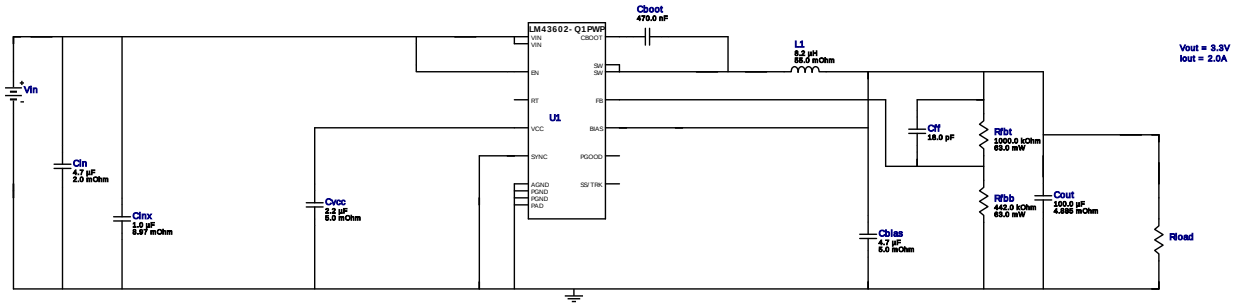
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 3.3V
Iout = 2.0A

Device = LM43602QPWPRQ1
Topology = Buck
Created = 7/12/16 1:40:50 AM
BOM Cost = $2.65
BOM Count = 11
Total Pd = 1.28W

Design : 4737567/56 LM43602QPWPRQ1
LM43602QPWPRQ1 14.0V-22.0V to 3.30V @ 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.

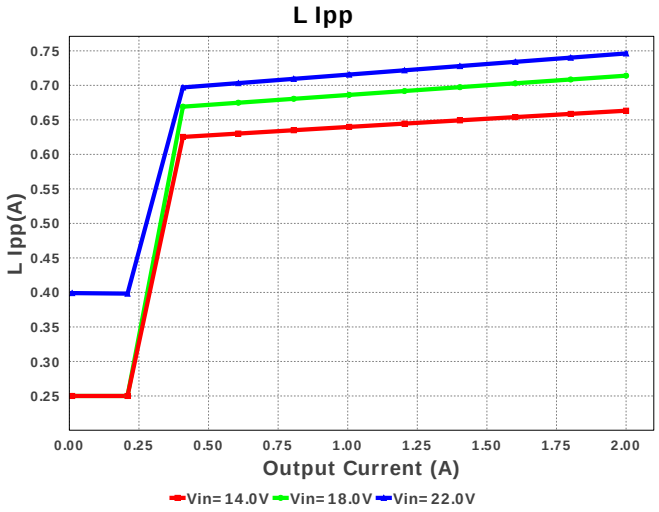
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating 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.

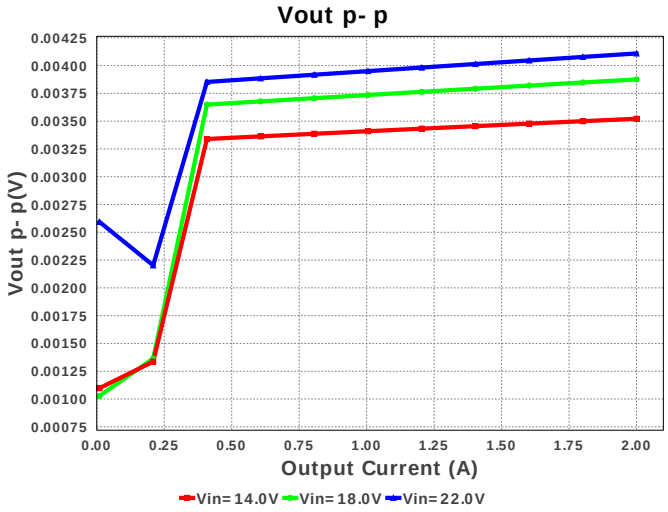
3. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

