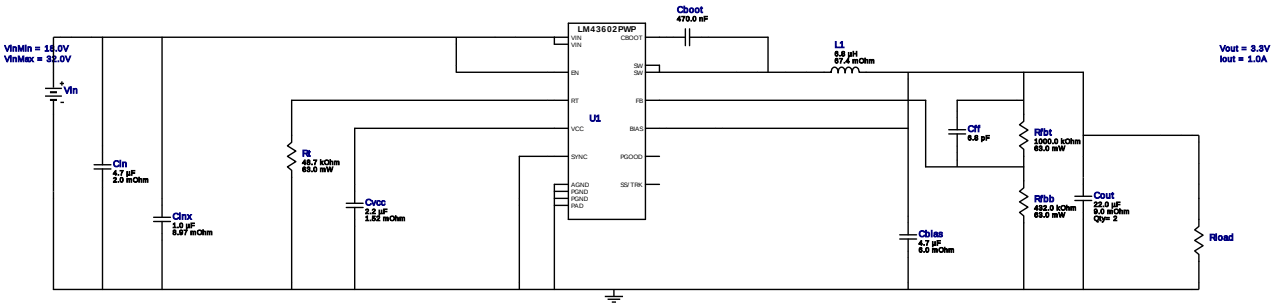
WEBENCH® Design Report

VinMin = 18.0V
VinMax = 32.0V
Vout = 3.3V
Iout = 1.0A

Device = LM43602PWPR
Topology = Buck
Created = 7/13/15 5:35:19 AM
BOM Cost = $3.00
Footprint = 146.0 mm^2
BOM Count = 13
Total Pd = 0.63W

Design : 4425714/4 LM43602PWPR
LM43602PWPR 18.0V-32.0V to 3.30V @ 1.0A



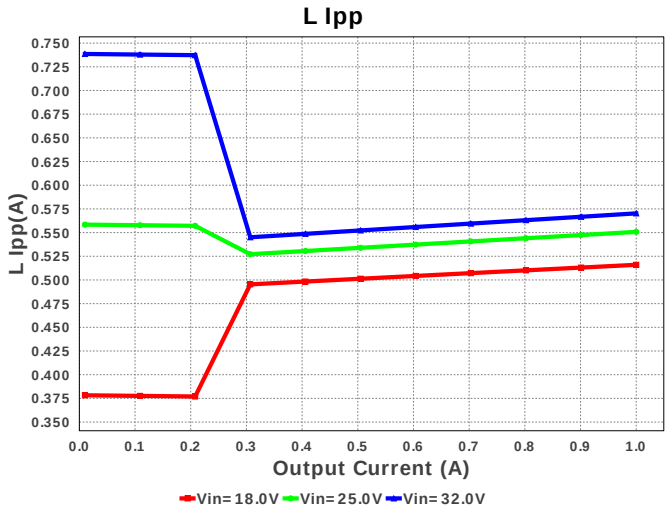
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.

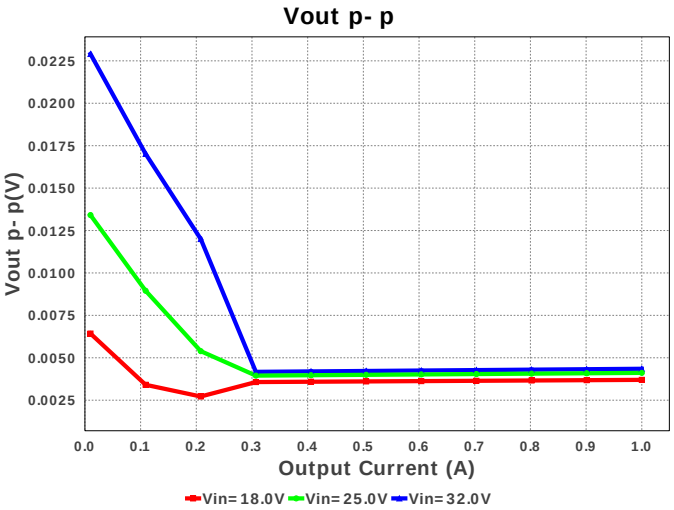
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating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

