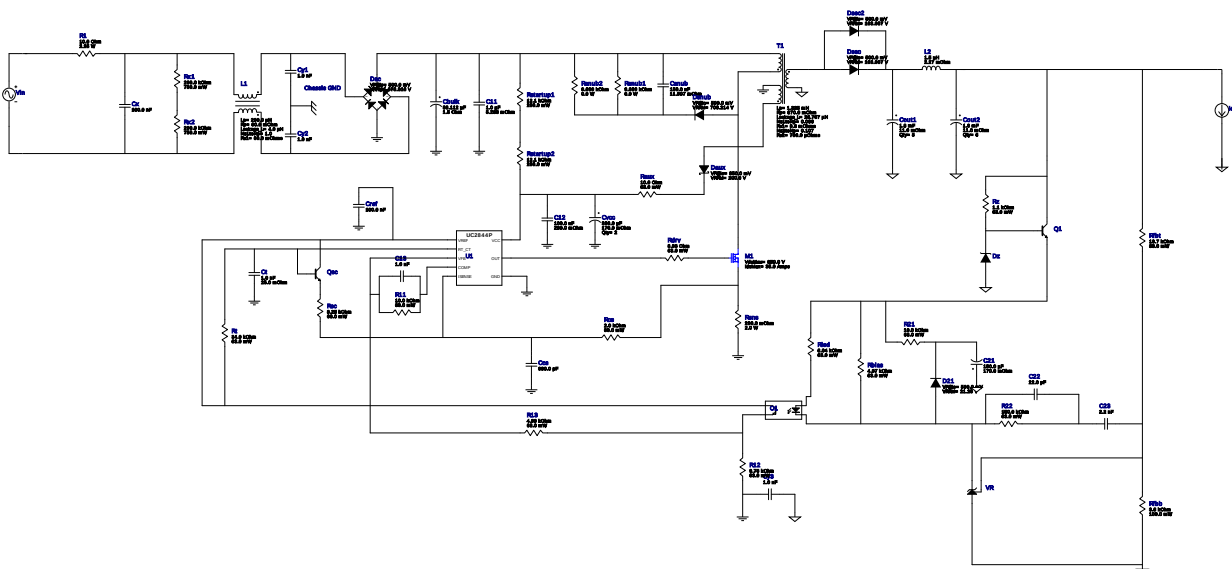


WEBENCH® Design Report

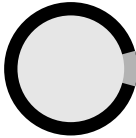
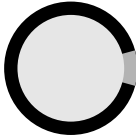
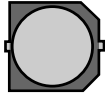
Design : 4790845/31 UC2844N
UC2844N 220.0V-240.0V to 12.00V @ 16.5A

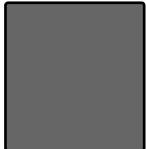


1. The EMI filter selected here contains the estimated values. The real numbers will depend on the attenuation needed at a particular frequency.

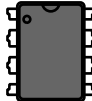
Electrical BOM

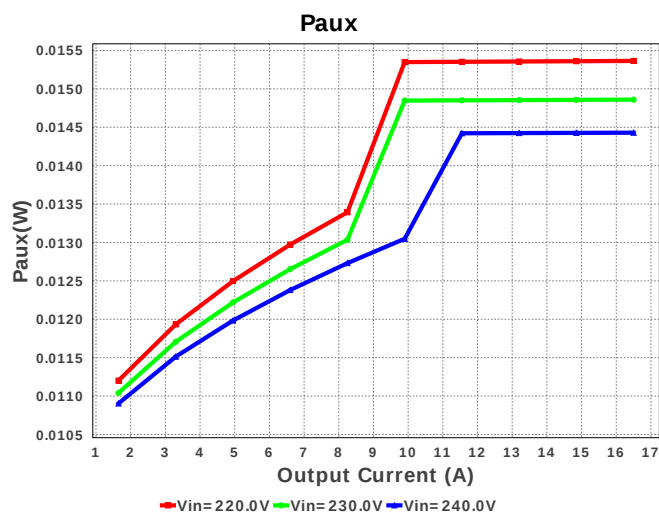
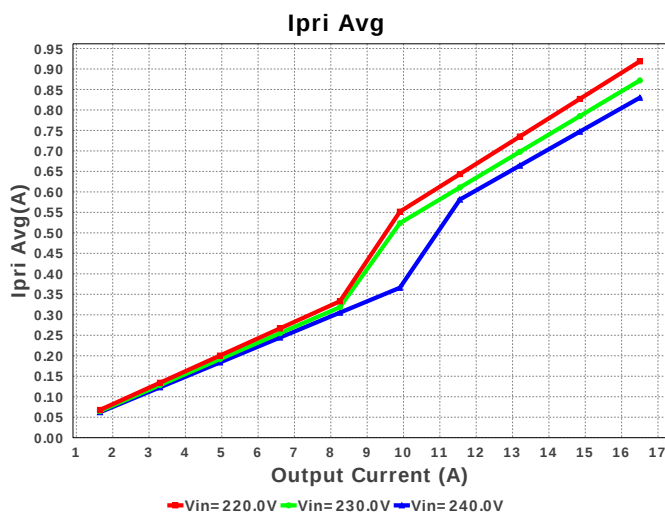
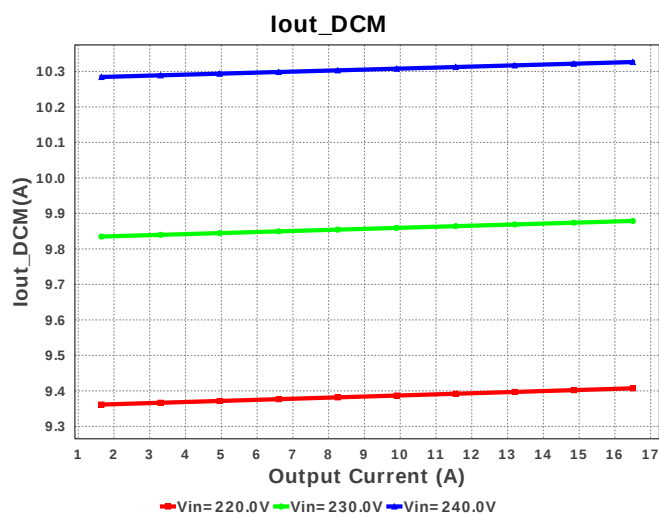
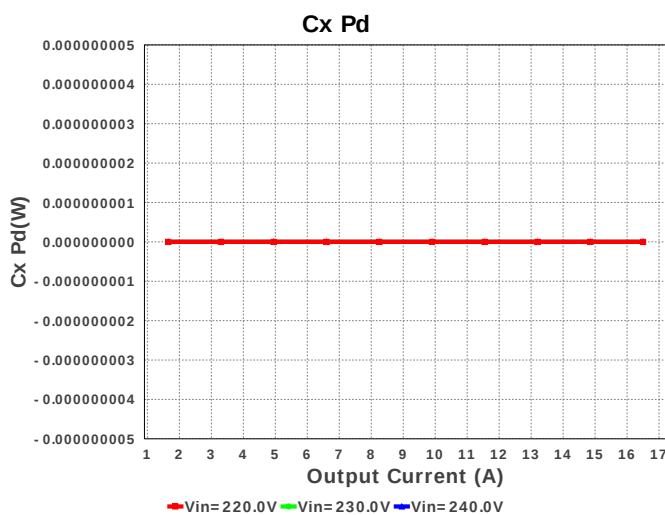
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C11	TDK	C5750X6S2W105K Series= X6S	Cap= 1.0 uF ESR= 5.263 mOhm VDC= 400.0 V IRMS= 0.0 A	1	\$1.19	 2220 54 mm ²
2.	C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
3.	C13	MuRata	GRM033R71C102KA01D Series= X7R	Cap= 1.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
4.	C21	Nichicon	UUD1E151MNL1GS Series= uD	Cap= 150.0 uF ESR= 170.0 mOhm VDC= 25.0 V IRMS= 450.0 mA	1	\$0.20	 SM_RADIAL_8MM 113 mm ²
5.	C22	MuRata	GRM0225C1C220JD05L Series= C0G/NP0	Cap= 22.0 pF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 01005 2 mm ²
6.	C23	MuRata	GRM033R61A222KA01D Series= X5R	Cap= 2.2 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
7.	Cbulk	CUSTOM	CUSTOM Series= ?	Cap= 88.112 uF ESR= 1.5005 Ohm VDC= 356.38 V IRMS= 2.1839 A	1	NA	CUSTOM 0 mm ²
8.	Ccs	MuRata	GRM033R71C681KA01D Series= X7R	Cap= 680.0 pF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²

