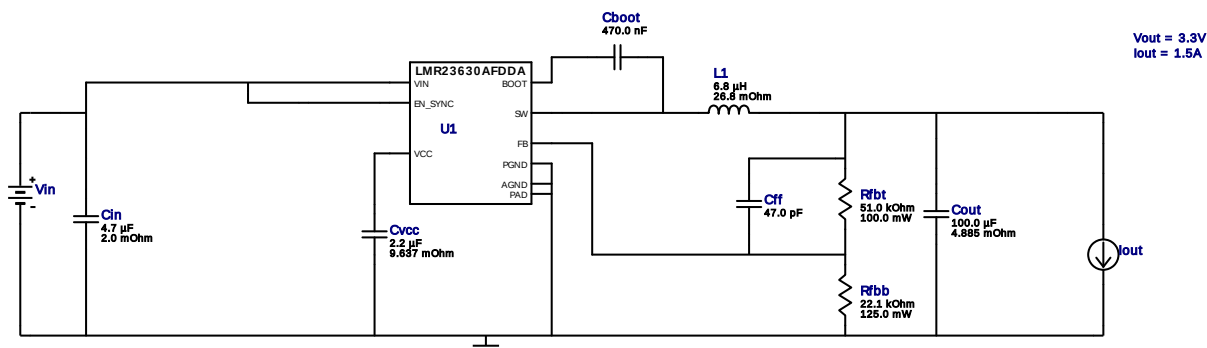


WEBENCH® Design Report

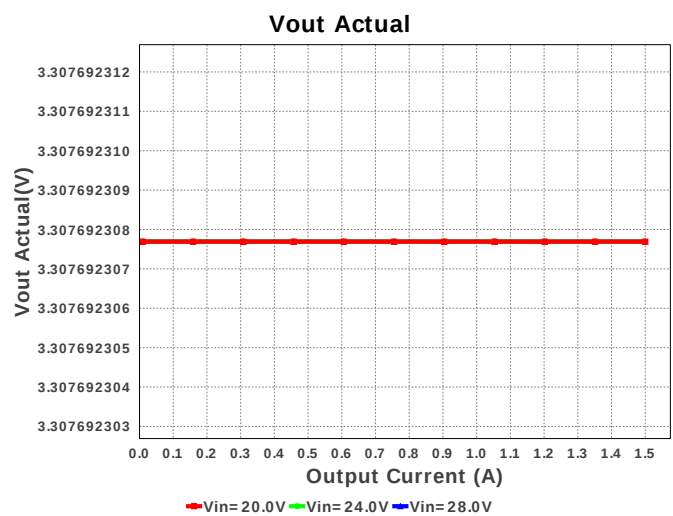
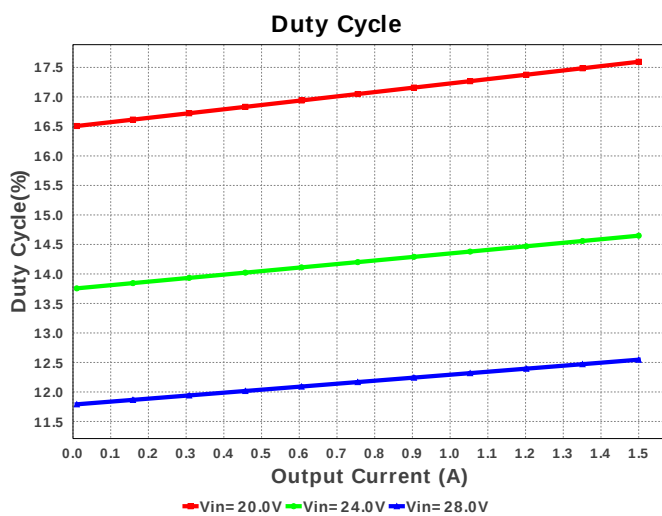
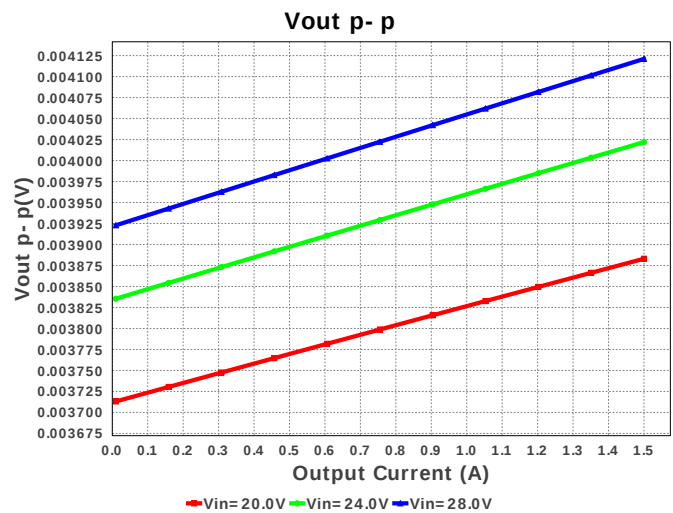
