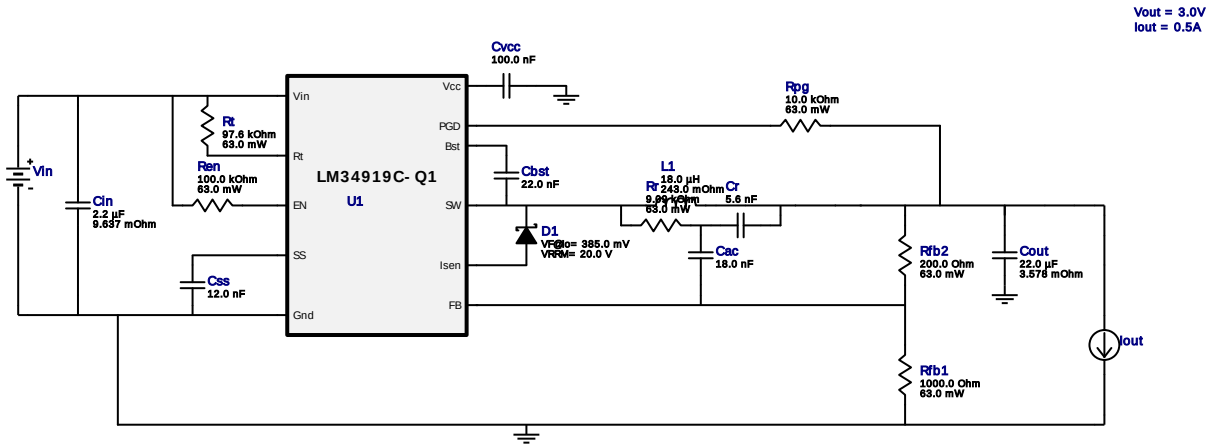
WEBENCH® Design Report

VinMin = 4.5V
VinMax = 5.5V
Vout = 3.0V
Iout = 0.5A

Device = LM34919CQTLX/NOPB
Topology = Buck
Created = 7/19/16 6:03:44 AM
BOM Cost = $1.86
BOM Count = 16
Total Pd = 0.26W

Design : 4742013/179 LM34919CQTLX/NOPB
LM34919CQTL/NOPB 4.5V-5.5V to 3.00V @ 0.5A

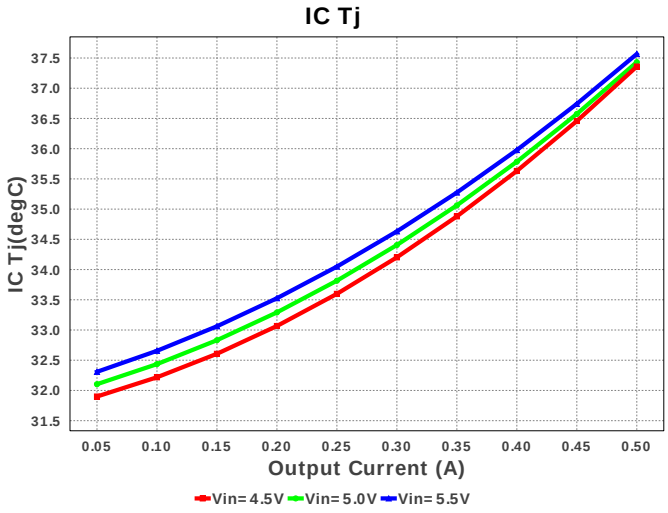


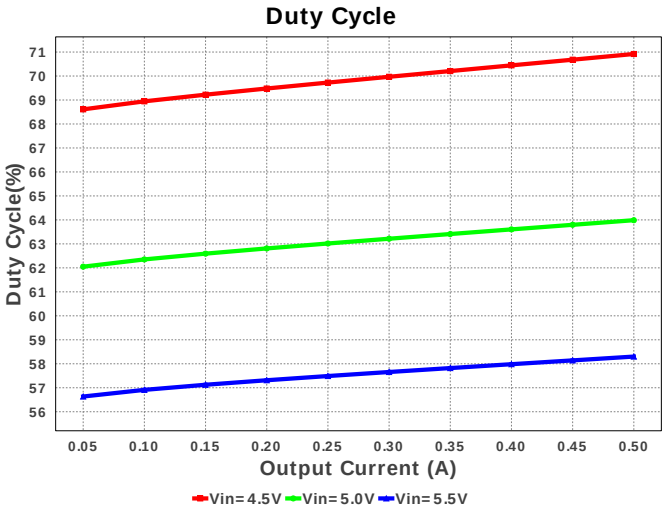
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

