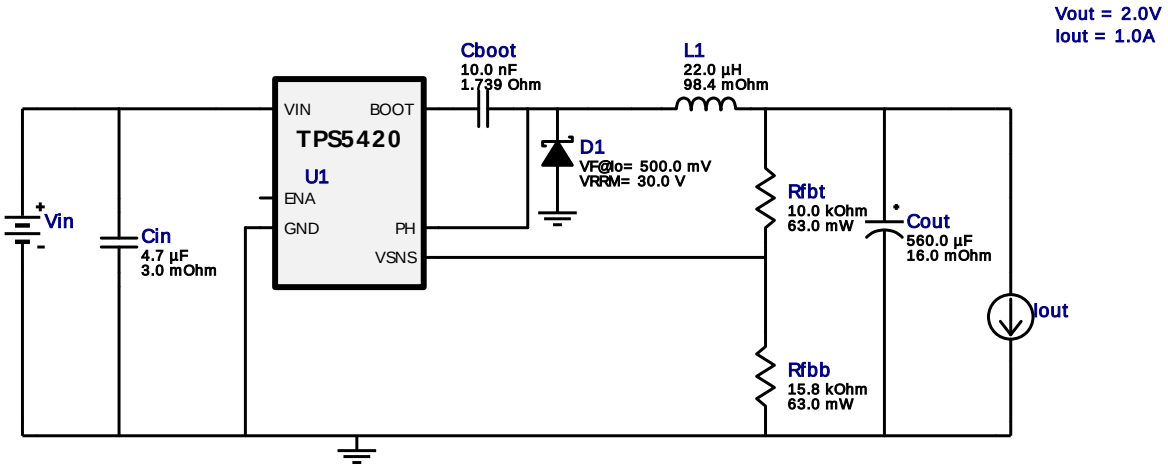
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 20.0V
Vout = 2.0V
Iout = 1.0A

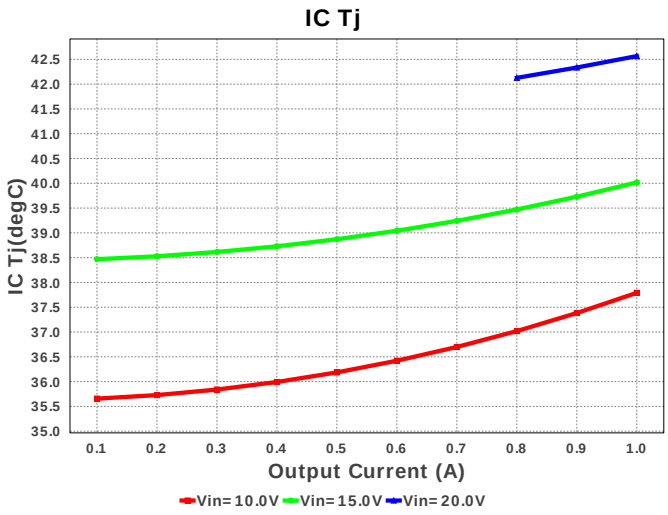
Device = TPS5420DR
Topology = Buck
Created = 7/19/16 7:21:39 AM
BOM Cost = $2.64
BOM Count = 8
Total Pd = 0.61W

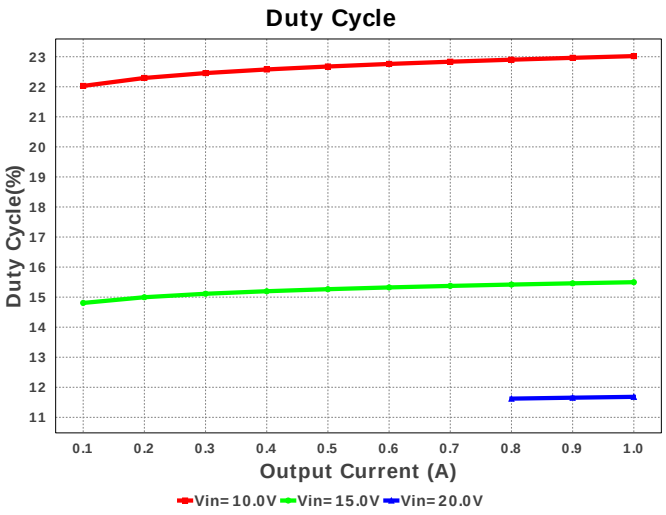
Design : 4728750/14 TPS5420DR
TPS5420DR 10.0V-20.0V to 2.00V @ 1.0A

