

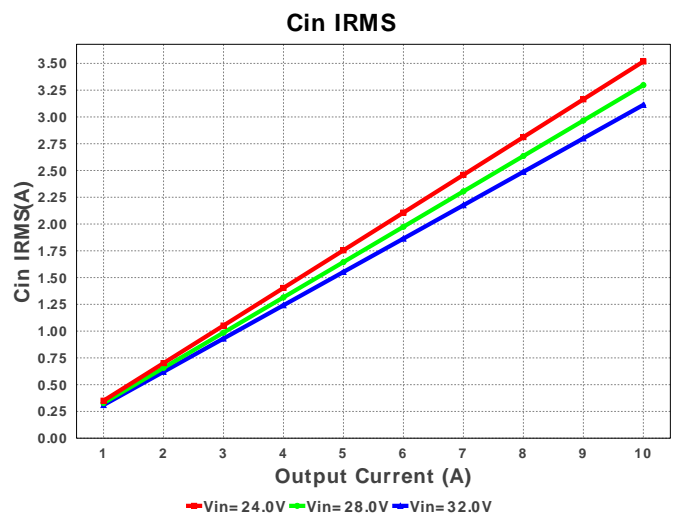
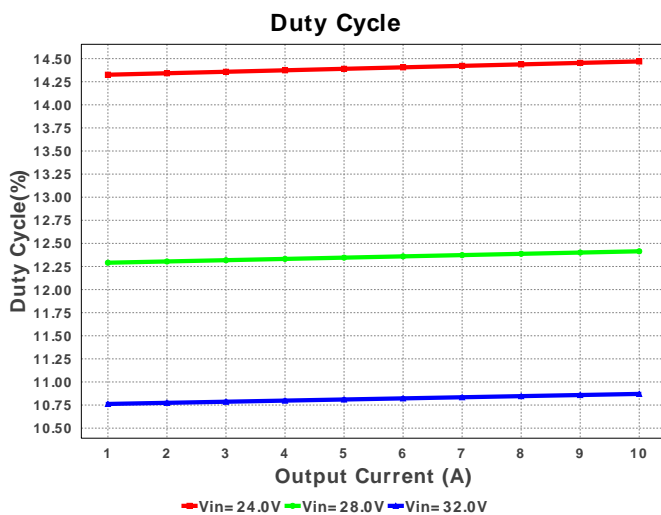
WEBENCH[®] Design Report

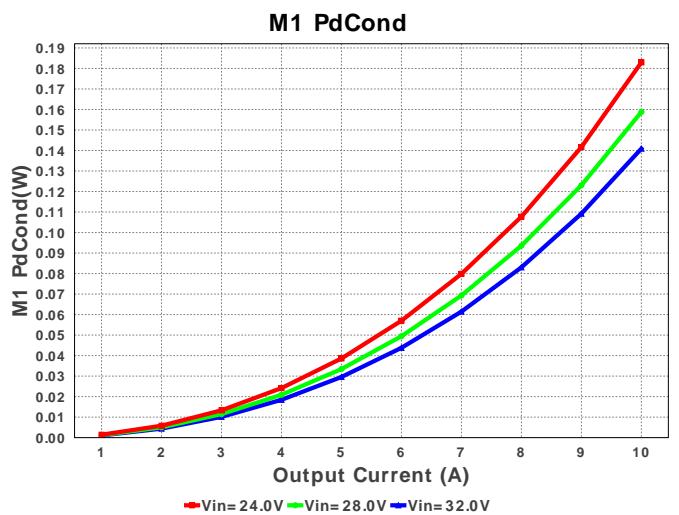
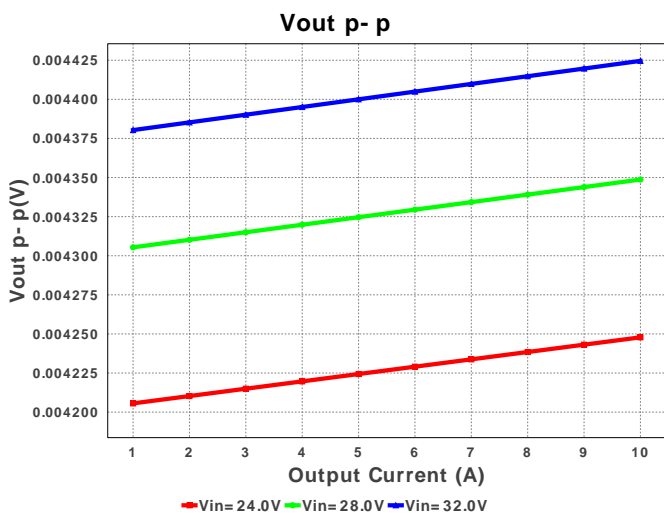
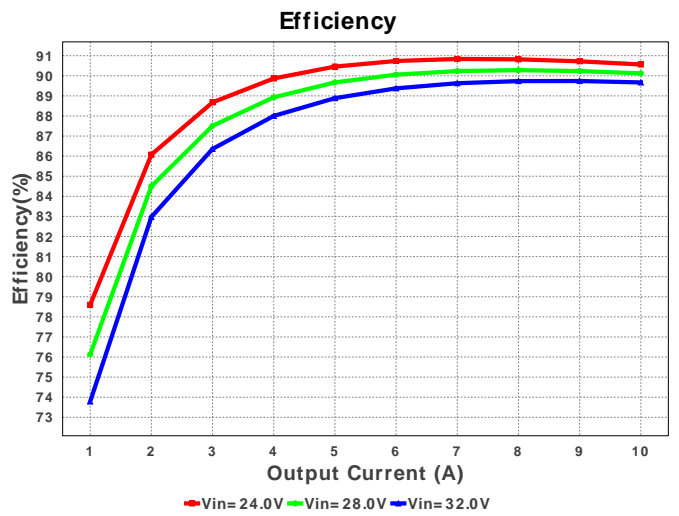
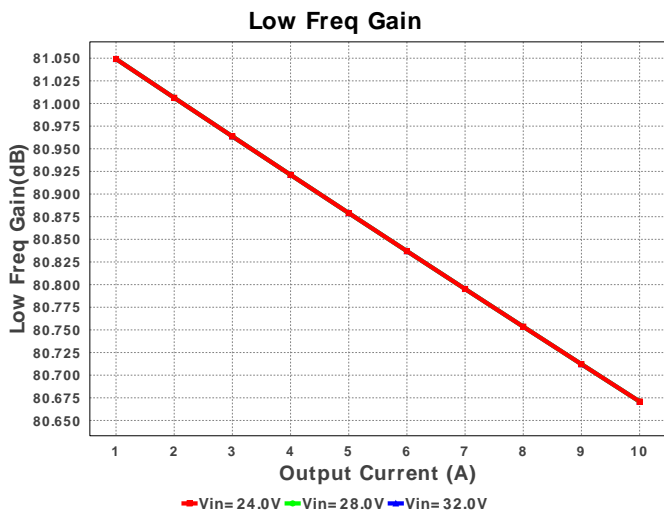
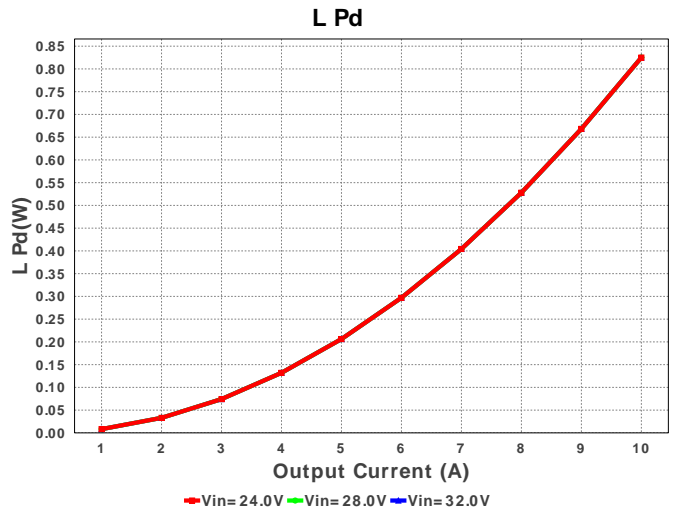
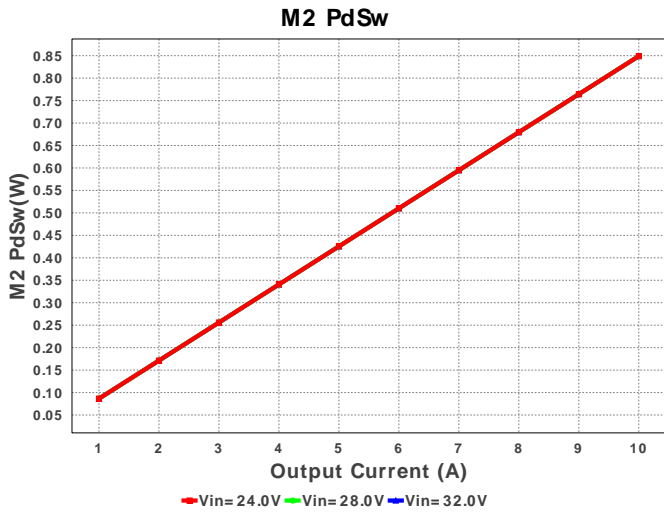
 Design : 4387409/1 TPS40170RGYR
 TPS40170RGYR 24.0V-32.0V to 3.30V @ 10.0A

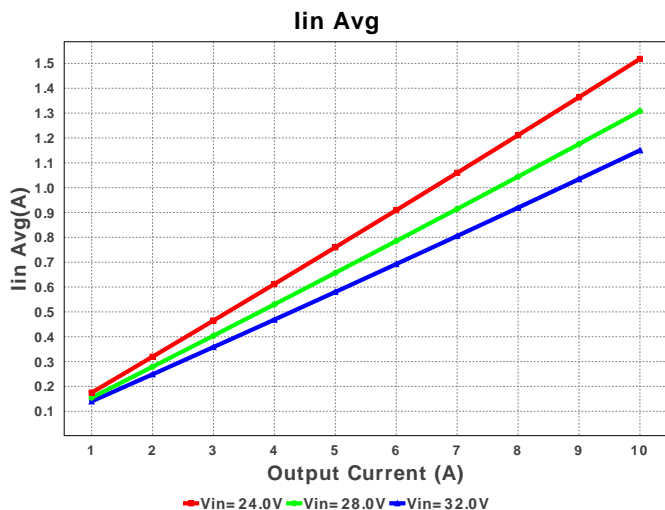
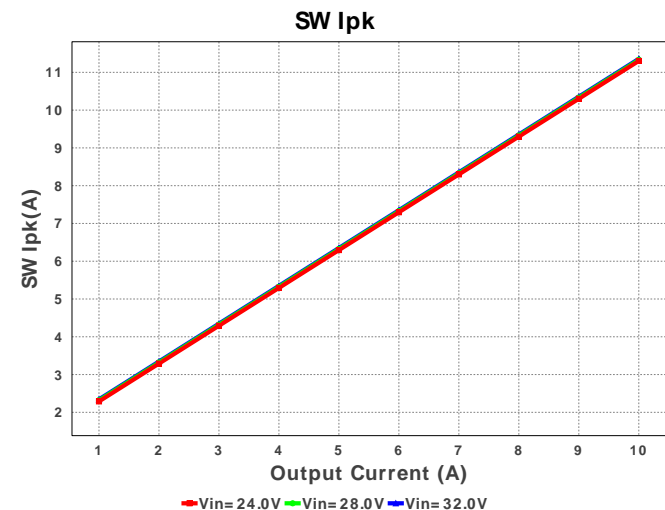
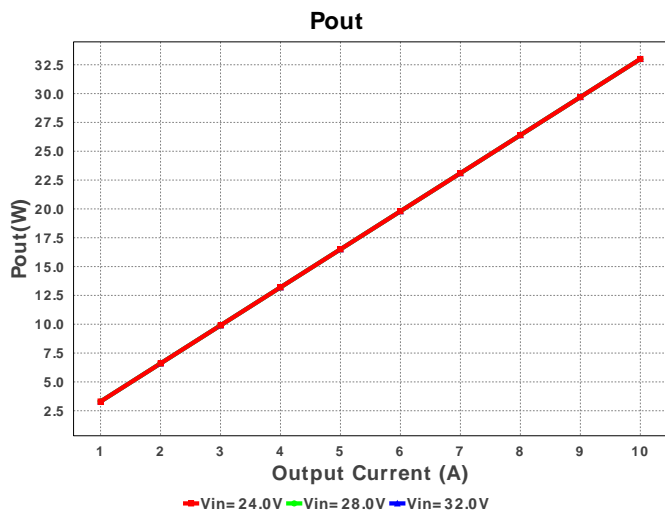
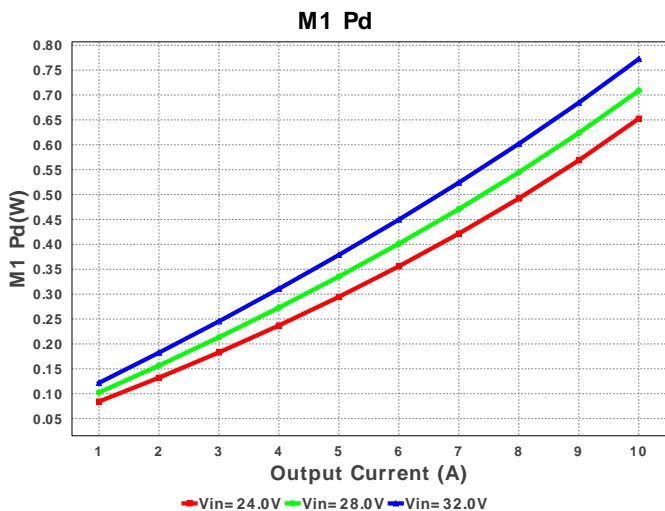
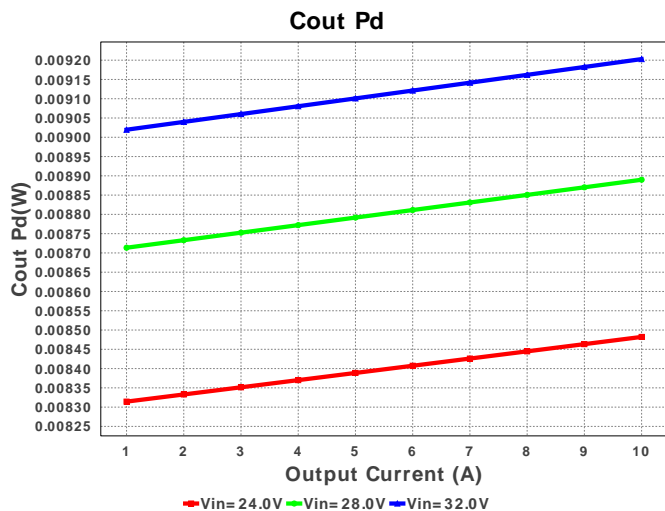
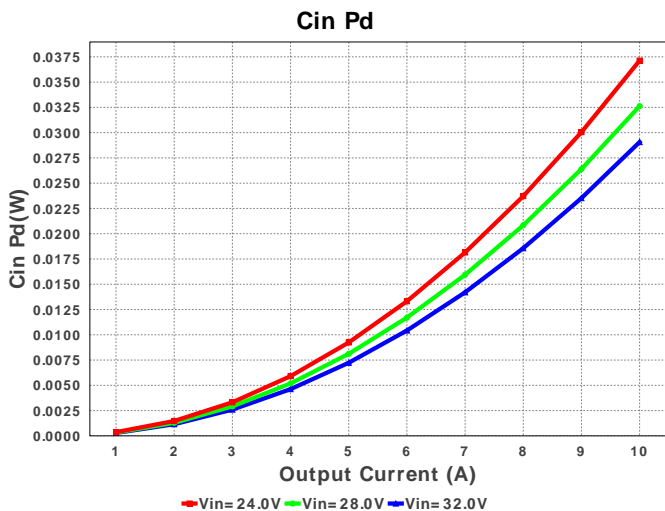
Electrical BOM

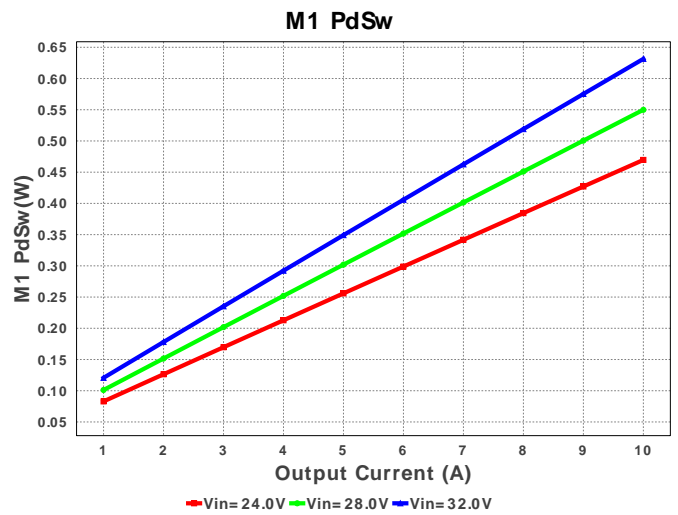
