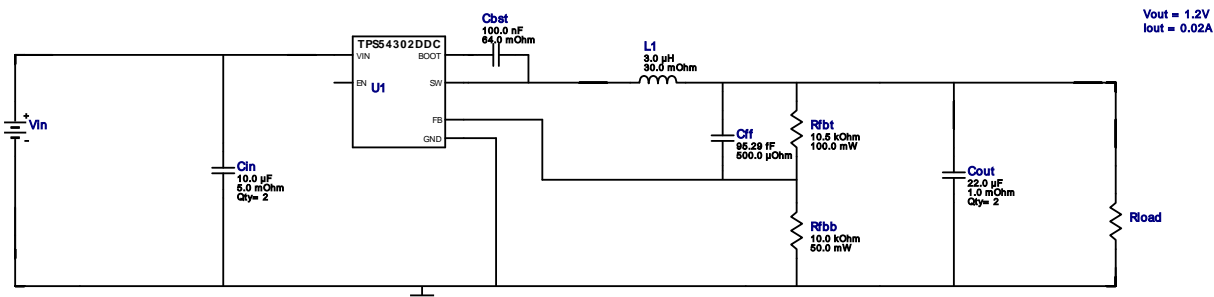


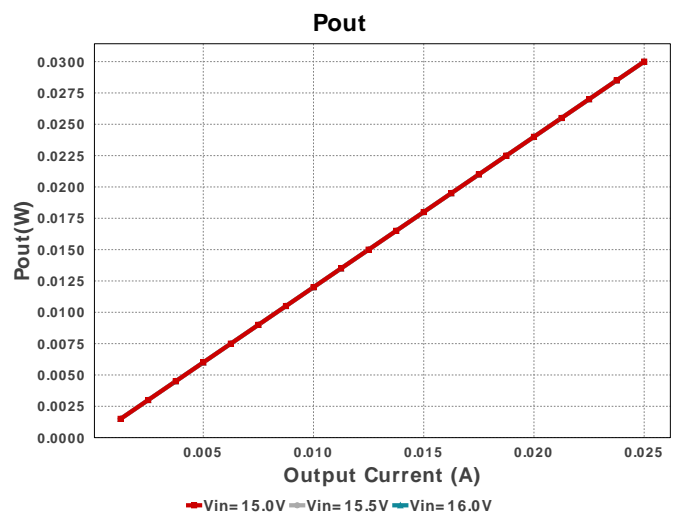
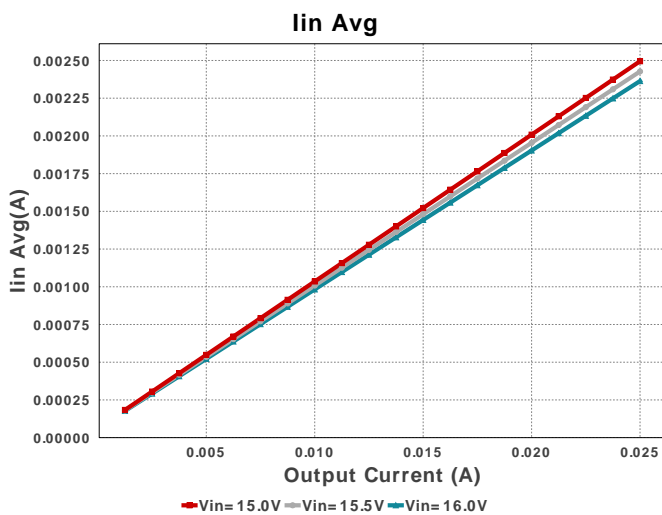
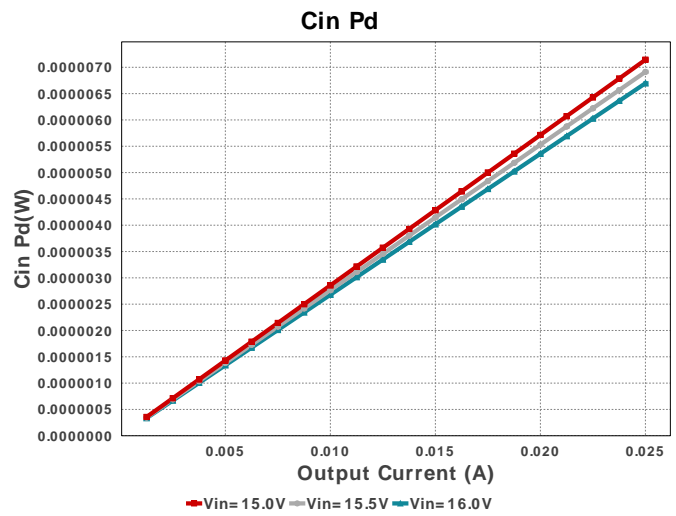
