

WEBENCH® Power Architect

Project Report

Project : 4085740/2 : PA_Project_303 (modified from 301)

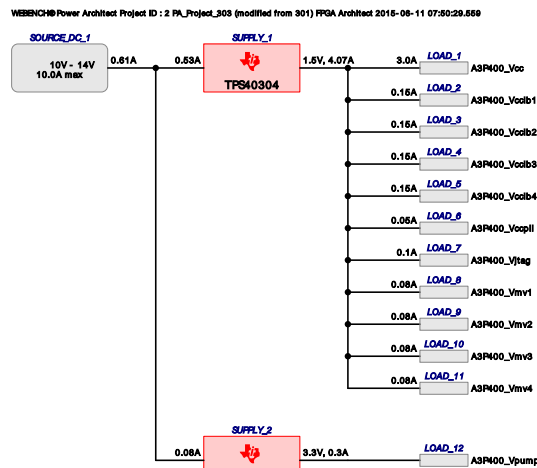
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Optimize project optFactor=3

Project Summary

1. Total System Efficiency	83.683 %
2. Total System BOM Count	26.0
3. Total System Footprint	310.0 mm ²
4. Total System BOM Cost	\$3.58
5. Total System Power Dissipation	1.383 W

--> Launch WEBENCH Power Architect.



Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS40304	Switcher : Synchronous Buck Controller	1.5 V	4.07 A	82.6%	236	\$2.20	6	4
2.	SUPPLY_2	TPS563200	Switcher : 17V, 3A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	3.3 V	0.3 A	91%	74	\$1.38	7	11

Power Loads

#	Name	VLoad	ILoad	Description
1.	A3P400_Vcc	1.5 V	3 A	VoutRipple=5%, SoftStart delay=1.0 mSec
2.	A3P400_Vccib1	1.5 V	0.15 A	VoutRipple=5%, SoftStart delay=1.0 mSec
3.	A3P400_Vccib2	1.5 V	0.15 A	VoutRipple=5%, SoftStart delay=1.0 mSec
4.	A3P400_Vccib3	1.5 V	0.15 A	VoutRipple=5%, SoftStart delay=1.0 mSec
5.	A3P400_Vccib4	1.5 V	0.15 A	VoutRipple=5%, SoftStart delay=1.0 mSec
6.	A3P400_Vccpll	1.5 V	0.05 A	VoutRipple=5%, SoftStart delay=1.0 mSec
7.	A3P400_Vjtag	1.5 V	0.1 A	VoutRipple=5%, SoftStart delay=1.0 mSec
8.	A3P400_Vmv1	1.5 V	0.08 A	VoutRipple=5%, SoftStart delay=1.0 mSec
9.	A3P400_Vmv2	1.5 V	0.08 A	VoutRipple=5%, SoftStart delay=1.0 mSec
10.	A3P400_Vmv3	1.5 V	0.08 A	VoutRipple=5%, SoftStart delay=1.0 mSec
11.	A3P400_Vmv4	1.5 V	0.08 A	VoutRipple=5%, SoftStart delay=1.0 mSec
12.	A3P400_Vpump	3.3 V	0.3 A	VoutRipple=9%, Group=Pump, SoftStart delay=1.0 mSec

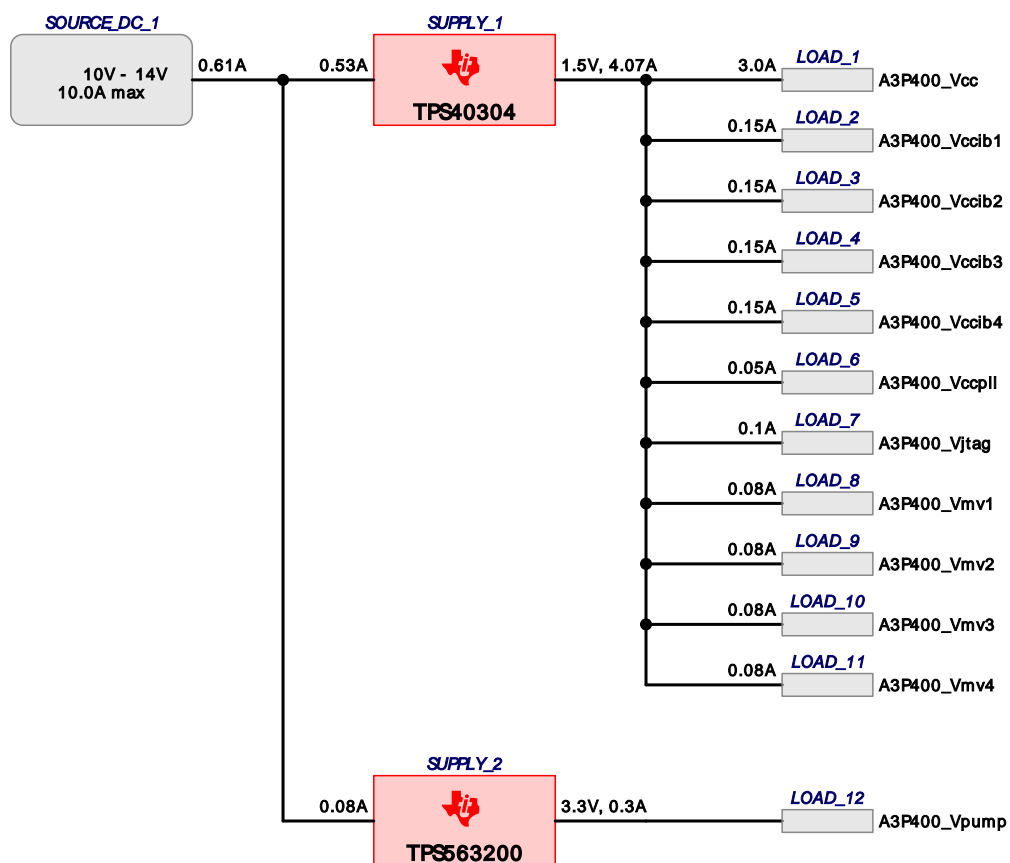
FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Actel	A3P400	FPGA_1	ProASIC3	FPGA Actel ProASIC3 A3P400

http://www.actel.com/documents/PA3_DS.pdf

Project Diagram

WEBENCH® Power Architect Project ID : 2 PA_Project_303 (modified from 301) FPGA Architect 2015-06-11 07:50:29.559



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	0805	2	\$0.01	14
Infineon Technologies	BSZ050N03MS G	PG-TSDSON-8	1	\$0.29	19
Yageo America	CC0805KRX7R9BB272	0805	1	\$0.01	7
Vishay-Dale	CRCW0402100KFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040210K0FKED	0402	2	\$0.01	6
Vishay-Dale	CRCW0402294RFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04022K32FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040233K2FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04023K16FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04026K65FKED	0402	1	\$0.01	3
Texas Instruments	CSD17308Q3	TRANS_NexFET_Q3	1	\$0.34	19
MuRata	GRM1555C1H241JA01D	0402	1	\$0.01	3
MuRata	GRM155R71C183KA01D	0402	1	\$0.01	3
MuRata	GRM155R71C822KA01D	0402	1	\$0.01	3
MuRata	GRM188R61A225KE34D	0603	1	\$0.02	5
MuRata	GRM188R61E105KA12D	0603	1	\$0.01	5
MuRata	GRM21BR61E475MA12L	0805	1	\$0.06	7
MuRata	GRM31CR60J107ME39L	1206	1	\$0.20	11
MuRata	GRM31CR60J476ME19L	1206	1	\$0.12	11
MuRata	GRM32ER61E226KE15L	1210	1	\$0.16	15
Texas Instruments	TPS40304DRCR	S-PVSON-N10	1	\$0.95	17
Texas Instruments	TPS563200DDCR	DDC0006A	1	\$0.52	10
TDK	VLP8040T-2R2N	VLP8040	1	\$0.22	113
Coilcraft	XFL4020-222MEB	XFL4020	1	\$0.55	25
Total			26	\$3.58	310

