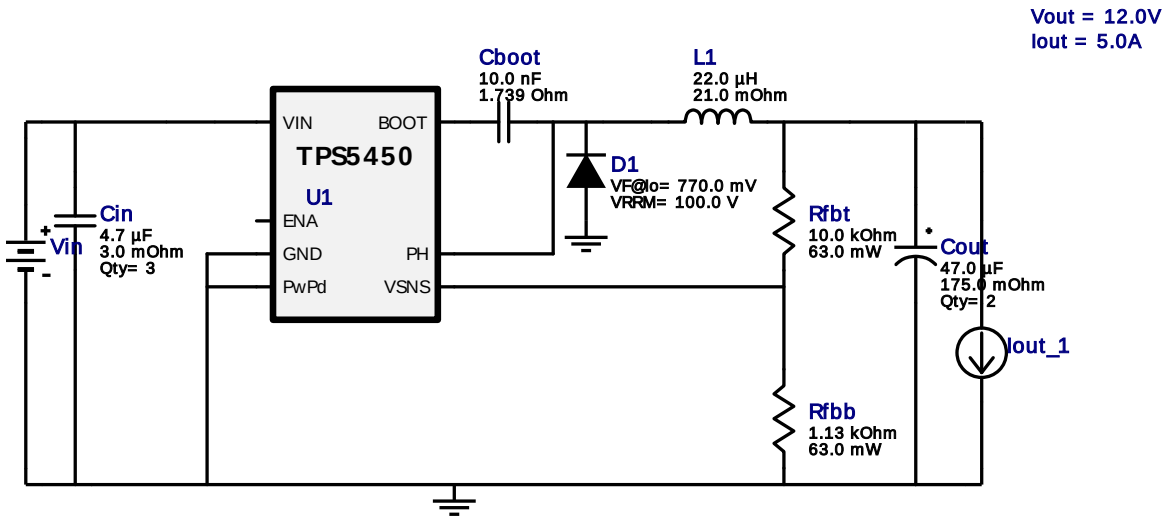
WEBENCH® Design Report

VinMin = 24.0V
VinMax = 36.0V
Vout = 12.0V
Iout = 5.0A

Device = TPS5450DDAR
Topology = Buck
Created = 7/17/16 9:11:09 AM
BOM Cost = $5.16
BOM Count = 11
Total Pd = 4.35W

Design : 4466246/79 TPS5450DDAR
TPS5450DDAR 24.0V-36.0V to 12.00V @ 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	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	3	$0.07	1206 11 mm²
3.	Cout	Kemet	T495D476K020ATE175 Series= T495	Cap= 47.0 uF ESR= 175.0 mOhm VDC= 20.0 V IRMS= 833.0 mA	2	$0.49	7343-31 59 mm²
4.	D1	Vishay-Semiconductor	50WQ10FNPBF	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.74	DPAK 102 mm²
5.	L1	Coilcraft	SER1390-223MLB	L= 22.0 µH DCR= 21.0 mOhm	1	$0.95	SER1390 240 mm²
6.	Rfbb	Vishay-Dale	CRCW04021K13FKED Series= CRCW..e3	Res= 1.13 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

