

WEBENCH® Power Architect

Project Report

Project : 4009018/27 : PA_Project_502 (modified from 501)

Created : 2016-08-21 08:26:48.472

Optimize project optFactor=5

Project Summary

1. Total System Efficiency	95.504 %
2. Total System BOM Count	13.0
3. Total System Footprint	777.0 mm2
4. Total System BOM Cost	\$4.26
5. Total System Power Dissipation	94.2 mW

--> Launch WEBENCH Power Architect.

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	LM43602	Switcher : SIMPLE SWITCHER Buck Regulator	5 V	0.4 A	95.5%	777	\$4.26	120	4

Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD #1	5 V	0.4 A	VoutRipple=10%

Project Diagram

WEBENCH® Power Architect Project ID : 27 PA_Project_502 (modified from 501) Power Architect 2016-08-21 08:26:48.472



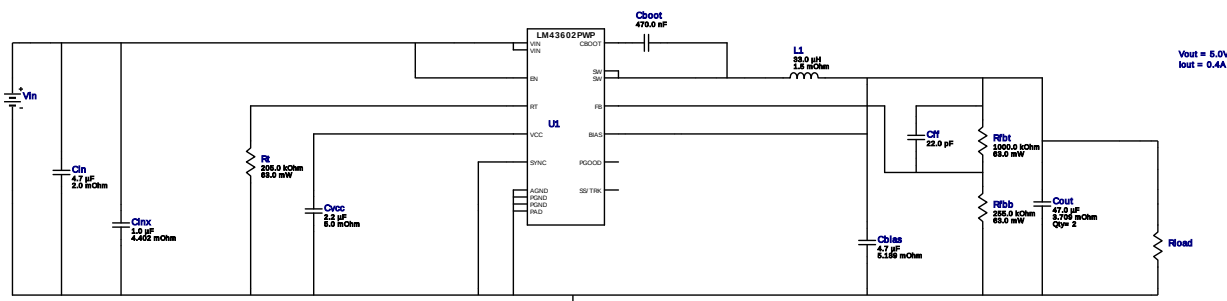
Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
Vishay-Dale	CRCW04021M00FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402205KFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402255KFKED	0402	1	\$0.01	3
MuRata	GRM0225C1C220JD05L	01005	1	\$0.01	2
MuRata	GRM155C80J474KE19D	0402	1	\$0.01	3
MuRata	GRM155R60J225ME15D	0402	1	\$0.02	3
MuRata	GRM21BR61E475KA12L	0805	1	\$0.02	7
MuRata	GRM21BR71H105KA12L	0805	1	\$0.05	7
MuRata	GRM31CR61A476KE15L	1206_190	2	\$0.15	11
MuRata	GRM32ER71H475KA88L	1210	1	\$0.19	15
Texas Instruments	LM43602PWPR	PWP0016F	1	\$1.75	59
Coilcraft	SER2915L-333KL	SER2915L	1	\$1.88	652
Total			13	\$4.26	766.42

Device = LM43602PWPR
Topology = Buck
Created = 8/21/16 8:26:47 AM
BOM Cost = \$4.26
BOM Count = 13
Total Pd = 0.09W

