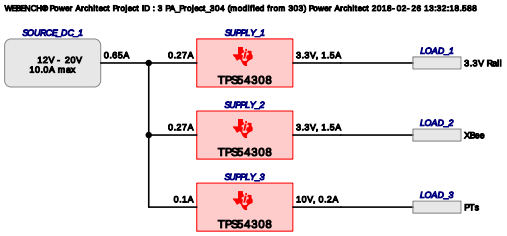
WEBENCH® Power Architect



Project Report

Project : 4823897/3 : PA_Project_304 (modified from 303)
Created : 2018-02-26 13:32:18.588
Optimize project optFactor=3

Project Summary

1.	Total System Efficiency	92.008 %
2.	Total System BOM Count	26.0
3.	Total System Footprint	1.022 kmm2
4.	Total System BOM Cost	$18.17
5.	Total System Power Dissipation	1.034 W

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_1	3.3V Rail
SUPPLY_2	0	LOAD_2	XBee
SUPPLY_3	0	LOAD_3	PTs

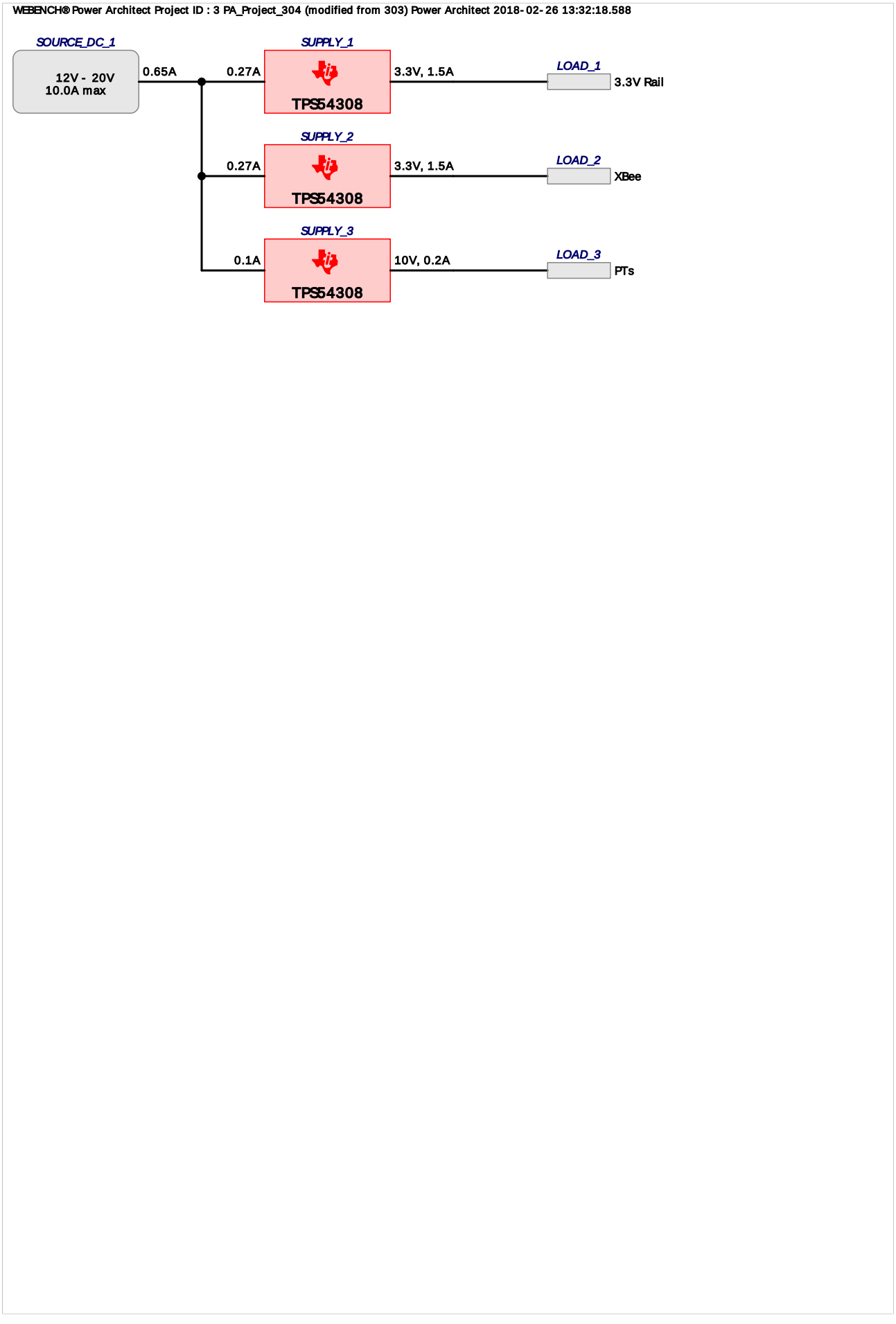
Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS54308	Switcher : 4.5-V to 28-V Input, 3-A Output Synchronous Step-Down Converter	3.3 V	1.5 A	91.3%	367	$4.57	12	4
2.	SUPPLY_2	TPS54308	Switcher : 4.5-V to 28-V Input, 3-A Output Synchronous Step-Down Converter	3.3 V	1.5 A	91.3%	367	$4.57	13	9
3.	SUPPLY_3	TPS54308	Switcher : 4.5-V to 28-V Input, 3-A Output Synchronous Step-Down Converter	10 V	0.2 A	95.5%	288	$9.03	14	14

Power Loads

#	Name	VLoad	ILoad	Description
1.	3.3V Rail	3.3 V	1.5 A	VoutRipple=5%
2.	XBee	3.3 V	1.5 A	VoutRipple=2%, Requires a separate supply
3.	PTs	10 V	0.2 A	VoutRipple=2%

Project Diagram



Electrical Procurement BOM

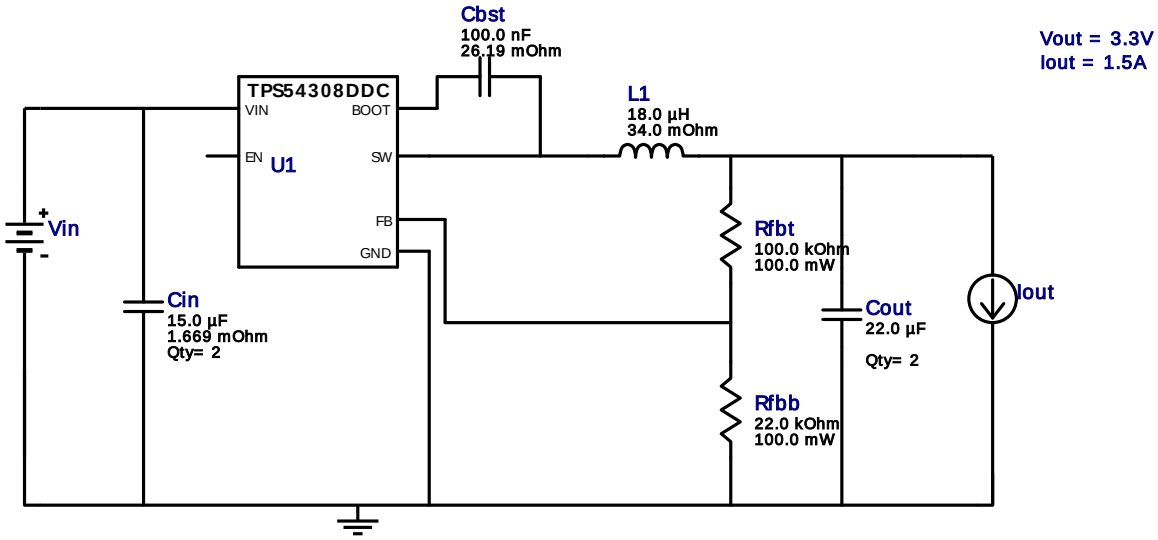
Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
Wurth Elektronik	7443251600	WE-HC5	1	$2.87	80
TDK	C2012X5R1H104M085AA	0805	3	$0.02	20
TDK	C2012X5R1V156M125AC	0805	4	$0.22	14
Sumida	CDRH125NP-180MC	CDRH125	2	$0.61	409
Panasonic	ERJ-6ENF6341V	0805	1	$0.01	7
MuRata	KCM55QR71E226KH01K	KCM55Q	4	$1.44	118
MuRata	KCM55WR71J226MH01K	KCM55W	2	$1.66	59
MuRata	KCM55WR7YA336MH01K	KCM55W	1	$2.20	59
Susumu Co Ltd	RR1220P-104-D	0805	3	$0.01	20
Susumu Co Ltd	RR1220P-223-D	0805	2	$0.01	14
Texas Instruments	TPS54308DDCR	DDC0006A_N	3	$0.60	31
Total			26	$18.17	831.2525

WEBENCH® Design Report

Vout = 3.3V
Iout = 1.5A

Device = TPS54308DDCR
Topology = Buck
Created = 2018-02-26 13:32:16.680
BOM Cost = $4.57
BOM Count = 9
Total Pd = 0.47W