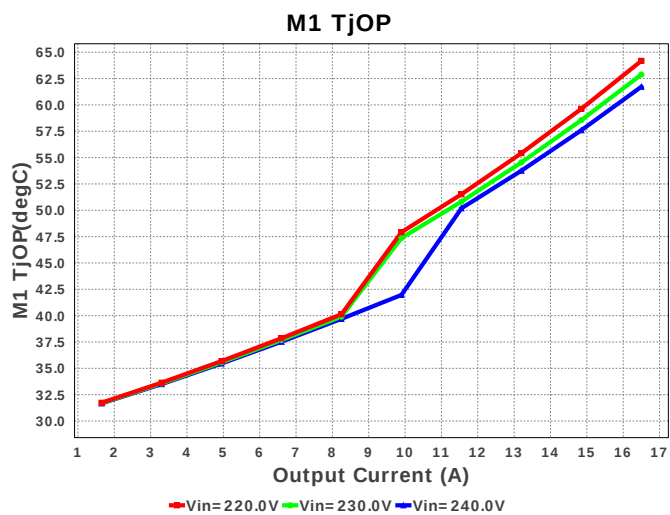
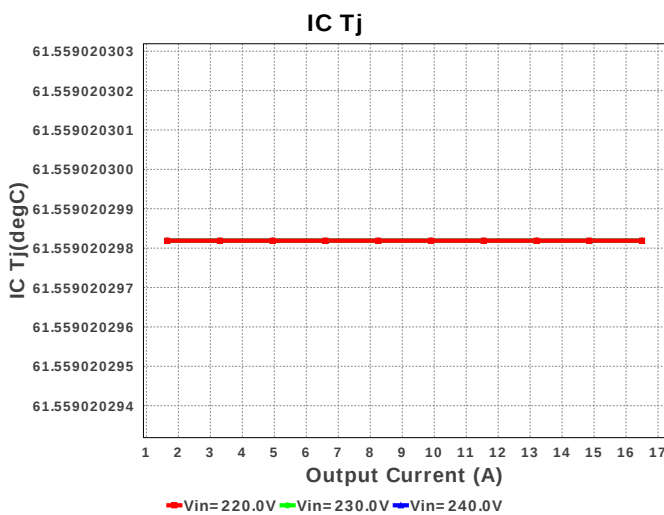
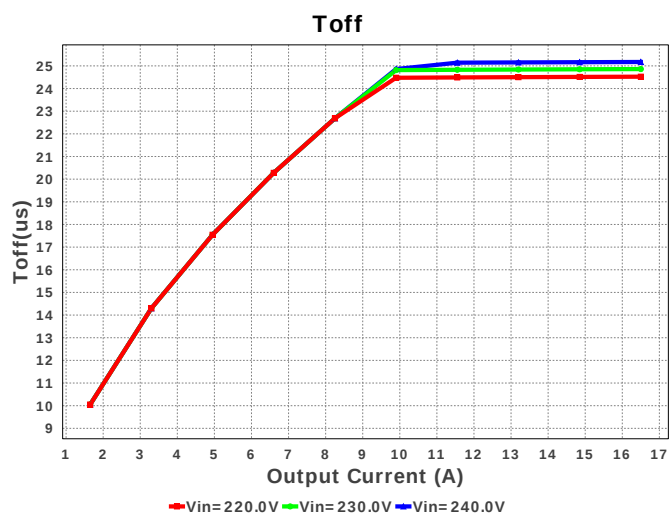
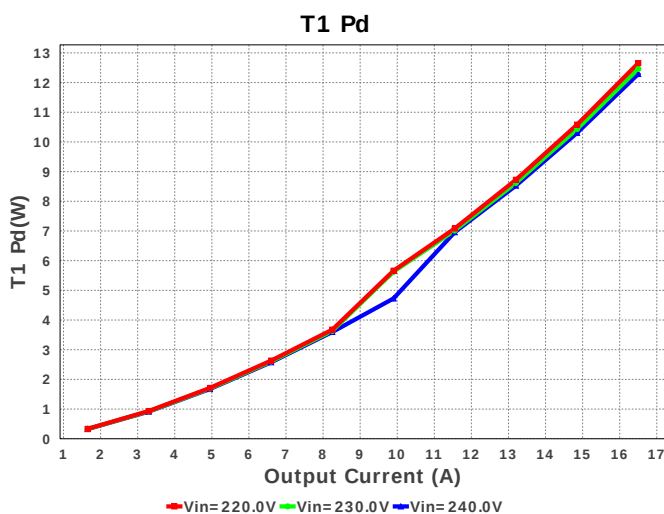
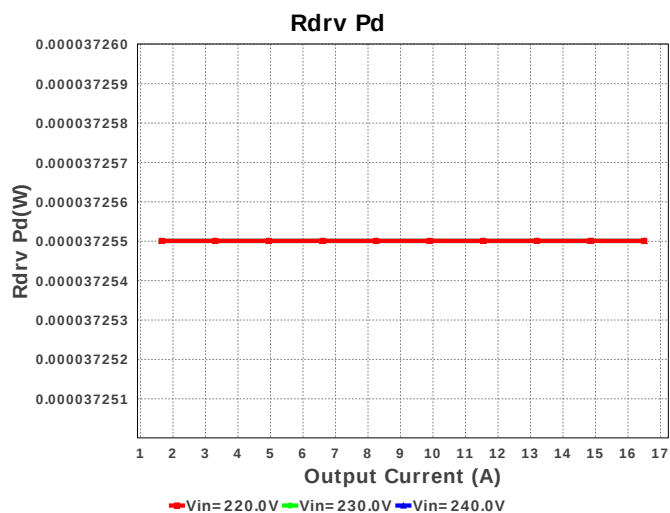
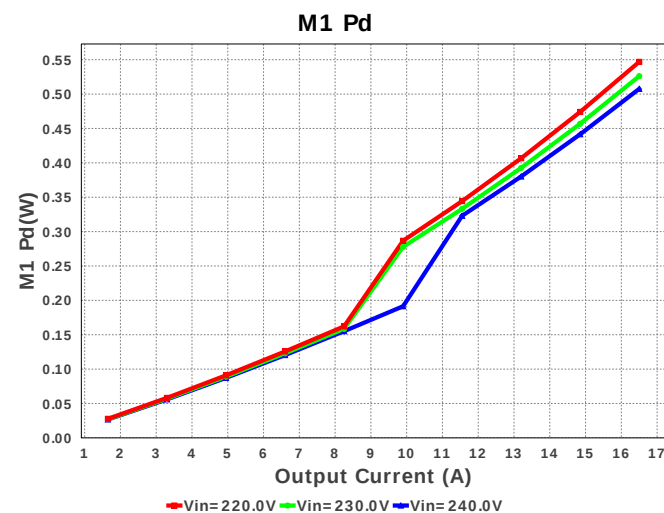
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cout1	Nichicon	UHV1V182MHD Series= HV	Cap= 1.8 mF ESR= 11.0 mOhm VDC= 35.0 V IRMS= 3.925 A	5	NA	 CAPPR5-12.5X25 210 mm ²
10.	Cout2	Nichicon	UHV1V182MHD Series= HV	Cap= 1.8 mF ESR= 11.0 mOhm VDC= 35.0 V IRMS= 3.925 A	6	NA	 CAPPR5-12.5X25 210 mm ²
11.	Cref	MuRata	GRM155R61C104KA88D Series= X5R	Cap= 100.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 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	Nichicon	UUD1E331MNL1GS Series= uD	Cap= 330.0 uF ESR= 170.0 mOhm VDC= 25.0 V IRMS= 450.0 mA	2	\$0.20	 SM_RADIAL_8MM 113 mm ²
15.	Cx	TDK	B32913A5104M000 Series= 2231	Cap= 100.0 nF VDC= 1000.0 V IRMS= 0.0 A	1	\$0.46	 B32913_2650x600x1500 228 mm ²
16.	Cy1	TDK	B81123C1102M Series= B81123	Cap= 1.0 nF VDC= 3.0 kV IRMS= 0.0 A	1	\$0.22	 B81123_1800x500x1050 140 mm ²
17.	Cy2	TDK	B81123C1102M Series= B81123	Cap= 1.0 nF VDC= 3.0 kV IRMS= 0.0 A	1	\$0.22	 B81123_1800x500x1050 140 mm ²

