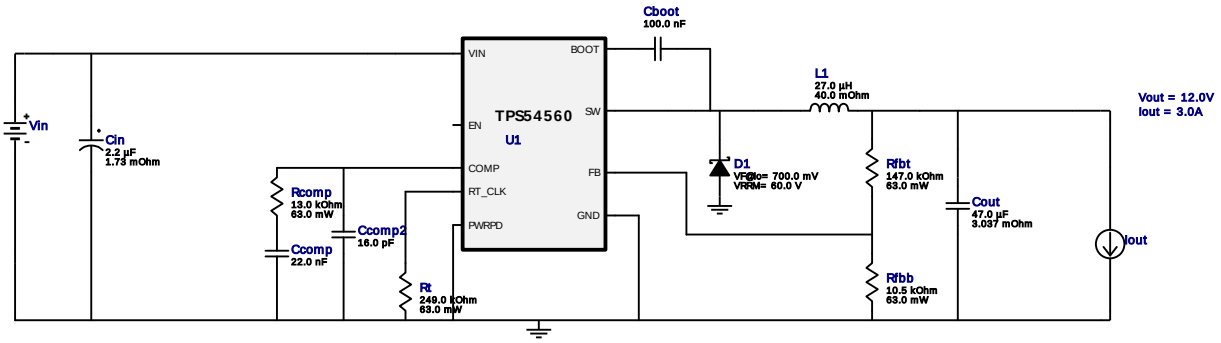
WEBENCH® Design Report

VinMin = 45.0V
VinMax = 48.0V
Vout = 12.0V
Iout = 3.0A

Device = TPS54560DDAR
Topology = Buck
Created = 7/19/16 4:27:14 AM
BOM Cost = $3.41
BOM Count = 12
Total Pd = 2.41W

Design : 4077713/32 TPS54560DDAR
TPS54560DDAR 45.0V-48.0V to 12.00V @ 3.0A



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	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	TDK	C0603C0G1E160G Series= C0G/NP0	Cap= 16.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
4.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 1.73 mOhm VDC= 100.0 V IRMS= 5.5932 A	1	$0.19	1210_250 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	Bourns	SRR1210-270M	L= 27.0 µH DCR= 40.0 mOhm	1	$0.44	 SRR1210 196 mm²
8.	Rcomp	Vishay-Dale	CRCW040213K0FKED Series= CRCW..e3	Res= 13.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rfbb	Vishay-Dale	CRCW040210K5FKED Series= CRCW..e3	Res= 10.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfbt	Vishay-Dale	CRCW0402147KFKED Series= CRCW..e3	Res= 147.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	Rt	Vishay-Dale	CRCW0402249KFKED Series= CRCW..e3	Res= 249.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

