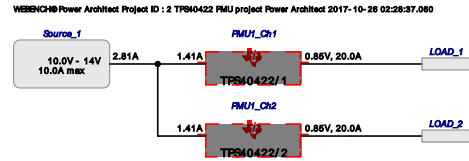


WEBENCH® Power Architect



Project Report

Project : 5019414/2 : TPS40422 PMU project
Created : 2017-10-26 02:28:37.060

Project Summary

- | | |
|-----------------------------------|------------|
| 1. Total System Efficiency | 86.341 % |
| 2. Total System BOM Count | 63.0 |
| 3. Total System Footprint | 1.211 kmm2 |
| 4. Total System BOM Cost | \$12.17 |
| 5. Total System Power Dissipation | 5.379 W |

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
PMU1_Ch1	0	LOAD_1	
PMU1_Ch2	0	LOAD_2	
PMU1	NA		

Power Supplies

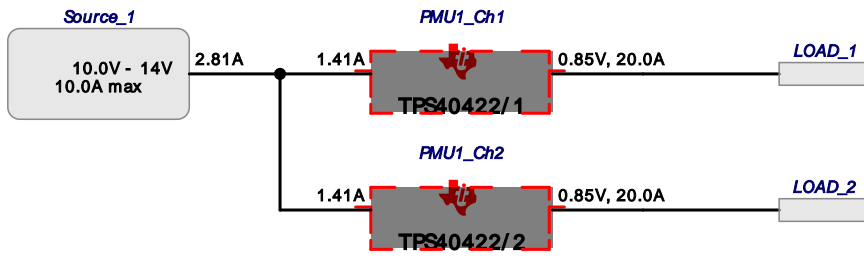
#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	PMU1_Ch1	TPS40422/1	Buck : Stackable 2 Channel Output Controller	0.85 V	20.0 A	86.3%	690	\$9.26	11	10
2.	PMU1_Ch2	TPS40422/2	Buck : Stackable 2 Channel Output Controller	0.85 V	20.0 A	86.3%	690	\$9.26	12	16
3.	PMU1	TPS40422	PMU : 4.5V to 20V Input Voltage High Current Dual Output Buck Controller	V	NaN A	86.3%	1211	\$12.17	10	4

Power Loads

#	Name	VLoad	Iload	Description
1.	LOAD_1	0.85 V	20.0 A	VoutRipple=10%
2.	LOAD_2	0.85 V	20.0 A	VoutRipple=10%

Project Diagram

WEBENCH® Power Architect Project ID : 2 TPS40422 PMU project Power Architect 2017-10-26 02:28:37.060



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	06035A470KAT2A	0603	4	\$0.01	19
AVX	08053C104KAT2A	0805	4	\$0.01	27
Panasonic	2R5SVPC1500M	SM_RADIAL_8MM	8	\$0.76	453
Kemet	C0603C105Z8VACTU	0603	1	\$0.01	5
Kemet	C0805C102K5RACTU	0805	12	\$0.01	81
TDK	C1005X5R1V105K050BC	0402	1	\$0.03	3
TDK	C1608X5R1H474K080AB	0603	4	\$0.03	19
Yageo America	CC0805KRX7R9BB152	0805	4	\$0.01	27
Vishay-Dale	CRCW040210K2FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW04021K05FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW04022K32FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW040236K5FKED	0402	2	\$0.01	6
Vishay-Dale	CRCW04024R99FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW040271K5FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW08053R32FKEA	0805	4	\$0.01	27
Texas Instruments	CSD86360Q5D	DQY0008A	4	\$0.99	224
MuRata	GRM155R60J104KA01D	0402	1	\$0.01	3
MuRata	GRM188R60J105KA01D	0603	1	\$0.01	5
MuRata	GRM188R71H202KA01D	0603	4	\$0.01	19
MuRata	GRM31CR60J476ME19L	1206_190	4	\$0.11	44
MuRata	GRM32ER61E226KE15L	1210	12	\$0.18	59
Fairchild Semiconductor	MMBT3904	SOT-23	4	\$0.05	56
Yageo America	RC0603FR-0724KL	0603	4	\$0.01	19
Yageo America	RC0805FR-0710RL	0805	8	\$0.01	54
Susumu Co Ltd	RR1220P-103-D	0805	9	\$0.01	61
Texas Instruments	TPS40422RHAR	RHA0040B	5	\$2.15	332
Coilcraft	XAL8080-681MEB	XAL8080	4	\$1.55	428
Total			121	\$30.69	2020.0225

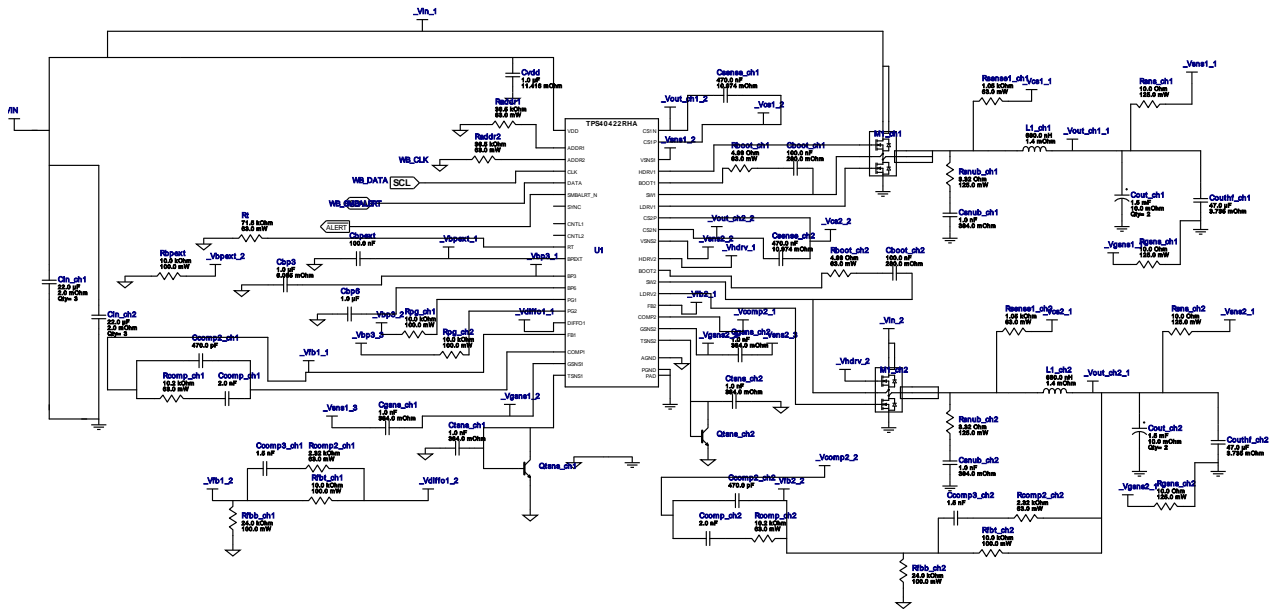


Vout = 0.85V
Iout = 20.0A

Device = TPS40422RHAR
Topology = PMU
Created = 2017-10-26 02:28:35.536
BOM Cost = \$12.17
BOM Count = 63
Total Pd = 5.38W

WEBENCH® Design Report

Design : 5019414/10 TPS40422RHAR
Design 10 - TPS40422RHAR



1. This schematic shows all the components for this Power Management Unit. The block diagram on the left shows how the channels are connected. Use the drop down PMU Options selector below the optimization dial on the summary page to get the details for each channel. Or click on the block diagram on the left to select a specific channel.

