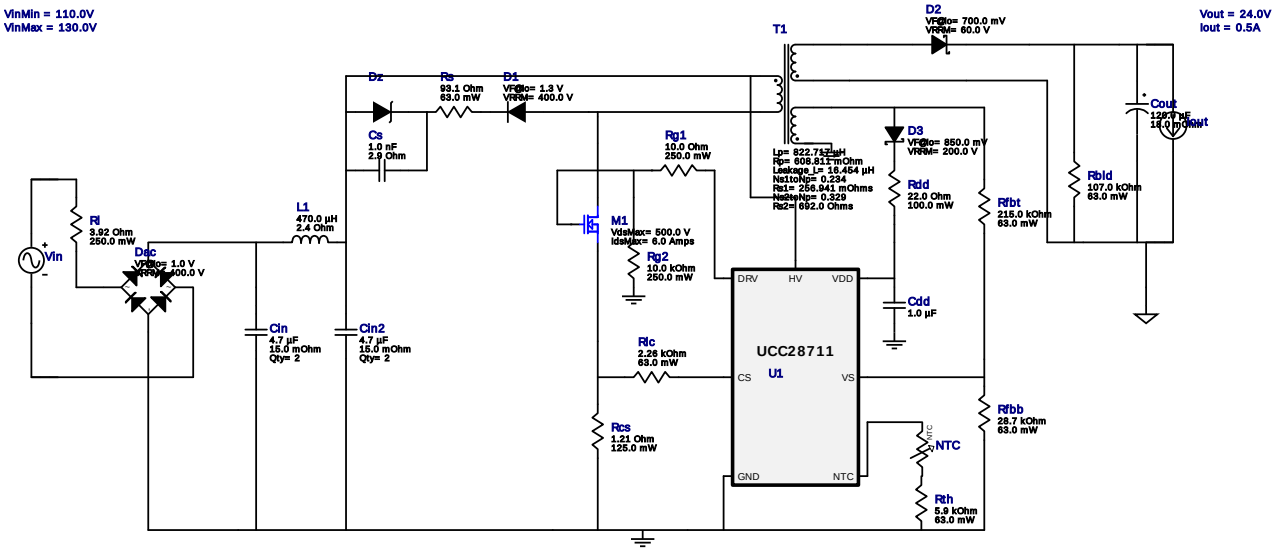
VinMin = 110.0V
VinMax = 130.0V
Vout = 24.0V
Iout = 0.5A

Device = UCC28711DR
Topology = Flyback
Created = 6/5/14 9:56:36 PM
BOM Cost = $0.00
Footprint = 3,315.0mm2
BOM Count = 28
Total Pd = 1.89W

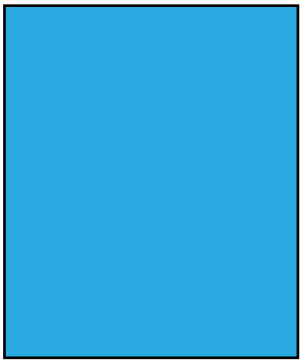
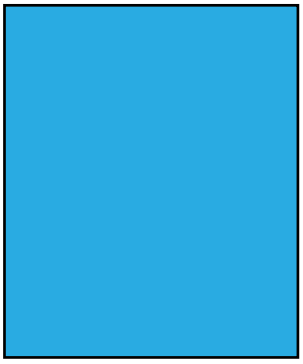
WEBENCH® Design Report

Design : 3610905/2 UCC28711DR
UCC28711DR 110.0V-130.0V to 23.755V @ 0.5A



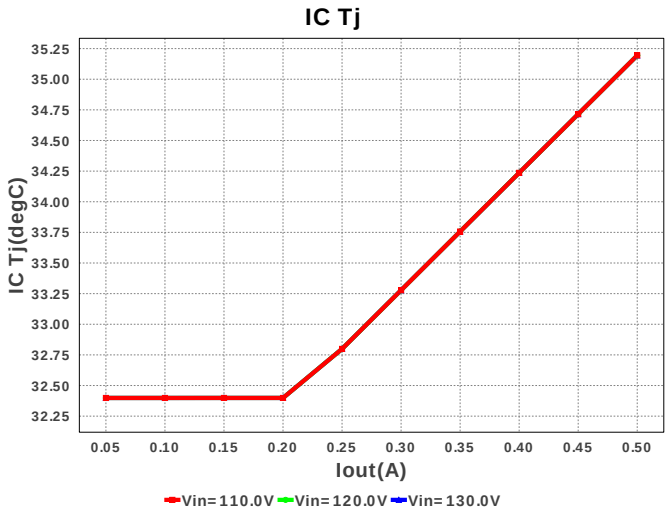
1. Rbld is a starting point, but may need to be experimented with in order to get minimum current needed to hold Vout at no load. Rlc and the feedback resistors may also need adjustment based on the actual transformer used. For more information please click the design assistance button.

