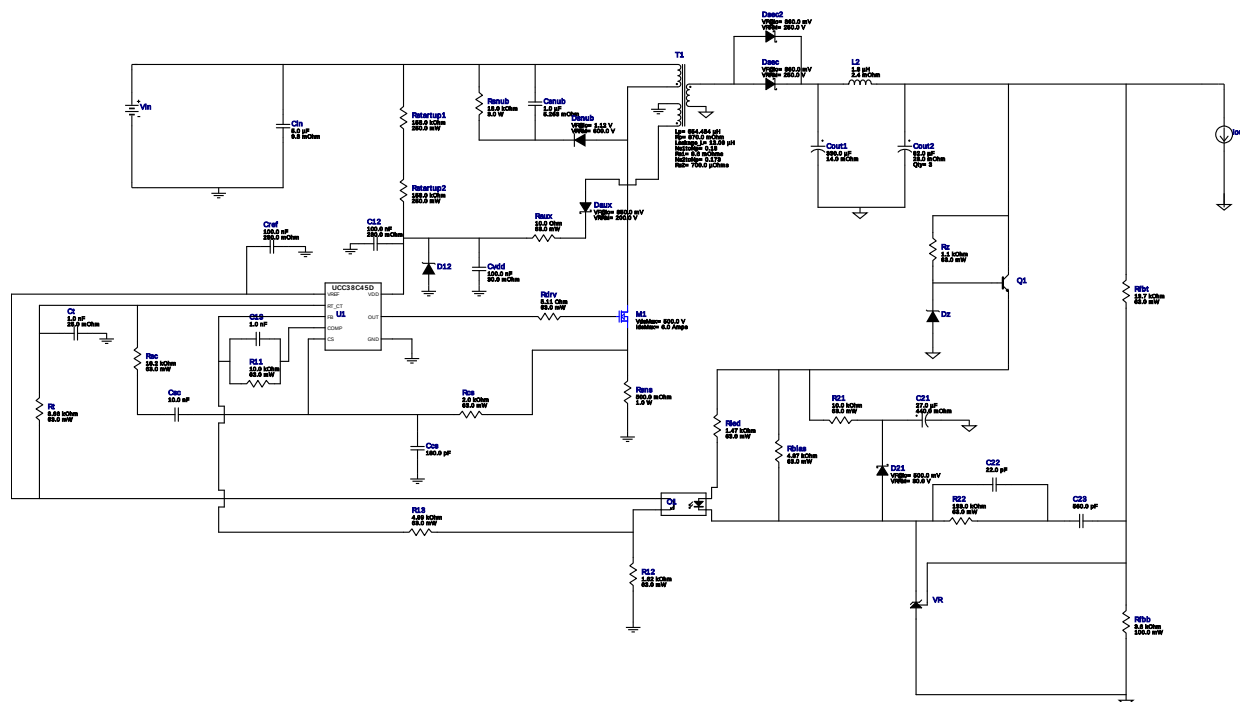


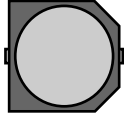
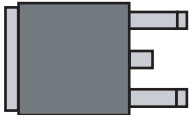
WEBENCH® Design Report

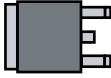
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UCC38C45DR 110.0V-250.0V to 12.00V @ 3.0A



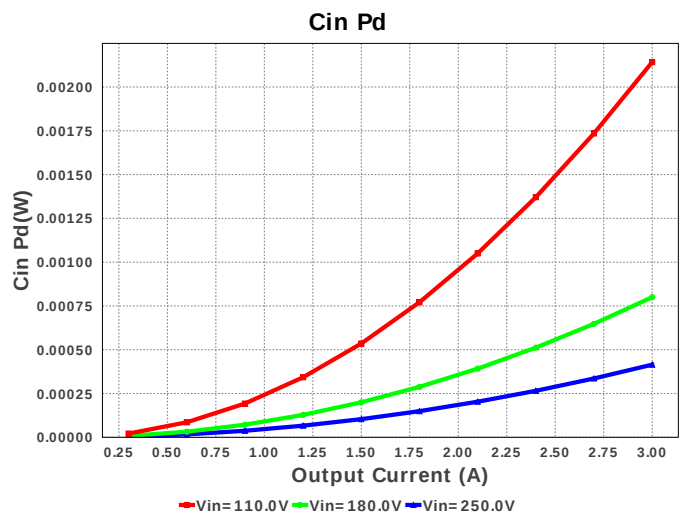
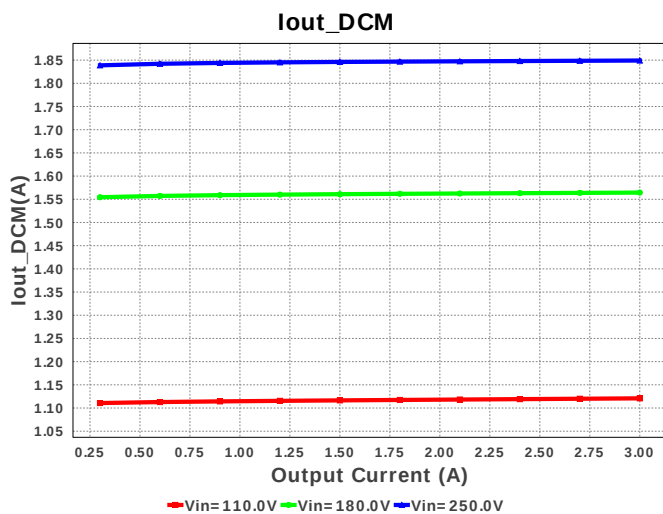
Electrical BOM

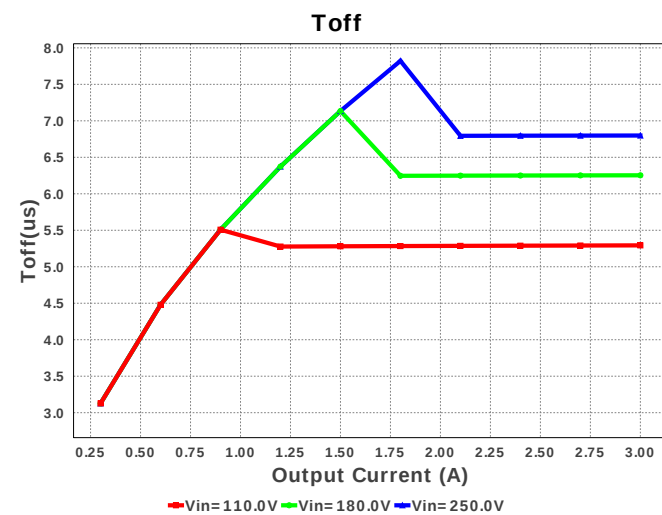
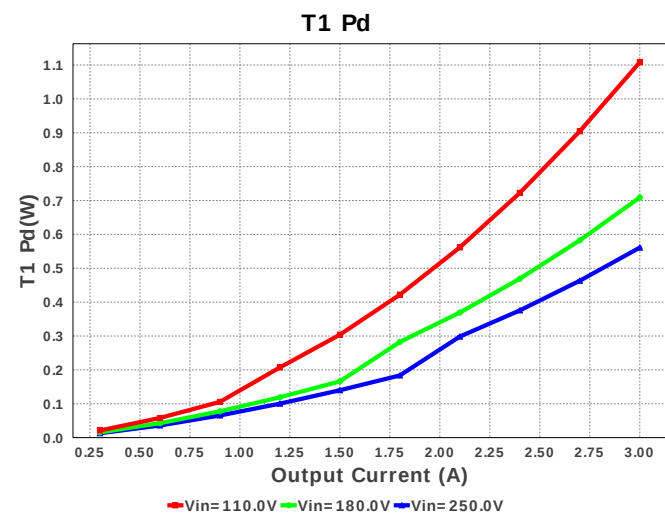
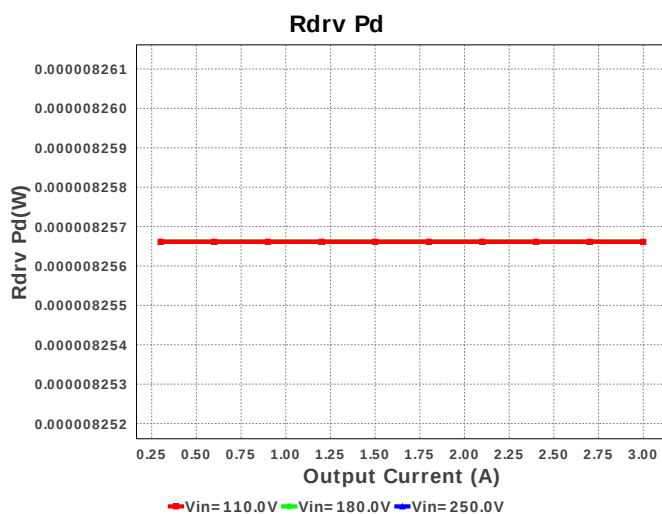
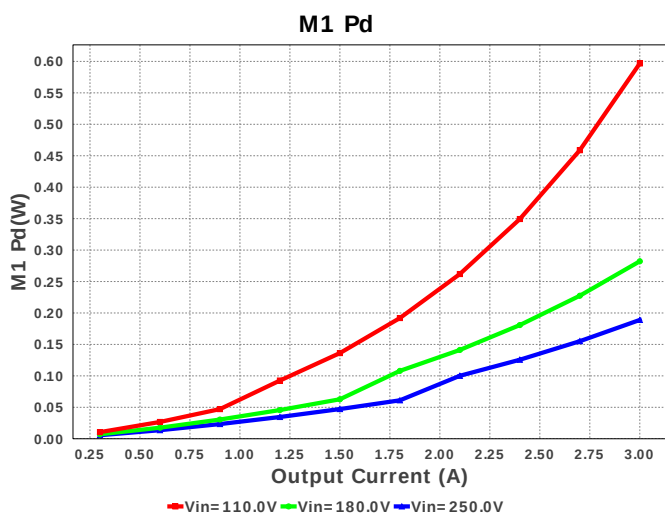
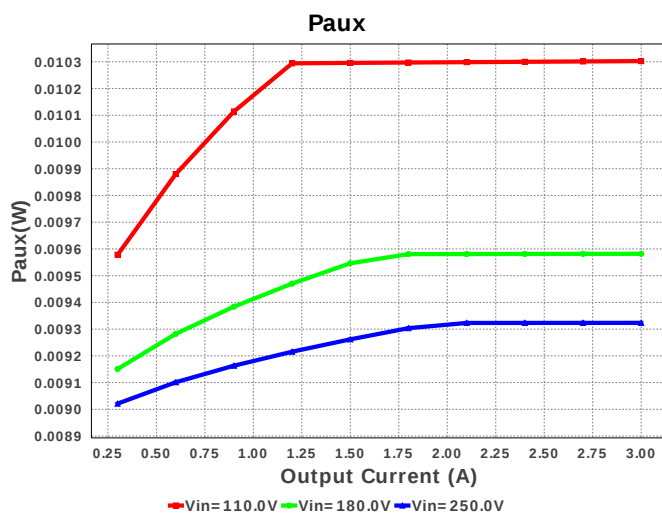
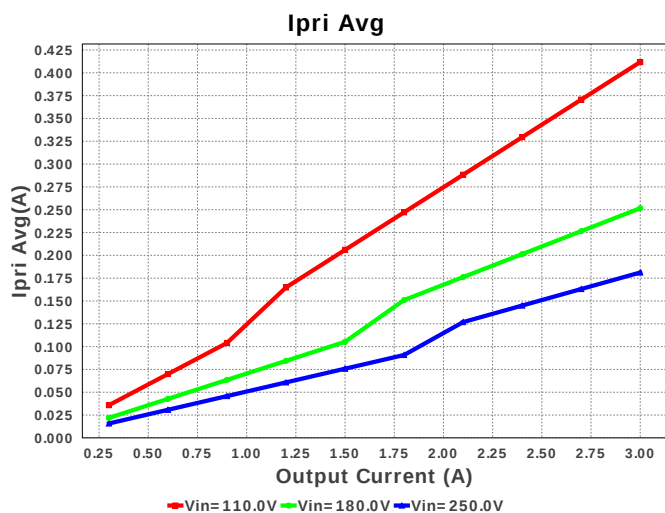
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1.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	C21	Nichicon	UUD1E270MCL1GS Series= uD	Cap= 27.0 uF ESR= 440.0 mOhm VDC= 25.0 V IRMS= 230.0 mA	1	\$0.11	 SM_RADIAL_6.3AMM 80 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	CC0805KRX7R9BB561 Series= X7R	Cap= 560.0 pF 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

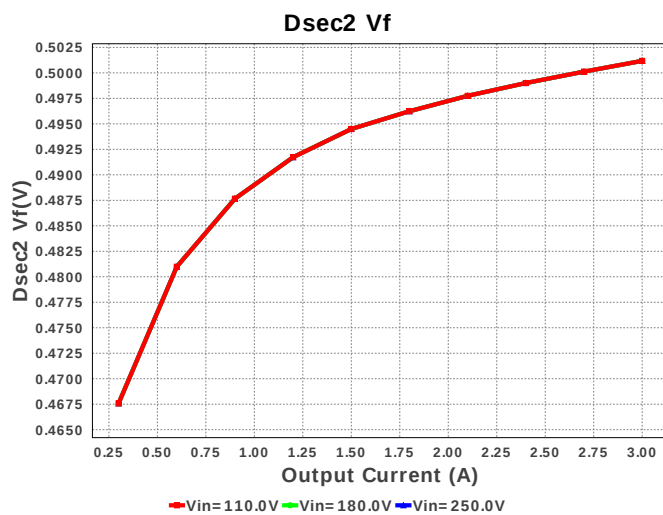
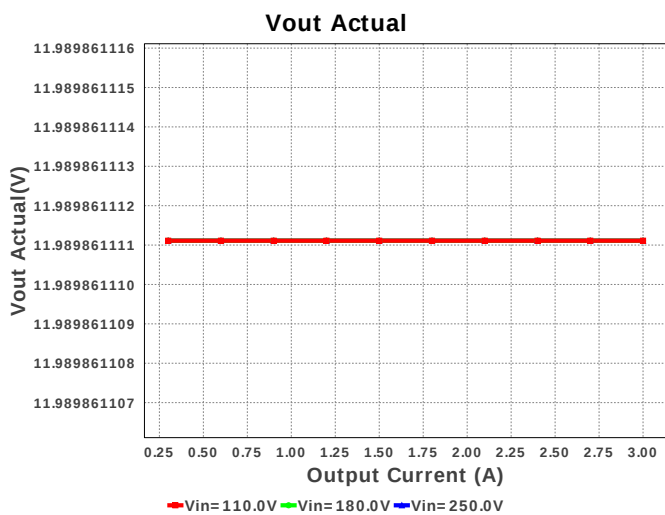
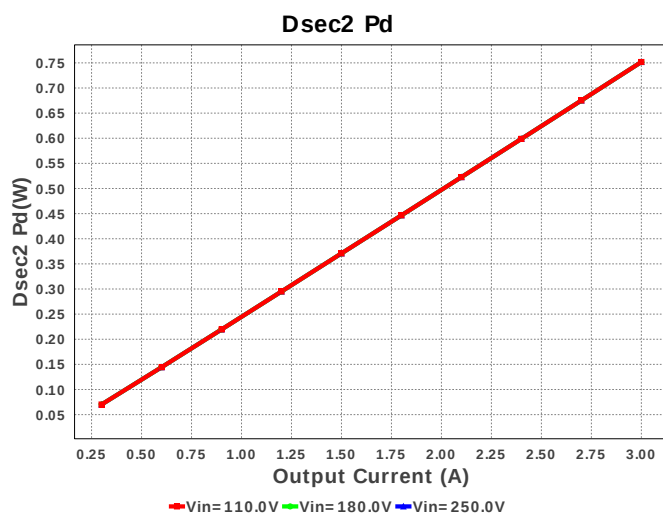
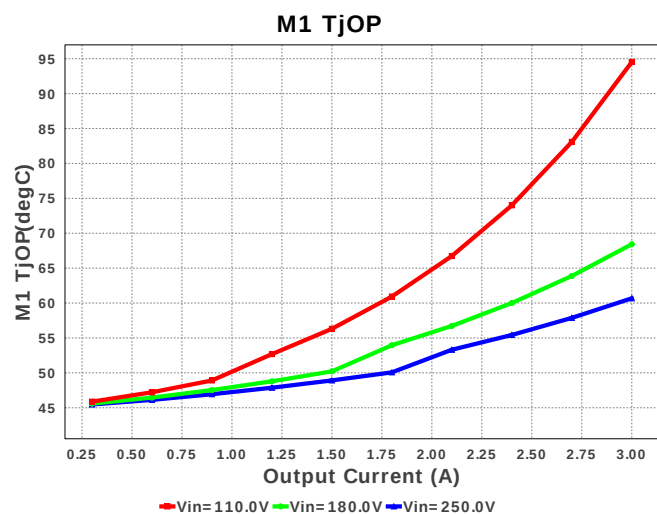
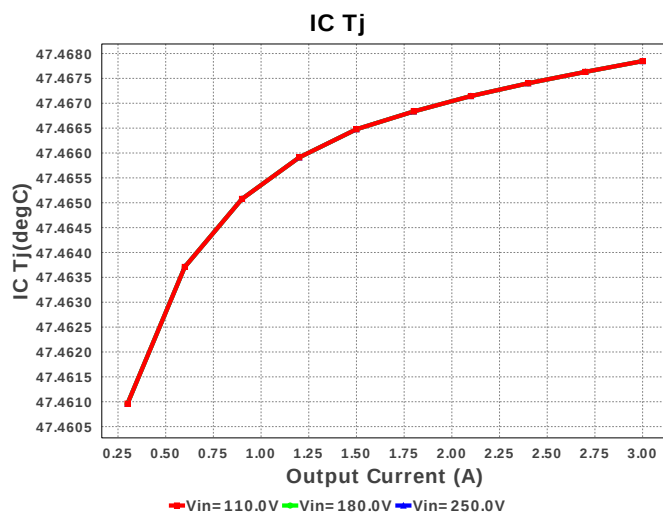
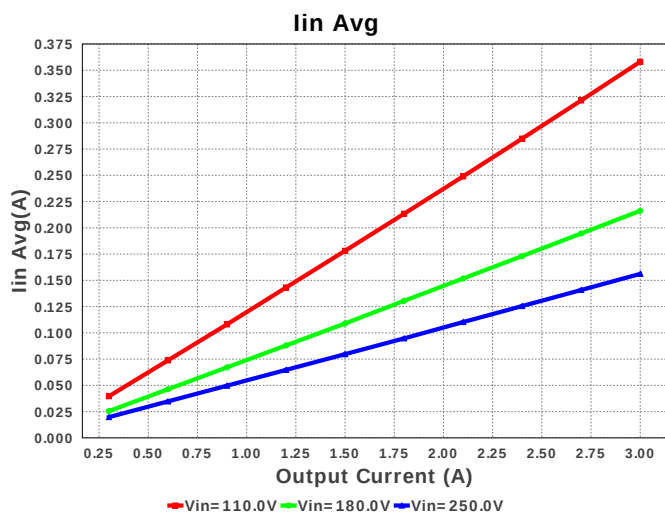
