

WEBENCH[®] Power Architect

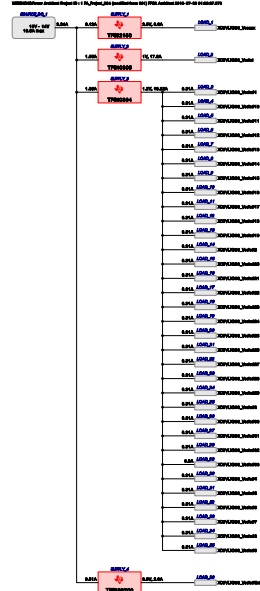
Project Report

Project : 4368542/1 : PA_Project_304 (modified from 301)
 Created : 2015-07-30 01:36:37.578
 Optimize project optFactor=3

Project Summary

1. Total System Efficiency	82.325 %
2. Total System BOM Count	58.0
3. Total System Footprint	787.0 mm ²
4. Total System BOM Cost	\$8.89
5. Total System Power Dissipation	8.022 W

--> Launch WEBENCH Power Architect.



Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS62150	Switcher : 3V-17V,1A,DCS-Control,FSW pin	2.5 V	0.6 A	86.6%	86	\$1.18	6	5
2.	SUPPLY_2	TPS40305	Switcher : Synchronous Buck Controller	1 V	17.0 A	78.3%	331	\$3.70	7	10
3.	SUPPLY_3	TPS40304	Switcher : Synchronous Buck Controller	1.2 V	10.22 A	83.1%	208	\$2.96	8	16
4.	SUPPLY_4	TPS563200	Switcher : 17V, 3A,6-pin, Low Iq Synchronous buck converter with Advanced Eco-mode	3.3 V	2.0 A	91.9%	162	\$1.05	9	22

Power Loads

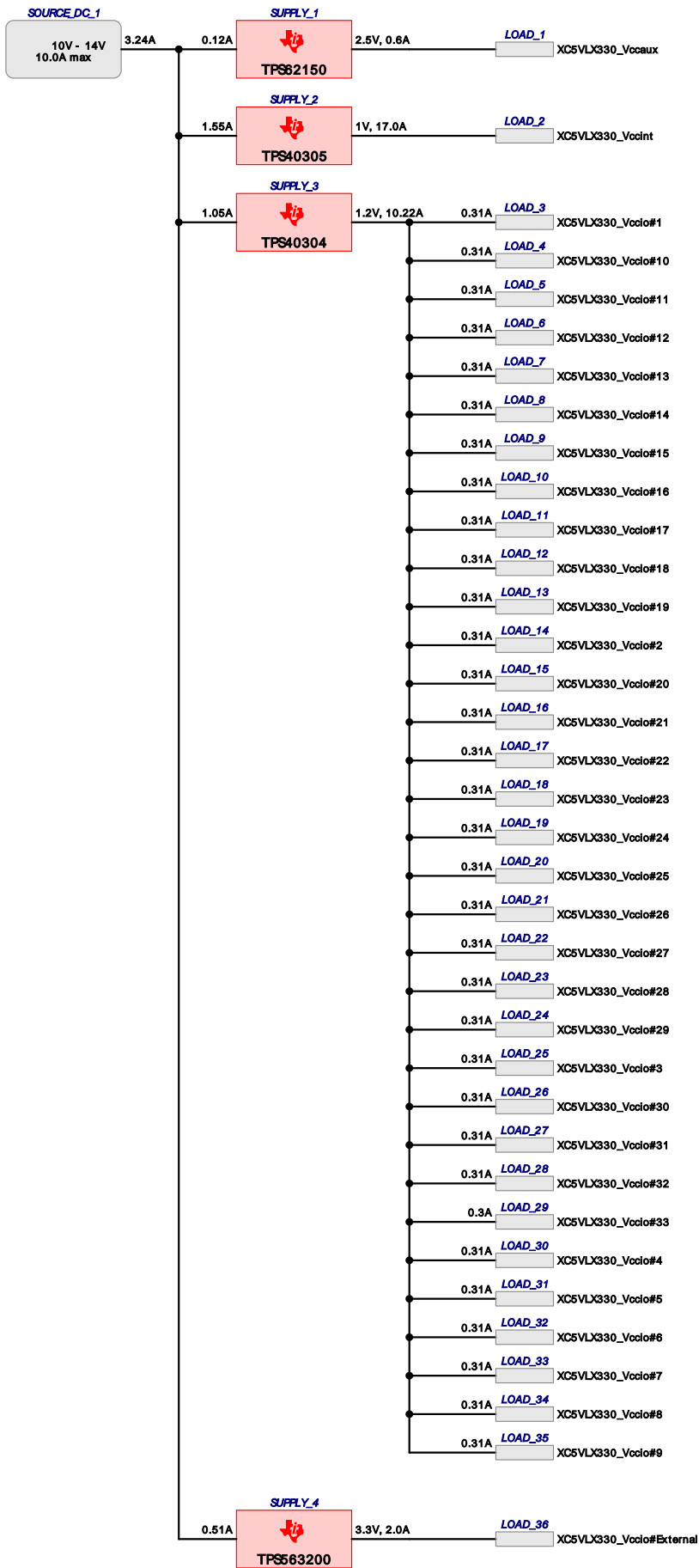
#	Name	VLoad	Iload	Description
1.	XC5VLX330_Vccaux	2.5 V	0.6 A	VoutRipple=10%, SoftStart delay=1.0 mSec
2.	XC5VLX330_Vccint	1 V	17 A	VoutRipple=10%, SoftStart delay=1.0 mSec
3.	XC5VLX330_Vccio#1	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
4.	XC5VLX330_Vccio#10	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
5.	XC5VLX330_Vccio#11	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
6.	XC5VLX330_Vccio#12	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
7.	XC5VLX330_Vccio#13	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
8.	XC5VLX330_Vccio#14	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
9.	XC5VLX330_Vccio#15	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
10.	XC5VLX330_Vccio#16	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
11.	XC5VLX330_Vccio#17	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
12.	XC5VLX330_Vccio#18	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
13.	XC5VLX330_Vccio#19	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
14.	XC5VLX330_Vccio#2	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
15.	XC5VLX330_Vccio#20	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
16.	XC5VLX330_Vccio#21	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
17.	XC5VLX330_Vccio#22	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
18.	XC5VLX330_Vccio#23	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
19.	XC5VLX330_Vccio#24	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
20.	XC5VLX330_Vccio#25	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
21.	XC5VLX330_Vccio#26	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
22.	XC5VLX330_Vccio#27	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
23.	XC5VLX330_Vccio#28	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
24.	XC5VLX330_Vccio#29	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
25.	XC5VLX330_Vccio#3	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
26.	XC5VLX330_Vccio#30	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
27.	XC5VLX330_Vccio#31	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
28.	XC5VLX330_Vccio#32	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
29.	XC5VLX330_Vccio#33	1.2 V	0.3 A	VoutRipple=10%, SoftStart delay=1.0 mSec
30.	XC5VLX330_Vccio#4	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
31.	XC5VLX330_Vccio#5	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
32.	XC5VLX330_Vccio#6	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
33.	XC5VLX330_Vccio#7	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
34.	XC5VLX330_Vccio#8	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
35.	XC5VLX330_Vccio#9	1.2 V	0.31 A	VoutRipple=10%, SoftStart delay=1.0 mSec
36.	XC5VLX330_Vccio#External	3.3 V	2 A	VoutRipple=10%

FPGAs, Processors

#	Manufacturer	Part Number	Name	Series	Description
1.	Xilinx	XC5VLX330	FPGA_1	Virtex-5 LX	FPGA Xilinx Virtex-5 LX XC5VLX330

Project Diagram

WEBENCH® Power Architect Project ID : 1 PA_Project_304 (modified from 301) FPGA Architect 2015-07-30 01:38:37.578



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	0805	3	\$0.01	20
Kemet	C0805C181K5GACTU	0805	1	\$0.01	7
Kemet	C0805C222K5RACTU	0805	1	\$0.01	7
TDK	C2012X5R0J226M	0805	1	\$0.06	7
Yageo America	CC0805JRNPO9BN121	0805	1	\$0.01	7
Yageo America	CC0805KRX7R9BB332	0805	1	\$0.01	7
Yageo America	CC0805KRX7R9BB562	0805	1	\$0.01	7
Samsung Electro-Mechanics	CL21C122JBFNNWE	0805	1	\$0.01	7
Vishay-Dale	CRCW0402100KFKED	0402	3	\$0.01	9
Vishay-Dale	CRCW040210K0FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW040215K0FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402332RFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW040233K2FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402340RFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW0402383KFKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04023K24FKED	0402	2	\$0.01	6
Vishay-Dale	CRCW04023K48FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04024K53FKED	0402	1	\$0.01	3
Texas Instruments	CSD17303Q5	TRANS_NexFET_Q5	1	\$0.73	55
Texas Instruments	CSD17552Q3A	TRANS_NexFET_Q3A	2	\$0.37	18
Texas Instruments	CSD17577Q3A	TRANS_NexFET_Q3A	1	\$0.28	18
Texas Instruments	CSD17578Q3A	TRANS_NexFET_Q3A	2	\$0.25	18
MuRata	GRM033R71A182KA01D	0201	1	\$0.01	2
MuRata	GRM155R71C183KA01D	0402	2	\$0.01	6
MuRata	GRM188R61A225KE34D	0603	2	\$0.02	9
MuRata	GRM188R61E105KA12D	0603	2	\$0.01	9
MuRata	GRM219R61E106KA12	0805	1	\$0.05	7
MuRata	GRM21BR61E475MA12L	0805	2	\$0.06	14
MuRata	GRM31CR60J107ME39L	1206	6	\$0.20	22
MuRata	GRM31CR60J476ME19L	1206	1	\$0.12	11
MuRata	GRM32ER61E226KE15L	1210	1	\$0.16	15
Susumu Co Ltd	RR1220P-184-D	0805	1	\$0.01	7
Bourns	SDR0403-2R2ML	SDR0403	1	\$0.18	28
Coilcraft	SLC1175-171MEB	SLC1175	1	\$0.48	125
Texas Instruments	TPS40304DRCR	S-PVSON-N10	1	\$0.95	17
Texas Instruments	TPS40305DRCR	S-PVSON-N10	1	\$0.95	17
Texas Instruments	TPS563200DDCR	DDC0006A	1	\$0.52	10
Texas Instruments	TPS62150RGTR	S-PVQFN-N16	1	\$0.85	25
TDK	VLP8040T-2R2N	VLP8040	1	\$0.22	113
Coilcraft	XAL5030-601MEB	XAL5030	1	\$0.63	54
Total			59	\$9.09	717

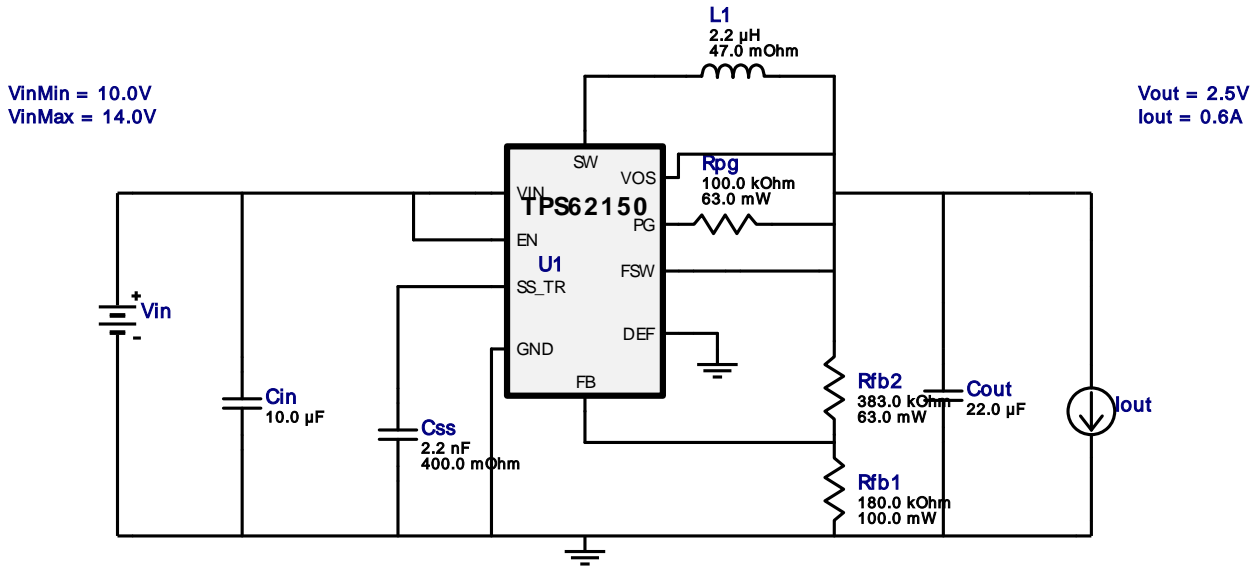


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 Vout = 2.5V
 Iout = 0.6A

Device = TPS62150RGTR
 Topology = Buck
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 Footprint = 86.0 mm²
 BOM Count = 8
 Total Pd = 0.23W

