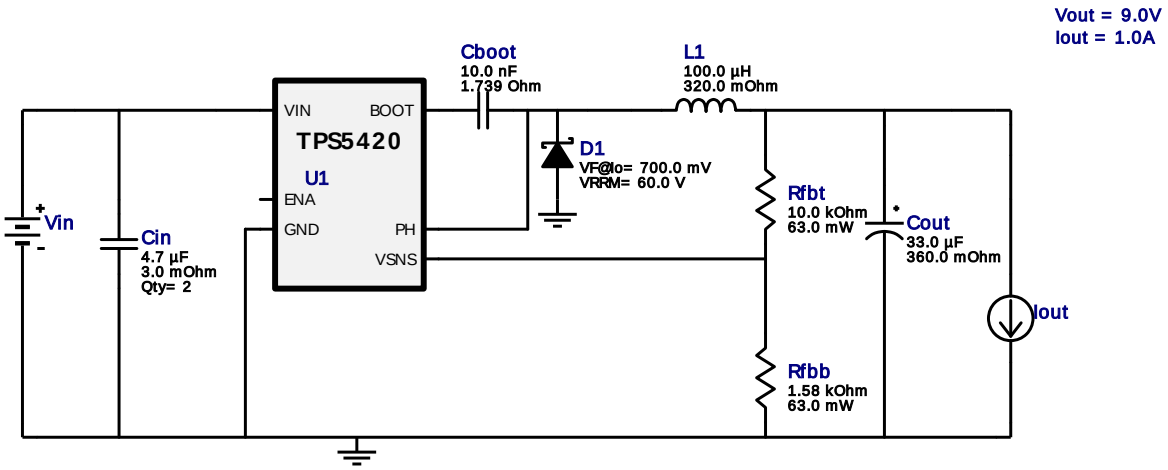
WEBENCH® Design Report

VinMin = 12.0V
VinMax = 30.0V
Vout = 9.0V
Iout = 1.0A

Device = TPS5420DR
Topology = Buck
Created = 7/19/16 8:13:18 PM
BOM Cost = $2.33
BOM Count = 9
Total Pd = 0.97W

