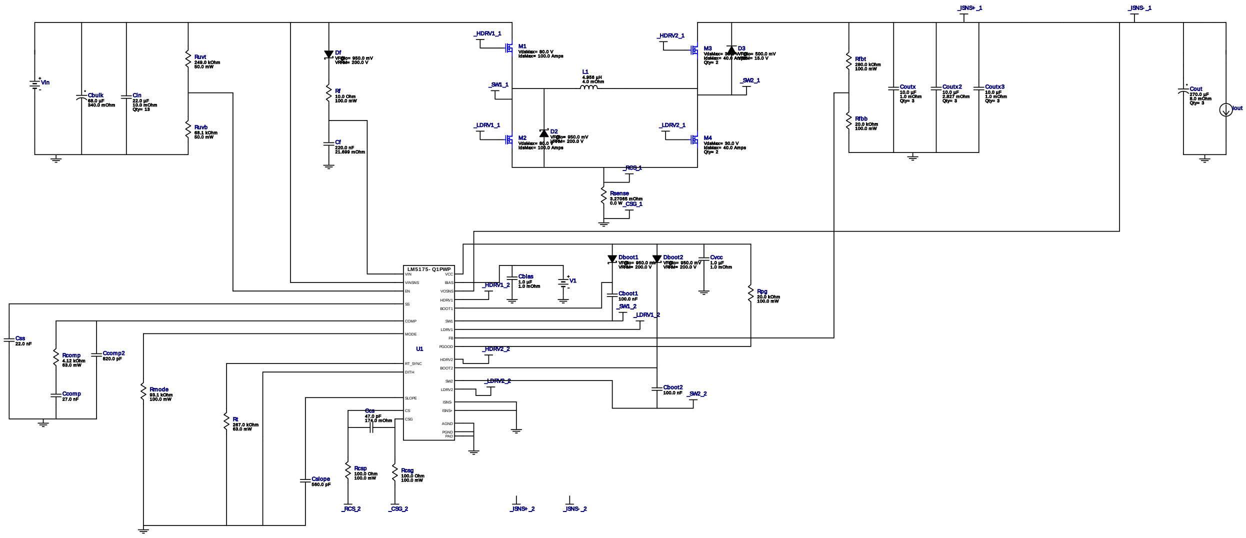
VinMin = 6.0V
VinMax = 36.0V
Vout = 12.0V
Iout = 15.0A

Device = LM5175QPWPRQ1
Topology = Buck_Boost
Created = 2021-07-19 07:56:52.814
BOM Cost = NA
BOM Count = 61
Total Pd = 13.6W

WEBENCH ® Design Report

Design : 23 LM5175QPWPRQ1
LM5175QPWPRQ1 6V-36V to 12.00V @ 15A



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.

Design Alerts

Component Selection Information

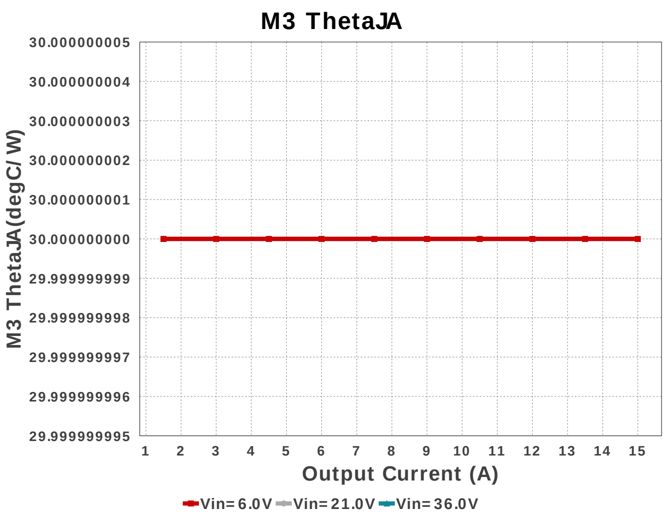
The LM5175-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.Please note that since parallel FETs have been chosen in this design, schematic and PCB export features will not work

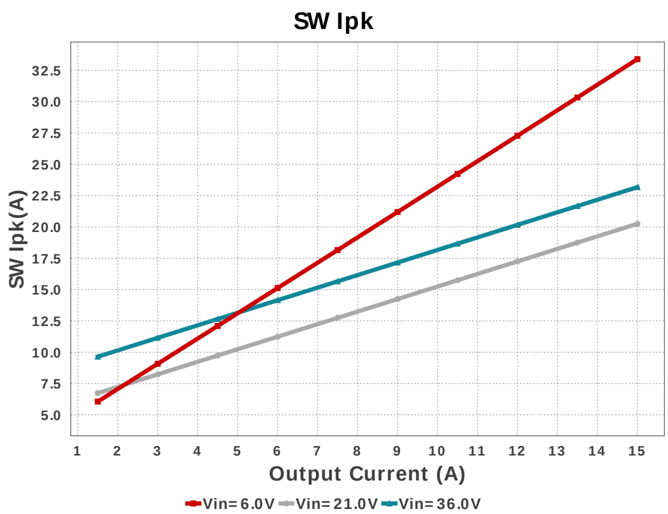
Electrical BOM

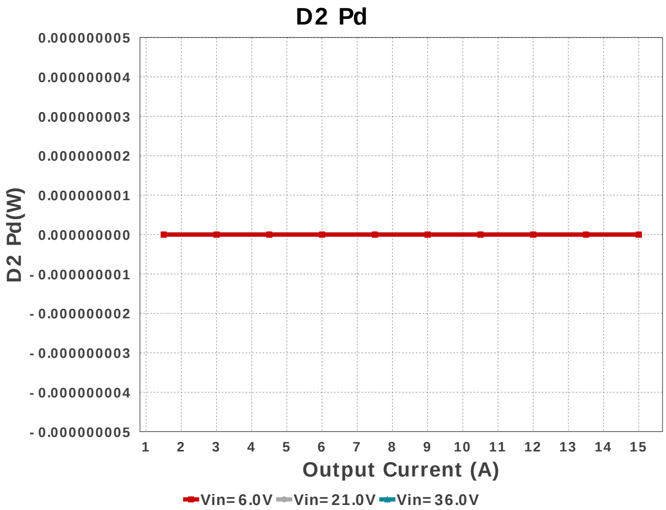
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cbias	Taiyo Yuden	TMK212B7105KG-T Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
Cboot1	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.06	0805 7 mm²
Cboot2	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.06	0805 7 mm²
Cbulk	Nichicon	UUD1H680MNL1GS Series= uD	Cap= 68.0 uF ESR= 340.0 mOhm VDC= 50.0 V IRMS= 300.0 mA	1	$0.20	SM_RADIAL_8MM 113 mm²
Ccomp	Kemet	C1812C273J5GACTU Series= C0G/NP0	Cap= 27.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.71	1812 23 mm²
Ccomp2	Samsung Electro-Mechanics	CL05C821JB5NNNC Series= C0G/NP0	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
Ccs	AVX	06035A470JAT2A Series= C0G/NP0	Cap= 47.0 pF ESR= 174.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²

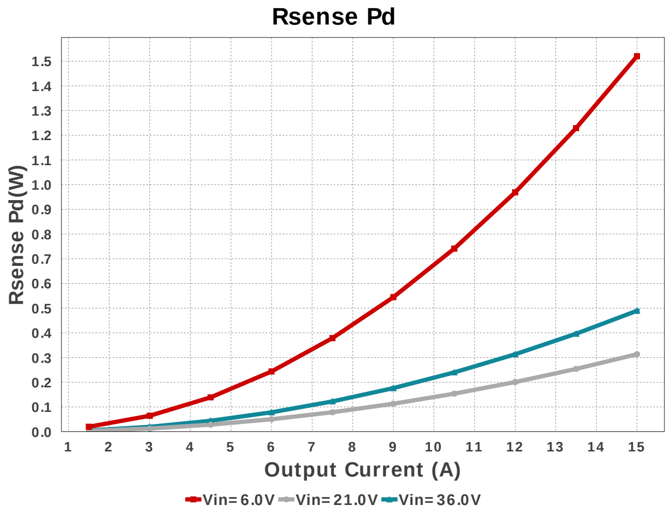
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cf	TDK	CGA3E3X7R1H224K080AB Series= X7R	Cap= 220.0 nF ESR= 21.699 mOhm VDC= 50.0 V IRMS= 1.125 A	1	$0.03	0603 5 mm^2
Cin	TDK	CKG57NX5R1H226M500JH Series= X5R	Cap= 22.0 uF ESR= 10.0 mOhm VDC= 50.0 V IRMS= 4.6 A	13	$1.93	CKG57N 56 mm^2
Cout	Panasonic	16SVPG270M Series= SVPG	Cap= 270.0 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 5.8 A	3	$0.67	CAPSMT_62_C10 74 mm^2
Coutx	MuRata	GRM32ER71H106MA12 Series= X7R	Cap= 10.0 uF ESR= 1.0 mOhm VDC= 50.0 V IRMS= 0.0 A	3	$0.33	1210_270 15 mm^2
Coutx2	TDK	CGA6P3X7S1H106K250AB Series= X7S	Cap= 10.0 uF ESR= 2.827 mOhm VDC= 50.0 V IRMS= 4.3729 A	3	$0.33	1210_280 15 mm^2
Coutx3	MuRata	GRM32ER71H106MA12 Series= X7R	Cap= 10.0 uF ESR= 1.0 mOhm VDC= 50.0 V IRMS= 0.0 A	3	$0.33	1210_270 15 mm^2
Cslope	Samsung Electro-Mechanics	CL10C561JB8NNNC Series= C0G/NP0	Cap= 560.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
Css	TDK	CGA4J2C0G1H223J125AA Series= C0G/NP0	Cap= 22.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.08	0805 7 mm^2
Cvcc	Taiyo Yuden	EMK107B7105KA-T Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
D2	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.12	DPAK 102 mm^2
D3	CUSTOM	CUSTOM	VF@Io= 500.0 mV VRRM= 15.0 V	1	NA	CUSTOM 0 mm^2
Dboot1	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.12	DPAK 102 mm^2
Dboot2	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.12	DPAK 102 mm^2
Df	SMC Diode Solutions	SBRD10200TR	VF@Io= 950.0 mV VRRM= 200.0 V	1	$0.12	DPAK 102 mm^2
L1	CUSTOM	CUSTOM	L= 4.956 µH 4.0 mOhm	1	NA	CUSTOM 0 mm^2
M1	Texas Instruments	CSD19502Q5B	VdsMax= 80.0 V IdsMax= 100.0 Amps	1	$0.90	DQK0006C 9 mm^2
M2	Texas Instruments	CSD19502Q5B	VdsMax= 80.0 V IdsMax= 100.0 Amps	1	$0.90	DQK0006C 9 mm^2
M3	Texas Instruments	CSD17578Q3A	VdsMax= 30.0 V IdsMax= 40.0 Amps	2	$0.17	DNH0008A 18 mm^2

