

WEBENCH® Power Architect

Project Report

Project : 4331192/3 : PA_Project_404 (modified from 401)

Created : 2016-08-11 20:57:01.657

Optimize project optFactor=4

Project Summary

1. Total System Efficiency	88.288 %
2. Total System BOM Count	9.0
3. Total System Footprint	323.0 mm2
4. Total System BOM Cost	\$2.20
5. Total System Power Dissipation	218.9 mW

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_1	LOAD #1

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	LMR23630AF	Switcher : SIMPLE SWITCHER Step-Down Converter	3.3 V	0.5 A	88.3%	323	\$2.20	40	4

Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD #1	3.3 V	0.5 A	VoutRipple=10%

Project Diagram

WEBENCH® Power Architect Project ID : 3 PA_Project_404 (modified from 401) Power Architect 2016-08-11 20:57:01.657



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
Kemet	C0805C220K3GACTU	0805	1	\$0.01	7
Panasonic	ERJ-6ENF2212V	0805	1	\$0.01	7
MuRata	GRM188R60J225KE19D	0603	1	\$0.02	5
MuRata	GRM31CC80J476KE18L	1206_190	1	\$0.10	11
MuRata	GRM32ER71H475KA88L	1210	1	\$0.19	15
Texas Instruments	LMR23630AFDDAR	DDA0008E_N	1	\$1.40	57
Yageo America	RC0603FR-0751KL	0603	1	\$0.01	5
Bourns	SRR1240-100M	SRR1240	1	\$0.41	210
Taiyo Yuden	UMK212B7474KG-T	0805	1	\$0.05	7
Total			9	\$2.20	322.88

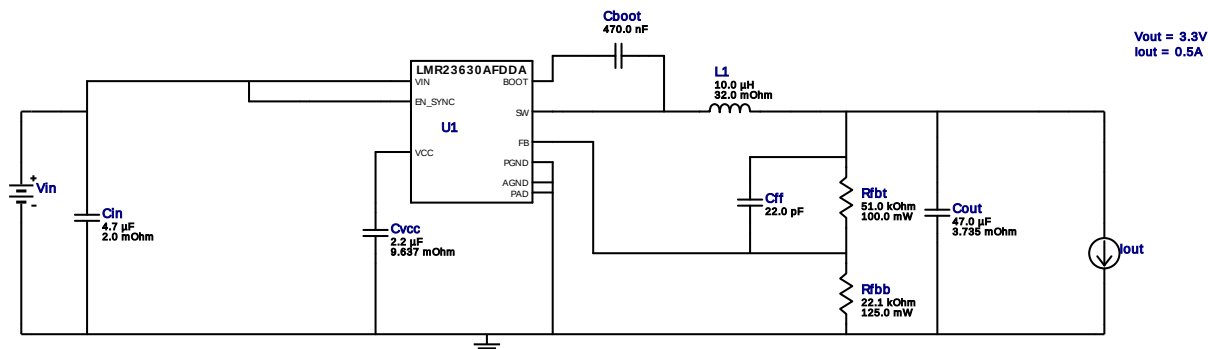


Vout = 3.3V
Iout = 0.5A

Device = LMR23630AFDDAR
Topology = Buck
Created = 8/11/16 8:57:01 PM
BOM Cost = \$2.20
BOM Count = 9
Total Pd = 0.22W