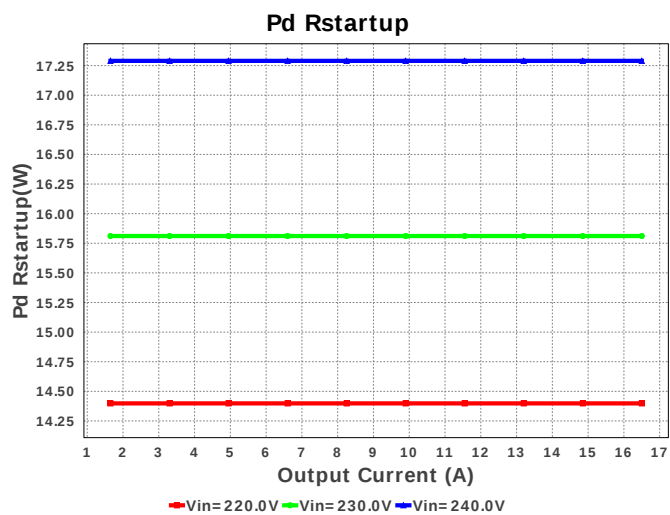
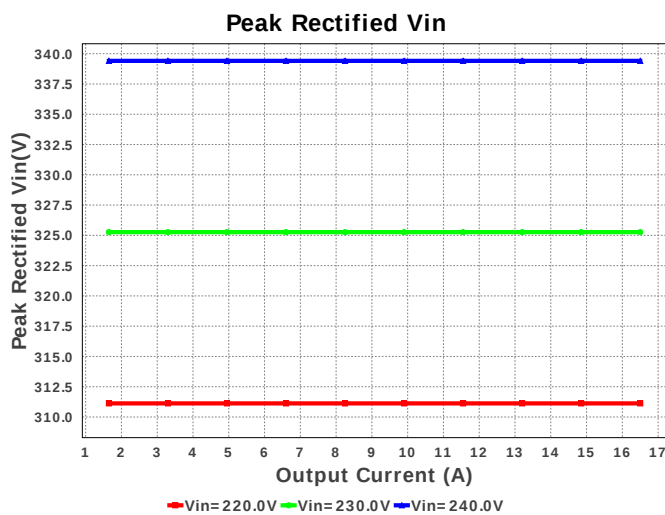
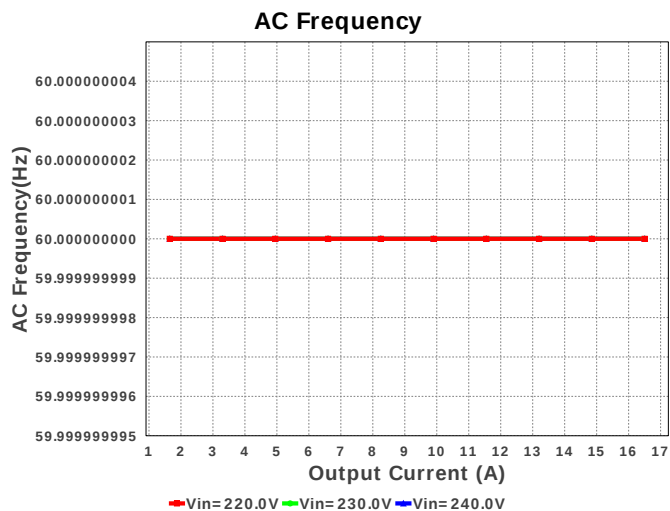
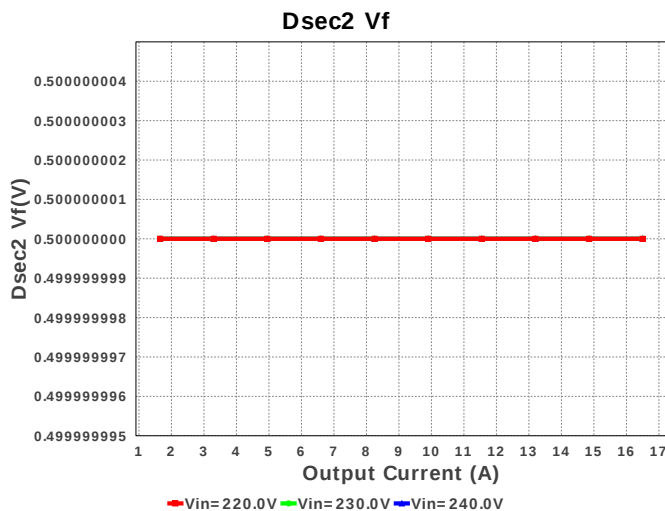
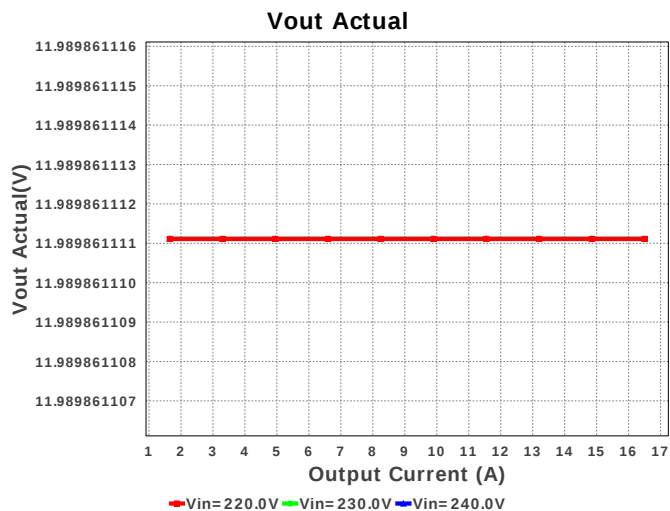
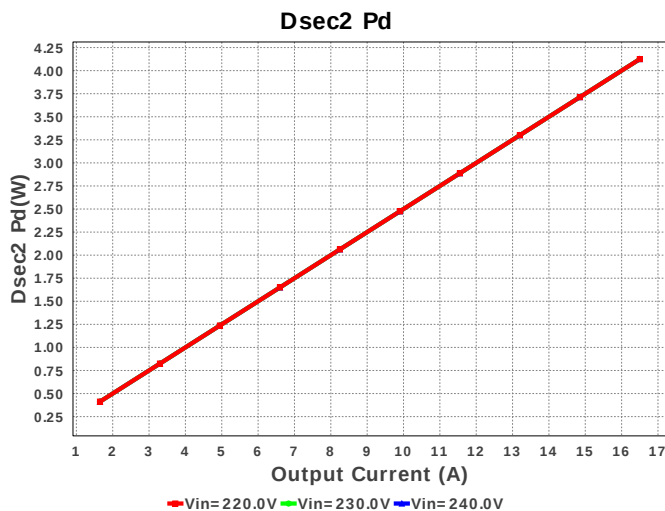
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
18.	Cy3	TDK	B81123C1102M Series= B81123	Cap= 1.0 nF VDC= 3.0 kV IRMS= 0.0 A	1	\$0.22	 B81123_1800x500x1050 140 mm ²
19.	D21	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 21.25 V	1	NA	CUSTOM 0 mm ²
20.	Dac	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 678.816 V	1	NA	CUSTOM 0 mm ²
21.	Daux	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	\$0.21	 PowerDI123 13 mm ²
22.	Dsec	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 103.087 V	1	NA	CUSTOM 0 mm ²
23.	Dsec2	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 103.087 V	1	NA	CUSTOM 0 mm ²
24.	Dsnub	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 708.214 V	1	NA	CUSTOM 0 mm ²
25.	Dz	ON Semiconductor	BZX84C9V1LT1G	Zener	1	\$0.02	 SOT-23 14 mm ²
26.	L1	CUSTOM	CUSTOM	Lp= 200.0 µH Rp= 60.0 mOhm Leakage_L= 4.0 µH Ns1toNp= 1.0 Rs1= 60.0 mOhms	1	NA	CUSTOM 0 mm ²
27.	L2	Coiltronics	HC9-1R5-R	L= 1.5 µH DCR= 2.27 mOhm	1	\$1.32	 HC9 243 mm ²
28.	M1	STMicroelectronics	STP45N65M5	VdsMax= 650.0 V IdsMax= 35.0 Amps	1	\$3.85	 TO-220AB 397 mm ²
29.	O1	Vishay-Semiconductor	TCMT1107	Optocoupler	1	\$0.21	 SOP-4 44 mm ²
30.	Q1	ON Semiconductor	BC846BLT1G	Bipolar Transistor	1	\$0.02	 SOT-23 14 mm ²
31.	Qsc	STMicroelectronics	2N2222A	Bipolar Transistor	1	NA	 TO-18 57 mm ²
32.	R1	Vishay-Dale	AC03000001009JACCS Series= F_RES	Res= 10.0 Ohm Power= 2.25 W Tolerance= 5.0%	1	\$0.30	 AC03 158 mm ²
33.	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
34.	R12	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

