WEBENCH® Design Report

VinMin = 18.0V
VinMax = 18.0V
Vout = 12.0V
Iout = 4.0A

Device = TPS5450DDAR
Topology = Buck
Created = 9/27/14 6:30:03 PM
BOM Cost = $4.33
Footprint = 377.0mm2
BOM Count = 8
Total Pd = 2.91W

Design : 3779120/654 TPS5450DDAR
TPS5450DDAR 18.0V-18.0V to 12.0V @ 4.0A

VinMin = 18.0V
VinMax = 18.0V

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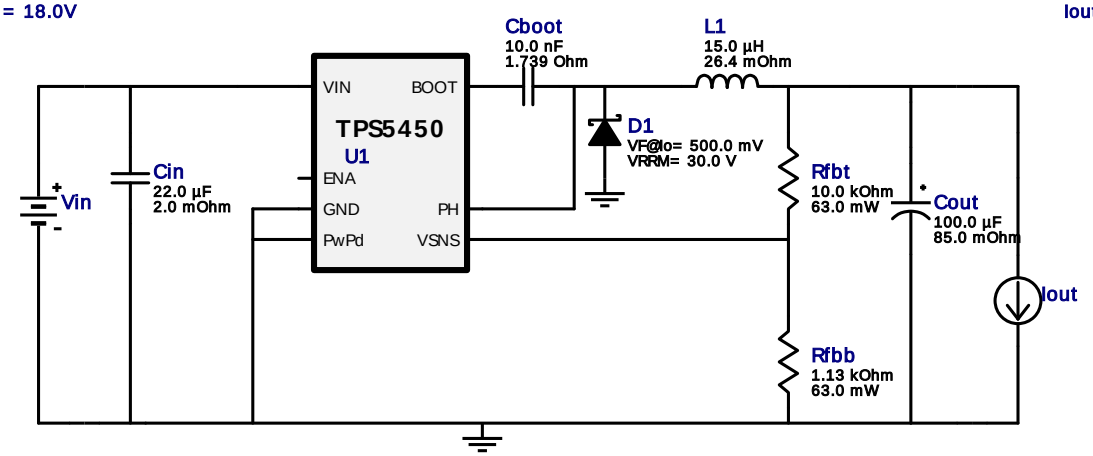
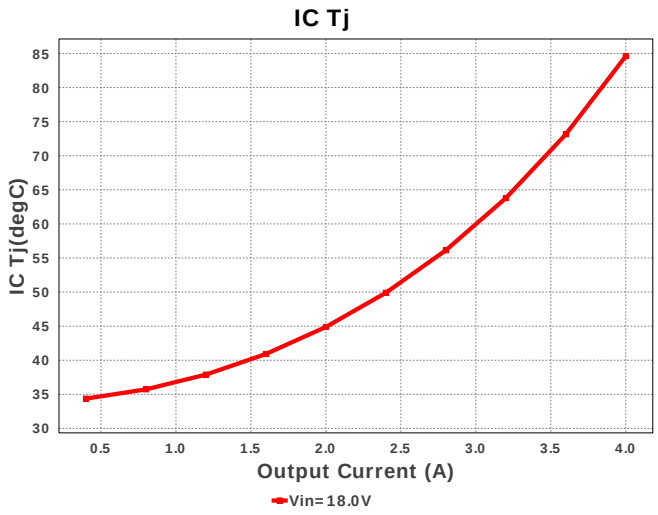
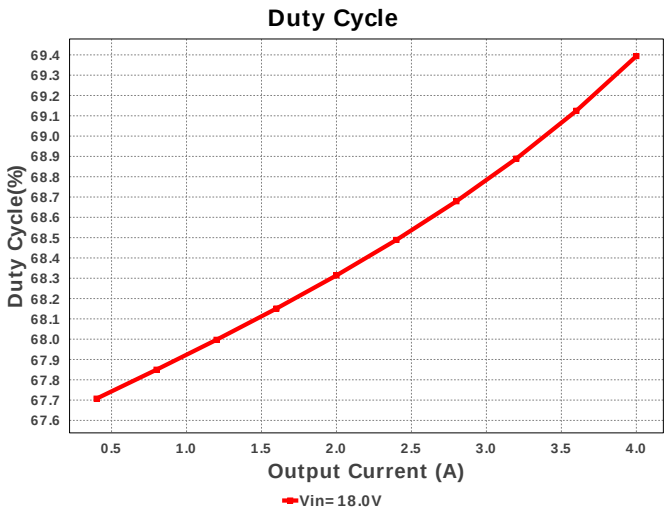
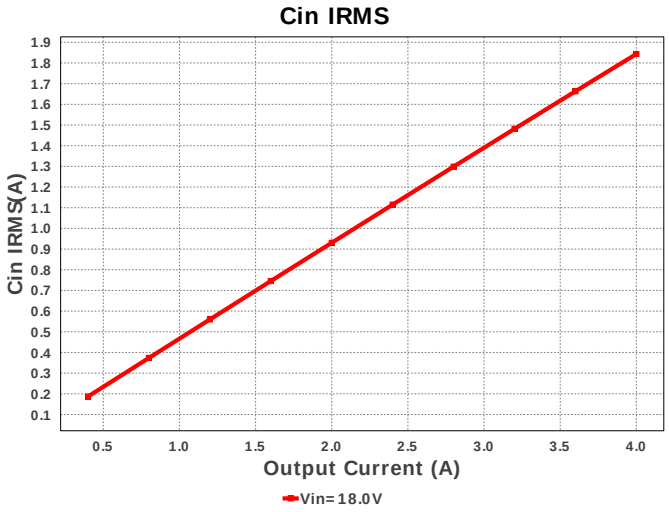


