

WEBENCH® Power Architect

Project Report

Project : 4009018/35 : PA_Project_304 (modified from 302)

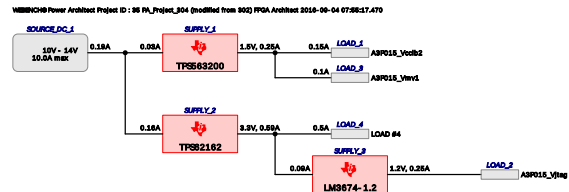
Created : 2016-09-04 07:55:17.470

Optimize project optFactor=3

Project Summary

1. Total System Efficiency	84.888 %
2. Total System BOM Count	16.0
3. Total System Footprint	246.0 mm2
4. Total System BOM Cost	\$2.97
5. Total System Power Dissipation	413.9 mW

--> Launch WEBENCH Power Architect.



Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_1	A3P015_Vccib2
SUPPLY_1	0	LOAD_3	A3P015_Vmv1
SUPPLY_2	0	LOAD_4	LOAD #4
SUPPLY_3	0	LOAD_2	A3P015_Vjtag

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS563200	Switcher : 17V, 3A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	1.5 V	0.25 A	83.9%	149	\$1.06	150	4
2.	SUPPLY_2	TPS62162	Switcher : 17V,3.3Vout,1A,Buck Converter with Power Good	3.3 V	0.594 A	83.1%	59	\$1.46	152	14
3.	SUPPLY_3	LM3674-1.2	Switcher : 2MHz, 600mA Step-Down DC-DC Converter in SOT 23-5	1.2 V	0.25 A	87.9%	38	\$0.45	151	9

Power Loads

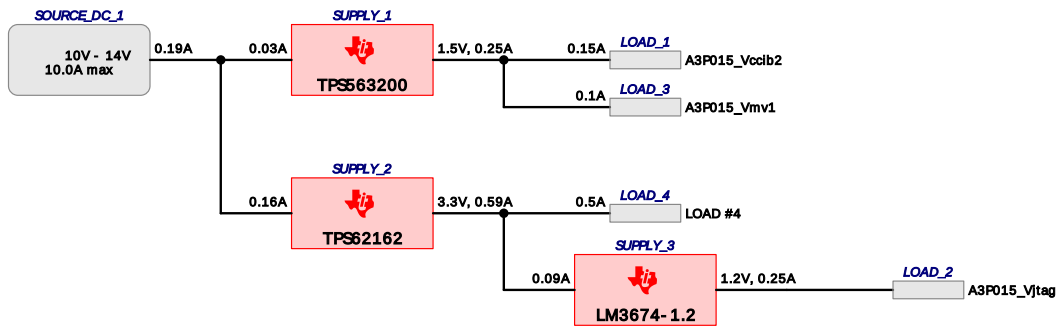
#	Name	VLoad	ILoad	Description
1.	A3P015_Vccib2	1.5 V	0.15 A	VoutRipple=5%, SoftStart delay=1.0 mSec
2.	A3P015_Vmv1	1.5 V	0.1 A	VoutRipple=5%, SoftStart delay=1.0 mSec
3.	LOAD #4	3.3 V	0.5 A	VoutRipple=10%
4.	A3P015_Vjtag	1.2 V	0.25 A	VoutRipple=5%, SoftStart delay=1.0 mSec

FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Actel	A3P015	FPGA_1	ProASIC3	FPGA Actel ProASIC3 A3P015
	http://www.actel.com/documents/PA3_DS.pdf				

Project Diagram

WEBENCH® Power Architect Project ID : 35 PA_Project_304 (modified from 302) FPGA Architect 2016-09-04 07:55:17.470



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
Vishay-Dale	CRCW0402100KFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040210K0FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04029K76FKED	0402	1	\$0.01	3
MuRata	GRM188R60J106ME47D	0603	1	\$0.02	5
MuRata	GRM188R60J475KE19D	0603	1	\$0.01	5
MuRata	GRM31CR70J226KE19L	1206_190	1	\$0.12	11
MuRata	GRM32ER61E226KE15L	1210	1	\$0.16	15
Texas Instruments	LM3674MFX-1.2/NOPB	MF05A	1	\$0.32	15
TDK	NLCV32T-2R2M-PFR	NLCV32	1	\$0.10	13
Bourns	SRN8040-1R5Y	SRN8040	1	\$0.22	100
Taiyo Yuden	TMK316BJ106KL-T	1206	1	\$0.05	11
Texas Instruments	TPS563200DDCR	DDC0006A	1	\$0.52	10
Texas Instruments	TPS62162DSGR	S- PWSON- N8	1	\$0.73	10
Coilcraft	XFL4020-222MEB	XFL4020	1	\$0.55	25
Total			16	\$2.45	300000000005

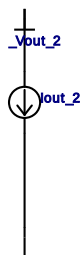
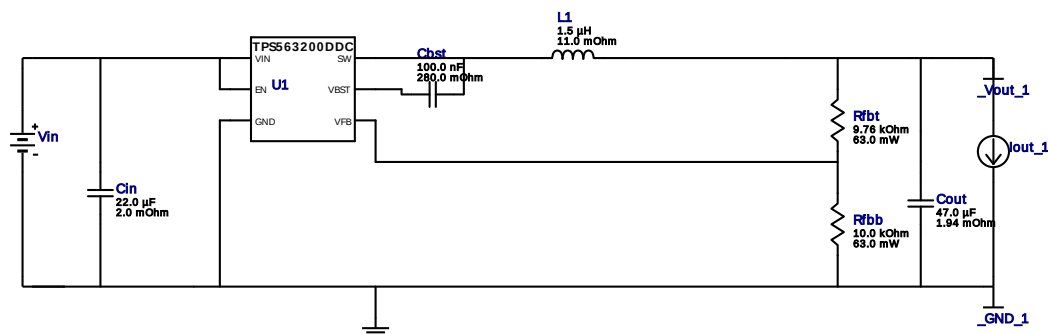


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Iout = 0.25A

Device = TPS563200DDCR
Topology = Buck
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BOM Cost = \$1.06
BOM Count = 7
Total Pd = 0.07W

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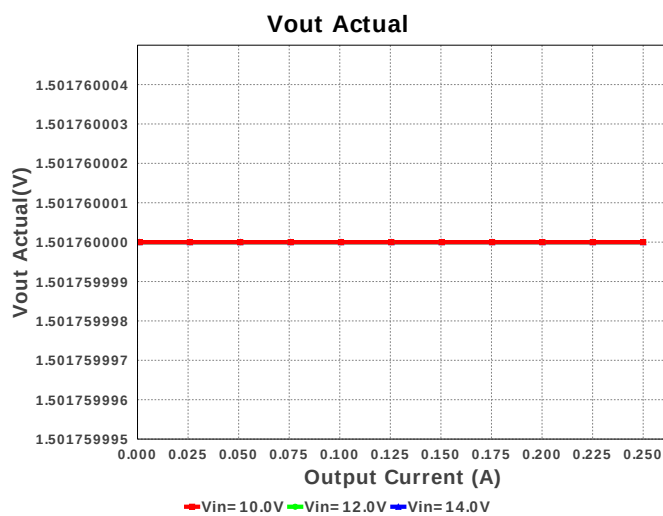
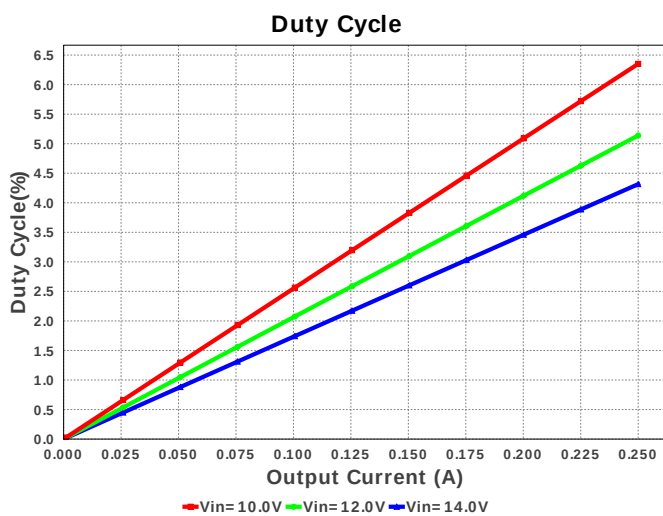
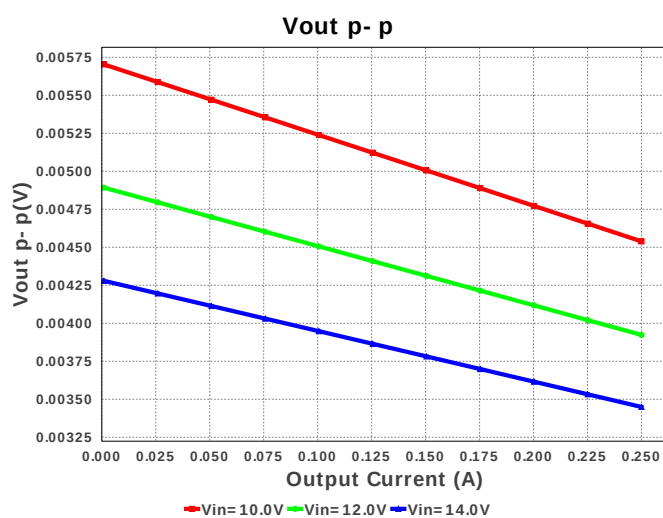
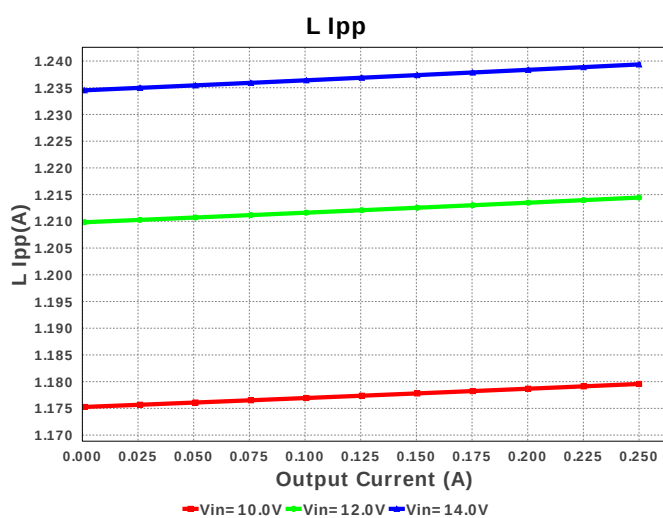
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TPS563200DDCR 10.0V-14.0V to 1.50V @ 0.25A

