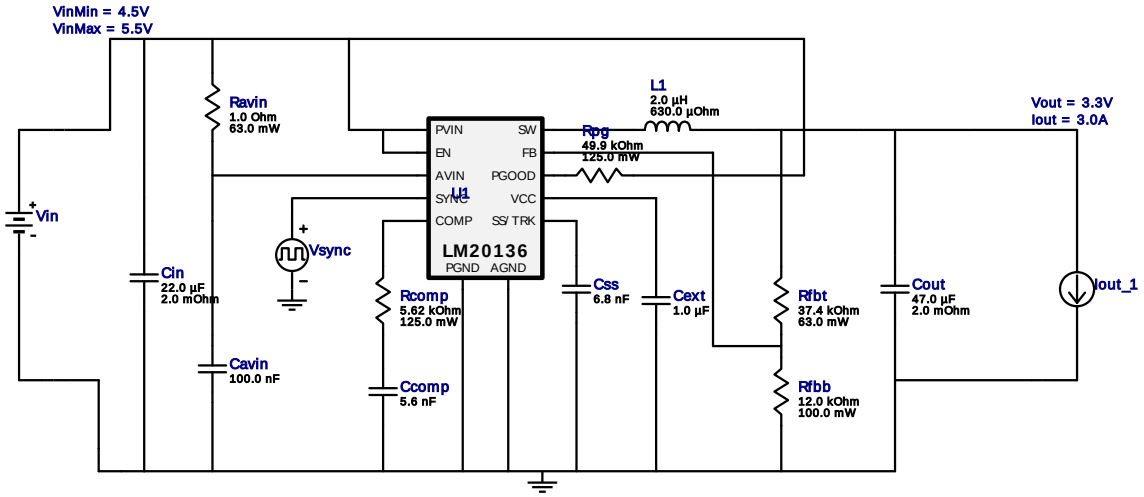
VinMin = 4.5V
VinMax = 5.5V
Vout = 3.3V
Iout = 3.0A

Device = LM20136MH/NOPB
Topology = Buck
创建 = 5/11/13 7:04:17 PM
BOM成本 = $2.99
Total Pd = 0.34W
大小 = 645.0mm2
BOM 数量 = 13

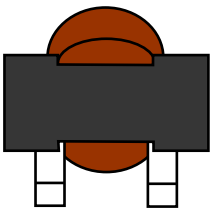
WEBENCH® 设计报告

Design : 3728439/21 LM20136MH/NOPB
LM20136MH/NOPB 4.5V-5.5V to 3.3V @ 3.0A



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.

电气材料清单

#	名称	制造商	零件编号	属性	Qty	Price	大小
1.	Cavin	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
2.	Ccomp	Yageo America	CC0805KRX7R9BB562 Series= X7R	Cap= 5.6 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
3.	Cext	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 µF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 13mm2
4.	Cin	TDK	C3225X5R1A226M Series= X5R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 10.0 V IRMS= 3.2 A	1	$0.19	1210 23mm2
5.	Cout	TDK	C3216X5R0J476M Series= X5R	Cap= 47.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 4.1 A	1	$0.21	1206 19mm2
6.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
7.	L1	Coilcraft	SER2009-202MLB	L= 2.0 µH DCR= 630.0 µOhm	1	$0.84	 SER2009 438mm2
8.	Ravin	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2

