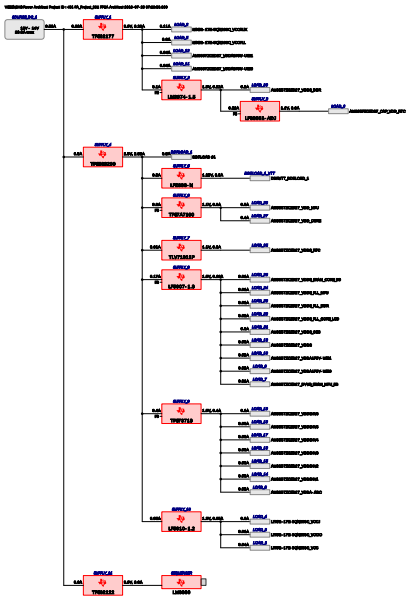
WEBENCH® Power Architect



Project Report

Project : 1194016/451 : PA_Project_301
Created : 2016-07-25 07:29:50.360
Optimize project optFactor=3

Project Summary

1.	Total System Efficiency	56.958 %
2.	Total System BOM Count	63.0
3.	Total System Footprint	782.0 mm2
4.	Total System BOM Cost	$8.30
5.	Total System Power Dissipation	3.696 W

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_2	LFXP2-17E-5QN208C_VCCAUX
SUPPLY_2	2	LOAD_20	AM3357ZCZD27_VDDS_DDR
SUPPLY_3	6	LOAD_6	AM3357ZCZD27_CAP_VDD_RTC
SUPPLY_1	0	LOAD_5	LFXP2-17E-5QN208C_VCCPLL
SUPPLY_1	0	LOAD_12	AM3357ZCZD27_VDDA3P3V-USB1
SUPPLY_1	0	LOAD_11	AM3357ZCZD27_VDDA3P3V-USB0
SUPPLY_4	0	DDRLOAD_1	DDRLOAD #1
SUPPLY_5	0	DDRLOAD_1_VTT	DDRVTT_DDRLOAD_1
SUPPLY_6	5	LOAD_28	AM3357ZCZD27_VDD_MPU
SUPPLY_6	5	LOAD_27	AM3357ZCZD27_VDD_CORE
SUPPLY_7	1	LOAD_25	AM3357ZCZD27_VDDS_RTC
SUPPLY_8	2	LOAD_26	AM3357ZCZD27_VDDS_SRAM_CORE_BG
SUPPLY_8	2	LOAD_24	AM3357ZCZD27_VDDS_PLL_MPU
SUPPLY_8	2	LOAD_23	AM3357ZCZD27_VDDS_PLL_DDR
SUPPLY_8	2	LOAD_22	AM3357ZCZD27_VDDS_PLL_CORE_LCD
SUPPLY_8	2	LOAD_21	AM3357ZCZD27_VDDS_OSC
SUPPLY_8	2	LOAD_13	AM3357ZCZD27_VDDS
SUPPLY_8	2	LOAD_10	AM3357ZCZD27_VDDA1P8V-USB1
SUPPLY_8	2	LOAD_9	AM3357ZCZD27_VDDA1P8V-USB0
SUPPLY_8	2	LOAD_7	AM3357ZCZD27_DVVS_SRAM_MPU_BB
SUPPLY_9	3	LOAD_19	AM3357ZCZD27_VDDSHV6
SUPPLY_9	3	LOAD_18	AM3357ZCZD27_VDDSHV5
SUPPLY_9	3	LOAD_17	AM3357ZCZD27_VDDSHV4
SUPPLY_9	3	LOAD_16	AM3357ZCZD27_VDDSHV3
SUPPLY_9	3	LOAD_15	AM3357ZCZD27_VDDSHV2
SUPPLY_9	3	LOAD_14	AM3357ZCZD27_VDDSHV1
SUPPLY_9	3	LOAD_8	AM3357ZCZD27_VDDA-ADC
SUPPLY_10	0	LOAD_4	LFXP2-17E-5QN208C_VCCJ
SUPPLY_10	0	LOAD_3	LFXP2-17E-5QN208C_VCCIO
SUPPLY_10	0	LOAD_1	LFXP2-17E-5QN208C_VCC
SUPPLY_11	NA		
SEQUENCER	NA		

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS62177	Switcher : Fixed 3.3Vout, High Light-Load Efficiency Buck Converter	3.3 V	0.292 A	86.5%	50	$1.02	2213	15
2.	SUPPLY_2	LM3674-1.5	Switcher : 2MHz, 600mA Step-Down DC-DC Converter in SOT 23-5	1.5 V	0.215 A	90.6%	38	$0.45	2212	10
3.	SUPPLY_3	LP38851-ADJ	LDO : Enable, Softstart; Requires Vbias	1.1 V	0.002 A	8%	166	$0.89	2211	6
4.	SUPPLY_4	TPS563200	Switcher : 17V, 3A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	2.5 V	2.524 A	89.4%	149	$1.06	2220	40
5.	SUPPLY_5	LP2996-N	DDRLDO : DDR1,DDR2	1.25 V	0.5 A	99.9%	87	$1.21	2214	20
6.	SUPPLY_6	TPS7A7100	LDO : 1-A, Fast-Transient, Low-Dropout Voltage Regulator	1.1 V	0.9 A	39.9%	60	$0.83	2215	22
7.	SUPPLY_7	TLV71311P	LDO : Capacitor-Free, 150-mA, Low-Dropout Regulator with Foldback Current Limit for Portable Devices	1.1 V	0.005 A	39.6%	21	$0.15	2216	26
8.	SUPPLY_8	LP5907-1.8	LDO : Ultra low noise with no bypass capacitor	1.8 V	0.165 A	65.4%	9	$0.16	2217	29
9.	SUPPLY_9	TPS73718	LDO : 1A LDO with Rev Current Protection	1.8 V	0.4 A	65.3%	85	$0.61	2218	32
10.	SUPPLY_10	LP5910-1.2	LDO : Ultra Low-Noise, 300-mA Linear Regulator for RF/Analog Circuits	1.2 V	0.052 A	43.5%	9	$0.16	2219	36
11.	SUPPLY_11	TPS62122	Switcher : 2V-15V,75mA, Buck Converter with DCS-Control	3.3 V	0.001 A	75.7%	43	$0.67	2222	48
12.	SEQUENCER	LM3880	Sequencer : Power Sequencer	3.3 V	0.001 A	0%	65	$1.09	2221	45

Power Loads

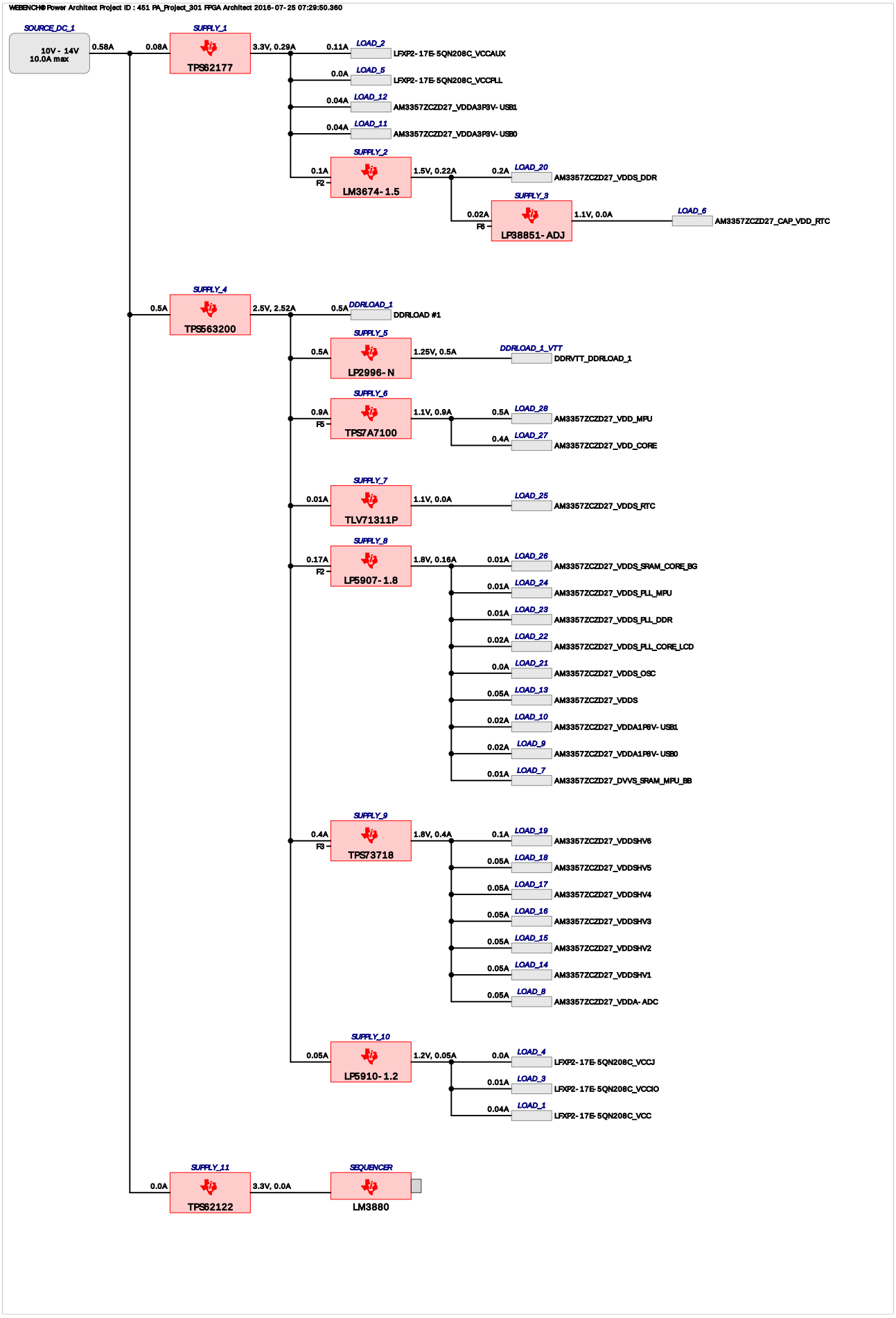
#	Name	VLoad	ILoad	Description
1.	LFXP2-17E-5QN208C_VCCAUX	3.3 V	0.112 A	VoutRipple=10%
2.	AM3357ZCZD27_VDDS_DDR	1.5 V	0.2 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
3.	AM3357ZCZD27_CAP_VDD_RTC	1.1 V	0.002 A	VoutRipple=8%, Up Sequence Order=5 delay=2.0 mSec, Down Sequence Order=0 delay=2.0 mSec
4.	LFXP2-17E-5QN208C_VCCPLL	3.3 V	0.0018 A	VoutRipple=10%
5.	AM3357ZCZD27_VDDA3P3V-USB1	3.3 V	0.04 A	VoutRipple=10%, Up Sequence Order=3 delay=2.0 mSec, Down Sequence Order=2 delay=2.0 mSec
6.	AM3357ZCZD27_VDDA3P3V-USB0	3.3 V	0.04 A	VoutRipple=10%, Up Sequence Order=3 delay=2.0 mSec, Down Sequence Order=2 delay=2.0 mSec
7.	DDRLOAD #1	2.5 V	0.5 A	VoutRipple=10%
8.	DDRVTT_DDRLOAD_1	1.25 V	0.5 A	VoutRipple=10%
9.	AM3357ZCZD27_VDD_MPU	1.1 V	0.5 A	VoutRipple=8%, Up Sequence Order=4 delay=2.0 mSec, Down Sequence Order=1 delay=2.0 mSec
10.	AM3357ZCZD27_VDD_CORE	1.1 V	0.4 A	VoutRipple=8%, Up Sequence Order=4 delay=2.0 mSec, Down Sequence Order=1 delay=2.0 mSec
11.	AM3357ZCZD27_VDDS_RTC	1.1 V	0.005 A	VoutRipple=16%, Up Sequence Order=0 delay=2.0 mSec, Down Sequence Order=5 delay=2.0 mSec
12.	AM3357ZCZD27_VDDS_SRAM_CORE_BG	1.8 V	0.01 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
13.	AM3357ZCZD27_VDDS_PLL_MPU	1.8 V	0.01 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
14.	AM3357ZCZD27_VDDS_PLL_DDR	1.8 V	0.01 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
15.	AM3357ZCZD27_VDDS_PLL_CORE_LCD	1.8 V	0.02 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
16.	AM3357ZCZD27_VDDS_OSC	1.8 V	0.005 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
17.	AM3357ZCZD27_VDDS	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
18.	AM3357ZCZD27_VDDA1P8V-USB1	1.8 V	0.025 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
19.	AM3357ZCZD27_VDDA1P8V-USB0	1.8 V	0.025 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
20.	AM3357ZCZD27_DVVS_SRAM_MPU_BB	1.8 V	0.01 A	VoutRipple=10%, Up Sequence Order=1 delay=2.0 mSec, Down Sequence Order=4 delay=2.0 mSec
21.	AM3357ZCZD27_VDDSHV6	1.8 V	0.1 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec
22.	AM3357ZCZD27_VDDSHV5	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec
23.	AM3357ZCZD27_VDDSHV4	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec

#	Name	VLoad	ILoad	Description
24.	AM3357ZCZD27_VDDSHV3	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec
25.	AM3357ZCZD27_VDDSHV2	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec
26.	AM3357ZCZD27_VDDSHV1	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec
27.	AM3357ZCZD27_VDDA-ADC	1.8 V	0.05 A	VoutRipple=10%, Up Sequence Order=2 delay=2.0 mSec, Down Sequence Order=3 delay=2.0 mSec
28.	LFXP2-17E-5QN208C_VCCJ	1.2 V	0.0012 A	VoutRipple=10%
29.	LFXP2-17E-5QN208C_VCCIO	1.2 V	0.0064 A	VoutRipple=10%
30.	LFXP2-17E-5QN208C_VCC	1.2 V	0.044 A	VoutRipple=10%

FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Lattice http://www.latticesemi.com/documents/DS1009.pdf	LFXP2-17E-5QN208C	FPGA_1	LFXP2	FPGA Lattice LFXP2 LFXP2-17E-5QN208C
2.	Texas Instruments http://www.ti.com/lit/ds/symlink/am3359.pdf	AM3357ZCZD27	FPGA_1	Sitara AM335X	FPGA Texas Instruments Sitara AM335X AM3357ZCZD27

Project Diagram



Electrical Procurement BOM

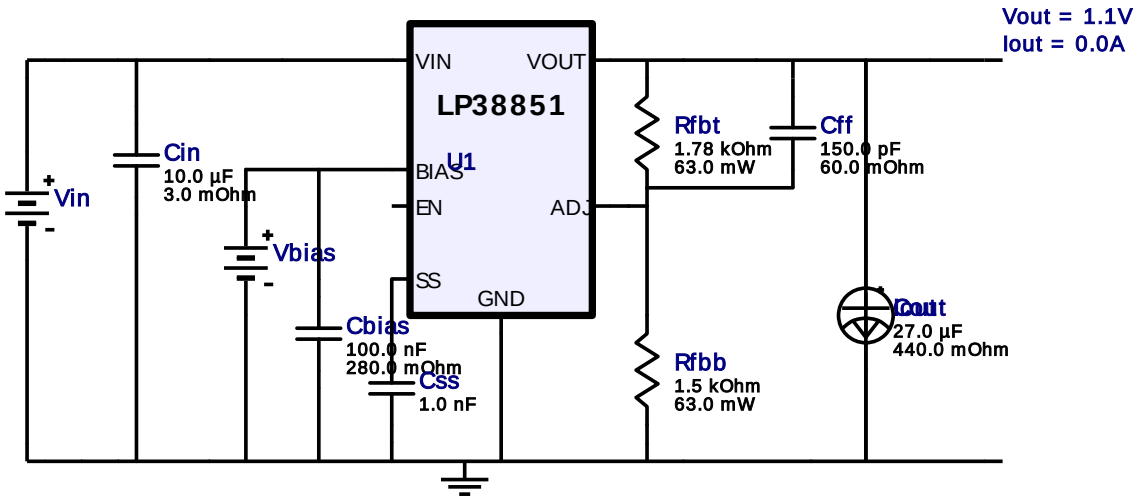
Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
AVX	08053C104KAT2A	0805	2	$0.01	14
Panasonic	2R5TPE220MAFB	CAPSMT_6_B2S	1	$0.50	17
Kemet	C0805C151J5GACTU	0805	1	$0.01	7
TDK	C1005X5R0J105M	0402	9	$0.01	27
TDK	C3216X6S0G476M	1206	1	$0.13	11
Taiyo Yuden	CBC2012T220M	CBC2012	1	$0.08	8
Samsung Electro-Mechanics	CL21C250JBANNNC	0805	1	$0.01	7
Vishay-Dale	CRCW0402100KFKED	0402	8	$0.01	24
Vishay-Dale	CRCW040210K0FKED	0402	1	$0.01	3
Vishay-Dale	CRCW04021K50FKED	0402	1	$0.01	3
Vishay-Dale	CRCW04021K78FKED	0402	1	$0.01	3
Vishay-Dale	CRCW040222K6FKED	0402	1	$0.01	3
Vishay-Dale	CRCW0402255KFKED	0402	1	$0.01	3
MuRata	GRM033R60J103KA01D	0201	1	$0.01	2
MuRata	GRM155R60J103KA01D	0402	1	$0.01	3
MuRata	GRM155R60J104KA01D	0402	1	$0.01	3
MuRata	GRM188R60G106ME47D	0603	1	$0.02	5
MuRata	GRM188R60J106ME47D	0603	1	$0.02	5
MuRata	GRM188R60J475KE19D	0603	3	$0.01	14
MuRata	GRM188R61C225KE15D	0603	1	$0.02	5
MuRata	GRM216R71E102KA01D	0805	1	$0.01	7
MuRata	GRM21BR60J226ME39L	0805	1	$0.04	7
MuRata	GRM32ER61E226KE15L	1210	1	$0.16	15
Taiyo Yuden	JMK212BJ476MG-T	0805	1	$0.14	7
Texas Instruments	LM3674MFX-1.5/NOPB	MF05A	1	$0.32	15
Texas Instruments	LM3880MF-1AE/NOPB	R-PDSO-G6	2	$0.45	19
Texas Instruments	LP2996MRX/NOPB	DDA0008A	1	$0.55	57
Texas Instruments	LP38851MRX-ADJ/NOPB	MRA08B	1	$0.71	56
Texas Instruments	LP5907UVX-1.8/NOPB	UVK04AAA	1	$0.14	3
Texas Instruments	LP5910-1.2YKAR	YKA0004ACAC	1	$0.14	3
Coilcraft	LPS4018-103MRB	LPS4018	1	$0.35	24
TDK	NLCV32T-2R2M-PFR	NLCV32	1	$0.10	13
Yageo America	RC0603FR-0782KL	0603	1	$0.01	5
Texas Instruments	SN74AHC1G08	SOT-23	1	$0.06	14
Texas Instruments	SN74AHC1G32	SOT-23	1	$0.07	14
Bourns	SRN8040-2R2Y	SRN8040	1	$0.22	100
Texas Instruments	TLV71311PDBVR	DBV0005A_N	1	$0.13	15
Taiyo Yuden	TMK212BJ475KG-T	0805	1	$0.05	7
Texas Instruments	TPS563200DDCR	DDC0006A	1	$0.52	10
Texas Instruments	TPS62122DRVR	S-PWSON-N6	1	$0.50	9
Texas Instruments	TPS62177DQCR	R-PWSON-N10	1	$0.60	12
Texas Instruments	TPS73718DCQR	DCQ0006A	1	$0.58	77
Texas Instruments	TPS7A7100RGWR	RGW0020A	1	$0.80	49
Nichicon	UUD1E270MCL1GS	SM_RADIAL_6.3AMM	1	$0.11	80
Total			63	$8.78	782.0323440000001

Vout = 1.1V
Iout = 0.0A

Device = LP38851MRX-ADJ/NOPB
Topology = LDO
Created = 7/25/16 7:29:43 AM
BOM Cost = $0.89
BOM Count = 8
Total Pd = 0.02W

WEBENCH® Design Report

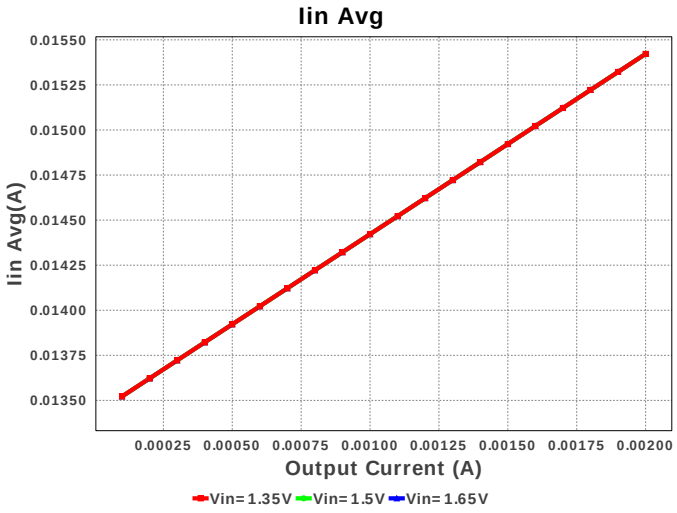
Design : 1194016/2211 LP38851MRX-ADJ/NOPB
LP38851MRX-ADJ/NOPB 1.35V-1.65V to 1.10V @ 0.002A

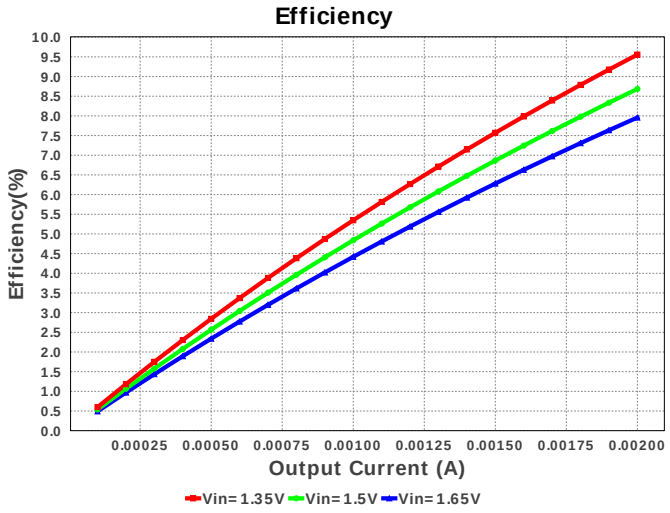


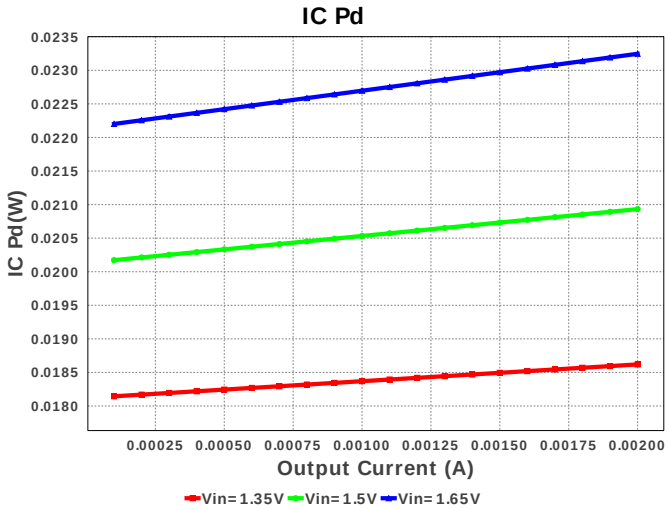
Electrical BOM

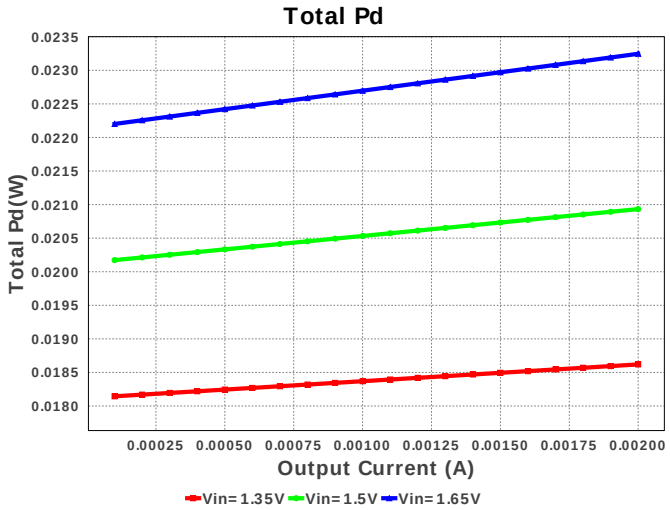
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbias	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cff	Kemet	C0805C151J5GACTU Series= C0G/NP0	Cap= 150.0 pF ESR= 60.0 mOhm VDC= 50.0 V IRMS= 676.0 mA	1	$0.01	0805 7 mm²
3.	Cin	MuRata	GRM188R60G106ME47D Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 4.0 V IRMS= 3.0 A	1	$0.02	0603 5 mm²
4.	Cout	Nichicon	UUD1E270MCL1GS Series= uD	Cap= 27.0 uF ESR= 440.0 mOhm VDC= 25.0 V IRMS= 230.0 mA	1	$0.11	SM_RADIAL_6.3AMM 80 mm²
5.	Css	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
6.	Rfbb	Vishay-Dale	CRCW04021K50FKED Series= CRCW..e3	Res= 1.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	Rfbt	Vishay-Dale	CRCW04021K78FKED Series= CRCW..e3	Res= 1.78 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

