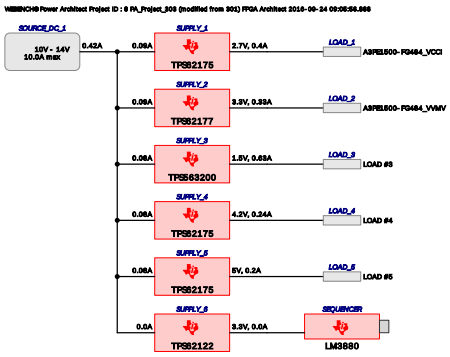
WEBENCH® Power Architect



Project Report

Project : 4790845/8 : PA_Project_303 (modified from 301)
Created : 2016-09-24 09:05:56.888
Optimize project optFactor=3

Project Summary

1.	Total System Efficiency	86.479 %
2.	Total System BOM Count	44.0
3.	Total System Footprint	436.0 mm2
4.	Total System BOM Cost	$6.30
5.	Total System Power Dissipation	800.8 mW

--> Launch WEBENCH Power Architect.

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	1	LOAD_1	A3PE1500-FG484_VCCI
SUPPLY_2	1	LOAD_2	A3PE1500-FG484_VVMV
SUPPLY_3	0	LOAD_3	LOAD #3
SUPPLY_4	0	LOAD_4	LOAD #4
SUPPLY_5	0	LOAD_5	LOAD #5
SUPPLY_6	NA		
SEQUENCER	NA		

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS62175	Switcher : High Light-Load Efficiency Buck Converter	2.7 V	0.4 A	83.9%	58	$1.02	47	4
2.	SUPPLY_2	TPS62177	Switcher : Fixed 3.3Vout, High Light-Load Efficiency Buck Converter	3.3 V	0.33 A	86.5%	50	$1.00	48	9
3.	SUPPLY_3	TPS563200	Switcher : 17V, 3A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	1.5 V	0.63 A	84.1%	149	$1.06	49	14
4.	SUPPLY_4	TPS62175	Switcher : High Light-Load Efficiency Buck Converter	4.2 V	0.24 A	88.6%	56	$1.02	50	19
5.	SUPPLY_5	TPS62175	Switcher : High Light-Load Efficiency Buck Converter	5 V	0.2 A	89.7%	61	$1.06	51	24
6.	SUPPLY_6	TPS62122	Switcher : 2V-15V,75mA, Buck Converter with DCS-Control	3.3 V	0.001 A	75.7%	43	$0.66	53	31
7.	SEQUENCER	LM3880	Sequencer : Power Sequencer	3.3 V	0.001 A	0%	19	$0.48	52	29

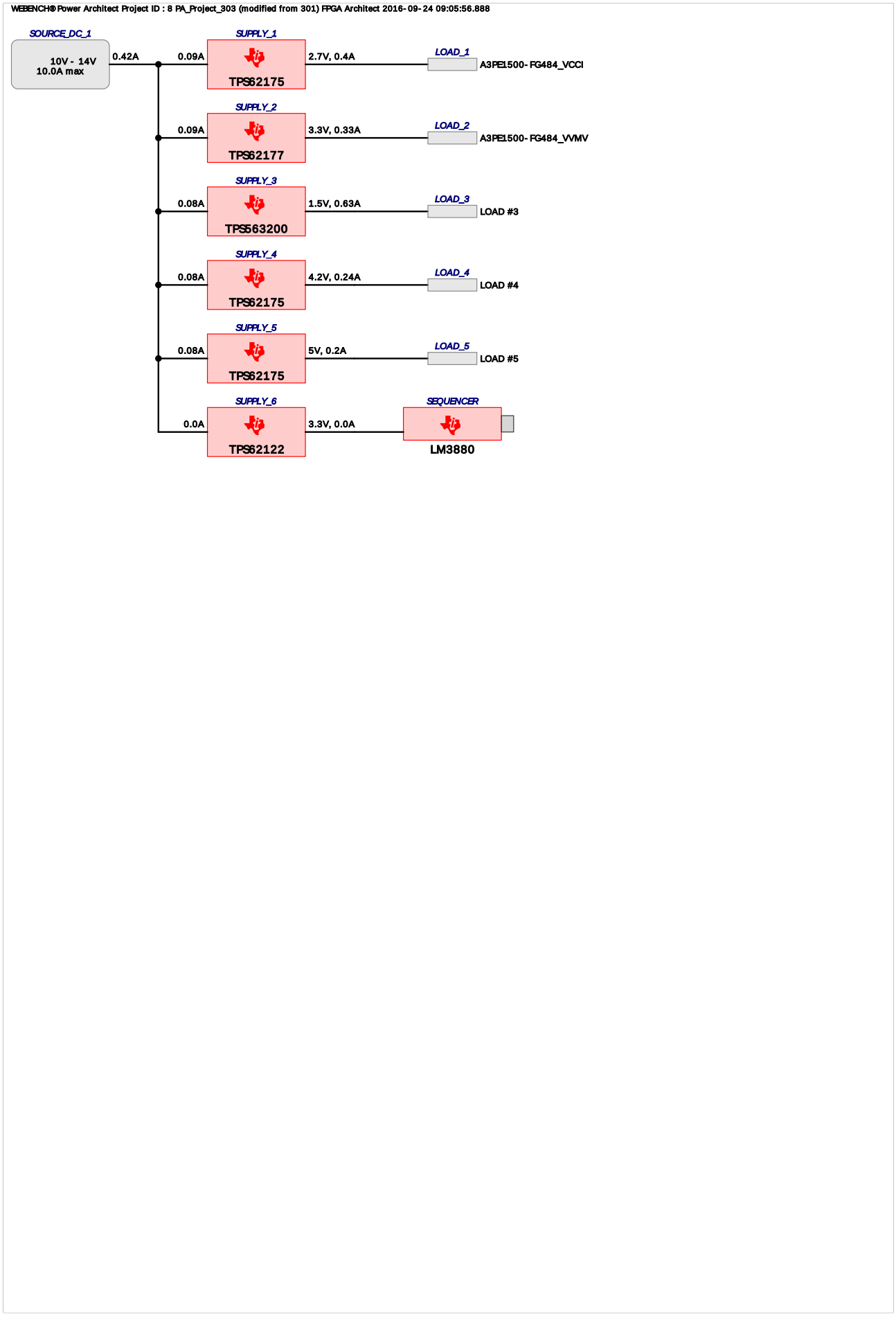
Power Loads

#	Name	VLoad	ILoad	Description
1.	A3PE1500-FG484_VCCI	2.7 V	0.4 A	VoutRipple=10%, Up Sequence Order=0 delay=2.0 mSec, Down Sequence Order=0 delay=2.0 mSec
2.	A3PE1500-FG484_VVMV	3.3 V	0.33 A	VoutRipple=10%, Up Sequence Order=0 delay=2.0 mSec, Down Sequence Order=0 delay=2.0 mSec
3.	LOAD #3	1.5 V	0.63 A	VoutRipple=10%
4.	LOAD #4	4.2 V	0.24 A	VoutRipple=10%
5.	LOAD #5	5 V	0.2 A	VoutRipple=10%

FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Actel http://www.actel.com/documents/PA3E_DS.pdf	A3PE1500-FG484	FPGA_1	ProASIC3E	FPGA Actel ProASIC3E A3PE1500-FG484

Project Diagram



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
AVX	08053C104KAT2A	0805	1	$0.01	7
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	7	$0.01	21
Vishay-Dale	CRCW040210K0FKED	0402	1	$0.01	3
Vishay-Dale	CRCW04021M62FKED	0402	1	$0.01	3
Vishay-Dale	CRCW0402255KFKED	0402	1	$0.01	3
Vishay-Dale	CRCW04022M00FKED	0402	1	$0.01	3
Vishay-Dale	CRCW0402383KFKED	0402	3	$0.01	9
Vishay-Dale	CRCW04029K76FKED	0402	1	$0.01	3
MuRata	GRM188R60J475KE19D	0603	1	$0.01	5
MuRata	GRM188R61C225KE15D	0603	4	$0.02	19
MuRata	GRM21BC80G226ME39L	0805	1	$0.04	7
MuRata	GRM21BR60J226ME39L	0805	2	$0.04	14
MuRata	GRM31CR61A226ME19L	1206_190	1	$0.08	11
MuRata	GRM32ER61E226KE15L	1210	1	$0.16	15
Texas Instruments	LM3880MF-1AE/NOPB	R-PDSO-G6	1	$0.45	10
Coilcraft	LPS4018-103MRB	LPS4018	4	$0.35	96
Yageo America	RC0603FR-0782KL	0603	1	$0.01	5
Yageo America	RC0603FR-07910KL	0603	1	$0.01	5
Bourns	SRN8040-1R5Y	SRN8040	1	$0.22	100
Taiyo Yuden	TMK212BJ475KG-T	0805	1	$0.05	7
Texas Instruments	TPS563200DDCR	DDC0006A	1	$0.52	10
Texas Instruments	TPS62122DRVR	S-PWSON-N6	1	$0.49	9
Texas Instruments	TPS62175DQCR	R-PWSON-N10	3	$0.58	36
Texas Instruments	TPS62177DQCR	R-PWSON-N10	1	$0.58	12
Total			44	$6.30	435.7575

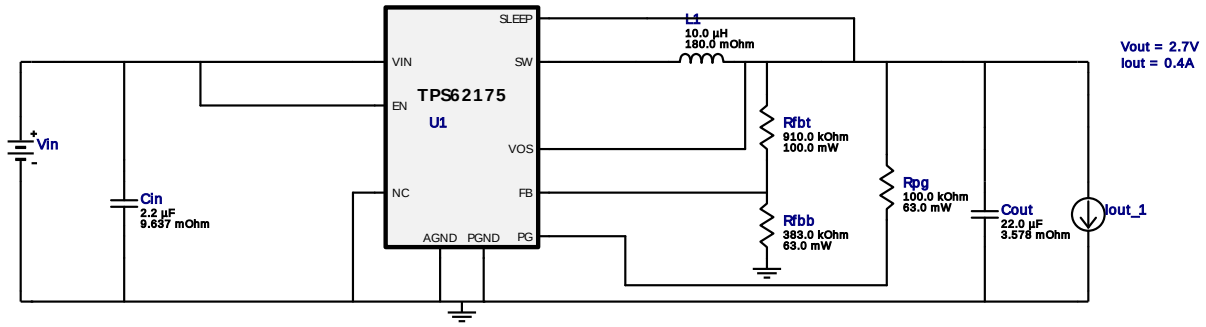
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 2.7V
Iout = 0.4A

Device = TPS62175DQCR
Topology = Buck
Created = 9/24/16 9:05:48 AM
BOM Cost = $1.02
BOM Count = 7
Total Pd = 0.21W

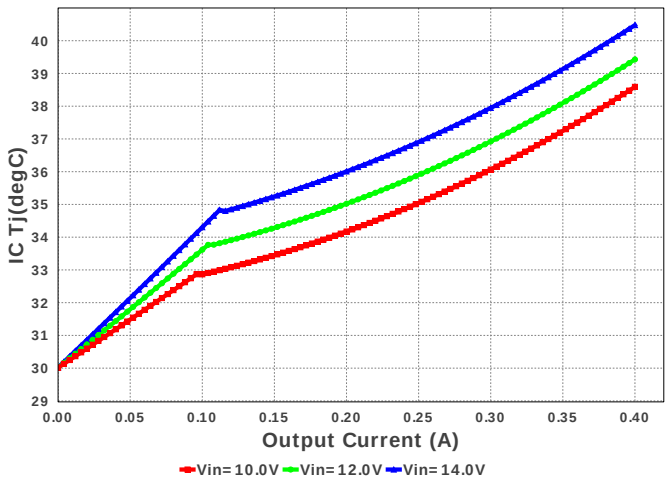
Design : 4790845/47 TPS62175DQCR
TPS62175DQCR 10.0V-14.0V to 2.70V @ 0.4A



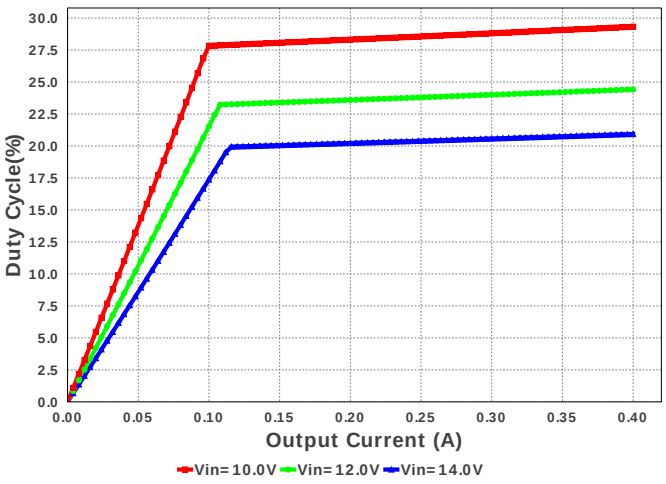
Electrical BOM

#	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 mm^2
2.	Cout	MuRata	GRM21BC80G226ME39L Series= X6S	Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A	1	$0.04	0805 7 mm^2
3.	L1	Coilcraft	LPS4018-103MRB	L= 10.0 µH DCR= 180.0 mOhm	1	$0.35	LPS4018 24 mm^2
4.	Rfbb	Vishay-Dale	CRCW0402383KFKED Series= CRCW..e3	Res= 383.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
5.	Rfbt	Yageo America	RC0603FR-07910KL Series= ?	Res= 910.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
6.	Rpg	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.	U1	Texas Instruments	TPS62175DQCR	Switcher	1	$0.58	R-PWSON-N10 12 mm^2

