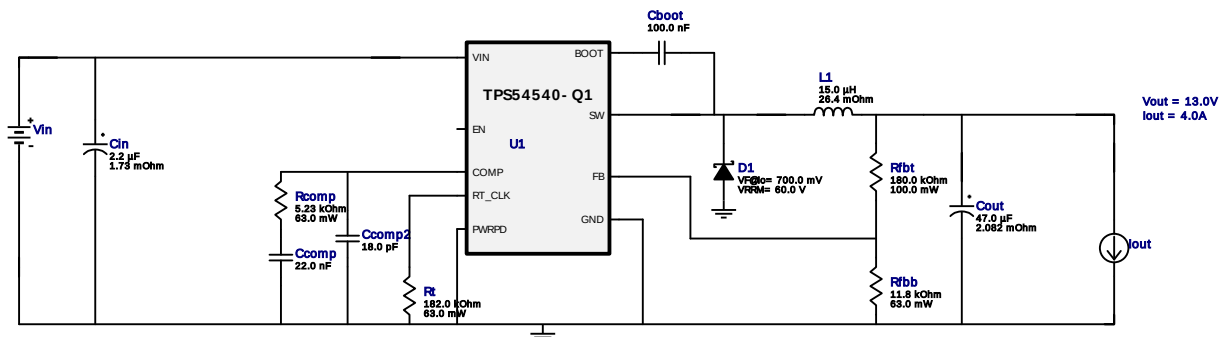


WEBENCH® Design Report

Design : 4806354/3 TPS54540QDDARQ1
TPS54540QDDARQ1 33.0V-42.0V to 13.00V @ 4.0A

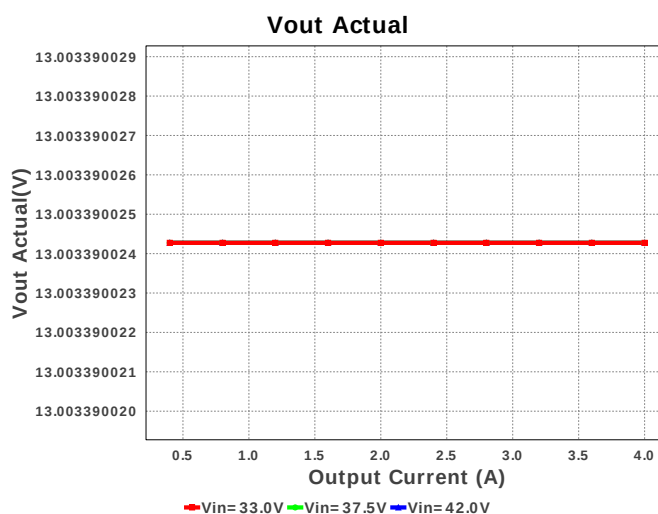
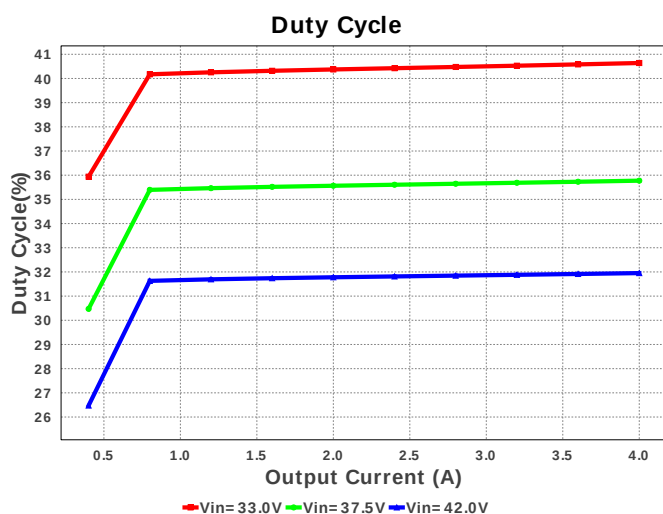
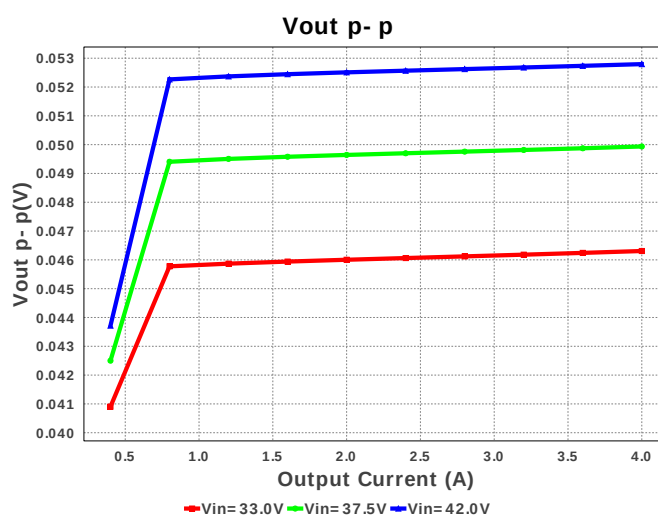
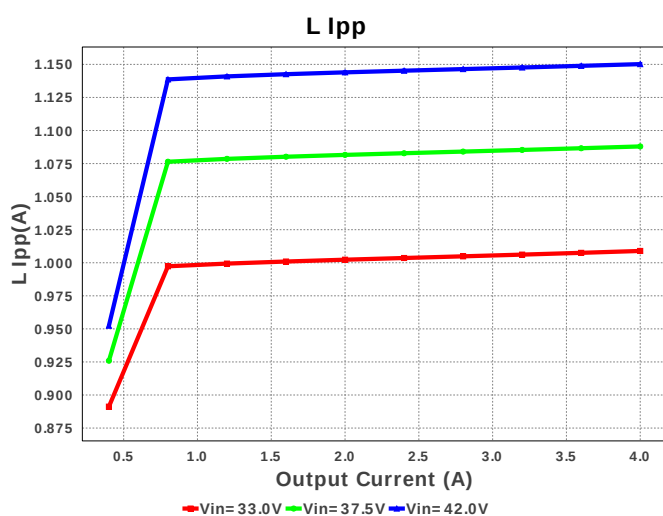


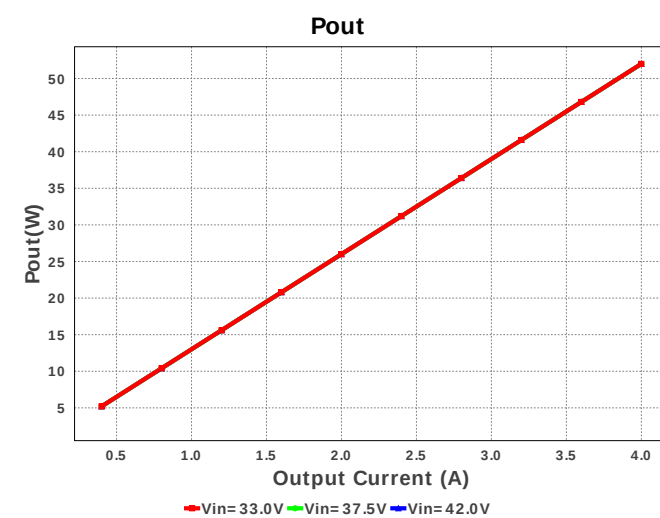
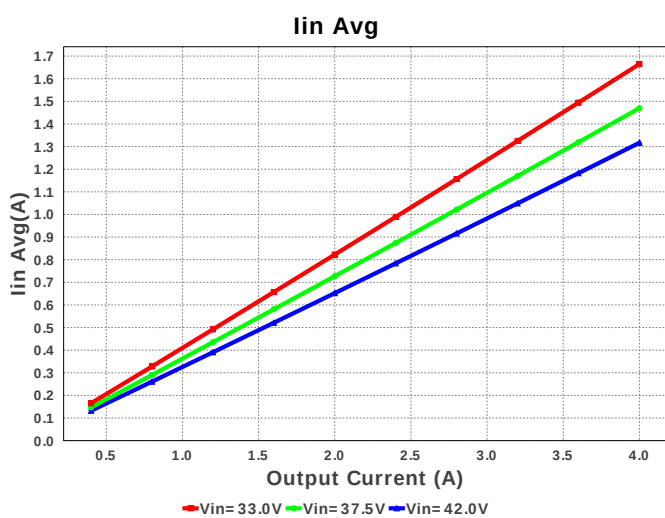
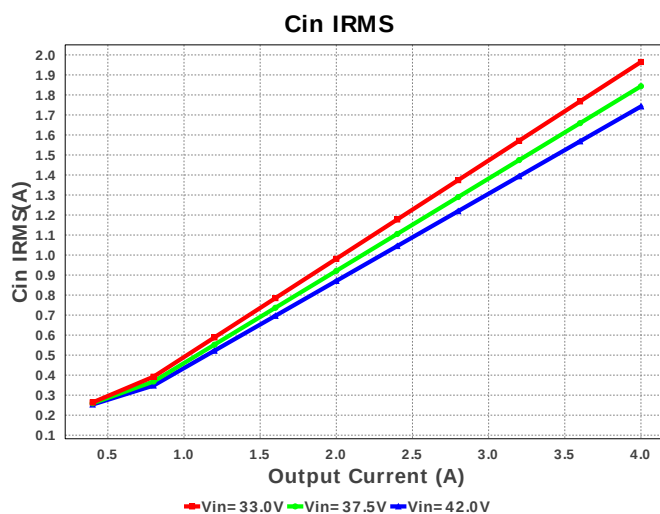
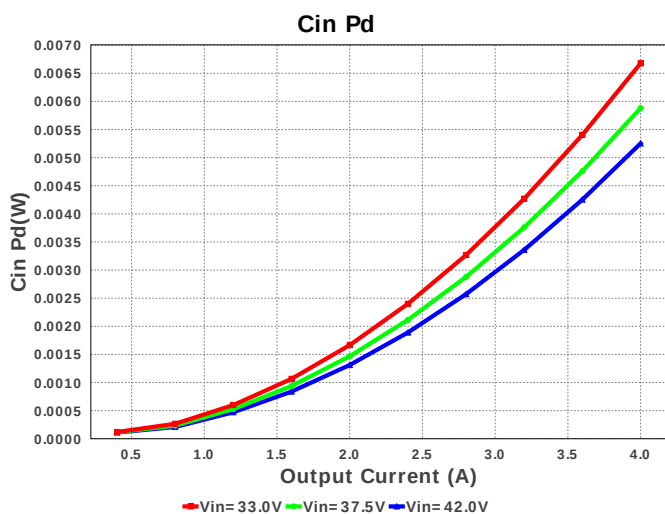
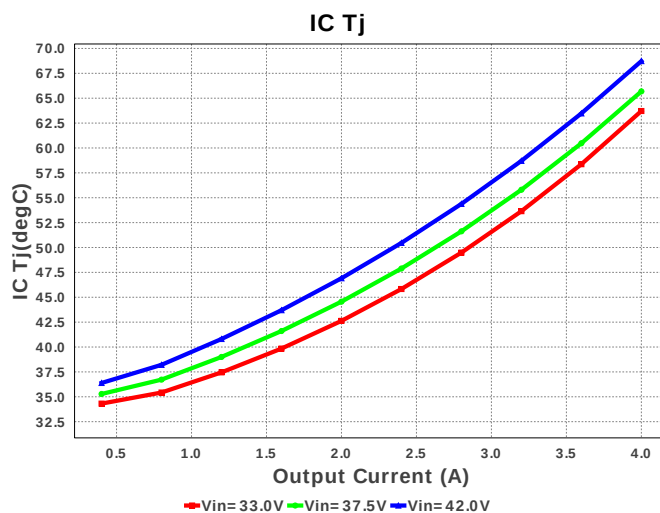
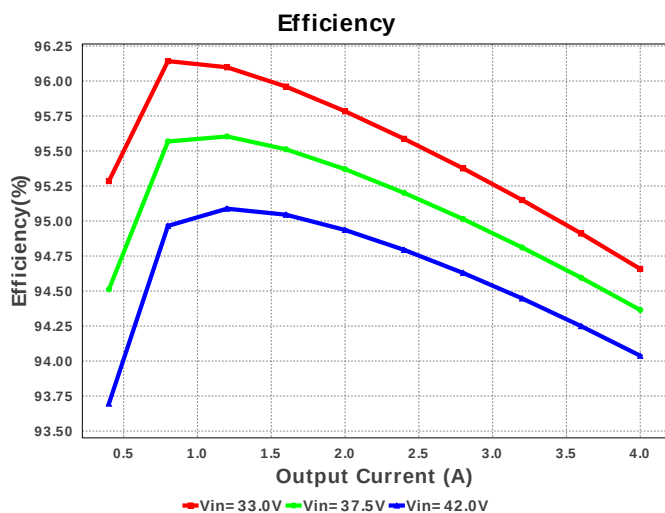
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

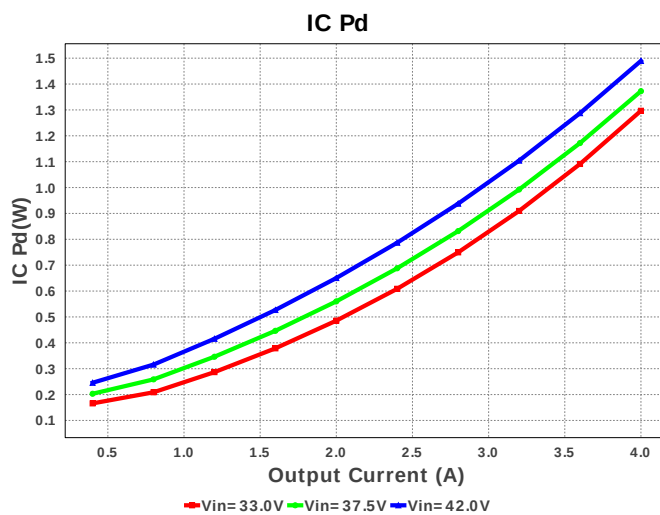
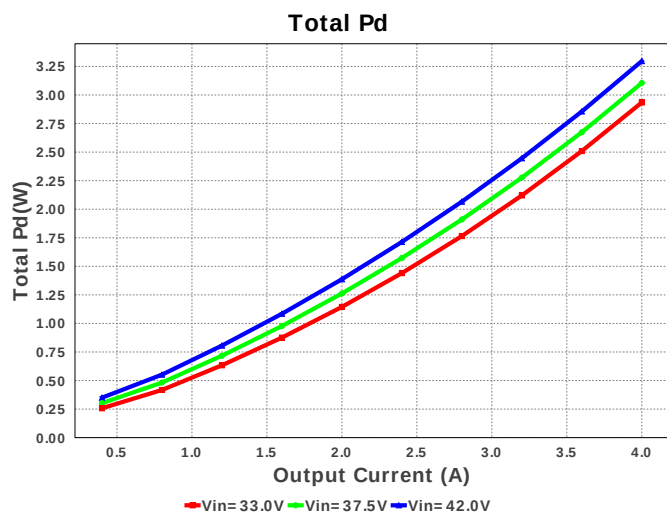
