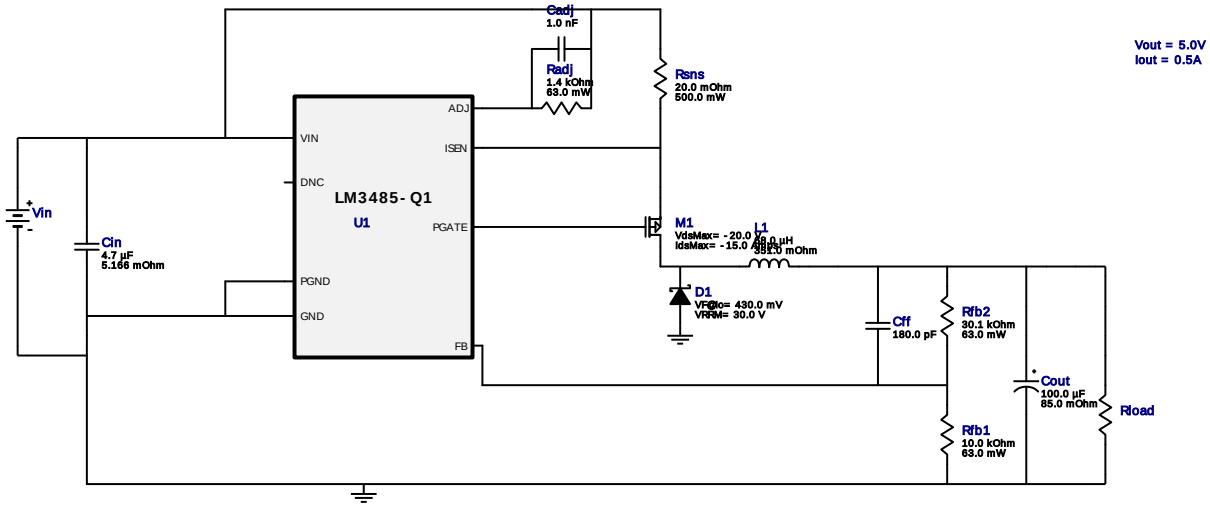
WEBENCH® Design Report

VinMin = 9.0V
VinMax = 16.0V
Vout = 5.0V
Iout = 0.5A

Device = LM3485Q1MM/NOPB
Topology = Buck
Created = 7/13/16 11:43:50 PM
BOM Cost = $2.33
BOM Count = 12
Total Pd = 0.31W

Design : 4740117/1 LM3485Q1MM/NOPB
Design 3 from yulzhu@gmail.com

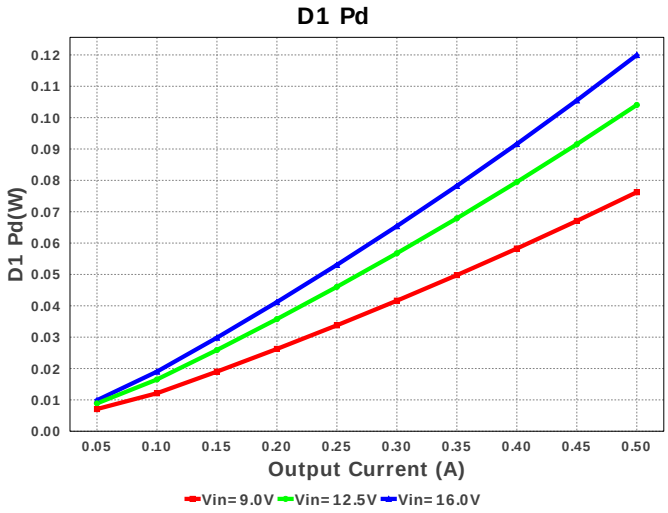


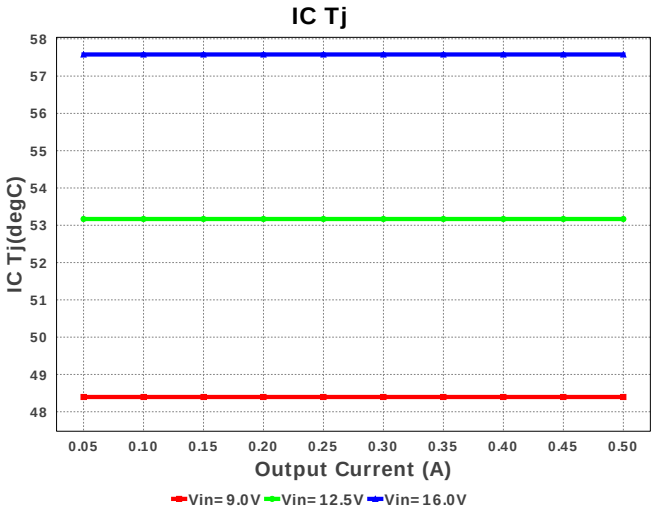
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