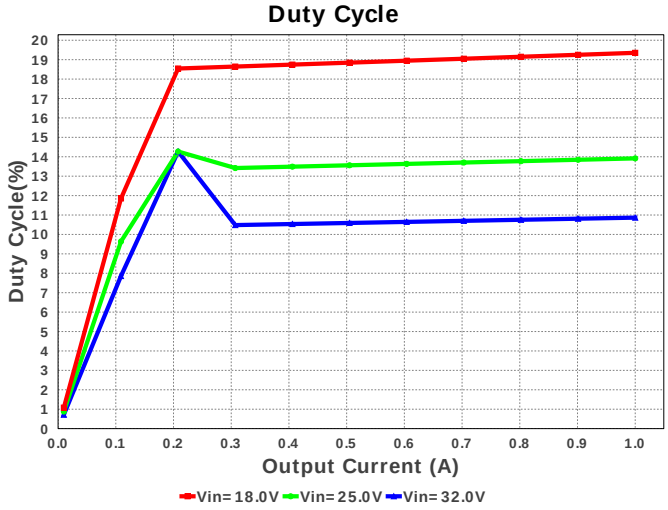
Electrical BOM

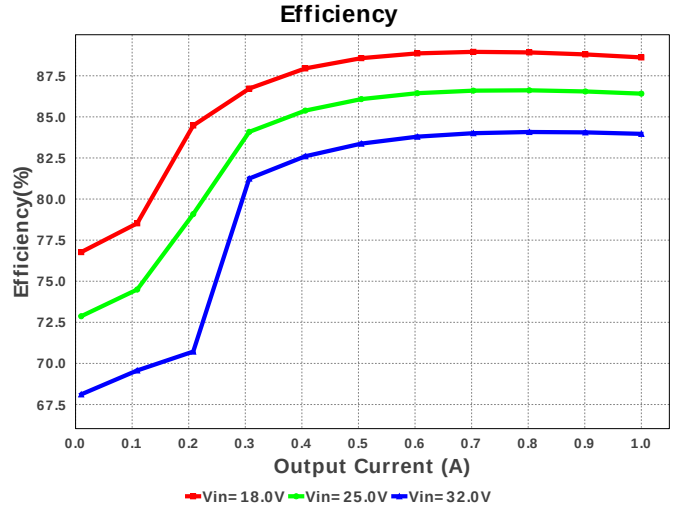
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	Kemet	C0603C475K9PACTU Series= X5R	Cap= 4.7 uF ESR= 6.0 mOhm VDC= 6.3 V IRMS= 7.24 A	1	$0.02	0603 5 mm^2
2.	Cboot	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	Cff	MuRata	GRM1555C1E6R8CA01D Series= C0G/NP0	Cap= 6.8 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 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	$0.29	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	$0.04	1206 11 mm^2
6.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	2	$0.05	0805 7 mm^2
7.	Cvcc	Taiyo Yuden	JMK105BJ225MV-F Series= X5R	Cap= 2.2 uF ESR= 1.52 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.03	0402 3 mm^2
8.	L1	Coilcraft	XAL4030-682MEB	L= 6.8 µH DCR= 67.4 mOhm	1	$0.72	XAL4030 25 mm^2
9.	Rfbb	Vishay-Dale	CRCW0402432KFKED Series= CRCW..e3	Res= 432.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2

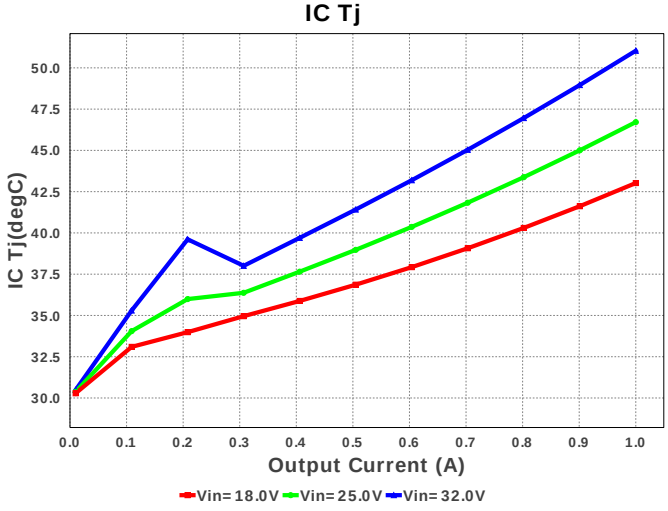
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rfbt	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	Rt	Vishay-Dale	CRCW040248K7FKED Series= CRCW..e3	Res= 48.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	U1	Texas Instruments	LM43602PWPR	Switcher	1	$1.75	PWP0016F 59 mm^2

