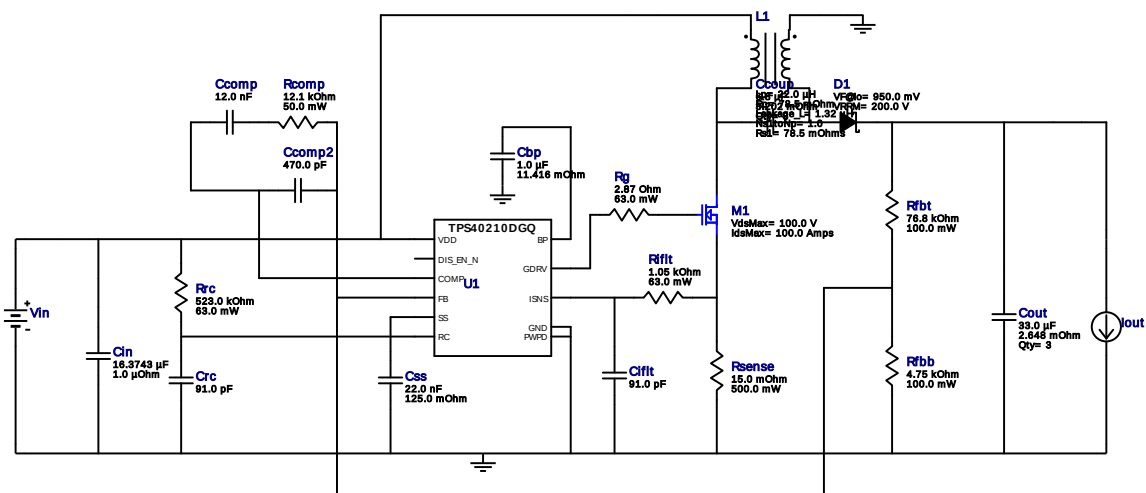


WEBENCH® Design Report

Design : TPS40210DGQR
TPS40210DGQR 10.0V-30.0V to 12.02V @ 2.0A

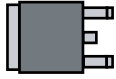
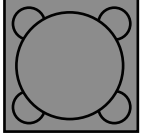


