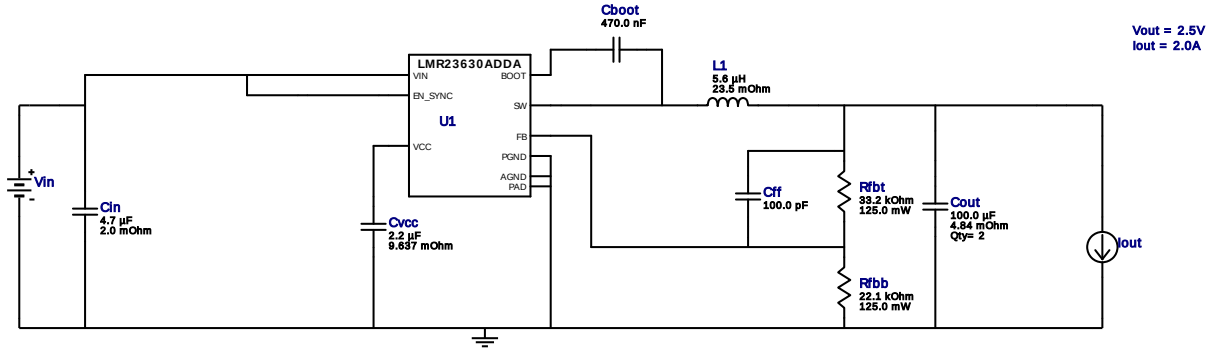
WEBENCH® Design Report

VinMin = 21.0V
VinMax = 25.0V
Vout = 2.5V
Iout = 2.0A

Device = LMR23630ADDAR
Topology = Buck
Created = 7/20/16 11:29:31 PM
BOM Cost = $3.03
BOM Count = 10
Total Pd = 0.98W

Design : 4742013/194 LMR23630ADDAR
LMR23630ADDAR 21.0V-25.0V to 2.50V @ 2.0A



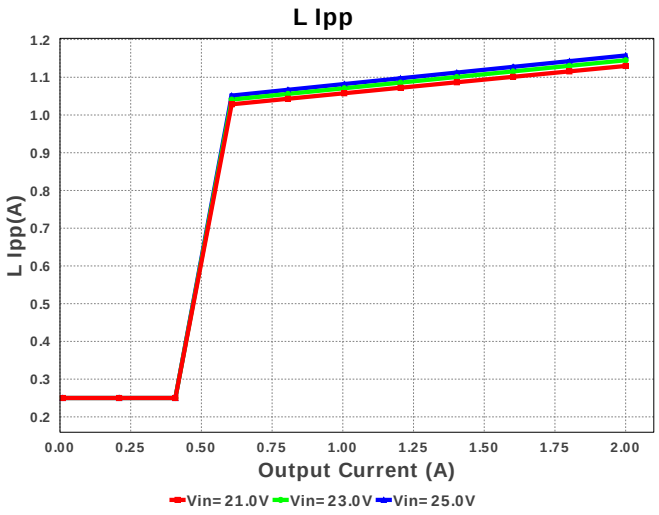
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.

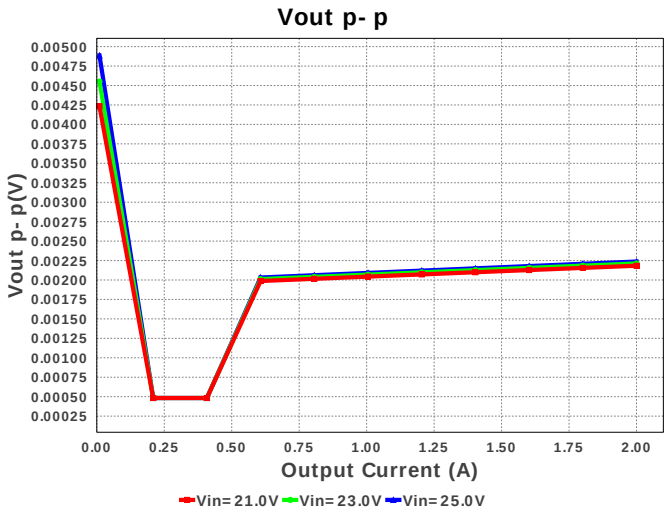
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating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

