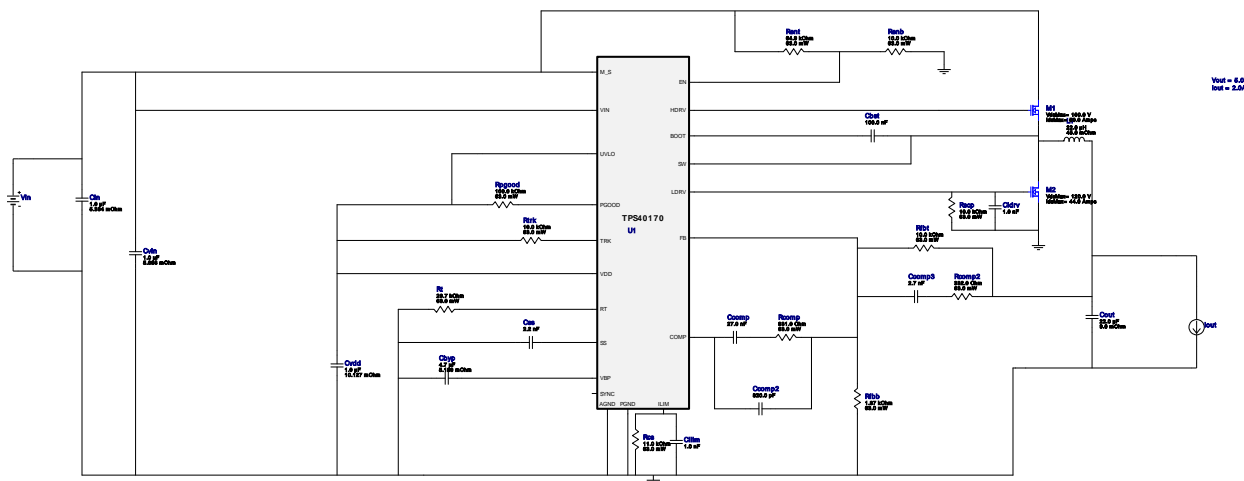


## WEBENCH® Design Report

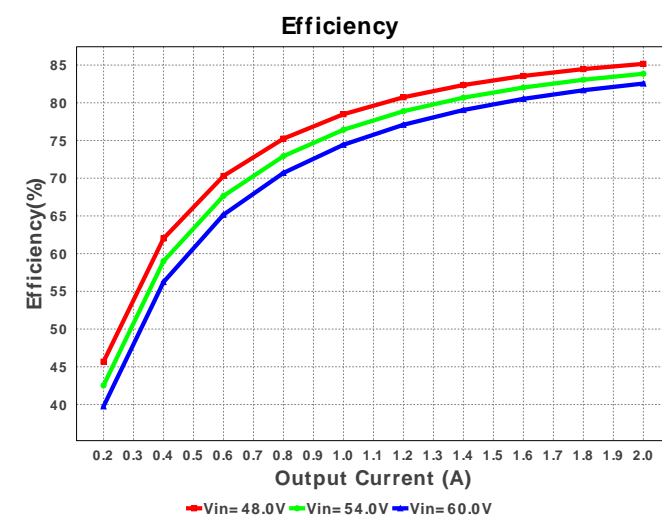
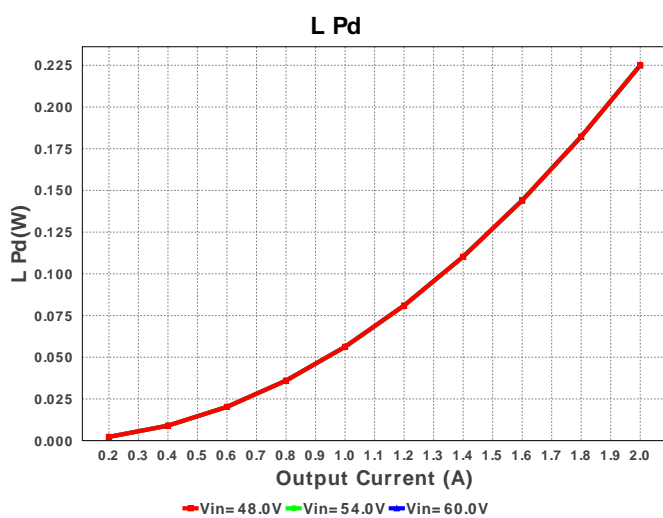
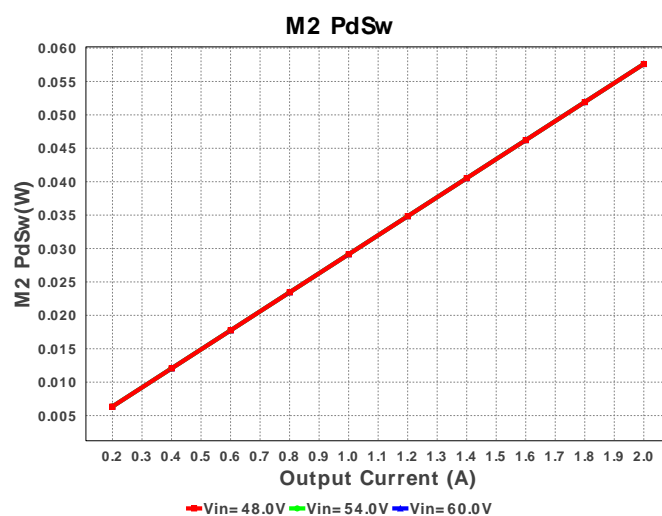
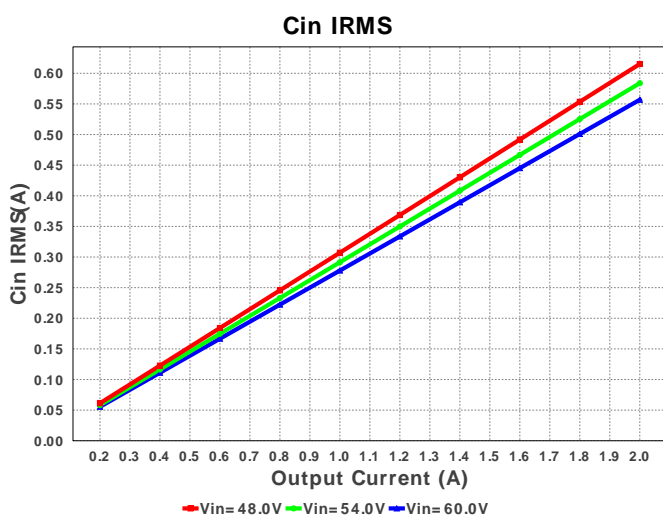
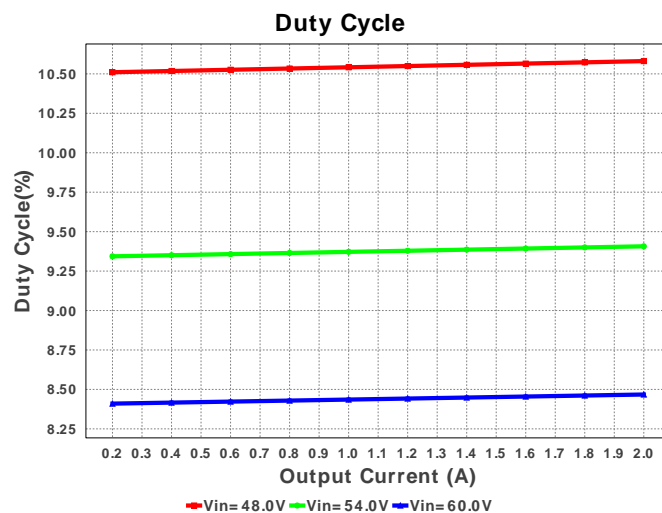
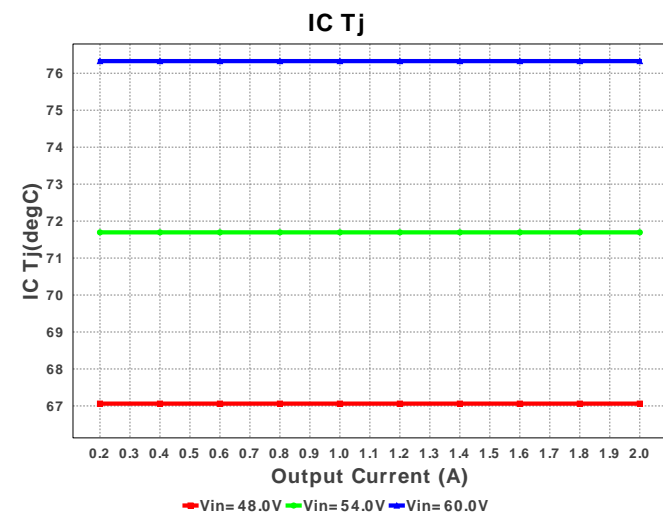
Design : 4466246/56 TPS40170RGYR  
TPS40170RGYR 48.0V-60.0V to 5.00V @ 2.0A

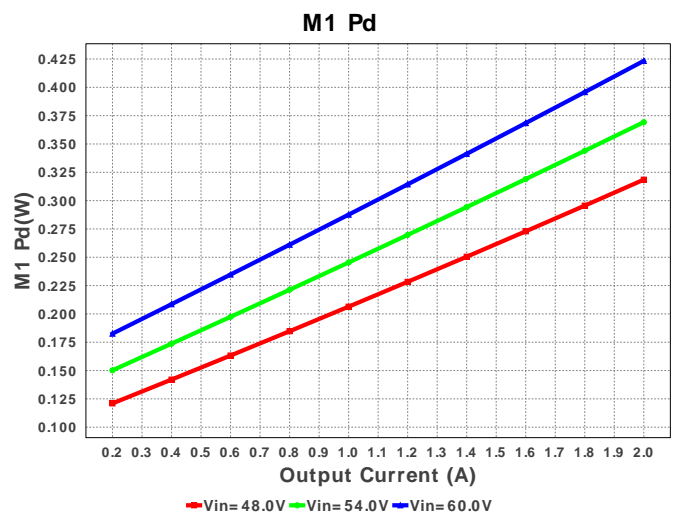
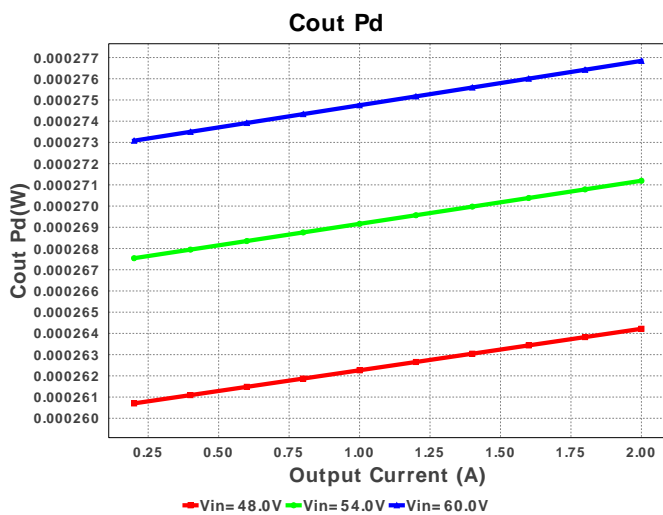
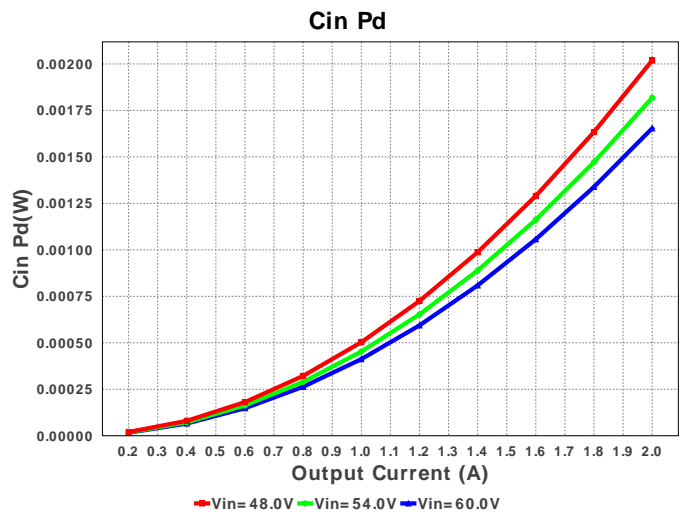
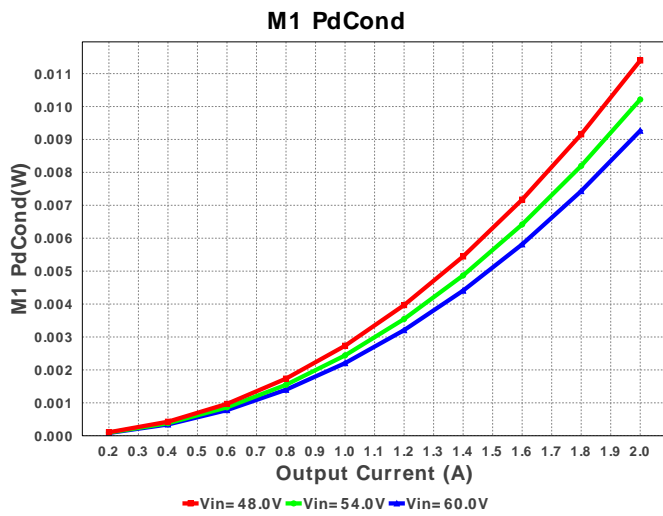
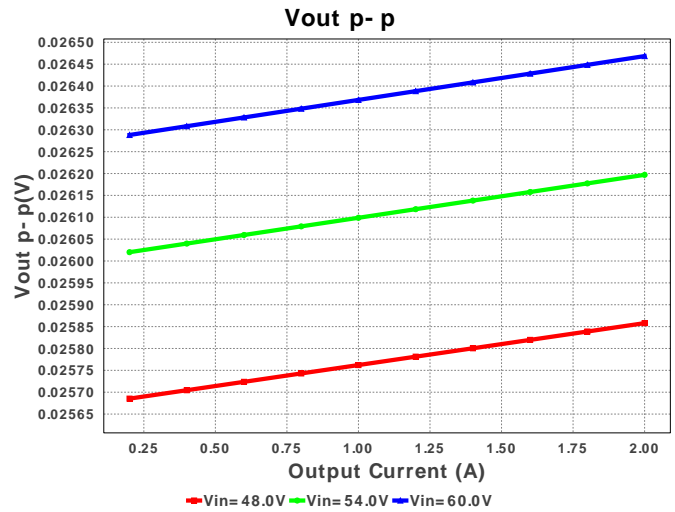
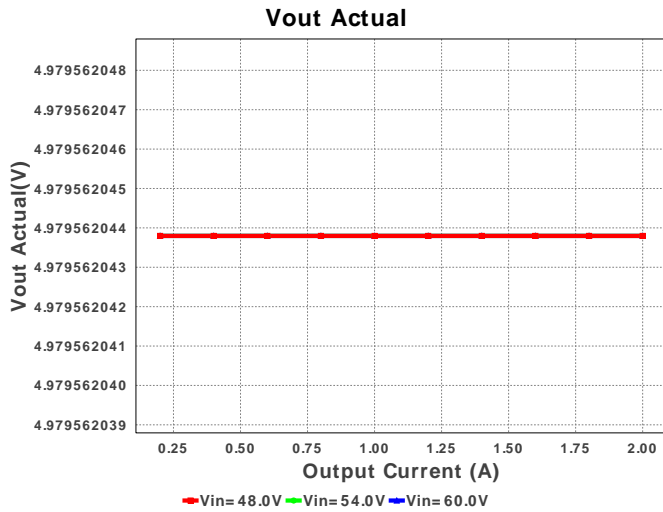


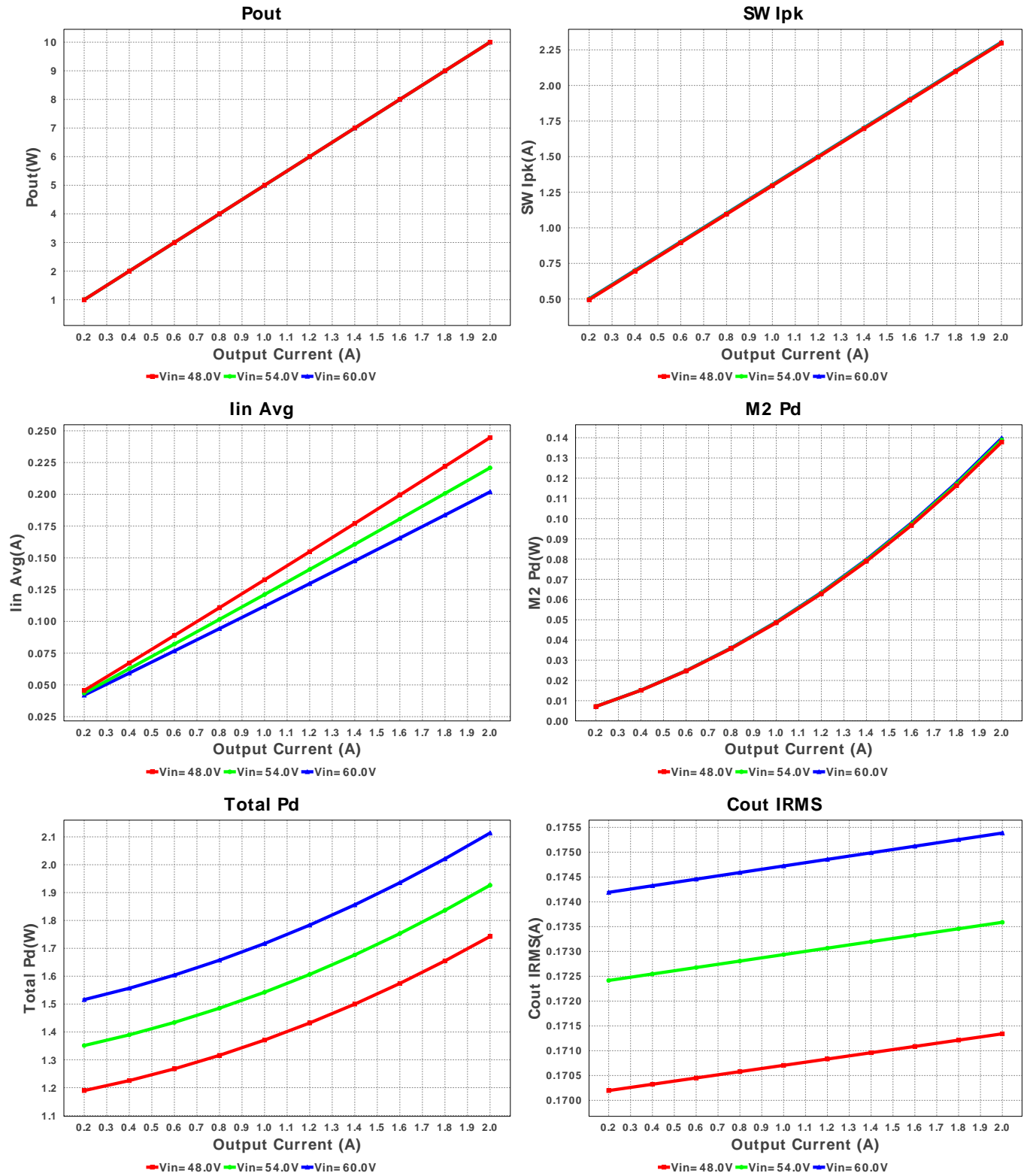
## Electrical BOM

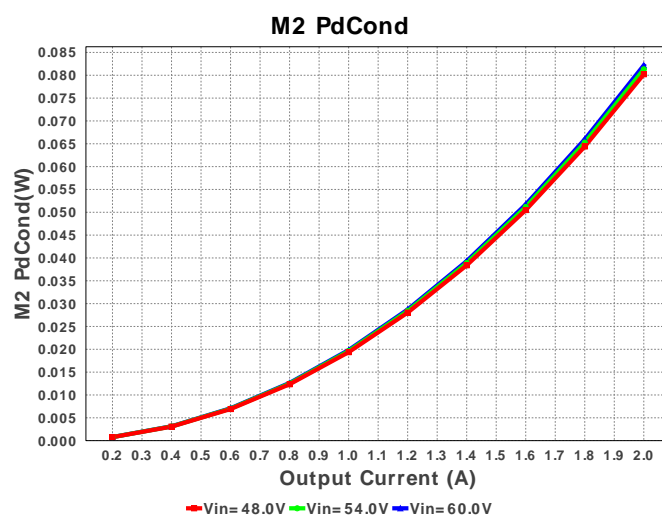