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7.	Cin	TDK	B32774D1505K Series= B32774	Cap= 5.0 uF ESR= 9.8 mOhm VDC= 1.3 kV IRMS= 10.5 A	1	\$3.08	 B32774_3150x2200x3650 804 mm ²
8.	Cout1	Panasonic	25SVPF330M Series= ?	Cap= 330.0 uF ESR= 14.0 mOhm VDC= 25.0 V IRMS= 5.0 A	1	\$0.70	 CAPSMT_62_F12 151 mm ²
9.	Cout2	Panasonic	25SVPF82M Series= ?	Cap= 82.0 uF ESR= 28.0 mOhm VDC= 25.0 V IRMS= 3.0 A	3	\$0.50	 CAPSMT_62_E7 106 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	C5750X6S2W105K Series= X6S	Cap= 1.0 uF ESR= 5.263 mOhm VDC= 400.0 V IRMS= 0.0 A	1	\$1.19	 2220 54 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.	Cvdd	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.	D12	Diodes Inc.	MMSZ5248B-7-F	Zener	1	\$0.04	 SOD-123 13 mm ²
16.	D21	Diodes Inc.	B230A-13-F	VF@Io= 500.0 mV VRRM= 30.0 V	1	\$0.09	 SMA 37 mm ²
17.	Daux	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	\$0.21	 PowerDI123 13 mm ²
18.	Dsec	ON Semiconductor	MBRB40250TG	VF@Io= 860.0 mV VRRM= 250.0 V	1	\$0.94	 DDPAK 210 mm ²
19.	Dsec2	ON Semiconductor	MBRB40250TG	VF@Io= 860.0 mV VRRM= 250.0 V	1	\$0.94	 DDPAK 210 mm ²
20.	Dsnub	Bourns	CD214C-F3600	VF@Io= 1.12 V VRRM= 600.0 V	1	\$0.18	 SMC 83 mm ²

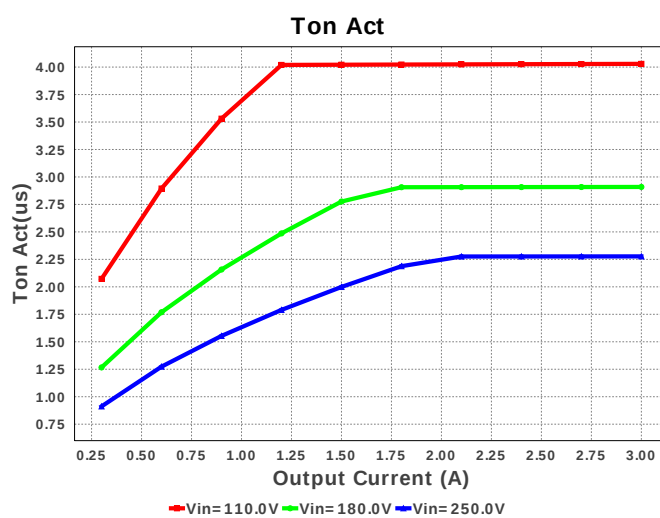
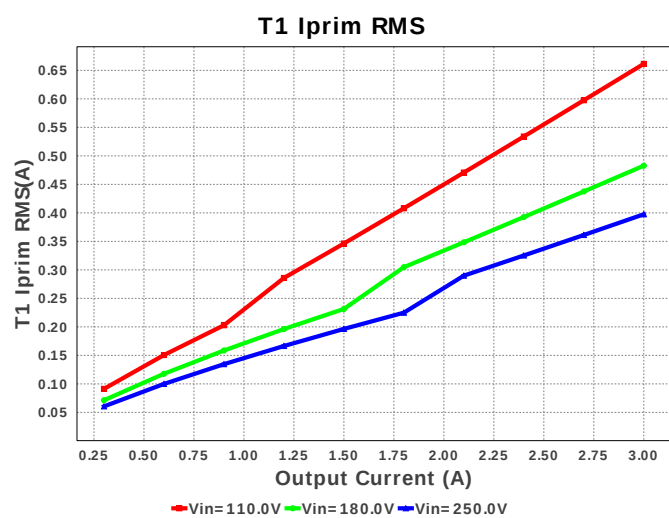
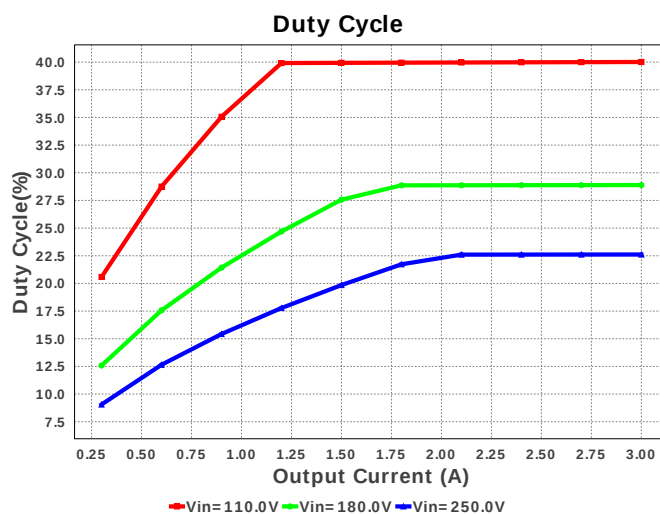
