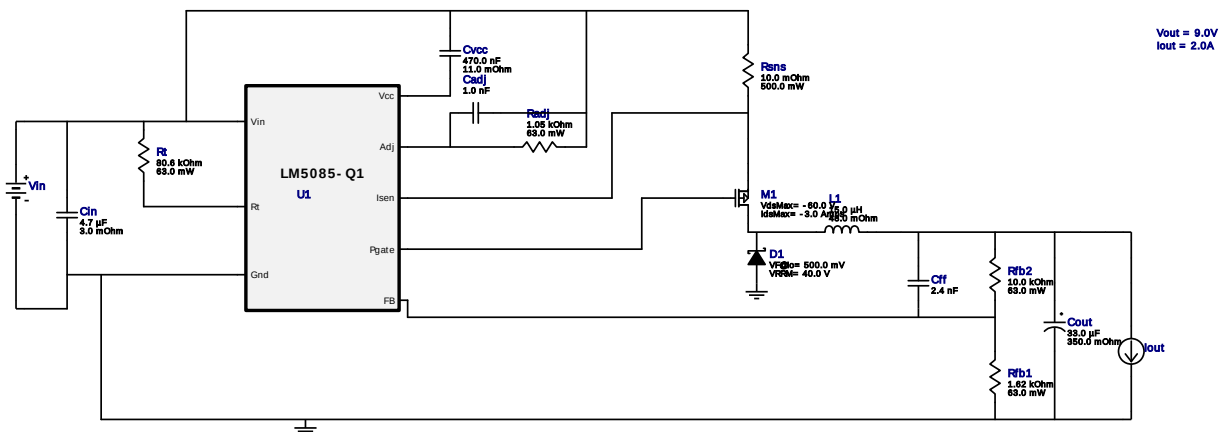


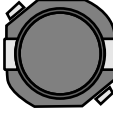
WEBENCH® Design Report

Design : 4743359/281 LM5085QMY/NOPB
LM5085QMY/NOPB 14.0V-22.0V to 9.00V @ 2.0A

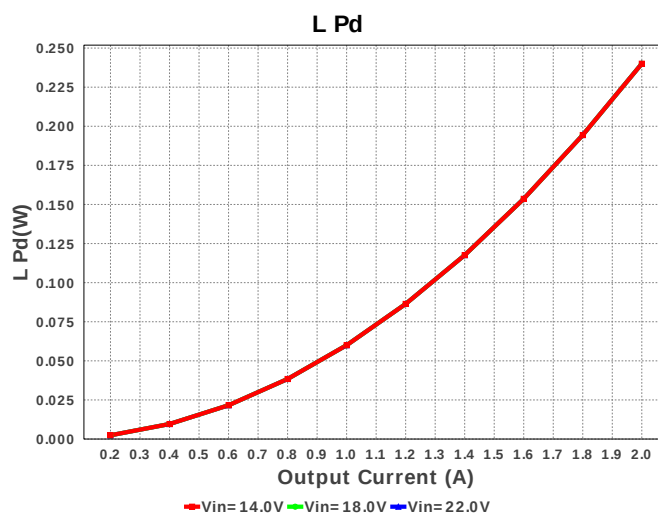
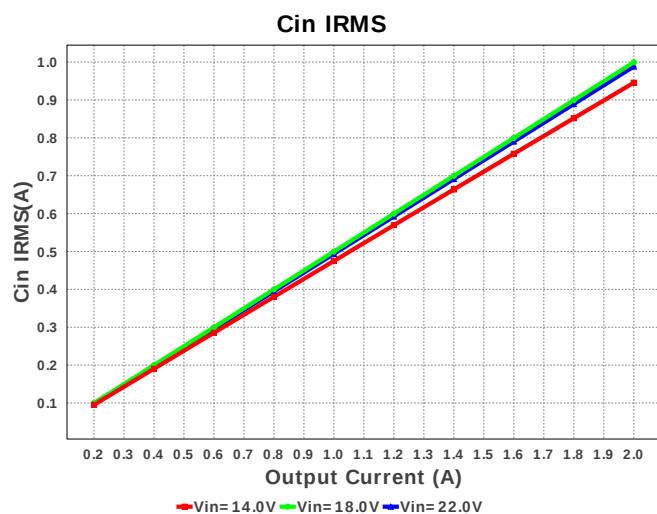
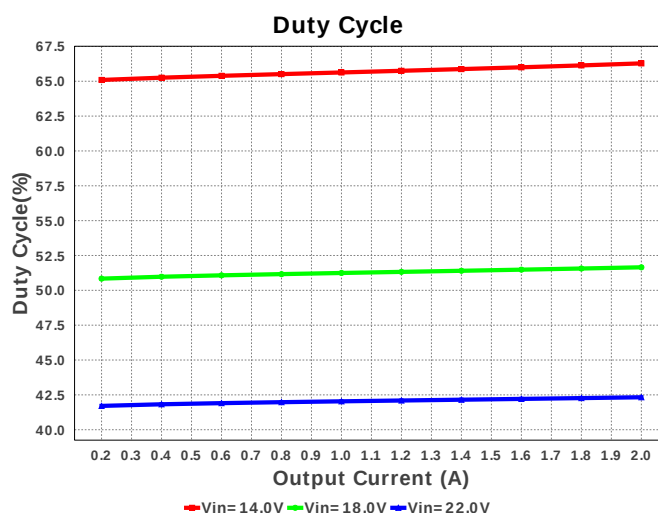
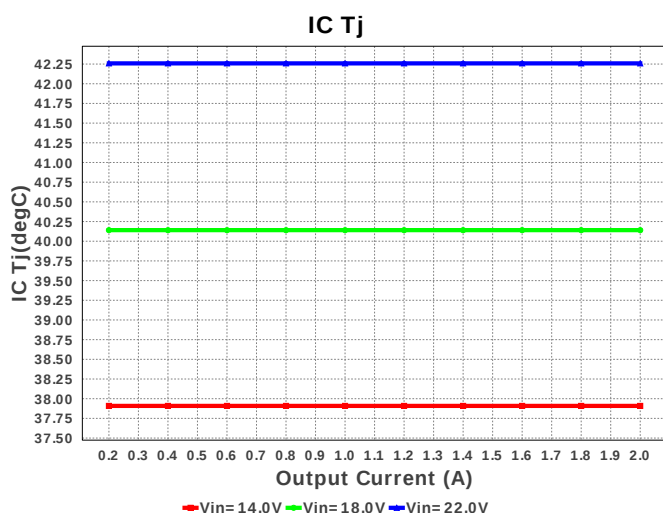


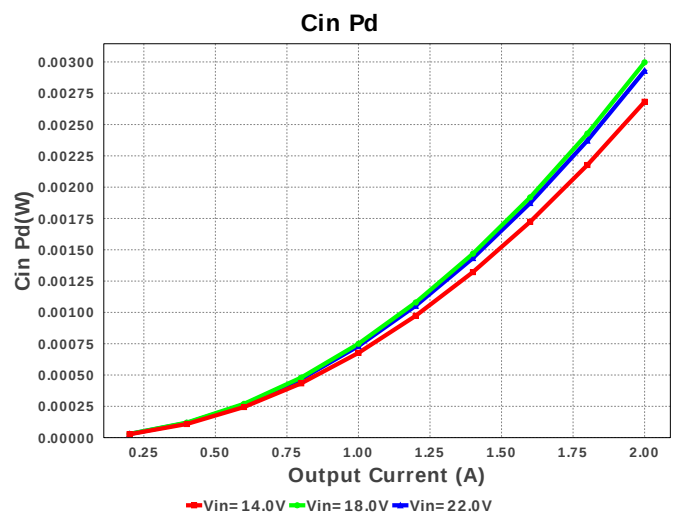
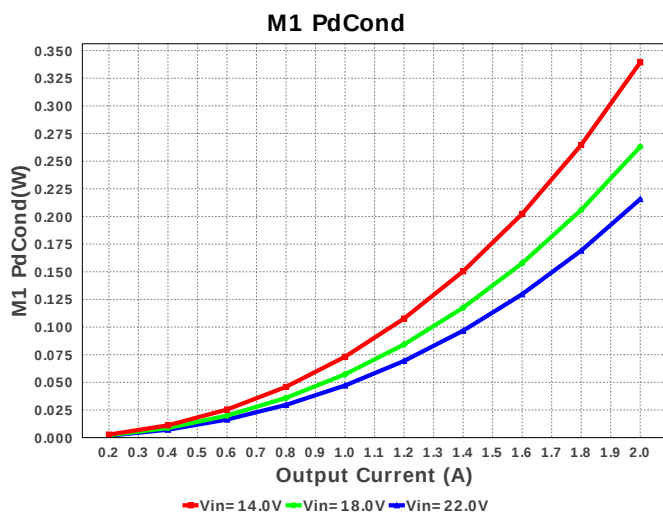
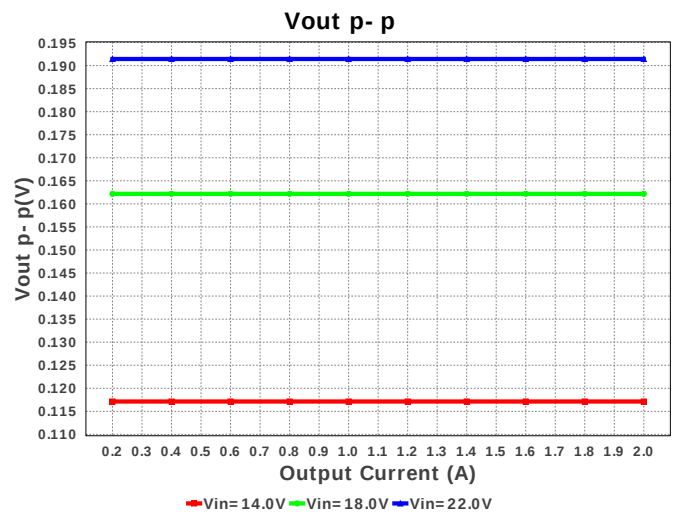
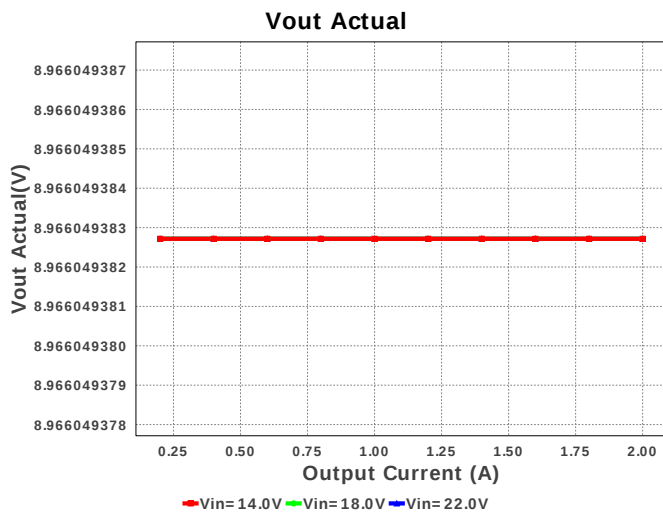
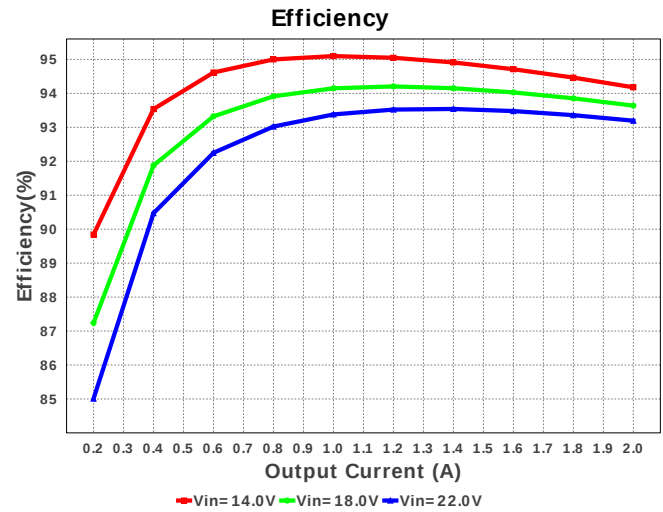
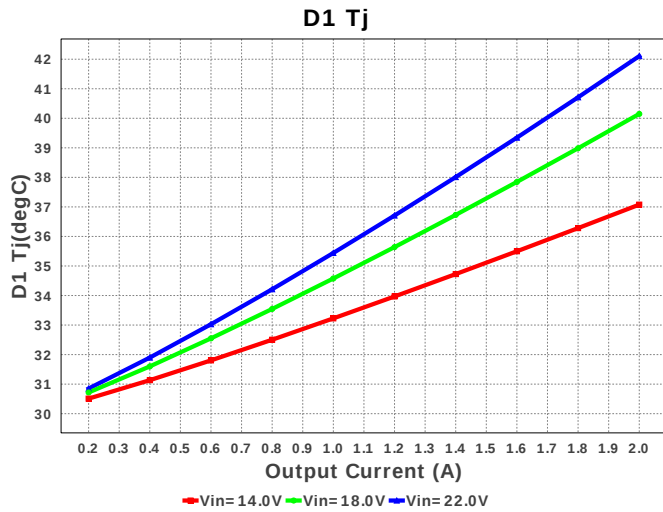
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

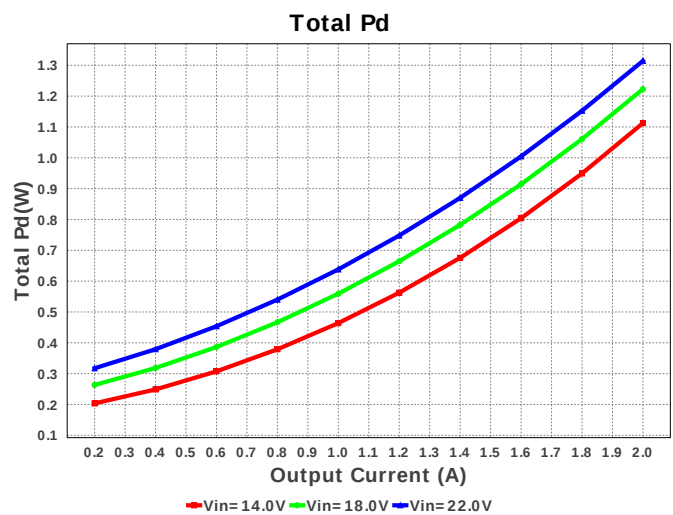