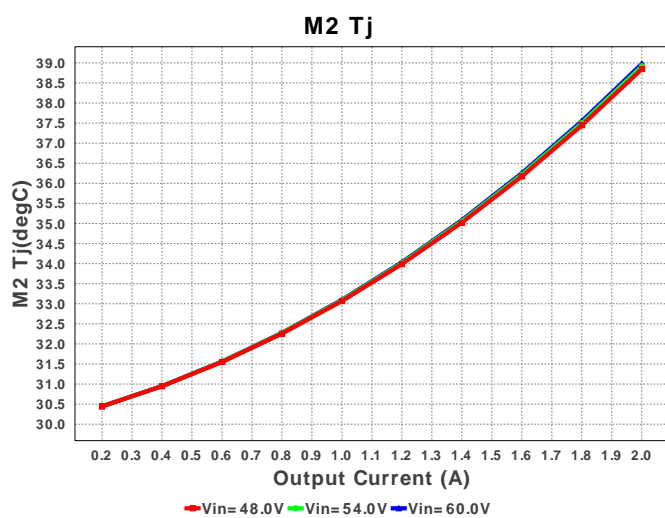
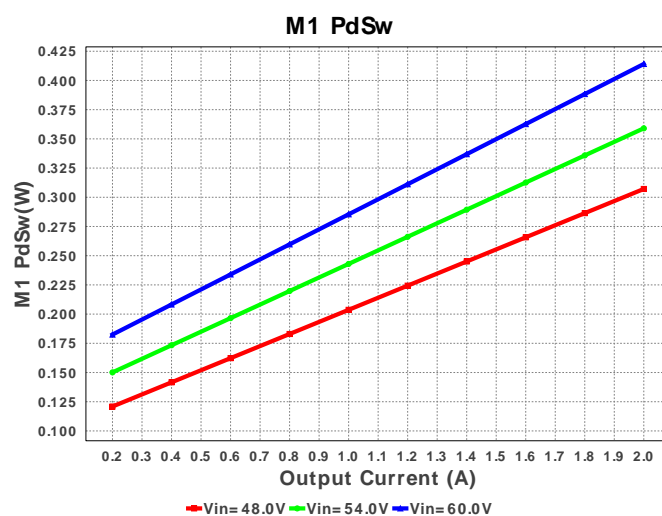
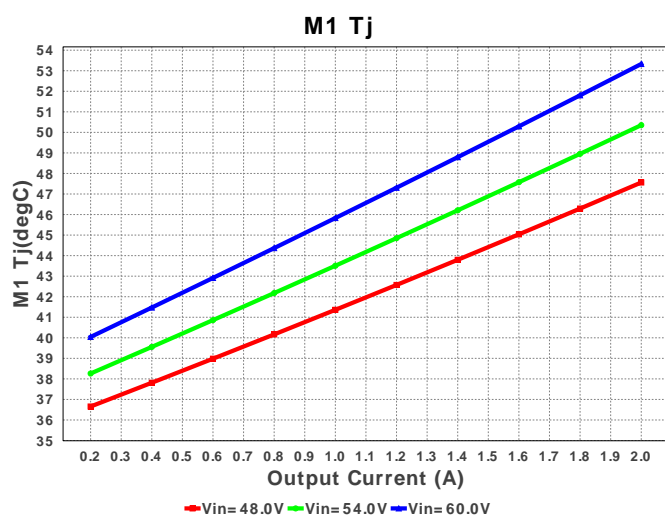
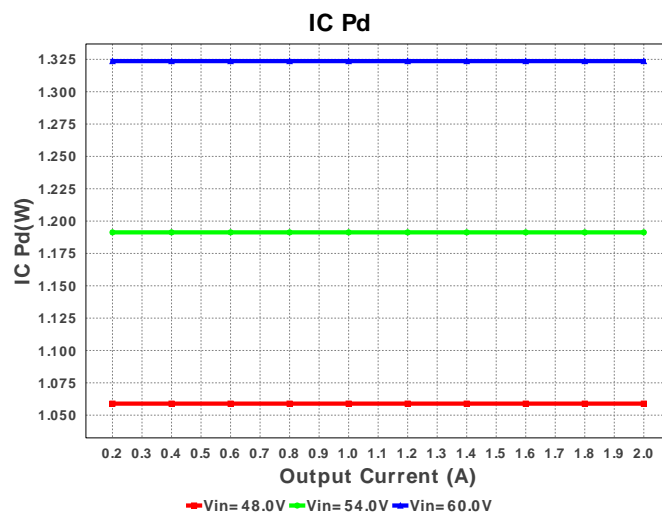
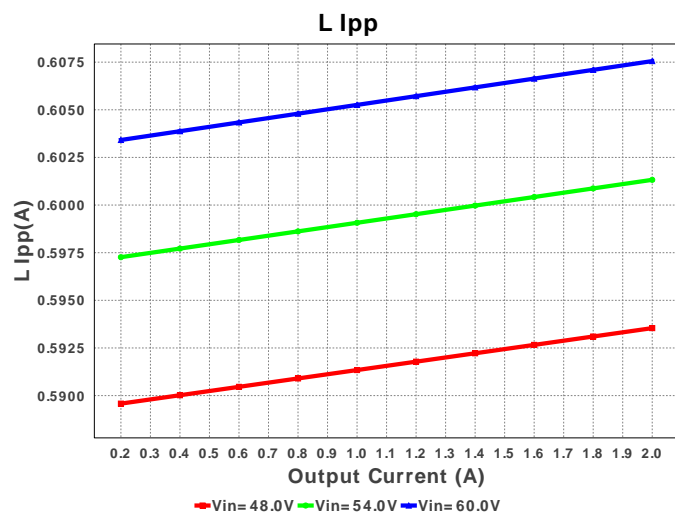
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Taiyo Yuden	HMK212B7104KG-T Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	\$0.03	0805 7 mm <sup>2</sup>
2.	Cbyp	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	\$0.02	0805 7 mm <sup>2</sup>
3.	Ccomp	MuRata	GRM155R61A273KA01D Series= X5R	Cap= 27.0 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm <sup>2</sup>
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 <sup>2</sup>
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 <sup>2</sup>
6.	Cilim	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>
