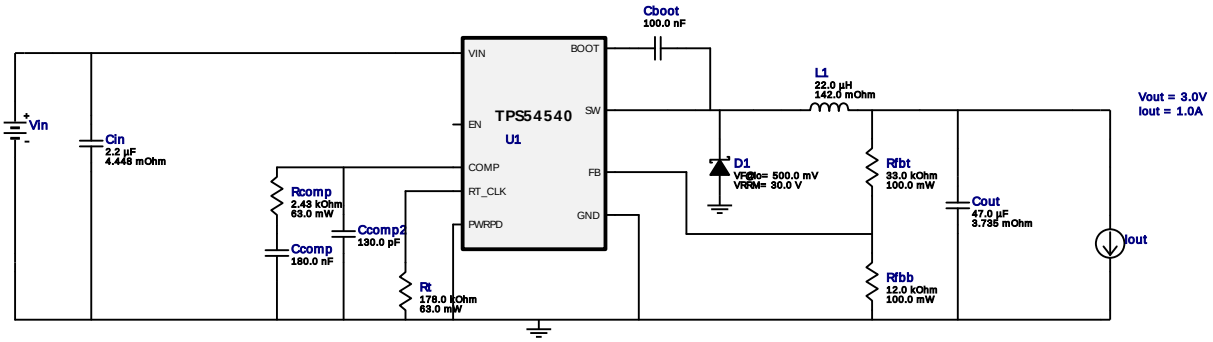
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 19.0V
Vout = 3.0V
Iout = 1.0A

Device = TPS54540DDAR
Topology = Buck
Created = 7/19/16 6:04:42 AM
BOM Cost = $2.43
BOM Count = 12
Total Pd = 0.57W