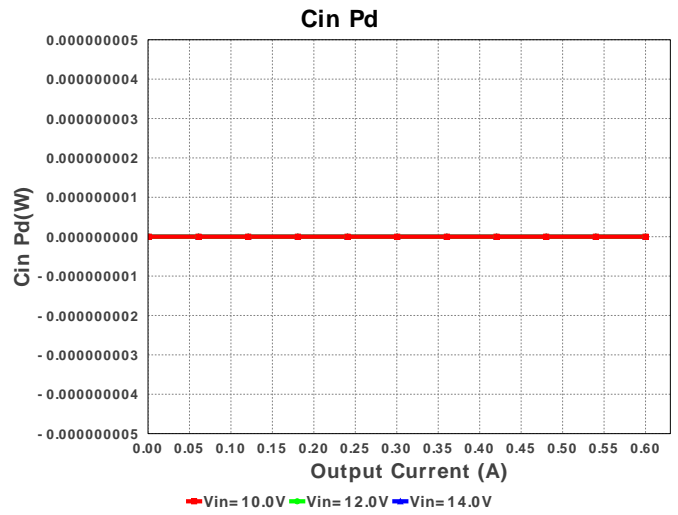
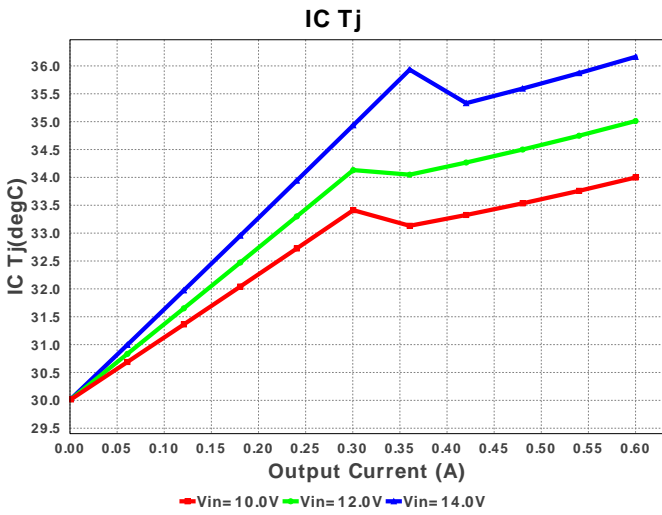
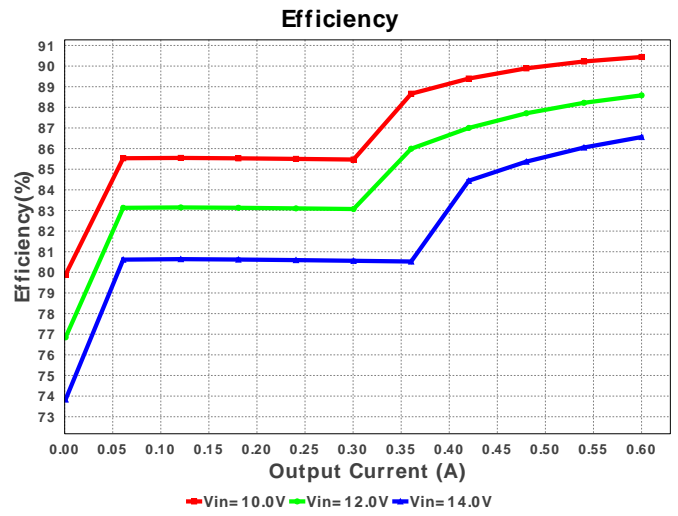
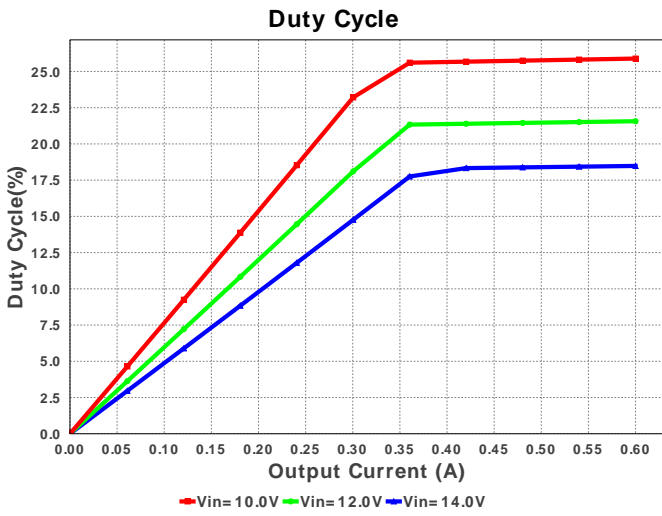
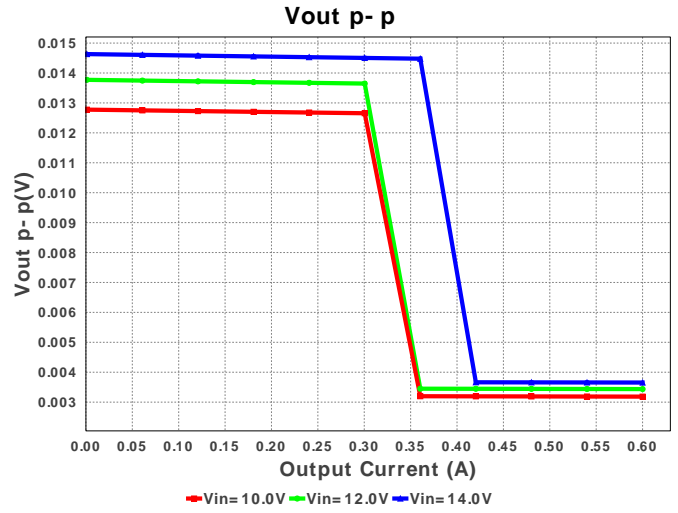
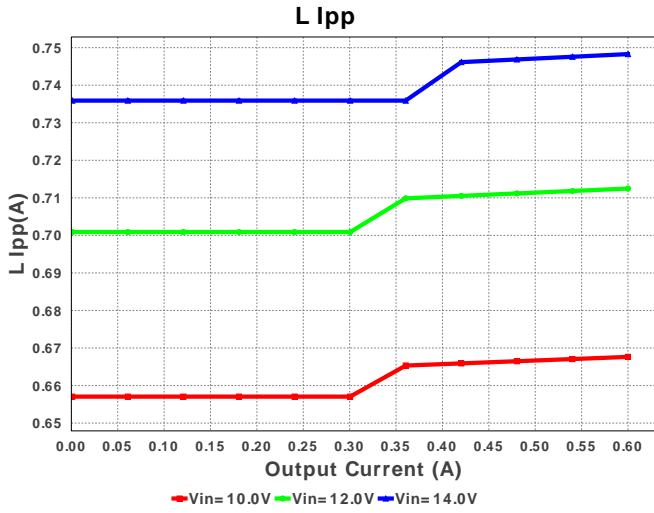
WEBENCH® Design Report

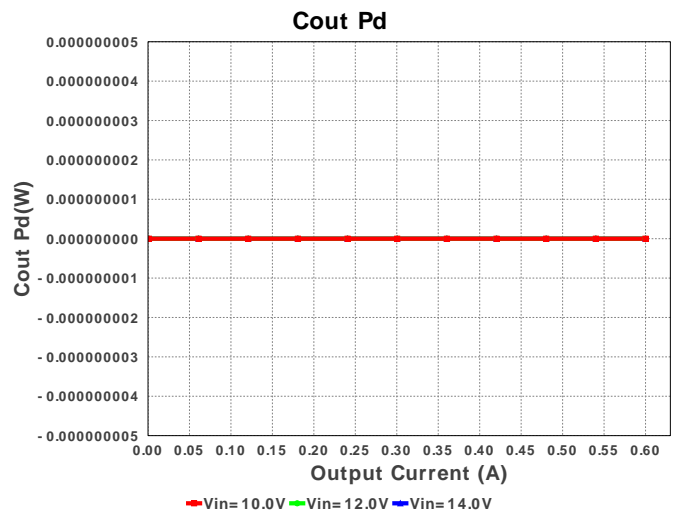
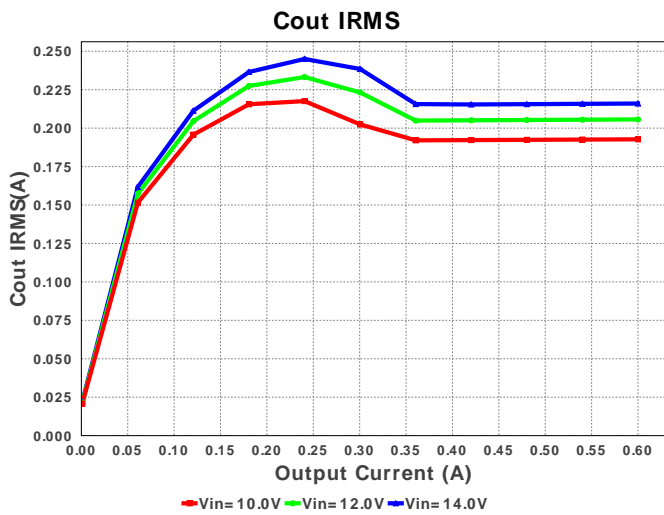
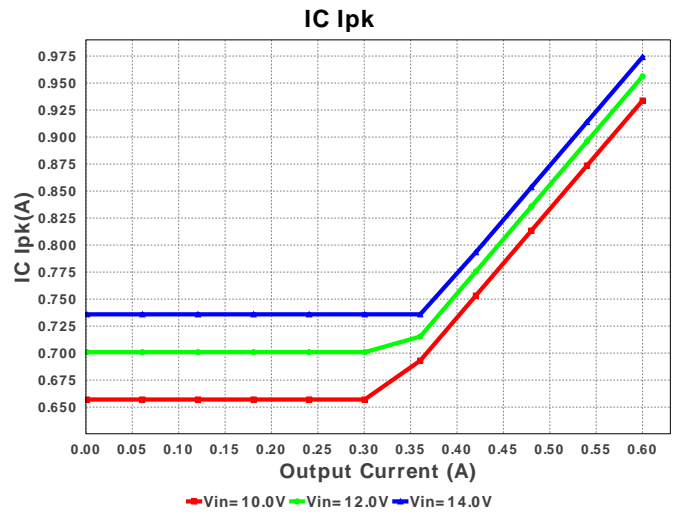
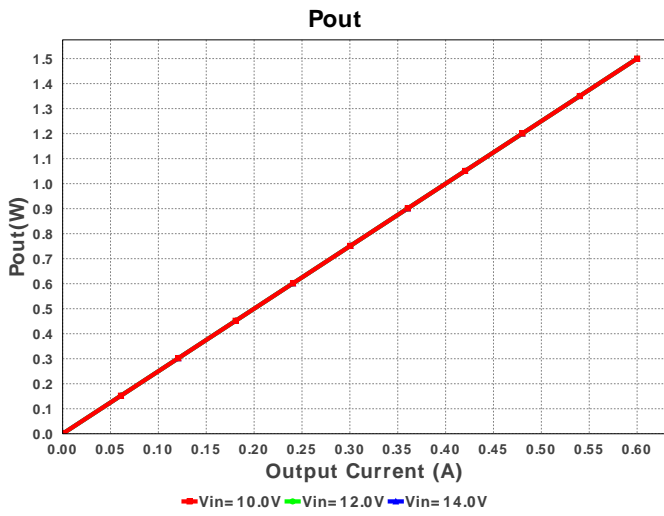
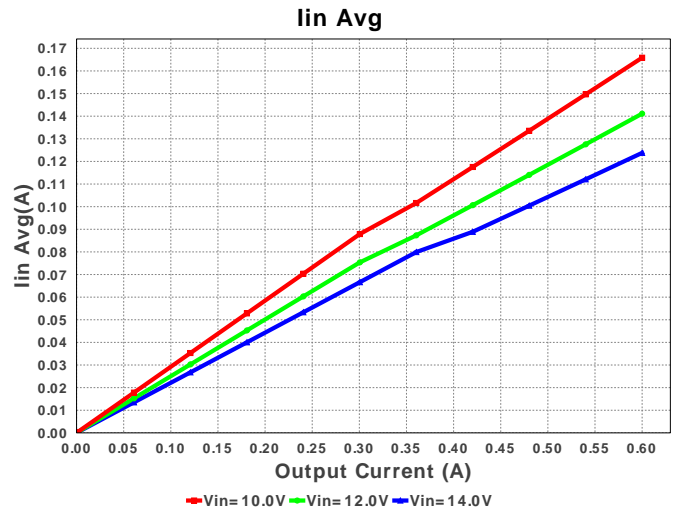
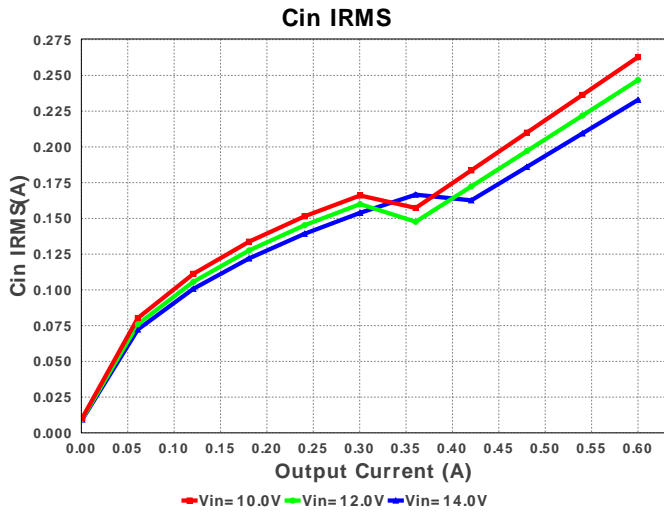
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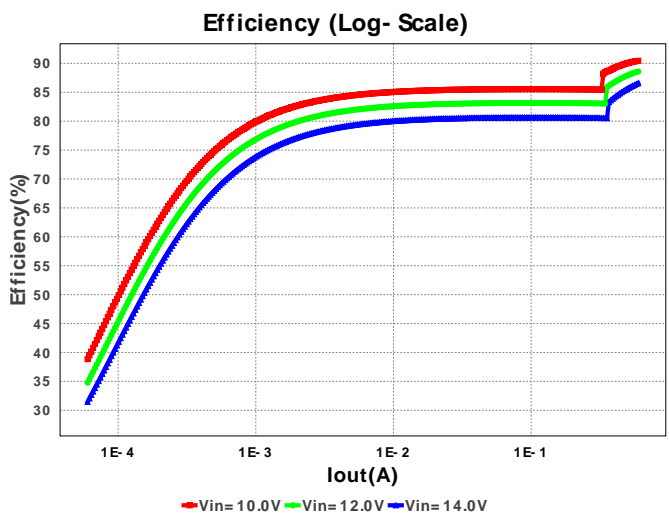
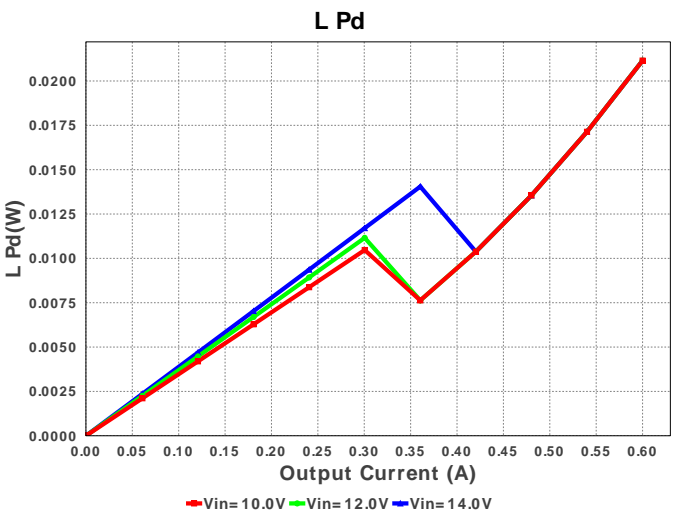
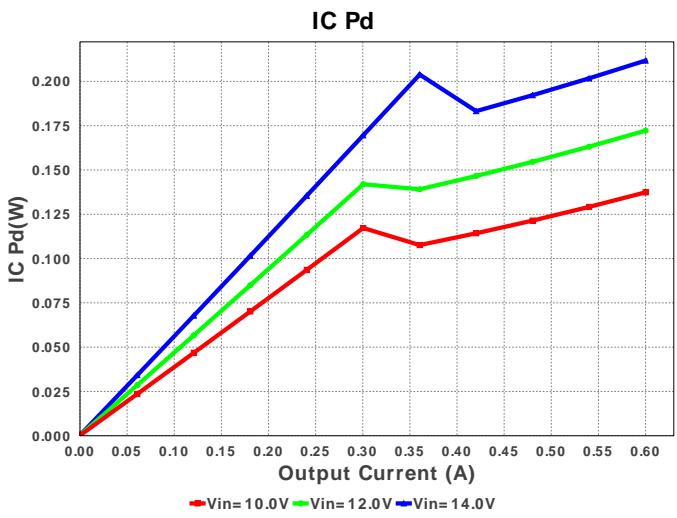
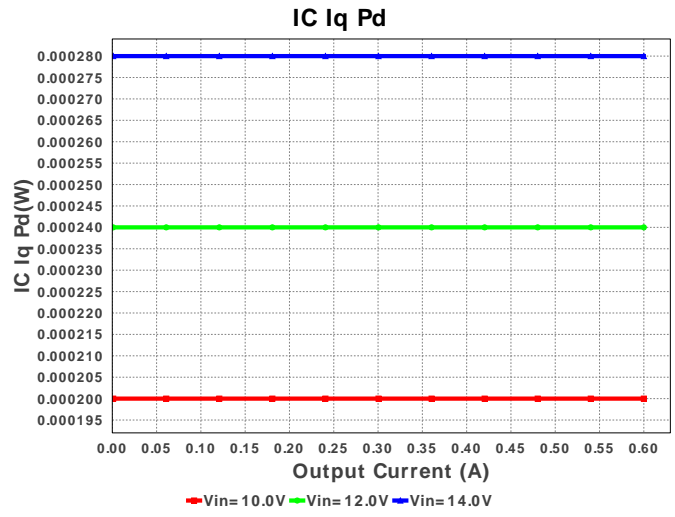
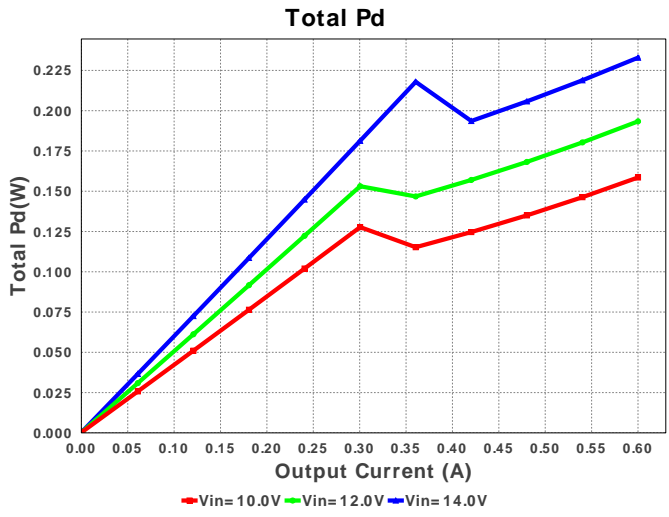