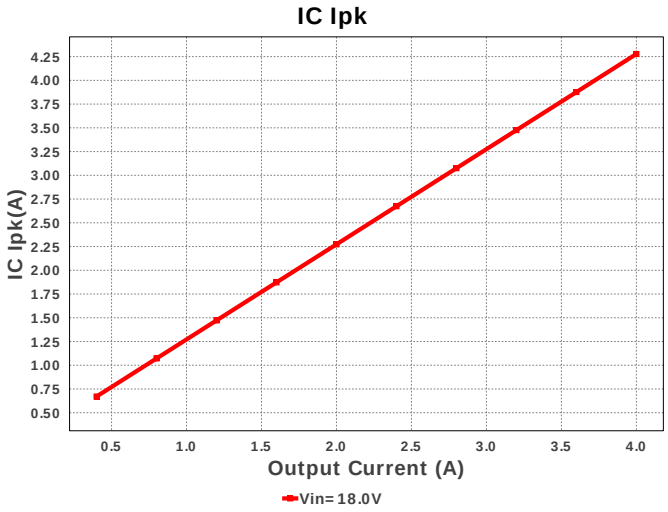
Electrical BOM

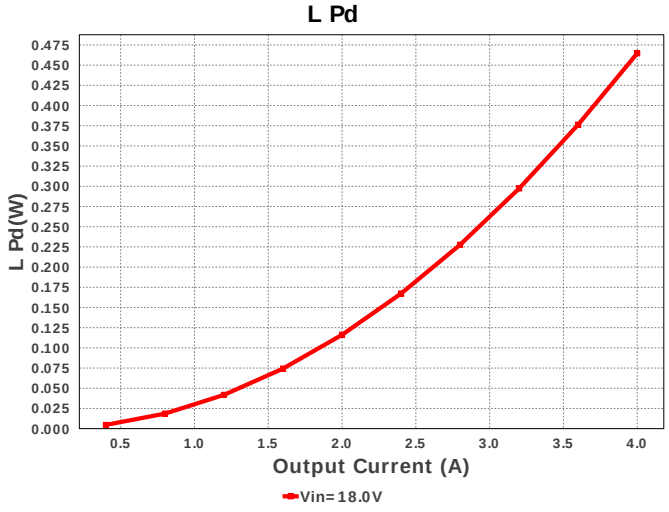
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	0805 7mm2
2.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	$0.28	1210 15mm2
3.	Cout	AVX	TPSD107K020R0085 Series= TPS	Cap= 100.0 uF ESR= 85.0 mOhm VDC= 20.0 V IRMS= 1.196 A	1	$1.07	7343-31 59mm2
4.	D1	Diodes Inc.	B230A-13-F	VF@Io= 500.0 mV VRRM= 30.0 V	1	$0.09	SMA 37mm2
5.	L1	Sumida	CDRH127/LDNP-150MC	L= 15.0 µH DCR= 26.4 mOhm	1	$0.61	CDRH127 196mm2
6.	Rfbb	Vishay-Dale	CRCW04021K13FKED Series= CRCW..e3	Res= 1.13 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
7.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
8.	U1	Texas Instruments	TPS5450DDAR	Switcher	1	$2.25	R-PDSO-G8 57mm2