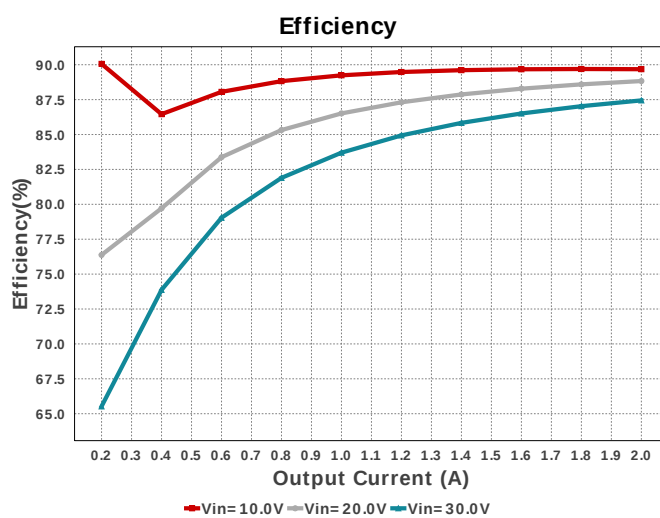
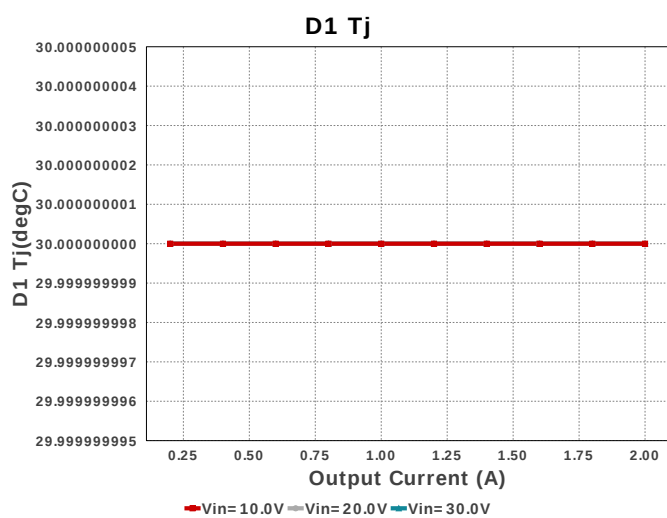
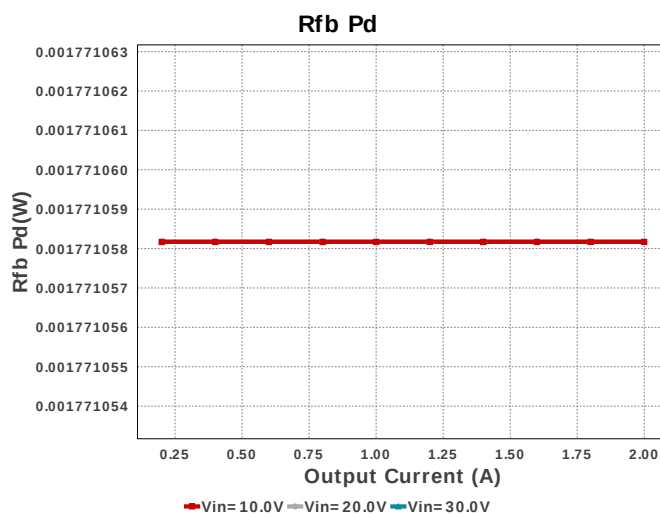
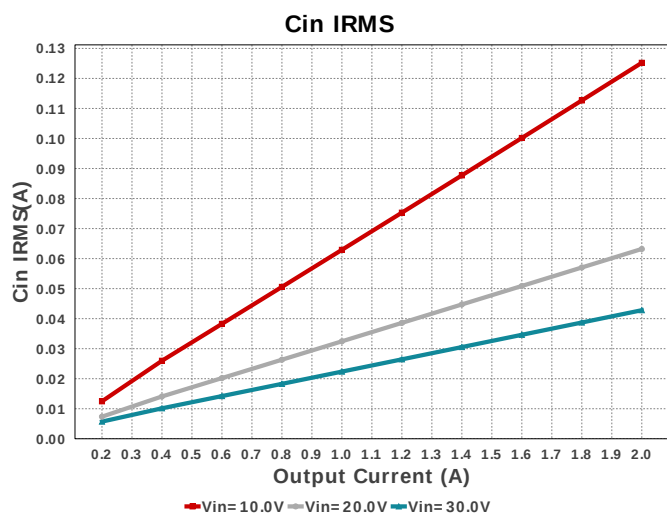
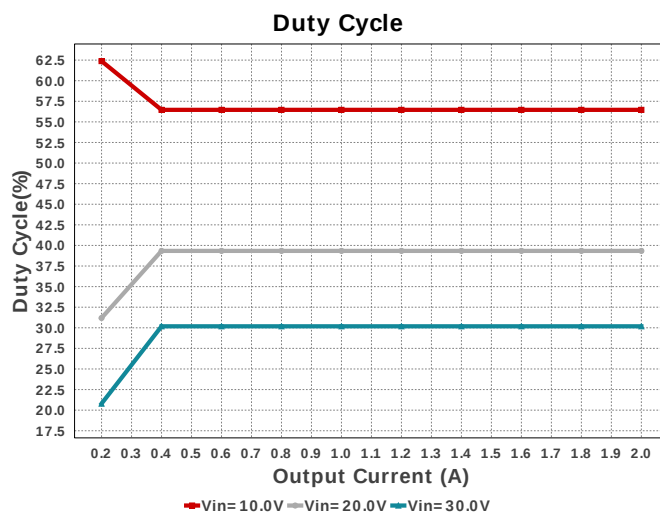
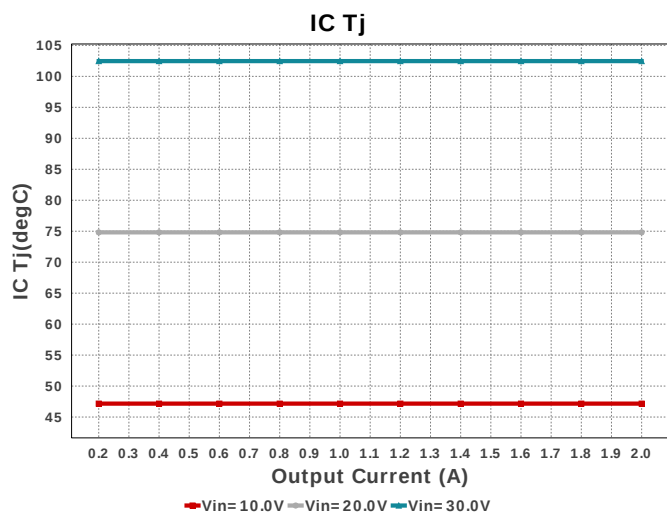
My Comments

