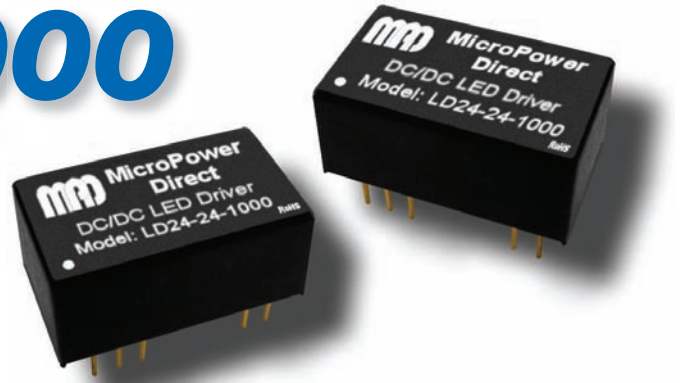


# LD24-24-1000

## Compact, 1,000 mA 24W, Constant Current DC/DC LED Driver



### Key Features:

- 24W Output Power
- Constant Current Output
- Wide 7V to 30V Input Range
- Efficiency to 95%
- Miniature MiniDIP Case
- 4.7 MHrs MTBF
- **Digital & Analog Dimming!**

### 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		7.0	24.0	30.0	VDC
Max Input Voltage	0.5 Sec. Max			40.0	VDC
Input Filter	Internal Capacitor				

#### Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Range	$V_{in} = 30V$	2		28	VDC
Output Current	$V_{in} - V_{out} > 2V$ to 3V			1,000	mA
Output Current Accuracy	$I_{out} = 1,000$ mA		±7.0		%
Output Power				24	W
Efficiency	$I_{out} = 1,000$ mA		95		%
Capacitive Load				47	µF
Operating Frequency		50		300	kHz
Ripple & Noise (20 MHz)				300	mV P - P
Temperature Coefficient				±0.08	%/°C
Thermal Impedance	Natural Convection			+40	°C/W
Output Short Circuit	Regulated At Rated Output Current				

#### Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+71	°C
	Case			+100	°C
Storage Temperature Range		-40		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%
Lead Temperature (Solder)	1.5 mm From Case For 10 Sec			260	°C

#### Physical

Case Size	0.92 x 0.55 x 0.40 Inches (23.40 x 14.00 x 10.16 mm)				
Case Material	Non-Conductive Black Plastic (UL94-V0)				
Weight	0.218 Oz (6.2g)				

#### Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Units
DC/DC On				Open Or $0.3V < V_{ADJ} < 1.25V$	
DC/DC Off	$V_{in} - V_{out} > 2V$ to 3V			$V_{ADJ} < 0.15V$	
Remote Pin Drive Current	$V_{adj} = 1.25V$			1	mA
Quiescent Input Current (Shutdown Mode)	$V_{in} = 30V$			25	µA

#### PWM Dimming

Parameter	Conditions	Min.	Typ.	Max.	Units
Operation Frequency	Recommended Maximum			1.0	kHz
Switch On Time		200			nS
Switch Off Time		200			nS

#### Analog Dimming

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	At $V_{adj}$ Input (Pin 3)	0.3		1.25	VDC
Output Current Adjustment		25		100	%
Control Voltage Range Limits	On	0.20		0.30	VDC
	Off	0.15		0.25	VDC
Drive Current	$V_{adj} = 1.25V$			1.0	mA

#### EMC Compliance (EN)

EMI/RFI	Radiated/Conducted	EN 55015 (CISPR22)			
Electrostatic Discharge (ESD)	Class A	IEC/EN 61000-4-2, -6, -8			
RF Field Susceptibility	Class A	IEC/EN 61000-4-3			
Electrical Fast Transients/Bursts On Mains	Class A	IEC/EN 61000-4-4			
EMS Immunity		EN61547			

#### Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	4.7			MHours
Safety Standards		Meets EN 60950, IEC 60950			



### MicroPower Direct

292 Page Street  
Suite D  
Stoughton, MA 02072  
USA

T: (781) 344-8226  
F: (781) 344-8481  
E: sales@micropowerdirect.com  
W: www.micropowerdirect.com



