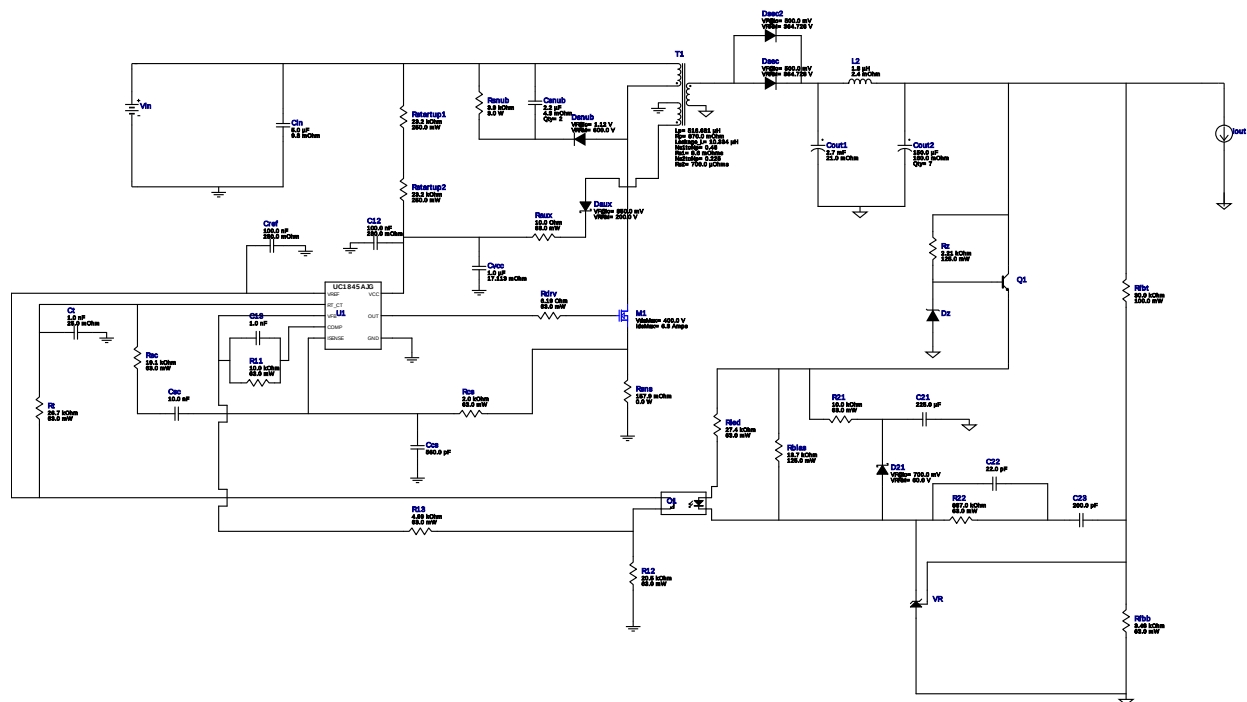


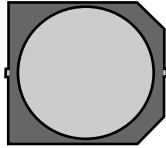
WEBENCH® Design Report

Design : 4762585/4 UC1845AJ
UC1845AJ 85.0V-265.0V to 24.00V @ 4.0A



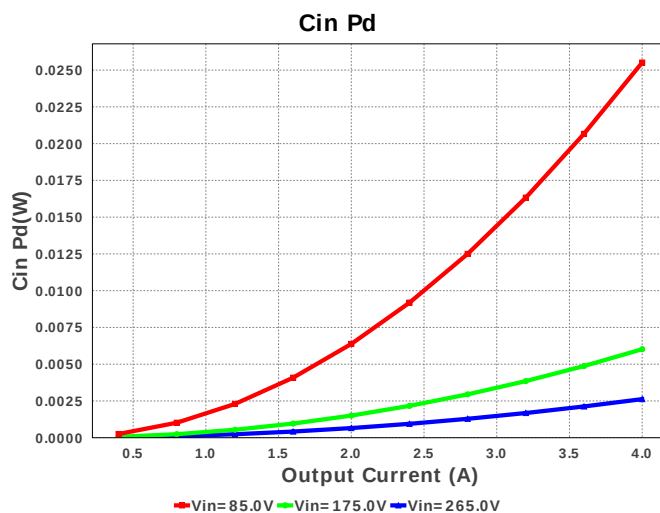
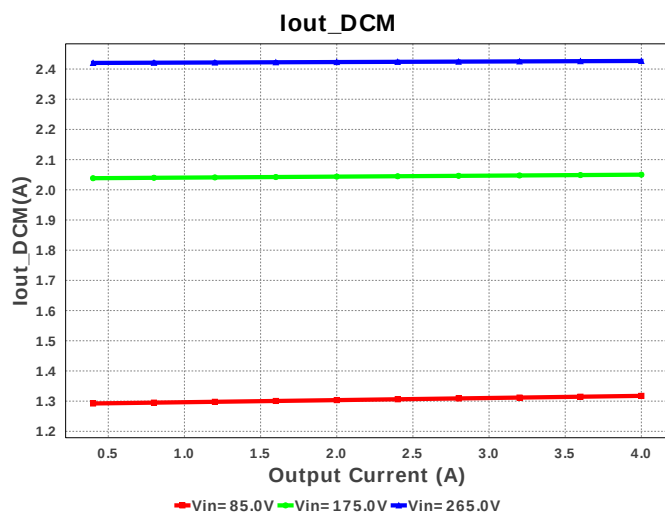
Electrical BOM