7.	Cin	MuRata	GRM31CR72A105KA01L Series= X7R	Cap= 1.0 uF ESR= 5.334 mOhm VDC= 100.0 V IRMS= 1.55432 A	1	\$0.11	1206_190 11 mm <sup>2</sup>
8.	Cldrv	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm <sup>2</sup>
9.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	\$0.04	0805 7 mm <sup>2</sup>
10.	Css	MuRata	GRM033R70J222KA01D Series= X7R	Cap= 2.2 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	0201 2 mm <sup>2</sup>

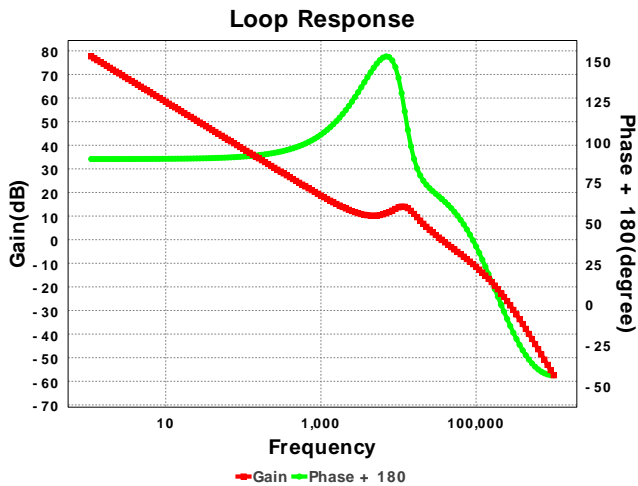
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Cvdd	MuRata	GRM188R61C105KA93D Series= X5R	Cap= 1.0 uF ESR= 10.127 mOhm VDC= 16.0 V IRMS= 994.63 mA	1	\$0.01	 0603 5 mm <sup>2</sup>
12.	Cvin	TDK	C3216X5R2A105K Series= X5R	Cap= 1.0 uF ESR= 5.698 mOhm VDC= 100.0 V IRMS= 0.0 A	1	\$0.07	 1206 11 mm <sup>2</sup>