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM219R61E106KA12 Series= X5R	Cap= 10.0 uF VDC= 25.0 V IRMS= 0.0 A	1	\$0.05	0805 7 mm ²
2.	Cout	TDK	C2012X5R0J226M Series= X5R	Cap= 22.0 uF VDC= 6.3 V IRMS= 0.0 A	1	\$0.06	0805 7 mm ²
3.	Css	Kemet	C0805C222K5RACTU Series= X7R	Cap= 2.2 nF ESR= 400.0 mOhm VDC= 50.0 V IRMS= 251.0 mA	1	\$0.01	0805 7 mm ²
4.	L1	Bourns	SDR0403-2R2ML	L= 2.2 uH DCR= 47.0 mOhm	1	\$0.18	SDR0403 28 mm ²
5.	Rfb1	Susumu Co Ltd	RR1220P-184-D Series= RR12	Res= 180.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	0805 7 mm ²
6.	Rfb2	Vishay-Dale	CRCW0402383KFKED Series= CRCW..e3	Res= 383.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	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
8.	U1	Texas Instruments	TPS62150RGTR	Switcher	1	\$0.85	S-PVQFN-N16 25 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	232.882 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	216.011 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	974.142 mA	Current	Peak switch current in IC
4.	Iin Avg	123.78 mA	Current	Average input current
5.	L Ipp	748.28 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	8	General	Total Design BOM count
7.	FootPrint	86.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	1.291 MHz	General	Switching frequency
9.	Pout	1.5 W	General	Total output power
10.	Total BOM	\$1.18	General	Total BOM Cost
11.	Vout OP	2.5 V	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
12.	Duty Cycle	18.48 %	Op_point	Duty cycle
13.	Efficiency	86.56 %	Op_point	Steady state efficiency
14.	IC Tj	36.162 degC	Op_point	IC junction temperature
15.	ICThetaJA	29.1 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	600.0 mA	Op_point	Iout operating point
17.	VIN_OP	14.0 V	Op_point	Vin operating point
18.	Vout p-p	3.655 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
20.	Cout Pd	0.0 W	Power	Output capacitor power dissipation
21.	IC Iq Pd	280.0 µW	Power	IC Iq Pd
22.	IC Pd	211.759 mW	Power	IC power dissipation
23.	L Pd	21.15 mW	Power	Inductor power dissipation
24.	Total Pd	232.904 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	600.0 m	Maximum Output Current
2.	Iout1	600.0 m	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	2.5	Output Voltage
7.	Vout1	2.5	Output Voltage #1
8.	base_pn	TPS62150	Base Product Number
9.	source	DC	Input Source Type
10.	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, Adjustable output voltage from 0.9V to 6V Selectable operating frequency, Optional Softstart Capacitor for slow startup, Tracking, Pin selectable output voltage (nominal, +5%) Seamless Power Save Mode for Light Load Efficiency, Power Good Output, 100% Duty Cycle mode, Short Circuit Protection, Thermal Shutdown

2. **TPS62150** Product Folder : <http://www.ti.com/product/TPS62150> : contains the data sheet and other resources.

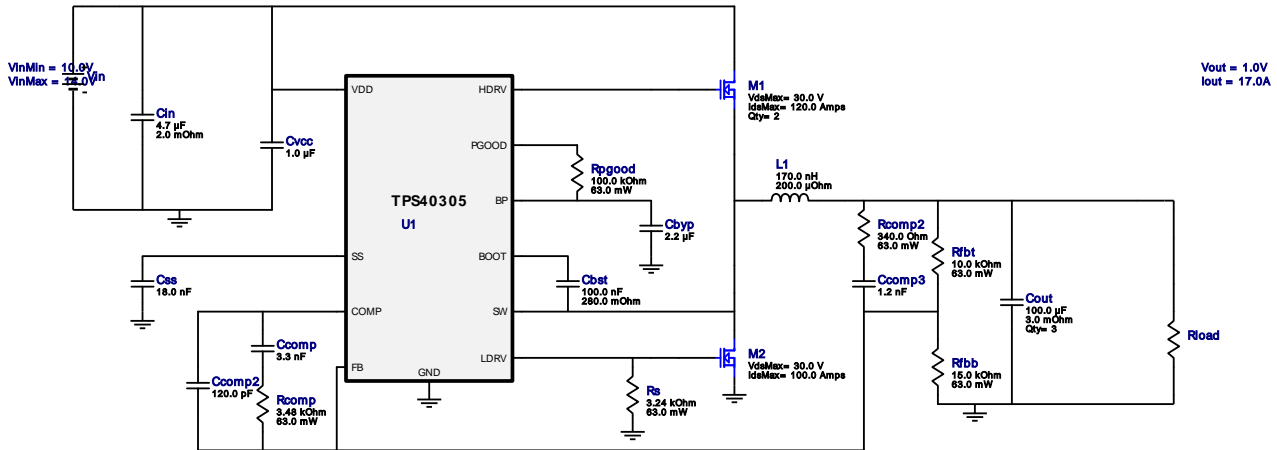


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 VinMax = 14.0V
 Vout = 1.0V
 Iout = 17.0A

Device = TPS40305DRCR
 Topology = Buck
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 BOM Cost = \$3.70
 Footprint = 331.0 mm²
 BOM Count = 22
 Total Pd = 4.72W


WEBENCH® Design Report

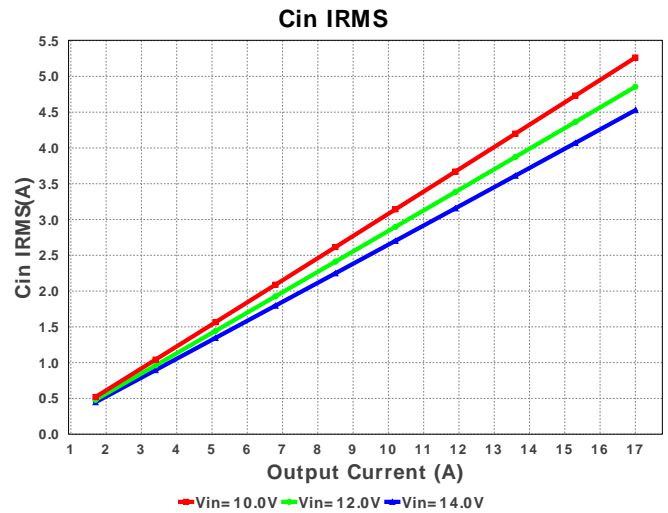
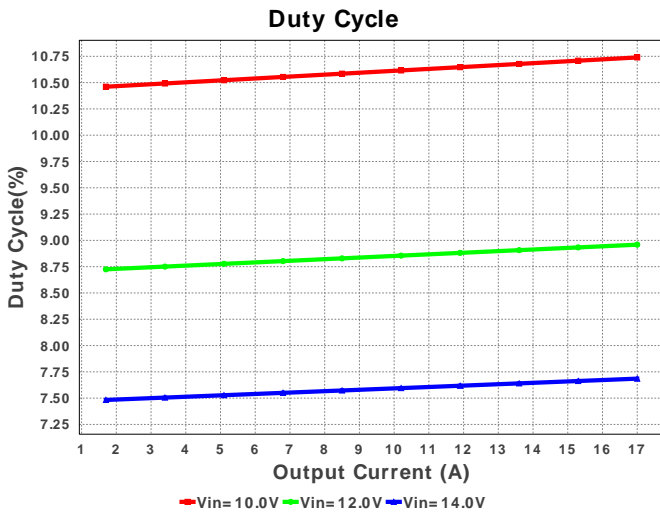
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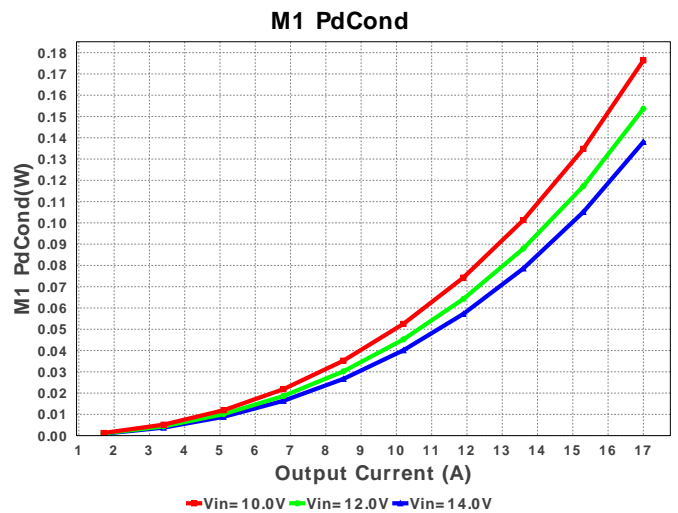
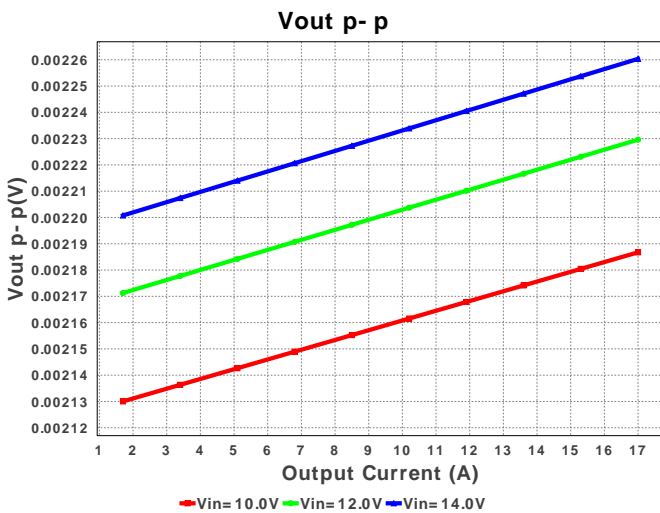
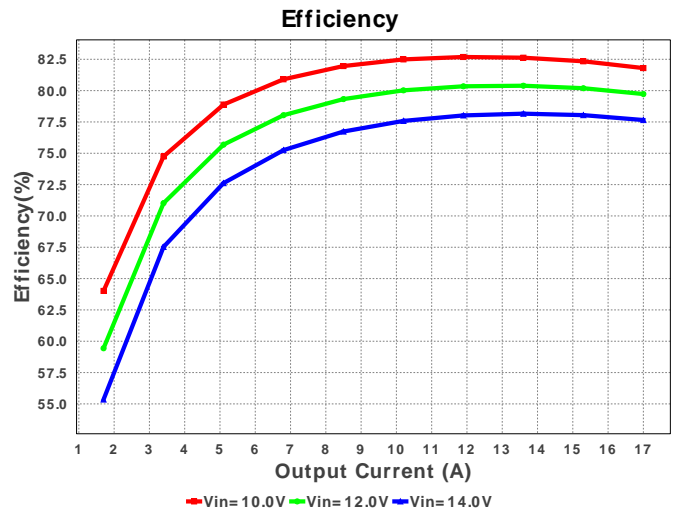
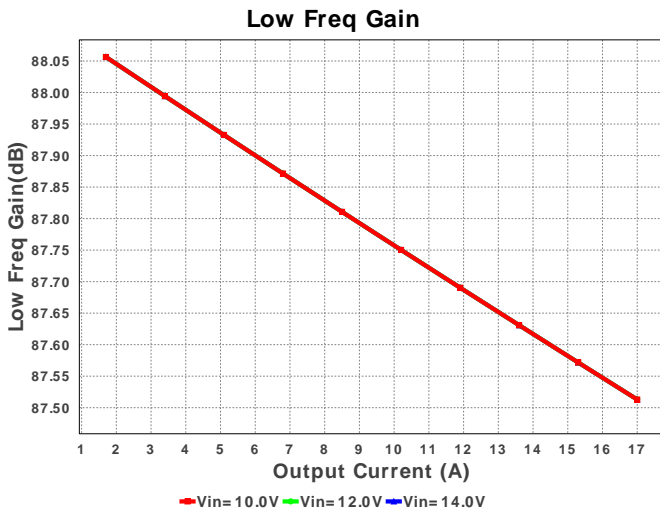
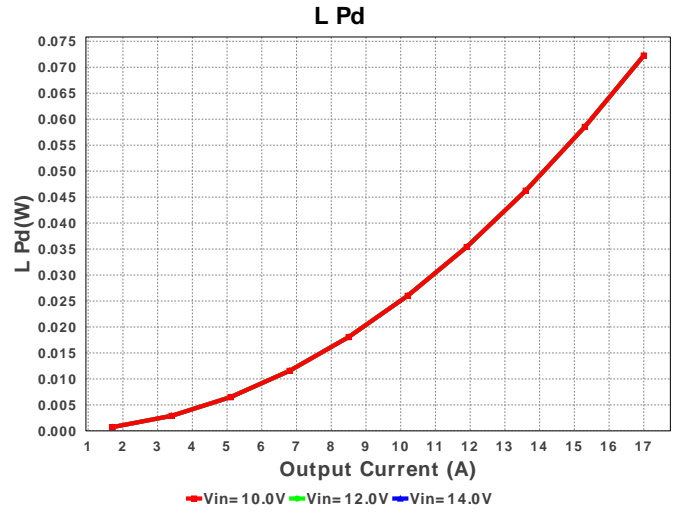
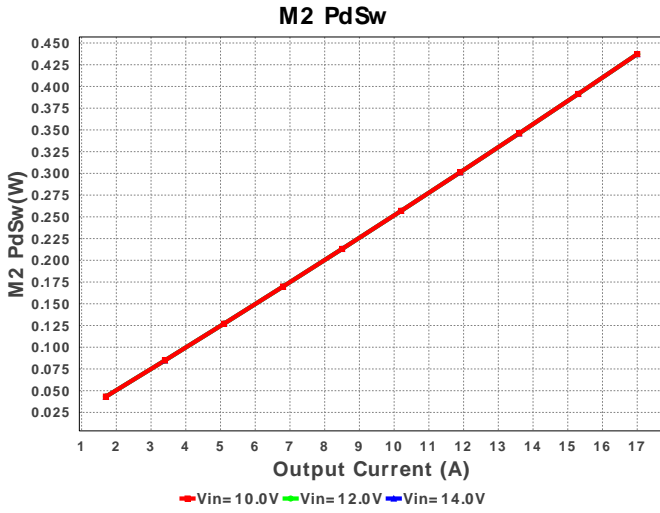


