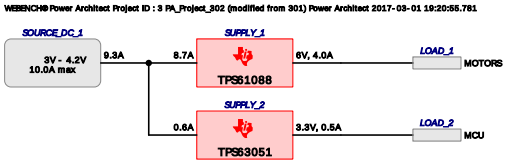
WEBENCH® Power Architect



Project Report

Project : 4653448/3 : PA_Project_302 (modified from 301)
Created : 2017-03-01 19:20:55.781
Optimize project optFactor=3

Project Summary

1.	Total System Efficiency	91.911 %
2.	Total System BOM Count	23.0
3.	Total System Footprint	230.0 mm2
4.	Total System BOM Cost	$3.81
5.	Total System Power Dissipation	2.258 W

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_1	MOTORS
SUPPLY_2	0	LOAD_2	MCU

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS61088	Switcher : TPS61088 10-A Fully-Integrated Synchronous Boost Converter	6 V	4.0 A	92%	186	$2.83	29	4
2.	SUPPLY_2	TPS63051	Switcher : 1A Single Inductor Buck Boost with adjustable soft start	3.3 V	0.5 A	91%	44	$0.98	30	10

Power Loads

#	Name	VLoad	ILoad	Description
1.	MOTORS	6 V	4 A	VoutRipple=10%
2.	MCU	3.3 V	0.5 A	VoutRipple=10%

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Project Diagram

Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
AVX	0402YC132KAT2A	0402	1	$0.05	3
AVX	08053C104KAT2A	0805	1	$0.01	7
TDK	C0603C0G1E360G	0201	1	$0.01	2
Vishay-Dale	CRCW0402102KFKED	0402	1	$0.01	3
Vishay-Dale	CRCW0402118KFKED	0402	1	$0.01	3
Vishay-Dale	CRCW0402261KFKED	0402	1	$0.01	3
Vishay-Dale	CRCW040238K3FKED	0402	1	$0.01	3
Vishay-Dale	CRCW0603100KFKEA	0603	1	$0.01	5
MuRata	GRM033R71C681KA01D	0201	1	$0.01	2
MuRata	GRM155R60J104KA01D	0402	1	$0.01	3
MuRata	GRM155R71C822KA01D	0402	1	$0.01	3
MuRata	GRM188R60J106ME47D	0603	3	$0.02	14
MuRata	GRM188R61A105KA61D	0603	1	$0.01	5
MuRata	GRM31CR61A476KE15L	1206_190	1	$0.15	11
MuRata	GRM32ER61C476ME15L	1210_280	2	$0.24	15
MuRata	LQM2HPN1R5MG0L	1008	1	$0.12	10
Yageo America	RC0603FR-07470KL	0603	1	$0.01	5
Bourns	SRP6540-1R0M	SRP6540	1	$0.49	83
Texas Instruments	TPS61088RHLR	RHL0020A	1	$1.60	25
Texas Instruments	TPS63051RMWR	RMW0012A	1	$0.74	12
Total			23	$3.81	215.76

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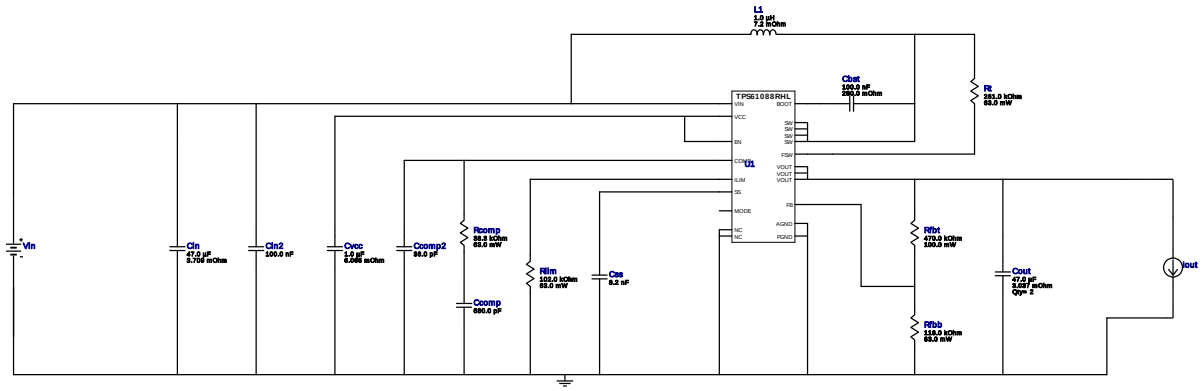
WEBENCH® Design Report

Vout = 6.0V
Iout = 4.0A

Device = TPS61088RHLR
Topology = Boost
Created = 3/1/17 7:20:54 PM
BOM Cost = $2.83
BOM Count = 16
Total Pd = 2.09W

Design : 4653448/29 TPS61088RHLR
TPS61088RHLR 3.0V-4.2V to 6.00V @ 4.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	MuRata	GRM033R71C681KA01D Series= X7R	Cap= 680.0 pF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
3.	Ccomp2	TDK	C0603C0G1E360G Series= C0G/NP0	Cap= 36.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
4.	Cin	MuRata	GRM31CR61A476KE15L Series= X5R	Cap= 47.0 uF ESR= 3.709 mOhm VDC= 10.0 V IRMS= 4.2862 A	1	$0.15	1206_190 11 mm²
5.	Cin2	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
6.	Cout	MuRata	GRM32ER61C476ME15L Series= X5R	Cap= 47.0 uF ESR= 3.037 mOhm VDC= 16.0 V IRMS= 4.59346 A	2	$0.24	1210_280 15 mm²
7.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
8.	Cvcc	MuRata	GRM188R61A105KA61D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 10.0 V IRMS= 1.30675 A	1	$0.01	0603 5 mm²
9.	L1	Bourns	SRP6540-1R0M	L= 1.0 µH DCR= 7.2 mOhm	1	$0.49	SRP6540 83 mm²
10.	Rcomp	Vishay-Dale	CRCW040238K3FKED Series= CRCW..e3	Res= 38.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

