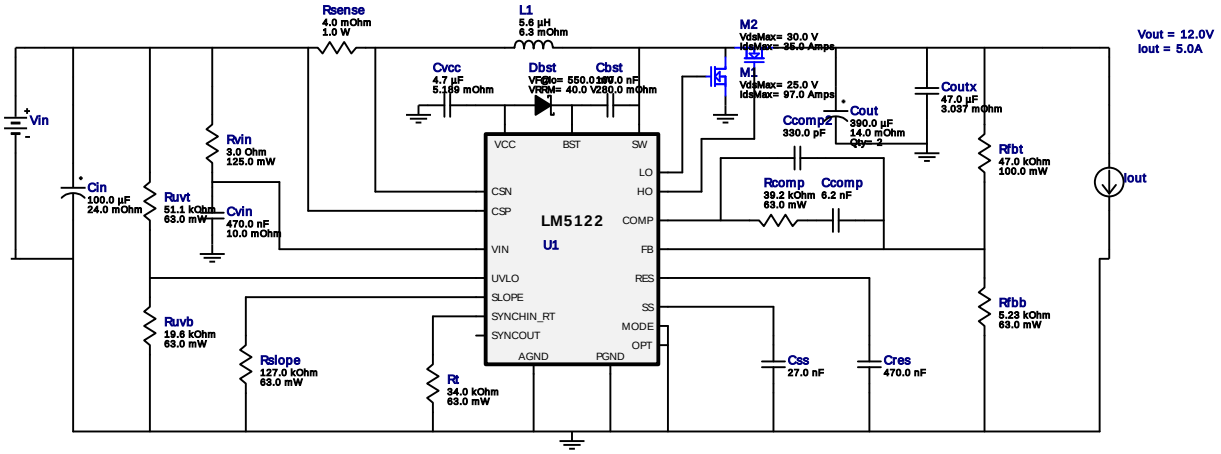
WEBENCH® Design Report

VinMin = 5.0V
VinMax = 10.0V
Vout = 12.0V
Iout = 5.0A

Device = LM5122MH/NOPB
Topology = Boost
Created = 2017-06-12 04:53:45.125
BOM Cost = $6.81
BOM Count = 25
Total Pd = 4.76W

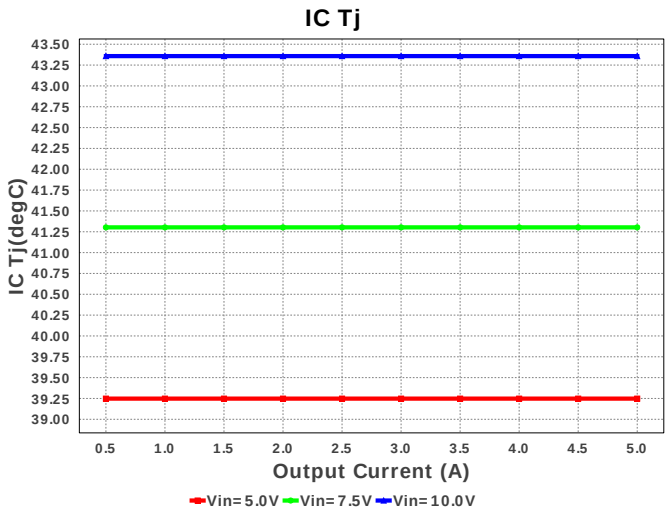
Design : 4573922/48 LM5122MH/NOPB
LM5122MH/NOPB 5.0V-10.0V to 12.00V @ 5.0A