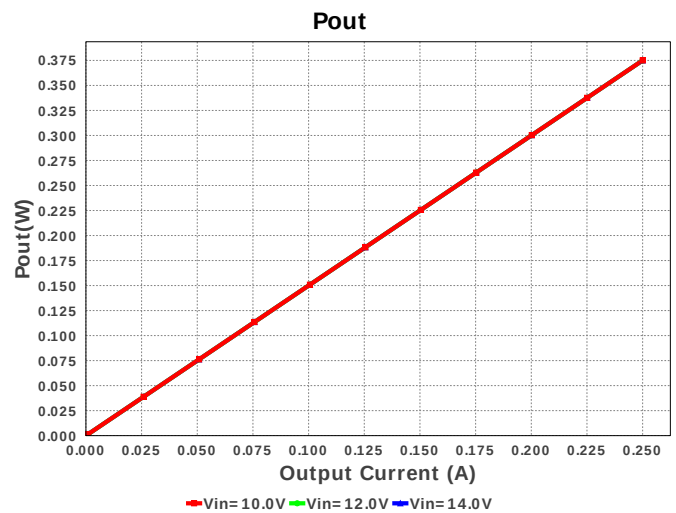
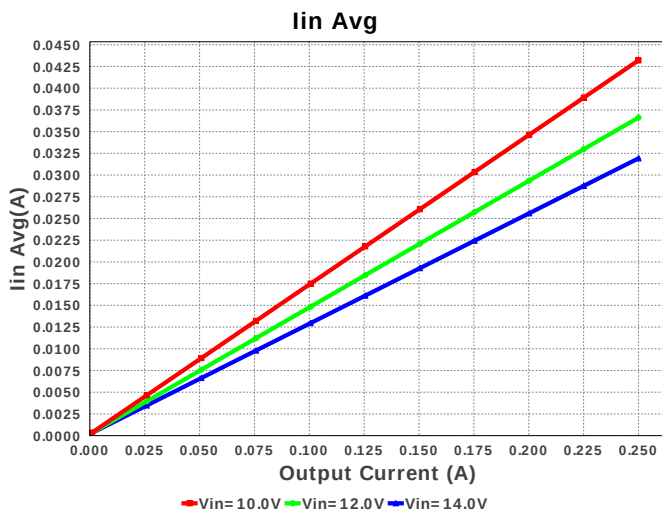
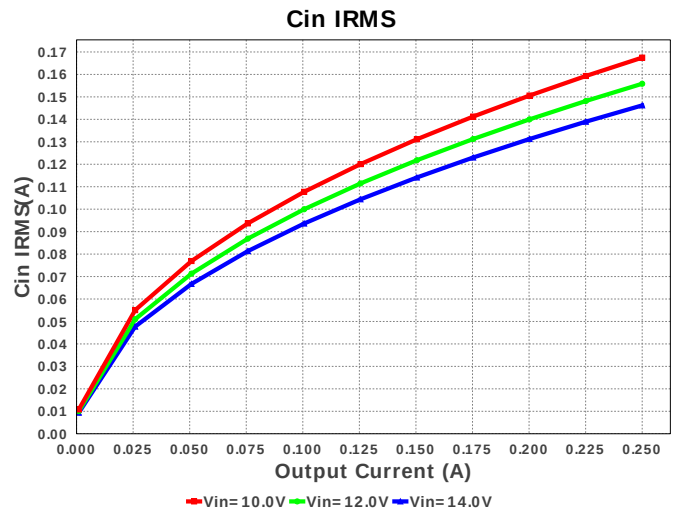
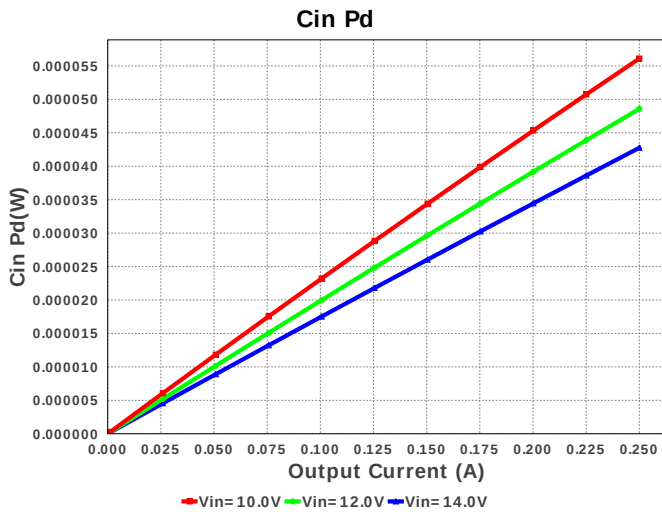
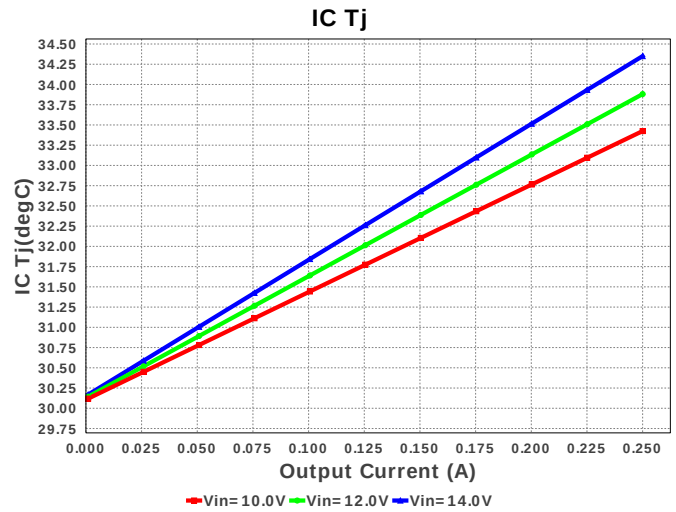
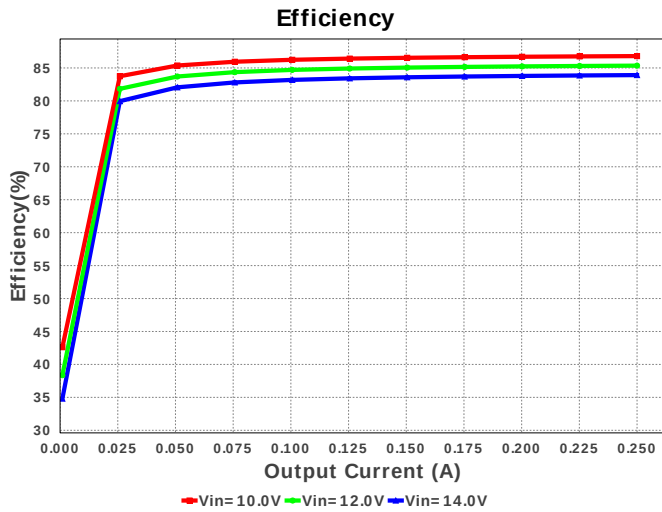