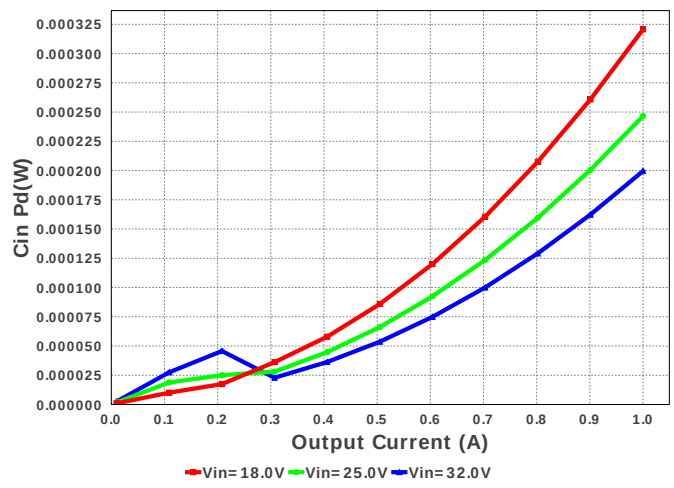




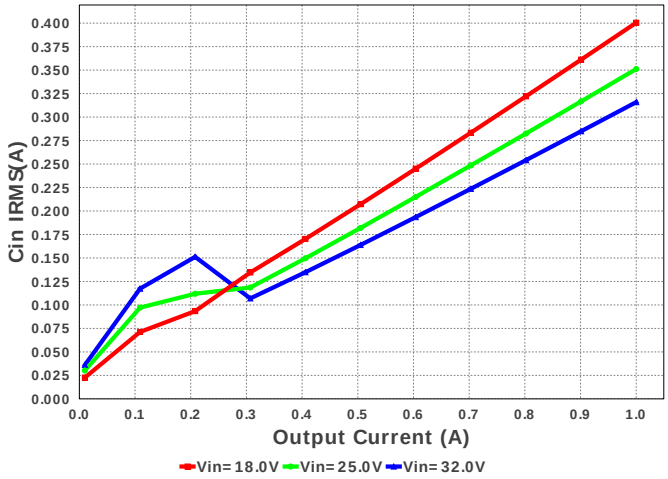




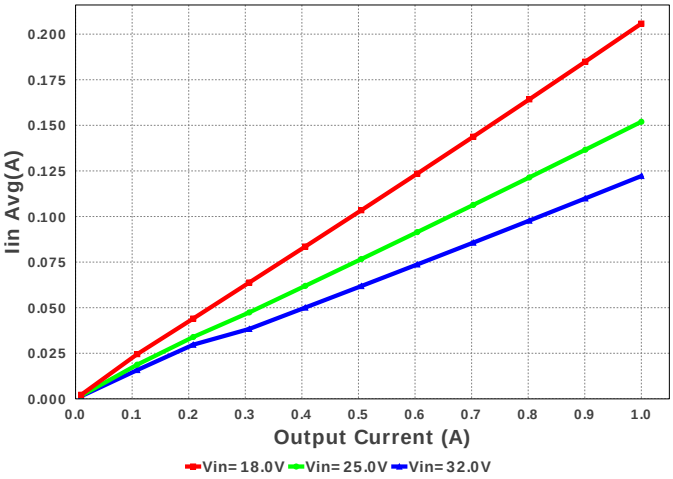




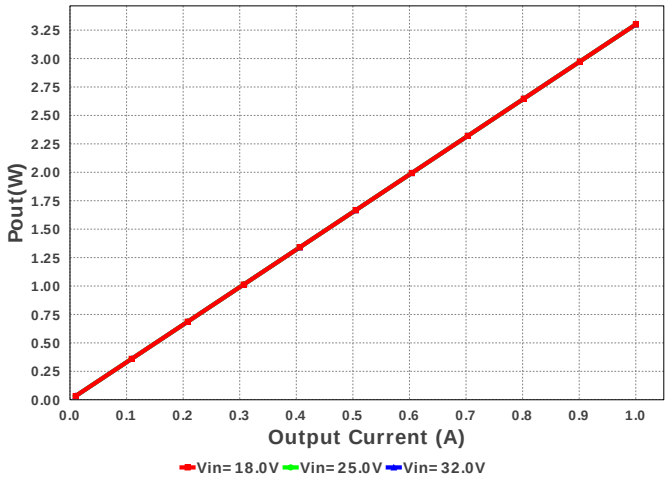
Cin IRMS



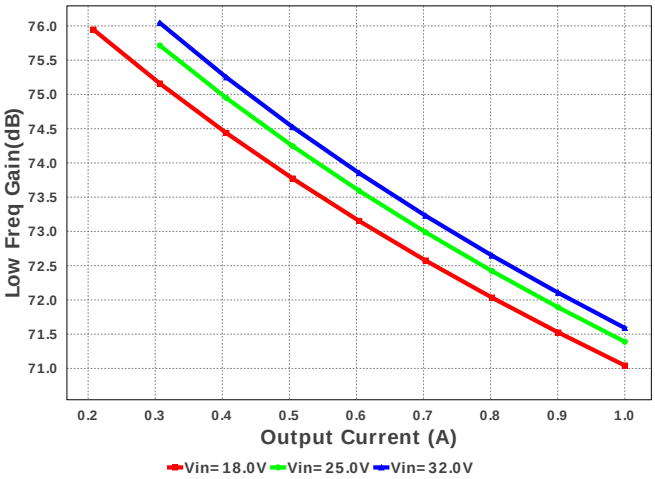
Iin Avg



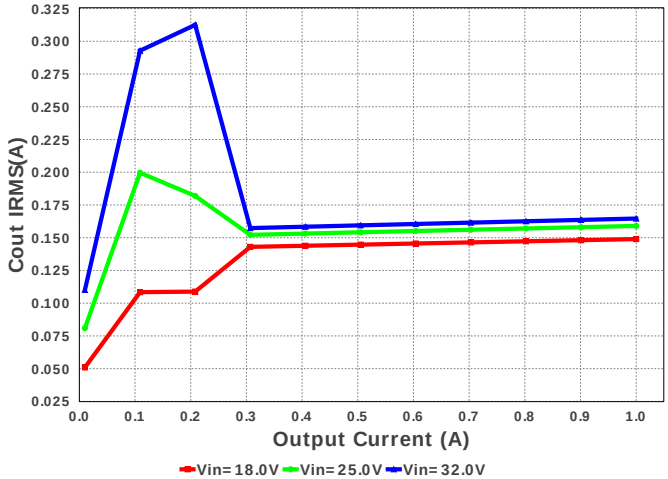
Pout



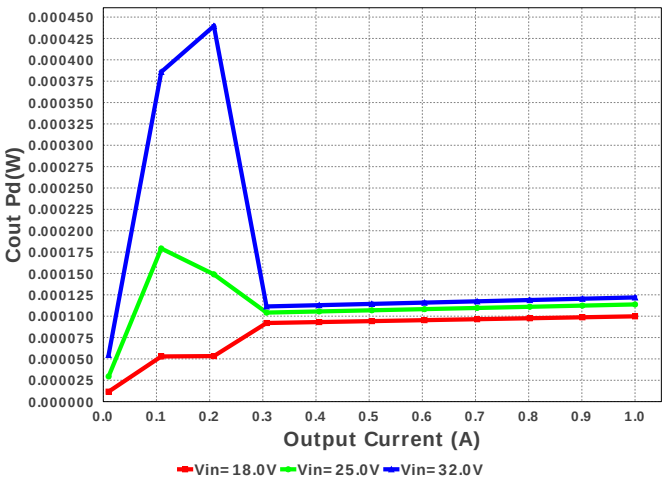
Low Freq Gain



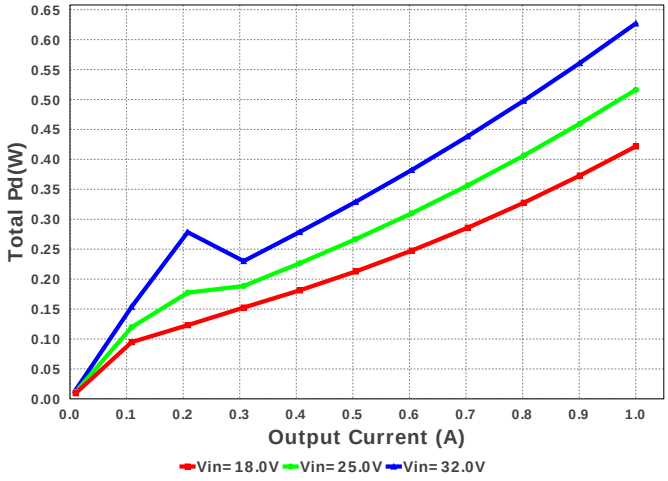
Cout IRMS



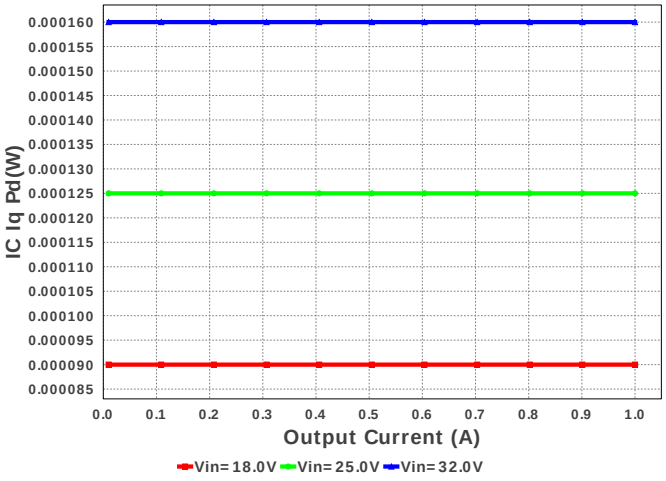
Cout Pd



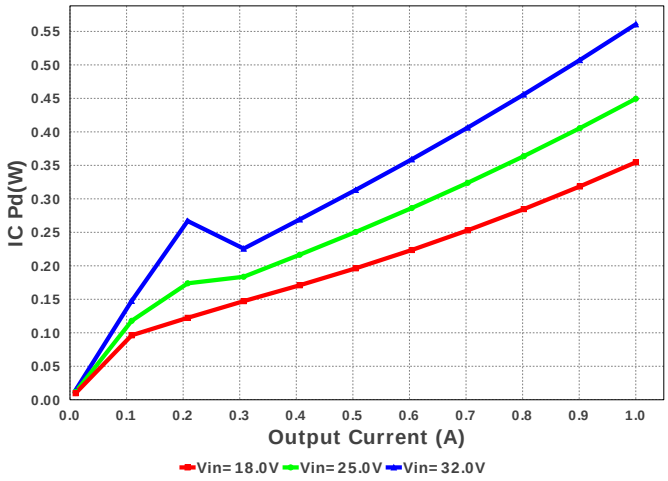
Total Pd



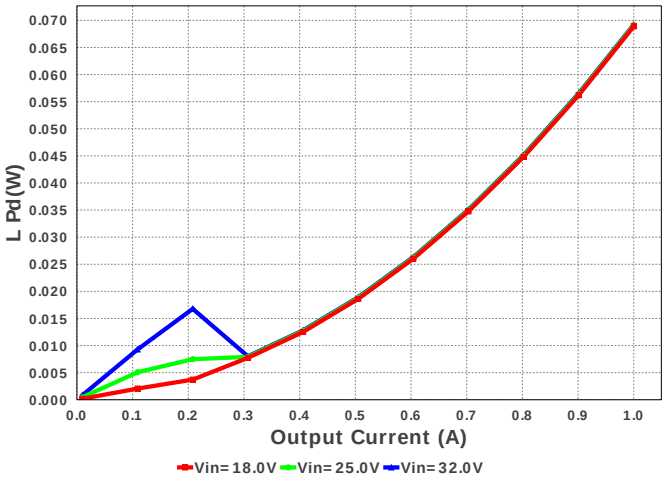
IC Iq Pd



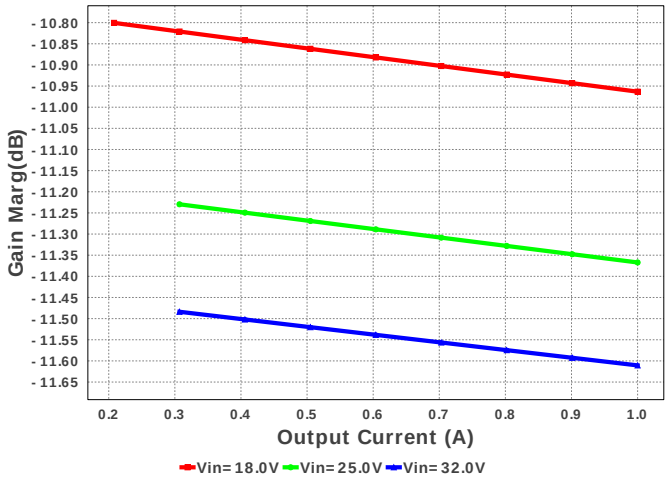
IC Pd



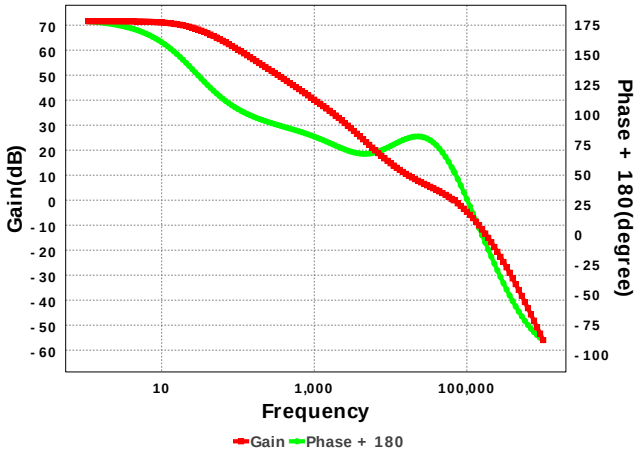
