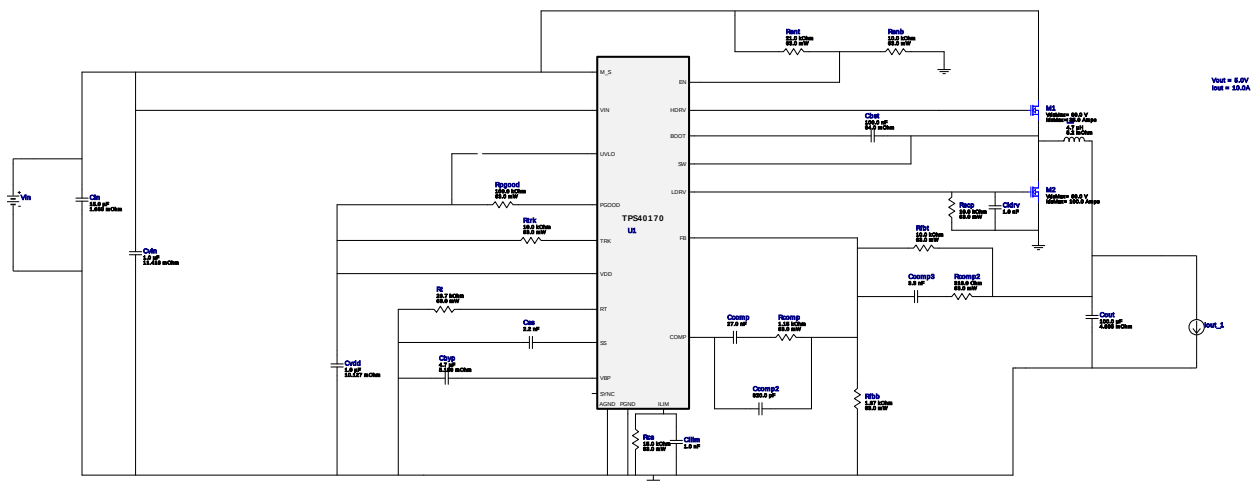


WEBENCH® Design Report

Design : 4561043/496 TPS40170RGYR
TPS40170RGYR 23.0V-25.0V to 5.00V @ 10.0A



My Comments

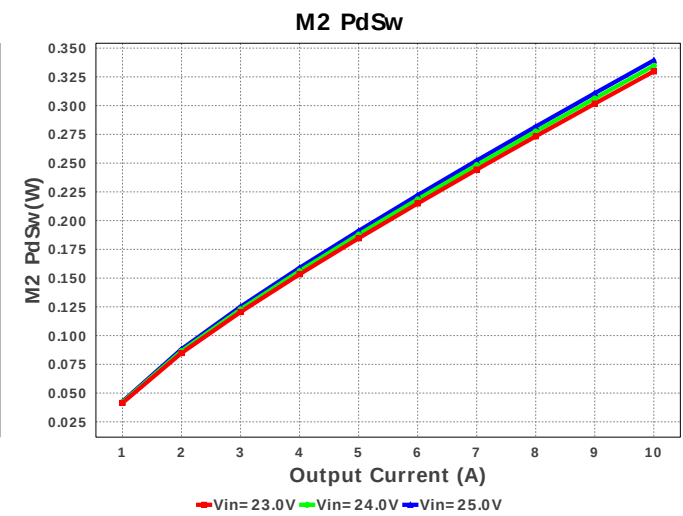
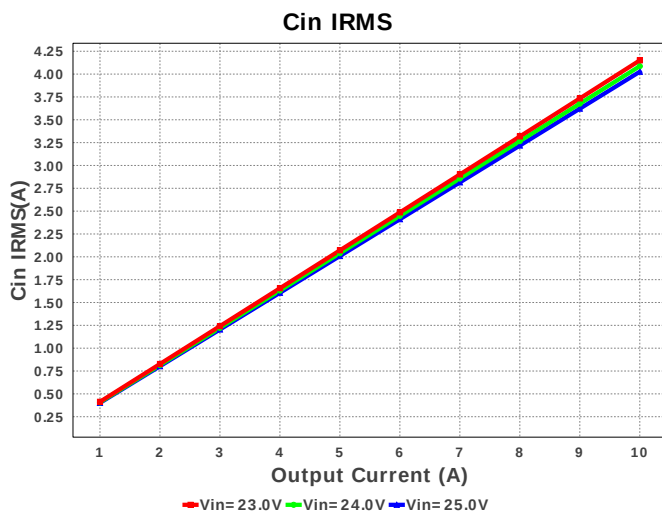
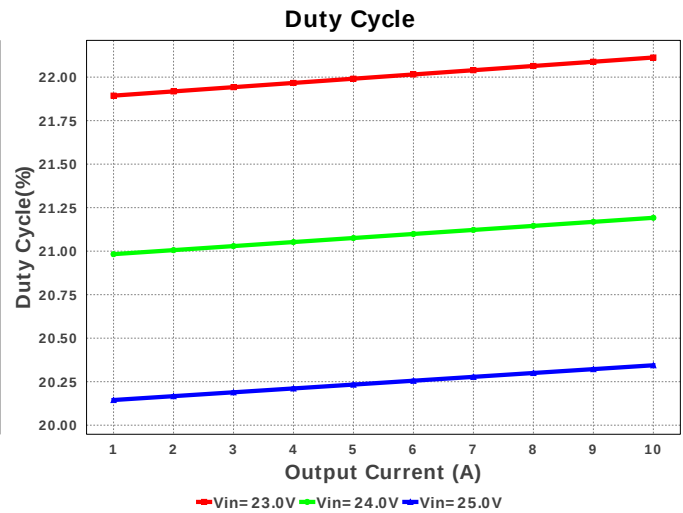
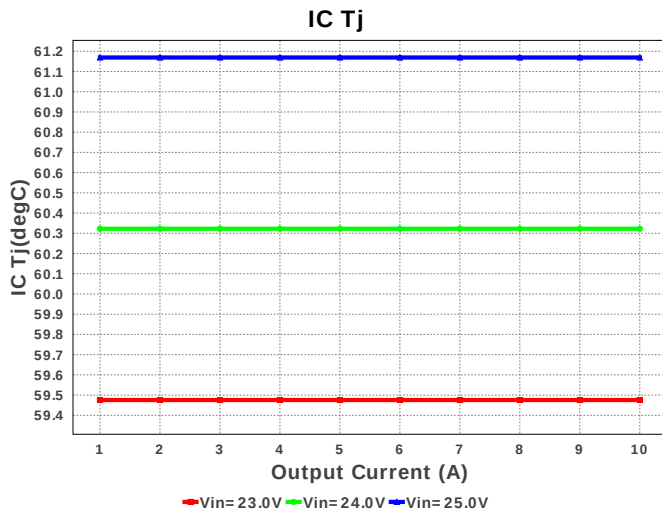
No comments

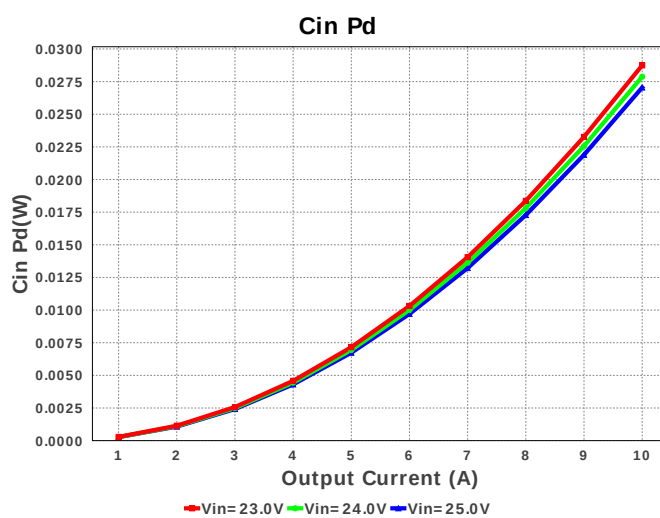
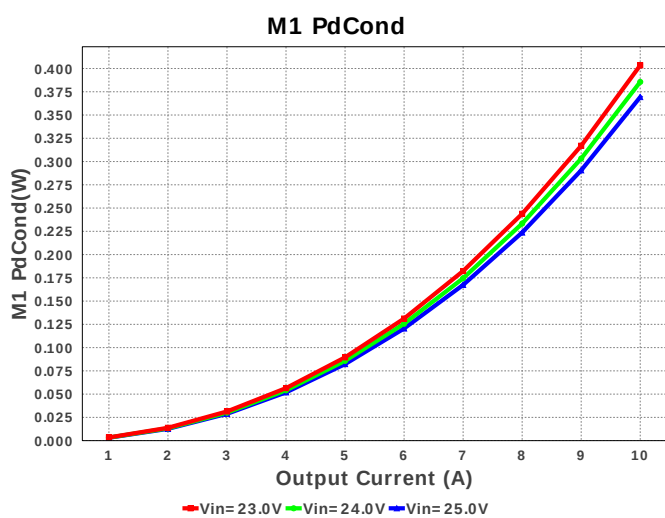
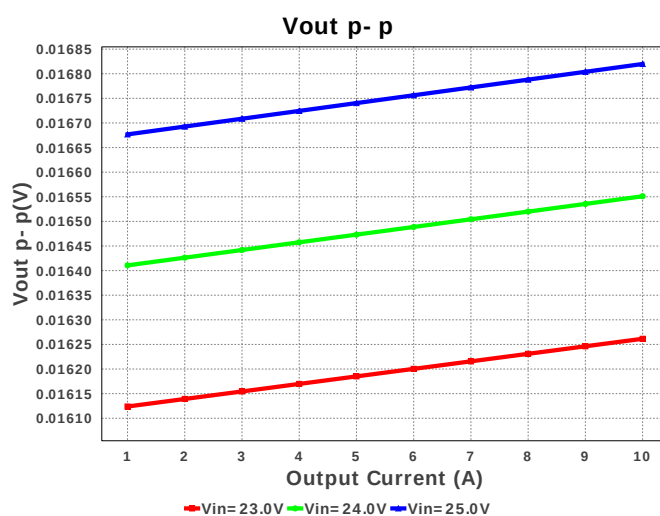
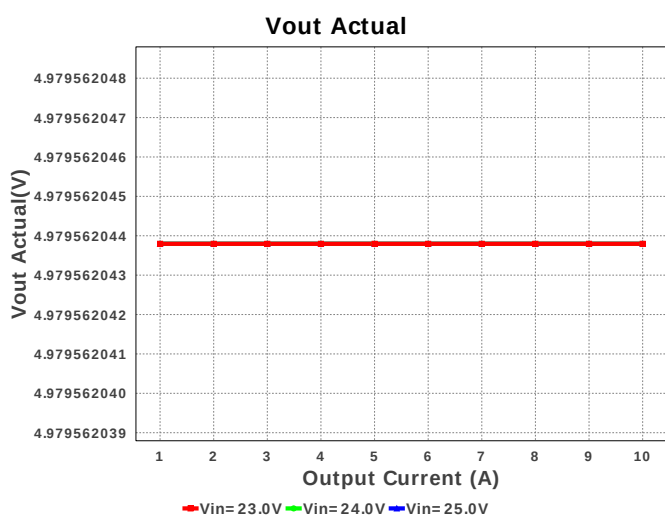
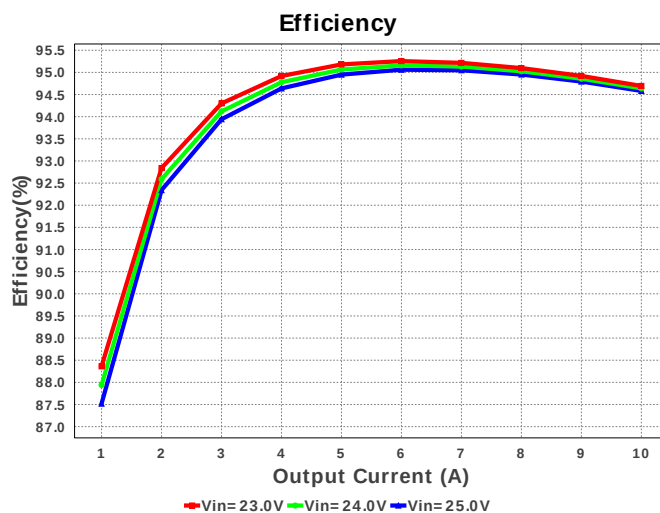
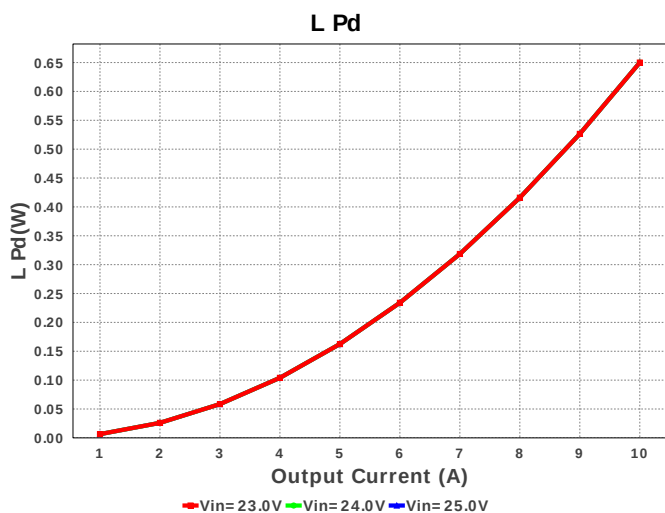
Electrical BOM

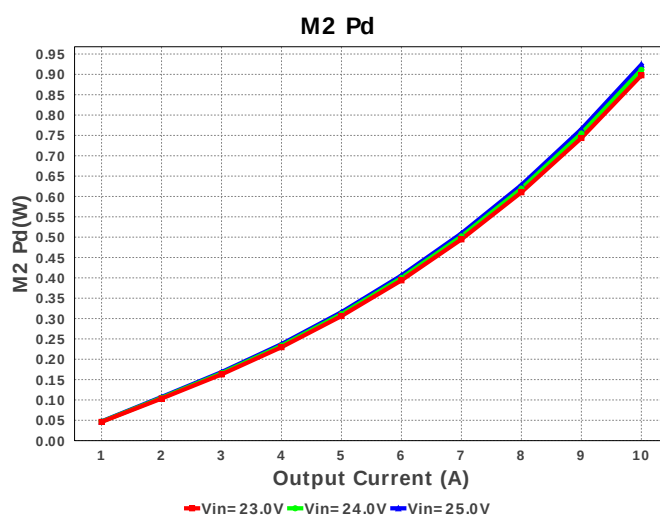
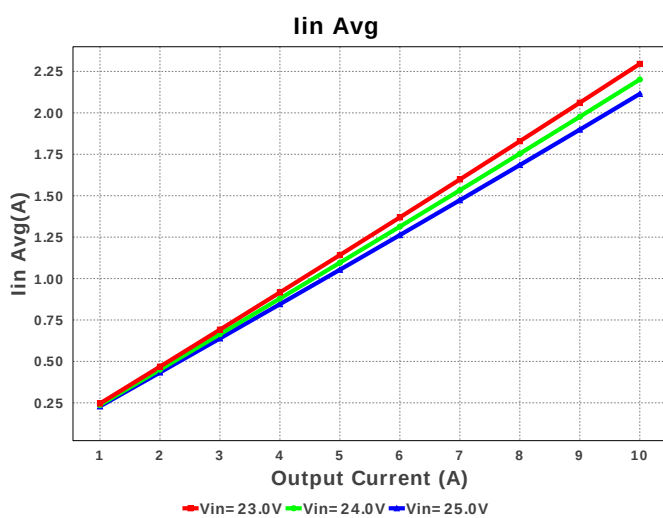
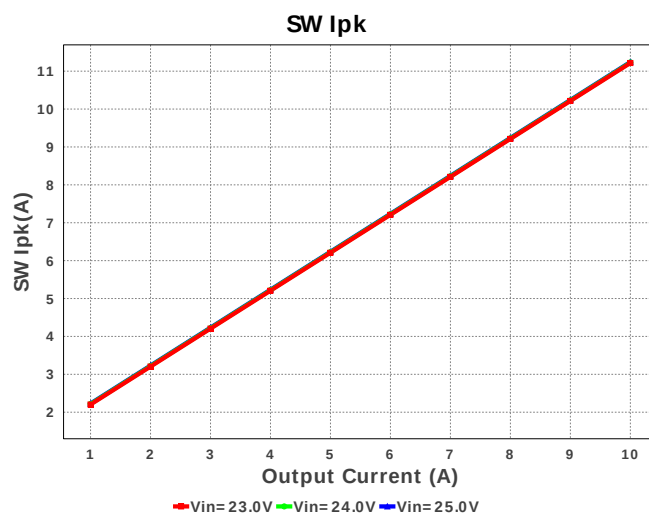
