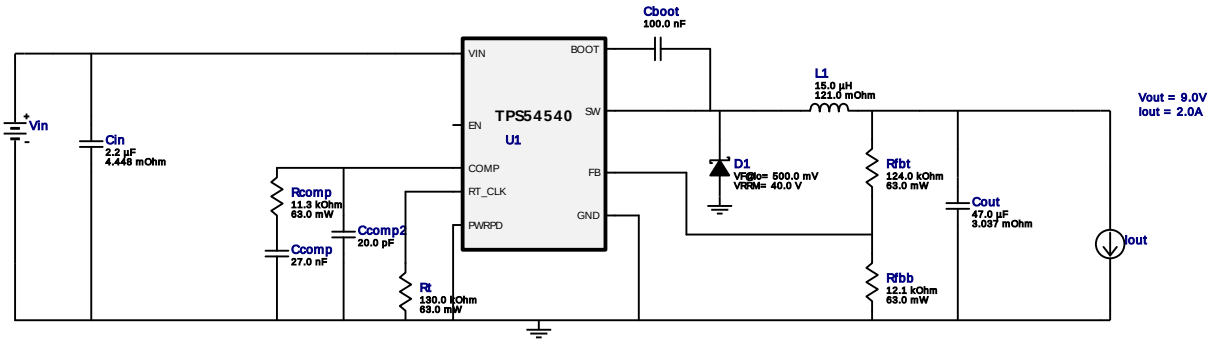
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 9.0V
Iout = 2.0A

Device = TPS54540DDAR
Topology = Buck
Created = 7/21/16 7:39:00 PM
BOM Cost = $3.02
BOM Count = 12
Total Pd = 1.44W

