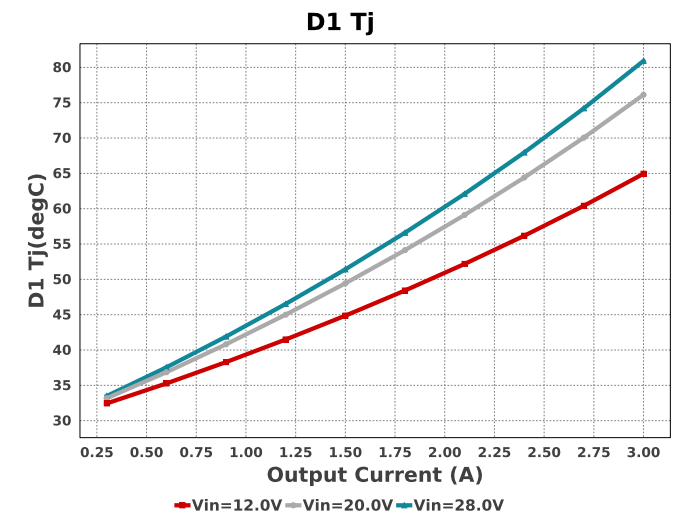
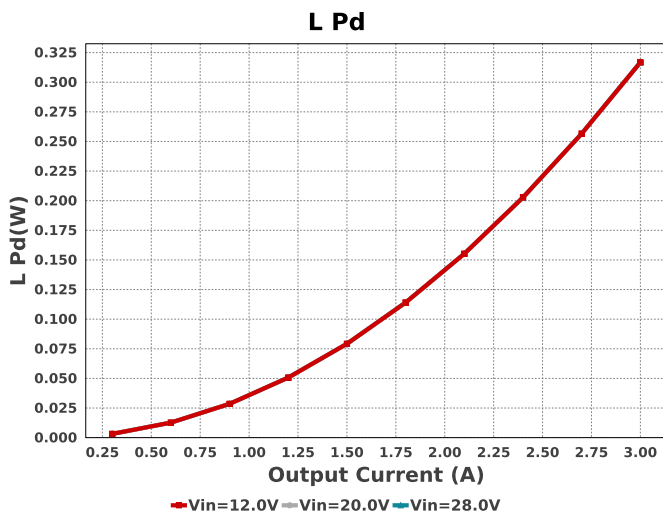
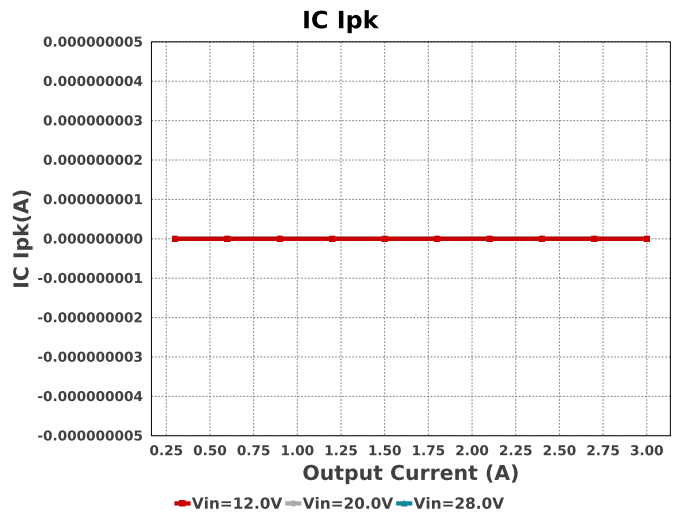
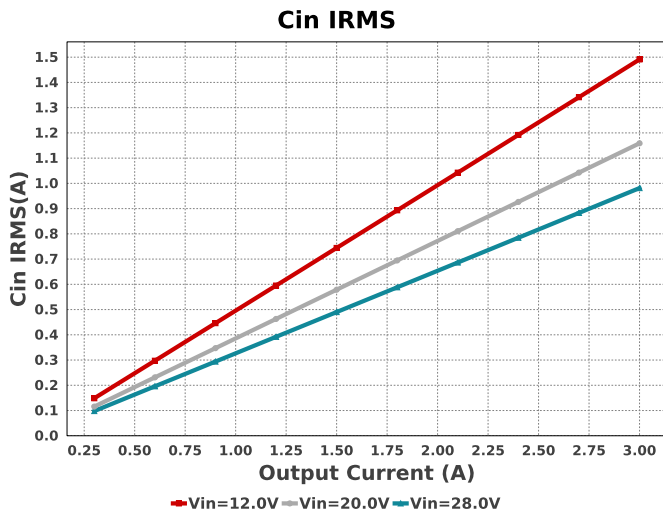
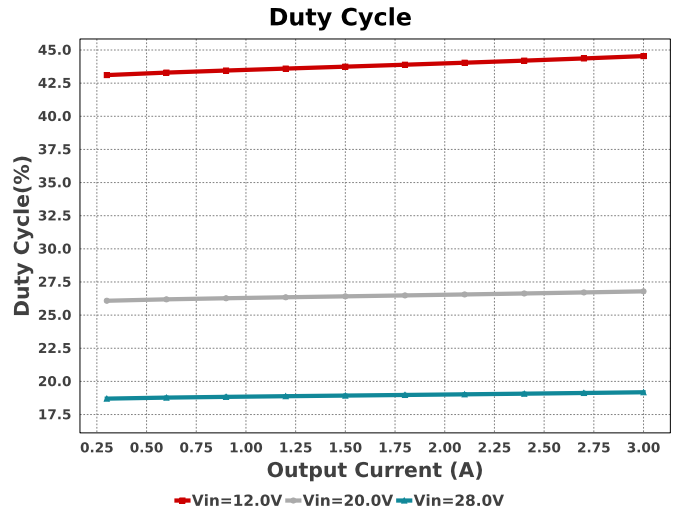
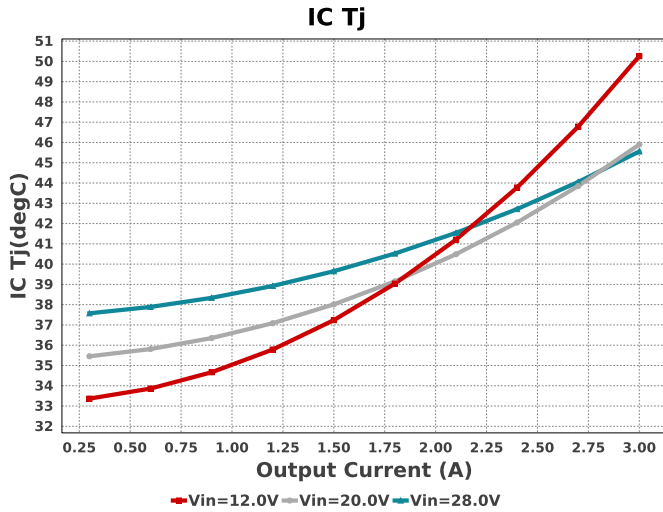
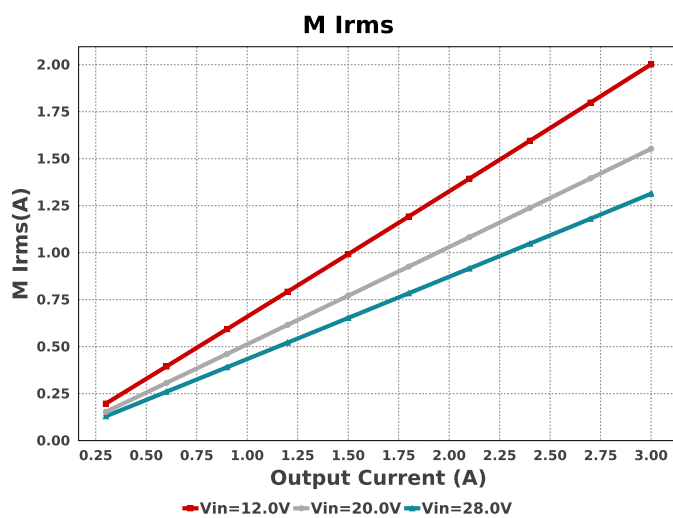
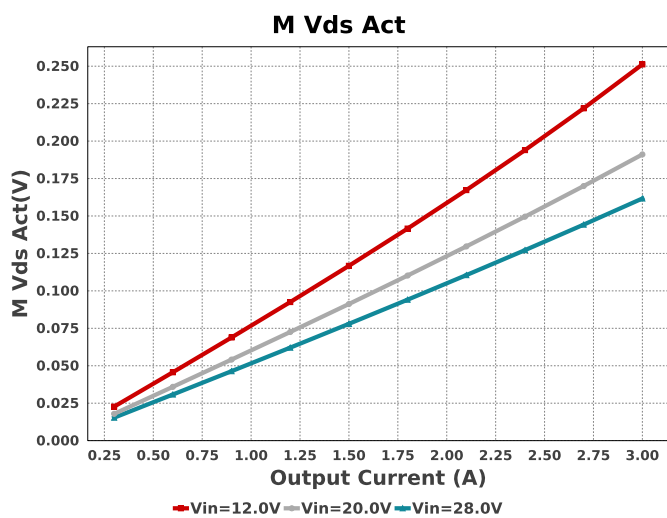
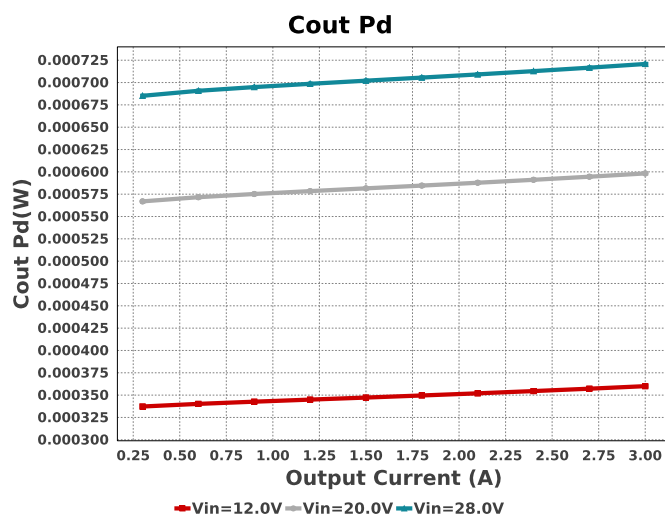
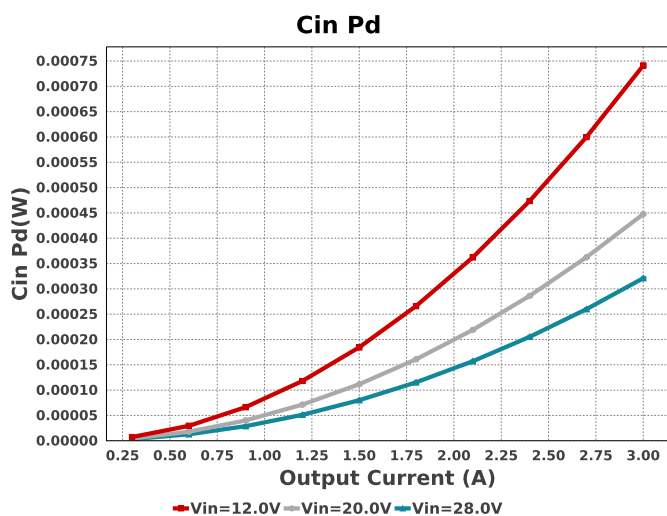
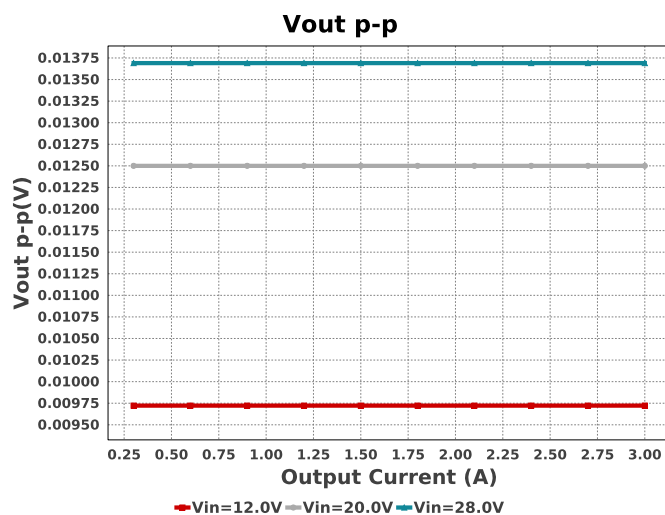
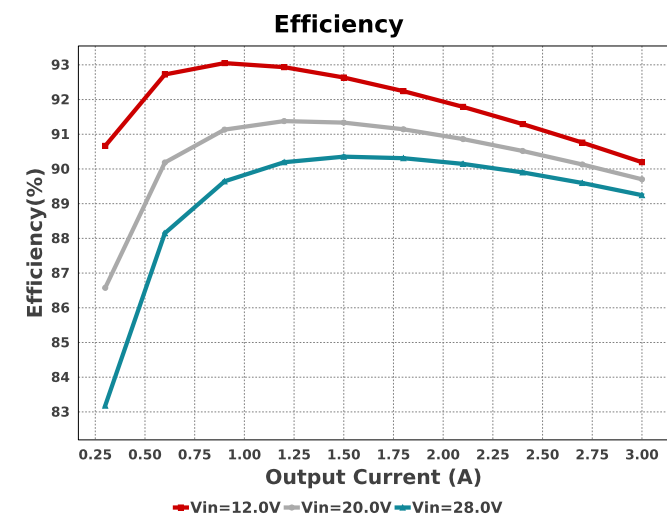
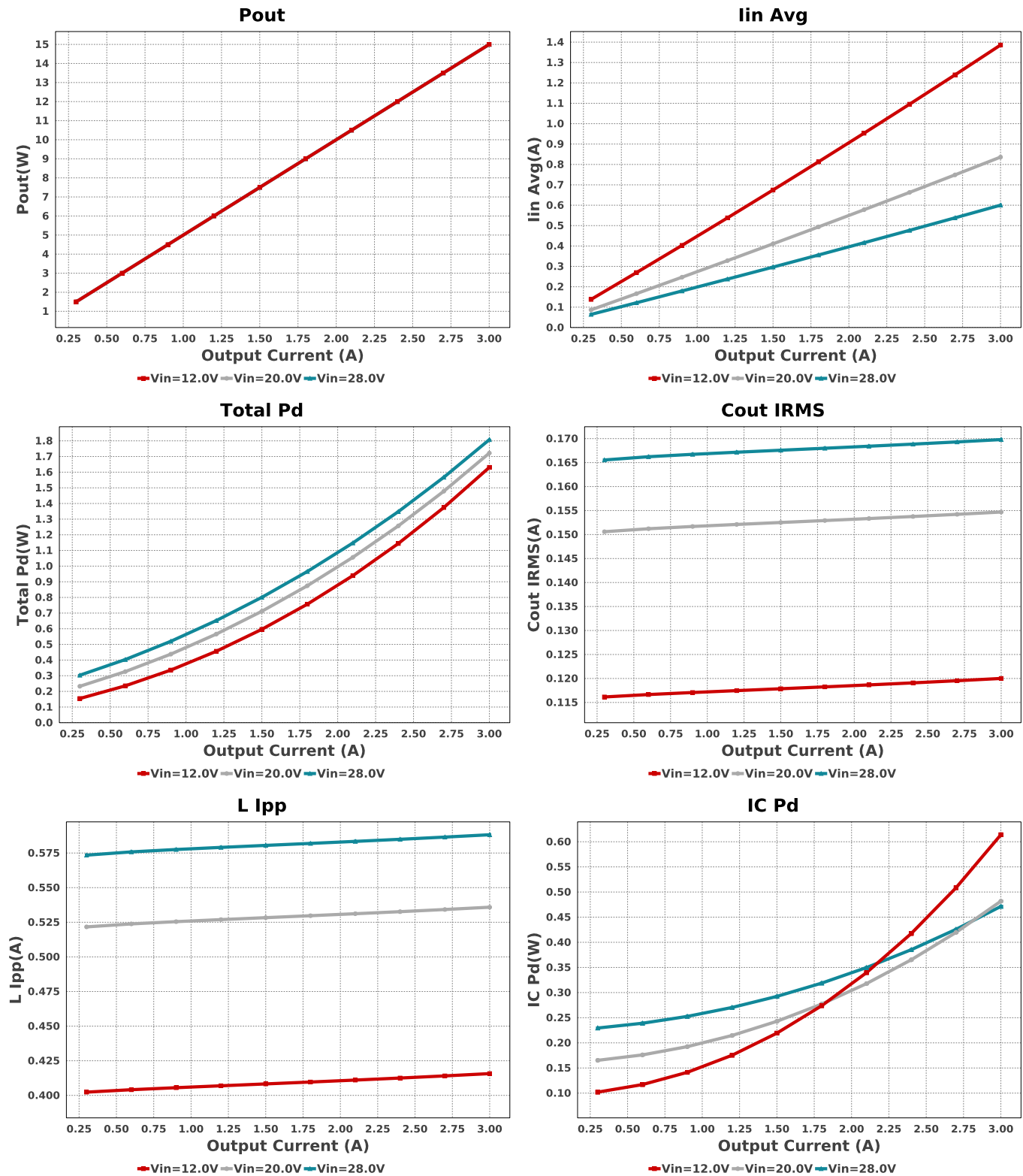


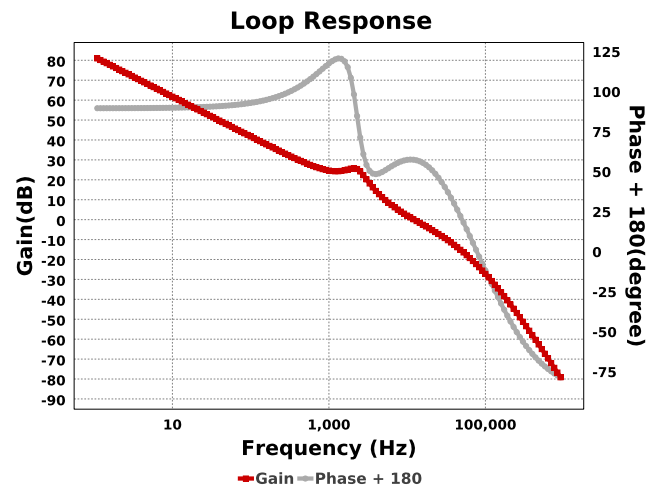
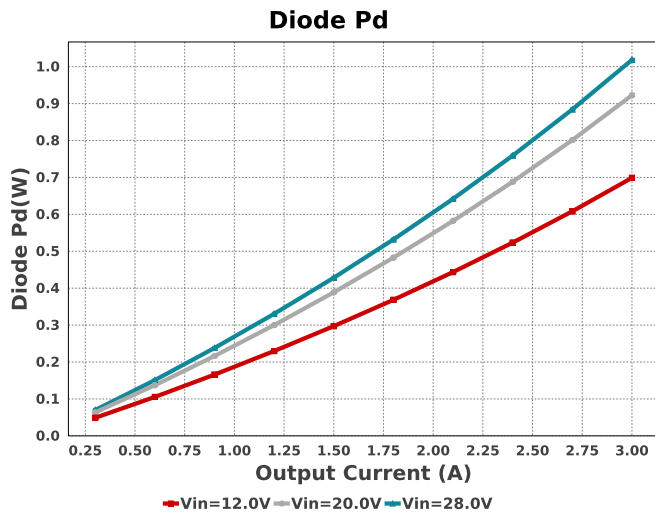


Device = TPS5430DDAR
Topology = Buck
Created = 2024-10-04 12:05:36.565
BOM Cost = \$3.54