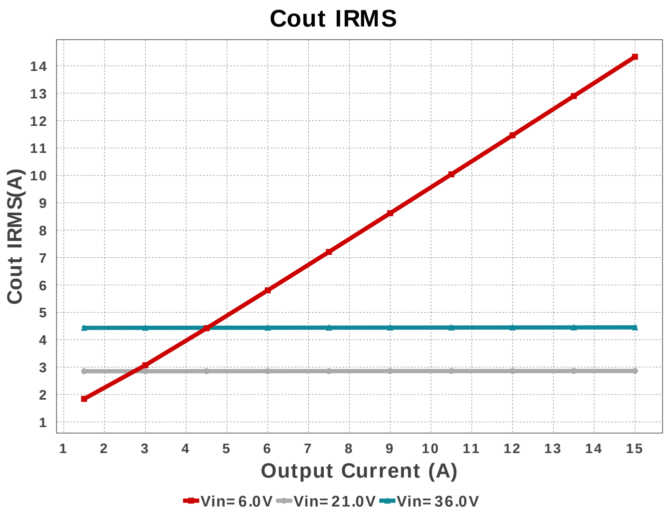
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
M4	Texas Instruments	CSD17578Q3A	VdsMax= 30.0 V IdsMax= 40.0 Amps	2	$0.17	DNH0008A 18 mm²
Rcomp	Vishay-Dale	CRCW04024K12FKED Series= CRCW..e3	Res= 4.12 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Rcsg	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rcsp	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rf	Vishay-Dale	CRCW060310R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rfbb	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rfbt	Vishay-Dale	CRCW0603280KFKEA Series= CRCW..e3	Res= 280.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rmode	Vishay-Dale	CRCW060393K1FKEA Series= CRCW..e3	Res= 93.1 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rpg	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
Rsense	CUSTOM	CUSTOM Series= ?	Res= 3.27065 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
Rt	Vishay-Dale	CRCW0402267KFKED Series= CRCW..e3	Res= 267.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Ruvb	Yageo	RC0201FR-7D68K1L Series= ?	Res= 68.1 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²
Ruvt	Yageo	RC0201FR-07249KL Series= ?	Res= 249.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm²
U1	Texas Instruments	LM5175QPWPRQ1	Switcher	1	$3.54	PWP0028C_N 98 mm²