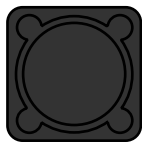
WEBENCH® Design Report

Design : 4331192/40 LMR23630AFDDAR
LMR23630AFDDAR 18.0V-32.0V to 3.30V @ 0.5A

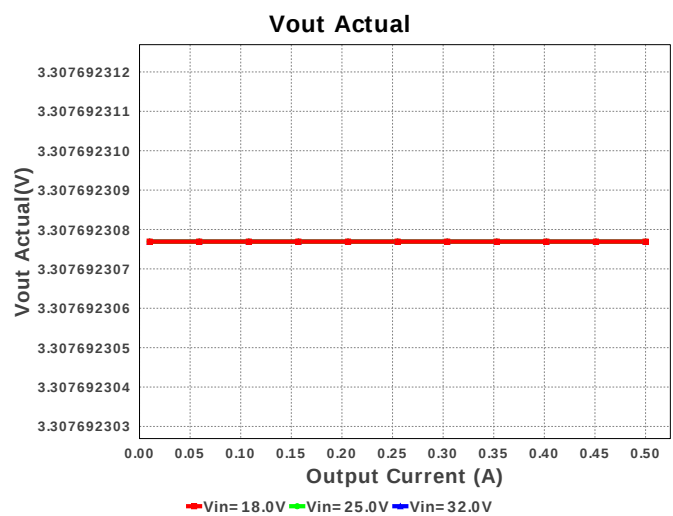
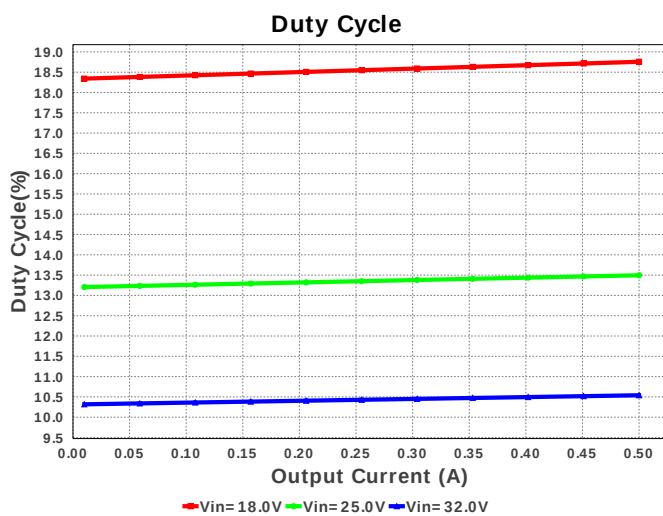
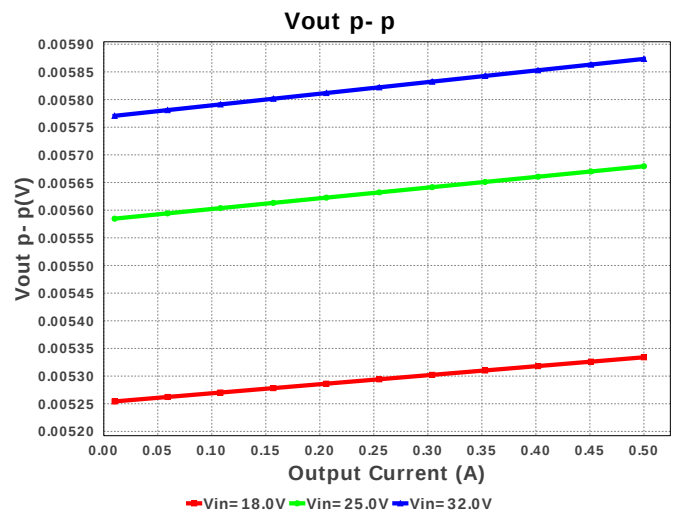
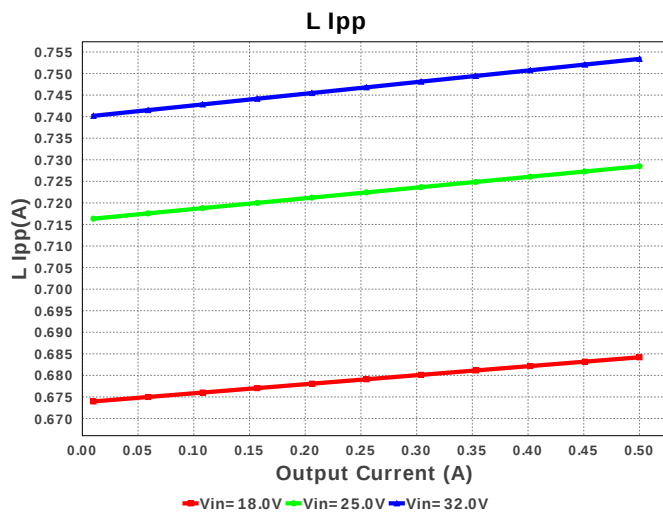


