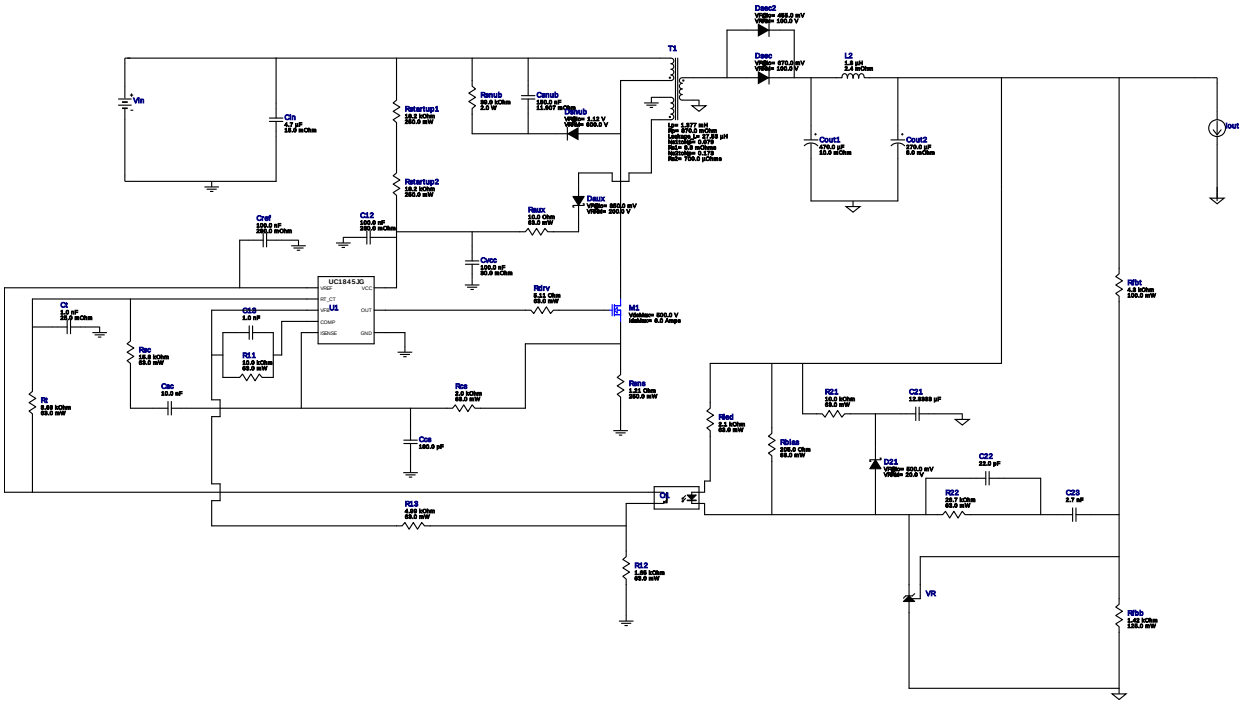
WEBENCH® Design Report

VinMin = 110.0V
VinMax = 230.0V
Vout = 5.0V
Iout = 3.0A

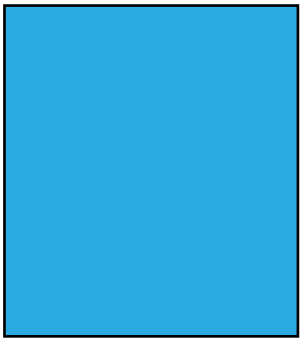
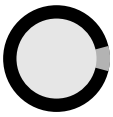
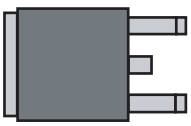
Device = UC1845J
Topology = Flyback
Created = 8/12/16 5:01:59 PM
BOM Cost = $0.00
BOM Count = 43
Total Pd = 0.0W

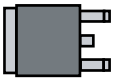
Design : 4118564/3 UC1845J
UC1845J 110.0V-230.0V to 5.00V @ 3.0A

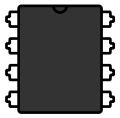


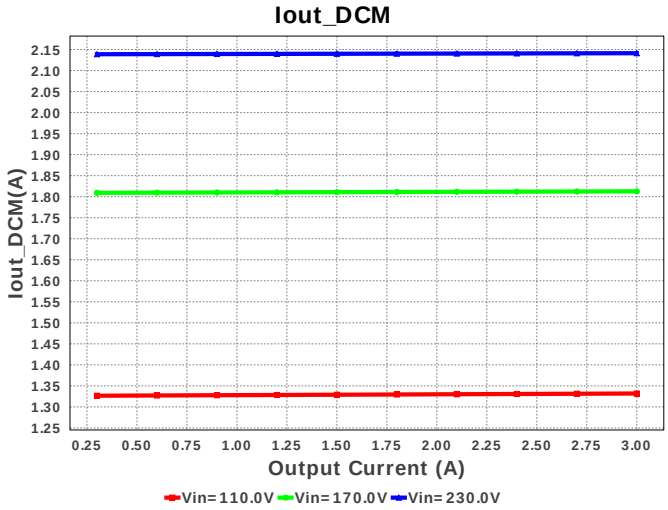
Electrical BOM

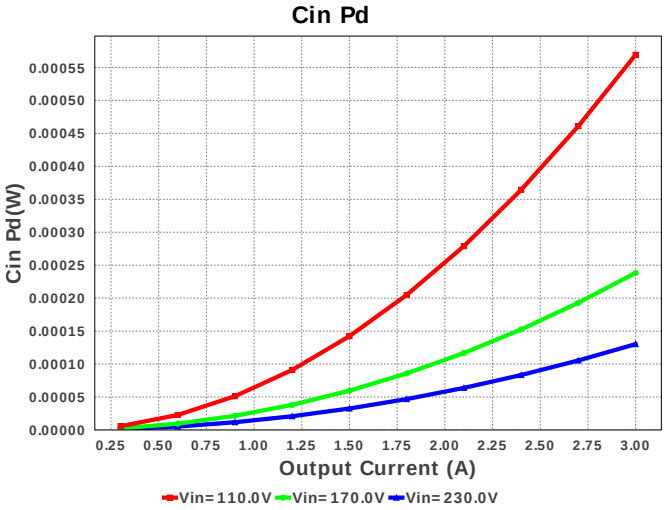
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
2.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
3.	C21	CUSTOM	CUSTOM Series= ?	Cap= 12.3333 uF VDC= 10.0 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2
4.	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
5.	C23	Yageo America	CC0805KRX7R9BB272 Series= X7R	Cap= 2.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
6.	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

