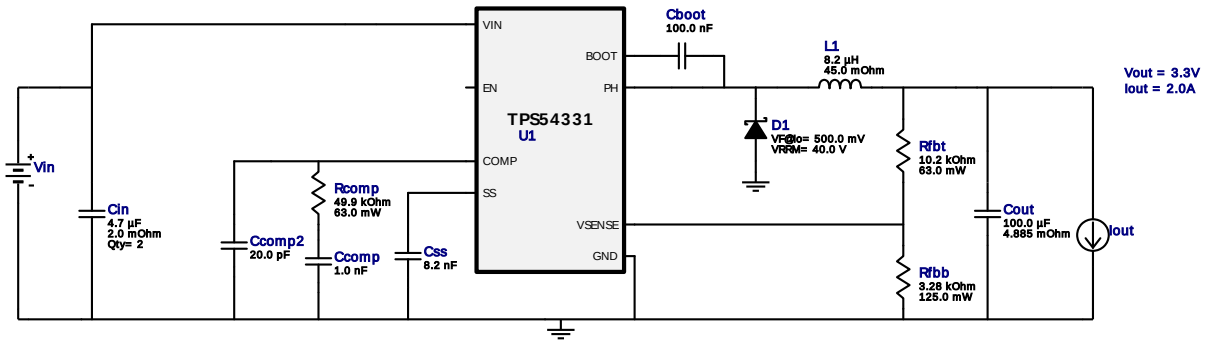
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 3.3V
Iout = 2.0A

Device = TPS54331DDAR
Topology = Buck
Created = 8/17/16 7:59:34 PM
BOM Cost = $1.61
BOM Count = 13
Total Pd = 1.48W

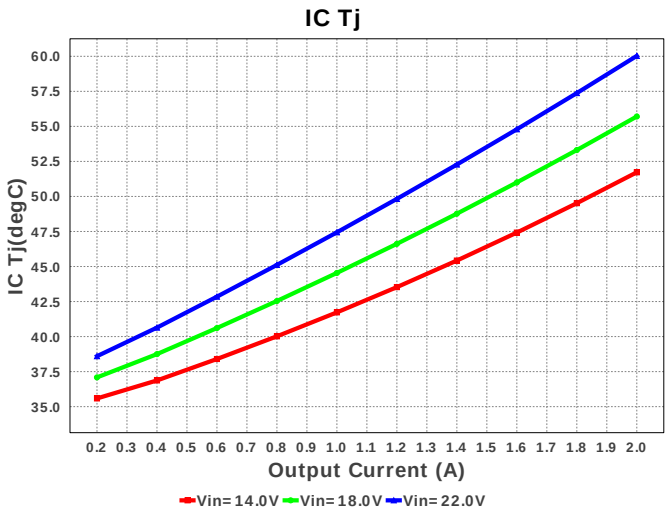
Design : 4770232/2 TPS54331DDAR
TPS54331DDAR 14.0V-22.0V to 3.30V @ 2.0A

