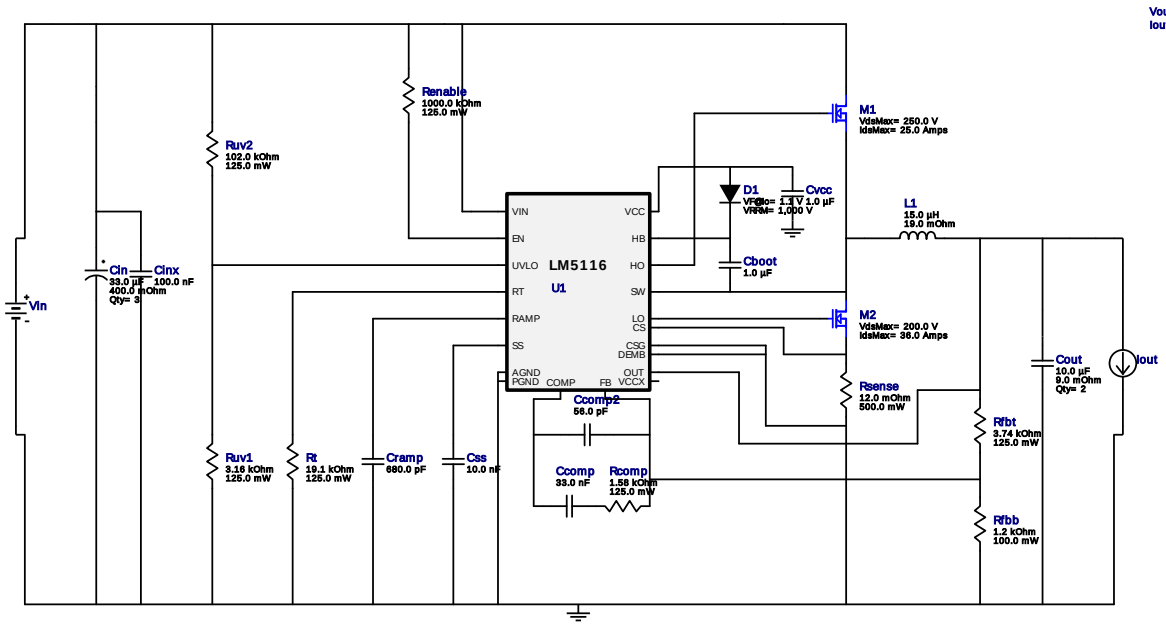
WEBENCH® Design Report

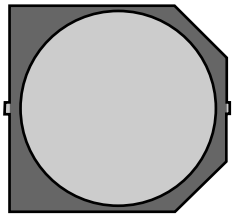
VinMin = 50.0V
VinMax = 95.0V
Vout = 5.0V
Iout = 5.0A

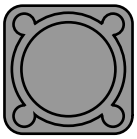
Device = LM5116MHX/NOPB
Topology = Buck
Created = 7/28/16 8:16:32 PM
BOM Cost = $10.11
BOM Count = 25
Total Pd = 3.71W

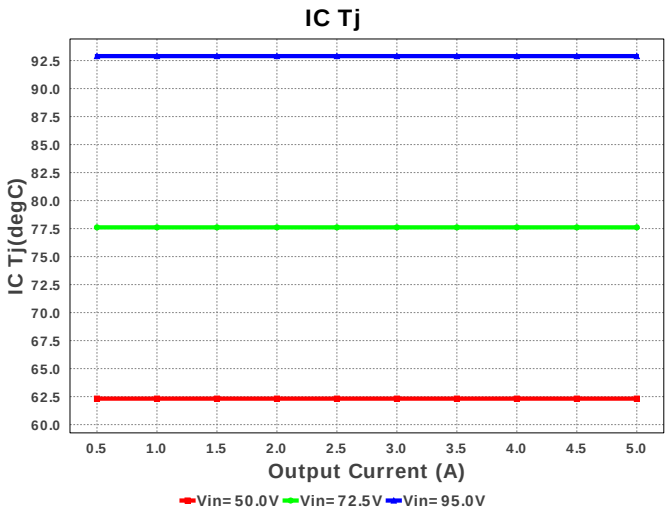
Design : 4508235/134 LM5116MHX/NOPB
LM5116MHX/NOPB 50.0V-95.0V to 5.00V @ 5.0A

