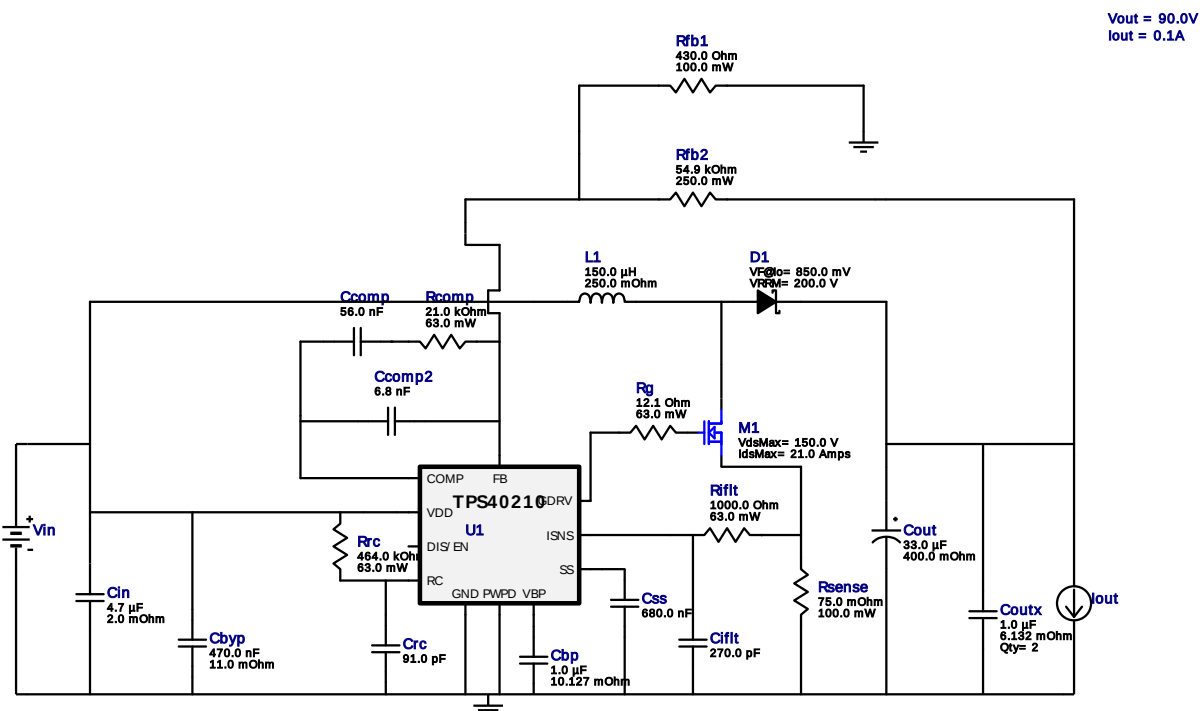


WEBENCH® Design Report

Design : 3536146/126 TPS40210DGQR
TPS40210DGQR 12.0V-12.0V to 90.07V @ 0.1A

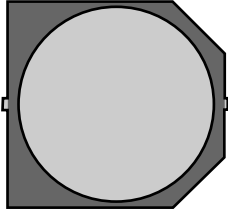
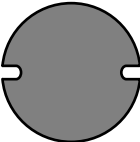


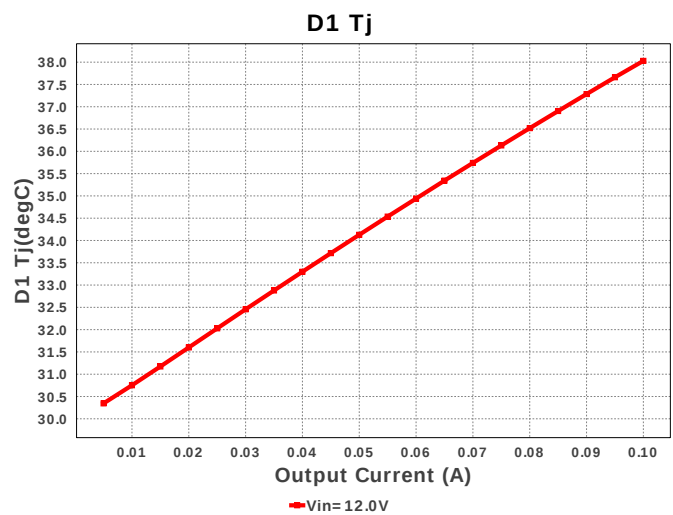
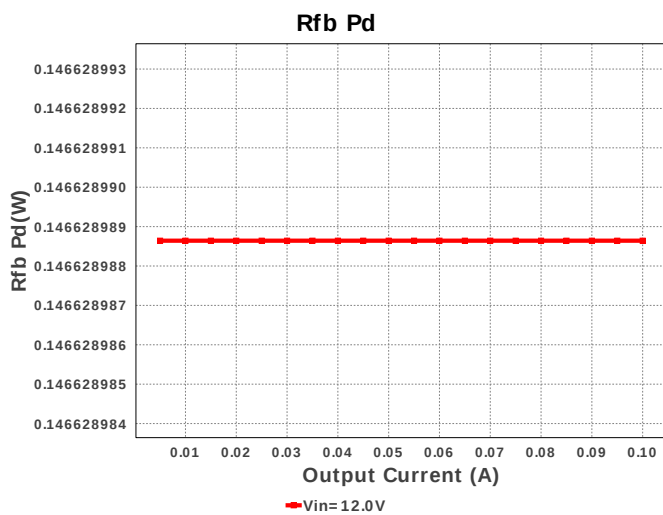
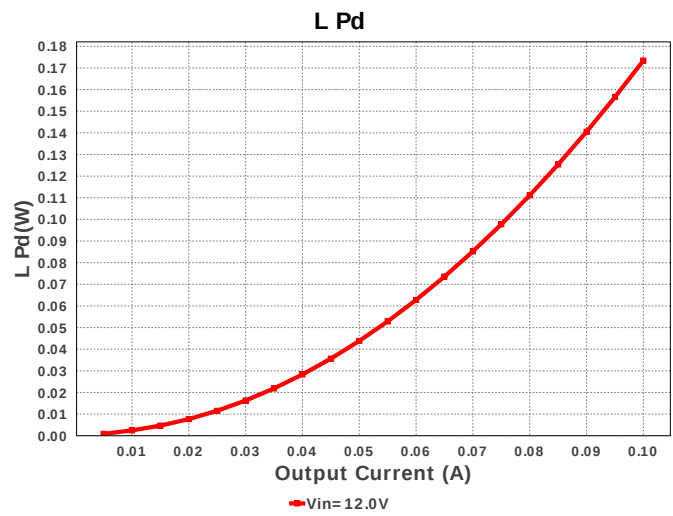
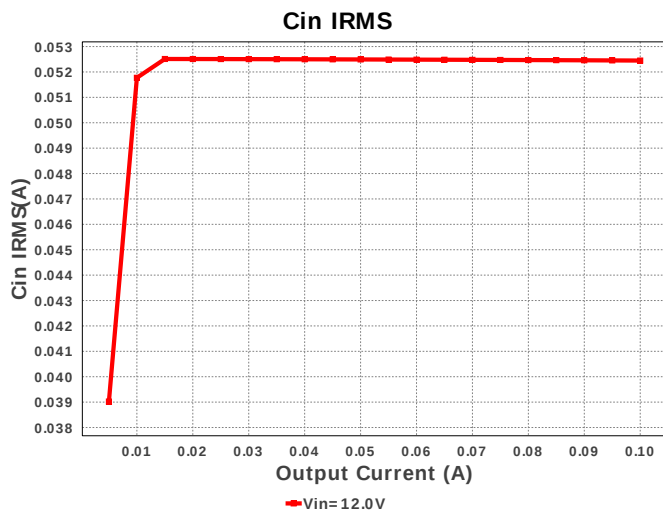
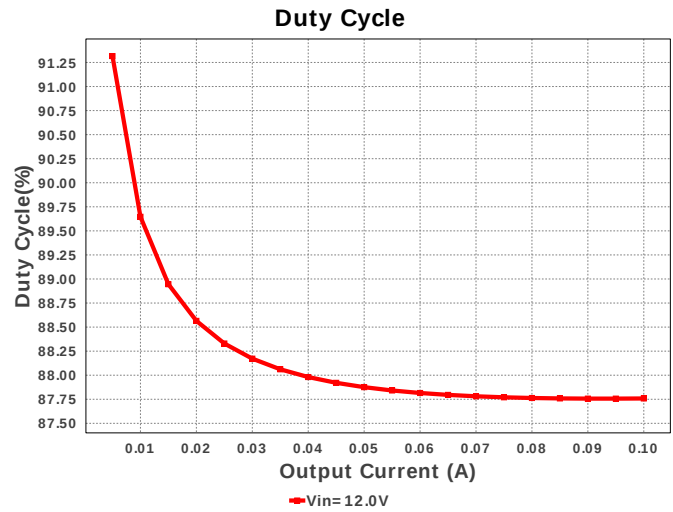
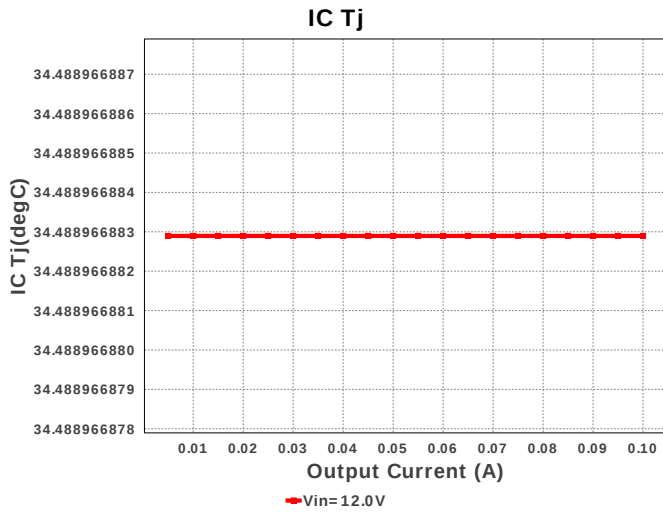
My Comments

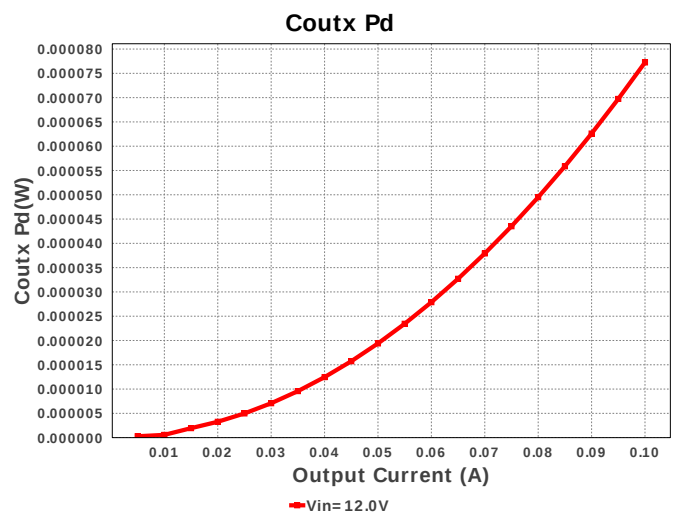
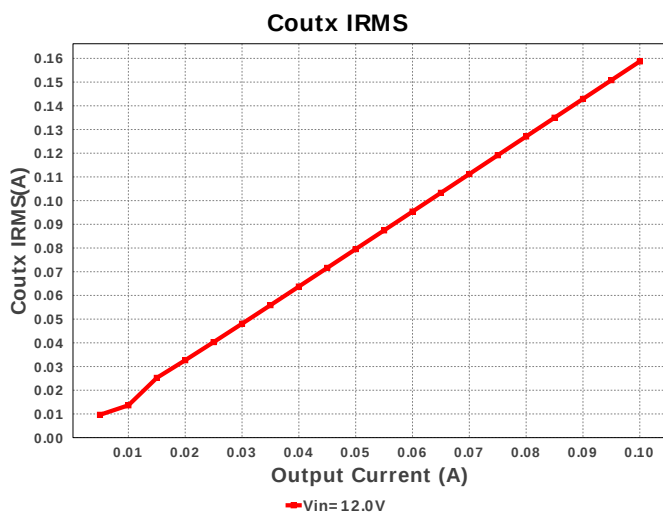
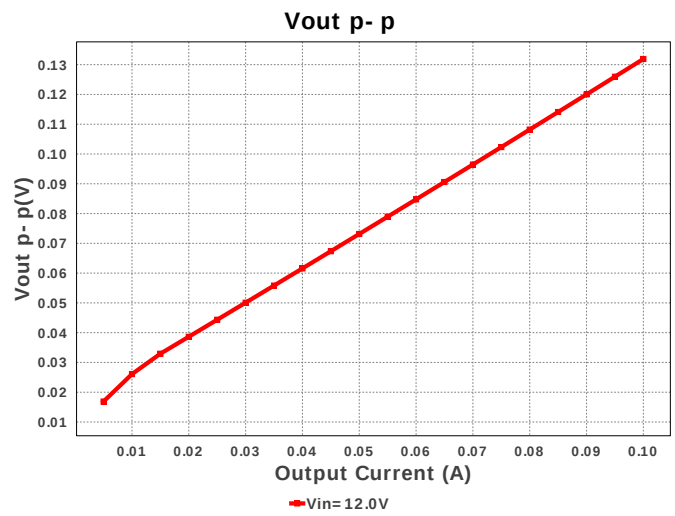
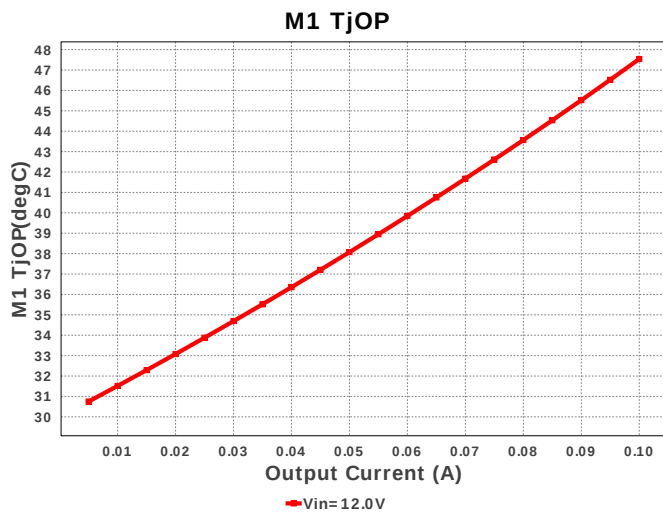
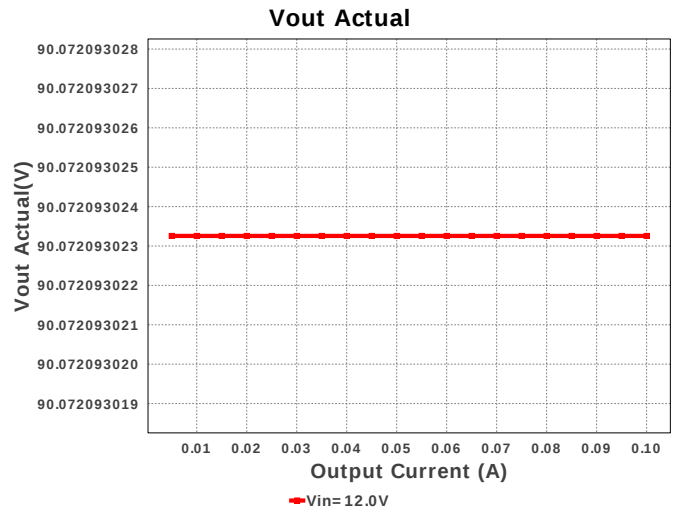
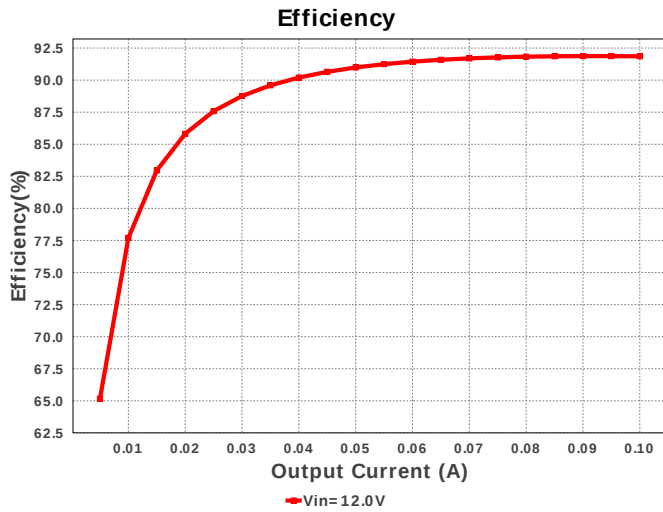
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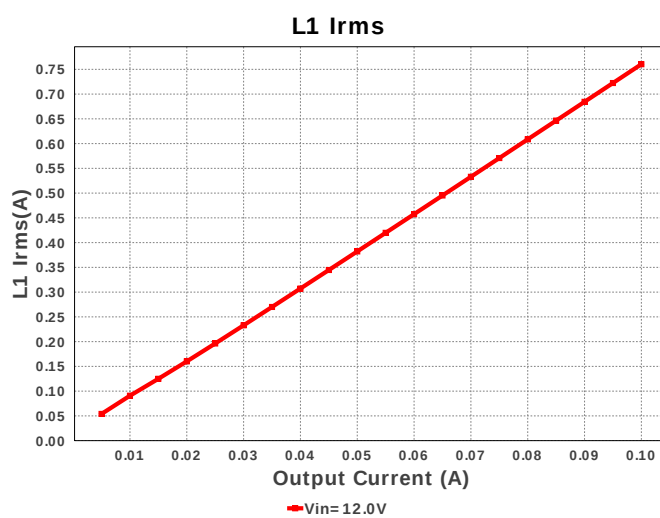
