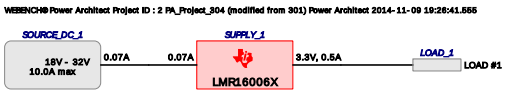


WEBENCH® Power Architect

Project Report

Project : 4058737/2 : PA_Project_304 (modified from 301)
Created : 2014-11-09 19:26:41.555
Optimize project optFactor=3

Project Summary

1.	Total System Efficiency	78.913 %
2.	Total System BOM Count	8.0
3.	Total System Footprint	117.0 mm2
4.	Total System BOM Cost	$1.92
5.	Total System Power Dissipation	440.9 mW

--> Launch WEBENCH Power Architect.

Power Supplies

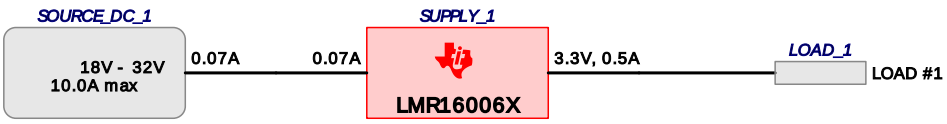
#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	LMR16006X	Switcher : SIMPLE SWITCHER Wide Vin Buck Regulator	3.3 V	0.5 A	78.9%	117	$1.92	21	4

Power Loads

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

Project Diagram

WEBENCH® Power Architect Project ID : 2 PA_Project_304 (modified from 301) Power Architect 2014-11-09 19:26:41.555



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
Kemet	C0805C104K5RACTU	0805	1	$0.01	7
TDK	C3225X7R2A225K230AB	1210	1	$0.19	15
Vishay-Dale	CRCW040228K0FKED	0402	1	$0.01	3
Vishay-Dale	CRCW04028K45FKED	0402	1	$0.01	3
MuRata	GRM21BR60J226ME39L	0805	1	$0.03	7
Texas Instruments	LMR16006XDDCT	MK06A	1	$1.38	11
NXP Semiconductor	PMEG6010CEH,115	SOD-123F	1	$0.11	12
Bourns	SDR0604-330KL	SDR0604	1	$0.18	61
Total			8	$1.92	117

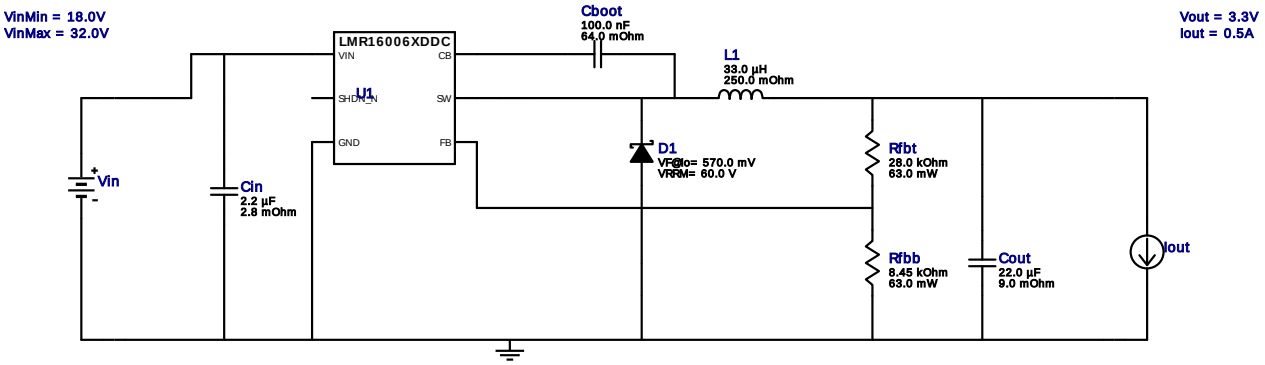
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 18.0V
VinMax = 32.0V
Vout = 3.3V
Iout = 0.5A

