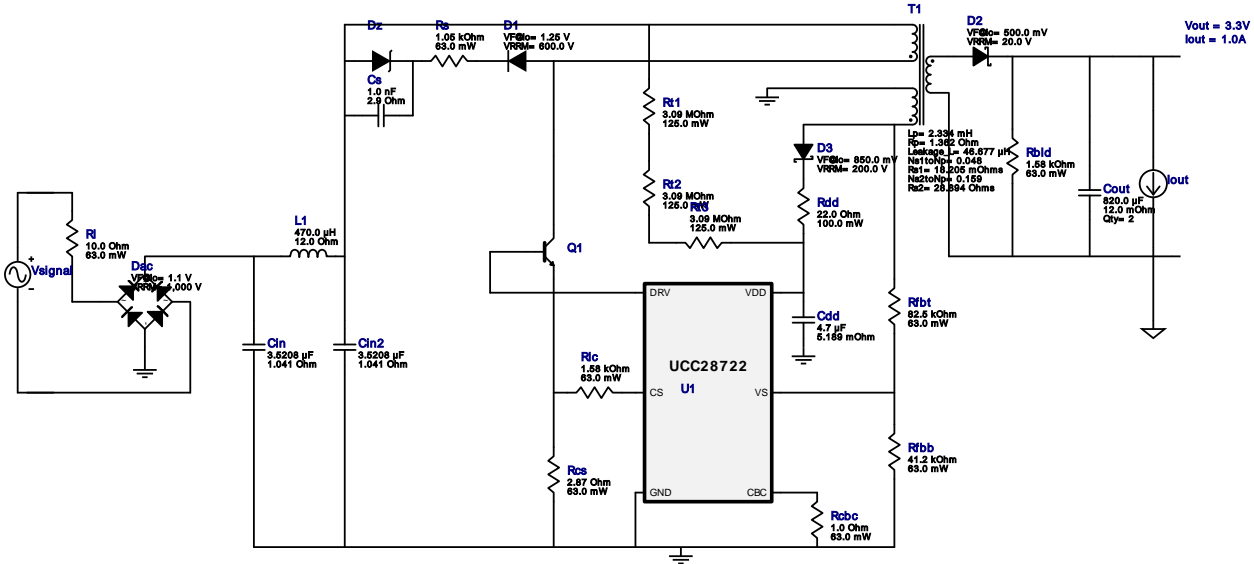


# WEBENCH® Design Report

Design : 3851011/38 UCC28722DBVR  
 UCC28722DBVR 85.0V-265.0V to 3.56V @ 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.


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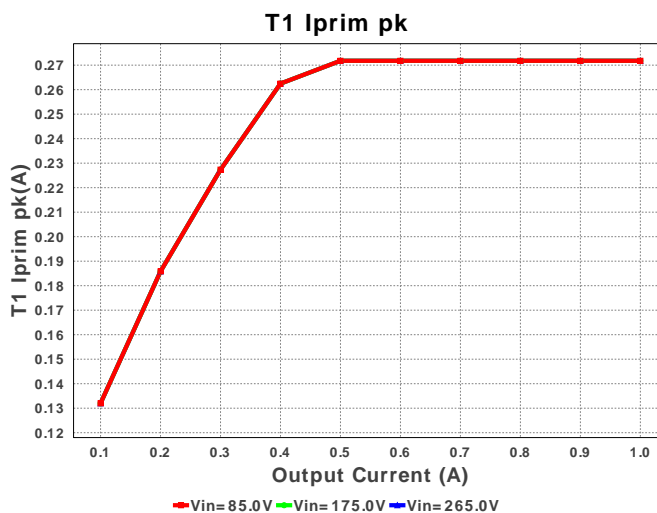
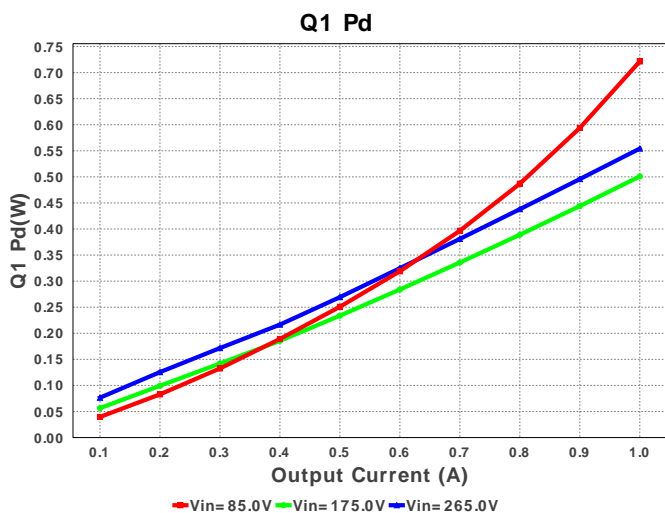
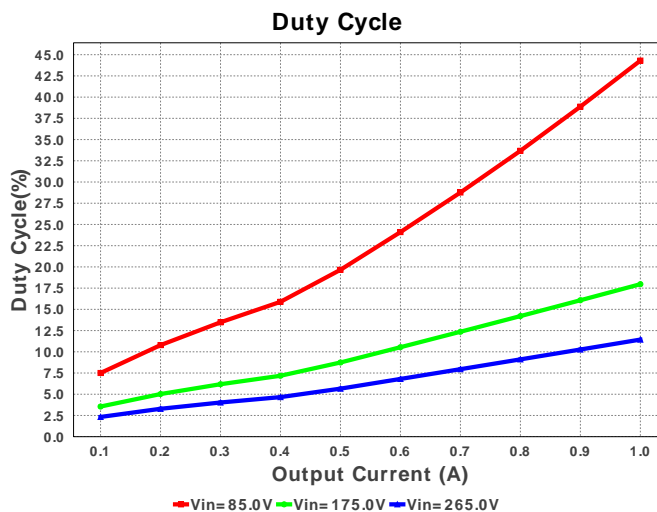
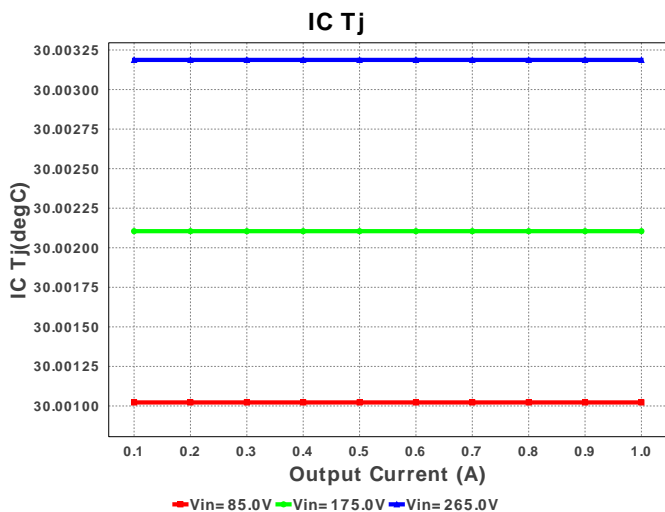
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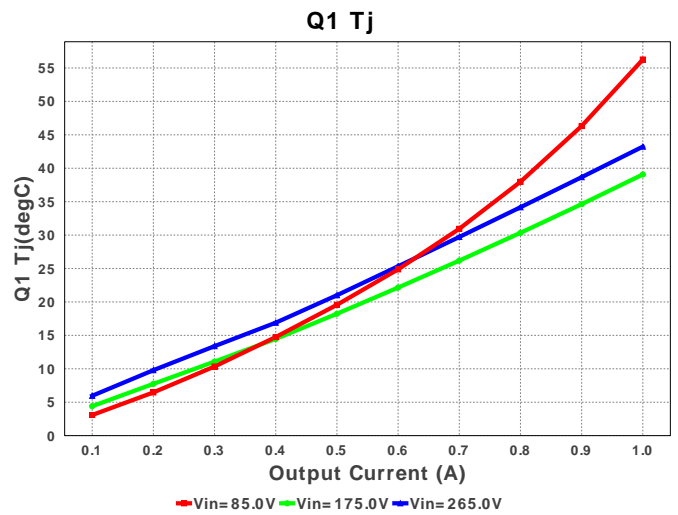
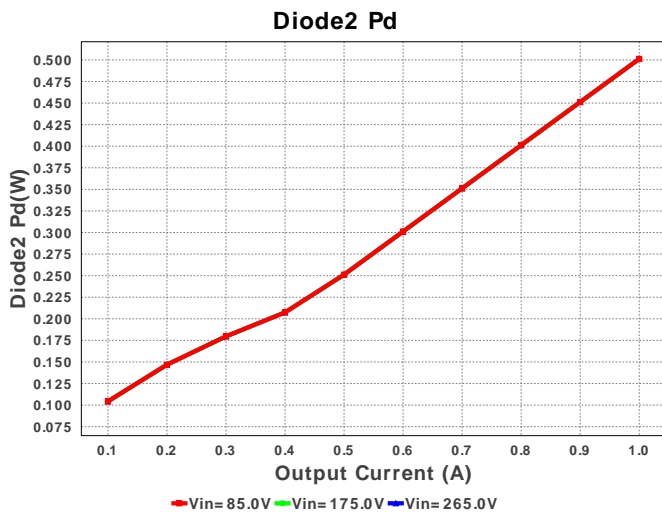
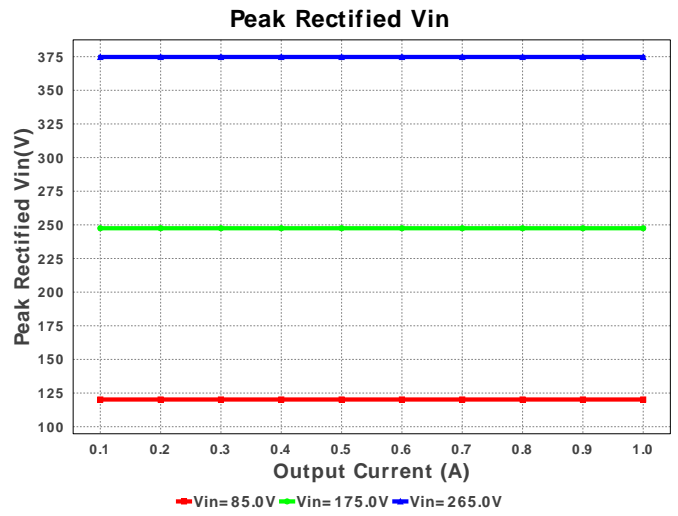
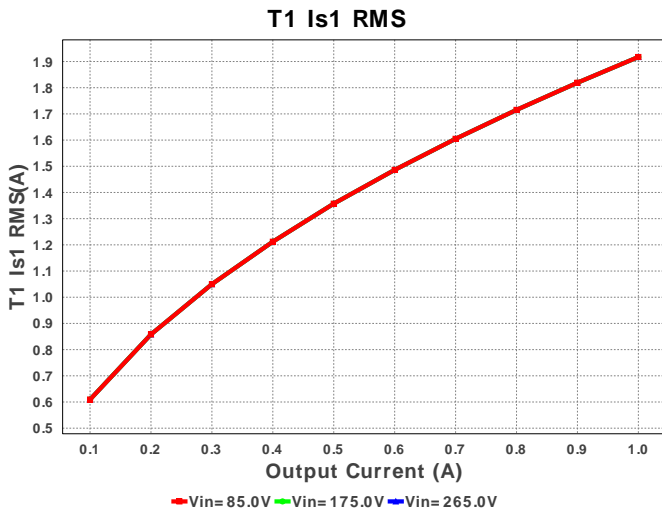
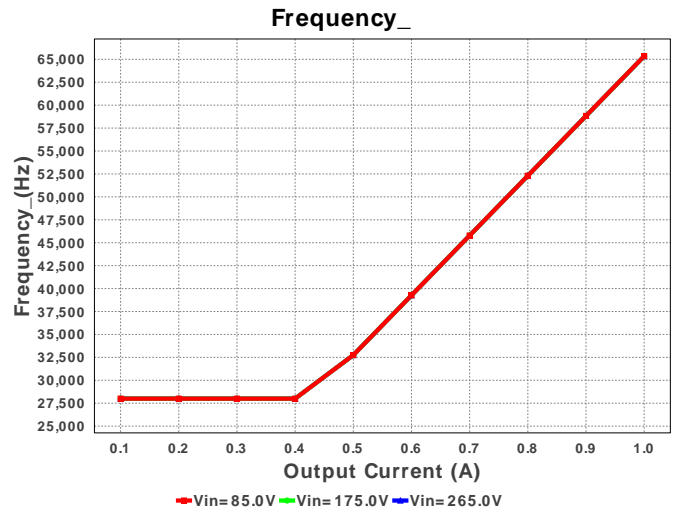
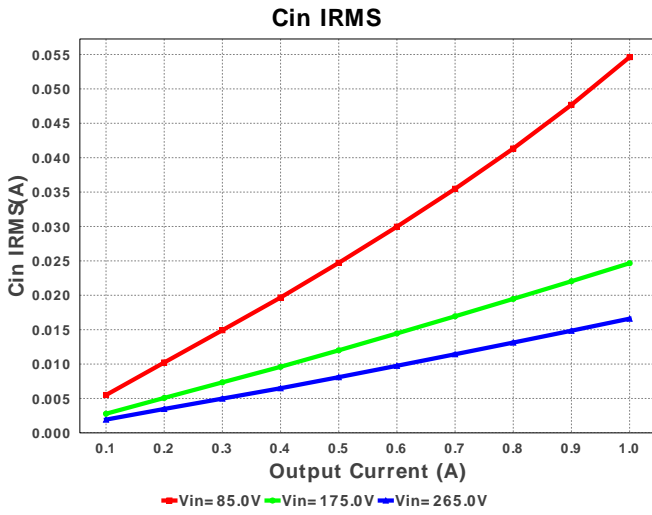
## Electrical BOM

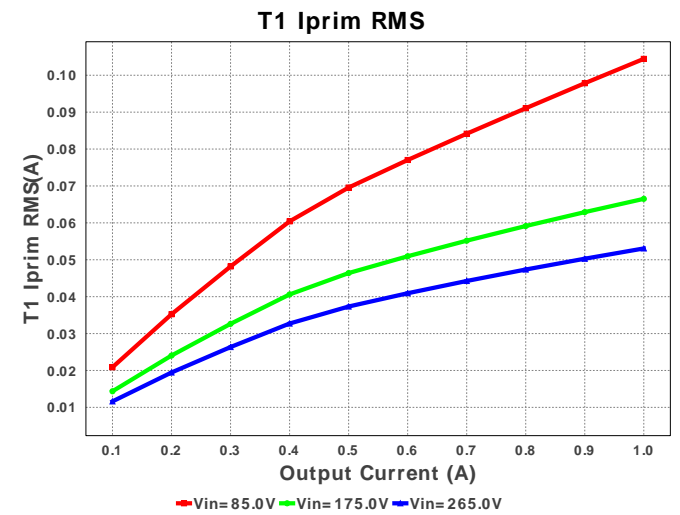
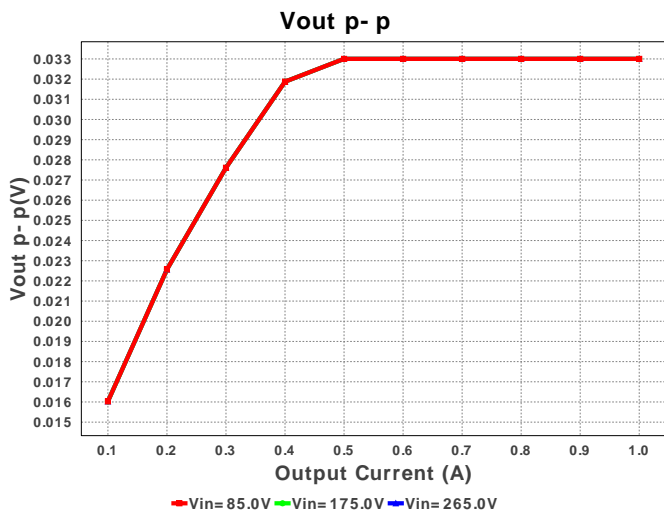
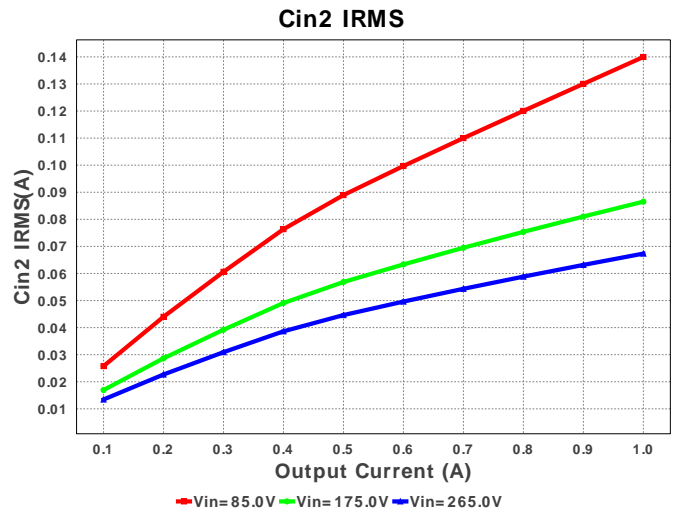
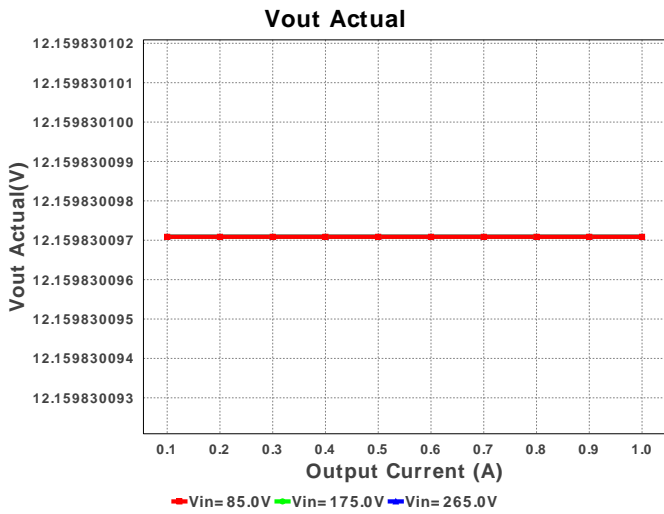
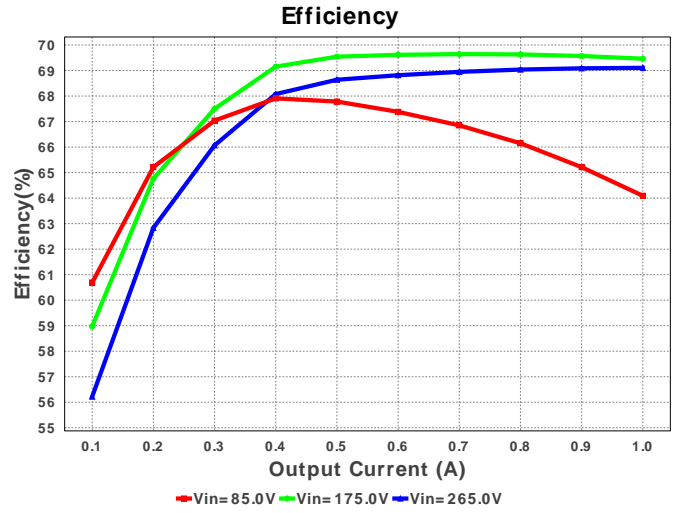
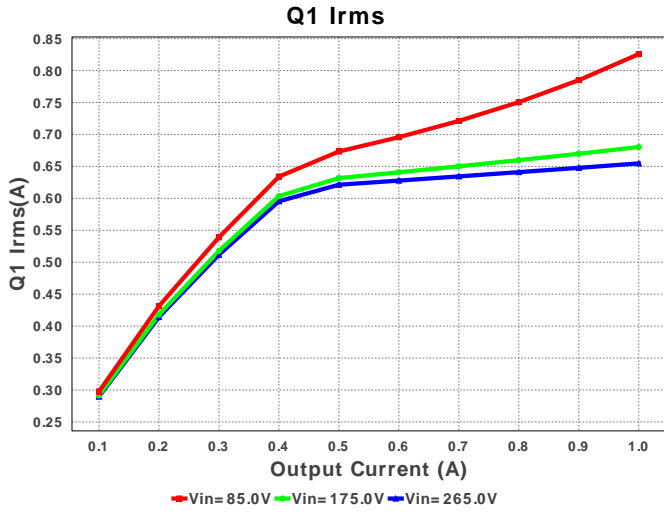
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1.	Cdd	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	\$0.02	0805 7 mm <sup>2</sup>
