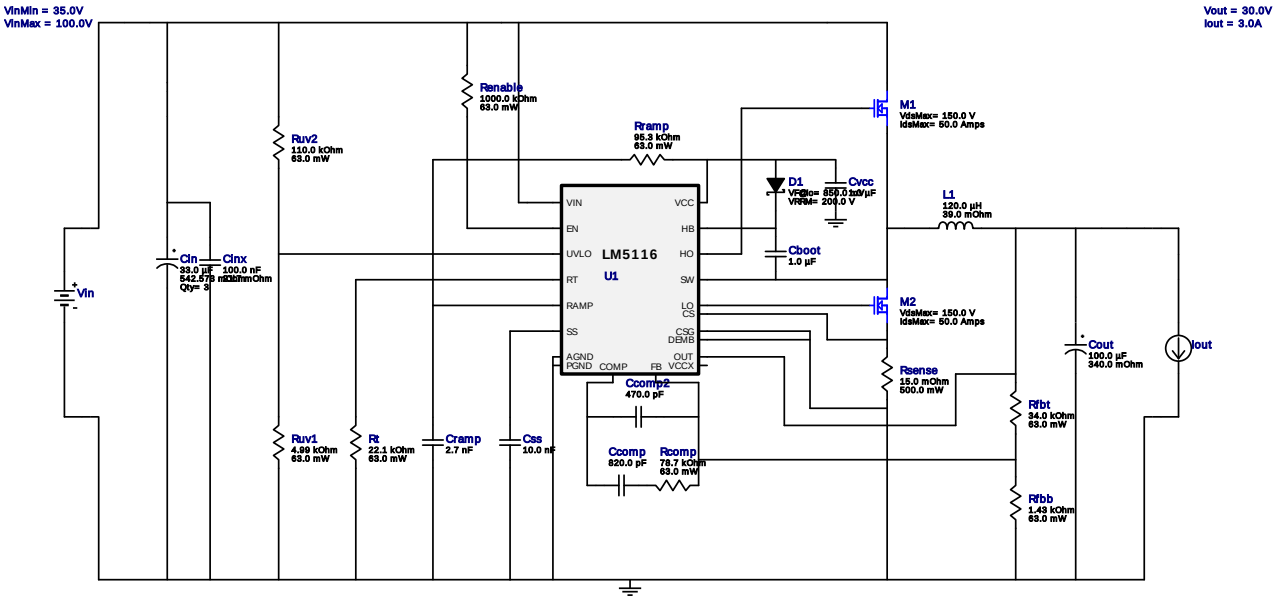
WEBENCH® Design Report

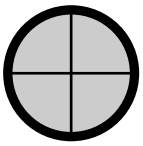
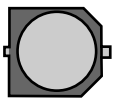
VinMin = 35.0V
VinMax = 100.0V
Vout = 30.0V
Iout = 3.0A

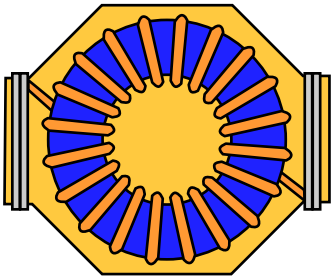
Device = LM5116MH/NOPB
Topology = Buck
Created = 1/24/14 6:03:56 AM
BOM Cost = $8.01
Total Pd = 3.67W
Footprint = 1,918.0mm2
BOM Count = 25

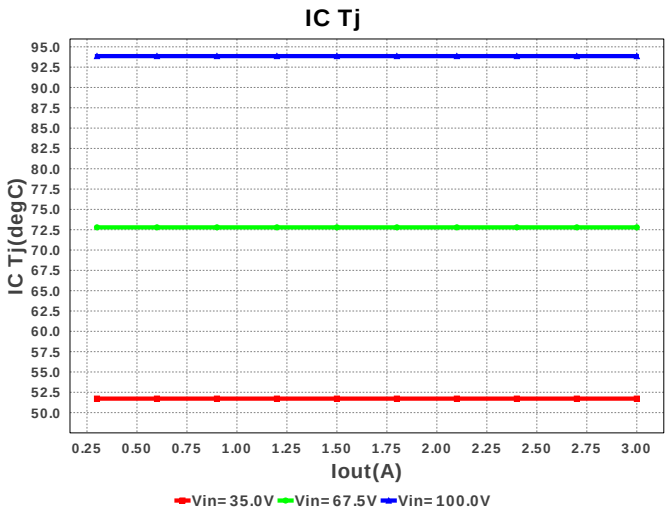
Design : 3828136/1 LM5116MH/NOPB
LM5116MH/NOPB 35.0V-100.0V to 30.0V @ 3.0A

