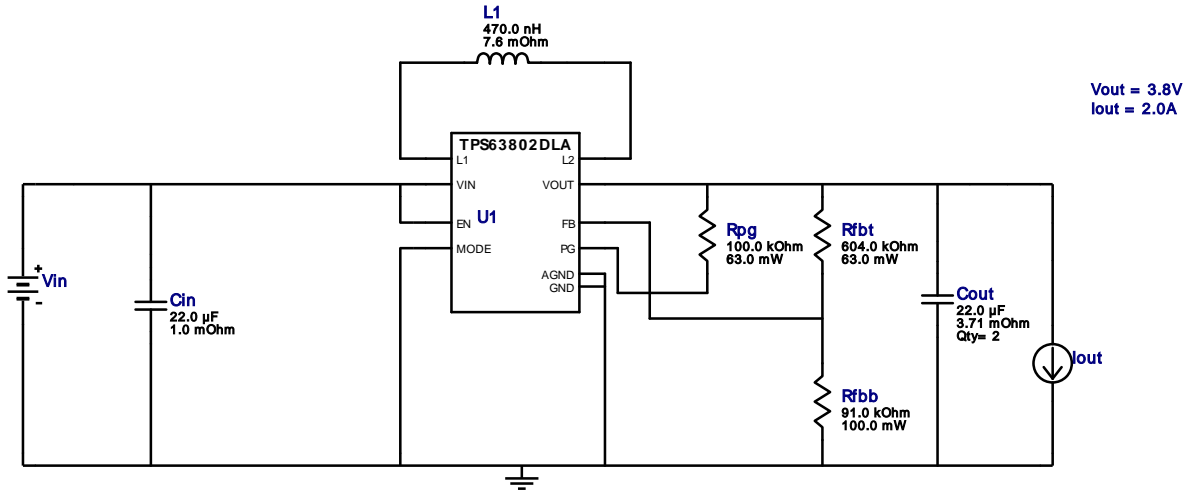


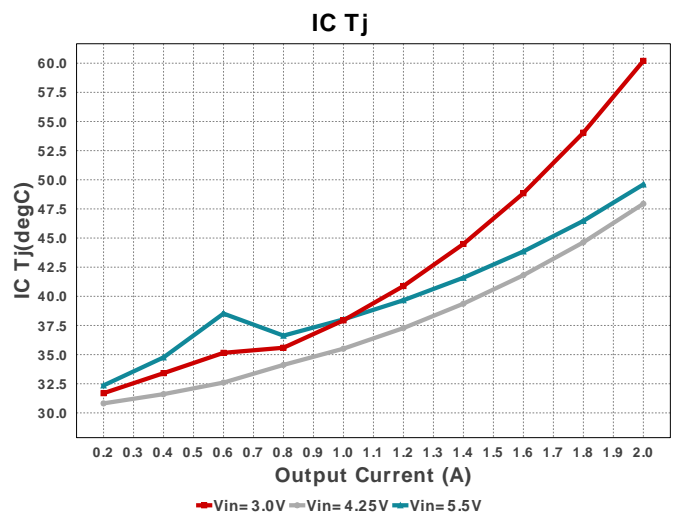
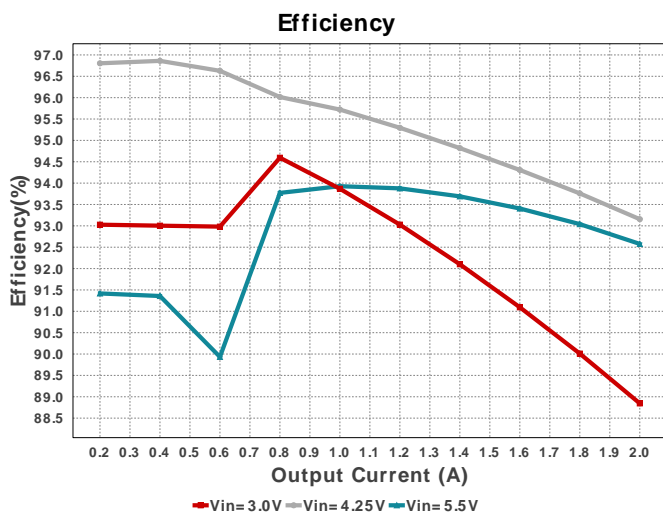
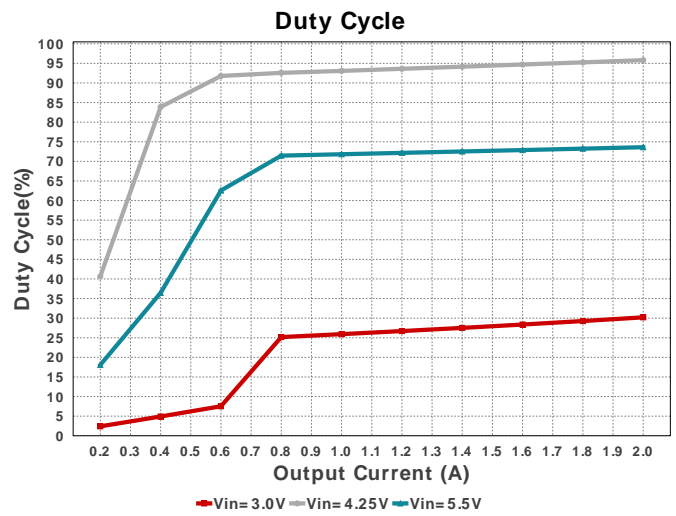