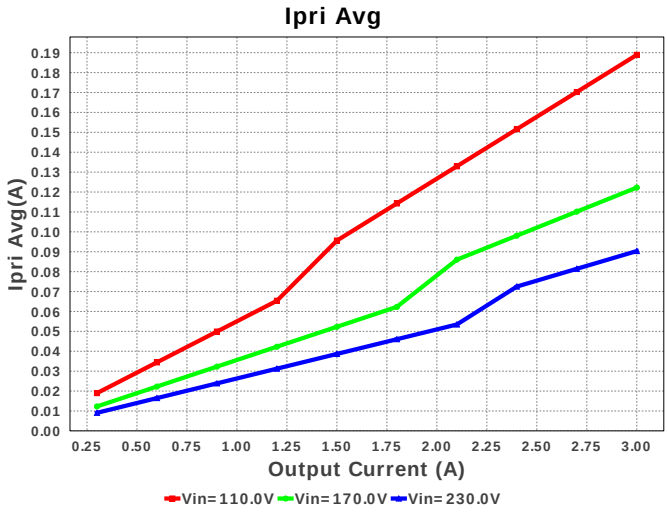
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	Cin	TDK	B32924D3475K Series= B32924	Cap= 4.7 uF ESR= 15.0 mOhm VDC= 630.0 V IRMS= 457.0 mA	1	$1.24	 B32924_31mm 770 mm^2
8.	Cout1	Nichicon	RNU1C471MDN1PH Series= ?	Cap= 470.0 uF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 6.1 A	1	$0.52	 NU_1000x1250 144 mm^2
9.	Cout2	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	$0.70	 CAPSMT_62_C10 74 mm^2
10.	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
11.	Csc	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 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.	D21	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	 SMB 44 mm^2
16.	Daux	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	 PowerDI123 13 mm^2
17.	Dsec	Fairchild Semiconductor	FSV8100V	VF@Io= 670.0 mV VRRM= 100.0 V	1	$0.21	 TO-277A 56 mm^2
18.	Dsec2	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	$1.33	 DDPAK 210 mm^2
19.	Dsnub	Bourns	CD214C-F3600	VF@Io= 1.12 V VRRM= 600.0 V	1	$0.18	 SMC 83 mm^2

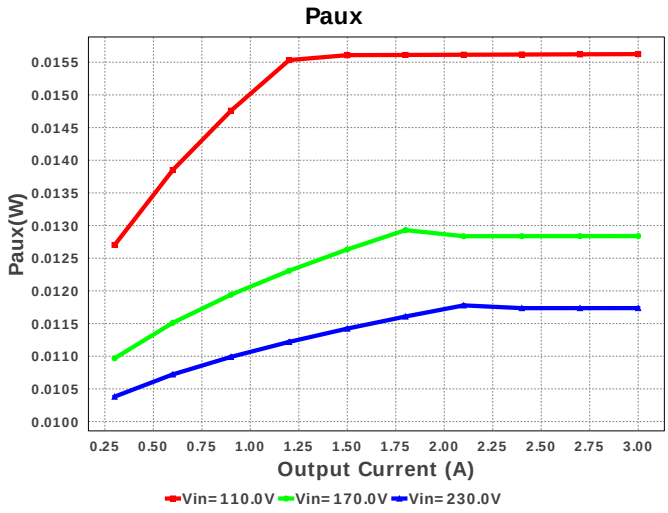
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
20.	L2	Coilcraft	SER1360-182KLB	L= 1.8 µH DCR= 2.4 mOhm	1	$0.72	 SER1360 225 mm²
21.	M1	Fairchild Semiconductor	FDD6N50TM	VdsMax= 500.0 V IdsMax= 6.0 Amps	1	$0.47	 DPAK 102 mm²
22.	O1	Vishay-Semiconductor	TCMT1109	Optocoupler	1	$0.21	 SOP-4 44 mm²
23.	R11	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
24.	R12	Vishay-Dale	CRCW04021K65FKED Series= CRCW..e3	Res= 1.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
25.	R13	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
26.	R21	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
27.	R22	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
28.	Raux	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
29.	Rbias	Vishay-Dale	CRCW0402205RFKED Series= CRCW..e3	Res= 205.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
30.	Rcs	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
31.	Rdrv	Vishay-Dale	CRCW04025R11FKED Series= CRCW..e3	Res= 5.11 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
32.	Rfbb	Yageo America	RT0805BRD071K42L Series= RT0805	Res= 1.42 kOhm Power= 125.0 mW Tolerance= 0.1%	1	$0.05	 0805 7 mm²
33.	Rfbt	Yageo America	RC0603FR-074K3L Series= ?	Res= 4.3 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
34.	Rled	Vishay-Dale	CRCW04022K10FKED Series= CRCW..e3	Res= 2.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
35.	Rsc	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
36.	Rsns	Vishay-Dale	CRCW12061R21FKEA Series= CRCW..e3	Res= 1.21 Ohm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm²
37.	Rsnub	TE Connectivity	352139KFT Series= ?	Res= 39.0 kOhm Power= 2.0 W Tolerance= 1.0%	1	$0.12	 2512 43 mm²
38.	Rstartup1	Panasonic	ERJ-8ENF1822V Series= ERJ-8E	Res= 18.2 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm²

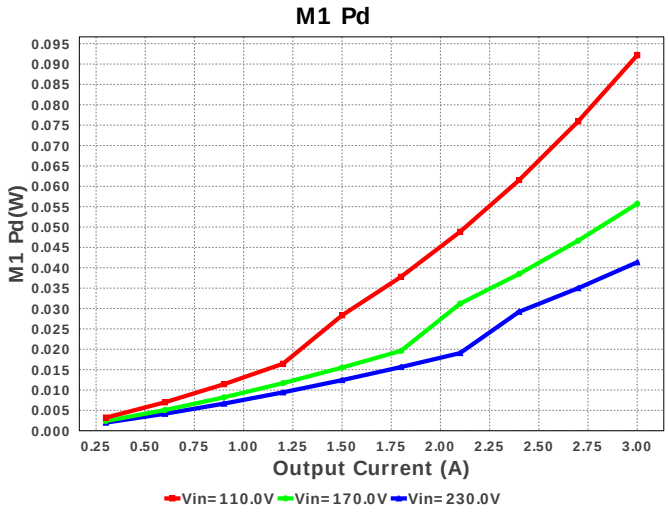
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
39.	Rstartup2	Panasonic	ERJ-8ENF1822V Series= ERJ-8E	Res= 18.2 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm^2
40.	Rt	Vishay-Dale	CRCW04028K66FKED Series= CRCW..e3	Res= 8.66 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
41.	T1	CUSTOM	CUSTOM	Lp= 1.377 mH Rp= 870.0 mOhm Leakage_L= 27.53 µH Ns1toNp= 0.079 Rs1= 8.6 mOhms Ns2toNp= 0.173 Rs2= 700.0 µOhms	1	NA	CUSTOM 0 mm^2
42.	U1	Texas Instruments	UC1845J	Switcher	1	$9.48	 JG0008A 111 mm^2
43.	VR	Texas Instruments	LMV431CM5/NOPB	Voltage References	1	$0.16	 R-PDSO-G3 16 mm^2

