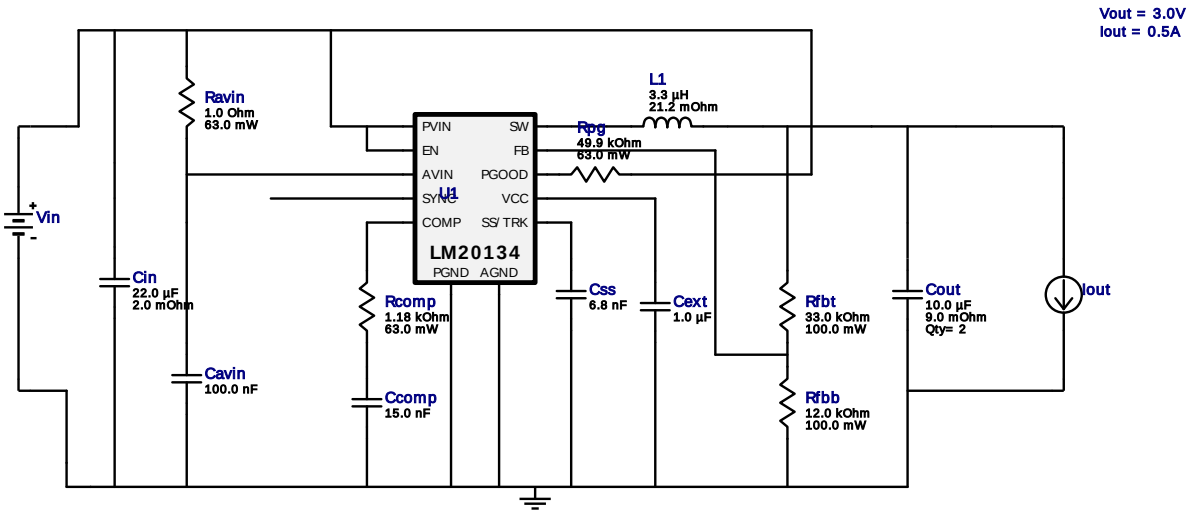
WEBENCH® Design Report

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

Device = LM20134MH/NOPB
Topology = Buck
Created = 7/19/16 5:55:47 AM
BOM Cost = $2.69
BOM Count = 14
Total Pd = 0.05W

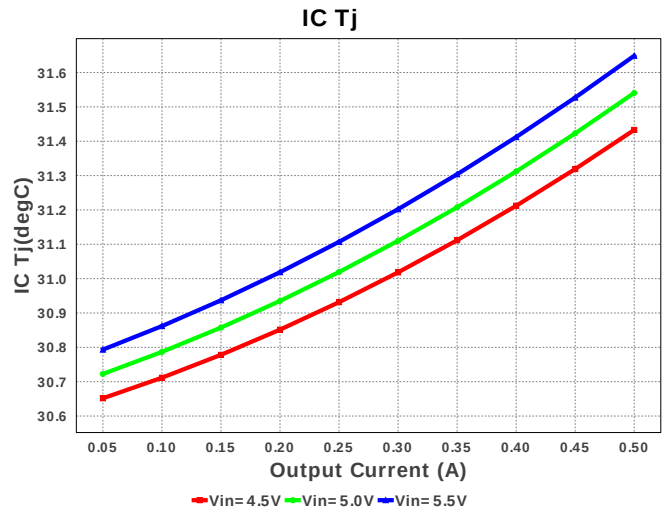
Design : 4742013/168 LM20134MH/NOPB
LM20134MH/NOPB 4.5V-5.5V to 3.00V @ 0.5A

