Texas Instruments

WEBENCH ® Assembly Document

Design : 3997477/93 LM3150MH/NOPB
LM3150MHX/NOPB 9.0V-18.0V to 3.3V @ 2.0A

VinMin = 9.0V
VinMax = 18.0V
Vout = 3.3V
Iout = 2.0A

Device = LM3150MH/NOPB
Topology = Buck
Created = 6/5/14 6:54:54 AM
BOM Cost = $3.17
Total Pd = 0.43W
Footprint = 614.0mm2
BOM Count = 16

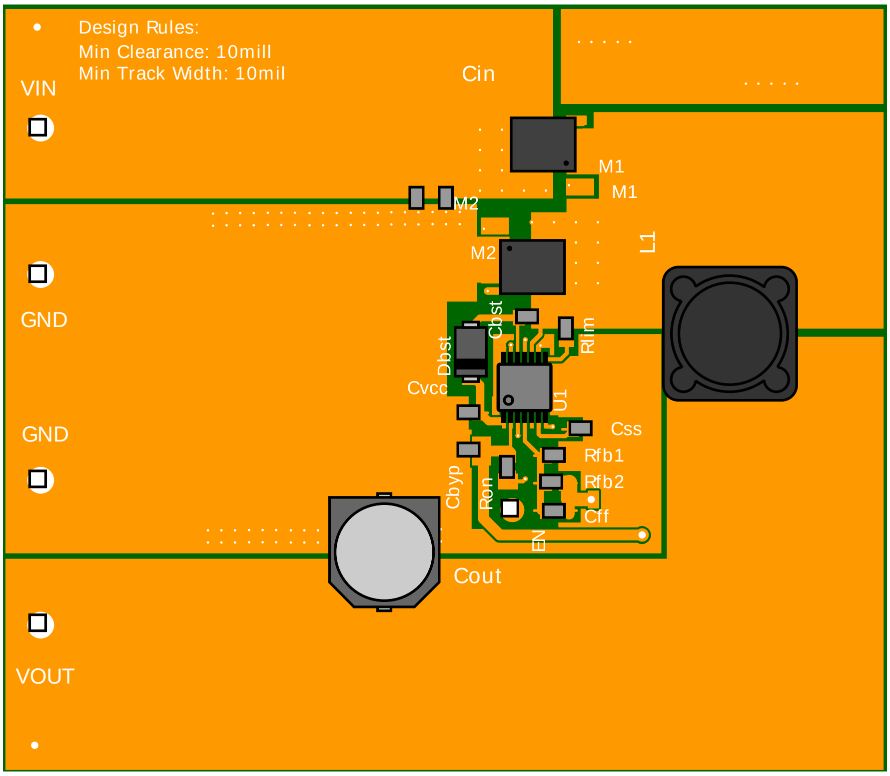
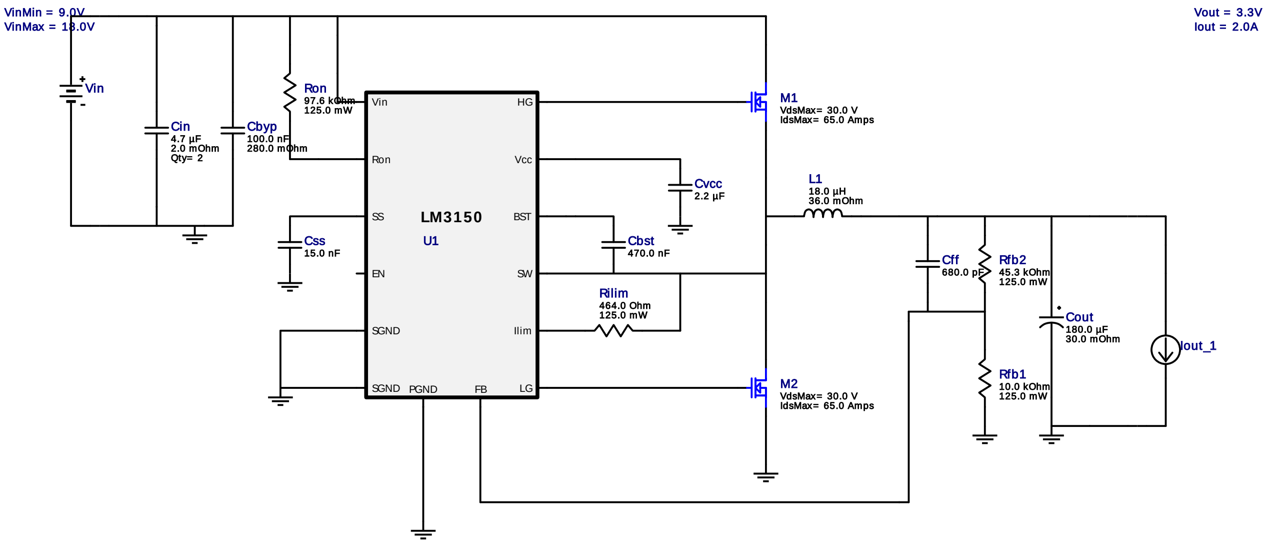


