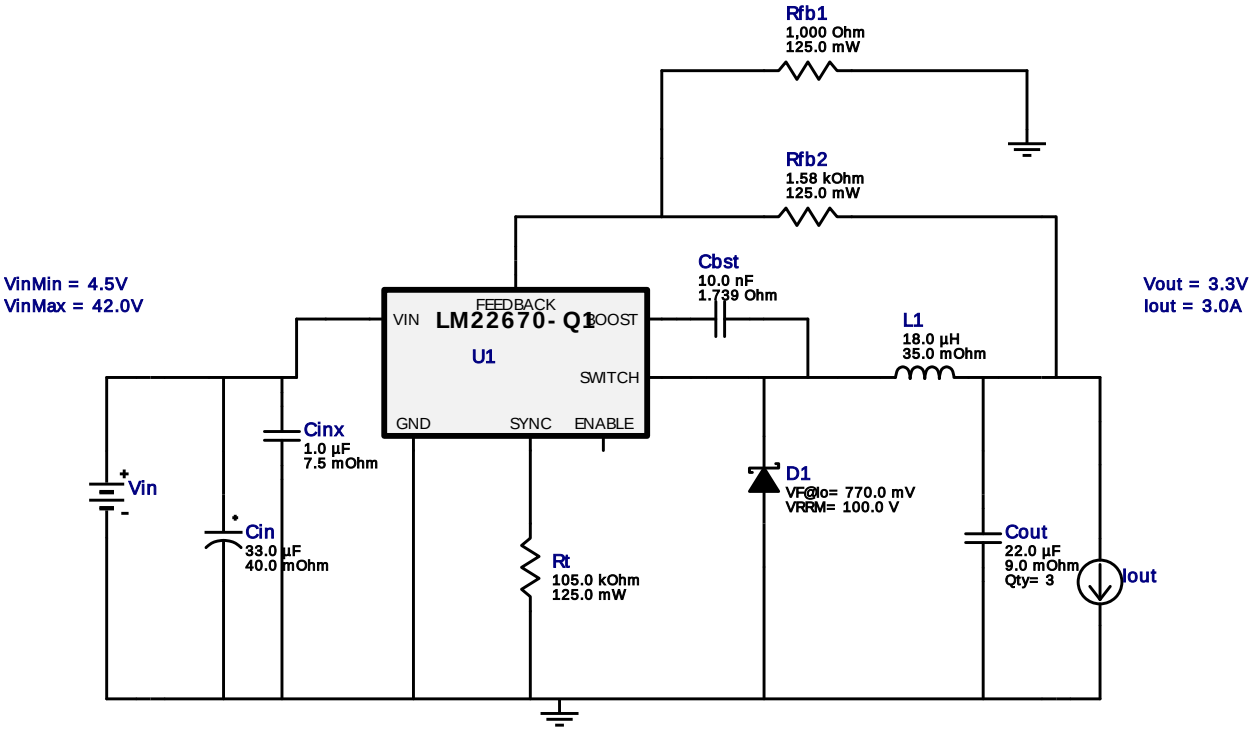
WEBENCH® Design Report

VinMin = 4.5V
VinMax = 42.0V
Vout = 3.3V
Iout = 3.0A

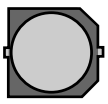
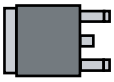
Device = LM22670QMRE-ADJ/NOPB
Topology = Buck
Created = 6/11/14 8:23:24 PM
BOM Cost = $4.29
Footprint = 668.0mm2
BOM Count = 12
Total Pd = 3.6W

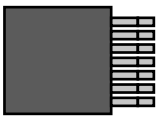
Design : 3986144/364 LM22670QMRE-ADJ/NOPB
LM22670QMRE-ADJ/NOPB 4.5V-42.0V to 3.3V @ 3.0A