BOM Count = 10
Total Pd = 1.81W









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	981.313 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	320.99 μ W	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	169.797 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	720.78 μ W	Capacitor	Output capacitor power dissipation
5.	D1 Tj	80.921 degC	Diode	D1 junction temperature
6.	Diode Pd	1.018 W	Diode	Diode power dissipation
7.	IC Ipk	0.0 A	IC	Peak switch current in IC
8.	IC Pd	471.42 mW	IC	IC power dissipation
9.	IC Tj	45.557 degC	IC	IC junction temperature
10.	IC Tolerance	18.315 mV	IC	IC Feedback Tolerance
11.	ICThetaJA	33.0 degC/W	IC	IC junction-to-ambient thermal resistance
12.	Iin Avg	600.27 mA	IC	Average input current
13.	L Ipp	588.196 mA	Inductor	Peak-to-peak inductor ripple current
14.	L Pd	316.8 mW	Inductor	Inductor power dissipation
15.	M Irms	1.314 A	Mosfet	MOSFET RMS ripple current
16.	M Vds Act	161.677 mV	Mosfet	Voltage drop across the MosFET
17.	Cin Pd	320.99 μ W	Power	Input capacitor power dissipation
18.	Cout Pd	720.78 μ W	Power	Output capacitor power dissipation
19.	Diode Pd	1.018 W	Power	Diode power dissipation
20.	IC Pd	471.42 mW	Power	IC power dissipation
21.	L Pd	316.8 mW	Power	Inductor power dissipation
22.	Total Pd	1.808 W	Power	Total Power Dissipation
23.	BOM Count	10	System	Total Design BOM count
24.	Cross Freq	12.259 kHz	System Information	Bode plot crossover frequency
