



WEBENCH® Power Architect

Project Report

Project : 916945/113 : PA_Project_304 (modified from 301)

Created : 2017-05-11 12:53:46.150

Optimize project optFactor=3

Project Summary

1. Total System Efficiency	76.712 %
2. Total System BOM Count	15.0
3. Total System Footprint	148.0 mm2
4. Total System BOM Cost	\$2.79
5. Total System Power Dissipation	512.1 mW

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
SUPPLY_1	0	LOAD_1	10AX066_VCC
SUPPLY_1	0	LOAD_9	10AX066_VCCP
SUPPLY_3	0	LOAD_2	10AX066_VCCIO#1
SUPPLY_3	0	LOAD_3	10AX066_VCCIO#2
SUPPLY_3	0	LOAD_4	10AX066_VCCIO#3
SUPPLY_3	0	LOAD_5	10AX066_VCCIO#4
SUPPLY_3	0	LOAD_6	10AX066_VCCIO#5
SUPPLY_3	0	LOAD_7	10AX066_VCCIO#6
SUPPLY_3	0	LOAD_8	10AX066_VCCIO#7
SUPPLY_2	NaN	LOAD_10	10AX066_VCCPT

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	0.9 V	1.761 A	79.9%	74	\$1.68	910	4
2.	SUPPLY_2	TPS62171	Switcher : 3V-17V,1.8Vout,0.5A,Buck Converter with Power Good	1.8 V	0.08 A	70.8%	62	\$0.95	912	13
3.	SUPPLY_3	LP5910-1.2	LDO : Ultra Low-Noise, 300-mA Linear Regulator for RF/Analog Circuits	1.2 V	0.07 A	60.5%	12	\$0.16	911	9

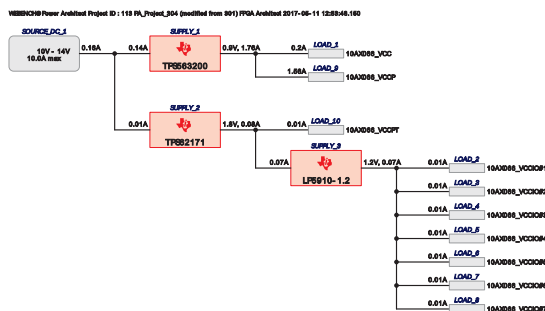
Power Loads

#	Name	VLoad	ILoad	Description
1.	10AX066_VCC	0.9 V	0.2 A	VoutRipple=5%
2.	10AX066_VCCP	0.9 V	1.561 A	VoutRipple=10%
3.	10AX066_VCCIO#1	1.2 V	0.01 A	VoutRipple=10%
4.	10AX066_VCCIO#2	1.2 V	0.01 A	VoutRipple=10%
5.	10AX066_VCCIO#3	1.2 V	0.01 A	VoutRipple=10%
6.	10AX066_VCCIO#4	1.2 V	0.01 A	VoutRipple=10%
7.	10AX066_VCCIO#5	1.2 V	0.01 A	VoutRipple=10%
8.	10AX066_VCCIO#6	1.2 V	0.01 A	VoutRipple=10%
9.	10AX066_VCCIO#7	1.2 V	0.01 A	VoutRipple=10%
10.	10AX066_VCCPT	1.8 V	0.01 A	VoutRipple=10%

FPGAs, Processors

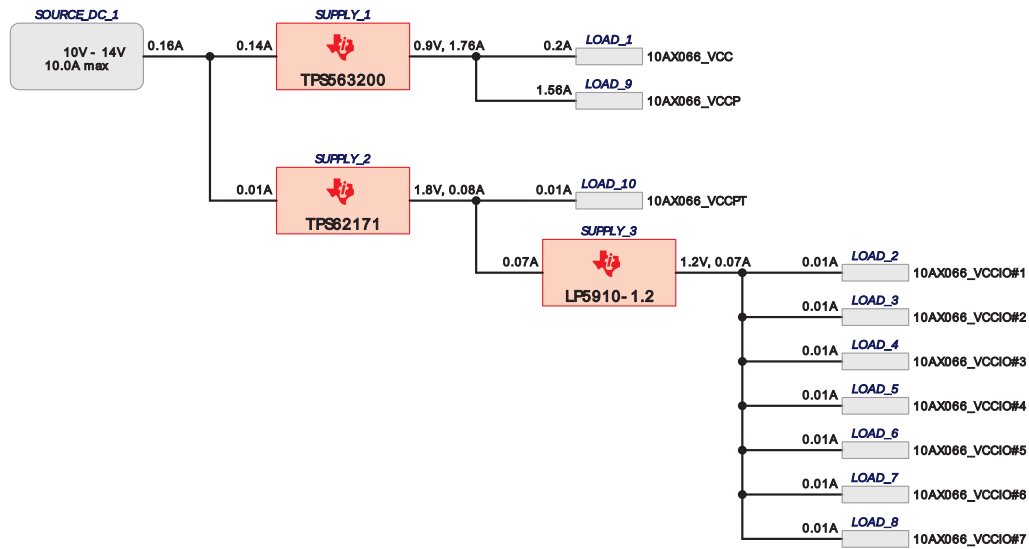
#	Manufacturer	Part Number	Name	Series	Description
1.	Altera	10AX066	FPGA_1	Arria 10 GX	FPGA Altera Arria 10 GX 10AX066