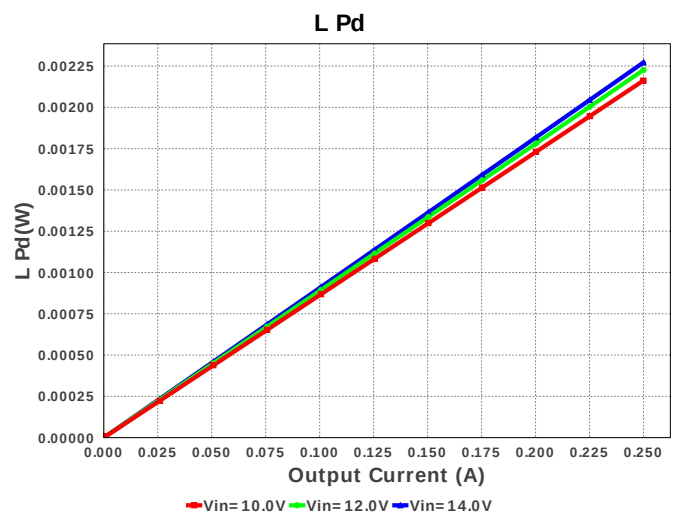
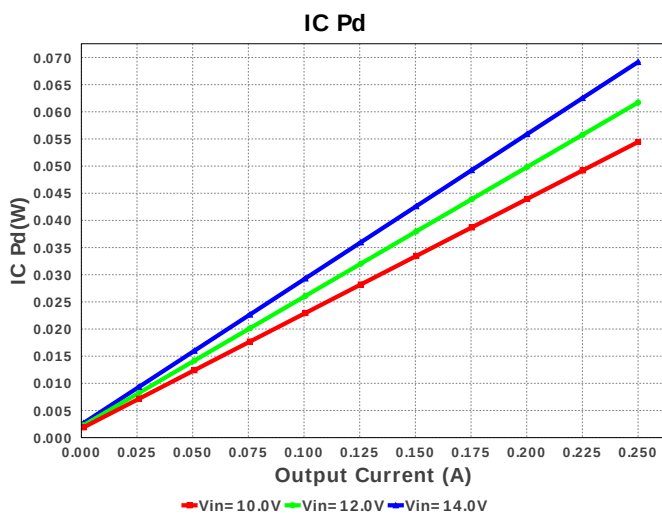
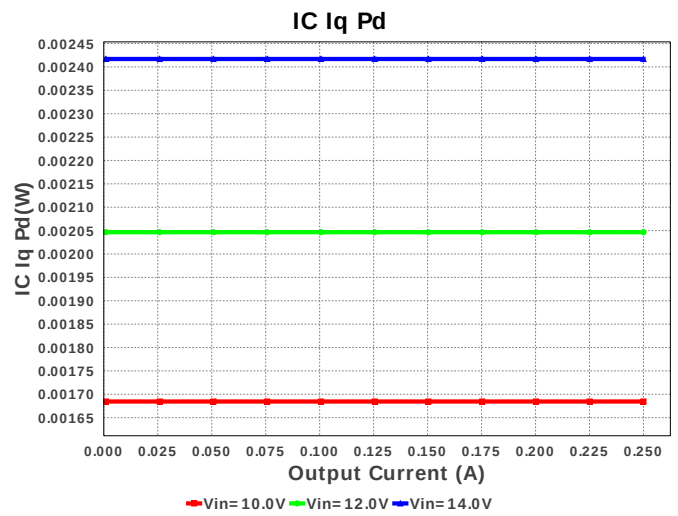
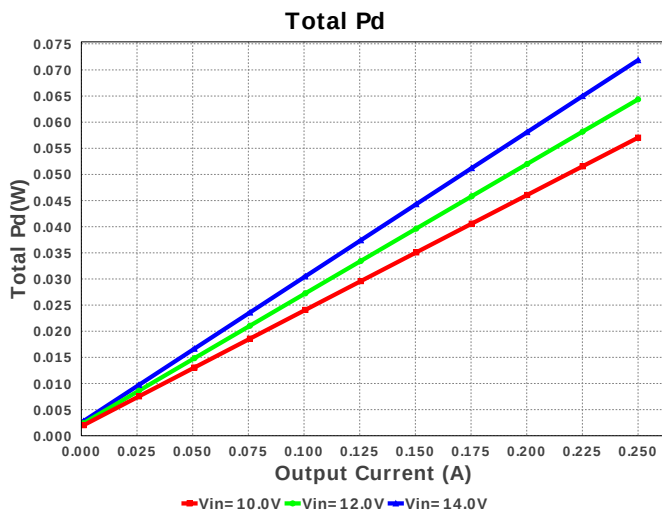
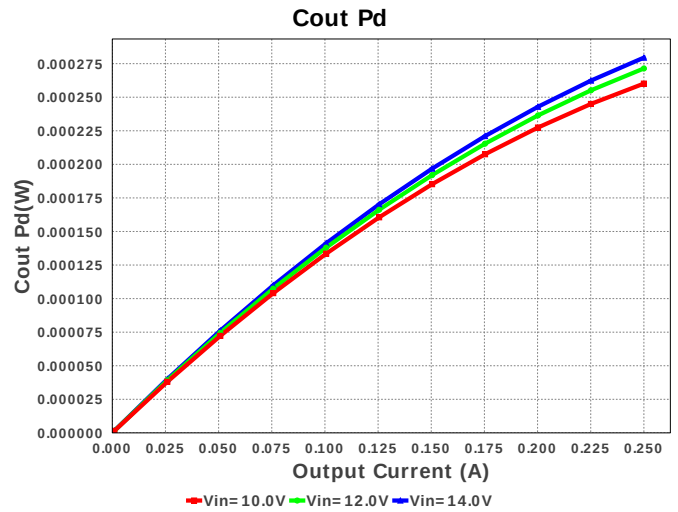
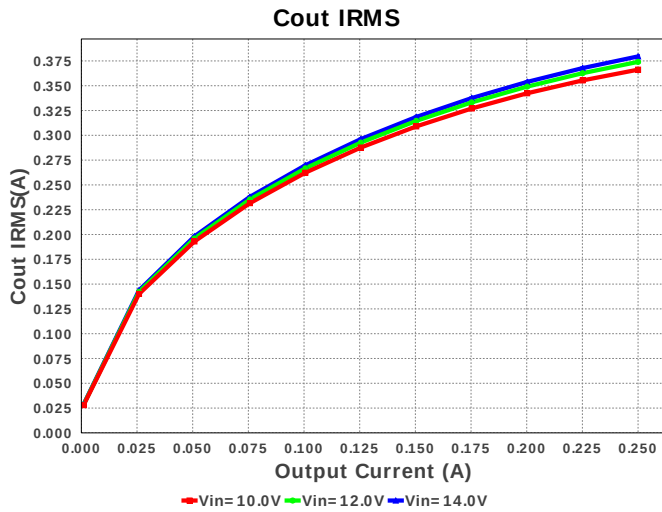
Electrical BOM

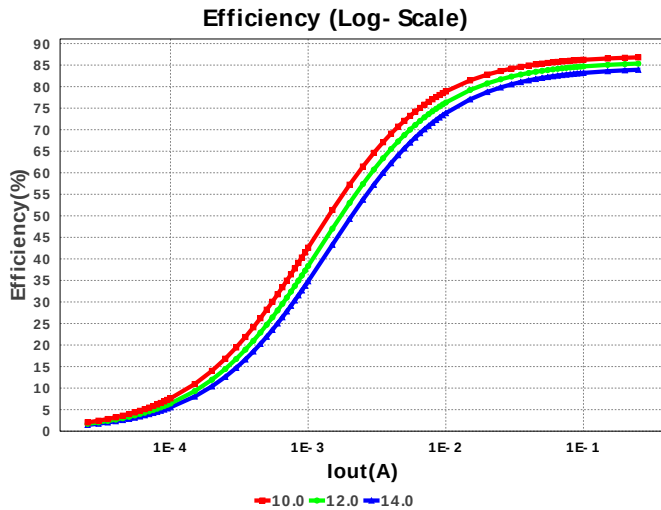
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm²
2.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	\$0.16	 1210 15 mm²
3.	Cout	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 uH 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.	Rf1	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 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









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	146.212 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	379.553 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	31.92 mA	Current	Average input current
4.	L Ipp	1.239 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	289.797 kHz	General	Switching frequency
8.	Mode	PFM	General	Conduction Mode
9.	Pout	375.0 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
12.	Vout OP	1.5 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	4.315 %	Op_point	Duty cycle
14.	Efficiency	83.916 %	Op_point	Steady state efficiency
15.	IC Tj	34.351 degC	Op_point	IC junction temperature
16.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	250.0 mA	Op_point	Iout operating point
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	4.321 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	42.756 μW	Power	Input capacitor power dissipation
21.	Cout Pd	279.478 μW	Power	Output capacitor power dissipation
22.	IC Iq Pd	2.417 mW	Power	IC Iq Pd
23.	IC Pd	69.167 mW	Power	IC power dissipation
24.	L Pd	2.272 mW	Power	Inductor power dissipation
25.	Total Pd	71.876 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	250.0 m	Maximum Output Current
2.	SoftStart	1.0 ms	Soft Start Time (ms)
3.	VinMax	14.0	Maximum input voltage
4.	VinMin	10.0	Minimum input voltage
5.	Vout	1.5	Output Voltage
6.	base_pn	TPS563200	Base Product Number
7.	source	DC	Input Source Type
8.	Ta	30.0	Ambient temperature

