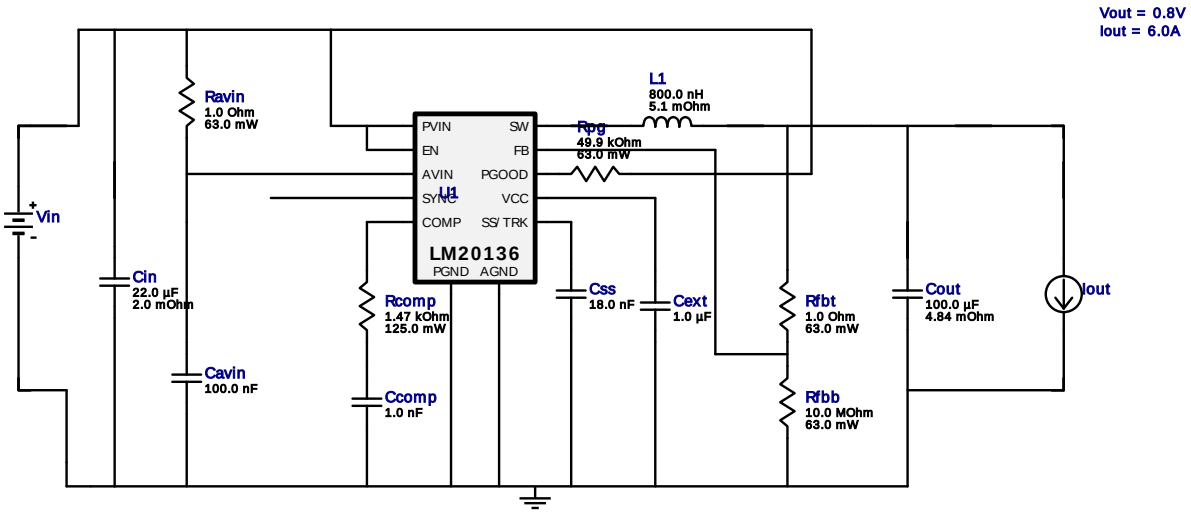
WEBENCH® Design Report

VinMin = 3.0V
VinMax = 5.0V
Vout = 0.8V
Iout = 6.0A

Device = LM20136MH/NOPB
Topology = Buck
Created = 8/19/16 8:18:55 PM
BOM Cost = $2.97
BOM Count = 13
Total Pd = 1.32W

