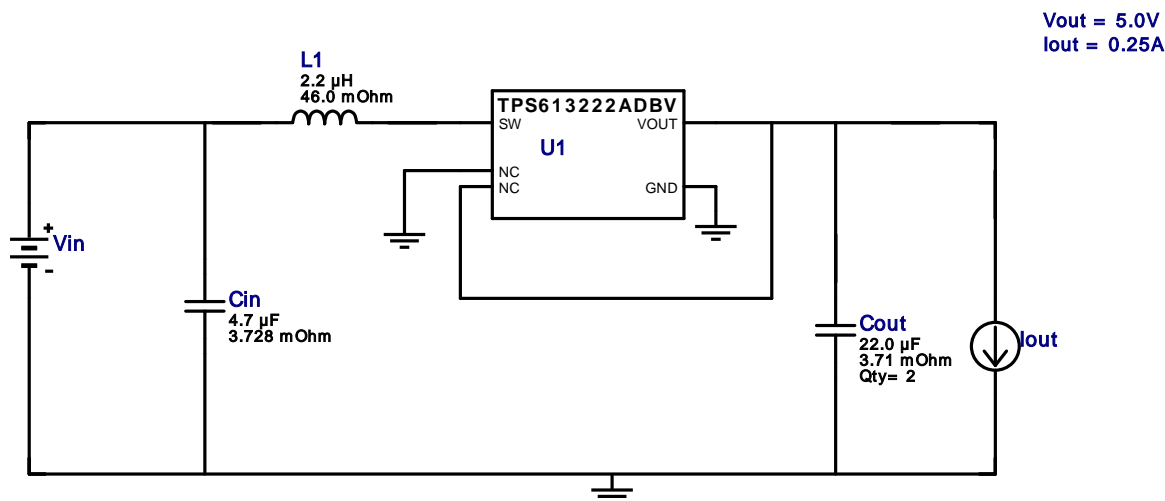


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VinMax = 3.6V
Vout = 5.0V
Iout = 0.25A

Device = TPS613222ADBVR
Topology = Boost
Created = 2023-07-21 23:32:05.784
BOM Cost = NA
BOM Count = 5
Total Pd = 0.19W

