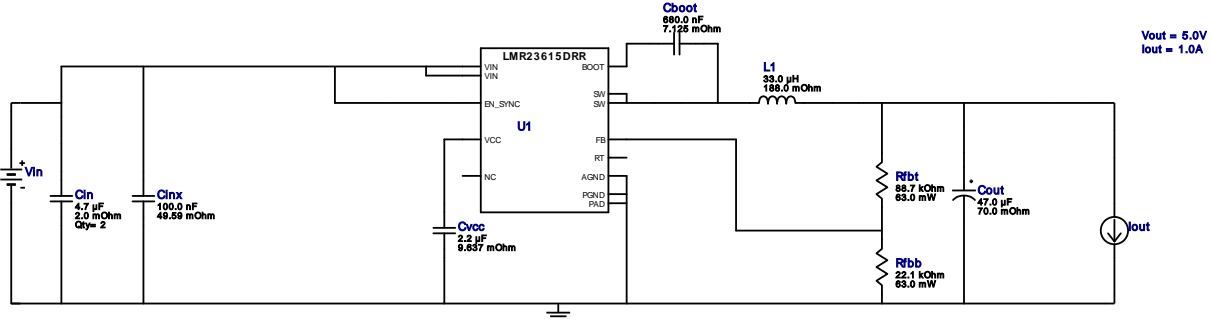


## WEBENCH® Design Report

 Design : 973400/246 LMR23615DRRR  
 LMR23615DRRR 20.0V-26.0V to 5.00V @ 1.0A



- 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.
- 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.

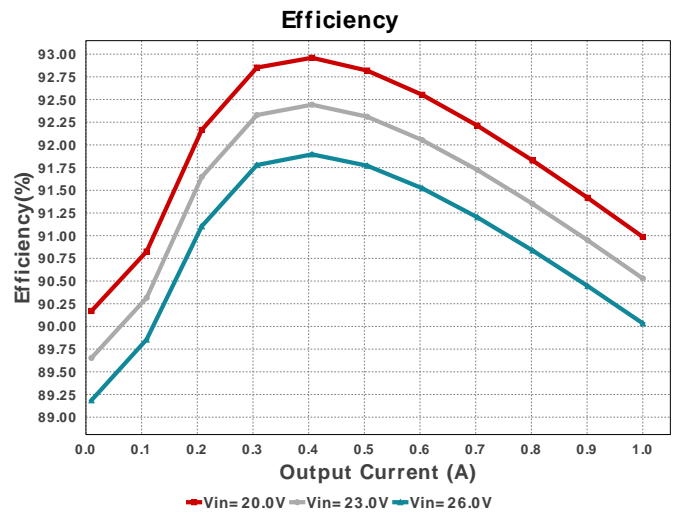
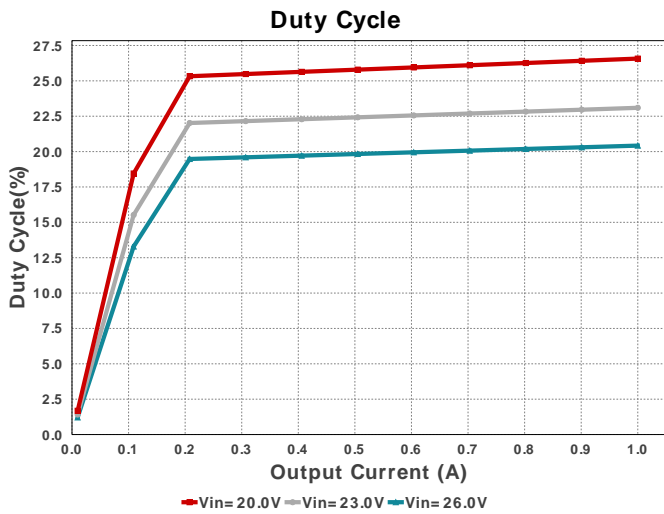
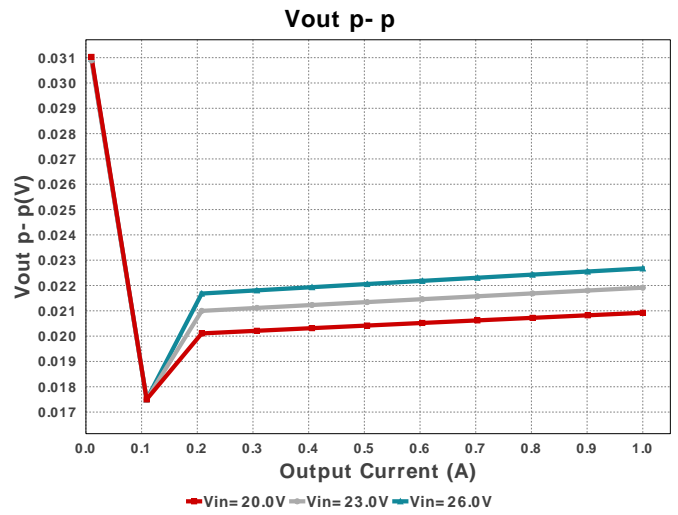
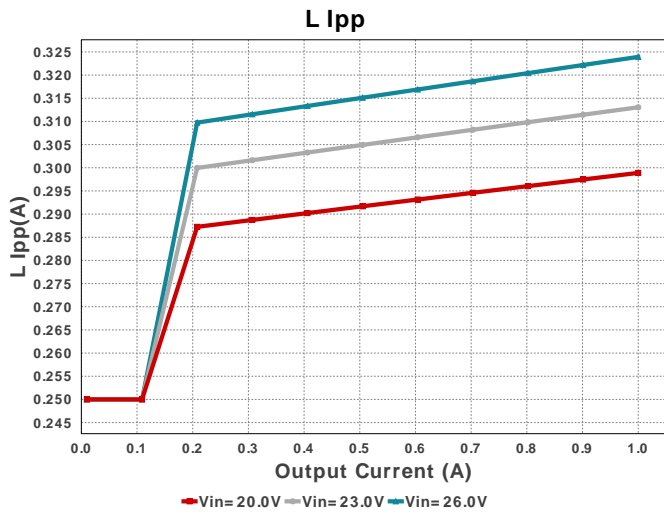
### My Comments