Design Assistance

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

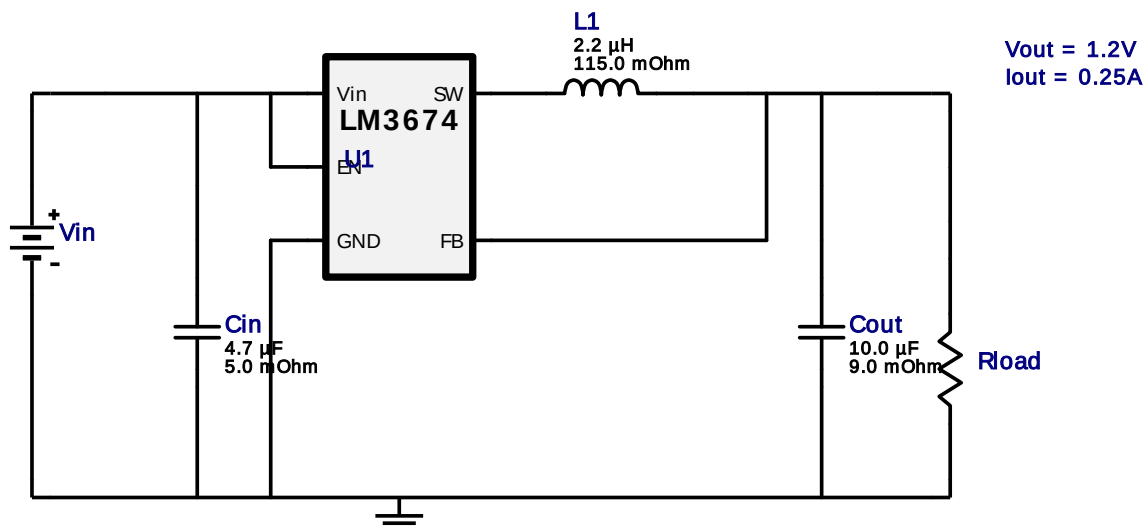


Vout = 1.2V
Iout = 0.25A

Device = LM3674MFX-1.2/NOPB
Topology = Buck
Created = 9/4/16 7:55:15 AM
BOM Cost = \$0.45
BOM Count = 4
Total Pd = 0.04W

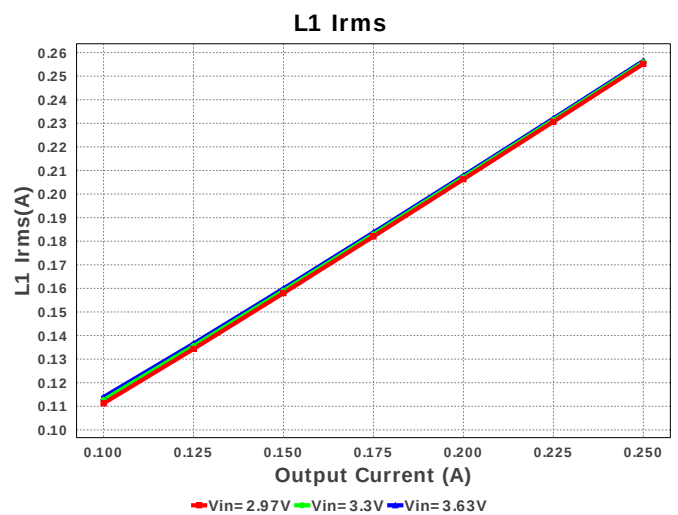
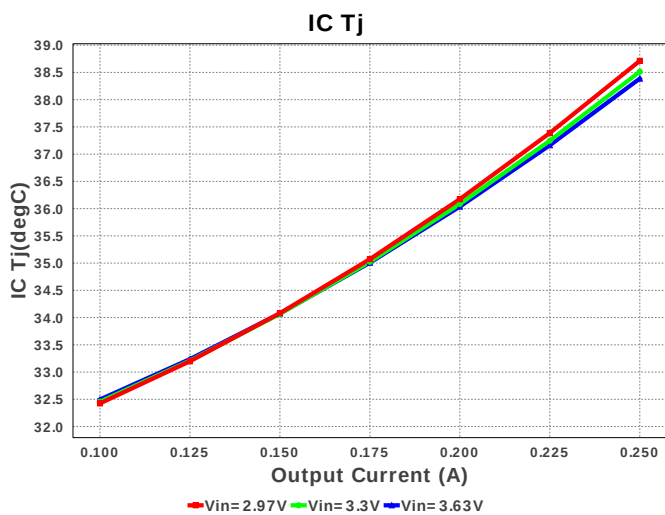
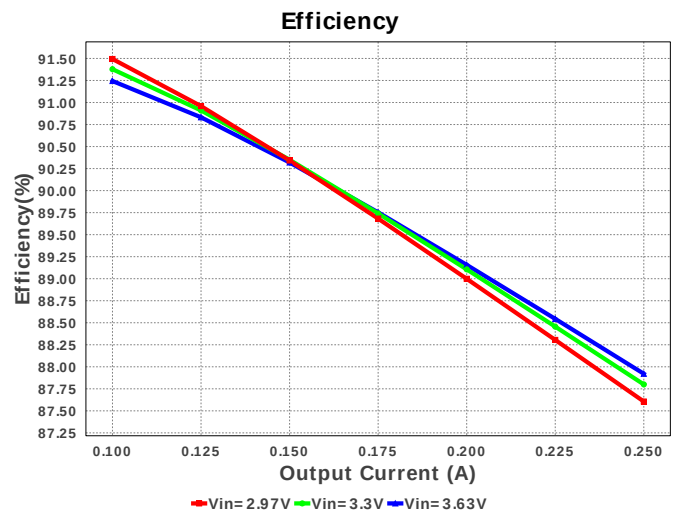
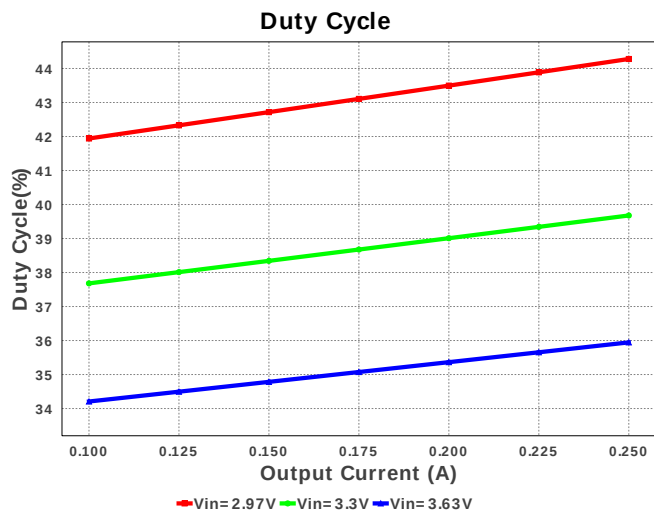
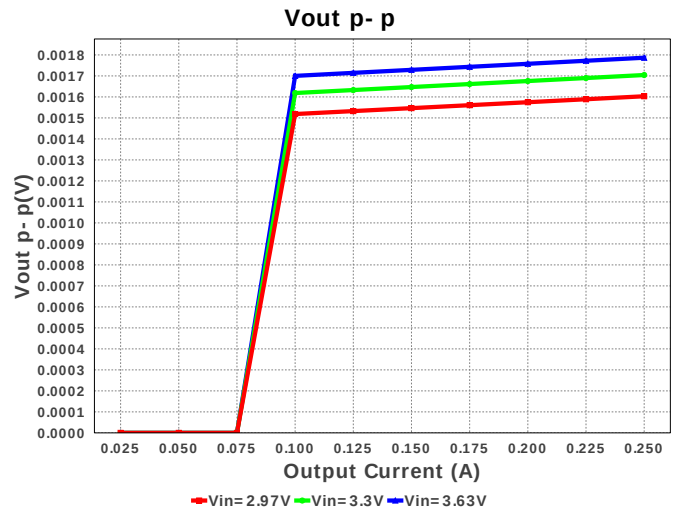
