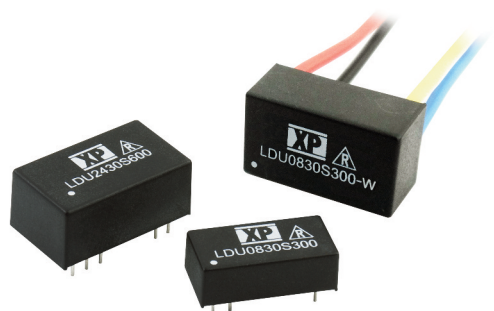


# LED Driver

## LDU Series



- Constant Current Output
- LED Drive Current up to 1000 mA
- LED Strings from 2 V to 57 V
- PWM & Analog Dimming Control
- High Efficiency – up to 95%
- Open or Short Circuit LED Protection
- 3 Year Warranty

## Specification

### Input

|               |                                                                                                                         |
|---------------|-------------------------------------------------------------------------------------------------------------------------|
| Input Voltage | <ul style="list-style-type: none"> <li>• LDU08 &amp; 24: 7-30 VDC</li> <li>• LDU48: 7-60 VDC</li> </ul>                 |
| Input Filter  | <ul style="list-style-type: none"> <li>• Capacitor</li> </ul>                                                           |
| Input Surge   | <ul style="list-style-type: none"> <li>• LDU08 &amp; 24: 40 VDC for 0.5 s</li> <li>• LDU48: 65 VDC for 0.5 s</li> </ul> |

### Output

|                              |                                                                                                                                                                                                                                                                                                                             |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage               | <ul style="list-style-type: none"> <li>• See tables<br/>(<math>V_{in}</math> must be at least 2 V greater than <math>V_{out}</math>)</li> </ul>                                                                                                                                                                             |
| Output Current               | <ul style="list-style-type: none"> <li>• See tables</li> </ul>                                                                                                                                                                                                                                                              |
| Output Current Trim          | <ul style="list-style-type: none"> <li>• 25-100%</li> </ul>                                                                                                                                                                                                                                                                 |
| Output Current Accuracy      | <ul style="list-style-type: none"> <li>• LDU08: <math>\pm 6.0\%</math> max</li> <li>• LDU24: <math>\pm 8.0\%</math> max</li> <li>• LDU48: <math>\pm 8.0\%</math> max</li> </ul>                                                                                                                                             |
| Ripple & Noise               | <ul style="list-style-type: none"> <li>• LDU08: 200 mV pk-pk max</li> <li>• LDU24: 250 mV pk-pk max<br/>(except 1000 mA units: 300 mV pk-pk max)</li> <li>• LDU48: See tables<br/>measured with 20 MHz bandwidth</li> </ul>                                                                                                 |
| Short Circuit Protection     | <ul style="list-style-type: none"> <li>• Current is limited to the rated output</li> </ul>                                                                                                                                                                                                                                  |
| Temperature Coefficient      | <ul style="list-style-type: none"> <li>• LDU08: <math>\pm 0.03\%/^{\circ}\text{C}</math> max</li> <li>• LDU24: <math>\pm 0.08\%/^{\circ}\text{C}</math> max</li> <li>• LDU48: <math>\pm 0.03\%/^{\circ}\text{C}</math> max</li> </ul>                                                                                       |
| Remote On/Off                | <ul style="list-style-type: none"> <li>• On = 0.3-1.25 V or open circuit</li> <li>• Off = <math>\leq 0.15</math> V (applied to control pin)</li> <li>• LDU08 &amp; 24: Quiescent input current is 25 <math>\mu\text{A}</math> max,</li> <li>• LDU48: Quiescent input current is 100 <math>\mu\text{A}</math> max</li> </ul> |
| Remote On/Off Signal Current | <ul style="list-style-type: none"> <li>• 1 mA max</li> </ul>                                                                                                                                                                                                                                                                |

### Dimming

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| <b>PWM</b>           |                                                                 |
| Output Current Range | <ul style="list-style-type: none"> <li>• 25% to 100%</li> </ul> |
| Operating Frequency  | <ul style="list-style-type: none"> <li>• 1 kHz max</li> </ul>   |
| On Time              | <ul style="list-style-type: none"> <li>• 200 ns min</li> </ul>  |
| Off Time             | <ul style="list-style-type: none"> <li>• 200 ns min</li> </ul>  |
| Amplitude            | <ul style="list-style-type: none"> <li>• 1.25 V max</li> </ul>  |

