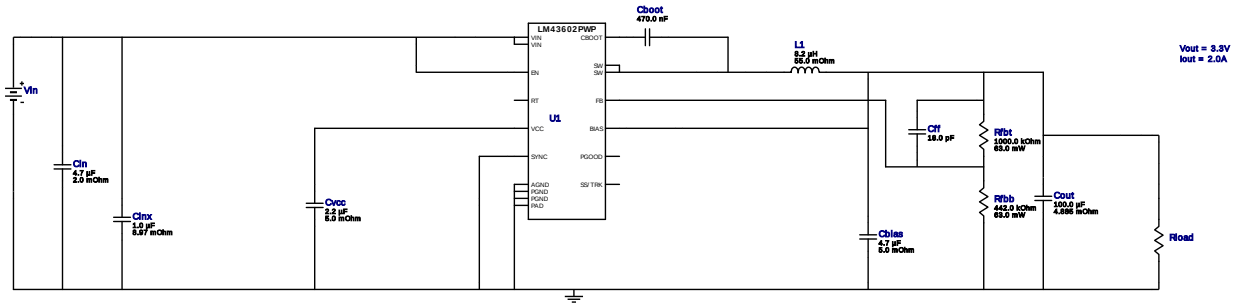
WEBENCH® Design Report

VinMin = 20.0V
VinMax = 30.0V
Vout = 3.3V
Iout = 2.0A

Device = LM43602PWPR
Topology = Buck
Created = 8/23/16 7:12:02 AM
BOM Cost = $2.33
BOM Count = 11
Total Pd = 1.67W

Design : 4774498/11 LM43602PWPR
LM43602PWPR 20.0V-30.0V to 3.30V @ 2.0A



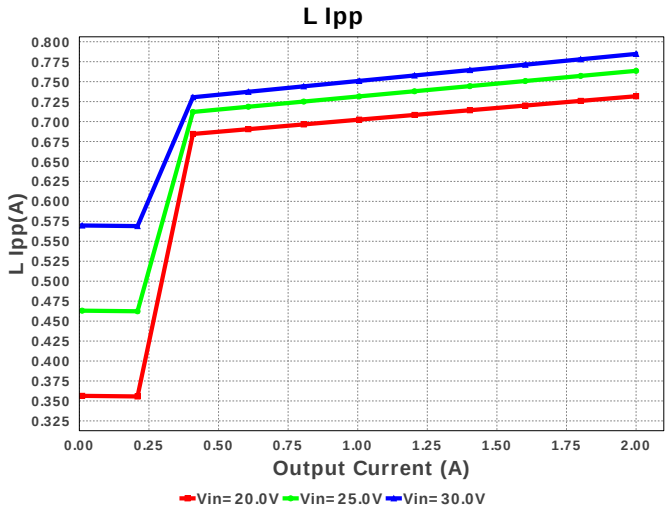
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.

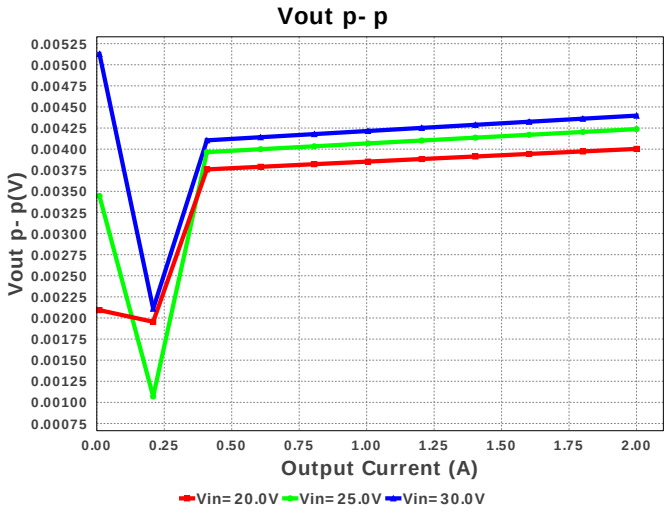
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating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

