














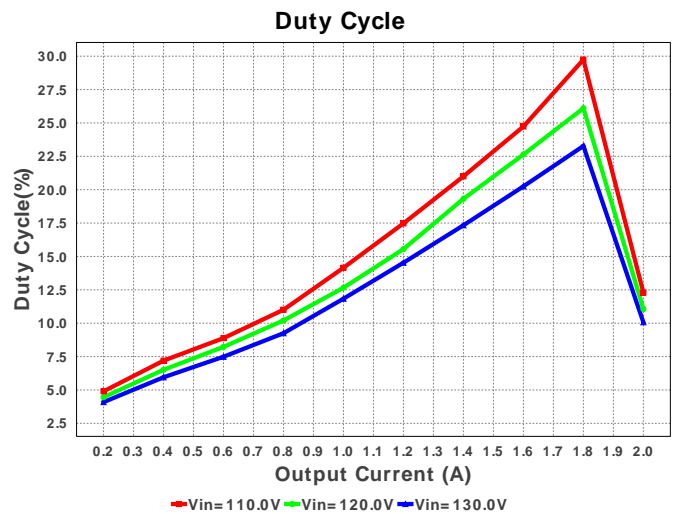
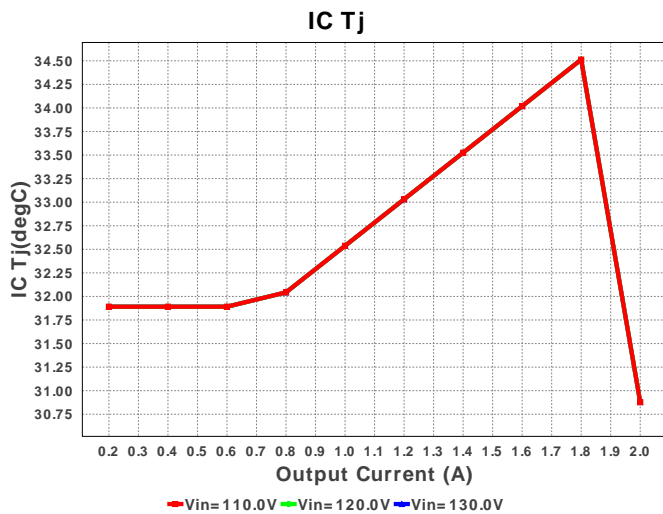
1. Rlc, Rtl and the feedback resistors for this design are a starting point, but may need adjustment based on the actual transformer used. For more information please click the design assistance button.
2. Click on the transformer symbol and select 'Design Transformer' to design using specific transformer cores and bobbin

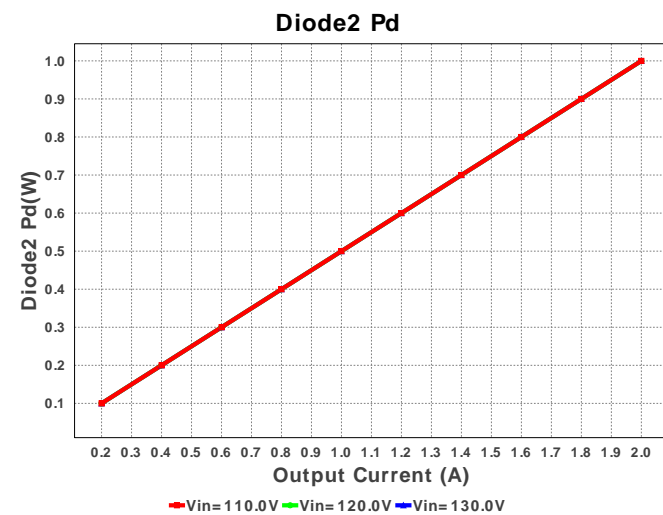
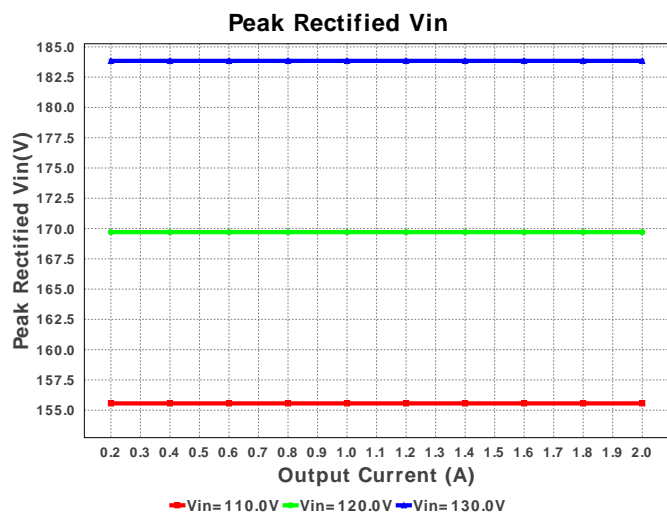
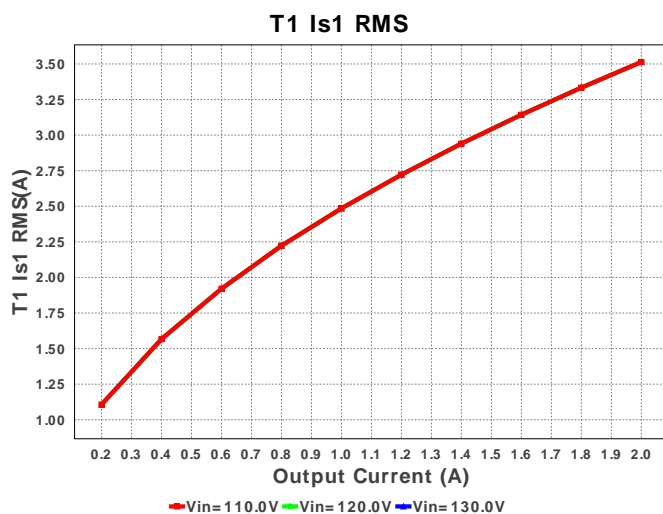
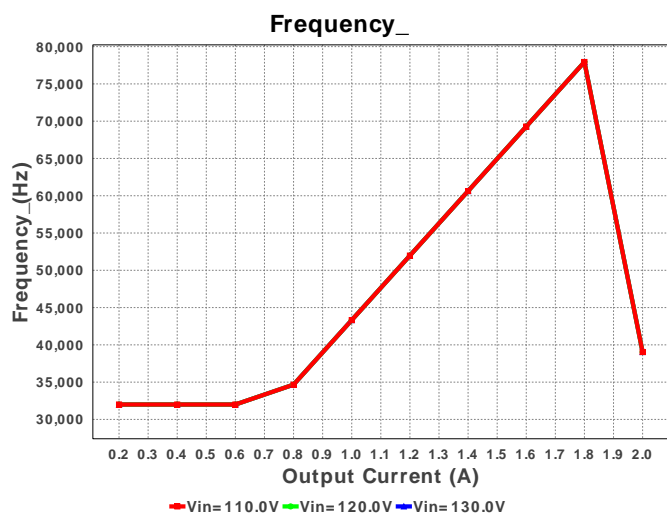
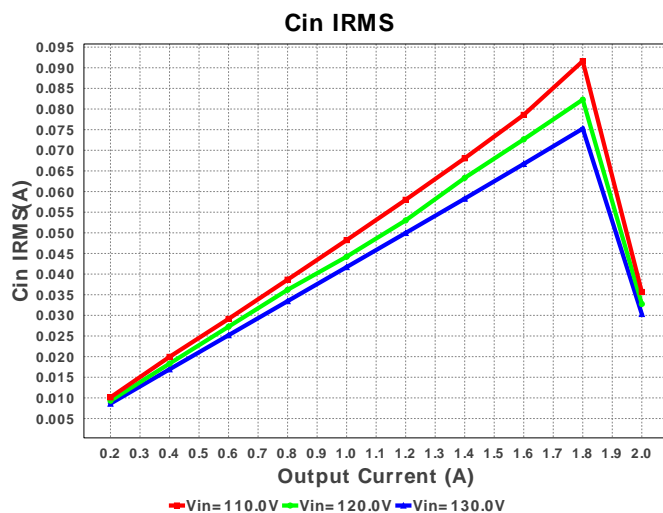
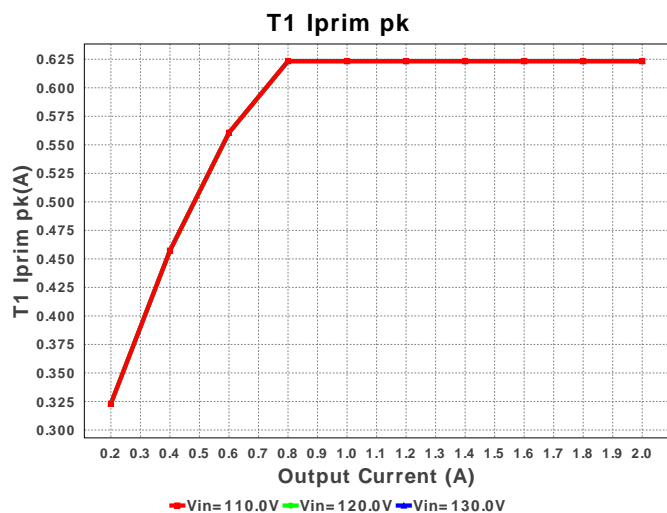
Electrical BOM

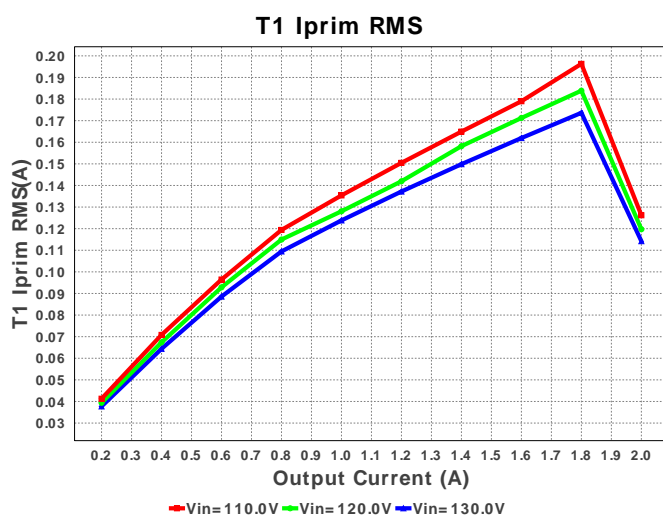
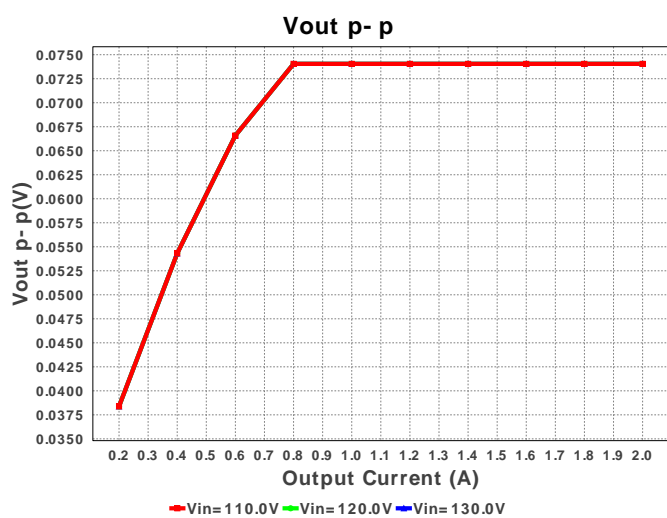
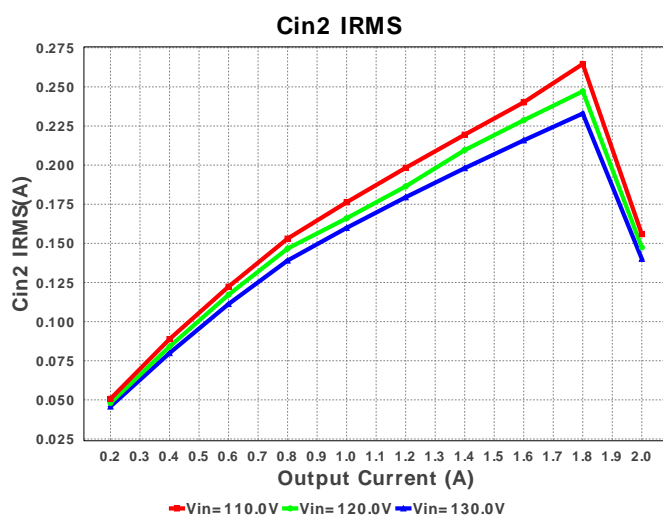
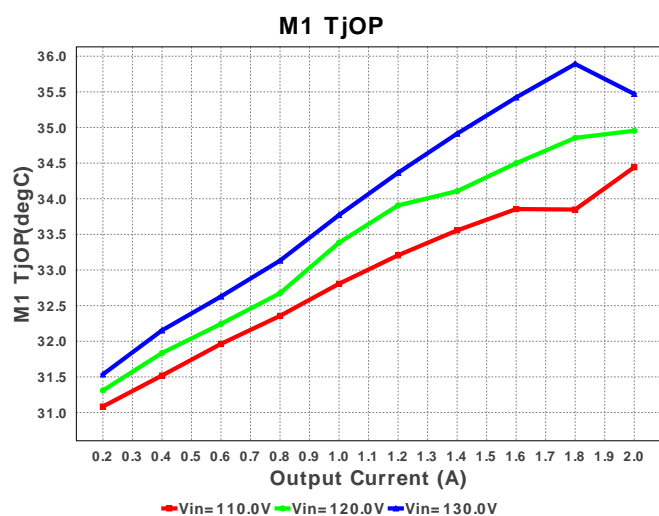
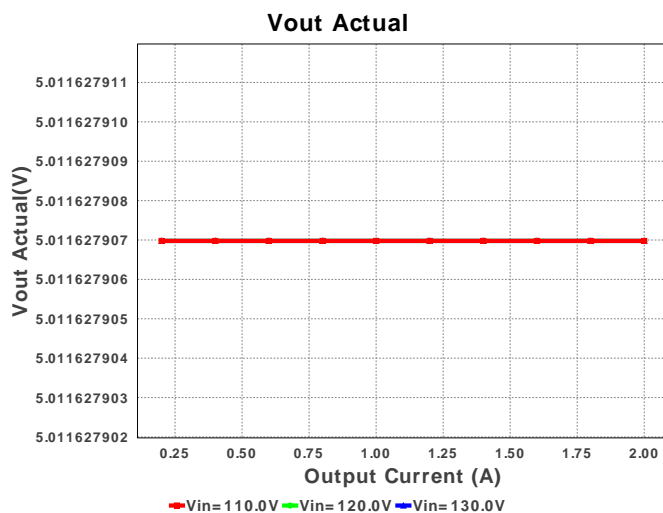
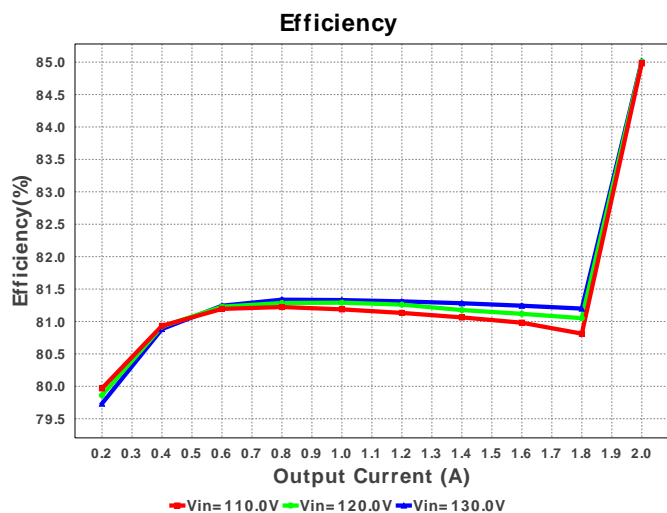
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccomp1	MuRata	GRM033R71C122KA01D Series= X7R	Cap= 1.2 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