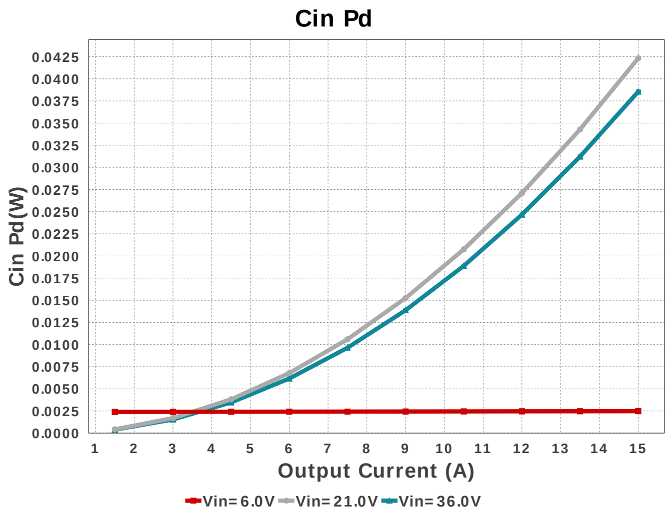


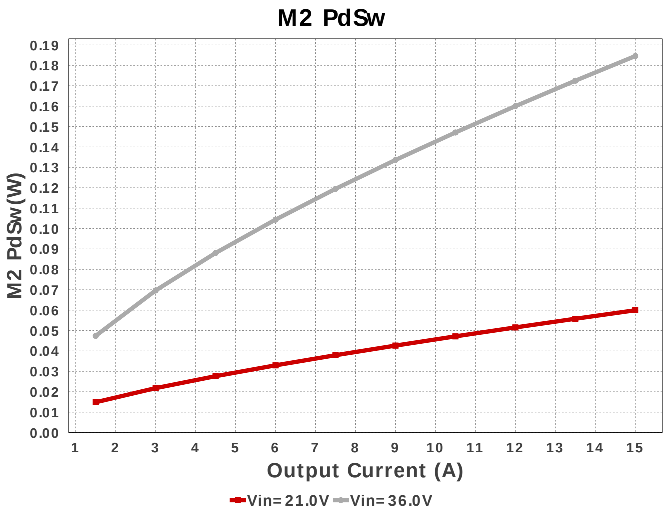


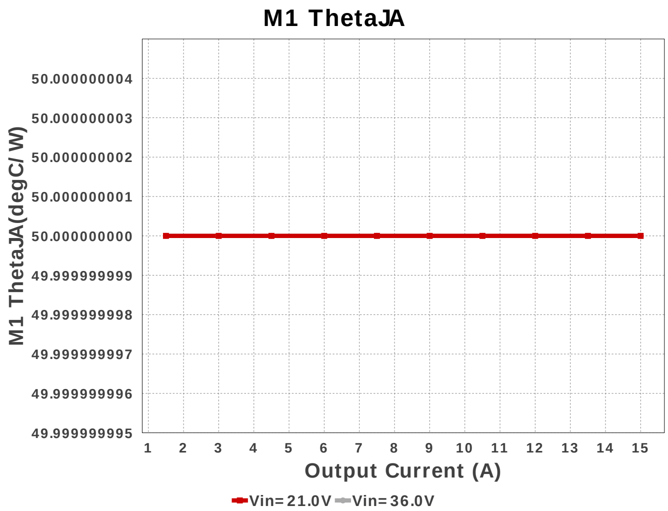

D2 Pd
D2 Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

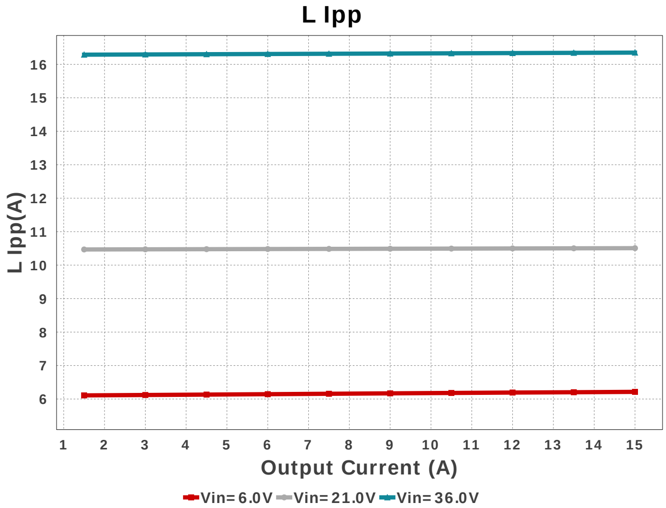

Rsense Pd
Rsense Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

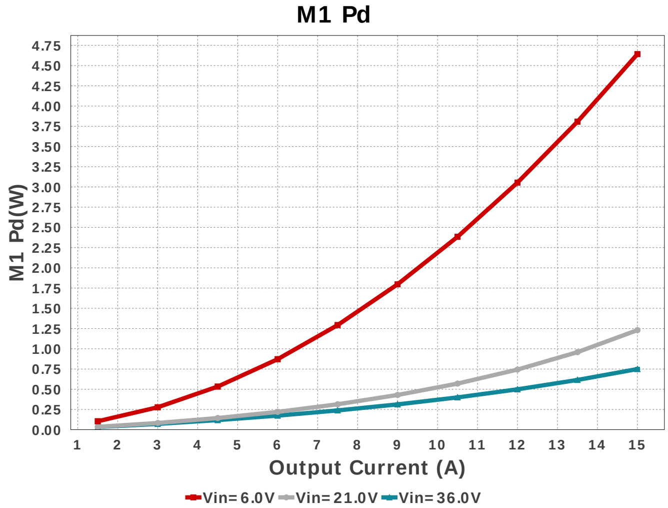

Cout IRMS
Cout IRMS(A)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

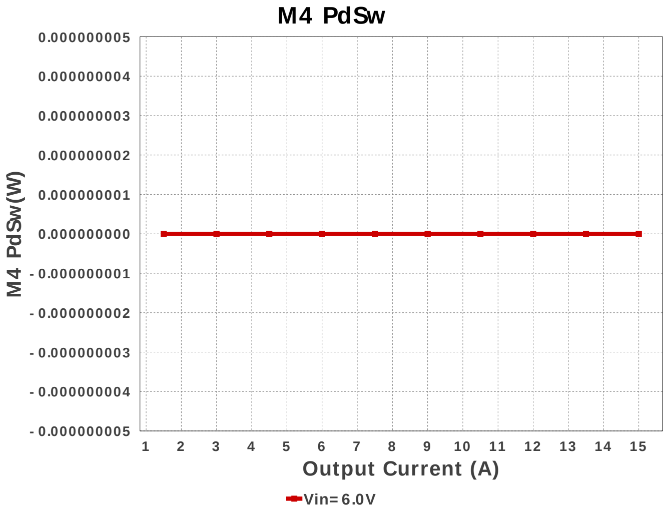

Cin Pd
Cin Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

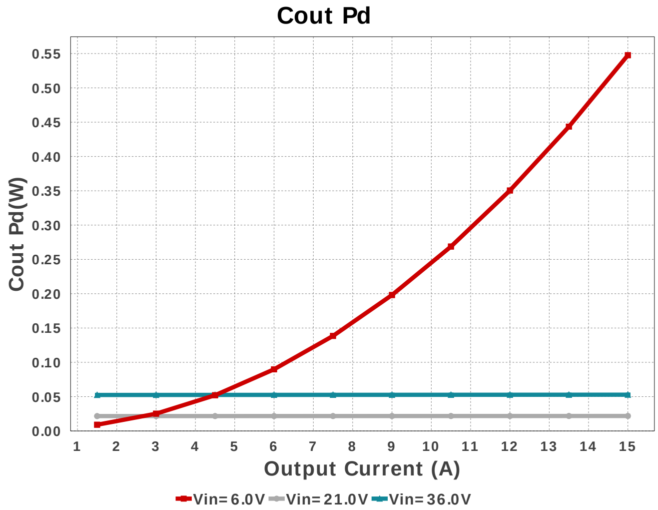

M2 PdSw
M2 PdSw(W)
Output Current (A)
Vin=21.0V Vin=36.0V

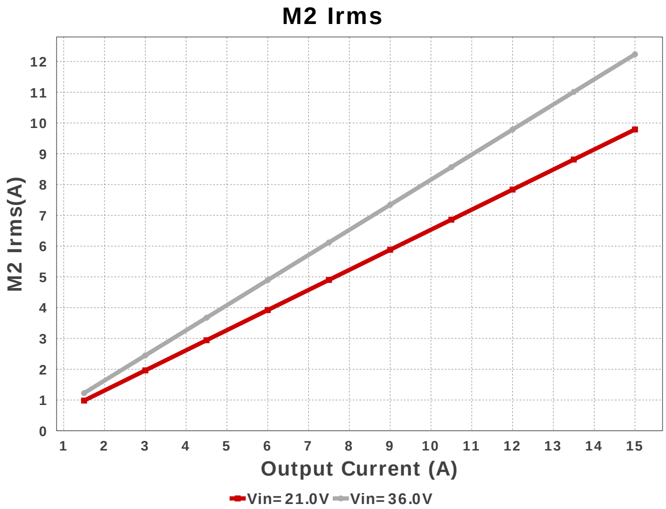

M1 ThetaJA
M1 ThetaJA(degC/W)
Output Current (A)
Vin=21.0V Vin=36.0V

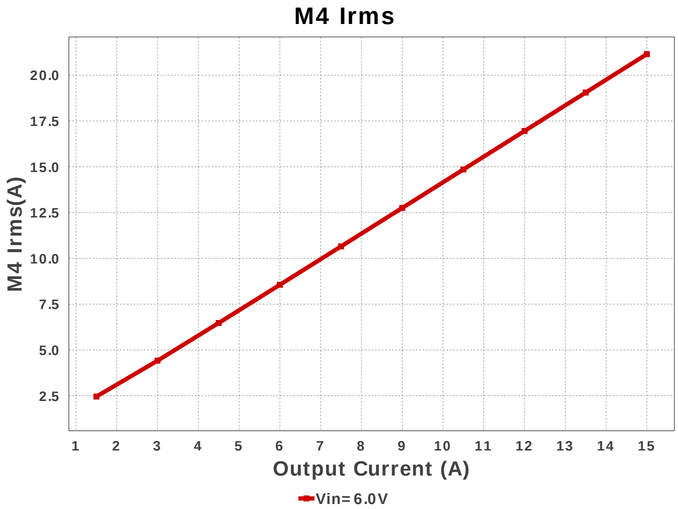

L Ipp
L Ipp(A)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

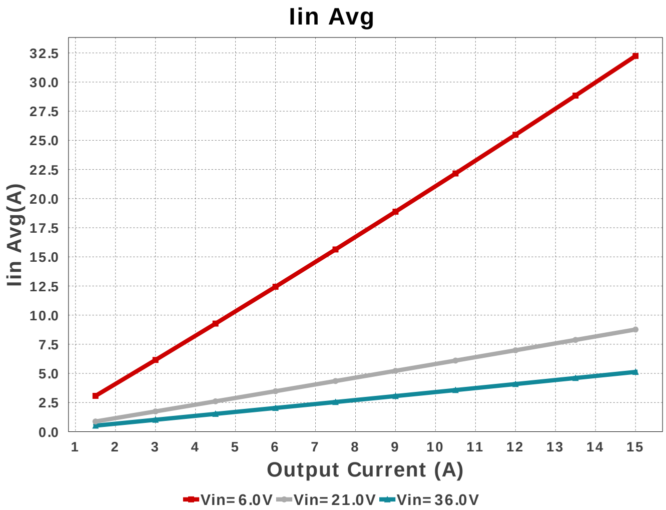

M1 Pd
M1 Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

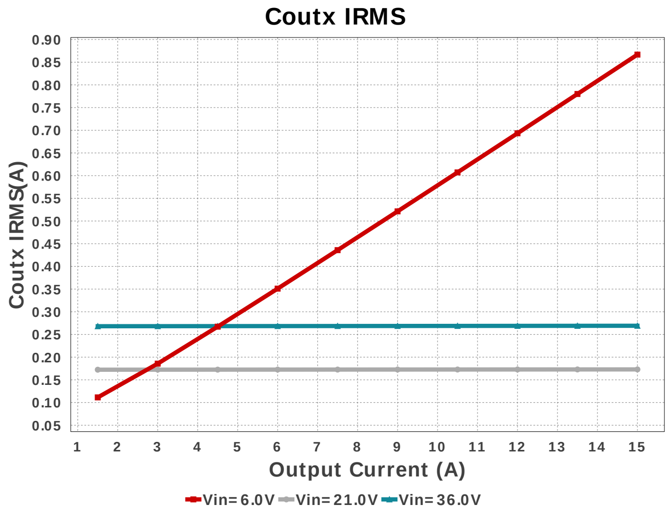

M4 PdSw
M4 PdSw(W)
Output Current (A)
Vin=6.0V

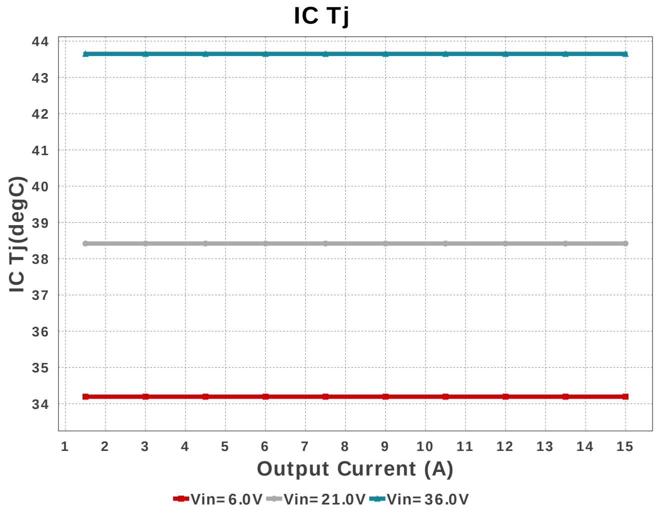

Cout Pd
Cout Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

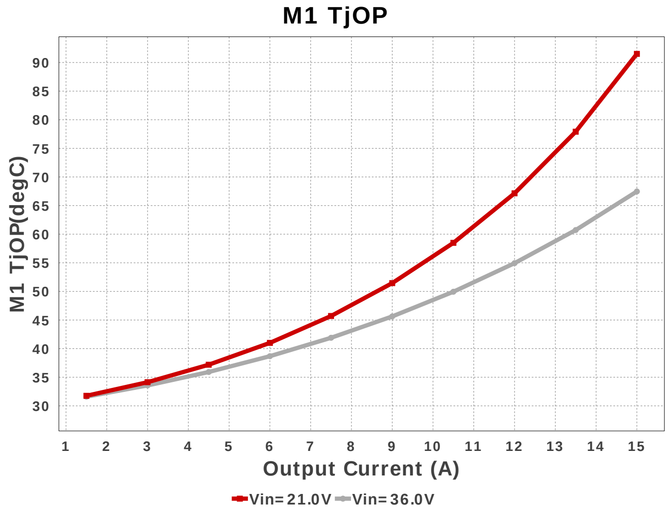

M2 Irms
M2 Irms(A)
Output Current (A)
Vin=21.0V Vin=36.0V

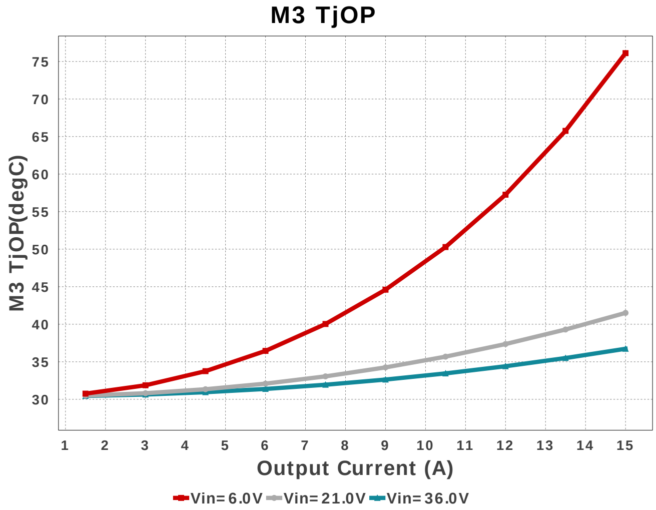

