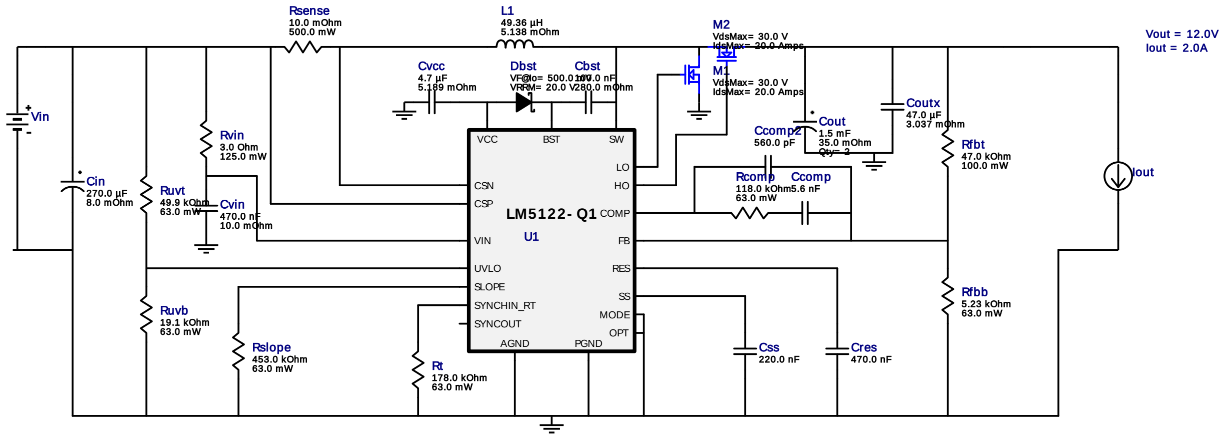
VinMin = 5.0V VinMax = 12.0V Vout = 12.0V Iout = 2.0A	Device = LM5122QMH/NOPB Topology = Boost Created = 8/11/16 7:59:31 AM BOM Cost = $0.00 BOM Count = 25 Total Pd = 1.02W

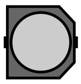
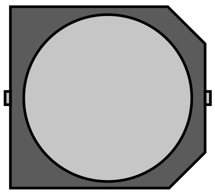
WEBENCH ® Design Report

Design : 4085315/12 LM5122QMH/NOPB
LM5122QMH/NOPB 5.0V-12.0V to 11.98V @ 2.0A

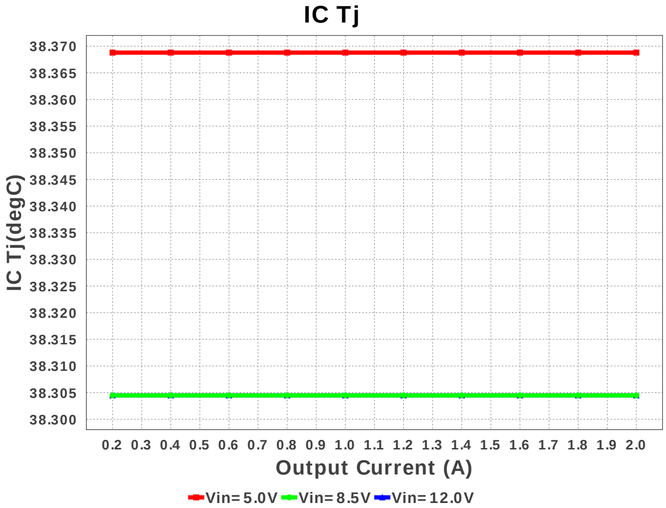


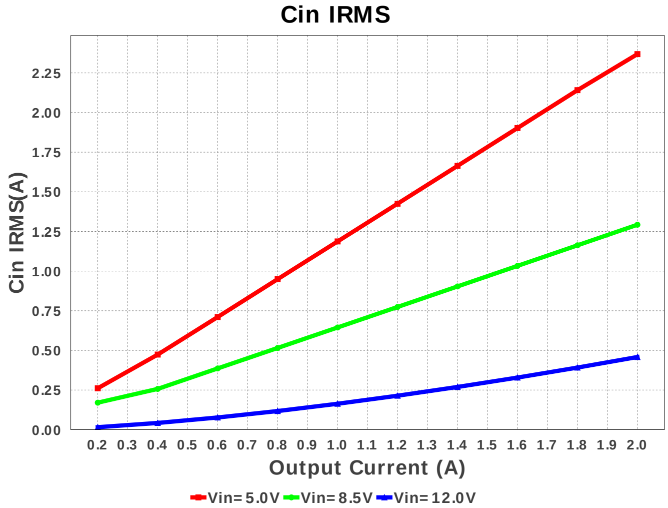
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.View WEBENCH(R) Disclaimer.