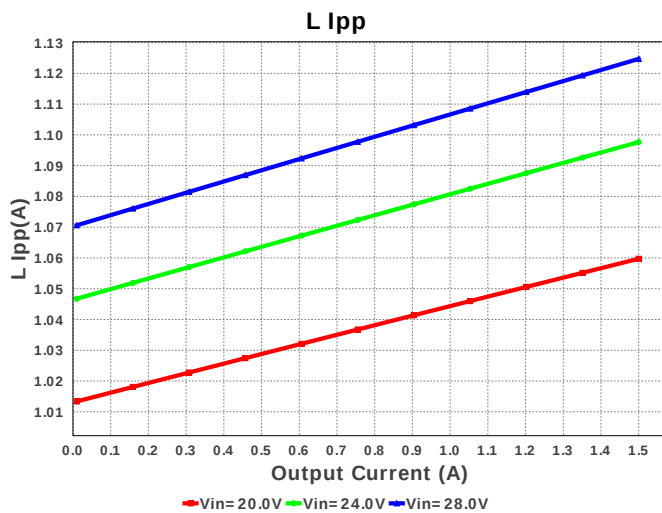
Design : 4774498/27 LMR23630AFDDAR
LMR23630AFDDAR 20.0V-28.0V to 3.30V @ 1.5A


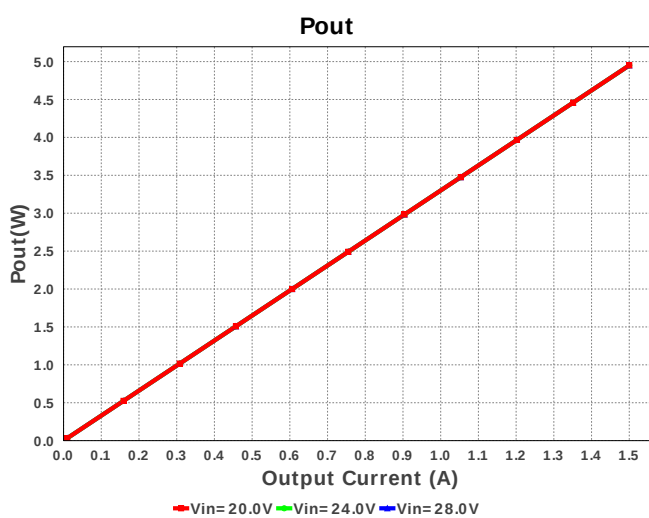
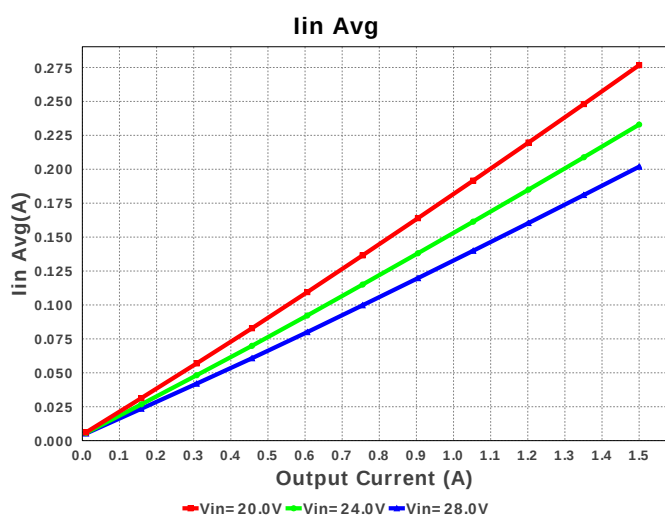