2.	Cdd	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	\$0.07	 1206 11 mm ²
3.	Cfb3	MuRata	GRM033C80J473KE19D Series= X6S	Cap= 47.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
4.	Cin	MuRata	GRM55DR72E105KW01L Series= X7R	Cap= 1.0 uF ESR= 7.086 mOhm VDC= 250.0 V IRMS= 2.0605 A	5	\$0.26	 2220_200 54 mm ²
5.	Cin2	MuRata	GRM55DR72E105KW01L Series= X7R	Cap= 1.0 uF ESR= 7.086 mOhm VDC= 250.0 V IRMS= 2.0605 A	5	\$0.26	 2220_200 54 mm ²
6.	Cout	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	\$0.70	 CAPSMT_62_C10 74 mm ²
7.	Cout2	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	\$0.70	 CAPSMT_62_C10 74 mm ²
8.	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 ²

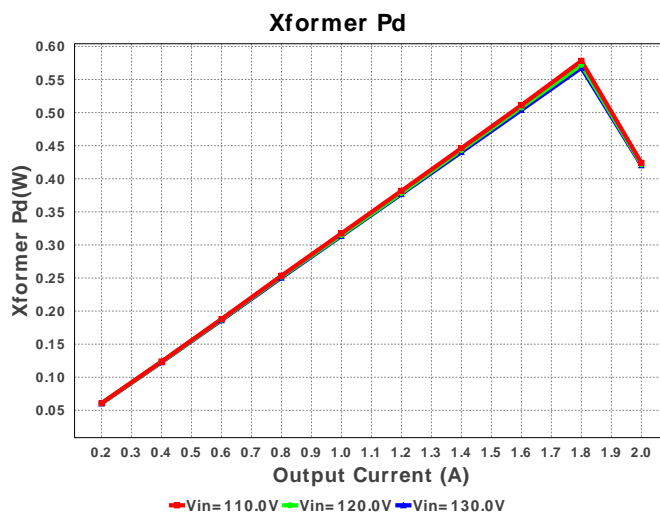
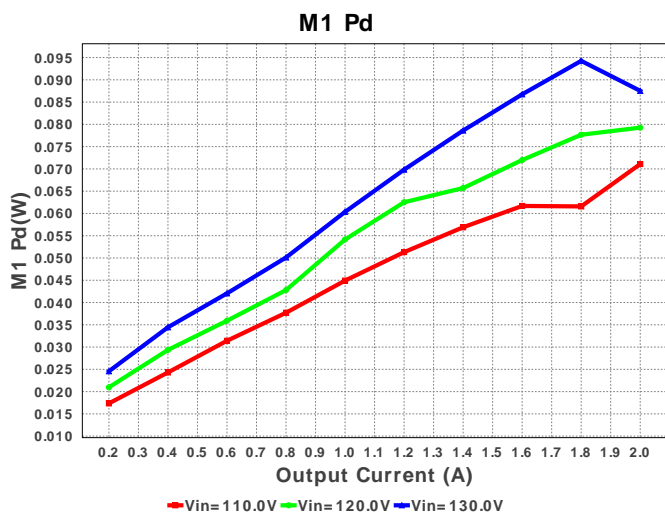
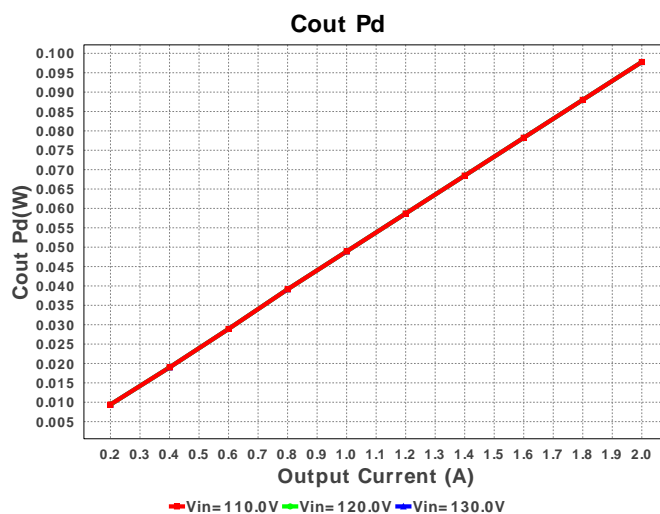
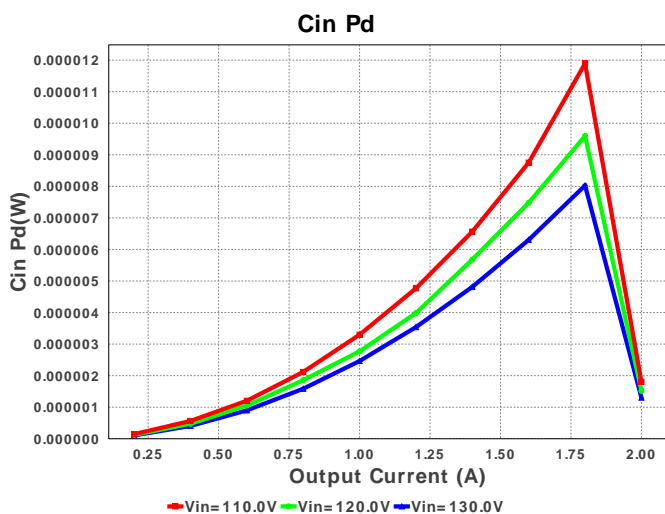
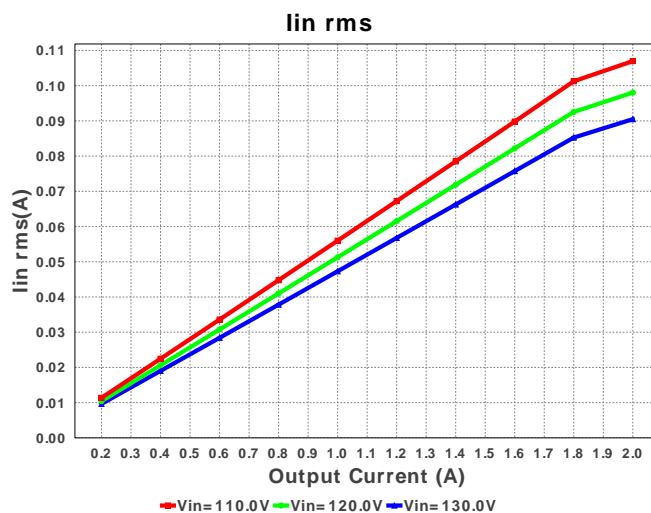
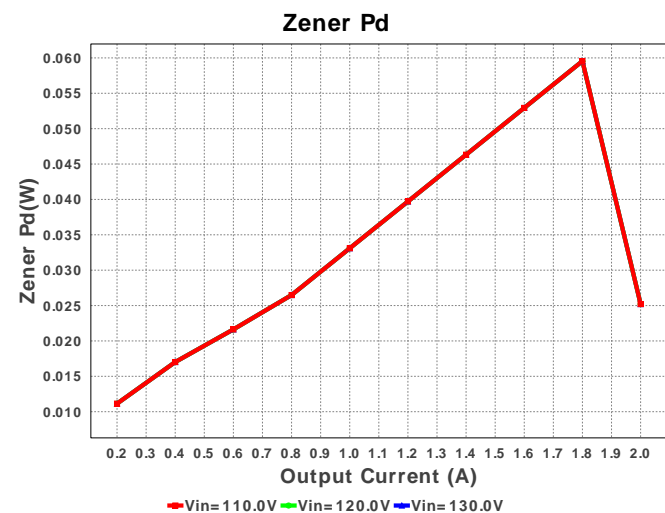
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	D1	Bourns	CD214B-F3600	VF@Io= 1.2 V VRRM= 600.0 V	1	\$0.14	 SMB 44 mm²
10.	D2	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.11	 SMA 37 mm²