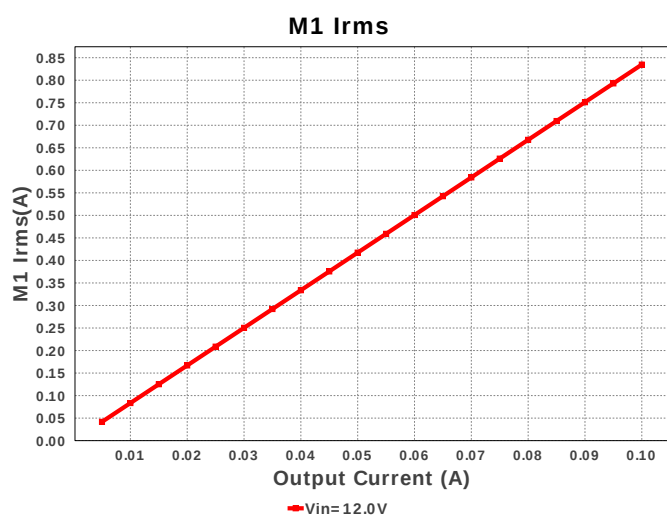
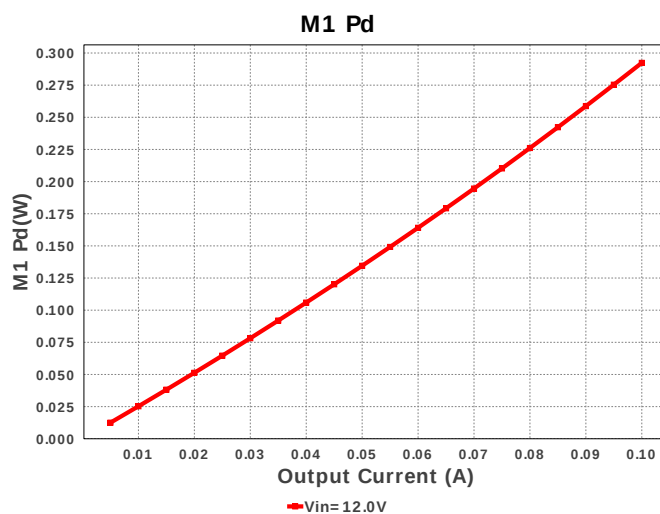
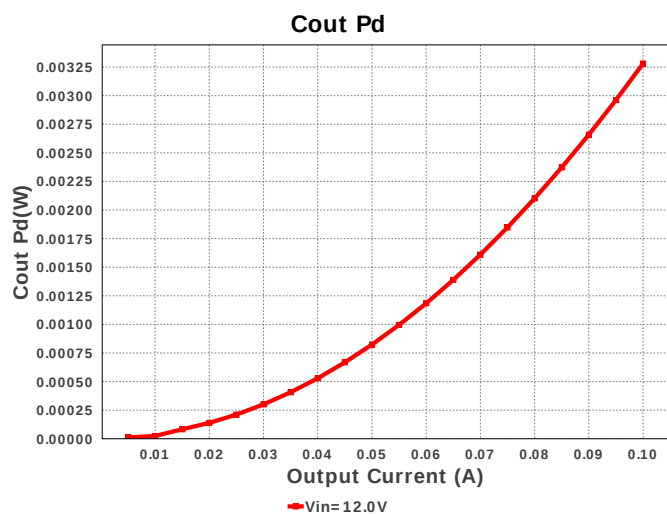
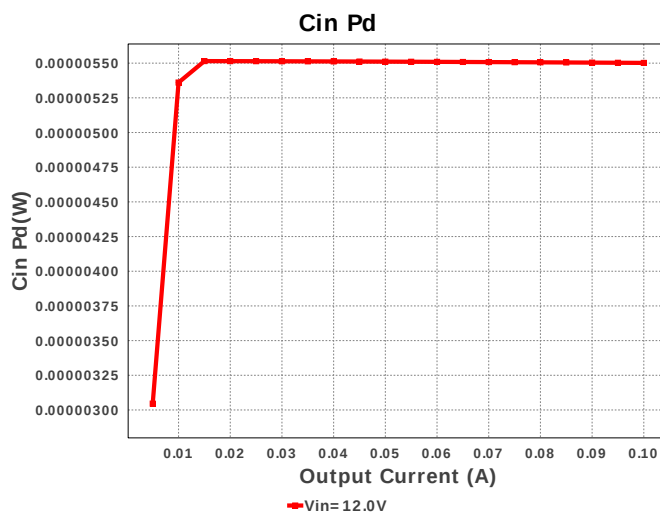
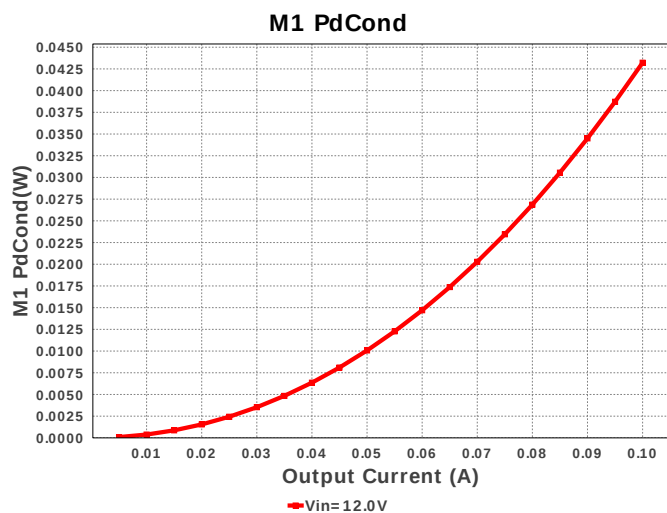
Electrical BOM

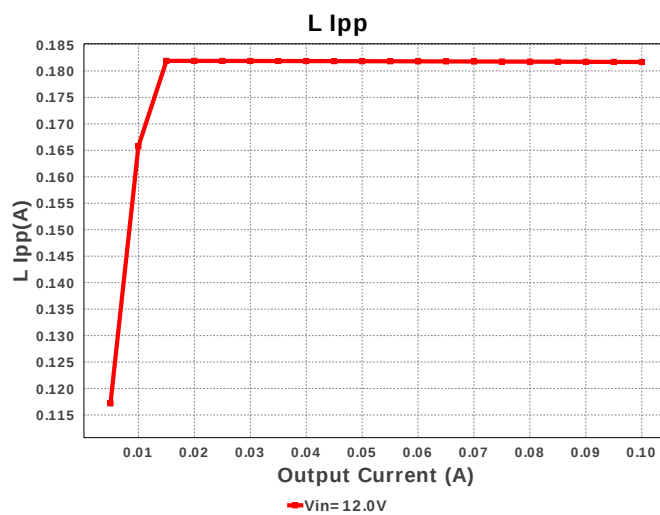
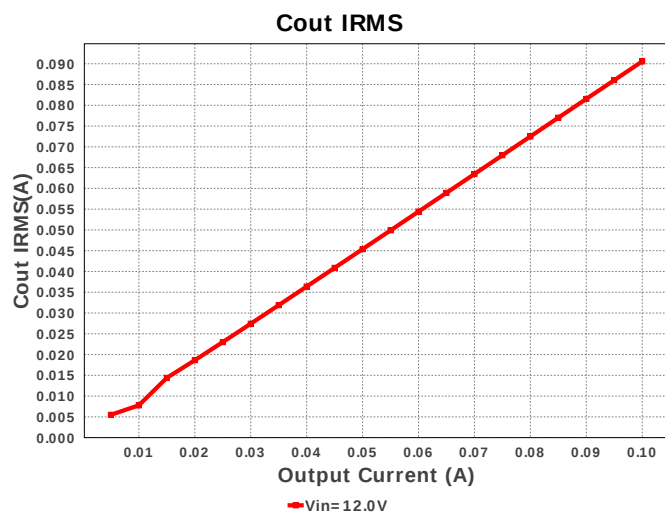
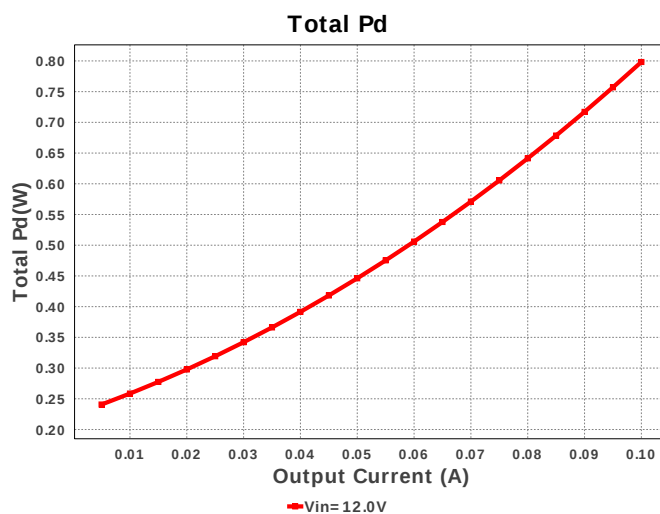
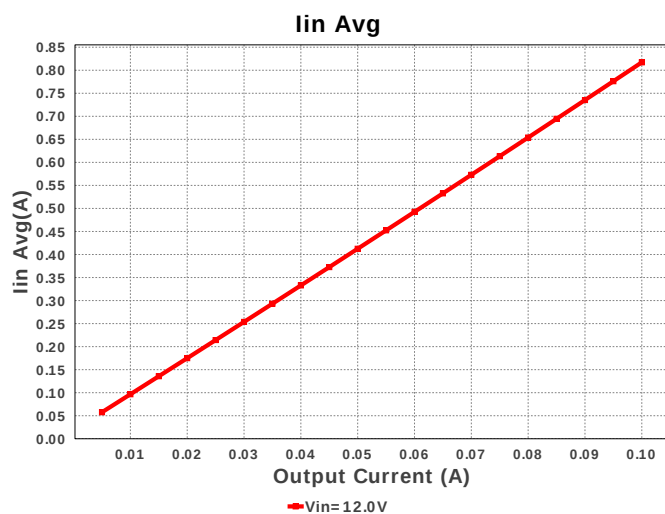
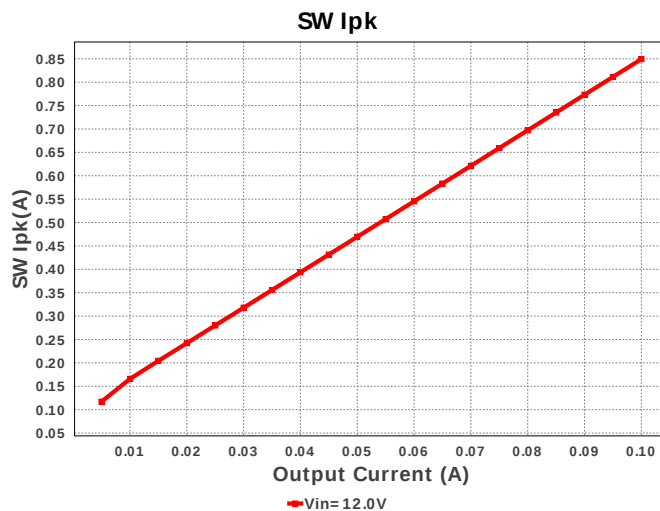
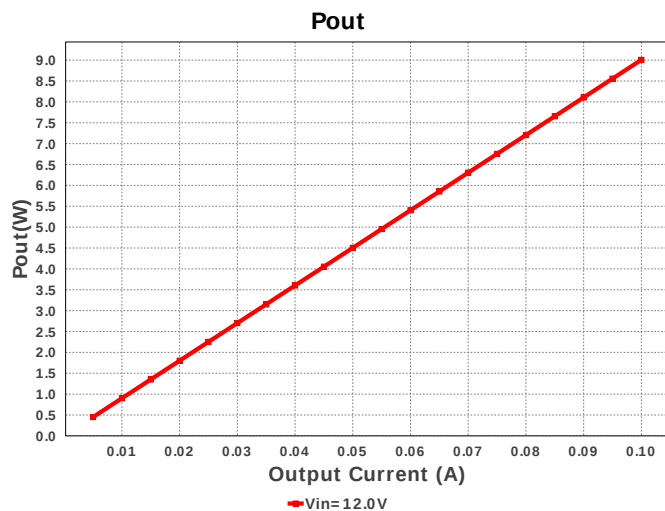
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	\$0.01	0603 5 mm ²
2.	Cbyp	AVX	0805YC474KAT2A Series= X7R	Cap= 470.0 nF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
3.	Ccomp	MuRata	GRM155R61A563KA01D Series= X5R	Cap= 56.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