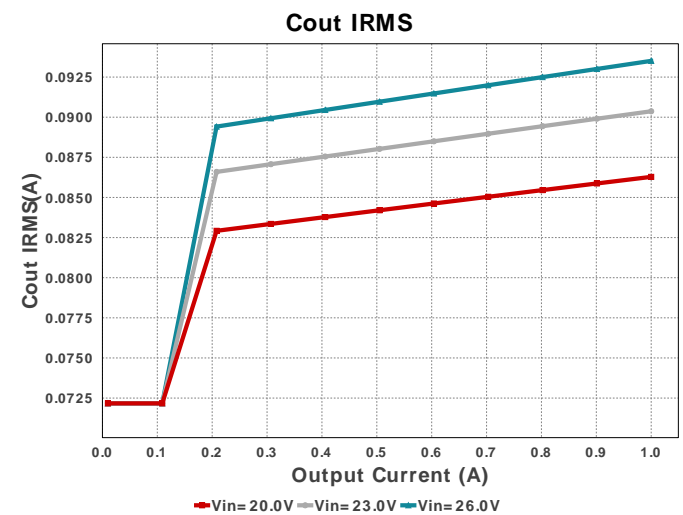
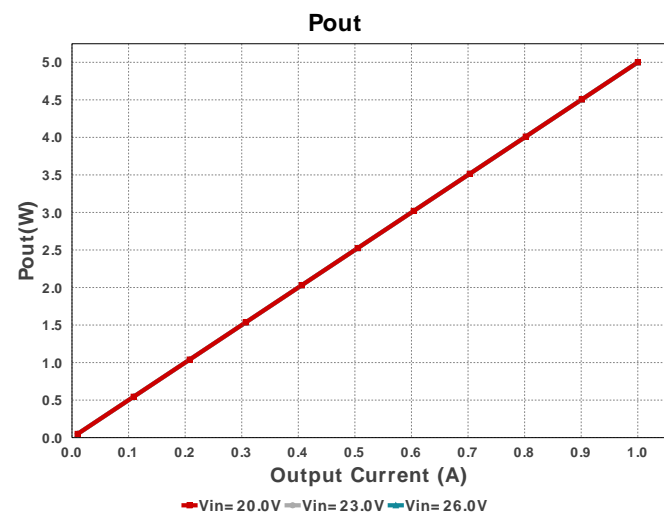
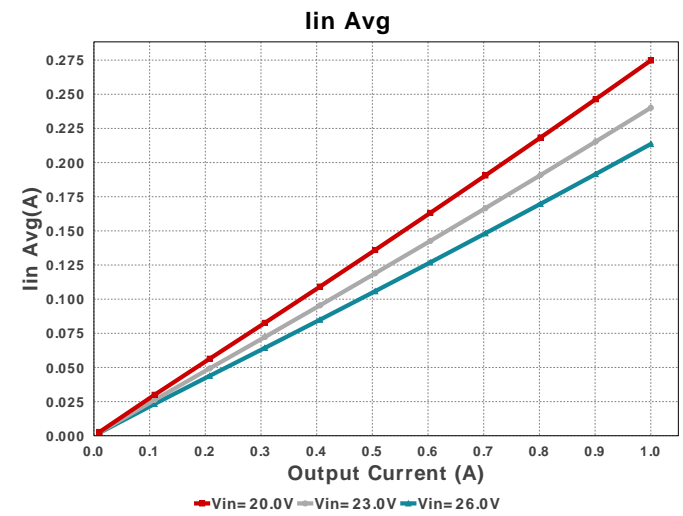