http://www.altera.com/literature/hb/arria-10/a10_datasheet.pdf



Project Diagram

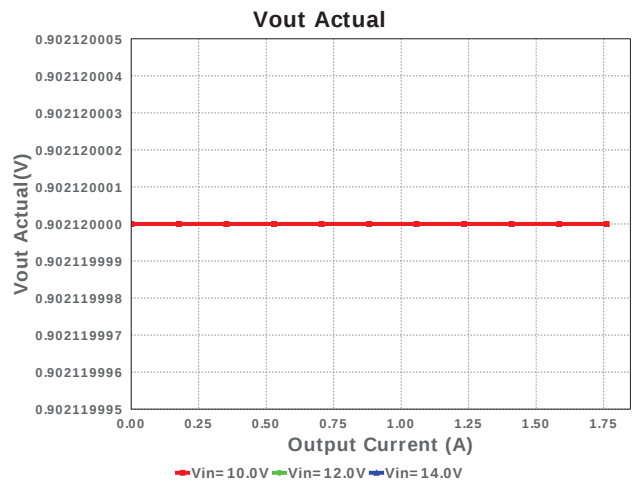
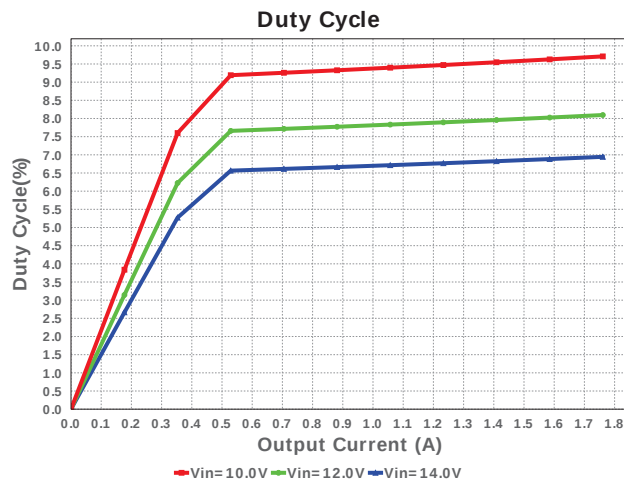
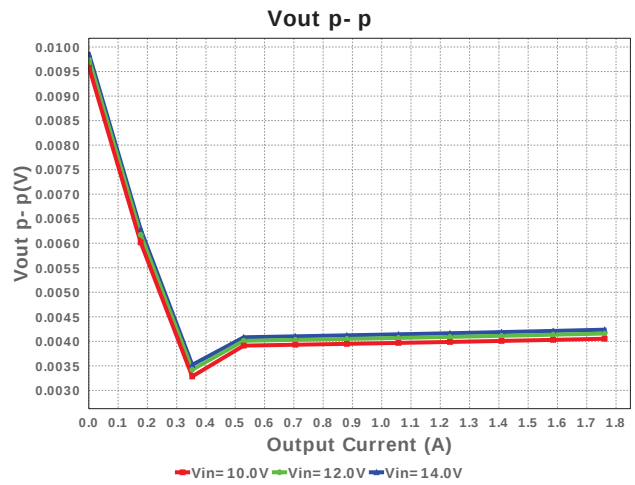
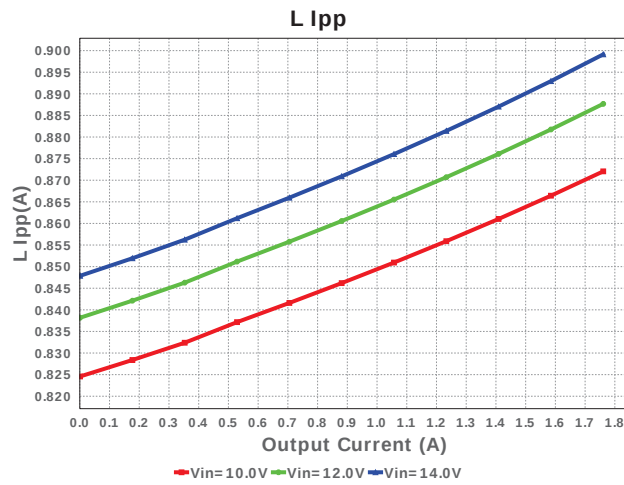
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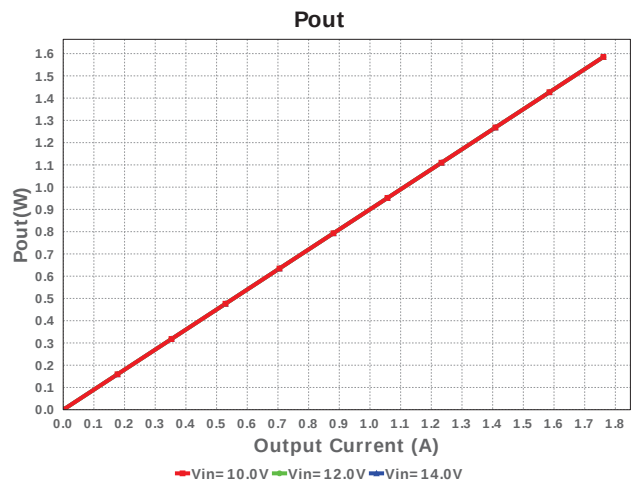
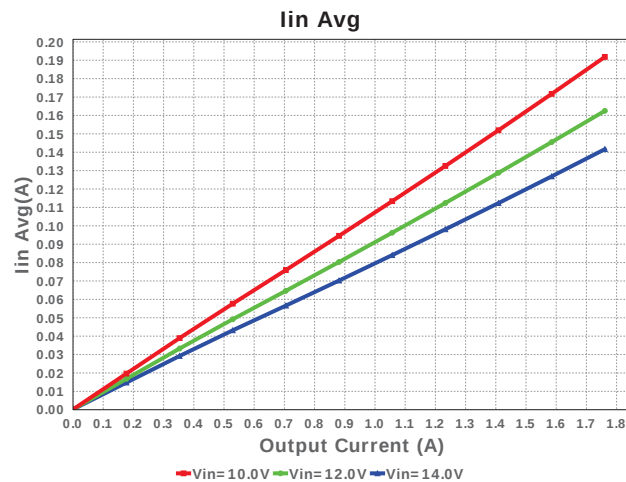
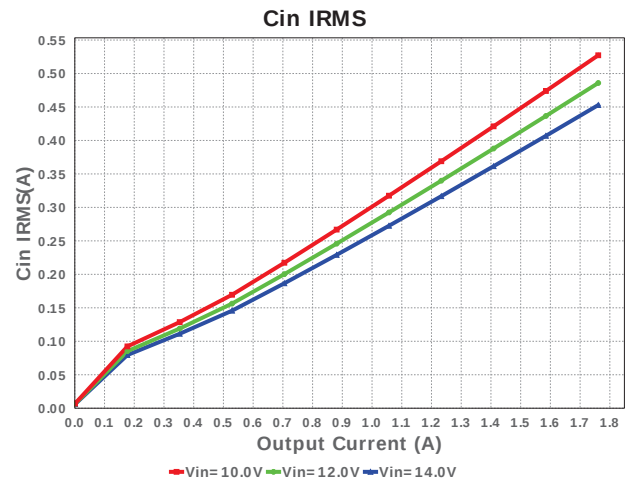
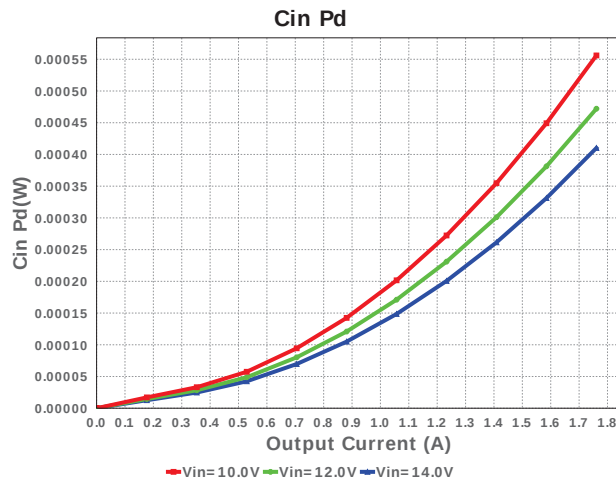
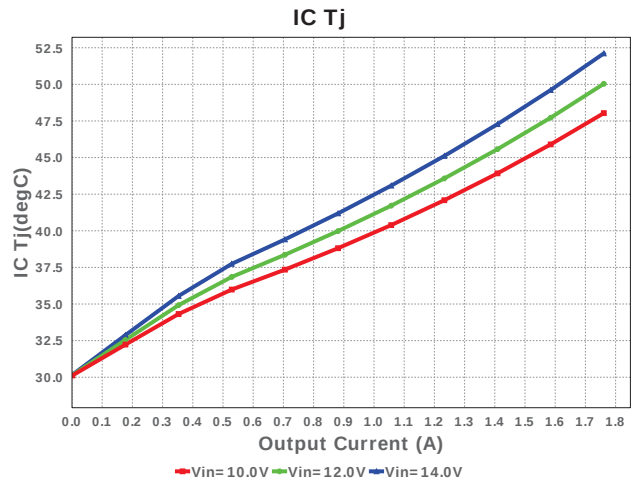
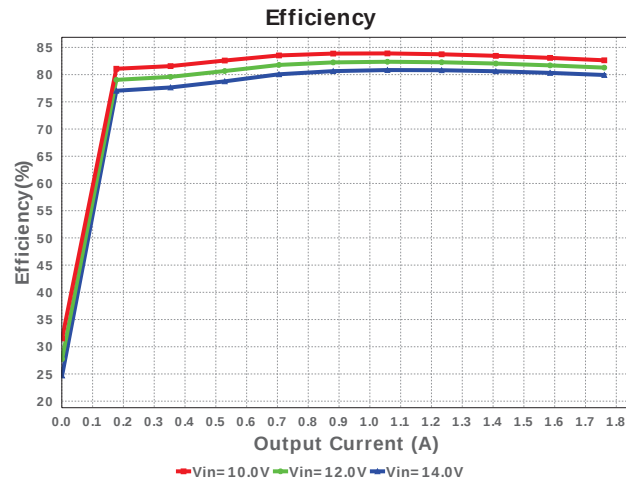