25.	Duty Cycle	19.18 %	System Information	Duty cycle
26.	Efficiency	89.245 %	System Information	Steady state efficiency
27.	FootPrint	701.0 mm ²	System Information	Total Foot Print Area of BOM components
28.	Frequency	500.0 kHz	System Information	Switching frequency
29.	Iout	3.0 A	System Information	Iout operating point
30.	Mode	CCM	System Information	Conduction Mode
31.	Phase Marg	57.818 deg	System Information	Bode Plot Phase Margin
32.	Pout	15.0 W	System Information	Total output power
33.	Total BOM	\$3.543	System Information	Total BOM Cost
34.	Vin	28.0 V	System Information	Vin operating point
35.	Vout	5.0 V	System Information	Operational Output Voltage
36.	Vout Actual	4.99 V	System Information	Vout Actual calculated based on selected voltage divider resistors
37.	Vout Tolerance	3.049 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

#	Name	Value	Category	Description
38.	Vout p-p	13.69 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	3.0	Maximum Output Current
VinMax	28.0	Maximum input voltage
VinMin	12.0	Minimum input voltage
Vout	5.0	Output Voltage
base_pn	TPS5430	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 12.0V 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

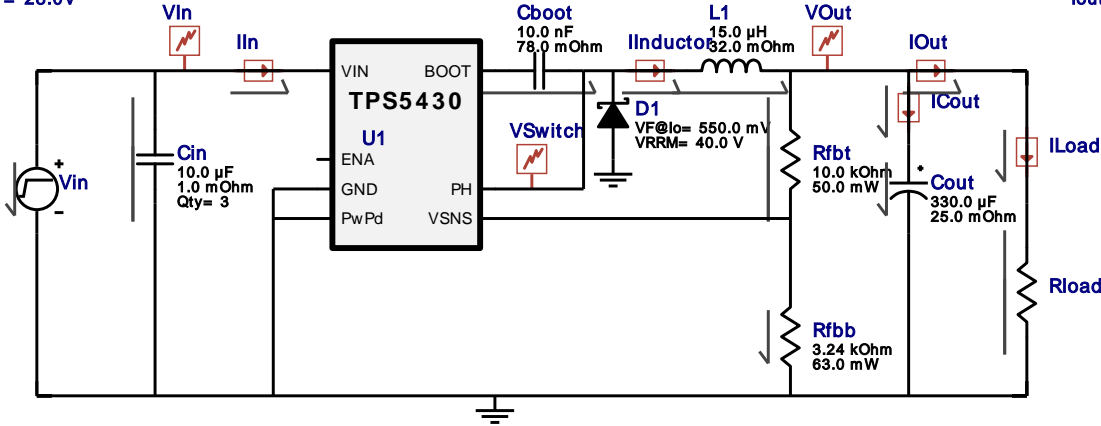
The setup is the same as the initial startup, except that an additional digital voltmeter is connected between V_{in} and GND, a load is connected between V_{out} and GND and a current meter is connected in series between V_{out} and the load. The load must be able to handle at least rated output power + 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 = 8
sim_id = 1
Simulation Type = Startup

VinMin = 12.0V
VinMax = 28.0V
Vout = 5.0V
Iout = 3.0A



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Rload	R	Load Resistance	1.666666666666667 Ohm

Design Assistance

- 1. Feature Highlights: 3A, 500kHz Fixed Switching Frequency, Internal Compensation
- 2. Master key : 0B4E0FC737FCF2E7B882DBA074140F54[v1]
- 3. **TPS5430** Product Folder : <http://www.ti.com/product/TPS5430> : contains the data sheet and other resources.

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