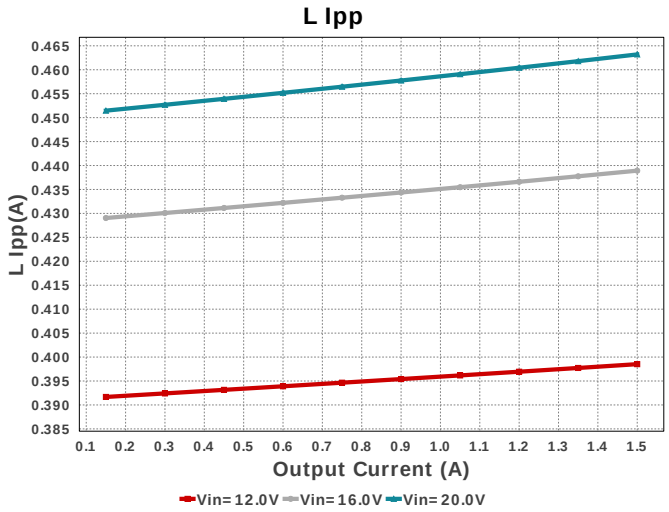
Design : 4823897/12 TPS54308DDCR
TPS54308DDCR 12.0V-20.0V to 3.30V @ 1.5A

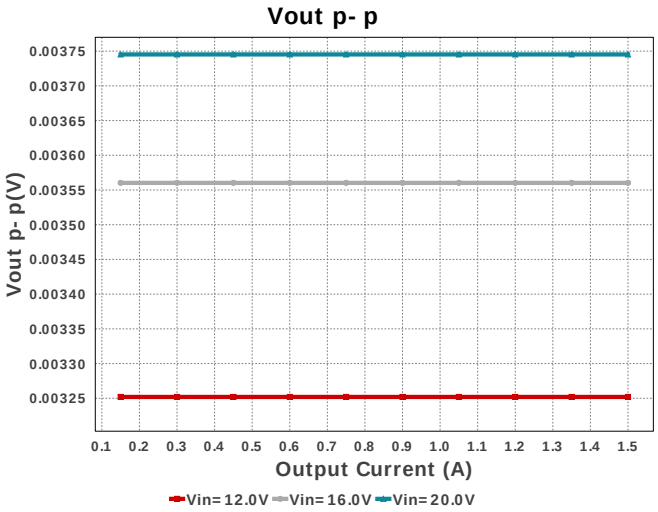


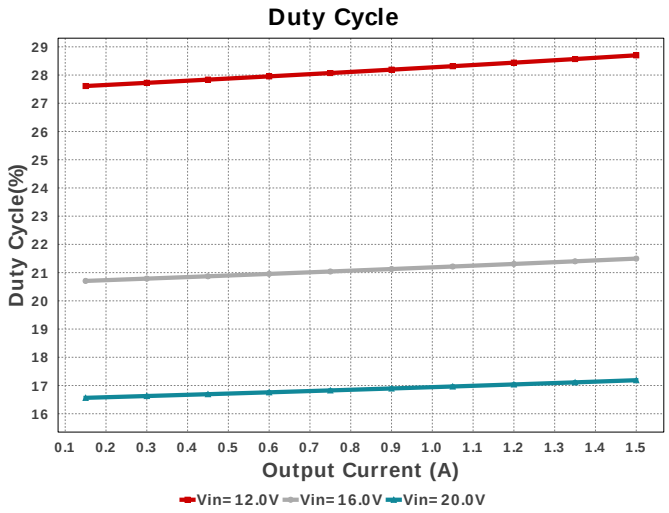
Electrical BOM

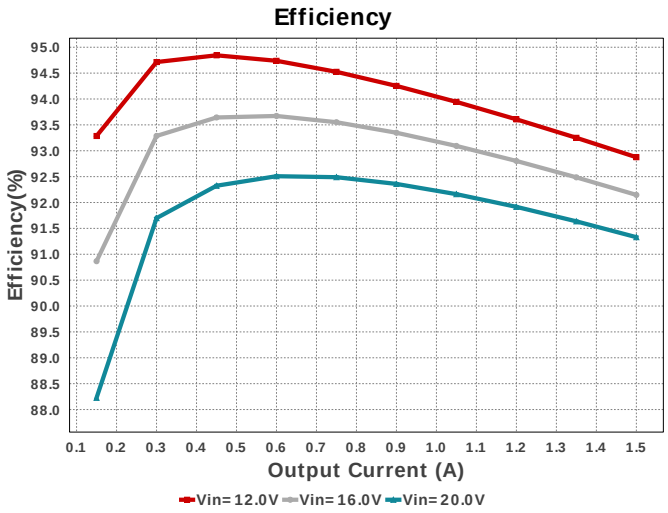
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	TDK	C2012X5R1H104M085AA Series= X5R	Cap= 100.0 nF ESR= 26.19 mOhm VDC= 50.0 V IRMS= 1.29514 A	1	$0.02	0805 7 mm²
2.	Cin	TDK	C2012X5R1V156M125AC Series= X5R	Cap= 15.0 uF ESR= 1.669 mOhm VDC= 35.0 V IRMS= 5.0498 A	2	$0.22	0805 7 mm²
3.	Cout	MuRata	KCM55QR71E226KH01K Series= X7R	Cap= 22.0 uF VDC= 25.0 V IRMS= 0.0 A	2	$1.44	KCM55Q 59 mm²
4.	L1	Sumida	CDRH125NP-180MC	L= 18.0 µH DCR= 34.0 mOhm	1	$0.61	CDRH125 204 mm²
5.	Rfbb	Susumu Co Ltd	RR1220P-223-D Series= RR12	Res= 22.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²
6.	Rfbt	Susumu Co Ltd	RR1220P-104-D Series= RR12	Res= 100.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	U1	Texas Instruments	TPS54308DDCR	Switcher	1	$0.60	DDC0006A_N 10 mm^2

