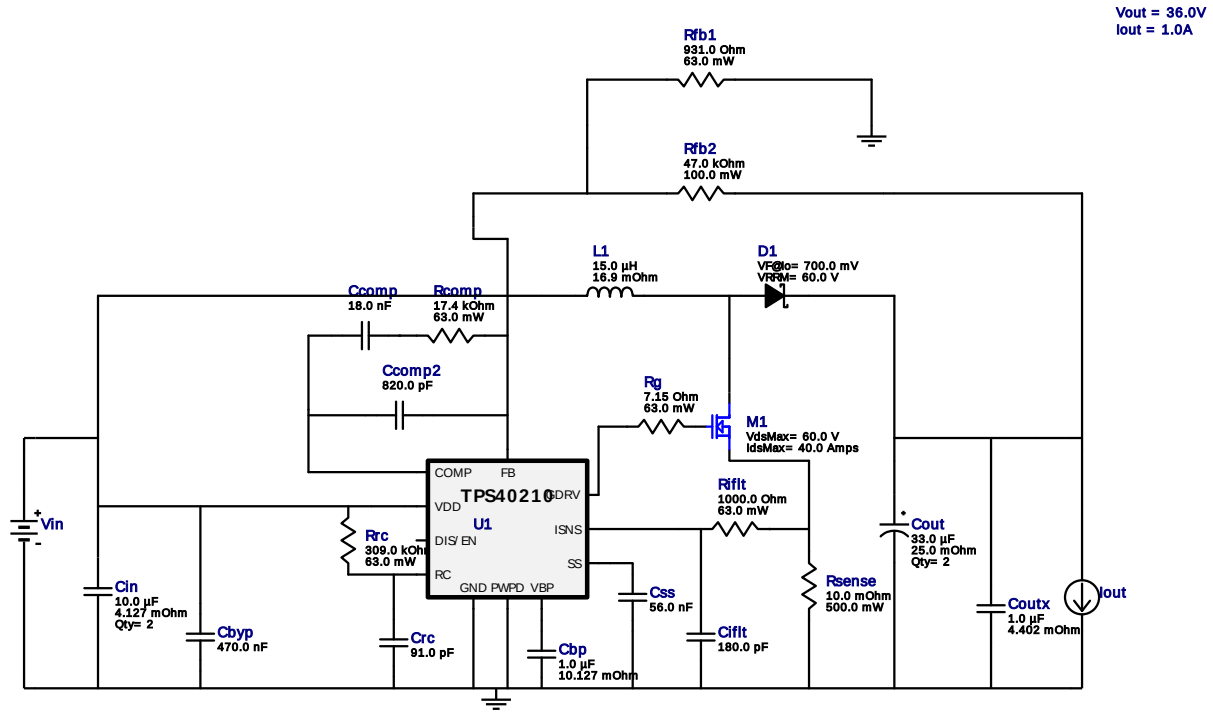
WEBENCH® Design Report

VinMin = 6.0V
VinMax = 10.0V
Vout = 36.0V
Iout = 1.0A

Device = TPS40210DGQR
Topology = Boost
Created = 7/24/16 7:26:55 AM
BOM Cost = $5.84
BOM Count = 23
Total Pd = 1.95W

