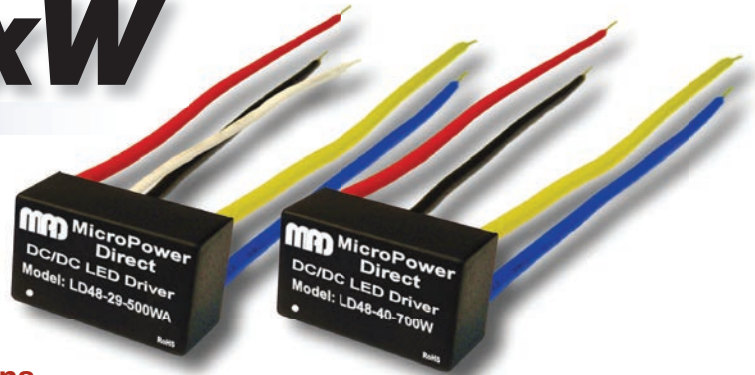


LD48-xx-xxW

Compact, Wired Constant Current DC/DC LED Drivers



Key Features:

- Constant Current Output
- Wide 7V to 60V Input Range
- Efficiency to 97%
- Miniature MiniDIP Case
- IP67 Rated
- Meets EN 60950
- 950 kHrs MTBF
- **Digital & Analog Dimming!**

**Board Mount
Models
Available**

IP67

RoHS



MicroPower Direct

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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		60.0	VDC
Max Input Voltage	0.5 Sec. Max			65.0	VDC
Input Filter	Internal Capacitor				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Range	V _{IN} = 60V	2		57	VDC
Output Current	See Model Selection Guide				
Output Current Accuracy	See Model Selection Guide				
Output Power	See Model Selection Guide				
Efficiency	See Model Selection Guide				
Capacitive Load				470	μF
Operating Frequency		20		500	kHz
Ripple & Noise (20 MHz)	See Model Selection Guide				
Temperature Coefficient				±0.03	%/°C
Thermal Impedance	Natural Convection			+30	°C/W
Output Short Circuit	Regulated At Rated Output Current				

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
	Case			+110	°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	1.25 x 0.80 x 0.49 Inches (31.75 x 20.32 x 12.45 mm)				
Case Material	Non-Conductive Black Plastic (UL94-V0)				
Weight	0.622 Oz (17.7g)				

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 _{ADJ} < 0.15V			
Remote Pin Drive Current	V _{ADJ} = 1.25V			1	mA
Quiescent Input Current (Shutdown Mode)	V _{IN} = 60V			100	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 4)	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	
Drive Current	V _{ADJ} = 1.25V			1.0	mA

EMC Compliance

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

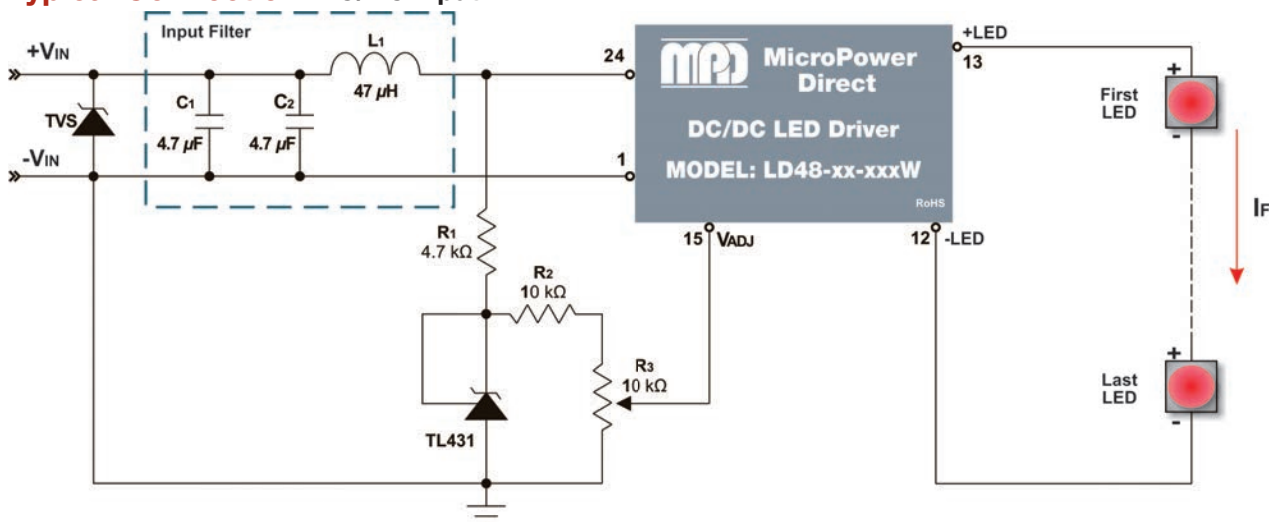
Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	950			kHours