L Pd

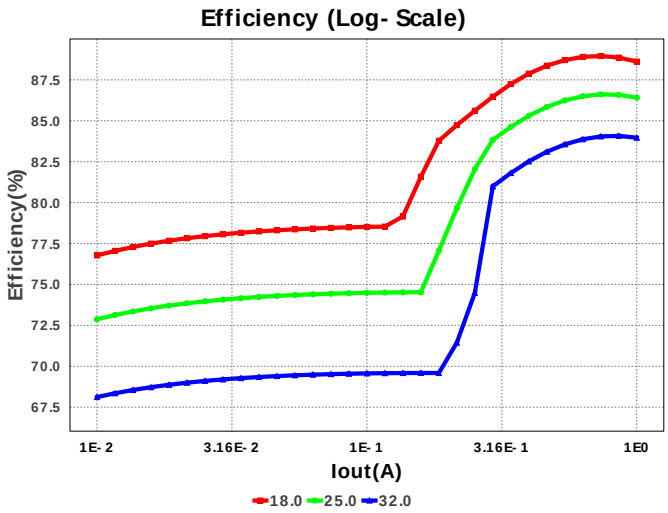


Gain Marg



Loop Response





Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	315.791 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	162.713 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	122.34 mA	Current	Average input current
4.	L Ipp	563.65 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	13	General	Total Design BOM count
6.	FootPrint	146.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	825.0 kHz	General	Switching frequency
8.	Pout	3.3 W	General	Total output power
9.	Total BOM	$3.0	General	Total BOM Cost
10.	Low Freq Gain	71.622 dB	Op_Point	Gain at 10Hz
