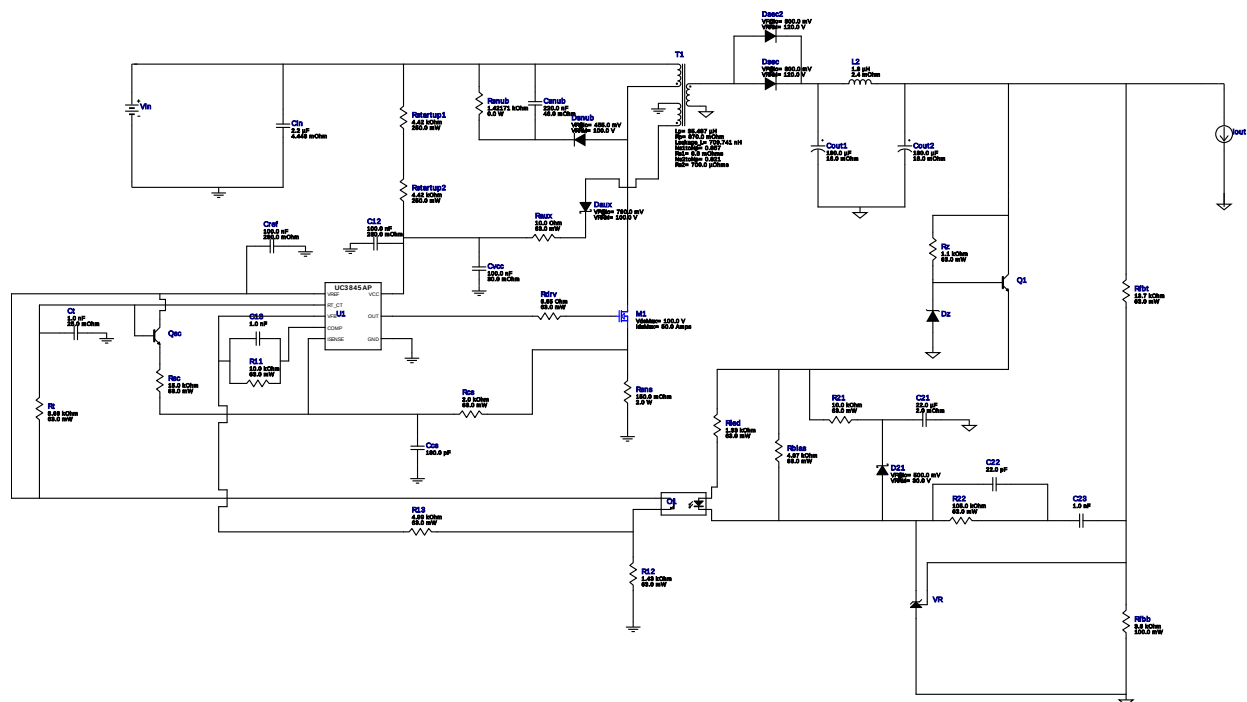


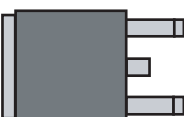
WEBENCH® Design Report

Design : 4215160/16 UC3845AN
UC3845AN 24.0V-35.0V to 12.00V @ 2.0A

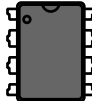


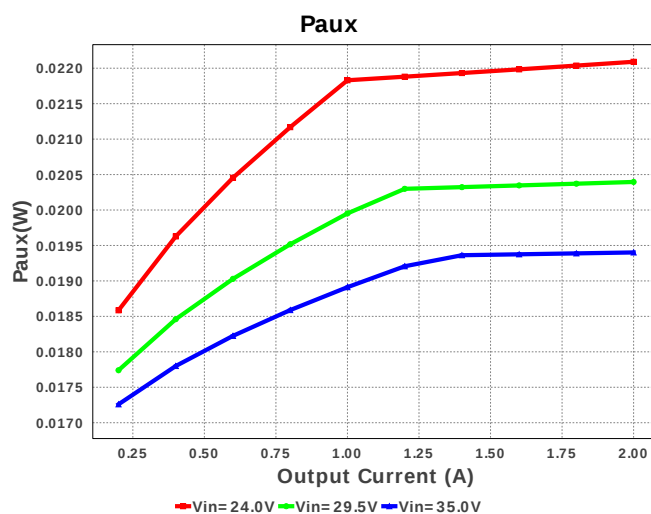
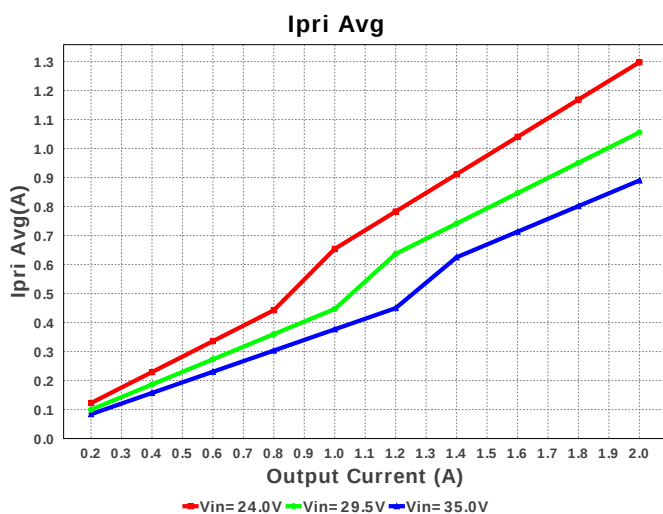
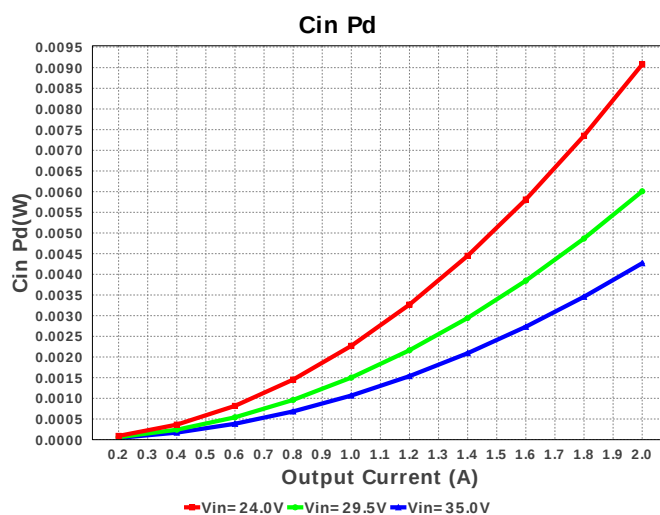
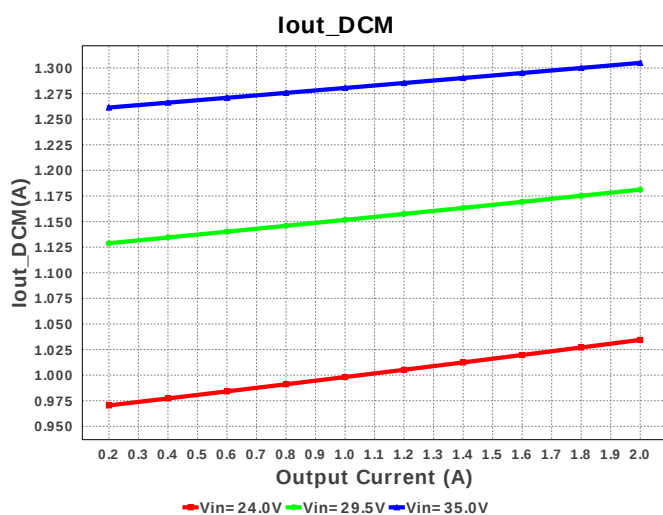
Electrical BOM