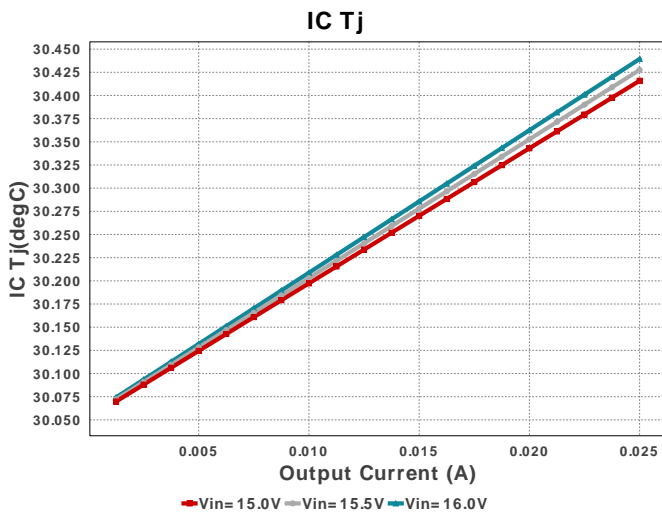
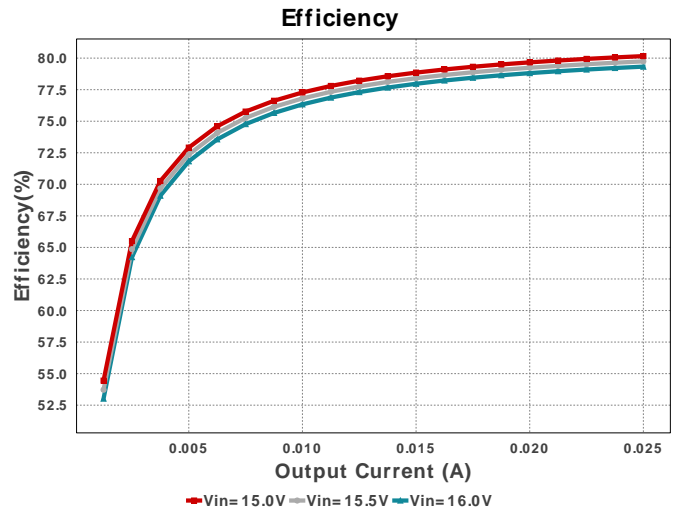
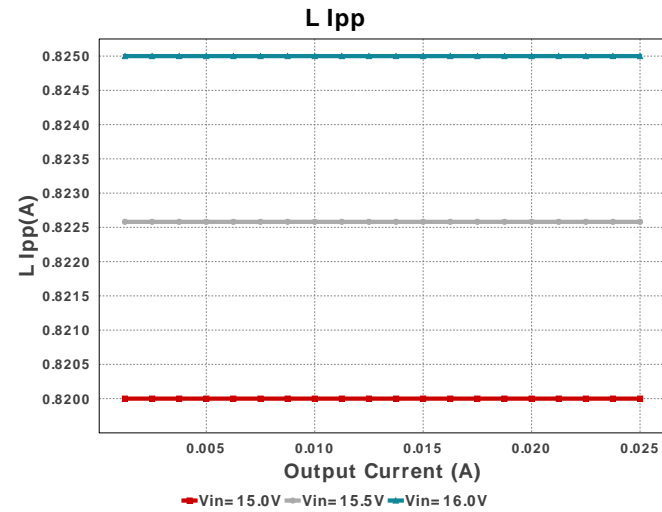
WEBENCH® Design Report

