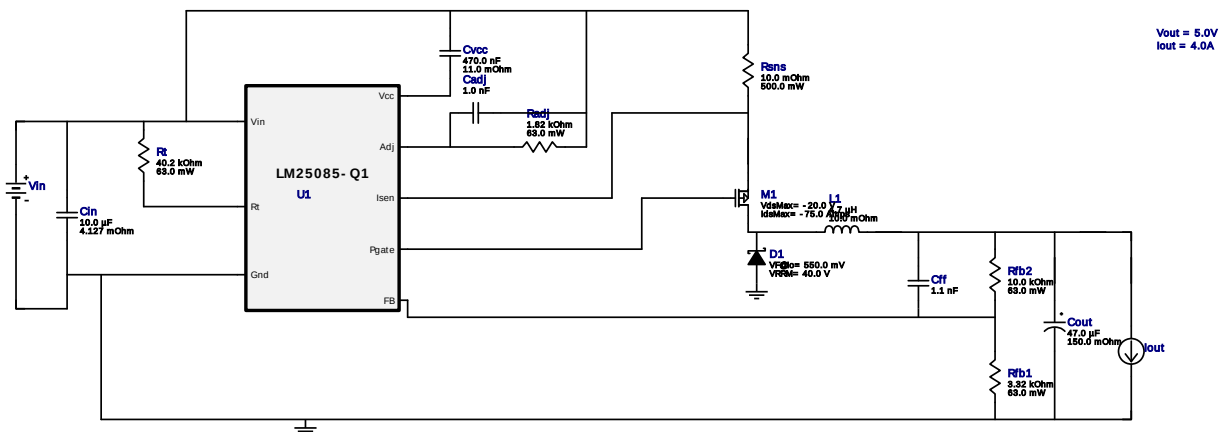


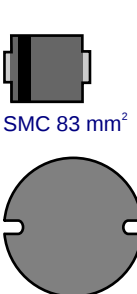
WEBENCH® Design Report

Design : 4766773/3 LM25085QMY/NOPB
LM25085QMY/NOPB 9.0V-12.0V to 5.00V @ 4.0A



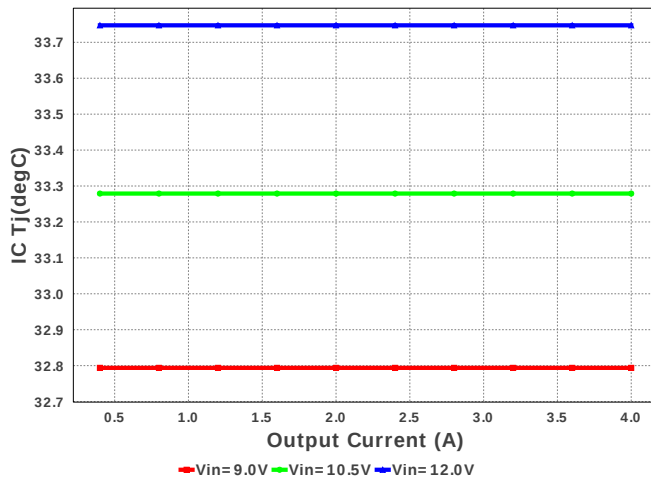
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

Electrical BOM

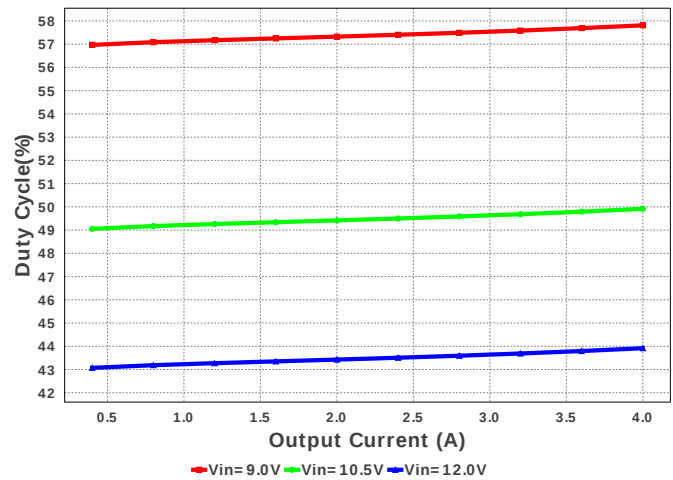
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
2.	Cff	Kemet	C0402C112J5GAC7867 Series= C0G/NP0	Cap= 1.1 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.09	 0402 3 mm ²
3.	Cin	MuRata	GRM21BR61C106KE15L Series= X5R	Cap= 10.0 uF ESR= 4.127 mOhm VDC= 16.0 V IRMS= 2.46634 A	1	\$0.03	 0805 7 mm ²