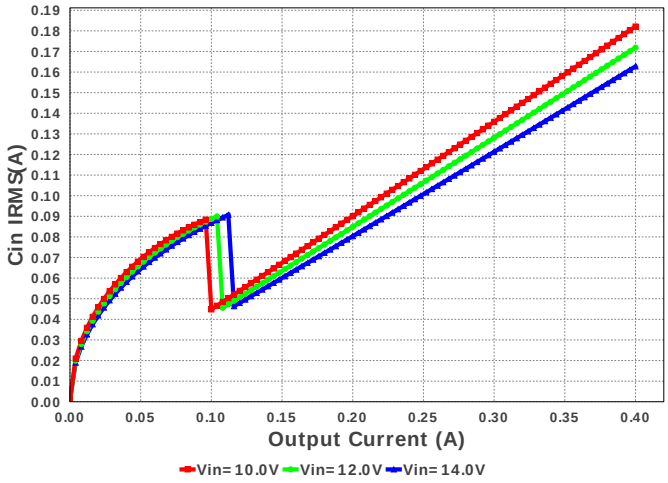
IC Tj



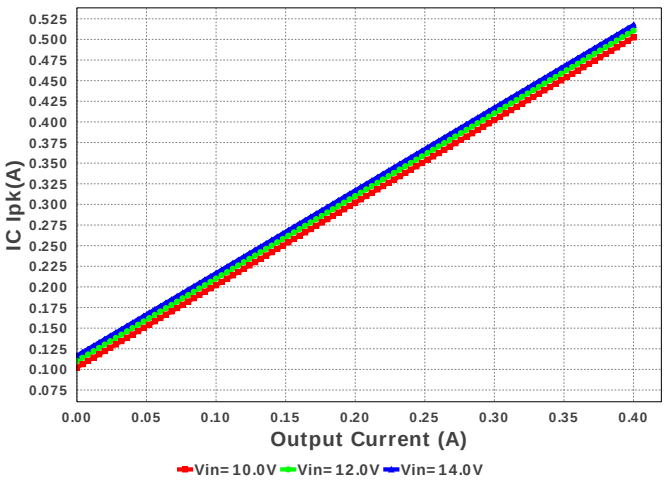
Duty Cycle



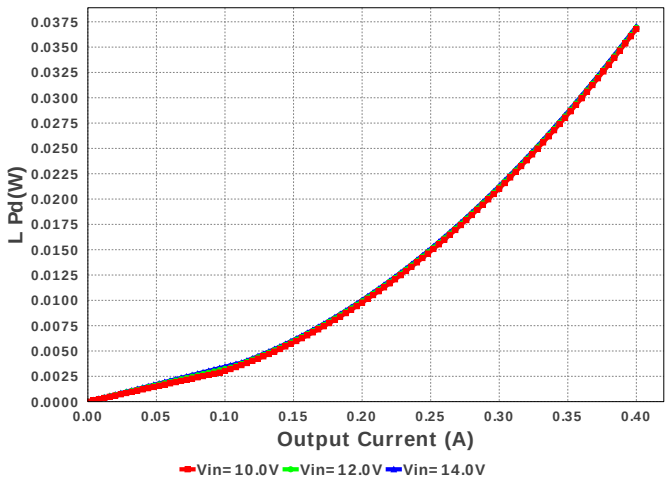
Cin IRMS



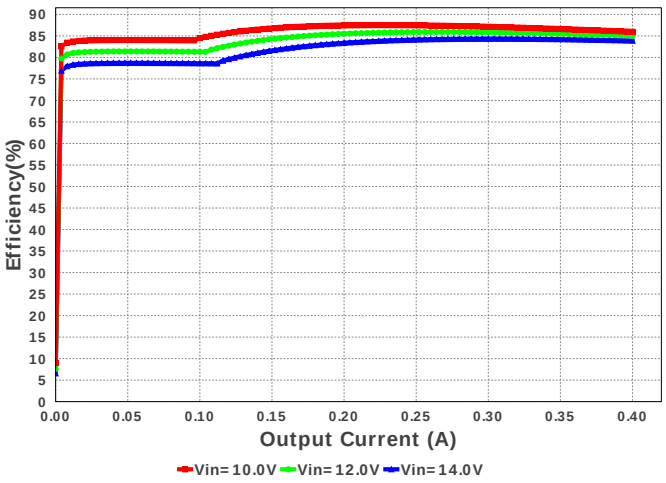
IC Ipk

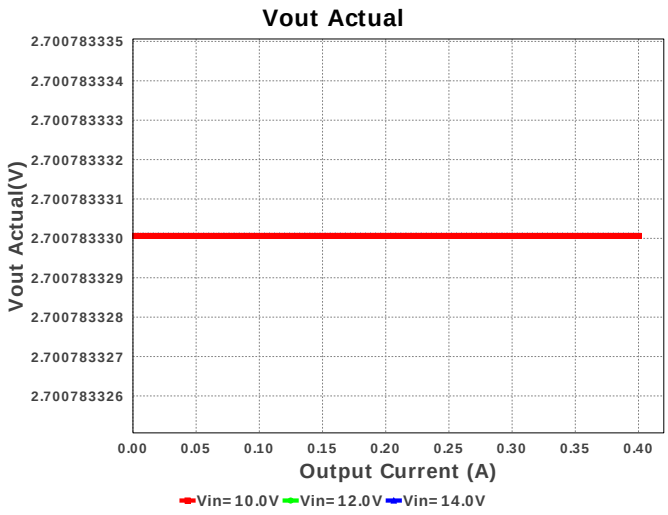


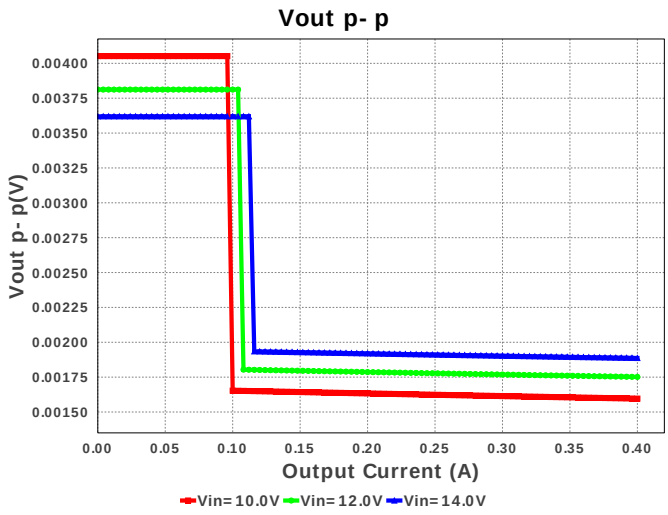
L Pd

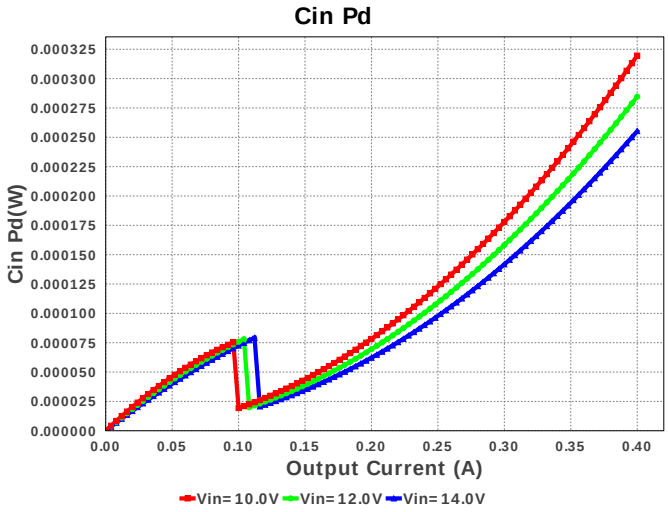


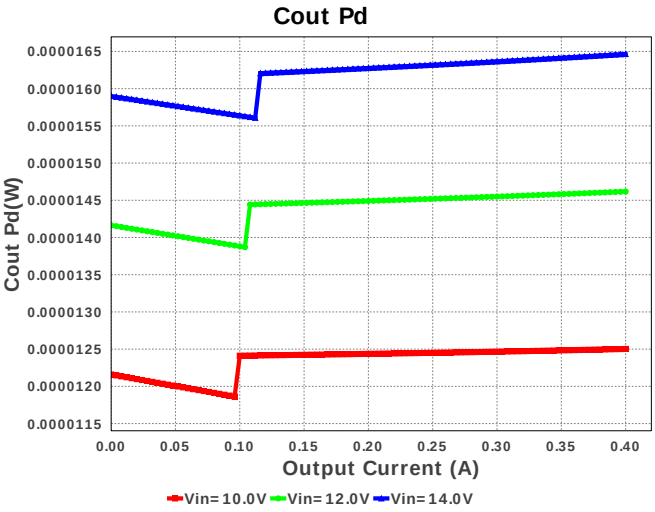
Efficiency

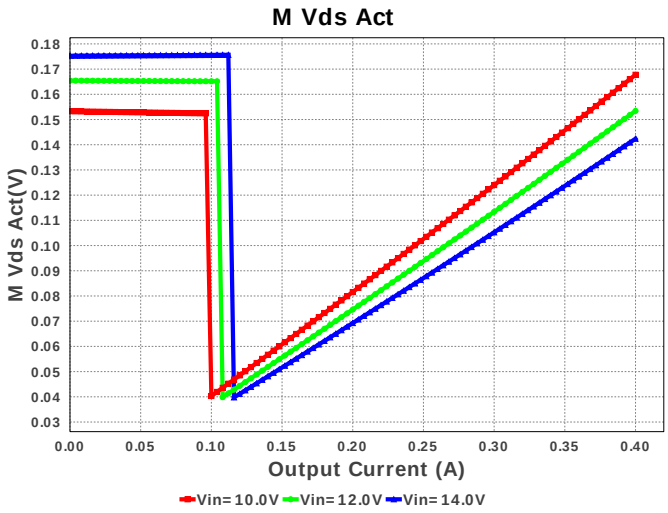


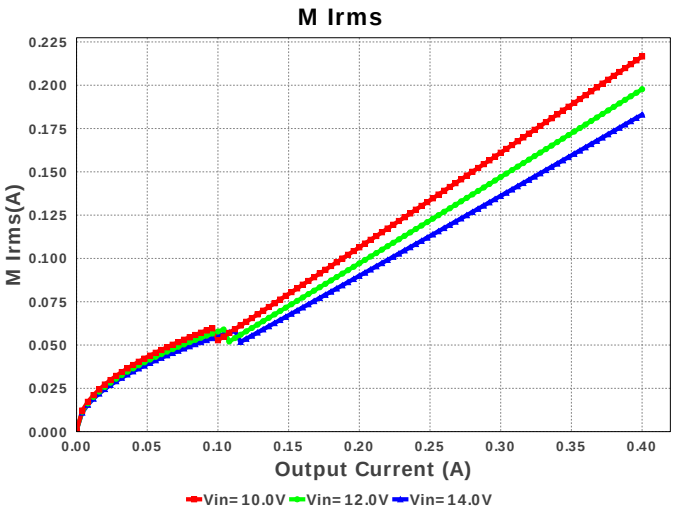


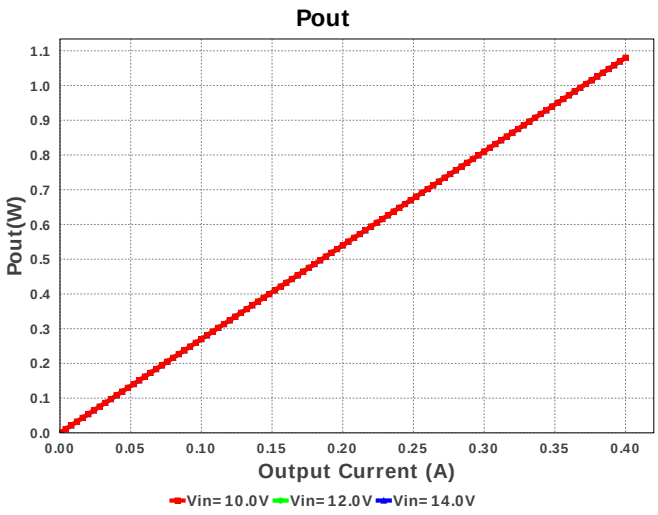


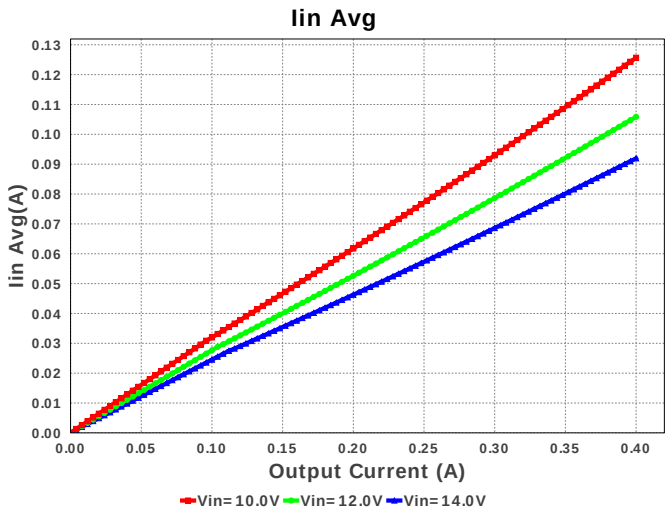


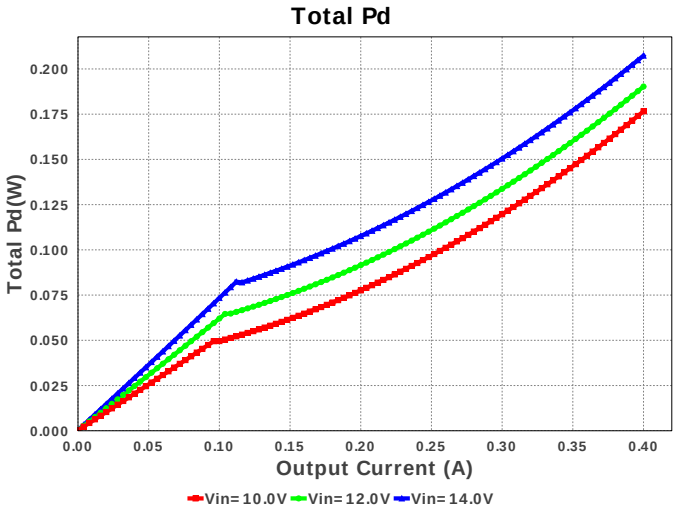


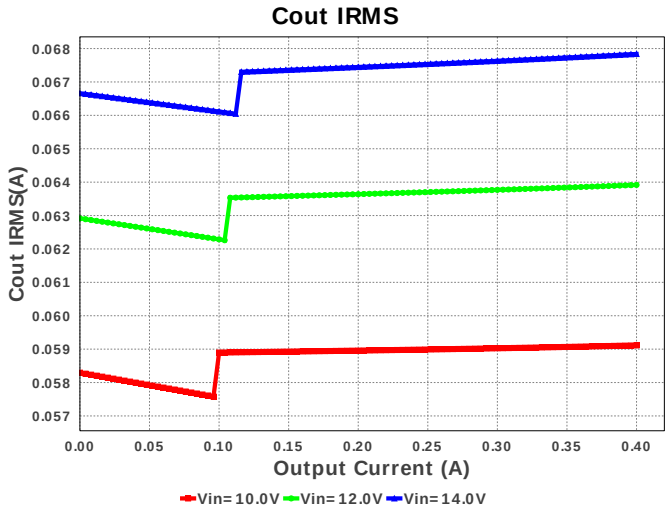


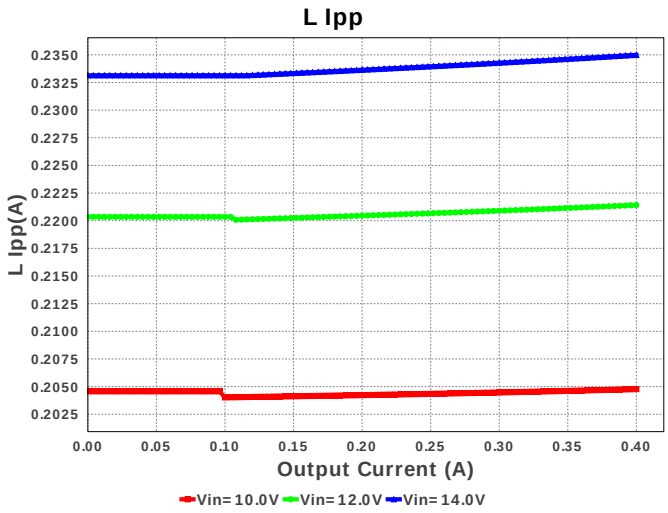


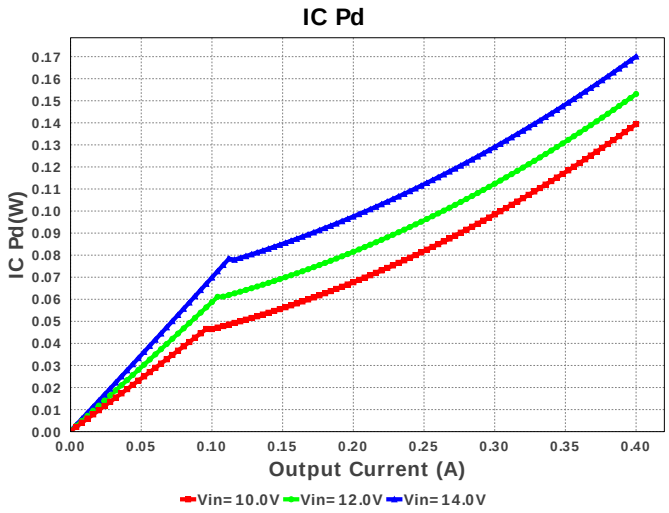


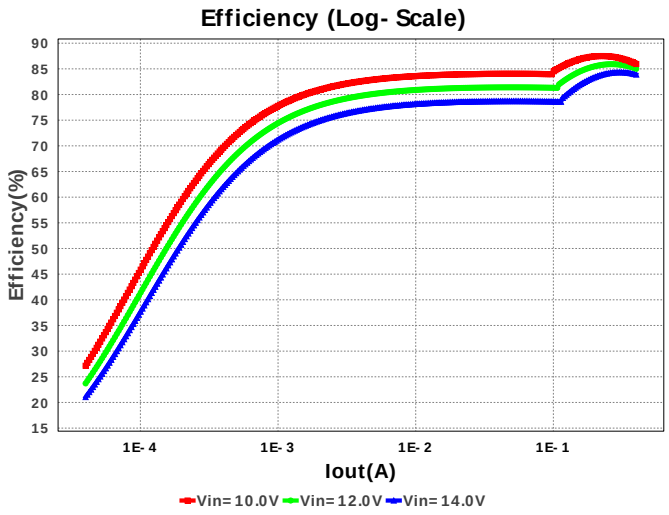












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	162.749 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	67.838 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	517.498 mA	Current	Peak switch current in IC
4.	Iin Avg	91.956 mA	Current	Average input current
5.	L Ipp	235.0 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	183.037 mA	Current	MOSFET RMS current
7.	BOM Count	7	General	Total Design BOM count
8.	FootPrint	58.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.007 MHz	General	Switching frequency
10.	IC Tolerance	24.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	142.375 mV	General	Voltage drop across the MosFET
12.	Mode	CCM	General	Conduction Mode
13.	Pout	1.08 W	General	Total output power
14.	Total BOM	$1.02	General	Total BOM Cost
15.	Vout Actual	2.701 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	2.7 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	20.939 %	Op_point	Duty cycle
18.	Efficiency	83.891 %	Op_point	Steady state efficiency
19.	IC Tj	40.477 degC	Op_point	IC junction temperature
20.	ICThetaJA	61.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	400.0 mA	Op_point	Iout operating point
22.	VIN_OP	14.0 V	Op_point	Vin operating point
23.	Vout p-p	1.887 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	255.258 µW	Power	Input capacitor power dissipation
25.	Cout Pd	16.466 µW	Power	Output capacitor power dissipation
26.	IC Pd	170.076 mW	Power	IC power dissipation
27.	L Pd	37.035 mW	Power	Inductor power dissipation
28.	Total Pd	207.385 mW	Power	Total Power Dissipation
29.	Vout Tolerance	4.464 %		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	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	2.7	Output Voltage
5.	base_pn	TPS62175	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. TPS62175 Product Folder : http://www.ti.com/product/TPS62175 : contains the data sheet and other resources.

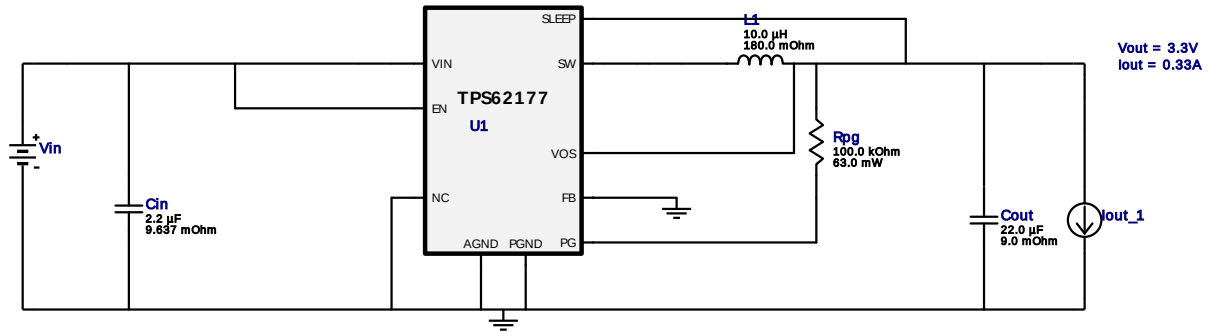
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 3.3V
Iout = 0.33A

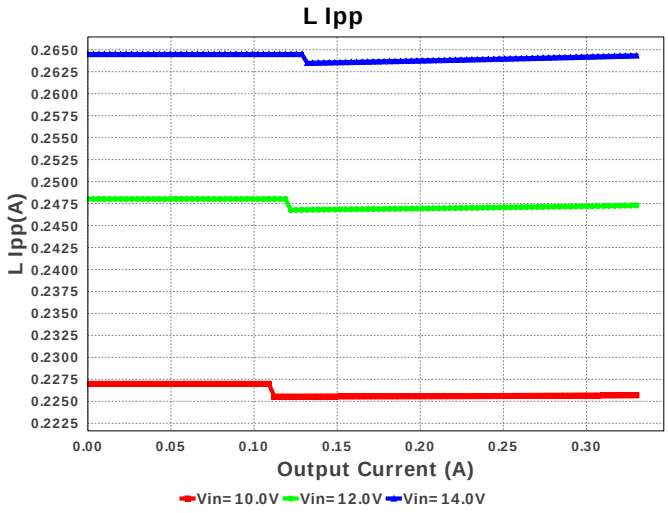
Device = TPS62177DQCR
Topology = Buck
Created = 9/24/16 9:05:49 AM
BOM Cost = $1.00
BOM Count = 5
Total Pd = 0.17W

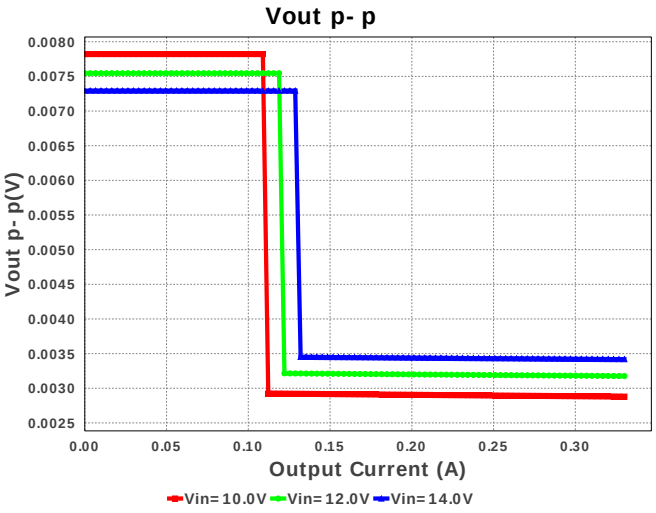
Design : 4790845/48 TPS62177DQCR
TPS62177DQCR 10.0V-14.0V to 3.30V @ 0.33A

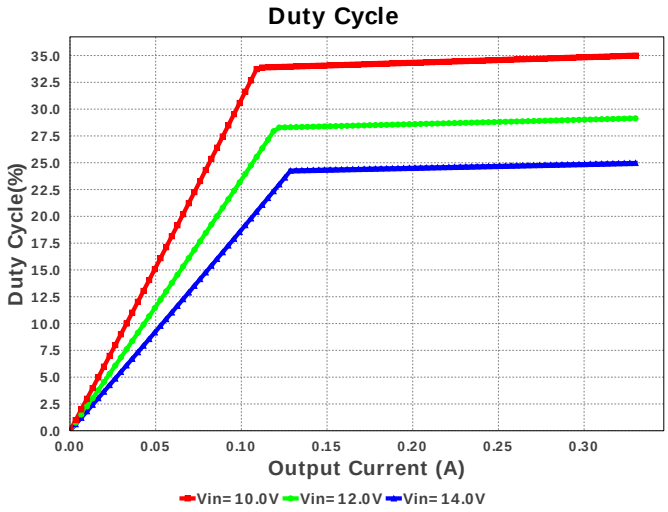


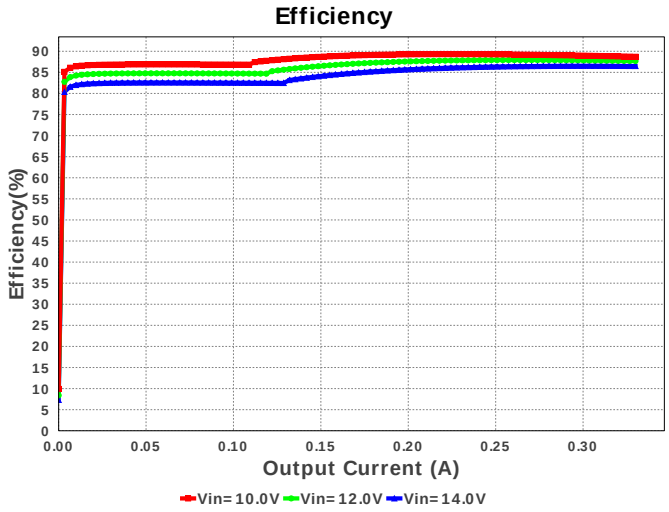
Electrical BOM

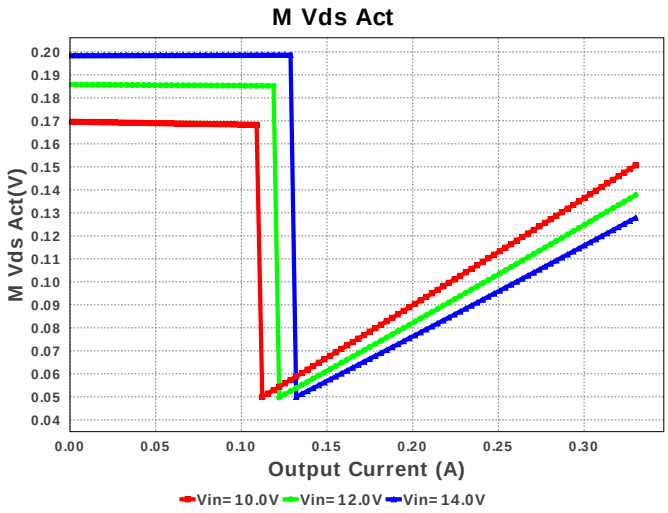
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	$0.02	0603 5 mm^2
2.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	$0.04	0805 7 mm^2
3.	L1	Coilcraft	LPS4018-103MRB	L= 10.0 µH DCR= 180.0 mOhm	1	$0.35	LPS4018 24 mm^2
4.	Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
5.	U1	Texas Instruments	TPS62177DQCR	Switcher	1	$0.58	R-PWSON-N10 12 mm^2

