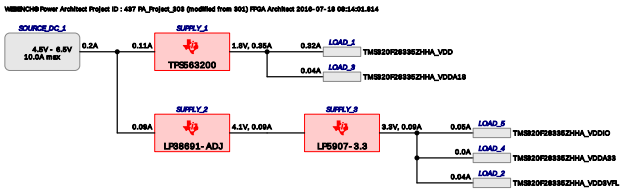
WEBENCH® Power Architect



Project Report

Project : 1194016/437 : PA_Project_303 (modified from 301)
Created : 2016-07-18 08:14:01.814
Optimize project optFactor=3

Project Summary

1.	Total System Efficiency	70.232 %
2.	Total System BOM Count	15.0
3.	Total System Footprint	185.0 mm2
4.	Total System BOM Cost	$1.67
5.	Total System Power Dissipation	395.7 mW

--> Launch WEBENCH Power Architect.

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_1	TMS320F28335ZHHA_VDD
SUPPLY_1	0	LOAD_3	TMS320F28335ZHHA_VDDA18
SUPPLY_3	0	LOAD_5	TMS320F28335ZHHA_VDDIO
SUPPLY_3	0	LOAD_4	TMS320F28335ZHHA_VDDA33
SUPPLY_3	0	LOAD_2	TMS320F28335ZHHA_VDD3VFL
SUPPLY_2	NA		

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS563200	Switcher : 17V, 3A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	1.8 V	0.35 A	91.1%	145	$0.97	2116	4
2.	SUPPLY_2	LP38691-ADJ	LDO : Very low quiescent current	4.1 V	0.092 A	62.7%	31	$0.54	2118	13
3.	SUPPLY_3	LP5907-3.3	LDO : Ultra low noise with no bypass capacitor	3.3 V	0.092 A	73%	9	$0.16	2117	9

Power Loads

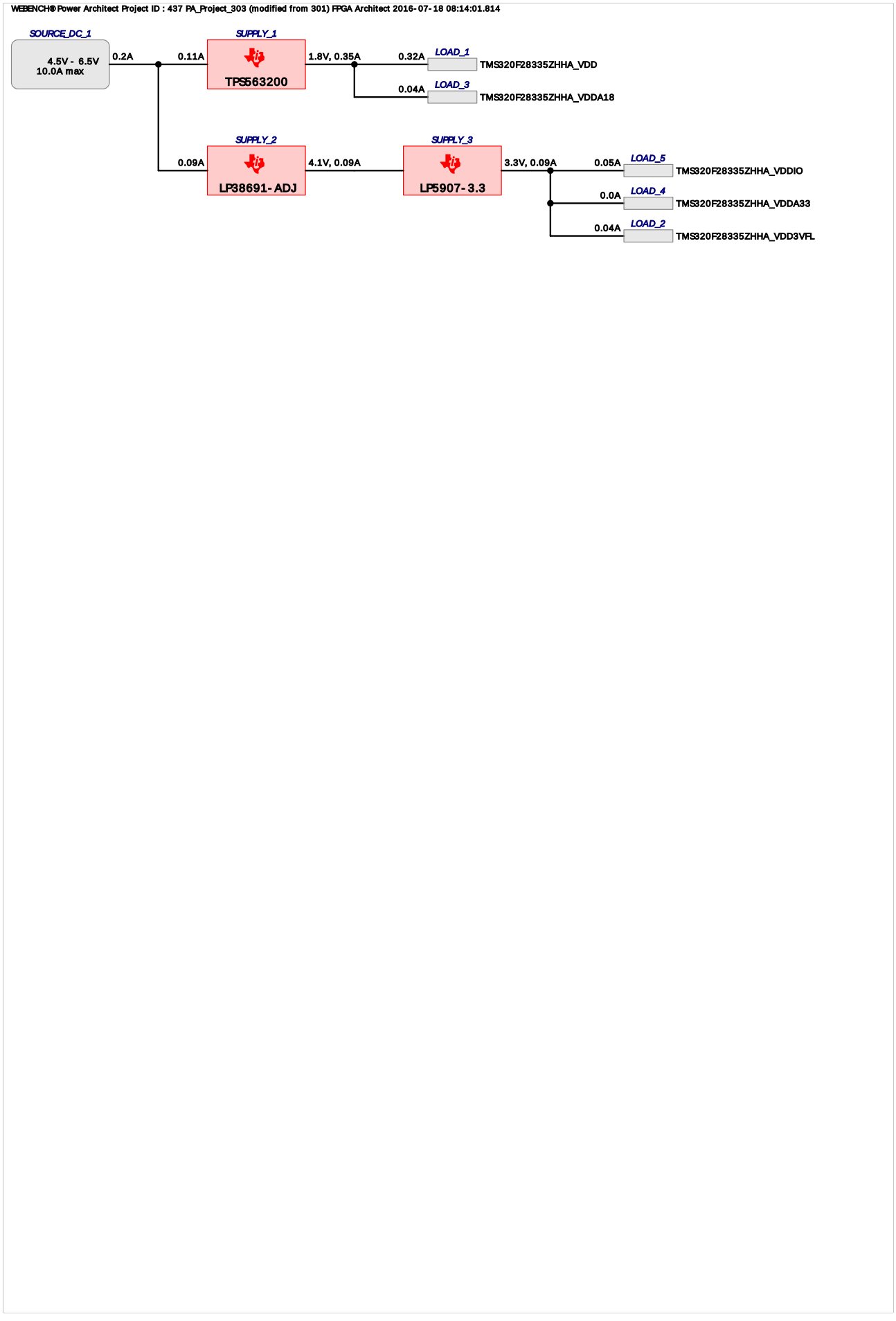
#	Name	VLoad	ILoad	Description
1.	TMS320F28335ZHHA_VDD	1.8 V	0.315 A	VoutRipple=10%
2.	TMS320F28335ZHHA_VDDA18	1.8 V	0.035 A	VoutRipple=10%
3.	TMS320F28335ZHHA_VDDIO	3.3 V	0.05 A	VoutRipple=10%
4.	TMS320F28335ZHHA_VDDA33	3.3 V	0.002 A	VoutRipple=10%
5.	TMS320F28335ZHHA_VDD3VFL	3.3 V	0.04 A	VoutRipple=10%

FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Texas Instruments	TMS320F28335ZHHA	FPGA_1	TMS320C2000	FPGA Texas Instruments TMS320C2000 TMS320F28335ZHHA