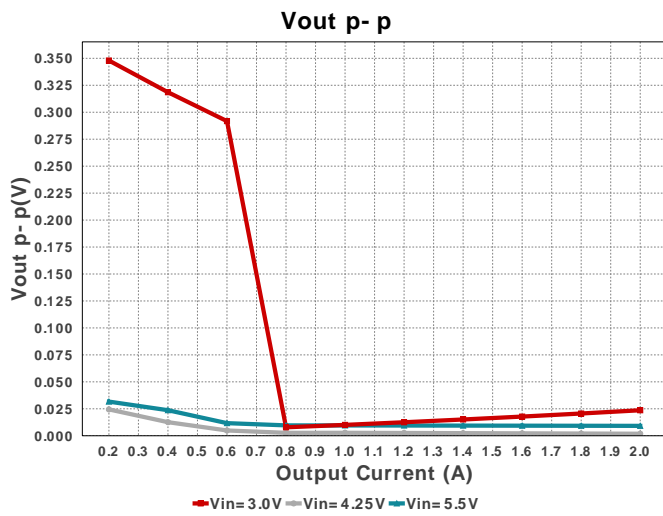
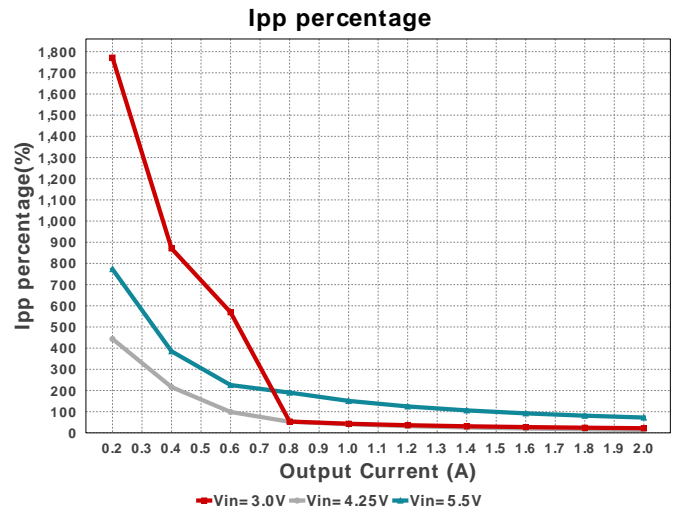
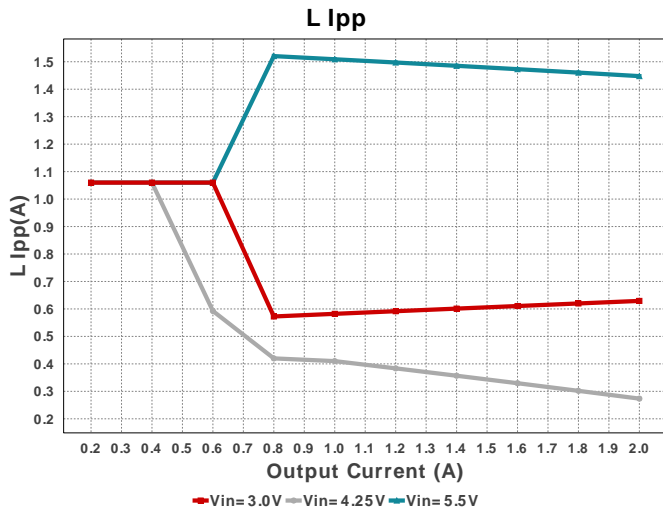
WEBENCH® Design Report

