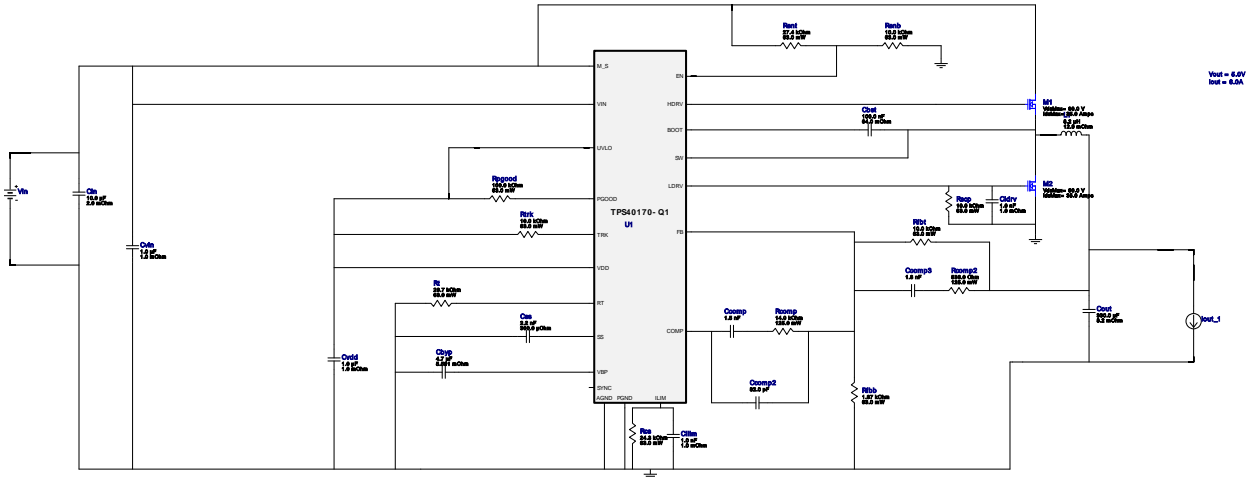


WEBENCH® Design Report

 Design : 855015/240 TPS40170QRGYRQ1
 TPS40170QRGYRQ1 20.0V-30.0V to 5.00V @ 6.0A


1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application. View WEBENCH(R) Disclaimer.


