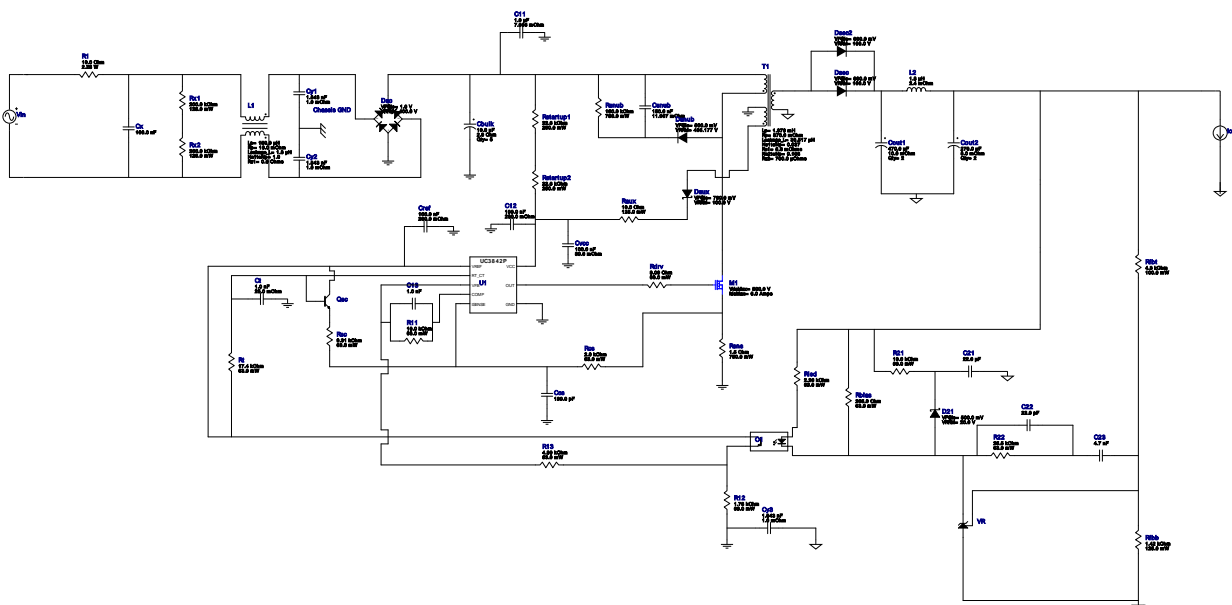


WEBENCH® Design Report

Design : 4215160/25 UC3842N
UC3842N 100.0V-120.0V to 5.00V @ 4.0A



1. The EMI filter selected here contains the estimated values. The real numbers will depend on the attenuation needed at a particular frequency.

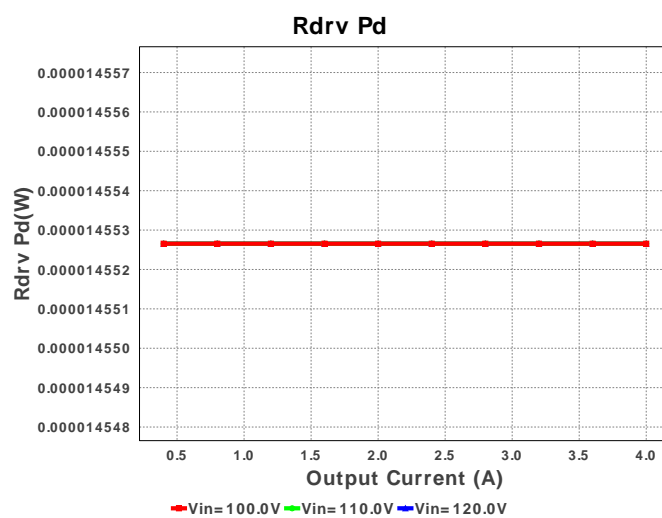
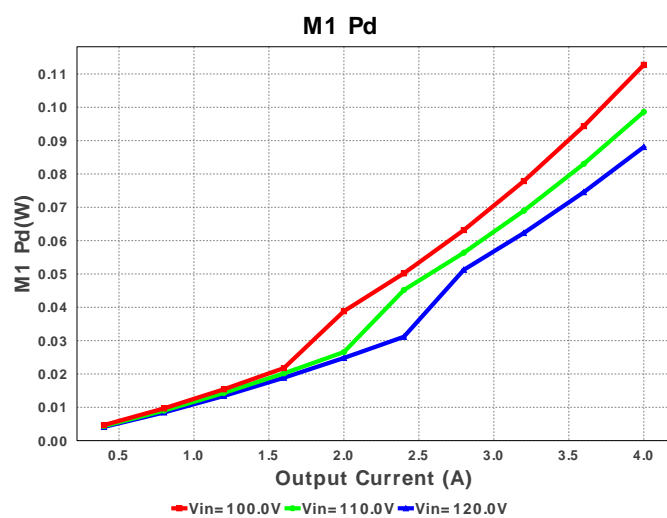
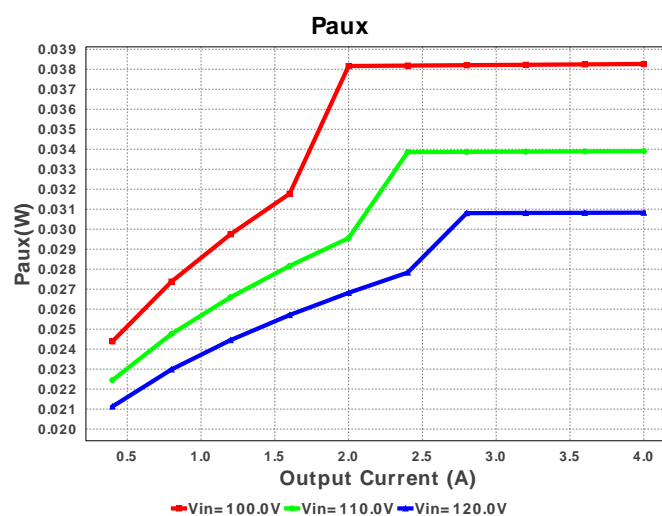
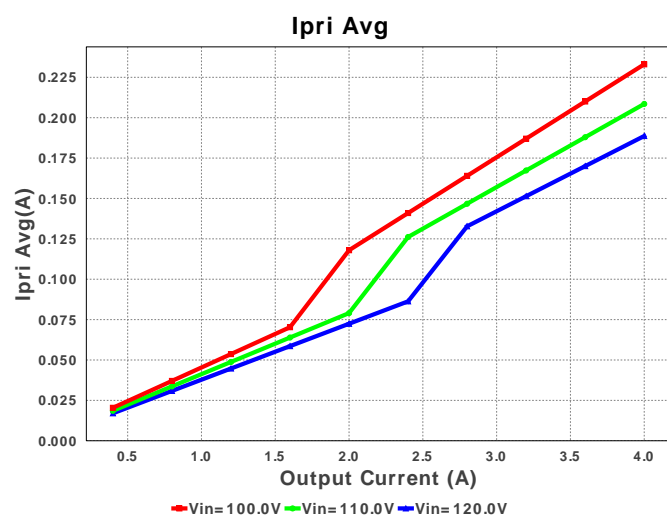
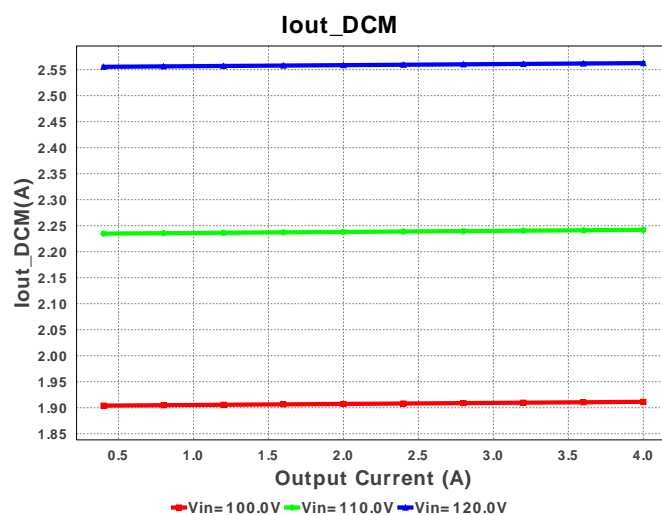
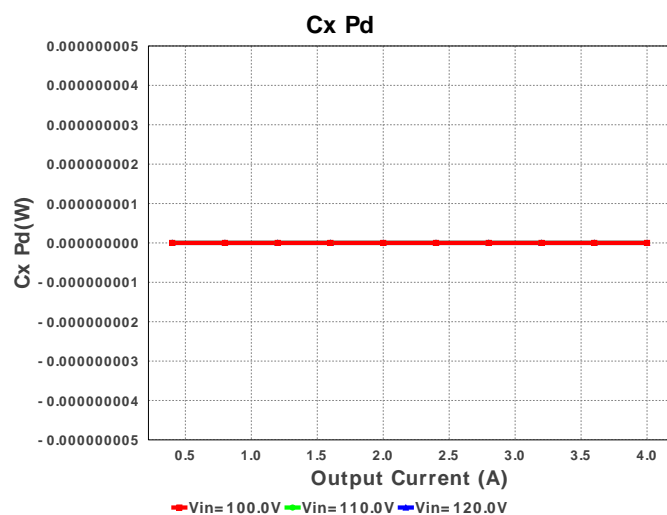
Electrical BOM