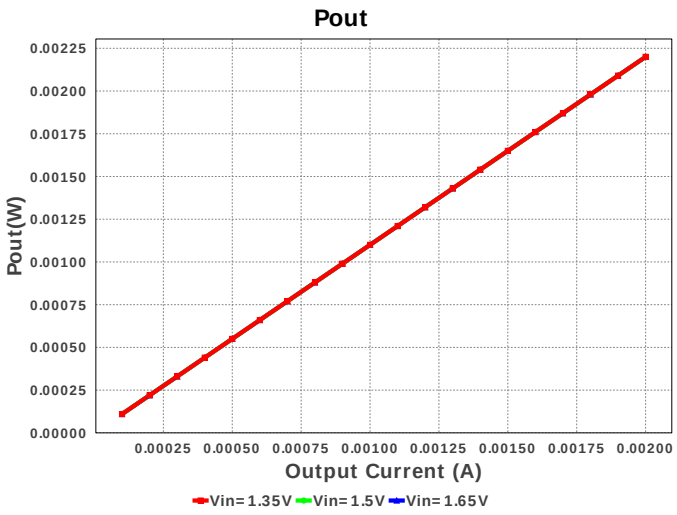
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	U1	Texas Instruments	LP38851MRX-ADJ/NOPB	Switcher	1	$0.71	 MRA08B 56 mm^2

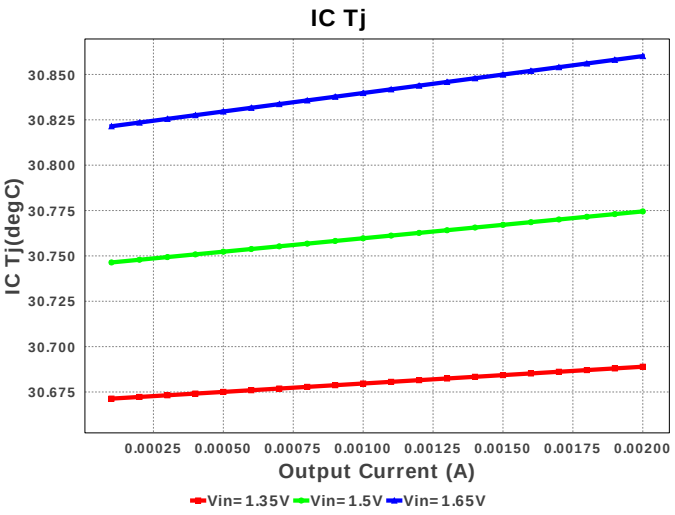


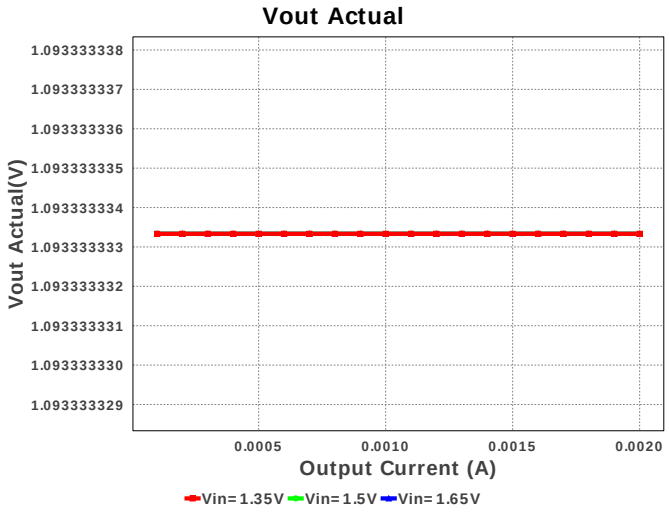


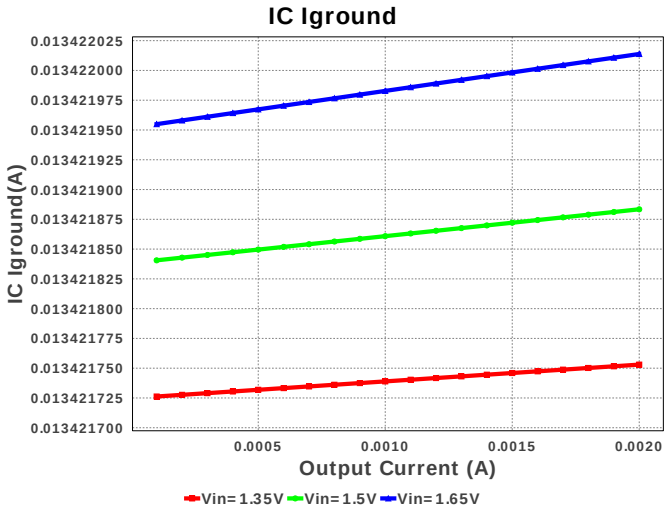


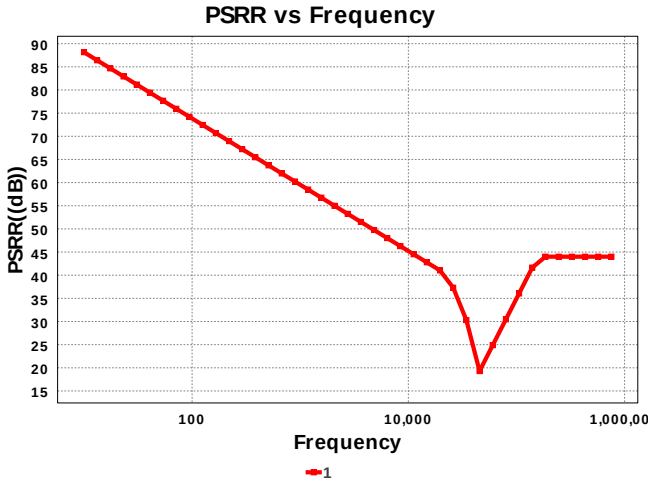












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	13.424 mA	Current	IC ground current
2.	Iin Avg	15.424 mA	Current	Average input current
3.	BOM Count	8	General	Total Design BOM count
4.	FootPrint	166.0 mm^2	General	Total Foot Print Area of BOM components
5.	IC Tolerance	15.0 mV	General	IC Feedback Tolerance
6.	Pout	2.2 mW	General	Total output power
7.	Total BOM	$0.89	General	Total BOM Cost
8.	Vin p-p	1.911 mV	Op_Point	Input Source ripple voltage
9.	Vout Actual	1.093 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
10.	Vout OP	1.1 V	Op_Point	Operational Output Voltage
11.	Efficiency	7.957 %	Op_point	Steady state efficiency

#	Name	Value	Category	Description
12.	IC Tj	32.278 degC	Op_point	IC junction temperature
13.	ICThetaJA	98.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	2.0 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	2.0 MHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-44.0 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	1.65 V	Op_point	Vin operating point
18.	Vout p-p	112.06 µV	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	23.25 mW	Power	IC power dissipation
20.	Total Pd	23.25 mW	Power	Total Power Dissipation
21.	Vout Tolerance	4.129 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 m	Maximum Output Current
2.	VinMax	1.65	Maximum input voltage
3.	VinMin	1.35	Minimum input voltage
4.	Vout	1.1	Output Voltage
5.	base_pn	LP38851	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

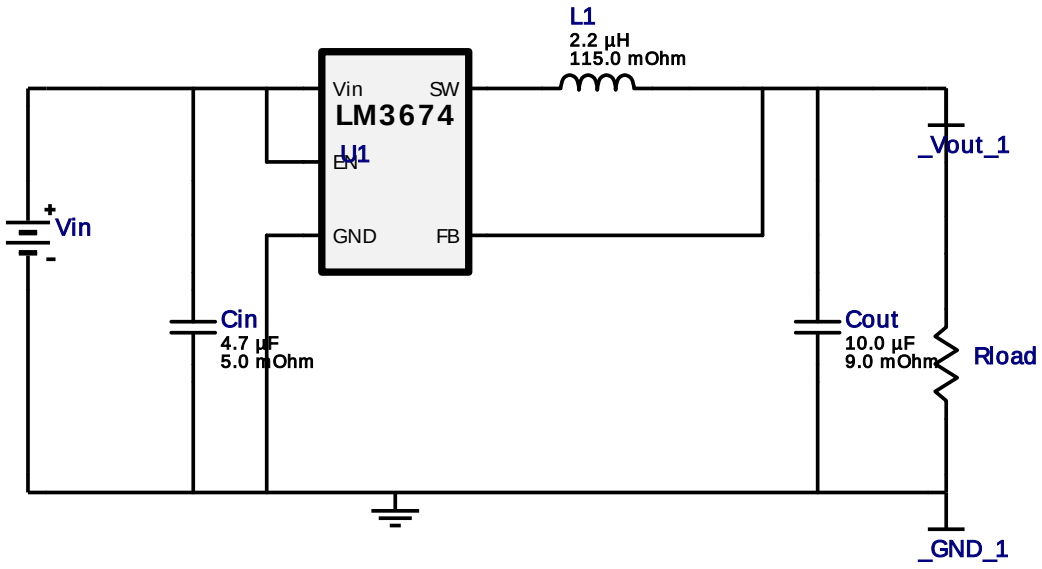
1. **LP38851** Product Folder : http://www.ti.com/product/lp38851 : contains the data sheet and other resources.

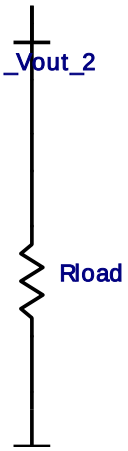
WEBENCH® Design Report

Vout = 1.5V
Iout = 0.22A

Device = LM3674MFX-1.5/NOPB
Topology = Buck
Created = 7/25/16 7:29:43 AM
BOM Cost = $0.45
BOM Count = 4
Total Pd = 0.03W

Design : 1194016/2212 LM3674MFX-1.5/NOPB
LM3674MFX-1.5/NOPB 2.97V-3.63V to 1.50V @ 0.21542A

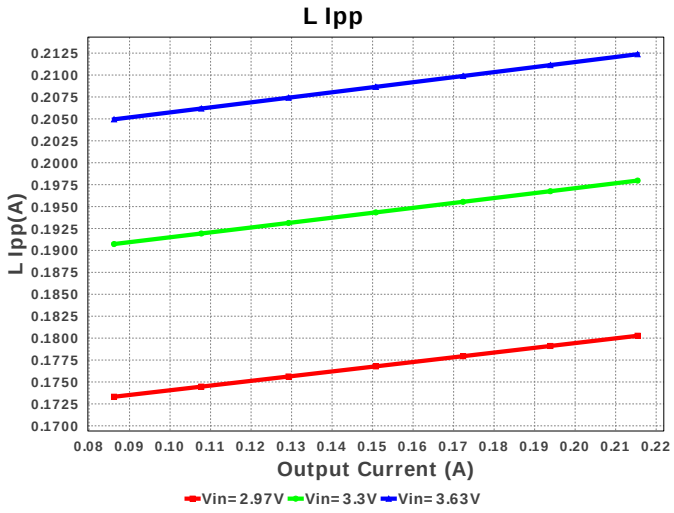


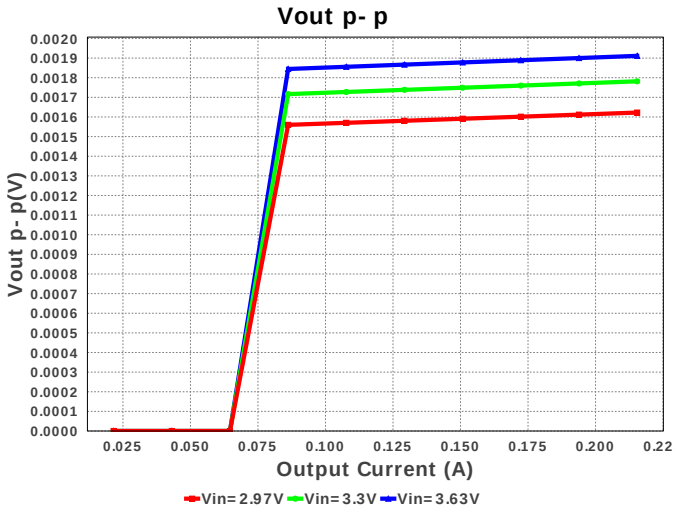


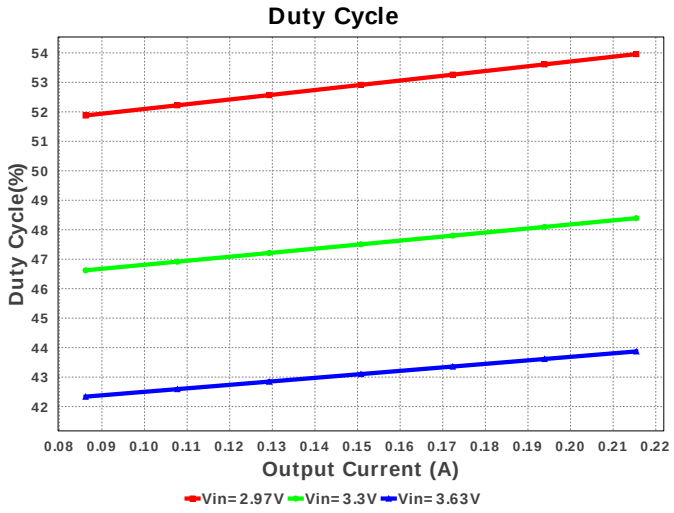
Electrical BOM

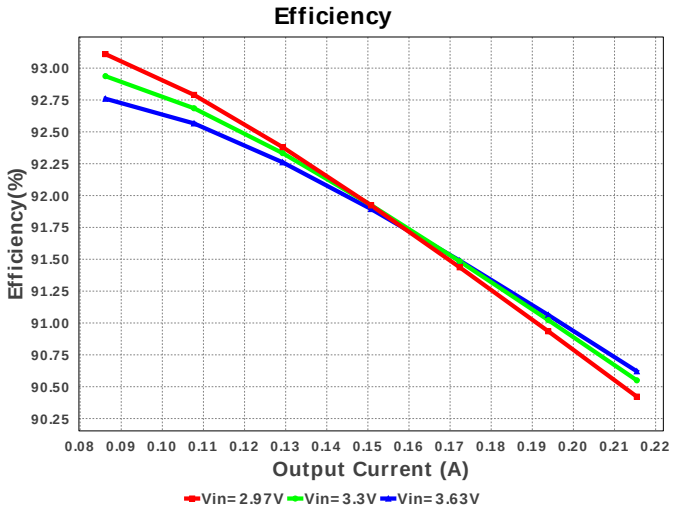
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm²
2.	Cout	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	1	$0.02	0603 5 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
3.	L1	TDK	NLCV32T-2R2M-PFR	L= 2.2 µH DCR= 115.0 mOhm	1	$0.10	NLCV32 13 mm²
4.	U1	Texas Instruments	LM3674MFX-1.5/NOPB	Switcher	1	$0.32	MF05A 15 mm²

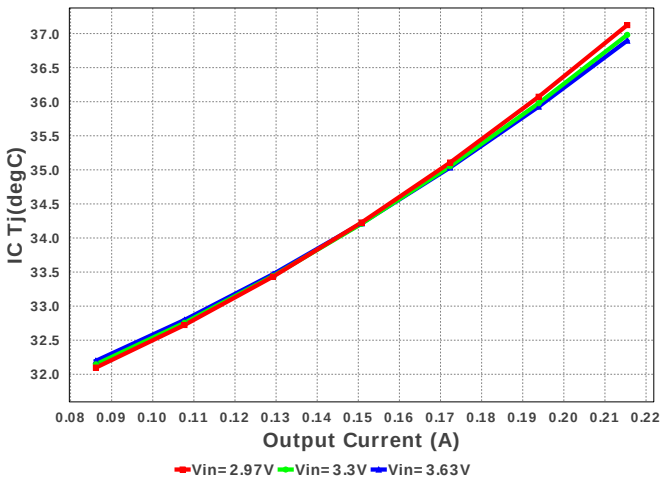




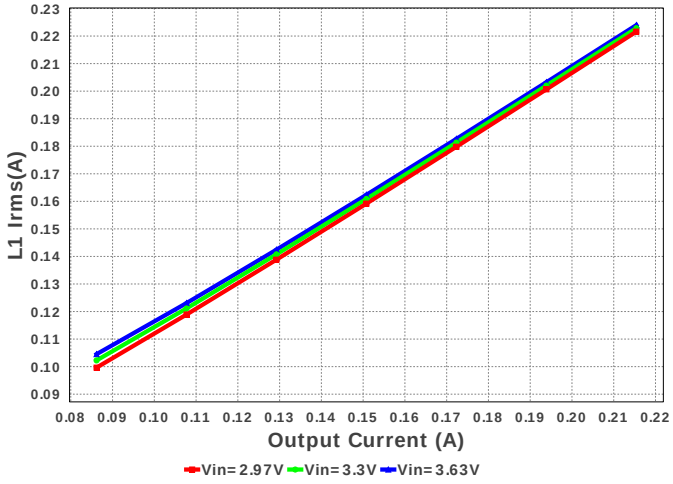




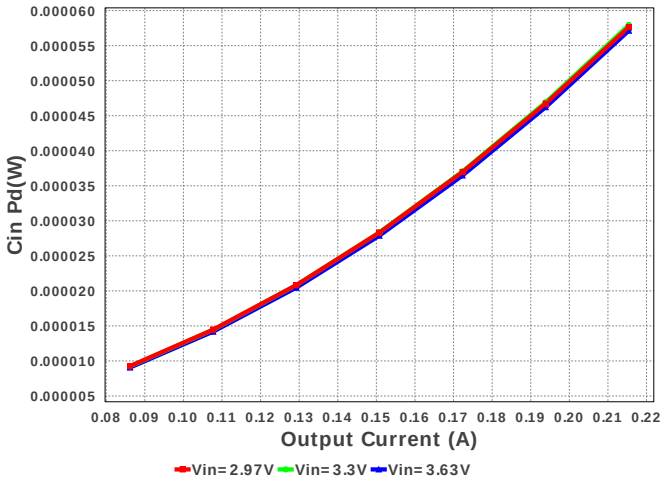
IC Tj



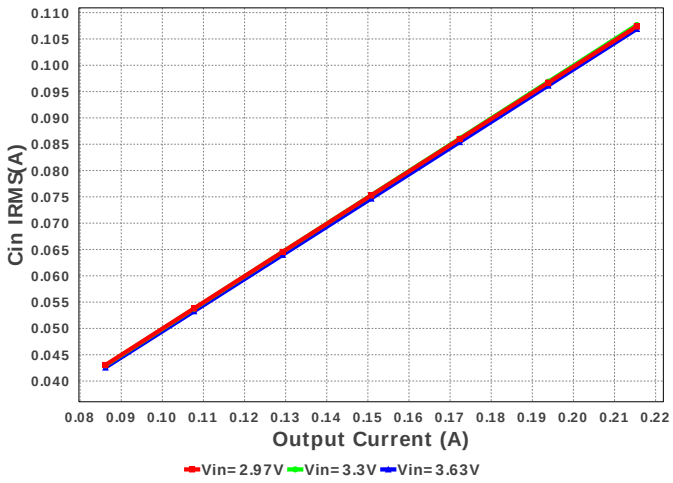
L1 Irms



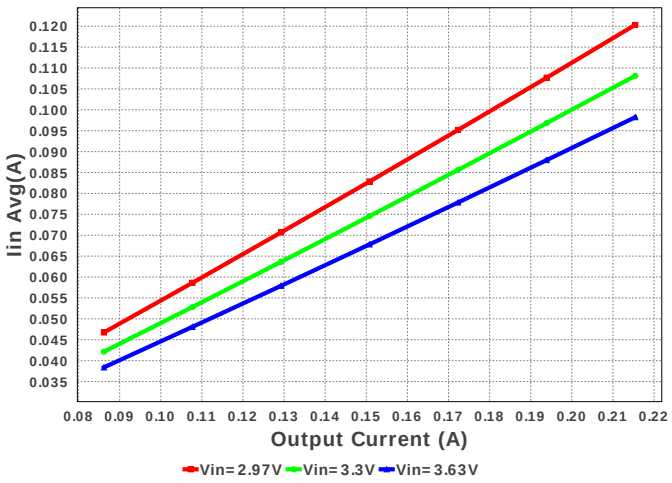
Cin Pd



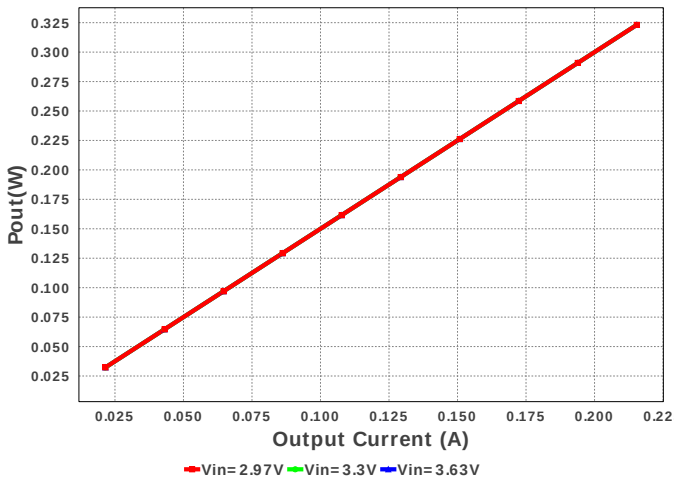
Cin IRMS

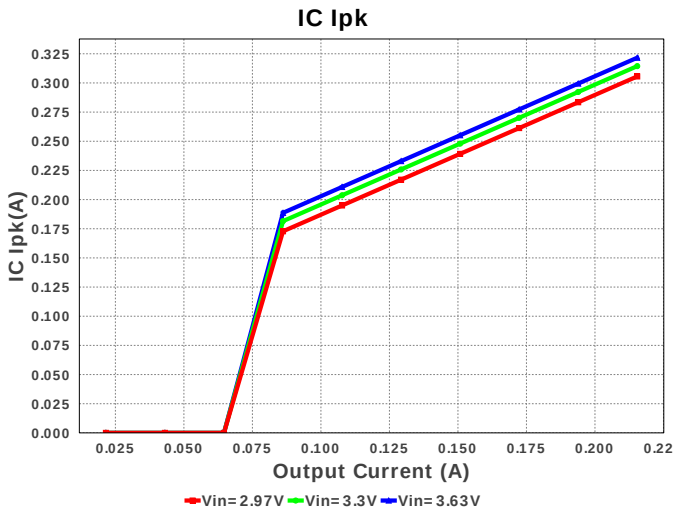


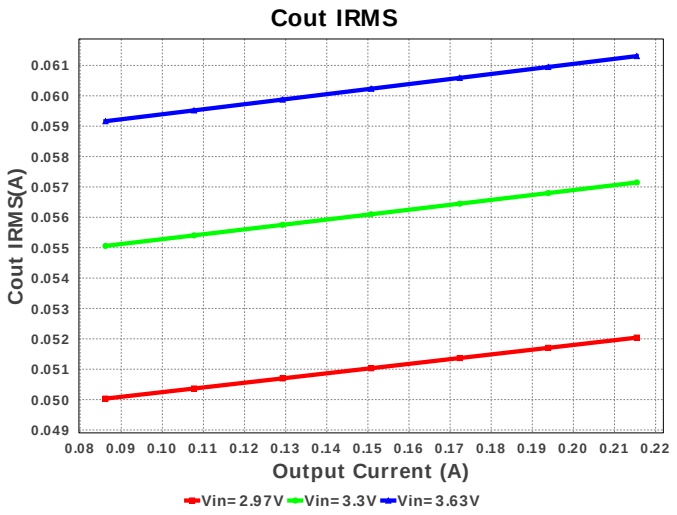
Iin Avg

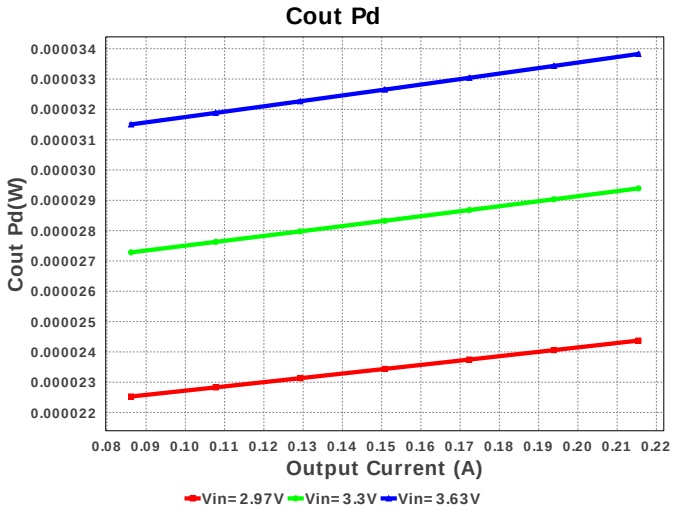


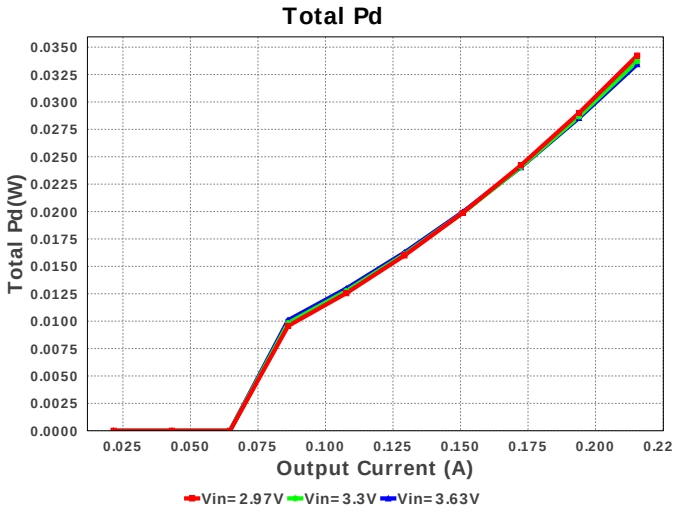
Pout

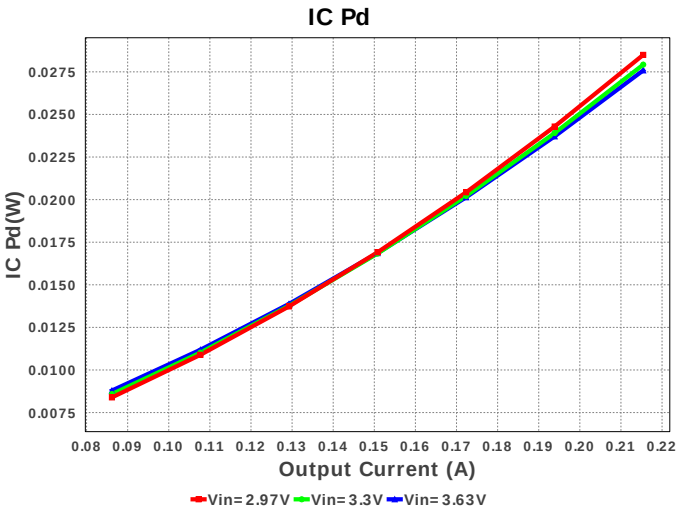


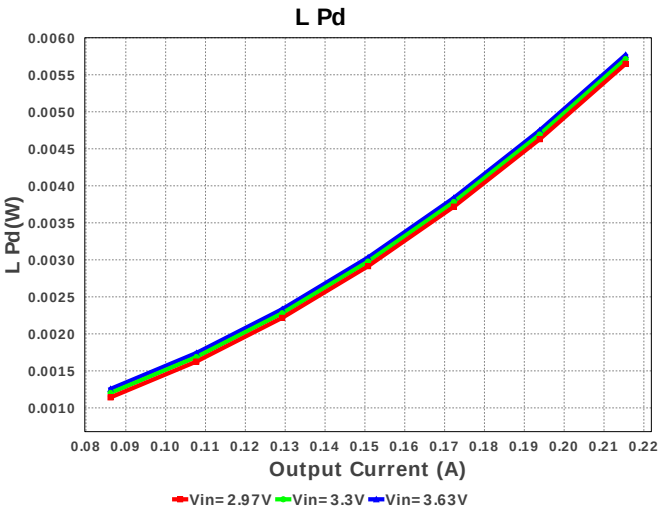












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	106.898 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	61.307 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	321.607 mA	Current	Peak switch current in IC
4.	Iin Avg	98.23 mA	Current	Average input current
5.	L Ipp	212.37 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	223.974 mA	Current	Inductor ripple current
7.	BOM Count	4	General	Total Design BOM count
8.	FootPrint	38.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	2.0 MHz	General	Switching frequency
10.	IC Tolerance	0.0 V	General	IC Feedback Tolerance
11.	Pout	323.13 mW	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	$0.45	General	Total BOM Cost
13.	Duty Cycle	43.871 %	Op_point	Duty cycle
14.	Efficiency	90.621 %	Op_point	Steady state efficiency
15.	IC Tj	36.896 degC	Op_point	IC junction temperature
16.	ICThetaJA	250.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	215.42 mA	Op_point	Iout operating point
18.	VIN_OP	3.63 V	Op_point	Vin operating point
19.	Vout p-p	1.911 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	57.135 µW	Power	Input capacitor power dissipation
21.	Cout Pd	33.827 µW	Power	Output capacitor power dissipation
22.	IC Pd	27.585 mW	Power	IC power dissipation
23.	L Pd	5.769 mW	Power	Inductor power dissipation
24.	Total Pd	33.443 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	215.42 m	Maximum Output Current
2.	VinMax	3.63	Maximum input voltage
3.	VinMin	2.97	Minimum input voltage
4.	Vout	1.5	Output Voltage
5.	base_pn	LM3674	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM3674** Product Folder : http://www.ti.com/product/LM3674 : contains the data sheet and other resources.

