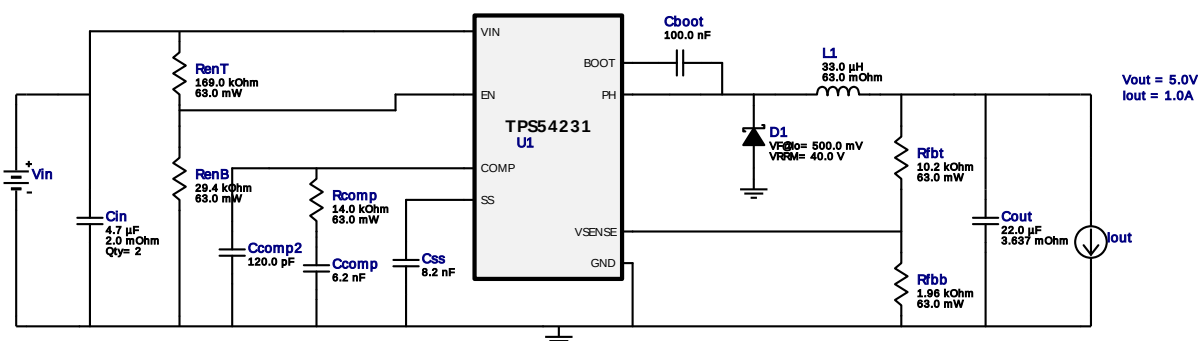


WEBENCH® Design Report

Design : 4743042/10 TPS54231DR
TPS54231DR 14.0V-22.0V to 5.00V @ 1.0A



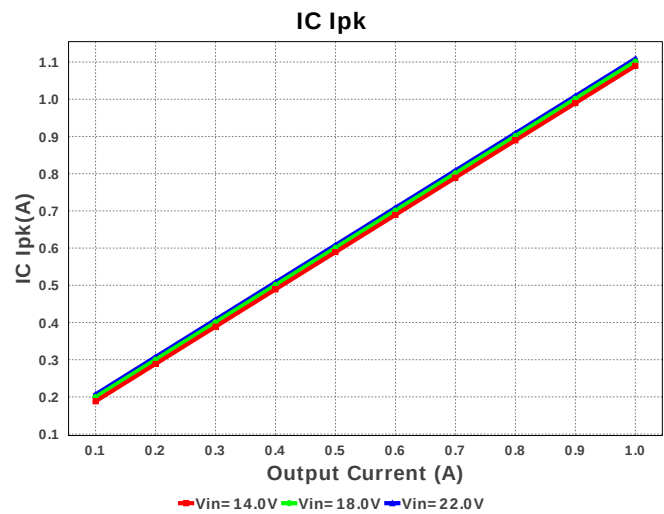
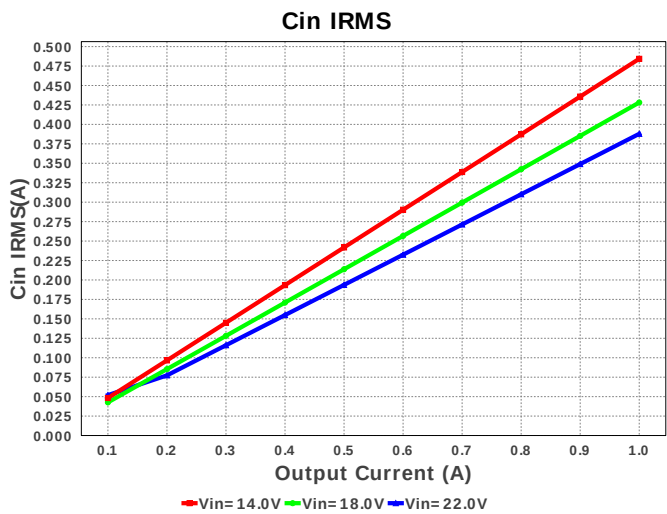
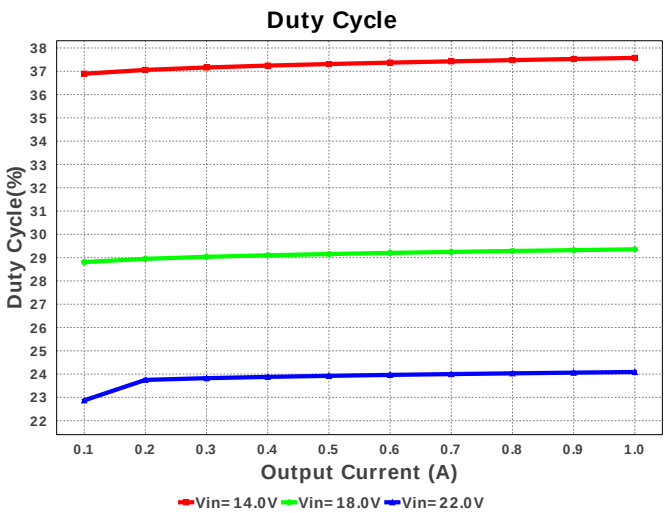
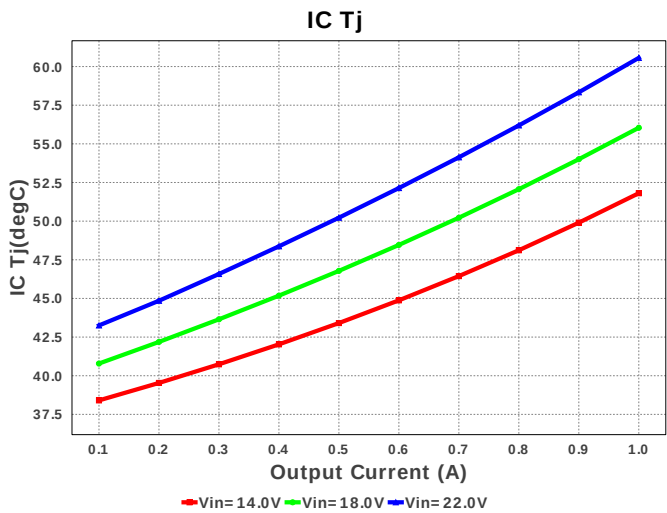
Electrical BOM

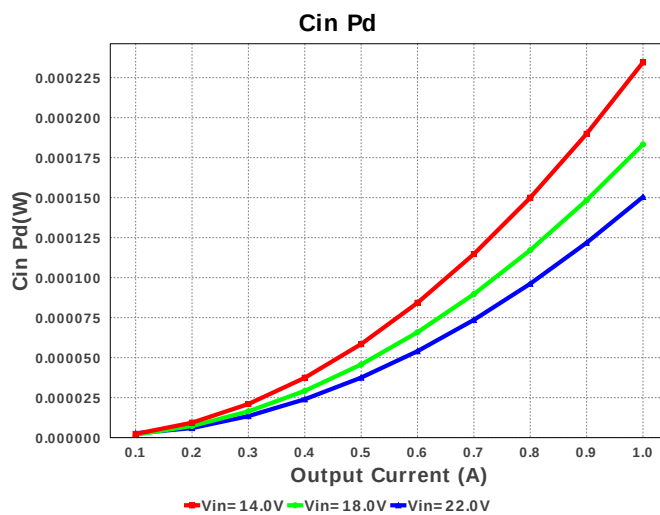
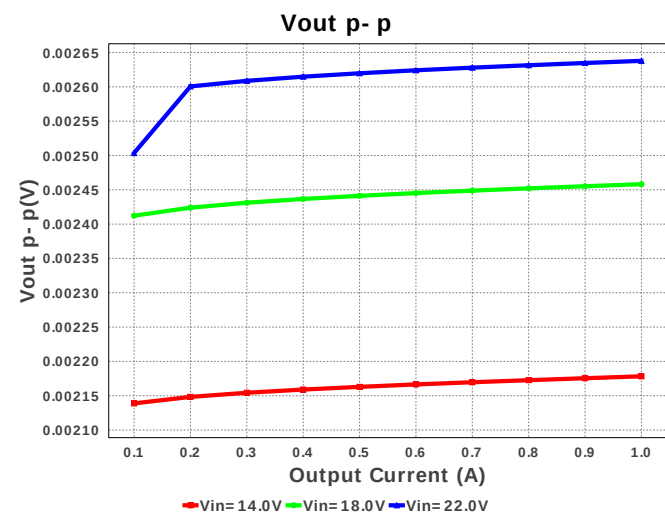
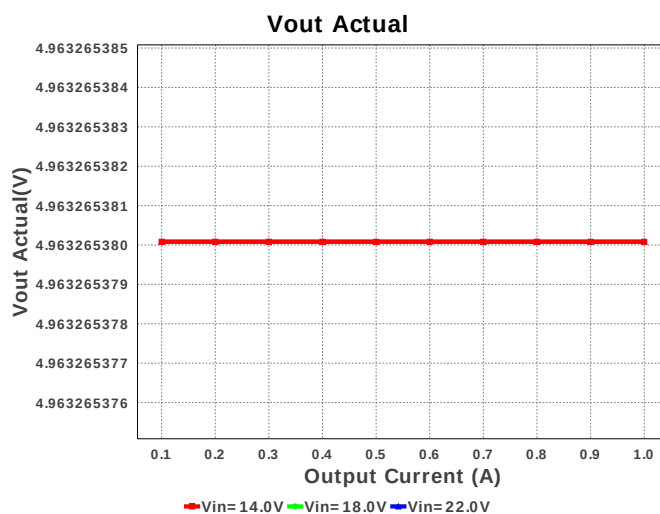
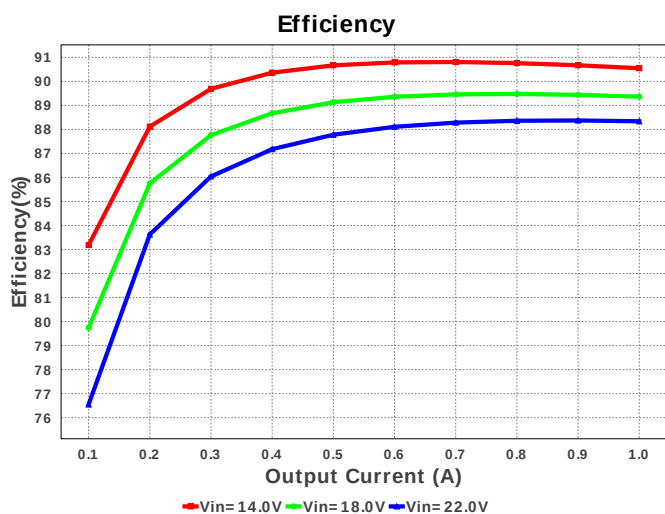
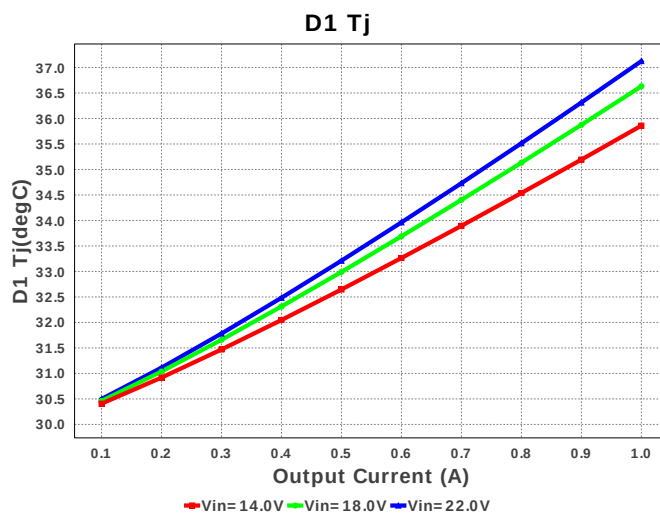
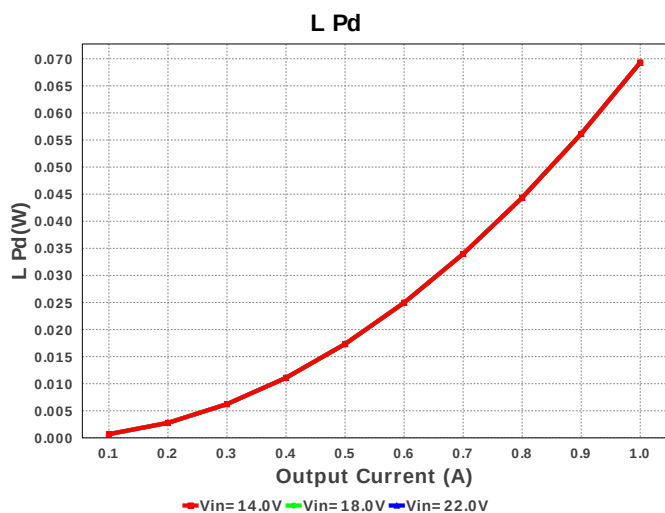
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