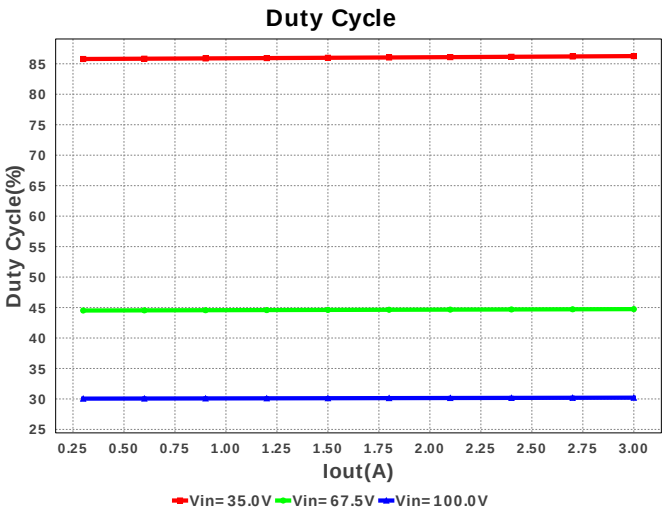


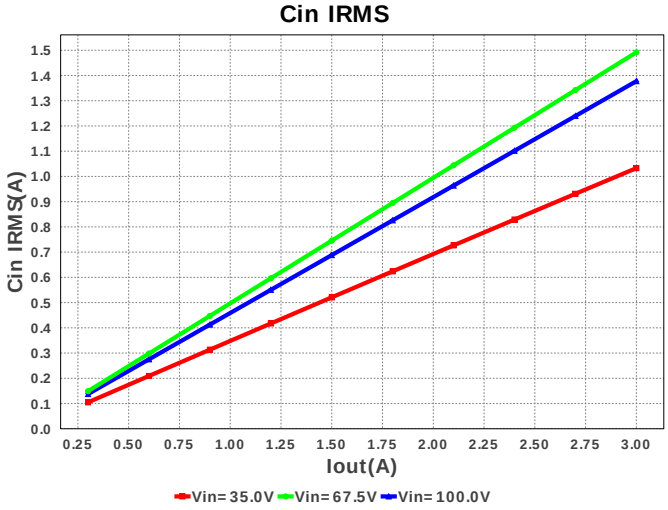
Electrical BOM

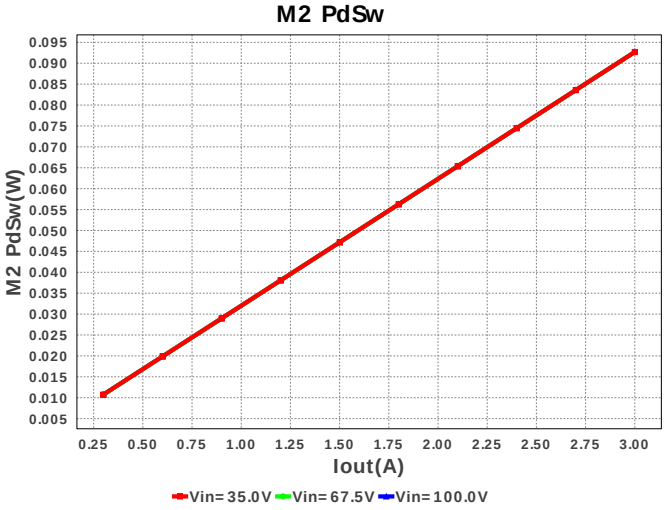
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A105KE15D Series= X5R	Cap= 1.0 µF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3mm2
2.	Ccomp	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
3.	Ccomp2	Yageo America	CC0805KRX7R9BB471 Series= X7R	Cap= 470.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
4.	Cin	Panasonic	EEUED2E330 Series= 286	Cap= 33.0 µF ESR= 542.573 mOhm VDC= 250.0 V IRMS= 710.0 mA	3	$0.29	 CAPPR5-12.5X20 210mm2
5.	Cinx	TDK	C3216X7R2E104K Series= X7R	Cap= 100.0 nF ESR= 21.7 mOhm VDC= 250.0 V IRMS= 0.0 A	1	$0.07	1206 11mm2
6.	Cout	Panasonic	EEE-FK1H101P Series= FK	Cap= 100.0 µF ESR= 340.0 mOhm VDC= 50.0 V IRMS= 350.0 mA	1	$0.24	 SM_RADIAL_F 124mm2
7.	Cramp	Yageo America	CC0805KRX7R9BB272 Series= X7R	Cap= 2.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
8.	Css	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2

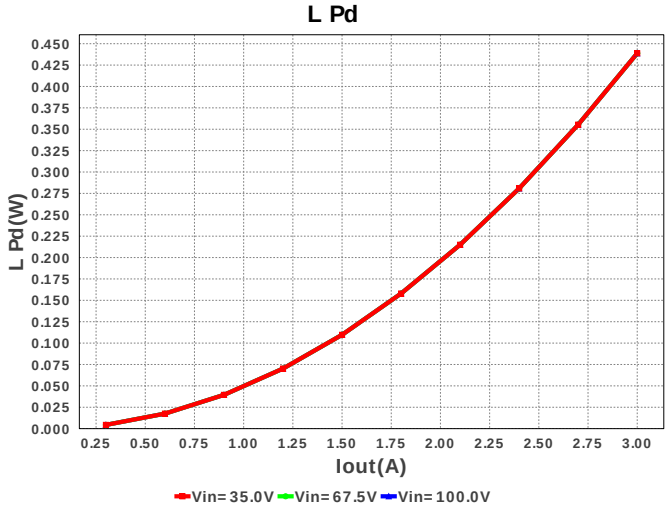
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvcc	MuRata	GRM155R61A105KE15D Series= X5R	Cap= 1.0 µF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	 0402 3mm2
10.	D1	Diodes Inc.	DFLS1200-7	VF@Io= 850.0 mV VRRM= 200.0 V	1	$0.21	 PowerDI123 13mm2
11.	L1	Bourns	PM2120-121K-RC	L= 120.0 µH DCR= 39.0 mOhm	1	$1.33	 PM2120 890mm2
12.	M1	Infineon Technologies	BSC190N15NS3 G	VdsMax= 150.0 V IdsMax= 50.0 Amps	1	$1.31	 PG-TDSON-8 55mm2
13.	M2	Infineon Technologies	BSC190N15NS3 G	VdsMax= 150.0 V IdsMax= 50.0 Amps	1	$1.31	 PG-TDSON-8 55mm2
14.	Rcomp	Vishay-Dale	CRCW040278K7FKED Series= CRCW..e3	Res= 78.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
15.	Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
16.	Rfbb	Vishay-Dale	CRCW04021K43FKED Series= CRCW..e3	Res= 1.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
17.	Rfbt	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
18.	Rramp	Vishay-Dale	CRCW040295K3FKED Series= CRCW..e3	Res= 95.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
19.	Rsense	Stackpole Electronics Inc	CSR1206FK15L0 Series= ?	Res= 15.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 11mm2
20.	Rt	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
21.	Ruv1	Vishay-Dale	CRCW04024K99FKED Series= CRCW..e3	Res= 4.99 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
22.	Ruv2	Vishay-Dale	CRCW0402110KFKED Series= CRCW..e3	Res= 110.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
23.	U1	Texas Instruments	LM5116MH/NOPB	Switcher	1	$2.42	 MXA20A 71mm2

