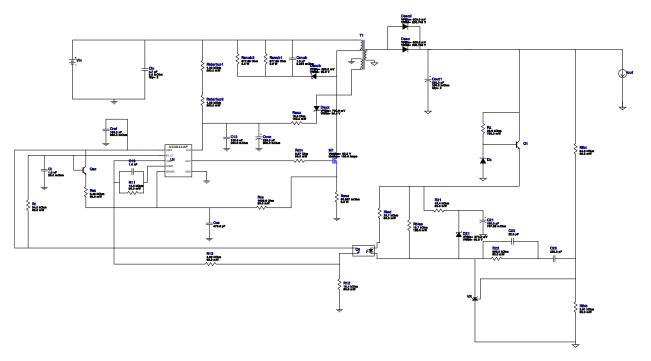
VinMin = 12.0V VinMax = 18.0V Vout = 48.0V Iout = 1.0A Device = UC3843AN Topology = Flyback Created = 2023-05-20 08:23:24.555 BOM Cost = NA BOM Count = 47 Total Pd = 4.89W

# WEBENCH® Design Report

Design: 3 UC3843AN UC3843AN 12V-18V to 48.00V @ 1A



### **Design Alerts**

### **Component Selection Information**

Click on the transformer symbol in the schematic and select "Explore Transformer Core/Bobbin Selection" to design using specific transformer cores and bobbin.