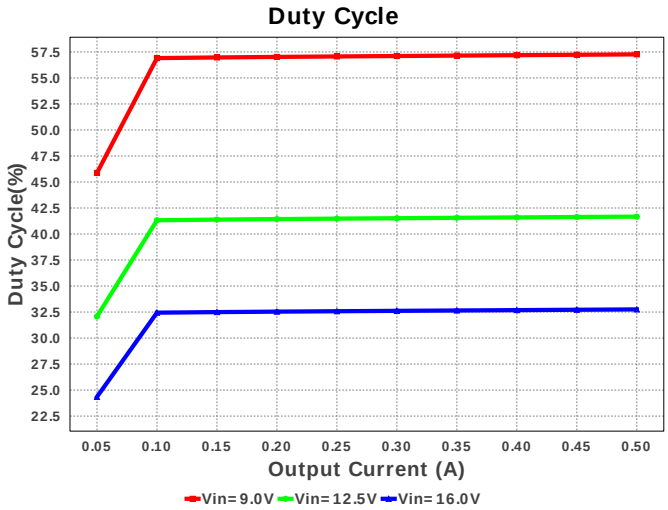
Electrical BOM

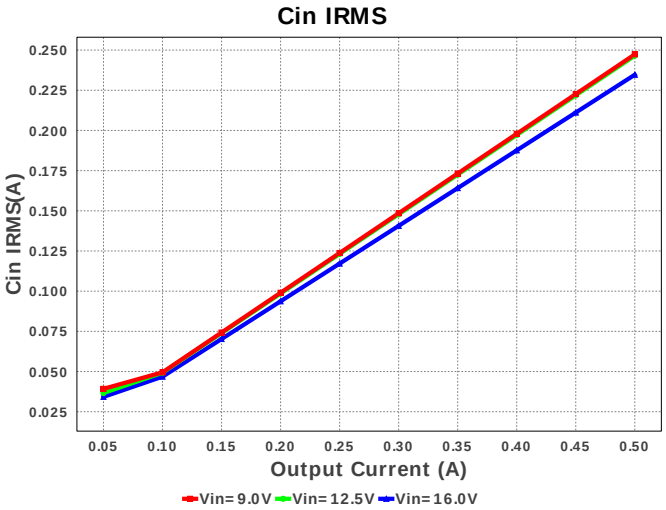
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cff	Kemet	C0805C181K5GACTU Series= C0G/NP0	Cap= 180.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Cin	MuRata	GRM21BC81E475KA12L Series= X6S	Cap= 4.7 uF ESR= 5.166 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	$0.02	0805 7 mm²
4.	Cout	AVX	TPSD107K020R0085 Series= TPS	Cap= 100.0 uF ESR= 85.0 mOhm VDC= 20.0 V IRMS= 1.196 A	1	$1.07	7343-31 59 mm²
5.	D1	ON Semiconductor	MBR0530T1G	VF@Io= 430.0 mV VRRM= 30.0 V	1	$0.06	SOD-123 13 mm²
6.	L1	Bourns	SRN6045-680M	L= 68.0 µH DCR= 351.0 mOhm	1	$0.16	SRN6045 64 mm²
7.	M1	Texas Instruments	CSD25402Q3A	VdsMax= -20.0 V IdsMax= -15.0 Amps	1	$0.34	TRANS_NexFET_Q3A 18 mm²
8.	Radj	Vishay-Dale	CRCW04021K40FKED Series= CRCW..e3	Res= 1.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