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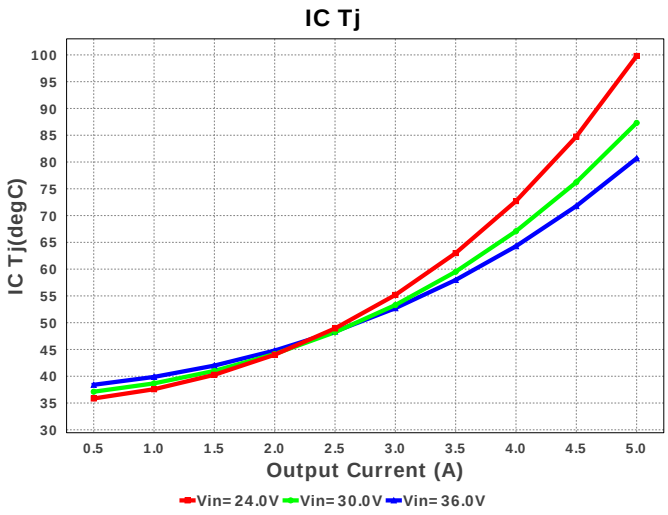
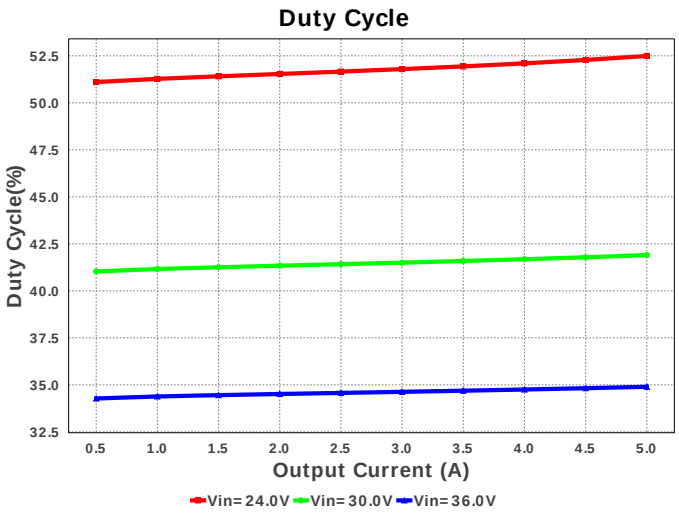
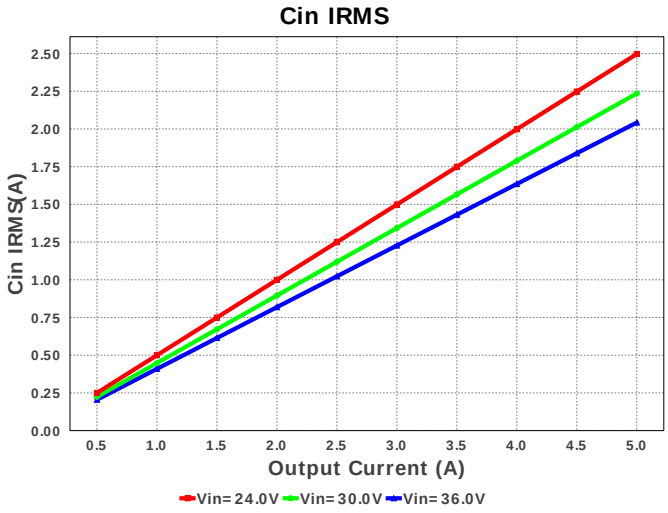
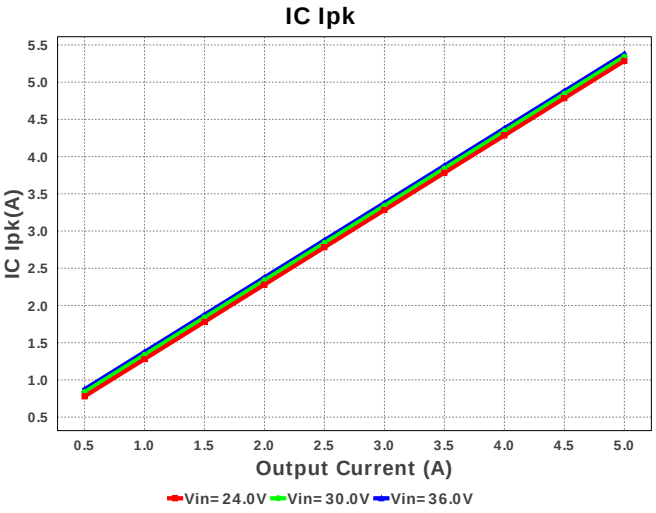
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	U1	Texas Instruments	TPS5450DDAR	Switcher	1	$2.25	

