THE DATASHEET OF

LM3481EVAL

AN-1756 LM3481 Evaluation Board

1 Introduction

The LM3481 is a current mode, low side N channel FET controller. It can be utilized in numerous configurations including a Boost, Flyback or SEPIC (Single Ended Primary Inductor Converter). This evaluation board demonstrates the flexibility of the LM3481 in a boost topology. The operating conditions for the evaluation board are listed below:

$3V \le V_{IN} \le 11V$

$V_{OUT} = 12V$

$0A \le I_{OUT} \le 1.5A$

The circuit and bill of materials for this design are given below:

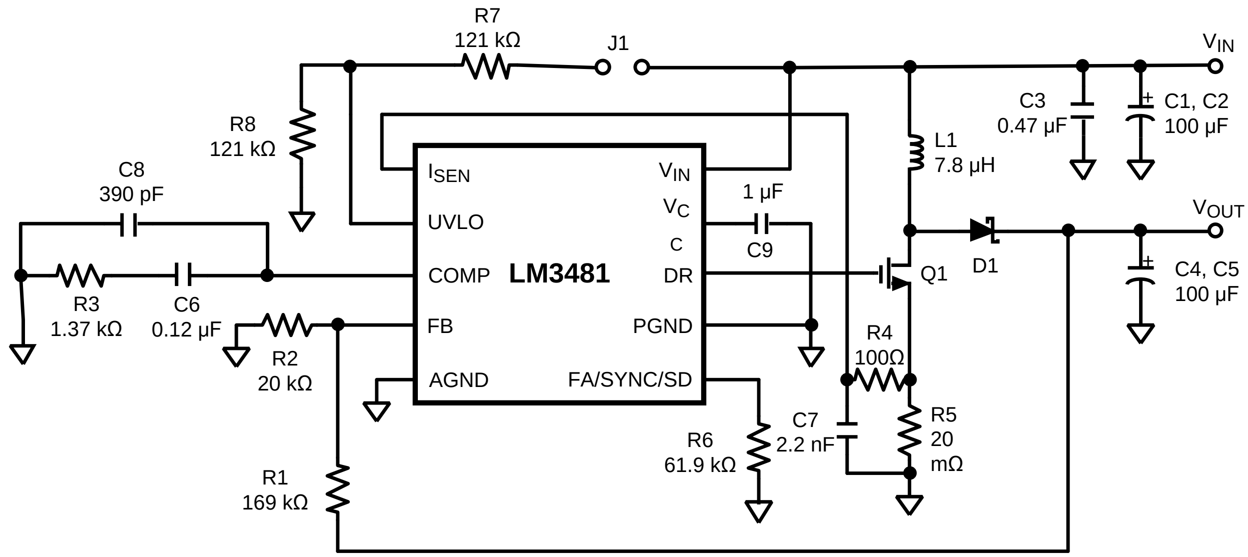

Figure 1. Circuit Diagram

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2 Bill of Materials

Table 1. Bill of Materials
300 kHz, Vin = 5V, Vo = 12V, I_O = 1.5A

Designator	Function	Description	Part Number	Vendor
U1	Controller	LM3481 VSSOP-10	LM3481	Texas Instruments
C1	Input Filter Cap	100 µF, 20V, D case, OxiCap	TPSV107M020R0060	AVX
C2	Input Filter Cap	100 µF, 20V, D case, OxiCap	TPSV107M020R0060	AVX
C3	Decoupling Cap	.47 µF, 16V, X7R, 1206	ECJ-3VB1C474K	Panasonic
C4	Output Filter Cap	100 µF, 16V, Y case, Ta	TPSD107M016R0100	AVX
C5	Output Filter Cap	100 µF, 16V, Y case, Ta	TPSD107M016R0100	AVX
C6	Comp Cap	0.12 µF, 25V, 0805	ECJ-2YB1E124K	Panasonic
C7	Current Limit Sense Cap	2200 pF, 50V, 0805	ECJ-2VB1H222K	Panasonic
C8	Comp Cap	390 pF, 50V, 0805	08055C391KAT2A	AVX
C9	V_{CC} Cap	1 µF, 25V, 1206	12063C105KAT	AVX
C11	Analog Input By. Cap	1 µF, 10V, 0805	0805ZC105KAT	AVX
R1	Resistor Divider (Upper)	169 kΩ, 1%, 0805	CRCW0805169KFK	Vishay
R2	Resistor Divider (Lower)	20k, 1%, 0805	CRCW080520K0FK	Vishay
R3	Comp Resistor	1.37k, 1%, 0805	CRCW08051K37FK	Vishay
R4	Filter Resistor	100Ω, 1%, 0805	CRCW0805100RFK	Vishay
R5	Sense Resistor	20 mΩ, 1%	WSL2512R0200FE	Vishay
R6	Freq. Adj. Resistor	61.9 kΩ, 1%, 0805	CRCW08056192F	Vishay
R7	UVLO Res. Div.	121 kΩ, 1%, 0805	CRCW08051213F	Vishay
R8	UVLO Res. Div.	121 kΩ, 1%, 0805	CRCW08051213F	Vishay