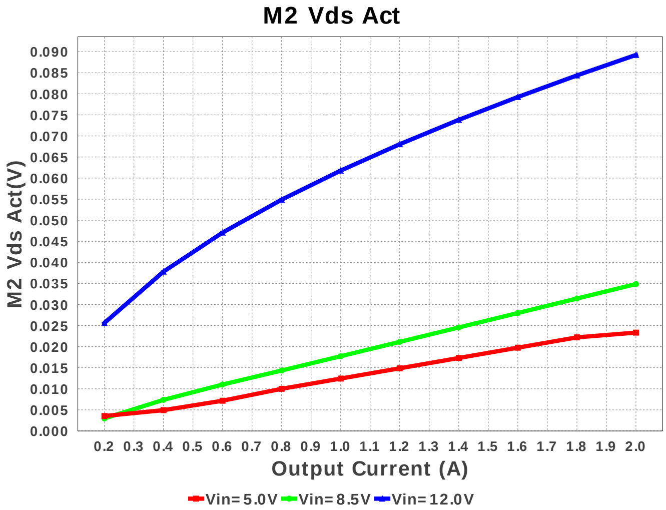
Electrical BOM

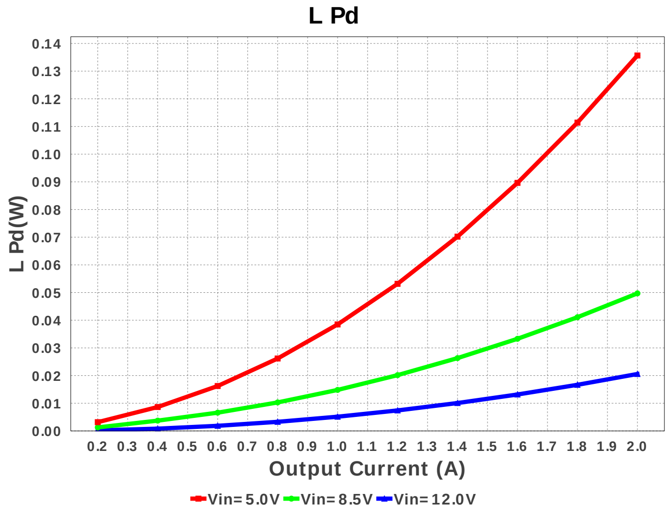
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB562 Series= X7R	Cap= 5.6 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB561 Series= X7R	Cap= 560.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	16SVPG270M Series= ?	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	1	$0.70	 CAPSMT_62_C10 74 mm²
5.	Cout	Panasonic	EEV-FK1V152M Series= FK	Cap= 1.5 mF ESR= 35.0 mOhm VDC= 35.0 V IRMS= 1.8 A	2	$0.74	 SM_RADIAL_J16 399 mm²
6.	Coutx	MuRata	GRM32ER61C476ME15L Series= X5R	Cap= 47.0 uF ESR= 3.037 mOhm VDC= 16.0 V IRMS= 4.59346 A	1	$0.24	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	GRM155R61A224KE19D Series= X5R	Cap= 220.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²

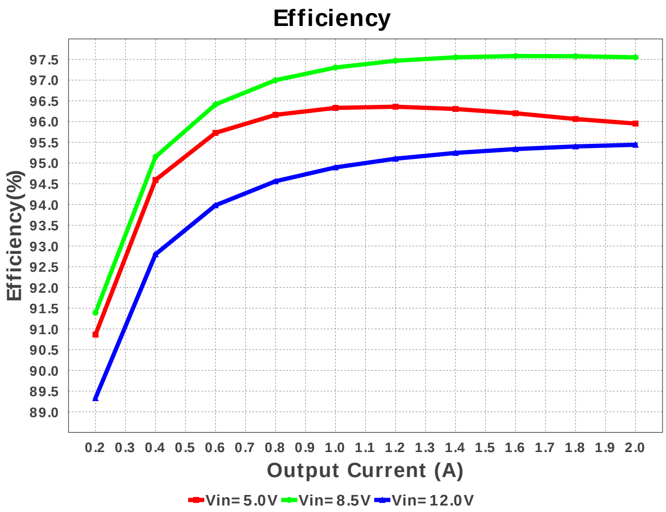
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvcc	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 uF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	$0.02	0805 7 mm^2
10.	Cvin	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
11.	Dbst	Vishay-Semiconductor	SS12-E3/61T	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	SMA 37 mm^2
12.	L1	CUSTOM	CUSTOM	L= 49.36 µH DCR= 5.138 mOhm	1	NA	CUSTOM 0 mm^2
13.	M1	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	$0.19	TRANS_NexFET_Q3A 18 mm^2
14.	M2	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	$0.19	TRANS_NexFET_Q3A 18 mm^2
15.	Rcomp	Vishay-Dale	CRCW0402118KFKED Series= CRCW..e3	Res= 118.0 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	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	1206 11 mm^2
19.	Rslope	Vishay-Dale	CRCW0402453KFKED Series= CRCW..e3	Res= 453.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
20.	Rt	Vishay-Dale	CRCW0402178KFKED Series= CRCW..e3	Res= 178.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
21.	Ruvb	Vishay-Dale	CRCW040219K1FKED Series= CRCW..e3	Res= 19.1 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	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	LM5122QMH/NOPB	Switcher	1	$2.46	MXA20A 71 mm^2