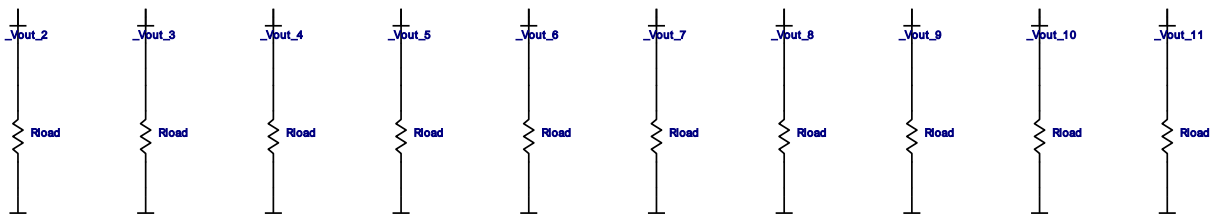
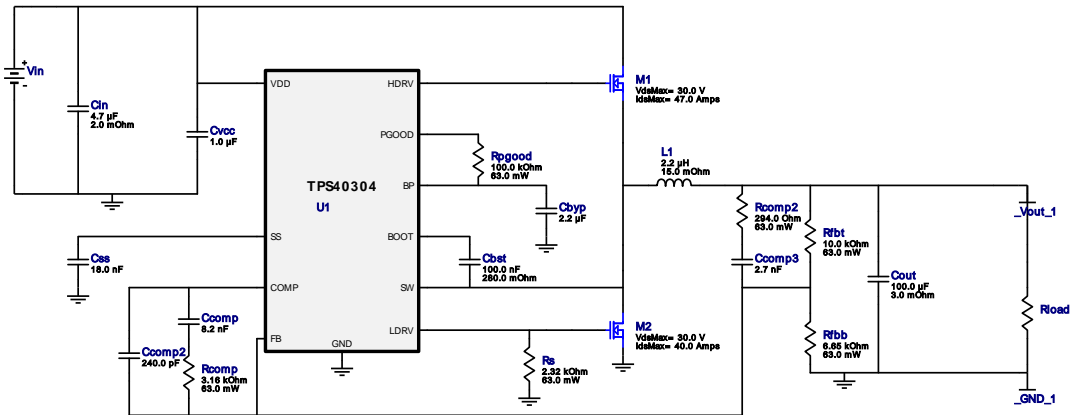


WEBENCH® Design Report

Design : 4085740/6 TPS40304DRCR
TPS40304DRCR 10.0V-14.0V to 1.50V @ 4.07A

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VinMax = 14.0V
Vout = 1.5V
Iout = 4.07A

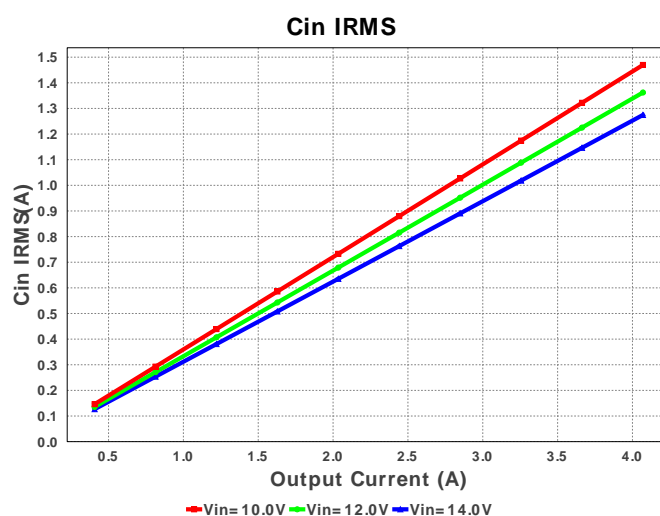
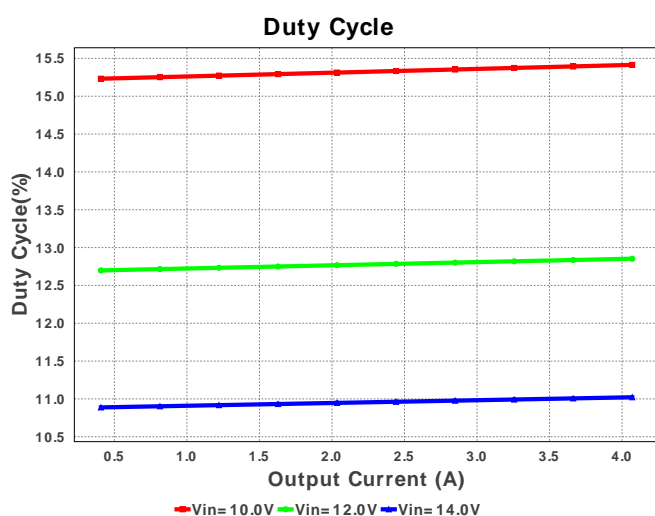
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Footprint = 236.0 mm²
BOM Count = 19
Total Pd = 1.29W