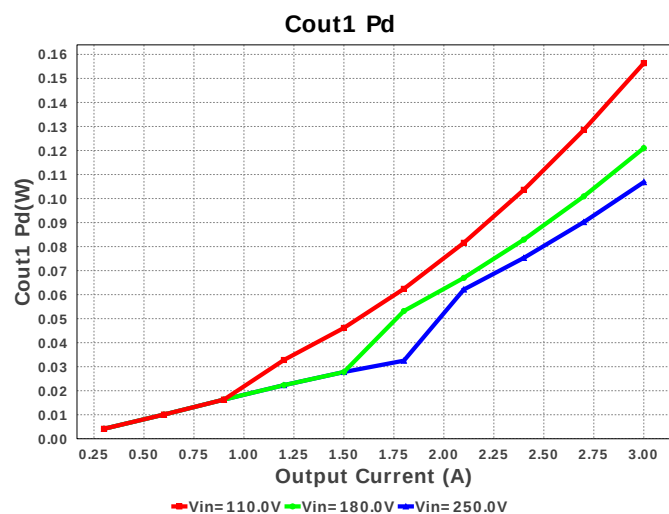
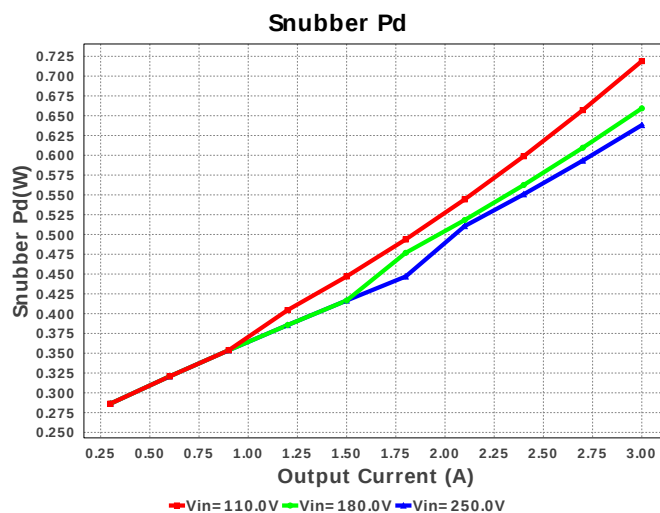
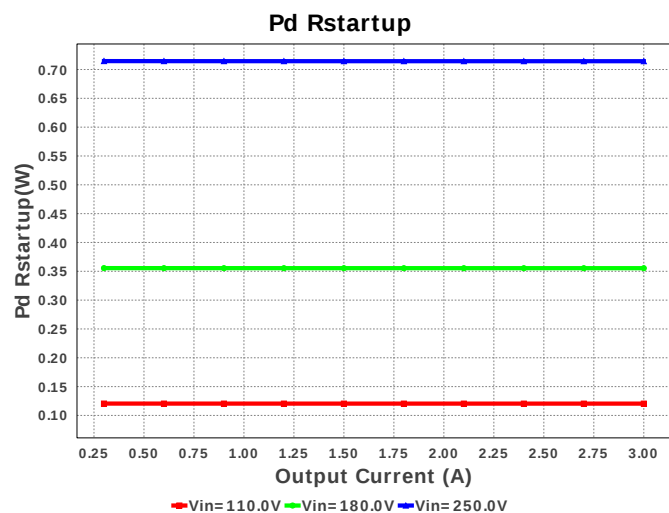
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
21.	Dz	ON Semiconductor	BZX84C9V1LT1G	Zener	1	\$0.02	 SOT-23 14 mm ²
22.	L2	Coilcraft	SER1360-182KLB	L= 1.8 µH DCR= 2.4 mOhm	1	\$0.72	 SER1360 225 mm ²
23.	M1	Fairchild Semiconductor	FDD6N50TM	VdsMax= 500.0 V IdsMax= 6.0 Amps	1	\$0.47	 DPAK 102 mm ²
24.	O1	Vishay-Semiconductor	TCMT1107	Optocoupler	1	\$0.21	 SOP-4 44 mm ²
25.	Q1	ON Semiconductor	BC846BLT1G	Bipolar Transistor	1	\$0.02	 SOT-23 14 mm ²
26.	R11	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
27.	R12	Vishay-Dale	CRCW04021K62FKED Series= CRCW..e3	Res= 1.62 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
28.	R13	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
29.	R21	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
30.	R22	Vishay-Dale	CRCW0402133KFKED Series= CRCW..e3	Res= 133.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
31.	Raux	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
32.	Rbias	Vishay-Dale	CRCW04024K87FKED Series= CRCW..e3	Res= 4.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
33.	Rcs	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