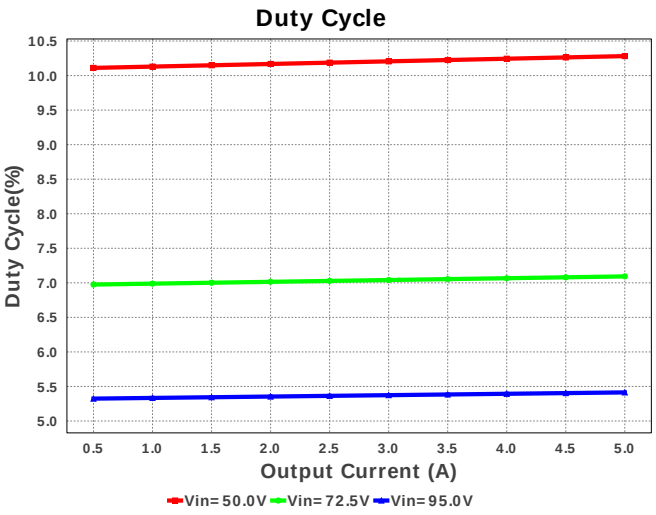


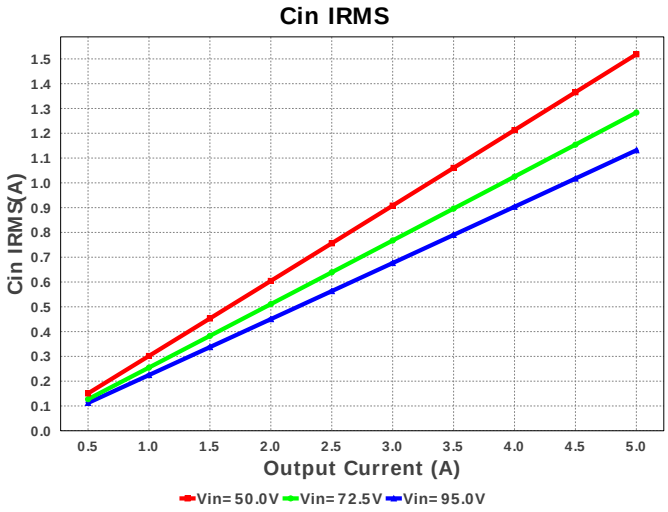
Electrical BOM

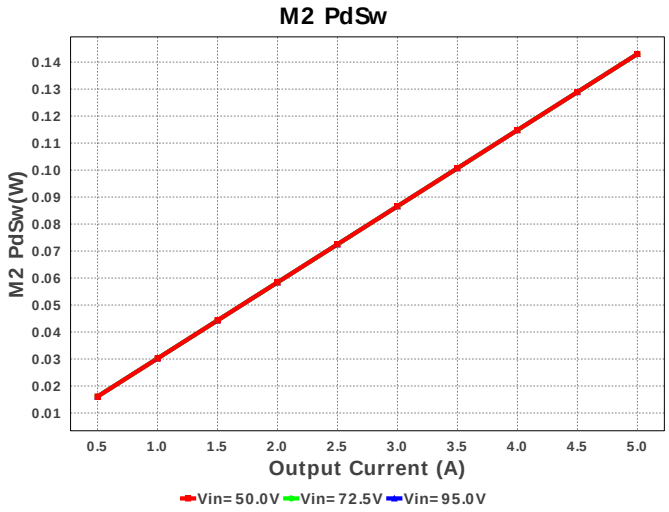
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
2.	Ccomp	MuRata	GRM216R71E333KA01D Series= X7R	Cap= 33.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805JRNPO9BN560 Series= C0G/NP0	Cap= 56.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	EEV-EB2E330SM Series= ?	Cap= 33.0 uF ESR= 400.0 mOhm VDC= 250.0 V IRMS= 560.0 mA	3	$1.25	 EB_K16 483 mm²
5.	Cinx	MuRata	GRM31CR72E104KW03L Series= X7R	Cap= 100.0 nF VDC= 250.0 V IRMS= 0.0 A	1	$0.06	1206 11 mm²
6.	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
7.	Cramp	Yageo America	CC0805KRX7R9BB681 Series= X7R	Cap= 680.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

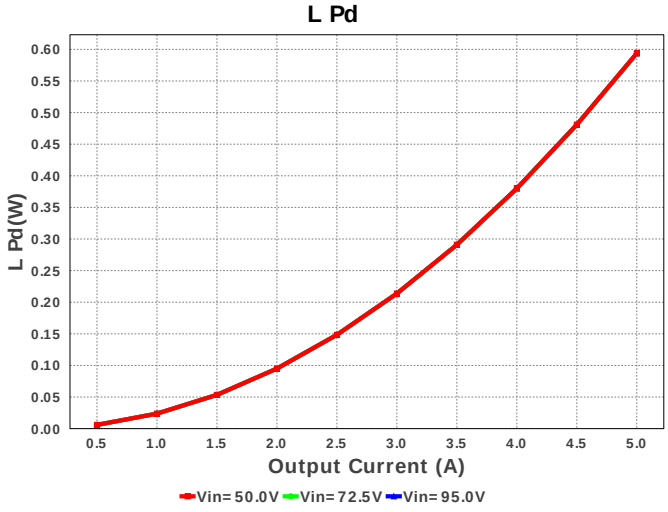
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Css	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm²
9.	Cvcc	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	 0805 7 mm²
10.	D1	Fairchild Semiconductor	1N4007	VF@Io= 1.1 V VRRM= 1,000.0 V	1	$0.03	 DO-41 43 mm²
11.	L1	Coilcraft	MSS1210-153MEB	L= 15.0 µH DCR= 19.0 mOhm	1	$0.81	 MSS1210 204 mm²
12.	M1	Infineon Technologies	BSC600N25NS3 G	VdsMax= 250.0 V IdsMax= 25.0 Amps	1	$1.41	 PG-TDSON-8 55 mm²
13.	M2	Infineon Technologies	BSC320N20NS3 G	VdsMax= 200.0 V IdsMax= 36.0 Amps	1	$1.32	 PG-TDSON-8 55 mm²
14.	Rcomp	Panasonic	ERJ-6ENF1581V Series= ERJ-6E	Res= 1.58 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
15.	Renable	Panasonic	ERJ-6ENF1004V Series= ERJ-6E	Res= 1000.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
16.	Rfbb	Yageo America	RC0603FR-071K2L Series= ?	Res= 1.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
17.	Rfbt	Panasonic	ERJ-6ENF3741V Series= ERJ-6E	Res= 3.74 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
18.	Rsense	Stackpole Electronics Inc	CSR1206FK12L0 Series= ?	Res= 12.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 11 mm²
19.	Rt	Panasonic	ERJ-6ENF1912V Series= ERJ-6E	Res= 19.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
20.	Ruv1	Panasonic	ERJ-6ENF3161V Series= ERJ-6E	Res= 3.16 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
21.	Ruv2	Panasonic	ERJ-6ENF1023V Series= ERJ-6E	Res= 102.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
22.	U1	Texas Instruments	LM5116MHX/NOPB	Switcher	1	$2.42	 MXA20A 71 mm²

