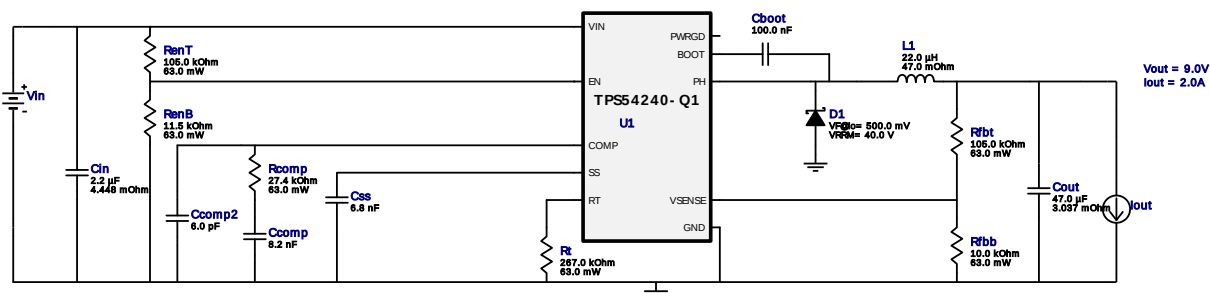


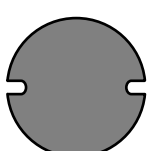
WEBENCH® Design Report

Design : 4742013/8 TPS54240QDGQRQ1
TPS54240QDGQRQ1 14.0V-25.0V to 9.00V @ 2.0A

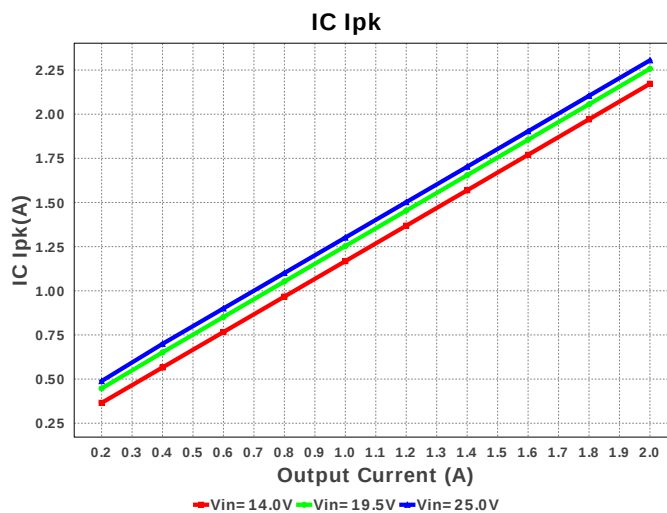
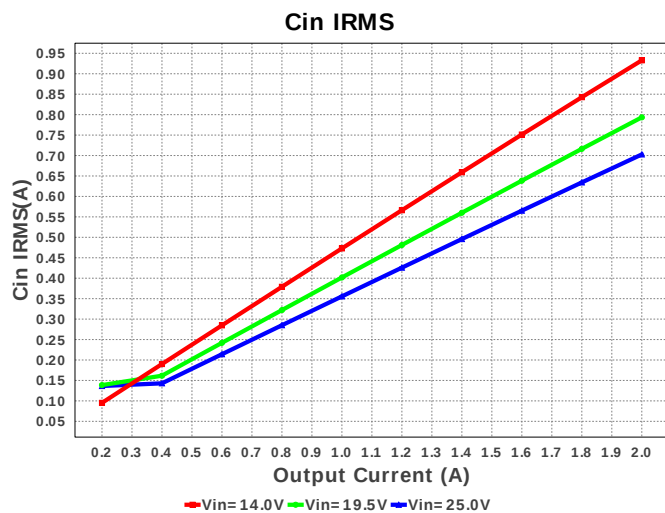
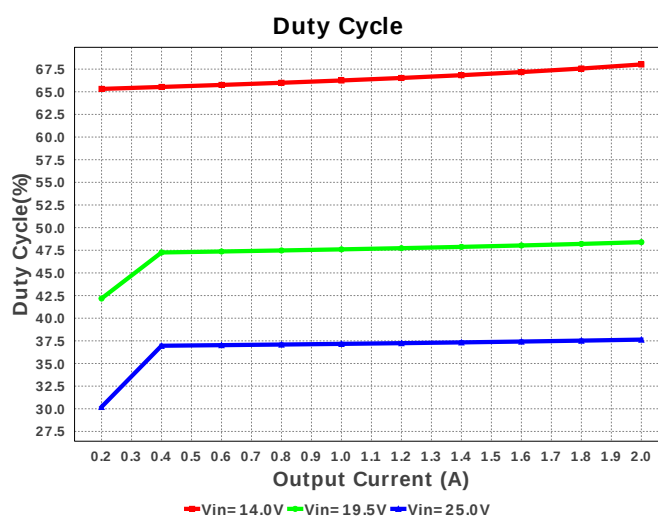
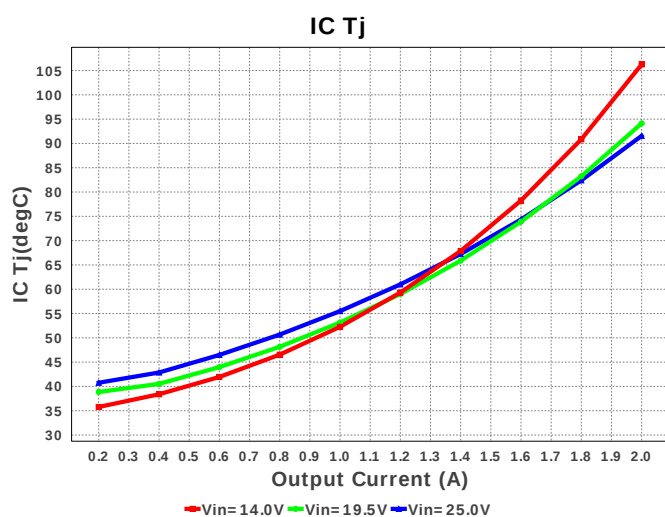


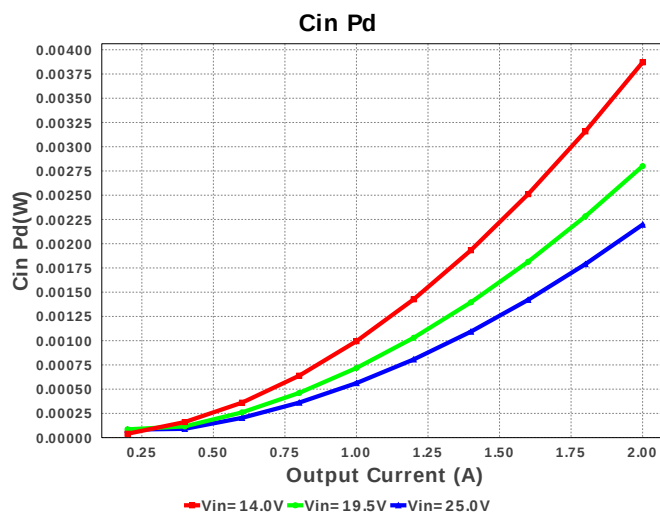
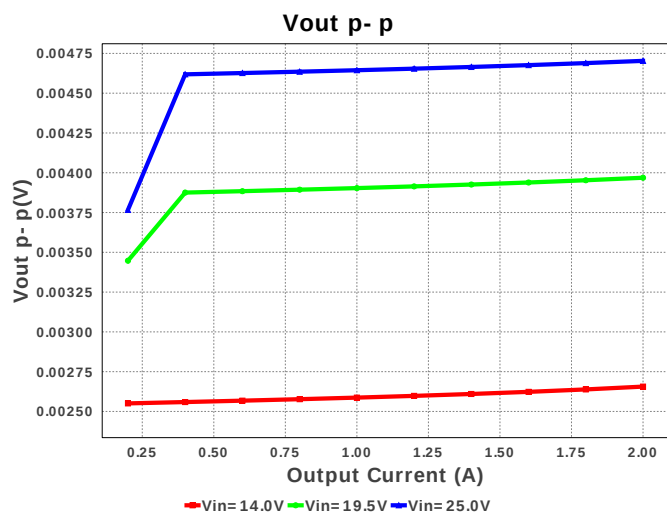
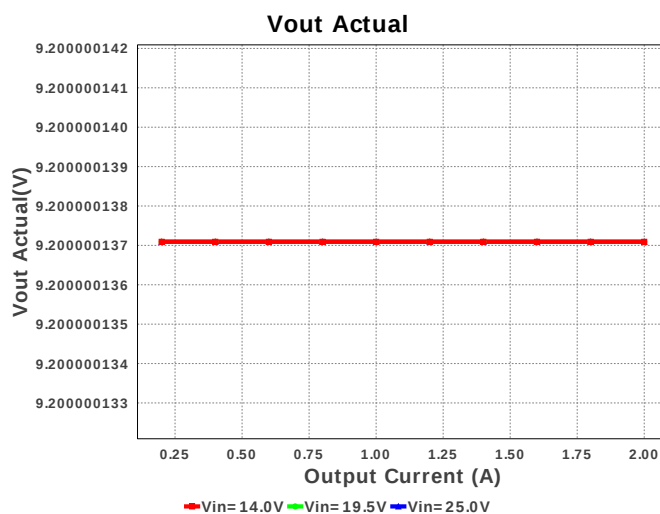
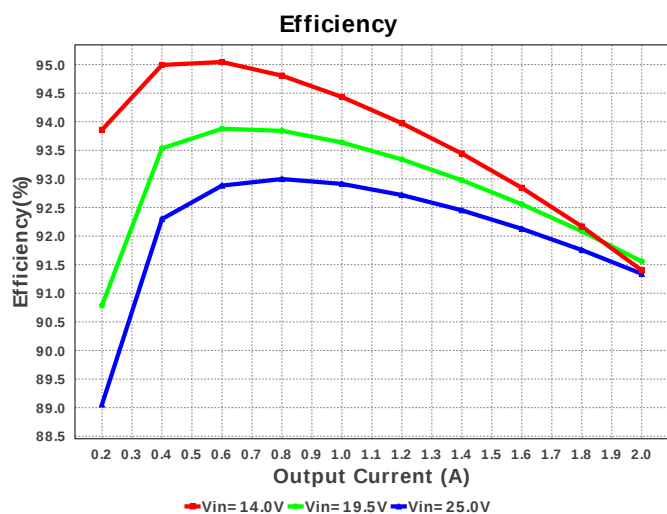
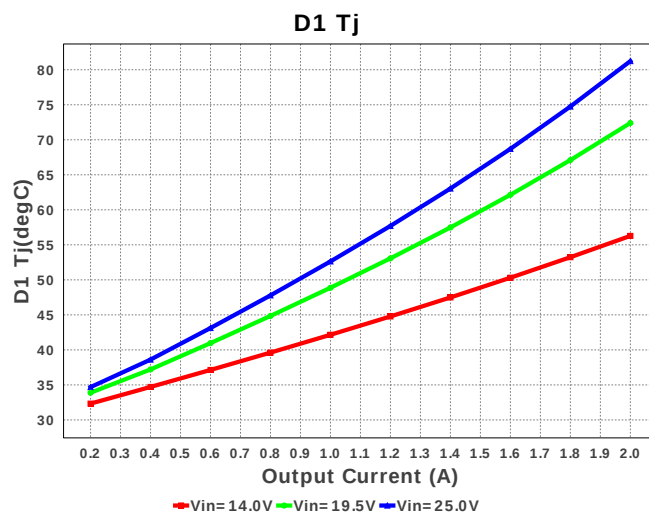
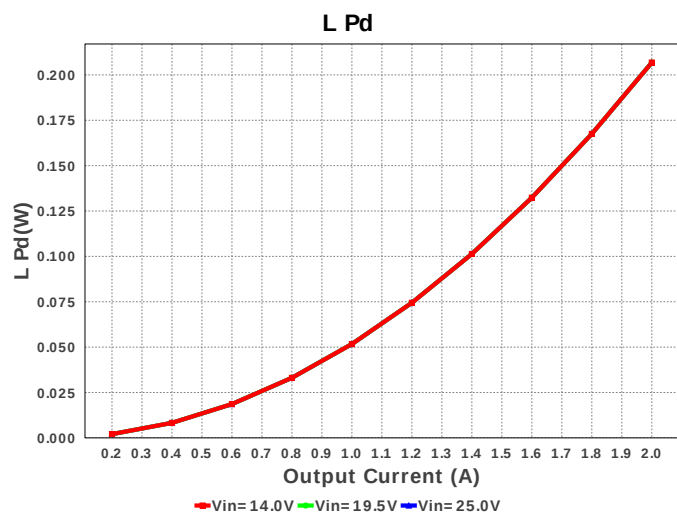
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

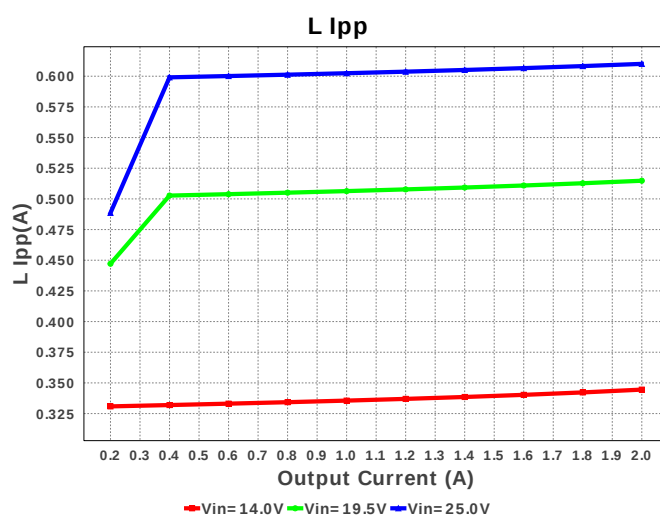
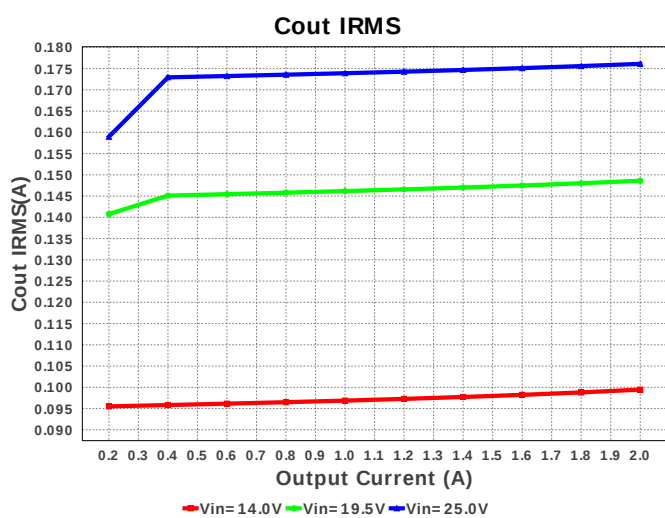
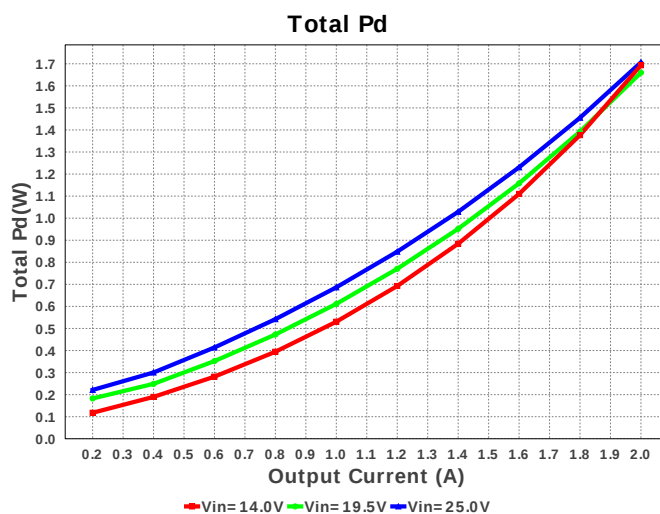