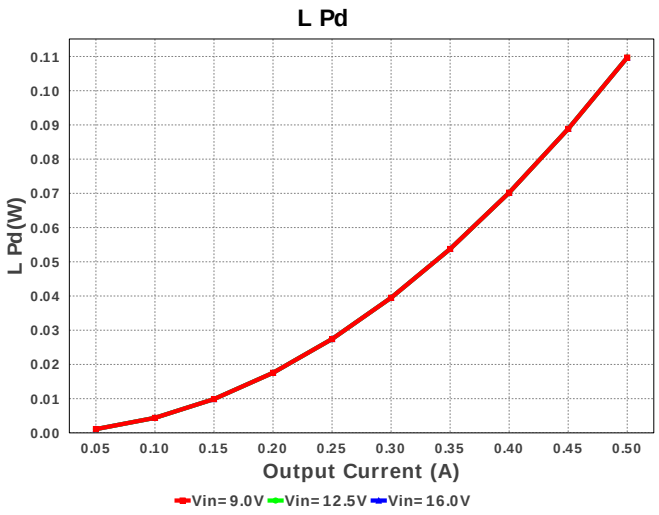
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rfb2	Vishay-Dale	CRCW040230K1FKED Series= CRCW..e3	Res= 30.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	Rsns	Stackpole Electronics Inc	CSR1206FK20L0 Series= ?	Res= 20.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	1206 11 mm^2
12.	U1	Texas Instruments	LM3485Q1MM/NOPB	Switcher	1	$0.53	MUA08A 24 mm^2

