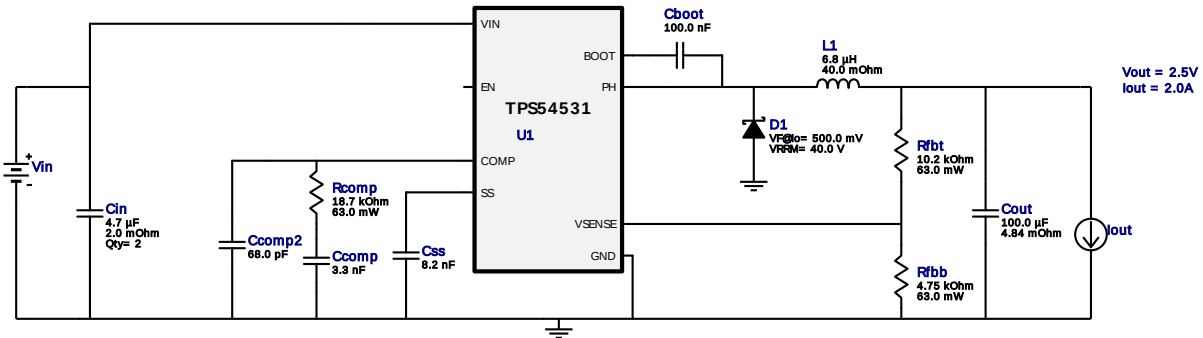


WEBENCH® Design Report

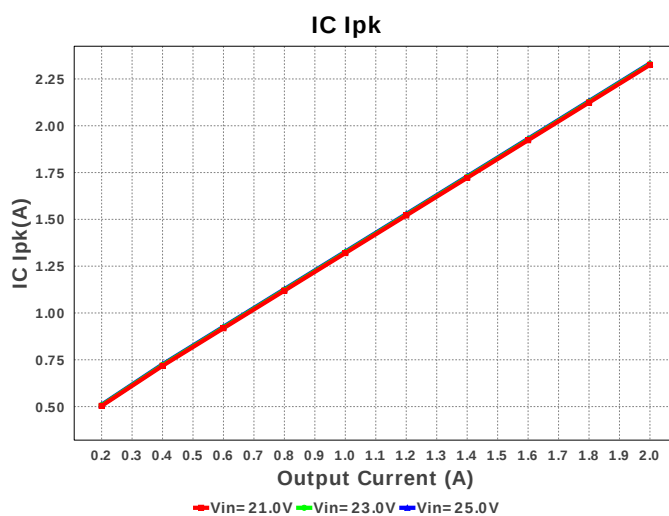
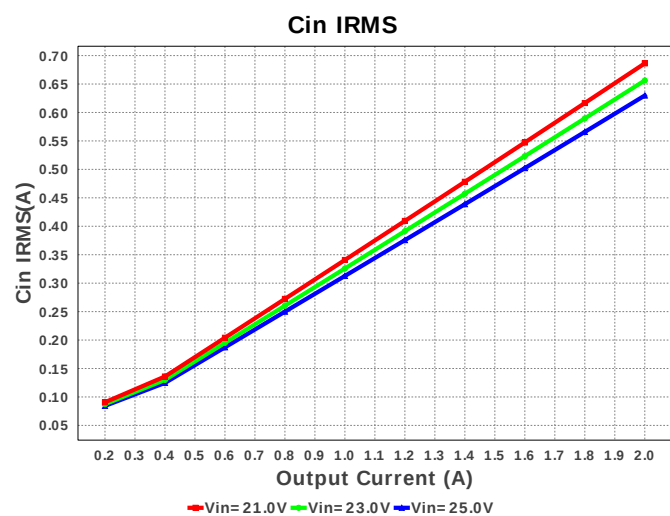
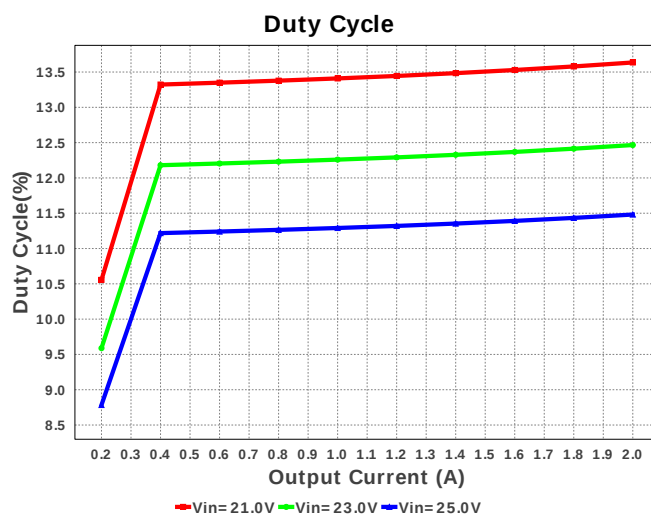
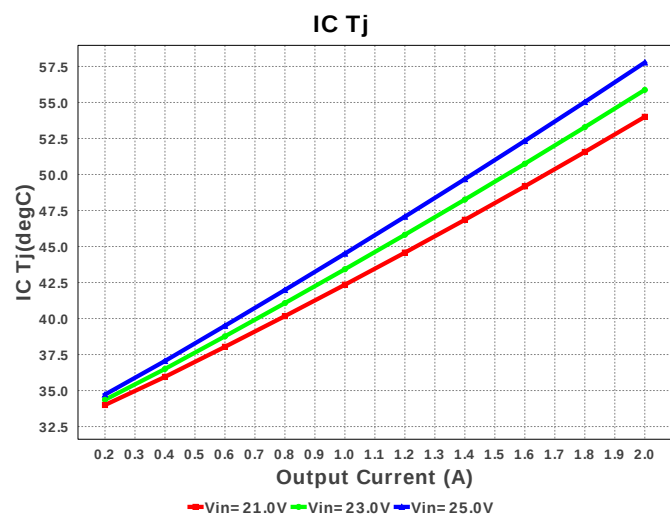
Design : 4742013/183 TPS54531DDAR
TPS54531DDAR 21.0V-25.0V to 2.50V @ 2.0A

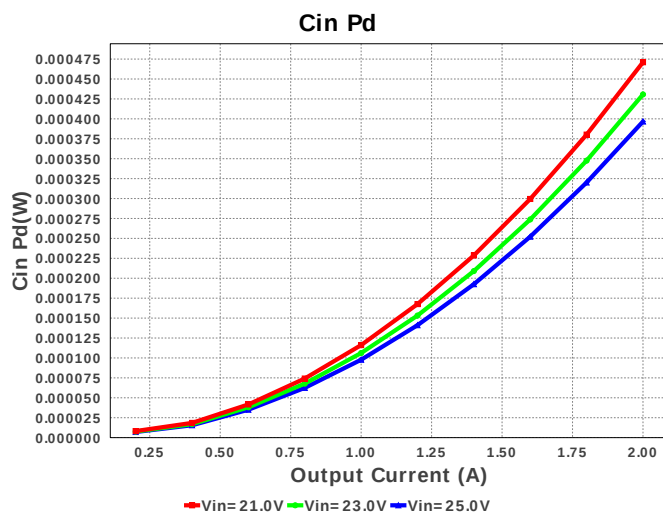
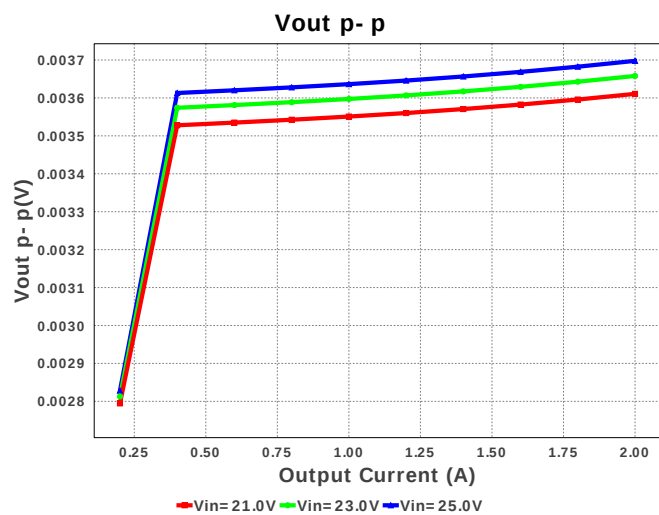
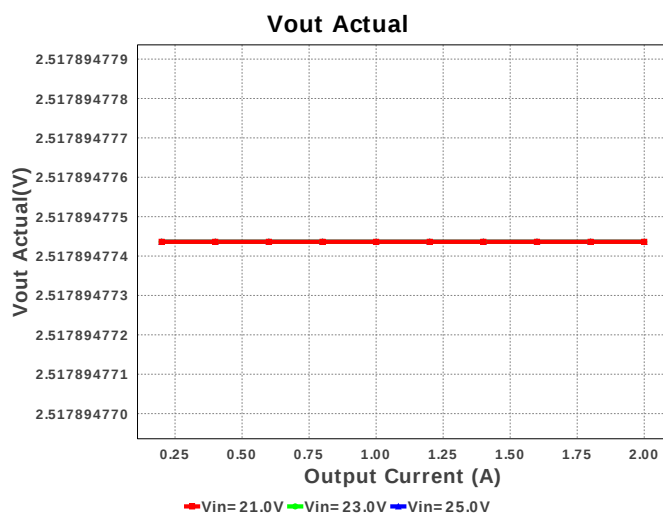
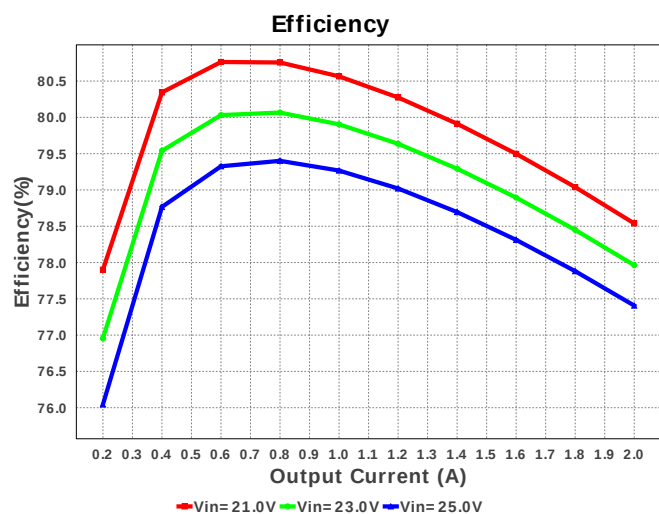
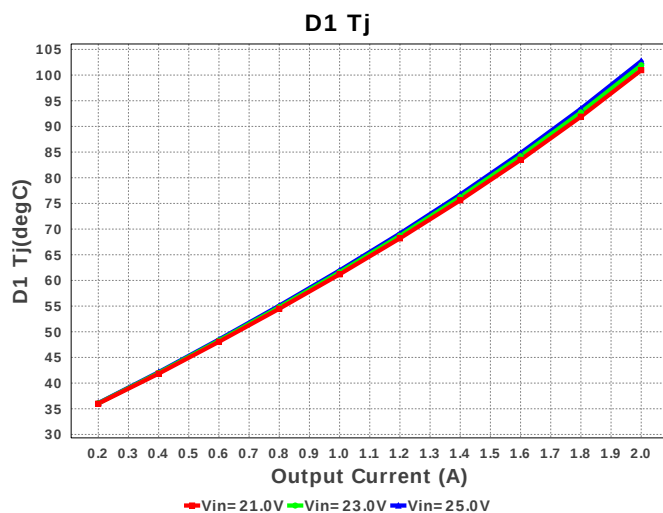
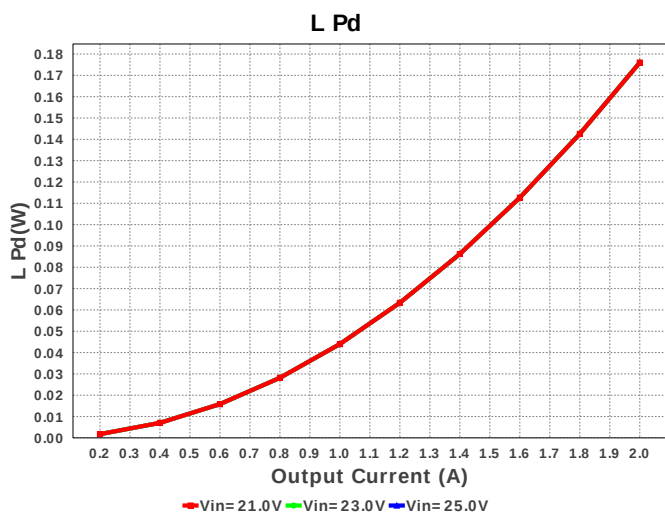


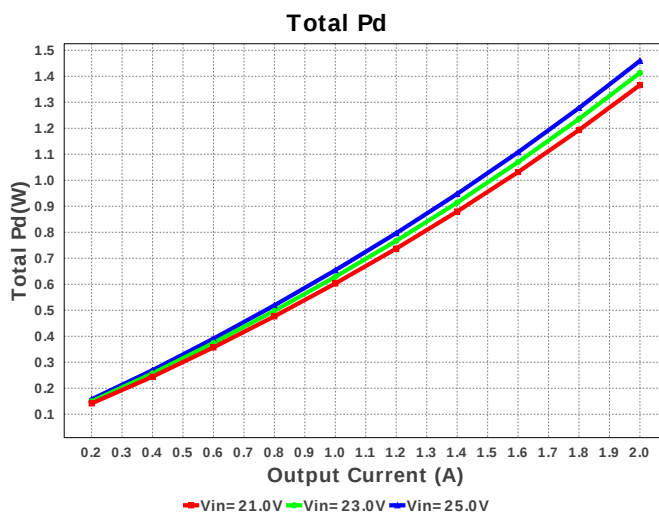