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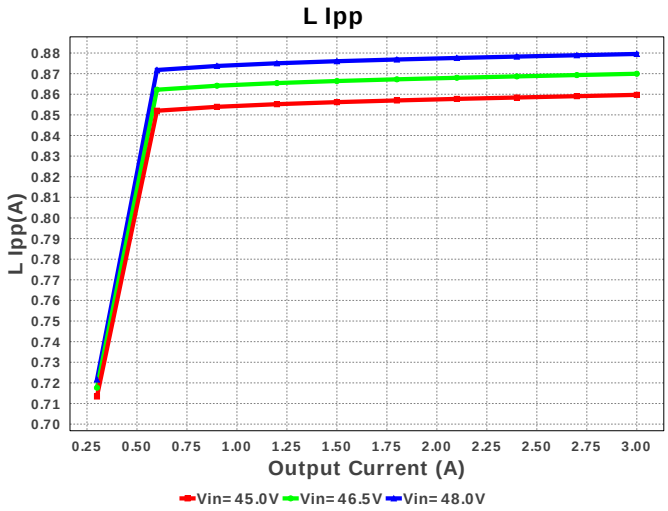
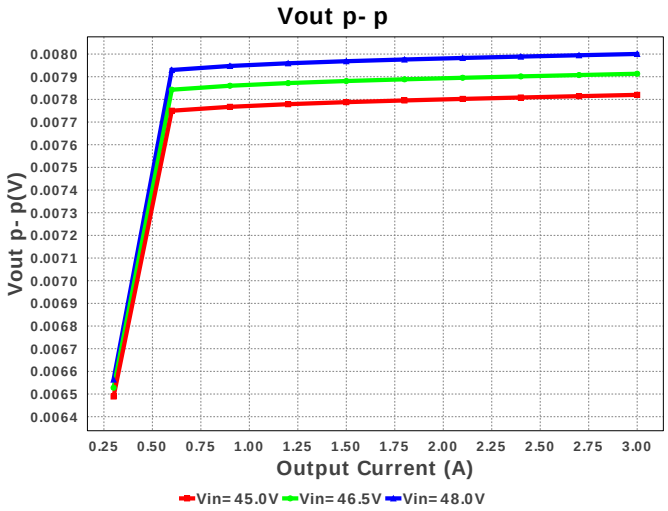
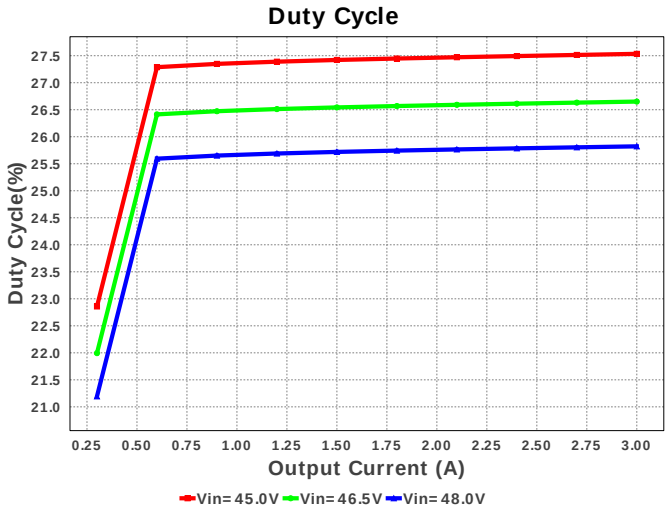
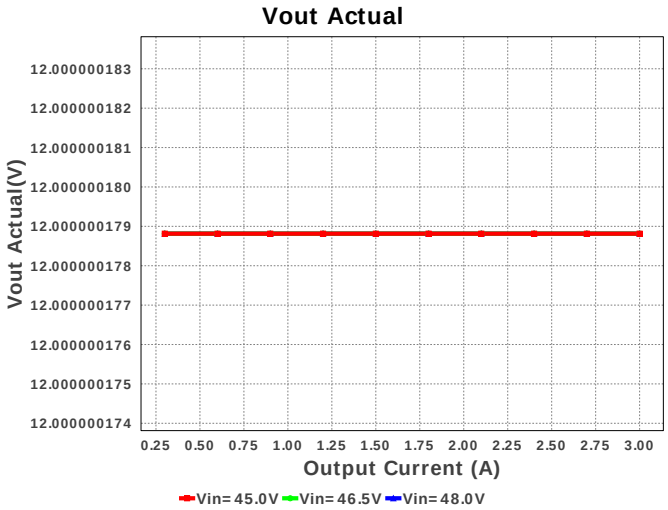
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	U1	Texas Instruments	TPS54560DDAR	Switcher	1	$2.30	