34.	Rdrv	Vishay-Dale	CRCW04025R11FKED Series= CRCW..e3	Res= 5.11 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
35.	Rfbb	Yageo America	RC0603FR-073K6L Series= ?	Res= 3.6 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
36.	Rfbt	Vishay-Dale	CRCW040213K7FKED Series= CRCW..e3	Res= 13.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
37.	Rled	Vishay-Dale	CRCW04021K47FKED Series= CRCW..e3	Res= 1.47 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
38.	Rsc	Vishay-Dale	CRCW040218K2FKED Series= CRCW..e3	Res= 18.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
39.	Rsns	Stackpole Electronics Inc	CSRN2010FKR500 Series= ?	Res= 500.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	\$0.10	 2010 32 mm ²

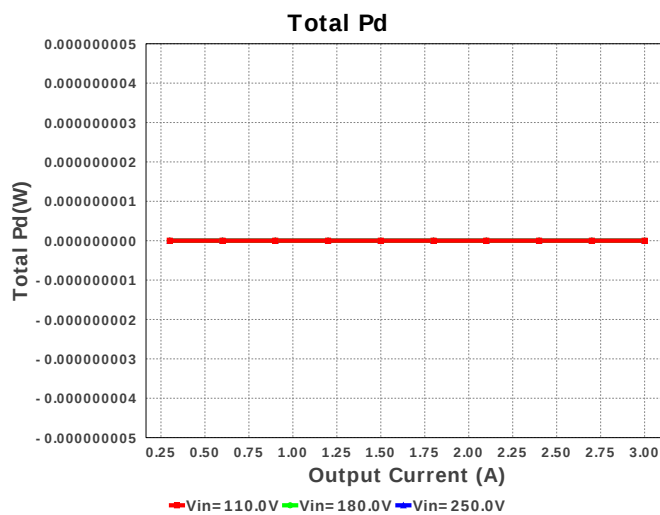
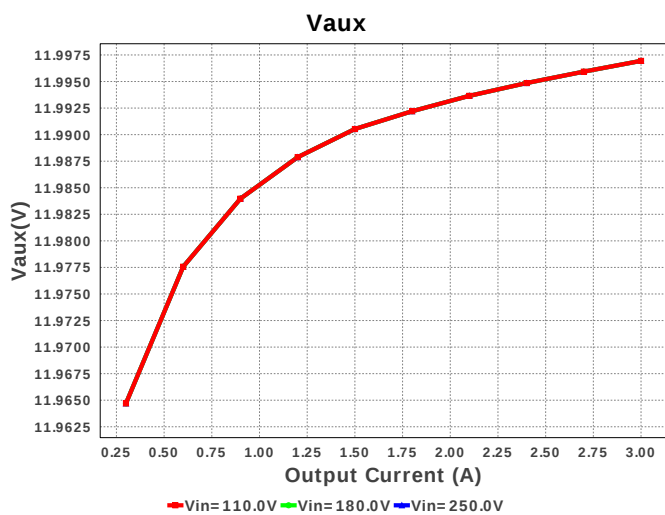
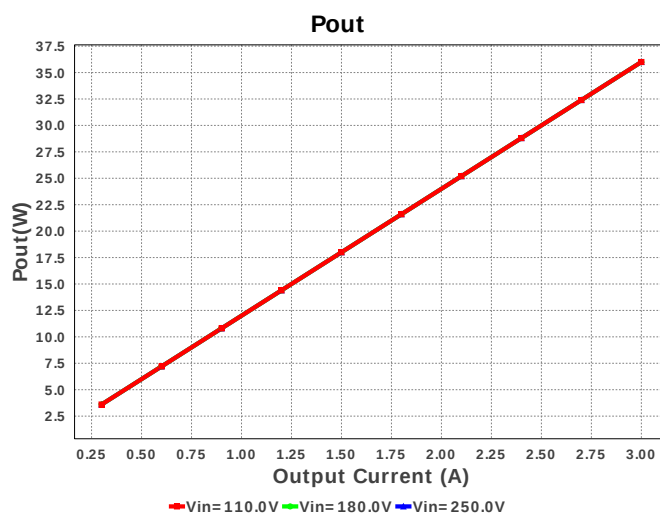
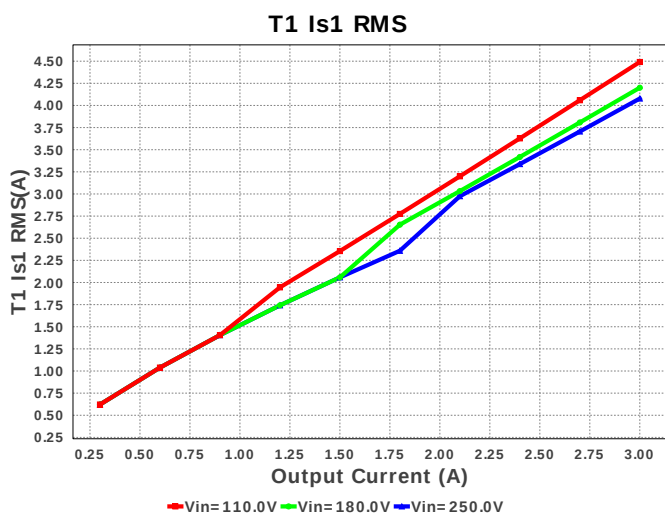
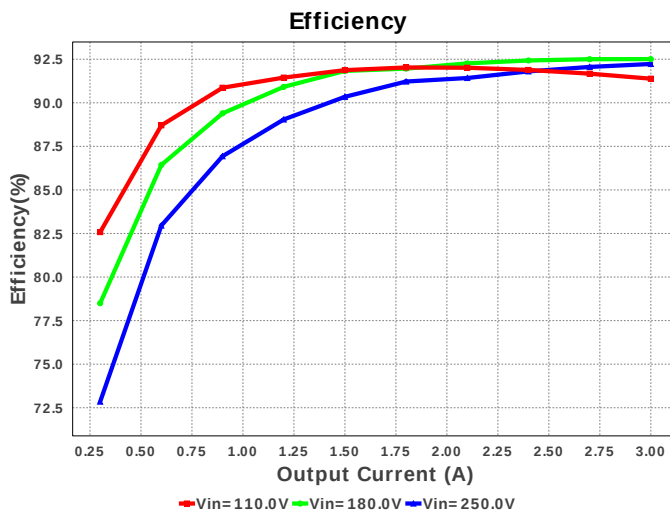
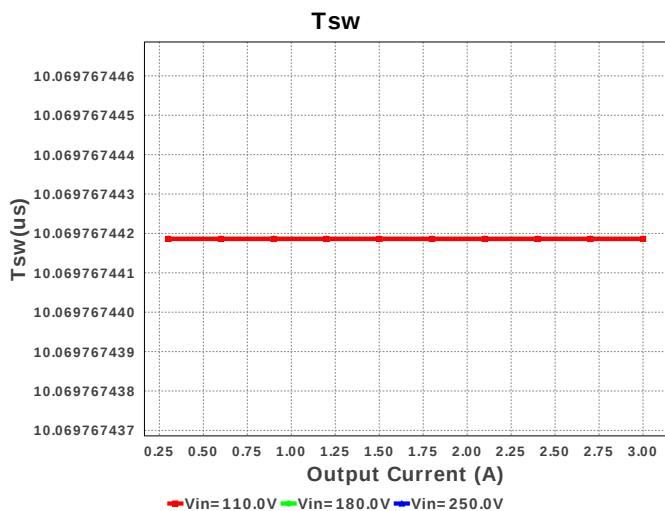
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
40.	Rsub	Vishay-Bccomponents	PR03000201802JAC00 Series= ?	Res= 18.0 kOhm Power= 3.0 W Tolerance= 5.0%	1	\$0.19	 PR03 0 mm²
41.	Rstartup1	Panasonic	ERJ-8ENF1583V Series= ERJ-8E	Res= 158.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
