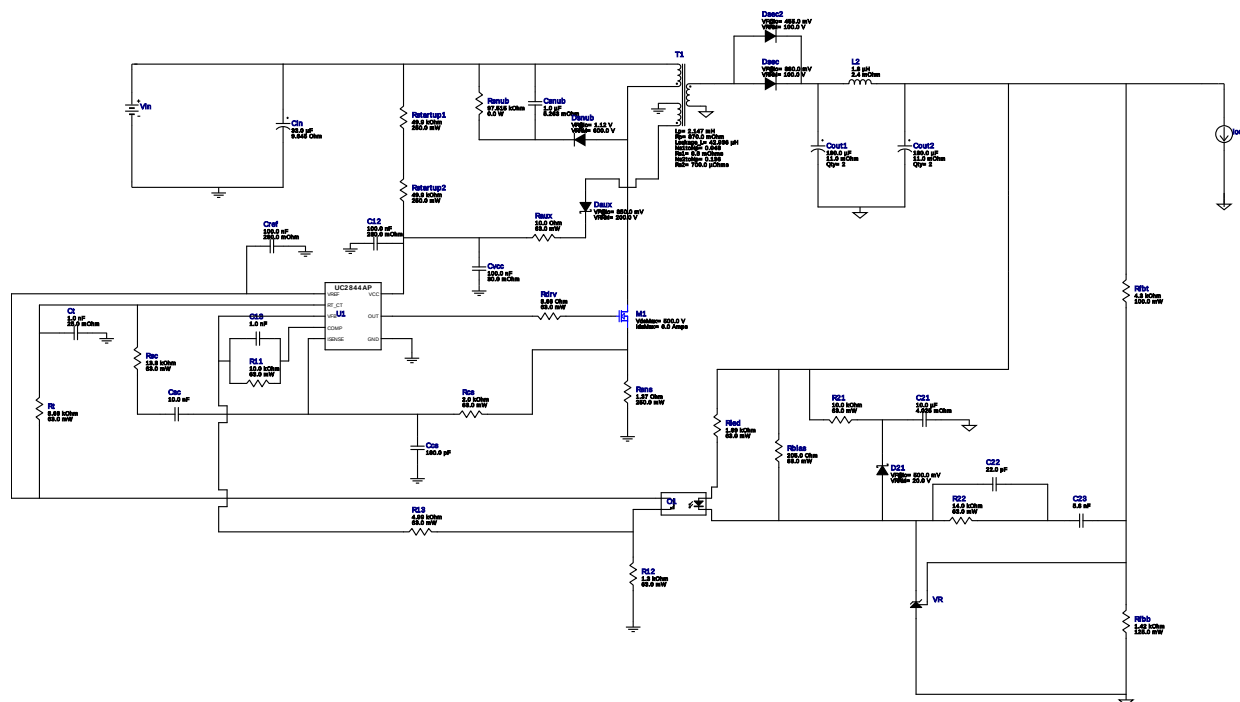


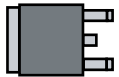
WEBENCH® Design Report

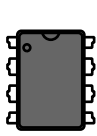
Design : 4766773/5 UC2844AN
UC2844AN 180.0V-250.0V to 5.00V @ 4.0A



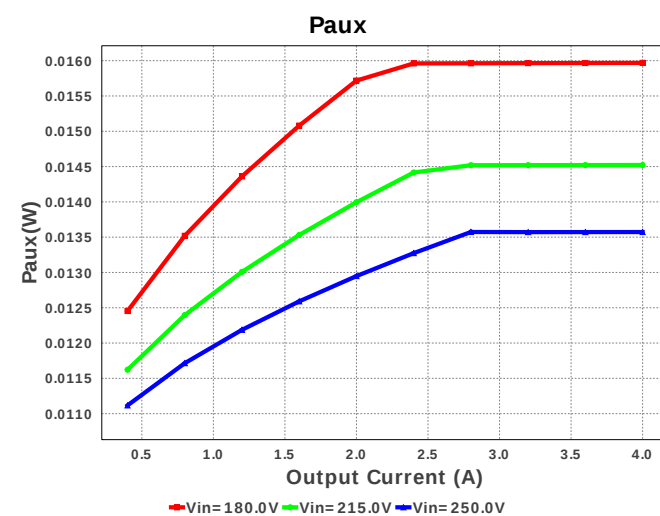
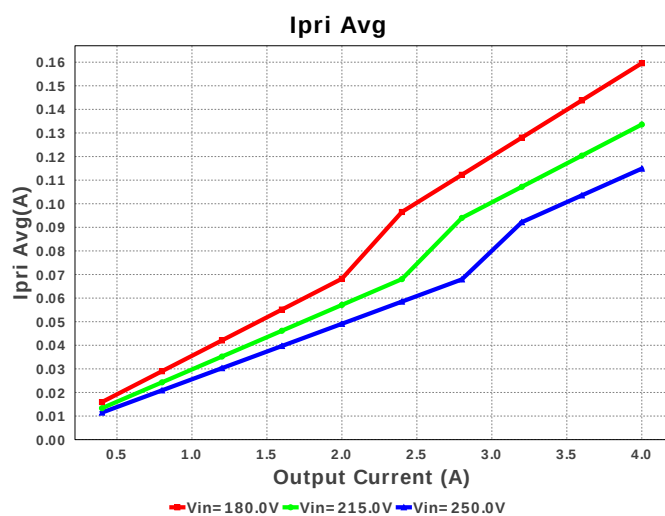
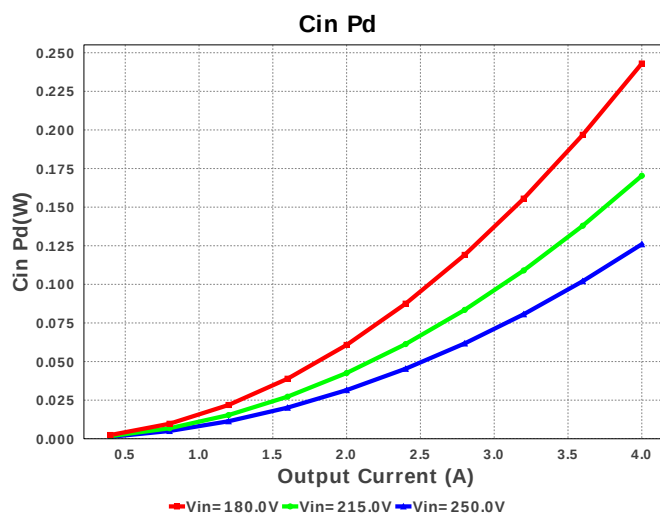
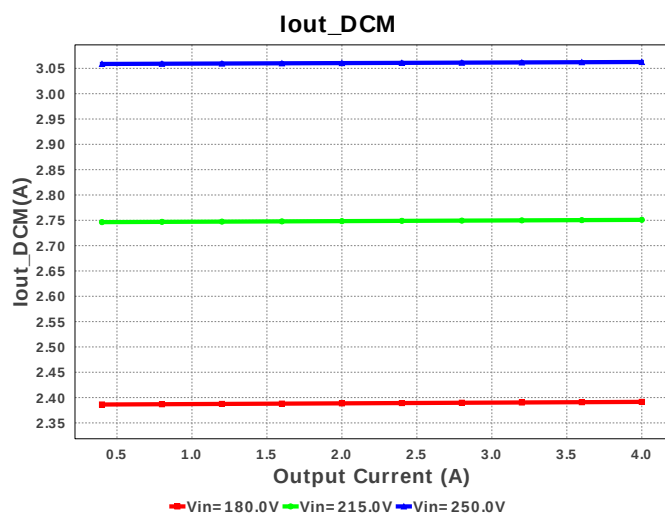
Electrical BOM