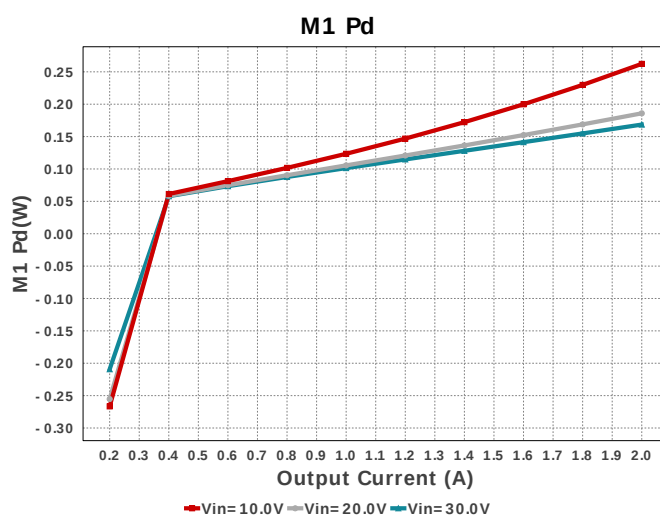
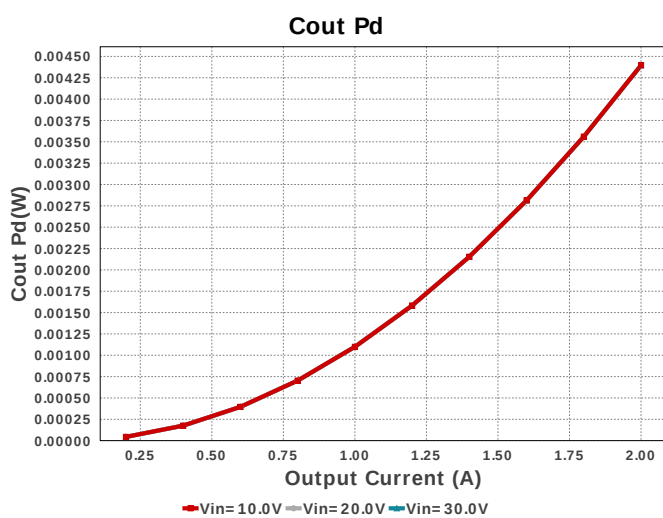
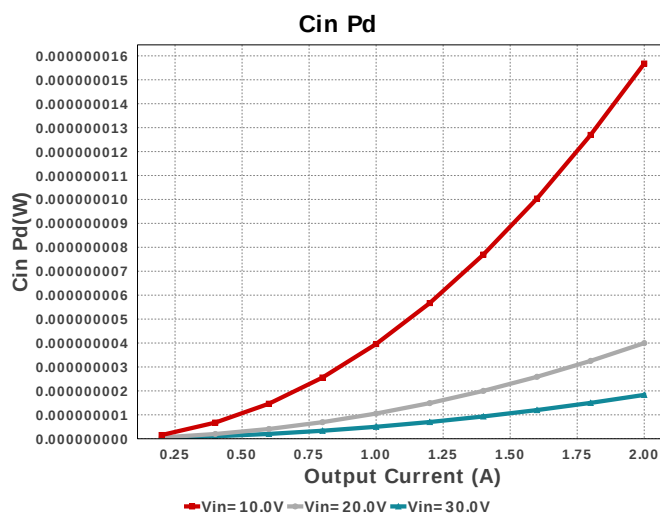
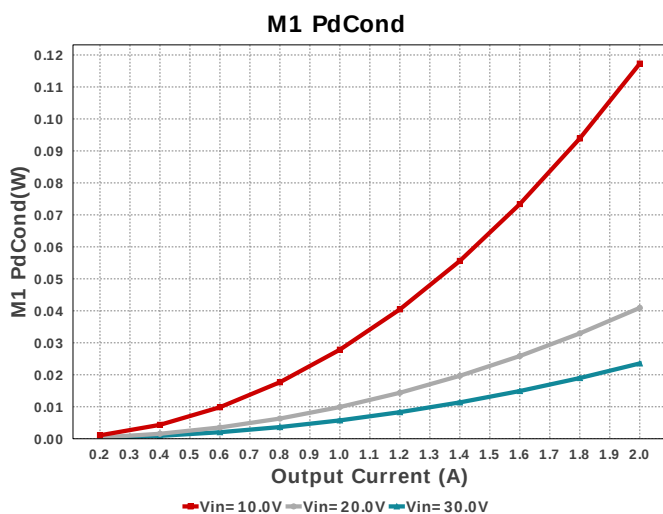
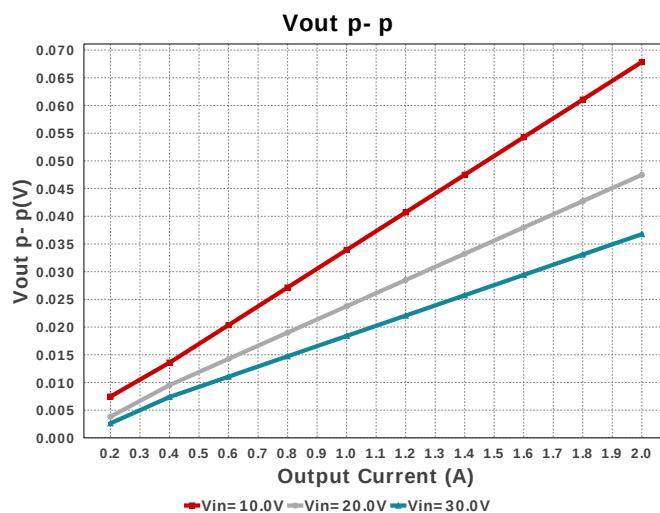
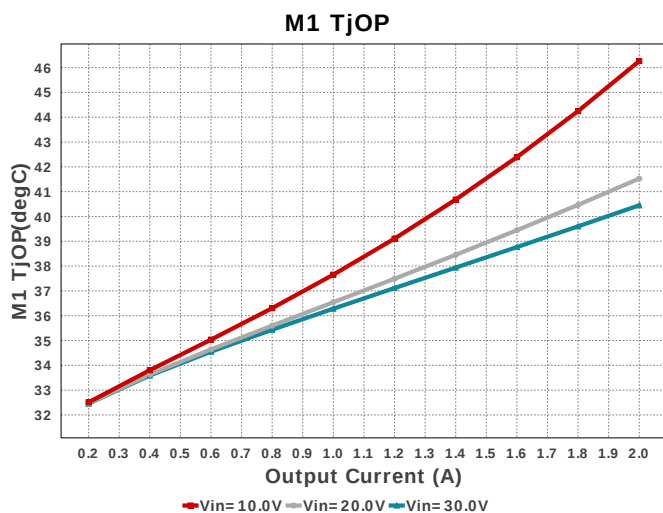
INPUT-10-30VDC-OUTPUT-12VDC@2A