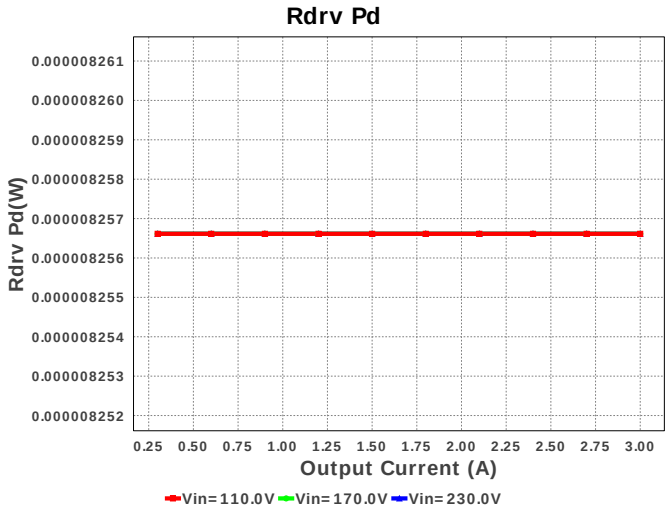


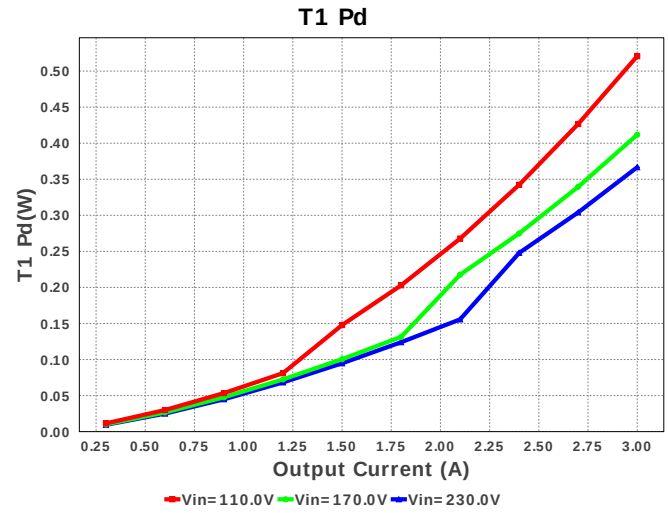


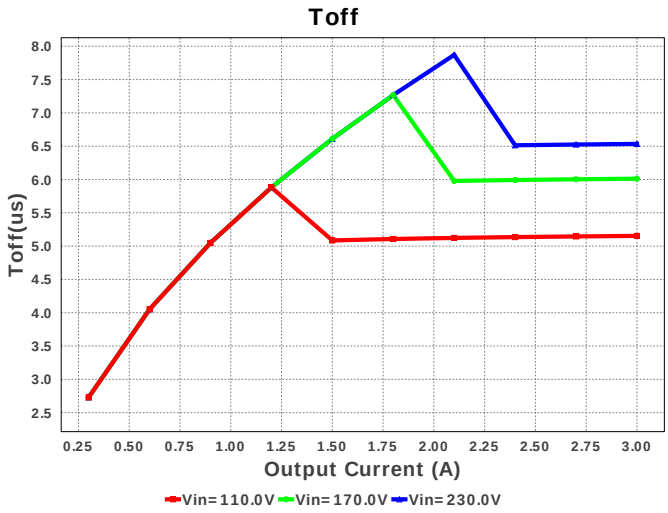


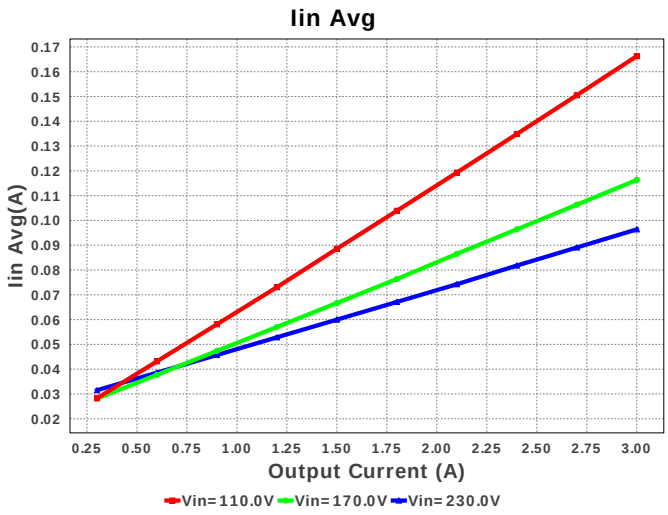


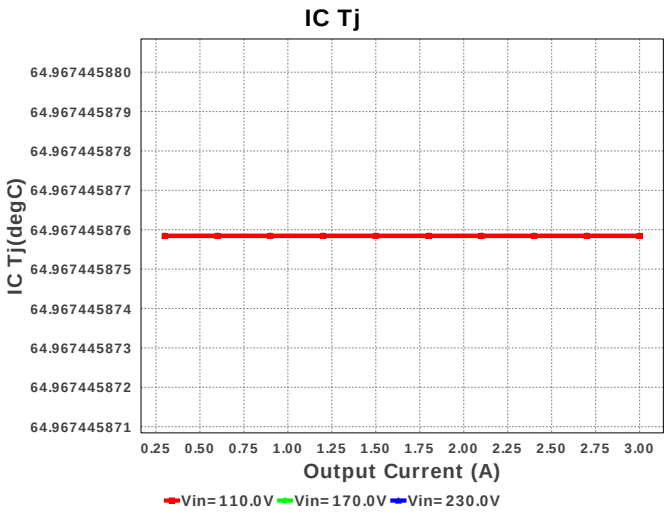


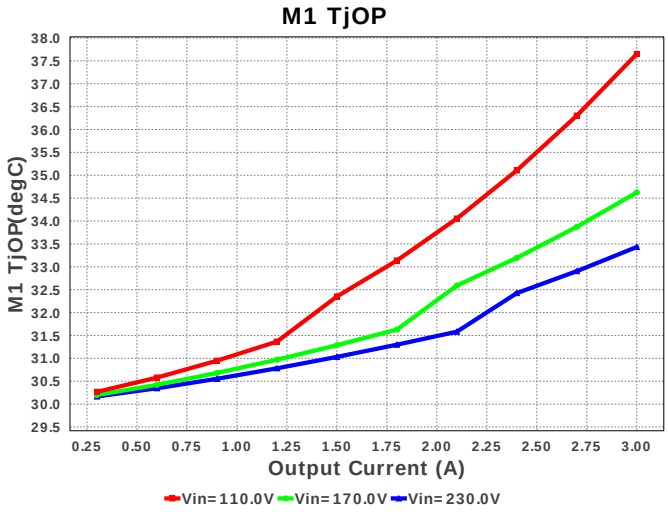


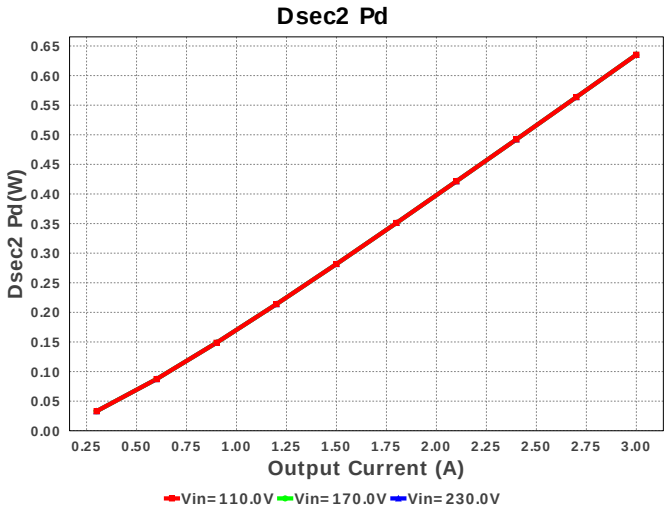


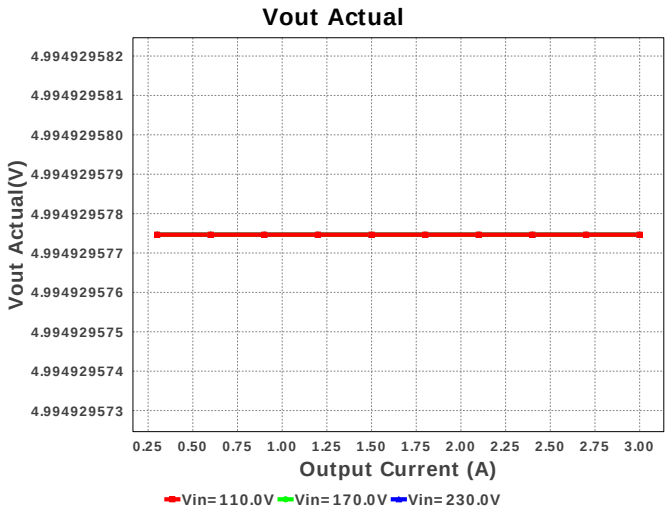


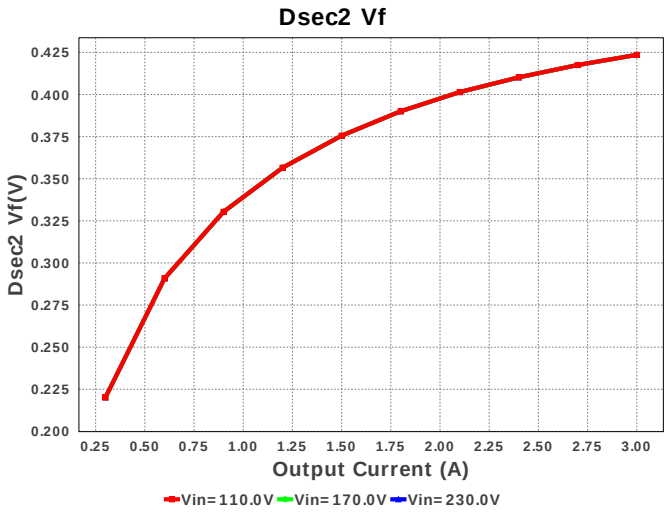


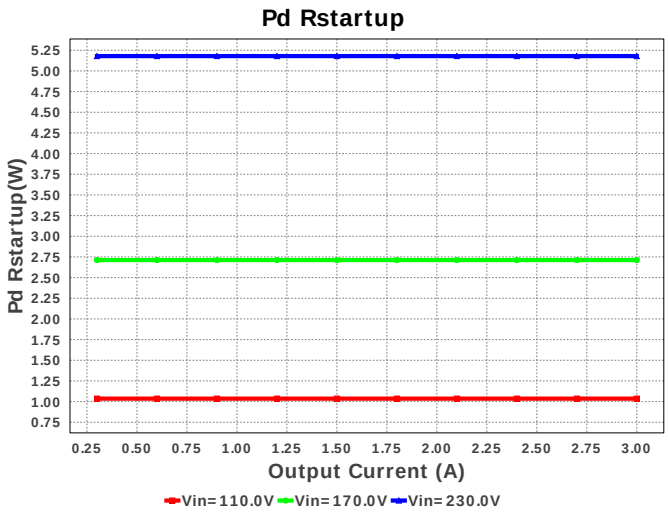


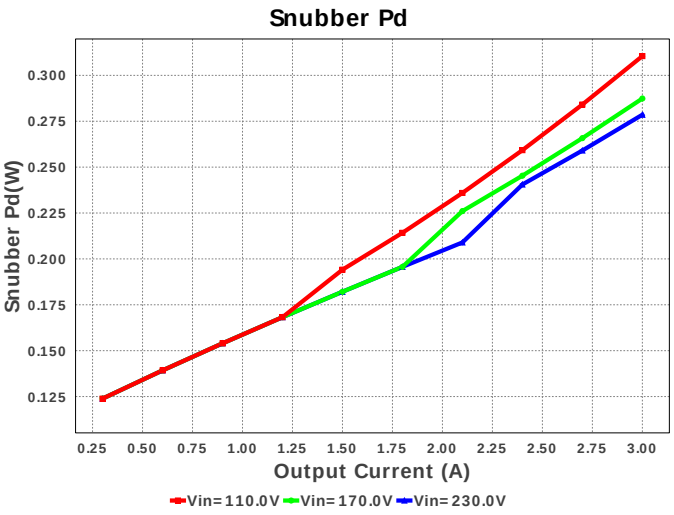


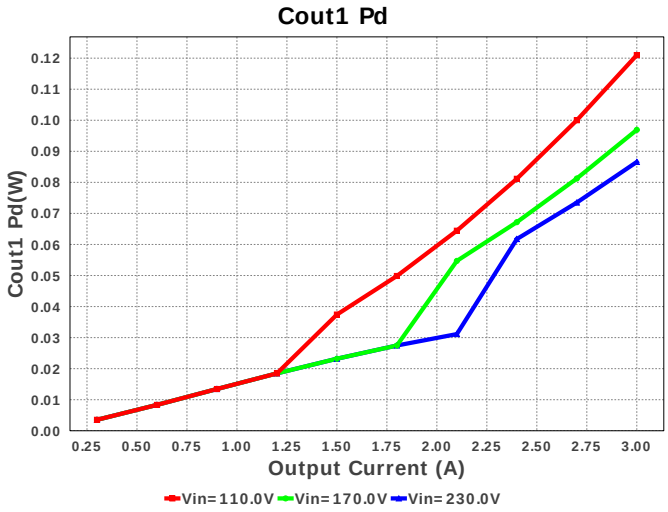


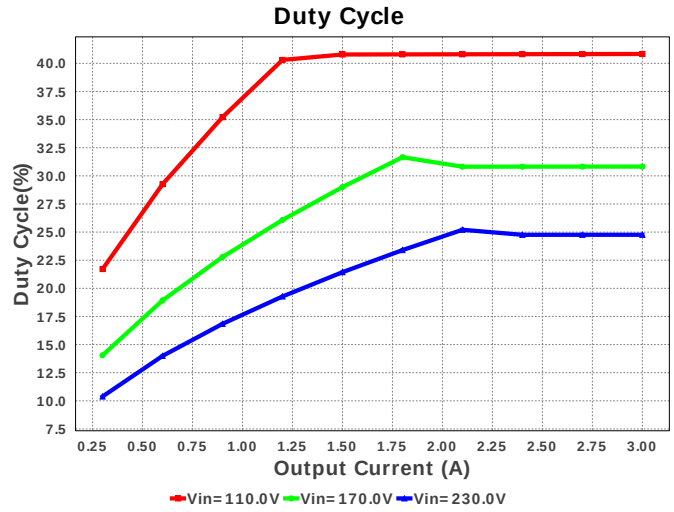


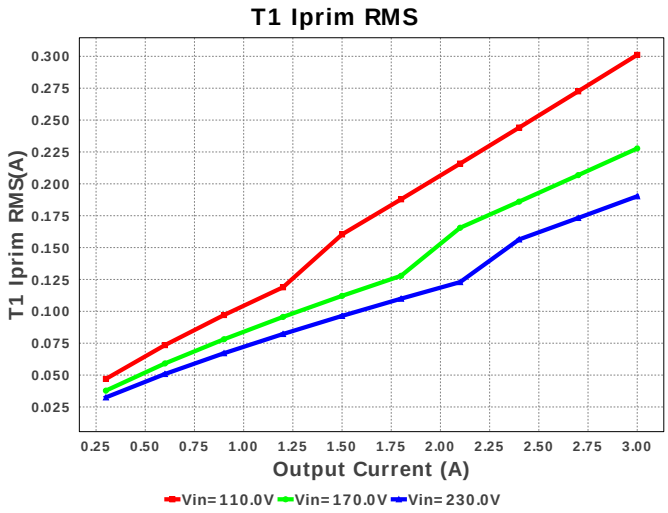


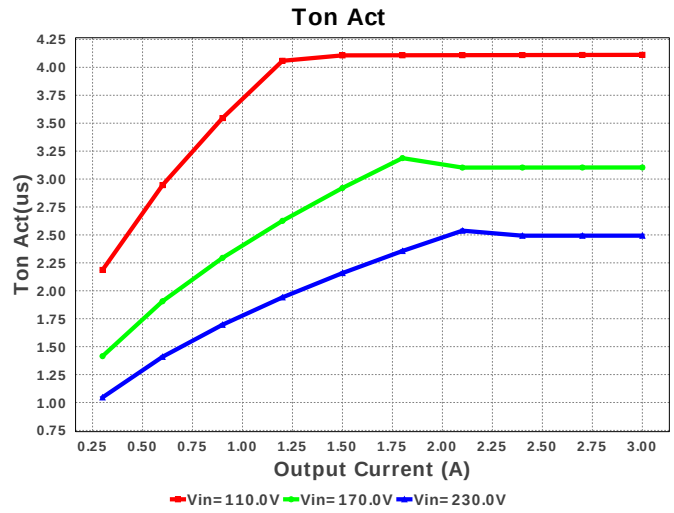


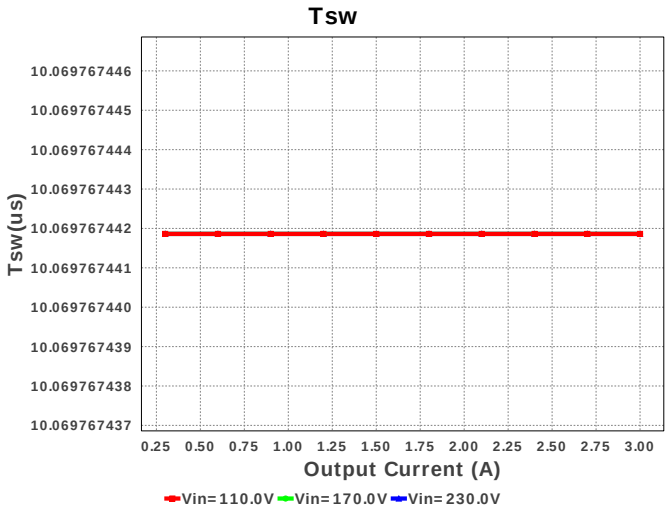


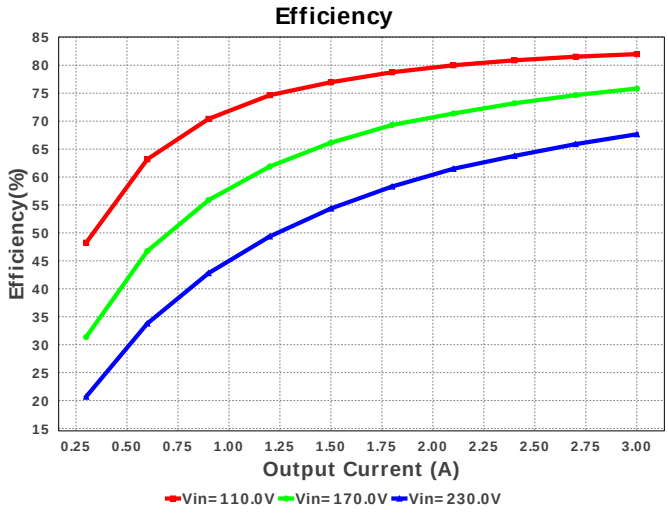


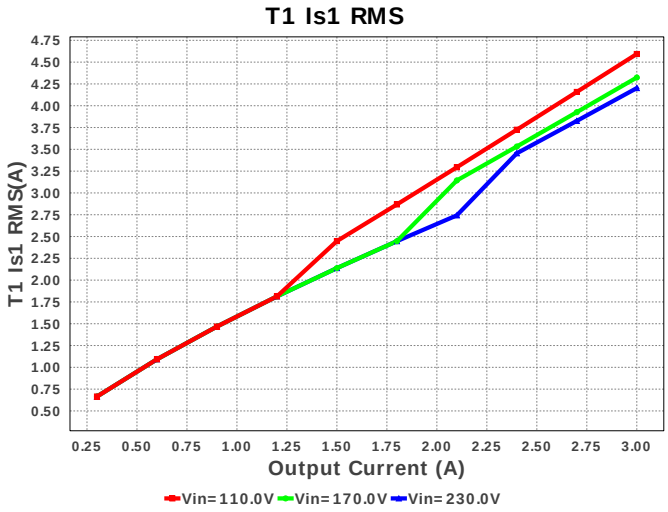


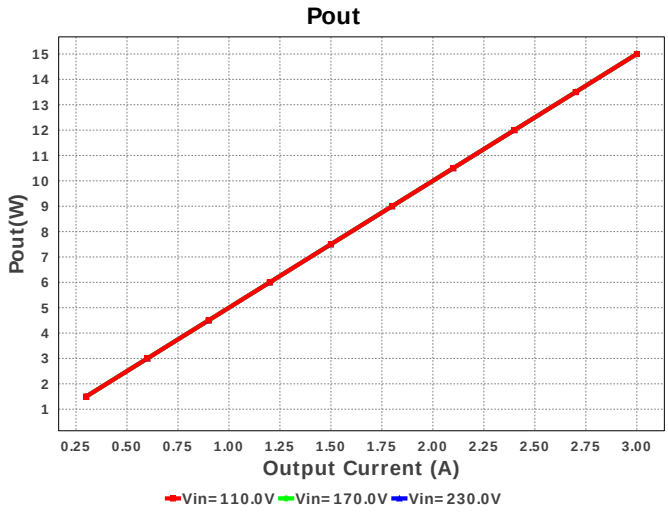


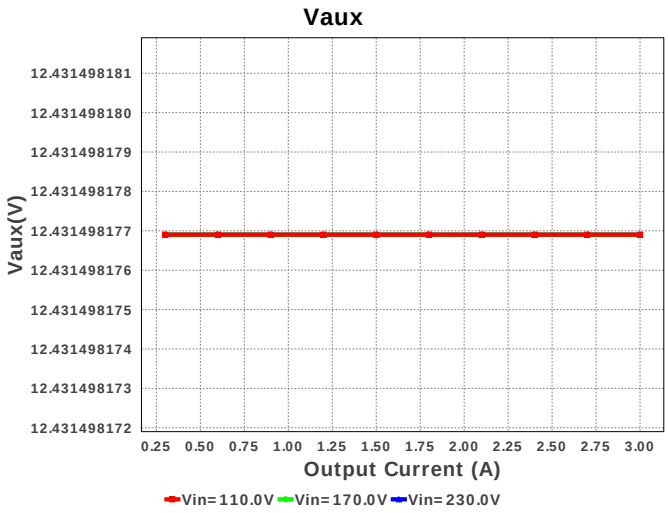