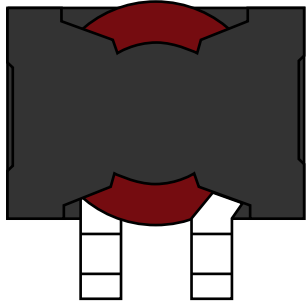
WEBENCH[®] Design Report

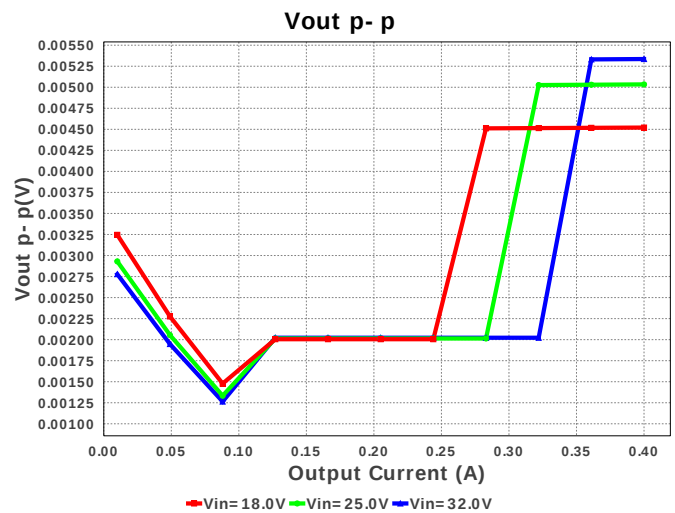
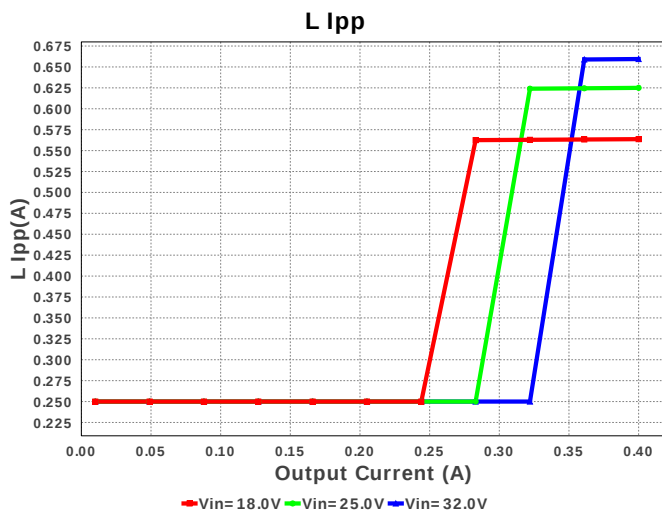
Design : 4009018/120 LM4362PWPR
LM4362PWPR 18.0V-32.0V to 5.00V @ 0.4A