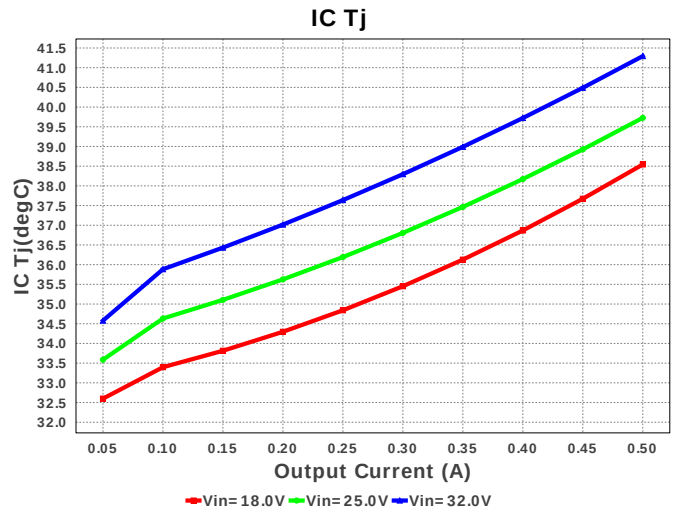
Device = LMR16006XDDCT
Topology = Buck
Created = 11/9/14 7:26:41 PM
BOM Cost = $1.92
Footprint = 117.0 mm²
BOM Count = 8
Total Pd = 0.44W

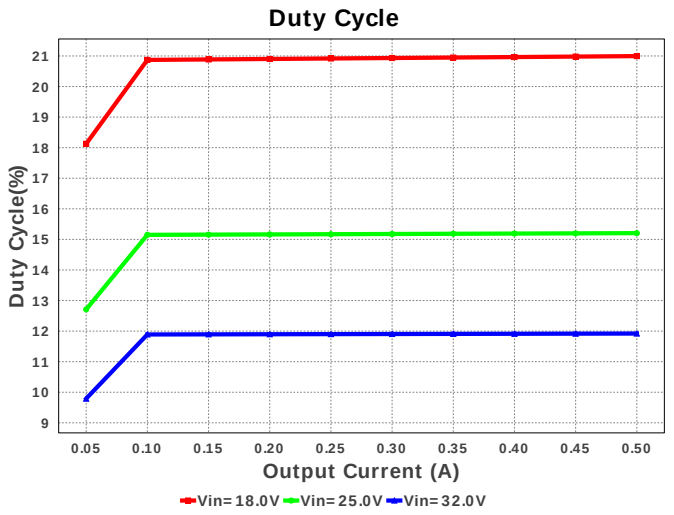
Design : 4058737/21 LMR16006XDDCT
LMR16006XDDCT 18.0V-32.0V to 3.30V @ 0.5A