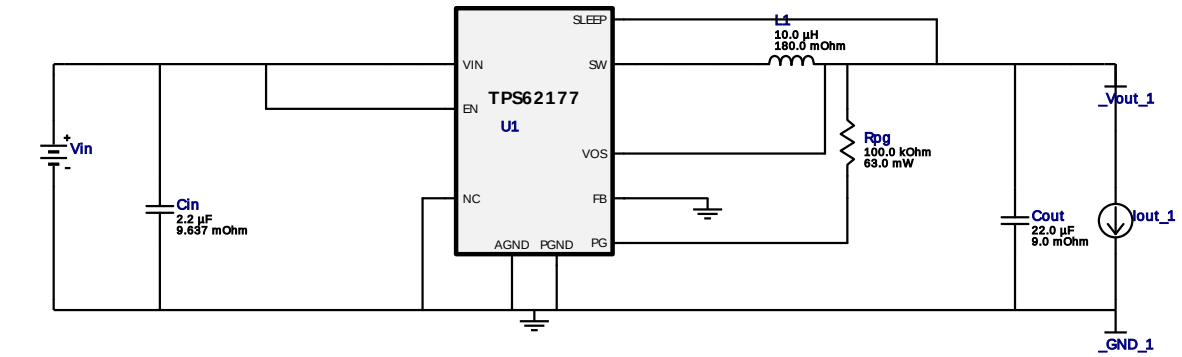
TEXAS INSTRUMENTS

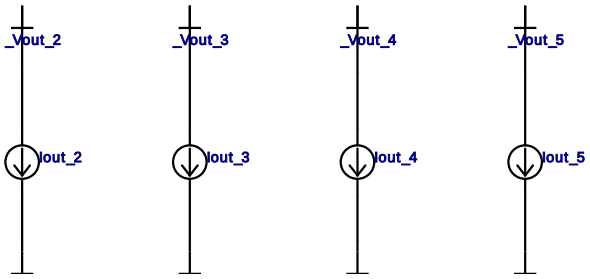
WEBENCH® Design Report

Vout = 3.3V
Iout = 0.29A

Device = TPS62177DQCR
Topology = Buck
Created = 7/25/16 7:29:44 AM
BOM Cost = $1.02
BOM Count = 5
Total Pd = 0.15W

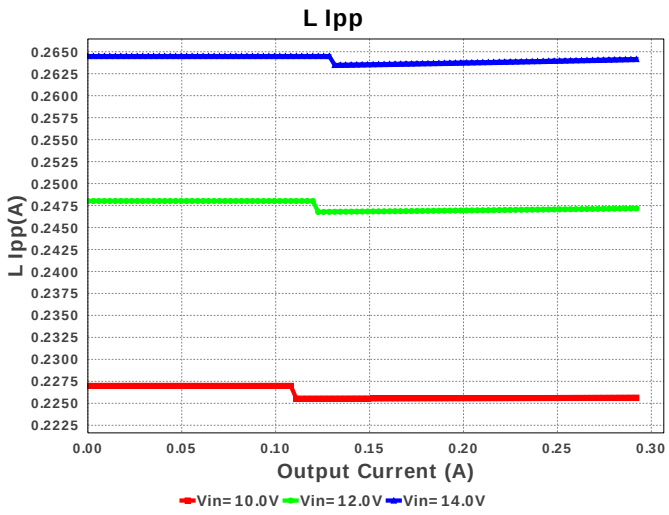
Design : 1194016/2213 TPS62177DQCR
TPS62177DQCR 10.0V-14.0V to 3.30V @ 0.29203A

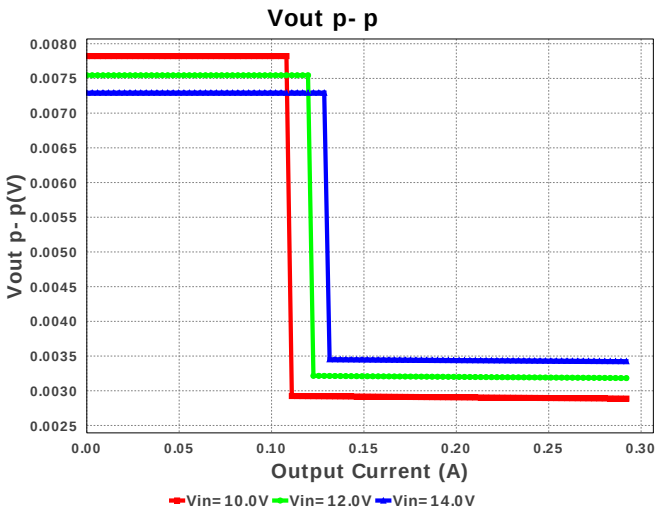


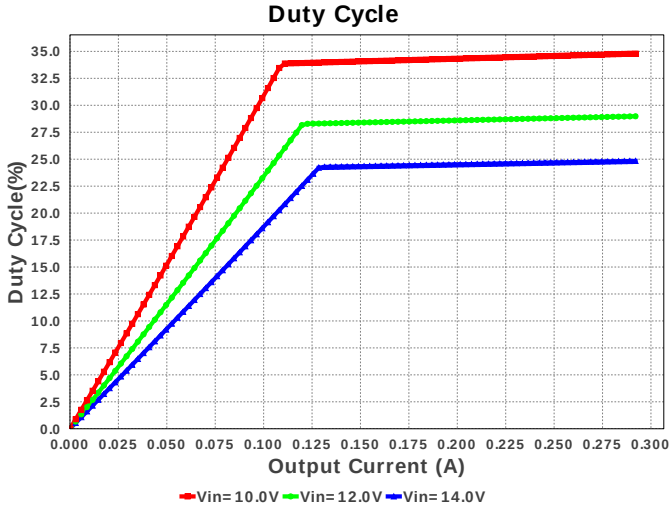


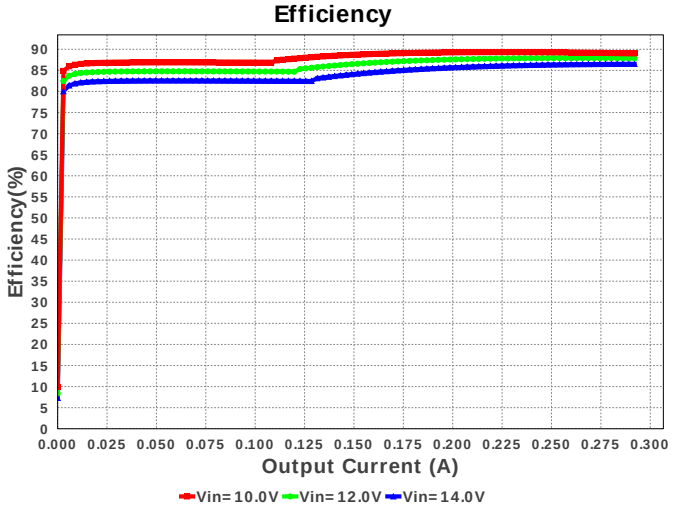
Electrical BOM

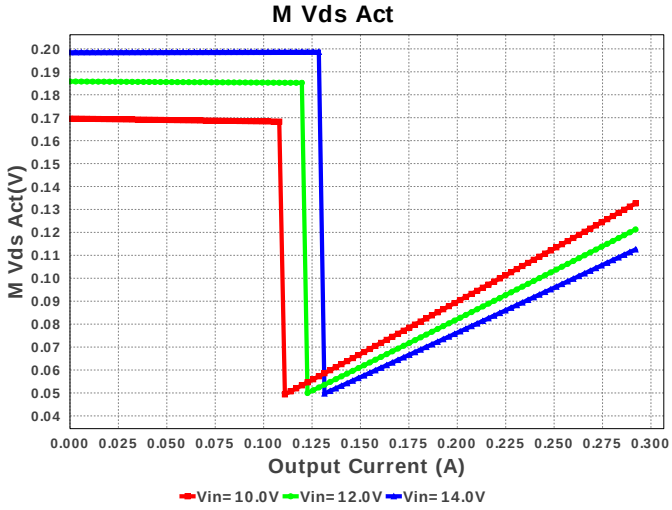
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	$0.02	0603 5 mm²
2.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	$0.04	0805 7 mm²
3.	L1	Coilcraft	LPS4018-103MRB	L= 10.0 µH DCR= 180.0 mOhm	1	$0.35	LPS4018 24 mm²
4.	Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
5.	U1	Texas Instruments	TPS62177DQCR	Switcher	1	$0.60	R-PWSON-N10 12 mm²

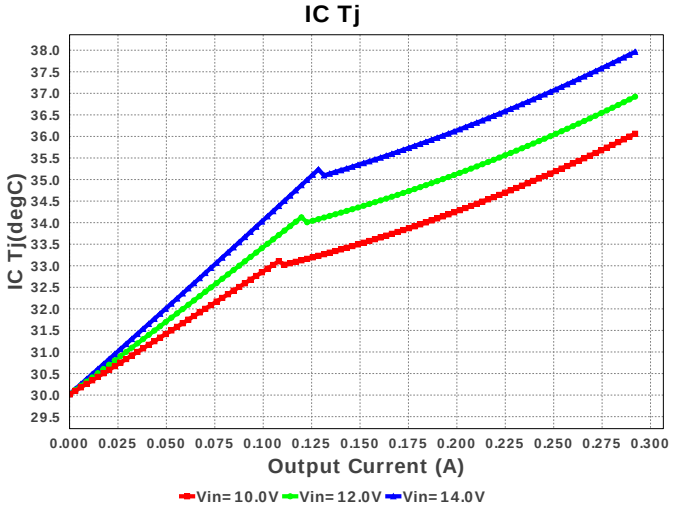




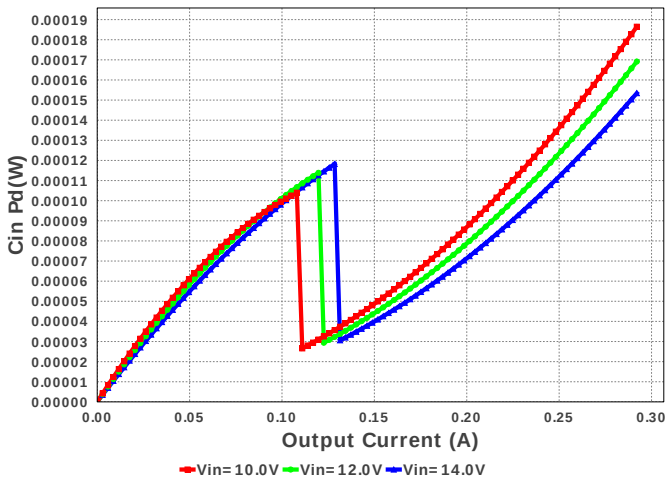




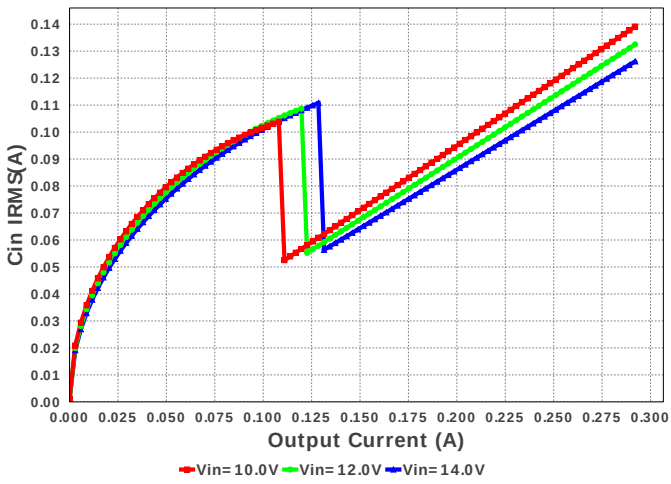




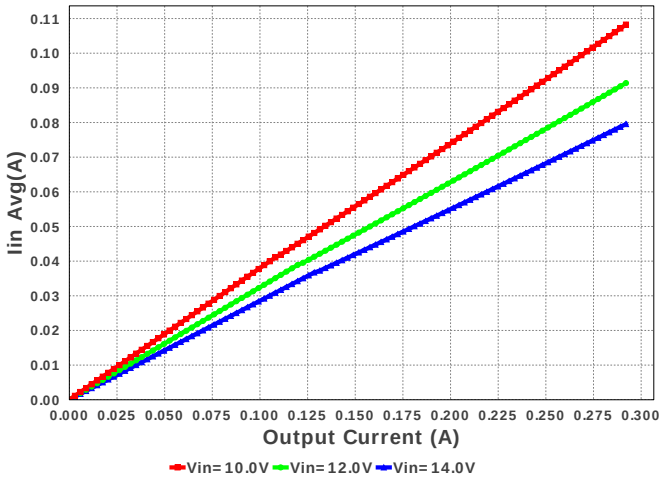
Cin Pd



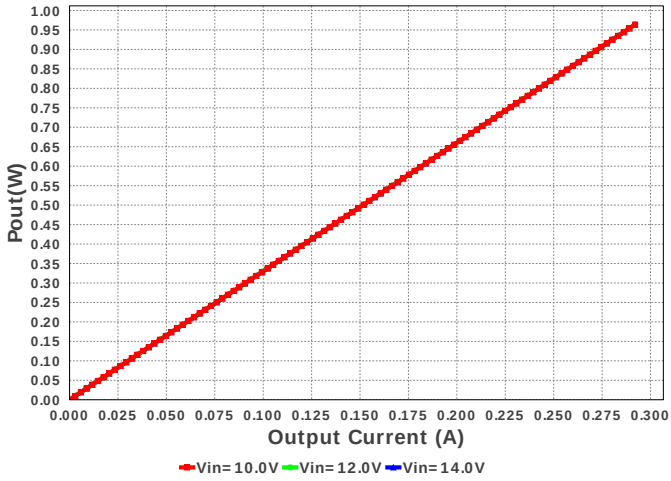
Cin IRMS



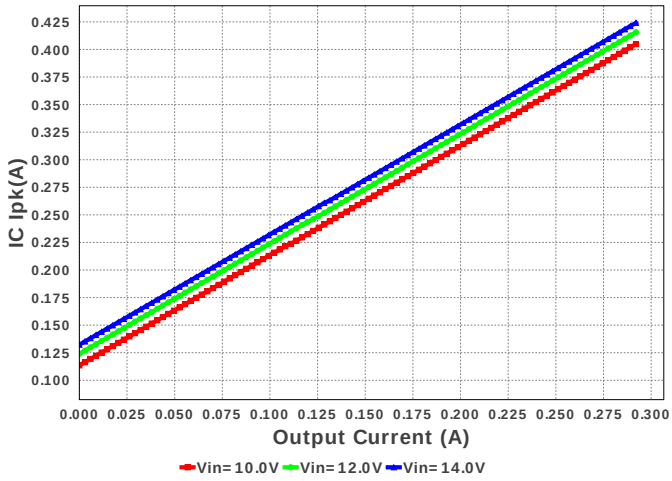
Iin Avg



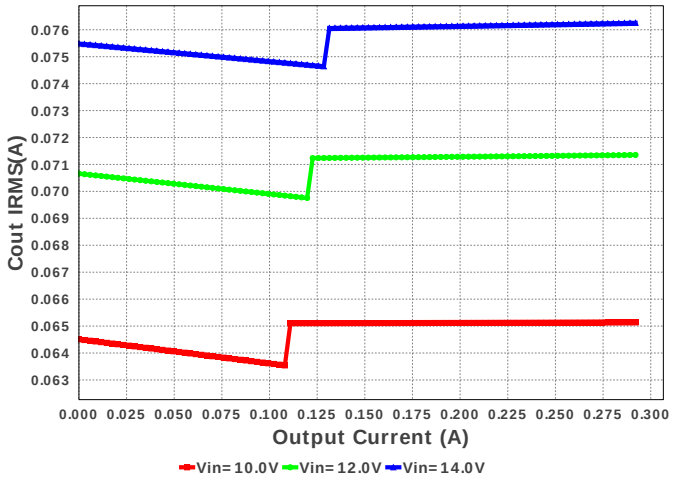
Pout

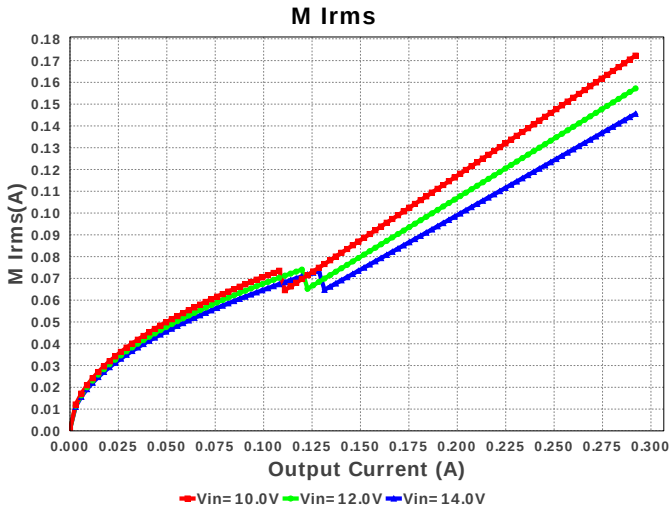


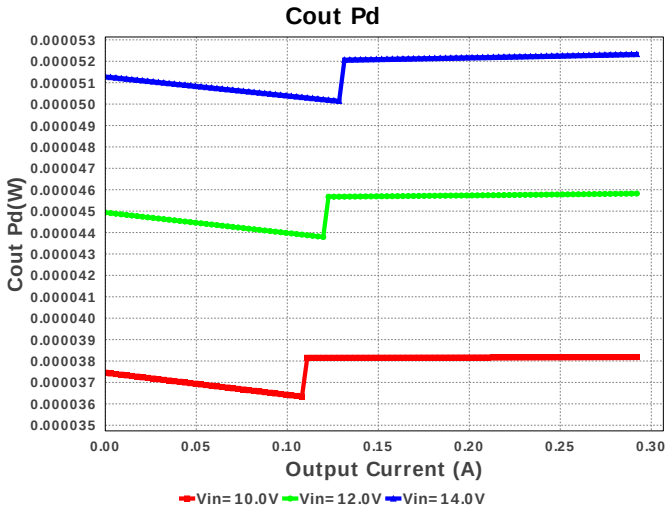
IC Ipk

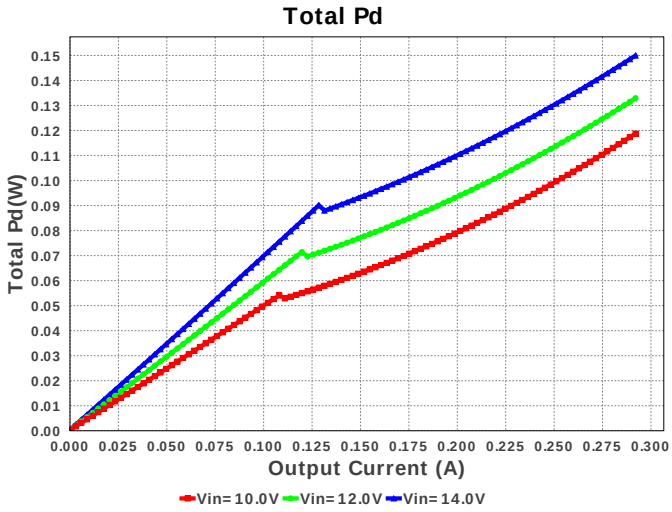


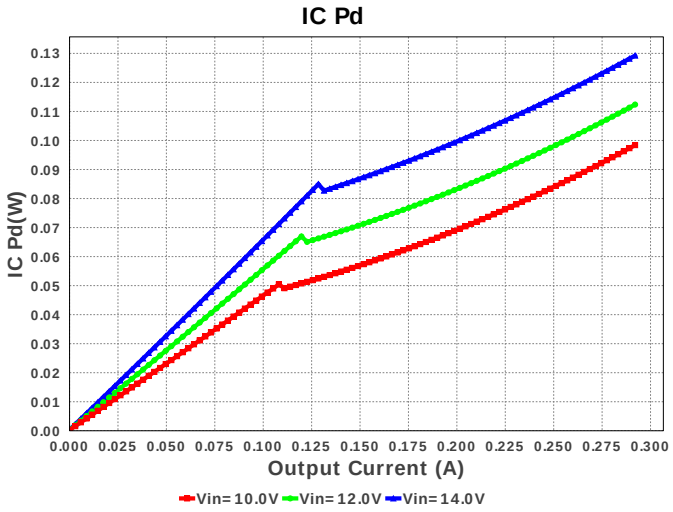
Cout IRMS

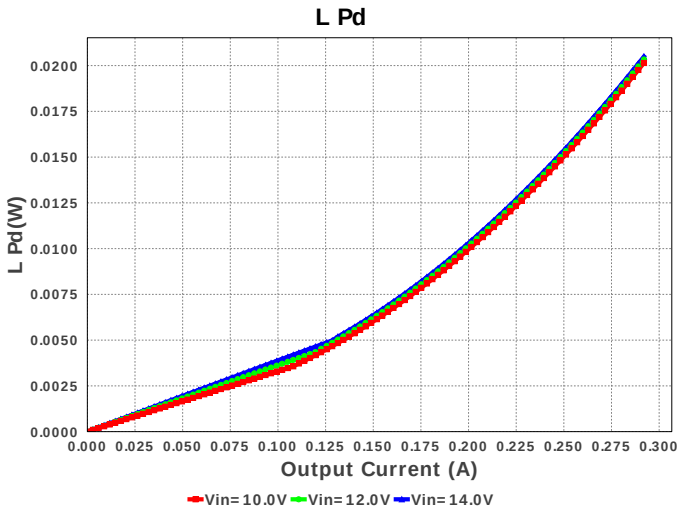


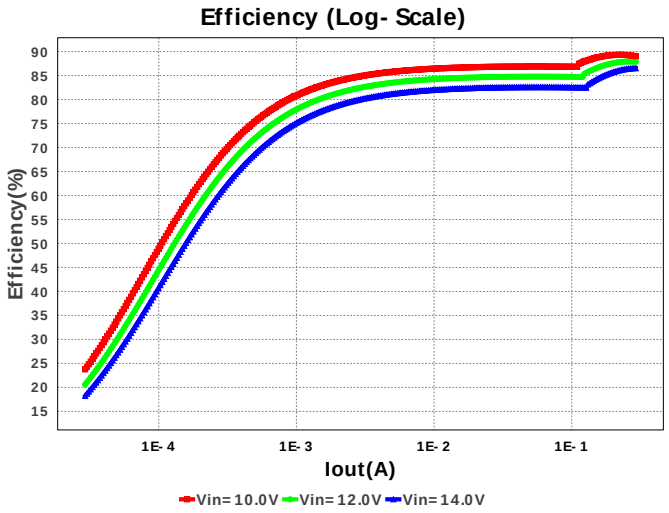












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	126.182 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	76.256 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	424.109 mA	Current	Peak switch current in IC
4.	Iin Avg	79.546 mA	Current	Average input current
5.	L Ipp	264.16 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	145.547 mA	Current	Q Iavg
7.	BOM Count	5	General	Total Design BOM count
8.	FootPrint	50.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.006 MHz	General	Switching frequency
10.	IC Tolerance	24.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	112.556 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	963.699 mW	General	Total output power
13.	Total BOM	$1.02	General	Total BOM Cost
14.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	24.84 %	Op_point	Duty cycle
16.	Efficiency	86.535 %	Op_point	Steady state efficiency
17.	IC Tj	37.962 degC	Op_point	IC junction temperature
18.	ICThetaJA	61.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	292.03 mA	Op_point	Iout operating point
20.	VIN_OP	14.0 V	Op_point	Vin operating point
21.	Vout p-p	3.426 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	153.439 µW	Power	Input capacitor power dissipation
23.	Cout Pd	52.335 µW	Power	Output capacitor power dissipation
24.	IC Pd	129.248 mW	Power	IC power dissipation
25.	L Pd	20.497 mW	Power	Inductor power dissipation
26.	Total Pd	149.952 mW	Power	Total Power Dissipation
27.	Vout Tolerance	727.273 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	292.03 m	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS62177	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS62177** Product Folder : http://www.ti.com/product/TPS62177 : contains the data sheet and other resources.