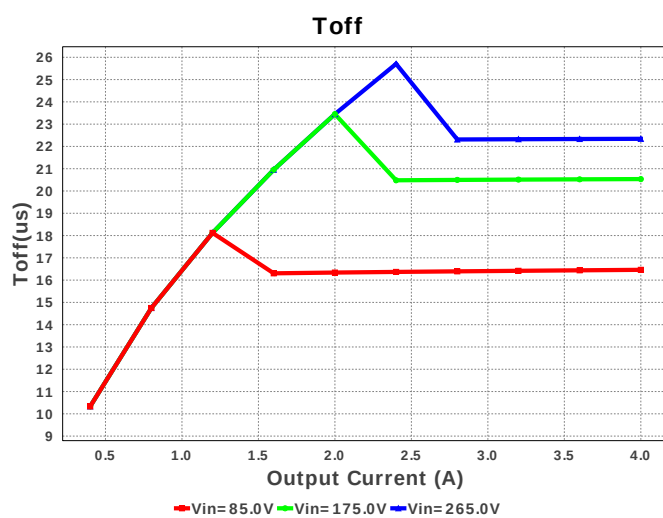
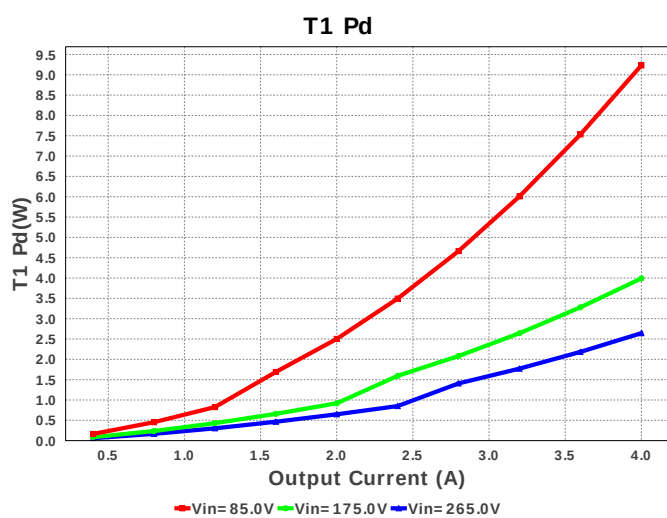
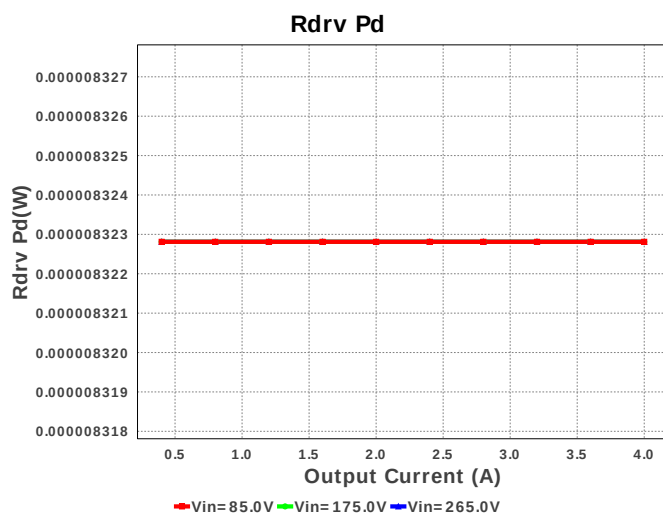
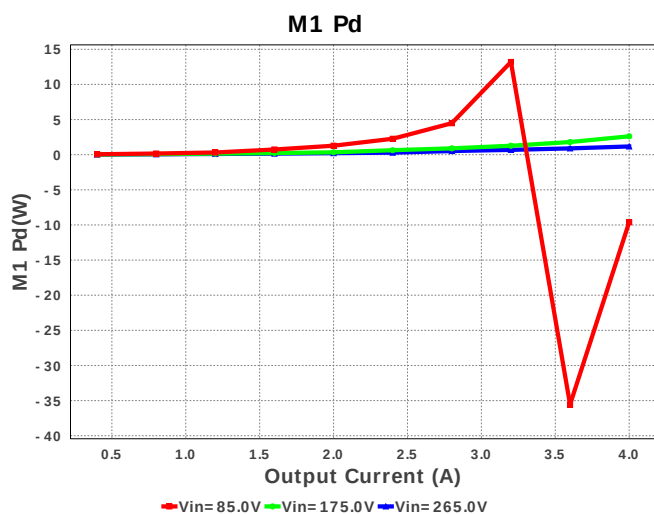
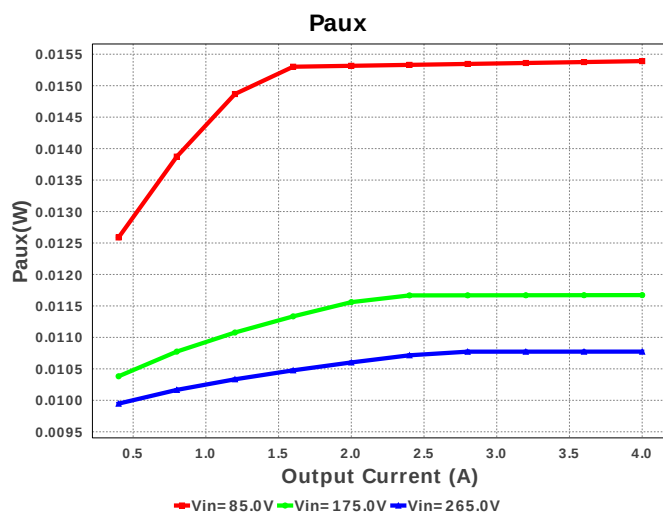
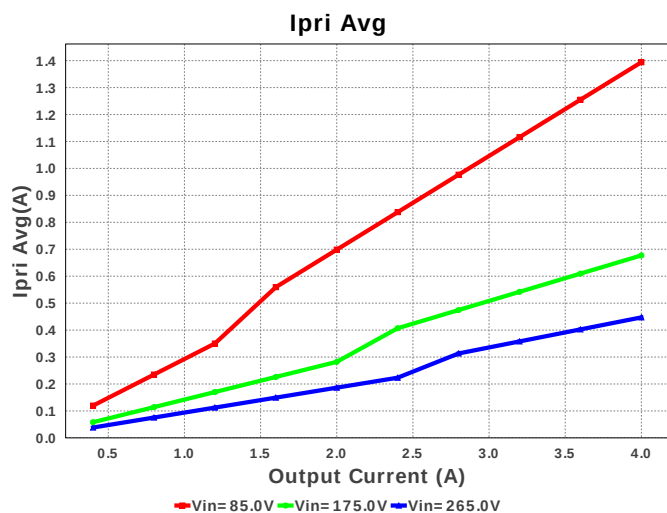
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1.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	C13	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	C21	CUSTOM	CUSTOM Series= ?	Cap= 225.0 uF VDC= 40.0 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	Samsung Electro-Mechanics	CL21C201JBANNNC Series= C0G/NP0	Cap= 200.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Ccs	Yageo America	CC0805KRX7R9BB561 Series= X7R	Cap= 560.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²

