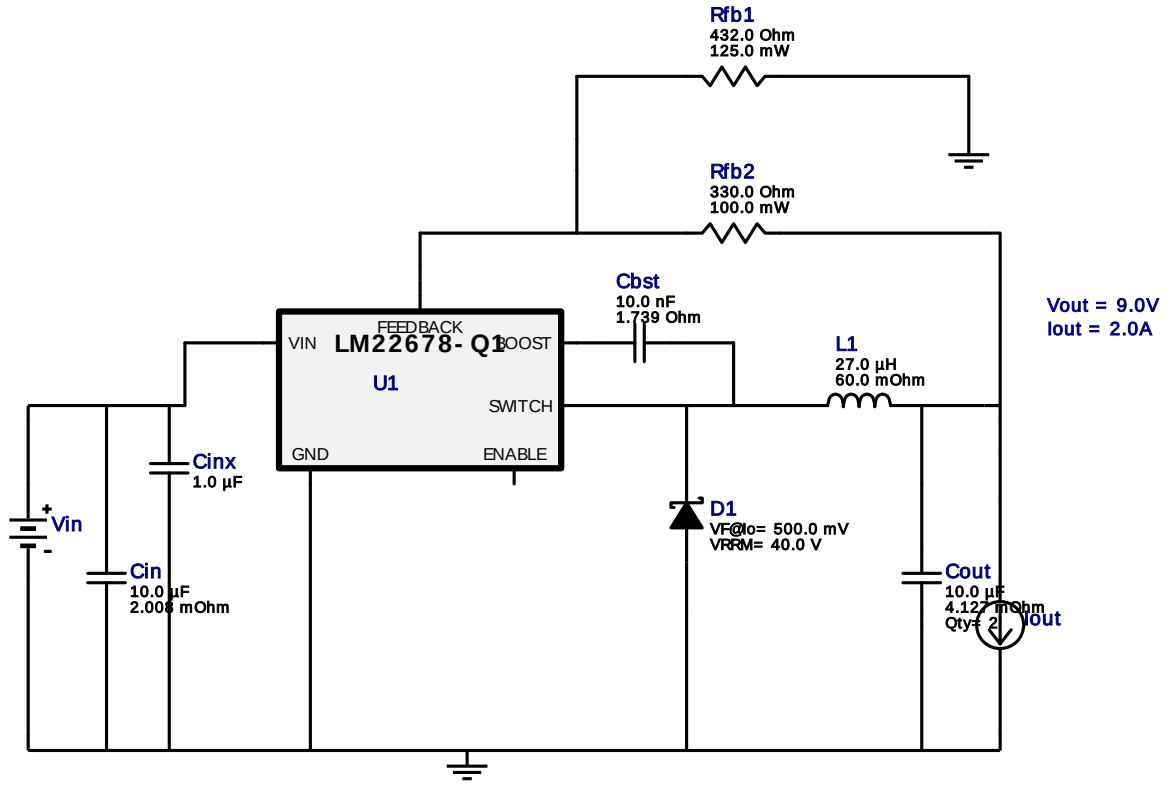
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 25.0V
Vout = 9.0V
Iout = 2.0A

Device = LM22678QTJ-5.0/NOPB
Topology = Buck
Created = 7/15/16 6:47:09 PM
BOM Cost = $3.45
BOM Count = 10
Total Pd = 1.54W

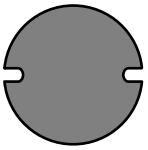
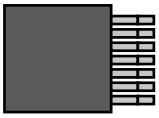
Design : 4742013/23 LM22678QTJ-5.0/NOPB
LM22678QTJ-5.0/NOPB 14.0V-25.0V to 9.00V @ 2.0A