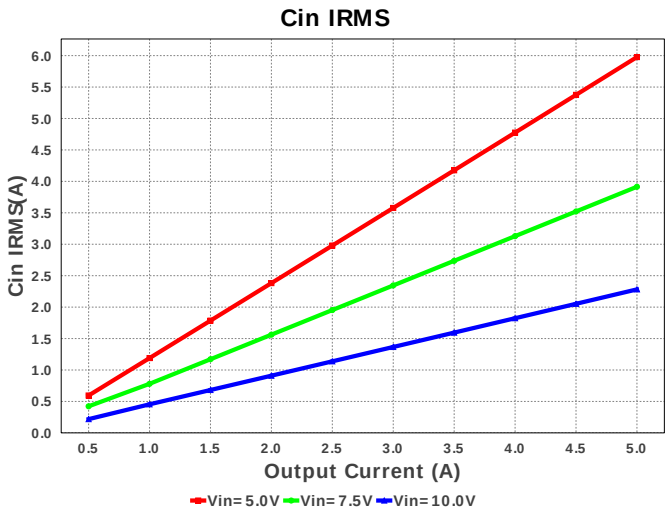


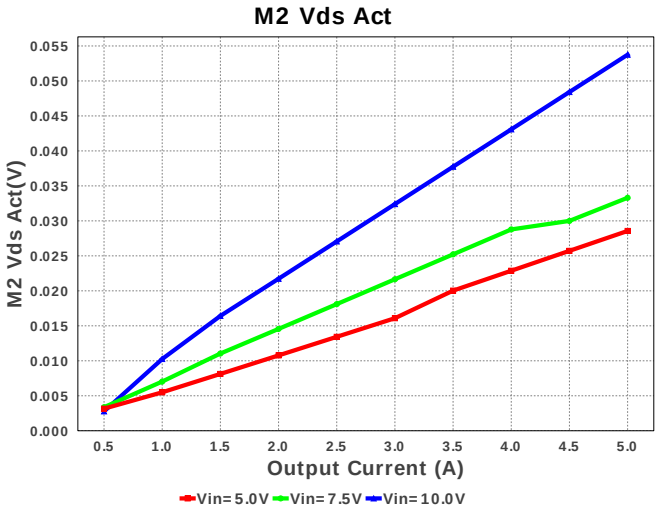
Electrical BOM

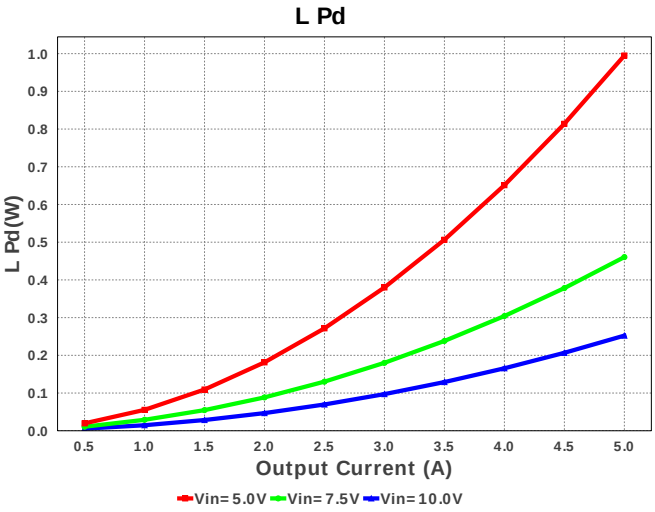
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	MuRata	GRM2195C1H622JA01D Series= C0G/NP0	Cap= 6.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.05	0805 7 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C331JBANFNC Series= C0G/NP0	Cap= 330.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	16SVPC100M Series= SVPC	Cap= 100.0 uF ESR= 24.0 mOhm VDC= 16.0 V IRMS= 2.49 A	1	$0.31	SM_RADIAL_6.3AMM 80 mm²
5.	Cout	Panasonic	20SVPF390M Series= ?	Cap= 390.0 uF ESR= 14.0 mOhm VDC= 20.0 V IRMS= 4.95 A	2	$0.66	CAPSMT_62_E12 106 mm²
6.	Coutx	MuRata	GRM32ER61C476ME15L Series= X5R	Cap= 47.0 uF ESR= 3.037 mOhm VDC= 16.0 V IRMS= 4.59346 A	1	$0.26	1210_280 15 mm²
7.	Cres	Taiyo Yuden	TMK212BJ474KD-T Series= X5R	Cap= 470.0 nF VDC= 20.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
8.	Css	MuRata	GRM155R61A273KA01D Series= X5R	Cap= 27.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
9.	Cvcc	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	$0.03	0805 7 mm²

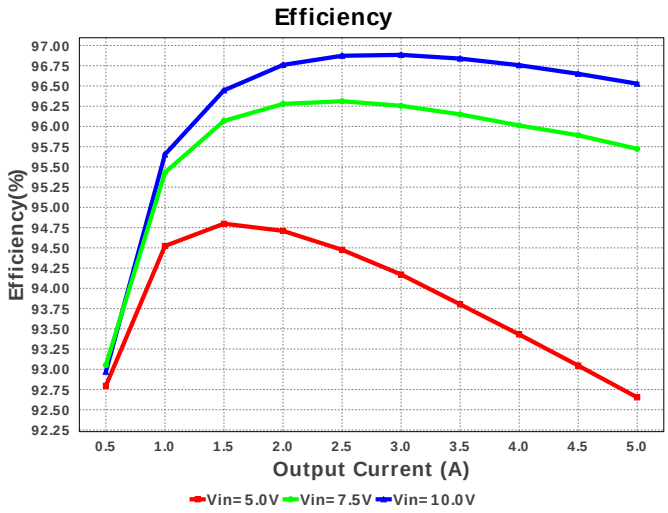
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Cvin	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	 0603 5 mm^2
11.	Dbst	Fairchild Semiconductor	SS24FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.07	 SOD-123F 12 mm^2
12.	L1	Coilcraft	XAL1010-562MEB	L= 5.6 µH DCR= 6.3 mOhm	1	$1.71	 XAL1010 160 mm^2
13.	M1	Texas Instruments	CSD16322Q5	VdsMax= 25.0 V IdsMax= 97.0 Amps	1	$0.40	 TRANS_NexFET_Q5 55 mm^2
14.	M2	Texas Instruments	CSD17577Q3A	VdsMax= 30.0 V IdsMax= 35.0 Amps	1	$0.21	 DNH0008A 18 mm^2
15.	Rcomp	Vishay-Dale	CRCW040239K2FKED Series= CRCW..e3	Res= 39.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rfbb	Vishay-Dale	CRCW04025K23FKED Series= CRCW..e3	Res= 5.23 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rfbt	Yageo America	RC0603FR-0747KL Series= ?	Res= 47.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm^2
18.	Rsense	Panasonic	ERJ-M1WSF4M0U Series= ERJ	Res= 4.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.14	 2512 43 mm^2
19.	Rslope	Vishay-Dale	CRCW0402127KFKED Series= CRCW..e3	Res= 127.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Rt	Vishay-Dale	CRCW040234K0FKED Series= CRCW..e3	Res= 34.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
21.	Ruvb	Vishay-Dale	CRCW040219K6FKED Series= CRCW..e3	Res= 19.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
22.	Ruvt	Vishay-Dale	CRCW040251K1FKED Series= CRCW..e3	Res= 51.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
23.	Rvin	Yageo America	RC0805FR-073RL Series= ?	Res= 3.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
24.	U1	Texas Instruments	LM5122MH/NOPB	Switcher	1	$2.16	 MXA20A 71 mm^2