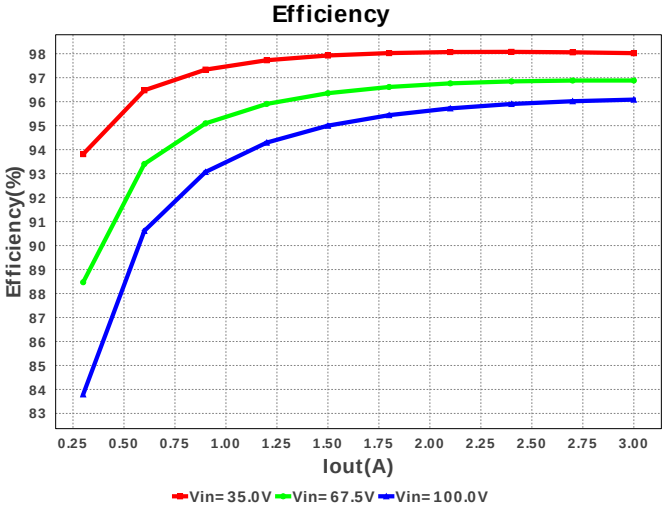


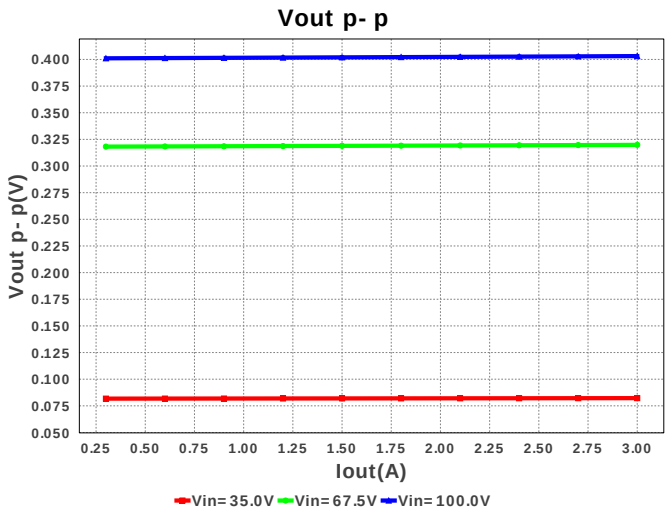


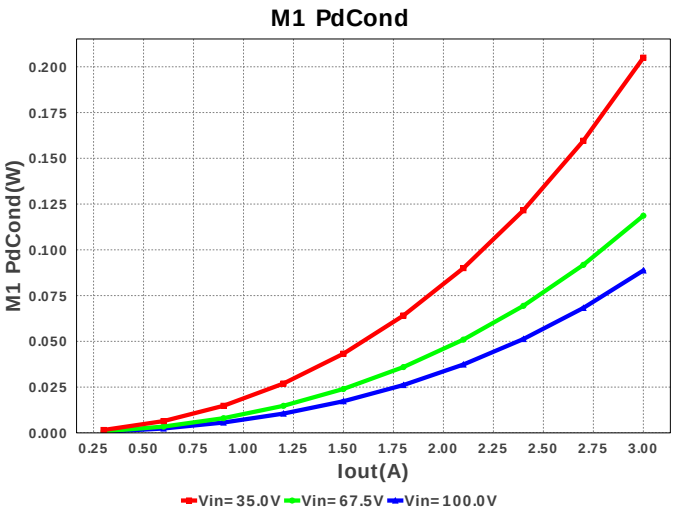


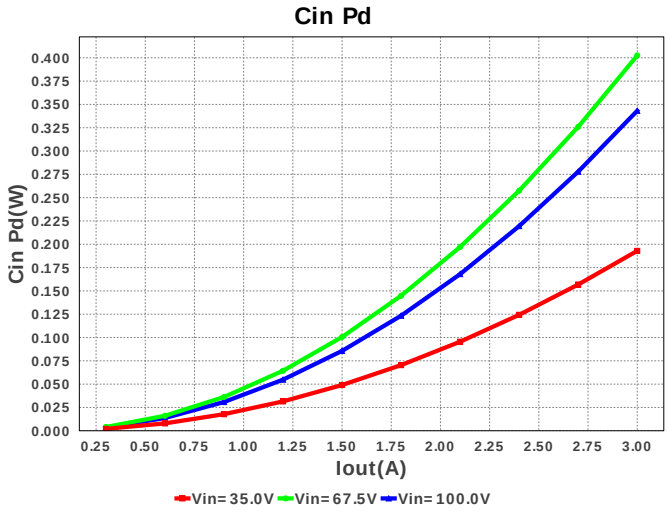


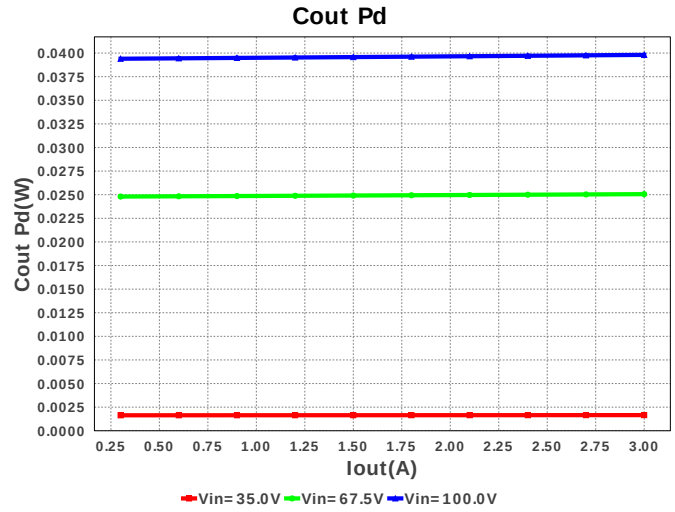


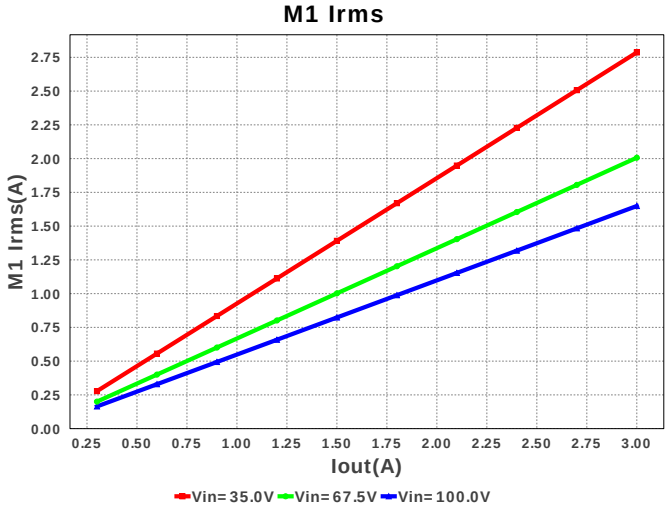


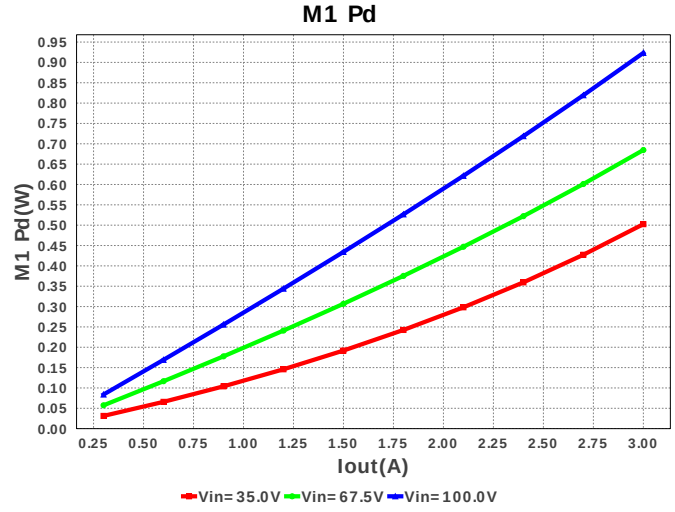


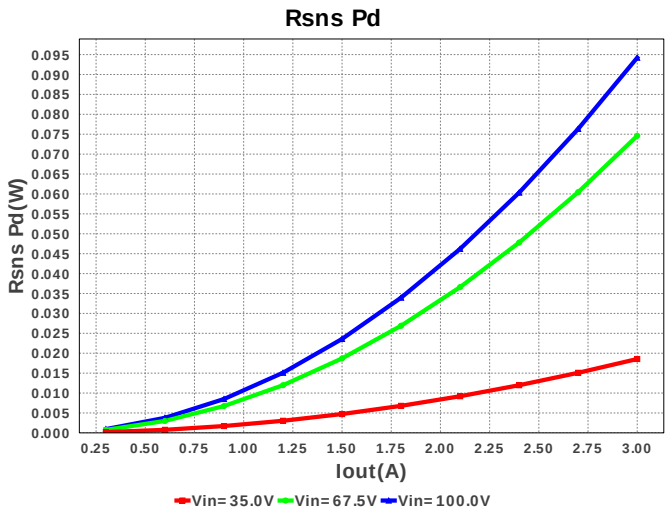


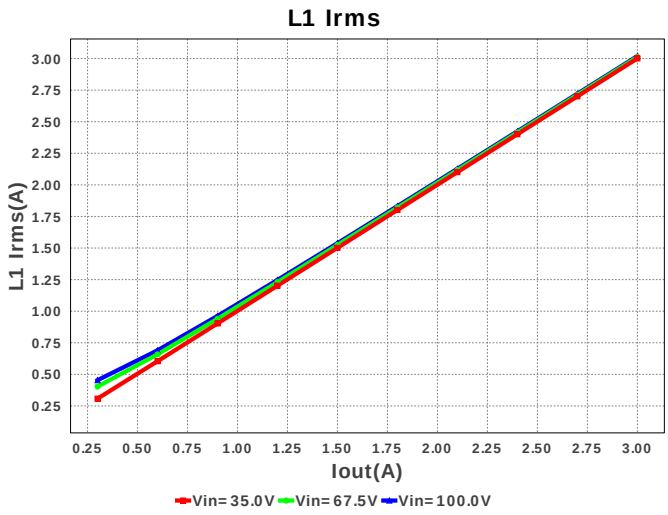


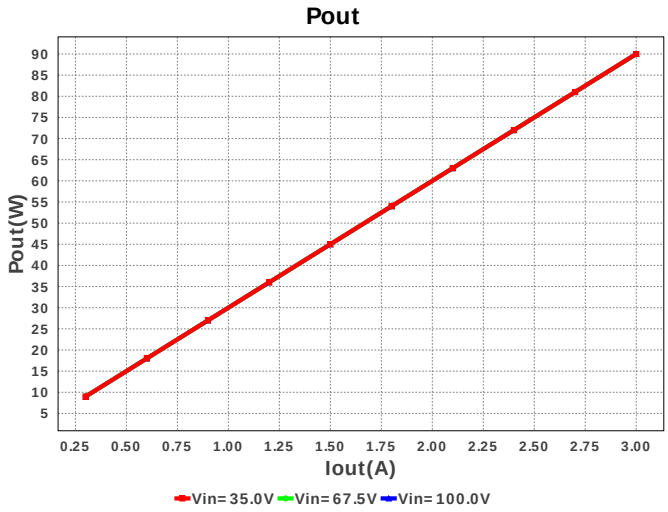


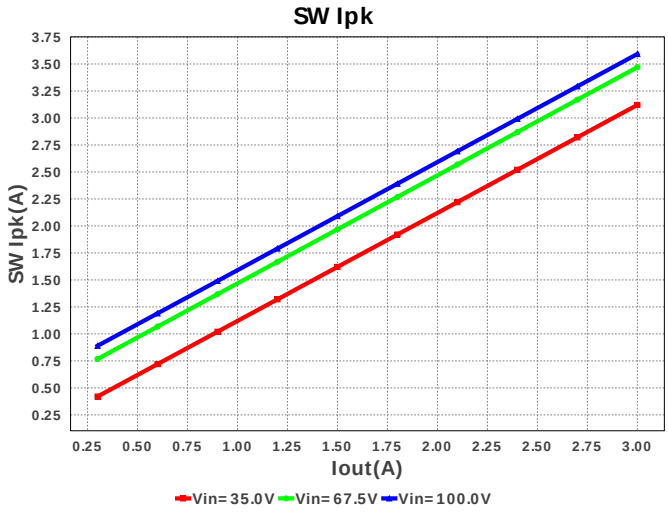


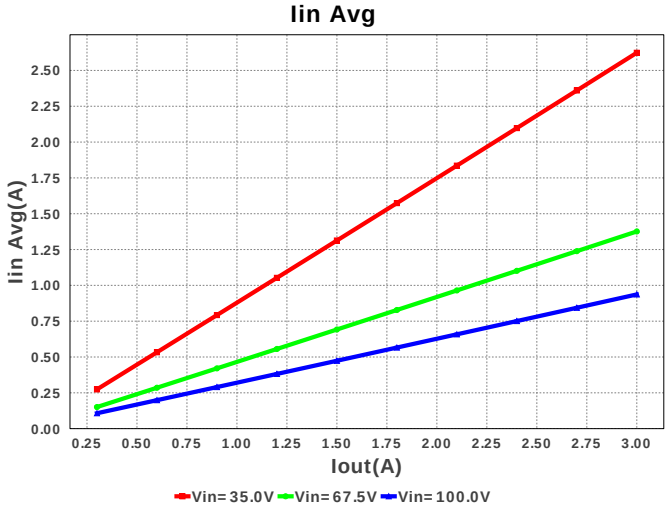


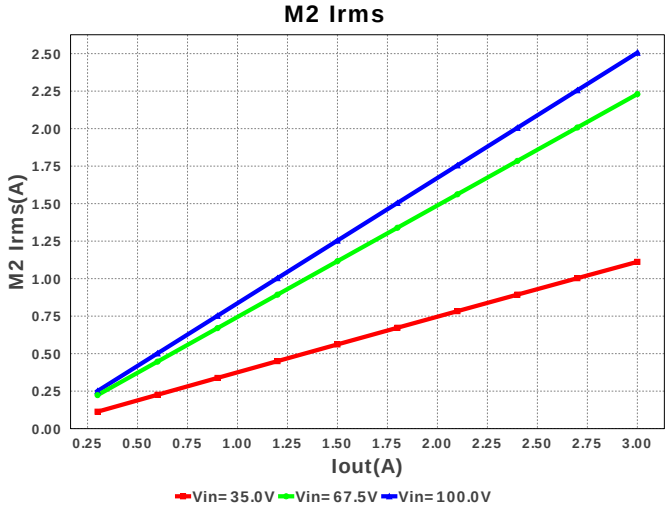


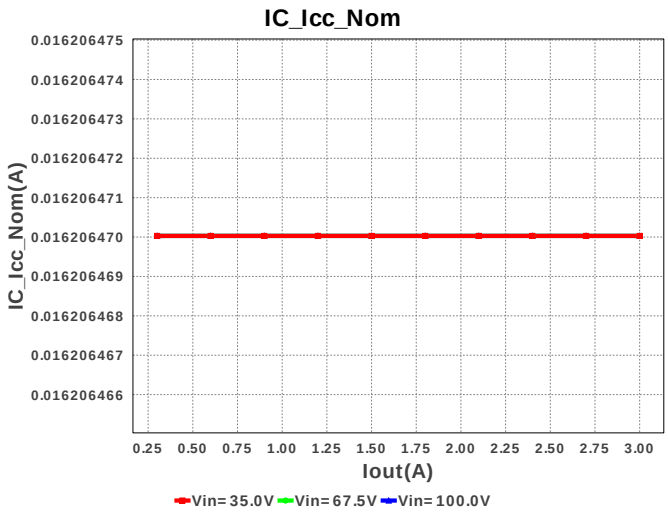


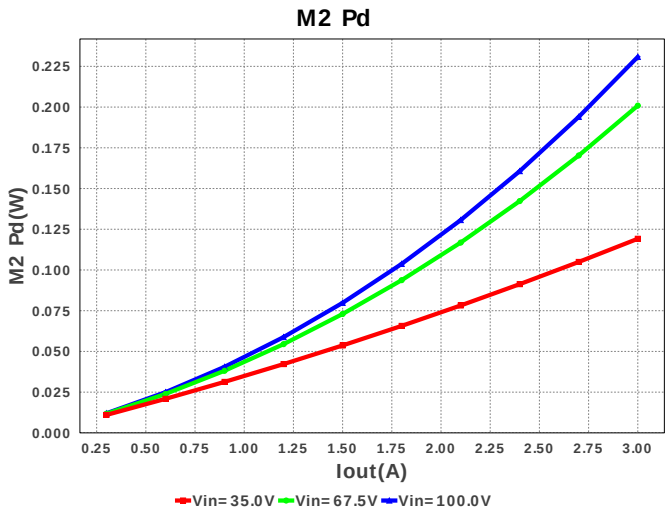