### DC Voltage Control

|                      |                                                                       |
|----------------------|-----------------------------------------------------------------------|
| Output Current Range | <ul style="list-style-type: none"> <li>• 25% to 100%</li> </ul>       |
| Control Input        | <ul style="list-style-type: none"> <li>• 0.3 to 1.25 V max</li> </ul> |

### Variable Resistor

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| Output Current Range | <ul style="list-style-type: none"> <li>• 25% to 100%</li> </ul> |
|----------------------|-----------------------------------------------------------------|

### General

|                     |                                                                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Efficiency          | <ul style="list-style-type: none"> <li>• See tables</li> </ul>                                                                                                                                     |
| Switching Frequency | <ul style="list-style-type: none"> <li>• LDU08: 40-380 kHz variable</li> <li>• LDU24: 50-330 kHz variable</li> <li>• LDU48: 20-500 kHz variable</li> </ul>                                         |
| MTBF                | <ul style="list-style-type: none"> <li>• LDU08: &gt;1.6 Mhrs</li> <li>• LDU24: &gt;1.6 Mhrs</li> <li>• LDU48: &gt;950 Khrs<br/>to MIL-HDBK-217F at 25 <math>^{\circ}\text{C}</math>, GB</li> </ul> |

### Environmental

|                           |                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating Temperature     | <ul style="list-style-type: none"> <li>• LDU08: -40 <math>^{\circ}\text{C}</math> to +85 <math>^{\circ}\text{C}</math>,</li> <li>• LDU24: -40 <math>^{\circ}\text{C}</math> to +85 <math>^{\circ}\text{C}</math>,</li> <li>• LDU24 1000 mA unit: -40 <math>^{\circ}\text{C}</math> to +70 <math>^{\circ}\text{C}</math>,</li> <li>• LDU48: See derating curves</li> </ul> |
| Case Temperature          | <ul style="list-style-type: none"> <li>• LDU08 &amp; 24: +100 <math>^{\circ}\text{C}</math> max</li> <li>• LDU48: +110 <math>^{\circ}\text{C}</math> max</li> </ul>                                                                                                                                                                                                       |
| Storage Temperature       | <ul style="list-style-type: none"> <li>• -40 <math>^{\circ}\text{C}</math> to +125 <math>^{\circ}\text{C}</math></li> </ul>                                                                                                                                                                                                                                               |
| Humidity                  | <ul style="list-style-type: none"> <li>• Up to 95%, non-condensing</li> </ul>                                                                                                                                                                                                                                                                                             |
| Thermal Impedance         | <ul style="list-style-type: none"> <li>• 35-50 <math>^{\circ}\text{C}/\text{W}</math> model dependant</li> </ul>                                                                                                                                                                                                                                                          |
| Ingress Protection Rating | <ul style="list-style-type: none"> <li>• IP67 (wired versions)</li> </ul>                                                                                                                                                                                                                                                                                                 |

### EMC

|                    |                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Emissions          | <ul style="list-style-type: none"> <li>• EN55022 class B conducted &amp; radiated with external components - see application notes</li> </ul> |
| ESD Immunity       | <ul style="list-style-type: none"> <li>• EN61000-4-2, level 2 Perf Criteria A</li> </ul>                                                      |
| Radiated Immunity  | <ul style="list-style-type: none"> <li>• EN61000-4-3, level 2 Perf Criteria A</li> </ul>                                                      |
| EFT/Burst          | <ul style="list-style-type: none"> <li>• EN61000-4-4, level 2 Perf Criteria A</li> </ul>                                                      |
| Surge              | <ul style="list-style-type: none"> <li>• EN61000-4-5, level 2 Perf Criteria A</li> </ul>                                                      |
| Conducted Immunity | <ul style="list-style-type: none"> <li>• EN61000-4-6, level 2 Perf Criteria A</li> </ul>                                                      |

## Models and Ratings

**LDU08/24** **XP**

### With Dimming Control

| Output Power | Input Voltage Range | Output Voltage | Output Current | Efficiency | Model Number |
|--------------|---------------------|----------------|----------------|------------|--------------|
| 8.0 W        | 7 - 30 V            | 2 - 28 V       | 300 mA         | 95%        | LDU0830S300  |
| 8.0 W        | 7 - 30 V            | 2 - 28 V       | 350 mA         | 95%        | LDU0830S350  |
| 14.0 W       | 7 - 30 V            | 2 - 28 V       | 500 mA         | 95%        | LDU2430S500  |
| 17.0 W       | 7 - 30 V            | 2 - 28 V       | 600 mA         | 95%        | LDU2430S600  |
| 20.0 W       | 7 - 30 V            | 2 - 28 V       | 700 mA         | 95%        | LDU2430S700  |
| 24.0 W       | 7 - 30 V            | 2 - 28 V       | 1000 mA        | 95%        | LDU2430S1000 |