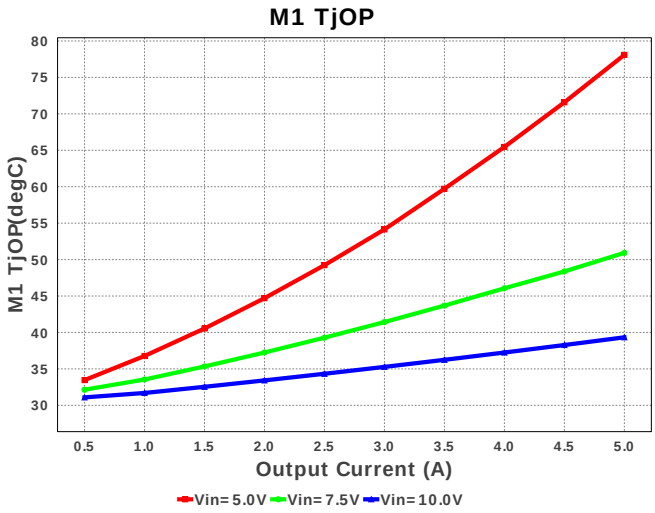


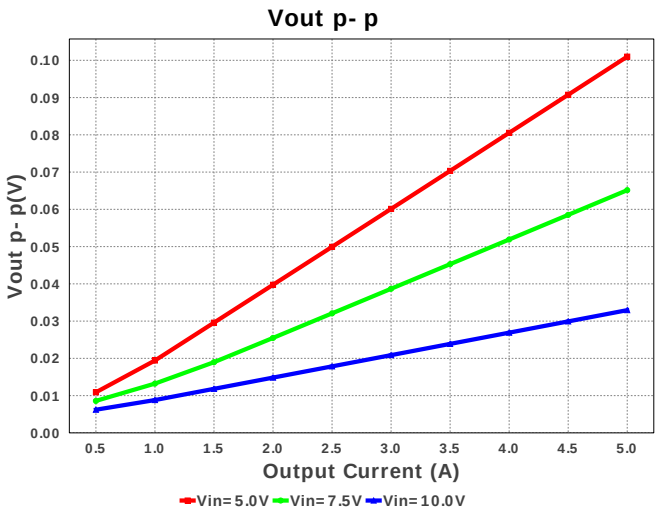


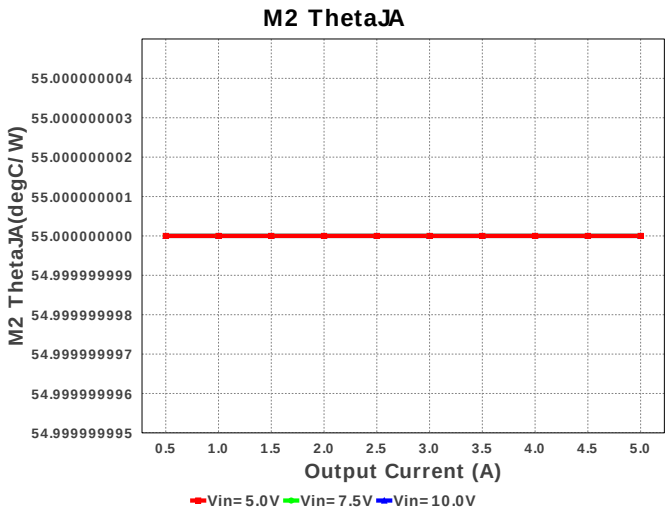


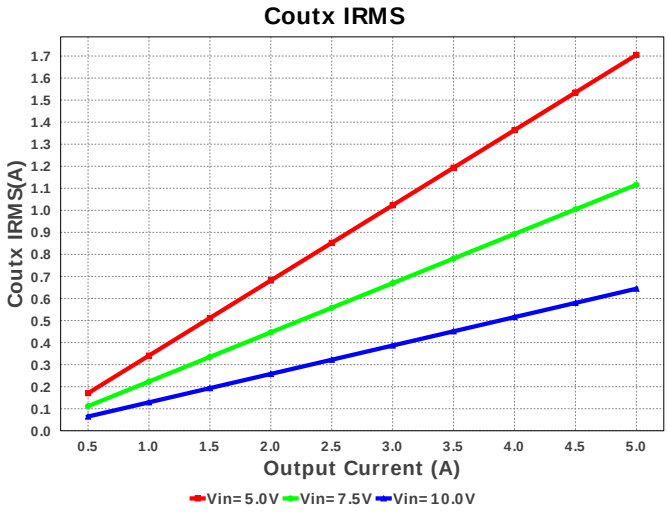


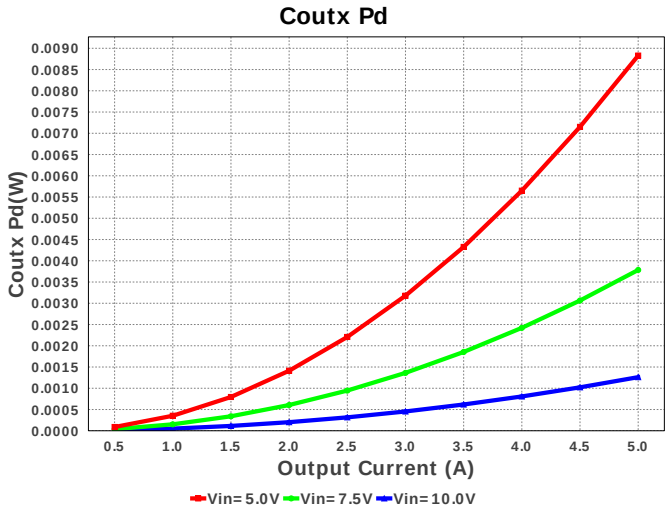


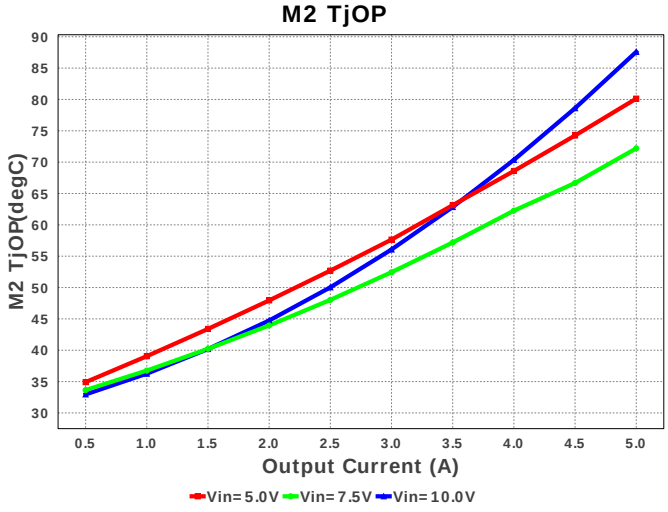


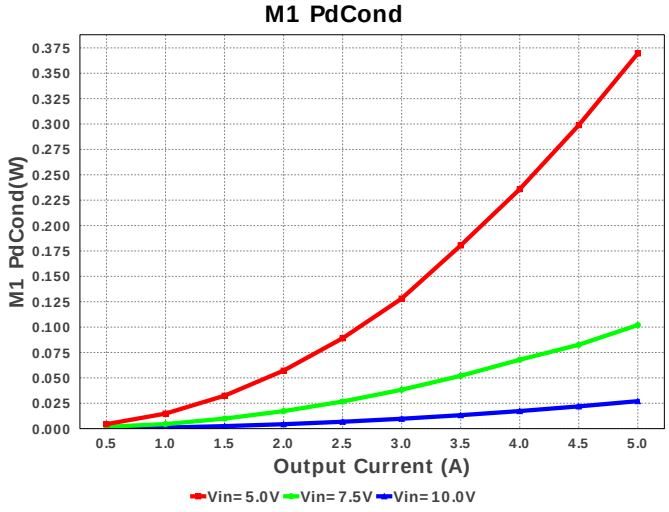


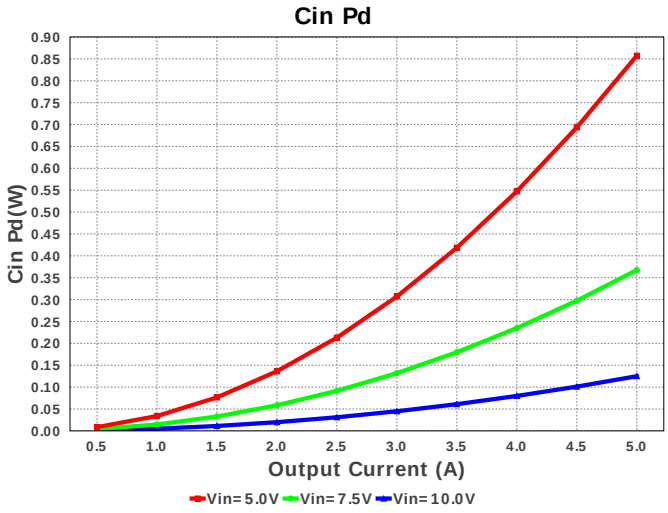


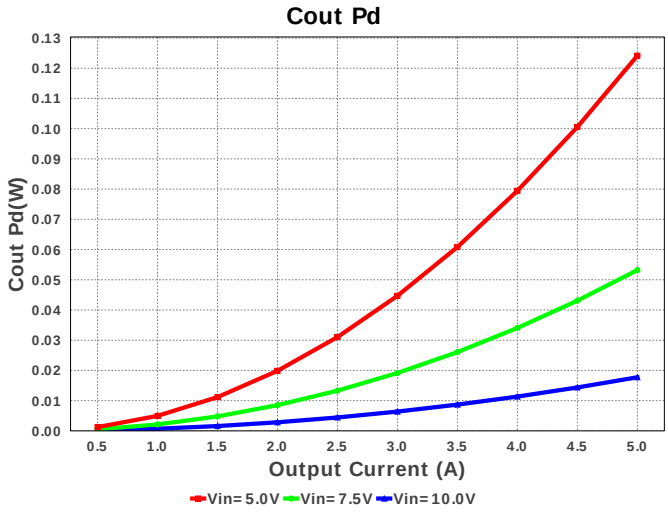


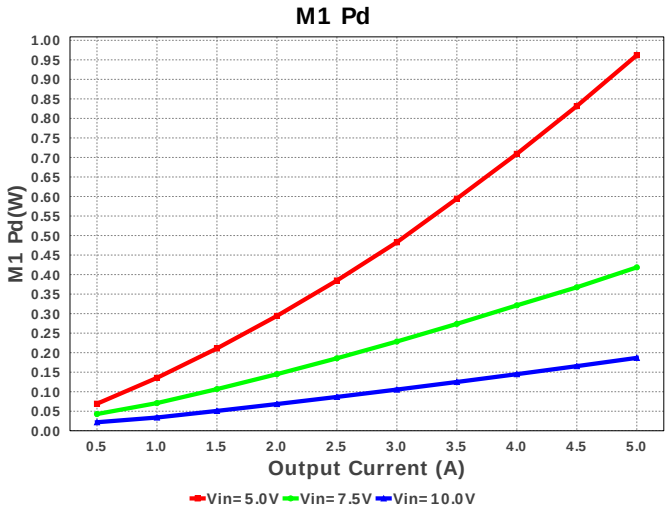


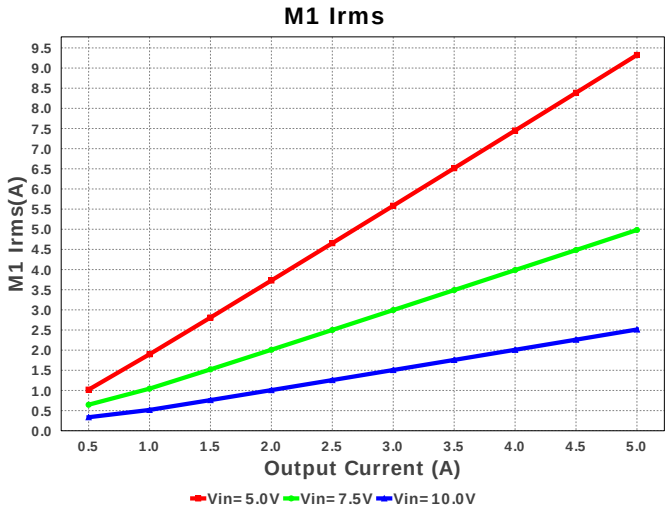


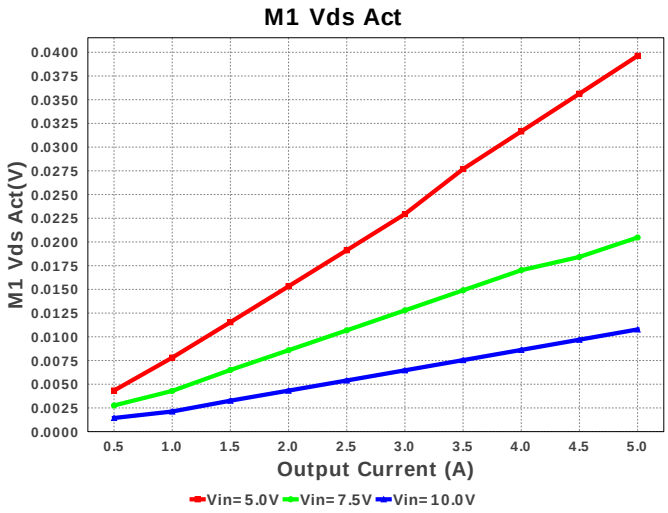


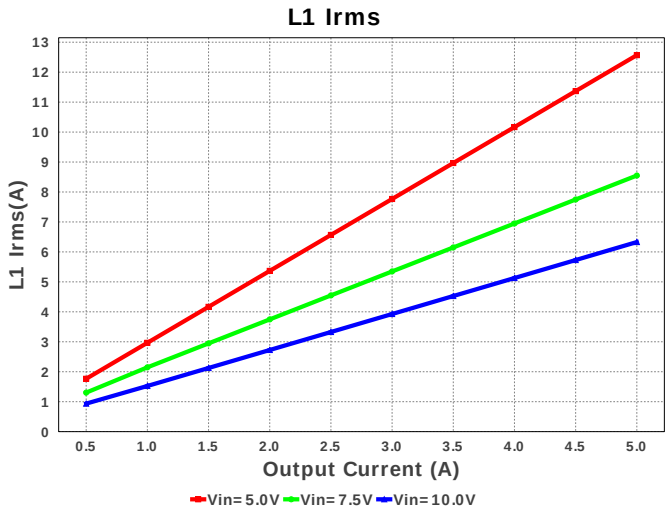


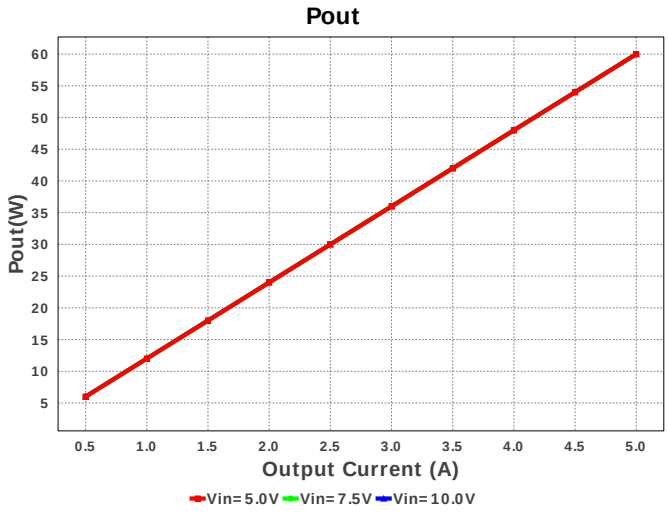


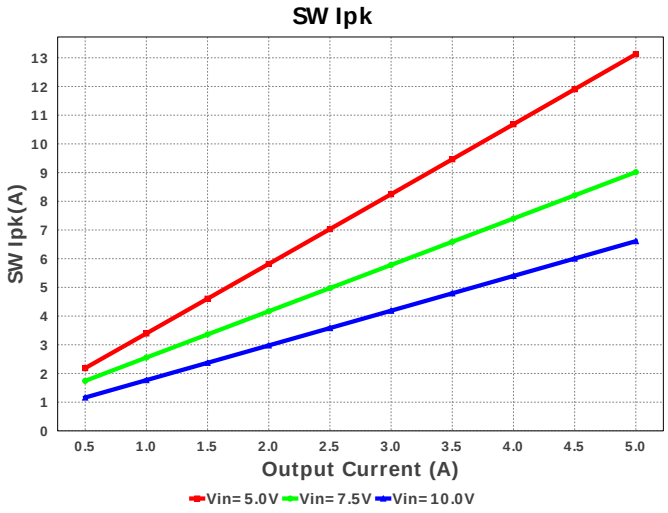


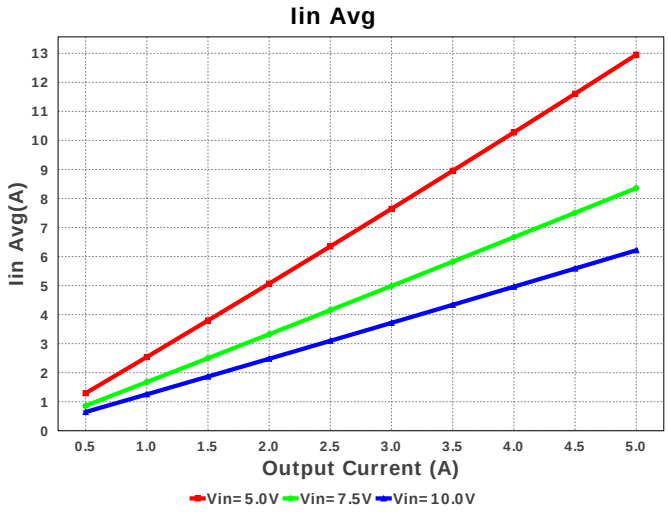


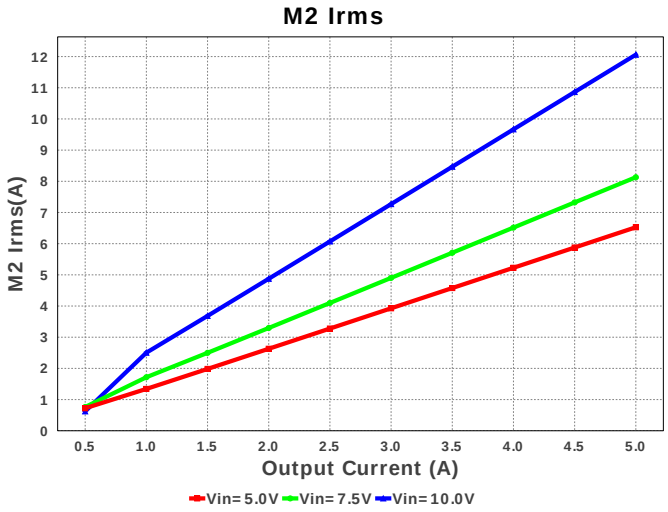


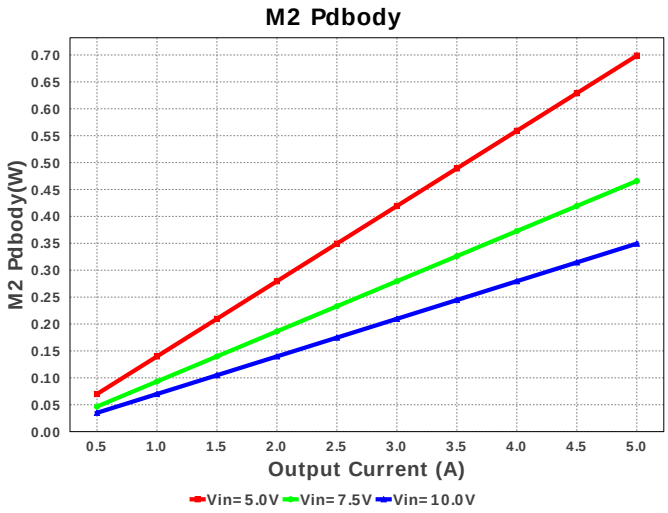


