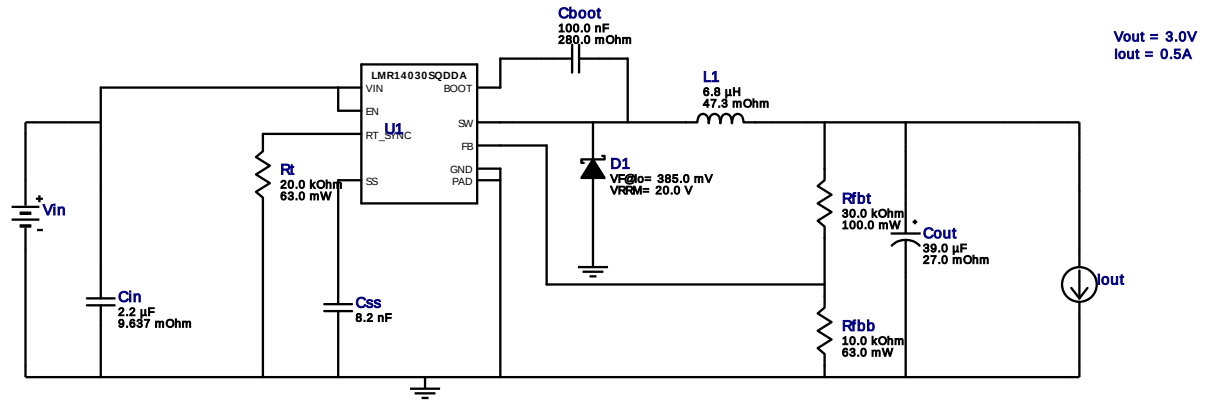
WEBENCH® Design Report

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

Device = LMR14030SQDDARQ1
Topology = Buck
Created = 7/19/16 6:02:36 AM
BOM Cost = $2.55
BOM Count = 10
Total Pd = 0.16W

Design : 4742013/177 LMR14030SQDDARQ1
LMR14030SQDDARQ1 4.5V-5.5V to 3.00V @ 0.5002250000000001A

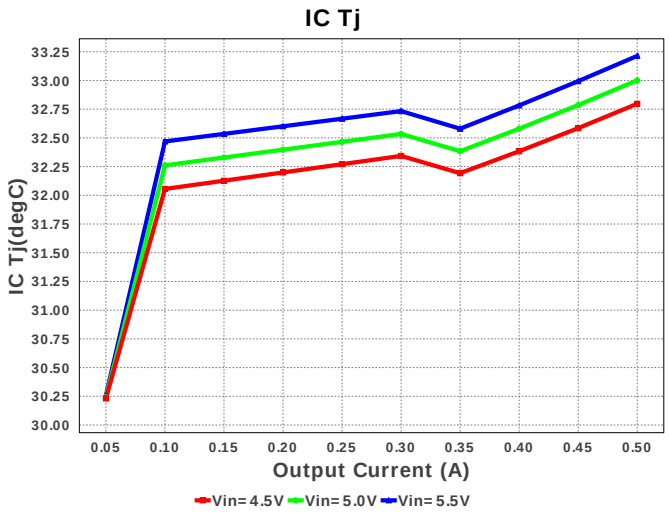


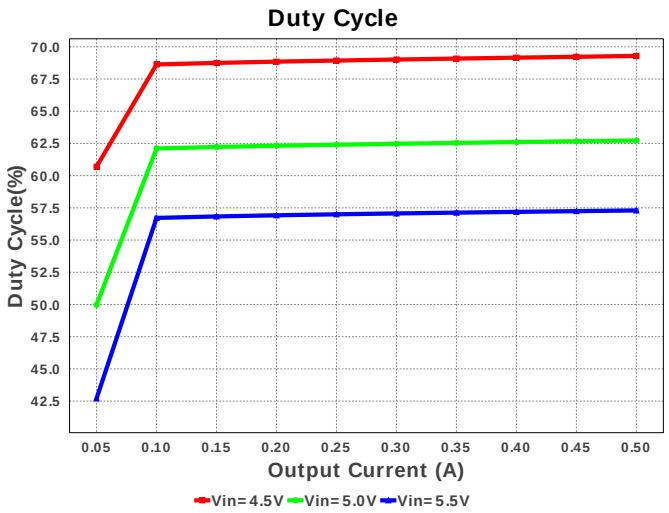
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