11.	D3	Micro Commercial Components	ES1J-TP	VF@Io= 1.35 V VRRM= 600.0 V	1	\$0.08	 SMA 37 mm²
12.	Dac	Diodes Inc.	HD04-T	VF@Io= 1.0 V VRRM= 400.0 V	1	\$0.12	 MiniDIP 62 mm²
13.	Dz	ON Semiconductor	1SMB5951BT3G	Zener	1	\$0.10	 SMB 44 mm²
14.	L1	Bourns	SDR0403-471KL	L= 470.0 µH DCR= 7.0 Ohm	1	\$0.18	 SDR0403 28 mm²
15.	L2	TDK	MLP2520S1R0ST0S1	L= 1.2 µH DCR= 104.0 mOhm	1	\$0.14	 MLP2520S-S 12 mm²
16.	M1	STMicroelectronics	STF10N80K5	VdsMax= 800.0 V IdsMax= 9.0 Amps	1	\$2.52	 TO-220FP 79 mm²
17.	O1	California Eastern Laboratories	PS2811-1	Optocoupler	1	\$0.38	 SSOP-4 111 mm²
18.	Rcs	Vishay-Dale	CRCW06031R24FKEA Series= CRCW..e3	Res= 1.24 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm²
19.	Rdd	Yageo America	RC0603FR-0722RL Series= ?	Res= 22.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm²
20.	Rfb3	Vishay-Dale	CRCW0402210KFKED Series= CRCW..e3	Res= 210.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
21.	Rfb4	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
22.	Rfbb	Yageo America	RC0603FR-0743KL Series= ?	Res= 43.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm²