Design : 4343161/2 LM20136MH/NOPB
LM20136MH/NOPB 3.0V-5.0V to .80V @ 6.0A



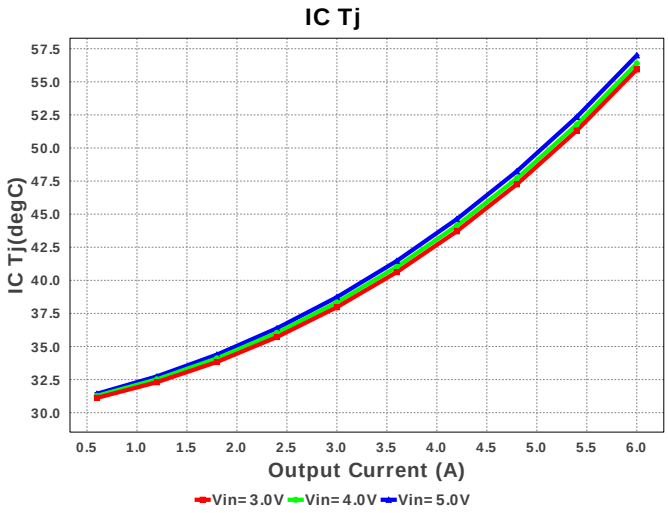
My Comments

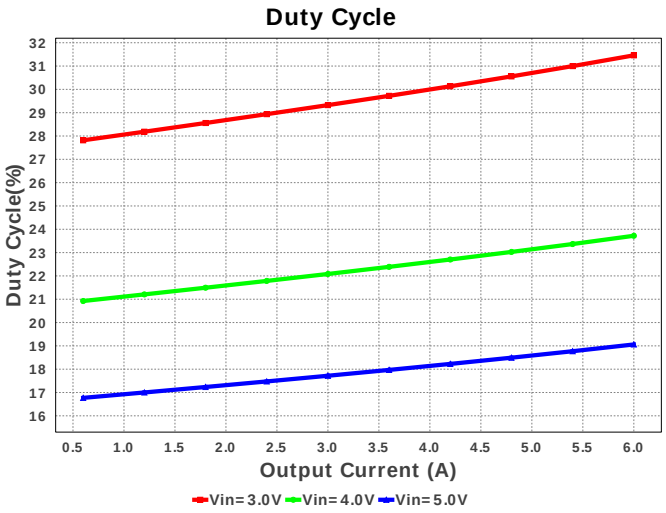
No comments

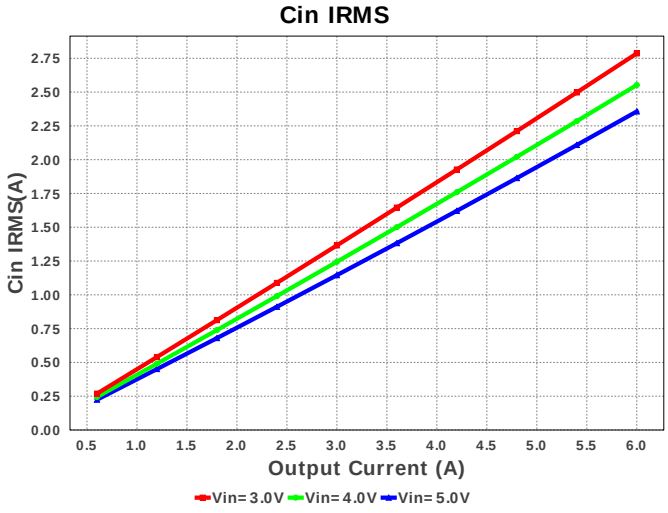
Electrical BOM

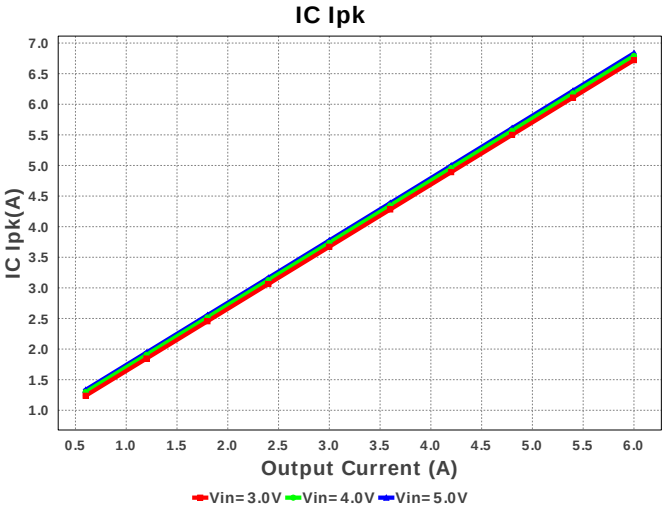
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cavin	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Cext	Taiyo 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	GRM31CD80G107ME39L Series= X6T	Cap= 100.0 uF ESR= 4.84 mOhm VDC= 4.0 V IRMS= 4.3381 A	1	$0.14	1206_190 11 mm²
6.	Css	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	L1	Coilcraft	XAL5030-801MEB	L= 800.0 nH DCR= 5.1 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	Panasonic	ERJ-6ENF1471V Series= ERJ-6E	Res= 1.47 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²

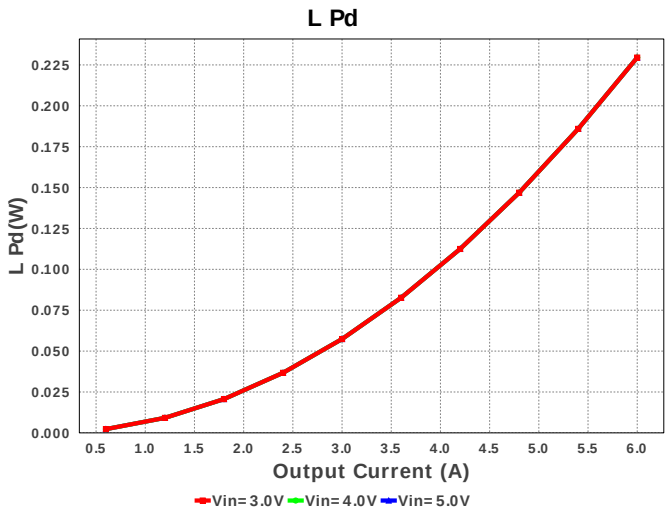
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rfbb	Vishay-Dale	CRCW040210M0FKED Series= CRCW..e3	Res= 10.0 MOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	Rfbt	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
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	LM20136MH/NOPB	Switcher	1	$1.98	 MXA16A 59 mm^2