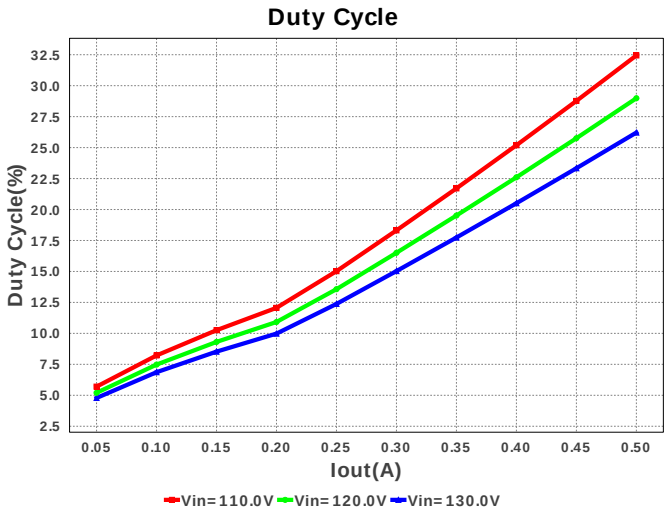
Electrical BOM

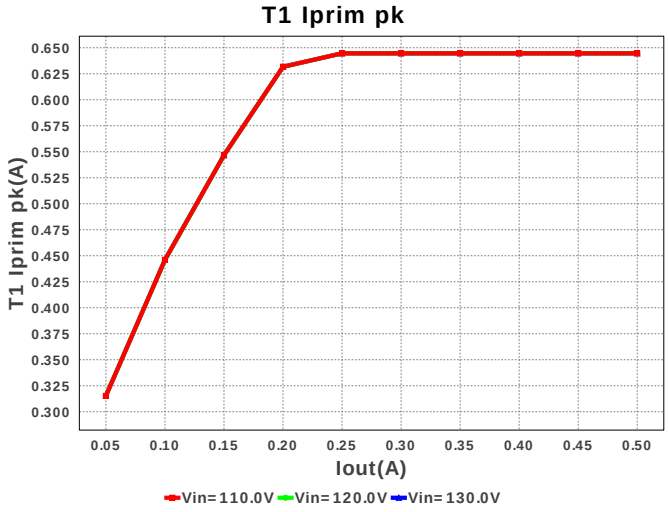
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cdd	Taiyo Yuden	GMK212B7105KG-T Series= X7R	Cap= 1.0 µF VDC= 35.0 V IRMS= 0.0 A	1	$0.05	 0805 7mm2
2.	Cin	EPCOS Inc	B32924C3475M Series= 303	Cap= 4.7 µF ESR= 15.0 mOhm VDC= 630.0 V IRMS= 457.0 mA	2	$1.83	 B32924_33mm 670mm2
3.	Cin2	EPCOS Inc	B32924C3475M Series= 303	Cap= 4.7 µF ESR= 15.0 mOhm VDC= 630.0 V IRMS= 457.0 mA	2	$1.83	 B32924_33mm 670mm2

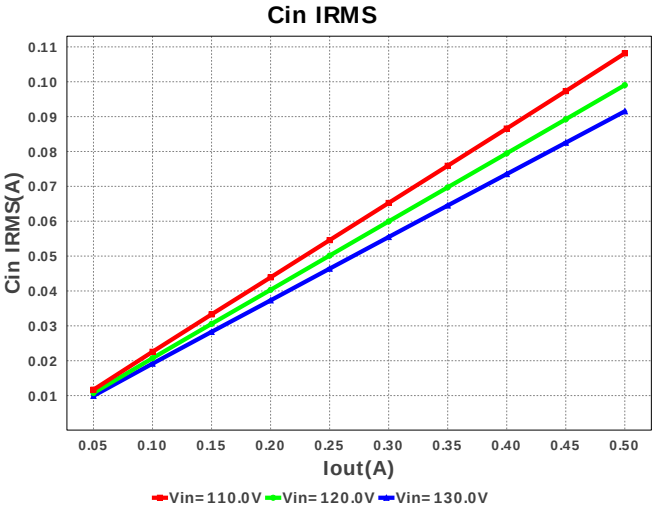
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
4.	Cout	Panasonic	35SVPF120M Series= 1273	Cap= 120.0 µF ESR= 18.0 mOhm VDC= 35.0 V IRMS= 4.4 A	1	$0.70	CAPSMT_62_F12 151mm2
5.	Cs	MuRata	GRM188R72E102KW07D Series= X7R	Cap= 1.0 nF ESR= 2.9 Ohm VDC= 250.0 V IRMS= 90.0 mA	1	$0.02	0603 5mm2
6.	D1	Diodes Inc.	RS1G-13-F	VF@Io= 1.3 V VRRM= 400.0 V	1	$0.07	SMA 37mm2
7.	D2	Diodes Inc.	B160-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.06	SMA 37mm2
8.	D3	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	PowerDI123 13mm2
9.	Dac	Diodes Inc.	HD04-T	VF@Io= 1.0 V VRRM= 400.0 V	1	$0.12	MiniDIP 62mm2
10.	Dz	ON Semiconductor	1SMB5956BT3G	Zener	1	$0.08	SMB 44mm2
11.	L1	Bourns	SRR7032-471M	L= 470.0 µH DCR= 2.4 Ohm	1	$0.25	SRR7032 81mm2
12.	M1	Fairchild Semiconductor	FDD6N50TM	VdsMax= 500.0 V IdsMax= 6.0 Amps	1	$0.41	DPAK 102mm2
13.	Rbld	Vishay-Dale	CRCW0402107KFKED Series= CRCW..e3	Res= 107.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
14.	Rcs	Vishay-Dale	CRCW08051R21FKEA Series= CRCW..e3	Res= 1.21 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7mm2
15.	Rdd	Yageo America	RC0603FR-0722RL Series= 233	Res= 22.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5mm2
16.	Rfbb	Vishay-Dale	CRCW040228K7FKED Series= CRCW..e3	Res= 28.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
17.	Rfbt	Vishay-Dale	CRCW0402215KFKED Series= CRCW..e3	Res= 215.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
18.	Rg1	Panasonic	ERJ-8ENF10R0V Series= ERJ-8E	Res= 10.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11mm2
19.	Rg2	Panasonic	ERJ-8ENF1002V Series= ERJ-8E	Res= 10.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11mm2
20.	Rl	Vishay-Dale	CRCW12063R92FKEA Series= CRCW..e3	Res= 3.92 Ohm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11mm2
21.	Rlc	Vishay-Dale	CRCW04022K26FKED Series= CRCW..e3	Res= 2.26 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
22.	Rs	Vishay-Dale	CRCW040293R1FKED Series= CRCW..e3	Res= 93.1 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
23.	Rth	Vishay-Dale	CRCW04025K90FKED Series= CRCW..e3	Res= 5.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2