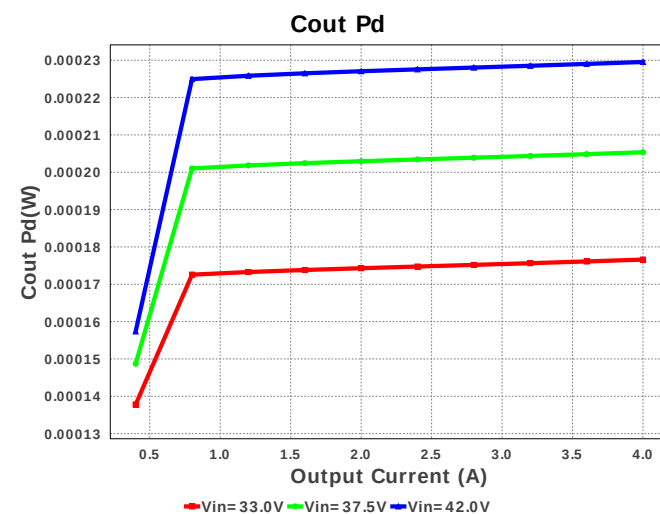
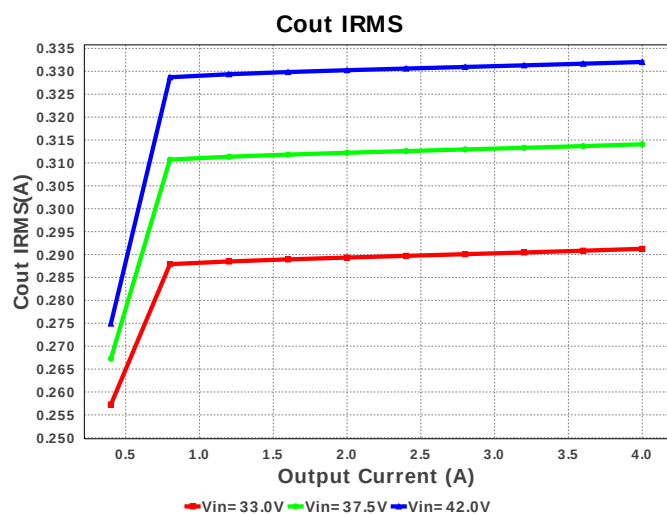
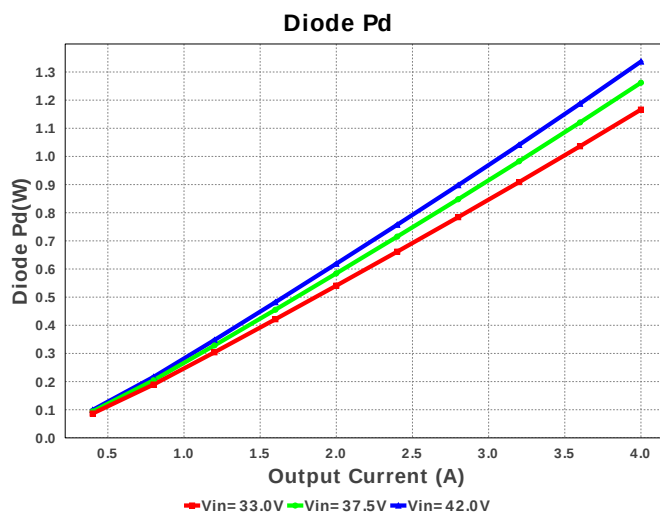
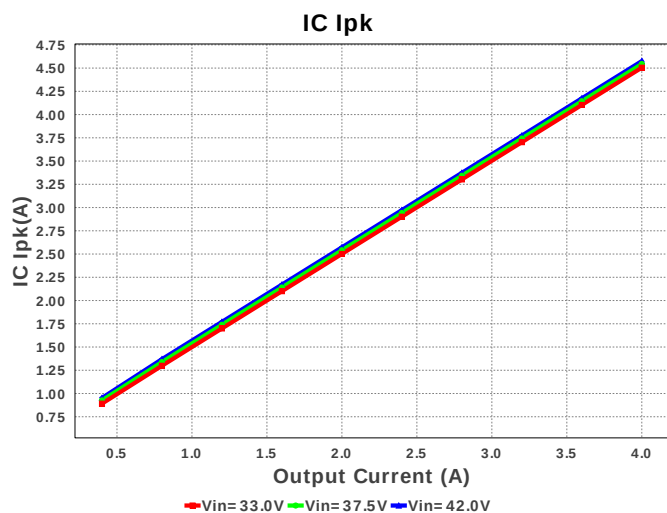
Electrical BOM

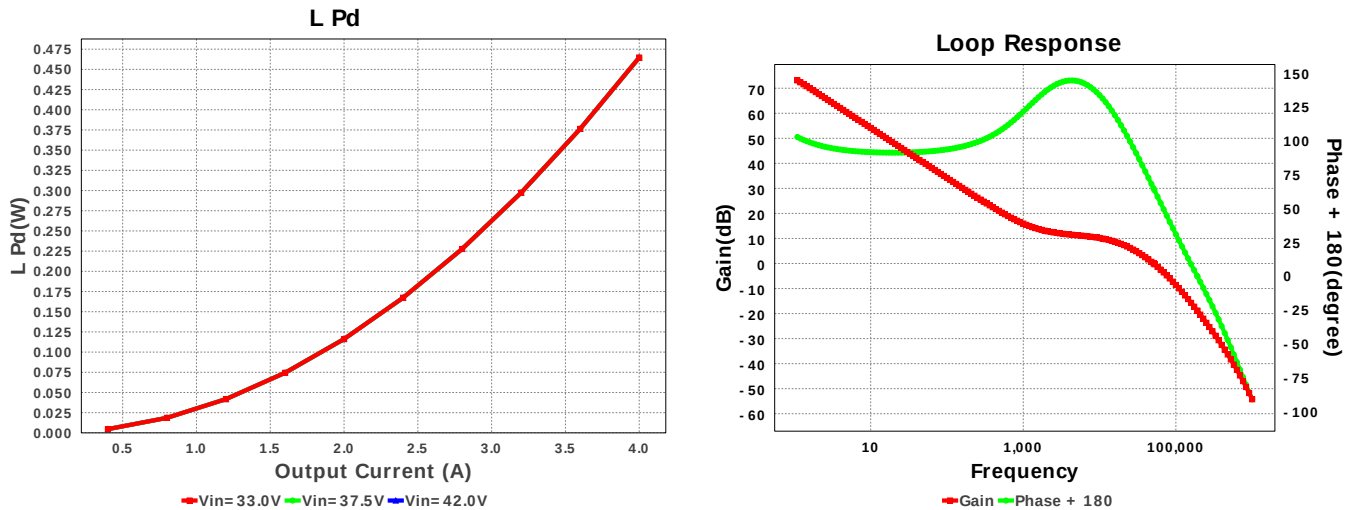
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
2.	Ccomp	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	Kemet	C0805C180K5GACTU Series= C0G/NP0	Cap= 18.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 1.73 mOhm VDC= 100.0 V IRMS= 5.5932 A	1	\$0.19	1210_250 15 mm ²
5.	Cout	TDK	C3216X5R1E476M160AC Series= X5R	Cap= 47.0 uF ESR= 2.082 mOhm VDC= 25.0 V IRMS= 5.0279 A	1	\$0.35	1206 11 mm ²
6.	D1	Diodes Inc.	B560C-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.17	SMC 83 mm ²