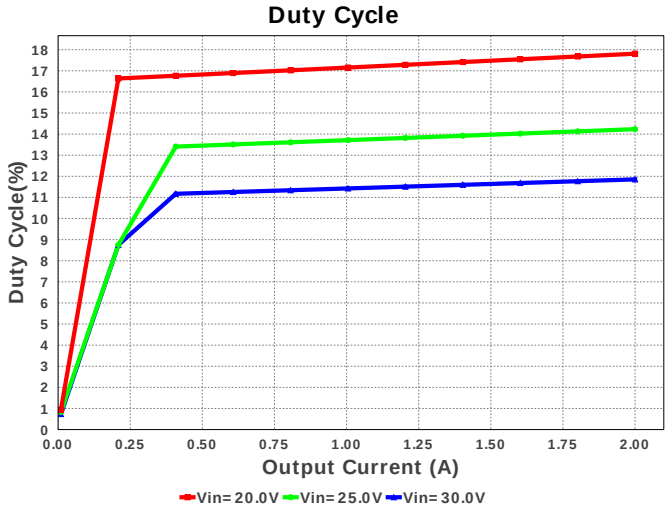
Electrical BOM

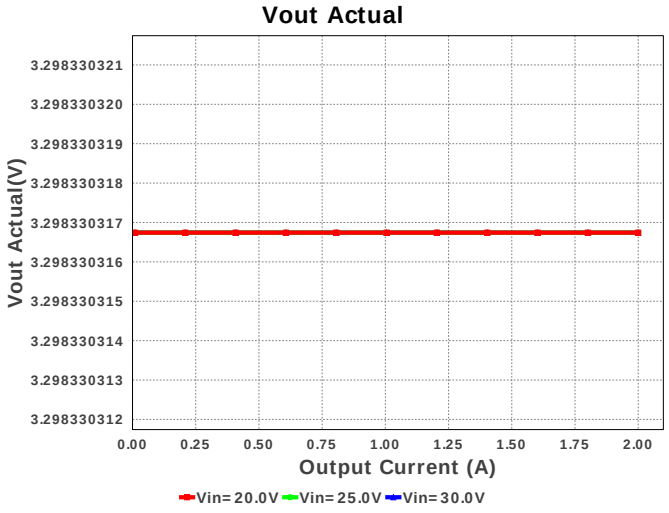
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm^2
2.	Cboot	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	Cff	Kemet	C0805C180M3GACTU 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
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

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
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	LM43602PWPR	Switcher	1	$1.75	 PWP0016F 59 mm^2