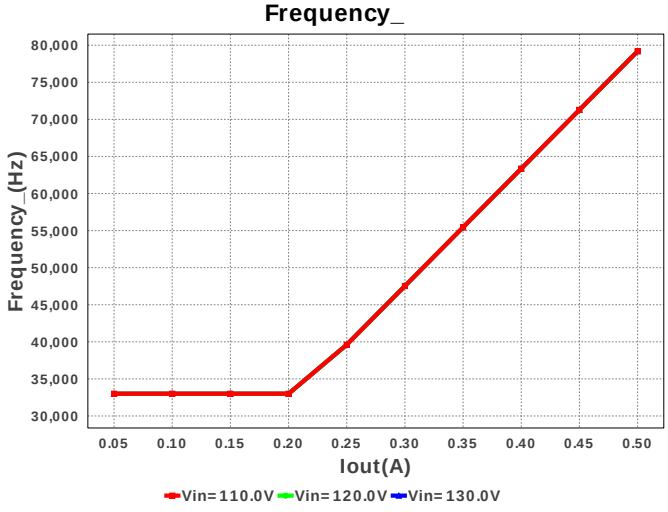
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
24.	T1	CUSTOM	CUSTOM	Lp= 822.717 µH Rp= 608.811 mOhm Leakage_L= 16.454 µH Ns1toNp= 0.234 Rs1= 256.941 mOhms Ns2toNp= 0.329 Rs2= 692.0 Ohms	1	NA	CUSTOM 0mm2
25.	U1	Texas Instruments	UCC28711DR	Switcher	1	$0.42	 SOIC-7 0mm2