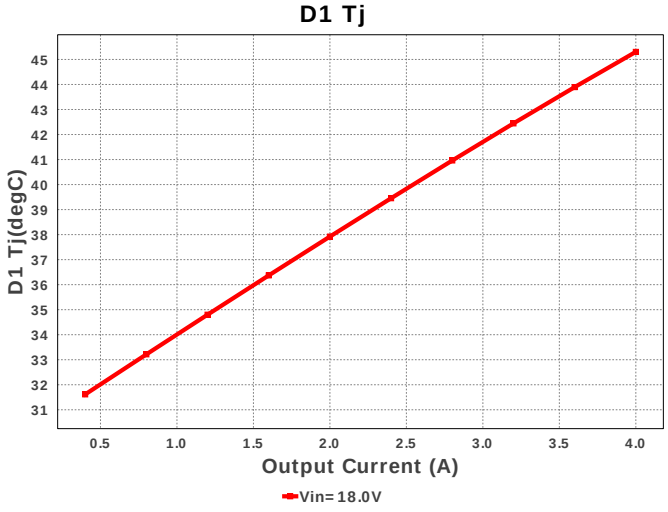


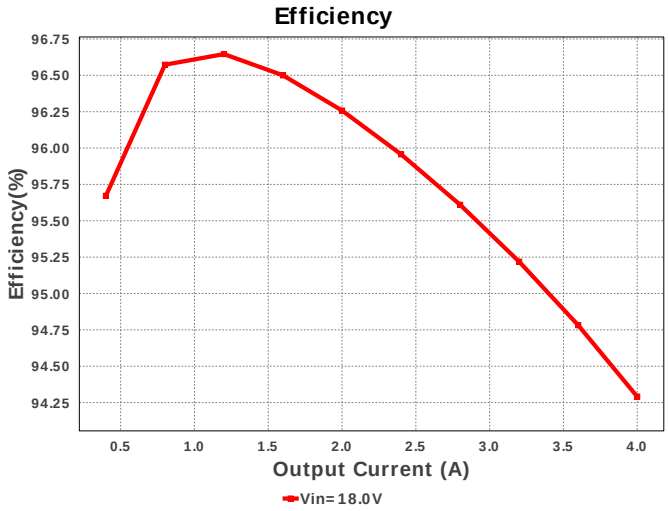


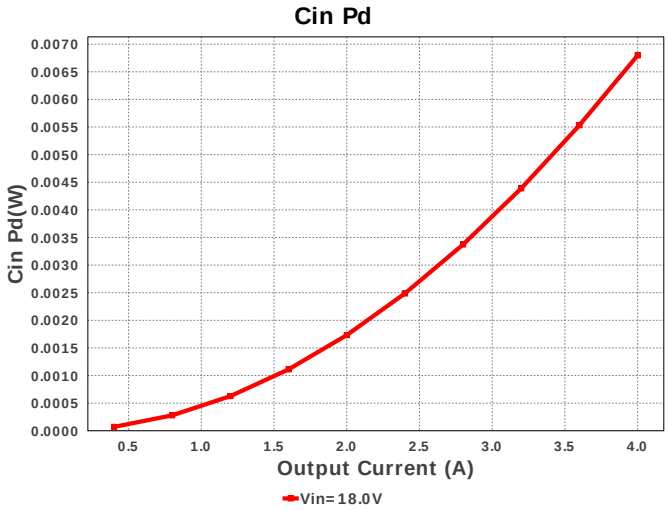


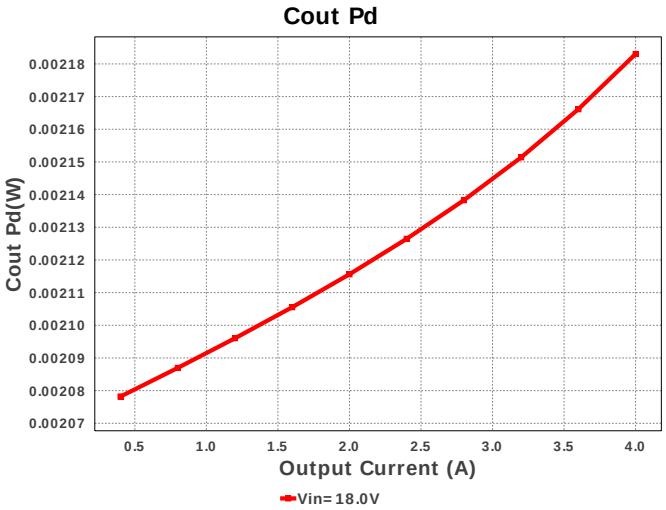


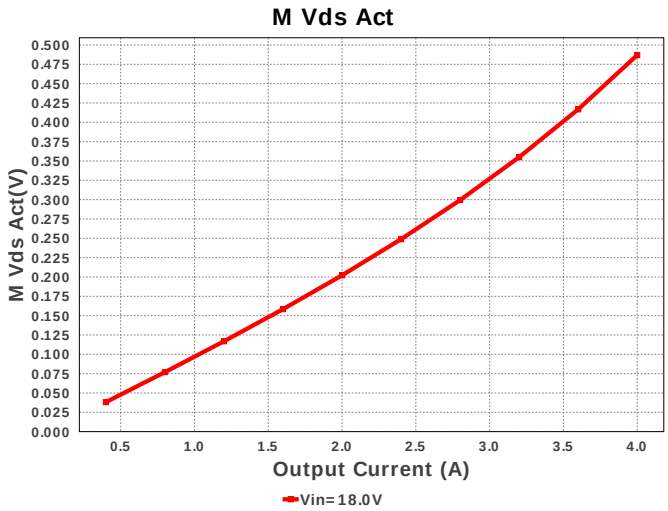


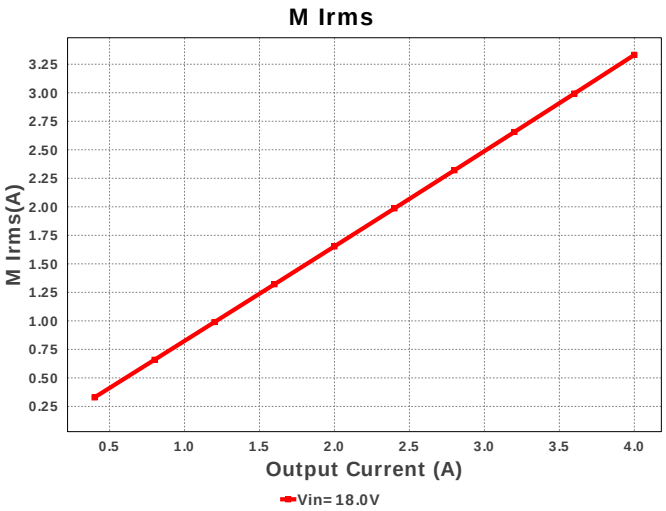


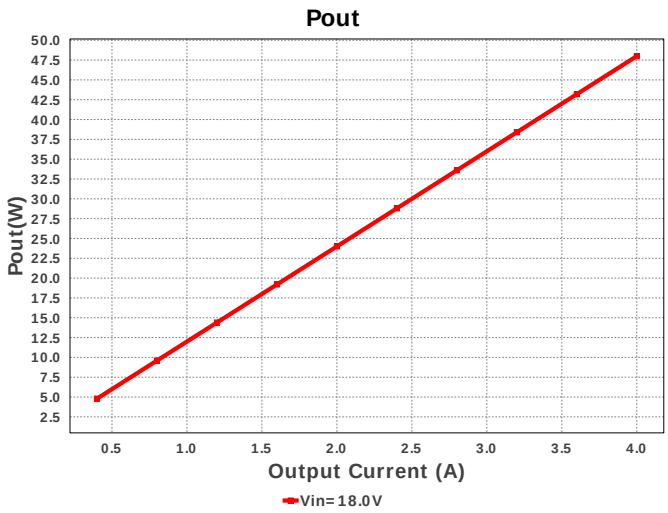


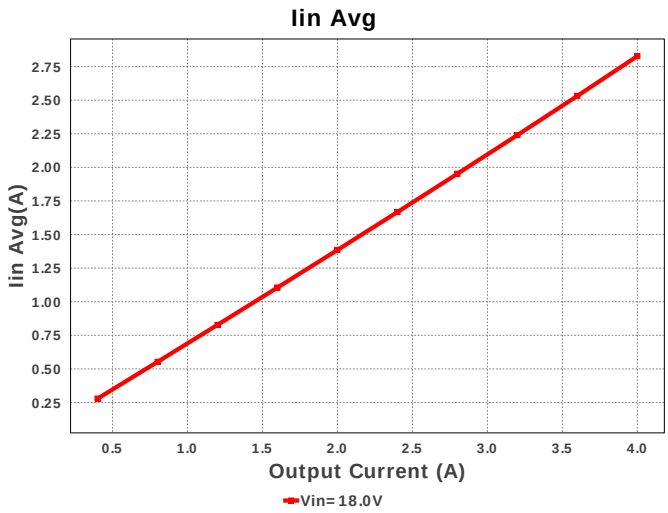


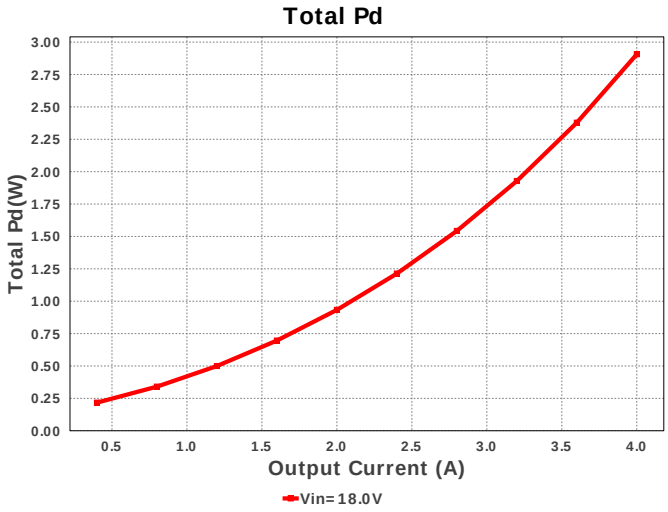


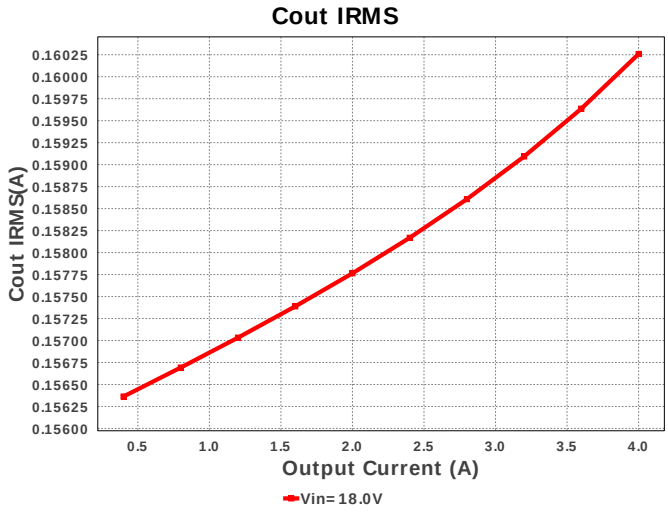


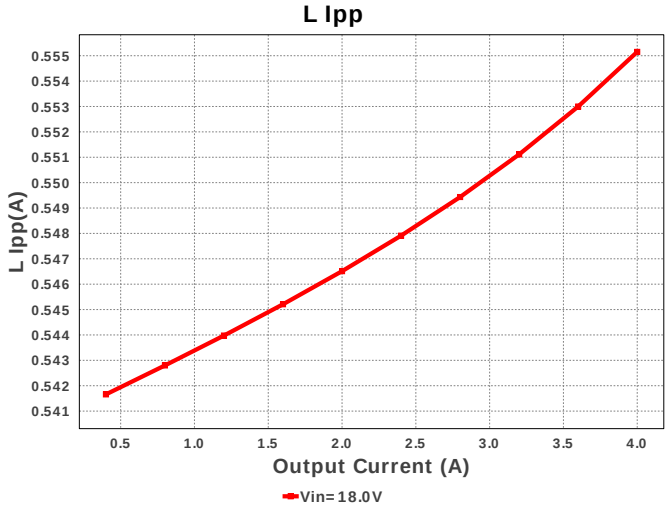


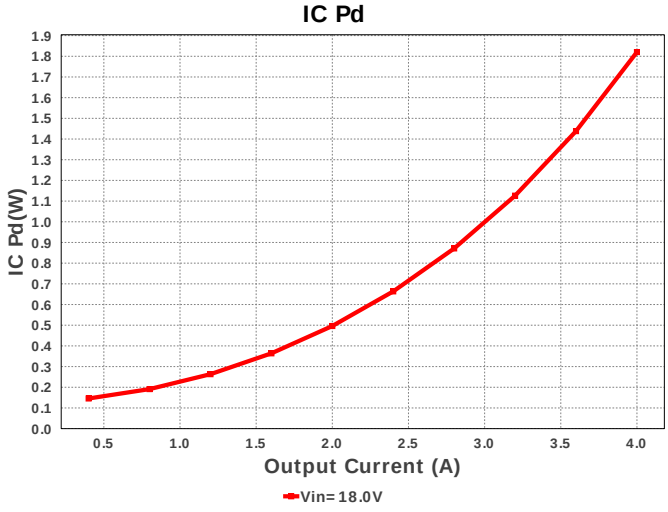


