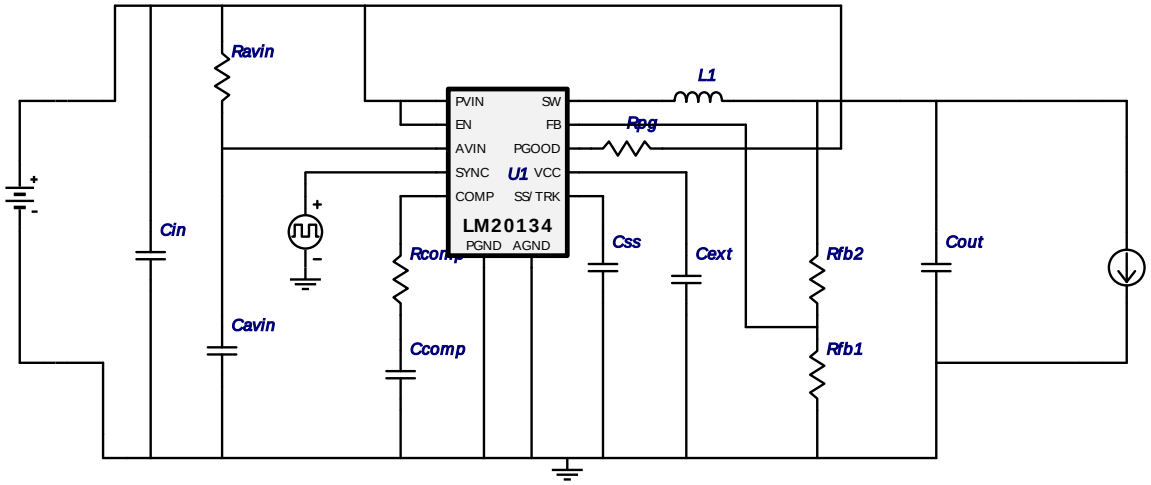
WEBENCH® Design Report

VinMin = 3.3V
VinMax = 3.4V
Vout = 1.0V
Iout = 3.4A

Device = LM20134MH/NOPB
Topology = Buck
Created = 1/30/13 7:02:46 AM
BOM Cost = $2.76
Total Pd = 0.71 W
Footprint = 220.0 mm2
BOM Count = 13

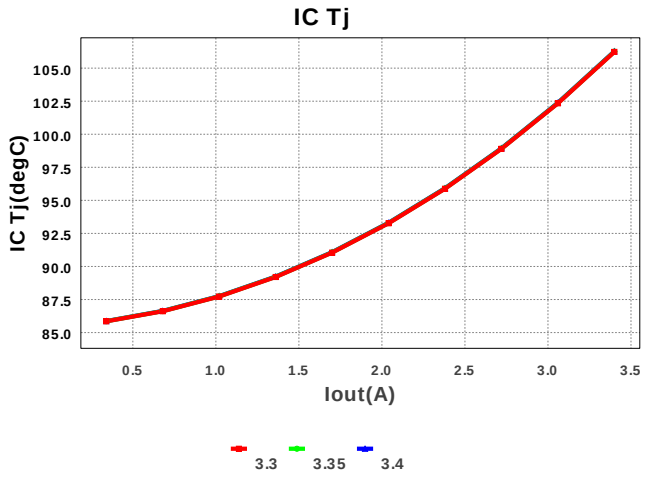
Design : 1228111/56 LM20134MH/NOPB
LM20134MH/NOPB 3.3V-3.4V to 1.0V @ 3.4A

