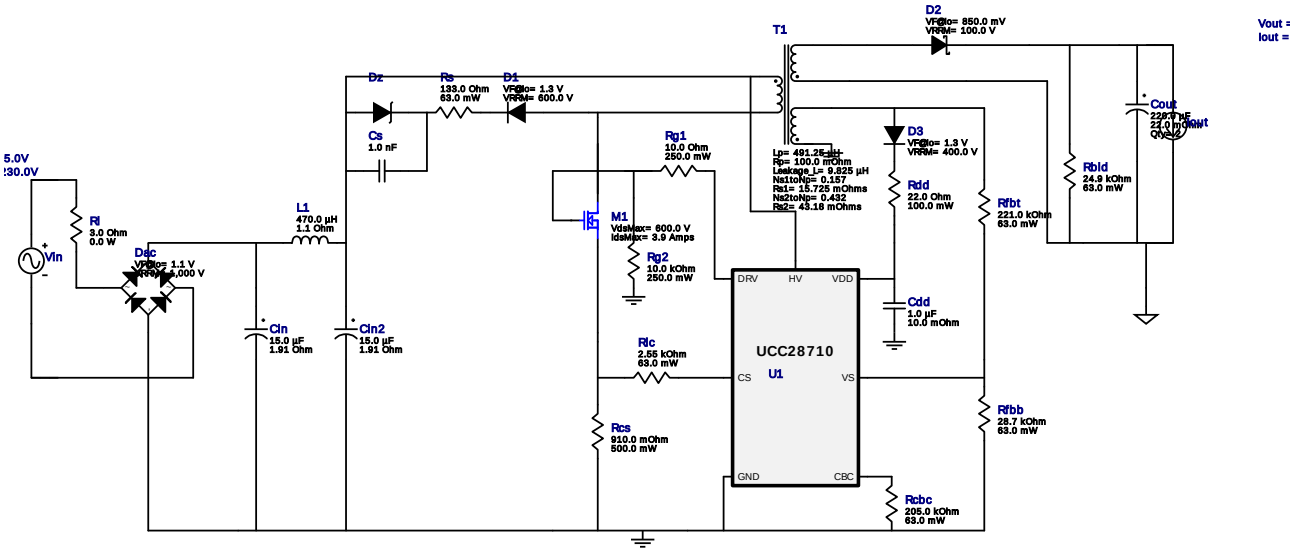
VinMin = 85.0V
VinMax = 230.0V
Vout = 12.0V
Iout = 1.0A

Device = UCC28710DR
Topology = Flyback
Created = 9/25/13 8:08:22 PM
BOM Cost = $0.00
Total Pd = 2.91W
Footprint = 1,344.0mm2
BOM Count = 1

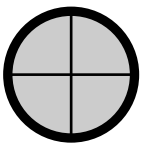
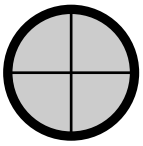
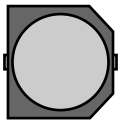
WEBENCH® Design Report

Design : 550074/10 UCC28710DR
UCC28710DR 85.0V-230.0V to 12.095V @ 1.0A



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	TDK	C3216X7R1H105K Series= X7R	Cap= 1.0 µF ESR= 10.0 mOhm VDC= 50.0 V IRMS= 3.2 A	1	$0.04	 1206 19mm2
2.	Cin	Panasonic	EEUED2G150 Series= 286	Cap= 15.0 µF ESR= 1.91 Ohm VDC= 400.0 V IRMS= 410.0 mA	1	$0.33	 CAPPR5-12.5X20 210mm2
3.	Cin2	Panasonic	EEUED2G150 Series= 286	Cap= 15.0 µF ESR= 1.91 Ohm VDC= 400.0 V IRMS= 410.0 mA	1	$0.33	 CAPPR5-12.5X20 210mm2
4.	Cout	Nippon Chemi-Con	APXE160ARA221MJ80G Series= PXE	Cap= 220.0 µF ESR= 22.0 mOhm VDC= 16.0 V IRMS= 3.45 A	2	$0.77	 CAPSMT_62_J80 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	CD214B-F3600	VF@Io= 1.3 V VRRM= 600.0 V	1	NA	 SMB 44mm2
7.	D2	Micro Commercial Components	SK310A-TP	VF@Io= 850.0 mV VRRM= 100.0 V	1	$0.10	 SMA 37mm2