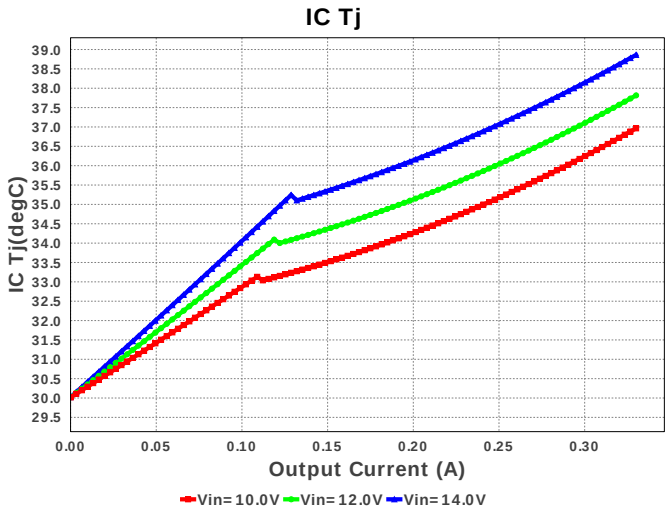


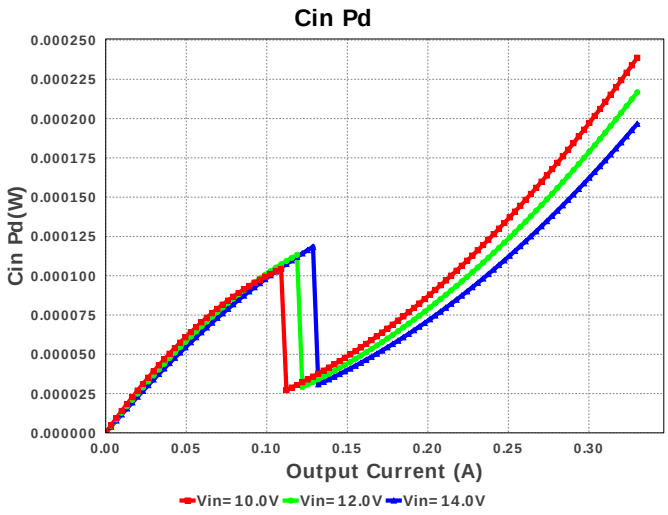


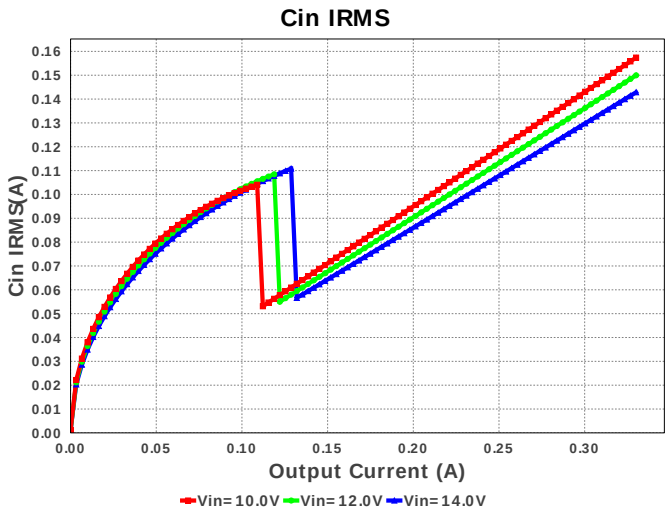


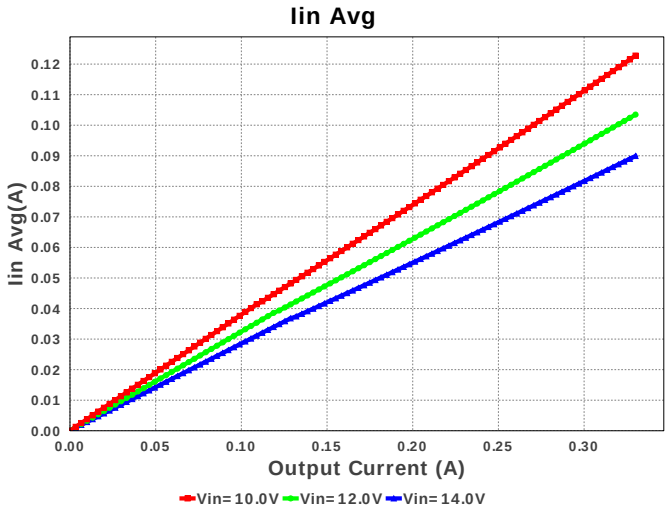


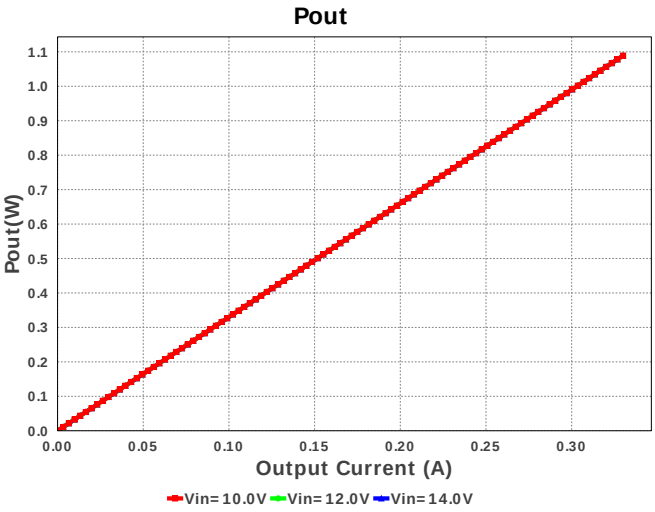


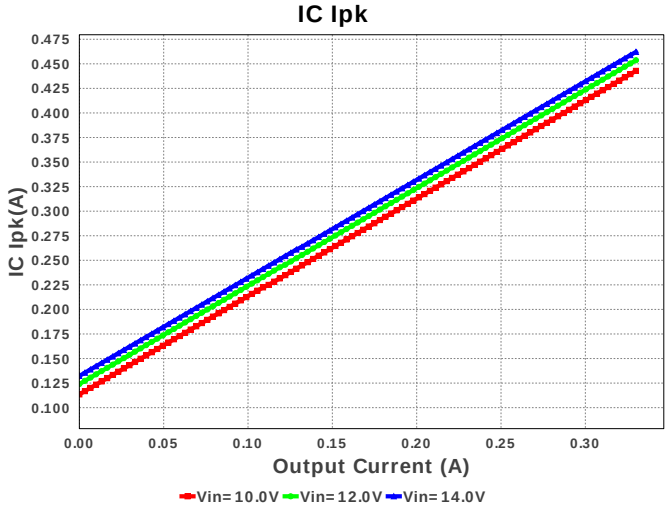


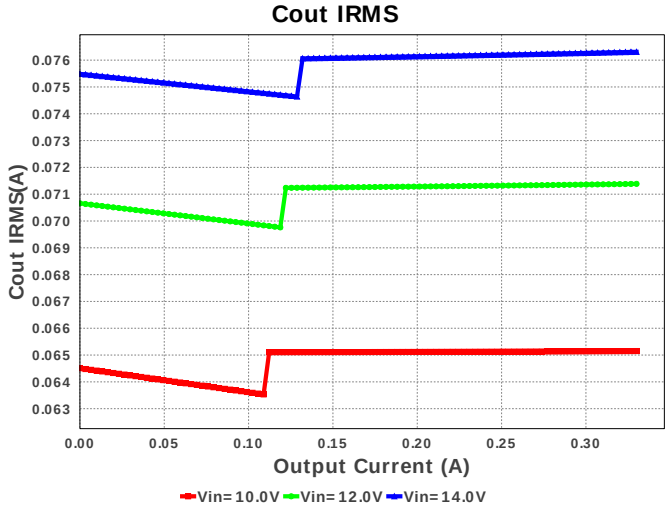


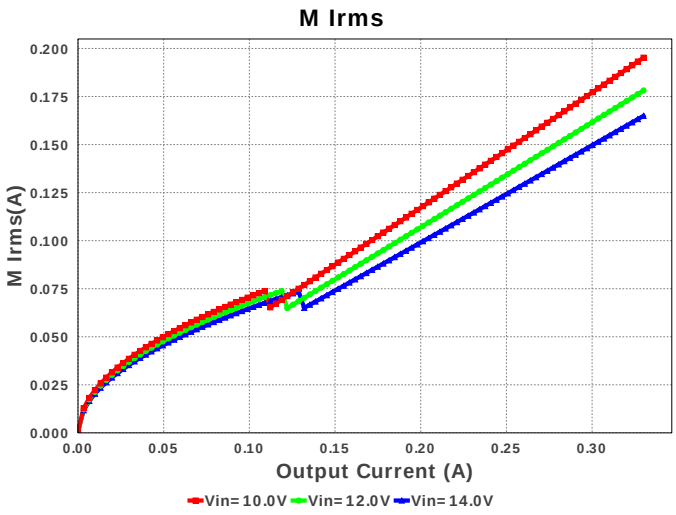


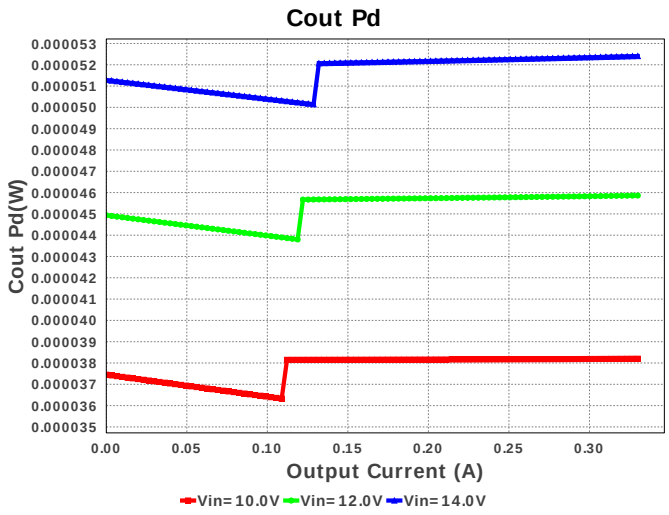


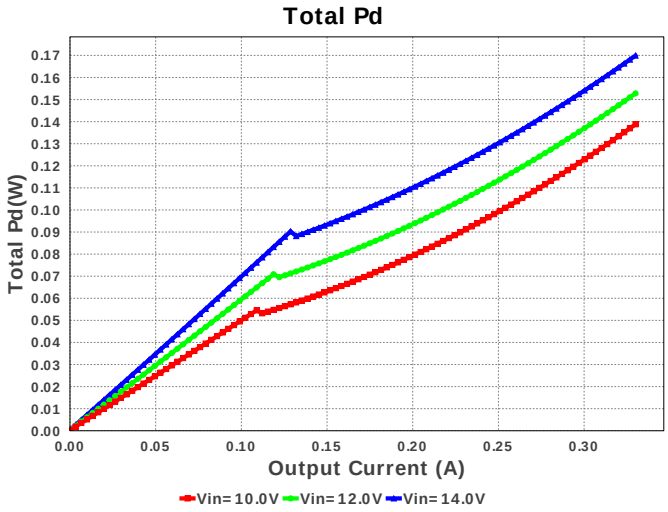


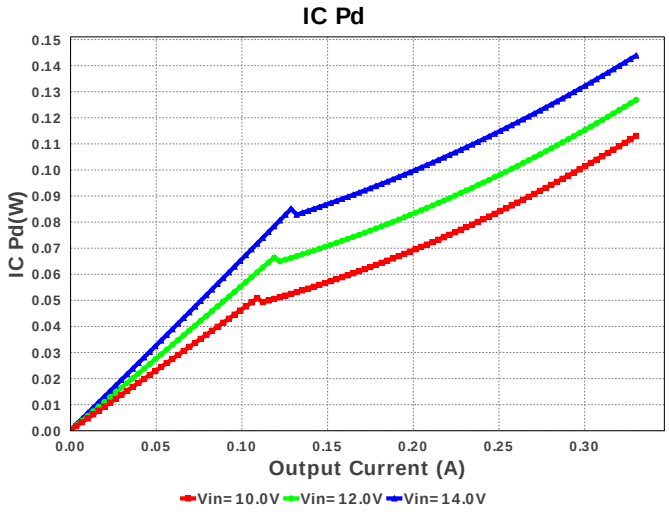


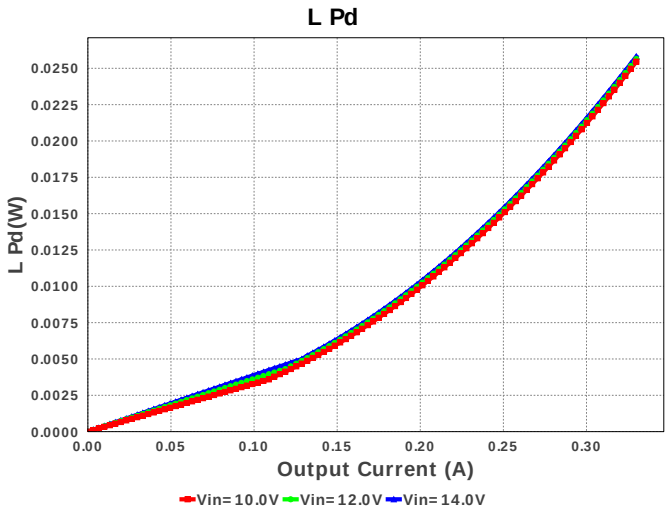


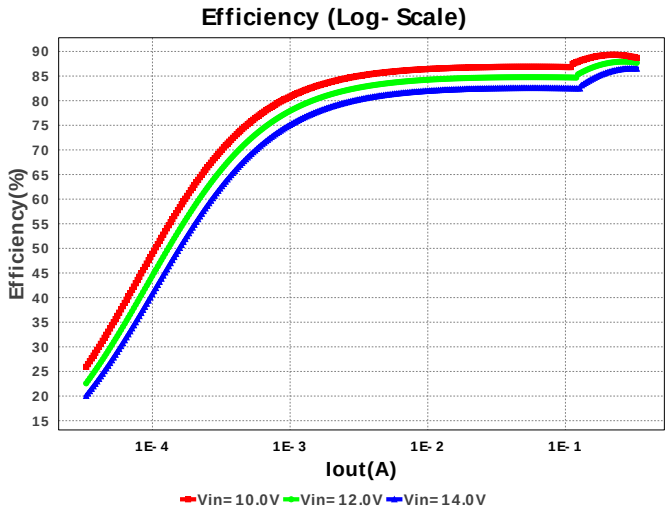












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	142.849 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	76.309 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	462.17 mA	Current	Peak switch current in IC
4.	Iin Avg	89.923 mA	Current	Average input current
5.	L Ipp	264.34 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	164.921 mA	Current	MOSFET RMS current
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	1.011 MHz	General	Switching frequency
10.	IC Tolerance	24.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	127.805 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	1.089 W	General	Total output power
14.	Total BOM	$1.0	General	Total BOM Cost
15.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	24.976 %	Op_point	Duty cycle
17.	Efficiency	86.503 %	Op_point	Steady state efficiency
18.	IC Tj	38.862 degC	Op_point	IC junction temperature
19.	ICThetaJA	61.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	330.0 mA	Op_point	Iout operating point
21.	VIN_OP	14.0 V	Op_point	Vin operating point
22.	Vout p-p	3.419 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	196.65 µW	Power	Input capacitor power dissipation
24.	Cout Pd	52.407 µW	Power	Output capacitor power dissipation
25.	IC Pd	143.859 mW	Power	IC power dissipation
26.	L Pd	25.813 mW	Power	Inductor power dissipation
27.	Total Pd	169.917 mW	Power	Total Power Dissipation
28.	Vout Tolerance	727.27 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	330.0 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	TPS62177	Texas Instruments Base Part 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.