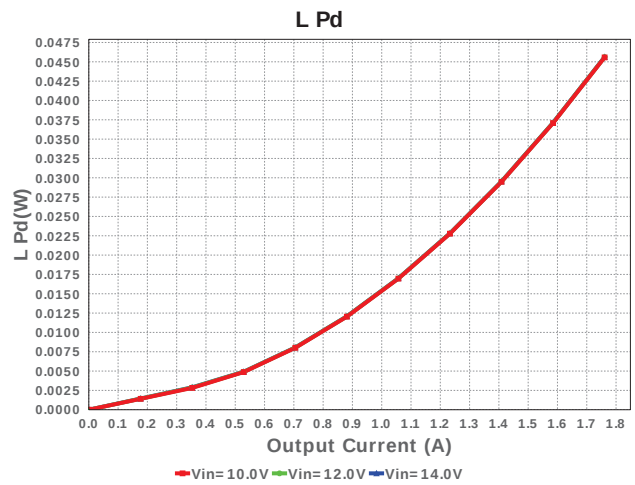
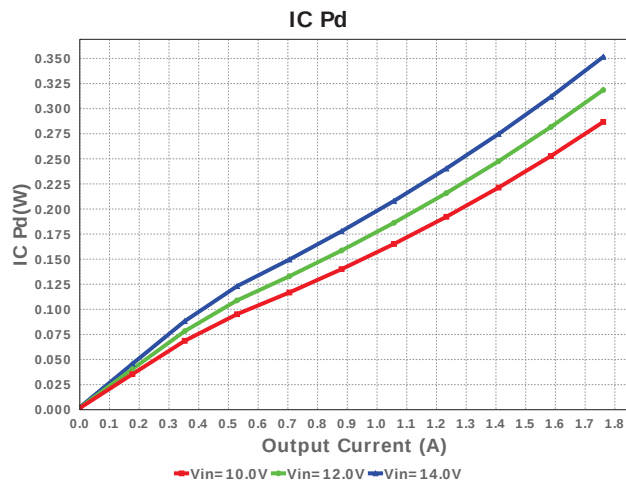
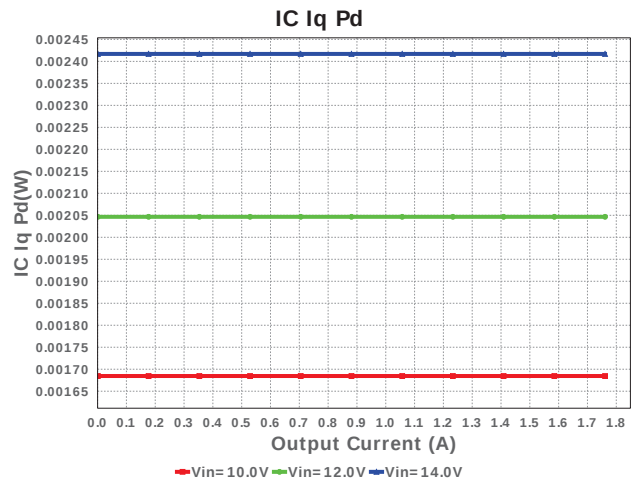
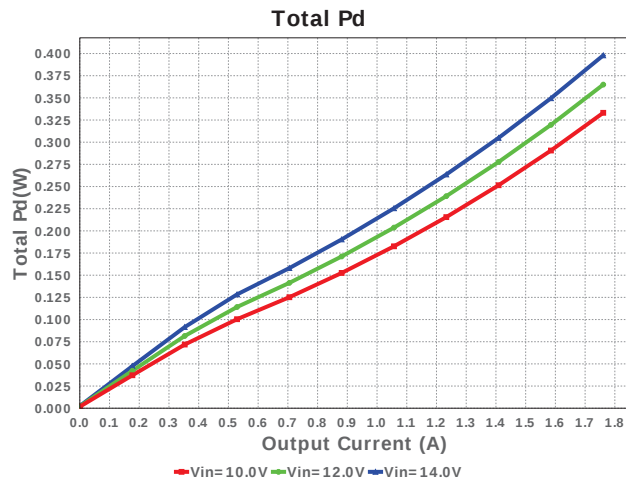
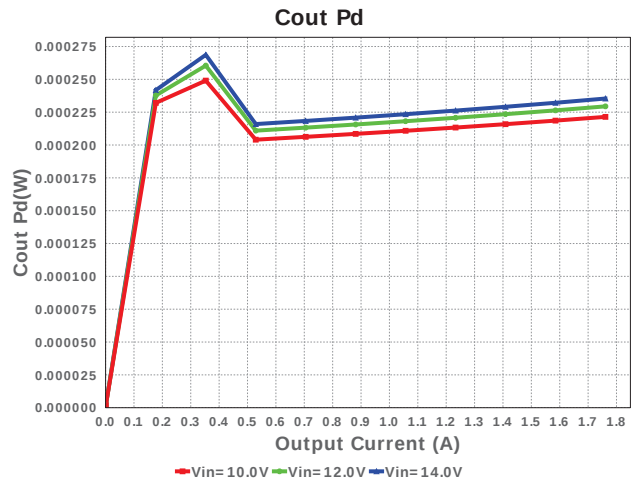
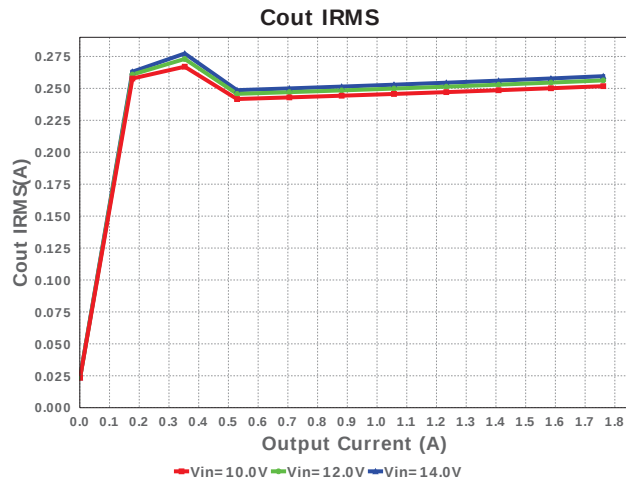
Electrical Procurement BOM