R-PDSO-G8 57 mm^2









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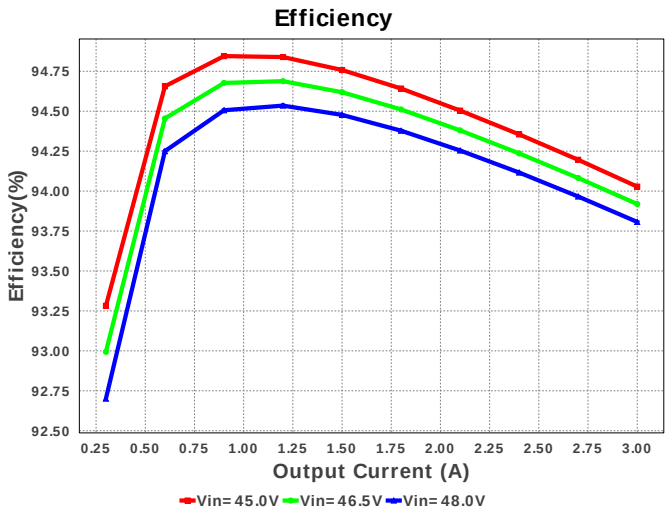

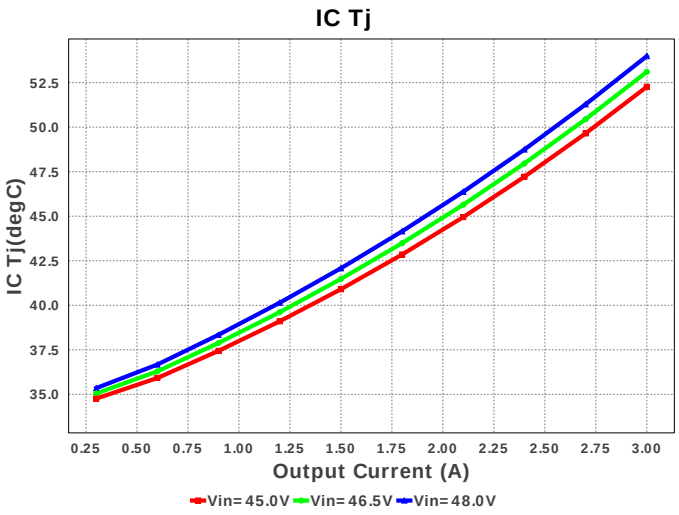

