# Series LD12C

## Low Cost, PWM Control, Constant Current, DC/DC LED Driver


***Engeneering description***

**2503TN003**

submitted by Mr. Pekar

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ELPEK Electronics

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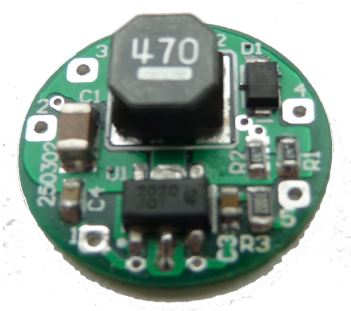
*Low Cost, PWM Control Constant Current DC/DC LED Driver*




**Key Features :**

- Constant current output type - CC
- Step-down connection - down convertors
- Wide input range of 8V to 32V
- Output to 32V
- Efficiency up to 95 %
- 5 to 25 W output power
- Operating temperature -40 ° C to + 85 ° C
- Digital PWM dimmer ( dimmer )
- Miniature size Φ 16.8 mm , height 5.8 mm

LED Driver Board of **LD12C Series**

is a highly effective continuous step - down converter optimized for managing one or High Power LED string from a source with a higher voltage than the sum of the voltages of all LED strings attached .

Control algorithm allows highly efficient and accurate control of power LEDs . The device operates from an input voltage between 8V and 32V and provides an externally adjustable output current of up to 1A . Depending on the components , supply voltage and configuration can provide up to 25 watts of output power .

The device has a special entry DIM to manage output. Depending on the input circuit allows to realize digital version dimming ( dimming ) by applying a PWM control either directly or using a transistor with open collector ( OC ) and management of the microcontroller .

Permanent applied voltage of 0.3 V or lower the DIM input turns out to state and switches off the device from the current state to the low-power standby mode .

Mechanical dimensions are minimized . Size plates mounted thereon a circular shape with a diameter of 16.8mm and 5.8mm height , including the PCB allows you to integrate this driver together with the LED module .

Also suitable to mobile lighting system .

## Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

### Input

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Range | | 8.0 | 12.0 | 32.0 | VDC |
| Max Input Voltage | | | | 40.0 | VDC |
| Under Voltage Lock Out | | | 7 | | VDC |
| Soft Start Time | | | | 50 | mS |
| Input Filter | Internal Capacitor | | | | |

### Output

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output Voltage Range | Vin = 32V | 2.0 | | 30.0 | VDC |
| Output Current | See Model Selection Guide | | | | |
| Output Current Accuracy | Vin = 12V | | ±5.0 | ±8.0 | % |
| Output Current Stability | Vin = 12V | | ±5.0 | ±10.0 | % |
| Output Capacitive Load | | | | 47 | µF |
| Output Short Circuit | Regulated At Rated Output Current | | | | |

### General

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Efficiency | See Model Selection Guide | | | | |
| Operating Frequency | See Model Selection Guide | | | | |
| Reliability Calculated MTBF | (MIL-HDBK-25°C) | 1.29 | | | Mhrs |

### Physical

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Size | Diameter | | 16.8 | | mm |
| Height | with 1.6mm PCB | | 5.8 | | mm |
| Case Material | FR4 Board (with Conductive Base) | | | | |
| Weight | | | 6.2 | | g |

### Environment

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operating Temperature | | -40 | | +85 | °C |
| Maximum Case Temperature | | | | +100 | °C |
| Storage Temperature | | -40 | | +125 | °C |
| Humidity | | | | 95 | % |
| Cooling | Free Air Convection | | | | |

**Remote On/Off Control**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| DC/DC On | DIM pin | Open Or | 2.0< Vcont | < 6.0 | VDC |
| DC/DC Off | DIM pin | | Vcont | < 0.3 | VDC |
| Remote Pin Drive Current | | | 1 | | mA |
| Quiescent Input Current | | | | | mA |

**PWM Dimming**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operation Frequency | Recomended Maximum | 0.1 | | 50 | kHz |
| On Control Voltage | | 0.4 | | 5.0 | VDC |
| Off Control Voltage | | 0.0 | | 0.3 | VDC |

**Specification Notes:**

1. Exceeding 40V on the unit input could damage the unit
2. No connection should be made between input ground and the output.
3. These are step-dovn devices, the maximum output open voltage is equal to the input voltage.
4. The DIM input (Pin 5) should be left open if not used
5. Exceeding the specified maximum output power could cause damage to the unit.
6. In some noise sensitive applications, the adition of the input filter should be used.