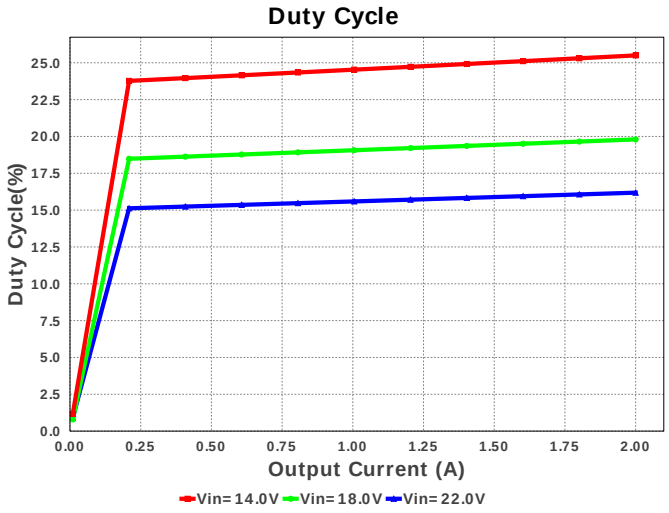
Electrical BOM

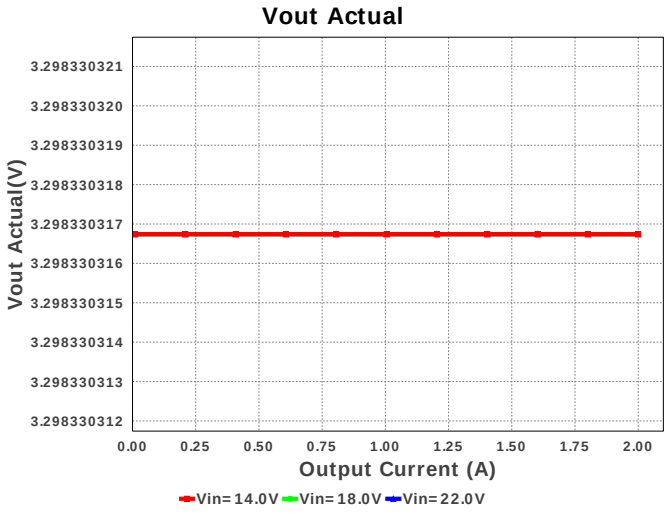
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm^2
2.	Cboot	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	Cff	Kemet	C0805C180M3GACTU Series= C0G/NP0	Cap= 18.0 pF VDC= 25.0 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	1	$0.19	1210 15 mm^2
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 mm^2
6.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	$0.14	1206_190 11 mm^2
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 mm^2
8.	L1	Bourns	SRN6045-8R2Y	L= 8.2 µH DCR= 55.0 mOhm	1	$0.16	SRN6045 64 mm^2

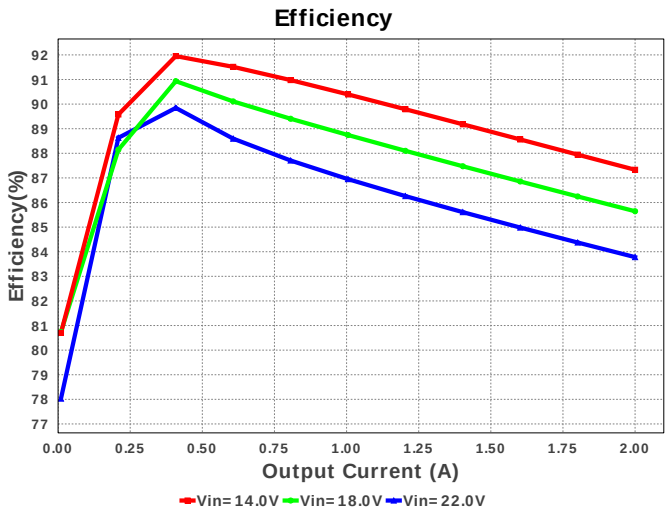
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Rfbb	Vishay-Dale	CRCW0402442KFKED Series= CRCW..e3	Res= 442.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
10.	Rfbt	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	U1	Texas Instruments	LM43602QPWPRQ1	Switcher	1	$2.07	 PWP0016F 59 mm^2