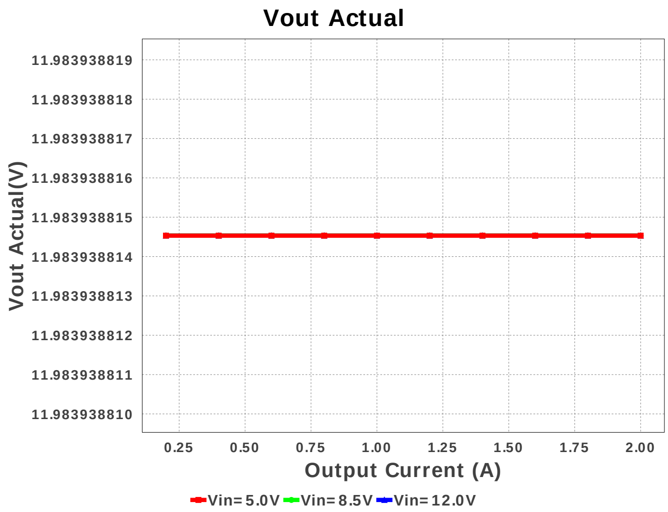

IC Tj
IC Tj(degC)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

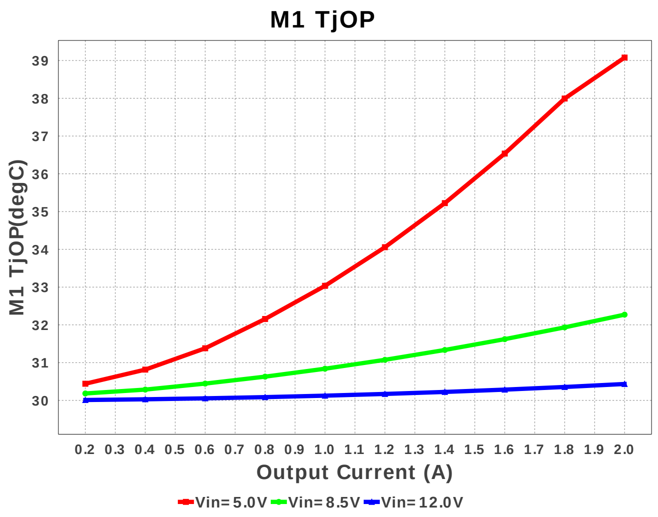

Cin IRMS
Cin IRMS(A)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

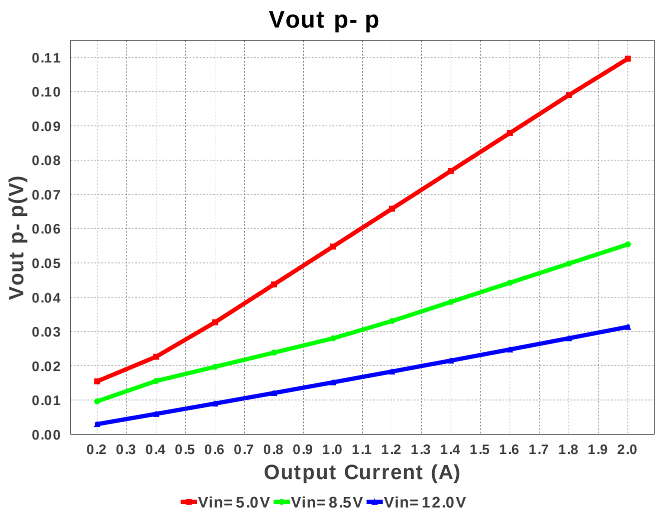

M2 Vds Act
M2 Vds Act(V)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

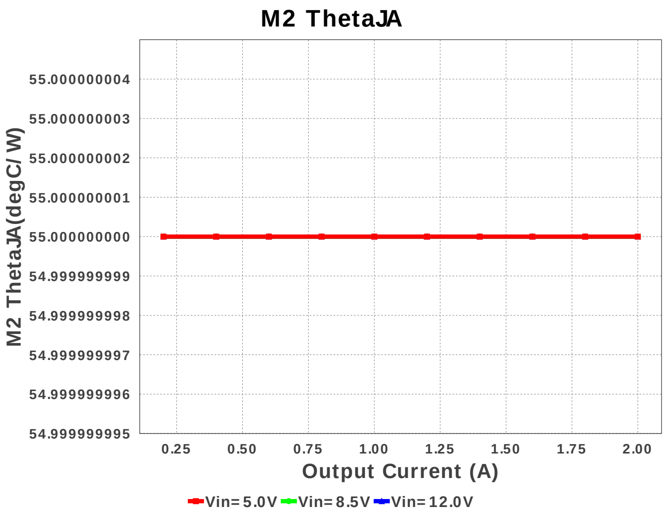

L Pd
L Pd(W)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

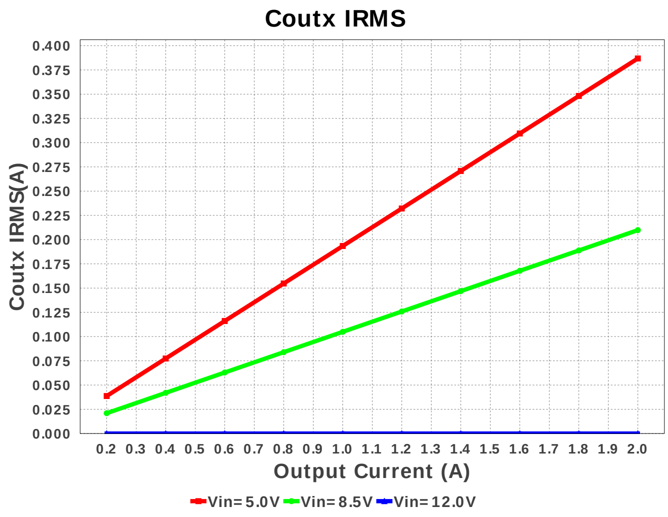

Efficiency
Efficiency(%)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

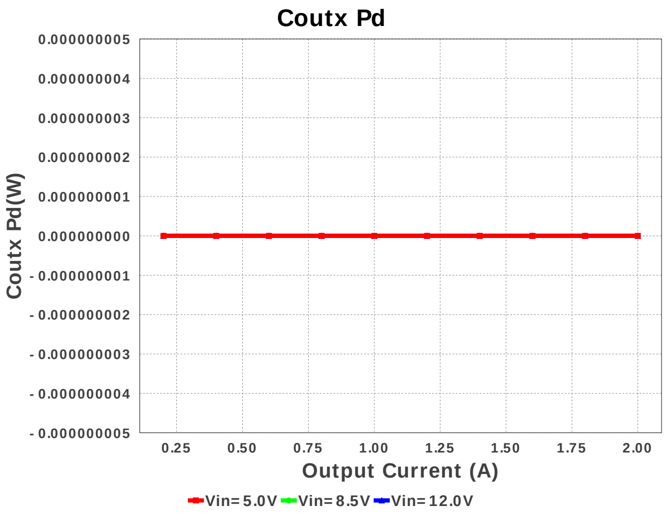

Vout Actual
Vout Actual(V)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

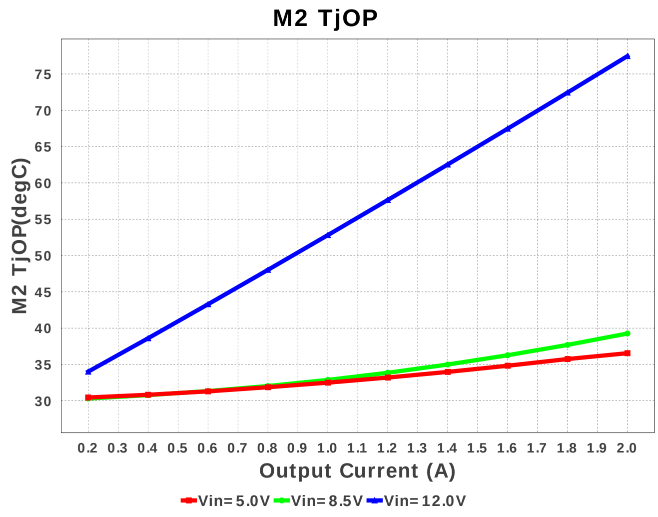

M1 TjOP