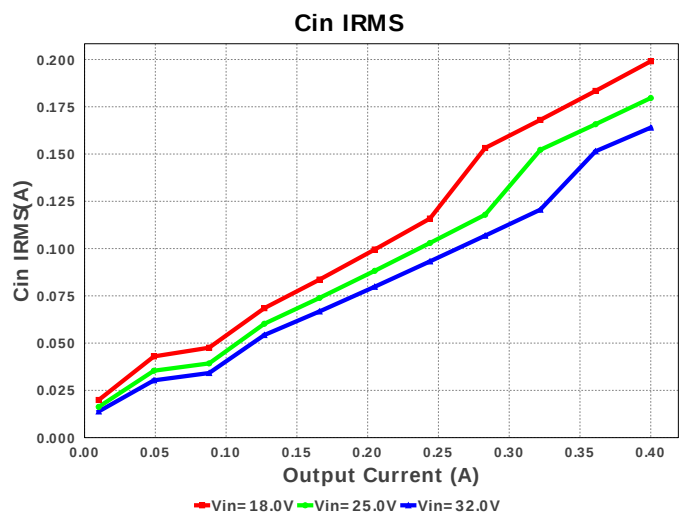
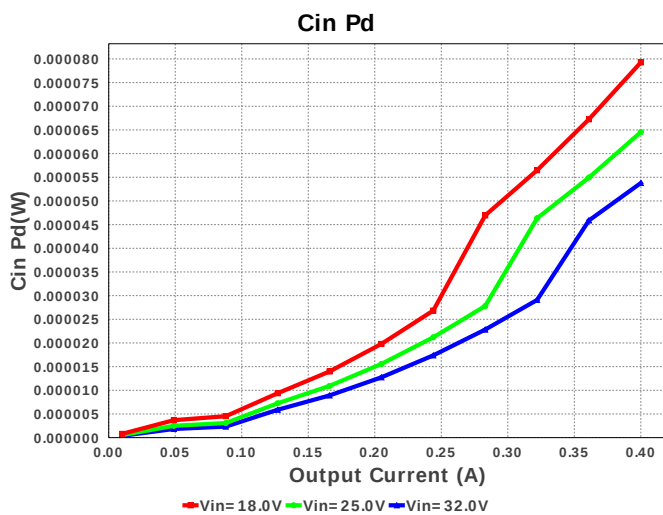
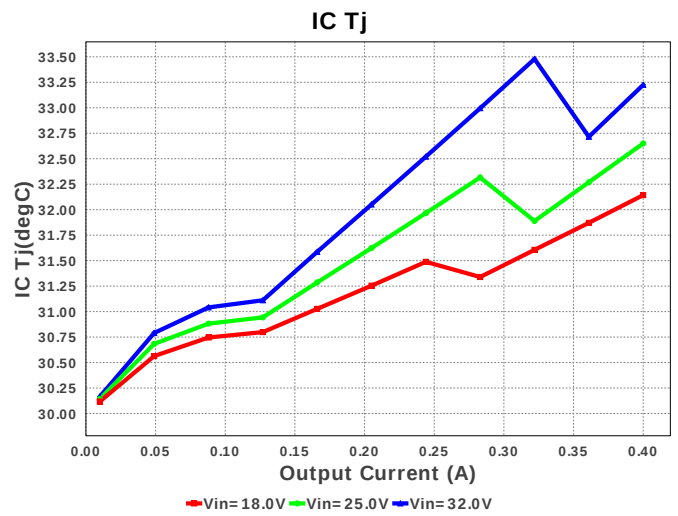
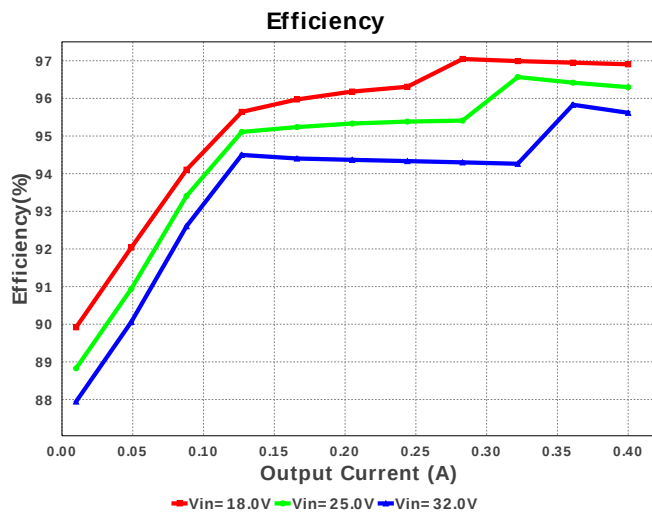
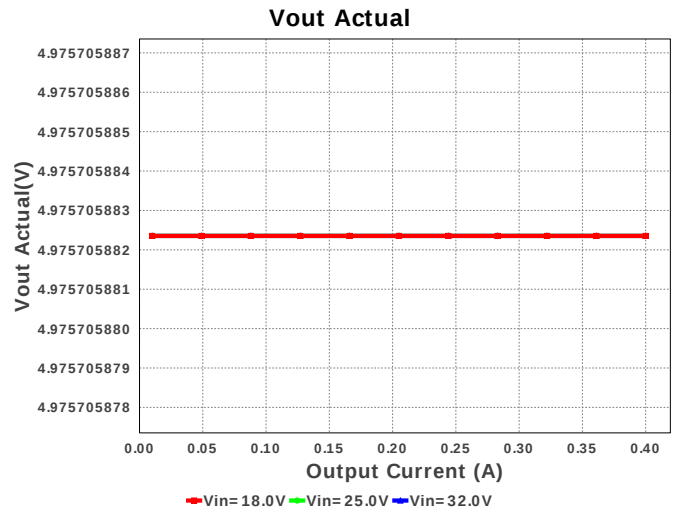
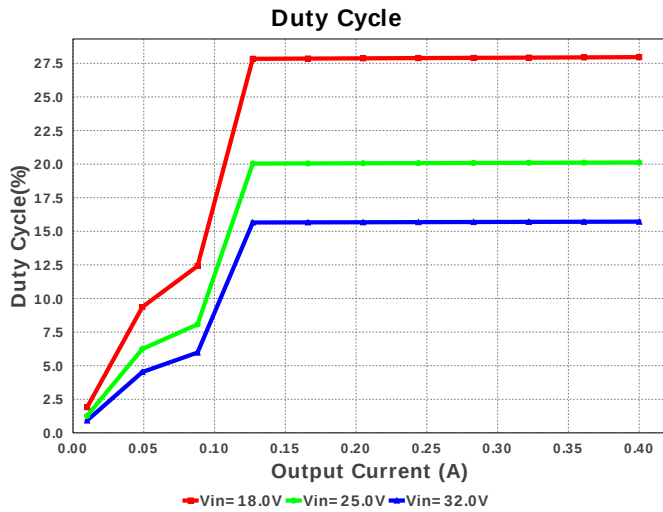