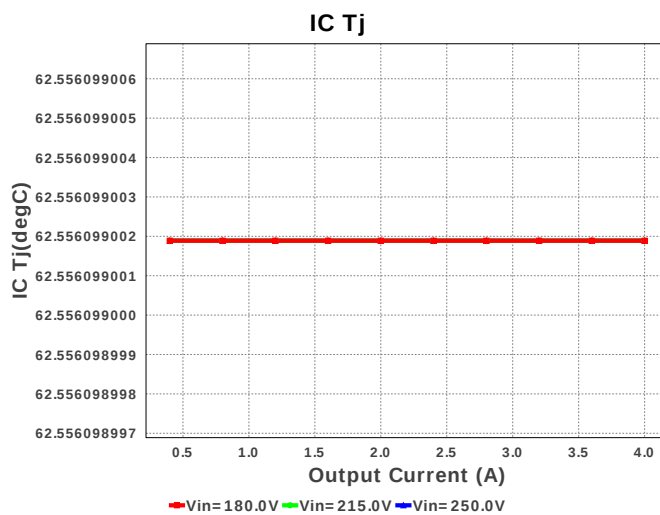
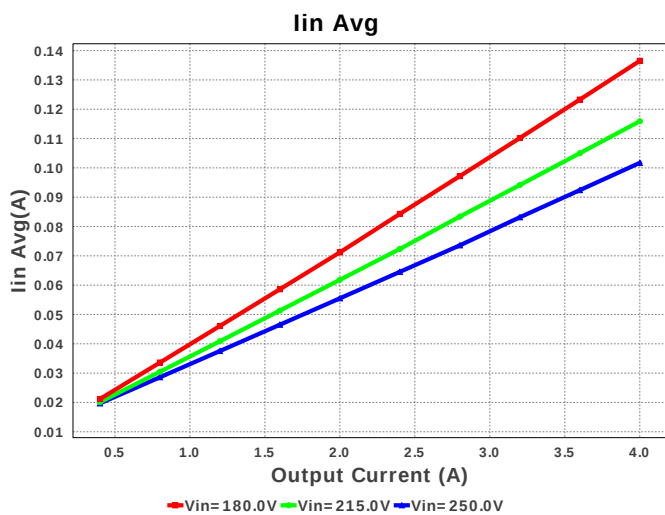
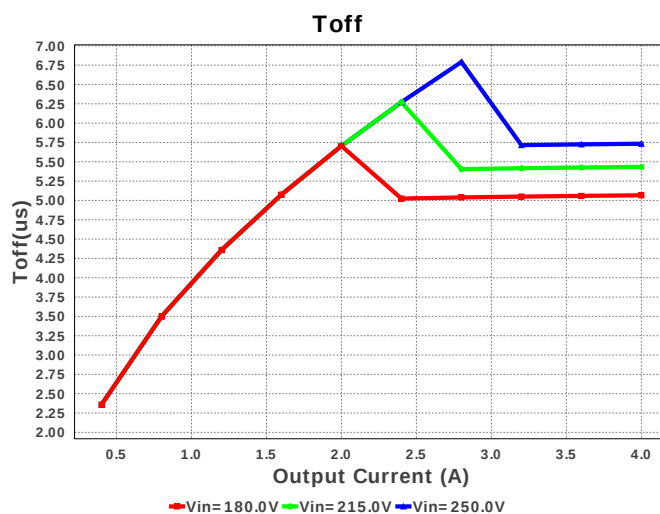
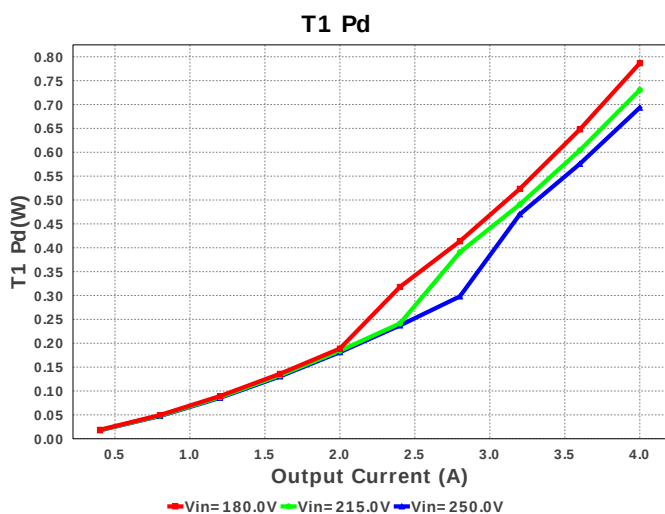
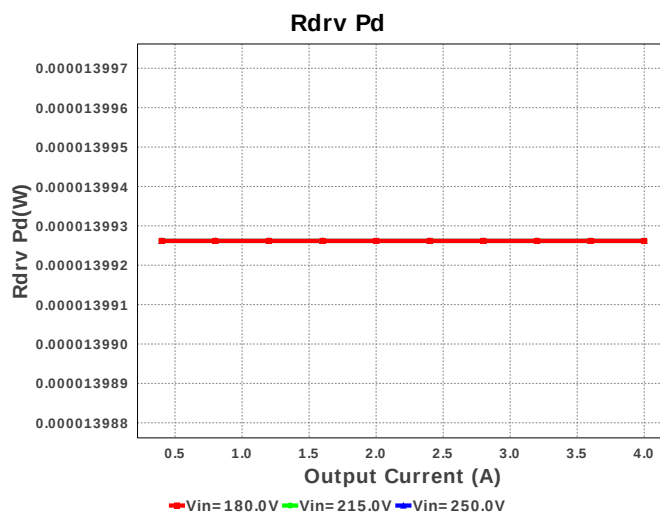
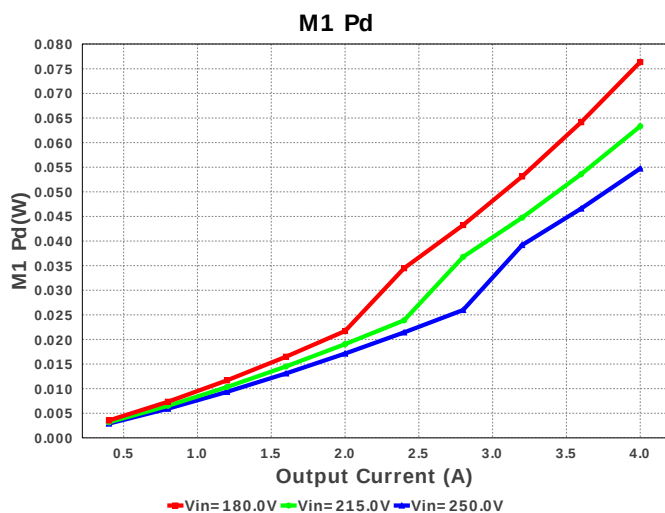
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	C21	MuRata	GRM21BR61A106KE19L Series= X5R	Cap= 10.0 uF ESR= 4.025 mOhm VDC= 10.0 V IRMS= 2.445 A	1	\$0.03	0805 7 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	CC0805KRX7R9BB562 Series= X7R	Cap= 5.6 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
7.	Cin	Nichicon	UCS2W330MHD6 Series= 2234	Cap= 33.0 uF ESR= 9.645 Ohm VDC= 450.0 V IRMS= 490.0 mA	1	\$0.58	UCS_1800x2000 0 mm ²
8.	Cout1	Panasonic	16SVPE180M Series= SVPE	Cap= 180.0 uF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 4.46 A	2	\$0.49	 CAPSMT_62_C10 74 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cout2	Panasonic	16SVPE180M Series= SVPE	Cap= 180.0 uF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 4.46 A	2	\$0.49	 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	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.	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	Vishay-Semiconductor	SS10PH10-M3/86A	VF@Io= 880.0 mV VRRM= 100.0 V	1	\$0.29	 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
20.	L2	Coilcraft	SER1360-182KLB	L= 1.8 uH DCR= 2.4 mOhm	1	\$0.72	 SER1360 225 mm ²
21.	M1	Fairchild Semiconductor	FDD6N50TM	VdsMax= 500.0 V IdsMax= 6.0 Amps	1	\$0.47	 DPAK 102 mm ²
22.	O1	Vishay-Semiconductor	TCMT1109	Optocoupler	1	\$0.21	 SOP-4 44 mm ²
23.	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
24.	R12	Vishay-Dale	CRCW04021K30FKED Series= CRCW..e3	Res= 1.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

