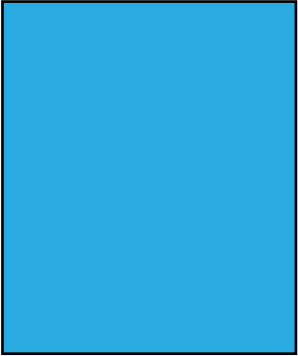
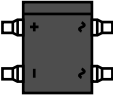
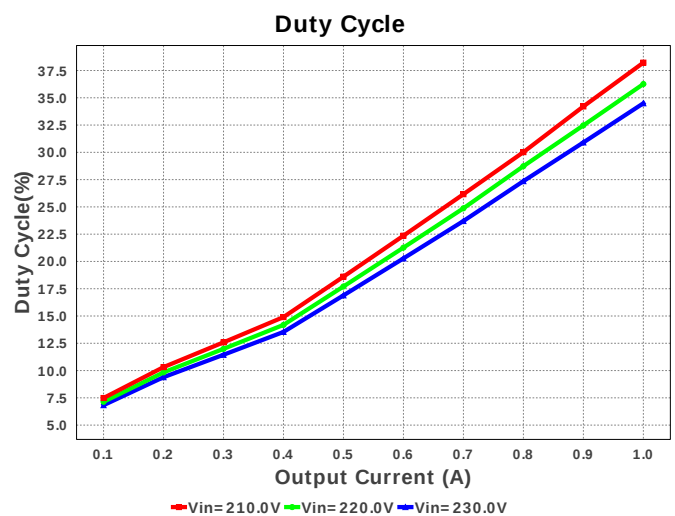
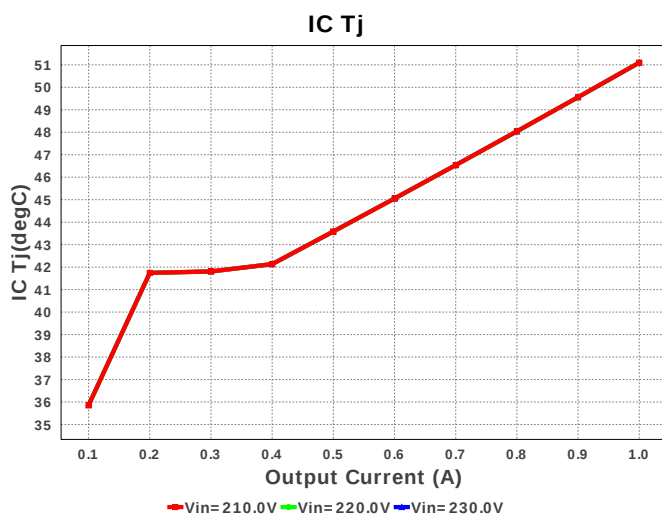


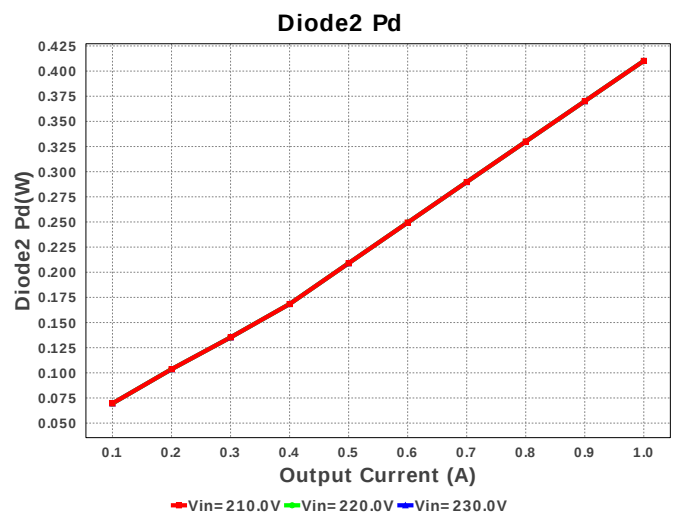
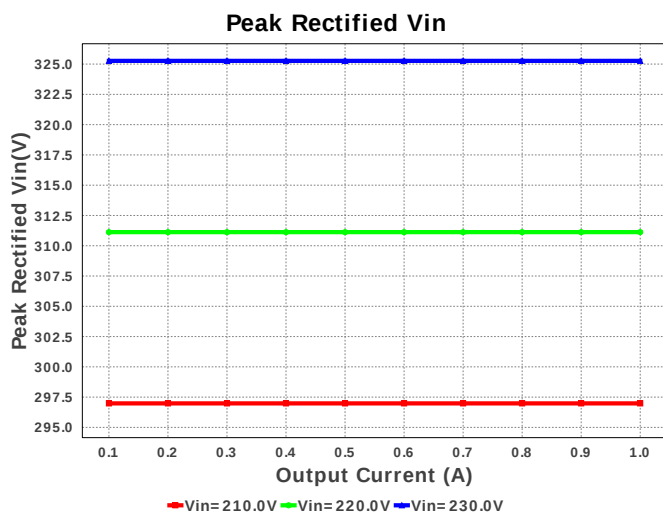
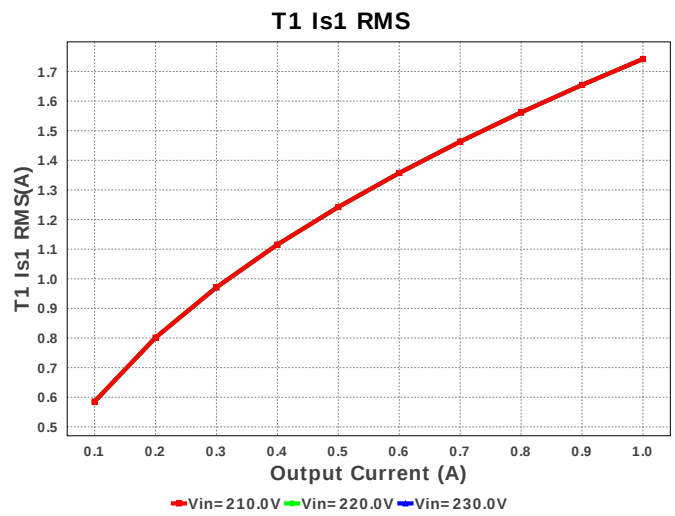
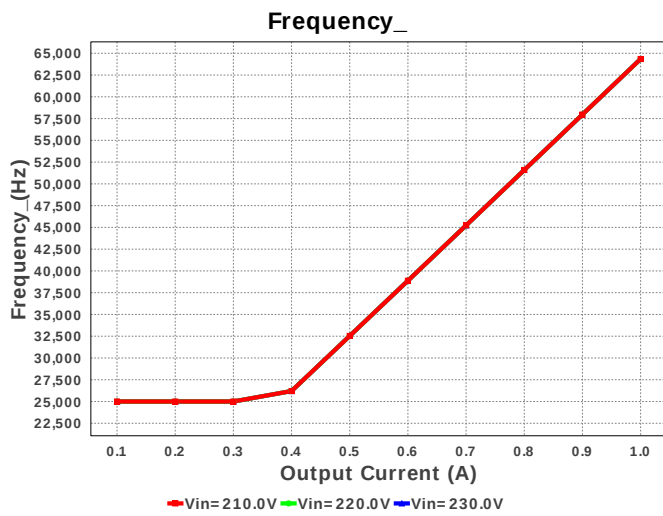
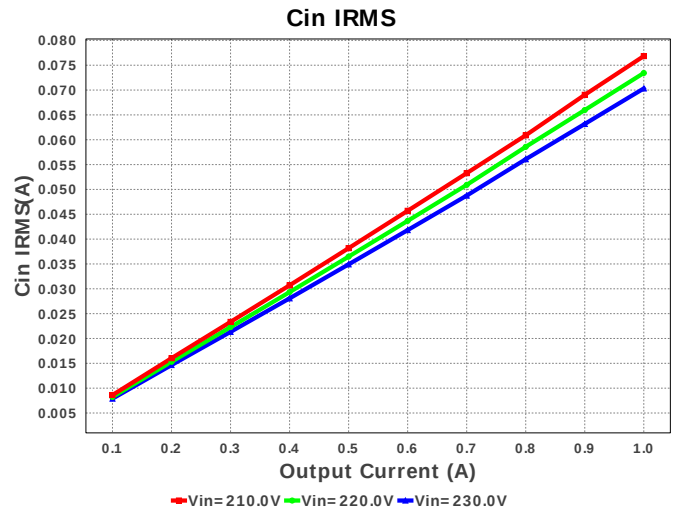
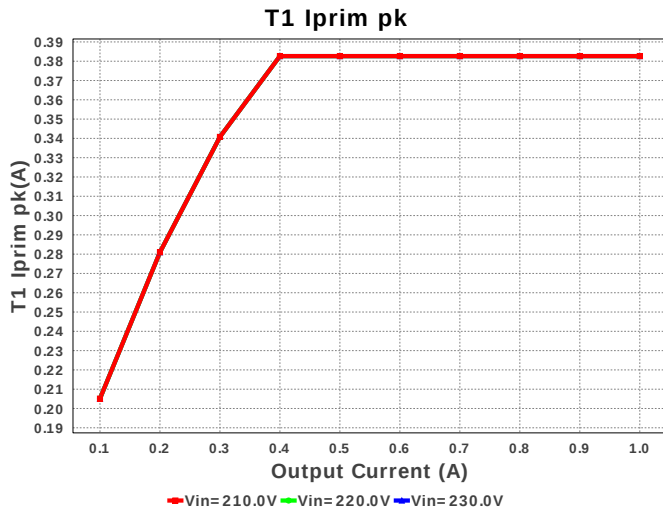


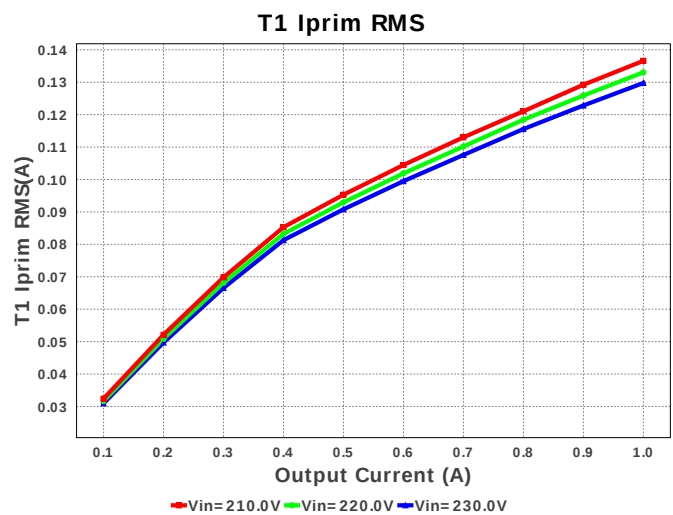
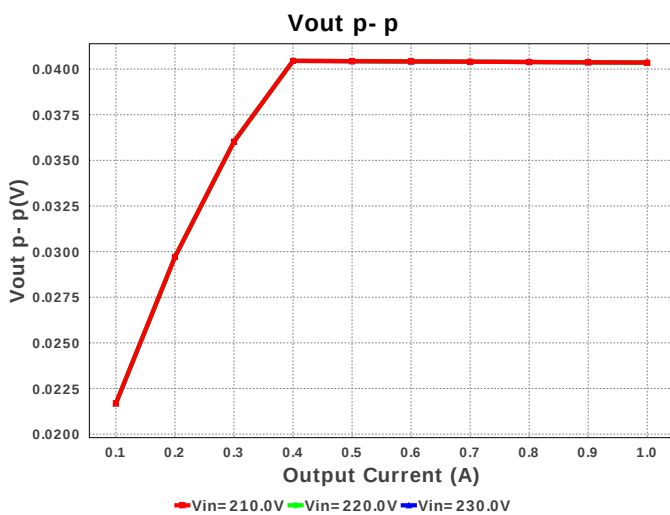
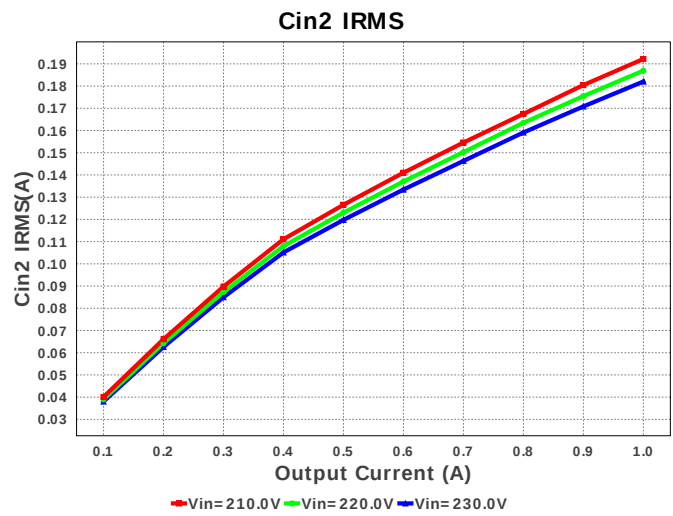
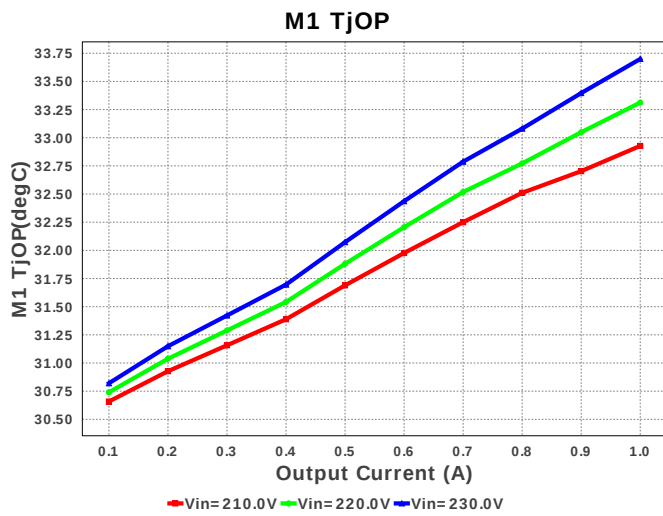
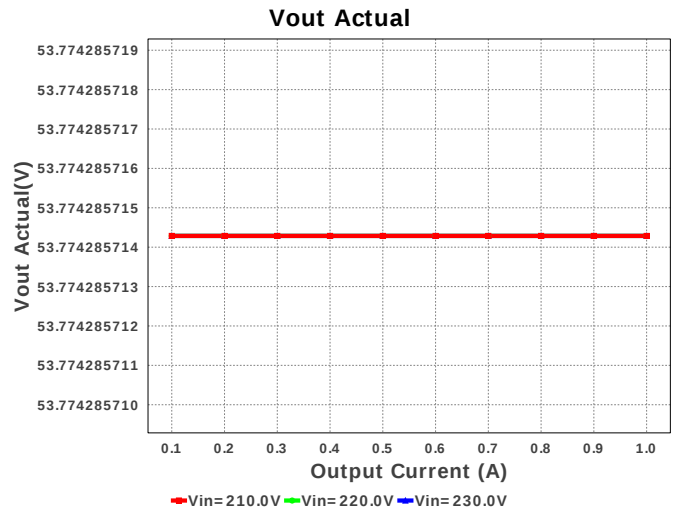
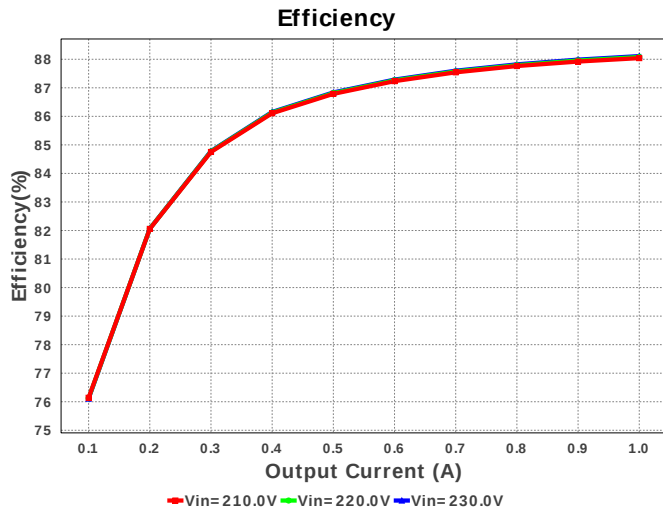
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Topology = Flyback
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BOM Count = 29
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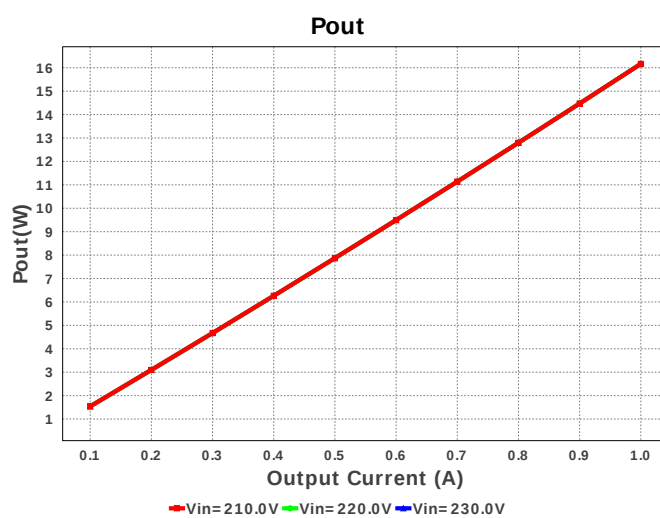
