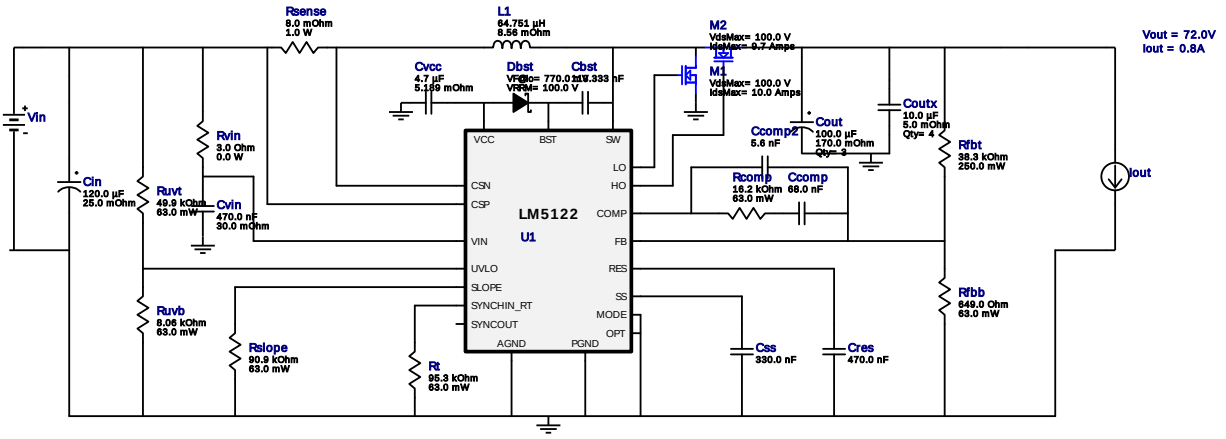
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 14.4V
Vout = 72.0V
Iout = 0.8A

Device = LM5122MH/NOPB
Topology = Boost
Created = 7/11/16 4:32:39 AM
BOM Cost = $0.00
BOM Count = 29
Total Pd = 3.42W

Design : 1641152/108 LM5122MH/NOPB
LM5122MH/NOPB 10.0V-14.4V to 72.02V @ 0.8A

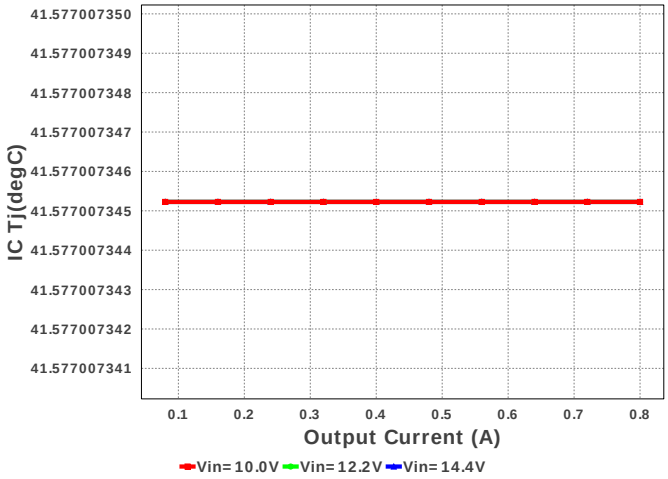


Electrical BOM

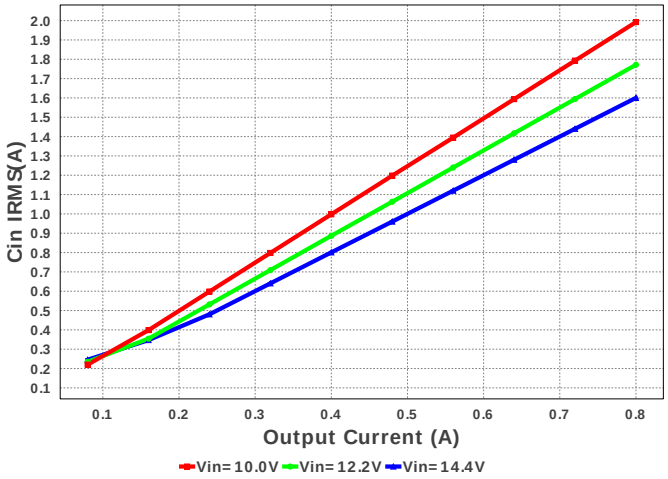
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	CUSTOM	CUSTOM Series= ?	Cap= 113.333 nF VDC= 86.4 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm²
2.	Ccomp	MuRata	GRM155R61A683KA01D Series= X5R	Cap= 68.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB562 Series= X7R	Cap= 5.6 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	20SVPF120M Series= ?	Cap= 120.0 uF ESR= 25.0 mOhm VDC= 20.0 V IRMS= 3.2 A	1	$0.43	CAPSMT_62_F61 74 mm²
5.	Cout	Panasonic	EEV-FK2A101M Series= FK	Cap= 100.0 uF ESR= 170.0 mOhm VDC= 100.0 V IRMS= 793.0 mA	3	$0.79	SM_RADIAL_J16 399 mm²
6.	Coutx	TDK	C5750X7S2A106M230KB Series= X7S	Cap= 10.0 uF ESR= 5.0 mOhm VDC= 100.0 V IRMS= 6.45 A	4	NA	2220 54 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	GRM155R61A334KE15D Series= X5R	Cap= 330.0 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	$0.02	0805 7 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Cvin	MuRata	GRM188R71E474KA12D Series= X7R	Cap= 470.0 nF ESR= 30.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.02	 0603 5 mm^2
11.	Dbst	Diodes Inc.	DFLS1100-7	VF@Io= 770.0 mV VRRM= 100.0 V	1	$0.14	 PowerDI123 13 mm^2
12.	L1	CUSTOM	CUSTOM	L= 64.751 µH DCR= 8.56 mOhm	1	NA	CUSTOM 0 mm^2
13.	M1	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 10.0 Amps	1	$0.68	 TRANS_NexFET_Q5A 55 mm^2
14.	M2	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 9.7 Amps	1	$0.75	 TRANS_NexFET_Q3 18 mm^2
15.	Rcomp	Vishay-Dale	CRCW040216K2FKED Series= CRCW..e3	Res= 16.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rfbb	Vishay-Dale	CRCW0402649RFKED Series= CRCW..e3	Res= 649.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rfbt	Panasonic	ERJ-8ENF3832V Series= ERJ-8E	Res= 38.3 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm^2
18.	Rsense	Susumu Co Ltd	PRL1632-R008-F-T1 Series= PRL1632	Res= 8.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	 0612 11 mm^2
19.	Rslope	Vishay-Dale	CRCW040290K9FKED Series= CRCW..e3	Res= 90.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Rt	Vishay-Dale	CRCW040295K3FKED Series= CRCW..e3	Res= 95.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
21.	Ruvb	Vishay-Dale	CRCW04028K06FKED Series= CRCW..e3	Res= 8.06 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
22.	Ruvt	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
23.	Rvin	CUSTOM	CUSTOM Series= ?	Res= 3.0 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm^2
24.	U1	Texas Instruments	LM5122MH/NOPB	Switcher	1	$2.16	 MXA20A 71 mm^2