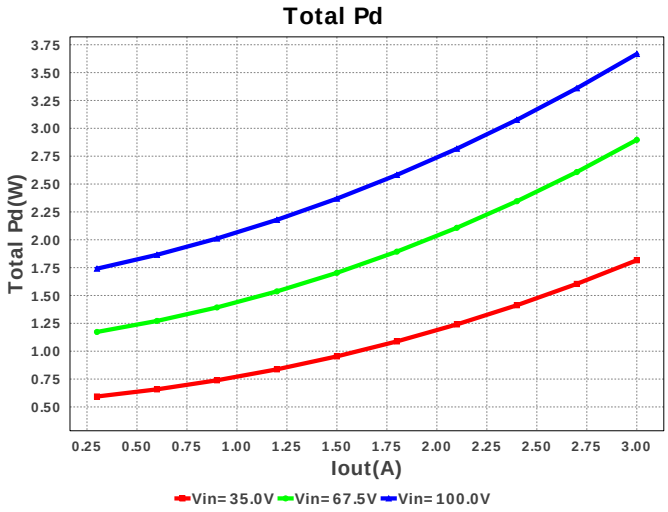


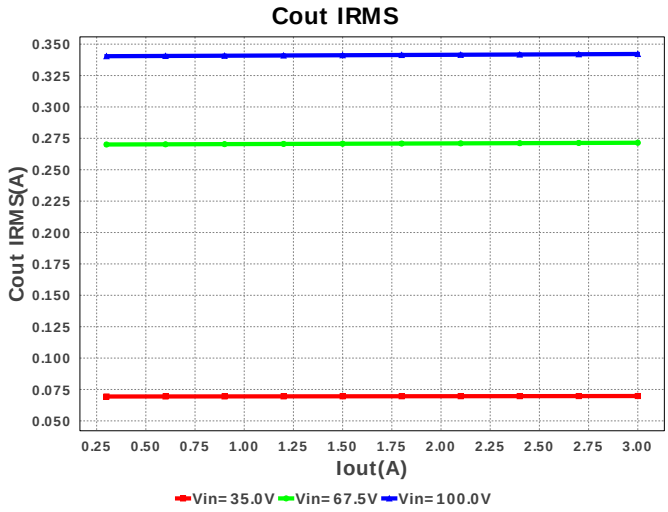


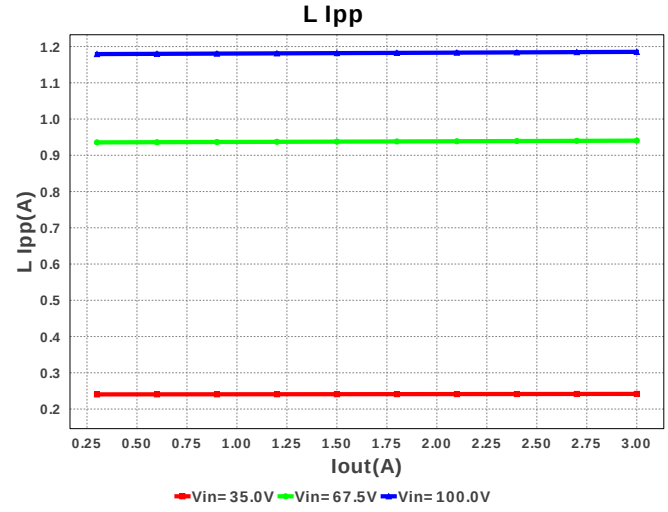


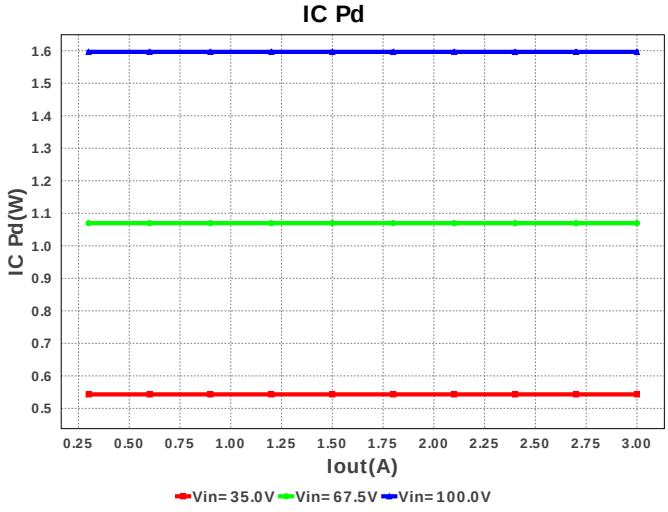


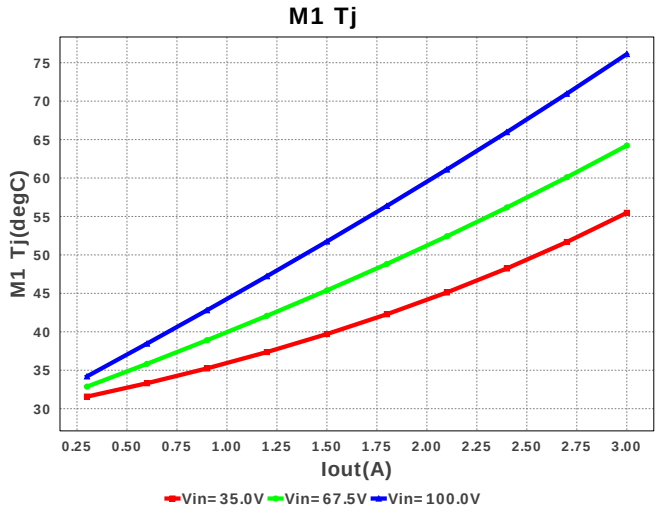


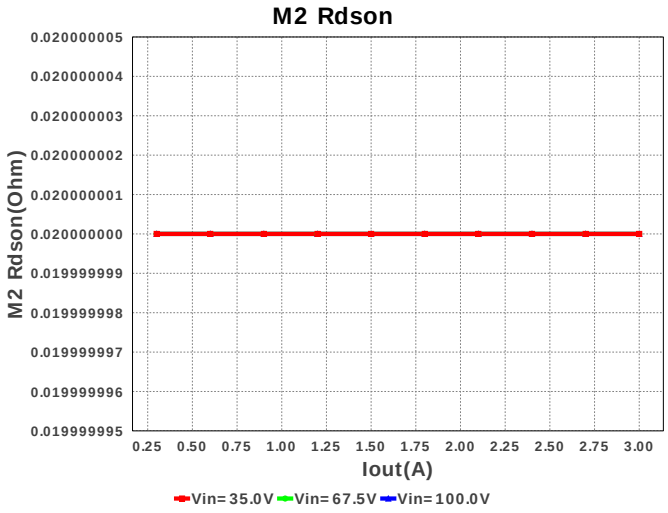


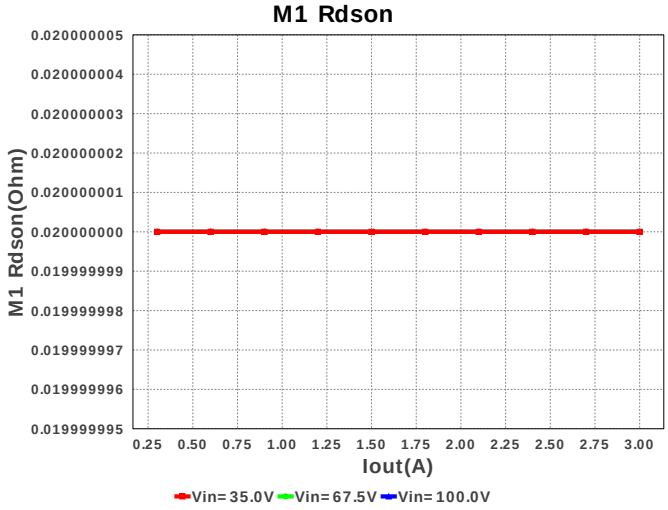


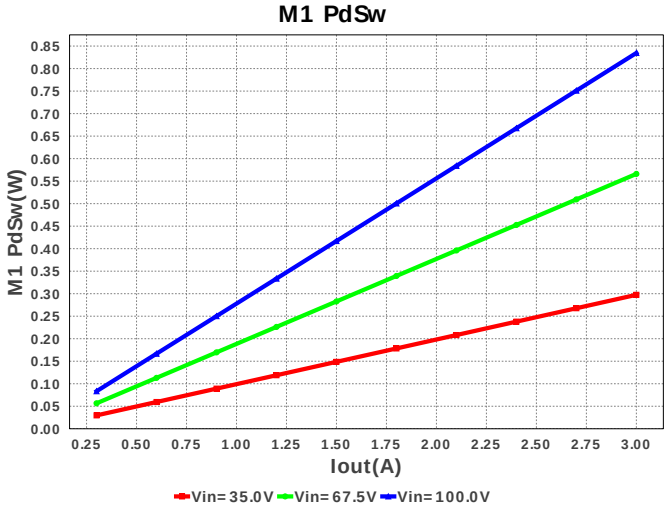


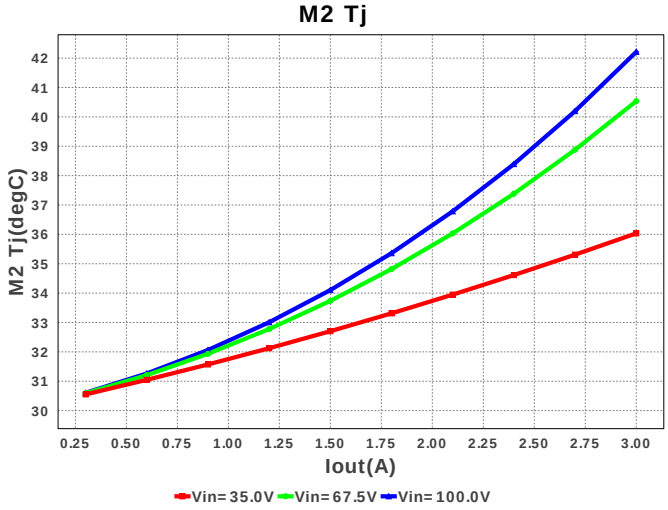


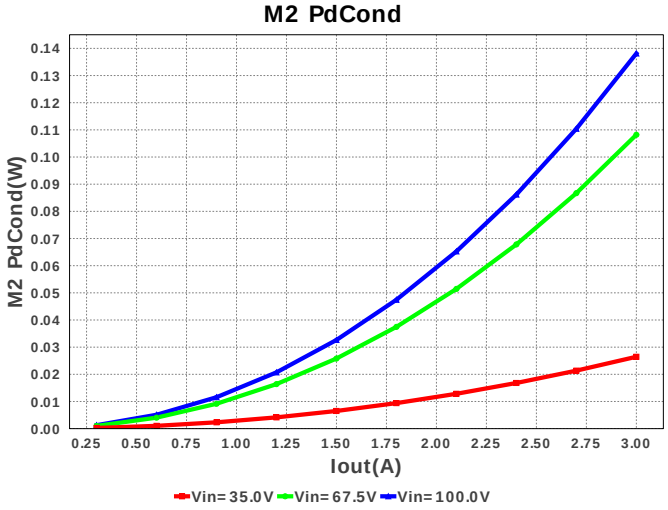












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.377 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	342.174 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	936.74 mA	Current	Average input current