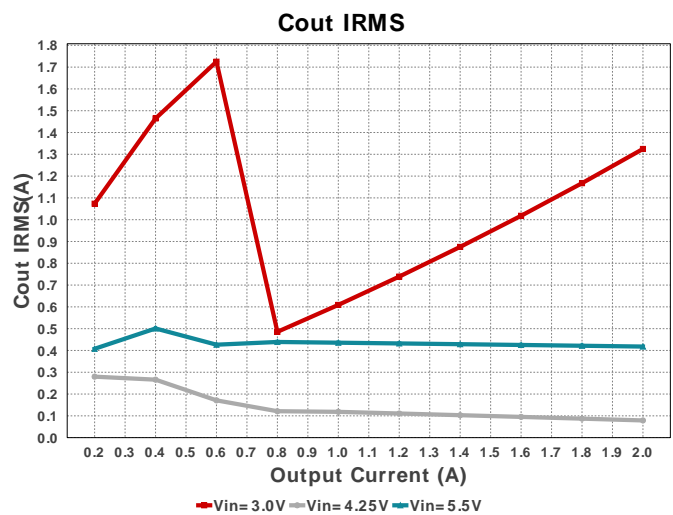
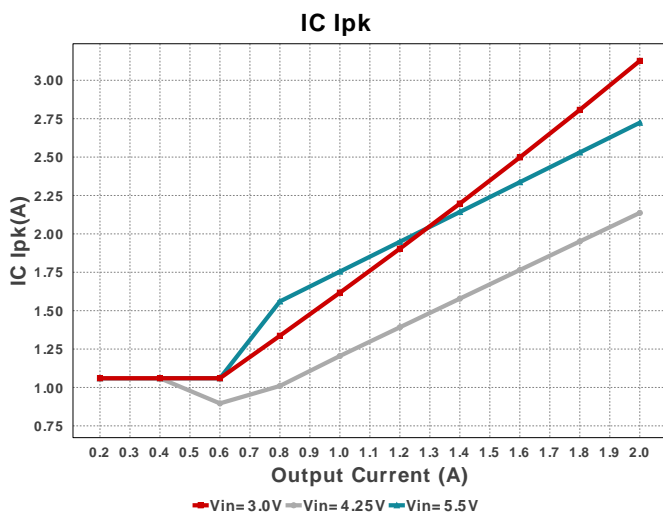
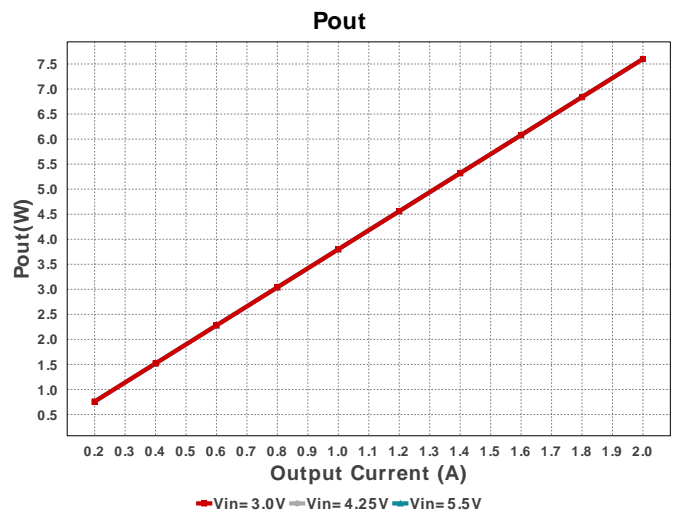
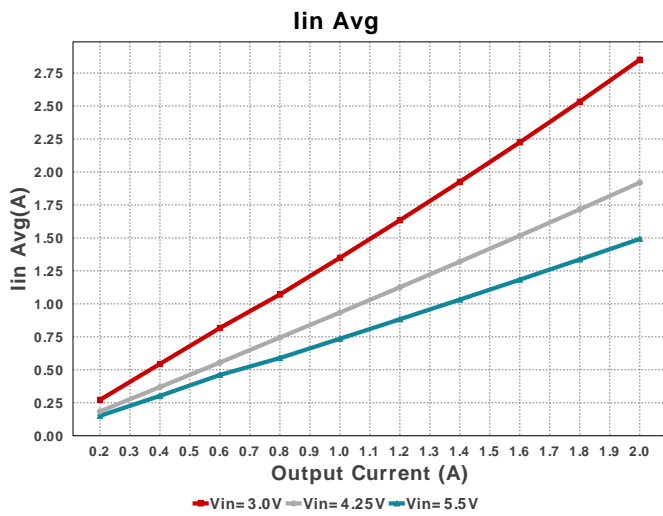
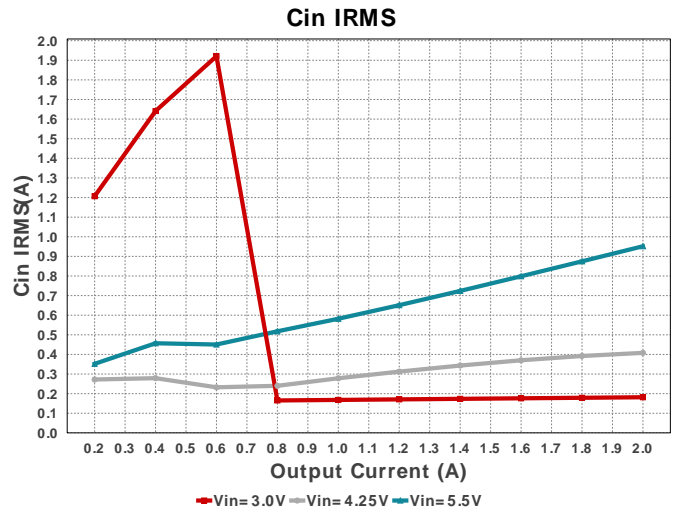
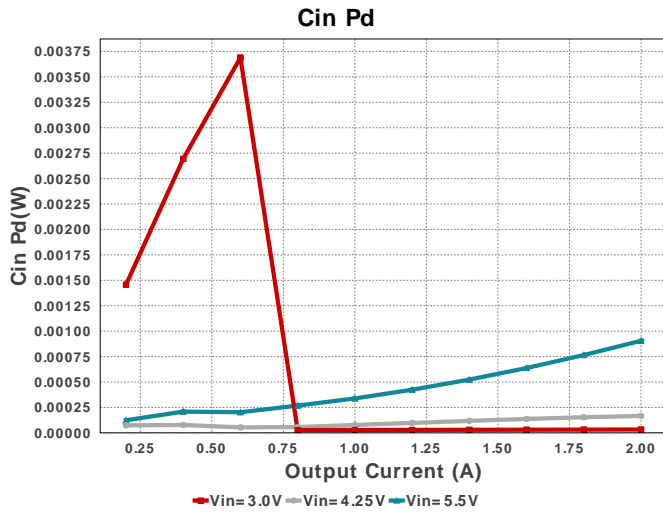
Design : 30 TPS63802DLAR
TPS63802DLAR 3V-5.5V to 3.80V @ 2A