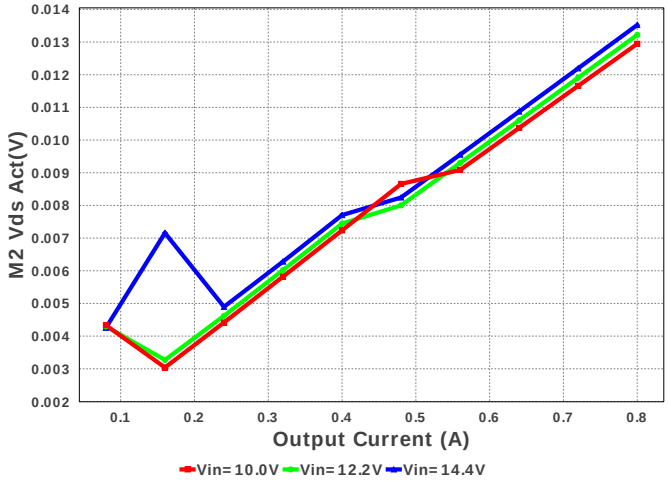
IC Tj



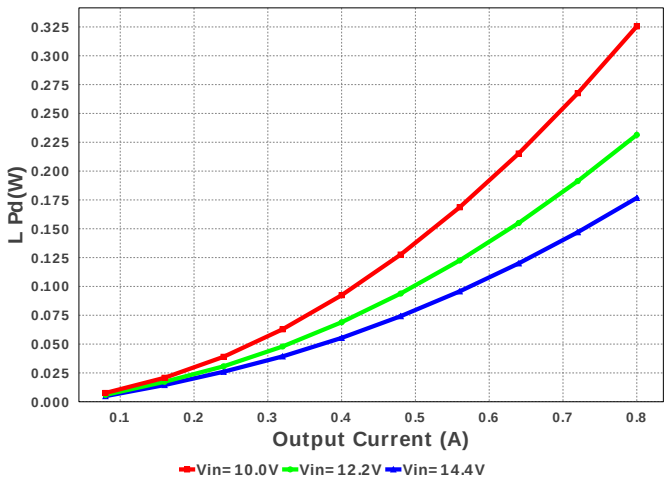
Cin IRMS



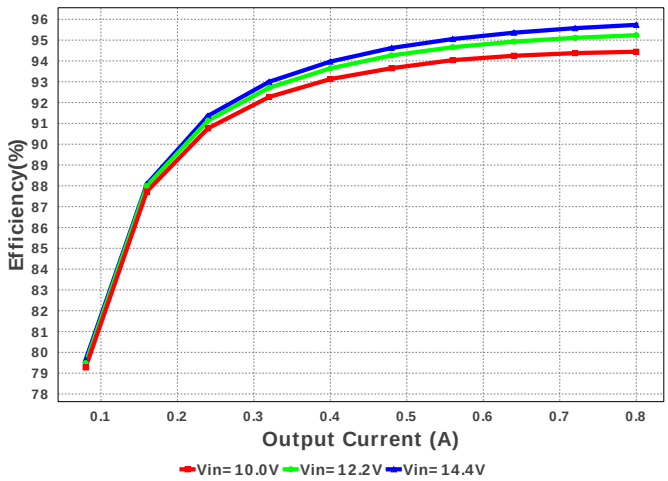
M2 Vds Act



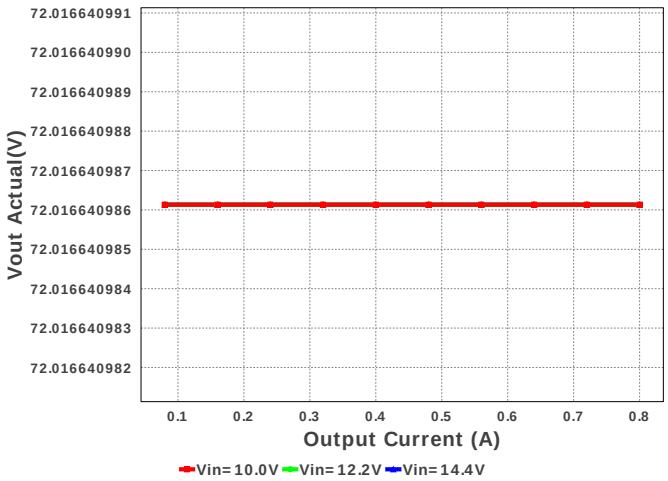
L Pd

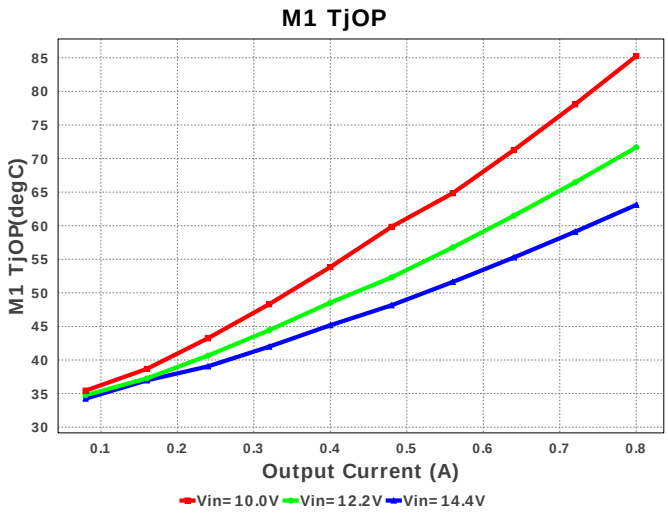


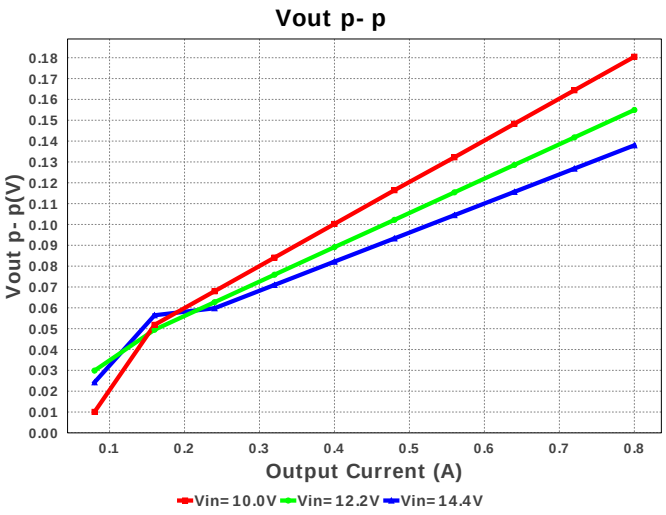
Efficiency

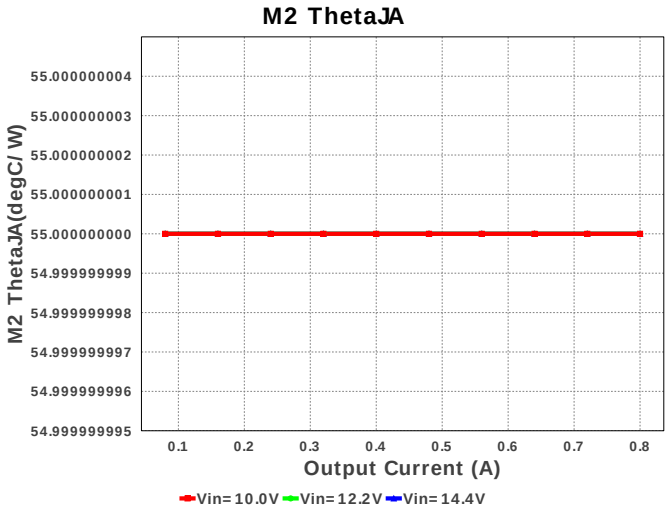


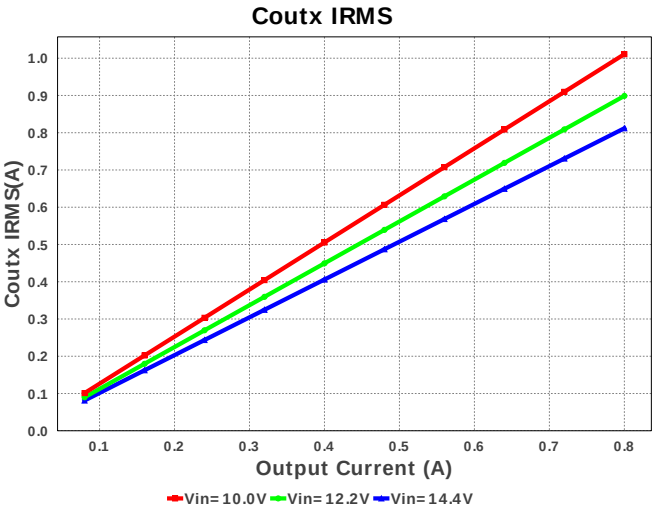
Vout Actual

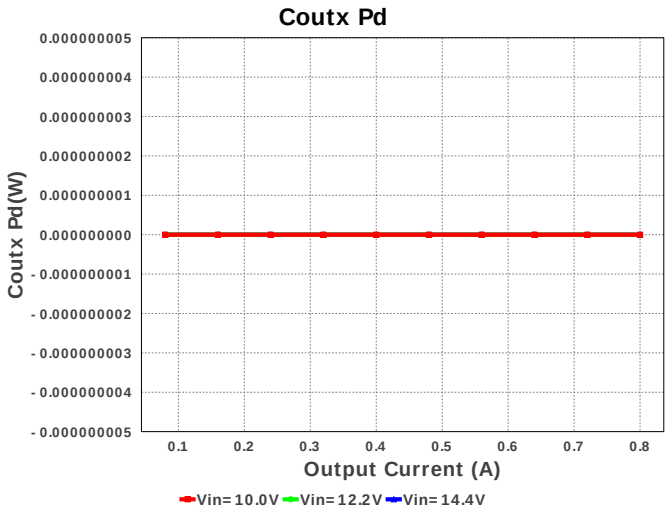


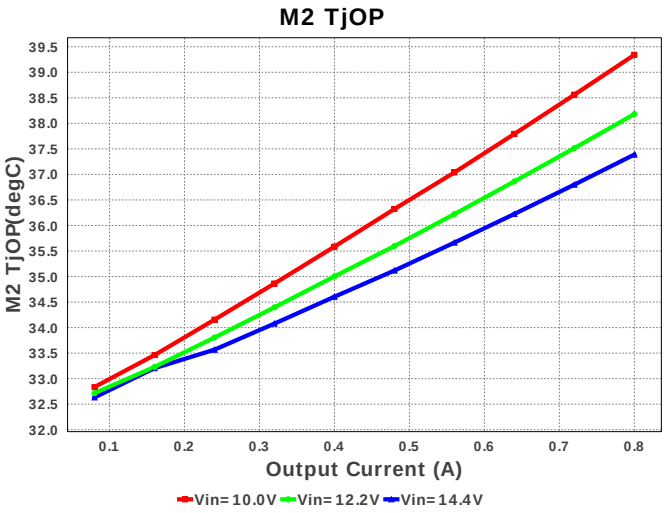


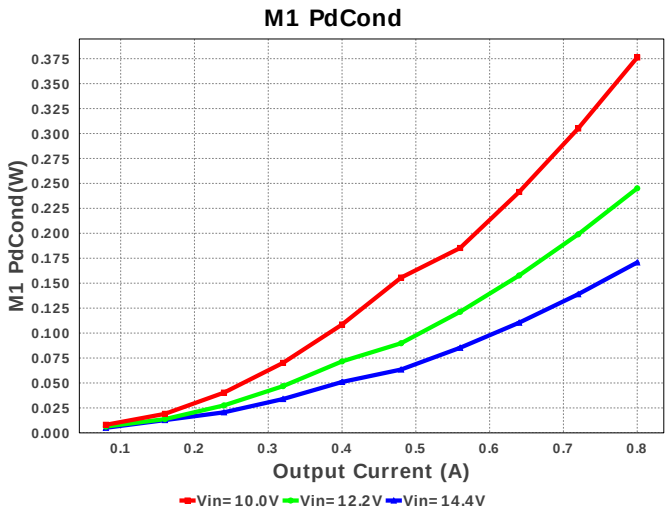


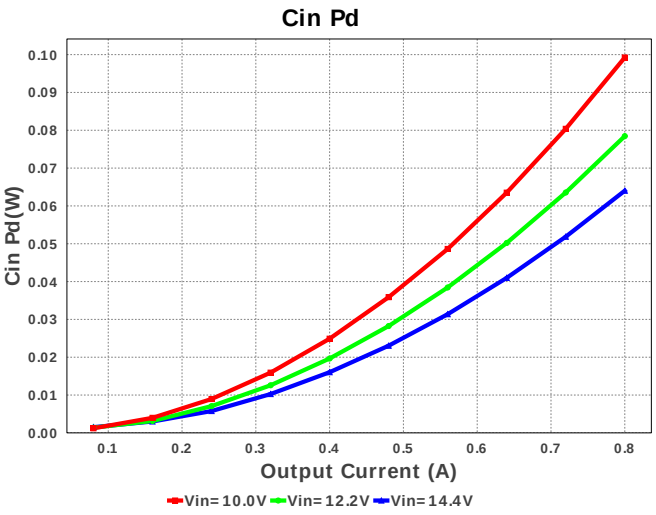


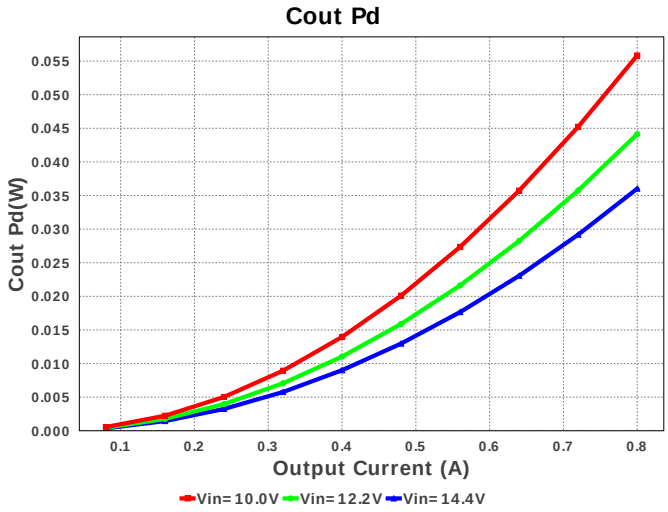