WEBENCH® Design Report

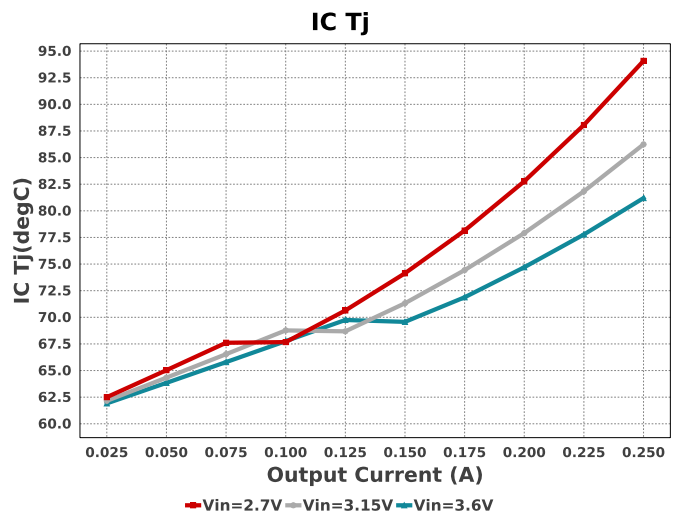
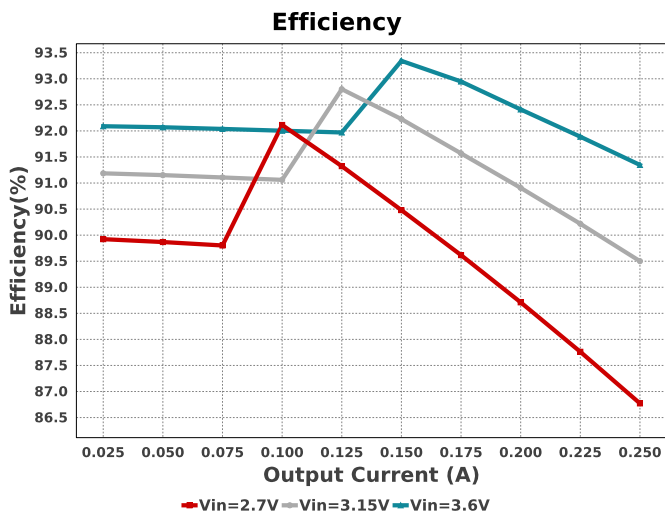
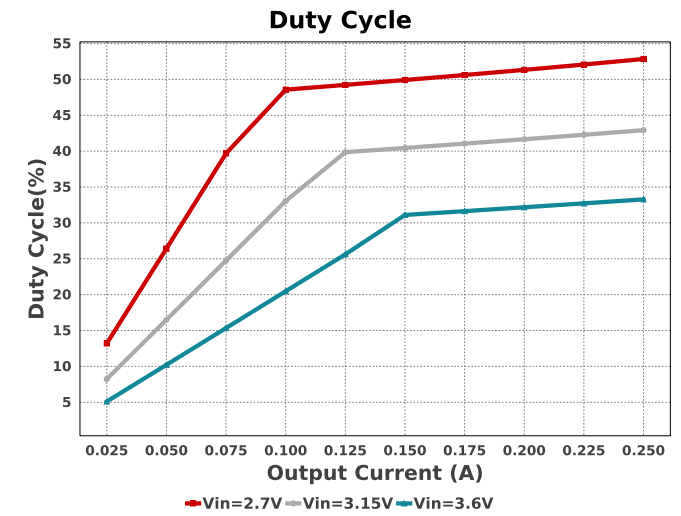
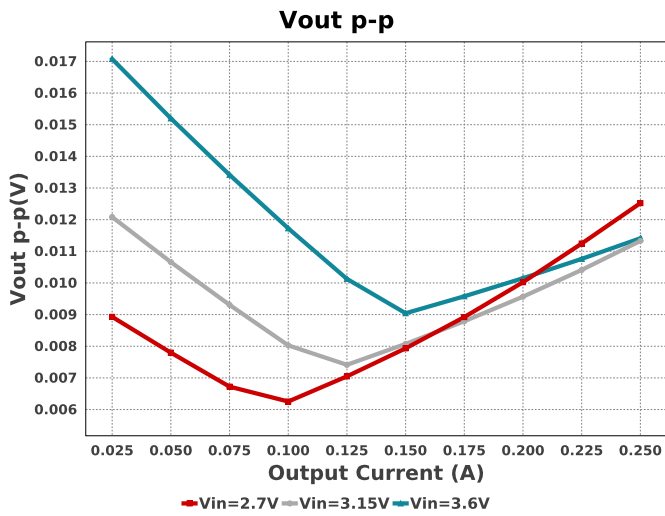