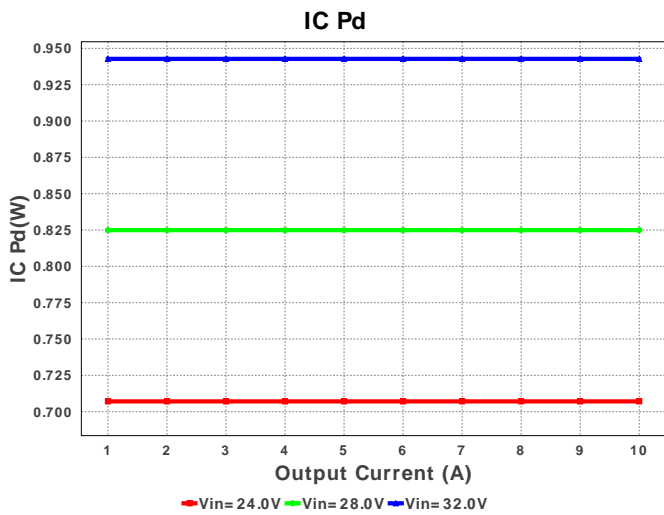
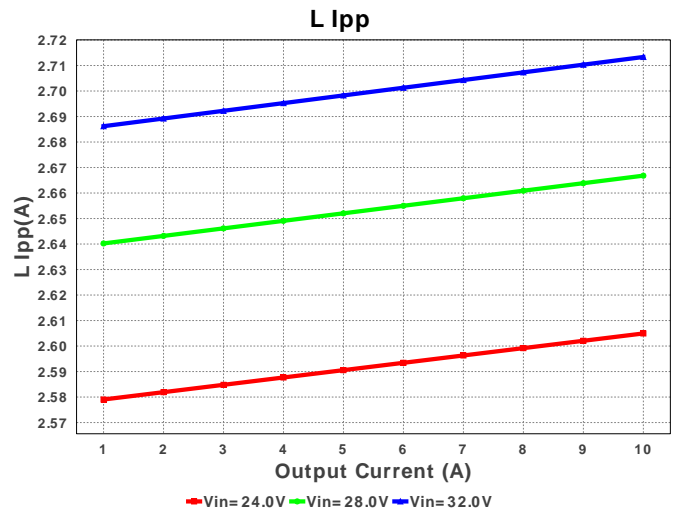
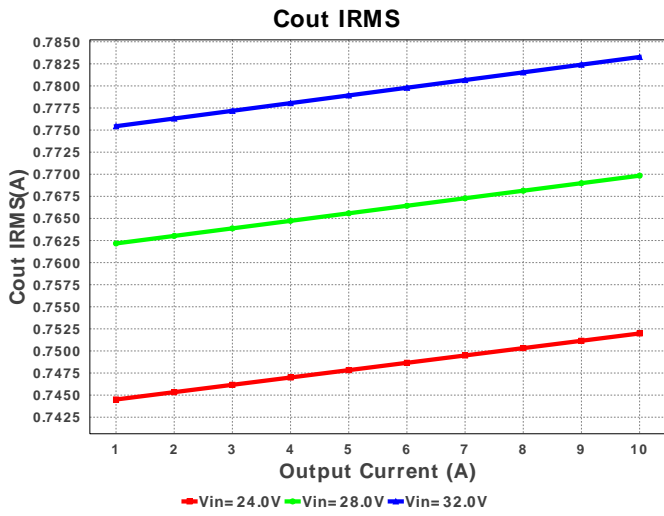
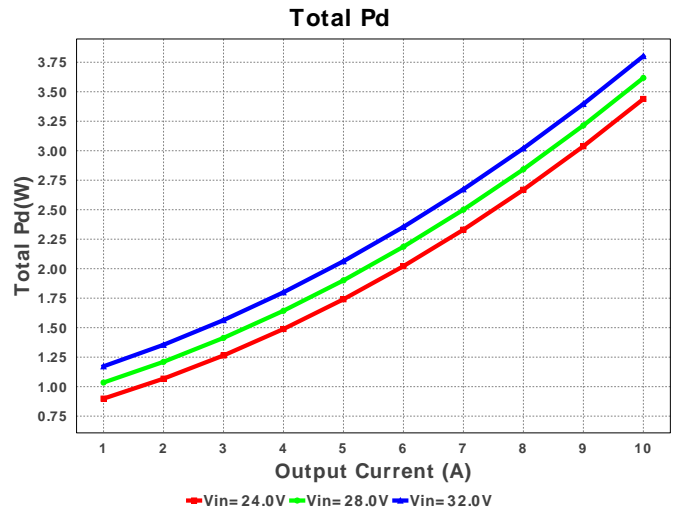
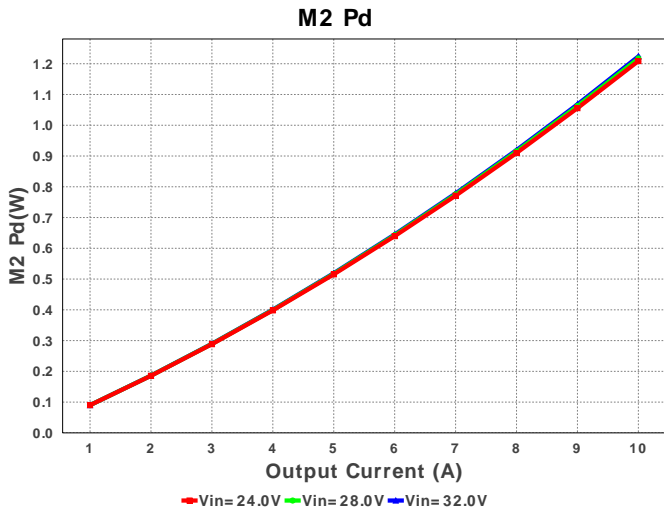
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	 0805 7 mm ²
2.	Cbyp	MuRata	GRM21BR61C475KA88L Series= X5R	Cap= 4.7 uF ESR= 5.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm ²
3.	Ccomp	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
4.	Ccomp2	MuRata	GRM216R71E122KA01D Series= X7R	Cap= 1.2 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
5.	Ccomp3	Yageo America	CC0805KRX7R9BB272 Series= X7R	Cap= 2.7 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	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	