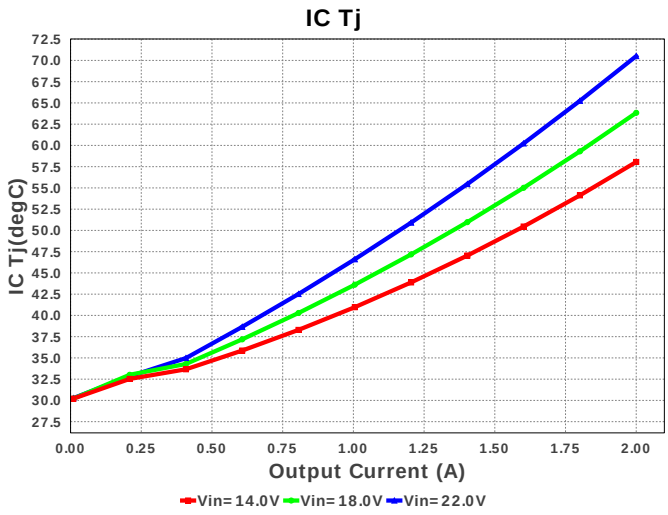


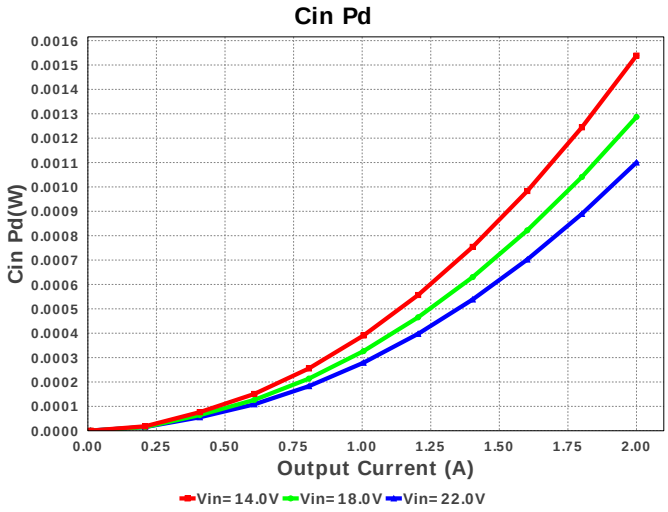


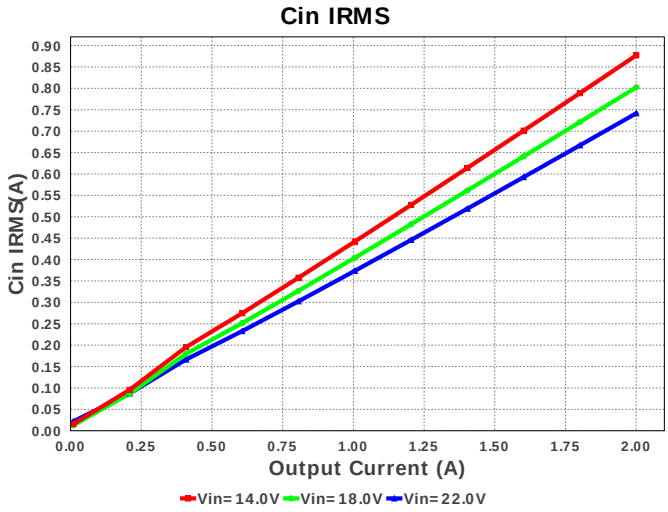


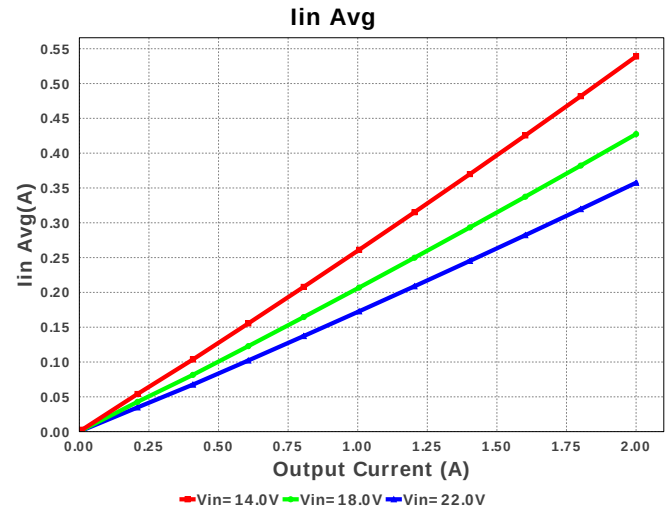


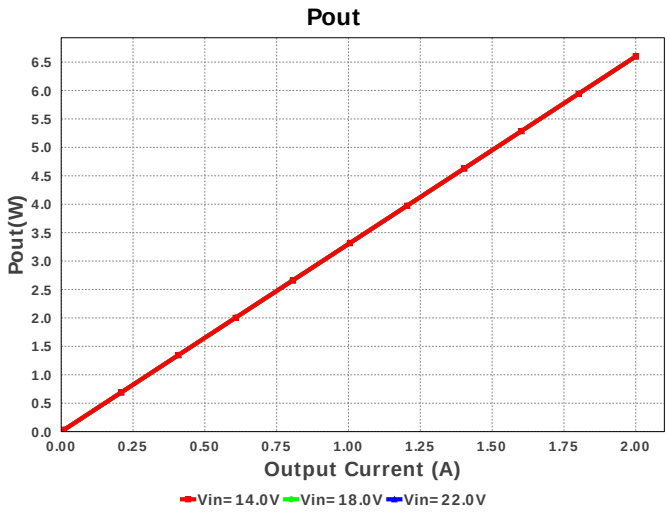


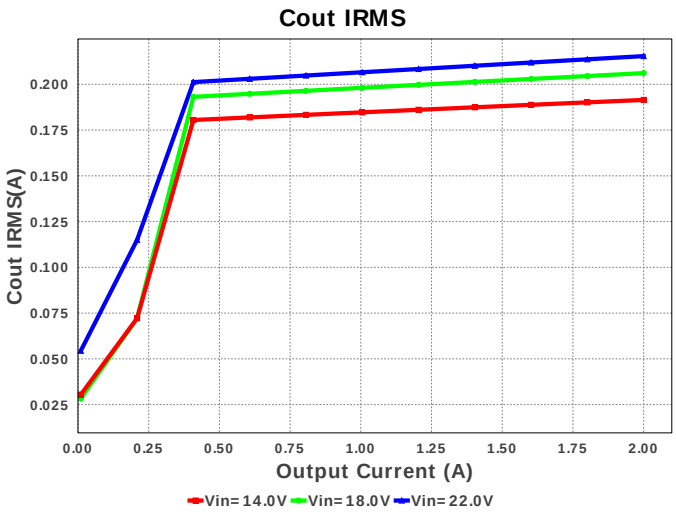


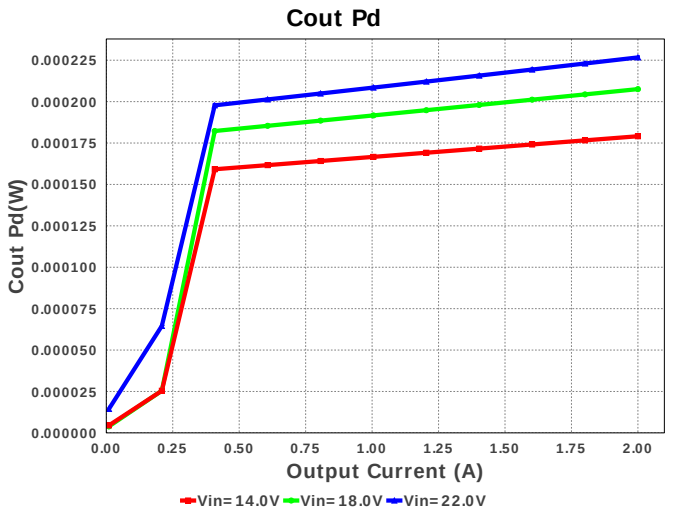


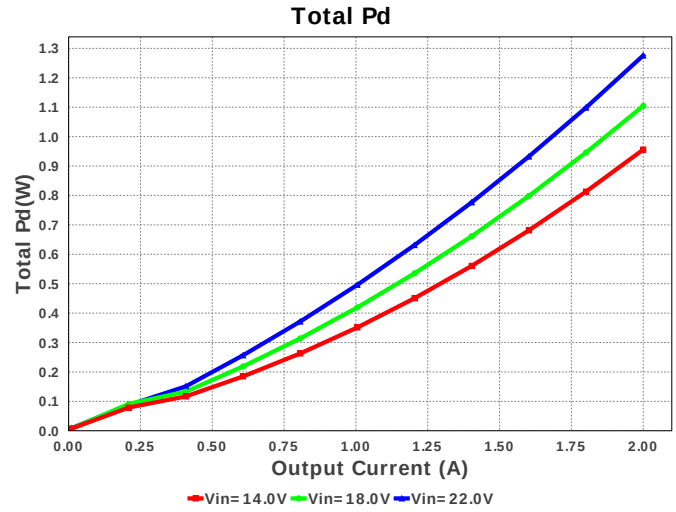


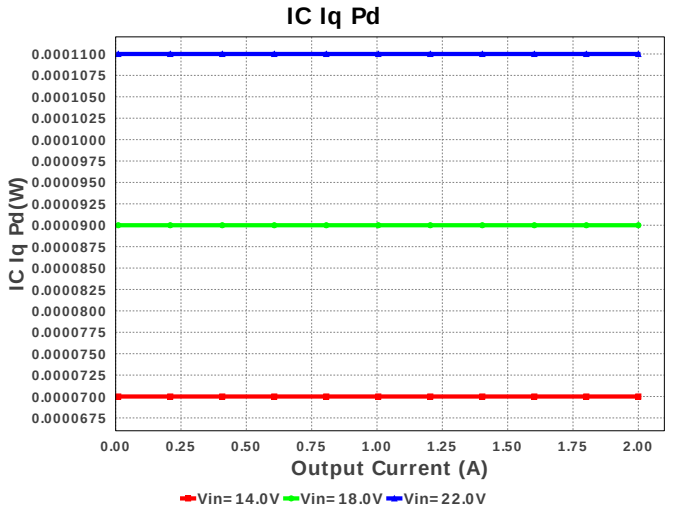


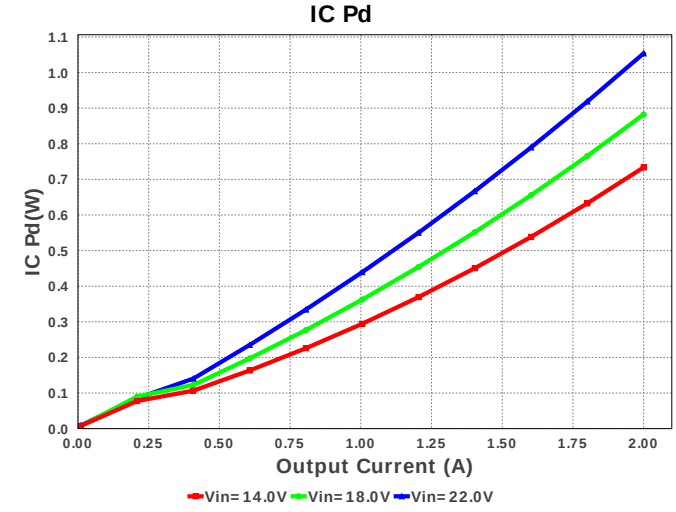


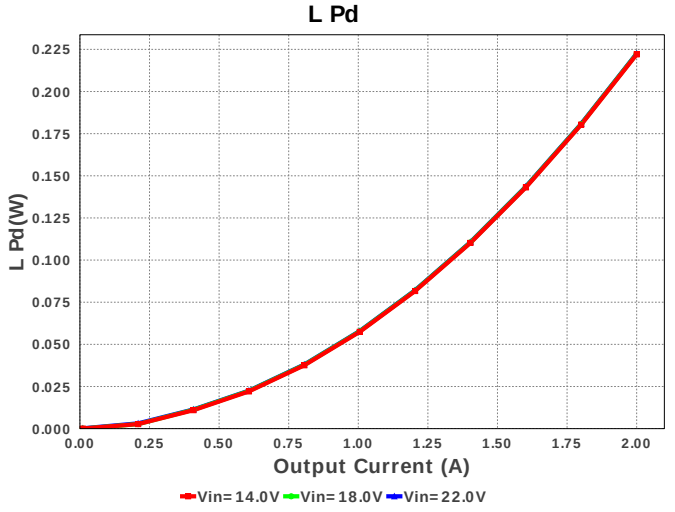


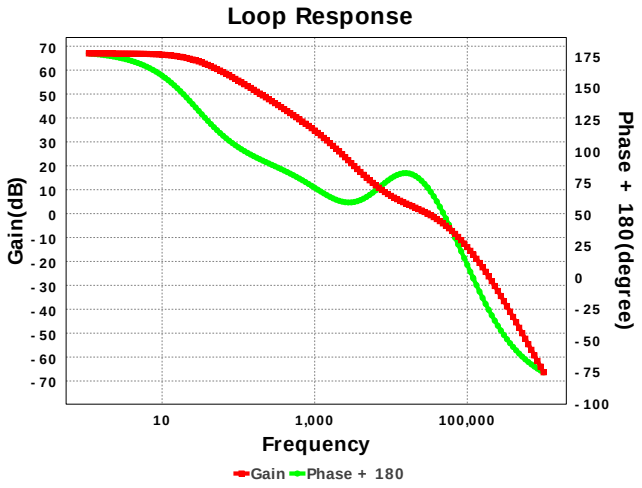


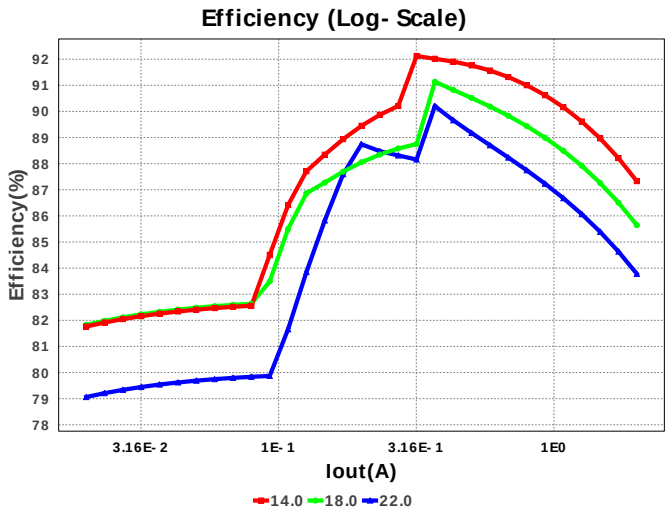