23.	Rfbt	Vishay-Dale	CRCW040243K2FKED Series= CRCW..e3	Res= 43.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
24.	RI	Vishay-Dale	CRCW080510R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm²
25.	Rlc	Vishay-Dale	CRCW04023K09FKED Series= CRCW..e3	Res= 3.09 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
26.	Ropt	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
27.	Rs	Vishay-Dale	CRCW0402698RFKED Series= CRCW..e3	Res= 698.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
28.	Rs1	Vishay-Dale	CRCW0402154KFKED Series= CRCW..e3	Res= 154.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²

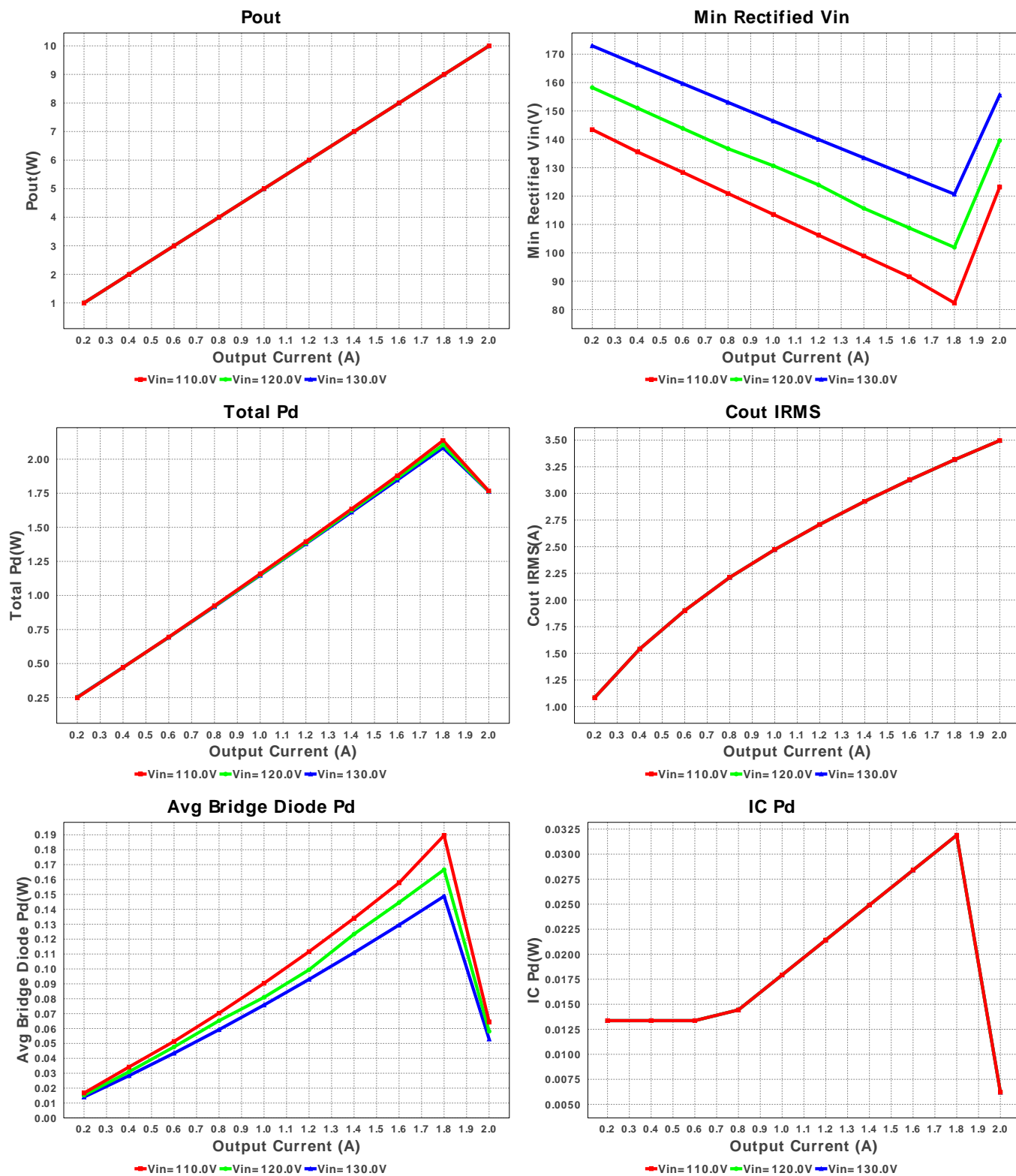
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
29.	Rs2	Vishay-Dale	CRCW040239K2FKED Series= CRCW..e3	Res= 39.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
30.	Rtl	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
31.	T1	Core=TDK , CoilFormer=TDK	Core=B66311G0000X127 , CoilFormer=B66206C1014T001	Lp= 697.0 µH Turns Ratio(Nas)= 22:6 Turns Ratio(Nps)= 91:6 Npri= 91.0 Naux= 22.0 Nsec= 6.0	1	\$1.06	 TDK_B66305 186 mm²