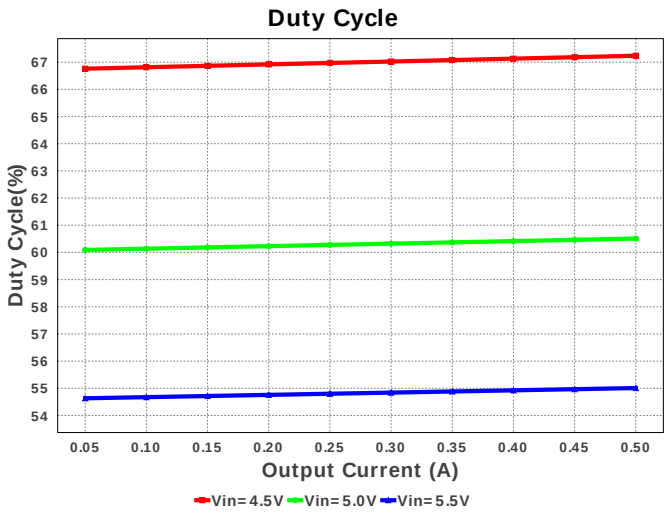


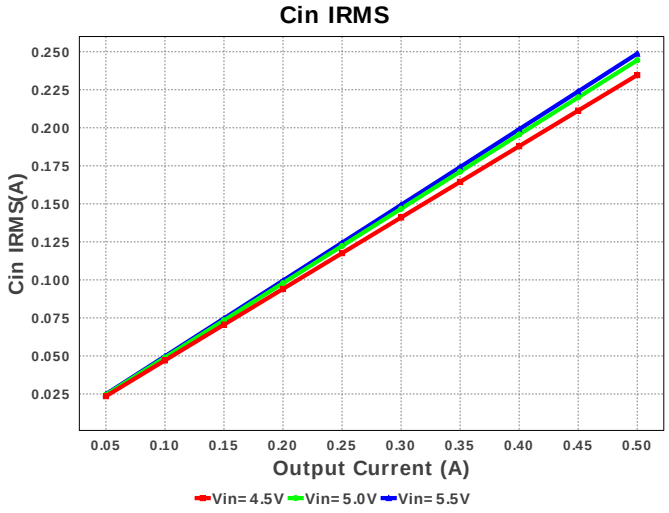
Electrical BOM

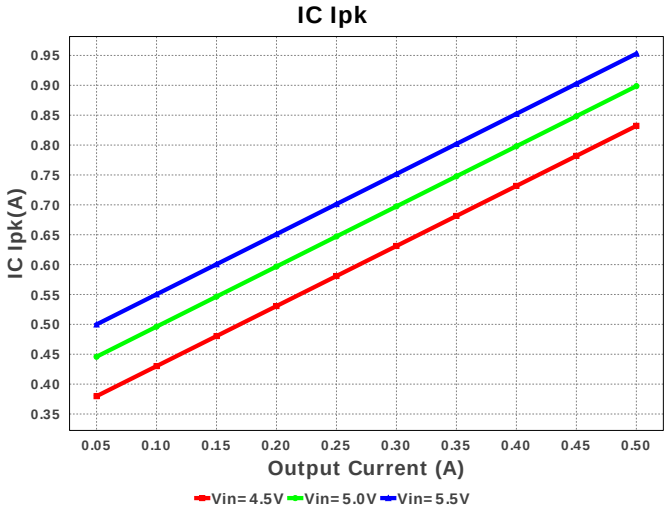
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cavin	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Cext	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
4.	Cin	MuRata	GRM32ER61C226ME20L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 3.68 A	1	$0.12	1210 15 mm²
5.	Cout	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	2	$0.02	0603 5 mm²
6.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	L1	Coilcraft	XAL5030-332MEB	L= 3.3 µH DCR= 21.2 mOhm	1	$0.63	XAL5030 54 mm²
8.	Ravin	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
9.	Rcomp	Vishay-Dale	CRCW04021K18FKED Series= CRCW..e3	Res= 1.18 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

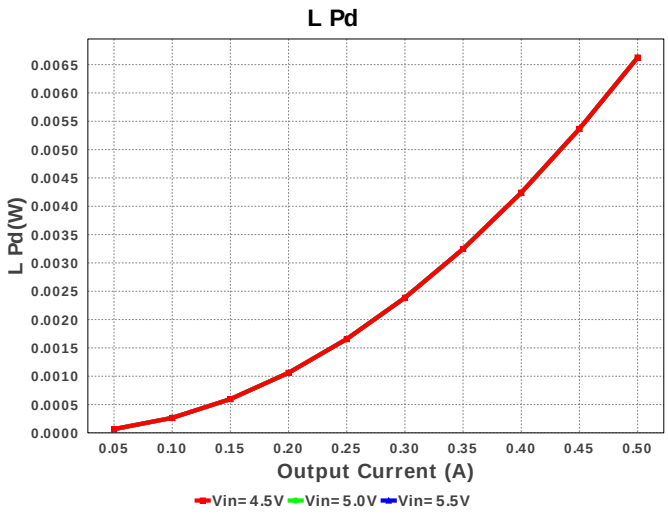
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
11.	Rfbt	Yageo America	RC0603FR-0733KL Series= ?	Res= 33.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
12.	Rpg	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	U1	Texas Instruments	LM20134MH/NOPB	Switcher	1	$1.80	MXA16A 59 mm^2