2.	Cin	CUSTOM	CUSTOM Series= ?	Cap= 3.5208 uF ESR= 1.04086 Ohm VDC= 562.14 V IRMS= 173.75 mA	1	NA	CUSTOM 0 mm <sup>2</sup>
3.	Cin2	CUSTOM	CUSTOM Series= ?	Cap= 3.5208 uF ESR= 1.04086 Ohm VDC= 562.14 V IRMS= 173.75 mA	1	NA	CUSTOM 0 mm <sup>2</sup>
4.	Cout	Panasonic	6SVPC820M Series= SVPC	Cap= 820.0 uF ESR= 12.0 mOhm VDC= 6.3 V IRMS= 4.7 A	2	\$0.72	SM_RADIAL_8MM 113 mm <sup>2</sup>
5.	Cs	MuRata	GRM188R72E102KW07D Series= X7R	Cap= 1.0 nF ESR= 2.9 Ohm VDC= 250.0 V IRMS= 90.0 mA	1	\$0.01	0603 5 mm <sup>2</sup>
6.	D1	Diodes Inc.	MURS160-13-F	VF@Io= 1.25 V VRRM= 600.0 V	1	\$0.11	SMB 44 mm <sup>2</sup>

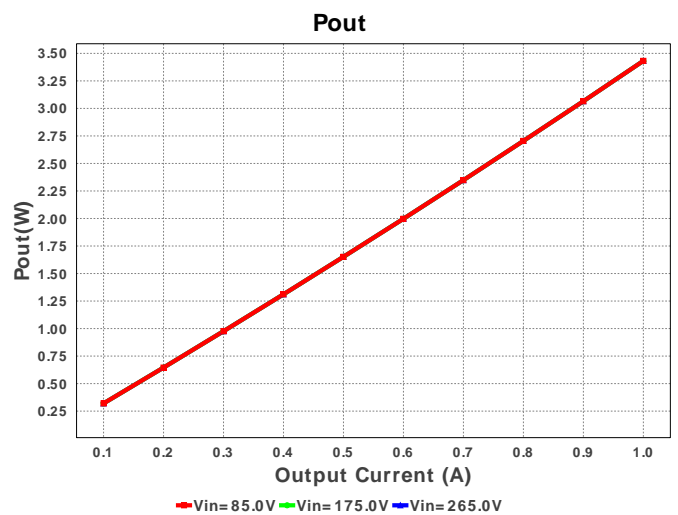
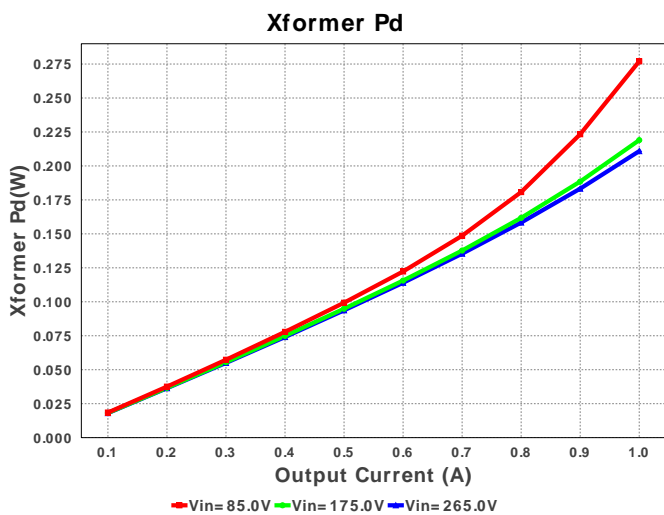
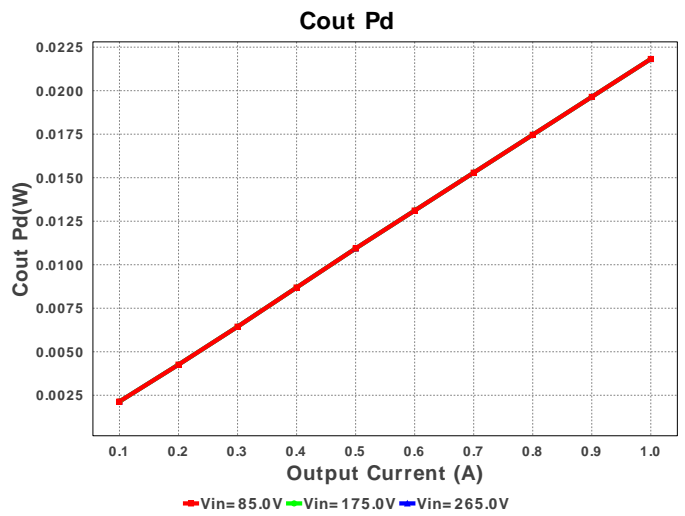
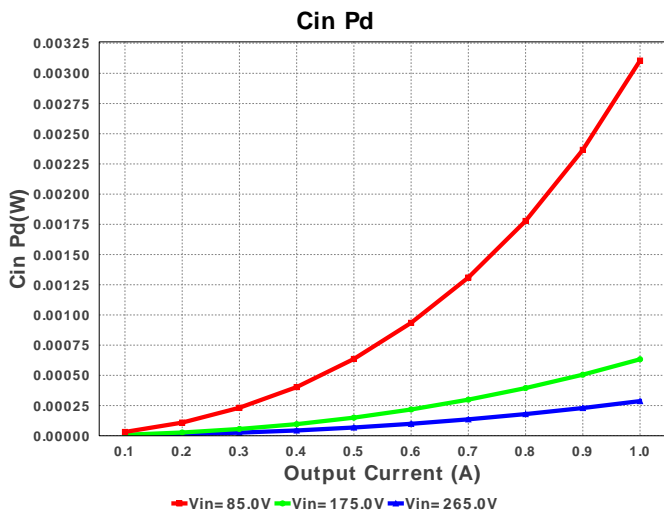
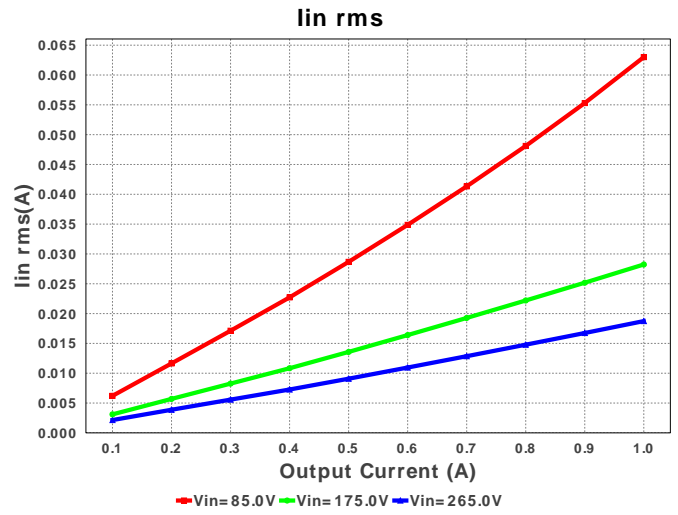
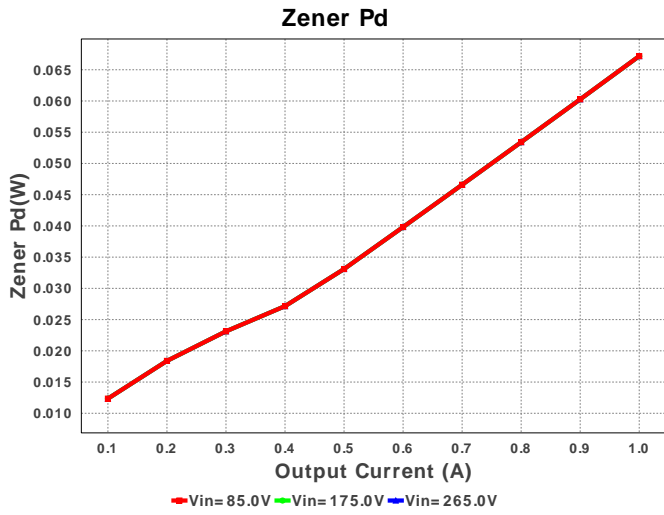
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	D2	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	\$0.08	 SMB 44 mm <sup>2</sup>
