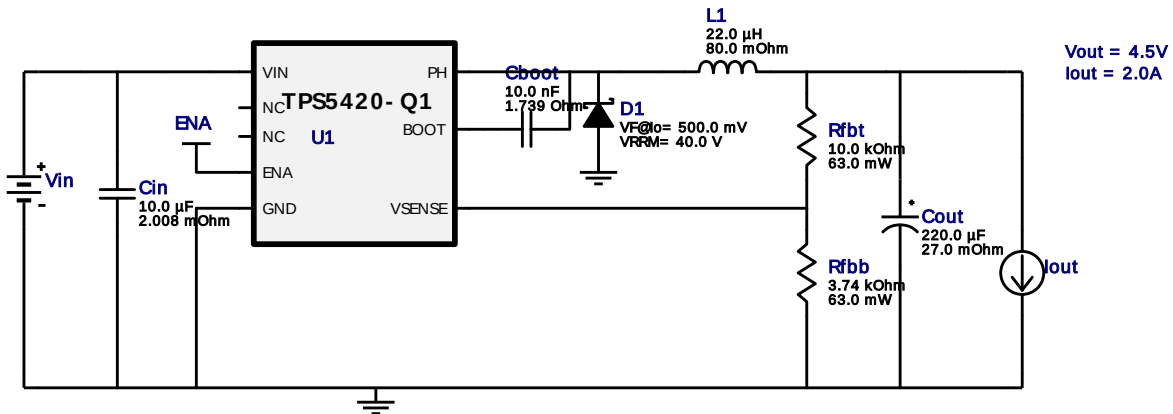


WEBENCH® Design Report

Design : 4770666/30 TPS5420QDRQ1
TPS5420QDRQ1 22.0V-25.0V to 4.50V @ 2.0A

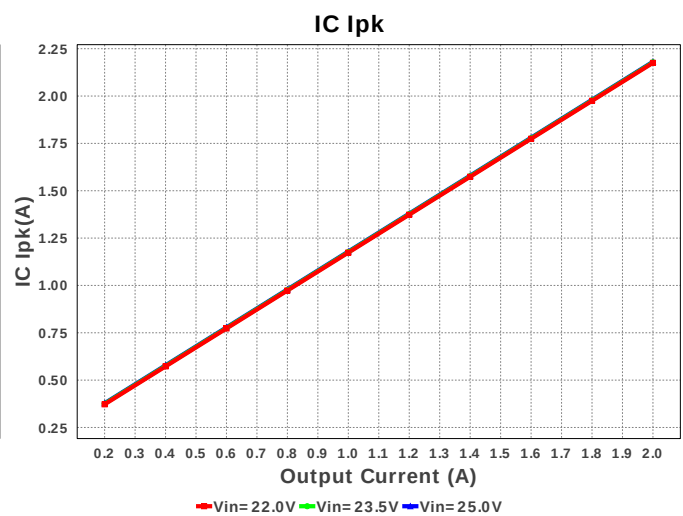
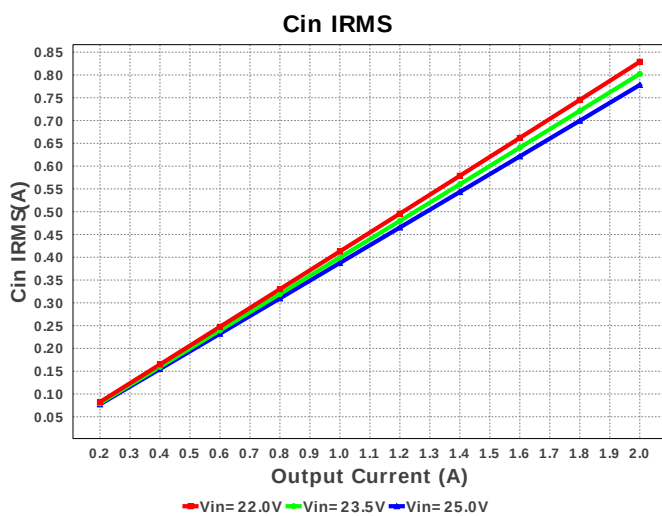