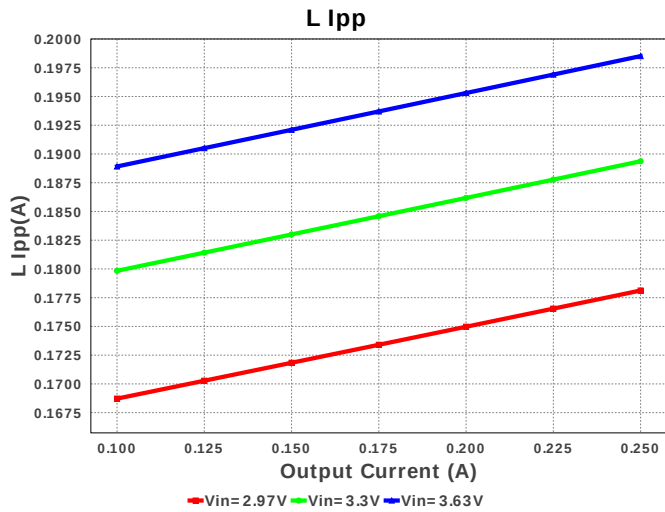
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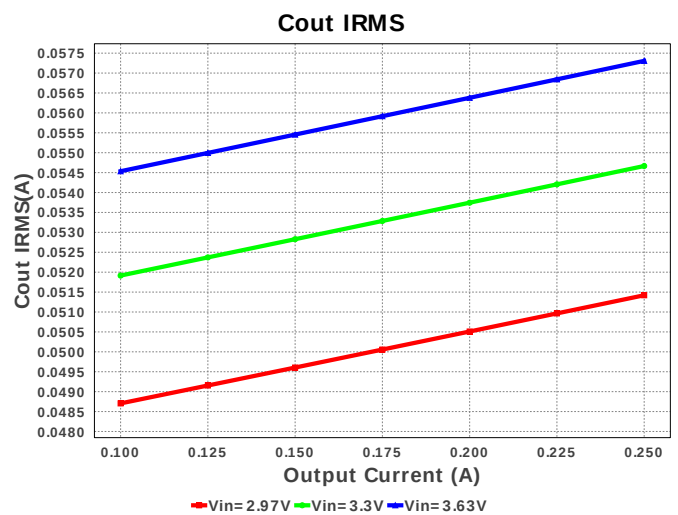
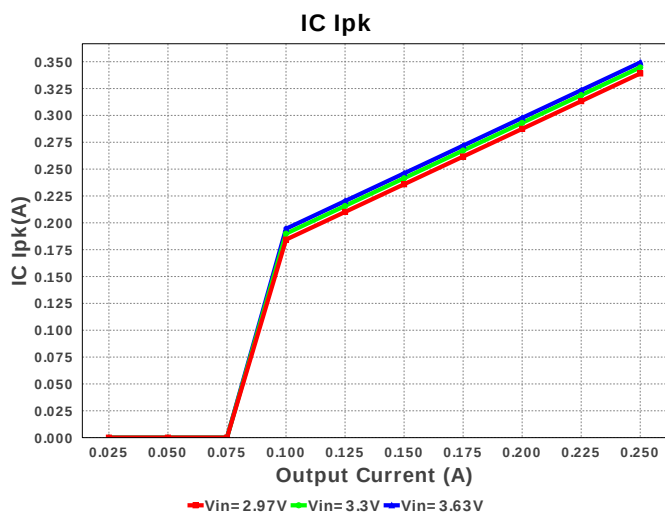
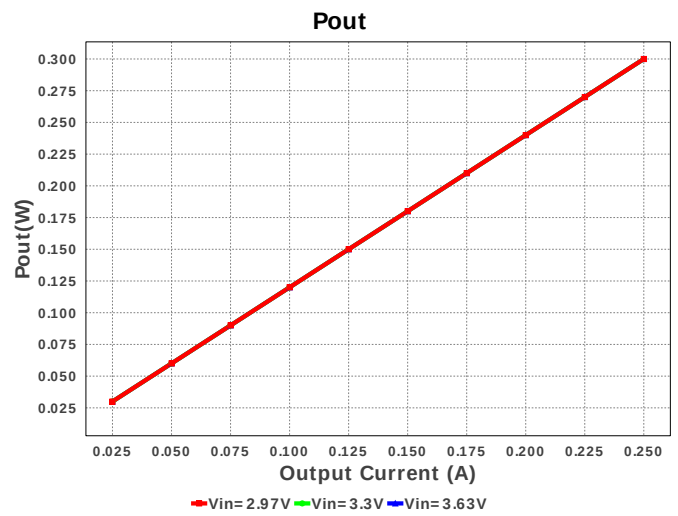
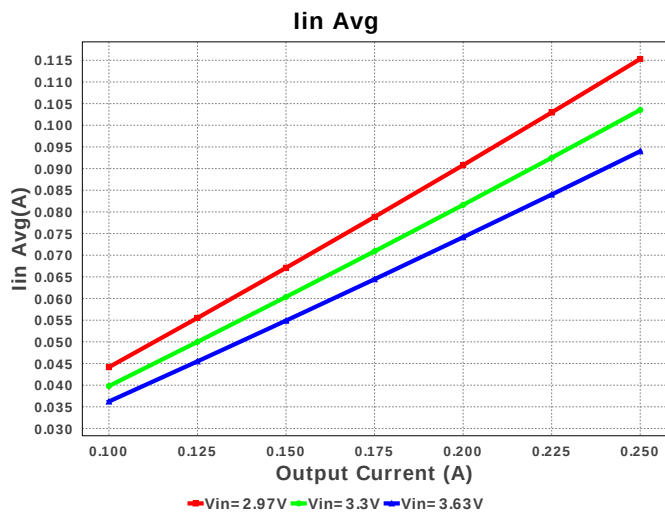
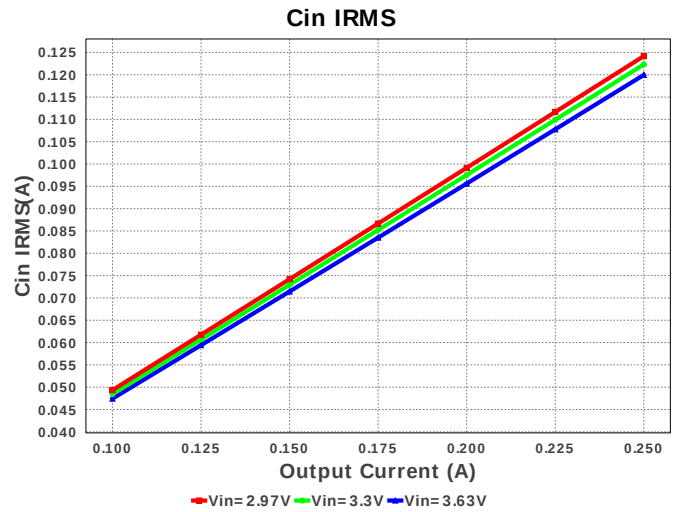
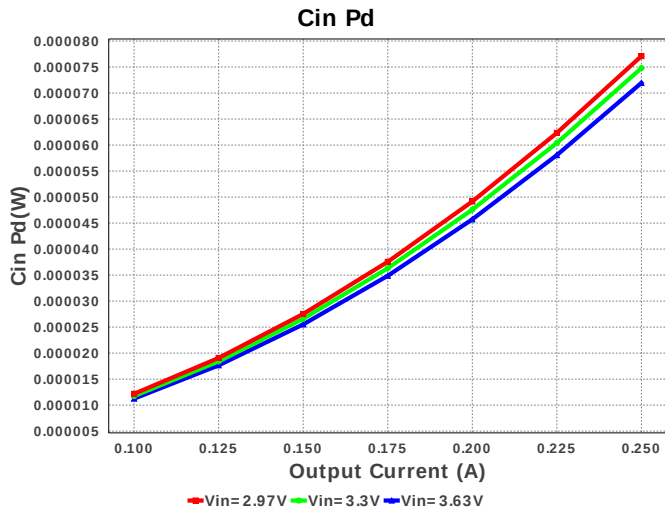
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LM3674MFX-1.2/NOPB 2.97V-3.63V to 1.20V @ 0.25A