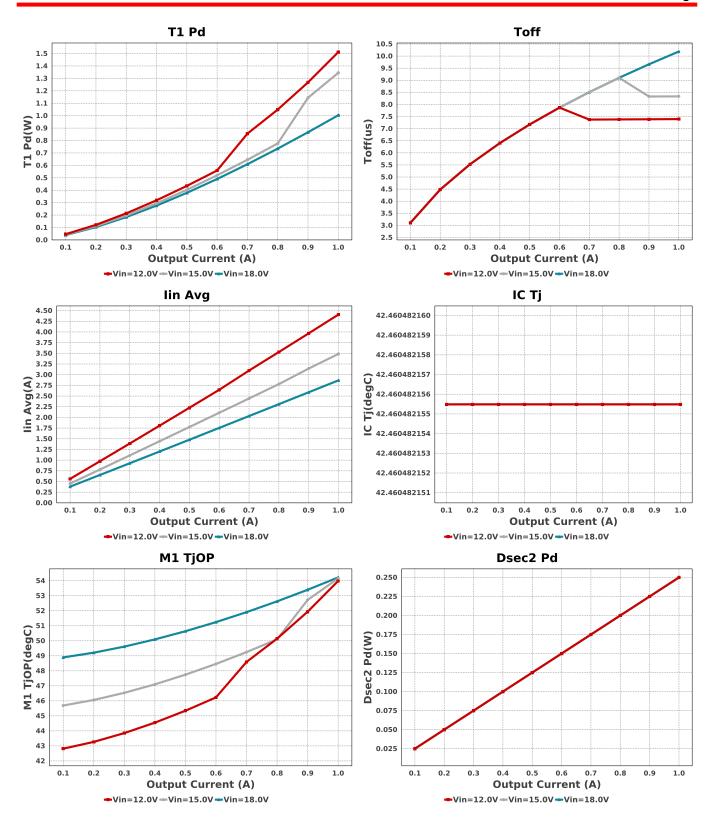
### **Electrical BOM**

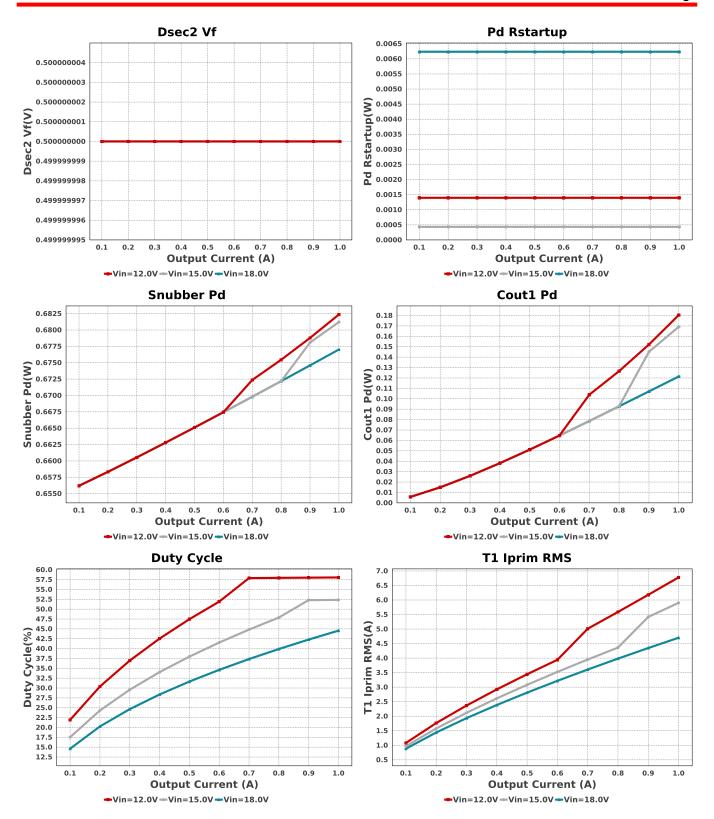
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
C12	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>
C13	MuRata	GRM1555C1H102JA01J Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm <sup>2</sup>
C21	Chemi-Con	ELXZ630ELL151MH20D Series= LXZ	Cap= 150.0 uF ESR= 707.26 mOhm VDC= 63.0 V IRMS= 690.0 mA	1	\$0.21	Chemi-Con_800x2000 100 mm²
C22	Samsung Electro- Mechanics	CL21C220JBANNNC Series= C0G/NP0	Cap= 22.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>
C23	Samsung Electro- Mechanics	CL21C221JBANNNC Series= C0G/NP0	Cap= 220.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>
Ccs	Samsung Electro- Mechanics	CL21C471JBANNNC Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>

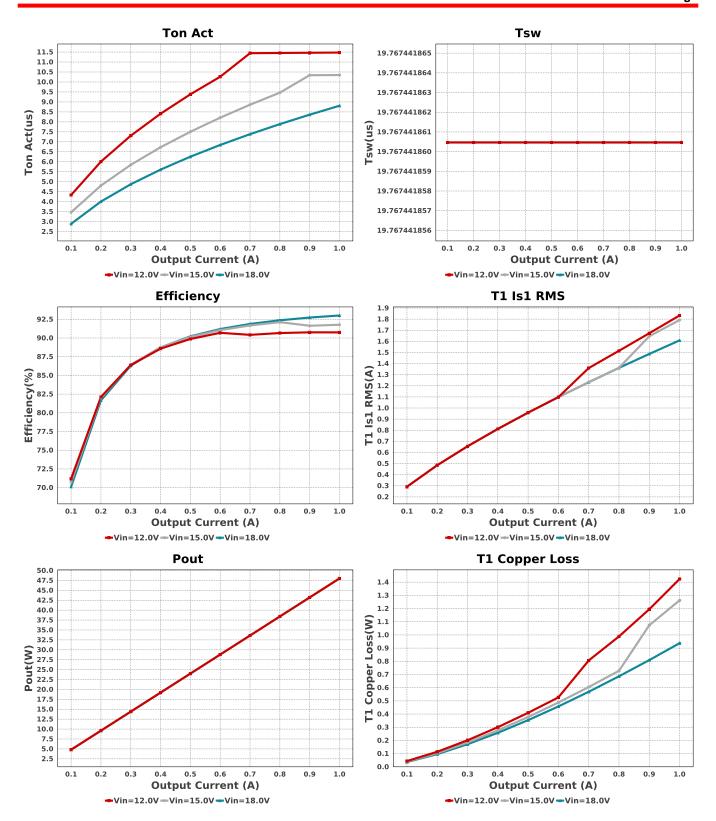
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	2	\$0.10	1206 11 mm <sup>2</sup>
Cout1	Panasonic	EEV-FK2A221M Series= FK	Cap= 220.0 uF ESR= 153.0 mOhm VDC= 100.0 V IRMS= 917.0 mA	2	\$1.60	SM_RADIAL_K16 483 mm <sup>2</sup>
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 <sup>2</sup>
Csnub	MuRata	GRM31CR72A105KA01L Series= X7R	Cap= 1.0 uF ESR= 5.334 mOhm VDC= 100.0 V IRMS= 1.55432 A	1	\$0.11	1206_190 11 mm <sup>2</sup>
Ct	Kemet	C0805C102J5GACTU Series= C0G/NP0	Cap= 1.0 nF ESR= 25.0 mOhm VDC= 50.0 V IRMS= 1.71 A	1	\$0.02	0805 7 mm <sup>2</sup>