7.	L1	Sumida	CDRH127/LDNP-150MC	L= 15.0 µH DCR= 26.4 mOhm	1	\$0.61	CDRH127 196 mm ²
8.	Rcomp	Vishay-Dale	CRCW04025K23FKED Series= CRCW...e3	Res= 5.23 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
9.	Rfbb	Vishay-Dale	CRCW040211K8FKED Series= CRCW...e3	Res= 11.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
10.	Rfbb	Yageo America	RC0603FR-07180KL Series= ?	Res= 180.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Rt	Vishay-Dale	CRCW0402182KFKED Series= CRCW..e3	Res= 182.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
12.	U1	Texas Instruments	TPS54540QDDARQ1	Switcher	1	\$2.32	 R-PDSO-G8 55 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.746 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	335.525 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	4.581 A	Current	Peak switch current in IC
4.	Iin Avg	1.33 A	Current	Average input current
5.	L Ipp	1.162 A	Current	Peak-to-peak inductor ripple current
6.	BOM Count	12	General	Total Design BOM count
7.	FootPrint	390.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	537.066 kHz	General	Switching frequency
9.	Mode	CCM	General	Conduction Mode
10.	Pout	52.0 W	General	Total output power
11.	Total BOM	\$3.71	General	Total BOM Cost
12.	ICThetaJA Effective	26.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
13.	Low Freq Gain	73.117 dB	Op_Point	Gain at 10Hz
