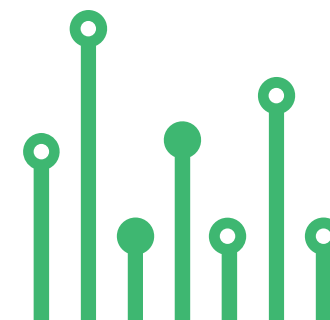


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POWER



High Current DC-DC Converter – 12V/6A Output from 16V to 38V DC Input



SKU: EL130615

POWER

High Current DC-DC Converter – 12V/6A Output from 16V to 38V DC Input



The project presented here is a low quiescent current, synchronous buck converter featuring the LTC3807. This DC-DC converts a 16V to 38V input voltage to a 12V at 6A output. The main features of this board include an internal LDO for gate drive power from VIN or EXT VCC, RUN pins, a mode selector jumper CN1 that allows the converter to run in constant current mode (CCM), pulse-skipping or Burst Mode operation, and selectable current limit. Output is fixed and provides 12V DC but it supports an adjustable output voltage. Refer to the datasheet below to learn more about the adjustable output. The circuit has also soft-start and tracking.



Note: The relay can handle load up to 17.5A with heatsink and 6.75A without heatsink, solder the CPC1718J relay under the PCB for heatsink mount.

Features

- Wide VIN Range: 16V to 38V (40V Abs Max)
- Output 12V DC Load Up to 6Amps
- Low Operating IQ: 50 μ A
- Output Voltage 12V (Adjustable Range: 0.8V \leq VOUT \leq 24V Read Note 2)
- Frequency 120kHz
- Selectable Continuous, Pulse-Skipping or Low Ripple Burst Mode Operation at Light Load
- Over Current Limit
- Efficiency up to 95%
- Very Low Dropout Operation: 99% Duty Cycle
- Inbuilt Soft-Start
- ...



The wide input voltage range of 16V to 38V is suitable for automotive and distributed DC power systems where the low quiescent current is essential. The operating frequency is set to 120Khz using resistor R6. MOSFETs are mounted under the PCB for easy heatsink mounting, it is important to use a heatsink for a full current load.

Features (cont.)

- Output Overvoltage Protection
- Low Shutdown IQ: 14 μ A
- Internal LDO Powers Gate Drive from VIN or EXTVCC
- No Current Foldback During Start-Up
- PCB Dimensions 71.44 x 41.75mm
- 4 x 3mm Mounting Holes



Note 1: The circuit offers output current up to 6A with a safe margin. The project can provide a higher current of up to 10A with low ohmic MOSFETs. In this case, the PCB needs to have thick tracks such as 95Microns and a higher current rating inductor L1.

Main Control Loop

The LTC3807 uses a constant frequency, current mode step-down architecture. During normal operation, the external top MOSFET is turned on when the clock for that channel sets the RS latch and is turned off when the main current comparator, ICMP, resets the RS latch. The peak inductor current at which ICMP trips and resets the latch is controlled by the voltage on the ITH pin, which is the output of the error amplifier, EA. The error amplifier compares the output voltage feedback signal at the VFB pin (which is generated with an external resistor divider connected across the output voltage, VOUT, to ground) to the internal 0.800V reference voltage. When the load current increases, it causes a slight decrease in VFB relative to the reference, which causes the EA to increase the ITH voltage until the average inductor current matches the new load current. After the top MOSFET is turned off each cycle, the bottom MOSFET is turned on until either the inductor current starts to reverse, as indicated by the current comparator IR, or the beginning of the next clock cycle.

