















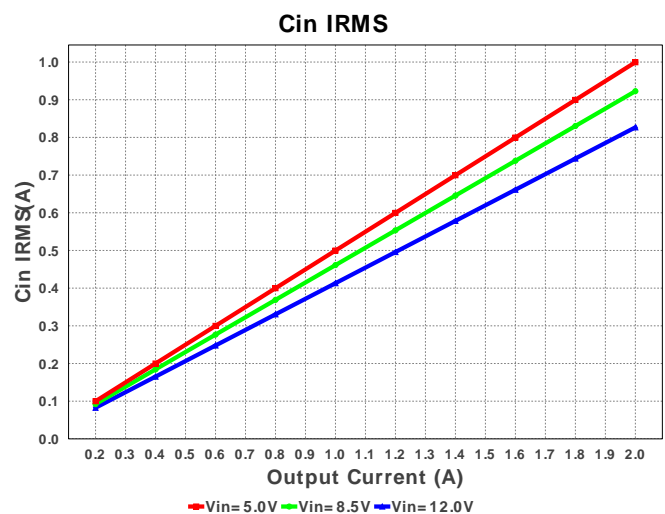
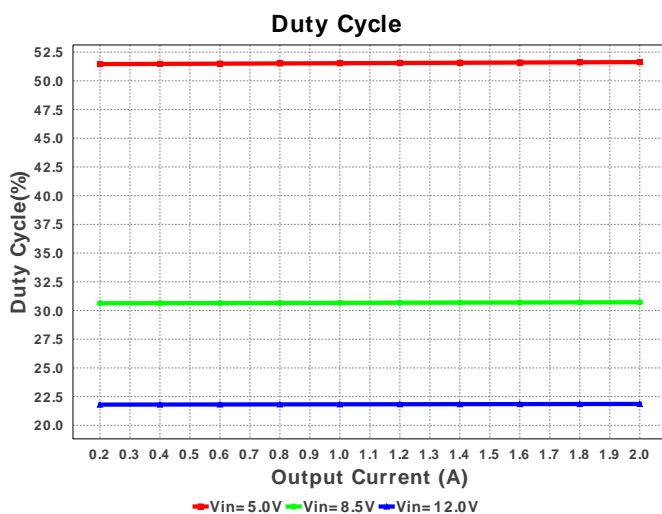
WEBENCH[®] Design Report

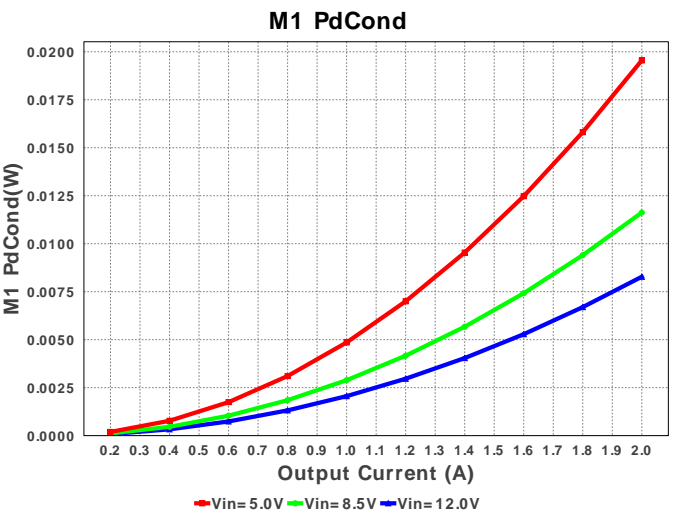
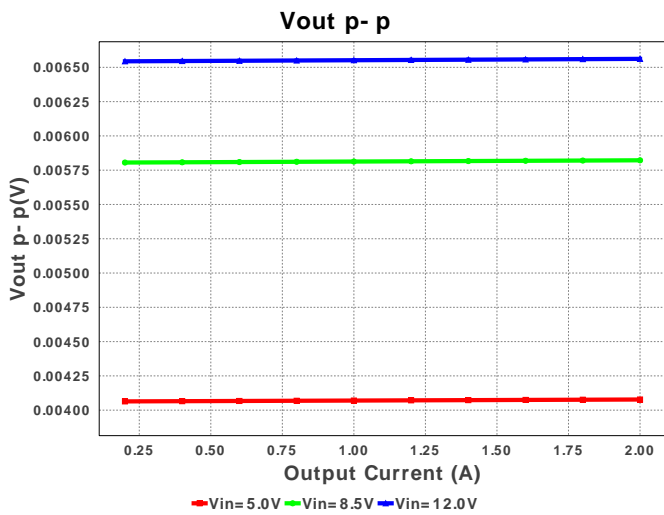
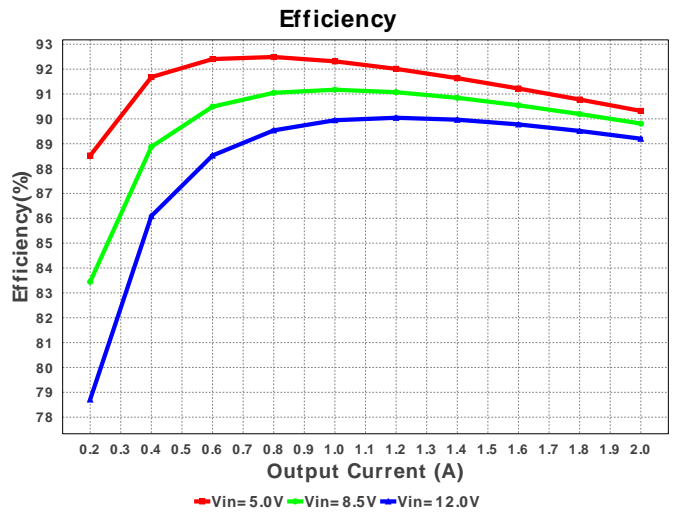
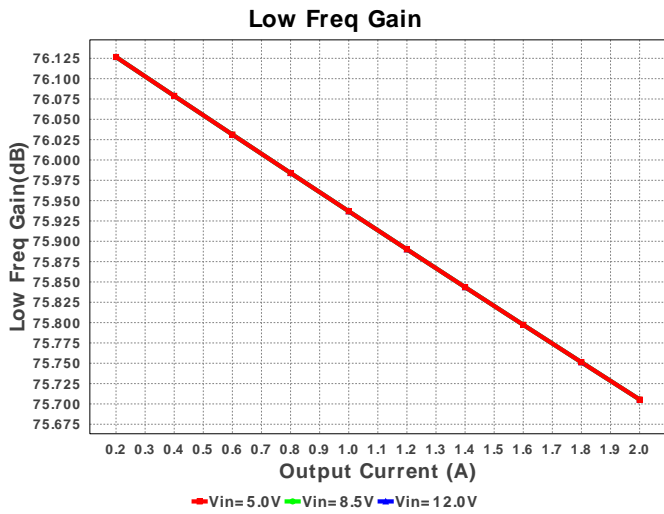
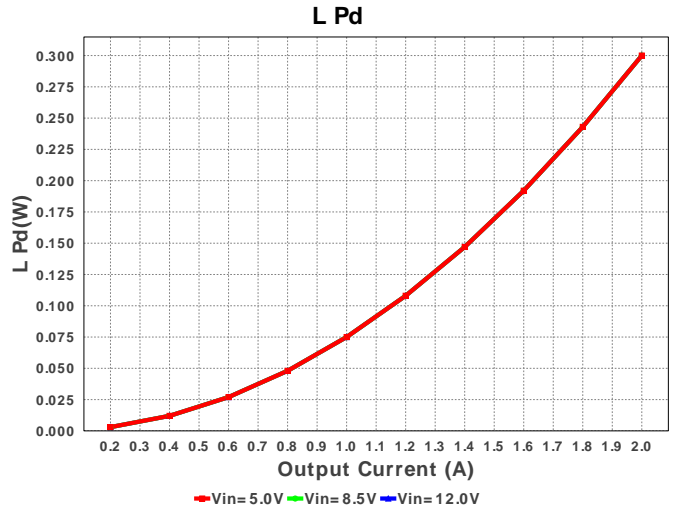
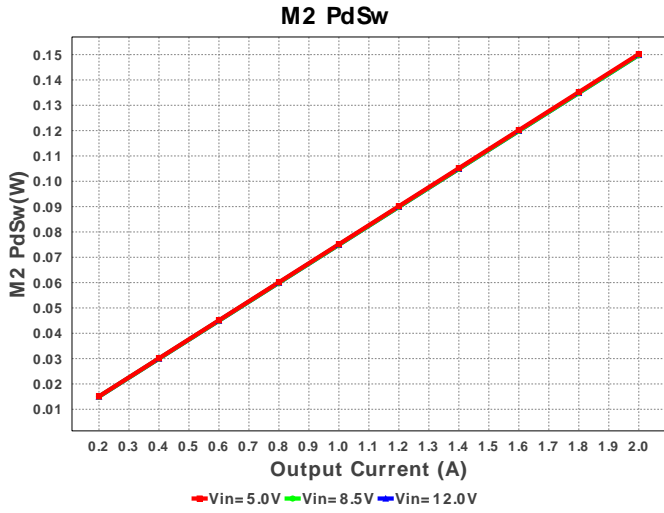
 Design : 1636742/2 TPS40170RGYR
 TPS40170RGYR 5.0V-12.0V to 2.50V @ 2.0A

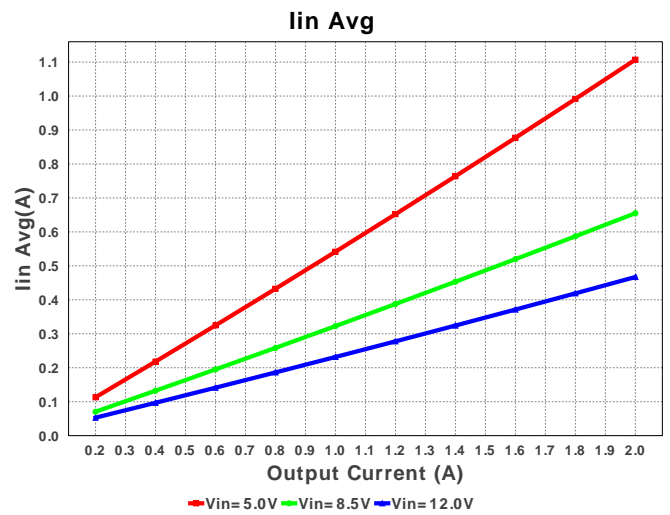
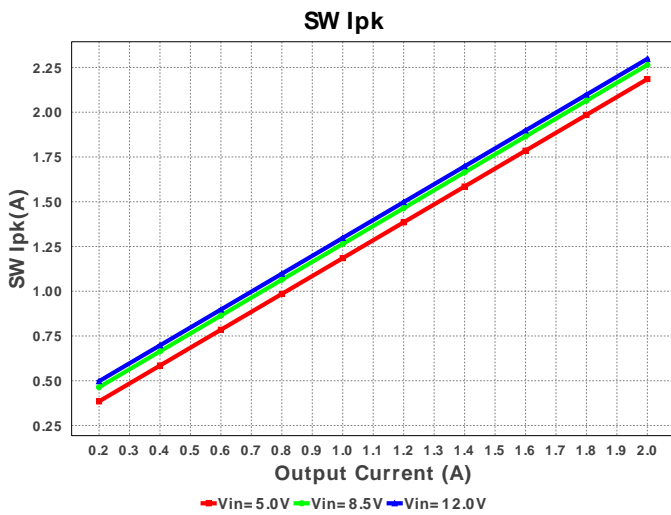
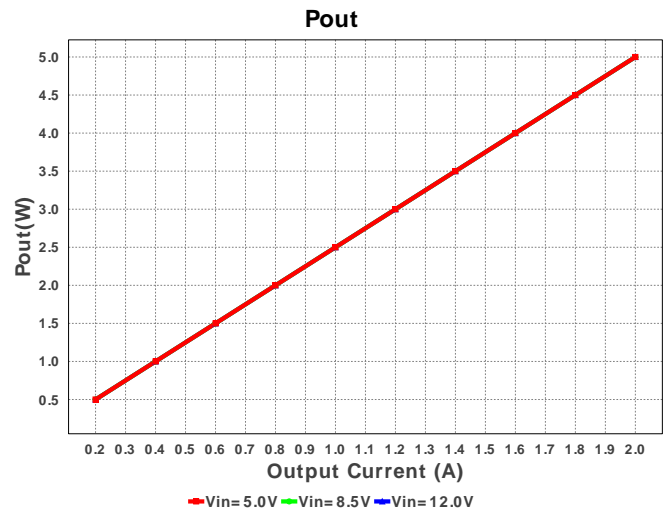
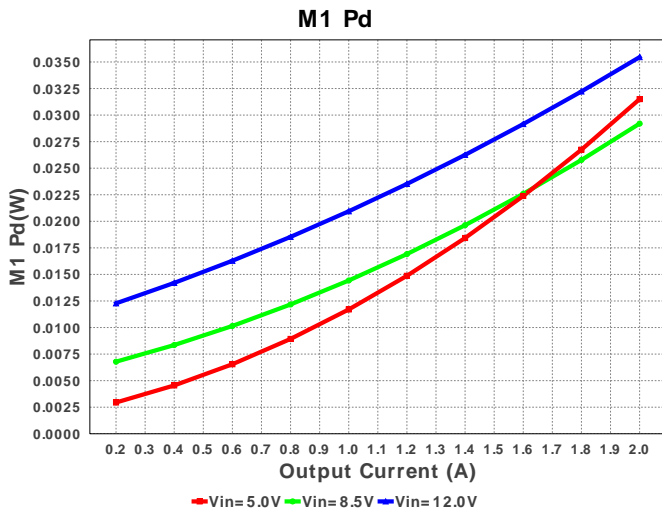
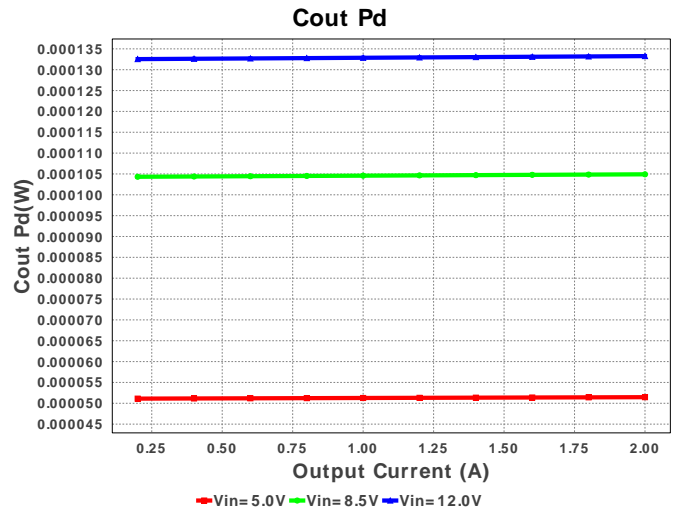
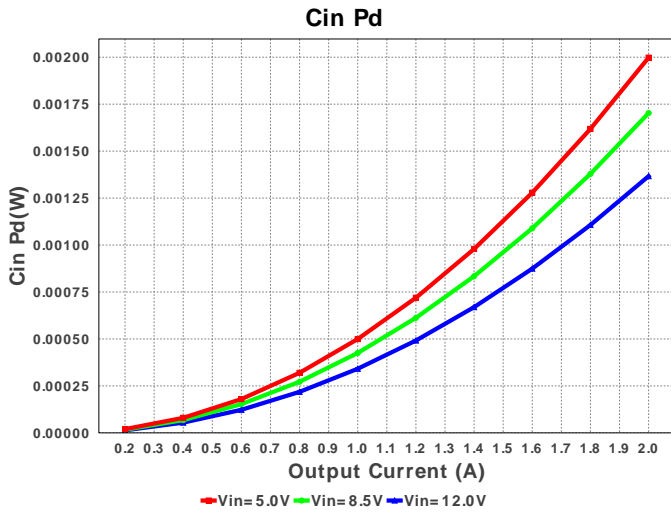
Electrical BOM