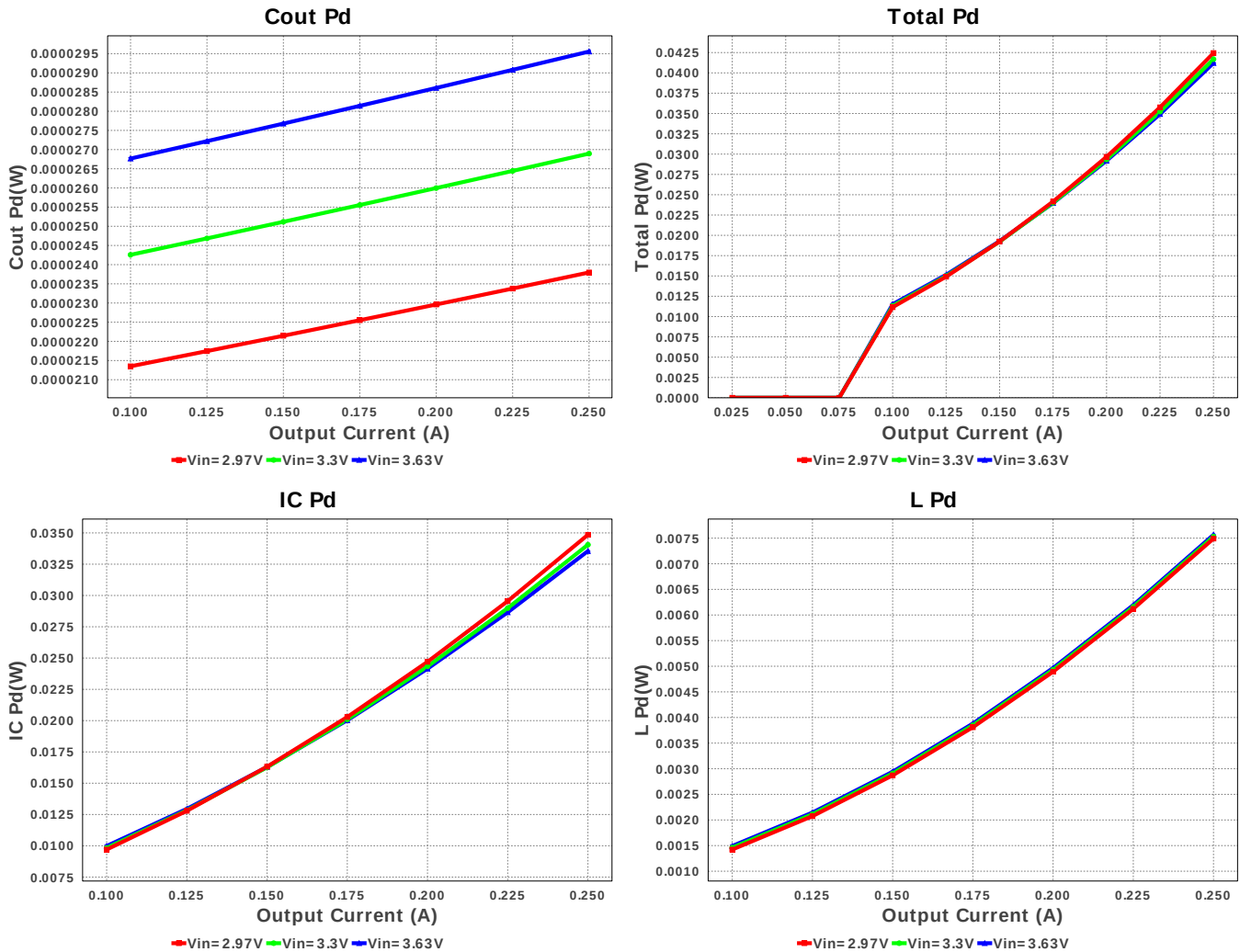


Electrical BOM

#	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 mm ²
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 mm ²
3.	L1	TDK	NLCV32T-2R2M-PFR	L= 2.2 uH DCR= 115.0 mOhm	1	\$0.10	NLCV32 13 mm ²
4.	U1	Texas Instruments	LM3674MFX-1.2/NOPB	Switcher	1	\$0.32	MF05A 15 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	119.96 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	57.306 mA	Current	Output capacitor RMS ripple current
3.	IC IpK	349.257 mA	Current	Peak switch current in IC
4.	Iin Avg	93.998 mA	Current	Average input current
5.	L Ipp	198.51 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	256.484 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.	Mode	CCM	General	Conduction Mode
12.	Pout	300.0 mW	General	Total output power
13.	Total BOM	\$0.45	General	Total BOM Cost
14.	Duty Cycle	35.945 %	Op_point	Duty cycle
15.	Efficiency	87.921 %	Op_point	Steady state efficiency
16.	IC Tj	38.387 degC	Op_point	IC junction temperature
17.	ICThetaJA	250.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
18.	IOUT_OP	250.0 mA	Op_point	Iout operating point
19.	VIN_OP	3.63 V	Op_point	Vin operating point
20.	Vout p-p	1.787 mV	Op_point	Peak-to-peak output ripple voltage
21.	Cin Pd	71.952 μW	Power	Input capacitor power dissipation
22.	Cout Pd	29.556 μW	Power	Output capacitor power dissipation
23.	IC Pd	33.547 mW	Power	IC power dissipation
24.	L Pd	7.565 mW	Power	Inductor power dissipation
25.	Total Pd	41.215 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	250.0 m	Maximum Output Current
2.	SoftStart	1.0 ms	Soft Start Time (ms)

#	Name	Value	Description
3.	VinMax	3.63	Maximum input voltage
4.	VinMin	2.97	Minimum input voltage
5.	Vout	1.2	Output Voltage
6.	base_pn	LM3674	Base Product Number
7.	source	DC	Input Source Type
8.	Ta	30.0	Ambient temperature

Design Assistance

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

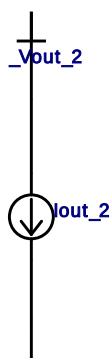
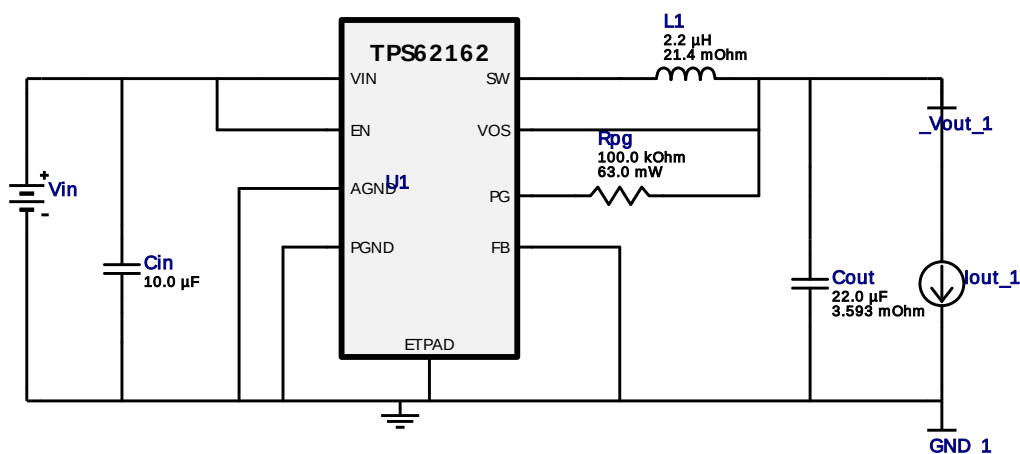


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Iout = 0.59A

Device = TPS62162DSGR
Topology = Buck
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BOM Cost = \$1.46
BOM Count = 5
Total Pd = 0.3W