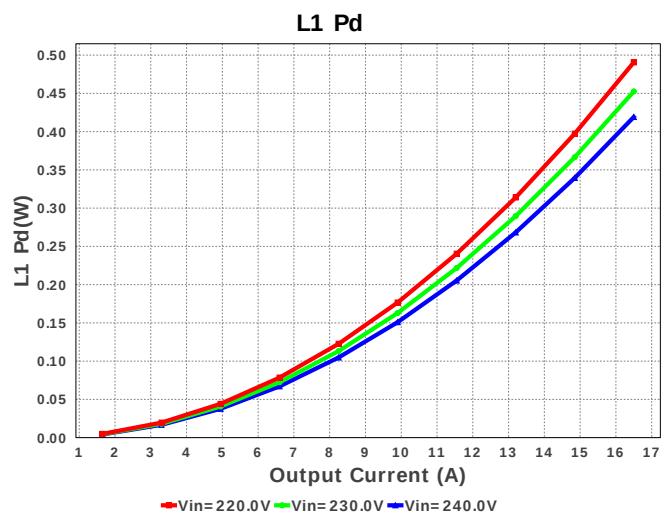
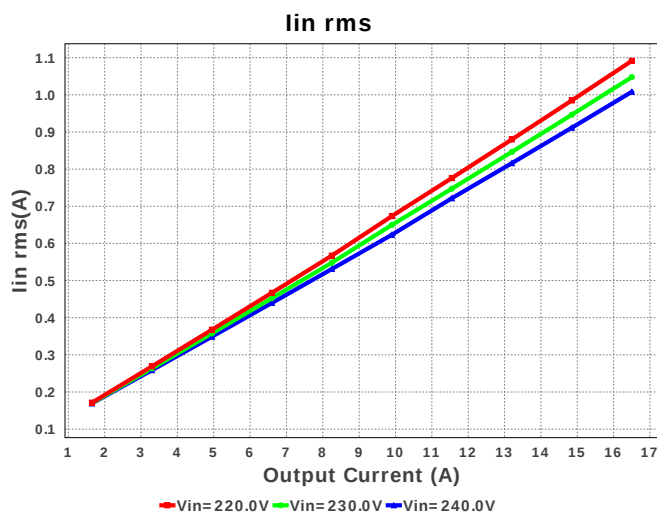
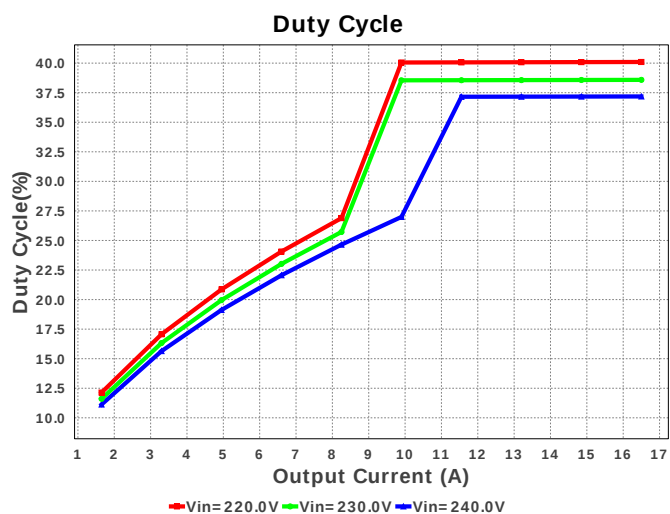
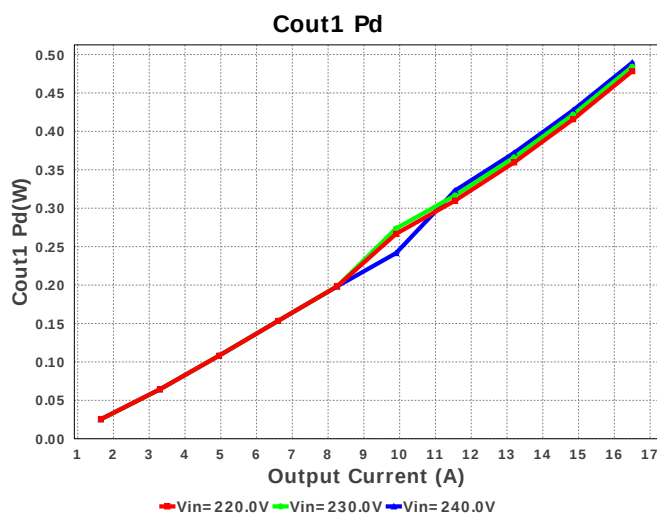
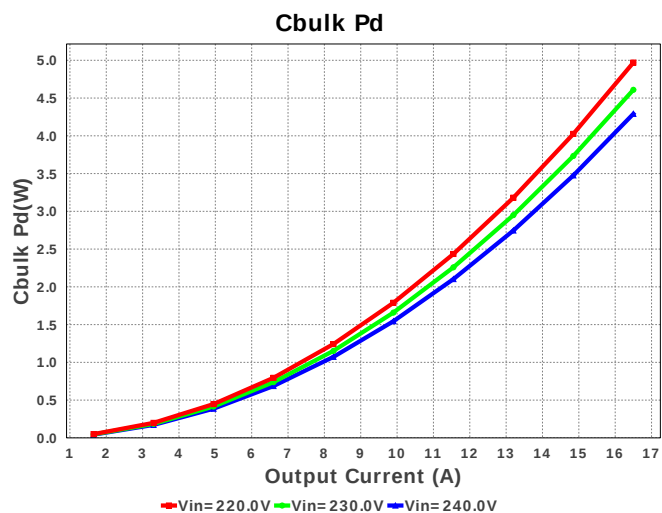
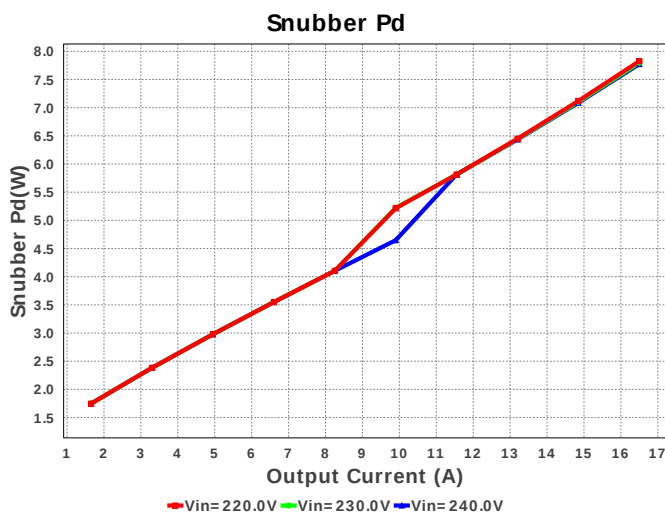
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35.	R13	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
36.	R21	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
37.	R22	Vishay-Dale	CRCW0402150KFKED Series= CRCW..e3	Res= 150.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
38.	Raux	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
39.	Rbias	Vishay-Dale	CRCW04024K87FKED Series= CRCW..e3	Res= 4.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
40.	Rcs	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
41.	Rdrv	Vishay-Dale	CRCW04028R66FKED Series= CRCW..e3	Res= 8.66 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
42.	Rfbb	Yageo America	RC0603FR-073K6L Series= ?	Res= 3.6 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm²
43.	Rfbt	Vishay-Dale	CRCW040213K7FKED Series= CRCW..e3	Res= 13.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
44.	Rled	Vishay-Dale	CRCW04026K04FKED Series= CRCW..e3	Res= 6.04 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
45.	Rsc	Vishay-Dale	CRCW04028K25FKED Series= CRCW..e3	Res= 8.25 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
46.	Rsns	Stackpole Electronics Inc	CSRN2512FKR200 Series= ?	Res= 200.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	\$0.13	 2512 43 mm²
47.	Rsub1	CUSTOM	CUSTOM Series= ?	Res= 9.699 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
48.	Rsub2	CUSTOM	CUSTOM Series= ?	Res= 9.699 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
49.	Rstartup1	Panasonic	ERJ-8ENF1212V Series= ERJ-8E	Res= 12.1 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
50.	Rstartup2	Panasonic	ERJ-8ENF1212V Series= ERJ-8E	Res= 12.1 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm²
51.	Rt	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
52.	Rx1	Vishay-Semiconductor	CRCW2010200KFKEF Series= ?	Res= 200.0 kOhm Power= 750.0 mW Tolerance= 1.0%	1	\$0.03	 2010 32 mm²
53.	Rx2	Vishay-Semiconductor	CRCW2010200KFKEF Series= ?	Res= 200.0 kOhm Power= 750.0 mW Tolerance= 1.0%	1	\$0.03	 2010 32 mm²
54.	Rz	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²