My Comments

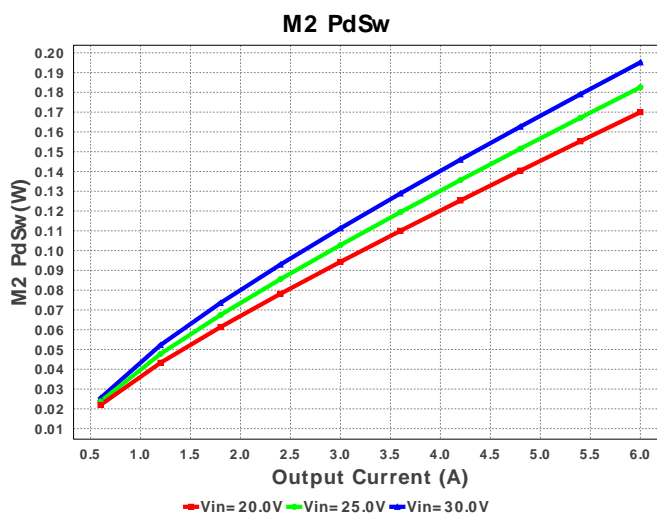
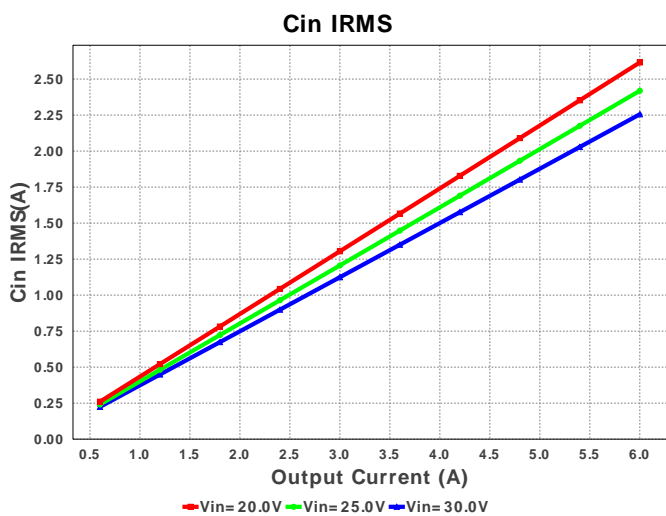
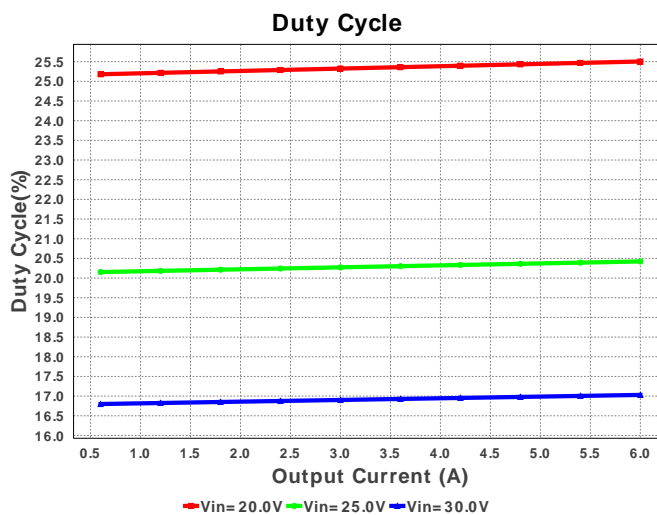
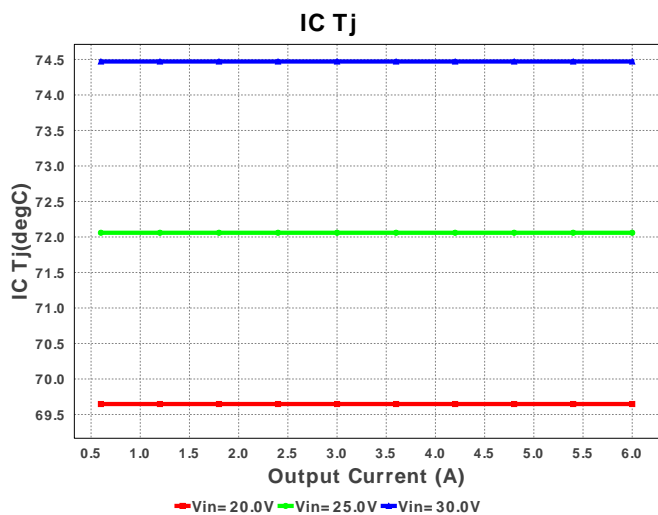
No comments