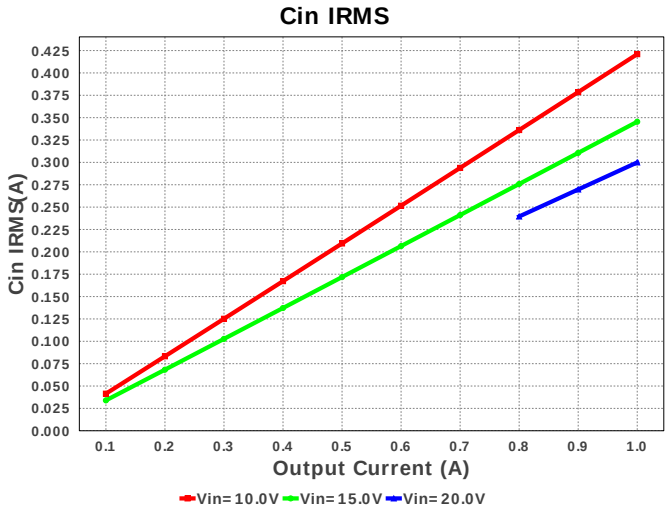


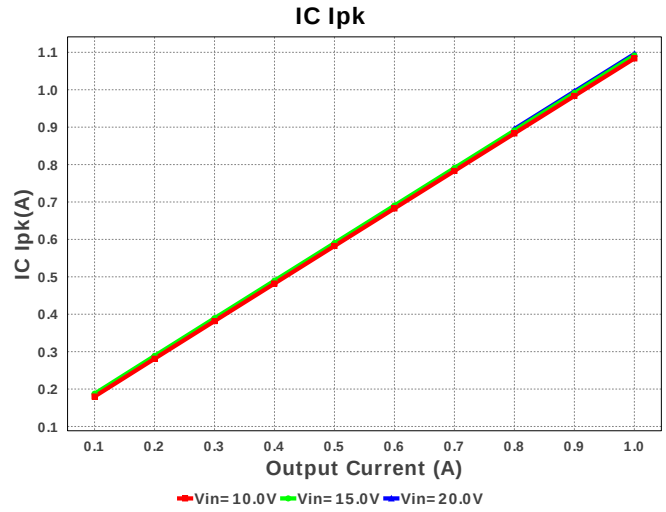
Electrical BOM

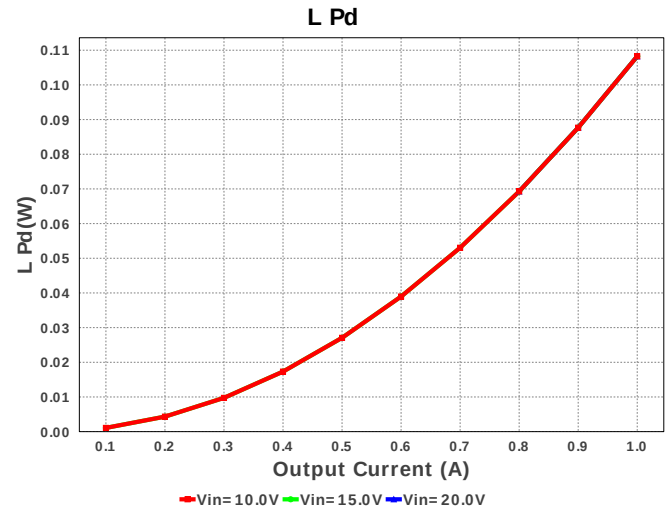
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	$0.07	1206 11 mm²
3.	Cout	Panasonic	2R5SVPC560M Series= SVPC	Cap= 560.0 uF ESR= 16.0 mOhm VDC= 2.5 V IRMS= 3.5 A	1	$0.32	SM_RADIAL_6.3AMM 80 mm²
4.	D1	Diodes Inc.	B230A-13-F	VF@Io= 500.0 mV VRRM= 30.0 V	1	$0.09	SMA 37 mm²
5.	L1	TDK	SLF6045T-220M1R1-3PF	L= 22.0 µH DCR= 98.4 mOhm	1	$0.43	SLF6045 64 mm²
6.	Rfbb	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 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
8.	U1	Texas Instruments	TPS5420DR	Switcher	1	$1.70	M08A 55 mm²