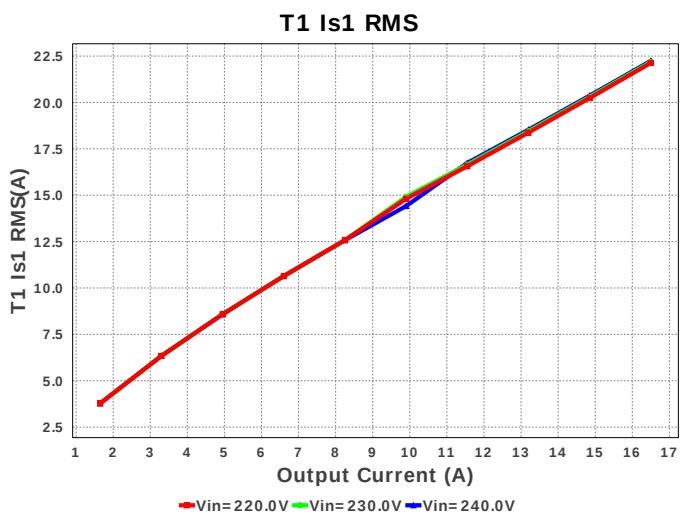
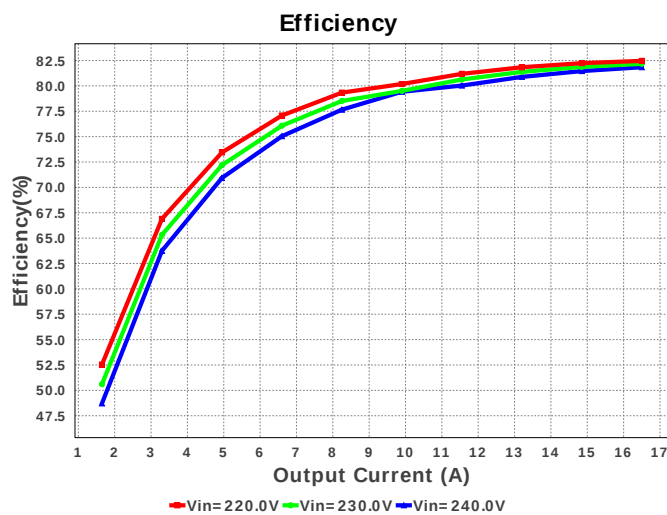
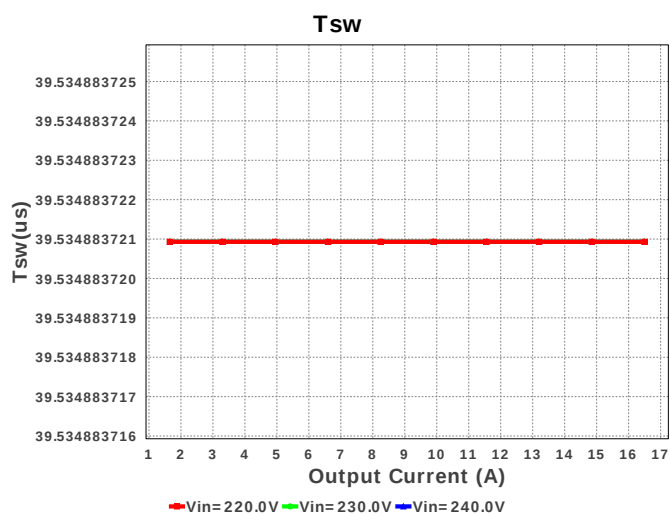
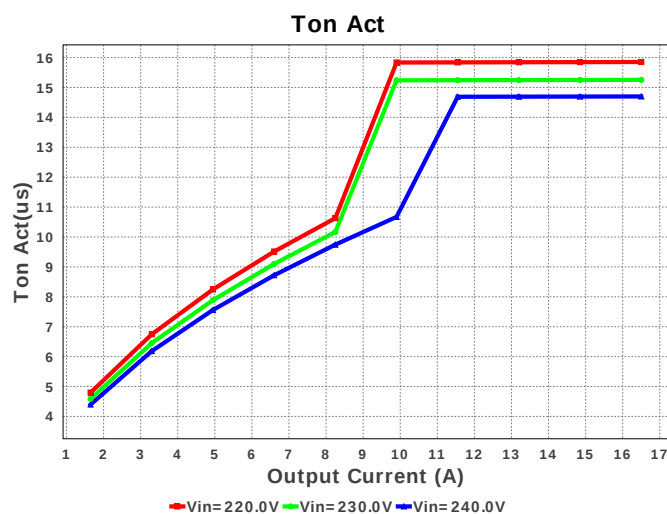
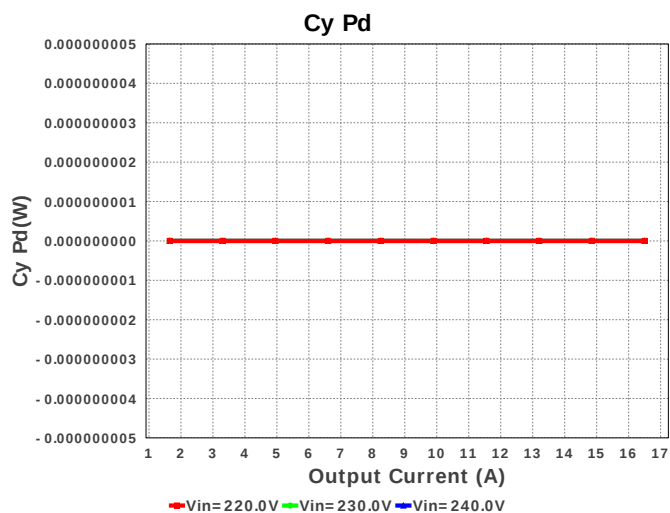
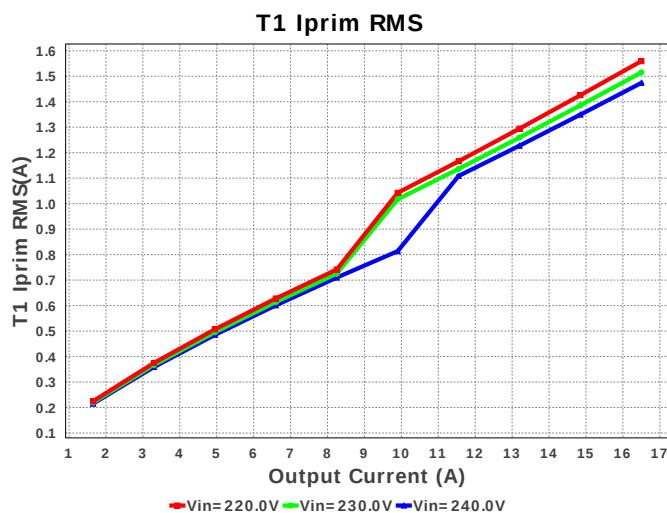
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
55.	T1	CUSTOM	CUSTOM	Lp= 1.335 mH Rp= 870.0 mOhm Leakage_L= 26.707 μ H Ns1toNp= 0.086 Rs1= 8.6 mOhms Ns2toNp= 0.107 Rs2= 700.0 μ Ohms	1	NA	CUSTOM 0 mm ²
56.	U1	Texas Instruments	UC2844N	Switcher	1	\$0.64	 P0008A 116 mm ²
57.	VR	Texas Instruments	TL431AIDBZR	Voltage References	1	\$0.08	 DBZ0003A 14 mm ²