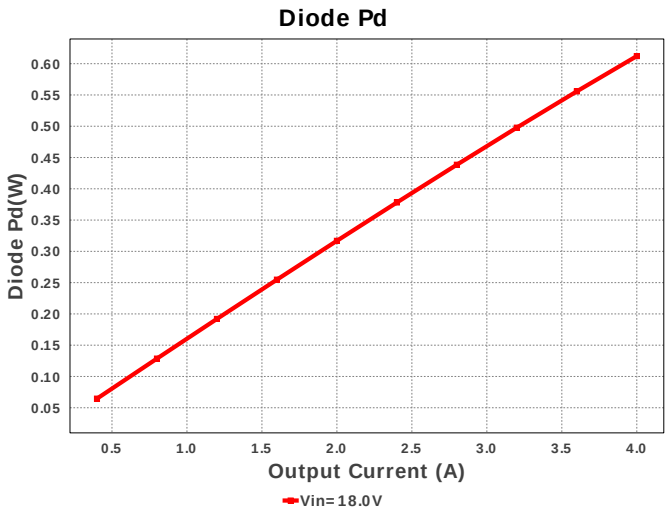


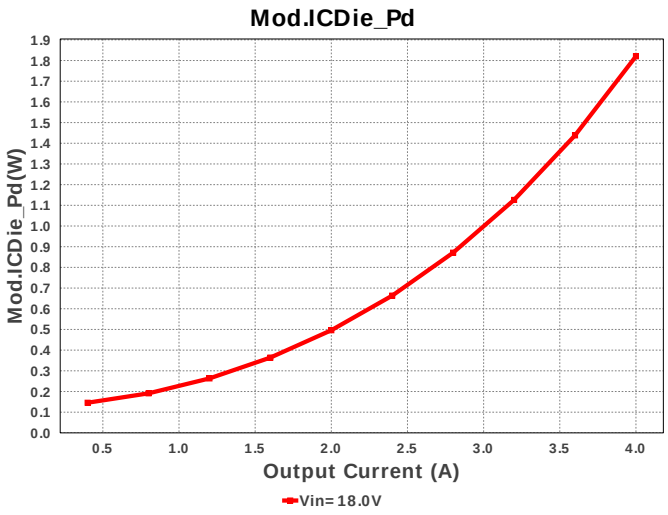


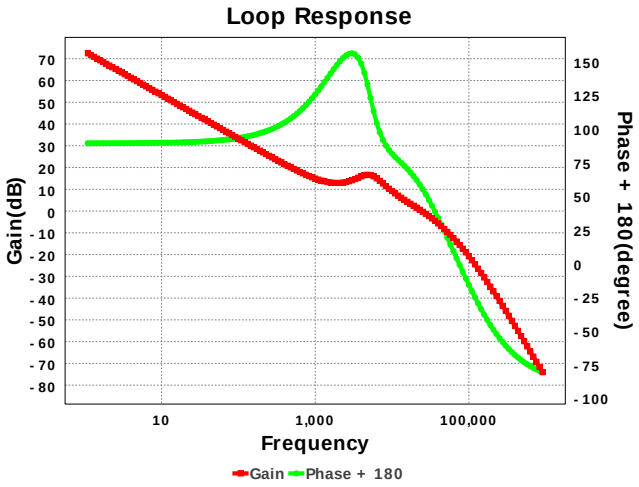












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.843 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	160.258 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	4.278 A	Current	Peak switch current in IC
4.	Iin Avg	2.828 A	Current	Average input current
5.	L Ipp	555.152 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	3.332 A	Current	MOSFET RMS current
