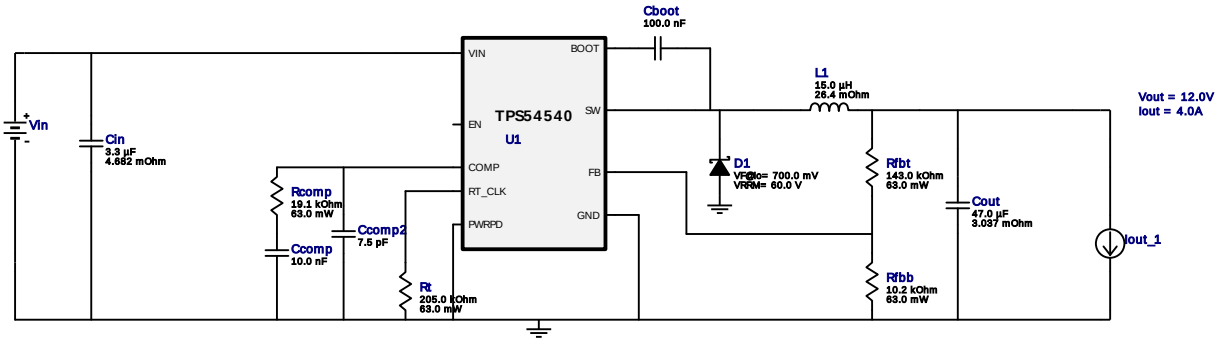
WEBENCH® Design Report

VinMin = 20.0V
VinMax = 40.0V
Vout = 12.0V
Iout = 4.0A

Device = TPS54540DDAR
Topology = Buck
Created = 3/14/16 5:25:52 PM
BOM Cost = $3.28
BOM Count = 12
Total Pd = 3.69W