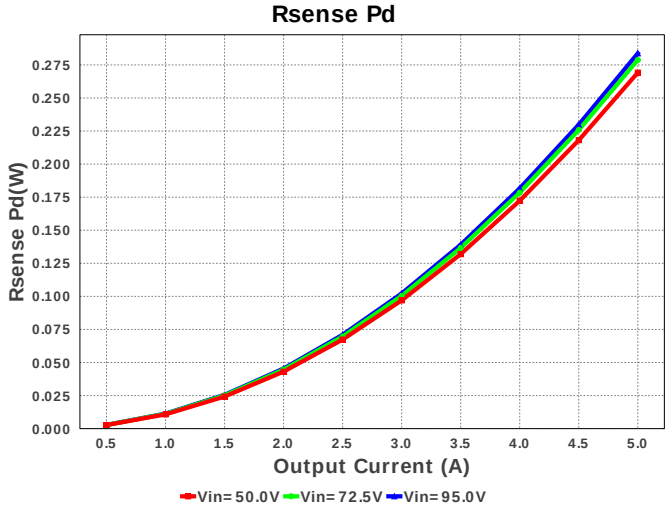




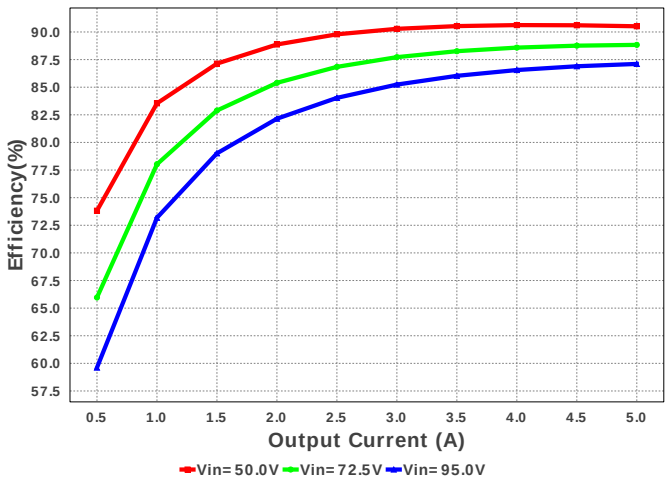




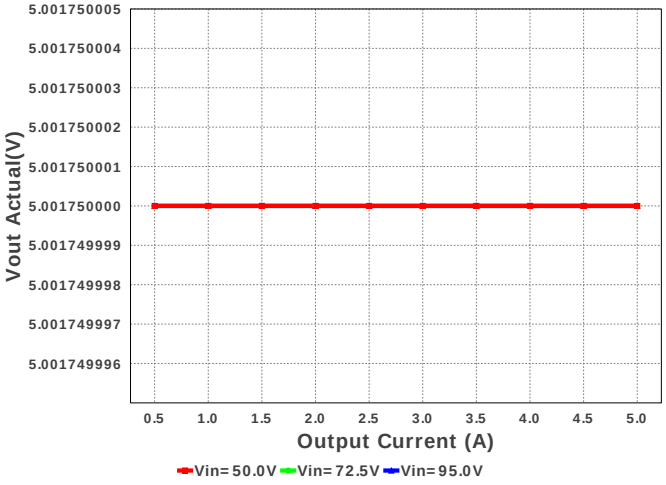




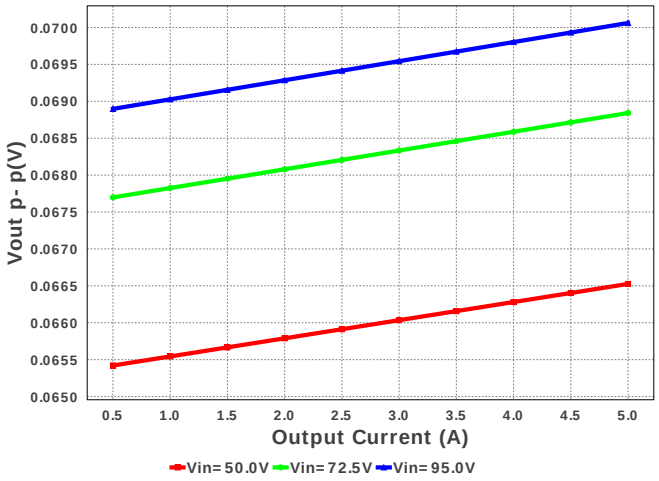
Efficiency



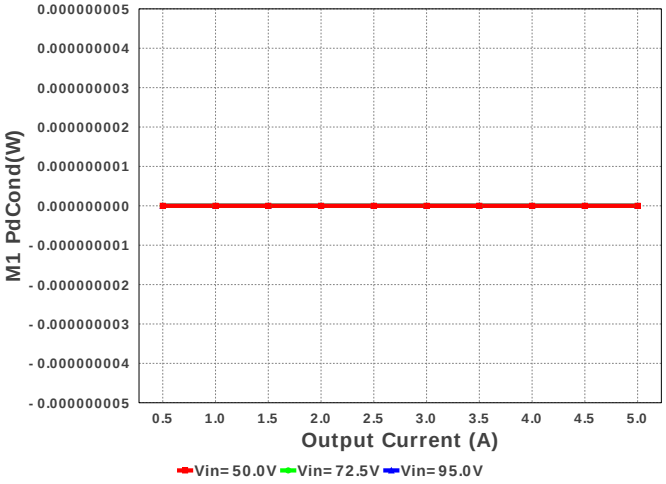
Vout Actual



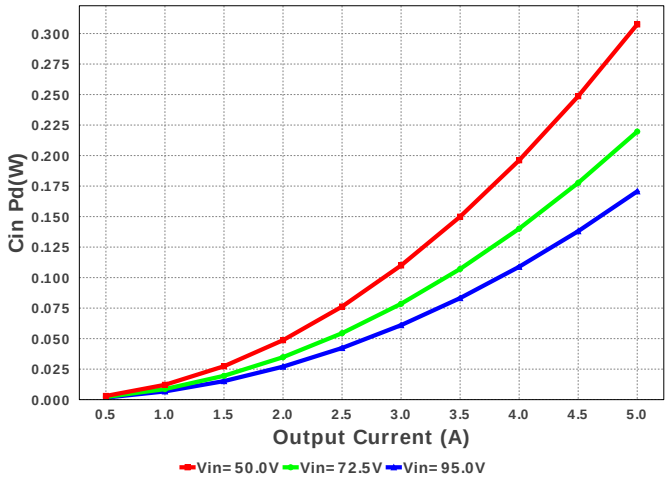
Vout p- p



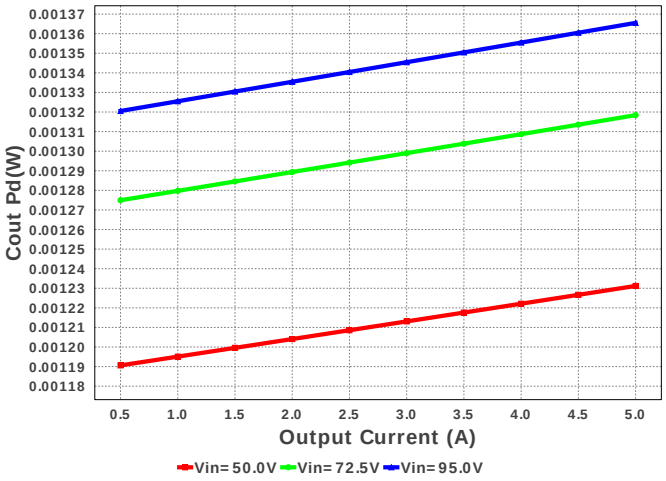
M1 PdCond

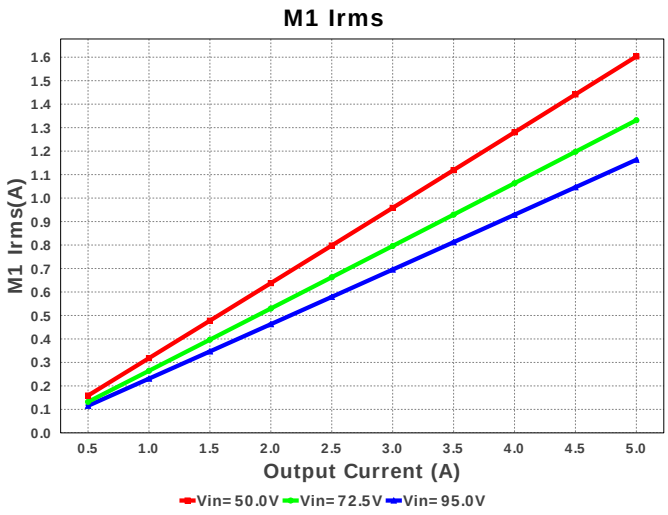


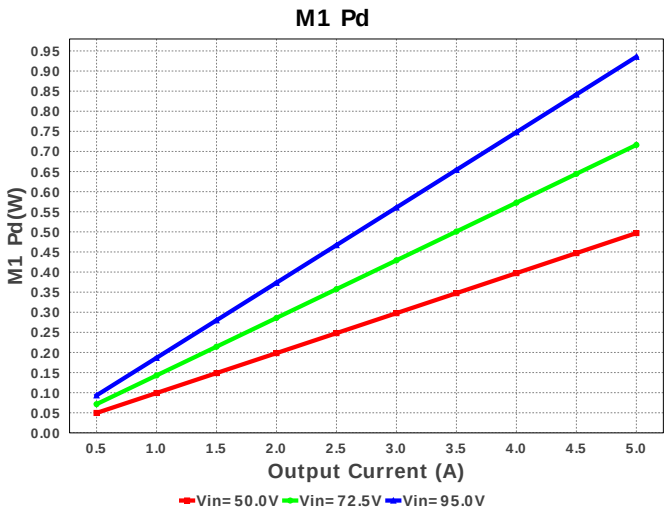
Cin Pd

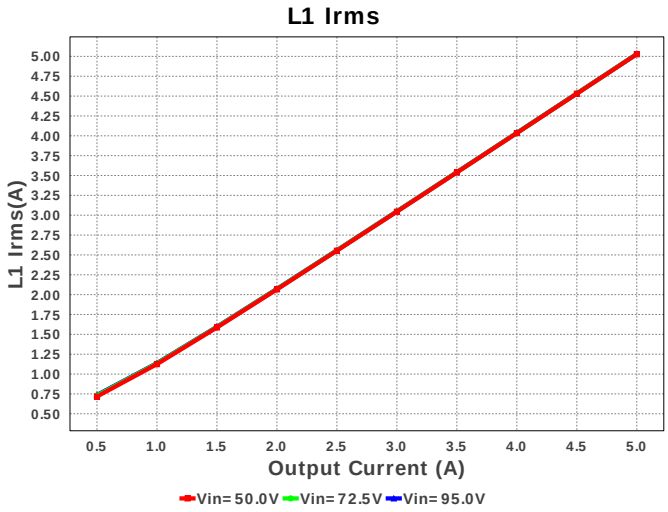


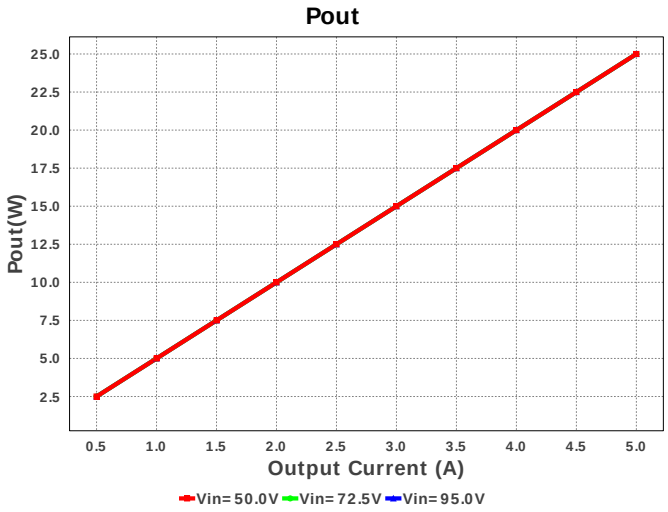
Cout Pd

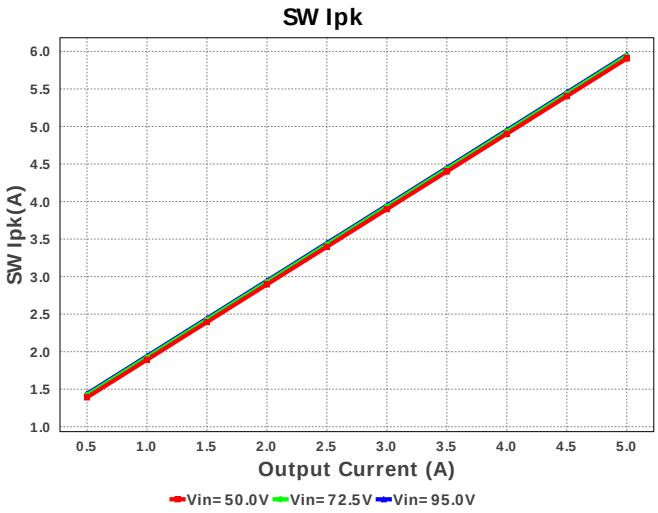


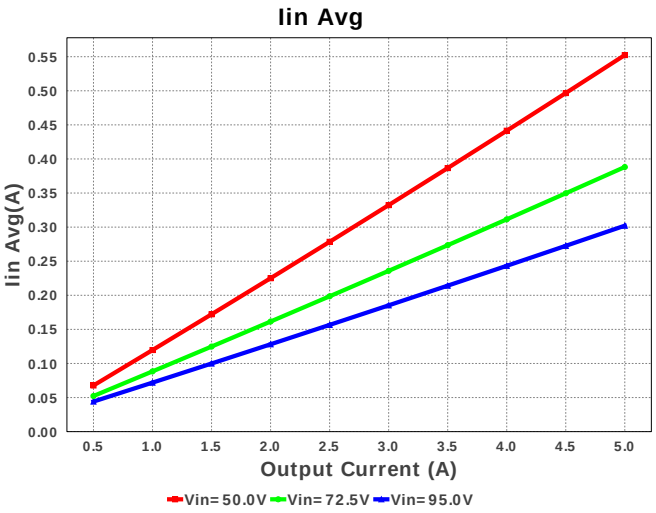


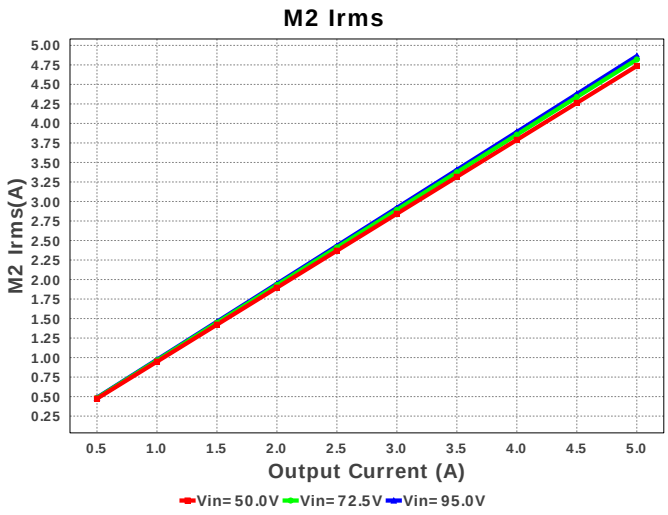