http://focus.ti.com/lit/ds/symlink/tms320f28335.pdf

Project Diagram



Electrical Procurement BOM

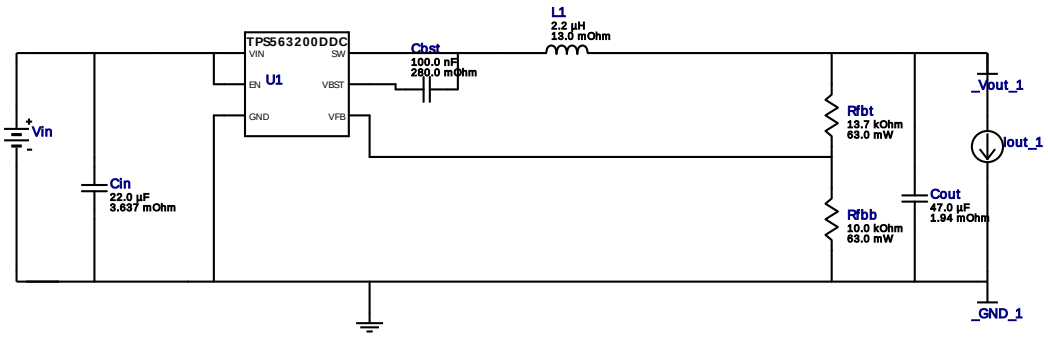
Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
AVX	08053C104KAT2A	0805	1	$0.01	7
TDK	C1005X5R0J105M	0402	3	$0.01	9
TDK	C3216X6S0G476M	1206	1	$0.13	11
Vishay-Dale	CRCW040210K0FKED	0402	1	$0.01	3
Vishay-Dale	CRCW040213K7FKED	0402	1	$0.01	3
Vishay-Dale	CRCW040227K4FKED	0402	1	$0.01	3
MuRata	GRM188R61A105KA61D	0603	1	$0.01	5
MuRata	GRM31CR61A226KE19L	1206_190	1	$0.07	11
Texas Instruments	LP38691SDX-ADJ/NOPB	SDE06A	1	$0.50	16
Texas Instruments	LP5907UVX-3.3/NOPB	UVK04AAA	1	$0.14	3
Yageo America	RC0603FR-0712KL	0603	1	$0.01	5
Bourns	SRN8040-2R2Y	SRN8040	1	$0.22	100
Texas Instruments	TPS563200DDCR	DDC0006A	1	$0.52	10
Total			15	$1.57	185.71400000000001

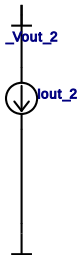
WEBENCH® Design Report

Vout = 1.8V
Iout = 0.35A

Device = TPS563200DDCR
Topology = Buck
Created = 7/18/16 8:14:00 AM
BOM Cost = $0.97
BOM Count = 7
Total Pd = 0.06W

Design : 1194016/2116 TPS563200DDCR
TPS563200DDCR 4.5V-6.5V to 1.80V @ 0.35A

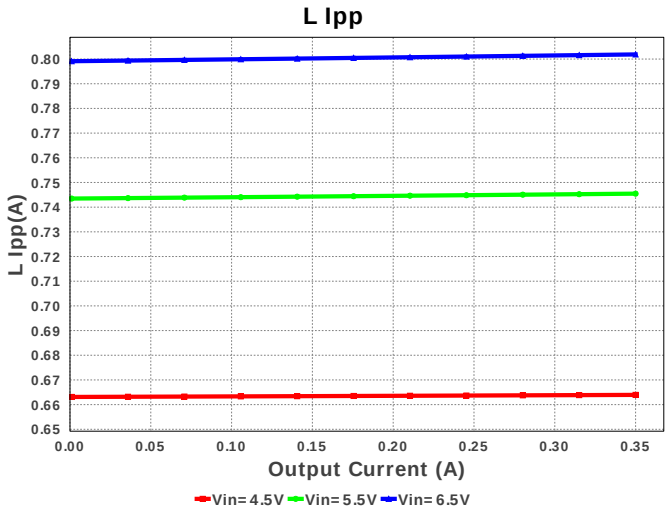


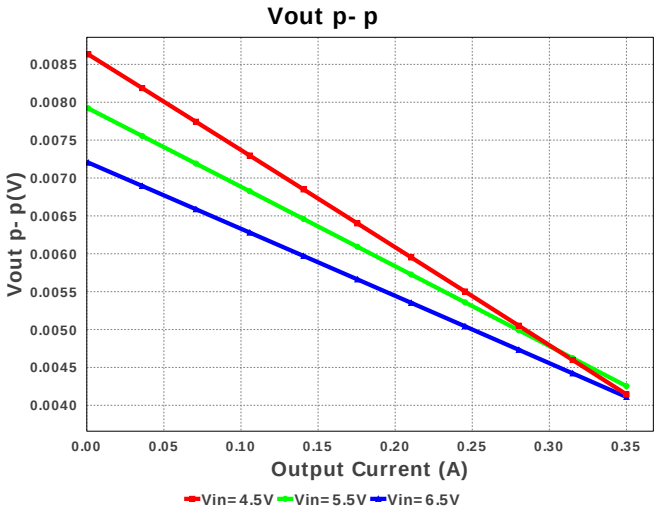


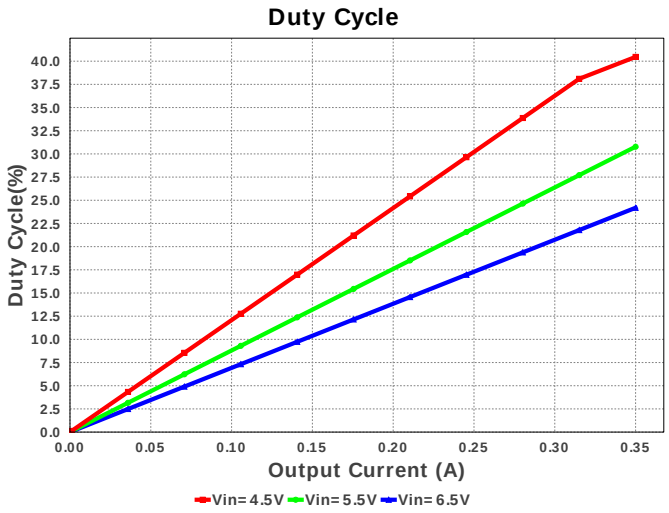
Electrical BOM

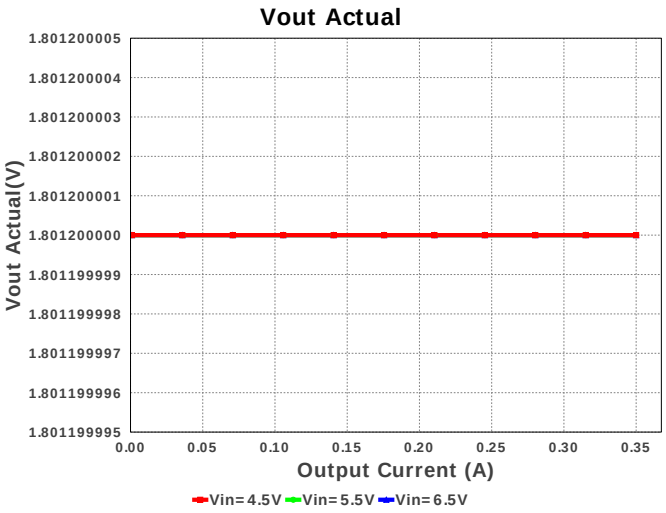
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM31CR61A226KE19L Series= X5R	Cap= 22.0 uF ESR= 3.637 mOhm VDC= 10.0 V IRMS= 3.56456 A	1	$0.07	1206_190 11 mm²
3.	Cout	TDK	C3216X6S0G476M Series= X6S	Cap= 47.0 uF ESR= 1.94 mOhm VDC= 4.0 V IRMS= 0.0 A	1	$0.13	1206 11 mm²
4.	L1	Bourns	SRN8040-2R2Y	L= 2.2 µH DCR= 13.0 mOhm	1	$0.22	SRN8040 100 mm²
5.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
6.	Rfbt	Vishay-Dale	CRCW040213K7FKED Series= CRCW..e3	Res= 13.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	U1	Texas Instruments	TPS563200DDCR	Switcher	1	$0.52	DDC0006A 10 mm^2