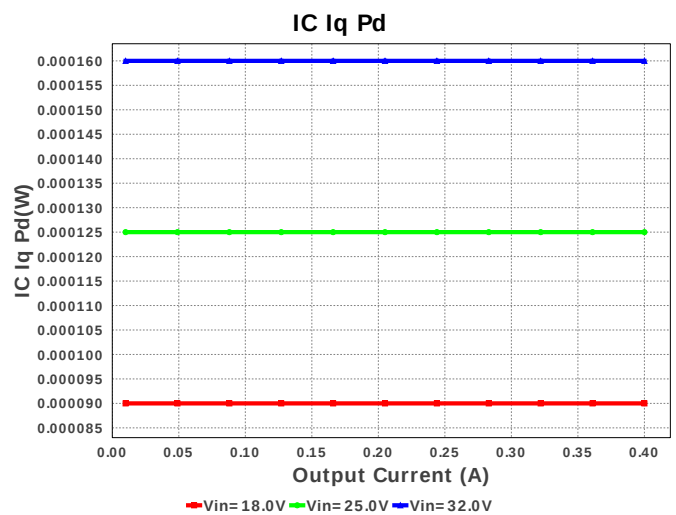
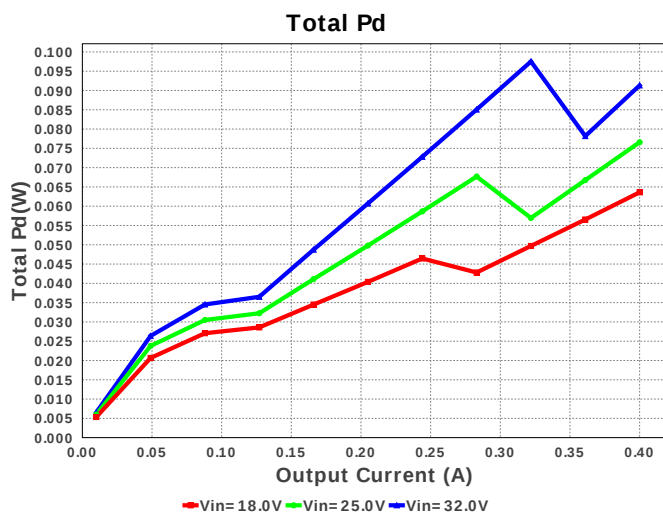
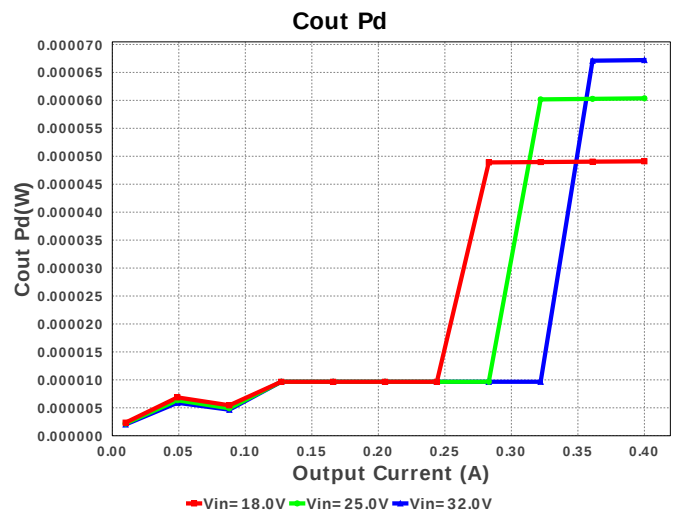
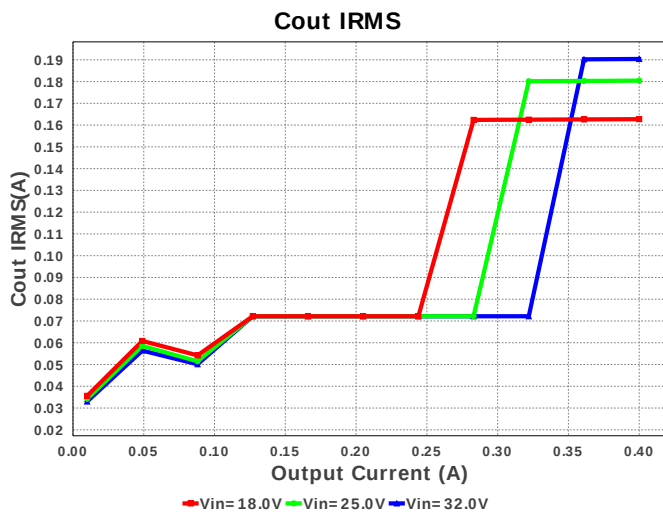
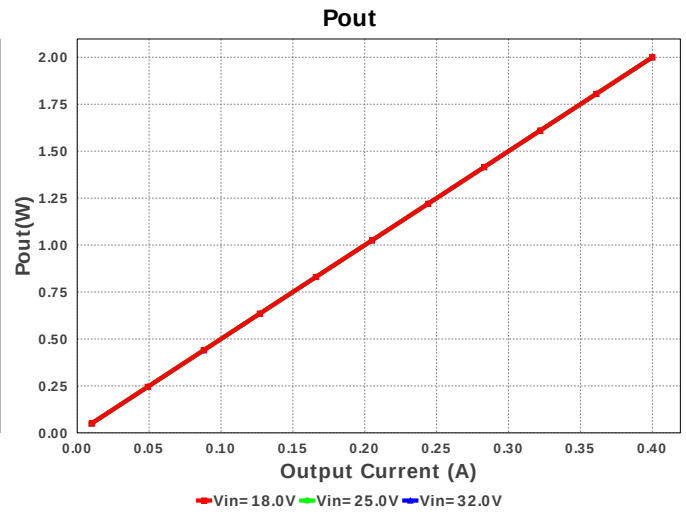
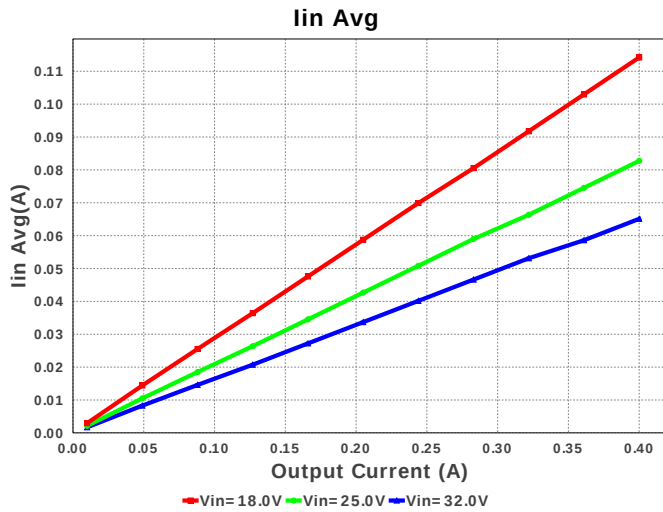
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.
2. If there is no VinTyp specified, WEBENCH will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