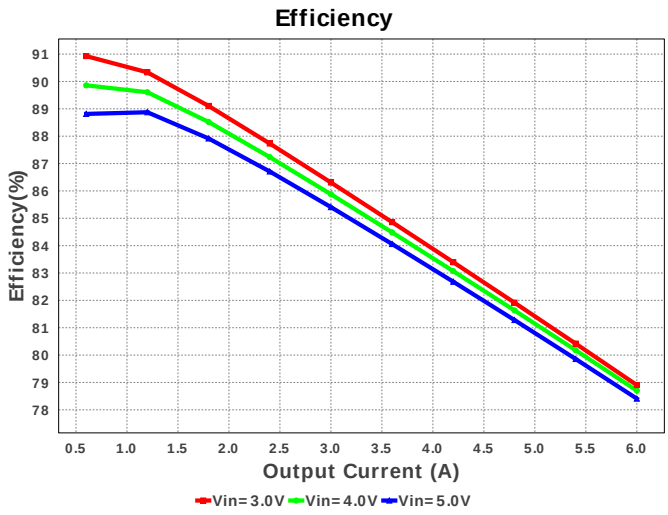


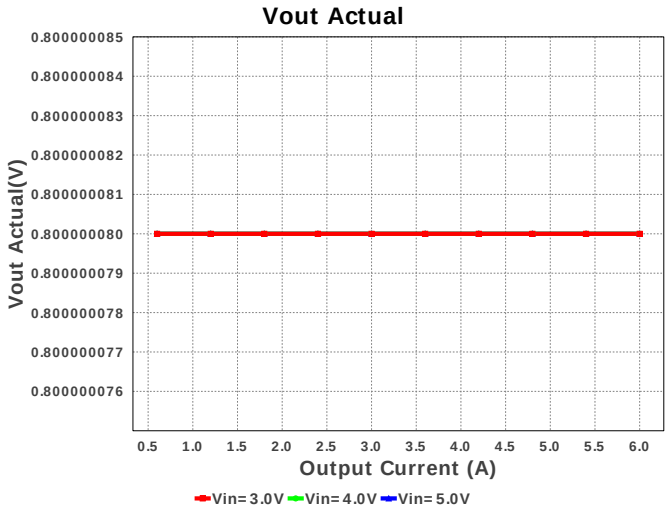


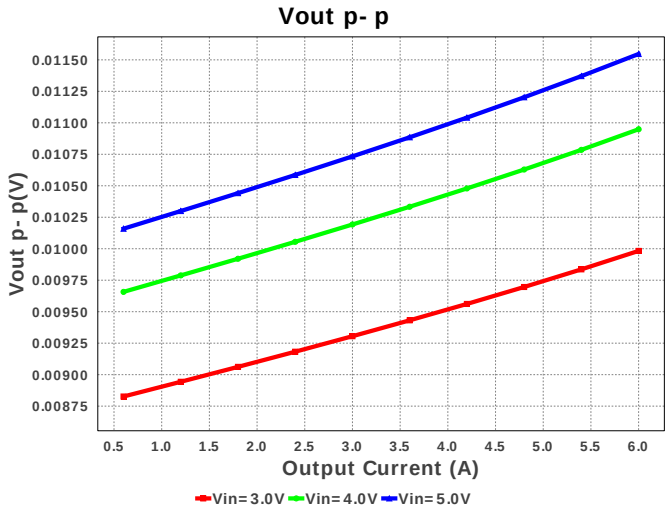


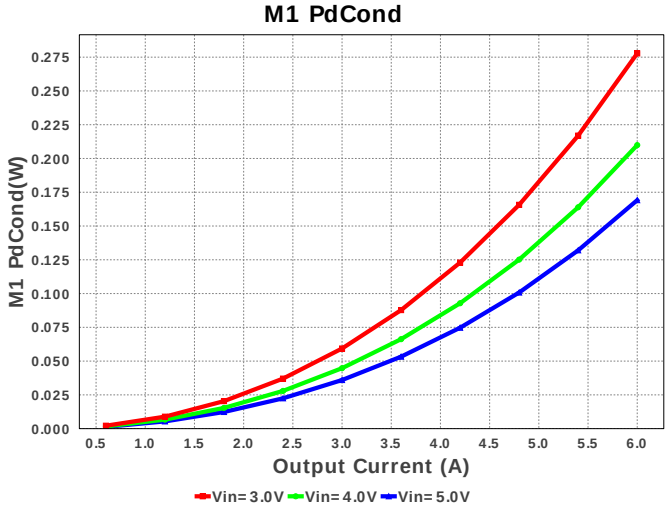


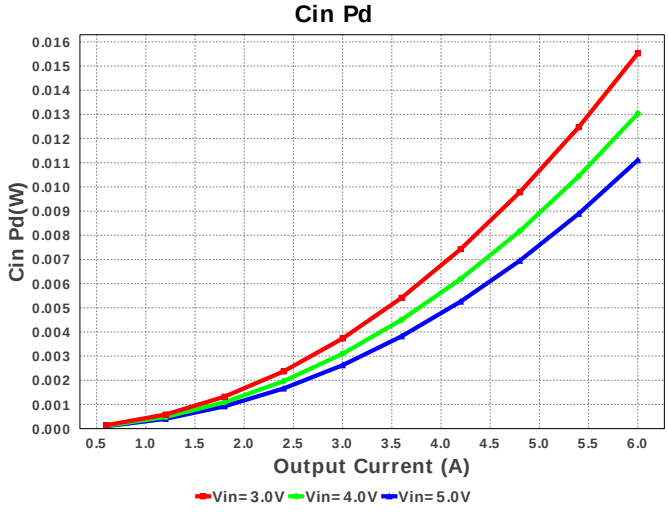


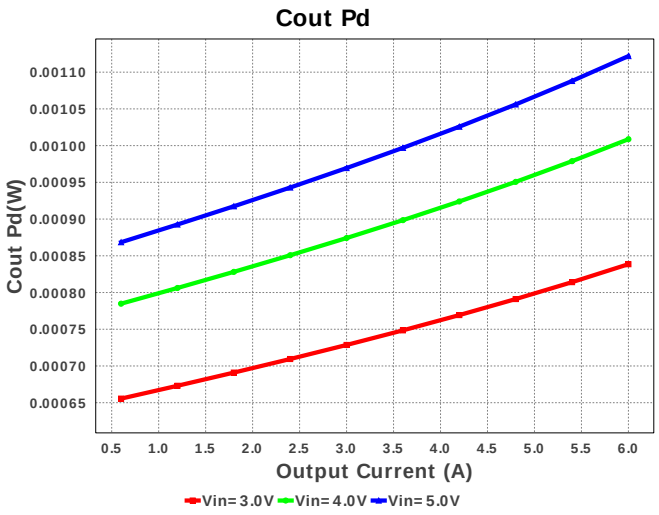


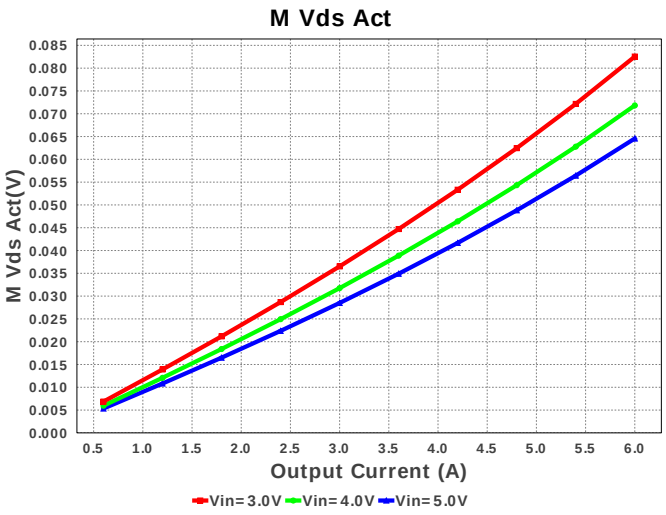


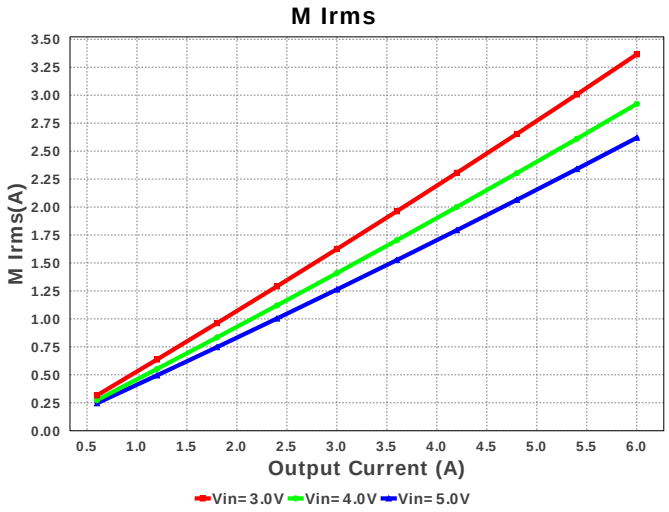


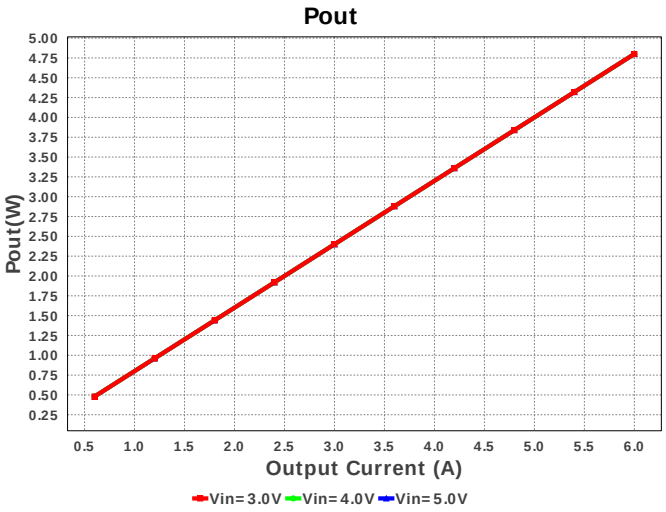


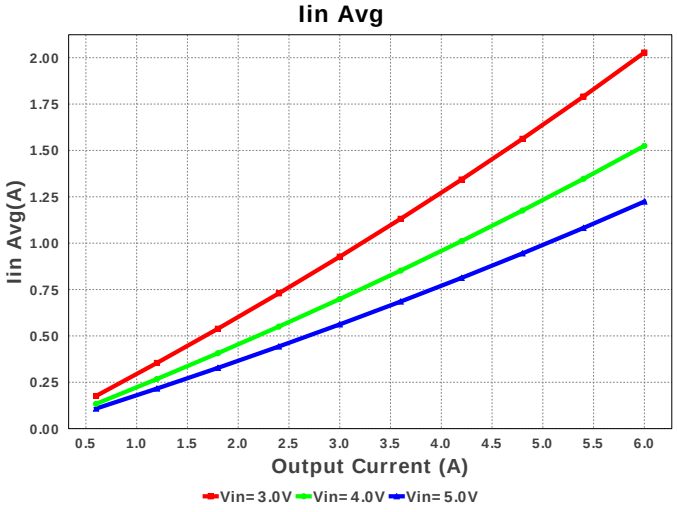


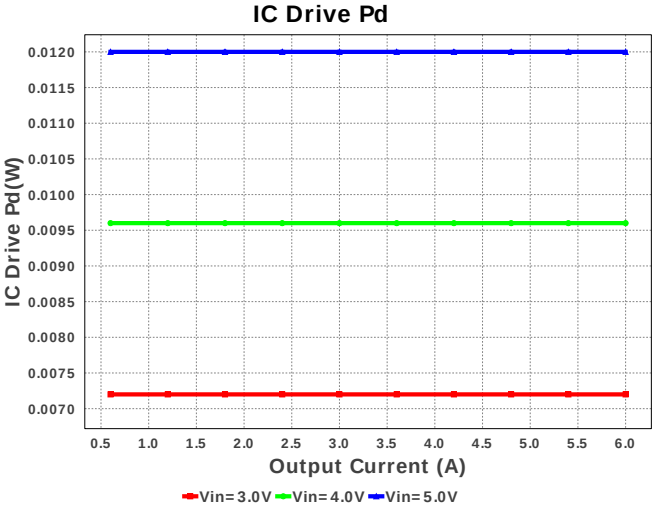


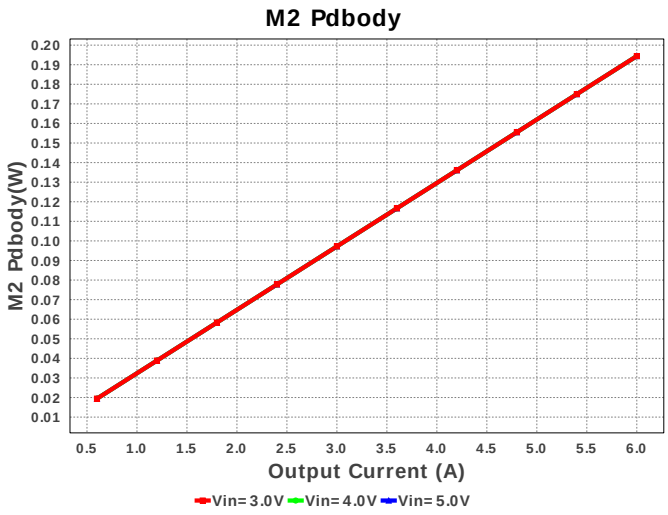


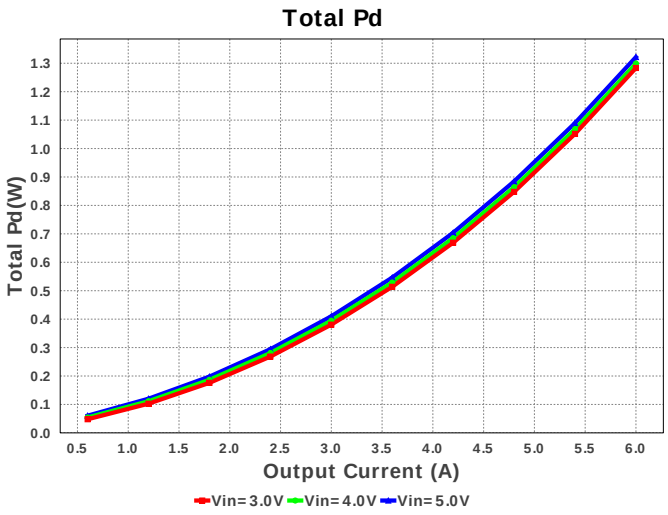