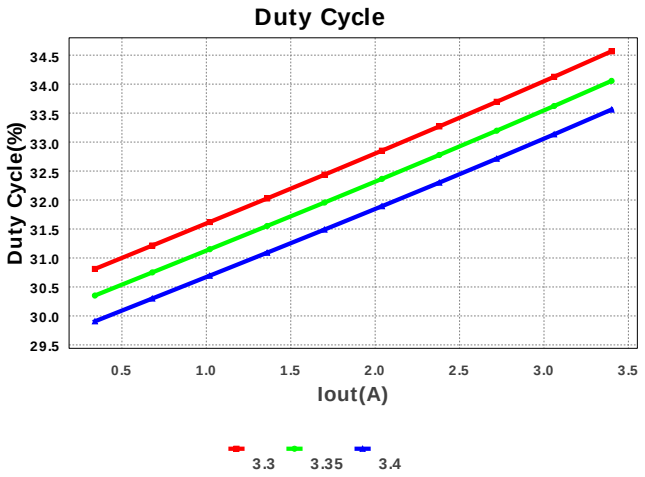


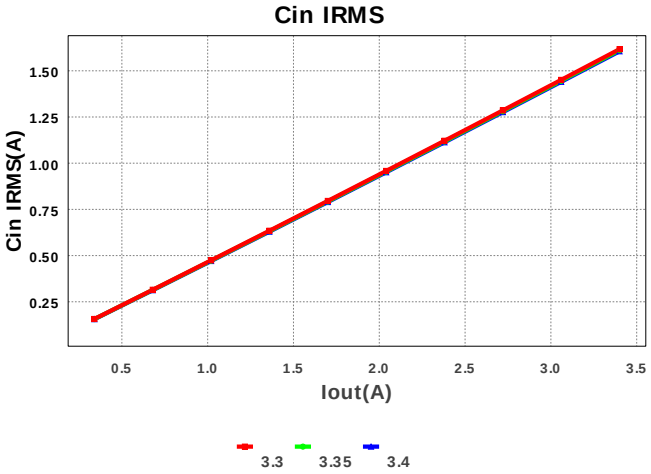
Electrical BOM

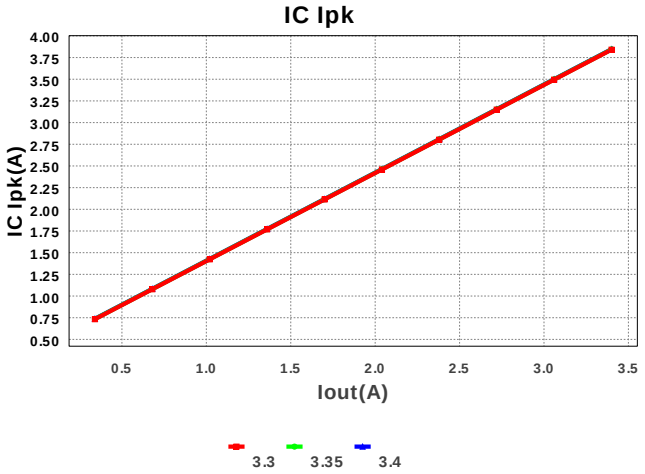
#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
1.	Cavin	MuRata	GRM155R61A105KE15D Series= X5R	1	$0.01	Cap= 1.0 µF VDC= 10.0 V IRMS= 0.0 A	0402 8mm2
2.	Ccomp	MuRata	GRM033R60J153KE01D Series= X5R	1	$0.01	Cap= 15.0 nF VDC= 6.3 V IRMS= 0.0 A	0201 6mm2
3.	Cext	MuRata	GRM155R61A105KE15D Series= X5R	1	$0.01	Cap= 1.0 µF VDC= 10.0 V IRMS= 0.0 A	0402 8mm2
4.	Cin	TDK	C3216X5R0J476M Series= X5R	1	$0.21	Cap= 47.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 4.1 A	1206 19mm2
5.	Cout	TDK	C3225X5R0J107M Series= X5R	1	$0.38	Cap= 100.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1210 23mm2
6.	Css	MuRata	GRM033R61A682KA01D Series= X5R	1	$0.03	Cap= 6.8 nF VDC= 10.0 V IRMS= 0.0 A	0201 6mm2
7.	L1	Coilcraft	XAL5030-222MEB	1	$0.56	L= 2.2 µH DCR= 10.0 mOhm	XAL5030 54mm2
8.	Ravin	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	1	$0.01	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
9.	Rcomp	Vishay-Dale	CRCW04021K82FKED Series= CRCW..e3	1	$0.01	Res= 1.82 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
10.	Rfb1	Vishay-Dale	CRCW040210K2FKED Series= CRCW..e3	1	$0.01	Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2