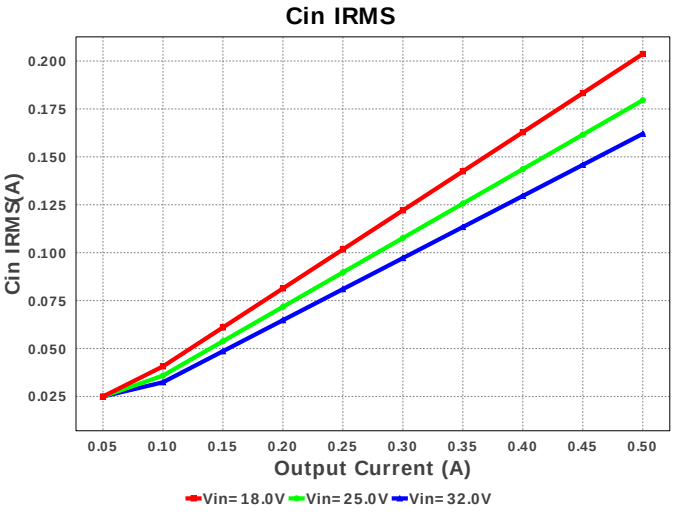


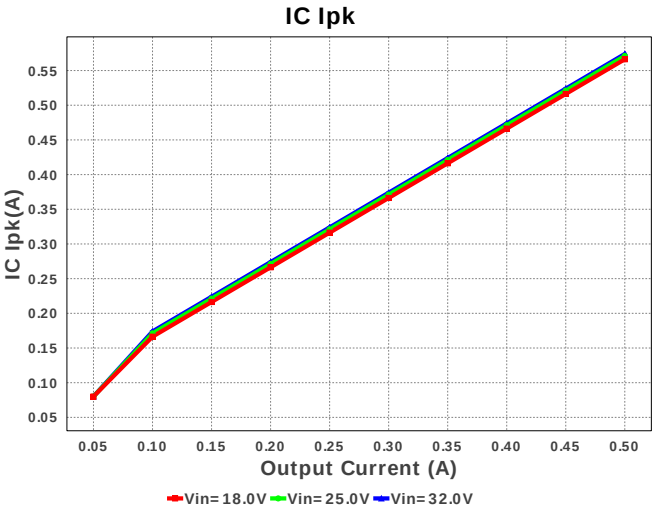
Electrical BOM

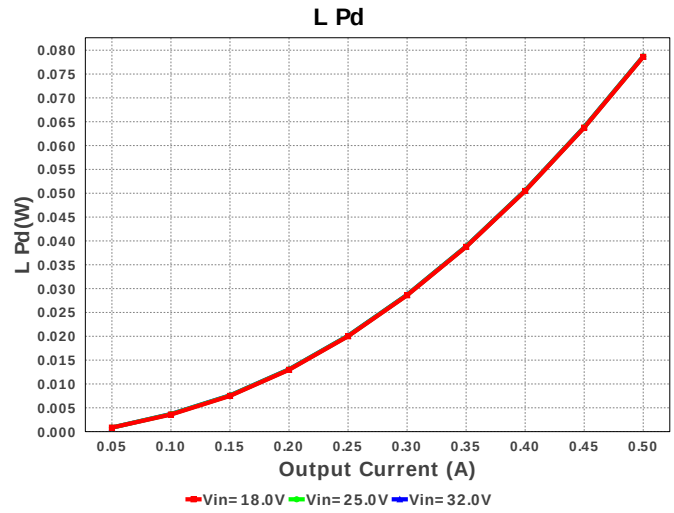
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
2.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 2.8 mOhm VDC= 100.0 V IRMS= 9.8247 A	1	$0.19	1210 15 mm²
3.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	$0.03	0805 7 mm²
4.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.11	SOD-123F 12 mm²
5.	L1	Bourns	SDR0604-330KL	L= 33.0 µH DCR= 250.0 mOhm	1	$0.18	SDR0604 61 mm²
6.	Rfbb	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	Rfbt	Vishay-Dale	CRCW040228K0FKED Series= CRCW..e3	Res= 28.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	U1	Texas Instruments	LMR16006XDDCT	Switcher	1	$1.38	MK06A 11 mm²