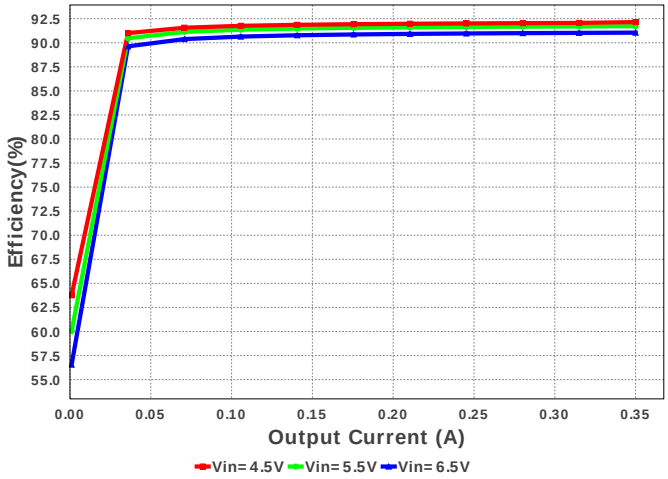




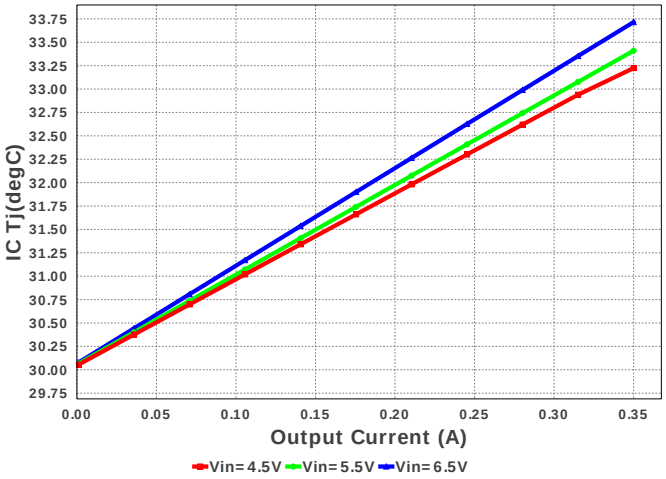




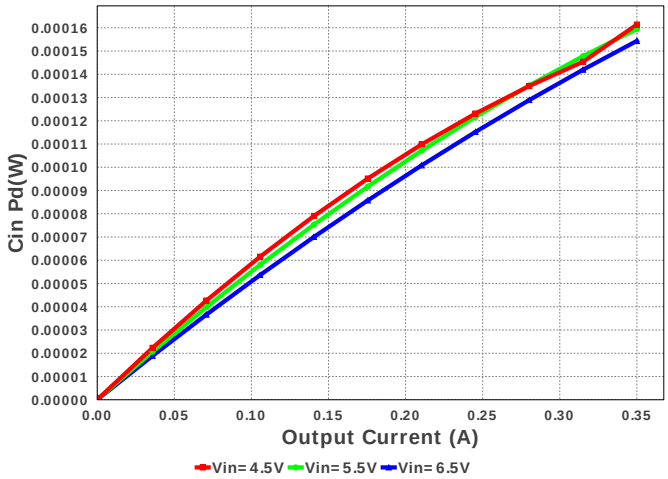
Efficiency



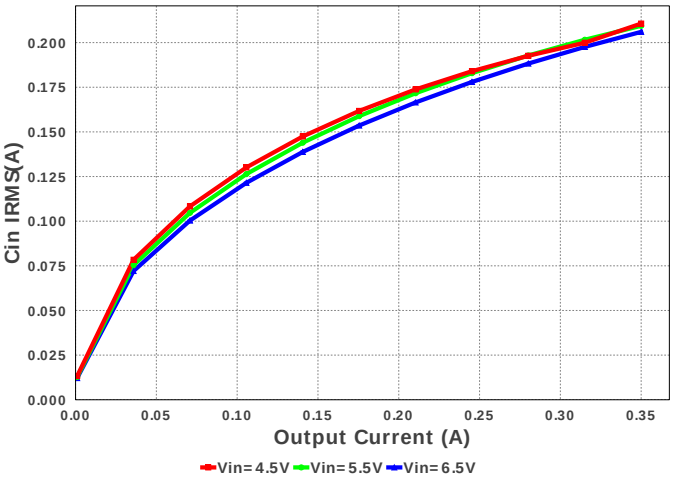
IC Tj



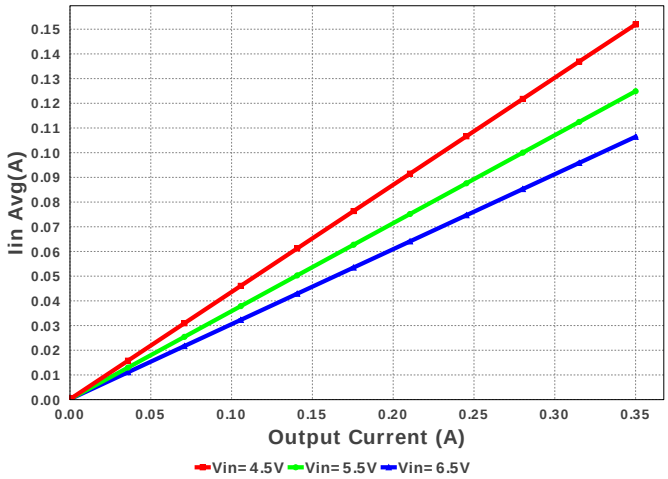
Cin Pd



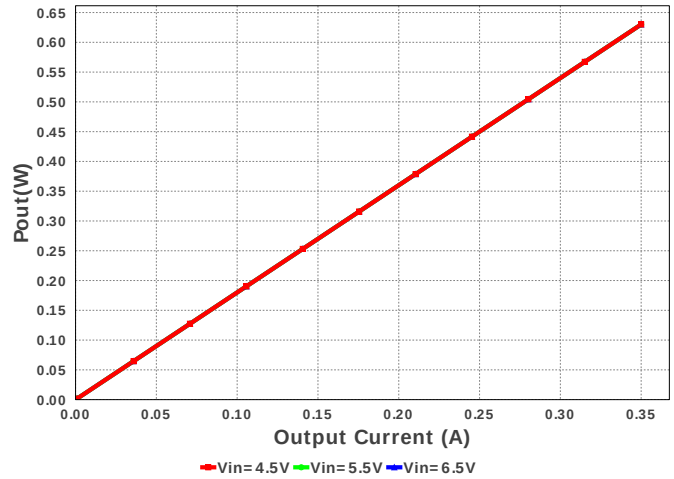
Cin IRMS

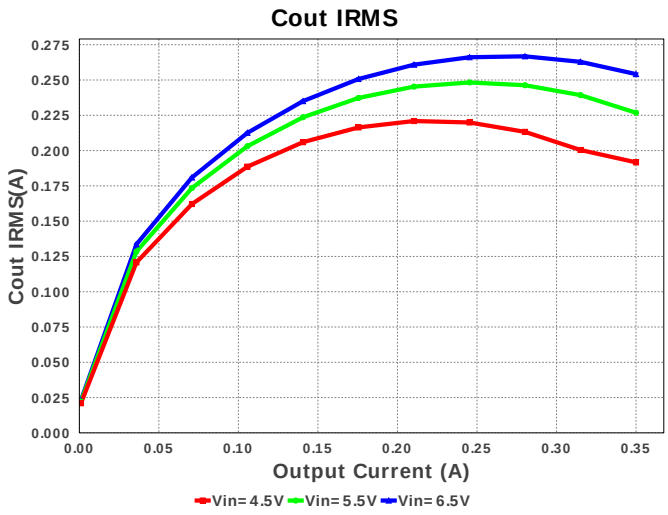


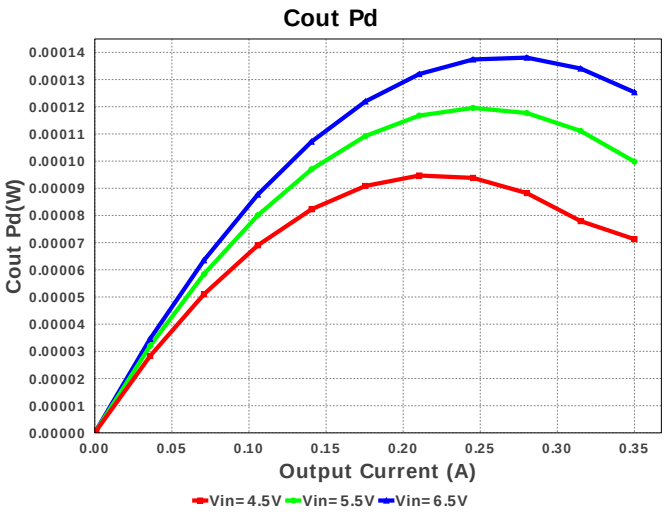
Iin Avg

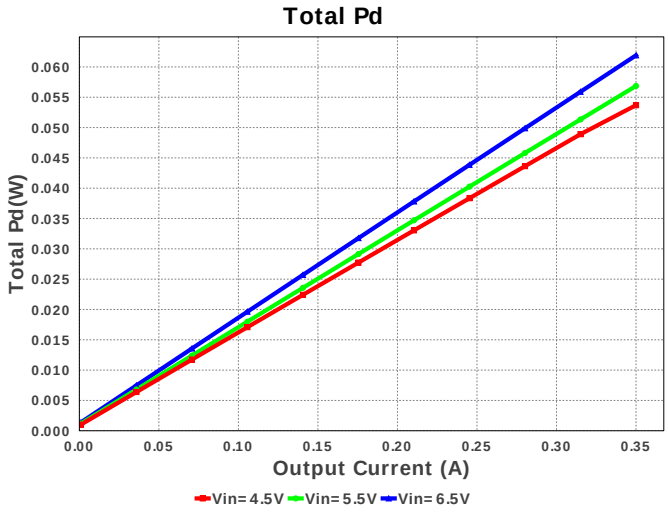


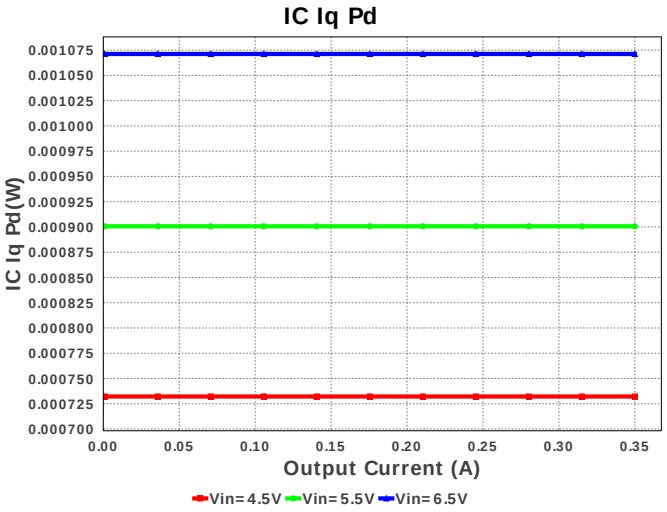
Pout

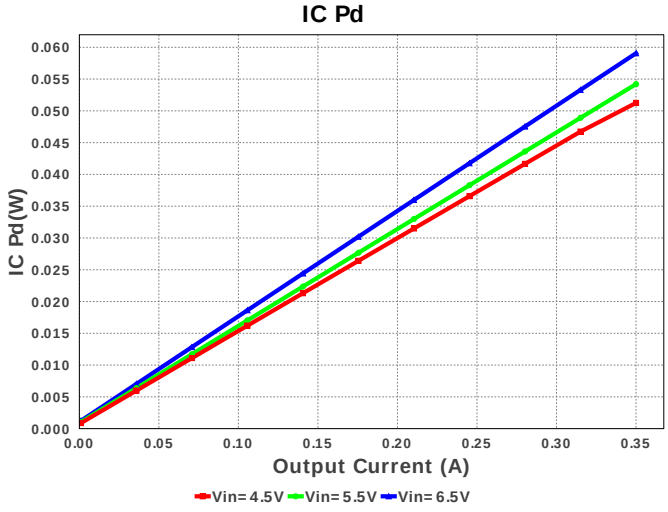


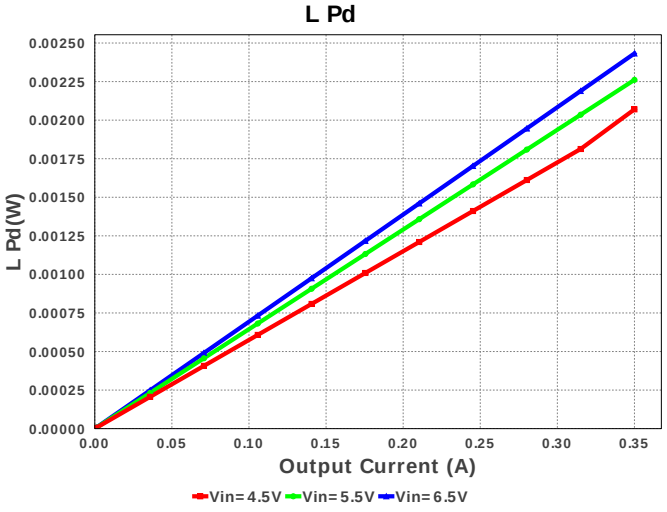


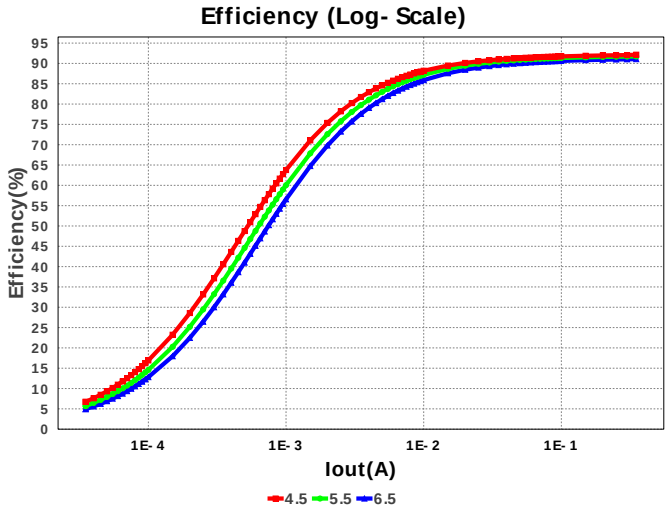












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	206.009 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	254.174 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	106.45 mA	Current	Average input current
4.	L Ipp	801.88 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	7	General	Total Design BOM count
6.	FootPrint	145.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	641.59 kHz	General	Switching frequency
8.	Pout	630.0 mW	General	Total output power
9.	Total BOM	$0.97	General	Total BOM Cost
10.	Vout Actual	1.801 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
11.	Vout OP	1.8 V	Op_Point	Operational Output Voltage
12.	Duty Cycle	24.189 %	Op_point	Duty cycle
13.	Efficiency	91.052 %	Op_point	Steady state efficiency
14.	IC Tj	33.715 degC	Op_point	IC junction temperature
15.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	350.0 mA	Op_point	Iout operating point
17.	VIN_OP	6.5 V	Op_point	Vin operating point
18.	Vout p-p	7.294 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	154.354 µW	Power	Input capacitor power dissipation
20.	Cout Pd	125.332 µW	Power	Output capacitor power dissipation
21.	IC Iq Pd	1.071 mW	Power	IC Iq Pd
22.	IC Pd	59.066 mW	Power	IC power dissipation
23.	L Pd	2.432 mW	Power	Inductor power dissipation
24.	Total Pd	61.913 mW	Power	Total Power Dissipation
25.	Vout Tolerance	2.499 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	350.0 m	Maximum Output Current
2.	VinMax	6.5	Maximum input voltage
3.	VinMin	4.5	Minimum input voltage
4.	Vout	1.8	Output Voltage
5.	base_pn	TPS563200	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