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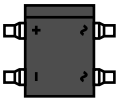
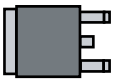
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	D3	Diodes Inc.	RS1G-13-F	VF@Io= 1.3 V VRRM= 400.0 V	1	$0.07	 SMA 37mm2
9.	Dac	Vishay-Semiconductor	DF10SA	VF@Io= 1.1 V VRRM= 1,000 V	1	$0.24	 DF-S 99mm2
10.	Dz	ON Semiconductor	MMBZ5270BLT1G	Zener	1	$0.03	 SOT-23 22mm2
11.	L1	Bourns	SRR7045-471M	L= 470.0 µH DCR= 1.1 Ohm	1	$0.25	 SRR7045 81mm2
12.	M1	Fairchild Semiconductor	FCD4N60TM	VdsMax= 600.0 V IdsMax= 3.9 Amps	1	$0.49	 DPAK 102mm2
13.	Rbld	Vishay-Dale	CRCW040224K9FKED Series= CRCW..e3	Res= 24.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
14.	Rcbc	Vishay-Dale	CRCW0402205KFKED Series= CRCW..e3	Res= 205.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
15.	Rcs	Rohm	MCR25JZHFLR910 Series= 298	Res= 910.0 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	CRCW040228K7FKED Series= CRCW..e3	Res= 28.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
18.	Rfbt	Vishay-Dale	CRCW0402221KFKED Series= CRCW..e3	Res= 221.0 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.	Rl	CUSTOM	CUSTOM Series= ?	Res= 3.0 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0mm2
22.	Rlc	Vishay-Dale	CRCW04022K55FKED Series= CRCW..e3	Res= 2.55 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
23.	Rs	Vishay-Dale	CRCW0402133RFKED Series= CRCW..e3	Res= 133.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
24.	T1	CUSTOM	CUSTOM	Lp= 491.25 µH Rp= 100.0 mOhm Leakage_L= 9.825 µH Ns1toNp= 0.157 Rs1= 15.725 mOhms Ns2toNp= 0.432 Rs2= 43.18 mOhms	1	NA	CUSTOM 0mm2
25.	U1	Texas Instruments	UCC28710DR	Switcher	1	$0.42	 SOIC-7 0mm2

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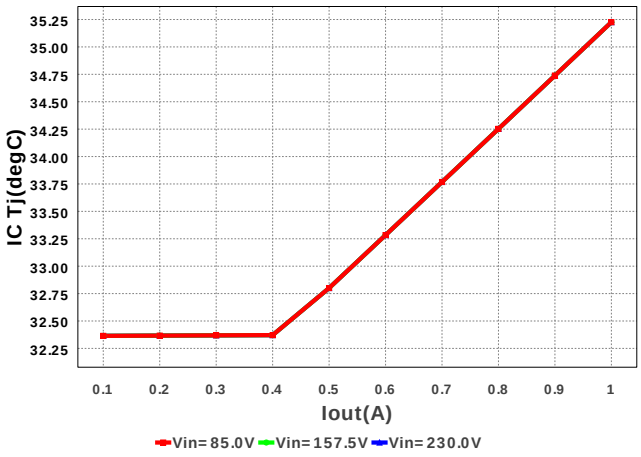
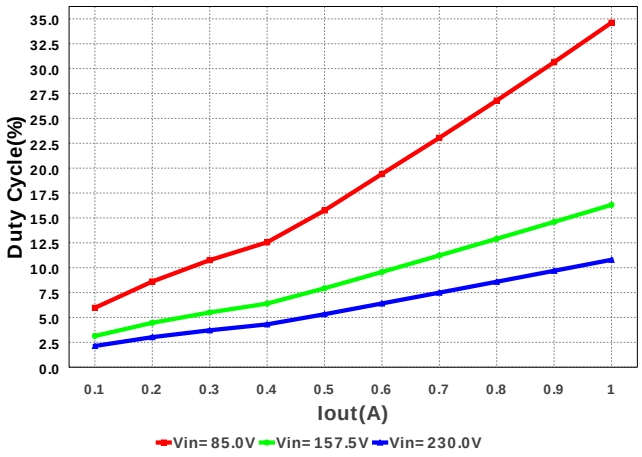
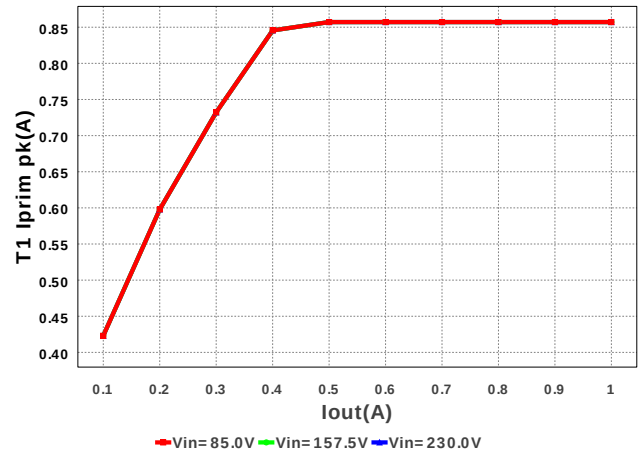
IC Tj