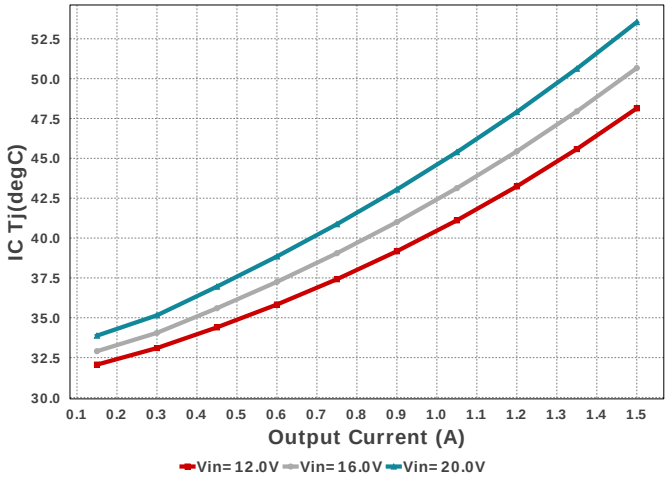




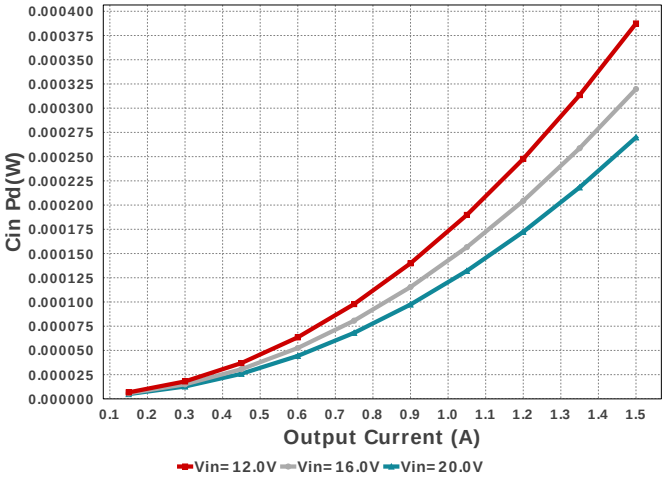




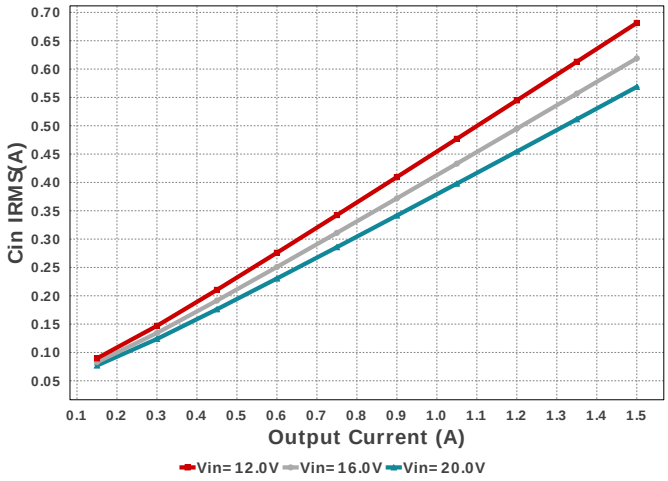
IC Tj



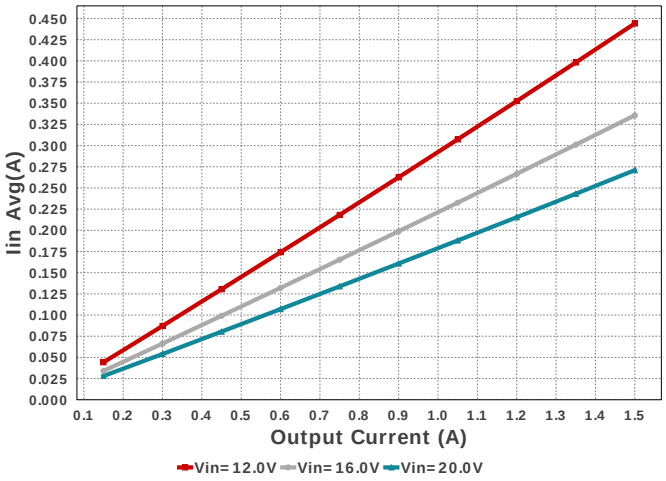
Cin Pd



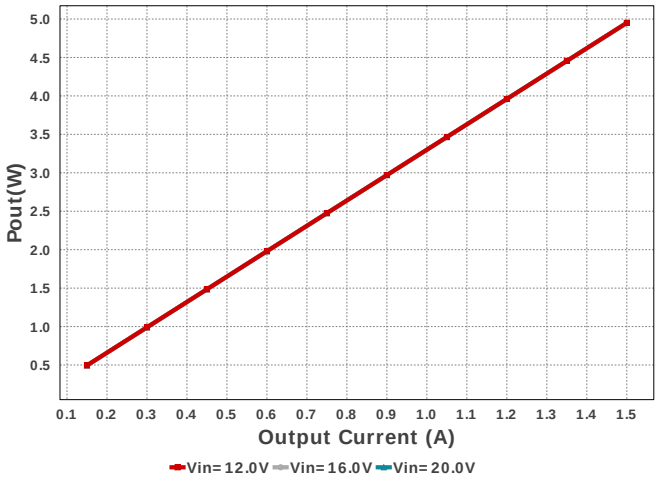
Cin IRMS



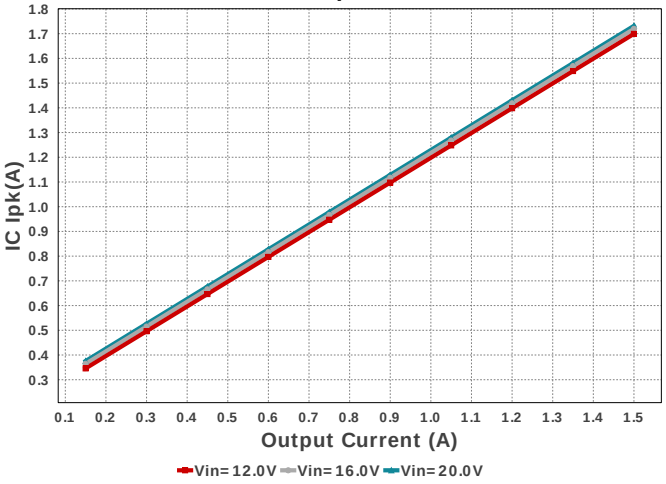
Iin Avg

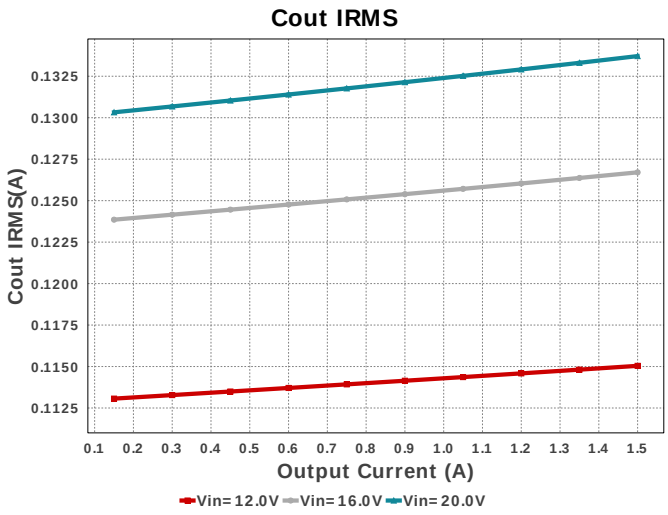


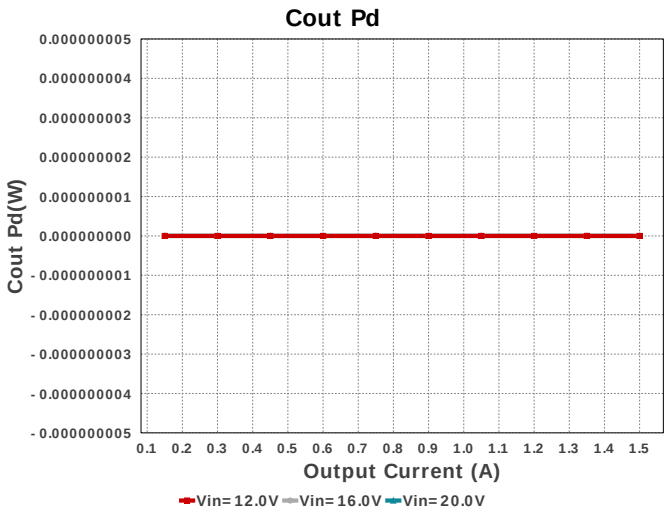
Pout

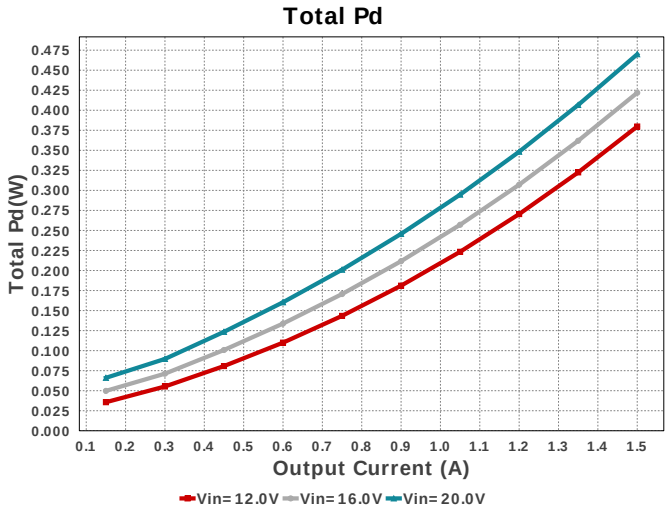


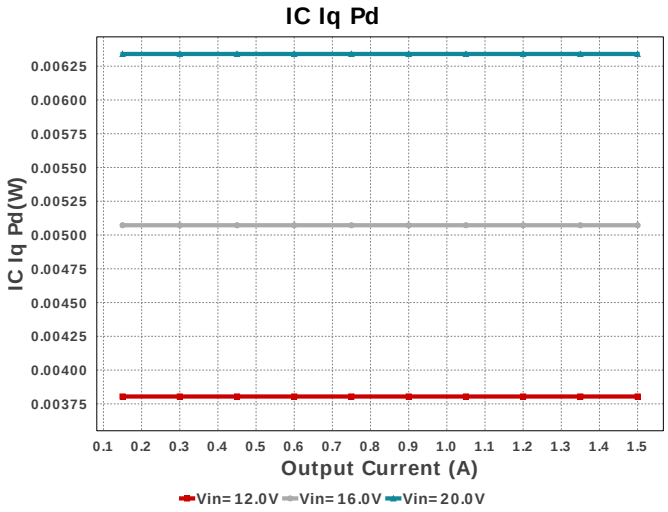
IC Ipk

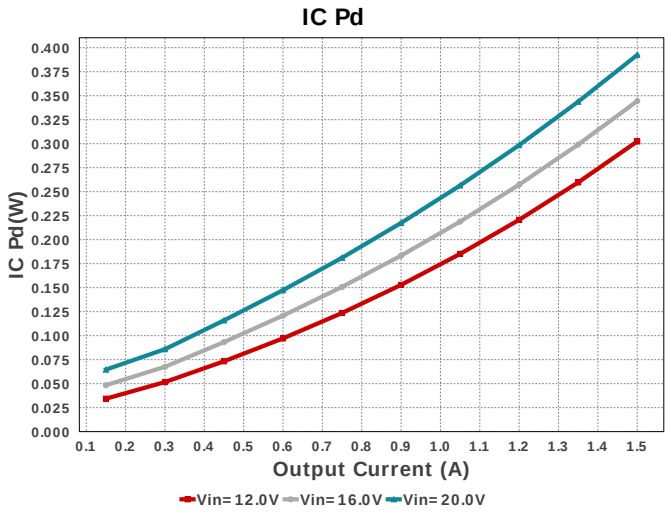


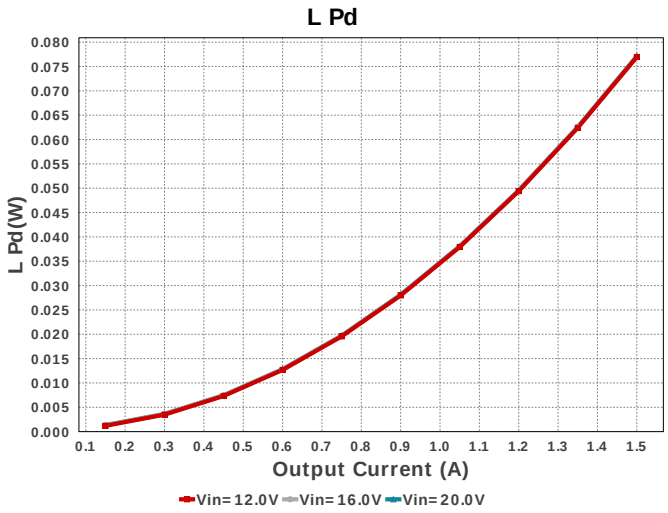












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	568.617 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	133.714 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.732 A	Current	Peak switch current in IC
4.	Iin Avg	271.0 mA	Current	Average input current
5.	L Ipp	463.2 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	9	General	Total Design BOM count
7.	FootPrint	367.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	340.0 kHz	General	Switching frequency
9.	Mode	CCM	General	PWM/PFM Mode
10.	Pout	4.95 W	General	Total output power
11.	Total BOM	$4.57	General	Total BOM Cost