R-PDSO-G8 57 mm^2









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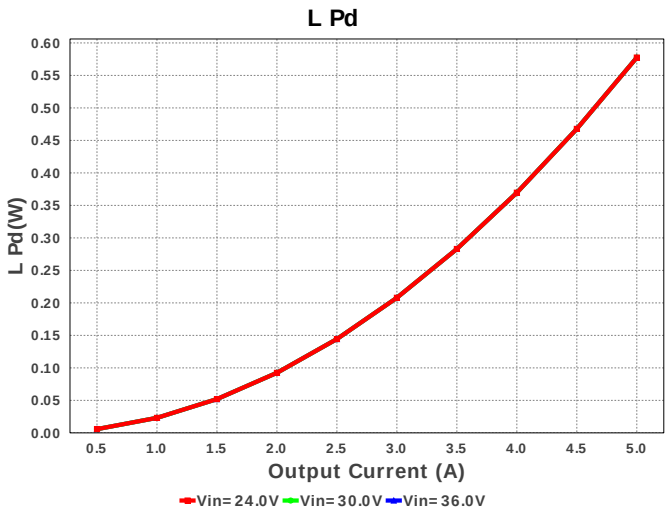

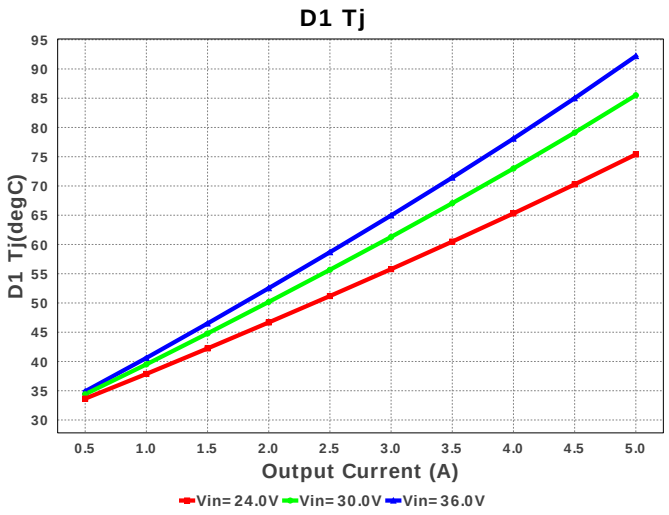

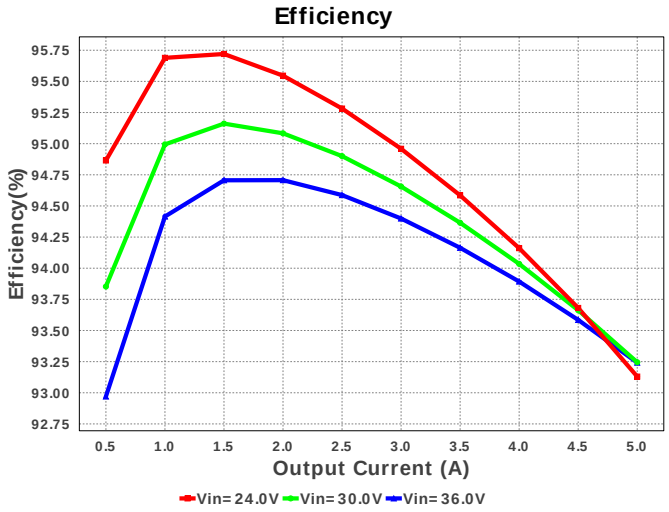