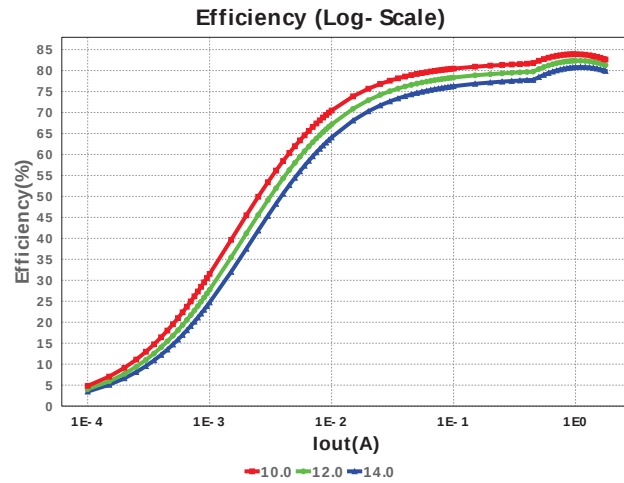
Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	0805	1	\$0.01	7
TDK	C3216X6S0G686M160AC	1206_190	1	\$0.37	11
TDK	C3216X6S1E106K	1206	1	\$0.12	11
Vishay-Dale	CRCW0402100KFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040210K0FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04021K87FKED	0402	1	\$0.01	3
MuRata	GRM188R60J105KA01D	0603	2	\$0.01	9
MuRata	GRM31CR70J226KE19L	1206_190	1	\$0.12	11
MuRata	GRM32ER61E226KE15L	1210	1	\$0.17	15
Texas Instruments	LP5910-1.2YKAR	YKA0004ACAC	1	\$0.14	3
Bourns	SDR0403-2R2ML	SDR0403	1	\$0.18	28
Texas Instruments	TPS563200DDCR	DDC0006A	1	\$0.50	10
Texas Instruments	TPS62171DSGR	S- PWSON- N8	1	\$0.51	10
Coilcraft	XFL4020-152MEB	XFL4020	1	\$0.61	25
Total			15	\$2.78	148.078444

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	U1	Texas Instruments	TPS563200DDCR	Switcher	1	\$0.50	 DDC0006A 10 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	452.862 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	259.557 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	141.63 mA	Current	Average input current
4.	L Ipp	899.13 mA	Current	Peak-to-peak inductor ripple current
5.	BOM Count	7	General	Total Design BOM count
6.	FootPrint	74.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	669.01 kHz	General	Switching frequency
8.	Mode	CCM	General	Conduction Mode
9.	Pout	1.585 W	General	Total output power
10.	Total BOM	\$1.68	General	Total BOM Cost
11.	Vout Actual	902.12 mV	Op_Point	Vout Actual calculated based on selected voltage divider resistors
12.	Vout OP	900.0 mV	Op_Point	Operational Output Voltage
13.	Duty Cycle	6.945 %	Op_point	Duty cycle
14.	Efficiency	79.932 %	Op_point	Steady state efficiency
15.	IC Tj	52.113 degC	Op_point	IC junction temperature
16.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	1.761 A	Op_point	Iout operating point
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	4.238 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	410.168 μ W	Power	Input capacitor power dissipation
21.	Cout Pd	235.391 μ W	Power	Output capacitor power dissipation
22.	IC Iq Pd	2.417 mW	Power	IC Iq Pd
23.	IC Pd	351.561 mW	Power	IC power dissipation
24.	L Pd	45.626 mW	Power	Inductor power dissipation
25.	Total Pd	397.912 mW	Power	Total Power Dissipation
26.	Vout Tolerance	1.638 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.761	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	900.0 m	Output Voltage
5.	base_pn	TPS563200	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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

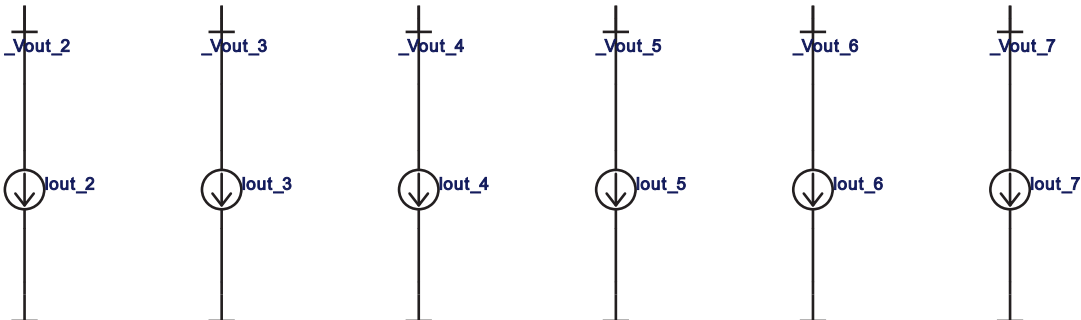
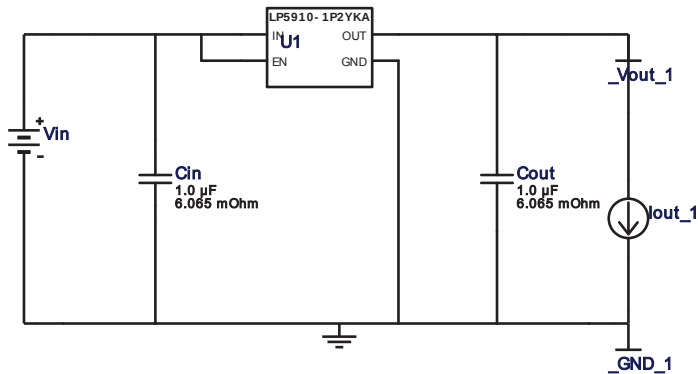


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Iout = 0.07A

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Topology = LDO
Created = 5/11/17 12:53:44 PM
BOM Cost = \$0.16
BOM Count = 3
Total Pd = 0.05W