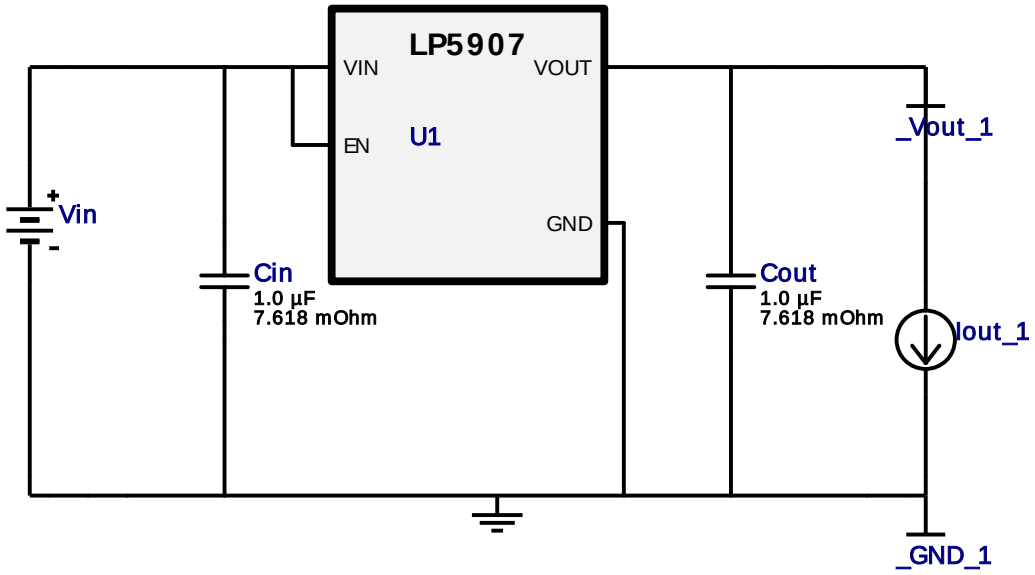
1. **TPS563200** Product Folder : http://www.ti.com/product/TPS563200 : contains the data sheet and other resources.

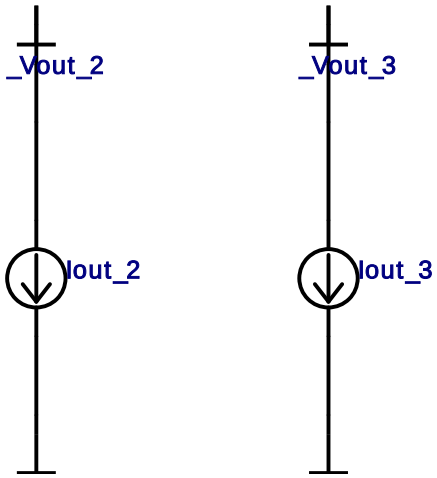
WEBENCH® Design Report

Vout = 3.3V
Iout = 0.09A

Device = LP5907UVX-3.3/NOPB
Topology = LDO
Created = 7/18/16 8:14:00 AM
BOM Cost = $0.16
BOM Count = 3
Total Pd = 0.11W

Design : 1194016/2117 LP5907UVX-3.3/NOPB
LP5907UVX-3.3/NOPB 3.69V-4.51V to 3.30V @ 0.092A