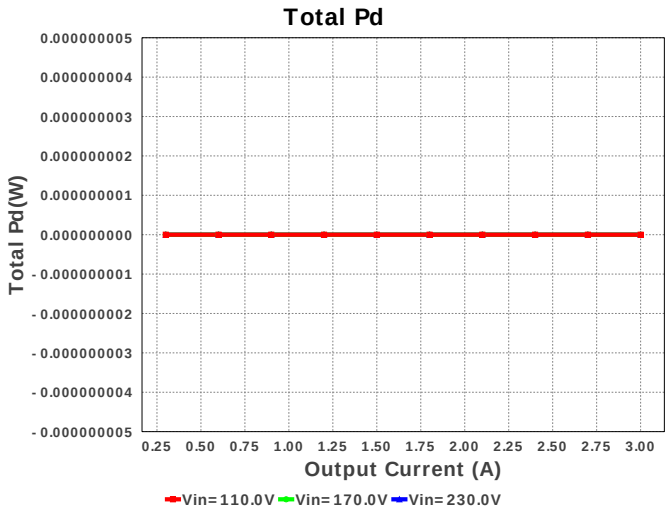


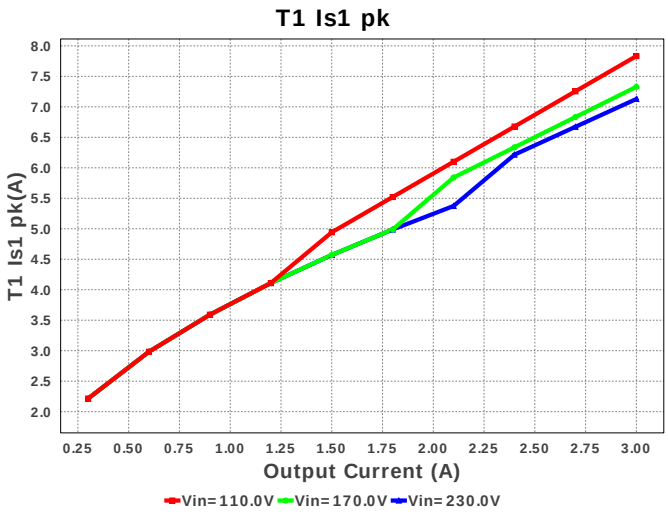


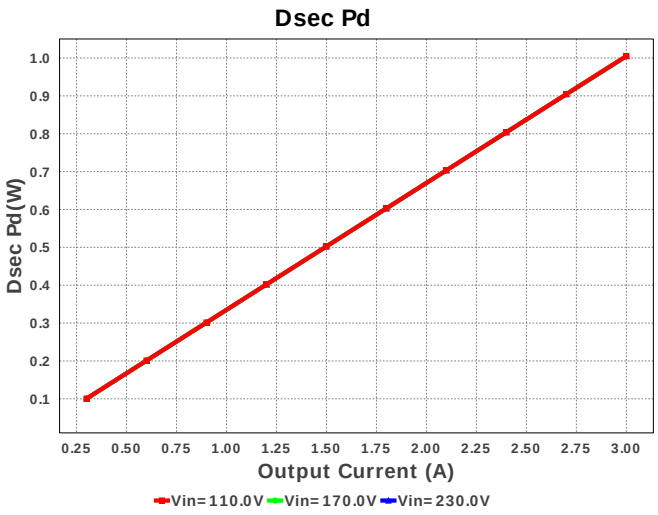


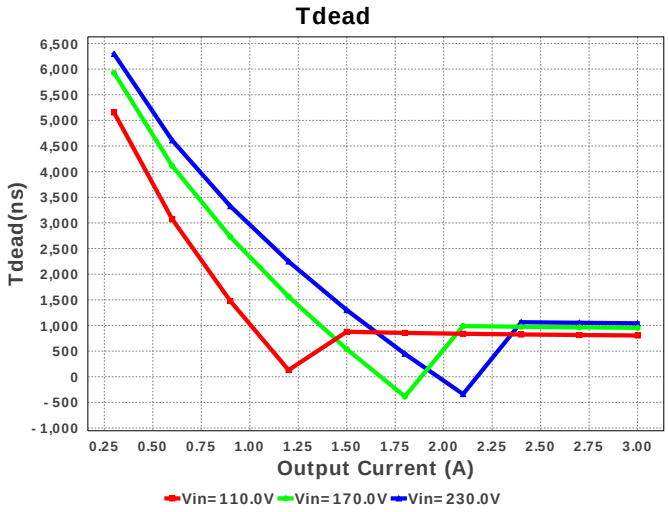


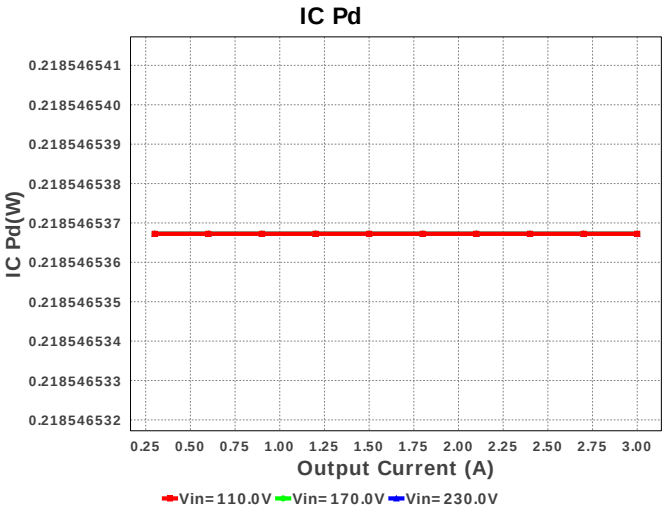


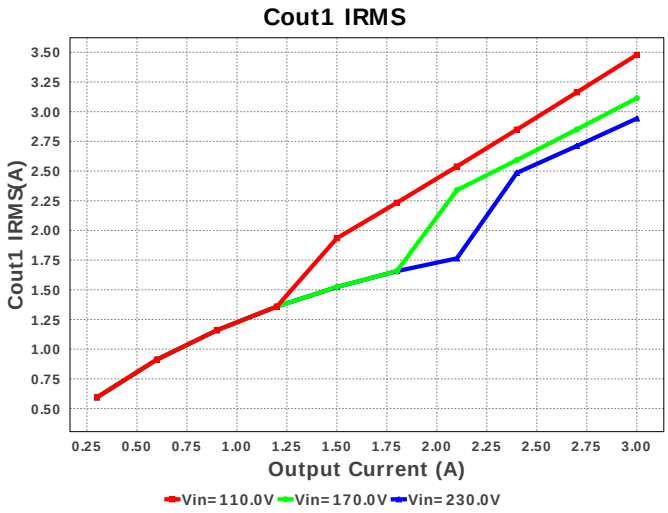


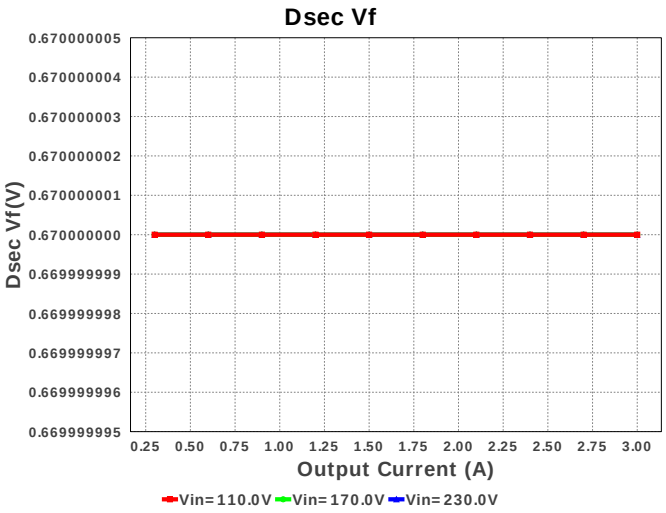


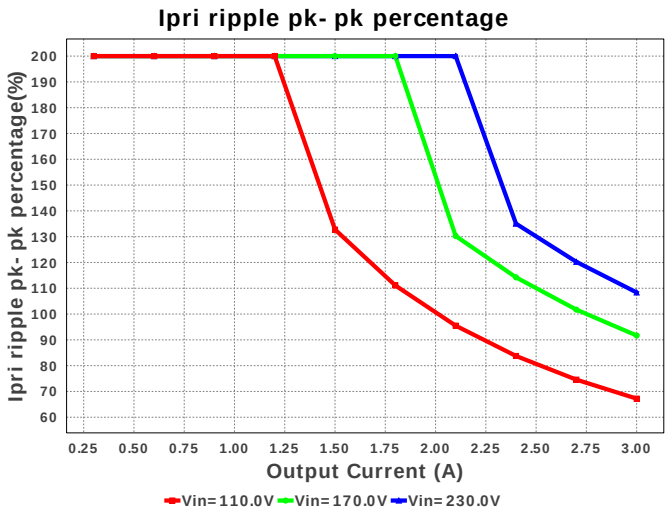


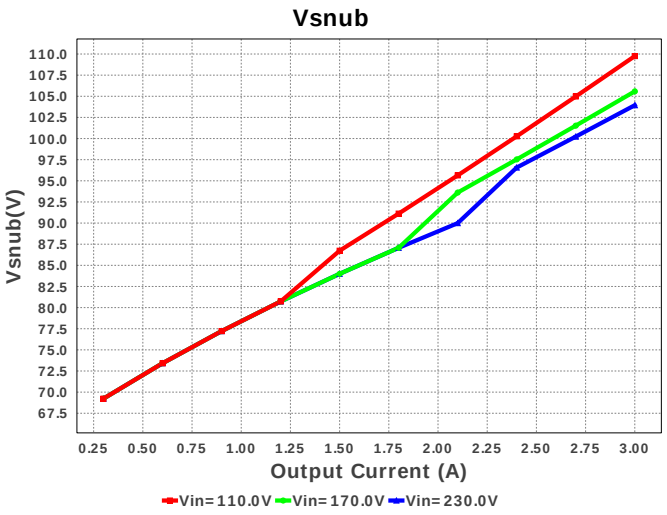


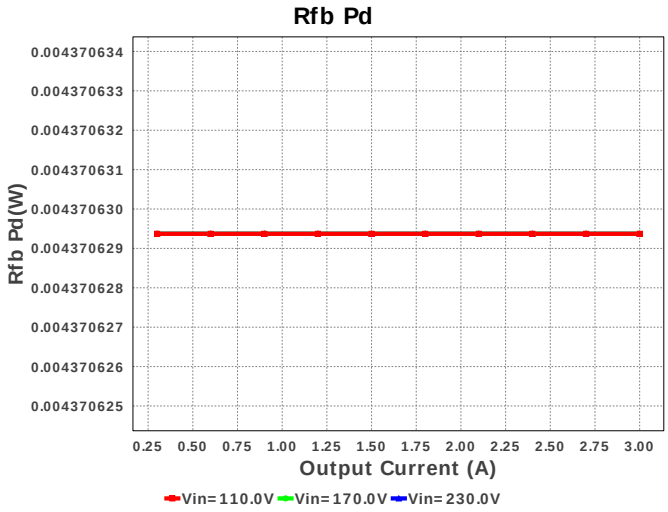


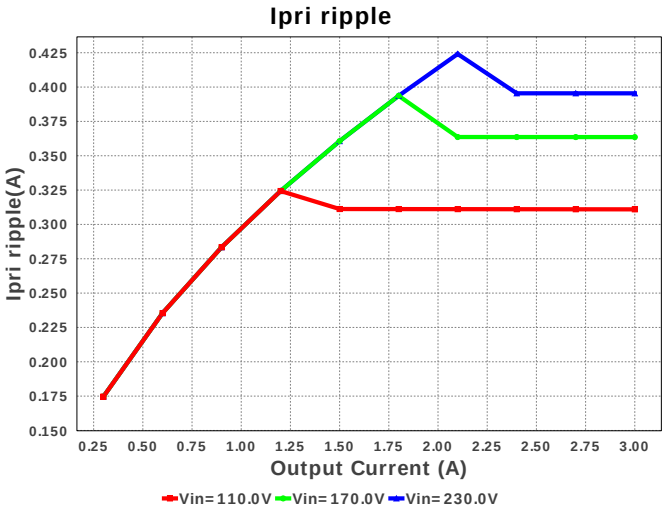


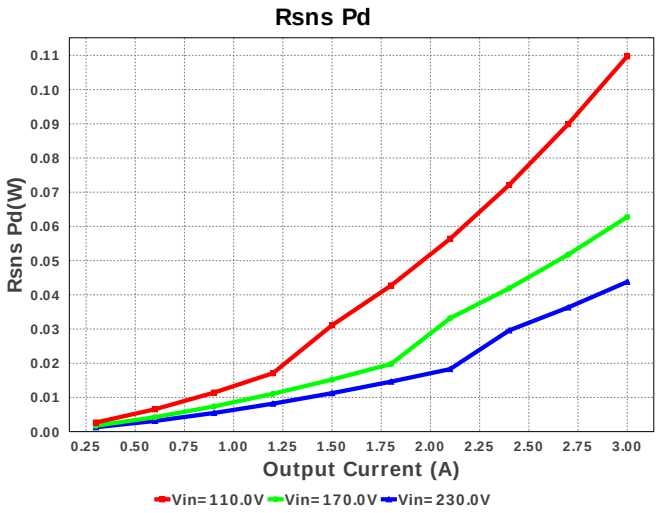


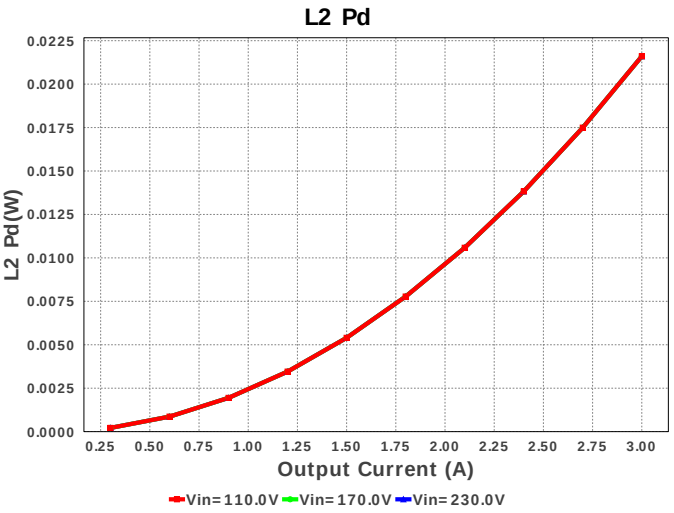


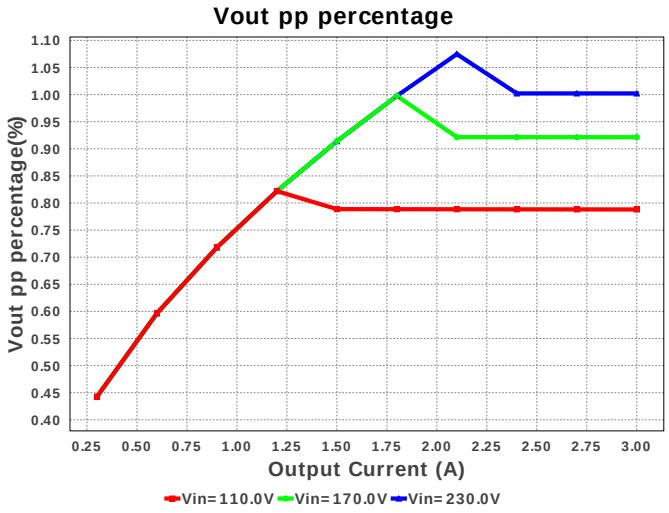


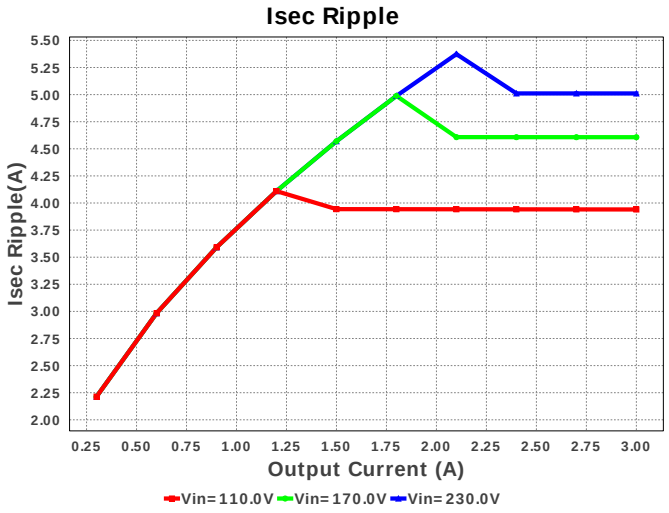


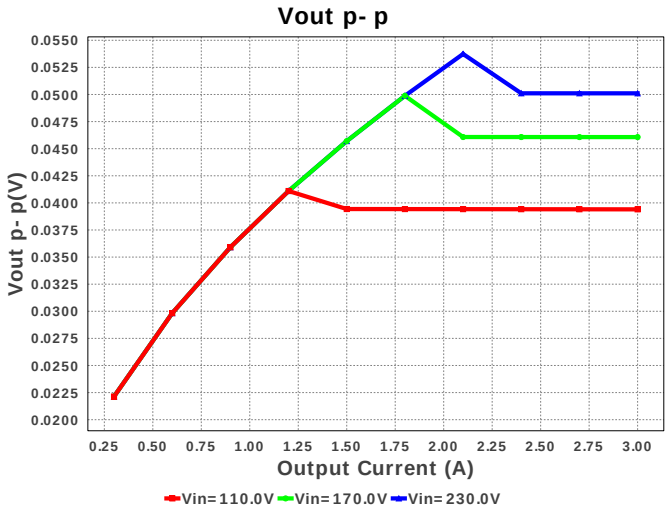


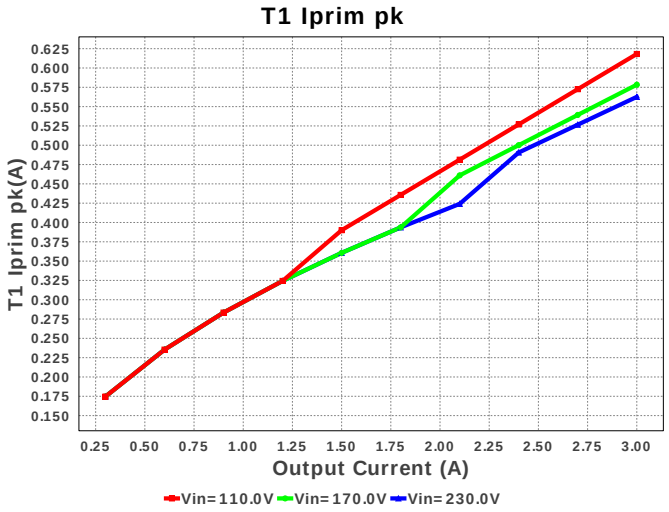












Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	3.478 A	Current	Output capacitor1 RMS ripple current
2.	Iin Avg	166.297 mA	Current	Average input current