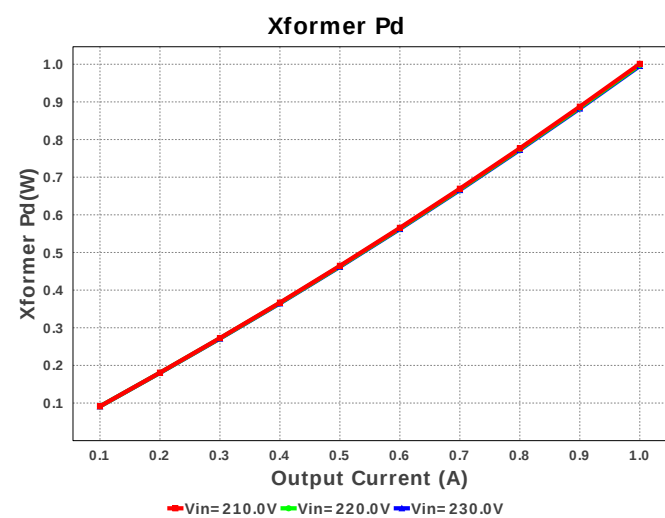
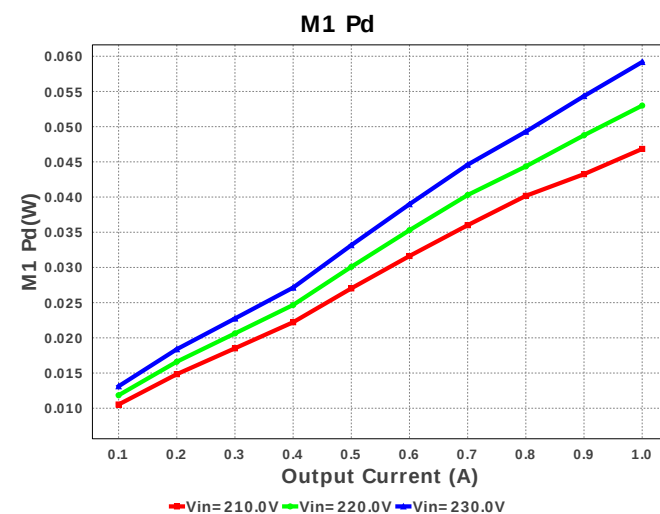
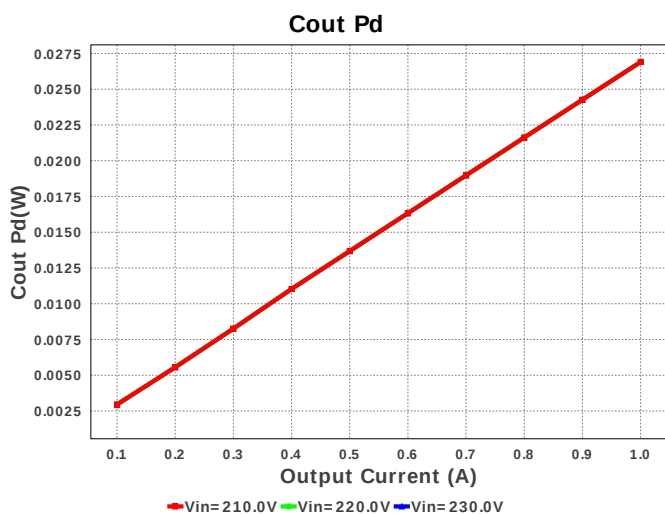
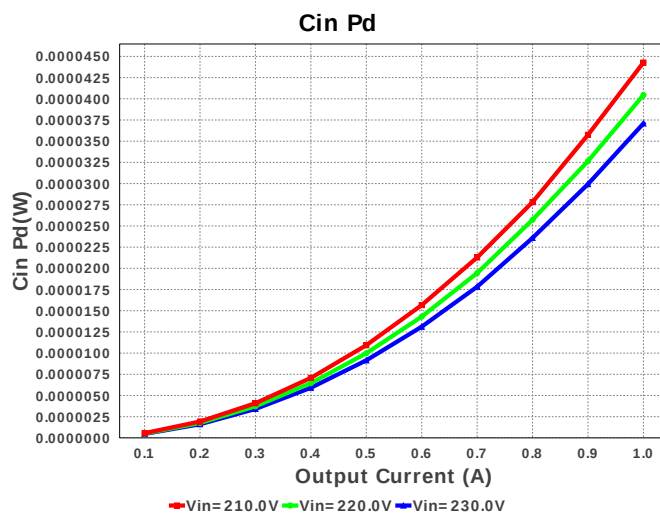
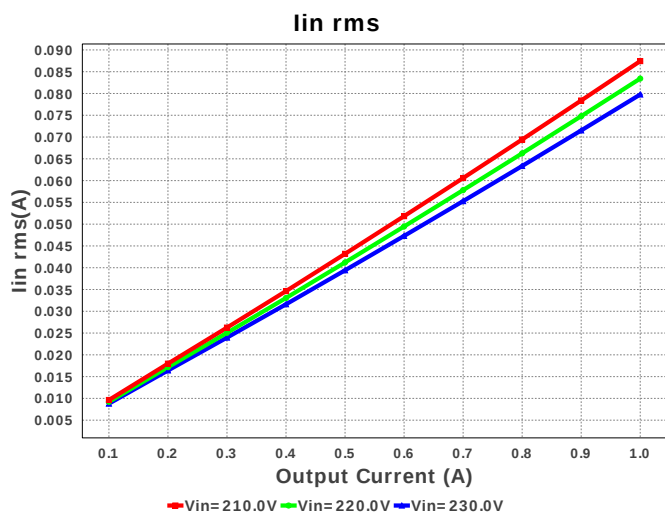
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
3.	Cin2	TDK	B32924C3475M Series= B32924	Cap= 4.7 uF ESR= 15.0 mOhm VDC= 630.0 V IRMS= 457.0 mA	2	\$0.57	 B32924_33mm 670 mm ²
4.	Cout	Panasonic	35SEPF120M Series= ?	Cap= 120.0 uF ESR= 18.0 mOhm VDC= 35.0 V IRMS= 4.4 A	2	\$0.69	SEPF_F13 0 mm ²
5.	Csnub	TDK	C3216CH2J151J Series= CH	Cap= 150.0 pF ESR= 113.93 mOhm VDC= 630.0 V IRMS= 0.0 A	1	\$0.03	 1206 11 mm ²
6.	D1	ON Semiconductor	MBRD360T4G	VF@Io= 600.0 mV VRRM= 60.0 V	1	\$0.25	 DPAK 102 mm ²
7.	Dac	Vishay-Semiconductor	DF10SA	VF@Io= 1.1 V VRRM= 1,000.0 V	1	\$0.24	 DF-S 99 mm ²
8.	Dsnub	Diodes Inc.	MURS160-13-F	VF@Io= 1.25 V VRRM= 600.0 V	1	\$0.11	 SMB 44 mm ²