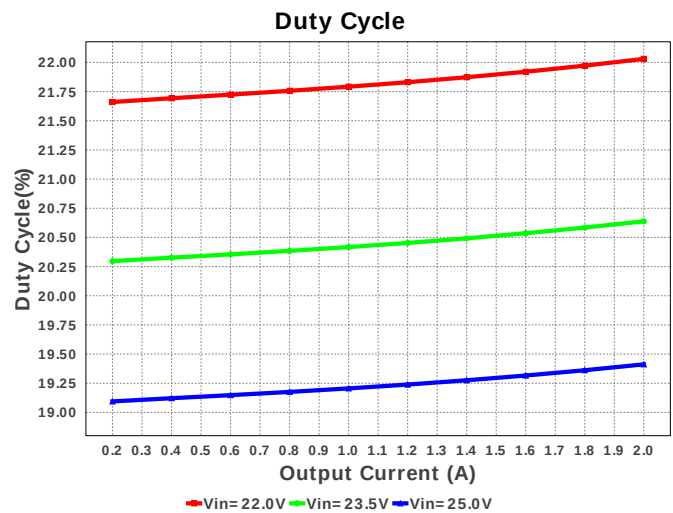
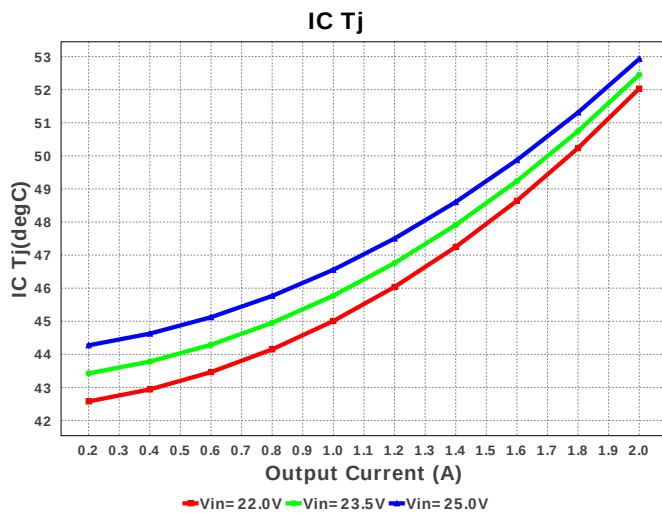


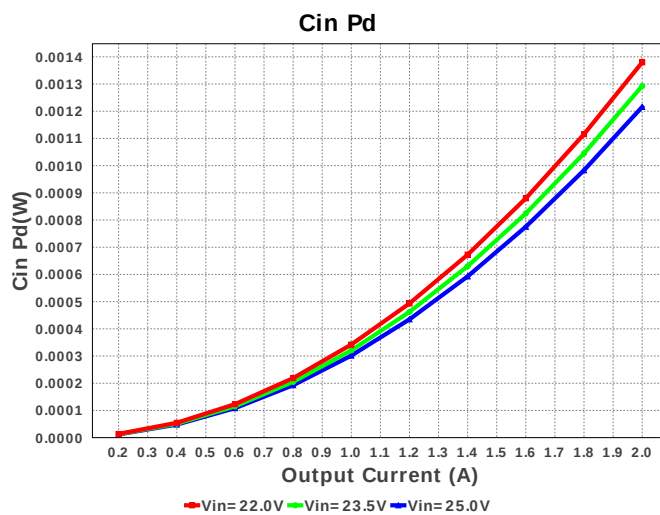
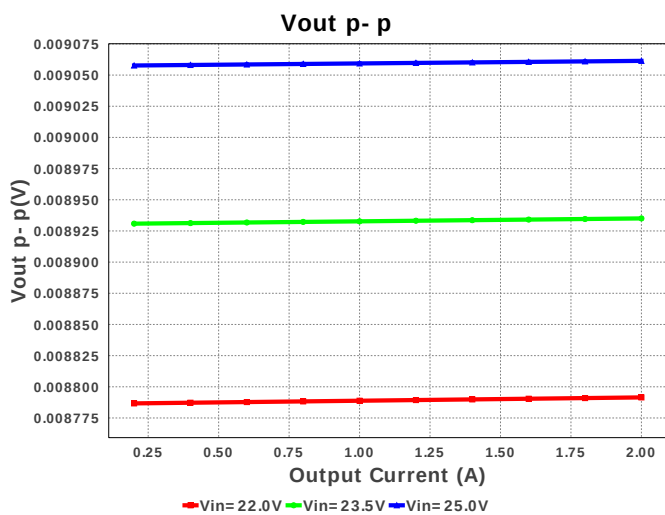
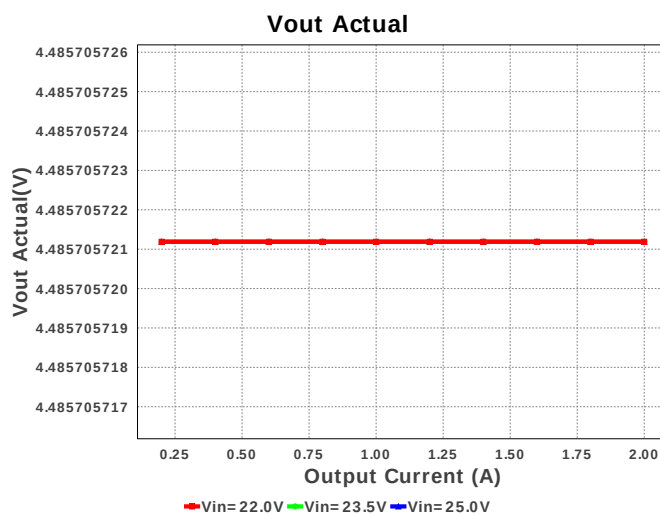