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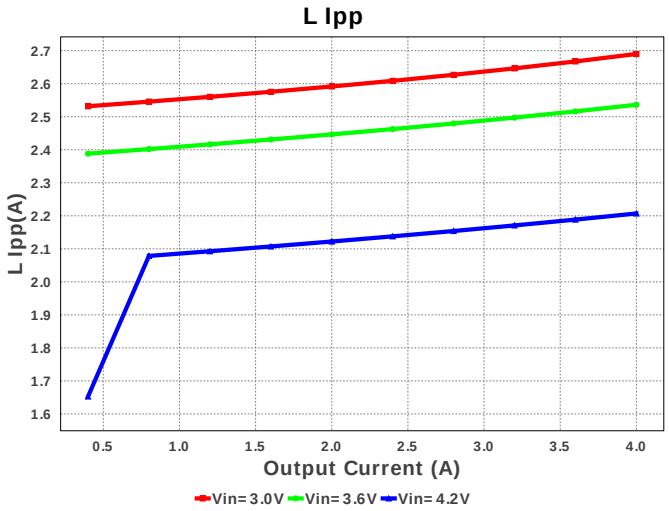
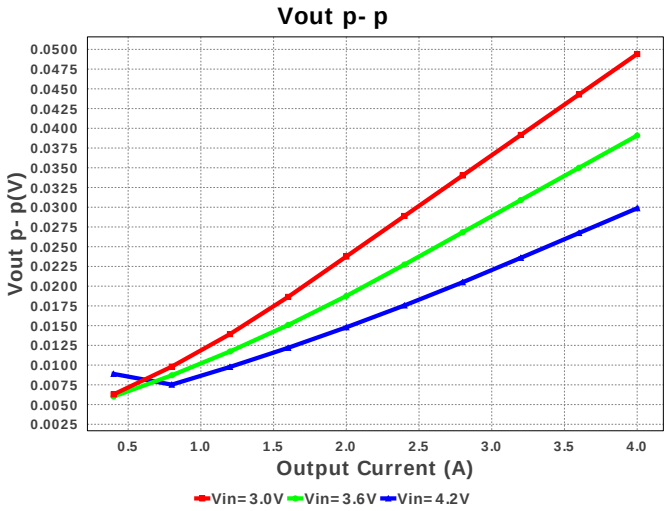
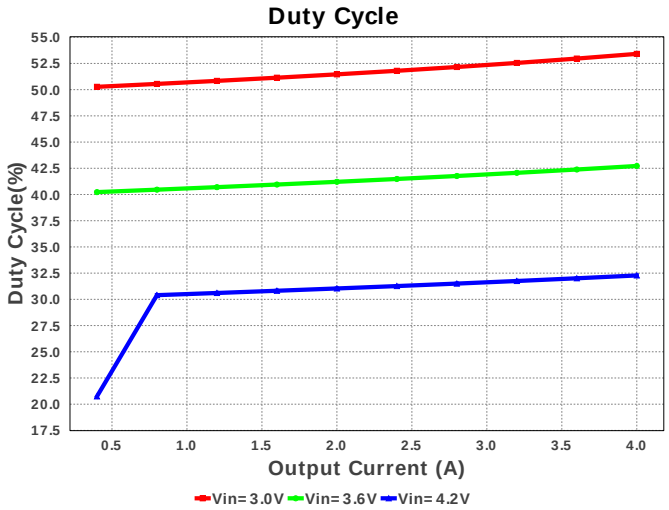
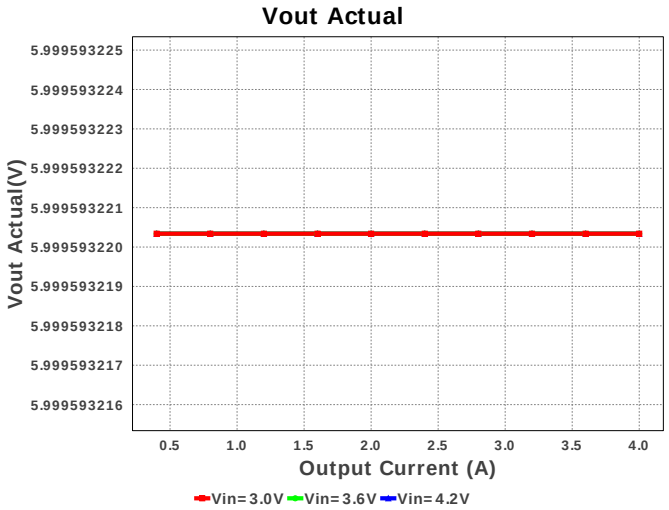
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Rfbb	Vishay-Dale	CRCW0402118KFKED Series= CRCW..e3	Res= 118.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
12.	Rfbt	Yageo America	RC0603FR-07470KL Series= ?	Res= 470.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
13.	Rlim	Vishay-Dale	CRCW0402102KFKED Series= CRCW..e3	Res= 102.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
14.	Rt	Vishay-Dale	CRCW0402261KFKED Series= CRCW..e3	Res= 261.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
15.	U1	Texas Instruments	TPS61088RHLR	Switcher	1	$1.60	RHL0020A 25 mm²









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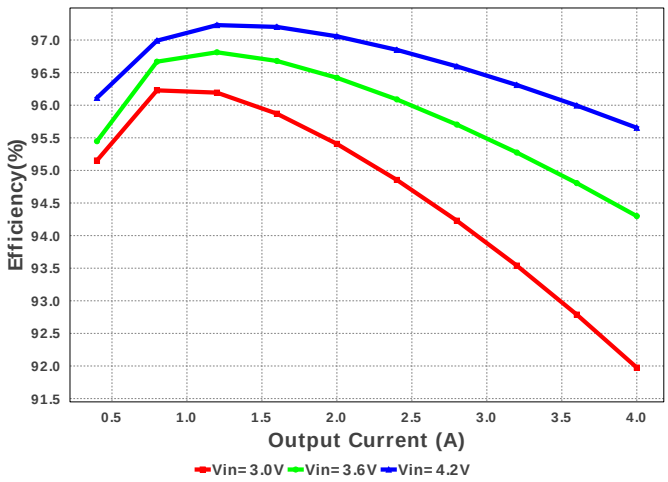
Efficiency