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Model Number	Input	Output			Maximum Power (W)	Ripple & Noise (mV P-P, Max)	Efficiency (% Typ)
	Voltage (VDC)	Voltage (VDC)	Current				
	Range	Range	Max (mA)	Accuracy (%)			
LD48-09-150W(A)	7.0 - 60.0	2.0 - 57.0	150	±8	9	150	97
LD48-14-250W(A)	7.0 - 60.0	2.0 - 57.0	250	±7	14	200	97
LD48-17-300W(A)	7.0 - 60.0	2.0 - 57.0	300	±6	17	250	97
LD48-20-350W(A)	7.0 - 60.0	2.0 - 57.0	350	±5	20	300	97
LD48-29-500W(A)	7.0 - 60.0	2.0 - 57.0	500	±5	29	400	97
LD48-34-600W(A)	7.0 - 60.0	2.0 - 57.0	600	±5	34	450	97
LD48-40-700W(A)	7.0 - 60.0	2.0 - 57.0	700	±5	40	500	97
LD48-48-1000W(A)	7.0 - 60.0	2.0 - 57.0	1000	±5	48	800	97

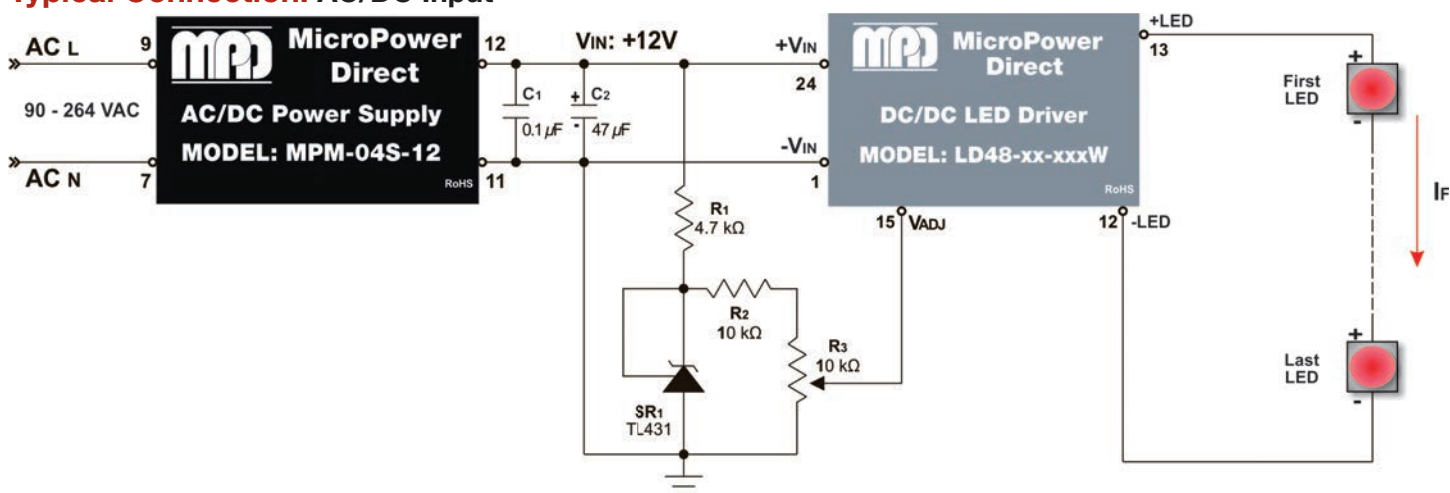
Notes:

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 V_{ADJ} input should be left open if not used. Grounding V_{ADJ} will shut the unit down. Connecting V_{ADJ} to V_{IN} may damage the unit.
5. Exceeding the specified maximum output power could cause damage to the unit.

Typical Connection: DC/DC Input**Connection Notes:**

To comply with EN61000-4-5, a TVS should be installed before the input filter components. A 3.0SMCJ48A or SMCJ48A is recommended. The TVS max clamping voltage (@max peak pulse current I_C) must be $\leq \pm 60V$. This will prevent any surge from exceeding the maximum input of the driver (65 VDC). Exceeding the maximum input rating could damage the driver.