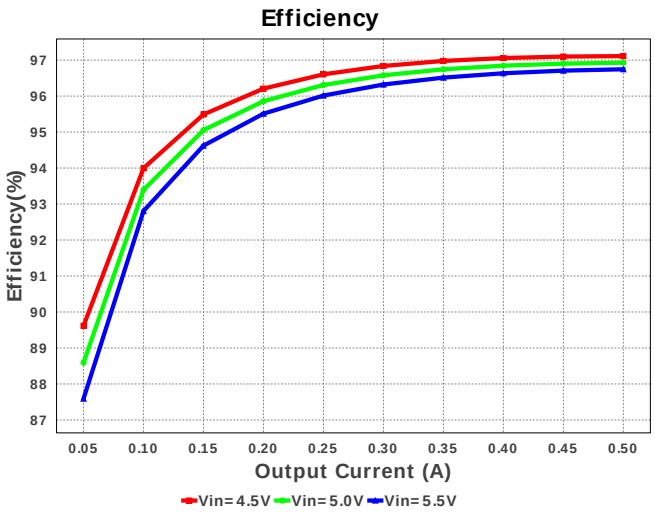


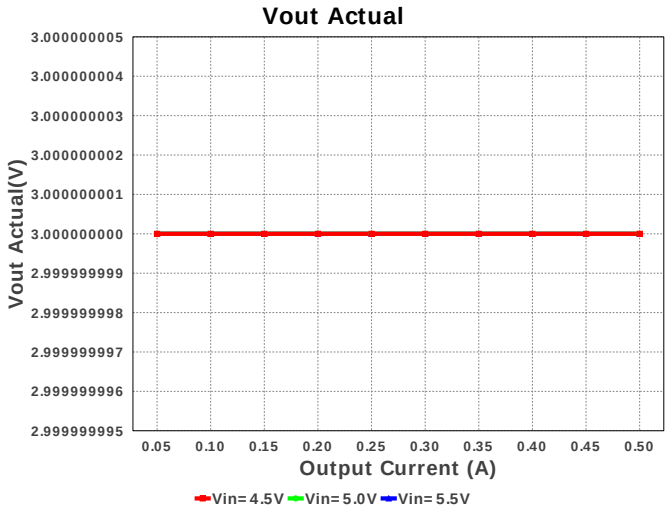


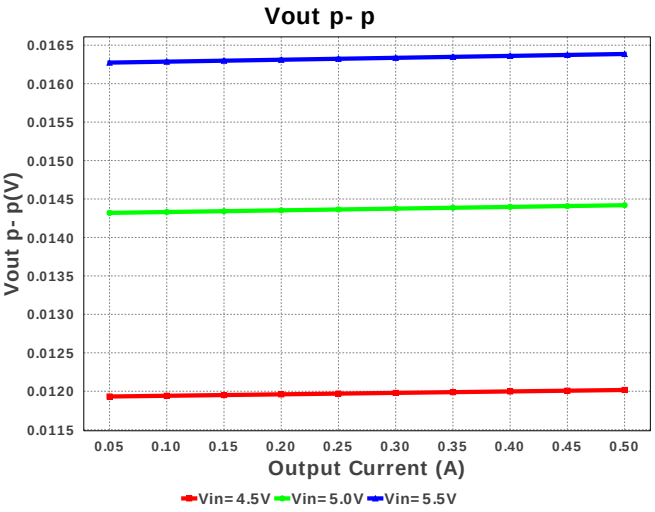


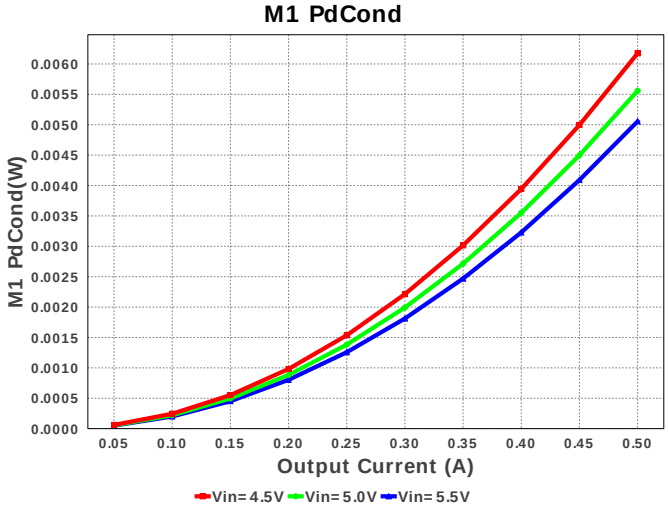


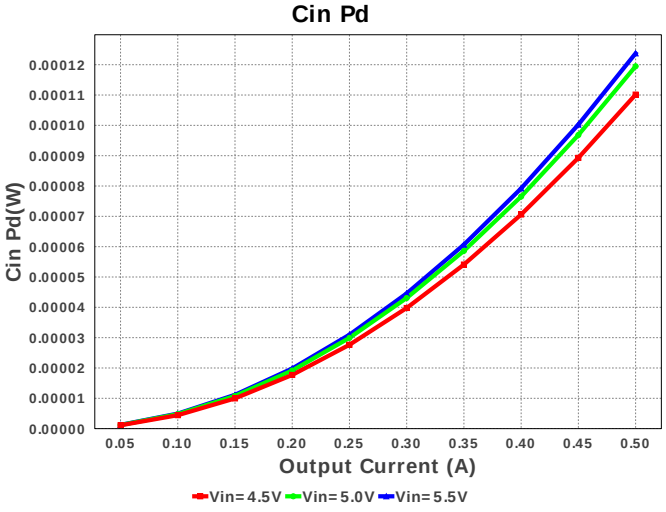


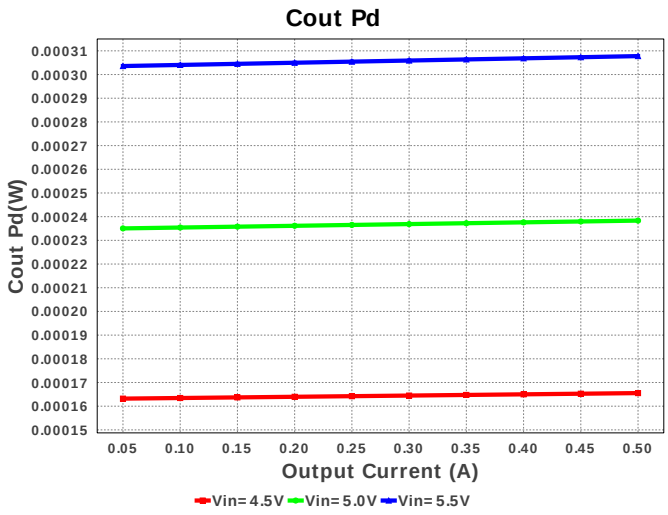


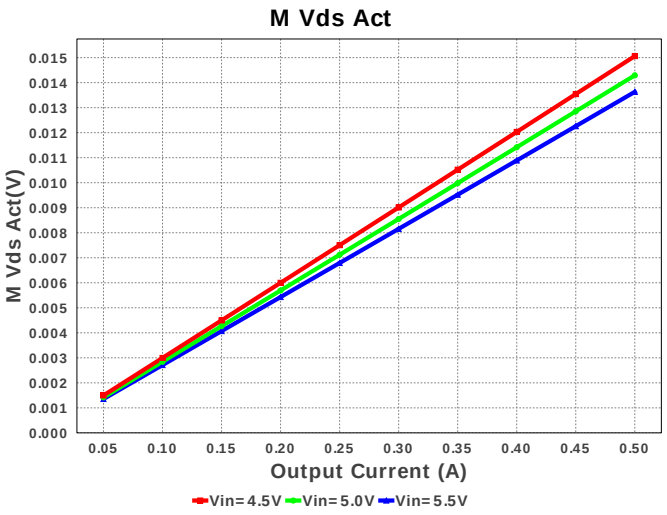