\$0.07	 1206 11 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	Panasonic	6SVPE220MW Series= 259	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 6.3 V IRMS= 3.15 A	1	\$0.14	 CAPSMT_62_E61 53 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	C3216X5R1H105K Series= X5R	Cap= 1.0 uF ESR= 8.97 mOhm VDC= 50.0 V IRMS= 0.0 A	1	\$0.04	 1206 11 mm ²
13.	L1	Bourns	SRP1270-3R3M	L= 3.3 uH DCR= 6.6 mOhm	1	\$0.60	 SRP1270 246 mm ²

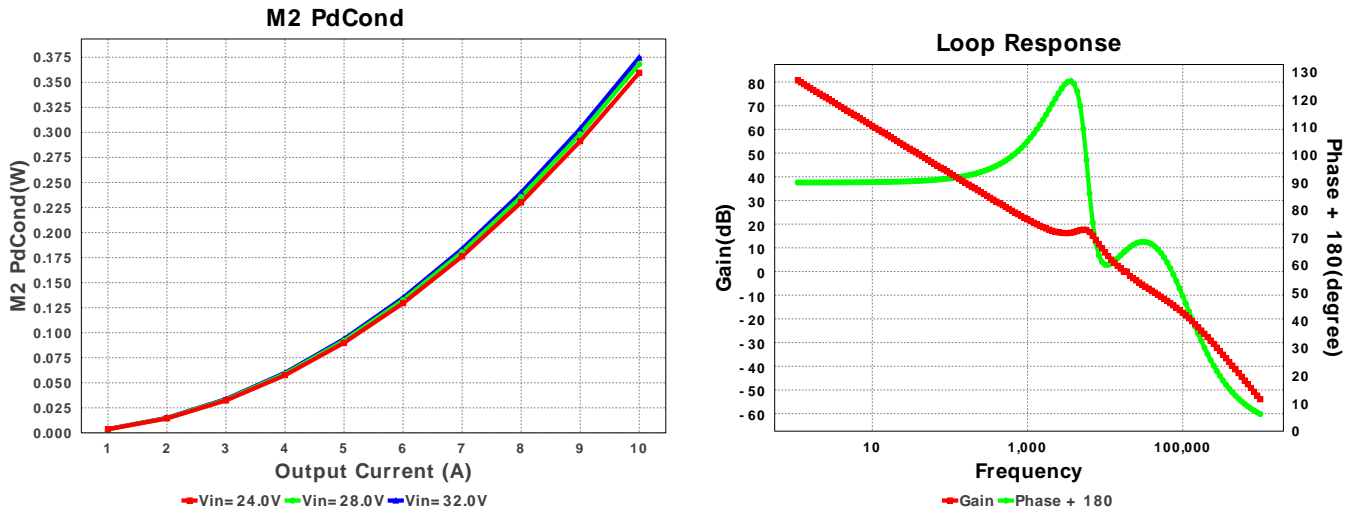
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
14.	M1	Texas Instruments	CSD18504Q5A	VdsMax= 40.0 V IdsMax= 50.0 Amps	1	\$0.56	 TRANS_NexFET_Q5A 55 mm ²
15.	M2	Infineon Technologies	BSC042NE7NS3 G	VdsMax= 75.0 V IdsMax= 100.0 Amps	1	\$0.98	 PG-TDSON-8 55 mm ²