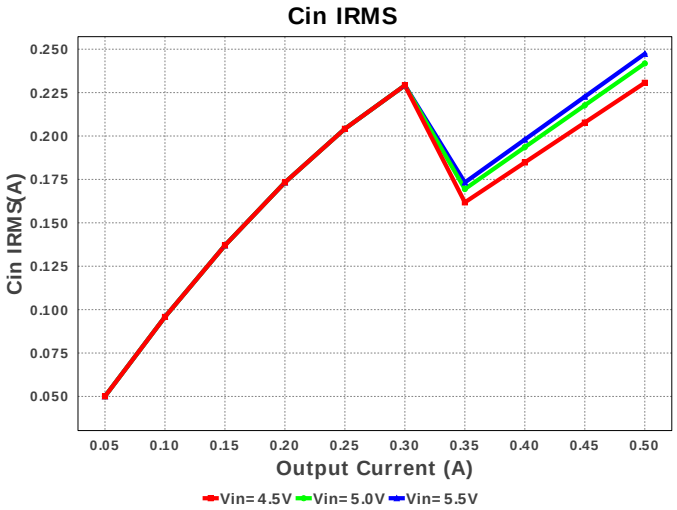
Electrical BOM

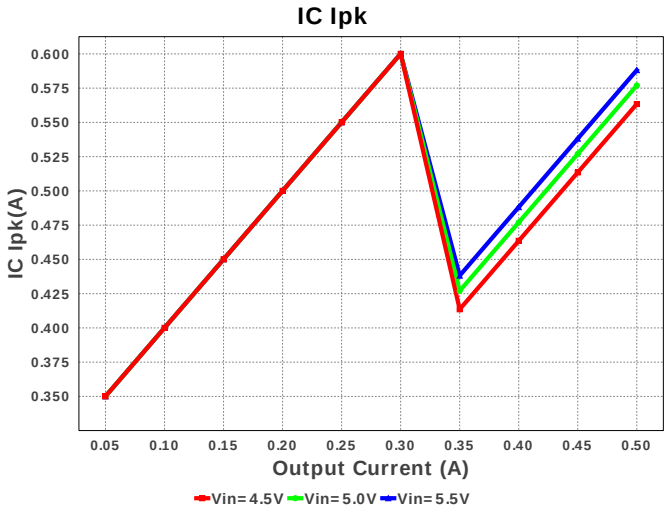
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cin	MuRata	GRM188R61A225KE34D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 10.0 V IRMS= 1.24283 A	1	$0.02	0603 5 mm²
3.	Cout	Panasonic	16SVPC39MV Series= SVPC	Cap= 39.0 uF ESR= 27.0 mOhm VDC= 16.0 V IRMS= 2.35 A	1	$0.28	SM_RADIAL_5MM 58 mm²
4.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
5.	D1	ON Semiconductor	MBR0520LT1G	VF@Io= 385.0 mV VRRM= 20.0 V	1	$0.06	SOD-123 13 mm²
6.	L1	Bourns	SRN6045-6R8Y	L= 6.8 µH DCR= 47.3 mOhm	1	$0.16	SRN6045 64 mm²
7.	Rfbb	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	Rfbt	Yageo America	RC0603FR-0730KL Series= ?	Res= 30.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
9.	Rt	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LMR14030SQDDARQ1	Switcher	1	$1.98	DDA0008E_N 57 mm²