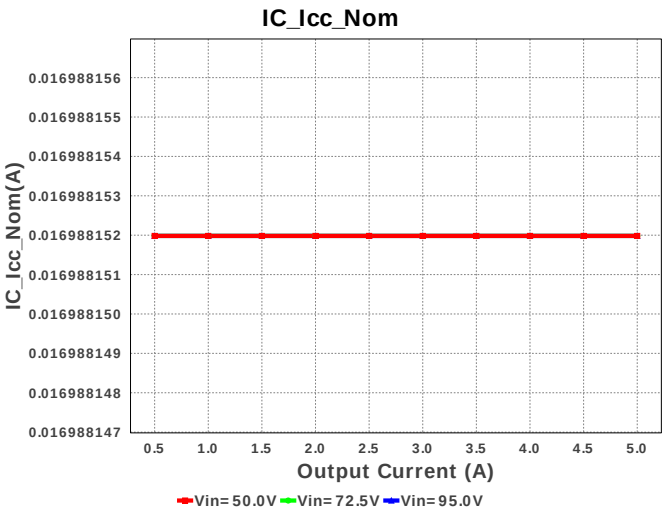


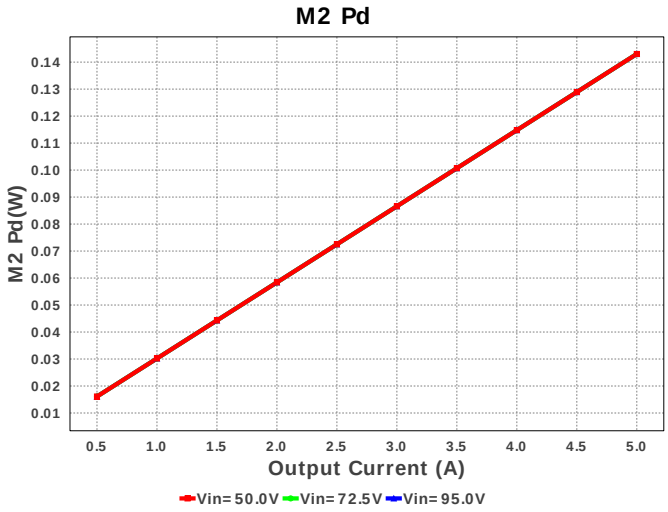


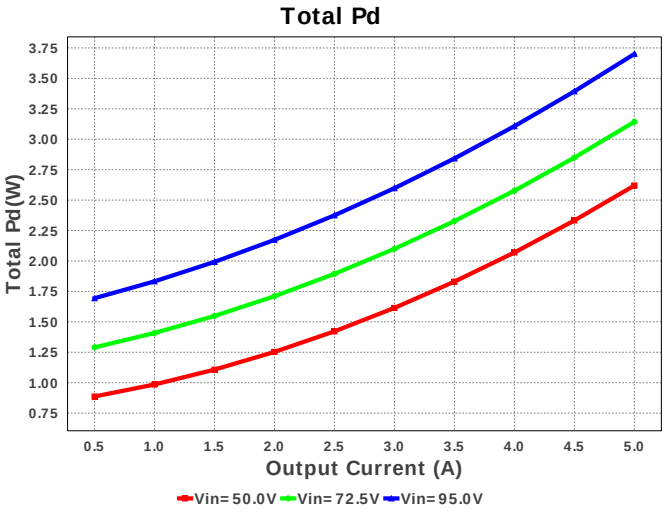


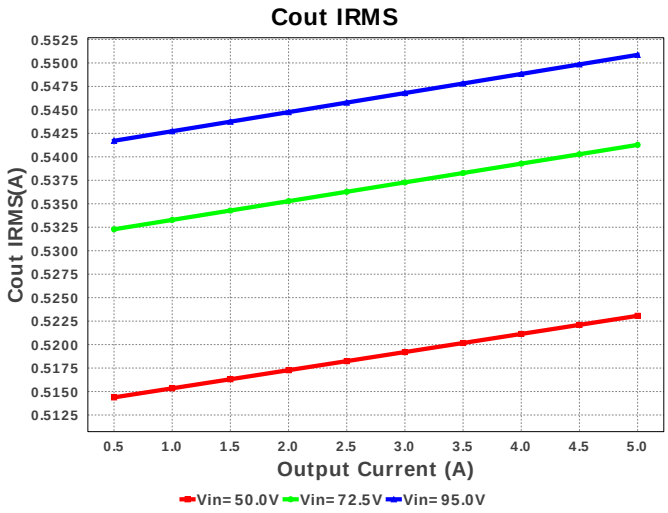


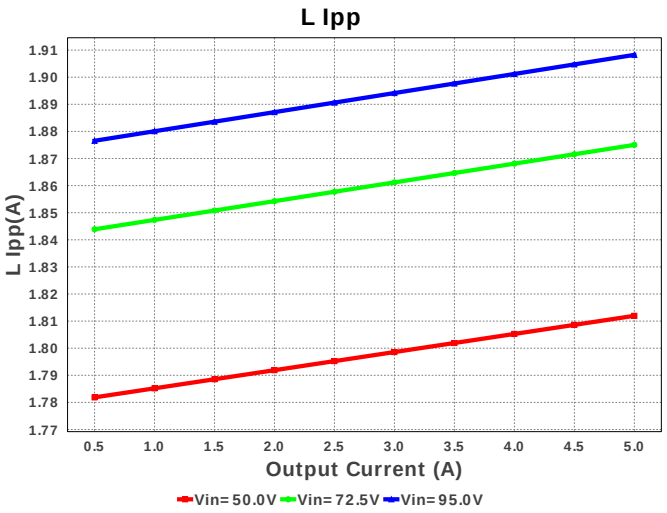


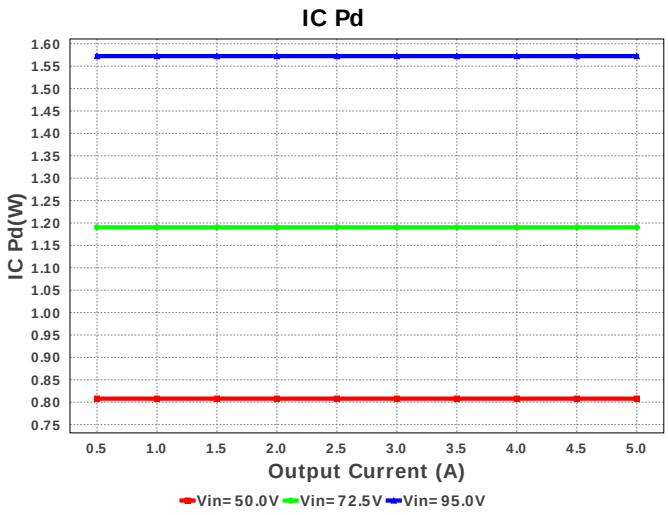


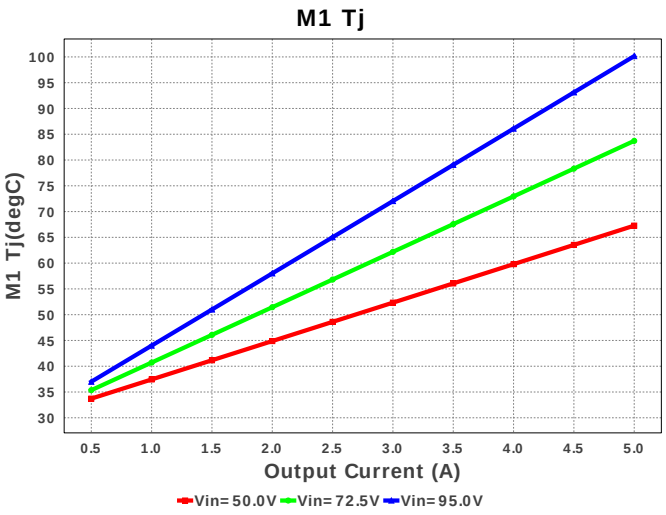


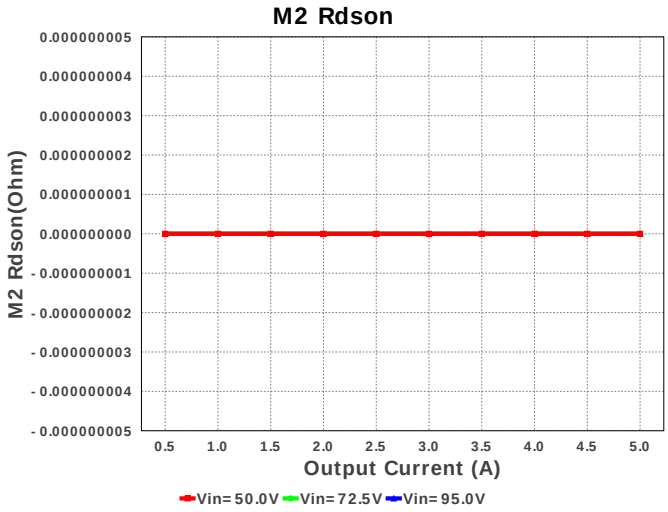


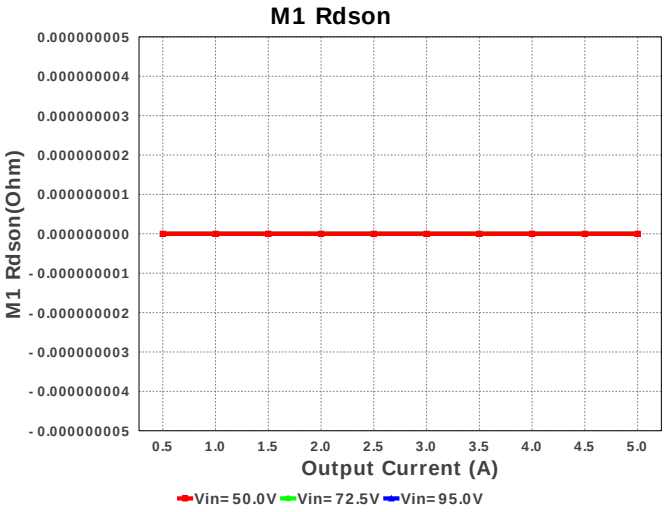


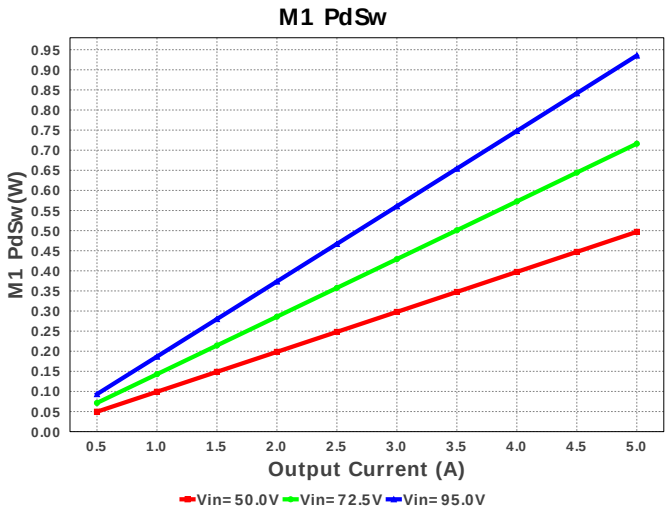


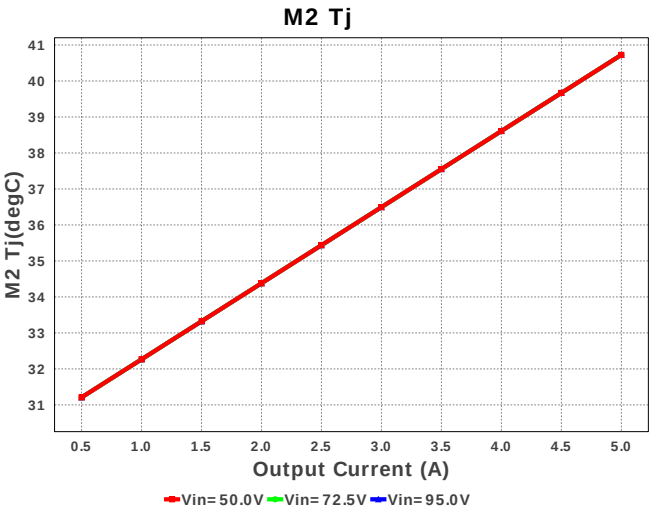


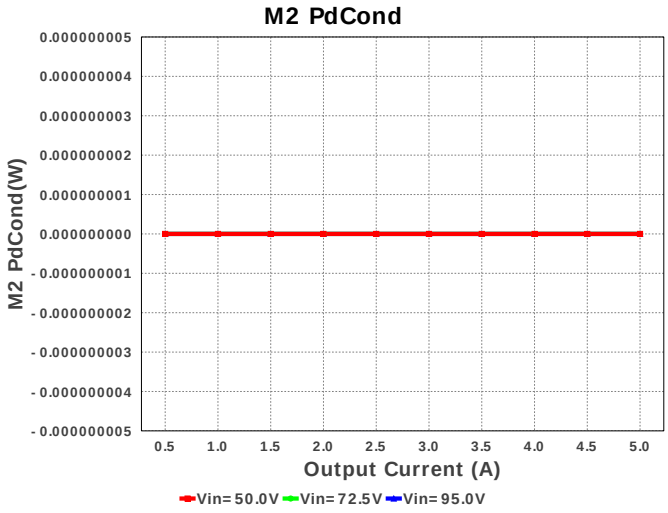












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.131 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	