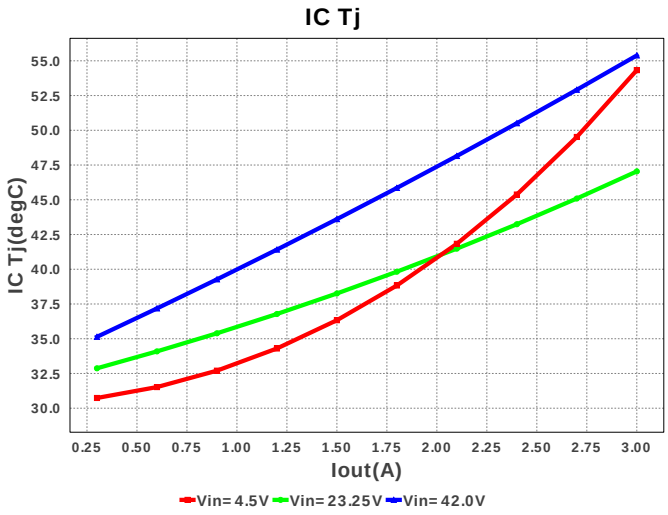


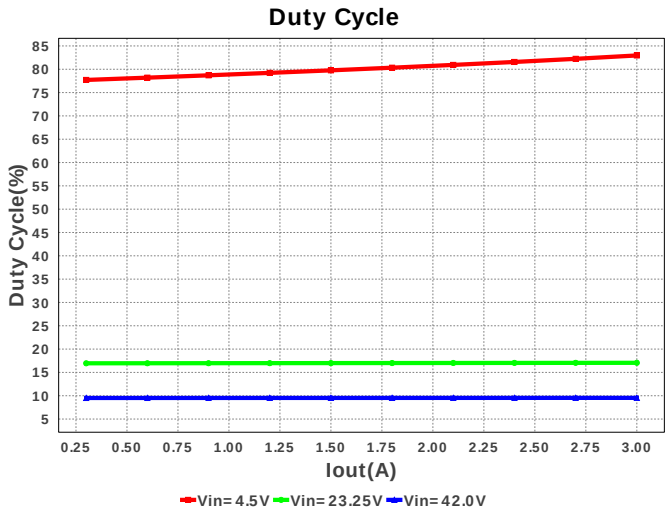
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

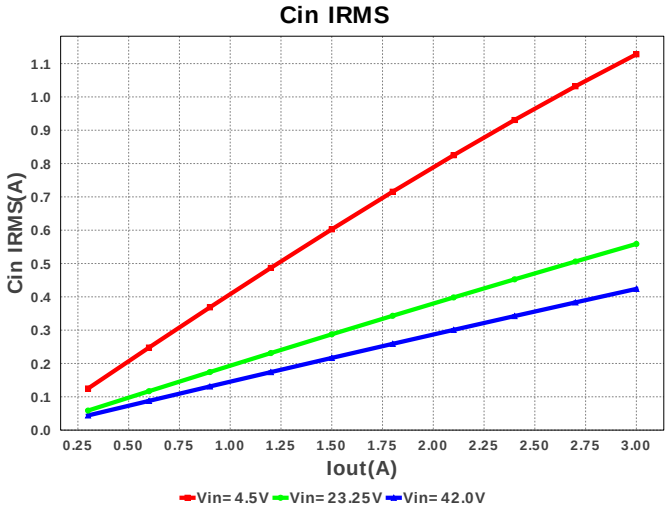
Electrical BOM

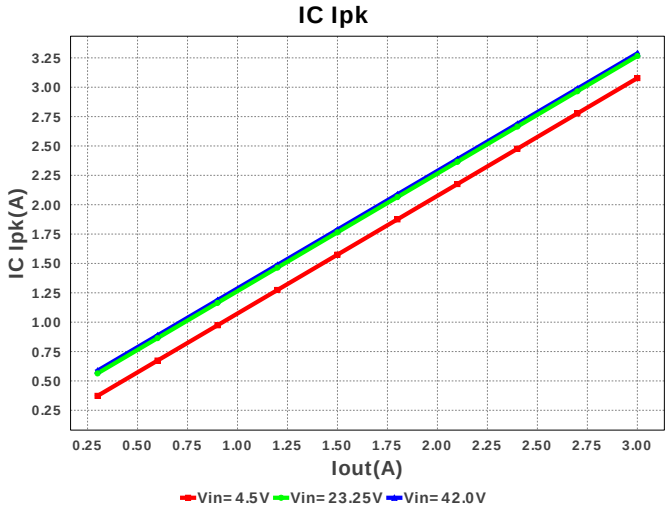
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	 0805 7mm2
2.	Cin	Panasonic	EEHZA1J330P Series= ?	Cap= 33.0 µF ESR= 40.0 mOhm VDC= 63.0 V IRMS= 1.7 A	1	$0.97	 SM_RADIAL_8MM 113mm2
3.	Cinx	TDK	C3216X7R2A105M160AA Series= X7R	Cap= 1.0 µF ESR= 7.5 mOhm VDC= 100.0 V IRMS= 5.923 A	1	$0.11	 1206 11mm2
4.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 µF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	3	$0.03	 0805 7mm2
5.	D1	Vishay-Semiconductor	50WQ10FNPBF	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.41	 DPAK 102mm2

