

This demonstration circuit is an active rectifier with reverse protection for batteries in automotive applications. The project is designed for 5A load current. Two clamping diodes, D1 and D2, are used on the board to protect the IC from overvoltage spikes at the input. The input supply range is 12V to 24V. The active rectifier controller chip LT8672 controls an external N-channel MOSFET (Q1) to form an ideal diode. The GATE amplifier senses across DRAIN and SOURCE and drives the gate of the MOSFET to regulate the forward voltage to 20mV. As the load current increases, GATE is driven higher until a point is reached where the MOSFET is fully on. If the load current is reduced, the GATE amplifier drives the MOSFET gate lower to maintain a 20mV drop. If the voltage VDRAIN is reduced to a point where a forward drop of 20mV cannot be supported, the GATE amplifier drives the MOSFET off. During fast SOURCE–DRAIN transients such as fast varying input (SOURCE) signals where the regulating 20mV loop is too slow, fast pull-up (FPU) and fast pull-down (FPD) current paths turn on and off the external MOSFET quickly. This rectifies the input signal the same way a diode would do but with much less power dissipation. The SOURCE and GATE pins are protected against reverse input voltages of up to –40V. GATE is pulled to SOURCE when SOURCE goes negative, turning off the MOSFET and isolating DRAIN from the negative input. The gate voltage for the external MOSFET is provided by the auxiliary boost regulator, which regulates its output AUX to 11V above DRAIN. D2 Input power LED, D4 output power LED, CN1 input, CN2 output.

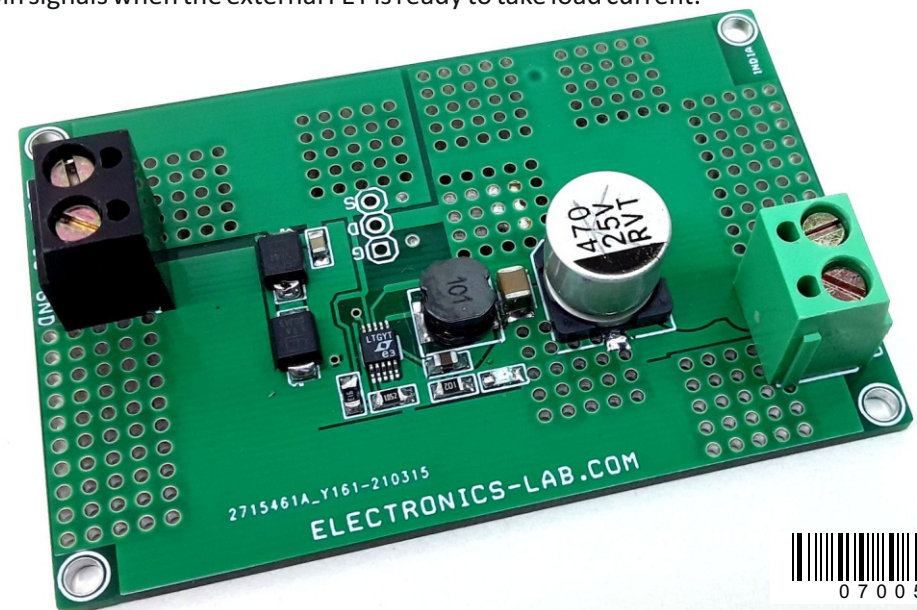
What is Active Rectification?