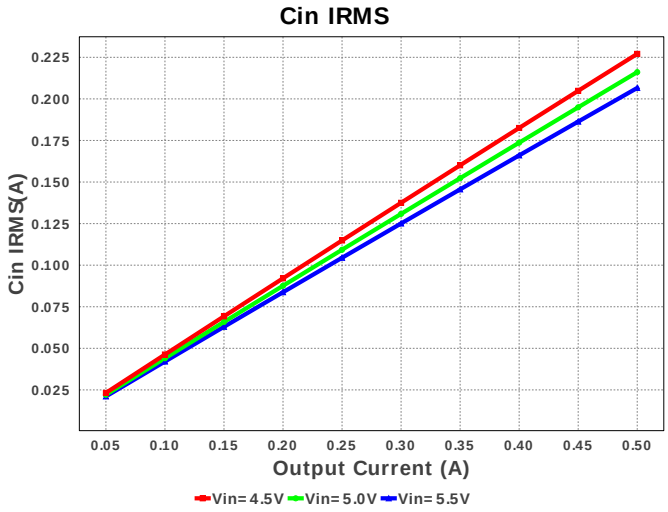
Electrical BOM

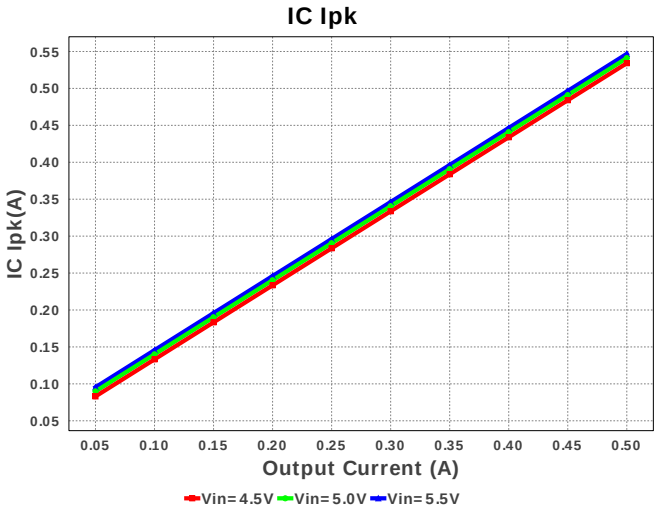
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cac	MuRata	GRM033C80G183KE01D Series= X6S	Cap= 18.0 nF VDC= 4.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
2.	Cbst	Yageo America	CC0805KRX7R9BB223 Series= X7R	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Cin	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 10.0 V IRMS= 1.24283 A	1	$0.02	0603 5 mm²
4.	Cout	MuRata	GRM21BC80G226ME39L Series= X6S	Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A	1	$0.04	0805 7 mm²
5.	Cr	AVX	06035A561GAT2A Series= C0G/NP0	Cap= 5.6 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.09	0603 5 mm²
6.	Css	MuRata	GRM033C80J123KE01D Series= X6S	Cap= 12.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
7.	Cvcc	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
8.	D1	ON Semiconductor	MBR0520LT1G	VF@Io= 385.0 mV VRRM= 20.0 V	1	$0.06	SOD-123 13 mm²
9.	L1	Coilcraft	LPS4018-183MRB	L= 18.0 µH DCR= 243.0 mOhm	1	$0.35	LPS4018 24 mm²
10.	Ren	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

