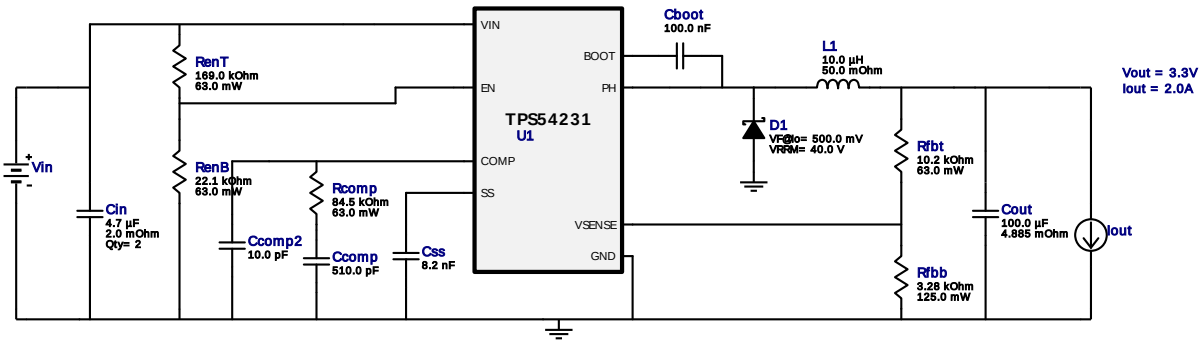


WEBENCH® Design Report

Design : 4767265/1 TPS54231DR
TPS54231DR 18.0V-22.0V to 3.30V @ 2.0A



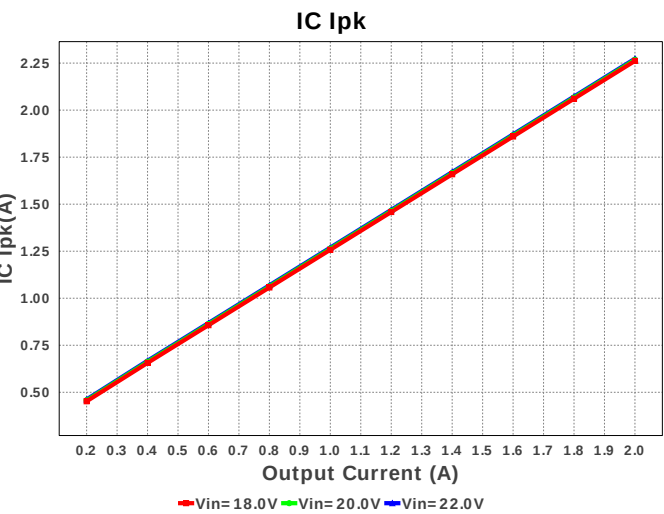
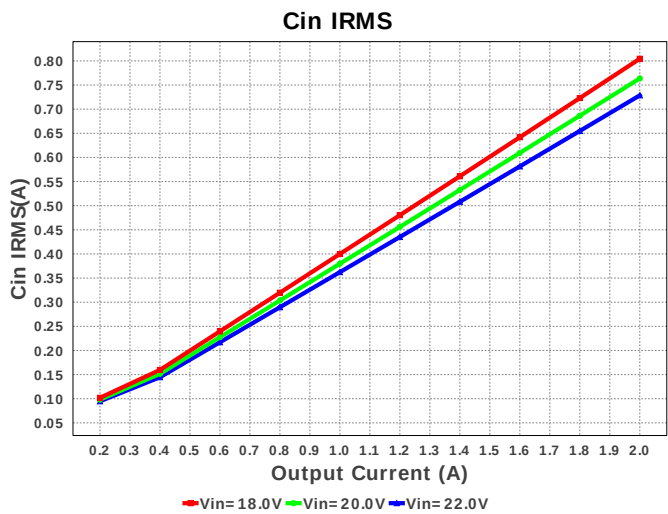
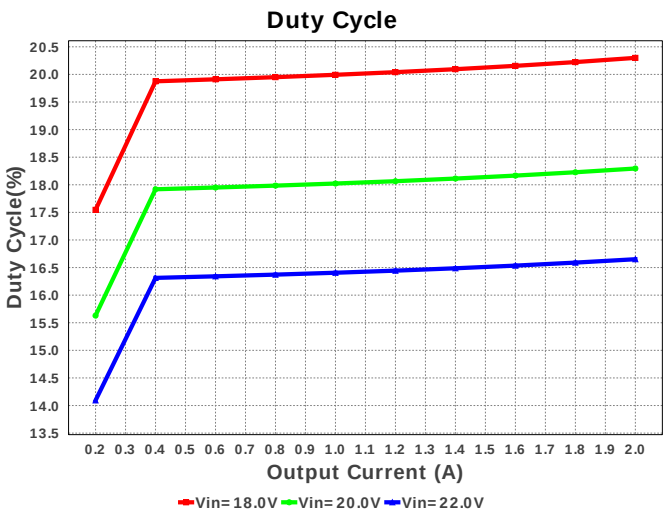
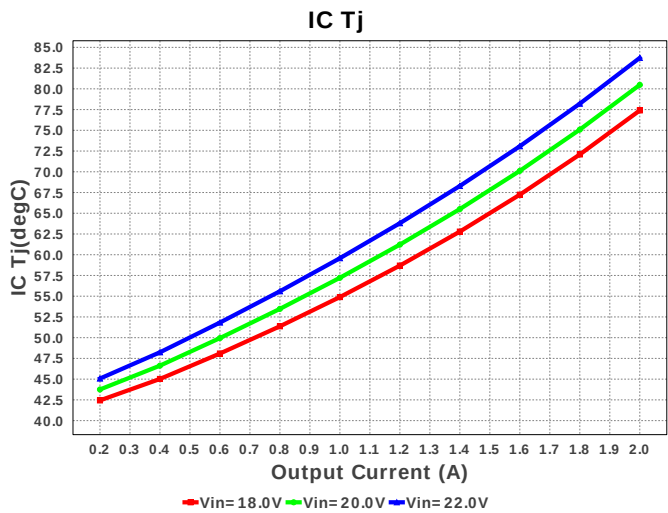
Electrical BOM

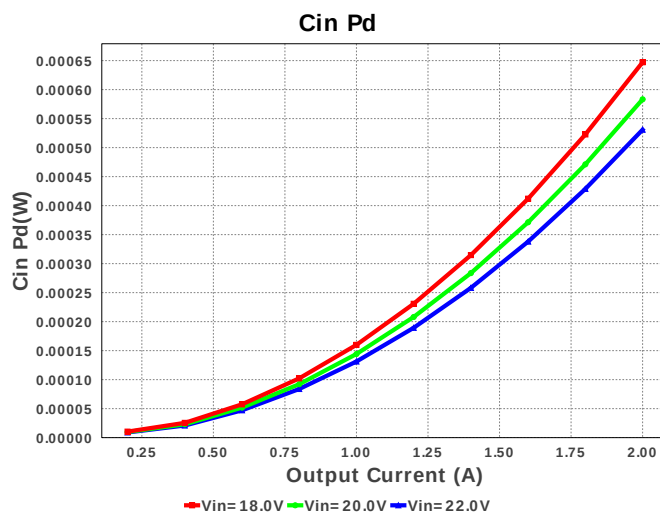
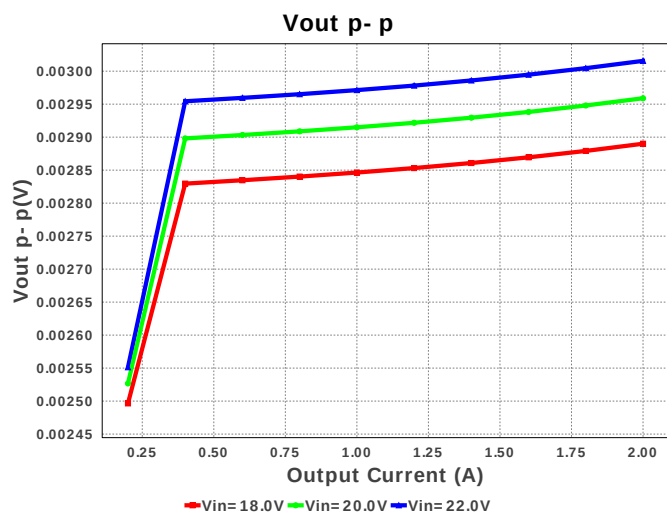
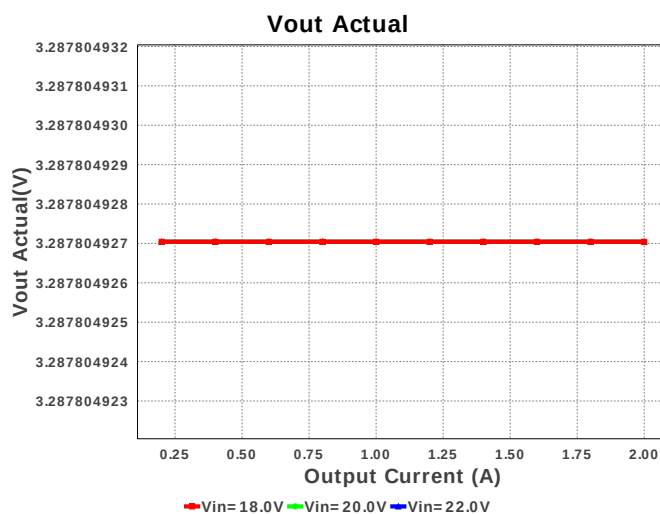
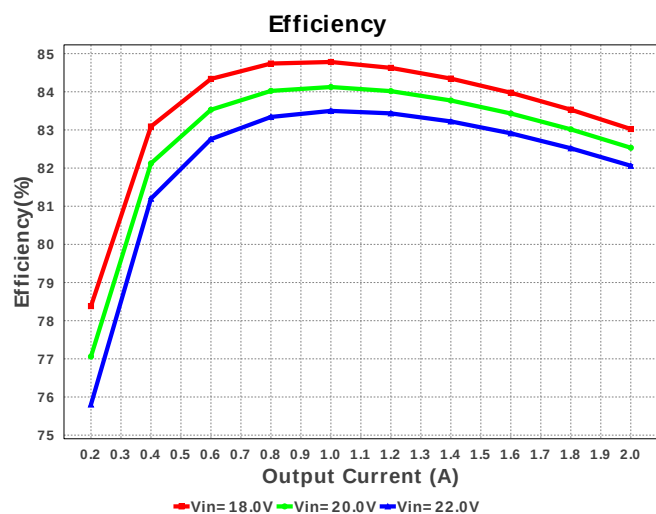
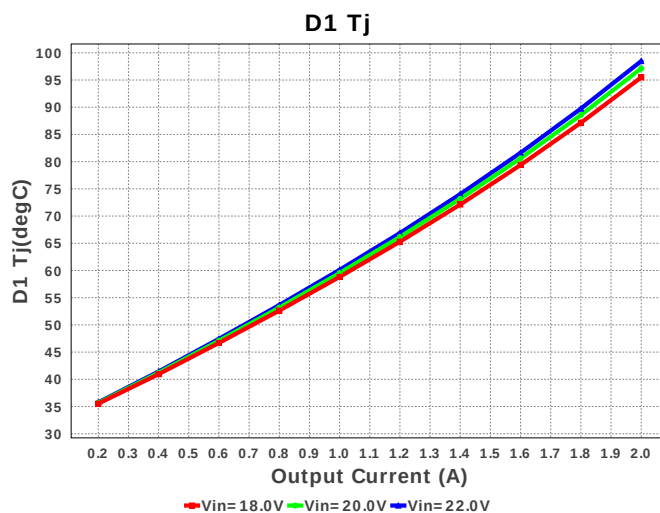
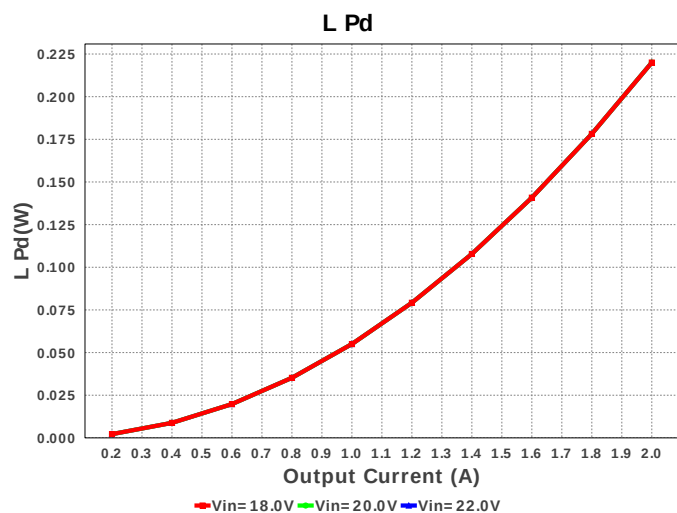
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
