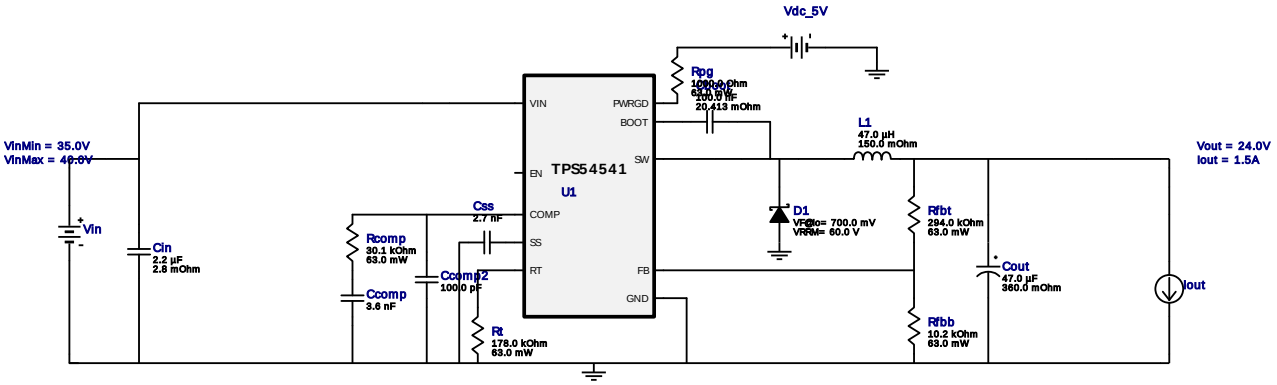
WEBENCH® Design Report

VinMin = 35.0V
VinMax = 40.0V
Vout = 24.0V
Iout = 1.5A

Device = TPS54541DPRR
Topology = Buck
Created = 8/11/15 6:41:00 AM
BOM Cost = $3.28
Footprint = 348.0 mm²
BOM Count = 14
Total Pd = 1.24W

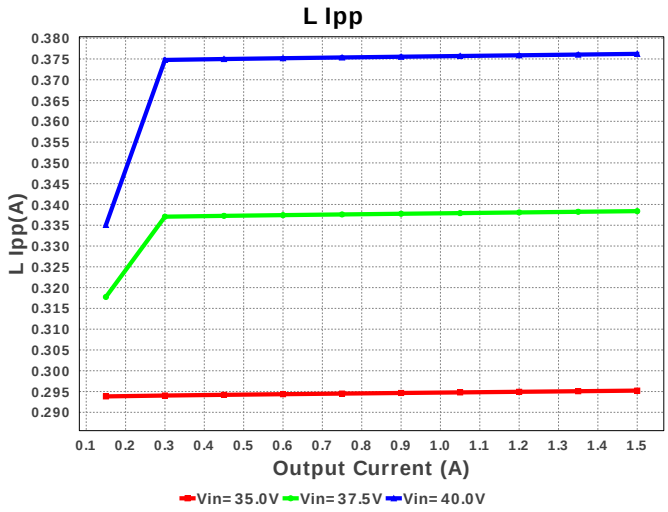
Design : 4320088/15 TPS54541DPRR
TPS54541DPRR 35.0V-40.0V to 24.00V @ 1.5A