42.	Rstartup2	Panasonic	ERJ-8ENF1583V Series= ERJ-8E	Res= 158.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
43.	Rt	Vishay-Dale	CRCW04028K66FKED Series= CRCW..e3	Res= 8.66 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
44.	Rz	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
45.	T1	CUSTOM	CUSTOM	Lp= 654.484 µH Rp= 870.0 mOhm Leakage_L= 13.09 µH Ns1toNp= 0.18 Rs1= 8.6 mOhms Ns2toNp= 0.173 Rs2= 700.0 µOhms	1	NA	CUSTOM 0 mm²
46.	U1	Texas Instruments	UCC38C45DR	Switcher	1	\$0.60	 D0008A 57 mm²
47.	VR	Texas Instruments	TL431AIDBVR	Voltage References	1	\$0.07	 R-PDSO-G3 16 mm²

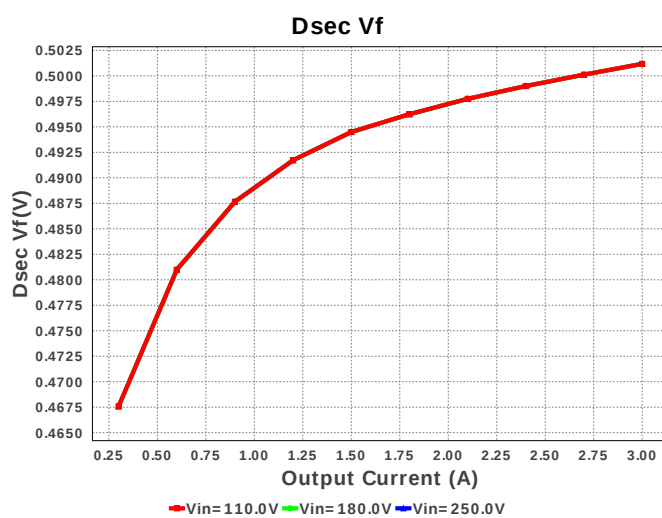
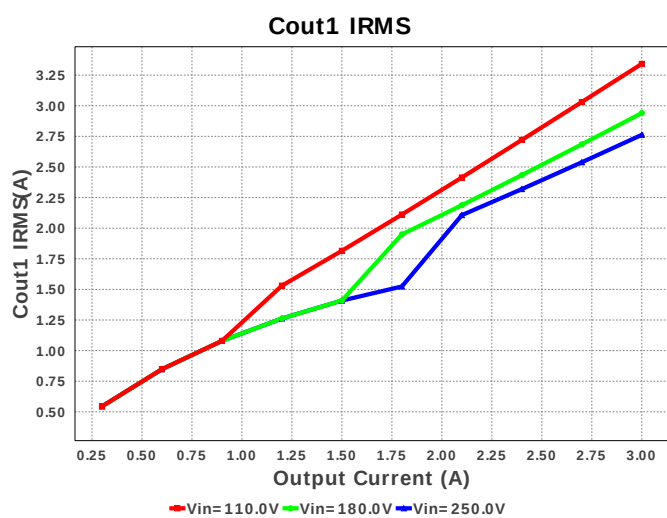
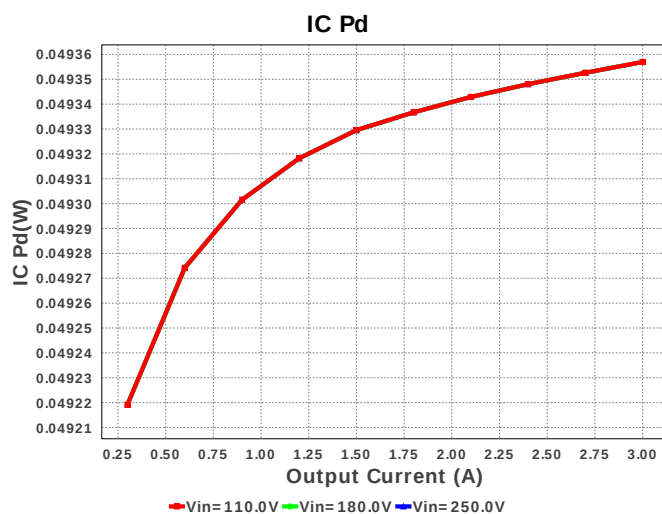
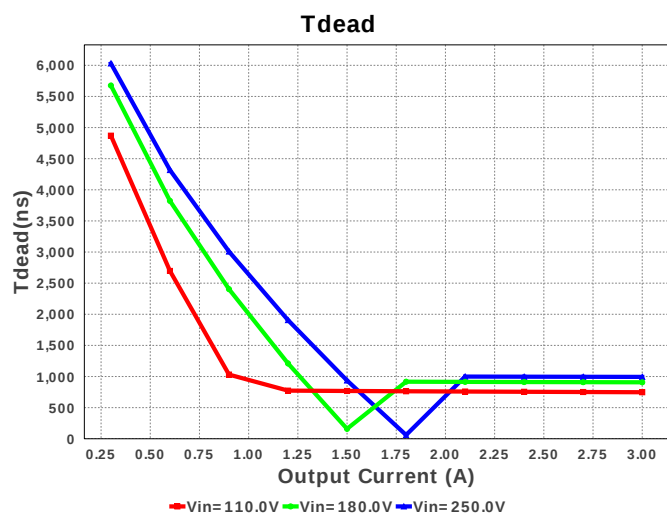
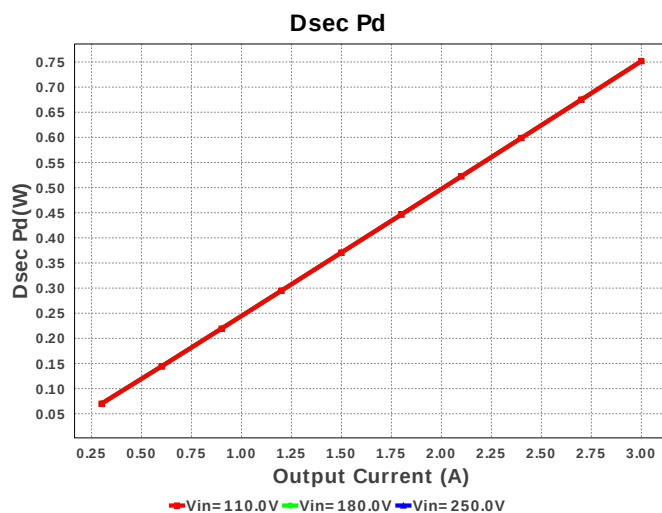
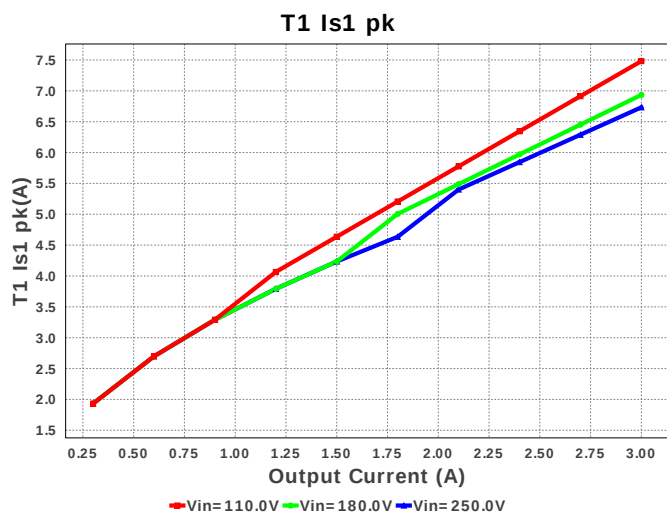


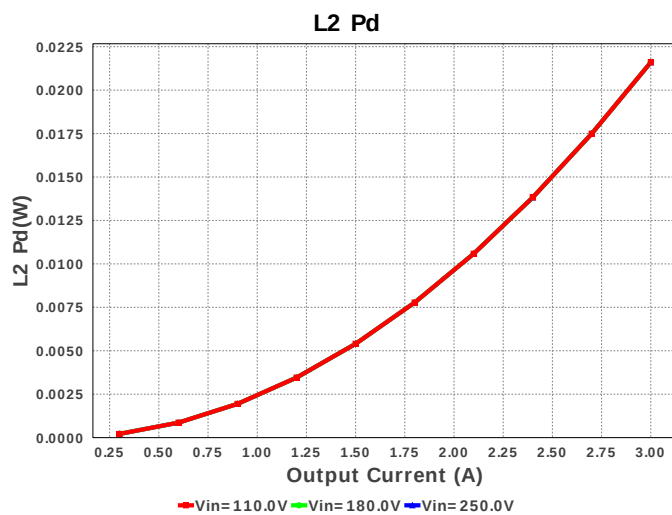
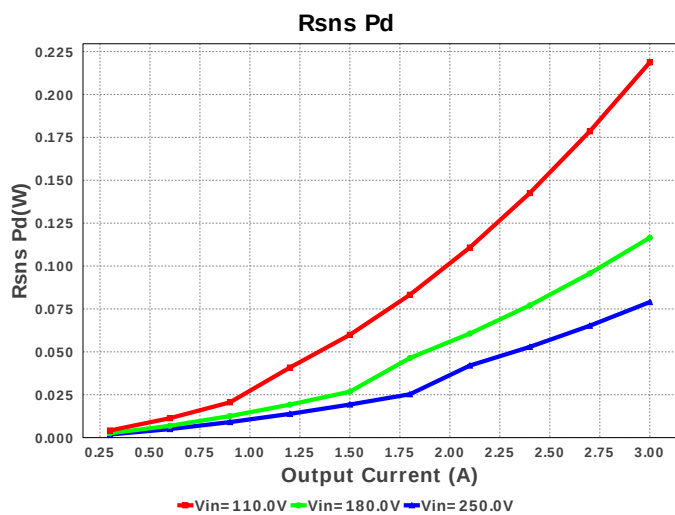
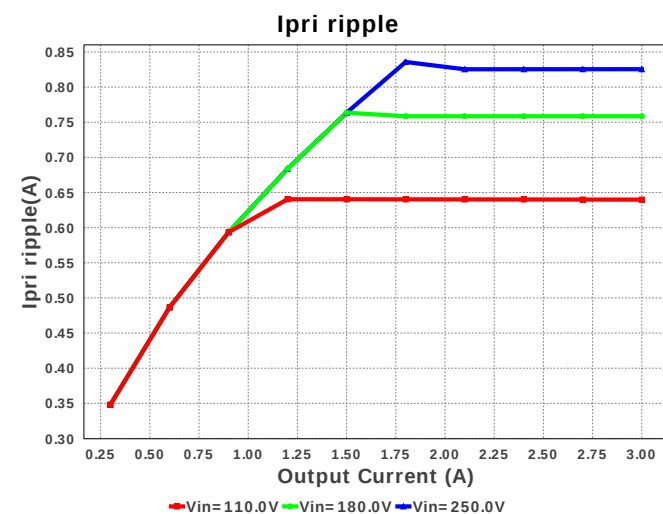
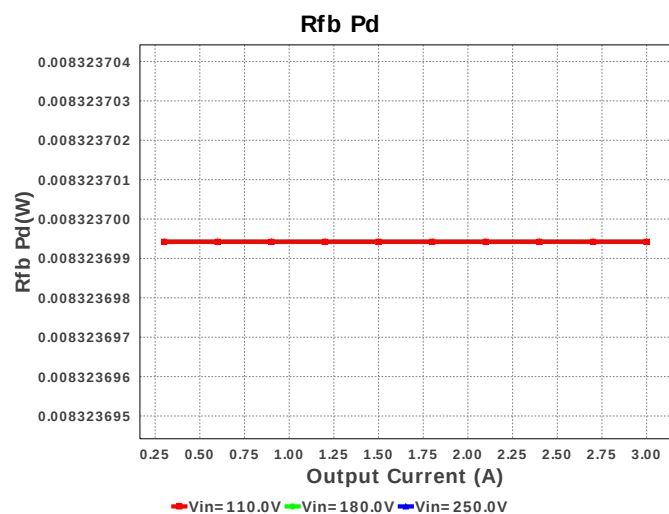
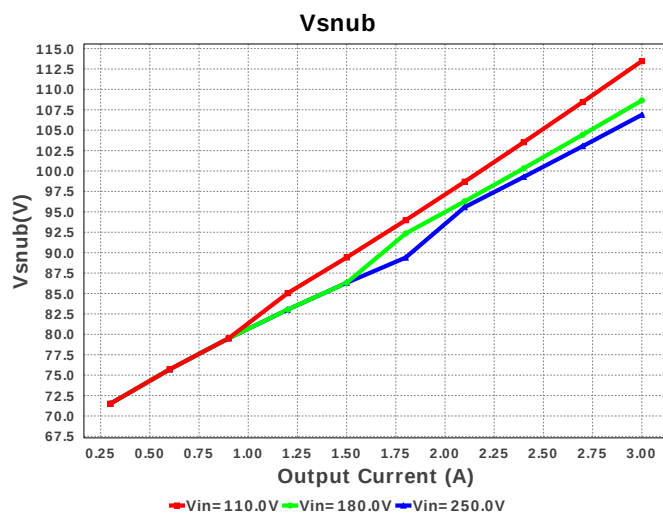
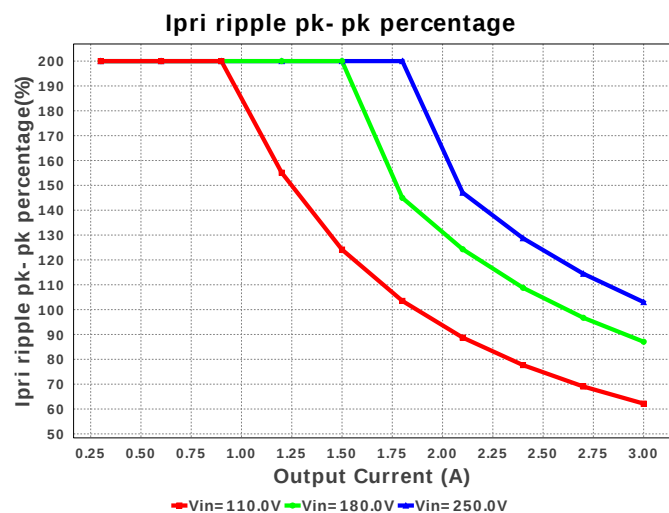


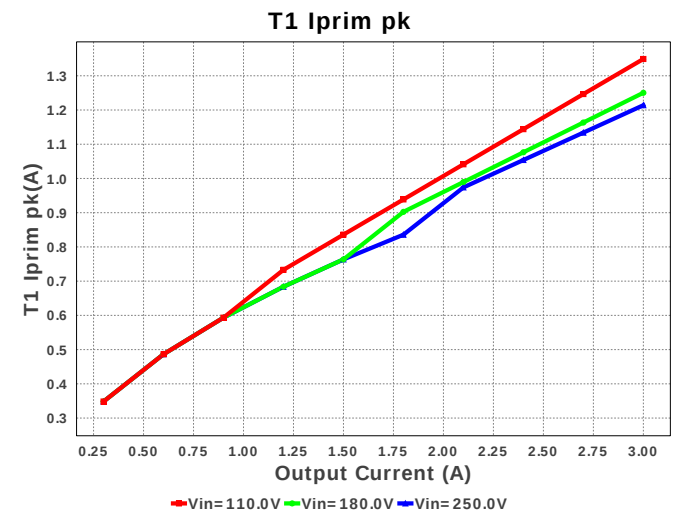
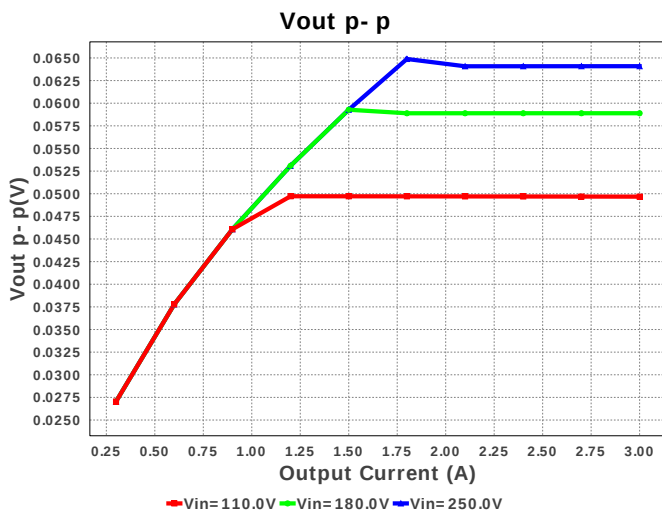
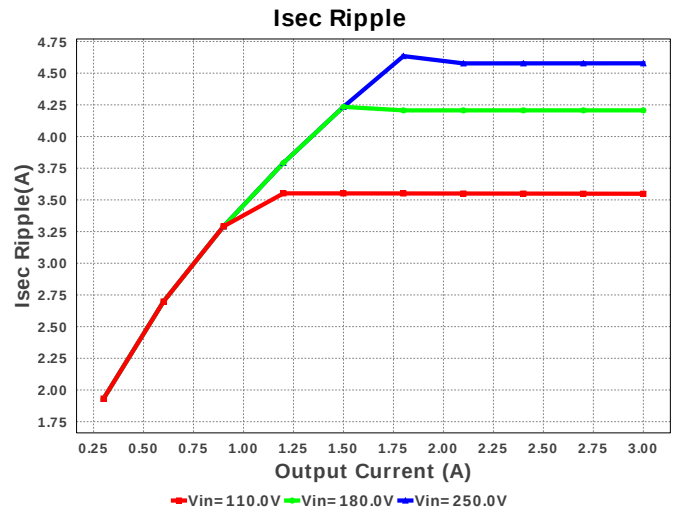
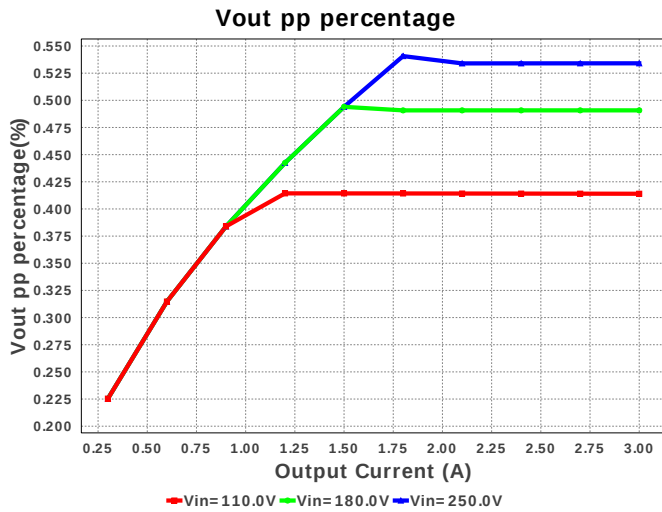












Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	3.342 A	Current	Output capacitor1 RMS ripple current