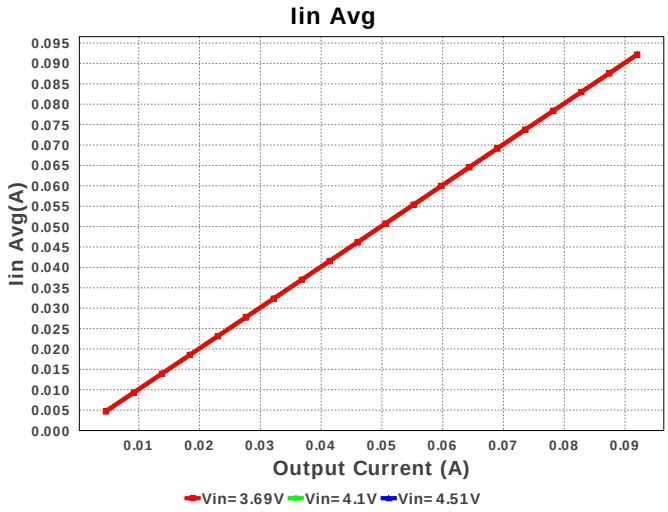


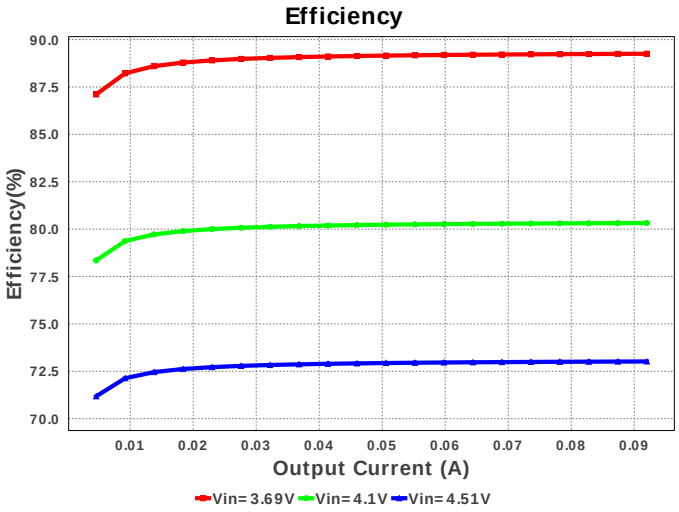


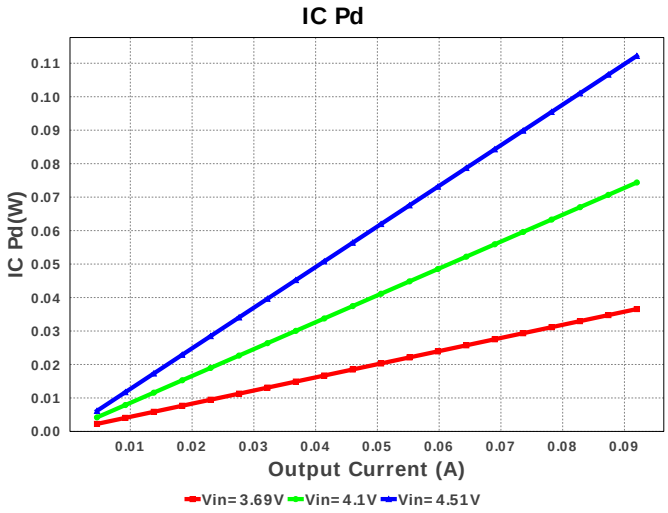
Electrical BOM

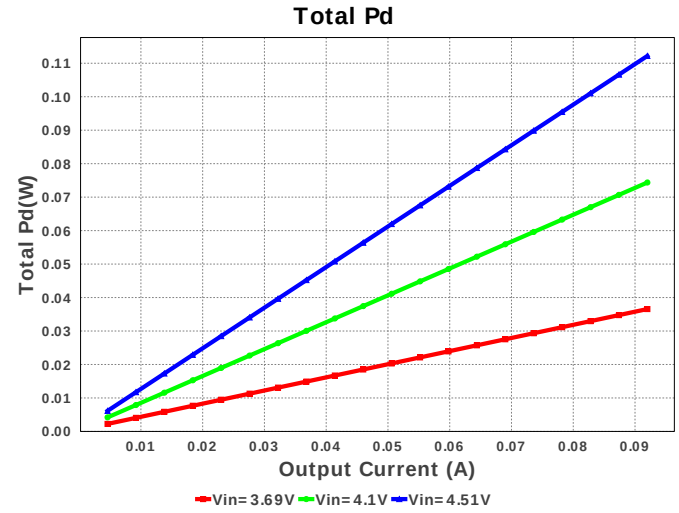
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2

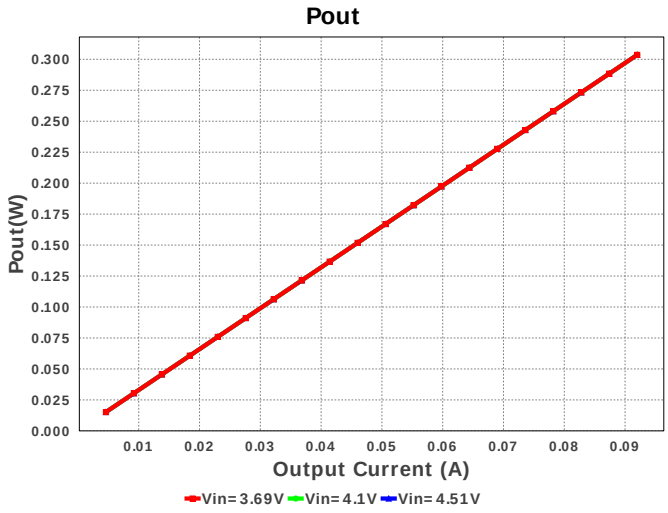
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
2.	Cout	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	U1	Texas Instruments	LP5907UVX-3.3/NOPB	Switcher	1	$0.14	UVK04AAA 3 mm^2

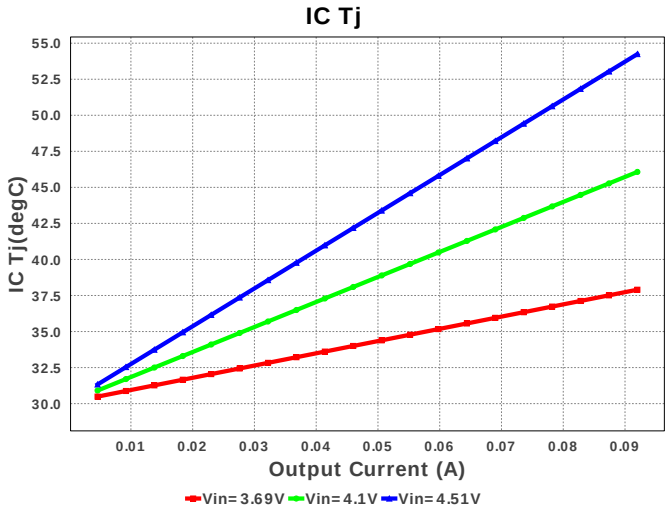


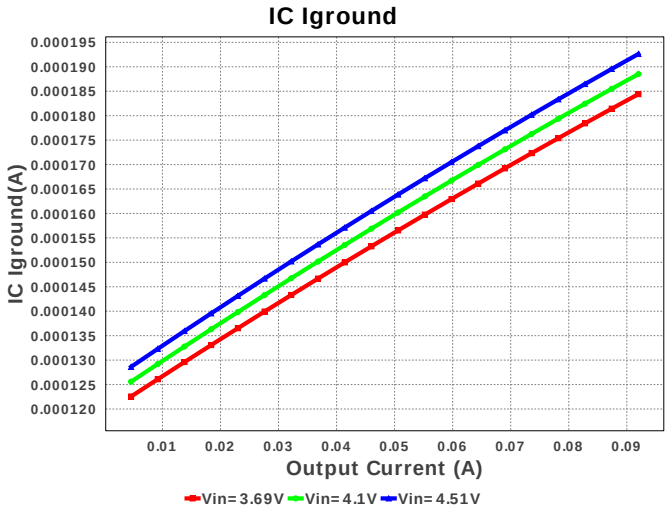


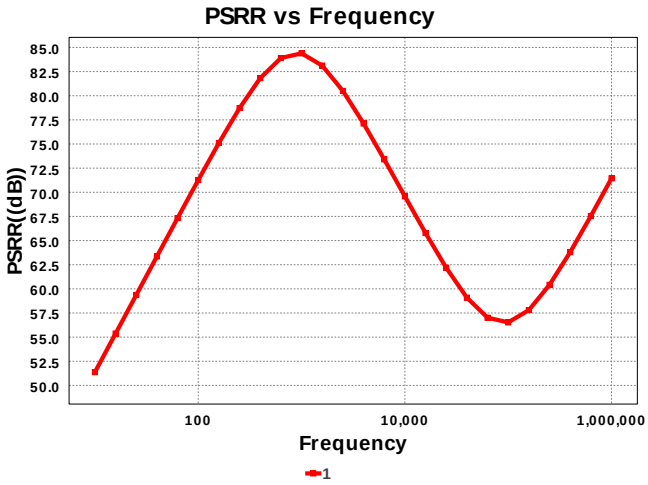












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	192.62 µA	Current	IC ground current
2.	Iin Avg	92.193 mA	Current	Average input current
3.	BOM Count	3	General	Total Design BOM count
4.	FootPrint	9.0 mm^2	General	Total Foot Print Area of BOM components
5.	IC Tolerance	66.0 mV	General	IC Feedback Tolerance
6.	Pout	303.6 mW	General	Total output power
7.	Total BOM	$0.16	General	Total BOM Cost
8.	Vin p-p	6.5 mV	Op_Point	Input Source ripple voltage
9.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
10.	Efficiency	73.018 %	Op_point	Steady state efficiency
11.	IC Tj	43.418 degC	Op_point	IC junction temperature
12.	ICThetaJA	119.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
13.	IOUT_OP	92.0 mA	Op_point	Iout operating point
14.	Input Ripple Frequency	100.0 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
15.	PSRR est.	-56.526 dB	Op_point	Power Supply Rejection Ratio estimated
16.	VIN_OP	4.51 V	Op_point	Vin operating point
17.	Vout p-p	9.697 µV	Op_point	Peak-to-peak output ripple voltage
18.	IC Pd	112.189 mW	Power	IC power dissipation
19.	Total Pd	112.189 mW	Power	Total Power Dissipation
20.	Vout Tolerance	2.0 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	92.0 m	Maximum Output Current
2.	VinMax	4.51	Maximum input voltage
3.	VinMin	3.69	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LP5907	Base Product Number
6.	source	DC	Input Source Type

#	Name	Value	Description
7.	Ta	30.0	Ambient temperature

Design Assistance

1.