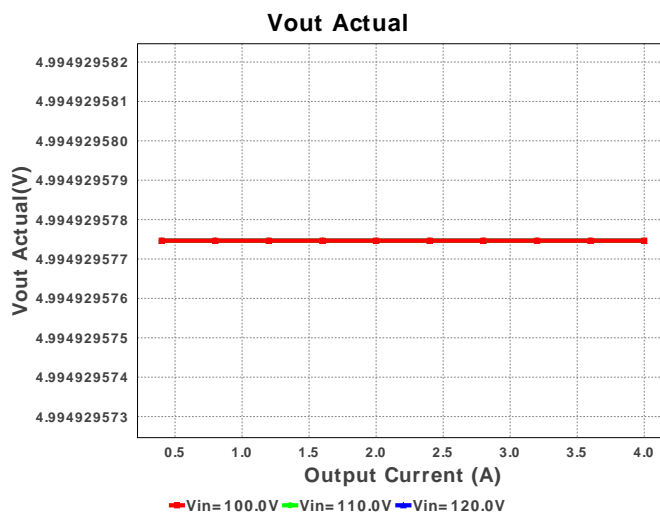
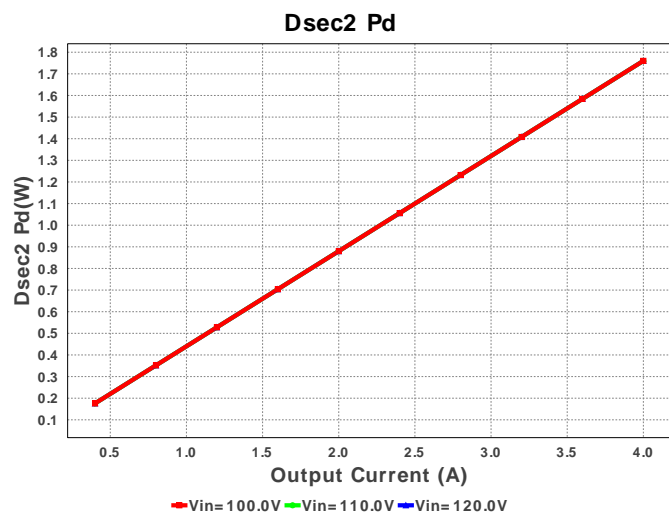
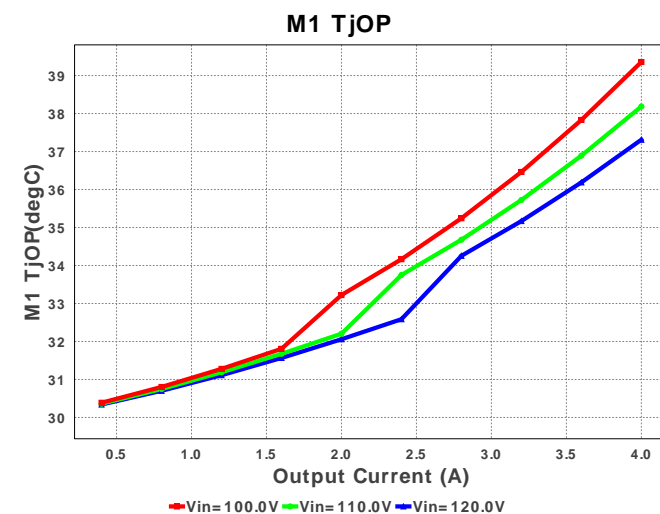
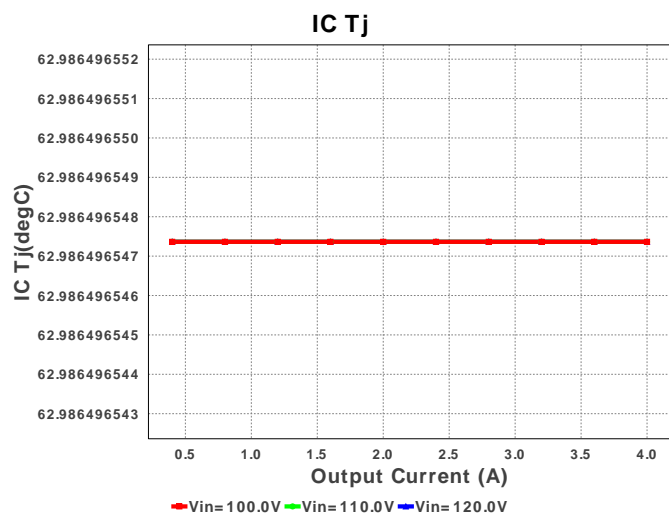
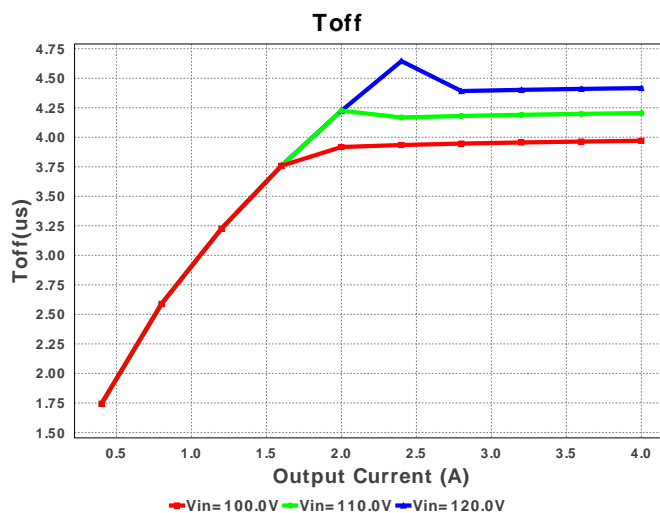
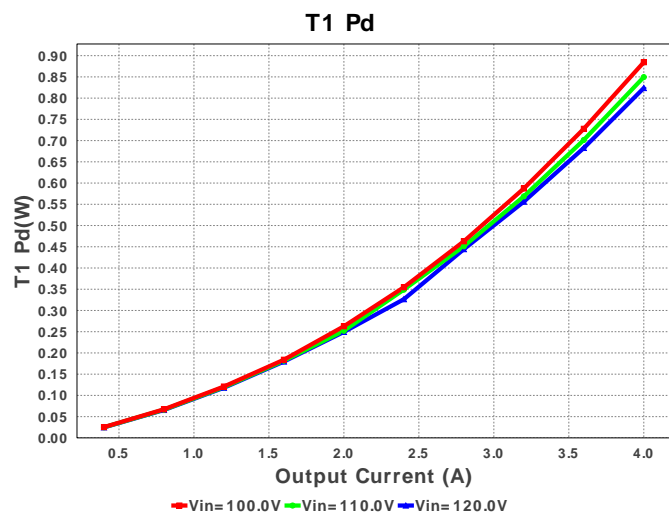
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C11	MuRata	GRM55DR72E105KW01L Series= X7R	Cap= 1.0 uF ESR= 7.086 mOhm VDC= 250.0 V IRMS= 2.0605 A	1	\$0.26	 2220_200 54 mm ²
2.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
3.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
4.	C21	Taiyo Yuden	LMK212BJ226MG-T Series= X5R	Cap= 22.0 uF VDC= 10.0 V IRMS= 0.0 A	1	\$0.12	 0805 7 mm ²
5.	C22	Kemet	C0805C220K3GACTU Series= C0G/NP0	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
6.	C23	Yageo America	CC0805KRX7R9BB472 Series= X7R	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
7.	Cbulk	Kemet	ESG106M400AH4AA Series= 2334	Cap= 10.0 uF ESR= 2.9 Ohm VDC= 400.0 V IRMS= 100.0 mA	5	\$0.19	 ESG106 144 mm ²
8.	Ccs	Kemet	C0805C181K5GACTU Series= C0G/NP0	Cap= 180.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cout1	Nichicon	RNU1C471MDN1PH Series= ?	Cap= 470.0 uF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 6.1 A	2	\$0.52	 NU_1000x1250 144 mm ²
10.	Cout2	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	2	\$0.70	 CAPSMT_62_C10 74 mm ²
11.	Cref	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
12.	Csnub	TDK	C3225X7T2J154K Series= X7T	Cap= 150.0 nF ESR= 11.907 mOhm VDC= 630.0 V IRMS= 0.0 A	1	\$0.19	 1210 15 mm ²
13.	Ct	Kemet	C0805C102J5GACTU Series= C0G/NP0	Cap= 1.0 nF ESR= 25.0 mOhm VDC= 50.0 V IRMS= 1.71 A	1	\$0.01	 0805 7 mm ²
14.	Cvcc	MuRata	GRM188R71E104KA01D Series= X7R	Cap= 100.0 nF ESR= 30.0 mOhm VDC= 25.0 V IRMS= 1.51 A	1	\$0.01	 0603 5 mm ²
15.	Cx	TDK	B32913A5104M000 Series= 2231	Cap= 100.0 nF VDC= 1000.0 V IRMS= 0.0 A	1	\$0.46	 B32913_2650x600x1500 228 mm ²
16.	Cy1	CUSTOM	CUSTOM Series= ?	Cap= 1.843 nF ESR= 1.0 mOhm VDC= 203.645 V IRMS= 500.0 uA	1	NA	CUSTOM 0 mm ²
17.	Cy2	CUSTOM	CUSTOM Series= ?	Cap= 1.843 nF ESR= 1.0 mOhm VDC= 203.645 V IRMS= 500.0 uA	1	NA	CUSTOM 0 mm ²
18.	Cy3	CUSTOM	CUSTOM Series= ?	Cap= 1.843 nF ESR= 1.0 mOhm VDC= 203.645 V IRMS= 500.0 uA	1	NA	CUSTOM 0 mm ²
19.	D21	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	\$0.08	 SMB 44 mm ²
20.	Dac	Diodes Inc.	HD04-T	VF@Io= 1.0 V VRRM= 400.0 V	1	\$0.12	 MiniDIP 62 mm ²
21.	Daux	Diodes Inc.	B1100-13-F	VF@Io= 790.0 mV VRRM= 100.0 V	1	\$0.10	 SMA 37 mm ²
22.	Dsec	Vishay-Semiconductor	SS10PH10-M3/86A	VF@Io= 880.0 mV VRRM= 100.0 V	1	\$0.29	 TO-277A 56 mm ²
23.	Dsec2	Vishay-Semiconductor	SS10PH10-M3/86A	VF@Io= 880.0 mV VRRM= 100.0 V	1	\$0.29	 TO-277A 56 mm ²
24.	Dsnub	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 495.177 V	1	NA	CUSTOM 0 mm ²