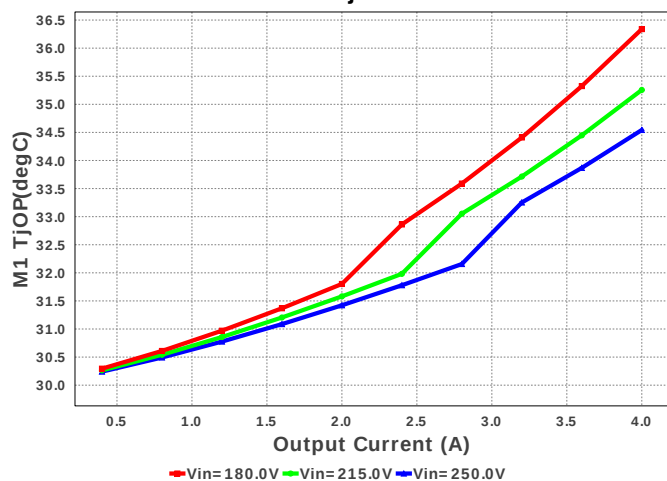
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25.	R13	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
26.	R21	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
27.	R22	Vishay-Dale	CRCW040214K0FKED Series= CRCW..e3	Res= 14.0 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	CRCW04028R66FKED Series= CRCW..e3	Res= 8.66 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	CRCW04021K69FKED Series= CRCW..e3	Res= 1.69 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
35.	Rsc	Vishay-Dale	CRCW040213K3FKED Series= CRCW..e3	Res= 13.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
36.	Rsns	Vishay-Dale	CRCW12061R37FKEA Series= CRCW..e3	Res= 1.37 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
37.	Rsnu	CUSTOM	CUSTOM Series= ?	Res= 97.515 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
38.	Rstartup1	Panasonic	ERJ-8ENF4992V Series= ERJ-8E	Res= 49.9 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
39.	Rstartup2	Panasonic	ERJ-8ENF4992V Series= ERJ-8E	Res= 49.9 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
40.	Rt	Vishay-Dale	CRCW04028K66FKED Series= CRCW..e3	Res= 8.66 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
41.	T1	CUSTOM	CUSTOM	Lp= 2.147 mH Rp= 870.0 mOhm Leakage_L= 42.936 μH Ns1toNp= 0.048 Rs1= 8.6 mOhms Ns2toNp= 0.136 Rs2= 700.0 μOhms	1	NA	CUSTOM 0 mm²
42.	U1	Texas Instruments	UC2844AN	Switcher	1	\$0.64	 P0008A 116 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
43.	VR	Texas Instruments	LMV431CM5/NOPB	Voltage References	1	\$0.16	 R-PDSO-G3 16 mm ²

