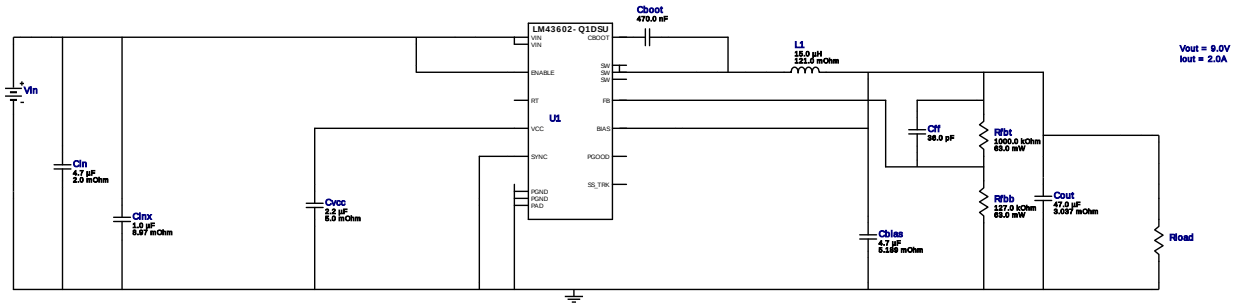
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 25.0V
Vout = 9.0V
Iout = 2.0A

Device = LM43602QDSURQ1
Topology = Buck
Created = 7/15/16 6:39:18 PM
BOM Cost = $3.20
BOM Count = 11
Total Pd = 1.82W

Design : 4742013/16 LM43602QDSURQ1
LM43602QDSURQ1 14.0V-25.0V to 9.00V @ 2.0A



1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.

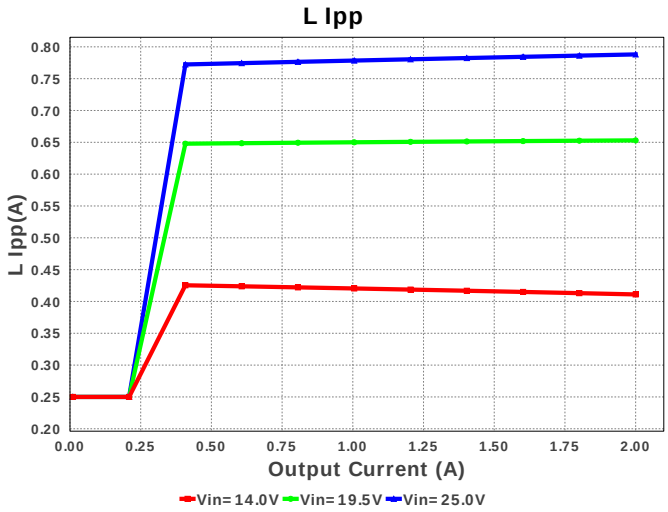
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating at a much lower voltage than the maximum input voltage. Sizing the inductor based on the maximum input voltage may yield an inductance much larger than typically needed, causing a larger footprint for the overall design. At the same time, components such as the input capacitor must be rated based on the maximum input voltage. WEBENCH now supports the use of this additional input voltage specification.

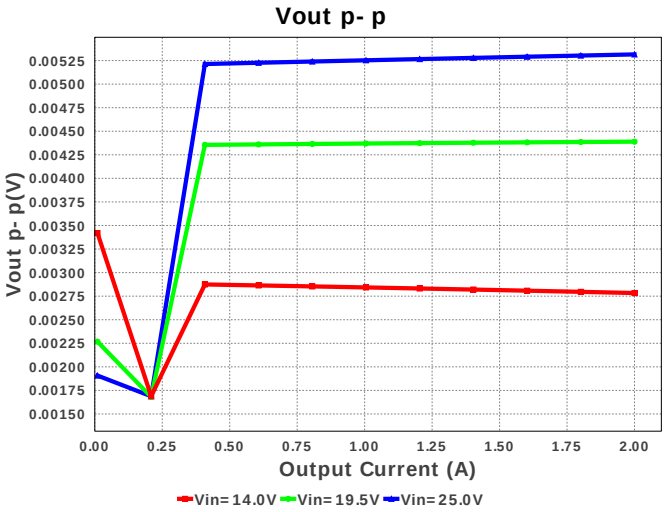
3. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

