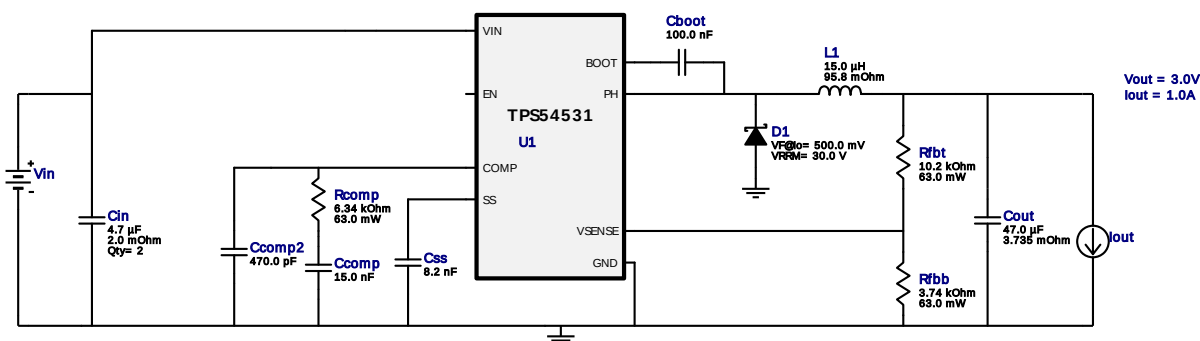


WEBENCH® Design Report

Design : 4728729/7 TPS54531DDAR
TPS54531DDAR 10.0V-19.0V to 3.00V @ 1.0A

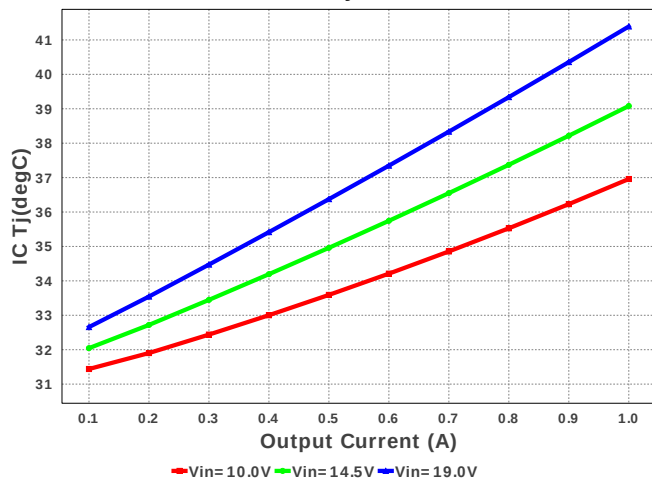


Electrical BOM

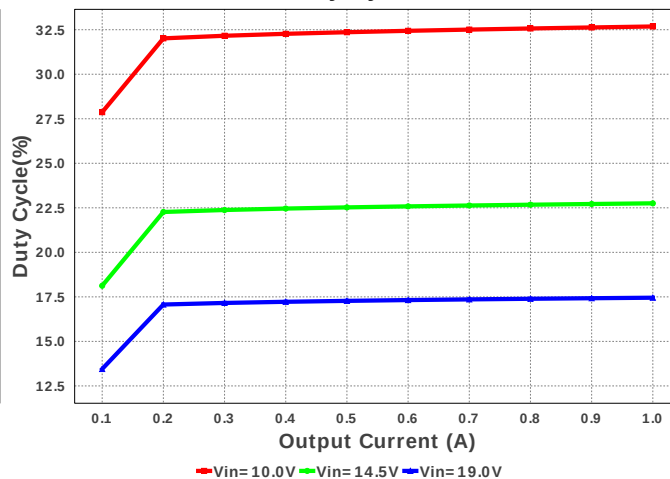
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
2.	Ccomp	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 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	GRM31CC80J476KE18L Series= X6S	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.0522 A	1	\$0.10	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.	B230A-13-F	Vf@Io= 500.0 mV VRRM= 30.0 V	1	\$0.09	SMA 37 mm ²
8.	L1	Bourns	SRN6045-150M	L= 15.0 uH DCR= 95.8 mOhm	1	\$0.16	SRN6045 64 mm ²
9.	Rcomp	Vishay-Dale	CRCW04026K34FKED Series= CRCW..e3	Res= 6.34 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
10.	Rfbb	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
11.	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