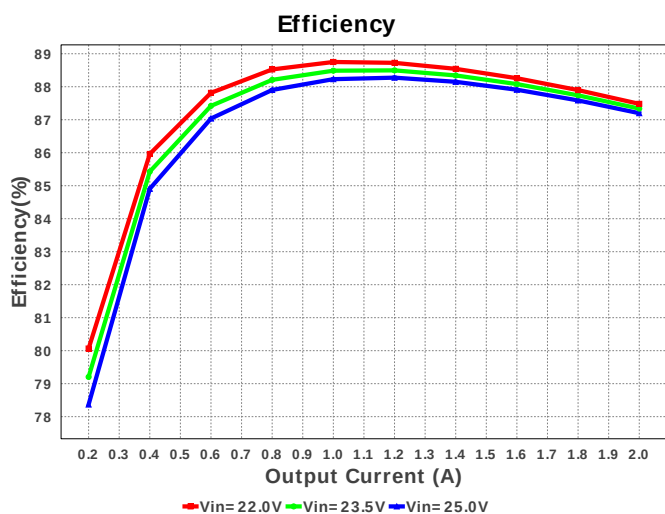
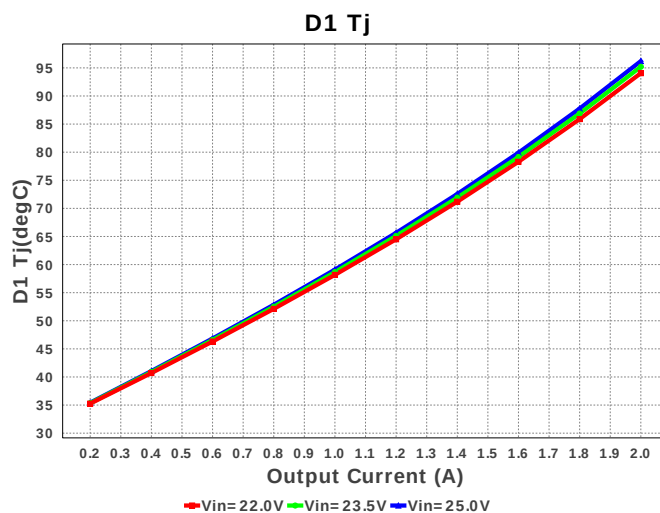
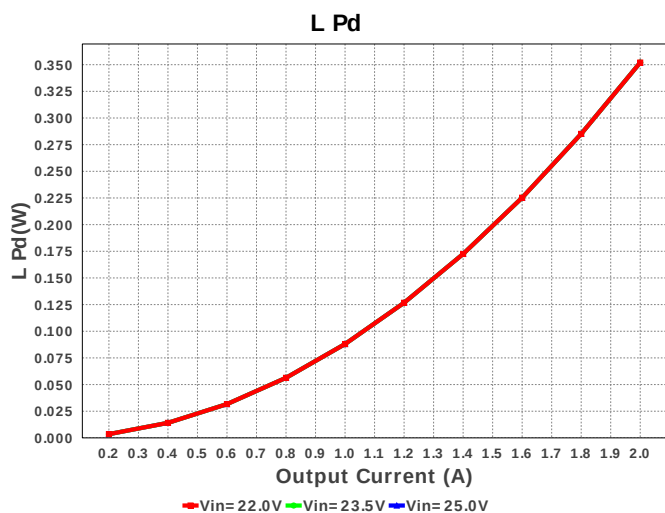
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application. View WEBENCH(R) Disclaimer.