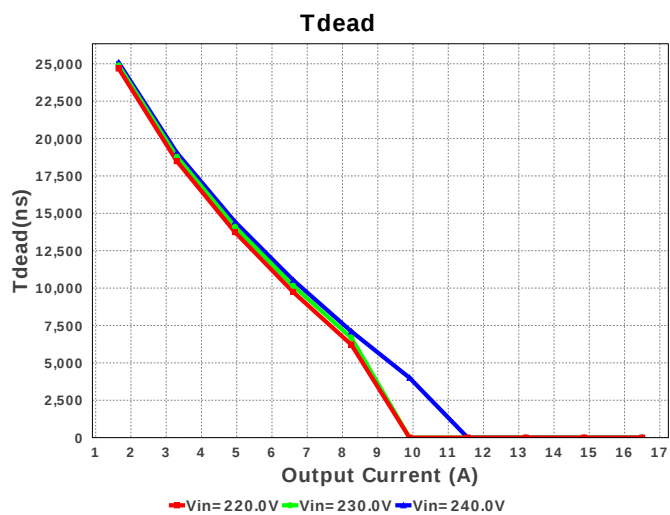
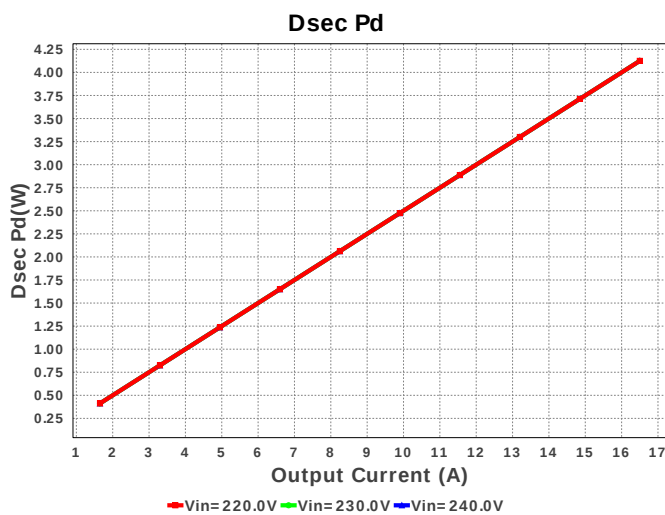
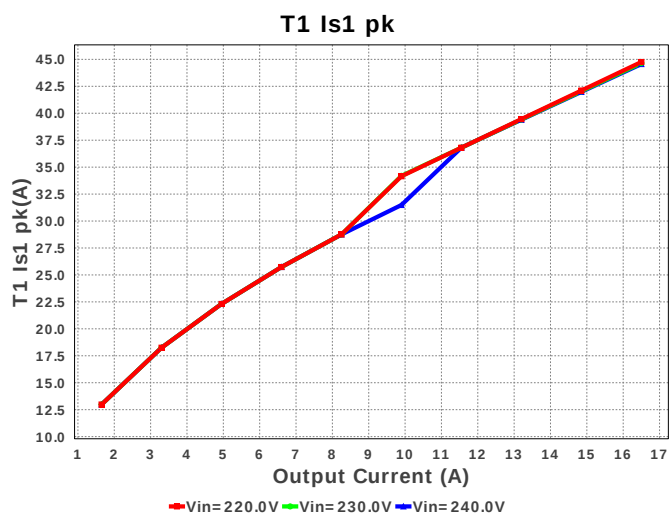
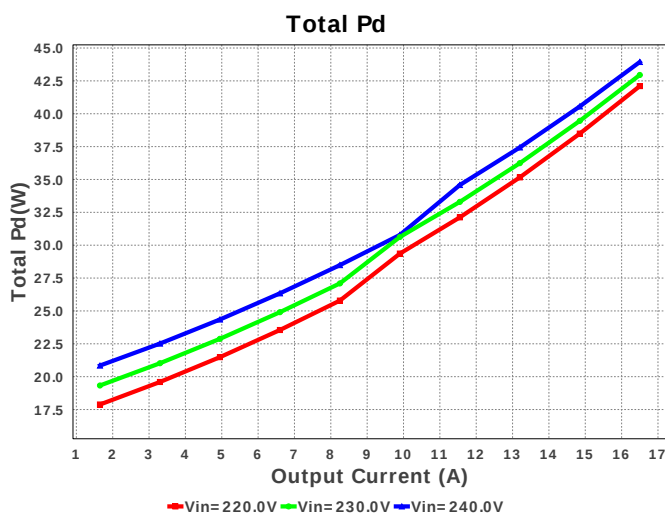
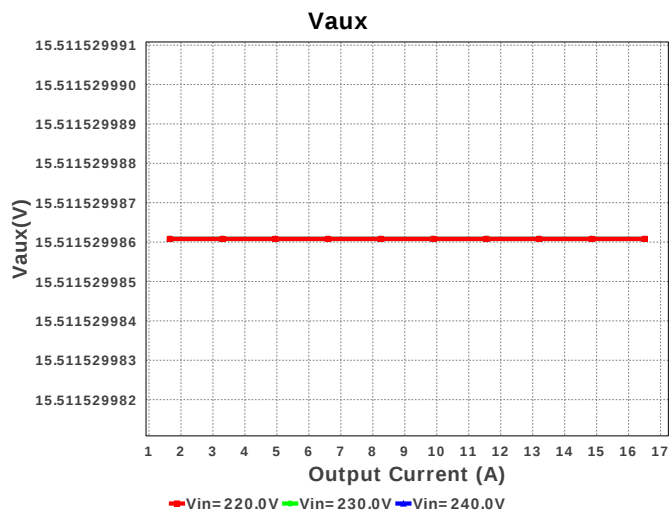
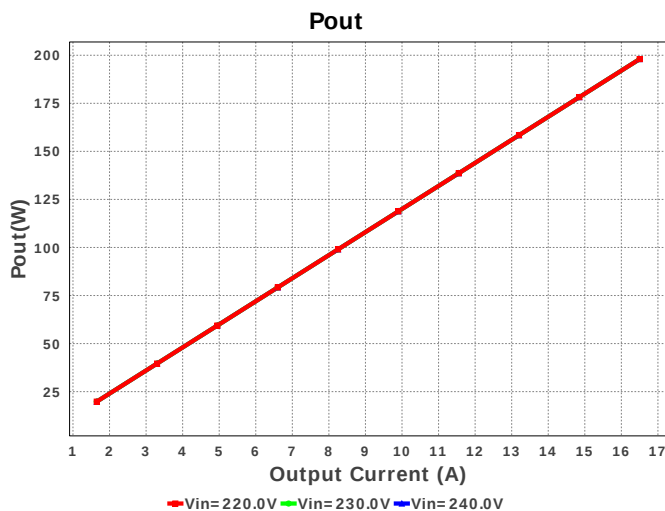