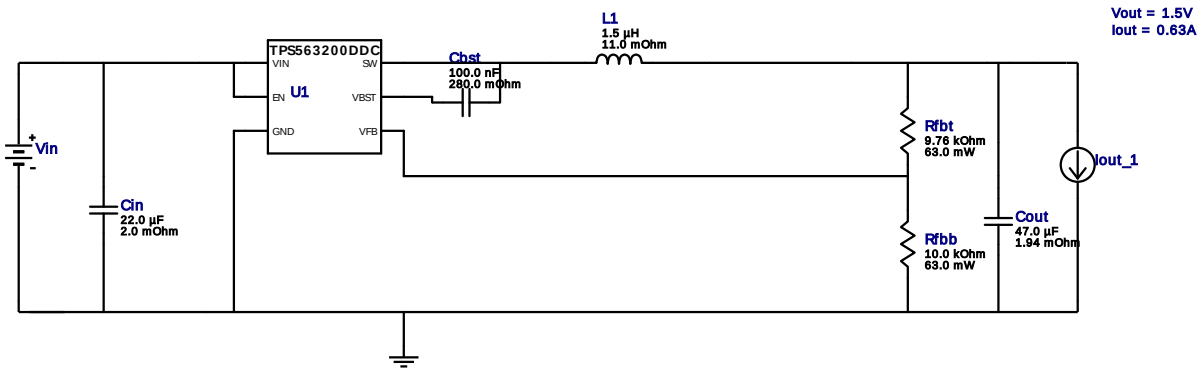
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 1.5V
Iout = 0.63A

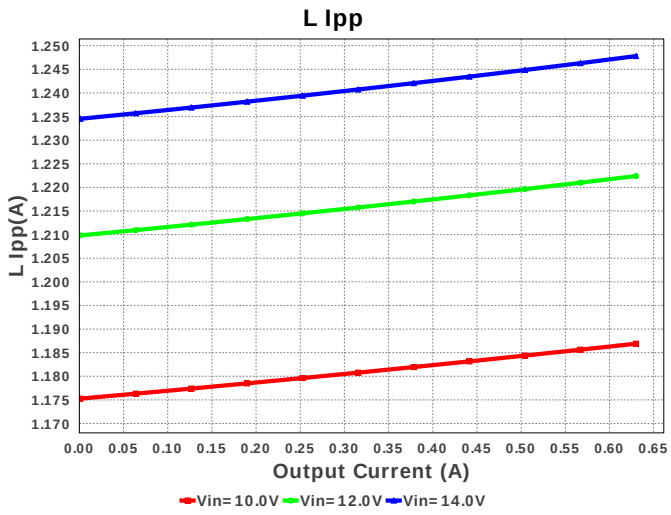
Device = TPS563200DDCR
Topology = Buck
Created = 9/24/16 9:05:50 AM
BOM Cost = $1.06
BOM Count = 7
Total Pd = 0.18W

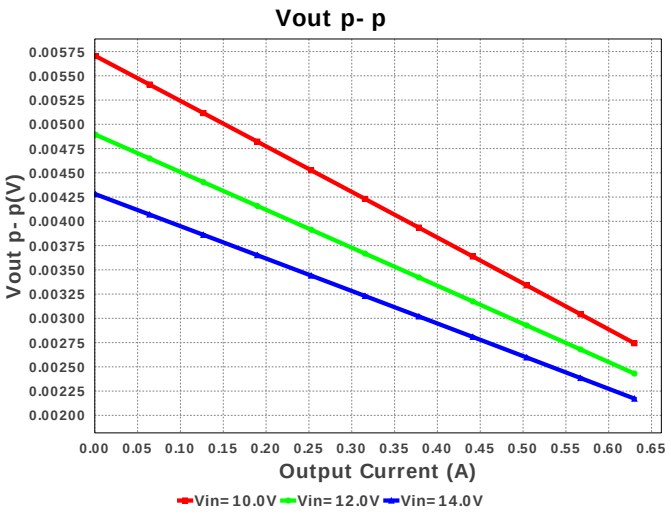
Design : 4790845/49 TPS563200DDCR
TPS563200DDCR 10.0V-14.0V to 1.50V @ 0.63A

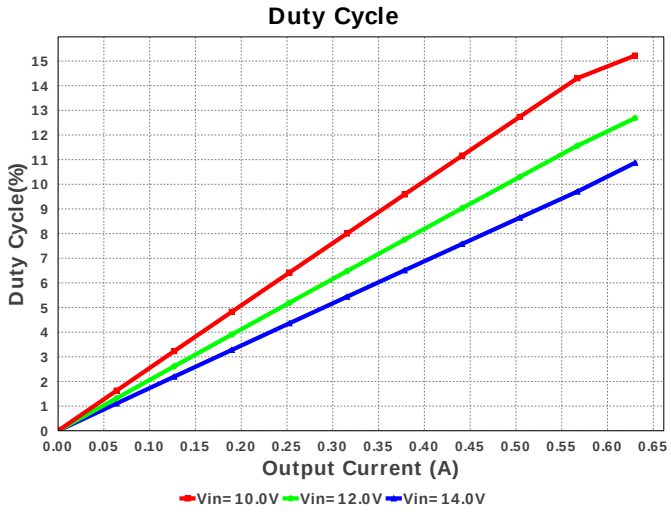


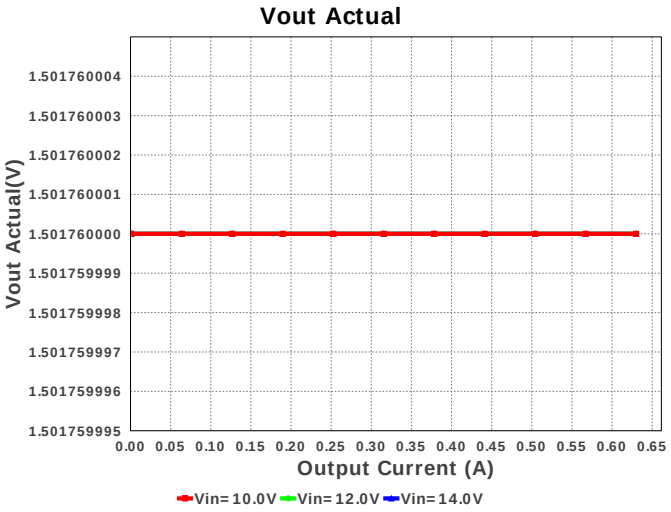
Electrical BOM

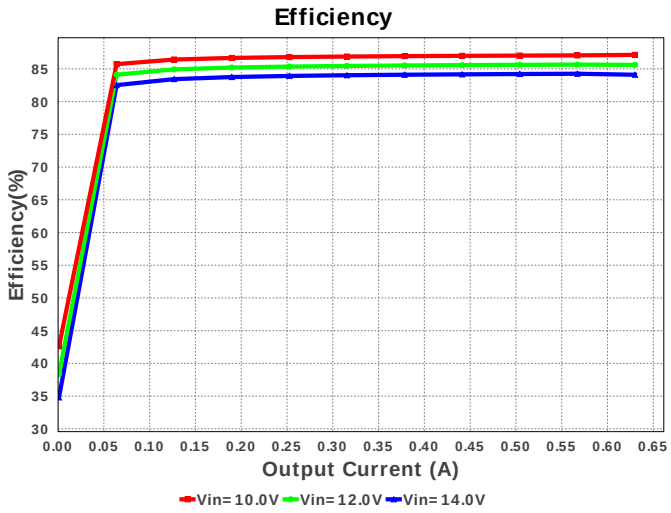
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	$0.16	1210 15 mm²
3.	Cout	TDK	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	SRN8040-1R5Y	L= 1.5 µH DCR= 11.0 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	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	U1	Texas Instruments	TPS563200DDCR	Switcher	1	$0.52	DDC0006A 10 mm²

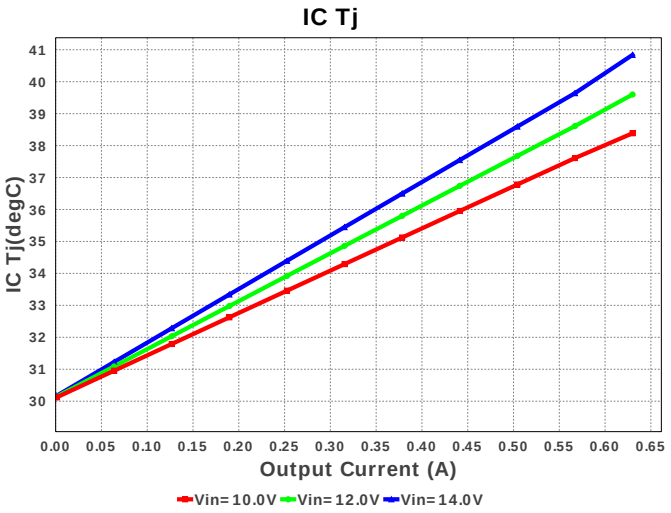


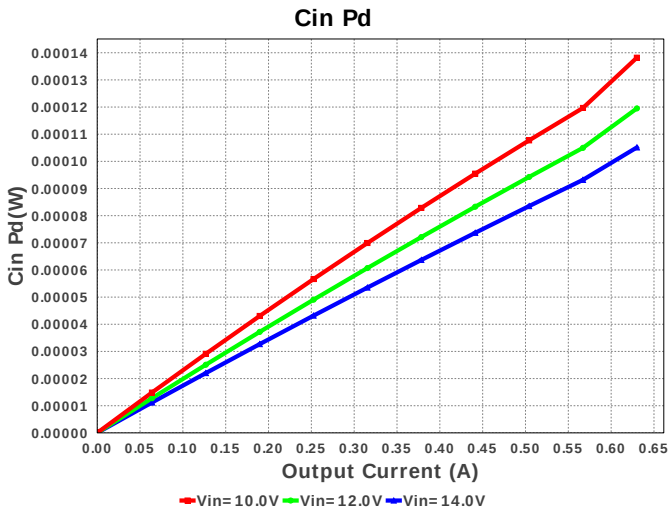


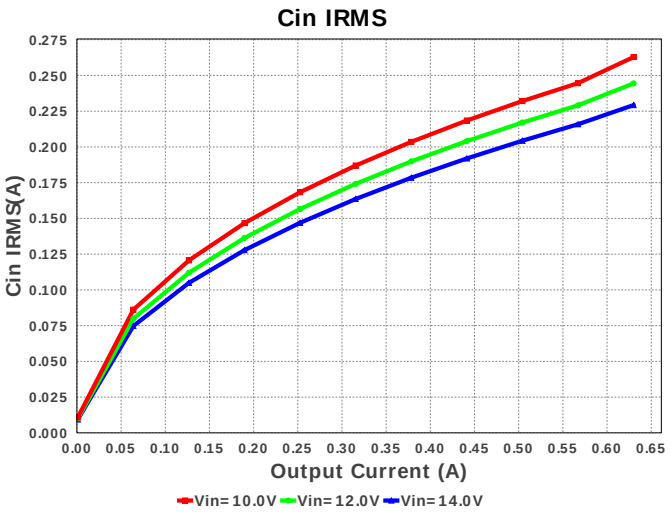


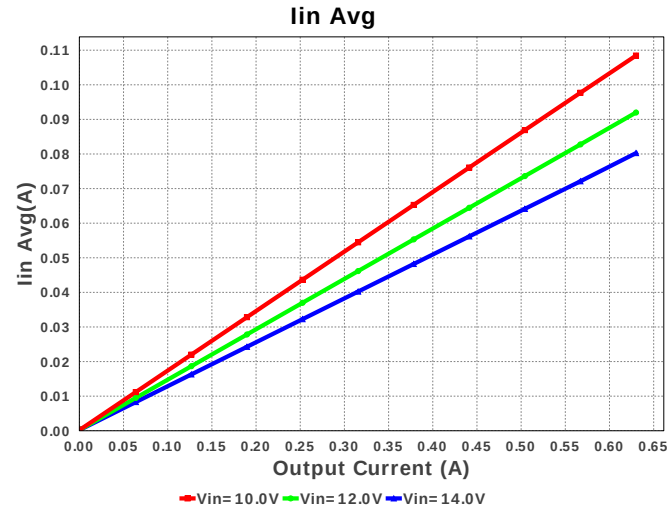


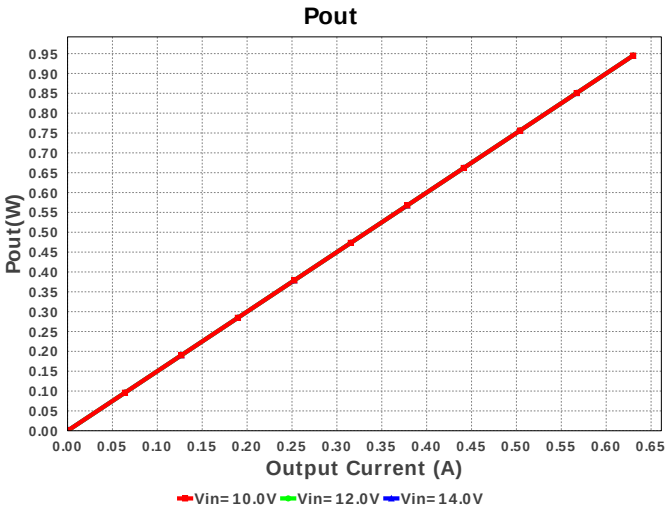


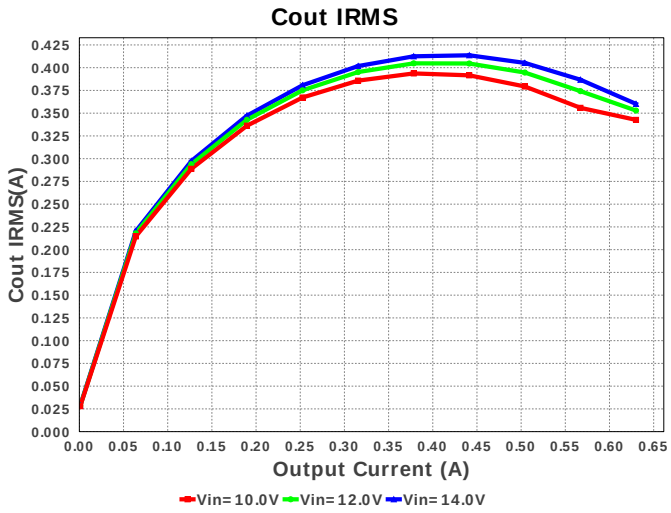


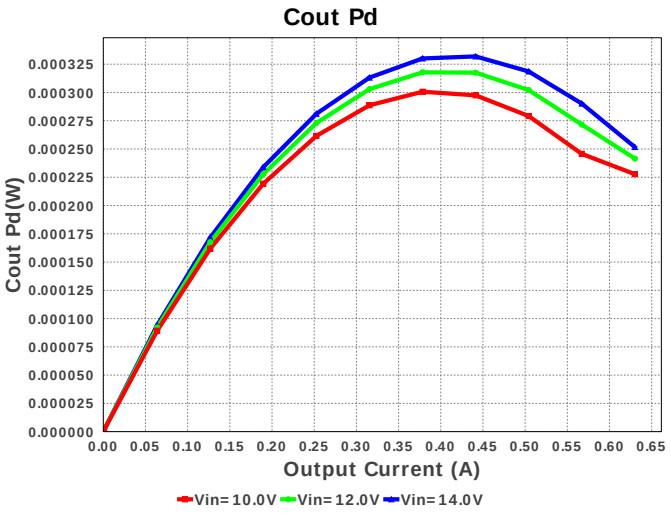


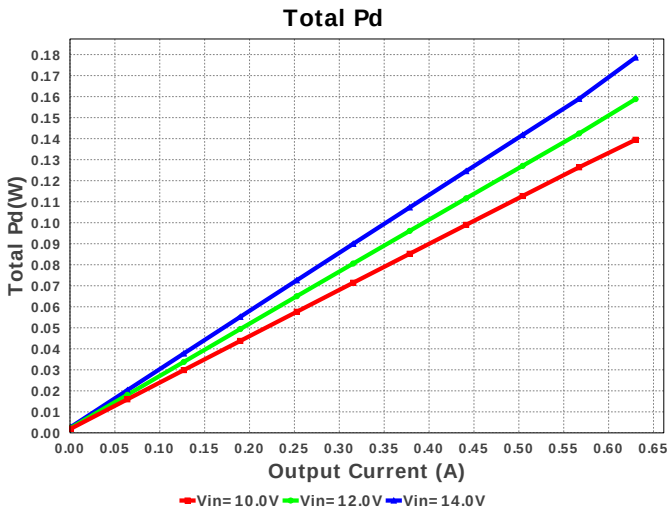


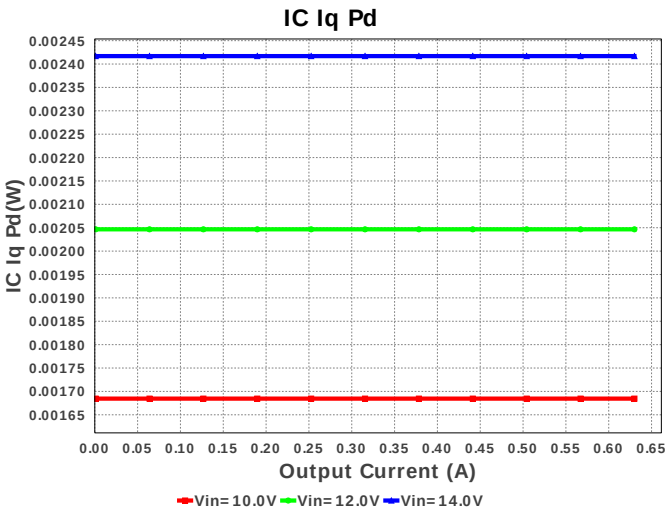


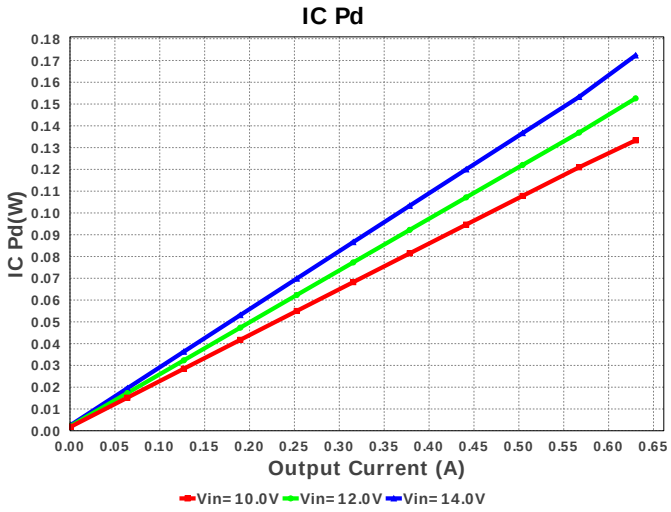


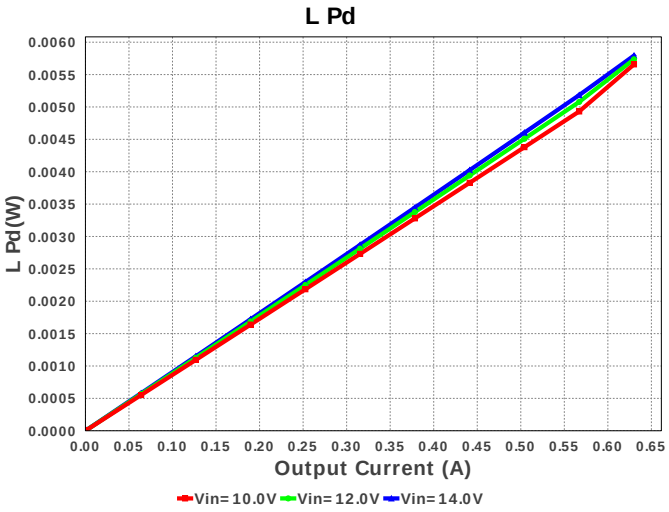


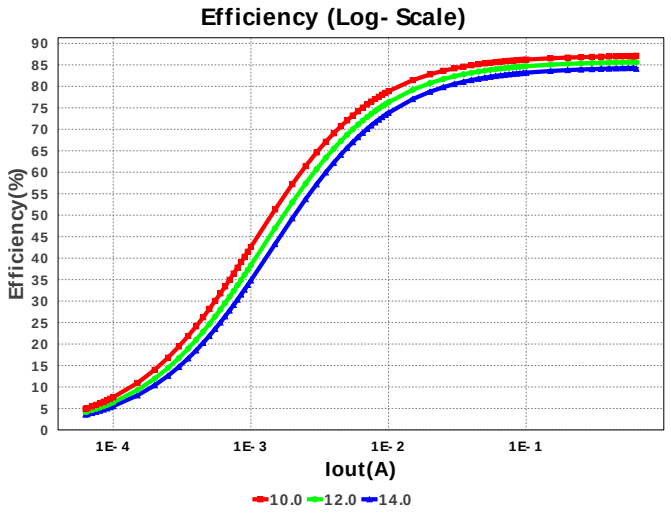












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	229.262 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	360.21 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	80.256 mA	Current	Average input current
4.	L Ipp	1.248 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	723.895 kHz	General	Switching frequency
8.	Mode	CCM	General	Conduction Mode
9.	Pout	945.0 mW	General	Total output power
10.	Total BOM	$1.06	General	Total BOM Cost
11.	Vout Actual	1.502 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors

#	Name	Value	Category	Description
12.	Vout OP	1.5 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	10.871 %	Op_point	Duty cycle
14.	Efficiency	84.105 %	Op_point	Steady state efficiency
15.	IC Tj	40.839 degC	Op_point	IC junction temperature
16.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	630.0 mA	Op_point	Iout operating point
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	5.789 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	105.122 µW	Power	Input capacitor power dissipation
21.	Cout Pd	251.717 µW	Power	Output capacitor power dissipation
22.	IC Iq Pd	2.417 mW	Power	IC Iq Pd
23.	IC Pd	172.326 mW	Power	IC power dissipation
24.	L Pd	5.793 mW	Power	Inductor power dissipation
25.	Total Pd	178.594 mW	Power	Total Power Dissipation
26.	Vout Tolerance	2.327 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	630.0 m	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	1.5	Output Voltage
5.	base_pn	TPS563200	Texas Instruments Base Part 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.