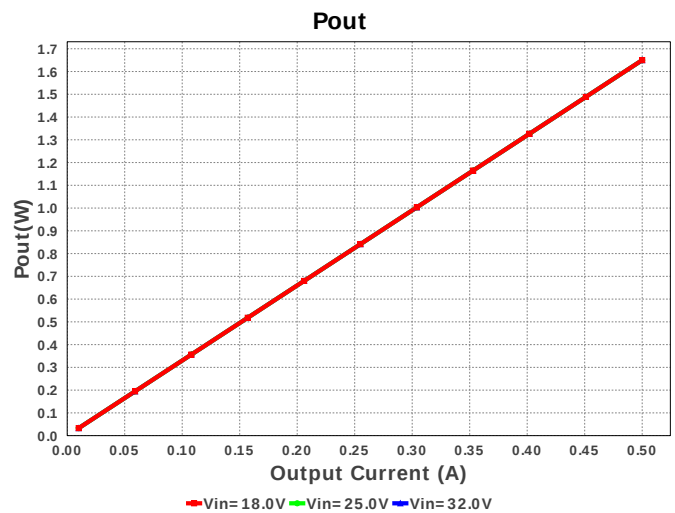
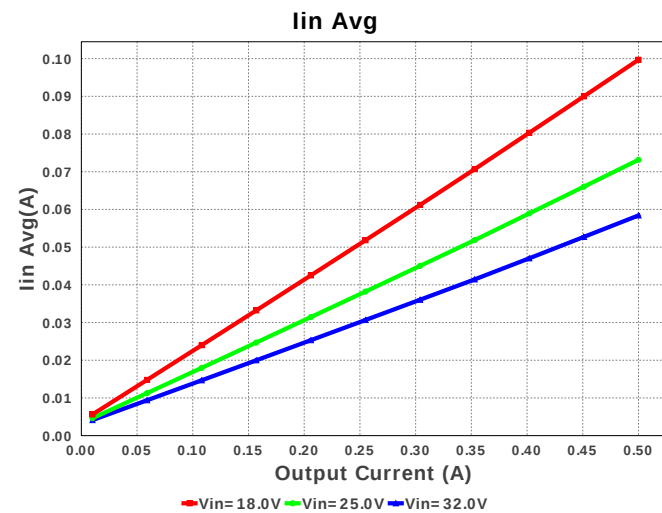
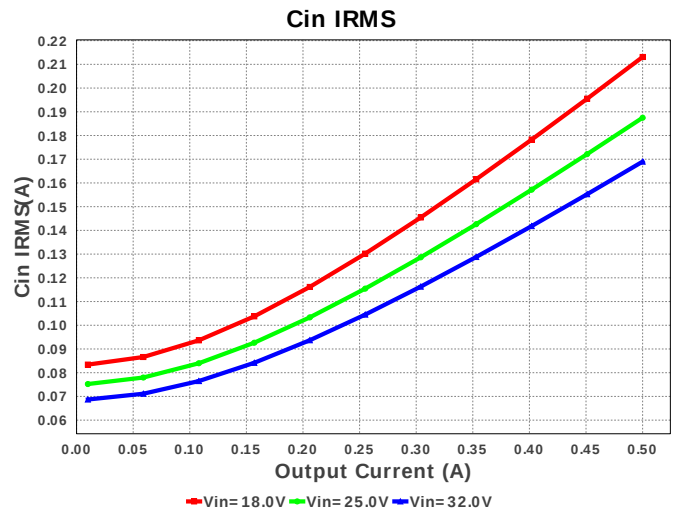
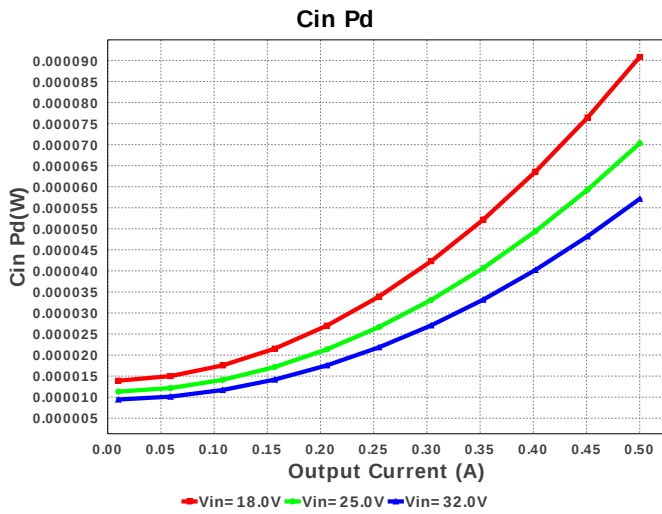
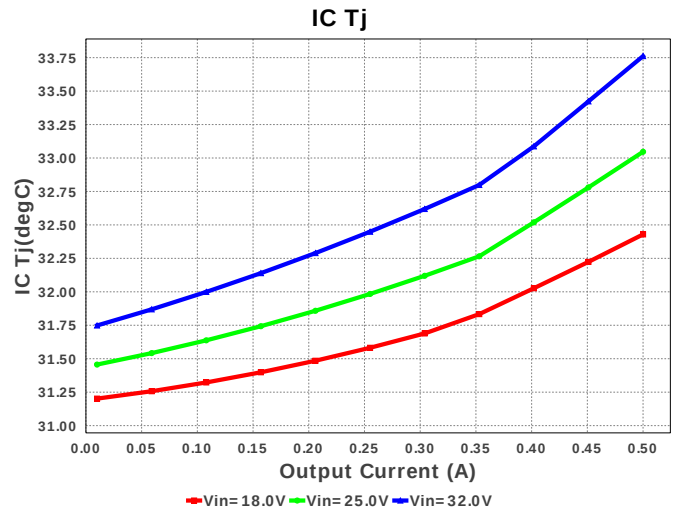
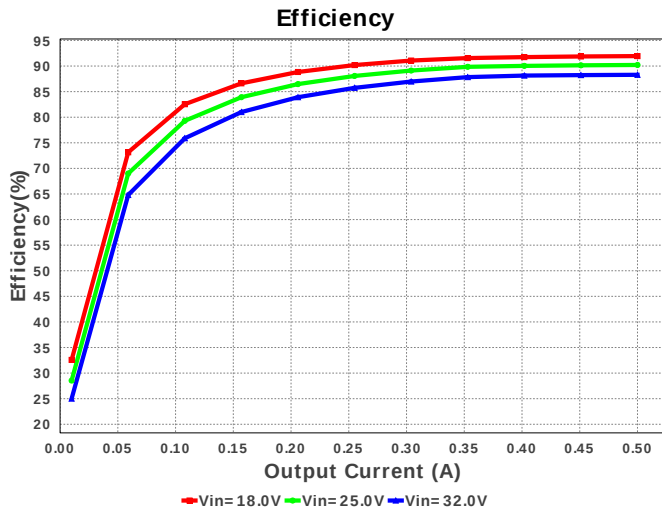
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.
2. If there is no VinTyp specified, WEBENCH will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