14.	Vout Actual	13.003 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Vout OP	13.0 V	Op_Point	Operational Output Voltage
16.	Cross Freq	51.009 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	32.288 %	Op_point	Duty cycle
18.	Efficiency	93.086 %	Op_point	Steady state efficiency
19.	Gain Marg	-18.929 dB	Op_point	Bode Plot Gain Margin
20.	IC Tj	68.908 degC	Op_point	IC junction temperature
21.	IOUT_OP	4.0 A	Op_point	Iout operating point
22.	Phase Marg	65.1 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	42.0 V	Op_point	Vin operating point
24.	Vout p-p	53.35 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	5.275 mW	Power	Input capacitor power dissipation
26.	Cout Pd	234.386 μ W	Power	Output capacitor power dissipation
27.	Diode Pd	1.896 W	Power	Diode power dissipation
28.	IC Pd	1.496 W	Power	IC power dissipation
29.	L Pd	464.64 mW	Power	Inductor power dissipation
30.	Total Pd	3.862 W	Power	Total Power Dissipation
31.	Vout Tolerance	2.915 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	42.0	Maximum input voltage
3.	VinMin	33.0	Minimum input voltage
4.	Vout	13.0	Output Voltage
5.	base_pn	TPS54540-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The TPS54540-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. **TPS54540-Q1** Product Folder : <http://www.ti.com/product/TPS54540%2DQ1> : contains the data sheet and other resources.

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