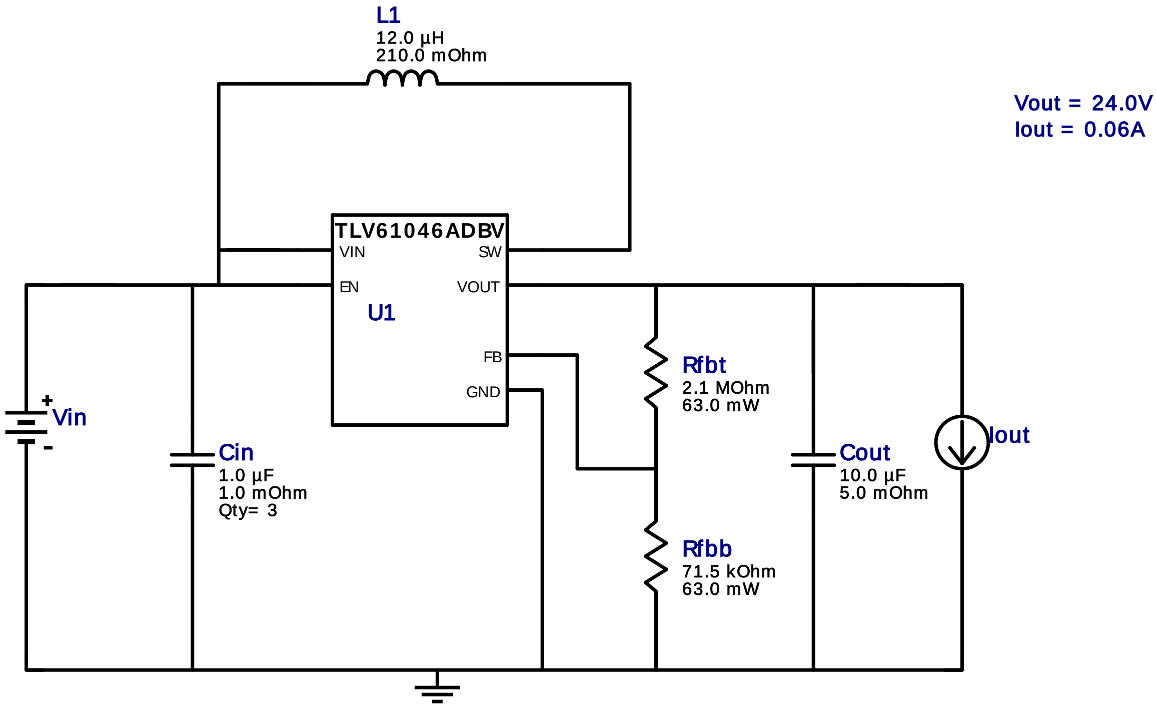
VinMin = 4.5V
VinMax = 5.5V
Vout = 24.0V
Iout = 0.06A

Device = TLV61046ADBVR
Topology = Boost
Created = 2020-04-08 07:00:33.975
BOM Cost = $0.62
BOM Count = 8
Total Pd = 0.31W

WEBENCH ® Design Report

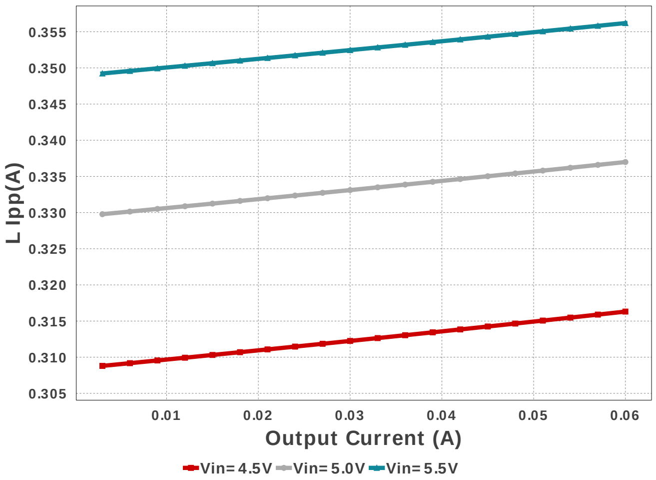
Design : 10 TLV61046ADBVR
TLV61046ADBVR 4.5V-5.5V to 24.00V @ 0.06A