32.	U1	Texas Instruments	UCC28740DR	Switcher	1	\$0.42	 R-PDSO-G7 55 mm²
33.	VR	Texas Instruments	TL431AIDBZR	Voltage References	1	\$0.08	 DBZ0003A 14 mm²

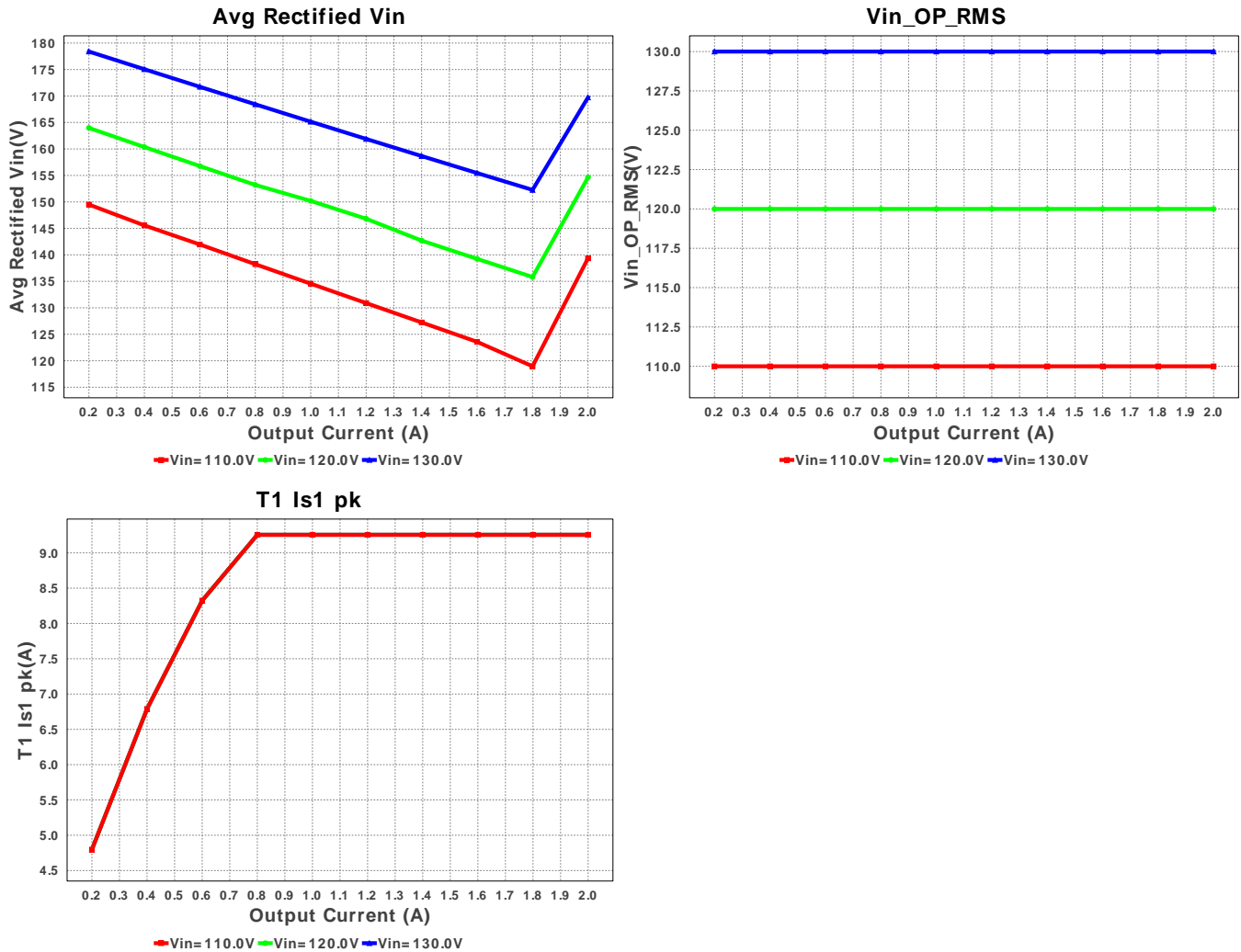












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	83.577 mA	Current	Input capacitor RMS ripple current
2.	Cin2 IRMS	247.34 mA	Current	Input Capacitor Cin2 RMS Ripple Current
3.	Cout IRMS	3.76 A	Current	Output capacitor RMS ripple current
4.	Iin rms	96.036 mA	Current	RMS Input Current
5.	T1 Iprim RMS	182.209 mA	Current	Transformer Primary RMS Current
6.	T1 Iprim pk	623.387 mA	Current	Transformer Primary Peak Current
7.	T1 Is1 RMS	3.779 A	Current	Transformer Secondary1 RMS Current
8.	T1 Is1 pk	10.708 A	Current	Transformer Secondary1 Peak Current
9.	Avg Rectified Vin	149.885 V	General	Average Rectified Voltage for the AC Line Period
10.	BOM Count	41	General	Total Design BOM count
11.	FootPrint	1.464 k mm ²	General	Total Foot Print Area of BOM components
12.	Pout	10.0 W	General	Total output power
13.	Total BOM	\$9.57	General	Total BOM Cost