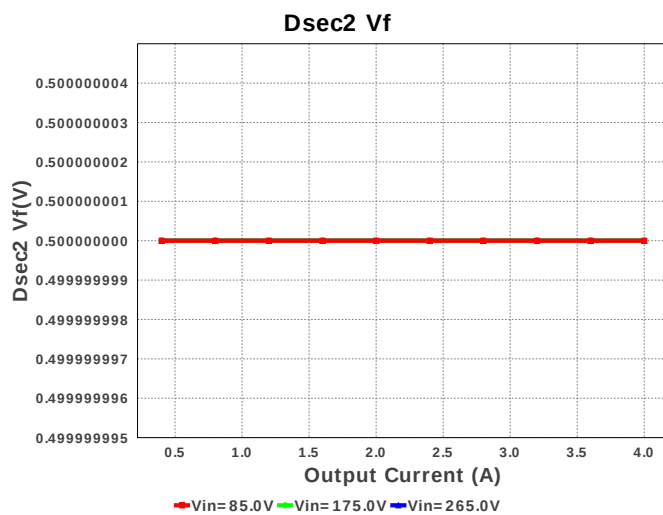
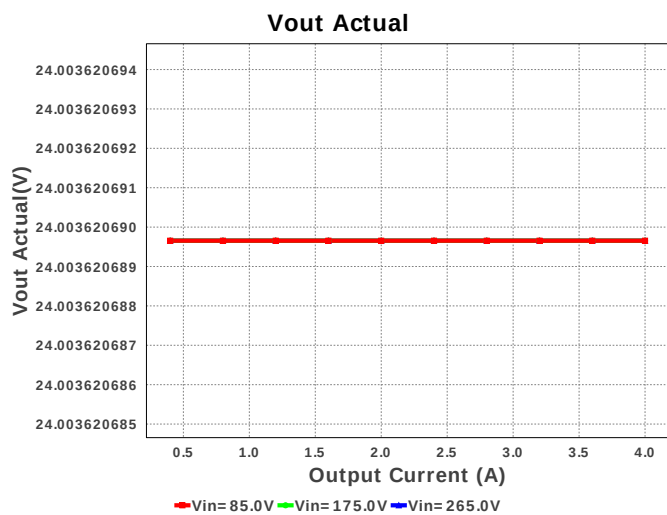
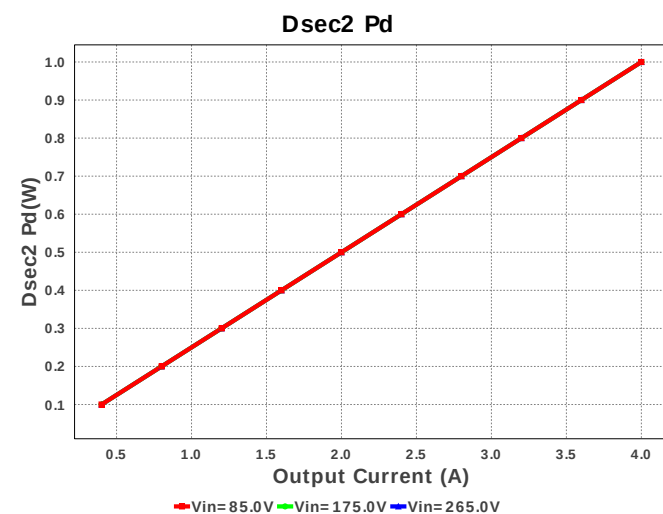
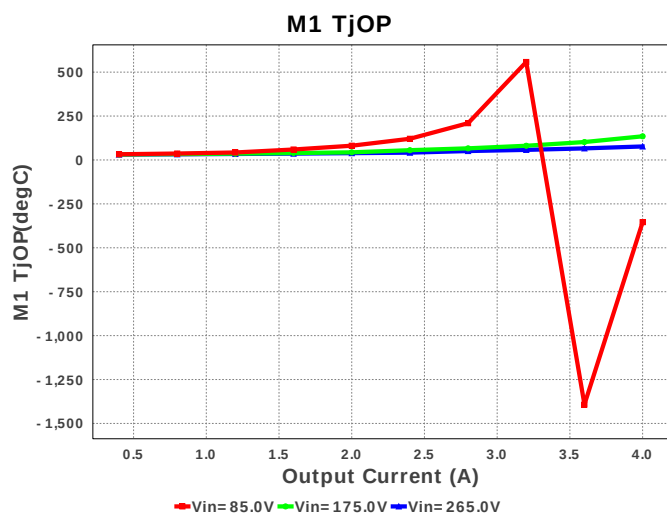
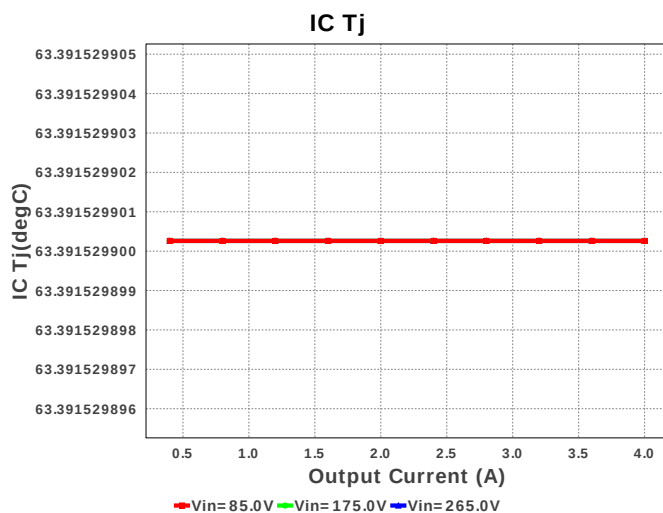
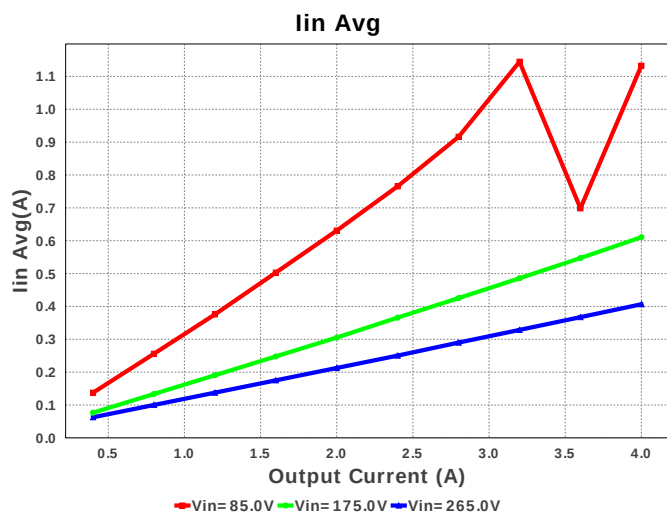
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7.	Cin	TDK	B32774D1505K Series= B32774	Cap= 5.0 uF ESR= 9.8 mOhm VDC= 1.3 kV IRMS= 10.5 A	1	\$3.08	 B32774_3150x2200x3650 804 mm ²
8.	Cout1	TDK	B41605A8278M009 Series= 2385	Cap= 2.7 mF ESR= 21.0 mOhm VDC= 63.0 V IRMS= 5.3 A	1	\$12.37	B41605_2500x4000_9 729 mm ²
9.	Cout2	Panasonic	EEV-FK1J151Q Series= FK	Cap= 150.0 uF ESR= 160.0 mOhm VDC= 63.0 V IRMS= 800.0 mA	7	\$0.51	 SM_RADIAL_H13 264 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	C5750X6S2W225K Series= X6S	Cap= 2.2 uF ESR= 4.3 mOhm VDC= 400.0 V IRMS= 0.0 A	2	NA	 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	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF ESR= 17.113 mOhm VDC= 25.0 V IRMS= 979.39 mA	1	\$0.01	 0603 5 mm ²
15.	D21	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.09	 SMA 37 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	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 364.728 V	1	NA	CUSTOM 0 mm ²
18.	Dsec2	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 364.728 V	1	NA	CUSTOM 0 mm ²
19.	Dsnub	Bourns	CD214C-F3600	VF@Io= 1.12 V VRRM= 600.0 V	1	\$0.18	 SMC 83 mm ²
20.	Dz	Diodes Inc.	MMSZ5250B-7-F	Zener	1	\$0.03	 SOD-123 13 mm ²
21.	L2	Coilcraft	SER1360-182KLB	L= 1.8 uH DCR= 2.4 mOhm	1	\$0.72	 SER1360 225 mm ²

