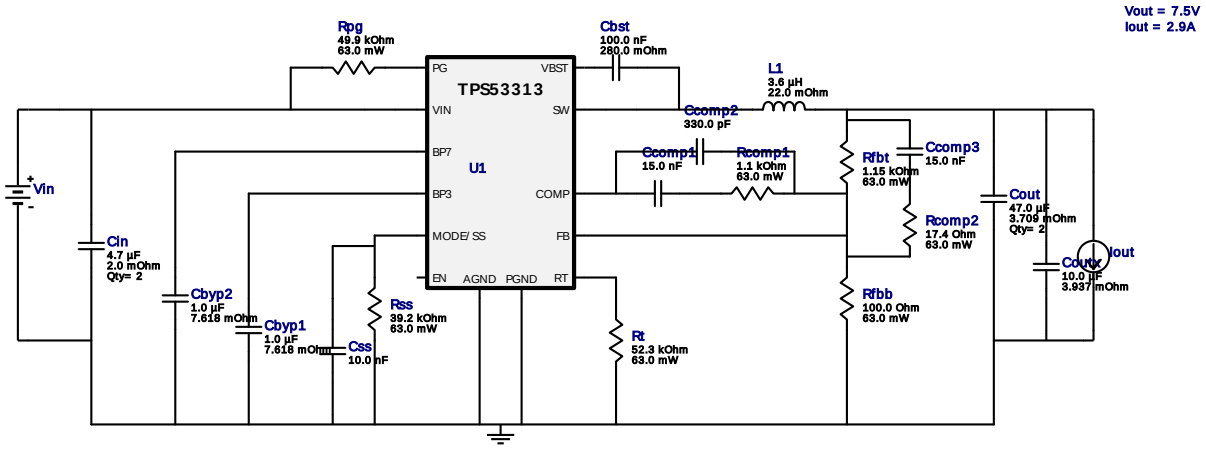
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 14.4V
Vout = 7.5V
Iout = 2.9A

Device = TPS53313RGER
Topology = Buck
Created = 7/11/16 4:20:14 AM
BOM Cost = $3.03
BOM Count = 21
Total Pd = 0.83W

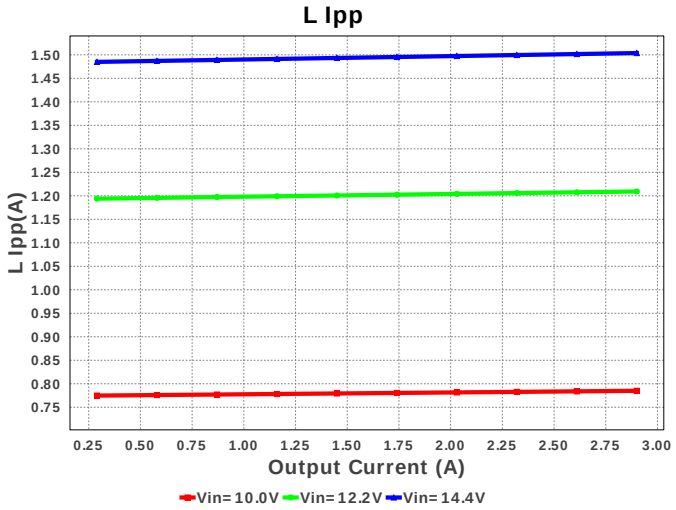
Design : 1641152/99 TPS53313RGER
TPS53313RGER 10.0V-14.4V to 7.50V @ 2.9A