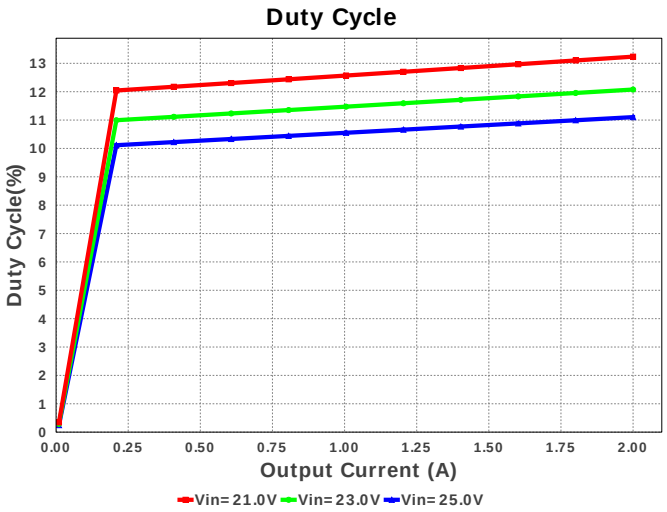
Electrical BOM

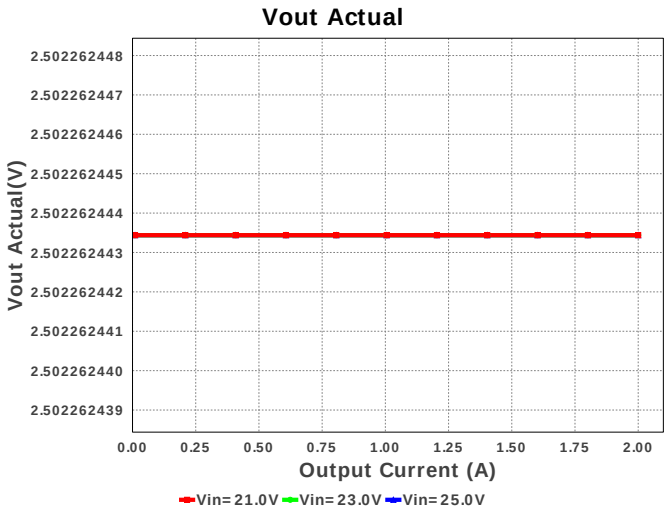
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71H474KA88L Series= X7R	Cap= 470.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.05	0805 7 mm^2
2.	Cff	Kemet	C0603C101J3GACTU Series= C0G/NP0	Cap= 100.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
3.	Cin	MuRata	GRM32ER71H475KA88L 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	GRM31CD80G107ME39L Series= X6T	Cap= 100.0 uF ESR= 4.84 mOhm VDC= 4.0 V IRMS= 4.3381 A	2	$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	XAL5050-562MEB	L= 5.6 µH DCR= 23.5 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.	Rfbt	Panasonic	ERJ-6ENF3322V Series= ERJ-6E	Res= 33.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm^2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	U1	Texas Instruments	LMR23630ADDAR	Switcher	1	$1.54	DDA0008E_N 57 mm²