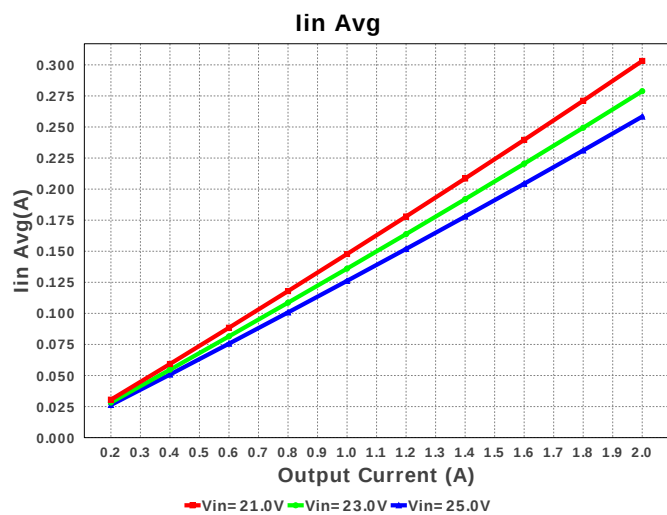
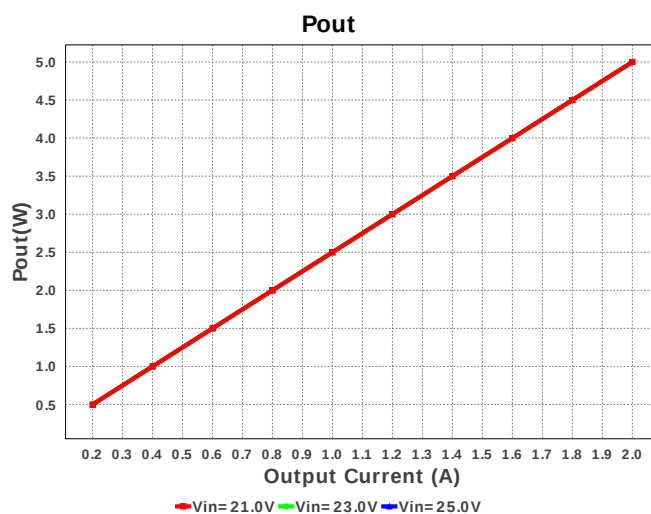
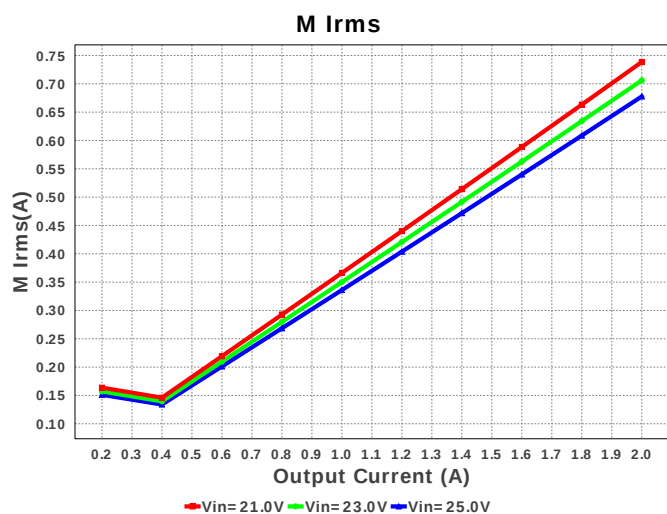
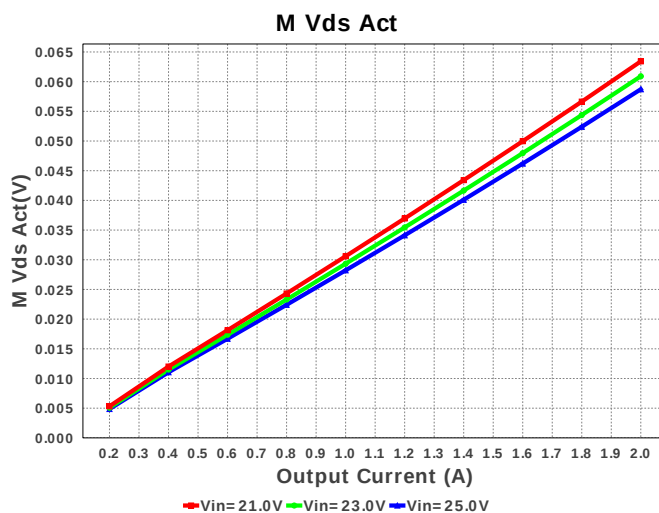
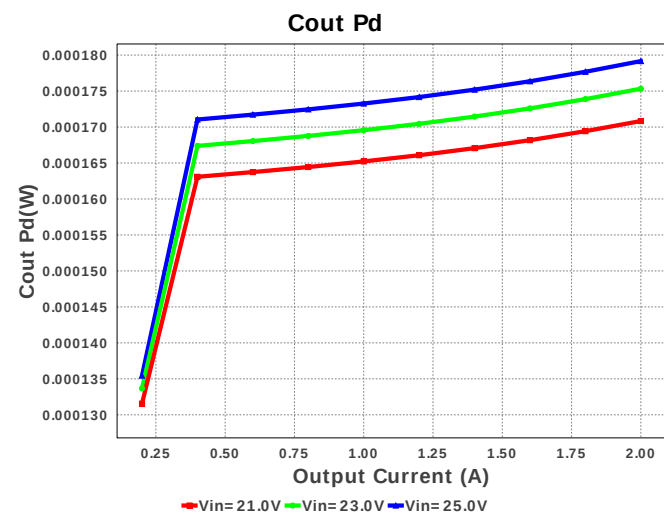
Electrical BOM

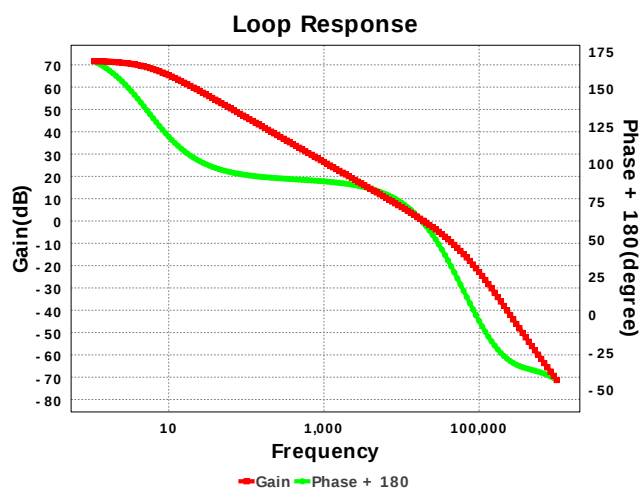
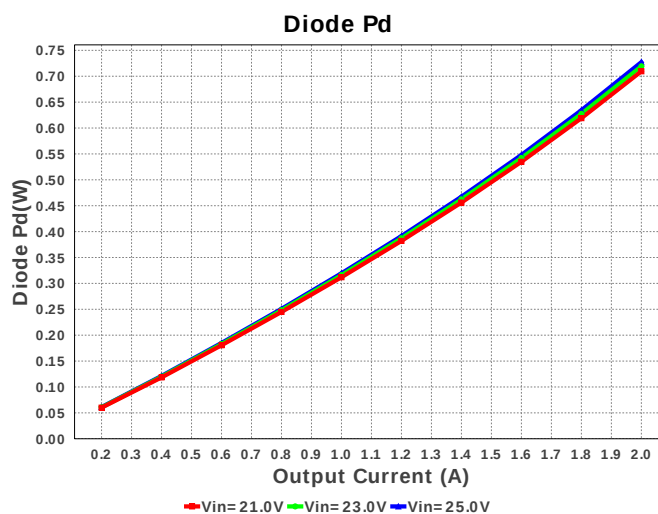
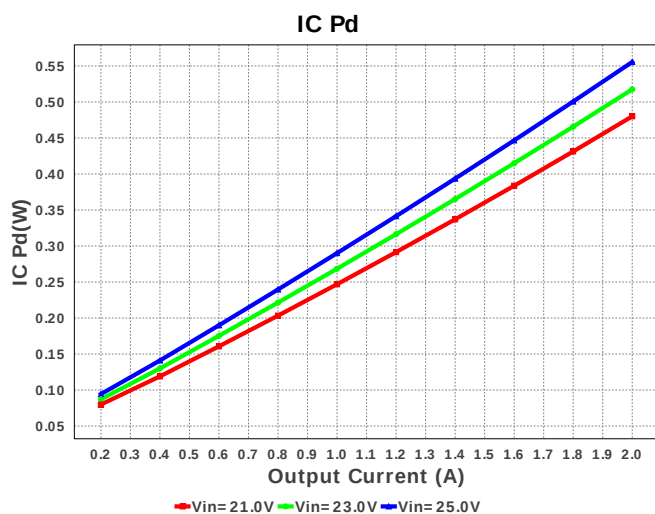
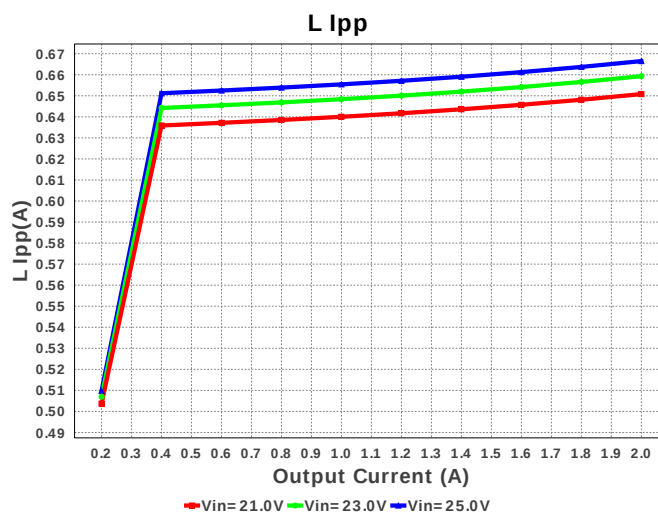
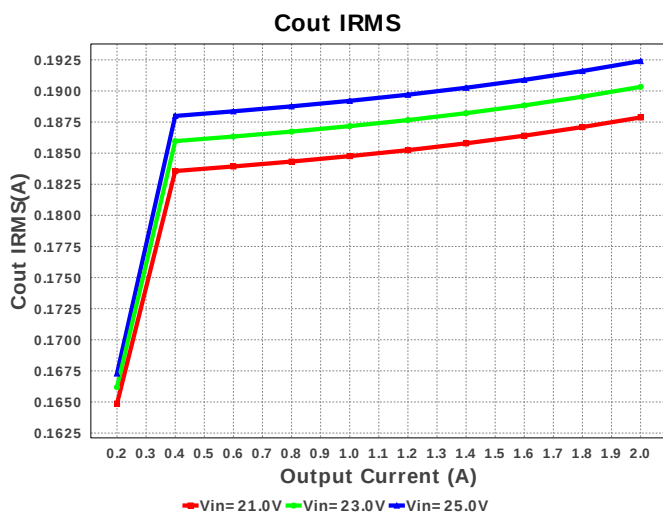
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
2.	Ccomp	MuRata	GRM216R71E332KA01D Series= X7R	Cap= 3.3 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	Kemet	