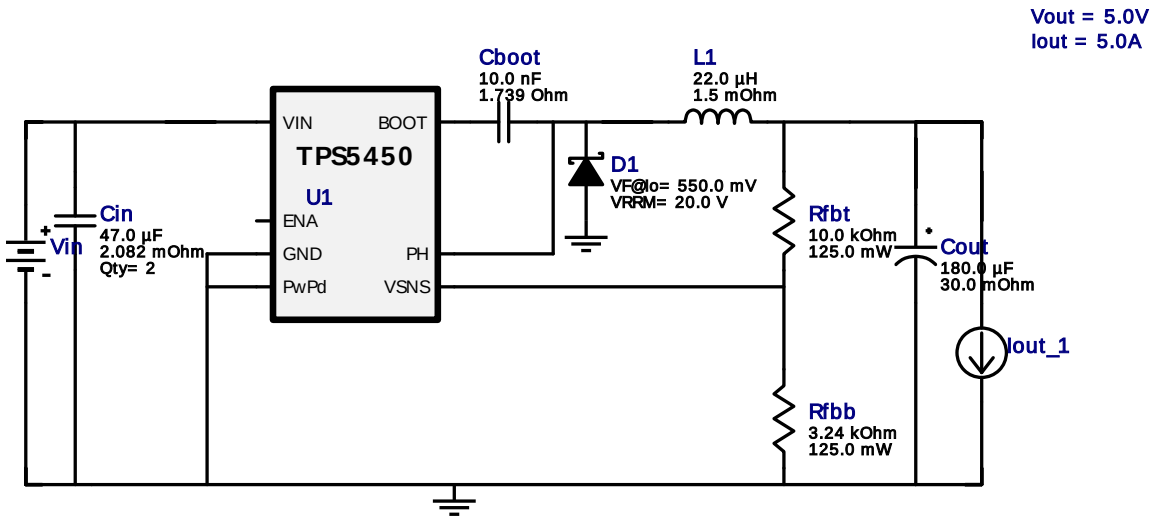
WEBENCH® Design Report

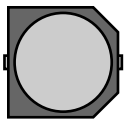
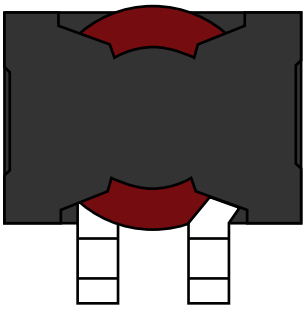
VinMin = 8.0V
VinMax = 13.2V
Vout = 5.0V
Iout = 5.0A

Device = TPS5450DDAR
Topology = Buck
Created = 5/9/16 12:58:07 AM
BOM Cost = $5.38
BOM Count = 9
Total Pd = 3.17W

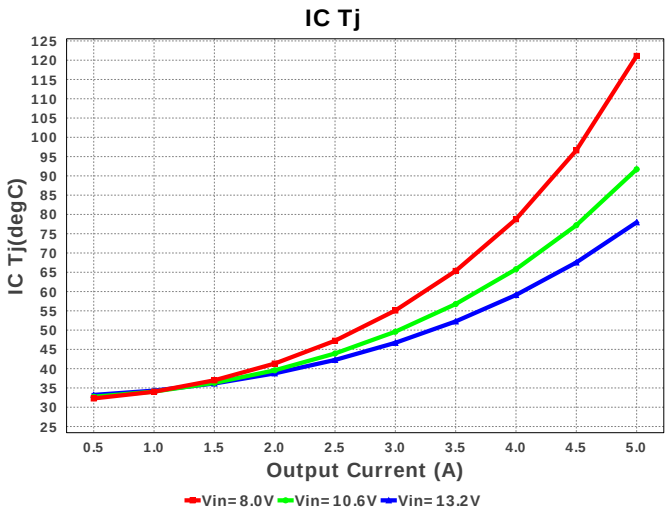
Design : 4493365/1 TPS5450DDAR
TPS5450DDAR 8.0V-13.2V to 5.00V @ 5.0A