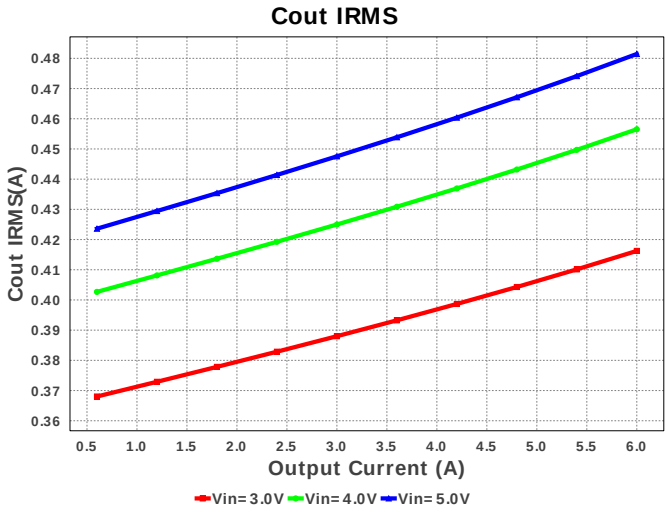


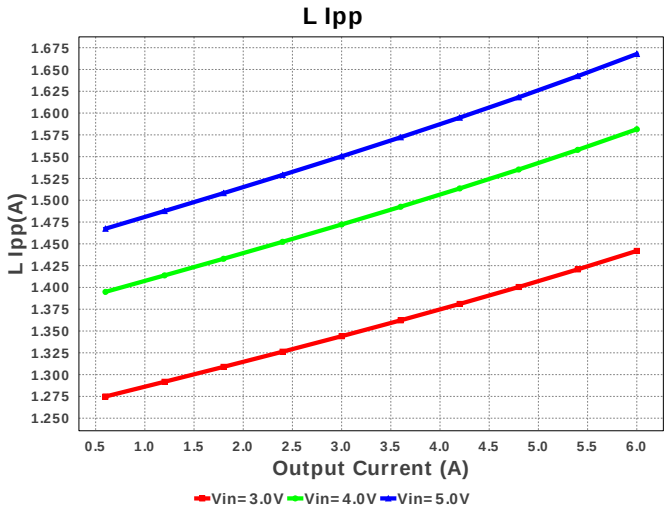


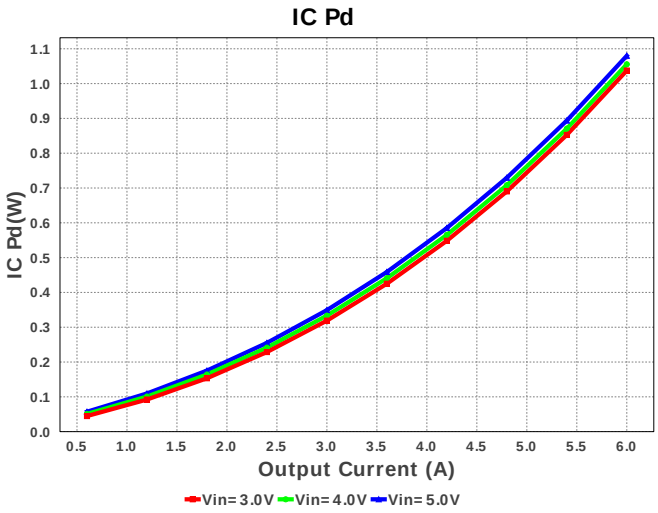


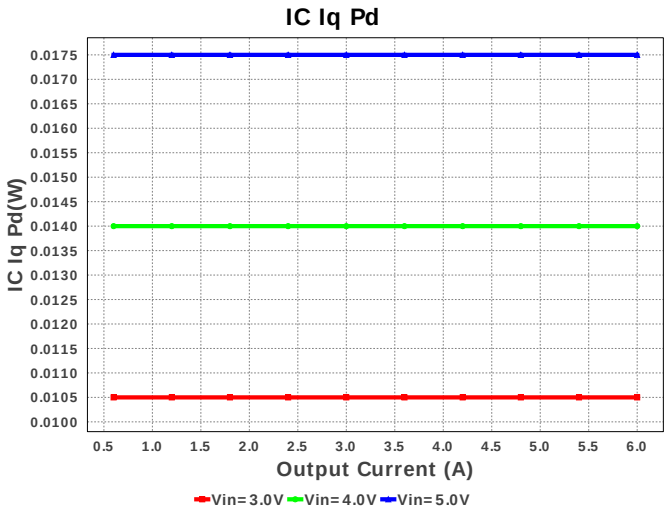


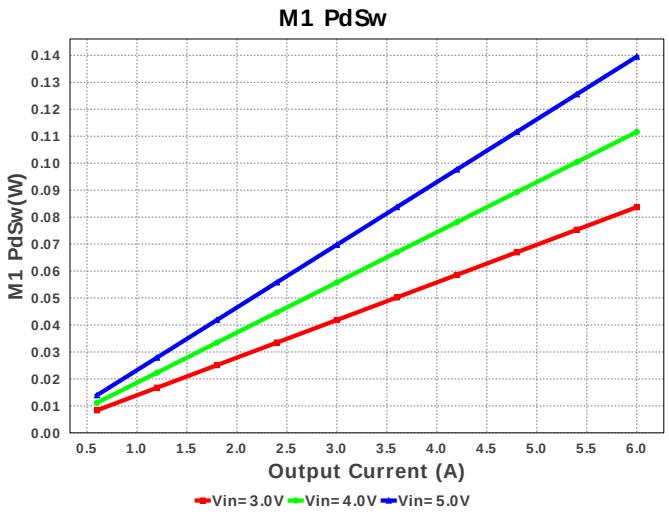


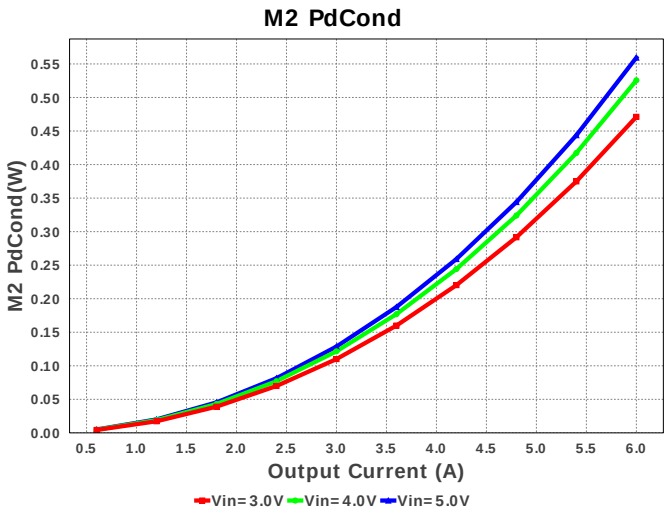


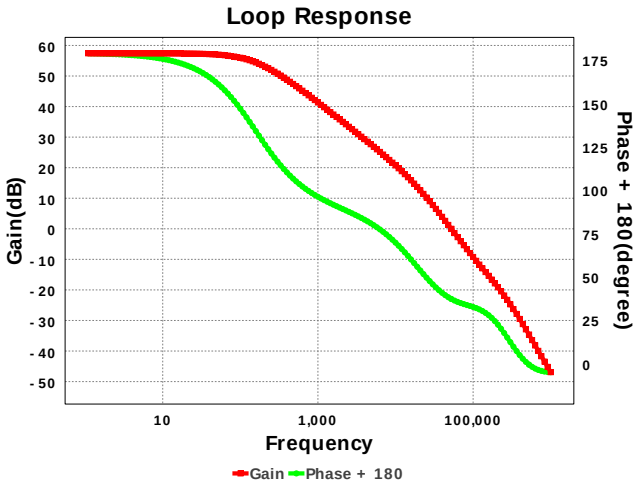












Operating Values

#	Name	Value	Category	Description
1.	BOM Count	13		Total Design BOM count
2.	Total BOM	$2.97		Total BOM Cost
3.	Cin IRMS	2.357 A	Current	Input capacitor RMS ripple current
4.	Cout IRMS	481.447 mA	Current	Output capacitor RMS ripple current
5.	IC Ipk	6.834 A	Current	Peak switch current in IC
