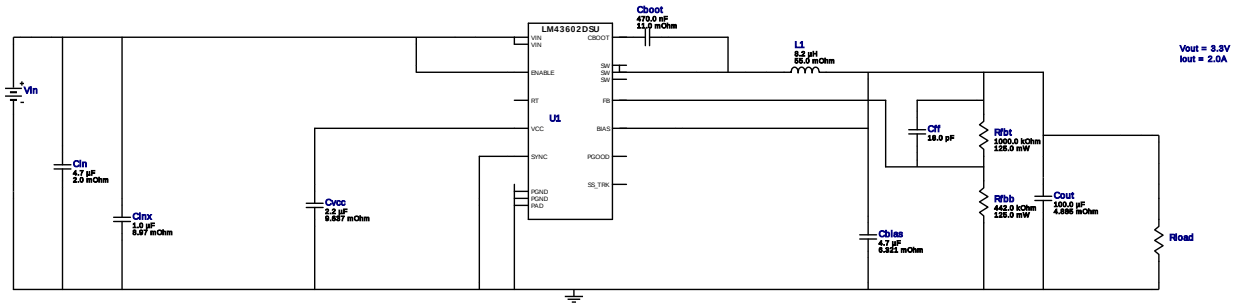
WEBENCH® Design Report

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

Device = LM43602DSUR
Topology = Buck
Created = 8/28/16 7:30:02 AM
BOM Cost = $2.34
BOM Count = 11
Total Pd = 1.28W

Design : 4778710/3 LM43602DSUR
LM43602DSUR 14.0V-22.0V to 3.30V @ 2.0A



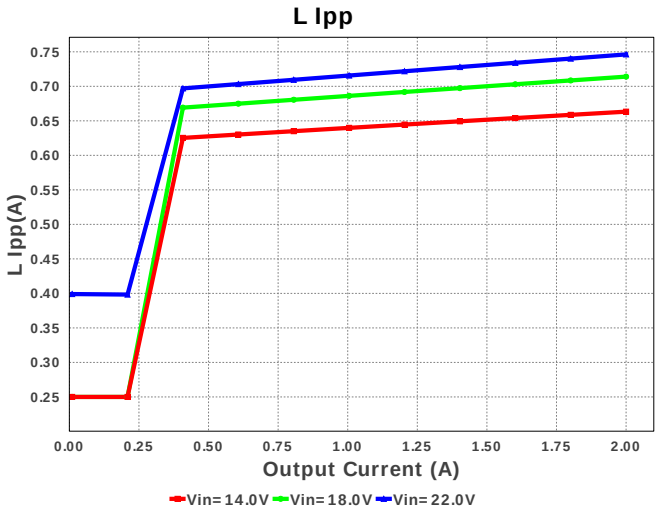
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.

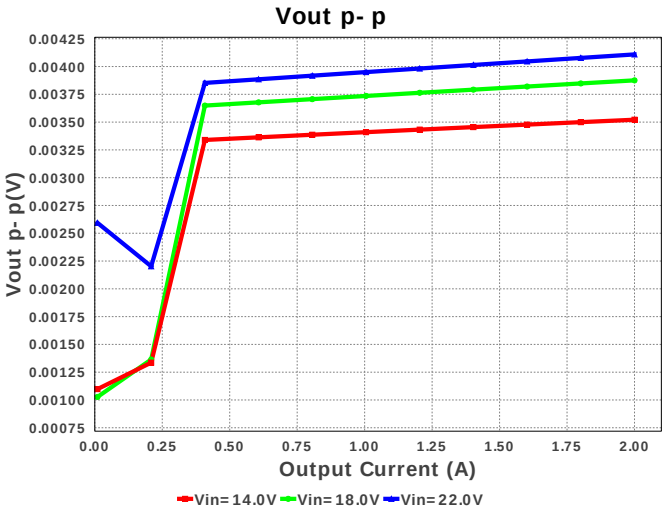
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating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