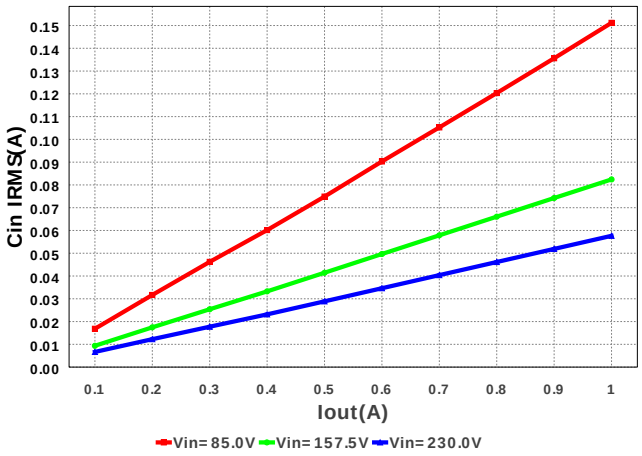
Duty Cycle



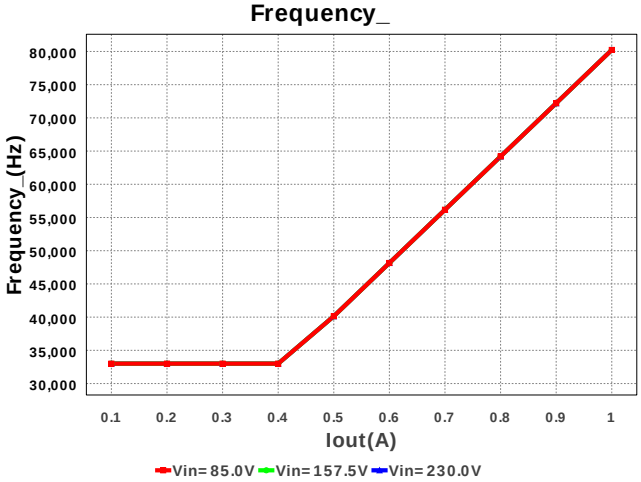
T1 Iprim pk



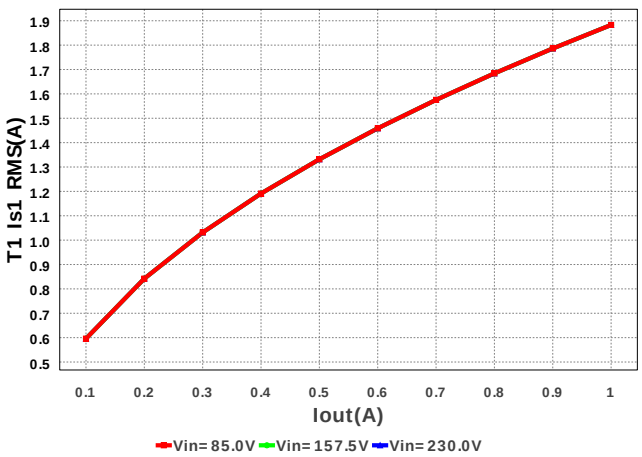
Cin IRMS



Frequency_



T1 Is1 RMS



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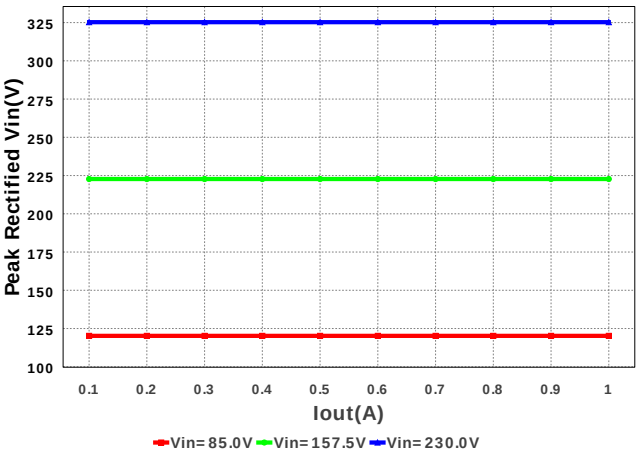
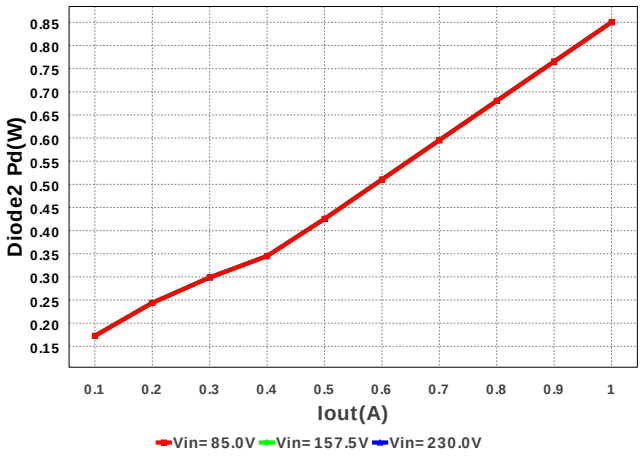
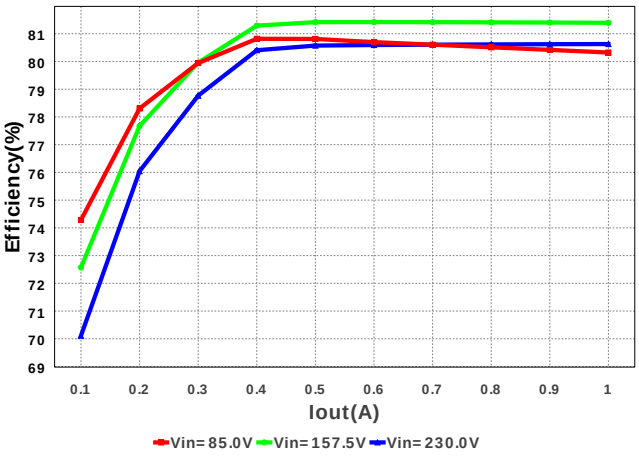
Peak Rectified Vin