2.	Iin Avg	358.131 mA	Current	Average input current
3.	Iout_DCM	1.121 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	411.787 mA	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	639.863 mA	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	62.175 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	3.549 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	661.389 mA	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	1.349 A	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	4.491 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	7.482 A	Current	Transformer Secondary1 Peak Current
12.	BOM Count	49	General	Total Design BOM count
13.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
14.	Dsec Vf	501.178 mV	General	Effective Forward Voltage Drop at the Operating Current
15.	Dsec trr	0.0 ns	General	Output Diode Reverse Recovery Time
16.	Dsec2 Vf	501.178 mV	General	Effective Forward Voltage Drop at the Operating Current
17.	Dsnub trr	30.0 ns	General	Snubber Diode Reverse Recovery Time
18.	FootPrint	2.614 k mm ²	General	Total Foot Print Area of BOM components
19.	Frequency	99.307 kHz	General	Switching frequency
20.	Pout	36.0 W	General	Total output power
21.	Tdead	747.442 ns	General	Approximate Dead Time of the Regulator
22.	Toff	5.293 us	General	Approximate Converter Off Time
23.	Ton Act	4.029 us	General	Approximate Converter On Time
24.	Total BOM	\$0.0	General	Total BOM Cost
25.	Tsw	10.07 us	General	Switching Time Period
26.	Vaux	11.997 V	General	Auxiliary Voltage
27.	Vsnub	113.463 V	General	Voltage Across the Snubber
28.	Vout Actual	11.99 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
29.	Vout OP	12.0 V	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
30.	Duty Cycle	40.013 %	Op_point	Duty cycle
31.	Efficiency	91.383 %	Op_point	Steady state efficiency
32.	IC Tj	47.468 degC	Op_point	IC junction temperature
33.	ICThetaJA	50.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
34.	IOUT_OP	3.0 A	Op_point	Iout operating point
35.	M1 TjOP	94.531 degC	Op_point	M1 MOSFET junction temperature
36.	Vout p-p	49.679 mV	Op_point	Peak-to-peak output ripple voltage
37.	Cin Pd	2.142 mW	Power	Input capacitor power dissipation
38.	Cout1 Pd	156.368 mW	Power	Output capacitor1 power dissipation
39.	Dsec Pd	751.768 mW	Power	Secondary Diode Power Dissipation
40.	Dsec2 Pd	751.768 mW	Power	Secondary Diode Power Dissipation
41.	IC Pd	49.357 mW	Power	IC power dissipation
42.	L2 Pd	21.6 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
43.	M1 Pd	596.76 mW	Power	M1 MOSFET total power dissipation