Design : 4161985/18 TPS54540DDAR
TPS54540DDAR 20.0V-40.0V to 12.00V @ 4.0A

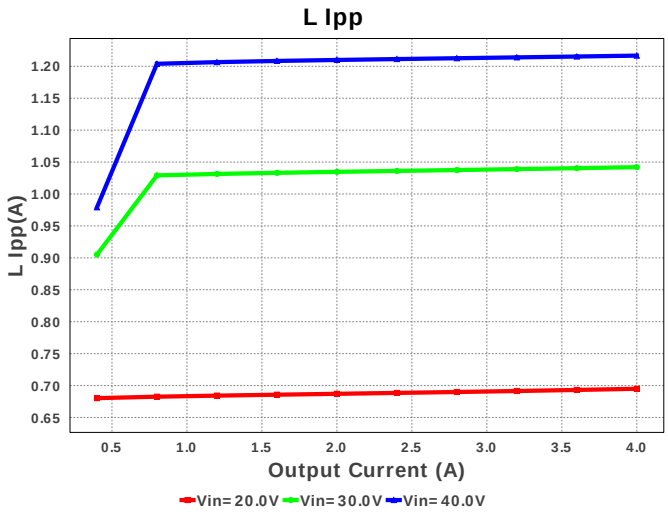


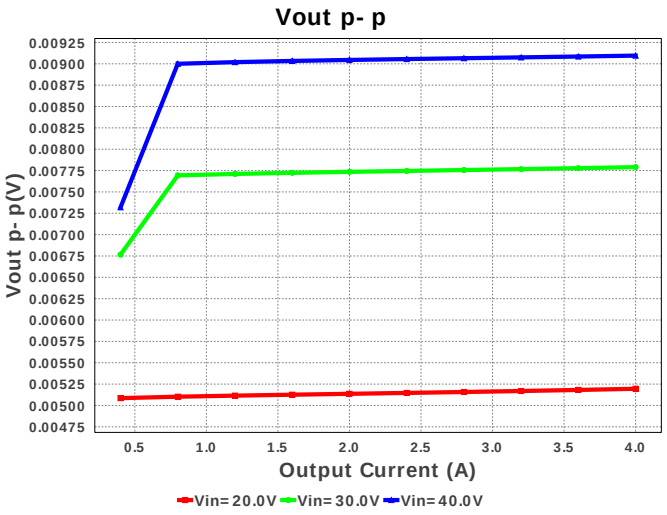
Electrical BOM

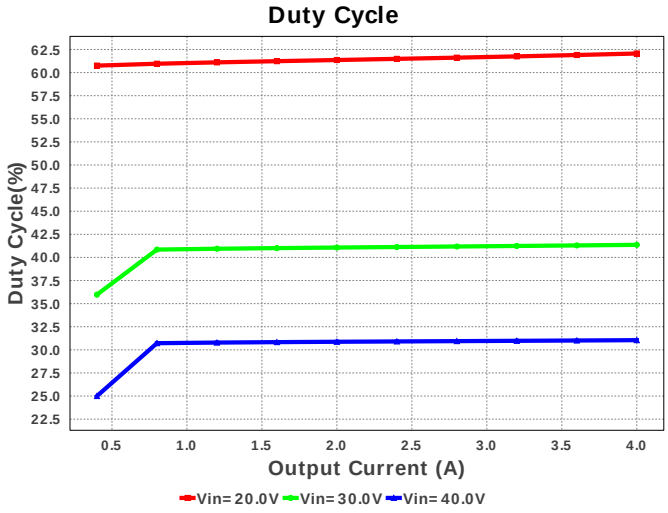
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	MuRata	GRM1555C1H7R5CA01D Series= C0G/NP0	Cap= 7.5 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
4.	Cin	TDK	C3225X7S2A335K200AB Series= X7S	Cap= 3.3 uF ESR= 4.682 mOhm VDC= 100.0 V IRMS= 3.39944 A	1	$0.24	1210 15 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.	B560C-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.17	SMC 83 mm²
7.	L1	Sumida	CDRH127/LDNP-150MC	L= 15.0 µH DCR= 26.4 mOhm	1	$0.61	CDRH127 196 mm²
8.	Rcomp	Vishay-Dale	CRCW040219K1FKED Series= CRCW..e3	Res= 19.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rfbb	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfbt	Vishay-Dale	CRCW0402143KFKED Series= CRCW..e3	Res= 143.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	Rt	Vishay-Dale	CRCW0402205KFKED Series= CRCW..e3	Res= 205.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

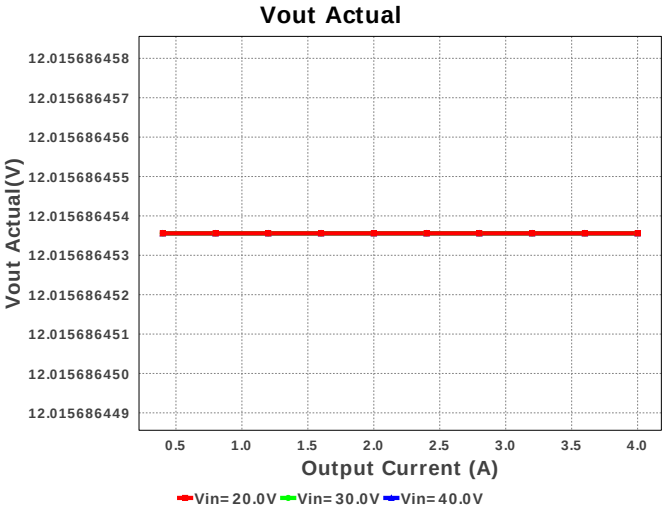
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	U1	Texas Instruments	TPS54540DDAR	Switcher	1	$1.95	