2.	Ccomp	MuRata	GRM1555C1H511JA01D Series= C0G/NP0	Cap= 510.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
3.	Ccomp2	Kemet	C0805C100K5GACTU Series= C0G/NP0	Cap= 10.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
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 mm ²
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 mm ²
6.	Css	MuRata	GRM033R61A822KA01D Series= X5R	Cap= 8.2 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
7.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.11	 SMA 37 mm ²
8.	L1	Bourns	SRN8040-100M	L= 10.0 uH DCR= 50.0 mOhm	1	\$0.22	 SRN8040 100 mm ²
9.	Rcomp	Vishay-Dale	CRCW040284K5FKED Series= CRCW..e3	Res= 84.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
10.	RenB	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
11.	RenT	Vishay-Dale	CRCW0402169KFKED Series= CRCW..e3	Res= 169.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

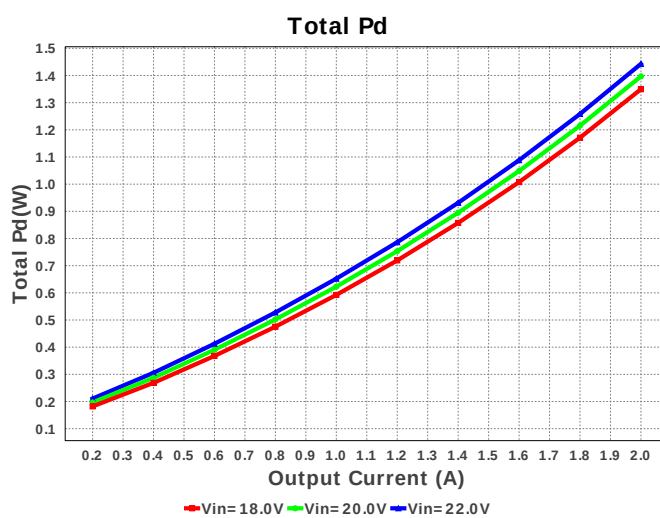
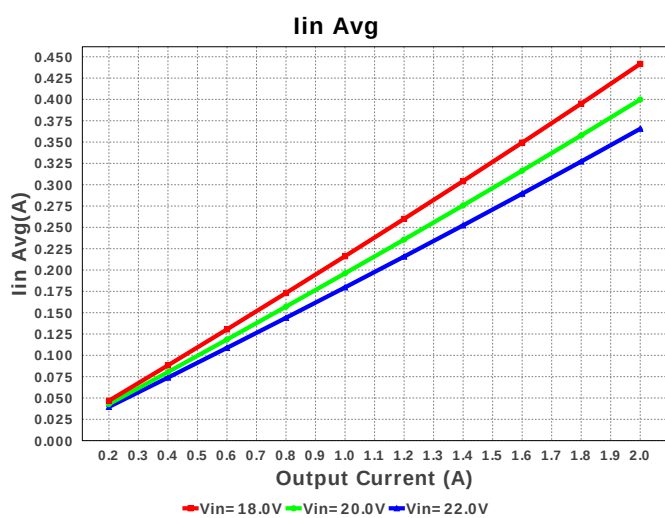
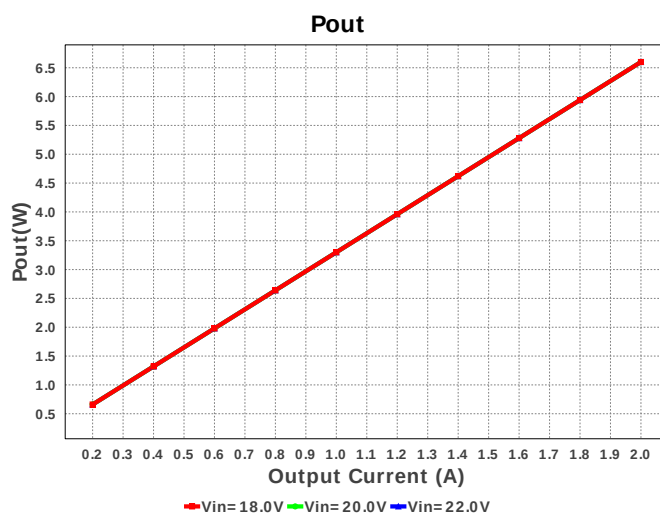
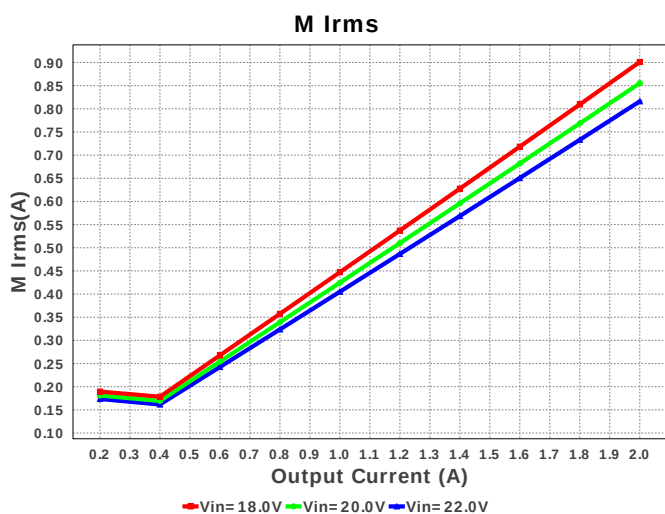
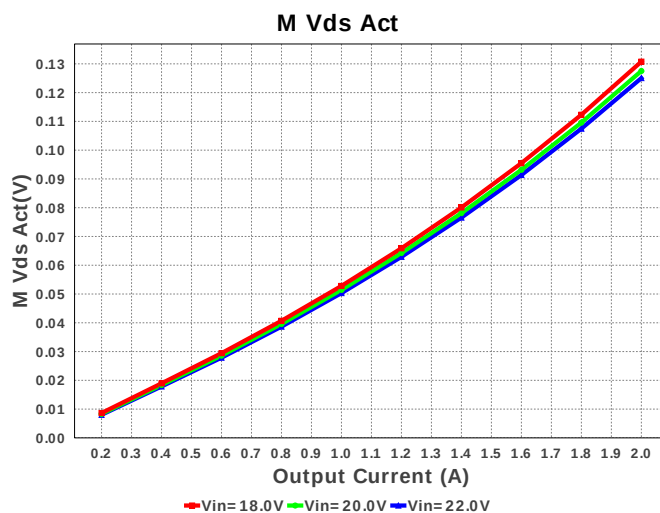
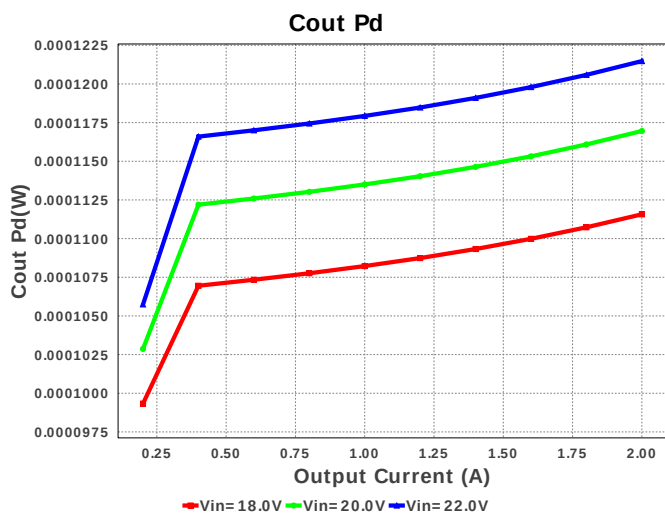