### Wired Versions (No Dimming Control)

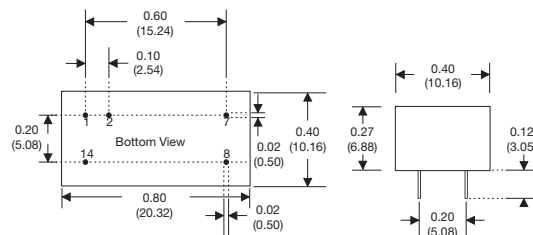
| Output Power | Input Voltage Range | Output Voltage | Output Current | Efficiency | Model Number   |
|--------------|---------------------|----------------|----------------|------------|----------------|
| 8.0 W        | 7 - 30 V            | 2 - 28 V       | 350 mA         | 95%        | LDU0830S350-W  |
| 14.0 W       | 7 - 30 V            | 2 - 28 V       | 500 mA         | 95%        | LDU2430S500-W  |
| 20.0 W       | 7 - 30 V            | 2 - 28 V       | 700 mA         | 95%        | LDU2430S700-W  |
| 24.0 W       | 7 - 30 V            | 2 - 28 V       | 1000 mA        | 95%        | LDU2430S1000-W |

### Wired Version with Dimming Control

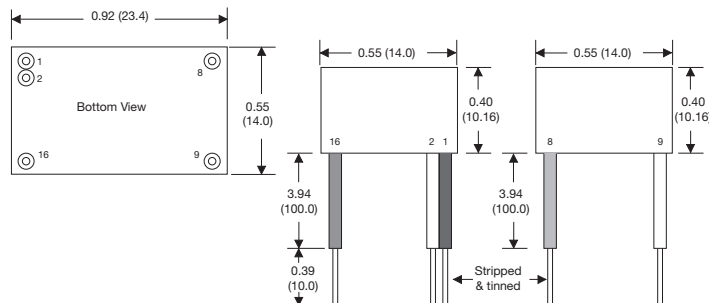
| Output Power | Input Voltage Range | Output Voltage | Output Current | Efficiency | Model Number    |
|--------------|---------------------|----------------|----------------|------------|-----------------|
| 8.0 W        | 7 - 30 V            | 2 - 28 V       | 350 mA         | 95%        | LDU0830S350-WD  |
| 14.0 W       | 7 - 30 V            | 2 - 28 V       | 500 mA         | 95%        | LDU2430S500-WD  |
| 20.0 W       | 7 - 30 V            | 2 - 28 V       | 700 mA         | 95%        | LDU2430S700-WD  |
| 24.0 W       | 7 - 30 V            | 2 - 28 V       | 1000 mA        | 95%        | LDU2430S1000-WD |