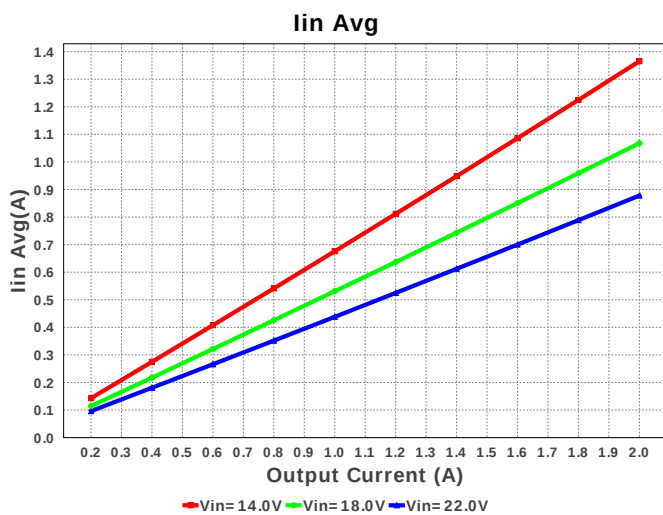
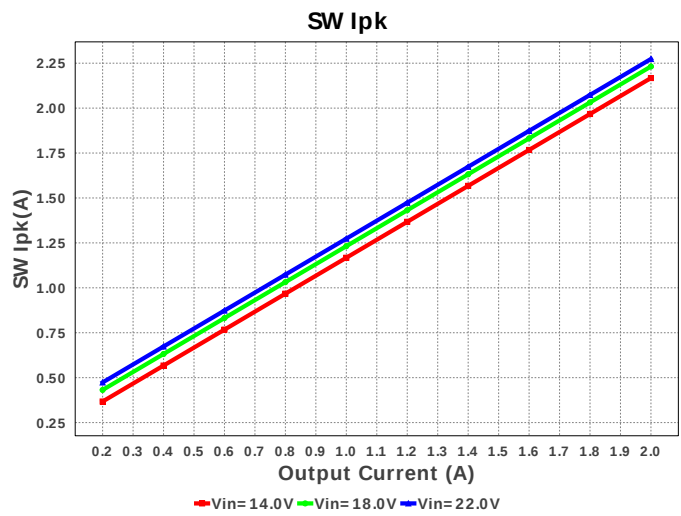
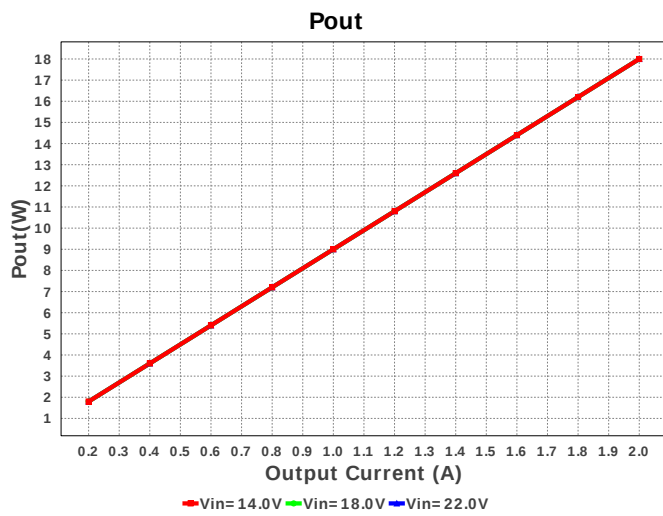
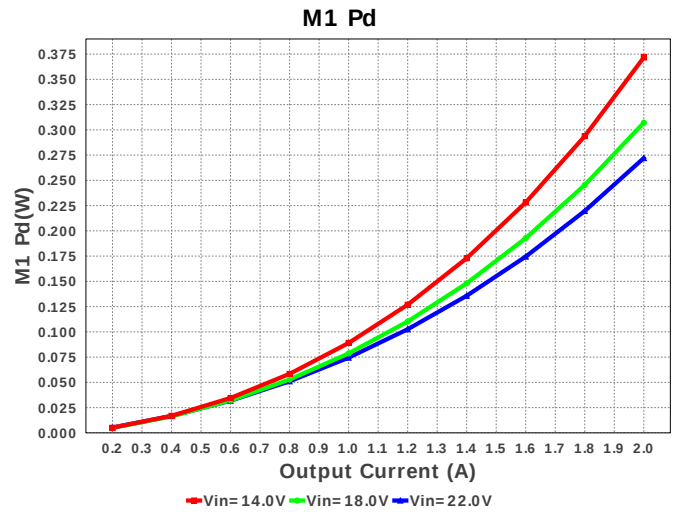
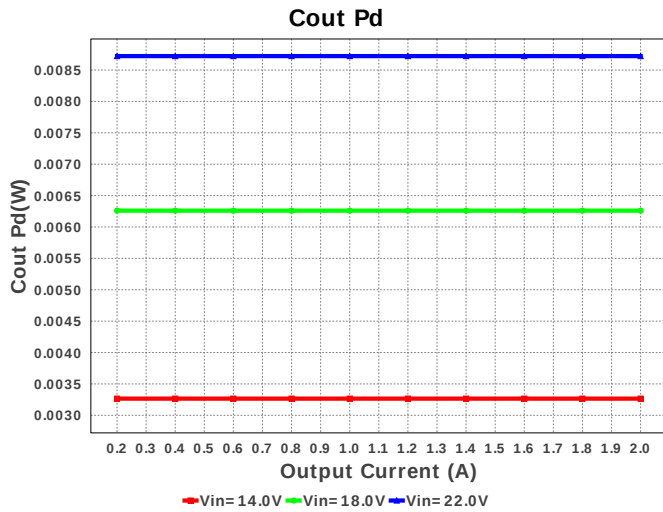
Electrical BOM

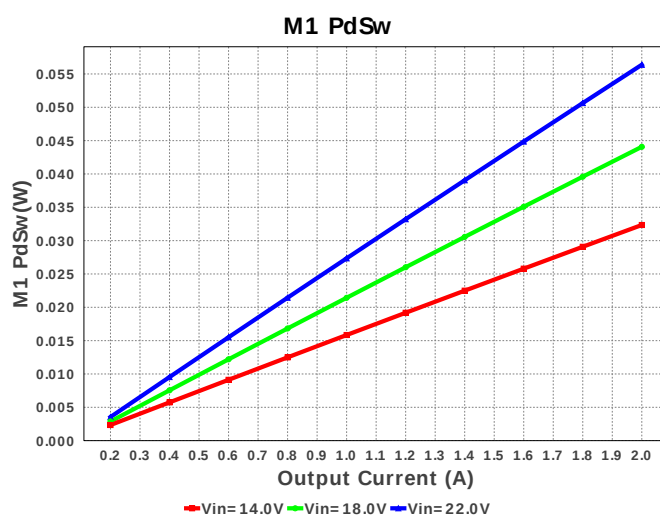
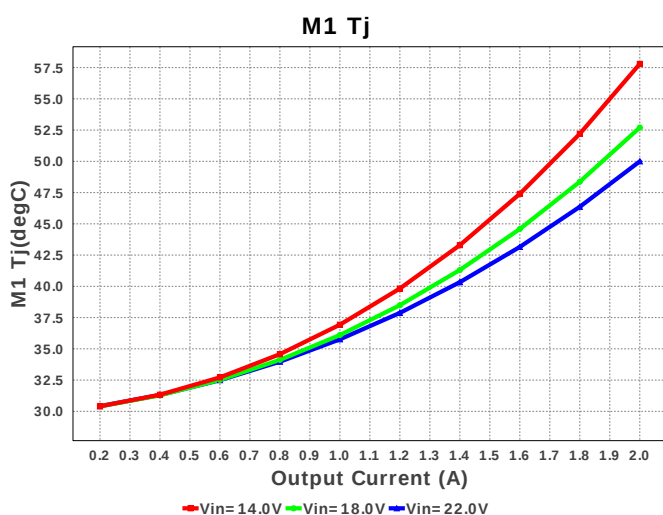
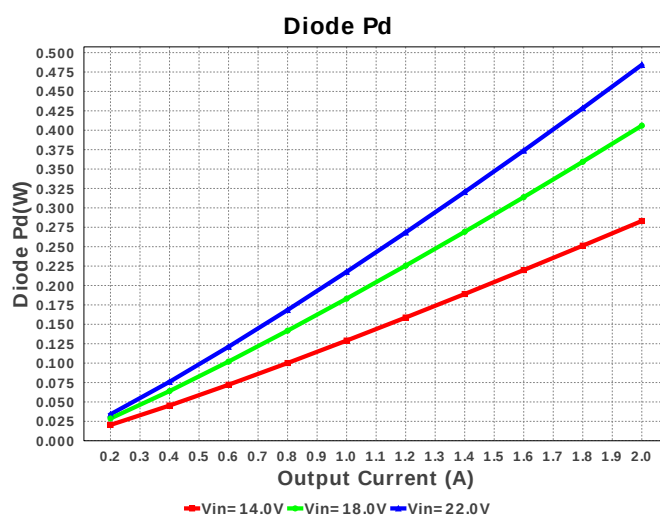
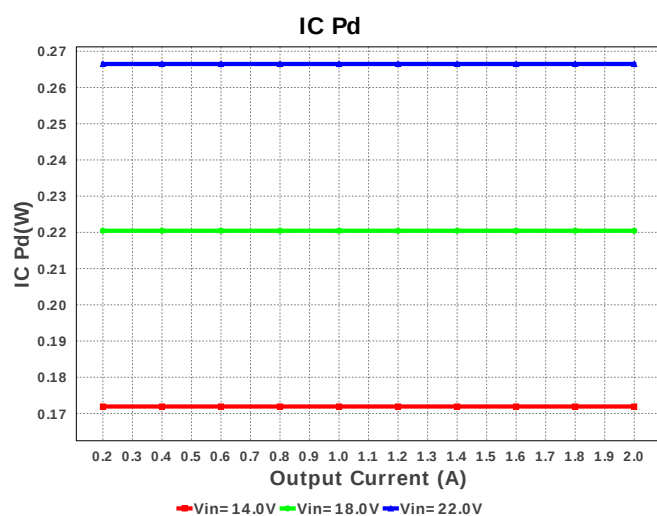
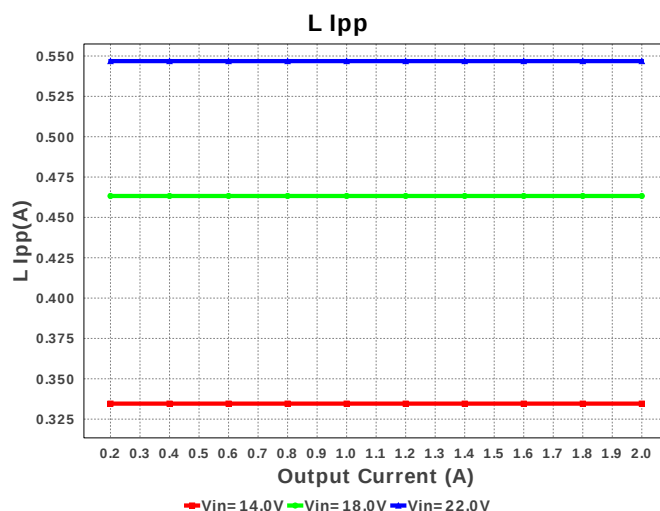
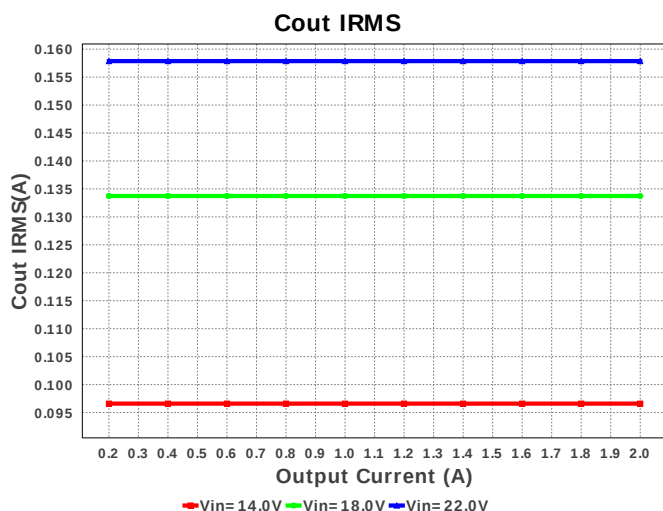
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
2.	Cff	MuRata	GRM1885C1H242JA01D Series= C0G/NP0	Cap= 2.4 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0603 5 mm ²
3.	Cin	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