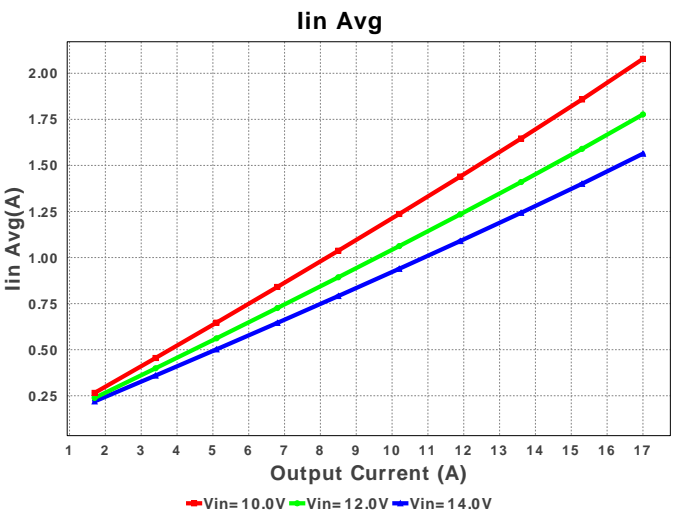
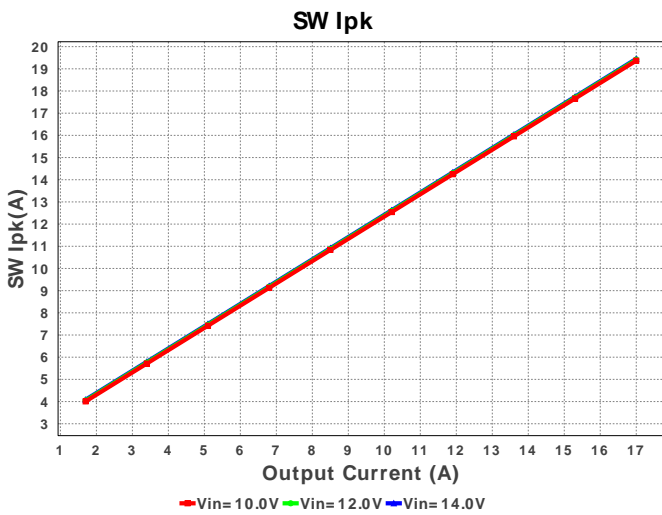
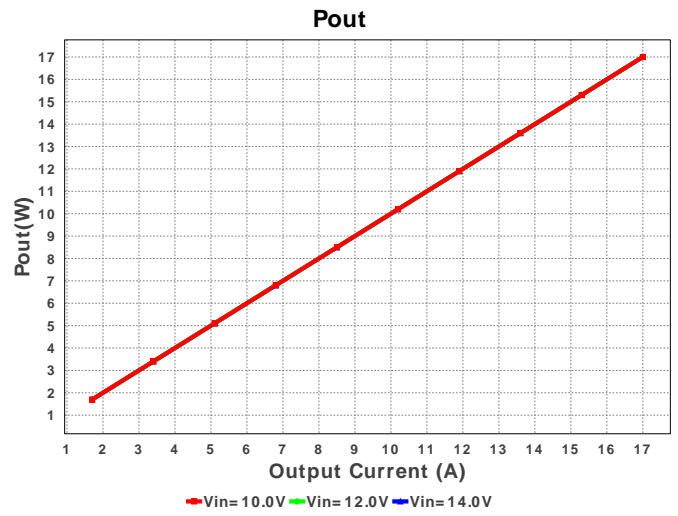
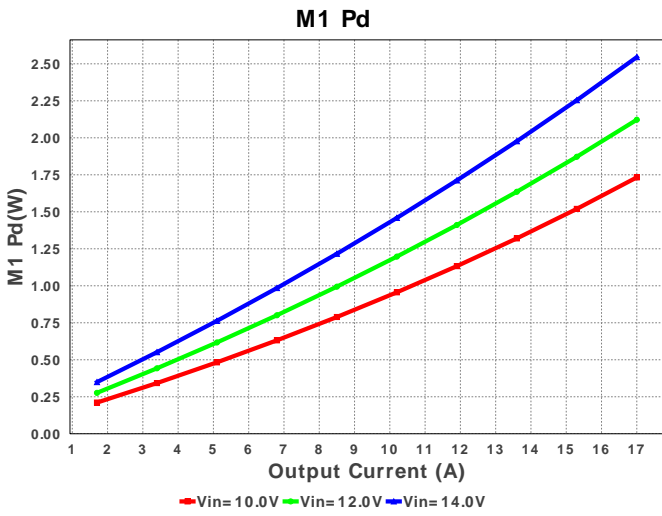
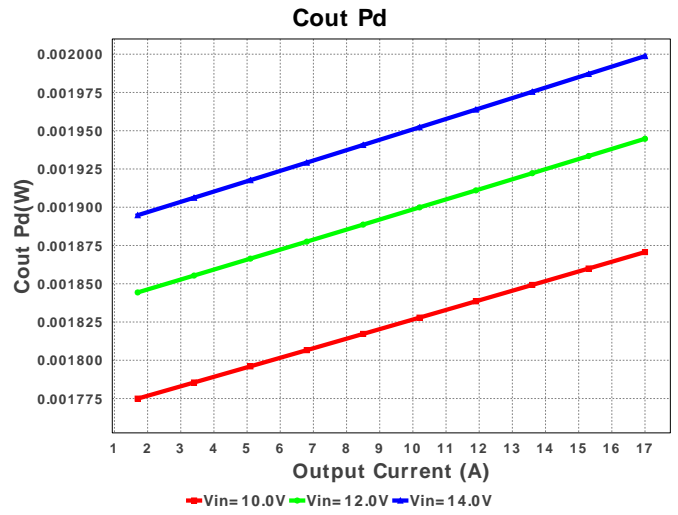
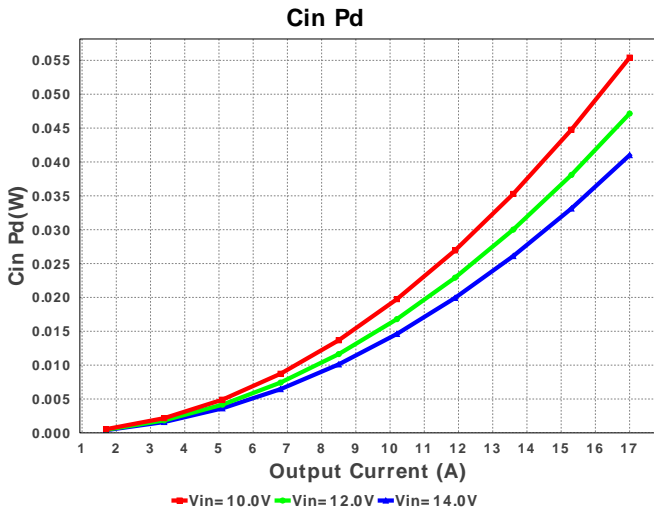
Electrical BOM

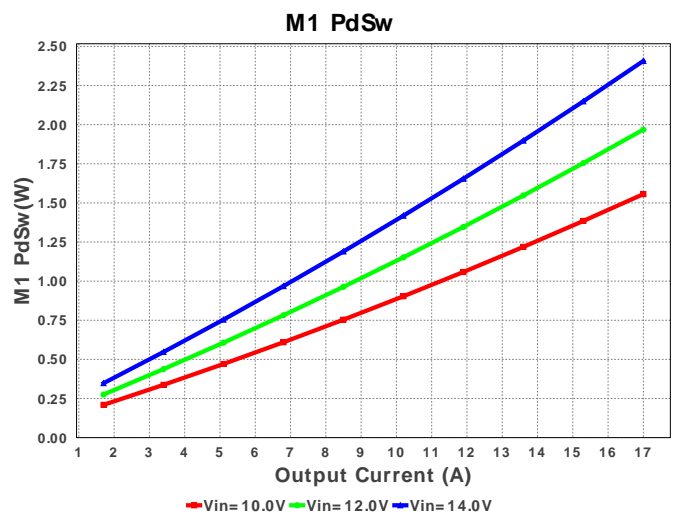
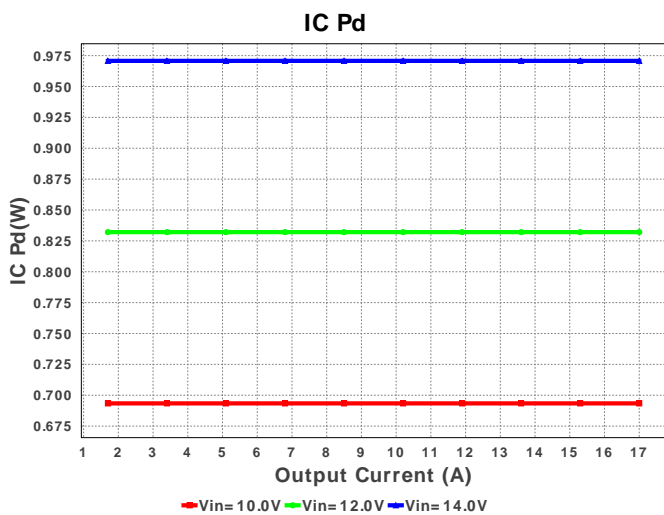
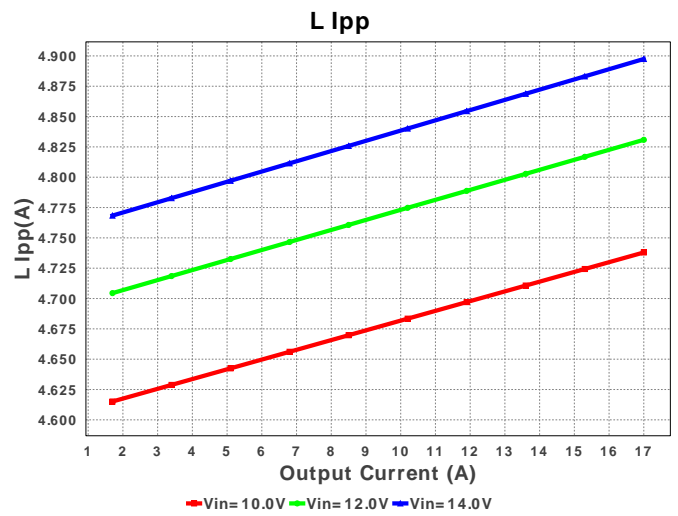
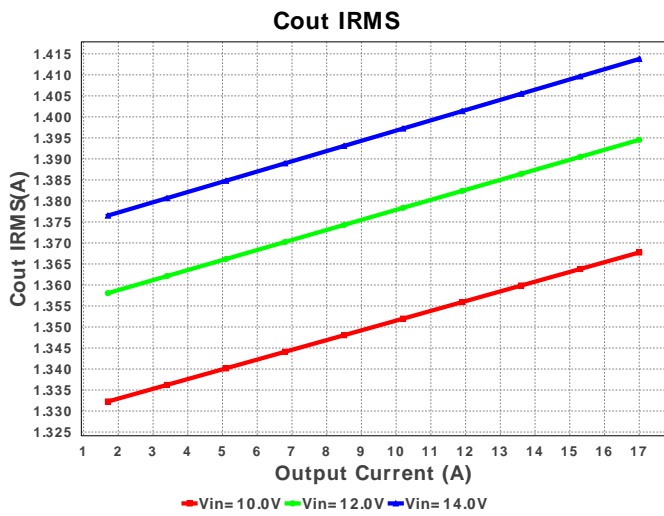
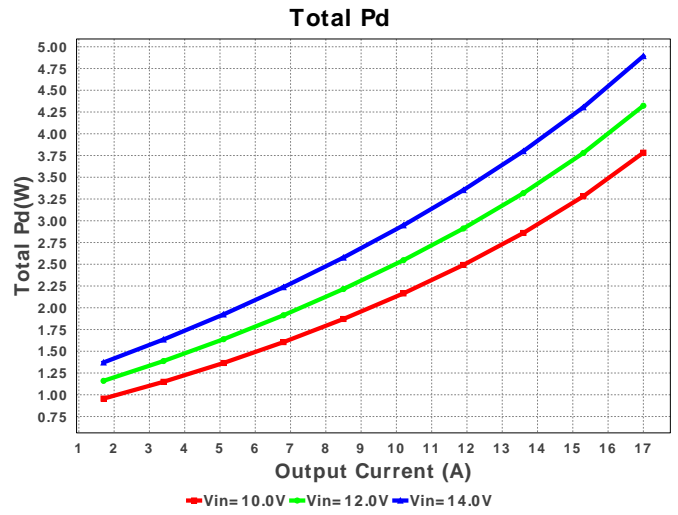
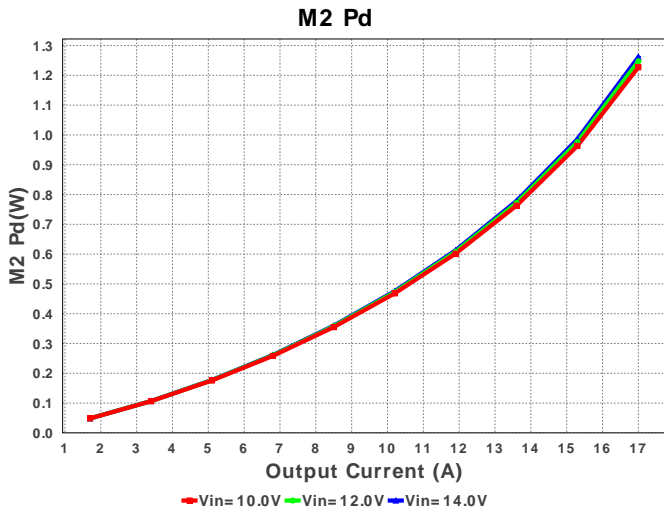
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Cbyp	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.02	0603 5 mm ²
3.	Ccomp	Yageo America	CC0805KRX7R9BB332 Series= X7R	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Ccomp2	Yageo America	CC0805JRNPO9BN121 Series= C0G/NP0	Cap= 120.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Ccomp3	Samsung Electro-Mechanics	CL21C122JBFNNWE Series= C0G/NP0	Cap= 1.2 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	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	3	\$0.20	1206 11 mm ²
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