L1	Input Filter	7.8µ , 8A, DCR = 10 mΩ	RLF12560-7R8N8R2	TDK
D1	Schottky Diode	4A,30V, V_f = 0.4V	SL-43	Vishay
Q1	FET	SO-8, Rdson = 2.9 mΩ@V_{DS} = 30V	SI4368DY	Vishay
J1	Jumper	Shunt LM with handle, 2 positions	881545-2	Tyco Electronics
VIN	VIN Post Turret	90mil mounting diameter	97H6305	Newark Catalog
GND	VIN GND Post Turret	90mil mounting diameter	97H6305	Newark Catalog
GND	VOUT Post Turret	90mil mounting diameter	97H6305	Newark Catalog
VOUT	VOUT GND Post Turret	90mil mounting diameter	97H6305	Newark Catalog

3 Performance

Benchmark data has been taken from the evaluation board using the LM3481. Figure 2 shows an efficiency measurement taken at the maximum load of 1.5A with Vin at 5V.

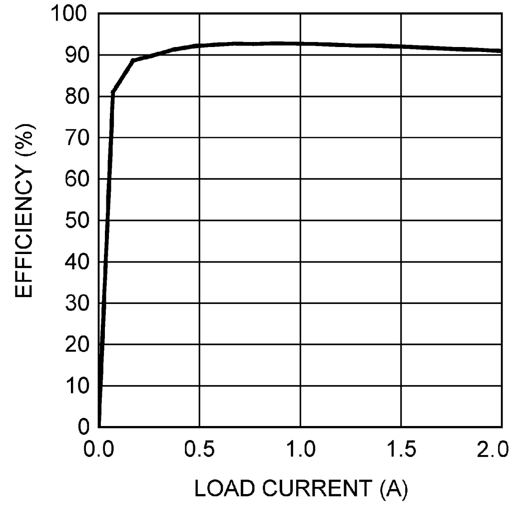

Figure 2. Efficiency vs Load

The advantage of the evaluation board is the ability to examine performance tradeoffs through substitution of parts. By careful selection of the components used, it is possible to optimize the application circuit for a given parameter. For instance, the FET footprint has been designed to accommodate either one SO-8 or two parallel SO-8 packages. The selection of the FET would then be determined by the design constraints. An example would be that a lower system cost could be obtained by selection of a FET with a higher $R_{DS(ON)}$, although performance would be sacrificed through reduced efficiency.

4 Current Limit

The purpose of the R4 (R_{SL}) resistor is to provide flexibility in the selection of the slope compensation needed for the required application. The amount of slope compensation directly determines the minimum inductance required for stability. (Please see the *LM3481/LM3481Q High Efficiency Low-Side N-Channel Control for Switching Regulators* (SNVS346) data sheet for adjustment of slope compensation and for a complete discussion on how to calculate the R4 value needed). This evaluation board uses R4 and C7 to filter the Isen signal with negligible affect on the slope compensation.