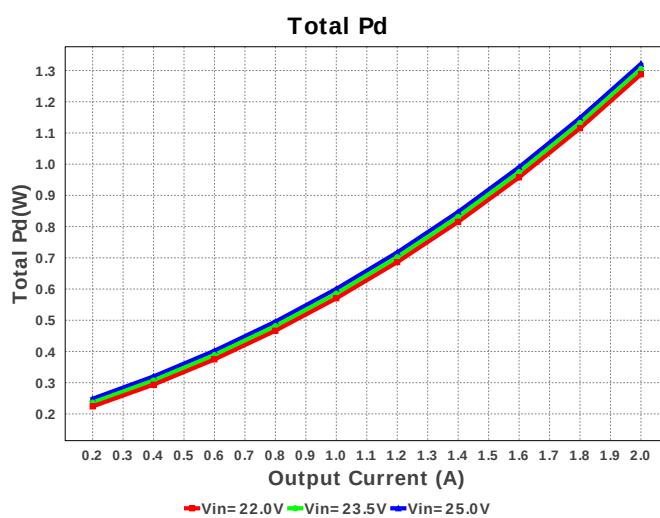
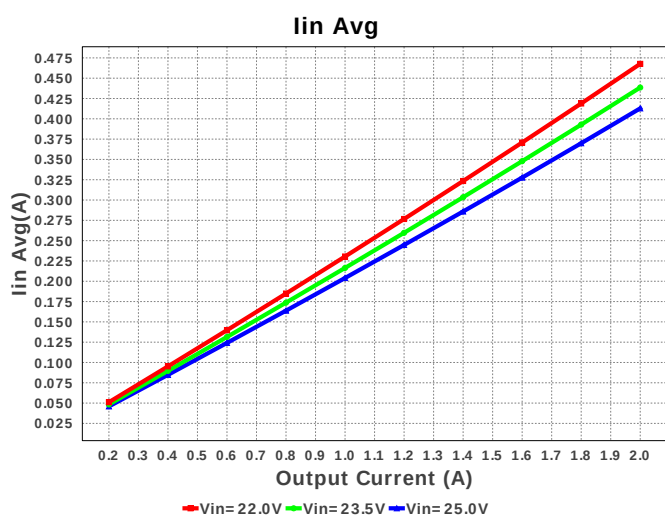
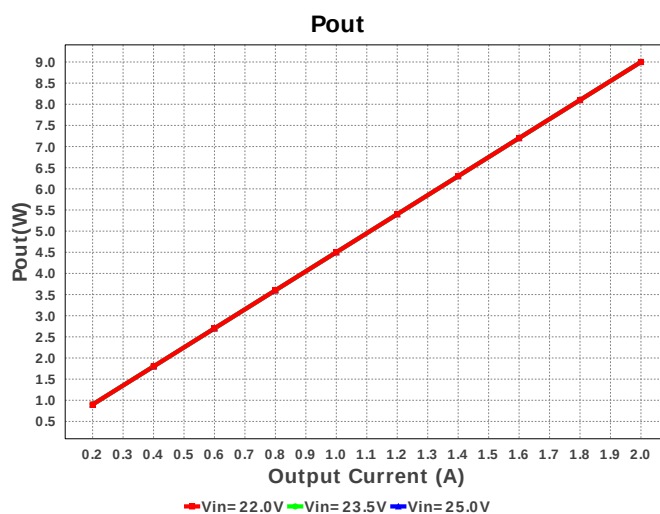
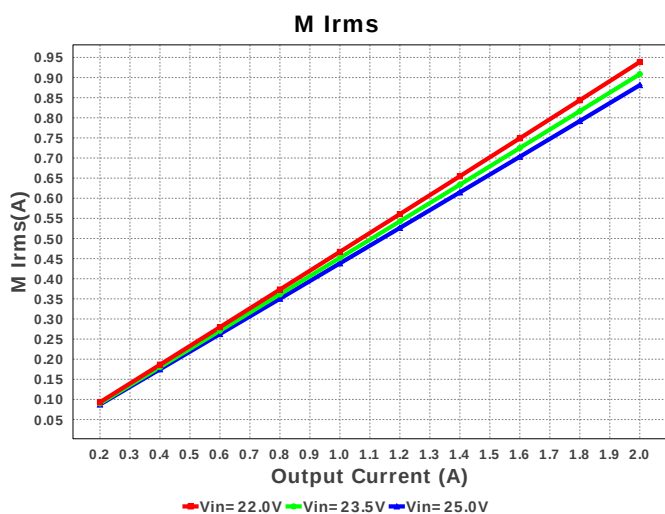
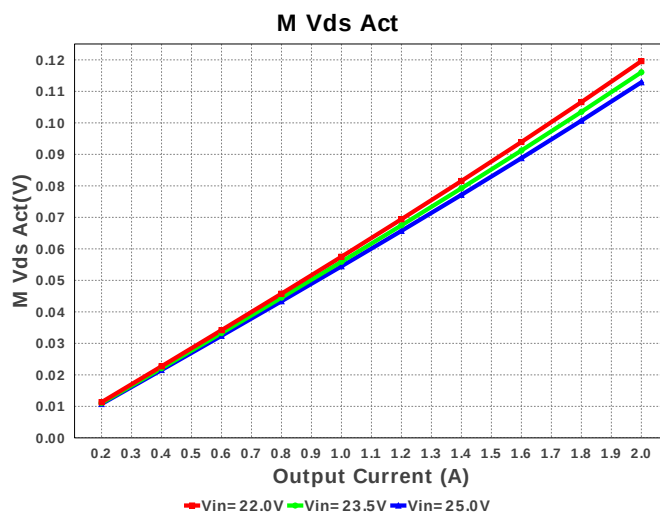
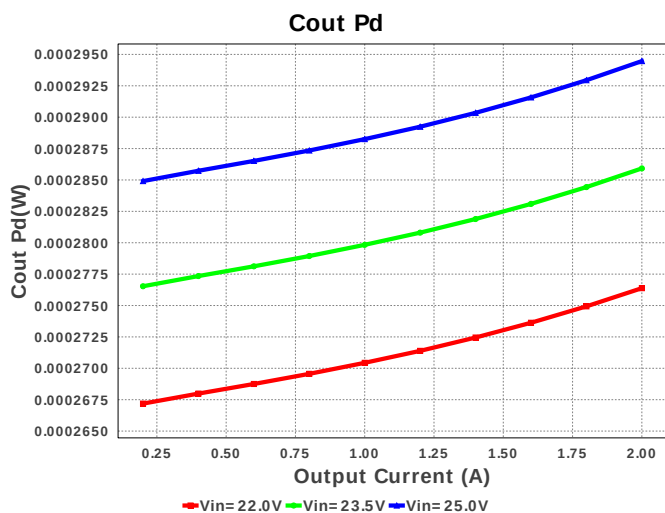
Electrical BOM

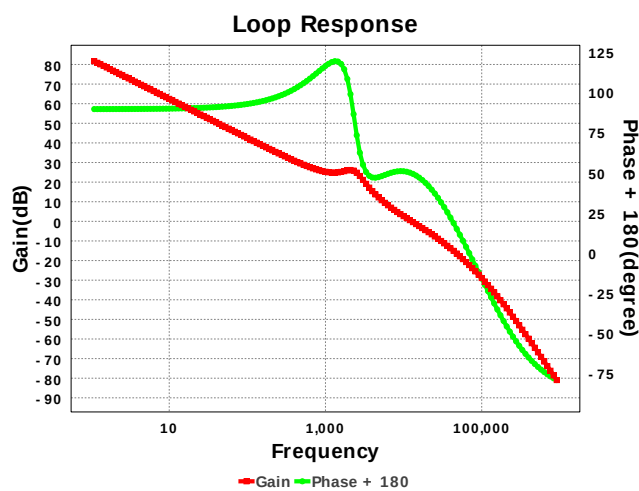
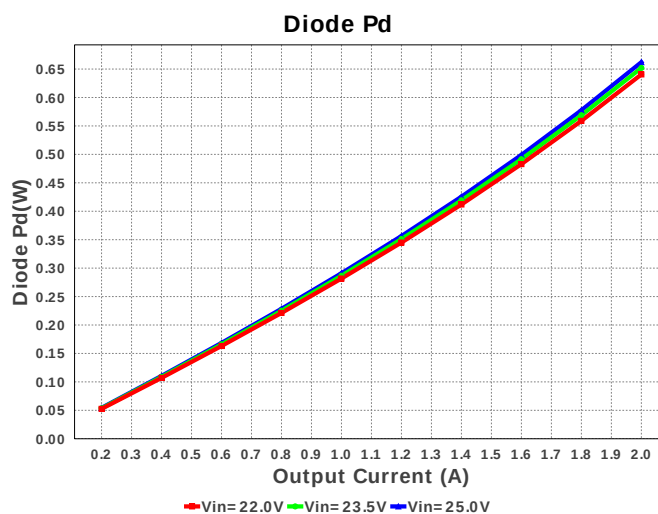
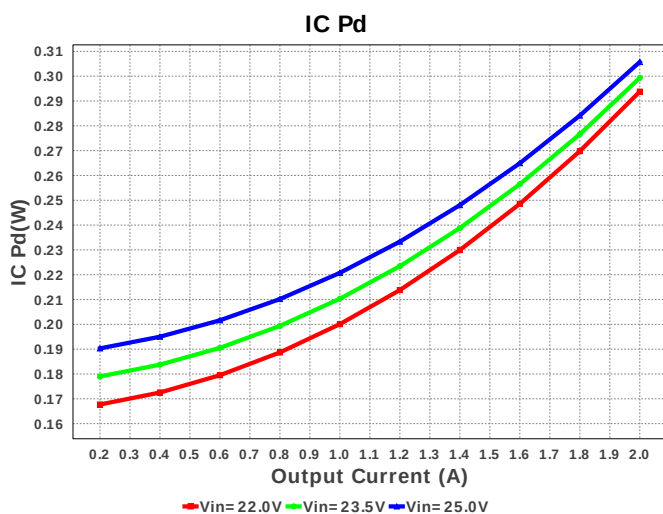
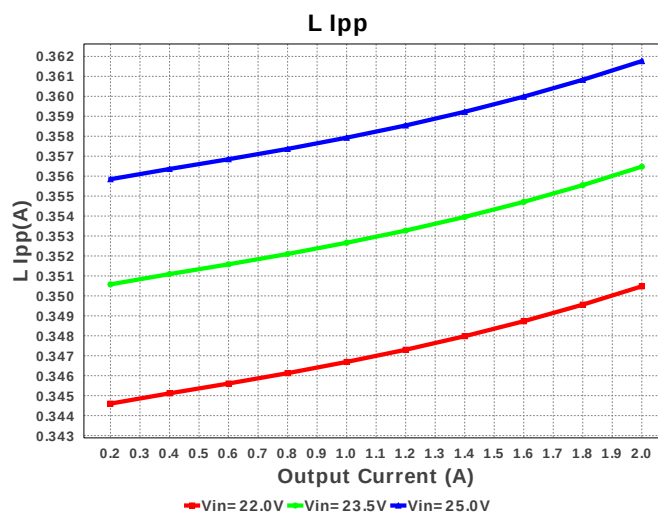
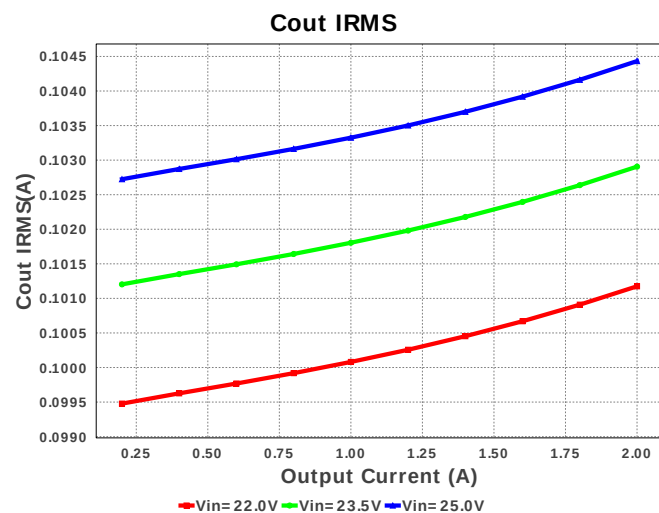
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	\$0.01	 0805 7 mm ²
2.	Cin	MuRata	GRM32ER7YA106KA12L Series= X7R	Cap= 10.0 uF ESR= 2.008 mOhm VDC= 35.0 V IRMS= 4.6772 A	1	\$0.22	 1210_280 15 mm ²
3.	Cout	Panasonic	6SVPC220M Series= SVPC	Cap= 220.0 uF ESR= 27.0 mOhm VDC= 6.3 V IRMS= 2.32 A	1	\$0.29	 SM_RADIAL_6.3AMM 80 mm ²
4.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.11	 SMA 37 mm ²