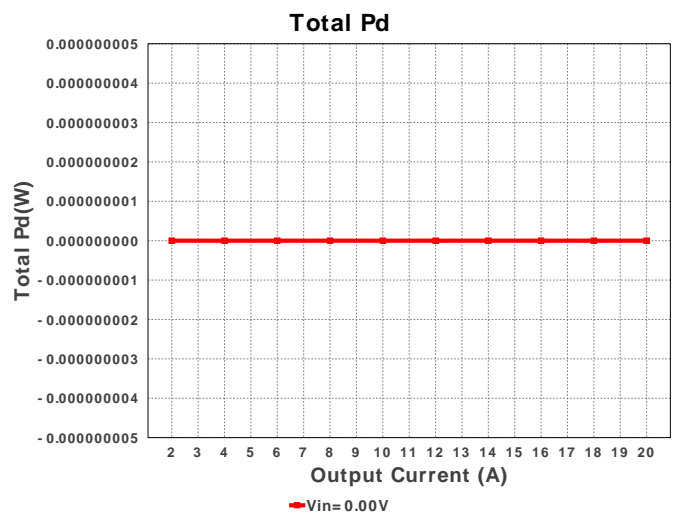
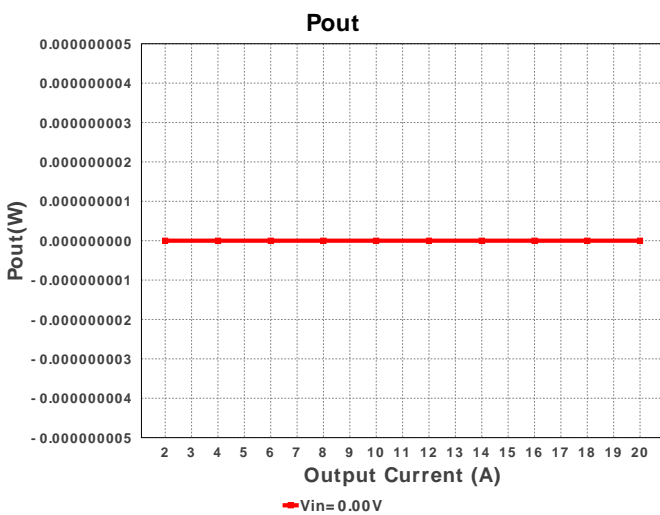
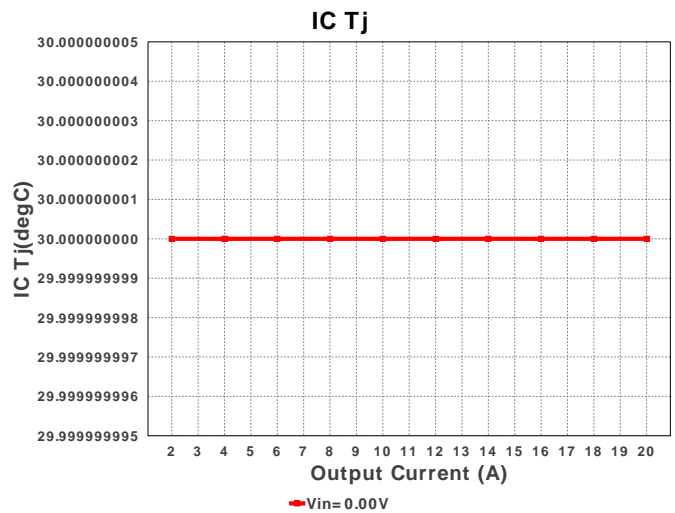
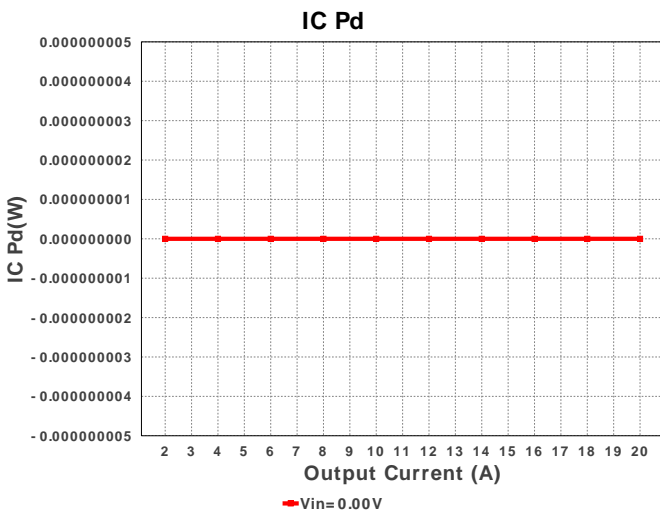
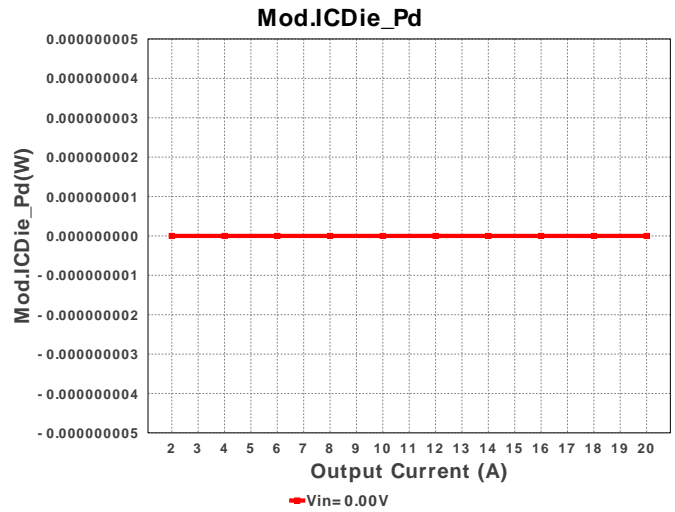
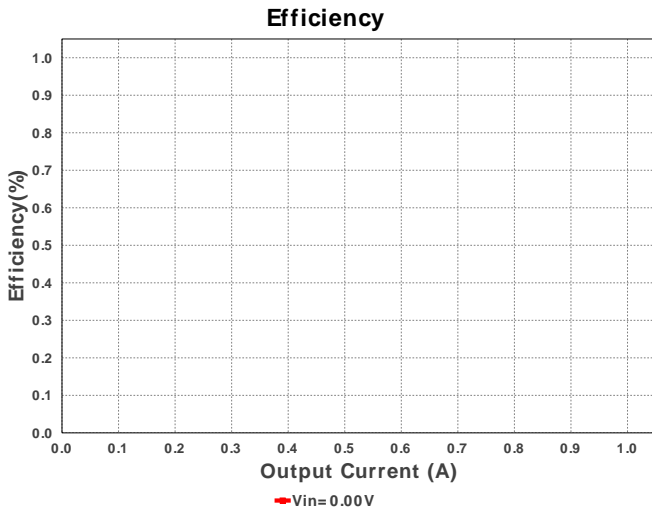
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot_ch1 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.	Cboot_ch2 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
3.	Cbp3	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
4.	Cbp6	Kemet	C0603C105Z8VACTU Series= Y5V	Cap= 1.0 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
5.	Cbpxt	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
6.	Ccomp2_ch1AVX		06035A470KAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
7.	Ccomp2_ch2AVX		06035A470KAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
8.	Ccomp3_ch1Yageo America		CC0805KRX7R9BB152 Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Ccomp3_ch3	Tageo America	CC0805KRX7R9BB152 Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
10.	Ccomp_ch1	MuRata	GRM188R71H202KA01D Series= X7R	Cap= 2.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
11.	Ccomp_ch2	MuRata	GRM188R71H202KA01D Series= X7R	Cap= 2.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
12.	Cgsns_ch1	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
13.	Cgsns_ch2	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
14.	Cin_ch1	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	3	\$0.18	 1210 15 mm ²
15.	Cin_ch2	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	3	\$0.18	 1210 15 mm ²
16.	Cout_ch1	Panasonic	2R5SVPC1500M Series= SVPC	Cap= 1.5 mF ESR= 10.0 mOhm VDC= 2.5 V IRMS= 5.15 A	2	\$0.76	 SM_RADIAL_8MM 113 mm ²
17.	Cout_ch2	Panasonic	2R5SVPC1500M Series= SVPC	Cap= 1.5 mF ESR= 10.0 mOhm VDC= 2.5 V IRMS= 5.15 A	2	\$0.76	 SM_RADIAL_8MM 113 mm ²
18.	Couthf_ch1	MuRata	GRM31CR60J476ME19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	\$0.11	 1206_190 11 mm ²
19.	Couthf_ch2	MuRata	GRM31CR60J476ME19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	\$0.11	 1206_190 11 mm ²
20.	Csense_ch1	TDK	C1608X5R1H474K080AB Series= X5R	Cap= 470.0 nF ESR= 10.974 mOhm VDC= 50.0 V IRMS= 1.57483 A	1	\$0.03	 0603 5 mm ²
21.	Csense_ch2	TDK	C1608X5R1H474K080AB Series= X5R	Cap= 470.0 nF ESR= 10.974 mOhm VDC= 50.0 V IRMS= 1.57483 A	1	\$0.03	 0603 5 mm ²
22.	Csub_ch1	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
23.	Csub_ch2	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
24.	Ctsns_ch1	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25.	Ctsns_ch2	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
26.	Cvdd	TDK	C1005X5R1V105K050BC Series= X5R	Cap= 1.0 uF ESR= 11.416 mOhm VDC= 35.0 V IRMS= 1.483 A	1	\$0.03	 0402 3 mm ²
27.	L1_ch1	Coilcraft	XAL8080-681MEB	L= 680.0 nH DCR= 1.4 mOhm	1	\$1.55	 XAL8080 107 mm ²
28.	L1_ch2	Coilcraft	XAL8080-681MEB	L= 680.0 nH DCR= 1.4 mOhm	1	\$1.55	 XAL8080 107 mm ²
29.	M1_ch1	Texas Instruments	CSD86360Q5D	PowerBlock	1	\$0.99	 DQY0008A 56 mm ²
30.	M1_ch2	Texas Instruments	CSD86360Q5D	PowerBlock	1	\$0.99	 DQY0008A 56 mm ²
31.	Qtsns_ch1	Fairchild Semiconductor	MMBT3904	Bipolar Transistor	1	\$0.05	 SOT-23 14 mm ²
32.	Qtsns_ch2	Fairchild Semiconductor	MMBT3904	Bipolar Transistor	1	\$0.05	 SOT-23 14 mm ²
33.	Raddr1	Vishay-Dale	CRCW040236K5FKED Series= CRCW..e3	Res= 36.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
34.	Raddr2	Vishay-Dale	CRCW040236K5FKED Series= CRCW..e3	Res= 36.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
35.	Rboot_ch1	Vishay-Dale	CRCW04024R99FKED Series= CRCW..e3	Res= 4.99 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
36.	Rboot_ch2	Vishay-Dale	CRCW04024R99FKED Series= CRCW..e3	Res= 4.99 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
37.	Rbpxt	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
38.	Rcomp2_ch1	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
39.	Rcomp2_ch2	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
40.	Rcomp_ch1	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
41.	Rcomp_ch2	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
42.	Rfbb_ch1	Yageo America	RC0603FR-0724KL Series= ?	Res= 24.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
43.	Rfbb_ch2	Yageo America	RC0603FR-0724KL Series= ?	Res= 24.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
44.	Rfbt_ch1	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
45.	Rfbt_ch2	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
46.	Rgsns_ch1	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
47.	Rgsns_ch2	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
48.	Rpg_ch1	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
49.	Rpg_ch2	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
50.	Rsense1_ch1	Mishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
51.	Rsense1_ch2	Mishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
52.	Rsns_ch1	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
53.	Rsns_ch2	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
54.	Rsns_ch1	Vishay-Dale	CRCW08053R32FKEA Series= CRCW..e3	Res= 3.32 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
55.	Rsns_ch2	Vishay-Dale	CRCW08053R32FKEA Series= CRCW..e3	Res= 3.32 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
56.	Rt	Vishay-Dale	CRCW040271K5FKED Series= CRCW..e3	Res= 71.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
57.	U1	Texas Instruments	TPS40422RHAR	Switcher	1	\$2.15	 RHA0040B 66 mm ²