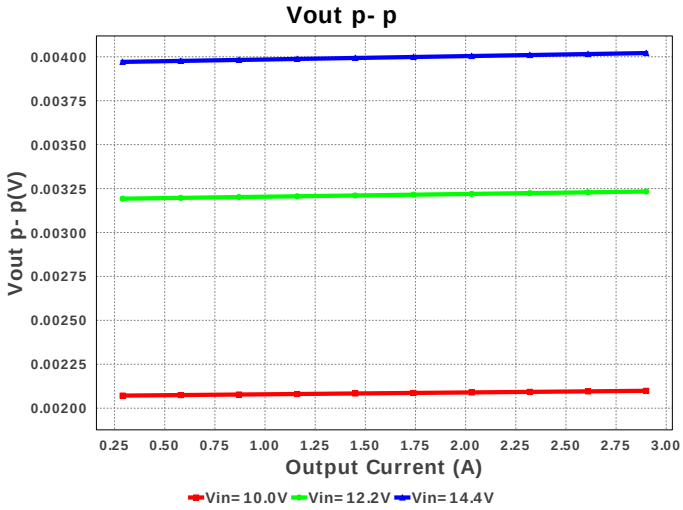


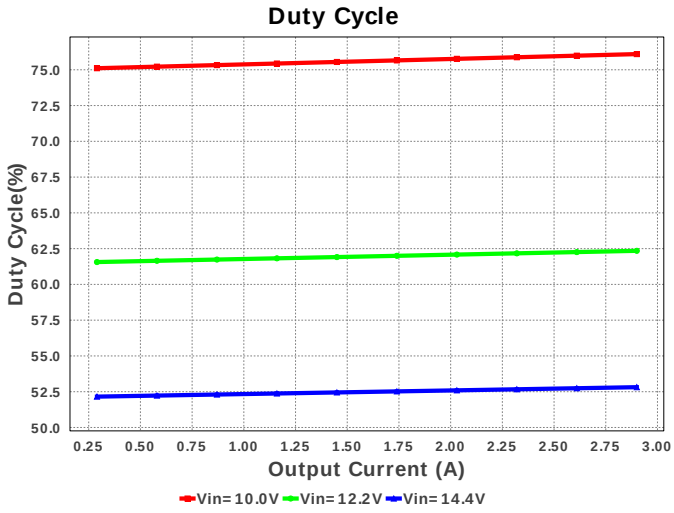
Electrical BOM

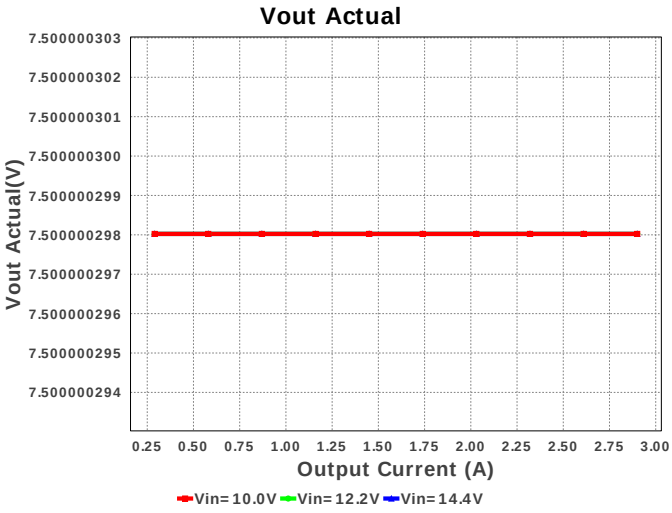
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cbyp1	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Cbyp2	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
4.	Ccomp1	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Ccomp2	Samsung Electro-Mechanics	CL21C331JBANFNC Series= C0G/NP0	Cap= 330.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
6.	Ccomp3	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	2	$0.02	0805 7 mm²
8.	Cout	MuRata	GRM31CR61A476KE15L Series= X5R	Cap= 47.0 uF ESR= 3.709 mOhm VDC= 10.0 V IRMS= 4.2862 A	2	$0.15	1206_190 11 mm²
9.	Coutx	MuRata	GRM219R61A106KE44D Series= X5R	Cap= 10.0 uF ESR= 3.937 mOhm VDC= 10.0 V IRMS= 2.7713 A	1	$0.03	0805 7 mm²
10.	Css	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