4.	Ccomp2	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Cift	Samsung Electro-Mechanics	CL21C271JBANFNC Series= C0G/NP0	Cap= 270.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	1	\$0.02	0805 7 mm ²

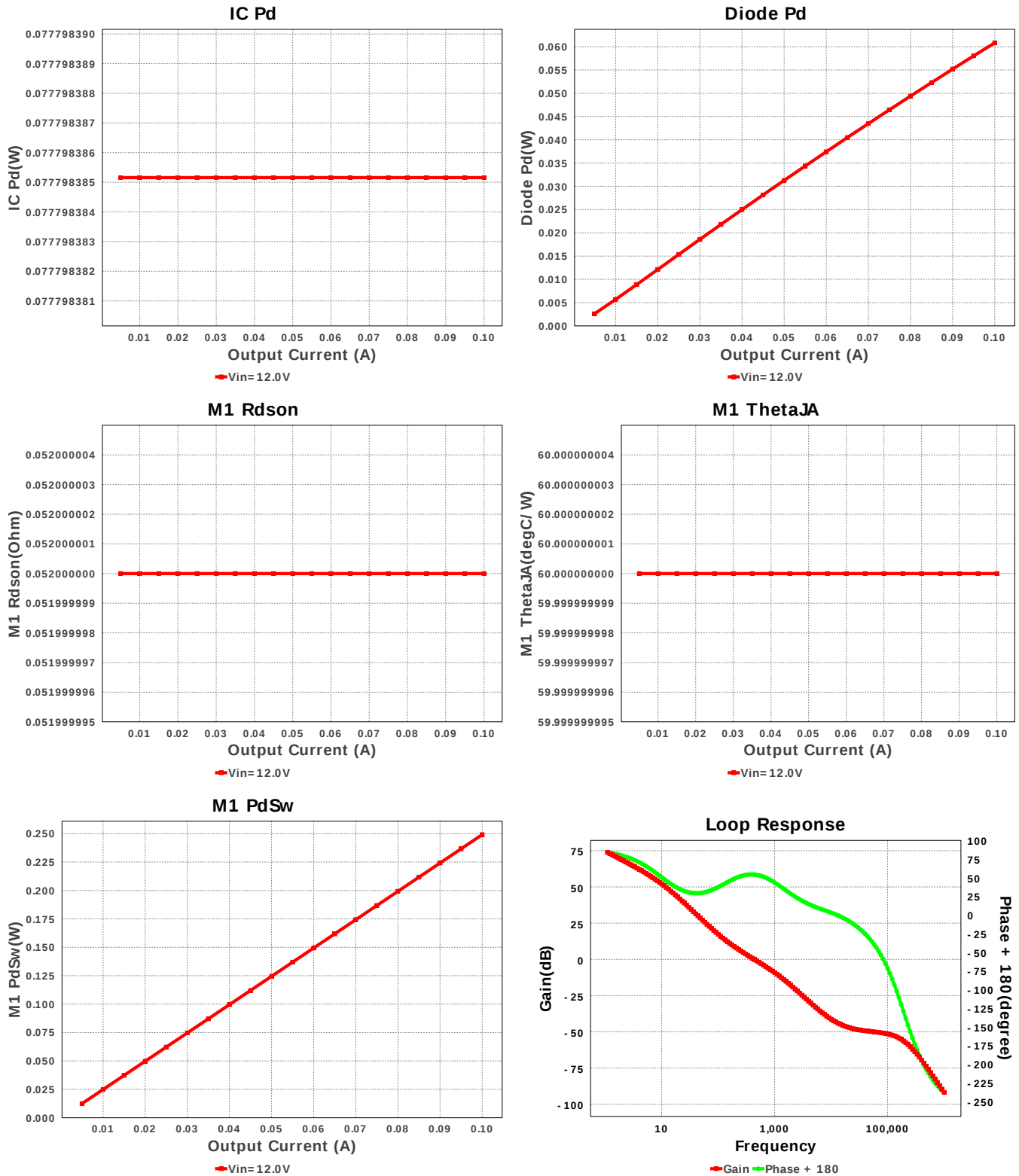
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	Cout	Panasonic	EEV-EB2E330SM Series= ?	Cap= 33.0 uF ESR= 400.0 mOhm VDC= 250.0 V IRMS= 560.0 mA	1	\$1.25	 EB_K16 483 mm ²
8.	Coutx	TDK	C4532X7T2E105K Series= X7T	Cap= 1.0 uF ESR= 6.132 mOhm VDC= 250.0 V IRMS= 0.0 A	2	\$0.27	 1812 23 mm ²
9.	Crc	Samsung Electro-Mechanics	CL21C910JBANNNC Series= C0G/NP0	Cap= 91.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
10.	Css	MuRata	GRM155R61A684KE15D Series= X5R	Cap= 680.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.02	 0402 3 mm ²