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	U1	Texas Instruments	TPS54531DDAR	Switcher	1	\$0.75	 DDA0008E 57 mm ²

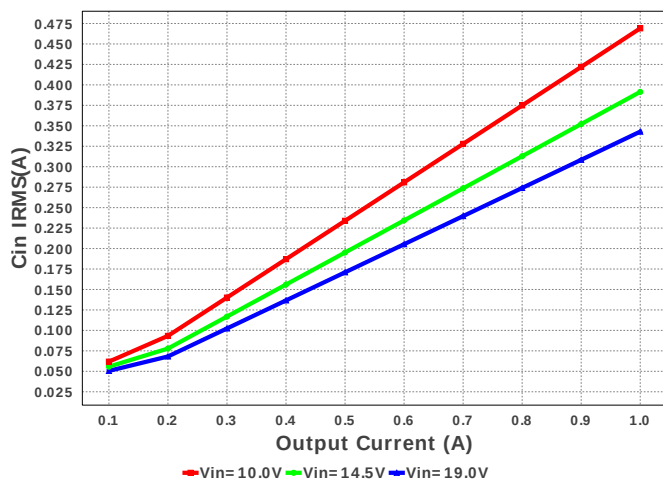
IC Tj



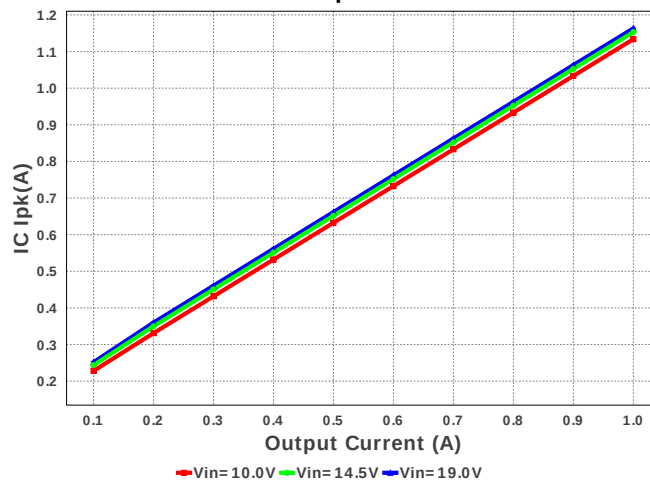
Duty Cycle