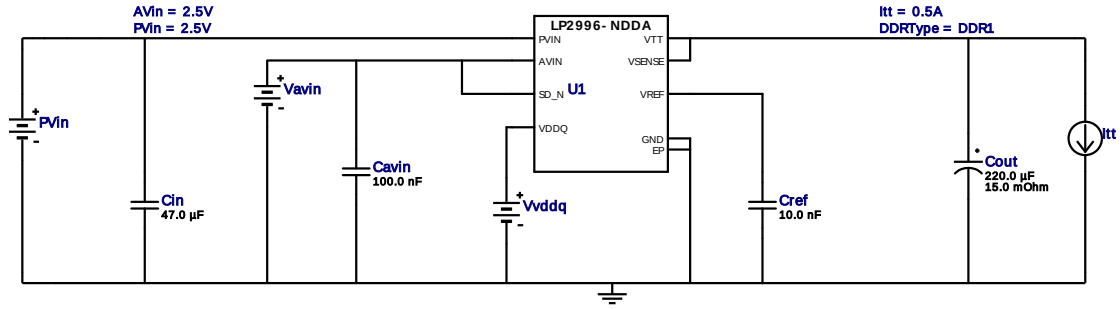
TEXAS INSTRUMENTS

WEBENCH® Design Report

DDRType = DDR1
PVin = 2.5V
AVin = 2.5V
Itt = 0.5A
Ta = 30.0degC

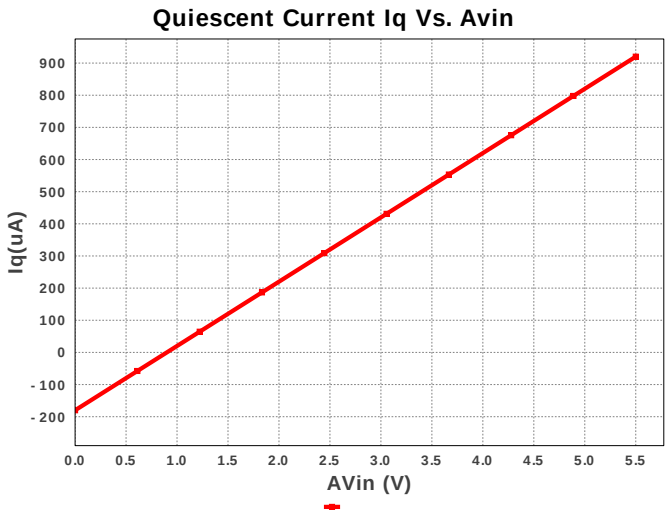
Device = LP2996MRX/NOPB
Topology = DDRLDO
Created = 7/25/16 7:29:45 AM
BOM Cost = $1.21
BOM Count = 5
Total Pd = 0.63W

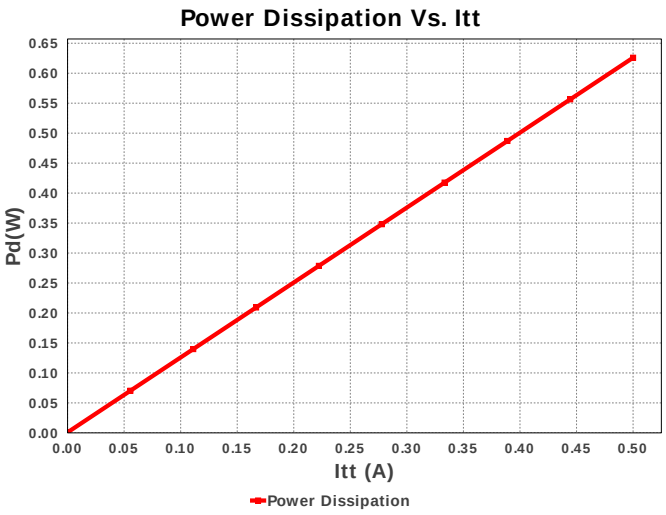
Design : 1194016/2214 LP2996MRX/NOPB
Design 2214 - LP2996MRX/NOPB

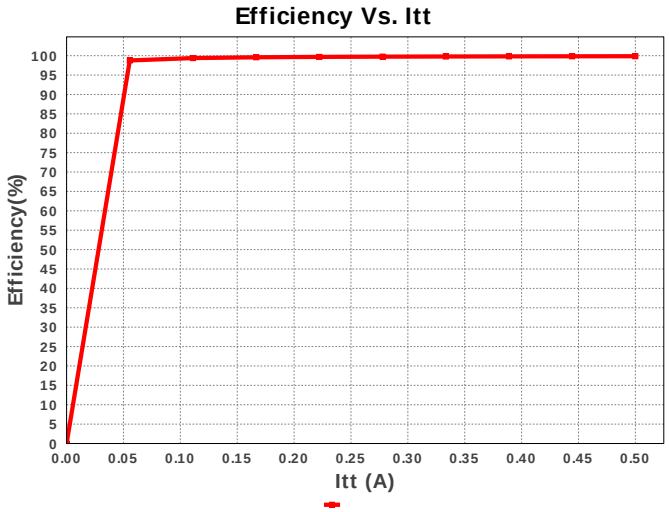


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cavin	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
2.	Cin	Taiyo Yuden	JMK212BJ476MG-T Series= X5R	Cap= 47.0 uF VDC= 6.3 V IRMS= 0.0 A	1	$0.14	0805 7 mm^2
3.	Cout	Panasonic	2R5TPE220MAFB Series= ?	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 2.5 V IRMS= 2.0 A	1	$0.50	CAPSMT_6_B2S 17 mm^2
4.	Cref	MuRata	GRM155R60J103KA01D Series= X5R	Cap= 10.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
5.	U1	Texas Instruments	LP2996MRX/NOPB	Switcher	1	$0.55	DDA0008A 57 mm^2







Operating Values

#	Name	Value	Category	Description
1.	BOM Count	5	General	Total Design BOM count
2.	FootPrint	87.0 mm^2	General	Total Foot Print Area of BOM components
3.	Total BOM	$1.21	General	Total BOM Cost
4.	AVin_OP	2.5 V	Op_Point	Pvin operating point
5.	Itt_OP	500.0 mA	Op_Point	Itt Operating Point
6.	PVin_OP	2.5 V	Op_Point	Pvin operating point
7.	Ta_OP	30.0 degC	Op_Point	Operating Ambient Temperature
8.	Vddq_OP	2.5 V	Op_Point	Vddq operating point
9.	Vtt_OP	1.25 V	Op_Point	Vtt operating point
10.	Efficiency	99.862 %	Op_point	Steady state efficiency
11.	IC Tj	56.912 degC	Op_point	IC junction temperature
12.	ICThetaJA	43.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
13.	Total Pd	625.862 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	AVin	2.5 A	AVin
2.	DDRType	DDR1	DDRType
3.	Itt	500.0 mA	Itt
4.	PVin	2.5 A	PVin
5.	application	DDRPower	application
6.	base_pn	LP2996-N	Base Product Number
7.	Ta	30.0 A	Ambient temperature

Design Assistance

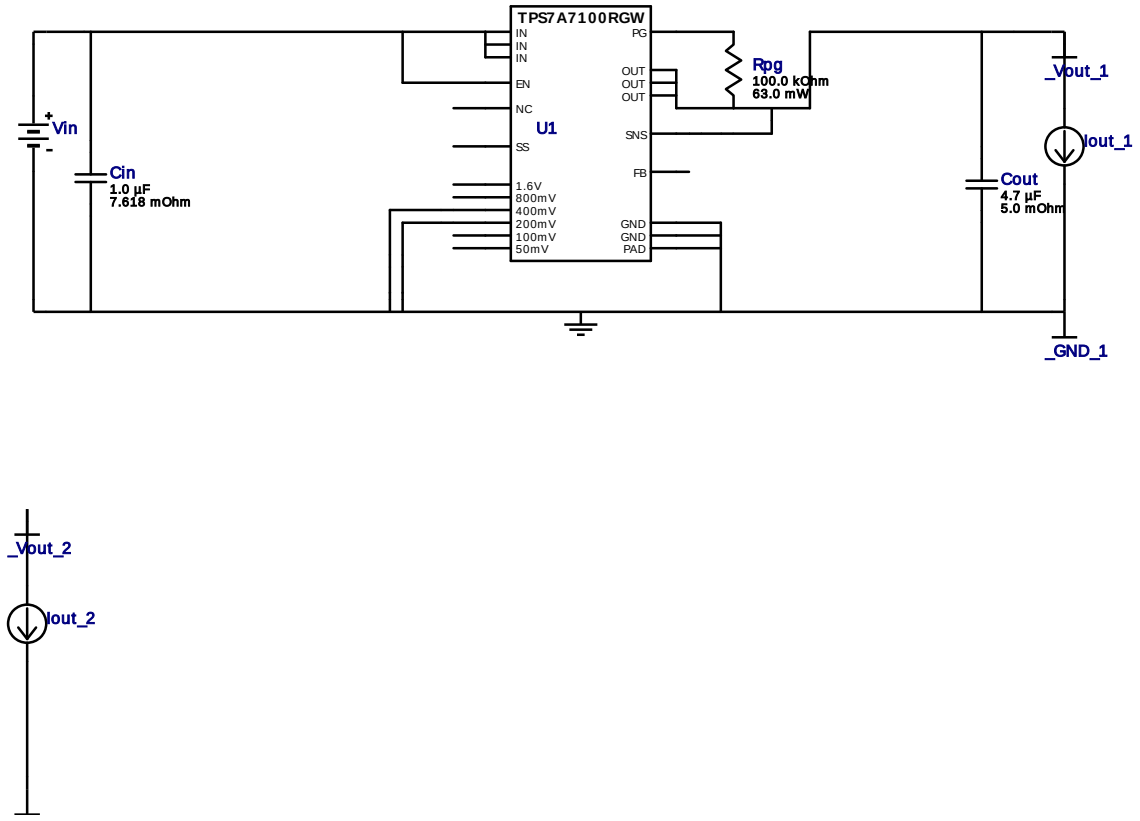
1. **LP2996-N** Product Folder : http://www.ti.com/product/lp2996-n/description : contains the data sheet and other resources.

WEBENCH® Design Report

Vout = 1.1V
Iout = 0.9A

Device = TPS7A7100RGWR
Topology = LDO
Created = 7/25/16 7:29:45 AM
BOM Cost = $0.83
BOM Count = 4
Total Pd = 1.49W

Design : 1194016/2215 TPS7A7100RGWR
TPS7A7100RGWR 2.25V-2.75V to 1.10V @ 0.9A

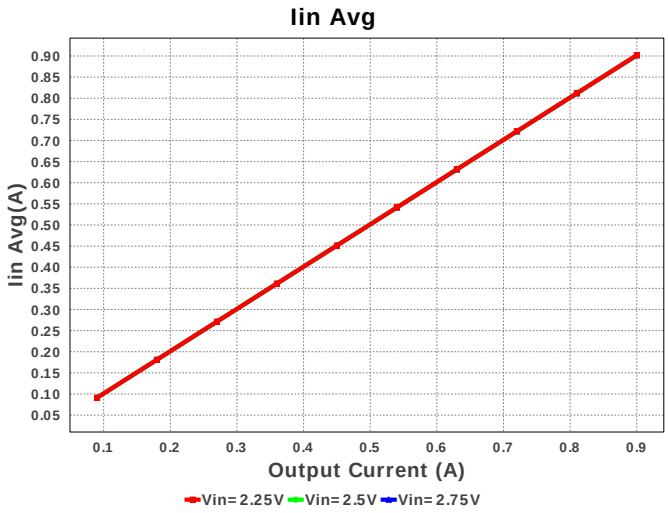


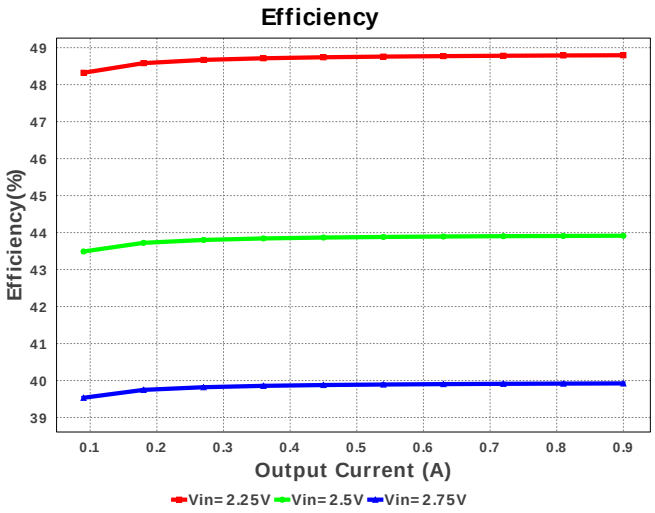
1. Soft start time is modeled in the circuit calculator but not in simulation.

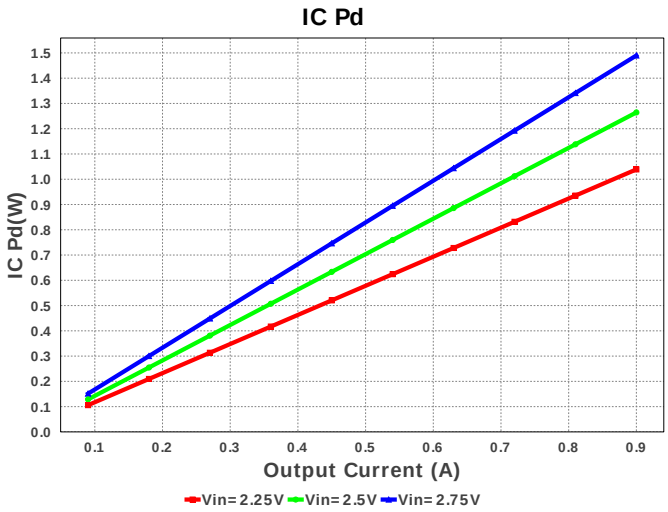
Electrical BOM

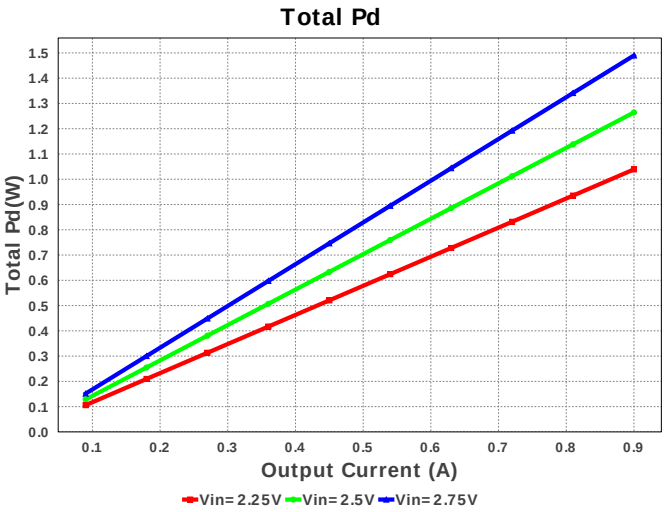
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Cout	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm²
3.	Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

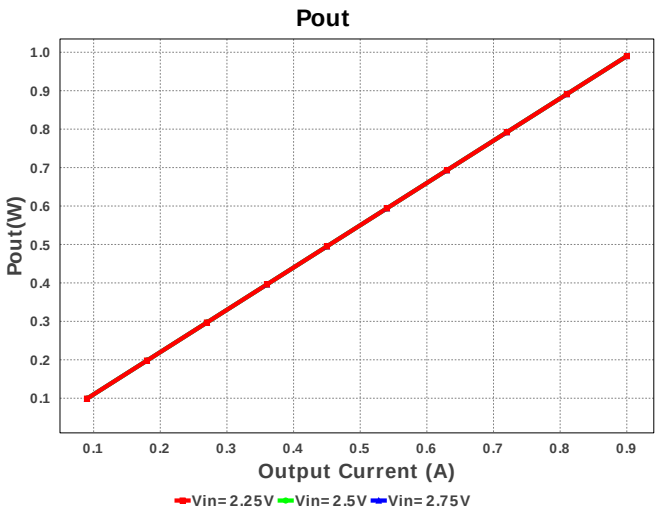
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
4.	U1	Texas Instruments	TPS7A7100RGWR	Switcher	1	$0.80	 RGW0020A 49 mm^2

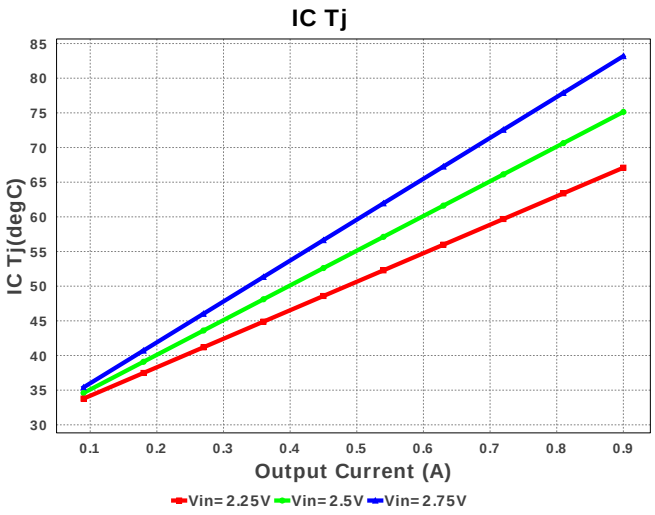


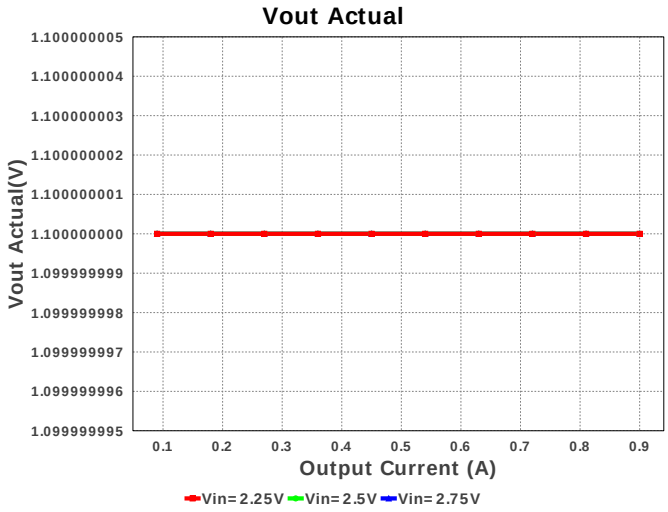


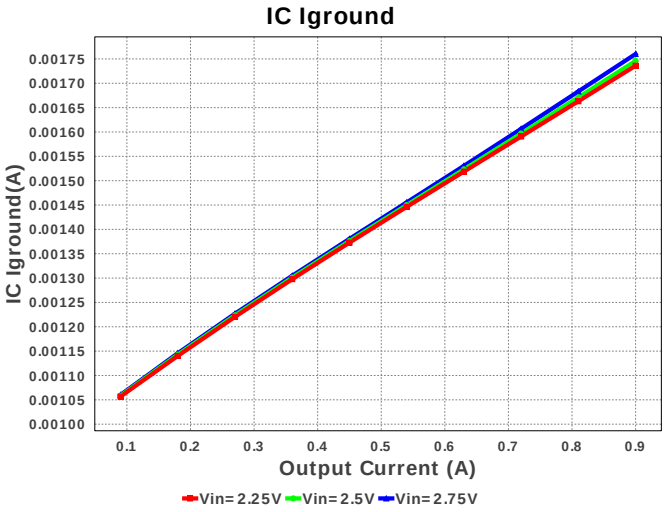


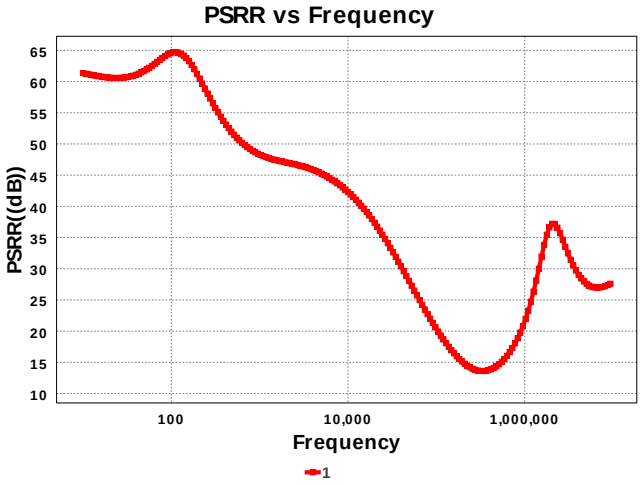












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	1.76 mA	Current	IC ground current
2.	Iin Avg	901.76 mA	Current	Average input current
3.	BOM Count	4	General	Total Design BOM count
4.	FootPrint	60.0 mm^2	General	Total Foot Print Area of BOM components
5.	IC Tolerance	15.0 mV	General	IC Feedback Tolerance
6.	Output Noise RMS	39.044 µV	General	Noise RMS
7.	Pout	990.0 mW	General	Total output power
8.	Softstart Time	700.0 µs	General	Softstart Time (Calculated)
9.	Total BOM	$0.83	General	Total BOM Cost
10.	Vin p-p	5.894 mV	Op_Point	Input Source ripple voltage
11.	Vout Actual	1.1 V	Op_Point	Closest output voltage selected

#	Name	Value	Category	Description
12.	Vout OP	1.1 V	Op_Point	Operational Output Voltage
13.	Efficiency	39.922 %	Op_point	Steady state efficiency
14.	IC Tj	83.187 degC	Op_point	IC junction temperature
15.	ICThetaJA	35.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	900.0 mA	Op_point	Iout operating point
17.	Input Ripple Frequency	764.098 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
18.	PSRR est.	-17.852 dB	Op_point	Power Supply Rejection Ratio estimated
19.	VIN_OP	2.75 V	Op_point	Vin operating point
20.	Vout p-p	754.811 µV	Op_point	Peak-to-peak output ripple voltage
21.	IC Pd	1.49 W	Power	IC power dissipation
22.	Total Pd	1.49 W	Power	Total Power Dissipation
23.	Vout Tolerance	1.364 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	900.0 m	Maximum Output Current
2.	VinMax	2.75	Maximum input voltage
3.	VinMin	2.25	Minimum input voltage
4.	Vout	1.1	Output Voltage
5.	base_pn	TPS7A7100	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1.

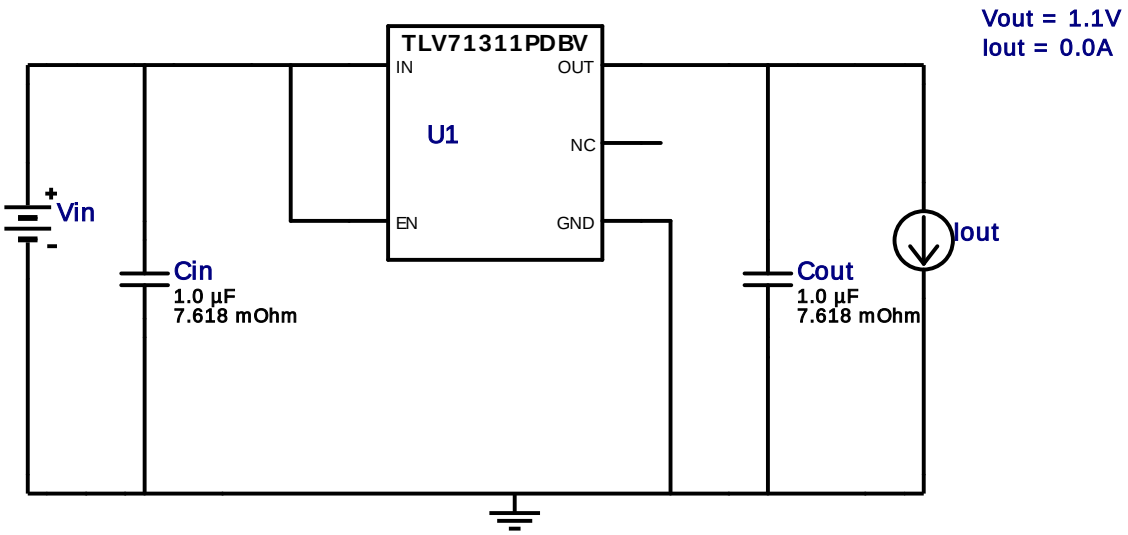
2. **TPS7A7100** Product Folder : http://www.ti.com/product/TPS7A7100 : contains the data sheet and other resources.