The filter shown (C_1 , C_2 and L_1) will help to meet conducted emission requirements. With the addition of the filter, the unit should meet the levels of EN 55015.

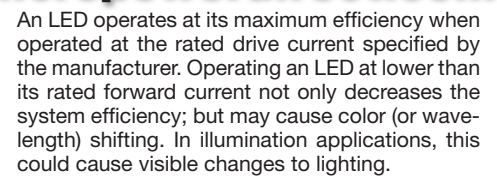
Typical Connection: AC/DC Input**Connection Notes:**

This is a distributed (or two-stage) AC connection. In this configuration, the AC line in (90 to 264 VAC) is connected to the **MPM-04S-12**, a miniature 4W AC/DC power supply. The **MPM-04S-12** provides a tightly regulated 12 VDC output at 333 mA. The 12 VDC output powers the LED driver.

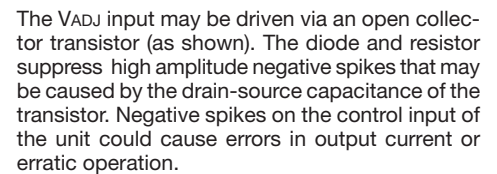
The two stage approach can simplify the safety approval process (most AC/DC power supplies on the market are approved to EN 60950) and may increase design flexibility. Besides the output power, other specifications to consider when selecting the input AC/DC supply would include input range, safety approvals, PFC rating (which may be needed for various system energy ratings) and operating temperature range.

Note: The output current adjustment circuit shown in both connection diagrams is discussed on page 4.





For duty cycles (DPWM) between 0 and 1, the output current is derived by the formula:

$$I_{NOM} = I_{MAX} \times D_{PWM}$$


PWM Dimming Application



The size of C4 is generally not critical, but it should be as low leakage as possible. In order to avoid excessive current flow through the internal discharge transistor, it is recommended that R1 be at least 5 k Ω .

The output current of the unit can also be set by adjusting the voltage level on the V_{ADJ} input to a value between 0.3V to 1.25V (I_{OUT} will vary from 25% to 100% of rated output current). Care must be taken not to exceed 1.25V on this input, or the driver may be damaged.

A simple analog circuit using two low cost, switching regulators is shown at left. Working from inputs that can range from 15 to 32 VDC, the top regulator (SR₁) keeps the input to the LED driver at 12 VDC.

The other regulator (SR₂), driven off the same input line maintains the control voltage (for the V_{ADJ} input) at 5 VDC. The resistor network of R₁ and R₂ can now be used to set the output current level of the LED driver. This level is equal to:

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

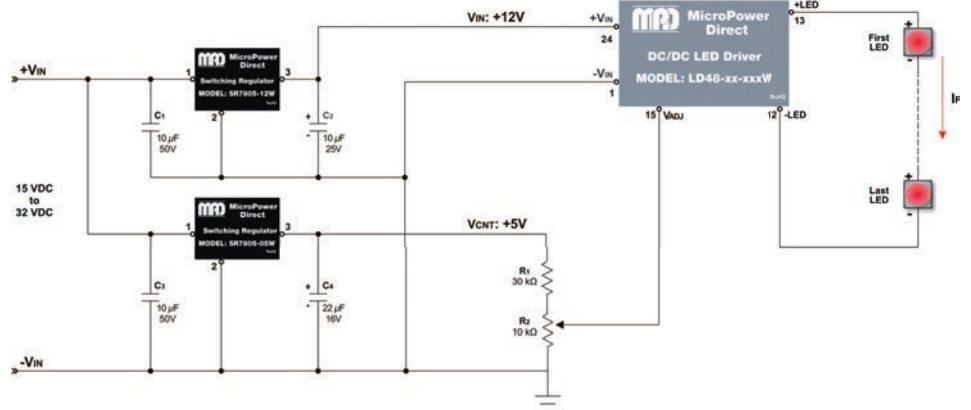
In the second circuit, the 5 VDC regulator (SR₂) is replaced by the shunt regulator (D₁) circuit connected in parallel with the resistor network. The regulator will maintain the voltage across R₂ and R₃ at 2.5 VDC, insuring that the 1.25 VDC limit on the V_{ADJ} pin will not be exceeded. This circuit will work for inputs between 7VDC and approximately 36 VDC. For inputs between 36 VDC and 60 VDC, a zener diode (D₂) has been added.