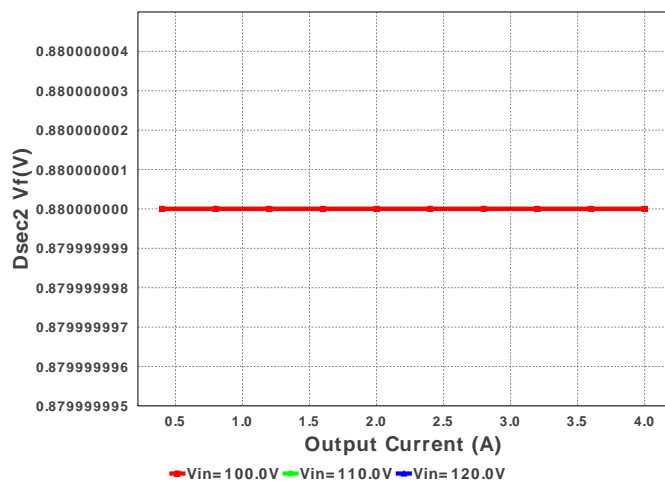
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25. L1		API Delevan	CM6296R-154	Lp= 150.0 μ H Rp= 16.0 mOhm Leakage_L= 1.8 μ H Ns1toNp= 1.0 Rs1= 0.0 Ohms	1	\$5.95	 CM6296 833 mm²
26. L2		Coilcraft	SER1360-182KLB	L= 1.8 μ H DCR= 2.4 mOhm	1	\$0.72	 SER1360 225 mm²
27. M1		Fairchild Semiconductor	FDD6N50TM	VdsMax= 500.0 V IdsMax= 6.0 Amps	1	\$0.47	 DPAK 102 mm²
28. O1		Vishay-Semiconductor	TCMT1109	Optocoupler	1	\$0.21	 SOP-4 44 mm²
29. Qsc		STMicroelectronics	2N2222A	Bipolar Transistor	1	NA	 TO-18 57 mm²
30. R1		Vishay-Dale	AC03000001009JACCS Series= F_RES	Res= 10.0 Ohm Power= 2.25 W Tolerance= 5.0%	1	\$0.30	 AC03 158 mm²
31. R11		Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
32. R12		Vishay-Dale	CRCW04021K78FKED Series= CRCW..e3	Res= 1.78 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
33. R13		Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
34. R21		Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
35. R22		Vishay-Dale	CRCW040225K5FKED Series= CRCW..e3	Res= 25.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
36. Raux		Vishay-Dale	CRCW080510R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm²
37. Rbias		Vishay-Dale	CRCW0402205RFKED Series= CRCW..e3	Res= 205.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
38. Rcs		Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
39. Rdrv		Vishay-Dale	CRCW04029R09FKED Series= CRCW..e3	Res= 9.09 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
40. Rfbb		Yageo America	RT0805BRD071K42L Series= RT0805	Res= 1.42 kOhm Power= 125.0 mW Tolerance= 0.1%	1	\$0.05	 0805 7 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
41.	Rfbt	Yageo America	RC0603FR-074K3L Series= ?	Res= 4.3 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
42.	Rled	Vishay-Dale	CRCW04022K26FKED Series= CRCW..e3	Res= 2.26 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
43.	Rsc	Vishay-Dale	CRCW04029K31FKED Series= CRCW..e3	Res= 9.31 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
44.	Rsns	Stackpole Electronics Inc	RMCF2010FT1R50 Series= ?	Res= 1.5 Ohm Power= 750.0 mW Tolerance= 1.0%	1	\$0.03	 2010 32 mm ²
45.	Rsnub	Vishay-Dale	CRCW2010160KFKEF Series= ?	Res= 160.0 kOhm Power= 750.0 mW Tolerance= 1.0%	1	\$0.03	 2010 32 mm ²
46.	Rstartup1	Panasonic	ERJ-8ENF2262V Series= ERJ-8E	Res= 22.6 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²
47.	Rstartup2	Panasonic	ERJ-8ENF2262V Series= ERJ-8E	Res= 22.6 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²
48.	Rt	Vishay-Dale	CRCW040217K4FKED Series= CRCW..e3	Res= 17.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
49.	Rx1	Panasonic	ERJ-6ENF2003V Series= ERJ-6E	Res= 200.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
50.	Rx2	Panasonic	ERJ-6ENF2003V Series= ERJ-6E	Res= 200.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
51.	T1	CUSTOM	CUSTOM	Lp= 1.976 mH Rp= 870.0 mOhm Leakage_L= 39.517 µH Ns1toNp= 0.037 Rs1= 8.6 mOhms Ns2toNp= 0.108 Rs2= 700.0 µOhms	1	NA	CUSTOM 0 mm ²
52.	U1	Texas Instruments	UC3842N	Switcher	1	\$0.56	 P0008A 116 mm ²
53.	VR	Texas Instruments	LMV431CM5/NOPB	Voltage References	1	\$0.16	 R-PDSO-G3 16 mm ²