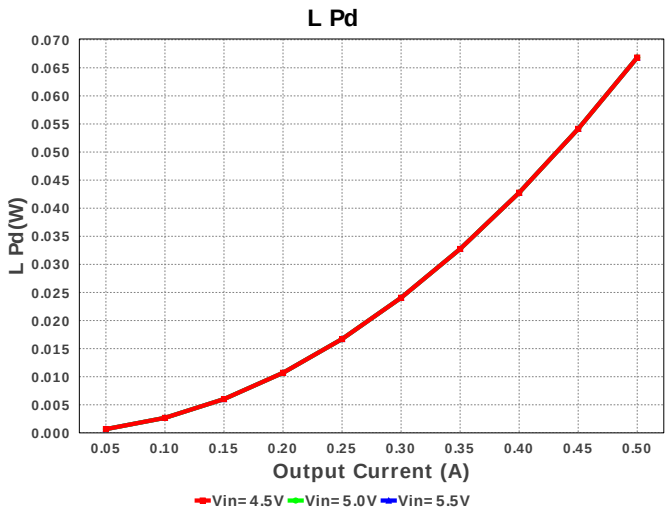
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	Rfb2	Vishay-Dale	CRCW0402200RFKED Series= CRCW..e3	Res= 200.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Rpg	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rr	Vishay-Dale	CRCW04029K09FKED Series= CRCW..e3	Res= 9.09 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
15.	Rt	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
16.	U1	Texas Instruments	LM34919CQTLX/NOPB	Switcher	1	$1.20	TLA12LDA 9 mm^2