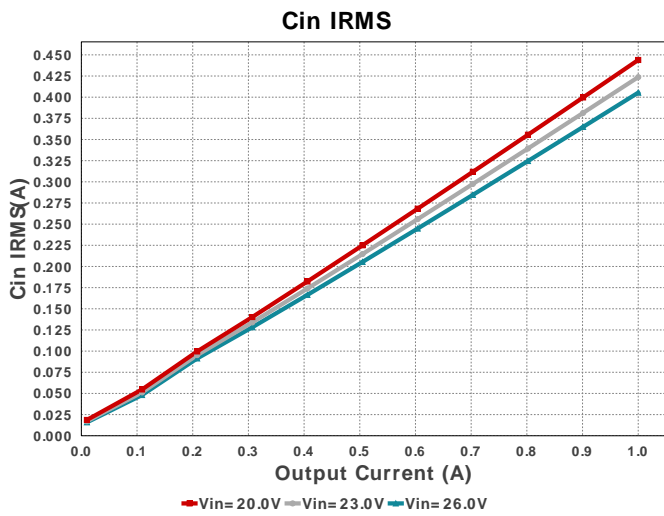
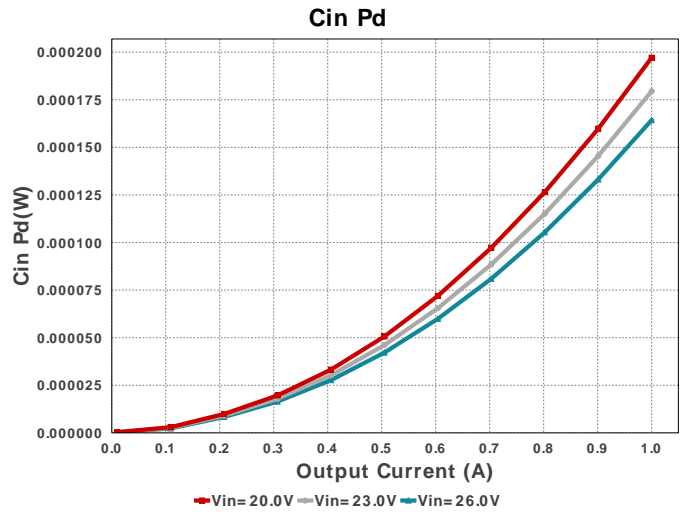
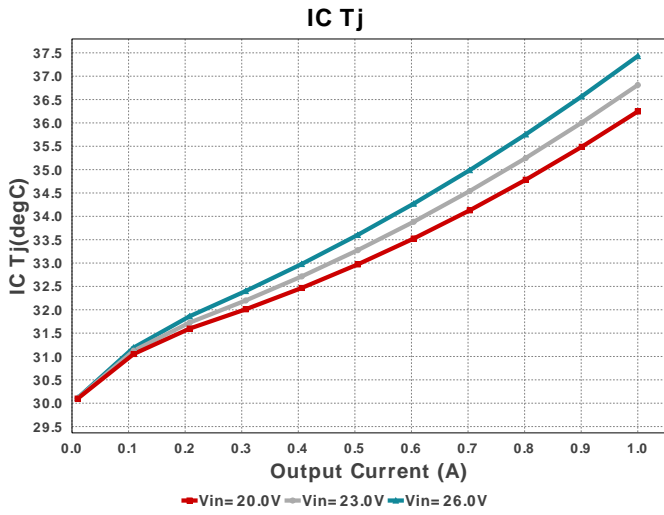
No comments