8.	D3	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	\$0.21	 PowerDI123 13 mm <sup>2</sup>
9.	Dac	Vishay-Semiconductor	DF10SA	VF@Io= 1.1 V VRRM= 1,000.0 V	1	\$0.24	 DF-S 99 mm <sup>2</sup>
10.	Dz	ON Semiconductor	MMBZ5270BLT1G	Zener	1	\$0.03	 SOT-23 14 mm <sup>2</sup>
11.	L1	NIC Components	NPI32C471MTRF	L= 470.0 µH DCR= 12.0 Ohm	1	\$0.08	 IND_NPI32C 21 mm <sup>2</sup>
12.	Q1	STMicroelectronics	STN2580	Bipolar Transistor	1	\$0.19	 SOT-223 76 mm <sup>2</sup>
13.	Rbld	Vishay-Dale	CRCW04021K58FKED Series= CRCW..e3	Res= 1.58 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
14.	Rcbc	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
15.	Rcs	Vishay-Dale	CRCW04022R87FKED Series= CRCW..e3	Res= 2.87 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
16.	Rdd	Yageo America	RC0603FR-0722RL Series= ?	Res= 22.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm <sup>2</sup>
17.	Rfbb	Vishay-Dale	CRCW040241K2FKED Series= CRCW..e3	Res= 41.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