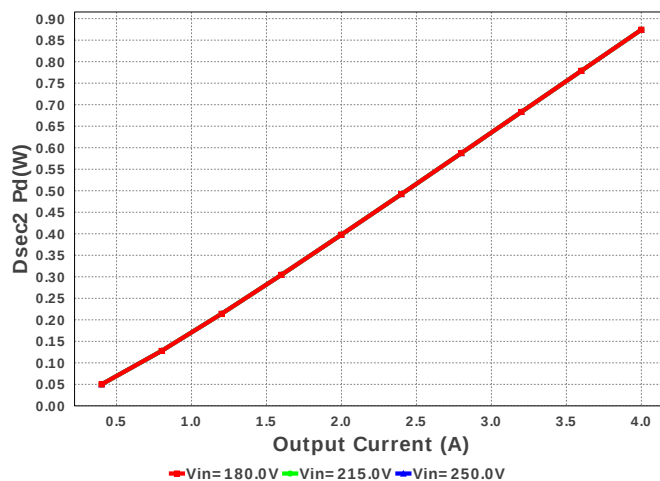




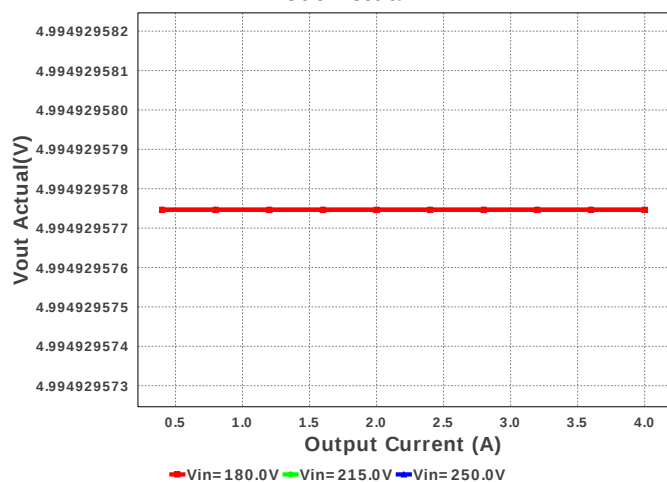
M1 TjOP



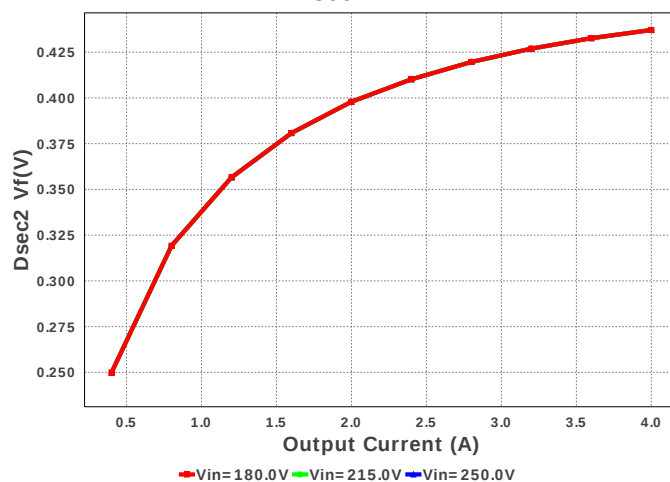
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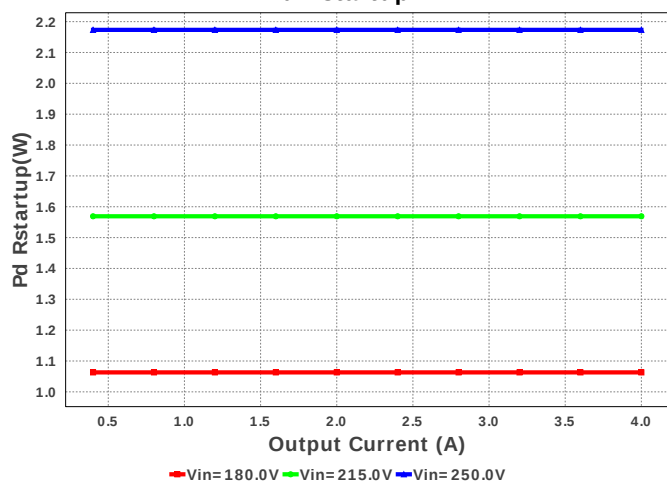
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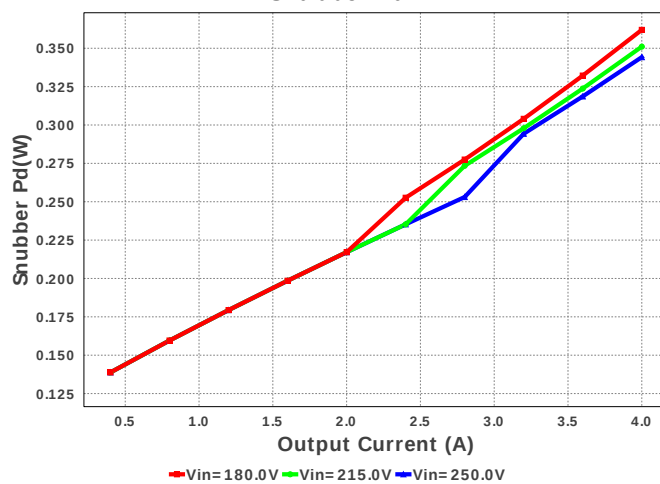
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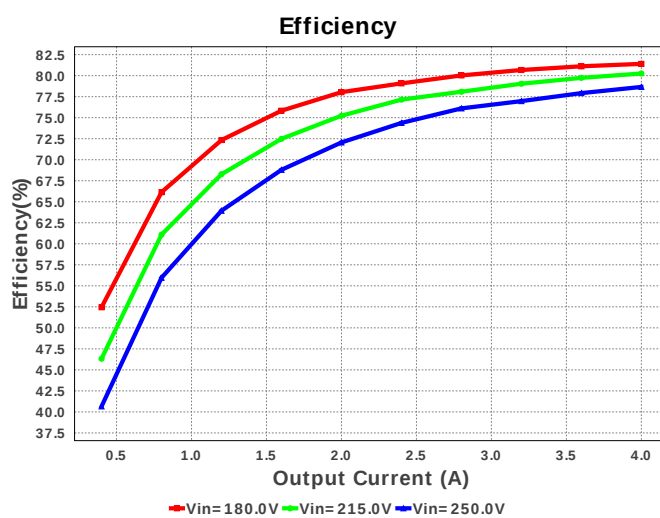
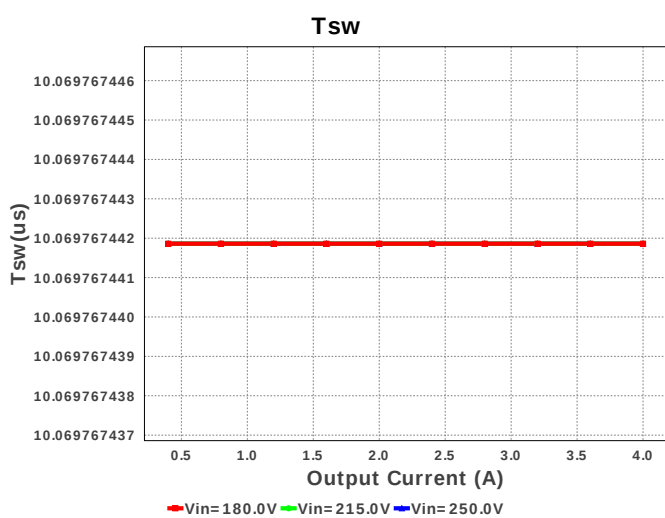
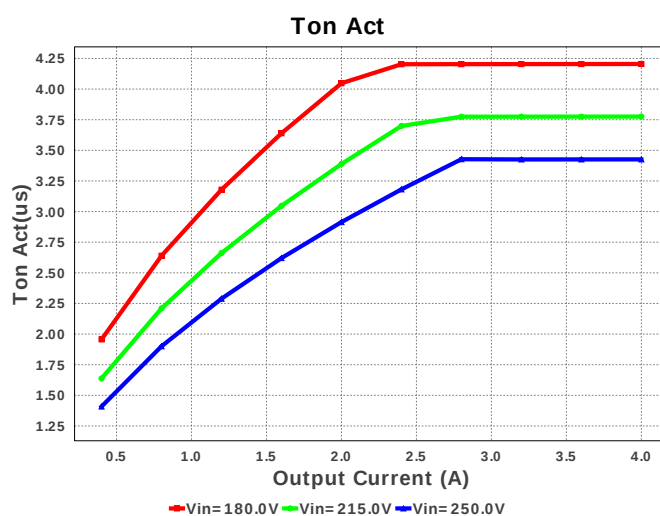
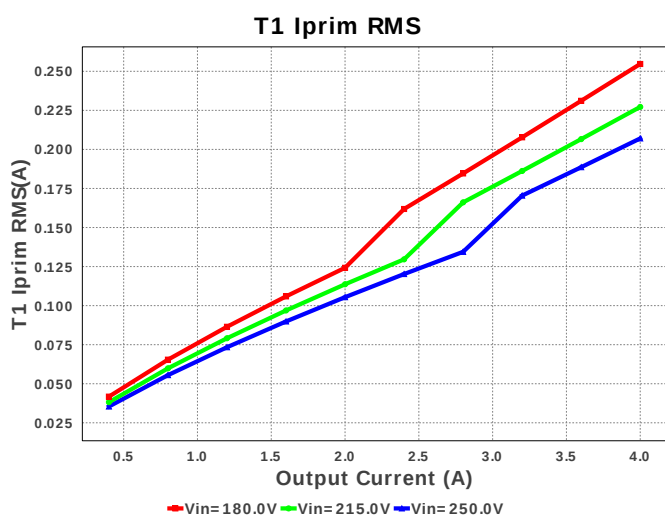
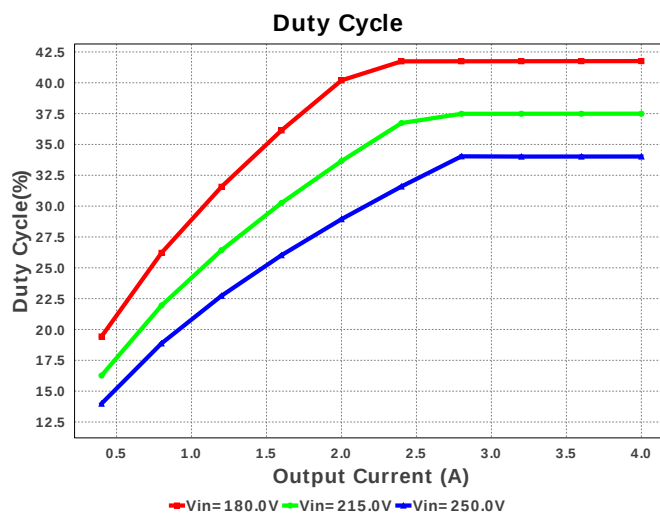
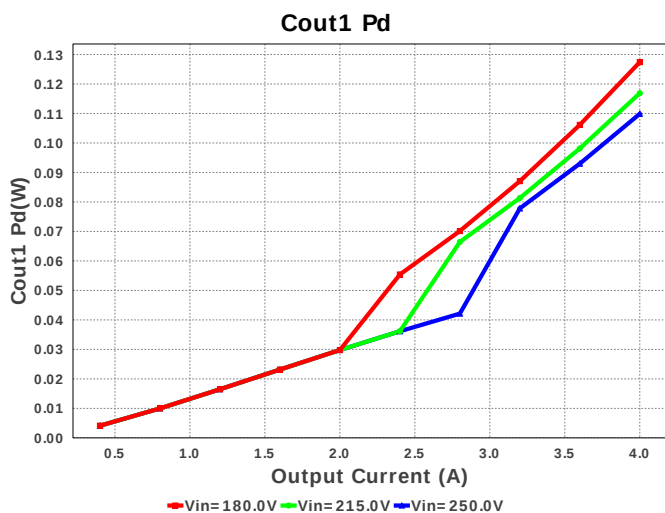