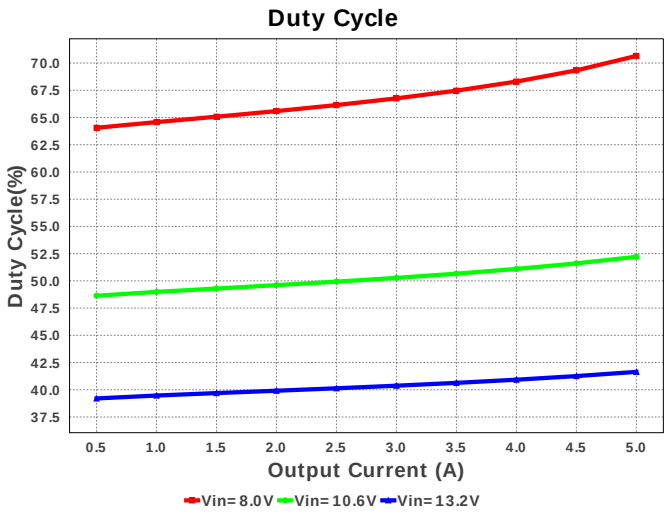


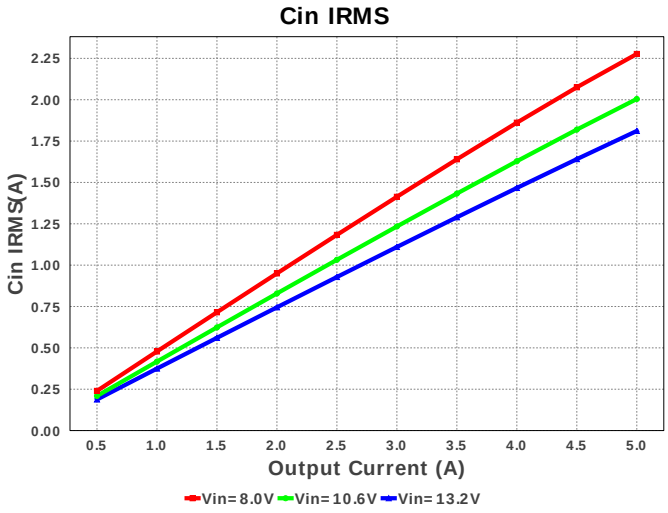
Electrical BOM

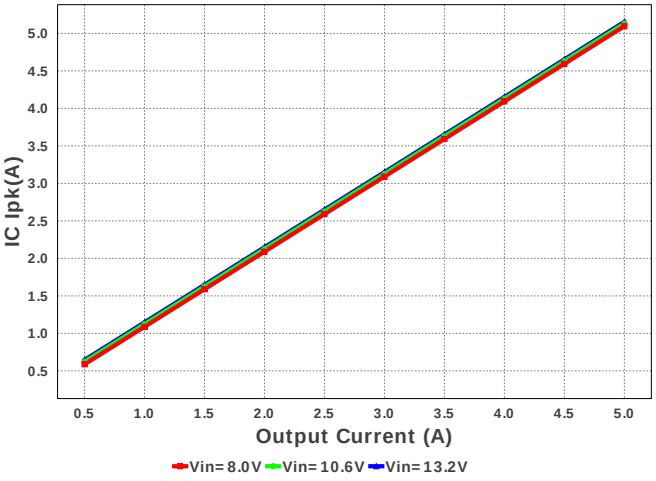
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	 0805 7 mm²
2.	Cin	TDK	C3216X5R1E476M160AC Series= X5R	Cap= 47.0 uF ESR= 2.082 mOhm VDC= 25.0 V IRMS= 5.0279 A	2	$0.35	 1206 11 mm²
3.	Cout	Panasonic	16SVP180MX Series= SVP	Cap= 180.0 uF ESR= 30.0 mOhm VDC= 16.0 V IRMS= 3.02 A	1	$0.29	 SM_RADIAL_10AMM 160 mm²
4.	D1	Comchip Technology	CDBC520-G	VF@Io= 550.0 mV VRRM= 20.0 V	1	$0.23	 SMC 83 mm²
5.	L1	Coilcraft	SER2915L-223KL	L= 22.0 µH DCR= 1.5 mOhm	1	$1.88	 SER2915L 652 mm²
6.	Rfbb	Panasonic	ERJ-6ENF3241V Series= ERJ-6E	Res= 3.24 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²