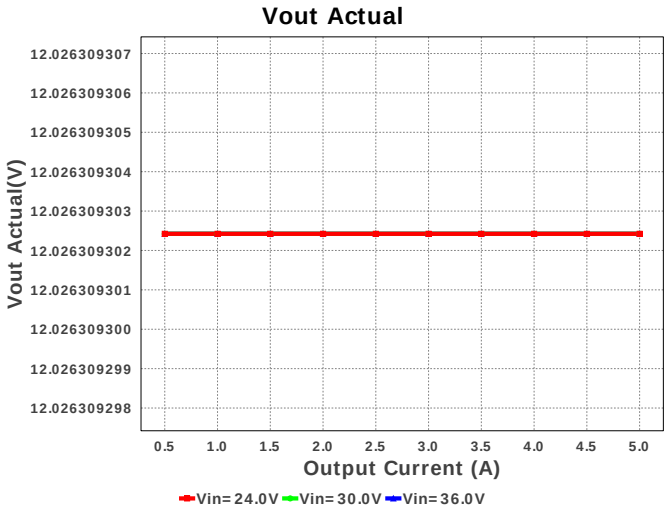

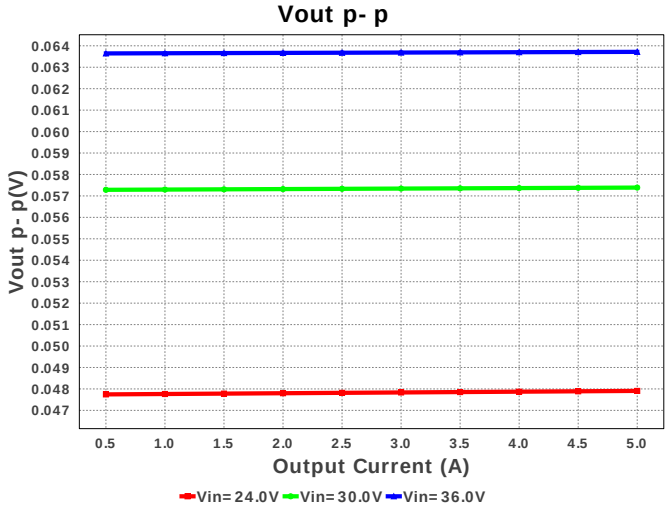

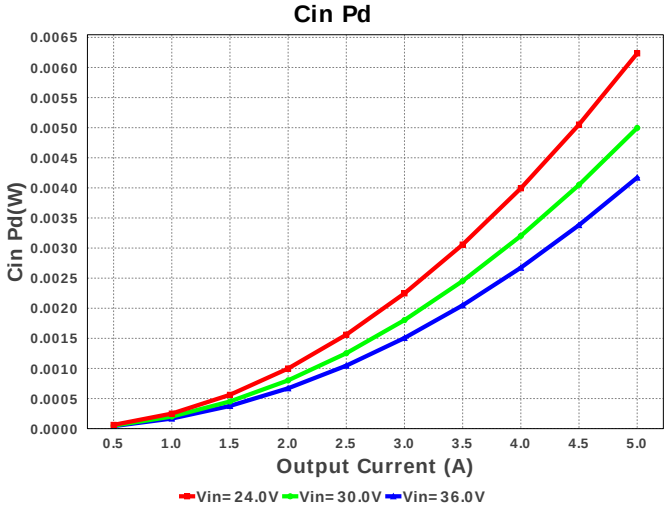

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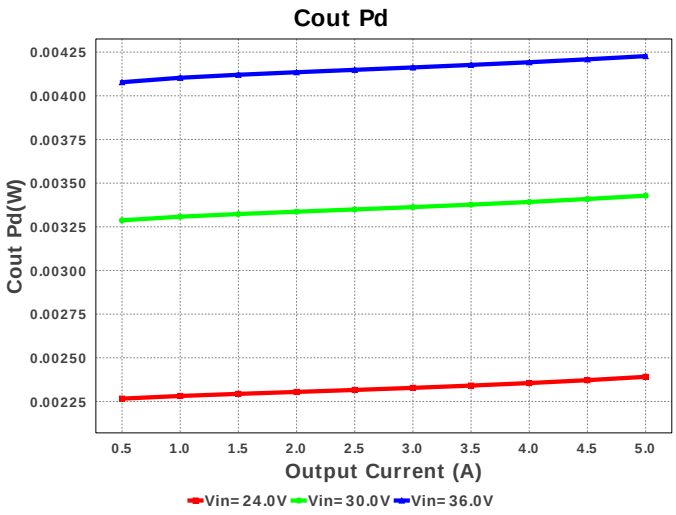