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	741.693 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	215.417 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	357.51 mA	Current	Average input current
4.	L Ipp	746.23 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	11	General	Total Design BOM count
6.	FootPrint	183.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	500.0 kHz	General	Switching frequency
8.	Pout	6.6 W	General	Total output power
9.	Total BOM	$2.65	General	Total BOM Cost
10.	Low Freq Gain	66.98 dB	Op_Point	Gain at 10Hz
11.	Vout Actual	3.298 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
12.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
13.	Cross Freq	30.191 kHz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	16.184 %	Op_point	Duty cycle
15.	Efficiency	83.78 %	Op_point	Steady state efficiency
16.	Gain Marg	-16.976 dB	Op_point	Bode Plot Gain Margin
17.	IC Tj	70.508 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	71.405 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	22.0 V	Op_point	Vin operating point
22.	Vout p-p	4.109 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	1.1 mW	Power	Input capacitor power dissipation
24.	Cout Pd	226.686 µW	Power	Output capacitor power dissipation
25.	IC Iq Pd	110.0 µW	Power	IC Iq Pd
26.	IC Pd	1.054 W	Power	IC power dissipation
27.	L Pd	222.552 mW	Power	Inductor power dissipation
28.	Total Pd	1.276 W	Power	Total Power Dissipation
29.	Vout Tolerance	2.404 %		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	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LM43602-Q1	Texas Instruments Base Part 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.