



Slave Dimmer Module / Solid State Relay: DIM10, DIM10HP

- 9 – 32V DC low voltage operation
- Up to 10A or 16A load – 240W or 384W at 24V
- Allows our dimmers to control an unlimited load in banks
- Slave dimmer controlled by master
- No minimum load requirement
- Works with LEDs, incandescent or halogen lamps
- Drives the lamp on the high (positive) side
- Fully protected and ruggedized
- Split power-supply and point-of-load capable
- Watertight – IP68 Rated (DIM10HP)



The ABELtronics DIM10 and DIM10HP are high frequency solid state relays that are designed to boost the power rating of the ABELtronics DIMxx series of PWM (Pulse Width Modulation) dimmer modules. The units have a slave control input that is designed to connect to the output of the other dimmer modules in the series. The DIM10 and DIM10HP switches its output on when the 'PWM Input' connection exceeds 5V, and off when the PWM Input goes below 2V. The output can be any resistive load up to 10A for the DIM10, or 16A for the

DIM10HP. A practically unlimited number of DIM10s and/or DIM10HPs can be connected to the master module, allowing control of an unlimited lighting load.

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	DIM10	DIM10HP	Comment
Nominal Supply Voltage Range	9 – 32 V DC		
Peak Supply Voltage Range	5.5 – 40V DC		Operation not guaranteed
Quiescent Current, max	0.01mA		at maximum operating voltage
Maximum Output Current	10A	16A	at <30°C ambient temperature
Maximum Load Power	120W at 12V, 240W at 24V	196W at 12V, 384W at 24V	at <30°C ambient temperature
Peak Output Current	30A	45A	<3sec at nominal operating voltage
Control Input Type	PWM Input from our DIMxx series		
Control Input Voltage	>5V DC on, <2V DC off, 50V DC Max		
Control Input Impedance	10 kΩ		Impedance of control inputs
Efficiency	> 97 %		
Operating Temperature Range	–5 – 70°C (23 – 160°F) – DIM10 and DIM10HP		
	–40 – 70°C (–40 – 160°F) – DIM10E and DIM10HPE		'E' suffix denotes extended temperature range
Max Switching Frequency	1kHz; 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	5 × Wire terminations, >30cm long	

Mounting and Connection Guidelines

The DIM10 and DIM10HP are slave dimmers, and must be connected to either a DIM11, DIM12, DIM13, DIM14 or DIM15 to provide them with a PWM signal. An unlimited number of DIM10s and/or DIM10HPs can be connected to the same PWM source, providing control for an unlimited amount of lighting.

Each DIM10 module must have its +Supply terminal fused separately at 10A (DIM10) or 16A (DIM10HP) or less, and be fed from a DC supply in the range of 9 – 32V. Please see the following pages for more information. The controlling module (either the DIM11, 12, 13, 14 or 15) should have its +Supply fused at 1A.

If using a switched-mode power supply with the modules, we recommend the supply be rated at 1.5 times the expected total maximum lamp power. For example, if using a DIM10 to control 100W of lighting, the power supply should be rated at 150W or more.

The units 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.

The DIM10 has high-quality rising-clamp terminal blocks capable of receiving up to 4mm² cable. The connectors are

spaced 5mm apart. To maximise the potential of the unit, 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 DIM10 terminals is recommended.

The modules are sealed in epoxy resin in an ABS enclosure and are fully resistant to moisture and oils. The DIM10's screw terminals are exposed however, and despite being nickel/zinc plated, could be susceptible to corrosion in extreme environments. It is recommended that exposure to acids and salts is minimised.