18.	Rfbt	Vishay-Dale	CRCW040282K5FKED Series= CRCW..e3	Res= 82.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
19.	RI	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
20.	Rlc	Vishay-Dale	CRCW04021K58FKED Series= CRCW..e3	Res= 1.58 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
21.	Rs	Vishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
22.	Rt1	Vishay-Dale	CRCW08053M09FKEA Series= CRCW..e3	Res= 3.09 MOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
23.	Rt2	Vishay-Dale	CRCW08053M09FKEA Series= CRCW..e3	Res= 3.09 MOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>
24.	Rt3	Vishay-Dale	CRCW08053M09FKEA Series= CRCW..e3	Res= 3.09 MOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm <sup>2</sup>

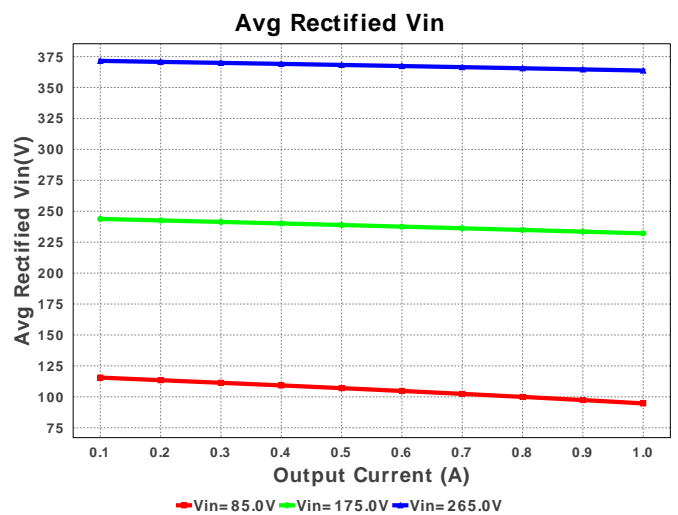
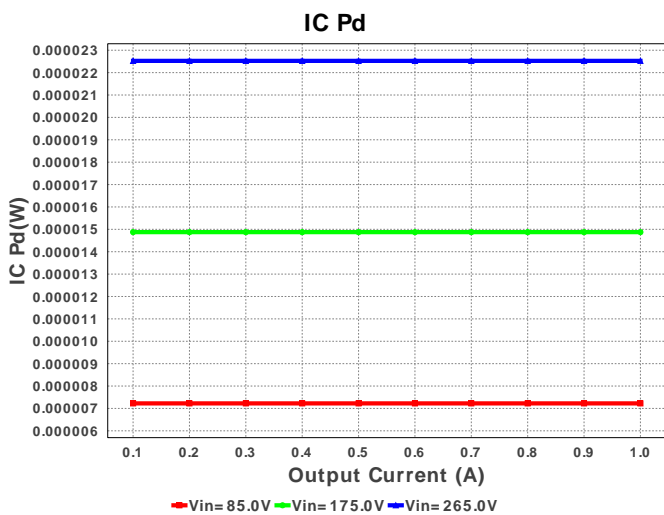
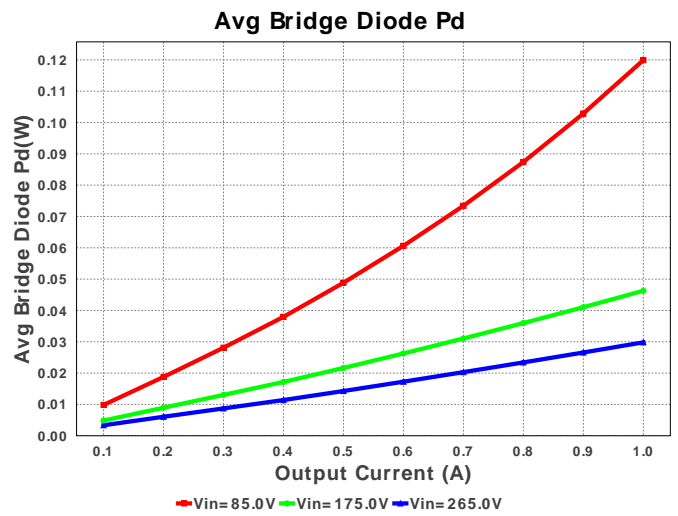
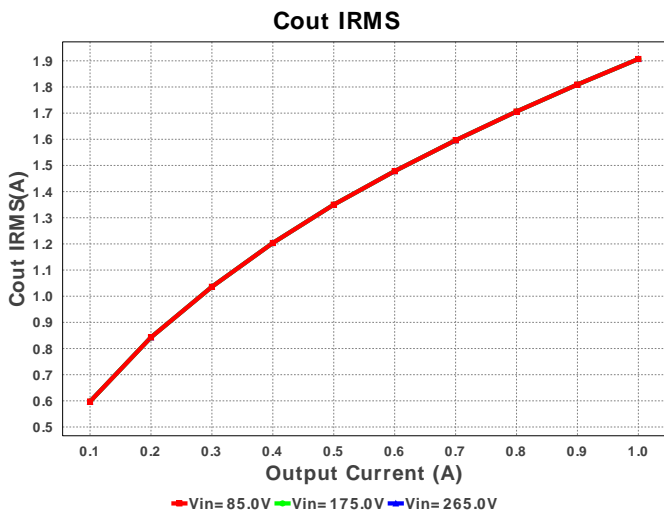
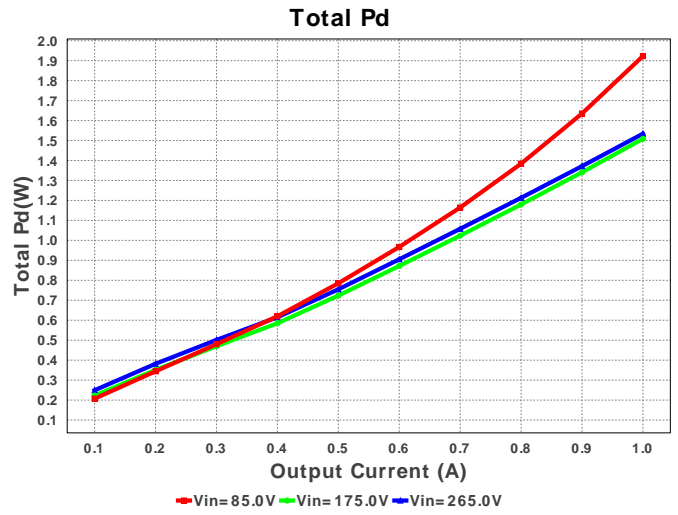
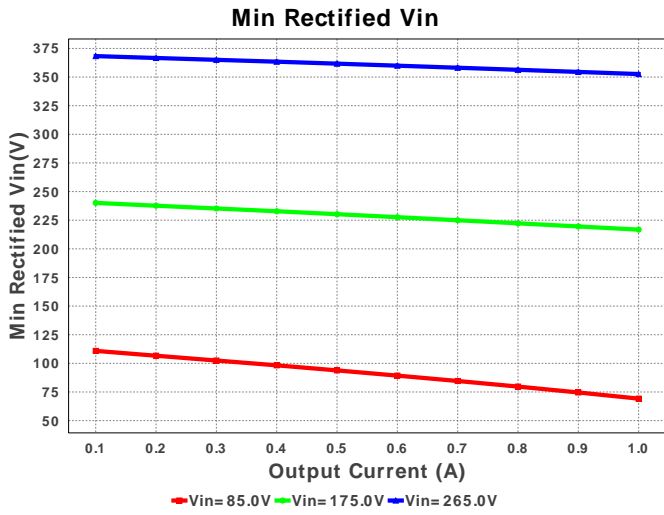
