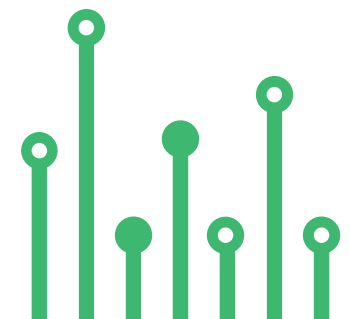


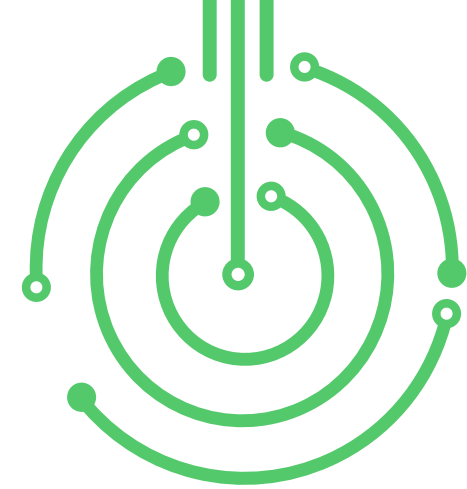
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21-Watt Universal AC LED driver with Accurate Average- Mode Constant Current Control



SKU: EL134655

21 Watt Universal AC LED Driver with Accurate Average-Mode Constant Current Control



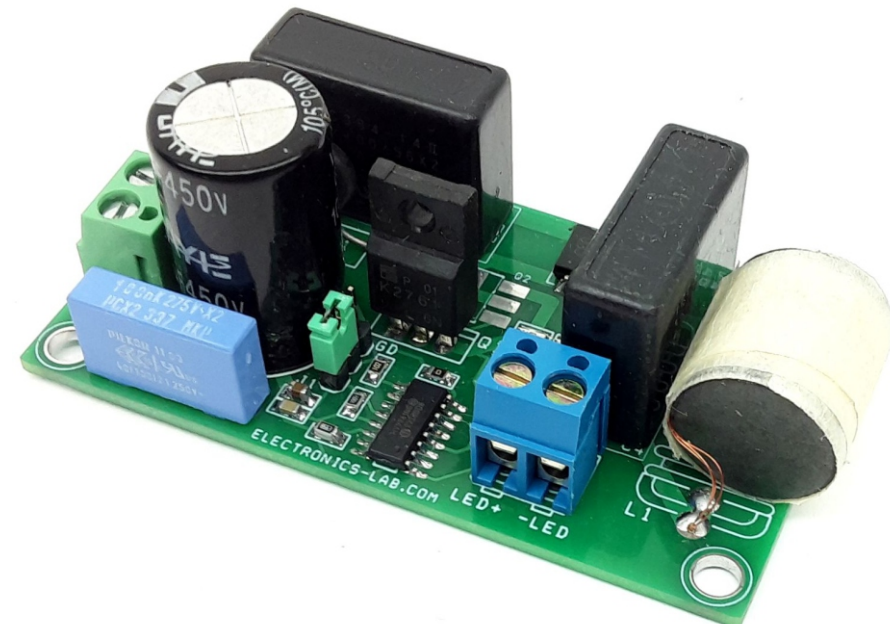
The project presented here is an average current mode control LED driver operating in a constant off-time mode. The project consists of a bridge rectifier followed by a buck converter operating with a fixed off-time of 20 μ s. The circuit provides accuracy, and line and load regulation of the LED current. The output LED current accuracy is +/-4%. The project is built using HV9961 chip which is equipped with a current limit comparator for hiccup-mode output short circuit protection. A PWM dimming input is provided that accepts an external control of a TTL-compatible signal. Connect the PWMD terminal to the VDD terminal using the jumper provided to enable the LED driver.



Warning HIGH VOLTAGE: Dangerous voltage exists until the power is off. Wait at least 1 minute after the input power is disconnected before touching the board and discharging HV capacitors.