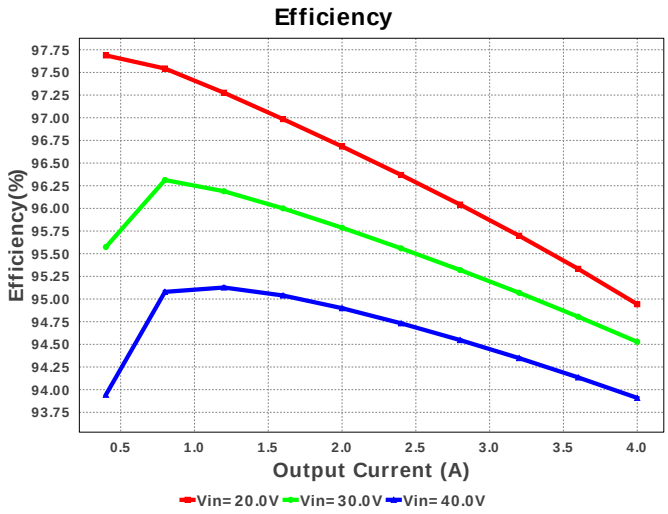
R-PDSO-G8 57 mm^2

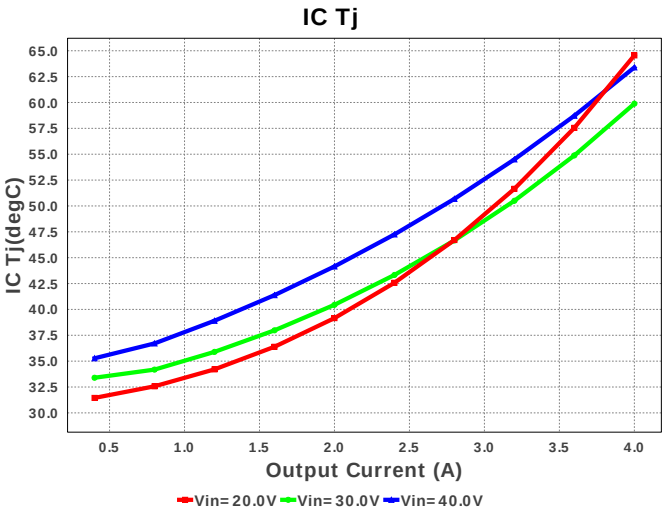


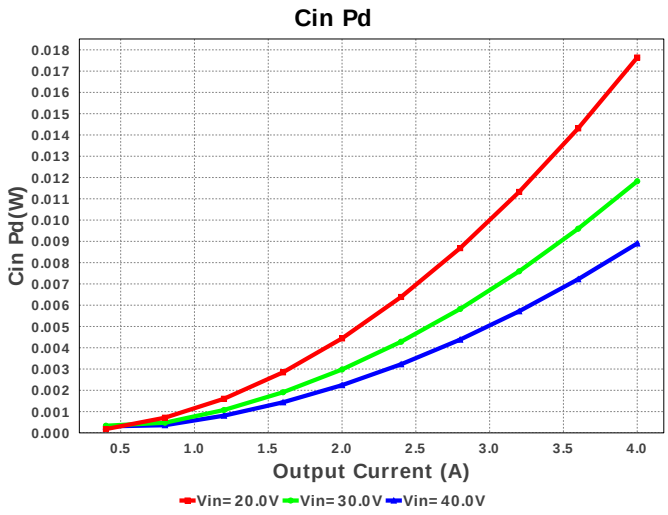


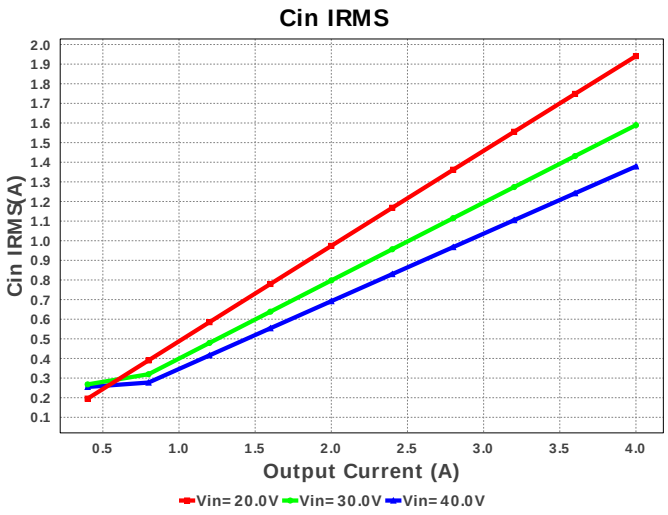


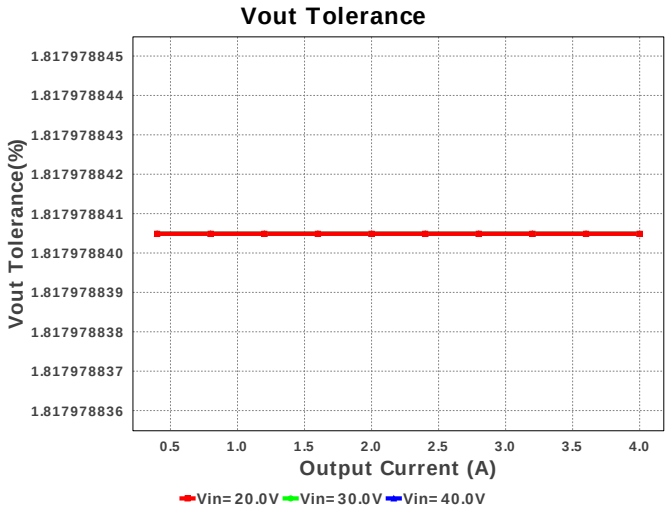


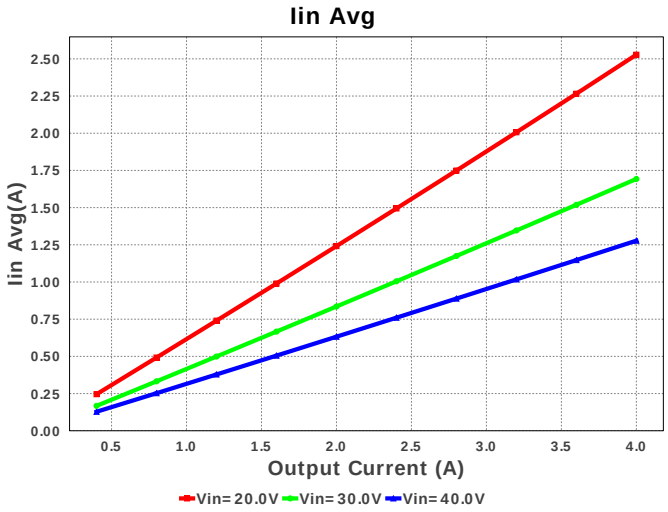


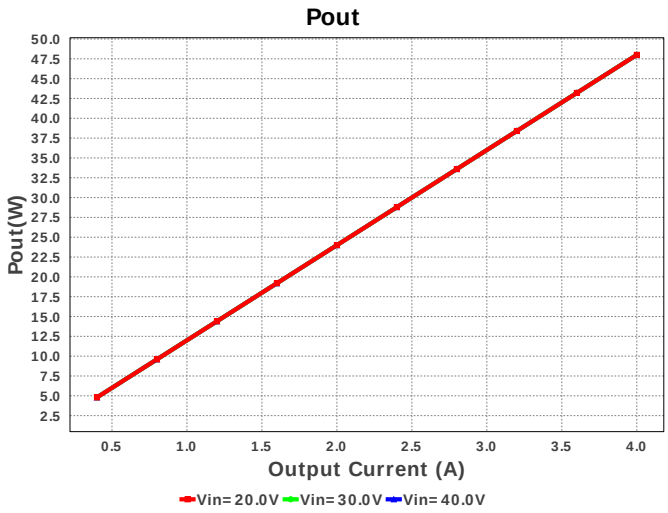


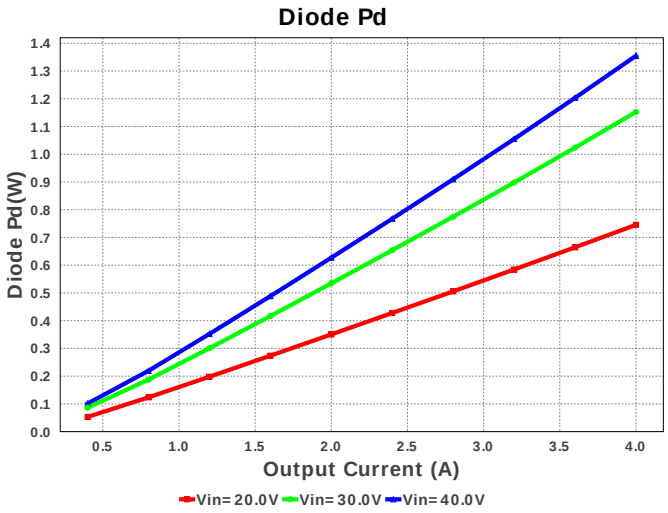


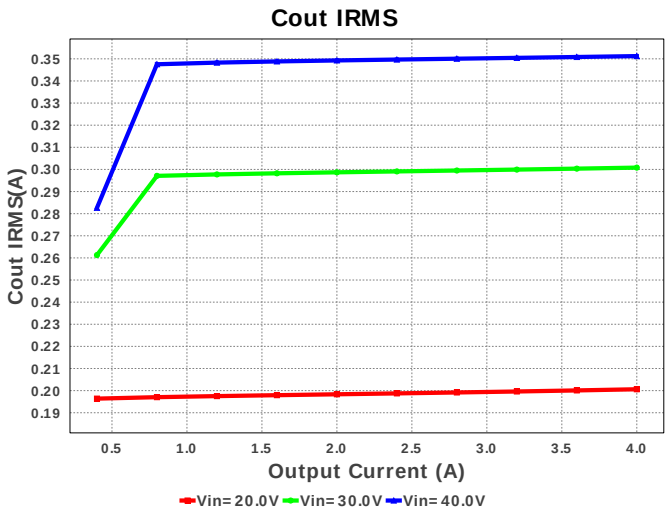


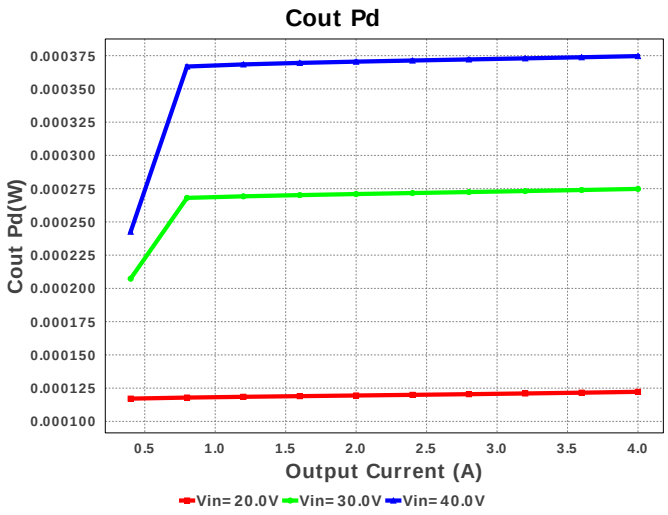


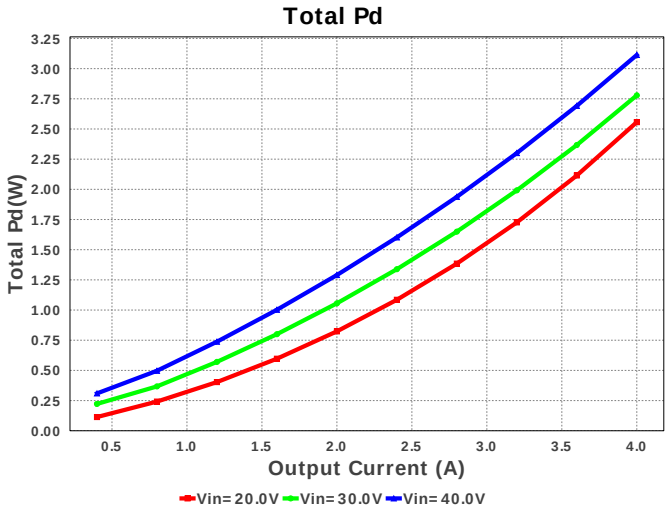


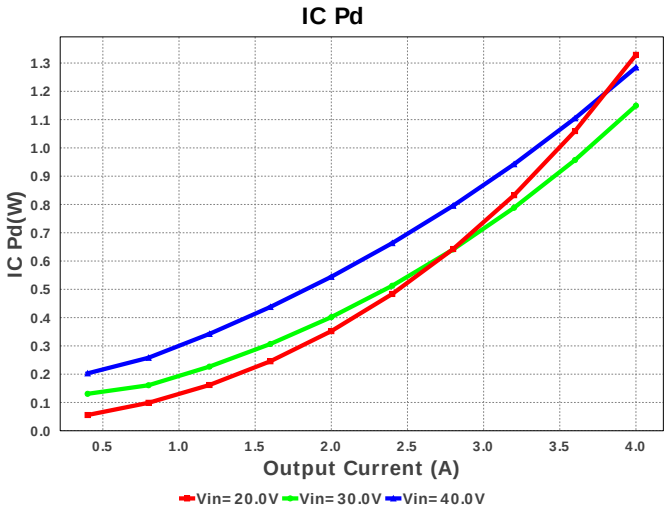


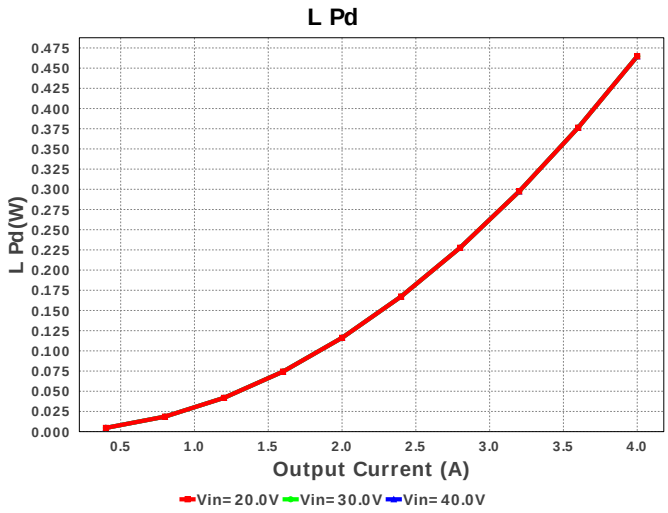


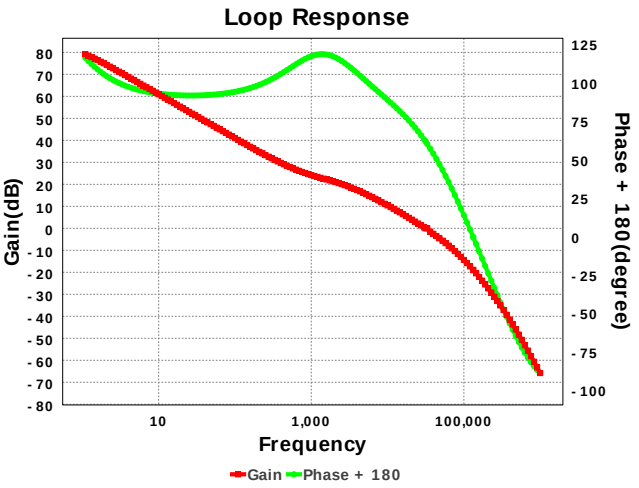












