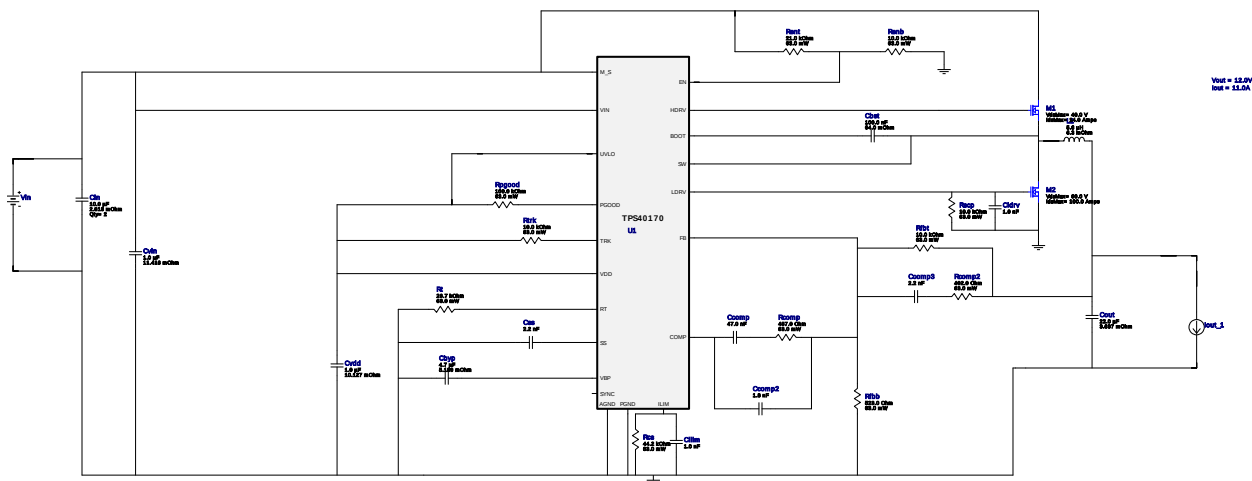


WEBENCH® Design Report

Design : 4561043/509 TPS40170RGYR
TPS40170RGYR 23.0V-25.0V to 12.00V @ 11.0A



My Comments

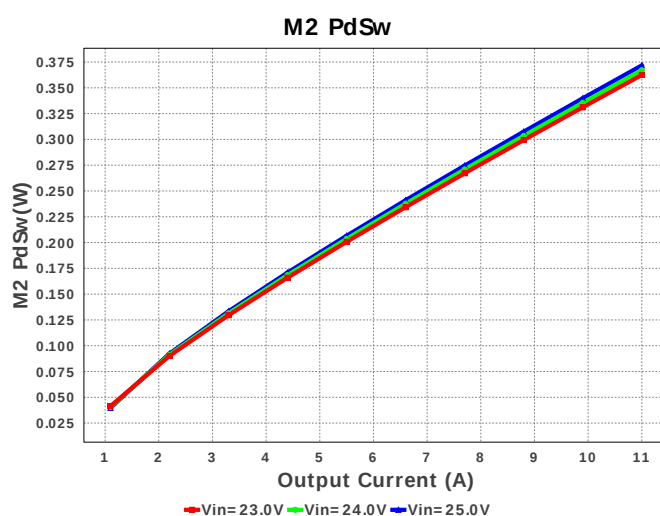
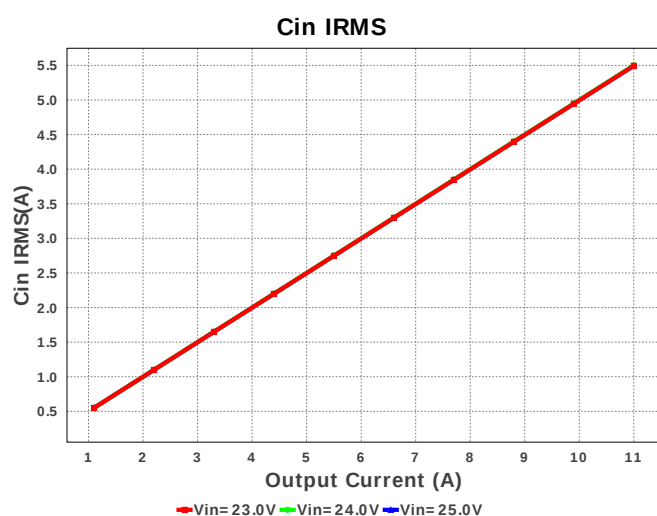
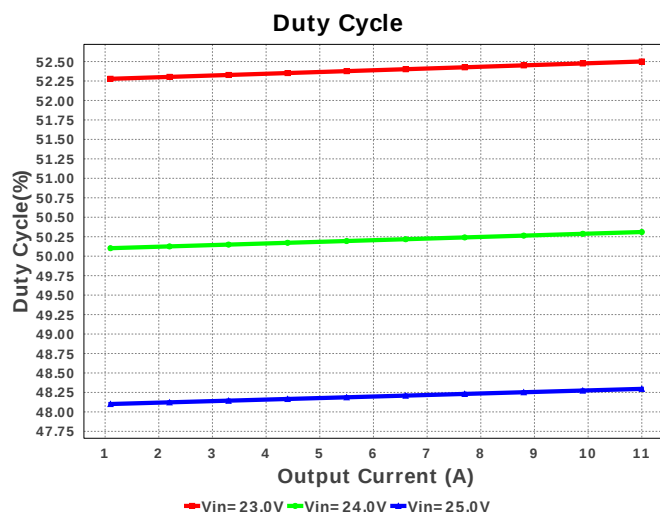
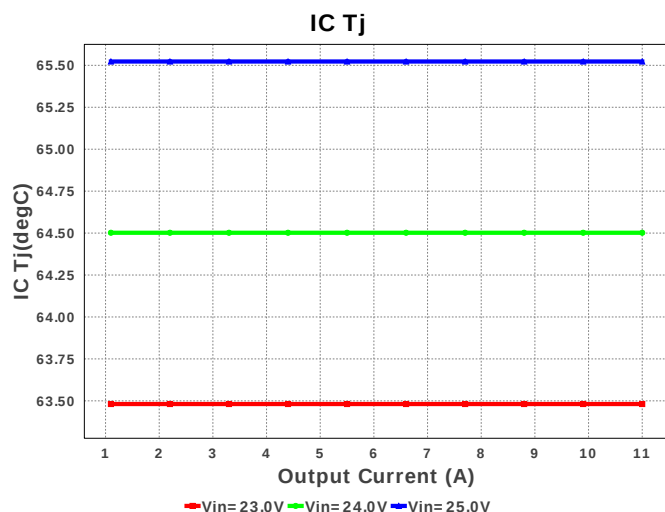
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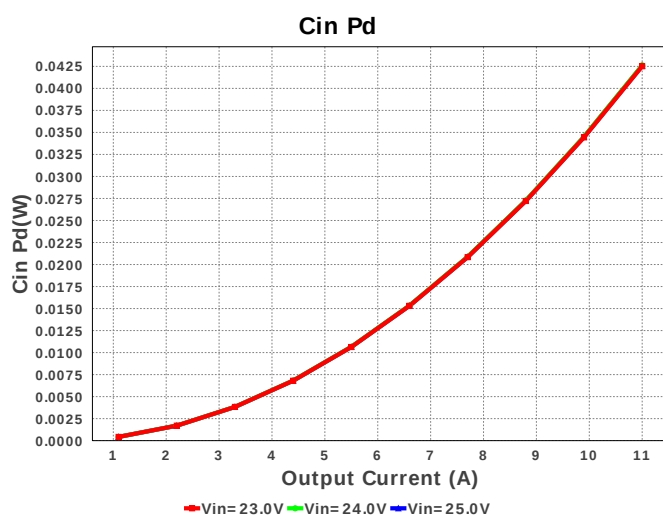
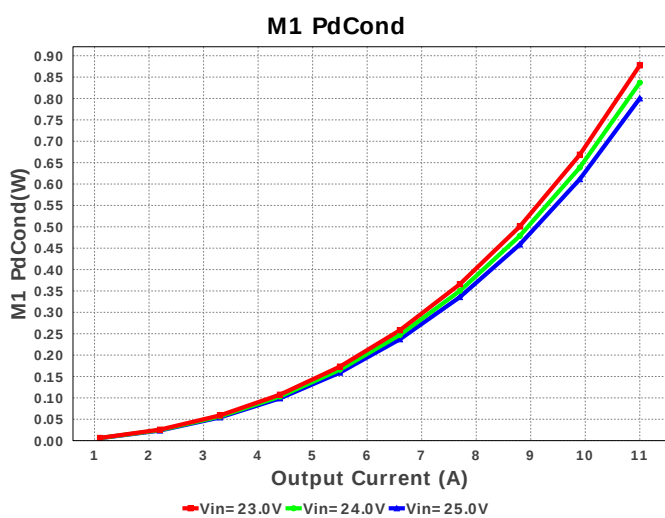
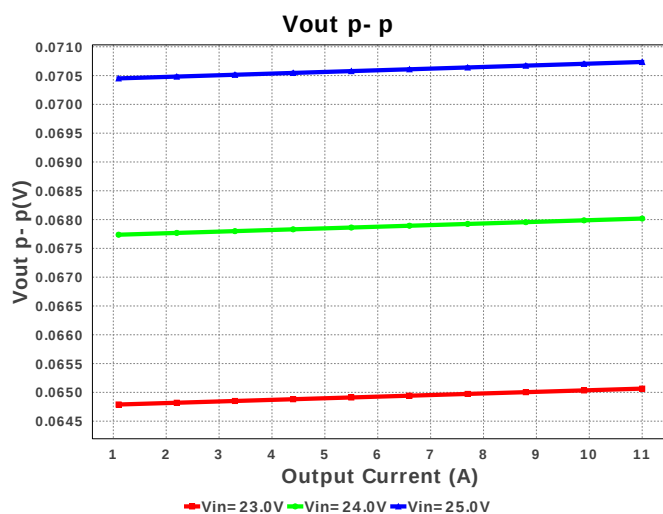
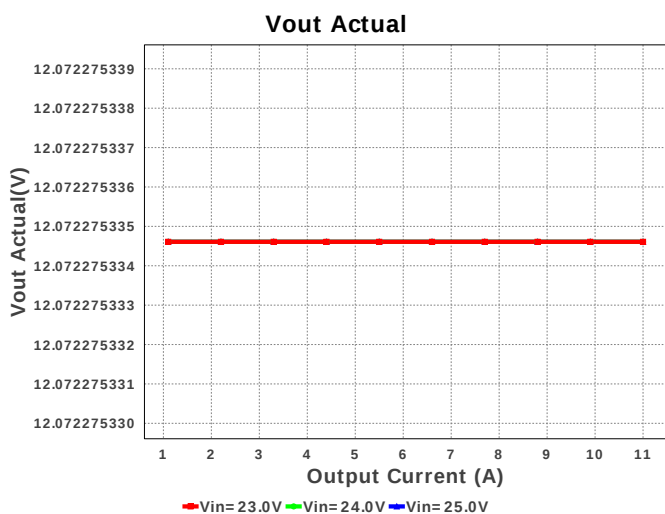
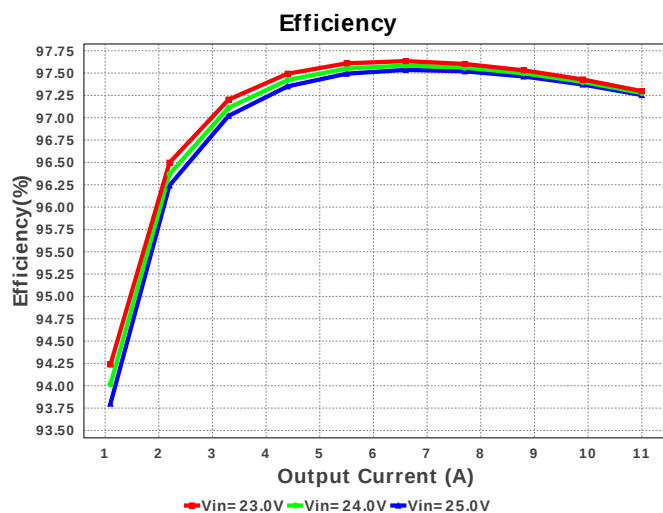
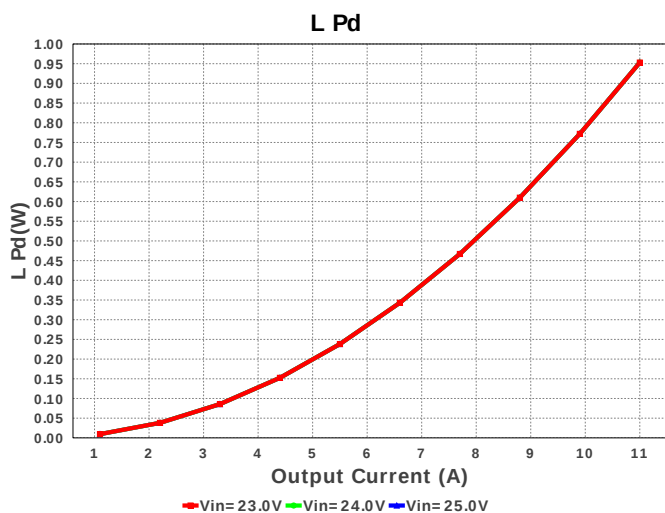
Electrical BOM

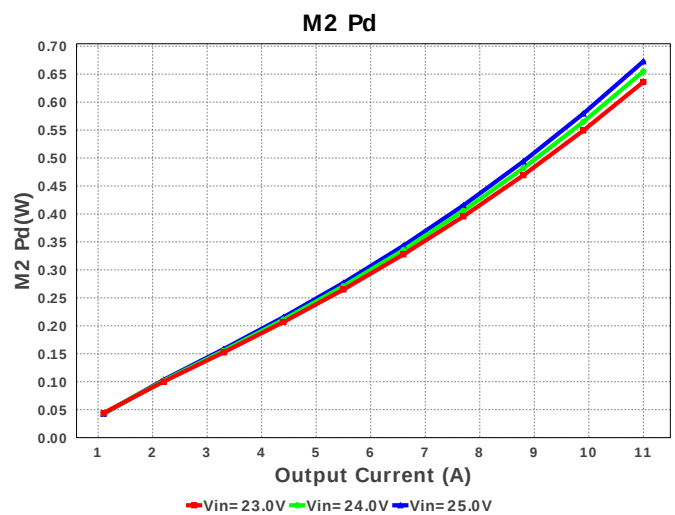
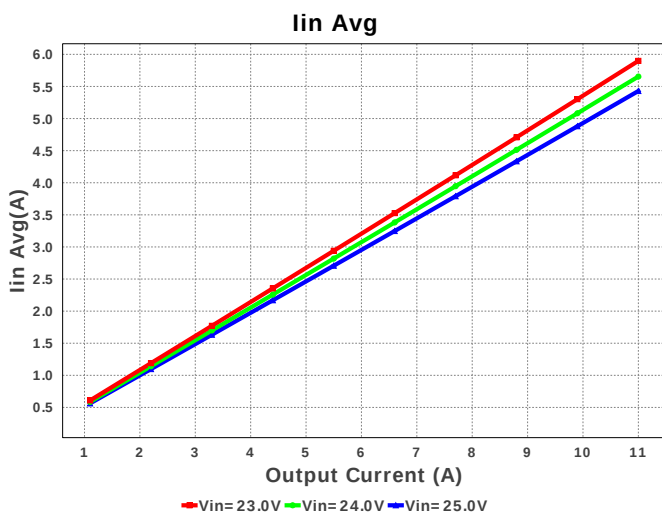