FEATURES

- Supply 90V to 265V AC 50Hz/60Hz
- Output 20 to 60V, 350mA
- Full Load Efficiency Up to 92%
- Switching Frequency 38Khz
- Fast Average Current Control
- PWM Dimming Input (Jumper J1)
- Output Short-Circuit Protection with Skip Mode
- PCB Dimensions 74.93 x 40.64mm
- 4 X 4MM Mounting Holes



PWM Dimming

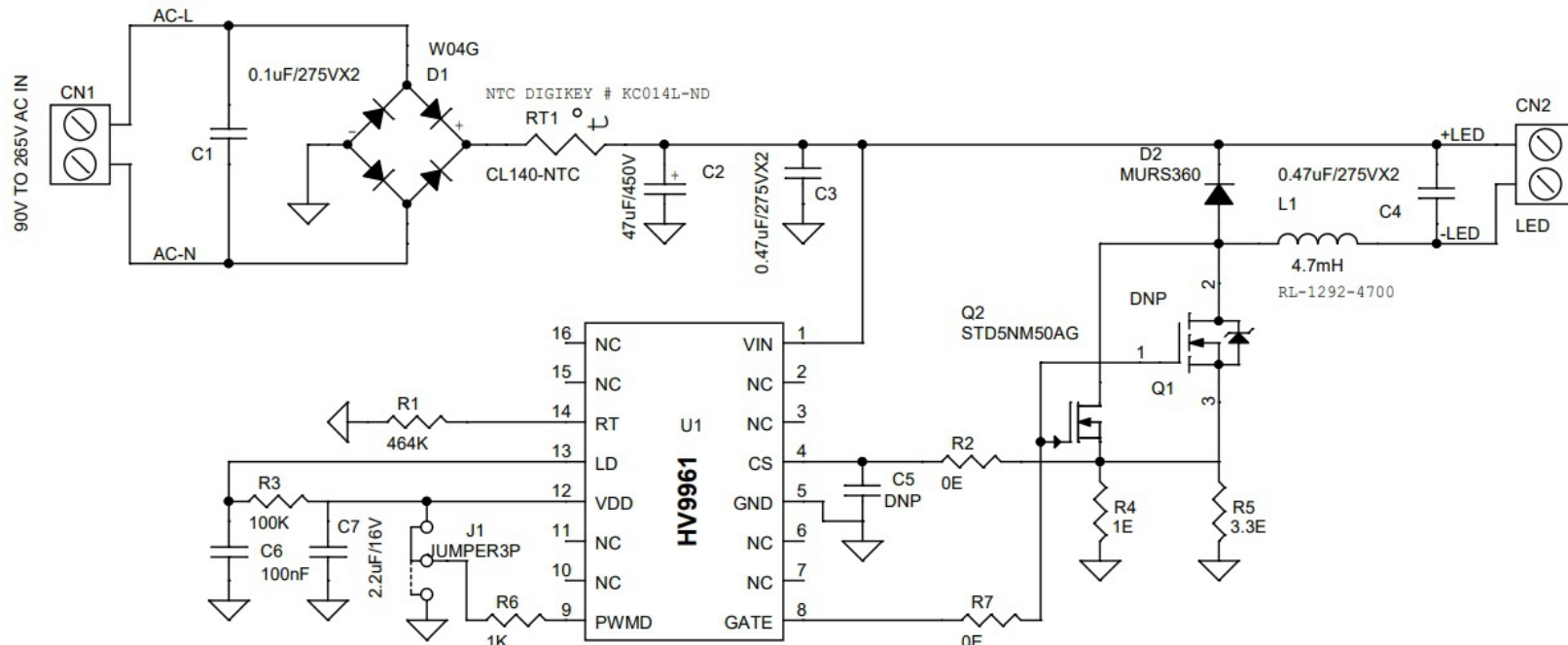
The circuit is capable of being PWM dimmed by applying a square wave TTL compatible signal between PWMD and GND terminals of Jumper J1. However, since there is no galvanic isolation on the board, care must be taken to prevent damage to the PWM dimming source and/or the circuit.