2.	Ccomp	MuRata	GRM2195C1H622JA01D Series= C0G/NP0	Cap= 6.2 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.04	 0805 7 mm ²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C121JB61PNC Series= C0G/NP0	Cap= 120.0 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	GRM31CR61A226KE19L Series= X5R	Cap= 22.0 uF ESR= 3.637 mOhm VDC= 10.0 V IRMS= 3.56456 A	1	\$0.07	 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.	B240A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.09	 SMA 37 mm ²
8.	L1	Bourns	SRU1048-330Y	L= 33.0 uH DCR= 63.0 mOhm	1	\$0.33	 SRU1048 144 mm ²
9.	Rcomp	Vishay-Dale	CRCW040214K0FKED Series= CRCW..e3	Res= 14.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
10.	RenB	Vishay-Dale	CRCW040229K4FKED Series= CRCW..e3	Res= 29.4 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

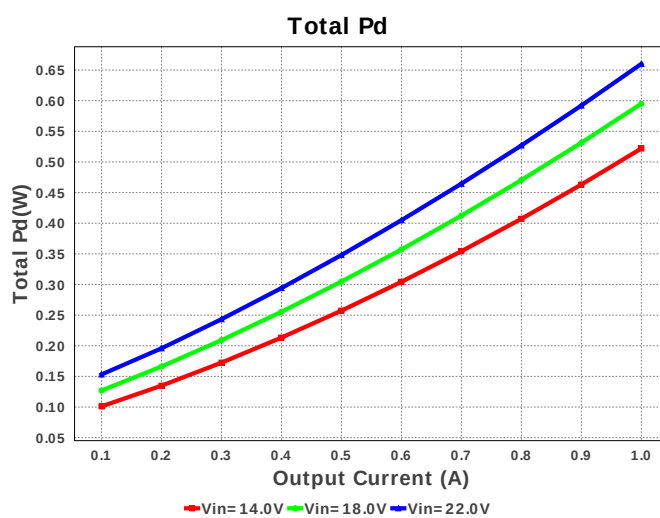
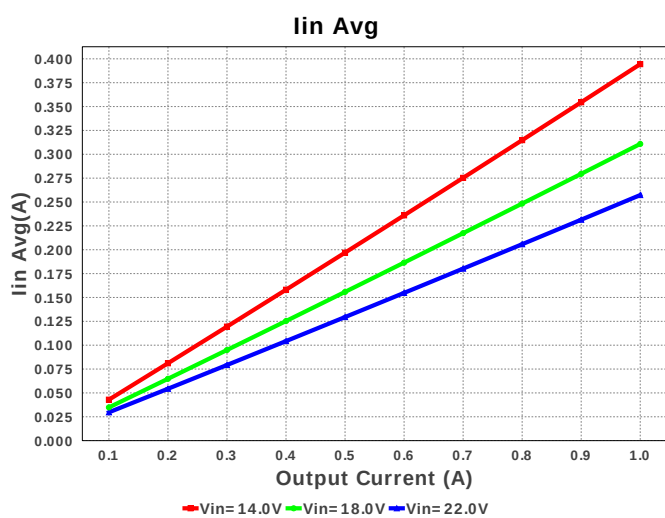
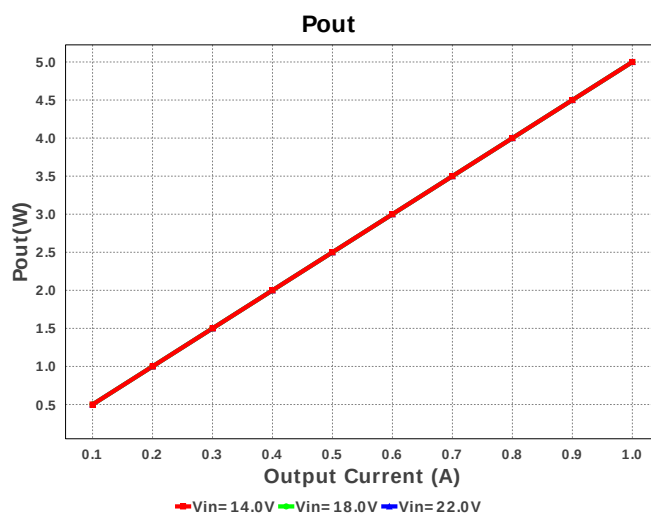
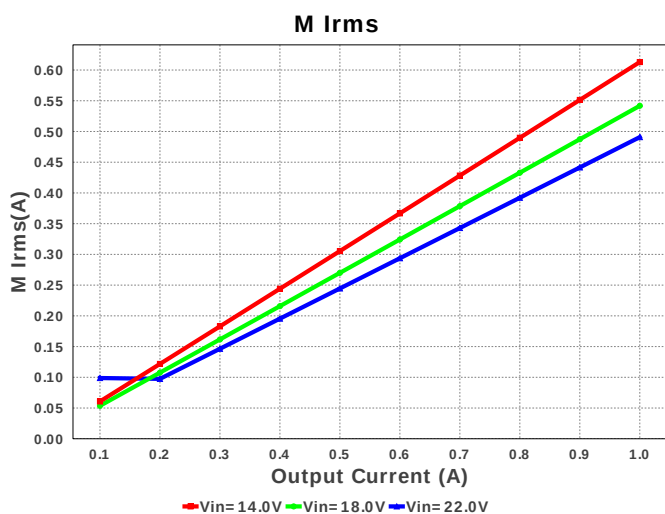
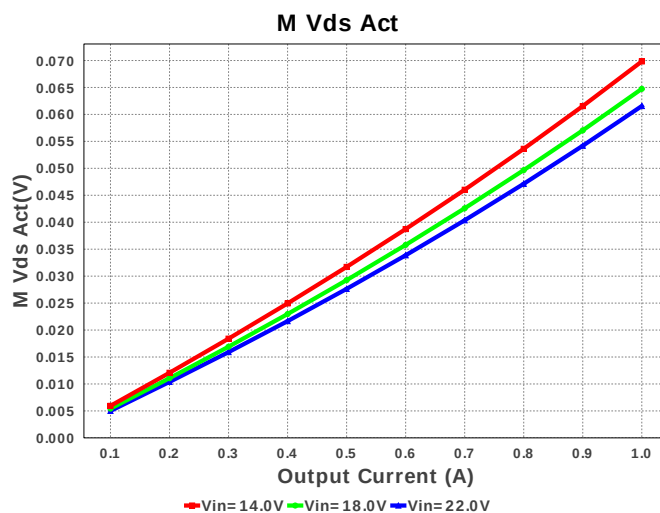
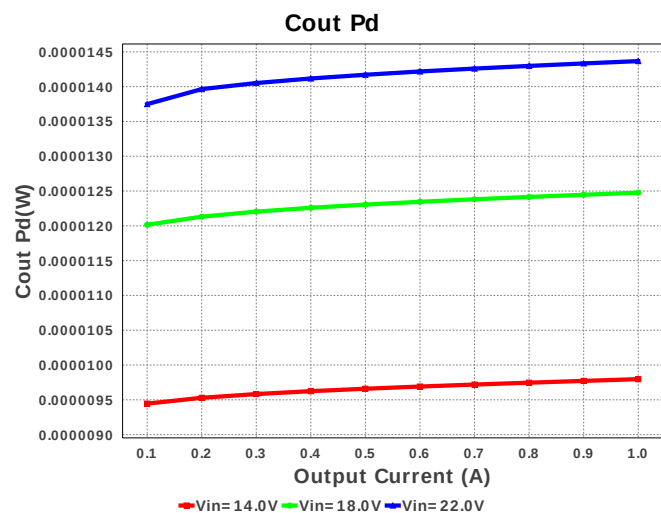
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rfbb	Vishay-Dale	CRCW04021K96FKED Series= CRCW..e3	Res= 1.96 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