4.	Cout	AVX	TPSB336K016R0350 Series= TPS	Cap= 33.0 uF ESR= 350.0 mOhm VDC= 16.0 V IRMS= 444.0 mA	1	\$0.33	 3528-21 17 mm ²
5.	Cvcc	AVX	0805YC474KAT2A Series= X7R	Cap= 470.0 nF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	 0805 7 mm ²
6.	D1	Diodes Inc.	B240A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.09	 SMA 37 mm ²
7.	L1	TDK	CLF10040T-150M	L= 15.0 uH DCR= 48.0 mOhm	1	\$0.46	 CLF10040 148 mm ²
8.	M1	Fairchild Semiconductor	FDC5614P	VdsMax= -60.0 V IdsMax= -3.0 Amps	1	\$0.23	 SOT-23-6 15 mm ²
9.	Radj	Vishay-Dale	CRCW04021K05FKED Series= CRCW.e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rfb1	Vishay-Dale	CRCW04021K62FKED Series= CRCW..e3	Res= 1.62 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
11.	Rfb2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
12.	Rsns	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	\$0.11	 1206 11 mm ²
13.	Rt	Vishay-Dale	CRCW040280K6FKED Series= CRCW..e3	Res= 80.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	U1	Texas Instruments	LM5085QMY/NOPB	Switcher	1	\$0.98	 MUY08A 24 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	988.153 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	157.862 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	877.87 mA	Current	Average input current
4.	L Ipp	546.85 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	2.273 A	Current	Peak switch current
6.	BOM Count	14	General	Total Design BOM count