6.	Iin Avg	1.224 A	Current	Average input current
7.	L Ipp	1.668 A	Current	Peak-to-peak inductor ripple current
8.	M Irms	2.619 A	Current	MOSFET RMS current
9.	FootPrint	185.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	600.0 kHz	General	Switching frequency
11.	IC Tolerance	12.0 mV	General	IC Feedback Tolerance
12.	M Vds Act	64.565 mV	General	Voltage drop across the MosFET
13.	Mode	CCM	General	Conduction Mode
14.	Pout	4.8 W	General	Total output power
15.	Low Freq Gain	57.424 dB	Op_Point	Gain at 10Hz
16.	Vout Actual	800.0 mV	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	800.0 mV	Op_Point	Operational Output Voltage
18.	Cross Freq	52.248 kHz	Op_point	Bode plot crossover frequency
19.	Duty Cycle	19.06 %	Op_point	Duty cycle
20.	Efficiency	78.409 %	Op_point	Steady state efficiency
21.	Gain Marg	-34.686 dB	Op_point	Bode Plot Gain Margin
22.	IC Tj	56.999 degC	Op_point	IC junction temperature
23.	ICThetaJA	25.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	6.0 A	Op_point	Iout operating point
25.	Phase Marg	37.915 deg	Op_point	Bode Plot Phase Margin
26.	VIN_OP	5.0 V	Op_point	Vin operating point
