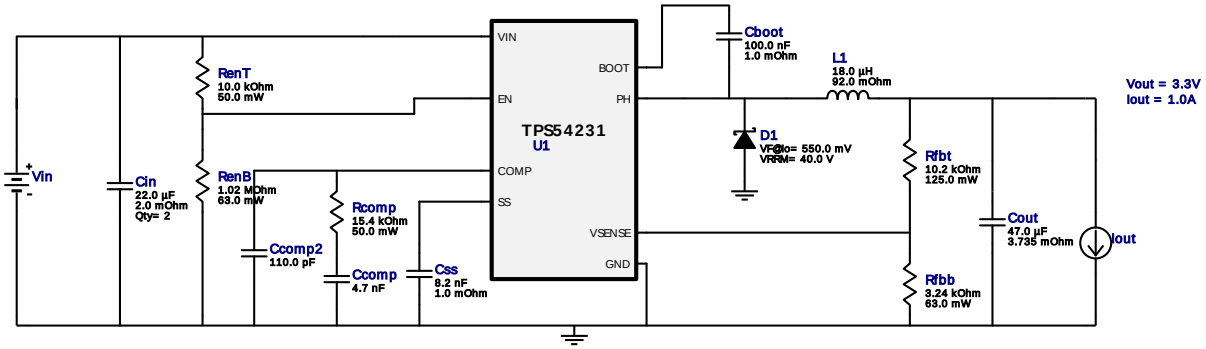
WEBENCH® Design Report

VinMin = 4.0V
VinMax = 15.0V
Vout = 3.3V
Iout = 1.0A

Device = TPS54231DR
Topology = Buck
Created = 2018-05-05 17:31:02.115
BOM Cost = $1.55
BOM Count = 15
Total Pd = 0.73W

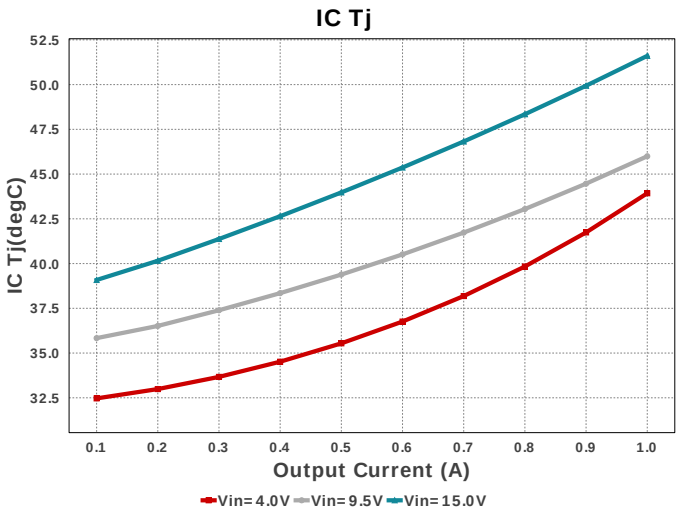
Design : 5277852/44 TPS54231DR
TPS54231DR 4.0V-15.0V to 3.30V @ 1.0A