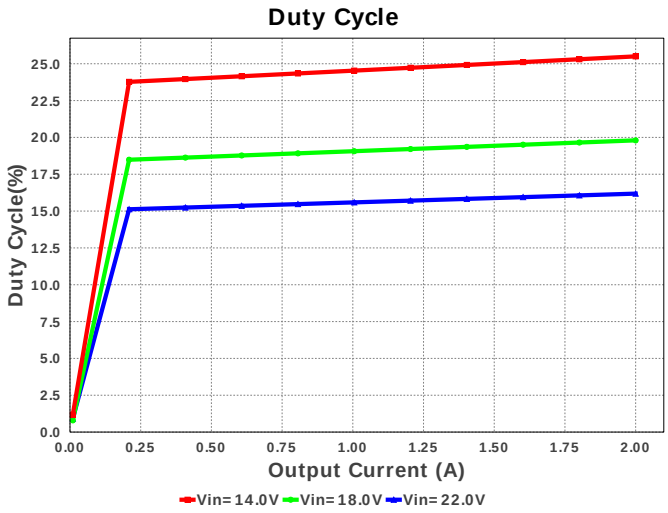
Electrical BOM

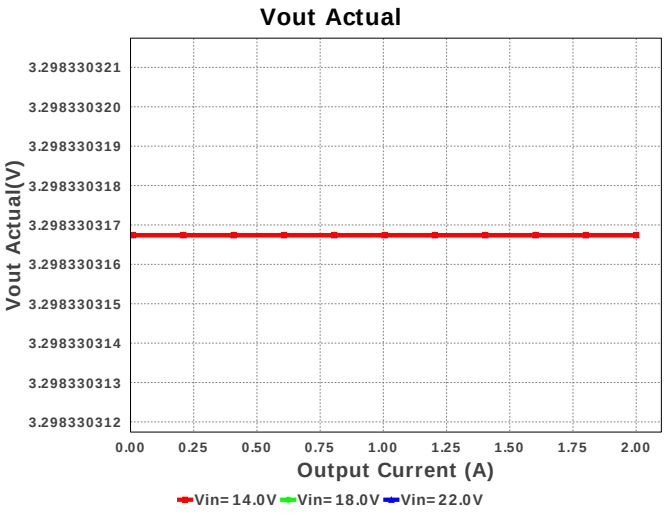
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	MuRata	GRM188R60J475ME19D Series= X5R	Cap= 4.7 uF ESR= 6.321 mOhm VDC= 6.3 V IRMS= 1.72348 A	1	$0.01	0603 5 mm²
2.	Cboot	AVX	0805YC474KAT2A Series= X7R	Cap= 470.0 nF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
3.	Cff	Kemet	C0805C180M3GACTU Series= C0G/NP0	Cap= 18.0 pF VDC= 25.0 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	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 mm²
7.	Cvcc	MuRata	GRM188R60J225KE19D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 6.3 V IRMS= 1.32271 A	1	$0.02	0603 5 mm²
8.	L1	Bourns	SRN6045-8R2Y	L= 8.2 µH DCR= 55.0 mOhm	1	$0.16	SRN6045 64 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Rfbb	Panasonic	ERJ-6ENF4423V Series= ERJ-6E	Res= 442.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2
10.	Rfbt	Panasonic	ERJ-6ENF1004V Series= ERJ-6E	Res= 1000.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2
11.	U1	Texas Instruments	LM43602DSUR	Switcher	1	$1.75	DSU0016A 42 mm^2