Electrical BOM

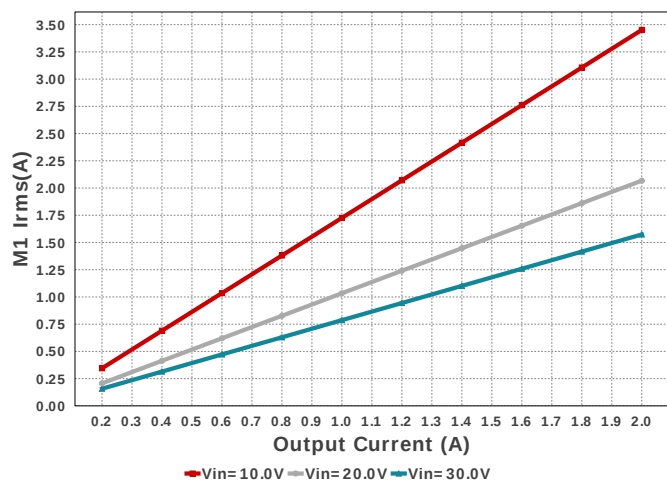
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	TDK	C1005X6S1C105K050BC Series= X6S	Cap= 1.0 uF ESR= 11.416 mOhm VDC= 16.0 V IRMS= 1.483 A	1	\$0.02	0402 3 mm ²
2.	Ccomp	Kemet	C0603C123J3GACTU Series= C0G/NP0	Cap= 12.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.10	0603 5 mm ²
3.	Ccomp2	AVX	04025A471JAT2A Series= C0G/NP0	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
4.	Ccouple	TDK	C3216X5R1H685K160AB Series= X5R	Cap= 6.8 uF ESR= 3.202 mOhm VDC= 50.0 V IRMS= 4.0553 A	3	\$0.36	1206_180 11 mm ²
5.	Cift	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
6.	Cin	CUSTOM	CUSTOM Series= ?	Cap= 16.3743 uF ESR= 1.0 uOhm VDC= 45.0 V IRMS= 295.09 mA	1	NA	CUSTOM 0 mm ²
7.	Cout	TDK	C3216X5R1E336M160AC Series= X5R	Cap= 33.0 uF ESR= 2.648 mOhm VDC= 25.0 V IRMS= 4.4586 A	3	\$0.44	1206_180 11 mm ²
8.	Crc	MuRata	GRM0335C1E910JA01D Series= C0G/NP0	Cap= 91.0 pF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0201 2 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Css	Kemet	C0805C223K5RACTU Series= X7R	Cap= 22.0 nF ESR= 125.0 mOhm VDC= 50.0 V IRMS= 645.0 mA	1	\$0.01	 0805 7 mm ²
10.	D1	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	\$0.12	 DPAK 102 mm ²
11.	L1	Coiltronics	DRQ127-220-R	Lp= 22.0 µH Rp= 78.5 mOhm Leakage_L= 1.32 µH Ns1toNp= 1.0 Rs1= 78.5 mOhms	1	\$1.16	 DRQ127 210 mm ²
12.	M1	Texas Instruments	CSD19531KCS	VdsMax= 100.0 V IdsMax= 100.0 Amps	1	\$0.72	 TO-220AB 79 mm ²
13.	Rcomp	Yageo	RC0201FR-0712K1L Series= ?	Res= 12.1 kOhm Power= 50.0 mW Tolerance= 1.0%	1	\$0.01	 0201 2 mm ²
14.	Rfbb	Susumu Co Ltd	RR1220P-4751-D-M Series= RR12	Res= 4.75 kOhm Power= 100.0 mW Tolerance= 0.5%	1	\$0.01	 0805 7 mm ²
15.	Rfbt	Susumu Co Ltd	RG1608P-7682-B-T5 Series= RG1608	Res= 76.8 kOhm Power= 100.0 mW Tolerance= 0.1%	1	\$0.06	 0603 5 mm ²
16.	Rg	Vishay-Dale	CRCW04022R87FKED Series= CRCW..e3	Res= 2.87 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rift	Vishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rrc	Vishay-Dale	CRCW0402523KFKED Series= CRCW..e3	Res= 523.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	Rsense	Stackpole Electronics Inc	CSR1206FK15L0 Series= ?	Res= 15.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	\$0.12	 1206 11 mm ²
20.	U1	Texas Instruments	TPS40210DGQR	Switcher	1	\$0.75	 S-PDSO-G10 24 mm ²