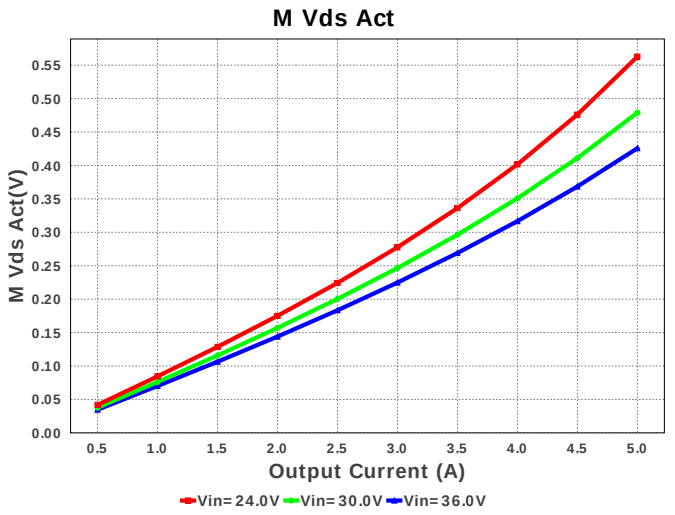

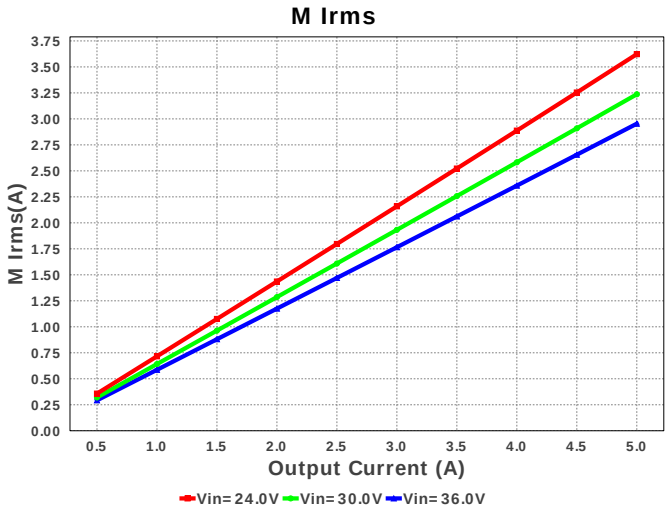

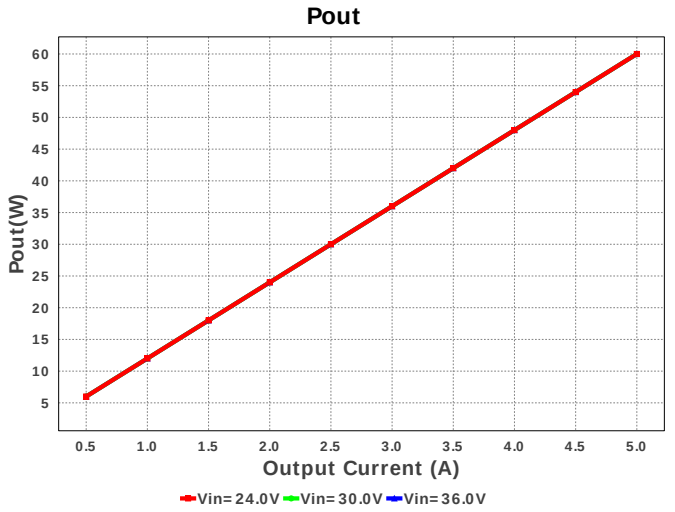

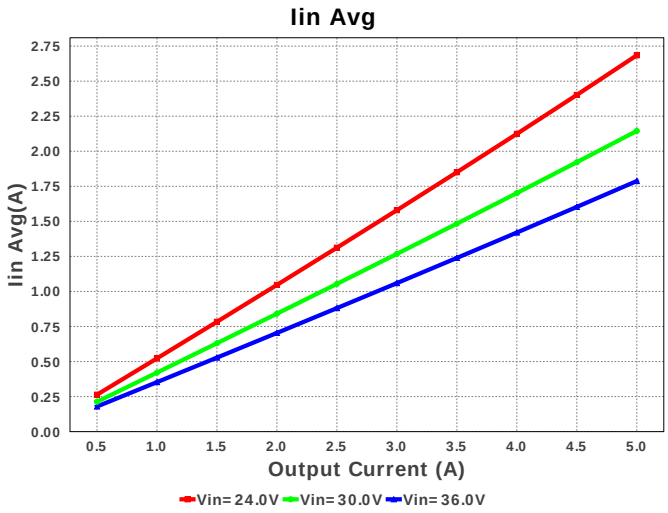