Mode of Operation

- Selectable Continuous
- Pulse-Skipping
- or Low Ripple Burst Mode Operation at Light Load

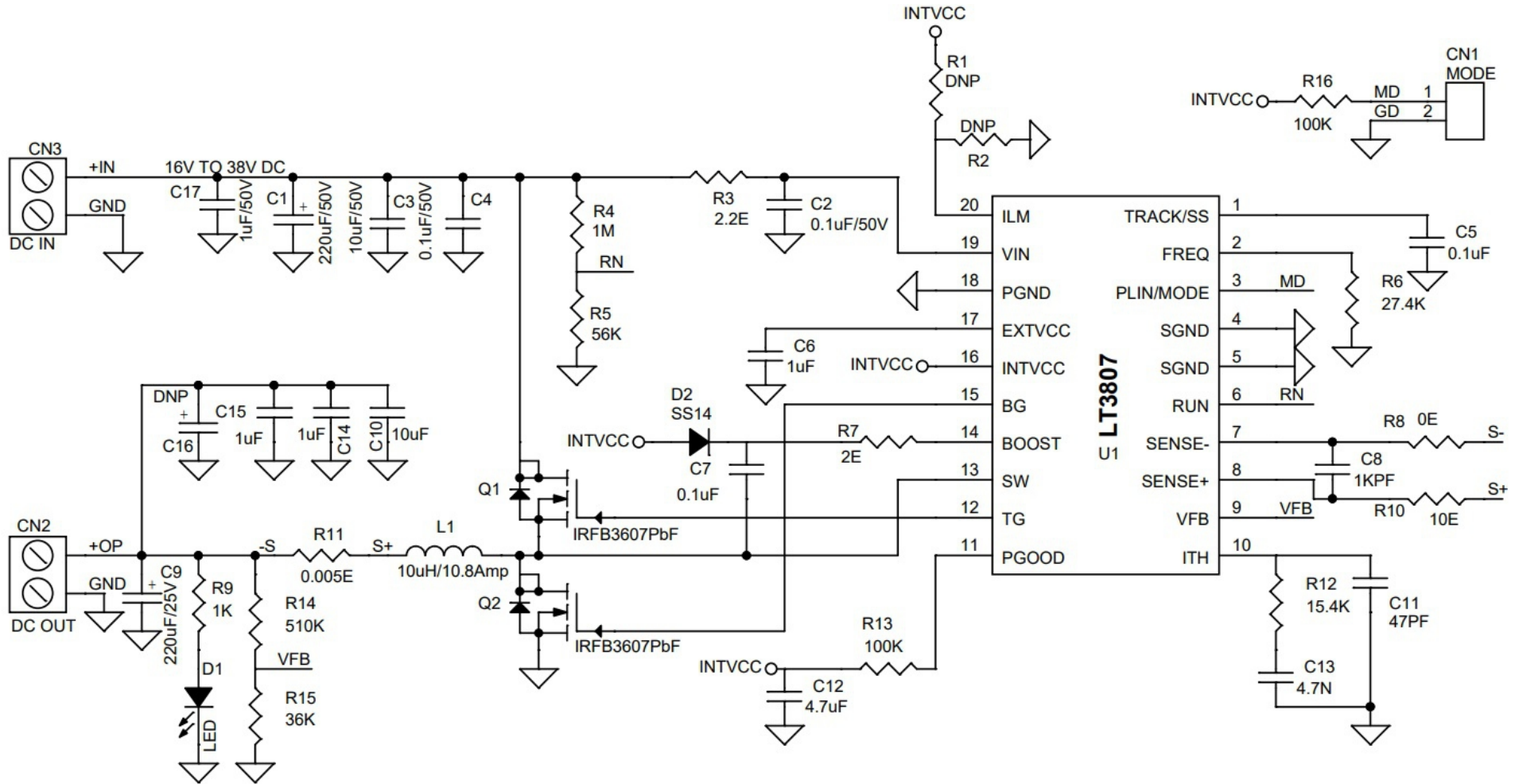
CN1 Can be used as jumper: Jumper/Shunt Open = Pulse Skip Mode, Jumper/Shunt Closed Burst Mode, Use R16 0 Ohms Resistor to select FCM Mode (Don't Use Shunt in this Case)

External Synchronization Input to Phase Detector and Forced Continuous Mode Input. When an external clock is applied to this pin, the phase-locked loop will force the rising TG signal to be synchronized with the rising edge of the external clock, and the regulator operates in forced continuous mode. When not synchronizing to an external clock, this input determines how the LTC3807 operates at light loads. Pulling this pin to the ground selects Burst Mode operation. An internal 100k resistor to the ground also invokes Burst Mode operation when the pin is floated. Tying this pin to INTVCC forces continuous inductor current operation. Tying this pin to a voltage greater than 1.2V and less than INTVCC -1.3V selects pulse-skipping operation.