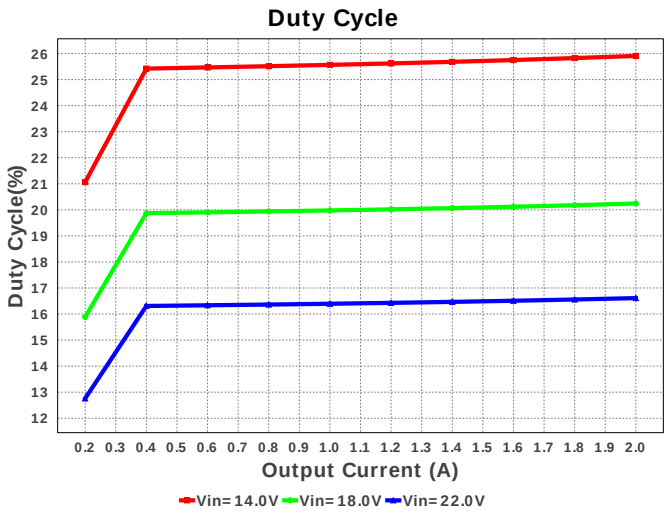


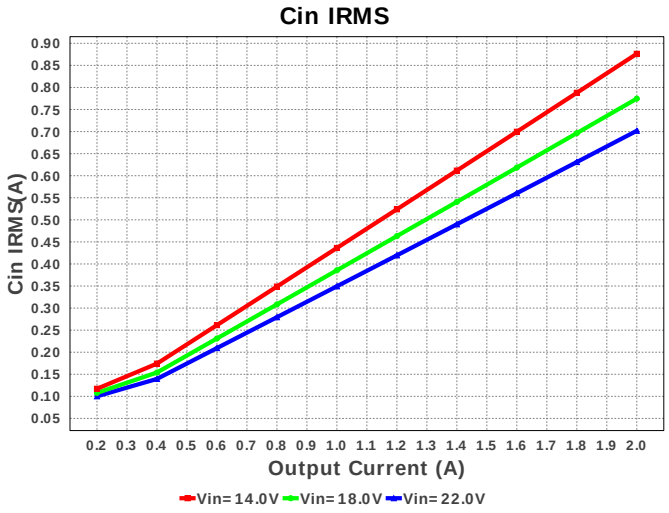
Electrical BOM

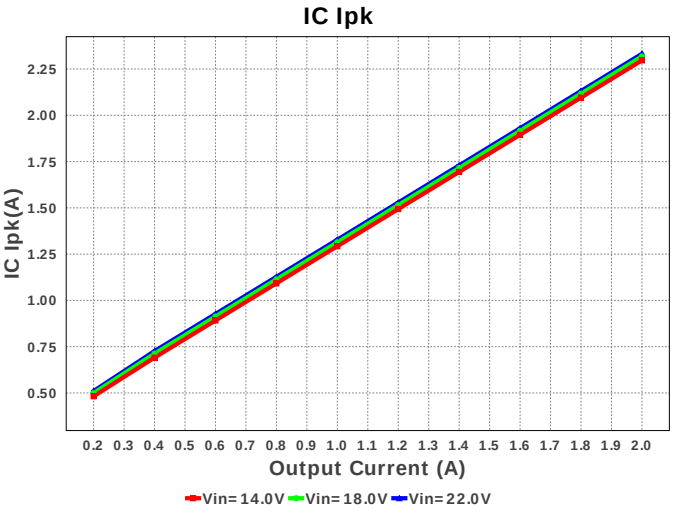
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C200JBANNNC Series= C0G/NP0	Cap= 20.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM32ER71H475KA88L Series= X7R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 50.0 V IRMS= 5.35 A	2	$0.19	1210 15 mm²
5.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	$0.14	1206_190 11 mm²
6.	Css	MuRata	GRM033R61A822KA01D Series= X5R	Cap= 8.2 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
7.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.11	SMA 37 mm²
8.	L1	Bourns	SRN8040-8R2Y	L= 8.2 µH DCR= 45.0 mOhm	1	$0.22	SRN8040 100 mm²
9.	Rcomp	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfbb	Yageo America	RT0805BRD073K28L Series= RT0805	Res= 3.28 kOhm Power= 125.0 mW Tolerance= 0.1%	1	$0.05	0805 7 mm²
11.	Rfbt	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

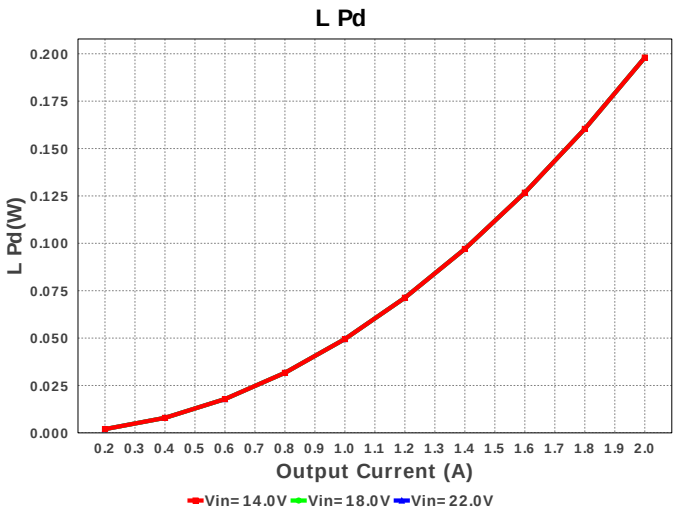
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	U1	Texas Instruments	TPS54331DDAR	Switcher	1	$0.65	DDA0008H 57 mm²