7.	FootPrint	292.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	600.739 kHz	General	Switching frequency
9.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
10.	Pout	18.0 W	General	Total output power
11.	Total BOM	\$2.35	General	Total BOM Cost

#	Name	Value	Category	Description
12.	D1 Tj	42.106 degC	Op_Point	D1 junction temperature
13.	Vout Actual	8.966 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	42.326 %	Op_point	Duty cycle
16.	Efficiency	93.201 %	Op_point	Steady state efficiency
17.	IC Tj	42.259 degC	Op_point	IC junction temperature
18.	ICThetaJA	46.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	2.0 A	Op_point	Iout operating point
20.	M1 Tj	49.997 degC	Op_point	M1 MOSFET junction temperature
21.	VIN_OP	22.0 V	Op_point	Vin operating point
22.	Vout p-p	191.428 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	2.929 mW	Power	Input capacitor power dissipation
24.	Cout Pd	8.722 mW	Power	Output capacitor power dissipation
25.	Diode Pd	484.236 mW	Power	Diode power dissipation
26.	IC Pd	266.493 mW	Power	IC power dissipation
27.	L Pd	240.0 mW	Power	Inductor power dissipation
28.	M1 Pd	270.749 mW	Power	M1 MOSFET total power dissipation
29.	M1 PdCond	214.368 mW	Power	M1 MOSFET conduction losses
30.	M1 PdSw	56.381 mW	Power	M1 MOSFET switching losses
31.	Total Pd	1.313 W	Power	Total Power Dissipation
32.	Vout Tolerance	3.773 %		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	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	LM5085-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. For a Constant On Time device to be stable, we need to provide a ripple at the feedback comparator. There are various methods to implement the ripple. Depending on the circuit complexity vs. the allowable ripple, we have three options to choose from. The simplest option, 'Low Complexity', would require only a high ESR cap at the output. This means that the BOM count will be small, but the output voltage ripple will be quite large. The 'optimal solution' would require a feed-forward cap in parallel with the upper feedback resistor to AC couple the ripple to the feedback node. This increases the BOM count slightly, but now we have more control over the output voltage ripple. If the output voltage requirement is very tight, then the best option is to go for the 'Low Output Ripple' solution. In this option we can go with very low ESR output caps and have very good control over the output voltage ripple

2. Feature Highlights: Automotive Qualified 75V Wide Vin Constant On-Time PFET Buck Switching Controller

3. The LM5085-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

4. **LM5085-Q1 Product Folder** : <http://www.ti.com/product/LM5085%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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