M1 TjOP(degC)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

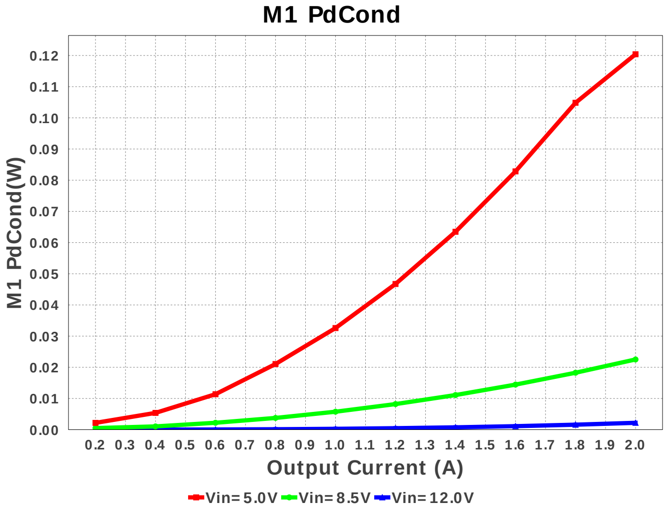

Vout p-p
Vout p-p(V)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

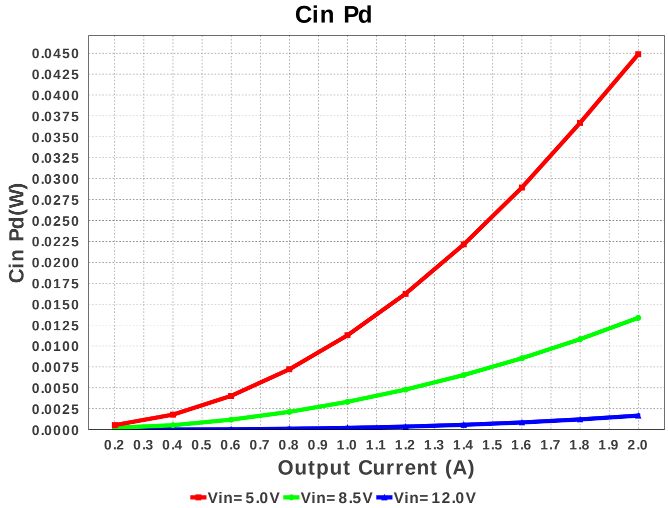

M2 ThetaJA
M2 ThetaJA(degC/W)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

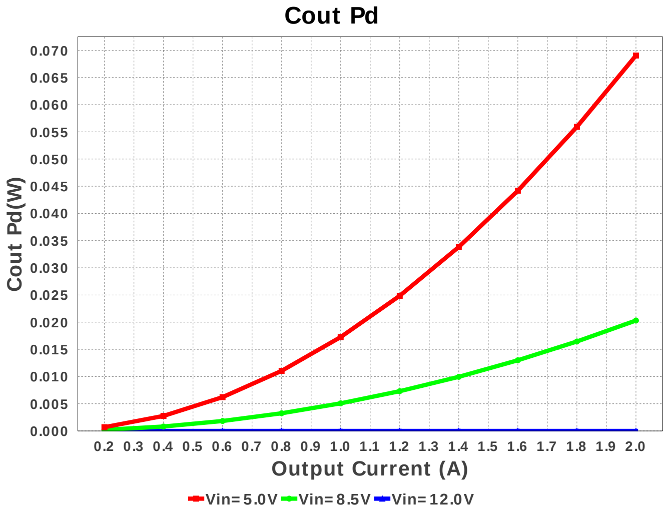

Coutx IRMS
Coutx IRMS(A)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

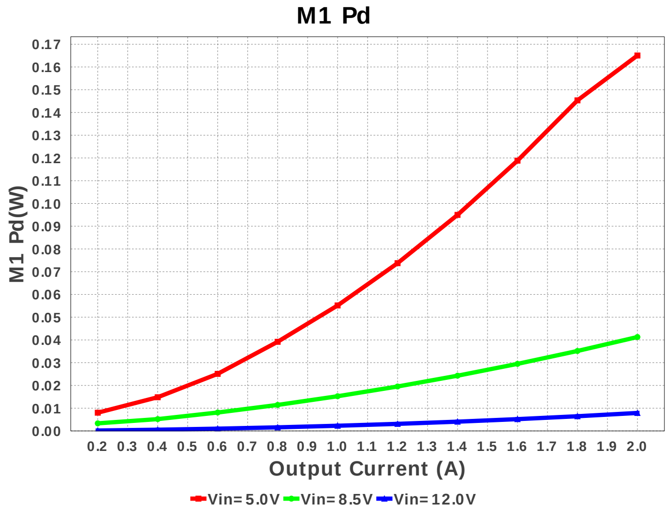

Coutx Pd
Coutx Pd(W)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

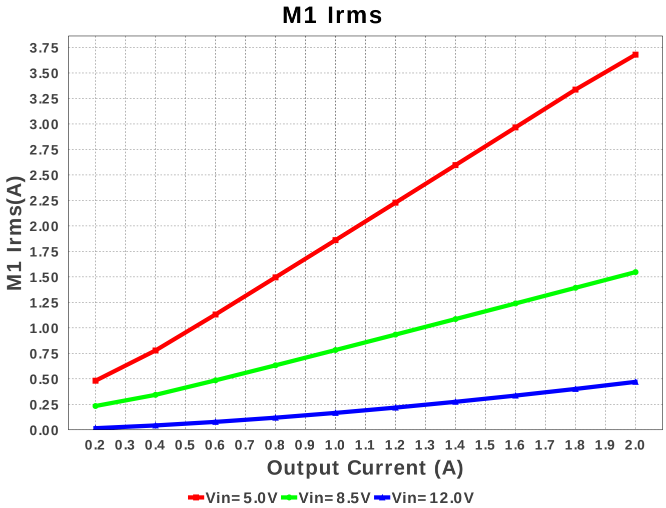

M2 TjOP
M2 TjOP(degC)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

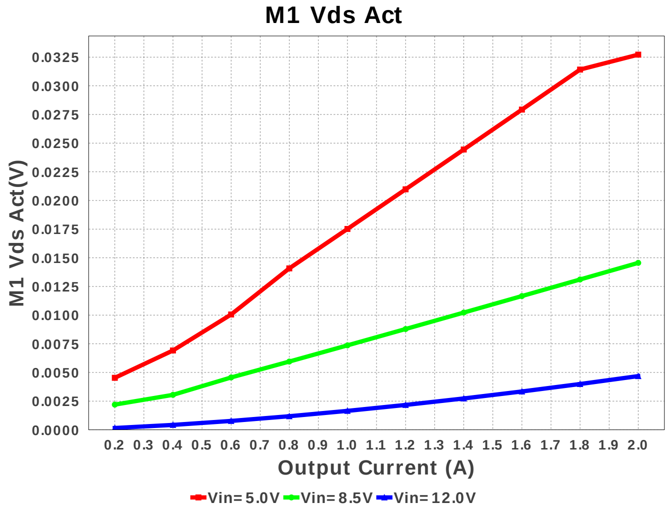

M1 PdCond
M1 PdCond(W)
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin= 5.0V
Vin= 8.5V
Vin= 12.0V