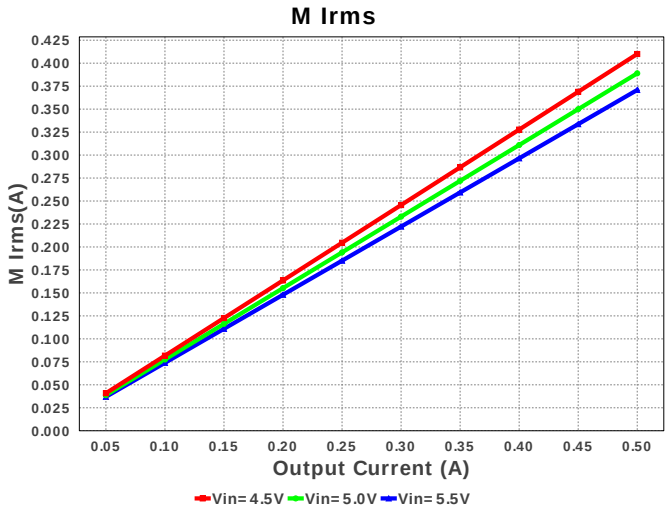


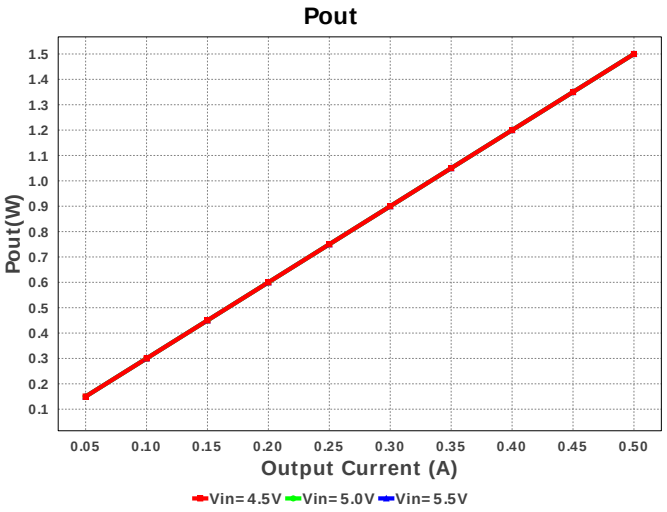


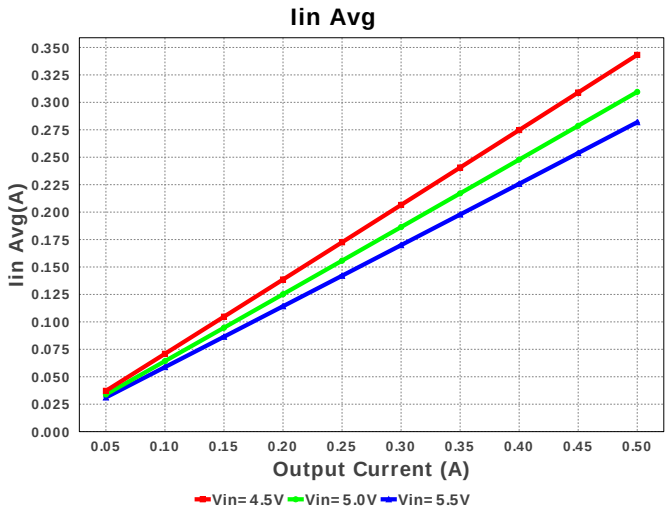


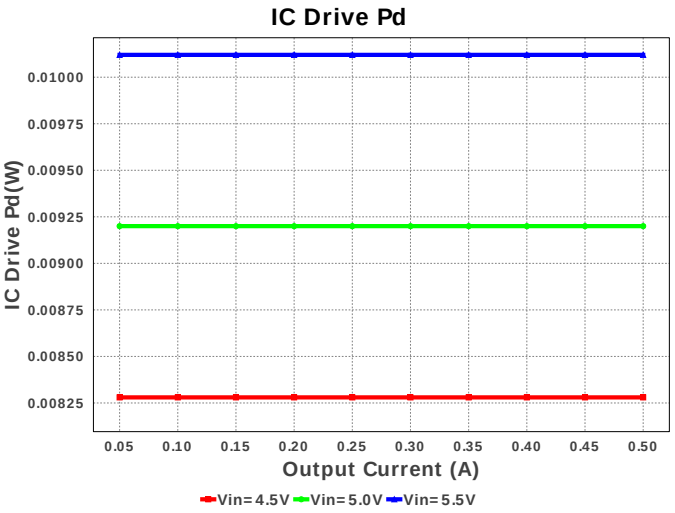


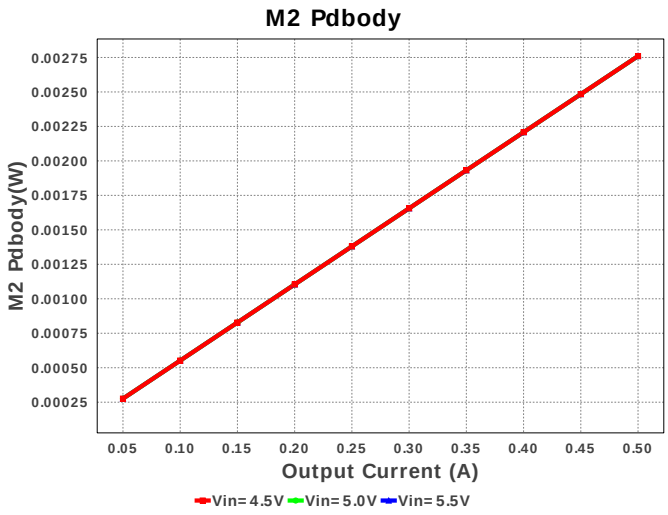


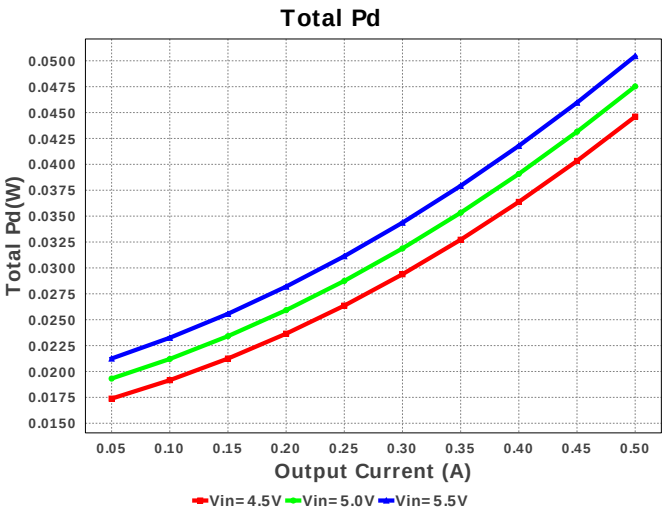


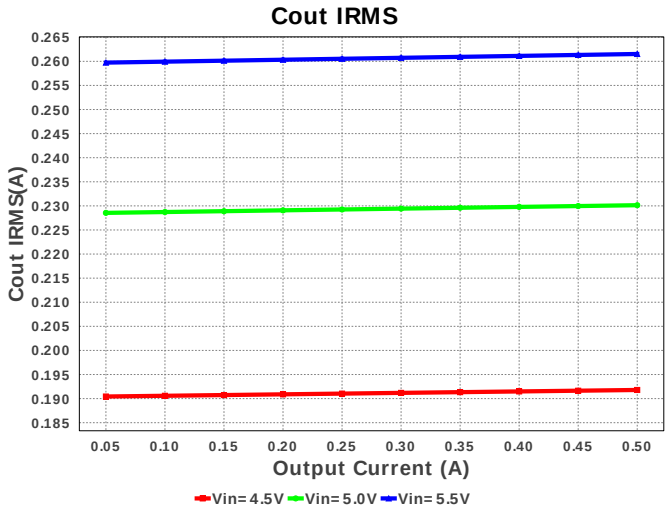