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	63	General	Total Design BOM count
2.	FootPrint	1.211 k mm ²	General	Total PMU footprint area of BOM components
3.	Pout	34.0 W	General	Total PMU output power
4.	Total BOM	\$12.17	General	Total BOM Cost
5.	Efficiency	86.341 %	Op_point	PMU steady state efficiency
6.	IC Tj	53.916 degC	Op_point	PMU IC junction temperature
7.	ICThetaJA	31.1 degC/W	Op_point	IC junction-to-ambient thermal resistance
8.	M1_ch1 TjOP	63.255 degC	Op_point	Power Block junction temperature
9.	M1_ch2 TjOP	63.255 degC	Op_point	Power Block junction temperature
10.	Cin_ch1 Pd	16.444 mW	Power	Input capacitor power dissipation
11.	Cin_ch2 Pd	16.444 mW	Power	Input capacitor power dissipation

#	Name	Value	Category	Description
12.	Cout_ch1 Pd	8.442 mW	Power	Output capacitor power dissipation
13.	Cout_ch2 Pd	8.442 mW	Power	Output capacitor power dissipation
14.	IC Pd	769.0 mW	Power	IC Pd
15.	L1_ch1 Pd	562.364 mW	Power	Inductor power dissipation
16.	L1_ch2 Pd	562.364 mW	Power	Inductor power dissipation
17.	M1_ch1 Pd	1.663 W	Power	Power Block power dissipation
18.	M1_ch2 Pd	1.663 W	Power	Power Block power dissipation
19.	Module ICPd	769.0 mW	Power	IC Pd
20.	Total Pd	5.379 W	Power	PMU total power dissipation
21.	Total Pd	5.379 W	Power	PMU total power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	20.0	Maximum Output Current
2.	Iout1	20.0	Output Current #1
3.	Iout2	20.0	Output Current #2
4.	Vin1Max	14.0	Maximum Input Voltage #1
5.	Vin1Min	10.0	Minimum Input Voltage #1
6.	Vin2Max	14.0	Maximum Input Voltage #2
7.	Vin2Min	10.0	Minimum Input Voltage #2
8.	Vout	850.0 m	Output Voltage
9.	Vout1	850.0 m	Output Voltage #1
10.	Vout2	850.0 m	Output Voltage #2
11.	base_pn	TPS40422	Base Product Number
12.	source	DC	Input Source Type
13.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40422** Product Folder : <http://www.ti.com/product/tps40422> : contains the data sheet and other resources.

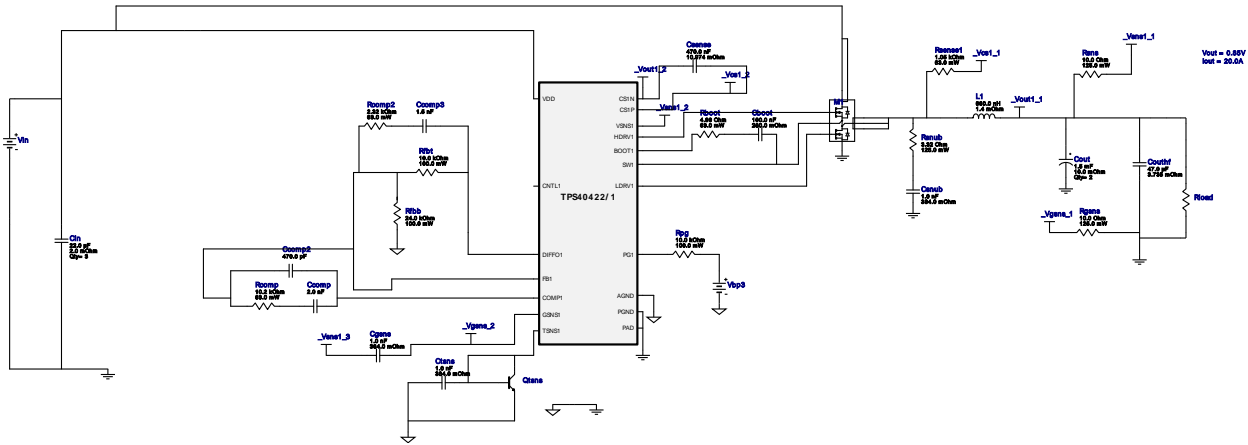


Vout = 0.85V
Iout = 20.0A

Device = TPS40422RHAR
Topology = Buck
Created = 2017-10-26 02:28:35.913
BOM Cost = \$NaN
BOM Count = NaN
Total Pd = 2.69W


















WEBENCH® Design Report

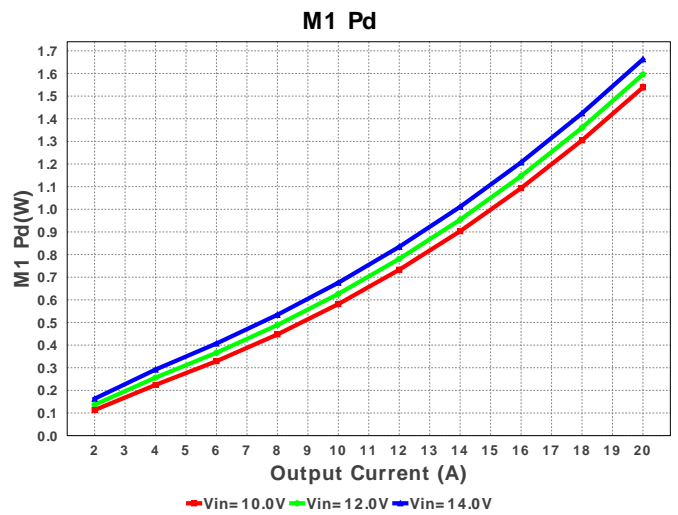
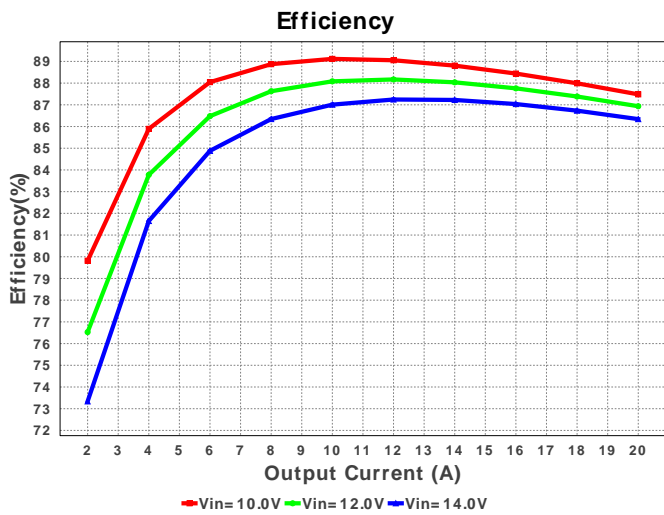
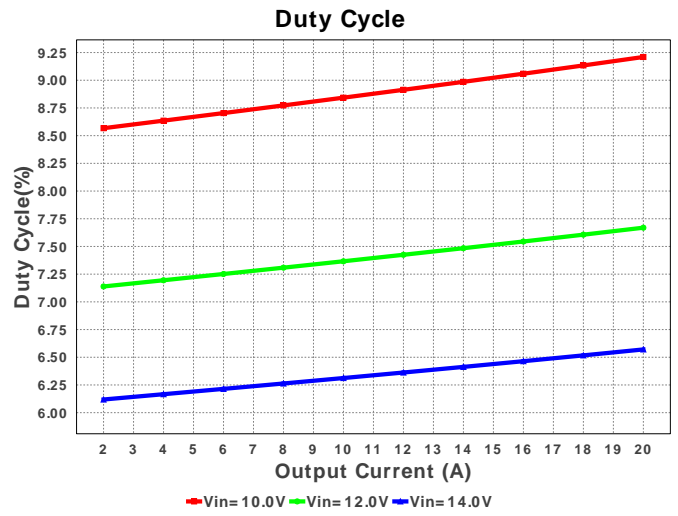
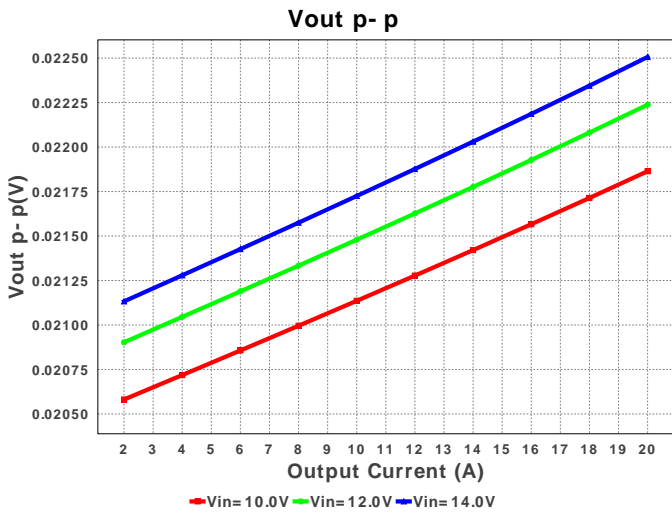
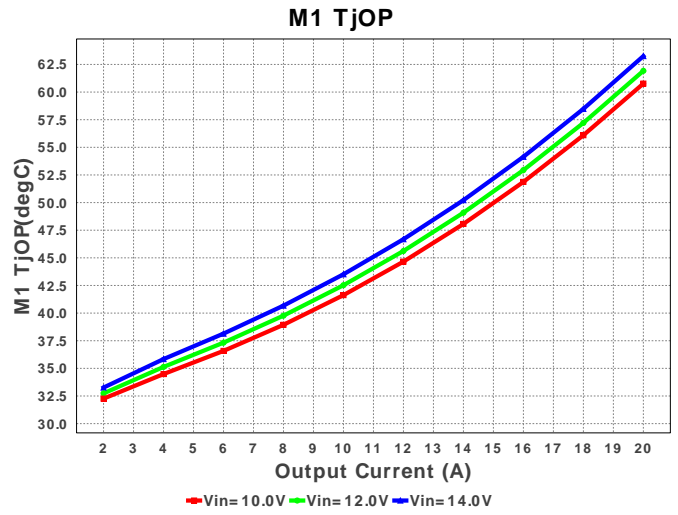
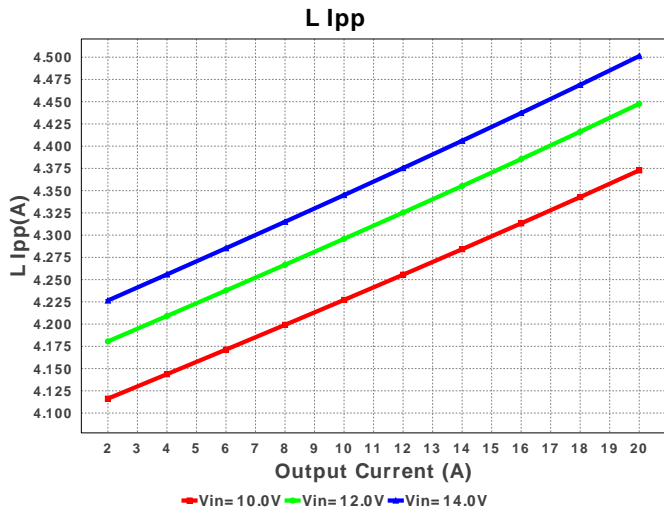
Design : 5019414/11 TPS40422RHAR
TPS40422RHAR 10.0V-14.0V to .85V @ 20.0A