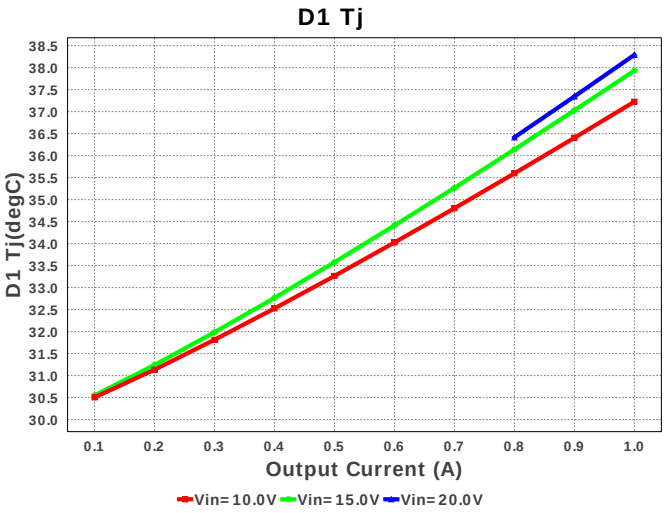


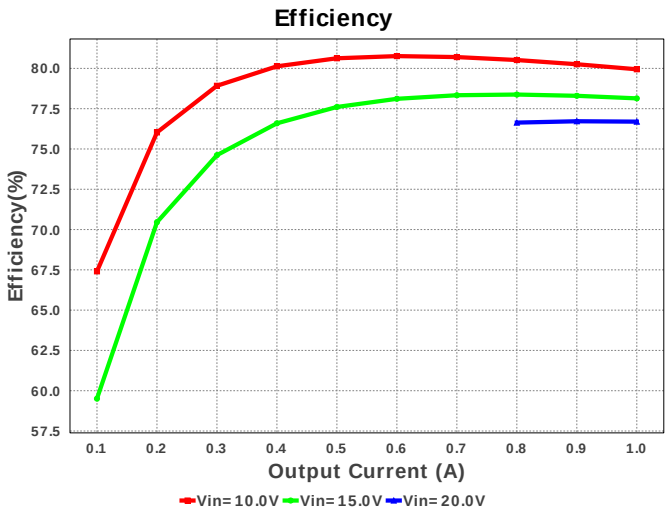


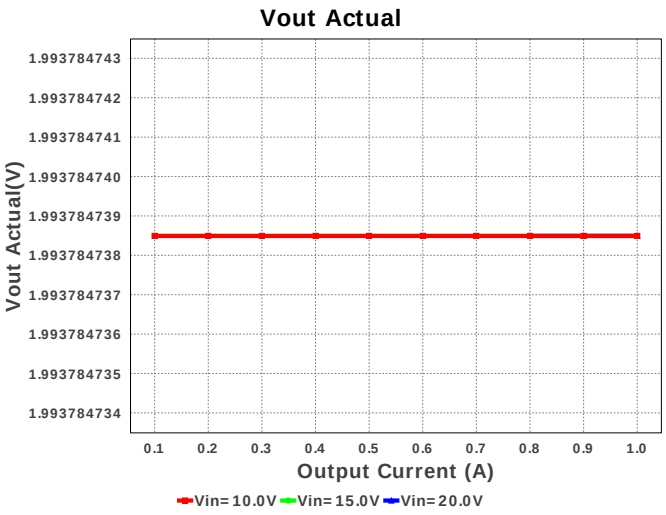


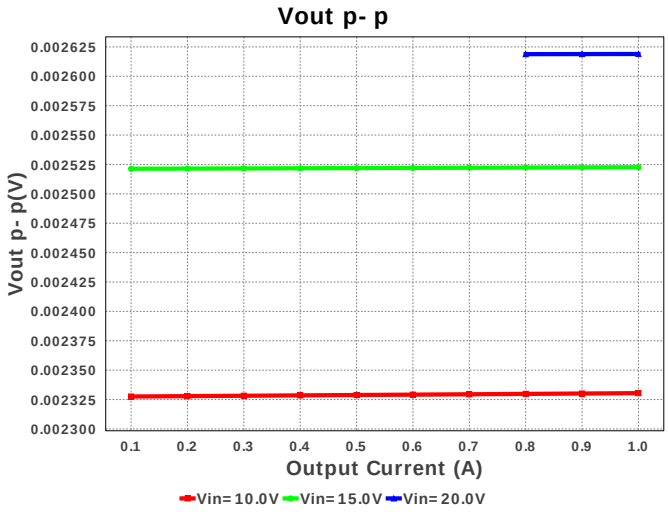


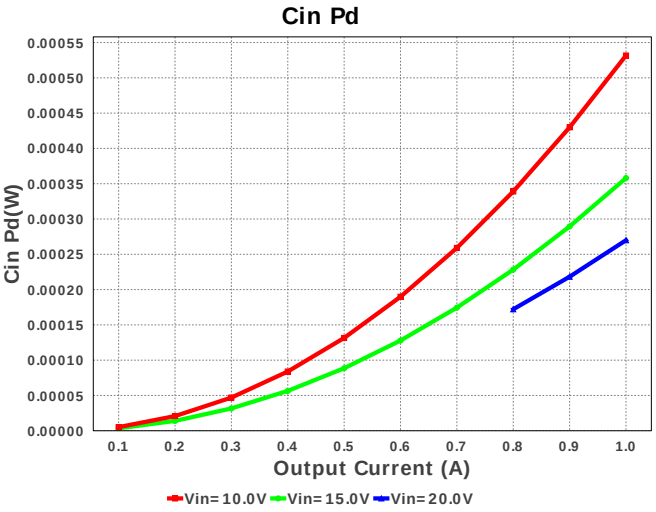


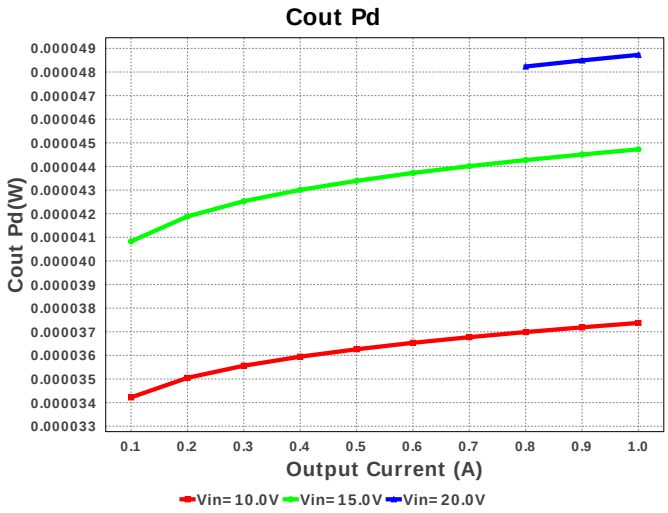


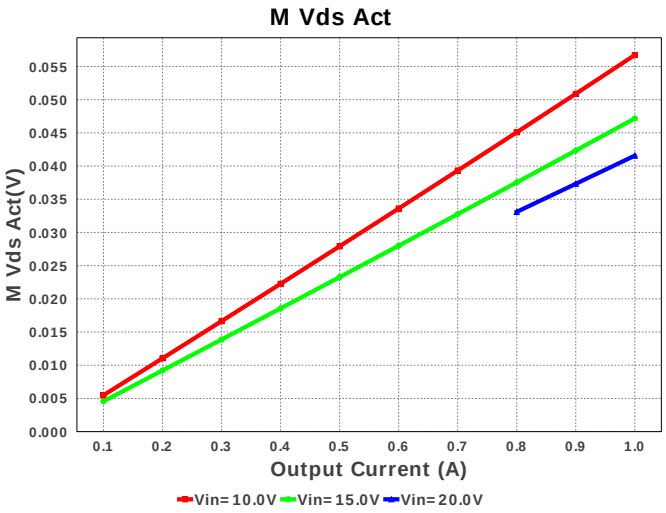


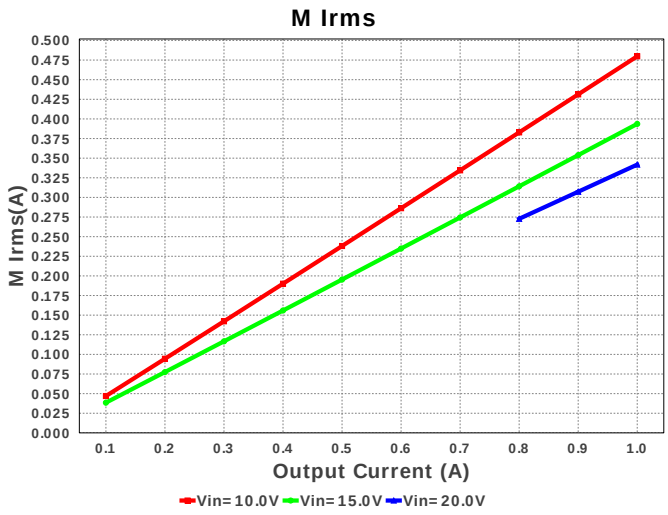


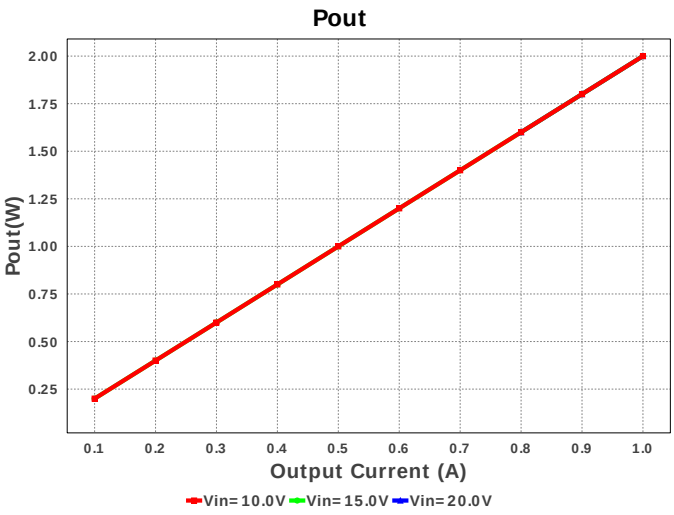


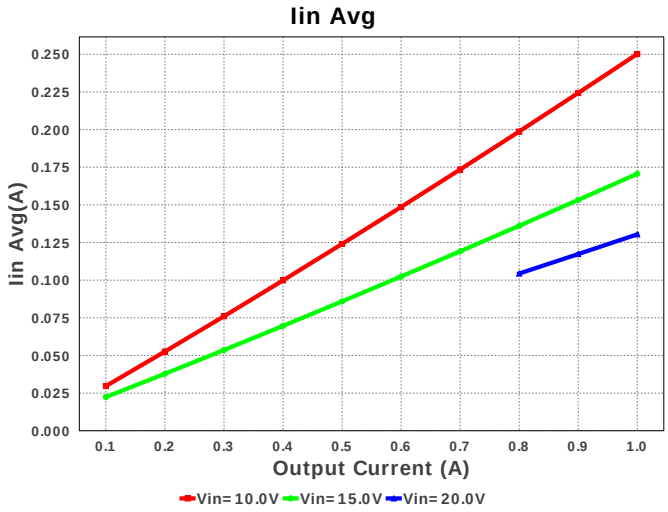


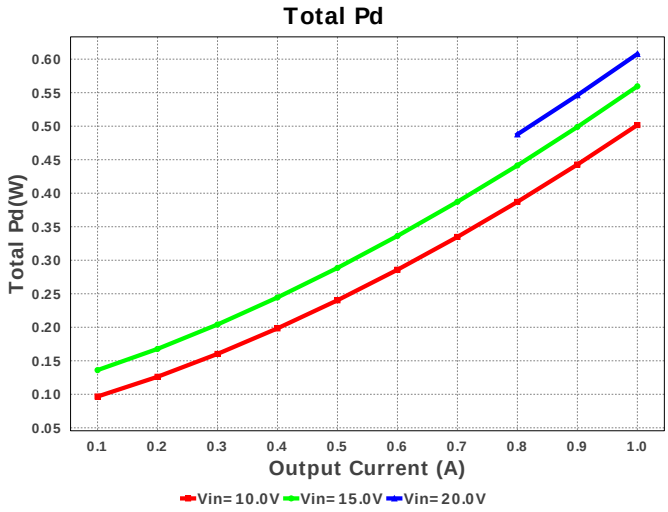


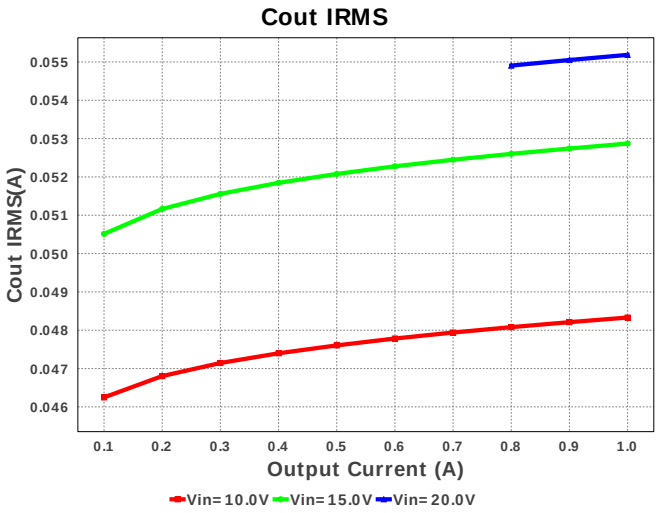


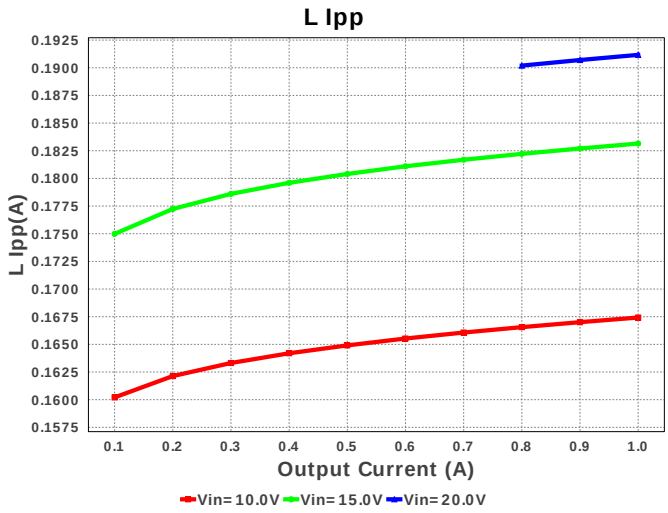