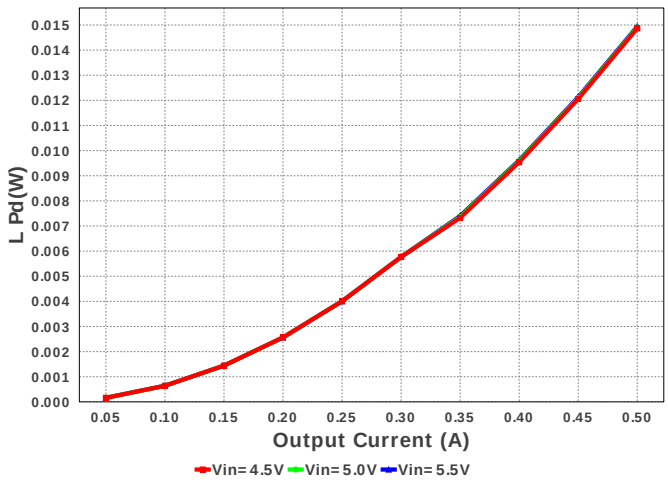




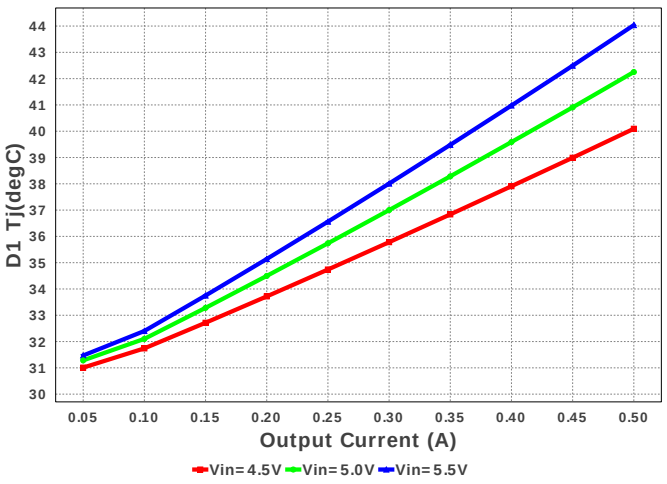




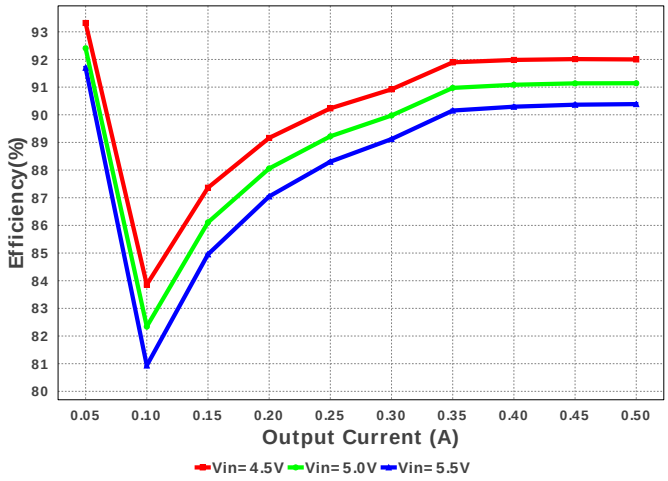
L Pd



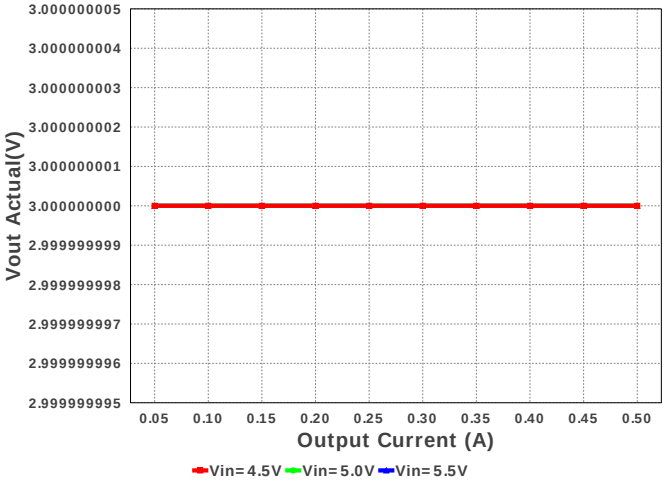
D1 Tj



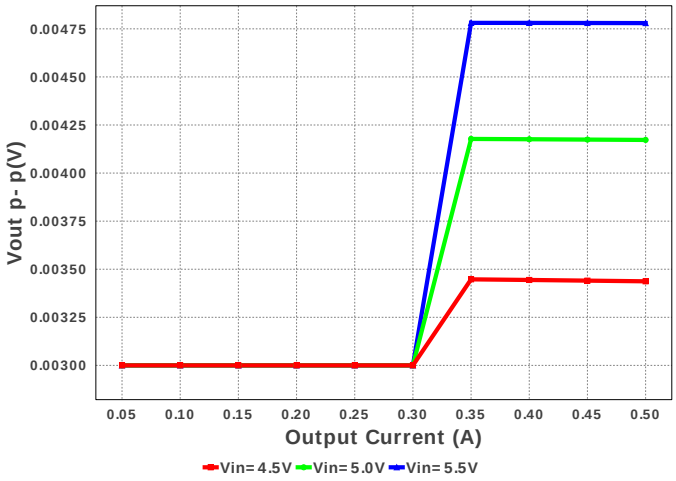
Efficiency



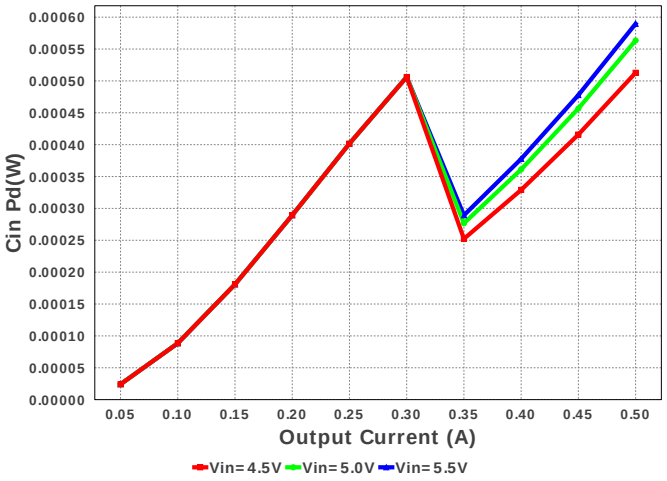
Vout Actual

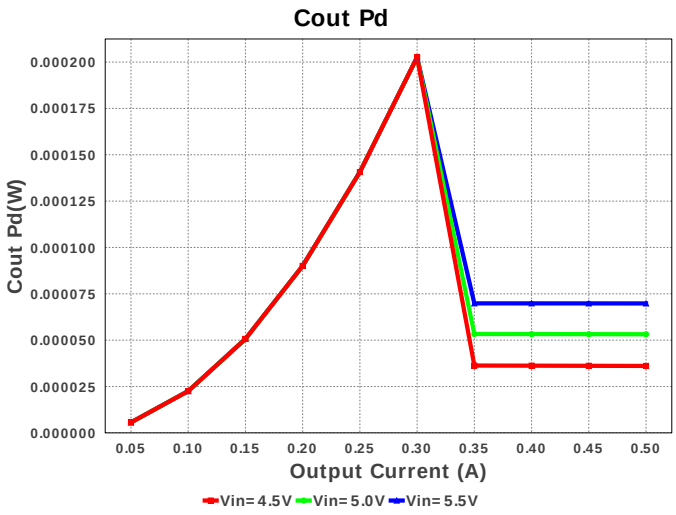


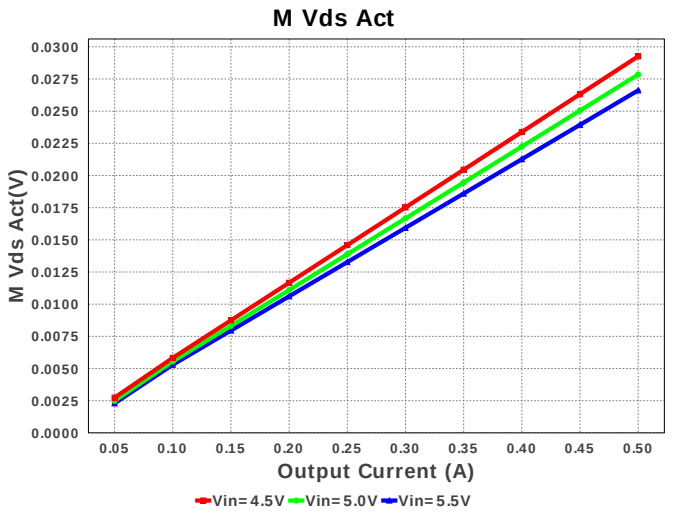
Vout p- p

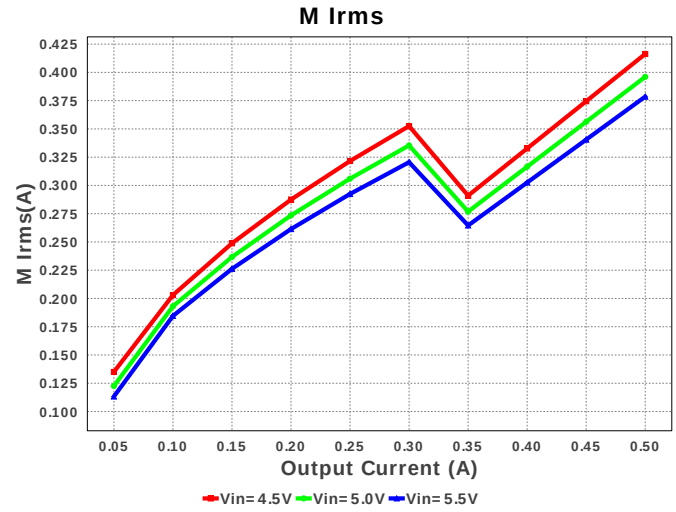


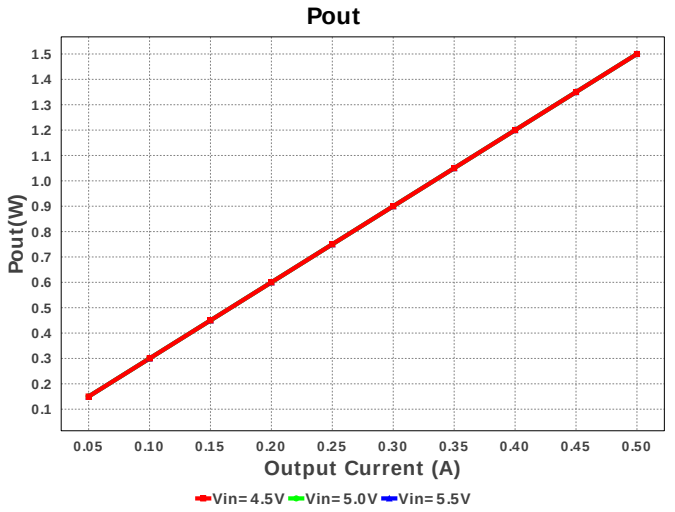
Cin Pd

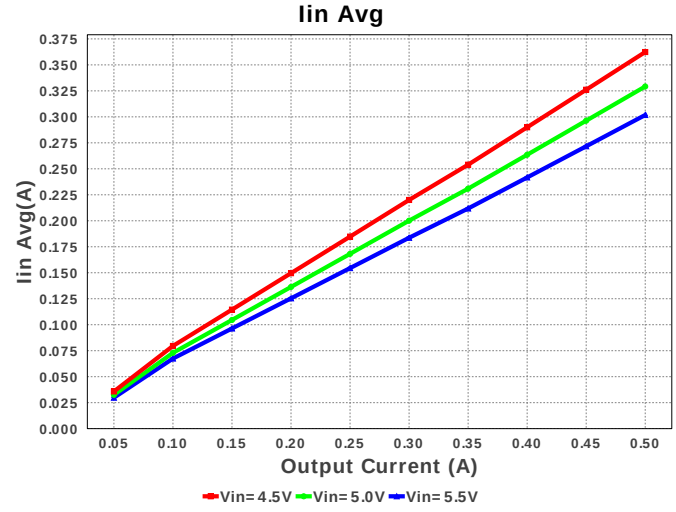