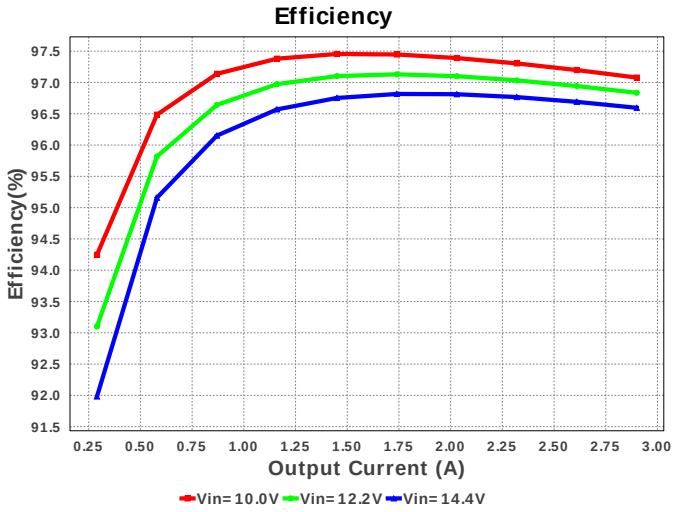
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	L1	Bourns	SRN8040-3R6Y	L= 3.6 µH DCR= 22.0 mOhm	1	$0.22	 SRN8040 100 mm²
12.	Rcomp1	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rcomp2	Vishay-Dale	CRCW040217R4FKED Series= CRCW..e3	Res= 17.4 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rfbb	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rfbt	Vishay-Dale	CRCW04021K15FKED Series= CRCW..e3	Res= 1.15 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rpg	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rss	Vishay-Dale	CRCW040239K2FKED Series= CRCW..e3	Res= 39.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
18.	Rt	Vishay-Dale	CRCW040252K3FKED Series= CRCW..e3	Res= 52.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
19.	U1	Texas Instruments	TPS53313RGER	Switcher	1	$2.30	 RGE0024B 25 mm²