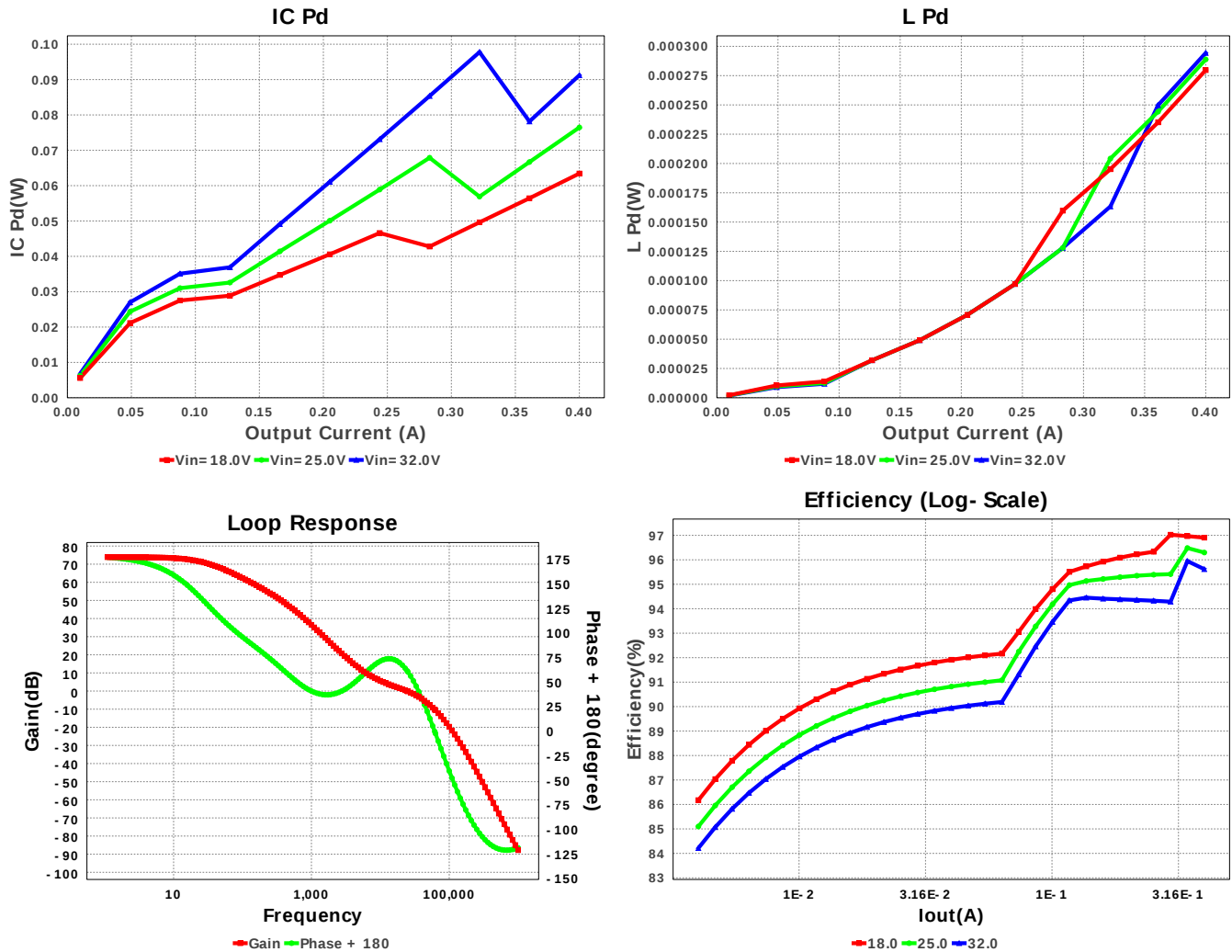
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	\$0.02	 0805 7 mm ²
2.	Cboot	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
3.	Cff	MuRata	GRM0225C1C220JD05L Series= C0G/NP0	Cap= 22.0 pF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 01005 2 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	\$0.19	 1210 15 mm ²
5.	Cinx	MuRata	GRM21BR71H105KA12L Series= X7R	Cap= 1.0 uF ESR= 4.402 mOhm VDC= 50.0 V IRMS= 1.677 A	1	\$0.05	 0805 7 mm ²
6.	Cout	MuRata	GRM31CR61A476KE15L Series= X5R	Cap= 47.0 uF ESR= 3.709 mOhm VDC= 10.0 V IRMS= 4.2862 A	2	\$0.15	 1206_190 11 mm ²
7.	Cvcc	MuRata	GRM155R60J225ME15D Series= X5R	Cap= 2.2 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 3.67 A	1	\$0.02	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Coilcraft	SER2915L-333KL	L= 33.0 μ H DCR= 1.5 mOhm	1	\$1.88	 SER2915L 652 mm ²
9.	Rfbb	Vishay-Dale	CRCW0402255KFKED Series= CRCW..e3	Res= 255.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
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	CRCW0402205KFKED Series= CRCW..e3	Res= 205.0 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