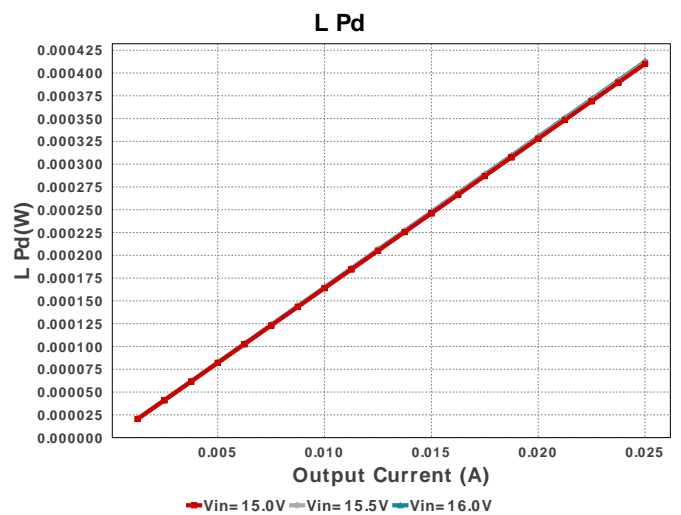
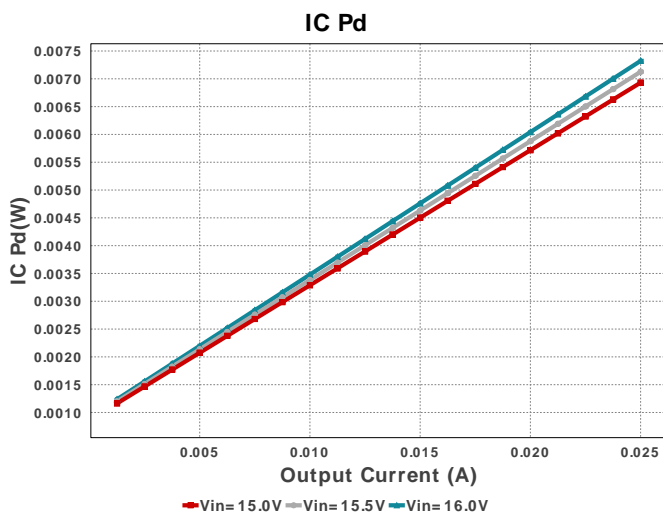
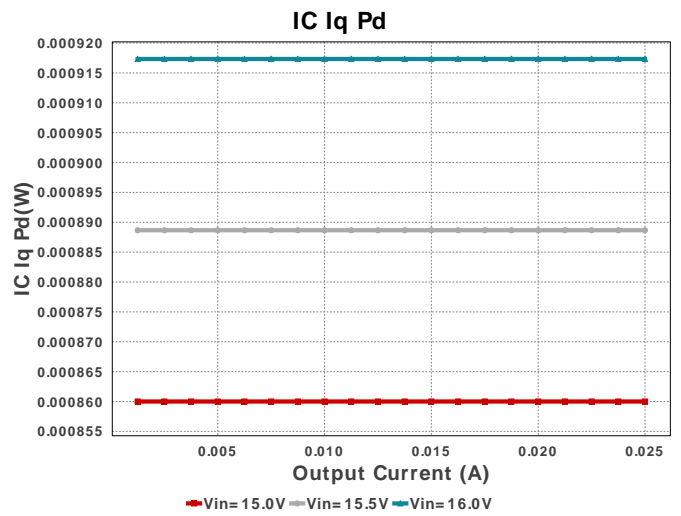
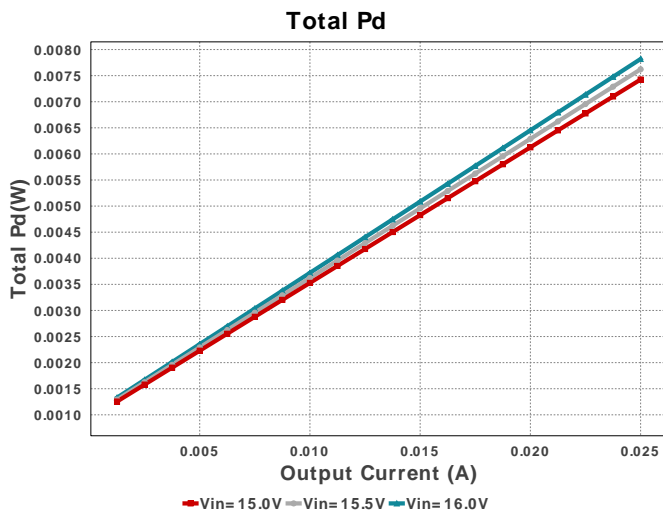