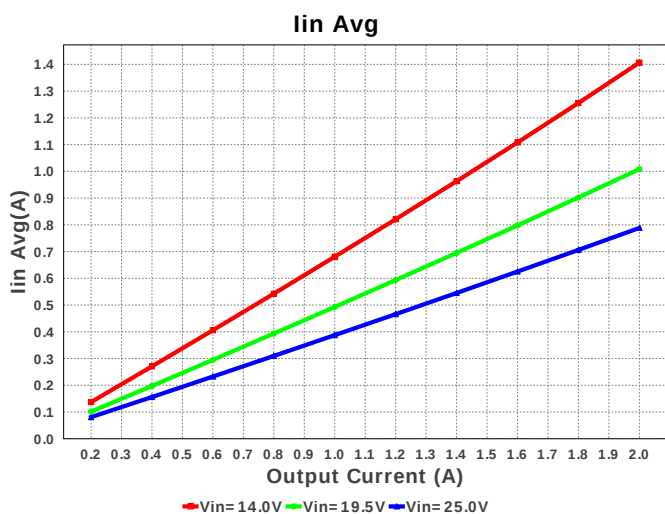
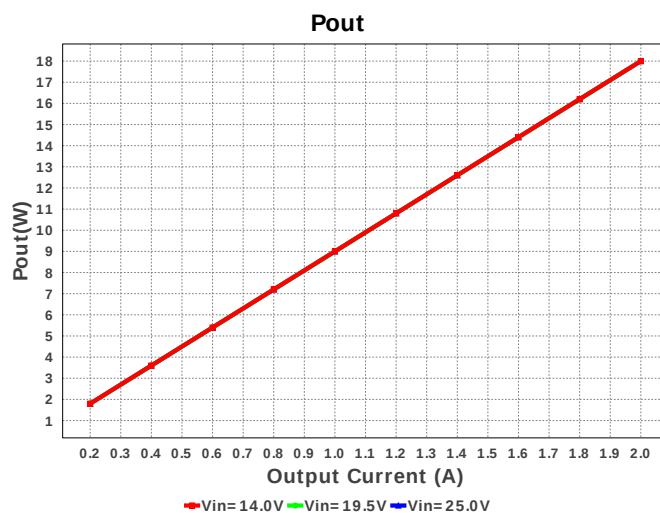
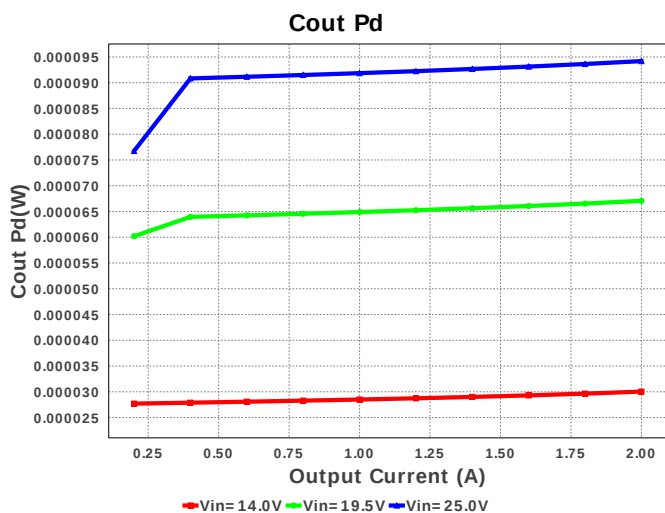
Electrical BOM

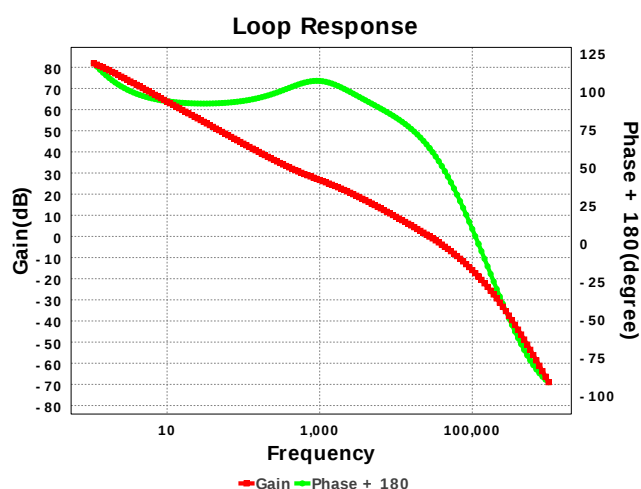
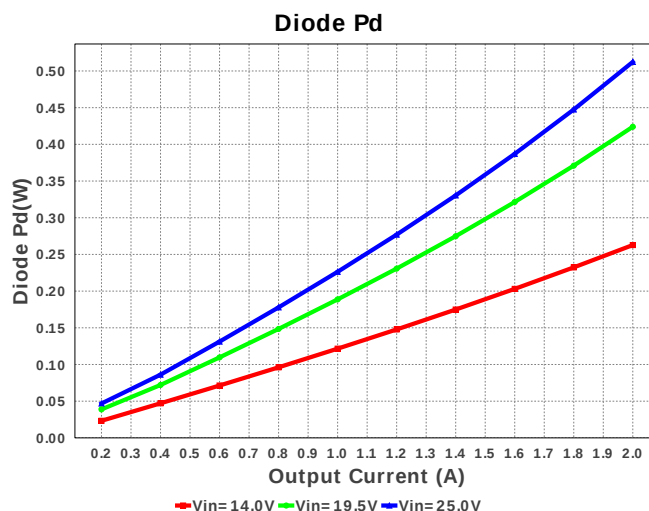
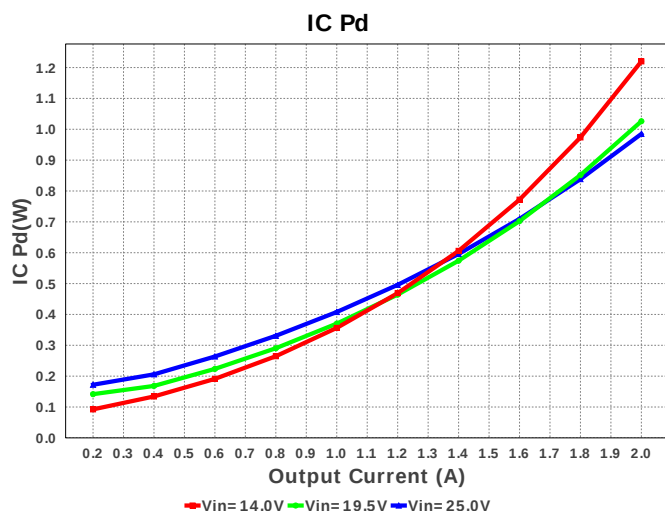
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
2.	Ccomp	MuRata	GRM033R61A822KA01D Series= X5R	Cap= 8.2 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
3.	Ccomp2	Yageo America	CC0805DRNP09BN6R0 Series= C0G/NP0	Cap= 6.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm ²
4.	Cin	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	\$0.05	 1206_190 11 mm ²
5.	Cout	MuRata	GRM32ER61C476ME15L Series= X5R	Cap= 47.0 uF ESR= 3.037 mOhm VDC= 16.0 V IRMS= 4.59346 A	1	\$0.24	 1210_280 15 mm ²