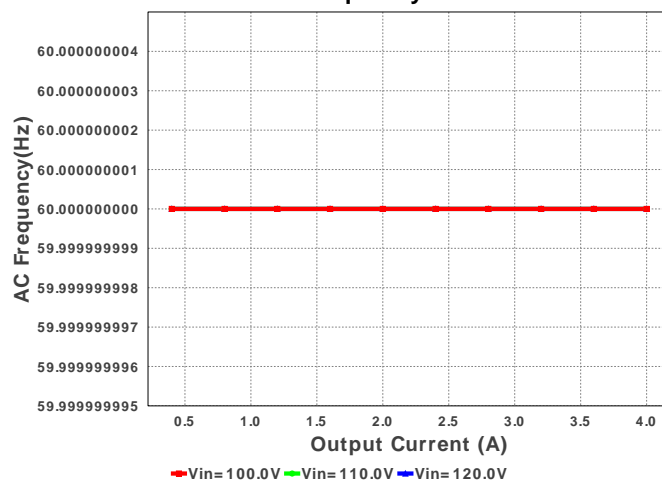




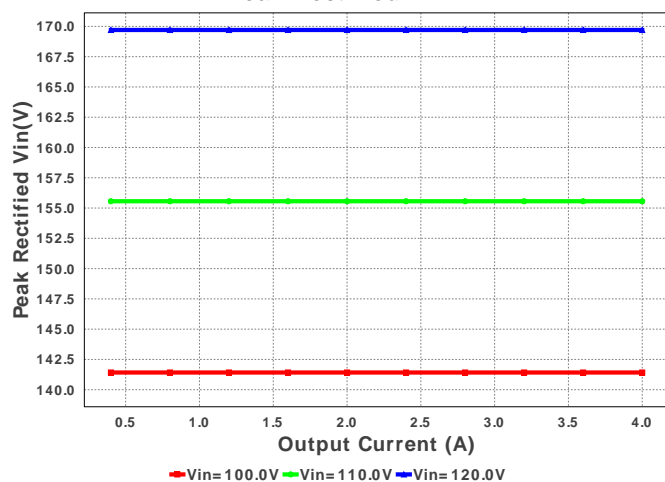
Dsec2 Vf



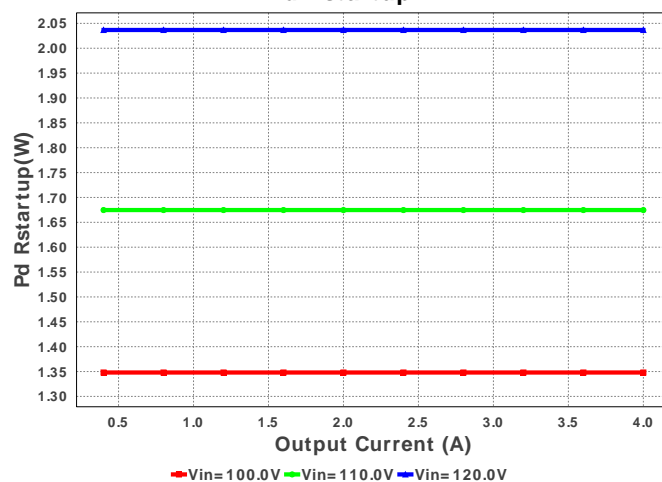
AC Frequency



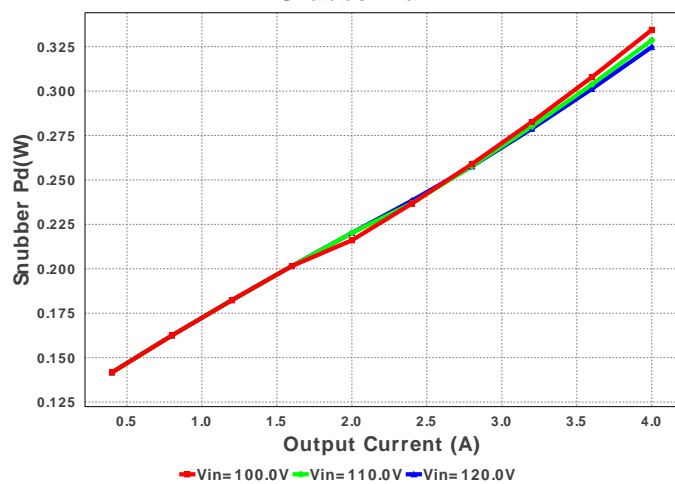
Peak Rectified Vin



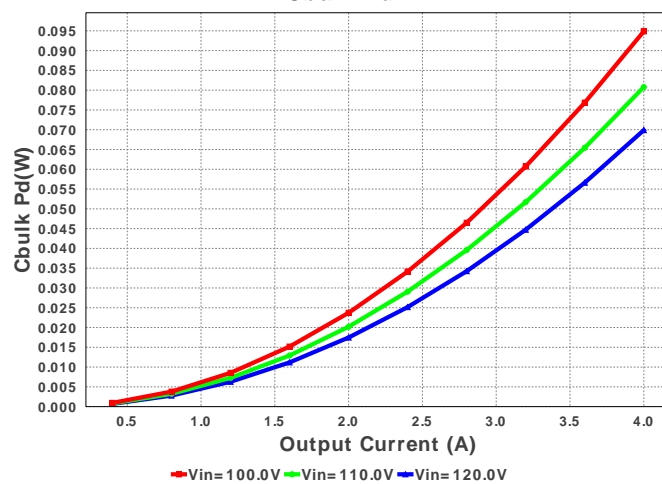
Pd Rstartup

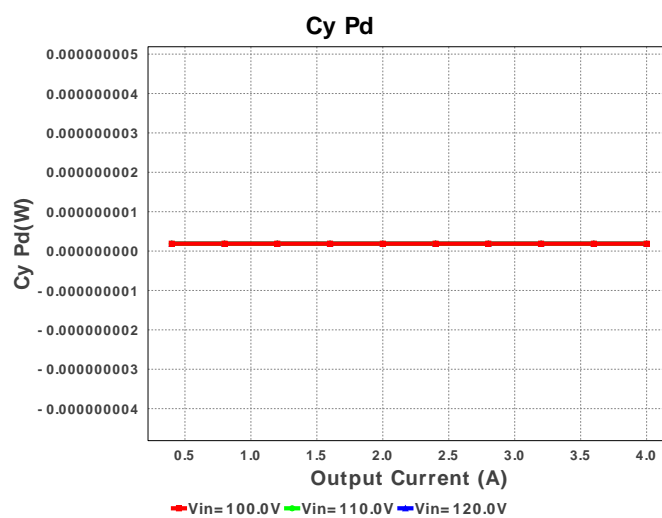
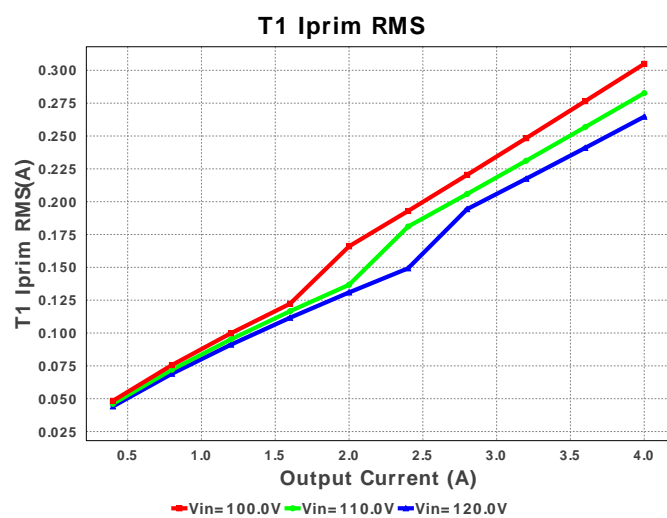
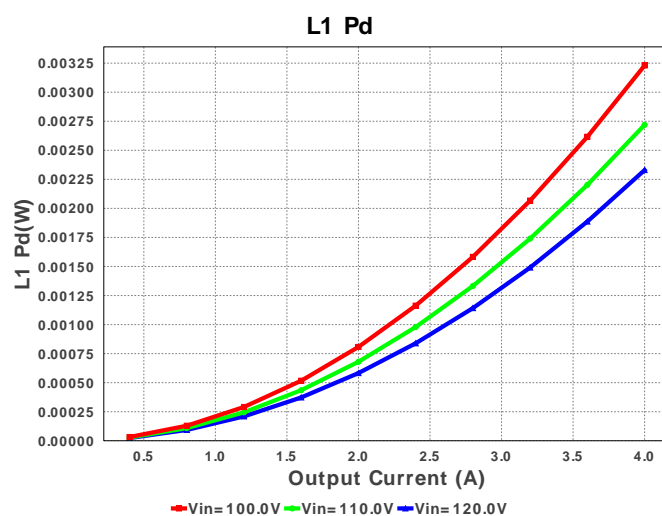
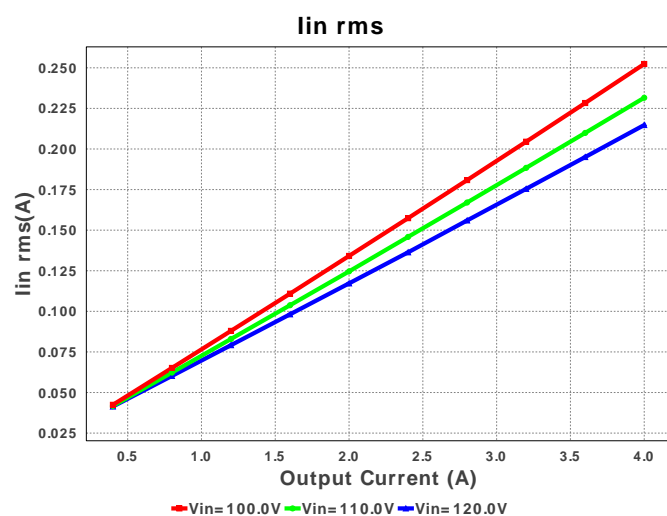
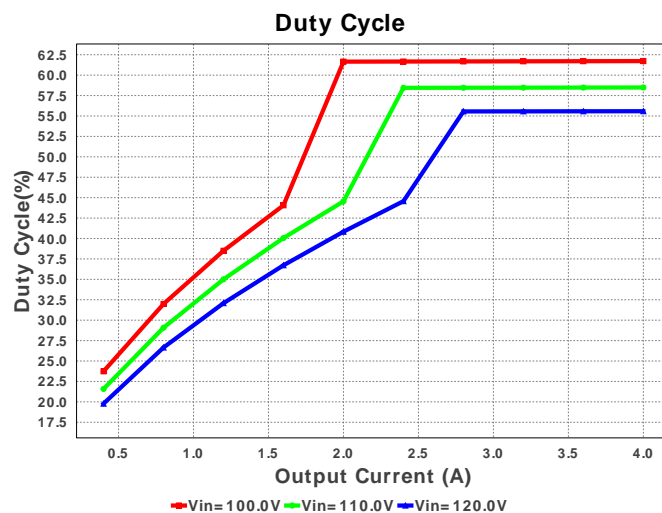
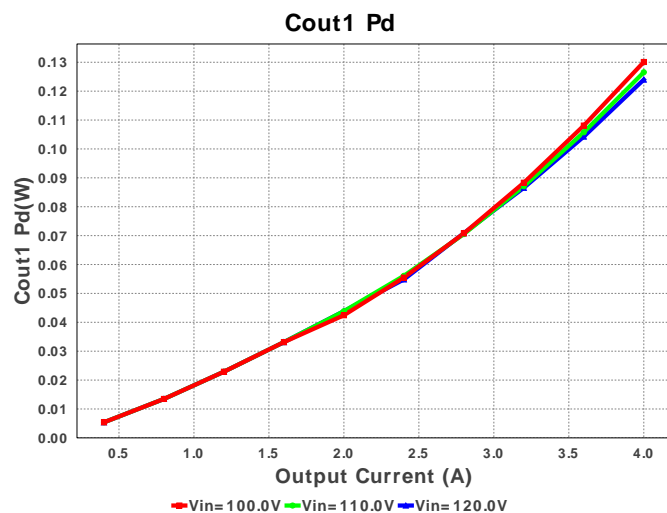


