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Low Voltage 8-Channel PWM Dimmer Module, Negative Output: DIM84NDIN

- 12/24V DC low voltage operation
- 8 independent channels, Universal 0-10V control
- Up to 5A load per channel – 960W at 24V in total
- Suitable for common anode RGB or RGBW LED Tape/Strip
- Lamp saving soft-start function
- Works with LEDs, incandescent or halogen lamps
- Flickerless dimming of LEDs (240Hz operation)
- Drives the load on the low (negative) side
- 16-bit resolution high-accuracy PWM, 32000 dimming steps.
- Fully protected and ruggedized

The DIM84NDIN is a self-contained low-side 8-channel dimmer module designed to control the brightness of low-voltage incandescent (filament), halogen or LED lamps rated up to 5A. Operating from 12V or 24V DC, and offering eight negative dimmed outputs, the module 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 lighting, low voltage architectural lighting, electronic signage, smart-building LED lighting, hazardous area lighting, etc. The unit is particularly suitable for RGB or RGBW LED tape or LED strip.

The unit is controlled by a standard 0-10V analogue voltage and features eight independent channels of lighting control. It employs a very efficient PWM (pulse-width modulation) switching technique to provide excellent operation for high power loads, and is fully protected from intermittent output short-circuits, over-temperature, reverse polarity, and input over/under voltage. Unlike other dimmers on the market, the module will control lamp brightness from 0% (fully off) to 100% (fully on). The unit is presented in a vented 4-unit wide DIN-mount enclosure suitable for mounting to standard DIN-rail.

The module also features 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 module utilises a soft-start feature at power-on, where the lamp brightness increases gradually to the pre-set 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 DIM84NDIN features a 'Full On' input designed for emergency lighting applications. When this input is connected to a positive voltage, all eight channels are quickly brought up to full brightness. 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. The unit is not suitable for driving constant current LEDs.

Please note, as part of the internal fault protection circuitry, a small current is permanently applied to the output terminals. When the dimmer is fully off, this current may cause some sensitive LEDs to glow. The effect can be mitigated by applying a resistor in parallel with the LEDs, value dependent on supply voltage and LED sensitivity.

Parameter	DIM84NDIN	Comment
Nominal Supply Voltage Range	9 – 32 V DC	
Peak Supply Voltage Range	5.5 – 40V DC	Operation not guaranteed
Quiescent Current, max	20mA	at maximum operating voltage
Maximum Output Current	5A per channel	at <30°C ambient temperature
Maximum Load Power	60W at 12V supply, 120W at 24V supply, per channel	at <30°C ambient temperature
Peak Output Current	25A per channel	<3sec at nominal operating voltage
Control Input Type	0-10V Analogue Voltage	Independent control for all channels
Control Input Impedance	10 kΩ for each 0-10V input, 1.25 kΩ for 'Full On' input	Impedance of all control inputs
Efficiency	> 97 %	
Operating Temperature Range	–40 – 70°C (–40 – 160°F)	
PWM Switching Frequency	240 Hz ±3%; 0% – 100% Duty Cycle	
Dimensions	90 × 71 × 58mm – 4-unit wide DIN-mount	L × W × H ±3% excl. fixing tab
Electrical Connection	24× Rising Clamp Terminal Block	
Mechanical Fixing	2× DIN-Mount Clips	

Mounting and Connection Guidelines

The power supply to the unit typically comes from a suitably rated low-voltage DC supply in the range 9 – 32V which must be fused at the total load current or less to protect the module. If using a switched-mode power supply with the module, we recommend the supply be rated at 1.5 times the expected maximum total load current (i.e. 1.5 times the sum of the load on all channels).

The dimmer is packaged in a vented DIN-mount enclosure and will run warm in operation when controlling loads above 3A per channel. It is important therefore to mount the DIM84NDIN in a suitably ventilated enclosure, ensuring the module's vent holes are unobstructed during use. The unit should be mounted in a cool location, away from external sources of heat. The unit is not water resistant and should be mounted away from sources of moisture.

Connection terminals are high quality rising-clamp terminal blocks capable of receiving up to 4mm^2 cable. The connectors are spaced 5mm pitch along opposite sides of the enclosure. To maximise the potential of the DIM84NDIN, 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 unit's terminals is recommended.

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Terminals and Connections

The DIM84NDIN features terminal block connectors on opposite sides of the enclosure. Some terminals have duplicate names. Connections sharing duplicate names are internally connected together within the module: Both '+Supply' terminals are internally connected together; and all four 'GND' terminals are internally connected together; and both 'Full On' terminals are internally connected together. This method serves two purposes; it allows easy daisy-chaining of multiple modules sharing the same DIN rail, and, as in the case of the GND connection, allows the effective current rating of the terminal to be increased.