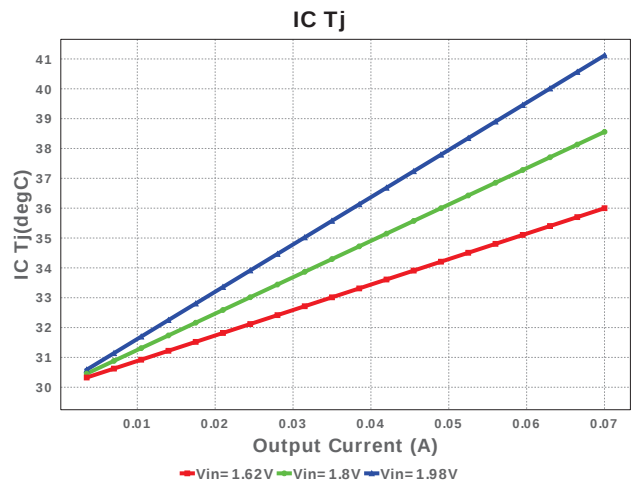
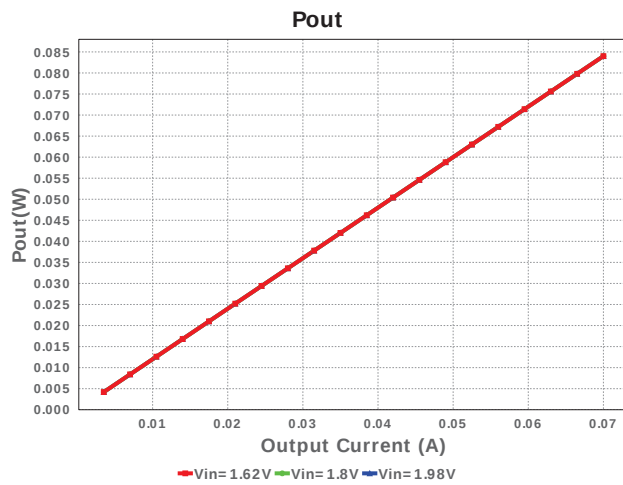
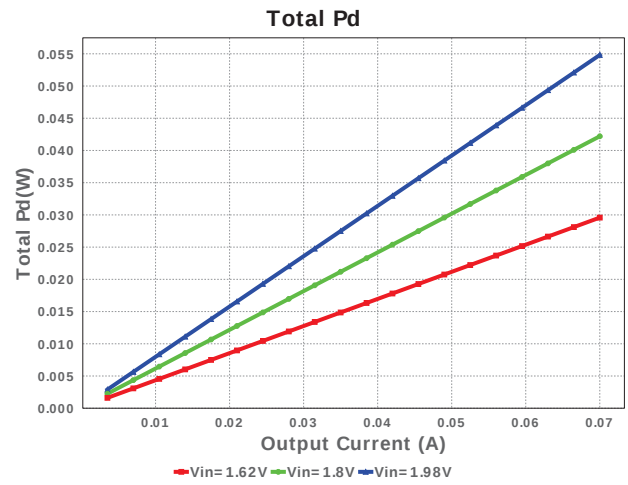
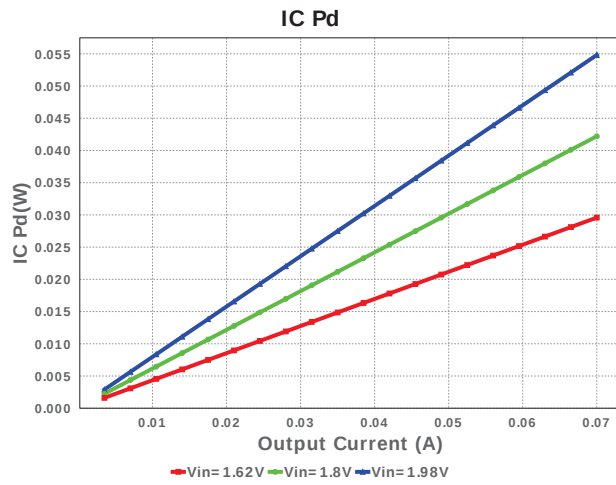
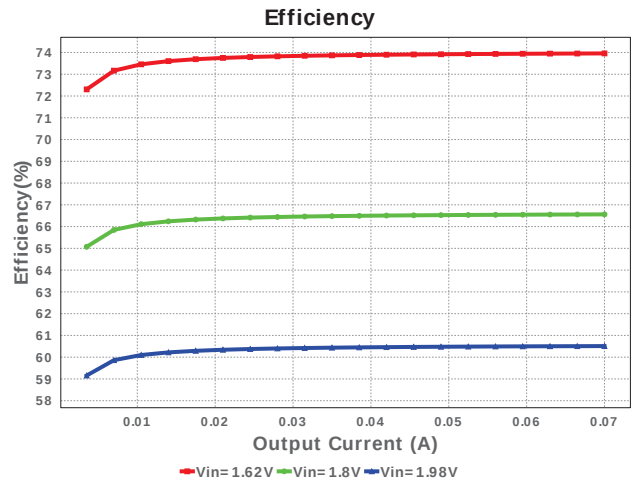
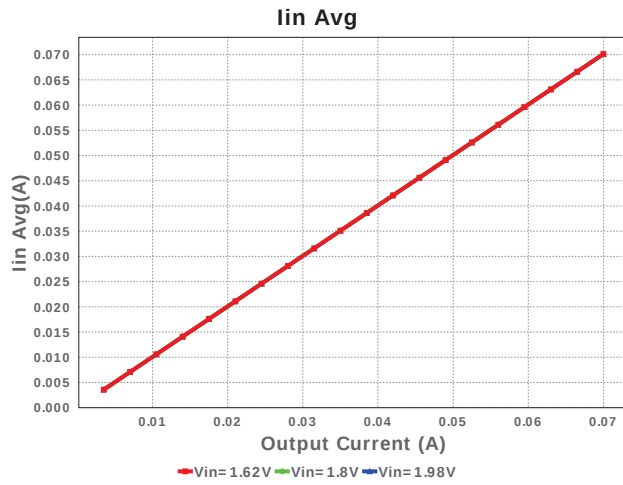
WEBENCH® Design Report

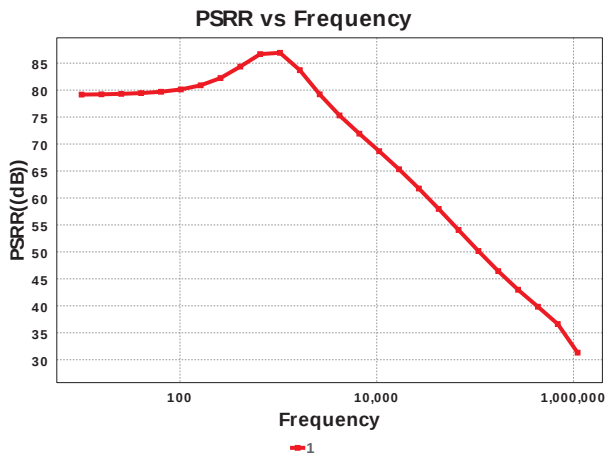
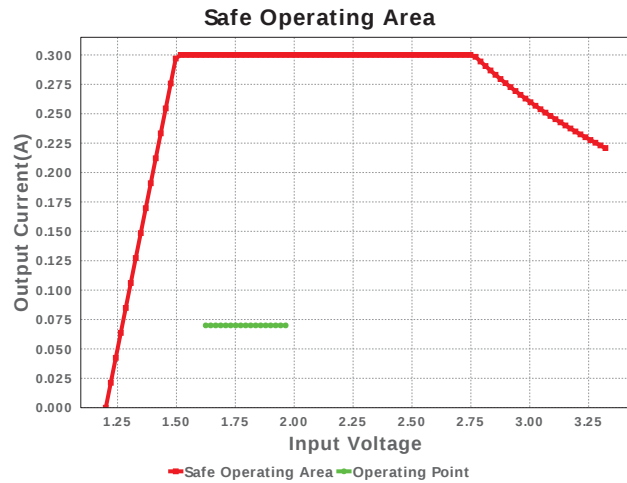
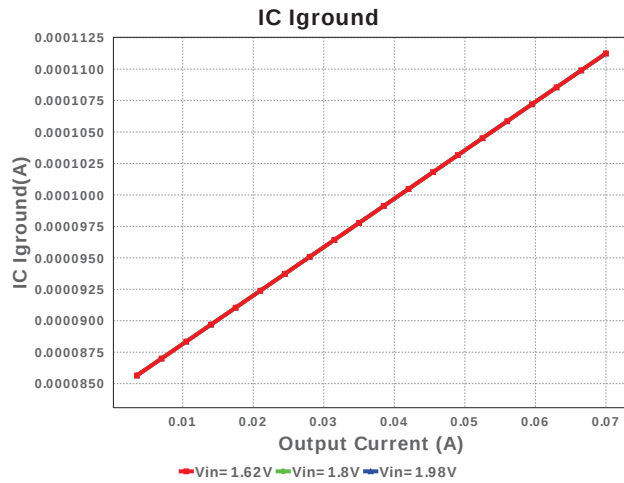
Design : 916945/911 LP5910-1.2YKAR
LP5910-1.2YKAR 1.62V-1.98V to 1.20V @ 0.07A