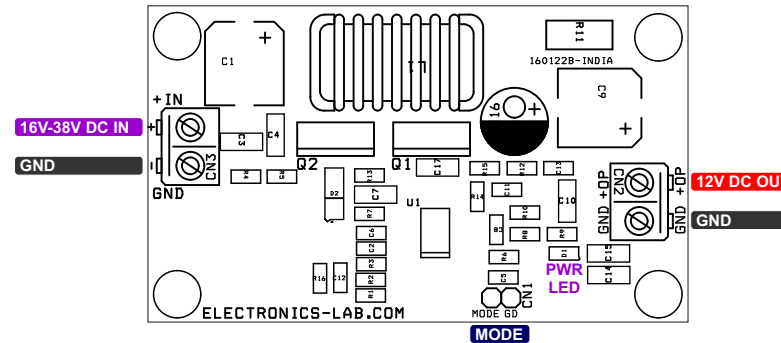


Note 2: Output voltage is fixed at 12V DC, this can be changed and its adjustable range is 0.8V to 24V, use appropriate feedback resistors R14 and R15 values to alter the output voltage and refer to the datasheet for more information on this.

Schematic



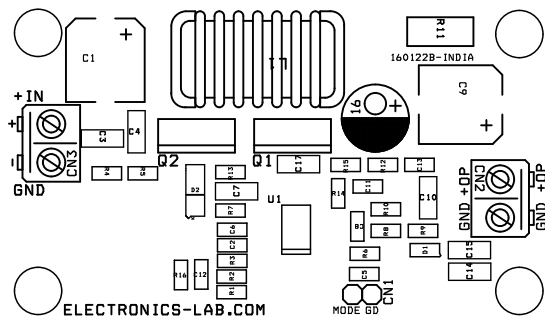
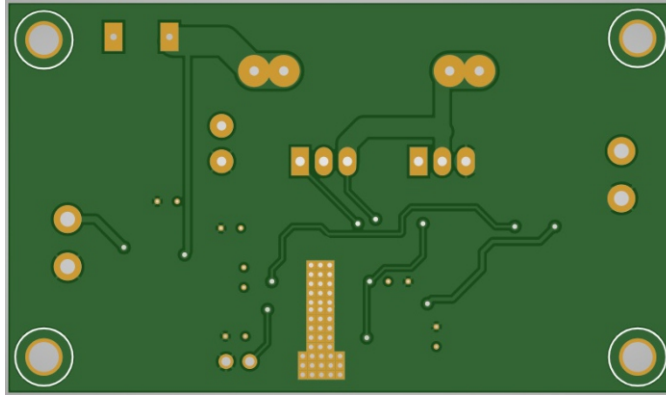
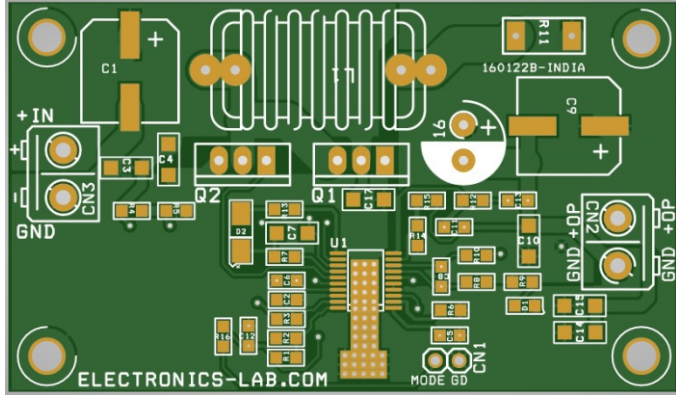
Connections