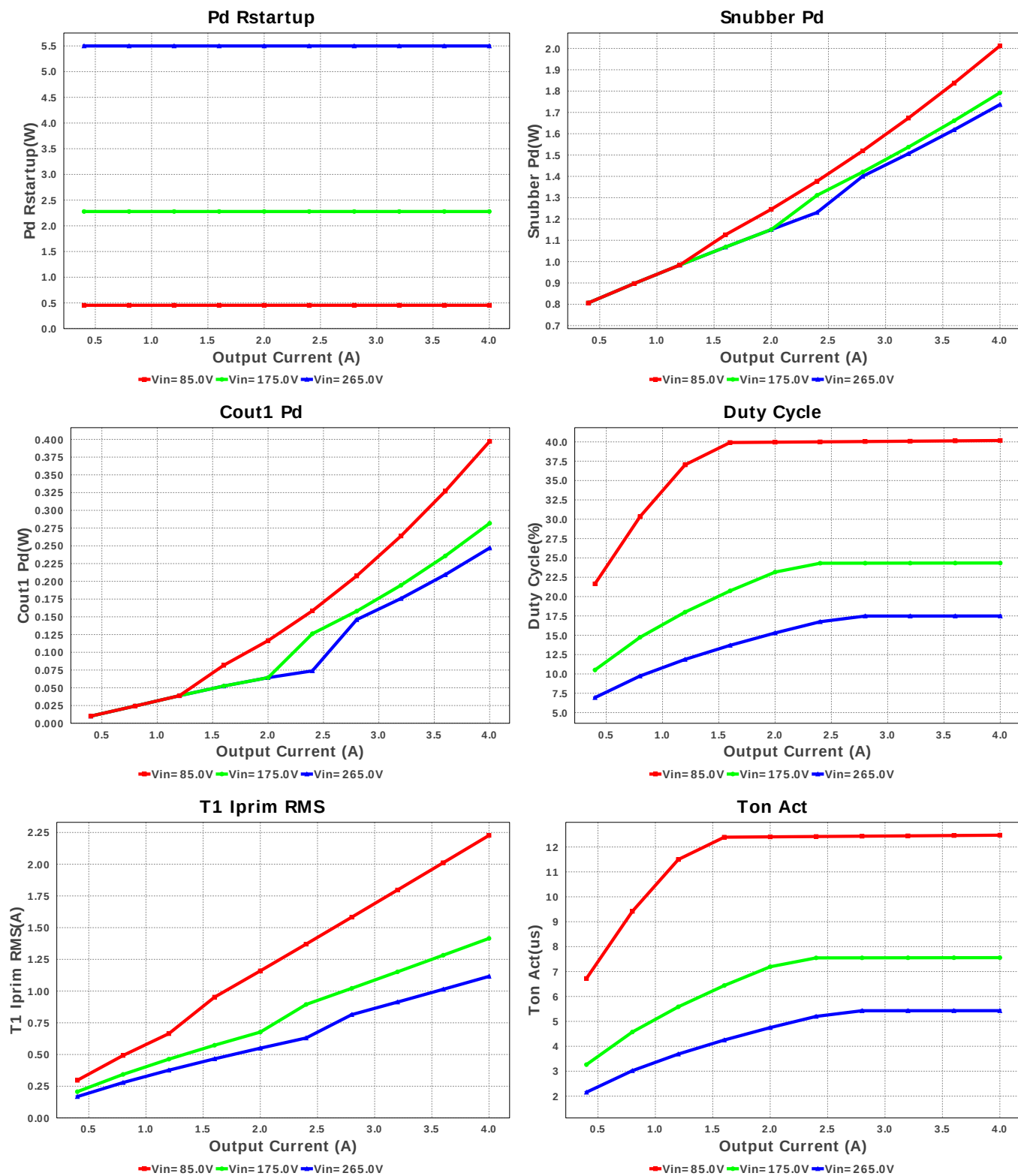
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22.	M1	Vishay-Siliconix	IRF740ASPBF	VdsMax= 400.0 V IdsMax= 6.3 Amps	1	\$0.81	 DDPAK 210 mm²
23.	O1	Vishay-Semiconductor	TCMT1107	Optocoupler	1	\$0.21	 SOP-4 44 mm²
24.	Q1	ON Semiconductor	BC846BLT1G	Bipolar Transistor	1	\$0.02	 SOT-23 14 mm²
25.	R11	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
26.	R12	Vishay-Dale	CRCW040220K5FKED Series= CRCW..e3	Res= 20.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
27.	R13	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
28.	R21	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
29.	R22	Vishay-Dale	CRCW0402887KFKED Series= CRCW..e3	Res= 887.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
30.	Raux	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
31.	Rbias	Panasonic	ERJ-6ENF1372V Series= ERJ-6E	Res= 13.7 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm²
32.	Rcs	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
33.	Rdrv	Vishay-Dale	CRCW04026R19FKED Series= CRCW..e3	Res= 6.19 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
34.	Rfbb	Vishay-Dale	CRCW04023K48FKED Series= CRCW..e3	Res= 3.48 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
35.	Rfbt	Yageo America	RC0603FR-0730KL Series= ?	Res= 30.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm²
36.	Rled	Vishay-Dale	CRCW040227K4FKED Series= CRCW..e3	Res= 27.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
37.	Rsc	Vishay-Dale	CRCW040219K1FKED Series= CRCW..e3	Res= 19.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
38.	Rsns	CUSTOM	CUSTOM Series= ?	Res= 157.9 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
39.	Rsns	Vishay-Bcomponents	PR03000203901JAC00 Series= ?	Res= 3.9 kOhm Power= 3.0 W Tolerance= 5.0%	1	\$0.19	 PR03 0 mm²
40.	Rstartup1	Panasonic	ERJ-8ENF2322V Series= ERJ-8E	Res= 23.2 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
41.	Rstartup2	Panasonic	ERJ-8ENF2322V Series= ERJ-8E	Res= 23.2 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²