#	Name	Value	Category	Description
12.	Duty Cycle	17.188 %	Op Point	Duty cycle
13.	Efficiency	91.33 %	Op Point	Steady state efficiency
14.	IC Tj	53.547 degC	Op Point	IC junction temperature
15.	ICThetaJA Effective	60.0 degC/W	Op Point	Effective IC Junction-to-Ambient Thermal Resistance
16.	IOUT_OP	1.5 A	Op Point	Iout operating point
17.	VIN_OP	20.0 V	Op Point	Vin operating point
18.	Vout Actual	3.305 V	Op Point	Vout Actual calculated based on selected voltage divider resistors
19.	Vout Tolerance	823.79 m%	Op Point	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
20.	Vout p-p	3.745 mV	Op Point	Peak-to-peak output ripple voltage
21.	Cin Pd	269.815 µW	Power	Input capacitor power dissipation
22.	Cout Pd	0.0 W	Power	Output capacitor power dissipation
23.	IC Iq Pd	6.341 mW	Power	IC Iq Pd
24.	IC Pd	392.455 mW	Power	IC power dissipation
25.	L Pd	77.108 mW	Power	Inductor power dissipation
26.	Total Pd	469.914 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS54308	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

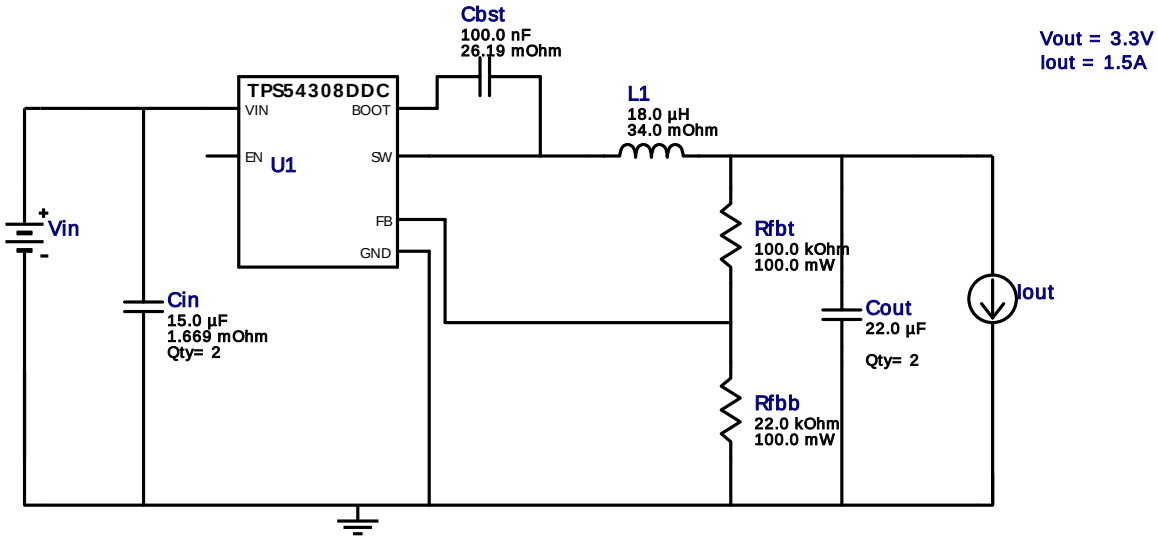
1. **TPS54308** Product Folder : http://www.ti.com/product/TPS54308 : contains the data sheet and other resources.

WEBENCH® Design Report

Vout = 3.3V
Iout = 1.5A

Device = TPS54308DDCR
Topology = Buck
Created = 2018-02-26 13:32:17.063
BOM Cost = $4.57
BOM Count = 9
Total Pd = 0.47W

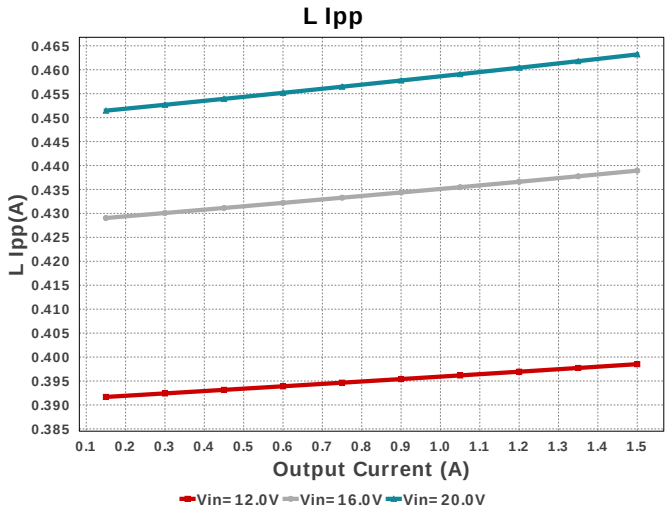
Design : 4823897/13 TPS54308DDCR
TPS54308DDCR 12.0V-20.0V to 3.30V @ 1.5A

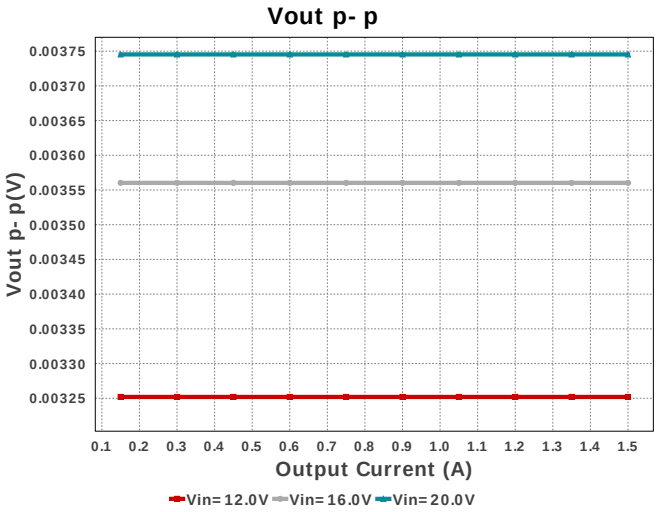


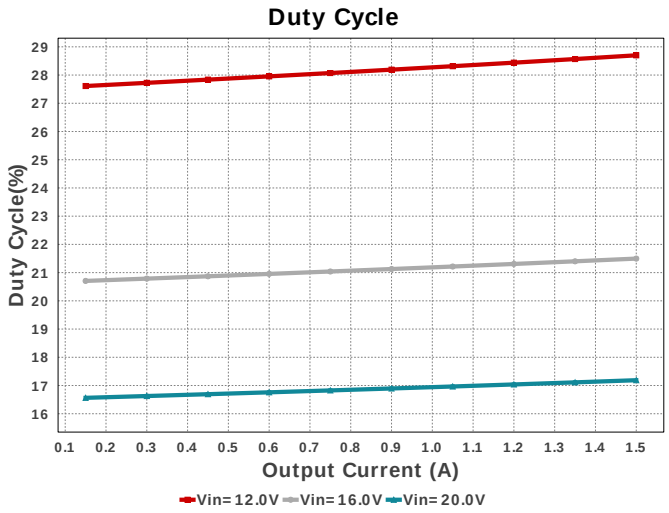
Electrical BOM

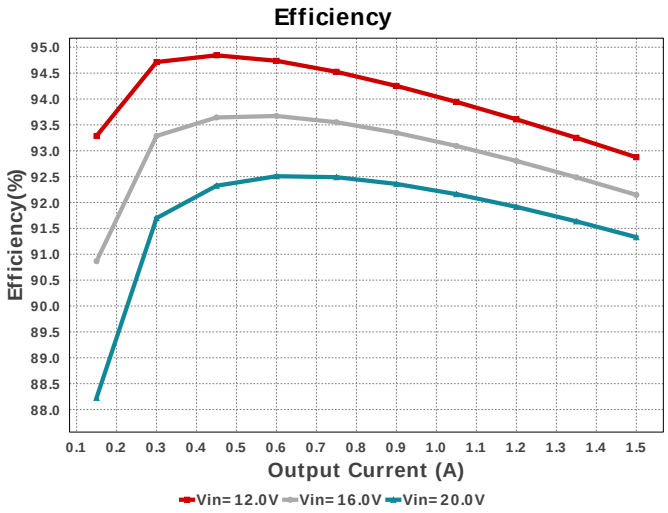
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	TDK	C2012X5R1H104M085AA Series= X5R	Cap= 100.0 nF ESR= 26.19 mOhm VDC= 50.0 V IRMS= 1.29514 A	1	$0.02	0805 7 mm²
2.	Cin	TDK	C2012X5R1V156M125AC Series= X5R	Cap= 15.0 uF ESR= 1.669 mOhm VDC= 35.0 V IRMS= 5.0498 A	2	$0.22	0805 7 mm²
3.	Cout	MuRata	KCM55QR71E226KH01K Series= X7R	Cap= 22.0 uF VDC= 25.0 V IRMS= 0.0 A	2	$1.44	KCM55Q 59 mm²
4.	L1	Sumida	CDRH125NP-180MC	L= 18.0 µH DCR= 34.0 mOhm	1	$0.61	CDRH125 204 mm²
5.	Rfbb	Susumu Co Ltd	RR1220P-223-D Series= RR12	Res= 22.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²
6.	Rfbt	Susumu Co Ltd	RR1220P-104-D Series= RR12	Res= 100.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	U1	Texas Instruments	TPS54308DDCR	Switcher	1	$0.60	DDC0006A_N 10 mm^2