WEBENCH® Design Report

Vout = 1.1V
Iout = 0.0A

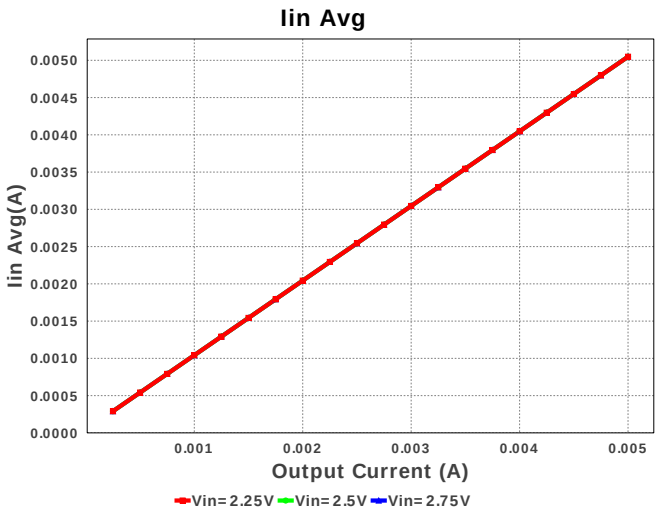
Device = TLV71311PDBVR
Topology = LDO
Created = 7/25/16 7:29:45 AM
BOM Cost = $0.15
BOM Count = 3
Total Pd = 0.01W

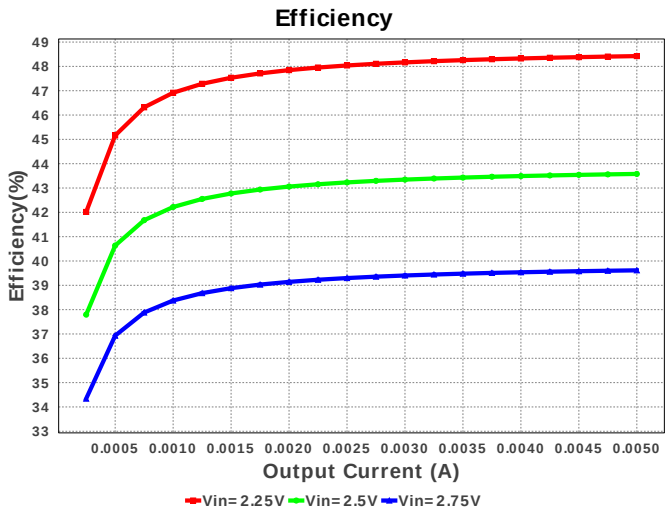
Design : 1194016/2216 TLV71311PDBVR
TLV71311PDBVR 2.25V-2.75V to 1.10V @ 0.005A

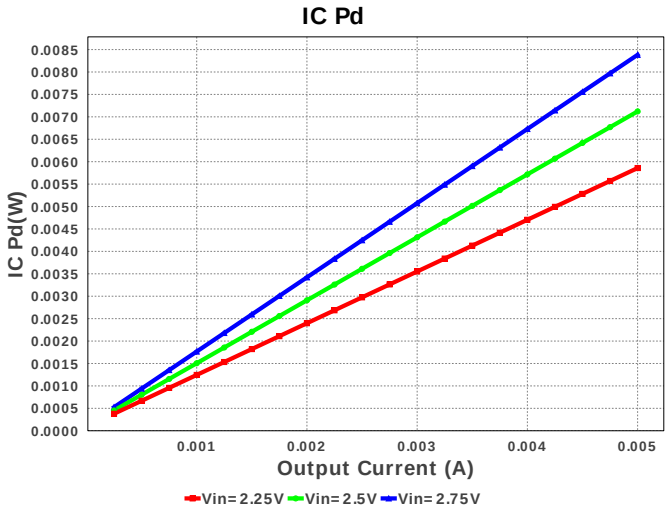


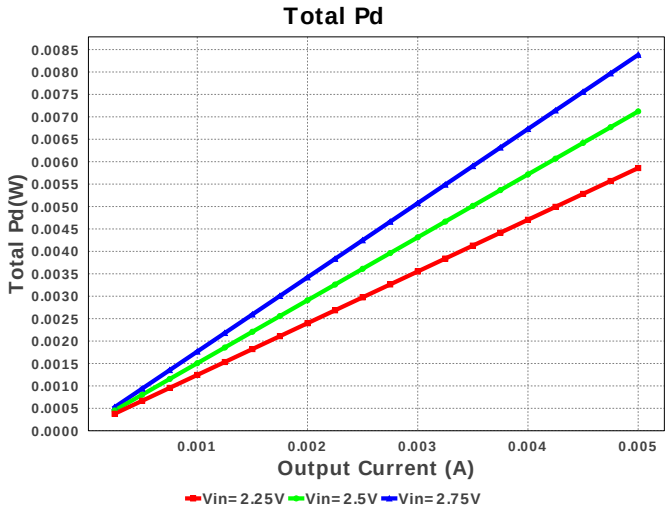
Electrical BOM

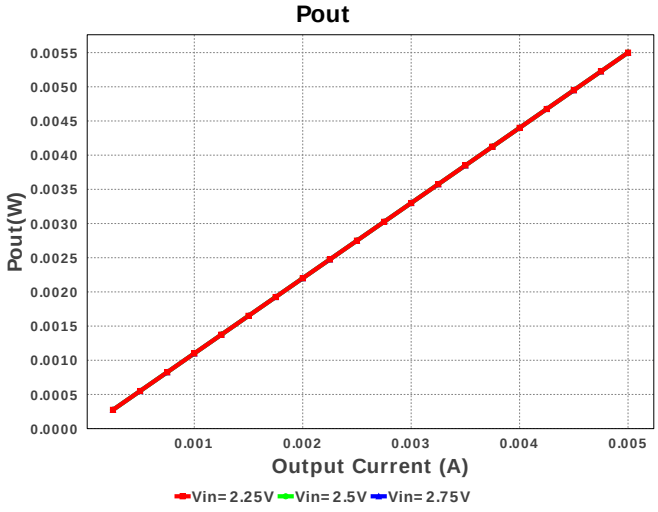
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Cout	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	U1	Texas Instruments	TLV71311PDBVR	Switcher	1	$0.13	DBV0005A_N 15 mm²

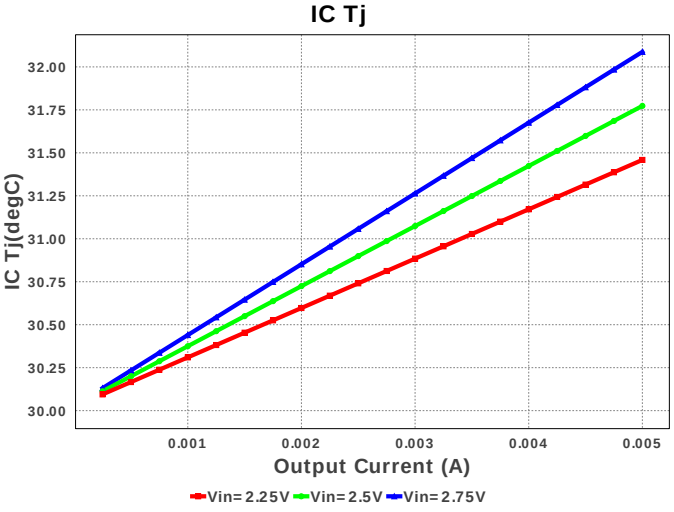


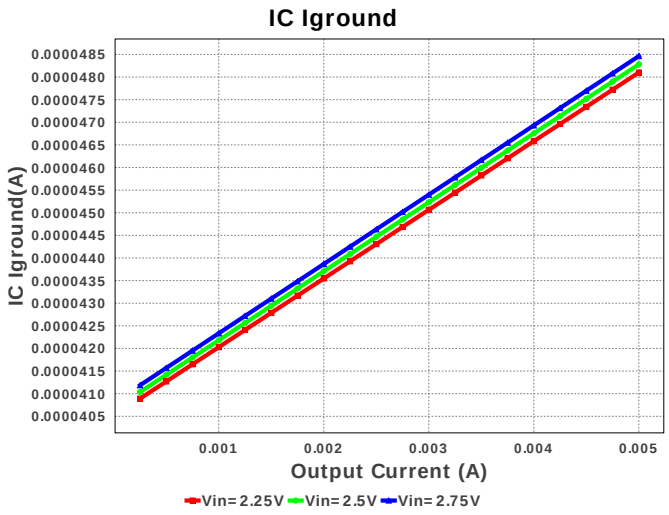


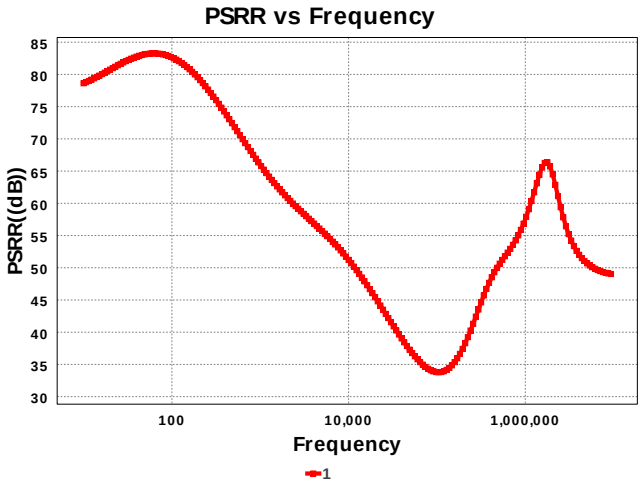












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	48.463 µA	Current	IC ground current
2.	Iin Avg	5.048 mA	Current	Average input current
3.	BOM Count	3	General	Total Design BOM count
4.	FootPrint	21.0 mm^2	General	Total Foot Print Area of BOM components
5.	IC Tolerance	50.0 mV	General	IC Feedback Tolerance
6.	Output Noise RMS	44.611 µV	General	Noise RMS
7.	Pout	5.5 mW	General	Total output power
8.	Total BOM	$0.15	General	Total BOM Cost
9.	Vin p-p	5.894 mV	Op_Point	Input Source ripple voltage
10.	Vout OP	1.1 V	Op_Point	Operational Output Voltage
11.	Efficiency	39.616 %	Op_point	Steady state efficiency
12.	IC Tj	32.087 degC	Op_point	IC junction temperature
13.	ICThetaJA	249.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	5.0 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	764.098 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-54.09 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	2.75 V	Op_point	Vin operating point
18.	Vout p-p	11.64 µV	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	8.383 mW	Power	IC power dissipation
20.	Total Pd	8.383 mW	Power	Total Power Dissipation
21.	Vout Tolerance	4.545 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	5.0 m	Maximum Output Current
2.	VinMax	2.75	Maximum input voltage
3.	VinMin	2.25	Minimum input voltage
4.	Vout	1.1	Output Voltage
5.	base_pn	TLV71311P	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1.

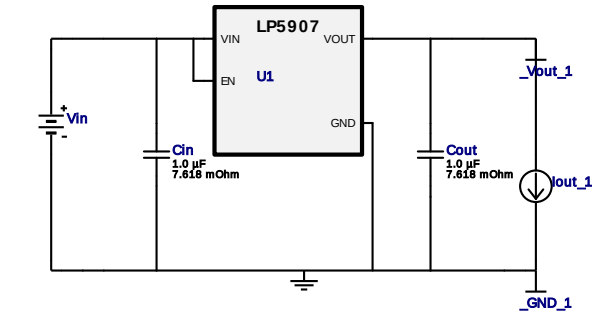
2. **TLV71311P** Product Folder : http://www.ti.com/product/tlv713p : contains the data sheet and other resources.

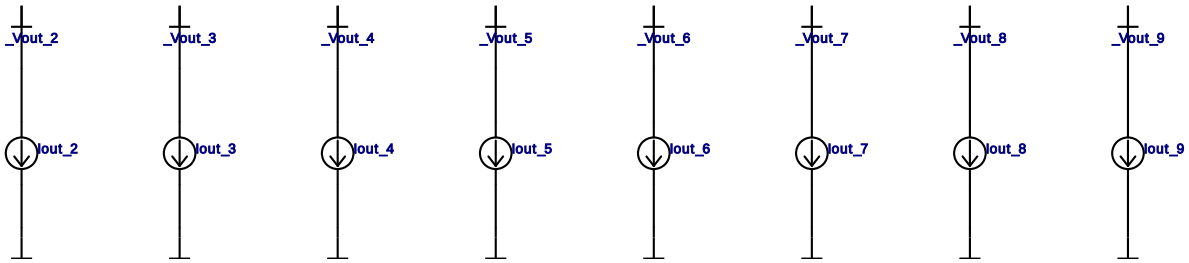
WEBENCH® Design Report

Vout = 1.8V
Iout = 0.16A

Device = LP5907UVX-1.8/NOPB
Topology = LDO
Created = 7/25/16 7:29:46 AM
BOM Cost = $0.16
BOM Count = 3
Total Pd = 0.16W

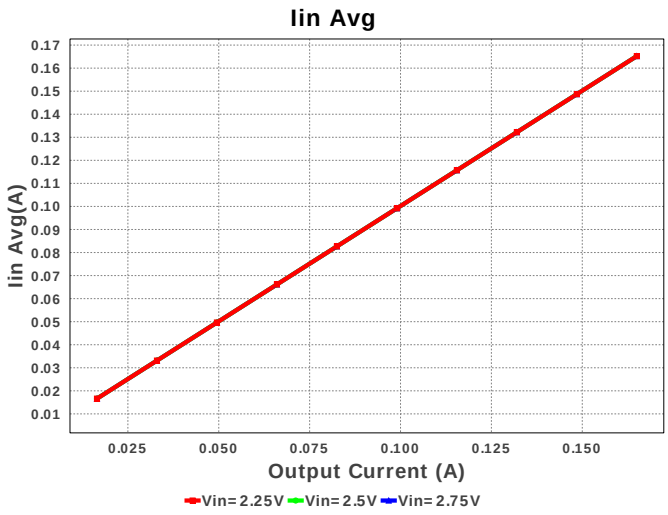
Design : 1194016/2217 LP5907UVX-1.8/NOPB
LP5907UVX-1.8/NOPB 2.25V-2.75V to 1.80V @ 0.165A

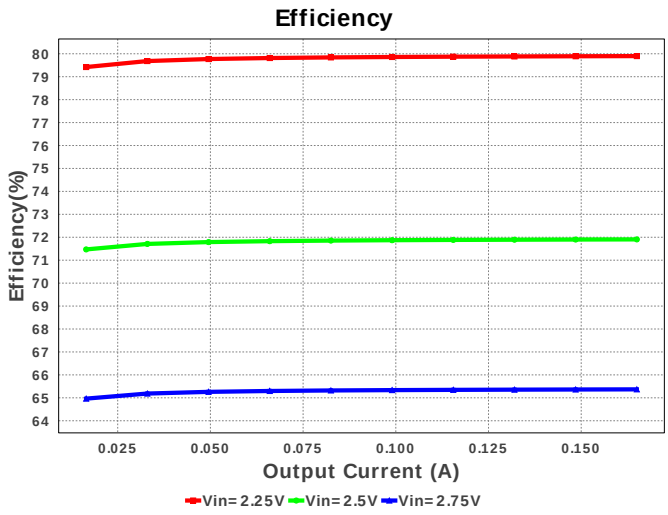


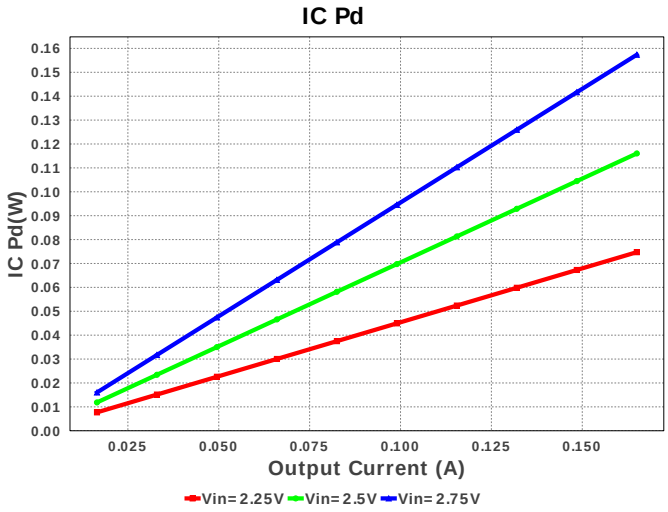


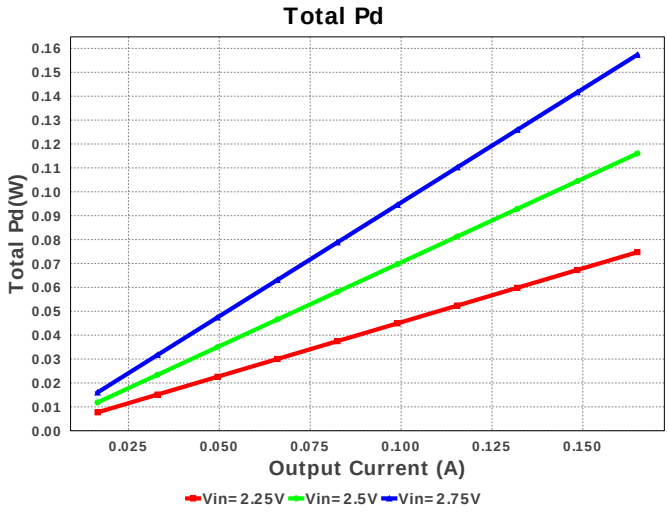
Electrical BOM

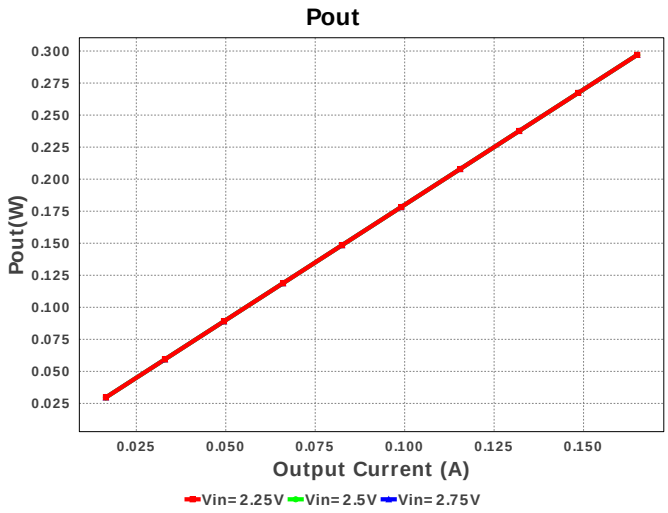
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
2.	Cout	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	U1	Texas Instruments	LP5907UVX-1.8/NOPB	Switcher	1	$0.14	UVK04AAA 3 mm^2

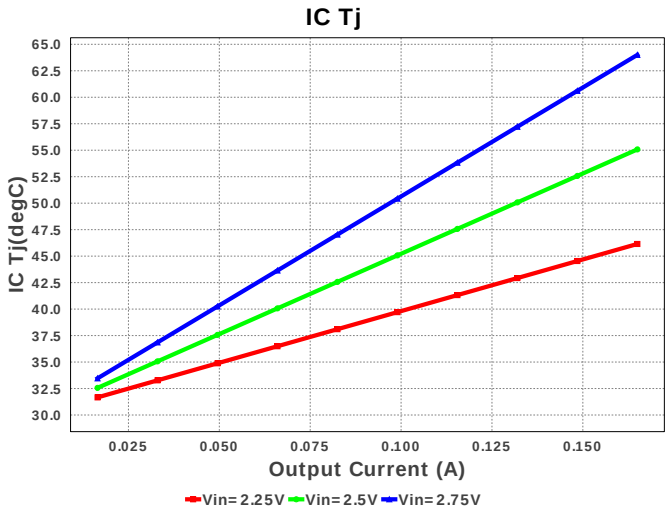


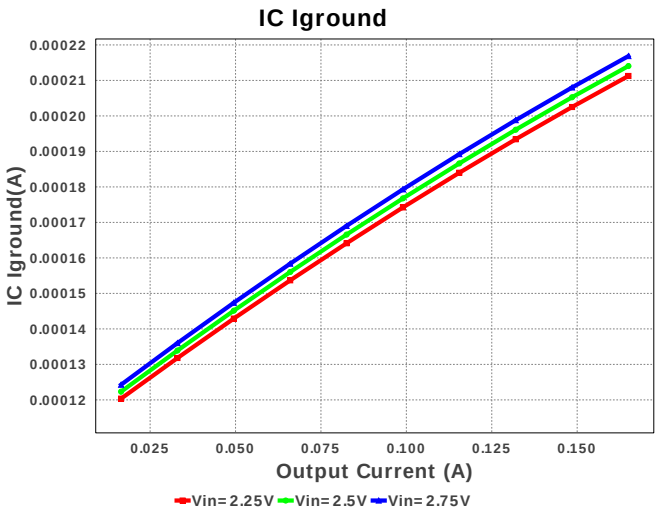


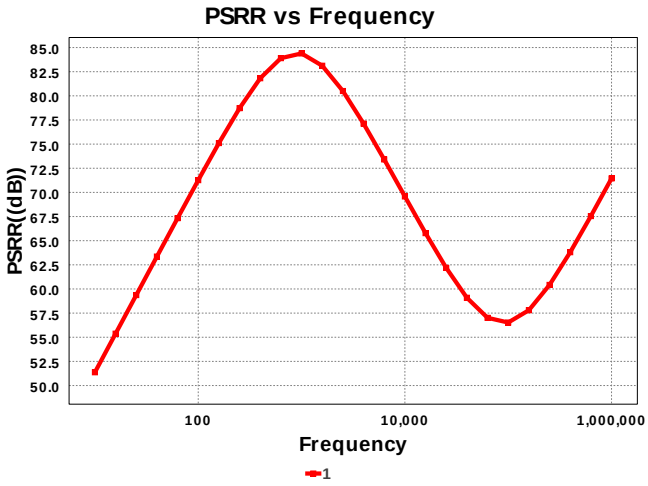












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	216.852 µA	Current	IC ground current
2.	Iin Avg	165.22 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	36.0 mV	General	IC Feedback Tolerance
6.	Output Noise RMS	10.0 µV	General	Noise RMS
7.	Pout	297.0 mW	General	Total output power
8.	Total BOM	$0.16	General	Total BOM Cost
9.	Vin p-p	5.894 mV	Op_Point	Input Source ripple voltage
10.	Vout OP	1.8 V	Op_Point	Operational Output Voltage
11.	Efficiency	65.369 %	Op_point	Steady state efficiency
12.	IC Tj	48.819 degC	Op_point	IC junction temperature
13.	ICThetaJA	119.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	165.0 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	764.098 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-69.155 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	2.75 V	Op_point	Vin operating point
18.	Vout p-p	2.054 µV	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	157.346 mW	Power	IC power dissipation
20.	Total Pd	157.346 mW	Power	Total Power Dissipation
21.	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	165.0 m	Maximum Output Current
2.	VinMax	2.75	Maximum input voltage
3.	VinMin	2.25	Minimum input voltage
4.	Vout	1.8	Output Voltage
5.	base_pn	LP5907	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1.

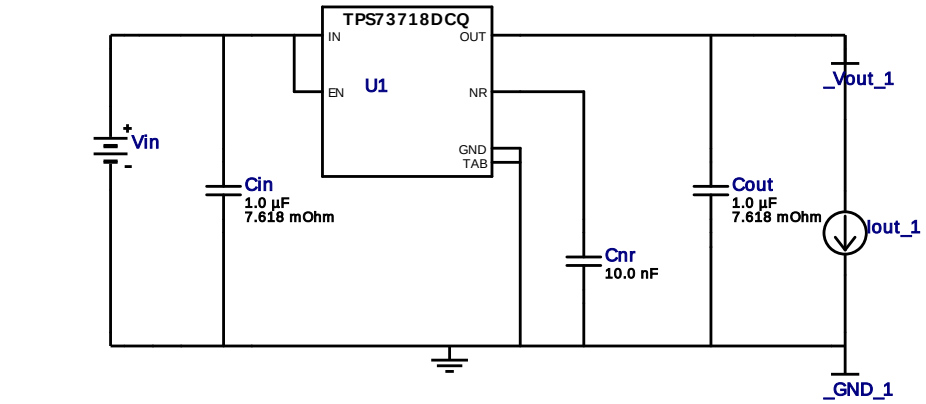
2. **LP5907** Product Folder : http://www.ti.com/product/lp5907 : contains the data sheet and other resources.