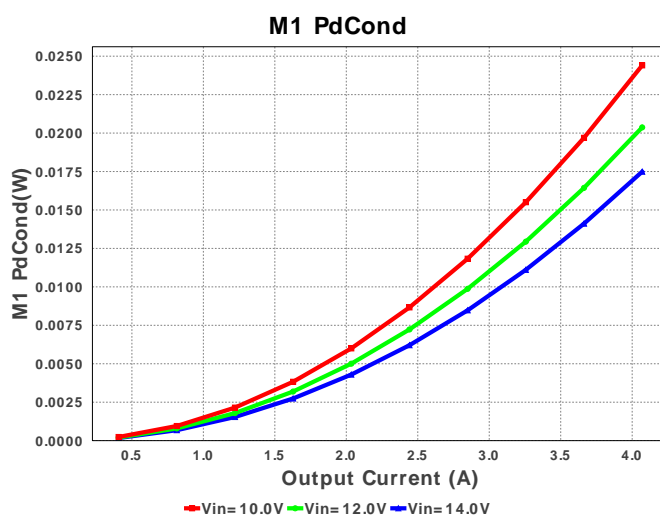
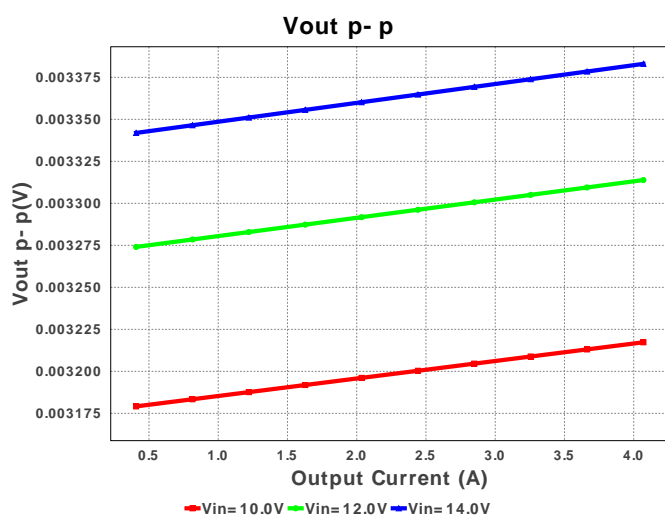
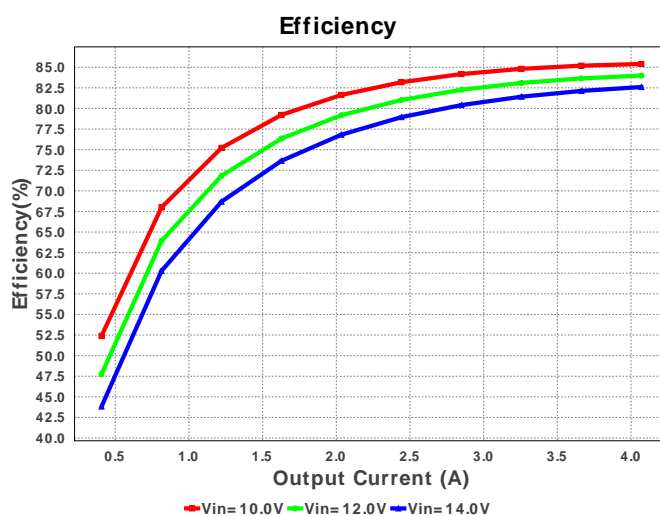
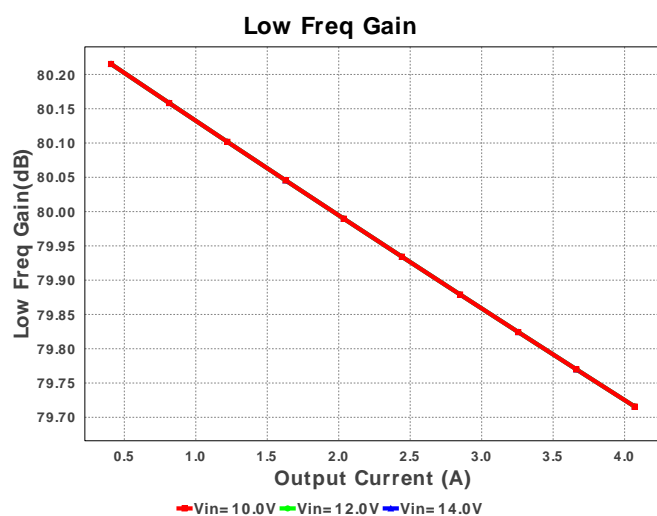
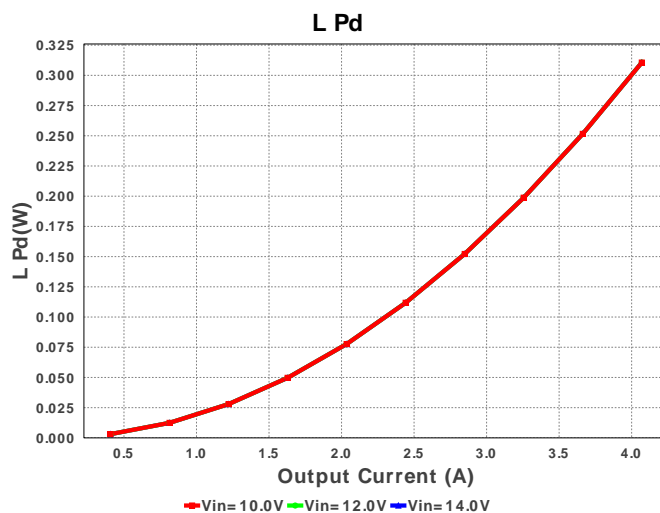
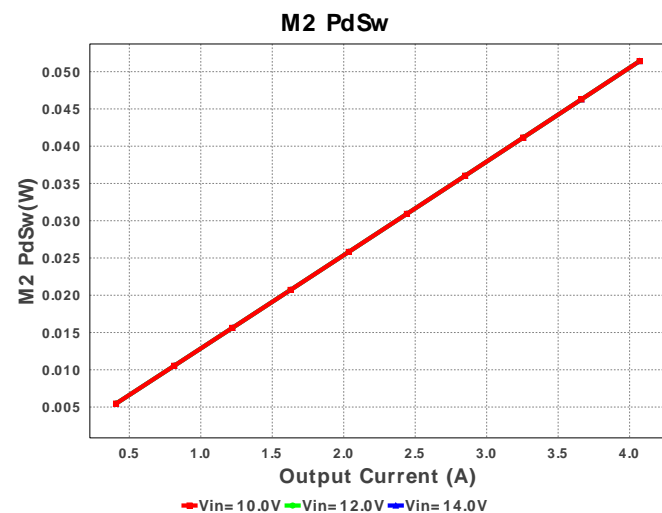


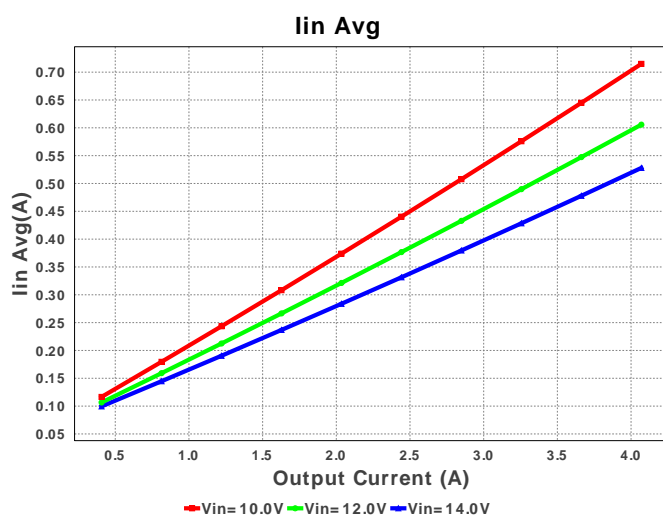
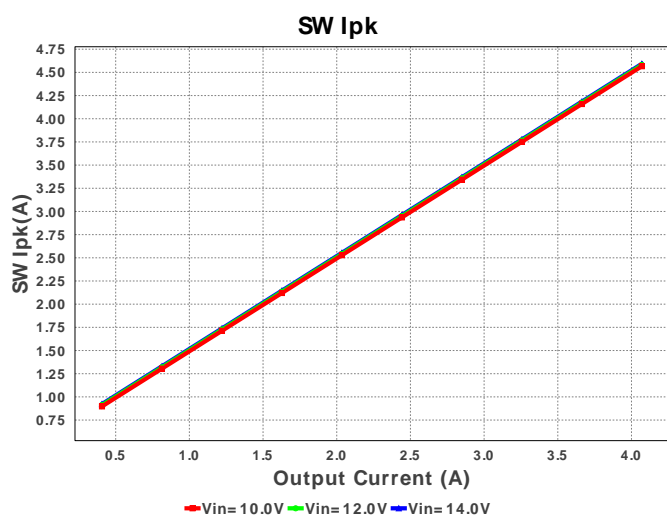
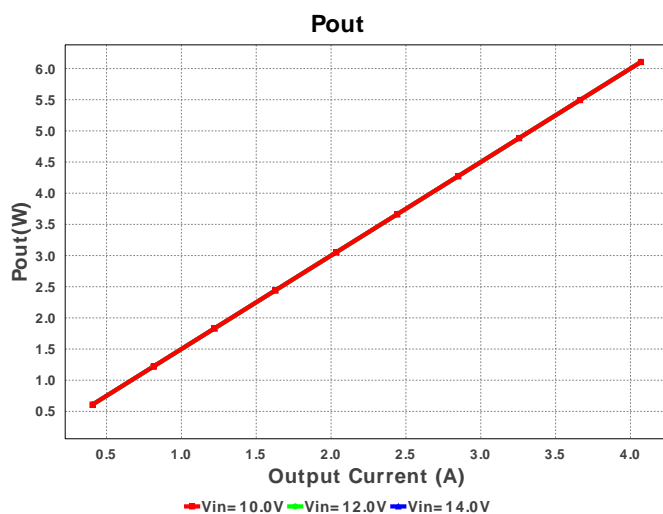
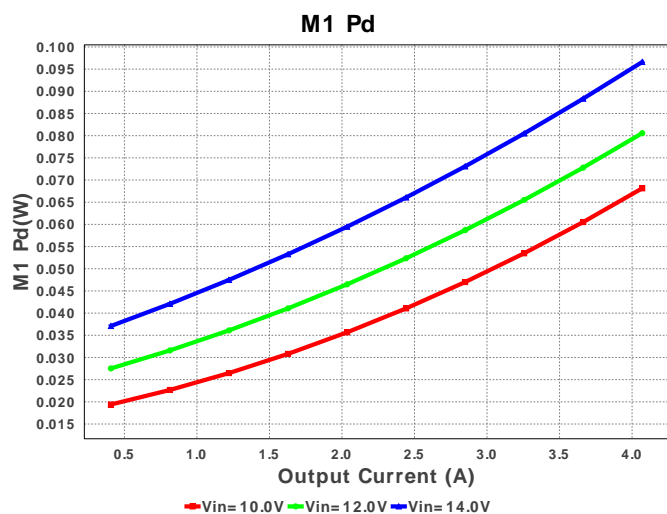
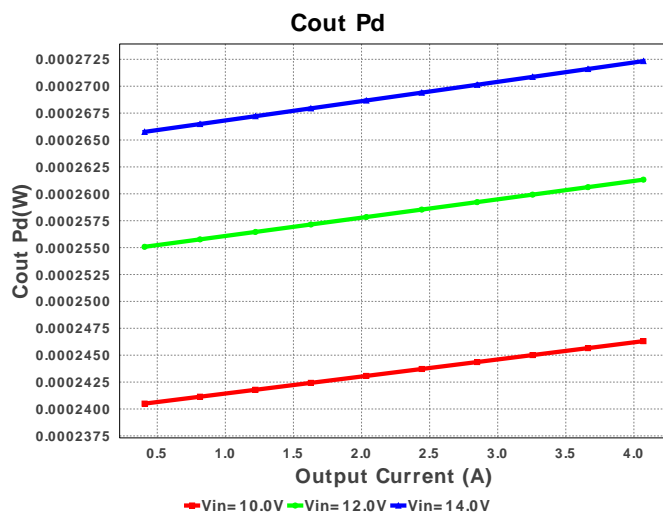
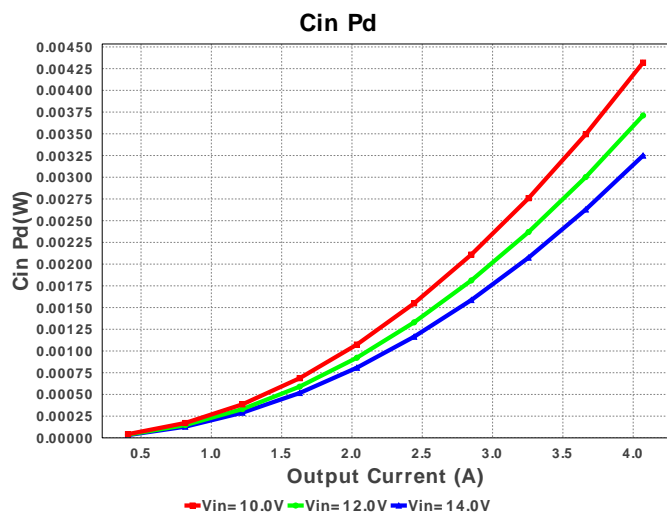
Electrical BOM