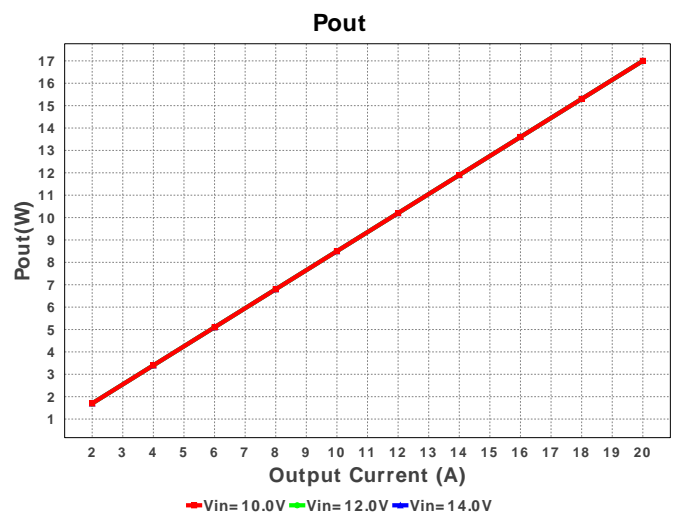
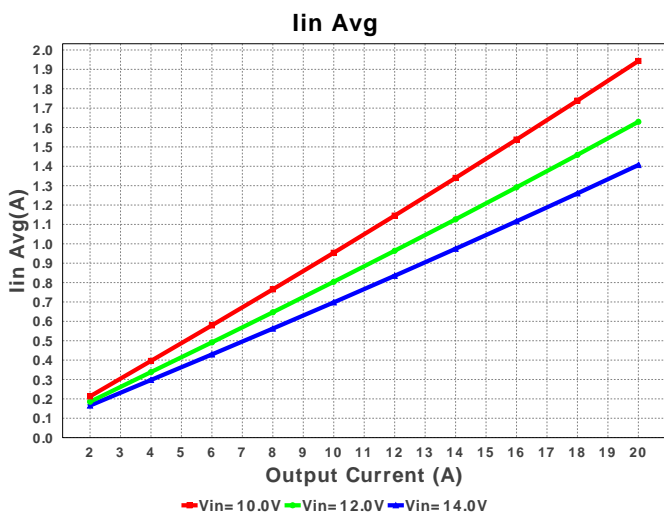
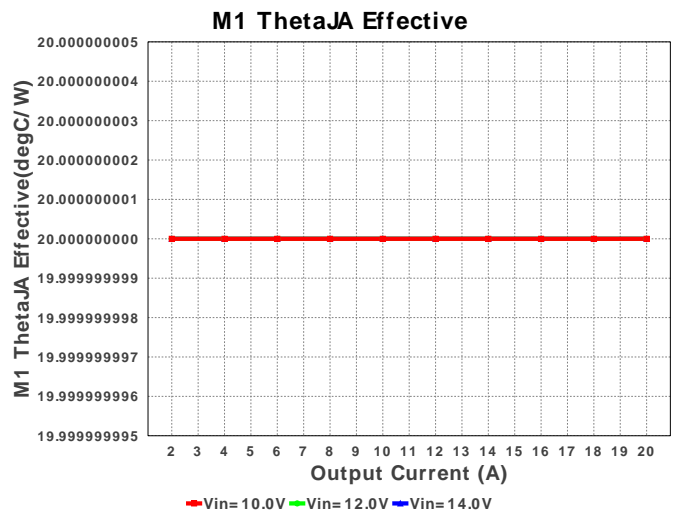
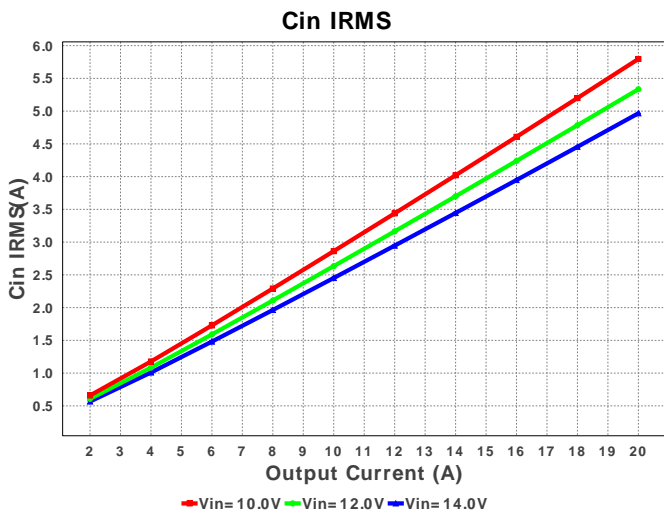
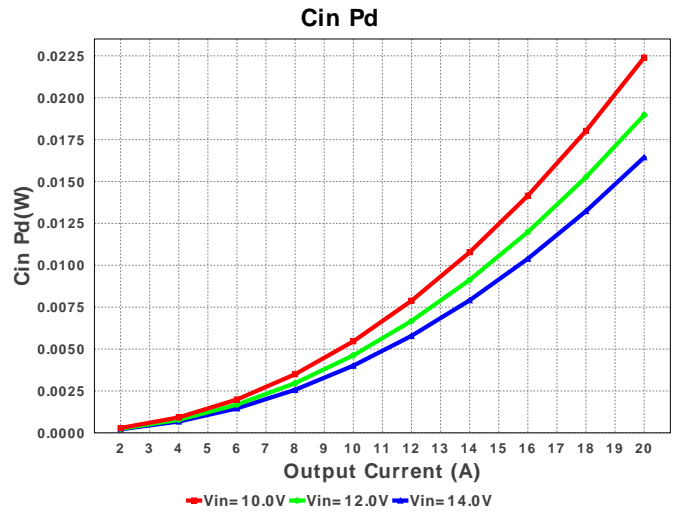
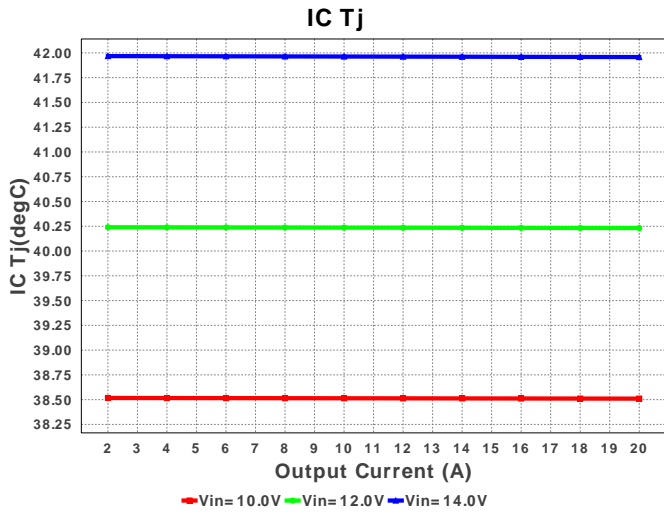