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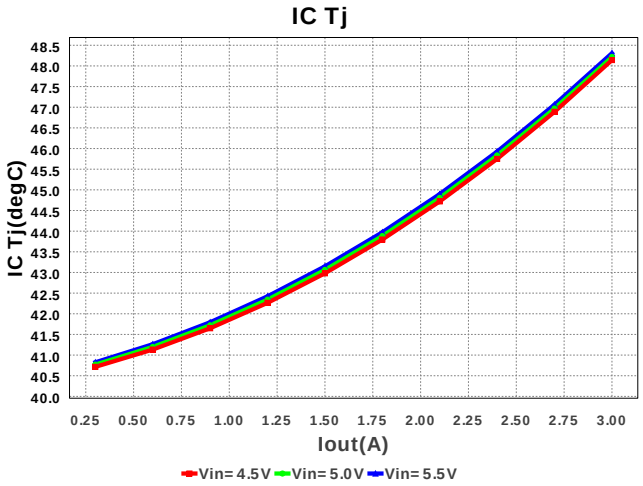
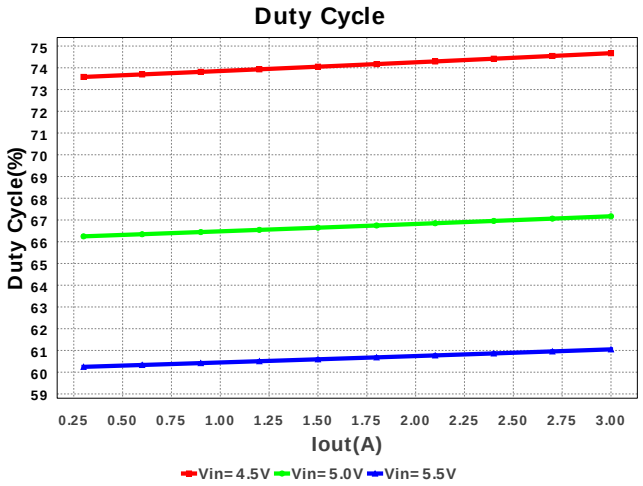
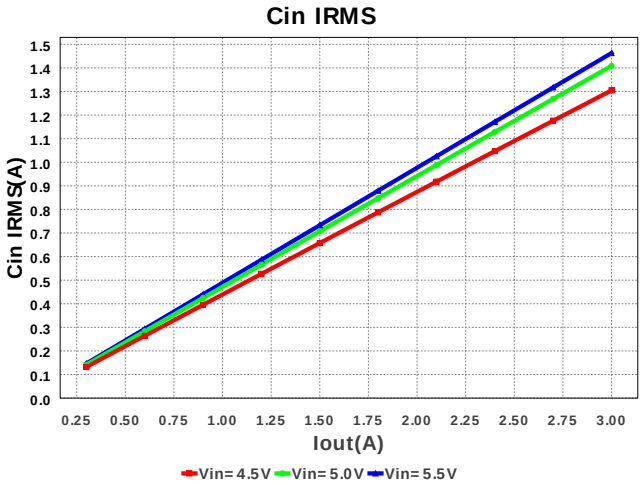
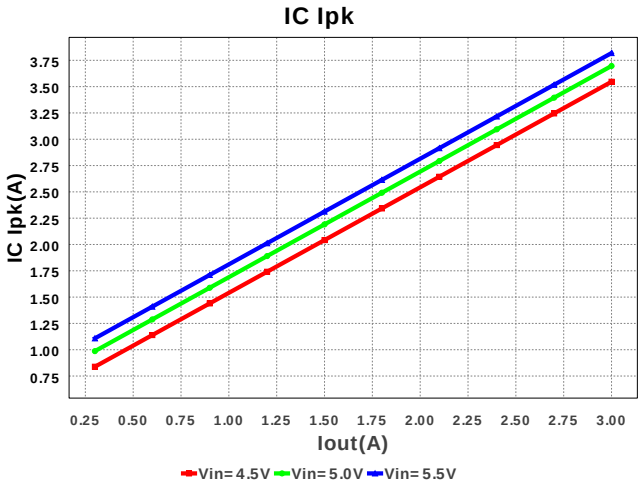
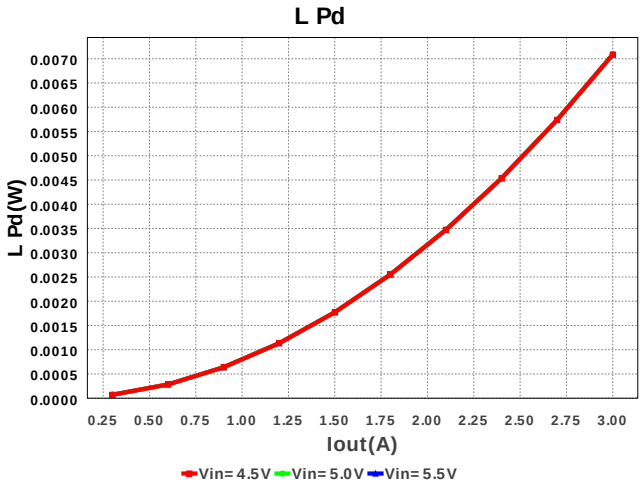
#	名称	制造商	零件编号	属性	Qty	Price	大小
9.	Rcomp	Vishay-Dale	CRCW08055K62FKEA Series= CRCW..e3	Res= 5.62 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 13mm2
10.	Rfbb	Susumu Co Ltd	RR1220P-123-D Series= 264	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 13mm2
11.	Rfbt	Vishay-Dale	CRCW040237K4FKED Series= CRCW..e3	Res= 37.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2
12.	Rpg	Vishay-Dale	CRCW080549K9FKEA Series= CRCW..e3	Res= 49.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 13mm2
13.	U1	Texas Instruments	LM20136MH/NOPB	Switcher	1	$1.65	MXA16A 59mm2