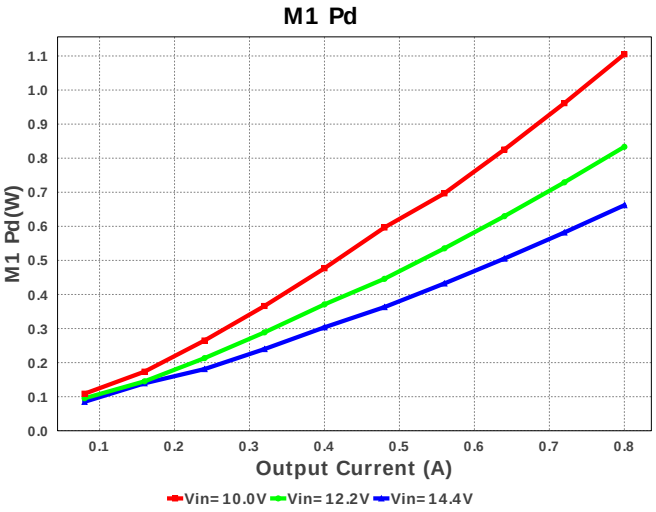


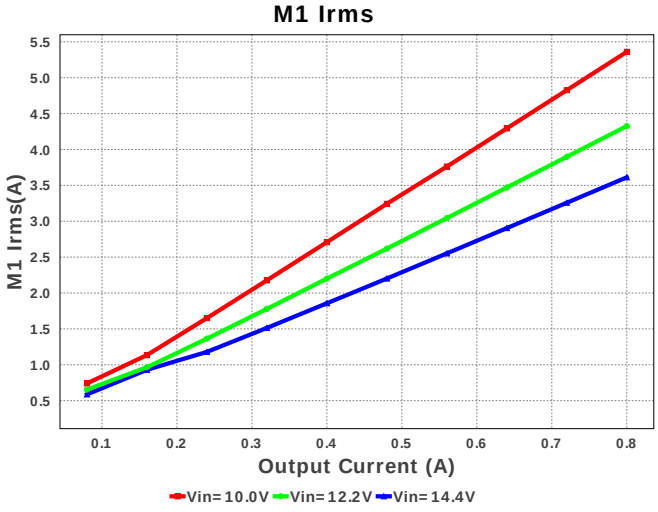


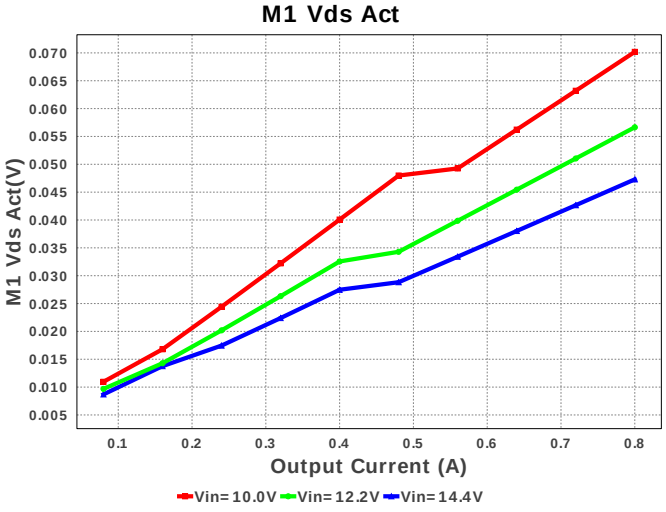


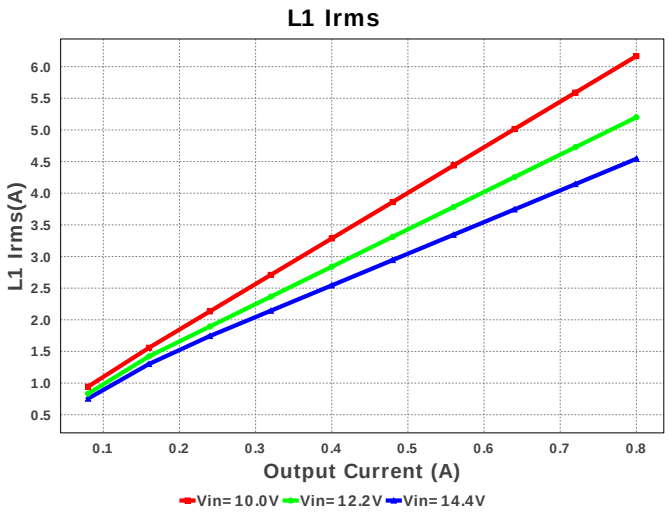


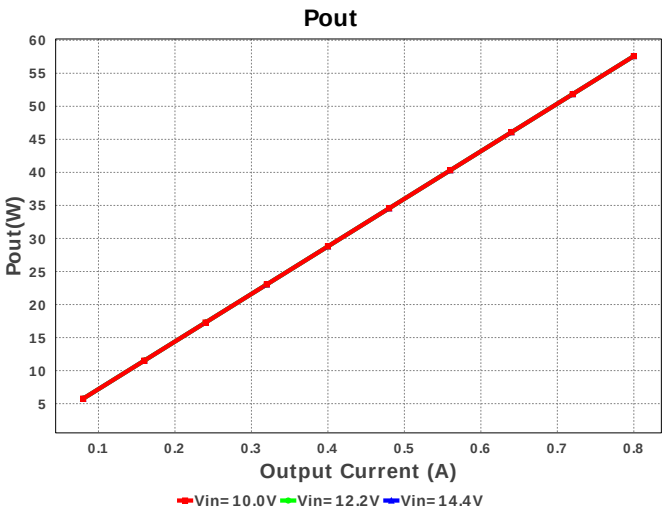


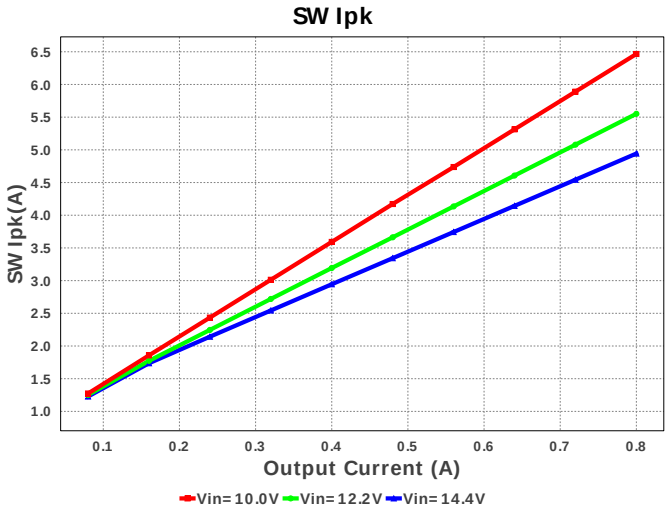


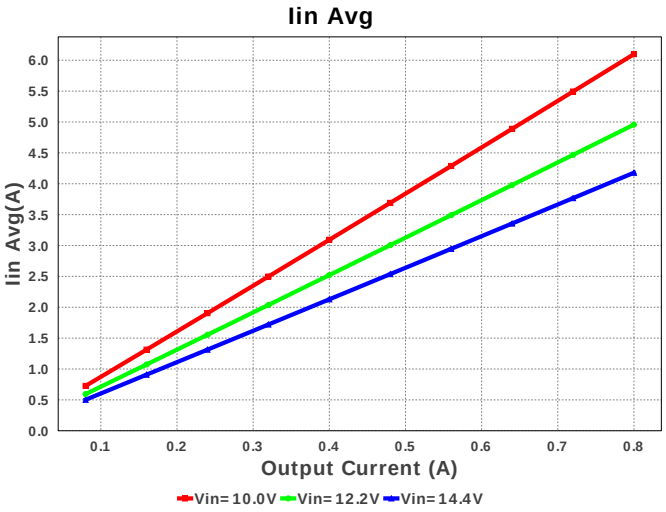


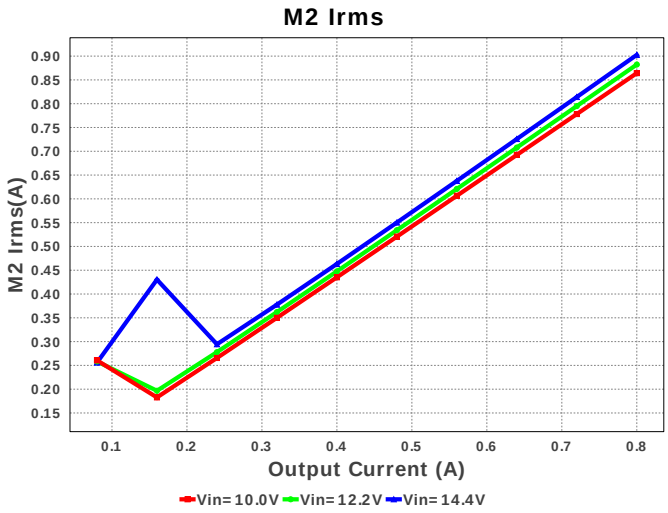


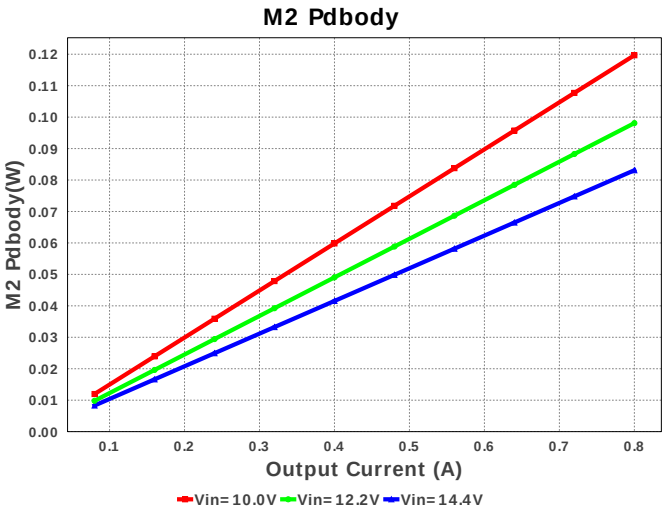


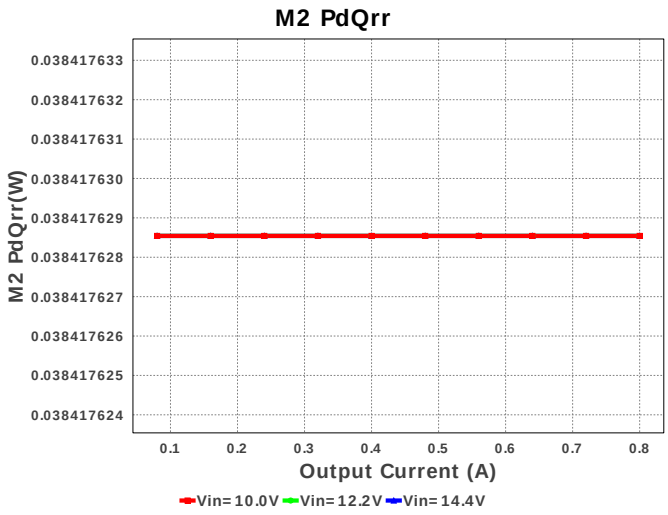


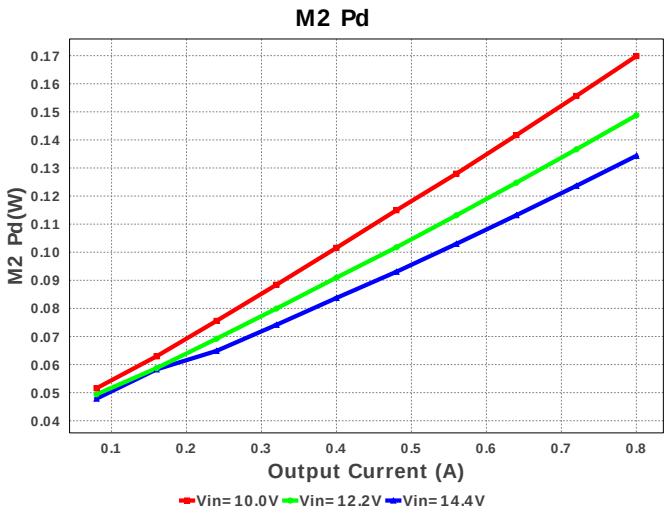


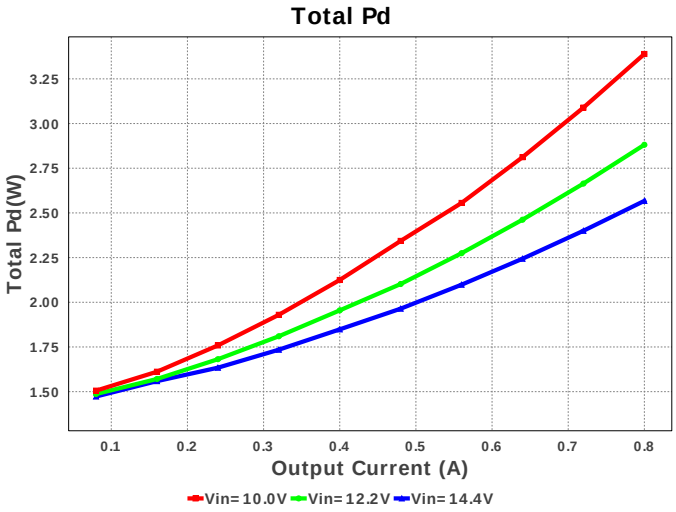


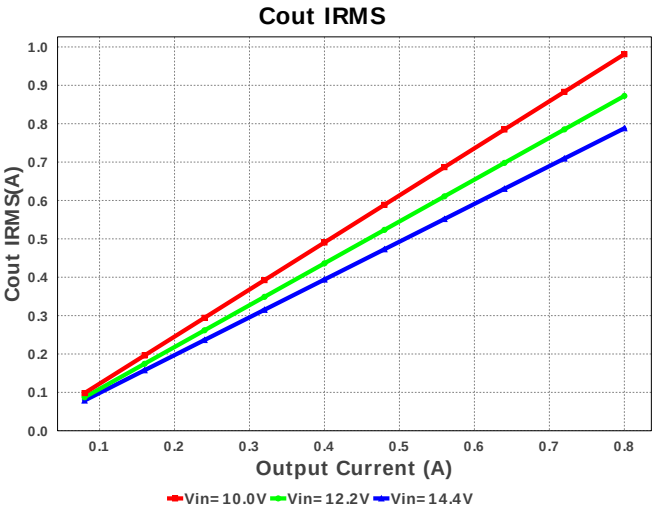


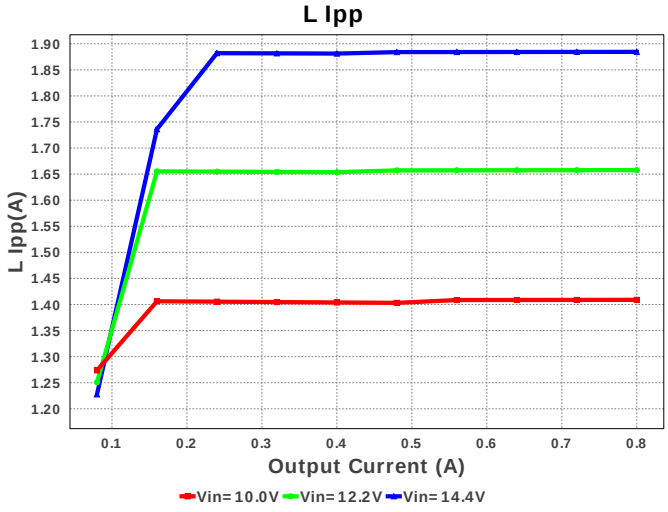


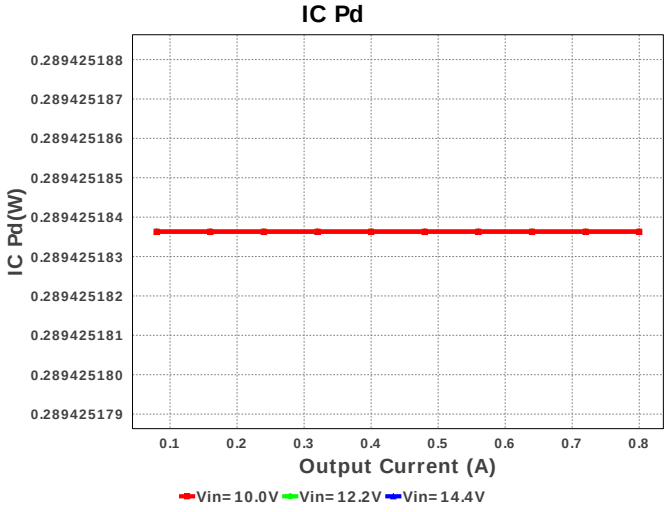