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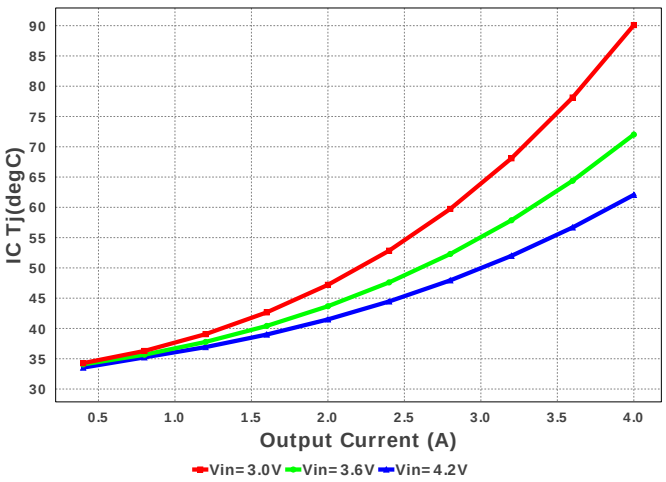
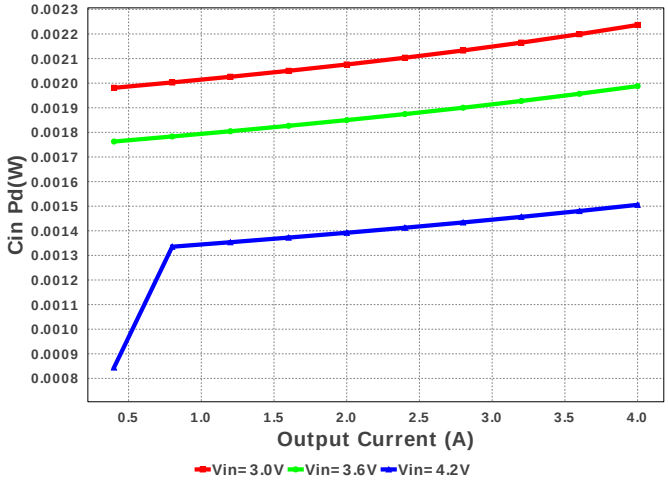
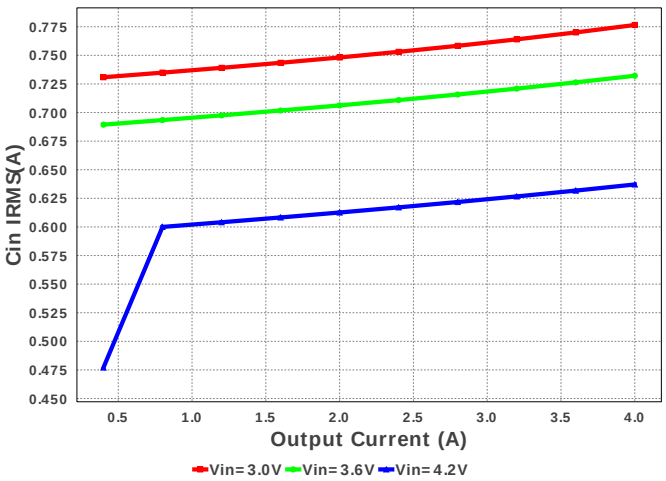


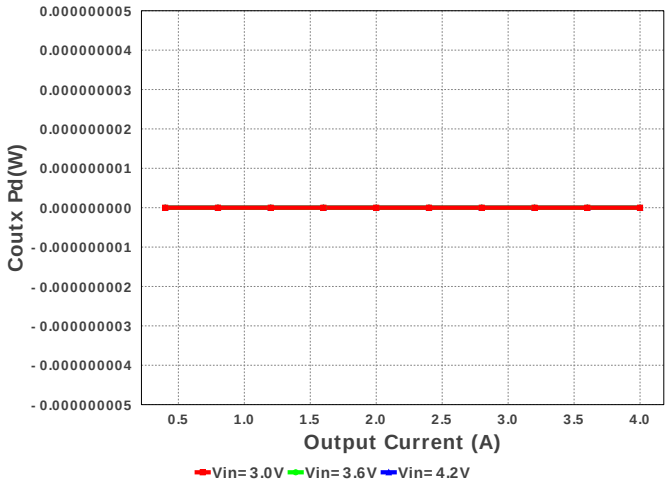
Cin Pd



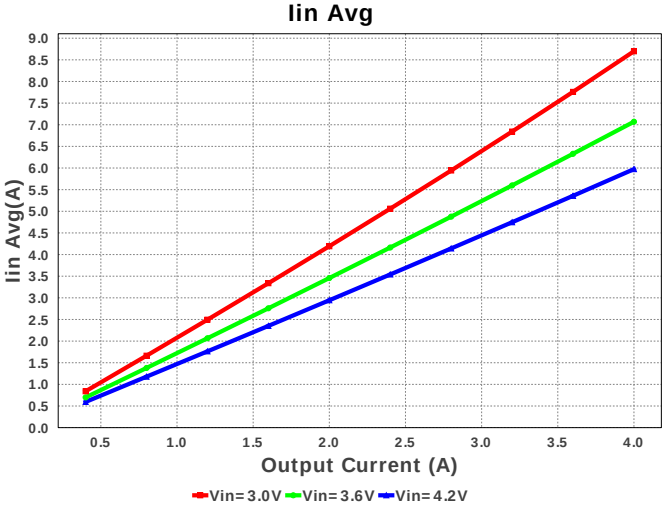
Cin IRMS



Coutx Pd



Iin Avg



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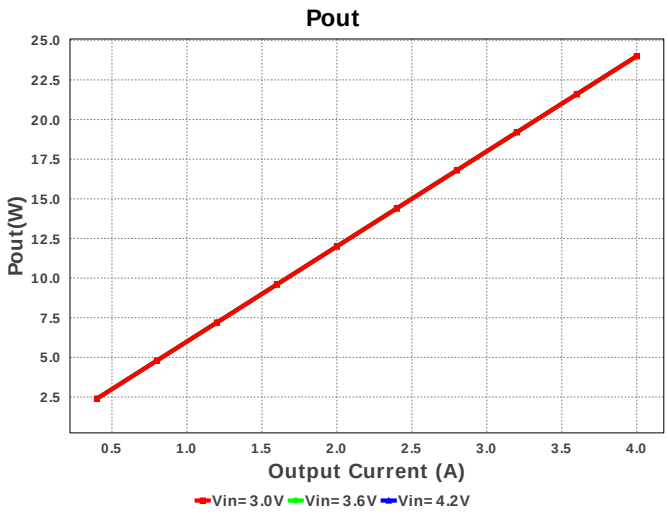