FIGURE 1 - Board Top Side Assembly Diagram

BuildIt BOM

#	Component Name(s)	Part Number	Manufacture	Qty	Unit Price	Top View
1.	M1,M2	CSD17507Q5A	Texas Instruments	2	$0.97	
2.	Cin	GRM21BR61E475MA12L	MuRata	2	$0.28	
3.	Rilim	CRCW0805464RFKEA	Vishay-Dale	1	$0.09	
4.	Cvcc	EMK212B7225KG-T	Taiyo Yuden	1	$0.18	
5.	Ron	ERJ-6ENF9762V	Panasonic	1	$0.1	
6.	Cbst	EMK212B7474KD-T	Taiyo Yuden	1	$0.12	
7.	L1	SRR1260-180M	Bourns	1	$0.93	
8.	Rfb1	ERJ-6ENF1002V	Panasonic	1	$0.1	
9.	Cbyp	08053C104KAT2A	AVX	1	$0.1	
10.	Css	CC0805KRX7R9BB153	Yageo America	1	$0.1	
11.	Rfb2	ERJ-6ENF4532V	Panasonic	1	$0.1	
12.	Cff	CC0805KRX7R9BB681	Yageo America	1	$0.1	
13.	VIN+,VIN-,VOUT+,VOUT-	1502-2	Keystone	4	$0.32	

#	Component Name(s)	Part Number	Manufacture	Qty	Unit Price	Top View
14.	U1	LM3150MH/NOPB	Texas Instruments	1	$0.0	
15.	Cout	16SVP180MX	Panasonic	1	$1.08	
16.	PC Board	551600142-002	Texas Instruments	1	$10.2	



Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage (9.0 V) and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter to Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply but the voltage remains near zero there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The test setup for load testing is shown in FIGURE 3. The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated ouptput power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. The four basic test conditions are listed in figure 4. In all cases, Vout should be well controlled within the targeted voltage range of 3.0 Volts to 3.6 Volts: When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit. The following figure depicts a method of wrapping voltage probes with uninsulated wire to achieve accurate measurements:

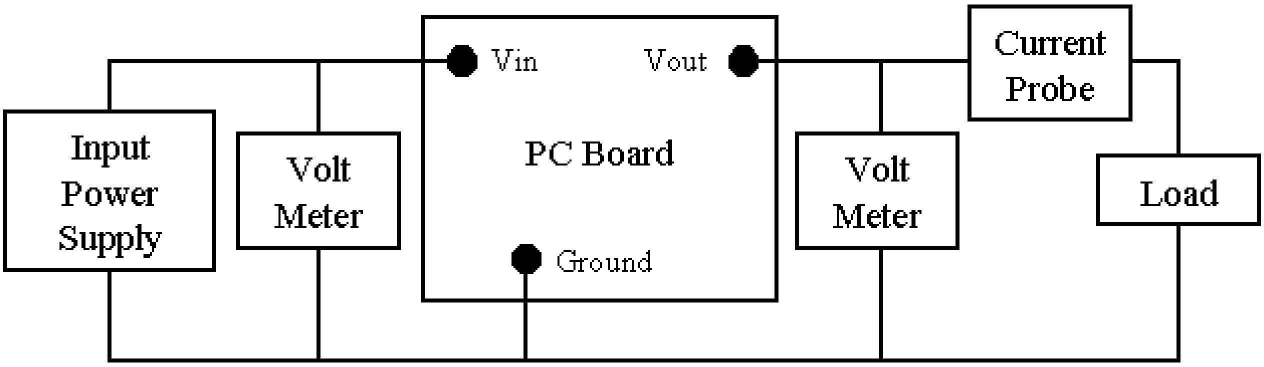


FIGURE 3 - Test setup for load testing

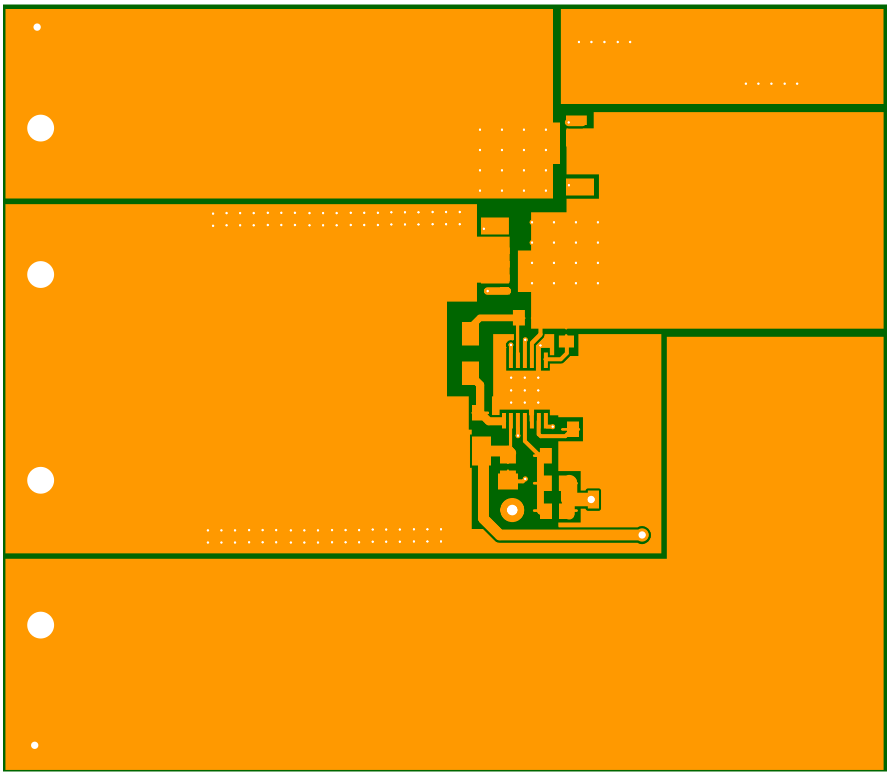


FIGURE 5 - Top Side Copper

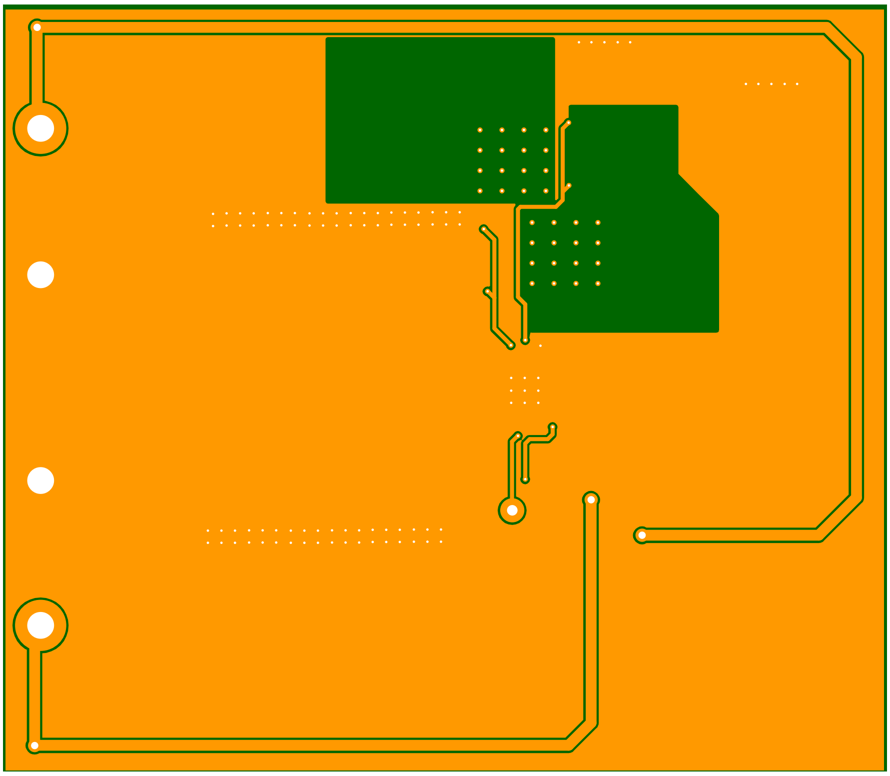


FIGURE 6 - Bottom Side Copper

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	18.0 V	Maximum input voltage
5.	VinMin	9.0 V	Minimum input voltage
6.	Vout	3.3 V	Output Voltage
7.	Vout1	3.3 Volt	Output Voltage #1
8.	base_pn	LM3150	Texas Instruments Base Part Number
9.	source	DC	Input Source Type
10.	ta	30.0 degC	Ambient temperature
11.	userfsw	277.593 kHz	Customer Selected Frequency

Design Assistance

1. LM3150 Product Folder : http://www.ti.com/product/lm3150 : contains the data sheet and other resources.