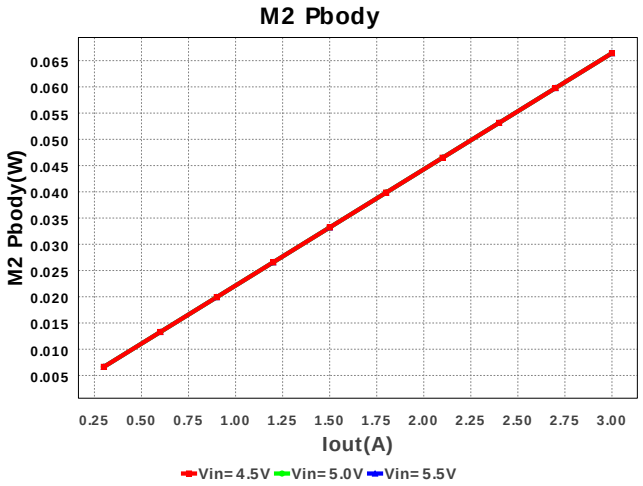


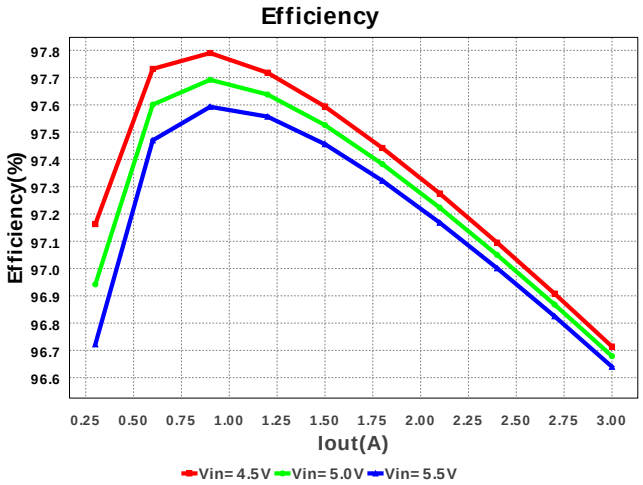


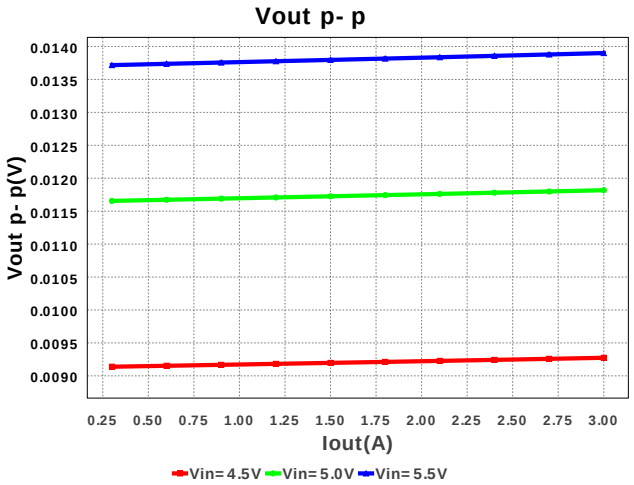


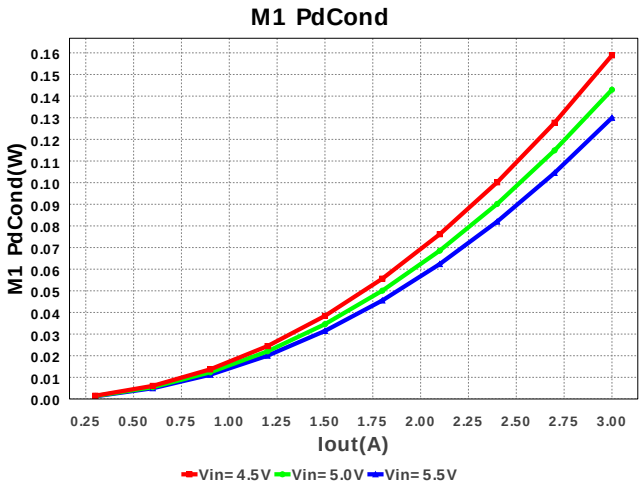


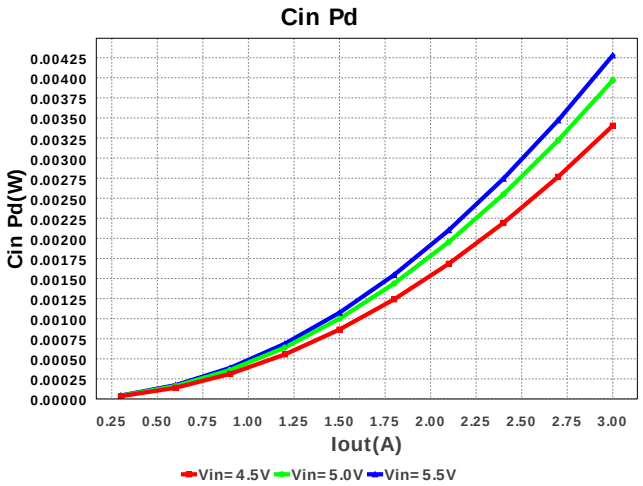

L Pd
L Pd(W)
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

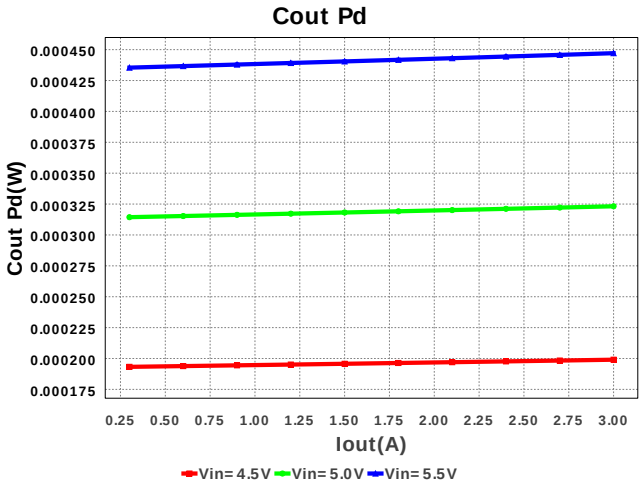

M2 Pbody
M2 Pbody(W)