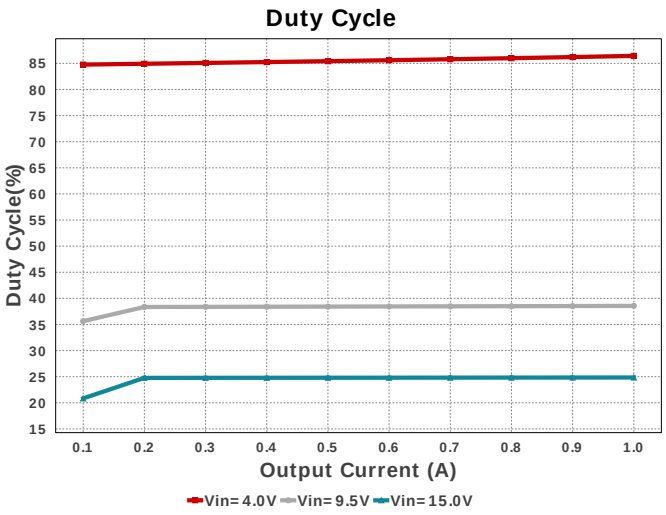


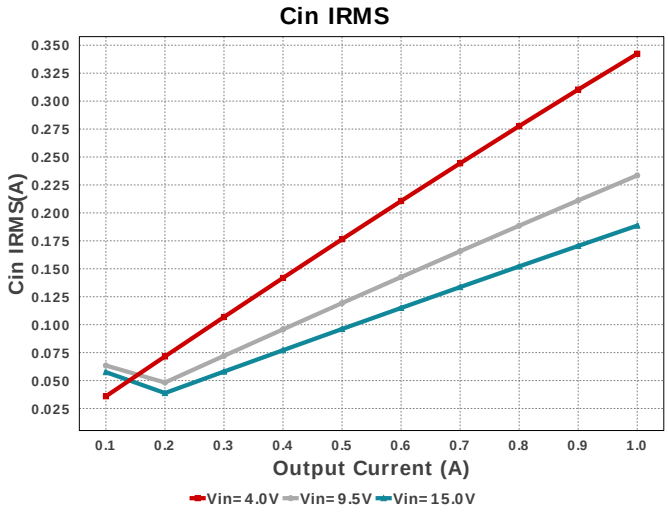
Electrical BOM

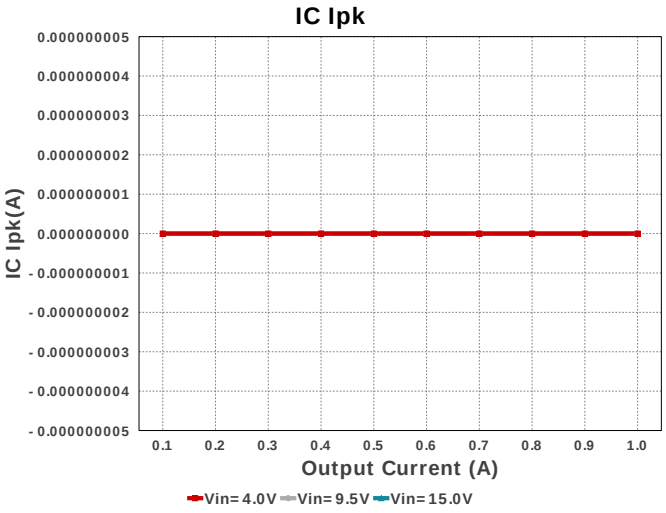
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R71A104KA01D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	TDK	CGA4C2C0G1H472J060AA Series= C0G/NP0	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm²
3.	Ccomp2	MuRata	GRM0335C1H111JA01D Series= C0G/NP0	Cap= 110.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
4.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	2	$0.20	1210 15 mm²
5.	Cout	MuRata	GRM31CR60J476ME19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	$0.12	1206_190 11 mm²
6.	Css	MuRata	GRM033R61A822KA01D Series= X5R	Cap= 8.2 nF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
7.	D1	Fairchild Semiconductor	SS24FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.07	SOD-123F 12 mm²
8.	L1	Bourns	SRR6038-180Y	L= 18.0 µH DCR= 92.0 mOhm	1	$0.29	SRR6038 77 mm²
9.	Rcomp	Yageo America	RC0201FR-0715K4L Series= ?	Res= 15.4 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²
10.	RenB	Vishay-Dale	CRCW04021M02FKED Series= CRCW..e3	Res= 1.02 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	RenT	Yageo America	RC0201FR-0710KL Series= ?	Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²