6.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 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	SDR1307-220ML	L= 22.0 uH DCR= 47.0 mOhm	1	\$0.35	 SDR1307 227 mm ²
9.	Rcomp	Vishay-Dale	CRCW040227K4FKED Series= CRCW..e3	Res= 27.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
10.	RenB	Vishay-Dale	CRCW040211K5FKED Series= CRCW..e3	Res= 11.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	RenT	Vishay-Dale	CRCW0402105KFKED Series= CRCW..e3	Res= 105.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
12.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
13.	Rfbt	Vishay-Dale	CRCW0402105KFKED Series= CRCW..e3	Res= 105.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
14.	Rt	Vishay-Dale	CRCW0402267KFKED Series= CRCW..e3	Res= 267.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
15.	U1	Texas Instruments	TPS54240QDGQRQ1	Switcher	1	\$1.76	 S-PDSO-G10 24 mm²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	702.6 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	176.589 mA	Current	Output capacitor RMS ripple current
3.	IC IpK	2.0 A	Current	Peak switch current in IC
4.	Iin Avg	790.3 mA	Current	Average input current
5.	L Ipp	611.72 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	15	General	Total Design BOM count
7.	FootPrint	350.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	448.677 kHz	General	Switching frequency
9.	Pout	18.0 W	General	Total output power
10.	Total BOM	\$2.63	General	Total BOM Cost
11.	D1 Tj	86.192 degC	Op_Point	D1 junction temperature
12.	Low Freq Gain	81.786 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	9.2 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
15.	Cross Freq	27.367 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	37.739 %	Op_point	Duty cycle
17.	Efficiency	91.105 %	Op_point	Steady state efficiency
18.	Gain Marg	-19.063 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	91.653 degC	Op_point	IC junction temperature
20.	ICThetaJA	62.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	2.0 A	Op_point	Iout operating point
22.	Phase Marg	62.381 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	25.0 V	Op_point	Vin operating point
24.	Vout p-p	4.716 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	2.196 mW	Power	Input capacitor power dissipation
26.	Cout Pd	94.705 μW	Power	Output capacitor power dissipation
27.	Diode Pd	561.922 mW	Power	Diode power dissipation
28.	IC Pd	986.447 mW	Power	IC power dissipation
29.	L Pd	206.8 mW	Power	Inductor power dissipation
30.	Total Pd	1.757 W	Power	Total Power Dissipation

#	Name	Value	Category	Description
31.	Vout Tolerance	2.863 %		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	14.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	TPS54240-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The TPS54240-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

2. **TPS54240-Q1** Product Folder : <http://www.ti.com/product/TPS54240%2DQ1> : contains the data sheet and other resources.

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

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