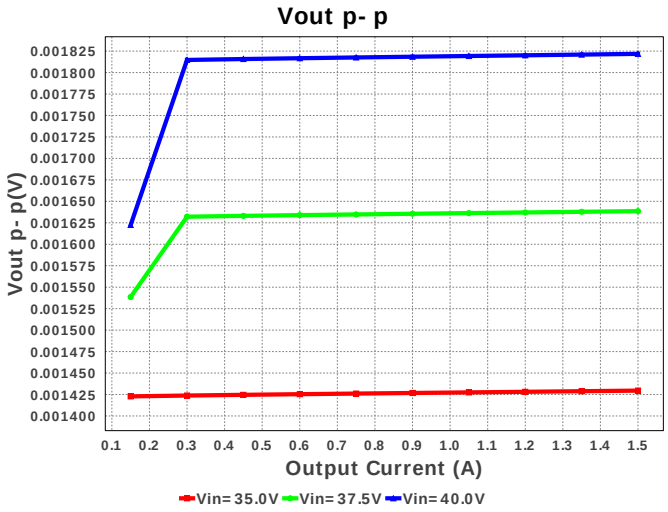


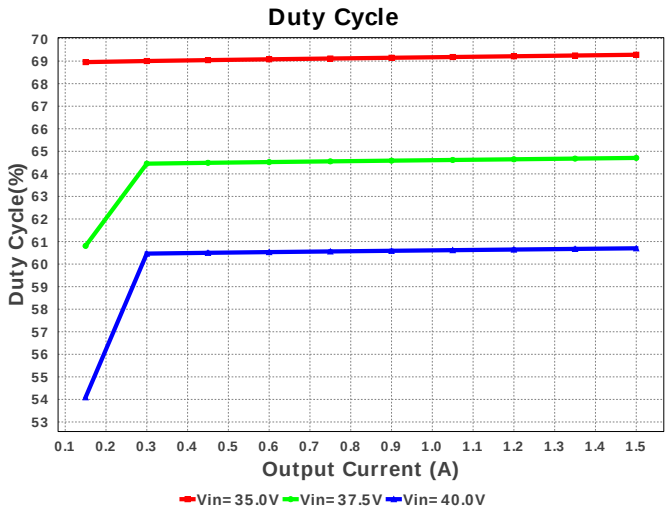
Electrical BOM

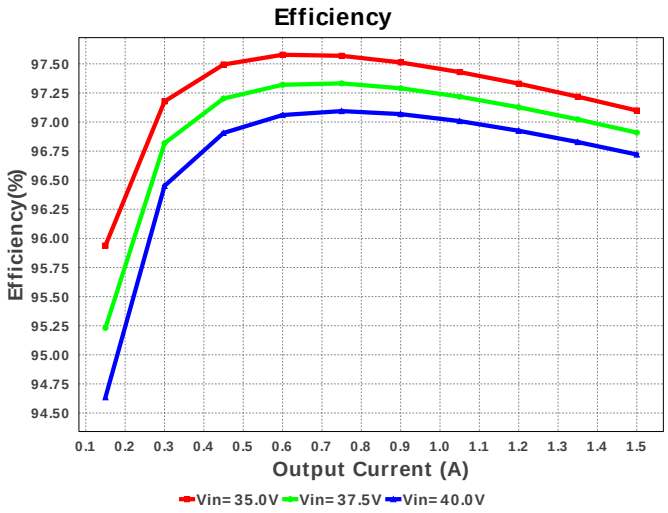
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	TDK	C1005X5R1A104K Series= X5R	Cap= 100.0 nF ESR= 20.413 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	1005 3 mm²
2.	Ccomp	MuRata	GRM2165C1H362JA01D Series= C0G/NP0	Cap= 3.6 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805JRNPO9BN101 Series= C0G/NP0	Cap= 100.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 2.8 mOhm VDC= 100.0 V IRMS= 9.8247 A	1	$0.19	1210 15 mm²
5.	Cout	Panasonic	EEE-FK1V470P Series= FK	Cap= 47.0 uF ESR= 360.0 mOhm VDC= 35.0 V IRMS= 240.0 mA	1	$0.12	SM_RADIAL_D 84 mm²
6.	Css	Yageo America	CC0805KRX7R9BB272 Series= X7R	Cap= 2.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	SMA 37 mm²
8.	L1	TDK	CLF10040T-470M	L= 47.0 µH DCR= 150.0 mOhm	1	$0.46	CLF10040 148 mm²
9.	Rcomp	Vishay-Dale	CRCW040230K1FKED Series= CRCW..e3	Res= 30.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfbb	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	Rfbt	Vishay-Dale	CRCW0402294KFKED Series= CRCW..e3	Res= 294.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

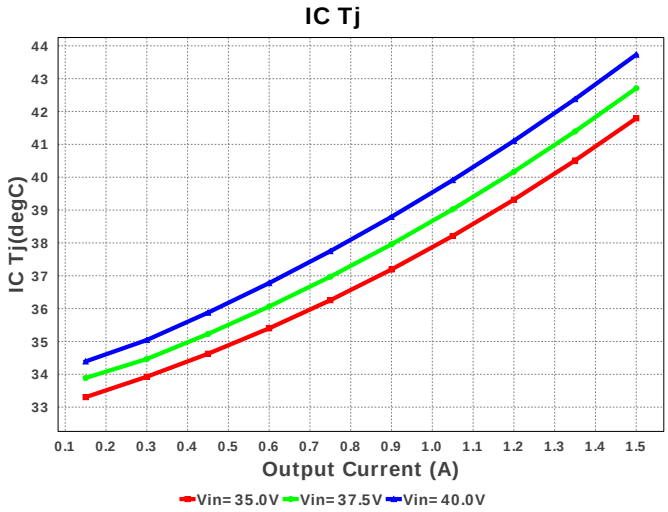
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rpg	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Rt	Vishay-Dale	CRCW0402178KFKED Series= CRCW..e3	Res= 178.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	U1	Texas Instruments	TPS54541DPRR	Switcher	1	$2.30	DPR0010A 26 mm^2