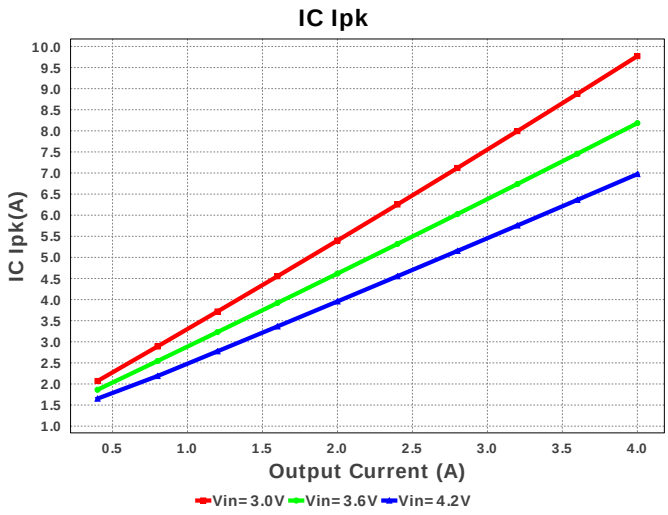

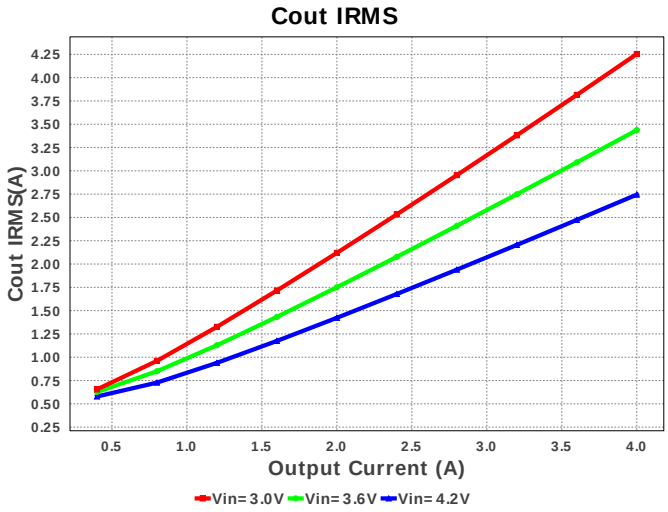

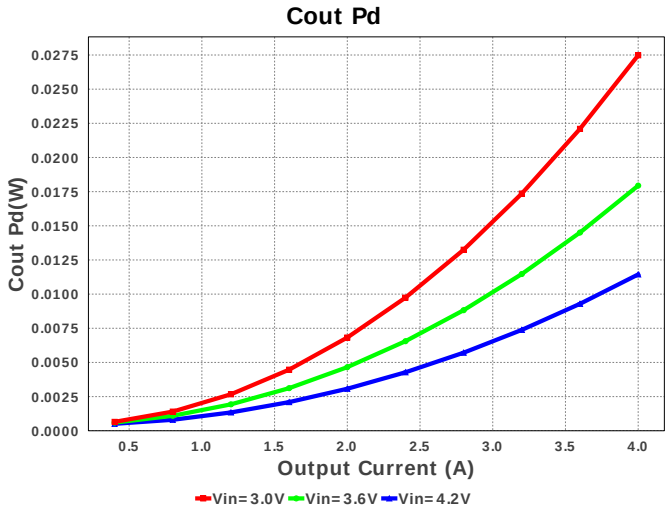

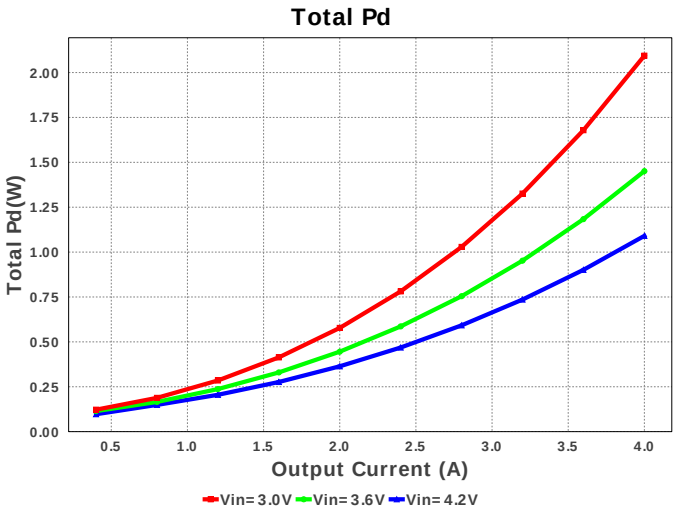

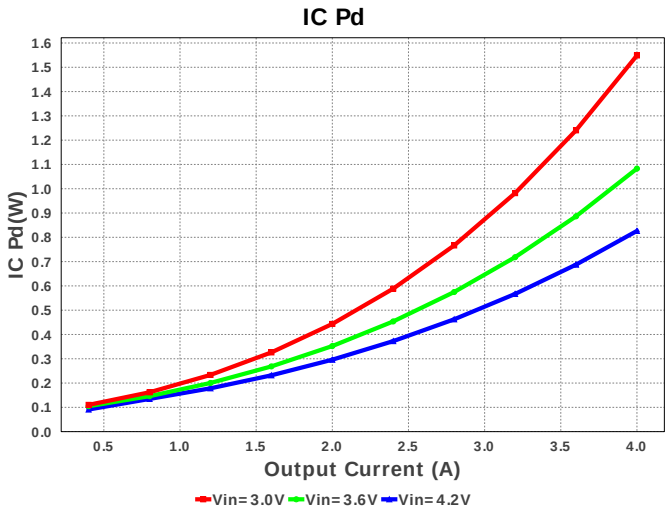

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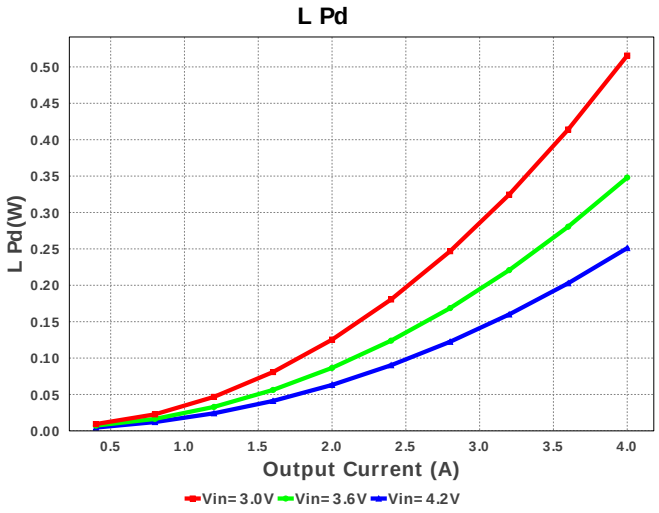