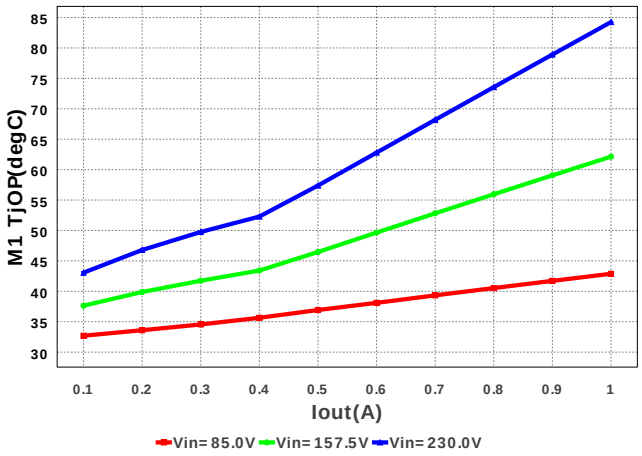
Diode2 Pd



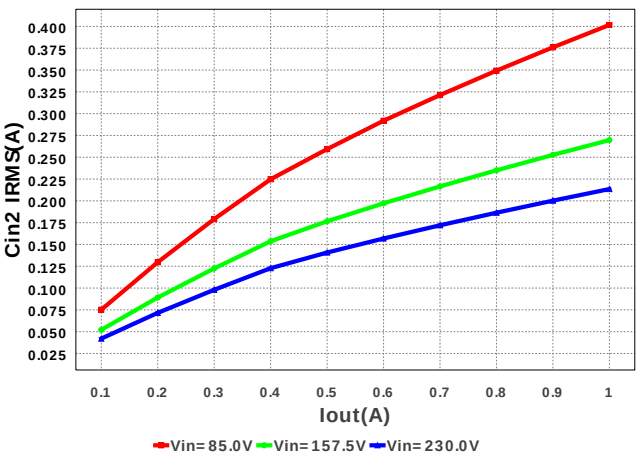
Efficiency



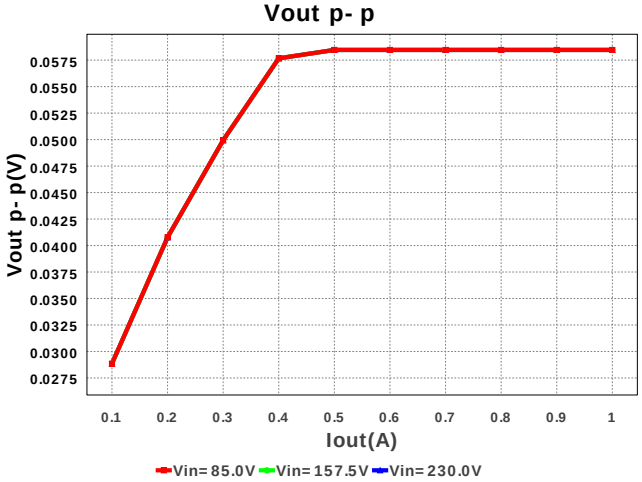
M1 TjOP



Cin2 IRMS



Vout p- p



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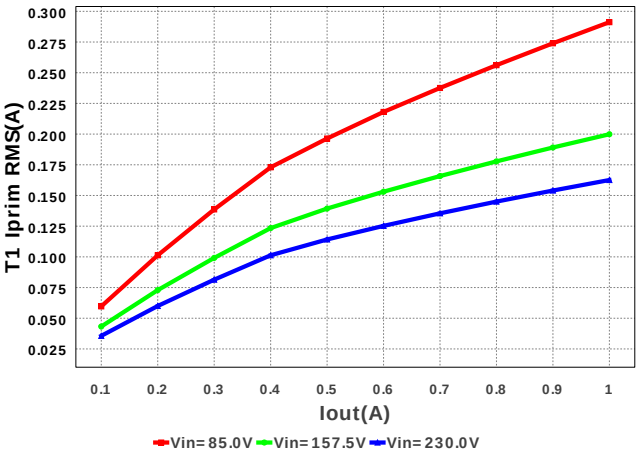
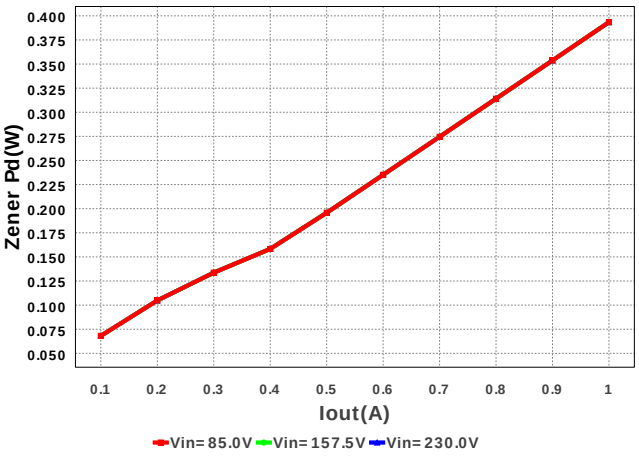
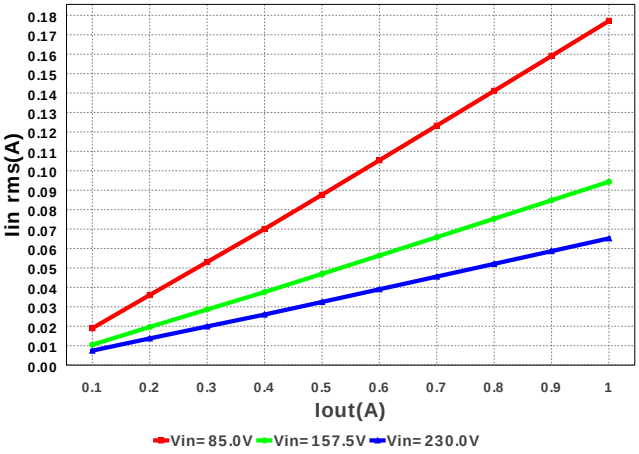
T1 Iprim RMS