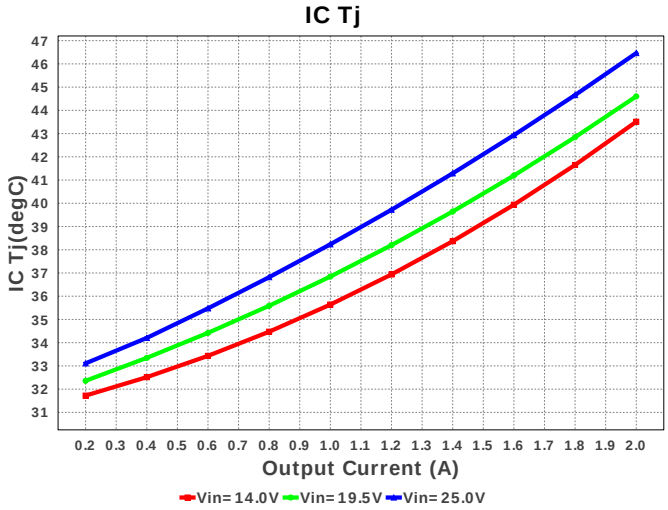


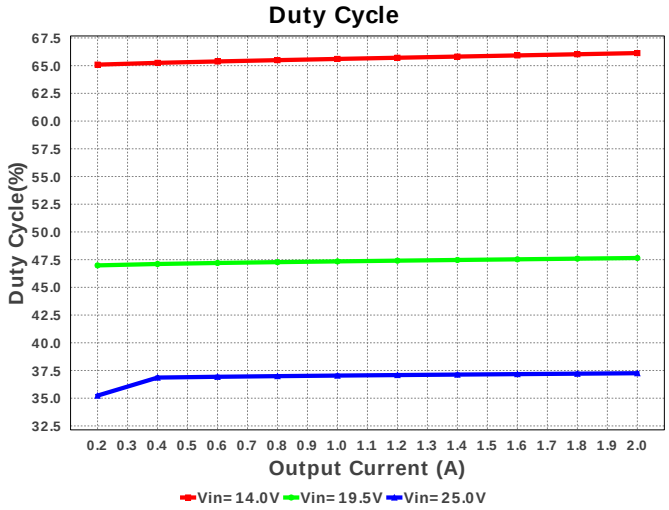
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

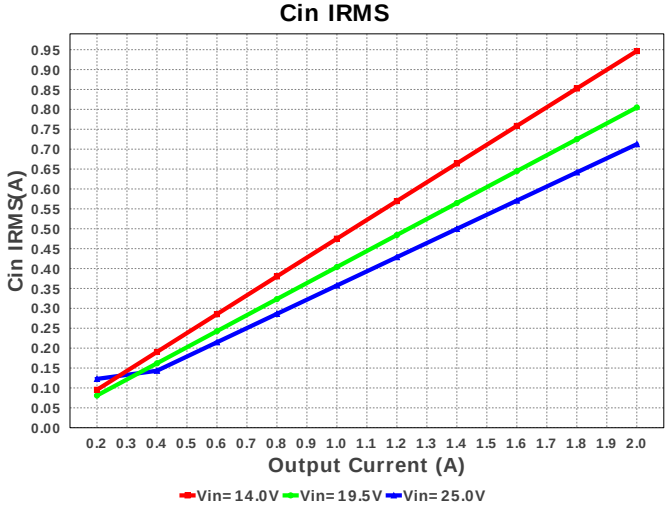
Electrical BOM

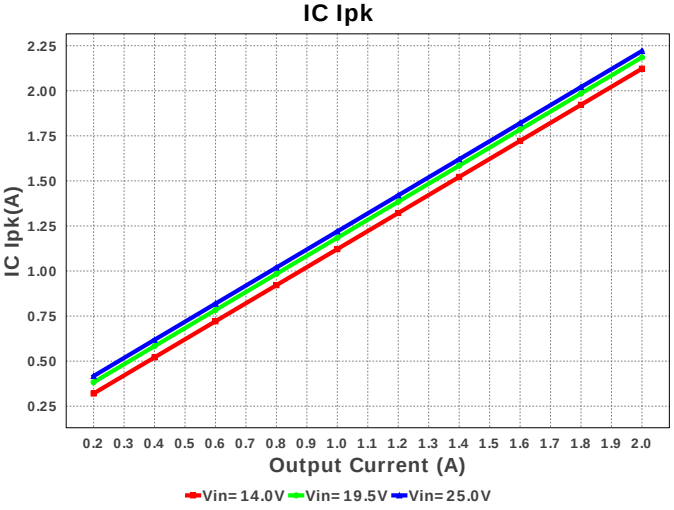
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM32ER7YA106KA12L Series= X7R	Cap= 10.0 uF ESR= 2.008 mOhm VDC= 35.0 V IRMS= 4.6772 A	1	$0.22	1210_280 15 mm²
3.	Cinx	Taiyo Yuden	GMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 35.0 V IRMS= 0.0 A	1	$0.05	0805 7 mm²
4.	Cout	MuRata	GRM21BR61C106KE15L Series= X5R	Cap= 10.0 uF ESR= 4.127 mOhm VDC= 16.0 V IRMS= 2.46634 A	2	$0.03	0805 7 mm²
5.	D1	Diodes Inc.	B240A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.09	SMA 37 mm²