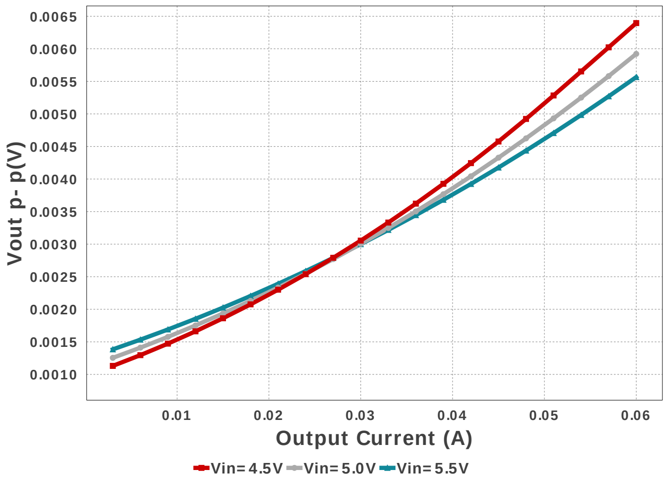
Electrical BOM

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	Kemet	C0603C105K8PACTU Series= X5R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	3	$0.01	0603 5 mm^2
Cout	Samsung Electro-Mechanics	CL32B106KBJNNWE Series= X7R	Cap= 10.0 uF ESR= 5.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.17	1210_270 15 mm^2
L1	NIC Components	NPI43C120MTRF	L= 12.0 µH 210.0 mOhm	1	$0.09	IND_NPI43C 31 mm^2
Rfbb	Vishay-Dale	CRCW040271K5FKED Series= CRCW..e3	Res= 71.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rfbt	Vishay-Dale	CRCW04022M10FKED Series= CRCW..e3	Res= 2.1 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
U1	Texas Instruments	TLV61046ADBVR	Switcher	1	$0.31	DBV0006A 15 mm^2