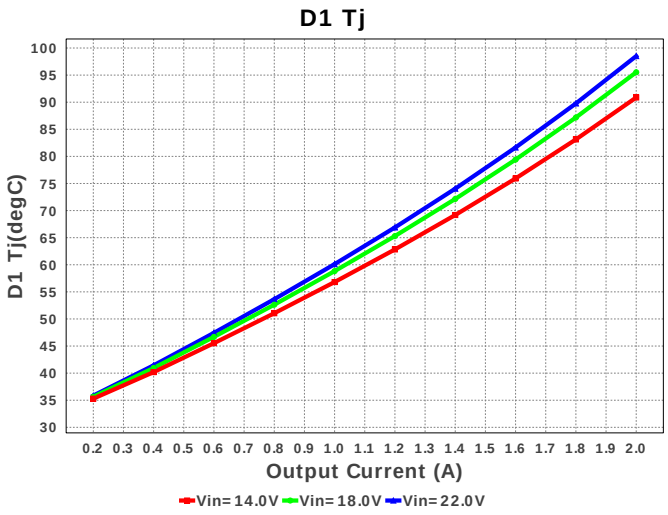


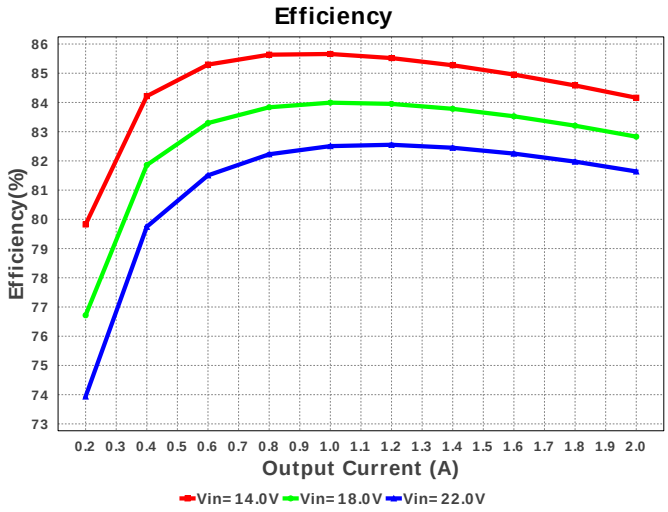


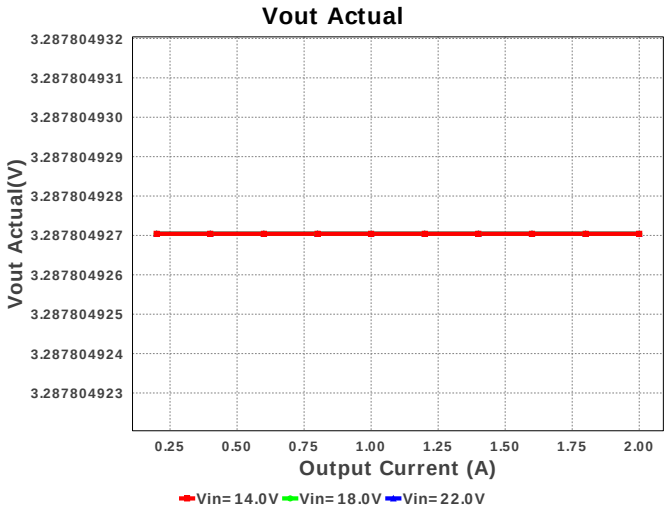


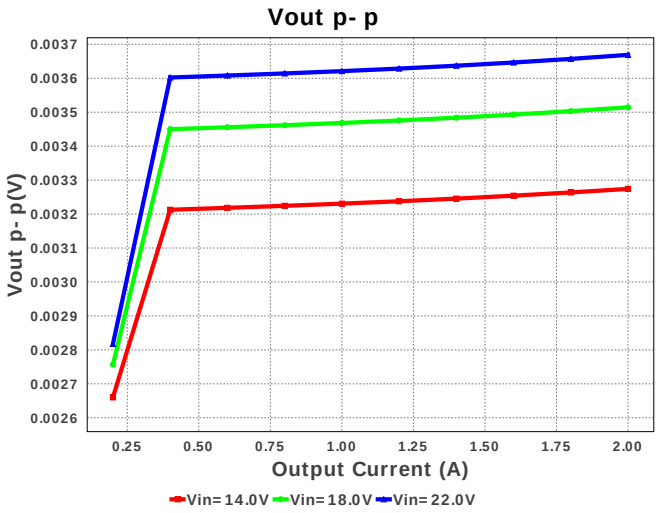


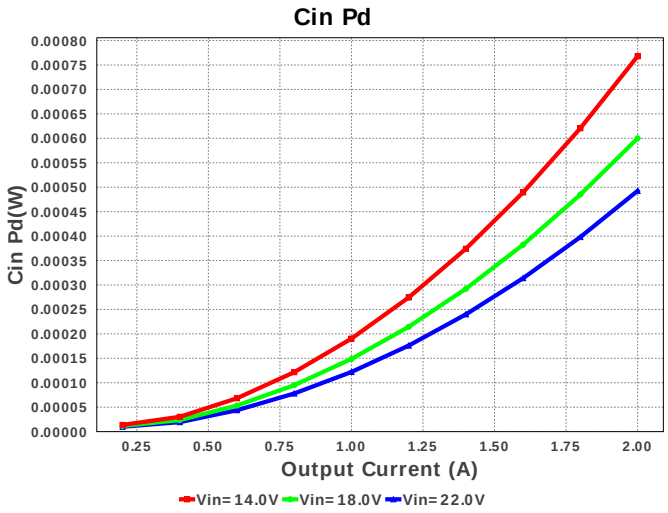


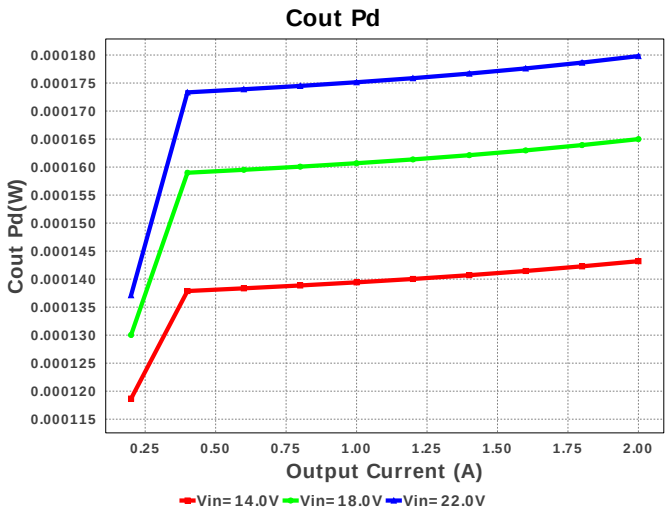


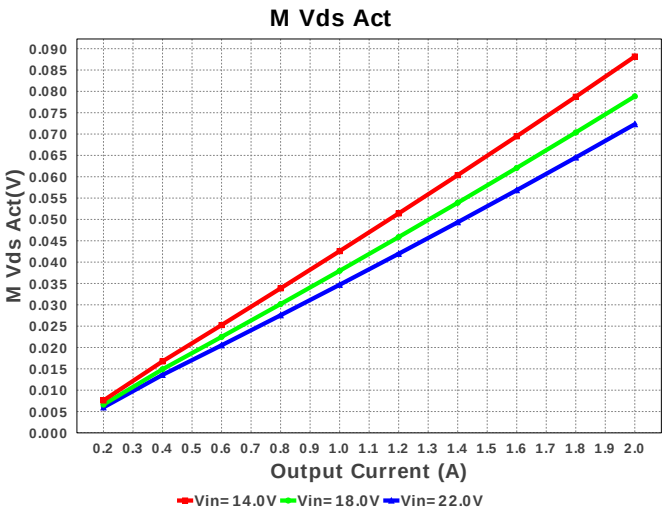


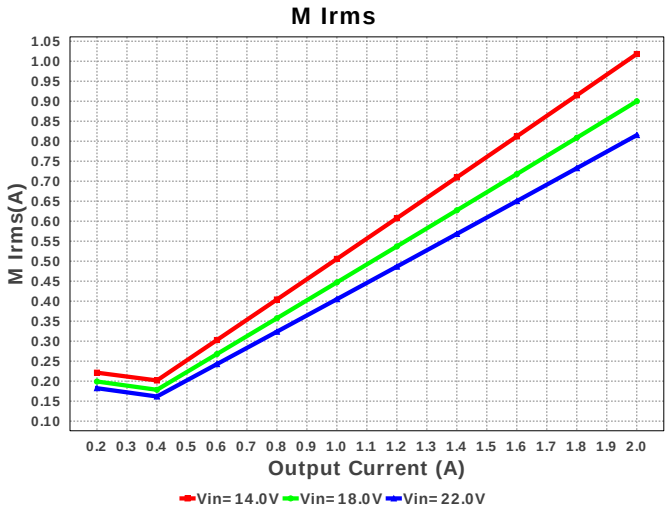


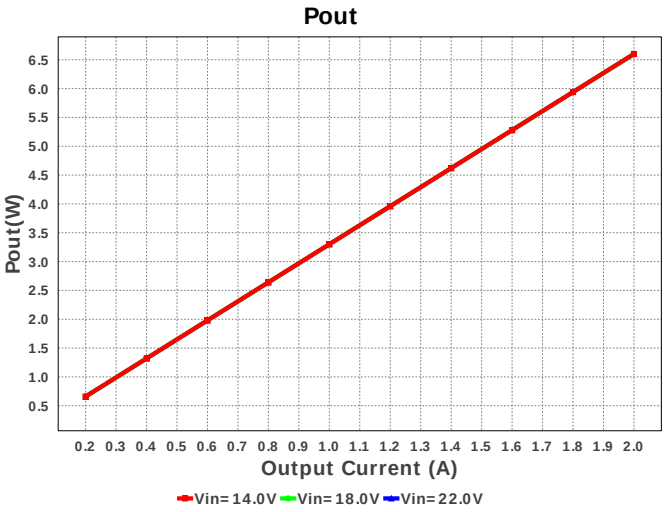


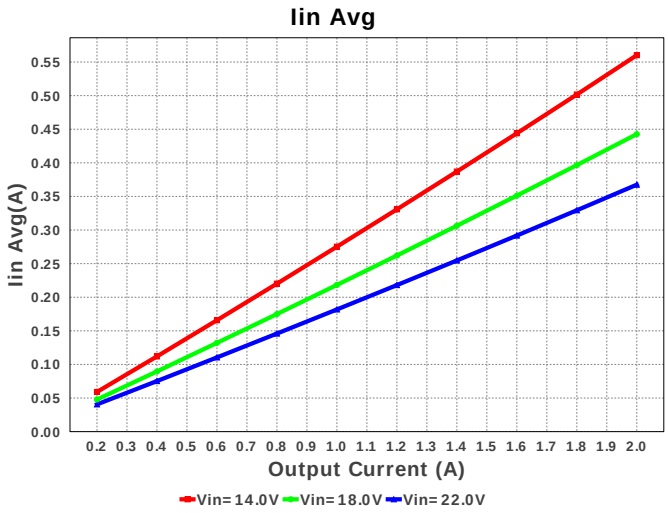


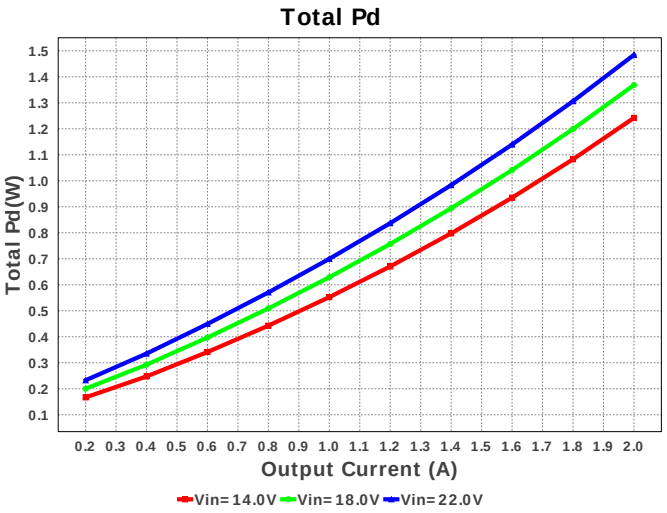


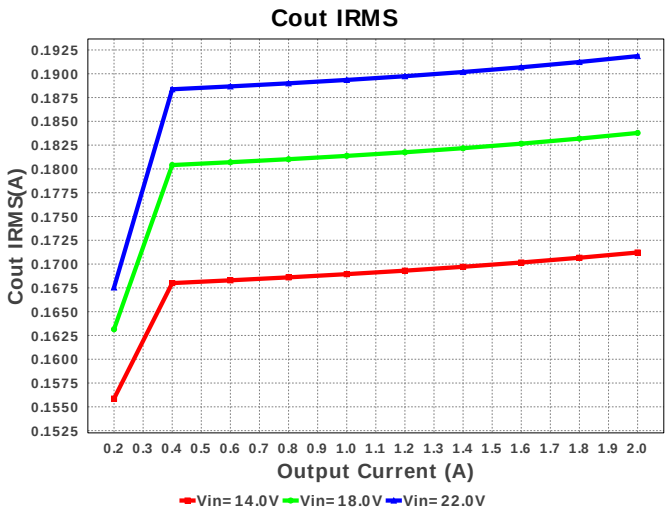


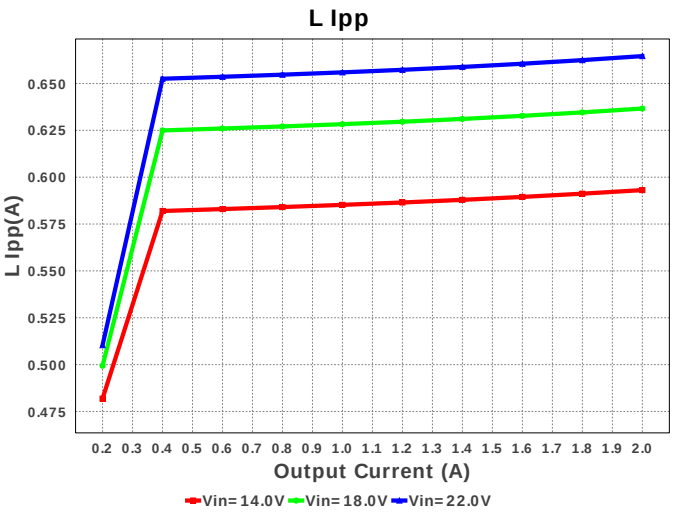