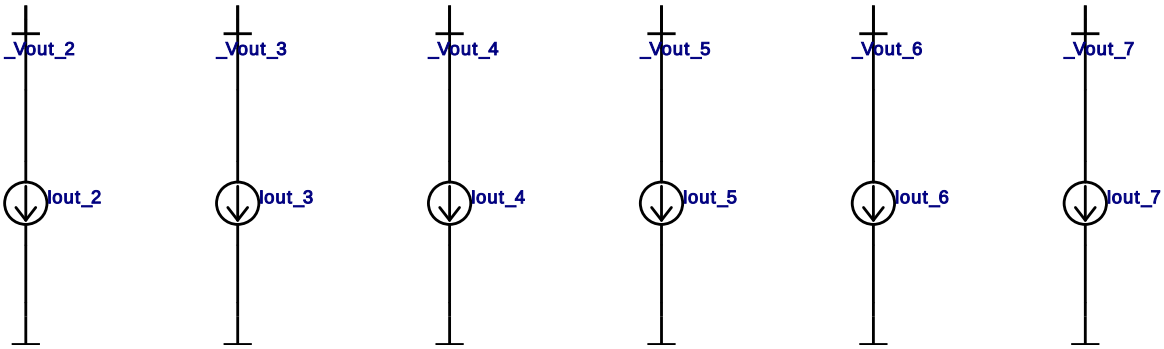
WEBENCH® Design Report

Vout = 1.8V
Iout = 0.4A

Device = TPS73718DCQR
Topology = LDO
Created = 7/25/16 7:29:46 AM
BOM Cost = $0.61
BOM Count = 4
Total Pd = 0.38W

Design : 1194016/2218 TPS73718DCQR
TPS73718DCQR 2.25V-2.75V to 1.80V @ 0.4A

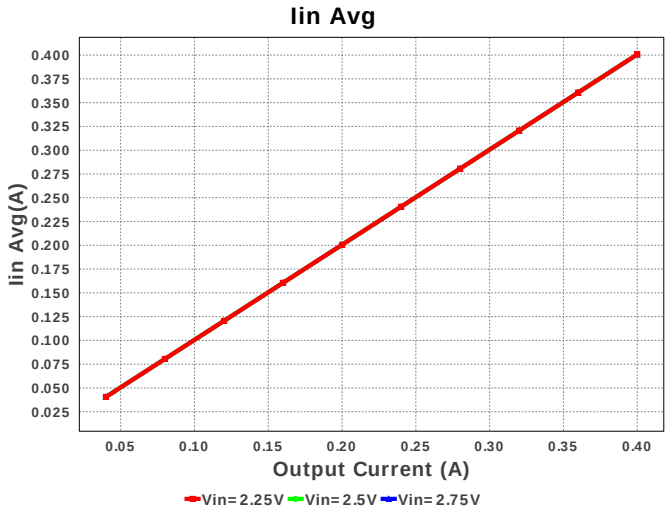


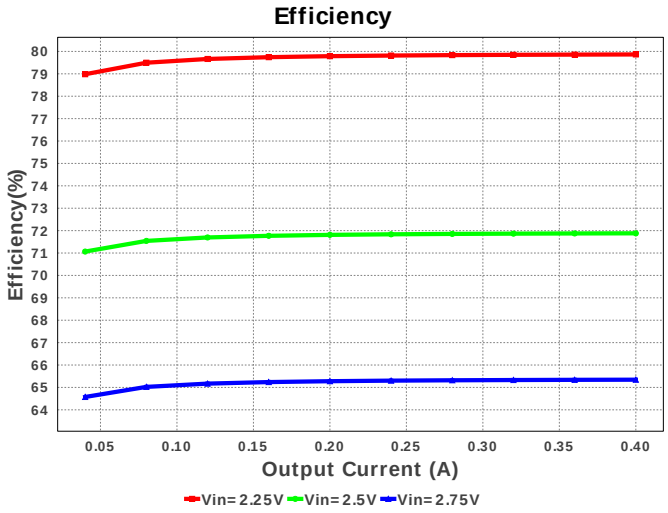


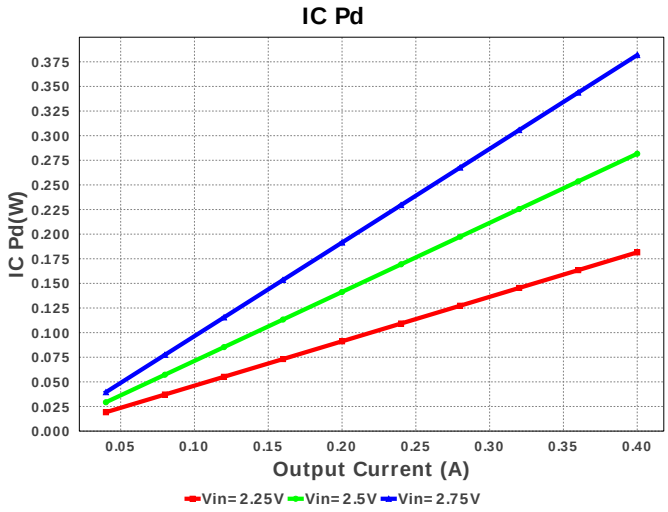
Electrical BOM

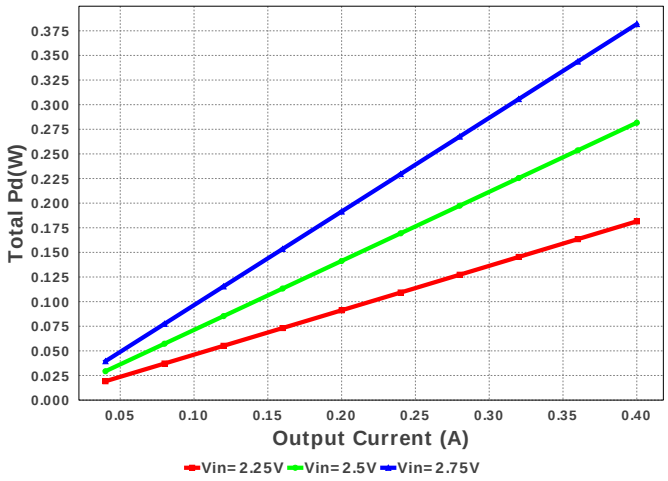
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Cnr	MuRata	GRM033R60J103KA01D Series= X5R	Cap= 10.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
3.	Cout	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²

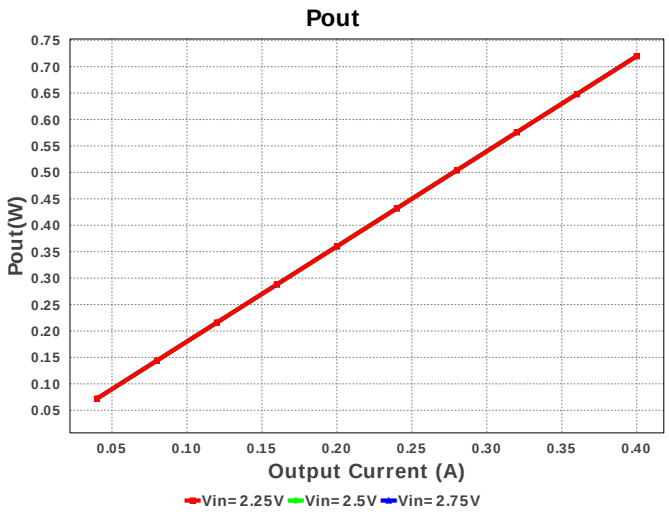
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
4.	U1	Texas Instruments	TPS73718DCQR	Switcher	1	$0.58	 DCQ0006A 77 mm^2

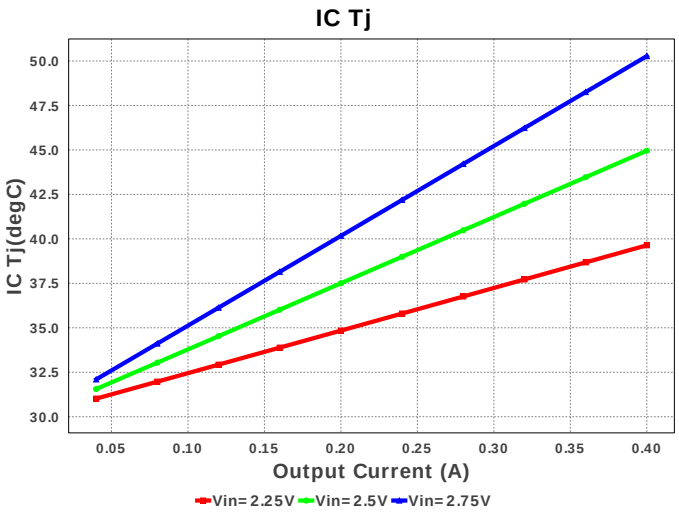


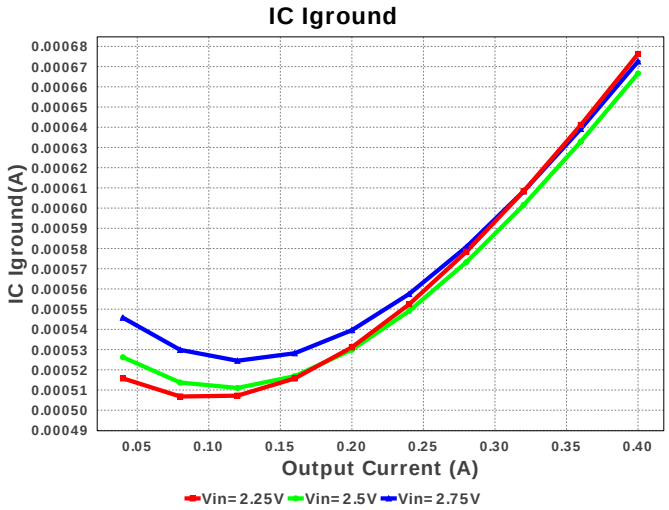


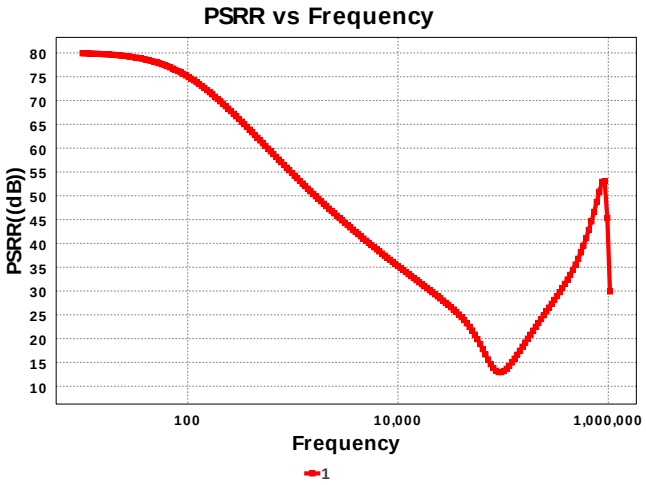












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	672.552 µA	Current	IC ground current
2.	Iin Avg	400.67 mA	Current	Average input current
3.	BOM Count	4	General	Total Design BOM count
4.	FootPrint	85.0 mm^2	General	Total Foot Print Area of BOM components
5.	IC Tolerance	54.0 mV	General	IC Feedback Tolerance
6.	Output Noise RMS	13.987 µV	General	Noise RMS
7.	Pout	720.0 mW	General	Total output power
8.	Total BOM	$0.61	General	Total BOM Cost
9.	Vin p-p	5.894 mV	Op_Point	Input Source ripple voltage
10.	Vout OP	1.8 V	Op_Point	Operational Output Voltage
11.	Efficiency	65.345 %	Op_point	Steady state efficiency
12.	IC Tj	50.276 degC	Op_point	IC junction temperature
13.	ICThetaJA	53.1 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	400.0 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	764.098 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-48.108 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	2.75 V	Op_point	Vin operating point
18.	Vout p-p	23.177 µV	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	381.85 mW	Power	IC power dissipation
20.	Total Pd	381.85 mW	Power	Total Power Dissipation
21.	Vout Tolerance	3.0 %		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	2.75	Maximum input voltage
3.	VinMin	2.25	Minimum input voltage
4.	Vout	1.8	Output Voltage
5.	base_pn	TPS73718	Base Product Number

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

Design Assistance

1.

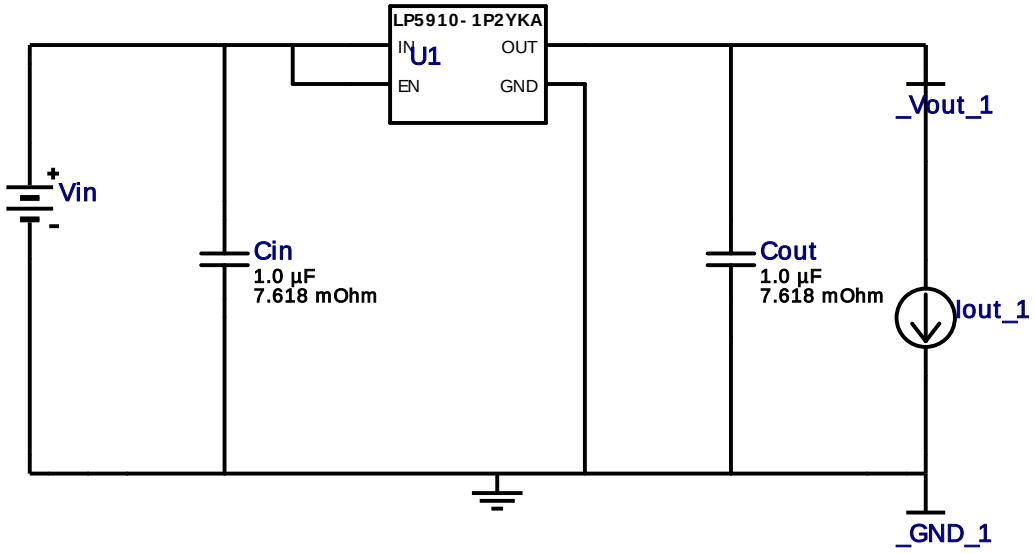
2. **TPS73718** Product Folder : http://www.ti.com/product/tps737 : contains the data sheet and other resources.

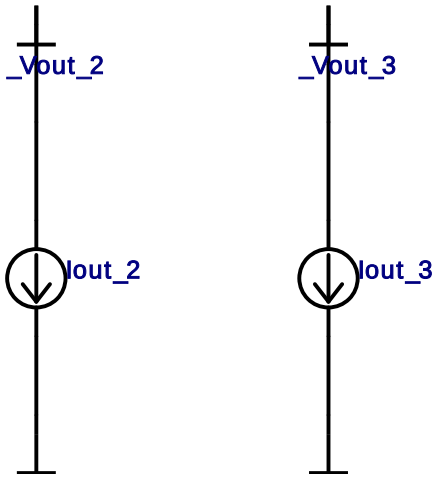
WEBENCH® Design Report

Vout = 1.2V
Iout = 0.05A

Device = LP5910-1.2YKAR
Topology = LDO
Created = 7/25/16 7:29:46 AM
BOM Cost = $0.16
BOM Count = 3
Total Pd = 0.08W

Design : 1194016/2219 LP5910-1.2YKAR
LP5910-1.2YKAR 2.25V-2.75V to 1.20V @ 0.0516A

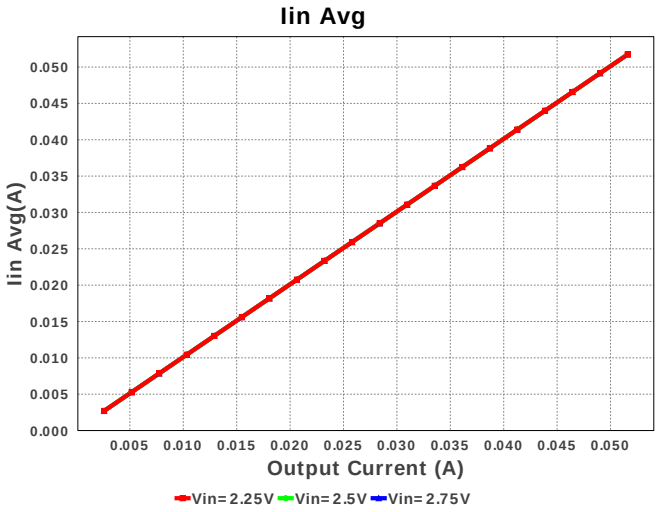


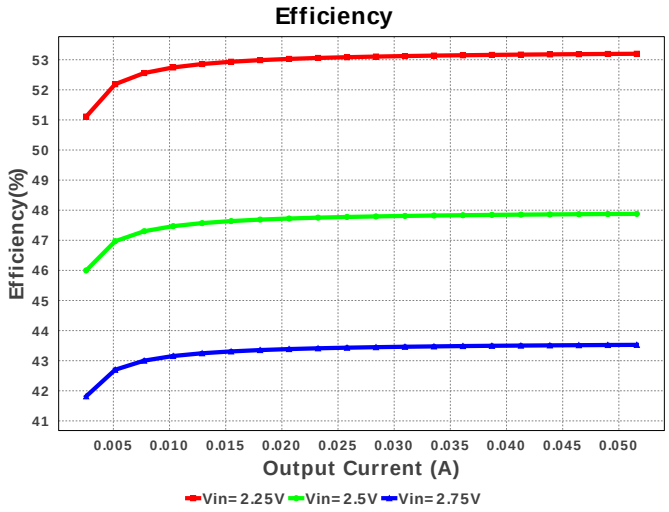


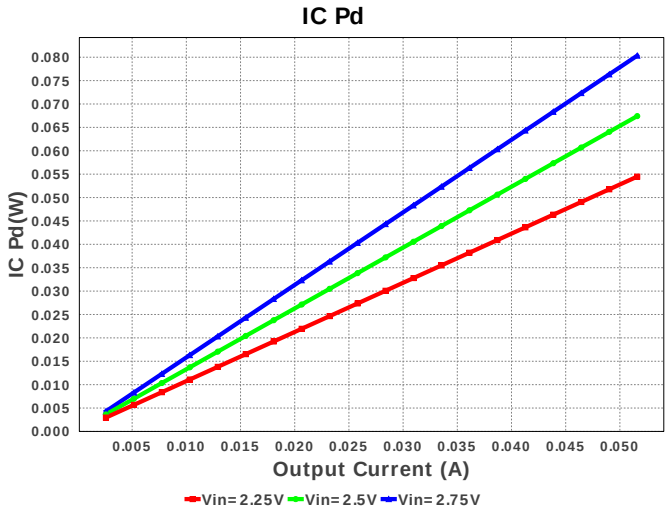
Electrical BOM

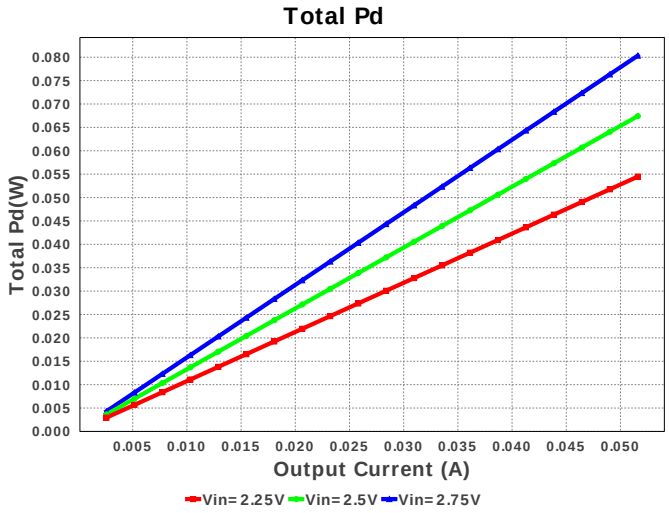
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2

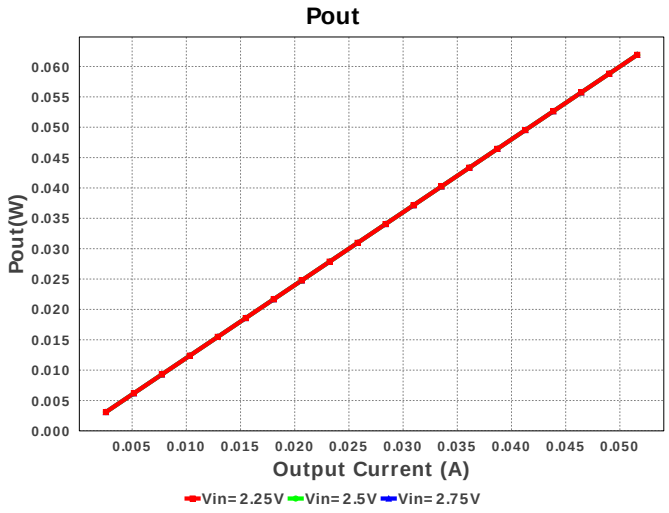
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
2.	Cout	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	U1	Texas Instruments	LP5910-1.2YKAR	Switcher	1	$0.14	YKA0004ACAC 3 mm^2

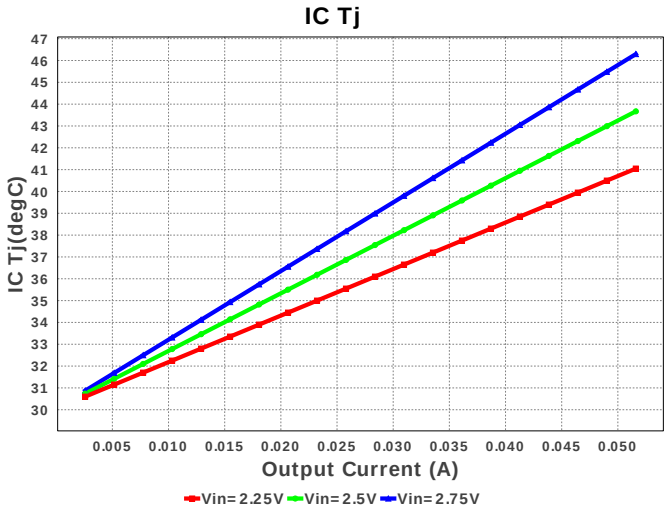


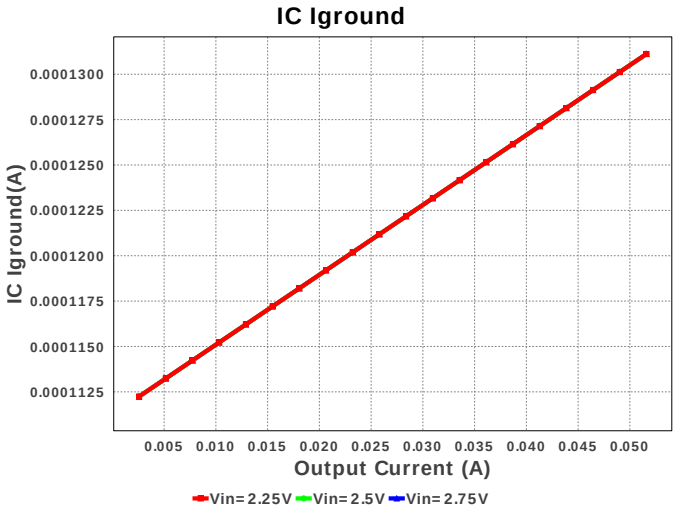


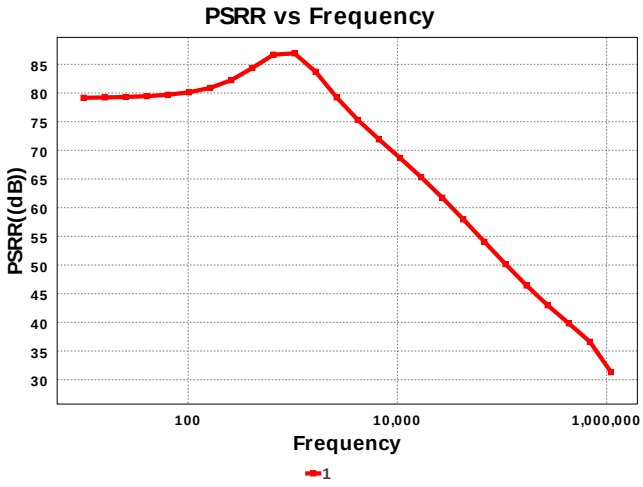












Operating Values

#	Name	Value	Category	Description
1.	IC Iground	131.116 µA	Current	IC ground current
2.	Iin Avg	51.731 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	24.0 mV	General	IC Feedback Tolerance
6.	Output Noise RMS	12.0 µV	General	Noise RMS
7.	Pout	61.92 mW	General	Total output power
8.	Total BOM	$0.16	General	Total BOM Cost
9.	Vin p-p	5.894 mV	Op_Point	Input Source ripple voltage
10.	Vout OP	0.0 V	Op_Point	Operational Output Voltage
11.	Efficiency	43.526 %	Op_point	Steady state efficiency
12.	IC Tj	46.293 degC	Op_point	IC junction temperature
13.	ICThetaJA	202.8 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	51.6 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	764.098 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-35.765 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	2.75 V	Op_point	Vin operating point
18.	Vout p-p	95.986 µV	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	80.341 mW	Power	IC power dissipation
20.	Total Pd	80.341 mW	Power	Total Power Dissipation
21.	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	51.6 m	Maximum Output Current
2.	VinMax	2.75	Maximum input voltage
3.	VinMin	2.25	Minimum input voltage
4.	Vout	1.2	Output Voltage
5.	base_pn	LP5910-1.2	Base Product Number

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

Design Assistance

1.

2. **LP5910-1.2** Product Folder : http://www.ti.com/product/LP5910 : contains the data sheet and other resources.