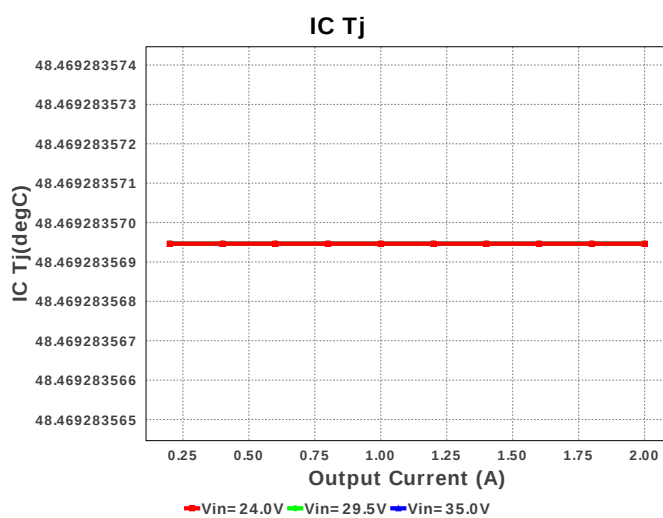
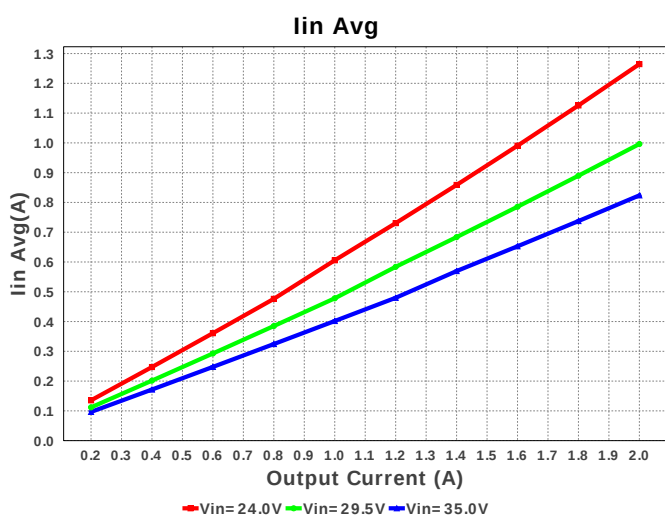
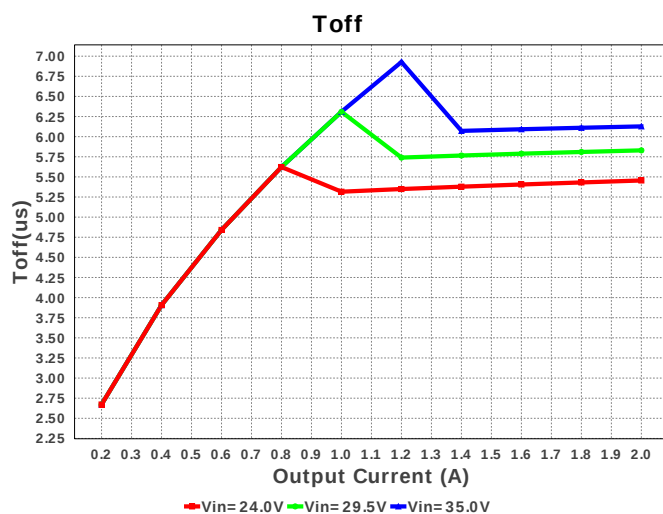
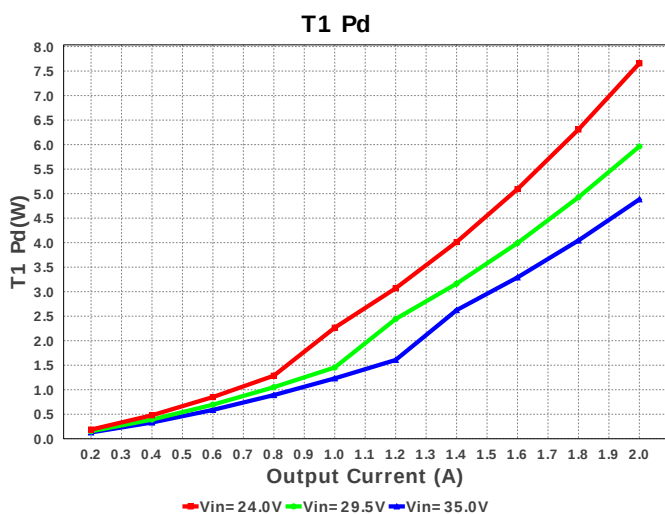
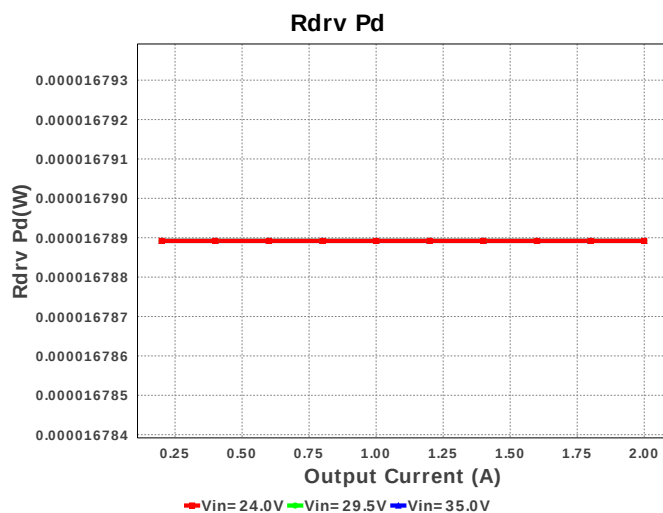
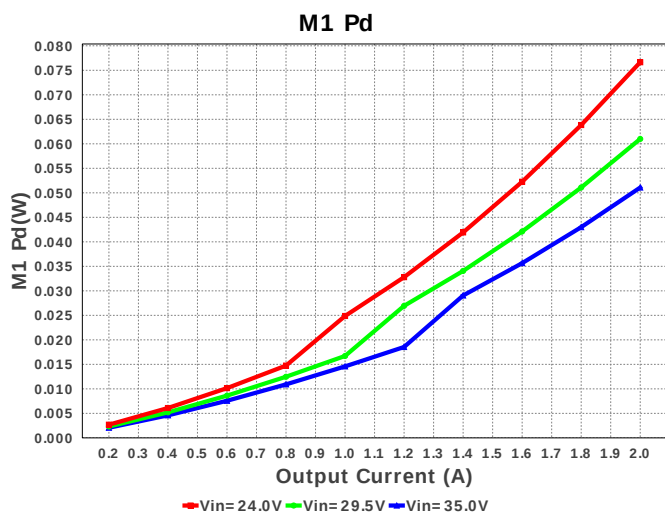
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	C21	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	\$0.16	1210 15 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	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
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	MuRata	GRM31CR71H225KA88L Series= X7R	Cap= 2.2 uF ESR= 4.448 mOhm VDC= 50.0 V IRMS= 2.2252 A	1	\$0.05	1206_190 11 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Cout1	Panasonic	25SVPF180M Series= ?	Cap= 180.0 uF ESR= 16.0 mOhm VDC= 25.0 V IRMS= 4.65 A	1	\$0.61	 CAPSMT_62_E12 106 mm ²
9.	Cout2	Panasonic	25SVPF180M Series= ?	Cap= 180.0 uF ESR= 16.0 mOhm VDC= 25.0 V IRMS= 4.65 A	1	\$0.61	 CAPSMT_62_E12 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.	Csnub	Kemet	C0805C224K5RACTU Series= X7R	Cap= 220.0 nF ESR= 46.0 mOhm VDC= 50.0 V IRMS= 2.65 A	1	\$0.02	 0805 7 mm ²
12.	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
13.	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
14.	D21	Bourns	CD214A-B130LF	VF@Io= 500.0 mV VRRM= 30.0 V	1	\$0.08	 SMA 37 mm ²
15.	Daux	Diodes Inc.	B1100-13-F	VF@Io= 790.0 mV VRRM= 100.0 V	1	\$0.10	 SMA 37 mm ²
16.	Dsec	Fairchild Semiconductor	FSV10120V	VF@Io= 800.0 mV VRRM= 120.0 V	1	\$0.21	 TO-277A 56 mm ²
17.	Dsec2	Fairchild Semiconductor	FSV10120V	VF@Io= 800.0 mV VRRM= 120.0 V	1	\$0.21	 TO-277A 56 mm ²
18.	Dsnub	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	\$1.33	 DDPAK 210 mm ²
19.	Dz	ON Semiconductor	BZX84C9V1LT1G	Zener	1	\$0.02	 SOT-23 14 mm ²
20.	L2	Coilcraft	SER1360-182KLB	L= 1.8 uH DCR= 2.4 mOhm	1	\$0.72	 SER1360 225 mm ²
21.	M1	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	\$0.50	 DQG0008A 18 mm ²
22.	O1	Vishay-Semiconductor	TCMT1107	Optocoupler	1	\$0.21	 SOP-4 44 mm ²
23.	Q1	ON Semiconductor	BC846BLT1G	Bipolar Transistor	1	\$0.02	 SOT-23 14 mm ²