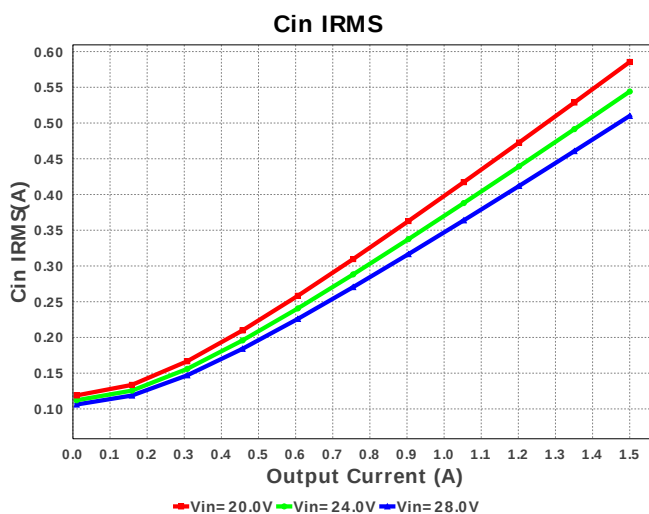
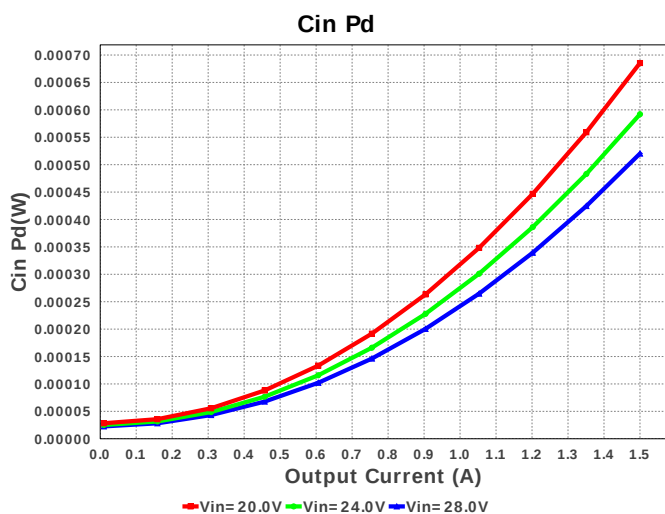
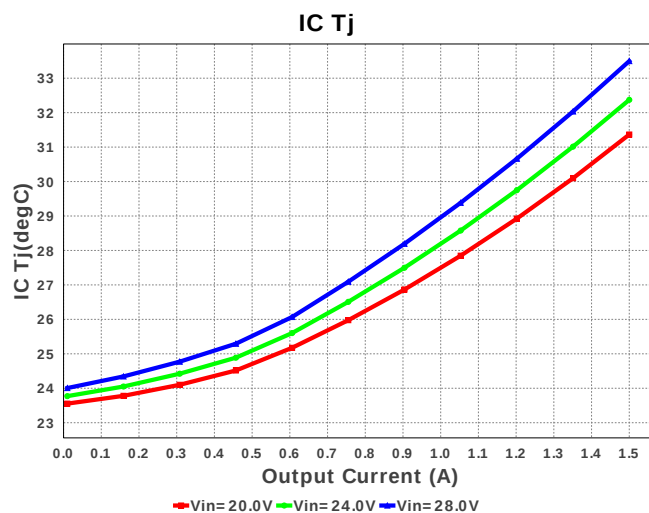
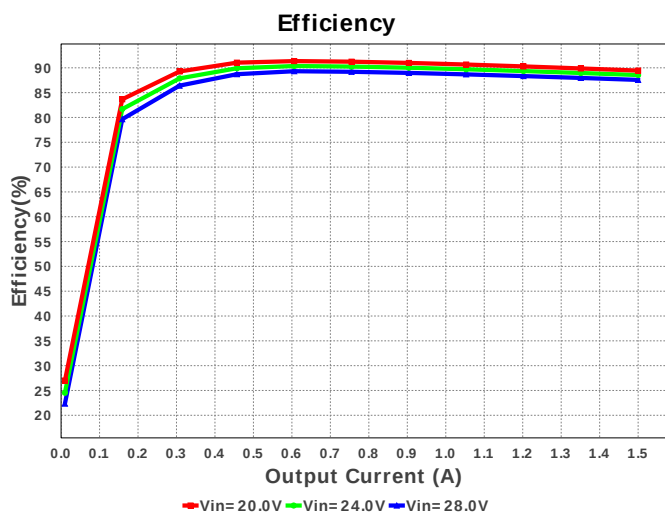
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.