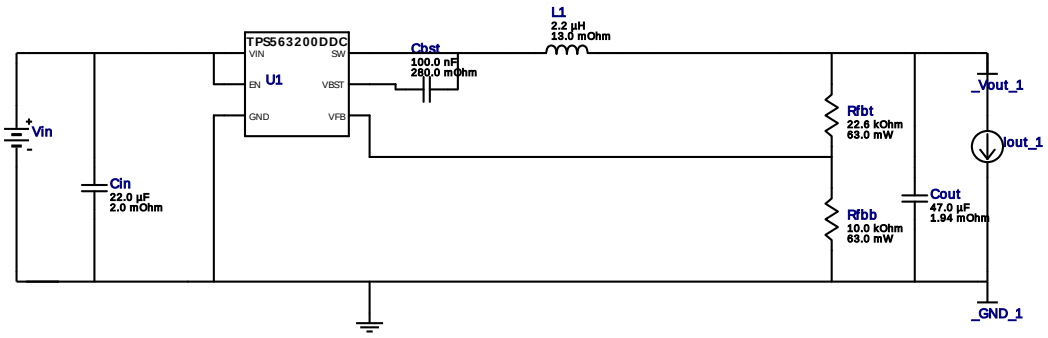
TEXAS INSTRUMENTS

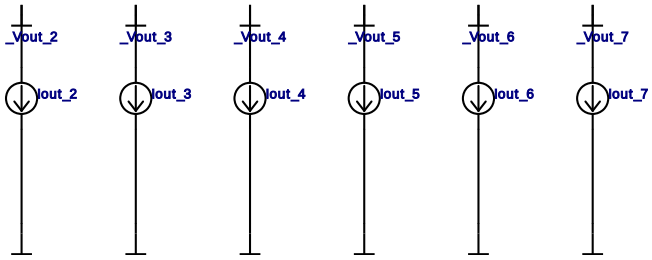
WEBENCH® Design Report

Vout = 2.5V
Iout = 2.52A

Device = TPS563200DDCR
Topology = Buck
Created = 7/25/16 7:29:47 AM
BOM Cost = $1.06
BOM Count = 7
Total Pd = 0.74W

Design : 1194016/2220 TPS563200DDCR
TPS563200DDCR 10.0V-14.0V to 2.50V @ 2.52443A

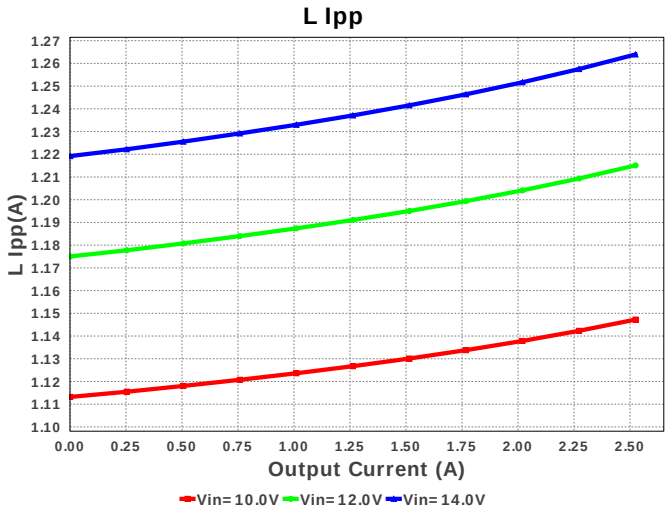


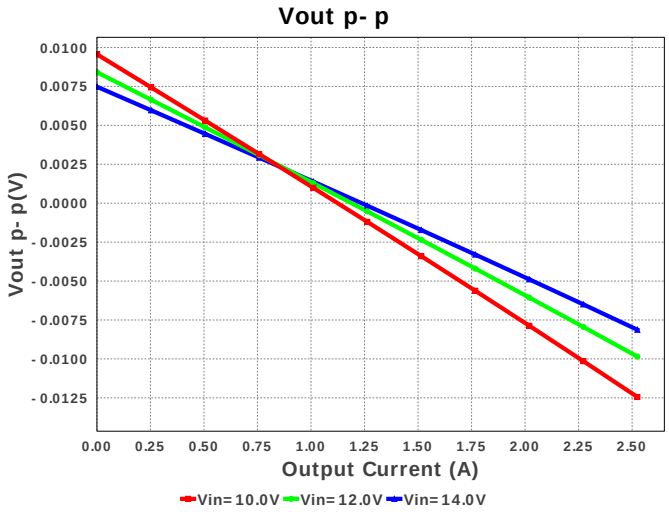


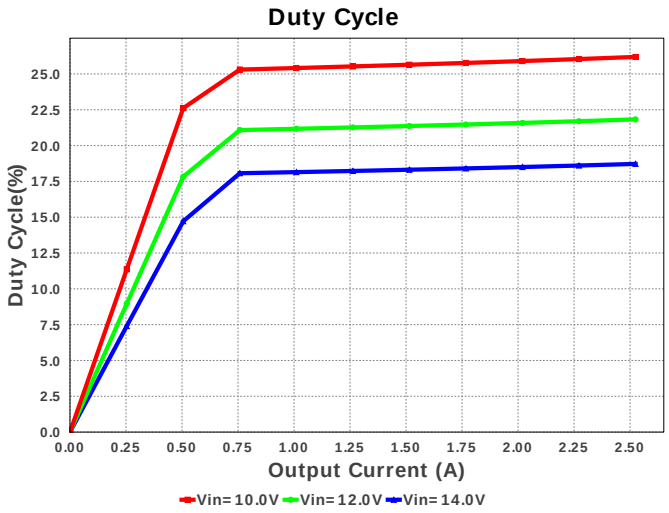
Electrical BOM

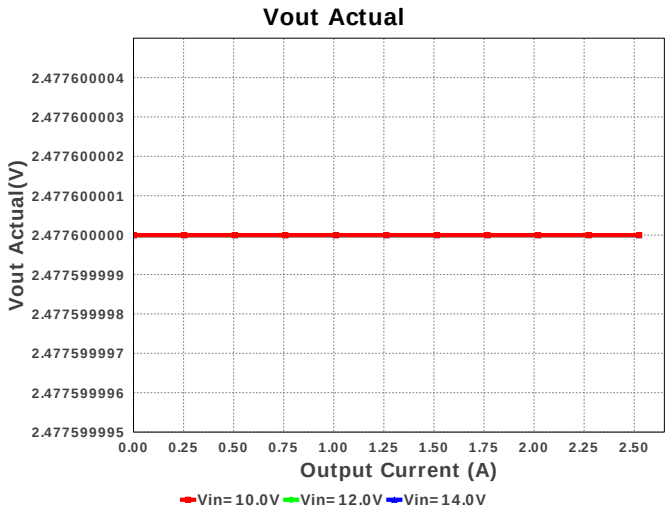
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	$0.16	1210 15 mm²
3.	Cout	TDK	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	CRCW040222K6FKED Series= CRCW..e3	Res= 22.6 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

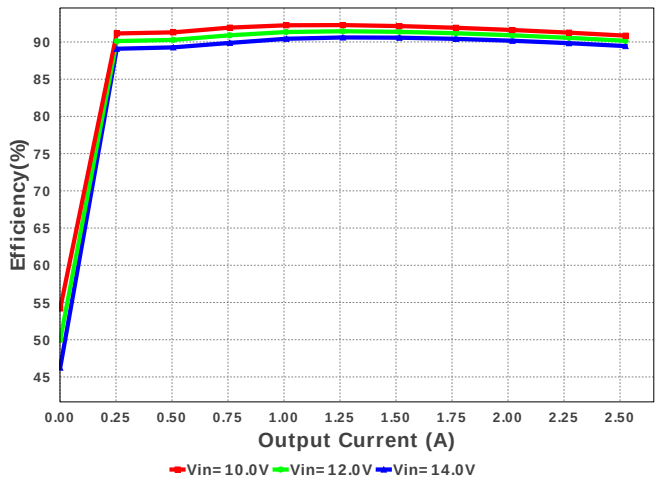




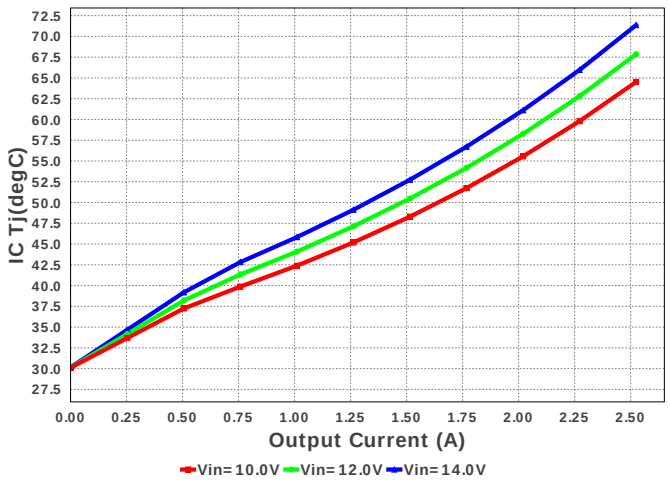




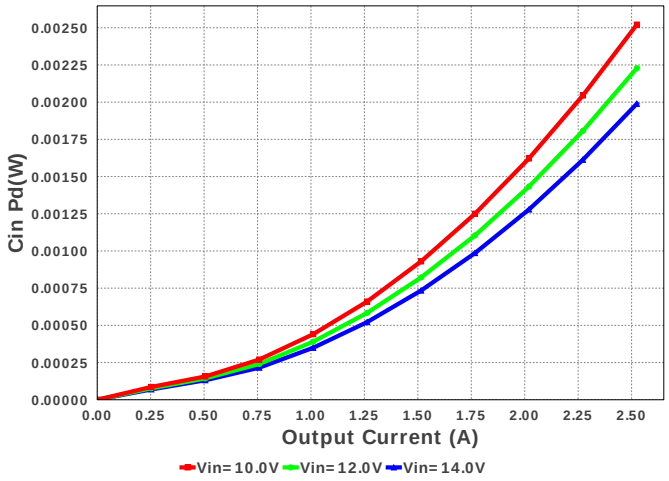
Efficiency



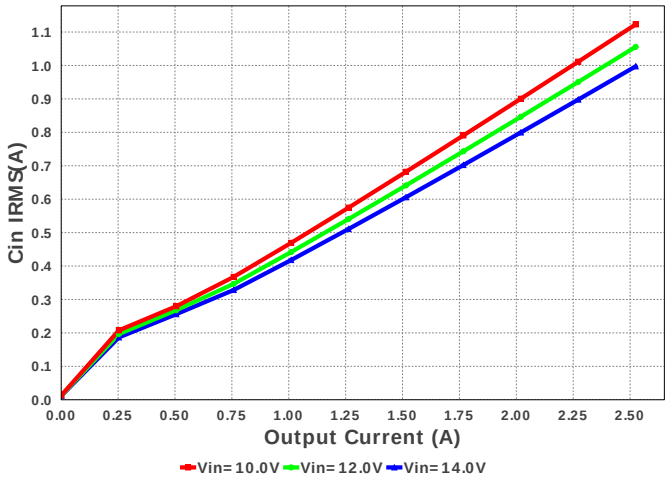
IC Tj



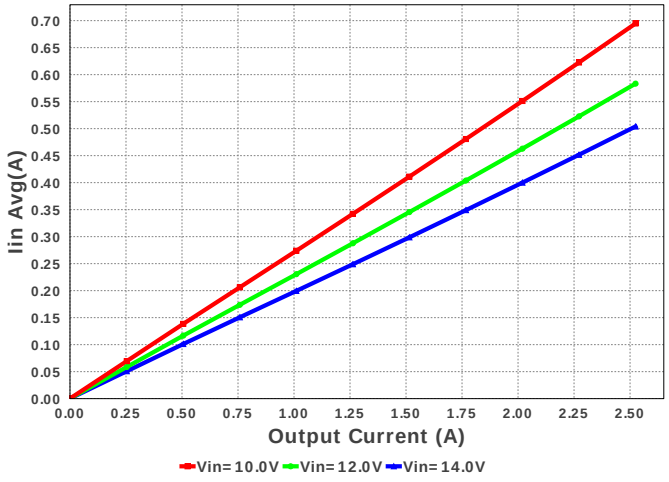
Cin Pd



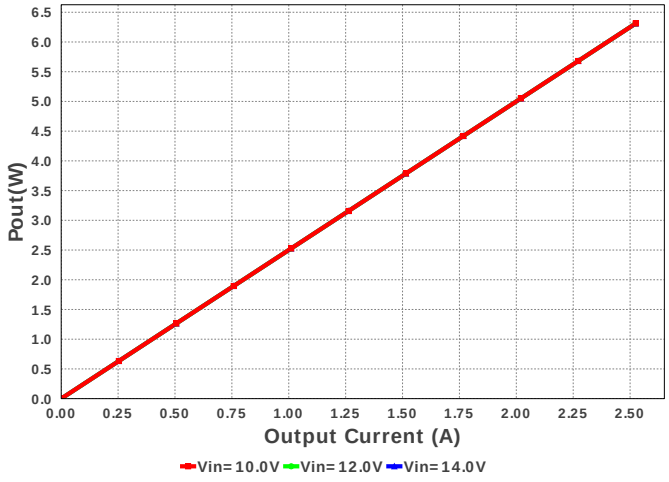
Cin IRMS

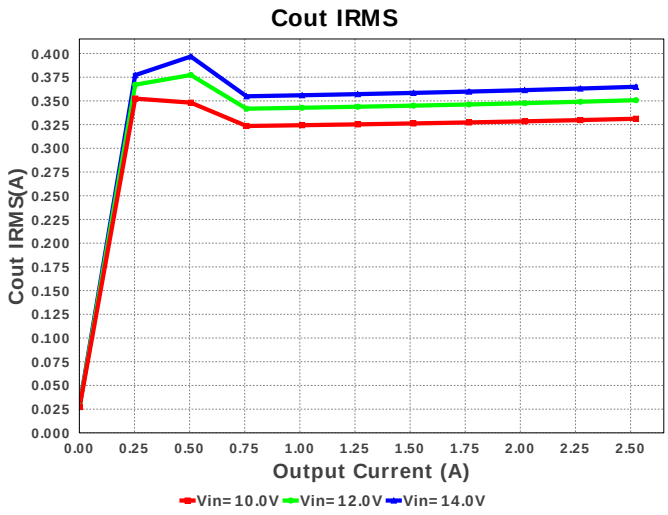


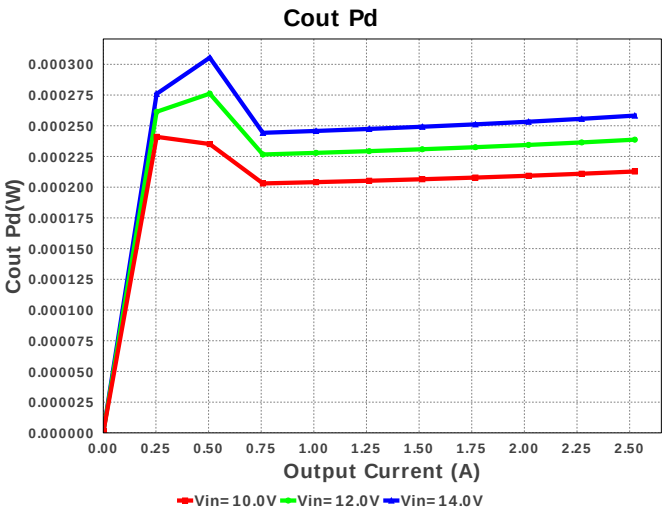
Iin Avg

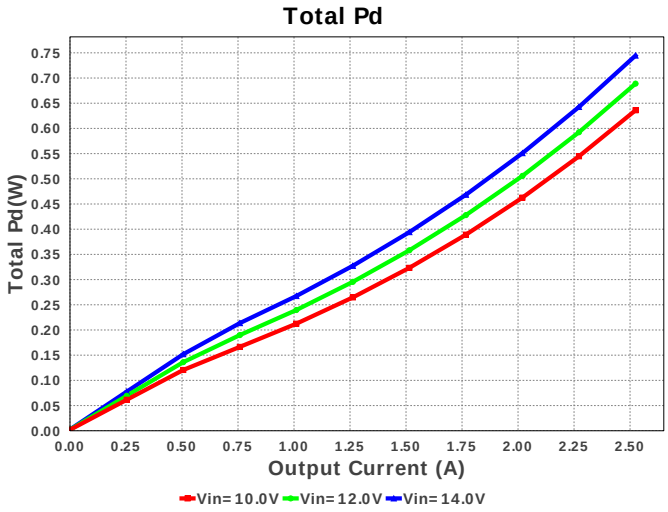


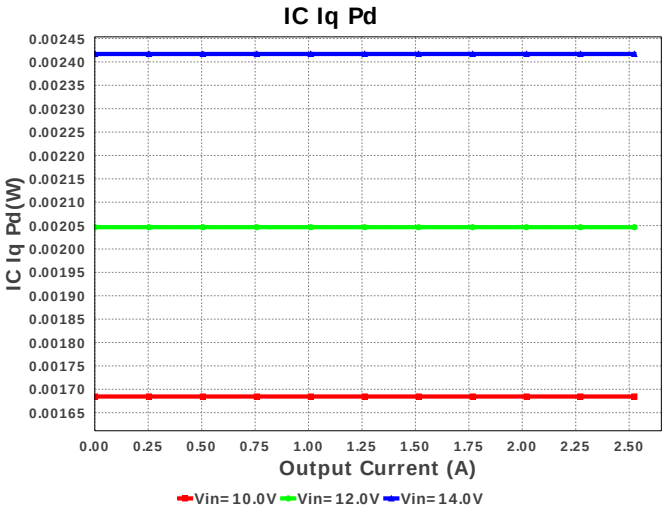
Pout

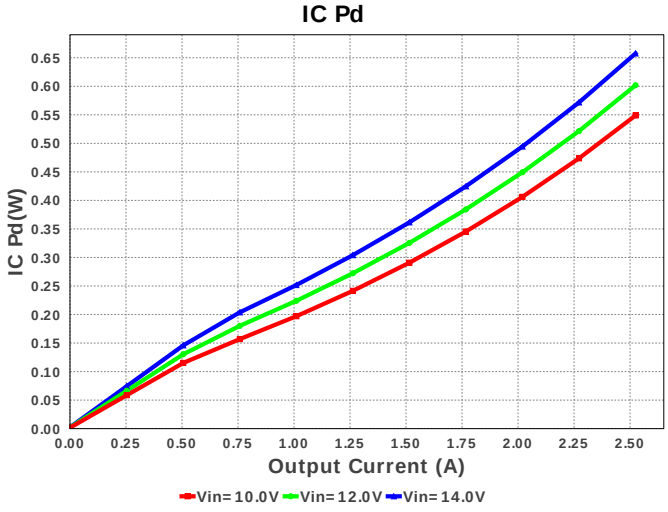


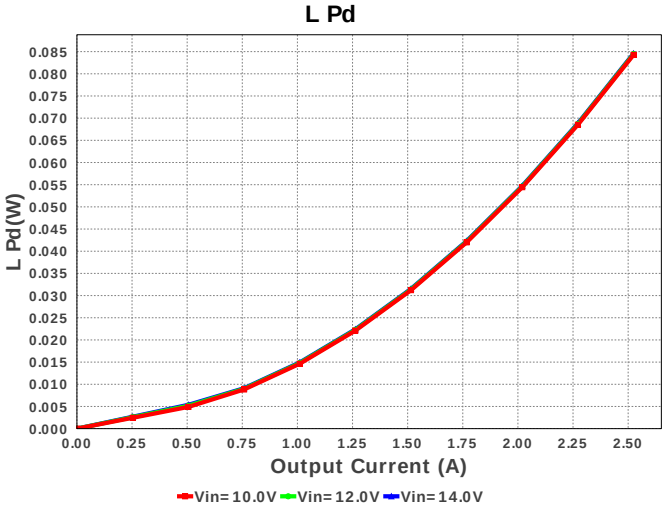


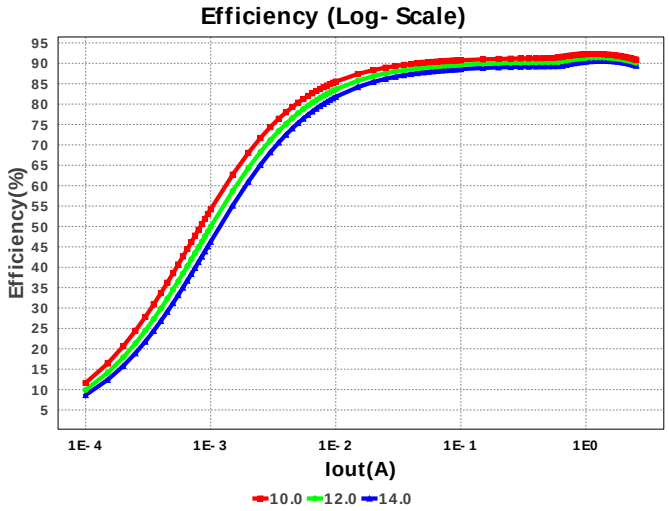












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	997.289 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	364.87 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	503.97 mA	Current	Average input current
4.	L Ipp	1.264 A	Current	Peak-to-peak inductor ripple current
5.	BOM Count	7	General	Total Design BOM count
6.	FootPrint	149.0 mm^2	General	Total Foot Print Area of BOM components
7.	Frequency	764.098 kHz	General	Switching frequency
8.	Pout	6.311 W	General	Total output power
9.	Total BOM	$1.06	General	Total BOM Cost
10.	Vout Actual	2.478 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
11.	Vout OP	2.5 V	Op_Point	Operational Output Voltage
12.	Duty Cycle	18.72 %	Op_point	Duty cycle
13.	Efficiency	89.447 %	Op_point	Steady state efficiency
14.	IC Tj	71.36 degC	Op_point	IC junction temperature
15.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	2.524 A	Op_point	Iout operating point
17.	VIN_OP	14.0 V	Op_point	Vin operating point
18.	Vout p-p	5.894 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	1.989 mW	Power	Input capacitor power dissipation
20.	Cout Pd	258.273 µW	Power	Output capacitor power dissipation
21.	IC Iq Pd	2.417 mW	Power	IC Iq Pd
22.	IC Pd	657.556 mW	Power	IC power dissipation
23.	L Pd	84.576 mW	Power	Inductor power dissipation
24.	Total Pd	744.575 mW	Power	Total Power Dissipation
25.	Vout Tolerance	2.735 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.524	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	2.5	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.

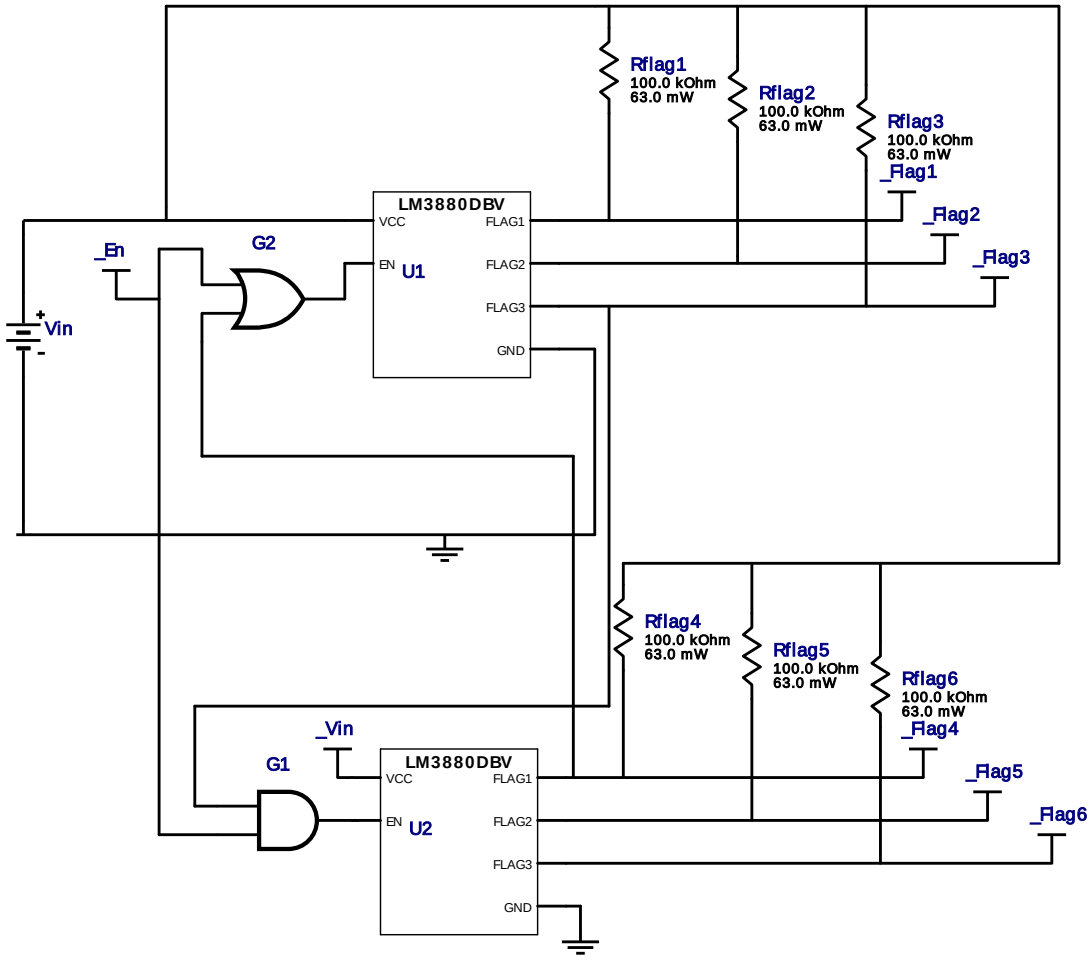
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 3.3V
Iout = 0.0A

Device = LM3880MF-1AE/NOPB
Topology = SEQUENCER
Created = 7/25/16 7:29:47 AM
BOM Cost = $1.09
BOM Count = 10
Total Pd = 0.0W

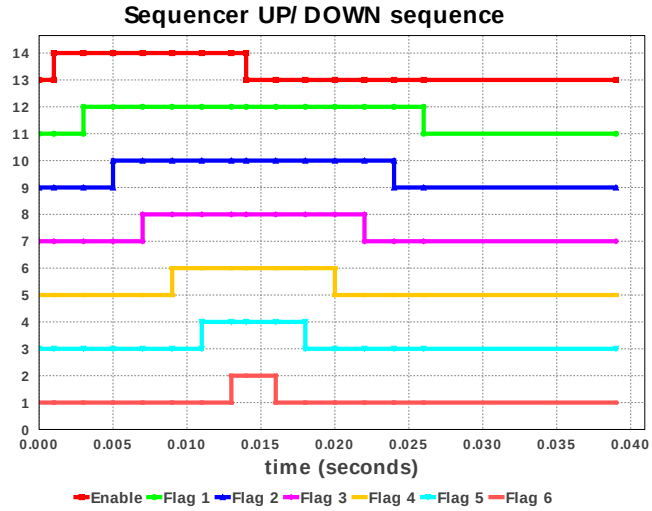
Design : 1194016/2221 LM3880MF-1AE/NOPB
Design 2221 - LM3880MF-1AE/NOPB



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	G1	Texas Instruments	SN74AHC1G08	LogicGate	1	$0.06	SOT-23 14 mm²
2.	G2	Texas Instruments	SN74AHC1G32	LogicGate	1	$0.07	SOT-23 14 mm²
3.	Rflag1	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
4.	Rflag2	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
5.	Rflag3	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	Rflag4	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
7.	Rflag5	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
8.	Rflag6	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
9.	U1	Texas Instruments	LM3880MF-1AE/NOPB	Switcher	1	$0.45	R-PDSO-G6 10 mm^2
10.	U2	Texas Instruments	LM3880MF-1AE/NOPB	Switcher	1	$0.45	R-PDSO-G6 10 mm^2



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	10	General	Total Design BOM count
2.	FootPrint	65.0 mm^2	General	Total Foot Print Area of BOM components
3.	Total BOM	$1.09	General	Total BOM Cost
4.	Total Pd	165.0 µW	Power	Total Power Dissipation
5.	Flag Voltage	3.3 V		Flag Voltage
6.	Flag1 Down delay (From EN high to low)	12.0 ms		Flag Delay
7.	Flag1 Up delay (From EN low to high)	2.0 ms		Flag Delay
8.	Flag2 Down delay (From EN high to low)	10.0 ms		Flag Delay
9.	Flag2 Up delay (From EN low to high)	4.0 ms		Flag Delay
10.	Flag3 Down delay (From EN high to low)	8.0 ms		Flag Delay
11.	Flag3 Up delay (From EN low to high)	6.0 ms		Flag Delay
12.	Flag4 Down delay (From EN high to low)	6.0 ms		Flag Delay
13.	Flag4 Up delay (From EN low to high)	8.0 ms		Flag Delay

#	Name	Value	Category	Description
14.	Flag5 Down delay (From EN high to low)	4.0 ms		Flag Delay
15.	Flag5 Up delay (From EN low to high)	10.0 ms		Flag Delay
16.	Flag6 Down delay (From EN high to low)	2.0 ms		Flag Delay
17.	Flag6 Up delay (From EN low to high)	12.0 ms		Flag Delay
18.	Flags Used	6.0		Flags Used
19.	Total Flags	6.0		Total Flags
20.	Vcc	3.3 V		Vcc

Design Inputs

#	Name	Value	Description
1.	Iout	1.0 µ	Maximum Output Current
2.	VinMax	3.3	Maximum input voltage
3.	VinMin	3.3	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LM3880	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM3880** Product Folder : http://www.ti.com/product/LM3880 : contains the data sheet and other resources.