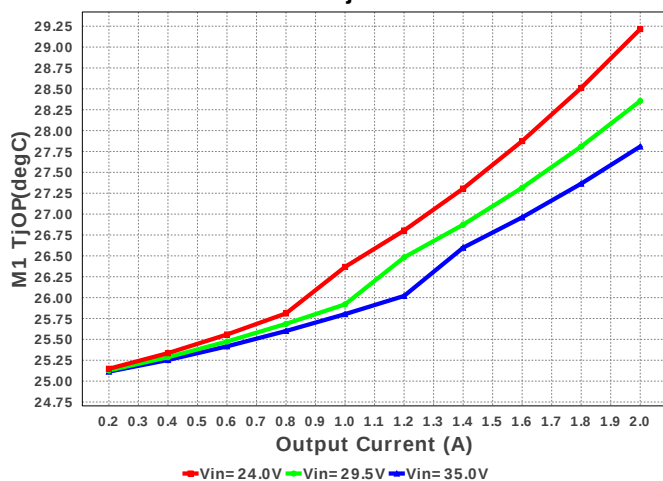
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
24.	Qsc	STMicroelectronics	2N2222A	Bipolar Transistor	1	NA	 TO-18 57 mm ²
25.	R11	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
26.	R12	Vishay-Dale	CRCW04021K43FKED Series= CRCW..e3	Res= 1.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
27.	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
28.	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
29.	R22	Vishay-Dale	CRCW0402105KFKED Series= CRCW..e3	Res= 105.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
30.	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
31.	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
32.	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
33.	Rdrv	Vishay-Dale	CRCW04026R65FKED Series= CRCW..e3	Res= 6.65 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
34.	Rfbb	Yageo America	RC0603FR-073K6L Series= ?	Res= 3.6 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
35.	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
36.	Rled	Vishay-Dale	CRCW04021K33FKED Series= CRCW..e3	Res= 1.33 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
37.	Rsc	Vishay-Dale	CRCW040215K0FKED Series= CRCW..e3	Res= 15.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
38.	Rsns	Stackpole Electronics Inc	CSRN2512FKR150 Series= ?	Res= 150.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	\$0.13	 2512 43 mm ²
39.	Rsnu	CUSTOM	CUSTOM Series= ?	Res= 1.42171 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm ²
40.	Rstartup1	Panasonic	ERJ-8ENF4421V Series= ERJ-8E	Res= 4.42 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²
41.	Rstartup2	Panasonic	ERJ-8ENF4421V Series= ERJ-8E	Res= 4.42 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²
42.	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
43.	Rz	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
44.	T1	CUSTOM	CUSTOM	Lp= 35.487 μ H Rp= 870.0 mOhm Leakage_L= 709.741 nH Ns1toNp= 0.857 Rs1= 8.6 mOhms Ns2toNp= 0.821 Rs2= 700.0 μ Ohms	1	NA	CUSTOM 0 mm ²
45.	U1	Texas Instruments	UC3845AN	Switcher	1	\$0.56	 P0008A 116 mm ²
46.	VR	Texas Instruments	TL431AIDBZR	Voltage References	1	\$0.08	 DBZ0003A 14 mm ²