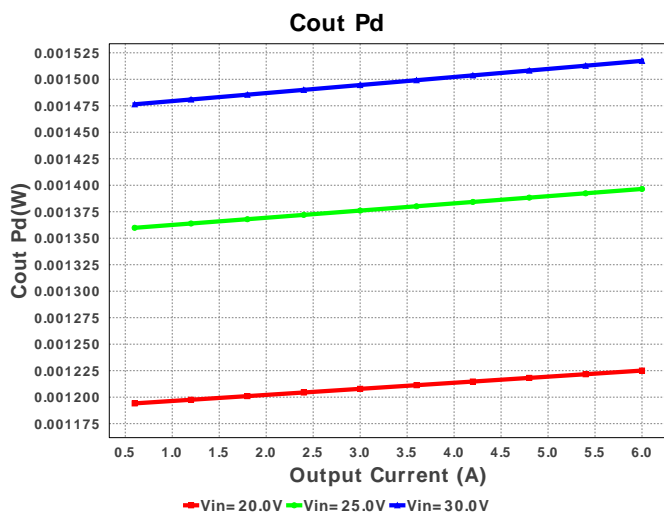
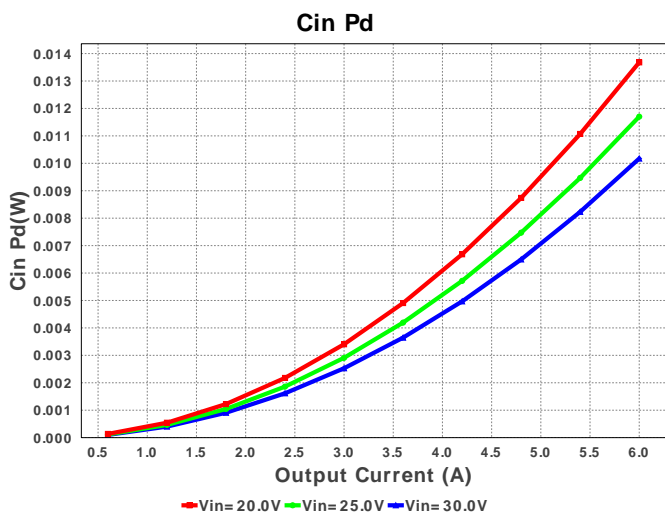
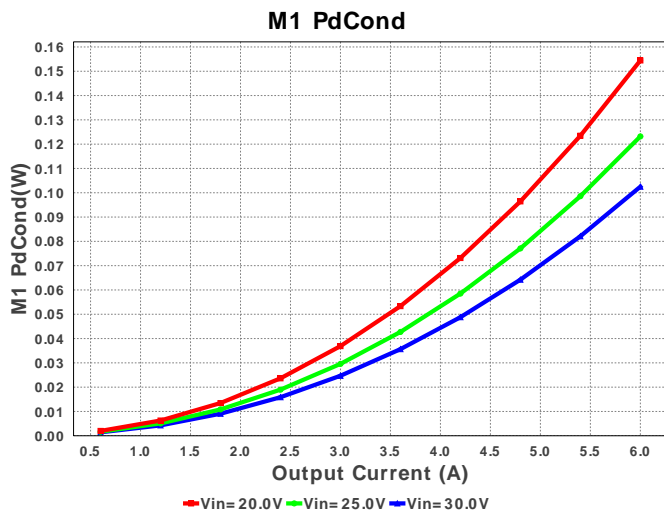
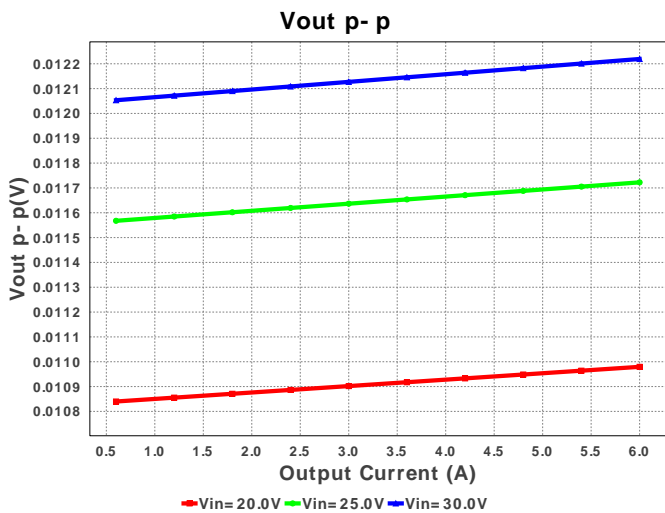
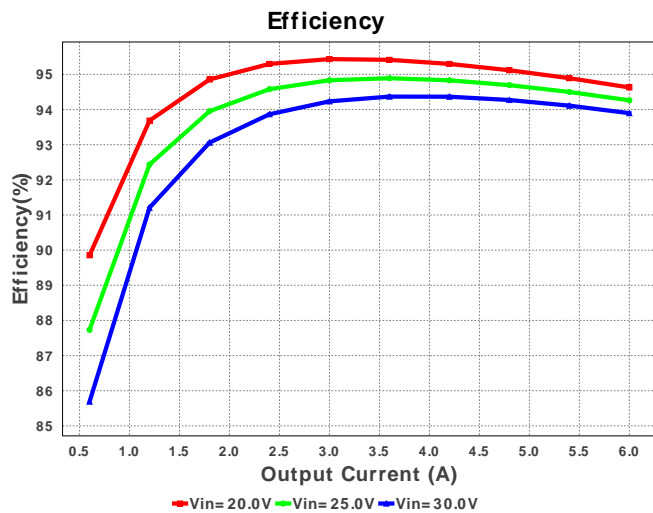
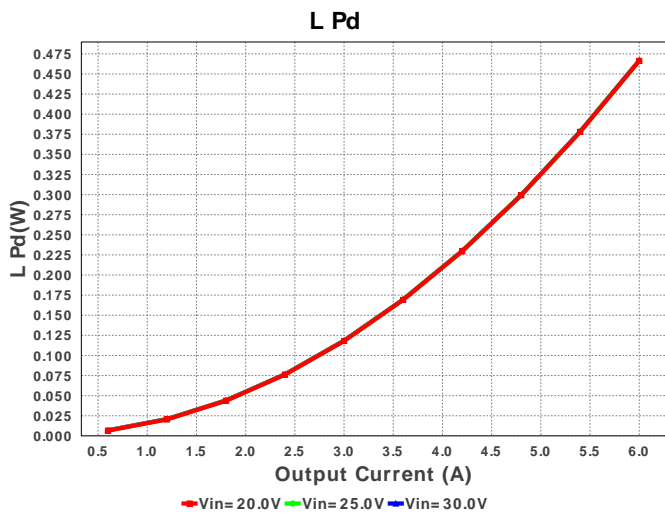
Electrical BOM