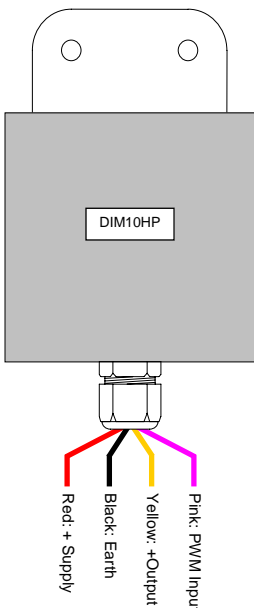
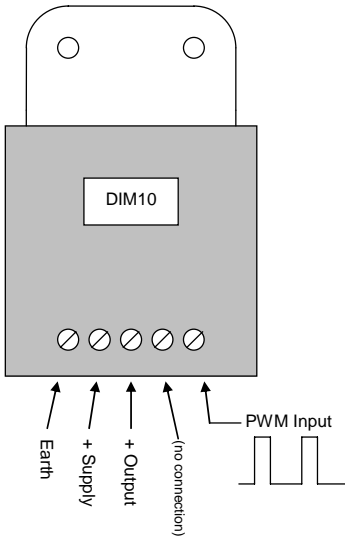
The DIM10HP has wire terminations and is fully watertight and IP68 rated. The cap of the cable gland used to terminate the wire lead-outs to the enclosure can be removed without loss of ingress protection to form a neat termination with flexible conduit or sleeving.

The DIM10HP wire terminations are colour coded as follows:

Colour	Function	Cable Size
Red	+ Supply	32/0.2, 3.1mm dia.
Black	Earth	24/0.2, 2.4mm dia.
Yellow	+ Output	32/0.2, 3.1mm dia.
Pink	PWM input	24/0.2, 2.4mm dia.

Temperature Ranges

The DIM10 and DIM10HP 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 – DIM10E and DIM10HPE.



Applications Information

Electrical connections to the DIM10 and DIM10HP are shown to the left, and bottom left, respectively. The DIM10 requires a PWM control signal from one of the other DIMxx series modules which is applied to the PWM Input connection. Power is supplied to the +Supply terminal from a 9 – 32V DC source fused at 10A (DIM10) or 16A (DIM10HP) or less. The terminal on the DIM10 marked 'no connection' is a dummy terminal and not connected to anything inside the module.

The DIM10 can also be used as a solid state relay. The output will be on for as long as the control input is above about 5V (referenced to the DIM10's Earth terminal). The output will turn off when the control input falls below about 2V. The input has a Schmitt-trigger action. Although the module is designed to work at the 240Hz frequency of the other DIMxx series modules, the input frequency can be up to 1kHz; finding applications where a mechanical relay is far too slow.

Banking

The DIM10 and DIM10HP modules are designed to be used to control banks of lighting up to 10A or 16A – each DIM10 or DIM10HP should be connected to a single bank of lighting not exceeding the respective module's maximum load specification. The PWM input to each DIM10 can then be connected to the output of the controlling dimmer. All lighting banks will be driven to the same brightness with this arrangement under control of the master dimmer. Banks of load should be balanced as much as possible between DIM10s or DIM10HPs.

For example, to control the brightness of ninety 10W 24V lamps with DIM10s:

Total load power: $90 \times 10W = 900W$

Each DIM10 is rated at 240W maximum at 24V. So the number of DIM10s required is:

$900W / 240W = 3.75$

Rounding up to the next highest number, we need at least 4 DIM10 units to control 900W at 24V. To balance the load between the four DIM10s as evenly as possible:

$900W / 4 = 225W$ per DIM10.

Since we are using 10W bulbs:

$225W / 10W = 22.5$ bulbs per DIM10.

Therefore we need to split the load into three banks of 23 bulbs, (or 230W in total per bank), plus one bank of 21 bulbs (210W), with each bank being fed from its own DIM10.



Power Supplies

Each bank of lighting, and the respective DIM10 or DIM10HP controlling it, can be powered from an individual smaller power supply rather than one large power supply for the whole system. This feature allows very large total loads to be controlled where one giant power supply would be impractical or unavailable.