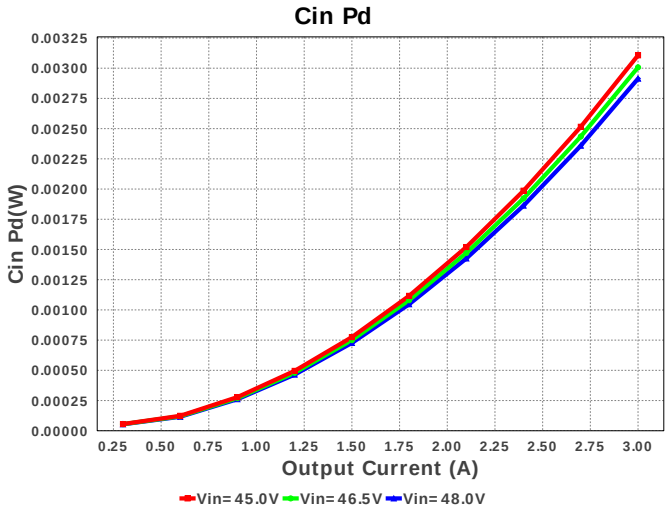

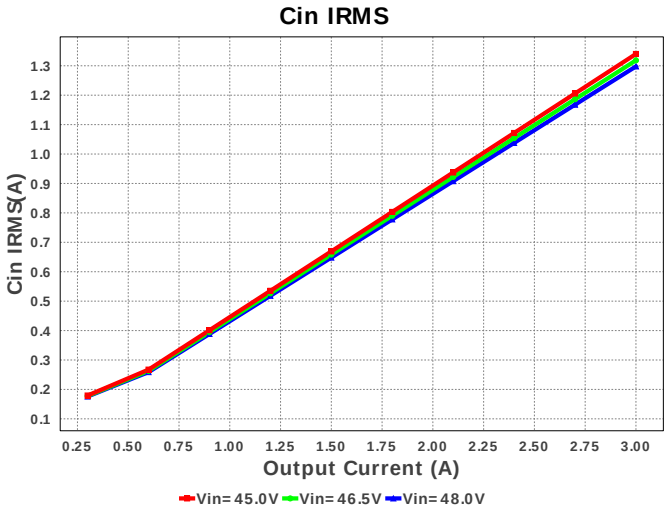

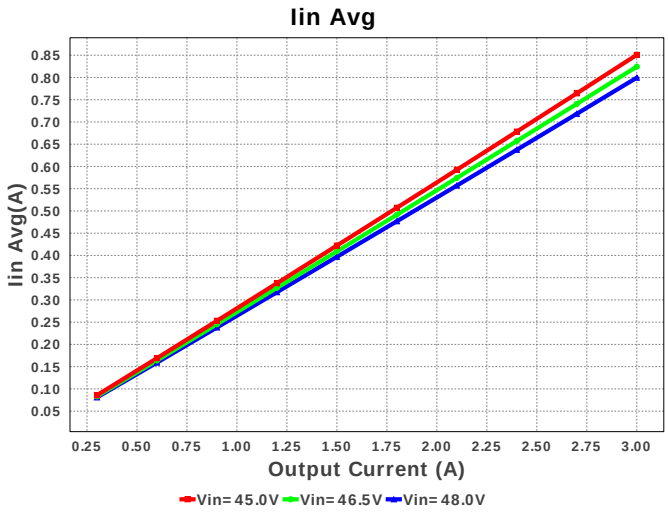

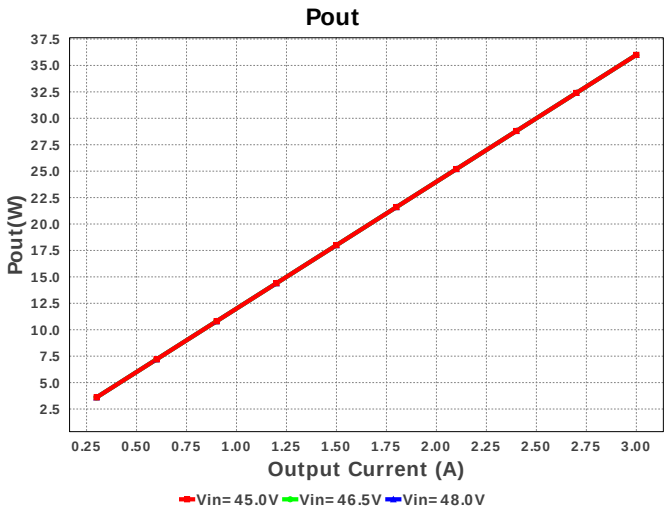