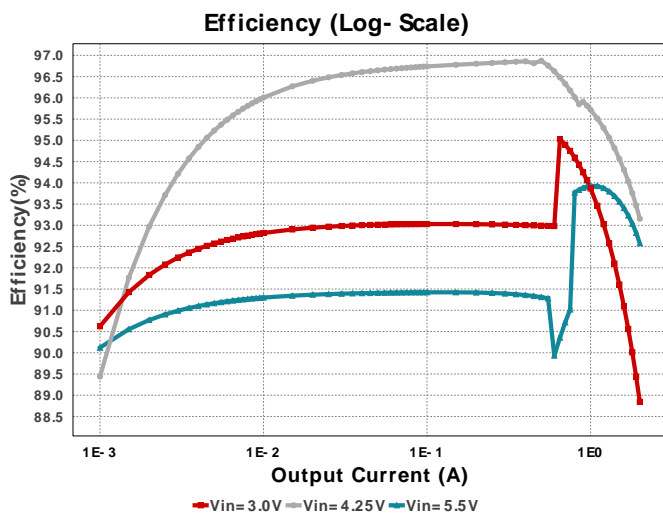
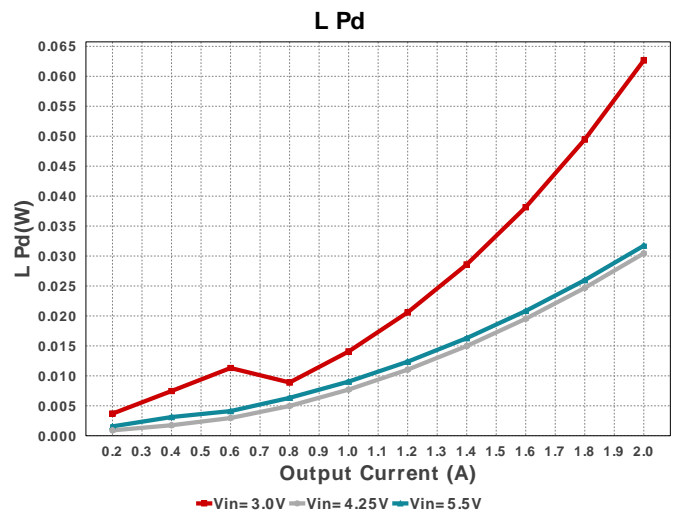
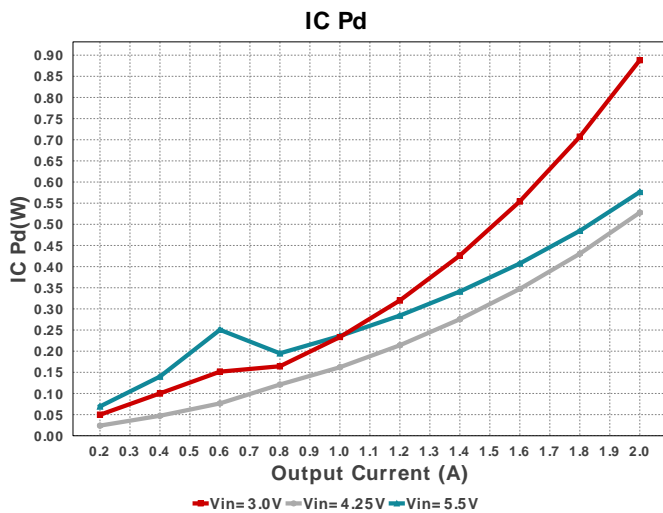
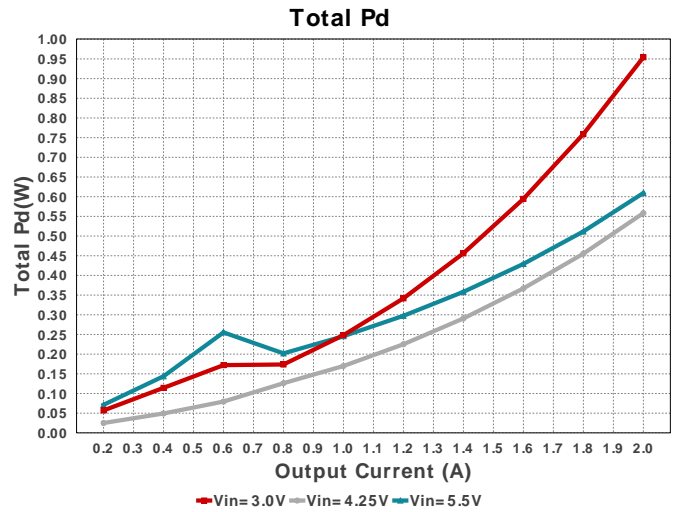
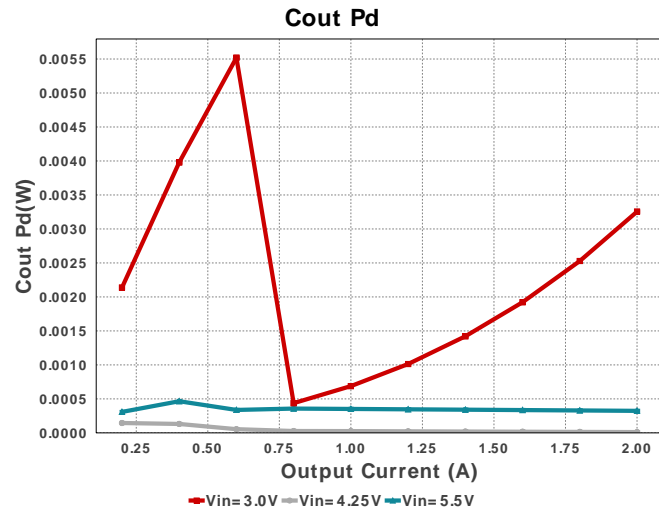