13.	L1	Coilcraft	MSS1048-223MLB	L= 22.0 uH DCR= 45.0 mOhm	1	\$0.56	 MSS1048 146 mm <sup>2</sup>
14.	M1	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	\$0.75	 TRANS_NexFET_Q3 18 mm <sup>2</sup>
15.	M2	Infineon Technologies	BSC190N12NS3 G	VdsMax= 120.0 V IdsMax= 44.0 Amps	1	\$0.64	 PG-TDSON-8 55 mm <sup>2</sup>
16.	Rcomp	Vishay-Dale	CRCW0402931RFKED Series= CRCW..e3	Res= 931.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
17.	Rcomp2	Vishay-Dale	CRCW0402332RFKED Series= CRCW..e3	Res= 332.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
18.	Rcs	Vishay-Dale	CRCW040211K0FKED Series= CRCW..e3	Res= 11.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
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 <sup>2</sup>
20.	Rent	Vishay-Dale	CRCW040264K9FKED Series= CRCW..e3	Res= 64.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
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 <sup>2</sup>
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 <sup>2</sup>
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 <sup>2</sup>
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 <sup>2</sup>
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 <sup>2</sup>
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 <sup>2</sup>
27.	U1	Texas Instruments	TPS40170RGYR	Switcher	1	\$2.10	 RGY0020A 25 mm <sup>2</sup>











## Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	556.8 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	175.386 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	201.9 mA	Current	Average input current