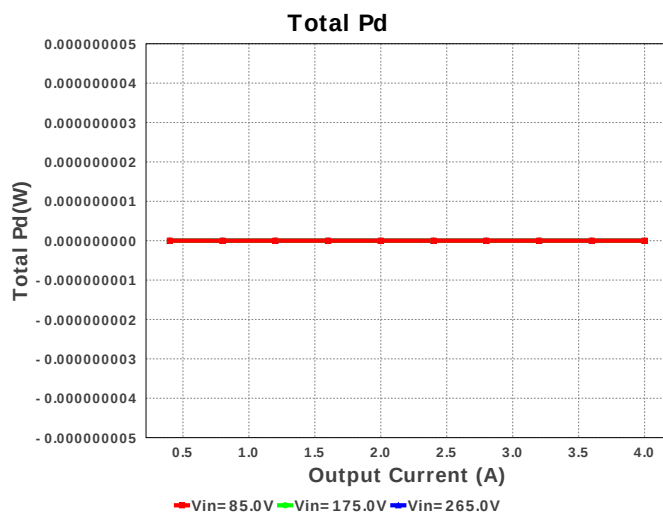
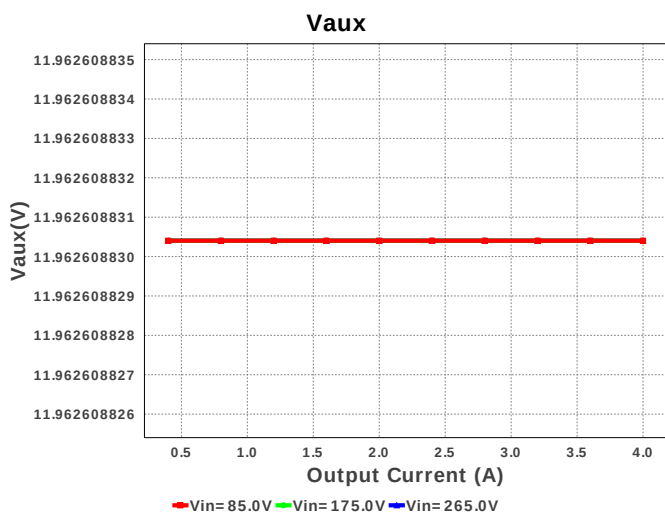
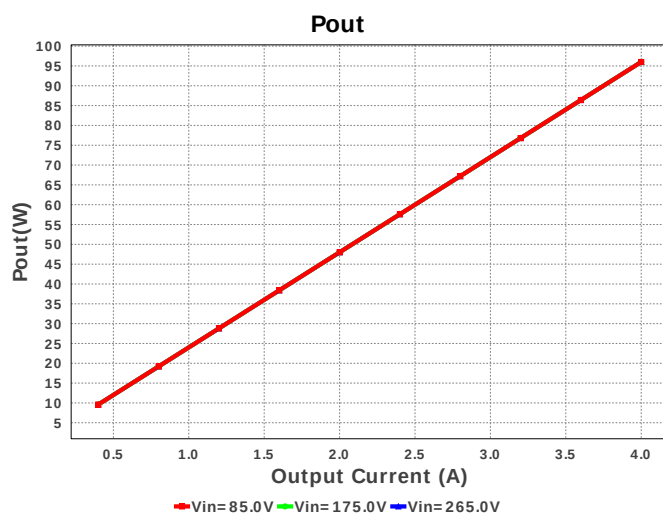
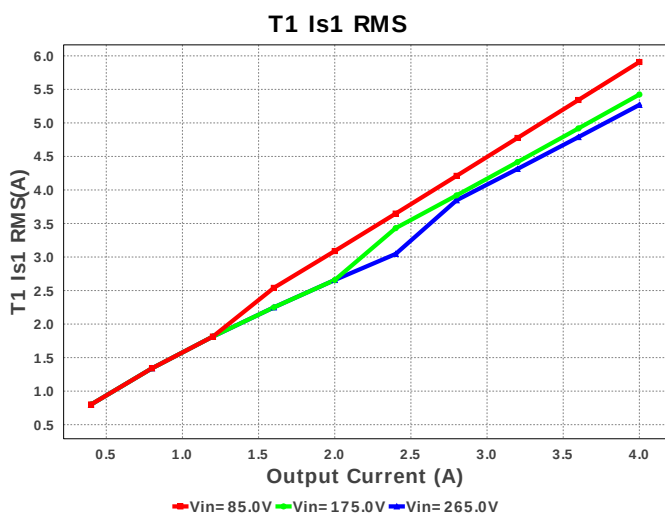
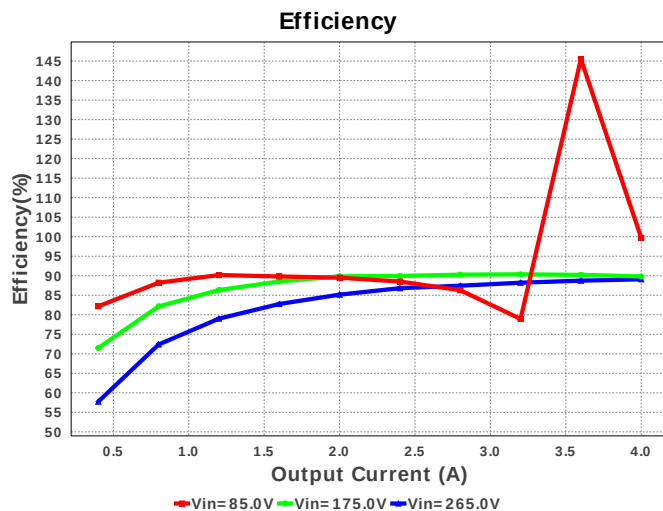
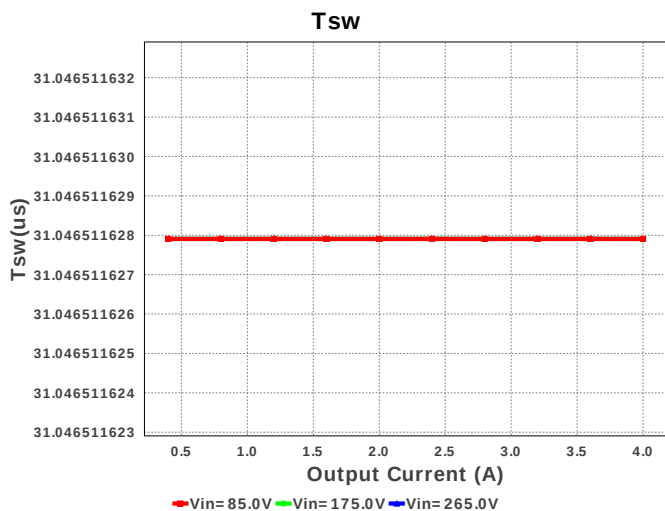
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
42.	Rt	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
43.	Rz	Panasonic	ERJ-6ENF2211V Series= ERJ-6E	Res= 2.21 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm²
44.	T1	CUSTOM	CUSTOM	Lp= 516.681 µH Rp= 870.0 mOhm Leakage_L= 10.334 µH Ns1toNp= 0.46 Rs1= 8.6 mOhms Ns2toNp= 0.225 Rs2= 700.0 µOhms	1	NA	CUSTOM 0 mm²
45.	U1	Texas Instruments	UC1845AJ	Switcher	1	\$14.16	 JG0008A 111 mm²
46.	VR	Texas Instruments	TL431AIDBZR	Voltage References	1	\$0.08	 DBZ0003A 14 mm²