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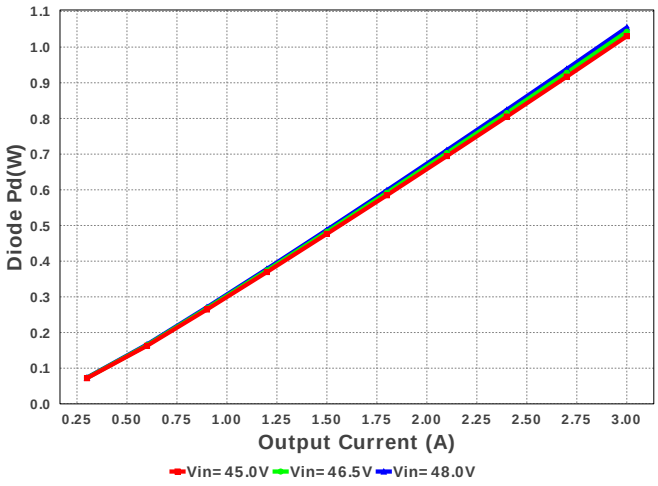
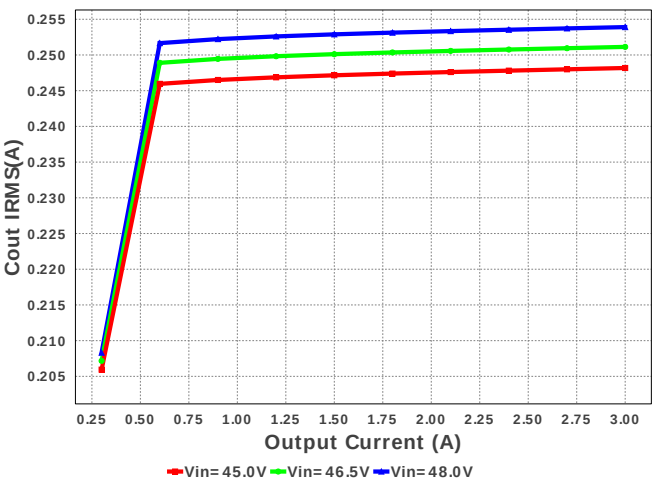
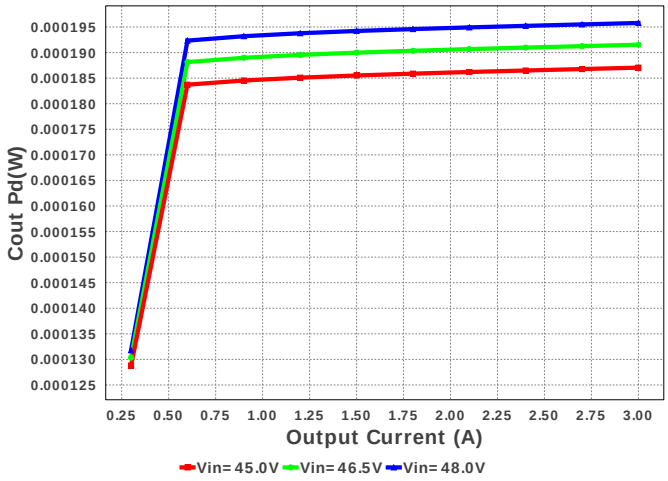
Diode Pd