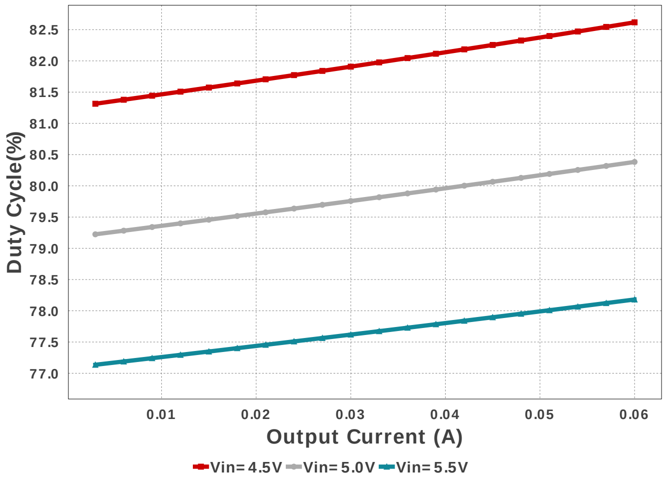
L Ipp



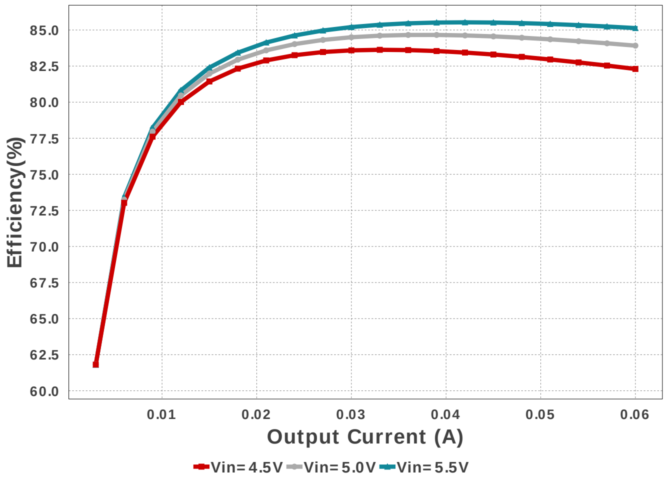
Vout p- p



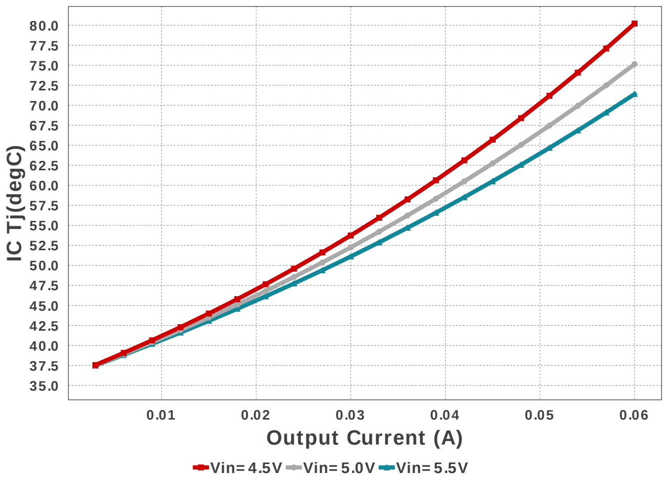
Duty Cycle



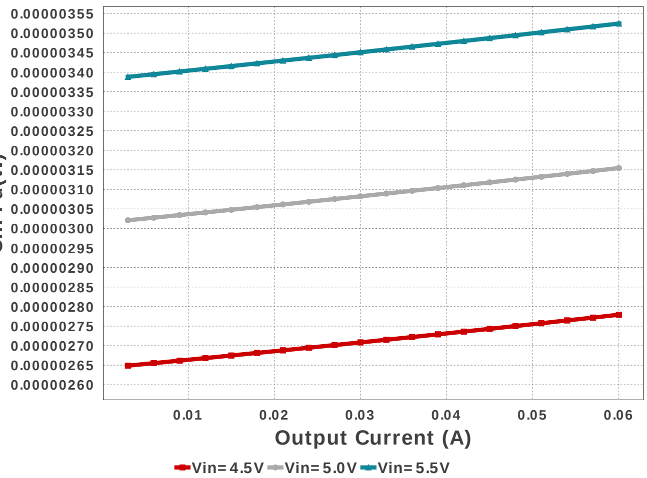
Efficiency



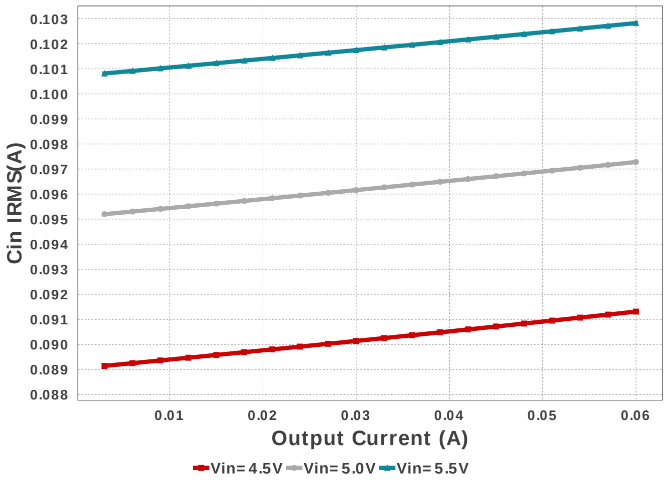