550.862 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	302.18 mA	Current	Average input current
4.	L Ipp	1.908 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	5.03 A	Current	Inductor ripple current
6.	M1 Irms	1.163 A	Current	MOSFET RMS ripple current
7.	M2 Irms	4.863 A	Current	MOSFET RMS ripple current
8.	SW Ipk	5.954 A	Current	Peak switch current
9.	BOM Count	25	General	Total Design BOM count
10.	FootPrint	1.995 k mm^2	General	Total Foot Print Area of BOM components
11.	Frequency	170.23 kHz	General	Switching frequency
12.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	0.0 Ohm	General	Drain-Source On-resistance
14.	M2 Rdson	0.0 Ohm	General	Drain-Source On-resistance
15.	Pout	25.0 W	General	Total output power
16.	Total BOM	$10.11	General	Total BOM Cost
17.	Low Freq Gain	77.14 dB	Op_Point	Gain at 10Hz
18.	Vout Actual	5.002 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
19.	Cross Freq	27.407 kHz	Op_point	Bode plot crossover frequency
20.	Duty Cycle	5.414 %	Op_point	Duty cycle
21.	Efficiency	87.086 %	Op_point	Steady state efficiency
22.	Gain Marg	-12.616 dB	Op_point	Bode Plot Gain Margin
23.	IC Tj	92.899 degC	Op_point	IC junction temperature
24.	IOUT_OP	5.0 A	Op_point	Iout operating point
25.	M1 Tj	100.964 degC	Op_point	M1 MOSFET junction temperature