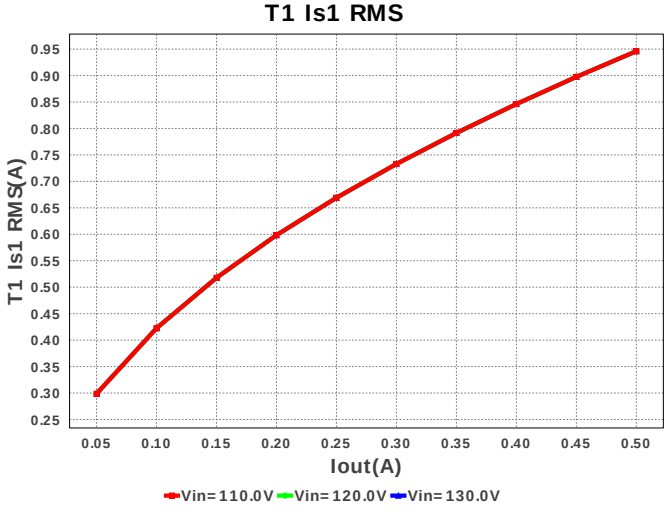


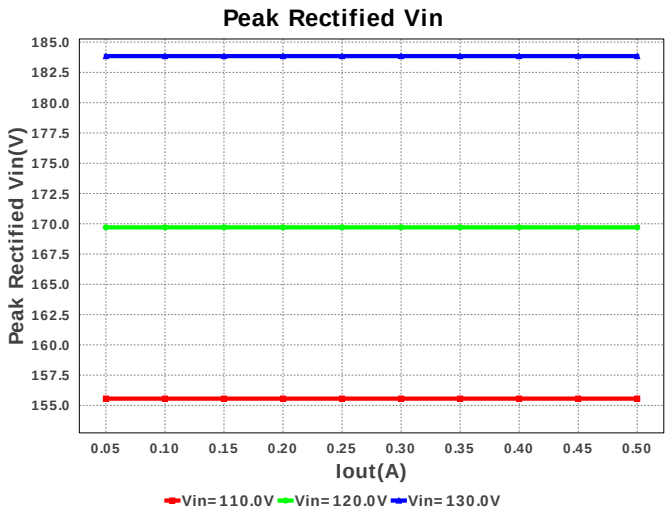


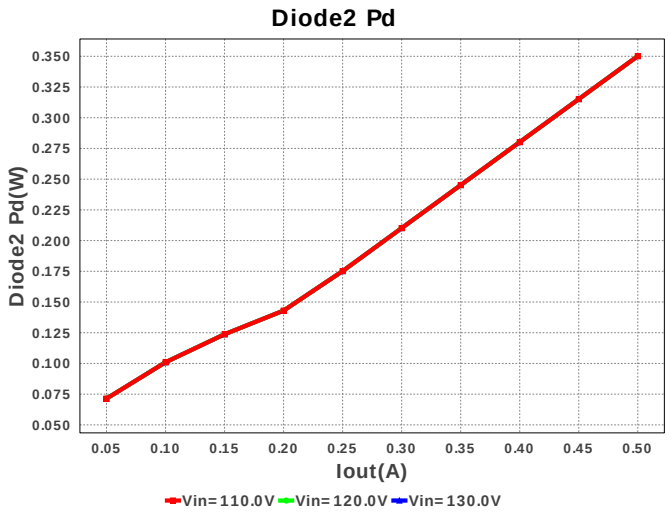


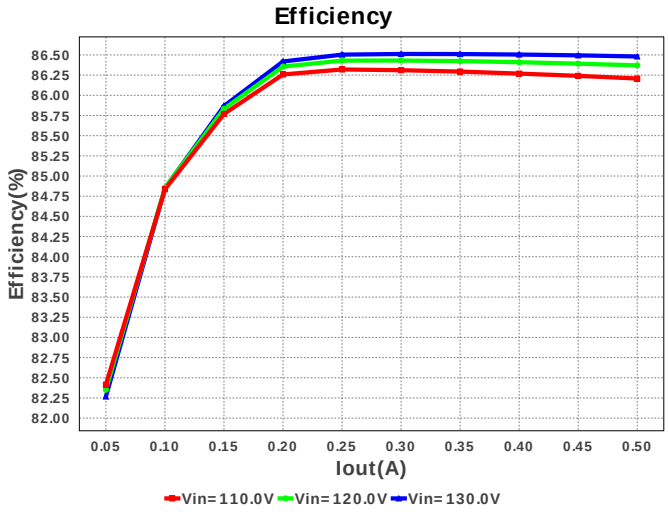


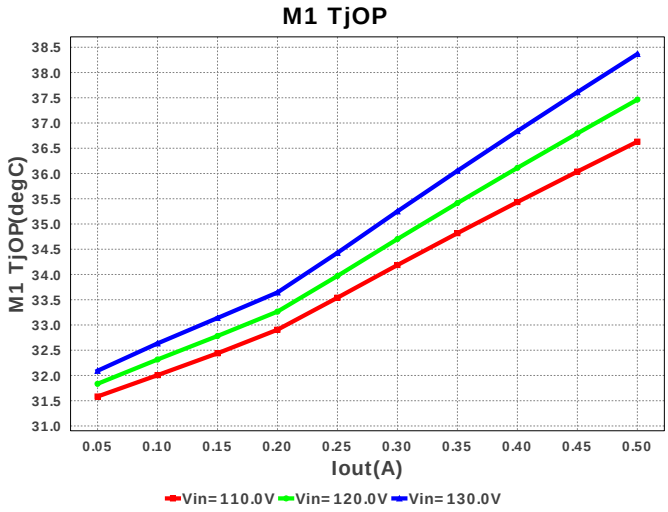


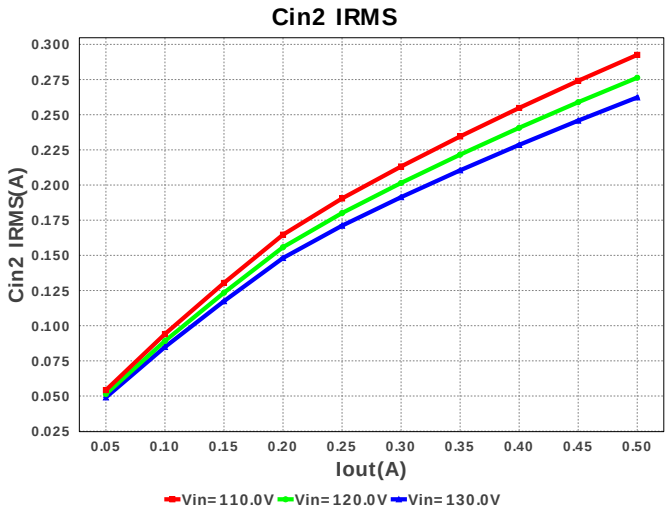


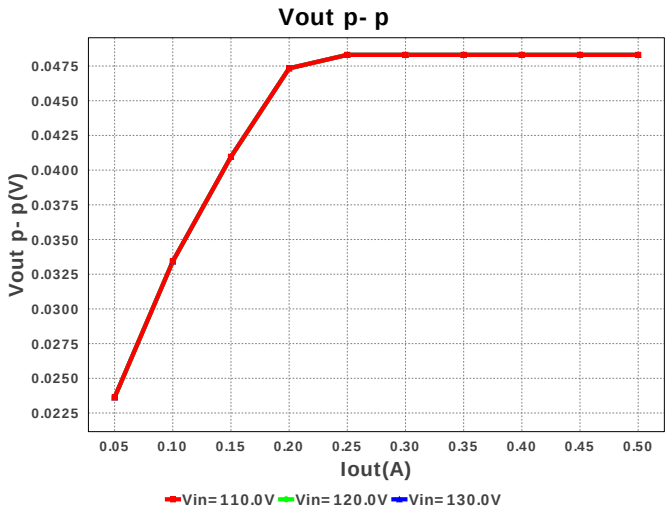


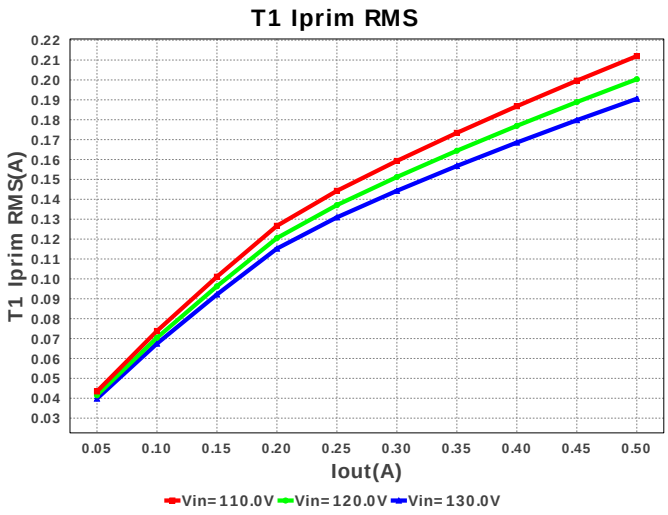


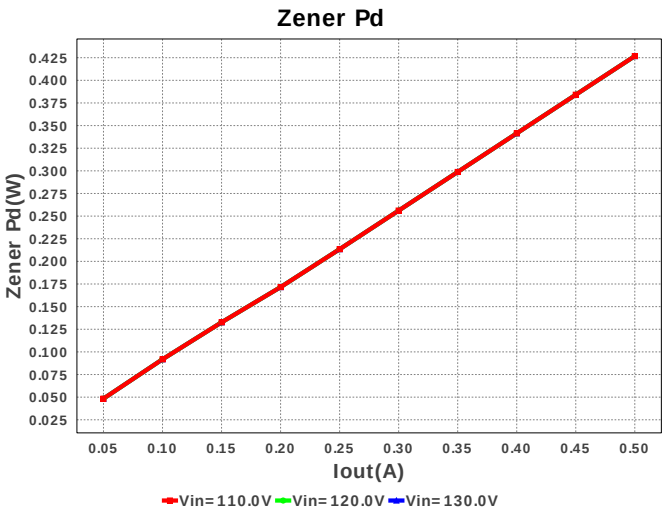


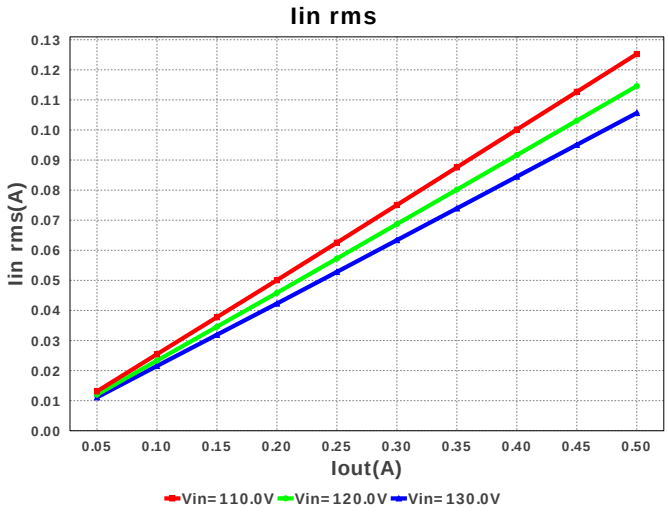


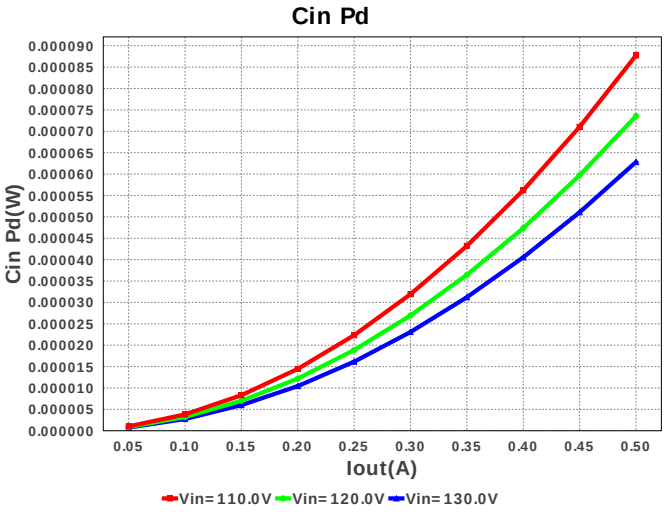


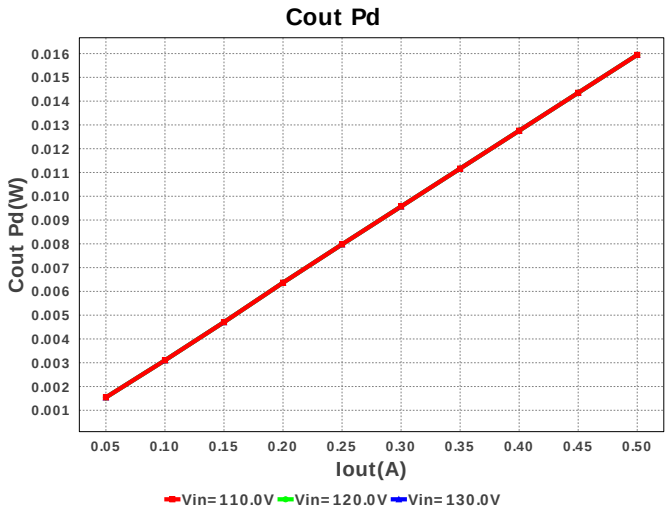


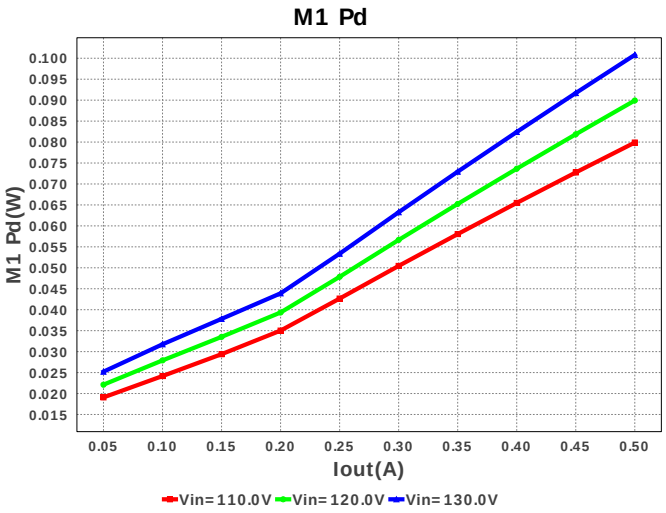


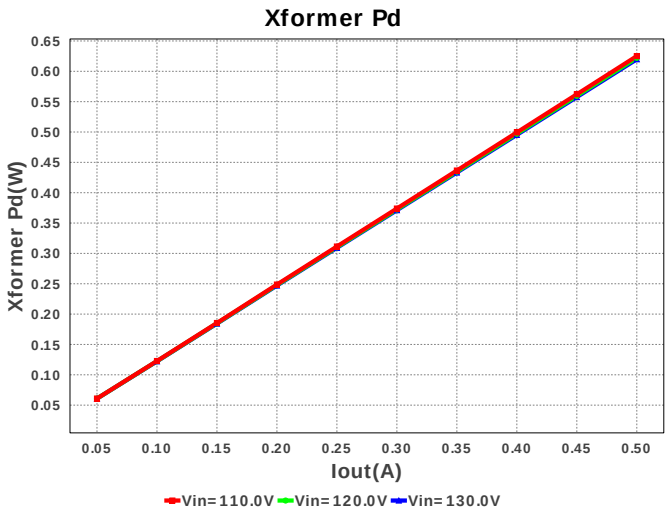


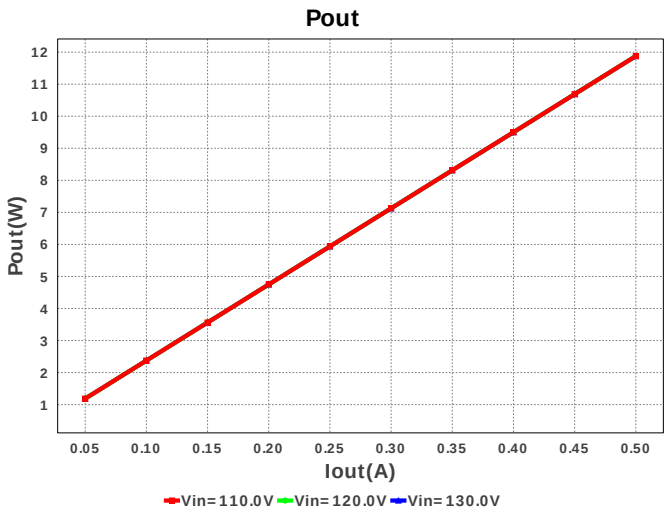


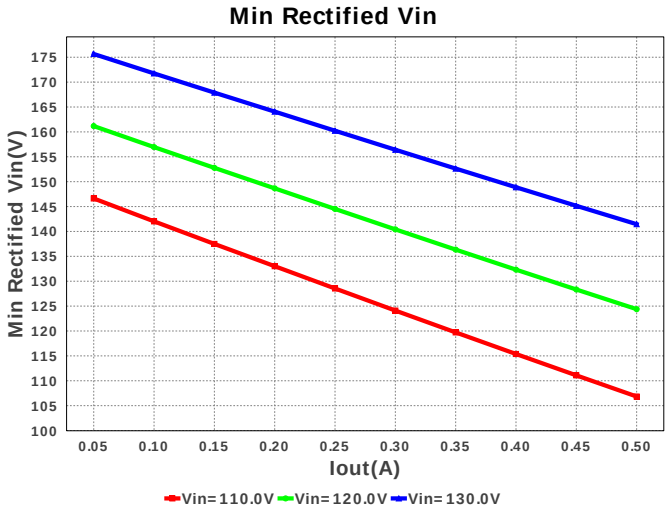


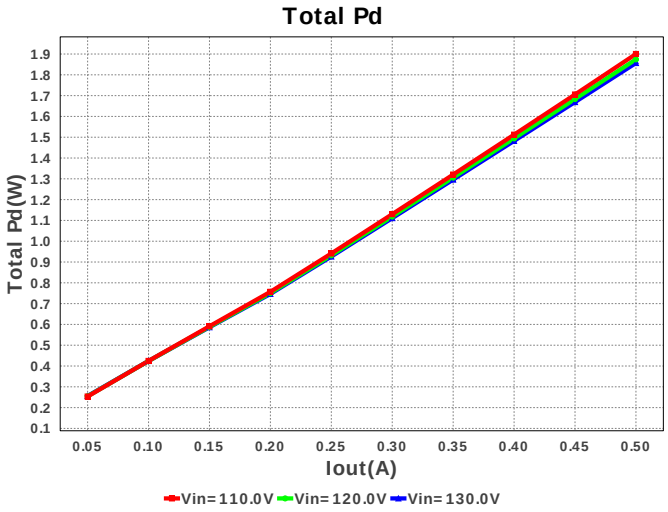


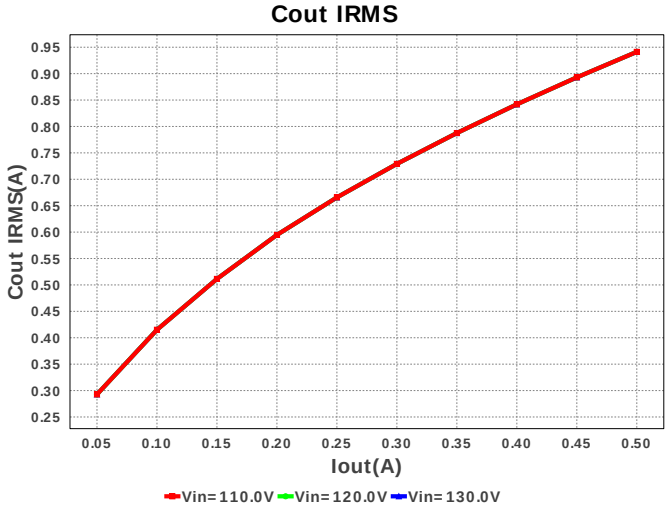


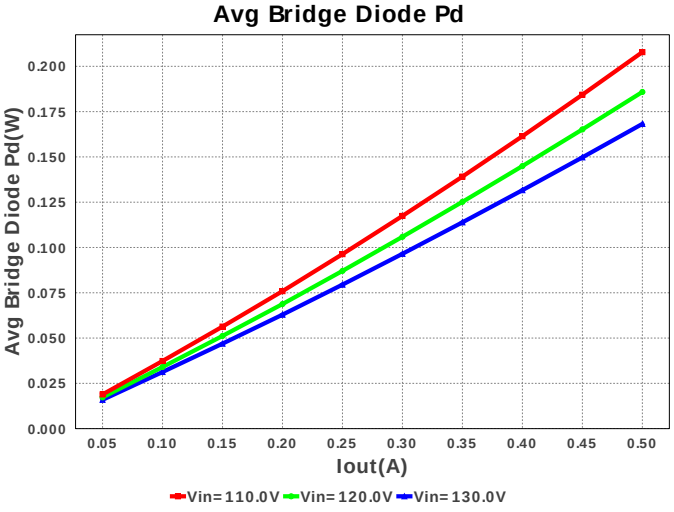


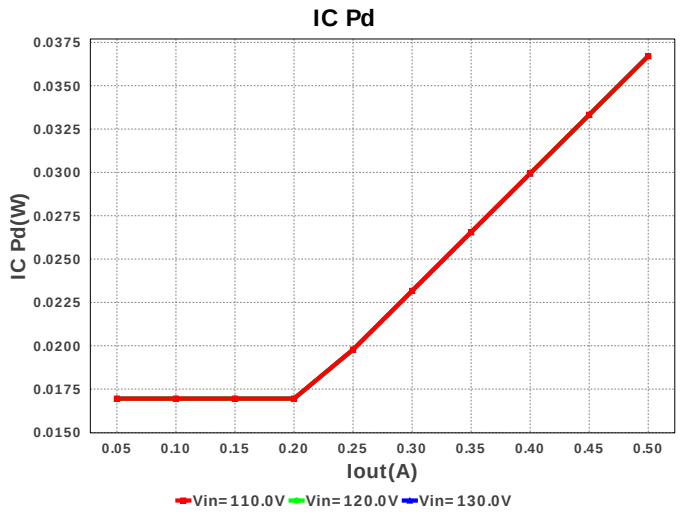


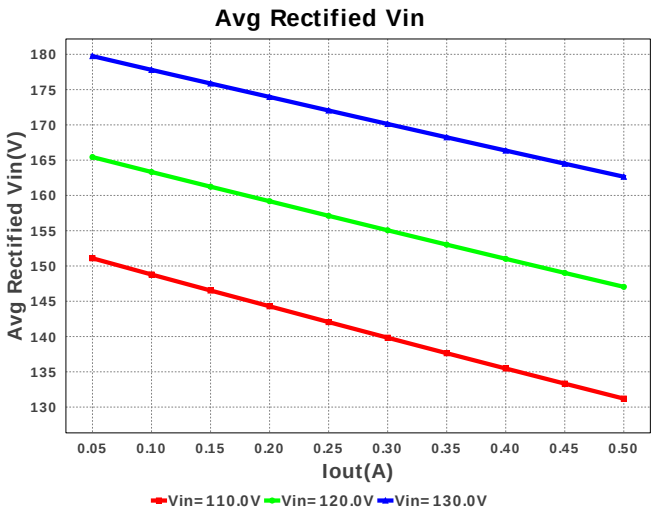


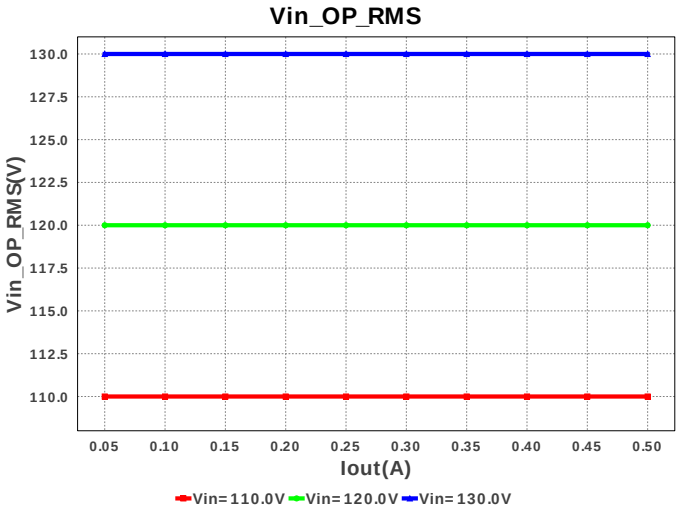


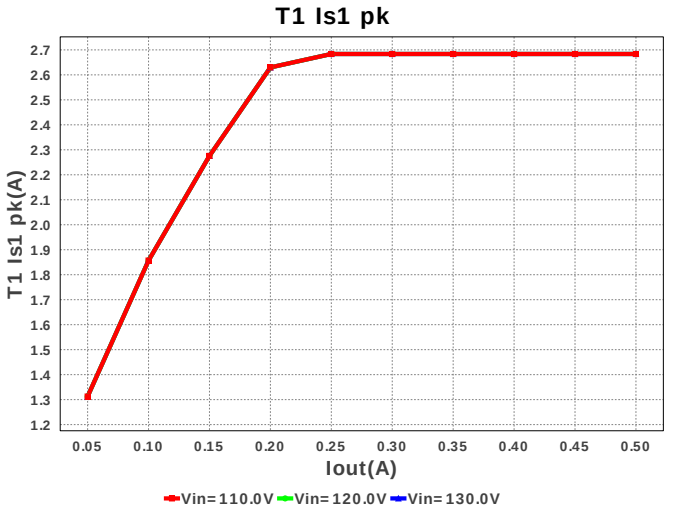