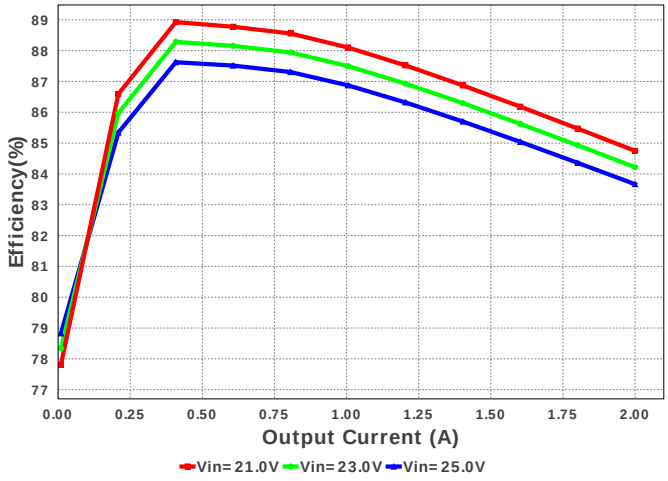




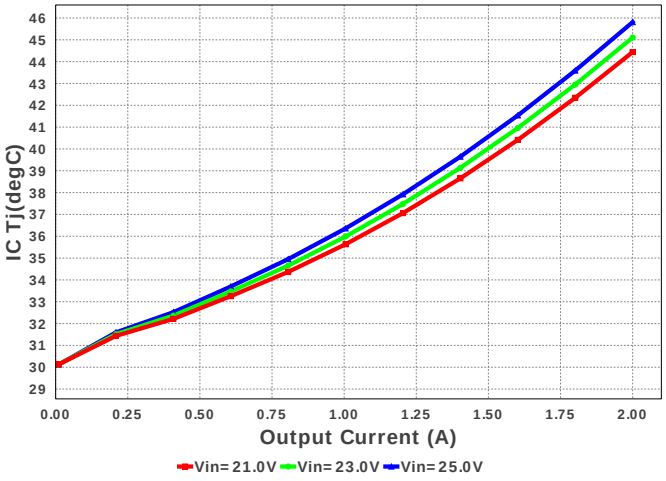




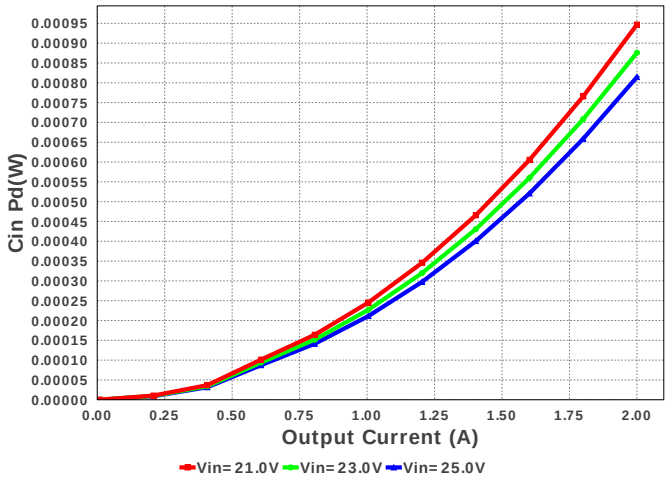
Efficiency



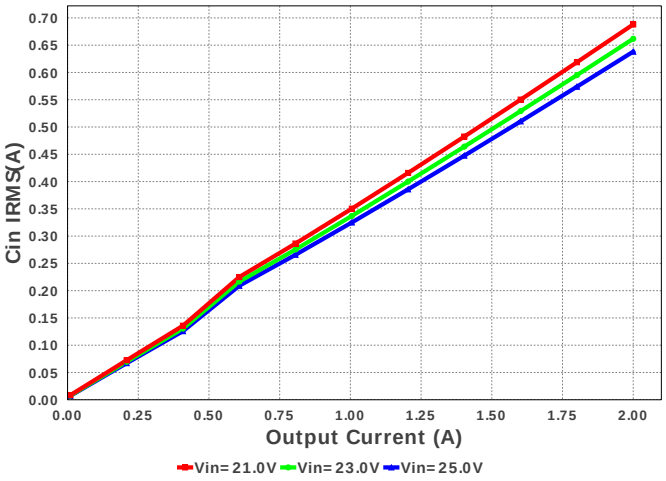
IC Tj



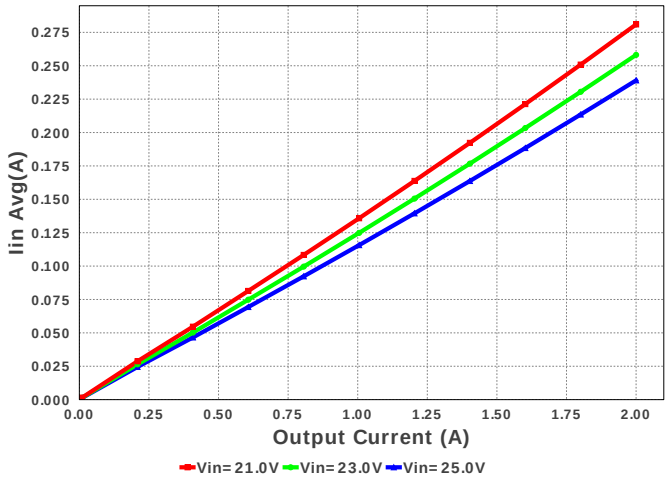
Cin Pd



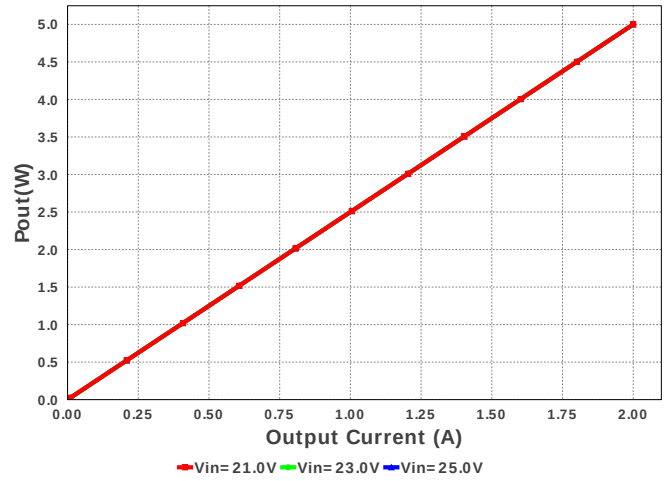
Cin IRMS



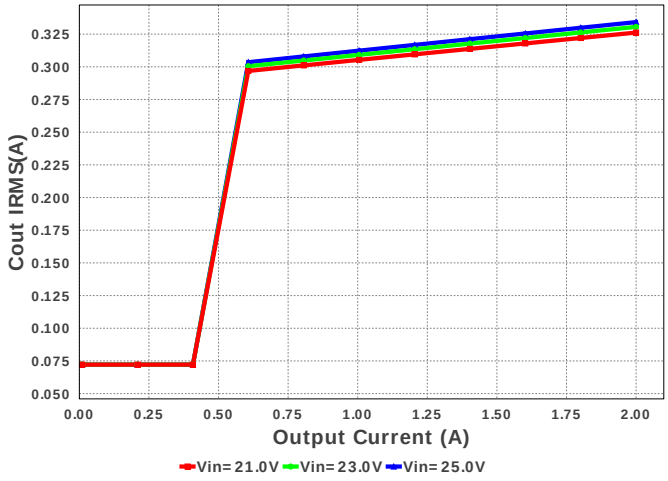
Iin Avg



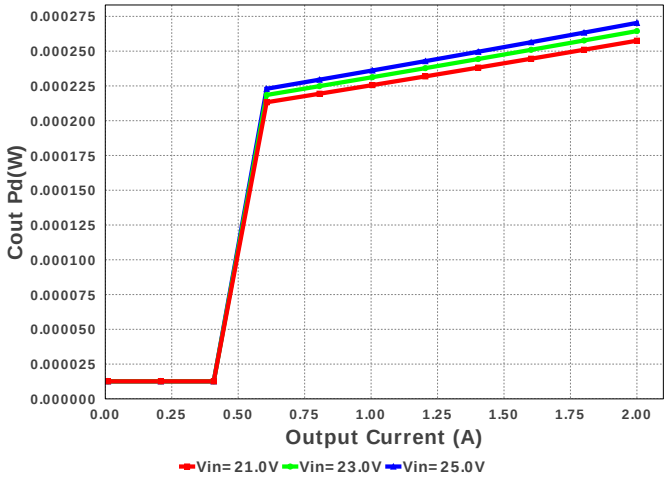
Pout



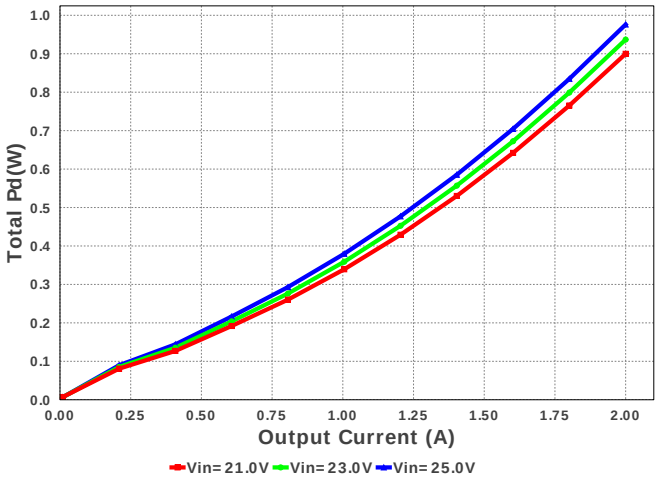
Cout IRMS



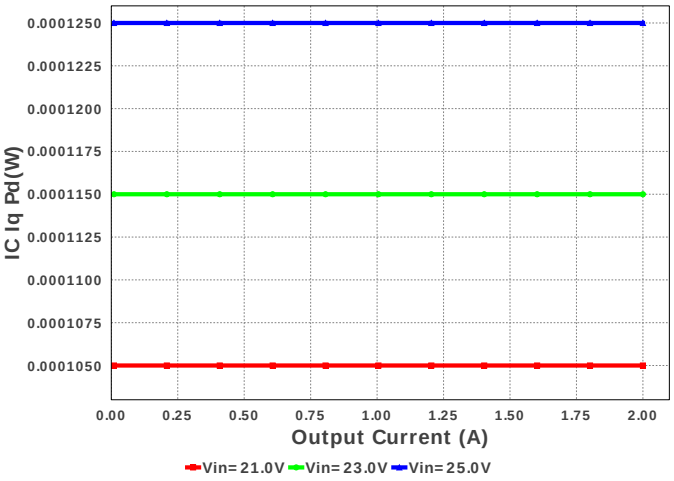
Cout Pd



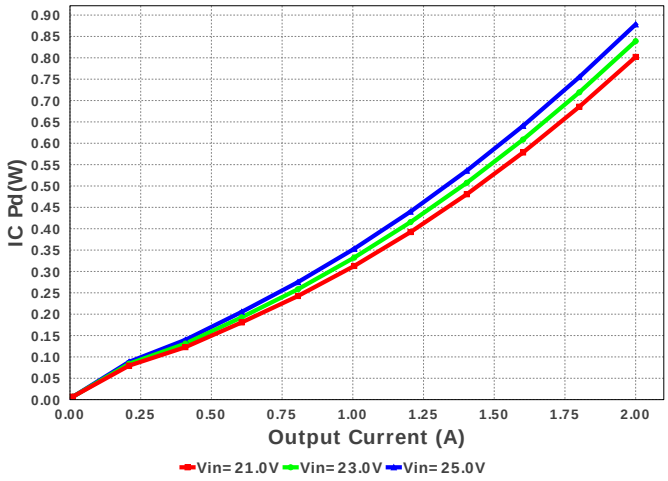
Total Pd



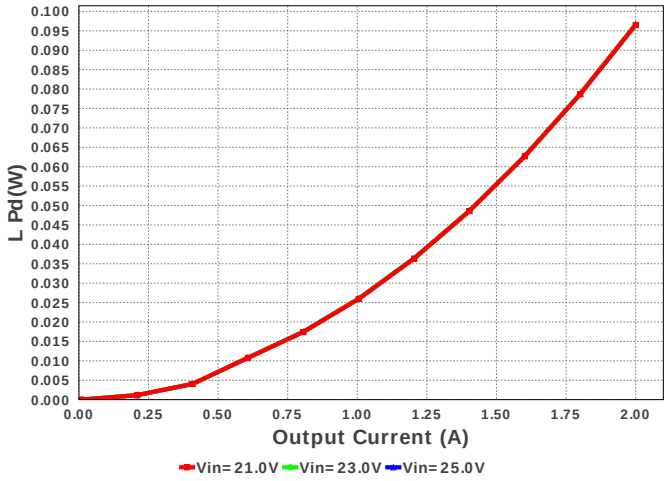
IC Iq Pd

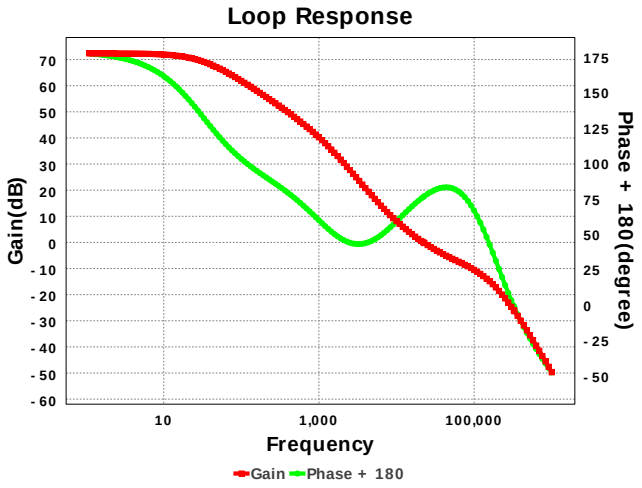