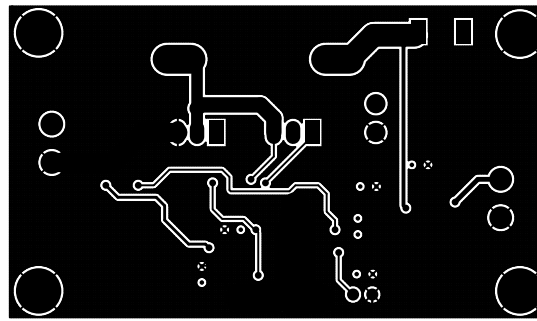
The LTC3807

The LTC3807 is a high-performance step-down switching regulator DC/DC controller that drives an all N-channel synchronous power MOSFET stage. A constant frequency current mode architecture allows a phase-lockable frequency of up to 750kHz. The 50µA no-load quiescent current extends operating run time in battery-powered systems. OPTI-LOOP® compensation allows the transient response to be optimized over a wide range of output capacitance and ESR values. The LTC3807 features a precision 0.8V reference and power good output indicator. A wide 4V to 38V input supply range encompasses a wide range of intermediate bus voltages and battery chemistries. The output voltage of the LTC3807 can be programmed between 0.8V to 24V. The TRACK/SS pin ramps the output voltages during start-up. Current foldback limits MOSFET heat dissipation during short-circuit conditions. The PLLIN/MODE pin selects among Burst Mode operation, pulse-skipping mode, or continuous conduction mode at light loads.

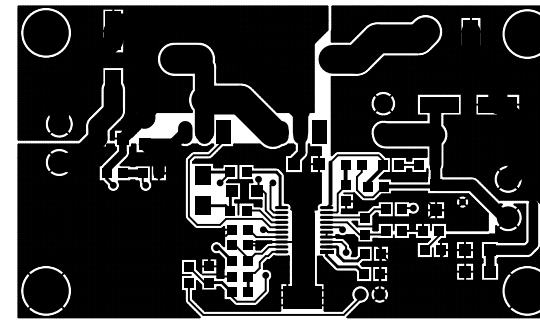
PCB



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 71.44MM X 41.75MM

Parts List

BOM						
NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
2	2	CN2,CN3	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
3	1	C1	220uF/50V	WURTH	DIGIKEY	732-8463-1-ND
4	3	C2,C5,C7	0.1uF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
5	2	C3,C10	10uF/50V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
6	1	C4	0.1uF/50V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
7	1	SHUNT	JUMPER SHUNT FOR MODE CN1	SULLINS INC	DIGIKEY	S9001-ND
8	4	C6,C14,C15,C17	1uF/50V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
9	1	C8	1KPF/50V CERAMIC SIZE 0805	YAGEO/MURATA	DIGIKEY	
10	1	C9	220uF/25V ELECTROLYTIC	VISHAY	DIGIKEY	4415PHCT-ND
11	1	C11	47PF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
12	1	C12	4.7uF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
13	1	C13	4.7nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
14	3	R1,R2,C16	DNP			
15	1	D1	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
16	1	D2	SS14 FAST DIODE	ONSEMI	DIGIKEY	SS14CT-ND
17	1	L1	10uH/10.8Amp	BOURNS	DIGIKEY	M8848-ND
18	2	Q1,Q2	IRFB3607PbF	INFINEON	DIGIKEY	IRFB3607PBF-ND
19	1	R3	2.2E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
20	1	R4	1M 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
21	1	R5	56K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
22	1	R6	27.4K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
23	1	R7	2E 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
24	1	R8	0E SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
25	1	R9	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
26	1	R10	10E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
27	1	R11	0.005E/3W SMD SIZE 2512	YAGEO/MURATA	DIGIKEY	
28	1	R12	15.4K 1% SMD SIZE 0895	YAGEO/MURATA	DIGIKEY	
29	2	R13,R16	100K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
30	1	R14	510K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
31	1	R15	36K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
32	1	U1	LTC3807 20TSSOP	ANALOG	DIGIKEY	LTC3807MPFE#PBF-ND

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