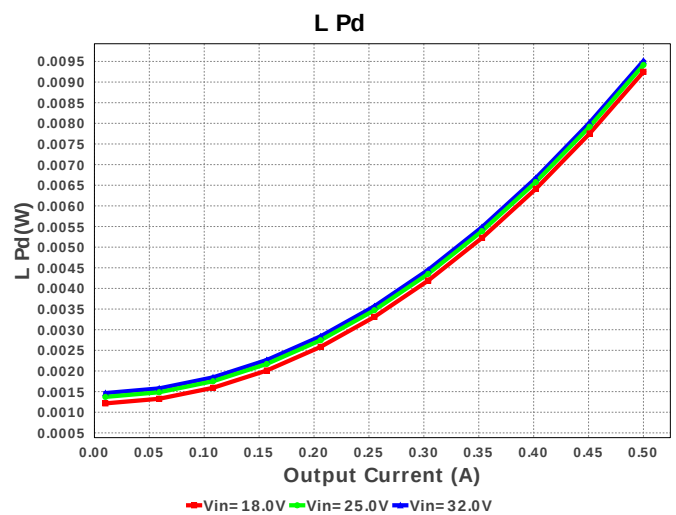
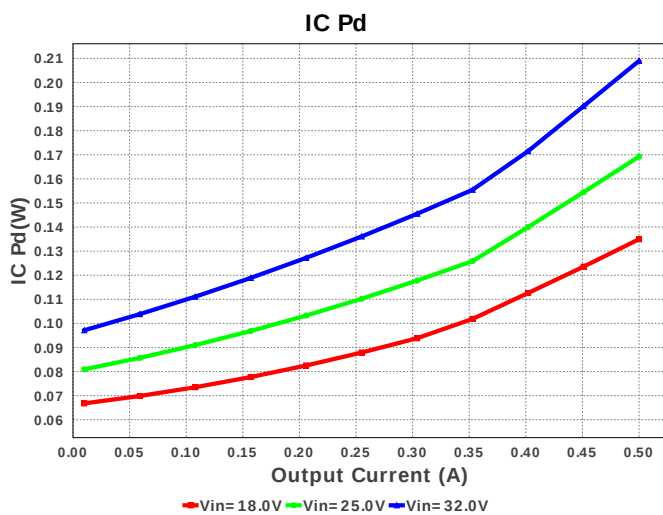
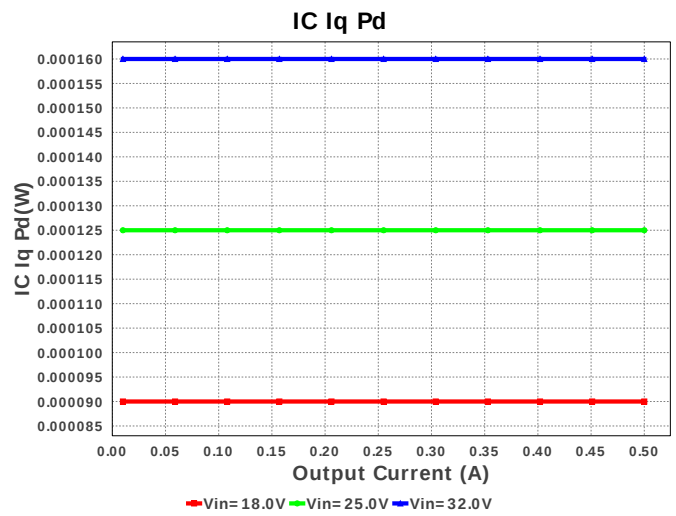
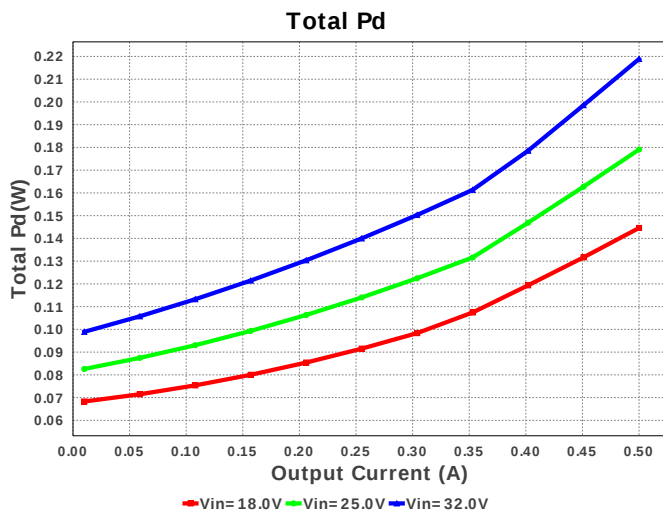
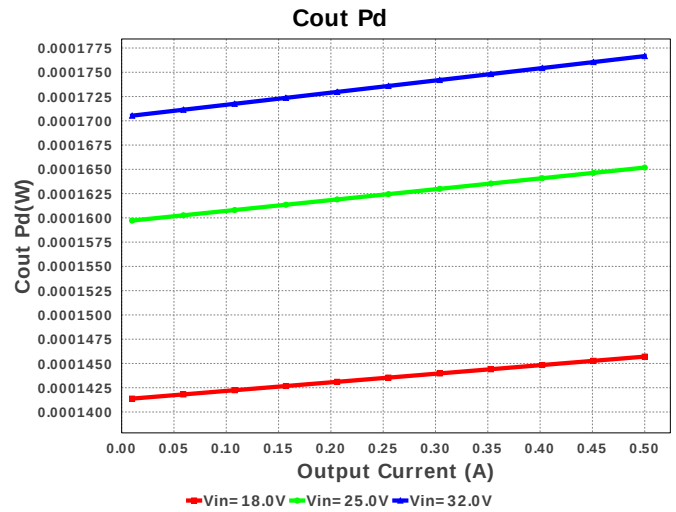
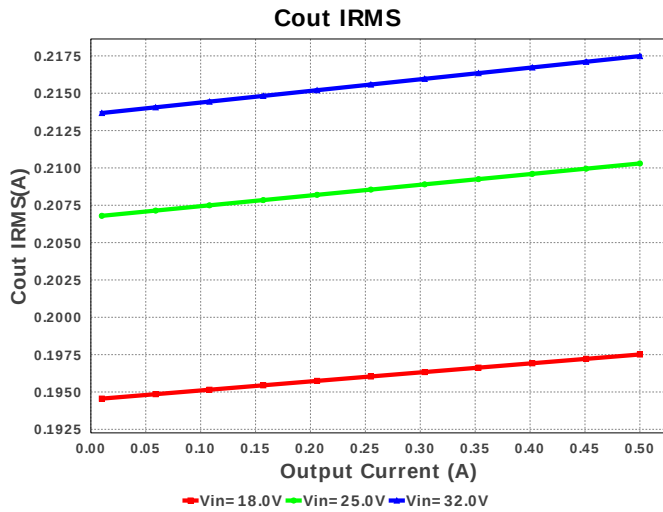
Electrical BOM