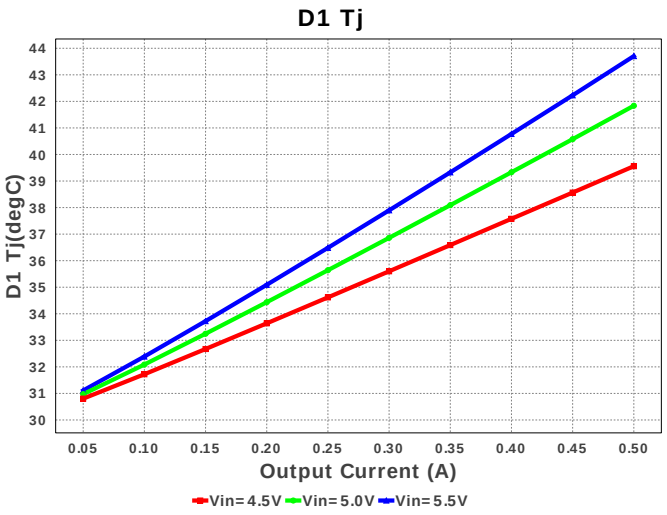


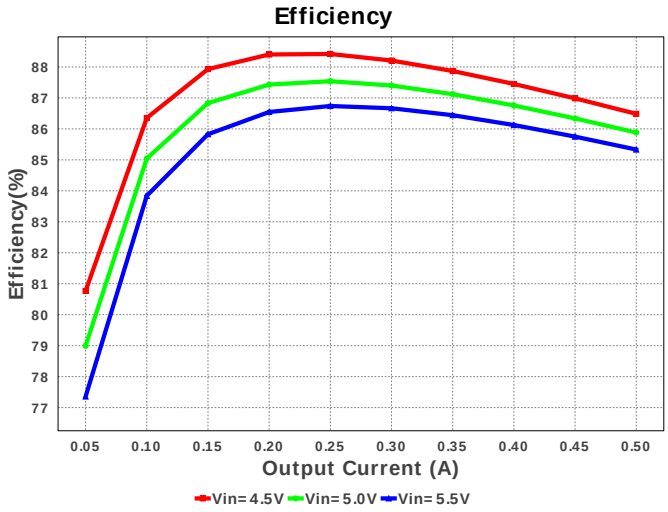


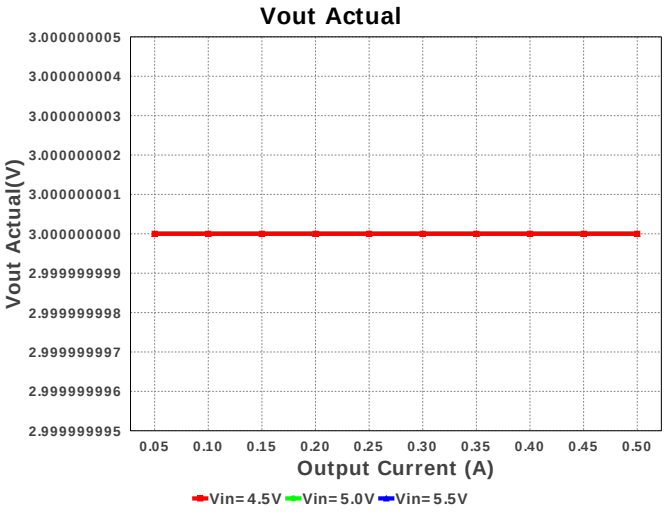


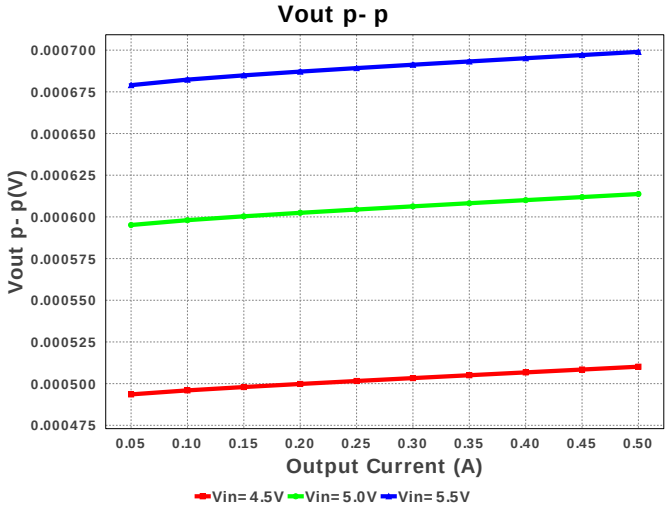


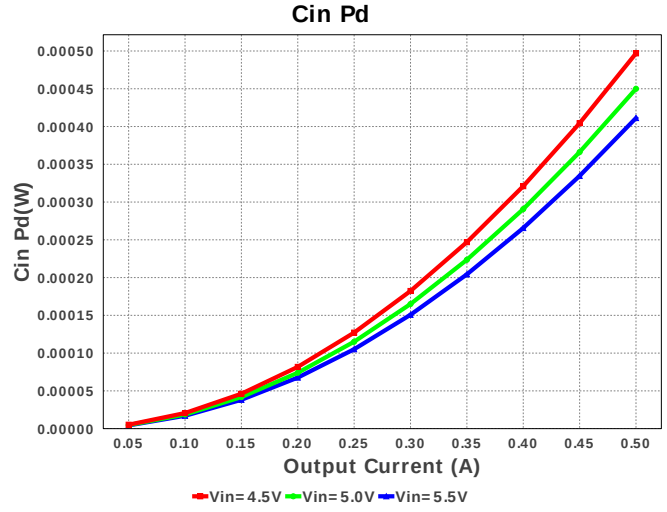


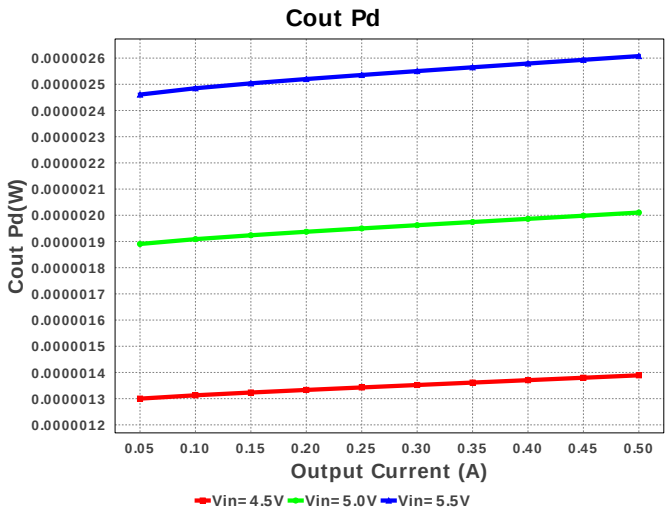


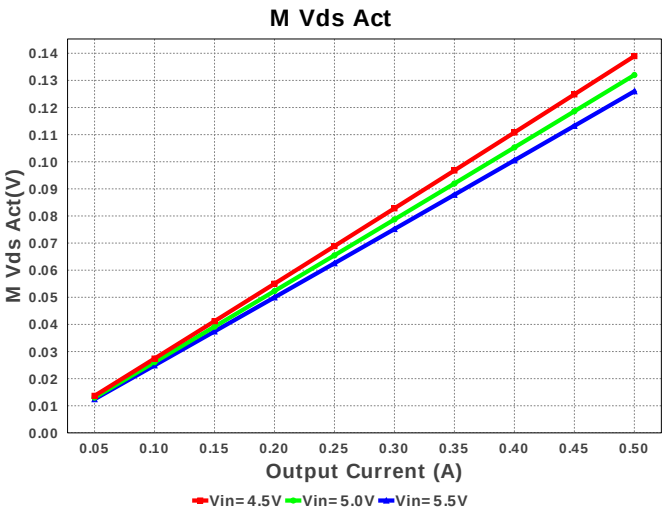


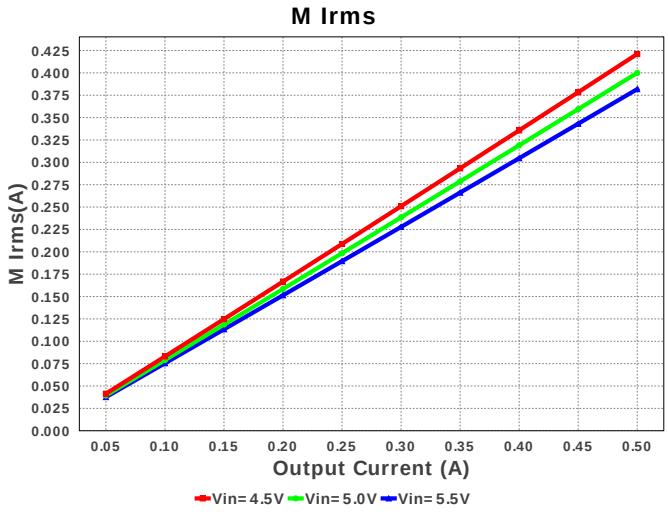


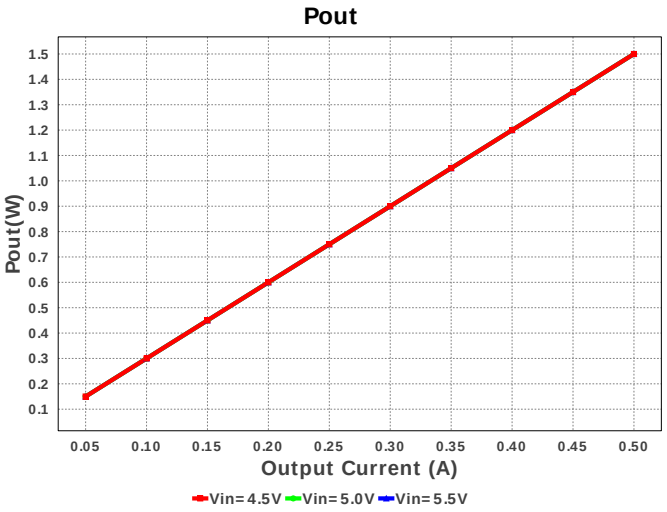


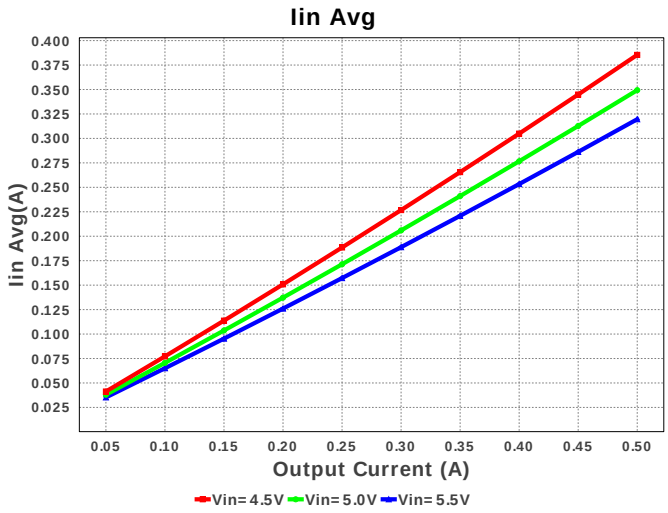


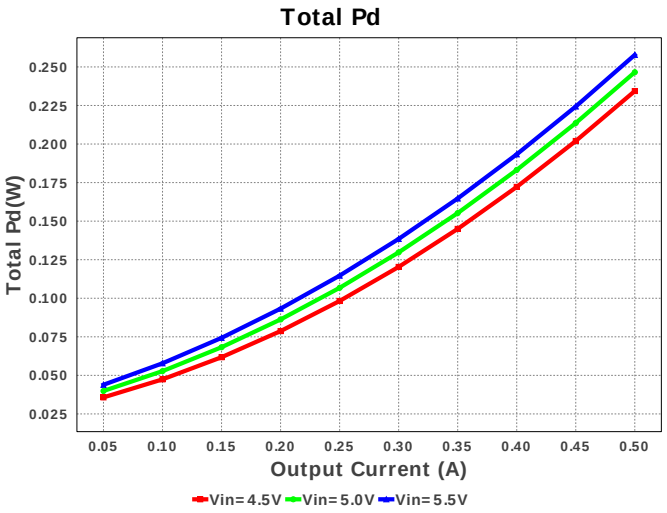


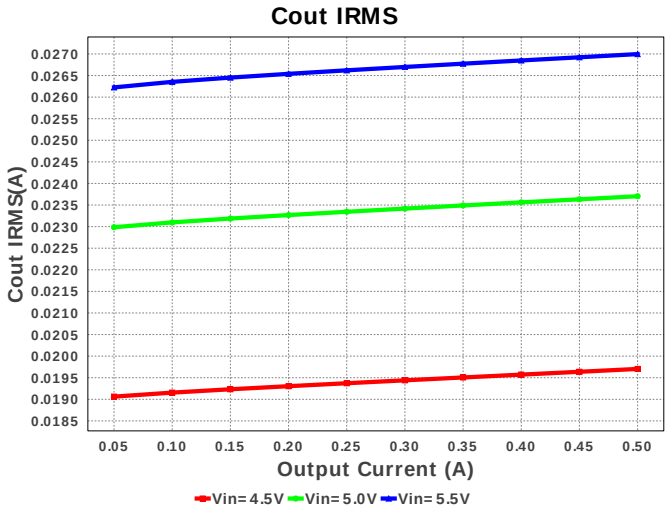


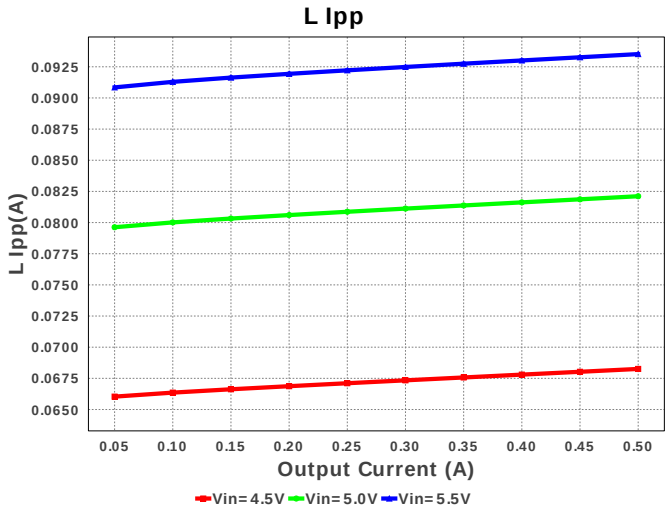


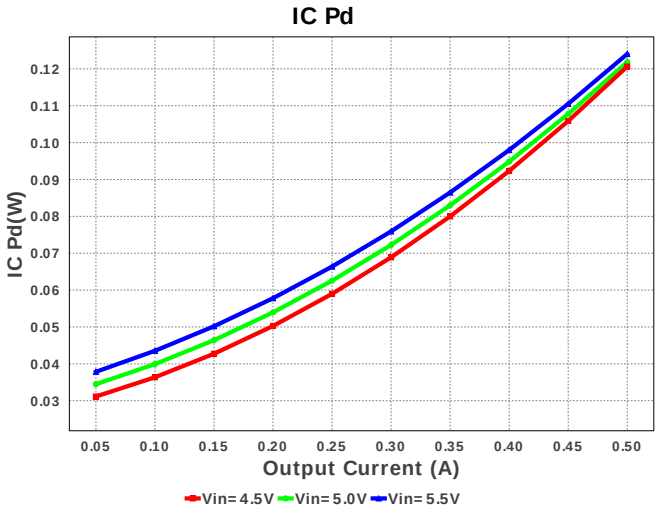


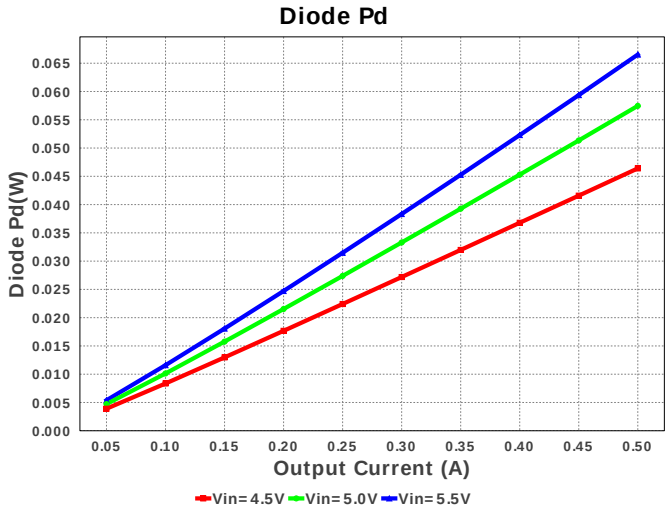