Throughout this datasheet connections sharing duplicate names are sometimes mentioned in the singular for clarity – they are effectively one connection despite the presence of more than one terminal.

Full Brightness Input

The DIM84NDIN features a 'Full On' input connection. When this input is connected to a positive voltage above 4V all eight channels are brought up to full brightness within 500ms, irrespective of the voltage present at any of the 'In' terminals. 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 all connected lamps need to be fully on. **Please note, this is not a substitute for a suitably approved, redundant, emergency lighting system.** These terminals should be left unconnected if this feature is not required.

Power Connections

All eight channels of the DIM84NDIN are fully independent – each channel has its own 0-10V analogue control input. The 'Full On' and GND terminals are shared between the channels and precautions must be taken to ensure the power supply and the DIM84NDIN's terminals are not overloaded.

The DIM84NDIN is capable of controlling loads of up to 5A per channel. It is an 8-channel unit so the total current draw from the power supply when each channel is fully loaded is up to 40A. For this reason a total of four GND terminals are provided on the module, all are internally connected together. Each *terminal* is rated at 10A. So if using the module to its maximum capacity of 40A total, *all four* GND terminals must be connected to the power supply negative with separate lengths of cable.

We recommend always connecting all four GND terminals to the power supply negative, regardless of the total load on the module. This will minimise cable losses and connection resistance and will improve the total efficiency of the system. Each GND terminal should have its own cable leading directly to the power supply. These four cables are electrically in parallel and therefore reduce cable and connection resistance without resorting to overly thick and cumbersome cable.

The cable leading to the GND terminals should be rated according to the following formula:

$$I_r = \frac{1.5 \times (L_1 + L_2 + L_3 + L_4 + L_5 + L_6 + L_7 + L_8)}{n_s}$$

I_r is the cable current rating in amps,
L_1 to L_8 are the loads on each of the channels 1 to 8,
n_s is the number of GND terminals connected (4)

The +Supply terminals on the module are internally connected together and should be connected to the power supply positive. Negligible current flows through this terminal and only one +Supply terminal needs to be connected irrespective of the total load current.

Applications Information

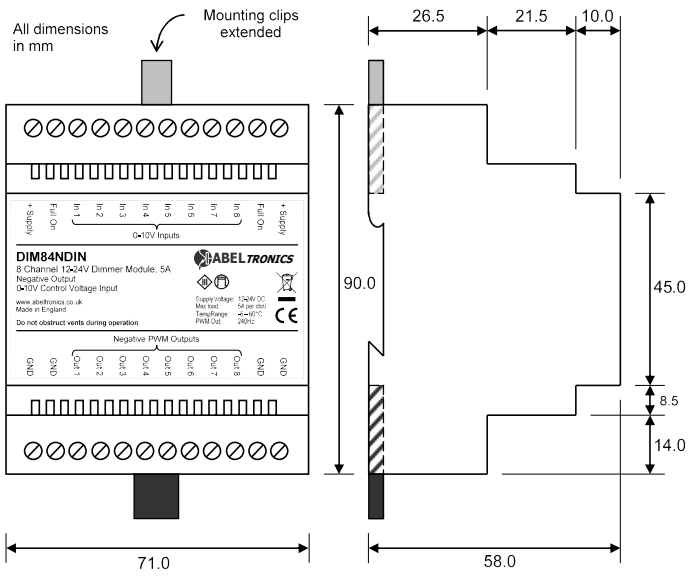
Each channel of the DIM84NDIN is controlled by a universal 0-10V analogue voltage input. The control inputs are current-*sinking* types with a maximum draw of 1mA. The inputs are designed to accept analogue 0-10V control signals from a current-*sourcing* controller such as a PLC, lighting controller, Crestron™/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 1V turns the lamp fully off, and more than 9V turns the lamp fully on. For best performance the control input must be connected to a low impedance source of less than 100Ω. PLCs, Crestron™ controllers and other lighting controllers often fulfil this requirement. The control voltage and 'Full On' inputs should never exceed the module's supply voltage. The control voltage input and the DIM84NDIN supply voltage are not electrically isolated from each other and share a common ground.

When the 'Full On' input is connected to +Supply, all channels are simultaneously brought up to full brightness within 500ms. Leave these terminals unconnected if this feature is not required, or connect to +Supply through a switch relay contact if the feature is desired.