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25.	T1	CUSTOM	CUSTOM	Lp= 2.334 mH Rp= 1.362 Ohm Leakage_L= 46.677 $\mu$ H Ns1toNp= 0.048 Rs1= 18.205 mOhms Ns2toNp= 0.159 Rs2= 28.894 Ohms	1	NA	CUSTOM 0 mm <sup>2</sup>
26.	U1	Texas Instruments	UCC28722DBVR	Switcher	1	\$0.25	 R-PDSO-G7 55 mm <sup>2</sup>

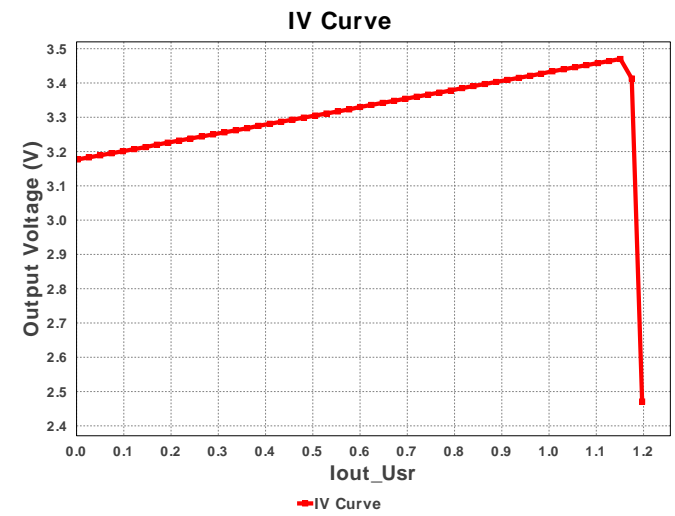
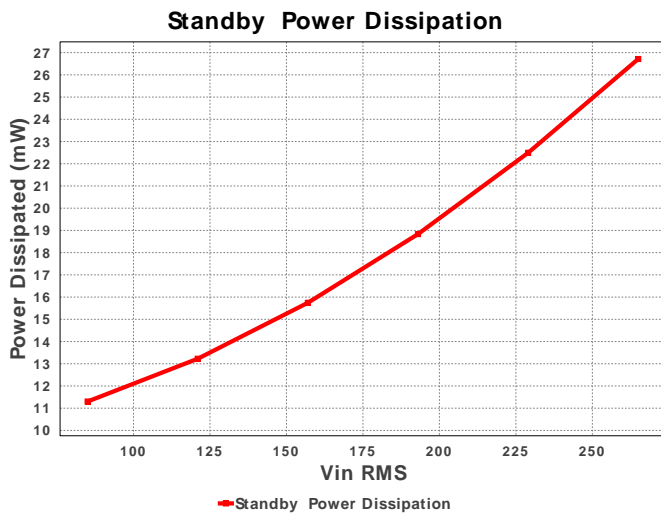
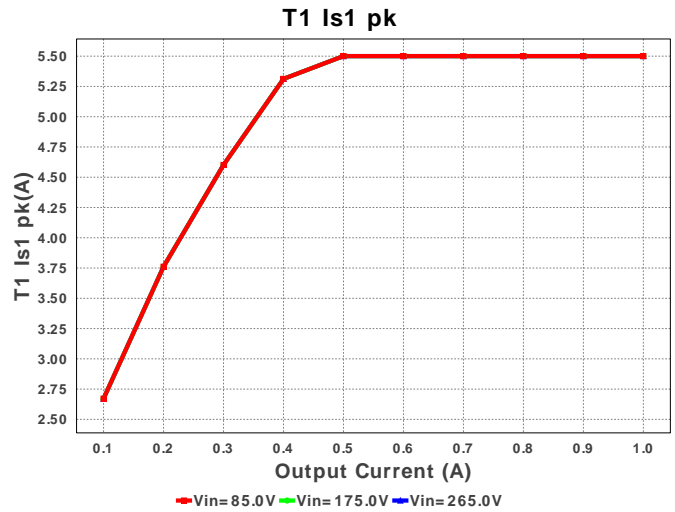
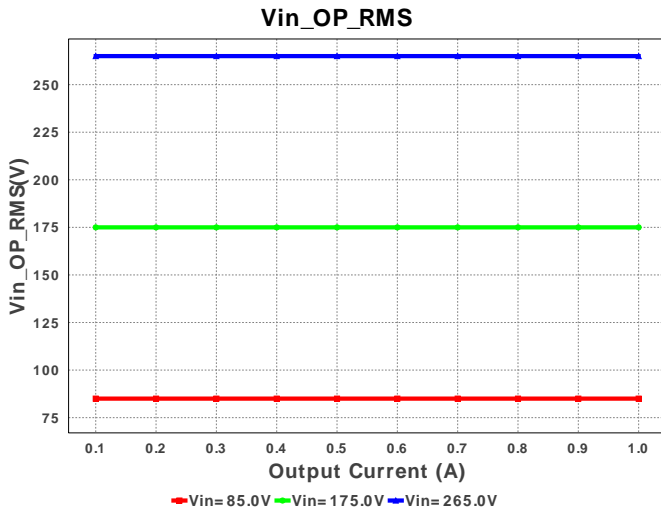












### Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	15.423 mA	Current	Input capacitor RMS ripple current
2.	Cin2 IRMS	65.105 mA	Current	Input Capacitor Cin2 RMS Ripple Current
3.	Cout IRMS	1.916 A	Current	Output capacitor RMS ripple current
4.	Iin rms	17.347 mA	Current	RMS Input Current
5.	Q1 Irms	678.551 mA	Current	Q1 RMS current
6.	T1 Iprim RMS	51.851 mA	Current	Transformer Primary RMS Current
7.	T1 Iprim pk	271.777 mA	Current	Transformer Primary Peak Current
8.	T1 Is1 RMS	1.926 A	Current	Transformer Secondary1 RMS Current
9.	T1 Is1 pk	5.552 A	Current	Transformer Secondary1 Peak Current
10.	Avg Rectified Vin	364.728 V	General	Average Rectified Voltage for the AC Line Period