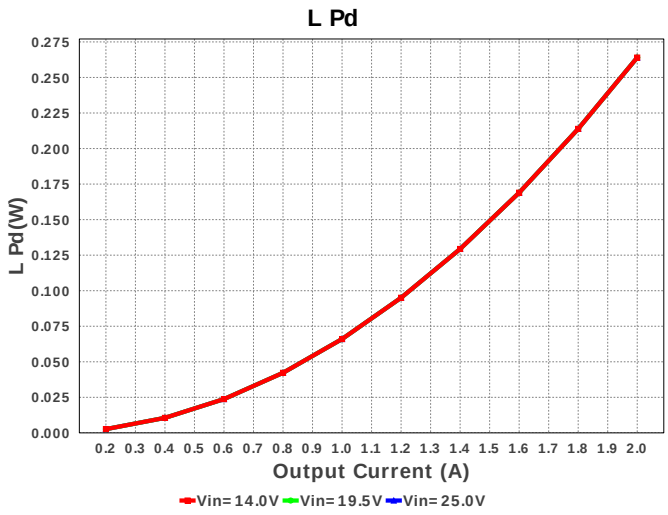
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	L1	Bourns	SDR1307-270ML	L= 27.0 µH DCR= 60.0 mOhm	1	$0.35	 SDR1307 227 mm^2
7.	Rfb1	Vishay-Dale	CRCW0805432RFKEA Series= CRCW..e3	Res= 432.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
8.	Rfb2	Yageo America	RC0603FR-07330RL Series= ?	Res= 330.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm^2
9.	U1	Texas Instruments	LM22678QTJ-5.0/NOPB	Switcher	1	$2.65	 TJ7A 199 mm^2