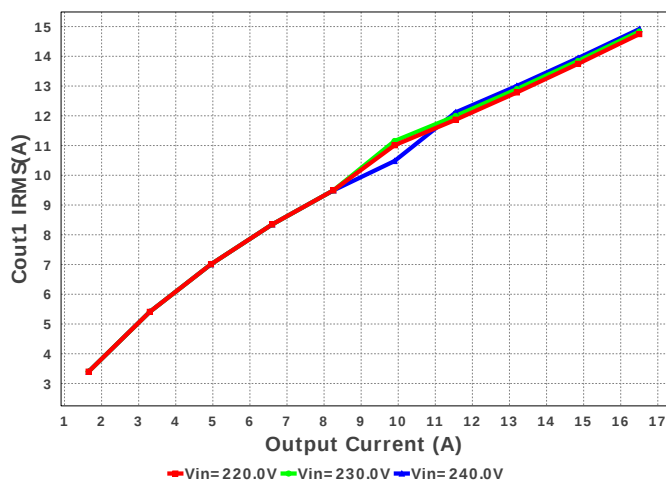




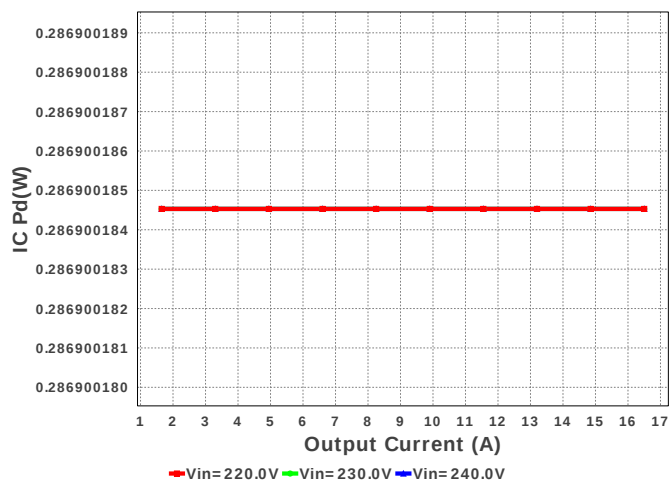




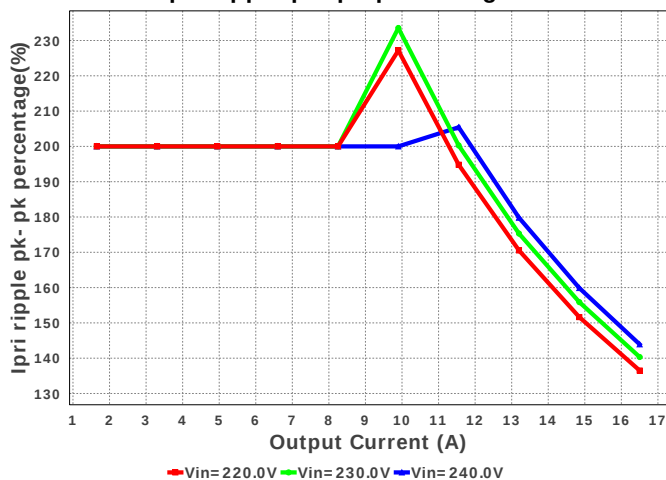
Cout1 IRMS



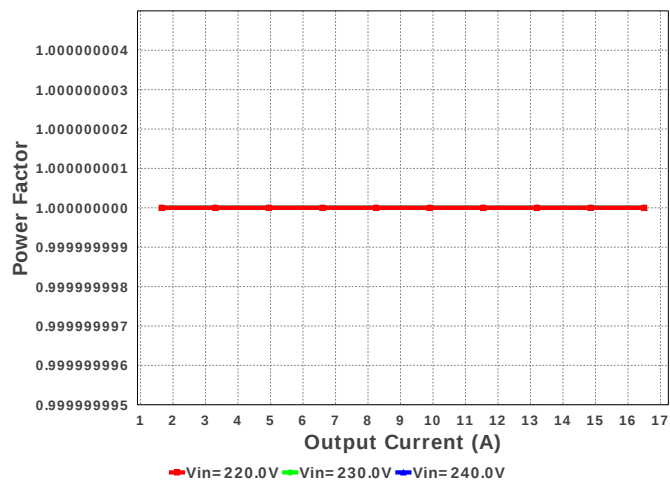
IC Pd



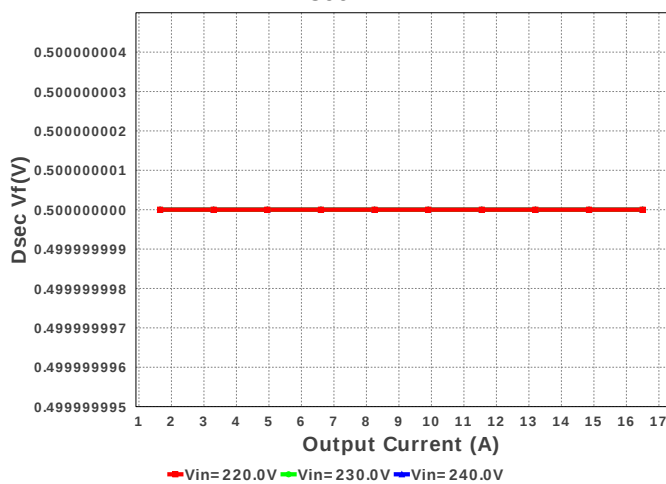
Ipri ripple pk- pk percentage



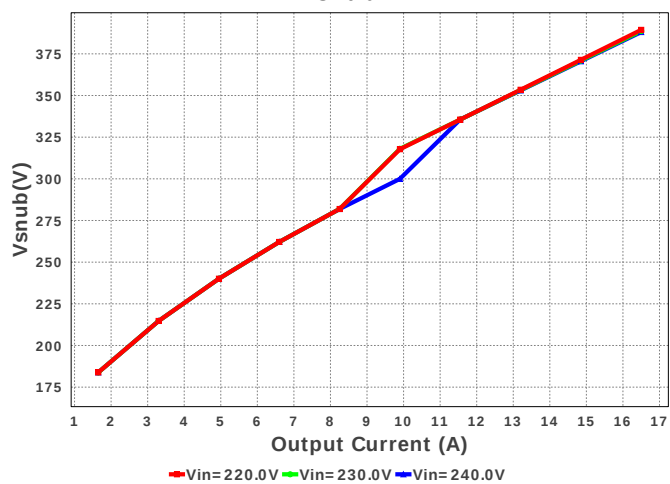
Power Factor

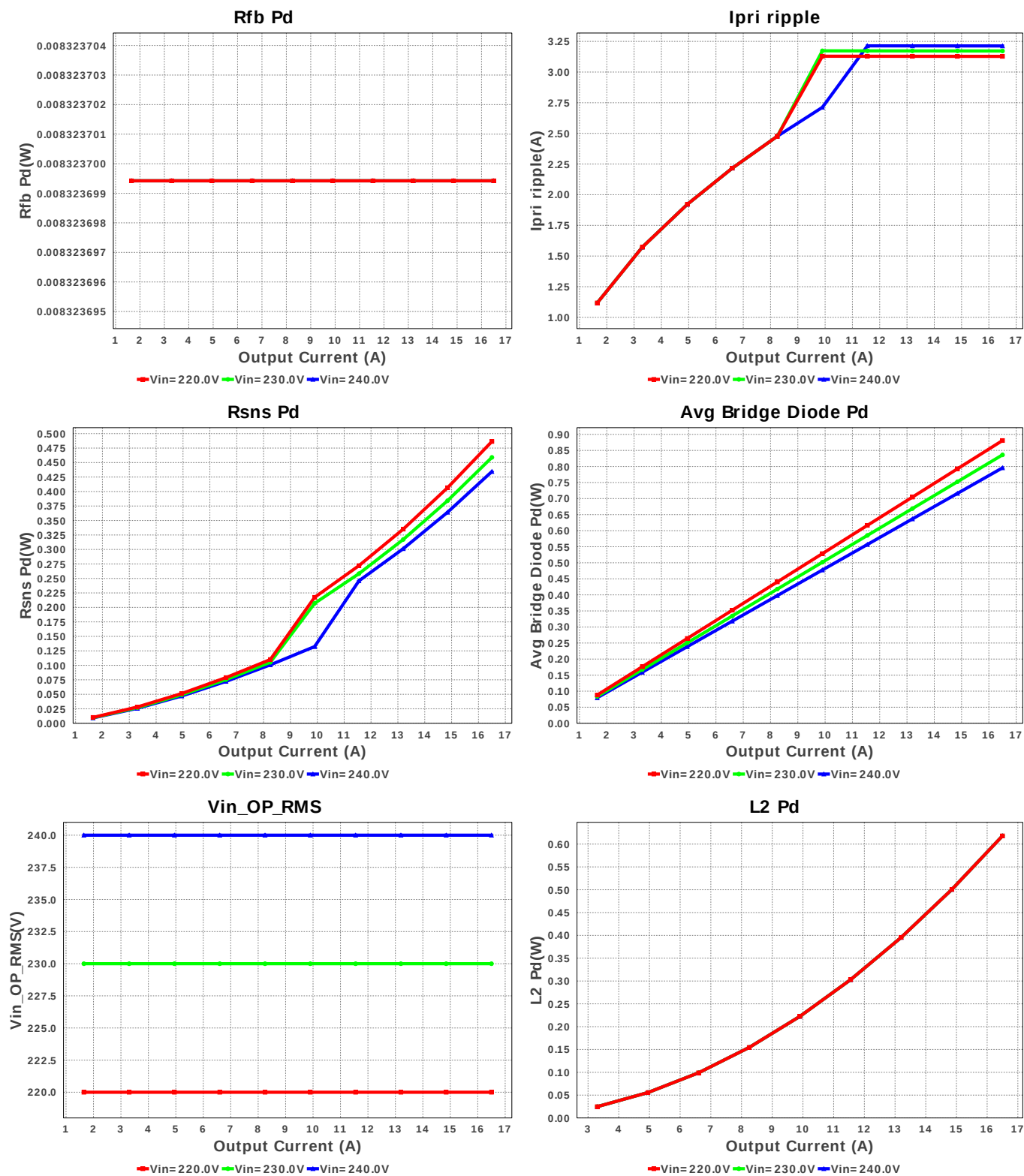


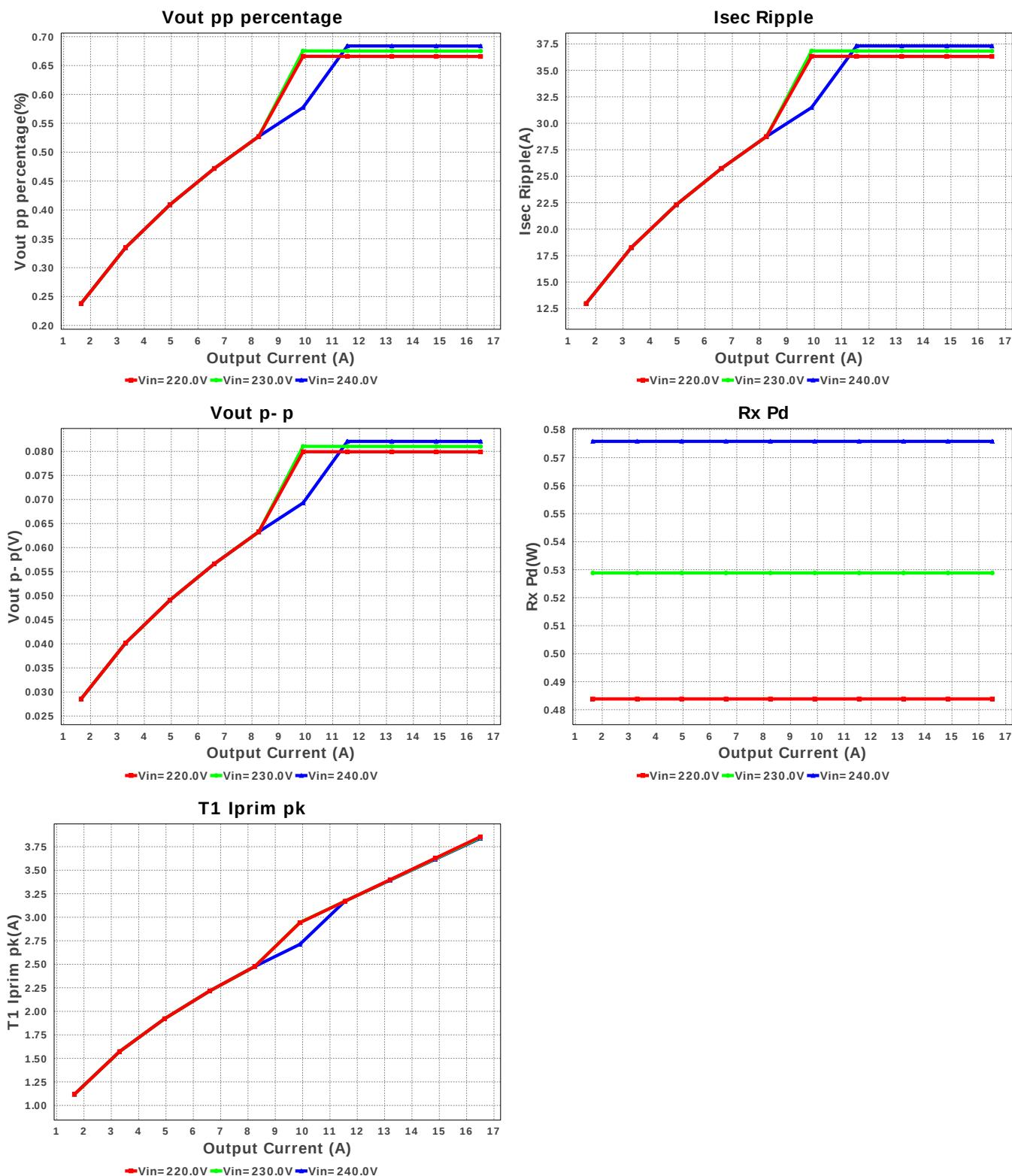
Dsec Vf



Vsnub







Operating Values

#	Name	Value	Category	Description
1.	Cout1 IRMS	14.746 A	Current	Output capacitor1 RMS ripple current
2.	Iin rms	1.091 A	Current	RMS Input Current
3.	Iout_DCM	9.407 A	Current	Approximate Current below which DCM mode of operation will begin
4.	Ipri Avg	918.708 mA	Current	Average Current in Primary Winding over the complete Switching Period
5.	Ipri ripple	3.128 A	Current	Ripple Current in the Primary Winding
6.	Ipri ripple pk-pk percentage	136.512 %	Current	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
7.	Isec Ripple	36.312 A	Current	Ripple Current in the Secondary Winding
8.	T1 Iprim RMS	1.559 A	Current	Transformer Primary RMS Current
9.	T1 Iprim pk	3.855 A	Current	Transformer Primary Peak Current

#	Name	Value	Category	Description
10.	T1 Is1 RMS	22.129 A	Current	Transformer Secondary1 RMS Current
11.	T1 Is1 pk	44.757 A	Current	Transformer Secondary1 Peak Current
12.	AC Frequency	60.0 Hz	General	Input AC frequency
13.	BOM Count	67	General	Total Design BOM count
14.	Daux trr	0.0 ns	General	Auxiliary Diode Reverse Recovery Time
15.	Dsec Vf	500.0 mV	General	Effective Forward Voltage Drop at the Operating Current
16.	Dsec trr	0.0 ns	General	Output Diode Reverse Recovery Time
17.	Dsec2 Vf	500.0 mV	General	Effective Forward Voltage Drop at the Operating Current
18.	Dsnub trr	0.0 ns	General	Snubber Diode Reverse Recovery Time
19.	FootPrint	4.978 k mm ²	General	Total Foot Print Area of BOM components
20.	Frequency	25.294 kHz	General	Switching frequency
21.	Mode	CCM	General	Conduction Mode
22.	Pout	198.0 W	General	Total output power
23.	Power Factor	1.0	General	Assumed Power Factor for the Application
24.	Tdead	0.0 ns	General	Approximate Dead Time of the Regulator
25.	Toff	24.523 us	General	Approximate Converter Off Time
26.	Ton Act	15.852 us	General	Approximate Converter On Time
27.	Total BOM	\$0.0	General	Total BOM Cost
28.	Tsw	39.535 us	General	Switching Time Period
29.	Vaux	15.512 V	General	Auxiliary Voltage
30.	Vsnub	389.387 V	General	Voltage Across the Snubber
31.	Vout Actual	11.99 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