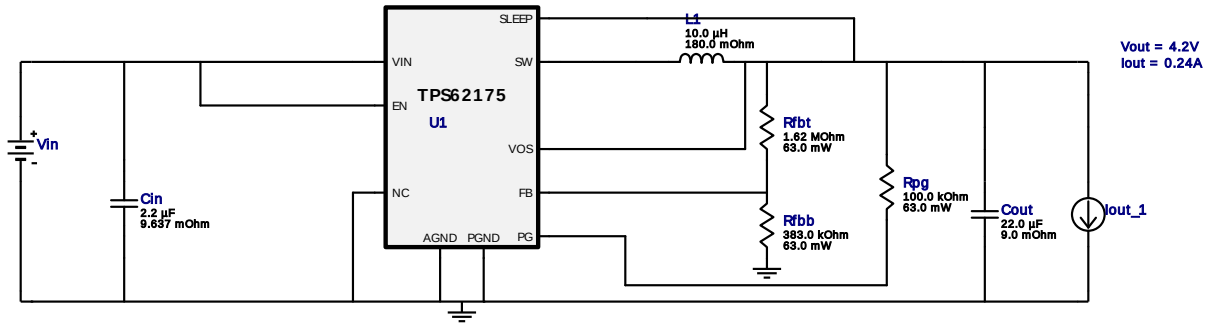
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 4.2V
Iout = 0.24A

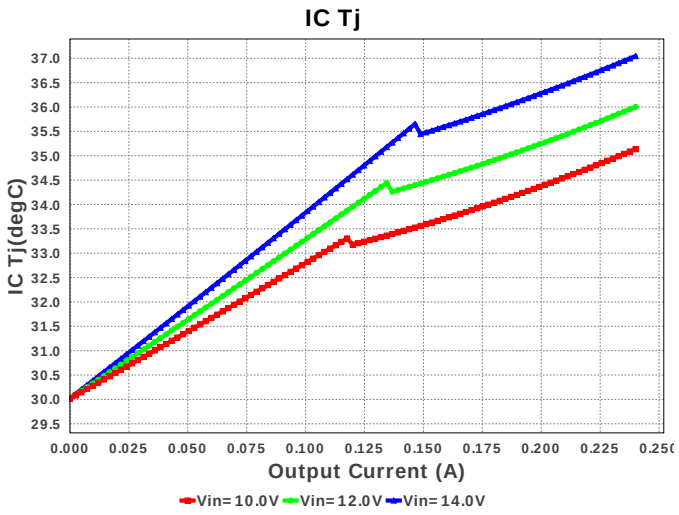
Device = TPS62175DQCR
Topology = Buck
Created = 9/24/16 9:05:50 AM
BOM Cost = $1.02
BOM Count = 7
Total Pd = 0.13W

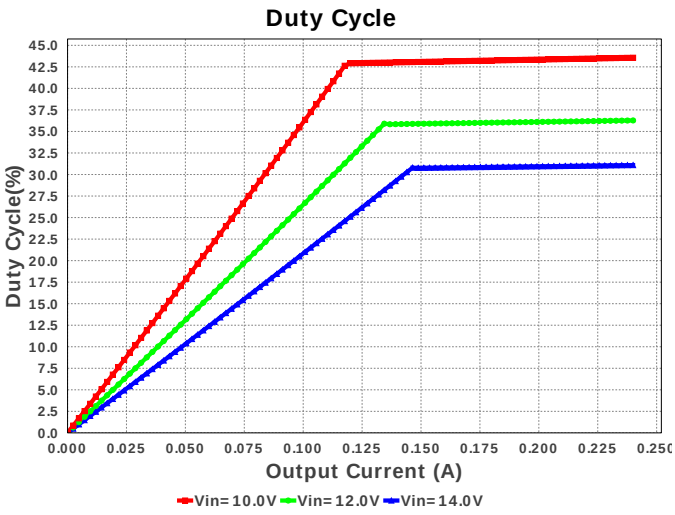
Design : 4790845/50 TPS62175DQCR
TPS62175DQCR 10.0V-14.0V to 4.20V @ 0.24A

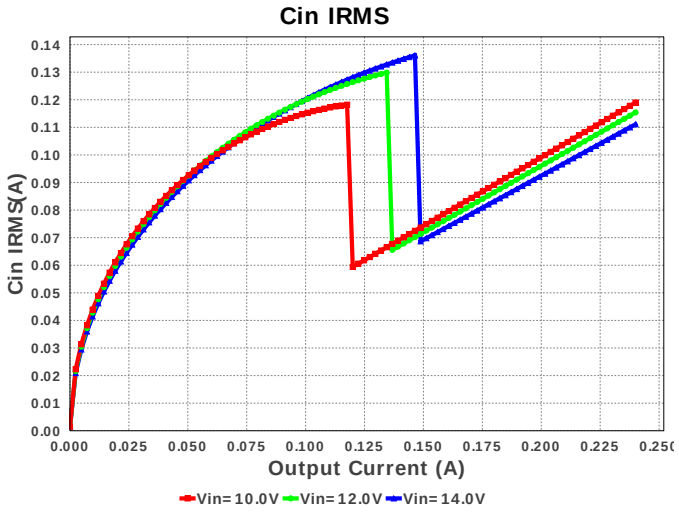


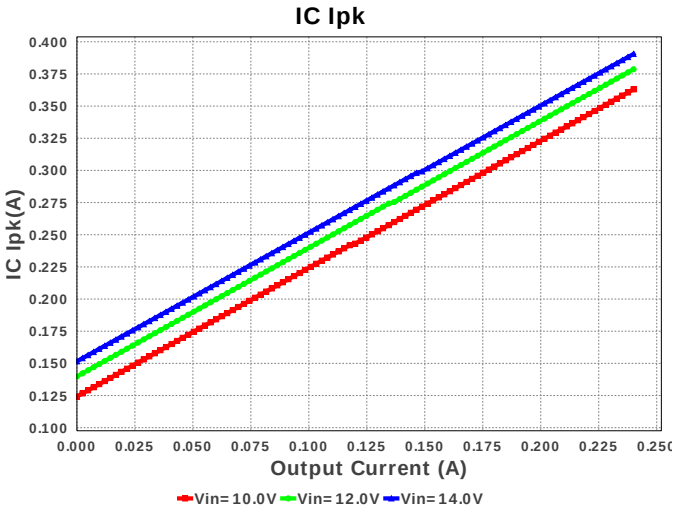
Electrical BOM

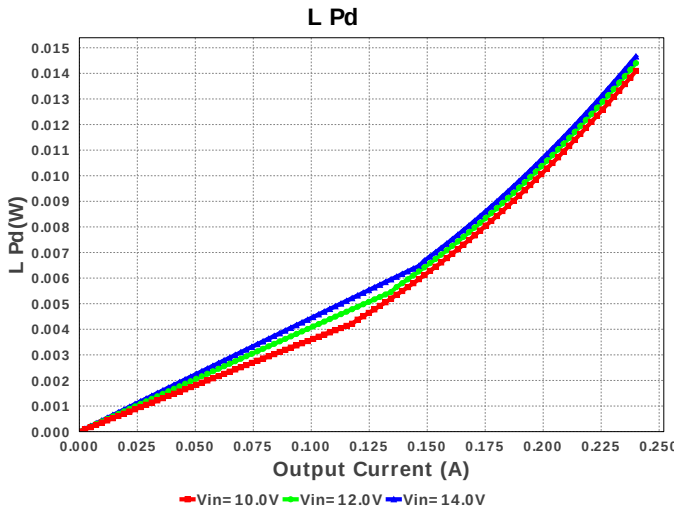
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	$0.02	0603 5 mm²
2.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	$0.04	0805 7 mm²
3.	L1	Coilcraft	LPS4018-103MRB	L= 10.0 µH DCR= 180.0 mOhm	1	$0.35	LPS4018 24 mm²
4.	Rfbb	Vishay-Dale	CRCW0402383KFKED Series= CRCW..e3	Res= 383.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
5.	Rfbt	Vishay-Dale	CRCW04021M62FKED Series= CRCW..e3	Res= 1.62 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
6.	Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	U1	Texas Instruments	TPS62175DQCR	Switcher	1	$0.58	R-PWSON-N10 12 mm²