4.	Cout	Panasonic	6TPU47MSI Series= ?	Cap= 47.0 uF ESR= 150.0 mOhm VDC= 6.3 V IRMS= 510.0 mA	1	\$0.46	 CAPSMT_6_S09 7 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.	B540C-13-F	VF@Io= 550.0 mV VRRM= 40.0 V	1	\$0.17	 SMC 83 mm ²
7.	L1	Bourns	SDR1307-4R7ML	L= 4.7 uH DCR= 10.0 mOhm	1	\$0.35	 SDR1307 227 mm ²
8.	M1	Texas Instruments	CSD25402Q3A	VdsMax= -20.0 V IdsMax= -75.0 Amps	1	\$0.33	 TRANS_NexFET_Q3A 18 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Radj	Vishay-Dale	CRCW04021K82FKED Series= CRCW..e3	Res= 1.82 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
10.	Rfb1	Vishay-Dale	CRCW04023K32FKED Series= CRCW..e3	Res= 3.32 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	CRCW040240K2FKED Series= CRCW..e3	Res= 40.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	U1	Texas Instruments	LM25085QMY/NOPB	Switcher	1	\$0.79	 MUY08A 24 mm ²

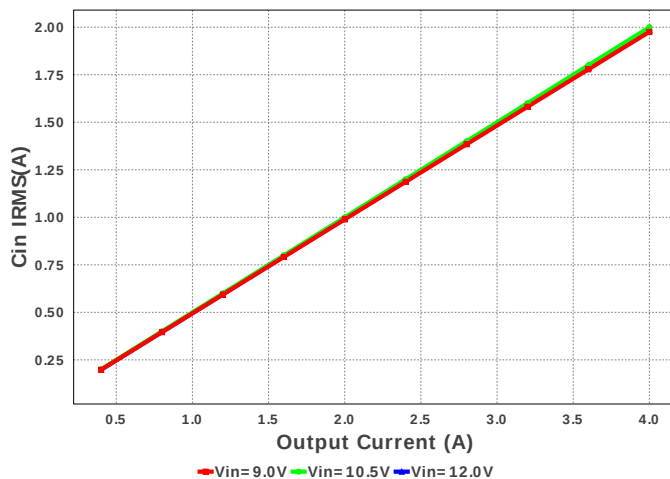
IC Tj



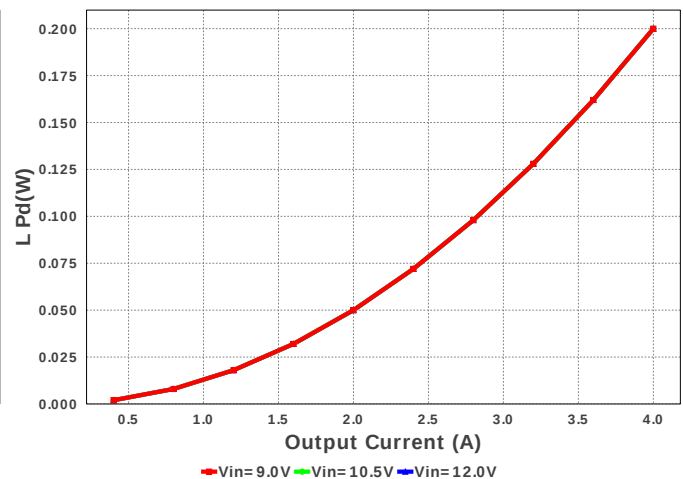
Duty Cycle

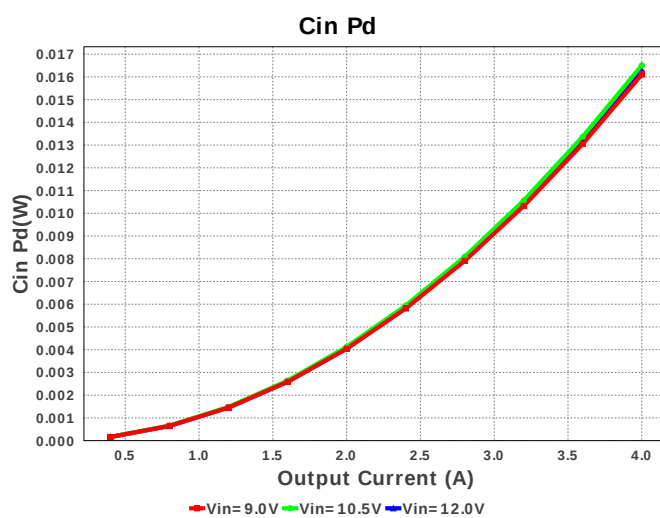
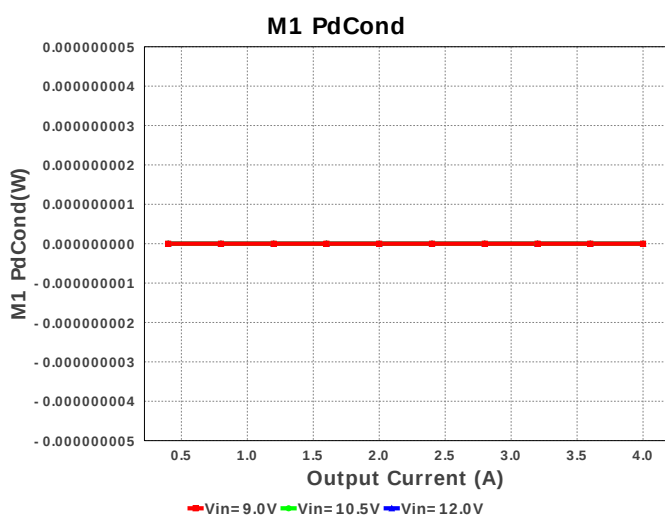
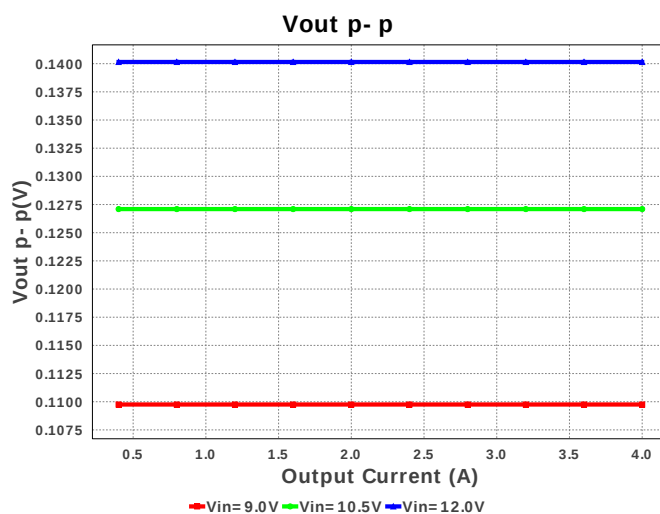
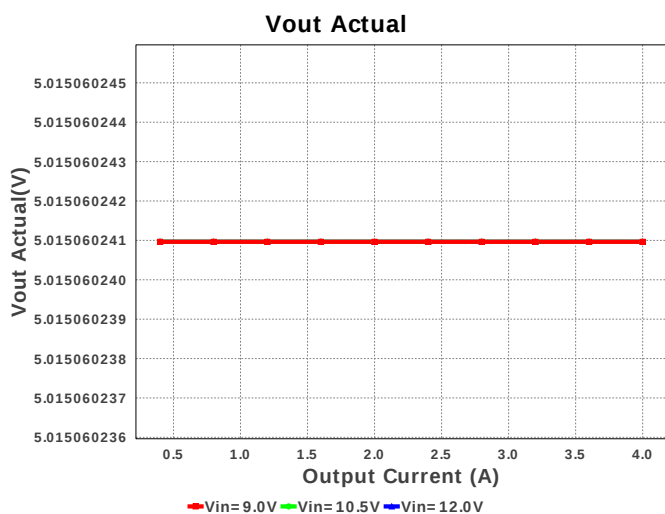
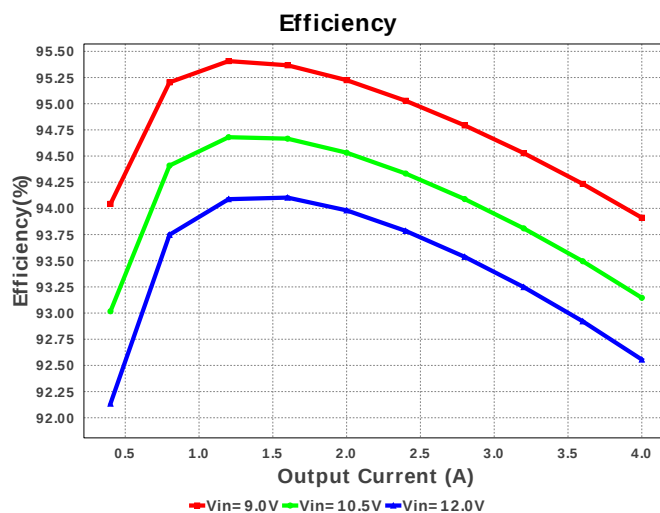
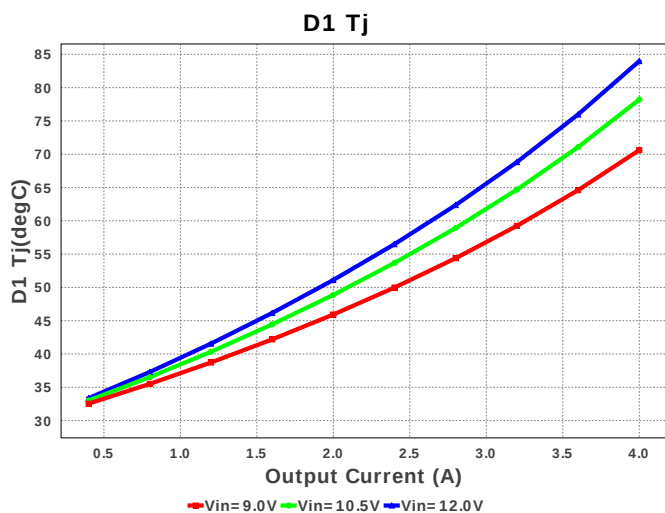


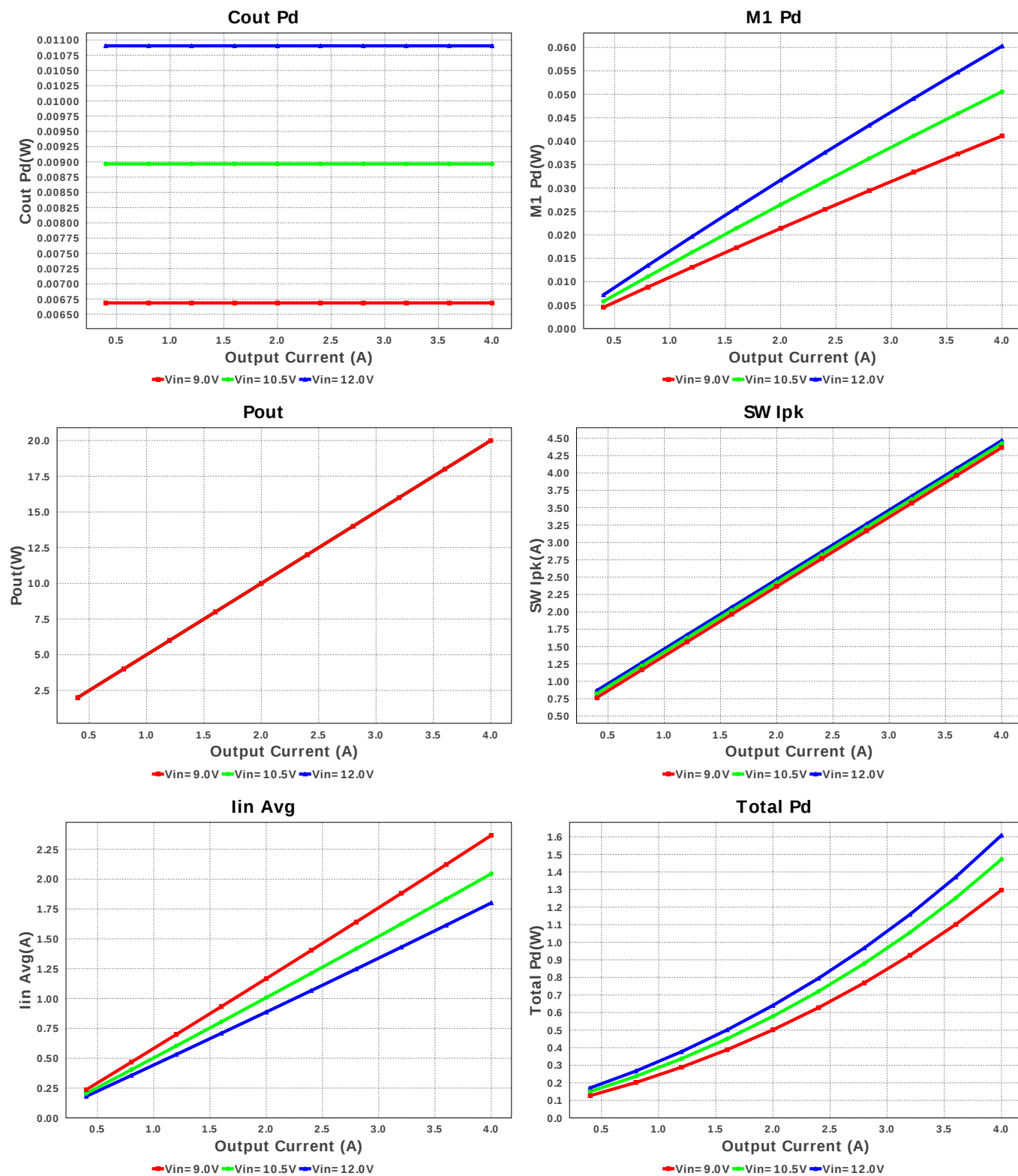
Cin IRMS