9.	Dvdd	Bourns	CD1408-FU1400	VF@Io= 1.05 V VRRM= 400.0 V	1	\$0.13	 Diode_1408 13 mm ²
10.	L1	Bourns	SDR0503-471KL	L= 470.0 uH DCR= 4.9 Ohm	1	\$0.19	 SDR0503 48 mm ²
11.	M1	STMicroelectronics	STF10N80K5	VdsMax= 800.0 V IdsMax= 9.0 Amps	1	\$2.52	 TO-220FP 79 mm ²
12.	R1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
13.	Rbld	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rcs	Vishay-Dale	CRCW04021R96FKED Series= CRCW..e3	Res= 1.96 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Rdd	Yageo America	RC0603FR-0722RL Series= ?	Res= 22.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
16.	Rfbb	Vishay-Dale	CRCW040229K4FKED Series= CRCW..e3	Res= 29.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rfbt	Yageo America	RC0603FR-07360KL Series= ?	Res= 360.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²

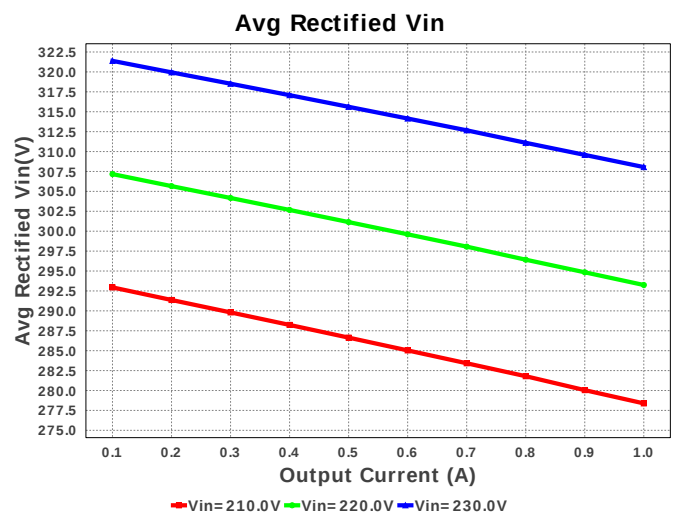
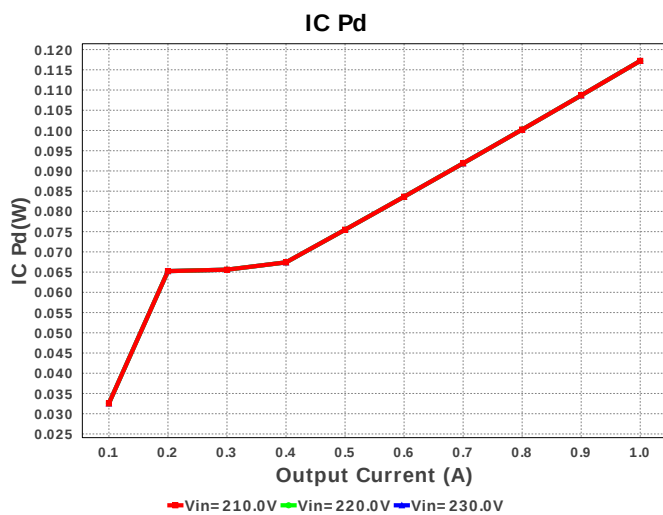
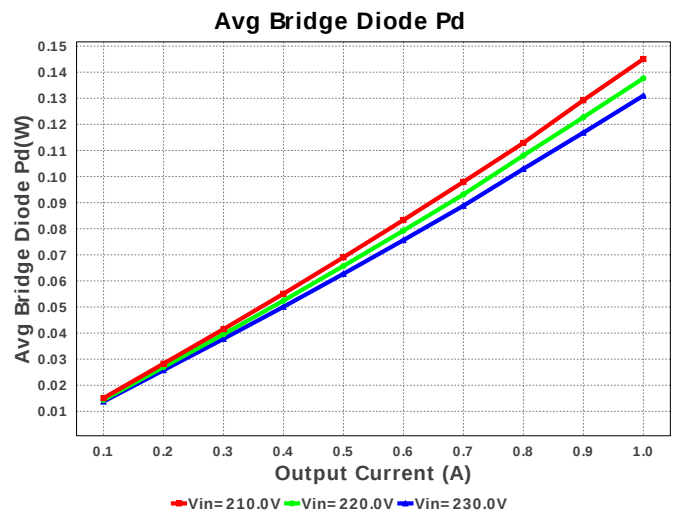