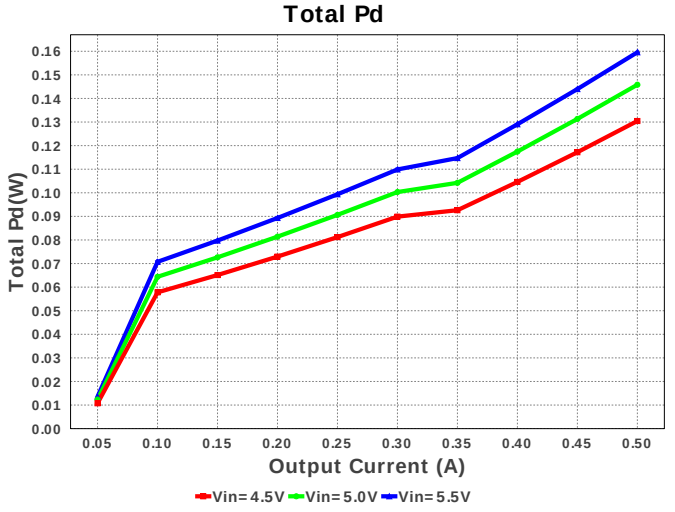


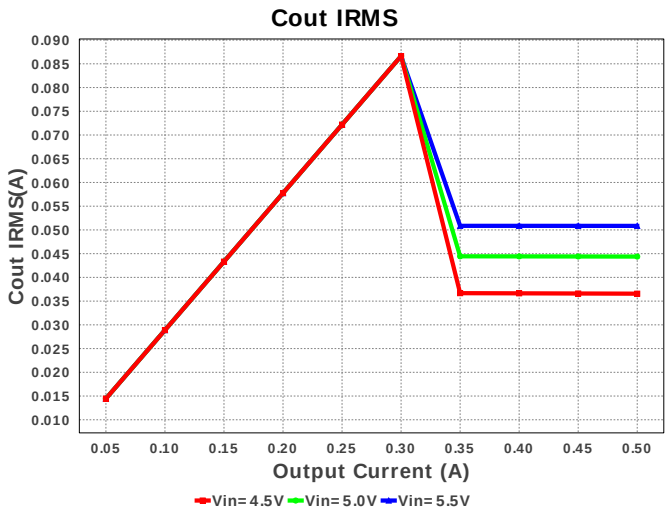


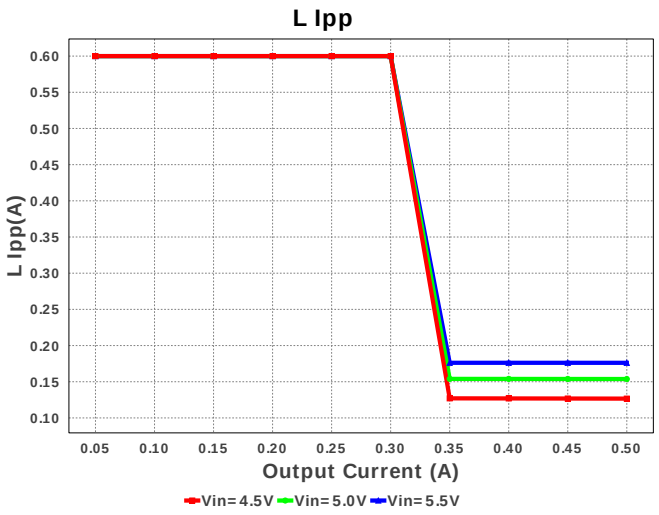


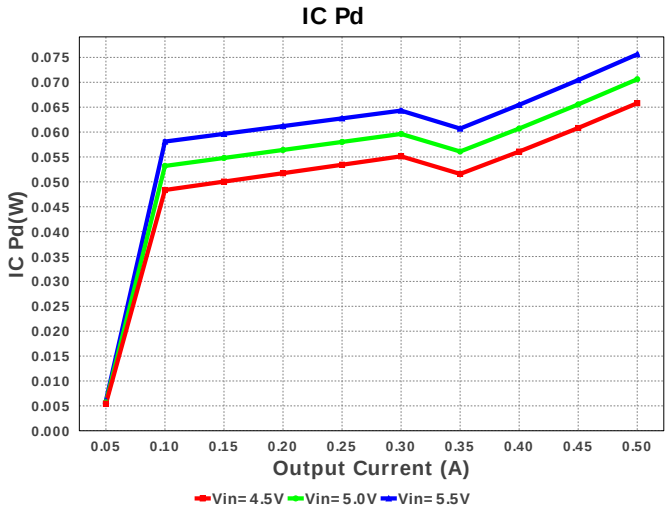


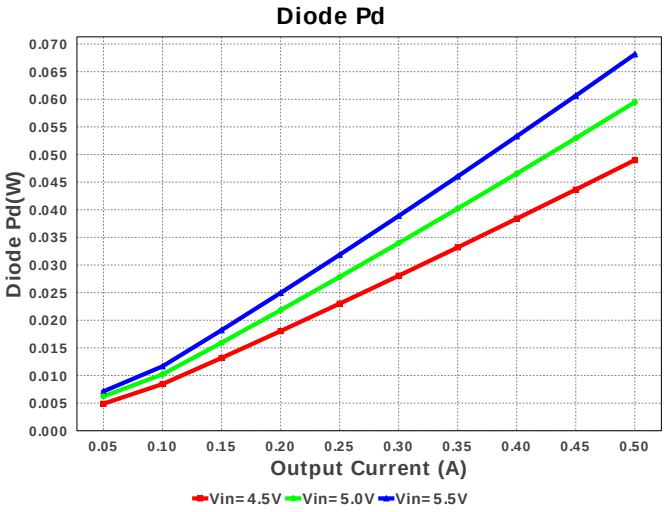


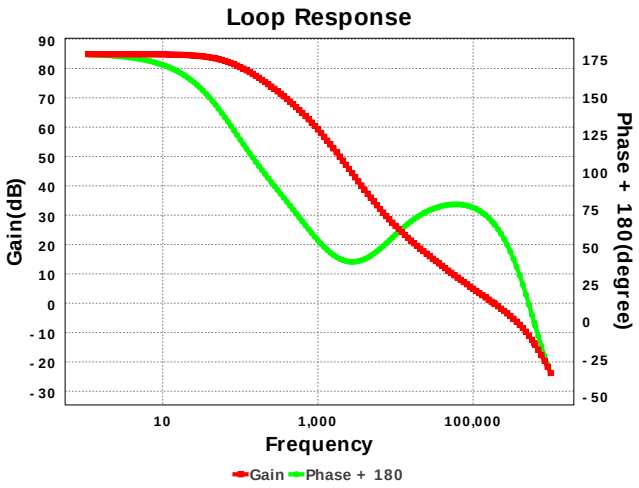












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	247.358 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	50.85 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	588.149 mA	Current	Peak switch current in IC
4.	Iin Avg	301.78 mA	Current	Average input current