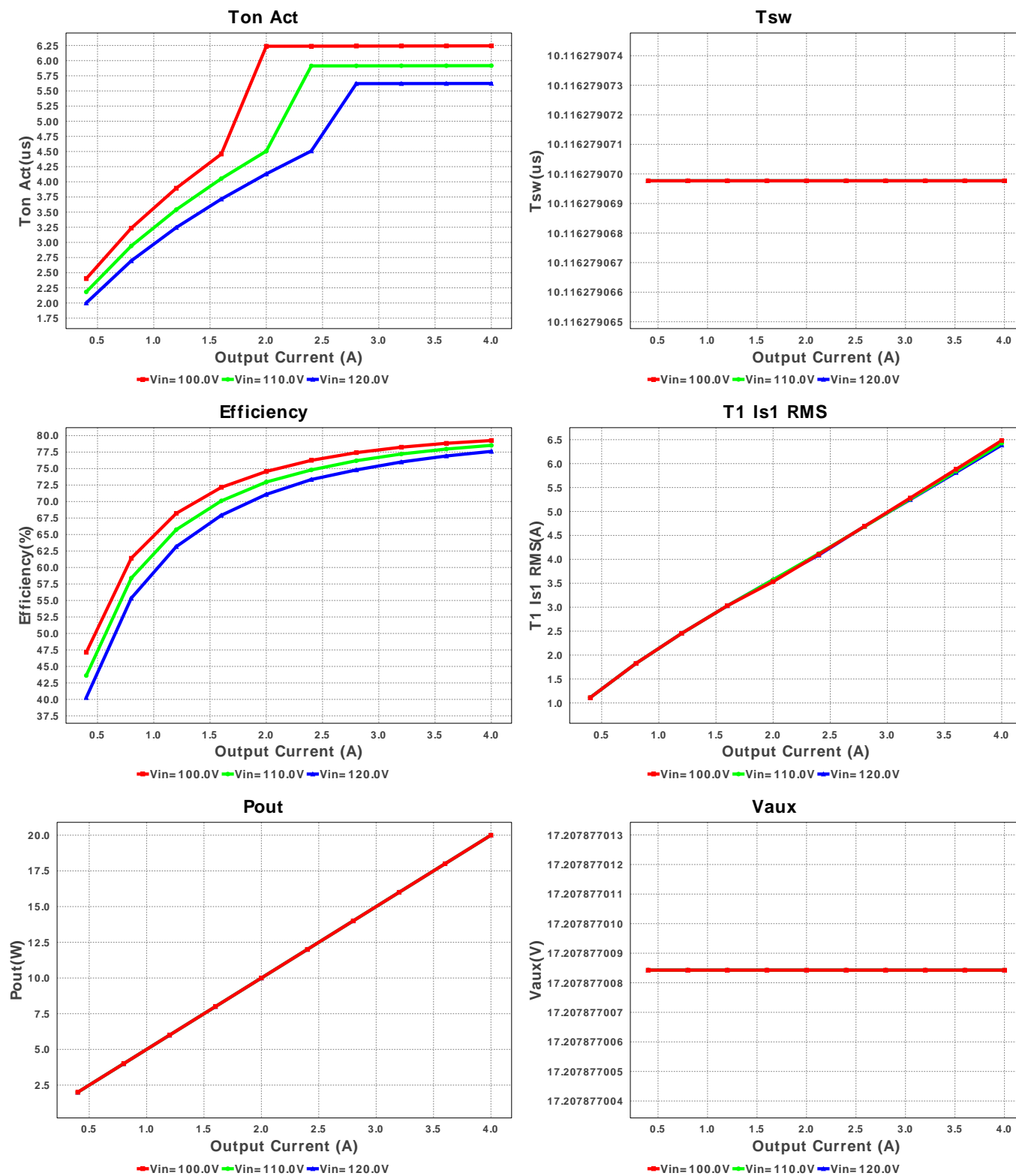
Snubber Pd

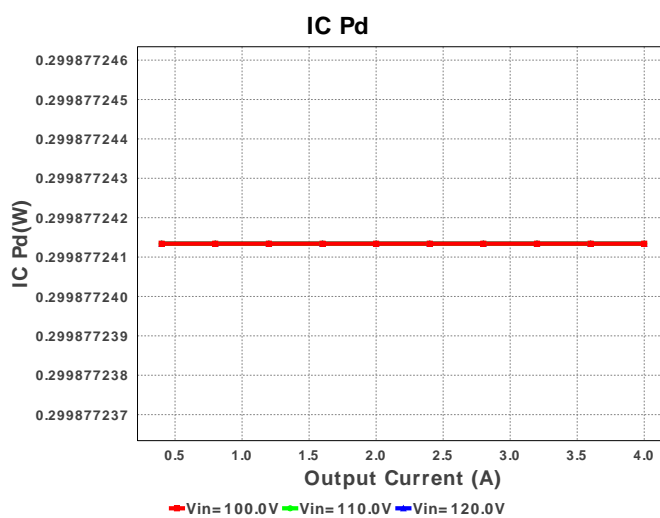
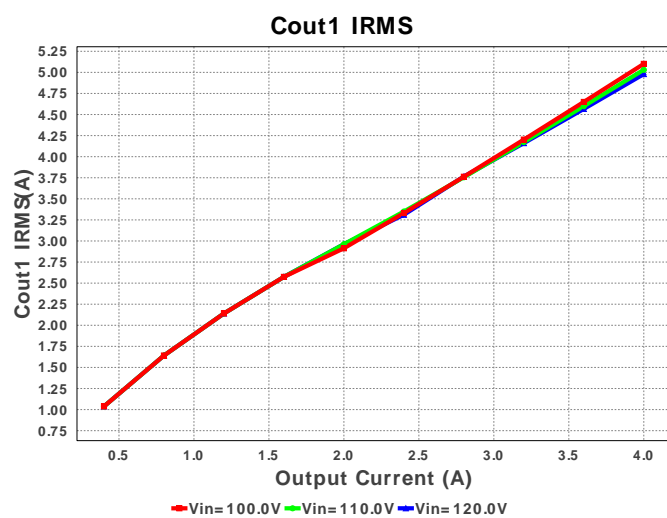
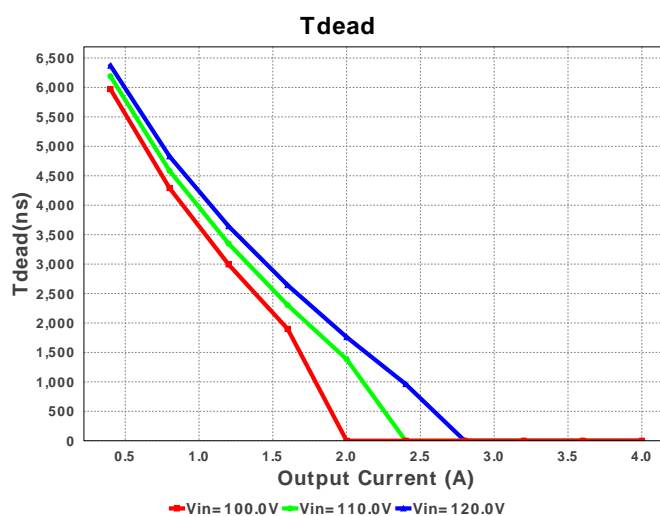
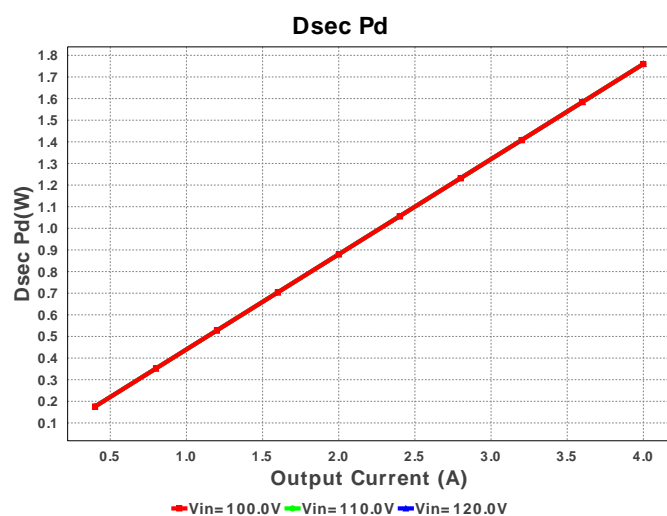
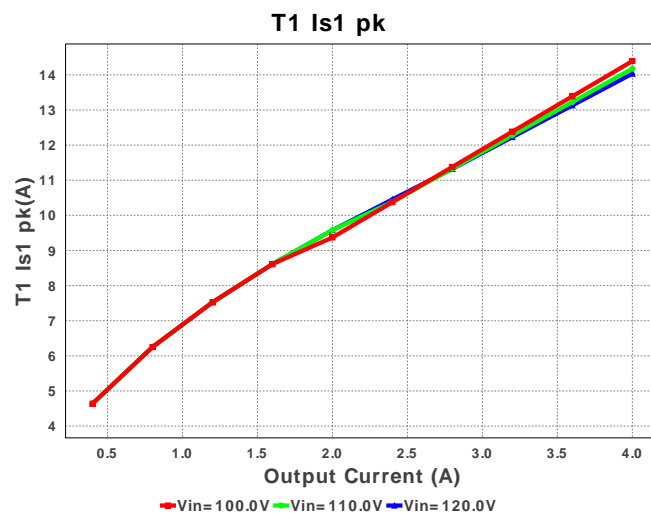