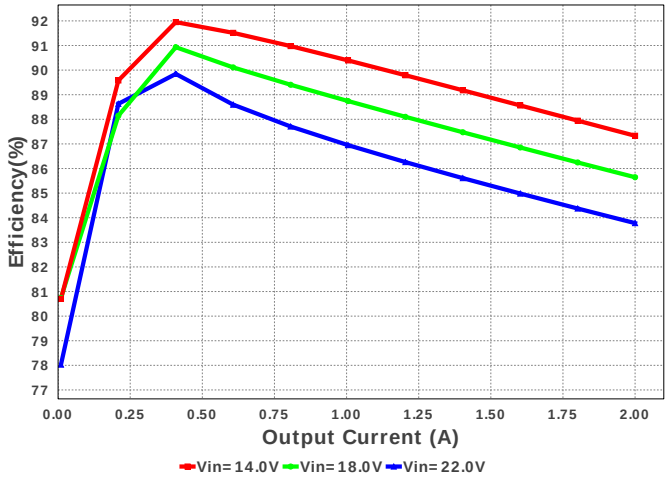




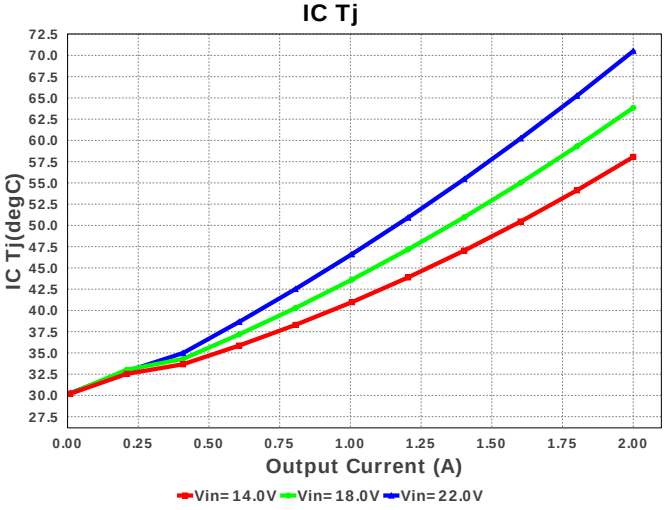




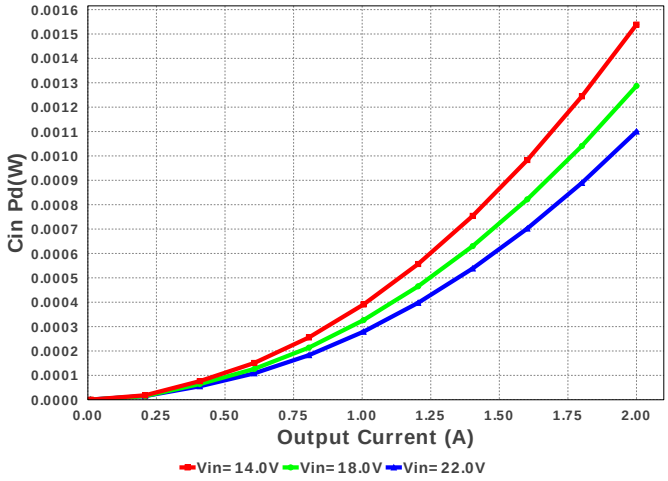
Efficiency



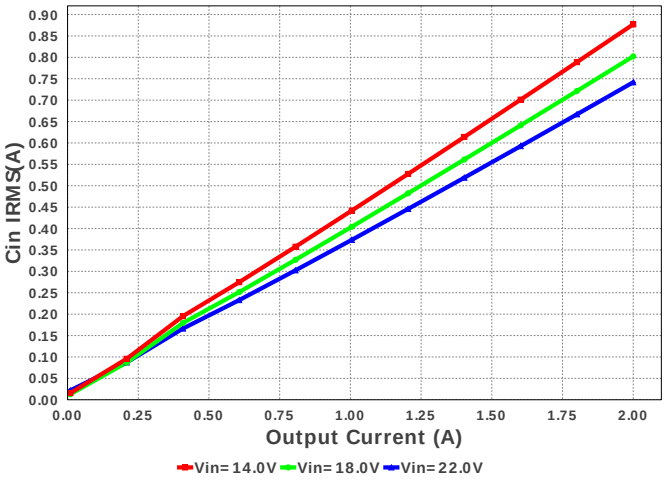
IC Tj



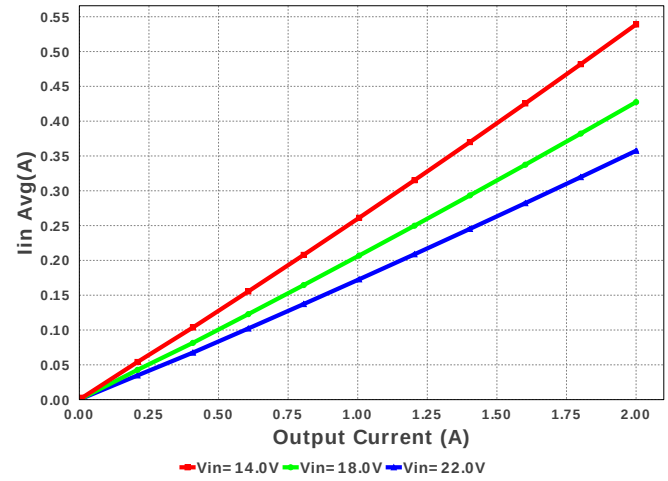
Cin Pd



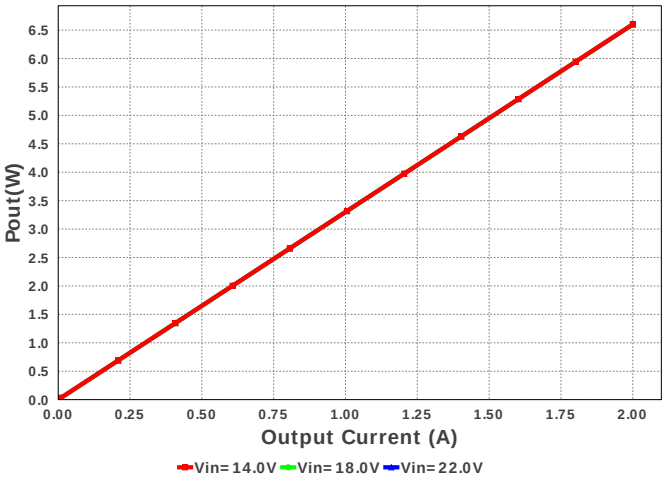
Cin IRMS

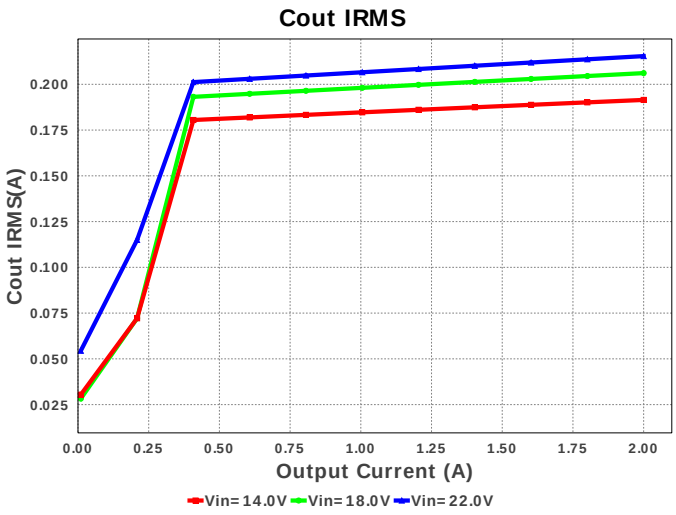


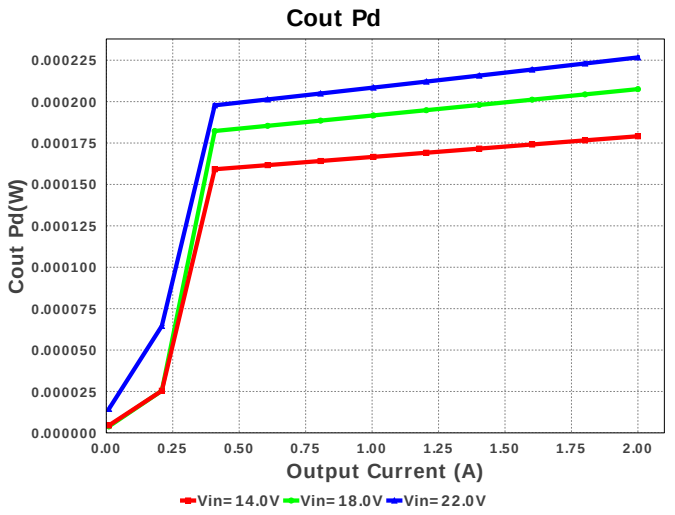
Iin Avg

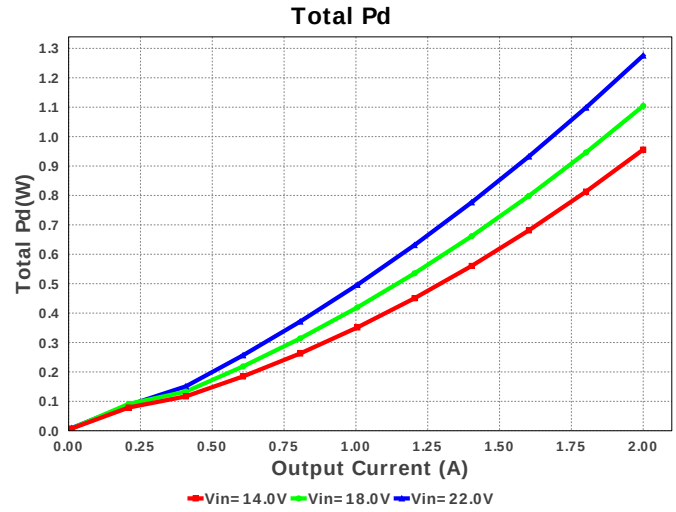


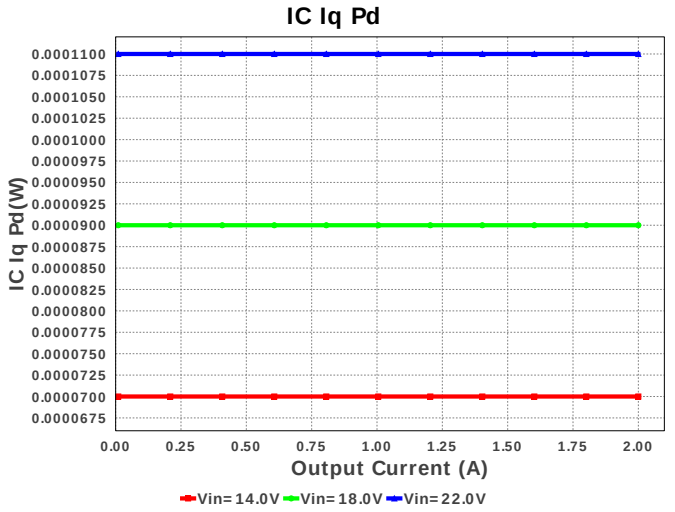
Pout

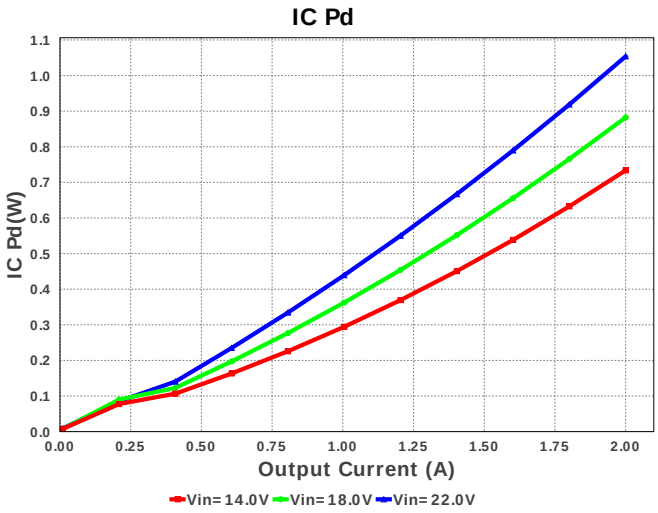