Design : 4743359/282 TPS54540DDAR
TPS54540DDAR 14.0V-22.0V to 9.00V @ 2.0A

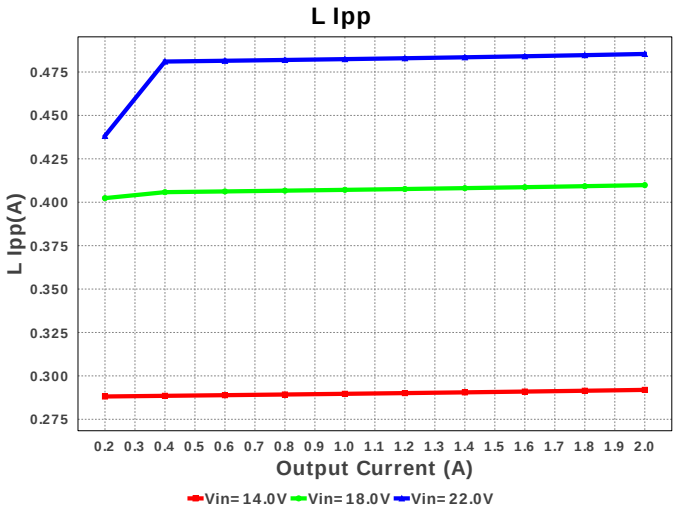


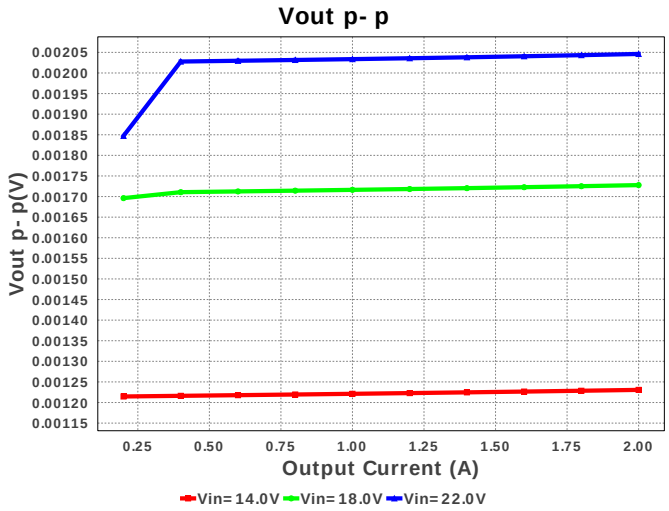
Electrical BOM

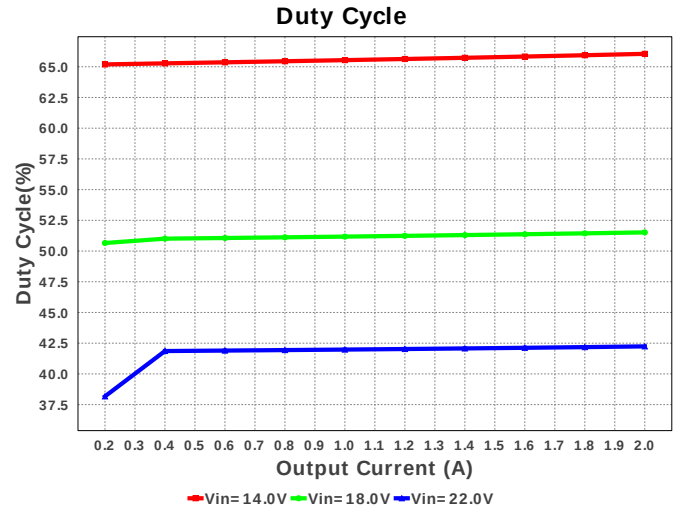
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	MuRata	GRM155R61A273KA01D Series= X5R	Cap= 27.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C200JBANNNC Series= C0G/NP0	Cap= 20.0 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	GRM32ER61C476ME15L Series= X5R	Cap= 47.0 uF ESR= 3.037 mOhm VDC= 16.0 V IRMS= 4.59346 A	1	$0.24	1210_280 15 mm²
6.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.11	SMA 37 mm²
7.	L1	Bourns	SRP6540-150M	L= 15.0 µH DCR= 121.0 mOhm	1	$0.60	SRP6540 83 mm²
8.	Rcomp	Vishay-Dale	CRCW040211K3FKED Series= CRCW..e3	Res= 11.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rfbb	Vishay-Dale	CRCW040212K1FKED Series= CRCW..e3	Res= 12.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfbt	Vishay-Dale	CRCW0402124KFKED Series= CRCW..e3	Res= 124.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	Rt	Vishay-Dale	CRCW0402130KFKED Series= CRCW..e3	Res= 130.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

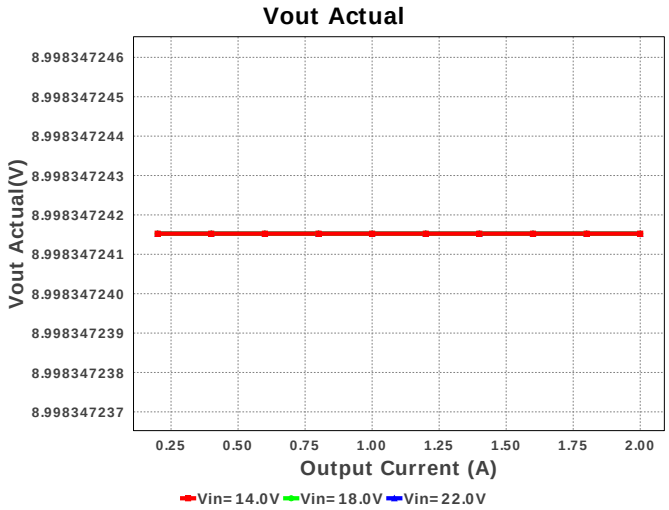
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	U1	Texas Instruments	TPS54540DDAR	Switcher	1	$1.95	