Electrical BOM

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	MuRata	GRM188R60J226MEA0D Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 6.0 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	\$0.12	0603 5 mm ²
L1	Coilcraft	XFL4015-471MEB	L= 470.0 nH 7.6 mOhm	1	\$0.60	XFL4015 28 mm ²
Rfbb	Yageo	RC0603FR-0791KL Series= ?	Res= 91.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
Rfbs	Vishay-Dale	CRCW0402604KFKED Series= CRCW..e3	Res= 604.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
U1	Texas Instruments	TPS63802DLAR	Switcher	1	\$0.86	DLA0010A 12 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	181.655 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	32.999 μ W	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	1.325 A	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	3.254 mW	Capacitor	Output capacitor power dissipation
5.	IC Ipk	3.126 A	IC	Peak switch current in IC
6.	IC Pd	888.28 mW	IC	IC power dissipation
7.	IC Tj	60.201 degC	IC	IC junction temperature
8.	IC Tolerance	5.0 mV	IC	IC Feedback Tolerance
9.	ICThetaJA	34.0 degC/W	IC	IC junction-to-ambient thermal resistance
10.	Iin Avg	2.851 A	IC	Average input current

#	Name	Value	Category	Description
11.	Ipp percentage	21.959 %	Inductor	Inductor ripple current percentage (with respect to average inductor current)
12.	L Ipp	629.27 mA	Inductor	Peak-to-peak inductor ripple current
13.	L Pd	62.663 mW	Inductor	Inductor power dissipation
14.	Cin Pd	32.999 μ W	Power	Input capacitor power dissipation
15.	Cout Pd	3.254 mW	Power	Output capacitor power dissipation
16.	IC Pd	888.28 mW	Power	IC power dissipation
17.	L Pd	62.663 mW	Power	Inductor power dissipation
18.	Total Pd	954.221 mW	Power	Total Power Dissipation
19.	BOM Count	8	System	Total Design BOM count
			Information	
20.	Duty Cycle	30.208 %	System	Duty cycle
			Information	
21.	Efficiency	88.845 %	System	Steady state efficiency
			Information	
22.	FootPrint	65.0 mm ²	System	Total Foot Print Area of BOM components
			Information	
23.	Frequency	2.52 MHz	System	Switching frequency
			Information	
24.	Iout	2.0 A	System	Iout operating point
			Information	
25.	Mode	CCM	System	Conduction Mode
			Information	
26.	Pout	7.6 W	System	Total output power
			Information	
27.	Total BOM	\$1.78	System	Total BOM Cost
			Information	
28.	Vin	3.0 V	System	Vin operating point
			Information	
29.	Vout	3.8 V	System	Operational Output Voltage
			Information	
30.	Vout Actual	3.819 V	System	Vout Actual calculated based on selected voltage divider resistors
			Information	
31.	Vout Tolerance	2.773 %	System	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
			Information	
32.	Vout p-p	23.648 mV	System	Peak-to-peak output ripple voltage
			Information	

Design Inputs

Name	Value	Description
Iout	2.0	Maximum Output Current
VinMax	5.5	Maximum input voltage
VinMin	3.0	Minimum input voltage
Vout	3.8	Output Voltage
base_pn	TPS63802	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

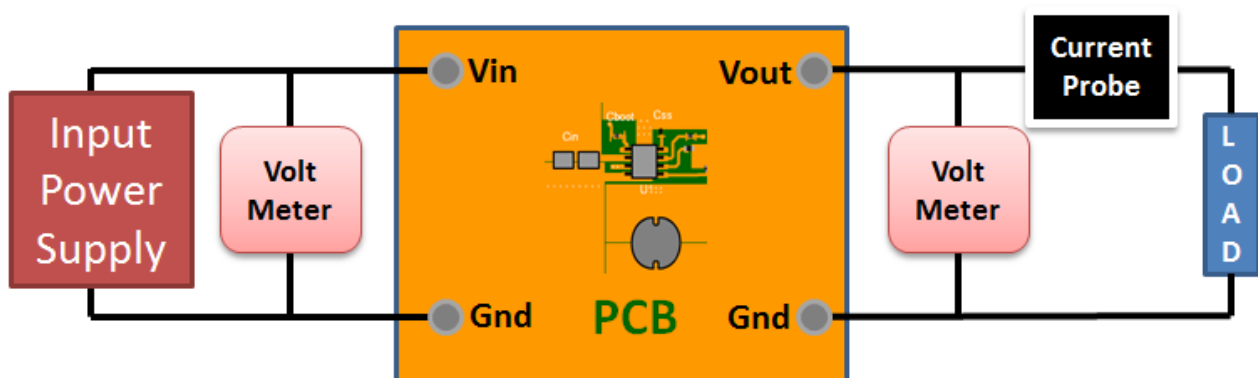
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 3.0V 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.