3.	Iout_DCM	1.332 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	188.908 mA	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	310.973 mA	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	67.216 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	3.94 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	301.145 mA	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	618.133 mA	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	4.593 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	7.832 A	Current	Transformer Secondary1 Peak Current
12.	BOM Count	43	General	Total Design BOM count
13.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
14.	Dsec Vf	670.0 mV	General	Effective Forward Voltage Drop at the Operating Current
15.	Dsec trr	19.64 ns	General	Output Diode Reverse Recovery Time
16.	Dsec2 Vf	423.539 mV	General	Effective Forward Voltage Drop at the Operating Current
17.	Dsnub trr	30.0 ns	General	Snubber Diode Reverse Recovery Time
18.	FootPrint	2.1 k mm^2	General	Total Foot Print Area of BOM components
19.	Frequency	99.307 kHz	General	Switching frequency
20.	Mode	CCM	General	Conduction Mode
21.	Pout	15.0 W	General	Total output power
22.	Tdead	804.845 ns	General	Approximate Dead Time of the Regulator
23.	Toff	5.153 us	General	Approximate Converter Off Time
24.	Ton Act	4.112 us	General	Approximate Converter On Time
25.	Total BOM	$0.0	General	Total BOM Cost
26.	Tsw	10.07 us	General	Switching Time Period
27.	Vaux	12.431 V	General	Auxiliary Voltage
28.	Vsnub	109.754 V	General	Voltage Across the Snubber
29.	Vout Actual	4.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors

#	Name	Value	Category	Description
30.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