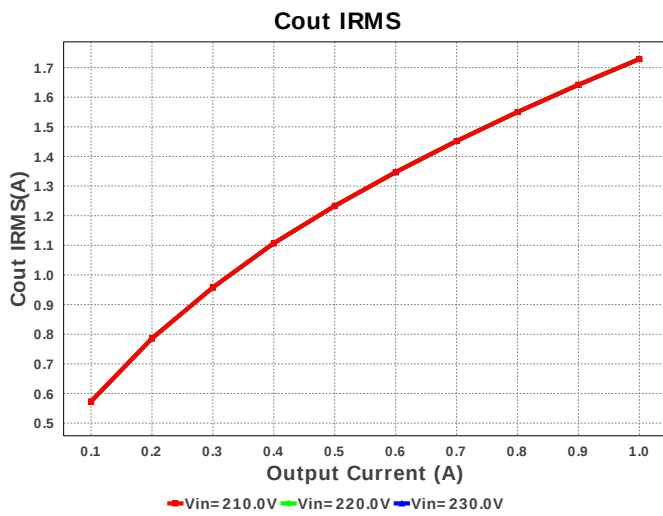
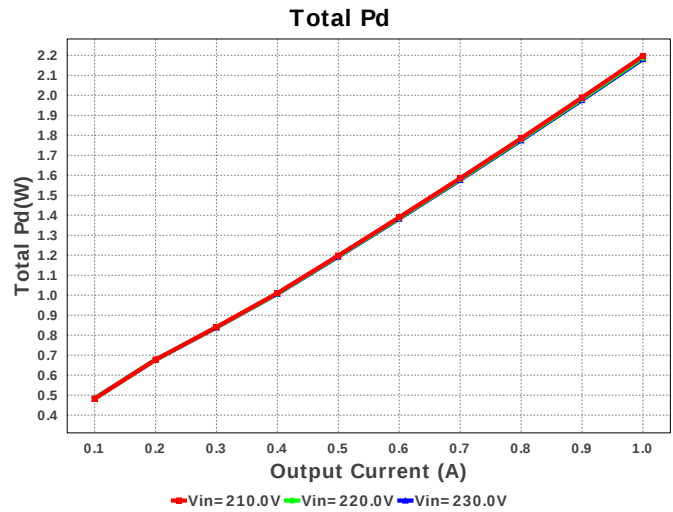
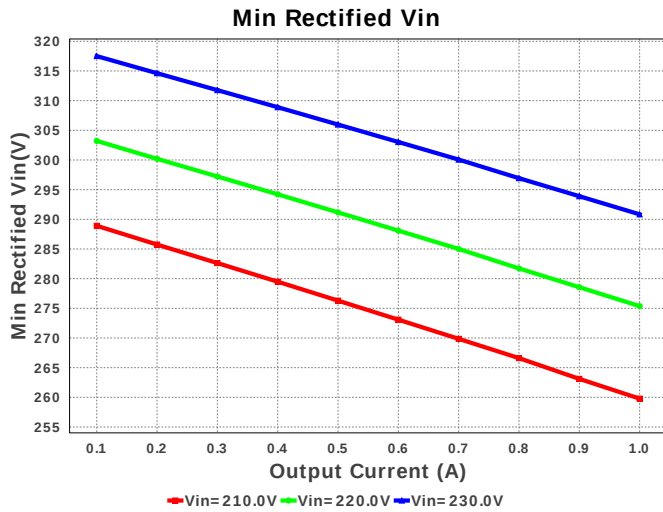
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
18.	RI	Panasonic	ERJ-8ENF10R0V Series= ERJ-8E	Res= 10.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²
19.	RIc	Vishay-Dale	CRCW04021K69FKED Series= CRCW..e3	Res= 1.69 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
20.	Rsnub	CUSTOM	CUSTOM Series= ?	Res= 2.2012 MOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm ²
21.	Rsnub2	Vishay-Dale	CRCW040251R1FKED Series= CRCW..e3	Res= 51.1 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
22.	Rst1	Vishay-Dale	CRCW08054M32FKEA Series= CRCW..e3	Res= 4.32 MOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
23.	Rst2	Vishay-Dale	CRCW08054M32FKEA Series= CRCW..e3	Res= 4.32 MOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