Design : 1852521/26 TPS5420DR
TPS5420DR 12.0V-30.0V to 9.00V @ 1.0A



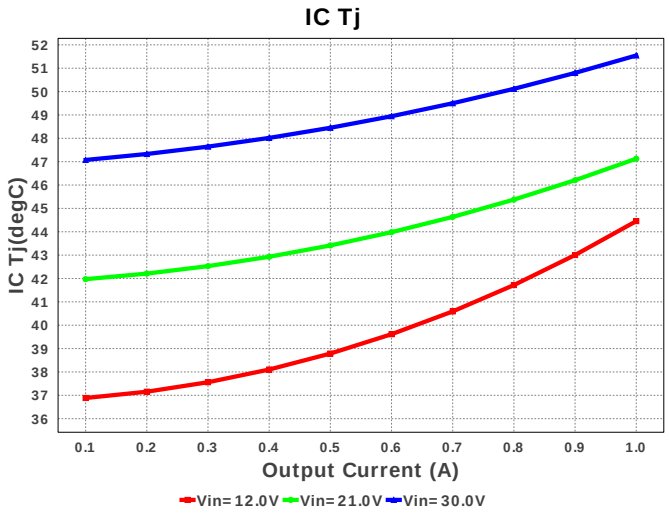
My Comments

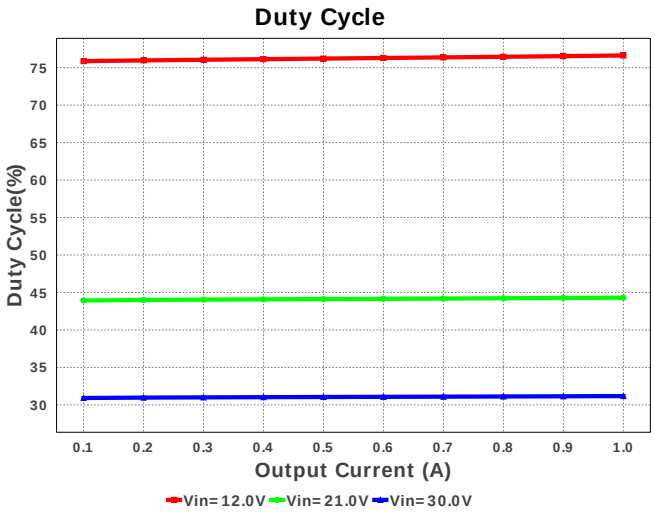
No comments

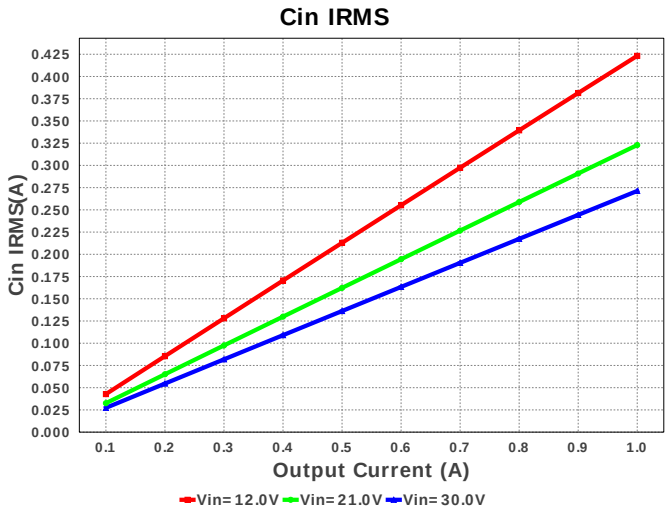
Electrical BOM

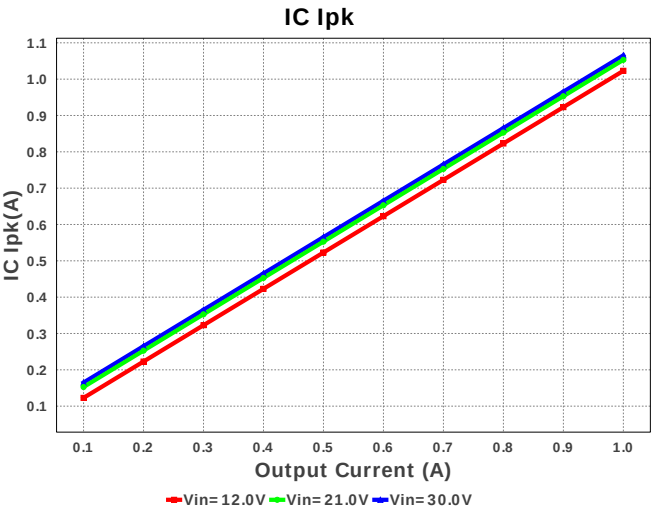
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	2	$0.07	1206 11 mm²
3.	Cout	Panasonic	EEE-FK1E330P Series= FK	Cap= 33.0 uF ESR= 360.0 mOhm VDC= 25.0 V IRMS= 240.0 mA	1	$0.11	SM_RADIAL_D 84 mm²
4.	D1	Diodes Inc.	B160-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.06	SMA 37 mm²
5.	L1	Bourns	SDR1105-101KL	L= 100.0 µH DCR= 320.0 mOhm	1	$0.29	SDR1105 157 mm²
6.	Rfbb	Vishay-Dale	CRCW04021K58FKED Series= CRCW..e3	Res= 1.58 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

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	U1	Texas Instruments	TPS5420DR	Switcher	1	$1.70	 M08A 55 mm^2