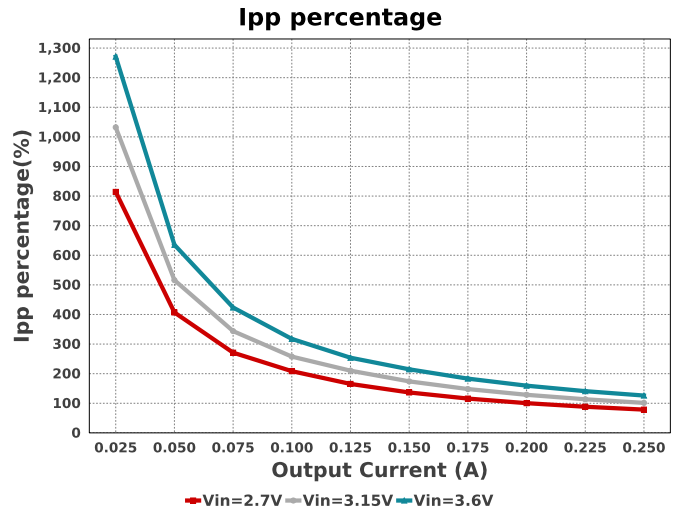
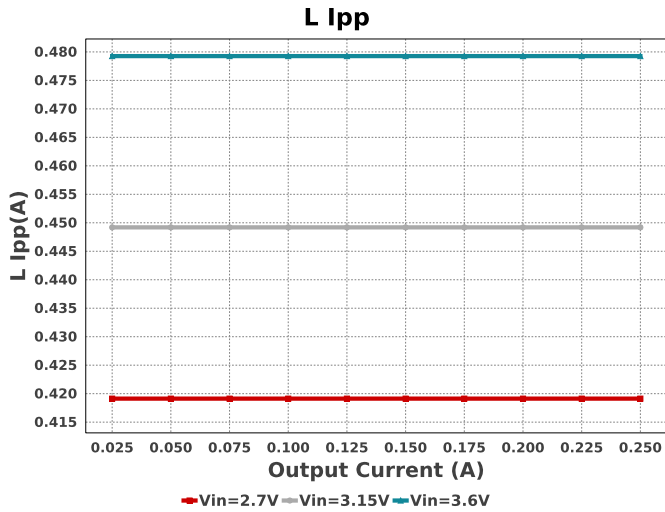
Design : 78 TPS613222ADBVR
TPS613222ADBVR 2.7V-3.6V to 5.00V @ 0.25A