11.	BOM Count	27	General	Total Design BOM count
12.	FootPrint	726.0 mm <sup>2</sup>	General	Total Foot Print Area of BOM components
13.	Mode	DCM	General	Conduction Mode
14.	Pout	3.556 W	General	Total output power
15.	Total BOM	\$0.0	General	Total BOM Cost
16.	Q1 Tj	27.196 degC	Op_Point	Q1 Junction Temperature
17.	Vout Actual	12.16 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
18.	Vout OP	3.556 V	Op_Point	Operational Output Voltage
19.	Duty Cycle	10.92 %	Op_point	Duty cycle
20.	Efficiency	77.354 %	Op_point	Steady state efficiency
21.	Frequency	62.274 kHz	Op_point	Switching frequency
22.	IC Tj	30.001 degC	Op_point	IC junction temperature
23.	ICThetaJA	70.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	1.0 A	Op_point	Iout operating point
25.	Min Rectified Vin	354.692 V	Op_point	Minimum voltage seen at rectified input
26.	Peak Rectified Vin	374.763 V	Op_point	Peak voltage seen at rectified input
27.	Vin_OP_RMS	265.0 V	Op_point	AC Input RMS Voltage
28.	Vout p-p	33.31 mV	Op_point	Peak-to-peak output ripple voltage