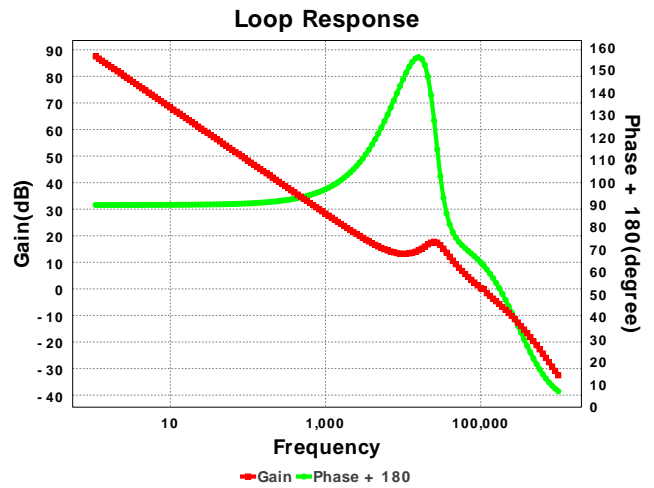
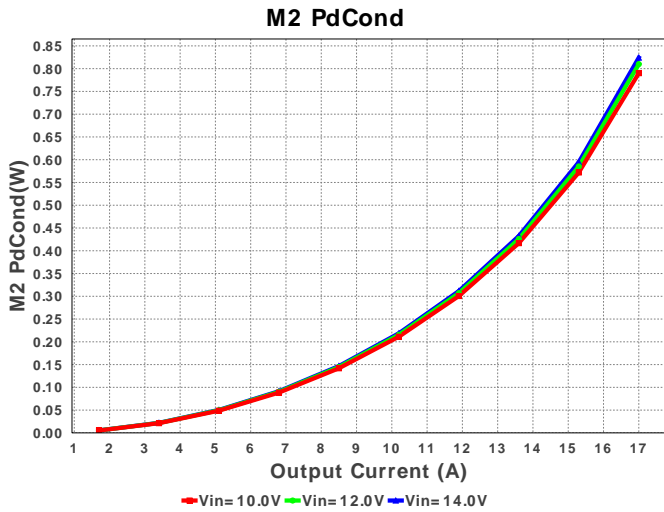
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	L1	Coilcraft	SLC1175-171MEB	L= 170.0 nH DCR= 200.0 µOhm	1	\$0.48	 SLC1175 125 mm²
11.	M1	Texas Instruments	CSD17552Q3A	VdsMax= 30.0 V IdsMax= 120.0 Amps	2	\$0.37	 TRANS_NexFET_Q3A 18 mm²
12.	M2	Texas Instruments	CSD17303Q5	VdsMax= 30.0 V IdsMax= 100.0 Amps	1	\$0.73	 TRANS_NexFET_Q5 55 mm²
13.	Rcomp	Vishay-Dale	CRCW04023K48FKED Series= CRCW..e3	Res= 3.48 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
14.	Rcomp2	Vishay-Dale	CRCW0402340RFKED Series= CRCW..e3	Res= 340.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
15.	Rfbb	Vishay-Dale	CRCW040215K0FKED Series= CRCW..e3	Res= 15.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
16.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
17.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
18.	Rs	Vishay-Dale	CRCW04023K24FKED Series= CRCW..e3	Res= 3.24 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
19.	U1	Texas Instruments	TPS40305DRCR	Switcher	1	\$0.95	 S-PVSON-N10 17 mm²











Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.528 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.414 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.551 A	Current	Average input current
4.	L Ipp	4.898 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	19.449 A	Current	Peak switch current
6.	BOM Count	22	General	Total Design BOM count
7.	FootPrint	331.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	1.2 MHz	General	Switching frequency
9.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
10.	Pout	17.0 W	General	Total output power
11.	Total BOM	\$3.7	General	Total BOM Cost
12.	Low Freq Gain	88.089 dB	Op_Point	Gain at 10Hz
13.	Cross Freq	81.783 kHz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	7.685 %	Op_point	Duty cycle
15.	Efficiency	78.275 %	Op_point	Steady state efficiency
16.	IOUT_OP	17.0 A	Op_point	Iout operating point
17.	Phase Marg	64.191 deg	Op_point	Bode Plot Phase Margin
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	1.701 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	41.007 mW	Power	Input capacitor power dissipation
21.	Cout Pd	1.999 mW	Power	Output capacitor power dissipation
22.	IC Pd	970.76 mW	Power	IC power dissipation
23.	L Pd	72.25 mW	Power	Inductor power dissipation
24.	M1 Pd	2.538 W	Power	M1 MOSFET total power dissipation
25.	M1 PdCond	130.593 mW	Power	M1 MOSFET conduction losses
26.	M1 PdSw	2.407 W	Power	M1 MOSFET switching losses
27.	M2 Pd	1.094 W	Power	M2 MOSFET total power dissipation
28.	M2 PdCond	657.277 mW	Power	M2 MOSFET conduction losses
29.	M2 PdSw	437.191 mW	Power	M2 MOSFET switching losses
30.	Total Pd	4.718 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	17.0	Maximum Output Current
2.	Iout1	17.0	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	1.0	Output Voltage
7.	Vout1	1.0	Output Voltage #1
8.	base_pn	TPS40305	Base Product Number
9.	source	DC	Input Source Type
10.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40305** Product Folder : <http://www.ti.com/product/TPS40305> : contains the data sheet and other resources.

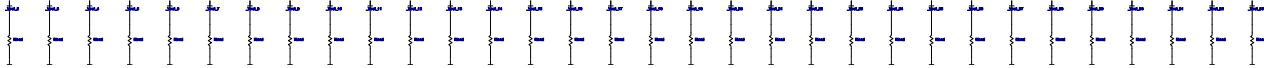
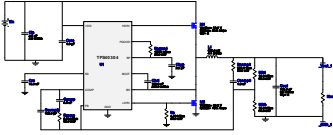


VinMin = 10.0V
 VinMax = 14.0V
 Vout = 1.2V
 Iout = 10.22A



Device = TPS40304DRCR
 Topology = Buck
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 BOM Cost = \$2.96
 Footprint = 208.0 mm²
 BOM Count = 21
 Total Pd = 2.49W

WEBENCH® Design Report

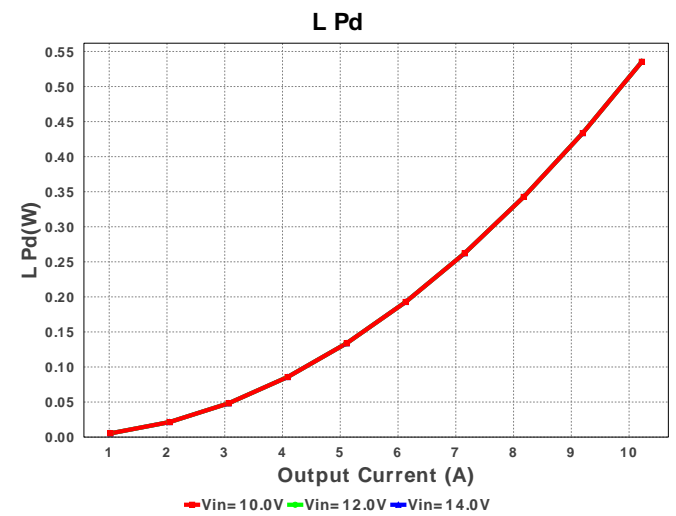
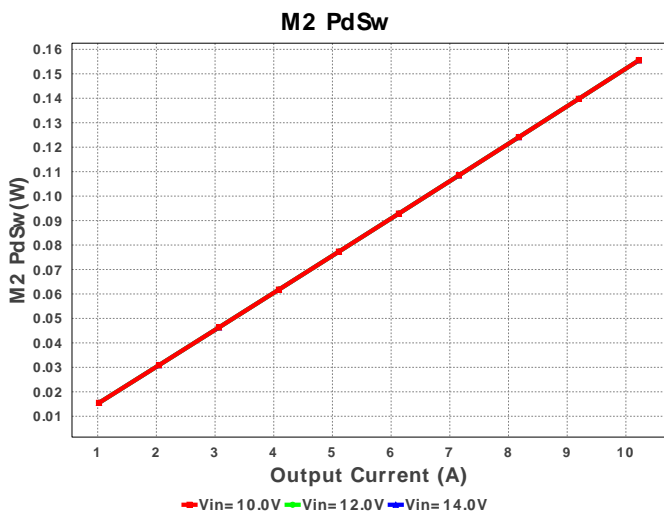
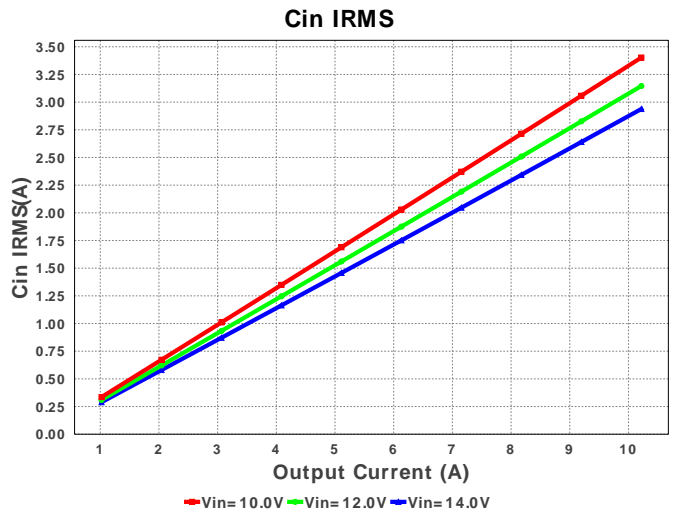
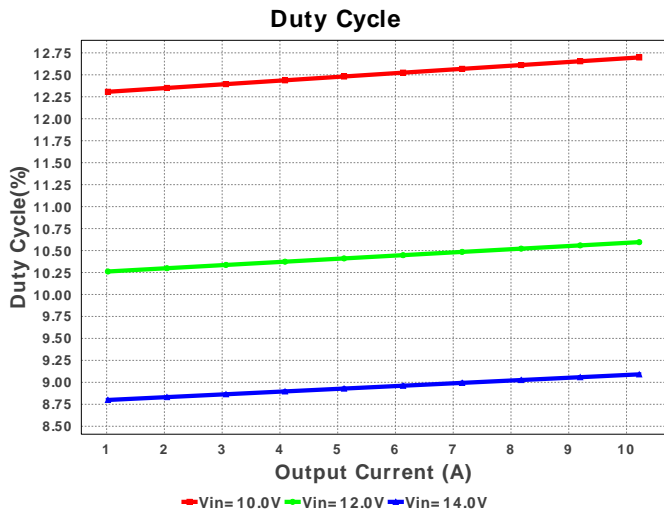
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 TPS40304DRCR 10.0V-14.0V to 1.20V @ 10.22A