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	206.571 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	26.996 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	546.759 mA	Current	Peak switch current in IC
4.	Iin Avg	319.6 mA	Current	Average input current
5.	L Ipp	93.518 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	381.773 mA	Current	Q Iavg
7.	BOM Count	16	General	Total Design BOM count
8.	FootPrint	98.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	865.851 kHz	General	Switching frequency
10.	IC Tolerance	50.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	125.985 mV	General	Voltage drop across the MosFET
12.	Pout	1.5 W	General	Total output power
13.	Total BOM	$1.86	General	Total BOM Cost
14.	D1 Tj	43.705 degC	Op_Point	D1 junction temperature
15.	Vout Actual	3.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	3.0 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	58.3 %	Op_point	Duty cycle
18.	Efficiency	85.333 %	Op_point	Steady state efficiency
19.	IC Tj	37.566 degC	Op_point	IC junction temperature
20.	ICThetaJA	61.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	500.0 mA	Op_point	Iout operating point
22.	VIN_OP	5.5 V	Op_point	Vin operating point
23.	Vout p-p	698.97 µV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	411.228 µW	Power	Input capacitor power dissipation
25.	Cout Pd	2.608 µW	Power	Output capacitor power dissipation
26.	Diode Pd	66.531 mW	Power	Diode power dissipation
27.	IC Pd	124.04 mW	Power	IC power dissipation
28.	L Pd	66.825 mW	Power	Inductor power dissipation
29.	Total Pd	257.817 mW	Power	Total Power Dissipation
30.	Vout Tolerance	2.343 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	VinMax	5.5	Maximum input voltage
3.	VinMin	4.5	Minimum input voltage
4.	Vout	3.0	Output Voltage
5.	base_pn	LM34919C-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 capat 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 parallelwith 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 theoutput 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 controlover the output voltage ripple

2. Feature Highlights: Automotive Qualified 12V to 14V Vin, 600mA Constant On-Time Buck Regulator.

3. The LM34919C-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. **LM34919C-Q1** Product Folder : http://www.ti.com/product/LM34919C%2DQ1 : contains the data sheet and other resources.