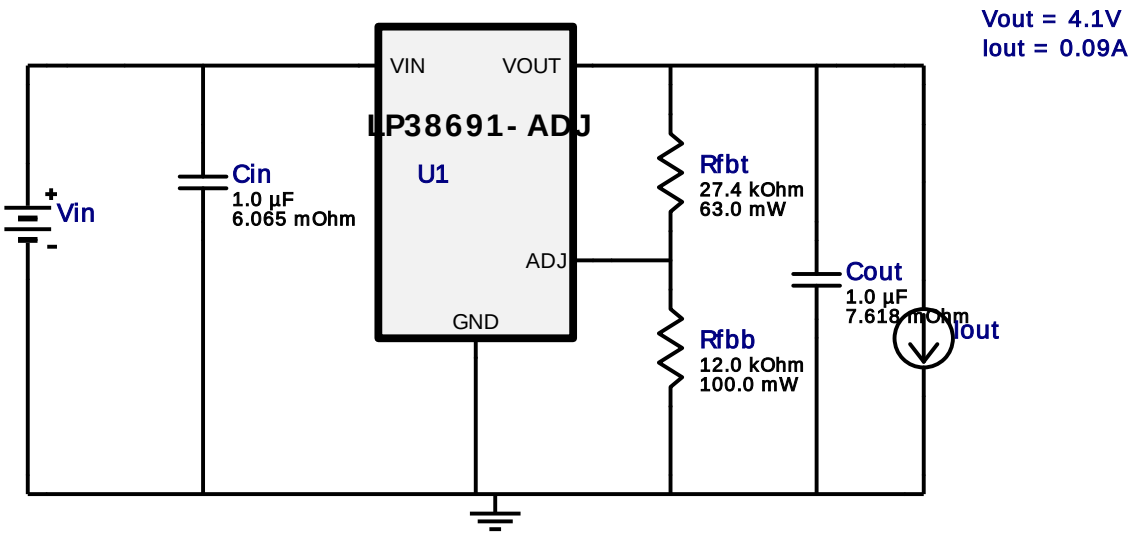
2. **LP5907** Product Folder : http://www.ti.com/product/lp5907 : contains the data sheet and other resources.

WEBENCH® Design Report

Vout = 4.1V
Iout = 0.09A

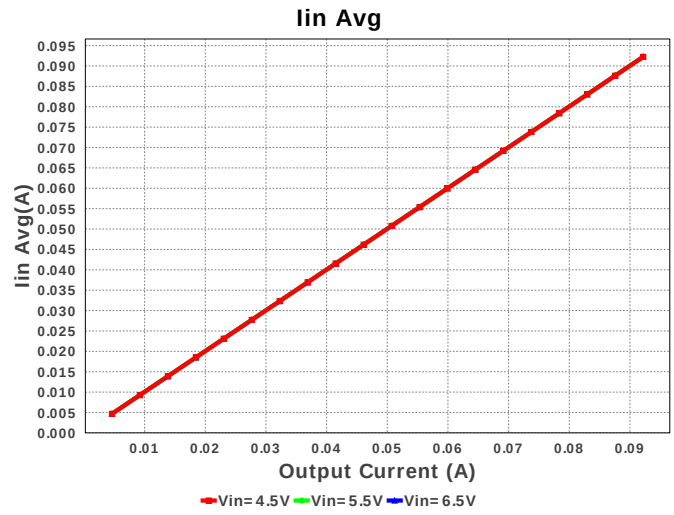
Device = LP38691SDX-ADJ/NOPB
Topology = LDO
Created = 7/18/16 8:14:01 AM
BOM Cost = $0.54
BOM Count = 5
Total Pd = 0.22W

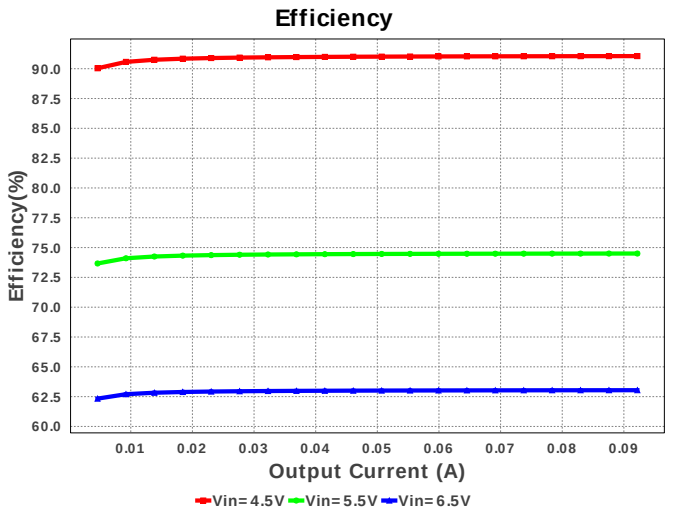
Design : 1194016/2118 LP38691SDX-ADJ/NOPB
LP38691SDX-ADJ/NOPB 4.5V-6.5V to 4.10V @ 0.09219A