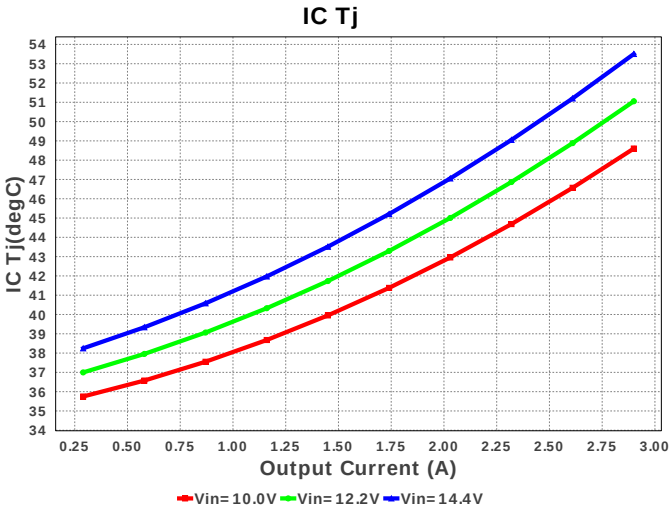


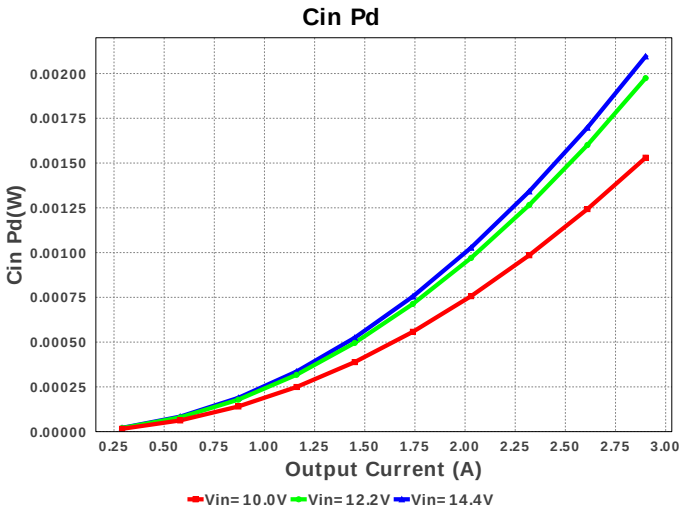


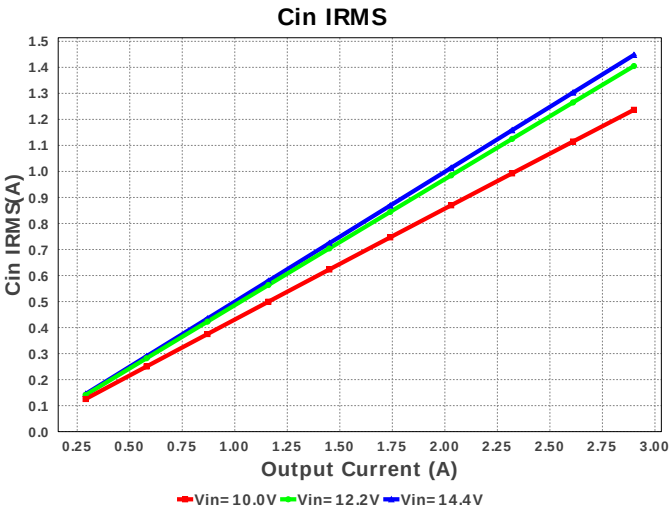


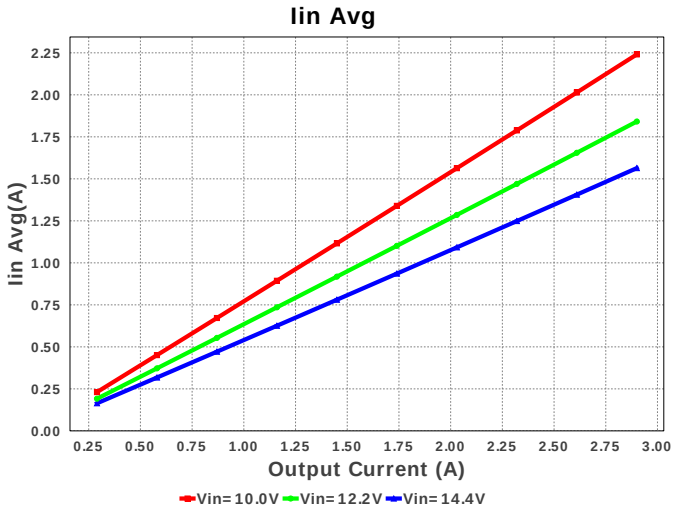


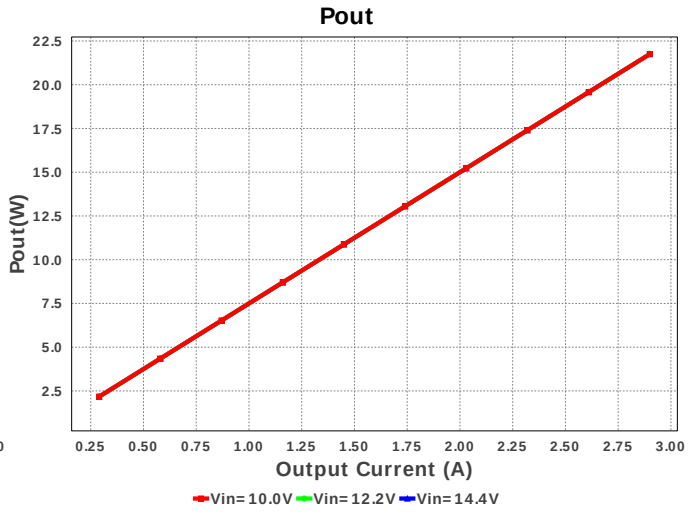


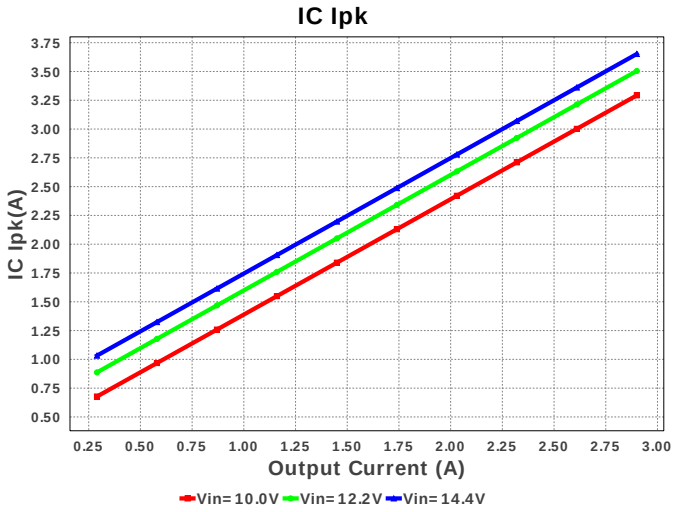


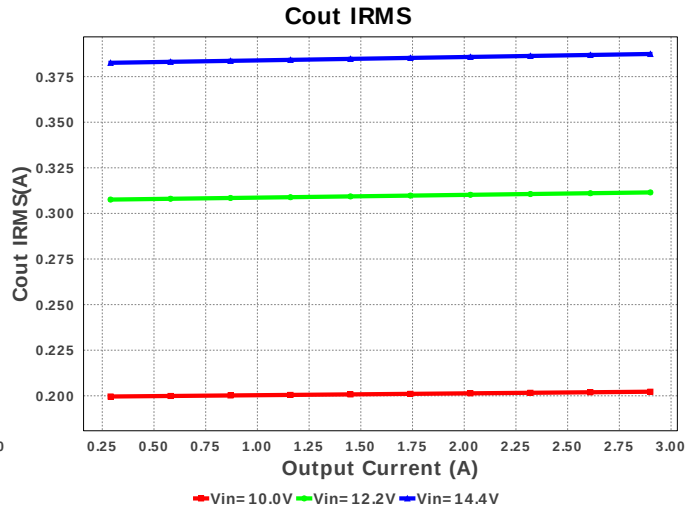


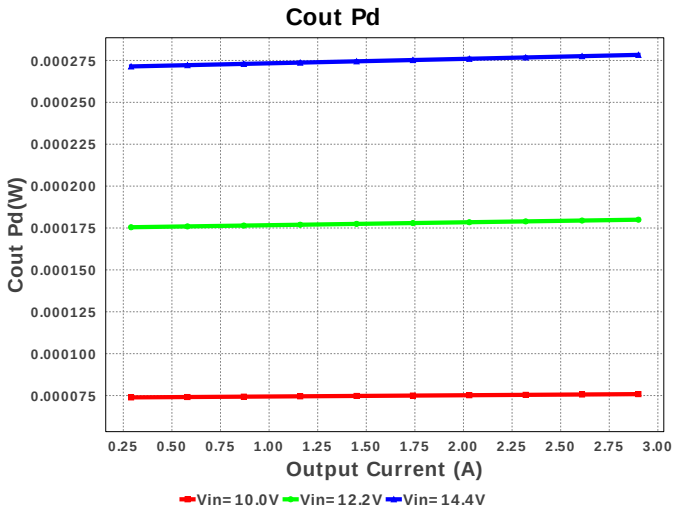


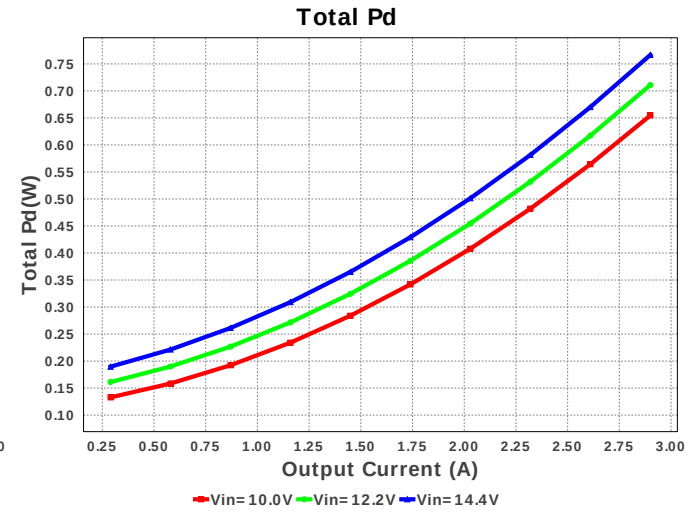


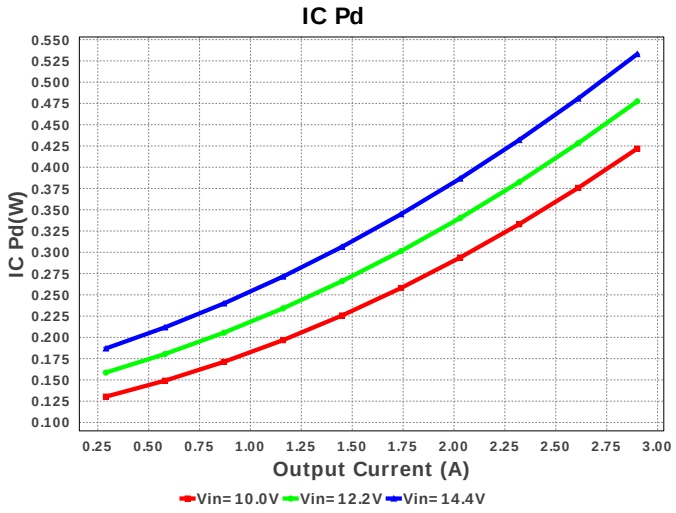


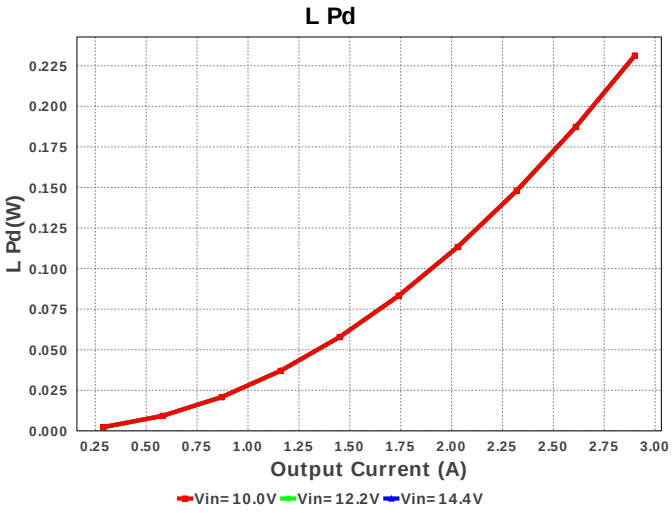


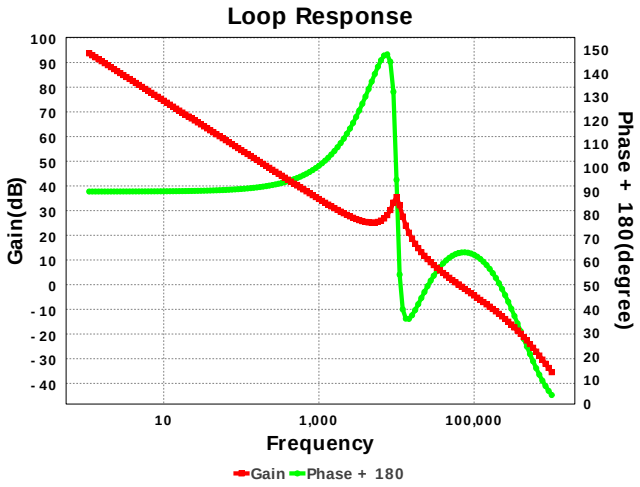












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.448 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	295.774 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	3.478 A	Current	Peak switch current in IC
4.	Iin Avg	1.568 A	Current	Average input current
5.	L Ipp	1.157 A	Current	Peak-to-peak inductor ripple current