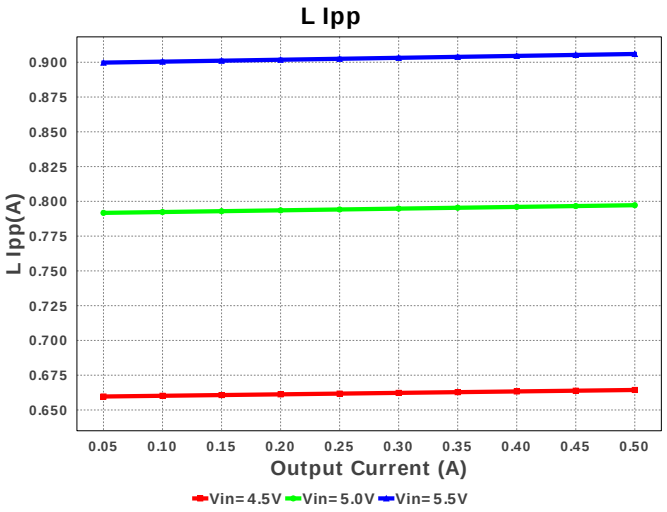


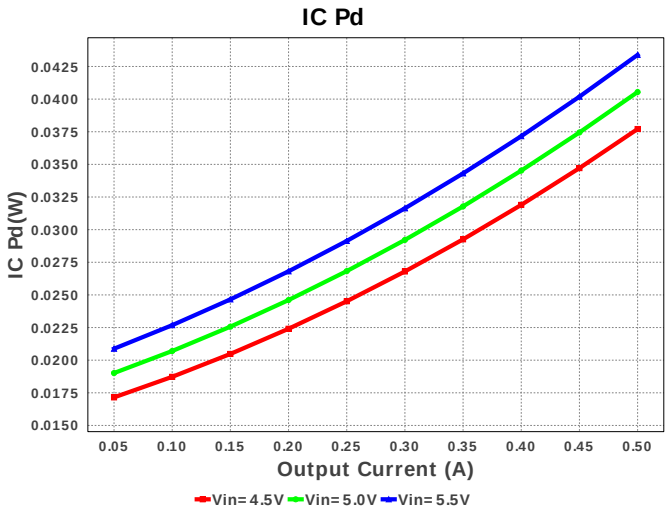


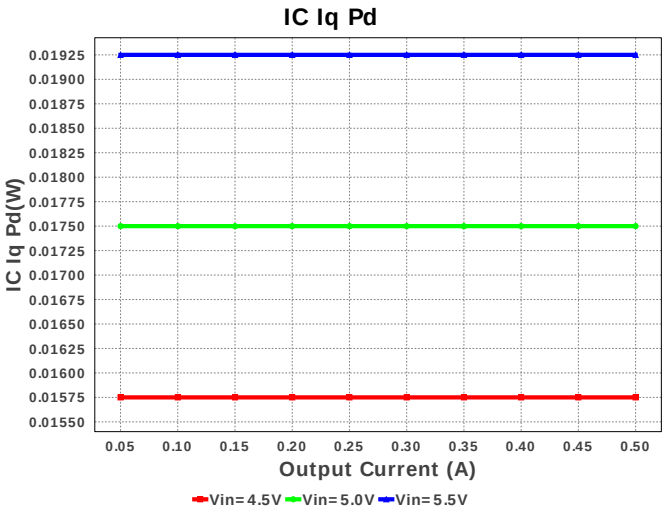

M2 Pdbody
M2 Pdbody(W)
0.00275
0.00250
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
0.00025
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