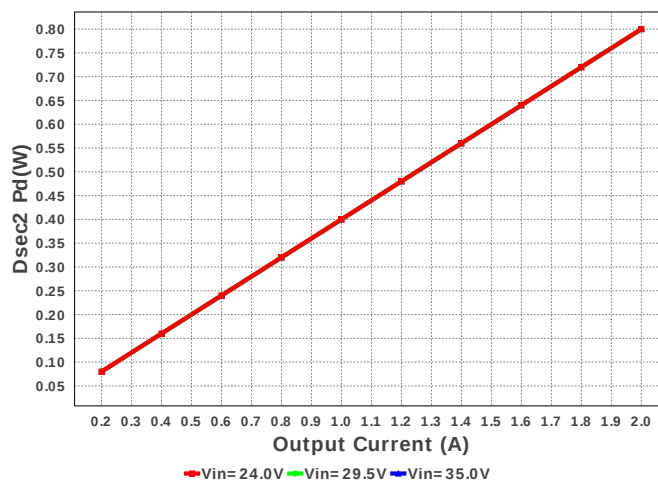




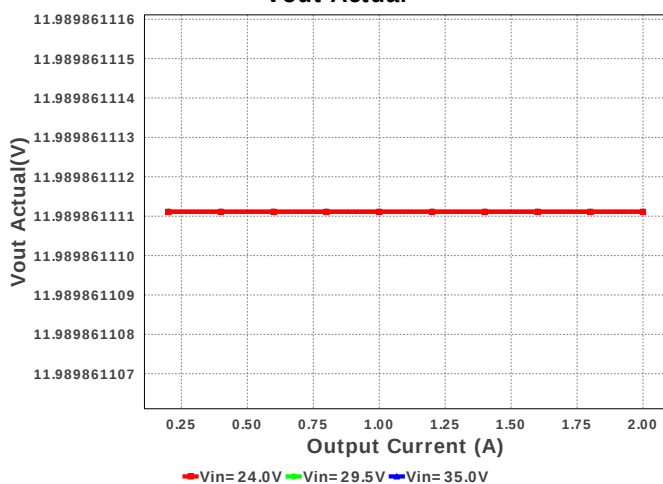
M1 TjOP



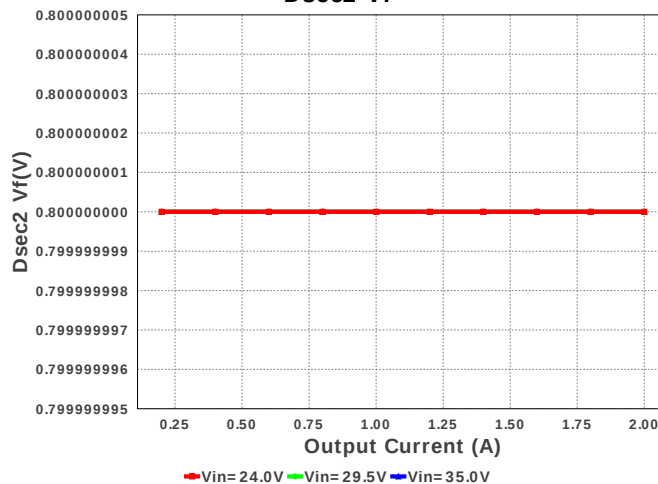
Dsec2 Pd



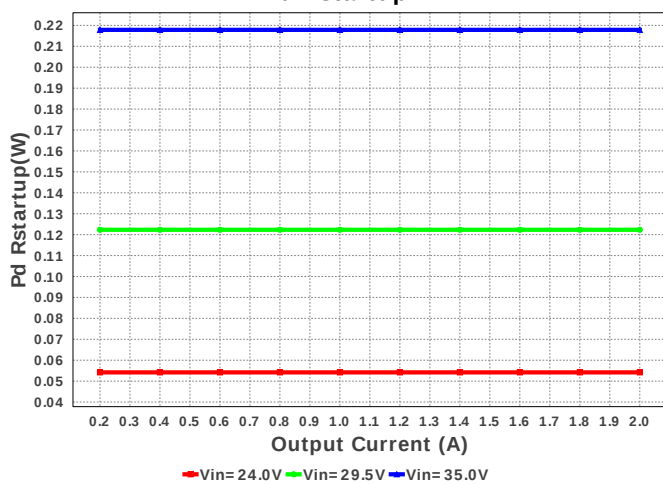
Vout Actual



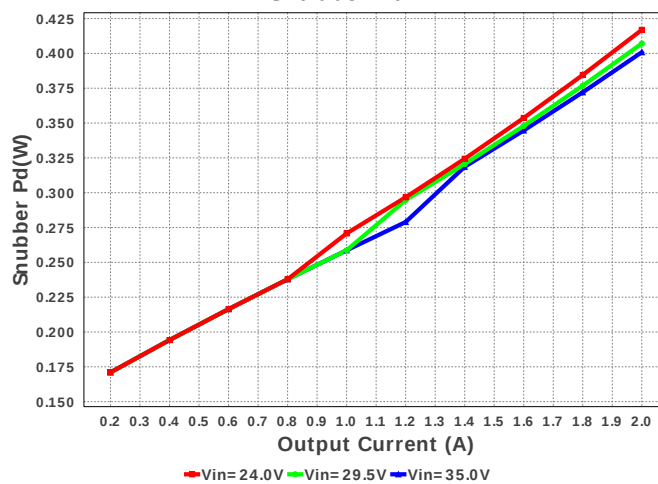
Dsec2 Vf



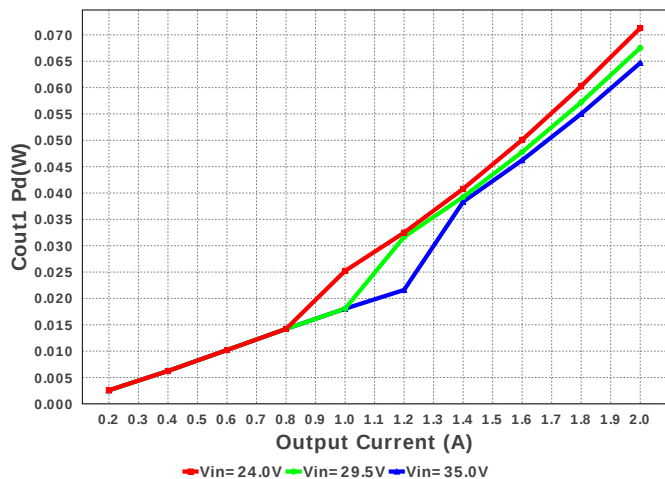
Pd Rstartup



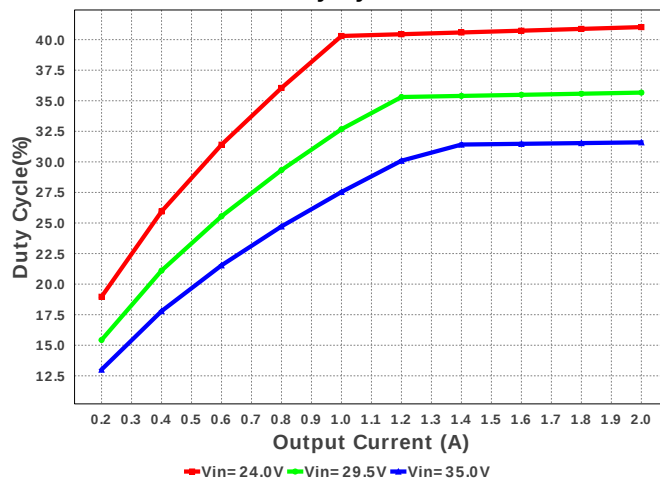
Snubber Pd



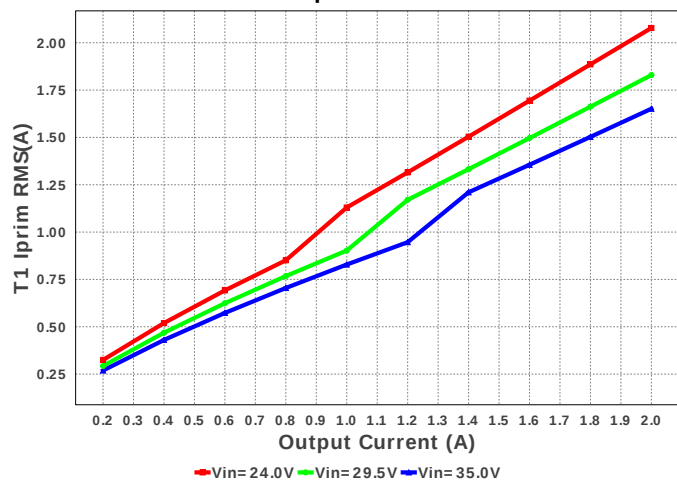