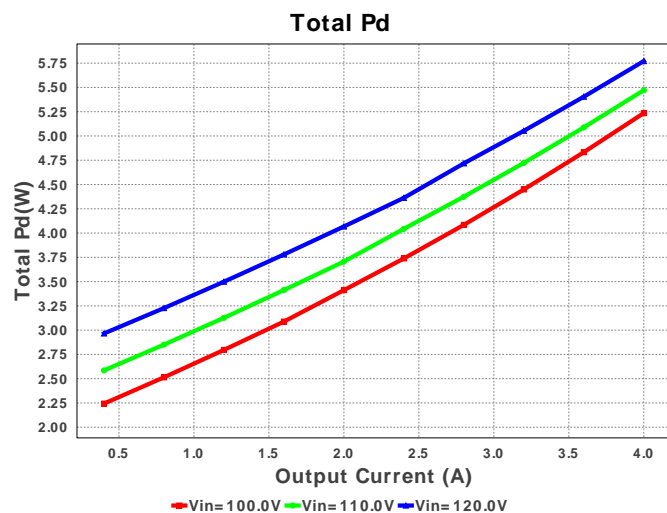


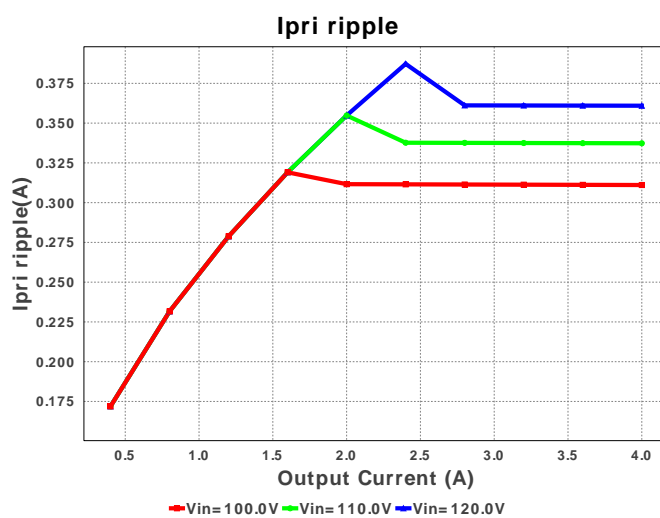
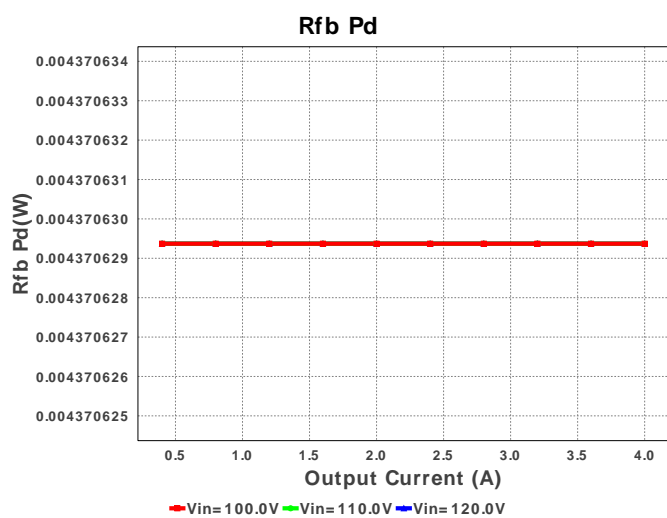
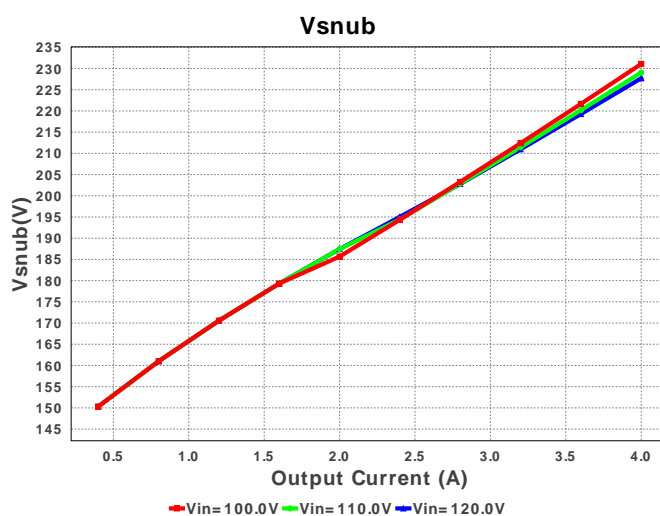
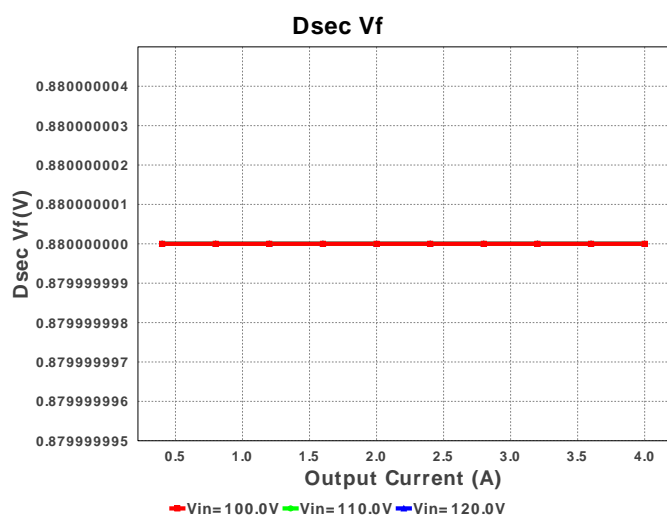
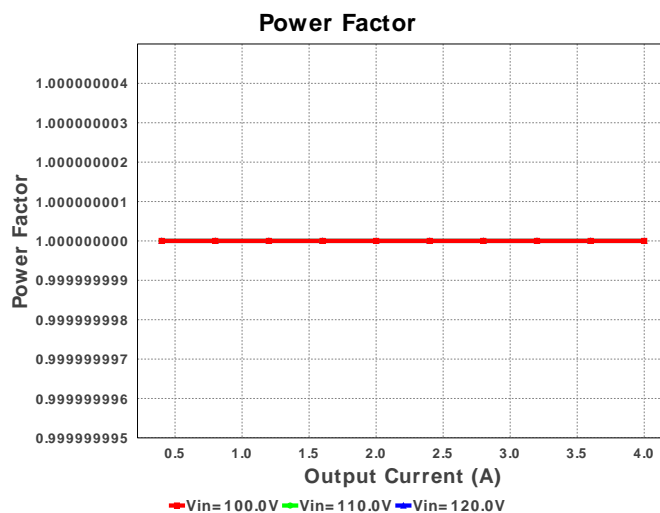
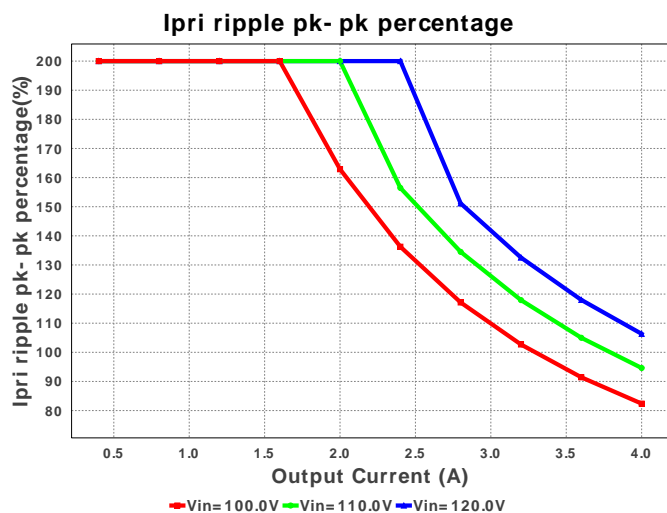
Cbulk Pd