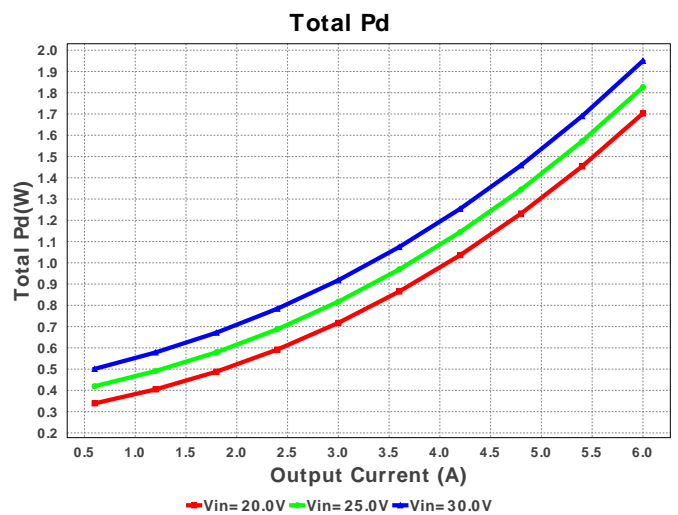
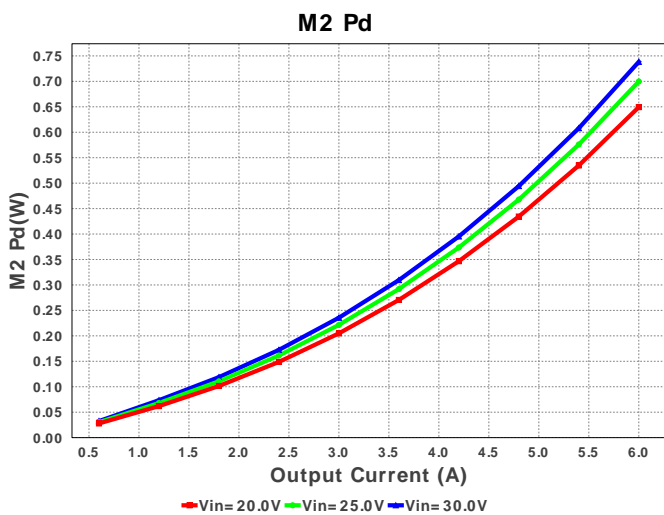
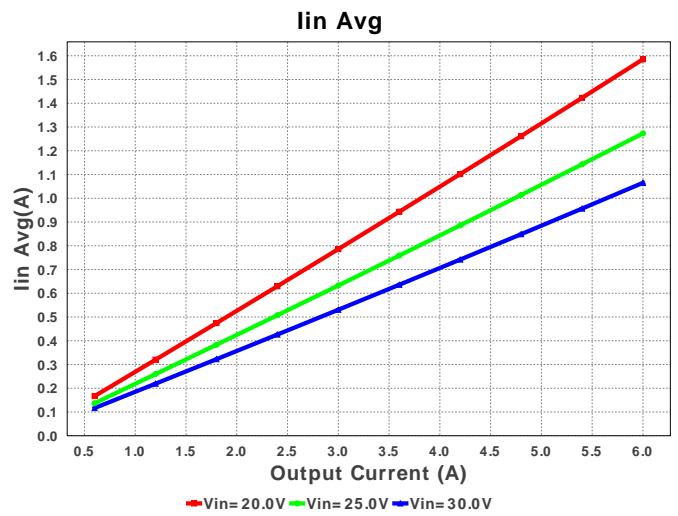
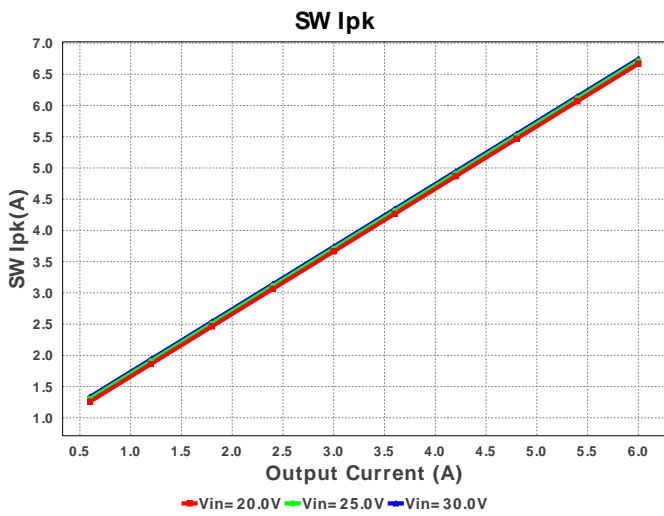
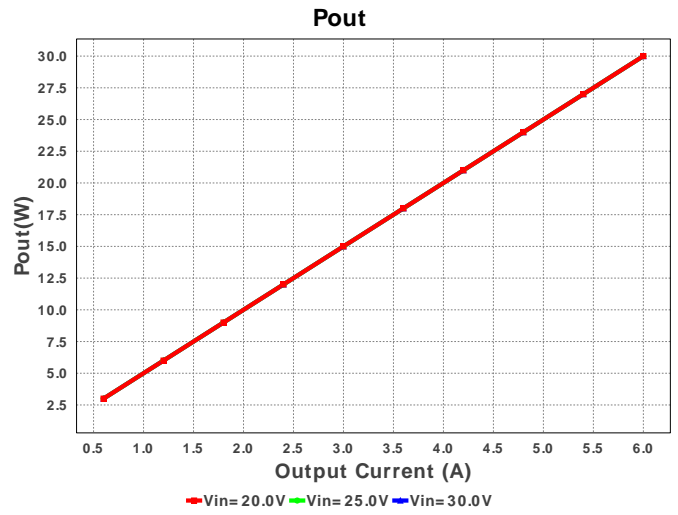
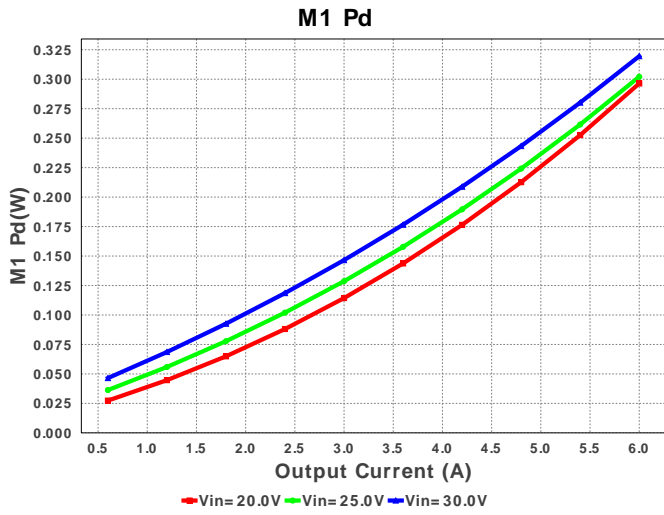
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	0805 7 mm ²
2.	Cbyp	MuRata	GRM219R61C475KE15D Series= X5R	Cap= 4.7 uF ESR= 5.591 mOhm VDC= 16.0 V IRMS= 1.8634 A	1	\$0.03	0805 7 mm ²
3.	Ccomp	Kemet	C0805C152J5GACTU Series= C0G/NP0	Cap= 1.5 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
4.	Ccomp2	Samsung Electro-Mechanics	CL21C820JB61PNC Series= C0G/NP0	Cap= 82.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Ccomp3	MuRata	GRM1885C1H182JA01J Series= C0G/NP0	Cap= 1.8 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
6.	Cilim	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
7.	Cin	GRM32ER71H106KA12L	CUSTOM_CAP_MD Series= CUSTOM	Cap= 10.0 uF ESR= 2.0 mOhm VDC= 50.0 V IRMS= 5.0 A	1	\$0.10	1210 5 mm ²
8.	Cldrv	MuRata	GRM216R71E102KA01D Series= X7R	Cap= 1.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cout	25SVPF330M	CUSTOM_CAP_MD Series= CUSTOM	Cap= 330.0 uF ESR= 8.2 mOhm VDC= 25.0 V IRMS= 5.0 A	1	\$0.10	 1210 8 mm ²
10.	Css	CUSTOM	CUSTOM_CAP_MD Series= CUSTOM	Cap= 2.2 nF ESR= 300.0 uOhm VDC= 50.0 V IRMS= 1.0 A	1	\$0.10	 1210 4 mm ²
11.	Cvdd	Taiyo Yuden	EMK107B7105KA-T Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
12.	Cvin	AVX	08055C105KAT2A Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	\$0.06	 0805 7 mm ²
13.	L1	XAL1010-822ME	CUSTOM_INDUCTOR_MD	L= 8.2 uH DCR= 12.9 mOhm	1	\$0.10	 XAL8080 70 mm ²
14.	M1	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	\$0.27	 DNH0008A 18 mm ²
15.	M2	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	\$0.27	 DNH0008A 18 mm ²
16.	Rcomp	Panasonic	ERJ-6ENF1402V Series= ERJ-6E	Res= 14.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
17.	Rcomp2	Vishay-Dale	CRCW0805536RFKEA Series= CRCW..e3	Res= 536.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
18.	Rcs	Vishay-Dale	CRCW040224K3FKED Series= CRCW..e3	Res= 24.3 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	CRCW040227K4FKED Series= CRCW..e3	Res= 27.4 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