Cout1 Pd



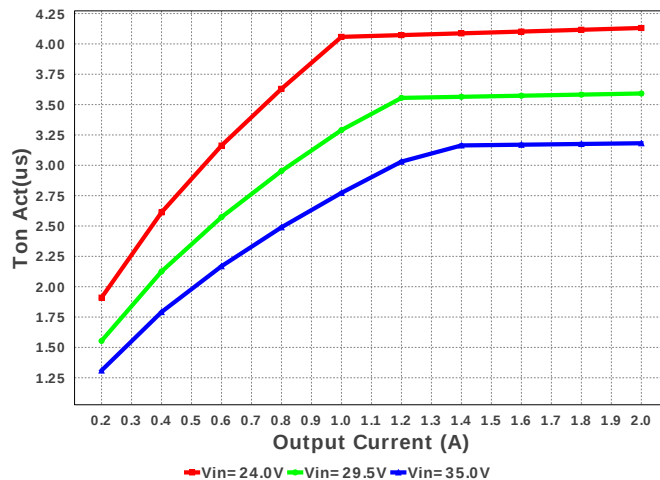
Duty Cycle



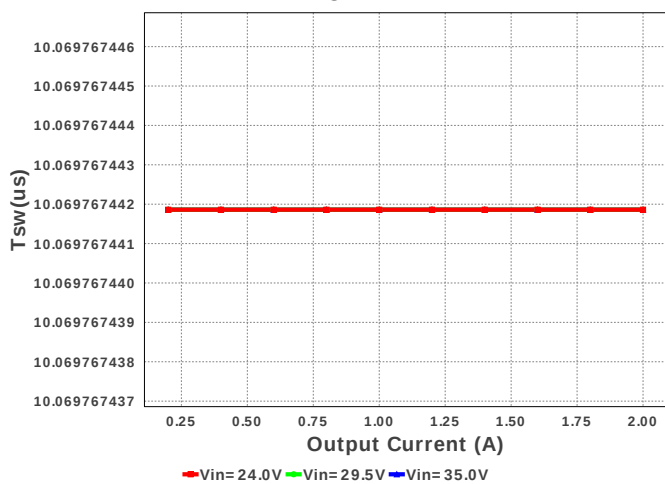
T1 Iprim RMS



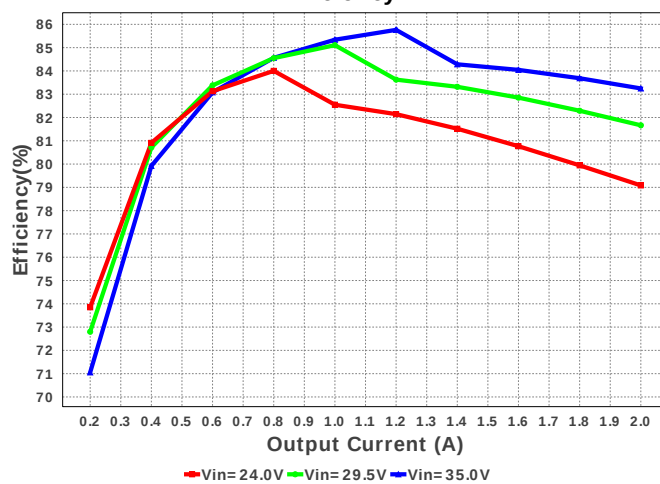
Ton Act

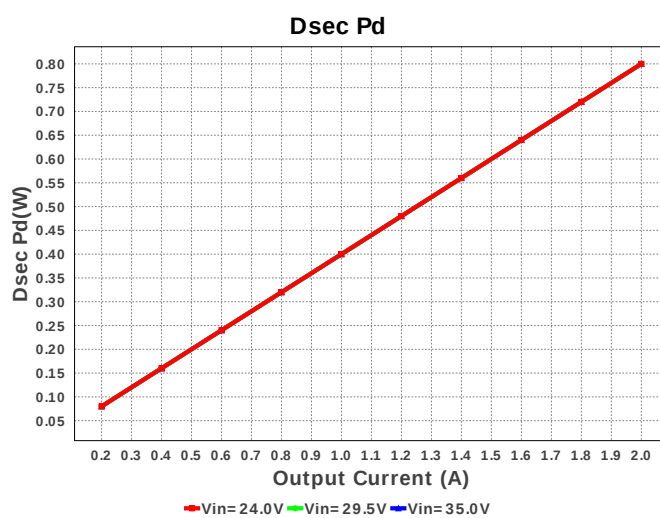
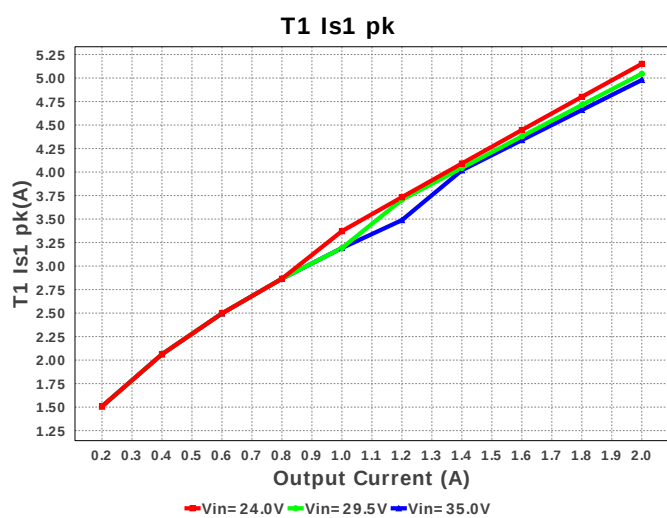
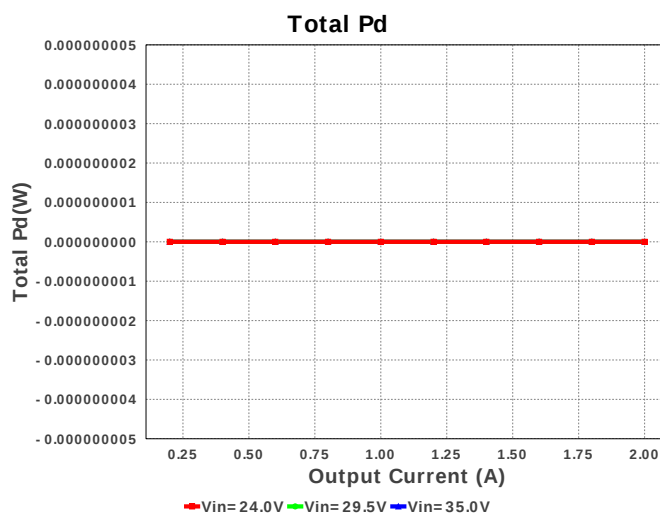
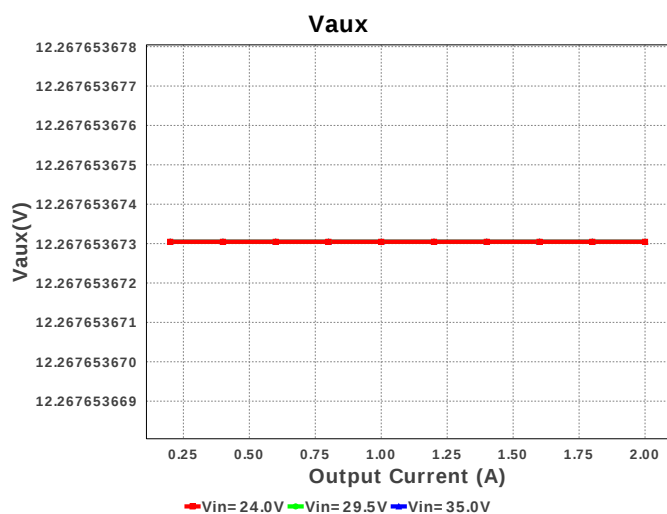
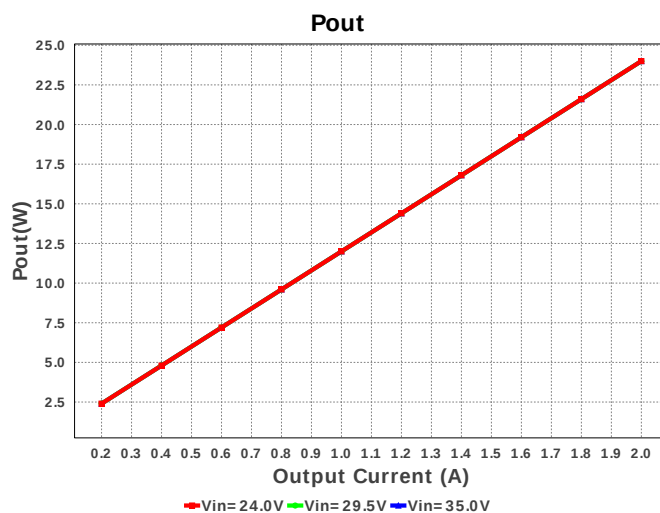
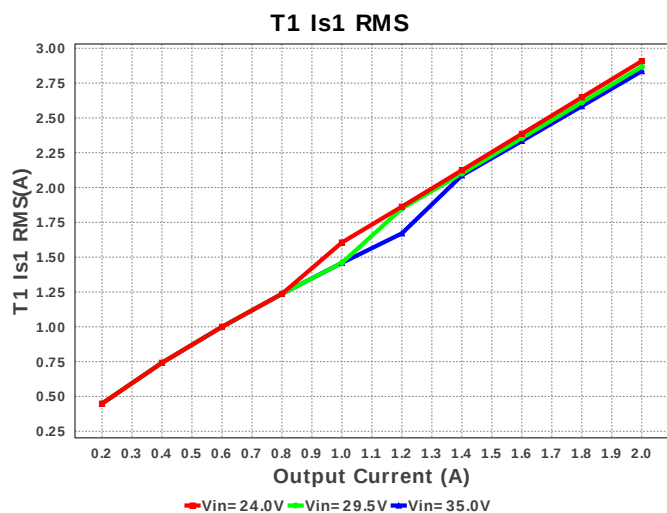