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

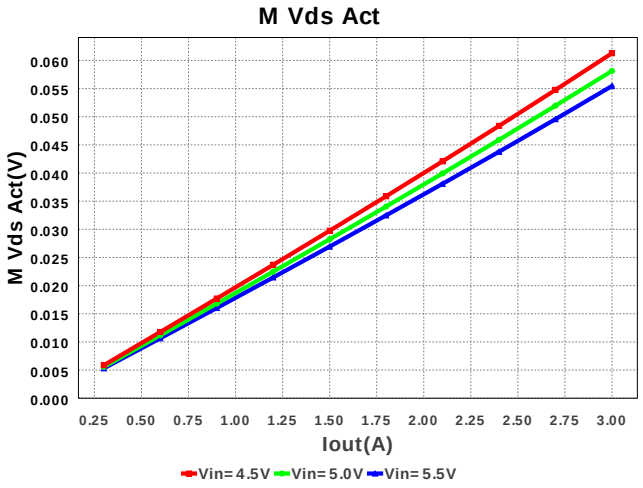

Efficiency
Efficiency(%)
97.8
97.7
97.6
97.5
97.4
97.3
97.2
97.1
97.0
96.9
96.8
96.7
96.6
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

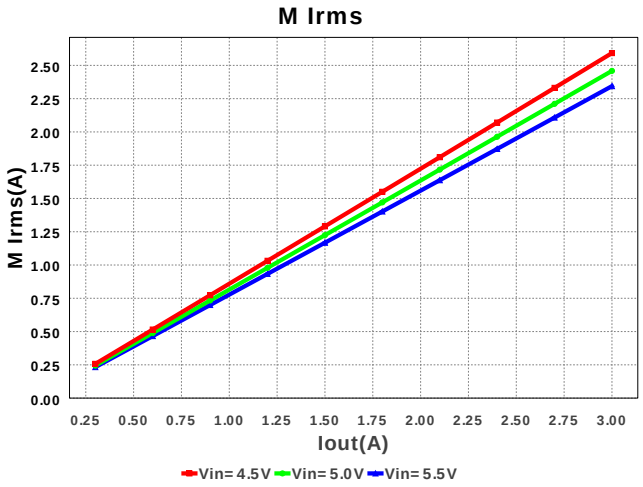

Vout p- p
Vout p- p(V)
0.0140
0.0135
0.0130
0.0125
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