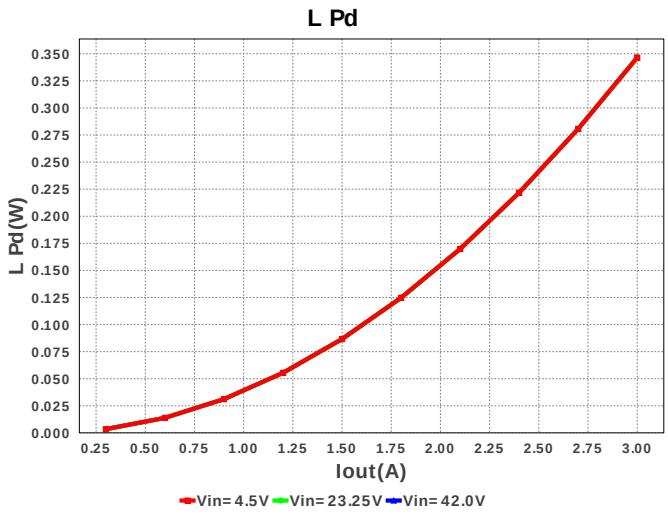
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	L1	Bourns	SRR1210-180M	L= 18.0 µH DCR= 35.0 mOhm	1	$0.44	 SRR1210 196mm2
7.	Rfb1	Panasonic	ERJ-6ENF1001V Series= 225	Res= 1,000 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7mm2
8.	Rfb2	Panasonic	ERJ-6ENF1581V Series= 225	Res= 1.58 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7mm2
9.	Rt	Panasonic	ERJ-6ENF1053V Series= 225	Res= 105.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7mm2
10.	U1	Texas Instruments	LM22670QMRE-ADJ/ NOPB	Switcher	1	$2.24	 TJ7A 199mm2

