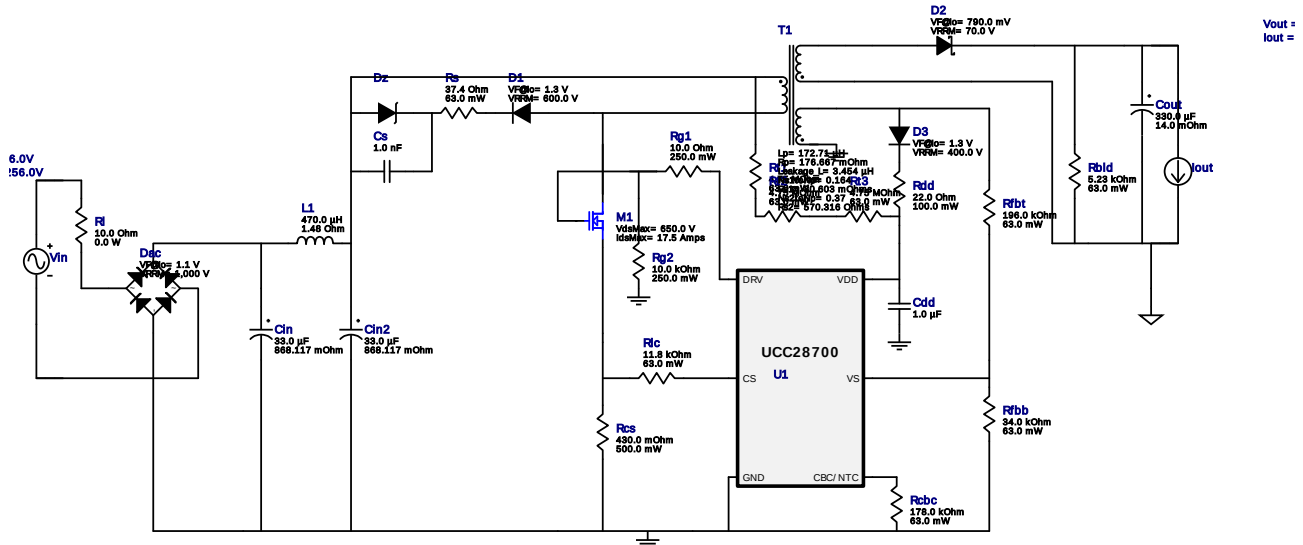


WEBENCH® Design Report

Design : 906020/12 UCC28700DBVR
UCC28700DBVR 86.0V-256.0V to 12.222V @ 2.0A

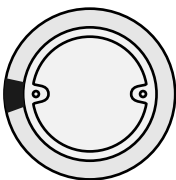
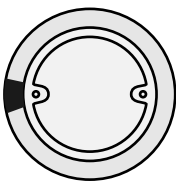
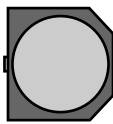
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VinMax = 256.0V
Vout = 12.0V
Iout = 2.0A

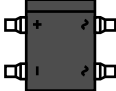
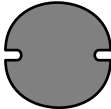
Device = UCC28700DBVR
Topology = Flyback
Created = 6/7/13 8:02:08 PM
BOM Cost = \$0.00
Total Pd = 13.68W
Footprint = 2,004.0mm2
BOM Count = 30