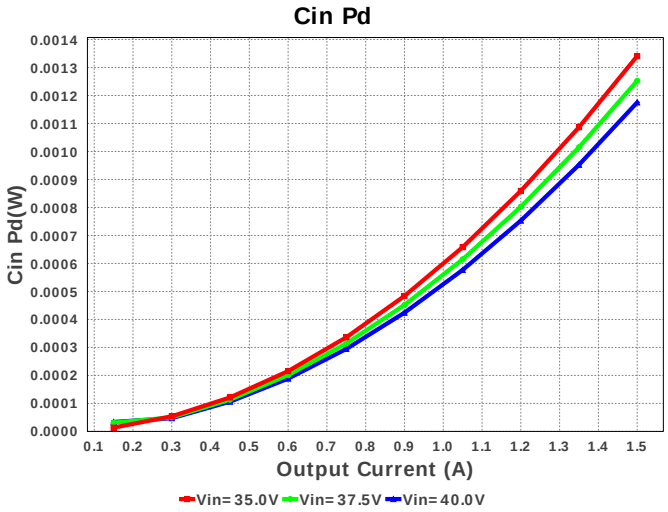


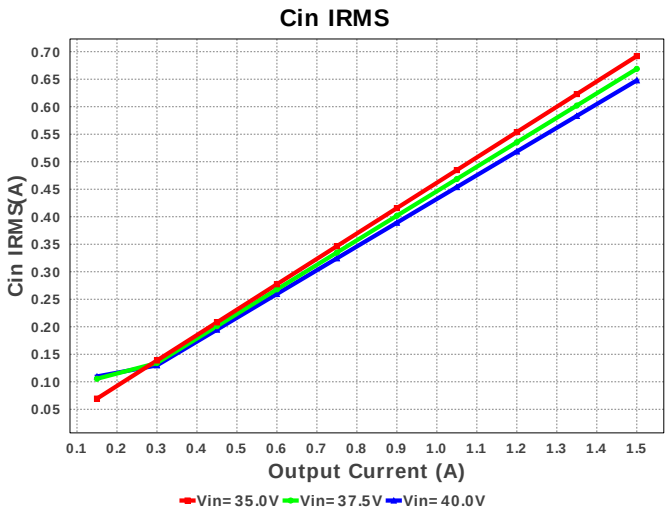


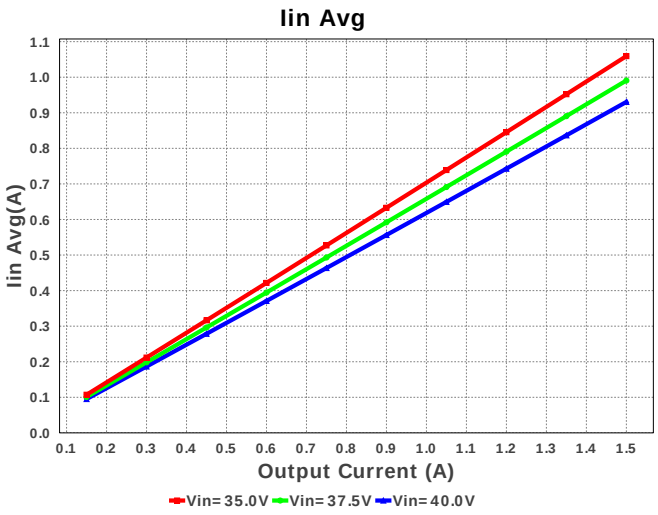


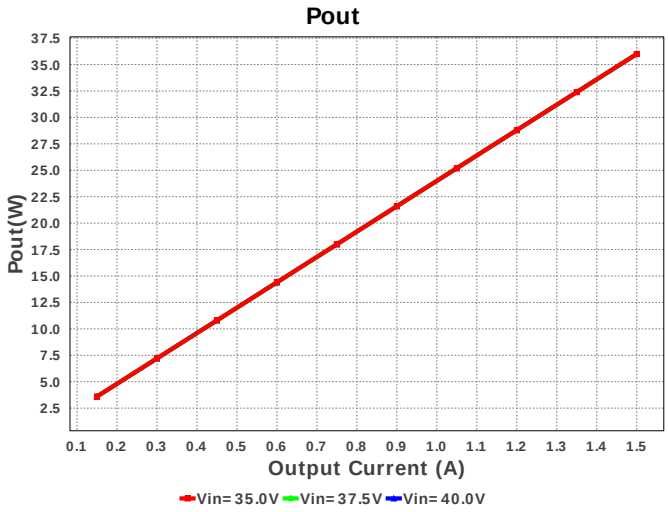


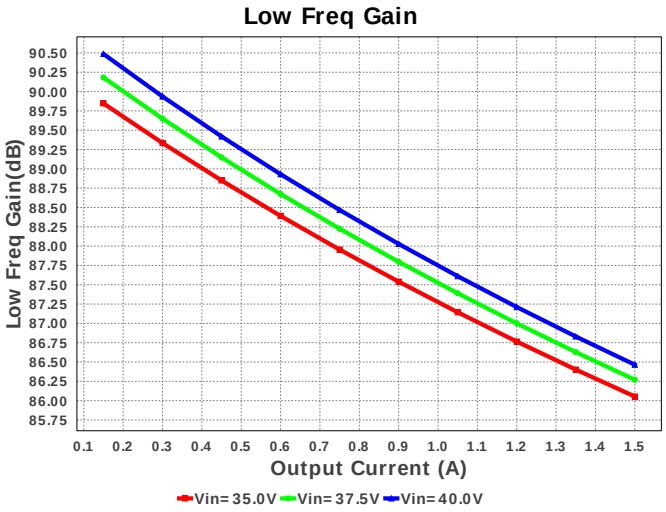


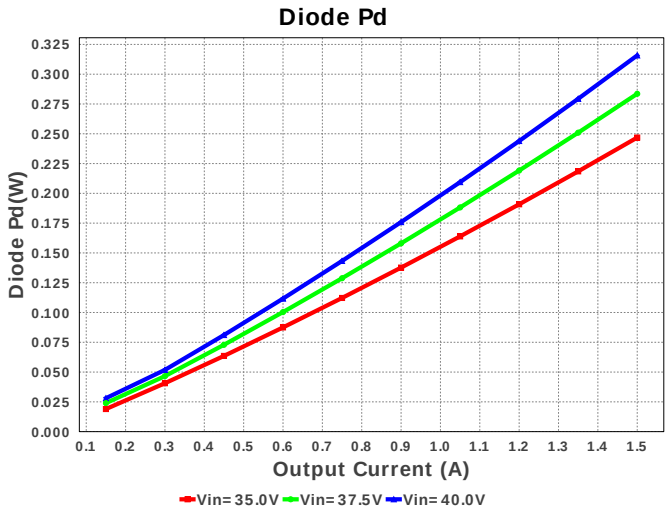


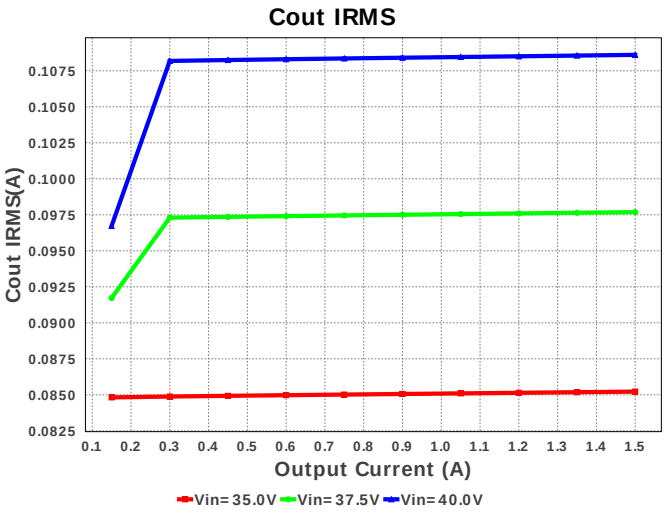


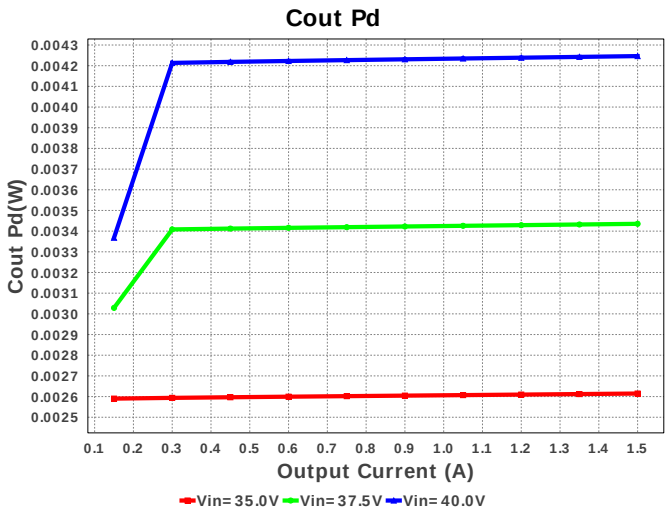


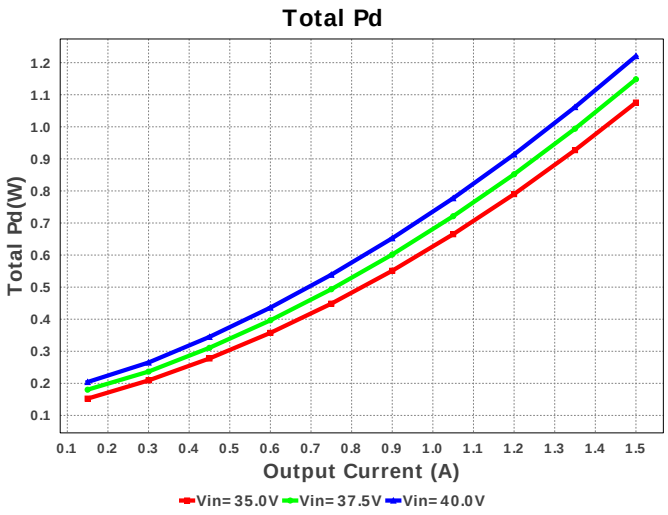


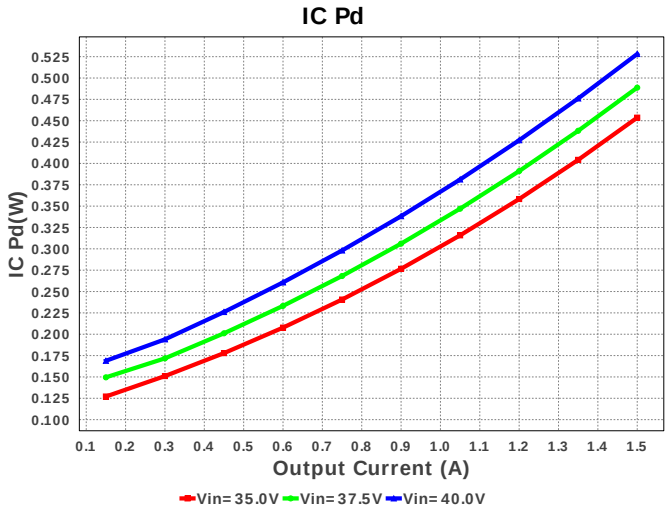


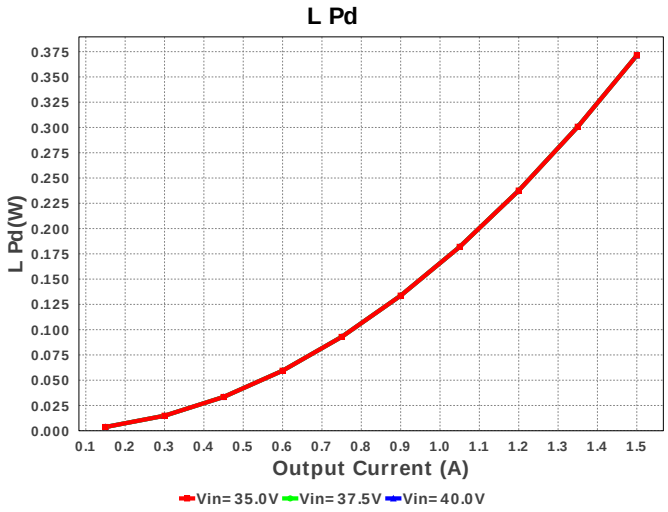


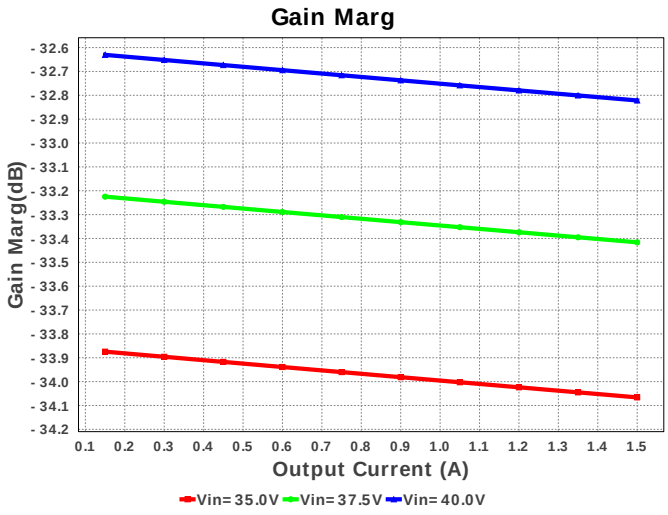


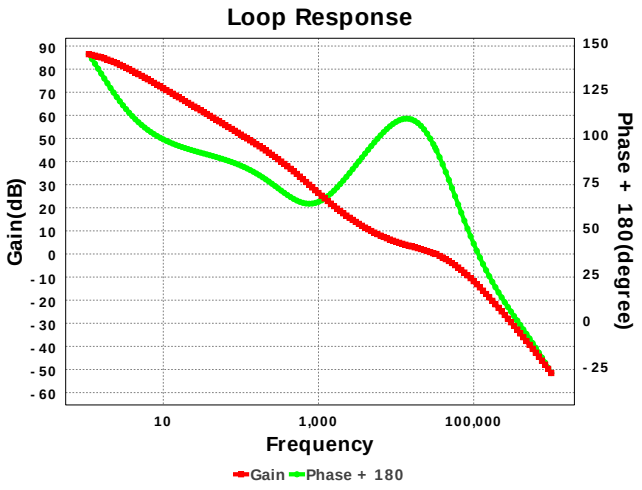