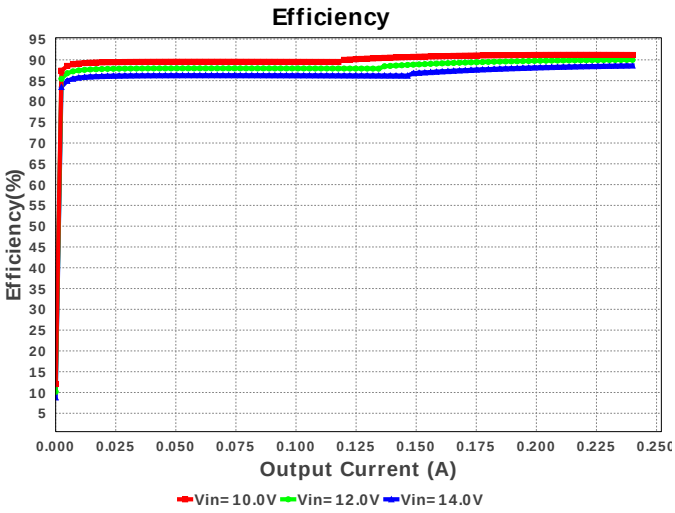


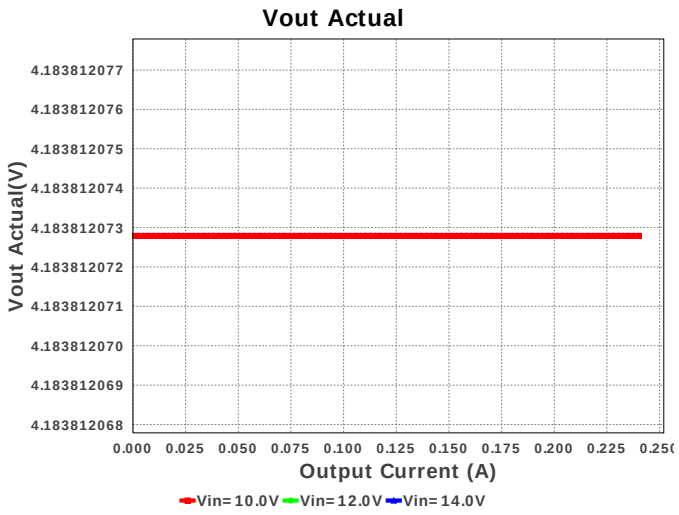


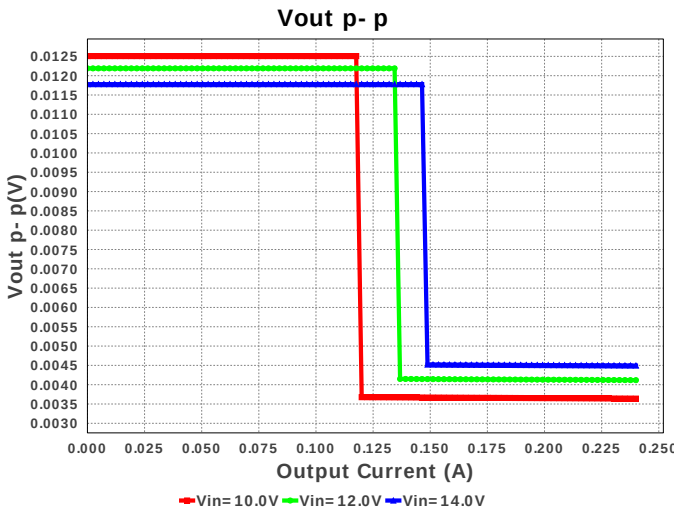


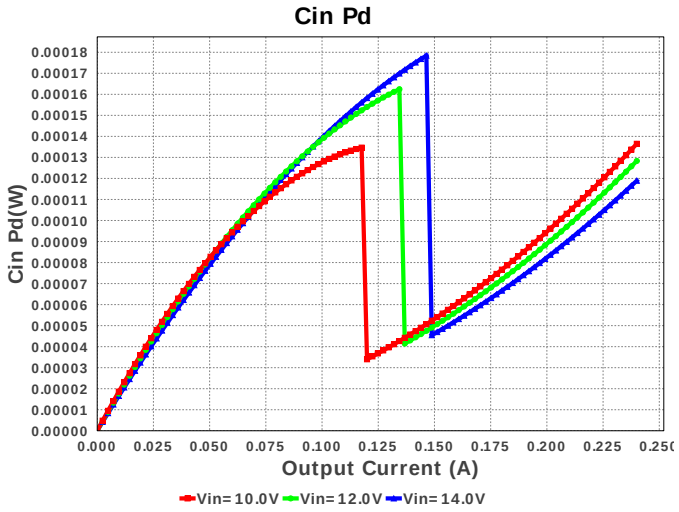


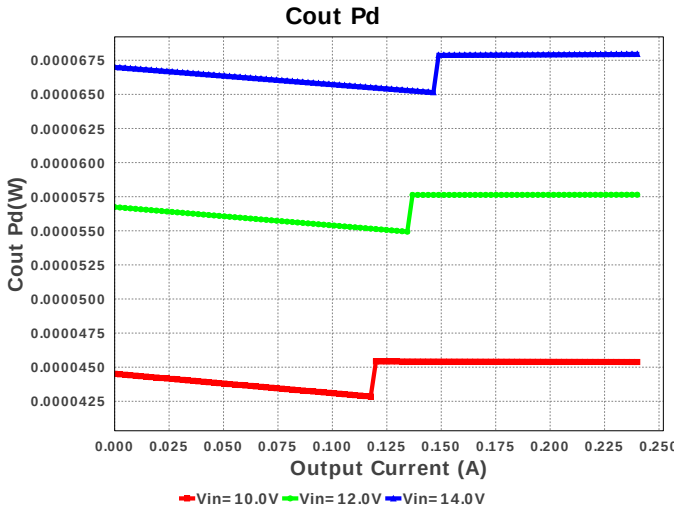


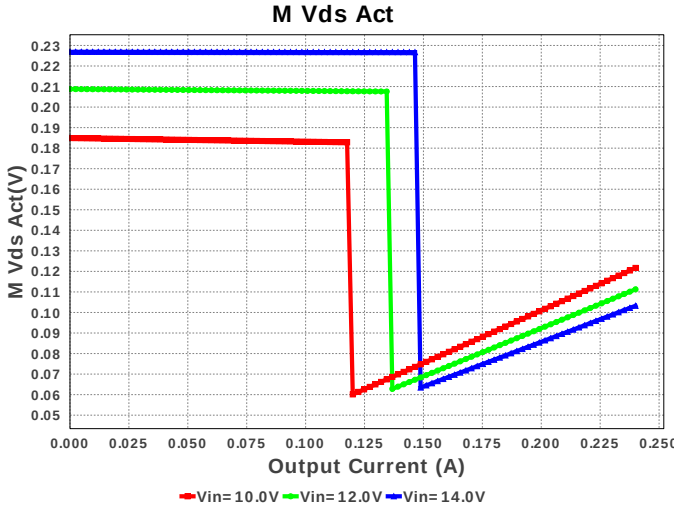


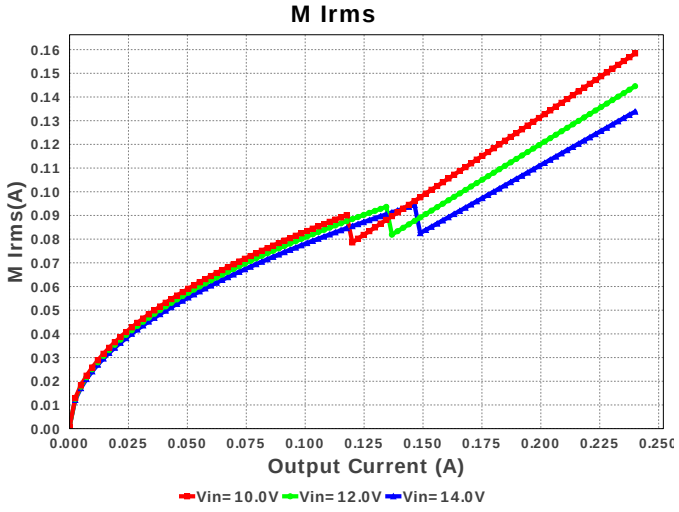


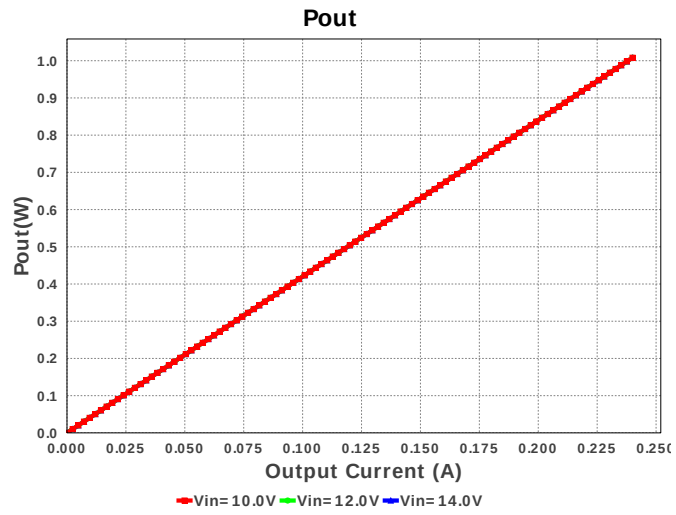


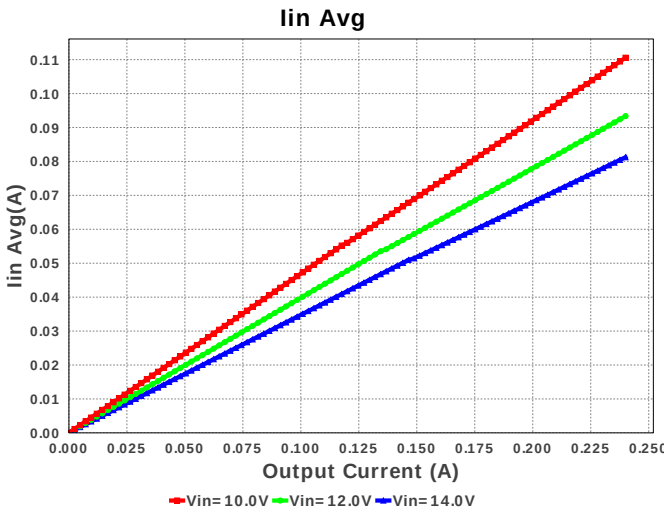


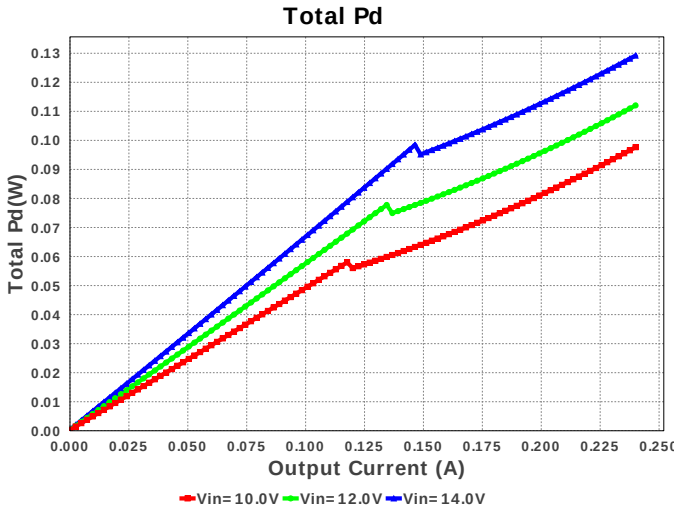


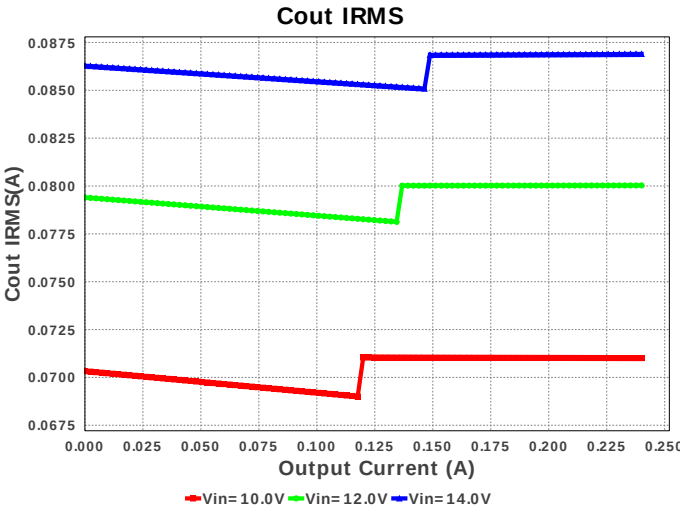


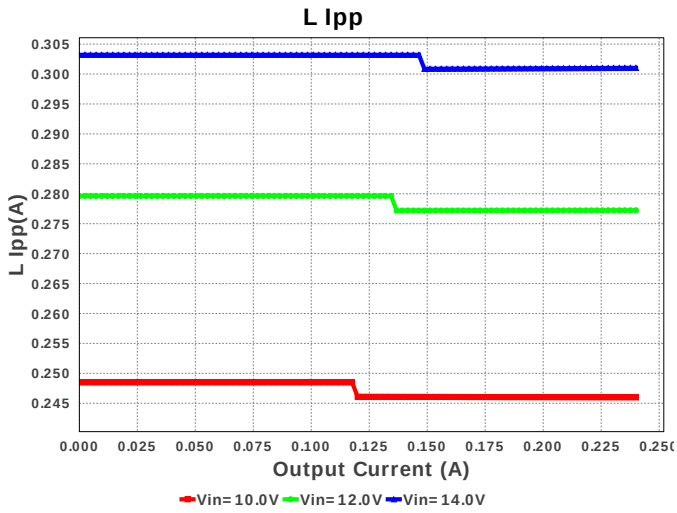


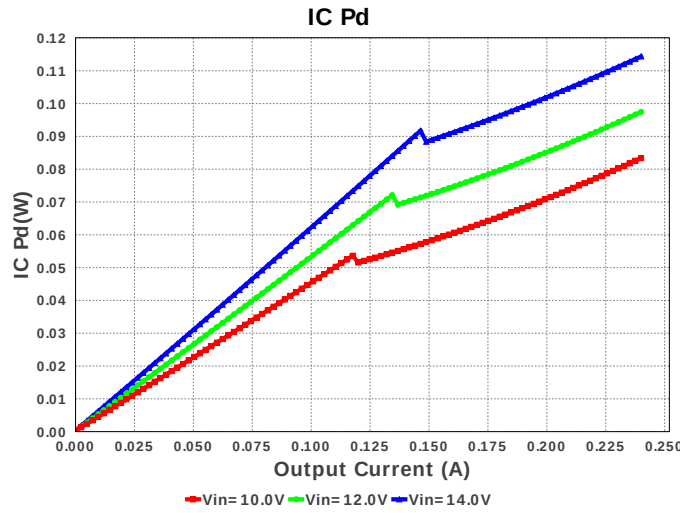


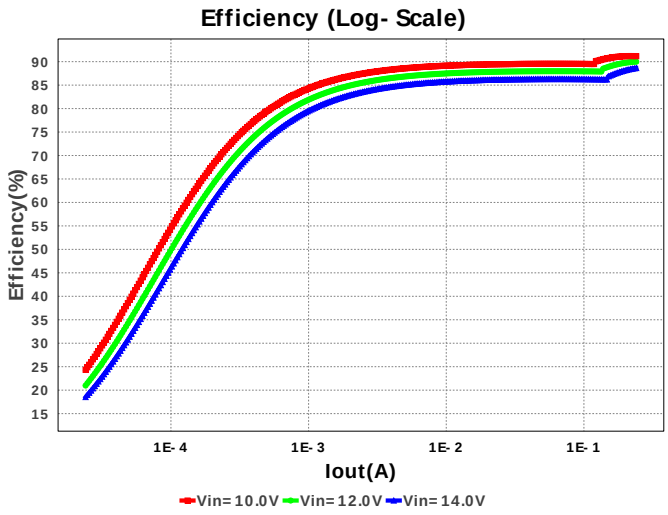












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	111.086 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	86.898 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	390.512 mA	Current	Peak switch current in IC
4.	Iin Avg	81.229 mA	Current	Average input current
5.	L Ipp	301.02 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	133.819 mA	Current	MOSFET RMS current
7.	BOM Count	7	General	Total Design BOM count
8.	FootPrint	56.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.012 MHz	General	Switching frequency
10.	IC Tolerance	24.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	103.259 mV	General	Voltage drop across the MosFET
12.	Mode	CCM	General	Conduction Mode
13.	Pout	1.008 W	General	Total output power
14.	Total BOM	$1.02	General	Total BOM Cost
15.	Vout Actual	4.184 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	4.2 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	31.09 %	Op_point	Duty cycle
18.	Efficiency	88.638 %	Op_point	Steady state efficiency
19.	IC Tj	37.045 degC	Op_point	IC junction temperature
20.	ICThetaJA	61.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	240.0 mA	Op_point	Iout operating point
22.	VIN_OP	14.0 V	Op_point	Vin operating point
23.	Vout p-p	4.495 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	118.922 µW	Power	Input capacitor power dissipation
25.	Cout Pd	67.961 µW	Power	Output capacitor power dissipation
26.	IC Pd	114.363 mW	Power	IC power dissipation
27.	L Pd	14.659 mW	Power	Inductor power dissipation
28.	Total Pd	129.209 mW	Power	Total Power Dissipation
29.	Vout Tolerance	4.683 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	240.0 m	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	4.2	Output Voltage
5.	base_pn	TPS62175	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. TPS62175 Product Folder : http://www.ti.com/product/TPS62175 : contains the data sheet and other resources.

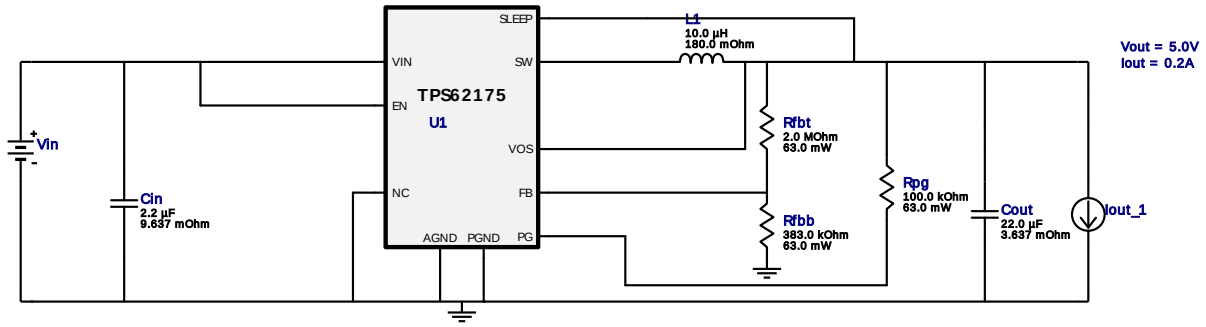
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 5.0V
Iout = 0.2A

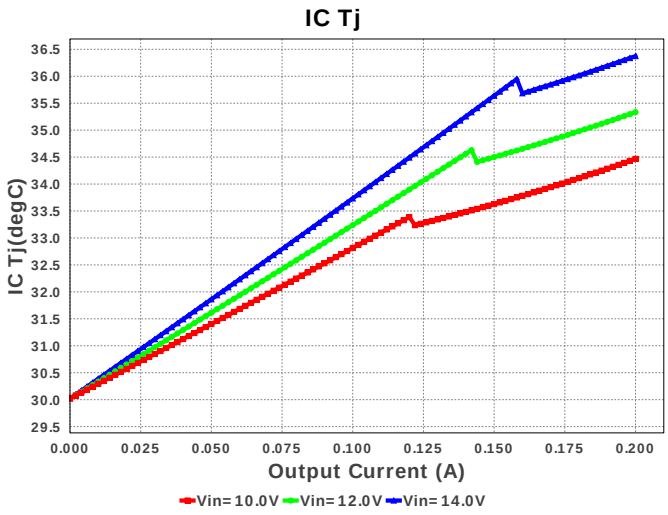
Device = TPS62175DQCR
Topology = Buck
Created = 9/24/16 9:05:51 AM
BOM Cost = $1.06
BOM Count = 7
Total Pd = 0.11W

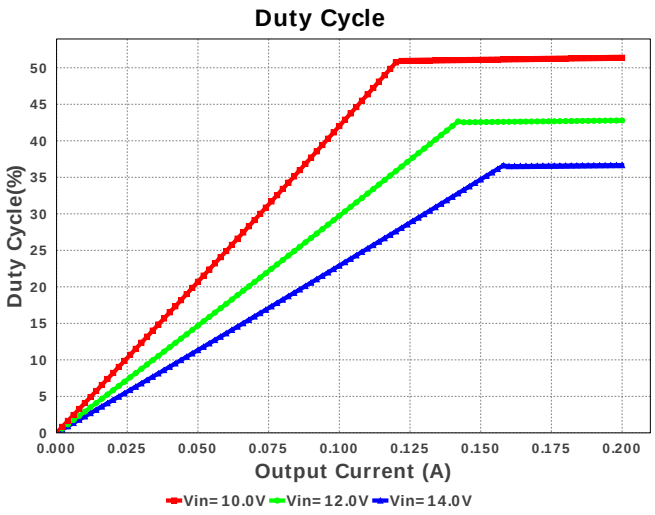
Design : 4790845/51 TPS62175DQCR
TPS62175DQCR 10.0V-14.0V to 5.00V @ 0.2A

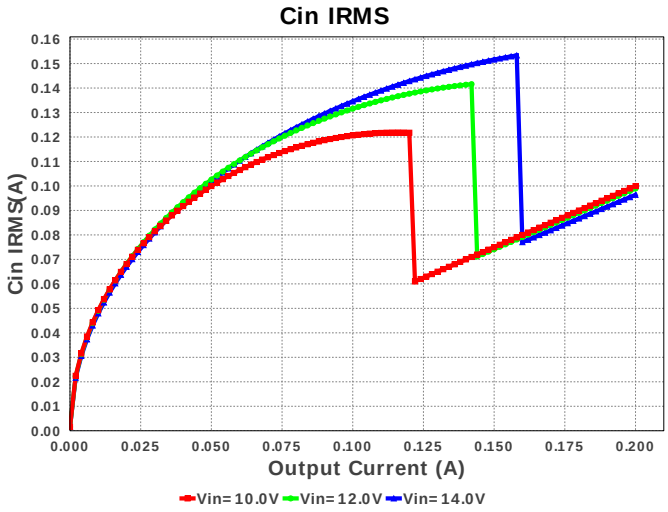


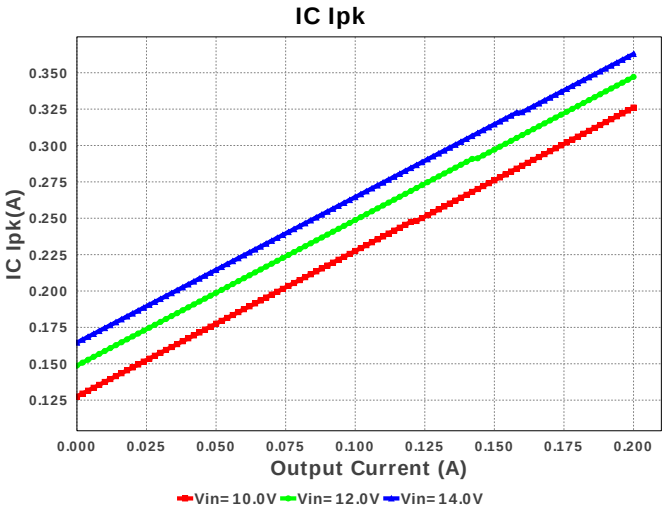
Electrical BOM

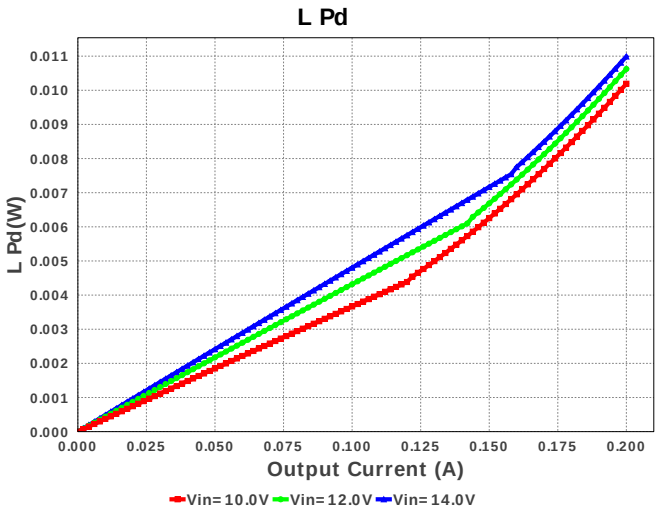
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	$0.02	0603 5 mm²
2.	Cout	MuRata	GRM31CR61A226ME19L Series= X5R	Cap= 22.0 uF ESR= 3.637 mOhm VDC= 10.0 V IRMS= 3.56456 A	1	$0.08	1206_190 11 mm²
3.	L1	Coilcraft	LPS4018-103MRB	L= 10.0 µH DCR= 180.0 mOhm	1	$0.35	LPS4018 24 mm²
4.	Rfbb	Vishay-Dale	CRCW0402383KFKED Series= CRCW..e3	Res= 383.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
5.	Rfbt	Vishay-Dale	CRCW04022M00FKED Series= CRCW..e3	Res= 2.0 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
6.	Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	U1	Texas Instruments	TPS62175DQCR	Switcher	1	$0.58	R-PWSON-N10 12 mm²