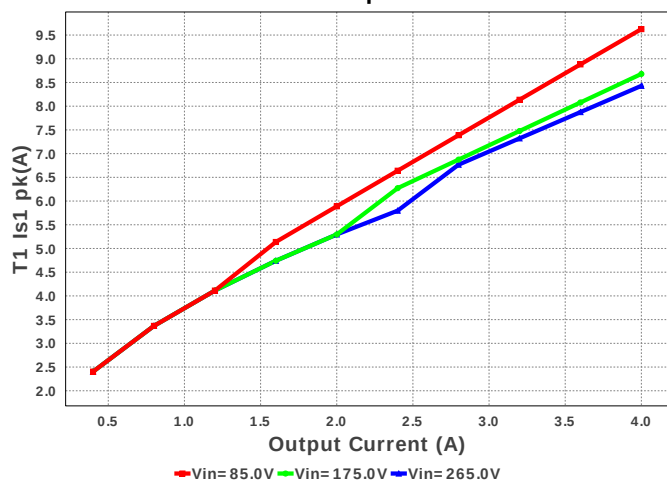




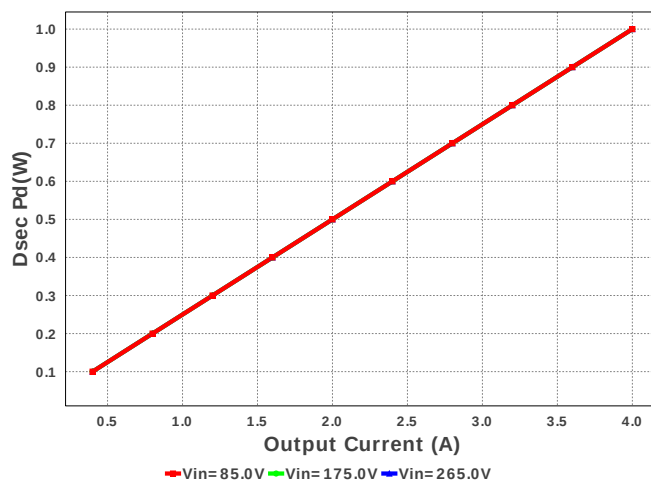




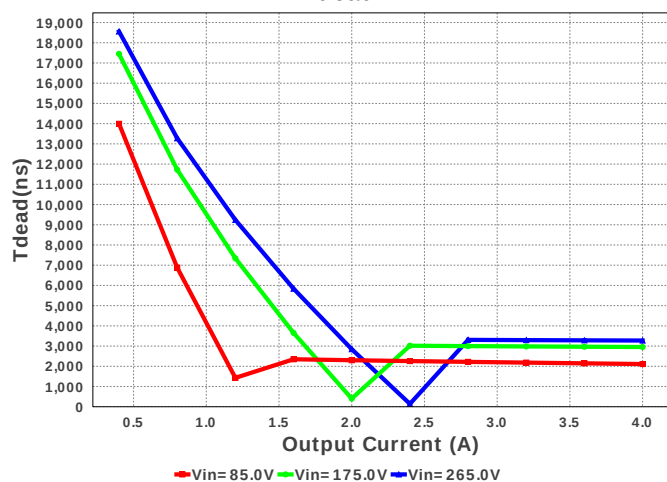
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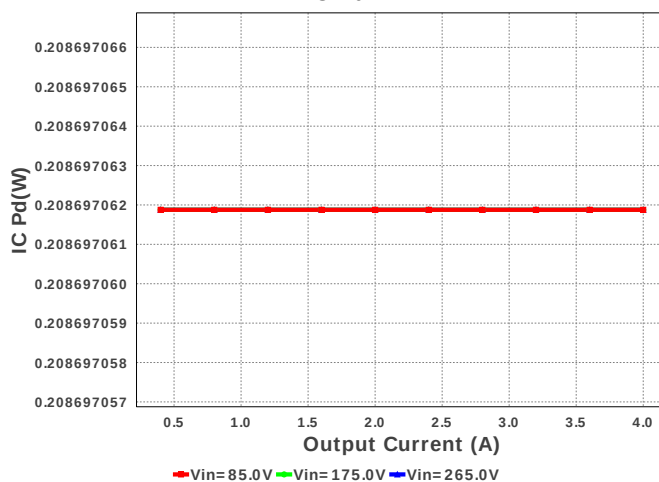
Dsec Pd