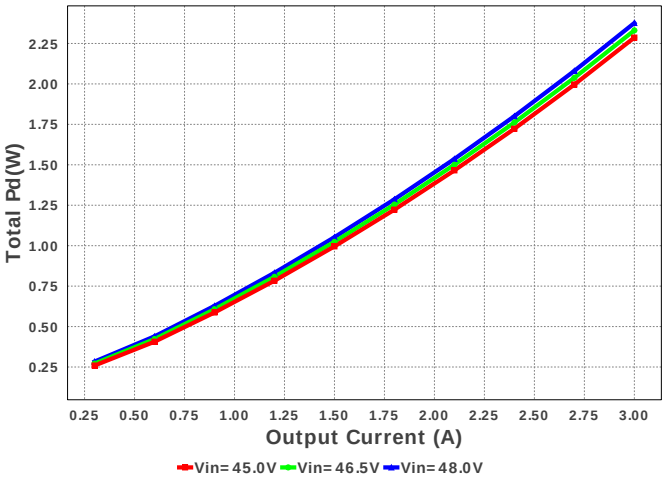
Cout IRMS



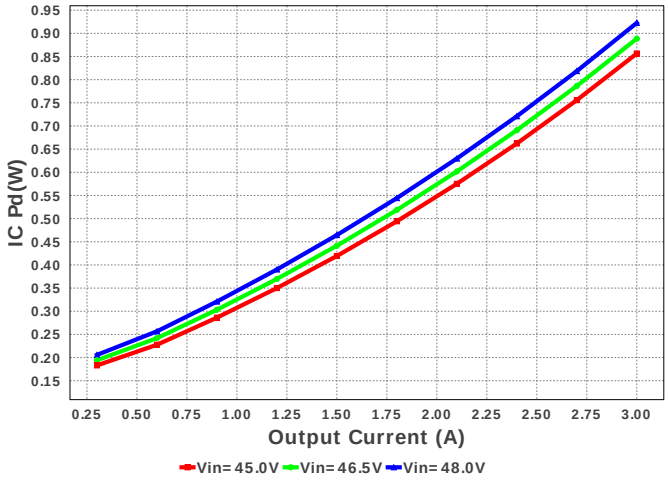
Cout Pd



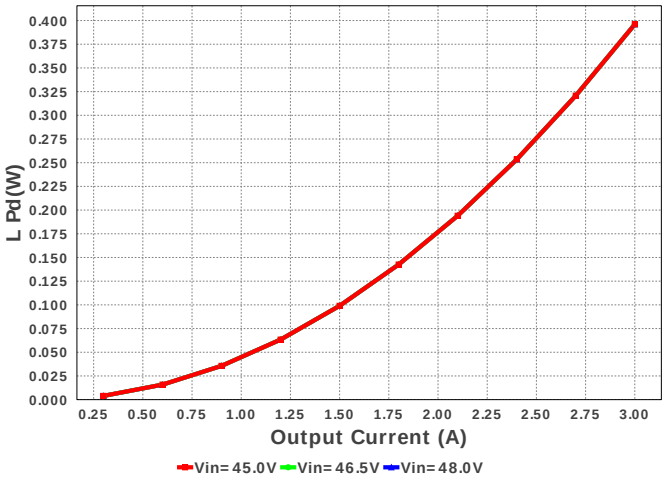
Total Pd



IC Pd



L Pd



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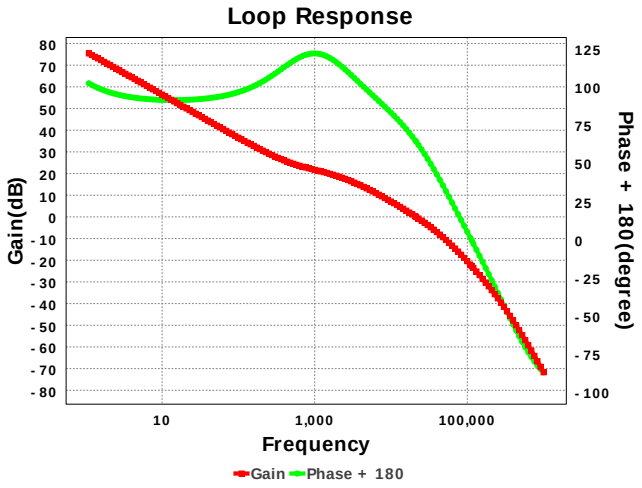

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.298 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	254.136 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	800.22 mA	Current	Average input current
4.	L Ipp	880.35 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	12	General	Total Design BOM count
6.	FootPrint	390.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	391.449 kHz	General	Switching frequency
8.	Pout	36.0 W	General	Total output power
9.	Total BOM	$3.41	General	Total BOM Cost
10.	ICThetaJA Effective	26.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
11.	Low Freq Gain	75.422 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	12.0 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	21.326 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	25.846 %	Op_point	Duty cycle
16.	Efficiency	93.724 %	Op_point	Steady state efficiency
17.	Gain Marg	-22.765 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	53.995 degC	Op_point	IC junction temperature
19.	IOUT_OP	3.0 A	Op_point	Iout operating point
20.	Phase Marg	64.872 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	48.0 V	Op_point	Vin operating point
22.	Vout p-p	8.008 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	2.915 mW	Power	Input capacitor power dissipation
24.	Cout Pd	196.145 µW	Power	Output capacitor power dissipation
25.	Diode Pd	1.089 W	Power	Diode power dissipation
26.	IC Pd	922.871 mW	Power	IC power dissipation
27.	L Pd	396.0 mW	Power	Inductor power dissipation
28.	Total Pd	2.411 W	Power	Total Power Dissipation
29.	Vout Tolerance	2.904 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	48.0	Maximum input voltage
3.	VinMin	45.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	TPS54560	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS54560** Product Folder : http://www.ti.com/product/TPS54560 : contains the data sheet and other resources.

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