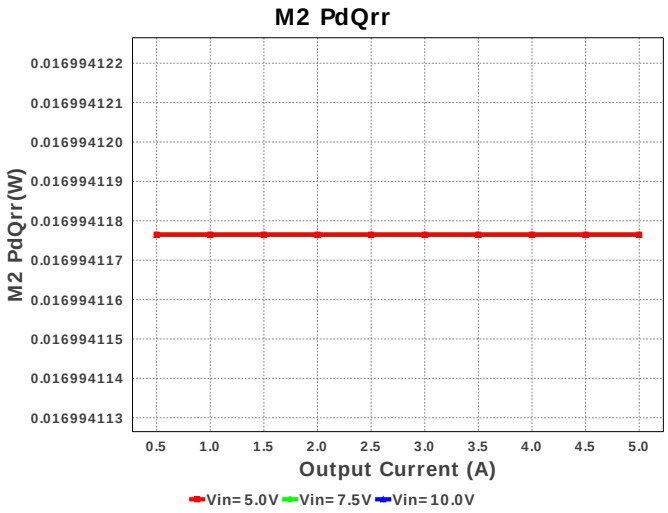


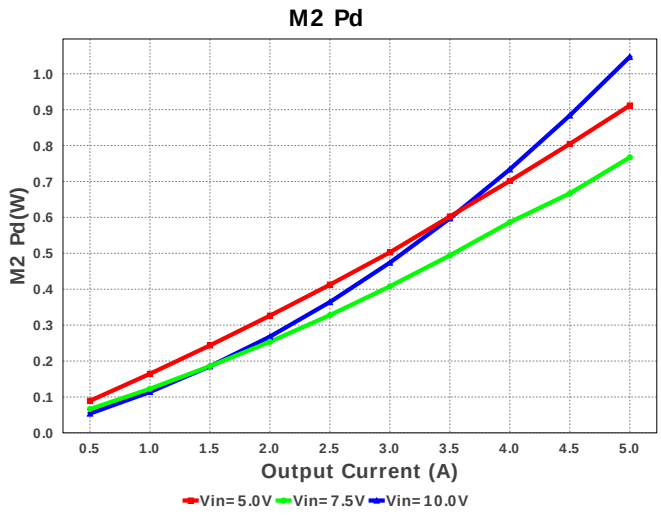


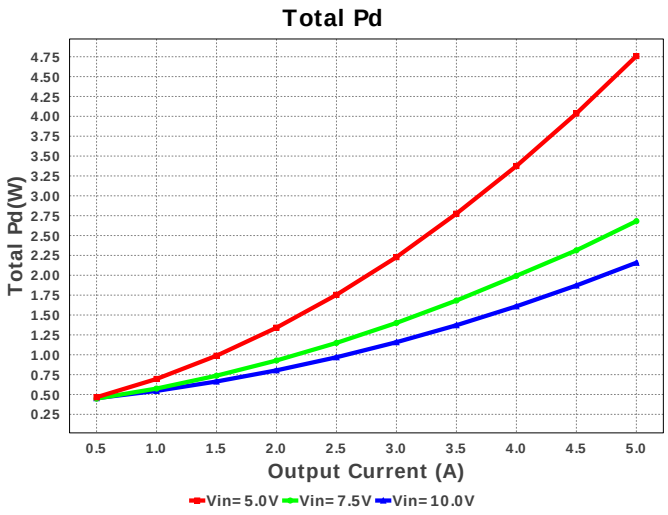


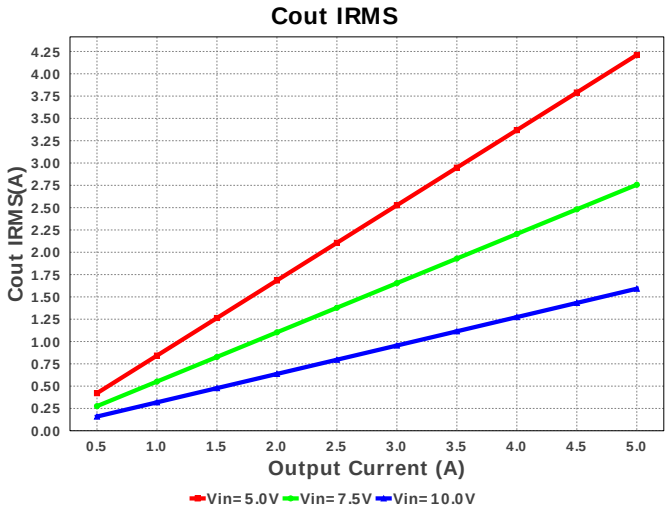


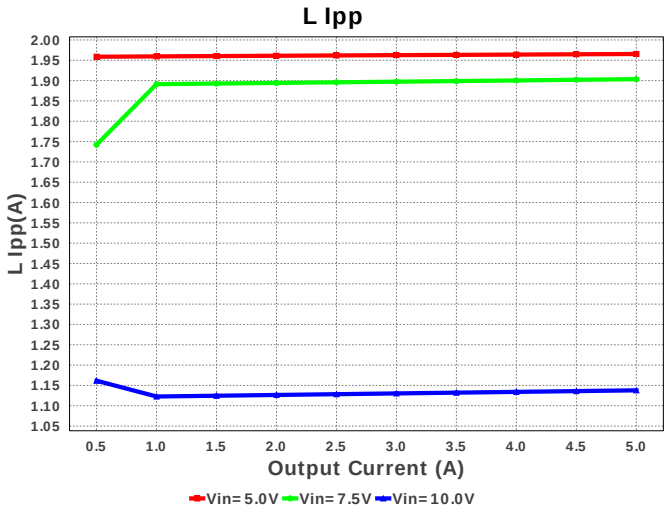


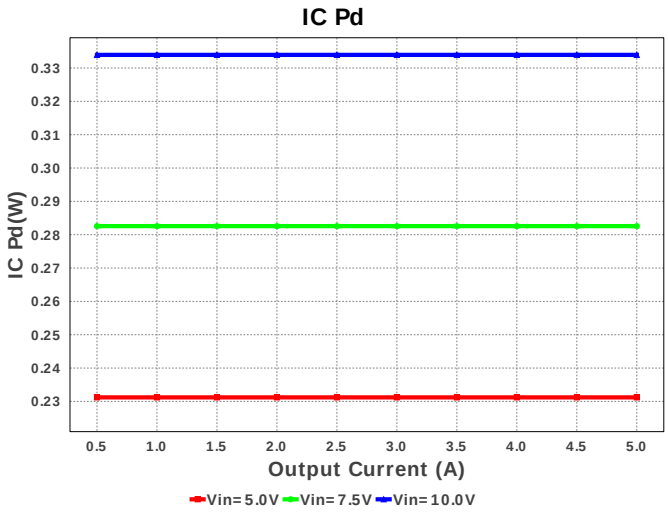


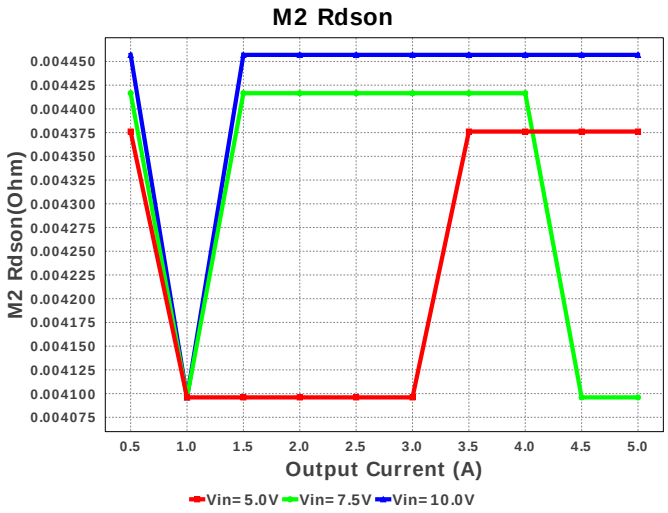


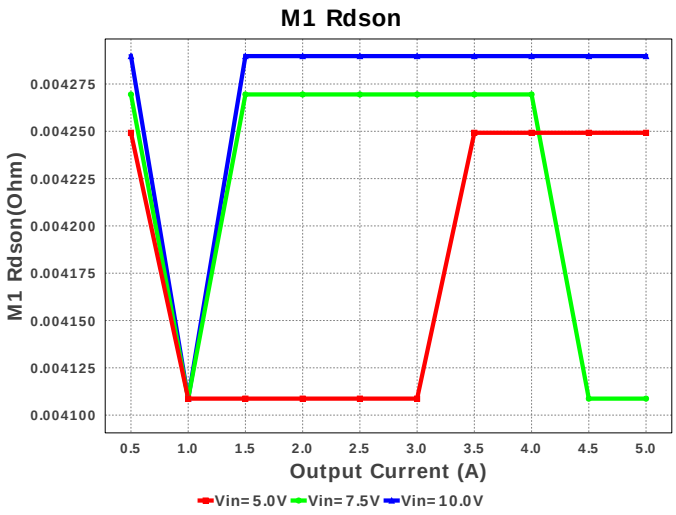


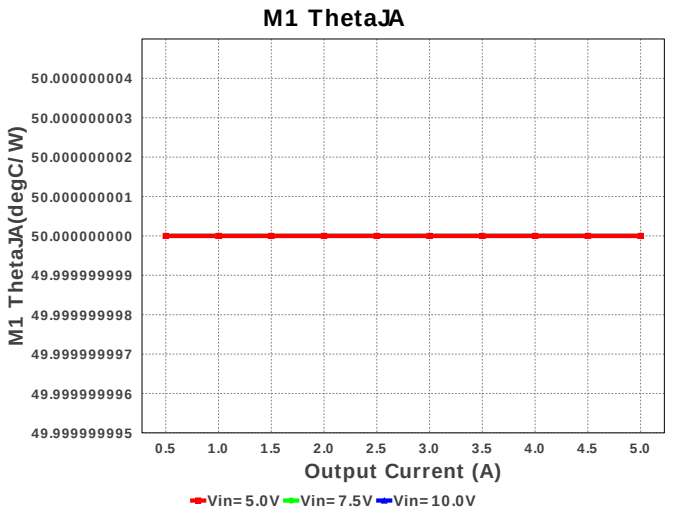


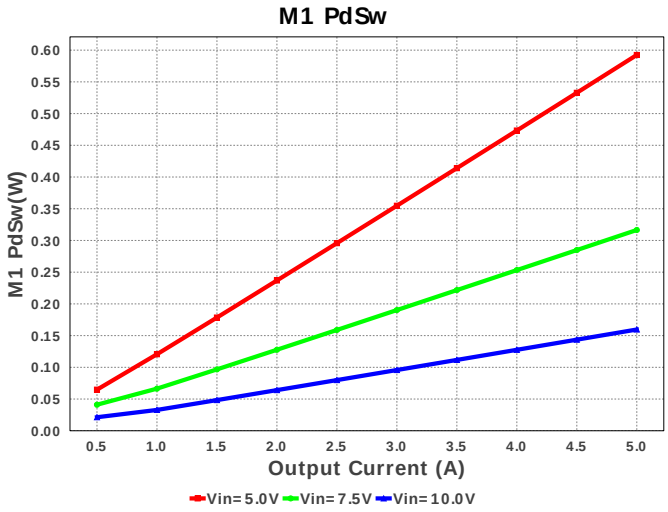


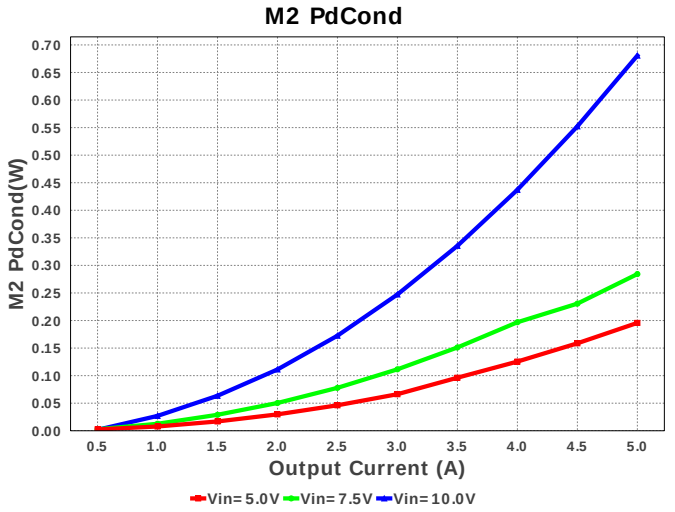


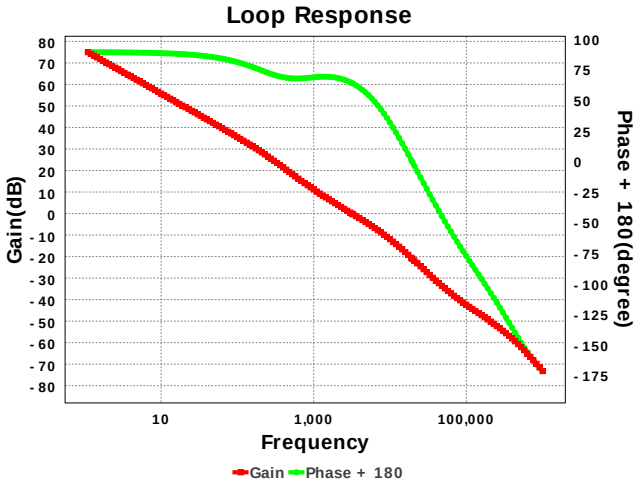












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	5.977 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	4.211 A	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	1.705 A	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	12.953 A	Current	Average input current