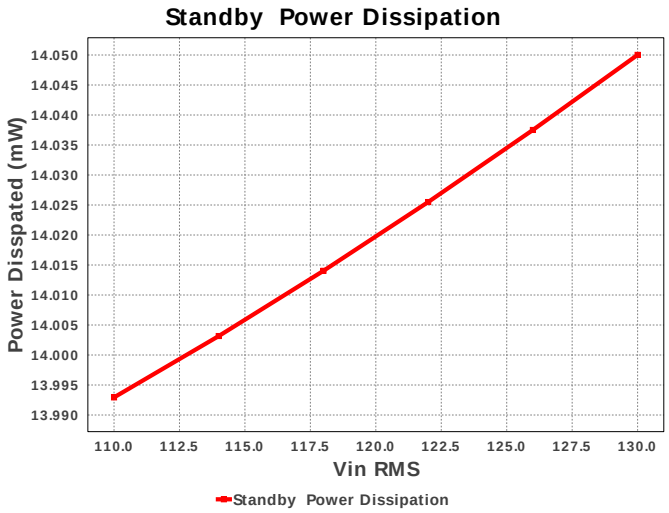


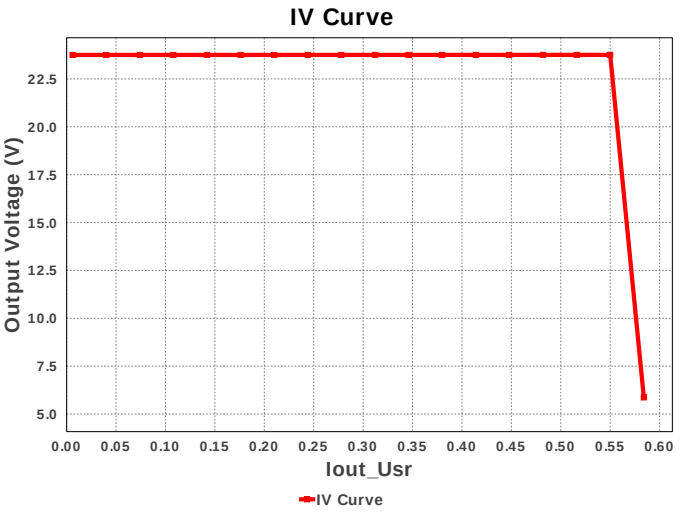












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	91.914 mA	Current	Input capacitor RMS ripple current
2.	Cin2 IRMS	263.112 mA	Current	Input capacitor2 RMS ripple current
3.	Cout IRMS	941.209 mA	Current	Output capacitor RMS ripple current
4.	Iin rms	105.87 mA	Current	RMS Input Current
5.	T1 Iprim RMS	191.146 mA	Current	Transformer Primary RMS Current
6.	T1 Iprim pk	644.628 mA	Current	Transformer Primary Peak Current
7.	T1 Is1 RMS	946.012 mA	Current	Transformer Secondary1 RMS Current
8.	T1 Is1 pk	2.684 A	Current	Transformer Secondary1 Peak Current
9.	Avg Rectified Vin	161.616 V	General	Average Rectified Voltage for the AC Line Period
10.	BOM Count	28	General	Total Design BOM count
11.	FootPrint	3.315 kmm2	General	Total Foot Print Area of BOM components

#	Name	Value	Category	Description
12.	Pout	11.878 W	General	Total output power