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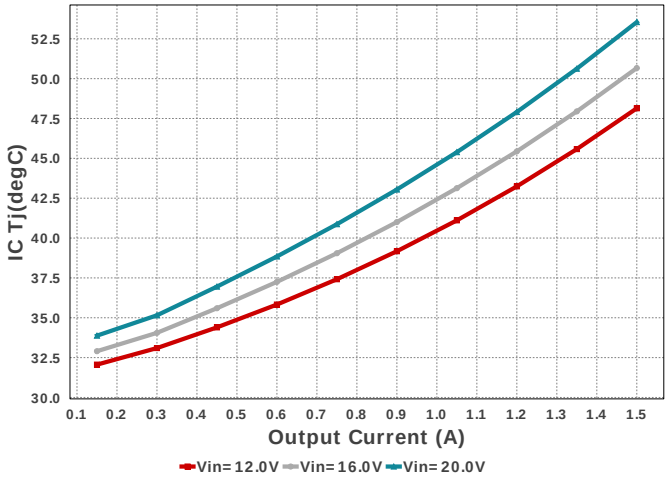
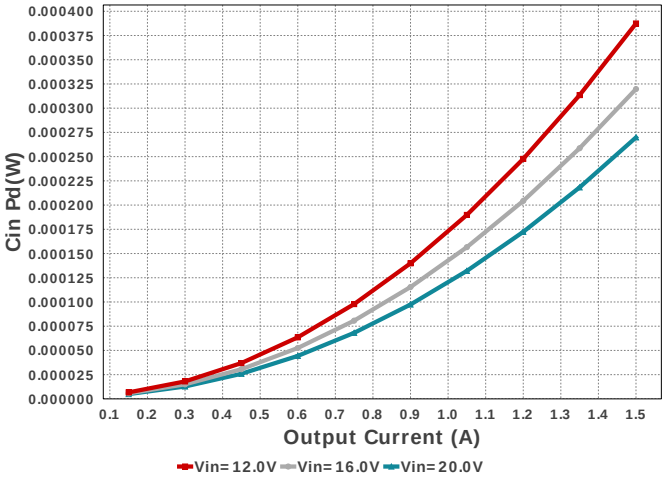
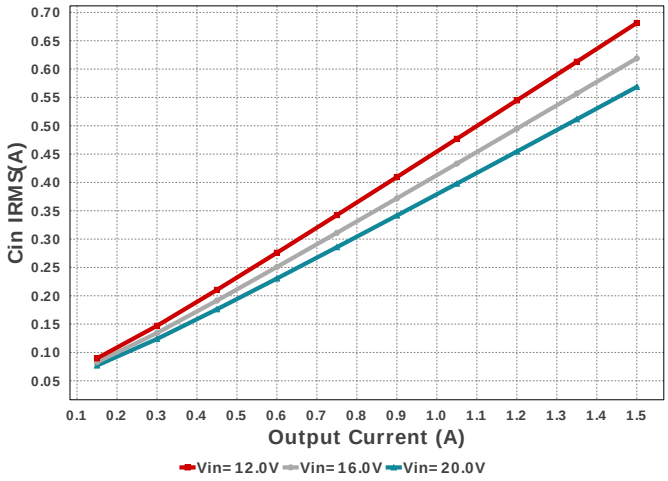