16.	Rcomp	Vishay-Dale	CRCW04021K69FKED Series= CRCW..e3	Res= 1.69 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rcomp2	Vishay-Dale	CRCW0402732RFKED Series= CRCW..e3	Res= 732.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rcs	Vishay-Dale	CRCW040210K7FKED Series= CRCW..e3	Res= 10.7 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	CRCW040230K1FKED Series= CRCW..e3	Res= 30.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
21.	Rfbb	Vishay-Dale	CRCW04022K21FKED Series= CRCW..e3	Res= 2.21 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	3.113 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	783.275 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.15 A	Current	Average input current
4.	L Ipp	2.713 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	11.357 A	Current	Peak switch current
6.	BOM Count	27	General	Total Design BOM count
7.	FootPrint	539.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	348.432 kHz	General	Switching frequency
9.	IC Tolerance	6.0 μ V	General	IC Feedback Tolerance
10.	Pout	33.0 W	General	Total output power
11.	Total BOM	\$4.71	General	Total BOM Cost
12.	Cross Freq	17.654 kHz	Op_point	Bode plot crossover frequency
13.	Duty Cycle	10.871 %	Op_point	Duty cycle
14.	Efficiency	89.663 %	Op_point	Steady state efficiency
15.	IOUT_OP	10.0 A	Op_point	Iout operating point
16.	Phase Marg	64.91 deg	Op_point	Bode Plot Phase Margin
17.	VIN_OP	32.0 V	Op_point	Vin operating point