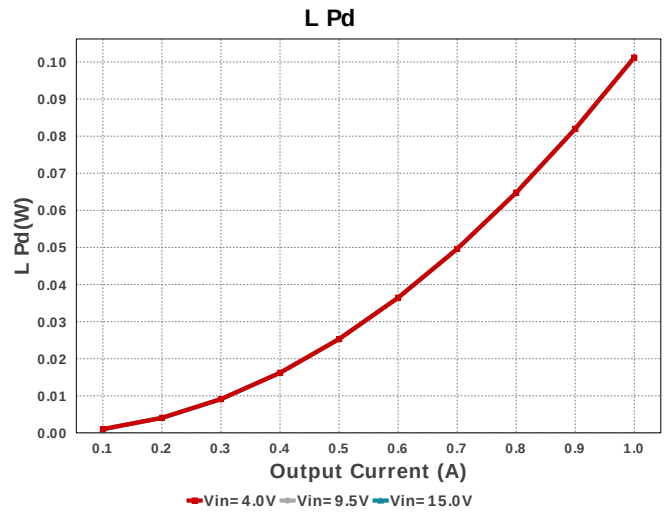
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rfbb	Vishay-Dale	CRCW04023K24FKED Series= CRCW..e3	Res= 3.24 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Rfbt	Vishay-Dale	CRCW080510K2FKEA Series= CRCW..e3	Res= 10.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2
14.	U1	Texas Instruments	TPS54231DR	Switcher	1	$0.55	D0008A 57 mm^2