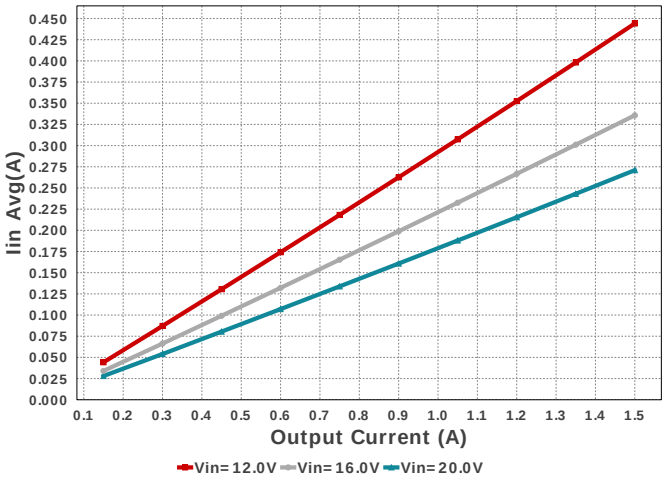
Cin Pd



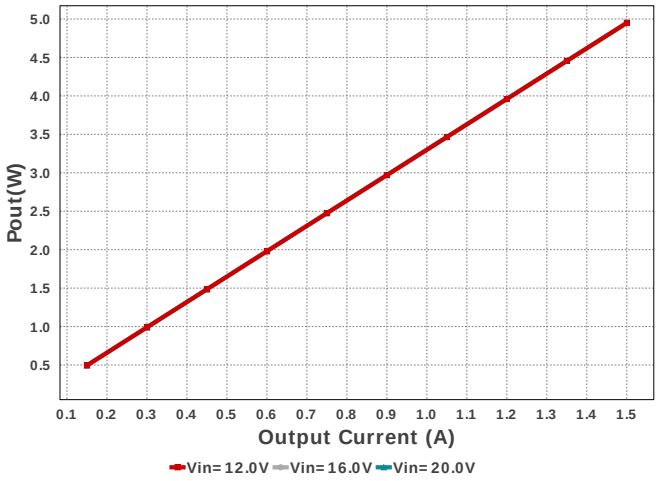
Cin IRMS



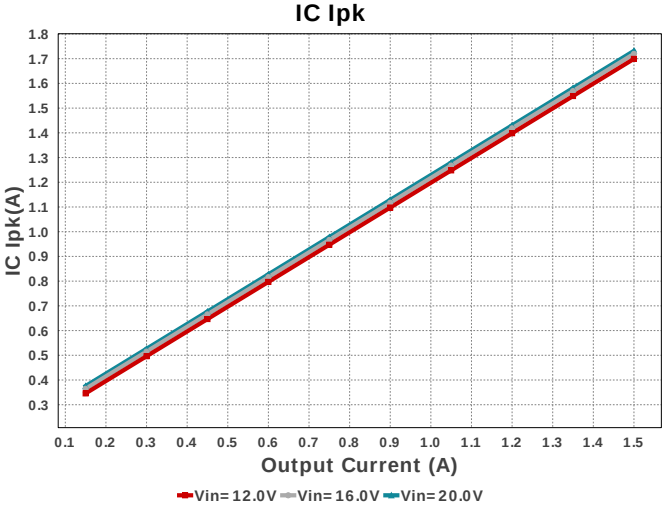
Iin Avg

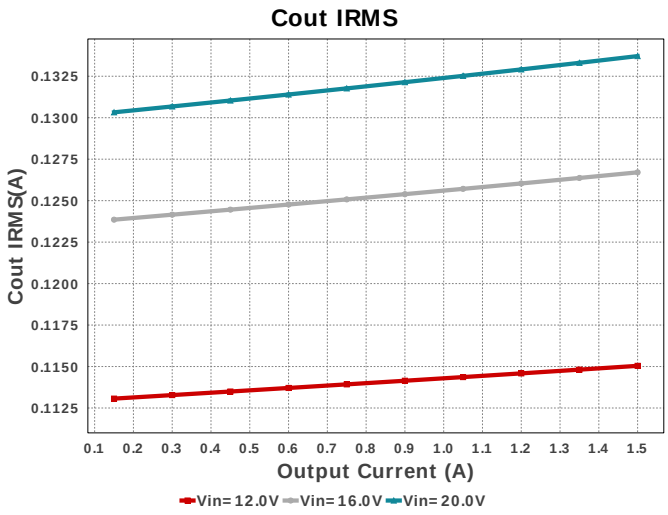


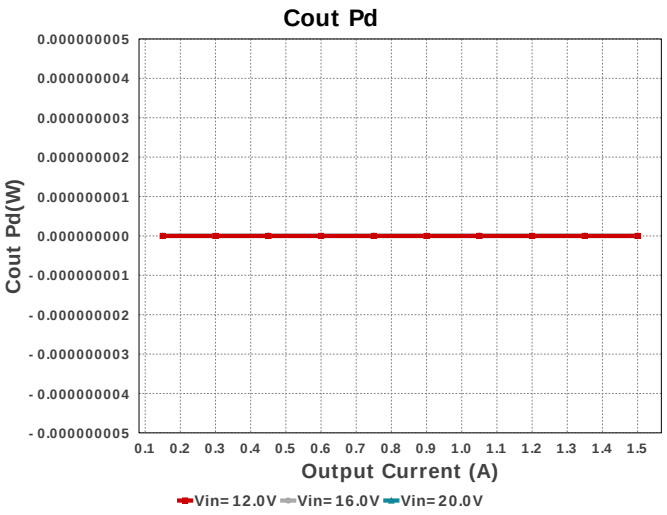
Pout

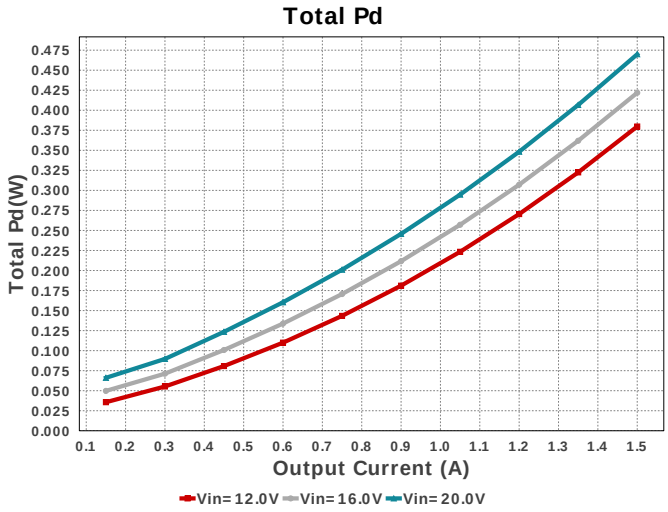


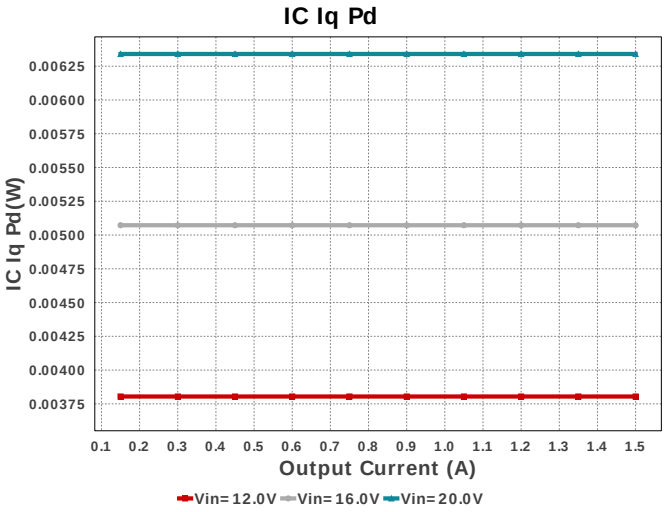
IC Ipk

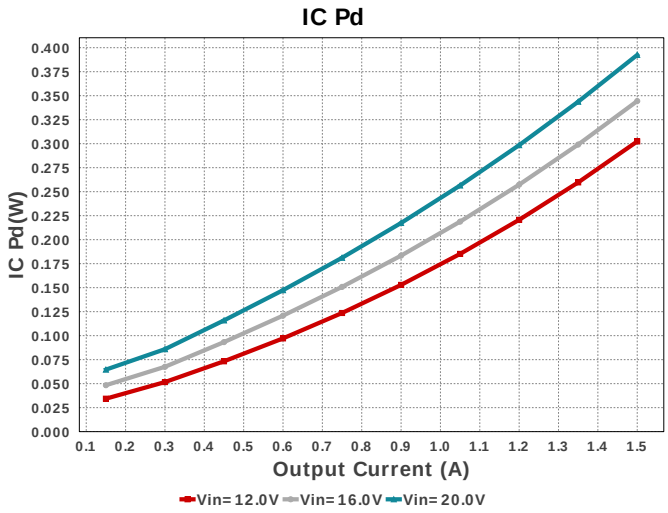


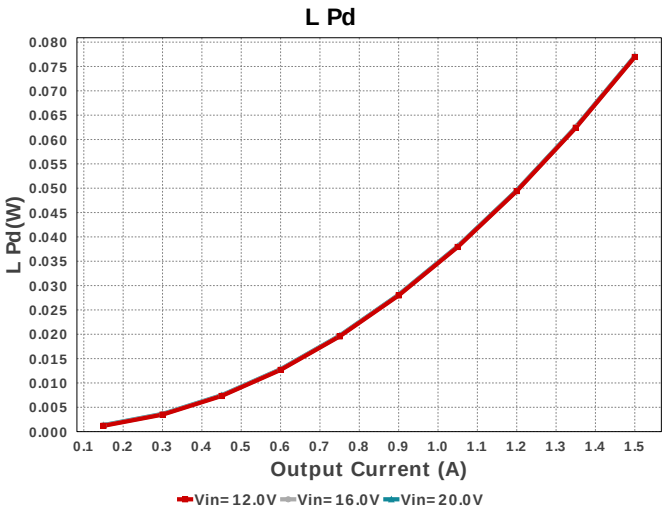












Operating Values

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2.	Cout IRMS	133.714 mA	Current	Output capacitor RMS ripple current
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4.	Iin Avg	271.0 mA	Current	Average input current
5.	L Ipp	463.2 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	9	General	Total Design BOM count
7.	FootPrint	367.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	340.0 kHz	General	Switching frequency
9.	Mode	CCM	General	PWM/PFM Mode
10.	Pout	4.95 W	General	Total output power
11.	Total BOM	$4.57	General	Total BOM Cost

#	Name	Value	Category	Description
12.	Duty Cycle	17.188 %	Op Point	Duty cycle
13.	Efficiency	91.33 %	Op Point	Steady state efficiency
14.	IC Tj	53.547 degC	Op Point	IC junction temperature
15.	ICThetaJA Effective	60.0 degC/W	Op Point	Effective IC Junction-to-Ambient Thermal Resistance
16.	IOUT_OP	1.5 A	Op Point	Iout operating point
17.	VIN_OP	20.0 V	Op Point	Vin operating point
18.	Vout Actual	3.305 V	Op Point	Vout Actual calculated based on selected voltage divider resistors
19.	Vout Tolerance	823.79 m%	Op Point	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
20.	Vout p-p	3.745 mV	Op Point	Peak-to-peak output ripple voltage
21.	Cin Pd	269.815 µW	Power	Input capacitor power dissipation
22.	Cout Pd	0.0 W	Power	Output capacitor power dissipation
23.	IC Iq Pd	6.341 mW	Power	IC Iq Pd
24.	IC Pd	392.455 mW	Power	IC power dissipation
25.	L Pd	77.108 mW	Power	Inductor power dissipation
26.	Total Pd	469.914 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.5	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	TPS54308	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

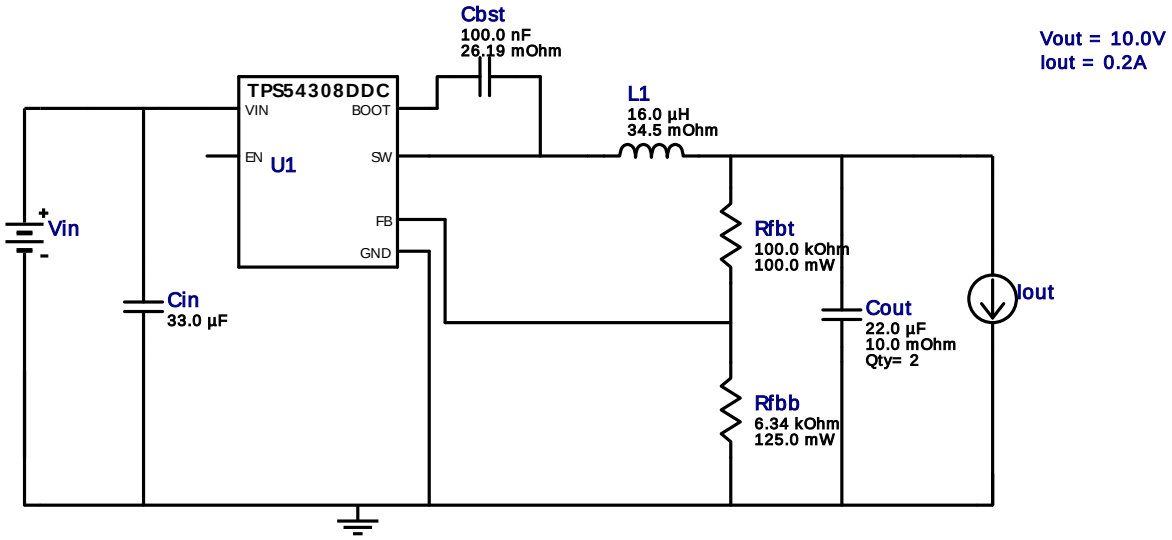
1. **TPS54308** Product Folder : http://www.ti.com/product/TPS54308 : contains the data sheet and other resources.

WEBENCH® Design Report

Vout = 10.0V
Iout = 0.2A

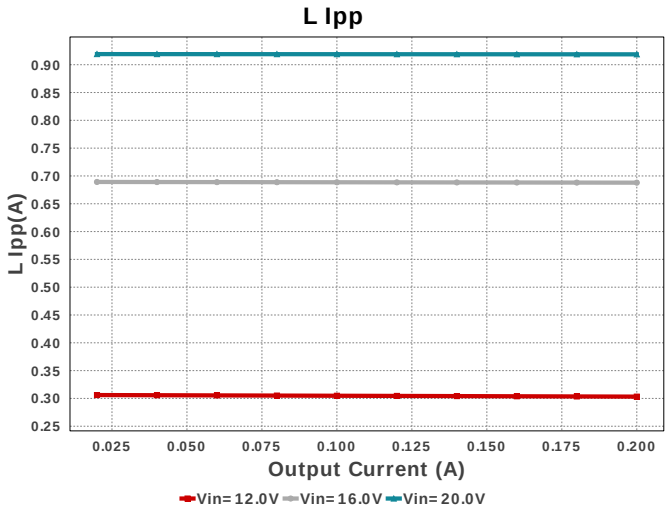
Device = TPS54308DDCR
Topology = Buck
Created = 2018-02-26 13:32:17.455
BOM Cost = $9.03
BOM Count = 8
Total Pd = 0.09W

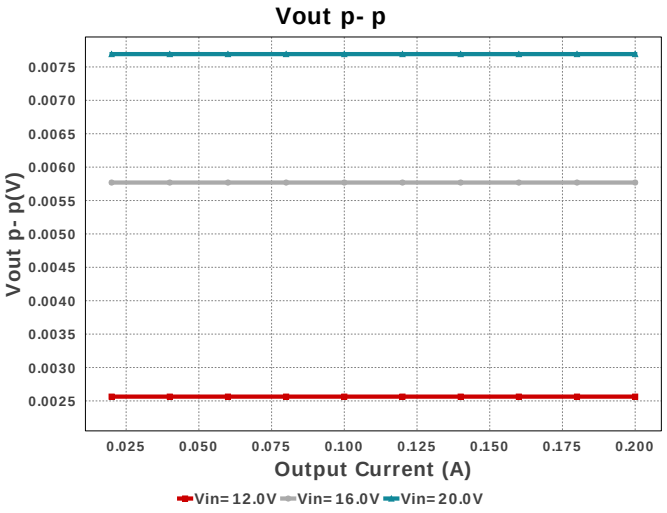
Design : 4823897/14 TPS54308DDCR
TPS54308DDCR 12.0V-20.0V to 10.00V @ 0.2A