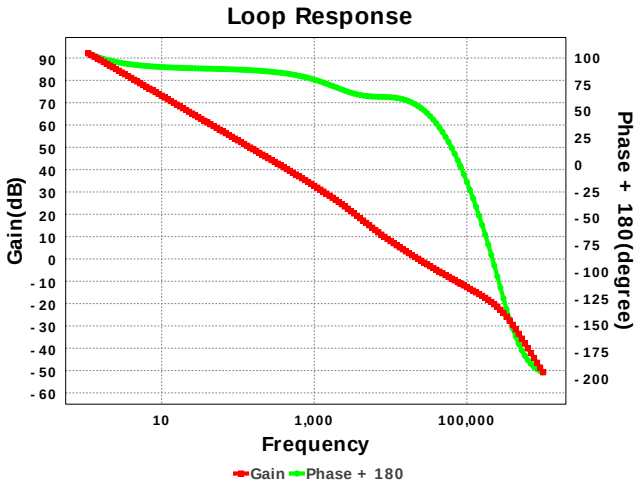

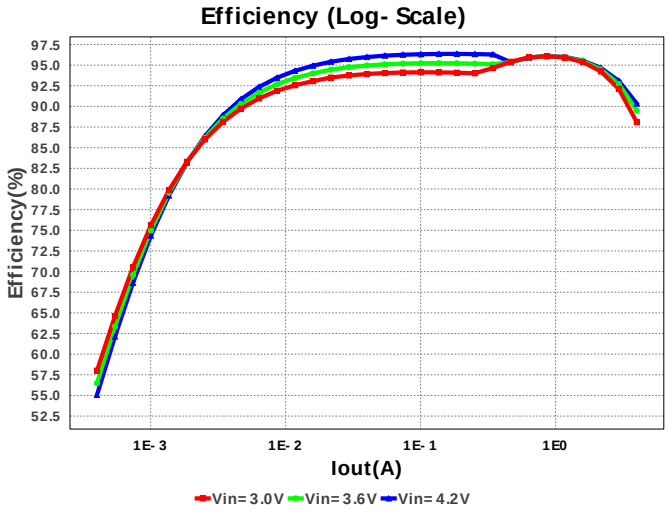

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	776.531 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	4.254 A	Current	Output capacitor RMS ripple current
3.	IC Ipk	9.771 A	Current	Peak switch current in IC
4.	Iin Avg	8.698 A	Current	Average input current
5.	L Ipp	2.69 A	Current	Peak-to-peak inductor ripple current
6.	BOM Count	16	General	Total Design BOM count
7.	FootPrint	186.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	595.681 kHz	General	Switching frequency
9.	Mode	BOOST CCM	General	PWM/PFM Mode
10.	Pout	24.0 W	General	Total output power
11.	Total BOM	$2.83	General	Total BOM Cost
12.	Low Freq Gain	91.303 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	6.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Cross Freq	22.671 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	53.412 %	Op_point	Duty cycle
16.	Efficiency	91.975 %	Op_point	Steady state efficiency
17.	Gain Marg	-10.687 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	90.091 degC	Op_point	IC junction temperature
19.	ICThetaJA	38.8 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	4.0 A	Op_point	Iout operating point
21.	Phase Marg	55.218 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	3.0 V	Op_point	Vin operating point
23.	Vout p-p	49.416 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	2.237 mW	Power	Input capacitor power dissipation
25.	Cout Pd	27.48 mW	Power	Output capacitor power dissipation
26.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
27.	IC Pd	1.549 W	Power	IC power dissipation
28.	L Pd	515.559 mW	Power	Inductor power dissipation
29.	Total Pd	2.094 W	Power	Total Power Dissipation
30.	Vout Tolerance	4.273 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

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Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	4.2	Maximum input voltage
3.	VinMin	3.0	Minimum input voltage
4.	Vout	6.0	Output Voltage
5.	base_pn	TPS61088	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS61088** Product Folder : http://www.ti.com/product/TPS61088 : contains the data sheet and other resources.

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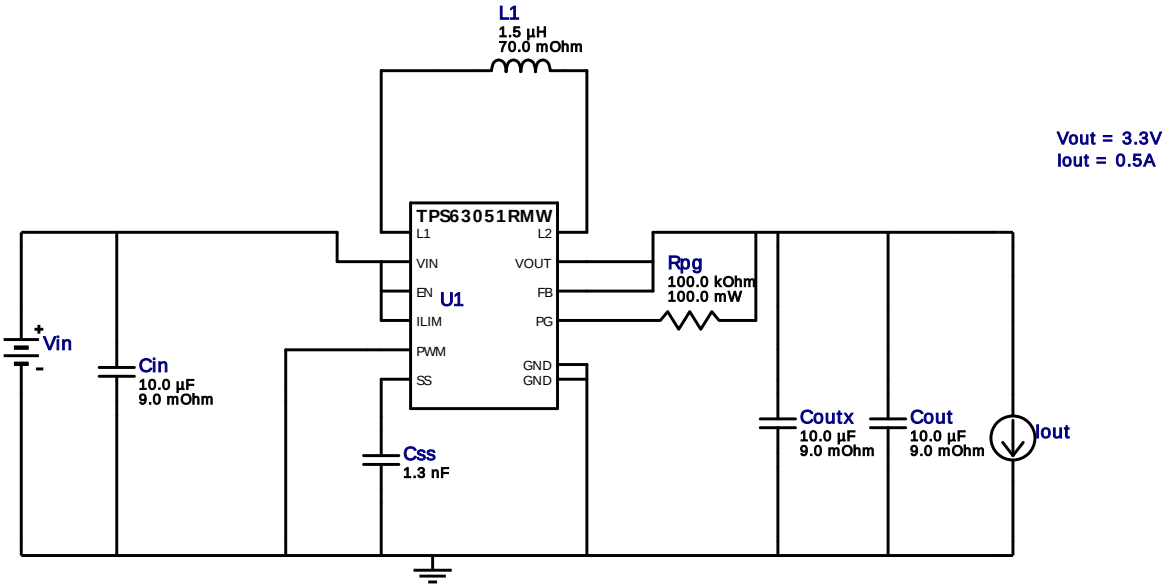
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 3.3V
Iout = 0.5A

Device = TPS63051RMWR
Topology = Buck_Boost
Created = 3/1/17 7:20:55 PM
BOM Cost = $0.98
BOM Count = 7
Total Pd = 0.16W