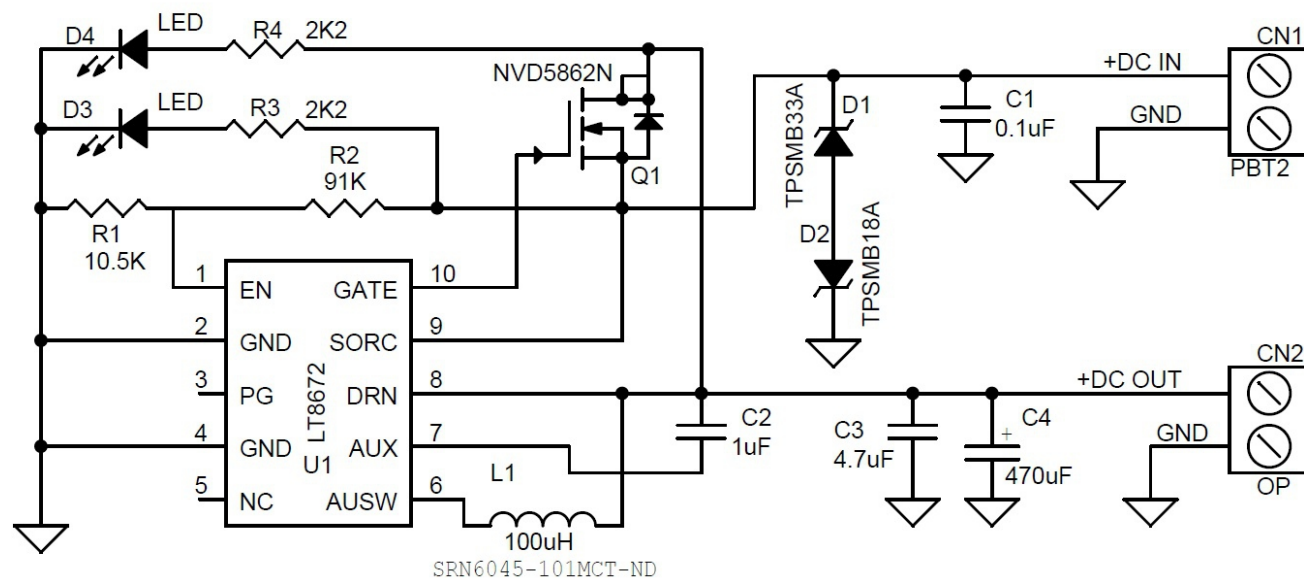
Active rectification, is a technique for improving the efficiency of rectification by replacing diodes with actively controlled switches like MOSFET based circuit, whereas normal semiconductor diodes have a roughly fixed voltage drop of around 0.5-1 volts, active rectifiers behave as resistances, and can have arbitrarily low voltage drop. Active rectification has many applications. It is frequently used for arrays of photovoltaic panels to avoid reverse current flow that can cause overheating with partial shading while giving minimum power loss. The constant voltage drop of a standard p-n junction diode is typically between 0.7 V and 1.7 V, causing significant power loss in the diode. Electric power depends on current and voltage: the power loss rises proportional to both current and voltage.

The LT8672 is an active rectifier controller for reverse input protection. It drives an external N-channel MOSFET to replace a power Schottky diode. It's very low quiescent current and fast transient response meet the tough requirements in automotive applications where AC input signals of up to 100kHz are present. These signals are rectified with minimum power dissipation on the external FET, simplifying thermal management on the PCB. With a drop of only 20mV, the LT8672 solution eases the minimum input voltage requirement during cold crank and start-stop, allowing simpler and more efficient circuits. If the input power source fails or is shorted, a fast turn-off minimizes reverse current transients. An available shutdown mode reduces the quiescent current to 3.5μA. An integrated auxiliary boost regulator provides the required boost voltage to turn the external FET fully on. A power good pin signals when the external FET is ready to take load current.

Features

- Input Supply Range 12V to 24V DC
- Load Current 5Amps
- Very Low drop across MOSFET 20mV (Between Input and Output)
- True Rectifier with very low ohms and fast reverse protection
- PCB Dimensions 70.01MM X 45.56MM