When using the analog control input, the nominal output current is equal to:

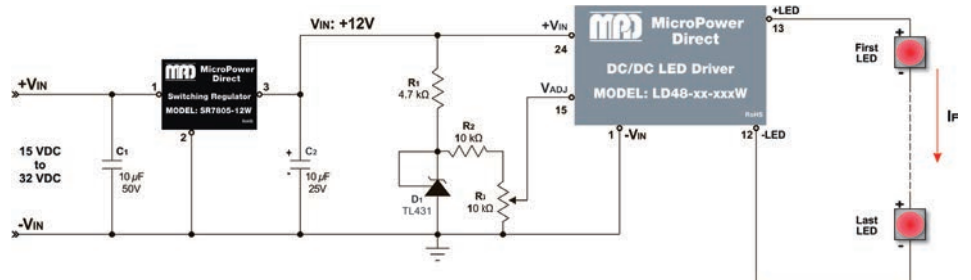
$$I_{NOM} = I_{MAX} \times \frac{V_{ADJ}}{1.25}$$

The V_{ADJ} input should be left open if not used. Grounding V_{ADJ} will shut the unit down. Connecting V_{ADJ} to directly to +V_{IN} may damage the unit.

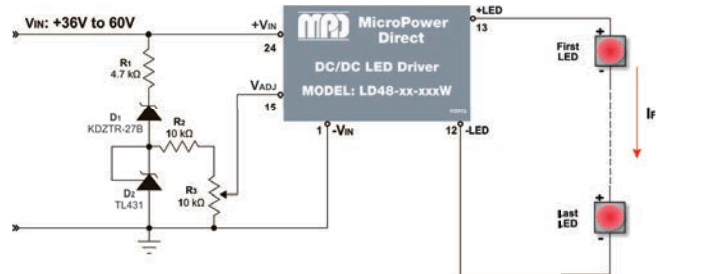
Analog Output Current Control



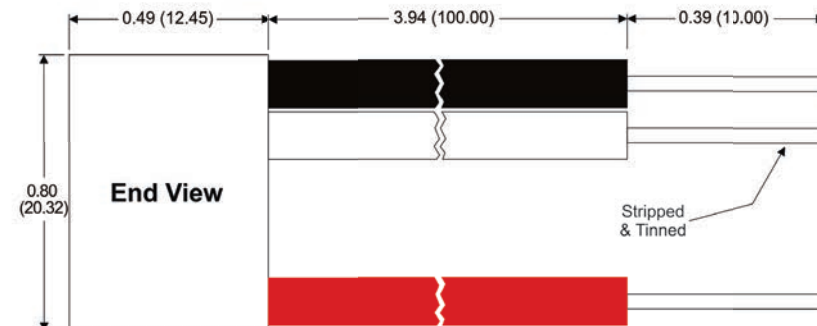
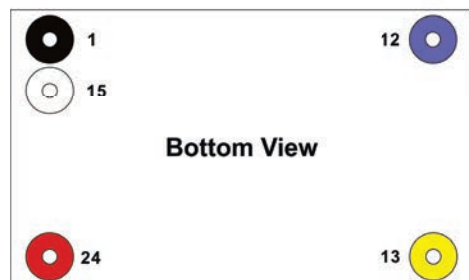
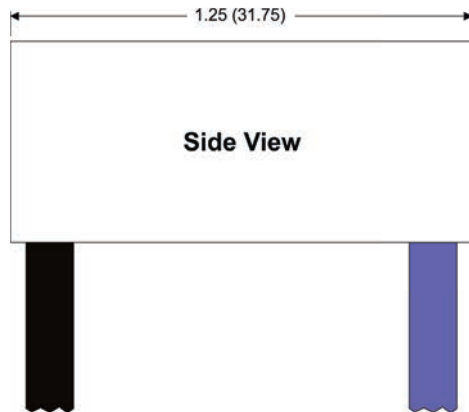
Analog Output Current Control (7 - 36 VDC IN)



Analog Output Current Control (36 - 60 VDC IN)



Mechanical Dimensions



Pin Connections

Pin	Color	LD48-xx-xxxW
1	Black	-VIN -DC Supply
15	White	No Wire
12	Blue	-LED LED Cathode Conn.
13	Yellow	+LED LED Anode Conn.
24	Red	+VIN +DC Supply

Pin	Color	LD48-xx-xxxWA
1	Black	-VIN -DC Supply
15	White	VADJ PWM, On/Off
12	Blue	-LED LED Cathode Conn.
13	Yellow	+LED LED Anode Conn.
24	Red	+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



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