M4 Irms
M4 Irms(A)
Output Current (A)
Vin=6.0V

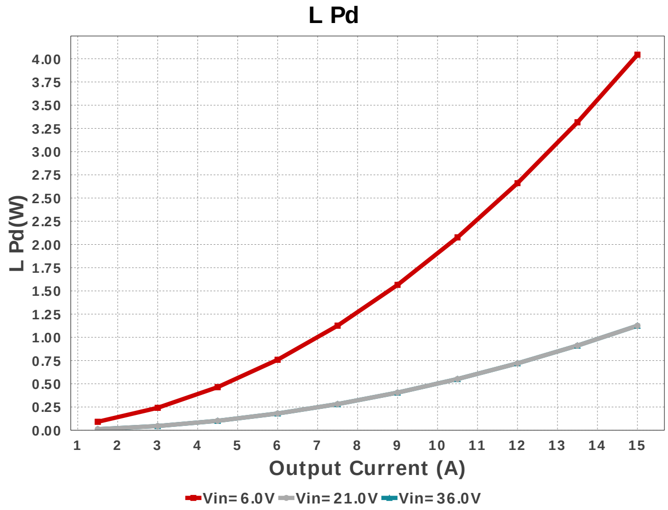

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

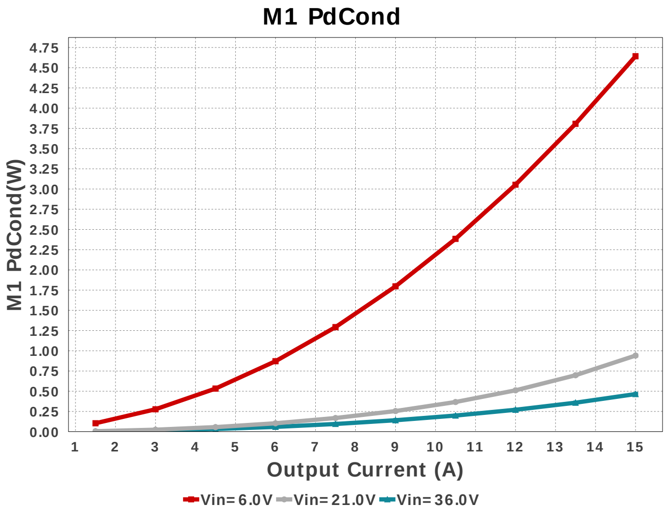

Coutx IRMS
Coutx IRMS(A)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

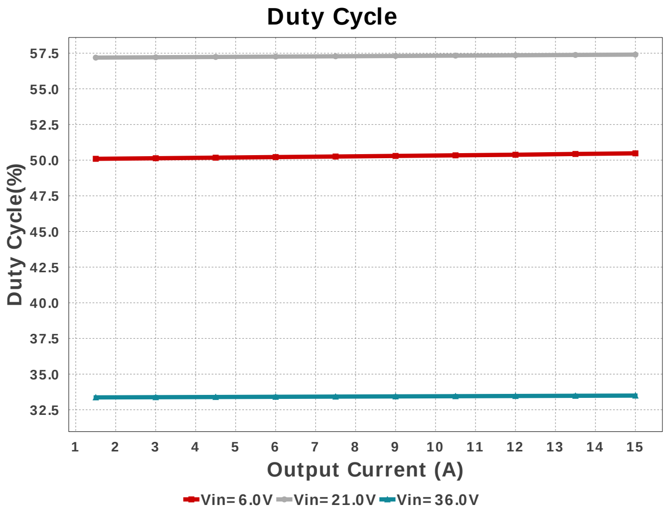

IC Tj
IC Tj(degC)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

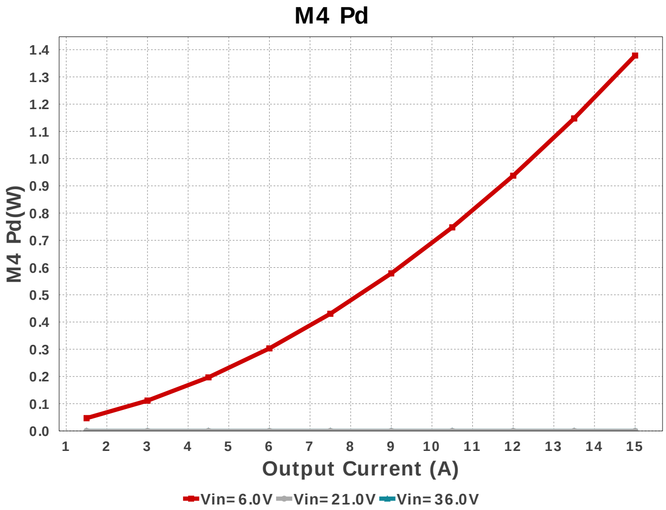

M1 TjOP
M1 TjOP(degC)
Output Current (A)
Vin=21.0V Vin=36.0V

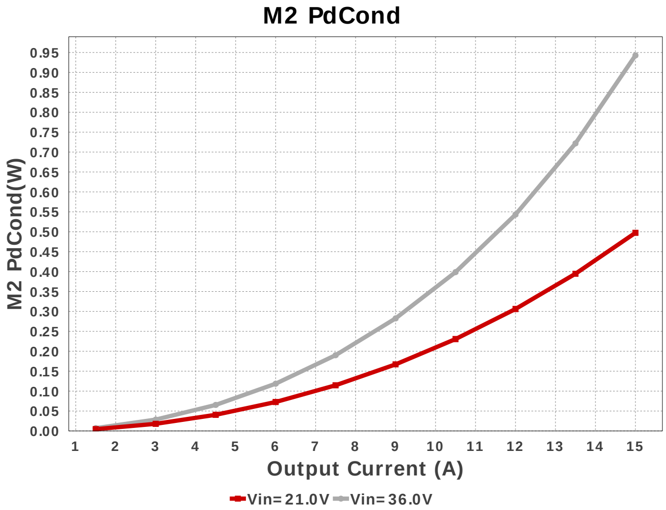

M3 TjOP
M3 TjOP(degC)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

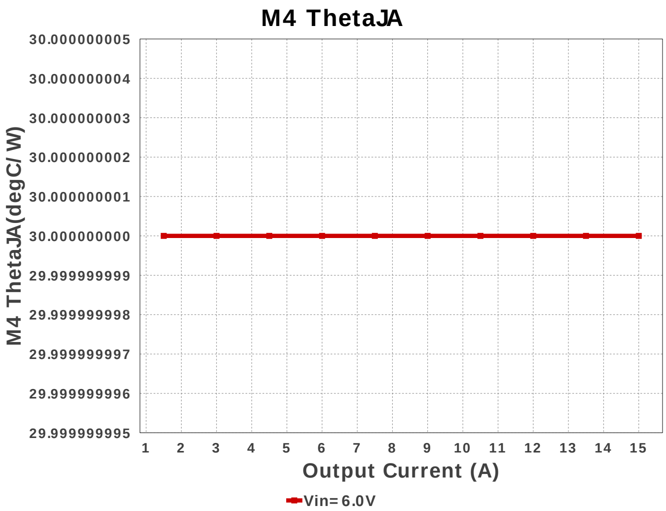

L Pd
L Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

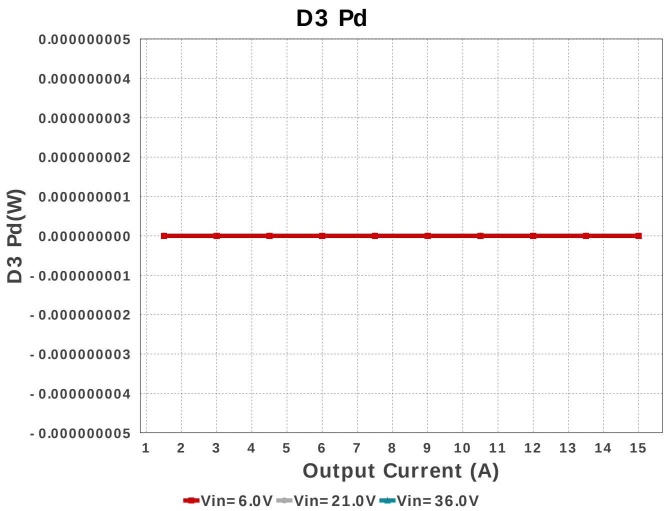

M1 PdCond
M1 PdCond(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

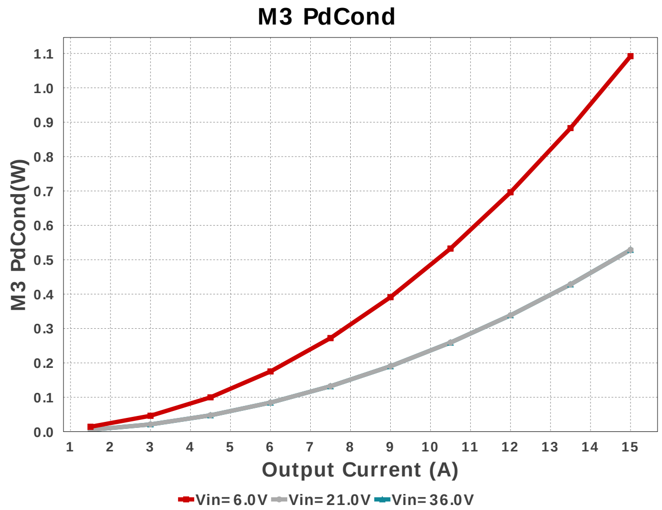

Duty Cycle
Duty Cycle(%)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

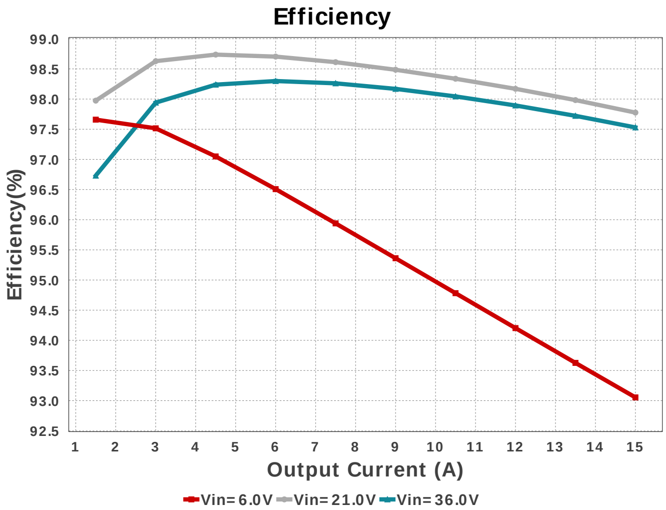

M4 Pd
M4 Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

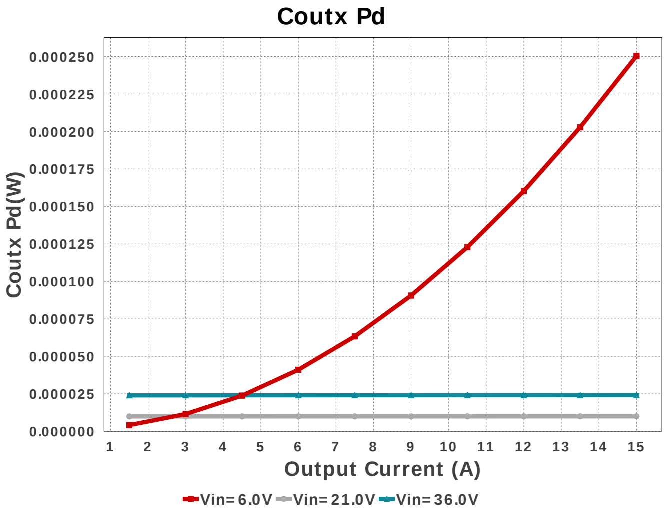

M2 PdCond
M2 PdCond(W)
Output Current (A)
Vin=21.0V Vin=36.0V

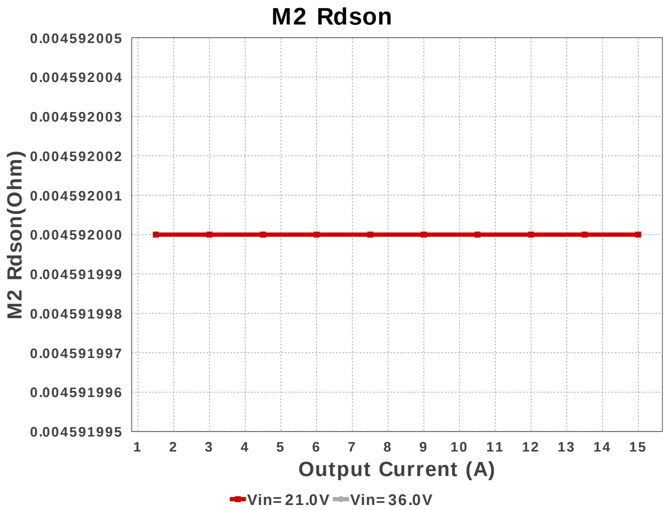

M4 ThetaJA
M4 ThetaJA(degC/W)
Output Current (A)
Vin=6.0V