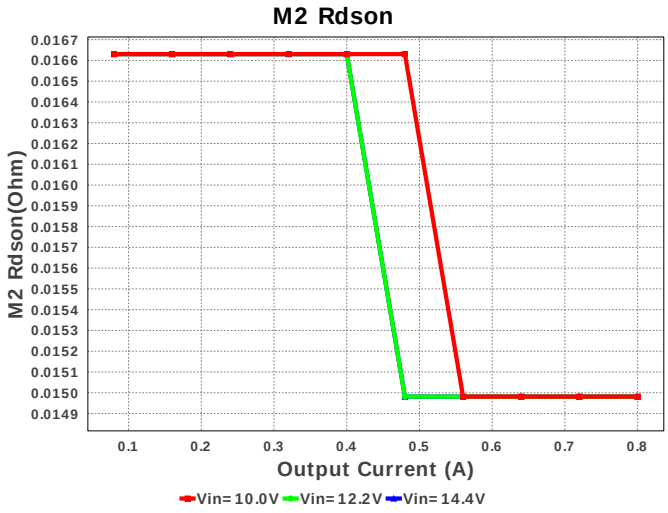


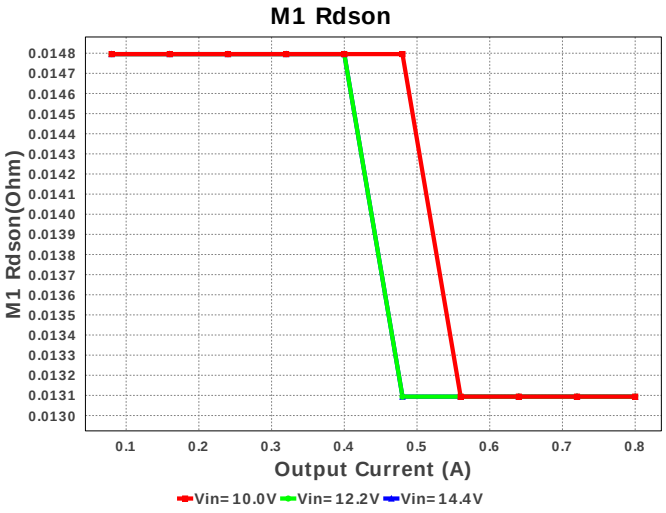


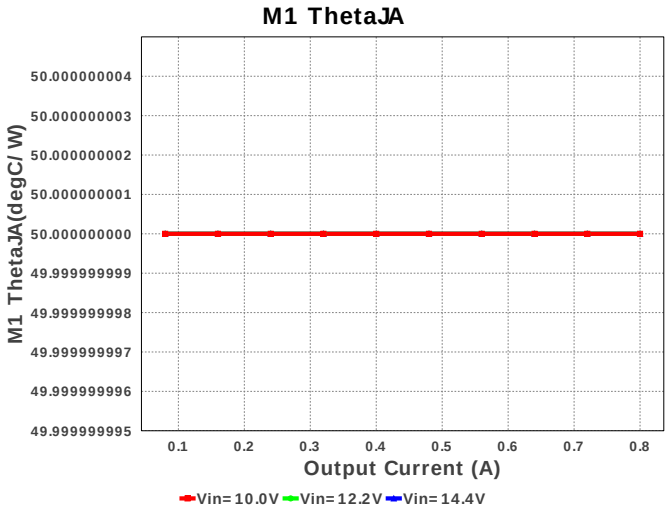


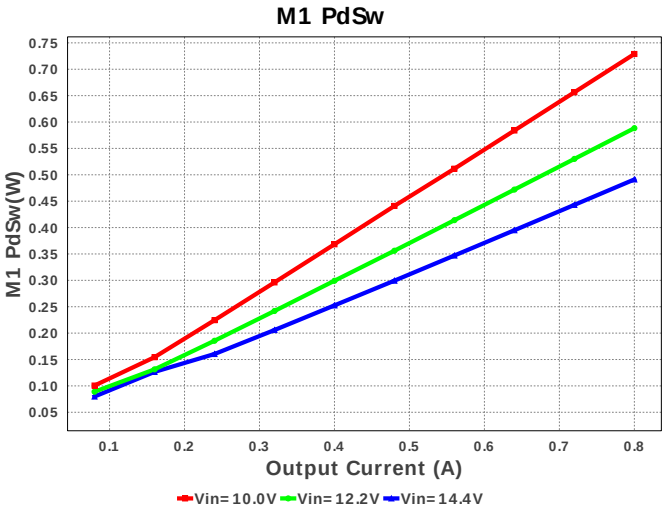


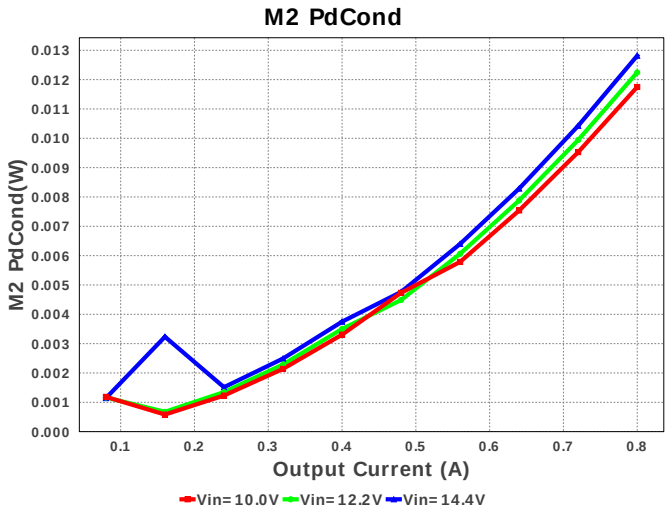


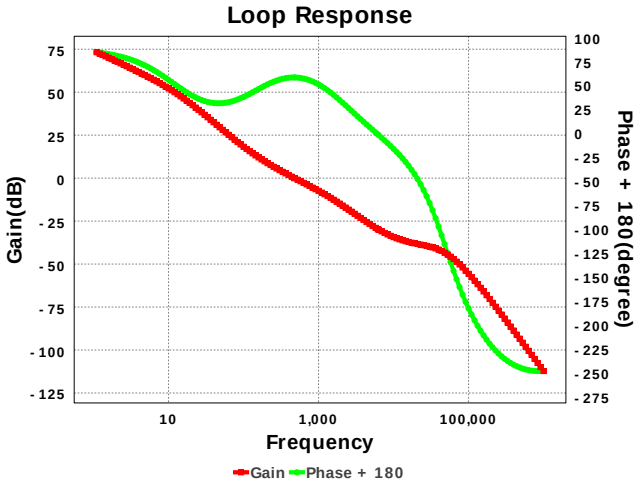












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.999 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	847.299 mA	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	1.145 A	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	6.102 A	Current	Average input current
5.	L Ipp	1.4 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	6.164 A	Current	Inductor ripple current