C0805C680K5GACTU Series= C0G/NP0	Cap= 68.0 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	GRM31CD80G107ME39L Series= X6T	Cap= 100.0 uF ESR= 4.84 mOhm VDC= 4.0 V IRMS= 4.3381 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	SDR0805-6R8ML	L= 6.8 µH DCR= 40.0 mOhm	1	\$0.22	SDR0805 96 mm ²
9.	Rcomp	Vishay-Dale	CRCW040218K7FKED Series= CRCW..e3	Res= 18.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
10.	Rfbb	Vishay-Dale	CRCW04024K75FKED Series= CRCW..e3	Res= 4.75 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









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	629.801 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	192.399 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.333 A	Current	Peak switch current in IC
4.	Iin Avg	258.37 mA	Current	Average input current
5.	L Ipp	666.49 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	677.685 mA	Current	MOSFET RMS current
7.	BOM Count	13	General	Total Design BOM count
8.	FootPrint	259.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	570.0 kHz	General	Switching frequency
10.	M Vds Act	58.715 mV	General	Voltage drop across the MosFET
11.	Pout	5.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	\$1.67	General	Total BOM Cost
13.	D1 Tj	102.723 degC	Op_Point	D1 junction temperature
14.	Low Freq Gain	71.619 dB	Op_Point	Gain at 10Hz
15.	Vout Actual	2.518 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	2.5 V	Op_Point	Operational Output Voltage
17.	Cross Freq	19.318 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	11.481 %	Op_point	Duty cycle
19.	Efficiency	77.407 %	Op_point	Steady state efficiency
20.	Gain Marg	-21.104 dB	Op_point	Bode Plot Gain Margin
21.	IC Tj	57.777 degC	Op_point	IC junction temperature
22.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	2.0 A	Op_point	Iout operating point
24.	Phase Marg	60.984 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	25.0 V	Op_point	Vin operating point
26.	Vout p-p	3.698 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	396.649 μ W	Power	Input capacitor power dissipation
28.	Cout Pd	179.165 μ W	Power	Output capacitor power dissipation
29.	Diode Pd	727.226 mW	Power	Diode power dissipation
30.	IC Pd	555.54 mW	Power	IC power dissipation
31.	L Pd	176.0 mW	Power	Inductor power dissipation
32.	Total Pd	1.459 W	Power	Total Power Dissipation
33.	Vout Tolerance	4.927 %		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	25.0	Maximum input voltage
3.	VinMin	21.0	Minimum input voltage
4.	Vout	2.5	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> : contains the data sheet and other resources.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.

Use of Texas Instruments' WEBENCH simulation tools is subject to [Texas Instruments' Site Terms and Conditions of Use](#). Prototype boards based on WEBENCH created designs are provided AS IS without warranty of any kind for evaluation and testing purposes and are subject to the terms of the [Evaluation License Agreement](#).