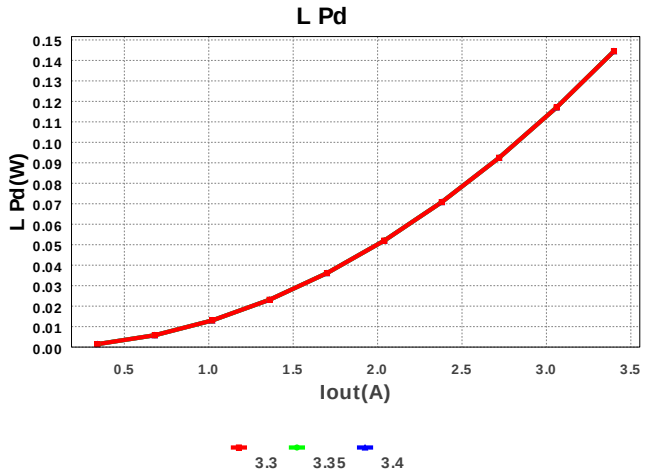
#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
11.	Rfb2	Vishay-Dale	CRCW04022K55FKED Series= CRCW..e3	1	$0.01	Res= 2.55 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
12.	Rpg	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	1	$0.01	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
13.	U1	Texas Instruments	LM20134MH/NOPB	1	$1.50	Switcher	MXA16A 59mm2