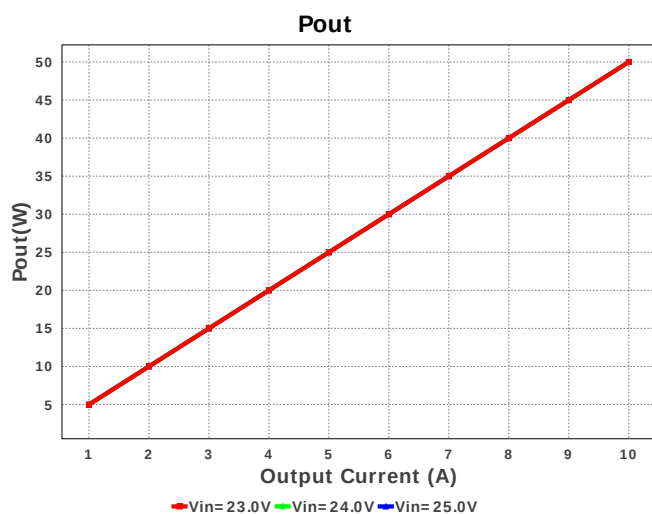
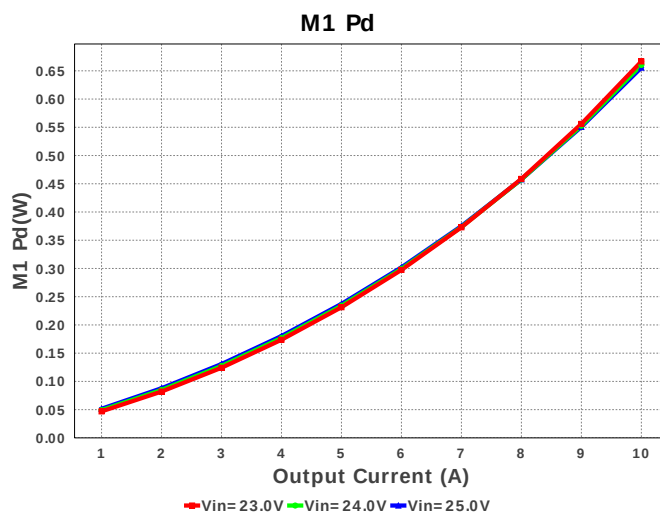
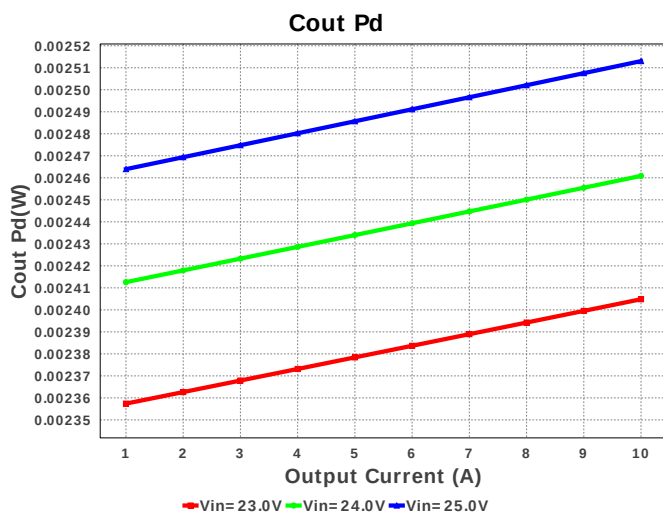
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1.	Cbst	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	0805 7 mm ²
2.	Cbyp	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	\$0.02	0805 7 mm ²
3.	Ccomp	Yageo America	CC0805KRX7R9BB273 Series= X7R	Cap= 27.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 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	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
7.	Cin	TDK	C2012X5R1V156M125AC Series= X5R	Cap= 15.0 uF ESR= 1.669 mOhm VDC= 35.0 V IRMS= 5.0498 A	1	\$0.20	0805 7 mm ²