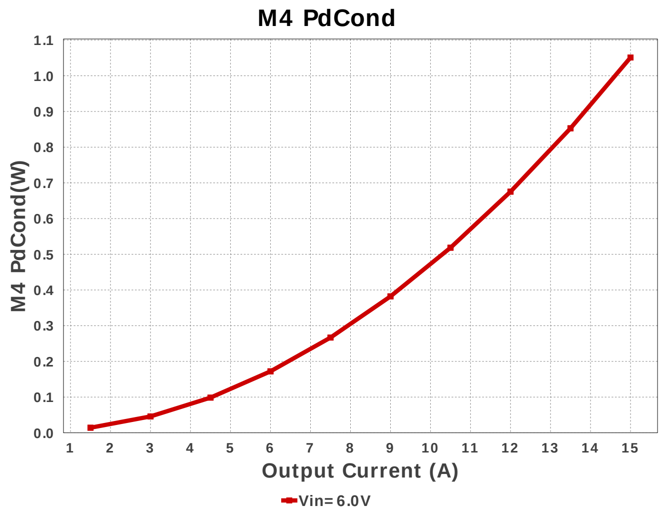

D3 Pd
D3 Pd(W)
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

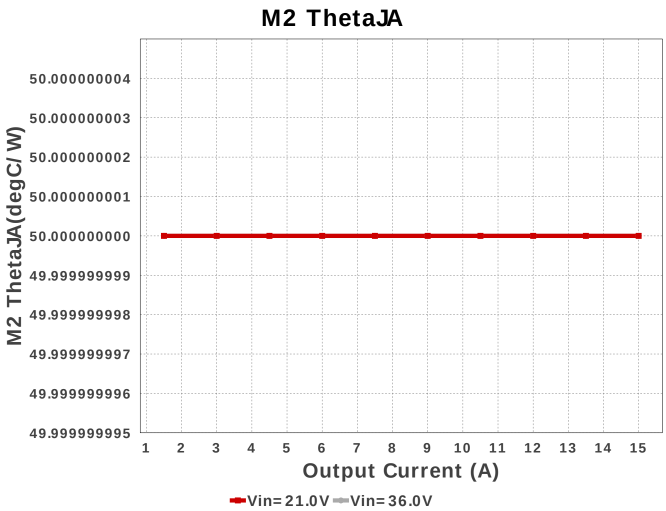

M3 PdCond
M3 PdCond(W)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

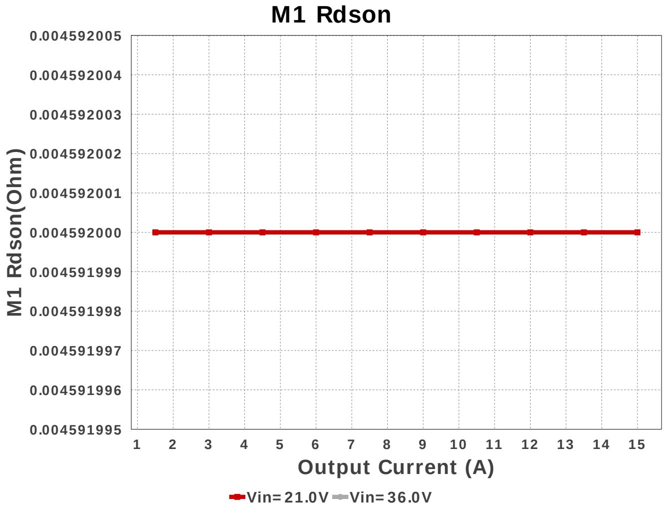

Efficiency
Efficiency(%)
99.0
98.5
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
92.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

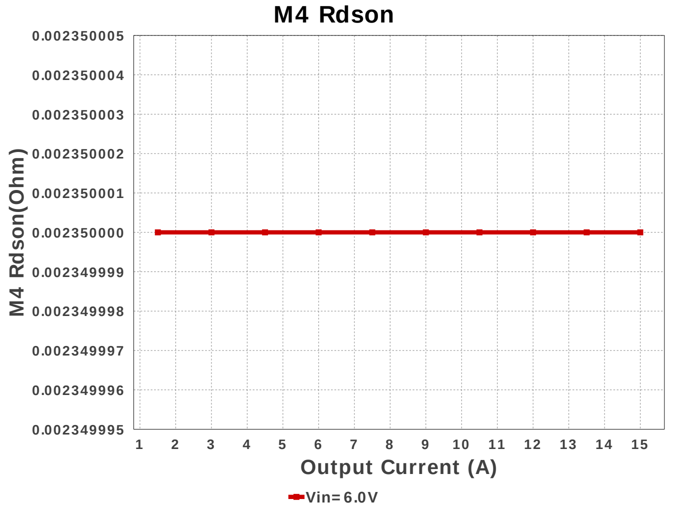

Coutx Pd
Coutx Pd(W)
0.000250
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
0.000075
0.000050
0.000025
0.000000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

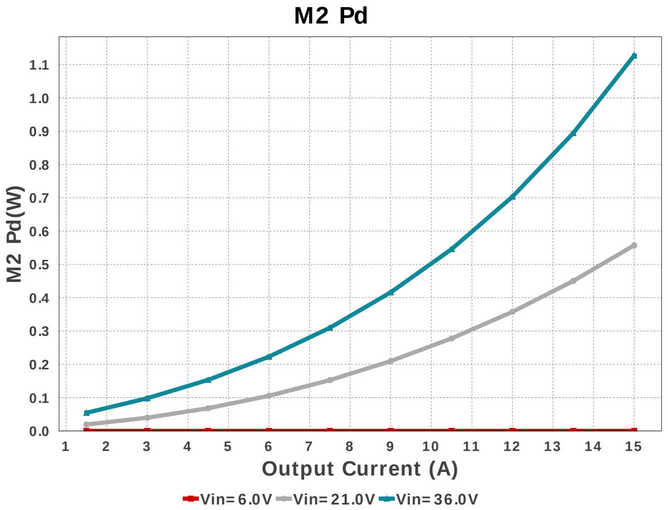

M2 Rdson
M2 Rdson(Ohm)
0.004592005
0.004592004
0.004592003
0.004592002
0.004592001
0.004592000
0.004591999
0.004591998
0.004591997
0.004591996
0.004591995
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=21.0V Vin=36.0V

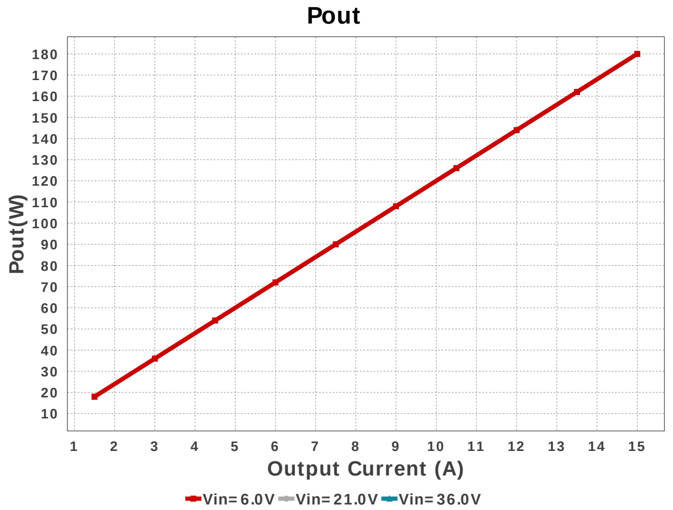

M4 PdCond
M4 PdCond(W)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V

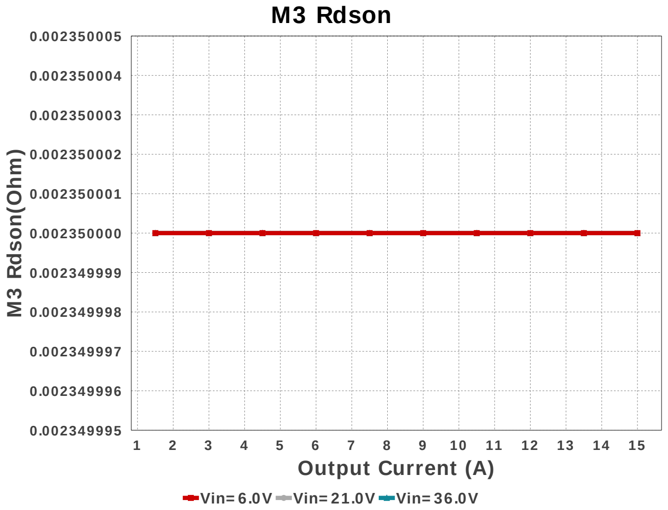

M2 ThetaJA
M2 ThetaJA(degC/W)
50.000000004
50.000000003
50.000000002
50.000000001
50.000000000
49.999999999
49.999999998
49.999999997
49.999999996
49.999999995
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=21.0V Vin=36.0V