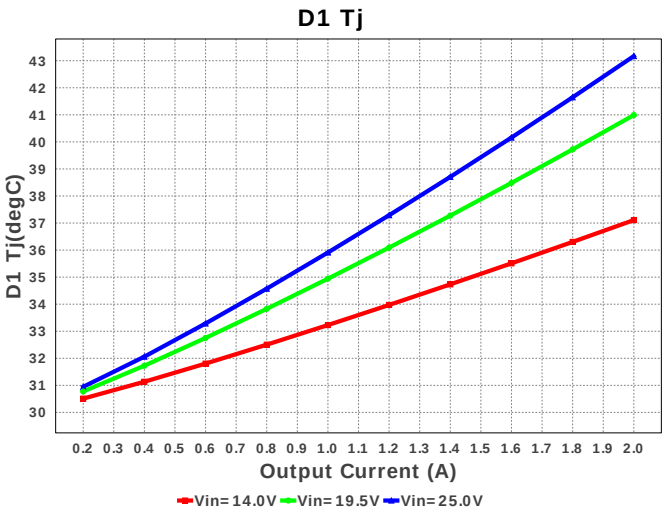


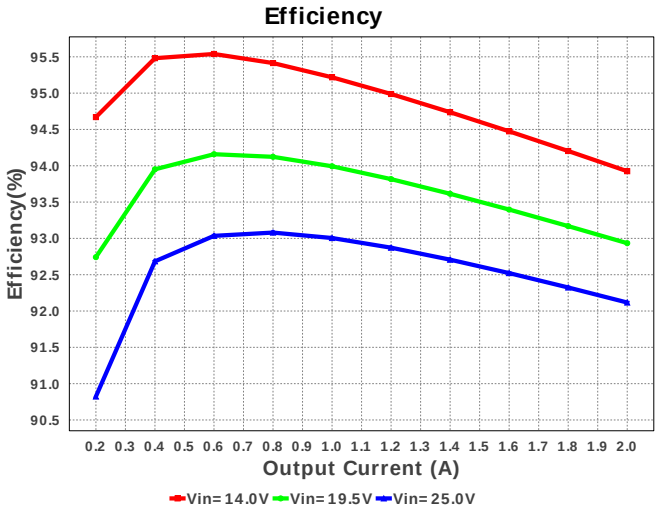


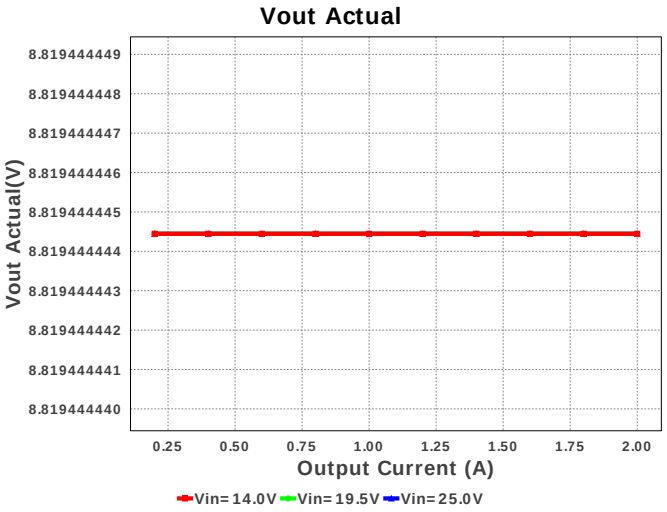


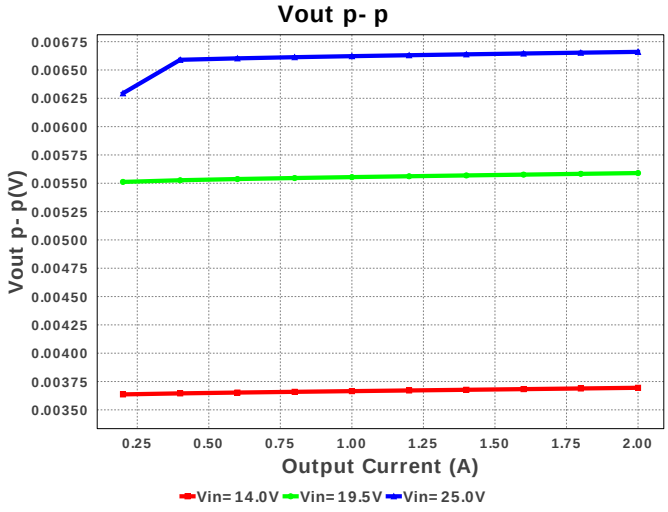


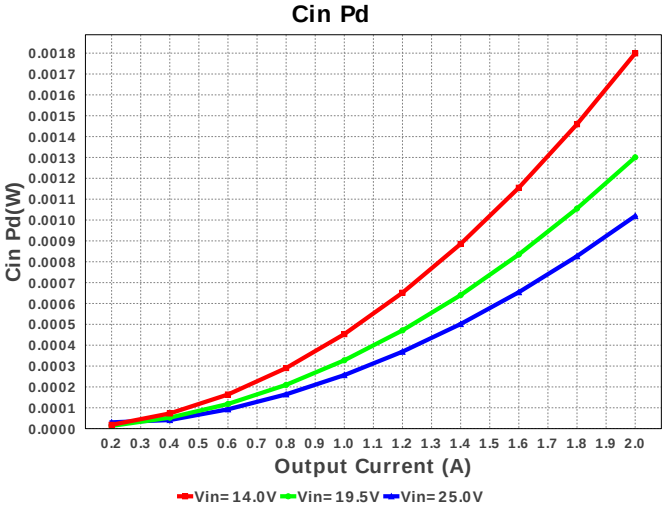


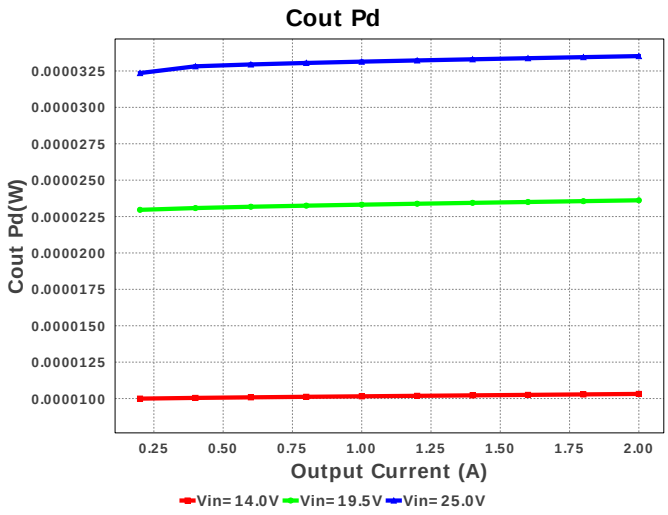


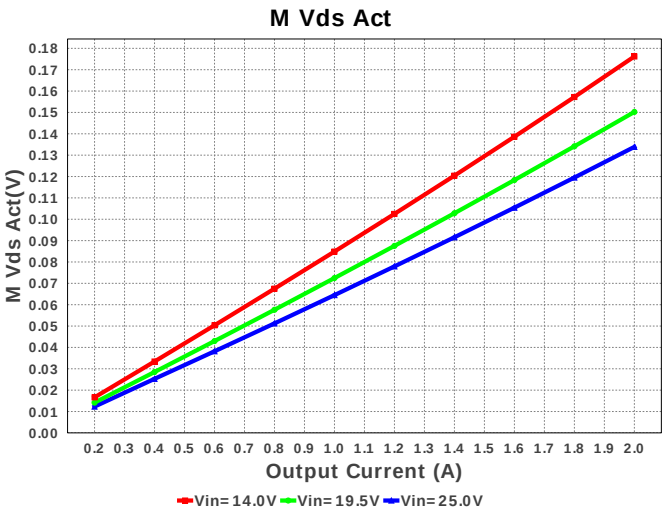


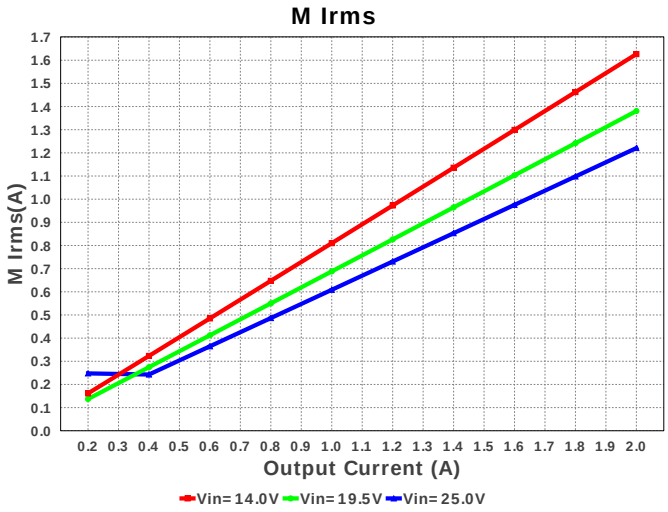


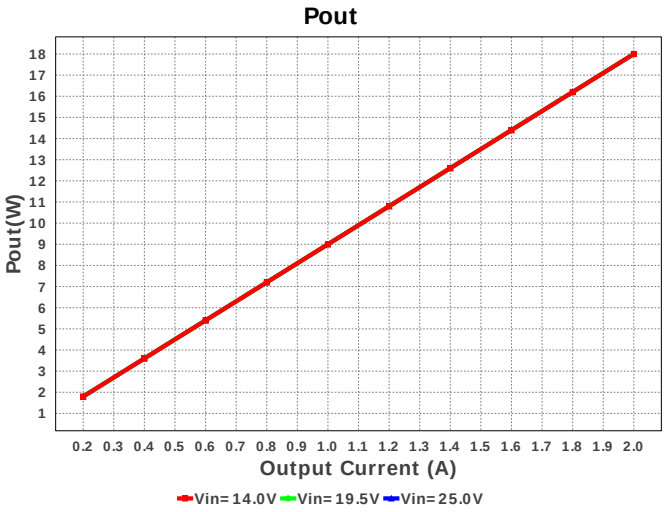


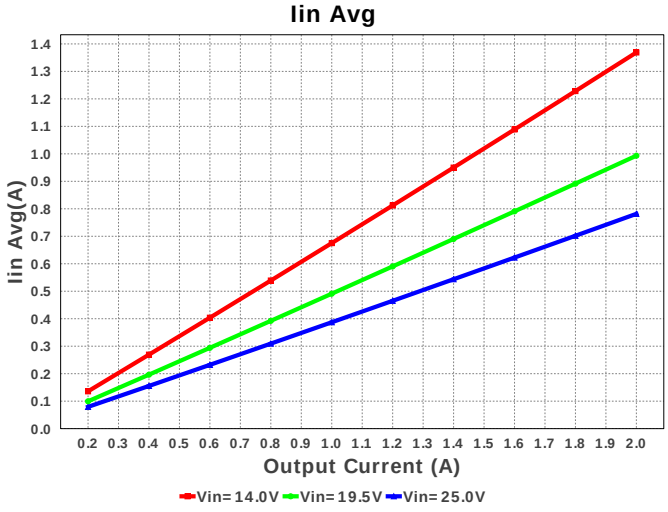


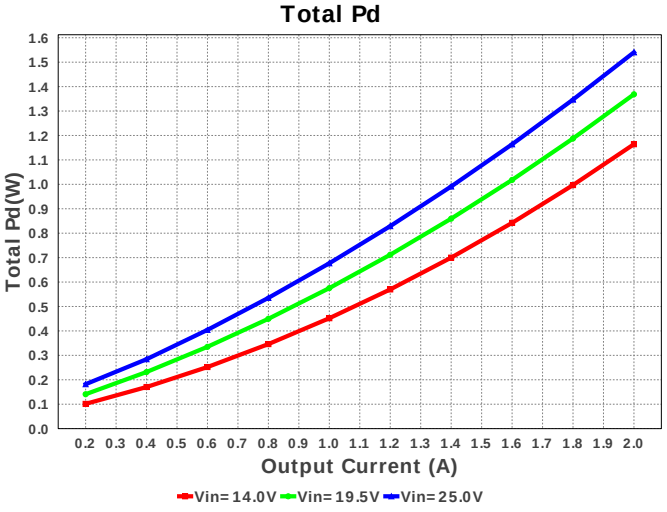


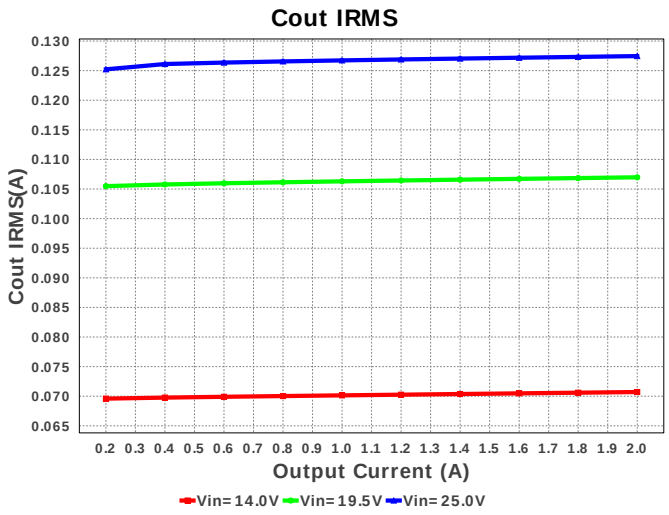


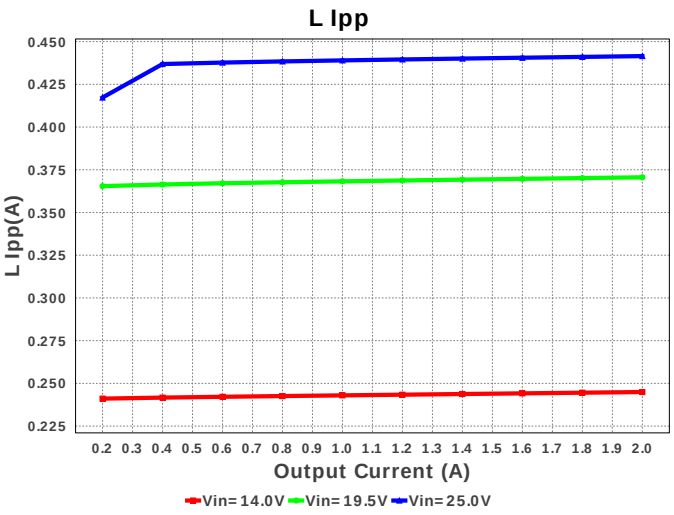


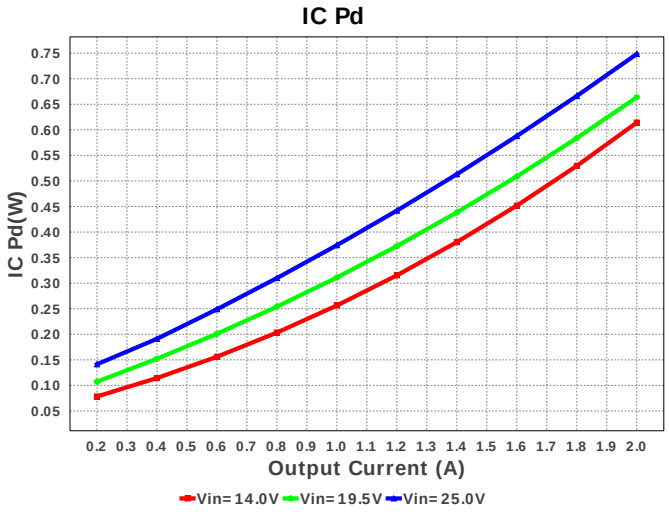


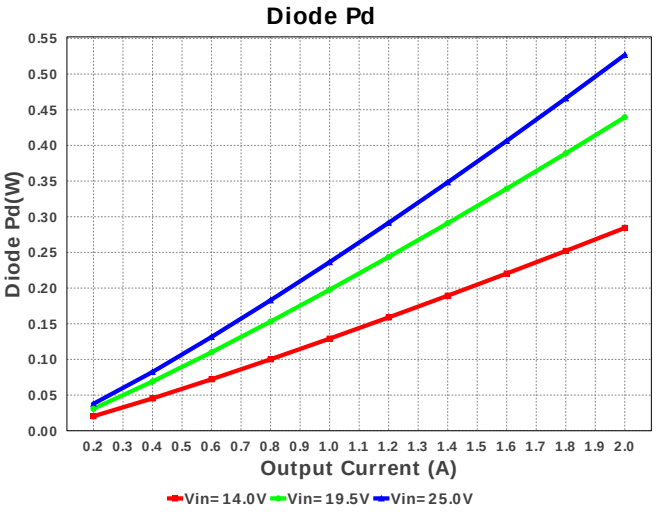