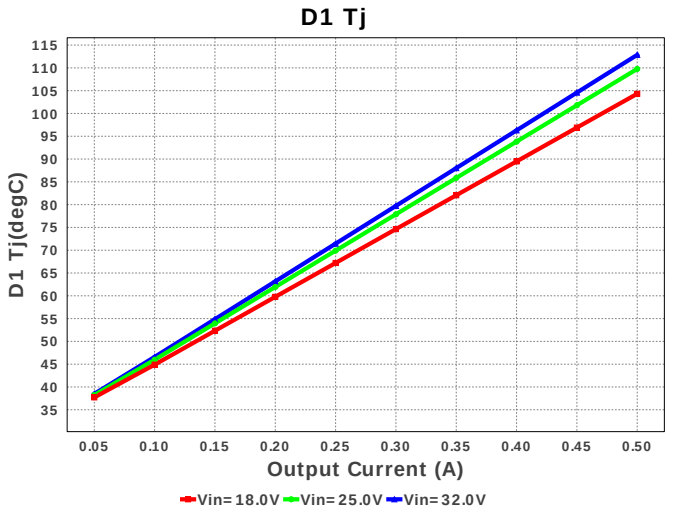


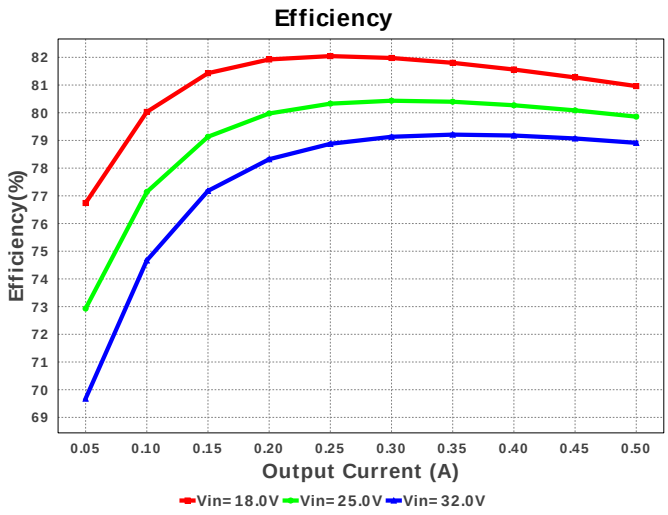


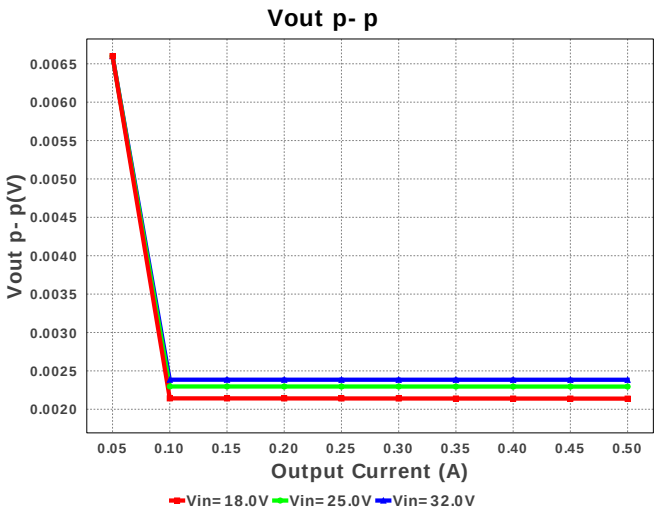


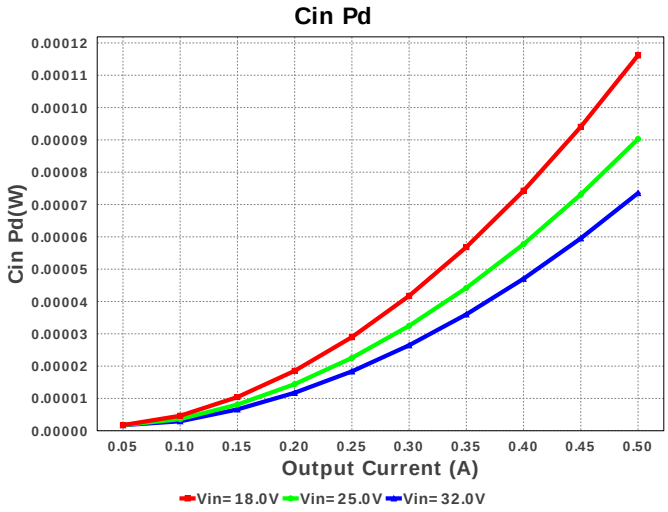


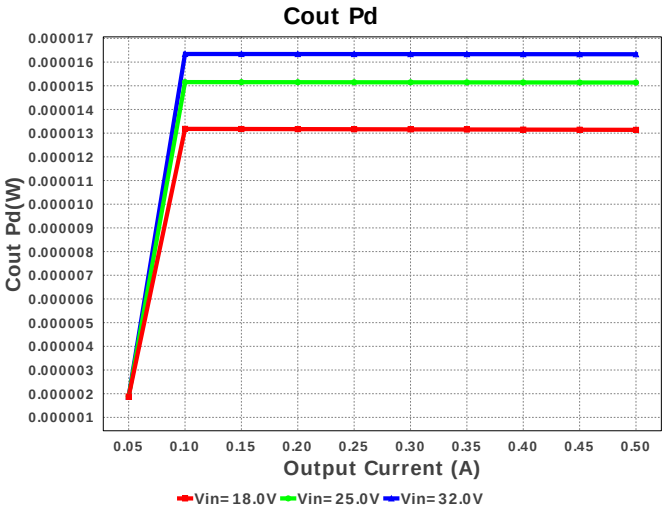


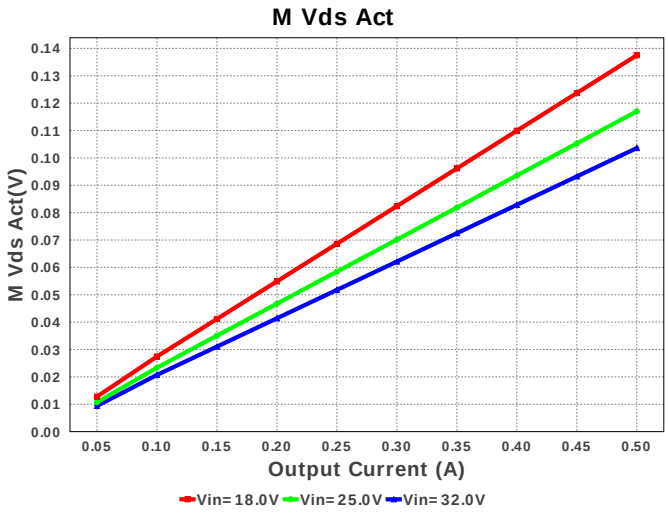


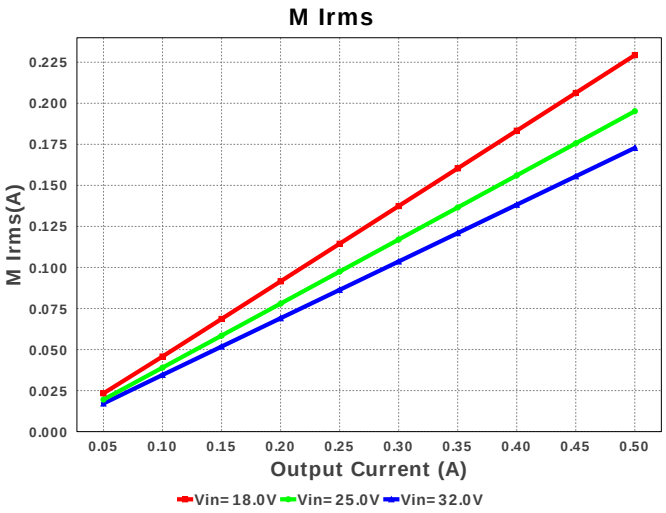


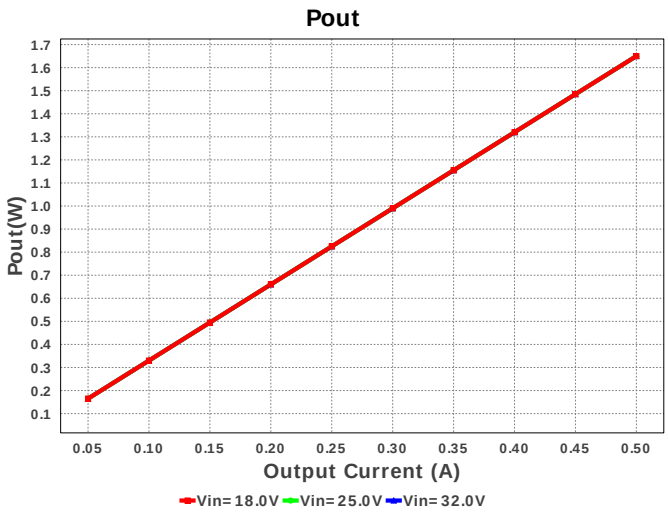


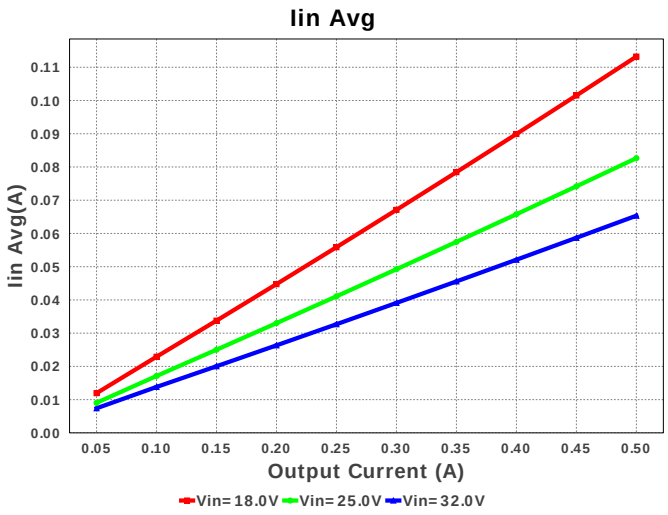


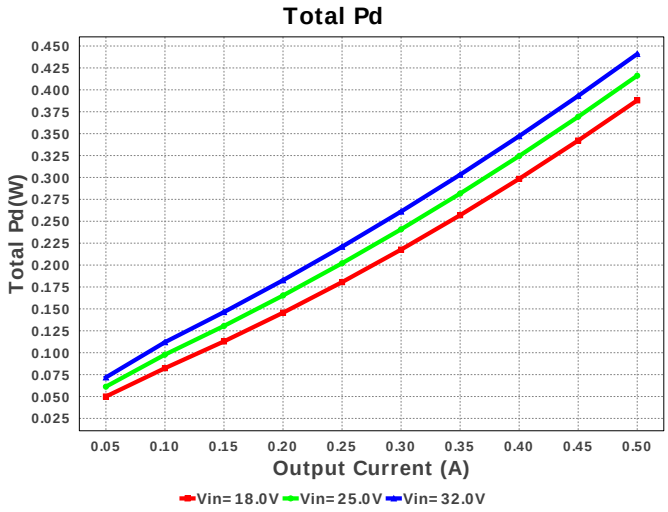


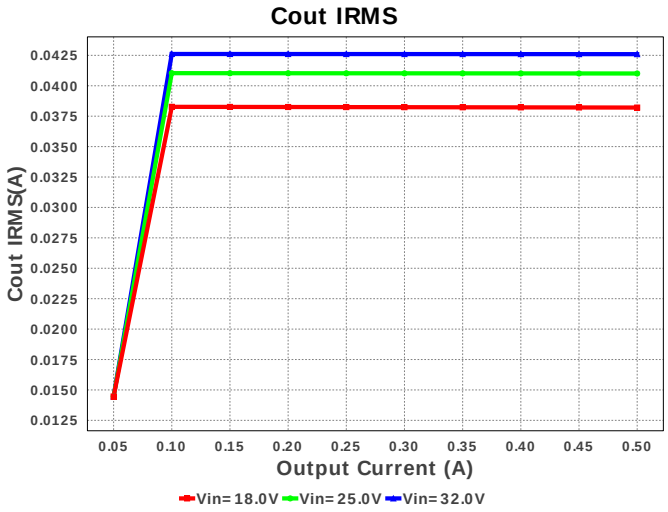


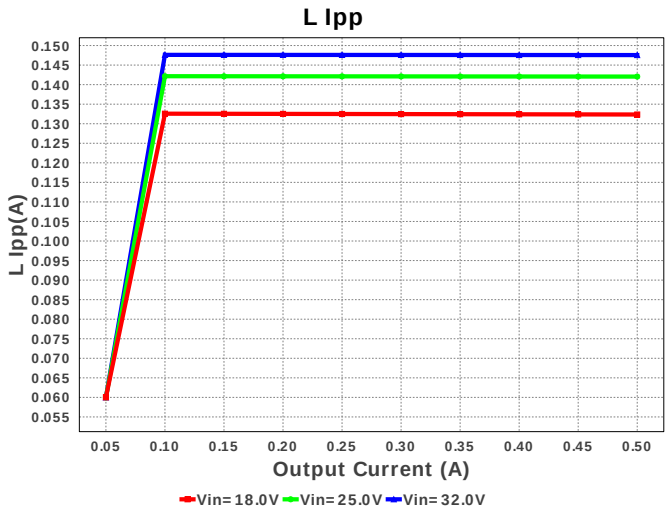


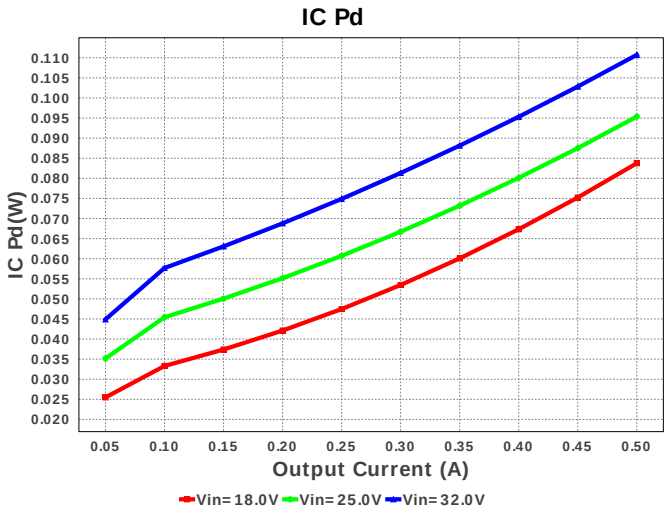


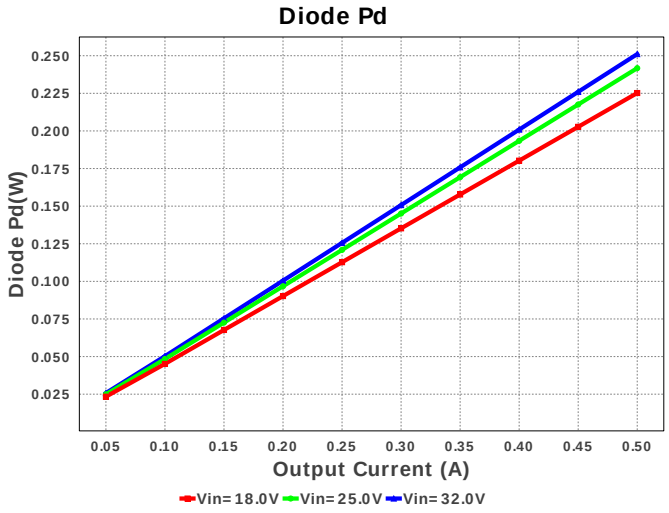


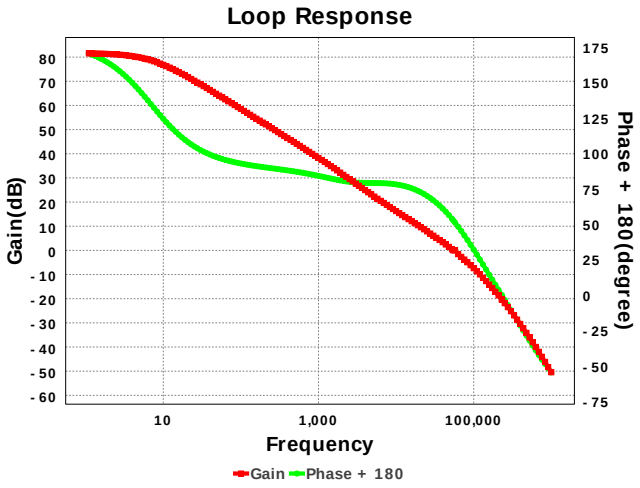