Output Current (A)
Vin= 4.5V Vin= 5.0V Vin= 5.5V

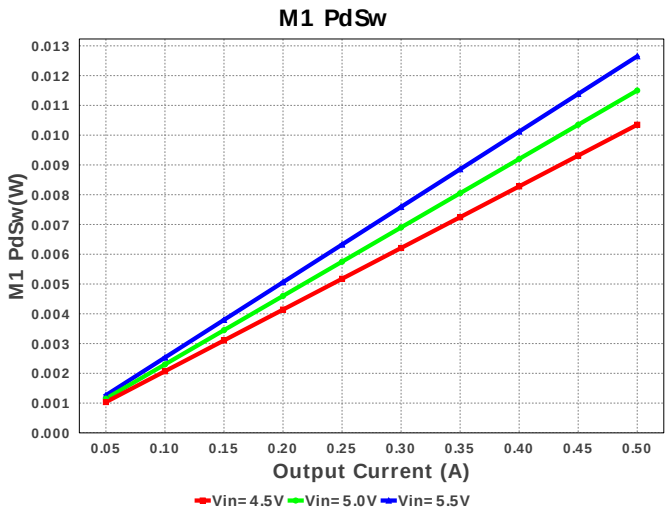

Total Pd
Total Pd(W)
0.0500
0.0475
0.0450
0.0425
0.0400
0.0375
0.0350
0.0325
0.0300
0.0275
0.0250
0.0225
0.0200
0.0175
0.0150
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
Output Current (A)