Design : 4728729/31 TPS54540DDAR
TPS54540DDAR 10.0V-19.0V to 3.00V @ 1.0A

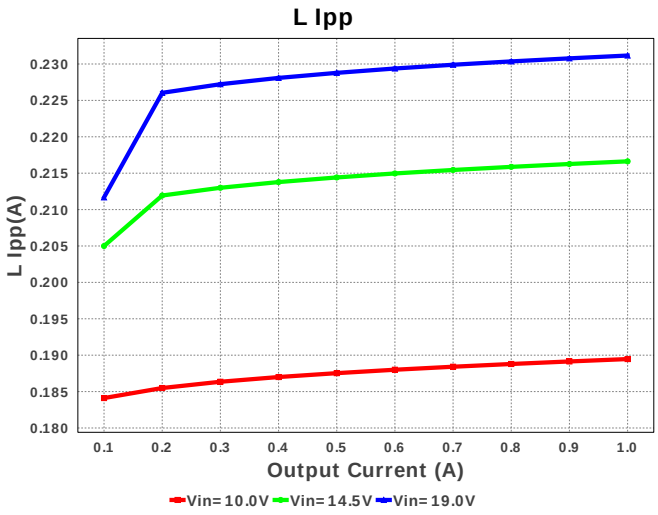


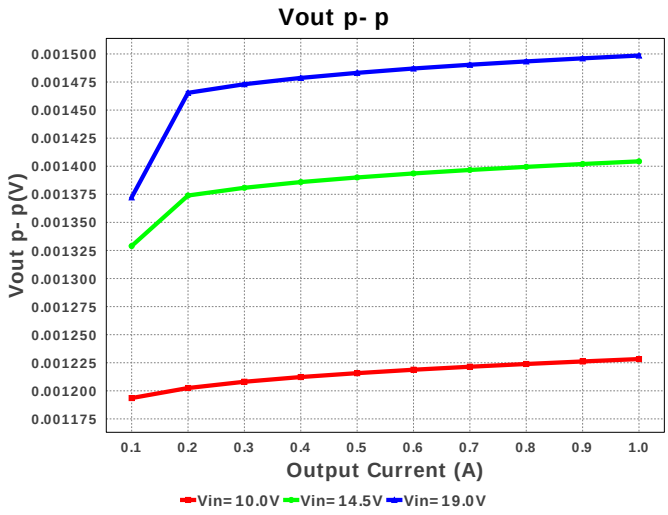
Electrical BOM

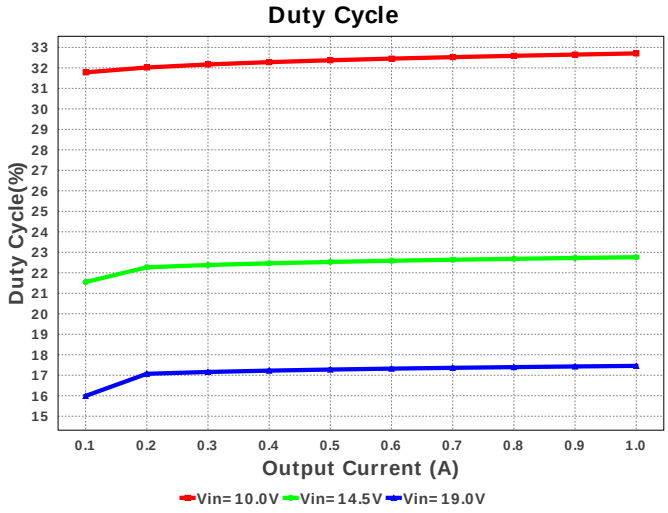
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	MuRata	GRM155R61A184KE19D Series= X5R	Cap= 180.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.02	0402 3 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C131JBANNNC Series= C0G/NP0	Cap= 130.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	$0.05	1206_190 11 mm²
5.	Cout	MuRata	GRM31CE70G476ME15L Series= X7U	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 4.0 V IRMS= 4.1841 A	1	$0.10	1206_190 11 mm²
6.	D1	Diodes Inc.	B230A-13-F	VF@Io= 500.0 mV VRRM= 30.0 V	1	$0.09	SMA 37 mm²
7.	L1	Bourns	SRN6045-220M	L= 22.0 µH DCR= 142.0 mOhm	1	$0.16	SRN6045 64 mm²
8.	Rcomp	Vishay-Dale	CRCW04022K43FKED Series= CRCW..e3	Res= 2.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
10.	Rfbt	Yageo America	RC0603FR-0733KL Series= ?	Res= 33.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
11.	Rt	Vishay-Dale	CRCW0402178KFKED Series= CRCW..e3	Res= 178.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

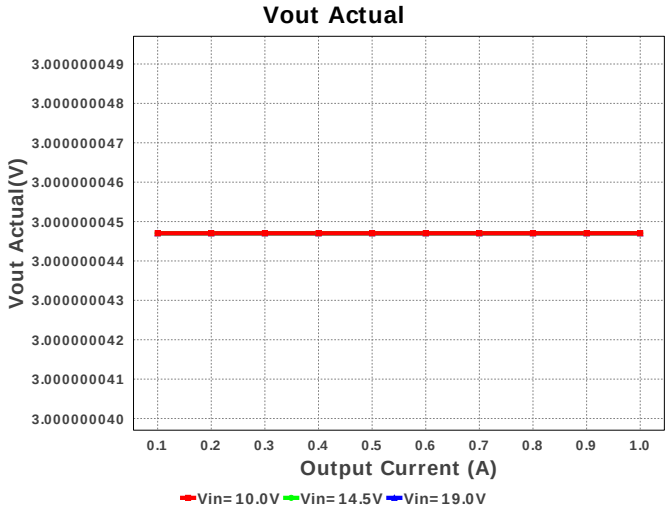
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	U1	Texas Instruments	TPS54540DDAR	Switcher	1	$1.95	