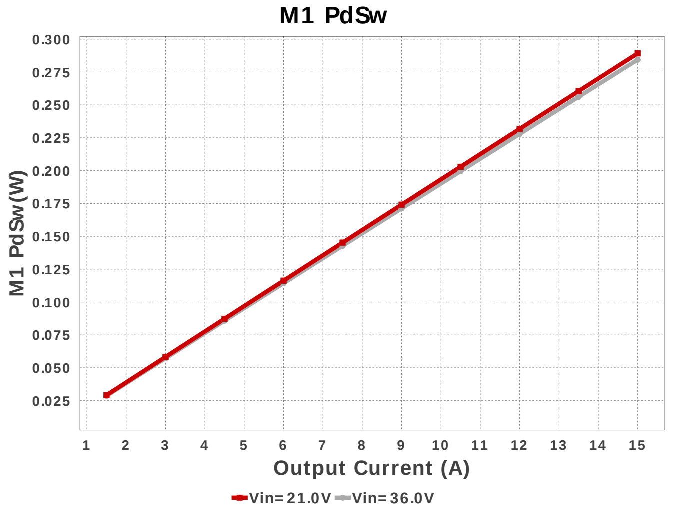

M1 Rdson
M1 Rdson(Ohm)
0.004592005
0.004592004
0.004592003
0.004592002
0.004592001
0.004592000
0.004591999
0.004591998
0.004591997
0.004591996
0.004591995
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=21.0V Vin=36.0V


M4 Rdson
M4 Rdson(Ohm)
0.002350005
0.002350004
0.002350003
0.002350002
0.002350001
0.002350000
0.002349999
0.002349998
0.002349997
0.002349996
0.002349995
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V

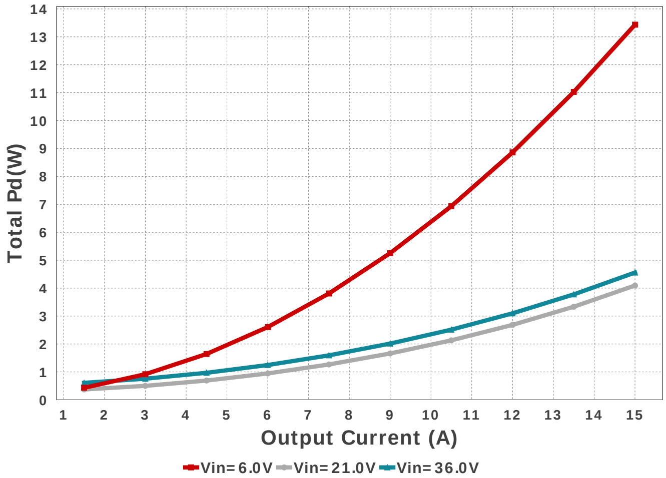

M2 Pd
M2 Pd(W)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V


Pout
Pout(W)
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V

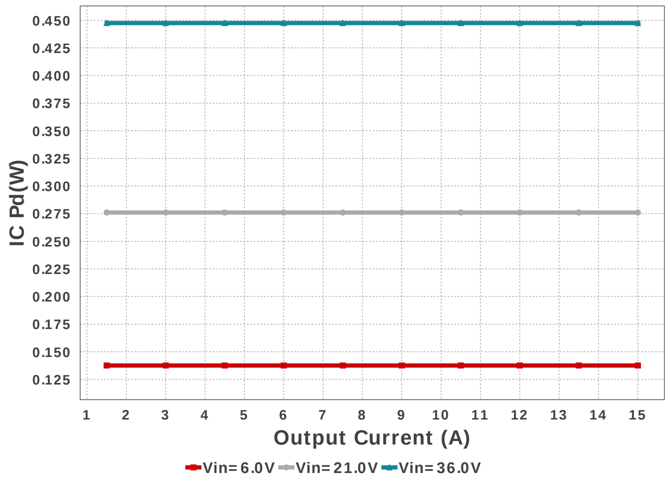

M3 Rdson
M3 Rdson(Ohm)
0.002350005
0.002350004
0.002350003
0.002350002
0.002350001
0.002350000
0.002349999
0.002349998
0.002349997
0.002349996
0.002349995
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=6.0V Vin=21.0V Vin=36.0V


M1 PdSw
M1 PdSw(W)
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Output Current (A)
Vin=21.0V Vin=36.0V