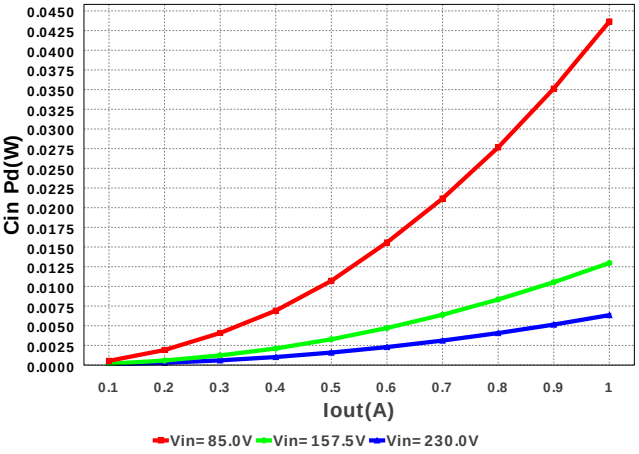
Zener Pd



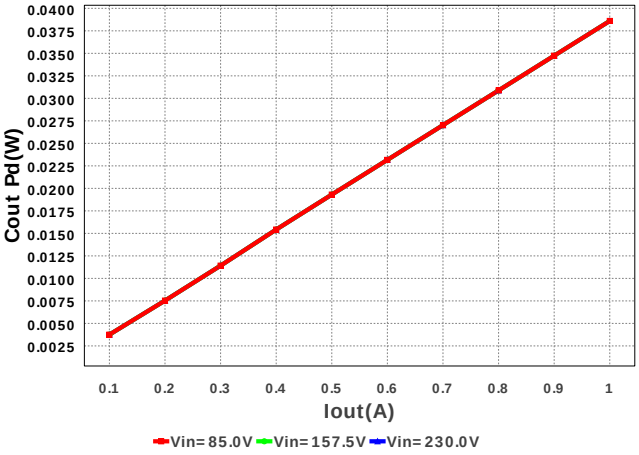
Iin rms



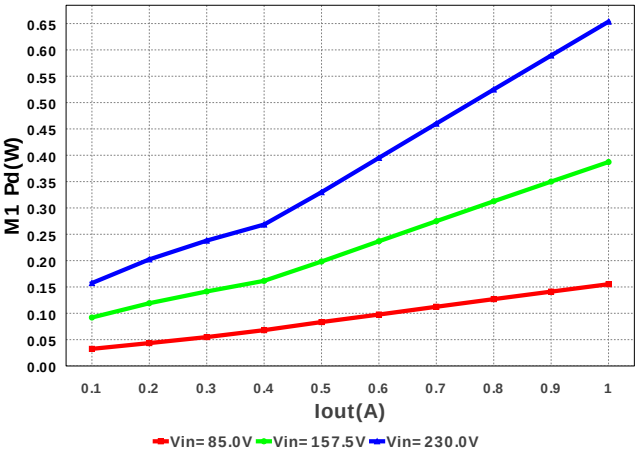
Cin Pd



Cout Pd



M1 Pd



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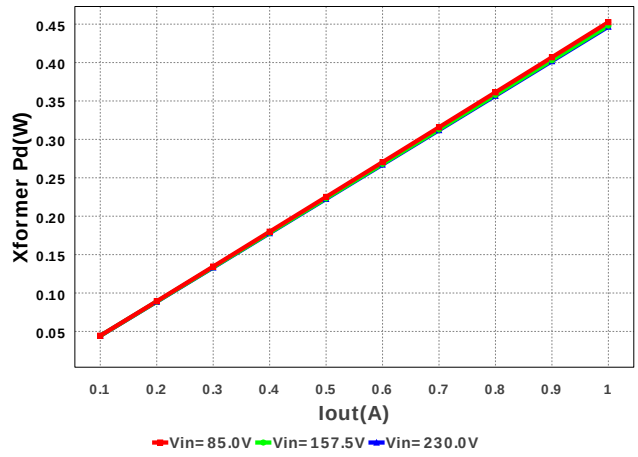
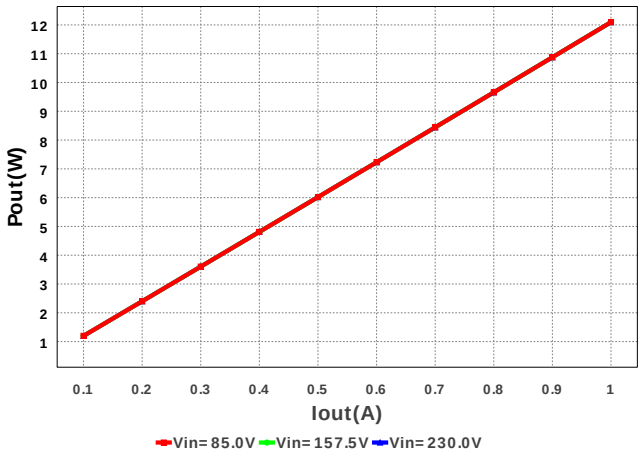
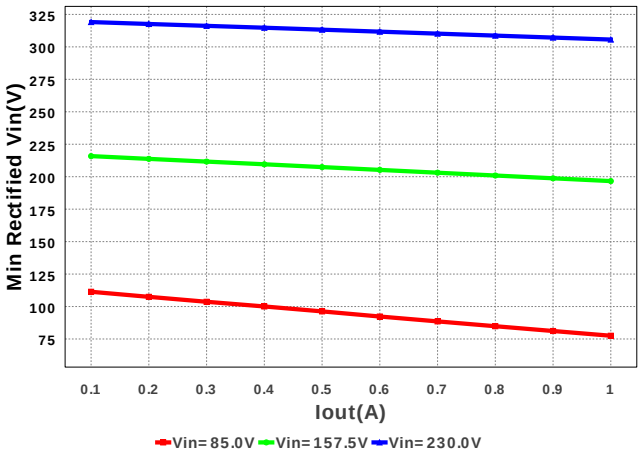
Xformer Pd