11.	D1	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	\$0.21	 PowerDI123 13 mm ²
12.	L1	Bourns	SDR1307-151KL	L= 150.0 uH DCR= 250.0 mOhm	1	\$0.35	 SDR1307 227 mm ²
13.	M1	Infineon Technologies	BSZ520N15NS3 G	VdsMax= 150.0 V IdsMax= 21.0 Amps	1	\$0.55	 PG-TSDSON-8 19 mm ²
14.	Rcomp	Vishay-Dale	CRCW040221K0FKED Series= CRCW..e3	Res= 21.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Rfb1	Yageo America	RC0603FR-07430RL Series= ?	Res= 430.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
16.	Rfb2	Panasonic	ERJ-8ENF5492V Series= ERJ-8E	Res= 54.9 kOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²
17.	Rg	Vishay-Dale	CRCW040212R1FKED Series= CRCW..e3	Res= 12.1 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rift	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	Rrc	Vishay-Dale	CRCW0402464KFKED Series= CRCW..e3	Res= 464.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
20.	Rsense	Panasonic	ERJ-L03UF75MV Series= ERJ-L03	Res= 75.0 mOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.08	 0603 5 mm ²
21.	U1	Texas Instruments	TPS40210DGQR	Switcher	1	\$0.75	 S-PDSO-G10 24 mm ²











Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	57.451 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	96.697 mA	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	155.378 mA	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	793.6 mA	Current	Average input current
5.	L Ipp	199.02 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	759.26 mA	Current	Inductor ripple current
7.	M1 Irms	832.233 mA	Current	M1 MOSFET Irms
8.	SW Ipk	856.592 mA	Current	Peak switch current