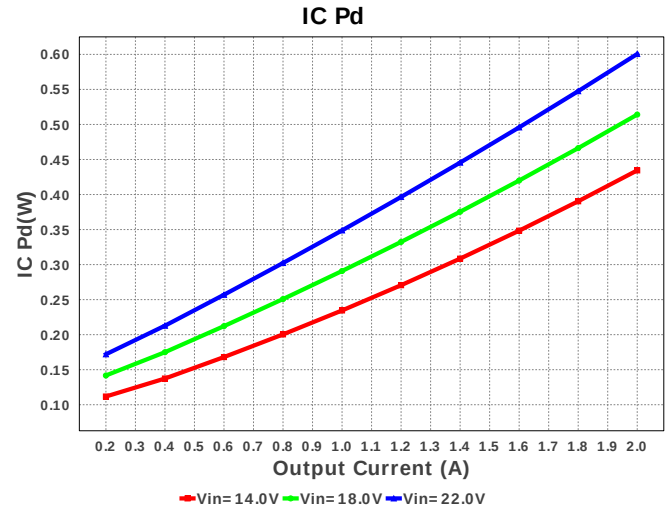


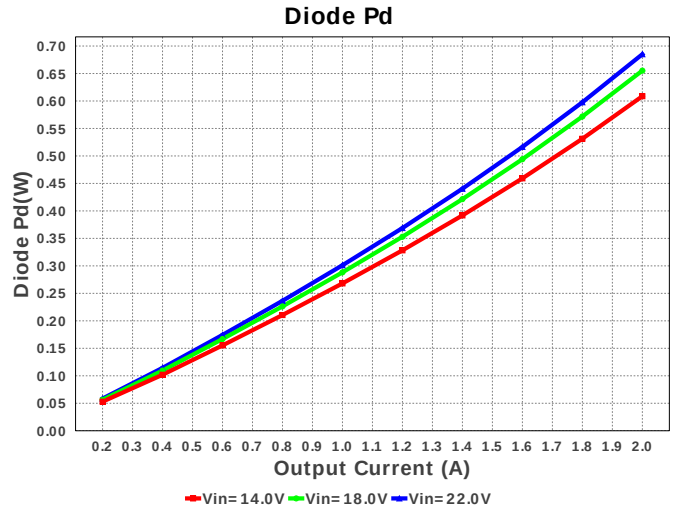


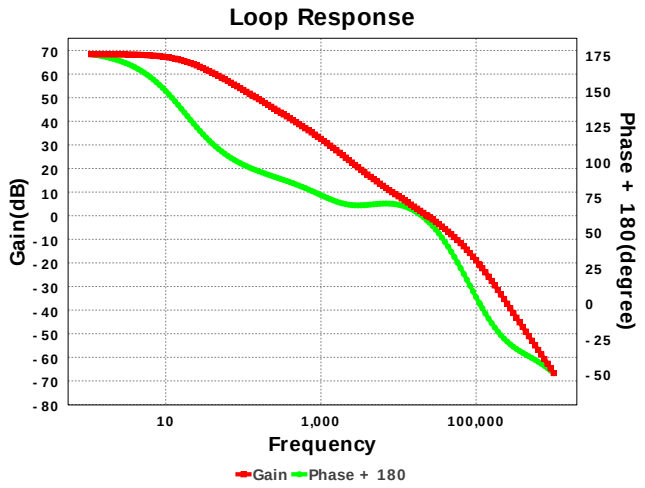












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	701.785 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	191.855 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.332 A	Current	Peak switch current in IC
4.	Iin Avg	367.47 mA	Current	Average input current
5.	L Ipp	664.61 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	815.147 mA	Current	Q Iavg
7.	BOM Count	13	General	Total Design BOM count