13.	Rfbt	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
14.	U1	Texas Instruments	TPS54231DR	Switcher	1	\$0.55	

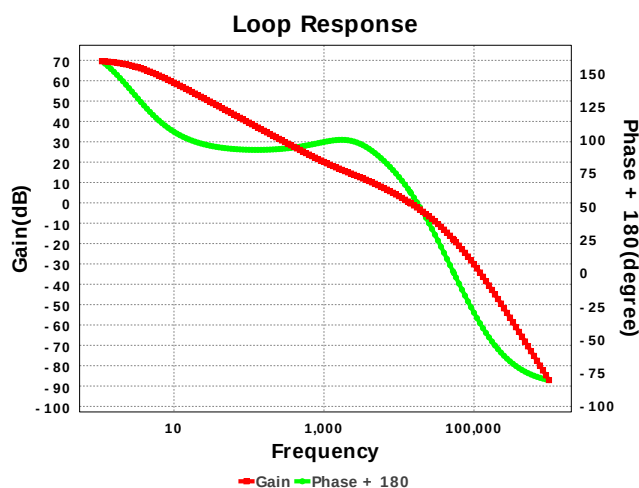
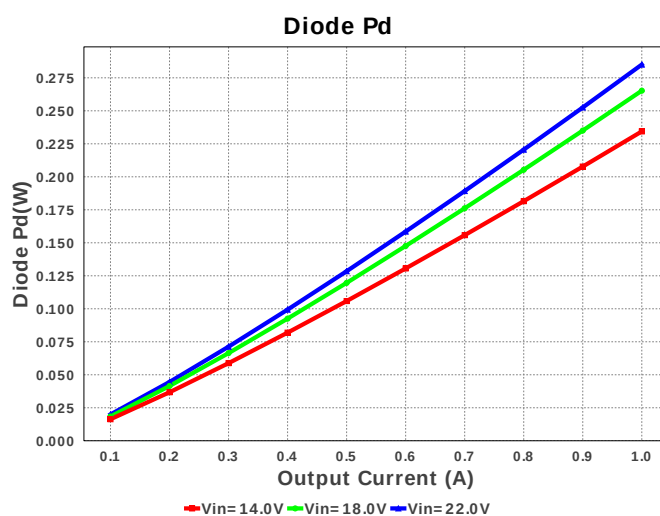
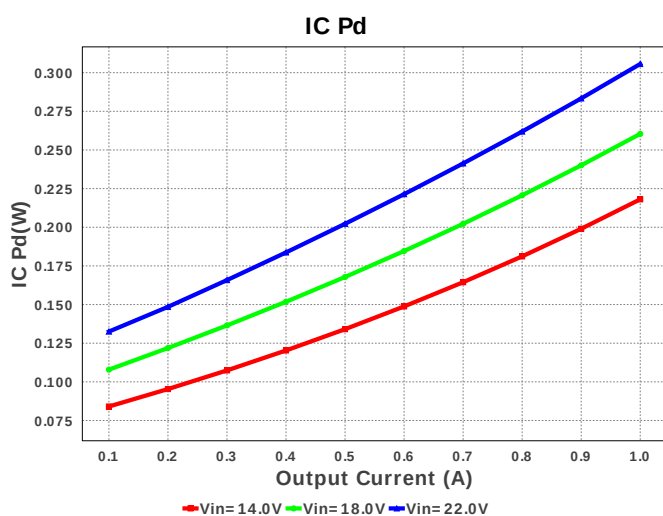
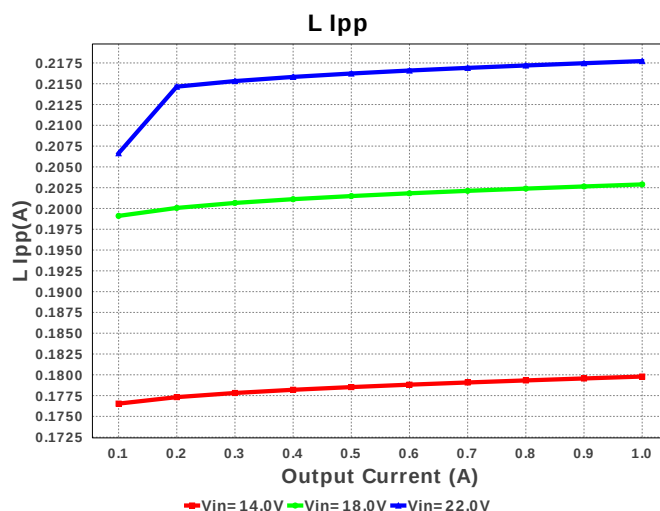
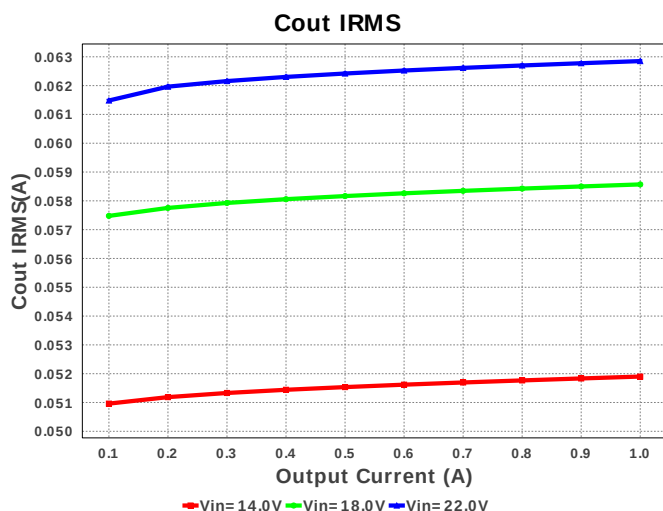


D0008A 57 mm²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	387.857 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	62.851 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.109 A	Current	Peak switch current in IC