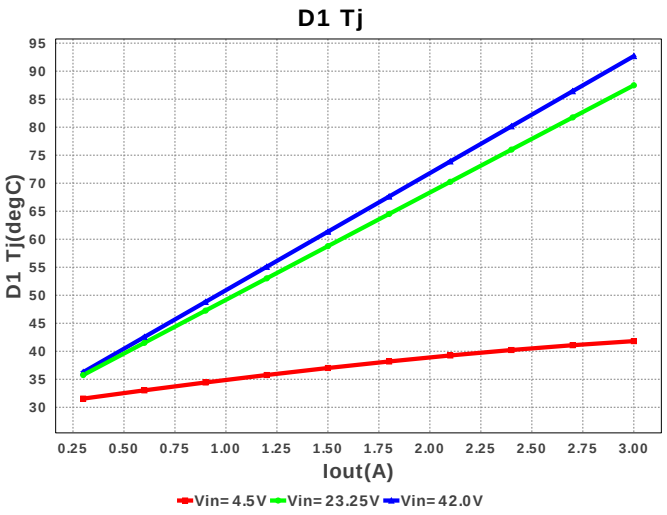


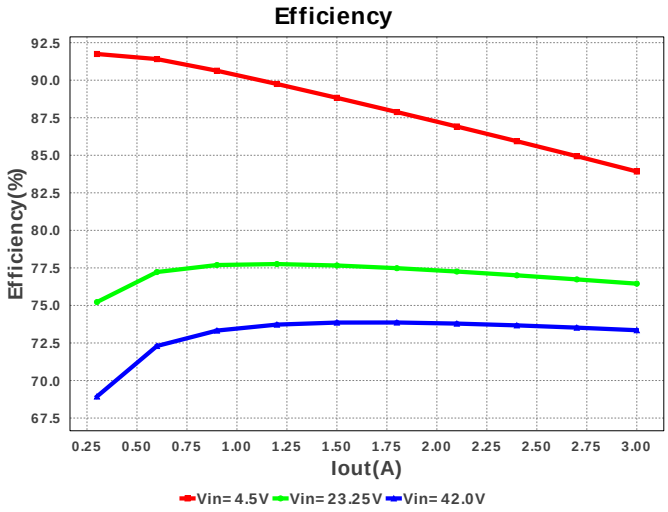


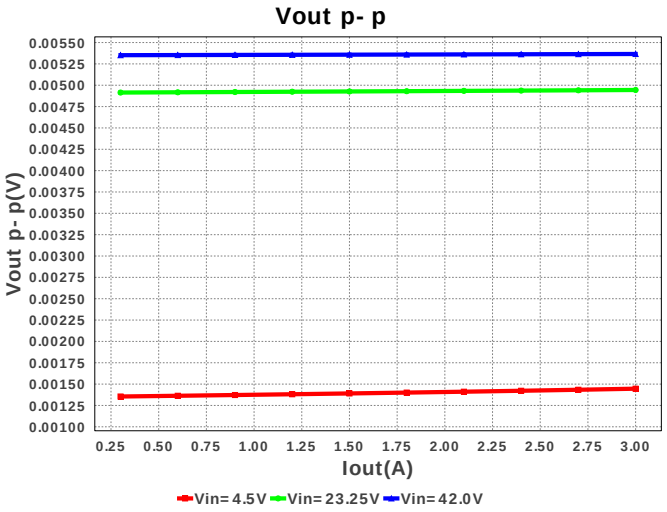


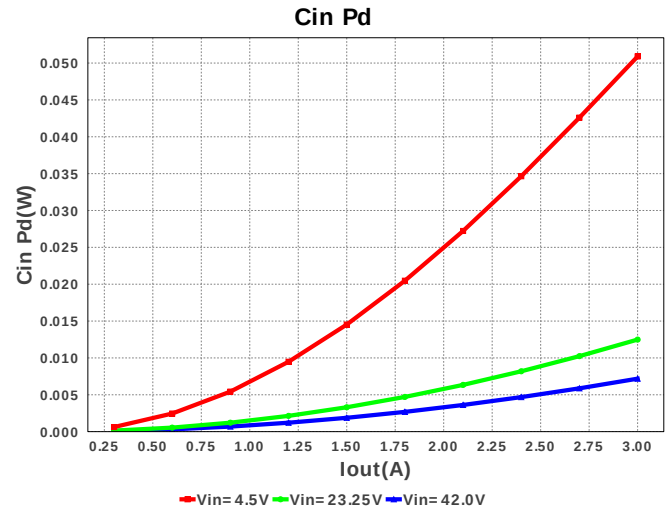


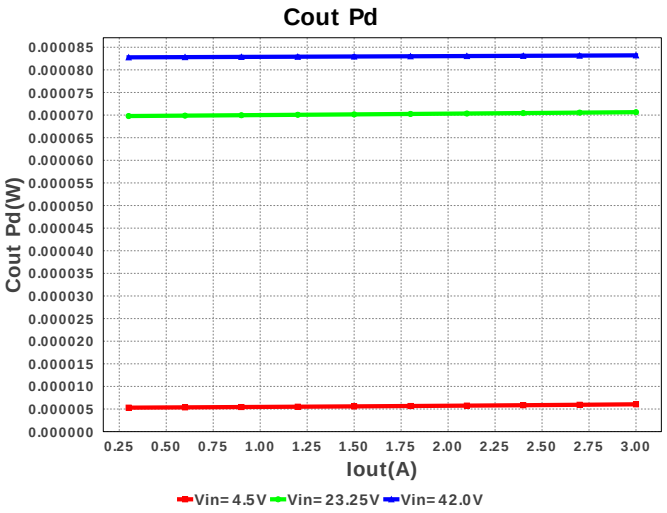


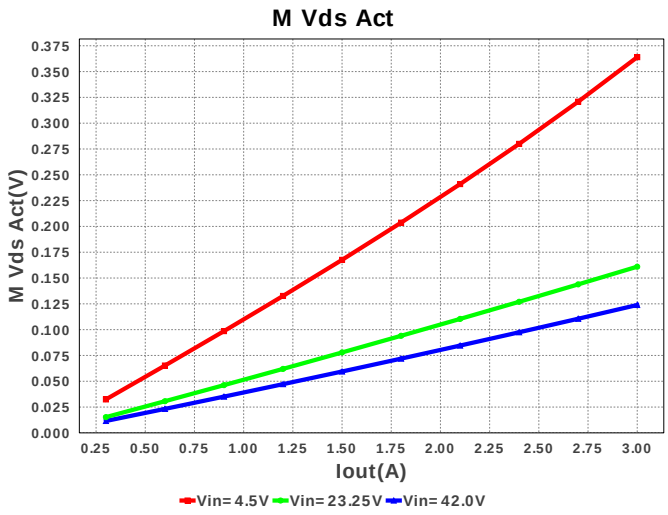


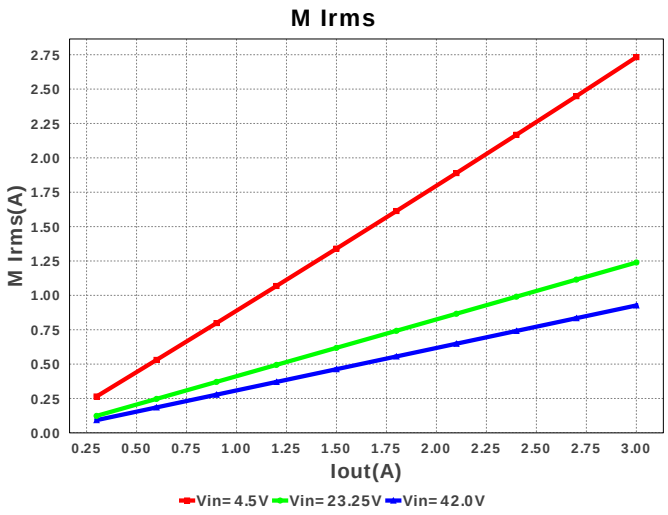


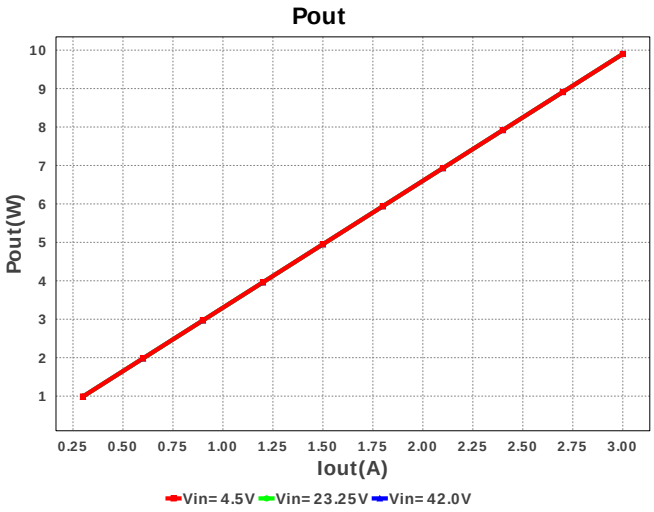


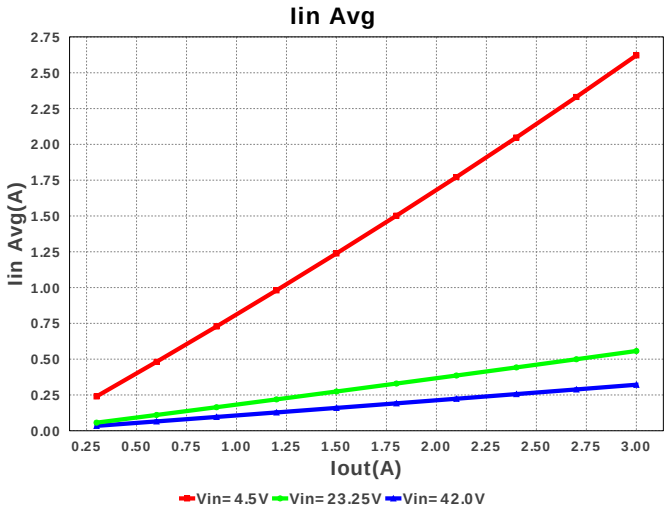


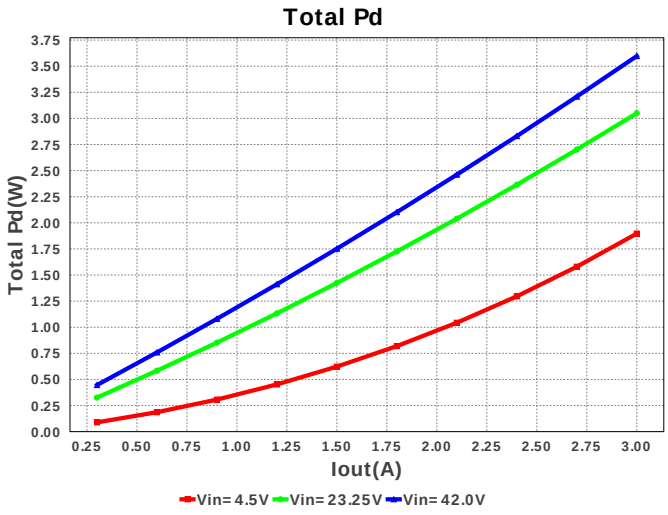


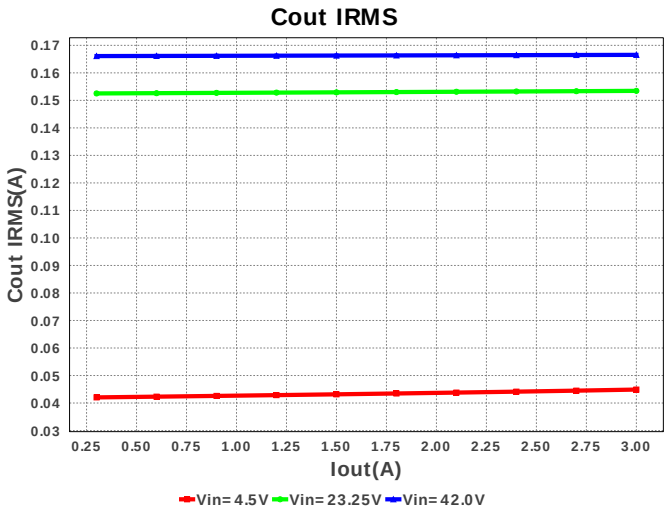


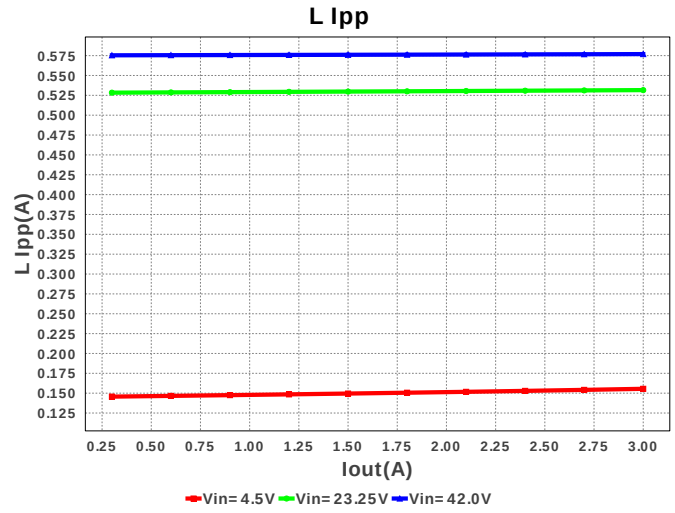


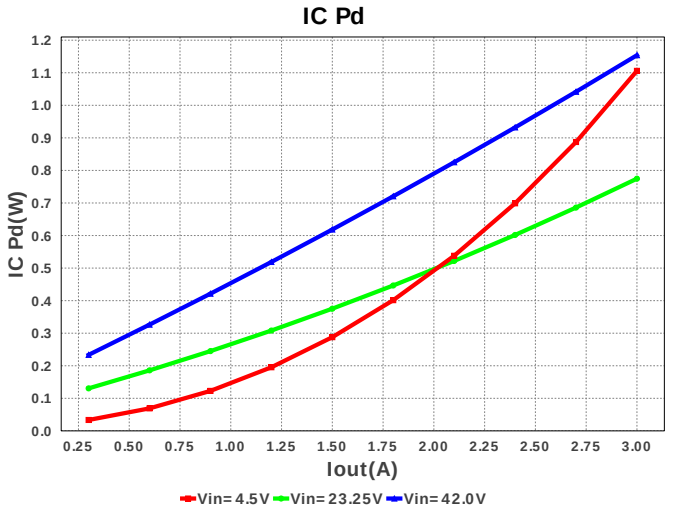


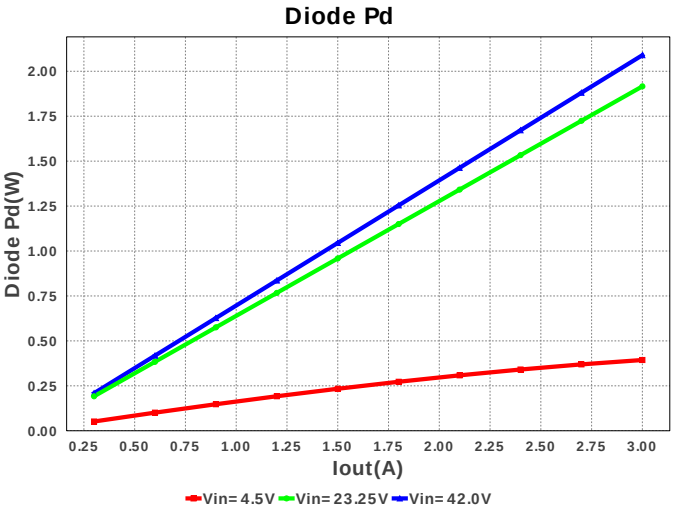


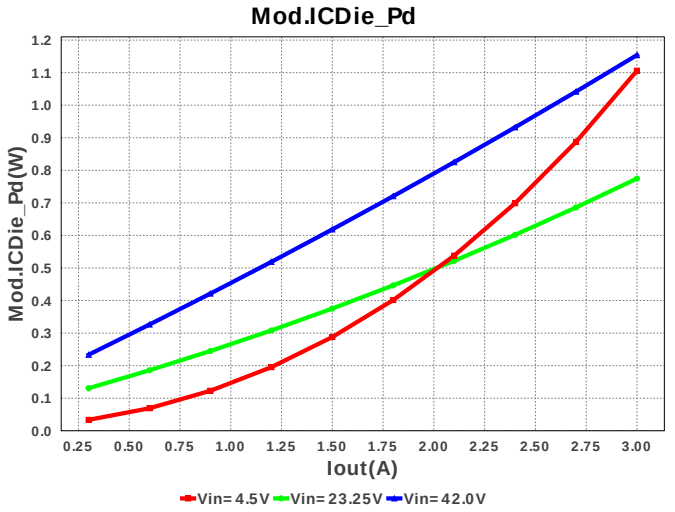