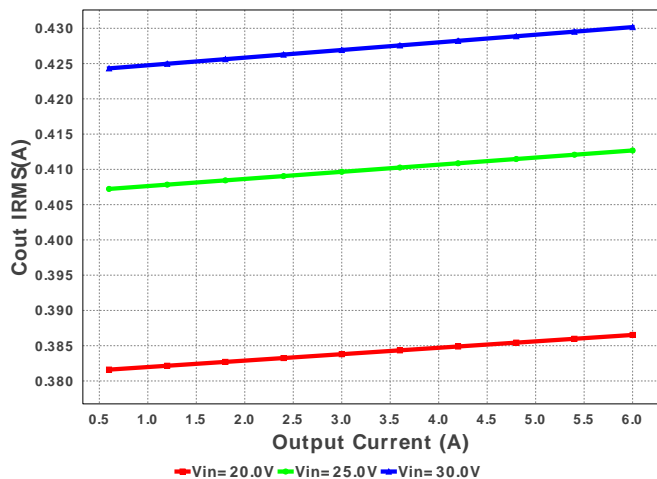
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27.	U1	Texas Instruments	TPS40170QRGYRQ1	Switcher	1	\$2.83	 R-PVQFN-N20 25 mm ²



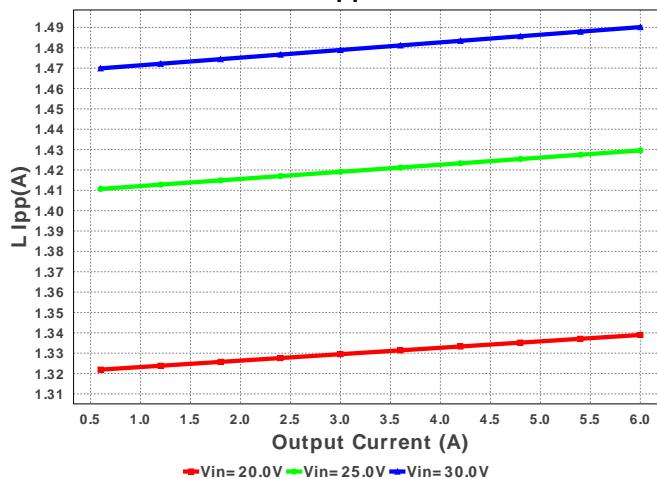




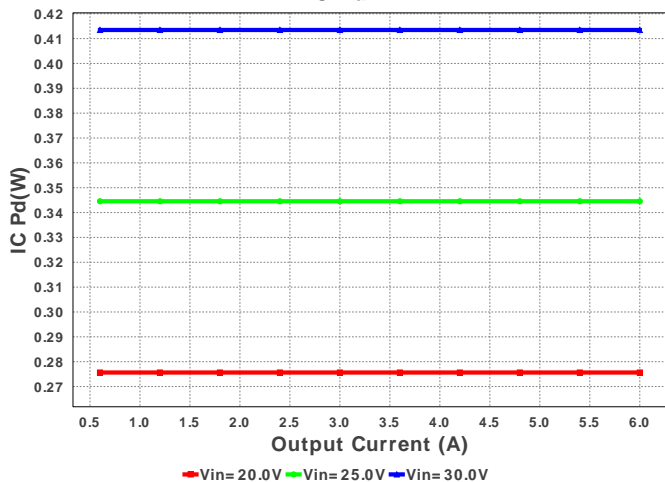
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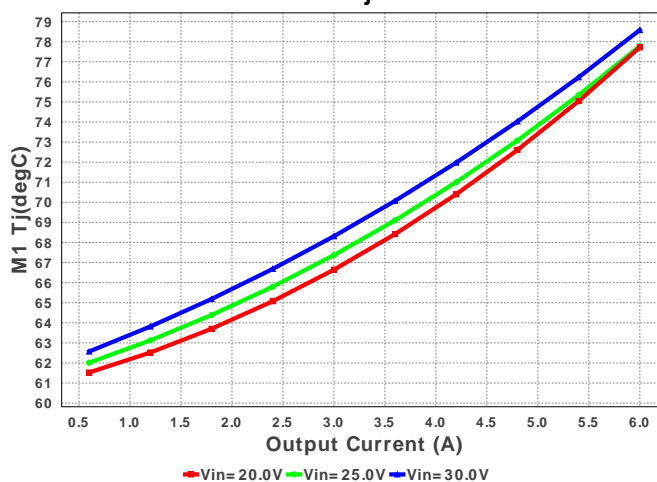
L Ipp