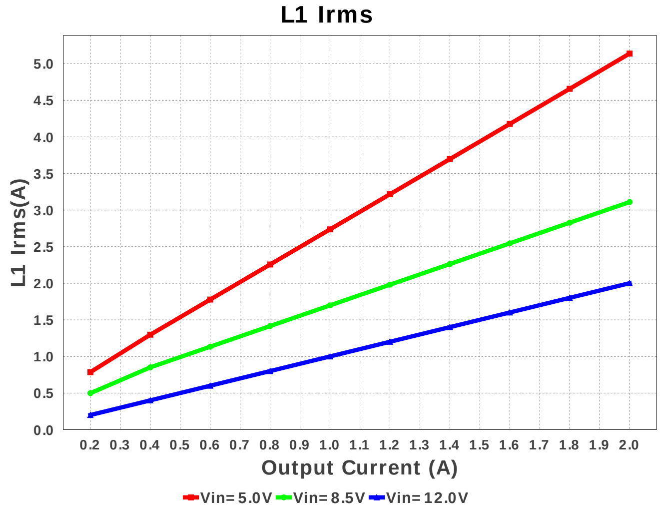

Cin Pd
Cin Pd(W)
0.0450
0.0425
0.0400
0.0375
0.0350
0.0325
0.0300
0.0275
0.0250
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin= 5.0V
Vin= 8.5V
Vin= 12.0V

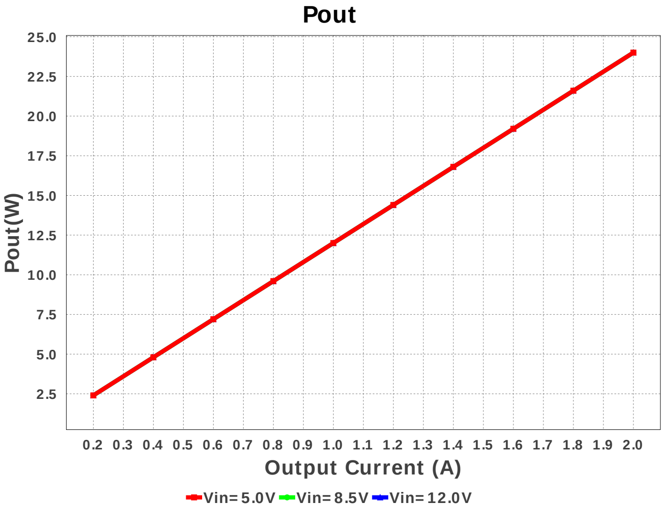

Cout Pd
Cout Pd(W)
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin= 5.0V
Vin= 8.5V
Vin= 12.0V

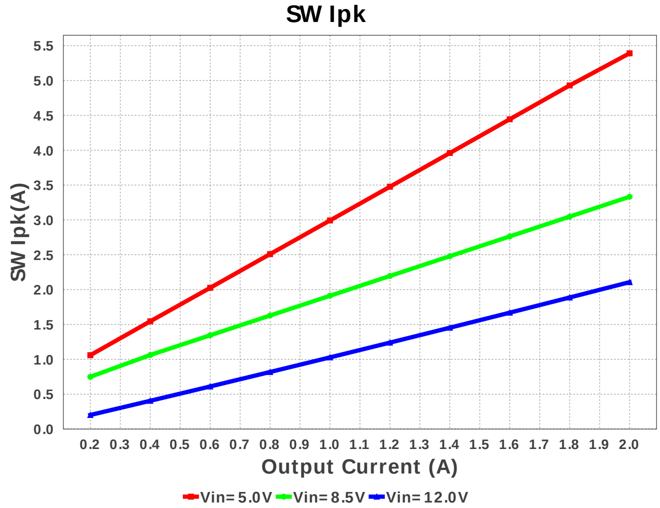

M1 Pd
M1 Pd(W)
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin= 5.0V
Vin= 8.5V
Vin= 12.0V

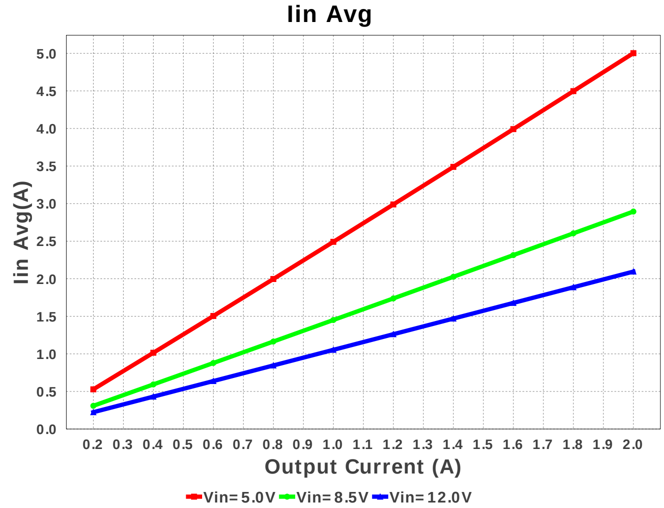

M1 Irms
M1 Irms(A)
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin= 5.0V
Vin= 8.5V
Vin= 12.0V

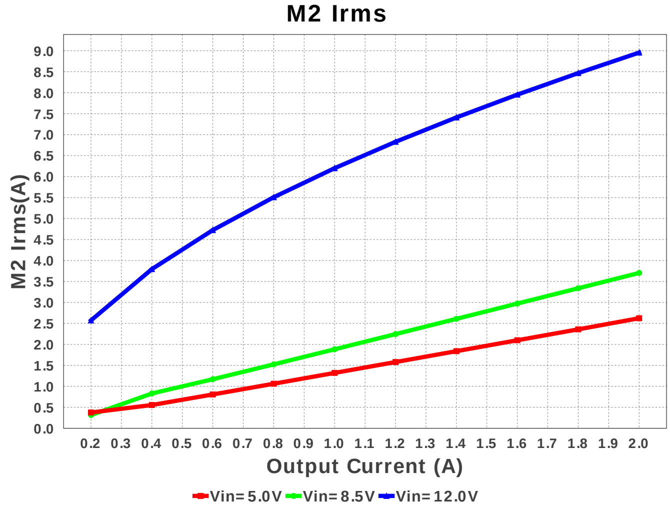

M1 Vds Act
M1 Vds Act(V)
0.0325
0.0300
0.0275
0.0250
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin= 5.0V
Vin= 8.5V
Vin= 12.0V