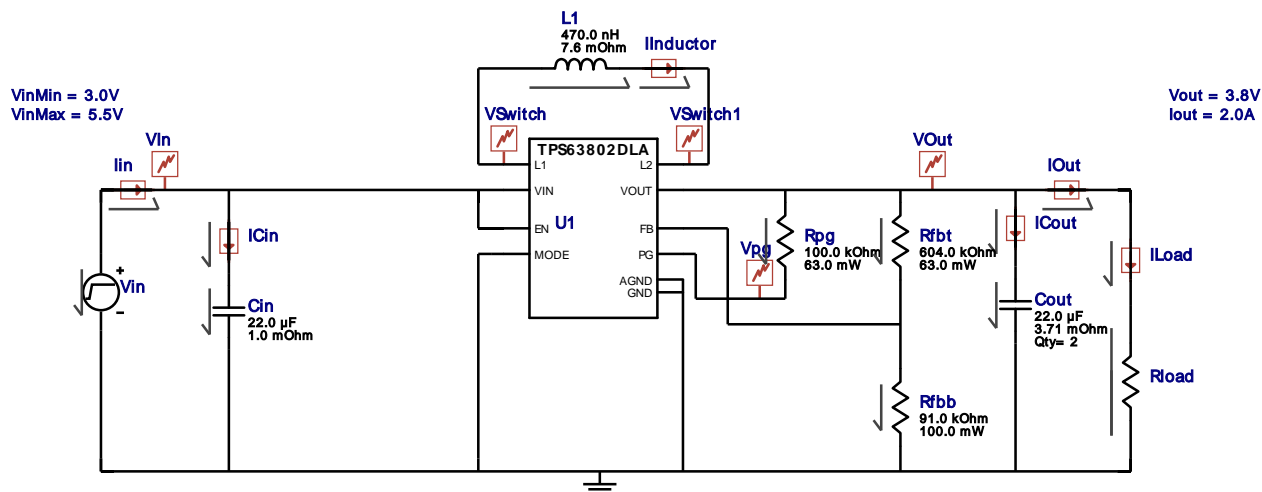


WEBENCH® Electrical Simulation Report

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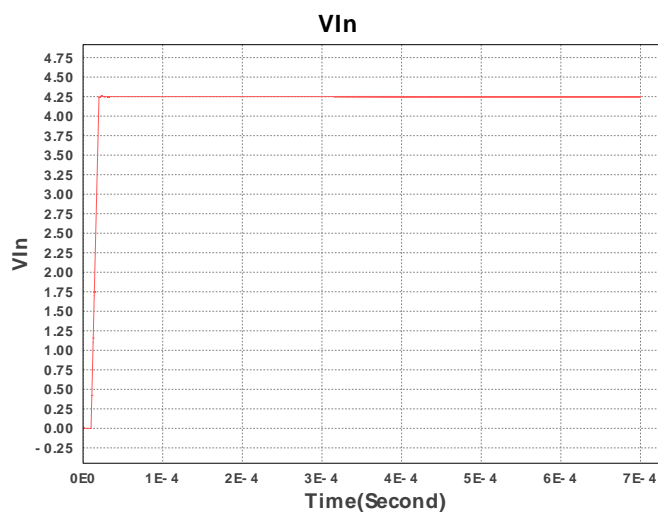
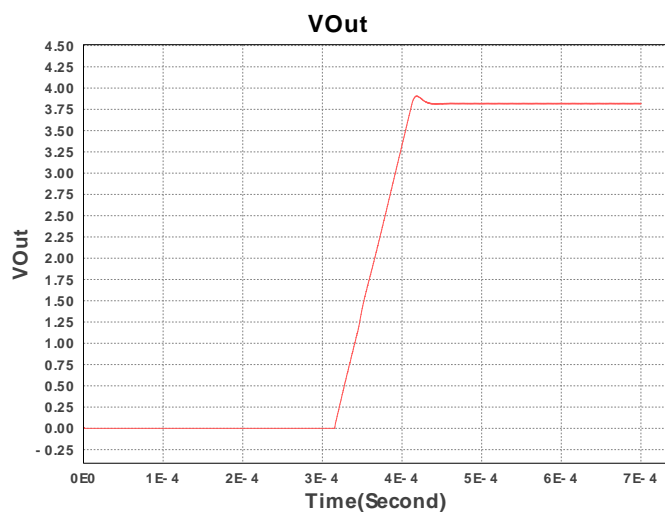
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Simulation Type = Startup



Simulation Parameters

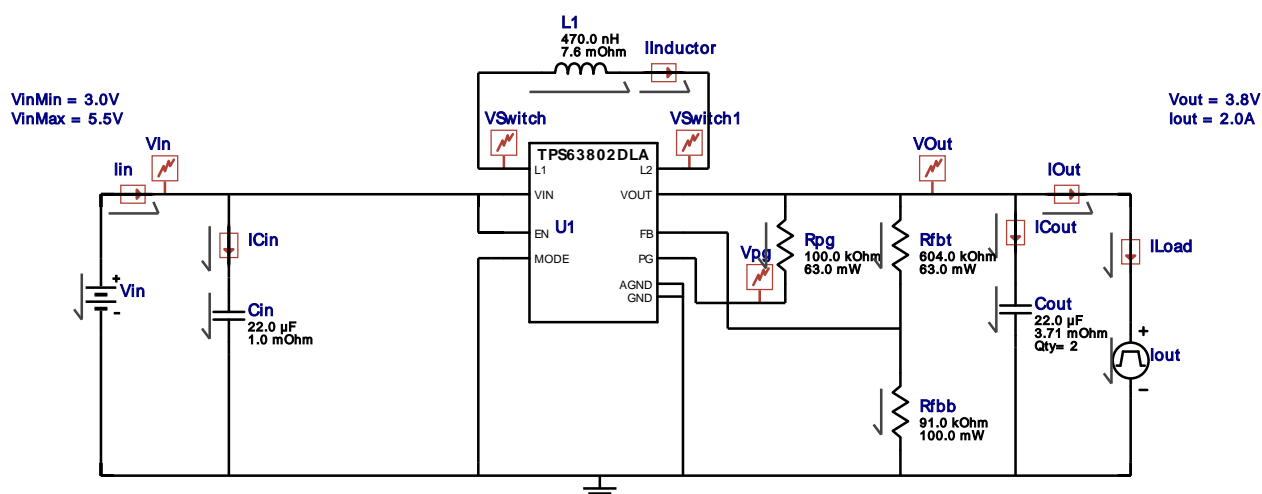
#	Name	Parameter Name	Description	Values
1.	Vzero1	Vmode	no description	0
2.	Vzero1	Ven	no description	0
3.	Rload	R	Load Resistance	1.9 Ohm