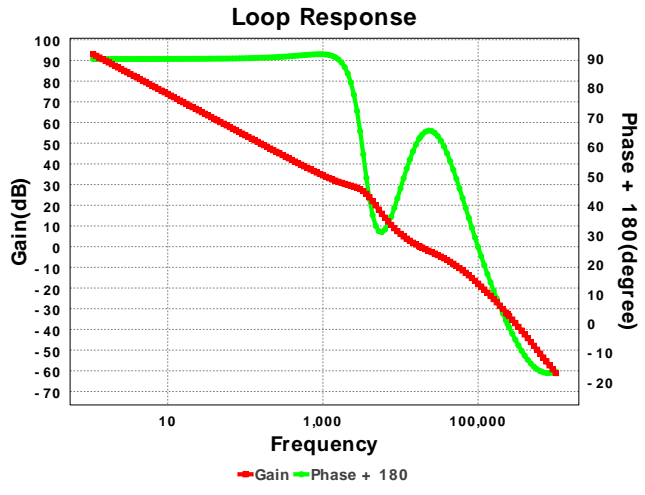
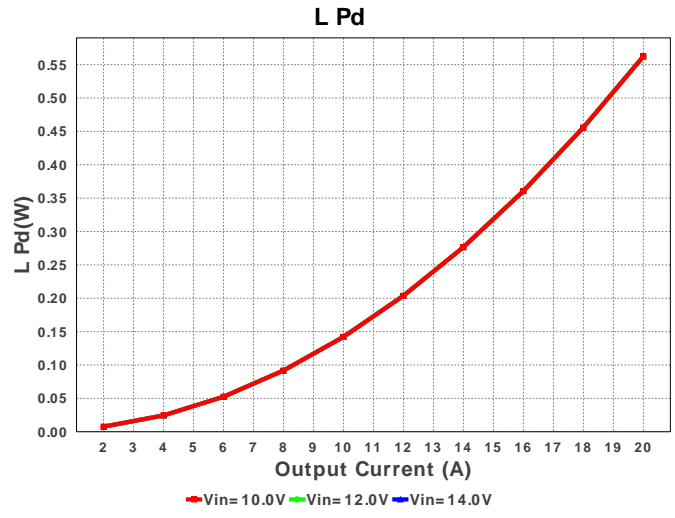
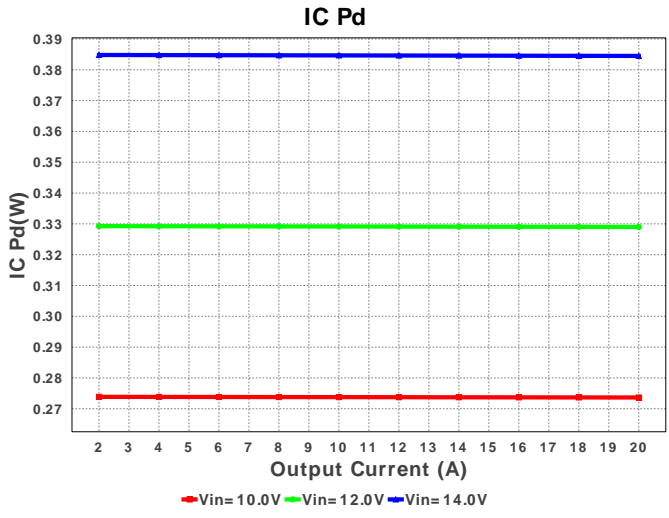
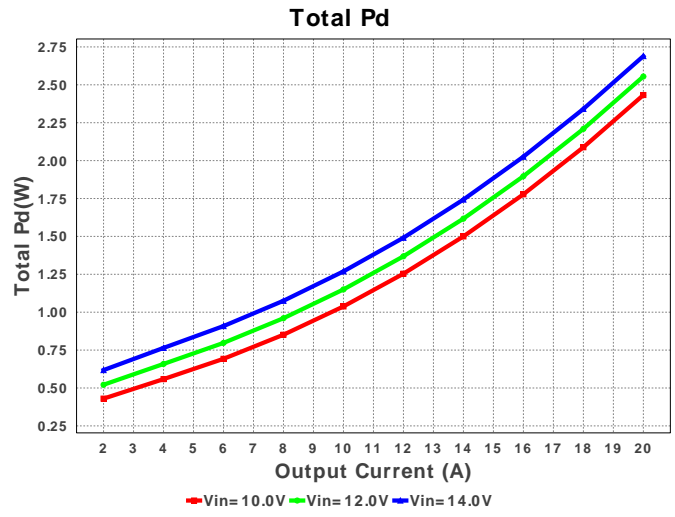
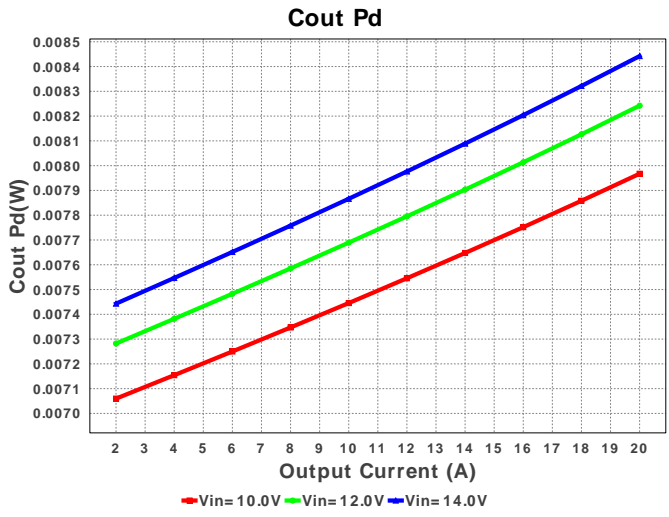
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	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.	Ccomp	MuRata	GRM188R71H202KA01D Series= X7R	Cap= 2.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
3.	Ccomp2	AVX	06035A470KAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
4.	Ccomp3	Yageo America	CC0805KRX7R9BB152 Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Cgsns	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	0805 7 mm ²
6.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	3	\$0.18	1210 15 mm ²
7.	Cout	Panasonic	2R5SVPC1500M Series= SVPC	Cap= 1.5 mF ESR= 10.0 mOhm VDC= 2.5 V IRMS= 5.15 A	2	\$0.76	 SM_RADIAL_8MM 113 mm ²
8.	Couthf	MuRata	GRM31CR60J476ME19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	\$0.11	1206_190 11 mm ²
9.	Csense	TDK	C1608X5R1H474K080AB Series= X5R	Cap= 470.0 nF ESR= 10.974 mOhm VDC= 50.0 V IRMS= 1.57483 A	1	\$0.03	0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Csusb	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
11.	Ctsns	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
12.	L1	Coilcraft	XAL8080-681MEB	L= 680.0 nH DCR= 1.4 mOhm	1	\$1.55	 XAL8080 107 mm ²
13.	M1	Texas Instruments	CSD86360Q5D	PowerBlock	1	\$0.99	 DQY0008A 56 mm ²
14.	Qtsns	Fairchild Semiconductor	MMBT3904	Bipolar Transistor	1	\$0.05	 SOT-23 14 mm ²
15.	Rboot	Vishay-Dale	CRCW04024R99FKED Series= CRCW..e3	Res= 4.99 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Rcomp	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rcomp2	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rfbb	Yageo America	RC0603FR-0724KL Series= ?	Res= 24.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
19.	Rfbt	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
20.	Rgsns	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
21.	Rpg	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
22.	Rsense1	Vishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
23.	Rsns	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
24.	Rsusb	Vishay-Dale	CRCW08053R32FKEA Series= CRCW..e3	Res= 3.32 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
25.	U1	Texas Instruments	TPS40422RHAR	Switcher	0	\$2.15	 RHA0040B 66 mm ²
26.	U1	Texas Instruments	TPS40422RHAR	Switcher	0	\$2.15	 RHA0040B 66 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.967 A	Current	Input capacitor RMS ripple current
2.	Iin Avg	1.406 A	Current	Average input current
3.	L Ipp	4.501 A	Current	Peak-to-peak inductor ripple current
4.	Frequency	279.72 kHz	General	Switching frequency
5.	IC Tolerance	3.0 mV	General	IC Feedback Tolerance
6.	Mode	CCM	General	Conduction Mode
7.	Pout	17.0 W	General	Total output power
8.	Low Freq Gain	93.008 dB	Op_Point	Gain at 1Hz
9.	M1 ThetaJA Effective	20.0 degC/W	Op_Point	Effective Power Block Junction-to-Ambient Thermal Resistance
10.	Vout Actual	850.0 mV	Op_Point	Vout Actual calculated based on selected voltage divider resistors
11.	Vout OP	850.0 mV	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
12.	Cross Freq	17.945 kHz	Op_point	Bode plot crossover frequency
13.	Duty Cycle	6.571 %	Op_point	Duty cycle
14.	Efficiency	86.341 %	Op_point	PMU channel steady state efficiency
15.	Gain Marg	-32.693 dB	Op_point	Bode Plot Gain Margin
16.	ICThetaJA	31.1 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	20.0 A	Op_point	Iout operating point
18.	M1 TjOP	63.255 degC	Op_point	Power Block junction temperature
19.	Phase Marg	63.447 deg	Op_point	Bode Plot Phase Margin
20.	VIN_OP	14.0 V	Op_point	Vin operating point
21.	Vout p-p	22.506 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	16.444 mW	Power	Input capacitor power dissipation
23.	Cout Pd	8.442 mW	Power	Output capacitor power dissipation
24.	IC Pd	384.5 mW	Power	IC power dissipation
25.	L Pd	562.364 mW	Power	Inductor power dissipation
26.	M1 Pd	1.663 W	Power	Power Block power dissipation
27.	Total Pd	2.689 W	Power	PMU channel power dissipation
28.	Vout Tolerance	947.86 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	20.0	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	850.0 m	Output Voltage
5.	base_pn	TPS40422/1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40422/1** Product Folder : <http://www.ti.com/product/tps40422> : contains the data sheet and other resources.