Design : 1194016/2195 TPS40210DGQR
TPS40210DGQR 6.0V-10.0V to 36.04V @ 1.0A

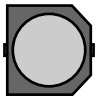


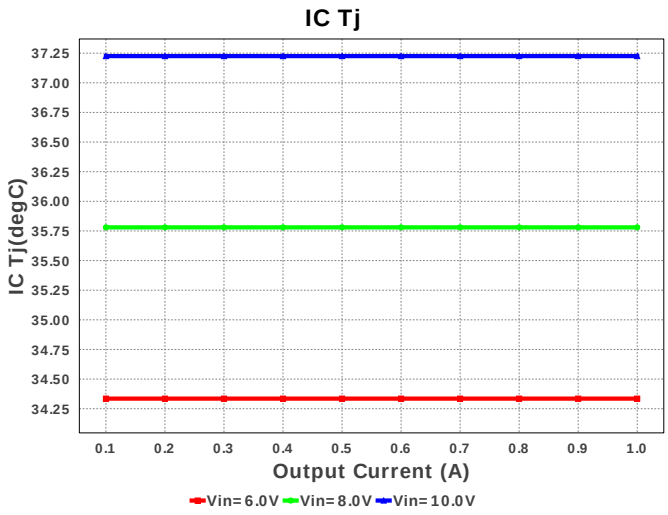
My Comments

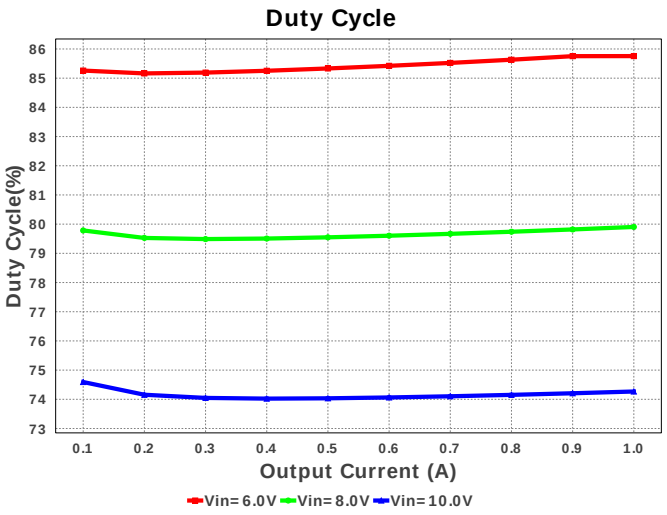
No comments

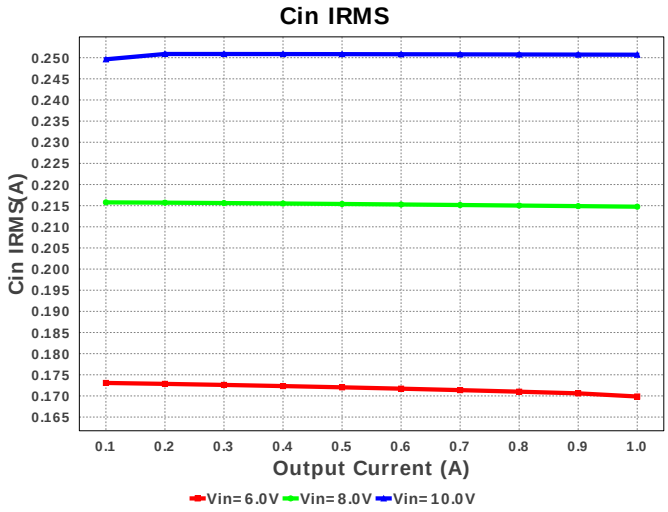
Electrical BOM

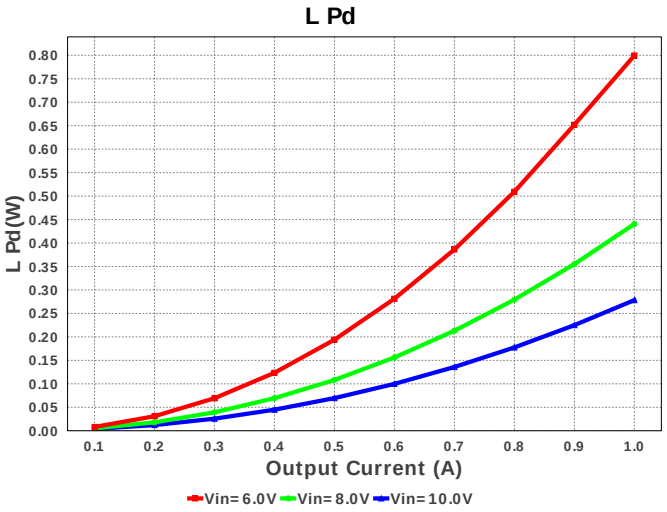
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	$0.01	0603 5 mm²
2.	Cbyp	MuRata	GRM155R61A474KE15D Series= X5R	Cap= 470.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Ccomp2	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Ciflt	Kemet	C0805C181K5GACTU Series= C0G/NP0	Cap= 180.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
6.	Cin	MuRata	GRM21BR61C106KE15L Series= X5R	Cap= 10.0 uF ESR= 4.127 mOhm VDC= 16.0 V IRMS= 2.46634 A	2	$0.03	0805 7 mm²

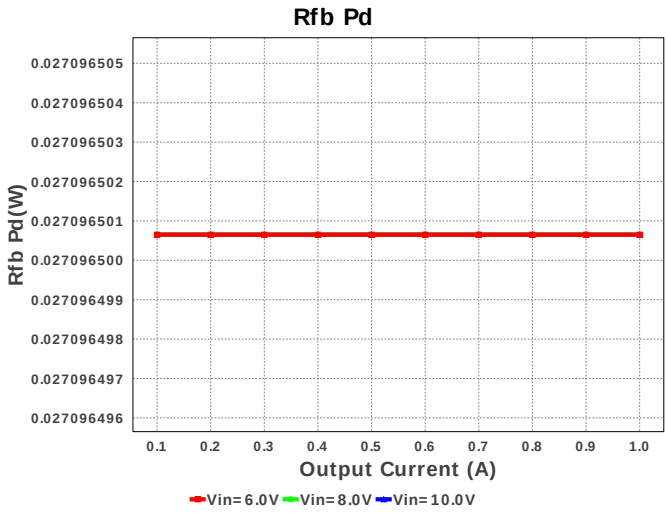
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	Cout	Panasonic	63SXV33M Series= ?	Cap= 33.0 uF ESR= 25.0 mOhm VDC= 63.0 V IRMS= 2.95 A	2	$1.25	 CAPSMT_62_E12 106 mm^2
8.	Coutx	MuRata	GRM21BR71H105KA12L Series= X7R	Cap= 1.0 uF ESR= 4.402 mOhm VDC= 50.0 V IRMS= 1.677 A	1	$0.05	 0805 7 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	GRM155R61A563KA01D Series= X5R	Cap= 56.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	 0402 3 mm^2
11.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	 SMA 37 mm^2
12.	L1	Coilcraft	XAL1010-153MEB	L= 15.0 µH DCR= 16.9 mOhm	1	$1.71	 XAL1010 160 mm^2
13.	M1	Infineon Technologies	BSZ100N06LS3 G	VdsMax= 60.0 V IdsMax= 40.0 Amps	1	$0.39	 PG-TSDSON-8 19 mm^2
14.	Rcomp	Vishay-Dale	CRCW040217K4FKED Series= CRCW..e3	Res= 17.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rfb1	Vishay-Dale	CRCW0402931RFKED Series= CRCW..e3	Res= 931.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rfb2	Yageo America	RC0603FR-0747KL Series= ?	Res= 47.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm^2
17.	Rg	Vishay-Dale	CRCW04027R15FKED Series= CRCW..e3	Res= 7.15 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
18.	Riflt	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	CRCW0402309KFKED Series= CRCW..e3	Res= 309.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Rsense	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 11 mm^2
21.	U1	Texas Instruments	TPS40210DGQR	Switcher	1	$0.80	 S-PDSO-G10 24 mm^2