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	163.224 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	186.11 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	65.189 mA	Current	Average input current
4.	L Ipp	644.7 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	13	General	Total Design BOM count
6.	FootPrint	777.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	200.0 kHz	General	Switching frequency
8.	Mode	CCM	General	Conduction Mode
9.	Pout	2.0 W	General	Total output power
10.	Total BOM	\$4.26	General	Total BOM Cost
11.	Low Freq Gain	73.958 dB	Op_Point	Gain at 10Hz
12.	Vout Actual	4.976 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
14.	Cross Freq	24.509 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	15.719 %	Op_point	Duty cycle
16.	Efficiency	95.486 %	Op_point	Steady state efficiency
17.	Gain Marg	-10.358 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	33.331 degC	Op_point	IC junction temperature
19.	ICThetaJA	38.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	400.0 mA	Op_point	Iout operating point
21.	Phase Marg	62.203 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	32.0 V	Op_point	Vin operating point
23.	Vout p-p	5.106 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	53.284 μW	Power	Input capacitor power dissipation
25.	Cout Pd	64.234 μW	Power	Output capacitor power dissipation
26.	IC Iq Pd	160.0 μW	Power	IC Iq Pd
27.	IC Pd	94.123 mW	Power	IC power dissipation
28.	L Pd	291.955 μW	Power	Inductor power dissipation
29.	Total Pd	94.164 mW	Power	Total Power Dissipation
30.	Vout Tolerance	2.615 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	400.0 m	Maximum Output Current
2.	VinMax	32.0	Maximum input voltage
3.	VinMin	18.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM43602	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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

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