4.	Iin Avg	257.28 mA	Current	Average input current
5.	L Ipp	217.72 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	490.818 mA	Current	Q lavg
7.	BOM Count	15	General	Total Design BOM count
8.	FootPrint	312.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	570.0 kHz	General	Switching frequency
10.	M Vds Act	61.556 mV	General	Voltage drop across the MosFET
11.	Pout	5.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	\$1.54	General	Total BOM Cost
13.	D1 Tj	37.125 degC	Op_Point	D1 junction temperature
14.	Low Freq Gain	69.585 dB	Op_Point	Gain at 10Hz
15.	Vout Actual	4.963 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	14.045 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	24.09 %	Op_point	Duty cycle
19.	Efficiency	88.338 %	Op_point	Steady state efficiency
20.	Gain Marg	-18.258 dB	Op_point	Bode Plot Gain Margin
21.	IC Tj	60.562 degC	Op_point	IC junction temperature
22.	ICThetaJA	100.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	1.0 A	Op_point	Iout operating point
24.	Phase Marg	61.21 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	22.0 V	Op_point	Vin operating point
26.	Vout p-p	2.638 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	150.433 μW	Power	Input capacitor power dissipation
28.	Cout Pd	14.367 μW	Power	Output capacitor power dissipation
29.	Diode Pd	285.018 mW	Power	Diode power dissipation
30.	IC Pd	305.617 mW	Power	IC power dissipation
31.	L Pd	69.3 mW	Power	Inductor power dissipation
32.	Total Pd	660.088 mW	Power	Total Power Dissipation
33.	Vout Tolerance	5.254 %		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	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	5.0	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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