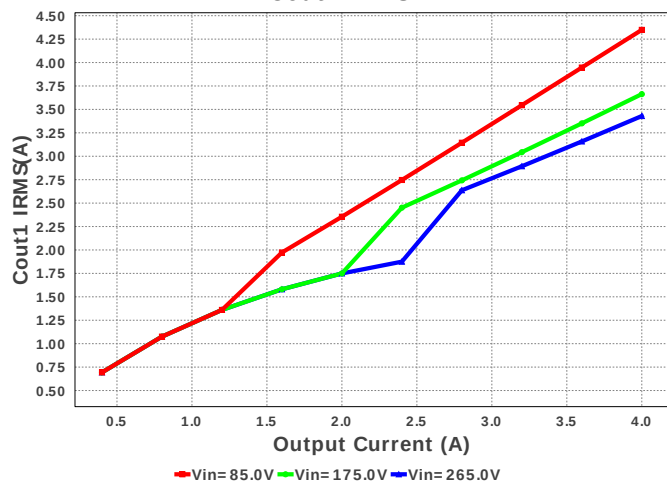
Tdead



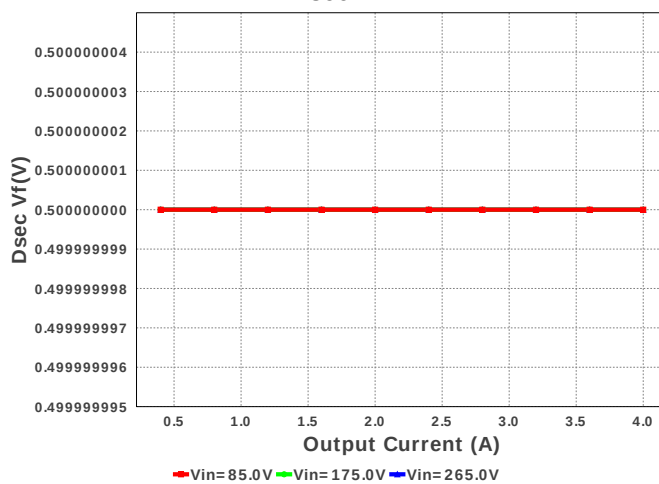
IC Pd

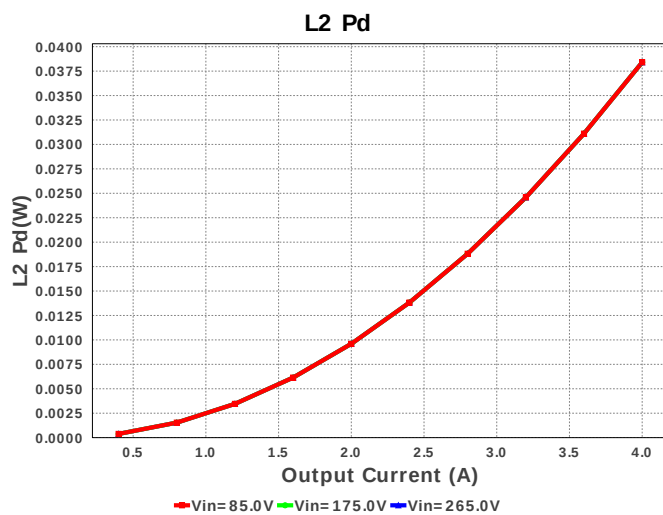
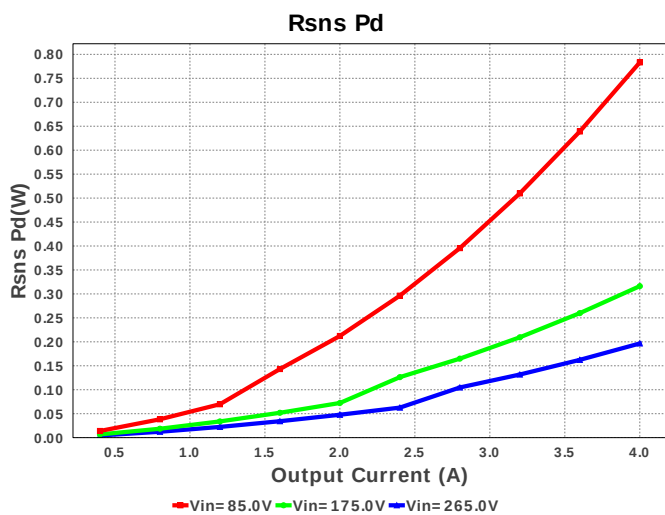
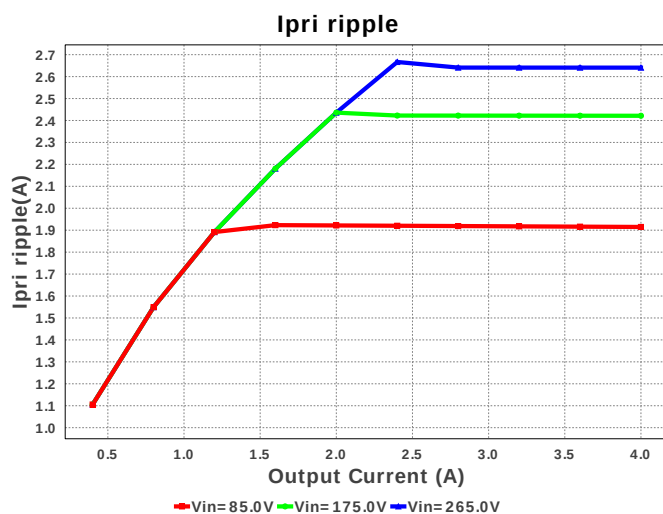
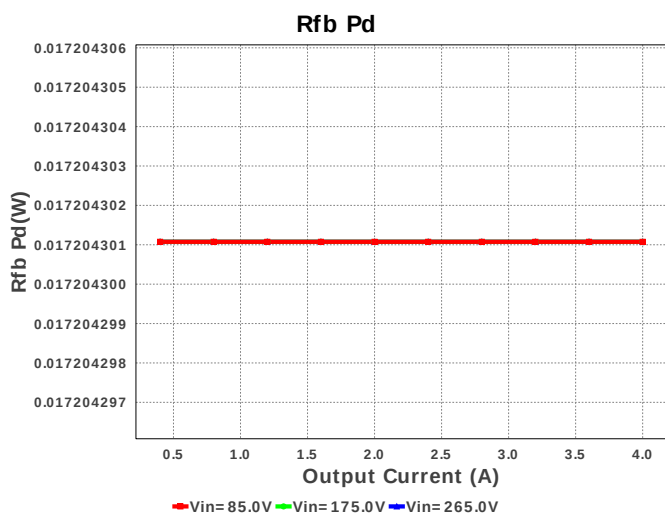
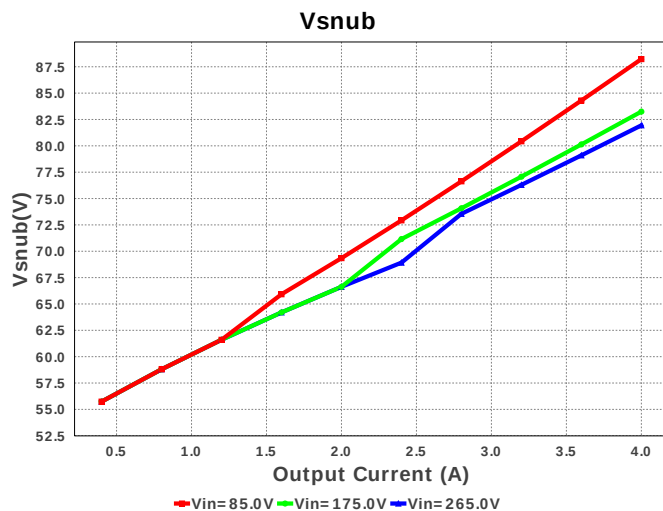
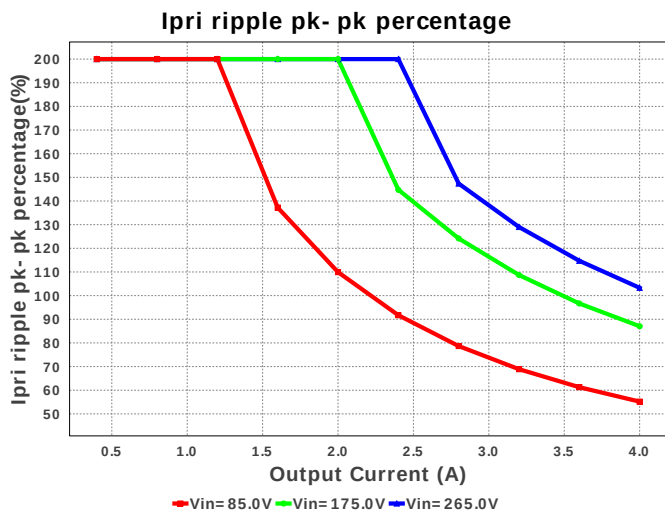