Cvcc	Chemi-Con	EMVY350ADA221MHA0G Series= MVY	Cap= 220.0 uF ESR= 300.0 mOhm VDC= 35.0 V IRMS= 450.0 mA	1	\$0.28	CAPSMT_62_HA0 106 mm <sup>2</sup>
D21	Nexperia	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	\$0.04	SOD-123F 12 mm <sup>2</sup>
Daux	Fairchild Semiconductor	SS26FL	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.11	SOD-123F 12 mm <sup>2</sup>
Dsec	CUSTOM	СUSTOM	VF@Io= 500.0 mV VRRM= 206.743 V	1	NA	CUSTOM 0 mm <sup>2</sup>
Dsec2	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 206.743 V	1	NA	CUSTOM 0 mm <sup>2</sup>
Dsnub	Fairchild Semiconductor	FSV360FP	VF@Io= 650.0 mV VRRM= 60.0 V	1	\$0.13	SOD-123HE 13 mm <sup>2</sup>
Dz	Diodes Inc.	MMSZ5250B-7-F	Zener	1	\$0.04	SOD-123 13 mm <sup>2</sup>
M1	Texas Instruments	CSD19502Q5B	VdsMax= 80.0 V IdsMax= 100.0 Amps	1	\$0.81	DQK0006C 9 mm²
O1	Vishay-Semiconductor	TCMT1107	Optocoupler	1	\$0.19	SOP-4 44 mm <sup>2</sup>
Q1	ON Semiconductor	BC846BLT1G	Bipolar Transistor	1	\$0.03	<b>S</b> OT-23 14 mm <sup>2</sup>
Qsc	STMicroelectronics	2N2222A	Bipolar Transistor	1	\$1.19	TO-18 57 mm <sup>2</sup>
R11	Yageo	RC0201FR-0710KL Series= ?	Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm <sup>2</sup>
R12	Yageo	RC0201FR-0715K4L Series=?	Res= 15.4 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm <sup>2</sup>