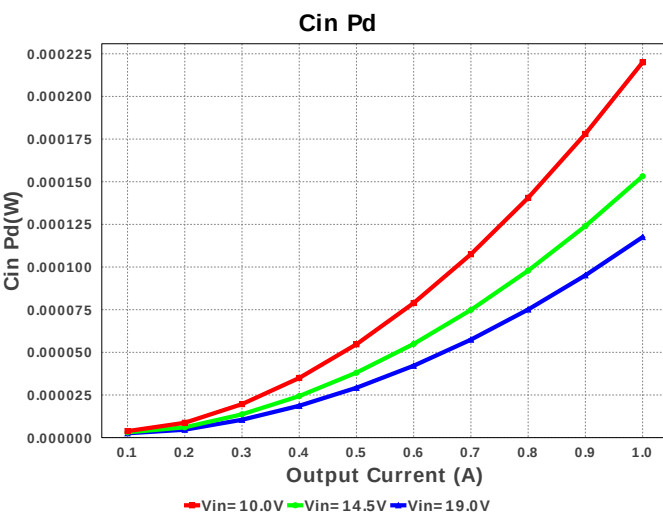
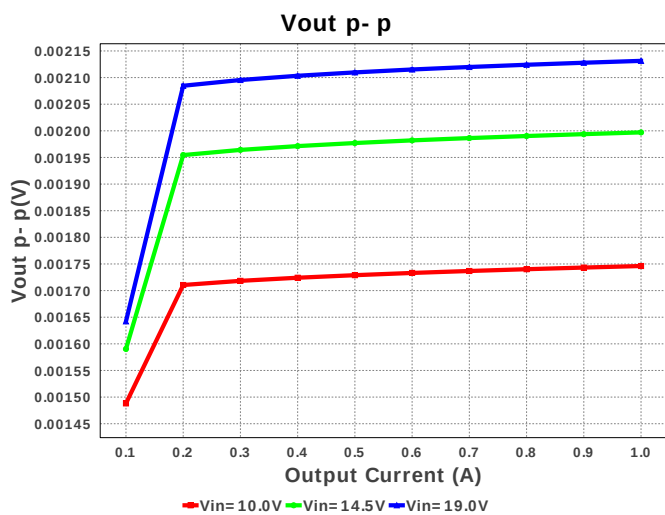
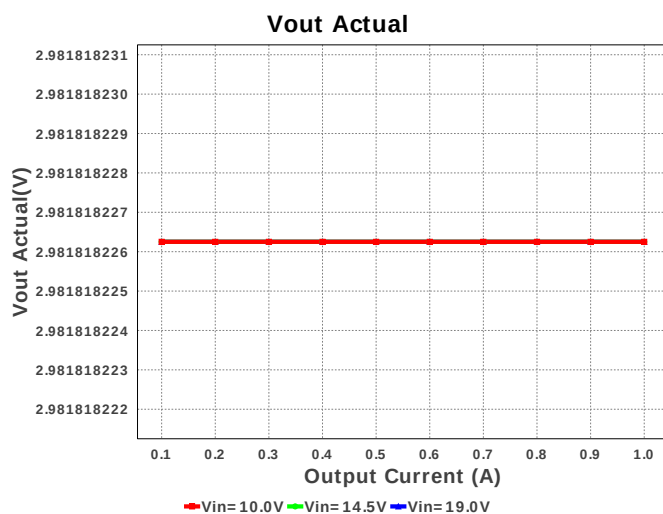
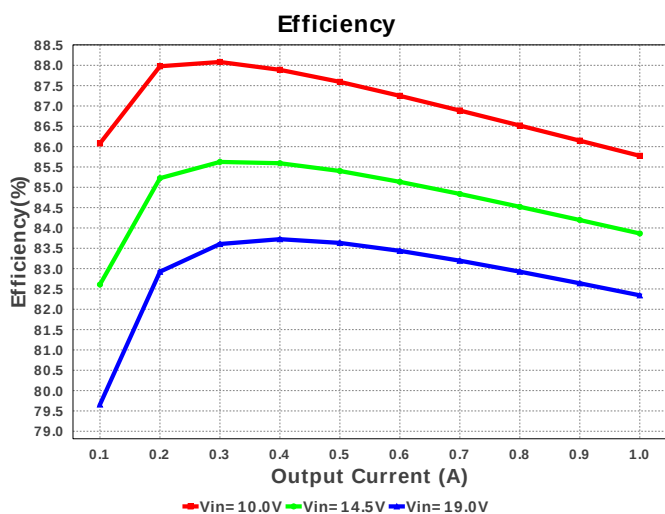
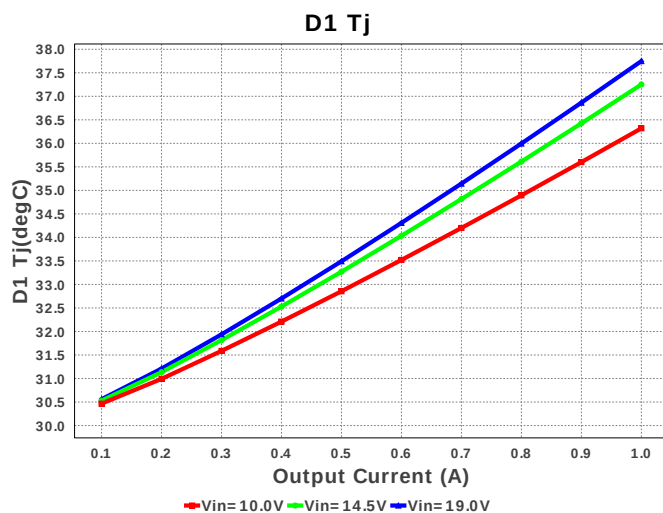
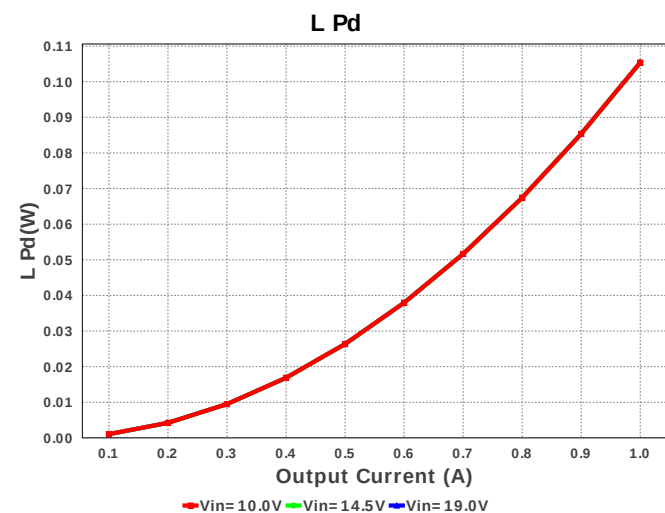