14.	Vout Actual	5.012 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	25.63 %	Op_point	Duty cycle
17.	Efficiency	80.098 %	Op_point	Steady state efficiency
18.	Frequency_	73.185 kHz	Op_point	Switching frequency
19.	IC Tj	34.462 degC	Op_point	IC junction temperature
20.	ICThetaJA	141.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	2.0 A	Op_point	Iout operating point
22.	M1 TjOP	35.102 degC	Op_point	M1 MOSFET junction temperature
23.	Min Rectified Vin	115.924 V	Op_point	Minimum voltage seen at rectified input
24.	Peak Rectified Vin	183.846 V	Op_point	Peak voltage seen at rectified input
25.	Vin_OP_RMS	130.0 V	Op_point	AC Input RMS Voltage
26.	Vout p-p	85.661 mV	Op_point	Peak-to-peak output ripple voltage
27.	Avg Bridge Diode Pd	115.859 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
28.	Cin Pd	9.899 μW	Power	Input capacitor power dissipation
29.	Cout Pd	113.113 mW	Power	Output capacitor power dissipation
30.	Diode2 Pd	821.552 mW	Power	Diode2 power dissipation
31.	IC Pd	31.533 mW	Power	IC power dissipation

#	Name	Value	Category	Description
32.	M1 Pd	81.639 mW	Power	M1 MOSFET total power dissipation