5.	L1	Bourns	SDR1105-220ML	L= 22.0 uH DCR= 80.0 mOhm	1	\$0.29	 SDR1105 157 mm ²
6.	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
7.	Rfht	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	U1	Texas Instruments	TPS5420QDRQ1	Switcher	1	\$2.00	 M08A 55 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	778.117 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	104.433 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.181 A	Current	Peak switch current in IC
4.	Iin Avg	412.85 mA	Current	Average input current
5.	L Ipp	361.77 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	881.176 mA	Current	Q lavg
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	357.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	500.0 kHz	General	Switching frequency
10.	IC Tolerance	18.315 mV	General	IC Feedback Tolerance
11.	M Vds Act	112.885 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	9.0 W	General	Total output power
14.	Total BOM	\$2.94	General	Total BOM Cost
15.	D1 Tj	96.207 degC	Op_Point	D1 junction temperature
16.	Vout Actual	4.486 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	4.5 V	Op_Point	Operational Output Voltage
18.	Cross Freq	12.724 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	19.412 %	Op_point	Duty cycle
20.	Efficiency	87.198 %	Op_point	Steady state efficiency
21.	IC Tj	52.929 degC	Op_point	IC junction temperature
22.	ICThetaJA	75.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	2.0 A	Op_point	Iout operating point
24.	Phase Marg	50.065 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	25.0 V	Op_point	Vin operating point
26.	Vout p-p	9.768 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	1.216 mW	Power	Input capacitor power dissipation
28.	Cout Pd	294.467 μW	Power	Output capacitor power dissipation
29.	Diode Pd	662.074 mW	Power	Diode power dissipation
30.	IC Pd	305.722 mW	Power	IC power dissipation
31.	L Pd	352.0 mW	Power	Inductor power dissipation
32.	Total Pd	1.321 W	Power	Total Power Dissipation
33.	Vout Tolerance	2.992 %		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	22.0	Minimum input voltage
4.	Vout	4.5	Output Voltage
5.	base_pn	TPS5420-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Feature Highlights: Automotive Qualified 2A, 500kHz Fixed Switching Frequency, Internal Compensation
2. The TPS5420-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application
3. **TPS5420-Q1 Product Folder** : <http://www.ti.com/product/TPS5420%2DQ1> : 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](#).