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	423.807 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	166.541 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	3.288 A	Current	Peak switch current in IC
4.	Iin Avg	321.36 mA	Current	Average input current
5.	L Ipp	576.917 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	926.784 mA	Current	Q Iavg
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	668.0 mm2	General	Total Foot Print Area of BOM components
9.	Frequency	355.664 kHz	General	Switching frequency
10.	IC Tolerance	19.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	123.887 mV	General	Voltage drop across the MosFET
12.	Pout	9.9 W	General	Total output power
13.	Total BOM	$4.29	General	Total BOM Cost
14.	D1 Tj	92.686 degC	Op_Point	D1 junction temperature
15.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
16.	Cross Freq	43.835 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	9.544 %	Op_point	Duty cycle
18.	Efficiency	73.349 %	Op_point	Steady state efficiency
19.	IC Tj	55.386 degC	Op_point	IC junction temperature
20.	ICThetaJA	22.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	3.0 A	Op_point	Iout operating point
22.	Phase Marg	50.51 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	42.0 V	Op_point	Vin operating point
24.	Vout p-p	5.366 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	7.184 mW	Power	Input capacitor power dissipation
26.	Cout Pd	83.208 µW	Power	Output capacitor power dissipation
27.	Diode Pd	2.09 W	Power	Diode power dissipation
28.	IC Pd	1.154 W	Power	IC power dissipation
29.	L Pd	346.5 mW	Power	Inductor power dissipation
30.	Total Pd	3.597 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	3.0 A	Maximum Output Current
2.	Iout1	3.0 Amps	Output Current #1
3.	VinMax	42.0 V	Maximum input voltage
4.	VinMin	4.5 V	Minimum input voltage
5.	Vout	3.3 V	Output Voltage
6.	Vout1	3.3 Volt	Output Voltage #1
7.	base_pn	LM22670-Q1	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature
10.	UserFsw	359.259 kHz	Customer Selected Frequency

Design Assistance

1. Feature Highlights: Automotive Qualified 4.5V to 18V Vin, 3A Synchronous DCAP2 Mode Buck Converter

2. The LM22670-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

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4. **LM22670-Q1** Product Folder : http://www.ti.com/product/lm22670-q1 : contains the data sheet and other resources.