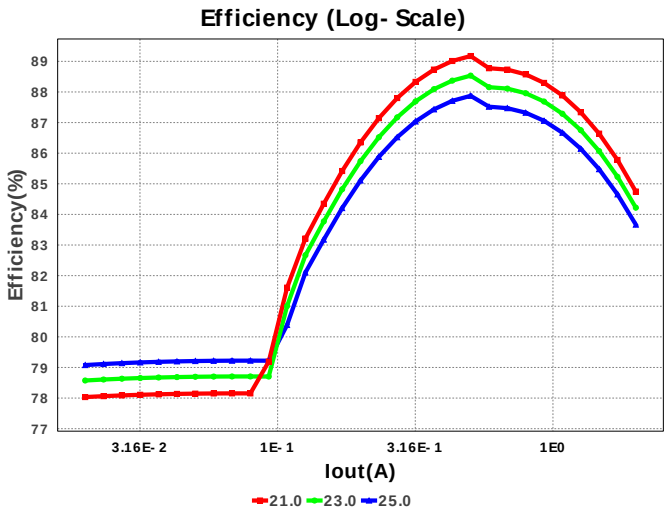
IC Pd



L Pd







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	638.158 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	334.214 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	239.05 mA	Current	Average input current
4.	L Ipp	1.158 A	Current	Peak-to-peak inductor ripple current
5.	BOM Count	10	General	Total Design BOM count
6.	FootPrint	178.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	400.0 kHz	General	Switching frequency
8.	Pout	5.0 W	General	Total output power
9.	Total BOM	$3.03	General	Total BOM Cost
10.	ICThetaJA Effective	18.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