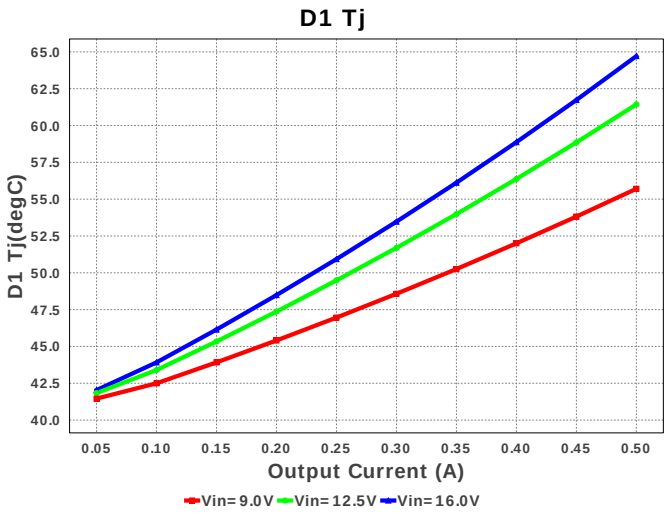


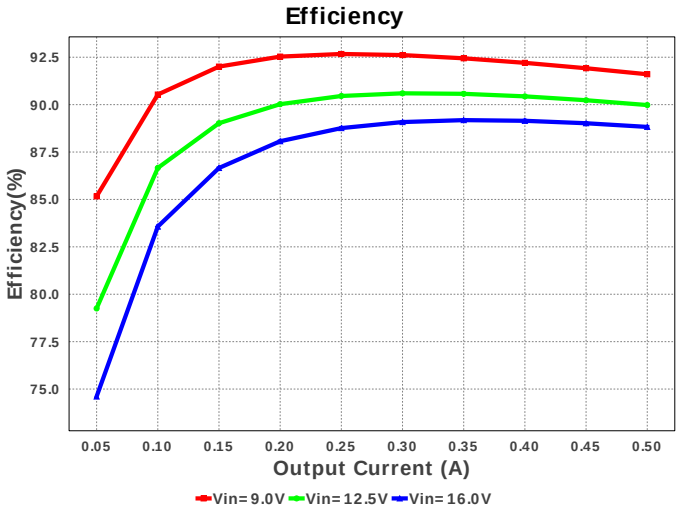


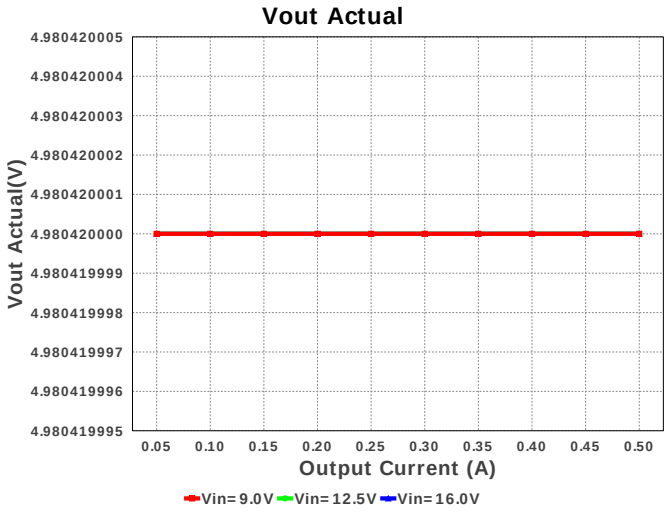


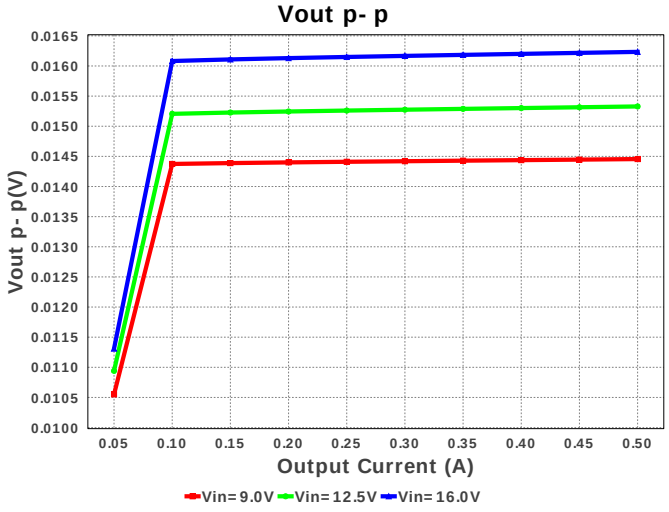


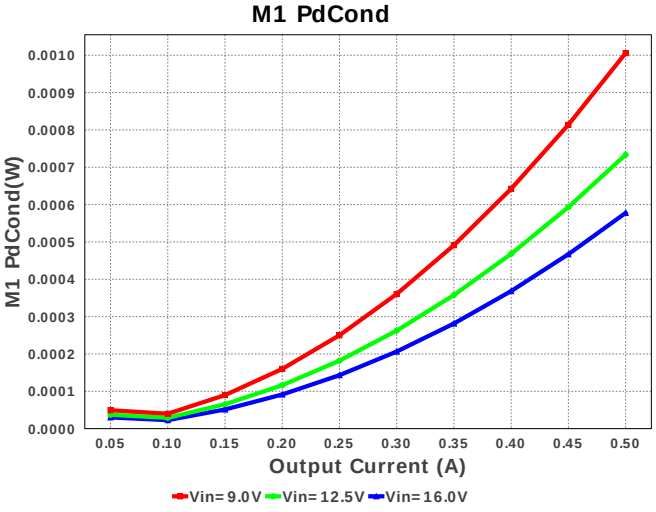


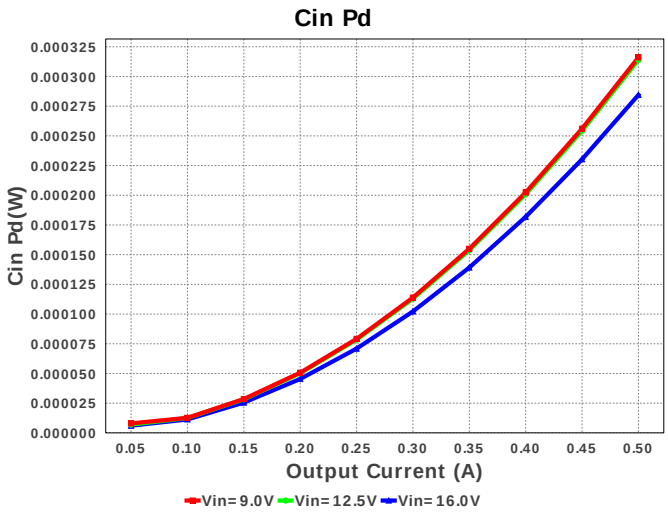


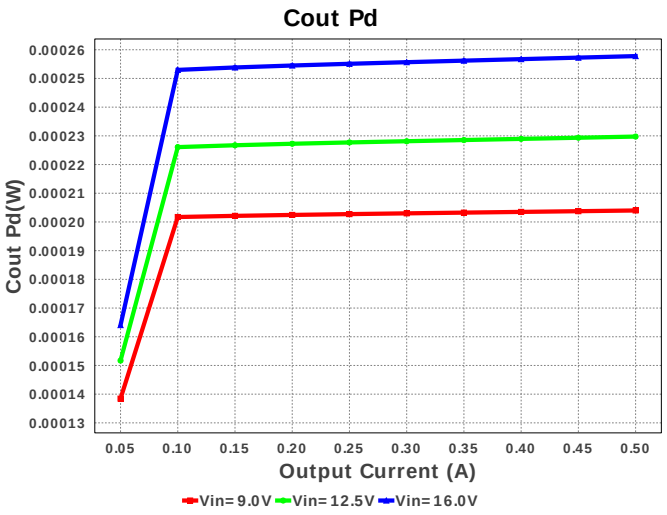


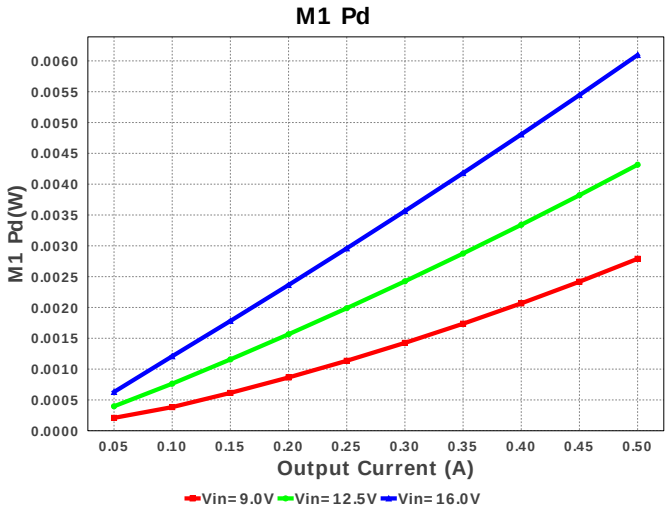


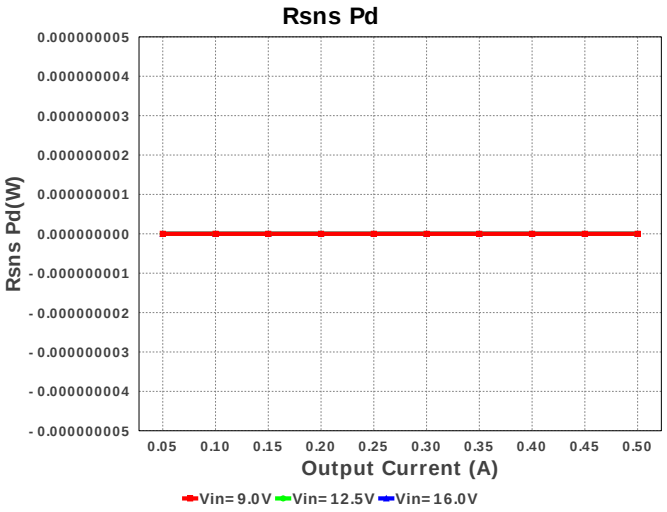


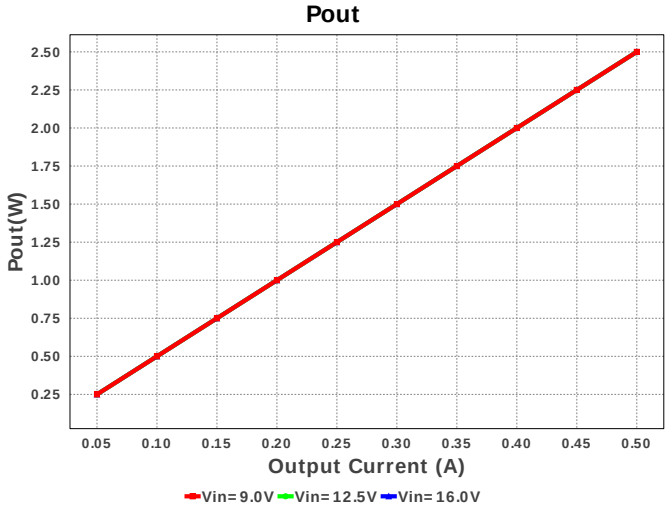


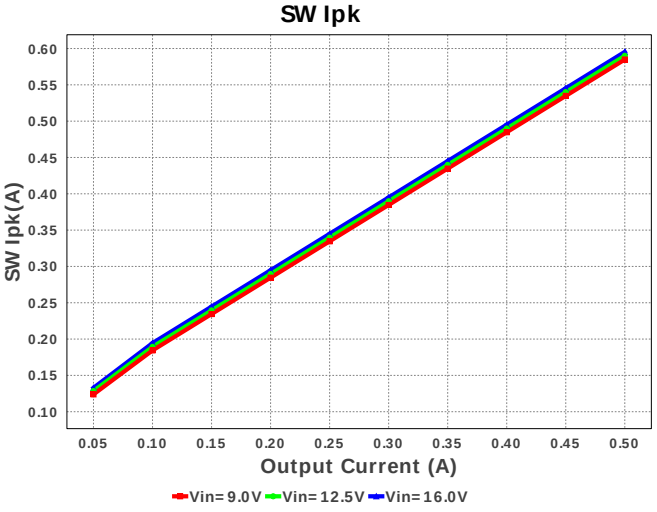


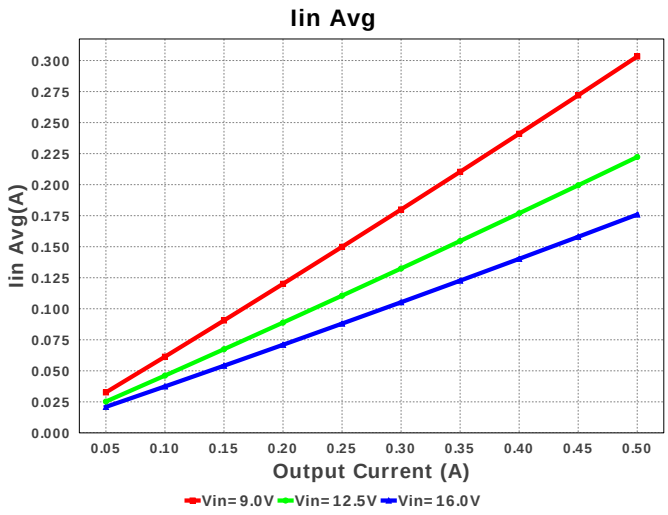


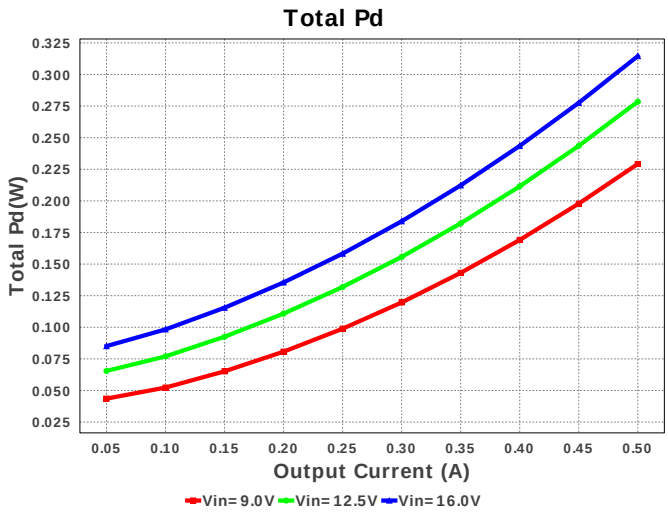


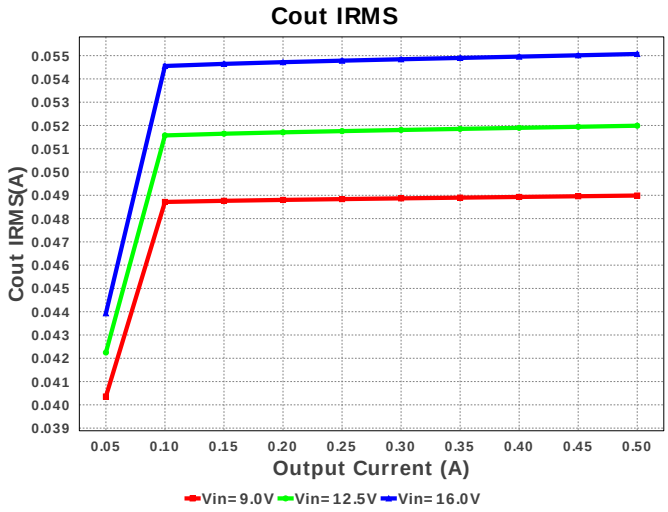


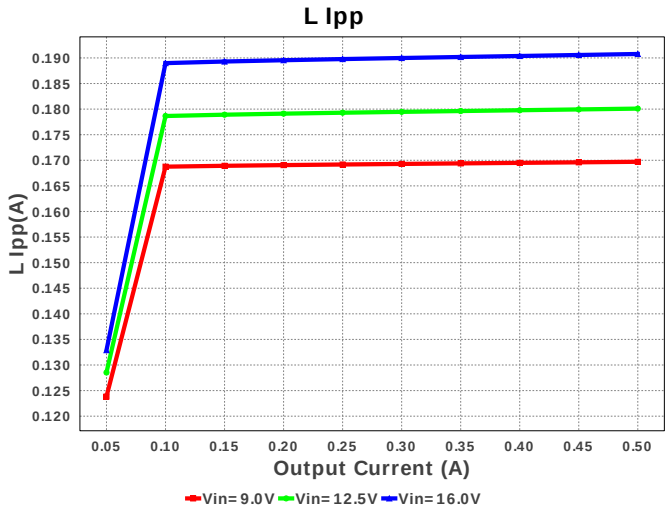


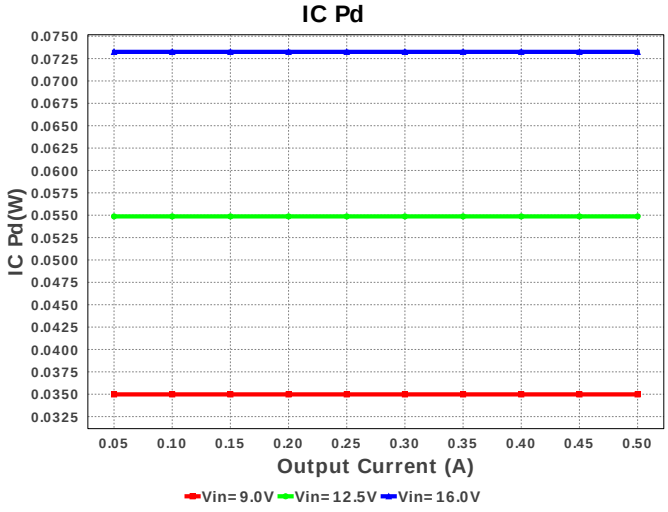


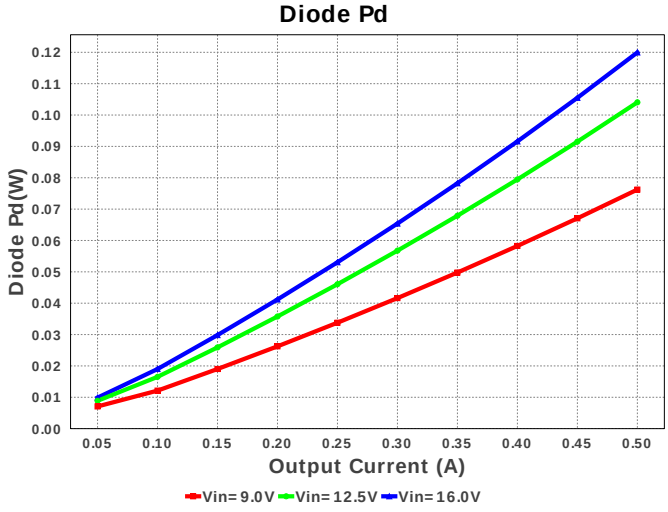


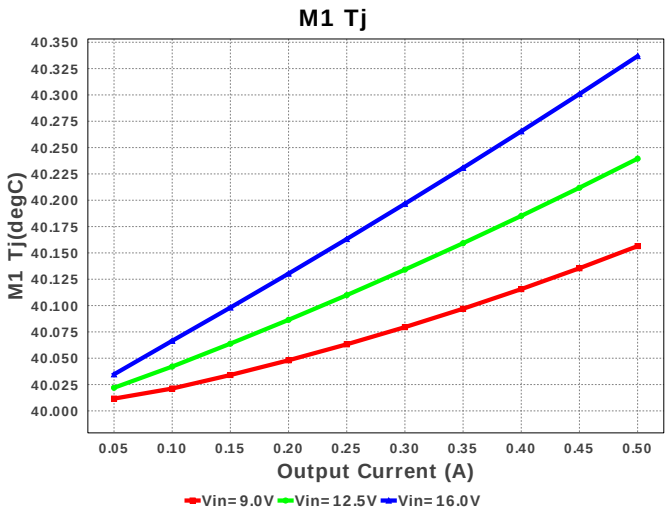