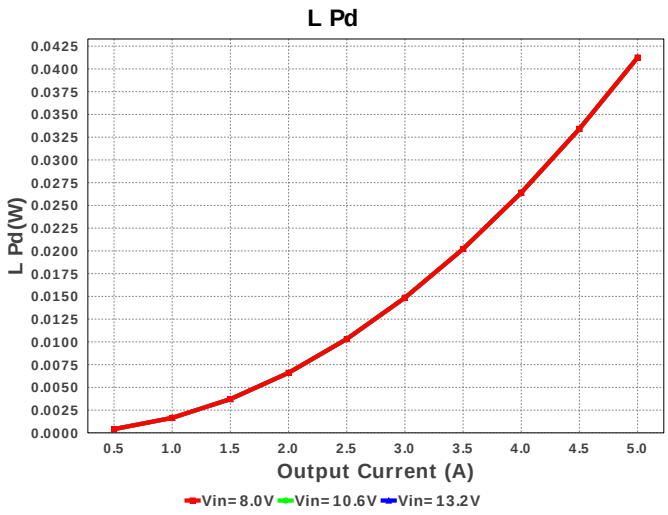
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	Rfbt	Panasonic	ERJ-6ENF1002V Series= ERJ-6E	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2
8.	U1	Texas Instruments	TPS5450DDAR	Switcher	1	$2.25	R-PDSO-G8 57 mm^2