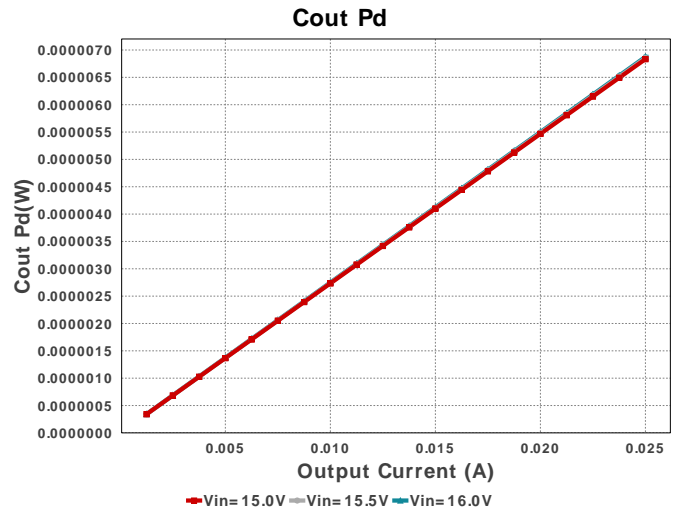
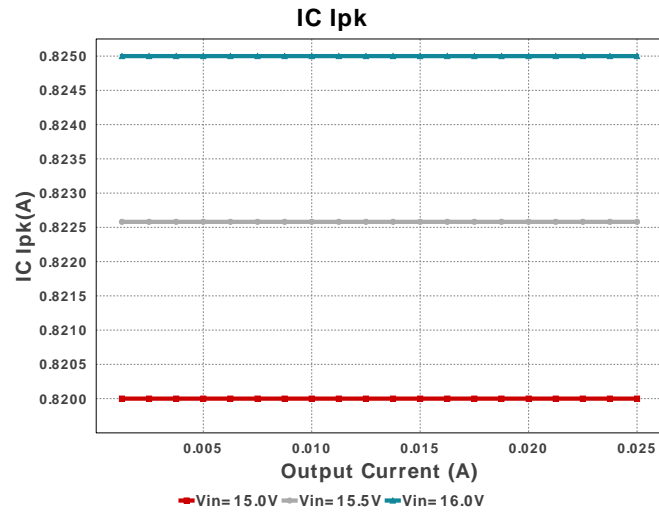
Design : 51 TPS54302DDCR
TPS54302DDCR 15V-16V to 1.20V @ 1A