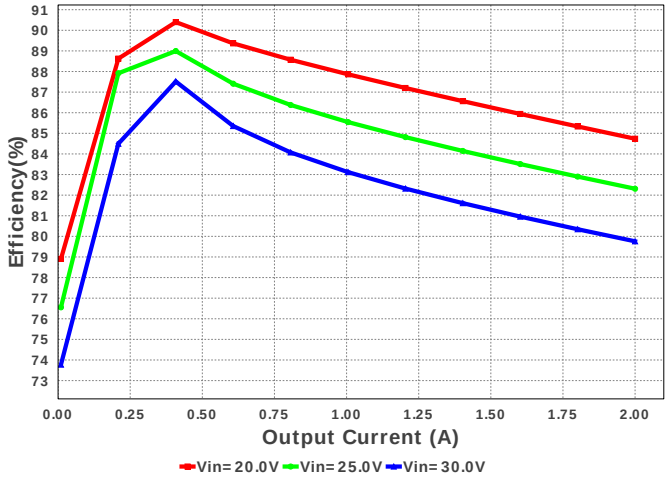




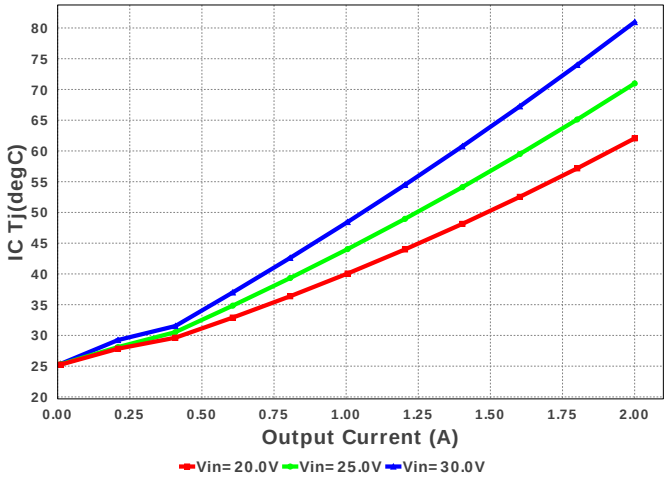




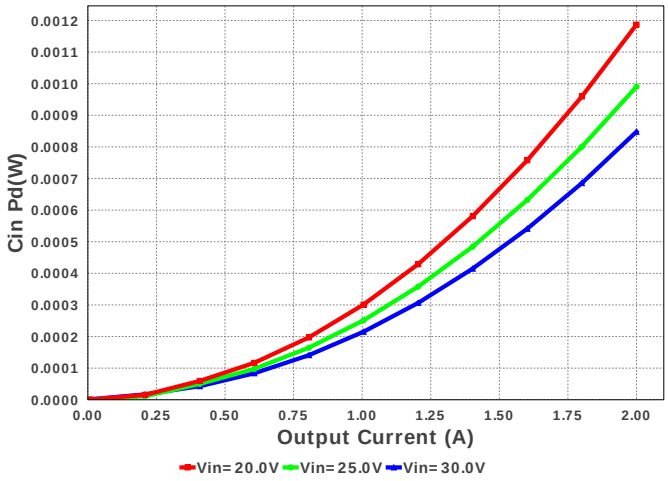
Efficiency



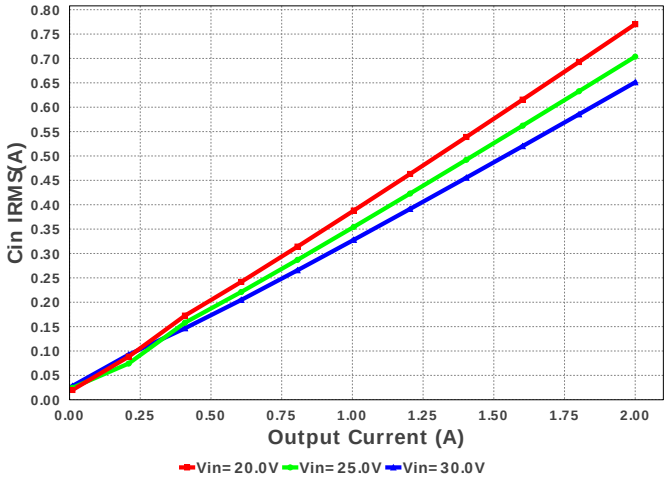
IC Tj



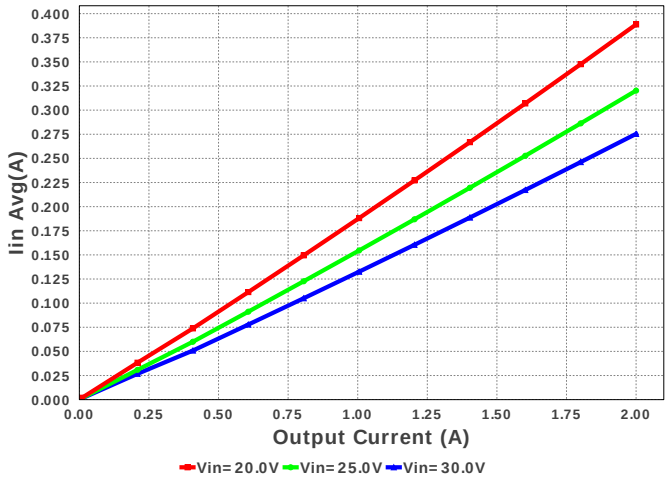
Cin Pd



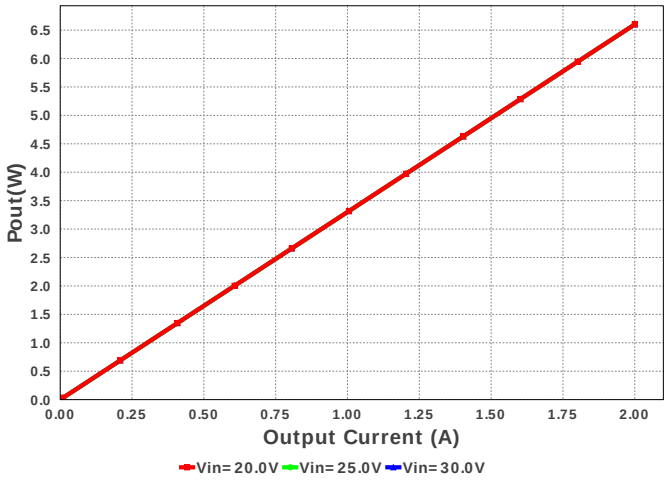
Cin IRMS

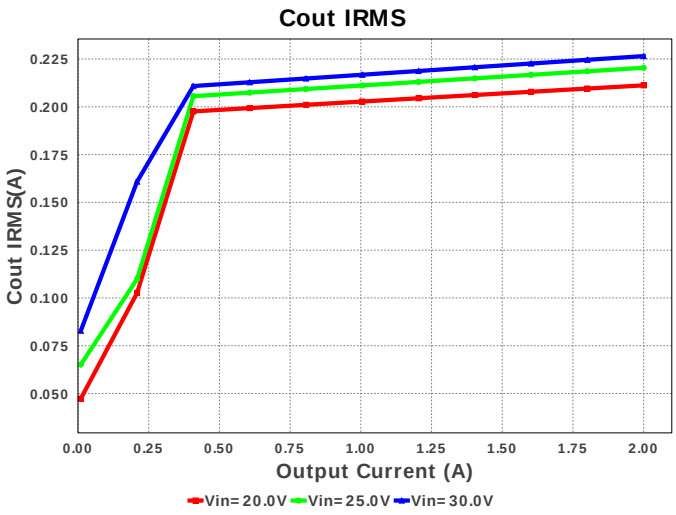


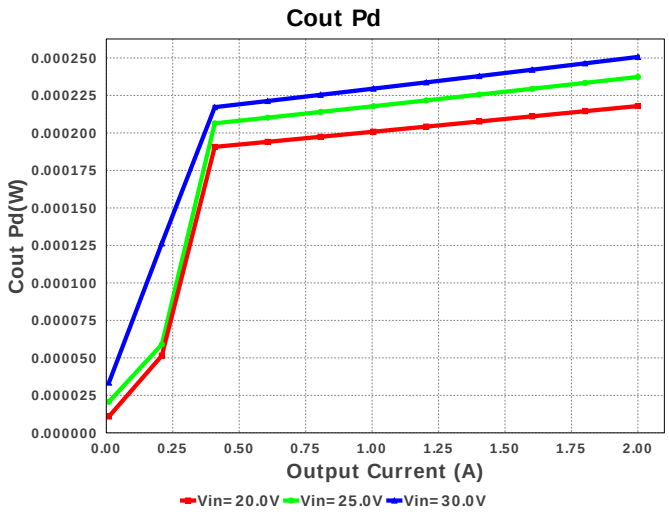
Iin Avg

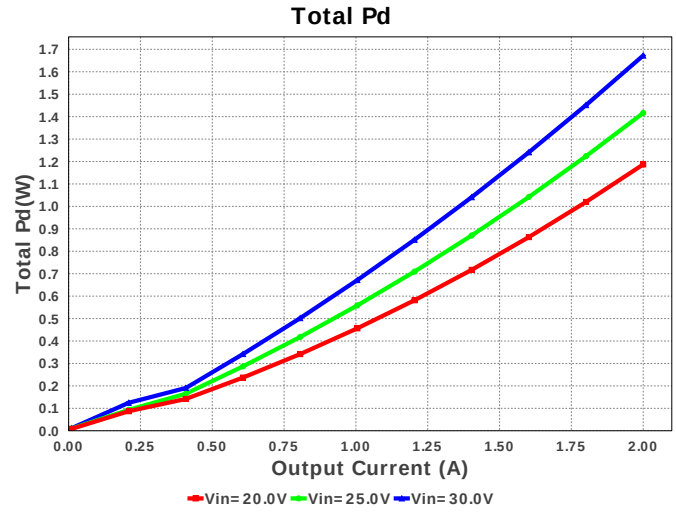


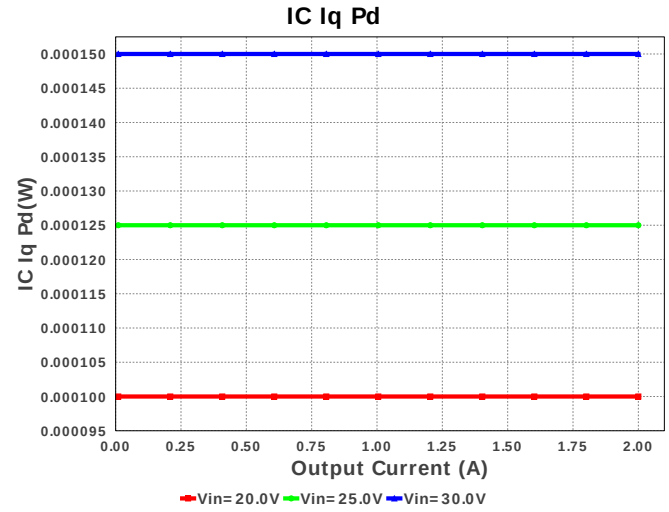
Pout

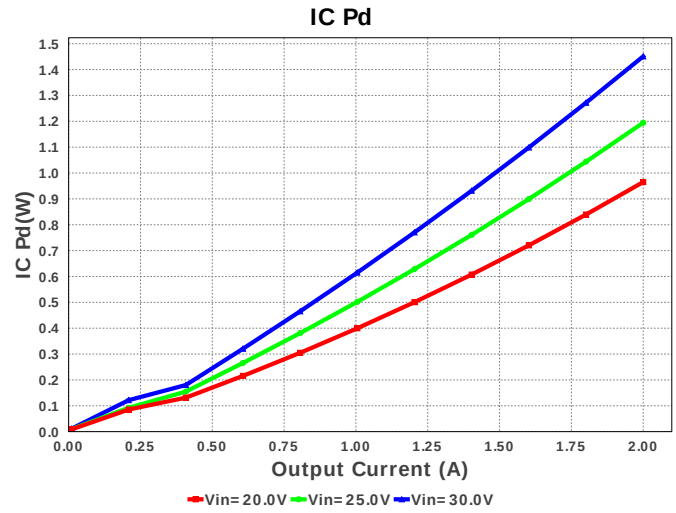