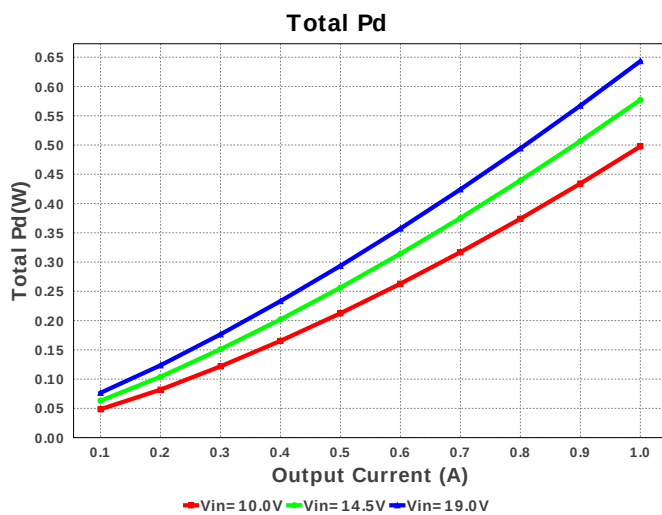
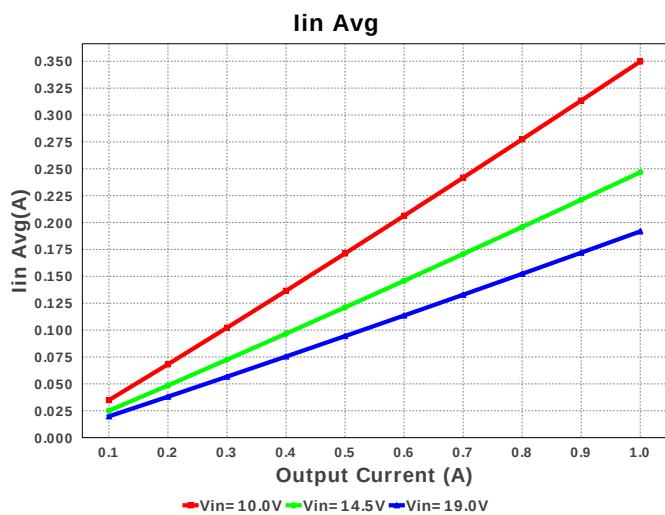
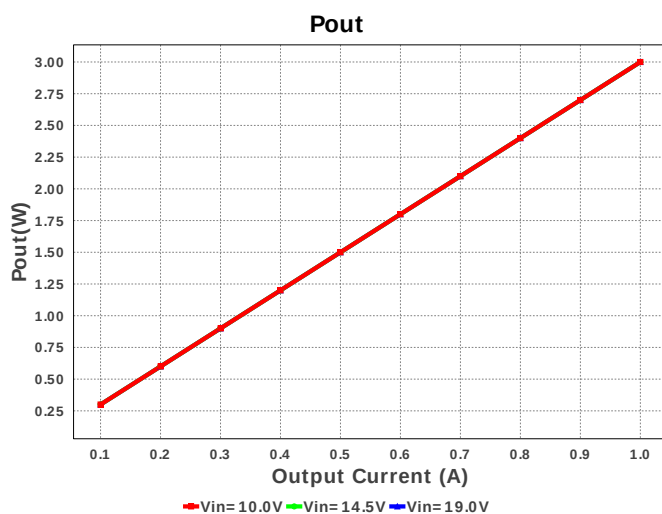