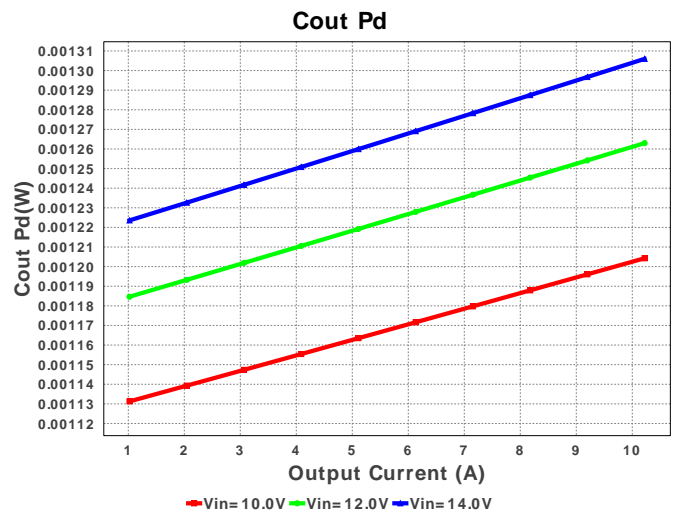
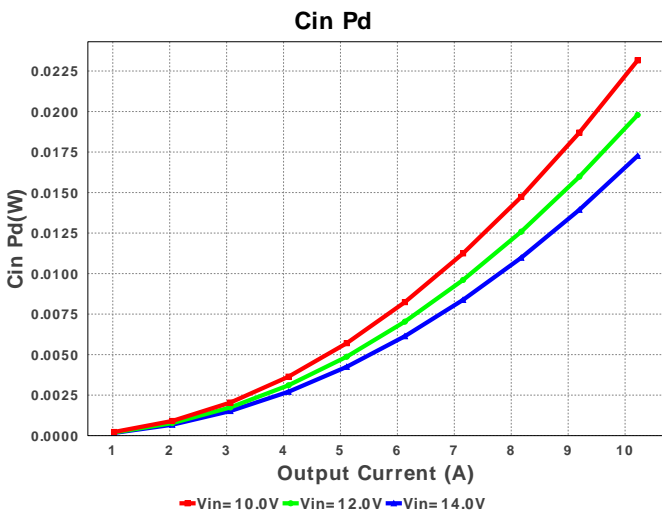
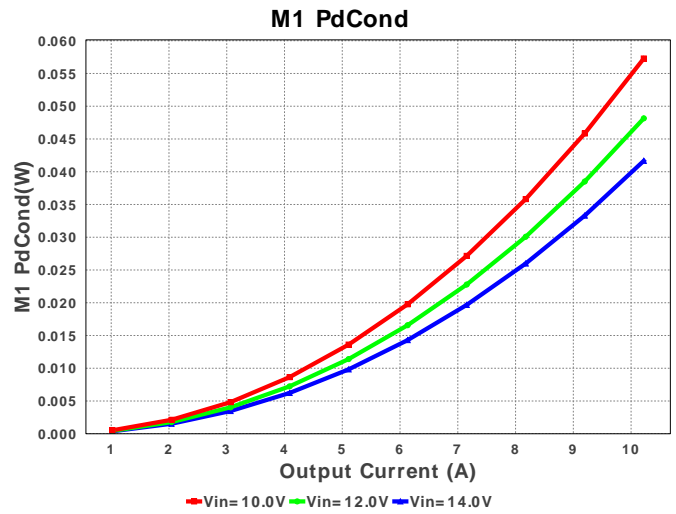
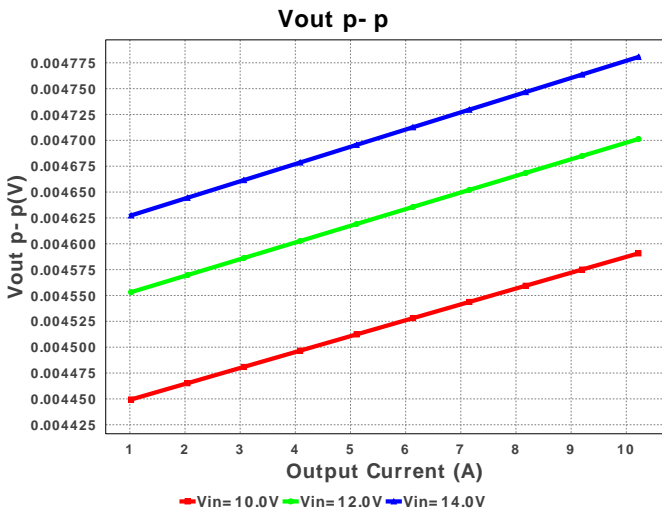
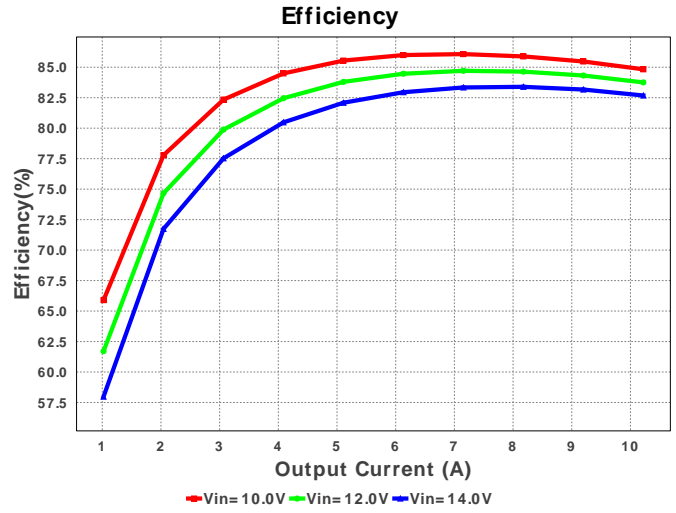
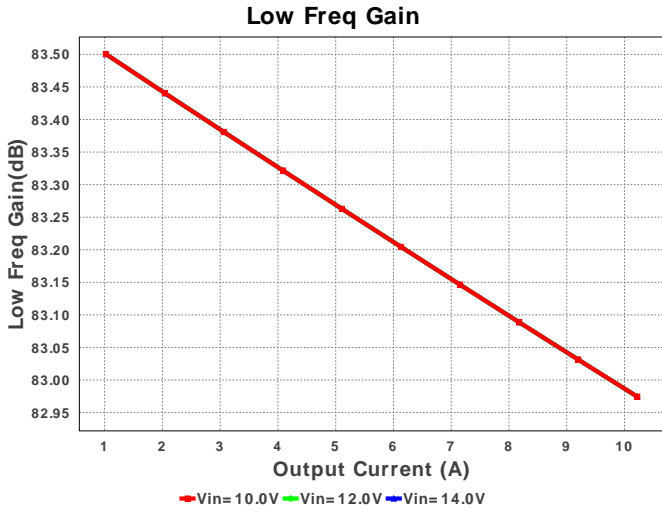


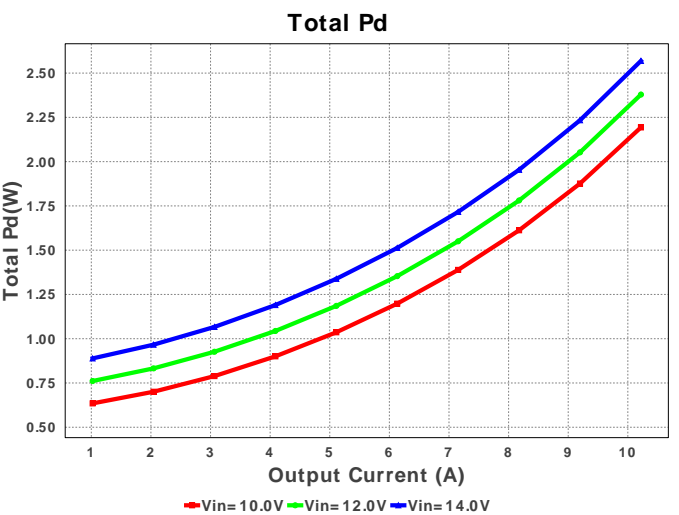
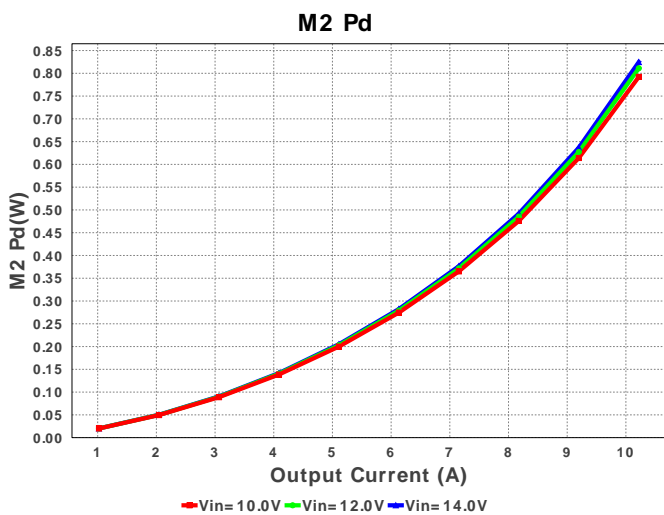
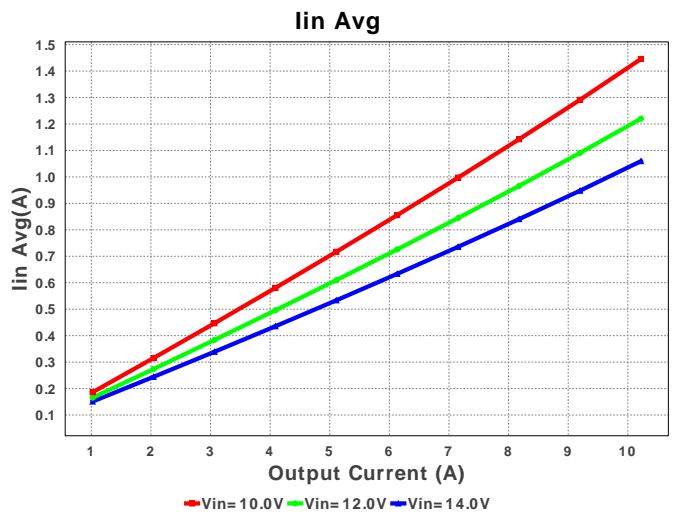
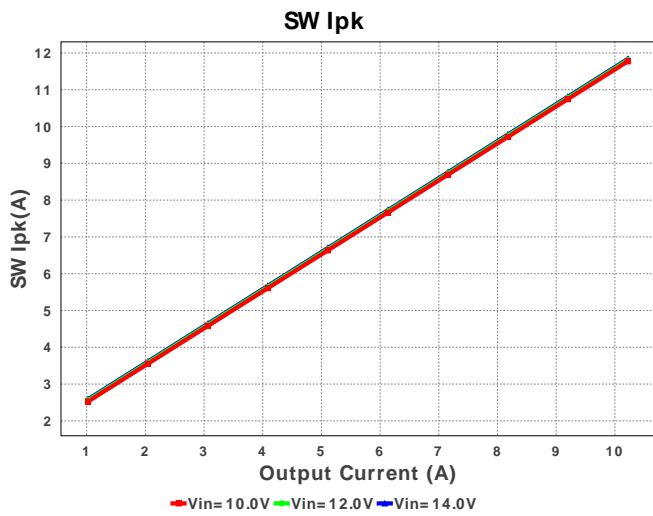
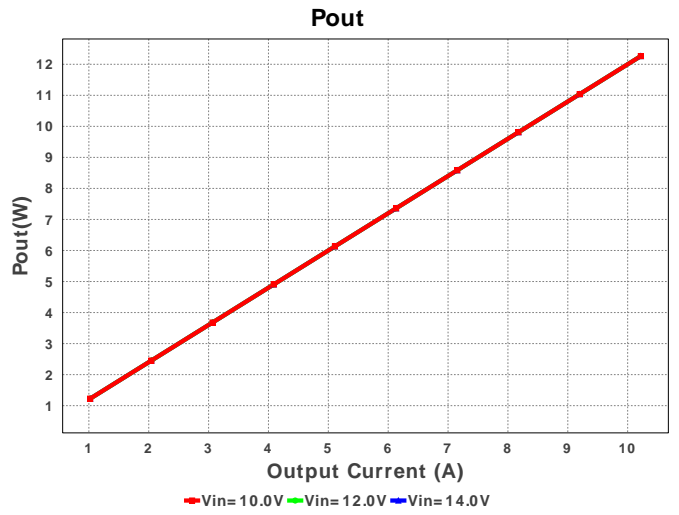
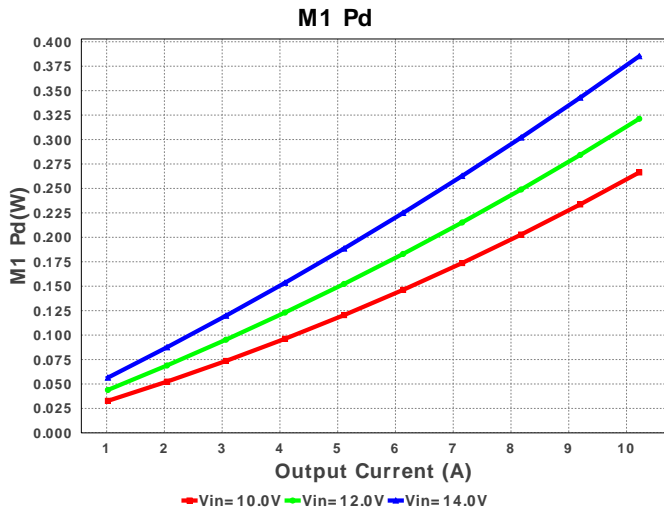
Electrical BOM