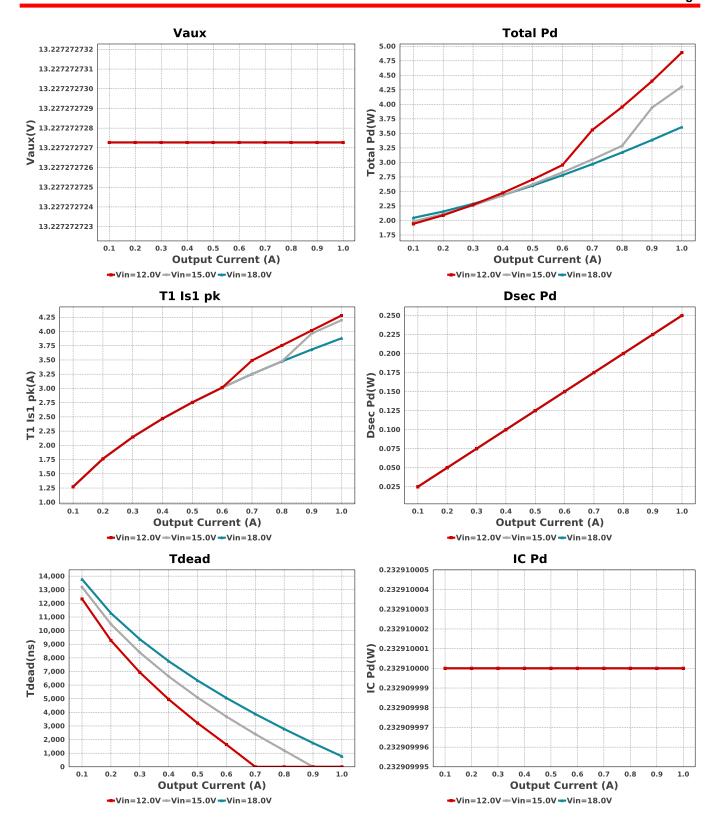
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
R13	Vishay-Dale	CRCW04024K99FKED Series= CRCWe3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
R21	Yageo	RC0201FR-0715K4L Series= ?	Res= 15.4 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm <sup>2</sup>
R22	Yageo	RC0201FR-7D866KL Series= ?	Res= 866.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm <sup>2</sup>
Raux	Vishay-Dale	CRCW060310R0FKEA Series= CRCWe3	Res= 10.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm <sup>2</sup>
Rbias	Vishay-Dale	CRCW080513K7FKEA Series= CRCWe3	Res= 13.7 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 7 mm <sup>2</sup>
Rcs	Vishay-Dale	CRCW04021K00FKED Series= CRCWe3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
Rdrv	Vishay-Dale	CRCW04028R87FKED Series= CRCWe3	Res= 8.87 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
Rfbb	Vishay-Dale	CRCW04023K01FKED Series= CRCWe3	Res= 3.01 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
Rfbt	Vishay-Dale	CRCW040254K9FKED Series= CRCWe3	Res= 54.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
Rled	Yageo	RC0201FR-0723K7L Series= ?	Res= 23.7 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	0201 2 mm <sup>2</sup>
Rsc	Vishay-Dale	CRCW04023K48FKED Series= CRCWe3	Res= 3.48 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
Rsns	CUSTOM	CUSTOM Series= ?	Res= 50.957 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm <sup>2</sup>
Rsnub1	CUSTOM	CUSTOM Series= ?	Res= 577.65 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm <sup>2</sup>
Rsnub2	CUSTOM	CUSTOM Series= ?	Res= 577.65 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm <sup>2</sup>
Rstartup1	Vishay-Dale	CRCW12061K33FKEA Series= CRCWe3	Res= 1.33 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	1206 11 mm <sup>2</sup>
Rstartup2	Vishay-Dale	CRCW12061K33FKEA Series= CRCWe3	Res= 1.33 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	1206 11 mm <sup>2</sup>
Rt	Vishay-Dale	CRCW040234K0FKED Series= CRCWe3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm <sup>2</sup>
Rz	Vishay-Dale	CRCW201020K0FKEF Series= CRCWe3	Res= 20.0 kOhm Power= 750.0 mW Tolerance= 1.0%	1	\$0.04	2010 32 mm <sup>2</sup>
Т1	Core=Wurth Elektronik , CoilFormer=Wurth Elektronik	Core=150-0693 , CoilFormer=070-6362	Lp= 13.0 µH Turns Ratio(Nas)= 6:22 Turns Ratio(Nps)= 7:22 Npri= 7.0 Naux= 6.0 Nsec= 22.0	1	NA	PQ2620 1009 mm <sup>2</sup>