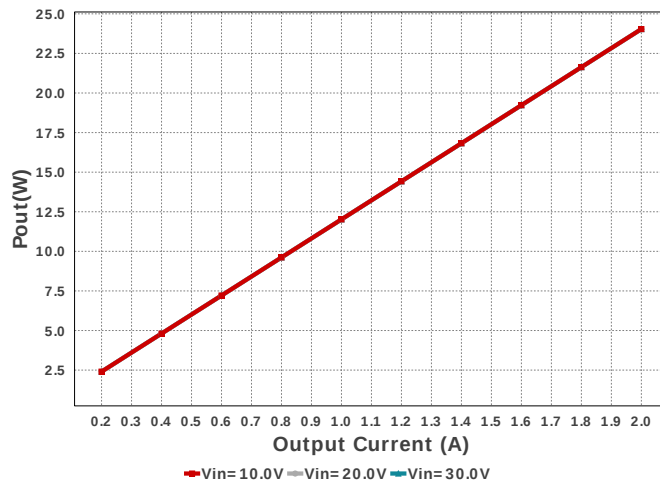




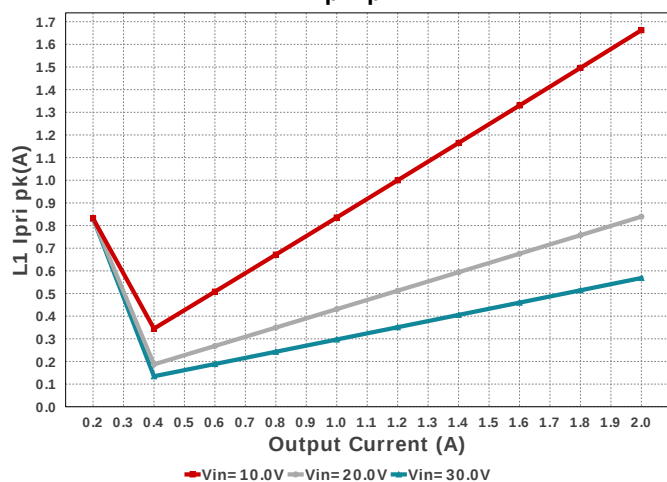
M1 Irms



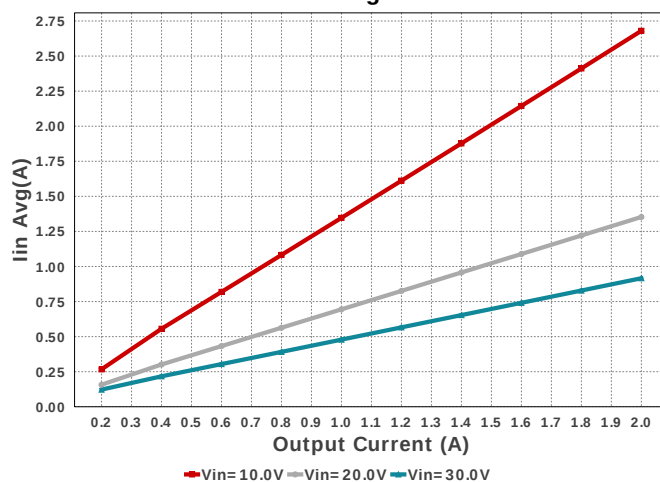
Pout