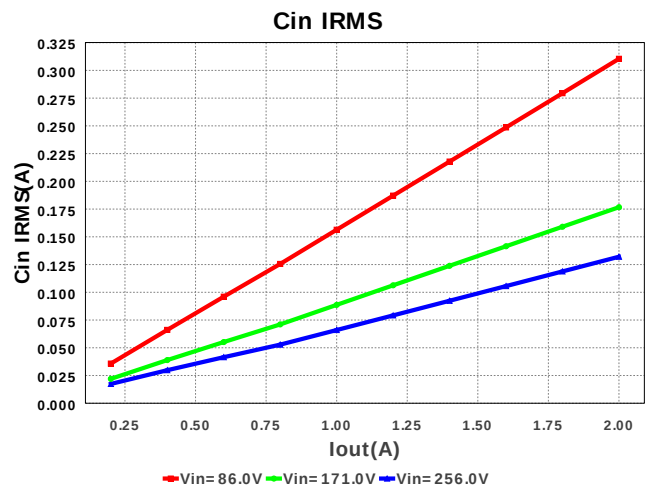
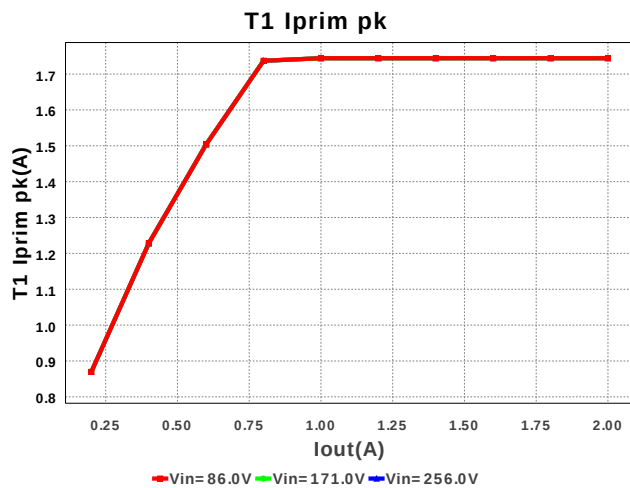
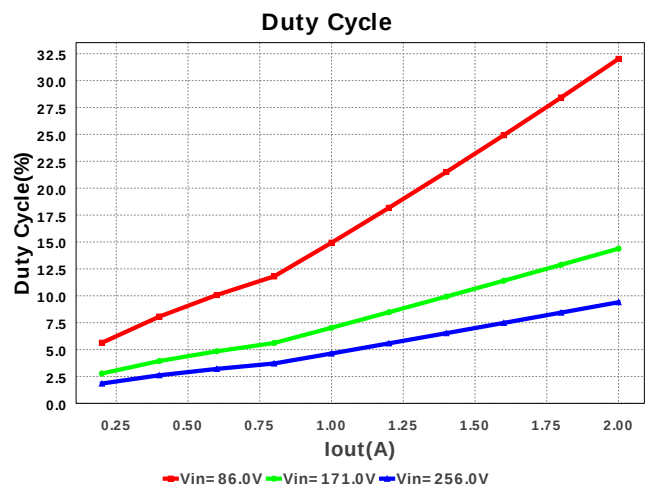
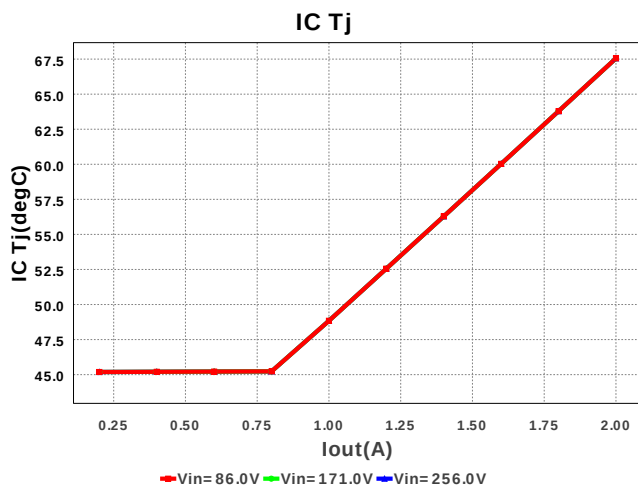
1. Rbld is a starting point, but may need to be experimented with in order to get minimum current needed to hold Vout at no load. Rlc and the feedback resistors may also need adjustment based on the actual transformer used. For more information please click the design assistance button.