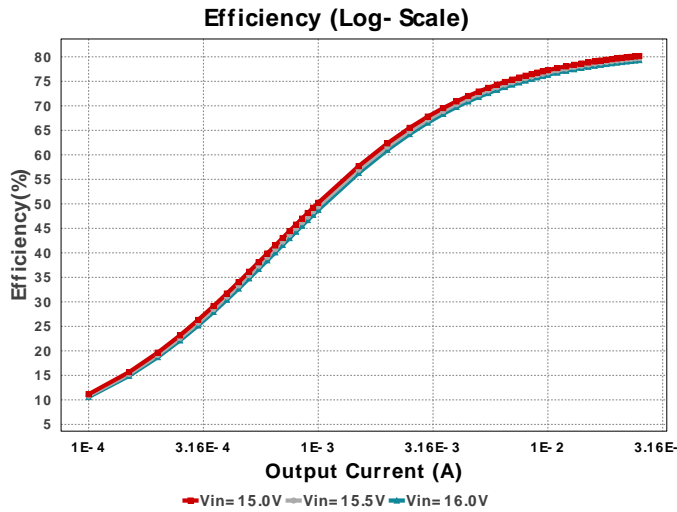


Electrical BOM

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cbst	Kemet	C0805C104M5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	0805 7 mm ²
Cff	CUSTOM	CUSTOM Series= ?	Cap= 95.29 fF ESR= 500.0 uOhm VDC= 25.0 V IRMS= 1.0 A	1	NA	CUSTOM 0 mm ²
Cin	Samsung Electro-Mechanics	CL32B106KBJNNWE Series= X7R	Cap= 10.0 uF ESR= 5.0 mOhm VDC= 50.0 V IRMS= 0.0 A	2	\$0.17	1210_270 15 mm ²
Cout	Taiyo Yuden	JMK212BJ226MG-T Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 0.0 A	2	\$0.05	0805 7 mm ²
L1	Bourns	SRR5028-3R0Y	L= 3.0 uH 30.0 mOhm	1	\$0.32	SRR5028 61 mm ²
Rfbb	Yageo	RC0201FR-0710KL Series= ?	Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm ²
Rfbt	Yageo	RC0603FR-0710K5L Series= ?	Res= 10.5 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
U1	Texas Instruments	TPS54302DDCR	Switcher	1	\$0.48	DDC0006A_N 10 mm ²







Operating Values

#	Name	Value	Category	Description
1.	BOM Count	10		Total Design BOM count
2.	Total BOM	NA		Total BOM Cost
3.	Cin Pd	6.696 μ W	Capacitor	Input capacitor power dissipation
4.	Cout Pd	6.875 μ W	Capacitor	Output capacitor power dissipation
5.	IC Ipk	825.0 mA	IC	Peak switch current in IC
6.	IC Iq Pd	917.333 μ W	IC	IC Iq Pd
7.	IC Pd	7.323 mW	IC	IC power dissipation
8.	IC Tj	30.439 degC	IC	IC junction temperature
9.	ICThetaJA Effective	60.0 degC/W	IC	Effective IC Junction-to-Ambient Thermal Resistance
10.	Iin Avg	2.364 mA	IC	Average input current
11.	L Ipp	825.0 mA	Inductor	Peak-to-peak inductor ripple current
12.	L Pd	412.5 μ W	Inductor	Inductor power dissipation
13.	Cin Pd	6.696 μ W	Power	Input capacitor power dissipation
14.	Cout Pd	6.875 μ W	Power	Output capacitor power dissipation
15.	IC Pd	7.323 mW	Power	IC power dissipation
16.	L Pd	412.5 μ W	Power	Inductor power dissipation
17.	Total Pd	7.819 mW	Power	Total Power Dissipation
18.	Efficiency	79.325 %	System	Steady state efficiency
19.	FootPrint	133.0 mm ²	Information System	Total Foot Print Area of BOM components
20.	Frequency	778.783 kHz	Information System	Switching frequency
21.	Iout	25.0 mA	Information System	Iout operating point
22.	Mode	Pulse Skip Mode	Information System	PWM/PFM Mode
23.	Pout	30.0 mW	Information System	Total output power
24.	Vin	16.0 V	Information System	Vin operating point
25.	Vout Actual	1.222 V	Information System	Vout Actual calculated based on selected voltage divider resistors
26.	Vout Tolerance	1.035 %	Information System	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

Name	Value	Description
Iout	25.0 m	Maximum Output Current
VinMax	16.0	Maximum input voltage
VinMin	15.0	Minimum input voltage
Vout	1.2	Output Voltage
base_pn	TPS54302	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 C_{in} and C_{out} , 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