2. If there is no VinTyp specified, WEBENCH will 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.

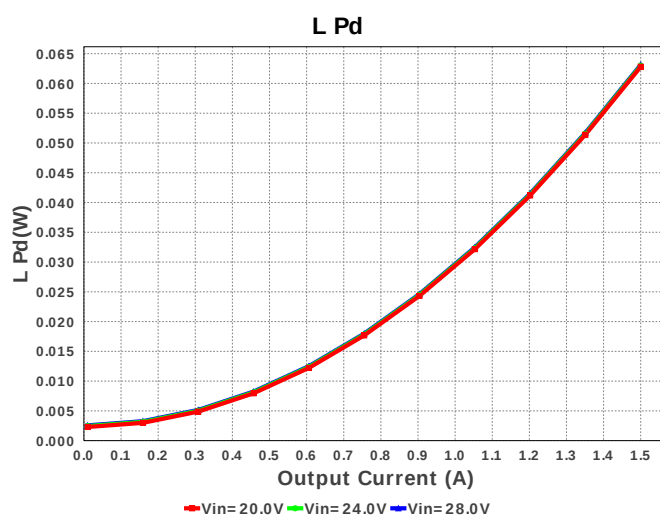
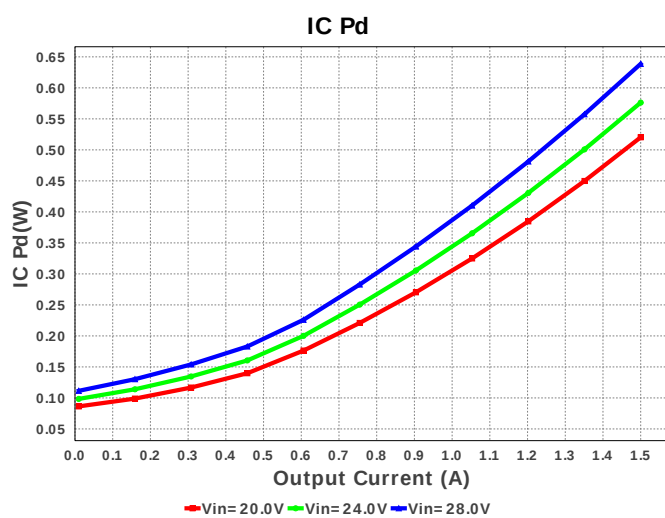
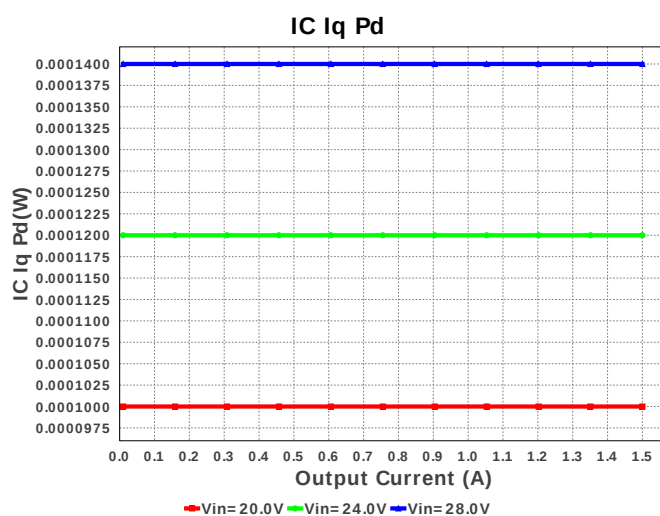
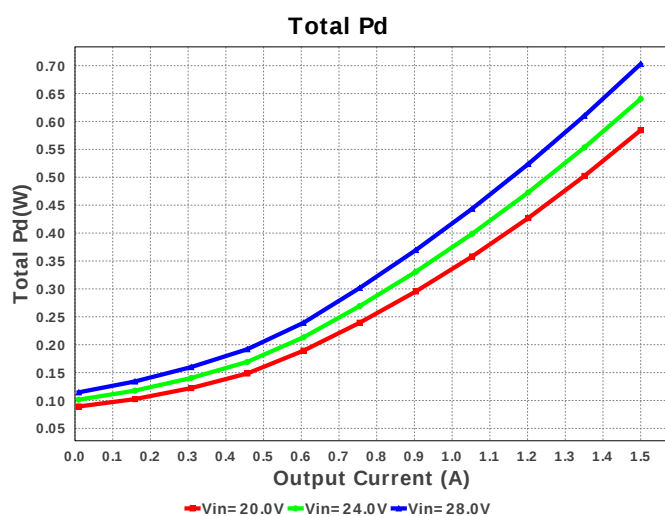
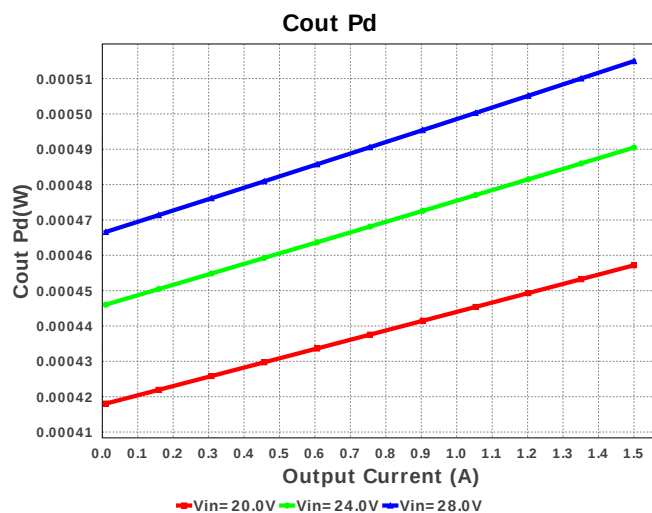
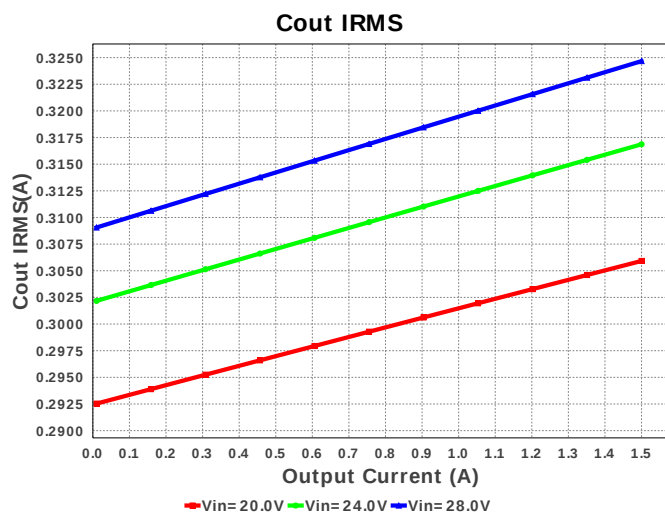
Electrical BOM

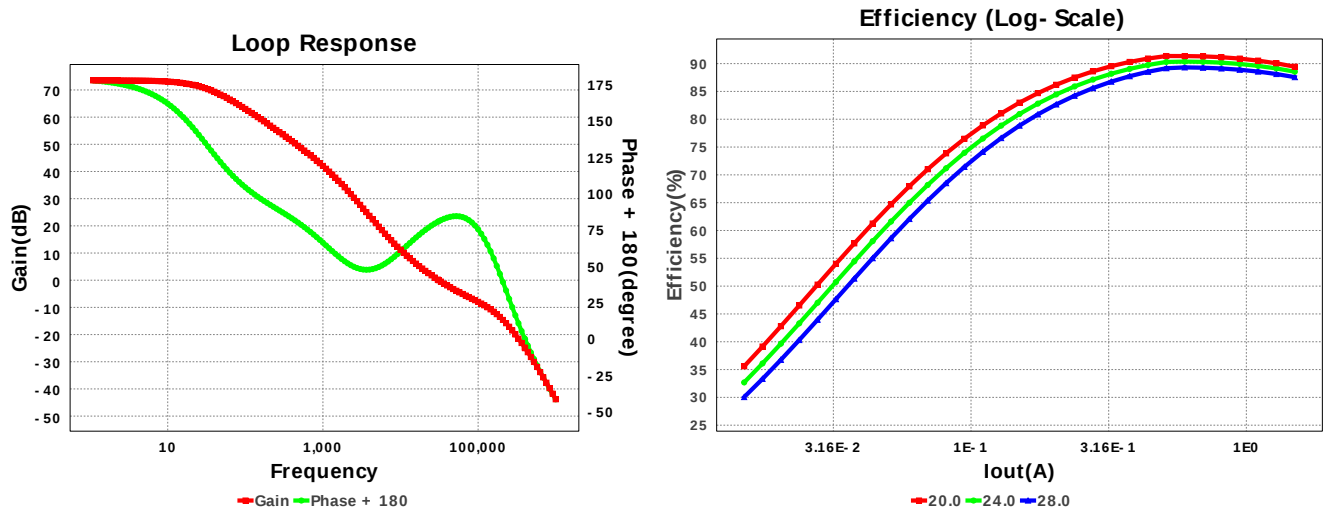
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71H474KA88L Series= X7R	Cap= 470.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.05	0805 7 mm ²
2.	Cff	Kemet	C0603C470J3GACTU Series= C0G/NP0	Cap= 47.0 pF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
3.	Cin	MuRata	GRM32ER71H475KA88L 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
4.	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
5.	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 mm ²
6.	L1	Coilcraft	XAL5050-682MEB	L= 6.8 uH DCR= 26.8 mOhm	1	\$0.92	XAL5050 54 mm ²
7.	Rfbb	Panasonic	ERJ-6ENF2212V Series= ERJ-6E	Res= 22.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 7 mm ²