4.	L Ipp	607.56 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	2.304 A	Current	Peak switch current
6.	BOM Count	27	General	Total Design BOM count
7.	FootPrint	357.0 mm <sup>2</sup>	General	Total Foot Print Area of BOM components
8.	Frequency	348.432 kHz	General	Switching frequency
9.	IC Tolerance	6.0 $\mu$ V	General	IC Feedback Tolerance
10.	Pout	10.0 W	General	Total output power
11.	Total BOM	\$4.5	General	Total BOM Cost
12.	Low Freq Gain	77.631 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	4.98 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Cross Freq	35.869 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	8.468 %	Op_point	Duty cycle
16.	Efficiency	82.55 %	Op_point	Steady state efficiency
17.	Gain Marg	-22.857 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	76.328 degC	Op_point	IC junction temperature
19.	IOUT_OP	2.0 A	Op_point	Iout operating point
20.	M1 Tj	53.329 degC	Op_point	M1 MOSFET junction temperature
21.	M2 Tj	38.975 degC	Op_point	M2 MOSFET junction temperature
22.	Phase Marg	65.559 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	60.0 V	Op_point	Vin operating point
24.	Vout p-p	26.468 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	1.654 mW	Power	Input capacitor power dissipation
26.	Cout Pd	276.842 $\mu$ W	Power	Output capacitor power dissipation
27.	IC Pd	1.324 W	Power	IC power dissipation
28.	L Pd	225.0 mW	Power	Inductor power dissipation
29.	M1 Pd	423.364 mW	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	9.264 mW	Power	M1 MOSFET conduction losses
31.	M1 PdSw	414.099 mW	Power	M1 MOSFET switching losses
32.	M2 Pd	139.852 mW	Power	M2 MOSFET total power dissipation
33.	M2 PdCond	82.235 mW	Power	M2 MOSFET conduction losses
34.	M2 PdSw	57.617 mW	Power	M2 MOSFET switching losses
35.	Total Pd	2.114 W	Power	Total Power Dissipation
36.	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	2.0	Maximum Output Current
2.	VinMax	60.0	Maximum input voltage
3.	VinMin	48.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	TPS40170	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	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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