Design : 4653448/30 TPS63051RMWR
TPS63051RMWR 3.0V-4.2V to 3.30V @ 0.5A



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	1	$0.02	0603 5 mm²
2.	Cout	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	1	$0.02	0603 5 mm²
3.	Coutx	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	1	$0.02	0603 5 mm²
4.	Css	AVX	0402YC132KAT2A Series= X7R	Cap= 1.3 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.05	0402 3 mm²
5.	L1	MuRata	LQM2HPN1R5MG0L	L= 1.5 µH DCR= 70.0 mOhm	1	$0.12	1008 10 mm²
6.	Rpg	Vishay-Dale	CRCW0603100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
7.	U1	Texas Instruments	TPS63051RMWR	Switcher	1	$0.74	RMW0012A 12 mm²

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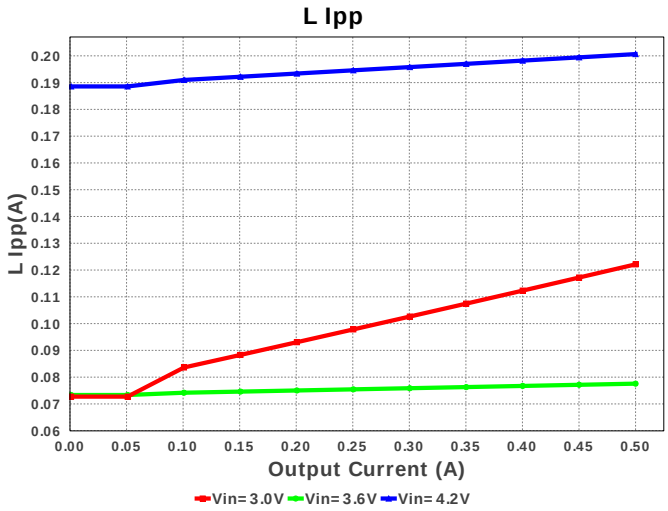