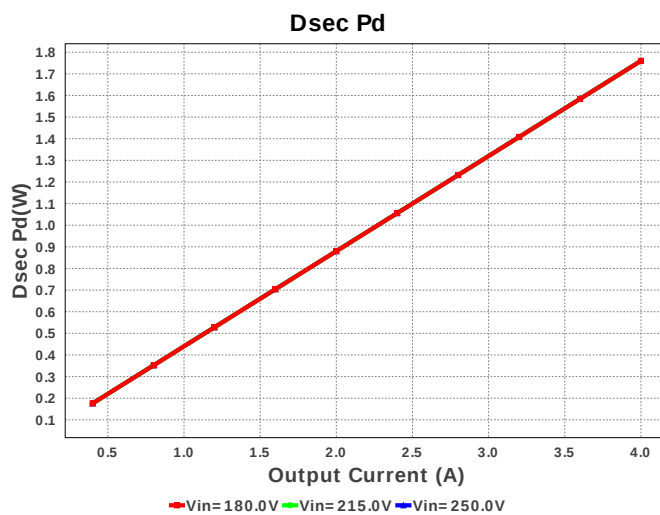
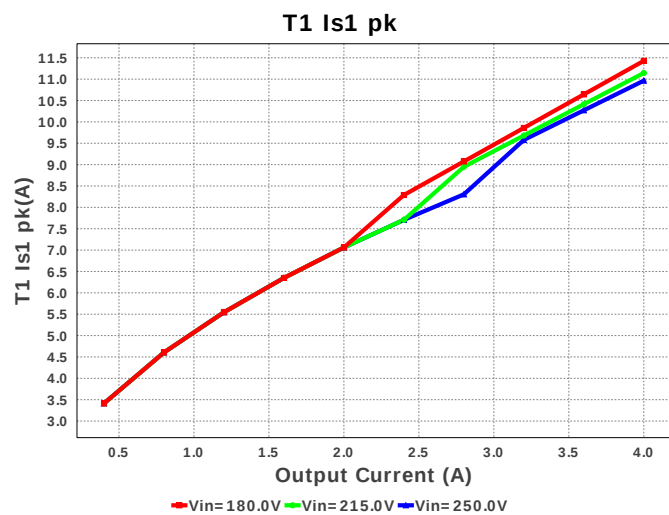
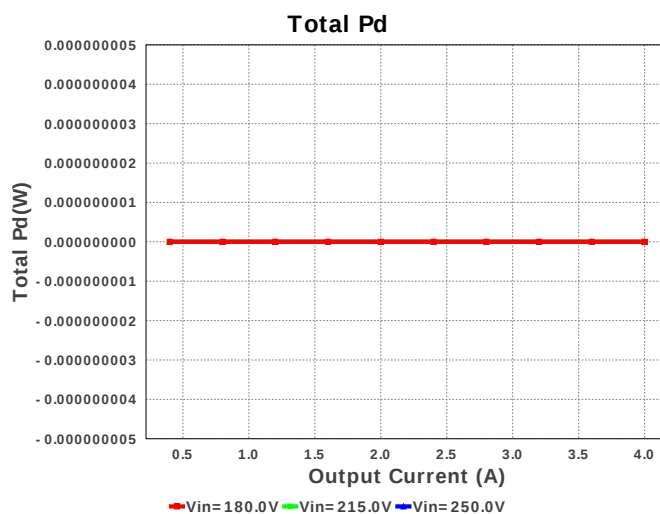
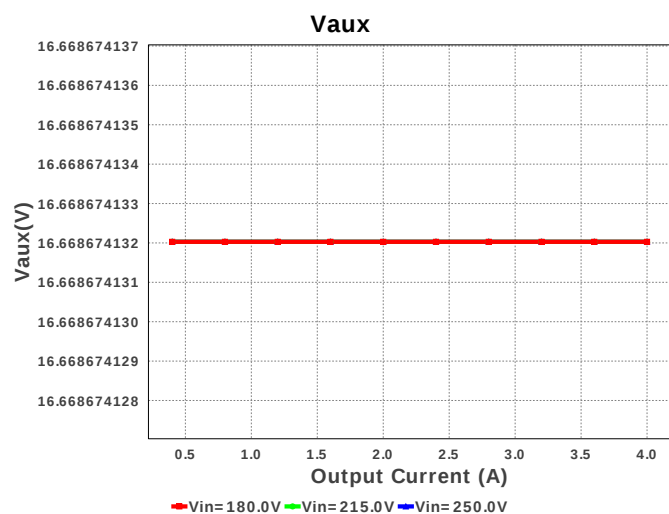
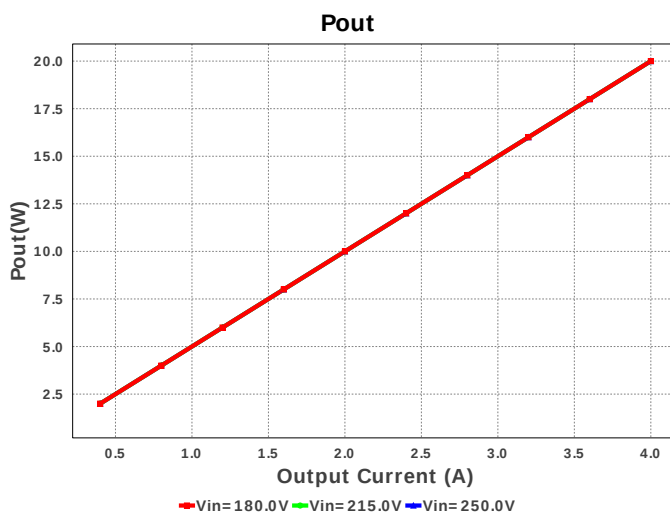
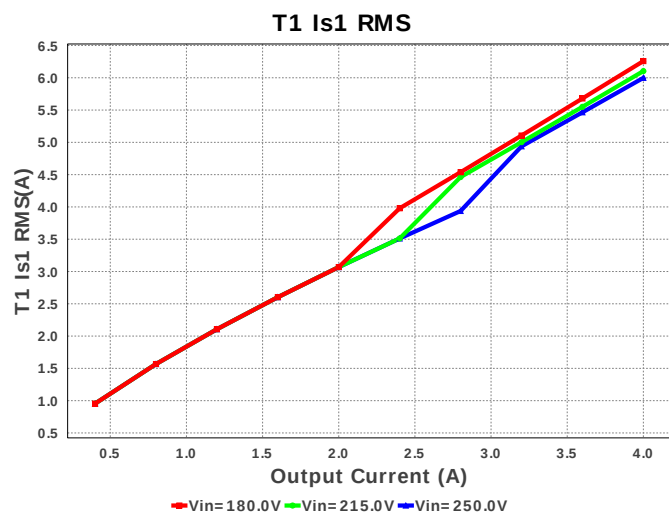
Pd Rstartup