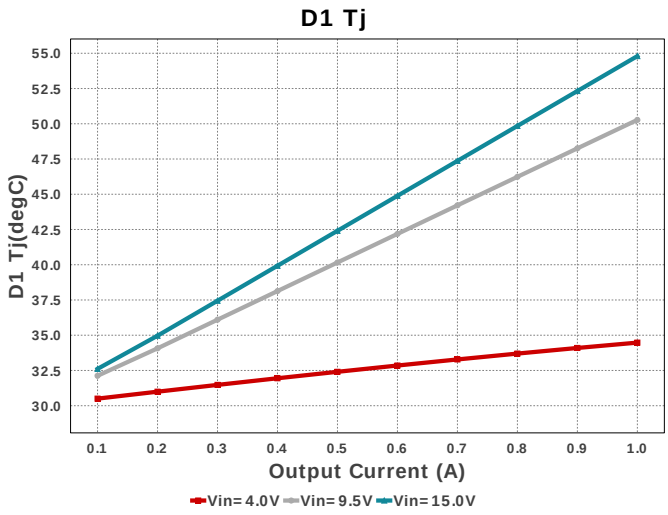


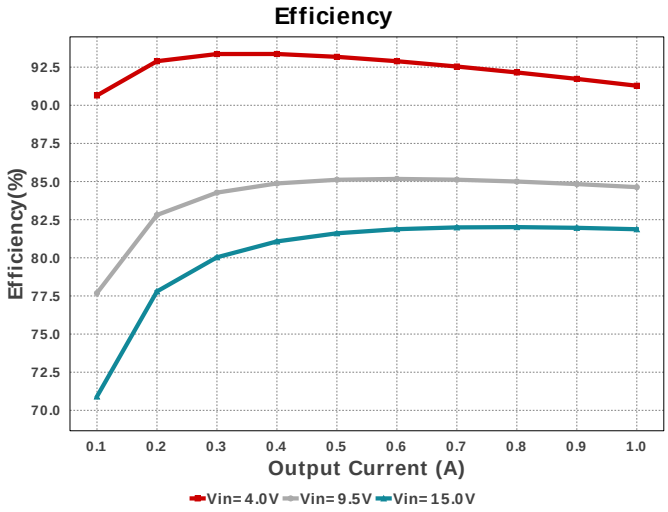


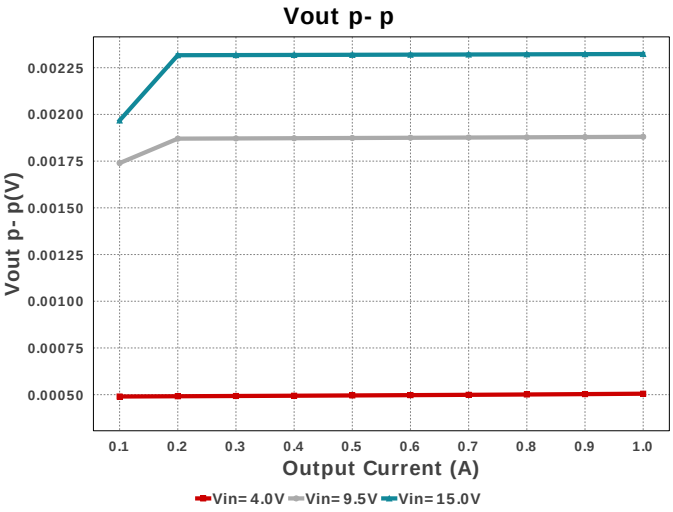


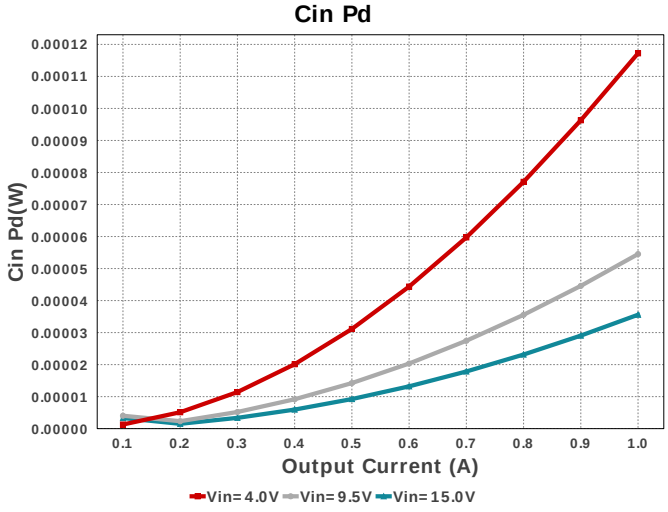


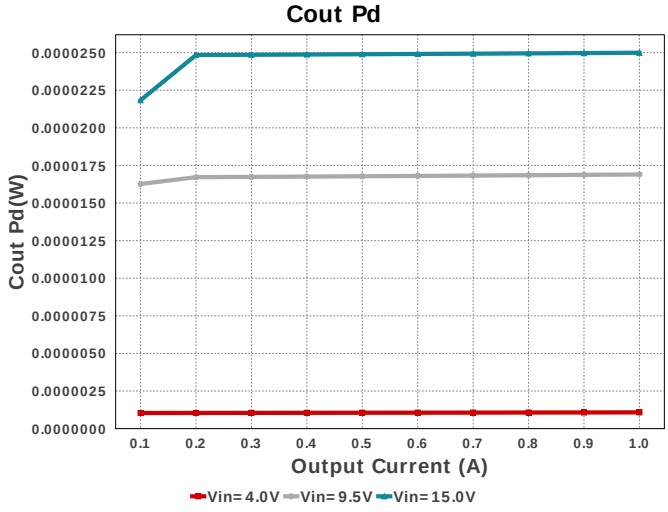


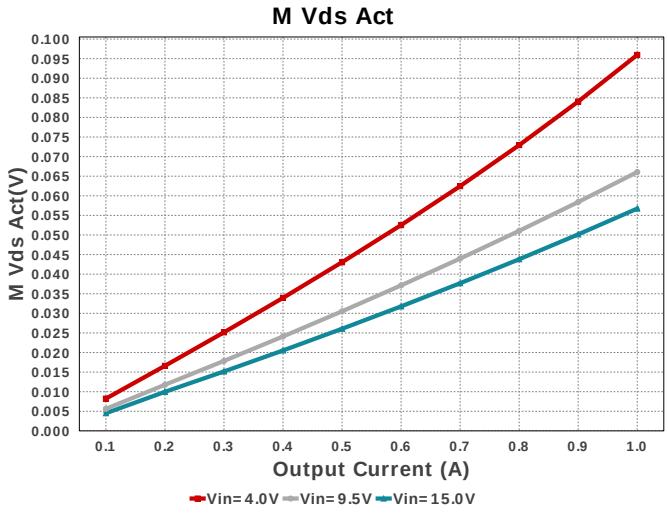


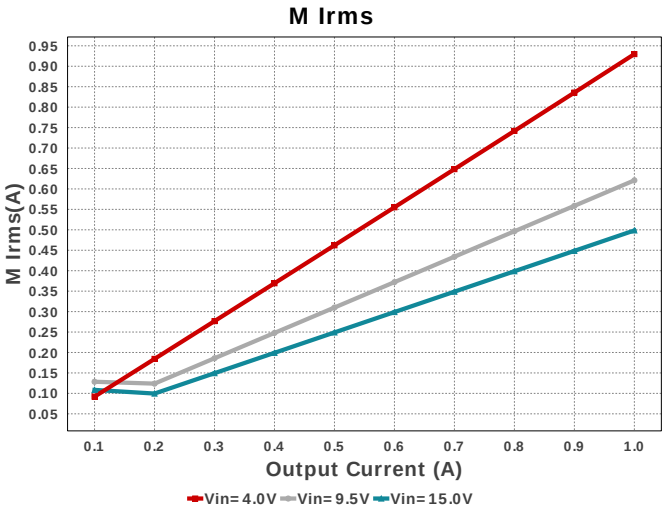


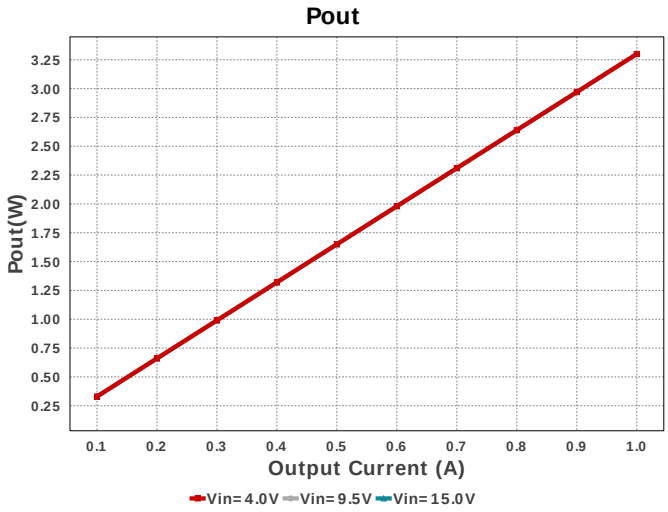


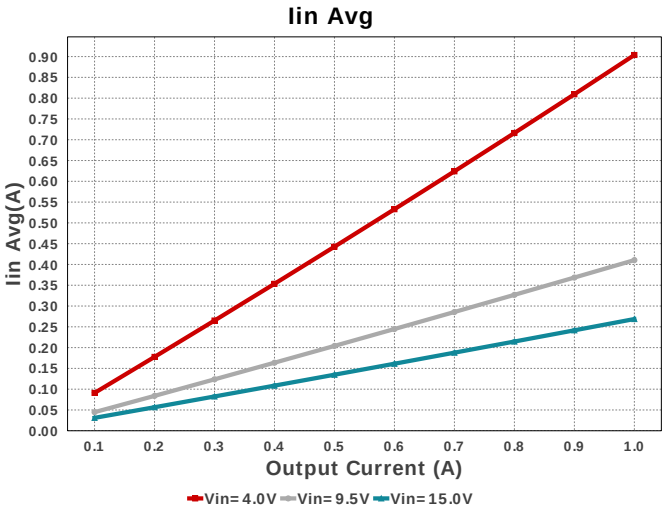


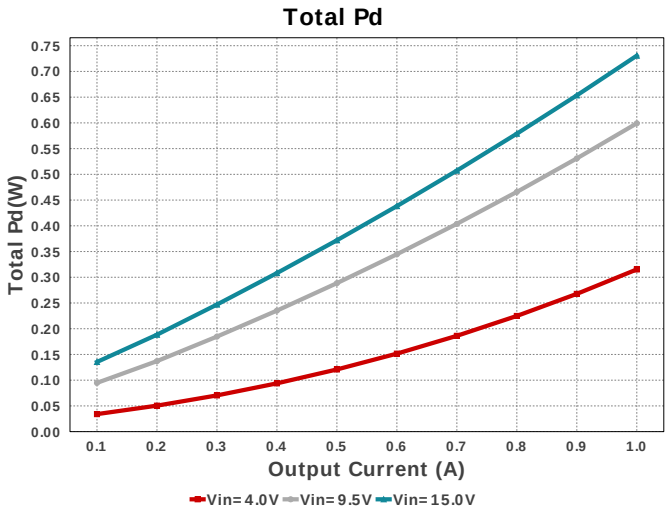


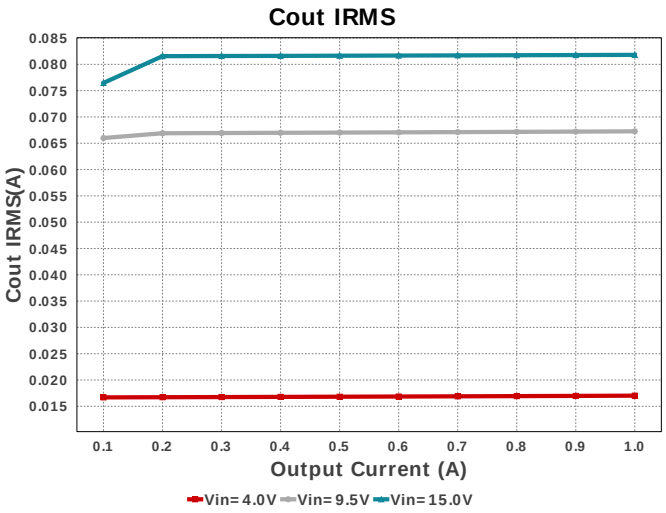


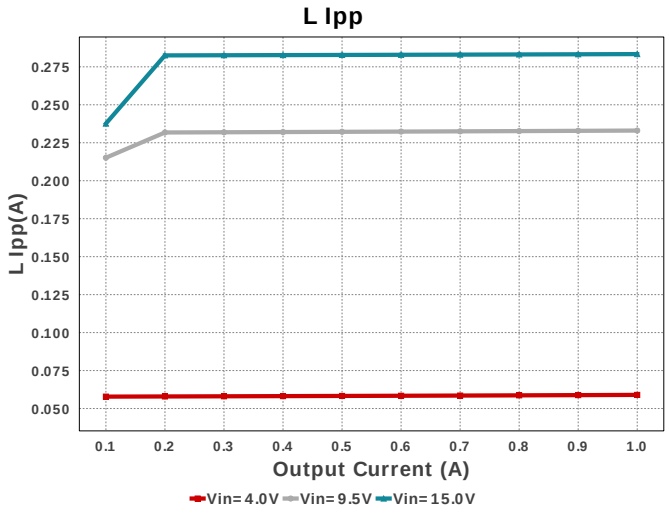


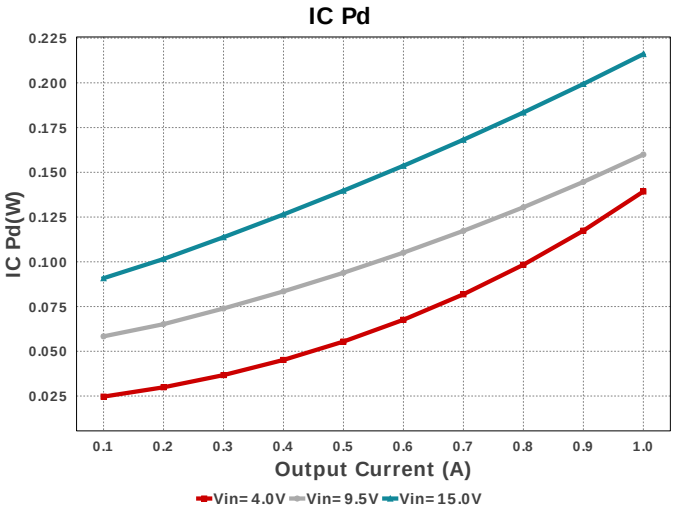


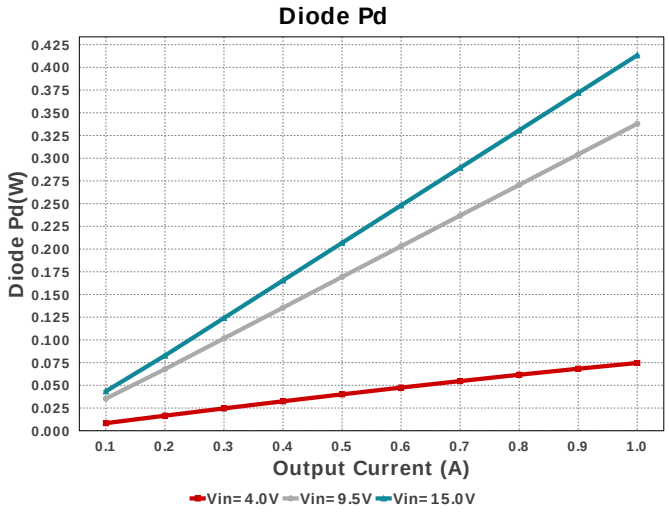


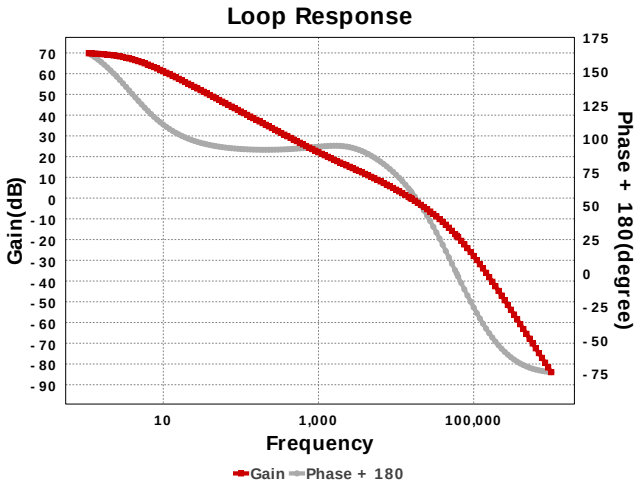