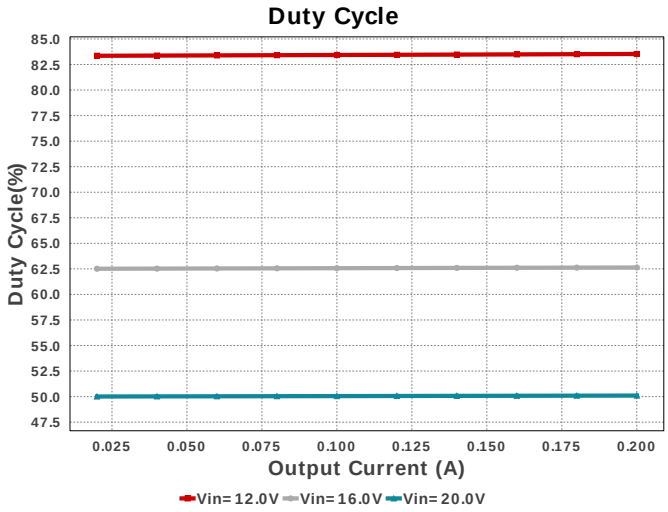


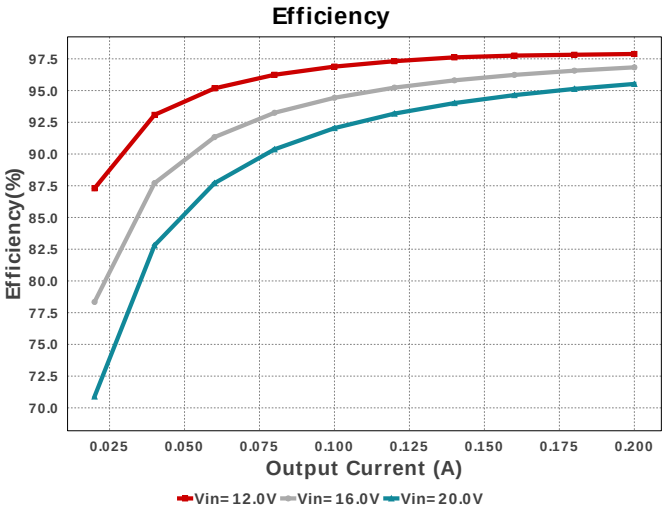
Electrical BOM

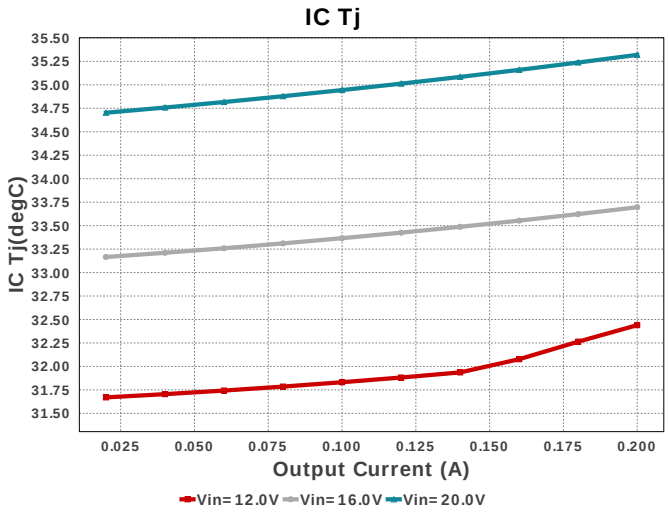
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	TDK	C2012X5R1H104M085AA Series= X5R	Cap= 100.0 nF ESR= 26.19 mOhm VDC= 50.0 V IRMS= 1.29514 A	1	$0.02	0805 7 mm²
2.	Cin	MuRata	KCM55WR7YA336MH01K Series= X7R	Cap= 33.0 uF VDC= 35.0 V IRMS= 0.0 A	1	$2.20	KCM55W 59 mm²
3.	Cout	MuRata	KCM55WR71J226MH01K Series= X7R	Cap= 22.0 uF ESR= 10.0 mOhm VDC= 63.0 V IRMS= 0.0 A	2	$1.66	KCM55W 59 mm²
4.	L1	Wurth Elektronik	7443251600	L= 16.0 µH DCR= 34.5 mOhm	1	$2.87	WE-HC5 80 mm²
5.	Rfbb	Panasonic	ERJ-6ENF6341V Series= ERJ-6E	Res= 6.34 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
6.	Rfbt	Susumu Co Ltd	RR1220P-104-D Series= RR12	Res= 100.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²
7.	U1	Texas Instruments	TPS54308DDCR	Switcher	1	$0.60	DDC0006A_N 10 mm²