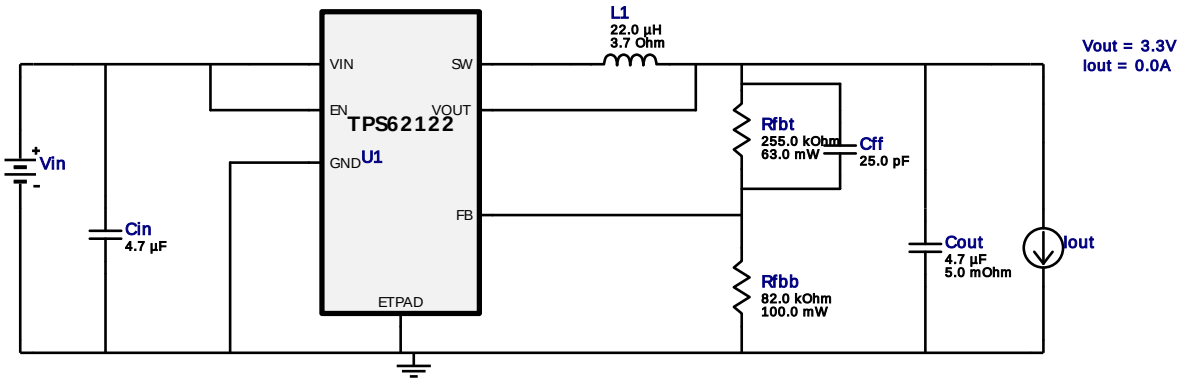
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 3.3V
Iout = 0.0A

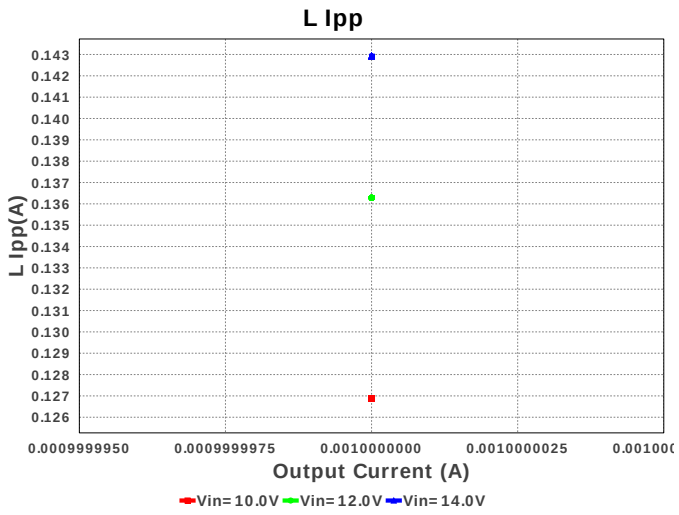
Device = TPS62122DRVR
Topology = Buck
Created = 7/25/16 7:29:47 AM
BOM Cost = $0.67
BOM Count = 7
Total Pd = 0.0W

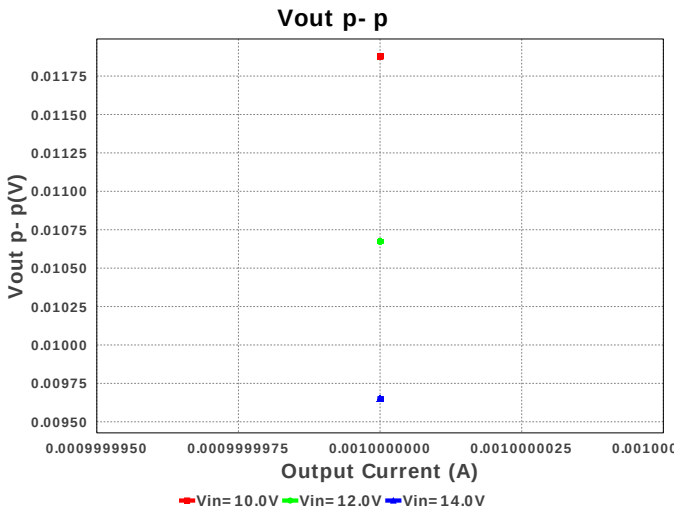
Design : 1194016/2222 TPS62122DRVR
TPS62122DRVR 10.0V-14.0V to 3.30V @ 0.001A

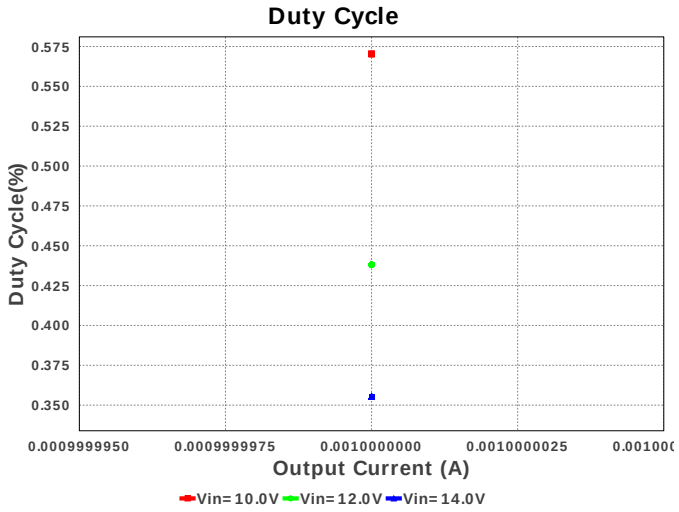


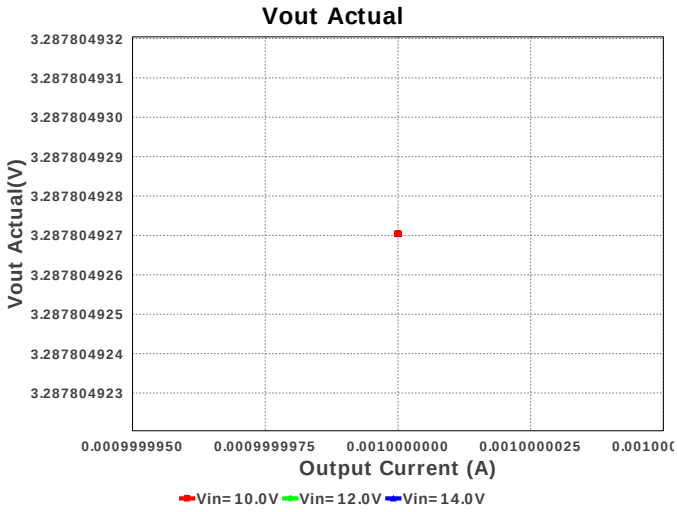
Electrical BOM

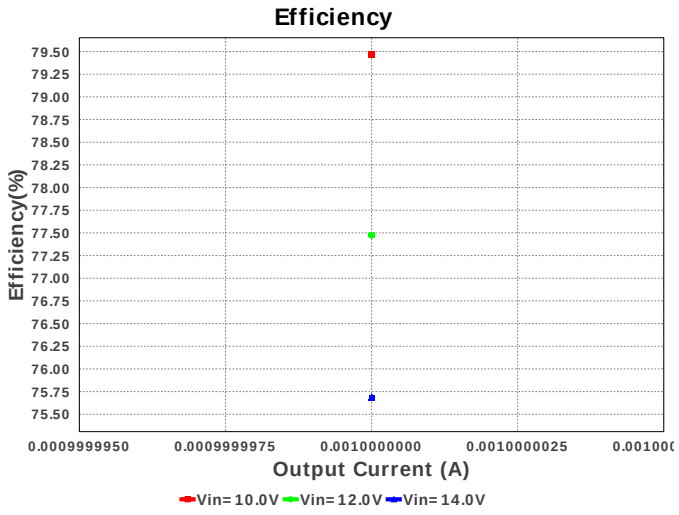
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cff	Samsung Electro-Mechanics	CL21C250JBANNNC Series= C0G/NP0	Cap= 25.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	Taiyo Yuden	TMK212BJ475KG-T Series= X5R	Cap= 4.7 uF VDC= 25.0 V IRMS= 0.0 A	1	$0.05	0805 7 mm²
3.	Cout	MuRata	GRM188R60J475KE19D Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 6.3 V IRMS= 2.0 A	1	$0.01	0603 5 mm²
4.	L1	Taiyo Yuden	CBC2012T220M	L= 22.0 µH DCR= 3.7 Ohm	1	$0.08	CBC2012 8 mm²
5.	Rfbb	Yageo America	RC0603FR-0782KL Series= ?	Res= 82.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
6.	Rfbt	Vishay-Dale	CRCW0402255KFKED Series= CRCW..e3	Res= 255.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	U1	Texas Instruments	TPS62122DRVR	Switcher	1	$0.50	S-PWSON-N6 9 mm²

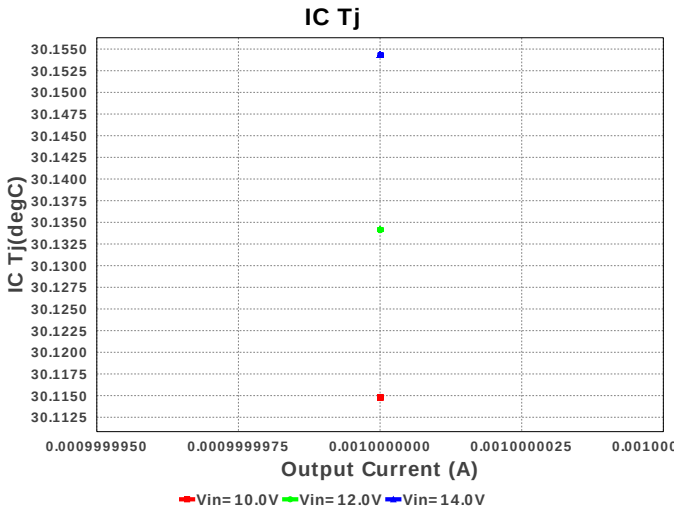


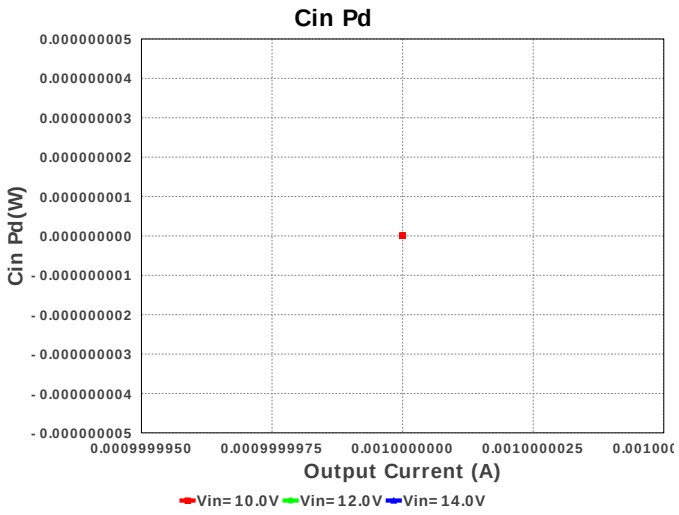


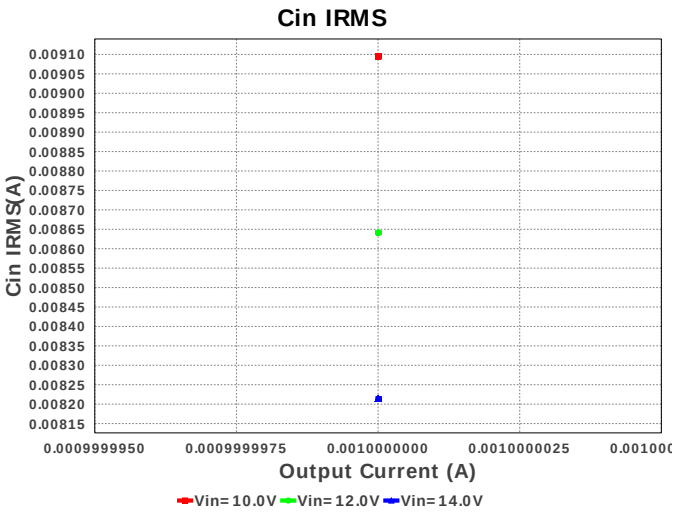


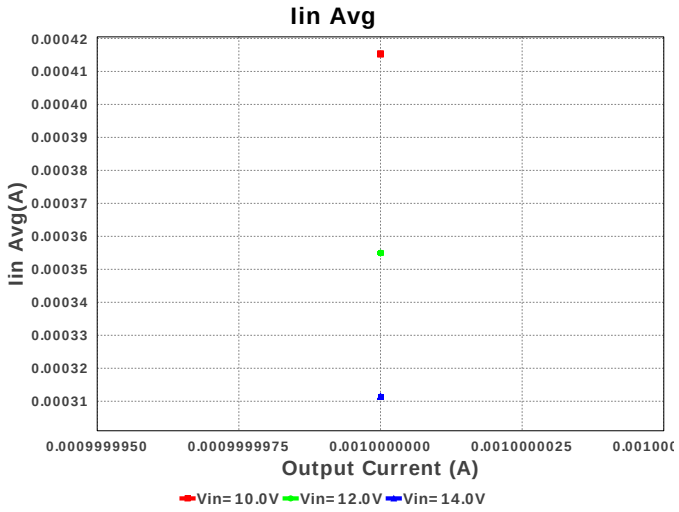


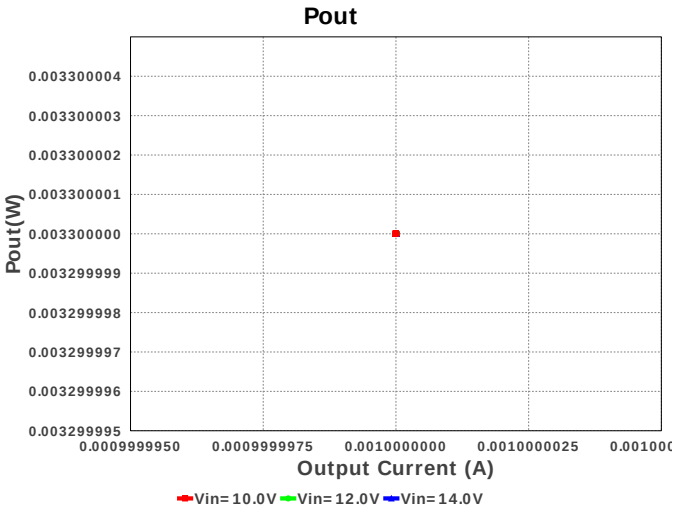


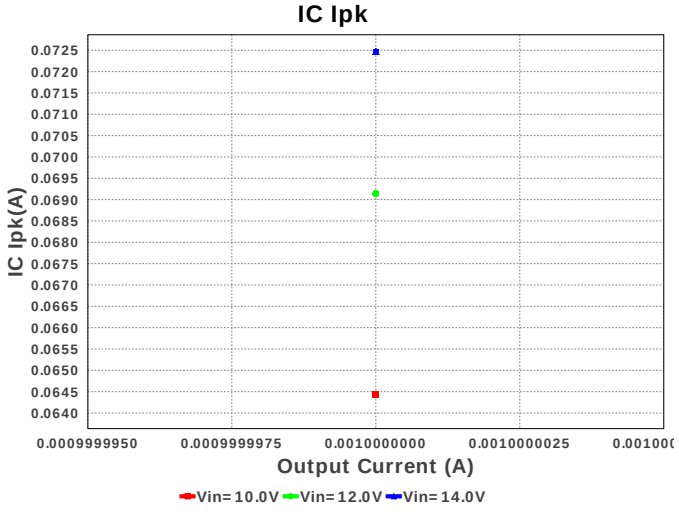


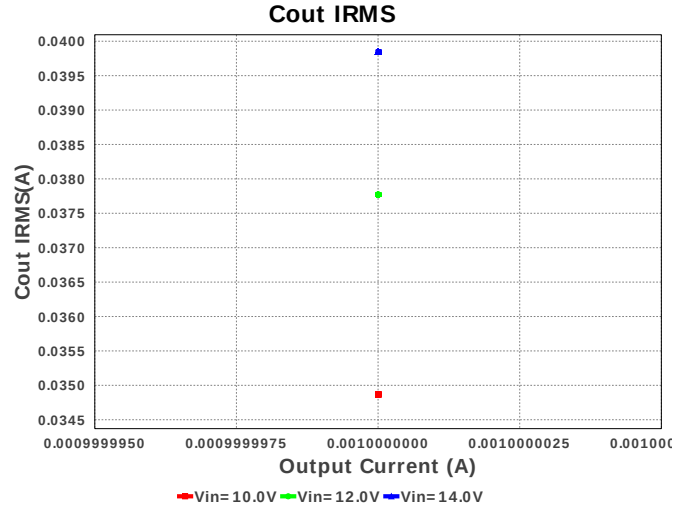


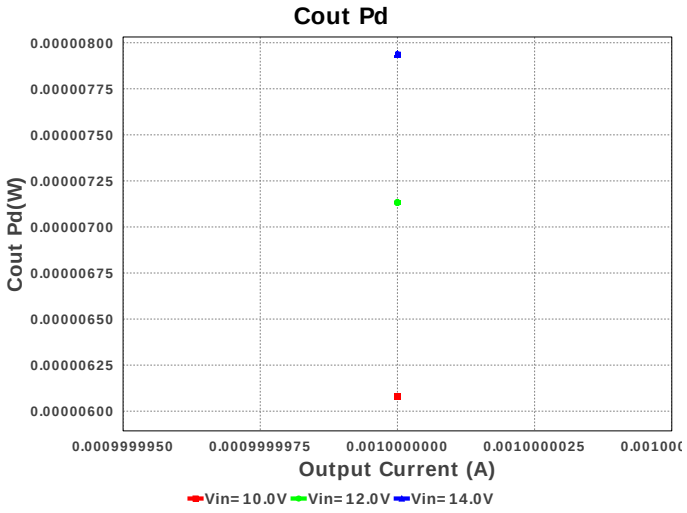


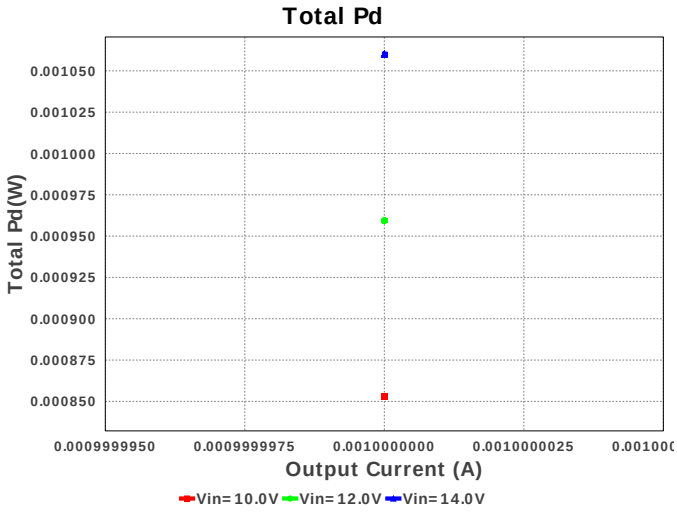


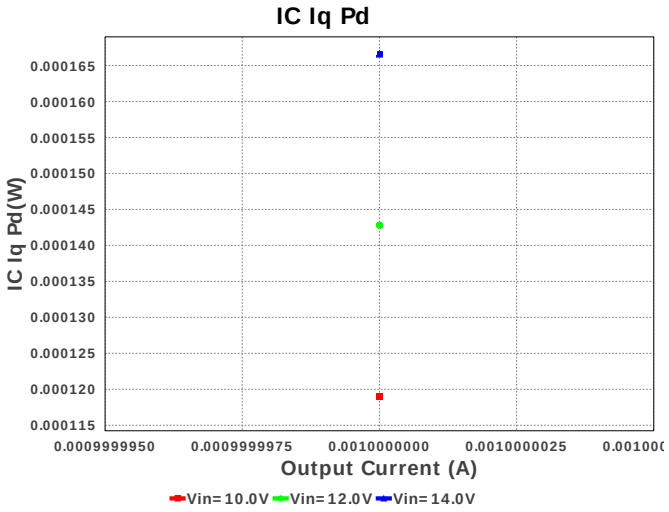


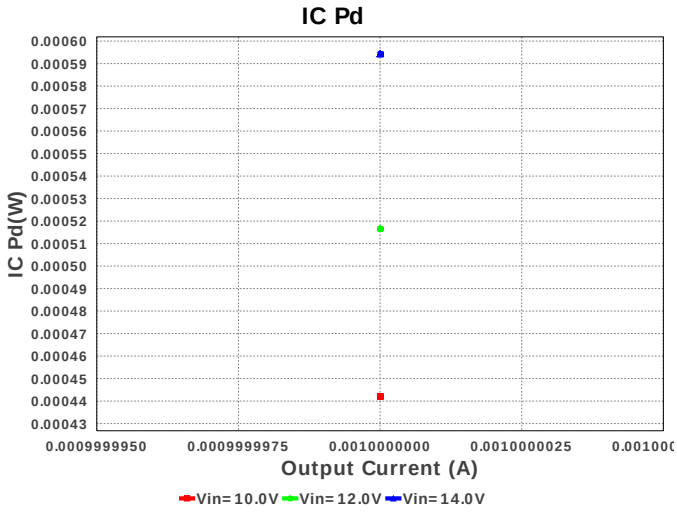


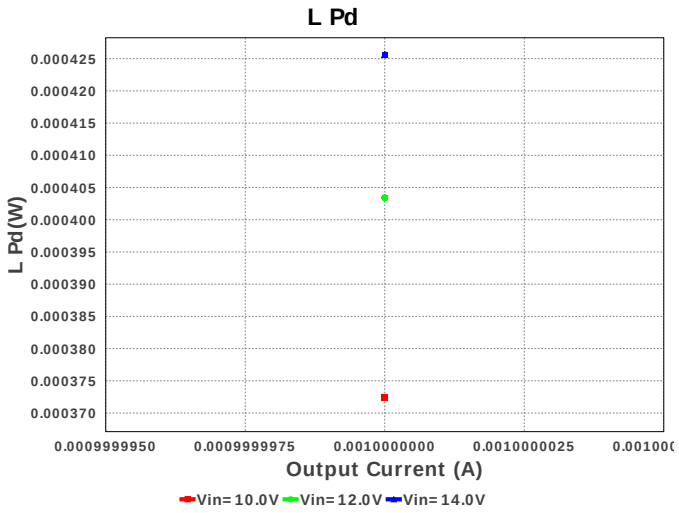


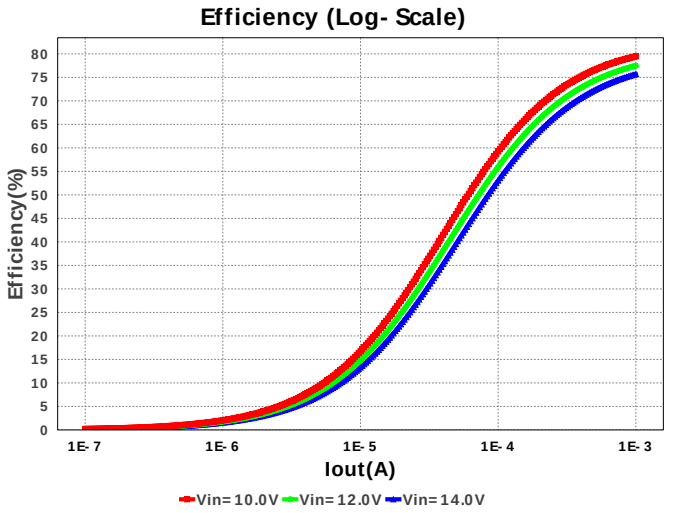












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	8.214 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	39.845 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	72.462 mA	Current	Peak switch current in IC
4.	Iin Avg	311.44 µA	Current	Average input current
5.	L Ipp	142.92 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	7	General	Total Design BOM count
7.	FootPrint	43.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	12.095 kHz	General	Switching frequency
9.	Pout	3.3 mW	General	Total output power
10.	Total BOM	$0.67	General	Total BOM Cost
11.	Vout Actual	3.288 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors

#	Name	Value	Category	Description
12.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	355.416 m%	Op_point	Duty cycle
14.	Efficiency	75.686 %	Op_point	Steady state efficiency
15.	IC Tj	30.154 degC	Op_point	IC junction temperature
16.	ICThetaJA	259.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	1.0 mA	Op_point	Iout operating point
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	9.651 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
21.	Cout Pd	7.938 µW	Power	Output capacitor power dissipation
22.	IC Iq Pd	166.6 µW	Power	IC Iq Pd
23.	IC Pd	594.262 µW	Power	IC power dissipation
24.	L Pd	425.589 µW	Power	Inductor power dissipation
25.	Total Pd	1.06 mW	Power	Total Power Dissipation
26.	Vout Tolerance	4.067 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0 m	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS62122	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS62122** Product Folder : http://www.ti.com/product/TPS62122 : contains the data sheet and other resources.