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.379 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	355.278 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.292 A	Current	Average input current
4.	L Ipp	1.231 A	Current	Peak-to-peak inductor ripple current
5.	BOM Count	12	General	Total Design BOM count
6.	FootPrint	391.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	476.3 kHz	General	Switching frequency
8.	Pout	48.0 W	General	Total output power
9.	Total BOM	$3.28	General	Total BOM Cost
10.	ICThetaJA Effective	26.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
11.	Low Freq Gain	79.168 dB	Op_Point	Gain at 10Hz

#	Name	Value	Category	Description
12.	Vout Actual	12.016 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
14.	Cross Freq	31.42 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	31.403 %	Op_point	Duty cycle
16.	Efficiency	92.868 %	Op_point	Steady state efficiency
17.	Gain Marg	-19.048 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	63.577 degC	Op_point	IC junction temperature
19.	IOUT_OP	4.0 A	Op_point	Iout operating point
20.	Phase Marg	62.535 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	40.0 V	Op_point	Vin operating point
22.	Vout p-p	9.2 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	8.909 mW	Power	Input capacitor power dissipation
24.	Cout Pd	383.337 µW	Power	Output capacitor power dissipation
25.	Diode Pd	1.921 W	Power	Diode power dissipation
26.	IC Pd	1.291 W	Power	IC power dissipation
27.	L Pd	464.64 mW	Power	Inductor power dissipation
28.	Total Pd	3.686 W	Power	Total Power Dissipation
29.	Vout Tolerance	1.818 %		Vout Tolerance based on IC Tolerance and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	40.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	12.0	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.