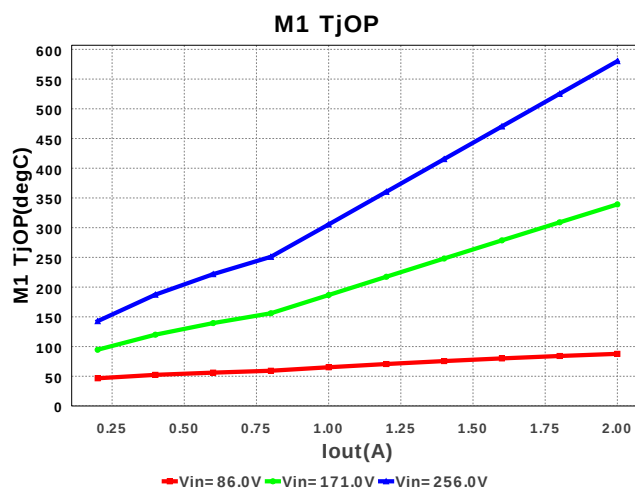
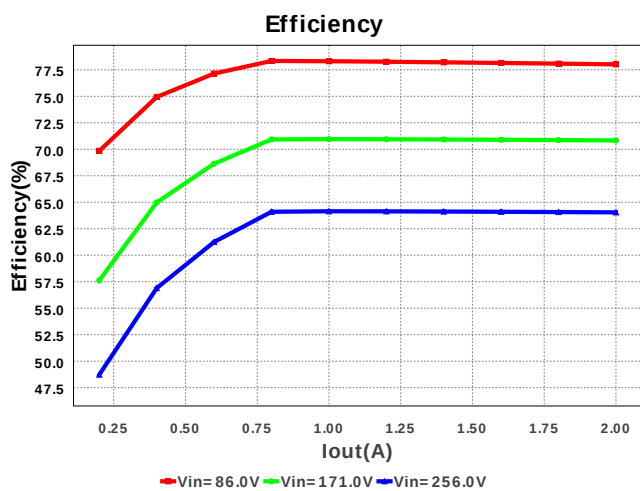
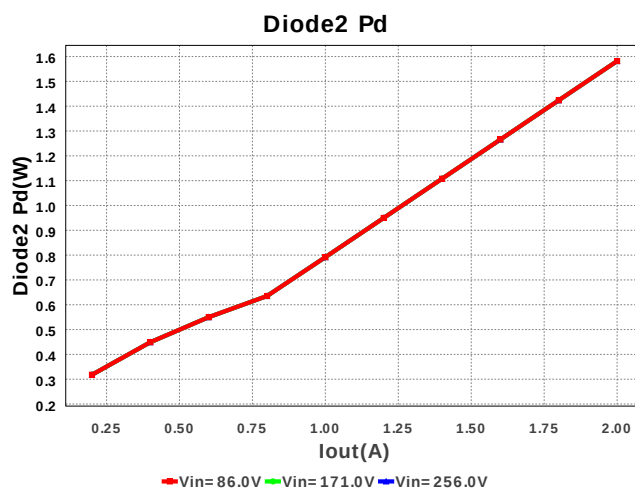
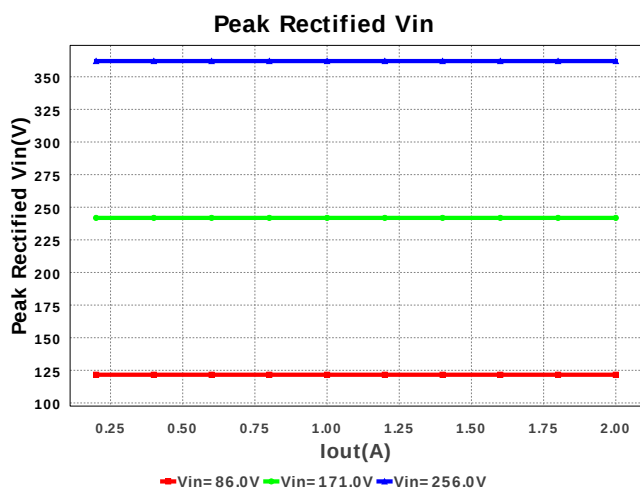
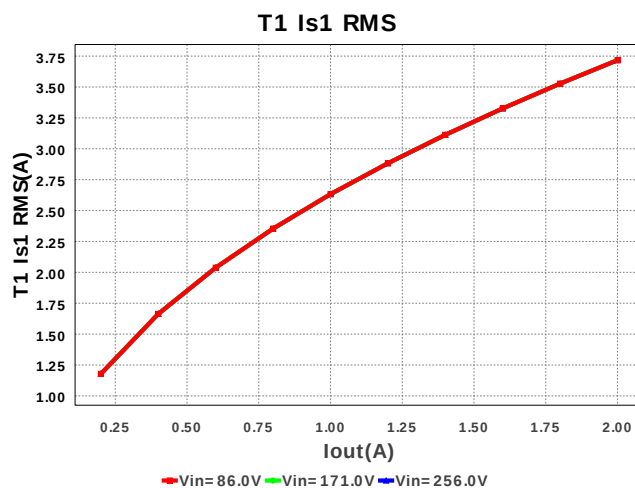
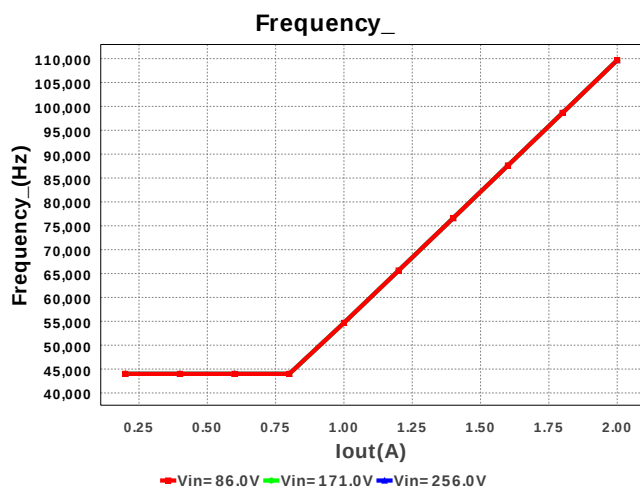
Electrical BOM