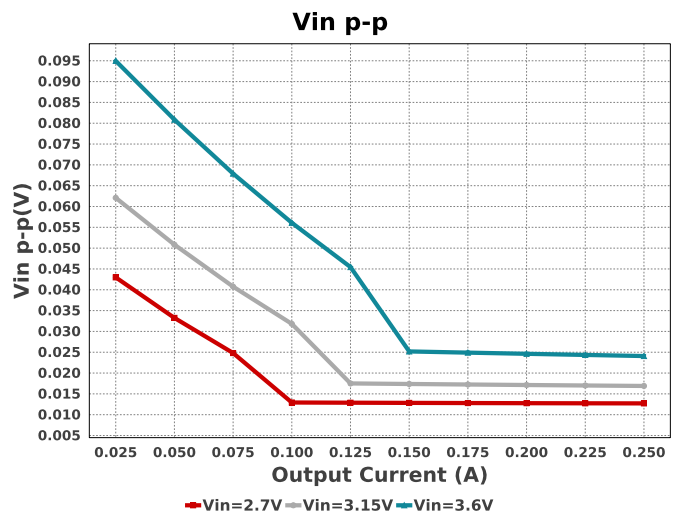
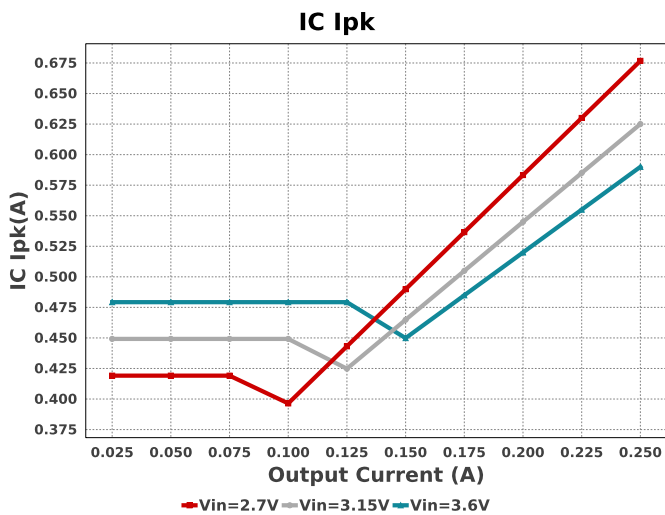
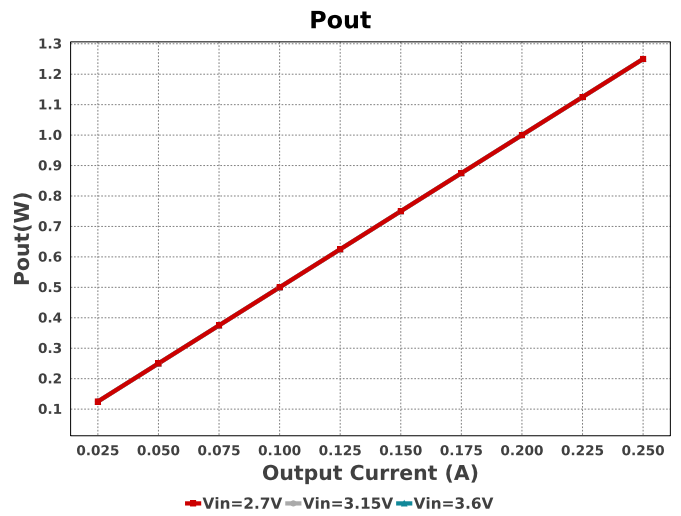
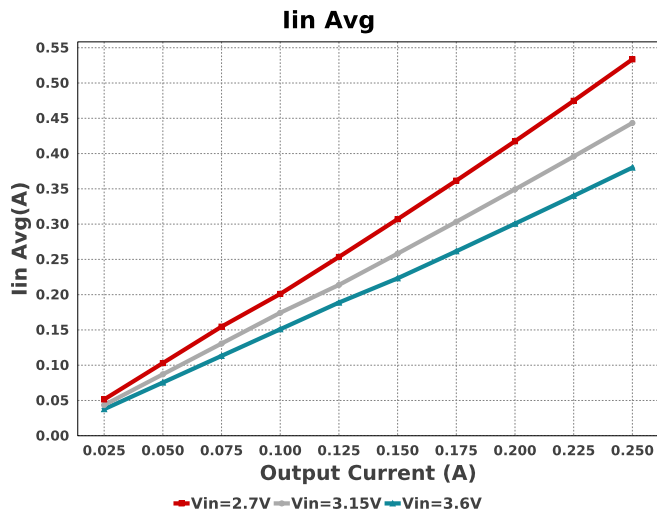
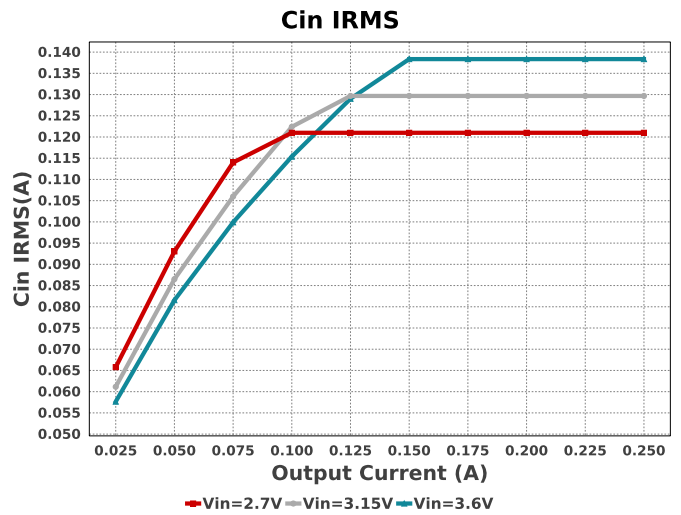
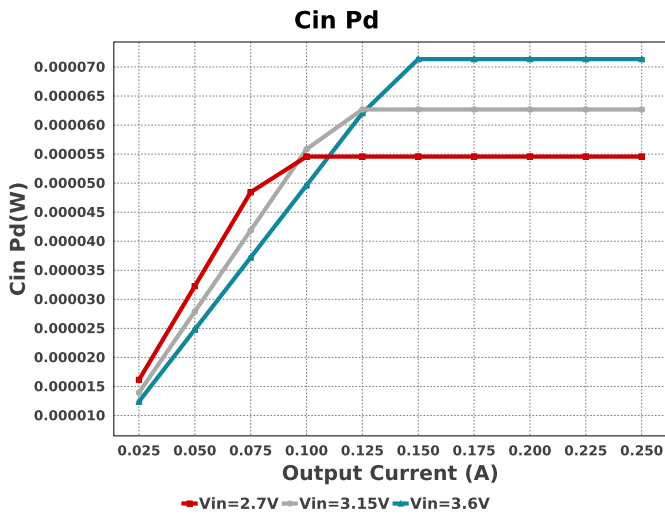