29.	Avg Bridge Diode Pd	16.664 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
30.	Cin Pd	247.582 μW	Power	Input capacitor power dissipation
31.	Cout Pd	22.022 mW	Power	Output capacitor power dissipation



#	Name	Value	Category	Description
32.	Diode2 Pd	376.345 mW	Power	Diode2 power dissipation
33.	IC Pd	7.225 $\mu$ W	Power	IC power dissipation
34.	Q1 Pd	348.673 mW	Power	Q1 Power Dissipation
35.	Total Pd	1.041 W	Power	Total Power Dissipation
36.	Xformer Pd	192.313 mW	Power	Transformer power dissipation
37.	Zener Pd	17.605 mW	Power	Zener power dissipation
38.	Vout Tolerance	1.548 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

## Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	265.0	Maximum input voltage
3.	VinMin	85.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	line_fsw	50.0	Light Output in Lumen
6.	base_pn	UCC28722	Base Product Number
7.	source	AC	Input Source Type
8.	Ta	30.0	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. Rcbc Rcbc is used to set the amount of output voltage compensation to offset cable resistance. Connecting this resistor from the CBC pin to GND will program a current that is summed into the VS feedback divider, increasing the regulation voltage as Iout increases. Rcbc may be left unpopulated if voltage compensation is not required. Rfbt & Rfbb The feedback resistors will set the output voltage of the circuit. The values chosen may need to be finely tuned based on the final Transformer turns ratios and the voltage across the output diode at close to zero current. Clamping Diode at VDD pin Depending on the startup resistor, an additional zener diode connected to the VDD pin may be required at light load and high line conditions. This is to prevent the voltage at VDD from running away since the IC would not consume all the current that passes through the startup resistor. 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/ucc28722.pdf>

2. **UCC28722** Product Folder : <http://www.ti.com/product/UCC28722> : 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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