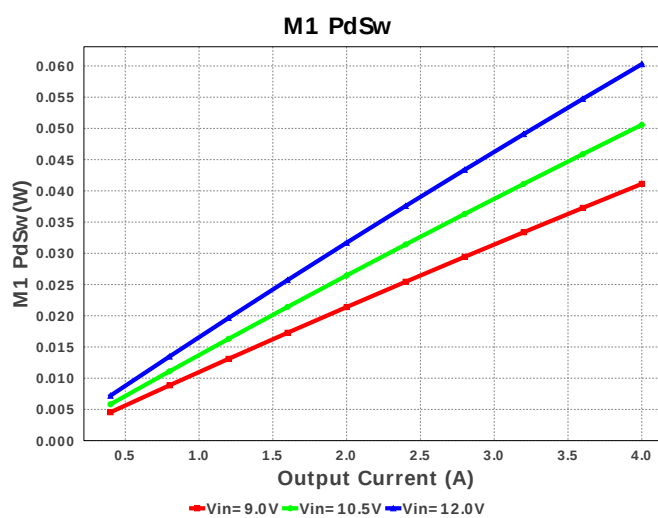
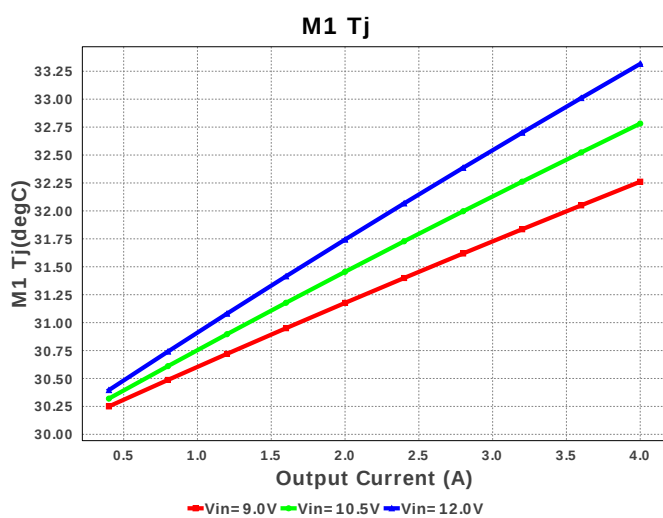
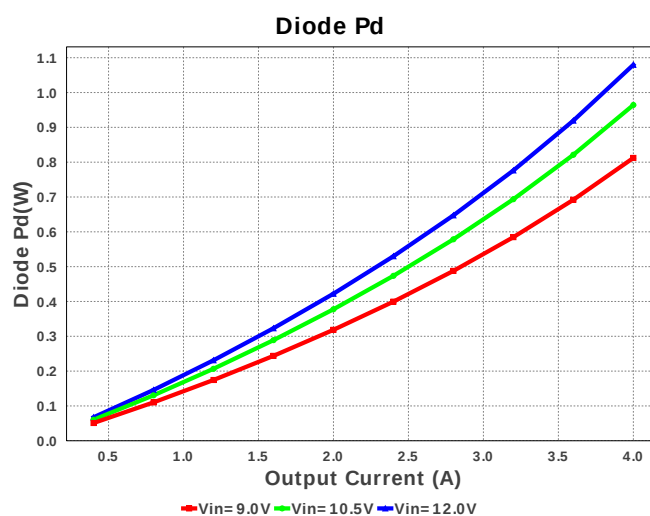
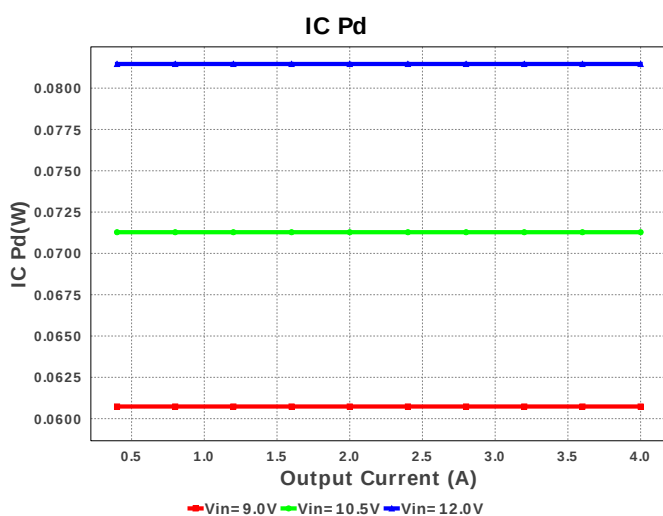
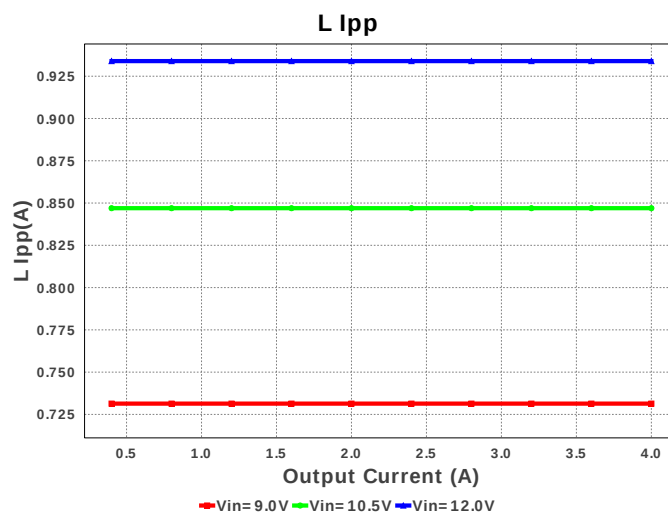
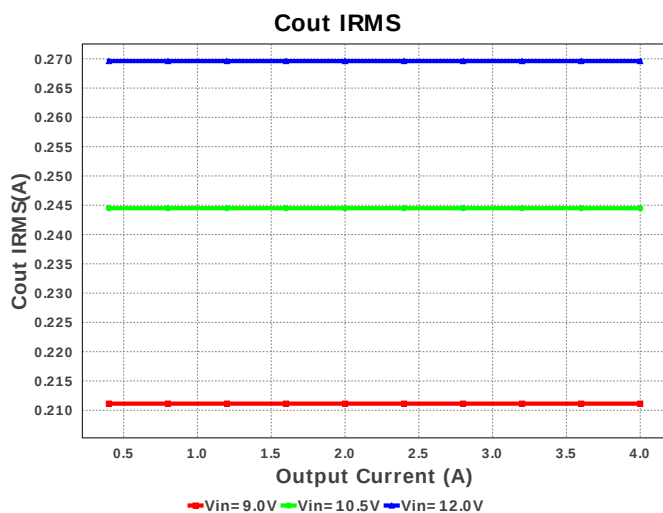


L Pd









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.985 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	269.606 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.801 A	Current	Average input current
4.	L Ipp	933.94 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	4.467 A	Current	Peak switch current
6.	BOM Count	14	General	Total Design BOM count