The DIM84NDIN connection diagram is shown on the following page. The power supply can be any current-limited power supply capable of providing enough current to drive the total load of all the channels of the DIM84NDIN. The power supply voltage must be the same as the rating of the load. For example, if using 12V LEDs, the power supply must be rated at 12V. If using a switched-mode power supply, we recommend overrating the power supply by 1.5 times the total load. For example, if the total load of all the channels is 200W, use a 300W power supply. Note the four cables leading from each GND terminal to the power supply negative output. This is necessary to ensure the DIM84NDIN can control the load with maximum efficiency as mentioned above. Thick lines in the diagram indicate wires carrying high current.

The DIM84NDIN is suitable for direct connection to automotive or marine systems of 12V or 24V nominal. The configuration is similar to the diagram below, except the 12V/24V power supply is substituted for the vehicle's, or vessel's, battery. A suitable fuse or circuit breaker (not shown in the diagram) *must* be added.

Dimensions



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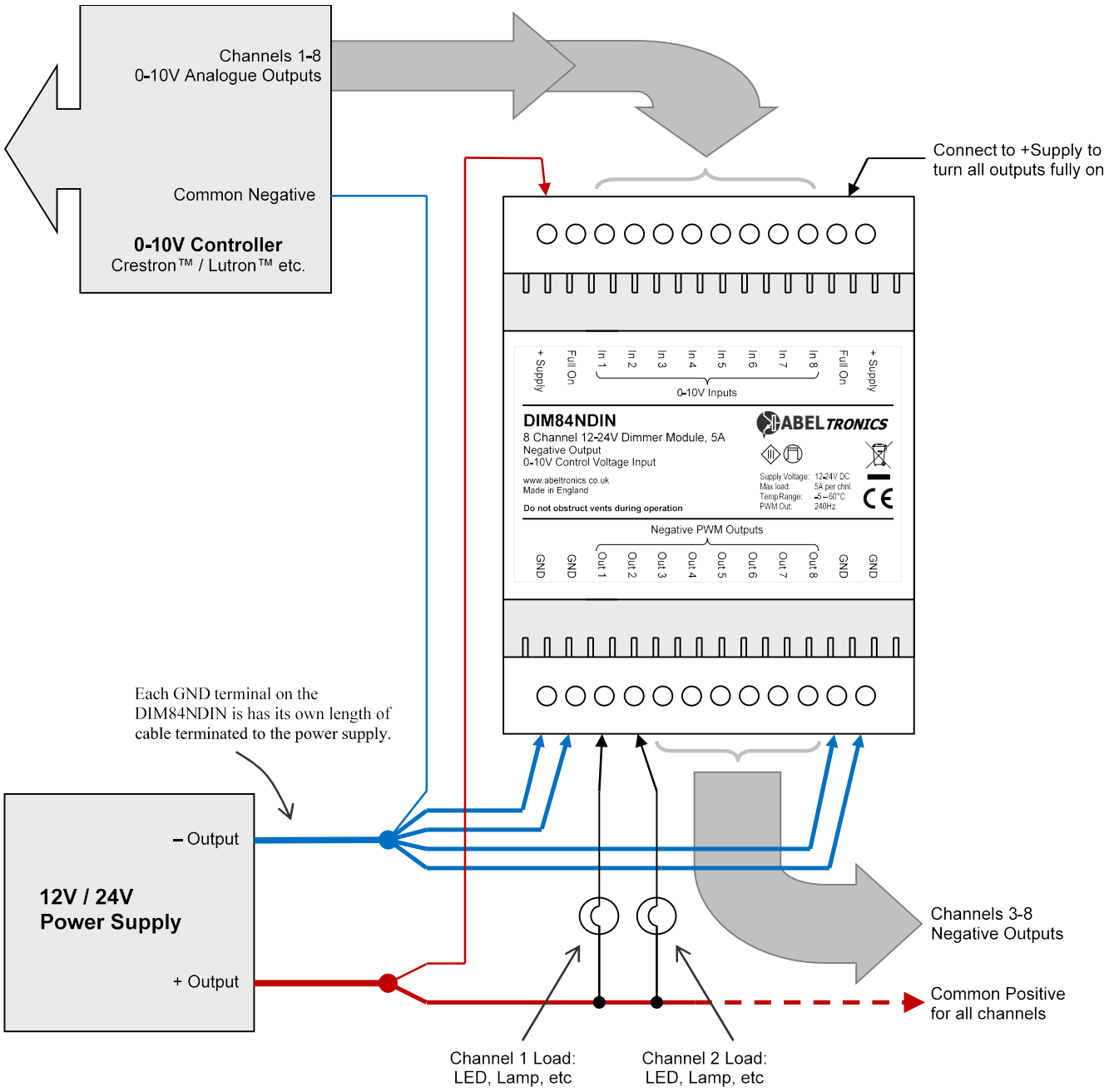
Typical Connection Diagram



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

DIM14NDIN – Single channel version
DIM84DIN – 8-channel positive output dimmer

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