24.	Rst3	Vishay-Dale	CRCW08054M32FKEA Series= CRCW..e3	Res= 4.32 MOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
25.	T1	CUSTOM	CUSTOM	Lp= 4.267 mH Rp= 3.059 Ohm Leakage_L= 12.8 µH Ns1toNp= 0.084 Rs1= 106.633 mOhms Ns2toNp= 0.293 Rs2= 1.408 Ohms	1	NA	CUSTOM 0 mm ²
26.	U1	Texas Instruments	UCC28704DBVR-1	Switcher	1	\$0.30	 SOT-23-6 15 mm ²

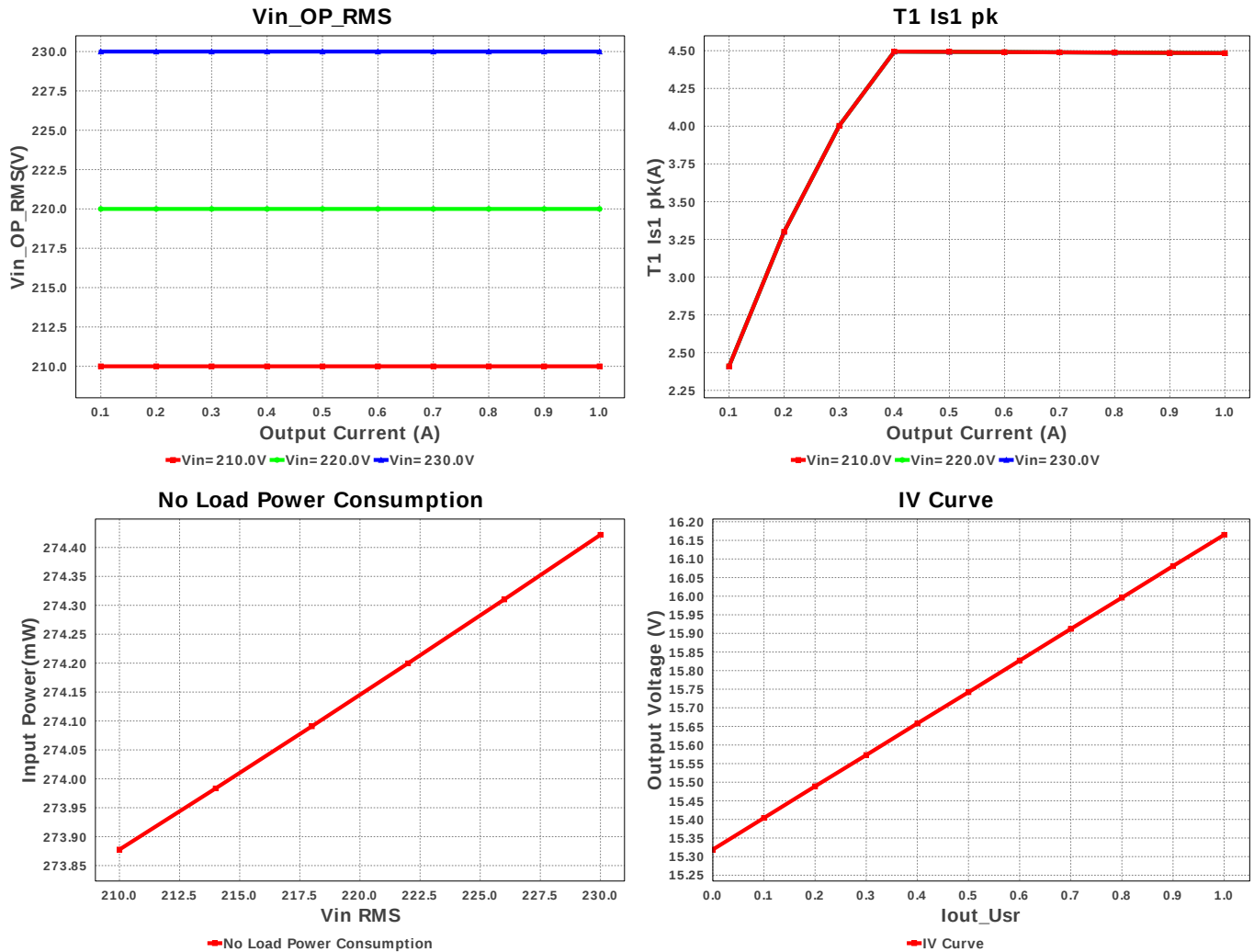












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	70.604 mA	Current	Input capacitor RMS ripple current
2.	Cin2 IRMS	182.384 mA	Current	Input Capacitor Cin2 RMS Ripple Current
3.	Cout IRMS	1.729 A	Current	Output capacitor RMS ripple current
4.	Iin rms	79.711 mA	Current	RMS Input Current
5.	T1 Iprim RMS	129.87 mA	Current	Transformer Primary RMS Current
6.	T1 Iprim pk	382.653 mA	Current	Transformer Primary Peak Current
7.	T1 Is1 RMS	1.742 A	Current	Transformer Secondary1 RMS Current
8.	T1 Is1 pk	4.484 A	Current	Transformer Secondary1 Peak Current