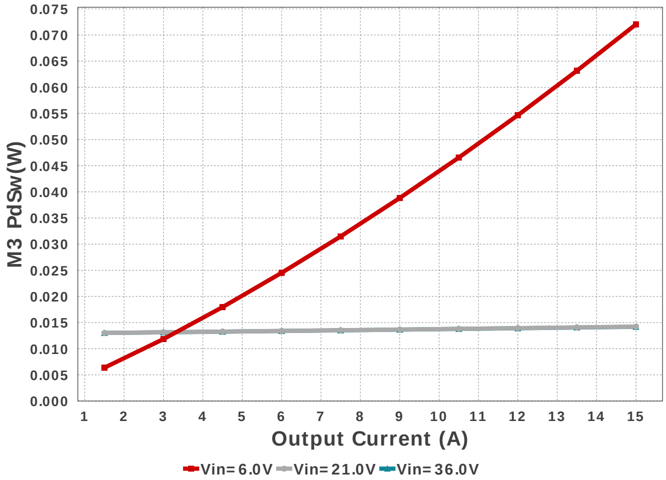
Total Pd



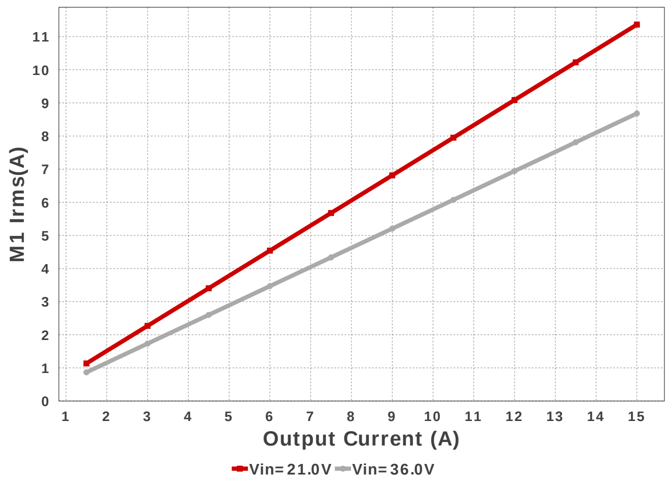
IC Pd



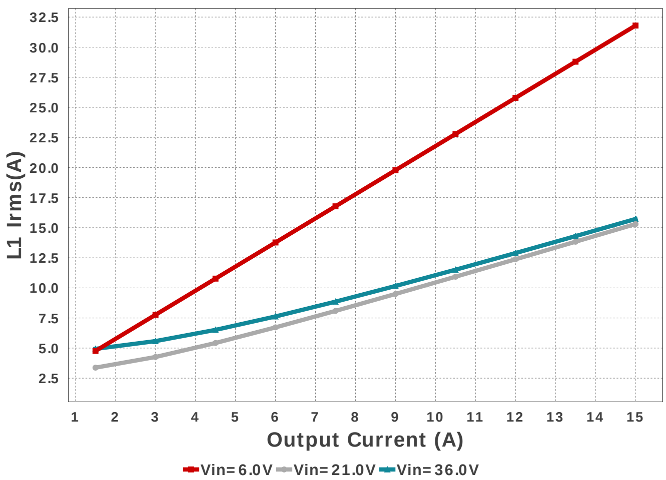
M3 PdSw



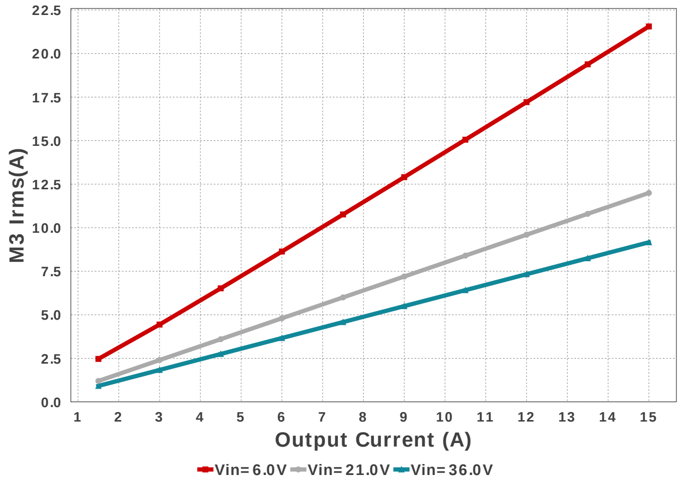
M1 Irms



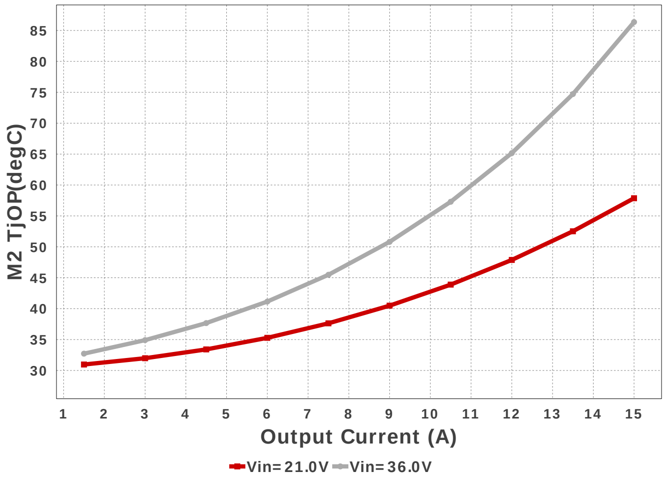
L1 Irms



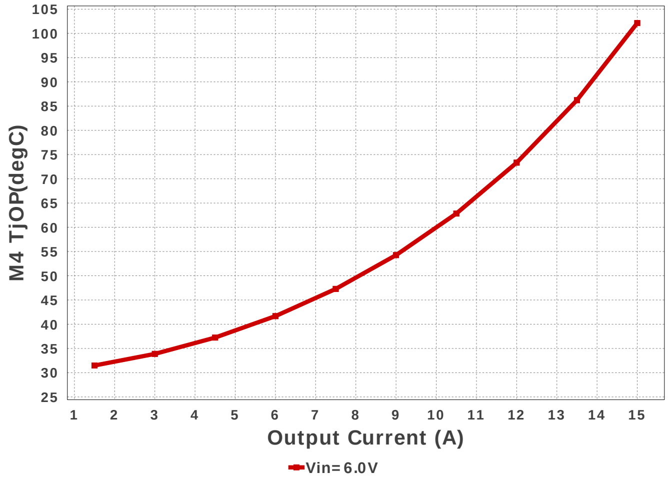
M3 Irms



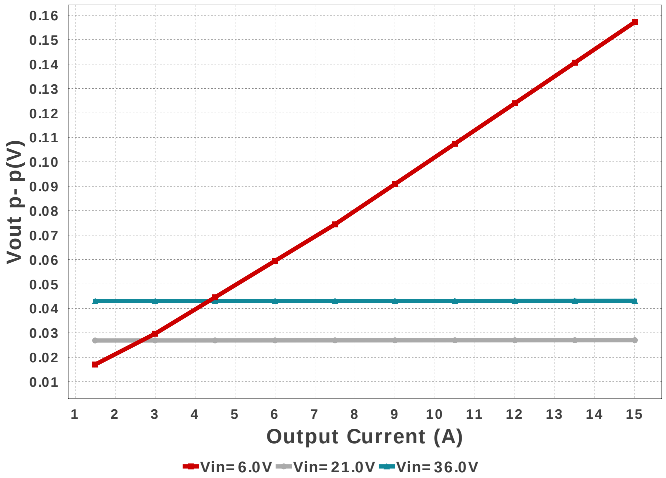
M2 TjOP



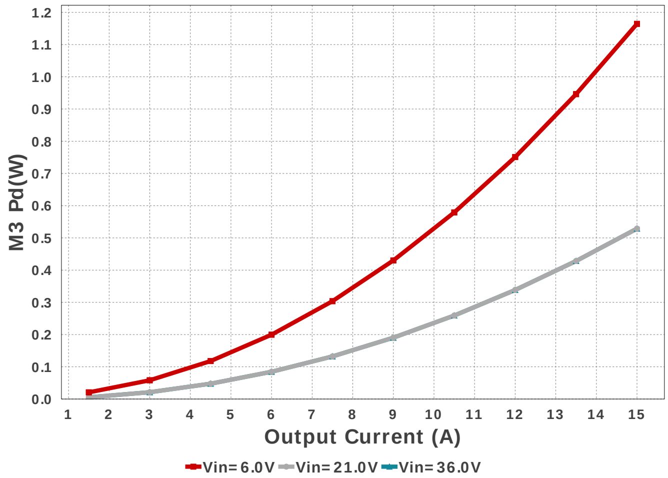
M4 TjOP



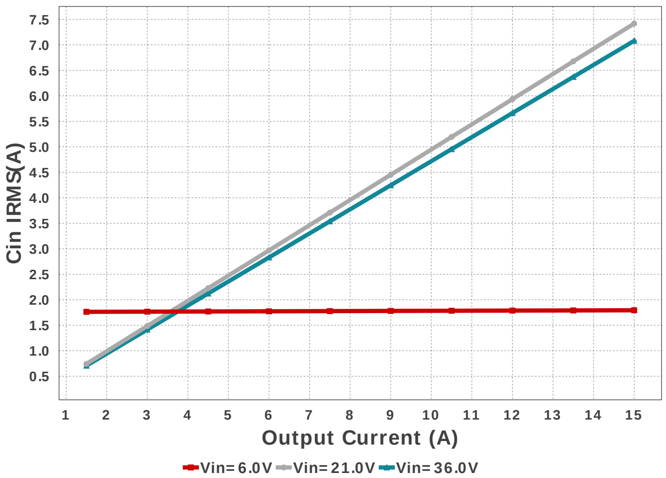
Vout p-p



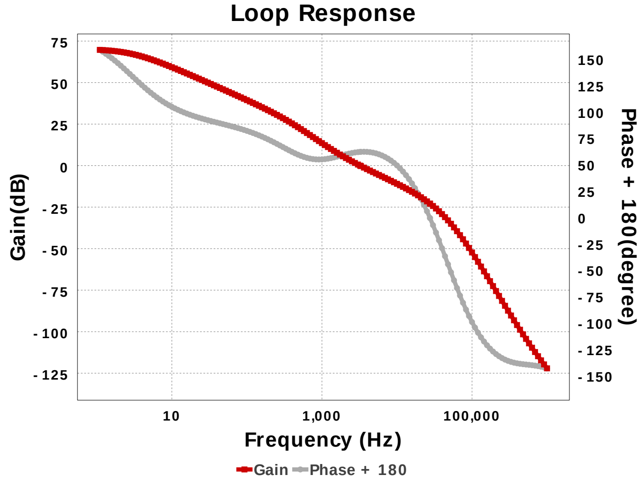
M3 Pd



Cin IRMS



Loop Response



Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.794 A	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	2.475 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	14.33 A	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	547.59 mW	Capacitor	Output capacitor power dissipation
5.	Coutx IRMS	866.714 mA	Capacitor	Output capacitor_x RMS ripple current
6.	Coutx Pd	250.4 µW	Capacitor	Output capacitor_x power loss
7.	D2 Pd	0.0 W	Diode	Diode power dissipation
8.	D3 Pd	0.0 W	Diode	Diode power dissipation
9.	IC Pd	306.88 mW	IC	IC power dissipation
10.	IC Tj	39.36 degC	IC	IC junction temperature
11.	IC Tolerance	12.0 mV	IC	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	ICThetaJA	30.5 degC/W	IC	IC junction-to-ambient thermal resistance
13.	Iin Avg	32.268 A	IC	Average input current
14.	L Ipp	6.214 A	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	4.043 W	Inductor	Inductor power dissipation
16.	L1 Irms	31.794 A	Inductor	Inductor ripple current
17.	M1 Pd	4.642 W	Mosfet	M1 MOSFET total power dissipation
18.	M1 PdCond	4.642 W	Mosfet	M1 MOSFET conduction losses
19.	M2 Pd	0.0 W	Mosfet	M2 MOSFET total power dissipation
20.	M3 Irms	21.558 A	Mosfet	MOSFET RMS ripple current
21.	M3 Pd	1.164 W	Mosfet	MOSFET power dissipation
22.	M3 PdCond	1.092 W	Mosfet	M1 MOSFET conduction losses
23.	M3 PdSw	72.035 mW	Mosfet	M1 MOSFET switching losses
24.	M3 ThetaJA	30.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
25.	M3 TjOP	76.11 degC	Mosfet	MOSFET junction temperature
26.	M4 Irms	21.15 A	Mosfet	MOSFET RMS ripple current
27.	M4 Pd	1.379 W	Mosfet	MOSFET power dissipation
28.	M4 PdCond	1.051 W	Mosfet	M2 MOSFET conduction losses
29.	M4 PdSw	0.0 W	Mosfet	M2 MOSFET switching losses
30.	M4 ThetaJA	30.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
31.	M4 TjOP	100.839 degC	Mosfet	MOSFET junction temperature
32.	M4 TjOP	100.84 degC	Mosfet	M4 MOSFET junction temperature
33.	Cin Pd	2.475 mW	Power	Input capacitor power dissipation
34.	Cout Pd	547.59 mW	Power	Output capacitor power dissipation
35.	Coutx Pd	250.4 µW	Power	Output capacitor_x power loss
36.	D2 Pd	0.0 W	Power	Diode power dissipation
37.	D3 Pd	0.0 W	Power	Diode power dissipation
38.	IC Pd	306.88 mW	Power	IC power dissipation
39.	L Pd	4.043 W	Power	Inductor power dissipation
40.	M1 Pd	4.642 W	Power	M1 MOSFET total power dissipation
41.	M1 PdCond	4.642 W	Power	M1 MOSFET conduction losses
42.	M2 Pd	0.0 W	Power	M2 MOSFET total power dissipation
43.	M3 Pd	1.164 W	Power	MOSFET power dissipation
44.	M3 PdCond	1.092 W	Power	M1 MOSFET conduction losses
45.	M3 PdSw	72.035 mW	Power	M1 MOSFET switching losses
46.	M3 Rdson	2.35 mOhm	Power	Drain-Source On-resistance
47.	M4 Pd	1.379 W	Power	MOSFET power dissipation
48.	M4 PdCond	1.051 W	Power	M2 MOSFET conduction losses
49.	M4 PdSw	0.0 W	Power	M2 MOSFET switching losses
50.	M4 Rdson	2.35 mOhm	Power	Drain-Source On-resistance
51.	Rsense Pd	1.52 W	Power	LED Current Rsns Power Dissipation
52.	Total Pd	13.605 W	Power	Total Power Dissipation
53.	Rsense Pd	1.52 W	Resistor	LED Current Rsns Power Dissipation
54.	BOM Count	61	System Information	Total Design BOM count
55.	Cross Freq	3.223 kHz	System Information	Bode plot crossover frequency
56.	Duty Cycle	50.478 %	System Information	Duty cycle
57.	Efficiency	92.973 %	System Information	Steady state efficiency
58.	FootPrint	2.812 k mm^2	System Information	Total Foot Print Area of BOM components
59.	Frequency	99.216 kHz	System Information	Switching frequency
60.	Gain Marg	-22.893 dB	System Information	Bode Plot Gain Margin
61.	Iout	15.0 A	System Information	Iout operating point
62.	Low Freq Gain	69.7 dB	System Information	Gain at 1Hz
63.	Mode	CCM	System Information	Conduction Mode
64.	Operating Topology	Boost	System Information	The current operating topology of the device
65.	Phase Marg	62.747 deg	System Information	Bode Plot Phase Margin
66.	Pout	180.0 W	System Information	Total output power
67.	SW Ipk	33.397 A	System Information	Peak switch current
68.	Total BOM	NA	System Information	Total BOM Cost
69.	Vin	6.0 V	System Information	Vin operating point
70.	Vout	12.0 V	System Information	Operational Output Voltage

#	Name	Value	Category	Description
71.	Vout Actual	12.0 V	System Information	Vout Actual calculated based on selected voltage divider resistors
72.	Vout Tolerance	3.414 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
73.	Vout p-p	157.195 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	15.0	Maximum Output Current
VinMax	36.0	Maximum input voltage
VinMin	6.0	Minimum input voltage
Vout	12.0	Output Voltage
base_pn	LM5175-Q1	Base Product Number
source	DC	Input Source Type
Ta	30.0	Ambient temperature

WEBENCH® Assembly

Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

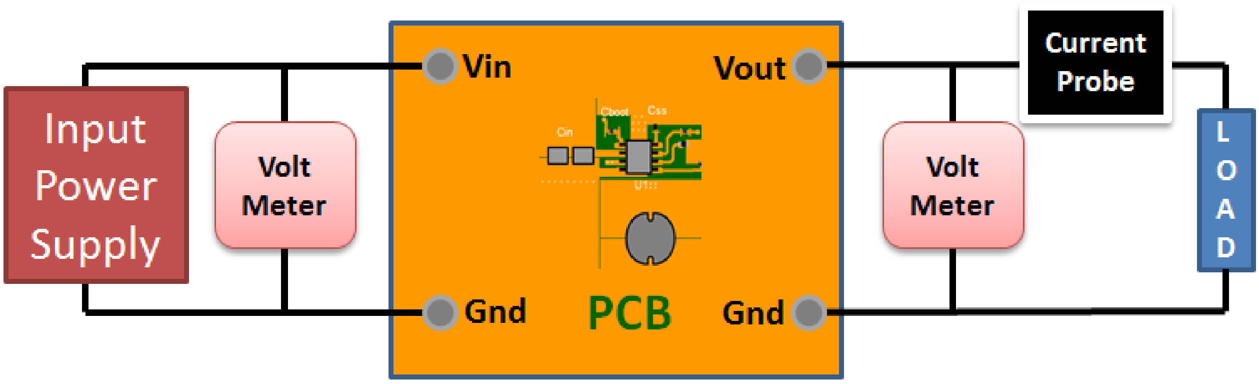
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 6.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum Iout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.