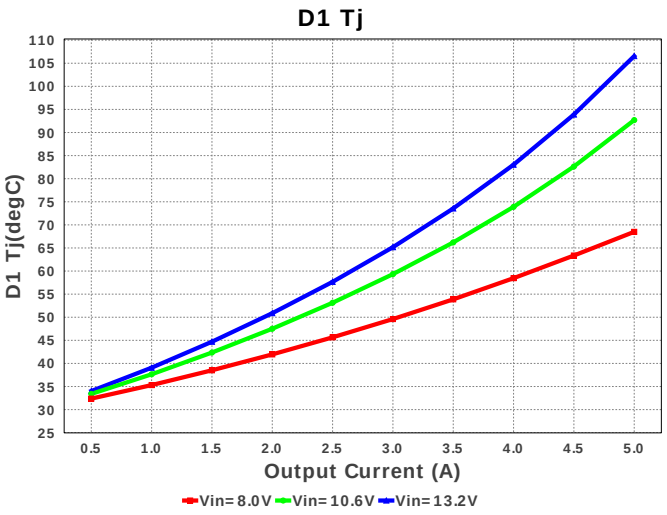


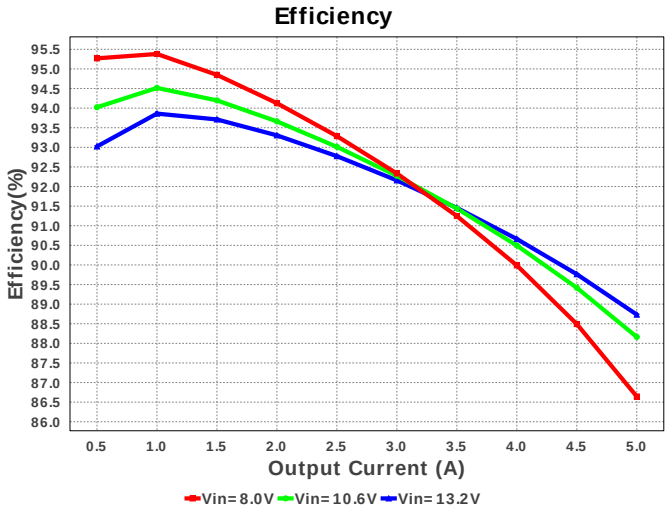


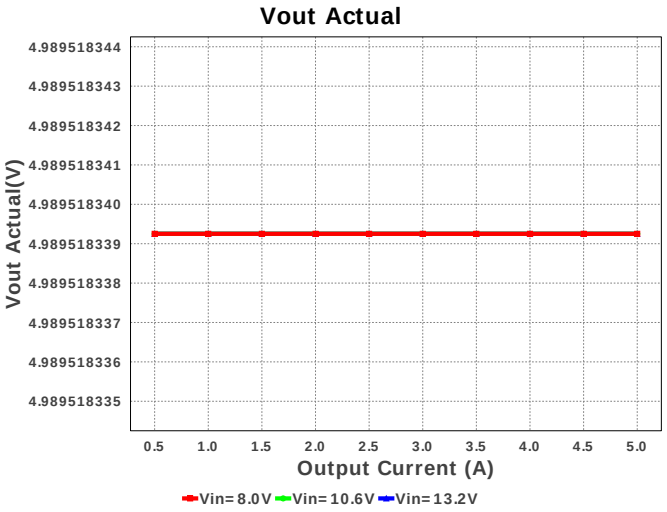


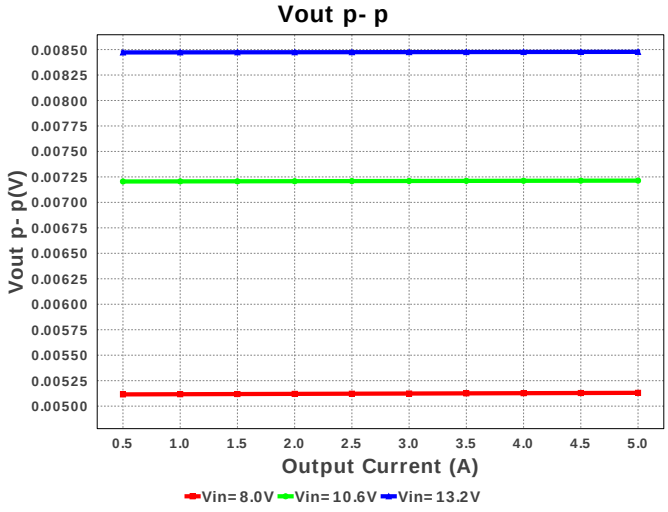


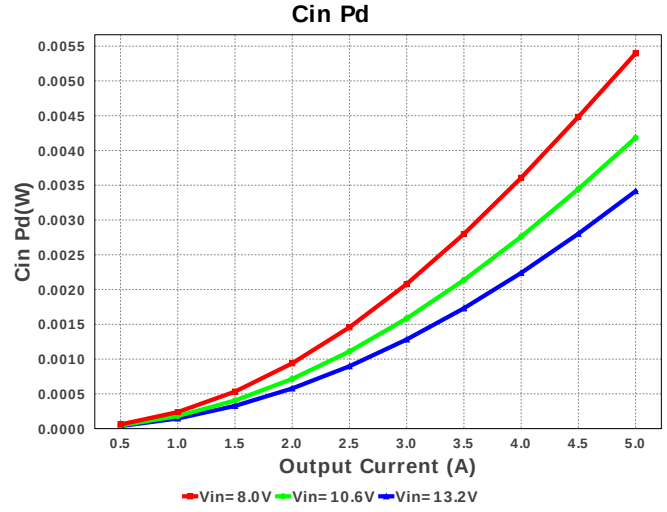


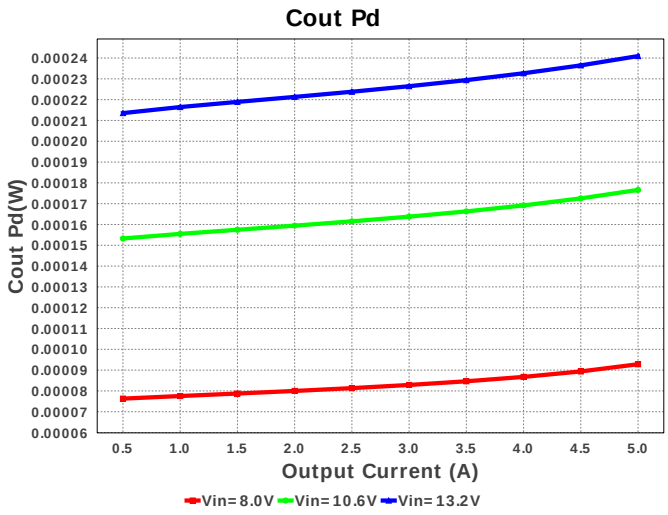


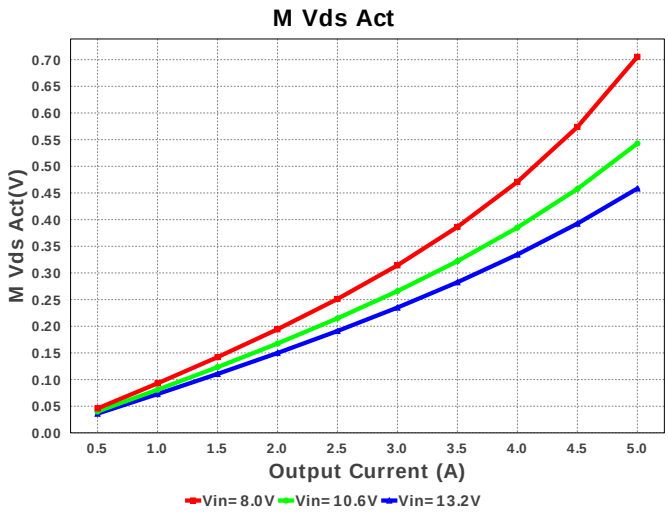


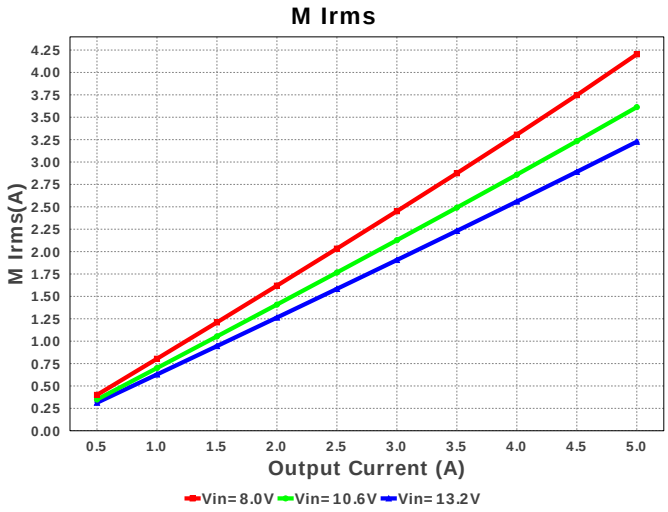


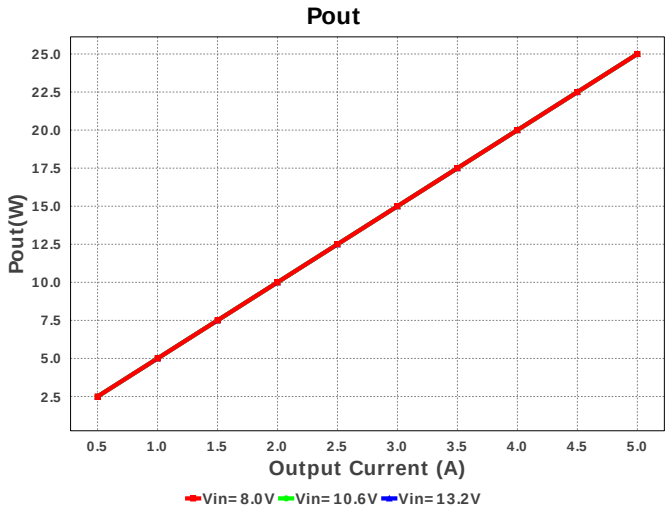


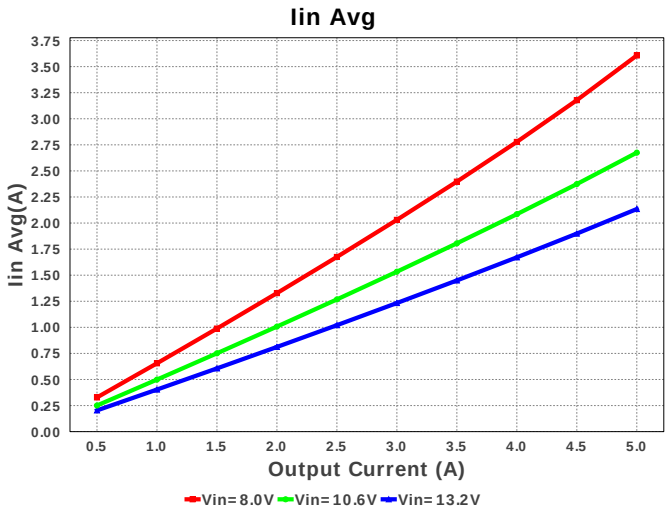


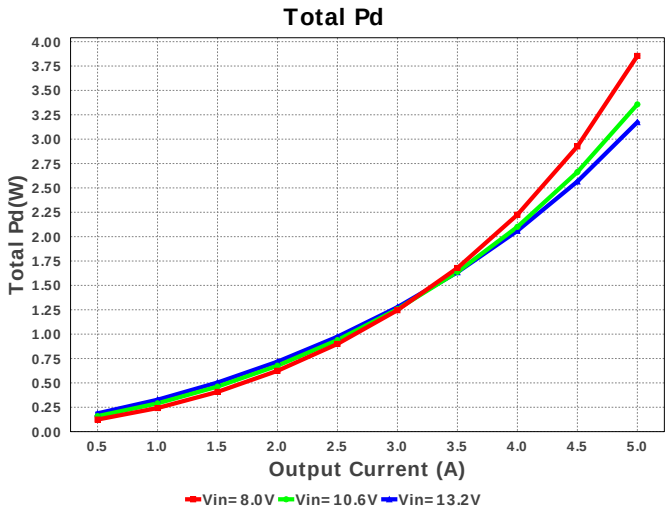


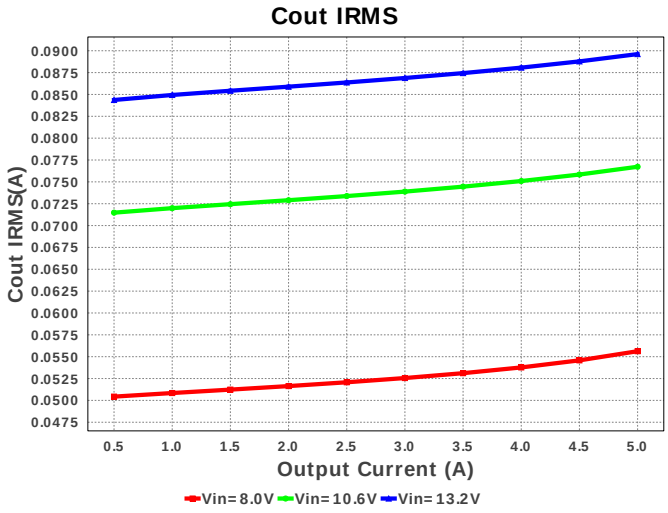


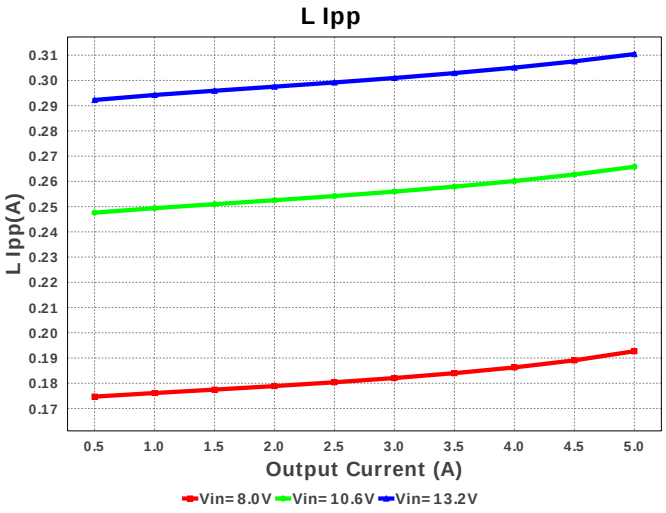


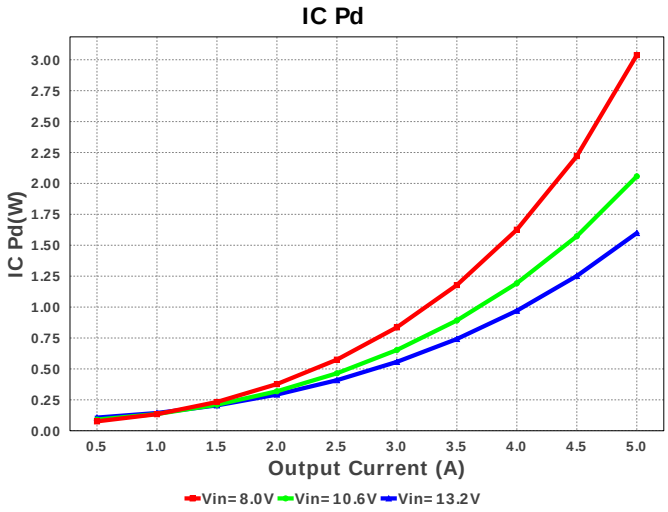


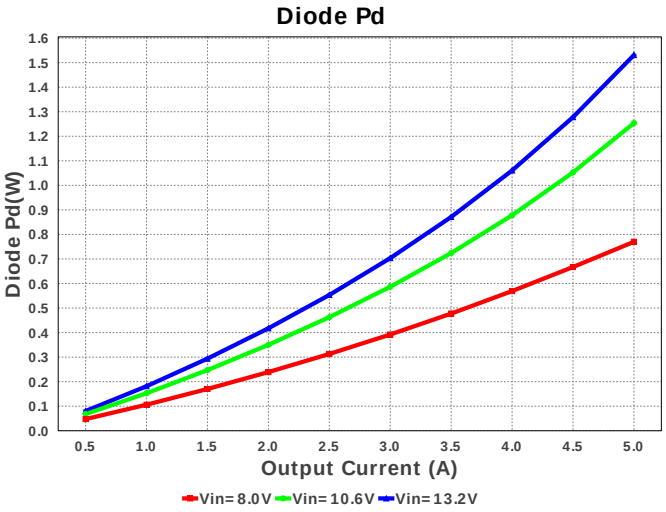


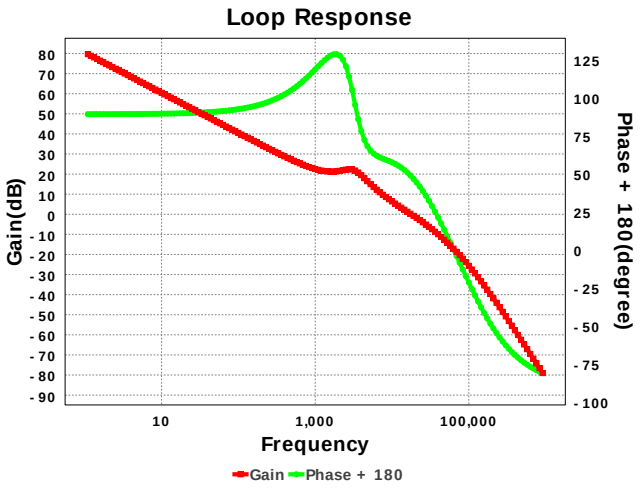