## Model Selection Guide

| Model Number | Input | | Output | | Dimming Control | Efficiency ( %, Max ) | LEDs in string |
|---|---|---|---|---|---|---|---|
| | Voltage (VDC) | | Voltage ( VDC ) | Current ( mA ) | | | |
| | Nominal | Range | | | | | |
| LD12C-02-120-DB | 12 | 8 - 32 | 2 - 28 | 120 | PWM | 95 | 3 |
| LD12C-02-180-DB | 12 | 8 - 32 | 2 - 28 | 180 | PWM | 95 | 3 |
| LD12C-03-240-DB | 12 | 8 - 32 | 2 - 28 | 240 | PWM | 95 | 3 |
| LD12C-03-300-DB | 12 | 8 - 32 | 2 - 28 | 300 | PWM | 95 | 3 |
| LD12C-04-360-DB | 12 | 8 - 32 | 2 - 28 | 360 | PWM | 95 | 3 |
| LD12C-05-480-DB | 12 | 8 - 32 | 2 - 28 | 480 | PWM | 95 | 3 |
| LD12C-07-600-DB | 12 | 8 - 32 | 2 - 28 | 600 | PWM | 95 | 3 |
| LD12C-08-700-DB | 12 | 8 - 32 | 2 - 28 | 700 | PWM | 95 | 3 |
| | | | | | | | |

If you need other specifications, please ask.

Using a higher input voltage required to ensure sufficient cooling plate .
( Double -sided , thermoconductive adhesive pad. )

## Package / Pinning

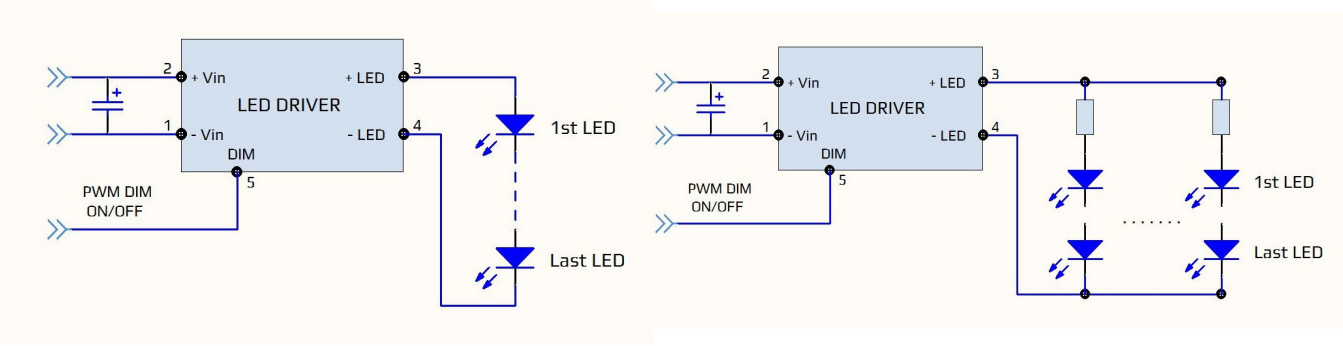

**Pin Connection**

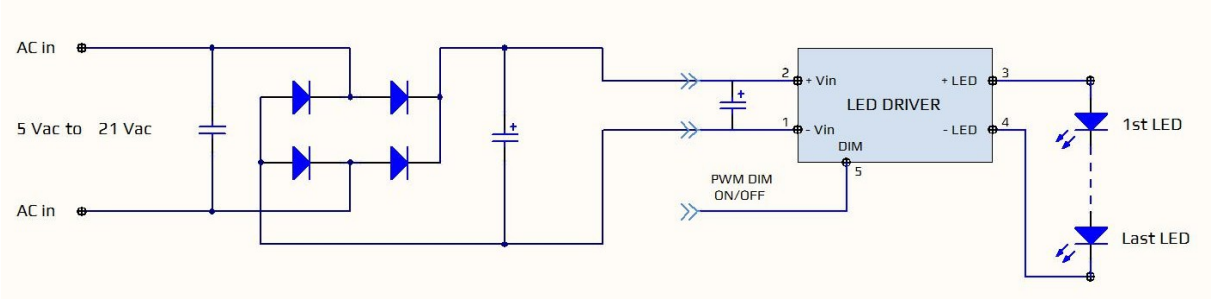
| Pin | Signal | Description |
|---|---|---|
| 1 | - Vin | Negative Terminal of the Source |
| 2 | + Vin | PositiveTerminal of the Source |
| 3 | + LED | LED Anode Connection |
| 4 | - LED | LED Catode Connection |
| 5 | DIM | PWM Dimming<br>(Leave it open if not used) |