IC Tj



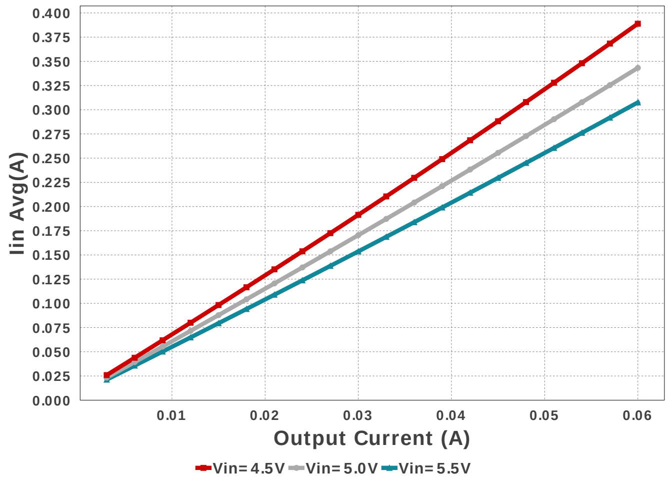
Cin Pd



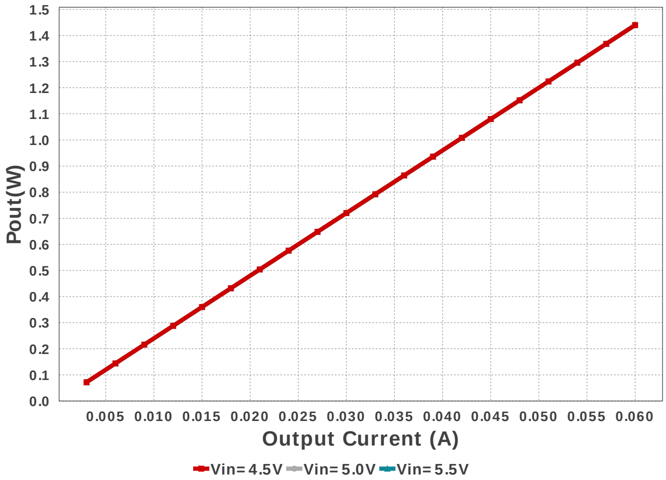
Cin IRMS



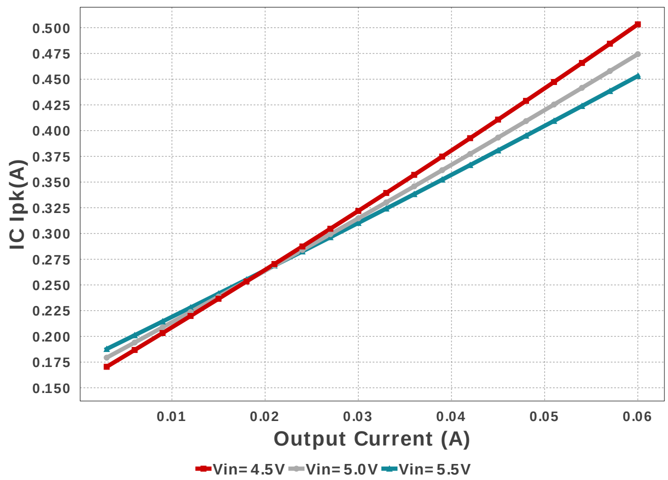
Iin Avg



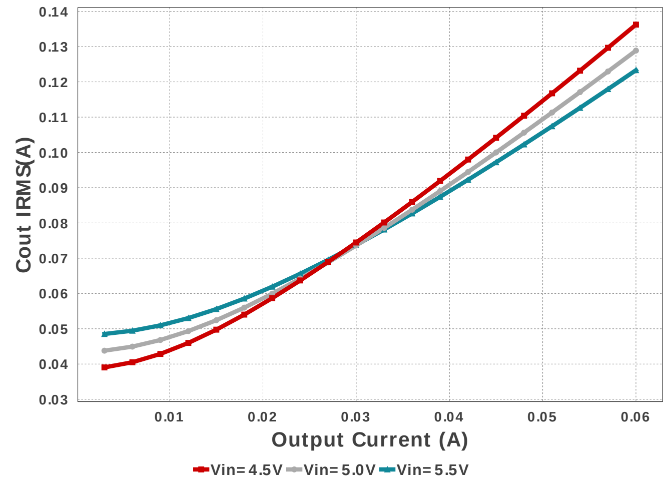
Pout



IC Ipk



Cout IRMS