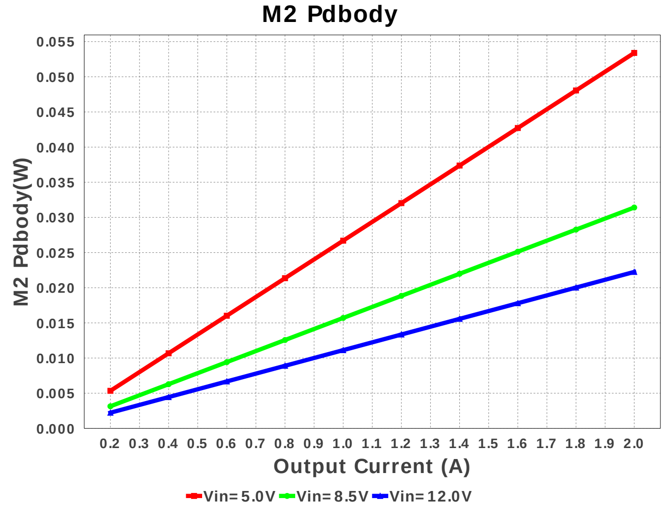

L1 Irms
L1 Irms(A)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

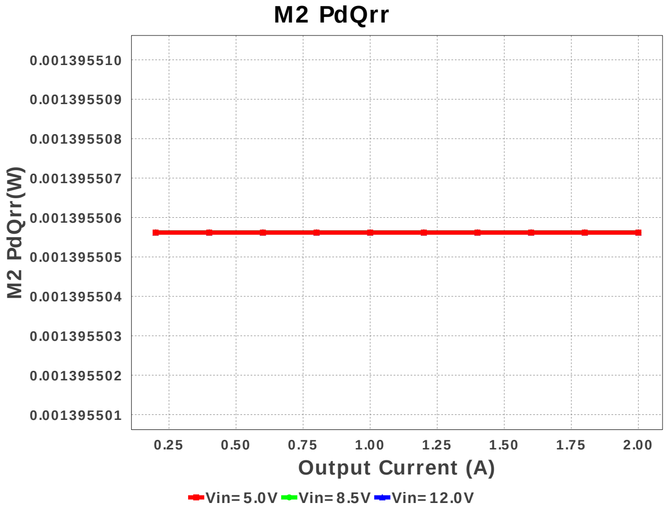

Pout
Pout(W)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

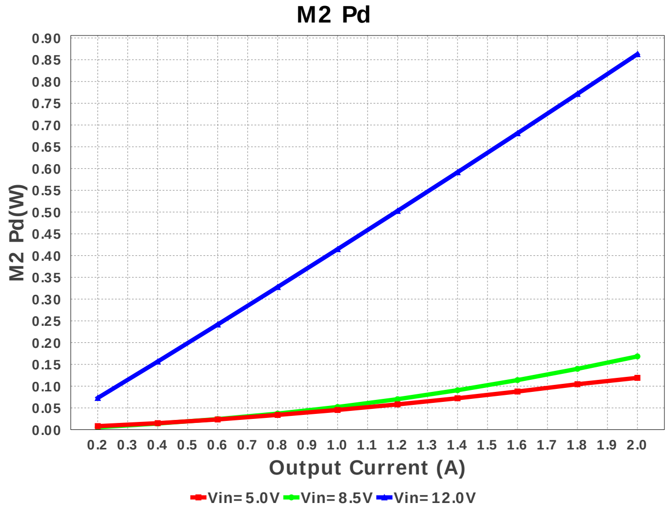

SW Ipk
SW Ipk(A)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

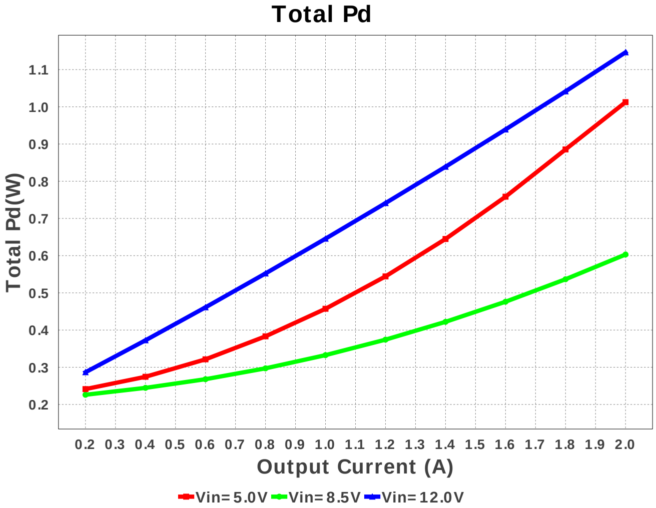

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

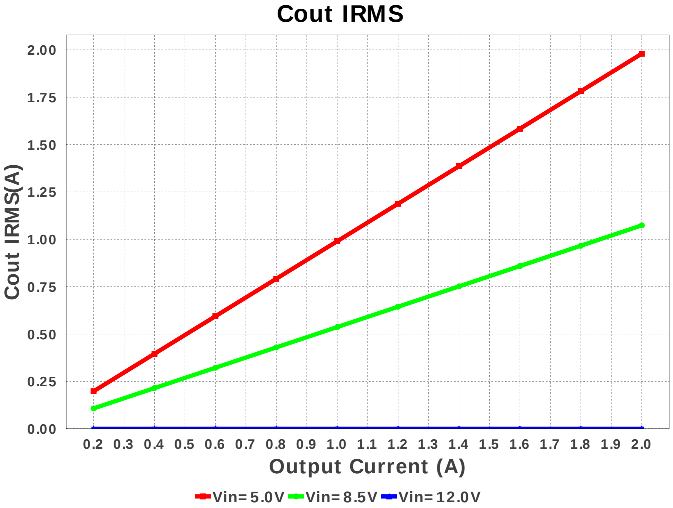

M2 Irms
M2 Irms(A)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

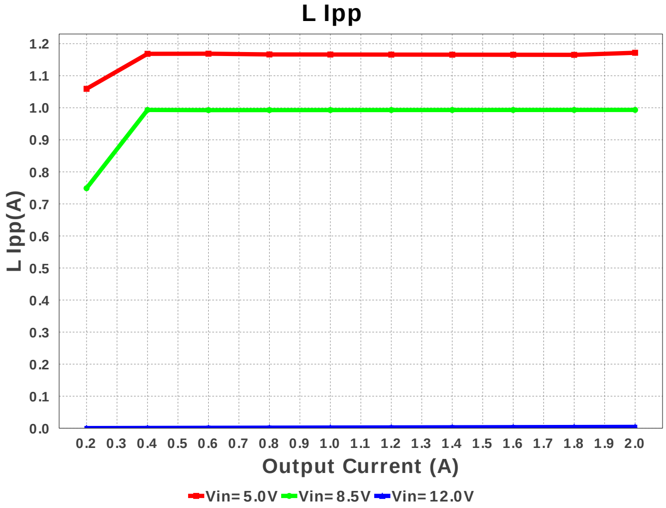

M2 Pdbody
M2 Pdbody(W)
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

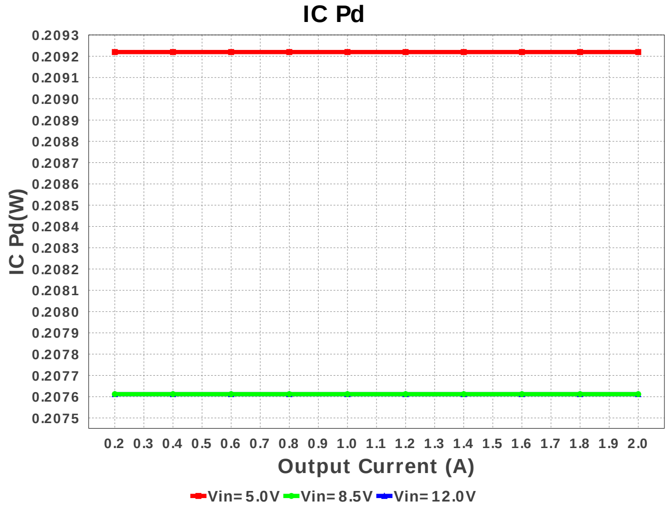