9.	BOM Count	22	General	Total Design BOM count
10.	FootPrint	888.0 mm ²	General	Total Foot Print Area of BOM components
11.	Frequency	349.719 kHz	General	Switching frequency

#	Name	Value	Category	Description
12.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	52.0 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	60.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Mode	CCM	General	Conduction Mode
16.	Pout	9.0 W	General	Total output power
17.	Total BOM	\$3.9	General	Total BOM Cost
18.	D1 Tj	41.22 degC	Op_Point	D1 junction temperature
19.	Low Freq Gain	73.939 dB	Op_Point	Gain at 10Hz
20.	Vout Actual	90.072 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
21.	Vout OP	90.072 V	Op_Point	Operational Output Voltage
22.	Cross Freq	445.126 Hz	Op_point	Bode plot crossover frequency
23.	Duty Cycle	87.399 %	Op_point	Duty cycle
24.	Efficiency	94.506 %	Op_point	Steady state efficiency
25.	Gain Marg	-45.221 dB	Op_point	Bode Plot Gain Margin
26.	IC Tj	34.256 degC	Op_point	IC junction temperature
27.	ICThetaJA	57.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
28.	IOUT_OP	100.0 mA	Op_point	Iout operating point
29.	M1 TjOP	46.629 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	55.044 deg	Op_point	Bode Plot Phase Margin
31.	VIN_OP	12.0 V	Op_point	Vin operating point
32.	Vout p-p	137.034 mV	Op_point	Peak-to-peak output ripple voltage
33.	Cin Pd	6.601 µW	Power	Input capacitor power dissipation
34.	Cout Pd	3.74 mW	Power	Output capacitor power dissipation
35.	Coutx Pd	74.021 µW	Power	Output capacitor_x power loss
36.	Diode Pd	85.0 mW	Power	Diode power dissipation
37.	IC Pd	73.768 mW	Power	IC power dissipation
38.	L Pd	172.943 mW	Power	Inductor power dissipation
39.	M1 Pd	277.142 mW	Power	M1 MOSFET total power dissipation
40.	M1 PdCond	42.684 mW	Power	M1 MOSFET conduction losses
41.	M1 PdSw	234.458 mW	Power	M1 MOSFET switching losses
42.	Rfb Pd	146.394 mW	Power	Rfb Power Dissipation
43.	Total Pd	523.205 mW	Power	Total Power Dissipation
44.	Vout Tolerance	3.462 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	100.0 m	Maximum Output Current
2.	VinMax	12.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	90.0	Output Voltage
5.	base_pn	TPS40210	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40210** Product Folder : <http://www.ti.com/product/TPS40210> : contains the data sheet and other resources.

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