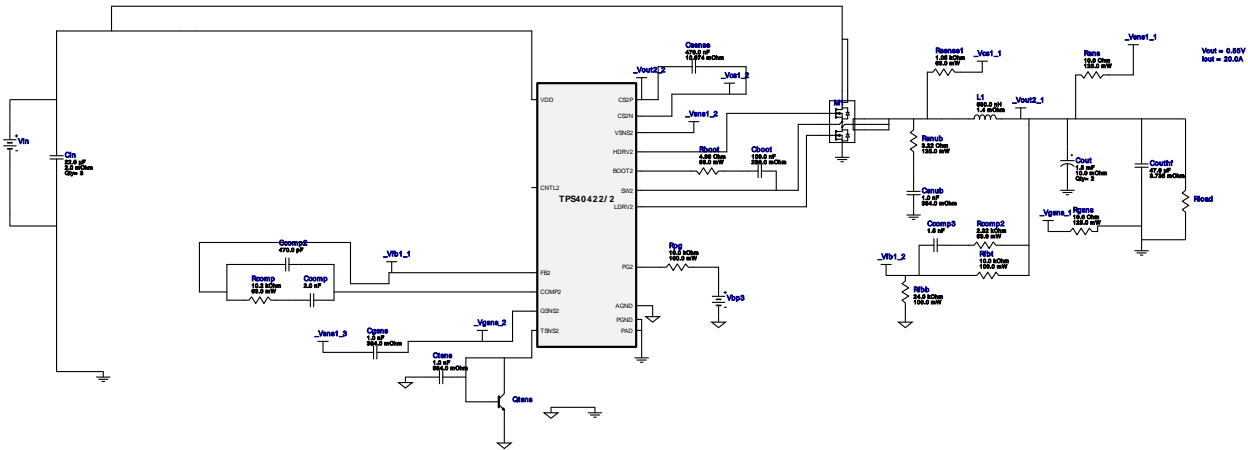


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Iout = 20.0A

Device = TPS40422RHAR
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WEBENCH® Design Report

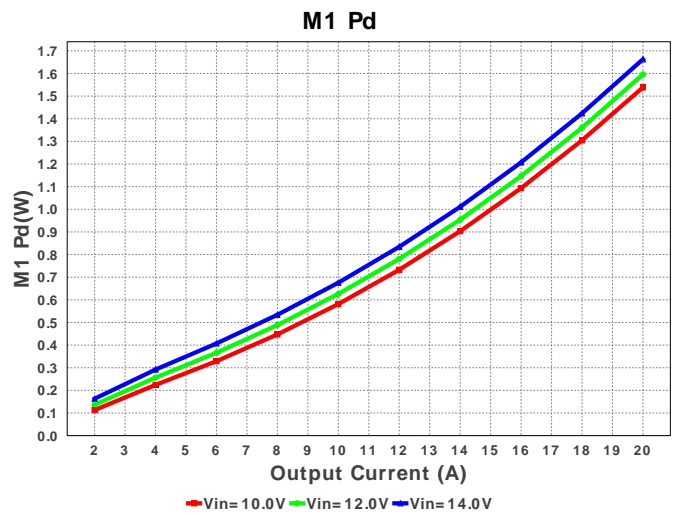
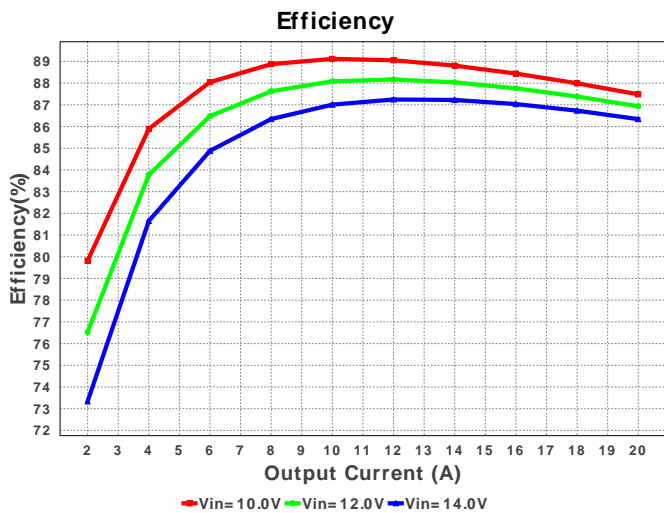
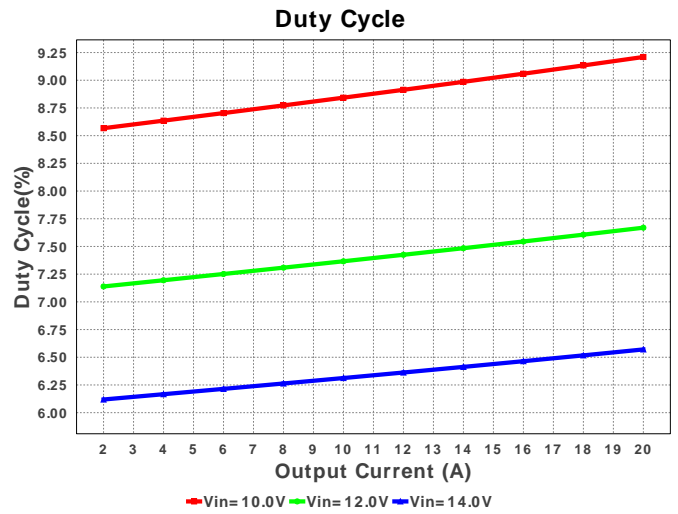
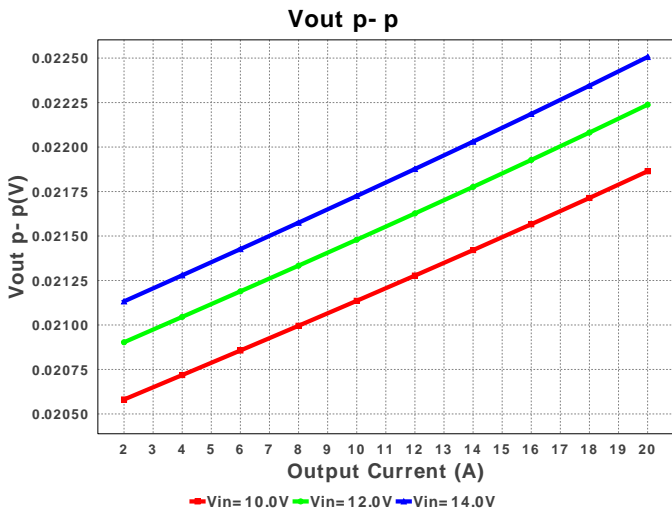
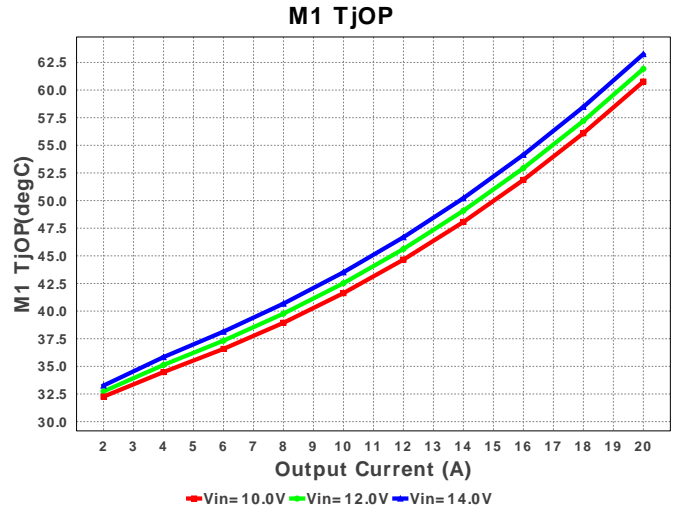
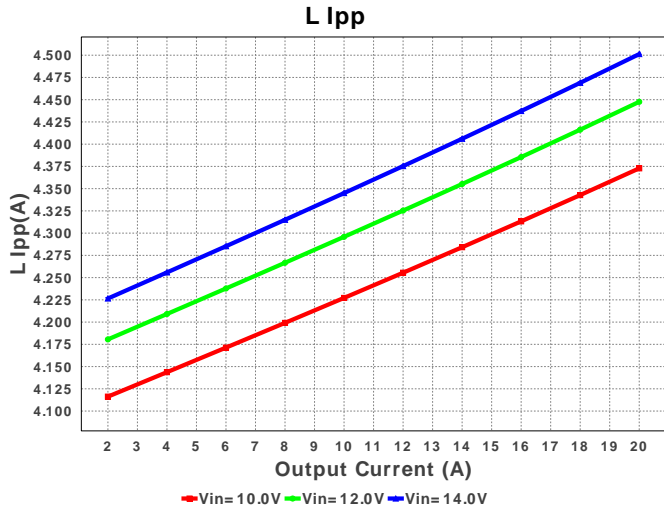
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TPS40422RHAR 10.0V-14.0V to .85V @ 20.0A