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.811 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	89.616 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	5.155 A	Current	Peak switch current in IC
4.	Iin Avg	2.134 A	Current	Average input current
5.	L Ipp	310.44 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	3.227 A	Current	Q Iavg
7.	BOM Count	9	General	Total Design BOM count
8.	FootPrint	994.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	500.0 kHz	General	Switching frequency
10.	IC Tolerance	18.315 mV	General	IC Feedback Tolerance
11.	M Vds Act	458.299 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	25.0 W	General	Total output power
13.	Total BOM	$5.38	General	Total BOM Cost
14.	D1 Tj	106.545 degC	Op_Point	D1 junction temperature
15.	Vout Actual	4.99 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	17.794 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	41.644 %	Op_point	Duty cycle
19.	Efficiency	88.733 %	Op_point	Steady state efficiency
20.	IC Tj	77.96 degC	Op_point	IC junction temperature
21.	ICThetaJA	30.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	5.0 A	Op_point	Iout operating point
23.	Phase Marg	49.07 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	13.2 V	Op_point	Vin operating point
25.	Vout p-p	9.323 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	3.415 mW	Power	Input capacitor power dissipation
27.	Cout Pd	240.93 µW	Power	Output capacitor power dissipation
28.	Diode Pd	1.531 W	Power	Diode power dissipation
29.	IC Pd	1.599 W	Power	IC power dissipation
30.	L Pd	41.25 mW	Power	Inductor power dissipation
31.	Total Pd	3.174 W	Power	Total Power Dissipation
32.	Vout Tolerance	3.049 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	5.0	Maximum Output Current
2.	VinMax	13.2	Maximum input voltage
3.	VinMin	8.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	TPS5450	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Feature Highlights: 5A, 500kHz Fixed Switching Frequency, Internal Compensation

2. **TPS5450** Product Folder : http://www.ti.com/product/TPS5450 : contains the data sheet and other resources.