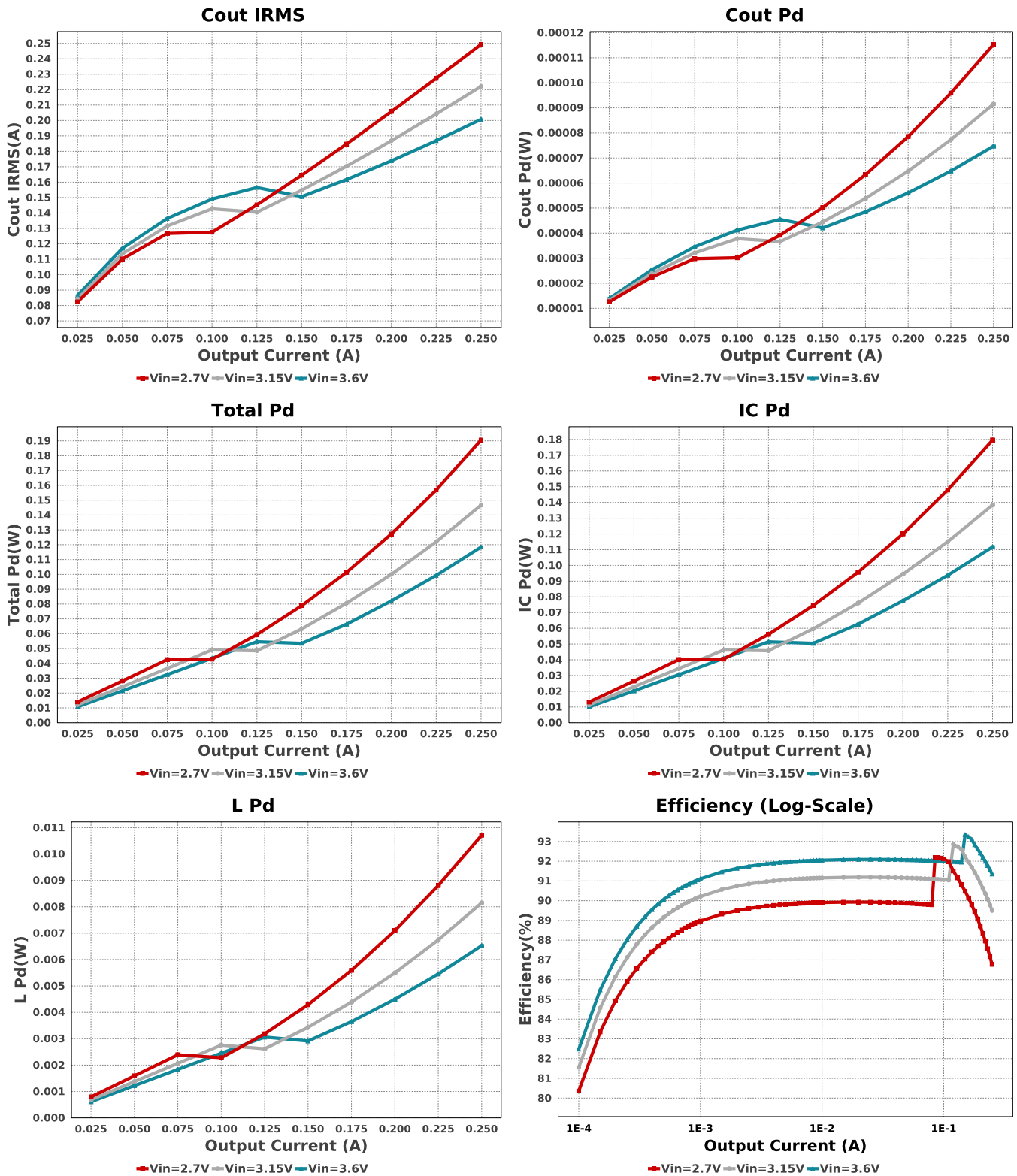
1. The inductor is designed for input current and not the current limit of the device.