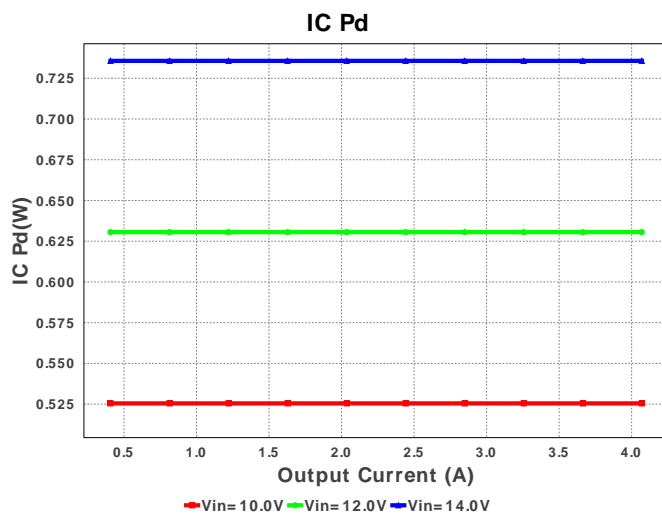
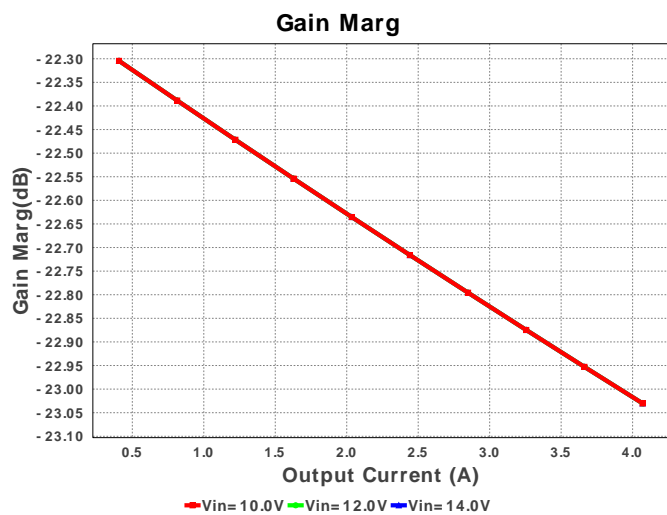
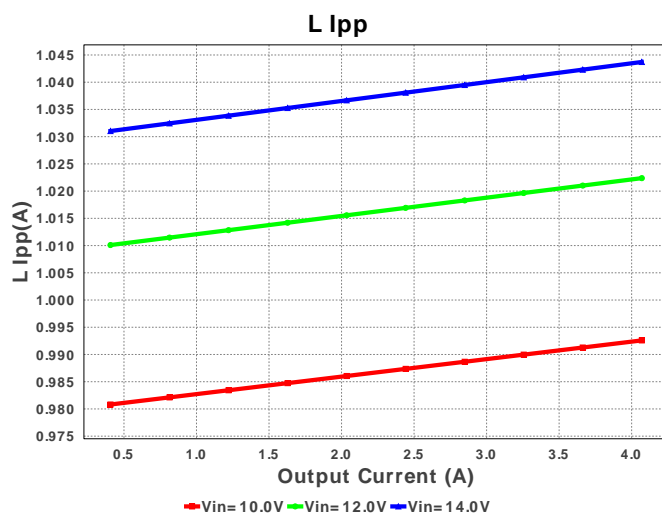
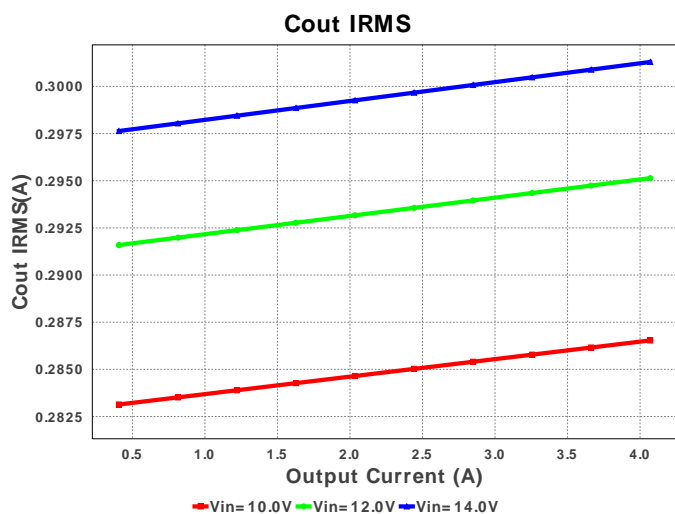
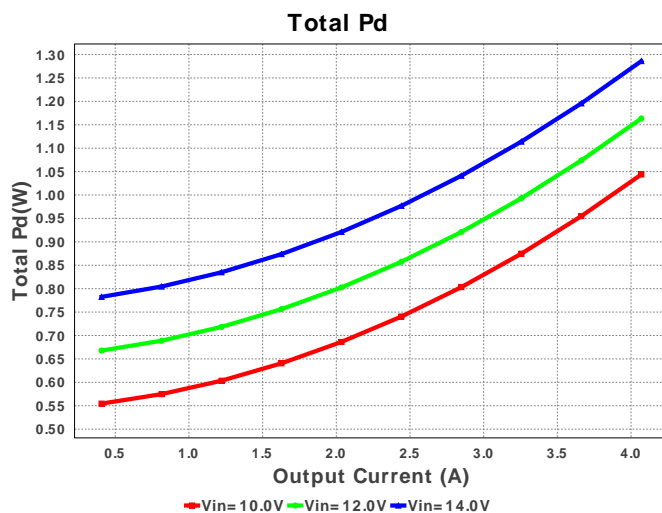
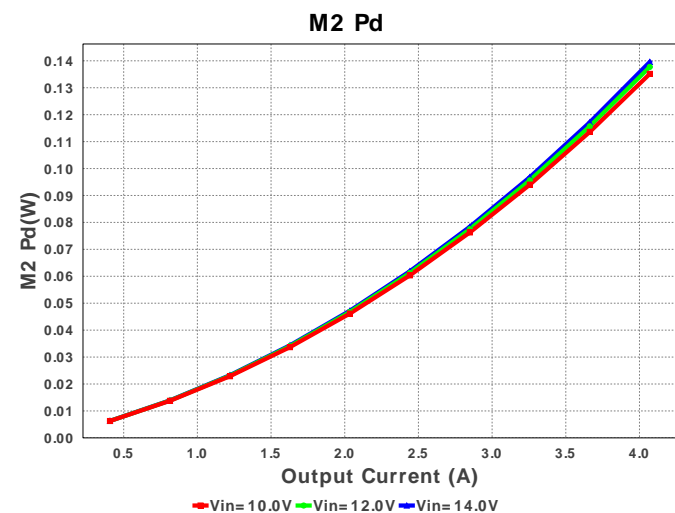
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1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Cbyp	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.02	0603 5 mm ²
3.	Ccomp	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
4.	Ccomp2	MuRata	GRM1555C1H241JA01D Series= C0G/NP0	Cap= 240.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
5.	Ccomp3	Yageo America	CC0805KRX7R9BB272 Series= X7R	Cap= 2.7 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	\$0.06	0805 7 mm ²
7.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 3.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	\$0.20	1206 11 mm ²