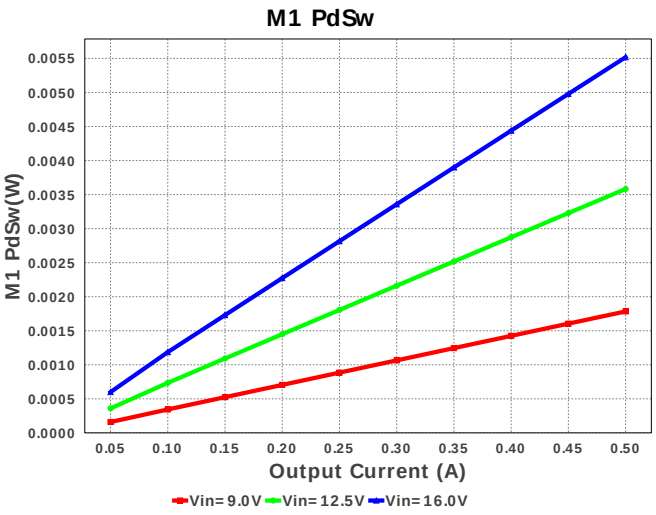












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	234.657 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	53.387 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	175.91 mA	Current	Average input current
4.	L Ipp	184.94 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	592.469 mA	Current	Peak switch current
6.	BOM Count	12	General	Total Design BOM count
7.	FootPrint	218.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	306.92 kHz	General	Switching frequency
9.	IC Tolerance	0.0 V	General	IC Feedback Tolerance
10.	Pout	2.5 W	General	Total output power
11.	Total BOM	$2.33	General	Total BOM Cost
12.	D1 Tj	64.712 degC	Op_Point	D1 junction temperature
13.	Vout Actual	4.98 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	32.754 %	Op_point	Duty cycle