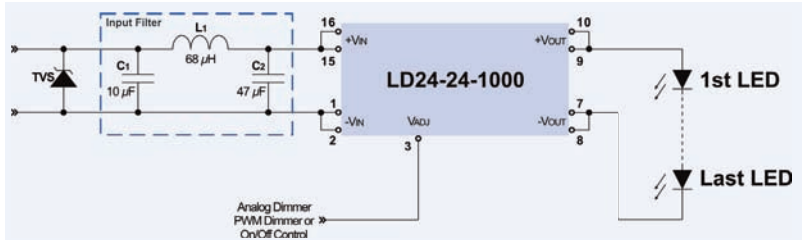
[www.micropowerdirect.com](http://www.micropowerdirect.com)

## Analog Output Current Control

### Specification Notes:

1. A reversed power source could damage the unit.
2. No connection should be made between input ground and the output.
3. These are step-down devices, the maximum output open voltage is equal to the input voltage.
4. The Vadj pin (Pin 3) should be left open if not used. Grounding Vadj will shut the unit down. Connecting Vadj to Vin may damage the unit.
5. Exceeding the specified maximum output power could cause damage to the unit.

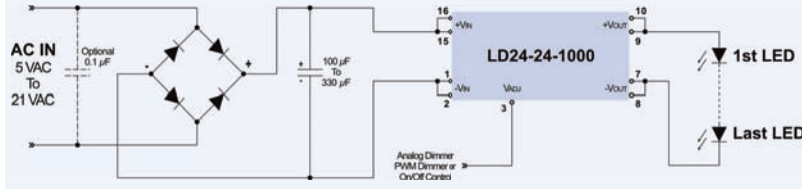
### Typical Connection: DC Input



### Connection Notes:

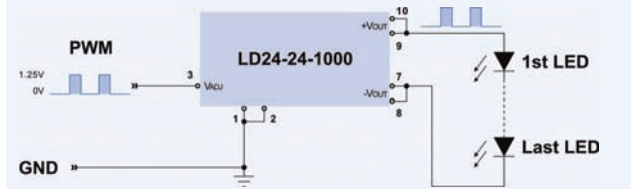
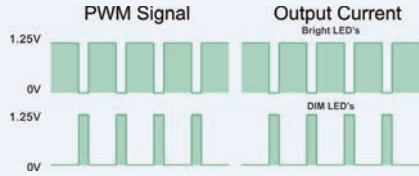
1. Input filter components (C1, L1 & C2) are used to help meet the conducted emissions requirements for the unit.
2. To comply with EN61000-4-5, a TVS should be installed before the input filter components. A 3.0SMCJ24A or SMCJ24A is recommended. The TVS max clamping voltage (@max peak pulse current VC) must be ≤40V.

### Typical Connection: AC Input



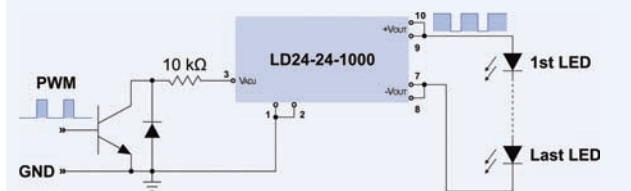
### PWM Output Current Control

Output current may be adjusted by using a pulse width modulated (PWM) signal. By varying the signal duty cycle (as shown at right) the output current is adjusted up or down. To avoid visible flicker, the PWM signal should be greater than 100 Hz.

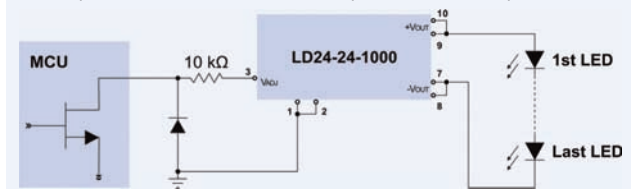


For duty cycles (D<sub>PWM</sub>) between 0 and 1, the output current is derived by the formula:

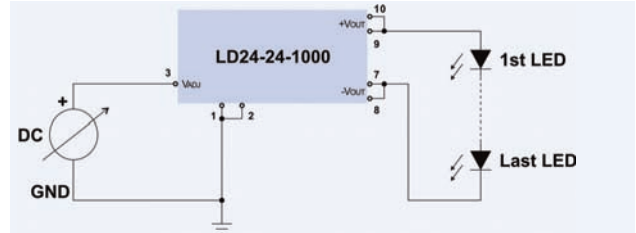
$$I_{OUT} = \frac{0.1 D_{PWM}}{0.095}$$



The diagram above shows the Vadj input being driven via an open collector transistor. The diode and resistor shown are used to suppress any high amplitude negative spikes that may be caused by the drain-source capacitance of the transistor. Negative spikes on the input of the unit could cause errors in output current or erratic operation.