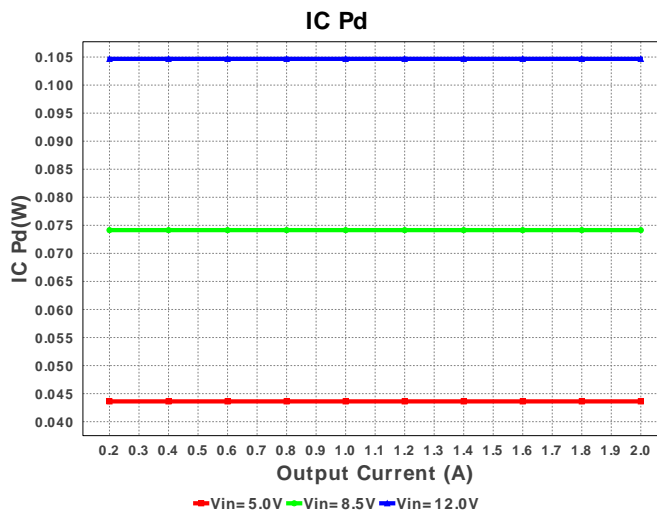
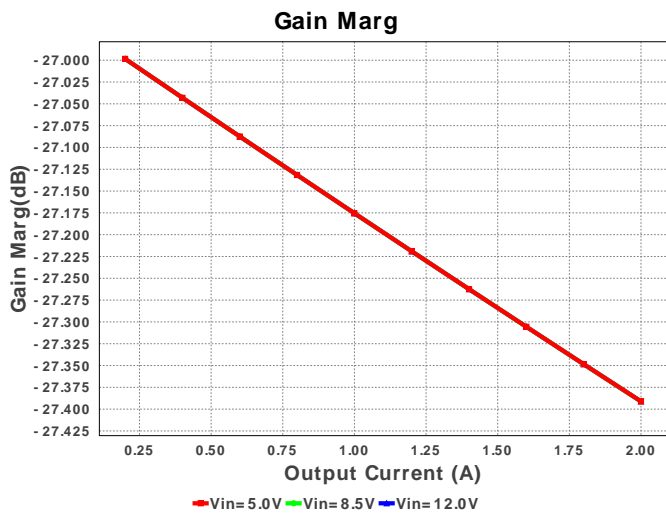
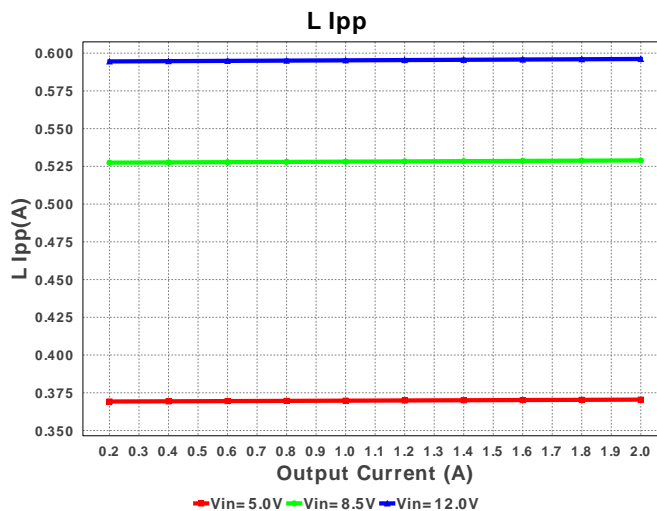
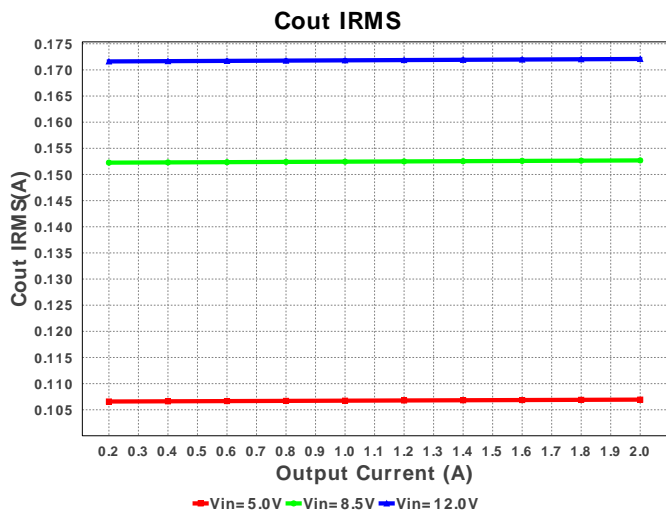
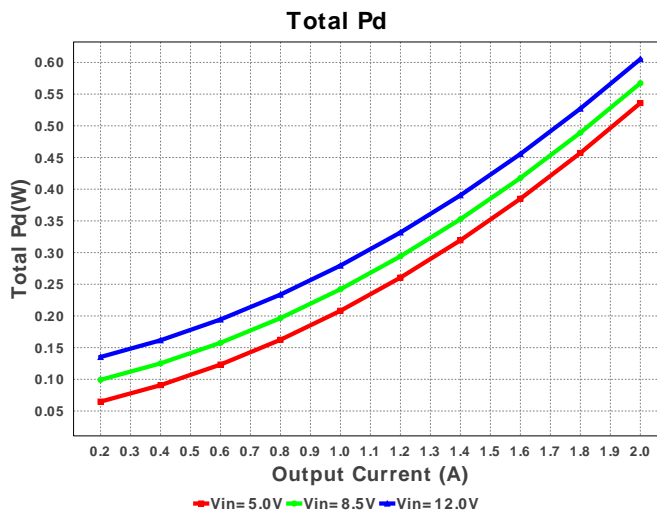
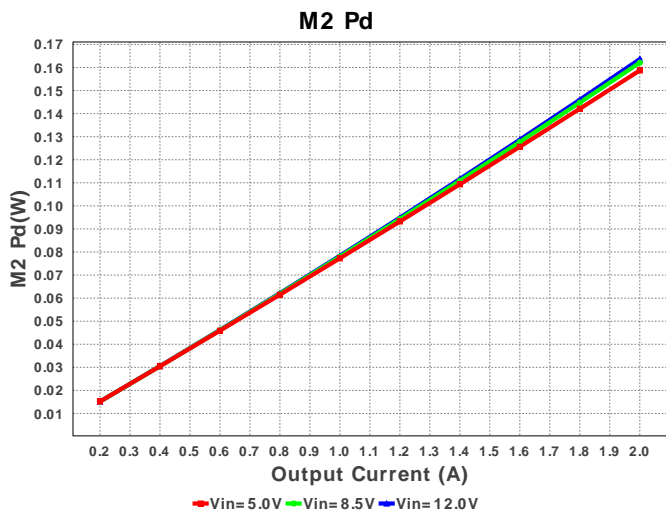
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
2.	Cbyp	MuRata	GRM21BR61C475KA88L Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm ²
3.	Ccomp	MuRata	GRM033R60J333KE01D Series= X5R	Cap= 33.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
4.	Ccomp2	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
5.	Ccomp3	Yageo America	CC0805KRX7R9BB332 Series= X7R	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