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	712.441 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	127.455 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.221 A	Current	Peak switch current in IC
4.	Iin Avg	781.61 mA	Current	Average input current
5.	L Ipp	441.52 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	1.221 A	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	516.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	500.0 kHz	General	Switching frequency
10.	IC Tolerance	75.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	133.862 mV	General	Voltage drop across the MosFET
12.	Pout	18.0 W	General	Total output power
13.	Total BOM	$3.45	General	Total BOM Cost
14.	D1 Tj	43.171 degC	Op_Point	D1 junction temperature
15.	Vout Actual	8.819 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	51.394 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	37.253 %	Op_point	Duty cycle
19.	Efficiency	92.117 %	Op_point	Steady state efficiency
20.	IC Tj	46.465 degC	Op_point	IC junction temperature
21.	ICThetaJA	22.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	2.0 A	Op_point	Iout operating point
23.	Phase Marg	45.428 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	25.0 V	Op_point	Vin operating point
25.	Vout p-p	6.66 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	1.019 mW	Power	Input capacitor power dissipation
27.	Cout Pd	33.521 µW	Power	Output capacitor power dissipation
28.	Diode Pd	526.832 mW	Power	Diode power dissipation
29.	IC Pd	748.406 mW	Power	IC power dissipation
30.	L Pd	264.0 mW	Power	Inductor power dissipation
31.	Total Pd	1.54 W	Power	Total Power Dissipation

#	Name	Value	Category	Description
32.	Vout Tolerance	2.388 %		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	25.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	LM22678-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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

2. The LM22678-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. **LM22678-Q1** Product Folder : http://www.ti.com/product/LM22678%2DQ1 : contains the data sheet and other resources.