M2 PdQrr
M2 PdQrr(W)
0.001395510
0.001395509
0.001395508
0.001395507
0.001395506
0.001395505
0.001395504
0.001395503
0.001395502
0.001395501
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

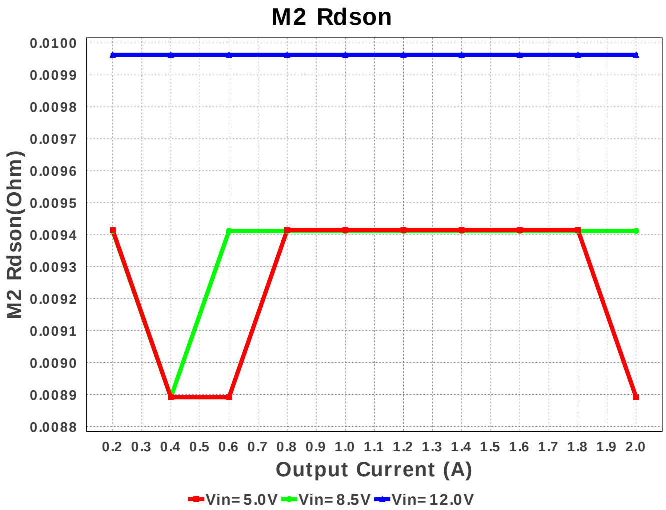

M2 Pd
M2 Pd(W)
0.90 0.85 0.80 0.75 0.70 0.65 0.60 0.55 0.50 0.45 0.40 0.35 0.30 0.25 0.20 0.15 0.10 0.05 0.00
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

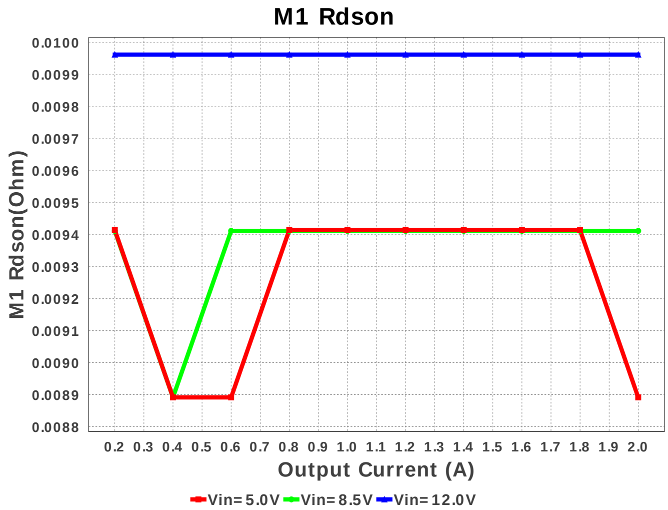

Total Pd
Total Pd(W)
1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

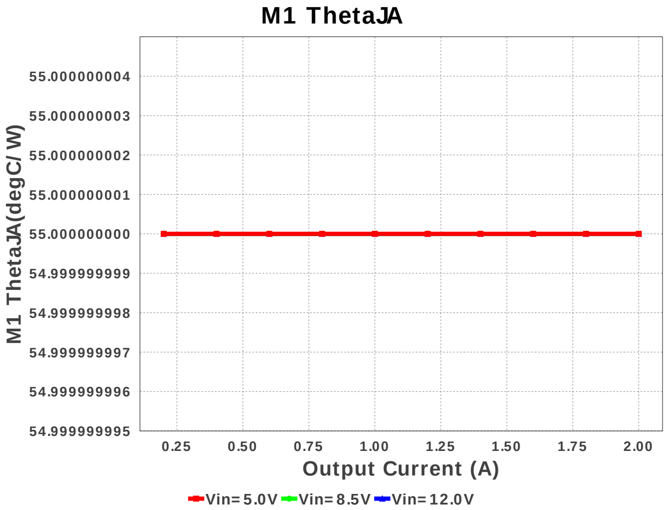

Cout IRMS
Cout IRMS(A)
2.00 1.75 1.50 1.25 1.00 0.75 0.50 0.25 0.00
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