31.	Duty Cycle	40.832 %	Op_point	Duty cycle
32.	Efficiency	82.0 %	Op_point	Steady state efficiency
33.	IC Tj	64.967 degC	Op_point	IC junction temperature
34.	ICThetaJA	160.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
35.	IOUT_OP	3.0 A	Op_point	Iout operating point
36.	M1 TjOP	37.65 degC	Op_point	M1 MOSFET junction temperature
37.	Vout p-p	39.404 mV	Op_point	Peak-to-peak output ripple voltage
38.	Cin Pd	569.236 µW	Power	Input capacitor power dissipation
39.	Cout1 Pd	120.989 mW	Power	Output capacitor1 power dissipation
40.	Dsec Pd	1.005 W	Power	Secondary Diode Power Dissipation
41.	Dsec2 Pd	635.309 mW	Power	Secondary Diode Power Dissipation
42.	IC Pd	218.547 mW	Power	IC power dissipation
43.	L2 Pd	21.6 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
44.	M1 Pd	92.166 mW	Power	M1 MOSFET total power dissipation
45.	Paux	15.624 mW	Power	Power Dissipation in Raux and Daux
46.	Pd Rstartup	1.036 W	Power	Power Dissipation in Rstartup1 and Rstartup2
47.	Rdrv Pd	8.257 µW	Power	Power Dissipation in Gate Drive Resistor
48.	Rfb Pd	4.371 mW	Power	Rfb Power Dissipation
49.	Rsns Pd	109.733 mW	Power	Current Limit Sense Resistor Power Dissipation
50.	Snubber Pd	310.497 mW	Power	Snubber Power Dissipation
51.	T1 Pd	520.7 mW	Power	Estimated Losses in Transformer
52.	Total Pd	0.0 W	Power	Total Power Dissipation
53.	Vout Tolerance	1.478 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
54.	Vout pp percentage	788.071 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	230.0	Maximum input voltage
3.	VinMin	110.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	UC1845	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **UC1845** Product Folder : http://www.ti.com/product/UC1845 : contains the data sheet and other resources.