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM188R60J105KA01D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 6.3 V IRMS= 1.36934 A	1	\$0.01	0603 5 mm ²
2.	Cout	MuRata	GRM188R60J105KA01D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 6.3 V IRMS= 1.36934 A	1	\$0.01	0603 5 mm ²
3.	U1	Texas Instruments	LP5910-1.2YKAR	Switcher	1	\$0.14	YKA0004ACAC 3 mm ²





Operating Values

#	Name	Value	Category	Description
1.	IC Iground	111.25 μ A	Current	IC ground current
2.	Iin Avg	70.111 mA	Current	Average input current
3.	BOM Count	3	General	Total Design BOM count
4.	FootPrint	12.0 mm ²	General	Total Foot Print Area of BOM components
5.	IC Tolerance	24.0 mV	General	IC Feedback Tolerance
6.	Output Noise RMS	12.0 μ V	General	Noise RMS
7.	Pout	84.0 mW	General	Total output power
8.	Total BOM	\$0.16	General	Total BOM Cost
9.	Vin p-p	2.399 mV	Op_Point	Input Source ripple voltage
10.	Vout OP	0.0 V	Op_Point	Operational Output Voltage
11.	Efficiency	60.51 %	Op_point	Steady state efficiency
12.	IC Tj	41.118 degC	Op_point	IC junction temperature
13.	ICThetaJA	202.8 degC/W	Op_point	IC junction-to-ambient thermal resistance
14.	IOUT_OP	70.0 mA	Op_point	Iout operating point
15.	Input Ripple Frequency	867.1 kHz	Op_point	Input Source Ripple Frequency for PSRR Calculation
16.	PSRR est.	-34.474 dB	Op_point	Power Supply Rejection Ratio estimated
17.	VIN_OP	1.98 V	Op_point	Vin operating point
18.	Vout p-p	45.321 μ V	Op_point	Peak-to-peak output ripple voltage
19.	IC Pd	54.82 mW	Power	IC power dissipation
20.	Total Pd	54.82 mW	Power	Total Power Dissipation
21.	Vout Tolerance	2.0 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	70.0 m	Maximum Output Current
2.	VinMax	1.98	Maximum input voltage
3.	VinMin	1.62	Minimum input voltage
4.	Vout	1.2	Output Voltage
5.	base_pn	LP5910-1.2	Base Product Number

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

Design Assistance

1.

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

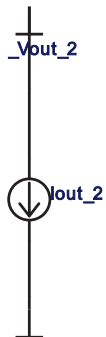
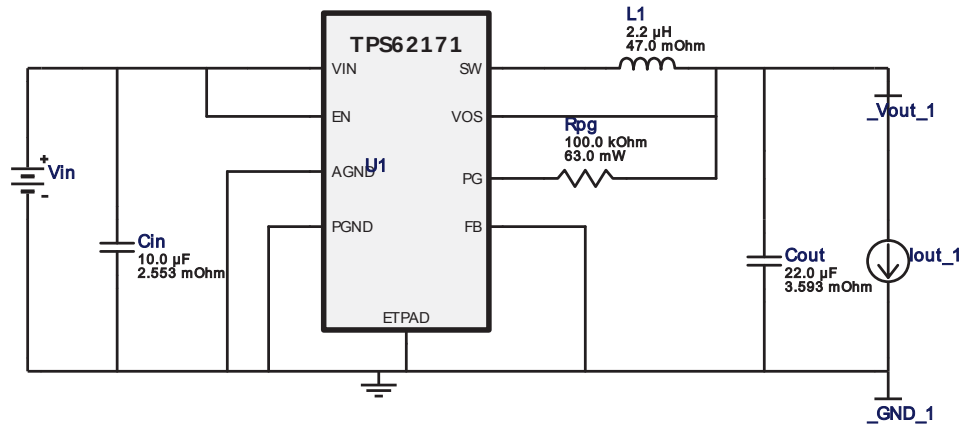


Vout = 1.8V
Iout = 0.08A

Device = TPS62171DSGR
Topology = Buck
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BOM Cost = \$0.95
BOM Count = 5
Total Pd = 0.06W

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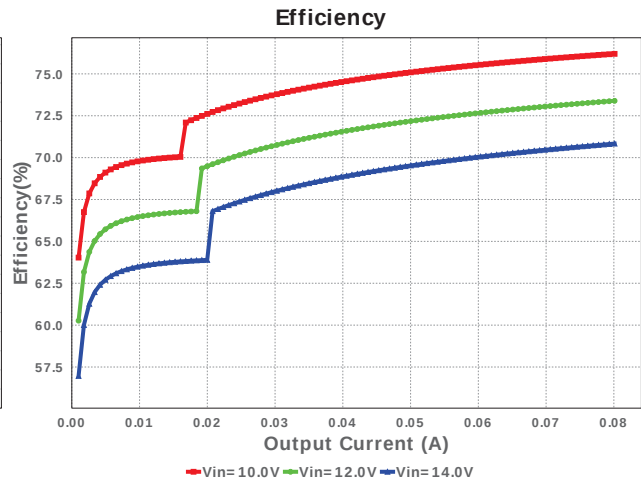
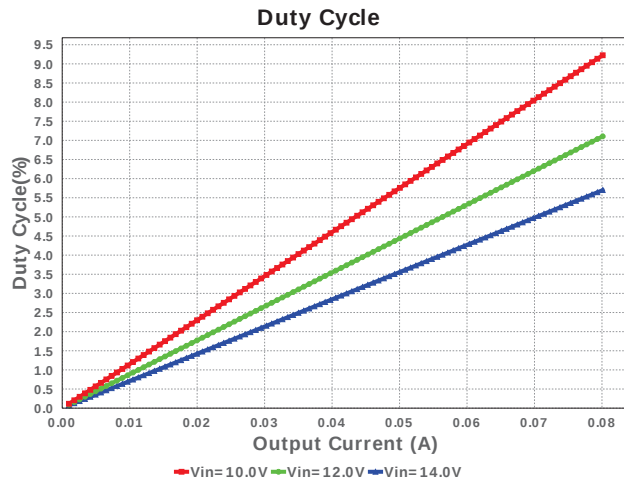
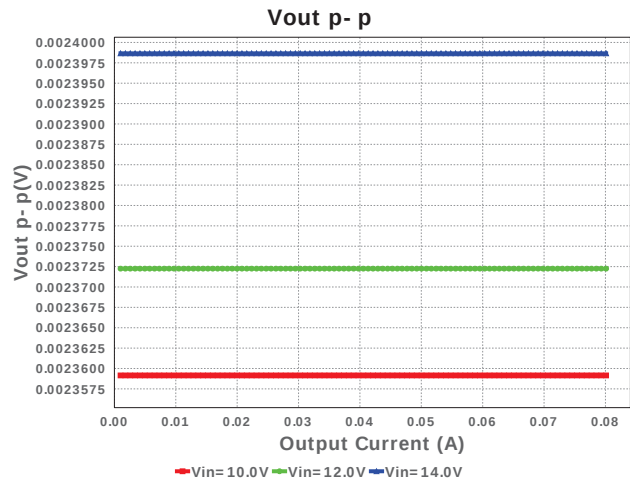
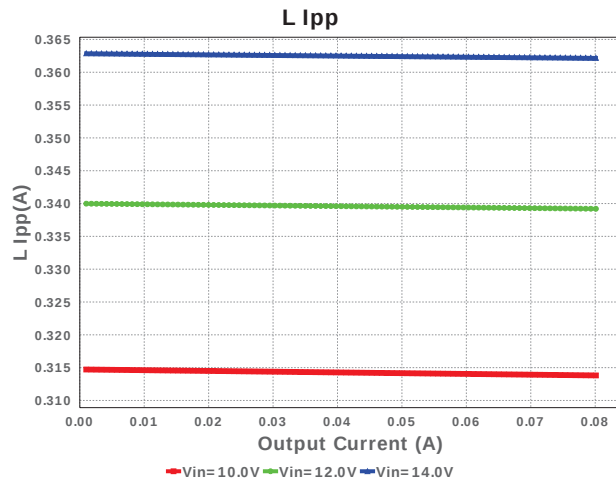
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TPS62171DSGR 10.0V-14.0V to 1.80V @ 0.08011A