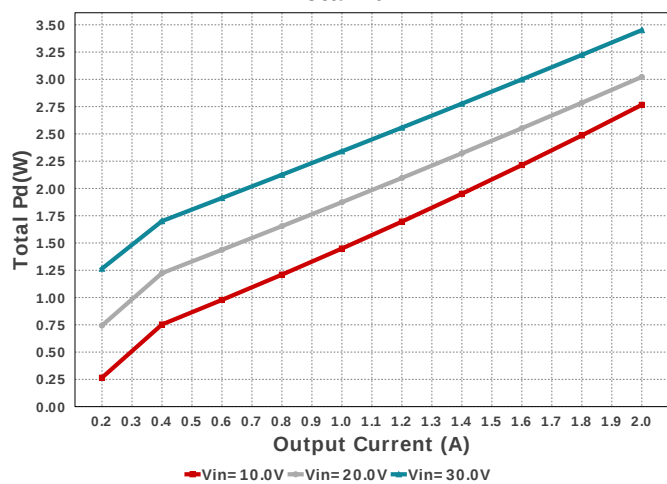
L1 Ipri pk



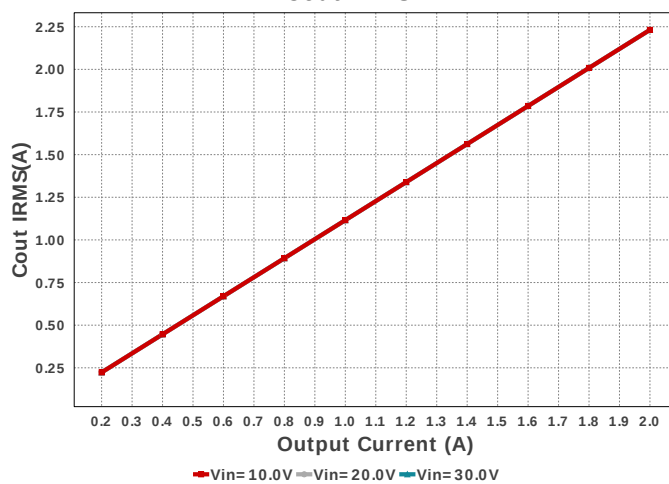
Iin Avg

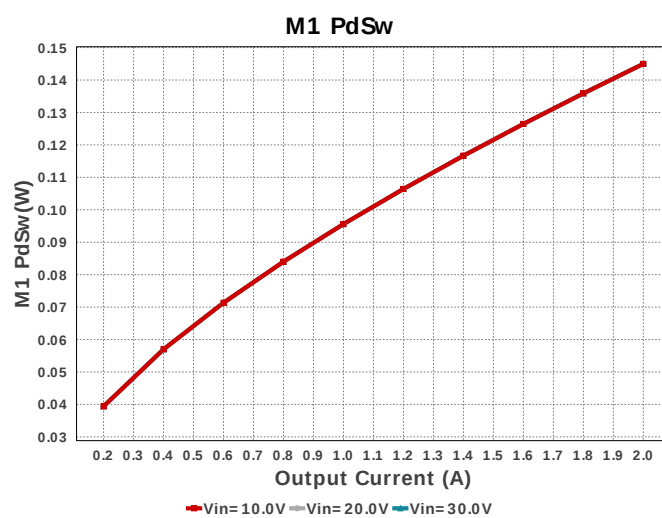
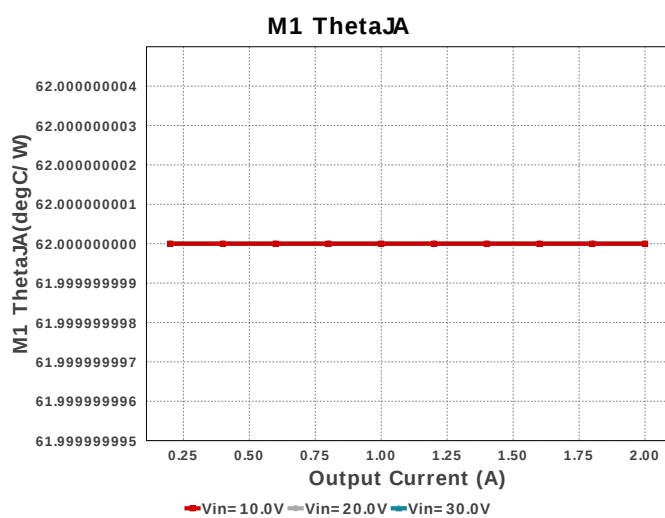