4.	L Ipp	1.185 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	3.019 A	Current	Inductor ripple current
6.	M1 Irms	1.649 A	Current	MOSFET RMS ripple current
7.	M2 Irms	2.506 A	Current	MOSFET RMS ripple current
8.	SW Ipk	3.593 A	Current	Peak switch current
9.	BOM Count	25	General	Total Design BOM count
10.	FootPrint	1.918 kmm2	General	Total Foot Print Area of BOM components
11.	Frequency	148.668 kHz	General	Switching frequency

#	Name	Value	Category	Description
12.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	20.0 mOhm	General	Drain-Source On-resistance
14.	M2 Rdson	20.0 mOhm	General	Drain-Source On-resistance
15.	Pout	90.0 W	General	Total output power
16.	Total BOM	$8.01	General	Total BOM Cost
17.	Cross Freq	17.719 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	30.209 %	Op_point	Duty cycle
19.	Efficiency	96.078 %	Op_point	Steady state efficiency
20.	IC Tj	93.858 degC	Op_point	IC junction temperature
21.	IOUT_OP	3.0 A	Op_point	Iout operating point
22.	M1 Tj	76.621 degC	Op_point	M1 MOSFET junction temperature
23.	M2 Tj	42.049 degC	Op_point	M2 MOSFET junction temperature
24.	Phase Marg	65.609 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	100.0 V	Op_point	Vin operating point