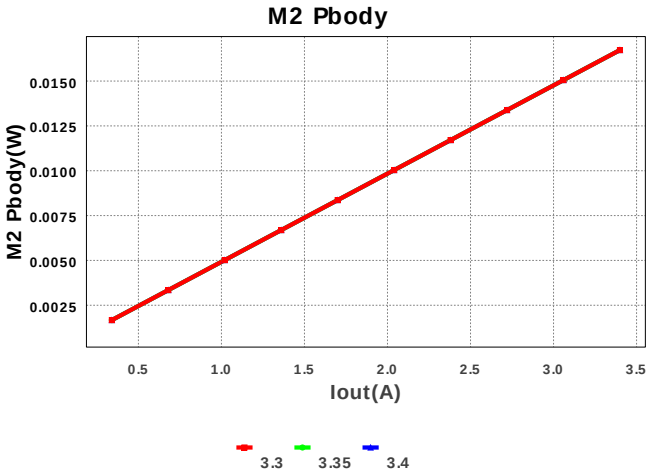




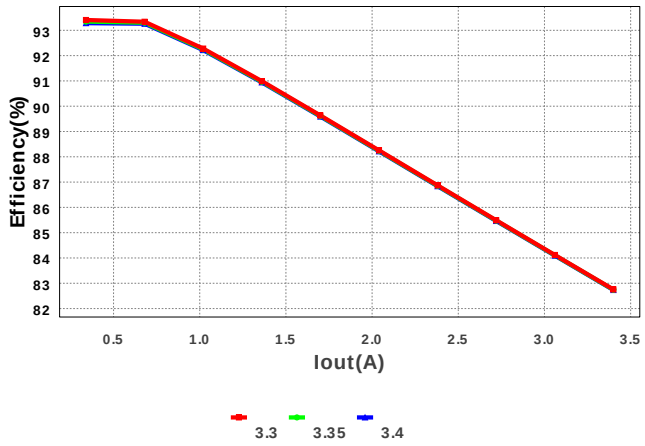




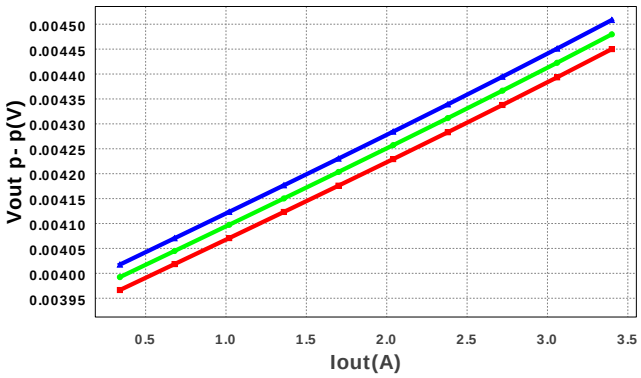




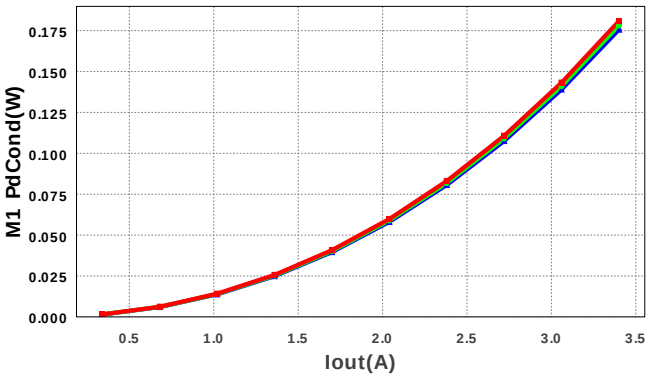
Efficiency



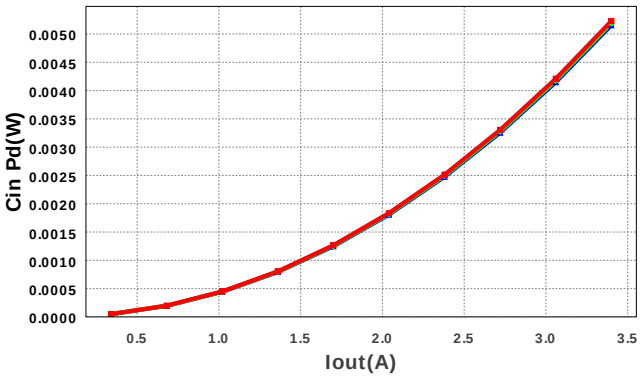
Vout p- p



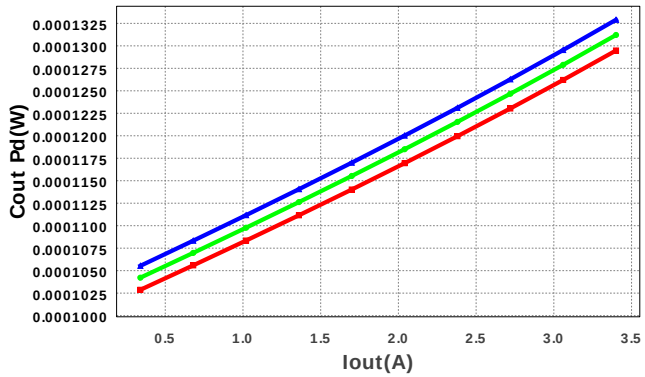
M1 PdCond



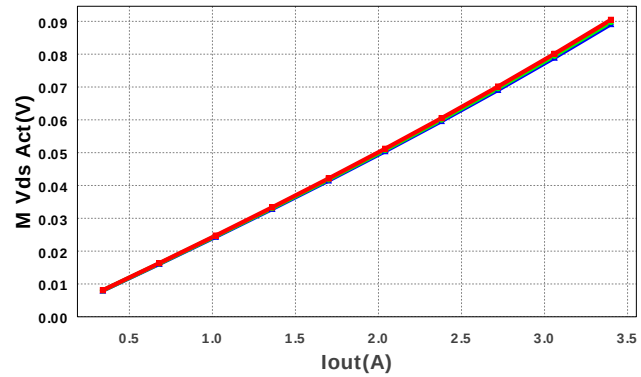
Cin Pd

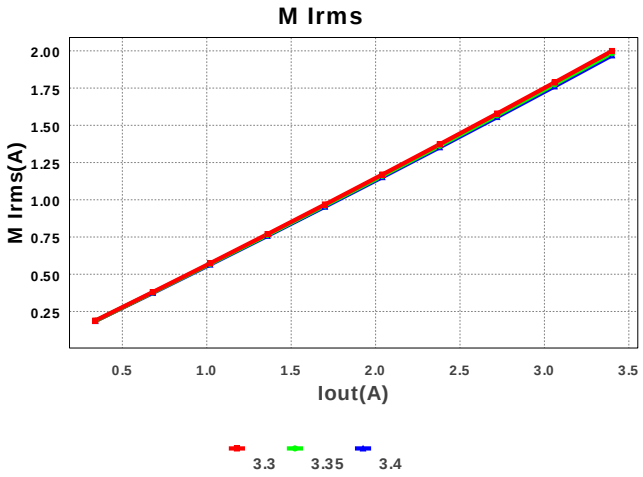


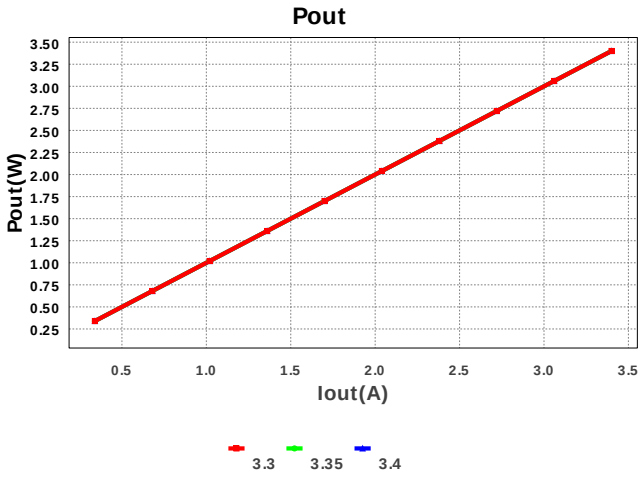
Cout Pd

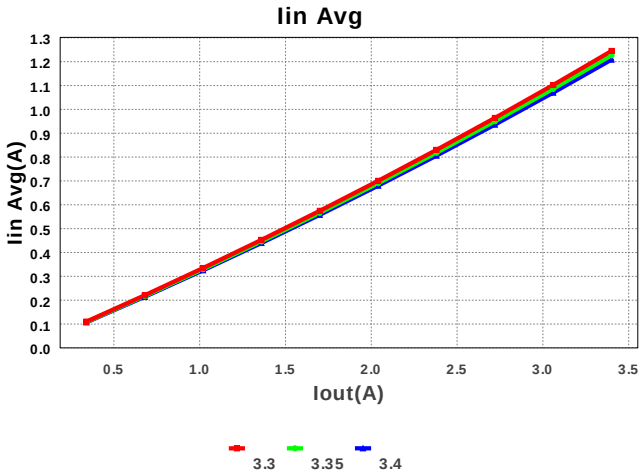


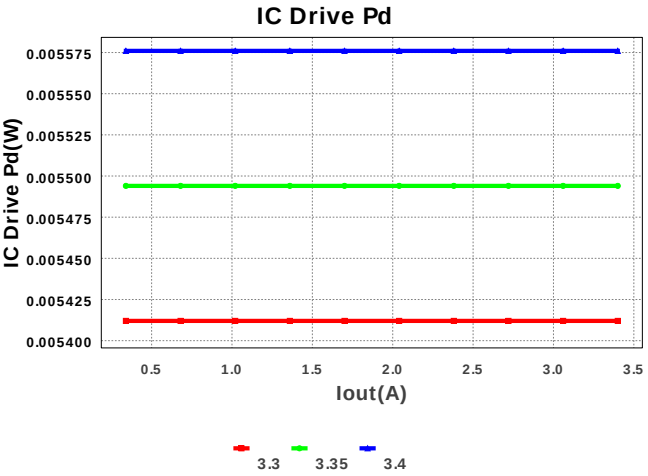
M Vds Act

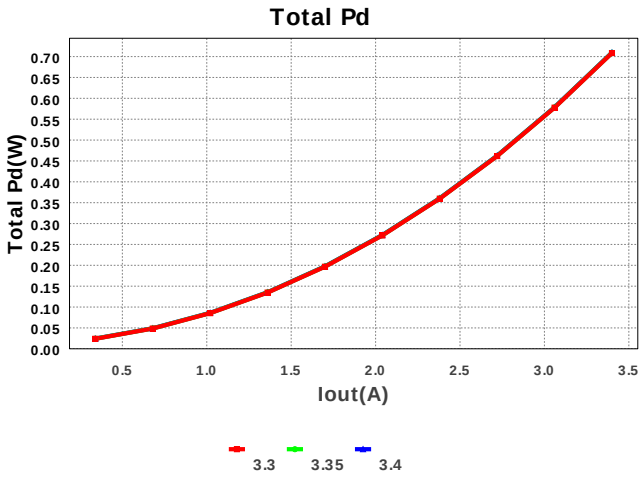


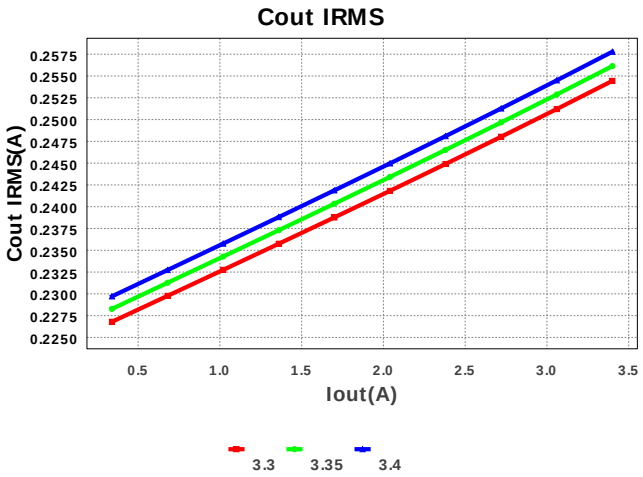


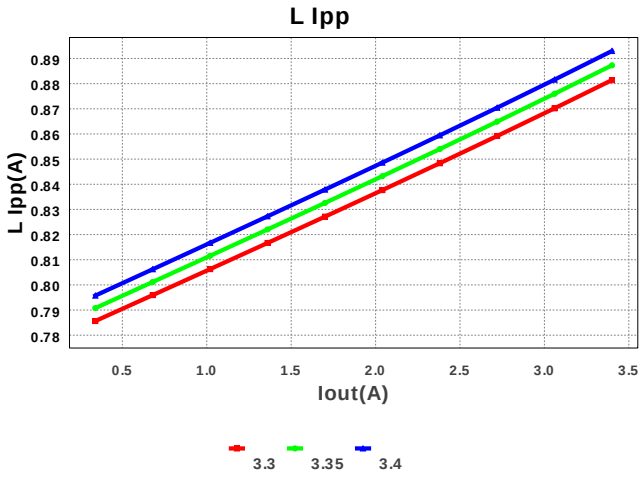


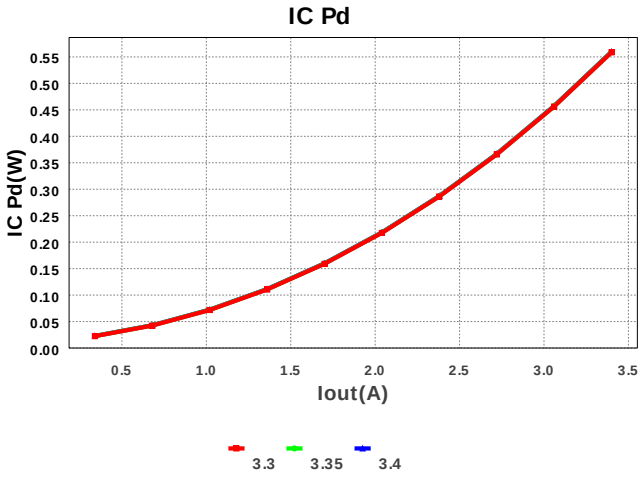


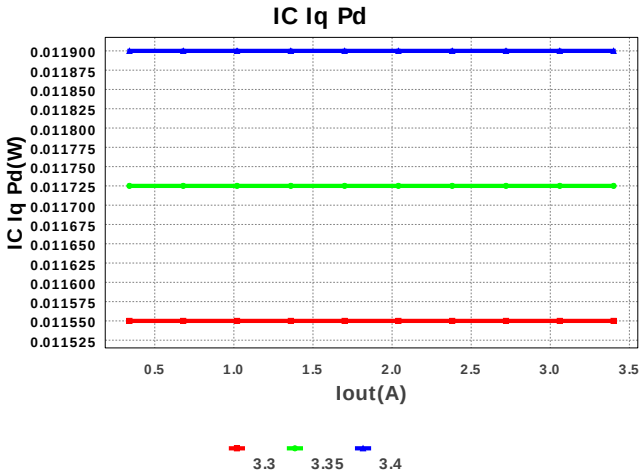


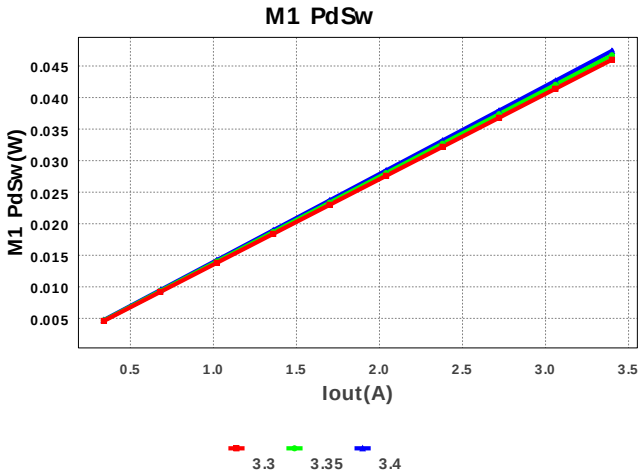