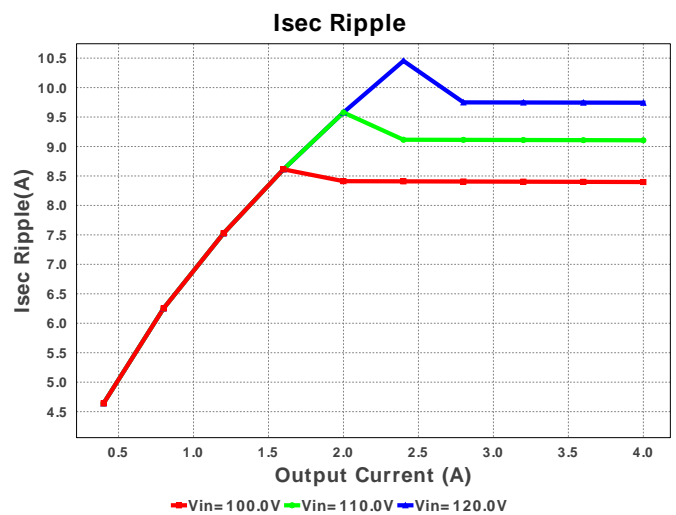
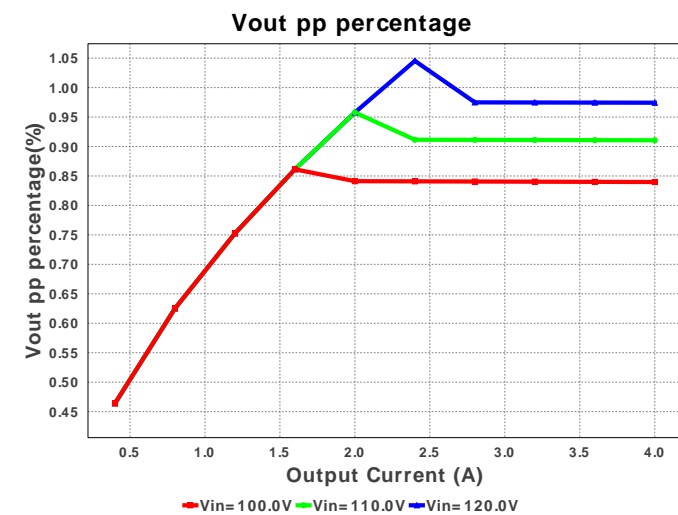
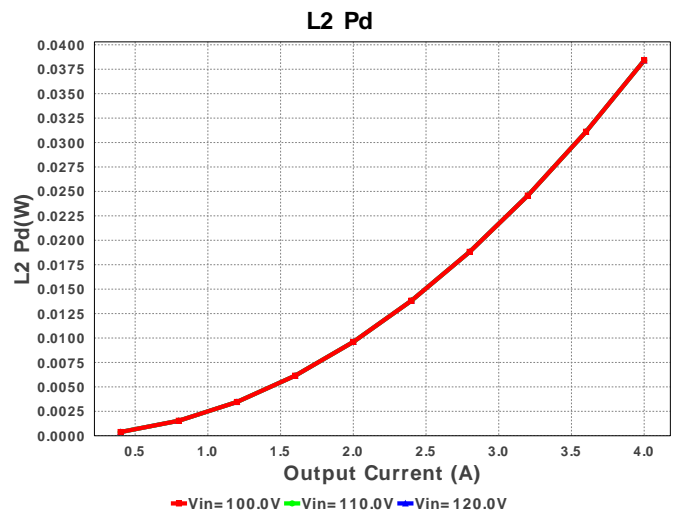
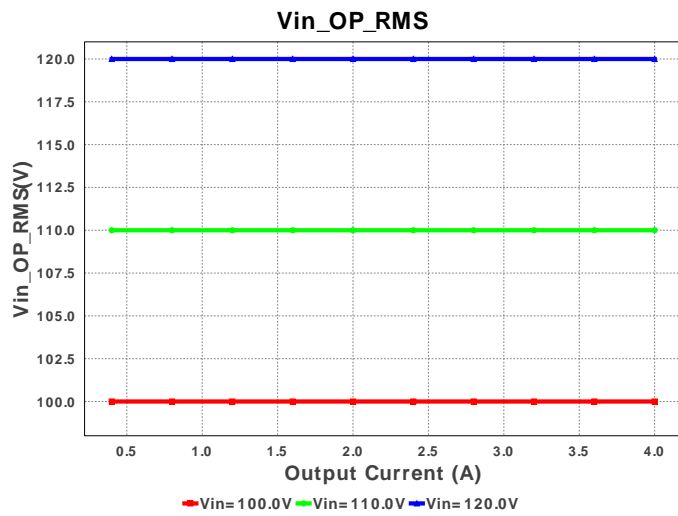
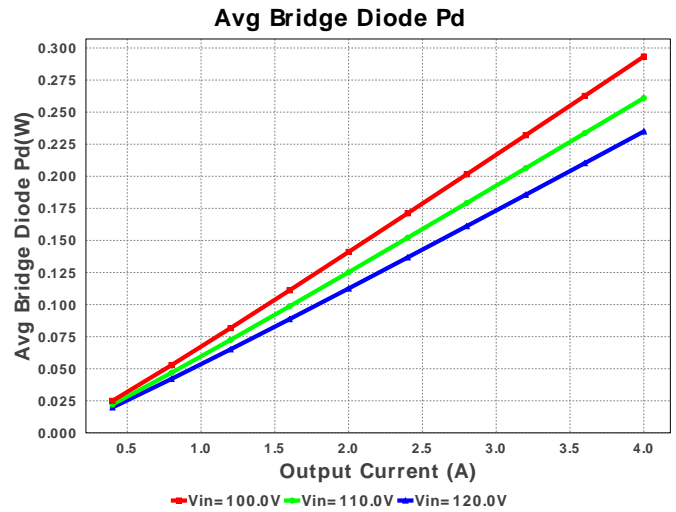
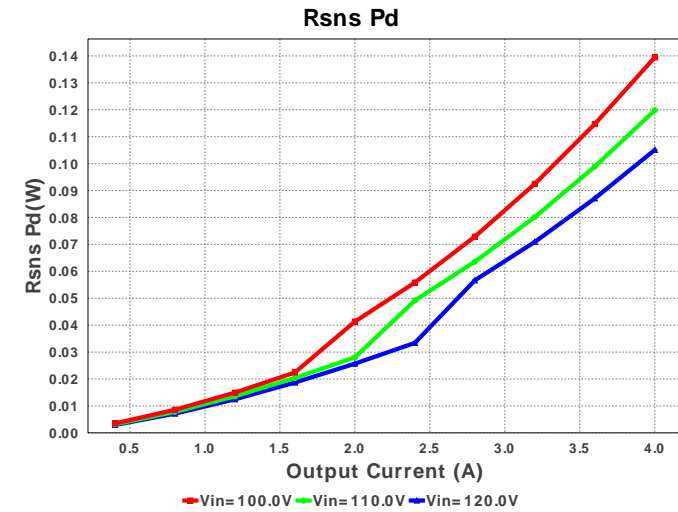