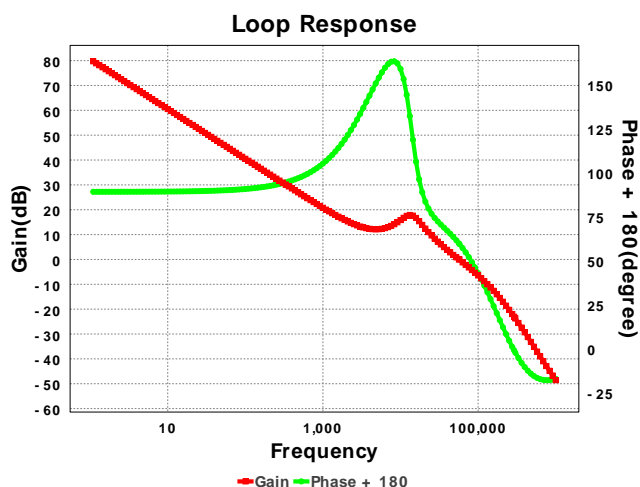
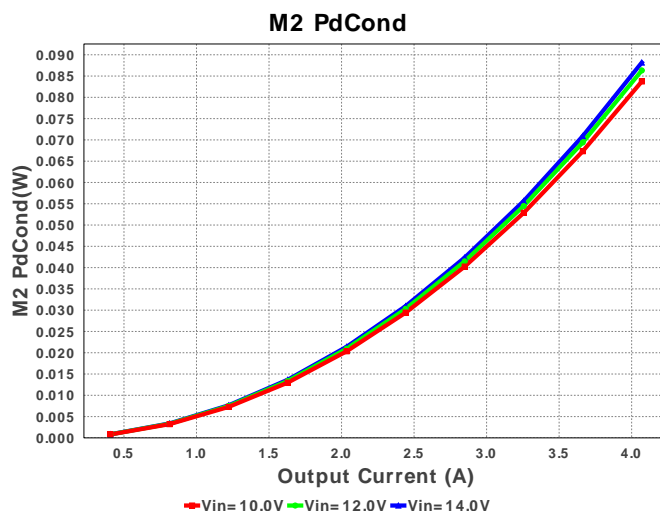
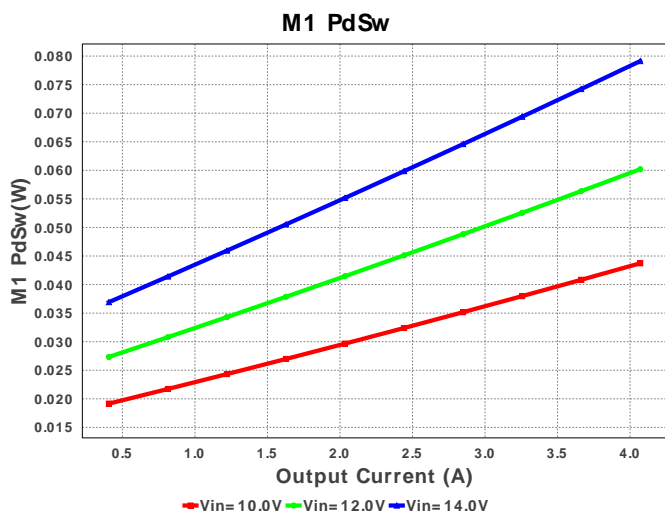
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Css	MuRata	GRM155R71C183KA01D Series= X7R	Cap= 18.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
9.	Cvcc	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
10.	L1	TDK	VLP8040T-2R2N	L= 2.2 µH DCR= 15.0 mOhm	1	\$0.22	 VLP8040 113 mm ²
11.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 47.0 Amps	1	\$0.34	 TRANS_NexFET_Q3 19 mm ²
12.	M2	Infineon Technologies	BSZ050N03MS G	VdsMax= 30.0 V IdsMax= 40.0 Amps	1	\$0.29	 PG-TSDSON-8 19 mm ²
13.	Rcomp	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rcomp2	Vishay-Dale	CRCW0402294RFKED Series= CRCW..e3	Res= 294.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Rfbb	Vishay-Dale	CRCW04026K65FKED Series= CRCW..e3	Res= 6.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rs	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	U1	Texas Instruments	TPS40304DRCR	Switcher	1	\$0.95	 S-PVSON-N10 17 mm ²











Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.275 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	301.294 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	527.92 mA	Current	Average input current
4.	L Ipp	1.044 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	4.592 A	Current	Peak switch current
6.	BOM Count	19	General	Total Design BOM count
7.	FootPrint	236.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	600.0 kHz	General	Switching frequency
9.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
10.	Pout	6.105 W	General	Total output power
11.	Total BOM	\$2.2	General	Total BOM Cost
12.	Cross Freq	39.057 kHz	Op_point	Bode plot crossover frequency
13.	Duty Cycle	11.022 %	Op_point	Duty cycle
14.	Efficiency	82.603 %	Op_point	Steady state efficiency
15.	Gain Marg	-33.483 dB	Op_point	Bode Plot Gain Margin
16.	IOUT_OP	4.07 A	Op_point	Iout operating point
17.	Phase Marg	64.473 deg	Op_point	Bode Plot Phase Margin
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	2.174 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	3.249 mW	Power	Input capacitor power dissipation
21.	Cout Pd	272.335 μ W	Power	Output capacitor power dissipation
22.	IC Pd	735.672 mW	Power	IC power dissipation
23.	L Pd	310.592 mW	Power	Inductor power dissipation
24.	M1 Pd	96.615 mW	Power	M1 MOSFET total power dissipation
25.	M1 PdCond	17.494 mW	Power	M1 MOSFET conduction losses
26.	M1 PdSw	79.121 mW	Power	M1 MOSFET switching losses
27.	M2 Pd	139.414 mW	Power	M2 MOSFET total power dissipation
28.	M2 PdCond	87.998 mW	Power	M2 MOSFET conduction losses
29.	M2 PdSw	51.416 mW	Power	M2 MOSFET switching losses
30.	Total Pd	1.286 W	Power	Total Power Dissipation
31.	Low Freq Gain	79.926 dB	Unknown	Gain at 10Hz

Design Inputs

#	Name	Value	Description
1.	Iout	4.07	Maximum Output Current
2.	Iout1	4.07	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	14.0	Maximum input voltage
5.	VinMin	10.0	Minimum input voltage
6.	Vout	1.5	Output Voltage
7.	Vout1	1.5	Output Voltage #1
8.	base_pn	TPS40304	Texas Instruments Base Part Number
9.	source	DC	Input Source Type
10.	ta	30.0	Ambient temperature

Design Assistance

1. TPS40304 Product Folder : <http://www.ti.com/product/TPS40304> : contains the data sheet and other resources.

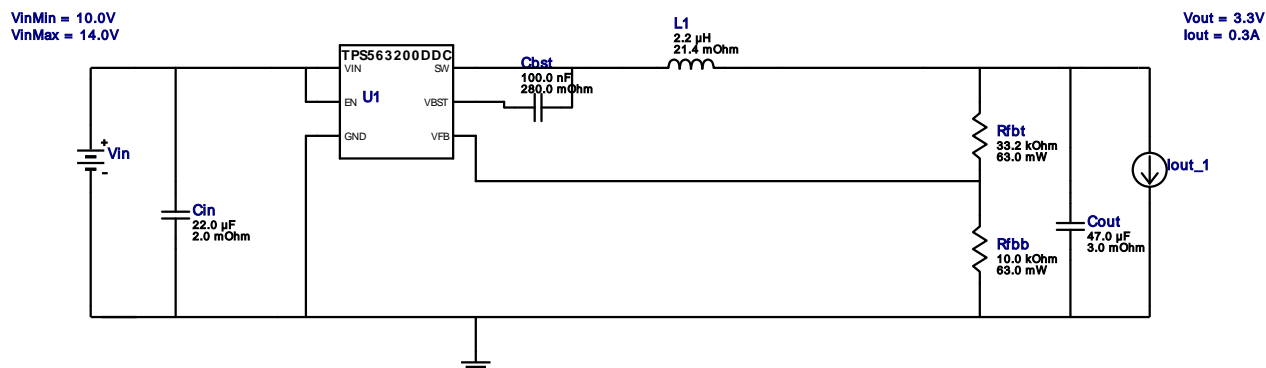


VinMin = 10.0V
 VinMax = 14.0V
 Vout = 3.3V
 Iout = 0.3A

Device = TPS563200DDCR
 Topology = Buck
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 BOM Cost = \$1.38
 Footprint = 74.0 mm²
 BOM Count = 7
 Total Pd = 0.1W

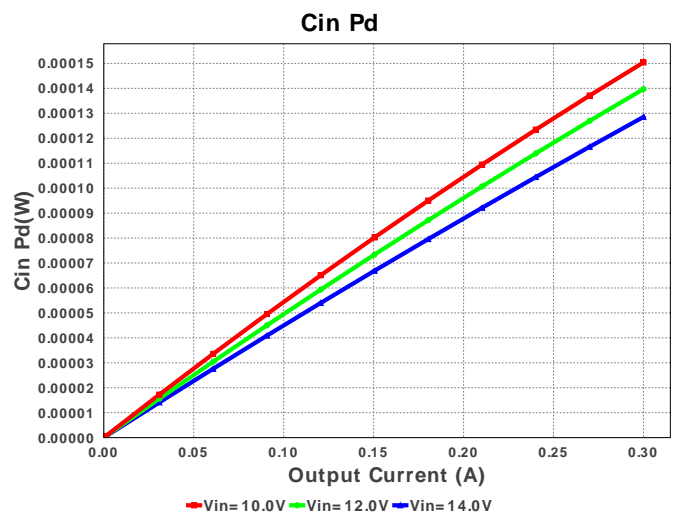
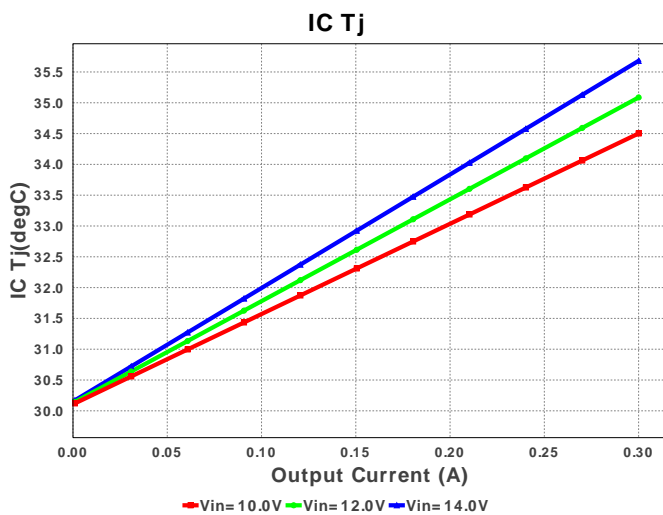
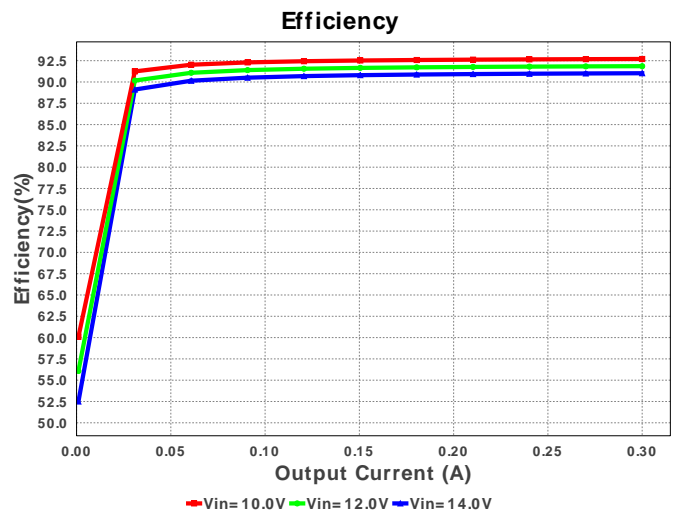
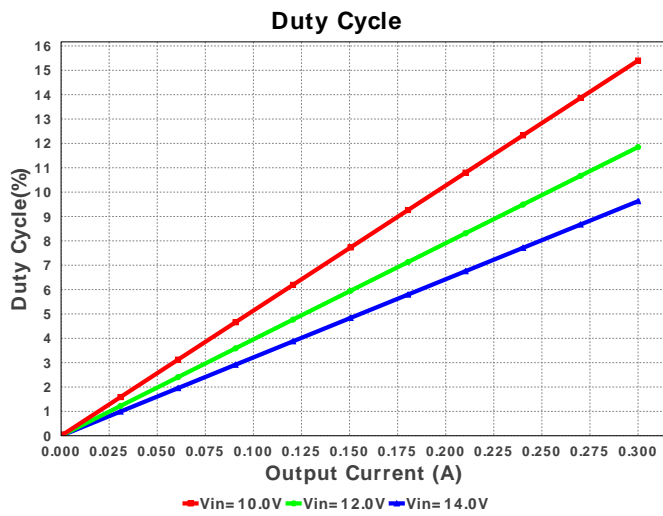
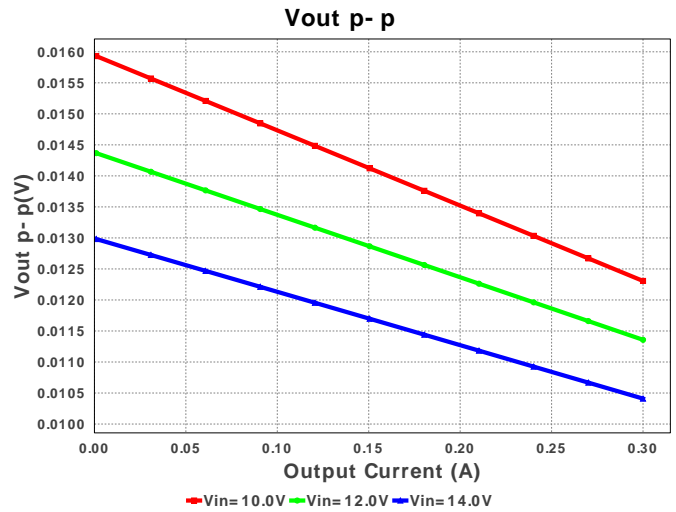
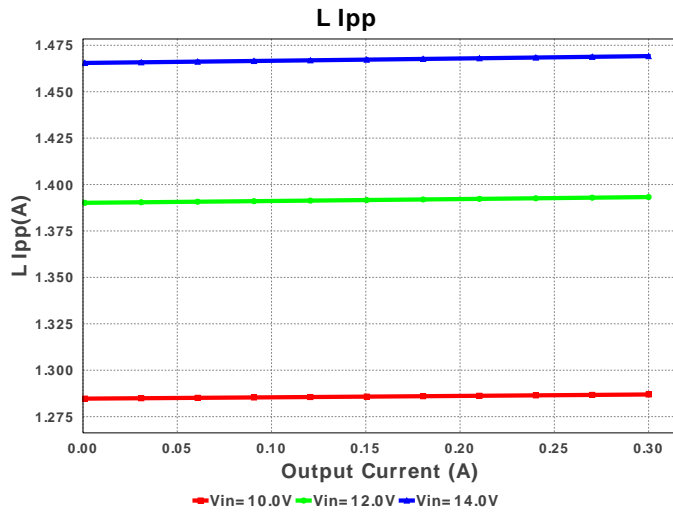
WEBENCH® Design Report