9.	Avg Rectified Vin	307.686 V	General	Average Rectified Voltage for the AC Line Period
10.	BOM Count	29	General	Total Design BOM count
11.	FootPrint	3.21 k mm ²	General	Total Foot Print Area of BOM components
12.	Pout	16.165 W	General	Total output power
13.	Total BOM	\$0.0	General	Total BOM Cost
14.	Vout Actual	53.774 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Duty Cycle	34.556 %	Op_point	Duty cycle
16.	Efficiency	88.172 %	Op_point	Steady state efficiency
17.	Frequency	64.345 kHz	Op_point	Switching frequency
18.	IC Tj	38.204 degC	Op_point	IC junction temperature
19.	ICThetaJA	70.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	1.0 A	Op_point	Iout operating point
21.	M1 TJOP	33.685 degC	Op_point	M1 MOSFET junction temperature
22.	Min Rectified Vin	290.106 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	40.356 mV	Op_point	Peak-to-peak output ripple voltage
26.	Avg Bridge Diode Pd	82.619 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
27.	Cin Pd	37.387 μW	Power	Input capacitor power dissipation
28.	Cout Pd	26.905 mW	Power	Output capacitor power dissipation
29.	Diode1 Pd	410.163 mW	Power	Diode2 power dissipation
30.	IC Pd	117.206 mW	Power	IC power dissipation
31.	M1 Pd	58.968 mW	Power	M1 MOSFET total power dissipation

#	Name	Value	Category	Description
32.	Total Pd	2.168 W	Power	Total Power Dissipation
33.	Xformer Pd	995.558 mW	Power	Transformer power dissipation
34.	Vout Tolerance	2.068 %		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	230.0	Maximum input voltage
3.	VinMin	210.0	Minimum input voltage
4.	Vout	15.0	Output Voltage
5.	line_fsw	50.0	Light Output in Lumen
6.	base_pn	UCC28704	Base Product Number
7.	source	AC	Input Source Type
8.	Ta	30.0	Ambient temperature

Design Assistance

1. Application Hints: T1: The transformer parameters assume that an RM6 core is used, and the DCR values are assumed values used only for efficiency estimates. 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. 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. Cdd: Cdd supplies the device operating current until the output of the converter reaches the target minimum operating voltage. The value calculated by WEBENCH for Cdd is a good starting point since it assumes that the output current of the Flyback is available to charge the output capacitance until the minimum output voltage is achieved, but may need to be adjusted. Part Description: The UCC28704 Flyback power supply controller 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/ucc28704.pdf>

2. **UCC28704 Product Folder** : <http://www.ti.com/product/UCC28704> : contains the data sheet and other resources.

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