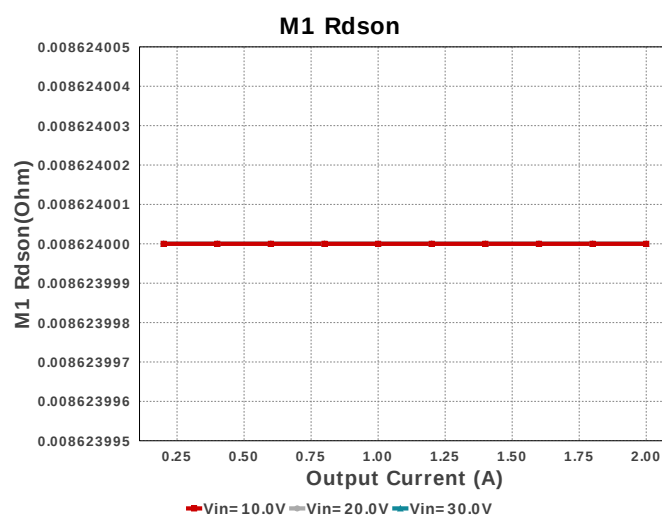
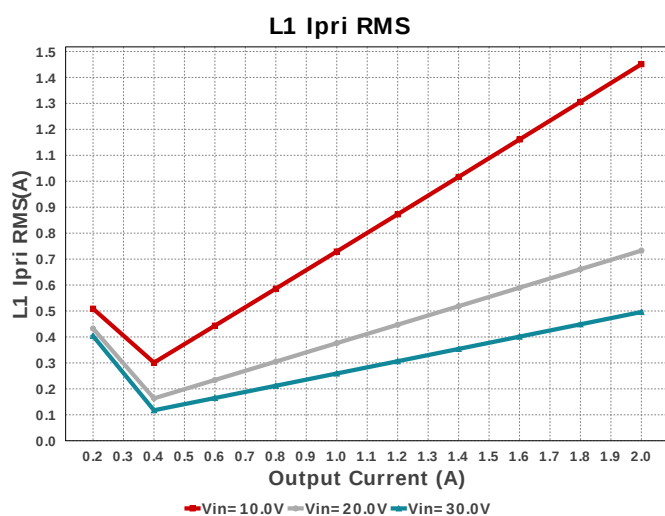
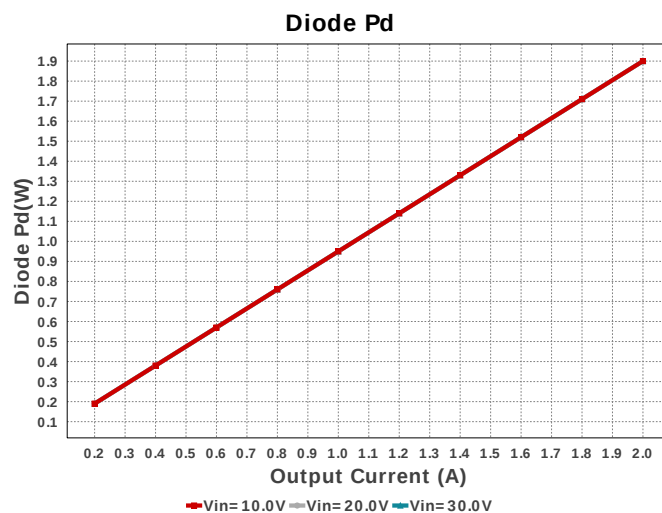
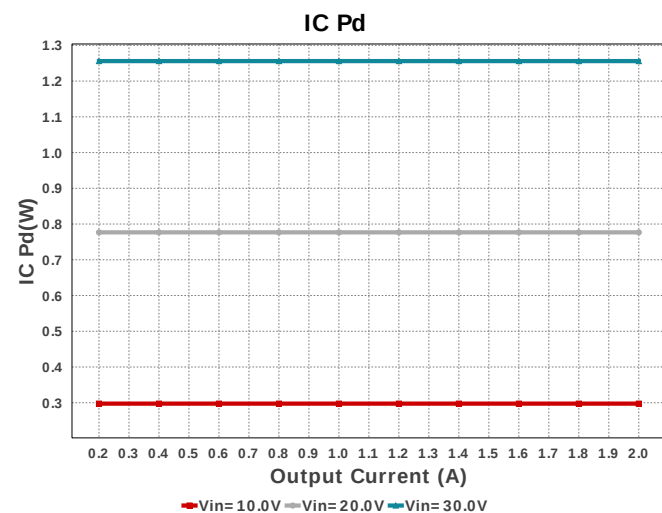