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rfbb	Yageo America	RT0805BRD073K28L Series= RT0805	Res= 3.28 kOhm Power= 125.0 mW Tolerance= 0.1%	1	\$0.05	 0805 7 mm²
13.	Rfbt	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
14.	U1	Texas Instruments	TPS54231DR	Switcher	1	\$0.55	

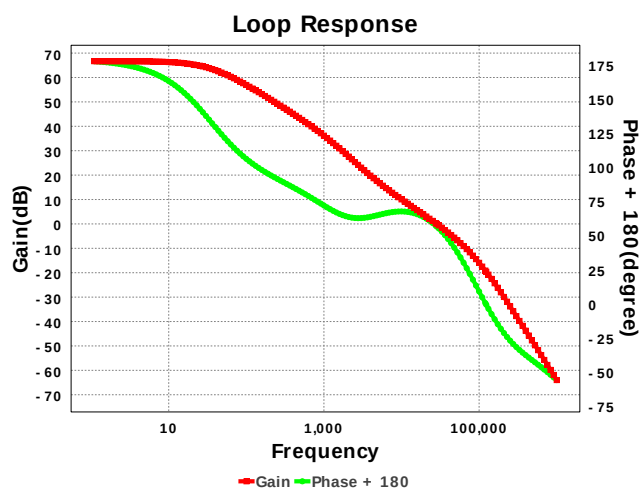
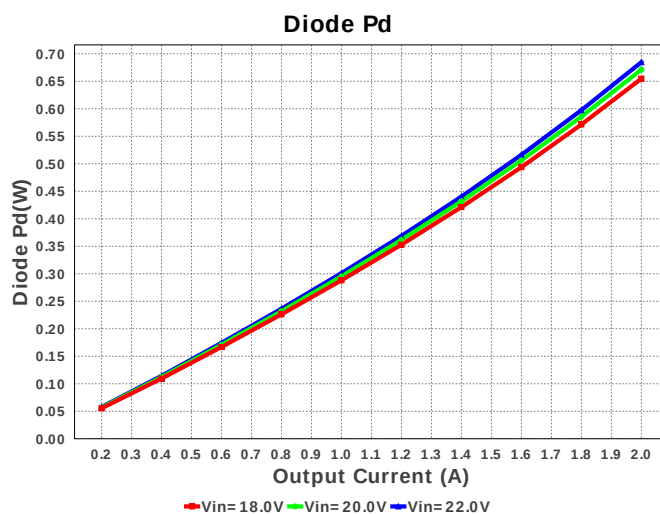
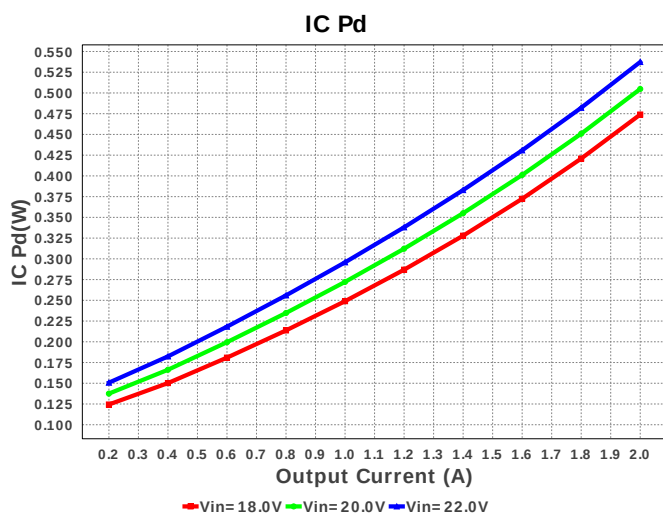
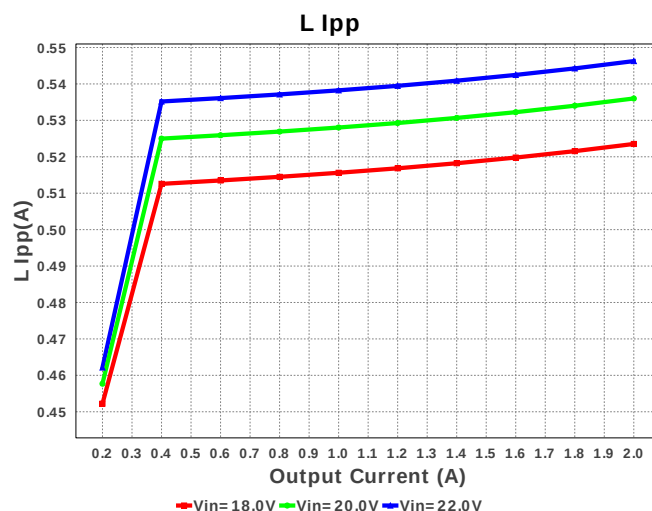
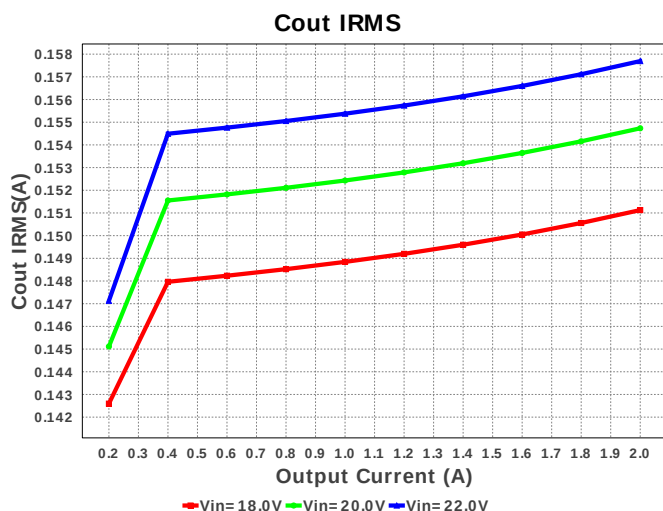


D0008A 57 mm²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	728.612 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	157.694 