R-PDSO-G8 57 mm^2

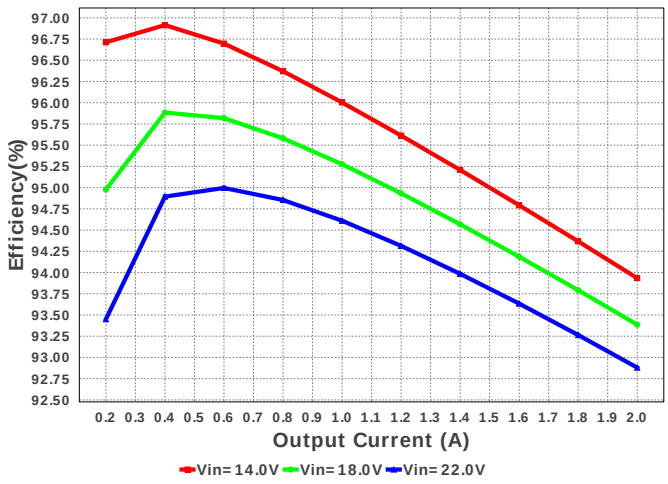




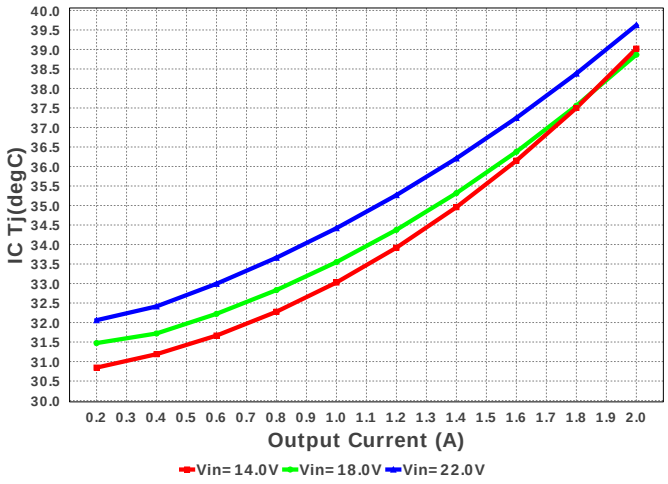




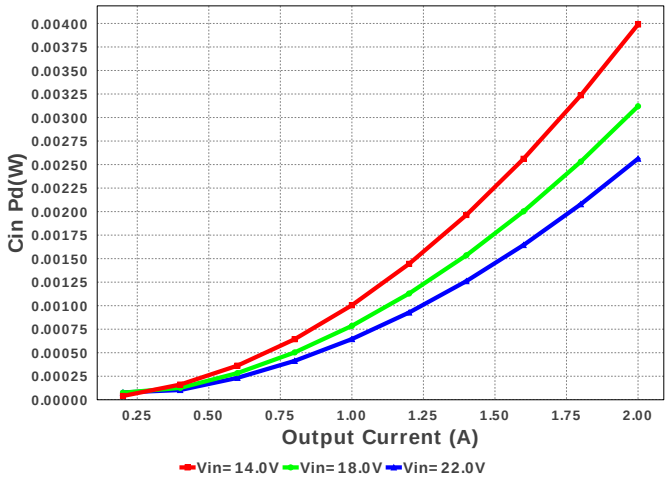
Efficiency



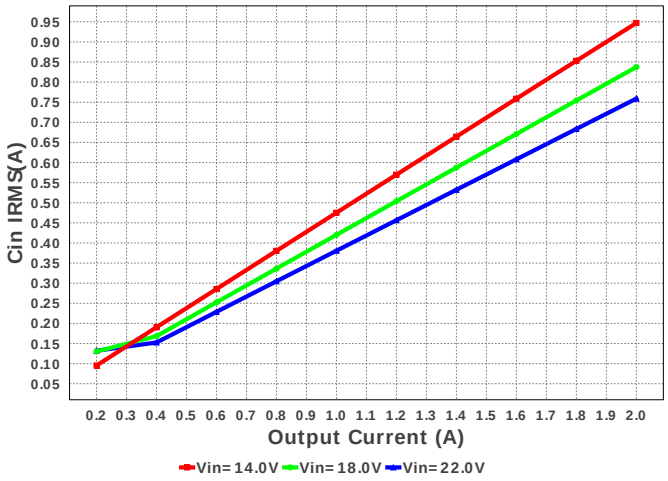
IC Tj



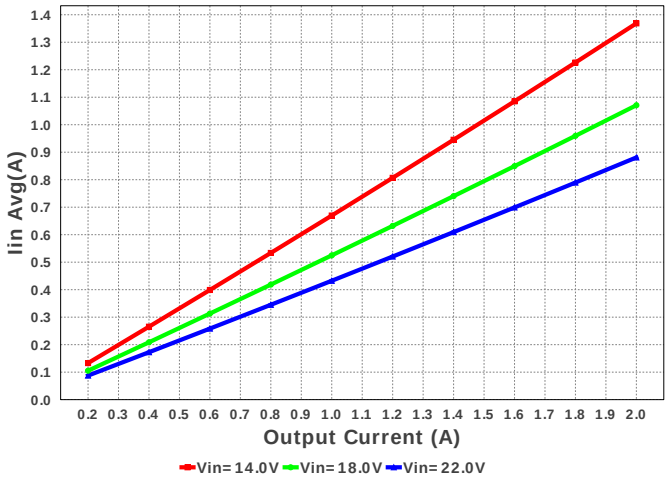
Cin Pd



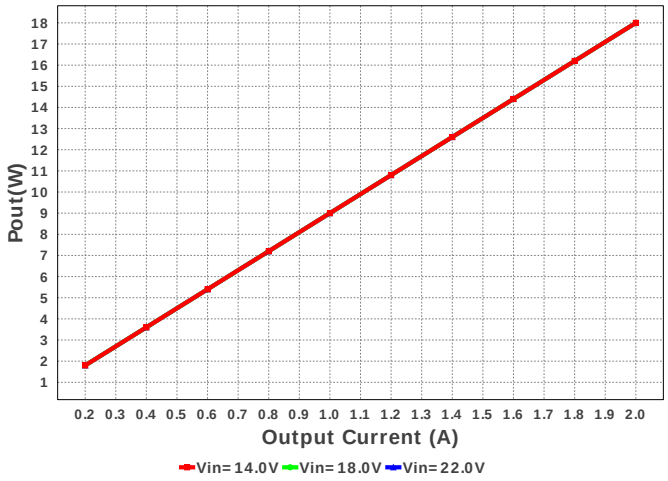
Cin IRMS



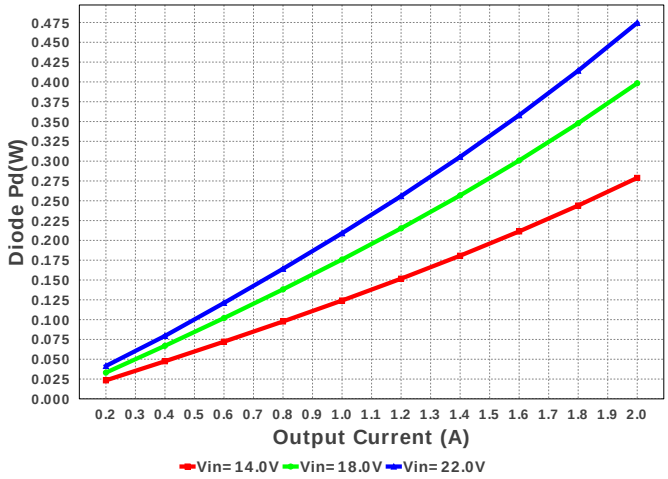
Iin Avg



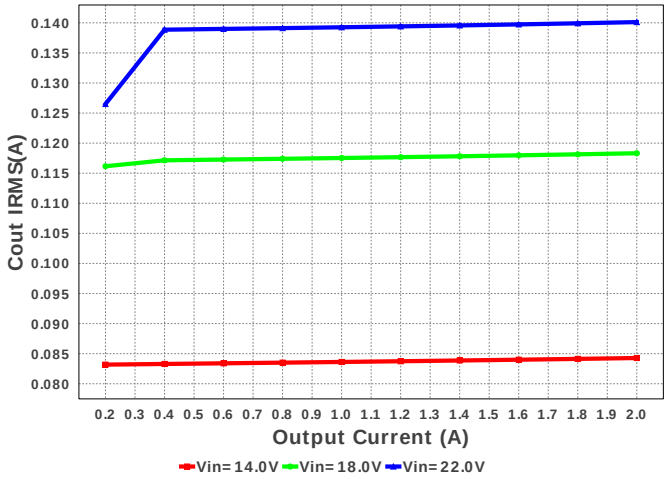
Pout



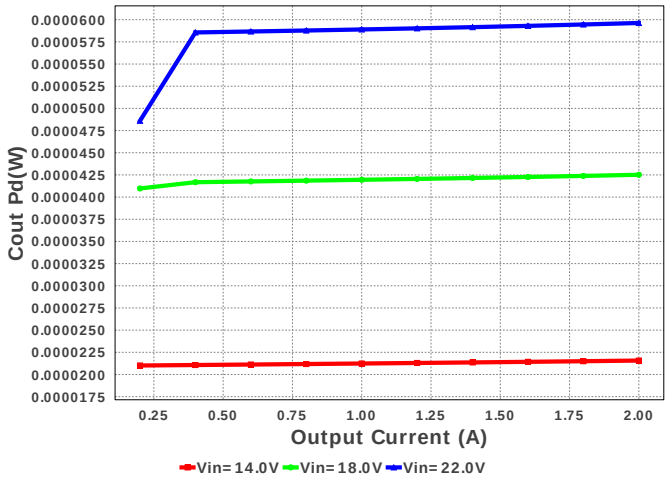
Diode Pd



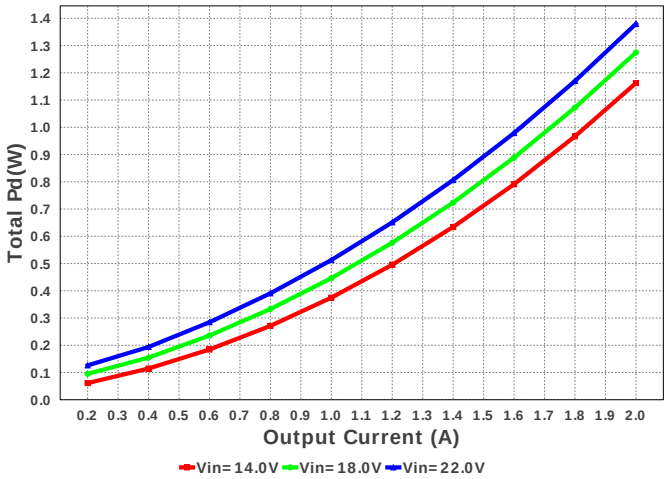
Cout IRMS



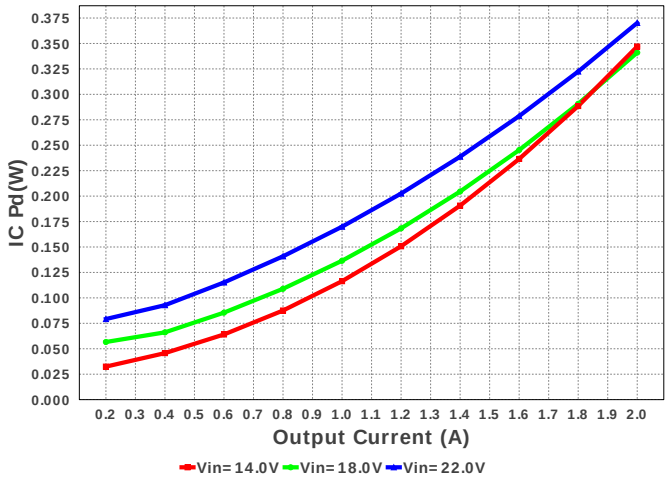
Cout Pd



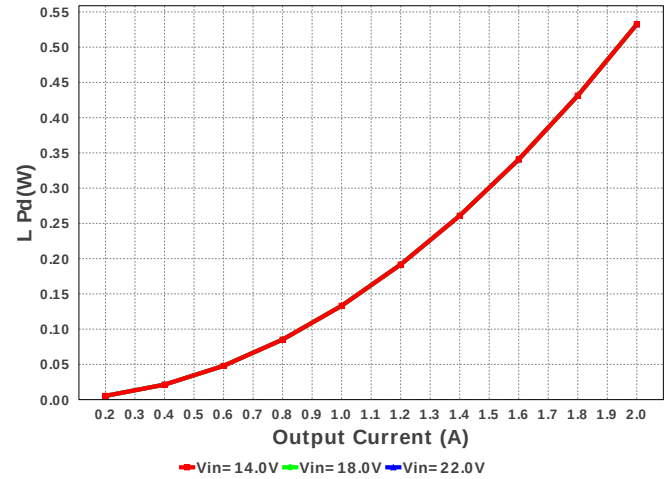