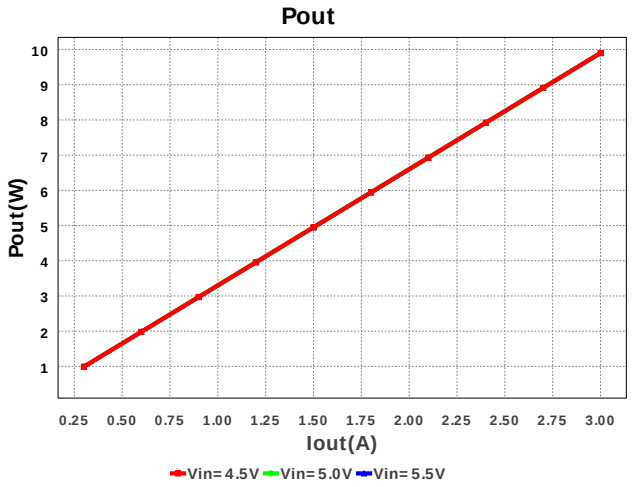

M1 PdCond
M1 PdCond(W)
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

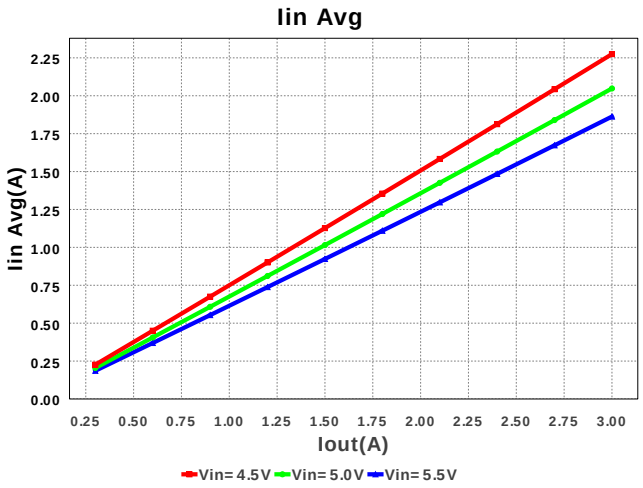

Cin Pd
Cin Pd(W)
0.00425
0.00400
0.00375
0.00350
0.00325
0.00300
0.00275
0.00250
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
0.00025
0.00000
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