13.	Total BOM	$0.0	General	Total BOM Cost
14.	Vout OP	23.755 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	26.377 %	Op_point	Duty cycle
16.	Efficiency	86.299 %	Op_point	Steady state efficiency
17.	Frequency_	79.193 kHz	Op_point	Switching frequency
18.	IC Tj	32.57 degC	Op_point	IC junction temperature
19.	ICThetaJA	70.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	500.0 mA	Op_point	Iout operating point
21.	M1 TjOP	38.307 degC	Op_point	M1 MOSFET junction temperature
22.	Min Rectified Vin	139.387 V	Op_point	Minimum voltage seen at rectified input
23.	Peak Rectified Vin	183.846 V	Op_point	Peak voltage seen at rectified input
24.	Vin_OP_RMS	130.0 V	Op_point	AC Input RMS Voltage
25.	Vout p-p	48.305 mV	Op_point	Peak-to-peak output ripple voltage
26.	Avg Bridge Diode Pd	169.258 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
27.	Cin Pd	63.362 µW	Power	Input capacitor power dissipation
28.	Cout Pd	15.946 mW	Power	Output capacitor power dissipation
29.	Diode2 Pd	350.16 mW	Power	Diode2 power dissipation
30.	IC Pd	36.708 mW	Power	IC power dissipation
31.	M1 Pd	100.087 mW	Power	M1 MOSFET total power dissipation
32.	Total Pd	1.886 W	Power	Total Power Dissipation
33.	Xformer Pd	619.947 mW	Power	Transformer power dissipation
34.	Zener Pd	426.763 mW	Power	Zener power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 mA	Maximum Output Current
2.	Iout1	500.0 mAmps	Output Current #1
3.	VinMax	130.0 V	Maximum input voltage
4.	VinMin	110.0 V	Minimum input voltage
5.	Vout	24.0 V	Output Voltage
6.	Vout1	24.0 Volt	Output Voltage #1
7.	base_pn	UCC28711	Texas Instruments Base Part Number
8.	source	AC	Input Source Type
9.	ta	30.0 degC	Ambient temperature

Design Assistance

1. Application Hints Rbld Rbld is used to to set a minimum load for the circuit, so that in standby the output voltage does not float up. The value chosen by WEBENCH should be a good starting point but may need to be adjusted to achieve minimum power dissipation at standby as well. Rlc Rlc provides the function of feed-forward line compensation to eliminate change in IPP due to change in di/dt and the propagation delay of the internal comparator and MOSFET turn-off time. For best results the chosen value may need to be adjusted based on board, FET and transformer parasitics. Rfbt & Rfbb The feedback resistors will set the output voltage of the circuit. The values chosen may need to be fined tuned based on the final Transformer turns ratios and the voltage across the output diode at close to zero current. Part Description The UCC28710 family of flyback power supply controllers provides Constant-Voltage (CV) and Constant-Current (CC) output regulation. Primary-Side Regulation (PSR) eliminates the use of an Opto-Coupler. Please see the datasheet for further design guidance. http://www.ti.com/lit/ds/symlink/ucc28710.pdf

2. UCC28711 Product Folder : http://www.ti.com/product/ucc28711 : contains the data sheet and other resources.