8.	Cldrv	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
9.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	\$0.14	1206_190 11 mm ²

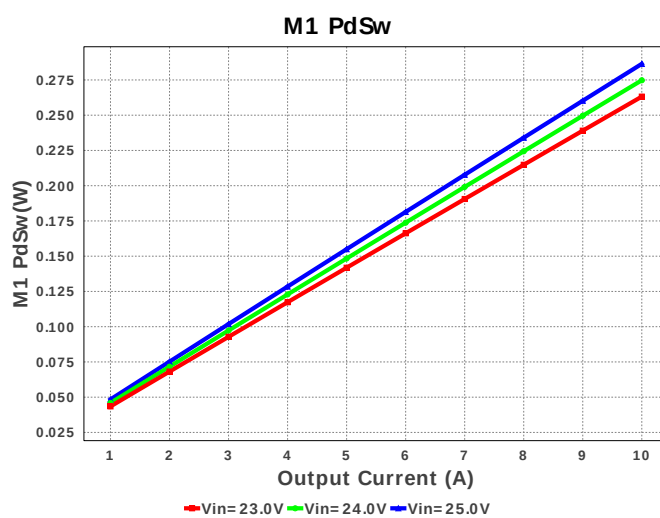
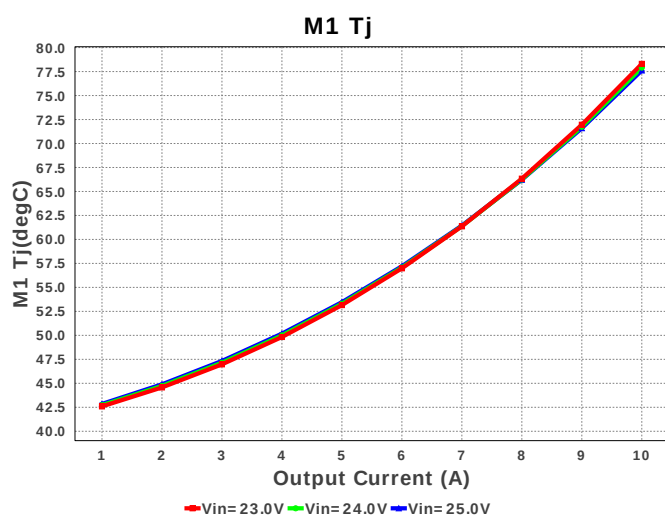
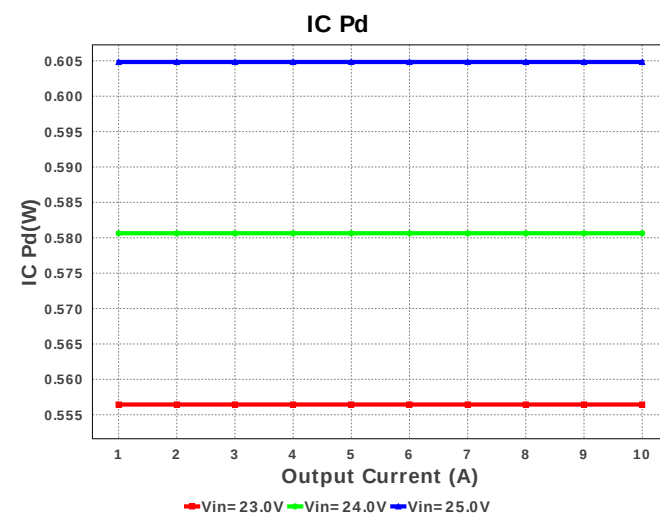
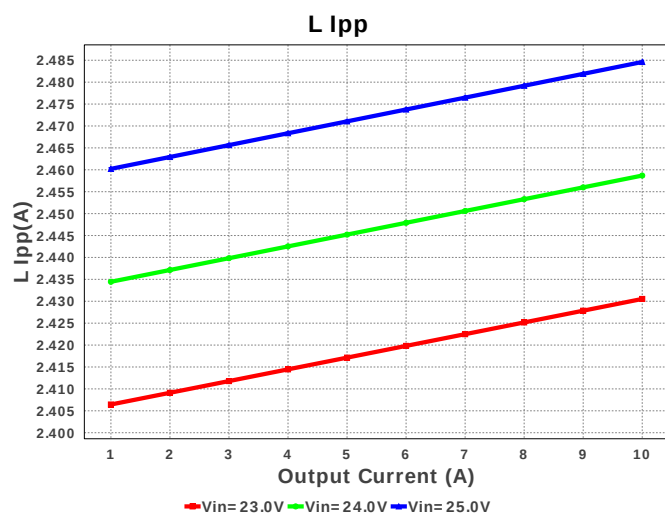
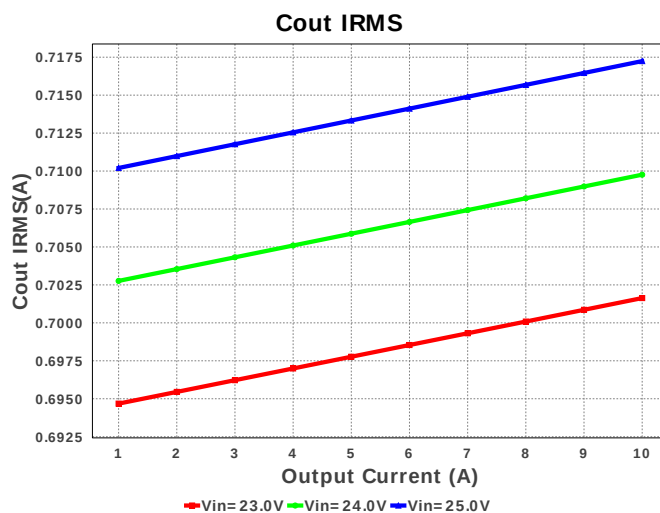
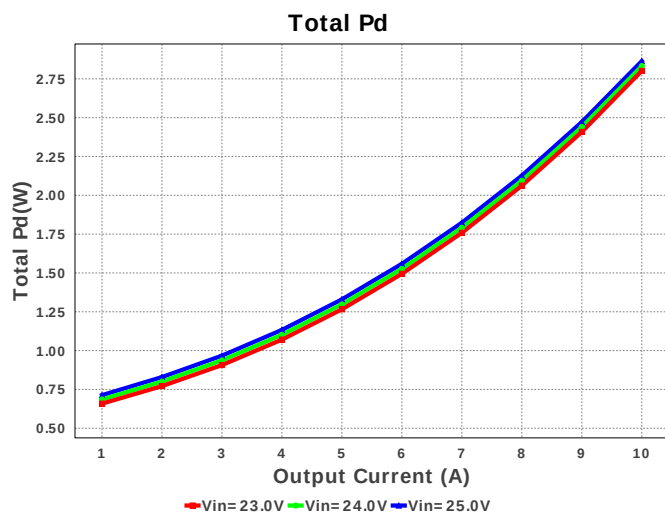
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10.	Css	MuRata	GRM033R70J222KA01D Series= X7R	Cap= 2.2 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
11.	Cvdd	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	\$0.01	 0603 5 mm ²
12.	Cvin	TDK	C1005X5R1V105K050BC Series= X5R	Cap= 1.0 uF ESR= 11.416 mOhm VDC= 35.0 V IRMS= 1.483 A	1	\$0.03	 0402 3 mm ²