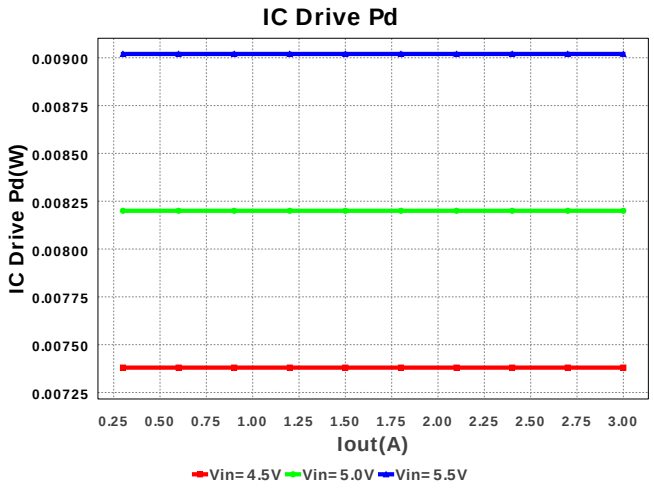












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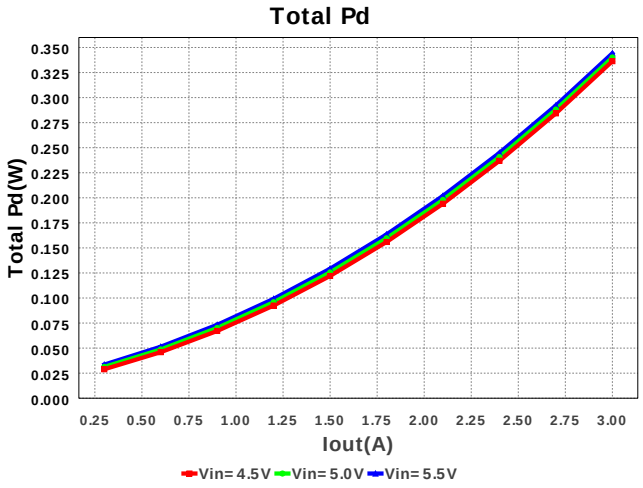
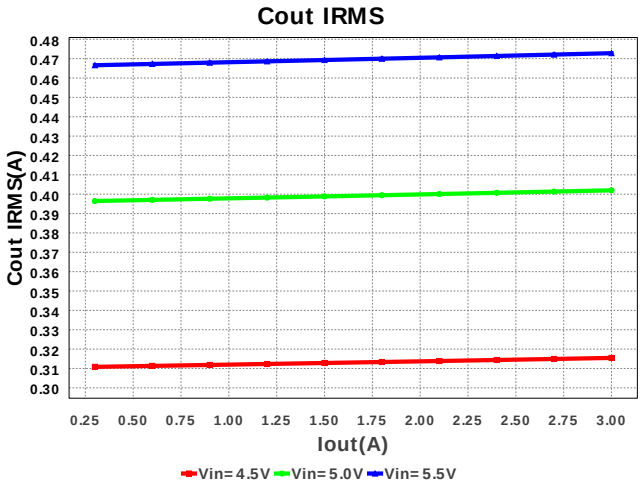
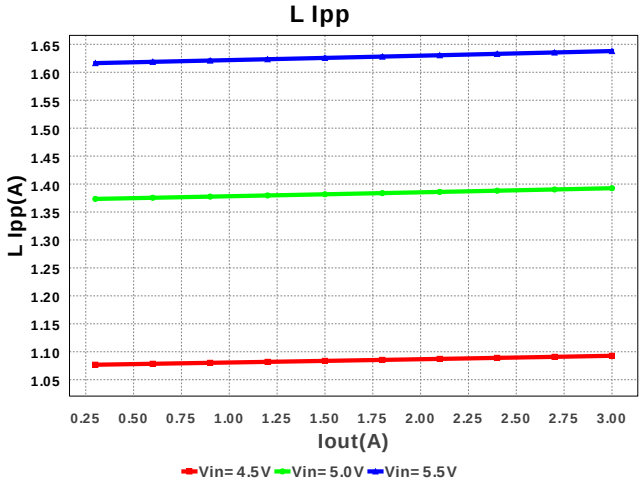