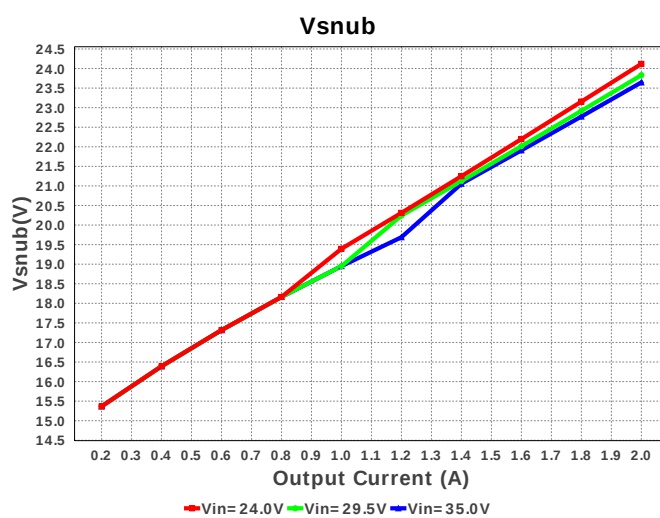
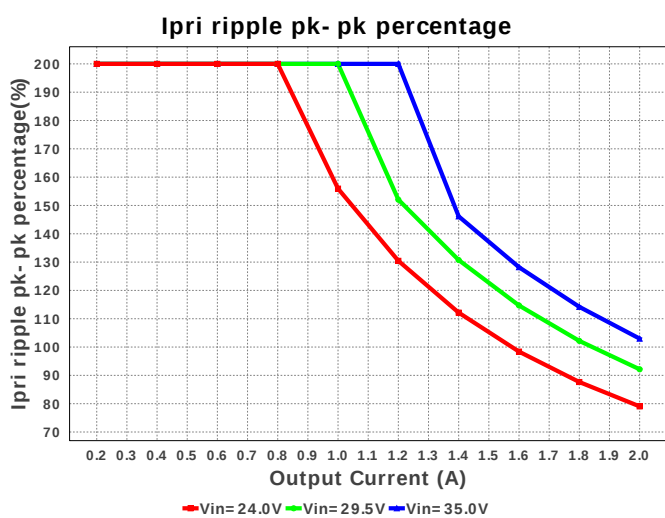
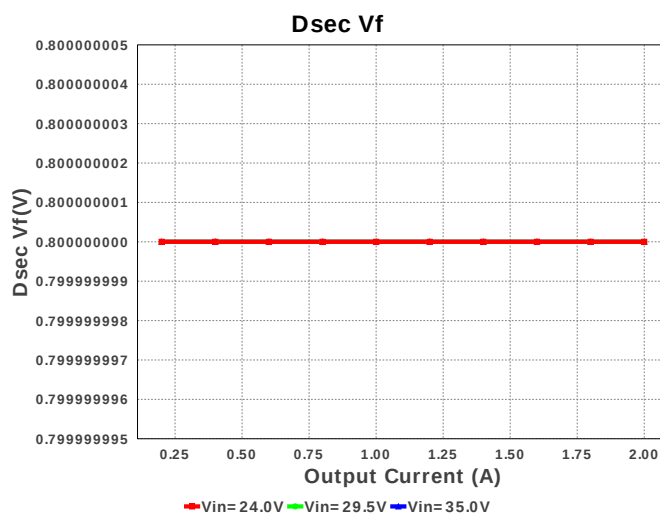
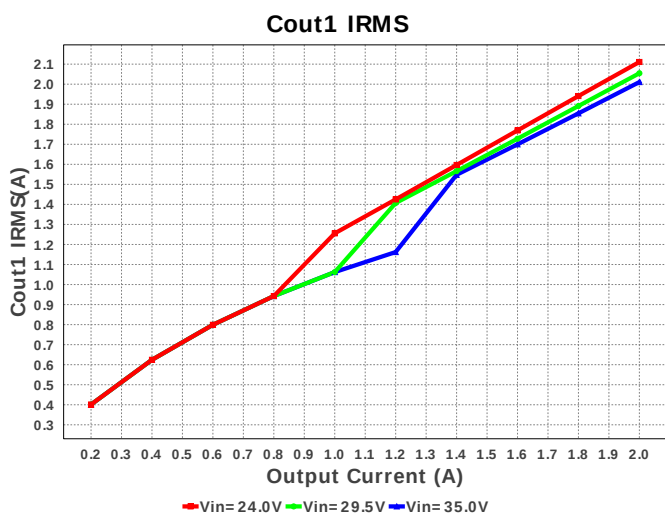
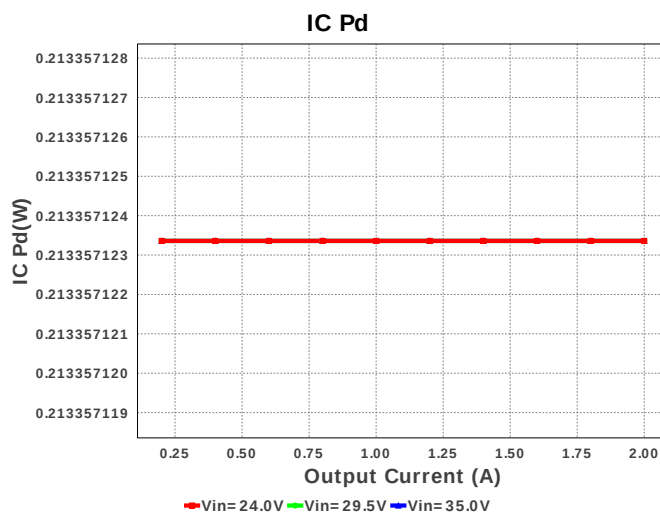
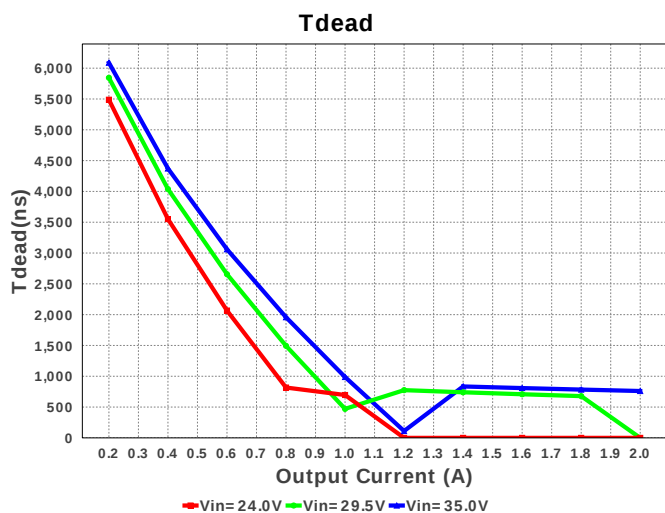
Tsw