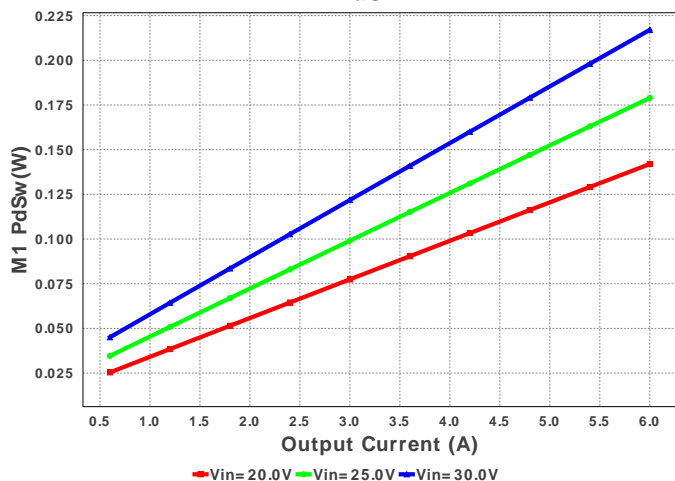
IC Pd



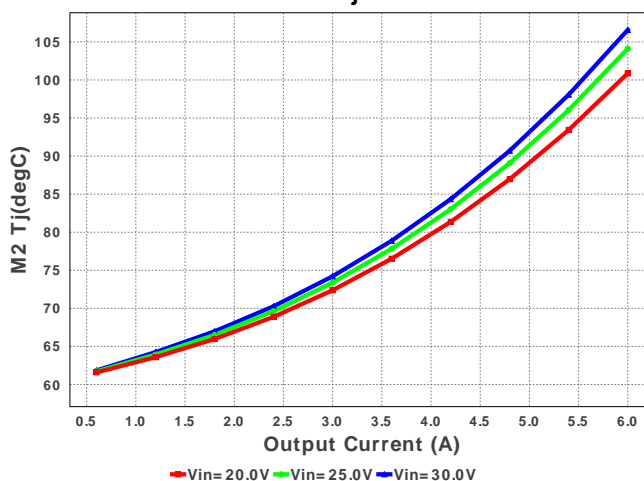
M1 Tj

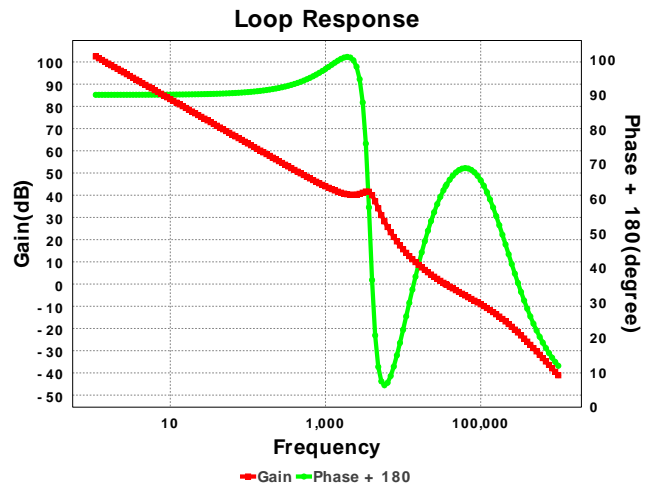
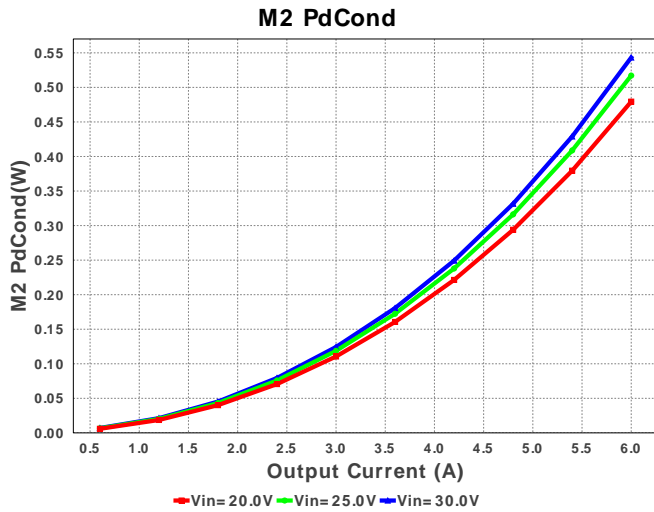


M1 PdSw



M2 Tj





Operating Values

#	Name	Value	Category	Description
1.	BOM Count	27		Total Design BOM count
2.	Total BOM	\$4.05		Total BOM Cost
3.	Cin IRMS	2.255 A	Current	Input capacitor RMS ripple current
4.	Cout IRMS	430.172 mA	Current	Output capacitor RMS ripple current
5.	Iin Avg	1.065 A	Current	Average input current
6.	L Ipp	1.49 A	Current	Peak-to-peak inductor ripple current
7.	SW Ipk	6.745 A	Current	Peak switch current
8.	FootPrint	301.0 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	30.0 W	General	Total output power
13.	Low Freq Gain	102.482 dB	Op_Point	Gain at 1Hz
14.	Vout Actual	4.98 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Cross Freq	35.241 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	17.03 %	Op_point	Duty cycle
17.	Efficiency	93.897 %	Op_point	Steady state efficiency
18.	Gain Marg	-52.413 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	74.471 degC	Op_point	IC junction temperature
20.	IOUT_OP	6.0 A	Op_point	Iout operating point
21.	M1 Tj	78.584 degC	Op_point	M1 MOSFET junction temperature
22.	M2 Tj	106.58 degC	Op_point	M2 MOSFET junction temperature
23.	Phase Marg	63.629 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	30.0 V	Op_point	Vin operating point