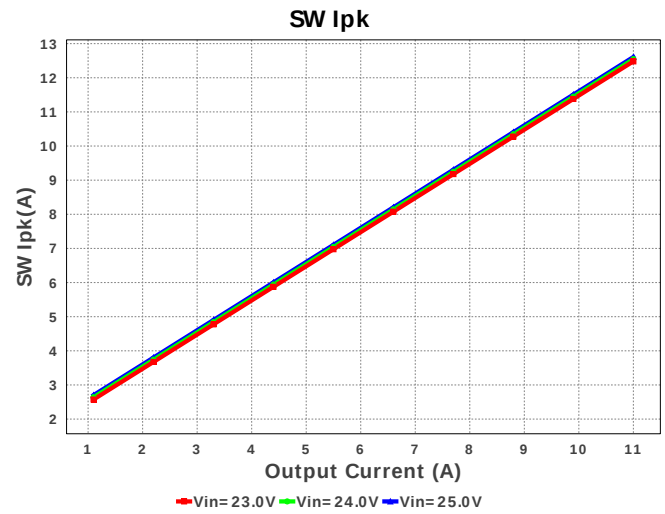
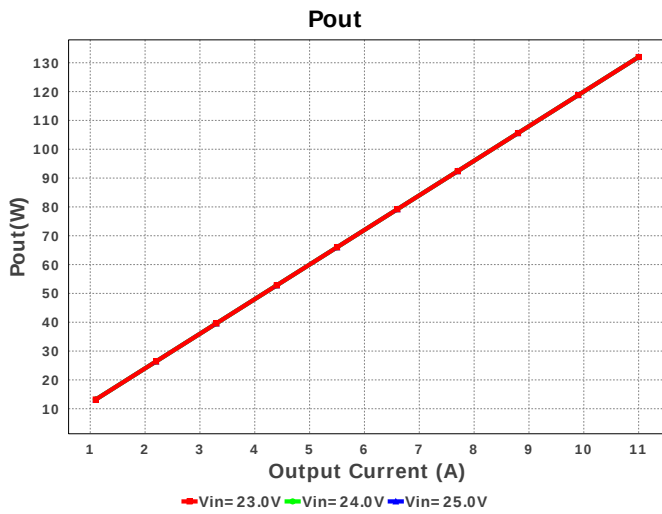
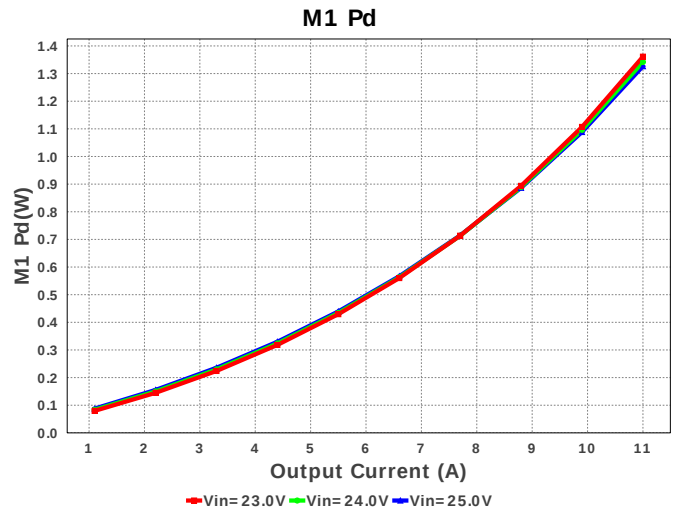
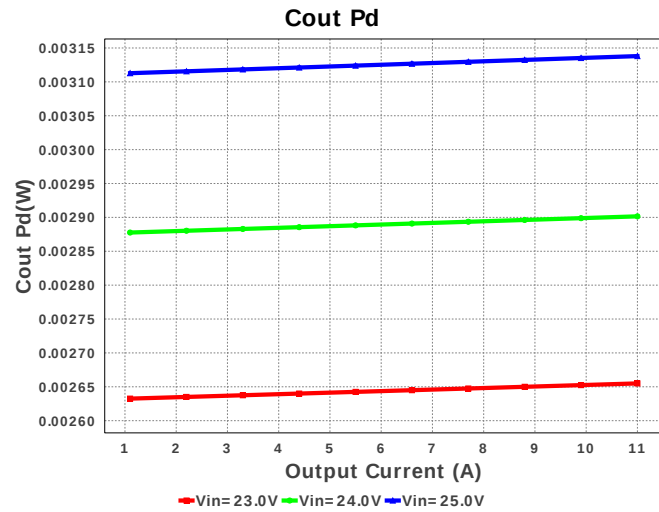
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1.	Cbst	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	0805 7 mm ²
2.	Cbyp	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	\$0.02	0805 7 mm ²
3.	Ccomp	Taiyo Yuden	TMK212B7473KD-T Series= X7R	Cap= 47.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Ccomp2	MuRata	GRM033R71A182KA01D Series= X7R	Cap= 1.8 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0201 2 mm ²