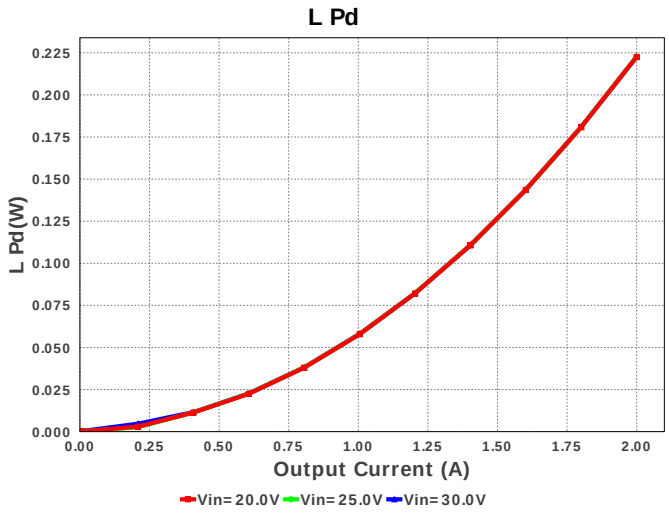


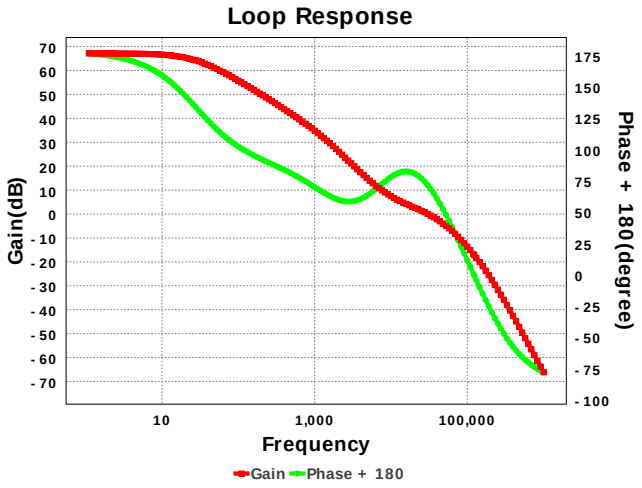


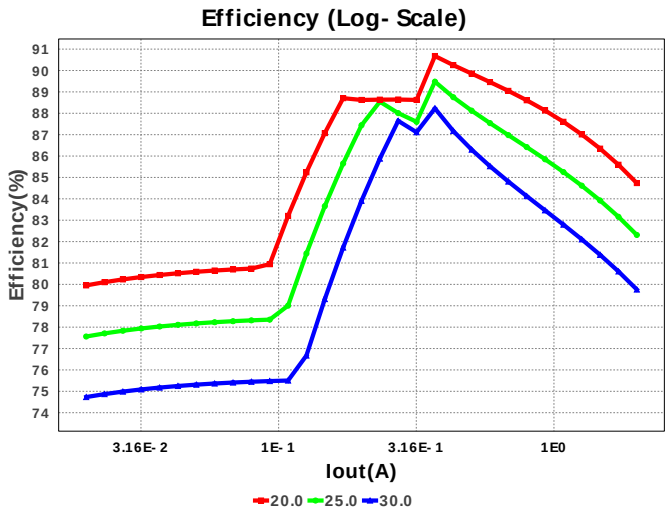












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	651.196 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	226.526 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	275.41 mA	Current	Average input current
4.	L Ipp	784.71 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.	Mode	CCM	General	Conduction Mode
9.	Pout	6.6 W	General	Total output power
10.	Total BOM	$2.33	General	Total BOM Cost
11.	Low Freq Gain	67.122 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	30.398 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	11.855 %	Op_point	Duty cycle
16.	Efficiency	79.759 %	Op_point	Steady state efficiency
17.	Gain Marg	-17.218 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	80.955 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	72.325 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	30.0 V	Op_point	Vin operating point
23.	Vout p-p	4.397 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	848.112 µW	Power	Input capacitor power dissipation
25.	Cout Pd	250.669 µW	Power	Output capacitor power dissipation
26.	IC Iq Pd	150.0 µW	Power	IC Iq Pd
27.	IC Pd	1.451 W	Power	IC power dissipation
28.	L Pd	222.822 mW	Power	Inductor power dissipation
29.	Total Pd	1.672 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	30.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LM43602	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	25.0	Ambient temperature

Design Assistance

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