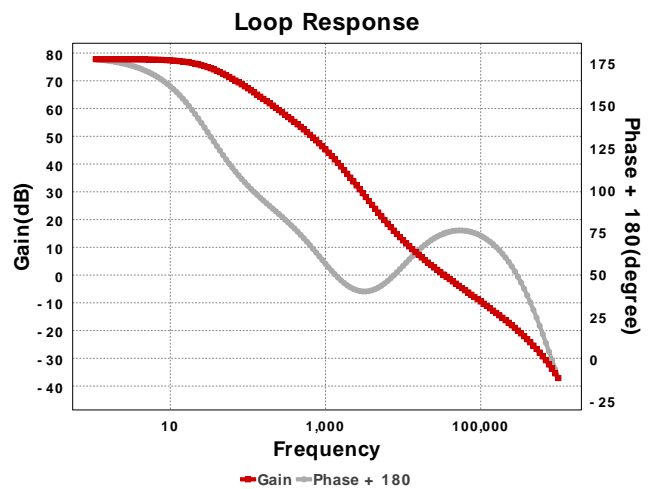
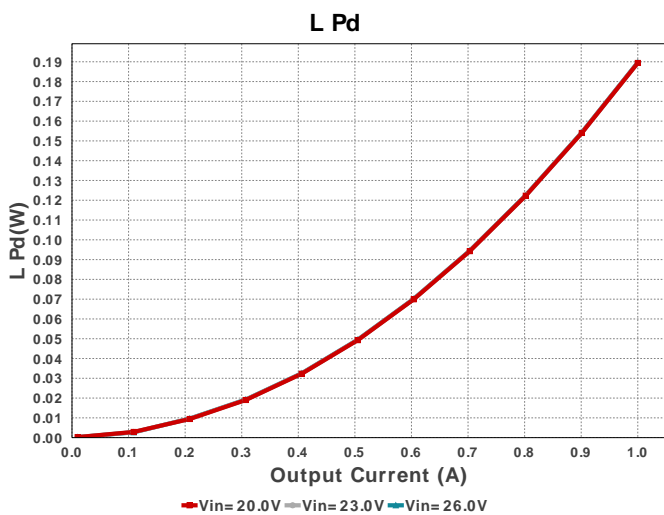
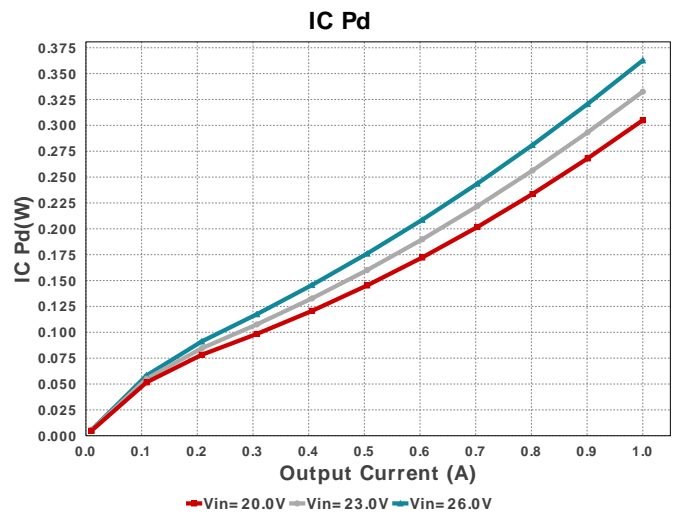
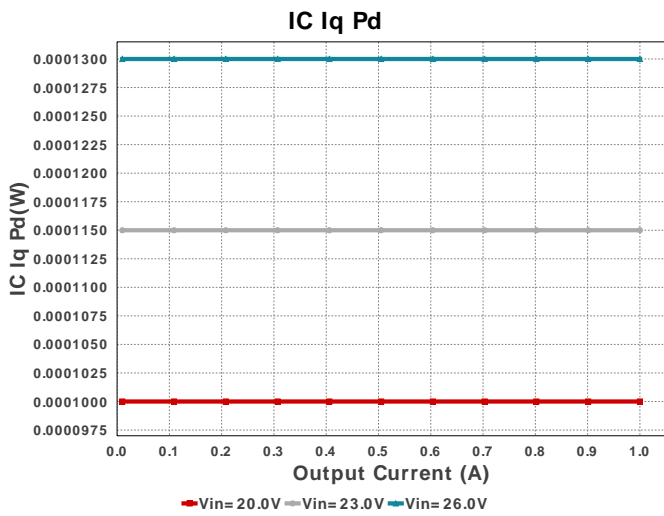
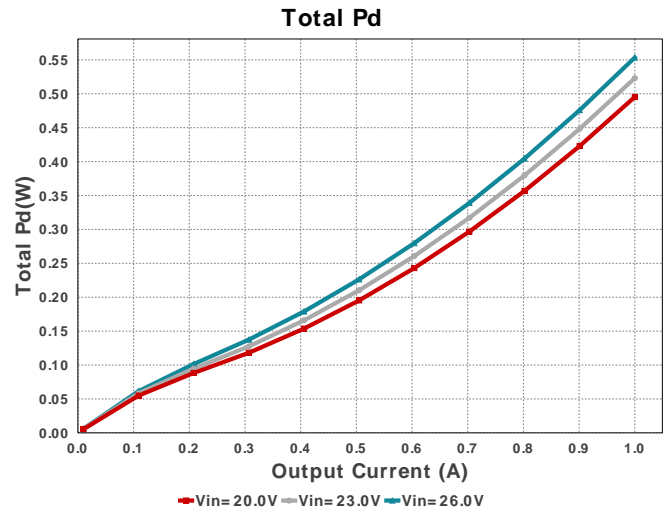
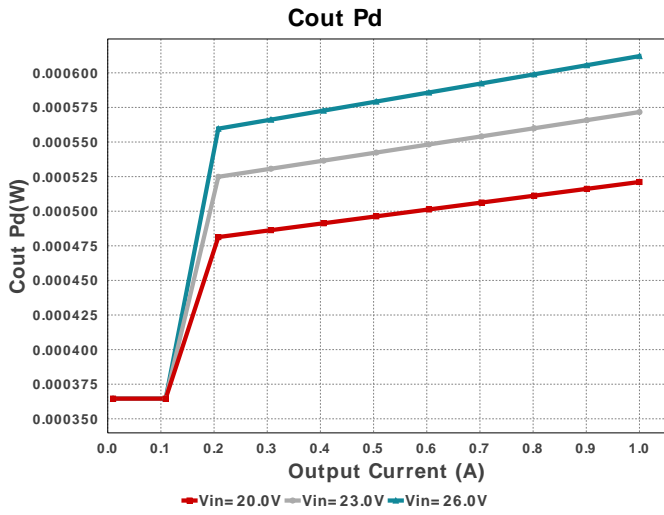
### Electrical BOM