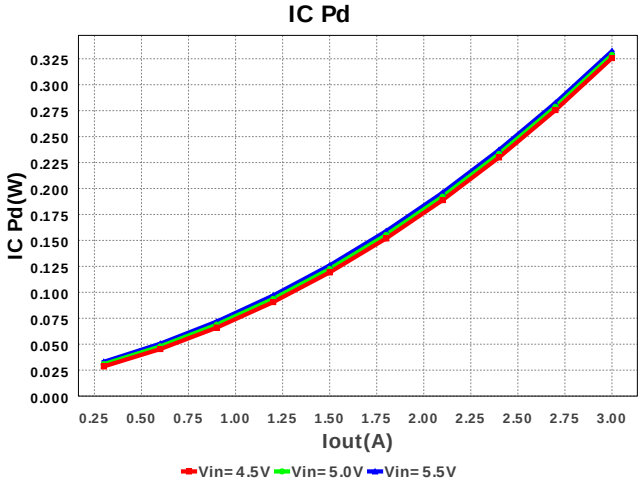
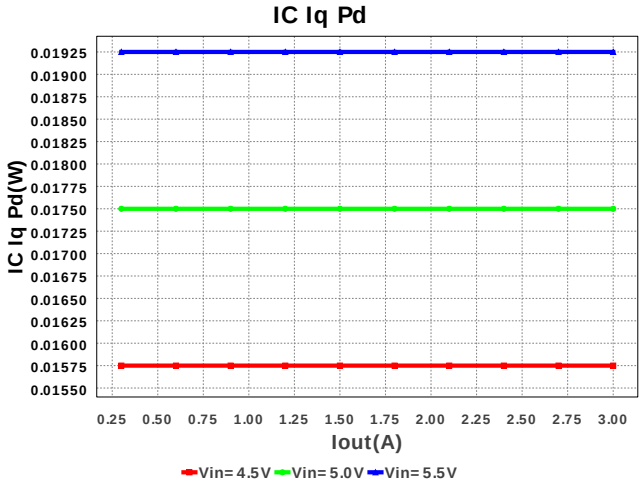
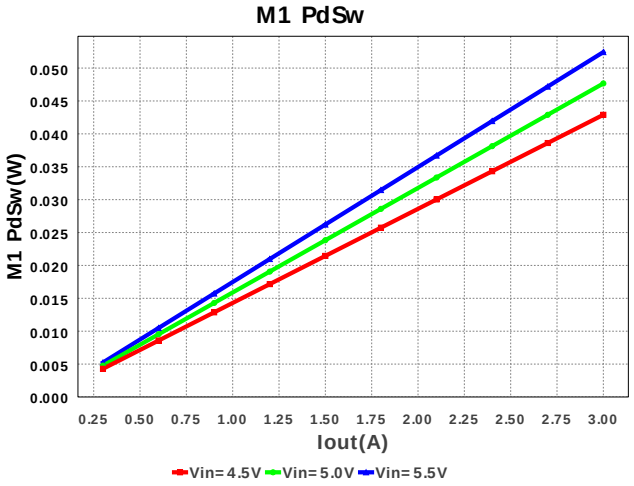

Total Pd
Total Pd(W)
0.350
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V