The LED driver features tight regulation of the LED current within a few milliamps over the entire range of the input AC line and the output LED string voltage. The LED current accuracy is almost insensitive to the passive component tolerances, such as the output filter inductance or the timing resistor. The accuracy of the LED current is mainly determined by the internal $275\text{mV} \pm 3\%$ reference voltage of the HV9961 control IC and by the external current sense resistor R4 and R5 tolerance. The output current can be adjusted down to 60mA using the onboard resistor R3. However, accurate current control is only achieved with continuous conduction of the filter inductor, i.e., when the LED current is greater than the inductor ripples current amplitude.



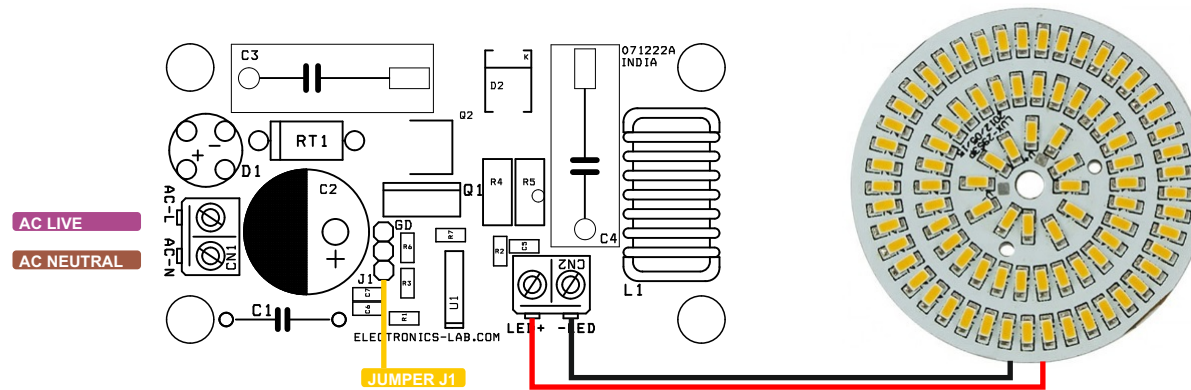
Note: The linear dimming input of the HV9961 disables switching, when its voltage falls below a 200V threshold. Expect the LED driver to shut off when the LED current falls below 50 to 55mA. The HV9961 features protection from an output short circuit condition. Open LED protection is inherent, since the output filter capacitor can accept the full rated rectified AC line voltage

Schematic



JUMPER J1 = CONNECT TO VDD = ENABLE, MIDDLE PIN + GND = PWM INPUT FOR DIMMER

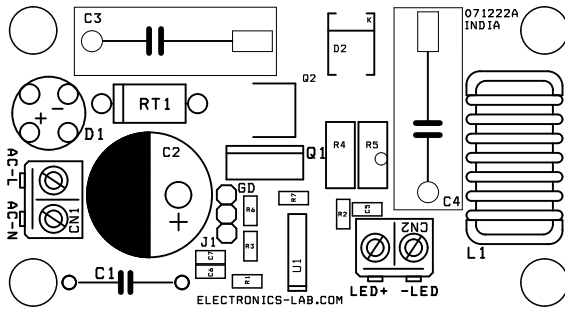
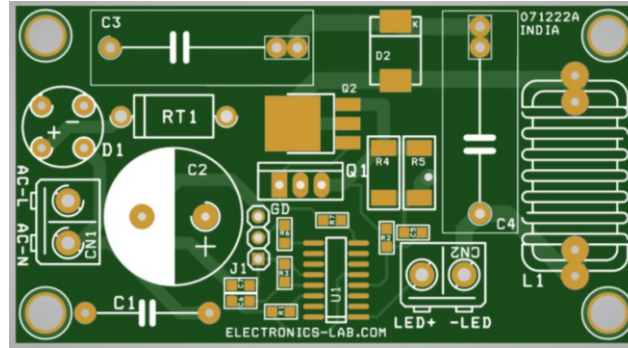
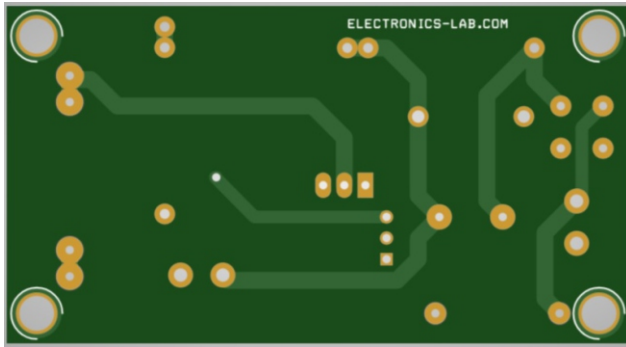
Connections