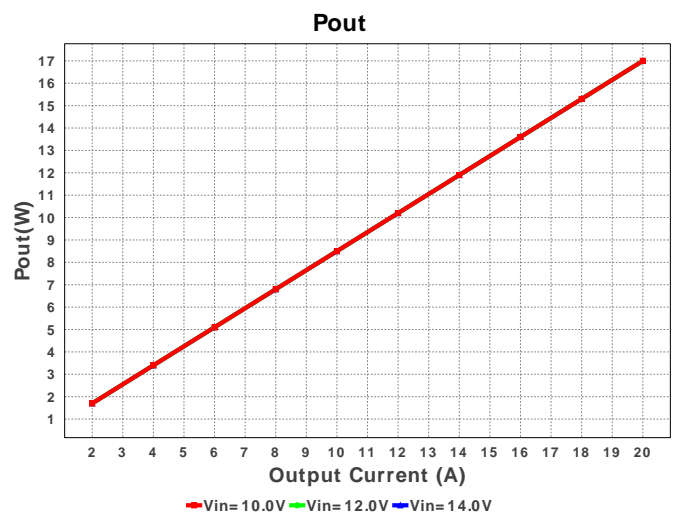
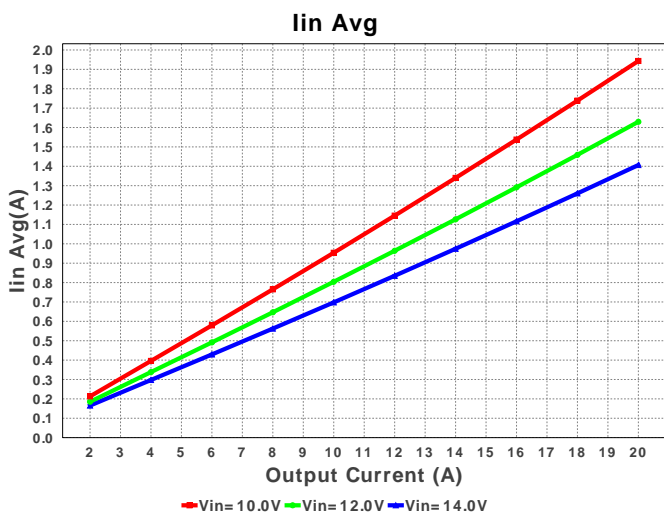
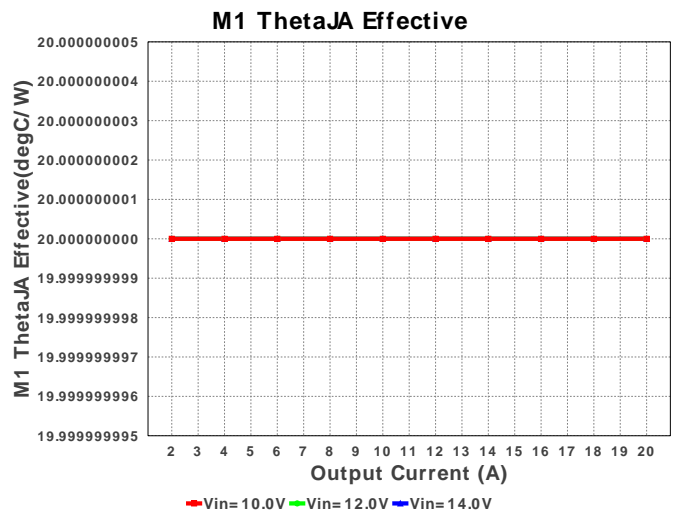
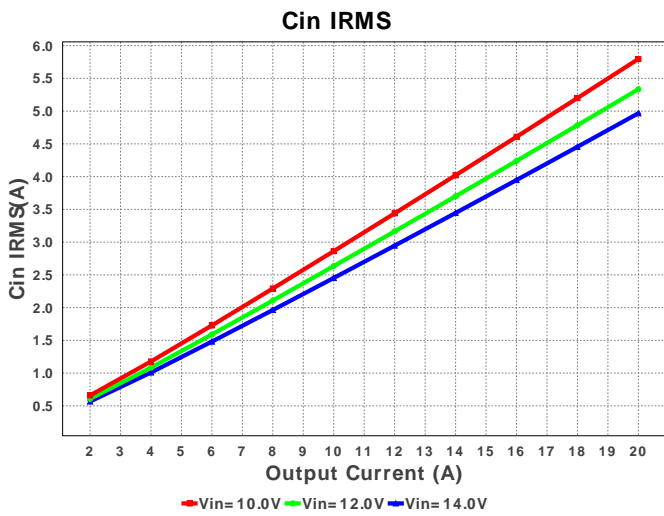
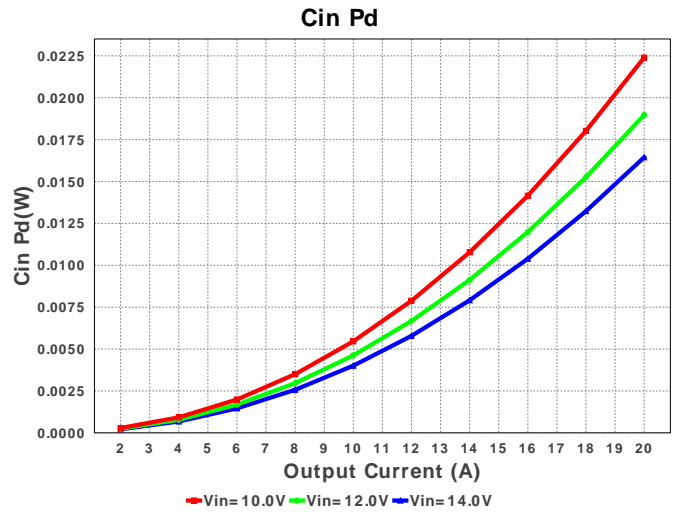
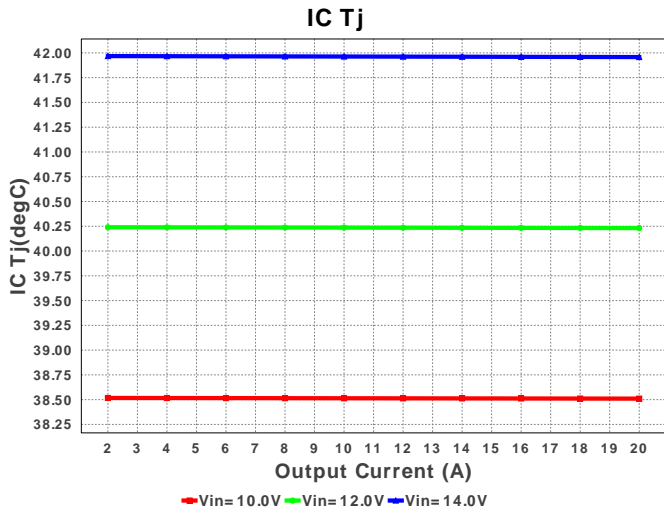