8.	FootPrint	266.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	570.0 kHz	General	Switching frequency
10.	M Vds Act	72.31 mV	General	Voltage drop across the MosFET
11.	Mode	CCM	General	Conduction Mode

#	Name	Value	Category	Description
12.	Pout	6.6 W	General	Total output power
13.	Total BOM	$1.61	General	Total BOM Cost
14.	D1 Tj	98.508 degC	Op_Point	D1 junction temperature
15.	Low Freq Gain	68.426 dB	Op_Point	Gain at 10Hz
16.	Vout Actual	3.288 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
18.	Cross Freq	23.573 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	16.612 %	Op_point	Duty cycle
20.	Efficiency	81.639 %	Op_point	Steady state efficiency
21.	Gain Marg	-20.979 dB	Op_point	Bode Plot Gain Margin
22.	IC Tj	60.029 degC	Op_point	IC junction temperature
23.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	2.0 A	Op_point	Iout operating point
25.	Phase Marg	58.927 deg	Op_point	Bode Plot Phase Margin
26.	VIN_OP	22.0 V	Op_point	Vin operating point
27.	Vout p-p	3.669 mV	Op_point	Peak-to-peak output ripple voltage
28.	Cin Pd	492.502 µW	Power	Input capacitor power dissipation
29.	Cout Pd	179.809 µW	Power	Output capacitor power dissipation
30.	Diode Pd	685.079 mW	Power	Diode power dissipation
31.	IC Pd	600.583 mW	Power	IC power dissipation
32.	L Pd	198.0 mW	Power	Inductor power dissipation
33.	Total Pd	1.484 W	Power	Total Power Dissipation
34.	Vout Tolerance	4.362 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS54331	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS54331** Product Folder : http://www.ti.com/product/TPS54331 : contains the data sheet and other resources.