5 Layout Fundamentals

Good layout for DC-DC converters can be implemented by following a few simple design guidelines:

1. Place the power components (catch diode, inductor, and filter capacitors) close together. Make the traces between them as short and wide as possible.
2. Use wide traces between the power components and for power connections to the DC-DC converter circuit.
3. Connect the ground pins of the input and output filter capacitors and catch diode as close as possible using generous component-side copper fill as a pseudo-ground plane. Then, connect this to the ground plane through several vias.
4. Arrange the power components so that the switching loops curl in the same direction.
5. Separate noise sensitive traces, such as the voltage feedback path, from noisy traces associated with the power components.
6. Ensure a good low-impedance ground for the converter IC.
7. Place the supporting components for the converter IC, such as compensation and frequency selection components as close to the converter IC as possible, but away from noisy traces and the power components. Make their connections to the converter IC and its pseudo-ground plane as short as

possible.

8. Place noise sensitive circuitry such as radio or modem blocks away from the DC-DC converter.

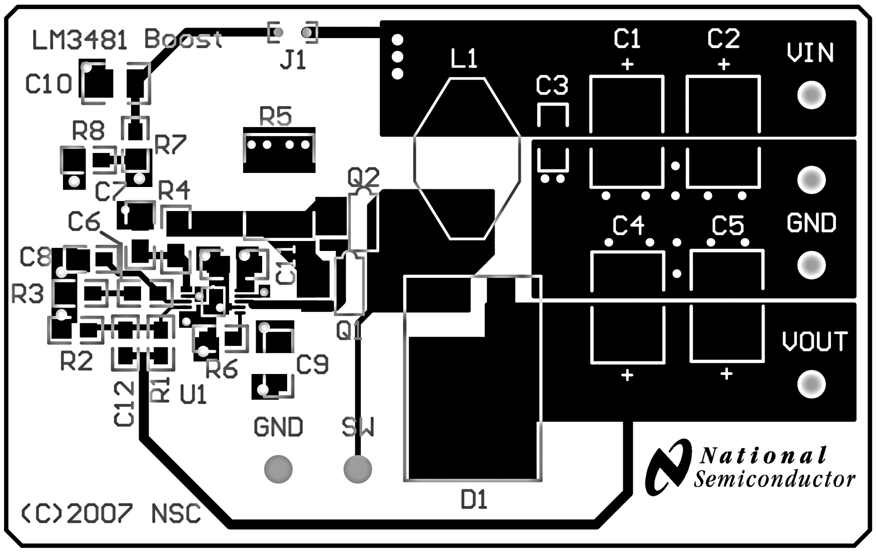

Figure 3. Top Layer

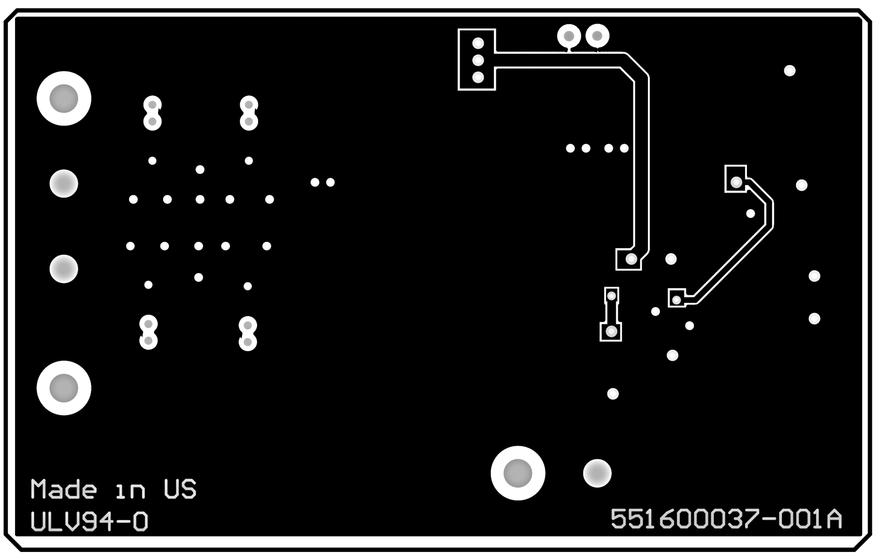

Figure 4. Bottom Layer