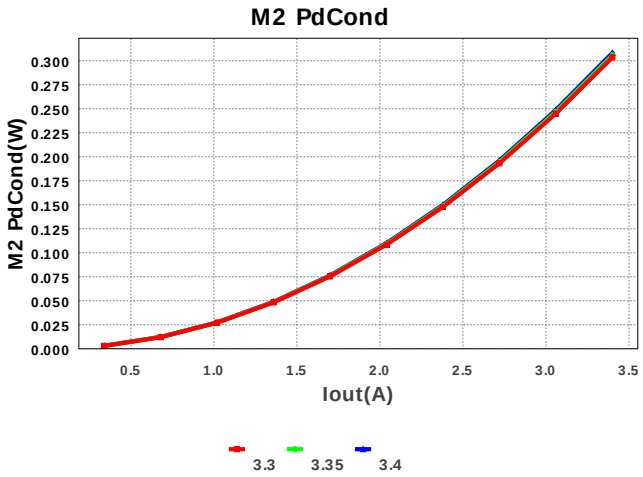












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.605 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	257.78 m A	Current	Output capacitor RMS ripple current
3.	IC Ipk	3.846 A	Current	Peak switch current in IC
4.	Iin Avg	1.209 A	Current	Average input current
5.	L Ipp	892.977 m A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	1.97 A	Current	Q Iavg
7.	BOM Count	13.0	General	Total Design BOM count
8.	FootPrint	220.0 mm2	General	Total Foot Print Area of BOM components
9.	Frequency	410.0 k Hz	General	Switching frequency
10.	IC Tolerance	12.0 m V	General	IC Feedback Tolerance
11.	M Vds Act	89.158 m V	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	3.4 W	General	Total output power
14.	Total BOM	$2.76	General	Total BOM Cost