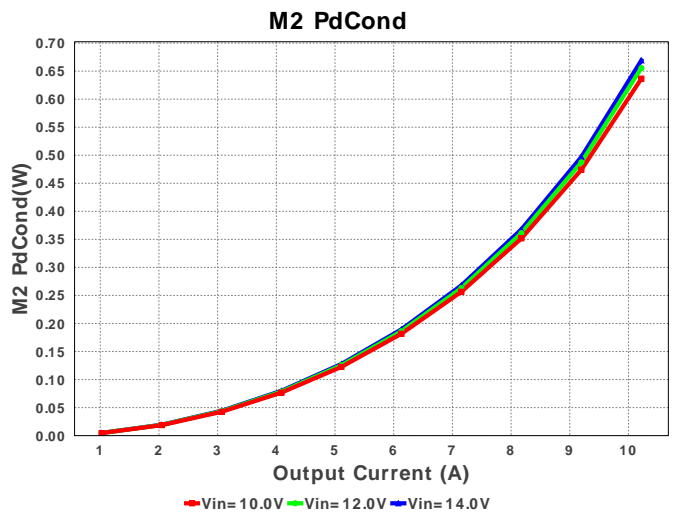
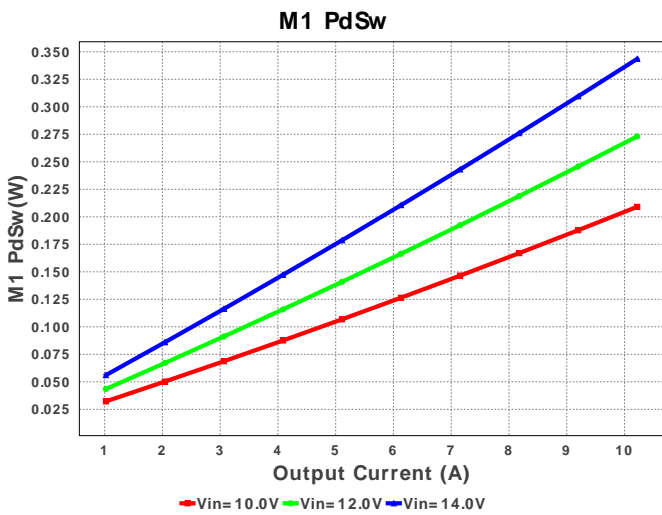
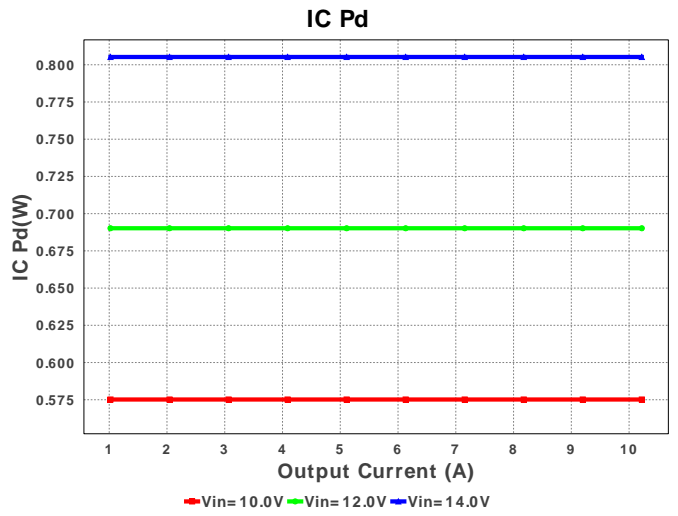
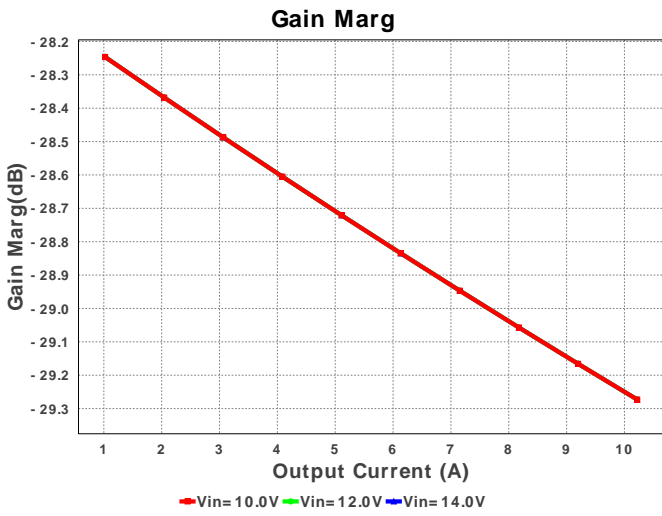
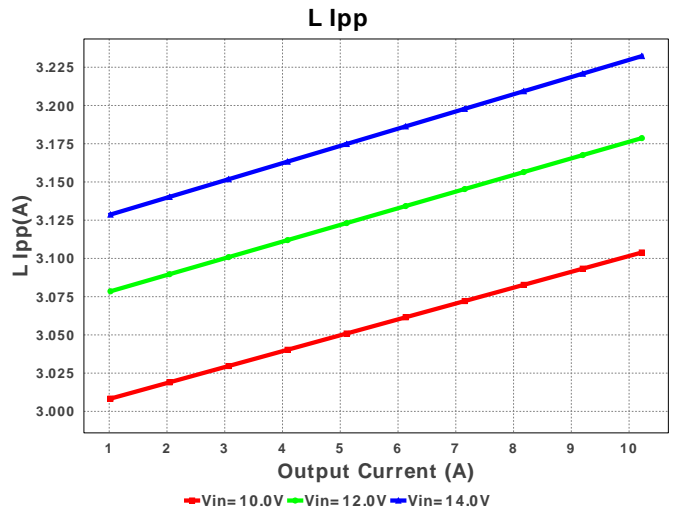
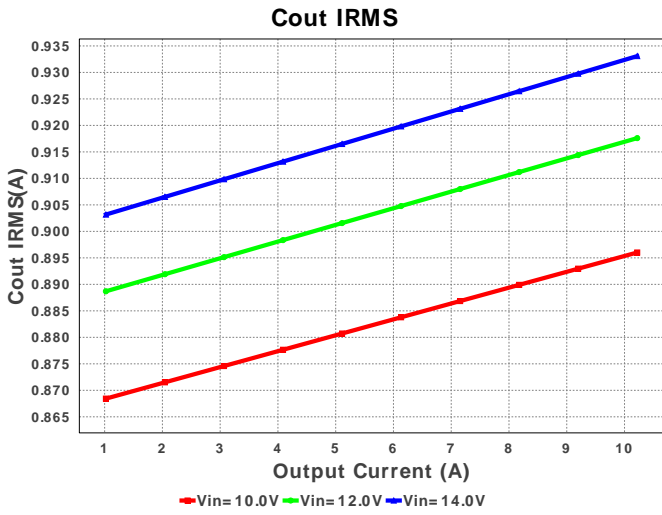
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
2.	Cbyp	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.02	 0603 5 mm ²
3.	Ccomp	Yageo America	CC0805KRX7R9BB562 Series= X7R	Cap= 5.6 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
4.	Ccomp2	Kemet	C0805C181K5GACTU Series= C0G/NP0	Cap= 180.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
5.	Ccomp3	MuRata	GRM033R71A182KA01D Series= X7R	Cap= 1.8 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 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	2	\$0.20	 1206 11 mm ²
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	Coilcraft	XAL5030-601MEB	L= 600.0 nH DCR= 4.1 mOhm	1	\$0.63	 XAL5030 54 mm ²
11.	M1	Texas Instruments	CSD17578Q3A	VdsMax= 30.0 V IdsMax= 28.0 Amps	2	\$0.25	 TRANS_NexFET_Q3A 18 mm ²
12.	M2	Texas Instruments	CSD17577Q3A	VdsMax= 30.0 V IdsMax= 19.0 Amps	1	\$0.28	 TRANS_NexFET_Q3A 18 mm ²

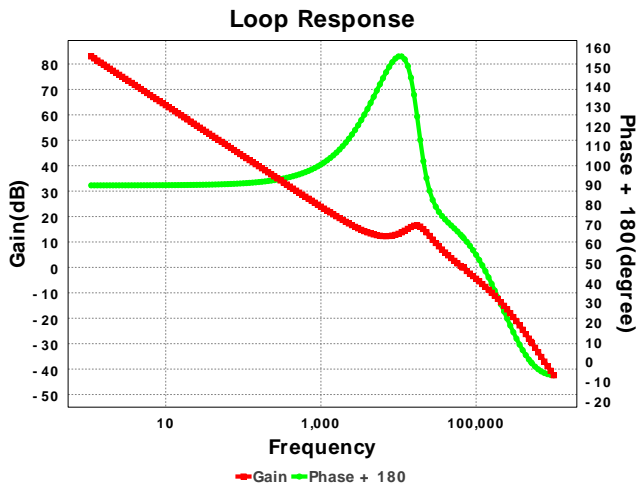
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
13.	Rcomp	Vishay-Dale	CRCW04023K24FKED Series= CRCW..e3	Res= 3.24 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
14.	Rcomp2	Vishay-Dale	CRCW0402332RFKED Series= CRCW..e3	Res= 332.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
15.	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
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	CRCW04024K53FKED Series= CRCW..e3	Res= 4.53 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	2.938 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	933.082 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.054 A	Current	Average input current
4.	L Ipp	3.232 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	11.836 A	Current	Peak switch current
6.	BOM Count	21	General	Total Design BOM count
7.	FootPrint	208.0 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	12.264 W	General	Total output power
11.	Total BOM	\$2.96	General	Total BOM Cost
12.	Low Freq Gain	83.263 dB	Op_Point	Gain at 10Hz
13.	Cross Freq	49.65 kHz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	9.091 %	Op_point	Duty cycle
15.	Efficiency	83.139 %	Op_point	Steady state efficiency
16.	IOUT_OP	10.22 A	Op_point	Iout operating point
17.	Phase Marg	65.216 deg	Op_point	Bode Plot Phase Margin
18.	VIN_OP	14.0 V	Op_point	Vin operating point
19.	Vout p-p	3.367 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	17.264 mW	Power	Input capacitor power dissipation
21.	Cout Pd	1.306 mW	Power	Output capacitor power dissipation
22.	IC Pd	805.224 mW	Power	IC power dissipation
23.	L Pd	535.298 mW	Power	Inductor power dissipation
24.	M1 Pd	384.963 mW	Power	M1 MOSFET total power dissipation
25.	M1 PdCond	41.406 mW	Power	M1 MOSFET conduction losses
26.	M1 PdSw	343.558 mW	Power	M1 MOSFET switching losses
27.	M2 Pd	743.142 mW	Power	M2 MOSFET total power dissipation
28.	M2 PdCond	587.633 mW	Power	M2 MOSFET conduction losses
29.	M2 PdSw	155.509 mW	Power	M2 MOSFET switching losses
30.	Total Pd	2.487 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	10.22	Maximum Output Current
2.	Iout1	10.22	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	1.2	Output Voltage
7.	Vout1	1.2	Output Voltage #1
8.	base_pn	TPS40304	Base Product 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.

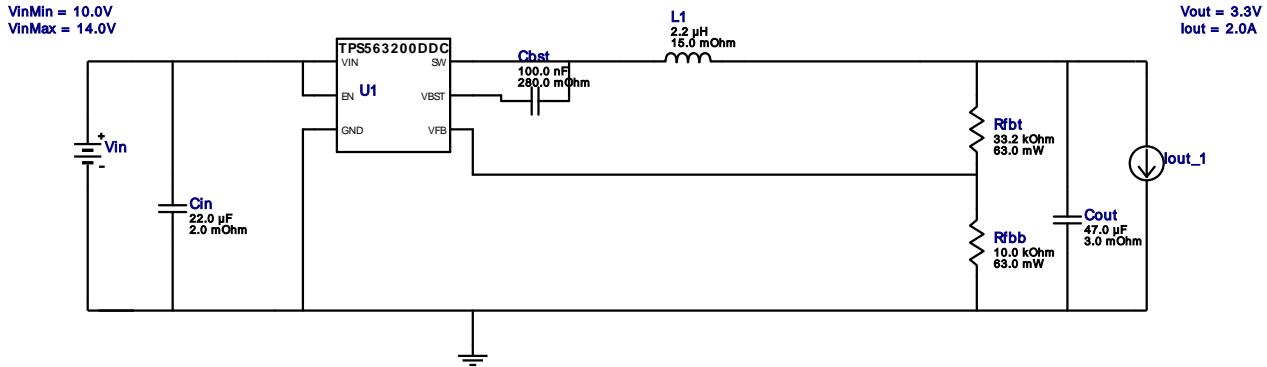


VinMin = 10.0V
 VinMax = 14.0V
 Vout = 3.3V
 Iout = 2.0A








Device = TPS563200DDCR
 Topology = Buck
 Created = 7/30/15 1:36:36 AM
 BOM Cost = \$1.05
 Footprint = 162.0 mm²
 BOM Count = 7
 Total Pd = 0.58W

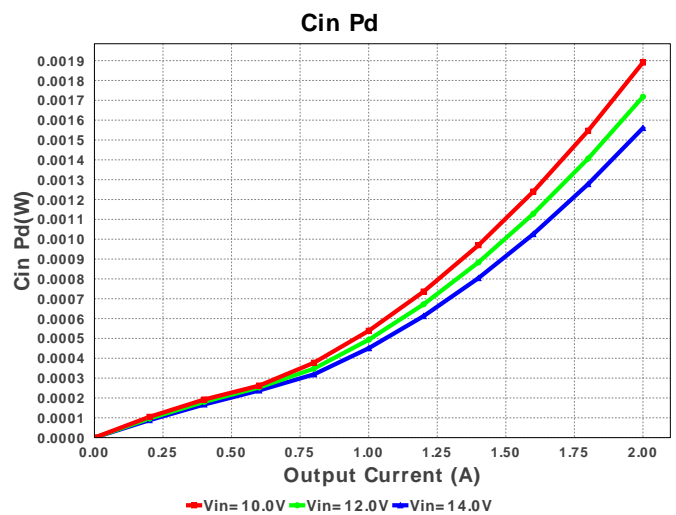
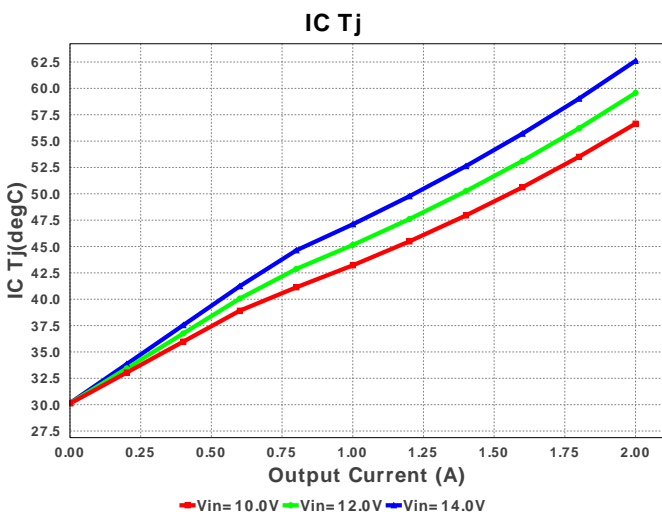
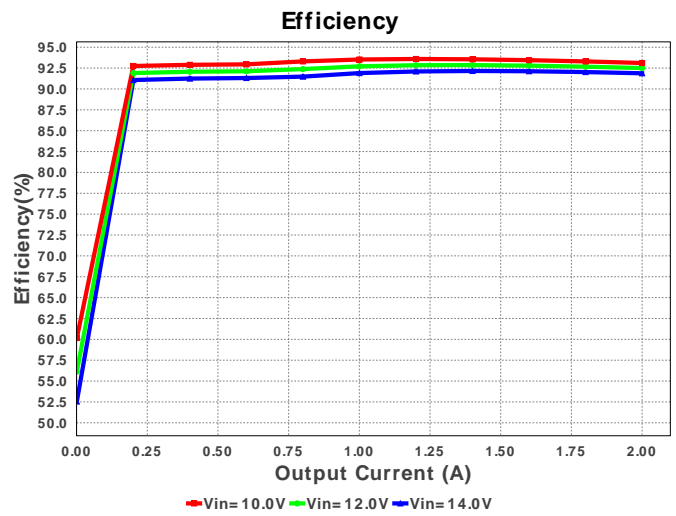
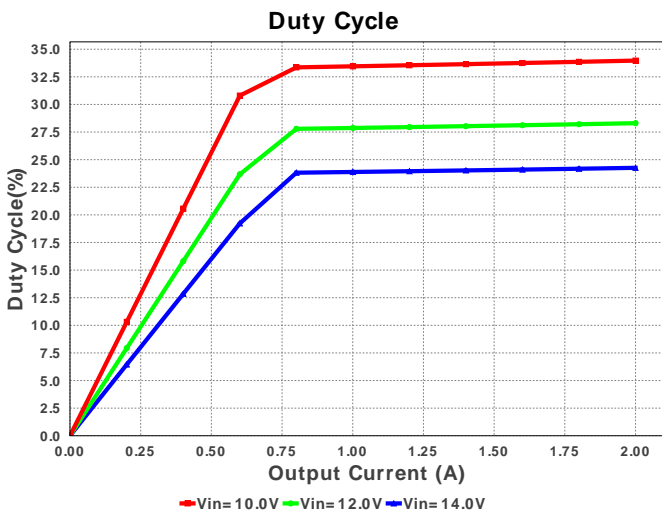
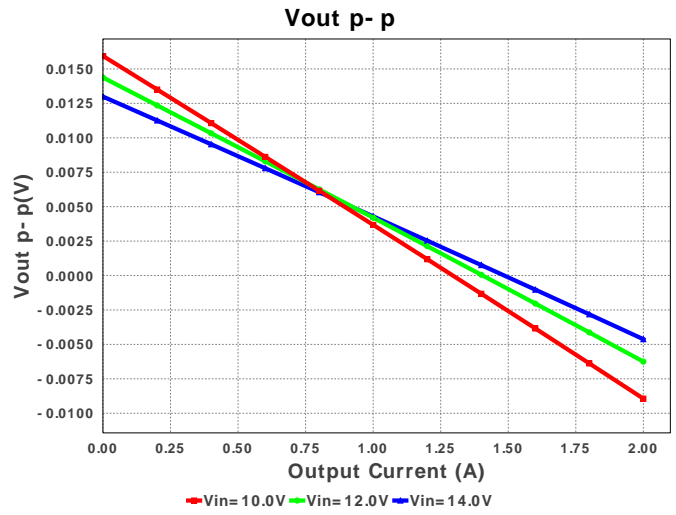
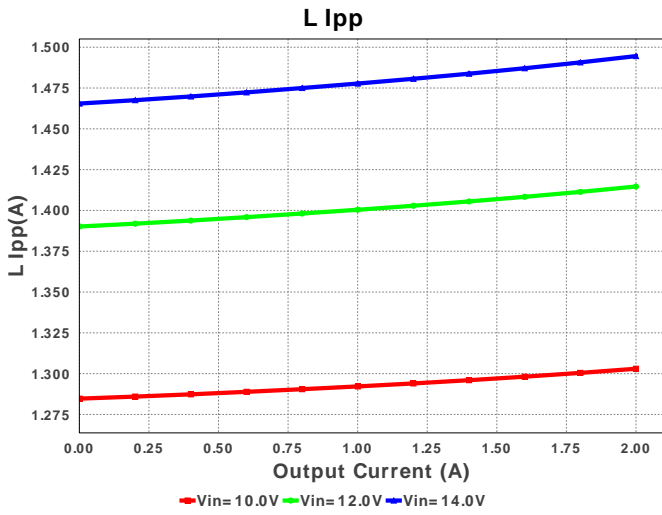
WEBENCH® Design Report