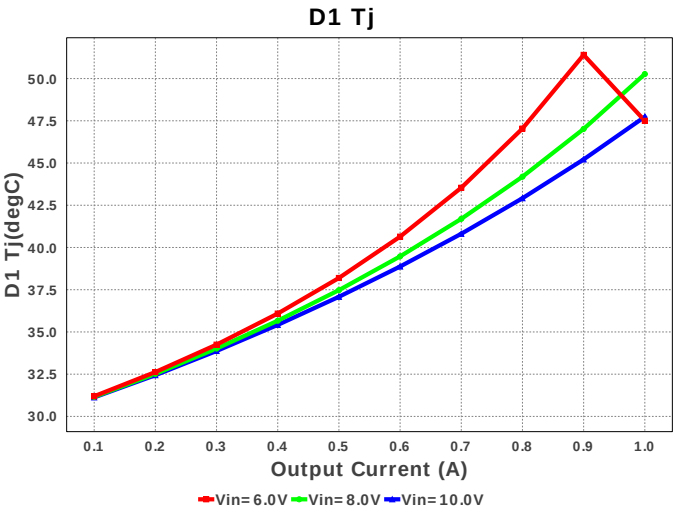


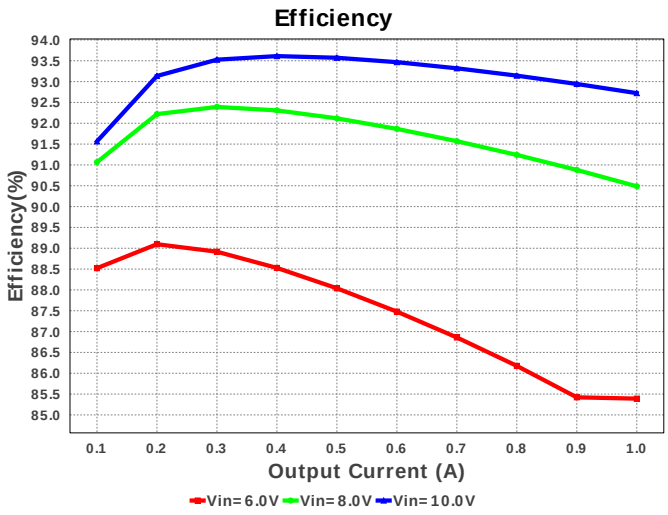


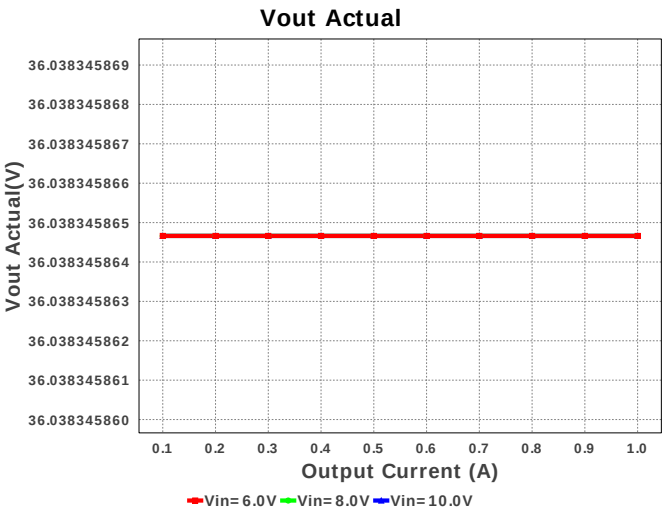


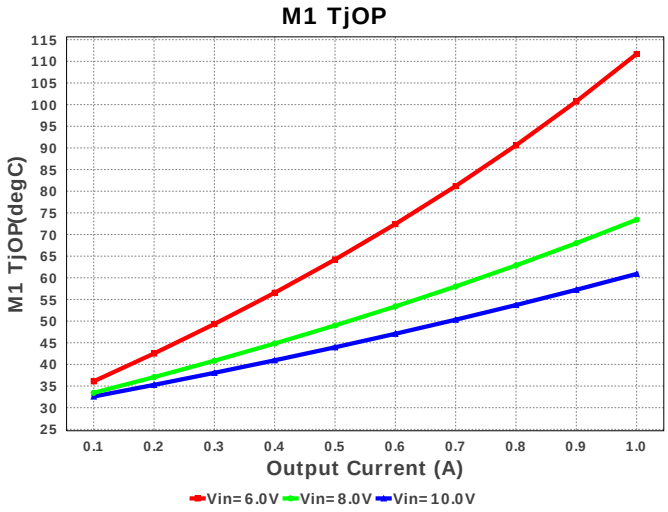


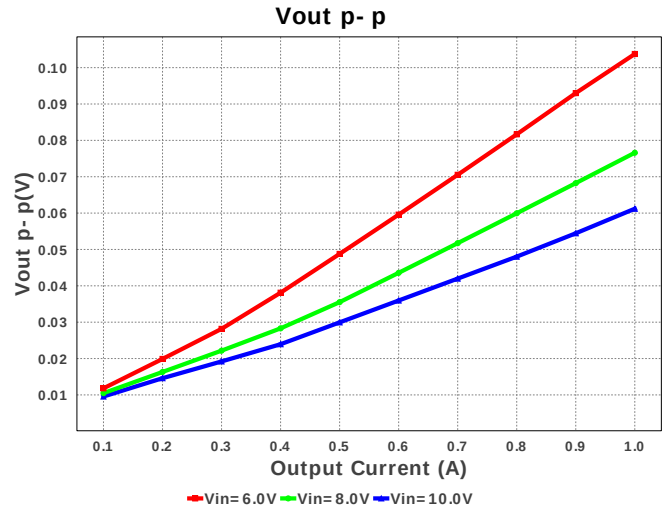


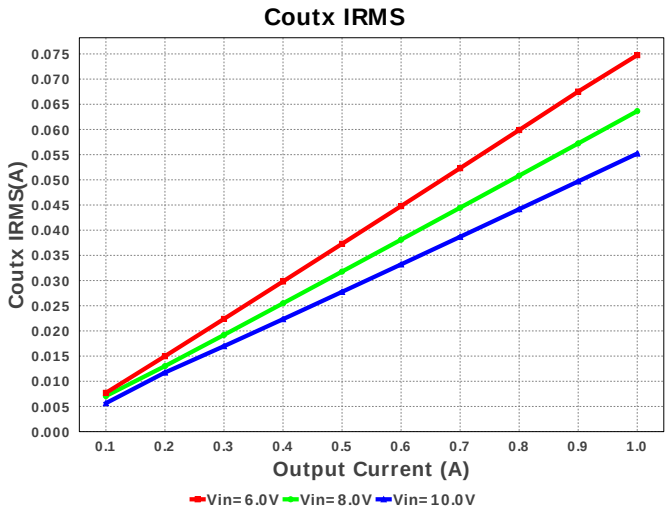


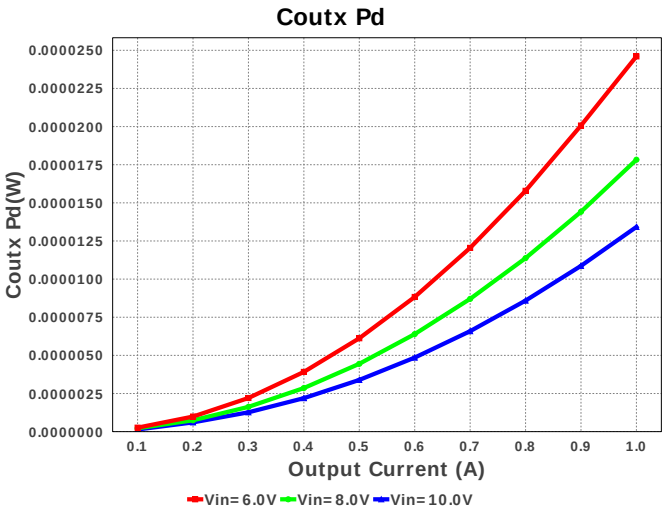


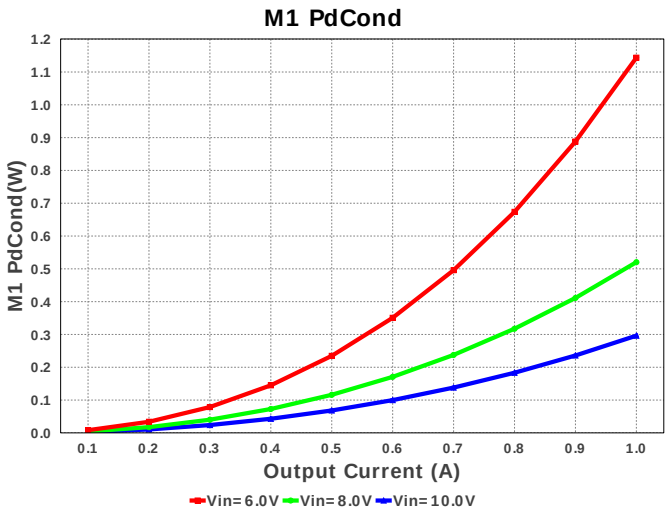


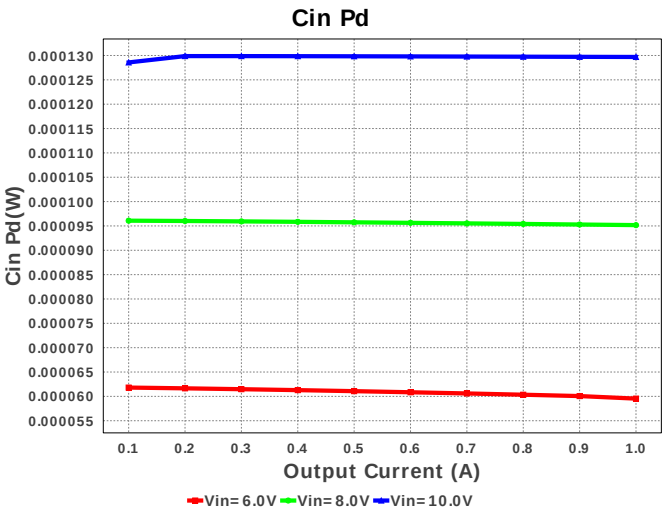


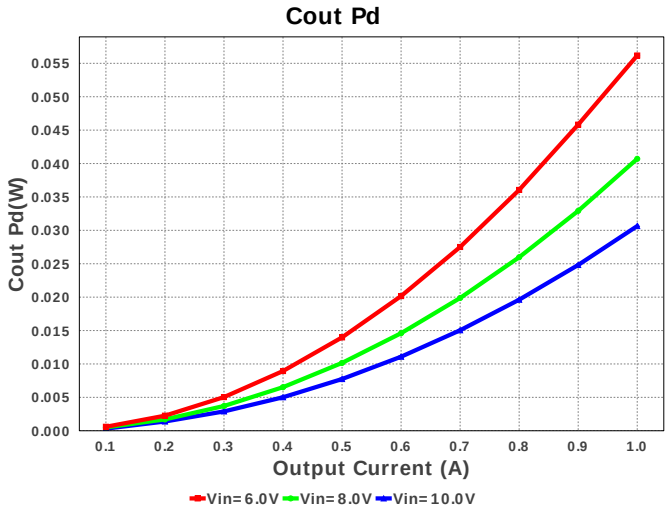


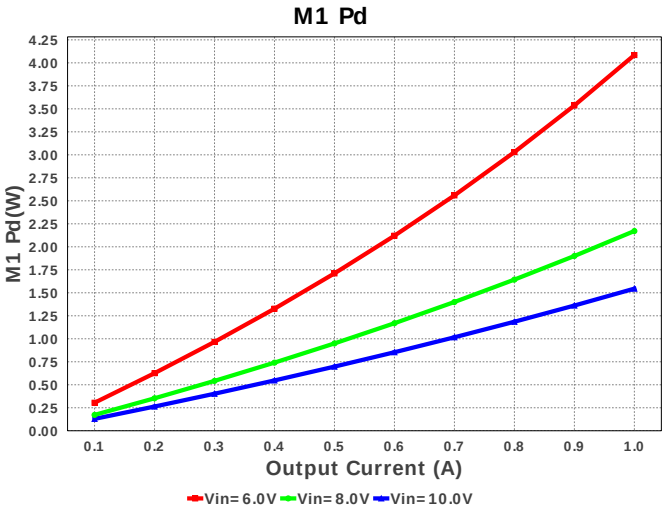


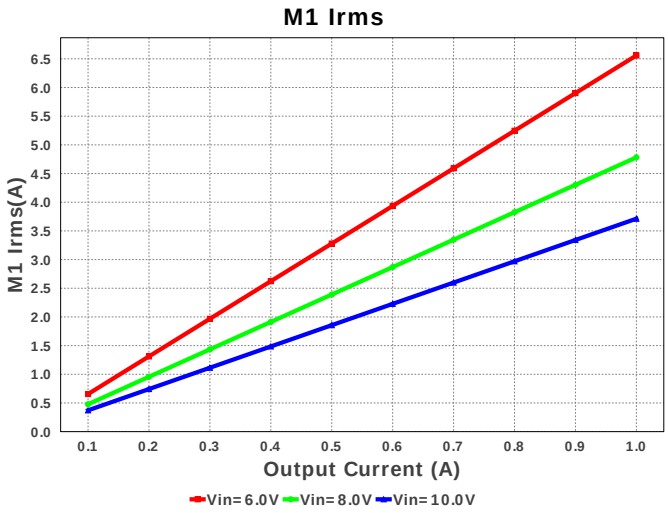


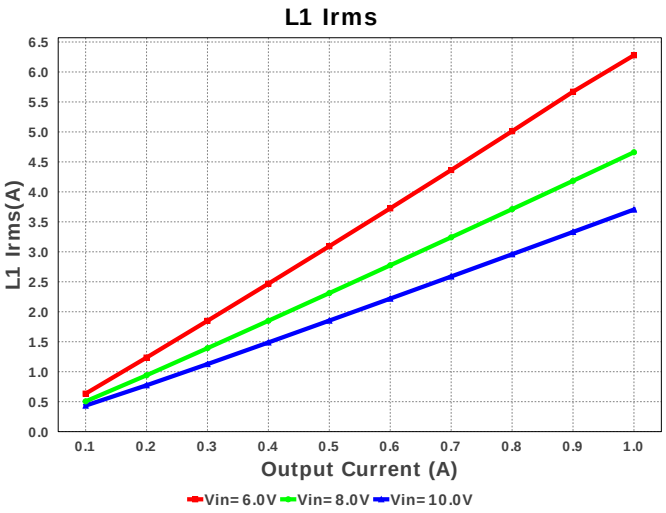


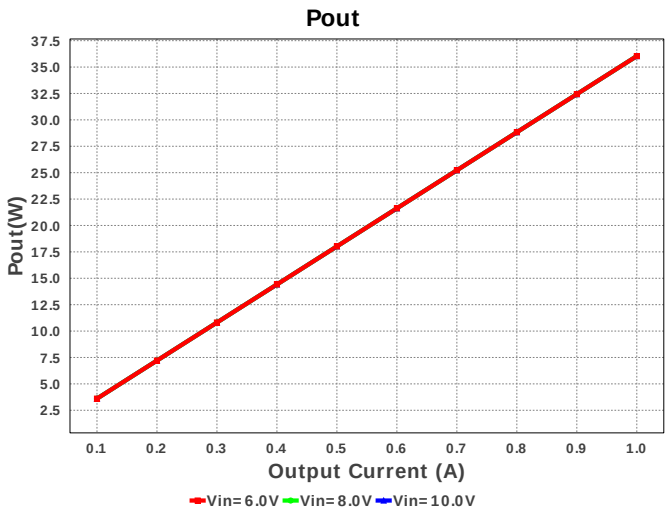