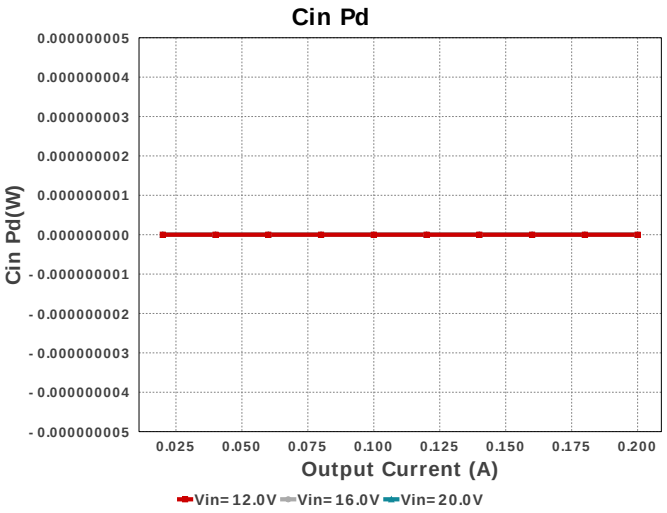


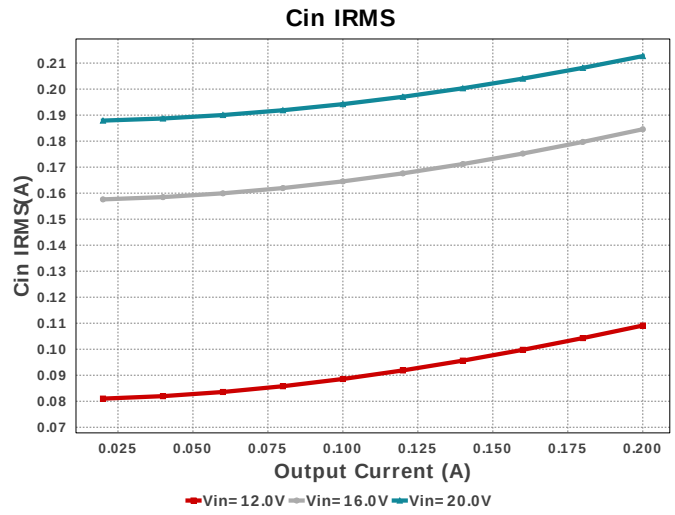


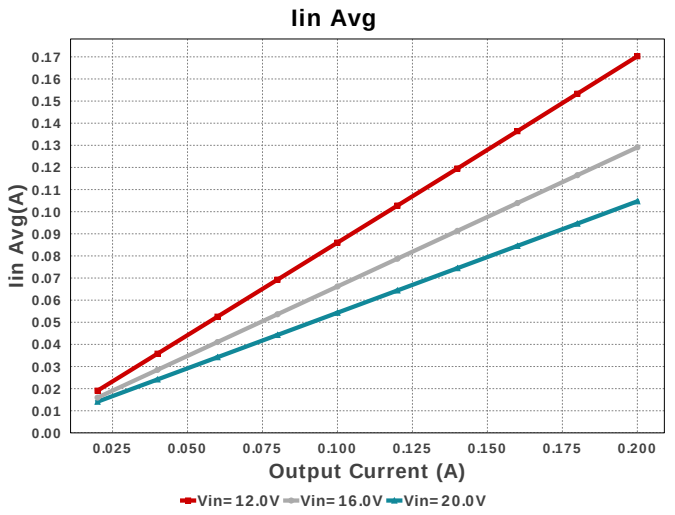


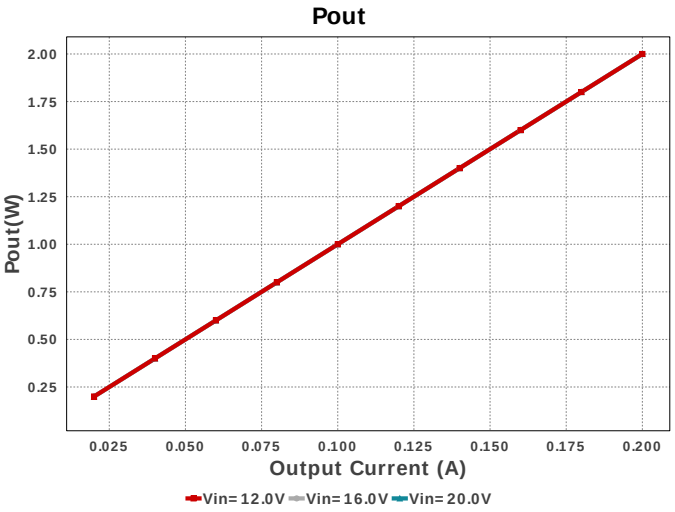


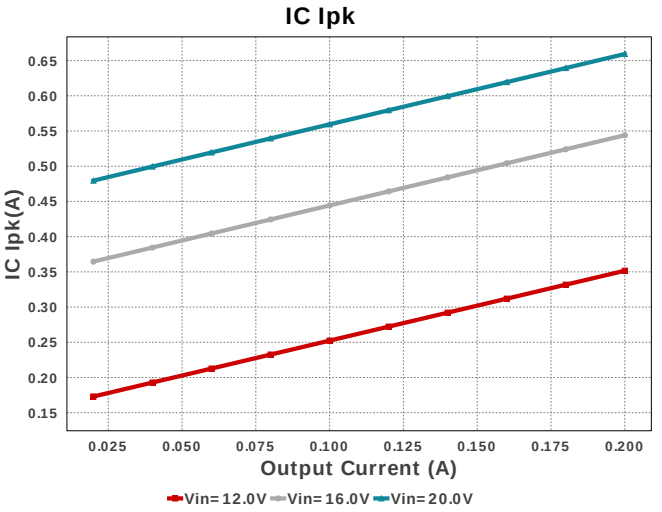


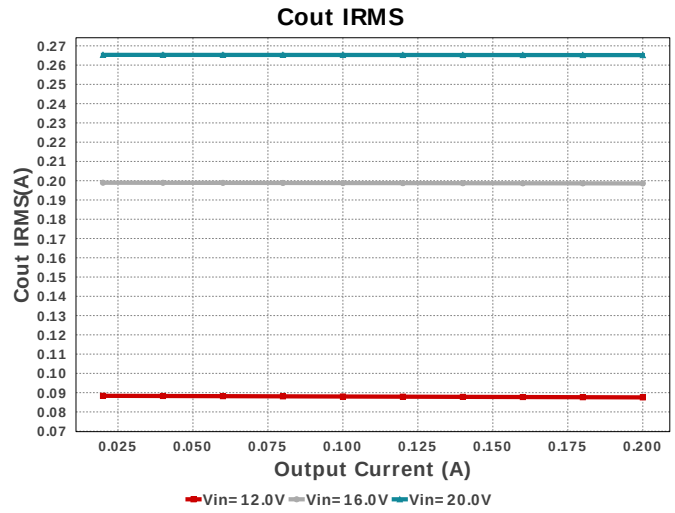


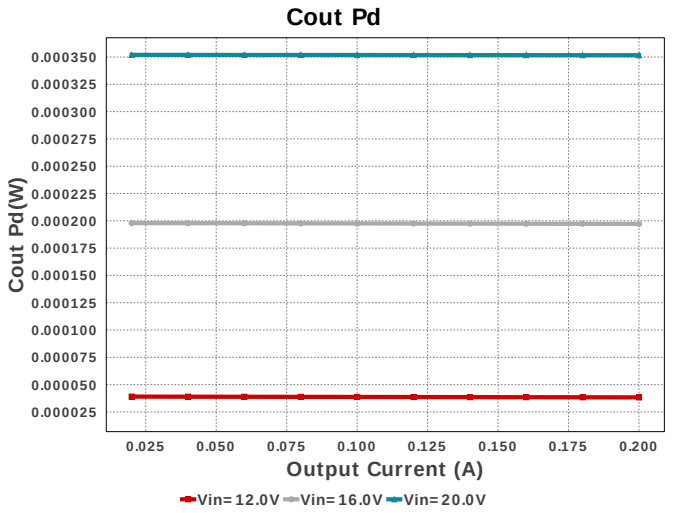


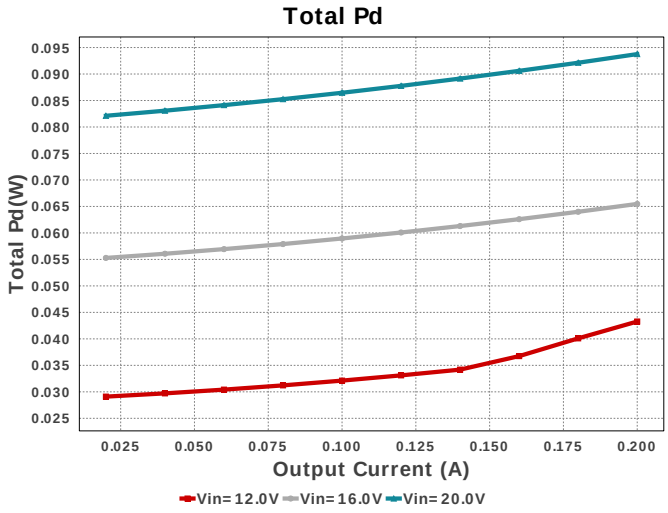


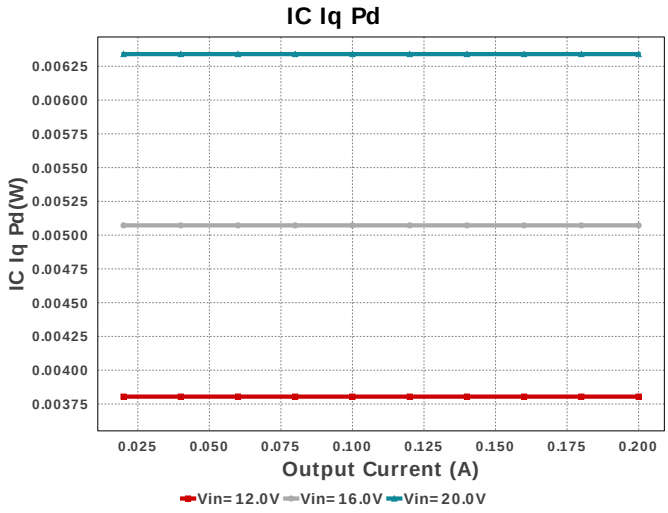


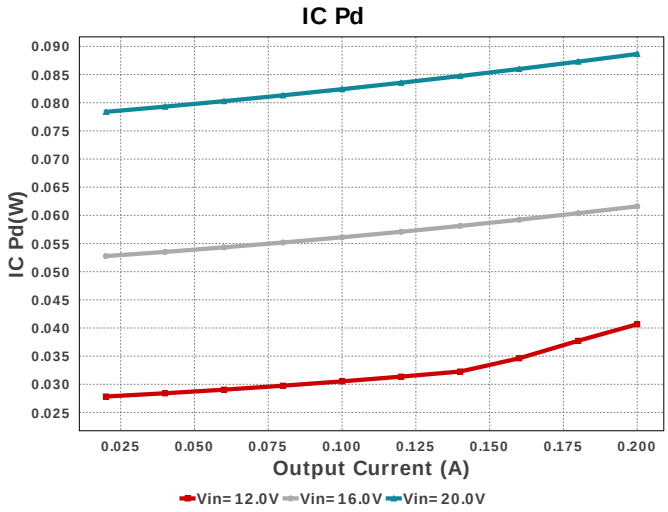


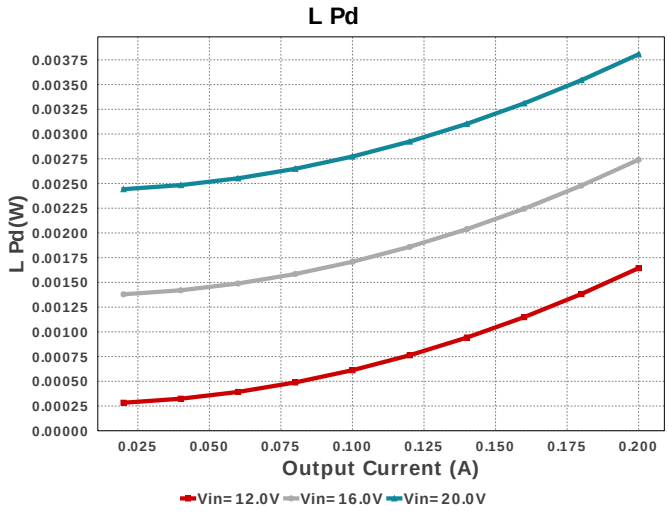












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	212.686 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	265.192 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	659.326 mA	Current	Peak switch current in IC
4.	Iin Avg	104.69 mA	Current	Average input current
5.	L Ipp	918.65 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	8	General	Total Design BOM count
7.	FootPrint	288.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	340.0 kHz	General	Switching frequency
9.	Mode	FCCM	General	PWM/PFM Mode
10.	Pout	2.0 W	General	Total output power
11.	Total BOM	$9.03	General	Total BOM Cost
12.	Duty Cycle	50.102 %	Op Point	Duty cycle
13.	Efficiency	95.522 %	Op Point	Steady state efficiency
14.	IC Tj	35.319 degC	Op Point	IC junction temperature
15.	ICThetaJA Effective	60.0 degC/W	Op Point	Effective IC Junction-to-Ambient Thermal Resistance
16.	IOUT_OP	200.0 mA	Op Point	Iout operating point
17.	VIN_OP	20.0 V	Op Point	Vin operating point
18.	Vout Actual	9.997 V	Op Point	Vout Actual calculated based on selected voltage divider resistors
19.	Vout Tolerance	1.425 %	Op Point	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
20.	Vout p-p	7.692 mV	Op Point	Peak-to-peak output ripple voltage
21.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
22.	Cout Pd	351.633 µW	Power	Output capacitor power dissipation
23.	IC Iq Pd	6.341 mW	Power	IC Iq Pd
24.	IC Pd	88.654 mW	Power	IC power dissipation
25.	L Pd	3.806 mW	Power	Inductor power dissipation
26.	Total Pd	93.76 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	200.0 m	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	10.0	Output Voltage
5.	base_pn	TPS54308	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS54308** Product Folder : http://www.ti.com/product/TPS54308 : contains the data sheet and other resources.