16.	Efficiency	88.825 %	Op_point	Steady state efficiency
17.	IC Tj	54.65 degC	Op_point	IC junction temperature
18.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	500.0 mA	Op_point	Iout operating point
20.	M1 Tj	40.337 degC	Op_point	M1 MOSFET junction temperature
21.	VIN_OP	16.0 V	Op_point	Vin operating point
22.	Vout p-p	15.738 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	284.461 µW	Power	Input capacitor power dissipation
24.	Cout Pd	242.267 µW	Power	Output capacitor power dissipation
25.	D1 Pd	119.959 mW	Power	Output Diode Power Dissipation
26.	Diode Pd	119.959 mW	Power	Diode power dissipation
27.	IC Pd	73.25 mW	Power	IC power dissipation
28.	L Pd	109.688 mW	Power	Inductor power dissipation
29.	M1 Pd	6.096 mW	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	578.267 µW	Power	M1 MOSFET conduction losses
31.	M1 PdSw	5.518 mW	Power	M1 MOSFET switching losses
32.	Rsns Pd	0.0 W	Power	LED Current Rsns Power Dissipation
33.	Total Pd	314.527 mW	Power	Total Power Dissipation
34.	Vout Tolerance	1.516 %		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	16.0	Maximum input voltage
3.	VinMin	9.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM3485-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	40.0	Ambient temperature
8.	UserFsw	435.127 k	Customer Selected Frequency

Design Assistance

1. The LM3485-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

2. Outline The LM3485-Q1 is a hysteretic PFET controller. The hysteretic control architecture provides for a stable design without the use of a control loop. The switching frequency depends on the inductance value, output capacitor ESR, and the input voltage. Therefore depending on the chosen BOM, the frequency at different input voltages would vary.

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

4. The LM3485-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

5. Outline The LM3485-Q1 is a hysteretic PFET controller. The hysteretic control architecture provides for a stable design without the use of a control loop. The switching frequency depends on the inductance value, output capacitor ESR, and the input voltage. Therefore depending on the chosen BOM, the frequency at different input voltages would vary.

6. **LM3485-Q1** Product Folder : http://www.ti.com/product/LM3485%2DQ1 : contains the data sheet and other resources.