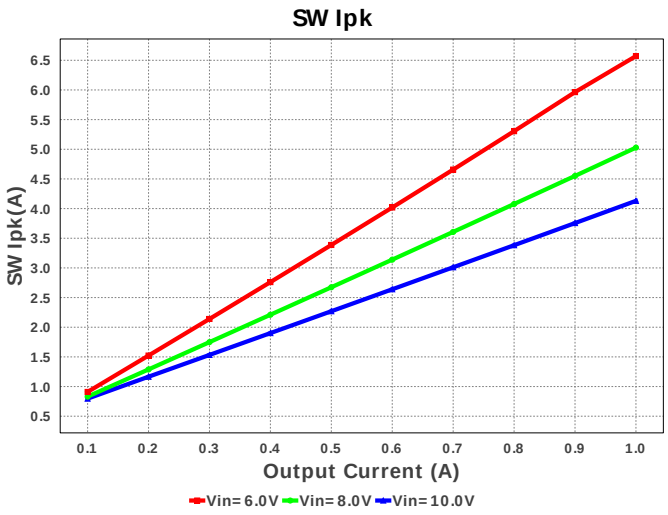


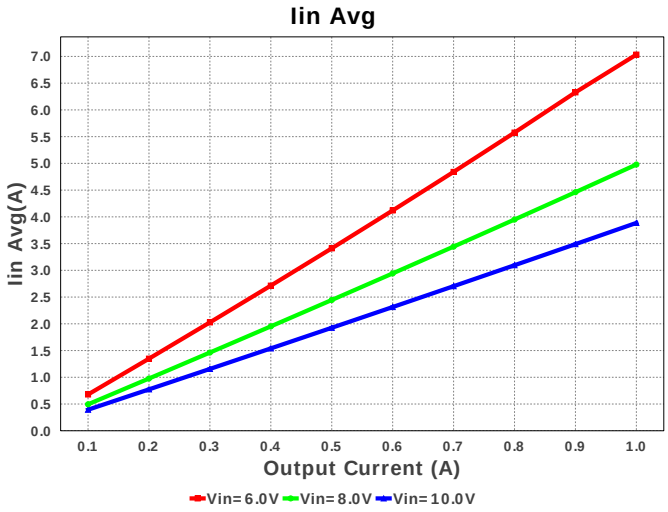


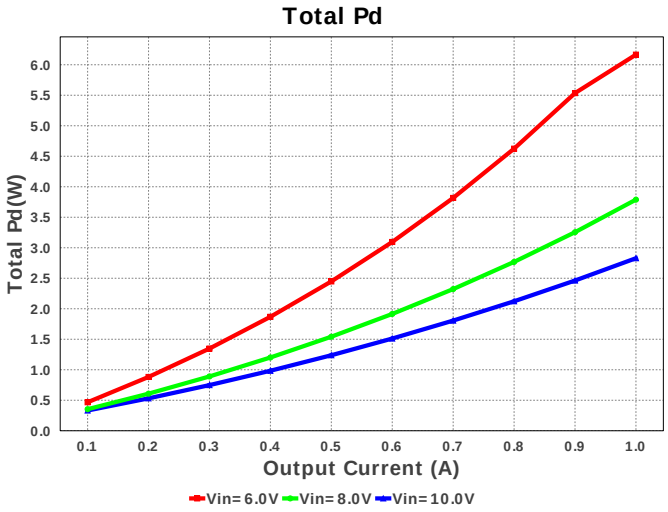


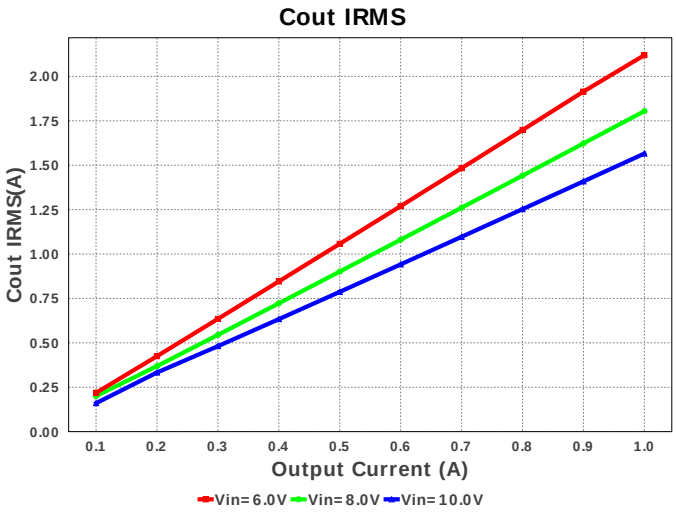


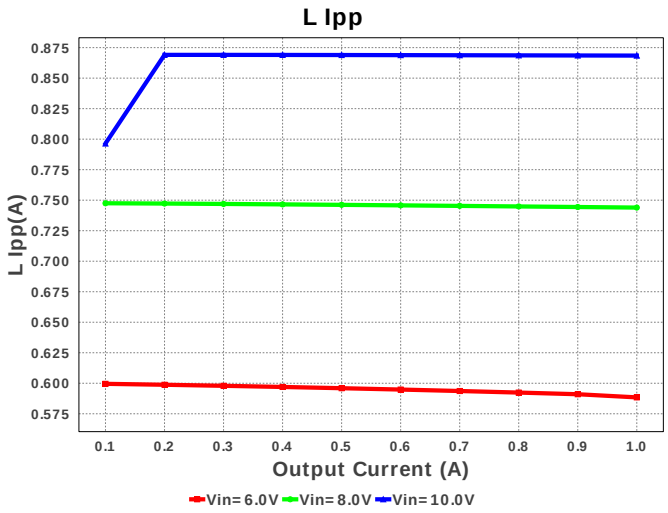


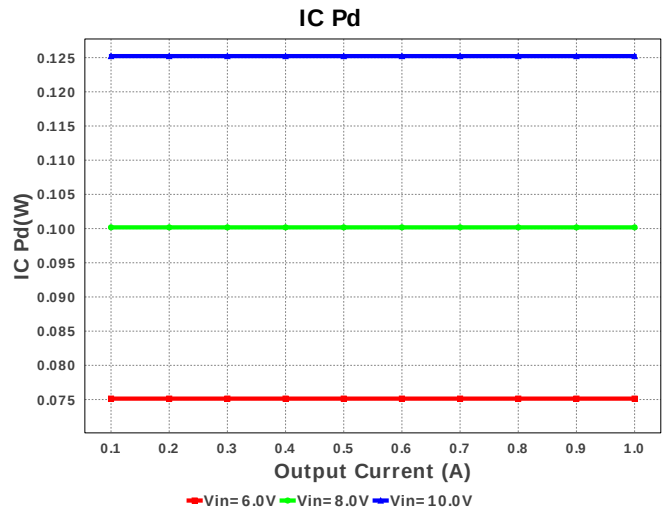


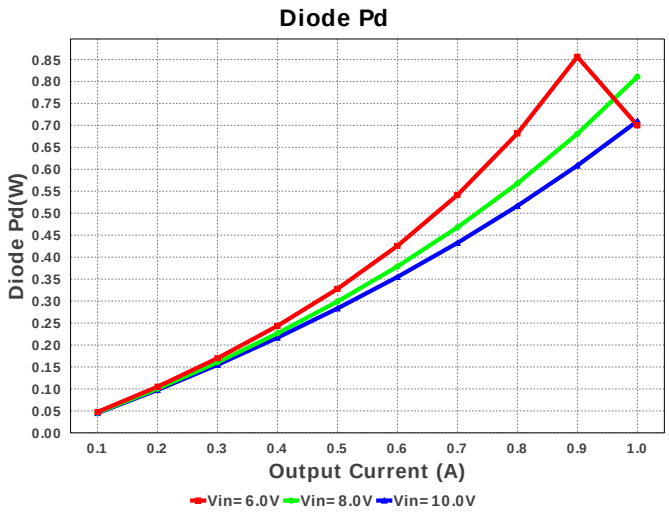


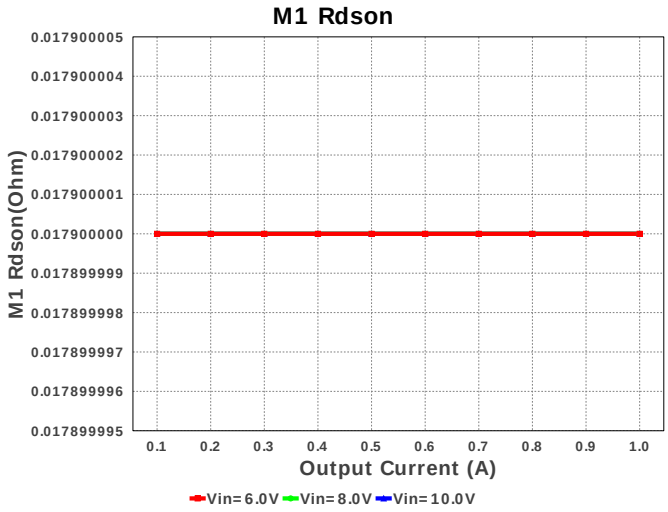


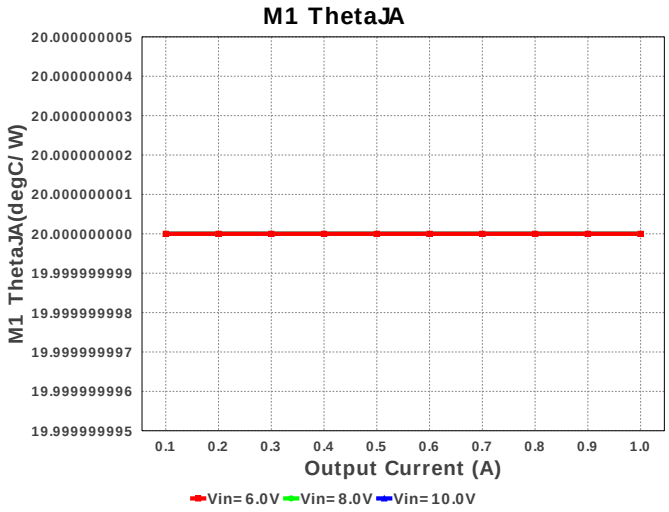


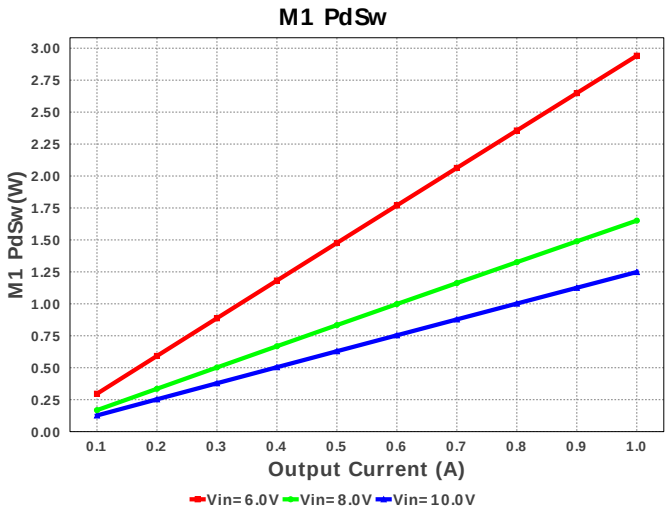


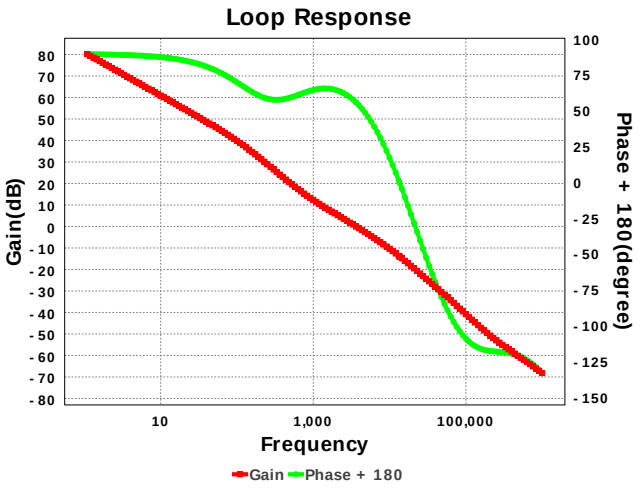












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	189.005 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.163 A	