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	377.0 mm2	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	486.902 mV	General	Voltage drop across the MosFET
12.	Pout	48.0 W	General	Total output power
13.	Total BOM	$4.33	General	Total BOM Cost
14.	D1 Tj	45.303 degC	Op_Point	D1 junction temperature
15.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
16.	Cross Freq	24.356 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	69.394 %	Op_point	Duty cycle
18.	Efficiency	94.291 %	Op_point	Steady state efficiency
19.	IC Tj	84.613 degC	Op_point	IC junction temperature
20.	ICThetaJA	30.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	4.0 A	Op_point	Iout operating point
22.	Phase Marg	57.068 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	18.0 V	Op_point	Vin operating point
24.	Vout p-p	47.208 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	6.796 mW	Power	Input capacitor power dissipation
26.	Cout Pd	2.183 mW	Power	Output capacitor power dissipation
27.	Diode Pd	612.121 mW	Power	Diode power dissipation
28.	IC Pd	1.82 W	Power	IC power dissipation
29.	L Pd	464.64 mW	Power	Inductor power dissipation
30.	Total Pd	2.906 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	4.0 A	Maximum Output Current
2.	Iout1	4.0 Amps	Output Current #1
3.	VinMax	18.0 V	Maximum input voltage
4.	VinMin	18.0 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	TPS5450	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0 degC	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.