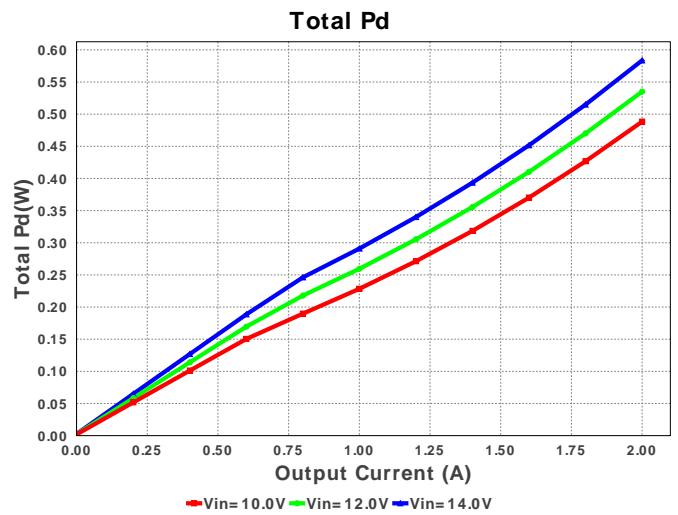
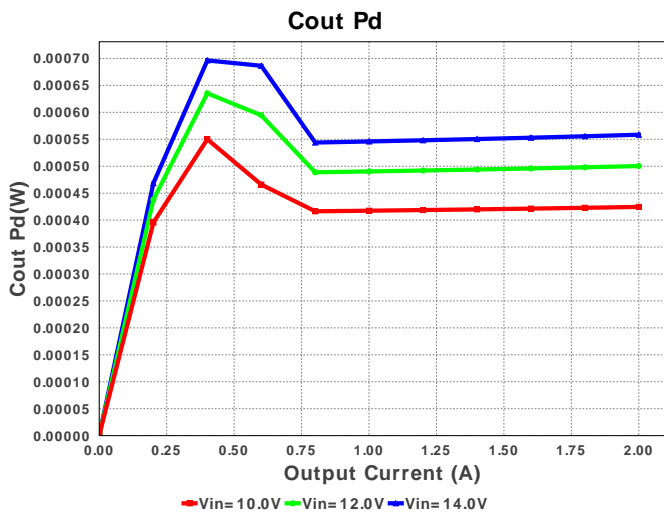
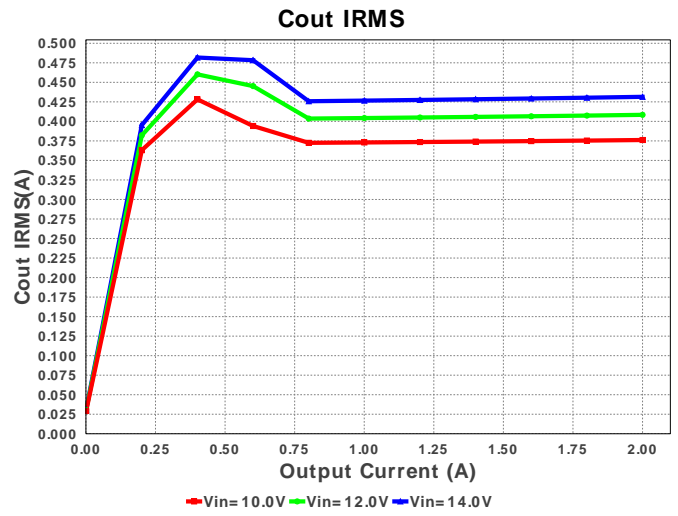
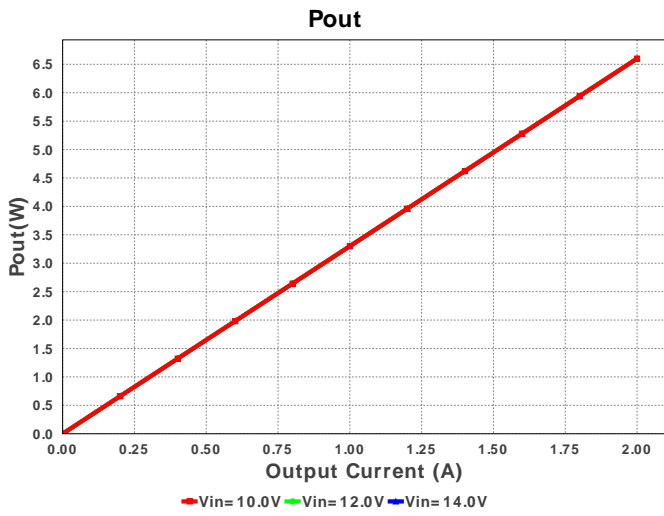
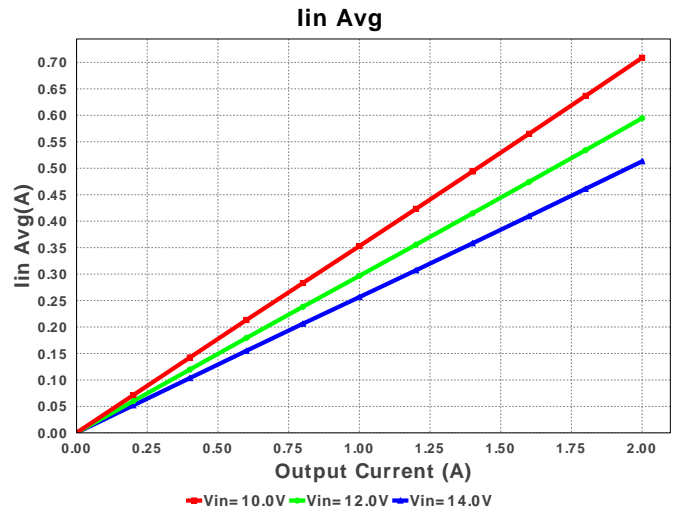
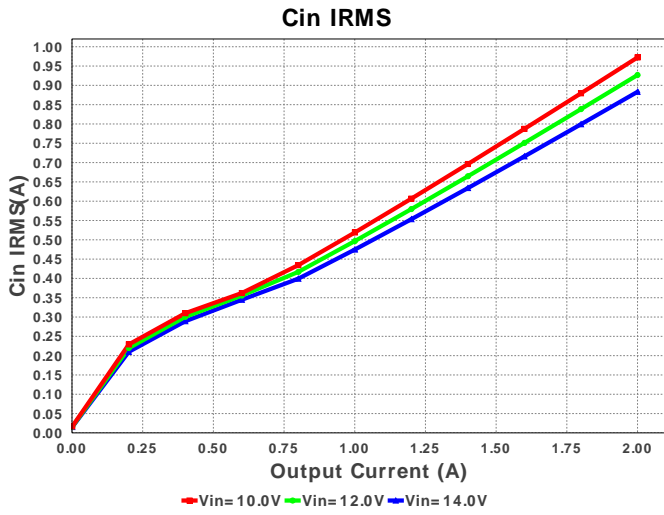
Design : 4368542/9 TPS563200DDCR
 TPS563200DDCR 10.0V-14.0V to 3.30V @ 2.0A

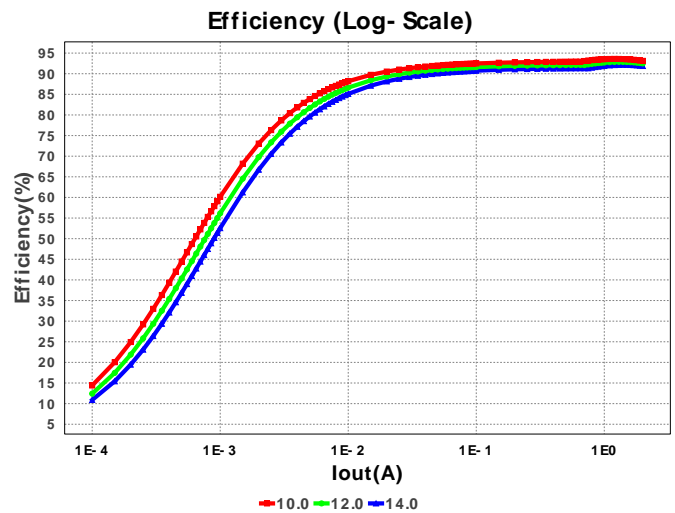
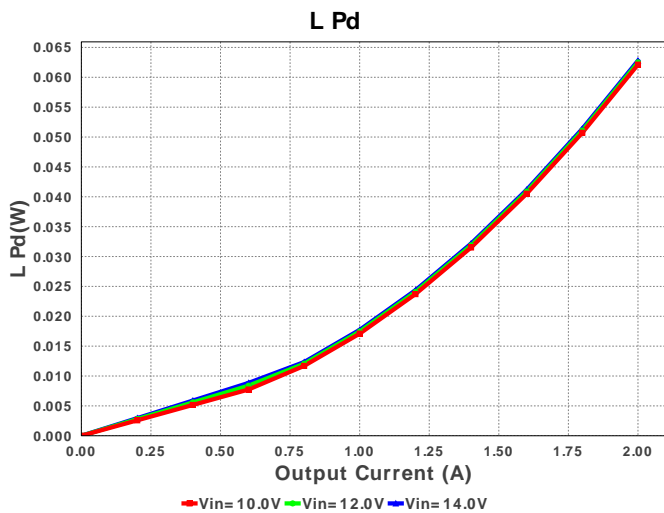
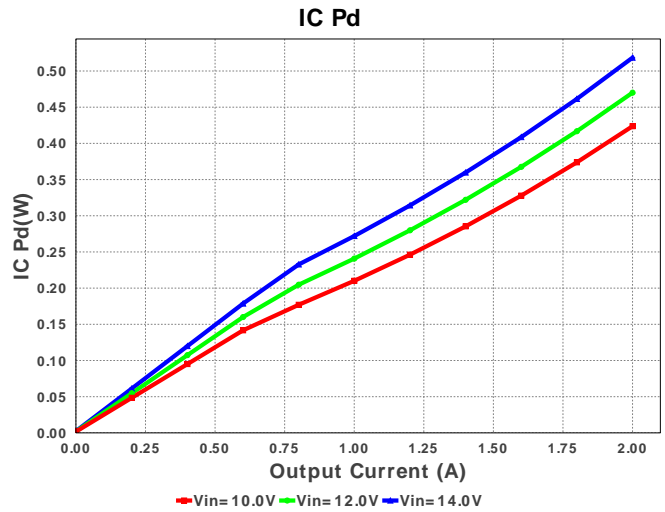
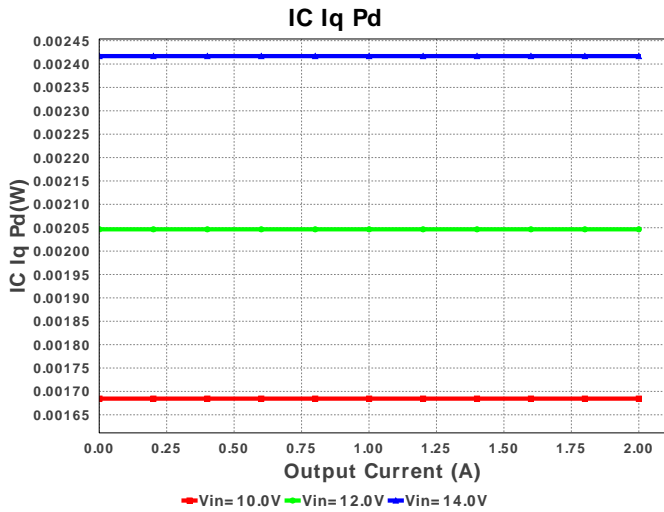


Electrical BOM

#	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	TDK	VLP8040T-2R2N	L= 2.2 uH DCR= 15.0 mOhm	1	\$0.22	 VLP8040 113 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.	Rfbt	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	883.261 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	431.441 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	513.11 mA	Current	Average input current
4.	L Ipp	1.495 A	Current	Peak-to-peak inductor ripple current
5.	BOM Count	7	General	Total Design BOM count
6.	FootPrint	162.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	780.419 kHz	General	Switching frequency
8.	Pout	6.6 W	General	Total output power
9.	Total BOM	\$1.05	General	Total BOM Cost
10.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
11.	Duty Cycle	24.26 %	Op_point	Duty cycle
12.	Efficiency	91.876 %	Op_point	Steady state efficiency
13.	IC Tj	62.609 degC	Op_point	IC junction temperature
14.	ICThetaJA	62.9 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	2.0 A	Op_point	Iout operating point
16.	VIN_OP	14.0 V	Op_point	Vin operating point
17.	Vout p-p	8.013 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	1.56 mW	Power	Input capacitor power dissipation
19.	Cout Pd	558.425 μW	Power	Output capacitor power dissipation
20.	IC Iq Pd	2.417 mW	Power	IC Iq Pd
21.	IC Pd	518.428 mW	Power	IC power dissipation
22.	L Pd	62.792 mW	Power	Inductor power dissipation
23.	Total Pd	583.591 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	Iout1	2.0	Output Current #1
3.	VinMax	14.0	Maximum input voltage
4.	VinMin	10.0	Minimum input voltage

#	Name	Value	Description
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	TPS563200	Base Product Number
8.	source	DC	Input Source Type
9.	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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