## Mechanical Details

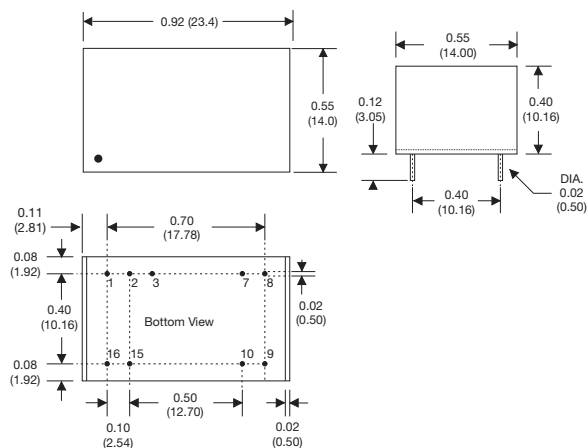
### LDU08: 14 Pin DIL



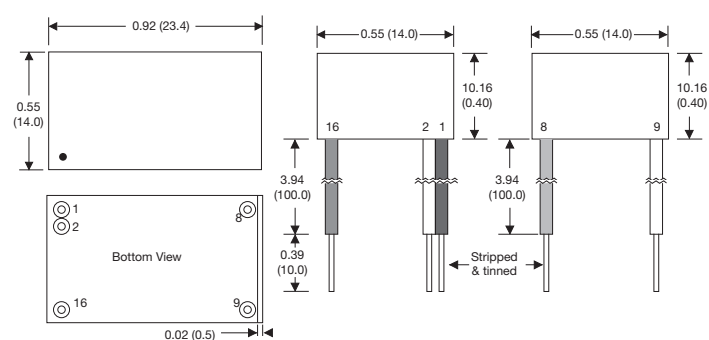
### LDU08 - Wired Versions



### LDU24- 16 Pin DIL



### LDU24 - Wired Versions



### Notes

1. All dimensions are in inches (mm)
2. Weight: LDU08 - 0.006 lbs (2.6 g) approx.  
LDU08 (wired version) - 0.02 lbs (11.1 g) approx.  
LDU24 - 0.014 lbs (6.2 g) approx.  
LDU24 (wired version) - 0.02 lbs (11.1 g) approx.
3. Pin diameter: 0.02±0.002 (0.5±0.05)
4. Pin pitch tolerance: ±0.014 (±0.35)
5. Case tolerance: ±0.02 (±0.5)

| LDU Connections |            |            |         |            |            | Function                      |
|-----------------|------------|------------|---------|------------|------------|-------------------------------|
| LDU08           | LDU08-W    | LDU08-WD   | LDU24   | LDU24-W    | LDU24-WD   |                               |
| 1               | 1 (Black)  | 1 (Black)  | 1 & 2   | 1 (Black)  | 1 (Black)  | -Vin: -DC supply              |
| 2               | No Wire    | 2 (White)  | 3       | No Wire    | 2 (White)  | Control                       |
| 7               | 8 (Blue)   | 8 (Blue)   | 7 & 8   | 8 (Blue)   | 8 (Blue)   | -Vout: LED cathode connection |
| 8               | 9 (Yellow) | 9 (Yellow) | 9 & 10  | 9 (Yellow) | 9 (Yellow) | +Vout: LED anode connection   |
| 14              | 16 (Red)   | 16 (Red)   | 15 & 16 | 16 (Red)   | 16 (Red)   | +Vin: +DC supply              |

Note: LDU08: Do not connect Pin 1 (-Vin) to Pin 7 (-Vout).  
LDU24: Do not connect Pins 1 & 2 (-Vin) to Pins 7 & 8 (-Vout).

## Models and Ratings

**LDU48** **XP**

### With Dimming Control

| Output Power | Input Voltage Range | Output Voltage | Output Current | Ripple & Noise (pk-pk) | Efficiency | Model Number |
|--------------|---------------------|----------------|----------------|------------------------|------------|--------------|
| 9.0 W        | 7 - 60 V            | 2 - 57 V       | 150 mA         | 150 mV                 | 97%        | LDU4860S150  |
| 14.0 W       | 7 - 60 V            | 2 - 57 V       | 250 mA         | 200 mV                 | 97%        | LDU4860S250  |
| 17.0 W       | 7 - 60 V            | 2 - 57 V       | 300 mA         | 250 mV                 | 97%        | LDU4860S300  |
| 20.0 W       | 7 - 60 V            | 2 - 57 V       | 350 mA         | 300 mV                 | 97%        | LDU4860S350  |
| 29.0 W       | 7 - 60 V            | 2 - 57 V       | 500 mA         | 400 mV                 | 97%        | LDU4860S500  |
| 34.0 W       | 7 - 60 V            | 2 - 57 V       | 600 mA         | 450 mV                 | 97%        | LDU4860S600  |
| 40.0 W       | 7 - 60 V            | 2 - 57 V       | 700 mA         | 500 mV                 | 97%        | LDU4860S700  |
| 48.0 W       | 7 - 60 V            | 2 - 48 V       | 1000 mA        | 800 mV                 | 97%        | LDU4860S1000 |