5.	Ccomp3	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 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	C2012X5R1V106K085AC Series= X5R	Cap= 10.0 uF ESR= 2.818 mOhm VDC= 35.0 V IRMS= 3.8868 A	2	\$0.15	0805 7 mm ²
8.	Cldr	MuRata	GRM033R71C102KA01D Series= X7R	Cap= 1.0 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	0201 2 mm ²
9.	Cout	MuRata	GRM31CR61C226ME15L Series= X5R	Cap= 22.0 uF ESR= 3.637 mOhm VDC= 16.0 V IRMS= 3.4771 A	1	\$0.14	1206_190 11 mm ²

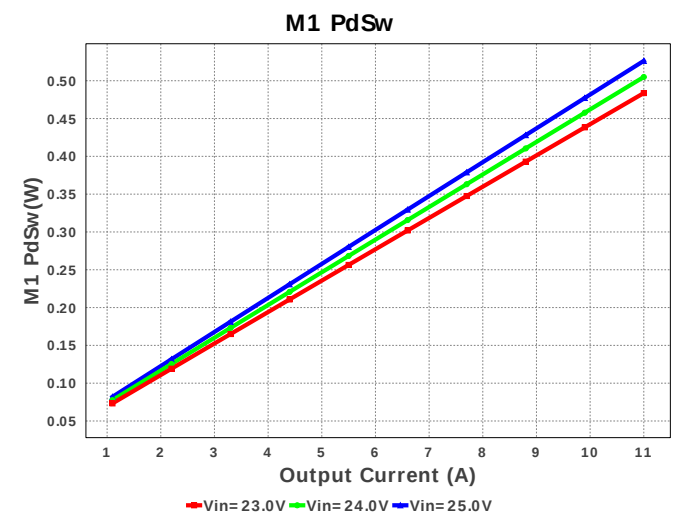
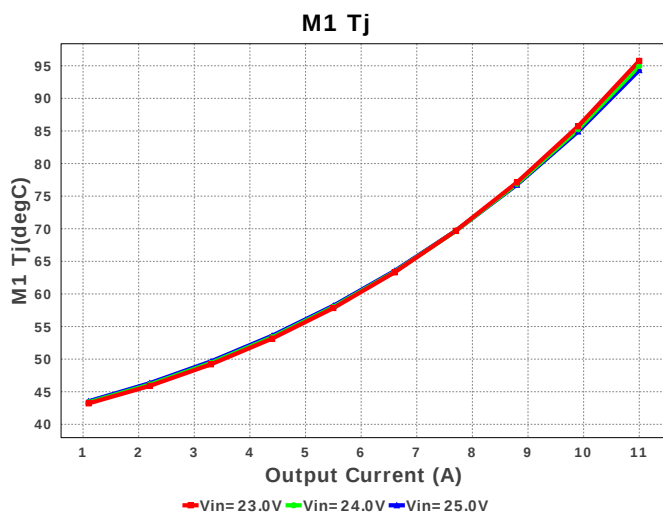
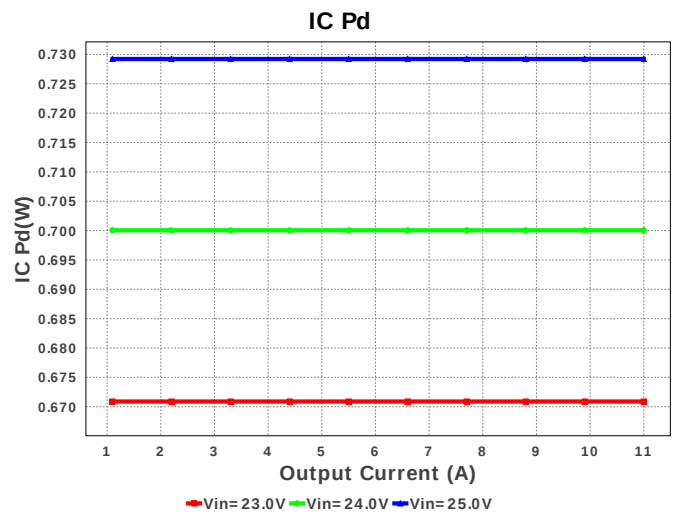
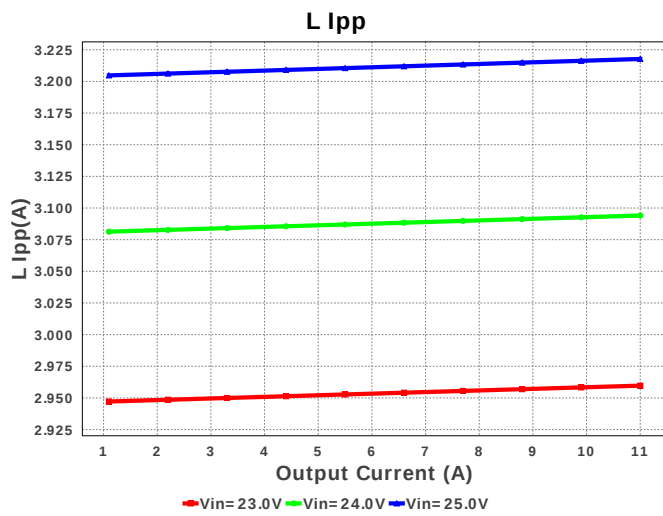
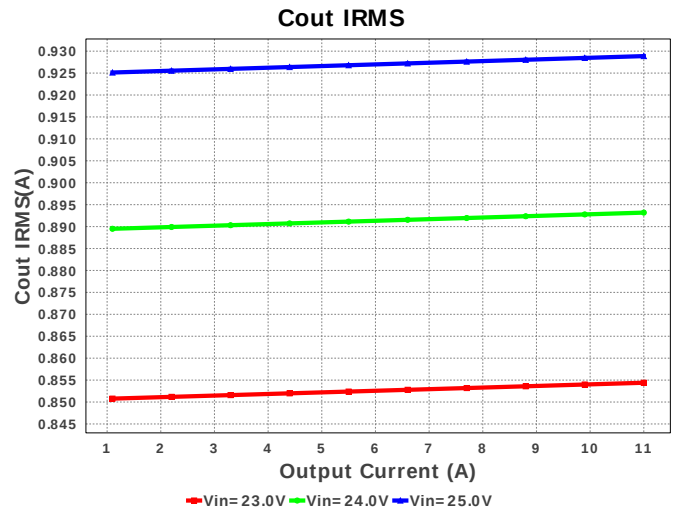
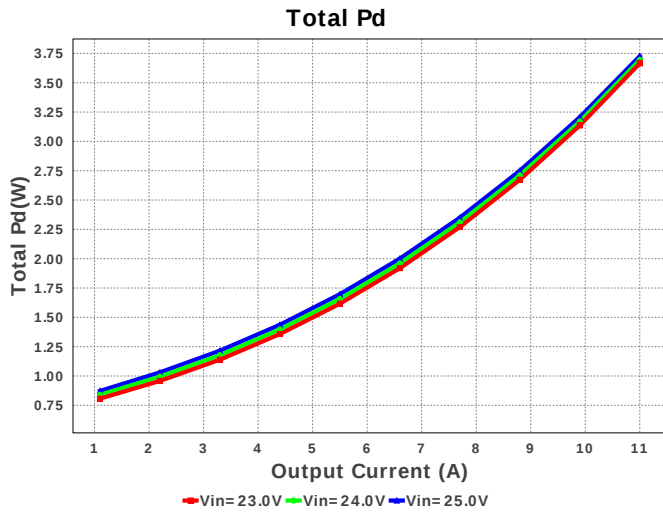