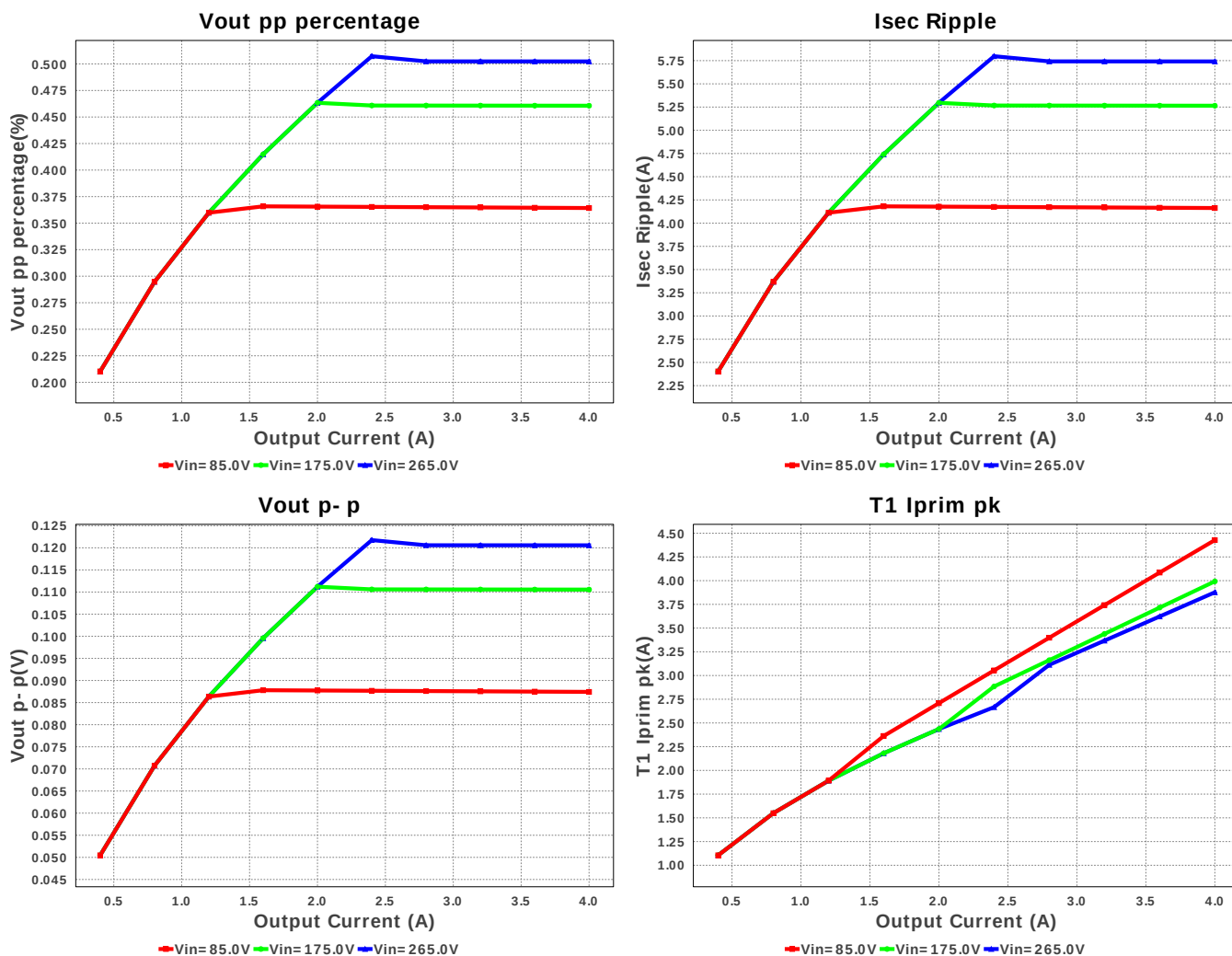
Cout1 IRMS



Dsec Vf







Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	4.349 A	Current	Output capacitor1 RMS ripple current
2.	Iin Avg	1.133 A	Current	Average input current
3.	Iout_DCM	1.317 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	1.394 A	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	1.915 A	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	55.18 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	4.163 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	2.227 A	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	4.427 A	Current	Transformer Primary Peak Current
10.	T1 Is1 RMS	5.909 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	9.625 A	Current	Transformer Secondary1 Peak Current
12.	BOM Count	53	General	Total Design BOM count
13.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
14.	Dsec Vf	500.0 mV	General	Effective Forward Voltage Drop at the Operating Current
15.	Dsec trr	60.0 ns	General	Output Diode Reverse Recovery Time
16.	Dsec2 Vf	500.0 mV	General	Effective Forward Voltage Drop at the Operating Current
17.	Dsnub trr	30.0 ns	General	Snubber Diode Reverse Recovery Time
18.	FootPrint	4.415 k mm ²	General	Total Foot Print Area of BOM components
19.	Frequency	32.21 kHz	General	Switching frequency
20.	Pout	96.0 W	General	Total output power
21.	Tdead	2.112 kns	General	Approximate Dead Time of the Regulator
22.	Toff	16.462 us	General	Approximate Converter Off Time
23.	Ton Act	12.473 us	General	Approximate Converter On Time
24.	Total BOM	\$0.0	General	Total BOM Cost
25.	Tsw	31.047 us	General	Switching Time Period
26.	Vaux	11.963 V	General	Auxiliary Voltage
27.	Vsnub	88.227 V	General	Voltage Across the Snubber
28.	Vout Actual	24.004 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
29.	Vout OP	24.0 V	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
30.	Duty Cycle	40.175 %	Op_point	Duty cycle
31.	Efficiency	99.715 %	Op_point	Steady state efficiency
32.	IC Tj	63.392 degC	Op_point	IC junction temperature
33.	ICThetaJA	160.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
34.	IOUT_OP	4.0 A	Op_point	Iout operating point
35.	M1 TjOP	-354.367 degC	Op_point	M1 MOSFET junction temperature
36.	Vout p-p	87.419 mV	Op_point	Peak-to-peak output ripple voltage
37.	Cin Pd	25.511 mW	Power	Input capacitor power dissipation
38.	Cout1 Pd	397.14 mW	Power	Output capacitor1 power dissipation
39.	Dsec Pd	1.0 W	Power	Secondary Diode Power Dissipation
40.	Dsec2 Pd	1.0 W	Power	Secondary Diode Power Dissipation
41.	IC Pd	208.697 mW	Power	IC power dissipation
42.	L2 Pd	38.4 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
43.	M1 Pd	-9.609 W	Power	M1 MOSFET total power dissipation
44.	Paux	15.391 mW	Power	Power Dissipation in Raux and Daux
45.	Pd Rstartup	453.965 mW	Power	Power Dissipation in Rstartup1 and Rstartup2
46.	Rdrv Pd	8.323 μ W	Power	Power Dissipation in Gate Drive Resistor
47.	Rfb Pd	17.204 mW	Power	Rfb Power Dissipation
48.	Rsns Pd	783.23 mW	Power	Current Limit Sense Resistor Power Dissipation
49.	Snubber Pd	2.012 W	Power	Snubber Power Dissipation
50.	T1 Pd	9.231 W	Power	Estimated Losses in Transformer
51.	Total Pd	0.0 W	Power	Total Power Dissipation
52.	Vout Tolerance	2.137 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
53.	Vout pp percentage	364.245 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	265.0	Maximum input voltage
3.	VinMin	85.0	Minimum input voltage
4.	Vout	24.0	Output Voltage
5.	base_pn	UC1845A	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. UC1845A Product Folder : <http://www.ti.com/product/UC1845A> : contains the data sheet and other resources.

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