Vin= 4.5V Vin= 5.0V Vin= 5.5V

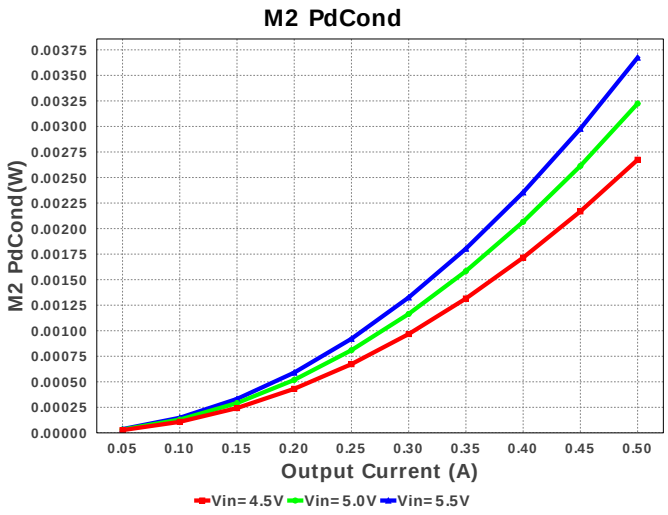

Cout IRMS
Cout IRMS(A)
0.265
0.260
0.255
0.250
0.245
0.240
0.235
0.230
0.225
0.220
0.215
0.210
0.205
0.200
0.195
0.190
0.185
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
Output Current (A)
Vin= 4.5V Vin= 5.0V Vin= 5.5V