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10.	Css	MuRata	GRM033R70J222KA01D Series= X7R	Cap= 2.2 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0201 2 mm ²
11.	Cvdd	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	\$0.01	 0603 5 mm ²
12.	Cvin	TDK	C1005X5R1V105K050BC 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	XAL1010-562MEB	L= 5.6 uH DCR= 6.3 mOhm	1	\$1.71	 XAL1010 160 mm ²
14.	M1	Fairchild Semiconductor	FDD8647L	VdsMax= 40.0 V IdsMax= 14.0 Amps	1	\$0.50	 DPAK 102 mm ²
15.	M2	Texas Instruments	CSD18532Q5B	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	\$0.84	 TRANS_NexFET_Q5B 58 mm ²
16.	Rcomp	Vishay-Dale	CRCW0402487RFKED Series= CRCW..e3	Res= 487.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rcomp2	Vishay-Dale	CRCW0402402RFKED Series= CRCW..e3	Res= 402.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rcs	Vishay-Dale	CRCW040244K2FKED Series= CRCW..e3	Res= 44.2 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	CRCW0402523RFKED Series= CRCW..e3	Res= 523.0 Ohm 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

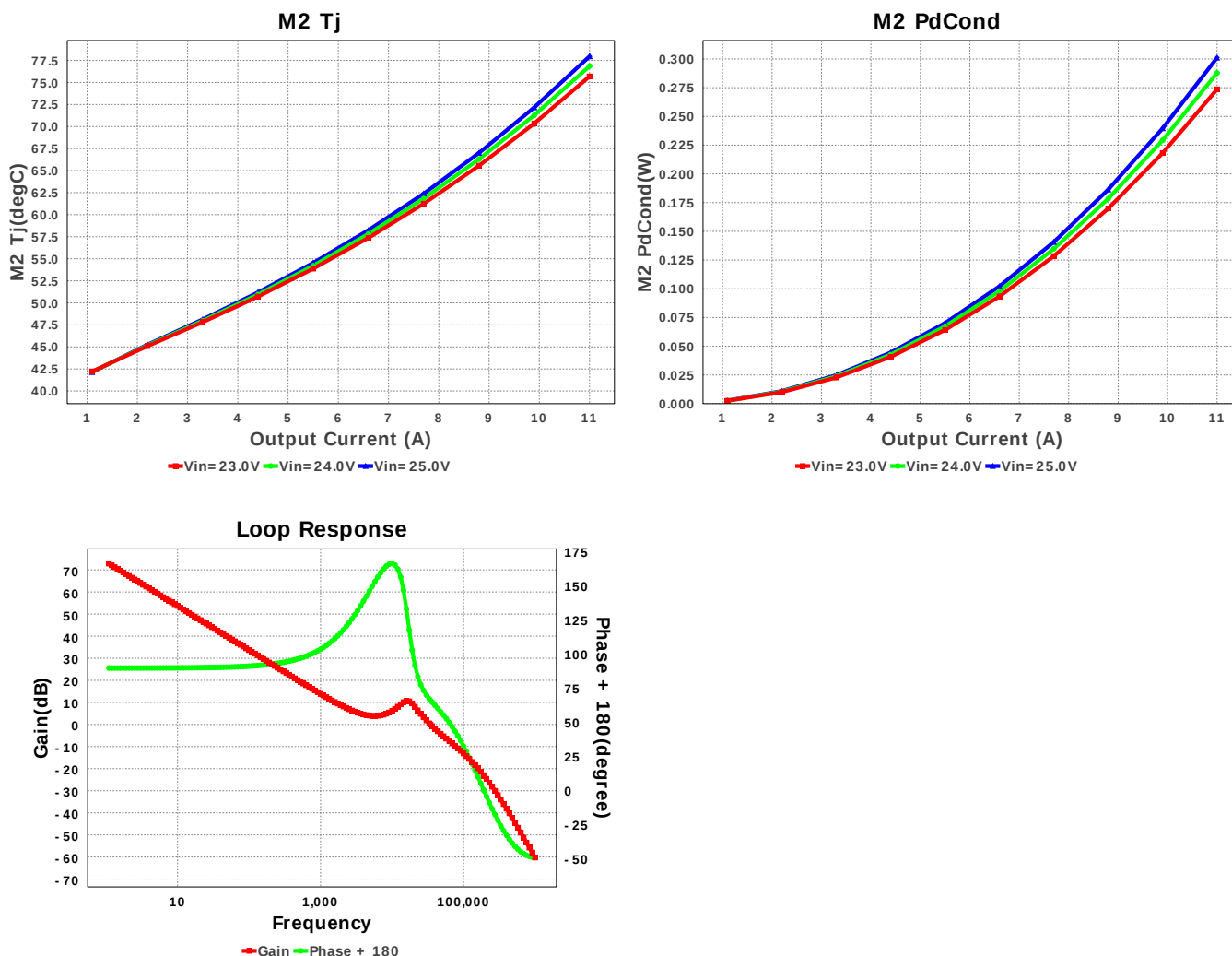
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
27.	U1	Texas Instruments	TPS40170RGYR	Switcher	1	\$1.50	 RGY0020A 25 mm ²











Operating Values

#	Name	Value	Category	Description
1.	BOM Count	28		Total Design BOM count
2.	Total BOM	\$5.23		Total BOM Cost
3.	Cin IRMS	5.497 A	Current	Input capacitor RMS ripple current
4.	Cout IRMS	928.872 mA	Current	Output capacitor RMS ripple current