Electrical BOM

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	TDK	C1608X7S1A475K080AC Series= X7S	Cap= 4.7 uF ESR= 3.728 mOhm VDC= 10.0 V IRMS= 2.69359 A	1	\$0.05	0603 5 mm ²
Cout	TDK	C1608X5R1A226M080AC Series= X5R	Cap= 22.0 uF ESR= 3.71 mOhm VDC= 10.0 V IRMS= 2.69936 A	2	\$0.08	0603 5 mm ²
L1	Vishay	IHLP1212BZER2R2M11	L= 2.2 µH 46.0 mOhm	1	NA	DfE201612E 9 mm ²
U1	Texas Instruments	TPS613222ADBVR	Switcher	1	\$0.13	DBV0005A_N 15 mm ²







Operating Values

#	Name	Value	Category	Description
1.	BOM Count	5		Total Design BOM count
2.	Total BOM	NA		Total BOM Cost
3.	Cin IRMS	120.992 mA	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	54.575 μ W	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	249.34 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	115.33 μ W	Capacitor	Output capacitor power dissipation
7.	IC Ipk	676.732 mA	IC	Peak switch current in IC
8.	IC Pd	179.67 mW	IC	IC power dissipation
9.	IC Tj	94.083 degC	IC	IC junction temperature
10.	ICThetaJA	189.7 degC/W	IC	IC junction-to-ambient thermal resistance
11.	Iin Avg	533.54 mA	IC	Average input current

#	Name	Value	Category	Description
12.	Ipp percentage	78.557 %	Inductor	Inductor ripple current percentage (with respect to average inductor current)
13.	L Ipp	419.129 mA	Inductor	Peak-to-peak inductor ripple current
14.	L Pd	10.713 mW	Inductor	Inductor power dissipation
15.	Cin Pd	54.575 μ W	Power	Input capacitor power dissipation
16.	Cout Pd	115.33 μ W	Power	Output capacitor power dissipation
17.	IC Pd	179.67 mW	Power	IC power dissipation
18.	L Pd	10.713 mW	Power	Inductor power dissipation
19.	Total Pd	190.557 mW	Power	Total Power Dissipation
20.	Duty Cycle	52.841 %	System	Duty cycle
21.	Efficiency	86.772 %	System	Steady state efficiency
22.	FootPrint	48.0 mm ²	System	Total Foot Print Area of BOM components
23.	Frequency	1.395 MHz	System	Switching frequency
24.	Iout	250.0 mA	System	Iout operating point
25.	Mode	CCM	System	Conduction Mode
26.	Pout	1.25 W	System	Total output power
27.	Vin	2.7 V	System	Vin operating point
28.	Vin p-p	12.714 mV	System	Peak-to-peak input voltage
29.	Vout	5.0 V	System	Operational Output Voltage
30.	Vout p-p	12.522 mV	System	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	250.0 m	Maximum Output Current
VinMax	3.6	Maximum input voltage
VinMin	2.7	Minimum input voltage
Vout	5.0	Output Voltage
base_pn	TPS613222A	Base Product Number
source	DC	Input Source Type
Ta	60.0	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 2.7V 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.



Design Assistance

1. Master key : F9884934EAC7C183[v1]
2. **TPS61322A** Product Folder : <http://www.ti.com/product/TPS61322> : contains the data sheet and other resources.

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