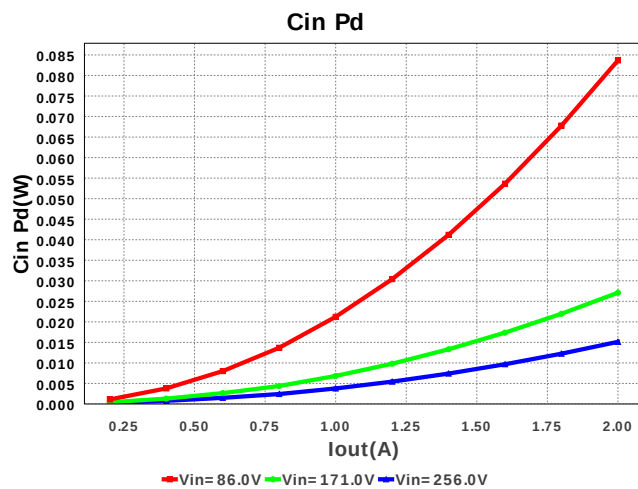
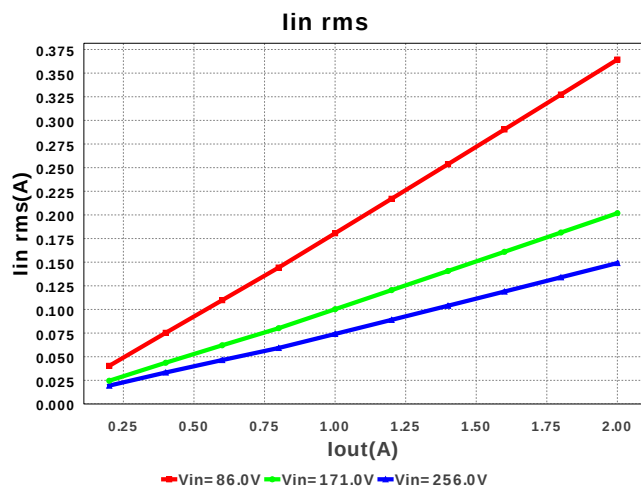
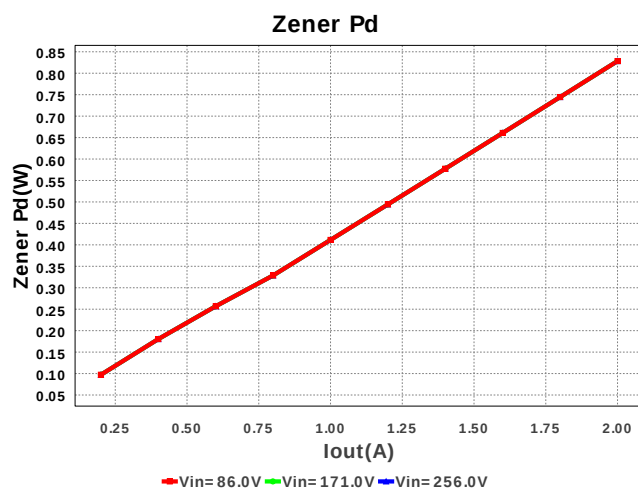
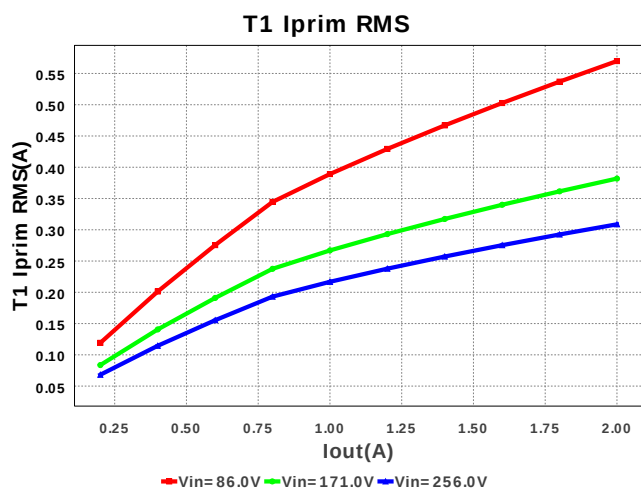
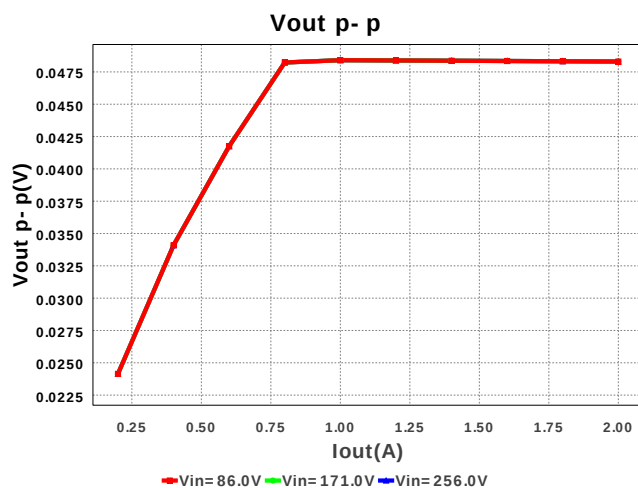
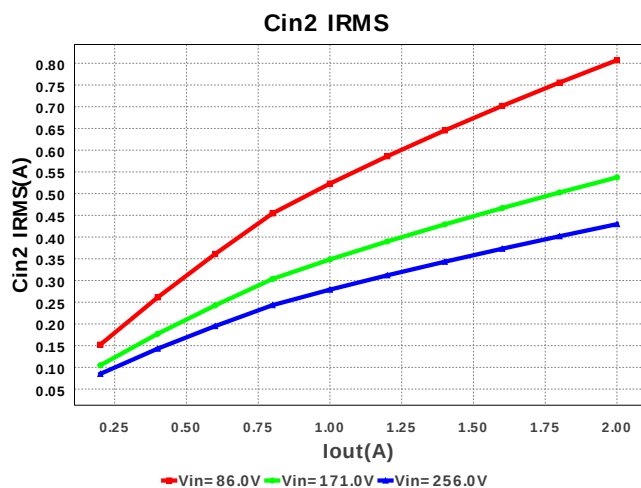
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1.	Cdd	Taiyo Yuden	GMK212B7105KG-T Series= X7R	Cap= 1.0 μ F VDC= 35.0 V IRMS= 0.0 A	1	\$0.05	 0805 13mm2
2.	Cin	Panasonic	EEUED2G330S Series= 286	Cap= 33.0 μ F ESR= 868.117 mOhm VDC= 400.0 V IRMS= 730.0 mA	1	\$0.53	 CAPPR7.5-16X20 324mm2
3.	Cin2	Panasonic	EEUED2G330S Series= 286	Cap= 33.0 μ F ESR= 868.117 mOhm VDC= 400.0 V IRMS= 730.0 mA	1	\$0.53	 CAPPR7.5-16X20 324mm2
4.	Cout	Nippon Chemi-Con	APXA160ARA331MJC0G Series= PXA	Cap= 330.0 μ F ESR= 14.0 mOhm VDC= 16.0 V IRMS= 5.05 A	3	\$1.66	 CAPSMT_62_JC0 156mm2
5.	Cs	MuRata	GRM188R72E102KW07D Series= X7R	Cap= 1.0 nF VDC= 250.0 V IRMS= 0.0 A	1	\$0.02	 0603 10mm2
6.	D1	Bourns	CD214C-F3600	VF@Io= 1.3 V VRRM= 600.0 V	1	NA	 SMC 83mm2