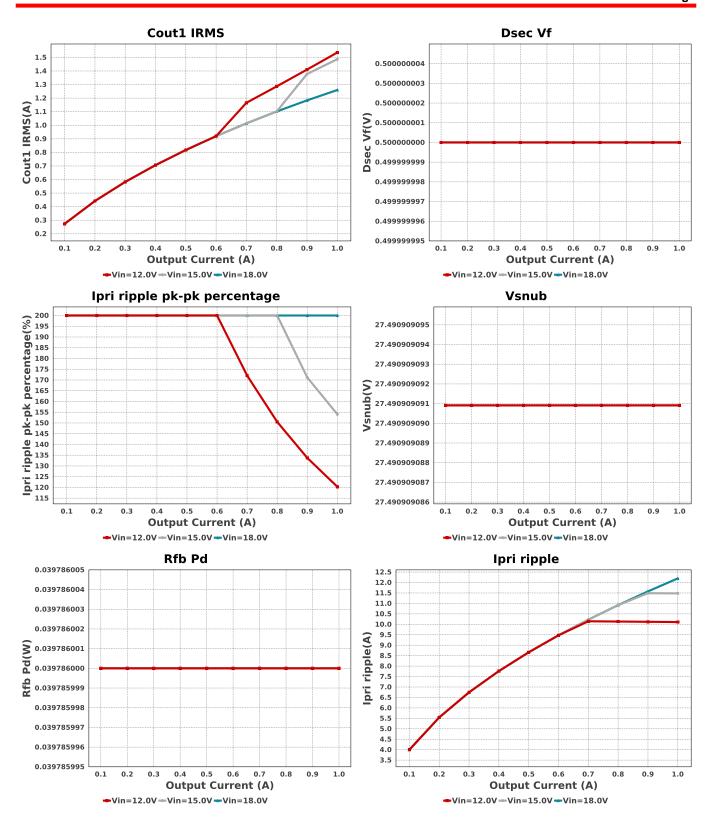
Name	Manufactur	rer	Part Nur	nber		Prope	rties		Qty	Price	Footpr	int	
U1	Texas Instr	ruments	UC3843.	AN		Switch	ner		1	\$0.43	Q Q Q	A 116 m	$m^2$
VR	Texas Instr	ruments	TL431ID	BVR		Voltag	ge Refere	nces	1	\$0.09	<b>:</b>	60-G3 16	
		lout_DC	м						Cin	Pd			
1.050		1001_50				0.050							
1.025						0.045							_/
1.000													
0.975						0.040							
0.925						0.035							
0.900					-	0.030						/	
0.875					_ ) p	0.025					/		
0.850 0.825					2								
0.800					Cin	0.020							
0.775						0.015							
0.750						0.010							
0.725													
0.675						0.005							
0.650	. 0.2 0.3	0.4 0.5	0.6 0.7	0.8 0.9	1.0	0.000	.1 0.2	0.3	0.4	0.5 0.	6 0.7	0.8 0.	.9 1
	➡Vin=12.	Inei Ava							Day				
4.75		Ipri Av	g			0.032			Pai	ux			
4.75 4.50 4.25		Ipri Av	9			1 1			Pai	ux			
4.75 4.50 4.25 4.00 3.75		Ipri Ave	9			0.031 0.030 0.029 0.028			Pai	ux			
4.75 4.50 4.25 4.00 3.75 3.50		Ipri Ave	g			0.031 0.030 0.029 0.028			Par	ux			
4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.00		Ipri Ave	g			0.031 0.030 0.029 0.028 0.027			Pai	ux			
1.75 1.50 1.25 1.00 3.75 3.50 3.25 3.00 2.75		Ipri Ave	g			0.031 0.030 0.029 0.028 0.027			Pai	ux			
4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.30 2.75 2.50 2.25		Ipri Avg	g		aux(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024			Pai	ux			
4.75 4.50 4.25 4.400 3.75 3.50 3.50 2.75 2.75 2.250 2.25		Ipri Avg	g		Paux(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024			Pau	ux			
1.75 1.50 1.25 1.00 3.75 3.50 2.25 2.50 2.25 2.200 1.75		Ipri Av	g		Paux(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.023 0.022			Pau	ux			
1.75 1.50 1.25 1.00 3.75 3.50 3.25 2.50 2.25 2.00 1.75 1.75		Ipri Av	g		Paux(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024			Pau	ux			
1.75 1.50 1.25 1.00 1.75 1.50 1.25 1.00 1.25 1.00 1.25 1.50 1.25 1.50 1.25 1.50 1.25 1.50		Ipri Avg	g		Paux(W)	0.031 0.030 0.029 0.028 0.027 0.027 0.025 0.024 0.023 0.022 0.023 0.022 0.021 0.021 0.021 0.021 0.021 0.021 0.021 0.022 0.023 0.023 0.024 0.025 0.			Pau	ux			
1.75 1.50 1.25 1.00 3.75 3.350 3.25 3.00 2.75 2.250 2.250 1.75 1.50 1.25 1.00		Ipri Ave	g		Paux(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.023 0.022 0.021 0.020 0.021 0.021 0.021 0.021 0.021 0.021 0.021 0.022			Pai	ux			
4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.00 2.75 2.50 2.25 2.00 1.75 1.50 1.50 1.00 0.75	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	Paux(W)	0.031 0.030 0.029 0.028 0.027 0.027 0.025 0.024 0.023 0.022 0.023 0.022 0.021 0.021 0.021 0.021 0.021 0.021 0.021 0.022 0.023 0.023 0.024 0.025 0.		0 n=12.0V	0.4 oo	.5 o t Curre	5 0.7 ent (A) Vin=18.0V	0.8 0.	9 1
1.75 1.50 1.25 1.00 3.75 3.50 3.25 3.00 2.275 2.75 2.50 2.25 1.75 1.50 1.25 1.00 0.75 0.10 0.11	0.2 0.3	0.4 0.5 Output Cu	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	1.0	0.031 0.030 0.029 0.028 0.027 0.027 0.025 0.024 0.023 0.022 0.021 0.020 0.011 0.020 0.011	<del>-</del> Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.00 2.75 2.25 2.00 1.75	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	L.o	0.031 0.030 0.029 0.028 0.027 0.025 0.025 0.024 0.023 0.022 0.021 0.	<b>-</b> Viı	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.00 2.75 2.25 2.00 2.25 2.00 0.75 0.50 0.00 0.1	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	1.0	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.023 0.022 0.021 0.020 0.019 0.019 0.019 0.019 0.019	<b>-</b> Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.50 3.25 3.00 2.75 2.50 2.25 2.00 1.75 1.00 0.75 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.15 0.00 0.00 0.15 0.00	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	1.0	0.031 0.030 0.029 0.028 0.027 0.027 0.026 0.025 0.024 0.023 0.021 0.009 0.	-Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.50 3.50 3.25 3.00 2.75 2.25 2.00 1.75	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	1.0	0.031 0.030 0.029 0.028 0.027 0.027 0.026 0.025 0.024 0.023 0.021 0.009 0.	-Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
0.475 0.450 0.425	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	1.0 (M)pd	0.031 0.030 0.029 0.028 0.027 0.027 0.026 0.025 0.024 0.023 0.021 0.009 0.	-Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.30 3.25 3.00 2.75 2.25 2.20 1.75 1.50 1.25 0.00 0.1	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	1.0 (M)pd	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.023 0.022 0.021 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.019 0.021 0.022 0.021 0.021 0.021 0.021 0.021 0.021 0.022 0.021 0.021 0.021 0.022 0.021 0.022 0.021 0.022 0.	Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.00 2.75 3.00 2.75 2.50 2.25 2.00 1.75 1.00 0.75 0.00 0.25 0.00 0.15 0.00	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	Rdrv Pd(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.023 0.020 0.020 0.019 0.019 0.010 0.010 0.00922810 0.00922810 0.00922810	Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.00 2.75 2.50 2.25 2.00 1.75 1.50 1.25 0.00 0.1	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	Rdrv Pd(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.021 0.022 0.009 0.	Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
4.75 4.50 4.25 4.00 3.75 3.30 2.75 2.50 2.25 2.00 1.75 1.50 1.25 1.00 0.75 0.75 0.75 0.475 0.475 0.475 0.475 0.490 0.375	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	Rdrv Pd(W)	0.031	Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1
1.75 1.50 1.25 1.00 3.75 3.00 2.75 2.50 2.25 2.00 1.75 1.50 1.75 1.50 1.75 1.50 1.75 1.50 1.75 1.50 1.75 1.50 1.75 1.50 1.25 1.00 0.175	0.2 0.3	0.4 0.5 Output Cu 0V-Vin=15.0	0.6 0.7 Irrent (A) V—Vin=18.0	0.8 0.9	Rdrv Pd(W)	0.031 0.030 0.029 0.028 0.027 0.026 0.025 0.024 0.023 0.022 0.021 0.029 0.019 0.009 0.	Vii	0 n=12.0V	0.4 oo	.5 o t Curre	ent (A)	0.8 0.	9 1

