12W Constant-Current LED Driver with PWM Dimming, Load Current Up to 1Amp, 12V DC Input

This is a high-performance, adjustable constant current, and PWM dimmer project. It provides accurate output constant current and PWM control. The circuit regulates the current flowing through a LED/LED array to maintain the desired level of light output. The board consists of CAT4101 LED driver chip and LTC6992-1 PWM generator chip.

Applications: Architect Lighting, General Lighting, Horticulture Lighting, Photography Lighting

The CAT4101 is a constant-current sink driving a string of high-brightness LEDs up to 1 A with very low dropout of 0.5 V at full load. It requires no inductor, provides a low noise operation and minimizes the number of components. The LED current is set by an external resistor connected to the RSET pin. The LED pin is compatible with high voltage up to 25 V, allowing the driving of long strings of LEDs. The device ensures an accurate and regulated current in the LEDs independent of supply and LED forward voltage variation. The PWM/EN input allows the device shutdown and the LED brightness adjustment by using an external pulse width modulation (PWM) signal. The driver features a thermal shutdown protection that becomes active whenever the die temperature exceeds 150C.

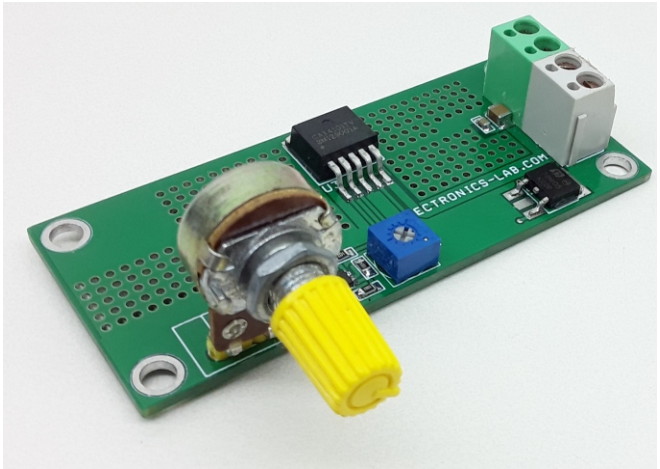
The LTC6992 is a silicon oscillator with an easy-to-use analog voltage-controlled pulse width modulation (PWM) capability. The LTC6992 is part of the Timer Blox® family of versatile silicon timing devices. A single resistor, RSET, programs the LTC6992's internal master oscillator frequency. The output frequency is determined by this master oscillator and an internal frequency divider, NDIV, programmable to eight settings from 1 to 16384.Applying a voltage between 0V and 1V on the MOD pin sets the duty cycle. The four versions differ in their minimum/maximum duty cycle. Note that a minimum duty cycle limit of 0% or maximum duty cycle limit of 100% allows oscillations to stop at the extreme duty cycle settings.