7.	M1 Irms	5.395 A	Current	MOSFET RMS ripple current
8.	M2 Irms	863.762 mA	Current	MOSFET RMS ripple current
9.	SW Ipk	6.497 A	Current	Peak switch current
10.	BOM Count	29	General	Total Design BOM count
11.	FootPrint	2.125 k mm^2	General	Total Foot Print Area of BOM components

#	Name	Value	Category	Description
12.	Frequency	94.439 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	13.094 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	M2 Rdson	14.981 mOhm	General	Drain-Source On-resistance
17.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
18.	M2 Vds Act	12.94 mV	General	M Vds
19.	Pout	57.6 W	General	Total output power
20.	Total BOM	$0.0	General	Total BOM Cost
21.	Low Freq Gain	71.316 dB	Op_Point	Gain at 10Hz
22.	Vout Actual	72.017 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
23.	Vout OP	72.017 V	Op_Point	Operational Output Voltage
24.	Cross Freq	339.334 Hz	Op_point	Bode plot crossover frequency
25.	Efficiency	94.393 %	Op_point	Steady state efficiency
26.	Gain Marg	-25.156 dB	Op_point	Bode Plot Gain Margin
27.	IC Tj	42.814 degC	Op_point	IC junction temperature
28.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
29.	IOUT_OP	800.0 mA	Op_point	Iout operating point
30.	M1 TjOP	85.734 degC	Op_point	M1 MOSFET junction temperature