Design Id = 30

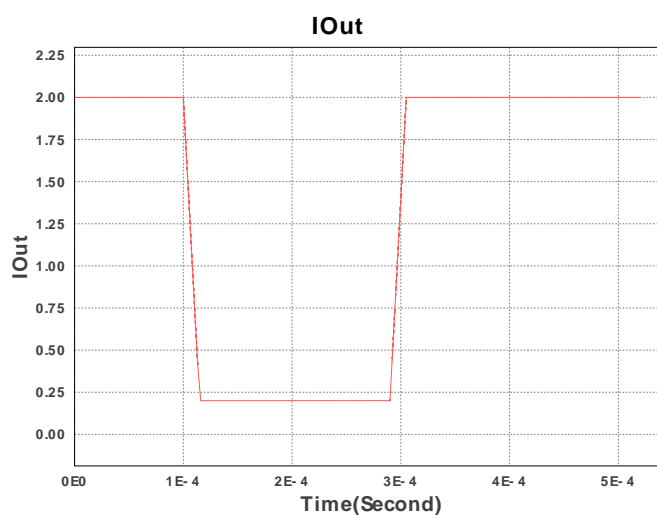
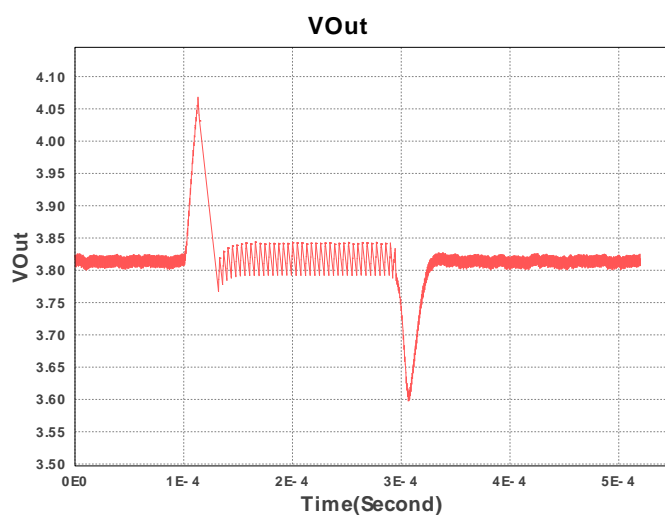
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Simulation Type = Load Transient



Simulation Parameters

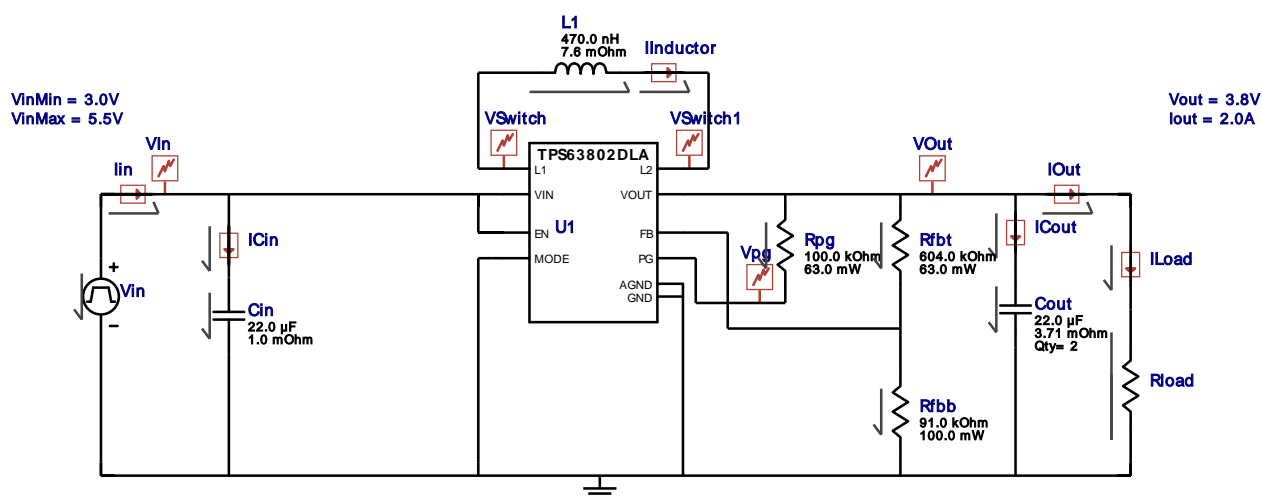
#	Name	Parameter Name	Description	Values
1.	L1	IC	Initial Current	2.0 A
2.	Cout	IC	Initial Voltage	3.8 V
3.	ILoad	I	Load Current	ILoad1 A
4.	Iout	signal_type	Signal Type	PULSE
		I1	Initial Input Voltage	2.0 A
		I2	Peak Input Voltage	0.2 A
		Td	Initial Time Delay	100u s
		Tr	Rise Time	15u s
		Tf	Fall Time	15u s
		Pw	Pulse Width	175u s



Design Id = 30

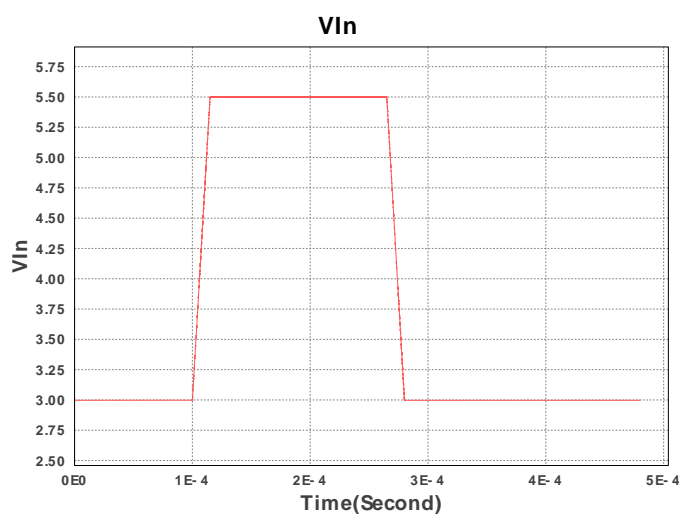
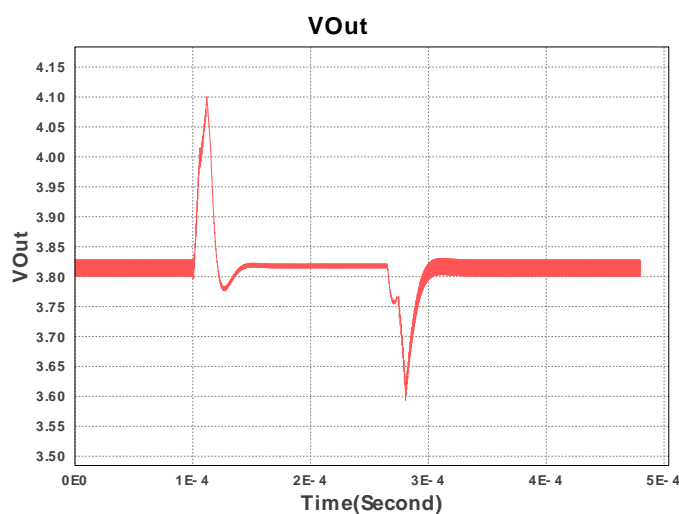
sim_id = 3