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	162.041 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	42.598 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	573.872 mA	Current	Peak switch current in IC
4.	Iin Avg	65.341 mA	Current	Average input current
5.	L Ipp	147.563 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	172.815 mA	Current	MOSFET RMS current
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	117.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	700.0 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	103.595 mV	General	Voltage drop across the MosFET
12.	Pout	1.65 W	General	Total output power
13.	Total BOM	$1.92	General	Total BOM Cost
14.	D1 Tj	112.854 degC	Op_Point	D1 junction temperature
15.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
16.	Cross Freq	54.874 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	11.92 %	Op_point	Duty cycle
18.	Efficiency	78.913 %	Op_point	Steady state efficiency
19.	IC Tj	41.294 degC	Op_point	IC junction temperature
20.	ICThetaJA	102.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	500.0 mA	Op_point	Iout operating point
22.	Phase Marg	53.084 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	32.0 V	Op_point	Vin operating point
24.	Vout p-p	2.384 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	73.521 µW	Power	Input capacitor power dissipation
26.	Cout Pd	16.331 µW	Power	Output capacitor power dissipation
27.	Diode Pd	251.073 mW	Power	Diode power dissipation
28.	IC Pd	110.727 mW	Power	IC power dissipation
29.	L Pd	78.72 mW	Power	Inductor power dissipation
30.	Total Pd	440.911 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 mA	Maximum Output Current
2.	Iout1	500.0 mAmps	Output Current #1
3.	VinMax	32.0 V	Maximum input voltage
4.	VinMin	18.0 V	Minimum input voltage
5.	Vout	3.3 V	Output Voltage
6.	Vout1	3.3 Volt	Output Voltage #1
7.	base_pn	LMR16006X	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0 degC	Ambient temperature

Design Assistance

1. LMR16006X Product Folder : http://www.ti.com/product/LMR16006 : contains the data sheet and other resources.