32.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
33.	Duty Cycle	40.097 %	Op_point	Duty cycle
34.	Efficiency	82.465 %	Op_point	Steady state efficiency
35.	IC Tj	61.559 degC	Op_point	IC junction temperature
36.	ICThetaJA	110.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
37.	IOUT_OP	16.5 A	Op_point	Iout operating point
38.	M1 TJOP	64.179 degC	Op_point	M1 MOSFET junction temperature
39.	Peak Rectified Vin	311.124 V	Op_point	Peak voltage seen at rectified input
40.	Vin_OP_RMS	220.0 V	Op_point	AC Input RMS Voltage
41.	Vout p-p	79.887 mV	Op_point	Peak-to-peak output ripple voltage
42.	Avg Bridge Diode Pd	880.834 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
43.	Cbulk Pd	4.97 W	Power	Bulk capacitor power dissipation
44.	Cout1 Pd	478.35 mW	Power	Output capacitor1 power dissipation
45.	Cx Pd	0.0 W	Power	X-cap Power Dissipation
46.	Cy Pd	0.0 W	Power	Y-caps Power Dissipation
47.	Dsec Pd	4.125 W	Power	Secondary Diode Power Dissipation
48.	Dsec2 Pd	4.125 W	Power	Secondary Diode Power Dissipation
49.	IC Pd	286.9 mW	Power	IC power dissipation
50.	L1 Pd	490.555 mW	Power	Power Dissipation in the Inductor
51.	L2 Pd	618.007 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
52.	M1 Pd	546.872 mW	Power	M1 MOSFET total power dissipation
53.	Paux	15.364 mW	Power	Power Dissipation in Raux and Daux
54.	Pd Rstartup	14.398 W	Power	Power Dissipation in Rstartup1 and Rstartup2
55.	Rdrv Pd	37.255 μW	Power	Power Dissipation in Gate Drive Resistor
56.	Rfb Pd	8.324 mW	Power	Rfb Power Dissipation
57.	Rsns Pd	486.368 mW	Power	Current Limit Sense Resistor Power Dissipation
58.	Rx Pd	483.845 mW	Power	Total Power Dissipation in Rx1 and Rx2
59.	Snubber Pd	7.826 W	Power	Snubber Power Dissipation
60.	T1 Pd	12.654 W	Power	Estimated Losses in Transformer
61.	Total Pd	42.103 W	Power	Total Power Dissipation
62.	Vout Tolerance	1.926 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
63.	Vout pp percentage	665.729 m%		Output Voltage ripple percentage

Design Inputs

#	Name	Value	Description
1.	Iout	16.5	Maximum Output Current
2.	VinMax	240.0	Maximum input voltage
3.	VinMin	220.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	acFrequency	60.0	Light Output in Lumen
6.	base_pn	UC2844	Texas Instruments Base Part Number
7.	source	AC	Input Source Type
8.	ta	30.0	Ambient temperature

Design Assistance

1. UC2844 Product Folder : <http://www.ti.com/product/UC2844> : contains the data sheet and other resources.

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