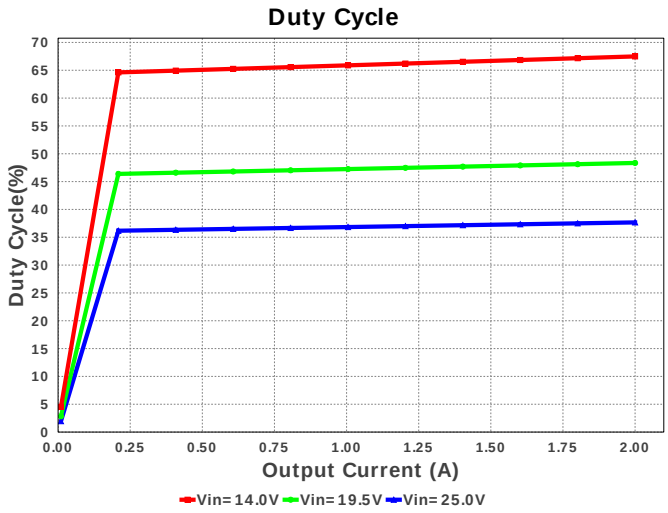
Electrical BOM

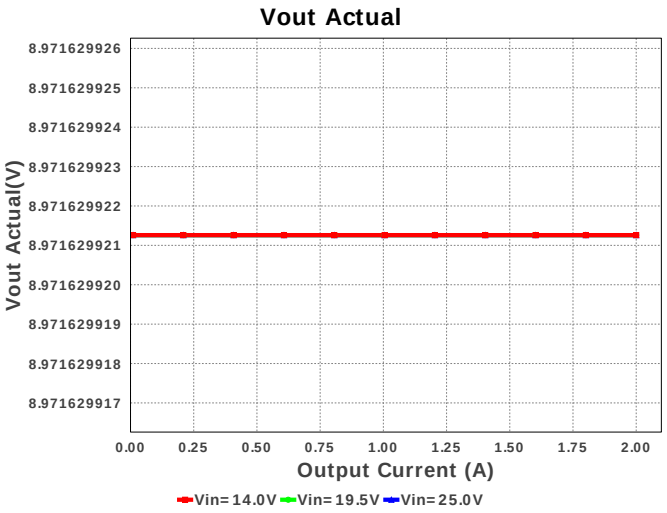
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	$0.02	0805 7 mm²
2.	Cboot	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Cff	Samsung Electro-Mechanics	CL21C360JBANNNC Series= C0G/NP0	Cap= 36.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM32ER71H475KA88L Series= X7R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 50.0 V IRMS= 5.35 A	1	$0.19	1210 15 mm²
5.	Cinx	TDK	C3216X5R1H105K Series= X5R	Cap= 1.0 uF ESR= 8.97 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.02	1206 11 mm²
6.	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 mm²
7.	Cvcc	MuRata	GRM155R60J225ME15D Series= X5R	Cap= 2.2 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 3.67 A	1	$0.02	0402 3 mm²
8.	L1	Bourns	SRP6540-150M	L= 15.0 µH DCR= 121.0 mOhm	1	$0.60	SRP6540 83 mm²

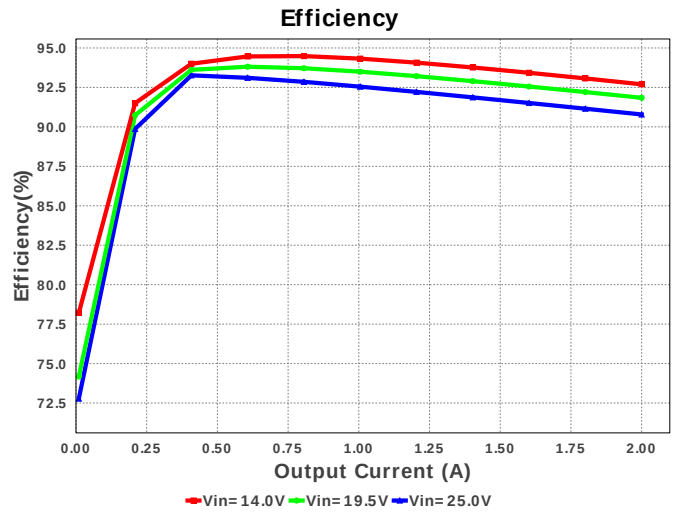
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Rfbb	Vishay-Dale	CRCW0402127KFKED Series= CRCW..e3	Res= 127.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
10.	Rfbt	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	U1	Texas Instruments	LM43602QDSURQ1	Switcher	1	$2.07	DSU0016A 42 mm^2