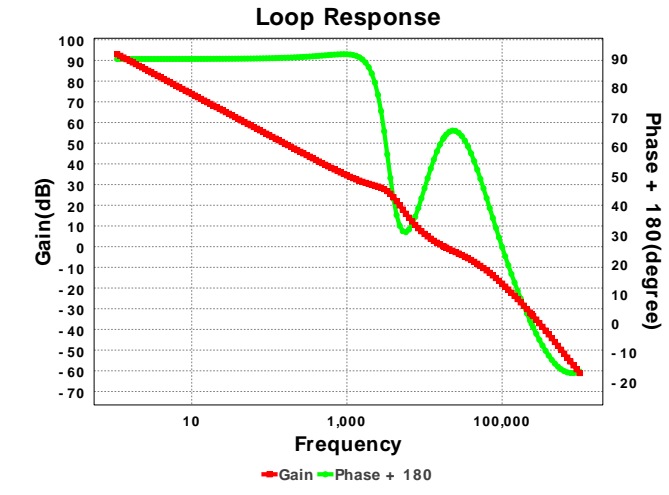
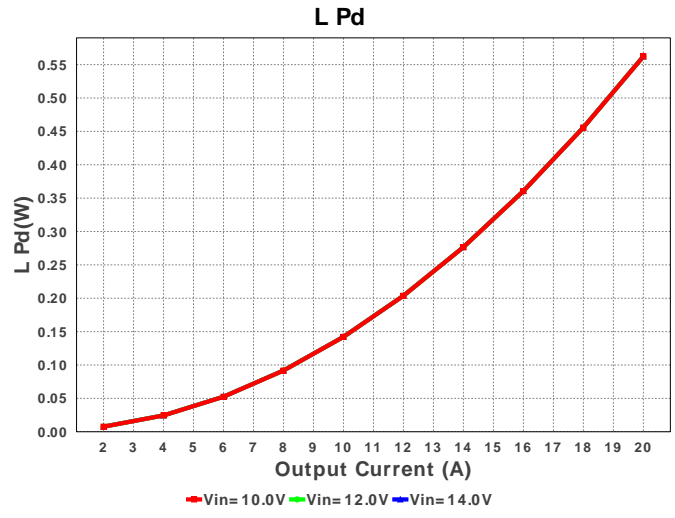
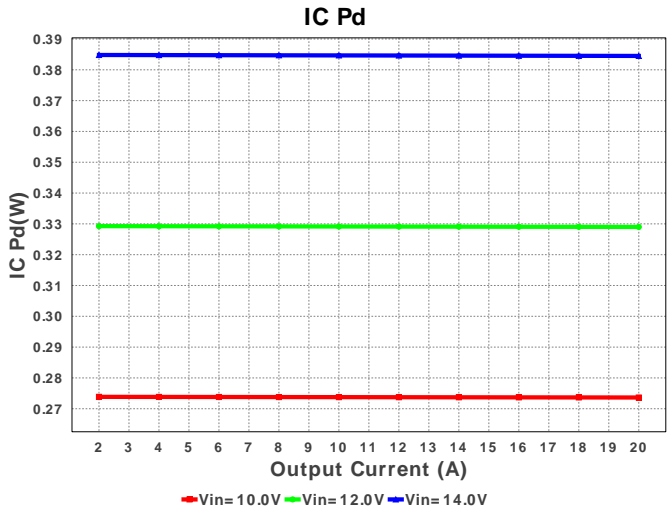
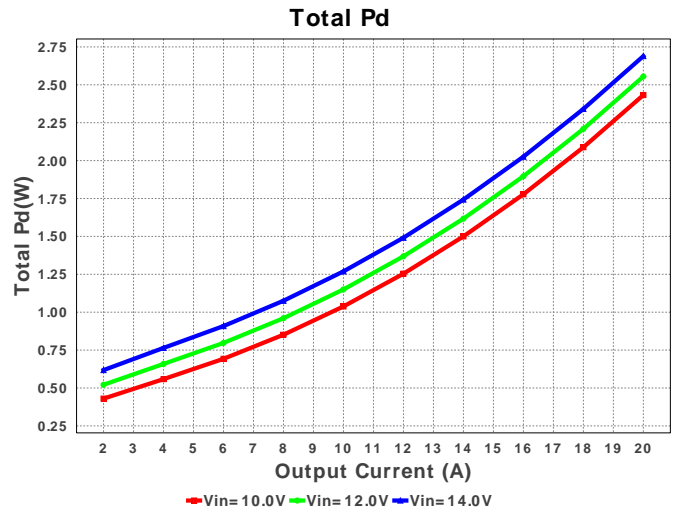
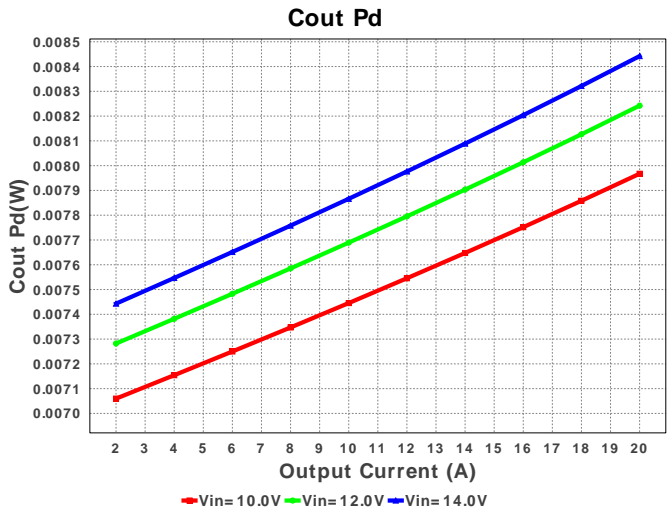
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	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.	Ccomp	MuRata	GRM188R71H202KA01D Series= X7R	Cap= 2.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
3.	Ccomp2	AVX	06035A470KAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
4.	Ccomp3	Yageo America	CC0805KRX7R9BB152 Series= X7R	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Cgsns	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	0805 7 mm ²
6.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	3	\$0.18	1210 15 mm ²
7.	Cout	Panasonic	2R5SVPC1500M Series= SVPC	Cap= 1.5 mF ESR= 10.0 mOhm VDC= 2.5 V IRMS= 5.15 A	2	\$0.76	 SM_RADIAL_8MM 113 mm ²
8.	Couthf	MuRata	GRM31CR60J476ME19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	\$0.11	 1206_190 11 mm ²
9.	Csense	TDK	C1608X5R1H474K080AB Series= X5R	Cap= 470.0 nF ESR= 10.974 mOhm VDC= 50.0 V IRMS= 1.57483 A	1	\$0.03	0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Csusb	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
11.	Ctsns	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
12.	L1	Coilcraft	XAL8080-681MEB	L= 680.0 nH DCR= 1.4 mOhm	1	\$1.55	 XAL8080 107 mm ²
13.	M1	Texas Instruments	CSD86360Q5D	PowerBlock	1	\$0.99	 DQY0008A 56 mm ²
14.	Qtsns	Fairchild Semiconductor	MMBT3904	Bipolar Transistor	1	\$0.05	 SOT-23 14 mm ²
15.	Rboot	Vishay-Dale	CRCW04024R99FKED Series= CRCW..e3	Res= 4.99 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Rcomp	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rcomp2	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rfbb	Yageo America	RC0603FR-0724KL Series= ?	Res= 24.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
19.	Rfbt	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
20.	Rgsns	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
21.	Rpg	Susumu Co Ltd	RR1220P-103-D Series= RR12	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
22.	Rsense1	Vishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
23.	Rsns	Yageo America	RC0805FR-0710RL Series= ?	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
24.	Rsusb	Vishay-Dale	CRCW08053R32FKEA Series= CRCW..e3	Res= 3.32 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
25.	U1	Texas Instruments	TPS40422RHAR	Switcher	0	\$2.15	 RHA0040B 66 mm ²
26.	U1	Texas Instruments	TPS40422RHAR	Switcher	0	\$2.15	 RHA0040B 66 mm ²







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.967 A	Current	Input capacitor RMS ripple current
2.	Iin Avg	1.406 A	Current	Average input current
3.	L Ipp	4.501 A	Current	Peak-to-peak inductor ripple current
4.	Frequency	279.72 kHz	General	Switching frequency
5.	IC Tolerance	3.0 mV	General	IC Feedback Tolerance
6.	Mode	CCM	General	Conduction Mode
7.	Pout	17.0 W	General	Total output power
8.	Low Freq Gain	93.008 dB	Op_Point	Gain at 1Hz
9.	M1 ThetaJA Effective	20.0 degC/W	Op_Point	Effective Power Block Junction-to-Ambient Thermal Resistance
10.	Vout Actual	850.0 mV	Op_Point	Vout Actual calculated based on selected voltage divider resistors
11.	Vout OP	850.0 mV	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
12.	Cross Freq	17.945 kHz	Op_point	Bode plot crossover frequency
13.	Duty Cycle	6.571 %	Op_point	Duty cycle
14.	Efficiency	86.341 %	Op_point	PMU channel steady state efficiency
15.	Gain Marg	-32.693 dB	Op_point	Bode Plot Gain Margin
16.	ICThetaJA	31.1 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	20.0 A	Op_point	Iout operating point
18.	M1 TjOP	63.255 degC	Op_point	Power Block junction temperature
19.	Phase Marg	63.447 deg	Op_point	Bode Plot Phase Margin
20.	VIN_OP	14.0 V	Op_point	Vin operating point
21.	Vout p-p	22.506 mV	Op_point	Peak-to-peak output ripple voltage
22.	Cin Pd	16.444 mW	Power	Input capacitor power dissipation
23.	Cout Pd	8.442 mW	Power	Output capacitor power dissipation
24.	IC Pd	384.5 mW	Power	IC power dissipation
25.	L Pd	562.364 mW	Power	Inductor power dissipation
26.	M1 Pd	1.663 W	Power	Power Block power dissipation
27.	Total Pd	2.689 W	Power	PMU channel power dissipation
28.	Vout Tolerance	947.86 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	20.0	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	850.0 m	Output Voltage
5.	base_pn	TPS40422/2	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40422/2** Product Folder : <http://www.ti.com/product/tps40422> : contains the data sheet and other resources.

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