### Wired Versions (No Dimming Control)

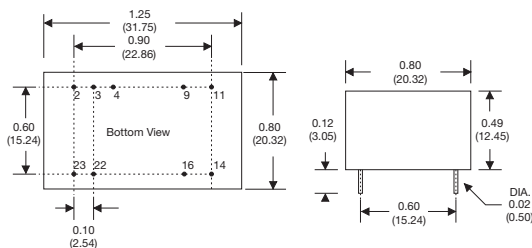
| Output Power | Input Voltage Range | Output Voltage | Output Current | Ripple & Noise (pk-pk) | Efficiency | Model Number   |
|--------------|---------------------|----------------|----------------|------------------------|------------|----------------|
| 9.0 W        | 7 - 60 V            | 2 - 57 V       | 150 mA         | 150 mV                 | 97%        | LDU4860S150-W  |
| 14.0 W       | 7 - 60 V            | 2 - 57 V       | 250 mA         | 200 mV                 | 97%        | LDU4860S250-W  |
| 17.0 W       | 7 - 60 V            | 2 - 57 V       | 300 mA         | 250 mV                 | 97%        | LDU4860S300-W  |
| 20.0 W       | 7 - 60 V            | 2 - 57 V       | 350 mA         | 300 mV                 | 97%        | LDU4860S350-W  |
| 29.0 W       | 7 - 60 V            | 2 - 57 V       | 500 mA         | 400 mV                 | 97%        | LDU4860S500-W  |
| 34.0 W       | 7 - 60 V            | 2 - 57 V       | 600 mA         | 450 mV                 | 97%        | LDU4860S600-W  |
| 40.0 W       | 7 - 60 V            | 2 - 57 V       | 700 mA         | 500 mV                 | 97%        | LDU4860S700-W  |
| 48.0 W       | 7 - 60 V            | 2 - 48 V       | 1000 mA        | 800 mV                 | 97%        | LDU4860S1000-W |

### Wired Version with Dimming Control

| Output Power | Input Voltage Range | Output Voltage | Output Current | Ripple & Noise (pk-pk) | Efficiency | Model Number    |
|--------------|---------------------|----------------|----------------|------------------------|------------|-----------------|
| 9.0 W        | 7 - 60 V            | 2 - 57 V       | 150 mA         | 150 mV                 | 97%        | LDU4860S150-WD  |
| 14.0 W       | 7 - 60 V            | 2 - 57 V       | 250 mA         | 200 mV                 | 97%        | LDU4860S250-WD  |
| 17.0 W       | 7 - 60 V            | 2 - 57 V       | 300 mA         | 250 mV                 | 97%        | LDU4860S300-WD  |
| 20.0 W       | 7 - 60 V            | 2 - 57 V       | 350 mA         | 300 mV                 | 97%        | LDU4860S350-WD  |
| 29.0 W       | 7 - 60 V            | 2 - 57 V       | 500 mA         | 400 mV                 | 97%        | LDU4860S500-WD  |
| 34.0 W       | 7 - 60 V            | 2 - 57 V       | 600 mA         | 450 mV                 | 97%        | LDU4860S600-WD  |
| 40.0 W       | 7 - 60 V            | 2 - 57 V       | 700 mA         | 500 mV                 | 97%        | LDU4860S700-WD  |
| 48.0 W       | 7 - 60 V            | 2 - 48 V       | 1000 mA        | 800 mV                 | 97%        | LDU4860S1000-WD |

## Mechanical Details

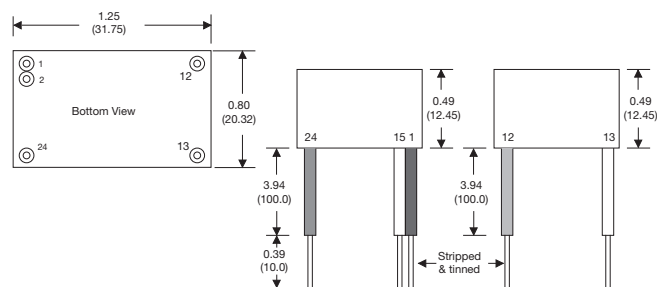
### LDU48 - 24 Pin DIL



| LDU48 Connections |             |             |                               |
|-------------------|-------------|-------------|-------------------------------|
| LDU48             | LDU48-W     | LDU48-WD    | Function                      |
| 2 & 3             | 1 (Black)   | 1 (Black)   | -Vin: -DC supply              |
| 4                 | No Wire     | 15 (White)  | Control                       |
| 9 & 11            | 12 (Blue)   | 12 (Blue)   | -Vout: LED cathode connection |
| 14 & 16           | 13 (Yellow) | 13 (Yellow) | +Vout: LED anode connection   |
| 22 & 23           | 24 (Red)    | 24 (Red)    | +Vin: +DC supply              |

Note: Do not connect pins 1 & 2 (-Vin) to pins 9 & 11 (-Vout)