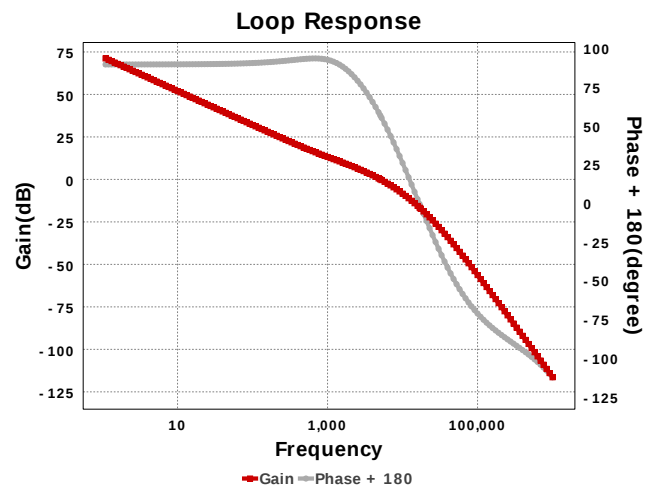
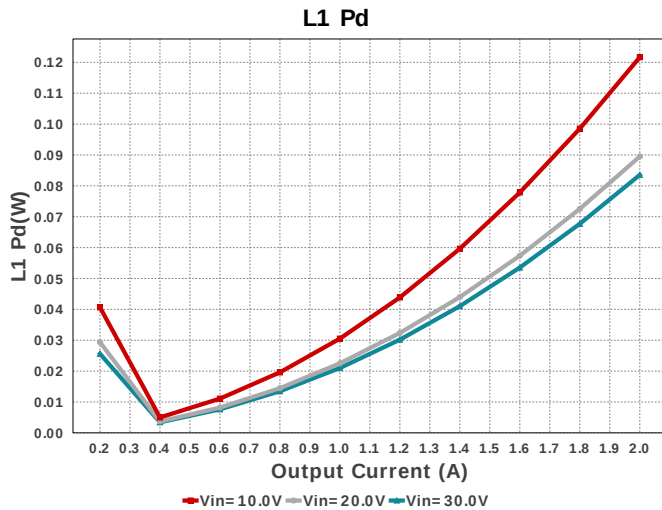
Total Pd



Cout IRMS







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	124.879 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.232 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	2.673 A	Current	Average input current
4.	M1 Irms	3.448 A	Current	M1 MOSFET Irms
5.	BOM Count	24	General	Total Design BOM count
6.	FootPrint	574.0 mm ²	General	Total Foot Print Area of BOM components
7.	Frequency	312.138 kHz	General	Switching frequency
8.	IC Tolerance	14.0 mV	General	IC Feedback Tolerance
9.	M1 Rdson	8.624 mOhm	General	Drain-Source On-resistance
10.	M1 ThetaJA	62.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
11.	Mode	CCM	General	Conduction Mode
12.	Pout	24.0 W	General	Total output power
13.	Total BOM	\$0.0	General	Total BOM Cost
14.	Cross Freq	5.377 kHz	Op Point	Bode plot crossover frequency
15.	D1 Tj	30.0 degC	Op Point	D1 junction temperature
16.	Duty Cycle	56.427 %	Op Point	Duty cycle
17.	Efficiency	89.792 %	Op Point	Steady state efficiency
18.	Gain Marg	-21.029 dB	Op Point	Bode Plot Gain Margin
19.	IC Tj	45.836 degC	Op Point	IC junction temperature
20.	ICThetaJA	57.7 degC/W	Op Point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	2.0 A	Op Point	Iout operating point
22.	Low Freq Gain	76.703 dB	Op Point	Gain at 1Hz
23.	M1 TjOP	45.387 degC	Op Point	M1 MOSFET junction temperature
24.	Phase Marg	68.399 deg	Op Point	Bode Plot Phase Margin
25.	VIN_OP	10.0 V	Op Point	Vin operating point
26.	Vout Actual	12.018 V	Op Point	Vout Actual calculated based on selected voltage divider resistors
27.	Vout OP	12.018 V	Op Point	Operational Output Voltage
28.	Vout Tolerance	2.579 %	Op Point	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
29.	Vout p-p	73.651 mV	Op Point	Peak-to-peak output ripple voltage
30.	Cin Pd	15.595 nW	Power	Input capacitor power dissipation
31.	Cout Pd	4.396 mW	Power	Output capacitor power dissipation
32.	Diode Pd	1.9 W	Power	Diode power dissipation
33.	IC Pd	274.461 mW	Power	IC power dissipation
34.	M1 Pd	248.17 mW	Power	M1 MOSFET total power dissipation
35.	M1 PdCond	116.457 mW	Power	M1 MOSFET conduction losses
36.	M1 PdSw	131.713 mW	Power	M1 MOSFET switching losses
37.	Rfb Pd	1.766 mW	Power	Rfb Power Dissipation
38.	Total Pd	2.728 W	Power	Total Power Dissipation
39.	L1 Ipri RMS	1.447 A	Transformer	RMS current in primary of PFC-Coil L1.
40.	L1 Ipri pk	1.658 A	Transformer	Peak current in primary of PFC-Coil L1.
41.	L1 Pd	121.427 mW	Transformer	Power Dissipation in the Inductor

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	30.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	TPS40210	Base Product Number
6.	source	DC	Input Source Type

#	Name	Value	Description
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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