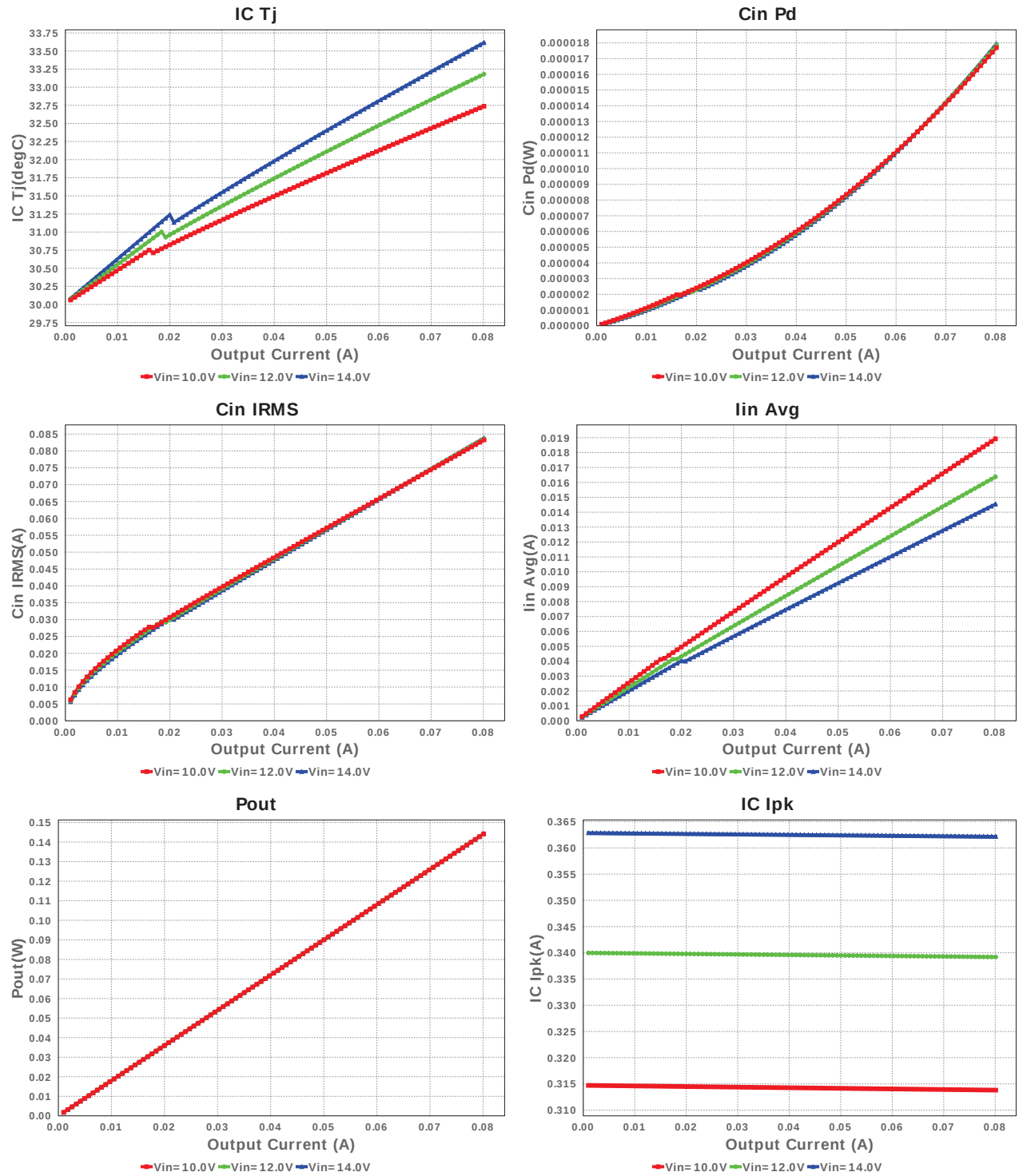


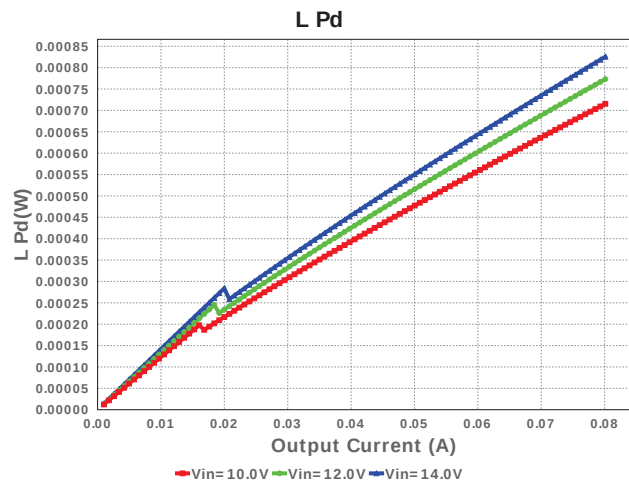
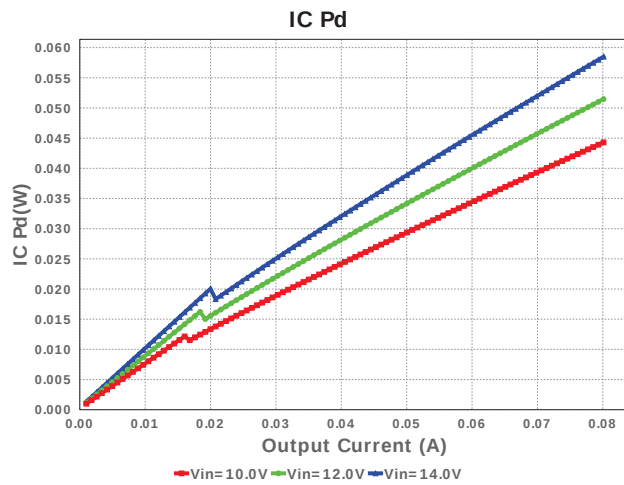
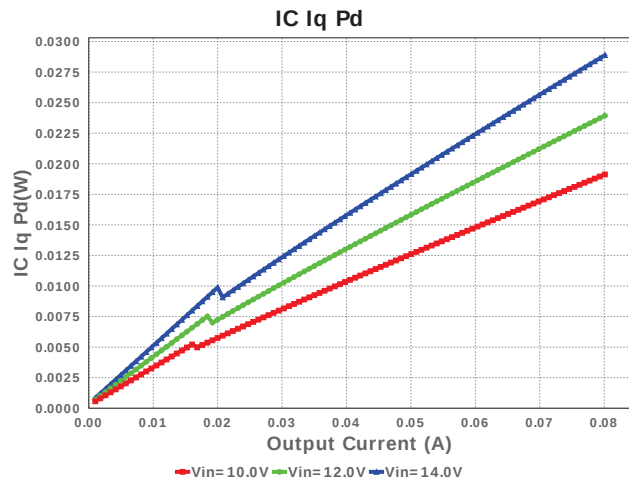
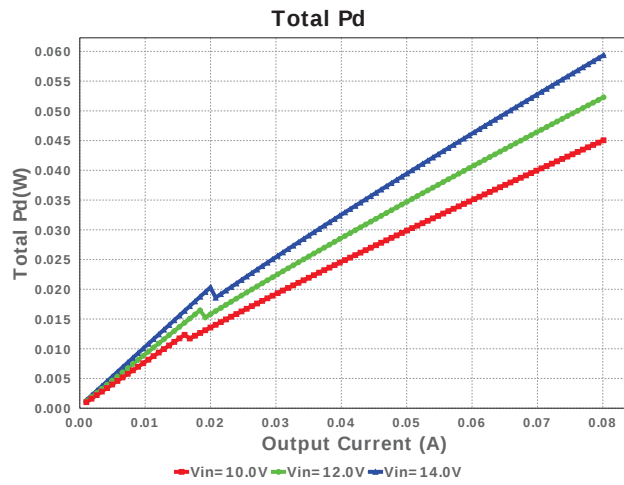
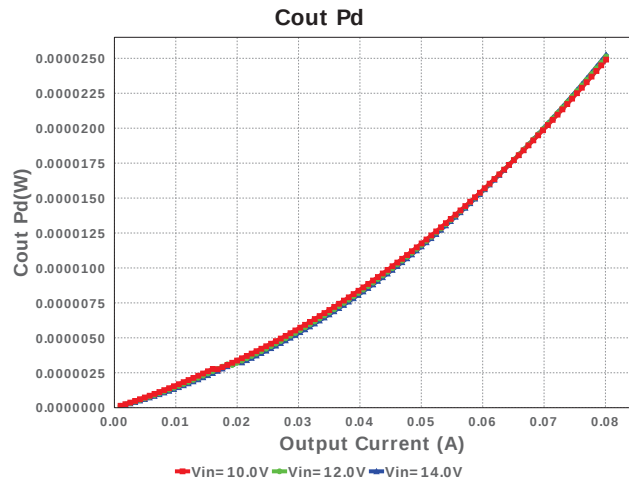
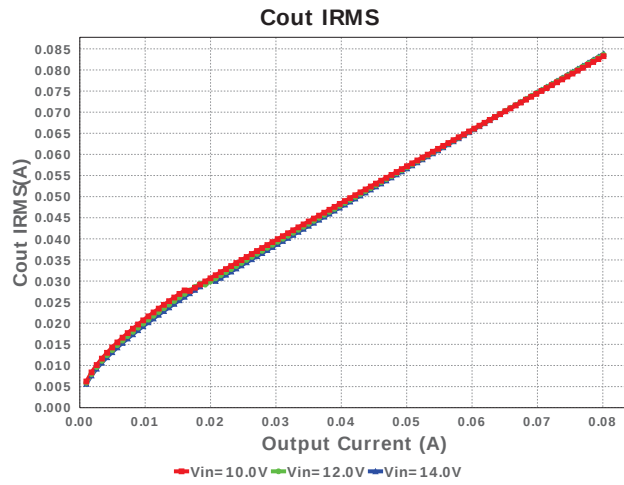
Electrical BOM

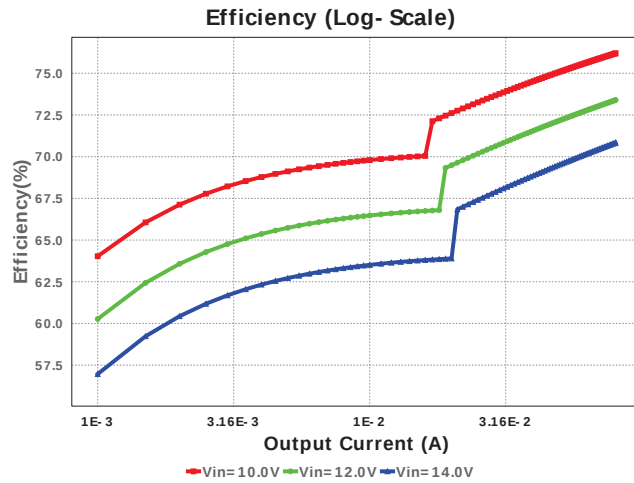
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1.	Cin	TDK	C3216X6S1E106K Series= X6S	Cap= 10.0 uF ESR= 2.553 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.12	1206 11 mm ²
2.	Cout	MuRata	GRM31CR70J226KE19L Series= X7R	Cap= 22.0 uF ESR= 3.593 mOhm VDC= 6.3 V IRMS= 3.44359 A	1	\$0.12	1206_190 11 mm ²
3.	L1	Bourns	SDR0403-2R2ML	L= 2.2 µH DCR= 47.0 mOhm	1	\$0.18	SDR0403 28 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	TPS62171DSGR	Switcher	1	\$0.51	 S-PWSON-N8 10 mm²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	83.825 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	83.825 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	362.182 mA	Current	Peak switch current in IC
4.	Iin Avg	14.54 mA	Current	Average input current
5.	L Ipp	362.18 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	5	General	Total Design BOM count
7.	FootPrint	62.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	867.1 kHz	General	Switching frequency
9.	Mode	DCM	General	Conduction Mode