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.273 A	Current	Peak switch current in IC
4.	Iin Avg	365.58 mA	Current	Average input current
5.	L Ipp	546.27 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	816.11 mA	Current	Q lavg
7.	BOM Count	15	General	Total Design BOM count
8.	FootPrint	268.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	570.0 kHz	General	Switching frequency
10.	M Vds Act	125.046 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	\$1.53	General	Total BOM Cost
14.	D1 Tj	98.476 degC	Op_Point	D1 junction temperature
15.	Low Freq Gain	66.675 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	28.485 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	16.651 %	Op_point	Duty cycle
20.	Efficiency	82.061 %	Op_point	Steady state efficiency
21.	Gain Marg	-19.614 dB	Op_point	Bode Plot Gain Margin
22.	IC Tj	83.734 degC	Op_point	IC junction temperature
23.	ICThetaJA	100.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	2.0 A	Op_point	Iout operating point
25.	Phase Marg	57.16 deg	Op_point	Bode Plot Phase Margin
26.	VIN_OP	22.0 V	Op_point	Vin operating point
27.	Vout p-p	3.016 mV	Op_point	Peak-to-peak output ripple voltage
28.	Cin Pd	530.876 μ W	Power	Input capacitor power dissipation
29.	Cout Pd	121.477 μ W	Power	Output capacitor power dissipation
30.	Diode Pd	684.756 mW	Power	Diode power dissipation
31.	IC Pd	537.34 mW	Power	IC power dissipation
32.	L Pd	220.0 mW	Power	Inductor power dissipation
33.	Total Pd	1.443 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	18.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS54231	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS54231** Product Folder : <http://www.ti.com/product/TPS54231> : contains the data sheet and other resources.

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