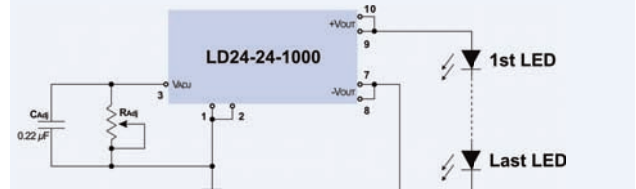


The Vadj input can also be driven from the open drain output of a microcontroller, as illustrated above. The diode and resistor shown are used to suppress any high amplitude negative spikes that may be caused by the drain-source capacitance of the transistor. Negative spikes on the input could cause errors in output current or erratic operation.



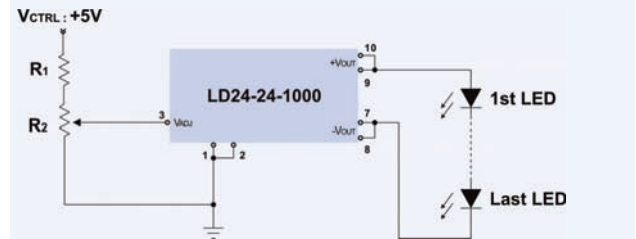
When driving the Vadj pin directly from a DC source, the output current is derived by the formula:

$$I_{OUT} = \frac{0.08 \times V_{ADJ}}{0.095}$$



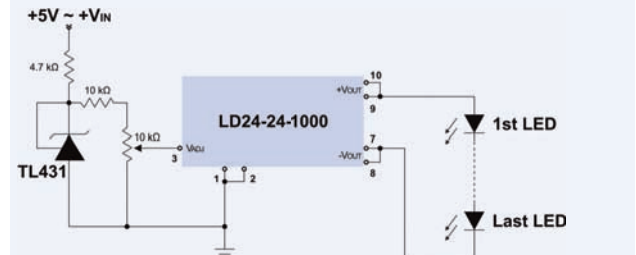
For simple dimming, a variable resistor is connected as shown above. Cadj is used to improve HF noise rejection and help prevent AC mains. Output current is derived by the formula:

$$I_{OUT} = \frac{(0.8 \cdot 0.095) \times R_{ADJ}}{(R_{ADJ} + 200k)}$$



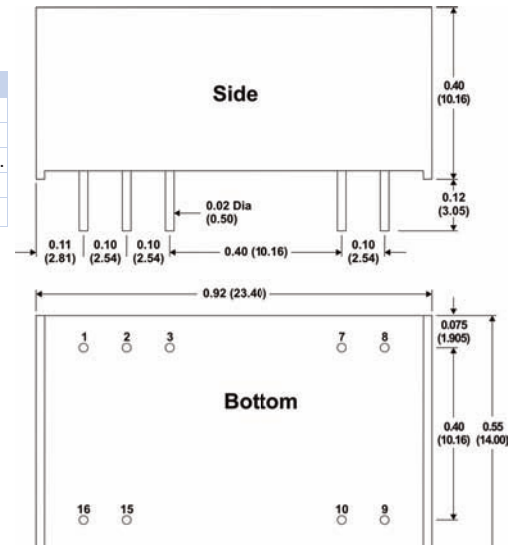
When setting the control voltage through a resistor network, the voltage level at pin 3 (Vadj) is derived by the formula:

$$V_{ADJ} = \frac{R_2}{R_1 + R_2} \times V_{CTRL}$$



This circuit is further enhanced by adding the shunt regulator TL431.

### Mechanical Dimensions



### Pin Connections

Pin	Function
1,2	-VIN -DC Supply
3	V <sub>ADJ</sub> PWM, On/Off
7,8	-V <sub>OUT</sub> LED Cathode Conn.
9,10	+V <sub>OUT</sub> LED Anode Conn.
15,16	+VIN +DC Supply

### Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Pin 1 is marked by a "dot" or indentation on the top of the unit