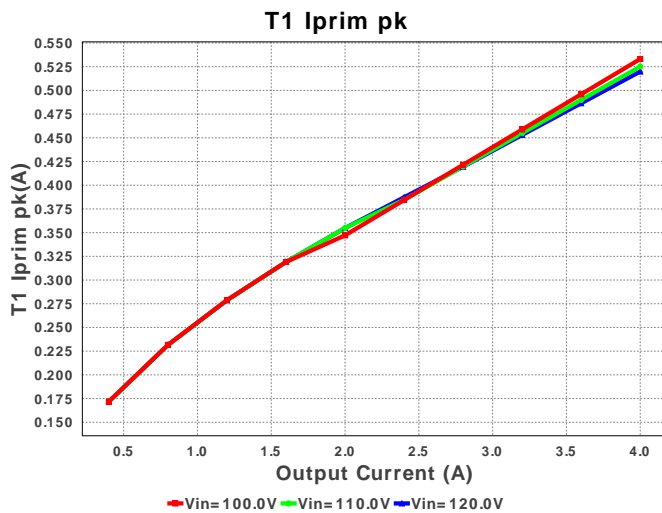
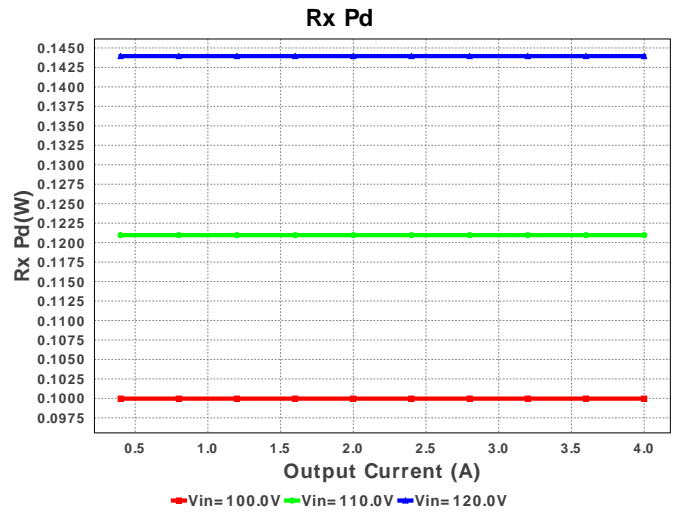
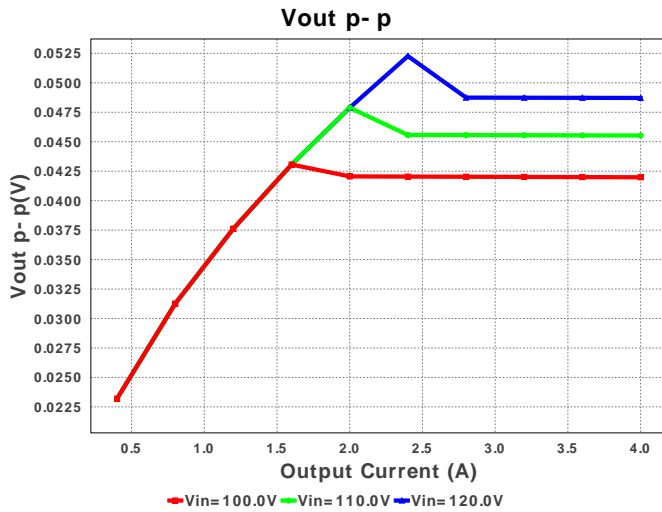












Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	5.101 A	Current	Output capacitor1 RMS ripple current
2.	Iin rms	252.36 mA	Current	RMS Input Current
3.	Iout_DCM	1.911 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	233.054 mA	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	311.078 mA	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	82.384 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	8.397 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	304.923 mA	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	533.136 mA	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	6.482 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	14.391 A	Current	Transformer Secondary1 Peak Current
12.	AC Frequency	60.0 Hz	General	Input AC frequency
13.	BOM Count	59	General	Total Design BOM count
14.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
15.	Dsec Vf	880.0 mV	General	Effective Forward Voltage Drop at the Operating Current
16.	Dsec trr	0.0 ns	General	Output Diode Reverse Recovery Time
17.	Dsec2 Vf	880.0 mV	General	Effective Forward Voltage Drop at the Operating Current
18.	Dsnub trr	0.0 ns	General	Snubber Diode Reverse Recovery Time
19.	FootPrint	3.492 k mm ²	General	Total Foot Print Area of BOM components
20.	Frequency	98.851 kHz	General	Switching frequency
21.	Mode	CCM	General	Conduction Mode
22.	Pout	20.0 W	General	Total output power
23.	Power Factor	1.0	General	Assumed Power Factor for the Application
24.	Tdead	0.0 ns	General	Approximate Dead Time of the Regulator
25.	Toff	3.97 us	General	Approximate Converter Off Time
26.	Ton Act	6.244 us	General	Approximate Converter On Time
27.	Total BOM	\$0.0	General	Total BOM Cost
28.	Tsw	10.116 us	General	Switching Time Period
29.	Vaux	17.208 V	General	Auxiliary Voltage

#	Name	Value	Category	Description
30.	Vsnub	231.07 V	General	Voltage Across the Snubber
31.	Vout Actual	4.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
32.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
33.	Duty Cycle	61.72 %	Op_point	Duty cycle
34.	Efficiency	79.253 %	Op_point	Steady state efficiency
35.	IC Tj	62.986 degC	Op_point	IC junction temperature
36.	ICThetaJA	110.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
37.	IOUT_OP	4.0 A	Op_point	Iout operating point
38.	M1 TjOP	39.357 degC	Op_point	M1 MOSFET junction temperature
39.	Peak Rectified Vin	141.42 V	Op_point	Peak voltage seen at rectified input
40.	Vin_OP_RMS	100.0 V	Op_point	AC Input RMS Voltage
41.	Vout p-p	41.986 mV	Op_point	Peak-to-peak output ripple voltage
42.	Avg Bridge Diode Pd	293.354 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
43.	Cbulk Pd	94.865 mW	Power	Bulk capacitor power dissipation
44.	Cout1 Pd	130.094 mW	Power	Output capacitor1 power dissipation
45.	Cx Pd	0.0 W	Power	X-cap Power Dissipation
46.	Cy Pd	187.5 pW	Power	Y-caps Power Dissipation
47.	Dsec Pd	1.76 W	Power	Secondary Diode Power Dissipation
48.	Dsec2 Pd	1.76 W	Power	Secondary Diode Power Dissipation
49.	IC Pd	299.877 mW	Power	IC power dissipation
50.	L1 Pd	3.23 mW	Power	Power Dissipation in the Inductor
51.	L2 Pd	38.4 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
52.	M1 Pd	112.736 mW	Power	M1 MOSFET total power dissipation
53.	Paux	38.264 mW	Power	Power Dissipation in Raux and Daux
54.	Pd Rstartup	1.348 W	Power	Power Dissipation in Rstartup1 and Rstartup2
55.	Rdrv Pd	14.553 μW	Power	Power Dissipation in Gate Drive Resistor
56.	Rfb Pd	4.371 mW	Power	Rfb Power Dissipation
57.	Rsns Pd	139.467 mW	Power	Current Limit Sense Resistor Power Dissipation
58.	Rx Pd	99.968 mW	Power	Total Power Dissipation in Rx1 and Rx2
59.	Snubber Pd	334.431 mW	Power	Snubber Power Dissipation
60.	T1 Pd	884.507 mW	Power	Estimated Losses in Transformer
61.	Total Pd	5.236 W	Power	Total Power Dissipation
62.	Vout Tolerance	1.478 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
63.	Vout pp percentage	839.716 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	120.0	Maximum input voltage
3.	VinMin	100.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	line_fsw	60.0	Light Output in Lumen
6.	base_pn	UC3842	Base Product Number
7.	source	AC	Input Source Type
8.	Ta	30.0	Ambient temperature

Design Assistance

1. **UC3842** Product Folder : <http://www.ti.com/product/UC3842> : contains the data sheet and other resources.

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