27.	Vout p-p	11.547 mV	Op_point	Peak-to-peak output ripple voltage
28.	Cin Pd	11.108 mW	Power	Input capacitor power dissipation
29.	Cout Pd	1.122 mW	Power	Output capacitor power dissipation
30.	IC Drive Pd	12.0 mW	Power	Driver power dissipation
31.	IC Iq Pd	17.5 mW	Power	IC Iq Pd

#	Name	Value	Category	Description
32.	IC Pd	1.08 W	Power	IC power dissipation
33.	L Pd	229.5 mW	Power	Inductor power dissipation
34.	M1 PdCond	169.127 mW	Power	M1 MOSFET switching losses
35.	M1 PdSw	139.5 mW	Power	M1 MOSFET switching losses
36.	M2 PdCond	559.453 mW	Power	M2 MOSFET switching losses
37.	M2 Pdbody	194.4 mW	Power	Power dissipation through lower FET
38.	Total Pd	1.322 W	Power	Total Power Dissipation
39.	Vout Tolerance	1.5 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	6.0	Maximum Output Current
2.	SoftStart	3.0 ms	Soft Start Time (ms)
3.	VinMax	5.0	Maximum input voltage
4.	VinMin	3.0	Minimum input voltage
5.	Vout	800.0 m	Output Voltage
6.	base_pn	LM20136	Texas Instruments Base Part Number
7.	source	DC	Input Source Type
8.	ta	30.0	Ambient temperature
9.	userfsw	600.0 k	Customer Selected Frequency

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