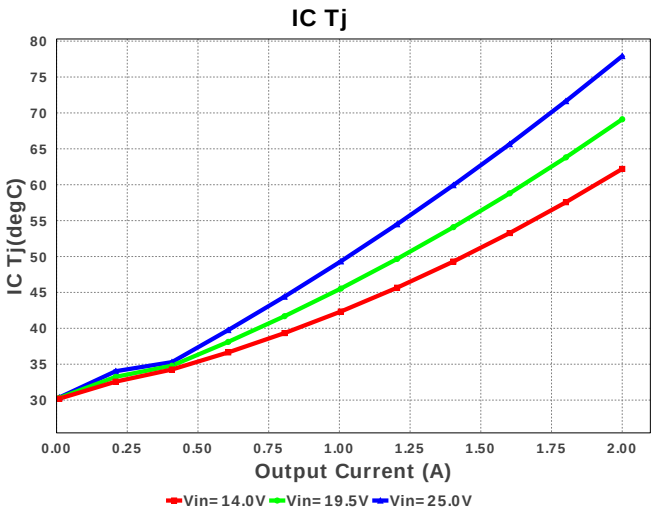


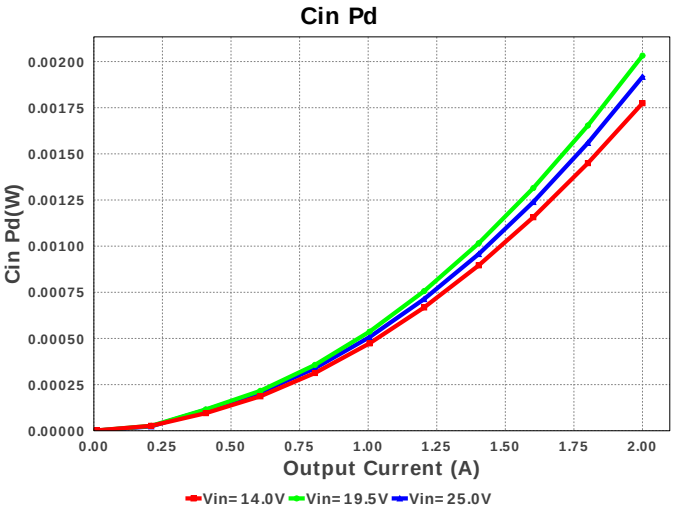


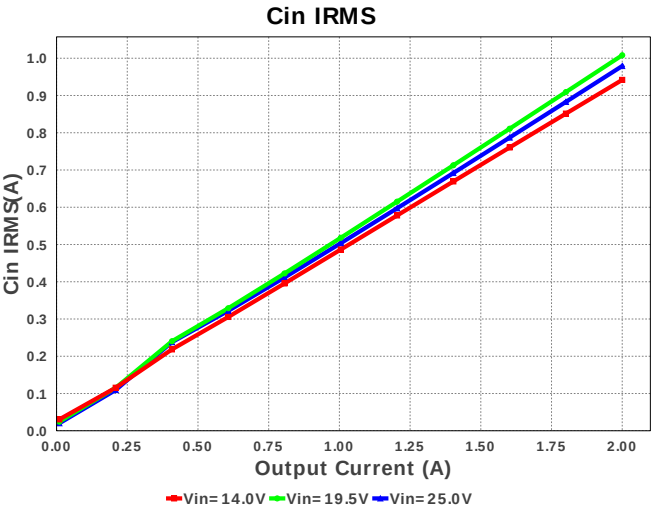


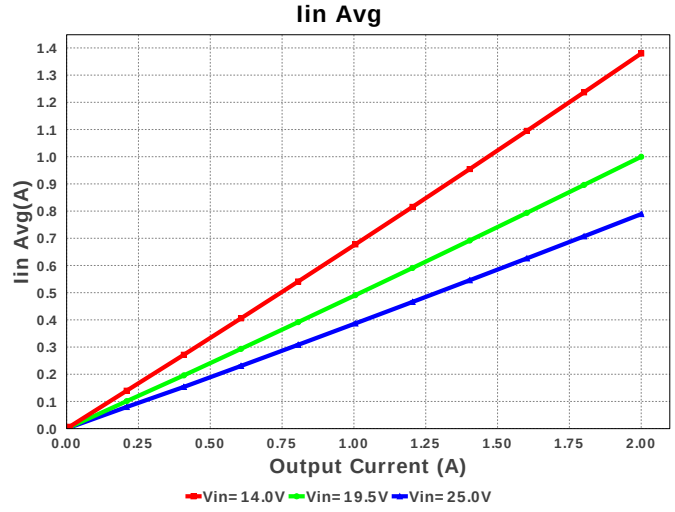


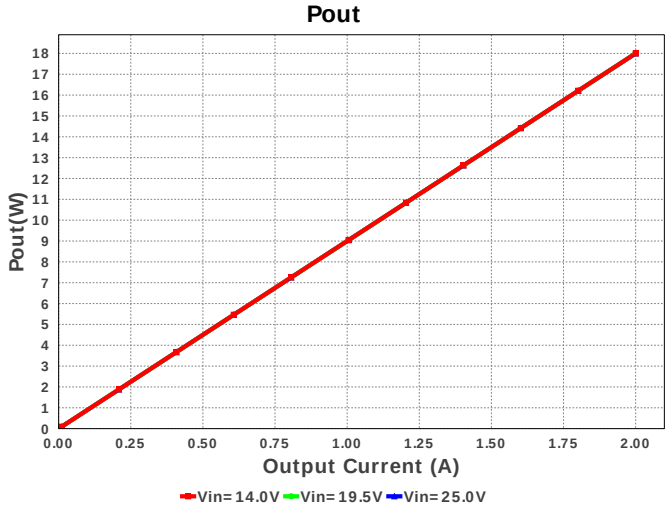


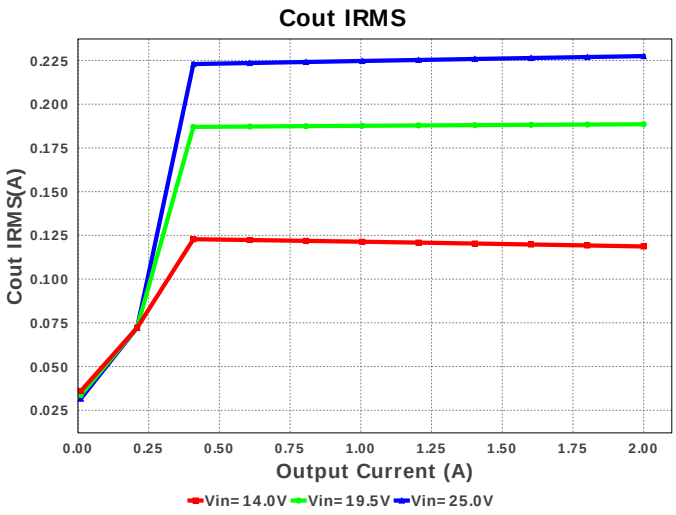


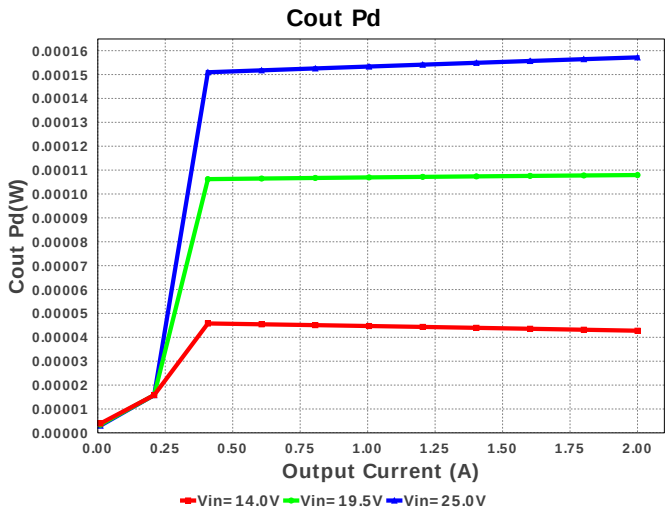


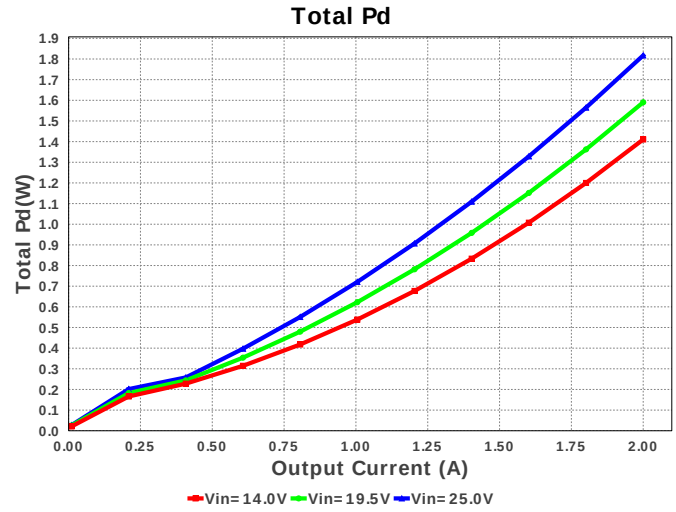


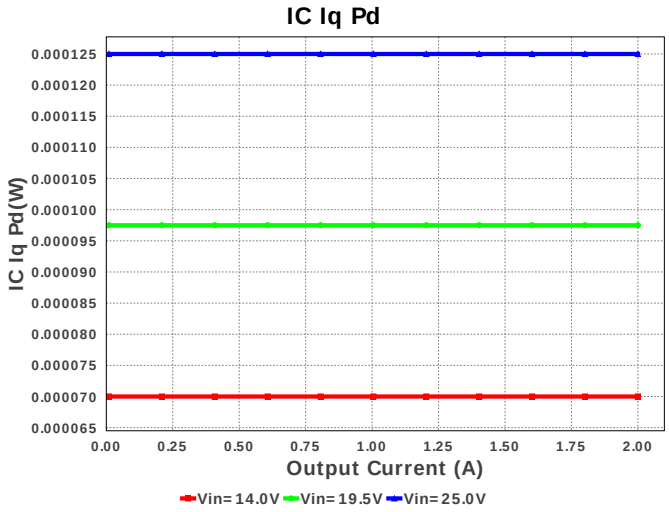


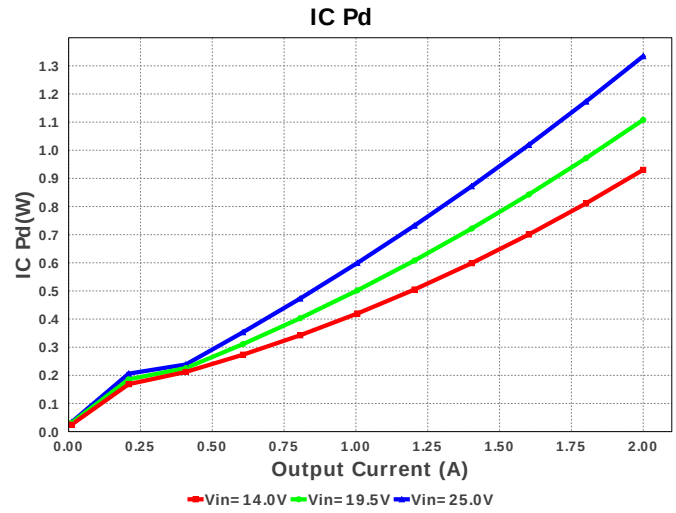


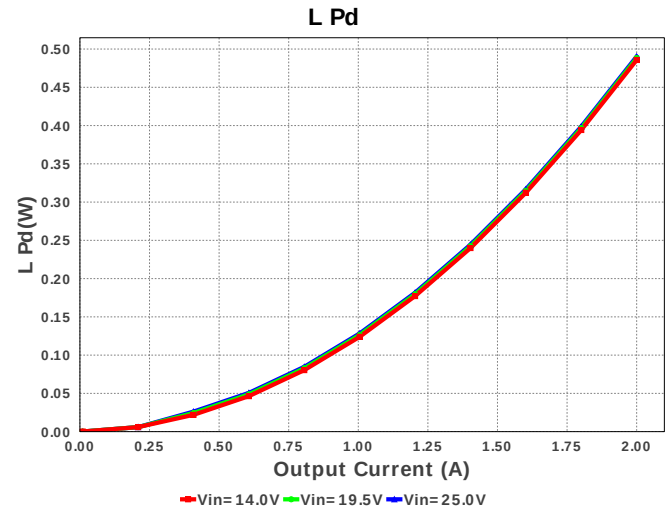


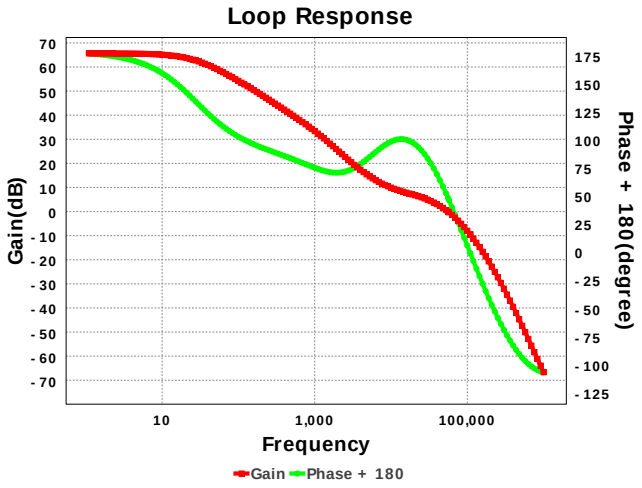


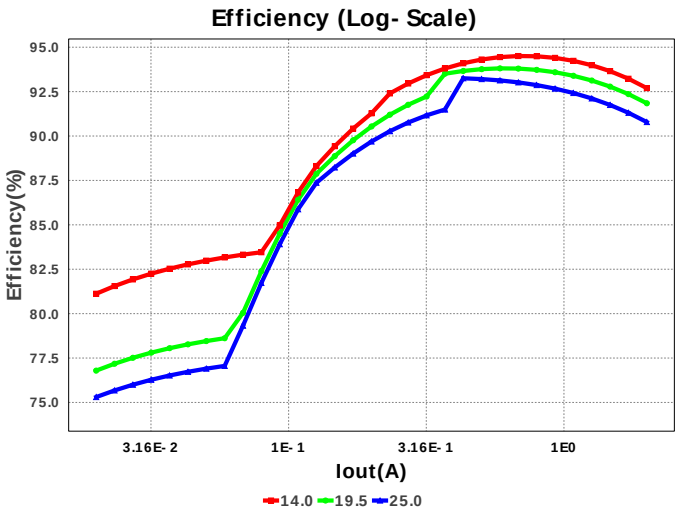