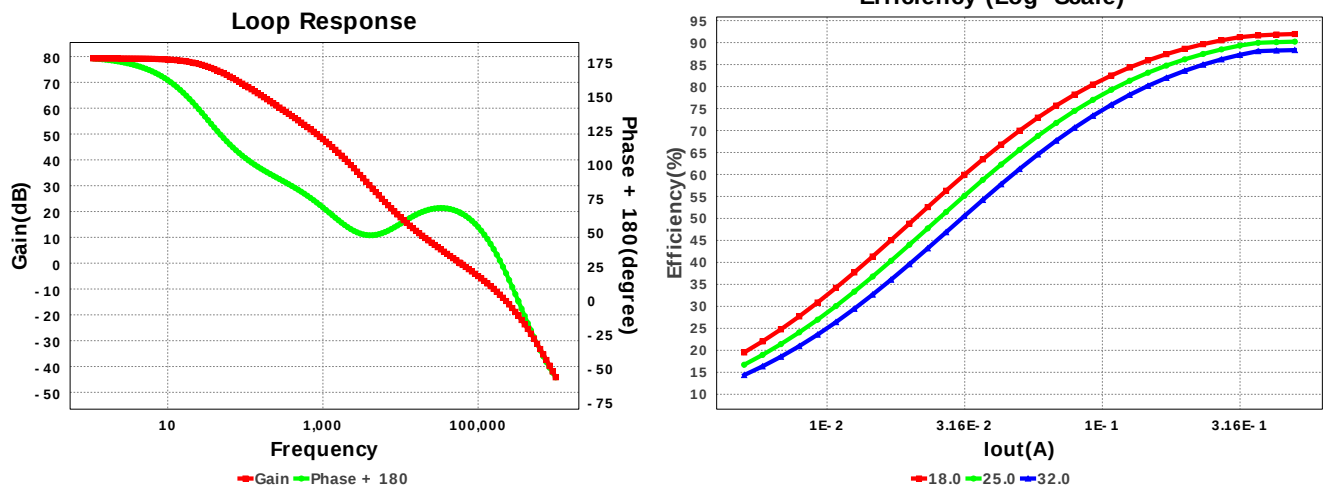
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	UMK212B7474KG-T Series= X7R	Cap= 470.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.05	0805 7 mm ²
2.	Cff	Kemet	C0805C220K3GACTU Series= C0G/NP0	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Cin	MuRata	GRM32ER71H475KA88L 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	GRM31CC80J476KE18L Series= X6S	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.0522 A	1	\$0.10	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	Bourns	SRR1240-100M	L= 10.0 uH DCR= 32.0 mOhm	1	\$0.41	 SRR1240 210 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.	Rfbs	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	168.993 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	217.486 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	58.402 mA	Current	Average input current
4.	L Ipp	753.39 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	9	General	Total Design BOM count
6.	FootPrint	323.0 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	1.65 W	General	Total output power
10.	Total BOM	\$2.2	General	Total BOM Cost
11.	ICThetaJA Effective	18.0 degC/W	Op_Point	Effective IC Junction-to-Ambient Thermal Resistance
12.	Low Freq Gain	79.266 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	59.119 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	10.54 %	Op_point	Duty cycle
17.	Efficiency	88.288 %	Op_point	Steady state efficiency
18.	Gain Marg	-20.251 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	33.762 degC	Op_point	IC junction temperature
20.	IOUT_OP	500.0 mA	Op_point	Iout operating point
21.	Phase Marg	64.611 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	32.0 V	Op_point	Vin operating point
23.	Vout p-p	5.873 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	57.117 μW	Power	Input capacitor power dissipation
25.	Cout Pd	176.666 μW	Power	Output capacitor power dissipation
26.	IC Iq Pd	160.0 μW	Power	IC Iq Pd
27.	IC Pd	208.985 mW	Power	IC power dissipation
28.	L Pd	9.514 mW	Power	Inductor power dissipation
29.	Total Pd	218.881 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	500.0 m	Maximum Output Current
2.	VinMax	32.0	Maximum input voltage
3.	VinMin	18.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LMR23630AF	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	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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