5.	L Ipp	176.15 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	378.541 mA	Current	Q Iavg
7.	BOM Count	10	General	Total Design BOM count
8.	FootPrint	218.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.183 MHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	26.612 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	1.5 W	General	Total output power
13.	Total BOM	$2.55	General	Total BOM Cost
14.	D1 Tj	44.036 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.	Cross Freq	184.26 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	57.3 %	Op_point	Duty cycle
19.	Efficiency	90.386 %	Op_point	Steady state efficiency
20.	IC Tj	33.176 degC	Op_point	IC junction temperature
21.	ICThetaJA	42.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	500.08 mA	Op_point	Iout operating point
23.	Phase Marg	66.071 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	5.5 V	Op_point	Vin operating point
25.	Vout p-p	4.78 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	589.65 µW	Power	Input capacitor power dissipation
27.	Cout Pd	69.814 µW	Power	Output capacitor power dissipation
28.	Diode Pd	68.137 mW	Power	Diode power dissipation
29.	IC Pd	75.617 mW	Power	IC power dissipation
30.	L Pd	14.939 mW	Power	Inductor power dissipation
31.	Total Pd	159.572 mW	Power	Total Power Dissipation
32.	Vout Tolerance	3.952 %		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	LMR14030S-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14030S-Q1** Product Folder : http://www.ti.com/product/LMR14030%2DQ1 : contains the data sheet and other resources.