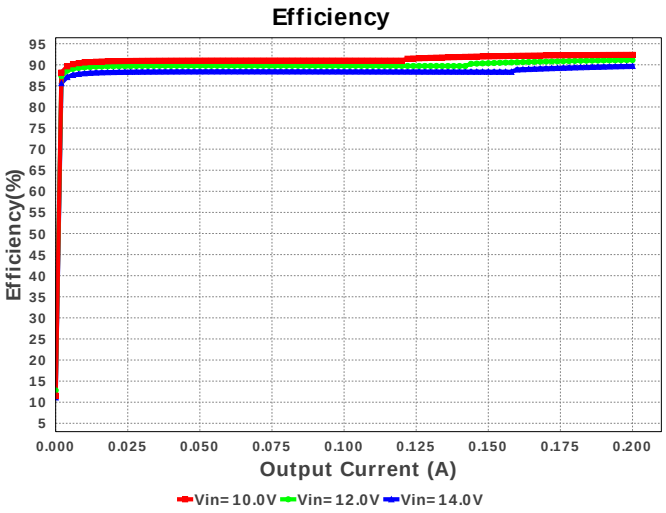


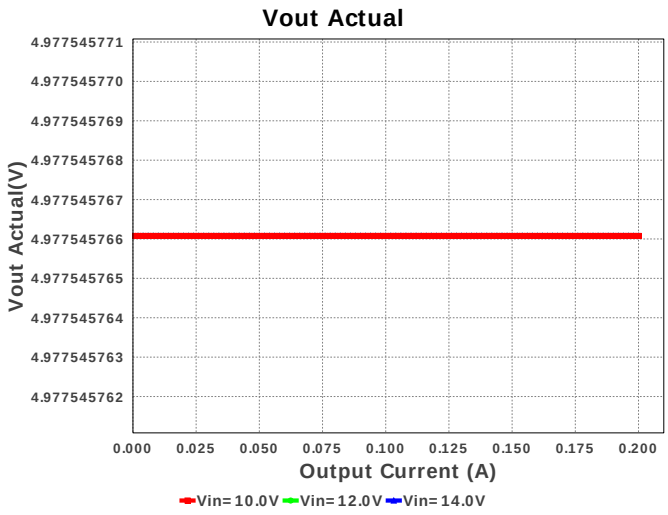


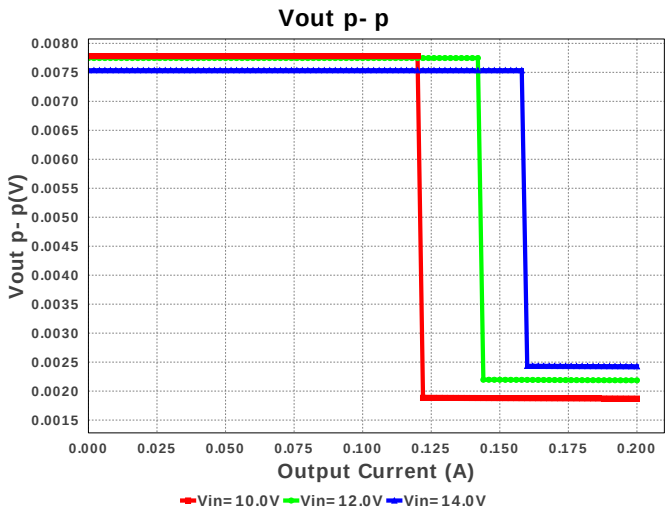


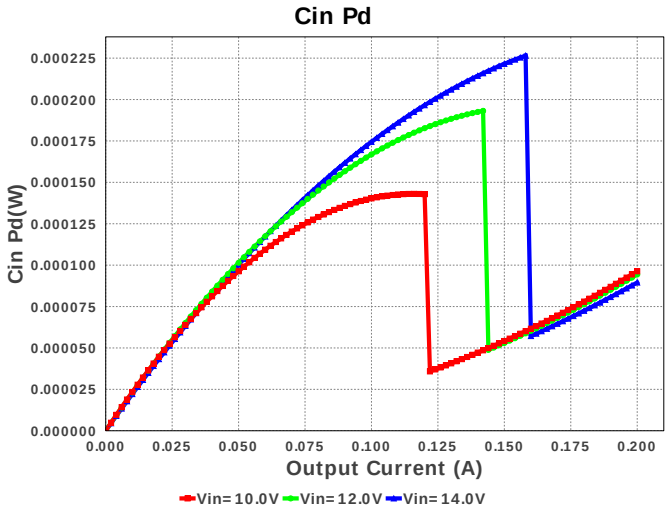


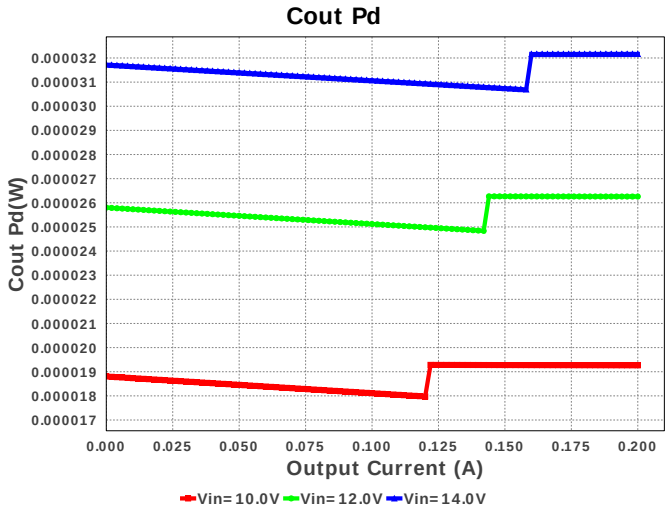


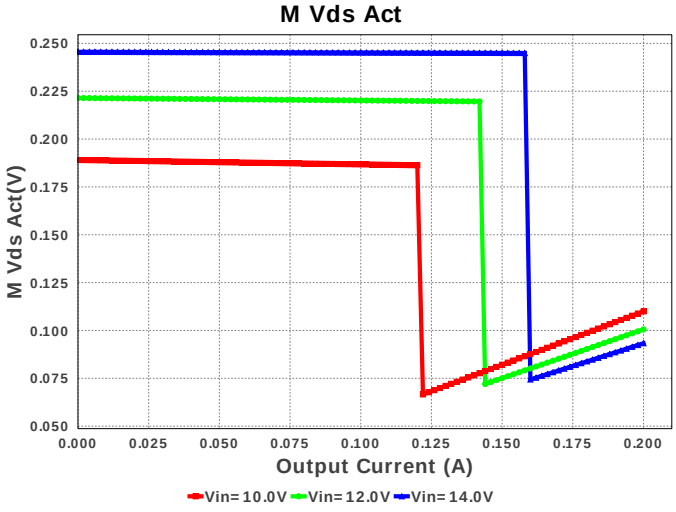


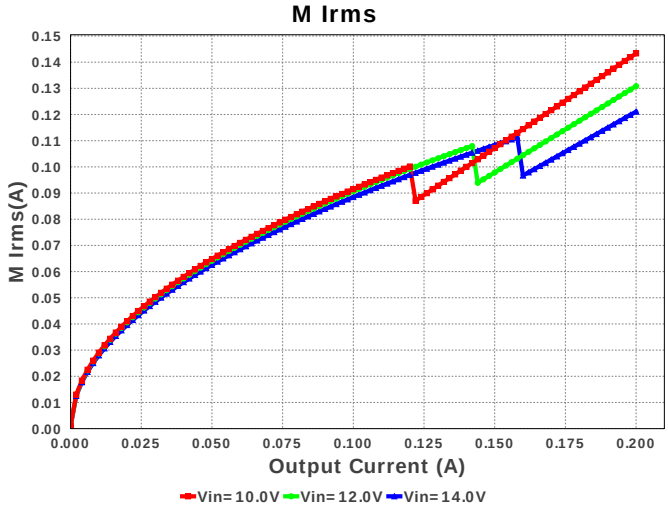


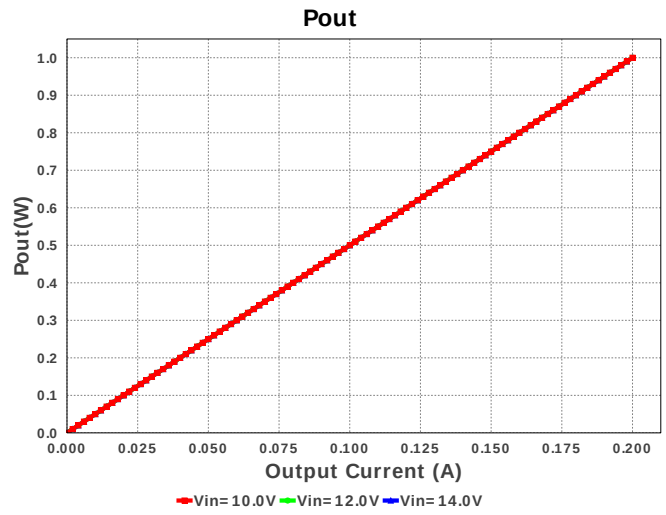


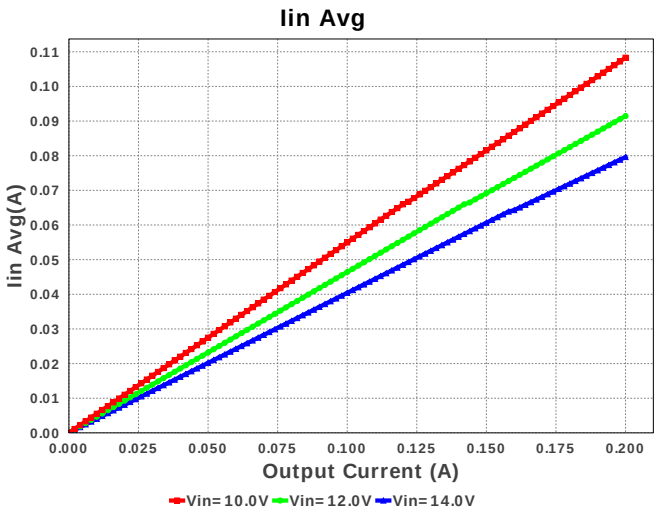


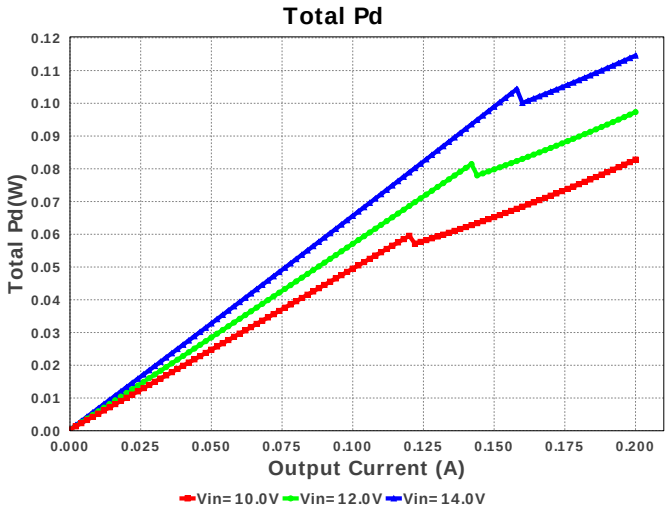


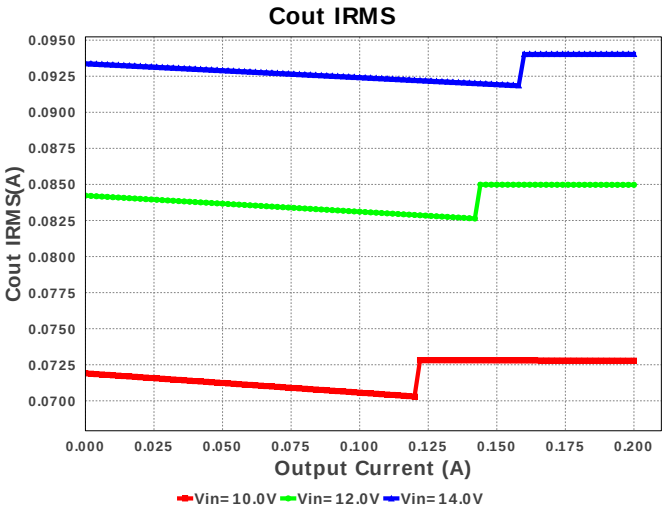


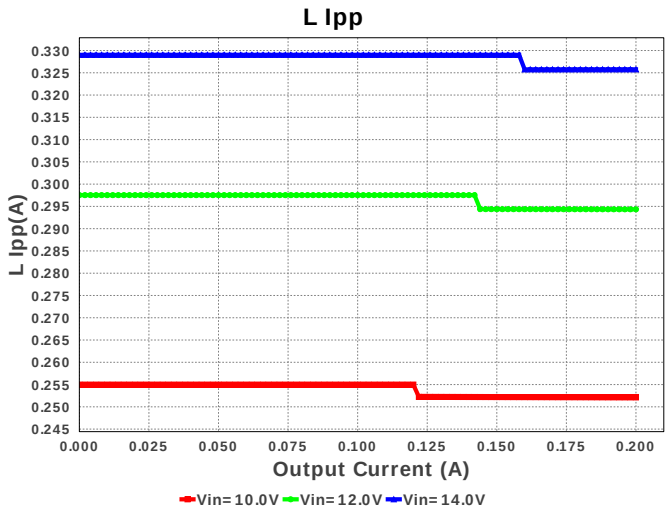


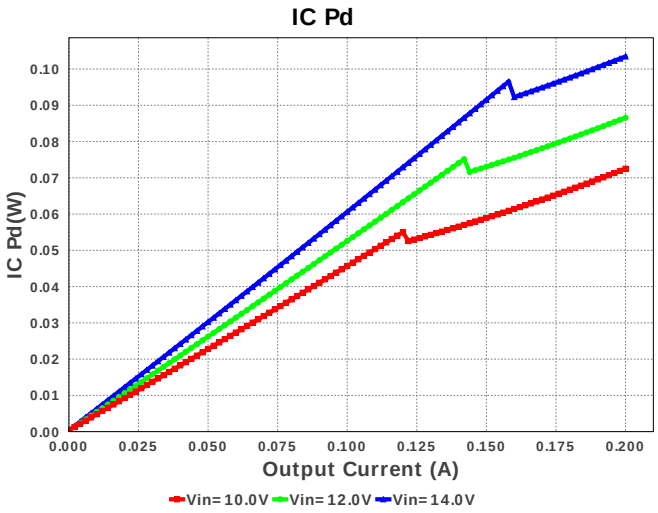


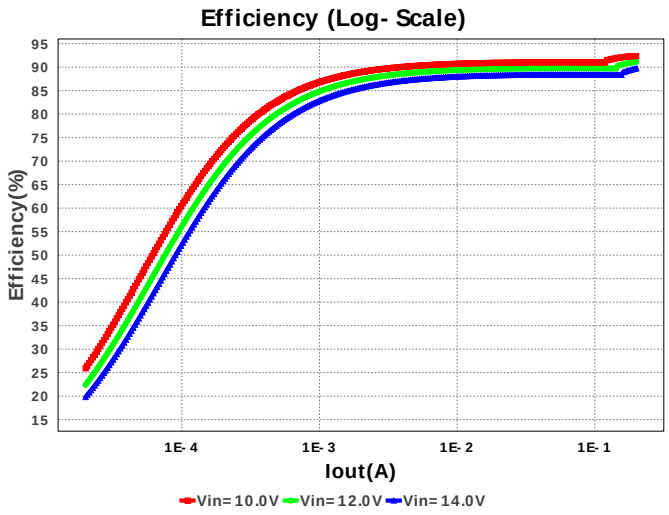












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	96.378 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	94.042 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	362.886 mA	Current	Peak switch current in IC
4.	Iin Avg	79.613 mA	Current	Average input current
5.	L Ipp	325.77 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	121.104 mA	Current	MOSFET RMS current
7.	BOM Count	7	General	Total Design BOM count
8.	FootPrint	61.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.013 MHz	General	Switching frequency
10.	IC Tolerance	24.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	93.304 mV	General	Voltage drop across the MosFET
12.	Mode	CCM	General	Conduction Mode
13.	Pout	1.0 W	General	Total output power
14.	Total BOM	$1.06	General	Total BOM Cost
15.	Vout Actual	4.978 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	36.666 %	Op_point	Duty cycle
18.	Efficiency	89.72 %	Op_point	Steady state efficiency
19.	IC Tj	36.374 degC	Op_point	IC junction temperature
20.	ICThetaJA	61.6 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	200.0 mA	Op_point	Iout operating point
22.	VIN_OP	14.0 V	Op_point	Vin operating point
23.	Vout p-p	2.427 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	89.516 µW	Power	Input capacitor power dissipation
25.	Cout Pd	32.165 µW	Power	Output capacitor power dissipation
26.	IC Pd	103.468 mW	Power	IC power dissipation
27.	L Pd	10.99 mW	Power	Inductor power dissipation
28.	Total Pd	114.579 mW	Power	Total Power Dissipation
29.	Vout Tolerance	4.746 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	200.0 m	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	TPS62175	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. TPS62175 Product Folder : http://www.ti.com/product/TPS62175 : contains the data sheet and other resources.

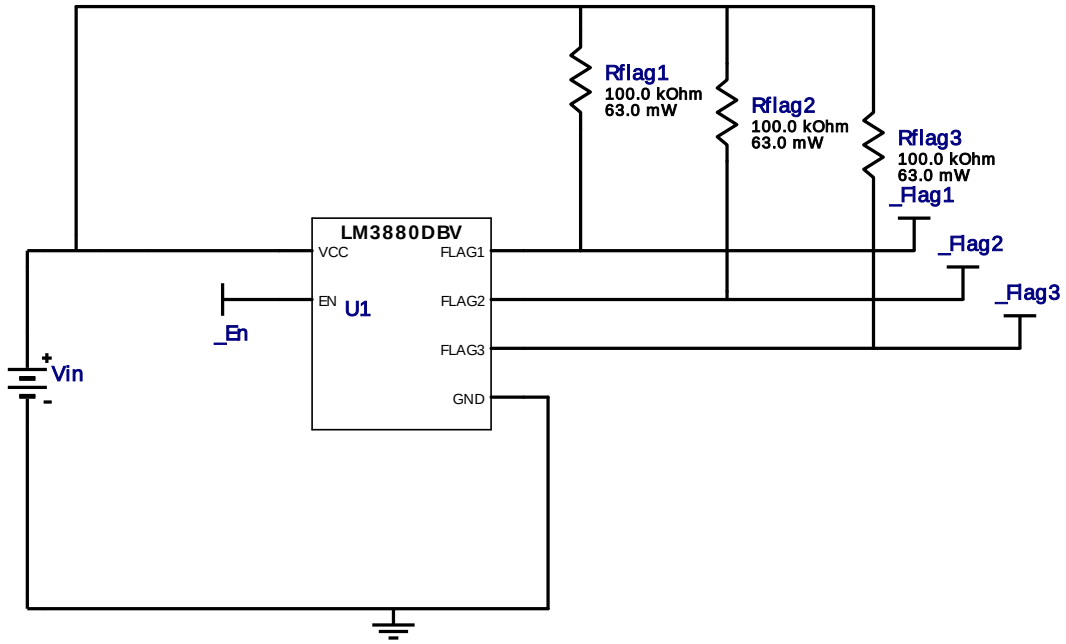
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 3.3V
Iout = 0.0A

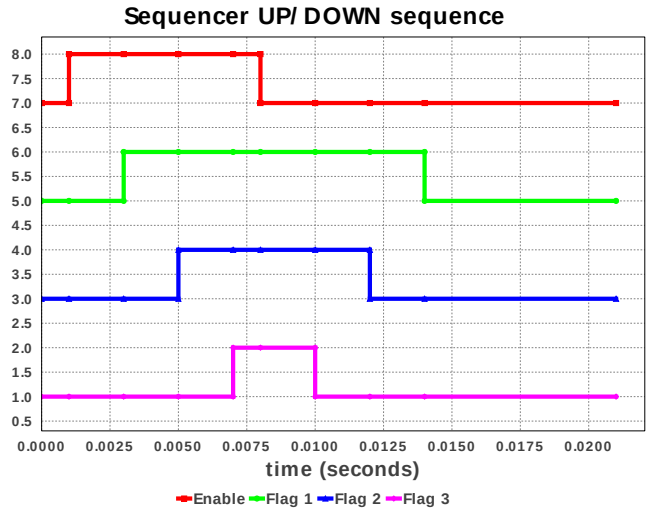
Device = LM3880MF-1AE/NOPB
Topology = SEQUENCER
Created = 9/24/16 9:05:51 AM
BOM Cost = $0.48
BOM Count = 4
Total Pd = 0.0W

Design : 4790845/52 LM3880MF-1AE/NOPB
Design 52 - LM3880MF-1AE/NOPB



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Rflag1	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
2.	Rflag2	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
3.	Rflag3	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
4.	U1	Texas Instruments	LM3880MF-1AE/NOPB	Switcher	1	$0.45	R-PDSO-G6 10 mm^2



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	4	General	Total Design BOM count
2.	FootPrint	19.0 mm^2	General	Total Foot Print Area of BOM components
3.	Total BOM	$0.48	General	Total BOM Cost
4.	Total Pd	82.5 µW	Power	Total Power Dissipation
5.	Flag Voltage	3.3 V		Flag Voltage
6.	Flag1 Down delay (From EN high to low)	6.0 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)	4.0 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)	2.0 ms		Flag Delay
11.	Flag3 Up delay (From EN low to high)	6.0 ms		Flag Delay
12.	Flags Used	2.0		Flags Used
13.	Total Flags	3.0		Total Flags
14.	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	Texas Instruments Base Part 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.

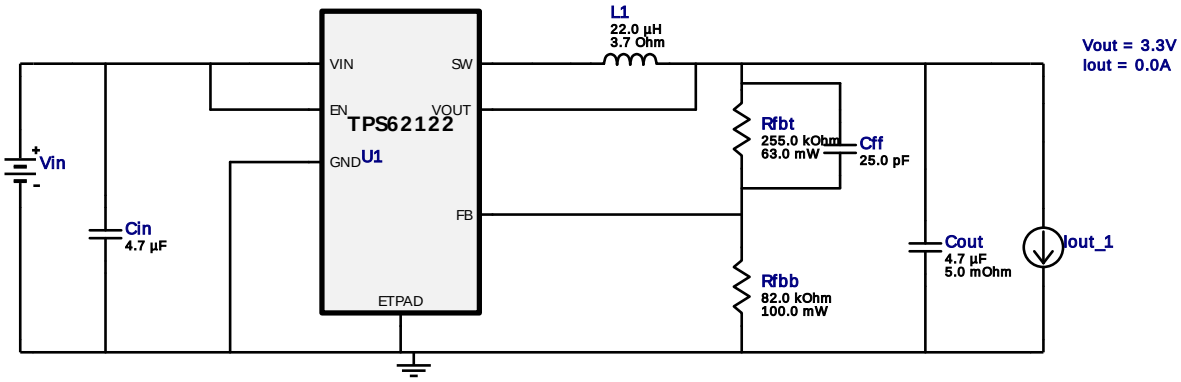
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 3.3V
Iout = 0.0A

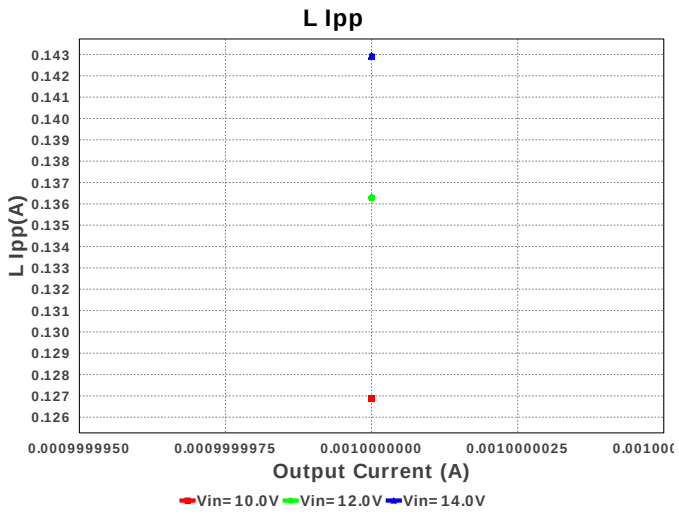
Device = TPS62122DRVR
Topology = Buck
Created = 9/24/16 9:05:52 AM
BOM Cost = $0.66
BOM Count = 7
Total Pd = 0.0W

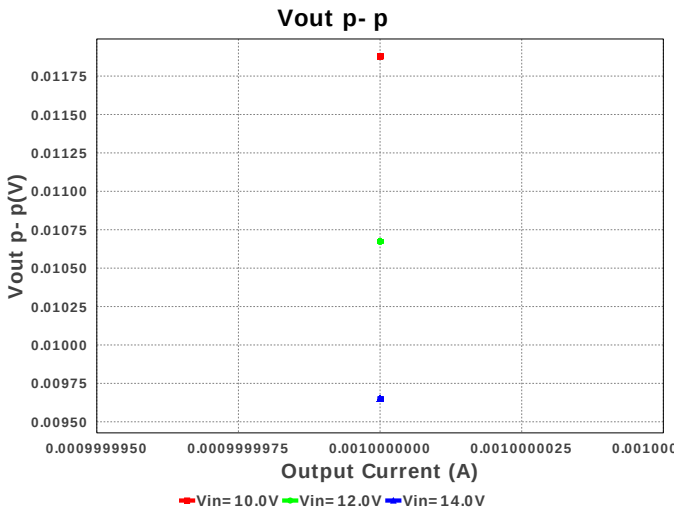
Design : 4790845/53 TPS62122DRVR
TPS62122DRVR 10.0V-14.0V to 3.30V @ 0.001A