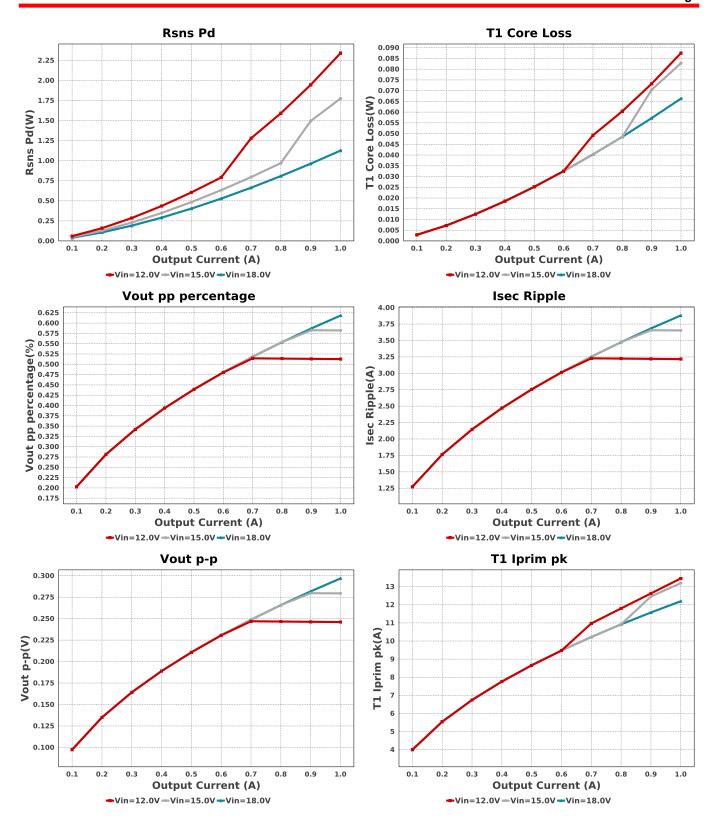












## **Operating Values**

	#	Name	Value	Category	Description
-	1.	Cin Pd	48.98 mW	Capacitor	Input capacitor power dissipation
	2.	Cout1 IRMS	1.536 A	Capacitor	Output capacitor1 RMS ripple current
	3.	Cout1 Pd	180.46 mW	Capacitor	Output capacitor1 power dissipation
	4.	Daux trr	8.26 ns	Diode	Auxiliary Diode Reverse Recovery Time
	5.	Dsec Pd	250.0 mW	Diode	Secondary Diode Power Dissipation
	6.	Dsec Vf	500.0 mV	Diode	Effective Forward Voltage Drop at the Operating Current
	7.	Dsec trr	0.0 ns	Diode	Output Diode Reverse Recovery Time
	8.	Dsec2 Pd	250.0 mW	Diode	Secondary Diode Power Dissipation
	9.	Dsec2 Vf	500.0 mV	Diode	Effective Forward Voltage Drop at the Operating Current
	10.	Dsnub trr	10.62 ns	Diode	Snubber Diode Reverse Recovery Time
	11.	IC Pd	232.91 mW	IC	IC power dissipation