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	647.742 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	108.655 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	930.92 mA	Current	Average input current
4.	L Ipp	376.39 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	14	General	Total Design BOM count
6.	FootPrint	348.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	549.245 kHz	General	Switching frequency
8.	Pout	36.0 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	86.465 dB	Op_Point	Gain at 10Hz

#	Name	Value	Category	Description
12.	Vout OP	24.0 V	Op_Point	Operational Output Voltage
13.	Cross Freq	31.814 kHz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	60.727 %	Op_point	Duty cycle
15.	Efficiency	96.679 %	Op_point	Steady state efficiency
16.	Gain Marg	-32.822 dB	Op_point	Bode Plot Gain Margin
17.	IC Tj	43.733 degC	Op_point	IC junction temperature
18.	IOUT_OP	1.5 A	Op_point	Iout operating point
19.	Phase Marg	93.293 deg	Op_point	Bode Plot Phase Margin
20.	VIN_OP	40.0 V	Op_point	Vin operating point
21.	Vout p-p	1.823 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	1.175 mW	Power	Input capacitor power dissipation
23.	Cout Pd	4.25 mW	Power	Output capacitor power dissipation
24.	Diode Pd	331.891 mW	Power	Diode power dissipation
25.	IC Pd	528.205 mW	Power	IC power dissipation
26.	L Pd	371.25 mW	Power	Inductor power dissipation
27.	Total Pd	1.237 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	Iout1	1.5	Output Current #1
3.	VinMax	40.0	Maximum input voltage
4.	VinMin	35.0	Minimum input voltage
5.	Vout	24.0	Output Voltage
6.	Vout1	24.0	Output Voltage #1
7.	base_pn	TPS54541	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0	Ambient temperature

Design Assistance

1. TPS54541 Product Folder : http://www.ti.com/product/TPS54541 : contains the data sheet and other resources.