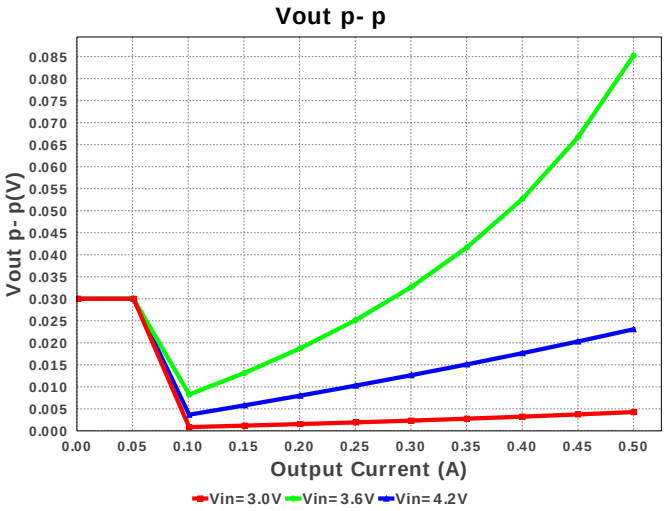

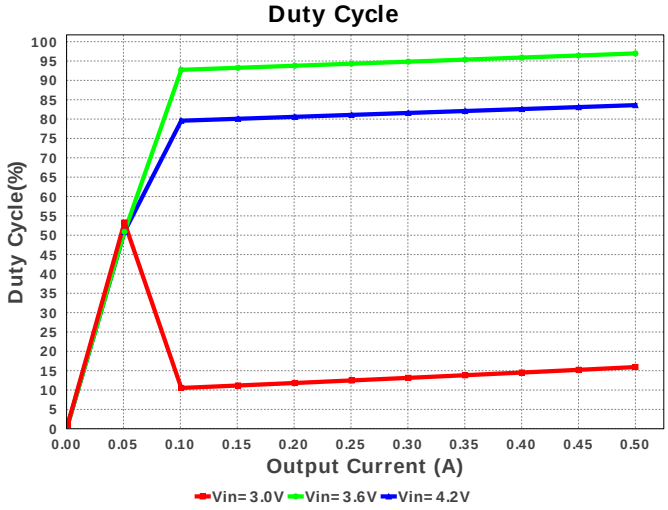

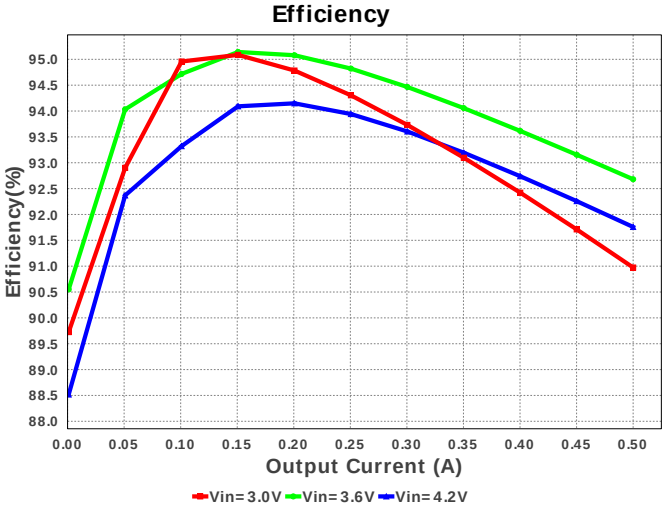

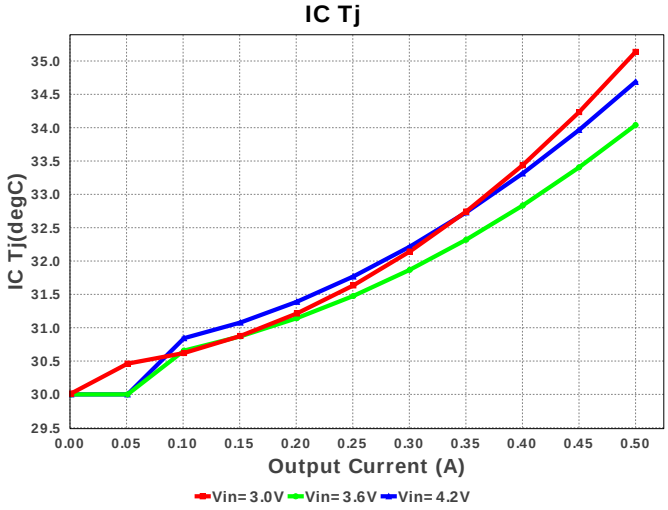

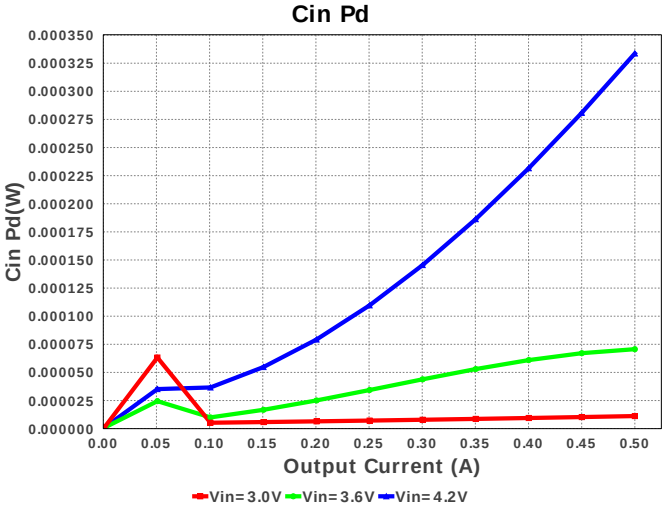

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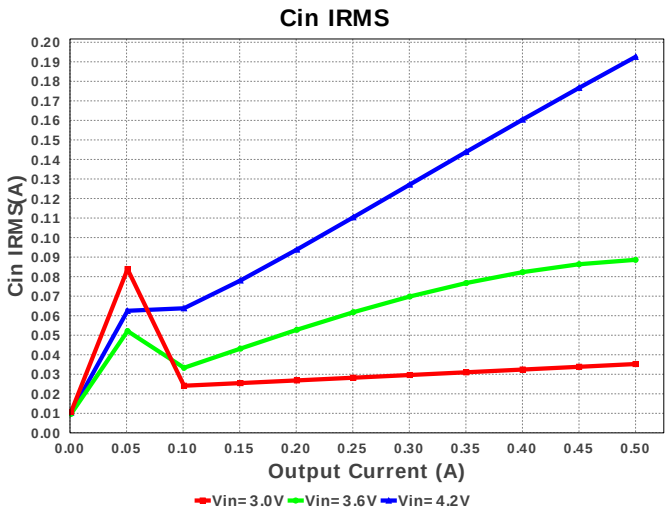