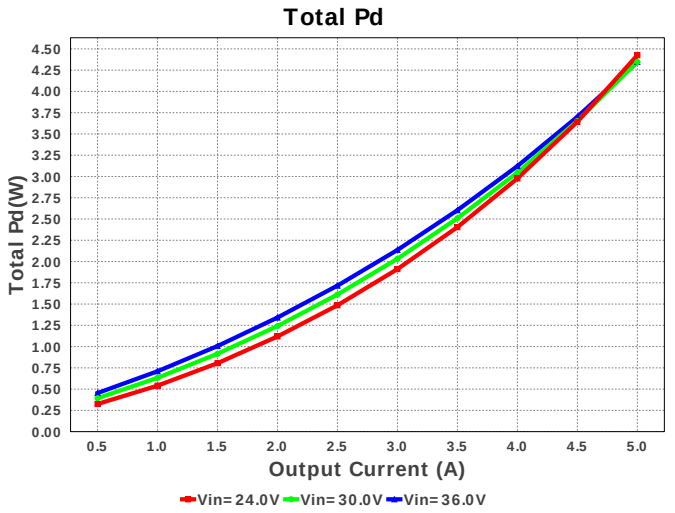

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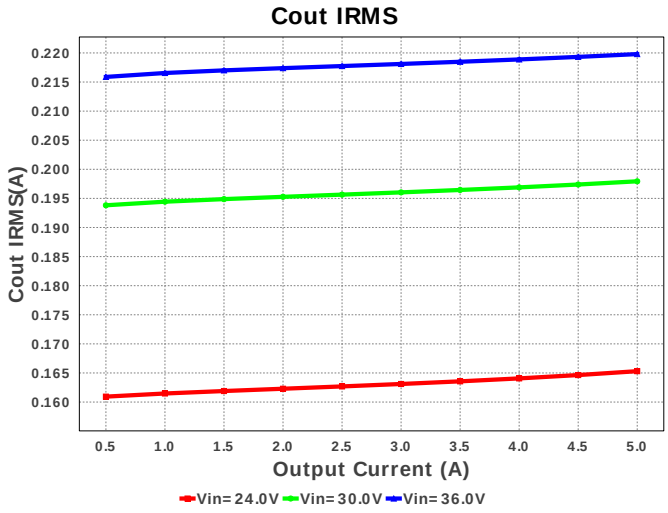