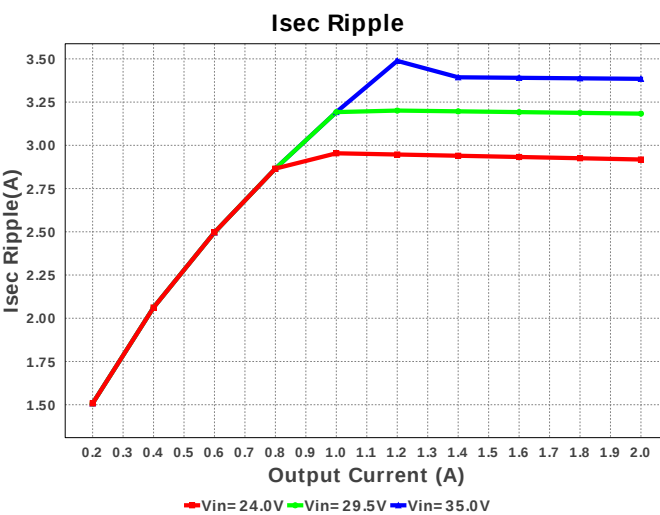
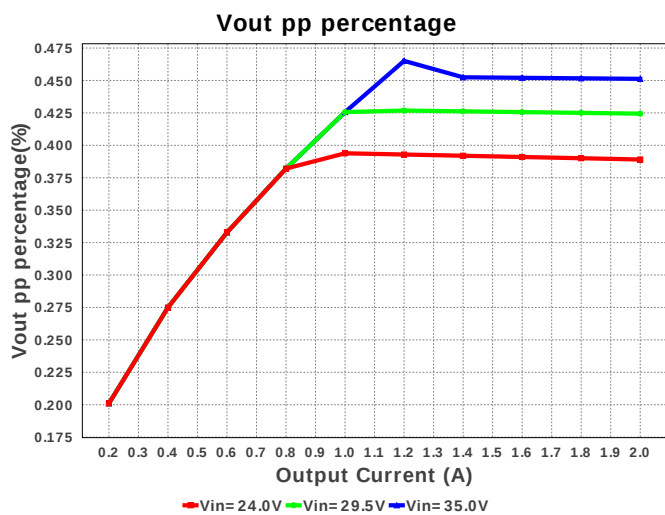
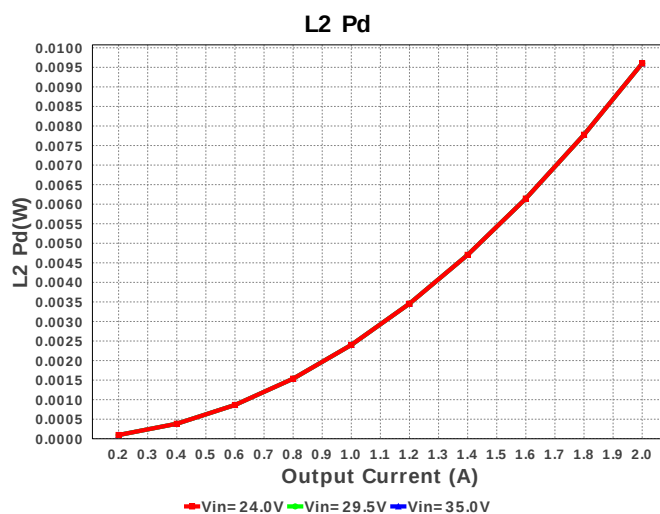
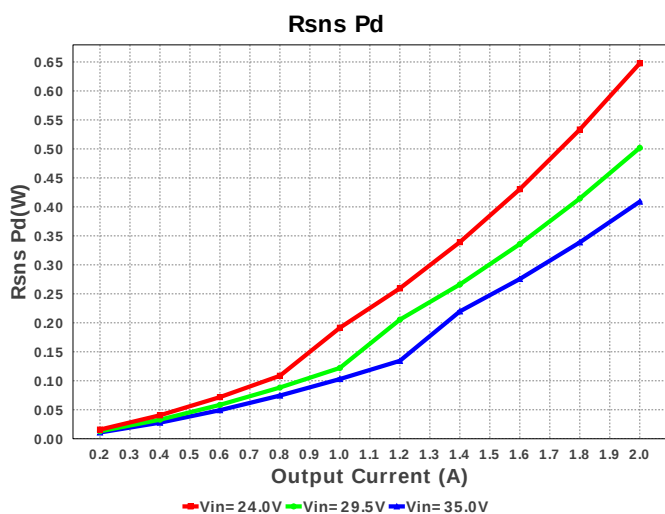
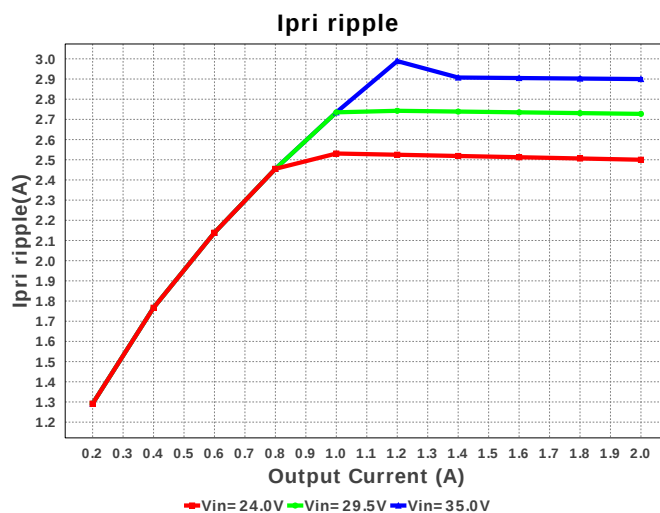
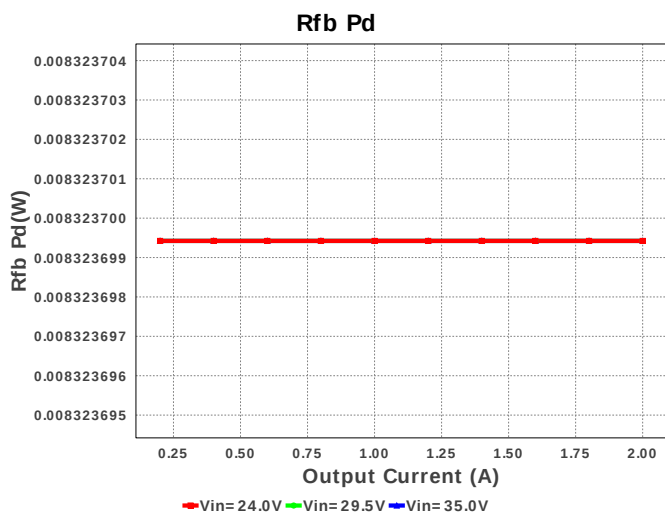