26.	Vout p-p	403.134 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	343.176 mW	Power	Input capacitor power dissipation
28.	Cout Pd	39.808 mW	Power	Output capacitor power dissipation
29.	IC Pd	1.596 W	Power	IC power dissipation
30.	L Pd	438.75 mW	Power	Inductor power dissipation
31.	M1 Pd	933.355 mW	Power	M1 MOSFET total power dissipation
32.	M1 PdCond	88.993 mW	Power	M1 MOSFET conduction losses
33.	M1 PdSw	844.362 mW	Power	M1 MOSFET switching losses
34.	M2 Pd	227.839 mW	Power	M2 MOSFET total power dissipation
35.	M2 PdCond	138.192 mW	Power	M2 MOSFET conduction losses
36.	M2 PdSw	89.646 mW	Power	M2 MOSFET switching losses
37.	Rsns Pd	94.218 mW	Power	Current Limit Sense Resistor Power Dissipation
38.	Total Pd	3.674 W	Power	Total Power Dissipation
39.	IC Icc Nom	16.206 mA	Unknown	IC Icc gate driver current

Design Inputs

#	Name	Value	Description
1.	Iout	3.0 A	Maximum Output Current
2.	Iout1	3.0 Amps	Output Current #1
3.	VinMax	100.0 V	Maximum input voltage
4.	VinMin	35.0 V	Minimum input voltage
5.	Vout	30.0 V	Output Voltage
6.	Vout1	30.0 Volt	Output Voltage #1
7.	base_pn	LM5116	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM5116** Product Folder : http://www.ti.com/product/lm5116 : contains the data sheet and other resources.