#	Name	Value	Category	Description Control to the second sec
12.	IC Tj	42.46 degC	IC	IC junction temperature
13.		53.5 degC/W	IC	IC junction-to-ambient thermal resistance
14.	0	4.408 A	IC	Average input current
15.	M1 Pd	439.08 mW	Mosfet	M1 MOSFET total power dissipation
16.	M1 TjOP	53.983 degC	Mosfet	M1 MOSFET junction temperature
17.	Cin Pd	48.98 mW	Power	Input capacitor power dissipation
18.	Cout1 Pd	180.46 mW	Power	Output capacitor1 power dissipation
19.	Dsec Pd	250.0 mW	Power	Secondary Diode Power Dissipation
20.	Dsec2 Pd	250.0 mW	Power	Secondary Diode Power Dissipation
21.	IC Pd	232.91 mW	Power	IC power dissipation
22.	M1 Pd	439.08 mW	Power	M1 MOSFET total power dissipation
23.	Paux	31.594 mW	Power	Power Dissipation in Raux and Daux
24.	Pd Rstartup	1.396 mW	Power	Power Dissipation in Rstartup1 and Rstartup2
25.	Rdrv Pd	9.228 mW	Power	Power Dissipation in Gate Drive Resistor
	Rfb Pd	39.786 mW	Power	Rfb Power Dissipation
27.		2.34 W	Power	Current Limit Sense Resistor Power Dissipation
28.	Snubber Pd	682.371 mW	Power	Snubber Power Dissipation
29.	T1 Copper Loss	1.342 W	Power	Transformer Copper Loss Power Dissipation
30.	T1 Core Loss	80.9 mW	Power	Transformer Core Loss Power Dissipation
	T1 Pd	1.423 W	Power	Estimated Losses in Transformer
32.	Total Pd	4.892 W	Power	Total Power Dissipation
33.	Pd Rstartup	1.396 mW	Resistor	Power Dissipation in Rstartup1 and Rstartup2
34.		9.228 mW	Resistor	Power Dissipation in Gate Drive Resistor
35.	Rfb Pd	39.786 mW	Resistor	Rfb Power Dissipation
36.	Rsns Pd	2.34 W	Resistor	Current Limit Sense Resistor Power Dissipation
37.	BOM Count	2.34 W 47	System	Total Design BOM count
51.	DOWN COUNT	71	Information	Total Dough Down Count
38.	Duty Cycle	58.051 %	System	Duty cycle
50.	Duty Cycle	30.031 /0	Information	Duty cycle
39.	Efficiency	90.751 %	System	Steady state efficiency
55.	Linciency	90.731 /6	Information	Steady State entitlerity
40.	FootPrint	0.00412	System	Total Foot Print Area of BOM components
40.	FOOLFIIII	2.684 k mm²	Information	Total Foot Fillit Area of Bolif components
41.	Frequency	50.588 kHz	System	Switching frequency
41.	riequency	30.300 KI IZ	•	Switching frequency
42.	lout	1.0 A	Information System	lout operating point
42.	lout	1.0 A	Information	lout operating point
43.	lout DCM	693.684 mA		Approximate Current helow which DCM made of appration will havin
43.	lout_DCM	093.004 IIIA	System	Approximate Current below which DCM mode of operation will begin
4.4	Mada	CCM	Information	Conduction Mode
44.	Mode	CCIVI	System	Conduction wode
45	Dout	40.0 \	Information	Total autnut naver
45.	Pout	48.0 W	System	Total output power
46	Tdood	0.0 ===	Information	Approximate Dood Time of the Degulator
46.	Tdead	0.0 ns	System	Approximate Dead Time of the Regulator
47	To#	7 205	Information	Approximate Convertor Off Time
47.	Toff	7.395 us	System	Approximate Converter Off Time
40	T A - (	44 475	Information	Assessing to Occupate Oc. The
48.	Ton Act	11.475 us	System	Approximate Converter On Time
40	T / 15014	N.1.A	Information	T. ( I DOM O . )
49.	Total BOM	NA	System	Total BOM Cost
<b>5</b> 0	T	40.707	Information	Outlebing The a Desired
50.	Tsw	19.767 us	System	Switching Time Period
	\/:-	40.01/	Information	Vin an autimorphis
51.	Vin	12.0 V	System	Vin operating point
	Maria	40.017	Information	On and for all Outset Walter
52.	Vout	48.0 V	System	Operational Output Voltage
		40.005.17	Information	
53.	Vout Actual	48.002 V	System	Vout Actual calculated based on selected voltage divider resistors
			Information	
54.	Vout Tolerance	2.242 %	System	Vout Tolerance based on IC Tolerance (no load) and voltage divider
			Information	resistors if applicable
55.	Vout p-p	246.045 mV	System	Peak-to-peak output ripple voltage
			Information	
56.	Vout pp percentage	512.593 m%	System	Output Voltage ripple percentage
			Information	
57.	Vsnub	27.491 V	System	Voltage Across the Snubber
			Information	
58.	Ipri Avg	4.877 A	Transformer	Average Current in Primary Winding over the complete Switching
	•			Period
59.	Ipri ripple	10.108 A	Transformer	Ripple Current in the Primary Winding
60.	lpri ripple pk-pk	120.323 %	Transformer	Primary Current pk-pk ripple percentage(of Ipri avg during ton only)
	percentage			
61.	· · · · · · · · · · · · · · · · · · ·	3.216 A	Transformer	Ripple Current in the Secondary Winding
62.	Paux	31.594 mW	Transformer	Power Dissipation in Raux and Daux
63.	T1 Copper Loss	1.342 W	Transformer	Transformer Copper Loss Power Dissipation
64.	T1 Core Loss	80.9 mW	Transformer	Transformer Core Loss Power Dissipation
	-			•