6.	Cilim	Kemet	C0805C102K5RACTU Series= X7R	Cap= 1.0 nF ESR= 384.0 mOhm VDC= 50.0 V IRMS= 214.0 mA	1	\$0.01	 0805 7 mm ²
7.	Cin	MuRata	GRM32ER61C226KE20L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 3.68 A	1	\$0.16	 1210 15 mm ²
8.	Cldrv	MuRata	GRM033R71E102KA01D Series= X7R	Cap= 1.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
9.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	2	\$0.05	 0805 7 mm ²
10.	Css	MuRata	GRM033R70J332KA01D Series= X7R	Cap= 3.3 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
11.	Cvdd	MuRata	GRM188R71C105KA12D Series= X7R	Cap= 1.0 uF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 2.72 A	1	\$0.01	 0603 5 mm ²
12.	Cvin	TDK	C1608X5R1C105K Series= X5R	Cap= 1.0 uF ESR= 5.713 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
13.	L1	Bourns	SRP7030-100FM	L= 10.0 uH DCR= 60.0 mOhm	1	\$0.49	 SRP7030 88 mm ²
14.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 47.0 Amps	1	\$0.34	 TRANS_NexFET_Q3 19 mm ²

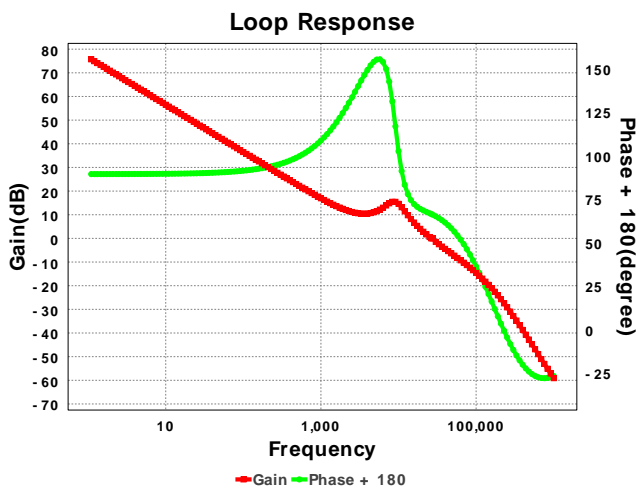
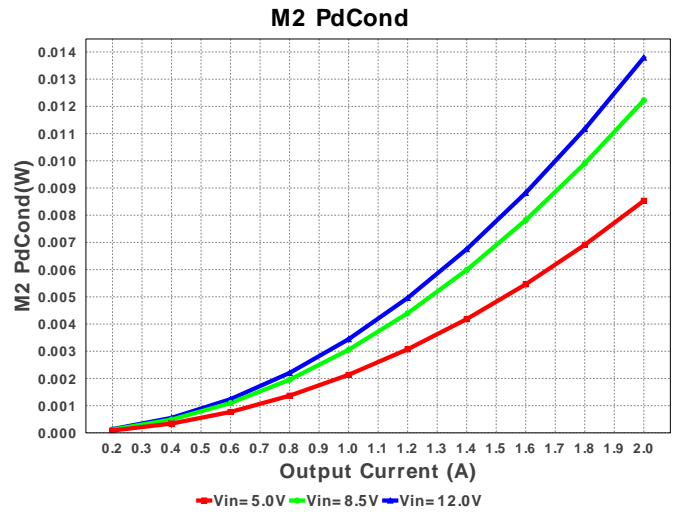
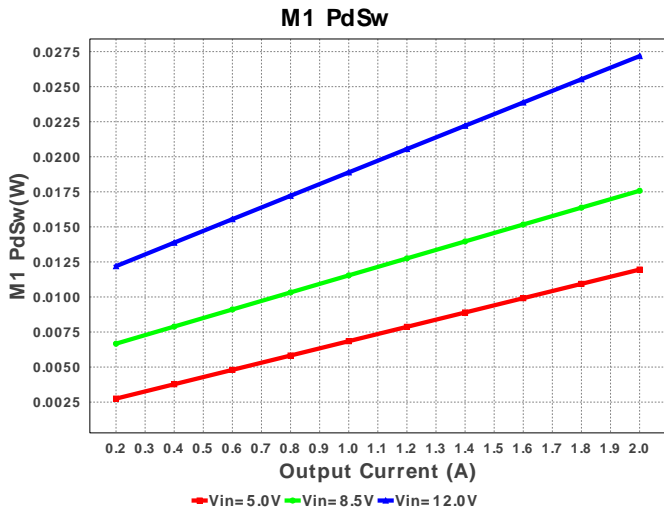
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
15.	M2	Texas Instruments	CSD16323Q3	VdsMax= 25.0 V IdsMax= 60.0 Amps	1	\$0.44	 TRANS_NexFET_Q3 19 mm ²
16.	Rcomp	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rcomp2	Vishay-Dale	CRCW0402274RFKED Series= CRCW..e3	Res= 274.