No connection between input and output is alloved!

## Application Notes

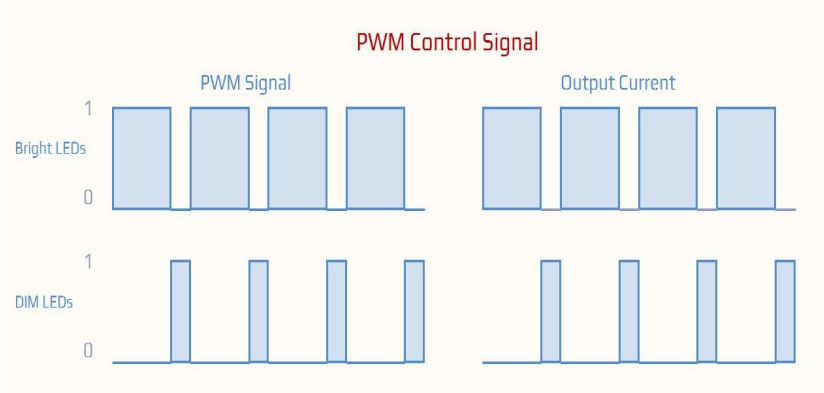
*Typical circuit:*



## Output current adjustment by PWM control:

An LED operates at its maximum efficiency when operated at the rated drive current specified by the manufacturer. Operating an LED at lower than its rated forward current not only decreases the system efficiency; but may cause color (or wave-length) shifting. In illumination applications, this could cause visible changes to lighting.




A preferred method is using pulse width modulation (PWM). As shown at next, the output current is adjusted by applying a PWM signal to the DIM input. By varying the signal duty cycle the average output current is adjusted up or down. To avoid visible flicker, the PWM signal should be greater than 200 Hz.

For duty cycles (DPWM) between 0.1 and 1, the output current is derived by the formula:

$$I_{OUT} = I_{RATED} \times D_{PWM}$$

Where Iout = Required output current
Irated = Full rated output current for the unit
Dpwm = Duty cycle of the control signal.

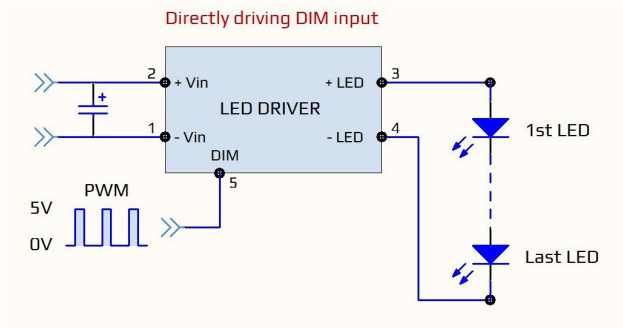
The signal can be generated by a microcontroller or a pulse generator with a duty cycle proportional to the amount of desired light output.

The DIM input may be driven via an open collec-tor transistor (as shown). The diode and integrated resistor suppress high amplitude negative spikes that may be caused by the drain-source capacitance of the transistor. Negative spikes on the control input of the unit could cause errors in output current or erratic operation.

The DIM input can also be driven by the open drain output of a microcontroller. Again, any high amplitude negative spikes that may be caused by the drain-source capacitance of the FET must be supressed.