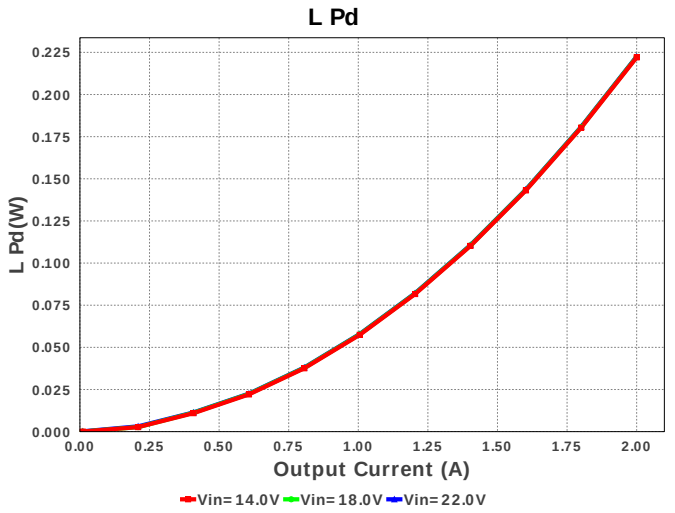


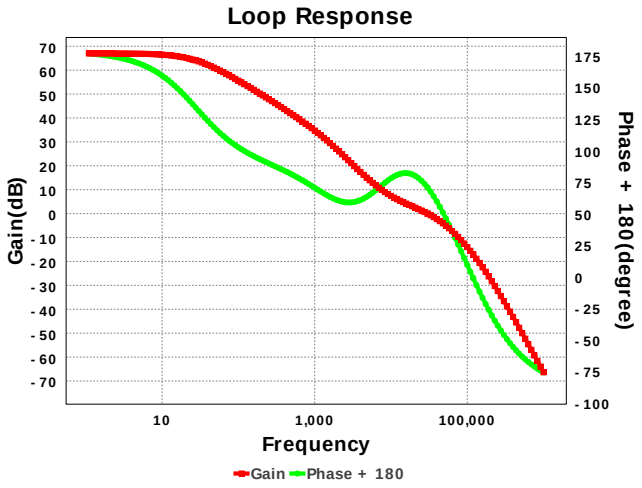


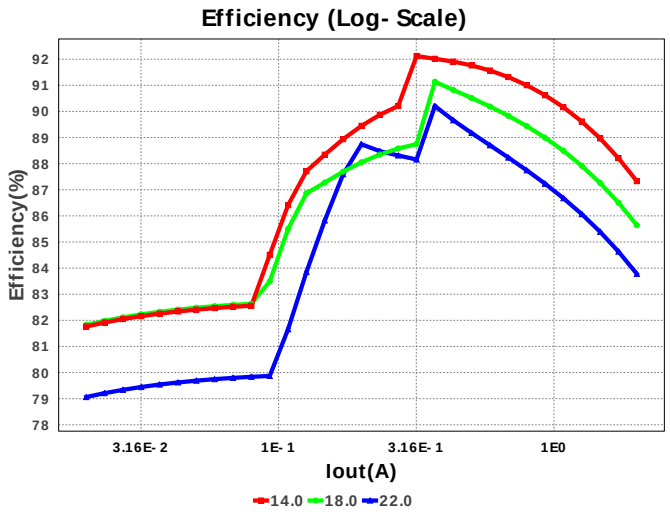












Operating Values

#	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	179.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	500.0 kHz	General	Switching frequency
8.	Mode	CCM	General	Conduction Mode
9.	Pout	6.6 W	General	Total output power
10.	Total BOM	$2.34	General	Total BOM Cost
11.	Low Freq Gain	66.98 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	3.298 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
14.	Cross Freq	30.191 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	16.184 %	Op_point	Duty cycle
16.	Efficiency	83.78 %	Op_point	Steady state efficiency
17.	Gain Marg	-16.976 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	70.508 degC	Op_point	IC junction temperature
19.	ICThetaJA	38.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	2.0 A	Op_point	Iout operating point
21.	Phase Marg	71.405 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	22.0 V	Op_point	Vin operating point
23.	Vout p-p	4.109 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	1.1 mW	Power	Input capacitor power dissipation
25.	Cout Pd	226.686 µW	Power	Output capacitor power dissipation
26.	IC Iq Pd	110.0 µW	Power	IC Iq Pd
27.	IC Pd	1.054 W	Power	IC power dissipation
28.	L Pd	222.552 mW	Power	Inductor power dissipation
29.	Total Pd	1.276 W	Power	Total Power Dissipation
30.	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	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM43602** Product Folder : http://www.ti.com/product/LM43602 : contains the data sheet and other resources.