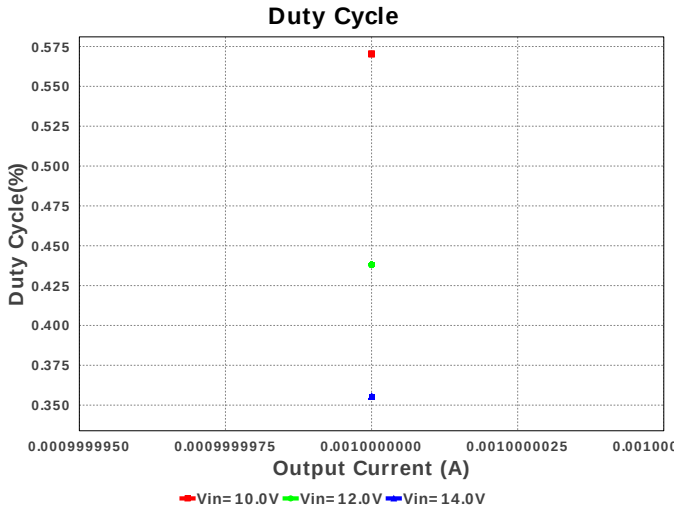


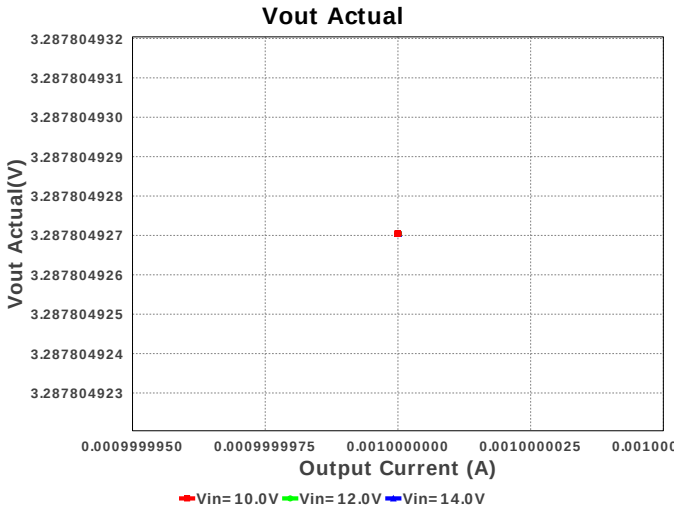
Electrical BOM

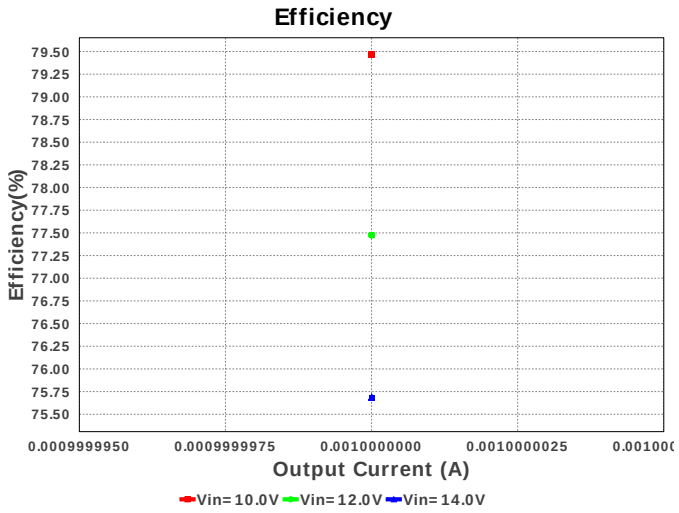
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cff	Samsung Electro-Mechanics	CL21C250JBANNNC Series= C0G/NP0	Cap= 25.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	Taiyo Yuden	TMK212BJ475KG-T Series= X5R	Cap= 4.7 uF VDC= 25.0 V IRMS= 0.0 A	1	$0.05	0805 7 mm²
3.	Cout	MuRata	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	$0.49	S-PWSON-N6 9 mm²

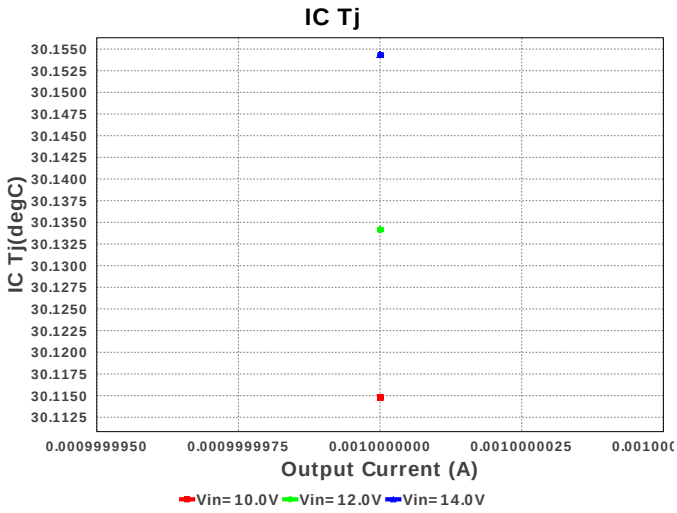


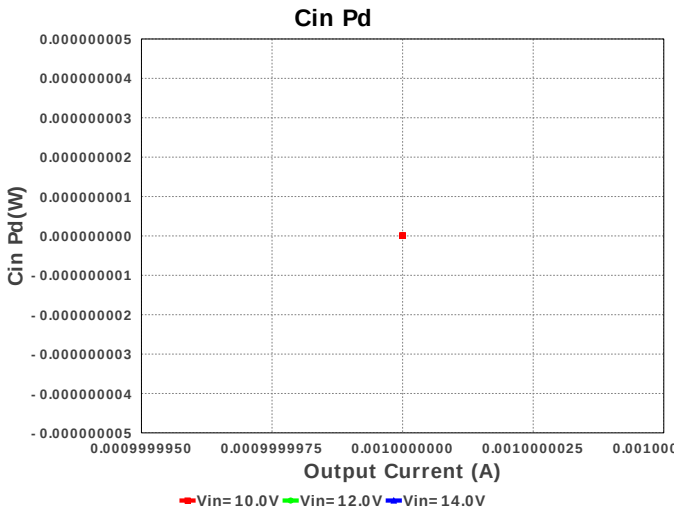


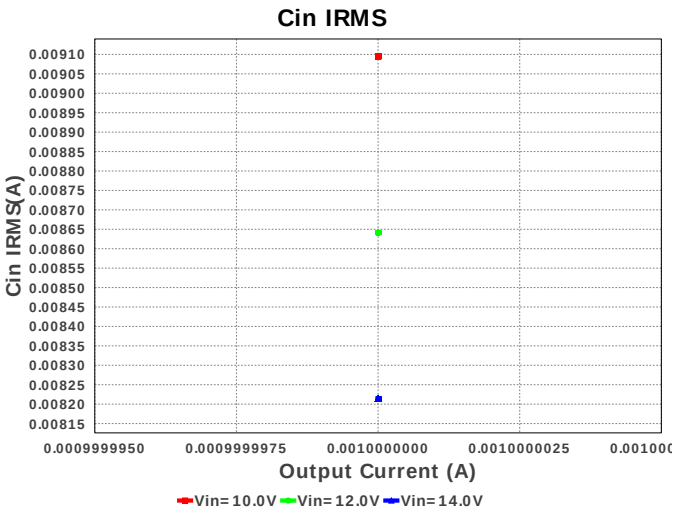


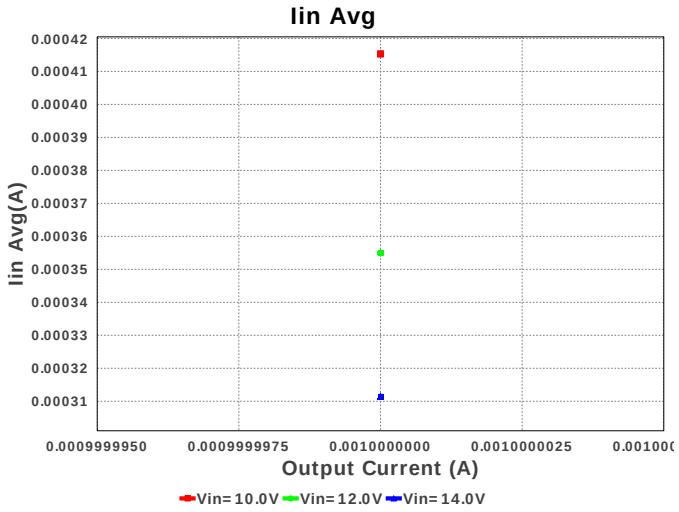


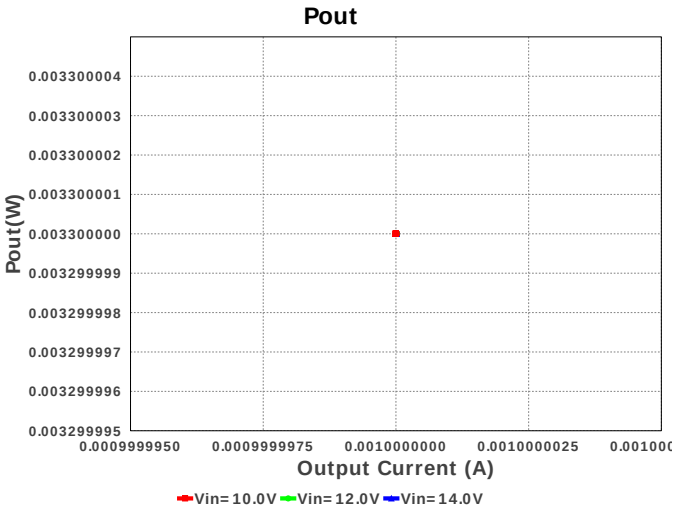


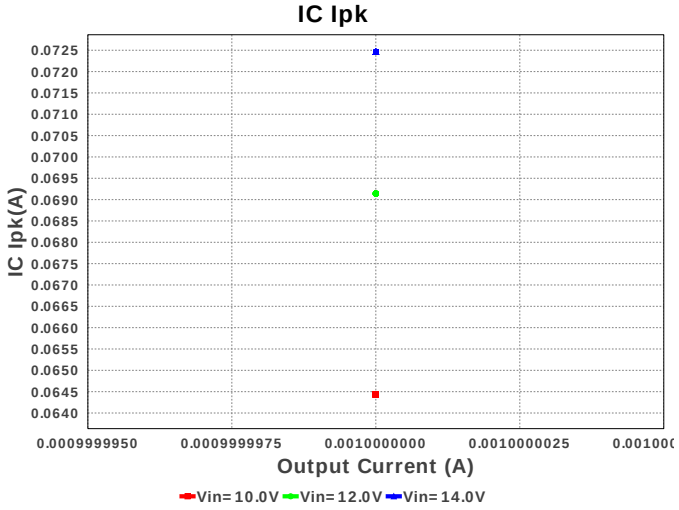


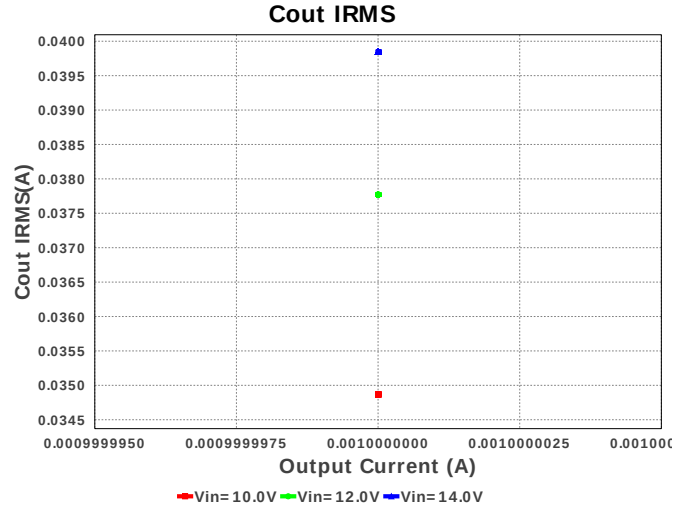


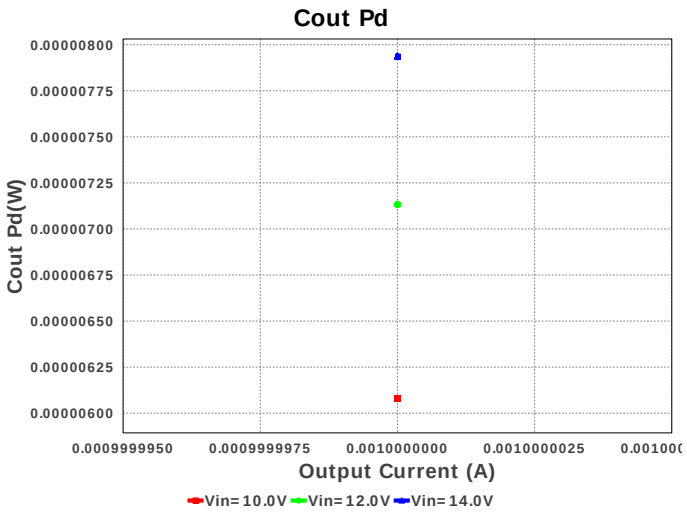


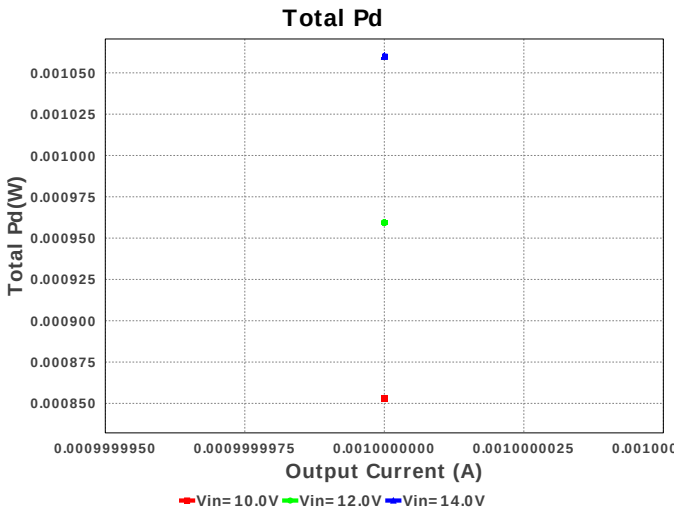


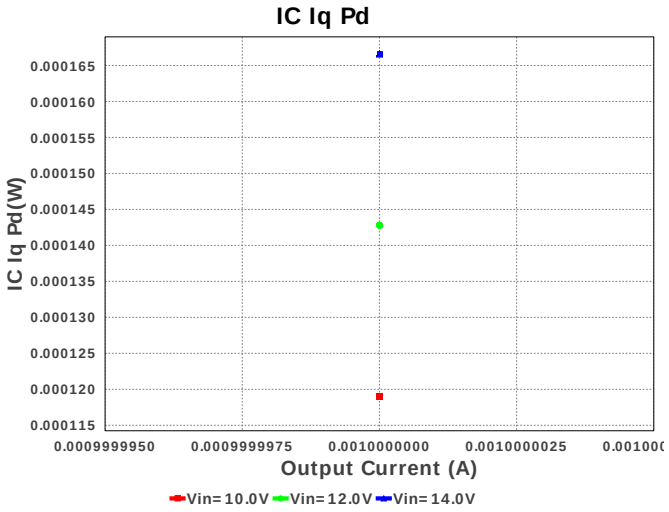


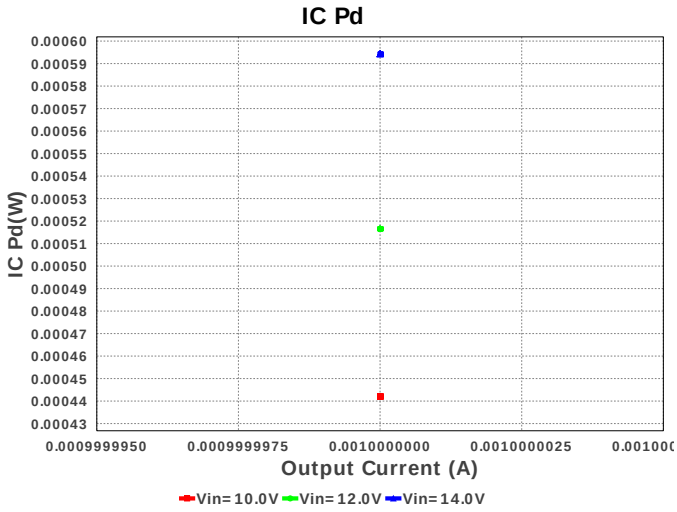


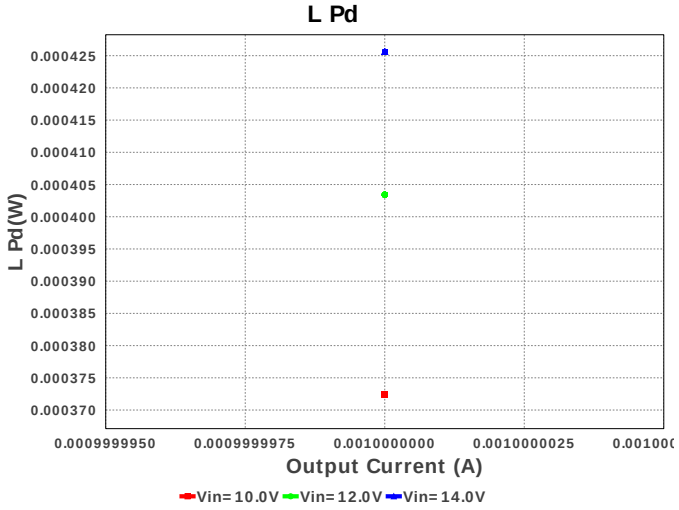


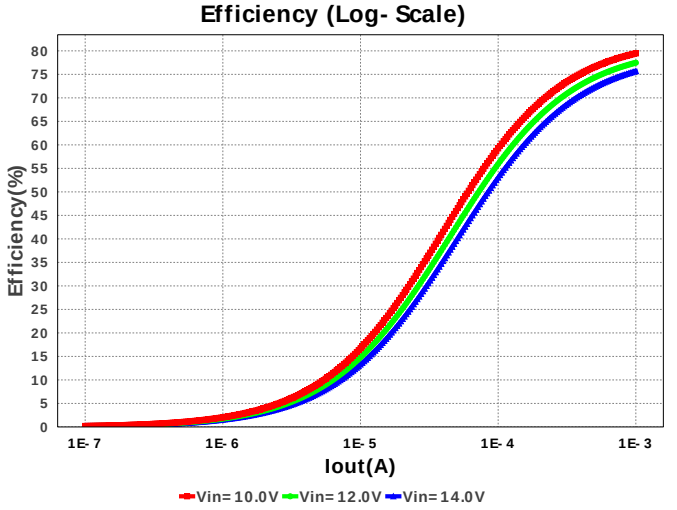












Operating Values

#	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.	Mode	DCM	General	Conduction Mode
10.	Pout	3.3 mW	General	Total output power
11.	Total BOM	$0.66	General	Total BOM Cost

#	Name	Value	Category	Description
12.	Vout Actual	3.288 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
14.	Duty Cycle	355.416 m%	Op_point	Duty cycle
15.	Efficiency	75.686 %	Op_point	Steady state efficiency
16.	IC Tj	30.154 degC	Op_point	IC junction temperature
17.	ICThetaJA	259.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
18.	IOUT_OP	1.0 mA	Op_point	Iout operating point
19.	VIN_OP	14.0 V	Op_point	Vin operating point
20.	Vout p-p	9.651 mV	Op_point	Peak-to-peak output ripple voltage
21.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
22.	Cout Pd	7.938 µW	Power	Output capacitor power dissipation
23.	IC Iq Pd	166.6 µW	Power	IC Iq Pd
24.	IC Pd	594.262 µW	Power	IC power dissipation
25.	L Pd	425.589 µW	Power	Inductor power dissipation
26.	Total Pd	1.06 mW	Power	Total Power Dissipation
27.	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	Texas Instruments Base Part 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.