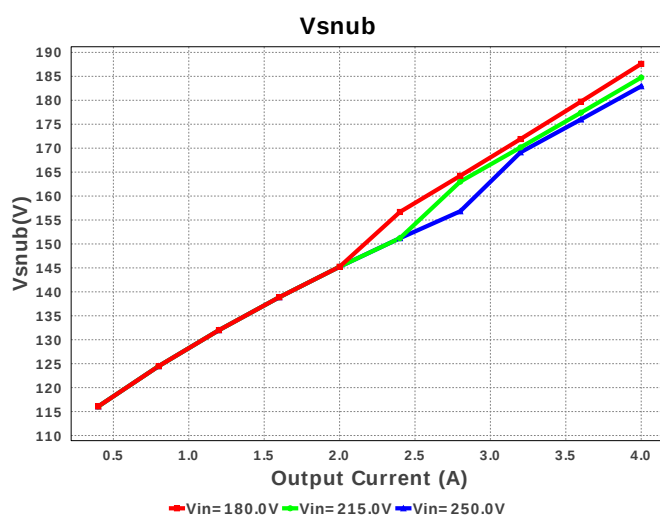
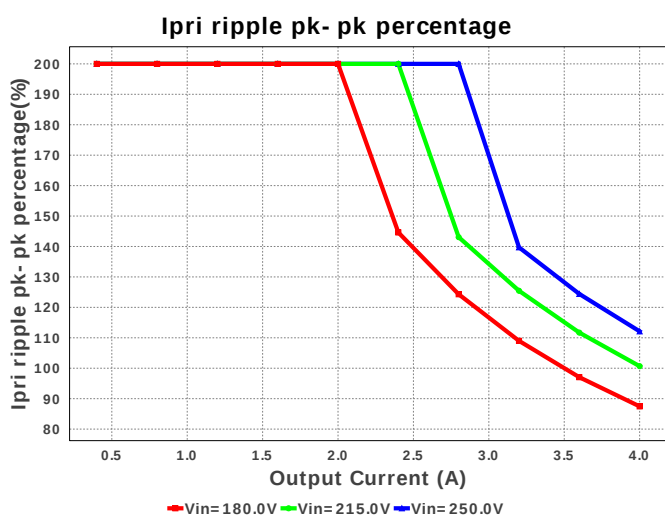
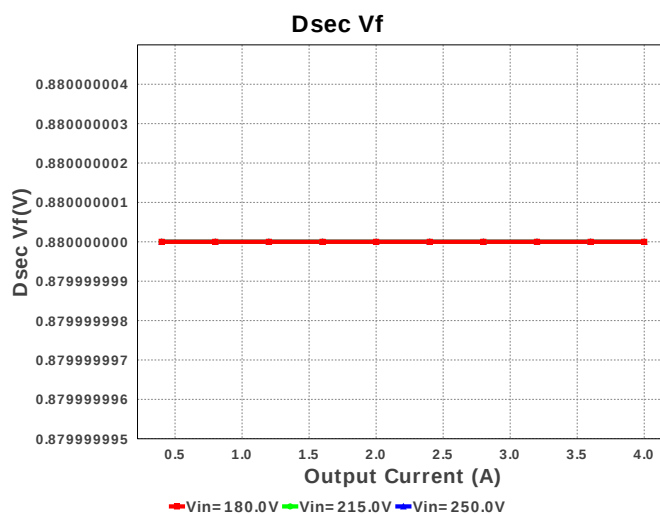
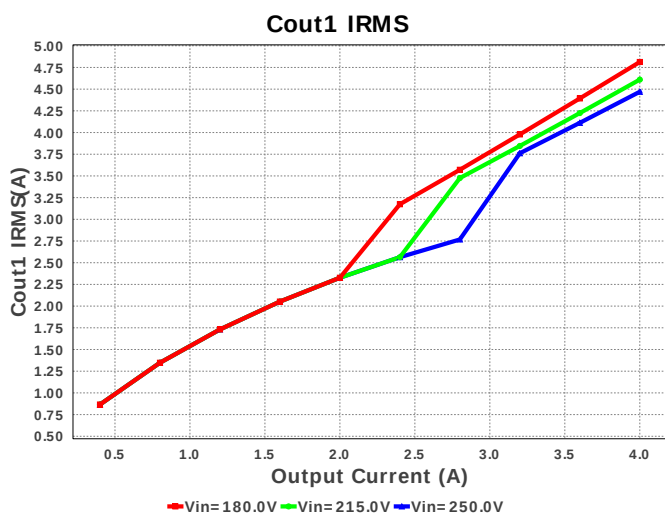
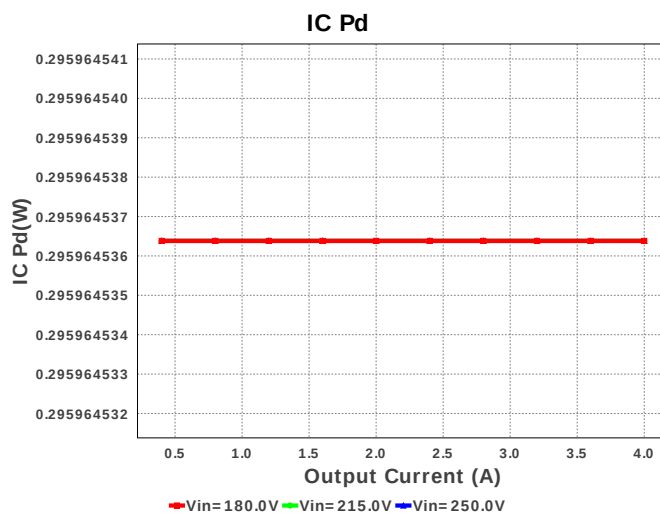
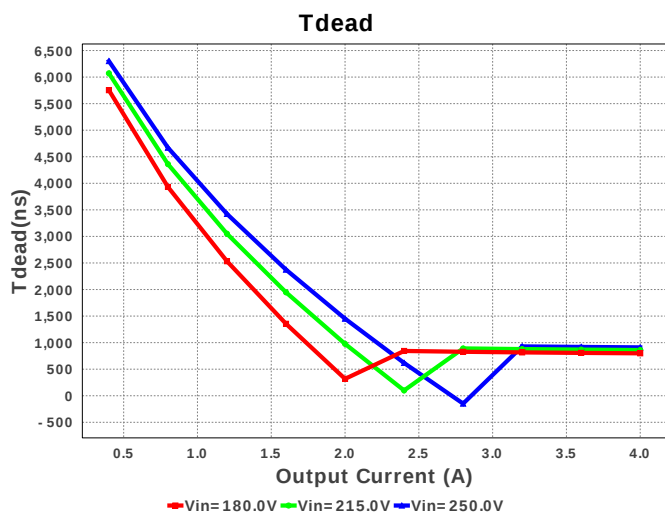