33.	Total Pd	2.485 W	Power	Total Power Dissipation
34.	Xformer Pd	1.065 W	Power	Transformer power dissipation
35.	Zener Pd	31.969 mW	Power	Zener power dissipation
36.	Vout Tolerance	1.336 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	130.0	Maximum input voltage
3.	VinMin	110.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	acFrequency	50.0	Light Output in Lumen
6.	base_pn	UCC28740	Texas Instruments Base Part Number
7.	source	AC	Input Source Type
8.	ta	30.0	Ambient temperature

Design Assistance

1. Application Hints 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. Rtl Rtl is added to prevent excessive diode current and limit Iopt to the maximum value necessary for regulation. The Rtl value may be adjusted for optimal limiting later during the prototype evaluation process. Rfbt & 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. Rfb3 & Cfb3 Rfb3 is necessary to limit the current into FB and to avoid excess draining of Cvdd during this type of transient situation. The value of Rfb3 is chosen to limit the excess Ifb and Rfb4 current to an acceptable level when the optocoupler is saturated. Cfb3 helps improve the transient response and is estimated initially by equating the time constant to 1ms. This can later be adjusted for optimal performance during prototype evaluation. Rfb4 Rfb4 speeds up the turnoff time of the optocoupler in the case of a heavy load-step transient condition. This value tends to fall within the range of 10k and 100k. A tradeoff must be made between a lower value for faster transient response and a higher value for lower standby power. Rfb4 also serves to set a minimum bias current for the optocoupler and to drain dark current. Part Description The UCC28740 isolated-flyback controller provides Constant-Voltage (CV) using an optical coupler to improve transient response. Constant-Current (CC) regulation is accomplished through Primary Side Regulation (PSR) techniques. Please see the datasheet for further design guidance. <http://www.ti.com/lit/ds/symlink/ucc28740.pdf>

2. UCC28740 Product Folder : <http://www.ti.com/product/UCC28740> : contains the data sheet and other resources.

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