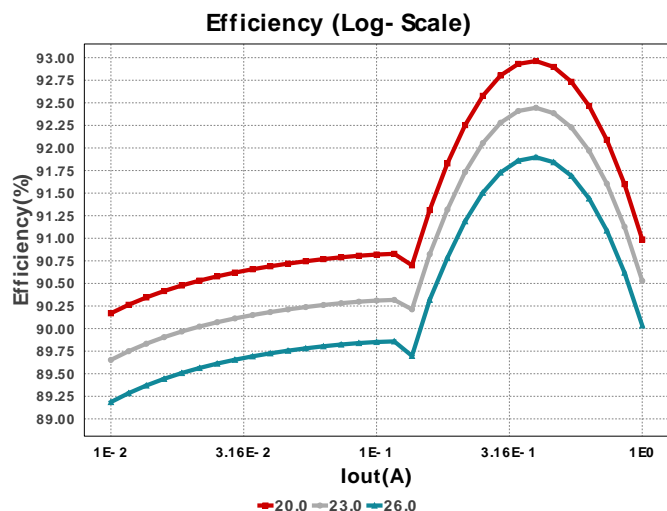
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	TDK	C1608X5R1H684K080AB Series= X5R	Cap= 680.0 nF ESR= 7.125 mOhm VDC= 50.0 V IRMS= 1.9522 A	1	\$0.03	0603 5 mm <sup>2</sup>
2.	Cin	MuRata	GRM32ER71H475KA88L Series= X7R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 50.0 V IRMS= 5.35 A	2	\$0.22	1210 15 mm <sup>2</sup>
3.	Cinx	TDK	C1608X7S2A104K080AB Series= X7S	Cap= 100.0 nF ESR= 49.59 mOhm VDC= 100.0 V IRMS= 751.62 mA	1	\$0.03	0603 5 mm <sup>2</sup>
4.	Cout	Panasonic	10TPB47M Series= TPB	Cap= 47.0 uF ESR= 70.0 mOhm VDC= 10.0 V IRMS= 1.1 A	1	\$0.35	3528-21 17 mm <sup>2</sup>
5.	Cvcc	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 10.0 V IRMS= 1.24283 A	1	\$0.02	0603 5 mm <sup>2</sup>
6.	L1	Bourns	SRN6045-330M	L= 33.0 uH DCR= 188.0 mOhm	1	\$0.18	SRN6045 64 mm <sup>2</sup>
7.	Rfbb	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
8.	Rfbt	Vishay-Dale	CRCW040288K7FKED Series= CRCW..e3	Res= 88.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	U1	Texas Instruments	LMR23615DRRR	Switcher	1	\$1.30	 DRR0012D 16 mm <sup>2</sup>









## Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	405.339 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	93.51 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	213.58 mA	Current	Average input current
4.	L Ipp	323.93 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	10	General	Total Design BOM count
6.	FootPrint	147.0 mm <sup>2</sup>	General	Total Foot Print Area of BOM components
7.	Frequency	400.0 kHz	General	Switching frequency
8.	Mode	CCM	General	Conduction Mode
9.	Pout	5.0 W	General	Total output power
10.	Total BOM	\$2.37	General	Total BOM Cost
11.	Cross Freq	33.839 kHz	Op Point	Bode plot crossover frequency
12.	Duty Cycle	20.422 %	Op Point	Duty cycle
13.	Efficiency	90.034 %	Op Point	Steady state efficiency
14.	Gain Marg	-33.63 dB	Op Point	Bode Plot Gain Margin
15.	IC Tj	37.43 degC	Op Point	IC junction temperature
16.	ICThetaJA Effective	20.5 degC/W	Op Point	Effective IC Junction-to-Ambient Thermal Resistance
17.	IOUT_OP	1.0 A	Op Point	Iout operating point
18.	Low Freq Gain	77.78 dB	Op Point	Gain at 1Hz
19.	Phase Marg	74.781 deg	Op Point	Bode Plot Phase Margin
20.	VIN_OP	26.0 V	Op Point	Vin operating point
21.	Vout Actual	5.014 V	Op Point	Vout Actual calculated based on selected voltage divider resistors
22.	Vout OP	5.0 V	Op Point	Operational Output Voltage
23.	Vout Tolerance	3.65 %	Op Point	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
24.	Vout p-p	22.675 mV	Op Point	Peak-to-peak output ripple voltage
25.	Cin Pd	164.3 μW	Power	Input capacitor power dissipation
26.	Cout Pd	612.087 μW	Power	Output capacitor power dissipation
27.	IC Iq Pd	130.0 μW	Power	IC Iq Pd
28.	IC Pd	362.795 mW	Power	IC power dissipation
29.	L Pd	189.644 mW	Power	Inductor power dissipation
30.	Total Pd	553.42 mW	Power	Total Power Dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	26.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LMR23615-WSON	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

## Design Assistance

1. **LMR23615-WSON** Product Folder : <http://www.ti.com/product/LMR23615> : contains the data sheet and other resources.

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