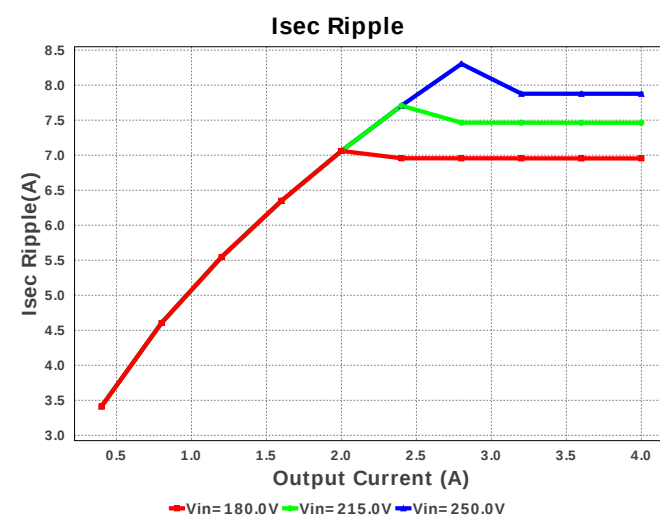
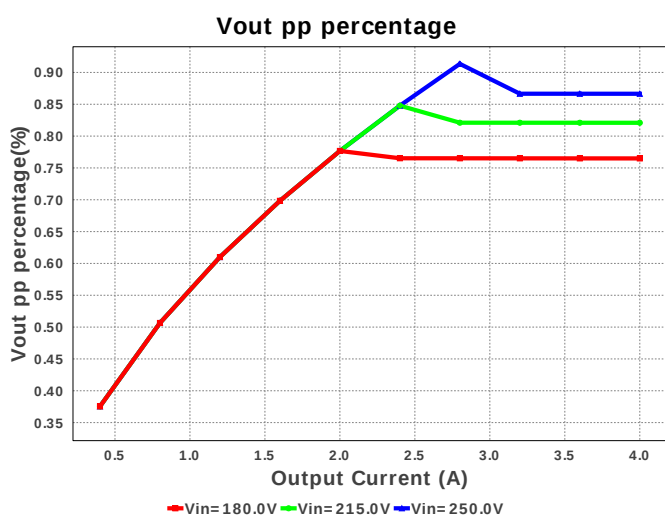
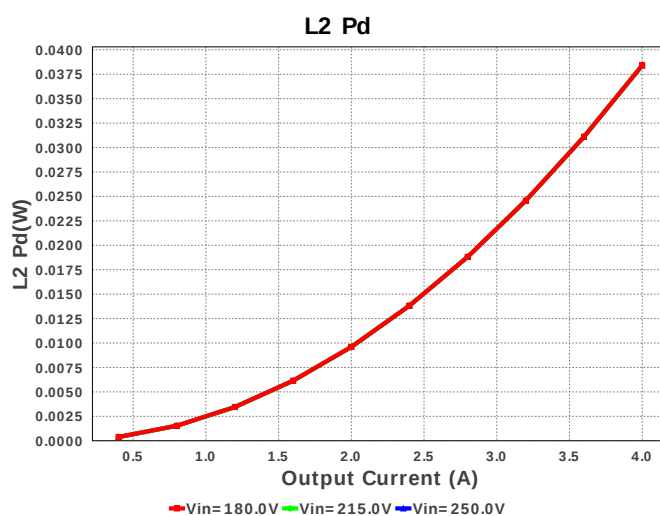
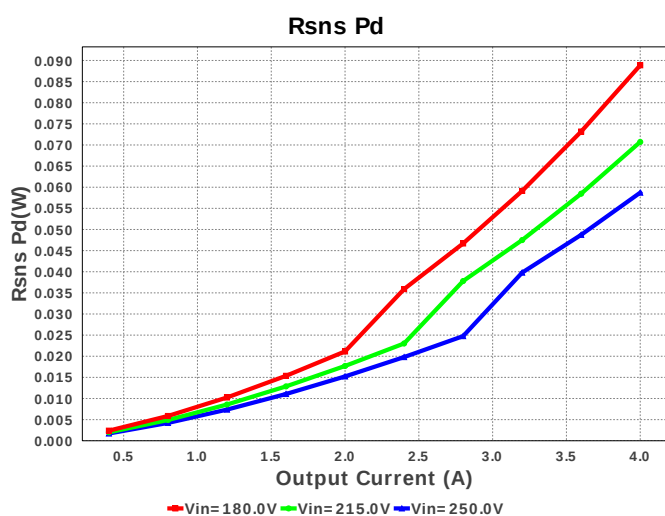
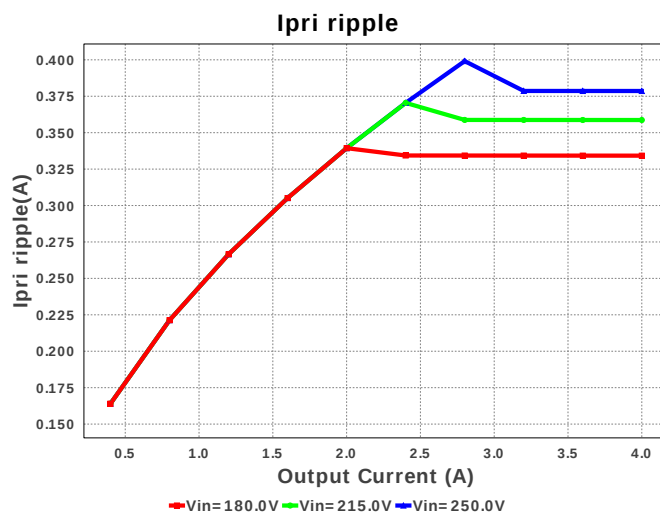
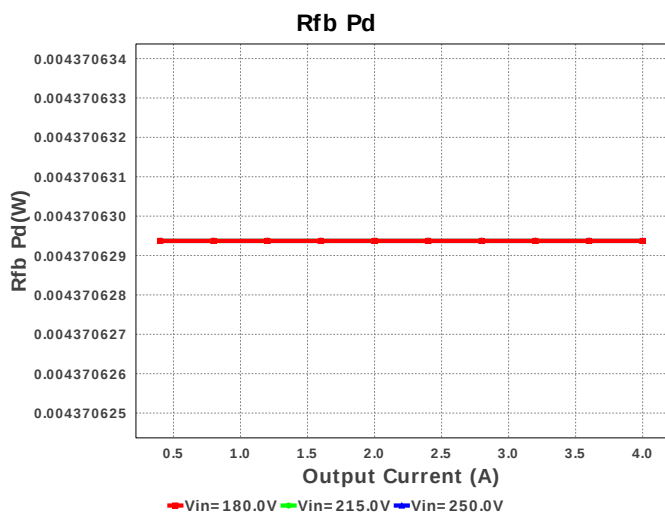
Snubber Pd