13.	L1	Coilcraft	XAL1010-472MEB	L= 4.7 uH DCR= 5.2 mOhm	1	\$1.71	 XAL1010 160 mm ²
14.	M1	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	\$0.34	 DNH0008A 18 mm ²
15.	M2	Texas Instruments	CSD18531Q5A	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	\$0.58	 TRANS_NexFET_Q5A 55 mm ²
16.	Rcomp	Vishay-Dale	CRCW04021K15FKED Series= CRCW..e3	Res= 1.15 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rcomp2	Vishay-Dale	CRCW0402316RFKED Series= CRCW..e3	Res= 316.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rcs	Vishay-Dale	CRCW040215K0FKED Series= CRCW..e3	Res= 15.0 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	CRCW040221K0FKED Series= CRCW..e3	Res= 21.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
21.	Rfbb	Vishay-Dale	CRCW04021K37FKED Series= CRCW..e3	Res= 1.37 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

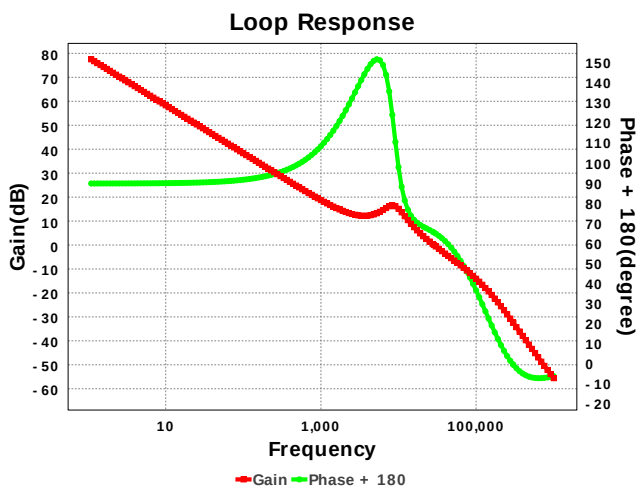
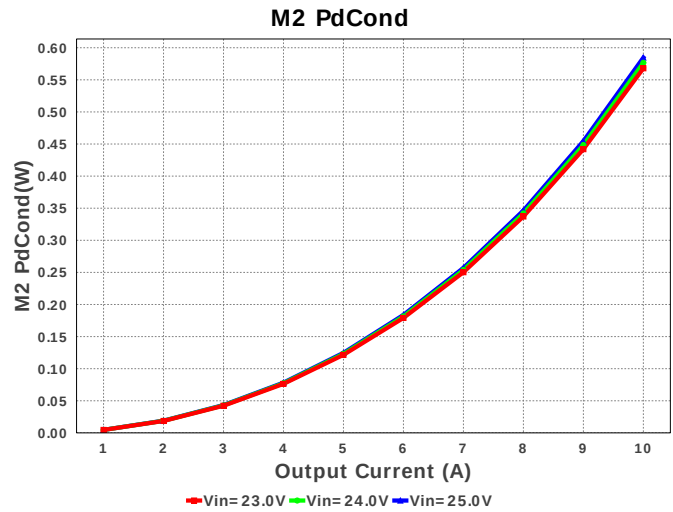
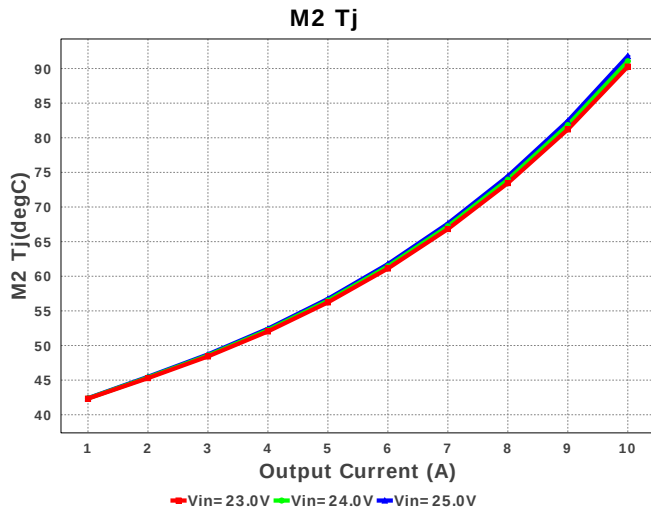
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
27.	U1	Texas Instruments	TPS40170RGYR	Switcher	1	\$1.50	 RGY0020A 25 mm ²











Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.026 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	717.243 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	2.114 A	Current	Average input current