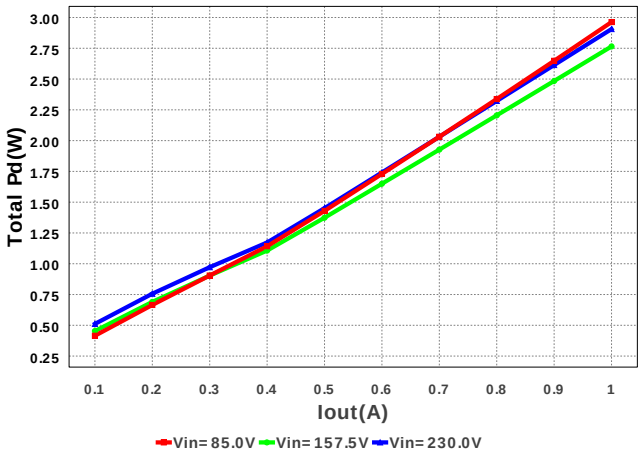
Pout



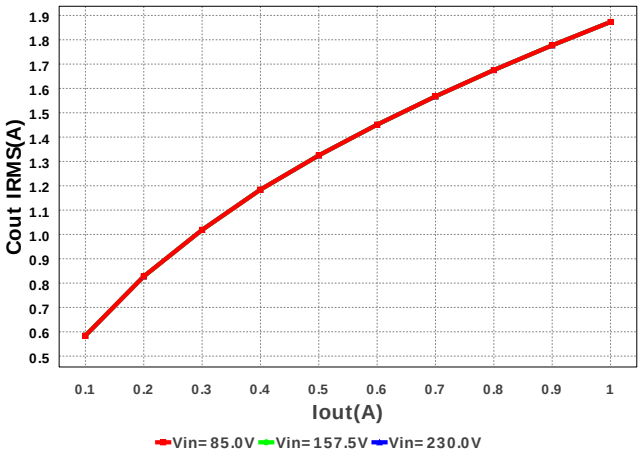
Min Rectified Vin



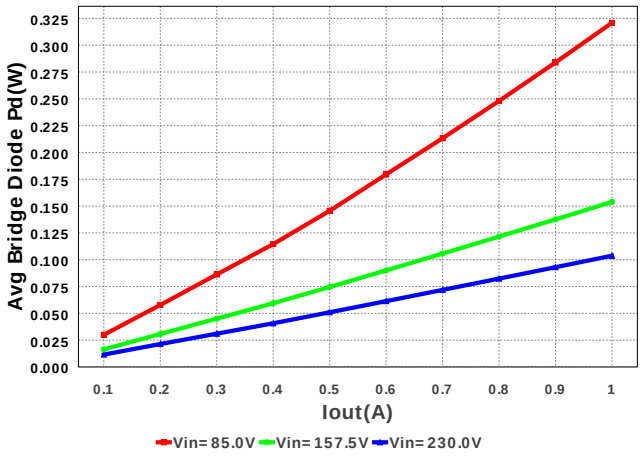
Total Pd



Cout IRMS



Avg Bridge Diode Pd



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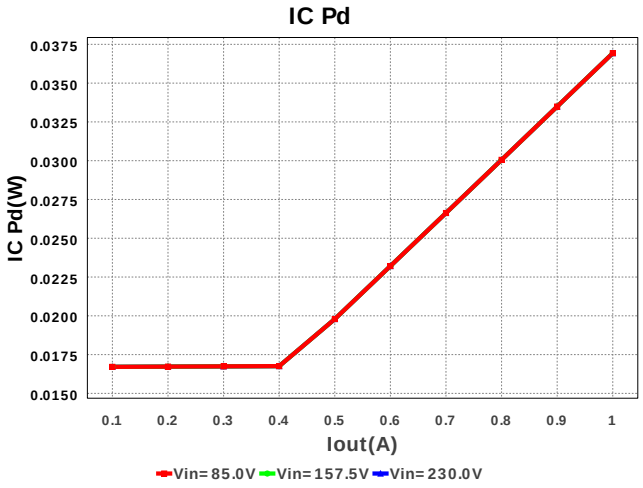