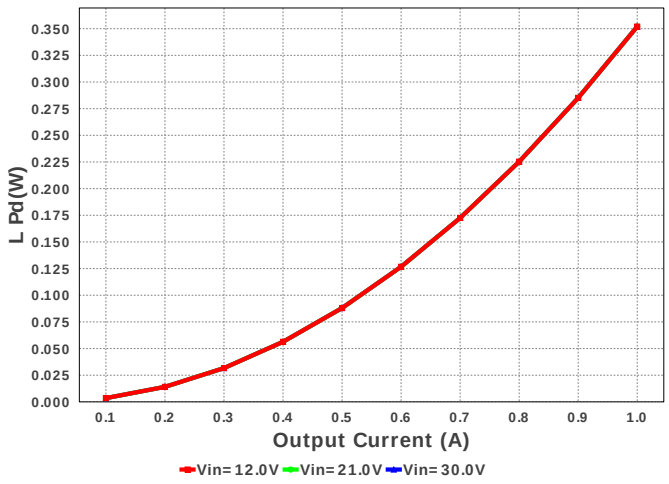




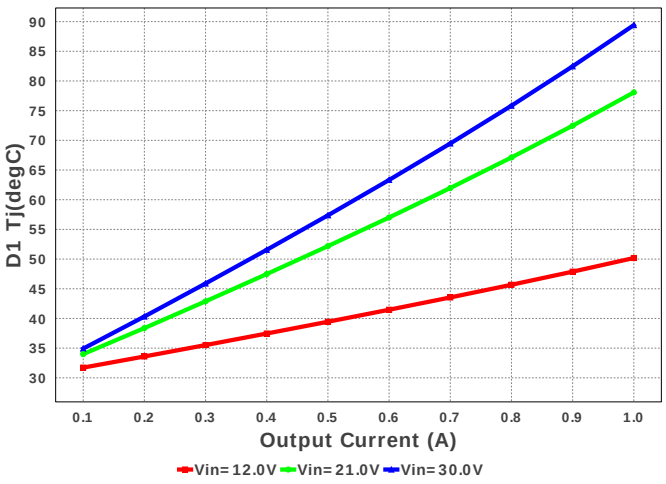




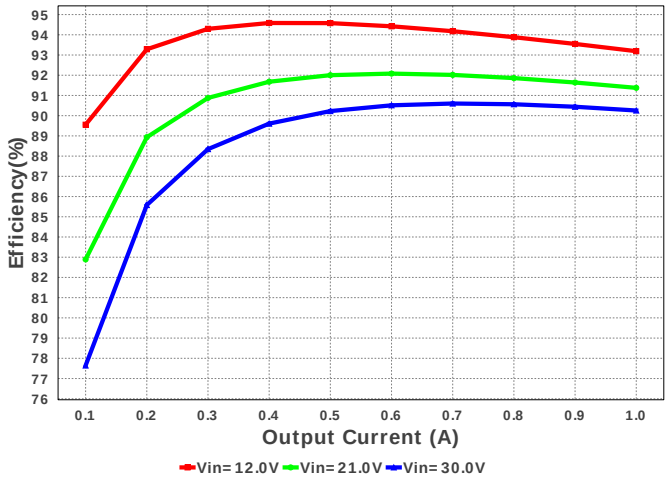
L Pd



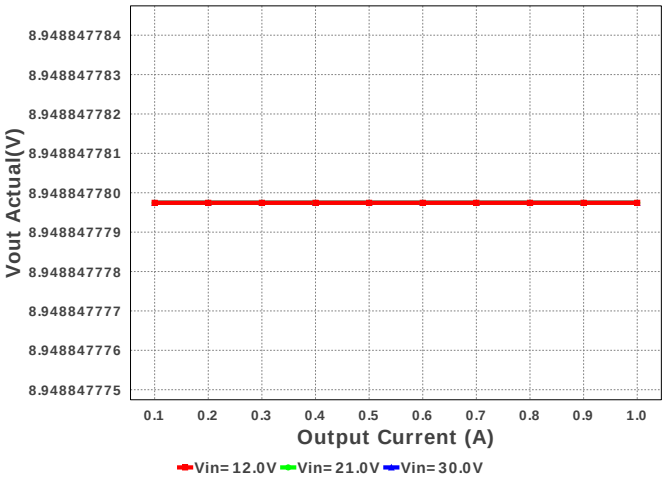
D1 Tj



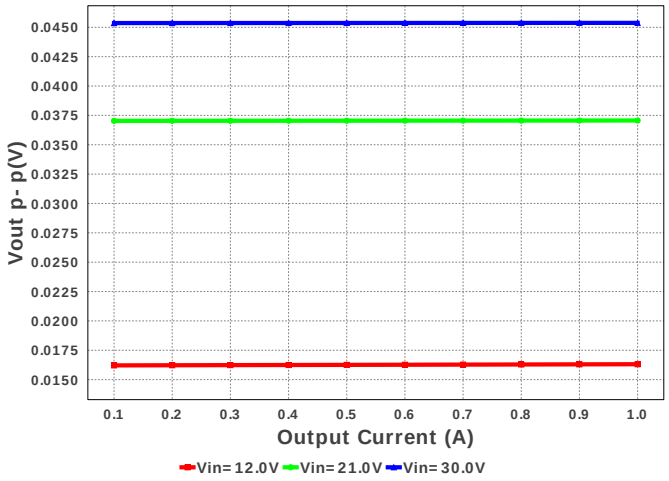
Efficiency



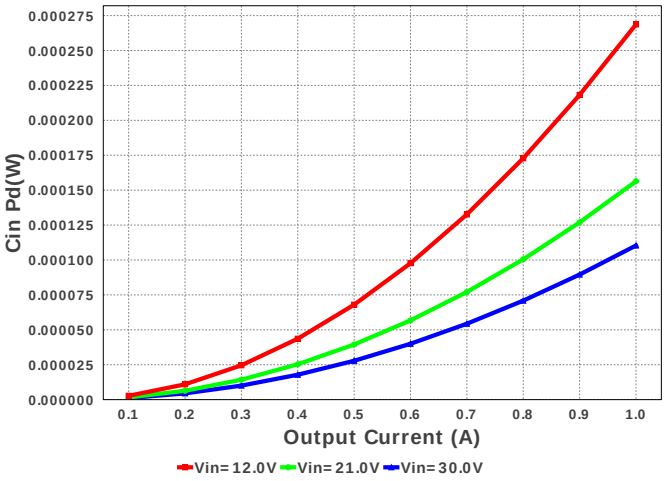
Vout Actual

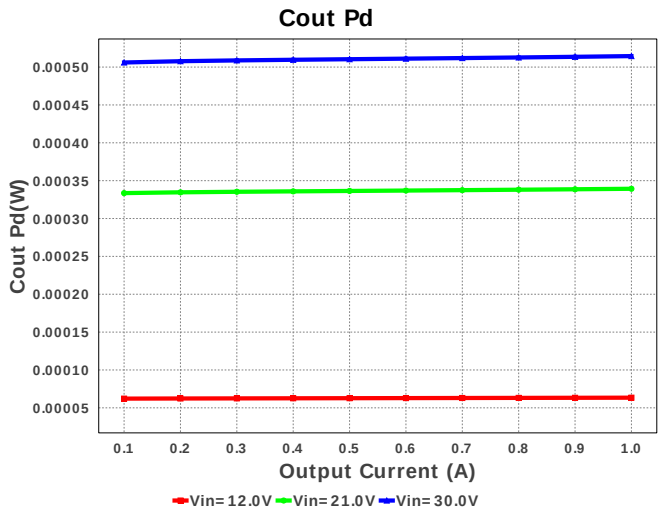


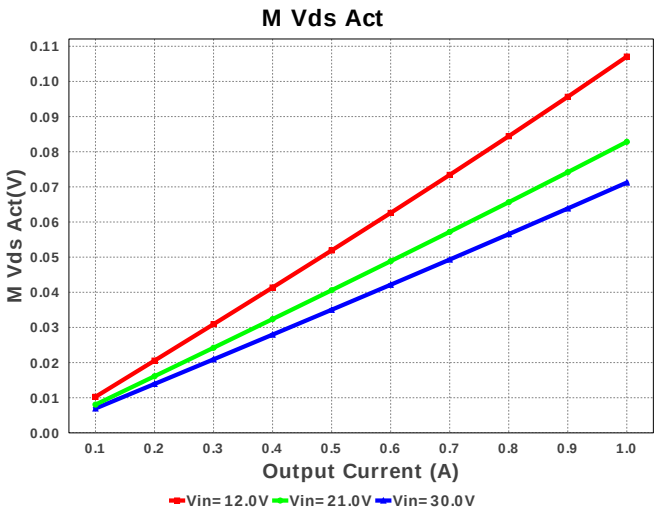
Vout p- p

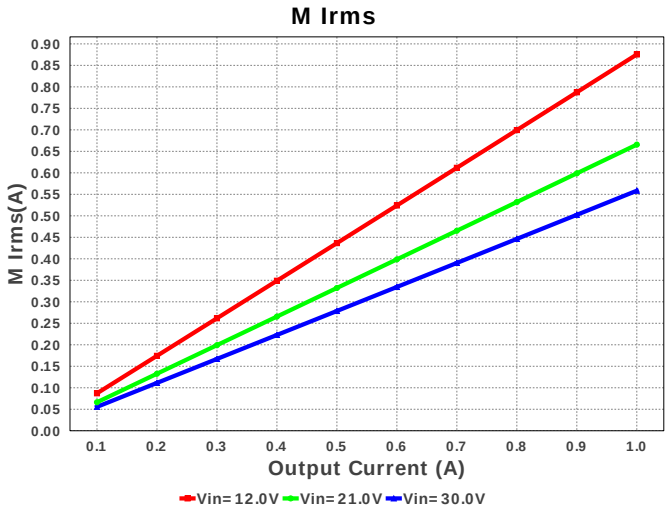


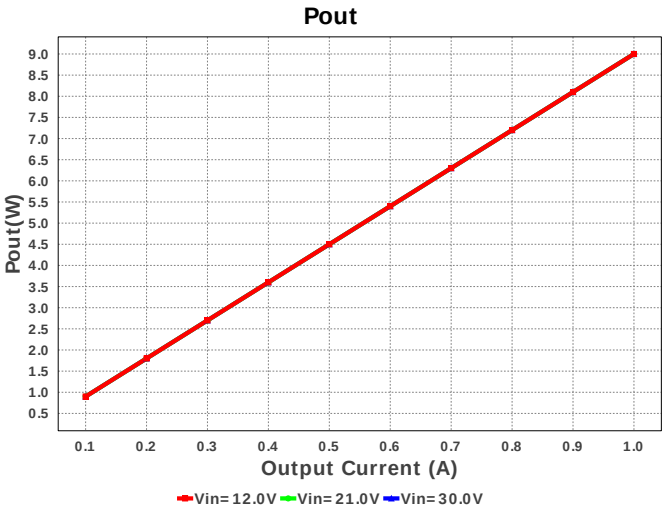
Cin Pd