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	70.966 mA	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	6.325 A	Current	Average input current
5.	L Ipp	654.73 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	6.12 A	Current	Inductor ripple current
7.	M1 Irms	6.551 A	Current	M1 MOSFET Irms
8.	SW Ipk	6.444 A	Current	Peak switch current
9.	BOM Count	23	General	Total Design BOM count
10.	FootPrint	541.0 mm^2	General	Total Foot Print Area of BOM components
11.	Frequency	512.777 kHz	General	Switching frequency

#	Name	Value	Category	Description
12.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	17.9 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	20.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	36.0 W	General	Total output power
16.	Total BOM	$5.84	General	Total BOM Cost
17.	D1 Tj	47.5 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	77.725 dB	Op_Point	Gain at 10Hz
19.	Vout Actual	36.038 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	36.038 V	Op_Point	Operational Output Voltage
21.	Cross Freq	2.395 kHz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	84.167 %	Op_point	Duty cycle
23.	Efficiency	94.857 %	Op_point	Steady state efficiency
24.	Gain Marg	-11.693 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	34.09 degC	Op_point	IC junction temperature
26.	ICThetaJA	57.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	1.0 A	Op_point	Iout operating point
28.	M1 TjOP	106.96 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	55.132 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	6.0 V	Op_point	Vin operating point
31.	Vout p-p	96.557 mV	Op_point	Peak-to-peak output ripple voltage
32.	Cin Pd	73.714 µW	Power	Input capacitor power dissipation
33.	Cout Pd	58.493 mW	Power	Output capacitor power dissipation
34.	Coutx Pd	22.169 µW	Power	Output capacitor_x power loss
35.	Diode Pd	700.0 mW	Power	Diode power dissipation
36.	IC Pd	70.89 mW	Power	IC power dissipation
37.	L Pd	759.472 mW	Power	Inductor power dissipation
38.	M1 Pd	3.848 W	Power	M1 MOSFET total power dissipation
39.	M1 PdCond	1.121 W	Power	M1 MOSFET conduction losses
40.	M1 PdSw	2.727 W	Power	M1 MOSFET switching losses
41.	Rfb Pd	27.039 mW	Power	Rfb Power Dissipation
42.	Total Pd	1.952 W	Power	Total Power Dissipation
43.	Vout Tolerance	3.438 %		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	10.0	Maximum input voltage
3.	VinMin	6.0	Minimum input voltage
4.	Vout	36.0	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.