In the example above, a single 900W 24V power supply is likely to be very bulky and expensive. Instead, each of the four banks could be fed from one smaller power supply. This requires four

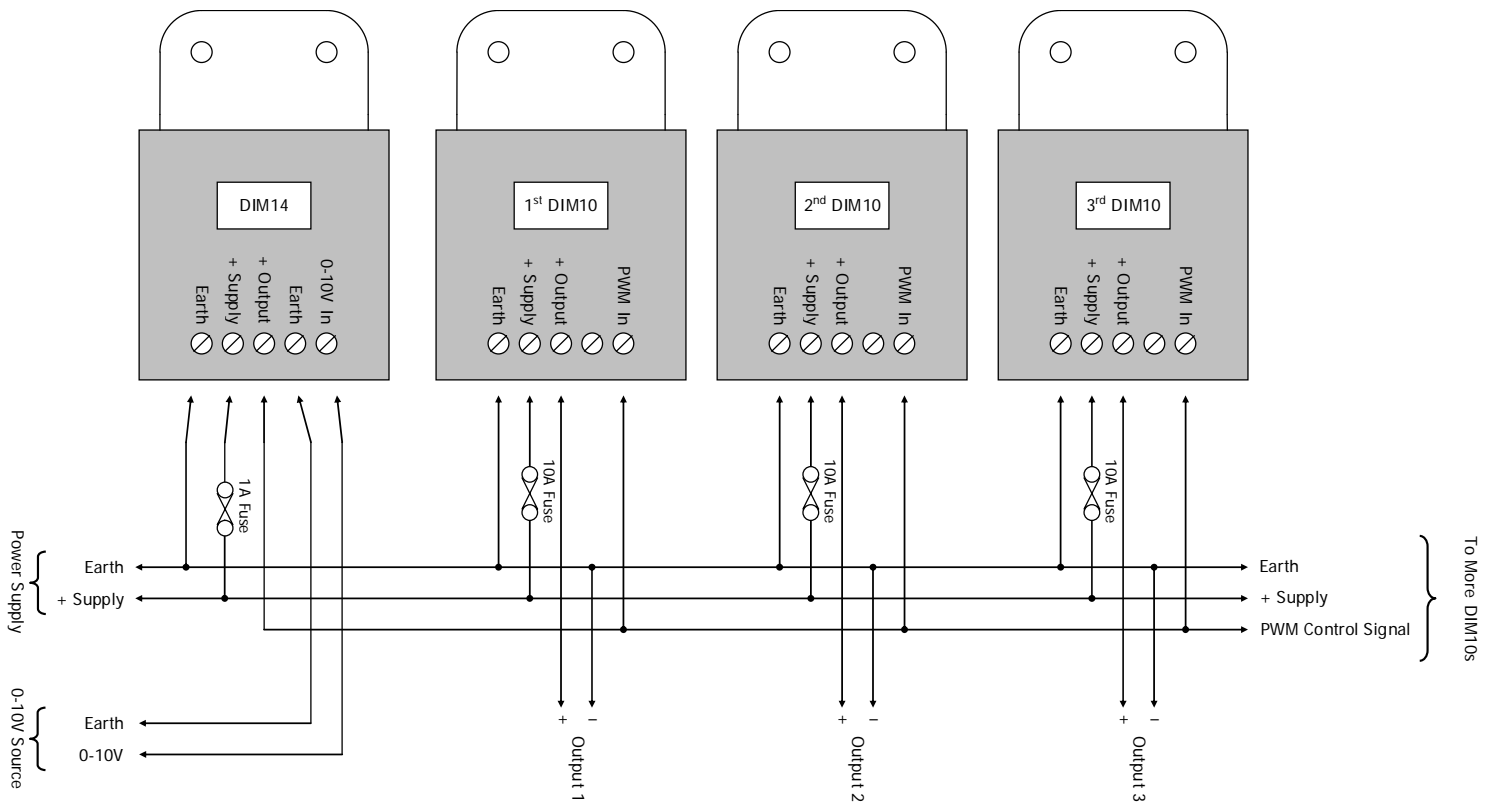
power supplies in total – one for each bank – but these tend to be much cheaper and more readily available.