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rcs	Vishay-Dale	CRCW04022K26FKED Series= CRCW..e3	Res= 2.26 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	Renb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
20.	Rent	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
21.	Rfbb	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
22.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
23.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
24.	Rscp	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
25.	Rt	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
26.	Rtrk	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
27.	U1	Texas Instruments	TPS40170RGYR	Switcher	1	\$2.10	 RGY0020A 25 mm ²











Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	826.651 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	172.087 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	467.11 mA	Current	Average input current
4.	L Ipp	596.13 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	2.298 A	Current	Peak switch current
6.	BOM Count	28	General	Total Design BOM count
7.	FootPrint	262.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	348.432 kHz	General	Switching frequency
9.	IC Tolerance	6.0 μV	General	IC Feedback Tolerance
10.	Pout	5.0 W	General	Total output power
11.	Total BOM	\$3.86	General	Total BOM Cost
12.	Cross Freq	26.472 kHz	Op_point	Bode plot crossover frequency
13.	Duty Cycle	21.864 %	Op_point	Duty cycle
14.	Efficiency	89.201 %	Op_point	Steady state efficiency
15.	Gain Marg	-27.391 dB	Op_point	Bode Plot Gain Margin
16.	IOUT_OP	2.0 A	Op_point	Iout operating point
17.	Phase Marg	67.044 deg	Op_point	Bode Plot Phase Margin
18.	VIN_OP	12.0 V	Op_point	Vin operating point
19.	Vout p-p	6.562 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	1.367 mW	Power	Input capacitor power dissipation
21.	Cout Pd	133.263 μW	Power	Output capacitor power dissipation
22.	IC Pd	104.676 mW	Power	IC power dissipation
23.	L Pd	300.0 mW	Power	Inductor power dissipation
24.	M1 Pd	35.468 mW	Power	M1 MOSFET total power dissipation
25.	M1 PdCond	8.289 mW	Power	M1 MOSFET conduction losses
26.	M1 PdSw	27.179 mW	Power	M1 MOSFET switching losses
27.	M2 Pd	163.644 mW	Power	M2 MOSFET total power dissipation
28.	M2 PdCond	13.803 mW	Power	M2 MOSFET conduction losses
29.	M2 PdSw	149.84 mW	Power	M2 MOSFET switching losses
30.	Total Pd	605.319 mW	Power	Total Power Dissipation
31.	Low Freq Gain	75.705 dB	Unknown	Gain at 10Hz

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	Iout1	2.0	Output Current #1
3.	VinMax	12.0	Maximum input voltage
4.	VinMin	5.0	Minimum input voltage
5.	Vout	2.5	Output Voltage
6.	Vout1	2.5	Output Voltage #1
7.	base_pn	TPS40170	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40170** Product Folder : <http://www.ti.com/product/TPS40170> : contains the data sheet and other resources.

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