Total Pd

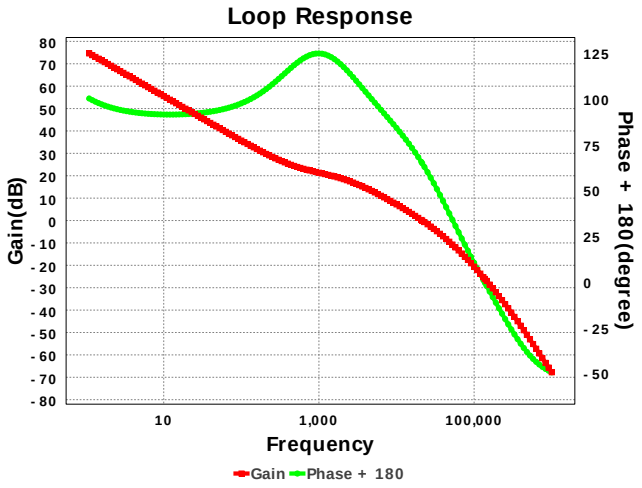


IC Pd



L Pd





Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	758.834 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	140.555 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	883.51 mA	Current	Average input current
4.	L Ipp	486.9 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	12	General	Total Design BOM count
6.	FootPrint	228.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	754.173 kHz	General	Switching frequency
8.	Pout	18.0 W	General	Total output power
9.	Total BOM	$3.02	General	Total BOM Cost
10.	ICThetaJA Effective	26.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
11.	Low Freq Gain	74.613 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	8.998 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
14.	Cross Freq	21.427 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	42.37 %	Op_point	Duty cycle
16.	Efficiency	92.606 %	Op_point	Steady state efficiency
17.	Gain Marg	-26.092 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	39.639 degC	Op_point	IC junction temperature
19.	IOUT_OP	2.0 A	Op_point	Iout operating point
20.	Phase Marg	65.336 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	22.0 V	Op_point	Vin operating point
22.	Vout p-p	2.052 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	2.561 mW	Power	Input capacitor power dissipation
24.	Cout Pd	59.998 µW	Power	Output capacitor power dissipation
25.	Diode Pd	531.466 mW	Power	Diode power dissipation
26.	IC Pd	370.723 mW	Power	IC power dissipation
27.	L Pd	532.4 mW	Power	Inductor power dissipation
28.	Total Pd	1.437 W	Power	Total Power Dissipation
29.	Vout Tolerance	2.859 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	TPS54540	Base Product 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.