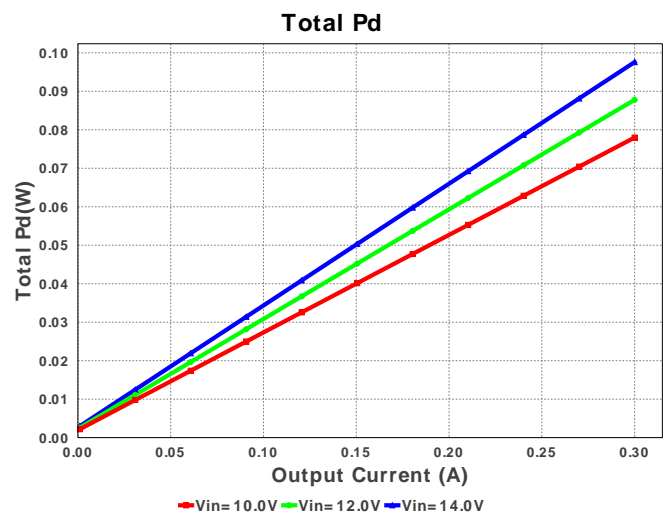
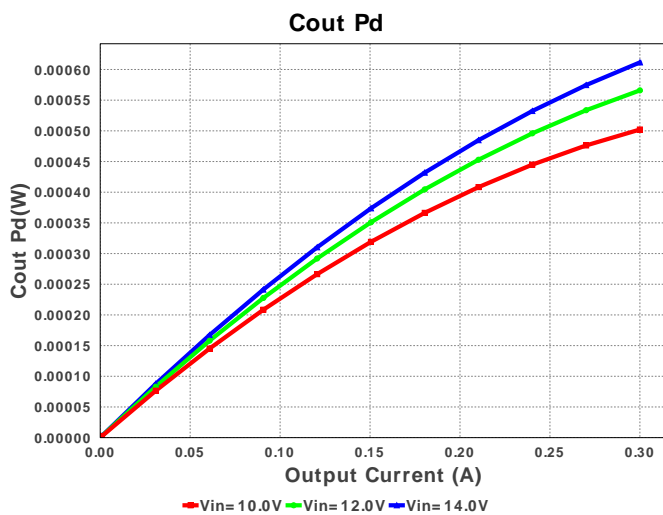
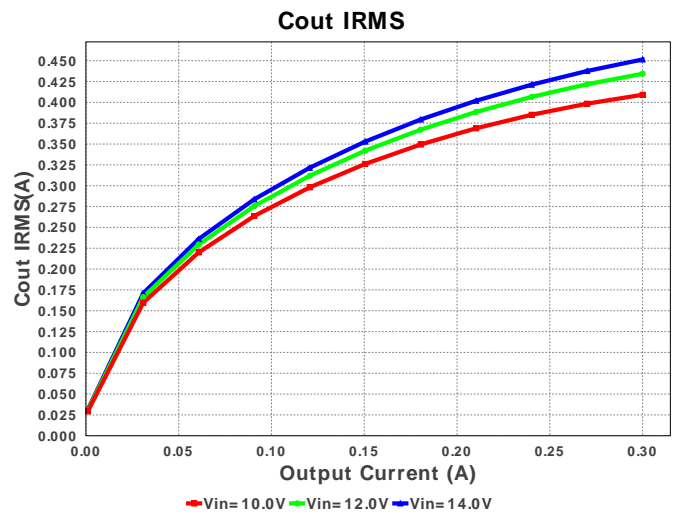
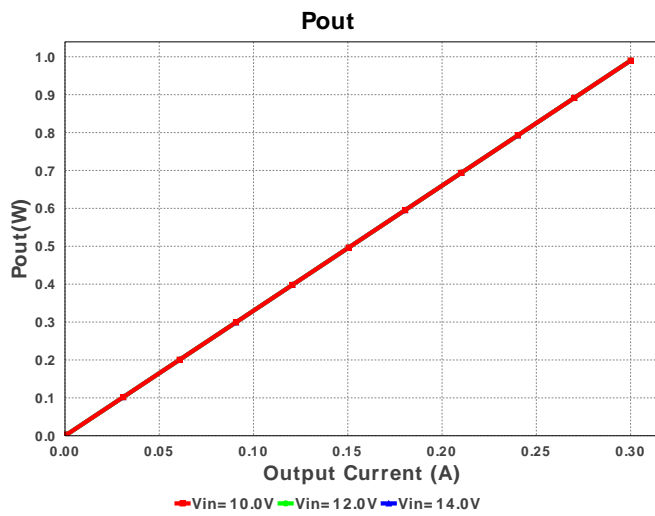
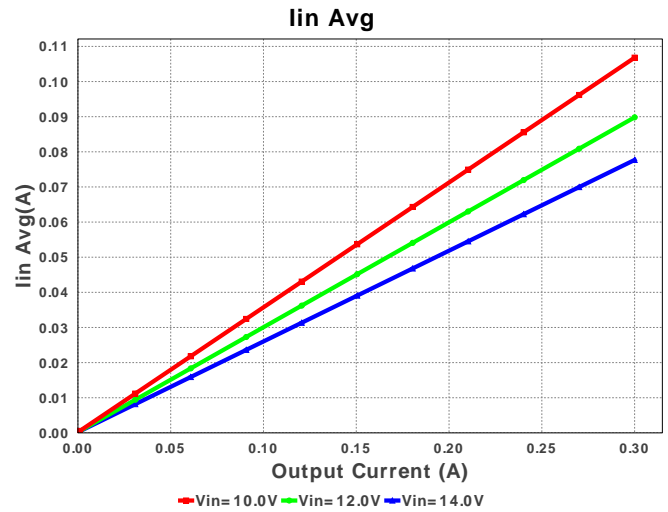
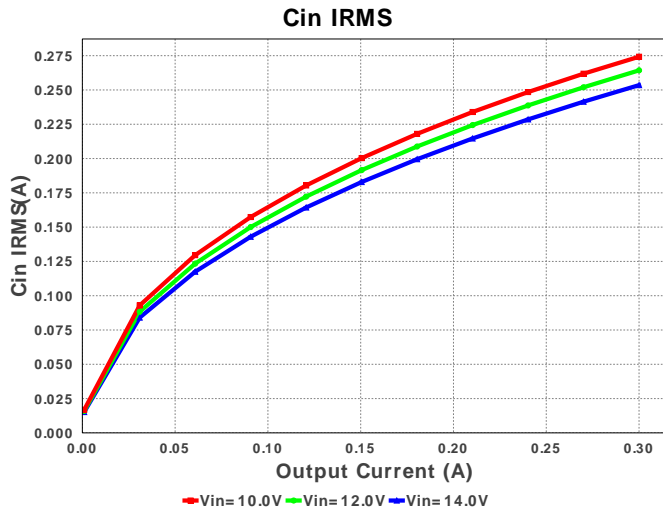
Design : 4085740/7 TPS563200DDCR
 TPS563200DDCR 10.0V-14.0V to 3.30V @ 0.3A