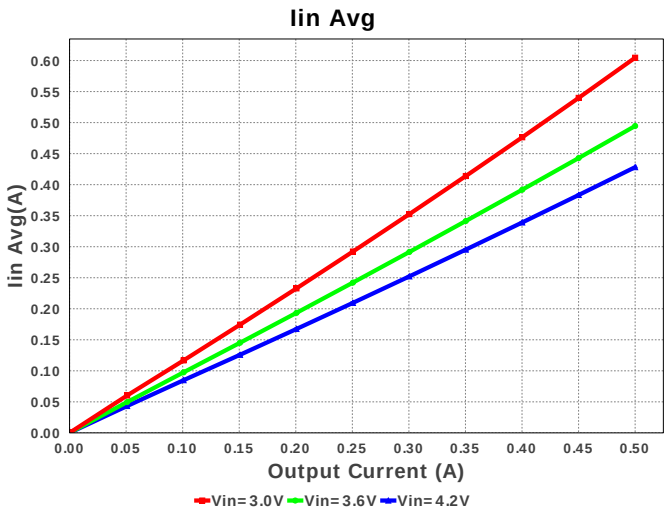

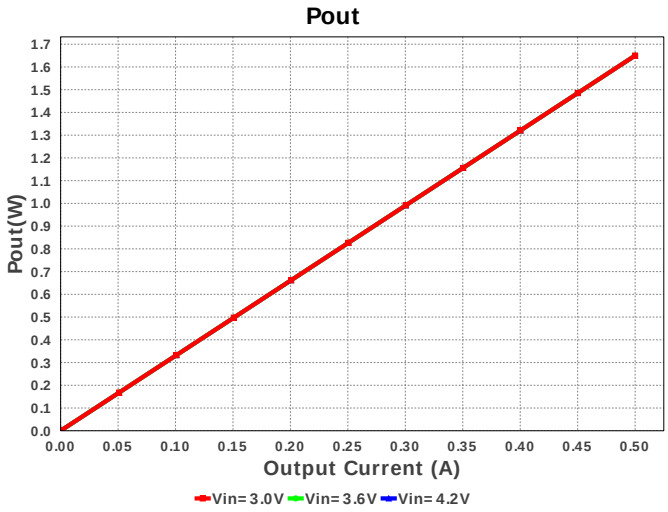

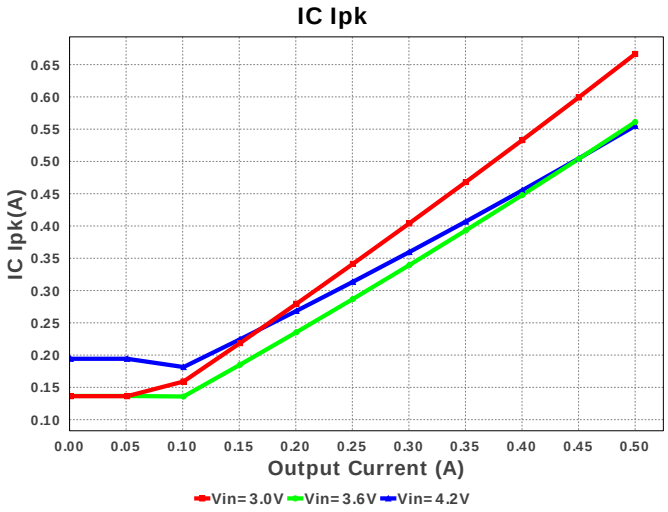

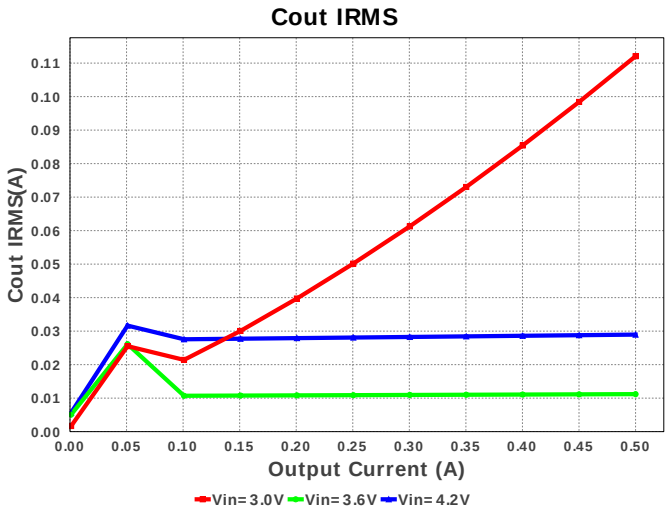

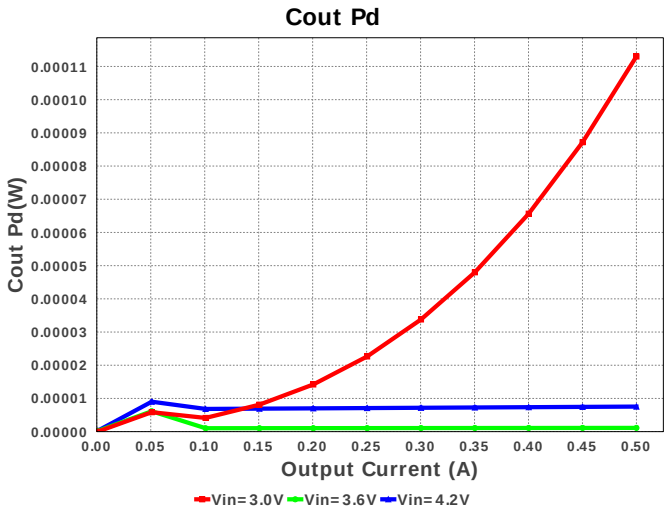

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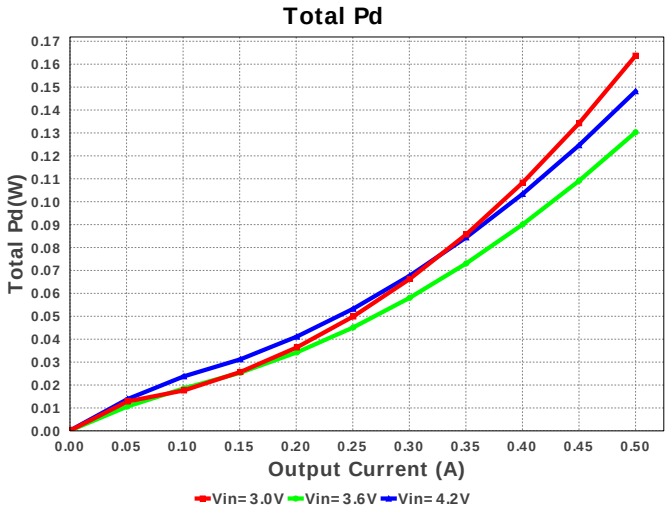

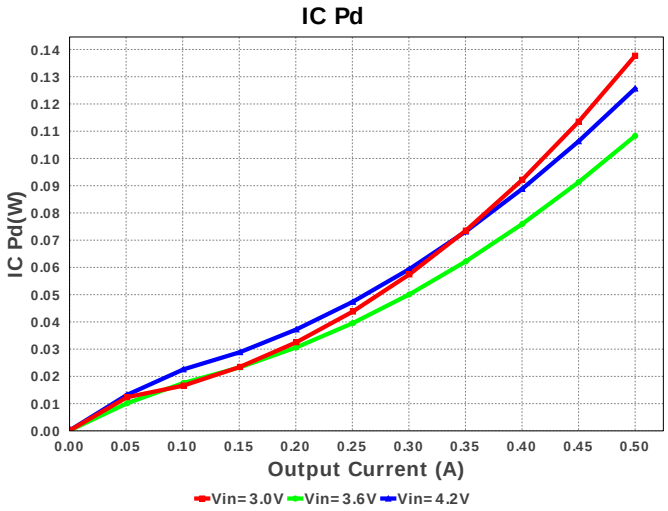

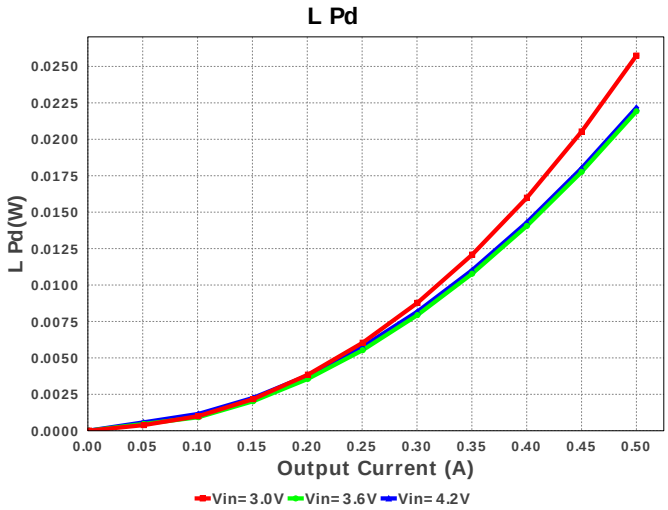

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	35.253 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	112.031 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	666.365 mA	Current	Peak switch current in IC
4.	Iin Avg	604.48 mA	Current	Average input current
5.	L Ipp	122.12 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	7	General	Total Design BOM count
7.	FootPrint	44.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	2.5 MHz	General	Switching frequency
9.	Mode	BOOST PWM CCM	General	PWM/PFM Mode
10.	Pout	1.65 W	General	Total output power
11.	Total BOM	$0.98	General	Total BOM Cost
12.	Duty Cycle	15.935 %	Op_point	Duty cycle
13.	Efficiency	90.987 %	Op_point	Steady state efficiency
14.	IC Tj	35.136 degC	Op_point	IC junction temperature
15.	ICThetaJA	37.3 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	500.0 mA	Op_point	Iout operating point
17.	VIN_OP	3.0 V	Op_point	Vin operating point
18.	Vout p-p	1.868 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	11.185 µW	Power	Input capacitor power dissipation
20.	Cout Pd	0.0 W	Power	Output capacitor power dissipation
21.	IC Pd	137.685 mW	Power	IC power dissipation
22.	L Pd	25.735 mW	Power	Inductor power dissipation
23.	Total Pd	163.445 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	VinMax	4.2	Maximum input voltage
3.	VinMin	3.0	Minimum input voltage
4.	Vout	3.3	Output Voltage

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#	Name	Value	Description
5.	base_pn	TPS63051	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS63051** Product Folder : http://www.ti.com/product/TPS63051 : contains the data sheet and other resources.

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