25.	Vout p-p	12.219 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	10.174 mW	Power	Input capacitor power dissipation
27.	Cout Pd	1.517 mW	Power	Output capacitor power dissipation
28.	IC Pd	413.467 mW	Power	IC power dissipation
29.	L Pd	466.787 mW	Power	Inductor power dissipation
30.	M1 Pd	319.528 mW	Power	M1 MOSFET total power dissipation
31.	M1 PdCond	102.505 mW	Power	M1 MOSFET conduction losses
32.	M1 PdSw	217.023 mW	Power	M1 MOSFET switching losses
33.	M2 Pd	738.368 mW	Power	M2 MOSFET total power dissipation
34.	M2 PdCond	543.211 mW	Power	M2 MOSFET conduction losses
35.	M2 PdSw	195.156 mW	Power	M2 MOSFET switching losses
36.	Total Pd	1.95 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	6.0	Maximum Output Current
2.	VinMax	30.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	TPS40170-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	60.0	Ambient temperature

Design Assistance

1. Feature Highlights: Automotive Qualified 4.5V to 60V Wide Input Synchronous PWM Buck Controller
2. The TPS40170-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application
3. **TPS40170-Q1** Product Folder : <http://www.ti.com/product/TPS40170%2DQ1> : contains the data sheet and other resources.

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

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