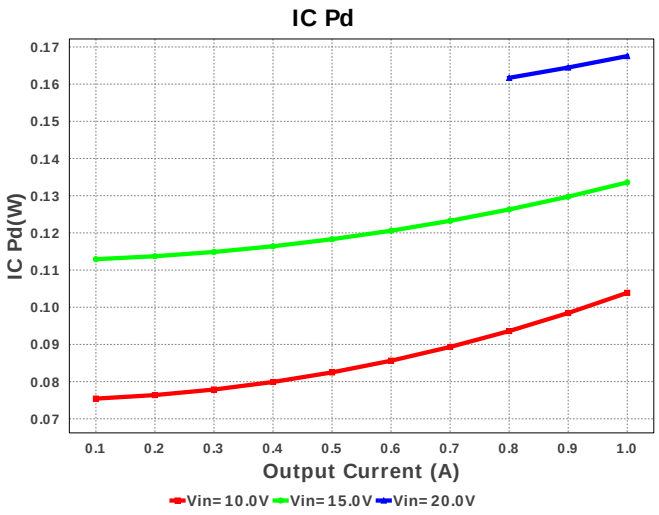


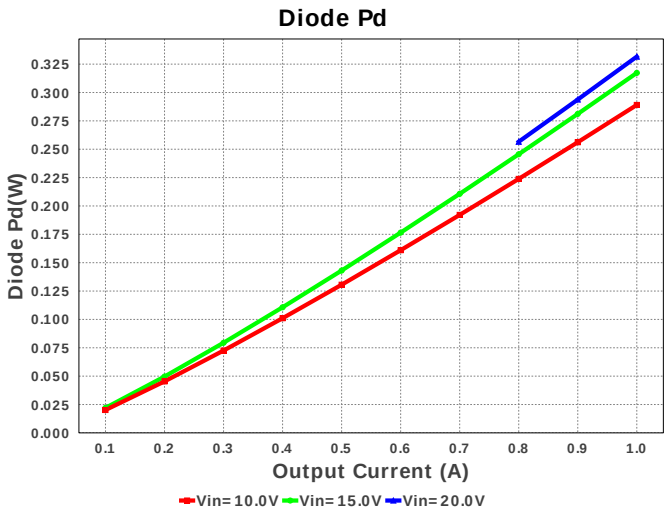


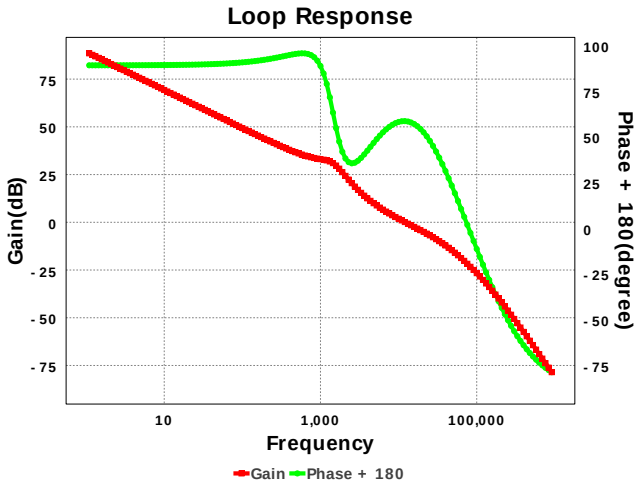












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	299.948 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	55.185 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.096 A	Current	Peak switch current in IC
4.	Iin Avg	130.39 mA	Current	Average input current
5.	L Ipp	191.17 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	341.794 mA	Current	Q Iavg