6.	BOM Count	21	General	Total Design BOM count
7.	FootPrint	228.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	875.0 kHz	General	Switching frequency
9.	Pout	21.75 W	General	Total output power
10.	Total BOM	$3.03	General	Total BOM Cost
11.	Low Freq Gain	93.727 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	7.5 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	7.5 V	Op_Point	Operational Output Voltage
14.	Cross Freq	63.402 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	52.816 %	Op_point	Duty cycle
16.	Efficiency	96.342 %	Op_point	Steady state efficiency
17.	Gain Marg	-38.748 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	56.116 degC	Op_point	IC junction temperature
19.	ICThetaJA	44.1 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	2.9 A	Op_point	Iout operating point
21.	Phase Marg	63.96 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	14.4 V	Op_point	Vin operating point
23.	Vout p-p	2.531 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	2.096 mW	Power	Input capacitor power dissipation
25.	Cout Pd	162.236 µW	Power	Output capacitor power dissipation
26.	IC Pd	592.197 mW	Power	IC power dissipation
27.	L Pd	231.275 mW	Power	Inductor power dissipation
28.	Total Pd	825.842 mW	Power	Total Power Dissipation
29.	Vout Tolerance	18.835 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.9	Maximum Output Current
2.	VinMax	14.4	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	7.5	Output Voltage
5.	base_pn	TPS53313	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS53313** Product Folder : http://www.ti.com/product/TPS53313 : contains the data sheet and other resources.