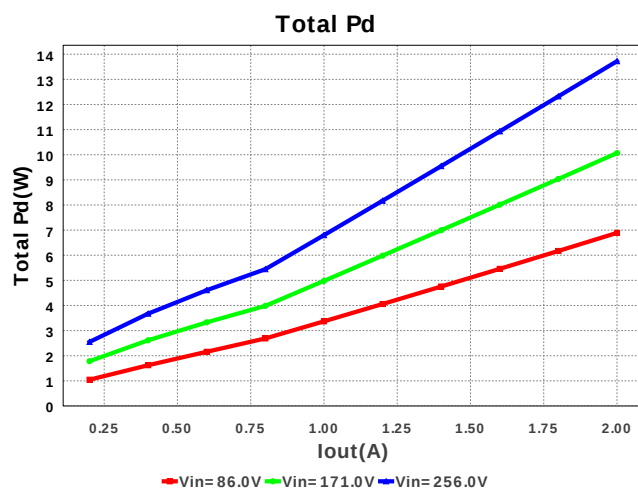
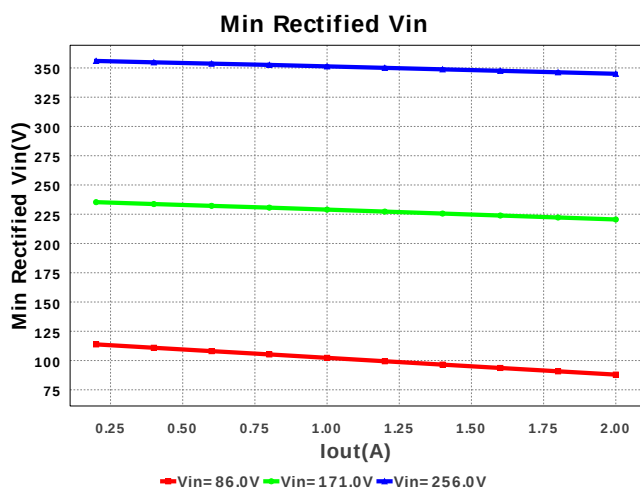
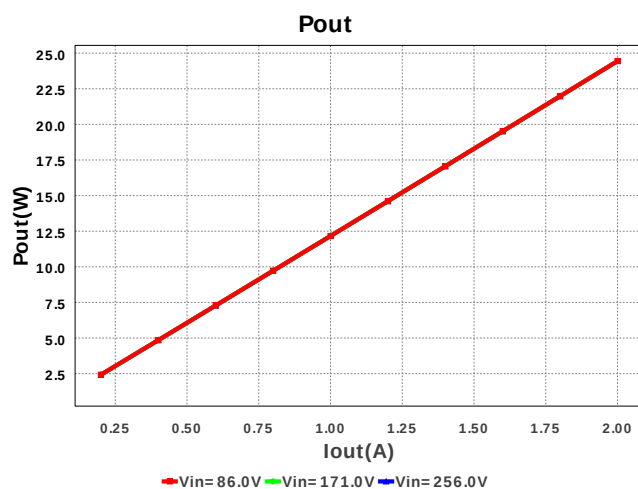
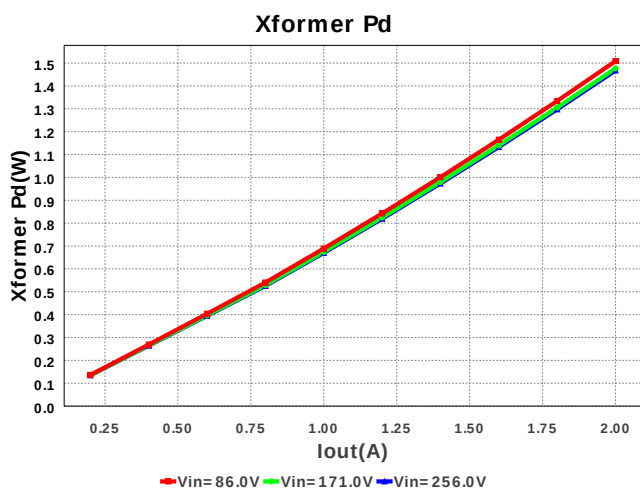
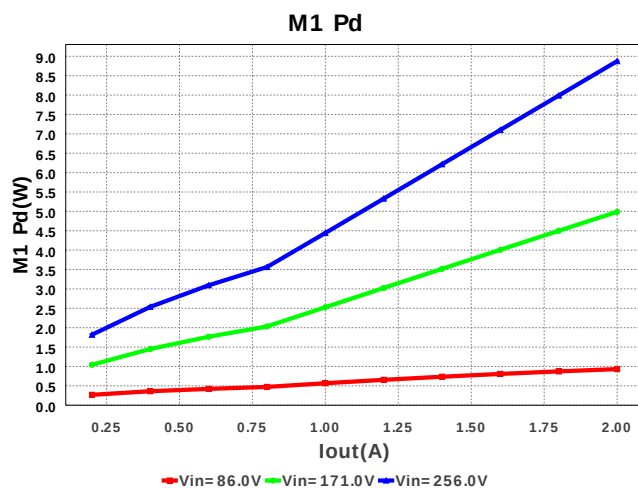
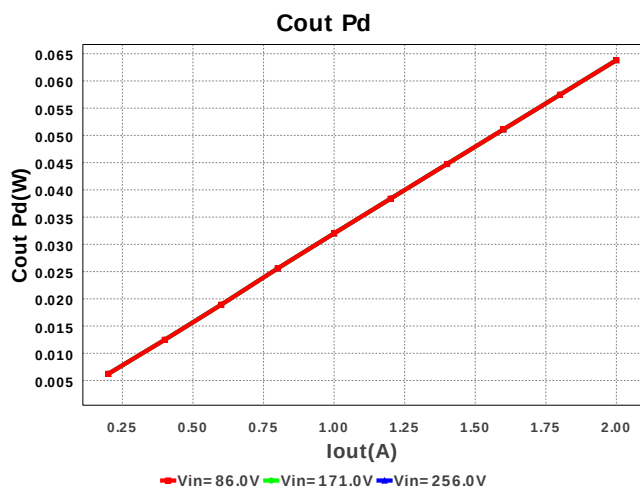
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7.	D2	Diodes Inc.	B370-13-F	VF@Io= 790.0 mV VRRM= 70.0 V	1	\$0.22	 SMC 83mm2
8.	D3	Diodes Inc.	RS1G-13-F	VF@Io= 1.3 V VRRM= 400.0 V	1	\$0.07	 SMA 37mm2
9.	Dac	Vishay-Semiconductor	DF10SA	VF@Io= 1.1 V VRRM= 1,000 V	1	\$0.24	 DF-S 99mm2
10.	Dz	ON Semiconductor	BZG03C150G	Zener	1	\$0.13	 SMA 37mm2
11.	L1	Bourns	SDR1006-471KL	L= 470.0 μ H DCR= 1.48 Ohm	1	\$0.27	 SDR1006 139mm2
12.	M1	Infineon Technologies	IPP65R190CFD	VdsMax= 650.0 V IdsMax= 17.5 Amps	1	\$2.47	 DDPAK 210mm2
13.	Rbld	Vishay-Dale	CRCW04025K23FKED Series= CRCW..e3	Res= 5.23 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
14.	Rcbc	Vishay-Dale	CRCW0402178KFKED Series= CRCW..e3	Res= 178.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
15.	Rcs	Rohm	MCR25JZHFLR430 Series= 298	Res= 430.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	\$0.04	 1210 23mm2
16.	Rdd	Susumu Co Ltd	RR1220Q-220-D Series= 264	Res= 22.0 Ohm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 13mm2
17.	Rfbb	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
18.	Rfbt	Vishay-Dale	CRCW0402196KFKED Series= CRCW..e3	Res= 196.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
19.	Rg1	Panasonic	ERJ-8ENF10R0V Series= ERJ-8E	Res= 10.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 19mm2
20.	Rg2	Panasonic	ERJ-8ENF1002V Series= ERJ-8E	Res= 10.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 19mm2
21.	RI	CUSTOM	CUSTOM Series= ?	Res= 10.0 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0mm2
22.	Rlc	Vishay-Dale	CRCW040211K8FKED Series= CRCW..e3	Res= 11.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
23.	Rs	Vishay-Dale	CRCW040237R4FKED Series= CRCW..e3	Res= 37.4 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2
24.	Rt1	Vishay-Dale	CRCW04024M75FKED Series= CRCW..e3	Res= 4.75 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 8mm2