15.	Vout OP	1.0 V	Op_Point	Operational Output Voltage
16.	Cross Freq	34.196 k Hz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	33.561 %	Op_point	Duty cycle
18.	Efficiency	82.733 %	Op_point	Steady state efficiency
19.	IC Tj	106.273 degC	Op_point	IC junction temperature
20.	ICThetaJA	38.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	3.4 A	Op_point	Iout operating point
22.	Phase Marg	69.041 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	3.4 V	Op_point	Vin operating point
24.	Vout p-p	4.508 m V	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	5.155 m W	Power	Input capacitor power dissipation
26.	Cout Pd	132.901 µ W	Power	Output capacitor power dissipation
27.	IC Drive Pd	5.576 m W	Power	Driver power dissipation
28.	IC Iq Pd	11.9 m W	Power	IC Iq Pd
29.	IC Pd	559.829 m W	Power	IC power dissipation
30.	L Pd	144.5 m W	Power	Inductor power dissipation
31.	M1 PdCond	175.613 m W	Power	M1 MOSFET switching losses
32.	M1 PdSw	47.396 m W	Power	M1 MOSFET switching losses
33.	M1 PdCond	308.192 m W	Power	M2 MOSFET switching losses
34.	Total Pd	709.601 m W	Power	Total Power Dissipation
35.	M2 Pbody	16.728 m W	Unknown	Power dissipation through lower FET

Design Inputs

#	Name	Value	Description
1.	Iout	3.4 A	Maximum Output Current
2.	Iout1	3.4 Amps	Output Current #1
3.	VinMax	3.4 V	Maximum input voltage
4.	VinMin	3.3 V	Minimum input voltage
5.	Vout	1.0 V	Output Voltage
6.	Vout1	1.0 Volt	Output Voltage #1
7.	base_pn	LM20134	National Based Product Number
8.	source	DC	Input Source Type
9.	Ta	85.0 degC	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.