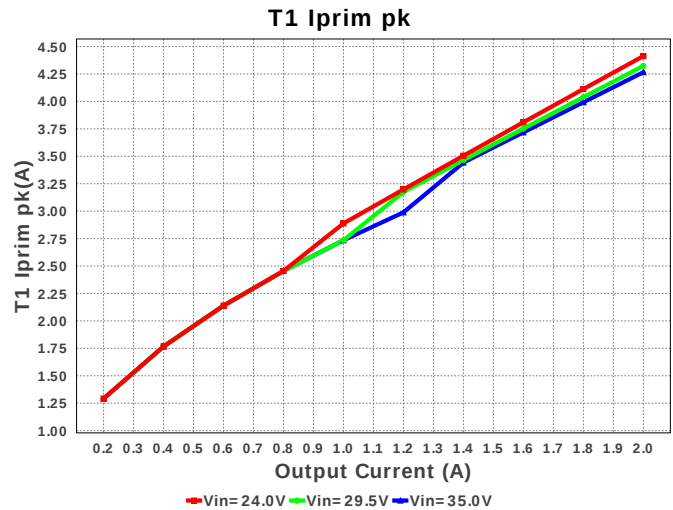
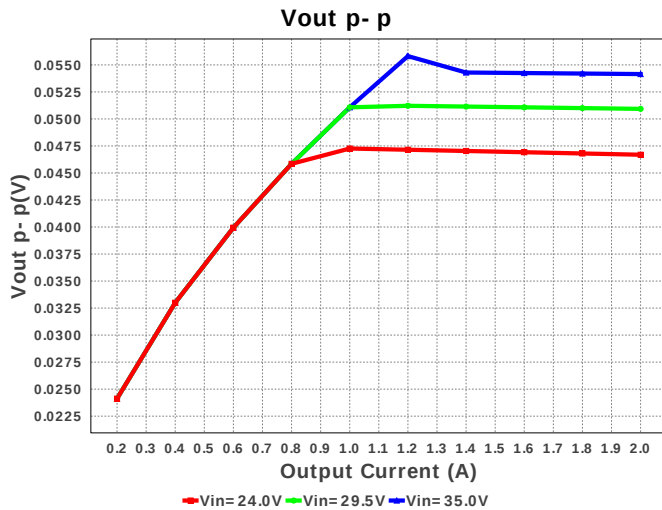
Efficiency











Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	2.111 A	Current	Output capacitor1 RMS ripple current
2.	Iin Avg	1.264 A	Current	Average input current
3.	Iout_DCM	1.034 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	1.298 A	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	2.5 A	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	79.045 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	2.918 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	2.078 A	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	4.413 A	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	2.908 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	5.151 A	Current	Transformer Secondary1 Peak Current
12.	BOM Count	46	General	Total Design BOM count
13.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
14.	Dsec Vf	800.0 mV	General	Effective Forward Voltage Drop at the Operating Current
15.	Dsec trr	16.7 ns	General	Output Diode Reverse Recovery Time
16.	Dsec2 Vf	800.0 mV	General	Effective Forward Voltage Drop at the Operating Current
17.	Dsnub trr	0.0 ns	General	Snubber Diode Reverse Recovery Time
18.	FootPrint	1.317 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	24.0 W	General	Total output power
22.	Tdead	0.0 ns	General	Approximate Dead Time of the Regulator
23.	Toff	5.456 us	General	Approximate Converter Off Time
24.	Ton Act	4.131 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	12.268 V	General	Auxiliary Voltage
28.	Vsnub	24.119 V	General	Voltage Across the Snubber
29.	Vout Actual	11.99 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
30.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
31.	Duty Cycle	41.025 %	Op_point	Duty cycle
32.	Efficiency	79.083 %	Op_point	Steady state efficiency
33.	IC Tj	48.469 degC	Op_point	IC junction temperature
34.	ICThetaJA	110.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
35.	IOUT_OP	2.0 A	Op_point	Iout operating point
36.	M1 TjOP	29.215 degC	Op_point	M1 MOSFET junction temperature
37.	Vout p-p	46.688 mV	Op_point	Peak-to-peak output ripple voltage
38.	Cin Pd	9.078 mW	Power	Input capacitor power dissipation
39.	Cout1 Pd	71.287 mW	Power	Output capacitor1 power dissipation
40.	Dsec Pd	800.0 mW	Power	Secondary Diode Power Dissipation
41.	Dsec2 Pd	800.0 mW	Power	Secondary Diode Power Dissipation
42.	IC Pd	213.357 mW	Power	IC power dissipation
43.	L2 Pd	9.6 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
44.	M1 Pd	76.643 mW	Power	M1 MOSFET total power dissipation
45.	Paux	22.091 mW	Power	Power Dissipation in Raux and Daux
46.	Pd Rstartup	54.179 mW	Power	Power Dissipation in Rstartup1 and Rstartup2
47.	Rdrv Pd	16.789 μW	Power	Power Dissipation in Gate Drive Resistor
48.	Rfb Pd	8.324 mW	Power	Rfb Power Dissipation
49.	Rsns Pd	647.66 mW	Power	Current Limit Sense Resistor Power Dissipation
50.	Snubber Pd	416.899 mW	Power	Snubber Power Dissipation

#	Name	Value	Category	Description
51.	T1 Pd	7.658 W	Power	Estimated Losses in Transformer
52.	Total Pd	0.0 W	Power	Total Power Dissipation
53.	Vout Tolerance	1.926 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
54.	Vout pp percentage	389.067 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	Iout1	2.0	Output Current #1
3.	Iout2	2.0	Output Current #2
4.	VinMax	35.0	Maximum input voltage
5.	VinMin	24.0	Minimum input voltage
6.	Vout	12.0	Output Voltage
7.	Vout1	12.0	Output Voltage #1
8.	Vout2	5.0	Output Voltage #2
9.	base_pn	UC3845A	Base Product Number
10.	source	DC	Input Source Type
11.	Ta	25.0	Ambient temperature

Design Assistance

1. **UC3845A** Product Folder : <http://www.ti.com/product/UC3845A> : contains the data sheet and other resources.

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