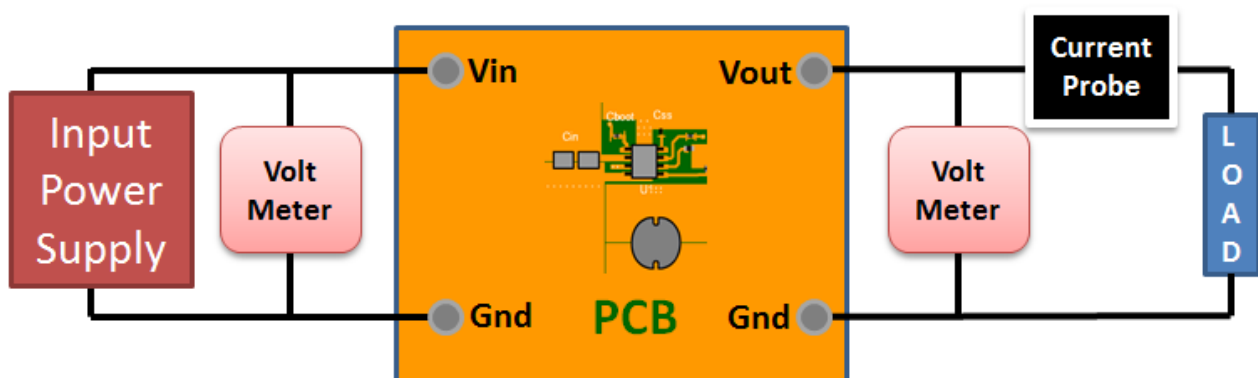
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab down 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 15.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to V_{in} and GND. Connect a digital volt meter and a load if needed to set the minimum load of the design from V_{out} 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 V_{in} and GND, a load is connected between V_{out} and GND and a current meter is connected in series between V_{out} 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.

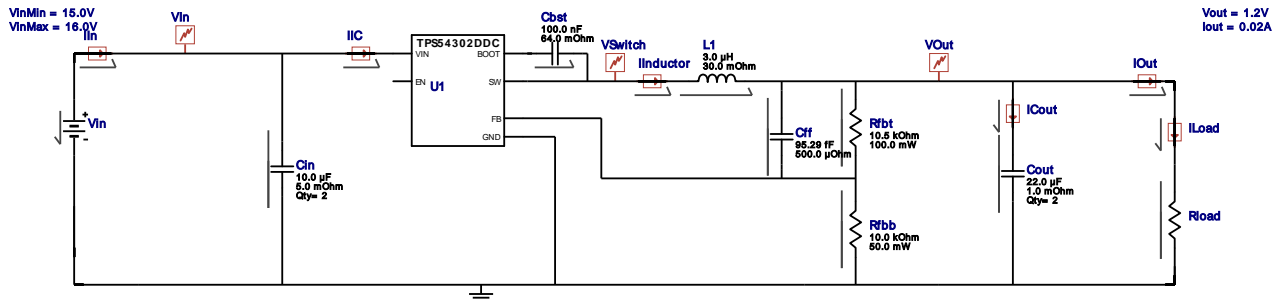


WEBENCH® Electrical Simulation Report

Design Id = 51

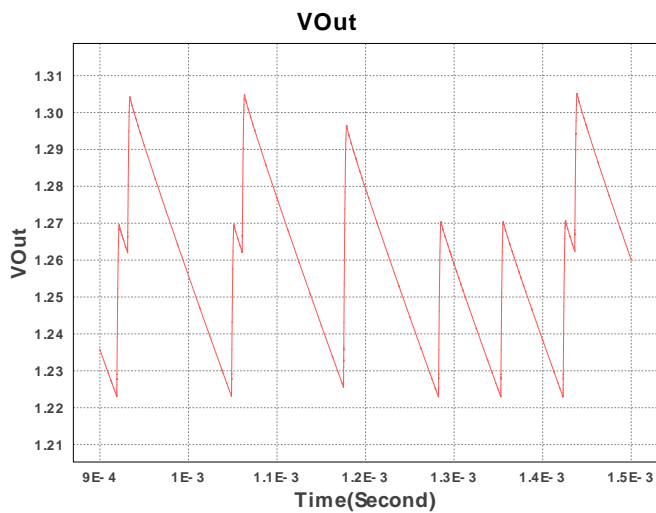
sim_id = 8

Simulation Type = Steady State



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	L1	IC	Initial Current	-0.025 V
2.	Cbst	IC	Initial Voltage	15.0 V
3.	Rload	R	Load Resistance	47.99999999999999 Ohm



Design Assistance

1. Master key : FA5FB7347F8FAABC[v1]

2. **TPS54302** Product Folder : <http://www.ti.com/product/TPS54302> : contains the data sheet and other resources.

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