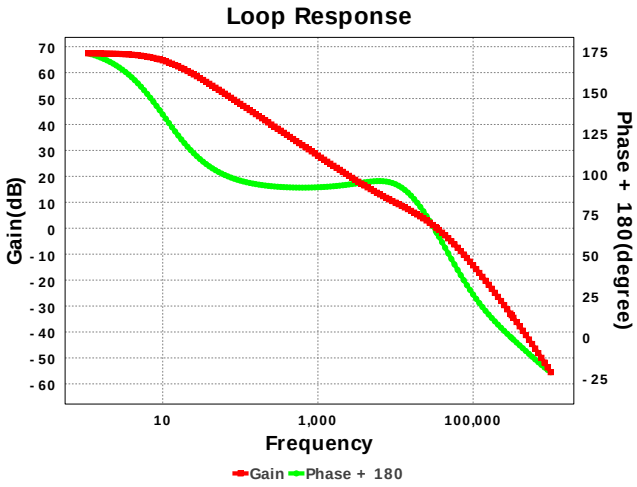

L Ipp
L Ipp(A)
0.900
0.875
0.850
0.825
0.800
0.775
0.750
0.725
0.700
0.675
0.650
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
Output Current (A)
Vin= 4.5V Vin= 5.0V Vin= 5.5V


IC Pd
IC Pd(W)
0.0425
0.0400
0.0375
0.0350
0.0325
0.0300
0.0275
0.0250
0.0225
0.0200
0.0175
0.0150
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
Output Current (A)
Vin= 4.5V Vin= 5.0V Vin= 5.5V


IC Iq Pd
IC Iq Pd(W)
0.01925
0.01900
0.01875
0.01850
0.01825
0.01800
0.01775
0.01750
0.01725
0.01700
0.01675
0.01650
0.01625
0.01600
0.01575
0.01550
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
Output Current (A)
Vin= 4.5V Vin= 5.0V Vin= 5.5V







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	248.742 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	261.525 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	952.975 mA	Current	Peak switch current in IC
4.	Iin Avg	281.9 mA	Current	Average input current
5.	L Ipp	905.95 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	370.841 mA	Current	Q Iavg
7.	BOM Count	14	General	Total Design BOM count
8.	FootPrint	183.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	460.0 kHz	General	Switching frequency
10.	IC Tolerance	12.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	13.631 mV	General	Voltage drop across the MosFET
12.	Pout	1.5 W	General	Total output power
13.	Total BOM	$2.69	General	Total BOM Cost
14.	Low Freq Gain	67.434 dB	Op_Point	Gain at 10Hz
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	34.123 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	55.009 %	Op_point	Duty cycle
19.	Efficiency	96.746 %	Op_point	Steady state efficiency
20.	Gain Marg	-33.554 dB	Op_point	Bode Plot Gain Margin
21.	IC Tj	31.649 degC	Op_point	IC junction temperature
22.	ICThetaJA	38.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	500.0 mA	Op_point	Iout operating point
24.	Phase Marg	64.138 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	5.5 V	Op_point	Vin operating point
26.	Vout p-p	16.386 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	123.745 µW	Power	Input capacitor power dissipation
28.	Cout Pd	307.78 µW	Power	Output capacitor power dissipation
29.	IC Drive Pd	10.12 mW	Power	Driver power dissipation
30.	IC Iq Pd	19.25 mW	Power	IC Iq Pd
31.	IC Pd	43.389 mW	Power	IC power dissipation

#	Name	Value	Category	Description
32.	L Pd	6.625 mW	Power	Inductor power dissipation
33.	M1 PdCond	5.055 mW	Power	M1 MOSFET switching losses
34.	M1 PdSw	12.65 mW	Power	M1 MOSFET switching losses
35.	M1 PdCond	3.674 mW	Power	M2 MOSFET switching losses
36.	M2 Pdbody	2.76 mW	Power	Power dissipation through lower FET
37.	Total Pd	50.452 mW	Power	Total Power Dissipation
38.	Vout Tolerance	3.004 %		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	LM20134	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Tip: The external sync feature can be enabled by checking the 'User Sync Frequency' check box. Please note that the default frequency internal to the device is below the external sync frequency range. (For example, LM20333 default frequency is 200KHz, but the synchable frequency range is from 250Khz to 1.5MHz)

2. **LM20134** Product Folder : http://www.ti.com/product/LM20134 : contains the data sheet and other resources.