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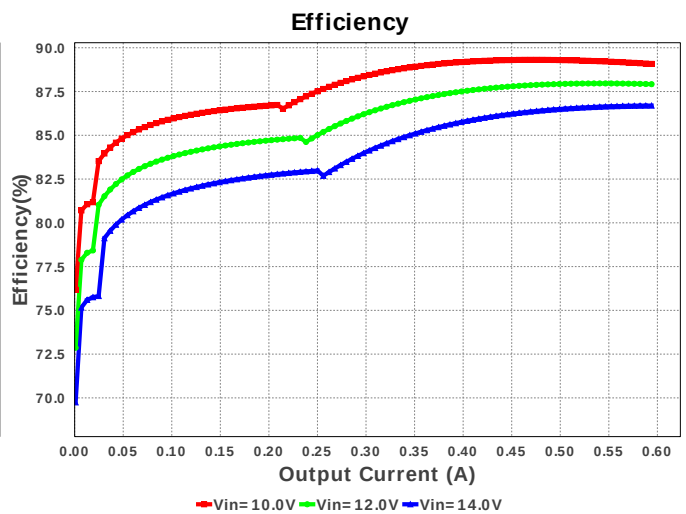
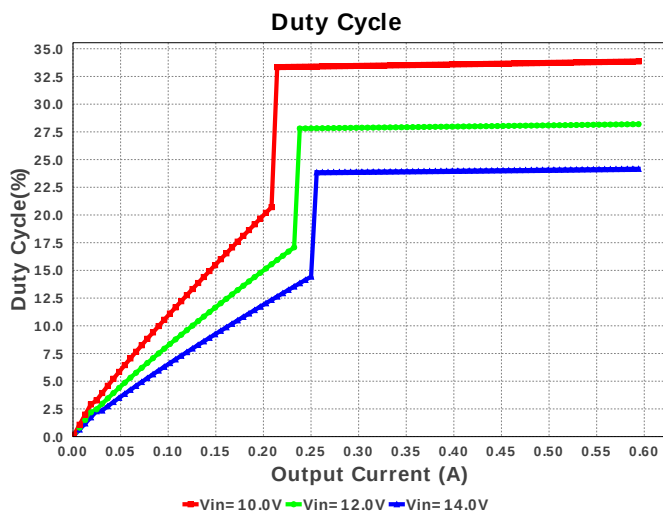
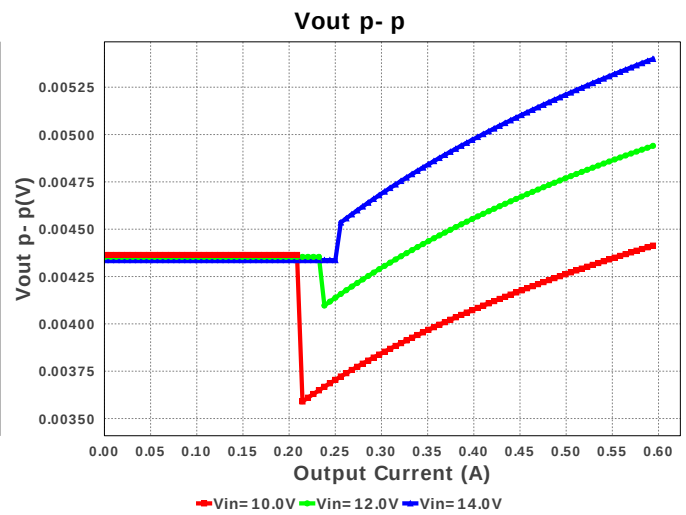
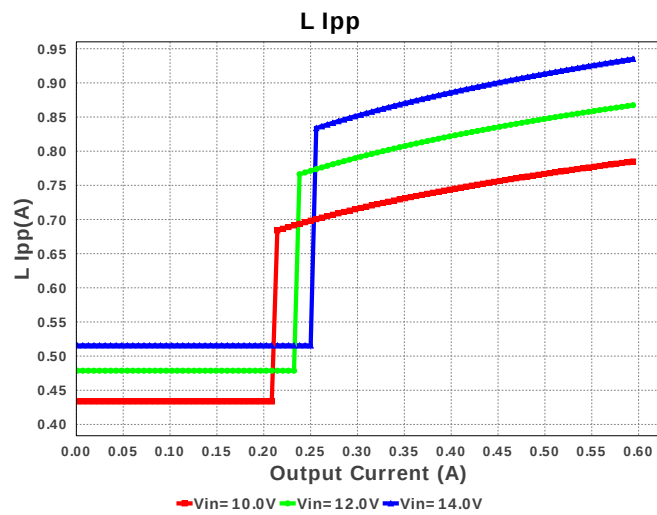
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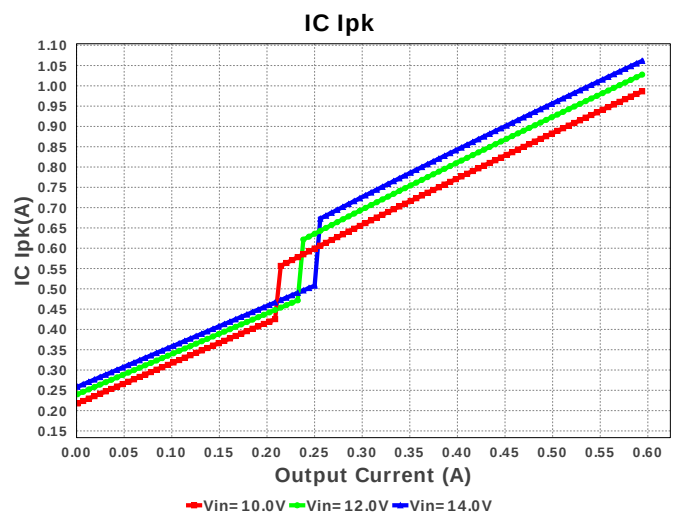
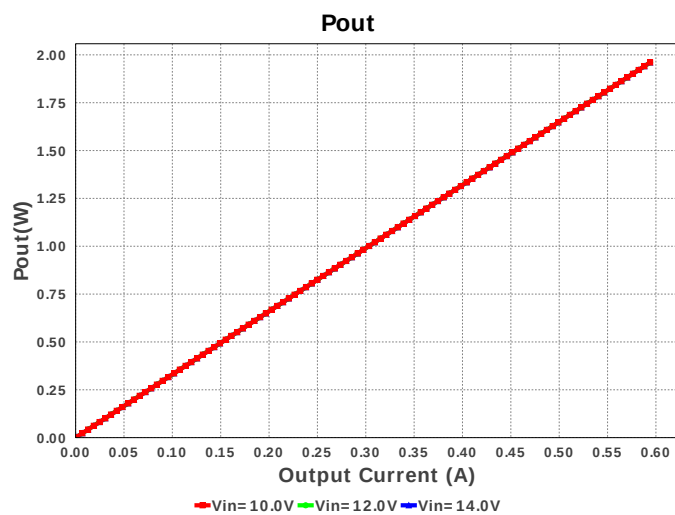
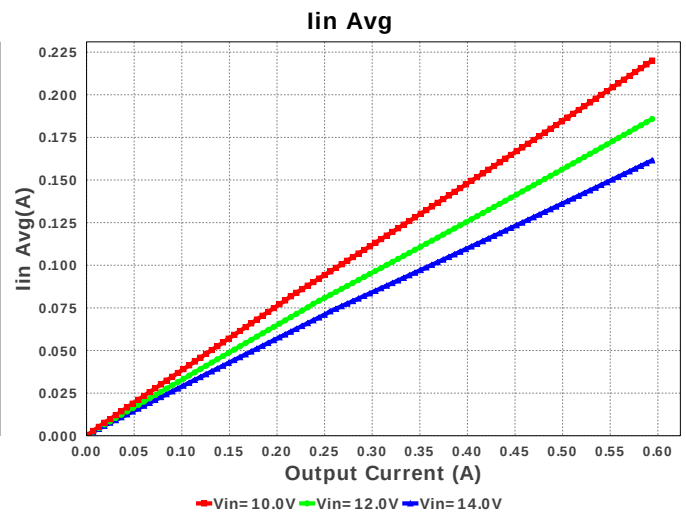
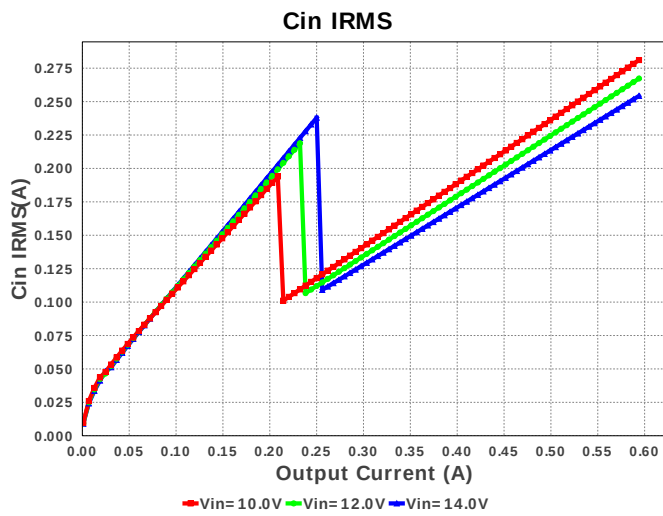
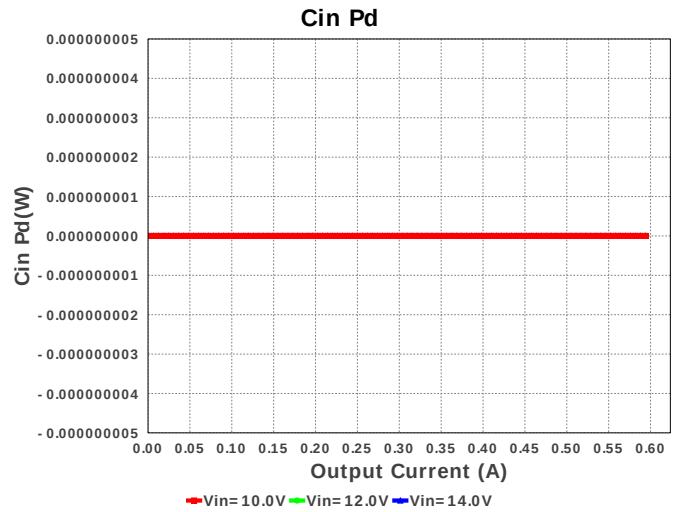
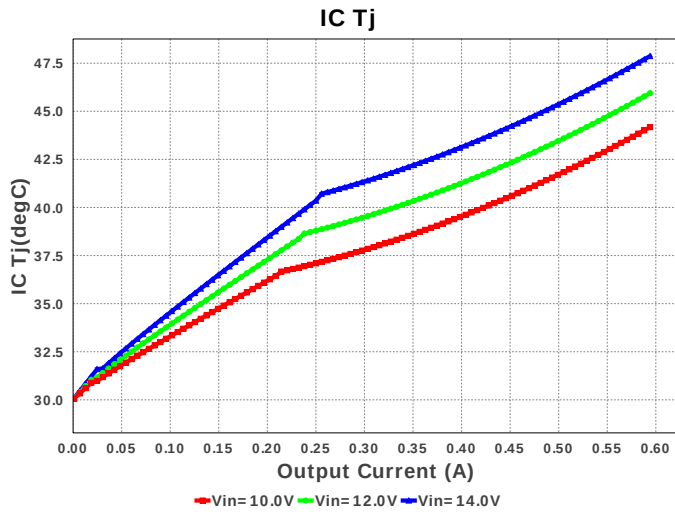