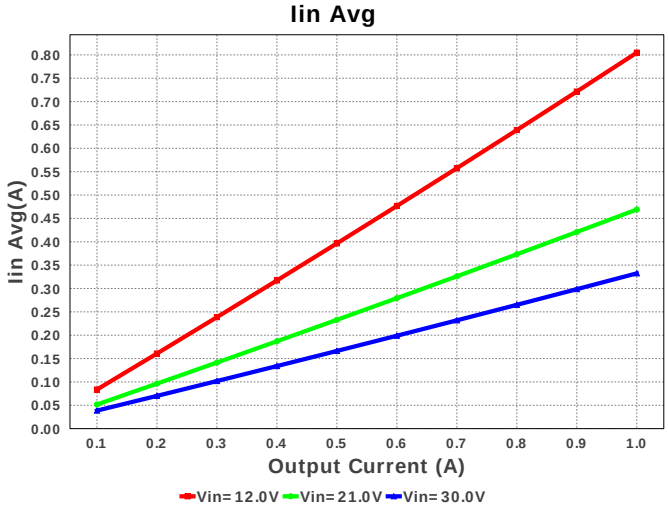


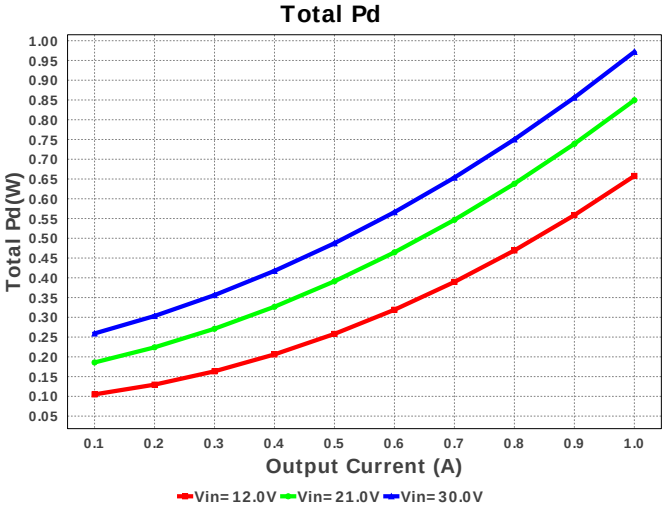


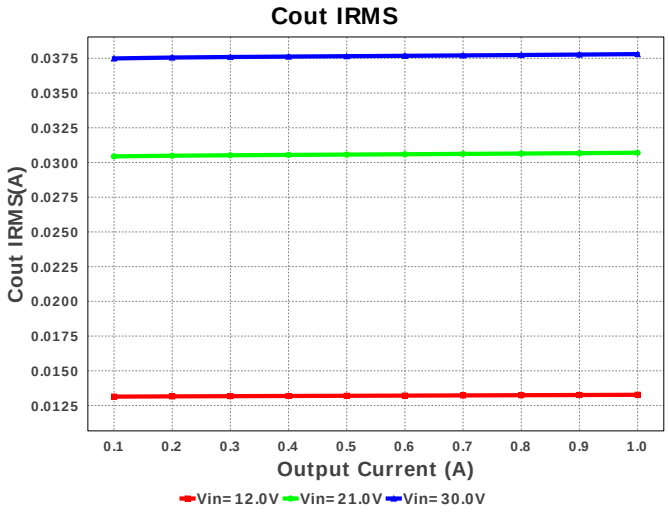


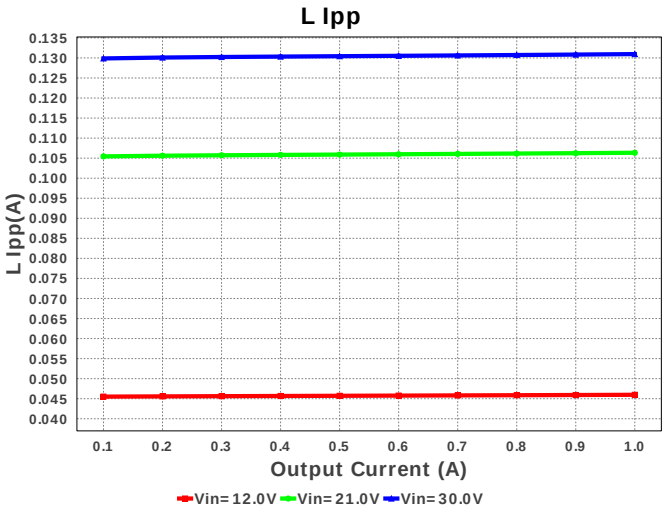


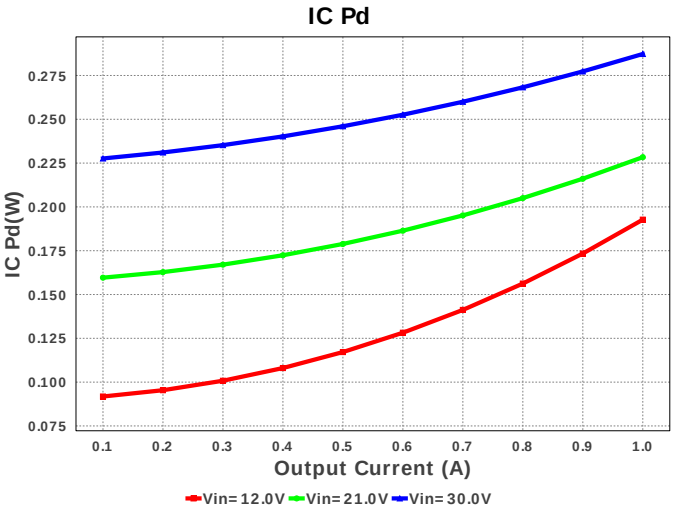


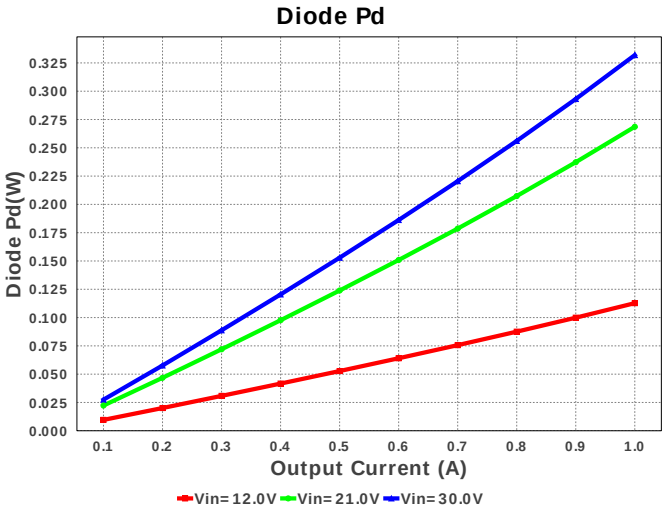


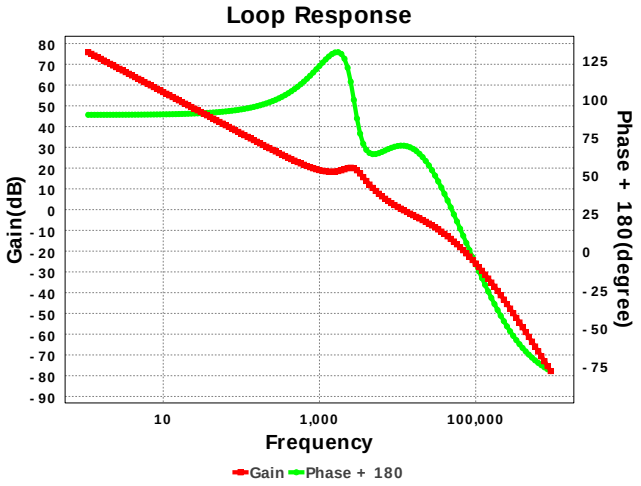












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	271.256 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	37.804 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.065 A	Current	Peak switch current in IC
4.	Iin Avg	332.39 mA	Current	Average input current
5.	L Ipp	130.96 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	558.394 mA	Current	MOSFET RMS current
7.	BOM Count	9	General	Total Design BOM count
8.	FootPrint	369.0 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	71.222 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	9.0 W	General	Total output power
13.	Total BOM	$2.33	General	Total BOM Cost
14.	D1 Tj	89.411 degC	Op_Point	D1 junction temperature
15.	Vout Actual	8.949 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	11.568 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	31.18 %	Op_point	Duty cycle
19.	Efficiency	90.255 %	Op_point	Steady state efficiency
20.	IC Tj	51.545 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	69.898 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	30.0 V	Op_point	Vin operating point
25.	Vout p-p	47.155 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	110.37 µW	Power	Input capacitor power dissipation
27.	Cout Pd	514.497 µW	Power	Output capacitor power dissipation
28.	Diode Pd	331.905 mW	Power	Diode power dissipation
29.	IC Pd	287.27 mW	Power	IC power dissipation
30.	L Pd	352.0 mW	Power	Inductor power dissipation
31.	Total Pd	971.742 mW	Power	Total Power Dissipation
32.	Vout Tolerance	3.271 %		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	30.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	TPS5420	Texas Instruments Base Part 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.