18.	Vout p-p	4.425 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	29.067 mW	Power	Input capacitor power dissipation
20.	Cout Pd	9.203 mW	Power	Output capacitor power dissipation
21.	IC Pd	942.774 mW	Power	IC power dissipation
22.	L Pd	825.0 mW	Power	Inductor power dissipation
23.	M1 Pd	774.655 mW	Power	M1 MOSFET total power dissipation
24.	M1 PdCond	143.193 mW	Power	M1 MOSFET conduction losses
25.	M1 PdSw	631.463 mW	Power	M1 MOSFET switching losses
26.	M2 Pd	1.224 W	Power	M2 MOSFET total power dissipation
27.	M2 PdCond	374.741 mW	Power	M2 MOSFET conduction losses
28.	M2 PdSw	849.051 mW	Power	M2 MOSFET switching losses
29.	Total Pd	3.804 W	Power	Total Power Dissipation
30.	Low Freq Gain	80.671 dB	Unknown	Gain at 10Hz

Design Inputs

#	Name	Value	Description
1.	Iout	10.0	Maximum Output Current
2.	Iout1	10.0	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	24.0	Minimum input voltage
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	TPS40170	Texas Instruments Base Part 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.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.

Use of Texas Instruments' WEBENCH simulation tools is subject to [Texas Instruments' Site Terms and Conditions of Use](#). Prototype boards based on WEBENCH created designs are provided AS IS without warranty of any kind for evaluation and testing purposes and are subject to the terms of the [Evaluation License Agreement](#).