5.	Iin Avg	5.429 A	Current	Average input current
6.	L Ipp	3.218 A	Current	Peak-to-peak inductor ripple current
7.	SW Ipk	12.609 A	Current	Peak switch current
8.	FootPrint	449.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	348.432 kHz	General	Switching frequency
10.	IC Tolerance	6.0 μ V	General	IC Feedback Tolerance
11.	Mode	CCM	General	Conduction Mode
12.	Pout	132.0 W	General	Total output power
13.	Low Freq Gain	72.862 dB	Op_Point	Gain at 10Hz
14.	Vout Actual	12.072 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Cross Freq	34.437 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	48.296 %	Op_point	Duty cycle
17.	Efficiency	97.254 %	Op_point	Steady state efficiency
18.	Gain Marg	-23.26 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	65.523 degC	Op_point	IC junction temperature
20.	IOUT_OP	11.0 A	Op_point	Iout operating point
21.	M1 Tj	94.332 degC	Op_point	M1 MOSFET junction temperature
22.	M2 Tj	77.966 degC	Op_point	M2 MOSFET junction temperature
23.	Phase Marg	66.377 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	25.0 V	Op_point	Vin operating point
25.	Vout p-p	70.736 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	42.573 mW	Power	Input capacitor power dissipation
27.	Cout Pd	3.138 mW	Power	Output capacitor power dissipation
28.	IC Pd	729.225 mW	Power	IC power dissipation
29.	L Pd	952.875 mW	Power	Inductor power dissipation
30.	M1 Pd	1.327 W	Power	M1 MOSFET total power dissipation
31.	M1 PdCond	800.345 mW	Power	M1 MOSFET conduction losses

#	Name	Value	Category	Description
32.	M1 PdSw	526.263 mW	Power	M1 MOSFET switching losses
33.	M2 Pd	672.851 mW	Power	M2 MOSFET total power dissipation
34.	M2 PdCond	301.105 mW	Power	M2 MOSFET conduction losses
35.	M2 PdSw	371.746 mW	Power	M2 MOSFET switching losses
36.	Total Pd	3.727 W	Power	Total Power Dissipation
37.	Vout Tolerance	1.921 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	11.0	Maximum Output Current
2.	VinMax	25.0	Maximum input voltage
3.	VinMin	23.0	Minimum input voltage
4.	Vout	12.0	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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