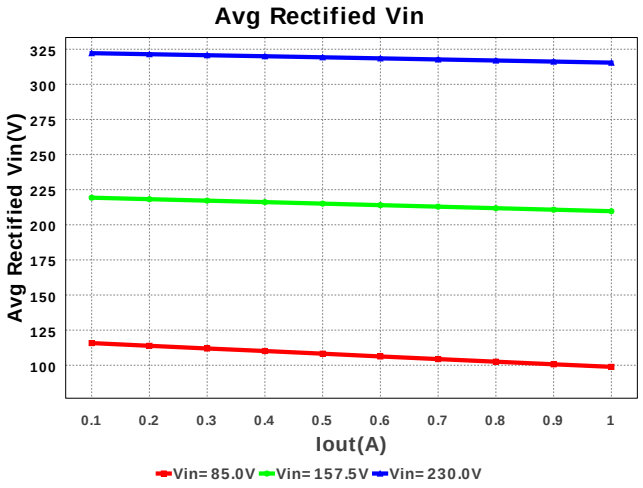

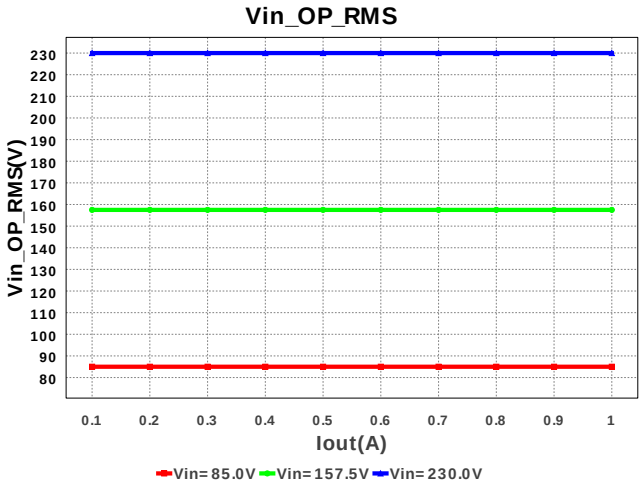

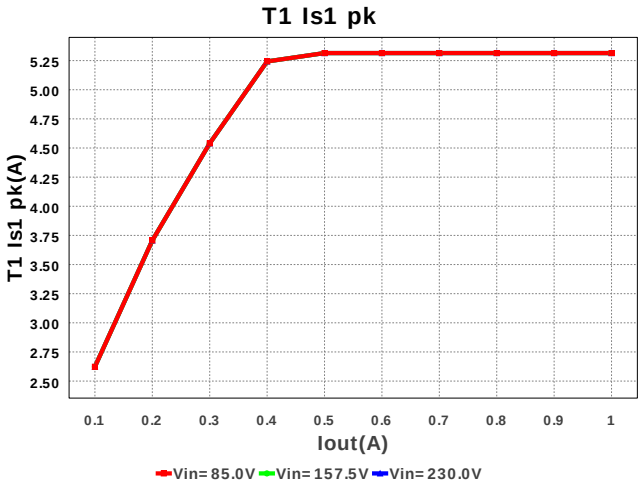

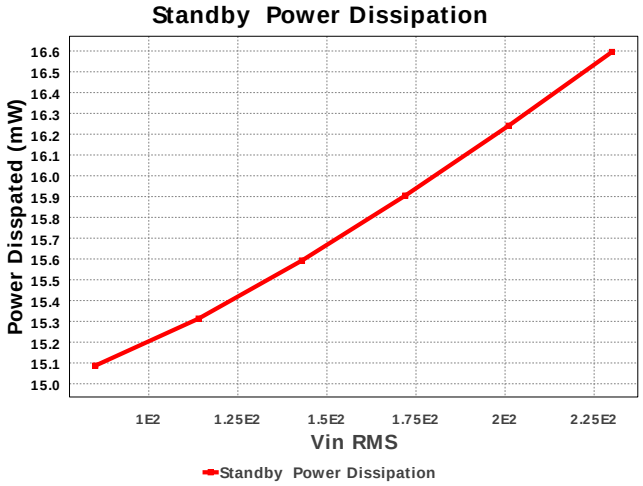

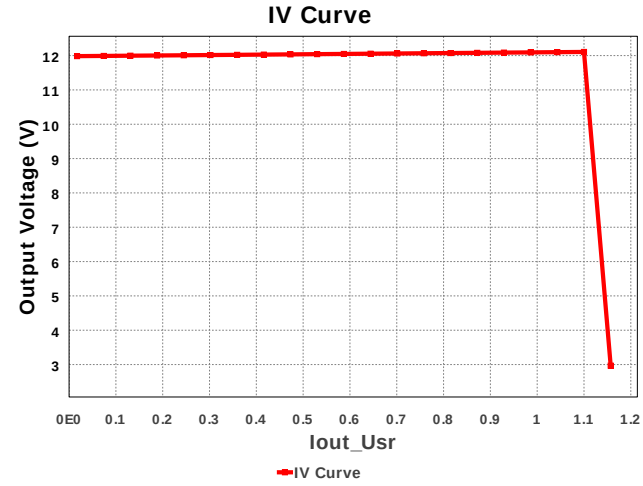

Operating Values

#	Name	Value	Category	Description
1.	Total BOM	$0.0		Total BOM Cost
2.	Cin IRMS	57.652 mA	Current	Input capacitor RMS ripple current
3.	Cin2 IRMS	213.516 mA	Current	Input capacitor2 RMS ripple current
4.	Cout IRMS	1.873 A	Current	Output capacitor RMS ripple current
5.	Iin rms	65.222 mA	Current	RMS Input Current
6.	T1 Iprim RMS	162.584 mA	Current	Transformer Primary RMS Current
7.	T1 Iprim pk	857.143 mA	Current	Transformer Primary Peak Current
8.	T1 Is1 RMS	1.883 A	Current	Transformer Secondary1 RMS Current
9.	T1 Is1 pk	5.315 A	Current	Transformer Secondary1 Peak Current
10.	Avg Rectified Vin	315.451 V	General	Average Rectified Voltage for the AC Line Period
11.	BOM Count	1	General	Total Design BOM count

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#	Name	Value	Category	Description
12.	FootPrint	1.344 kmm2	General	Total Foot Print Area of BOM components
13.	Pout	12.095 W	General	Total output power
14.	Vout OP	12.095 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	10.794 %	Op_point	Duty cycle
16.	Efficiency	80.628 %	Op_point	Steady state efficiency
17.	Frequency	80.227 kHz	Op_point	Switching frequency
18.	IC Tj	35.226 degC	Op_point	IC junction temperature
19.	ICThetaJA	141.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	1.0 A	Op_point	Iout operating point