7.	FootPrint	405.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	615.391 kHz	General	Switching frequency
9.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
10.	Mode	CCM	General	Conduction Mode
11.	Pout	20.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Total BOM	\$2.4	General	Total BOM Cost
13.	D1 Tj	83.986 degC	Op_Point	D1 junction temperature
14.	Vout Actual	5.015 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
15.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
16.	Duty Cycle	43.916 %	Op_point	Duty cycle
17.	Efficiency	92.556 %	Op_point	Steady state efficiency
18.	IC Tj	33.747 degC	Op_point	IC junction temperature
19.	ICThetaJA	46.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	4.0 A	Op_point	Iout operating point
21.	M1 Tj	33.316 degC	Op_point	M1 MOSFET junction temperature
22.	VIN_OP	12.0 V	Op_point	Vin operating point
23.	Vout p-p	140.15 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	16.264 mW	Power	Input capacitor power dissipation
25.	Cout Pd	10.903 mW	Power	Output capacitor power dissipation
26.	Diode Pd	1.08 W	Power	Diode power dissipation
27.	IC Pd	81.462 mW	Power	IC power dissipation
28.	L Pd	200.0 mW	Power	Inductor power dissipation
29.	M1 Pd	60.291 mW	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	0.0 W	Power	M1 MOSFET conduction losses
31.	M1 PdSw	60.291 mW	Power	M1 MOSFET switching losses
32.	Total Pd	1.609 W	Power	Total Power Dissipation
33.	Vout Tolerance	3.547 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	4.0	Maximum Output Current
2.	VinMax	12.0	Maximum input voltage
3.	VinMin	9.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM25085-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 LM25085-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. **LM25085-Q1 Product Folder** : <http://www.ti.com/product/LM25085%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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