26.	M2 Tj	40.417 degC	Op_point	M2 MOSFET junction temperature
27.	Phase Marg	80.248 deg	Op_point	Bode Plot Phase Margin
28.	VIN_OP	95.0 V	Op_point	Vin operating point
29.	Vout p-p	70.061 mV	Op_point	Peak-to-peak output ripple voltage
30.	Cin Pd	170.696 mW	Power	Input capacitor power dissipation
31.	Cout Pd	1.366 mW	Power	Output capacitor power dissipation
32.	IC Pd	1.572 W	Power	IC power dissipation
33.	L Pd	593.75 mW	Power	Inductor power dissipation
34.	M1 Pd	946.19 mW	Power	M1 MOSFET total power dissipation
35.	M1 PdCond	0.0 W	Power	M1 MOSFET conduction losses
36.	M1 PdSw	946.19 mW	Power	M1 MOSFET switching losses
37.	M2 Pd	138.891 mW	Power	M2 MOSFET total power dissipation
38.	M2 PdCond	0.0 W	Power	M2 MOSFET conduction losses
39.	M2 PdSw	138.891 mW	Power	M2 MOSFET switching losses
40.	Rsense Pd	283.758 mW	Power	LED Current Rsns Power Dissipation
41.	Total Pd	3.707 W	Power	Total Power Dissipation
42.	IC Icc Nom	16.988 mA		IC Icc gate driver current
43.	Vout Tolerance	2.866 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	5.0	Maximum Output Current
2.	VinMax	95.0	Maximum input voltage
3.	VinMin	50.0	Minimum input voltage
4.	Vout	5.0	Output Voltage

#	Name	Value	Description
5.	base_pn	LM5116	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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