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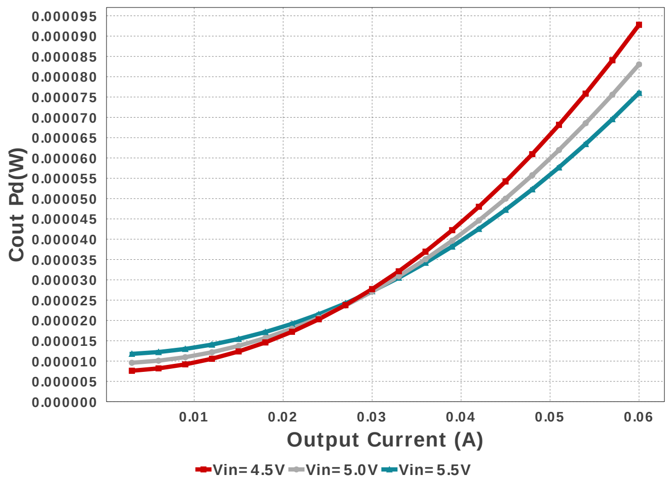
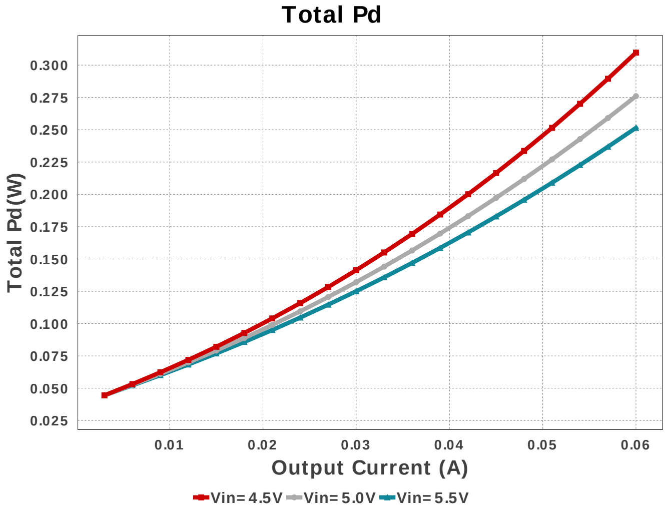
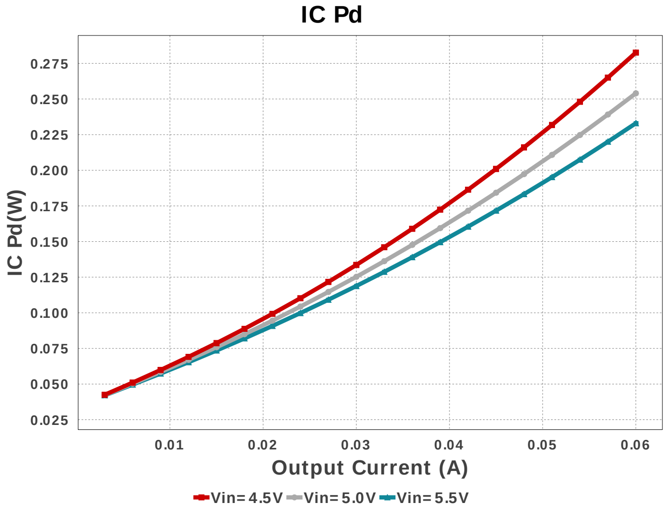
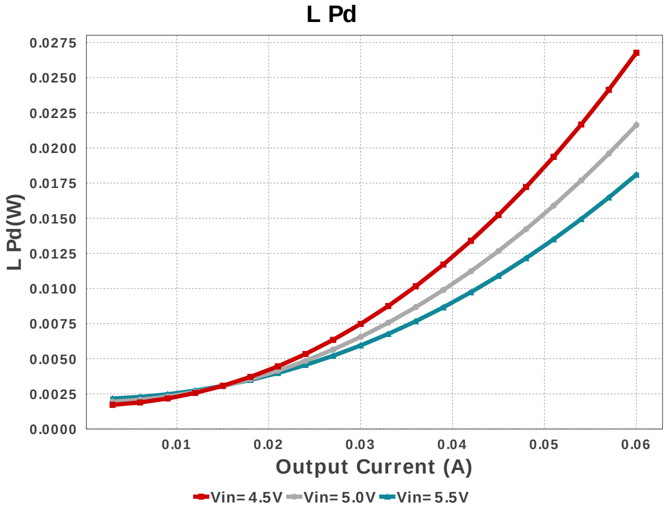
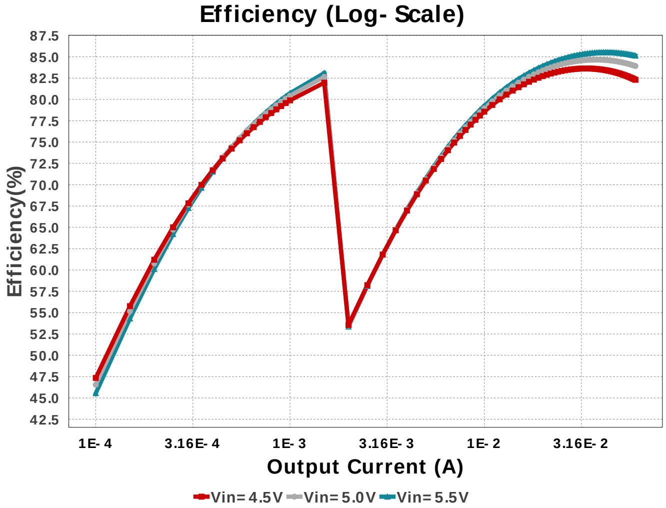










Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	91.31 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	2.779 µW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	136.227 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	92.789 µW	Capacitor	Output capacitor power dissipation
5.	IC Ipk	503.322 mA	IC	Peak switch current in IC
6.	IC Pd	282.55 mW	IC	IC power dissipation
7.	IC Tj	80.21 degC	IC	IC junction temperature
8.	ICThetaJA	177.7 degC/W	IC	IC junction-to-ambient thermal resistance
9.	Iin Avg	388.82 mA	IC	Average input current
10.	L Ipp	316.31 mA	Inductor	Peak-to-peak inductor ripple current
11.	L Pd	26.771 mW	Inductor	Inductor power dissipation
12.	Cin Pd	2.779 µW	Power	Input capacitor power dissipation
13.	Cout Pd	92.789 µW	Power	Output capacitor power dissipation
14.	IC Pd	282.55 mW	Power	IC power dissipation
15.	L Pd	26.771 mW	Power	Inductor power dissipation
16.	Total Pd	309.678 mW	Power	Total Power Dissipation
17.	BOM Count	8	System Information	Total Design BOM count
18.	Duty Cycle	82.617 %	System Information	Duty cycle
19.	Efficiency	82.301 %	System Information	Steady state efficiency
20.	FootPrint	80.0 mm^2	System Information	Total Foot Print Area of BOM components
21.	Frequency	979.472 kHz	System Information	Switching frequency
22.	Iout	60.0 mA	System Information	Iout operating point
23.	Mode	CCM	System Information	Conduction Mode
24.	Pout	1.44 W	System Information	Total output power

#	Name	Value	Category	Description
25.	Total BOM	$0.62	System Information	Total BOM Cost
26.	Vin	4.5 V	System Information	Vin operating point
27.	Vout	24.0 V	System Information	Operational Output Voltage
28.	Vout Actual	24.145 V	System Information	Vout Actual calculated based on selected voltage divider resistors
29.	Vout Tolerance	4.519 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
30.	Vout p-p	17.741 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	60.0 m	Maximum Output Current
VinMax	5.5	Maximum input voltage
VinMin	4.5	Minimum input voltage
Vout	24.0	Output Voltage
base_pn	TLV61046A	Base Product Number
source	DC	Input Source Type
Ta	30.0	Ambient temperature

WEBENCH® Assembly

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

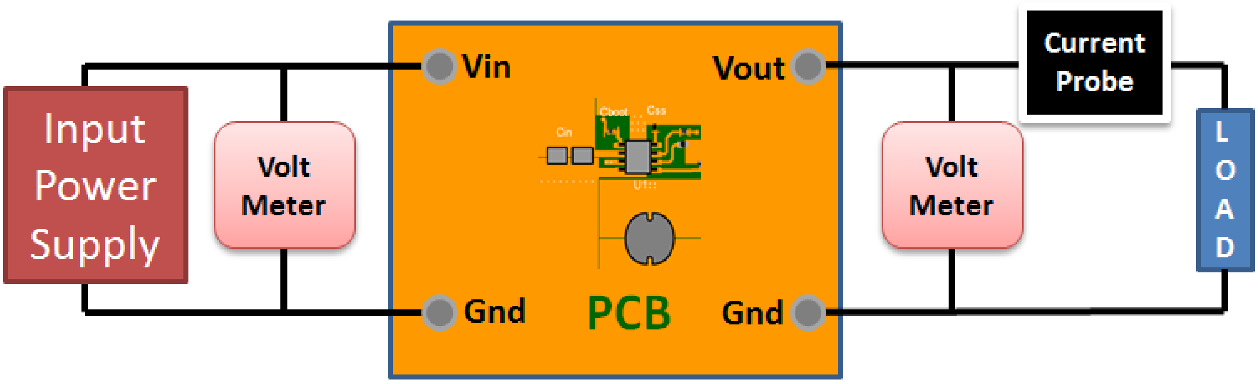
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 4.5V 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 and a load if needed to set the minimum Iout of the design from 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, then 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 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 output 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. 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.



Design Assistance

1. Master key : BABDD38534C0741E[v1]

2. **TLV61046A** Product Folder : http://www.ti.com/product/TLV61046A : contains the data sheet and other resources.

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