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	260.0 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	41.569 mV	General	Voltage drop across the MosFET
12.	Pout	2.0 W	General	Total output power
13.	Total BOM	$2.64	General	Total BOM Cost
14.	D1 Tj	38.29 degC	Op_Point	D1 junction temperature
15.	Vout Actual	1.994 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	2.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	12.197 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	11.682 %	Op_point	Duty cycle
19.	Efficiency	76.696 %	Op_point	Steady state efficiency
20.	IC Tj	42.566 degC	Op_point	IC junction temperature
21.	ICThetaJA	75.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	1.0 A	Op_point	Iout operating point
23.	Phase Marg	59.448 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	20.0 V	Op_point	Vin operating point
25.	Vout p-p	3.06 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	269.906 µW	Power	Input capacitor power dissipation
27.	Cout Pd	48.725 µW	Power	Output capacitor power dissipation
28.	Diode Pd	331.606 mW	Power	Diode power dissipation
29.	IC Pd	167.541 mW	Power	IC power dissipation
30.	L Pd	108.24 mW	Power	Inductor power dissipation
31.	Total Pd	607.722 mW	Power	Total Power Dissipation

#	Name	Value	Category	Description
32.	Vout Tolerance	2.295 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	2.0	Output Voltage
5.	base_pn	TPS5420	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Feature Highlights: 2A, 500kHz Fixed Switching Frequency, Internal Compensation

2. **TPS5420** Product Folder : http://www.ti.com/product/TPS5420 : contains the data sheet and other resources.