21.	M1 TjOP	84.254 degC	Op_point	M1 MOSFET junction temperature
22.	Min Rectified Vin	305.636 V	Op_point	Minimum voltage seen at rectified input
23.	Peak Rectified Vin	325.266 V	Op_point	Peak voltage seen at rectified input
24.	Vin_OP_RMS	230.0 V	Op_point	AC Input RMS Voltage
25.	Vout p-p	58.461 mV	Op_point	Peak-to-peak output ripple voltage
26.	Avg Bridge Diode Pd	103.707 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
27.	Cin Pd	6.348 mW	Power	Input capacitor power dissipation
28.	Cout Pd	38.599 mW	Power	Output capacitor power dissipation
29.	Diode2 Pd	850.438 mW	Power	Diode2 power dissipation
30.	IC Pd	36.93 mW	Power	IC power dissipation
31.	M1 Pd	653.663 mW	Power	M1 MOSFET total power dissipation
32.	Total Pd	2.906 W	Power	Total Power Dissipation
33.	Xformer Pd	446.736 mW	Power	Transformer power dissipation
34.	Zener Pd	393.416 mW	Power	Zener power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.0 A	Maximum Output Current
2.	Iout1	1.0 Amps	Output Current #1
3.	VinMax	230.0 V	Maximum input voltage
4.	VinMin	85.0 V	Minimum input voltage
5.	Vout	12.0 V	Output Voltage
6.	Vout1	12.0 Volt	Output Voltage #1
7.	base_pn	UCC28710	Base Product Number
8.	source	DC	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. **UCC28710** Product Folder : http://www.ti.com/product/ucc28710 : contains the data sheet and other resources.

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You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.

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