R-PDSO-G8 57 mm^2

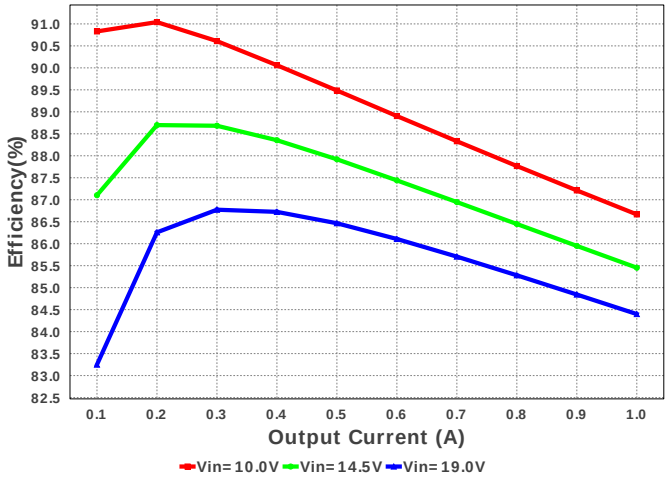




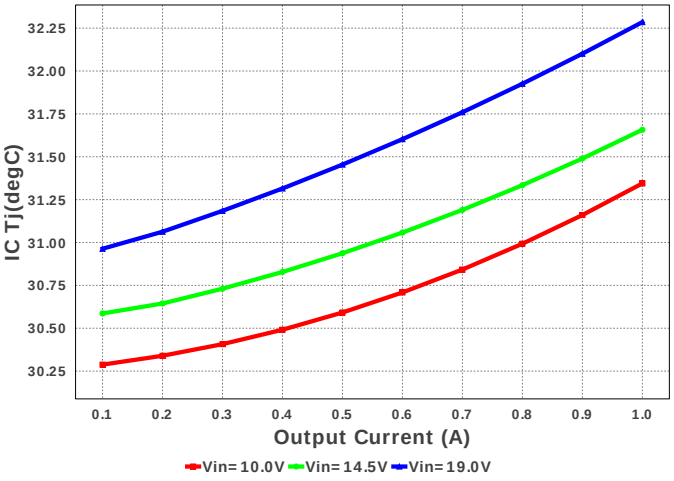




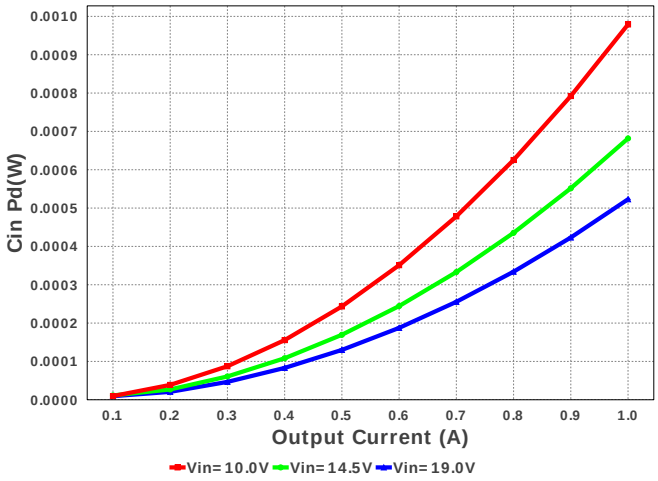
Efficiency



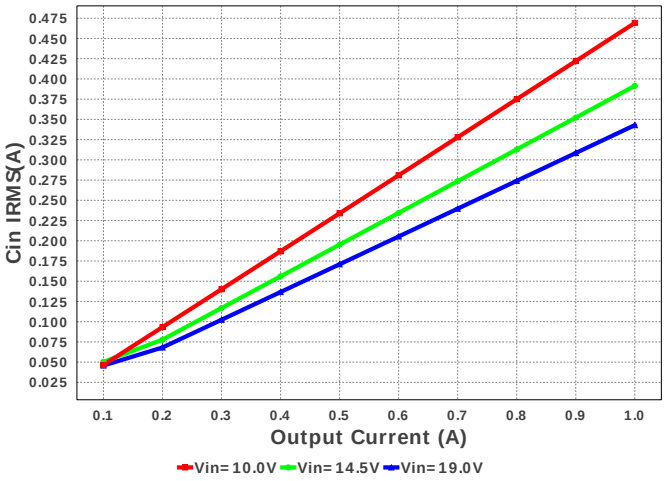
IC Tj



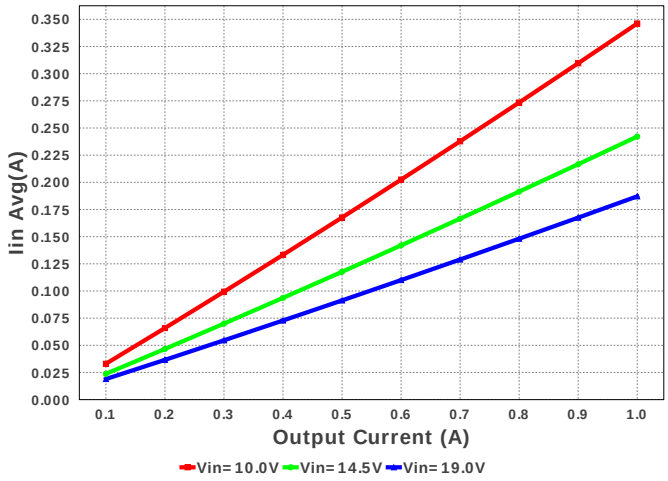
Cin Pd



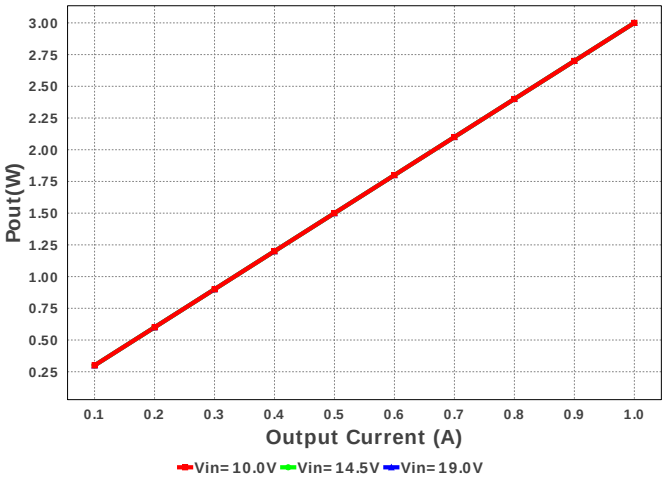
Cin IRMS

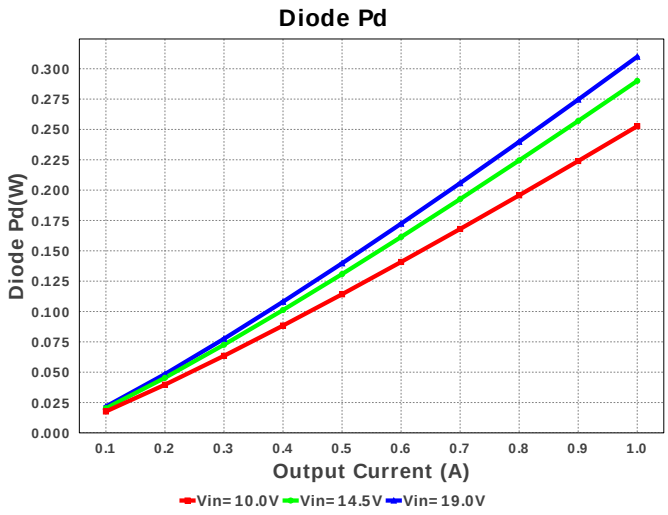


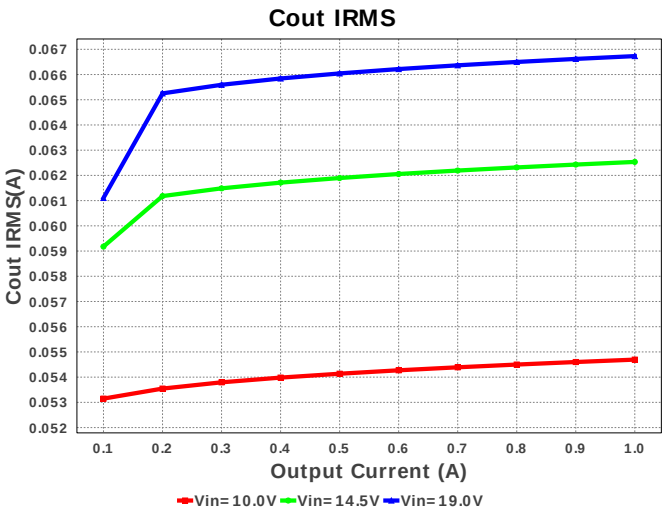
Iin Avg

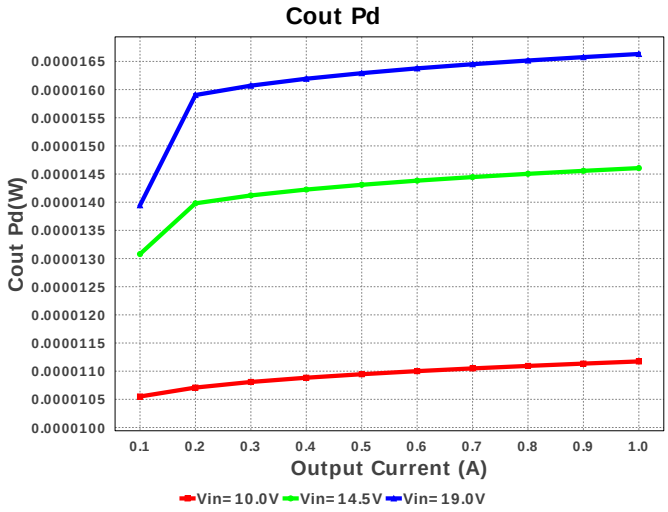


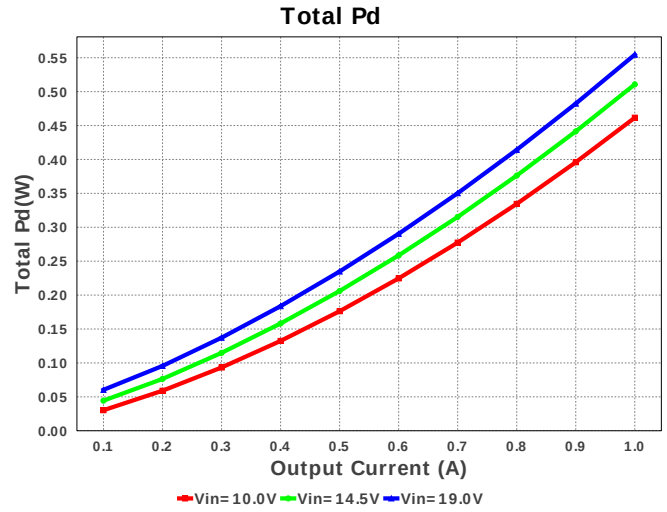
Pout

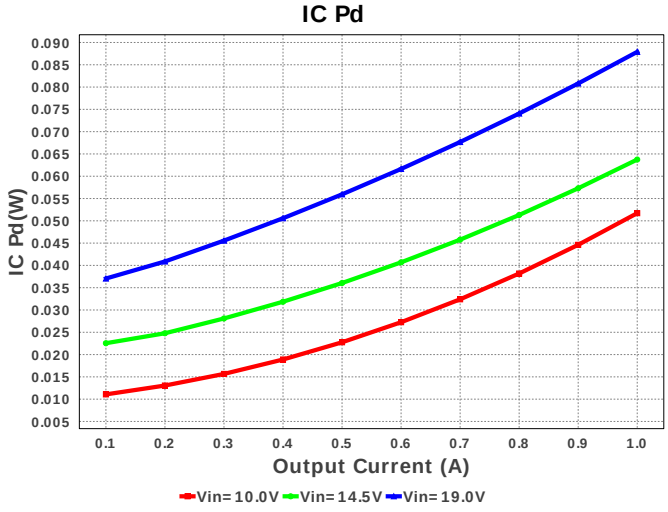


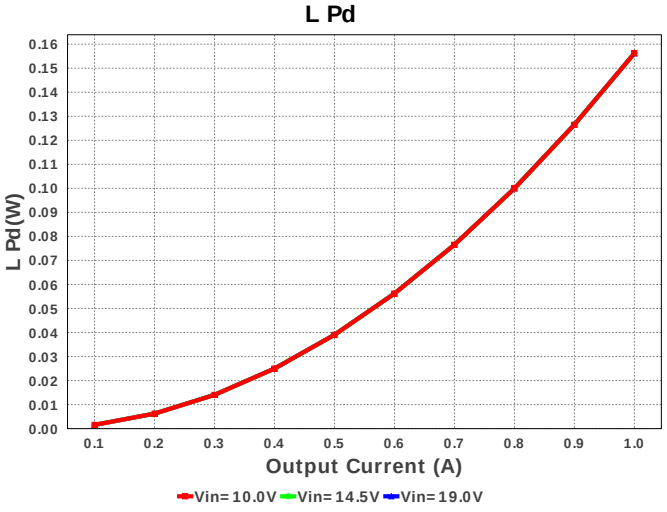


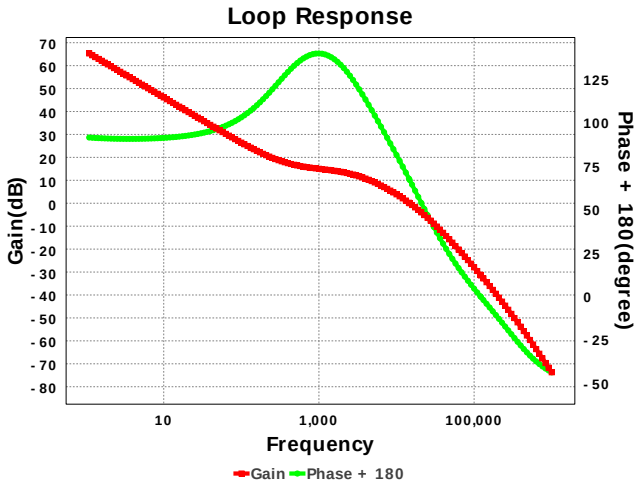