8.	Rfbb	Yageo America	RC0603FR-0751KL Series= ?	Res= 51.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	U1	Texas Instruments	LMR23630AFDDAR	Switcher	1	\$1.40	 DDA0008E_N 57 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	510.011 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	324.673 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	201.89 mA	Current	Average input current
4.	L Ipp	1.125 A	Current	Peak-to-peak inductor ripple current
5.	BOM Count	9	General	Total Design BOM count
6.	FootPrint	165.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	400.0 kHz	General	Switching frequency
8.	Mode	CCM	General	Conduction Mode
9.	Pout	4.95 W	General	Total output power
10.	Total BOM	\$2.75	General	Total BOM Cost
11.	ICThetaJA Effective	18.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
12.	Low Freq Gain	73.503 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	3.308 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
15.	Cross Freq	31.096 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	12.547 %	Op_point	Duty cycle
17.	Efficiency	87.564 %	Op_point	Steady state efficiency
18.	Gain Marg	-25.014 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	33.496 degC	Op_point	IC junction temperature
20.	IOUT_OP	1.5 A	Op_point	Iout operating point
21.	Phase Marg	81.197 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	28.0 V	Op_point	Vin operating point
23.	Vout p-p	4.121 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	520.222 μW	Power	Input capacitor power dissipation
25.	Cout Pd	514.939 μW	Power	Output capacitor power dissipation
26.	IC Iq Pd	140.0 μW	Power	IC Iq Pd
27.	IC Pd	638.685 mW	Power	IC power dissipation
28.	L Pd	63.125 mW	Power	Inductor power dissipation
29.	Total Pd	702.997 mW	Power	Total Power Dissipation
30.	Vout Tolerance	3.438 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	VinMax	28.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LMR23630AF	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	22.0	Ambient temperature

Design Assistance

1. **LMR23630AF** Product Folder : <http://www.ti.com/product/LMR23630> : contains the data sheet and other resources.

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