31.	M2 TjOP	39.34 degC	Op_point	MOSFET junction temperature
32.	Phase Marg	55.717 deg	Op_point	Bode Plot Phase Margin
33.	VIN_OP	10.0 V	Op_point	Vin operating point
34.	Vout p-p	156.591 mV	Op_point	Peak-to-peak output ripple voltage
35.	Cin Pd	99.928 mW	Power	Input capacitor power dissipation
36.	Cout Pd	42.32 mW	Power	Output capacitor power dissipation
37.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
38.	IC Pd	320.353 mW	Power	IC power dissipation
39.	L Pd	325.248 mW	Power	Inductor power dissipation
40.	M1 Pd	1.115 W	Power	MOSFET power dissipation
41.	M1 PdCond	381.061 mW	Power	M1 MOSFET conduction losses
42.	M1 PdSw	733.625 mW	Power	M1 MOSFET switching losses
43.	M2 Pd	169.827 mW	Power	MOSFET power dissipation
44.	M2 PdCond	11.736 mW	Power	M2 MOSFET conduction losses
45.	M2 PdQrr	38.418 mW	Power	Synchronous Boost High Side Reverse Recovery
46.	M2 Pdbody	119.673 mW	Power	Power dissipation through lower FET
47.	Total Pd	3.422 W	Power	Total Power Dissipation
48.	M1 Vds Act	70.637 mV		M Vds
49.	Vout Tolerance	3.516 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	800.0 m	Maximum Output Current
2.	VinMax	14.4	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	72.0	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.