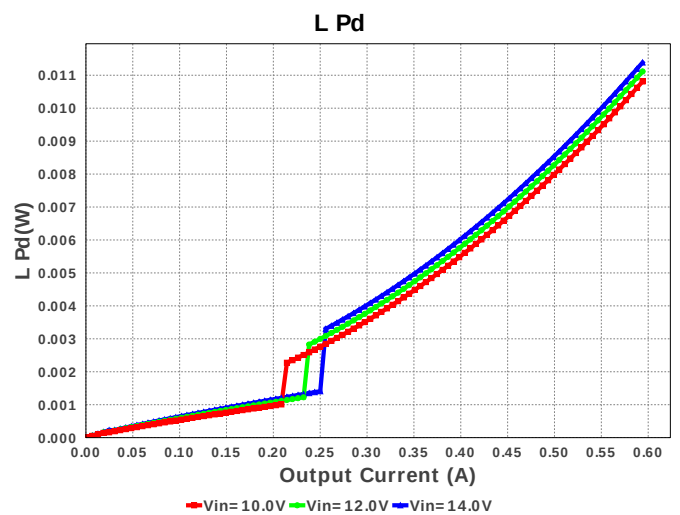
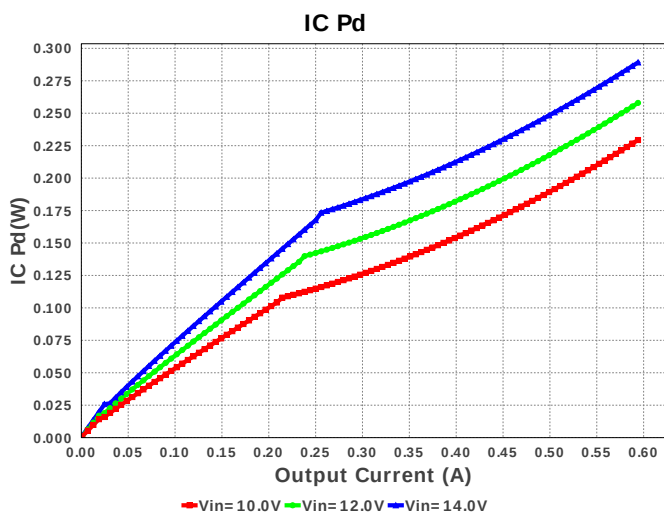
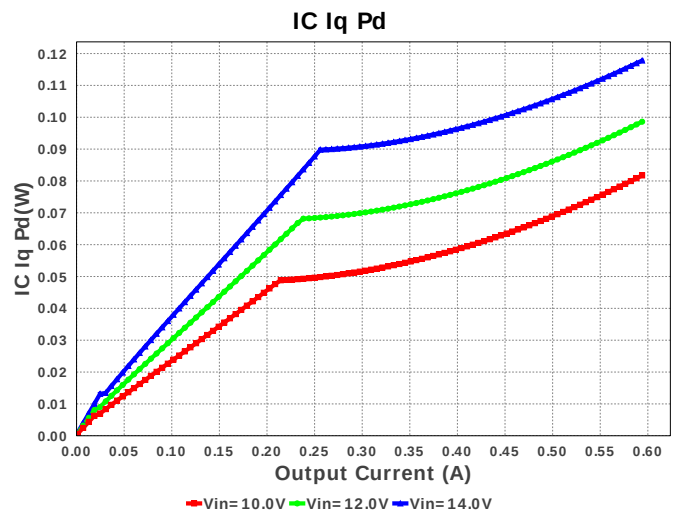
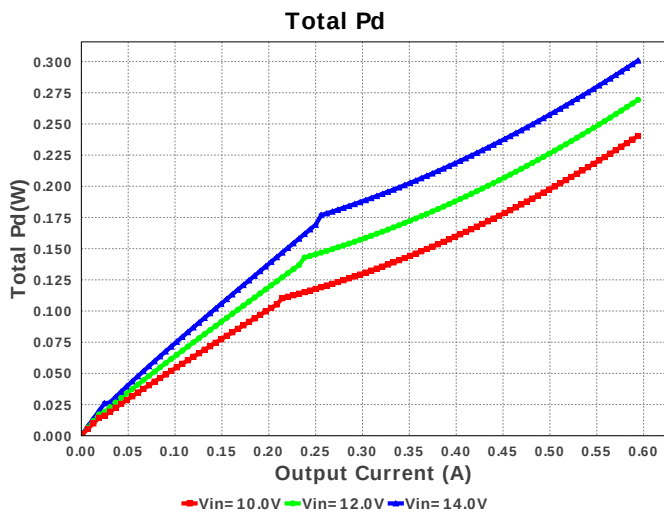
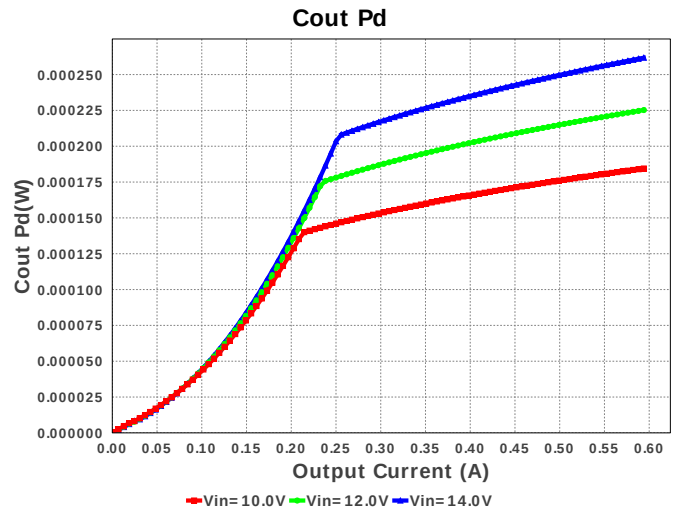
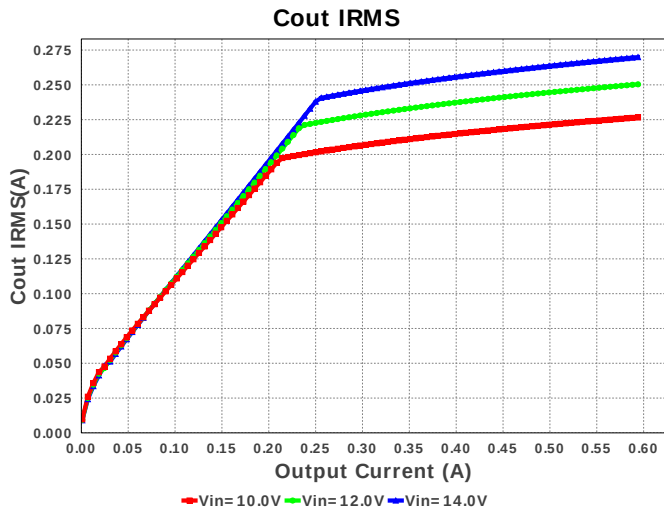
Electrical BOM

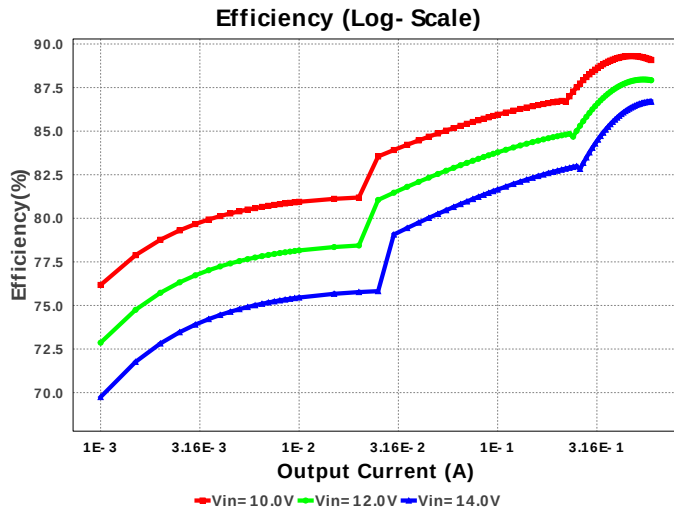
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	Taiyo Yuden	TMK316BJ106KL-T Series= X5R	Cap= 10.0 uF VDC= 25.0 V IRMS= 0.0 A	1	\$0.05	 1206 11 mm ²
2.	Cout	MuRata	GRM31CR70J226KE19L Series= X7R	Cap= 22.0 uF ESR= 3.593 mOhm VDC= 6.3 V IRMS= 3.44359 A	1	\$0.12	 1206_190 11 mm ²
3.	L1	Coilcraft	XFL4020-222MEB	L= 2.2 µH DCR= 21.4 mOhm	1	\$0.55	 XFL4020 25 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

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
5.	U1	Texas Instruments	TPS62162DSGR	Switcher	1	\$0.73	 S-PWSON-N8 10 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	254.274 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	269.913 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.062 A	Current	Peak switch current in IC
4.	Iin Avg	161.5 mA	Current	Average input current
5.	L Ipp	935.01 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	5	General	Total Design BOM count
7.	FootPrint	59.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	2.284 MHz	General	Switching frequency
9.	Mode	CCM	General	Conduction Mode
10.	Pout	1.96 W	General	Total output power
11.	Total BOM	\$1.46	General	Total BOM Cost
12.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	24.163 %	Op_point	Duty cycle
14.	Efficiency	86.696 %	Op_point	Steady state efficiency
15.	IC Tj	47.869 degC	Op_point	IC junction temperature
16.	ICThetaJA	61.8 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	594.0 mA	Op_point	Iout operating point
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	5.399 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
21.	Cout Pd	261.76 μ W	Power	Output capacitor power dissipation
22.	IC Iq Pd	117.812 mW	Power	IC Iq Pd
23.	IC Pd	289.143 mW	Power	IC power dissipation
24.	L Pd	11.387 mW	Power	Inductor power dissipation
25.	Total Pd	300.803 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	594.0 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	TPS62162	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Feature Highlights: DCS-Control(TM) Architecture with upto 1A output current, 3V to 17V Input Voltage Range, 3.3V Fixed Output voltage, Seamless Power Save Mode for Light Load Efficiency, Power Good Output, 100% Duty Cycle mode, Short Circuit Protection, Thermal Shutdown

2. **TPS62162** Product Folder : <http://www.ti.com/product/TPS62162> : contains the data sheet and other resources.

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