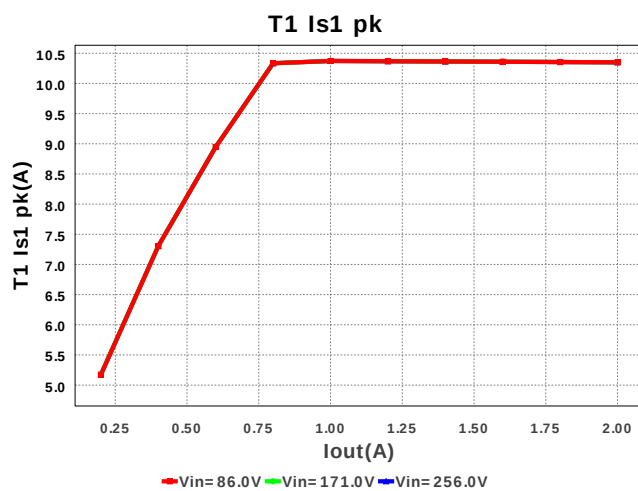
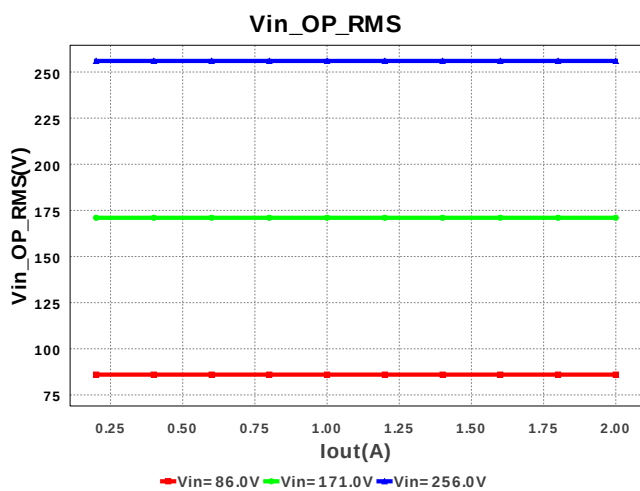
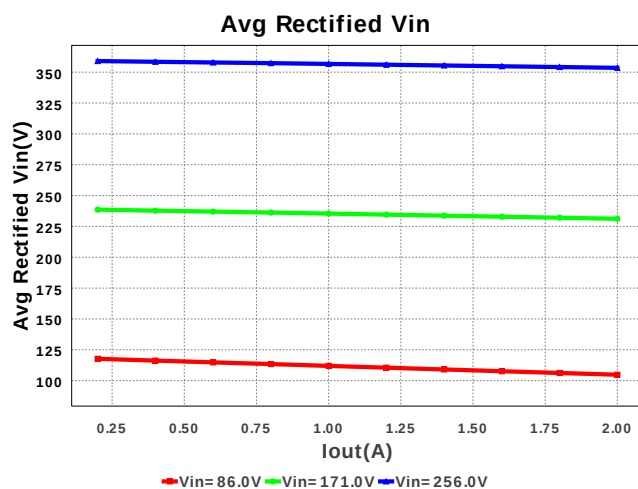
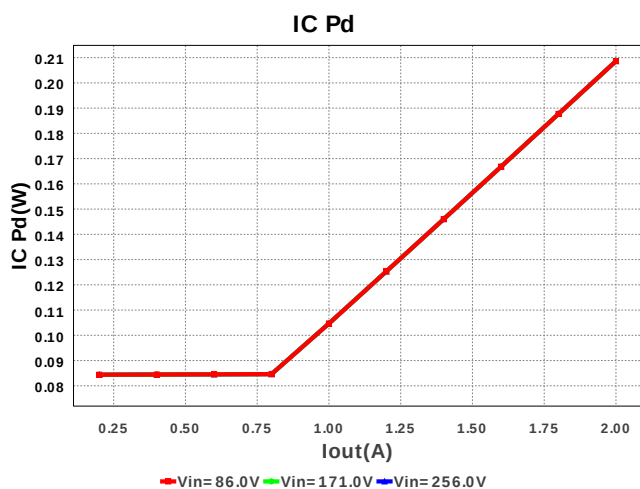
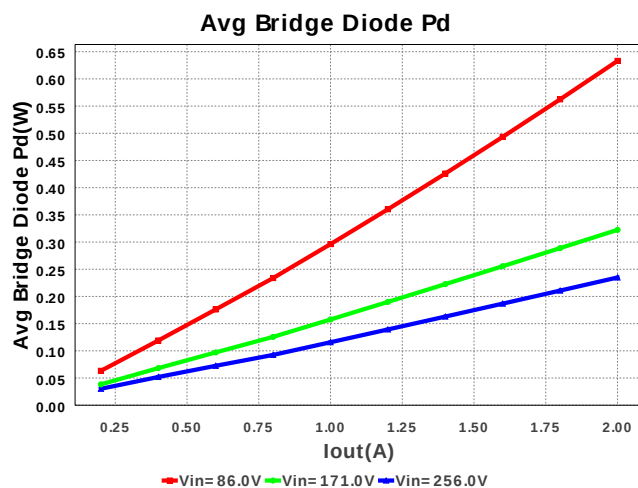
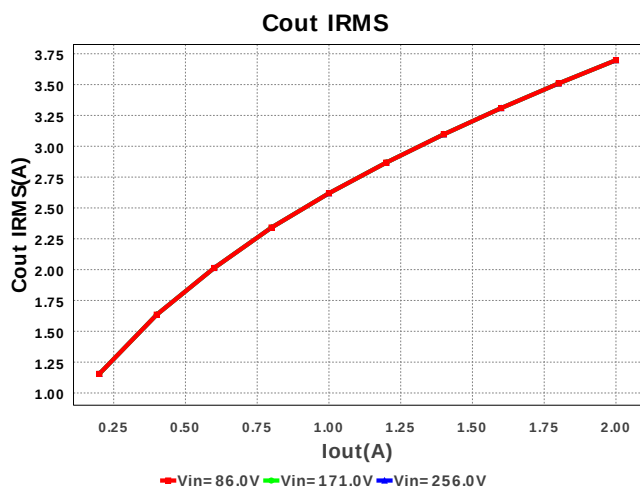
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25.	Rt2	Vishay-Dale	CRCW04024M75FKED Series= CRCW..e3	Res= 4.75 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 8mm2
26.	Rt3	Vishay-Dale	CRCW04024M75FKED Series= CRCW..e3	Res= 4.75 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 8mm2
27.	T1	CUSTOM	CUSTOM	Lp= 172.71 µH Rp= 176.667 mOhm Leakage_L= 3.454 µH Ns1toNp= 0.164 Rs1= 30.603 mOhms Ns2toNp= 0.37 Rs2= 570.316 Ohms	1	NA	CUSTOM 0mm2
28.	U1	Texas Instruments	UCC28700DBVR	Switcher	1	\$0.35	SOT-23-6 24mm2