10.	Pout	144.198 mW	General	Total output power
11.	Total BOM	\$0.95	General	Total BOM Cost
12.	Vout OP	1.8 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	5.699 %	Op_point	Duty cycle
14.	Efficiency	70.837 %	Op_point	Steady state efficiency
15.	IC Tj	33.615 degC	Op_point	IC junction temperature
16.	ICThetaJA	61.8 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	80.11 mA	Op_point	Iout operating point
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	2.399 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	17.939 μ W	Power	Input capacitor power dissipation
21.	Cout Pd	25.247 μ W	Power	Output capacitor power dissipation
22.	IC Iq Pd	28.886 mW	Power	IC Iq Pd
23.	IC Pd	58.496 mW	Power	IC power dissipation
24.	L Pd	825.536 μ W	Power	Inductor power dissipation
25.	Total Pd	59.364 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	80.11 m	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	1.8	Output Voltage
5.	base_pn	TPS62171	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 0.5A output current, 3V to 17V Input Voltage Range, 1.8V Fixed Output voltage, Seamless Power Save Mode for Light Load Efficiency, Power Good Output, 100% Duty Cycle mode, Short Circuit Protection, Thermal Shutdown

2. **TPS62171** Product Folder : <http://www.ti.com/product/TPS62171> : contains the data sheet and other resources.

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