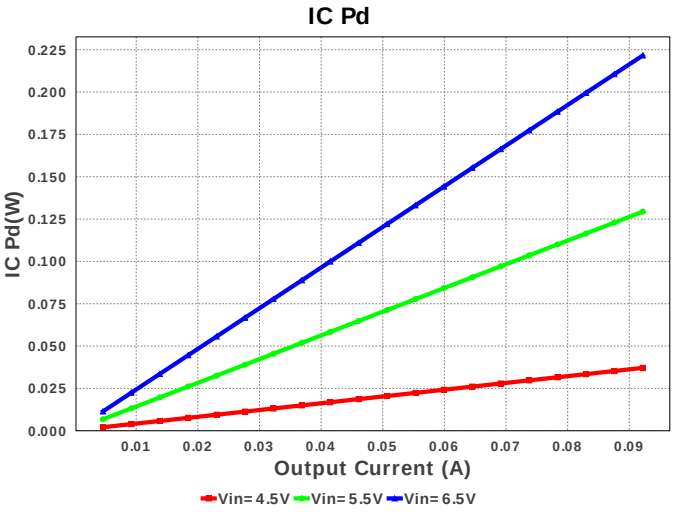


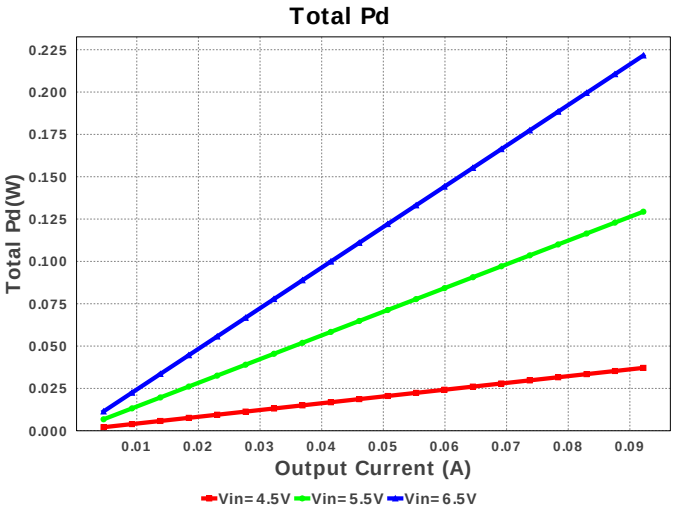
Electrical BOM

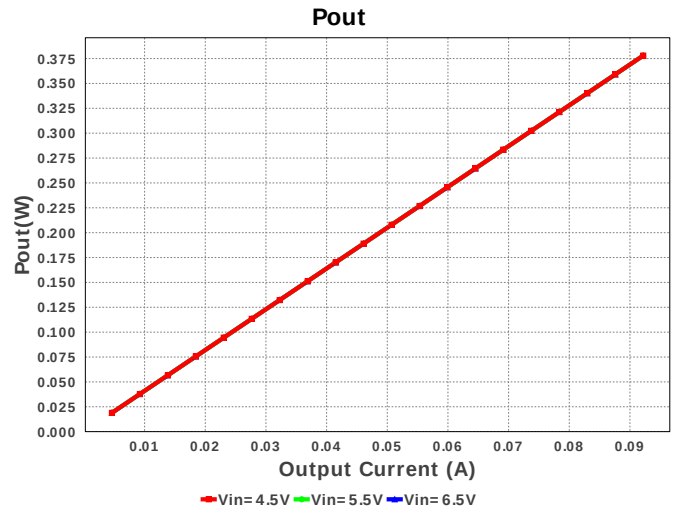
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R61A105KA61D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 10.0 V IRMS= 1.30675 A	1	$0.01	0603 5 mm²
2.	Cout	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
4.	Rfbt	Vishay-Dale	CRCW040227K4FKED Series= CRCW..e3	Res= 27.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
5.	U1	Texas Instruments	LP38691SDX-ADJ/NOPB	Switcher	1	$0.50	SDE06A 16 mm²

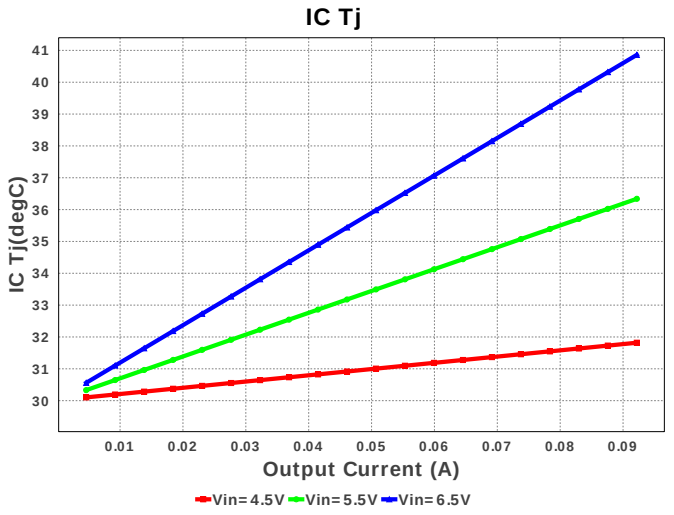


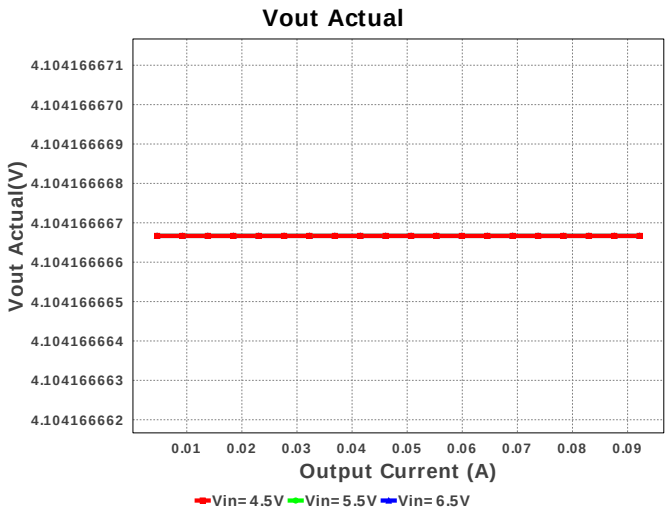


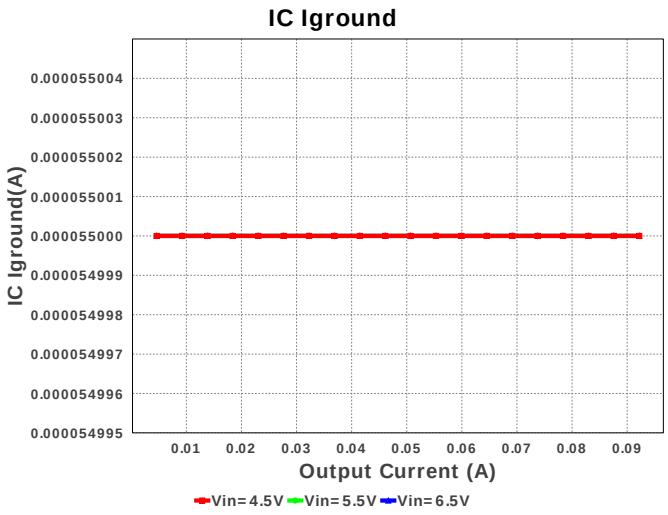


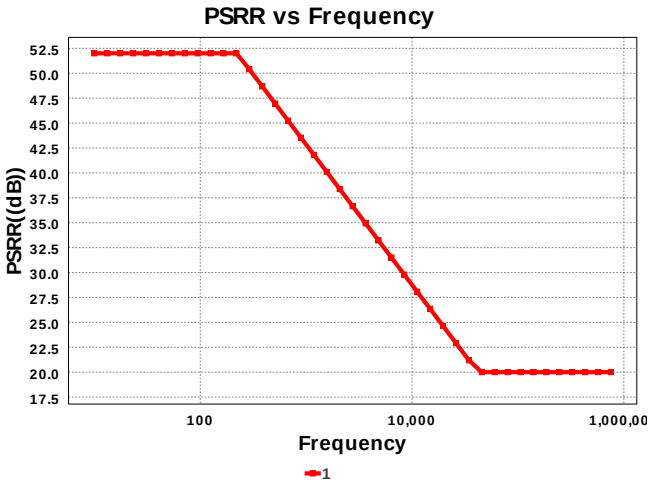












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	55.0 µA	Current	IC ground current
2.	Iin Avg	92.245 mA	Current	Average input current
3.	BOM Count	5	General	Total Design BOM count
4.	FootPrint	31.0 mm^2	General	Total Foot Print Area of BOM components
5.	IC Tolerance	50.0 mV	General	IC Feedback Tolerance
6.	Pout	377.979 mW	General	Total output power
7.	Total BOM	$0.54	General	Total BOM Cost
8.	Vin p-p	65.0 mV	Op_Point	Input Source ripple voltage
9.	Vout Actual	4.104 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
10.	Vout OP	4.1 V	Op_Point	Operational Output Voltage
11.	Efficiency	62.749 %	Op_point	Steady state efficiency
12.	IC Tj	40.859 degC	Op_point	IC junction temperature
13.	ICThetaJA	49.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	92.19 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	100.0 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-20.0 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	6.5 V	Op_point	Vin operating point
18.	Vout p-p	6.5 mV	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	221.614 mW	Power	IC power dissipation
20.	Total Pd	221.614 mW	Power	Total Power Dissipation
21.	Vout Tolerance	5.461 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	92.19 m	Maximum Output Current
2.	VinMax	6.5	Maximum input voltage
3.	VinMin	4.5	Minimum input voltage
4.	Vout	4.1	Output Voltage
5.	base_pn	LP38691	Base Product Number

#	Name	Value	Description
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LP38691** Product Folder : http://www.ti.com/product/lp38691-adj : contains the data sheet and other resources.