11.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
12.	Cross Freq	66.981 kHz	Op_point	Bode plot crossover frequency
13.	Duty Cycle	10.865 %	Op_point	Duty cycle
14.	Efficiency	83.864 %	Op_point	Steady state efficiency
15.	Gain Marg	-11.673 dB	Op_point	Bode Plot Gain Margin
16.	IC Tj	51.215 degC	Op_point	IC junction temperature
17.	ICThetaJA	38.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
18.	IOUT_OP	1.0 A	Op_point	Iout operating point
19.	Phase Marg	53.43 deg	Op_point	Bode Plot Phase Margin
20.	VIN_OP	32.0 V	Op_point	Vin operating point
21.	Vout p-p	4.269 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	199.447 µW	Power	Input capacitor power dissipation
23.	Cout Pd	119.14 µW	Power	Output capacitor power dissipation
24.	IC Iq Pd	160.0 µW	Power	IC Iq Pd
25.	IC Pd	565.417 mW	Power	IC power dissipation
26.	L Pd	69.184 mW	Power	Inductor power dissipation
27.	Total Pd	631.705 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	Iout1	1.0	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	18.0	Minimum input voltage
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	LM43602	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0	Ambient temperature
10.	UserFsw	500.0 k	Customer Selected Frequency

Design Assistance

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