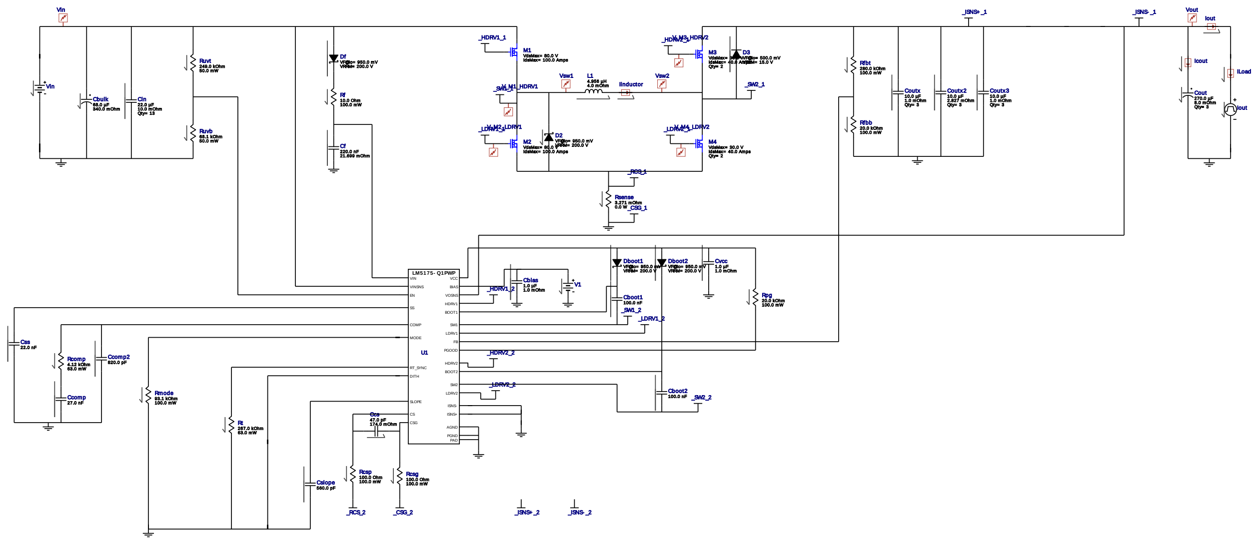


WEBENCH® Electrical Simulation Report

Design Id = 23

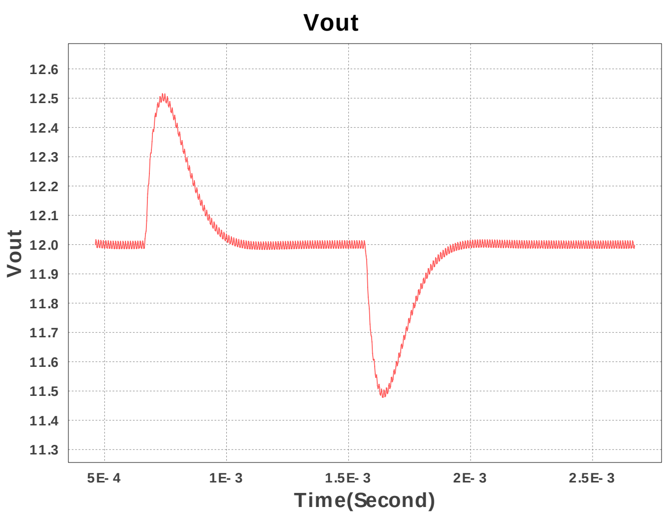
sim_id = 1

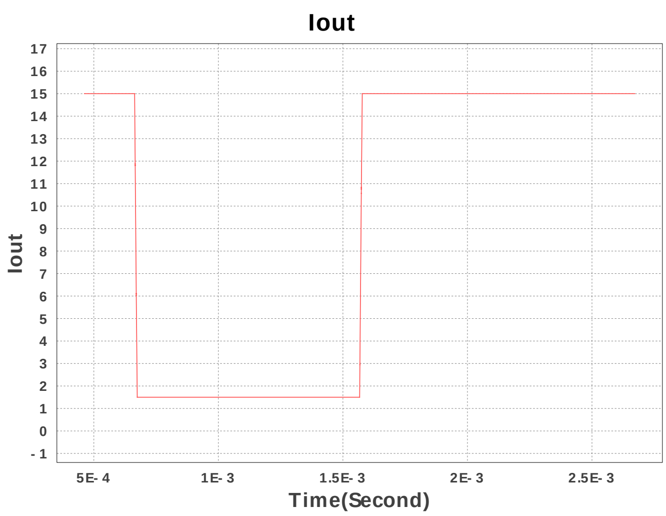
Simulation Type = Load Transient



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Css	IC	Initial Voltage	1.195 V
2.	Cout	IC	Initial Condition	12.0 V
3.	Coutx3	IC	Initial Condition	12.0 V
4.	L1	IC	Initial Current	-10.08403361344538 A
5.	V1	V	Bias Voltage	9 V
6.	Coutx2	IC	Initial Condition	12.0 V
7.	Coutx	IC	Initial Condition	12.0 V
8.	Iout	signal_type	Signal Type	PULSE
		I1	Initial Load Current	15.0 A
		I2	Minimum Load Current	1.5 A
		Td	Initial Time Delay	6.636333807917452E-4 s
		Tf	Fall Time	10u s
		Tr	Rise Time	10u s
		Pw	Pulse Width	8.935115564862677E-4 s

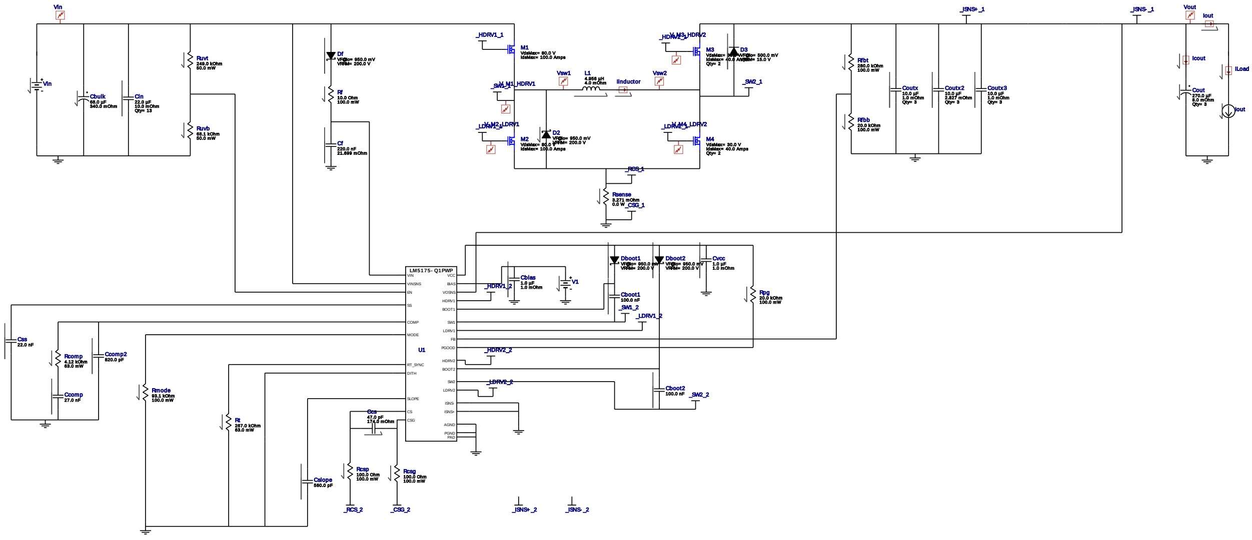




Design Id = 23

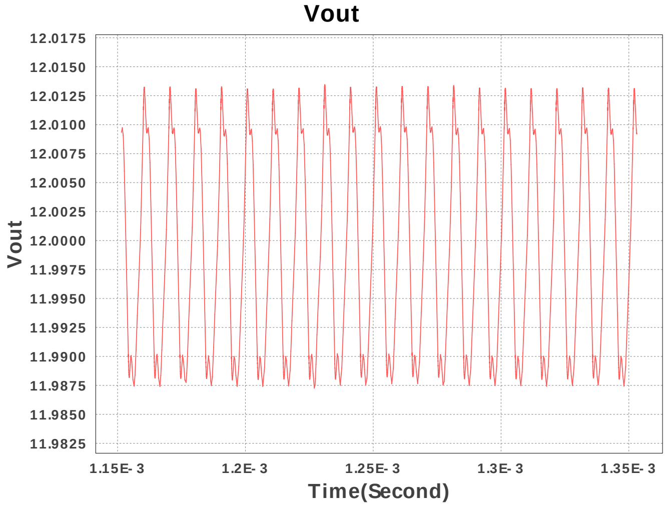
sim_id = 2

Simulation Type = Steady State



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Css	IC	Initial Voltage	1.195 V
2.	Cout	IC	no description	12.0 V
3.	Coutx3	IC	no description	12.0 V
4.	L1	IC	Initial Current	-10.08403361344538 A
5.	V1	V	Bias Voltage	9 V
6.	Coutx2	IC	no description	12.0 V
7.	Coutx	IC	Initial Condition	12.0
8.	Iout	I	Load Current	15.0 A



Design Assistance

1. The LM5175-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.

2. Tip: Snubbers and/or gate resistors may be required to limit the SW1,2 node switching spikes below the IC and FET abs max ratings.

3. Tip: Slope Capacitor: smaller slope capacitors provide better transition region behavior.

4. Master key : 864D914F612F9E83[v1]

5. **LM5175-Q1** Product Folder : http://www.ti.com/product/LM5175%2DQ1 : contains the data sheet and other resources.