Simulation Type = Input Transient



Simulation Parameters

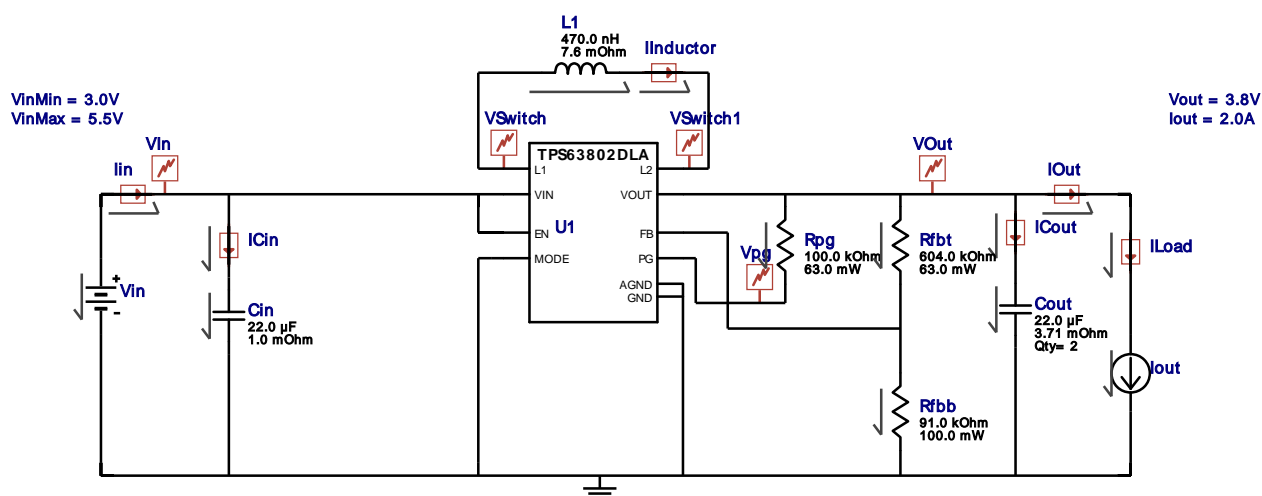
#	Name	Parameter Name	Description	Values
1.	L1	IC	Initial Current	2.0 A
2.	Cout	IC	Initial Voltage	3.8 V
3.	Rload	R	Load Resistance	1.9 Ohm



Design Id = 30

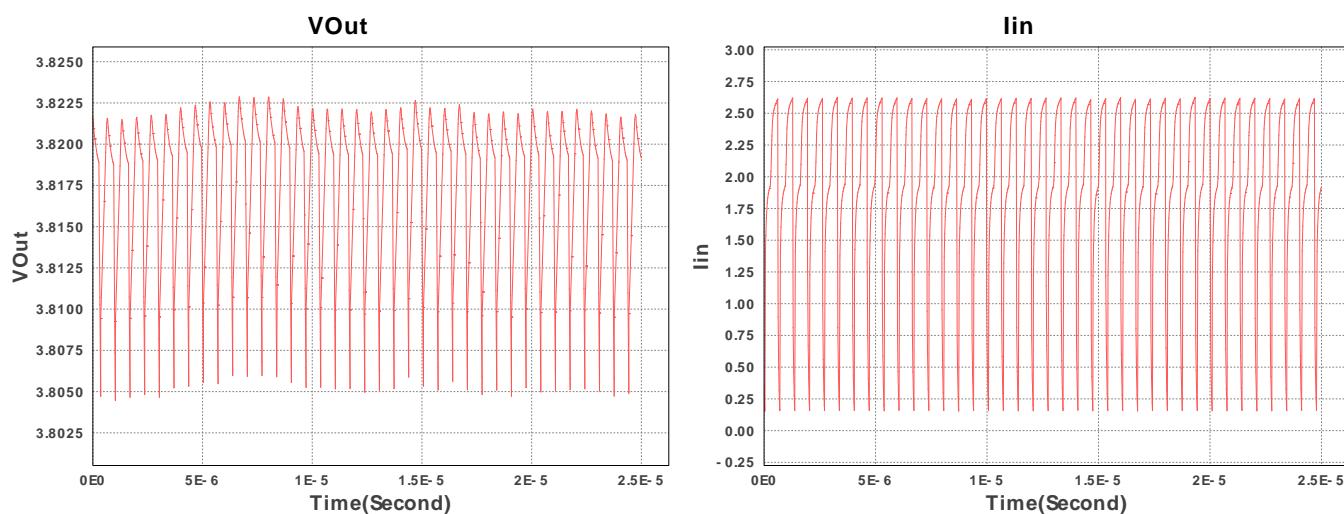
sim_id = 4

Simulation Type = Steady State



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	L1	IC	Initial Current	2.0 A
2.	Cout	IC	Initial Voltage	3.8
3.	Iout	I	Load current	2.0 A



Design Assistance

1. Master key : B5D4E2491D752E31[v1]

2. **TPS63802** Product Folder : <http://www.ti.com/product/TPS63802> : contains the data sheet and other resources.

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