5.	L Ipp	1.966 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	12.567 A	Current	Inductor ripple current
7.	M1 Irms	9.325 A	Current	MOSFET RMS ripple current
8.	M2 Irms	6.526 A	Current	MOSFET RMS ripple current
9.	SW Ipk	13.127 A	Current	Peak switch current
10.	BOM Count	25	General	Total Design BOM count
11.	FootPrint	737.0 mm^2	General	Total Foot Print Area of BOM components

#	Name	Value	Category	Description
12.	Frequency	264.71 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	4.249 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	M1 Vds Act	39.623 mV	General	M Vds
17.	M2 Rdson	4.376 mOhm	General	Drain-Source On-resistance
18.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
19.	M2 Vds Act	28.559 mV	General	M Vds
20.	Mode	CCM	General	Conduction Mode
21.	Pout	60.0 W	General	Total output power
22.	Total BOM	$6.81	General	Total BOM Cost
23.	Low Freq Gain	74.267 dB	Op_Point	Gain at 10Hz
24.	Vout Actual	11.984 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
25.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
26.	Cross Freq	1.71 kHz	Op_point	Bode plot crossover frequency
27.	Efficiency	92.644 %	Op_point	Steady state efficiency
28.	Gain Marg	-17.804 dB	Op_point	Bode Plot Gain Margin
29.	IC Tj	39.248 degC	Op_point	IC junction temperature
30.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
31.	IOUT_OP	5.0 A	Op_point	Iout operating point
32.	M1 TjOP	78.094 degC	Op_point	M1 MOSFET junction temperature