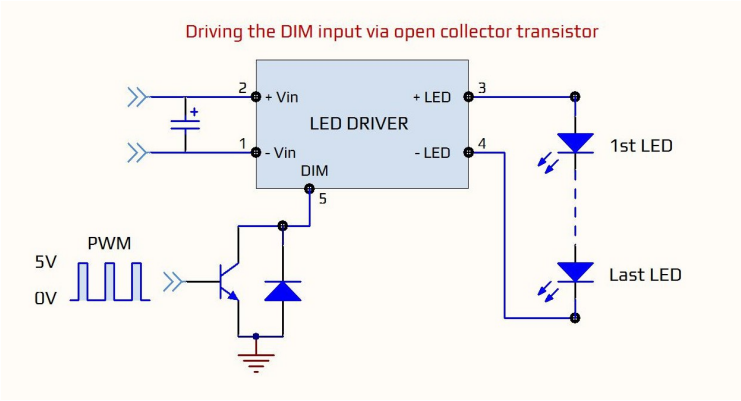
The diagram below show metod to doing this.

## PWM Dimming Application



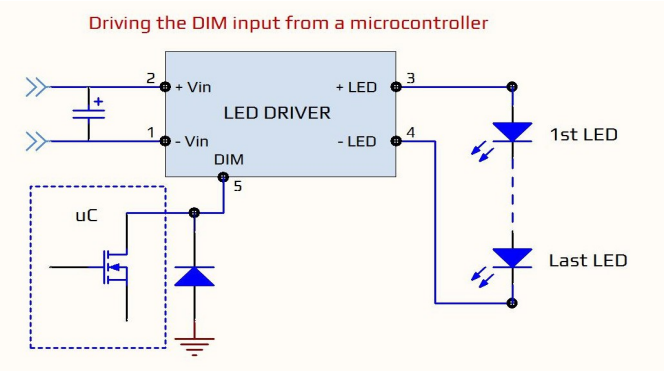

*Directly driving DIM input*

A pulse with modulated (PWM) signal with duty cycle DPWM can be applied to the DIM input as shown to left.




*Driving the DIM input via open collector transistor*

The diode and integrated resistor suppress possible high amplitude negative spikes on the DIM input resulting from the drain-source capacitance of the transistor. Negative spikes at the input to the device should be avoided as they may cause errors in output current, or erratic device operation.



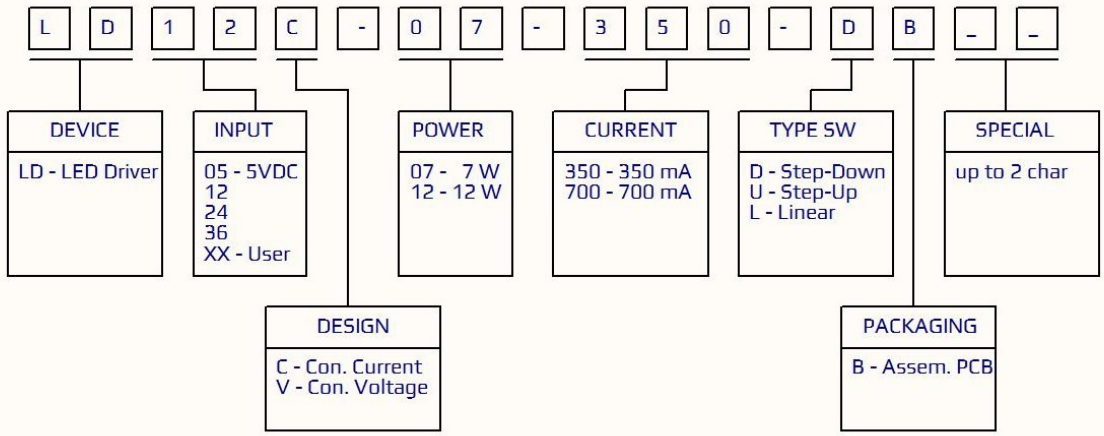

*Driving the DIM input from a microcontroller*

Another possibility is to drive the device from the open drain output of a microcontroller.

Leave the pin DIM opened while not in use , Grounded can shut the driver off and connect to Vin Power may burn the circuit.

## PART NUMBER AND PRODUCT DESCRIPTION

Part Number: LD12C-07-350-DB



**Version History:**

| Date | Version | Name | Description |
|---|---|---|---|
| 02-june-2014 | 0.1 | Ing. Pekar<br>pekar@elpek.sk | Initial Version |
| | | | |
| | | | |

Product was developed, manufactured, tested and distributed by

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