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	979.106 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	227.501 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	788.97 mA	Current	Average input current
4.	L Ipp	788.09 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	11	General	Total Design BOM count
6.	FootPrint	190.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	500.0 kHz	General	Switching frequency
8.	Pout	18.0 W	General	Total output power
9.	Total BOM	$3.2	General	Total BOM Cost
10.	Low Freq Gain	65.625 dB	Op_Point	Gain at 10Hz
11.	Vout Actual	8.972 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
12.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
13.	Cross Freq	55.848 kHz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	37.666 %	Op_point	Duty cycle
15.	Efficiency	90.786 %	Op_point	Steady state efficiency
16.	Gain Marg	-9.51 dB	Op_point	Bode Plot Gain Margin
17.	IC Tj	77.914 degC	Op_point	IC junction temperature
18.	ICThetaJA	38.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	2.0 A	Op_point	Iout operating point
20.	Phase Marg	49.295 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	25.0 V	Op_point	Vin operating point
22.	Vout p-p	5.315 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	1.917 mW	Power	Input capacitor power dissipation
24.	Cout Pd	157.185 µW	Power	Output capacitor power dissipation
25.	IC Iq Pd	125.0 µW	Power	IC Iq Pd
26.	IC Pd	1.334 W	Power	IC power dissipation
27.	L Pd	490.263 mW	Power	Inductor power dissipation
28.	Total Pd	1.817 W	Power	Total Power Dissipation
29.	Vout Tolerance	2.799 %		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	LM43602-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The LM43602-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. **LM43602-Q1** Product Folder : http://www.ti.com/product/LM43602%2DQ1 : contains the data sheet and other resources.