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	343.263 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	66.985 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	187.75 mA	Current	Average input current
4.	L Ipp	232.04 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	12	General	Total Design BOM count
6.	FootPrint	209.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	549.245 kHz	General	Switching frequency
8.	Pout	3.0 W	General	Total output power
9.	Total BOM	$2.43	General	Total BOM Cost
10.	ICThetaJA Effective	26.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
11.	Low Freq Gain	65.315 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	3.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	3.0 V	Op_Point	Operational Output Voltage
14.	Cross Freq	14.768 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	17.524 %	Op_point	Duty cycle
16.	Efficiency	84.1 %	Op_point	Steady state efficiency
17.	Gain Marg	-31.489 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	32.287 degC	Op_point	IC junction temperature
19.	IOUT_OP	1.0 A	Op_point	Iout operating point
20.	Phase Marg	67.321 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	19.0 V	Op_point	Vin operating point
22.	Vout p-p	1.504 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	524.105 µW	Power	Input capacitor power dissipation
24.	Cout Pd	16.759 µW	Power	Output capacitor power dissipation
25.	Diode Pd	322.503 mW	Power	Diode power dissipation
26.	IC Pd	87.958 mW	Power	IC power dissipation
27.	L Pd	156.2 mW	Power	Inductor power dissipation
28.	Total Pd	567.193 mW	Power	Total Power Dissipation
29.	Vout Tolerance	2.496 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	19.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	3.0	Output Voltage
5.	base_pn	TPS54540	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. TPS54540 Product Folder : http://www.ti.com/product/TPS54540 : contains the data sheet and other resources.