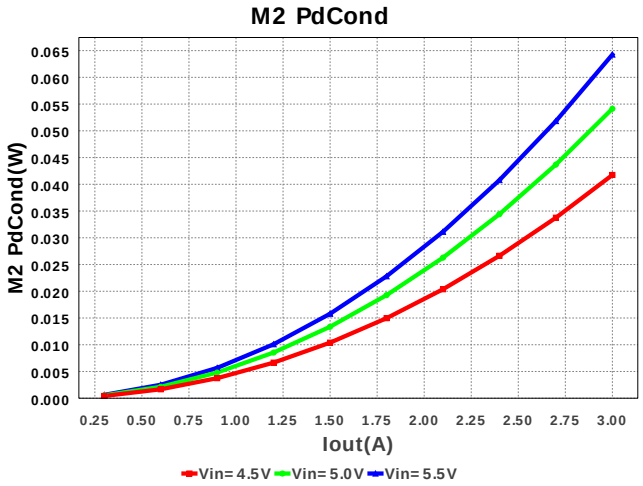

Cout IRMS
Cout IRMS(A)
0.48
0.47
0.46
0.45
0.44
0.43
0.42
0.41
0.40
0.39
0.38
0.37
0.36
0.35
0.34
0.33
0.32
0.31
0.30
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V


L Ipp
L Ipp(A)
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V


IC Pd
IC Pd(W)
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(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
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V


M1 PdSw
M1 PdSw(W)
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Iout(A)
Vin=4.5V Vin=5.0V Vin=5.5V



工作数值

#	名称	数值	类别	说明
1.	Cin IRMS	1.463 A	Current	输入电容器均方根纹波电流
2.	Cout IRMS	472.827 mA	Current	输出电容器均方根纹波电流
3.	IC Ipk	3.819 A	Current	电路内的峰值开关电流
4.	Iin Avg	1.863 A	Current	平均输入电流
5.	L Ipp	1.638 A	Current	峰值到峰值电感器纹波电流
6.	M1 Irms	2.344 A	Current	Q Iavg
7.	BOM 数量	13	General	Total Design BOM count
8.	大小	645.0 mm2	General	BOM组件的总所占面积
9.	频率	410.0 kHz	General	开关频率
10.	IC Tolerance	12.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	55.453 mV	General	Voltage drop across the MosFET
12.	模式	CCM	General	传导模式
13.	Pout	9.9 W	General	总输出功率
14.	总 BOM	$2.99	General	Total BOM Cost
15.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
16.	交叉频率	40.523 kHz	Op_point	波特图交叉频率
17.	占空比	61.05 %	Op_point	占空比
18.	效率	96.64 %	Op_point	稳态效率
19.	IC Tj	48.309 degC	Op_point	电路接点温度
20.	ICThetaJA	25.0 degC/W	Op_point	电路接点到环境热敏电阻
21.	IOUT_OP	3.0 A	Op_point	Iout 操作点
22.	相位裕度	82.387 deg	Op_point	波特图相位裕度
23.	VIN_OP	5.5 V	Op_point	Vin操作点
24.	Vout p-p	13.901 mV	Op_point	峰值到峰值输出纹波电压
25.	Cin Pd	4.28 mW	Power	输入电容器功率耗散
26.	Cout Pd	447.13 µW	Power	输出电容器功率耗散
27.	IC Drive Pd	9.02 mW	Power	驱动器功率耗散
28.	电路静态电流功率耗散	19.25 mW	Power	电路静态电流功率耗散
29.	IC Pd	332.342 mW	Power	电路功率耗散
30.	L Pd	7.088 mW	Power	电感器功率耗散
31.	M1 PdCond	129.984 mW	Power	M1 MOSFET 开关损耗
32.	M1 PdSw	52.429 mW	Power	M1 MOSFET 开关损耗
33.	M1 PdCond	64.259 mW	Power	M2 MOSFET 开关损耗
34.	整体 Pd	344.208 mW	Power	总功率耗散
35.	M2 Pbody	66.42 mW	Unknown	较低功率FET的功率耗散

设计输入

#	名称	数值	说明
1.	输出电流	3.0 A	最大输出电流
2.	Iout1	3.0 Amps	Output Current #1
3.	Vin 最大	5.5 V	最高输入电压
4.	Vin 最小	4.5 V	最低输入电压
5.	输出电压:	3.3 V	输出电压
6.	Vout1	3.3 Volt	Output Voltage #1
7.	base_pn	LM20136	美国国家半导体的产品编号
8.	源	DC	输入源类别
9.	工作环境温度	40.0 degC	环境温度

设计协助

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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. LM20136 Product Folder : http://www.ti.com/product/lm20136 : contains the data sheet and other resources.

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