If using switched-mode power supplies, we recommend using a power supply rated at least 1.5 times the total load power – or 345W in this case.

It is important to note that in a multi-supply system each of the power supply negatives must be connected together. Please see the following diagrams for more information.

Connection diagrams – DIM10

This diagram shows three DIM10 units controlled by a DIM14 voltage controlled dimmer all sharing a common power supply. The 0-10V signal present at the input terminals of the DIM14 causes a variable PWM signal to be generated at the DIM14's output, which in turn drives the PWM inputs of all the DIM10s.



Here, the DIM14 acts as a master controller for the DIM10s – the DIM14 does not connect directly to the load, rather it controls the DIM10s that connect to the load on its behalf. The outputs are shown as separate outputs 1, 2 and 3, and should connect to banks of lighting, each not exceeding the DIM10's load current specification. The DIM14 is connected to the same power supply and is fused at 1A, and the DIM10s are independently fused at 10A each. The '0-10V Source' connections are the control voltage terminals of the DIM14 – refer to the DIM14 datasheet available at www.abeltronics.co.uk/products/dim14 for more information.

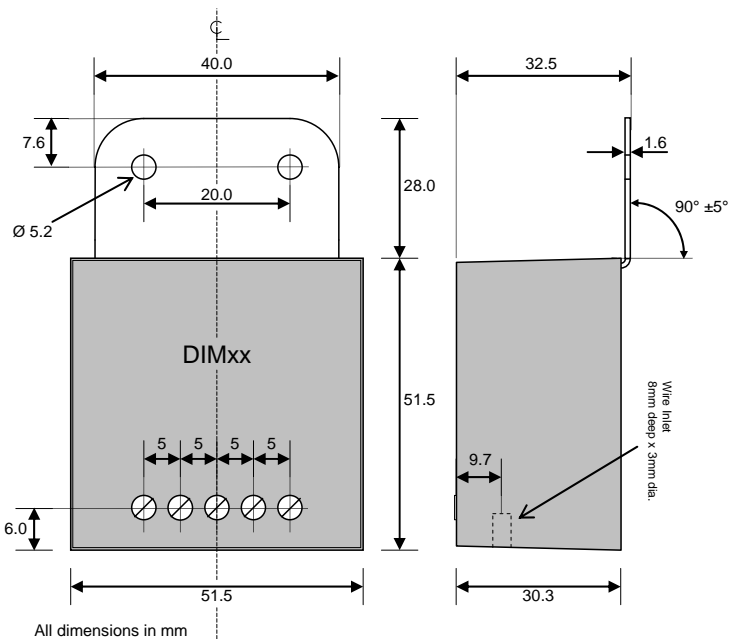
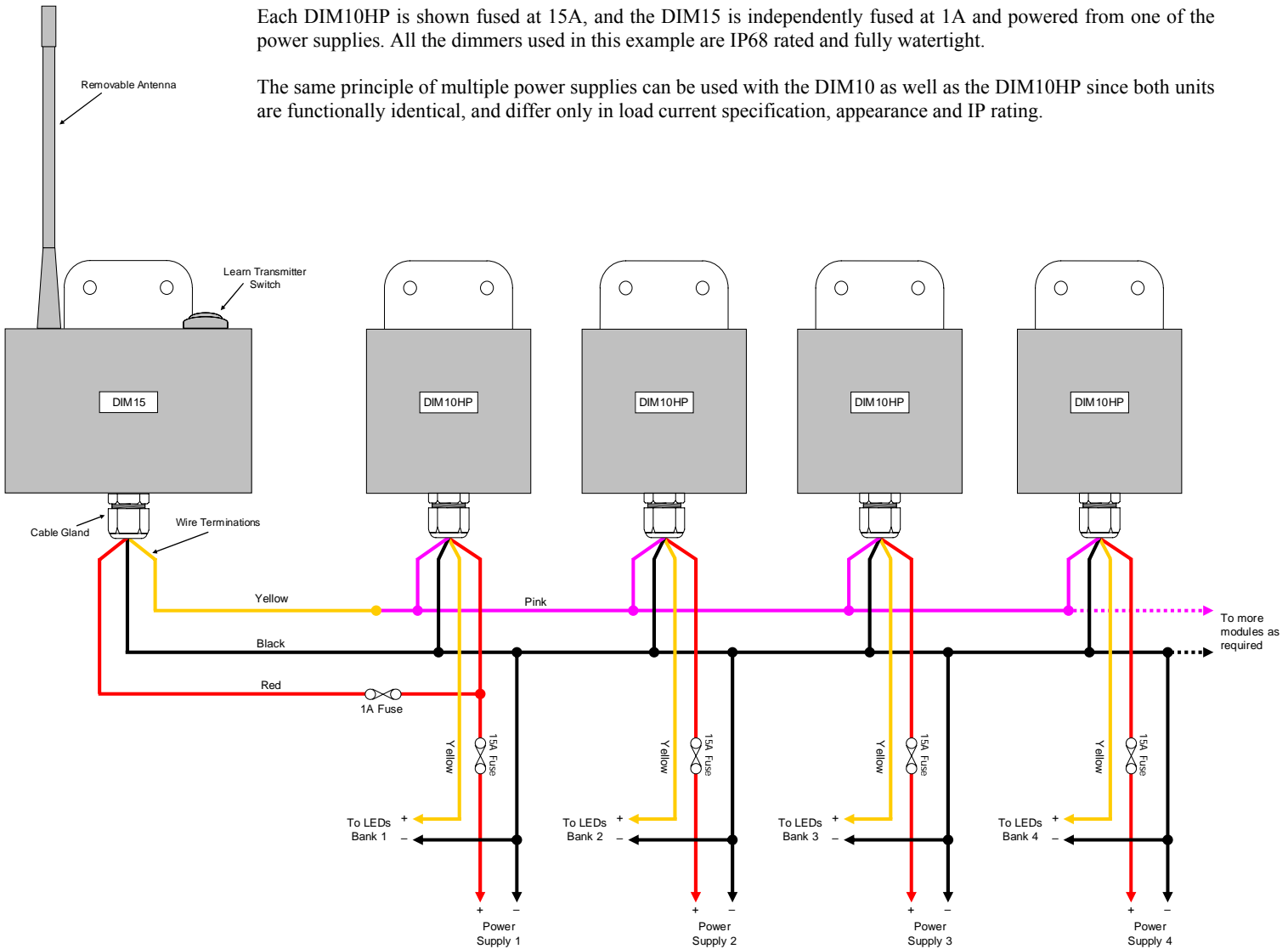
This arrangement ensures all the outputs are driven to the same brightness level under control of the DIM14. The DIM14 can be substituted for any of the dimmers in our range. Please see the datasheets available at www.abeltronics.co.uk/dimmers for more information.

Connection diagrams – DIM10HP

The diagram below shows four DIM10HP units connected to a DIM15 radio controlled dimmer with separate power supplies for each bank of lighting. The DIM15 acts as the master controller, its output (yellow) is fed to the PWM inputs of the DIM10HPs (pink). Please see the DIM15 datasheet available at www.abeltronics.co.uk/products/dim15 for more information. Each DIM10HP has its own power supply allowing greater flexibility in installation. Note the negatives of all the power supplies are connected together in the diagram (black wires).

Each DIM10HP is shown fused at 15A, and the DIM15 is independently fused at 1A and powered from one of the power supplies. All the dimmers used in this example are IP68 rated and fully watertight.

The same principle of multiple power supplies can be used with the DIM10 as well as the DIM10HP since both units are functionally identical, and differ only in load current specification, appearance and IP rating.



Dimensional Drawing

A drawing of the DIM10 is shown to the left. The DIM10HP is mounted in an enclosure of the same size with the addition of a cable gland terminating at the bottom of the enclosure.