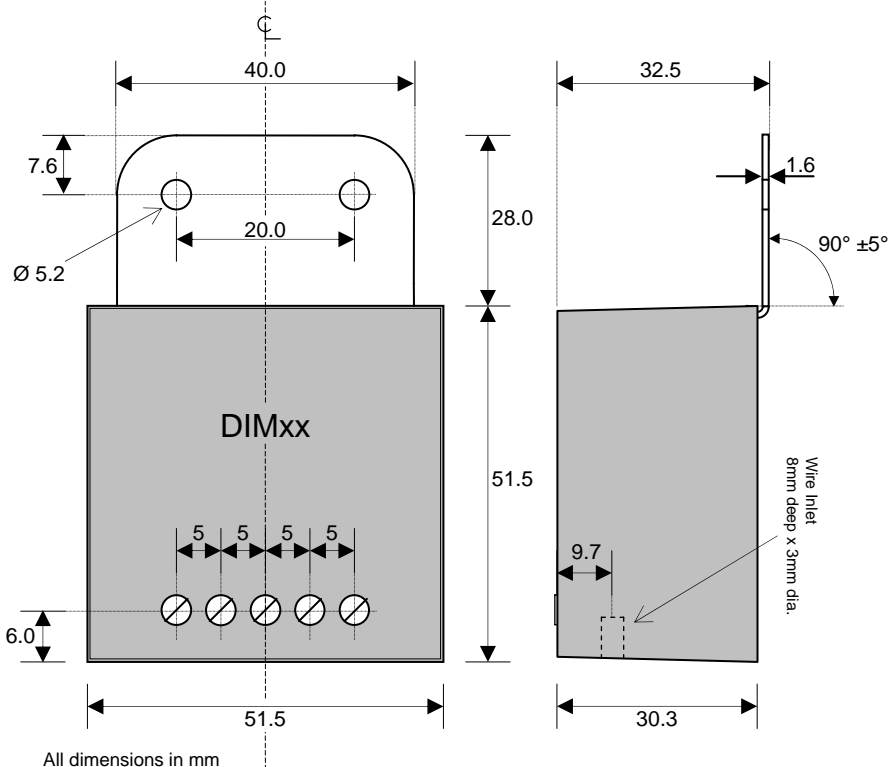


The DIM14 is controlled by a universal 0-10V analogue voltage input. The control input is designed to accept an analogue 0-10V control signal from a PLC, lighting controller, Crestron™ or Lutron™ controller, or similar. As the input signal is varied between 0 and 10V the connected lamp changes in brightness. An input of less than 0.2V turns the lamp fully off, and more than 9.8V turns the lamp fully on. The two earth connections shown on the module are internally tied together, and only one of them can be connected if desired. Please see the DIM14 application note available at www.abeltronics.co.uk/products/dim14 for further information.

For best performance the control input should be connected to a low impedance source of less than 100Ω. PLCs, Crestron™ controllers and other lighting controllers fulfil this requirement. The control input is a current-sink type with a maximum draw of 1mA.

The control 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 earth.

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/contact

Also Available

- DIM10 – Power booster for DIMxx Modules
- DIM15 – Radio Controlled remote dimmer
- DIM13-2DIN – Dual Output DIM13, DIN-Mount

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