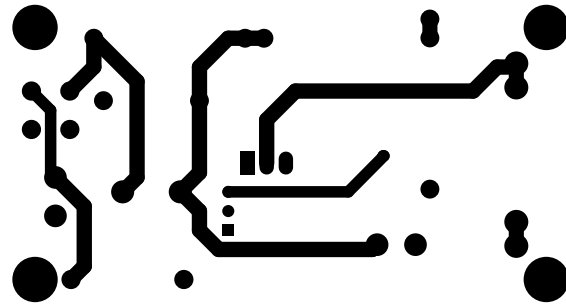
Connections

- CN1: Pin 1 = AC Live Input, Pin 2 = AC Neutral Input (90V to 265V AC Input)
- CN2: Pin 1 = DC 20V to 60V DC @ 350mA Output (+LED), Pin 2 = -LED
- Jumper J1: Pin 1 = VDD, Pin 2 = PWM In/Enable, Pin 3 = GND, Connect to VDD = Enable, Use as PWM input for Dimmer Function

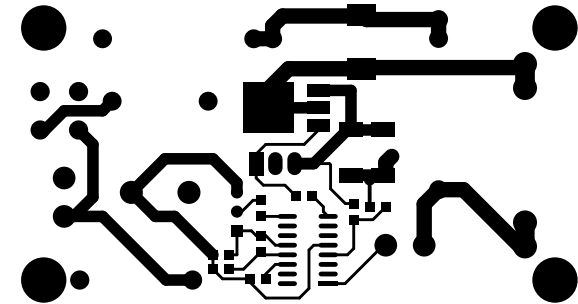
PCB



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 74.93MM X 40.64MM

Parts List

BOM						
NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER'S 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	C1	0.1uF/275VX2	KEMET	DIGIKEY	399-9651-ND
4	1	C2	47uF/450V DIA 12 TO 16MM	ELITE	DIGIKEY	4191-VJ2W470MNN1625A6-ND
5	2	C3,C4	0.47uF/275VX2	KEMET	DIGIKEY	399-12701-ND
6	1	C5	DNP			
7	1	C6	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
8	1	C7	2.2uF/16V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
9	1	D1	W04G/1.5A BRIDGE RECTIFIER	VISHAY	element14.com	1497577
10	1	D2	MURS360	DIODE INCORP	DIGIKEY	31-MURS360CT-ND
11	1	J1	JUMPER3P- 3 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5316-ND
12	1	L1	4.7mH INDUCTOR RENCO RL-1292-4700	RENCO	DIGIKEY	rencousa.com
13	1	Q1	DNP- OPTIONAL FOR Q2 TO220			
14	1	Q2	STD5NM50AG	DIGIKEY	ST	497-STD5NM50AGCT-ND
15	1	RT1	CL140-NTC	AMPHENOL	DIGIKEY	KC014L-ND
16	1	R1	464K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
17	2	R2,R7	0E SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
18	1	R3	100K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
19	1	R4	1E SMD SIZE 2512	YAGEO/MURATA	DIGIKEY	
20	1	R5	3.3E SMD SIZE 2512	YAGEO/MURATA	DIGIKEY	
21	1	R6	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
22	1	U1	HV9961	MICROCHIP	DIGIKEY	HV9961NG-G-ND
23	1	J1-S	SHUNT FOR JUMPER J1	SULLINS CONNECT	DIGIKEY	S9001-ND



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