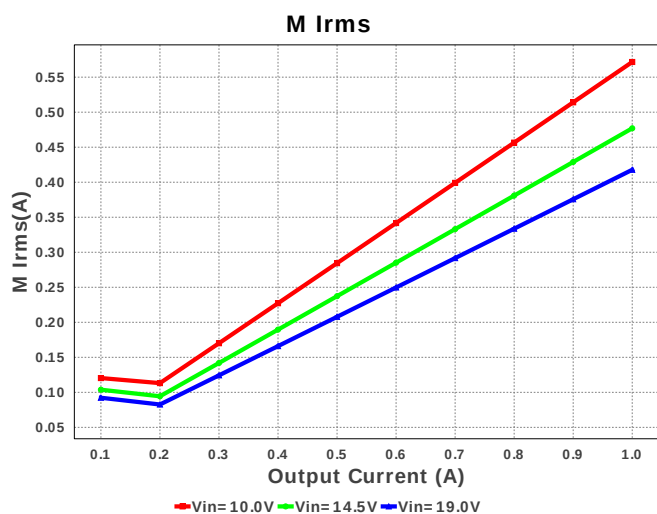
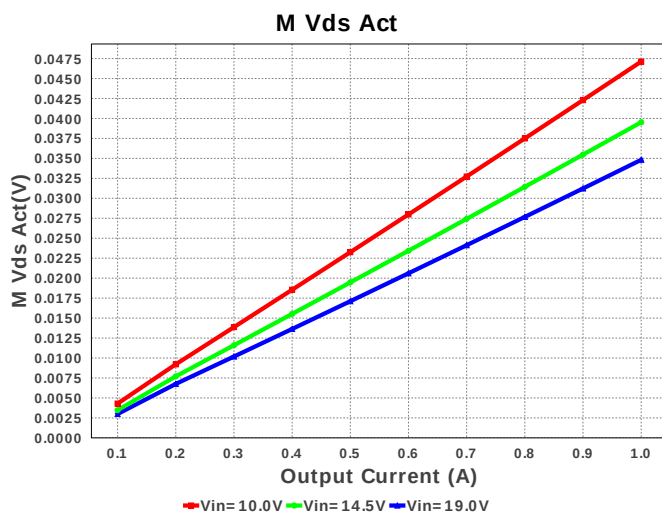
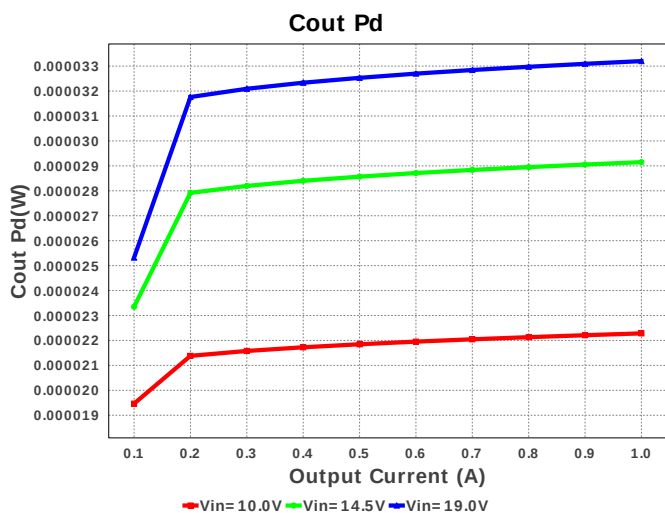
Cin IRMS