#	Name	Value	Category	Description
65.	T1 Iprim RMS	6.776 A	Transformer	Transformer Primary RMS Current
66.	T1 Iprim pk	13.455 A	Transformer	Transformer Primary Peak Current
67.	T1 Is1 RMS	1.833 A	Transformer	Transformer Secondary1 RMS Current
68.	T1 ls1 pk	4.281 A	Transformer	Transformer Secondary1 Peak Current
69.	T1 Pd	1.423 W	Transformer	Estimated Losses in Transformer
70.	Vaux	13.227 V	Transformer	Auxiliary Voltage

# **Design Inputs**

Name	Value	Description	
lout	1.0	Maximum Output Current	
VinMax	18.0	Maximum input voltage	
VinMin	12.0	Minimum input voltage	
Vout	48.0	Output Voltage	
base_pn	UC3843A	Base Product Number	
source	DC	Input Source Type	
Та	30.0	Ambient temperature	
UserFsw	50.0 k	Customer Selected Frequency	

# WEBENCH® Assembly

### Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

#### Soldering Component to Board

If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

### Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 12.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum lout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

#### Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.



# WEBENCH® Transformer Report

#	Name	Value
1.	Core Part Number	150-0693
2.	Core Manufacturer	Wurth Elektronik
3.	Coil Former Part Number	070-6362
4.	Coil Former Manufacturer	Wurth Elektronik

# Transformer Electrical Diagram

Primary		Secondary	
Turns	7.0	Turns	22.0
AWG	24.0	AWG	26.0
Layers	2.0	Layers	2.0
Strands	4.0	Strands	1.0
Insulation Type	Heavy Insulated Magnet Wire	Insulation Type	Triple Insulated

# Auxiliary

Turns	6.0
AWG	28.0
Layers	1.0
Strands	4.0
Insulation Type	Heavy Insulated Magnet Wire

# Transformer Construction Diagram

# Winding Instruction

Winding	AWG	Turns	Winding Orientation
Primary First 1/2.0	24.0	4	Clockwise
Auxiliary	28.0	6.0	Counter Clockwise
Triple Insulated Secondary	26.0	22.0	Counter Clockwise
Primary Second 1/2.0	24.0	3	Clockwise

### **Transformer Parameters**

#	Name	Value
1.	Lpri	1.3E-5H
2.	Inductance Factor(AI)	256.0nH
3.	Npri	7.0
4.	Nsec	22.0
5.	Naux	6.0
6.	Core Type	PQ2620
7.	Core Material	TP4A

#	Name	Value
8.	Bmax	0.20T
9.	Switching Frequency	50.59kHz
10.	DMax	0.6
11.	lpk(Primary)	13.6A
12.	Irms(Primary)	6.71A
13.	lpk(Secondary)	4.32A
14.	Irms(Secondary)	1.74A

#### Design Assistance

- 1. Master key: C0D589C8A459FFAEFA08F6C55363D542[v1]
- 2. UC3843A Product Folder: http://www.ti.com/product/UC3843A: contains the data sheet and other resources.

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