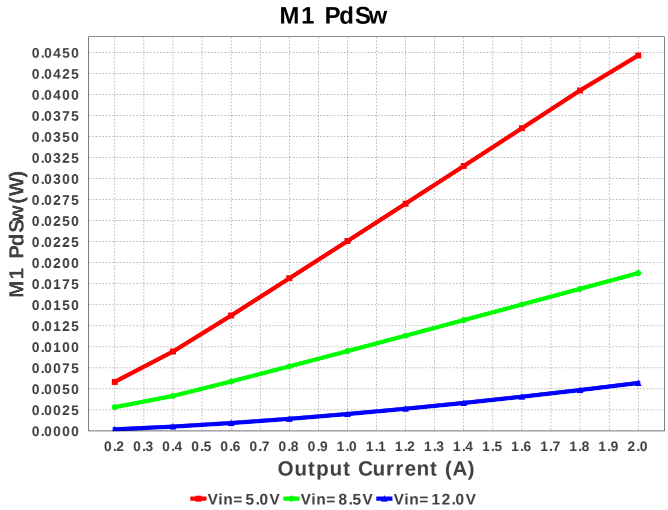

L Ipp
L Ipp(A)
1.2 1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

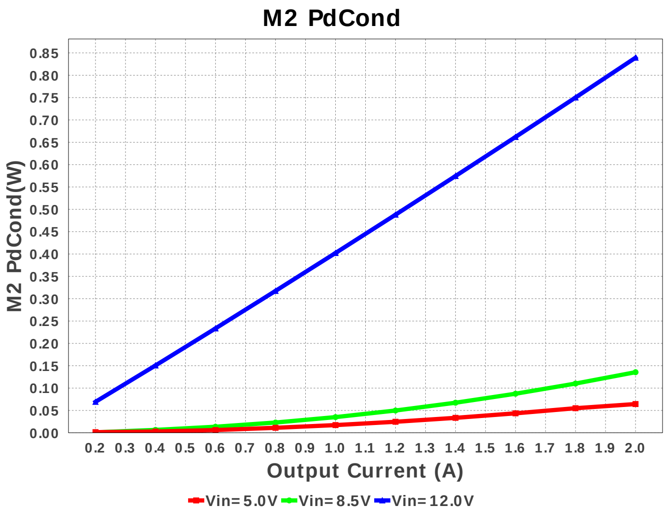

IC Pd
IC Pd(W)
0.2093 0.2092 0.2091 0.2090 0.2089 0.2088 0.2087 0.2086 0.2085 0.2084 0.2083 0.2082 0.2081 0.2080 0.2079 0.2078 0.2077 0.2076 0.2075
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Output Current (A)
Vin=5.0V Vin=8.5V Vin=12.0V

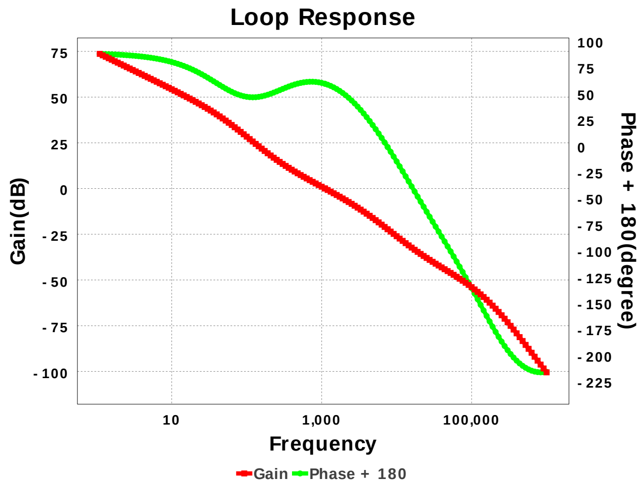












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.38 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.936 A	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	430.884 mA	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	5.003 A	Current	Average input current
5.	L Ipp	1.165 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	5.136 A	Current	Inductor ripple current
7.	M1 Irms	3.708 A	Current	MOSFET RMS ripple current
8.	M2 Irms	2.619 A	Current	MOSFET RMS ripple current
9.	SW Ipk	5.414 A	Current	Peak switch current
10.	BOM Count	25	General	Total Design BOM count
11.	FootPrint	1.514 k mm^2	General	Total Foot Print Area of BOM components

#	Name	Value	Category	Description
12.	Frequency	50.562 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	8.891 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	M2 Rdson	8.891 mOhm	General	Drain-Source On-resistance
17.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
18.	M2 Vds Act	23.285 mV	General	M Vds
19.	Mode	CCM	General	Conduction Mode
20.	Pout	24.0 W	General	Total output power
21.	Total BOM	$0.0	General	Total BOM Cost
22.	Low Freq Gain	74.666 dB	Op_Point	Gain at 10Hz
23.	Vout Actual	11.984 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
24.	Vout OP	11.984 V	Op_Point	Operational Output Voltage
25.	Cross Freq	544.558 Hz	Op_point	Bode plot crossover frequency
26.	Efficiency	95.941 %	Op_point	Steady state efficiency
27.	Gain Marg	-16.492 dB	Op_point	Bode Plot Gain Margin
28.	IC Tj	38.51 degC	Op_point	IC junction temperature
29.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
30.	IOUT_OP	2.0 A	Op_point	Iout operating point
31.	M1 TjOP	39.198 degC	Op_point	M1 MOSFET junction temperature
32.	M2 TjOP	36.535 degC	Op_point	MOSFET junction temperature
33.	Phase Marg	55.673 deg	Op_point	Bode Plot Phase Margin
34.	VIN_OP	5.0 V	Op_point	Vin operating point
35.	Vout p-p	107.876 mV	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	45.307 mW	Power	Input capacitor power dissipation
37.	Cout Pd	66.125 mW	Power	Output capacitor power dissipation
38.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
39.	IC Pd	212.757 mW	Power	IC power dissipation
40.	L Pd	135.552 mW	Power	Inductor power dissipation
41.	M1 Pd	167.236 mW	Power	MOSFET power dissipation
42.	M1 PdCond	122.242 mW	Power	M1 MOSFET conduction losses
43.	M1 PdSw	44.994 mW	Power	M1 MOSFET switching losses
44.	M2 Pd	118.817 mW	Power	MOSFET power dissipation
45.	M2 PdCond	64.028 mW	Power	M2 MOSFET conduction losses
46.	M2 PdQrr	1.396 mW	Power	Synchronous Boost High Side Reverse Recovery
47.	M2 Pdbody	53.393 mW	Power	Power dissipation through lower FET
48.	Total Pd	1.015 W	Power	Total Power Dissipation
49.	M1 Vds Act	32.968 mV		M Vds
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	2.0	Maximum Output Current
2.	VinMax	12.0	Maximum input voltage
3.	VinMin	5.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM5122-Q1	Texas Instruments Base Part 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. Feature Highlights: Automotive Qualified 12V to 14V Vin, 24Vout, 2A as typical design input conditions

3. The LM5122-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application

4. LM5122-Q1 Product Folder : http://www.ti.com/product/LM5122%2DQ1 : contains the data sheet and other resources.

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