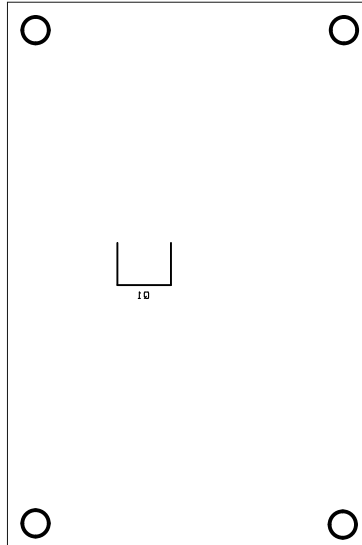




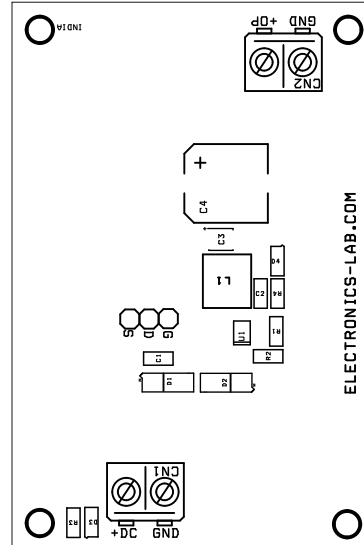


BOM						
NO	QNTY.	REF.	DESC	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN SCREW TERMINAL 5.08MM PITCH	PHOENIX	DIGIKEY	277-1247-ND
2	1	CN2	2 PIN SCREW TERMINAL 5.08MM PITCH	PHOENIX	DIGIKEY	277-1247-ND
3	1	C1	0.1uF/50V SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
4	1	C2	1uF/50V SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
5	1	C3	4.7uF/50V SMD SIZE 1210	TDK	DIGIKEY	445-181656-1-ND
6	1	C4	470uF/50V ELECTROLYTIC	RUBYCON	DIGIKEY	1189-4126-1-ND
7	1	D1	TPSMB33A	LITTILEFUSE INC	DIGIKEY	F6322CT-ND
8	1	D2	TPSMB18A	LITTILEFUSE INC	DIGIKEY	F6310CT-ND
9	1	L1	100uH	BOURNS INC.	DIGIKEY	SRN6045-101MCT-ND
10	1	Q1	NVD5862N-D	ON SEMI	DIGIKEY	NTD5862NT4GOSCT-ND
11	1	R1	10.5K, 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
12	1	R2	91K, 5% SMD SIZE 0805	MURATA/YAGEO	DIGIKEY	
13	1	U1	LT8672	ANALOG	DIGIKEY	LT8672EMS#PBF-ND
14	2	D3,D4	LED SMD SIZE 0805 RED OR RED/GREEN	LITE ON INC	DIGIKEY	160-1422-1-ND
15	2	R3,R4	2.2K, 5% SMD RESISTOR SIZE 0805	MURATA/YAGEO	DIGIKEY	

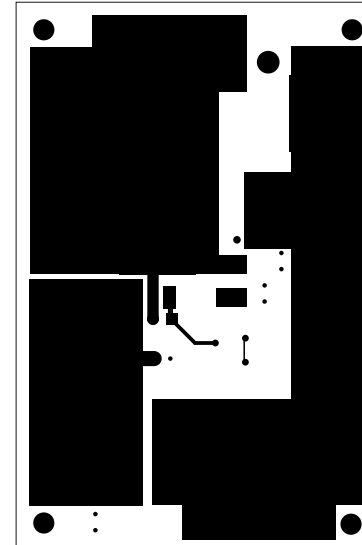




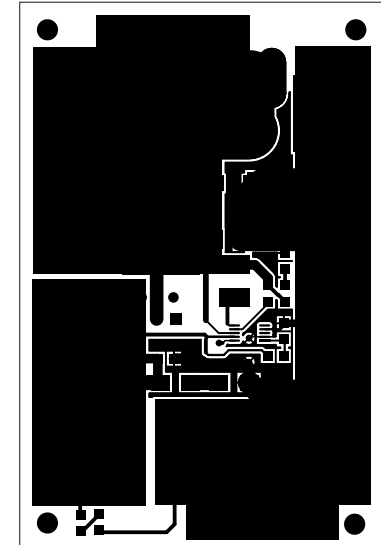
SILK SCREEN BOTTOM



SILK SCREEN BOTTOM



BOTTOM LAYER



TOP LAYER

PCB Dimension 70.01MM X 45.56MM