33.	M2 TjOP	80.133 degC	Op_point	MOSFET junction temperature
34.	Phase Marg	60.913 deg	Op_point	Bode Plot Phase Margin
35.	VIN_OP	5.0 V	Op_point	Vin operating point
36.	Vout p-p	100.99 mV	Op_point	Peak-to-peak output ripple voltage
37.	Cin Pd	857.316 mW	Power	Input capacitor power dissipation
38.	Cout Pd	124.135 mW	Power	Output capacitor power dissipation
39.	Coutx Pd	8.828 mW	Power	Output capacitor_x power loss
40.	IC Pd	231.2 mW	Power	IC power dissipation
41.	L Pd	995.016 mW	Power	Inductor power dissipation
42.	M1 Pd	961.876 mW	Power	MOSFET power dissipation
43.	M1 PdCond	369.477 mW	Power	M1 MOSFET conduction losses
44.	M1 PdSw	592.399 mW	Power	M1 MOSFET switching losses
45.	M2 Pd	911.512 mW	Power	MOSFET power dissipation
46.	M2 PdCond	195.695 mW	Power	M2 MOSFET conduction losses
47.	M2 PdQrr	16.994 mW	Power	Synchronous Boost High Side Reverse Recovery
48.	M2 Pdbody	698.824 mW	Power	Power dissipation through lower FET
49.	Total Pd	4.764 W	Power	Total Power Dissipation
50.	Vout Tolerance	3.345 %		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	10.0	Maximum input voltage
3.	VinMin	5.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM5122	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The LM5122 is a wide range boost controller which is operable in an ultra wide input range of 4.5 to 65V. A boost regulator can maintain regulation for input voltages lower than the output voltage.

2. **LM5122** Product Folder : http://www.ti.com/product/LM5122 : contains the data sheet and other resources.