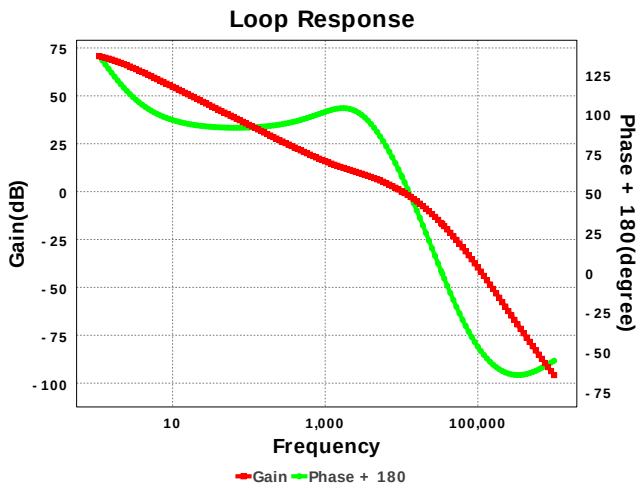
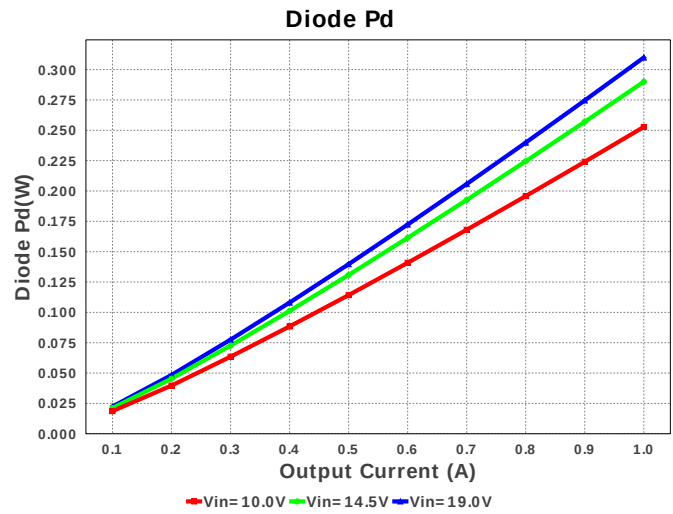
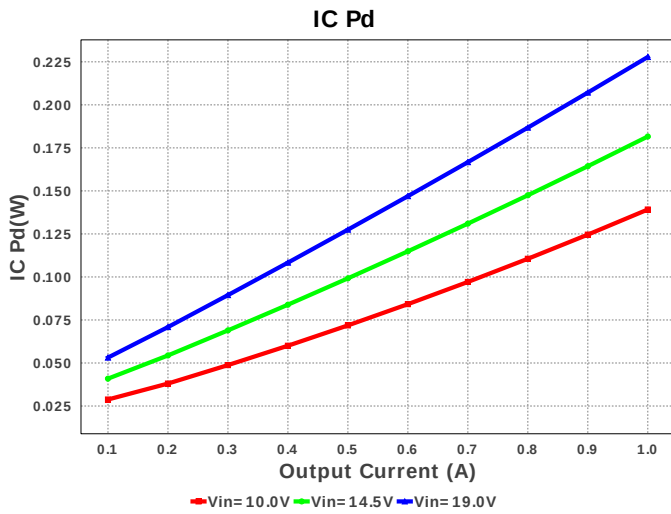
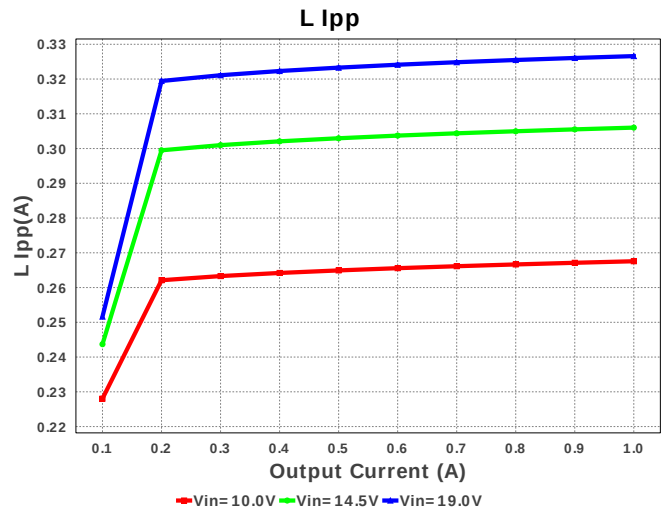
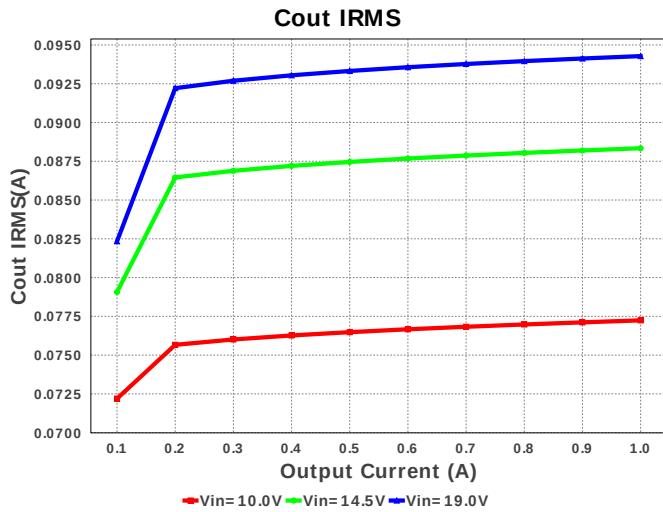