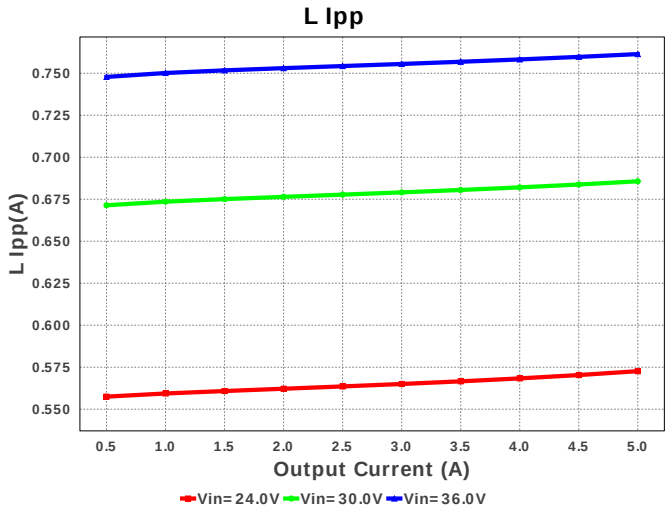

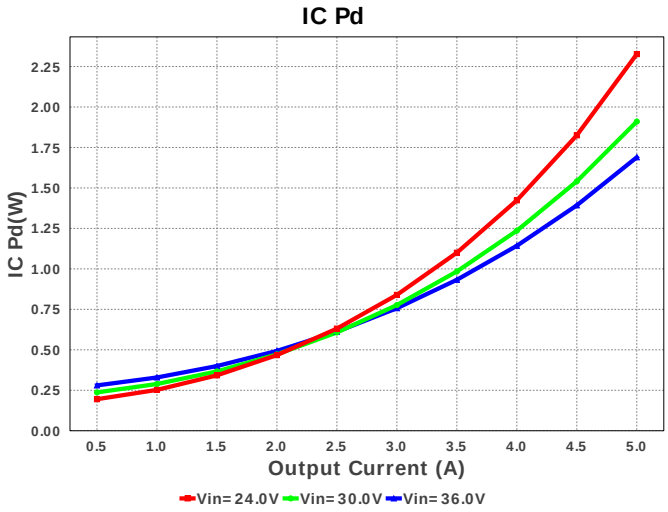

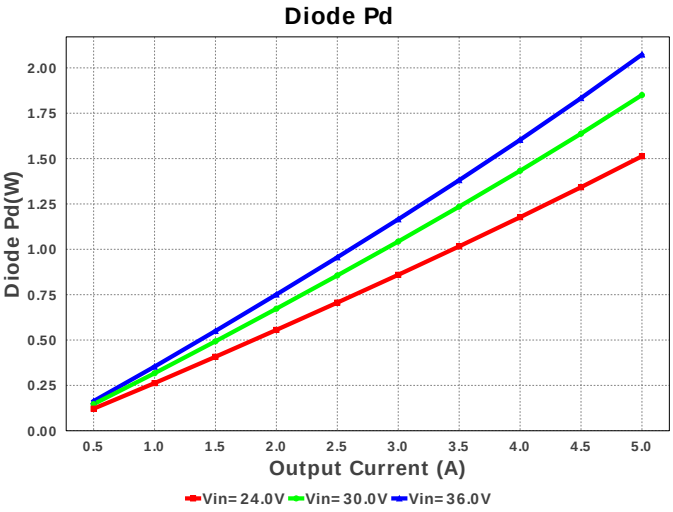

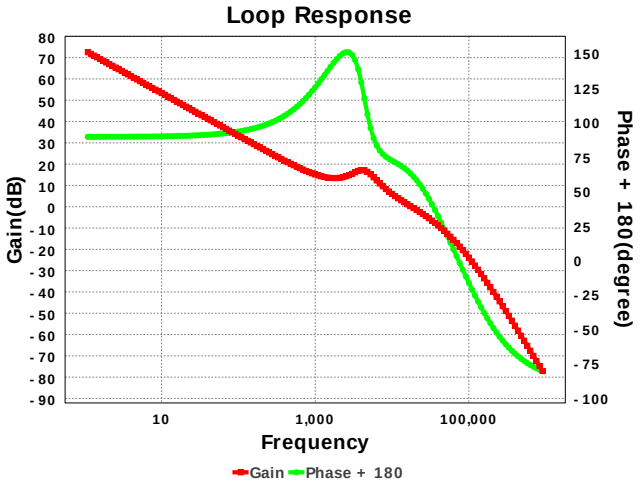

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.042 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	219.799 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	5.381 A	Current	Peak switch current in IC
4.	Iin Avg	1.788 A	Current	Average input current
5.	L Ipp	761.41 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	2.954 A	Current	Q Iavg
7.	BOM Count	11	General	Total Design BOM count
8.	FootPrint	562.0 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	425.695 mV	General	Voltage drop across the MosFET

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#	Name	Value	Category	Description
12.	Pout	60.0 W	General	Total output power
13.	Total BOM	$5.16	General	Total BOM Cost
14.	D1 Tj	92.2 degC	Op_Point	D1 junction temperature
15.	Vout Actual	12.026 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	17.901 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	34.898 %	Op_point	Duty cycle
19.	Efficiency	93.242 %	Op_point	Steady state efficiency
20.	IC Tj	80.682 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	62.77 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	36.0 V	Op_point	Vin operating point
25.	Vout p-p	66.654 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	4.171 mW	Power	Input capacitor power dissipation
27.	Cout Pd	4.227 mW	Power	Output capacitor power dissipation
28.	Diode Pd	2.073 W	Power	Diode power dissipation
29.	IC Pd	1.689 W	Power	IC power dissipation
30.	L Pd	577.5 mW	Power	Inductor power dissipation
31.	Total Pd	4.349 W	Power	Total Power Dissipation
32.	Vout Tolerance	3.342 %		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	36.0	Maximum input voltage
3.	VinMin	24.0	Minimum input voltage
4.	Vout	12.0	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.

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