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	188.615 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	81.802 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	0.0 A	Current	Peak switch current in IC
4.	Iin Avg	268.71 mA	Current	Average input current
5.	L Ipp	283.37 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	498.493 mA	Current	Q Iavg
7.	BOM Count	15	General	Total Design BOM count
8.	FootPrint	217.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	570.0 kHz	General	Switching frequency
10.	M Vds Act	56.726 mV	General	Voltage drop across the MosFET
11.	Mode	CCM	General	Conduction Mode
12.	Pout	3.3 W	General	Total output power
13.	Total BOM	$1.55	General	Total BOM Cost
14.	Cross Freq	15.352 kHz	Op Point	Bode plot crossover frequency
15.	D1 Tj	54.8 degC	Op Point	D1 junction temperature
16.	Duty Cycle	24.849 %	Op Point	Duty cycle
17.	Efficiency	81.873 %	Op Point	Steady state efficiency
18.	Gain Marg	-18.174 dB	Op Point	Bode Plot Gain Margin
19.	IC Tj	51.605 degC	Op Point	IC junction temperature
20.	ICThetaJA	100.0 degC/W	Op Point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	1.0 A	Op Point	Iout operating point
22.	Low Freq Gain	69.811 dB	Op Point	Gain at 1Hz
23.	Phase Marg	61.466 deg	Op Point	Bode Plot Phase Margin
24.	VIN_OP	15.0 V	Op Point	Vin operating point
25.	Vout Actual	3.319 V	Op Point	Vout Actual calculated based on selected voltage divider resistors
26.	Vout OP	3.3 V	Op Point	Operational Output Voltage
27.	Vout Tolerance	5.087 %	Op Point	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
28.	Vout p-p	2.323 mV	Op Point	Peak-to-peak output ripple voltage
29.	Cin Pd	35.575 µW	Power	Input capacitor power dissipation
30.	Cout Pd	24.993 µW	Power	Output capacitor power dissipation

#	Name	Value	Category	Description
31.	Diode Pd	413.328 mW	Power	Diode power dissipation
32.	IC Pd	216.053 mW	Power	IC power dissipation
33.	L Pd	101.2 mW	Power	Inductor power dissipation
34.	Total Pd	730.636 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	15.0	Maximum input voltage
3.	VinMin	4.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS54231	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS54231** Product Folder : http://www.ti.com/product/TPS54231 : contains the data sheet and other resources.