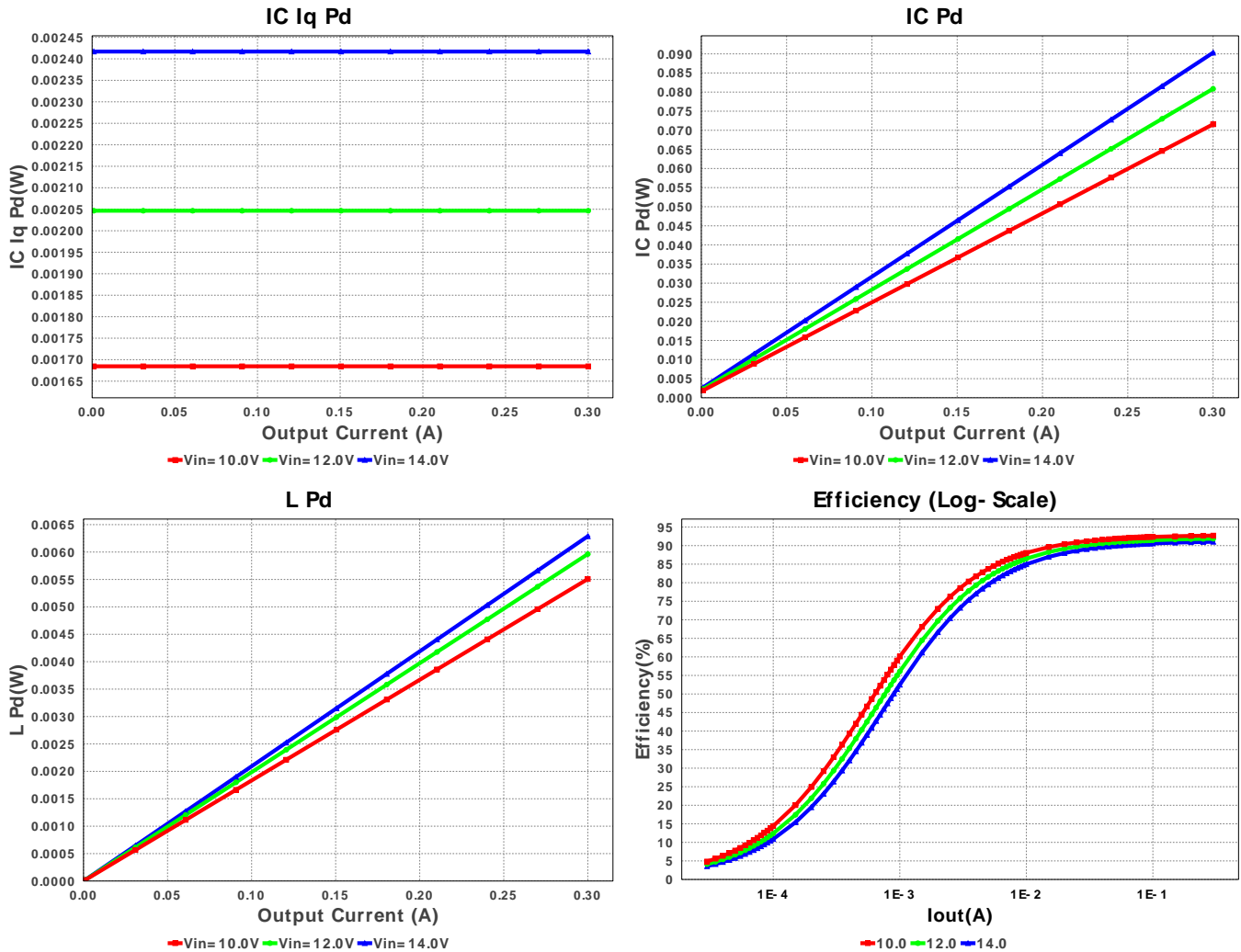


Electrical BOM

#	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 mm ²
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 mm ²
3.	Cout	MuRata	GRM31CR60J476ME19L Series= X5R	Cap= 47.0 uF ESR= 3.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	\$0.12	1206 11 mm ²
4.	L1	Coilcraft	XFL4020-222MEB	L= 2.2 uH DCR= 21.4 mOhm	1	\$0.55	XFL4020 25 mm ²
5.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	Rfht	Vishay-Dale	CRCW040233K2FKED Series= CRCW..e3	Res= 33.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	U1	Texas Instruments	TPS563200DDCR	Switcher	1	\$0.52	DDC0006A 10 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	253.512 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	451.482 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	77.685 mA	Current	Average input current
4.	L Ipp	1.469 A	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	318.109 kHz	General	Switching frequency
8.	Pout	990.0 mW	General	Total output power
9.	Total BOM	\$1.38	General	Total BOM Cost
10.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
11.	Duty Cycle	9.628 %	Op_point	Duty cycle
12.	Efficiency	91.027 %	Op_point	Steady state efficiency
13.	IC Tj	35.68 degC	Op_point	IC junction temperature
14.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	300.0 mA	Op_point	Iout operating point
16.	VIN_OP	14.0 V	Op_point	Vin operating point
17.	Vout p-p	13.081 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	128.536 μ W	Power	Input capacitor power dissipation
19.	Cout Pd	611.507 μ W	Power	Output capacitor power dissipation
20.	IC Iq Pd	2.417 mW	Power	IC Iq Pd
21.	IC Pd	90.304 mW	Power	IC power dissipation
22.	L Pd	6.288 mW	Power	Inductor power dissipation
23.	Total Pd	97.589 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	300.0 m	Maximum Output Current
2.	Iout1	300.0 m	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	14.0	Maximum input voltage

#	Name	Value	Description
5.	VinMin	10.0	Minimum input voltage
6.	Vout	3.3	Output Voltage
7.	Vout1	3.3	Output Voltage #1
8.	base_pn	TPS563200	Texas Instruments Base Part Number
9.	source	DC	Input Source Type
10.	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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