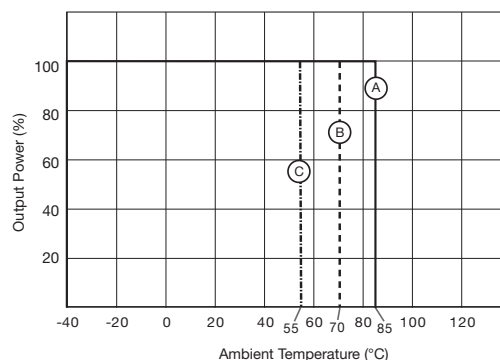
### LDU48 - Wired Versions



### Notes

- All dimensions are in inches (mm)
- Weight: LDU48 - 0.04 lbs (17.7 g) approx.  
LDU48 (wired version) - 0.04 lbs (18.0 g) approx.
- Pin diameter: 0.02±0.002 (0.5±0.05)
- Pin pitch tolerance: ±0.014 (±0.35)
- Case tolerance: ±0.02 (±0.5)

## Derating Curve for LDU48



### LDU48 Models

- (A) 150 mA, 250 mA, 300 mA, 350 mA
- (B) 500 mA, 600 mA, 700 mA
- (C) 1000 mA

### Notes

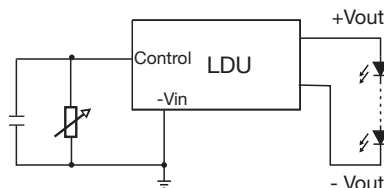
For LDU08 & LDU24 please see Operating Temperature Spec.

## Application Notes

## LDU08-48 XP

### Output Current Adjustment by Variable Resistor

By connecting a variable resistor between control and GND, simple dimming can be achieved. Capacitor is optional for HF noise rejection. Recommended value is 0.22  $\mu\text{F}$ .



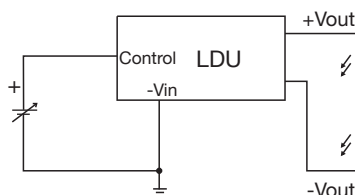
The output current can be determined using the equation:

$$\text{For LDU08-24} \quad I_{\text{out}} = \frac{I_{\text{out nom}} \times R}{(R + 200 \text{ k})} \quad \text{For LDU48} \quad I_{\text{out}} = \frac{I_{\text{out nom}} \times R}{(R + 50 \text{ k})}$$

Where the value of R is between 0 and 2 M $\Omega$ , the maximum adjustment range of output current is 25% to 90% (For Vin-Vout, LDU08 & 24: <20 VDC, LDU48: <30 VDC)

### Output Current Adjustment by DC Voltage

Control Voltage Range: 0.3 V to 1.25 VDC



The output current is given by:

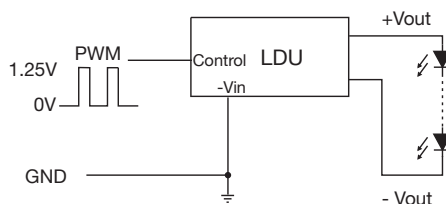
$$I_{\text{out}} = I_{\text{out nom}} \times \frac{\text{Control}}{1.25}$$

### Output Current Adjustment by PWM

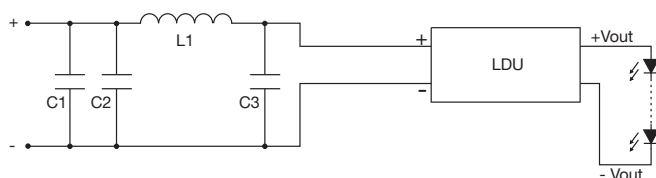
Directly driving control input

A Pulse Width Modulated (PWM) signal with duty cycle DPWM can be applied to the control pin, as shown:

$$I_{\text{out}} = I_{\text{out nom}} \times D_{\text{pwm}} \quad (D_{\text{pwm}} = \text{PWM duty cycle})$$



### Input Filter to meet Class B Conducted Emissions



|    | LDU08            | LDU24            | LDU48             |
|----|------------------|------------------|-------------------|
| C1 | 10 $\mu\text{F}$ | 10 $\mu\text{F}$ | 4.7 $\mu\text{F}$ |
| C2 | Not Fitted       | Not Fitted       | 4.7 $\mu\text{F}$ |
| C3 | 47 $\mu\text{F}$ | 47 $\mu\text{F}$ | Not Fitted        |
| L1 | 68 $\mu\text{H}$ | 68 $\mu\text{H}$ | 47 $\mu\text{H}$  |