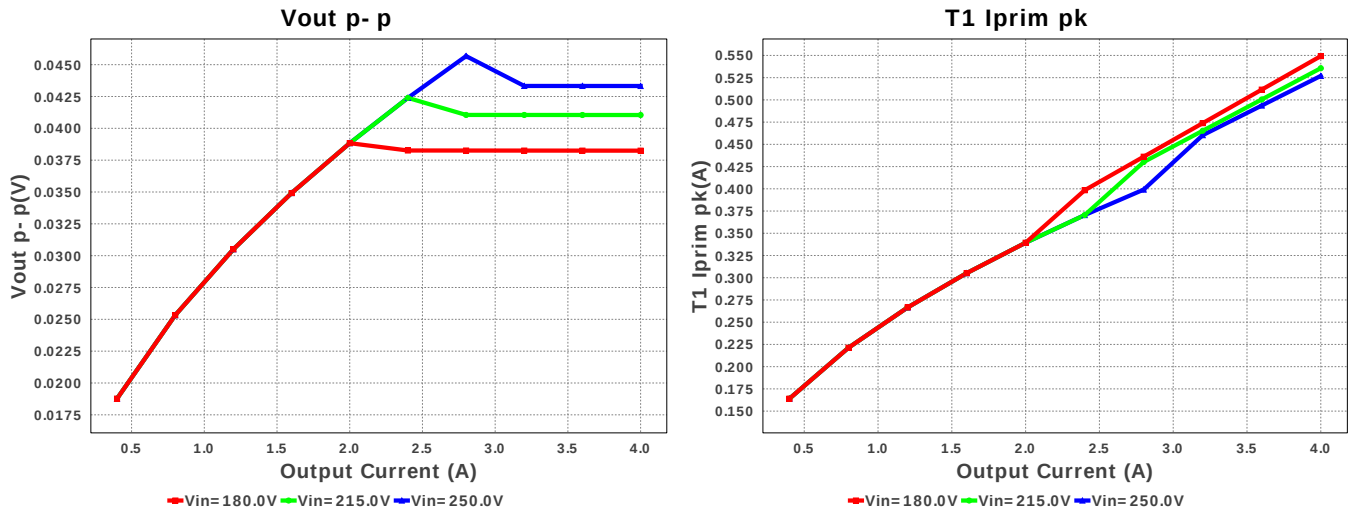












Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	4.813 A	Current	Output capacitor1 RMS ripple current
2.	Iin Avg	136.495 mA	Current	Average input current
3.	Iout_DCM	2.391 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	159.567 mA	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	334.225 mA	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	87.462 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	6.954 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	254.683 mA	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	549.249 mA	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	6.258 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	11.428 A	Current	Transformer Secondary1 Peak Current
12.	BOM Count	45	General	Total Design BOM count
13.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
14.	Dsec Vf	880.0 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	437.139 mV	General	Effective Forward Voltage Drop at the Operating Current
17.	Dsnub trr	30.0 ns	General	Snubber Diode Reverse Recovery Time
18.	FootPrint	1.448 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	20.0 W	General	Total output power
22.	Tdead	798.876 ns	General	Approximate Dead Time of the Regulator
23.	Toff	5.066 us	General	Approximate Converter Off Time
24.	Ton Act	4.205 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	16.669 V	General	Auxiliary Voltage
28.	Vsnub	187.605 V	General	Voltage Across the Snubber
29.	Vout Actual	4.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
30.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
31.	Duty Cycle	41.757 %	Op_point	Duty cycle
32.	Efficiency	81.403 %	Op_point	Steady state efficiency
33.	IC Tj	62.556 degC	Op_point	IC junction temperature
34.	ICThetaJA	110.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
35.	IOUT_OP	4.0 A	Op_point	Iout operating point
36.	M1 TjOP	36.339 degC	Op_point	M1 MOSFET junction temperature
37.	Vout p-p	38.246 mV	Op_point	Peak-to-peak output ripple voltage
38.	Cin Pd	243.008 mW	Power	Input capacitor power dissipation
39.	Cout1 Pd	127.406 mW	Power	Output capacitor1 power dissipation
40.	Dsec Pd	1.76 W	Power	Secondary Diode Power Dissipation
41.	Dsec2 Pd	874.277 mW	Power	Secondary Diode Power Dissipation
42.	IC Pd	295.965 mW	Power	IC power dissipation
43.	L2 Pd	38.4 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
44.	M1 Pd	76.374 mW	Power	M1 MOSFET total power dissipation
45.	Paux	15.969 mW	Power	Power Dissipation in Raux and Daux
46.	Pd Rstartup	1.063 W	Power	Power Dissipation in Rstartup1 and Rstartup2
47.	Rdrv Pd	13.993 uW	Power	Power Dissipation in Gate Drive Resistor
48.	Rfb Pd	4.371 mW	Power	Rfb Power Dissipation
49.	Rsns Pd	88.863 mW	Power	Current Limit Sense Resistor Power Dissipation
50.	Snubber Pd	361.988 mW	Power	Snubber Power Dissipation

#	Name	Value	Category	Description
51.	T1 Pd	786.498 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	764.925 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	250.0	Maximum input voltage
3.	VinMin	180.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	UC2844A	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **UC2844A** Product Folder : <http://www.ti.com/product/UC2844A> : contains the data sheet and other resources.

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