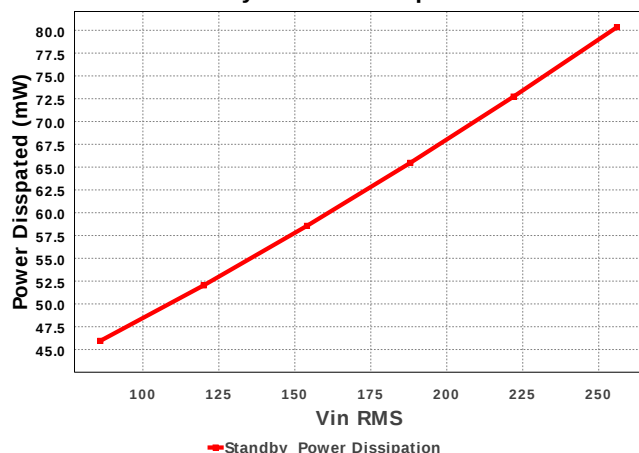




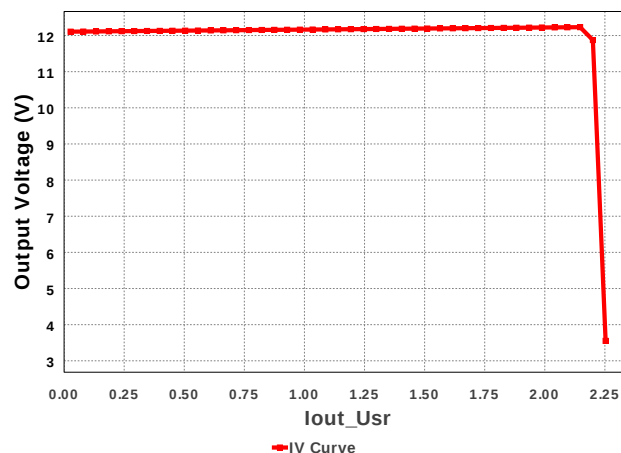




Standby Power Dissipation



IV Curve



Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	132.354 mA	Current	Input capacitor RMS ripple current
2.	Cin2 IRMS	432.018 mA	Current	Input capacitor2 RMS ripple current
3.	Cout IRMS	3.698 A	Current	Output capacitor RMS ripple current
4.	Iin rms	148.93 mA	Current	RMS Input Current
5.	T1 Iprim RMS	310.994 mA	Current	Transformer Primary RMS Current
6.	T1 Iprim pk	1.744 A	Current	Transformer Primary Peak Current
7.	T1 Is1 RMS	3.717 A	Current	Transformer Secondary1 RMS Current
8.	T1 Is1 pk	10.351 A	Current	Transformer Secondary1 Peak Current
9.	Avg Rectified Vin	348.428 V	General	Average Rectified Voltage for the AC Line Period
10.	BOM Count	30	General	Total Design BOM count
11.	FootPrint	2.004 kmm2	General	Total Foot Print Area of BOM components
12.	Mode	DCM	General	Conduction Mode
13.	Pout	24.444 W	General	Total output power
14.	Total BOM	\$0.0	General	Total BOM Cost
15.	Vout OP	12.222 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	9.538 %	Op_point	Duty cycle
17.	Efficiency	64.113 %	Op_point	Steady state efficiency
18.	Frequency_	109.676 kHz	Op_point	Switching frequency
19.	IC Tj	44.605 degC	Op_point	IC junction temperature
20.	ICThetaJA	70.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	2.0 A	Op_point	Iout operating point
22.	M1 TJOP	570.143 degC	Op_point	M1 MOSFET junction temperature
23.	Min Rectified Vin	334.82 V	Op_point	Minimum voltage seen at rectified input
24.	Peak Rectified Vin	362.035 V	Op_point	Peak voltage seen at rectified input
25.	Vin_OP_RMS	256.0 V	Op_point	AC Input RMS Voltage
26.	Vout p-p	48.302 mV	Op_point	Peak-to-peak output ripple voltage
27.	Avg Bridge Diode Pd	237.297 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
28.	Cin Pd	15.207 mW	Power	Input capacitor power dissipation
29.	Cout Pd	63.812 mW	Power	Output capacitor power dissipation
30.	Diode2 Pd	1.582 W	Power	Diode2 power dissipation
31.	IC Pd	208.64 mW	Power	IC power dissipation
32.	M1 Pd	8.712 W	Power	M1 MOSFET total power dissipation
33.	Total Pd	13.682 W	Power	Total Power Dissipation
34.	Xformer Pd	1.468 W	Power	Transformer power dissipation
35.	Zener Pd	828.345 mW	Power	Zener power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	VinMax	256.0 V	Maximum input voltage
4.	VinMin	86.0 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	UCC28700	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 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. Rfbd & Rfbb The feedback resistors will set the output voltage of the circuit. The values chosen may need to be fine tuned based on the final Transformer turns ratios and the voltage across the output diode at close to zero current. Part Description The UCC28700 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/ucc28700.pdf>

2. UCC28700 Product Folder : <http://www.ti.com/product/ucc28700> : contains the data sheet and other resources.

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