4.	L Ipp	2.485 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	11.242 A	Current	Peak switch current
6.	BOM Count	27	General	Total Design BOM count
7.	FootPrint	366.0 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.	Mode	CCM	General	Conduction Mode
11.	Pout	50.0 W	General	Total output power
12.	Total BOM	\$4.71	General	Total BOM Cost
13.	Low Freq Gain	77.517 dB	Op_Point	Gain at 10Hz
14.	Vout Actual	4.98 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Cross Freq	28.629 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	20.344 %	Op_point	Duty cycle
17.	Efficiency	94.588 %	Op_point	Steady state efficiency
18.	Gain Marg	-32.264 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	61.169 degC	Op_point	IC junction temperature
20.	IOUT_OP	10.0 A	Op_point	Iout operating point
21.	M1 Tj	77.616 degC	Op_point	M1 MOSFET junction temperature
22.	M2 Tj	91.591 degC	Op_point	M2 MOSFET junction temperature
23.	Phase Marg	65.626 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	25.0 V	Op_point	Vin operating point
25.	Vout p-p	16.82 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	27.047 mW	Power	Input capacitor power dissipation
27.	Cout Pd	2.513 mW	Power	Output capacitor power dissipation
28.	IC Pd	604.834 mW	Power	IC power dissipation
29.	L Pd	650.0 mW	Power	Inductor power dissipation
30.	M1 Pd	655.736 mW	Power	M1 MOSFET total power dissipation
31.	M1 PdCond	369.329 mW	Power	M1 MOSFET conduction losses

#	Name	Value	Category	Description
32.	M1 PdSw	286.407 mW	Power	M1 MOSFET switching losses
33.	M2 Pd	920.768 mW	Power	M2 MOSFET total power dissipation
34.	M2 PdCond	584.759 mW	Power	M2 MOSFET conduction losses
35.	M2 PdSw	336.009 mW	Power	M2 MOSFET switching losses
36.	Total Pd	2.861 W	Power	Total Power Dissipation
37.	Vout Tolerance	1.778 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	10.0	Maximum Output Current
2.	VinMax	25.0	Maximum input voltage
3.	VinMin	23.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	TPS40170	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	40.0	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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