IC Ipk









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	342.866 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	94.281 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.163 A	Current	Peak switch current in IC
4.	Iin Avg	191.75 mA	Current	Average input current
5.	L Ipp	326.6 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	417.765 mA	Current	MOSFET RMS current
7.	BOM Count	13	General	Total Design BOM count
8.	FootPrint	227.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	570.0 kHz	General	Switching frequency
10.	M Vds Act	34.818 mV	General	Voltage drop across the MosFET
11.	Pout	3.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	\$1.55	General	Total BOM Cost
13.	D1 Tj	37.749 degC	Op_Point	D1 junction temperature
14.	Low Freq Gain	70.687 dB	Op_Point	Gain at 10Hz
15.	Vout Actual	2.982 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	3.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	10.216 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	17.453 %	Op_point	Duty cycle
19.	Efficiency	82.343 %	Op_point	Steady state efficiency
20.	Gain Marg	-16.95 dB	Op_point	Bode Plot Gain Margin
21.	IC Tj	41.391 degC	Op_point	IC junction temperature
22.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	1.0 A	Op_point	Iout operating point
24.	Phase Marg	60.815 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	19.0 V	Op_point	Vin operating point
26.	Vout p-p	2.131 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	117.557 µW	Power	Input capacitor power dissipation
28.	Cout Pd	33.2 µW	Power	Output capacitor power dissipation
29.	Diode Pd	309.94 mW	Power	Diode power dissipation
30.	IC Pd	227.821 mW	Power	IC power dissipation
31.	L Pd	105.38 mW	Power	Inductor power dissipation
32.	Total Pd	643.289 mW	Power	Total Power Dissipation
33.	Vout Tolerance	5.03 %		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	19.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	3.0	Output Voltage
5.	base_pn	TPS54531	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. [TPS54531 Product Folder](http://www.ti.com/product/TPS54531) : <http://www.ti.com/product/TPS54531> : contains the data sheet and other resources.

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