44.	Paux	10.303 mW	Power	Power Dissipation in Raux and Daux
45.	Pd Rstartup	120.486 mW	Power	Power Dissipation in Rstartup1 and Rstartup2
46.	Rdrv Pd	8.257 μ W	Power	Power Dissipation in Gate Drive Resistor
47.	Rfb Pd	8.324 mW	Power	Rfb Power Dissipation
48.	Rsns Pd	218.718 mW	Power	Current Limit Sense Resistor Power Dissipation
49.	Snubber Pd	718.97 mW	Power	Snubber Power Dissipation
50.	T1 Pd	1.108 W	Power	Estimated Losses in Transformer
51.	Total Pd	0.0 W	Power	Total Power Dissipation
52.	Vout Tolerance	1.926 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
53.	Vout pp percentage	413.992 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	Iout1	3.0	Output Current #1
3.	Iout2	1.0	Output Current #2
4.	Iout3	800.0 m	Output Current #3
5.	VinMax	250.0	Maximum input voltage
6.	VinMin	110.0	Minimum input voltage
7.	Vout	12.0	Output Voltage
8.	Vout1	12.0	Output Voltage #1
9.	Vout2	5.0	Output Voltage #2
10.	Vout3	3.3	Output Voltage #3
11.	base_pn	UCC38C45	Texas Instruments Base Part Number
12.	source	DC	Input Source Type
13.	ta	45.0	Ambient temperature

Design Assistance

1. UCC38C45 Product Folder : <http://www.ti.com/product/UCC38C45> : contains the data sheet and other resources.

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