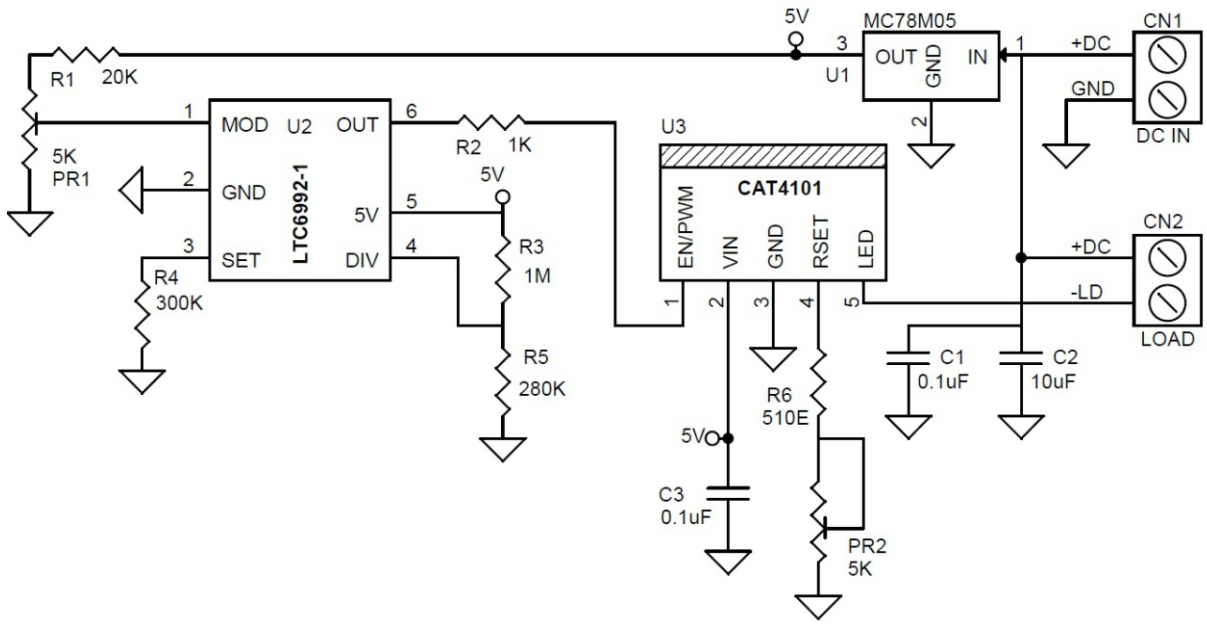
Components and Operations

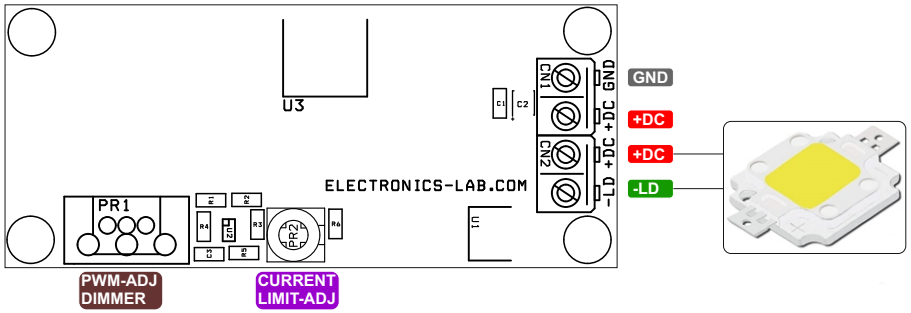
- **PR1 Potentiometer:** Duty Cycle Control, Range 0 to 100% (Dimmer Control)
- **PR2 Trimmer Potentiometer:** Constant Current Control 100mA to 1000mA (0.1A-1Amp)
- **U2 LTC6992-1:** Voltage to PWM converter Provides Duty Cycle 0 to 100%, Frequency 2.6Khz
- **U3 CAT4101:** 1 Amp Constant-Current LED Driver with PWM Dimming
- **U1 LM78M05:** 5V Regulator for logic Circuit

Features

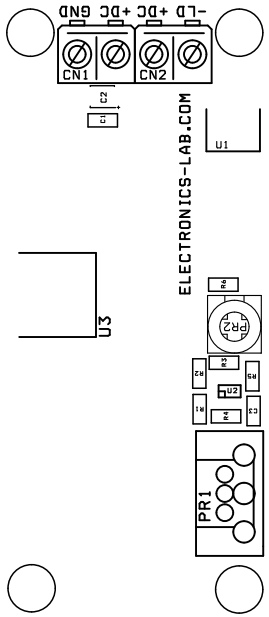
- Operating Power Supply 12V DC (Range 12-18V DC)
- Load Current 1Amp (High Brightness Single LED or String of LED)
- Load Current Adjustable 0.1A to 1Amp (100mA to 1000mA)
- Dimming PWM Duty Cycle 0% to 100%
- Zero Current Shutdown Mode
- Thermal Shutdown Protection
- Low Dropout 500mV at 1Amp
- PCB Dimensions 81.44 x 35.24 mm



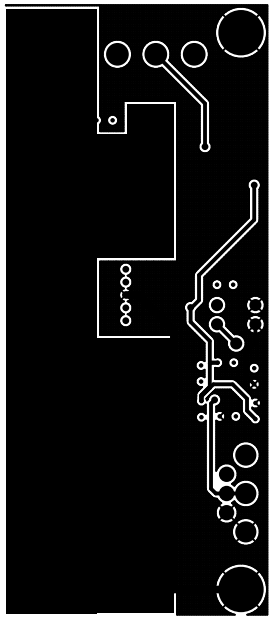

5V
MC78M05
U1
OUT
GND
IN
CN1
+DC
GND
DC IN
R1 20K
5K
PR1
MOD
U2
OUT
GND
LTC6992-1
5V
SET
DIV
R2 1K
5V
R3
1M
R4
300K
R5
280K
U3
CAT4101
EN/PWM
VIN
GND
RSET
LED
CN2
+DC
-LD
LOAD
C1
0.1uF
C2
10uF
R6
510E
5V
C3
0.1uF
PR2
5K



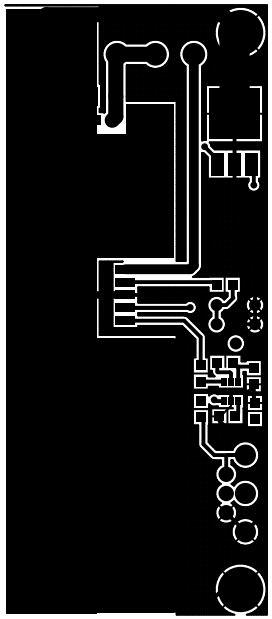
BOM						
NO	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
2	1	CN2	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
3	1	C2	47uF or 10uF/25V SMD SIZE 1210	MURATA/YAGEO	DIGIKEY	
4	2	C1,C3	0.1uF/50V SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
5	1	PR1	5K POTENTIOMTER	BOURNS	DIGIKEY	118-3362U-1-502RLFCT-ND
6	1	PR2	5K TRIMMER POT	BOURNS	DIGIKEY	PDB181-K420K-502B-ND
7	1	R1	20K 1% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
8	1	R2	1K 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
9	1	R3	1M 1% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
10	1	R4	300K 1% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
11	1	R5	280K 1% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
12	1	R6	510E 1% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
13	1	U1	MC78M05	ON SEMI	DIGIKEY	MC78M05CDTGOS-ND
14	1	U2	LTC6992-1	ANALOG	DIGIKEY	161-LTC6992IS6-1
15	1	U3	CAT4101	ONSEMI	WorldWayElec	CAT4101TV-3679303



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 81.44MM X 35.24MM