11.	Low Freq Gain	72.343 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	2.502 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	2.5 V	Op_Point	Operational Output Voltage
14.	Cross Freq	22.246 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	11.104 %	Op_point	Duty cycle
16.	Efficiency	83.667 %	Op_point	Steady state efficiency
17.	Gain Marg	-25.969 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	45.812 degC	Op_point	IC junction temperature
19.	IOUT_OP	2.0 A	Op_point	Iout operating point
20.	Phase Marg	76.892 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	25.0 V	Op_point	Vin operating point
22.	Vout p-p	2.237 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	814.491 µW	Power	Input capacitor power dissipation
24.	Cout Pd	270.311 µW	Power	Output capacitor power dissipation
25.	IC Iq Pd	125.0 µW	Power	IC Iq Pd
26.	IC Pd	878.276 mW	Power	IC power dissipation
27.	L Pd	96.625 mW	Power	Inductor power dissipation
28.	Total Pd	976.101 mW	Power	Total Power Dissipation
29.	Vout Tolerance	3.237 %		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	25.0	Maximum input voltage
3.	VinMin	21.0	Minimum input voltage
4.	Vout	2.5	Output Voltage
5.	base_pn	LMR23630A	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. LMR23630A Product Folder : http://www.ti.com/product/LMR23630 : contains the data sheet and other resources.