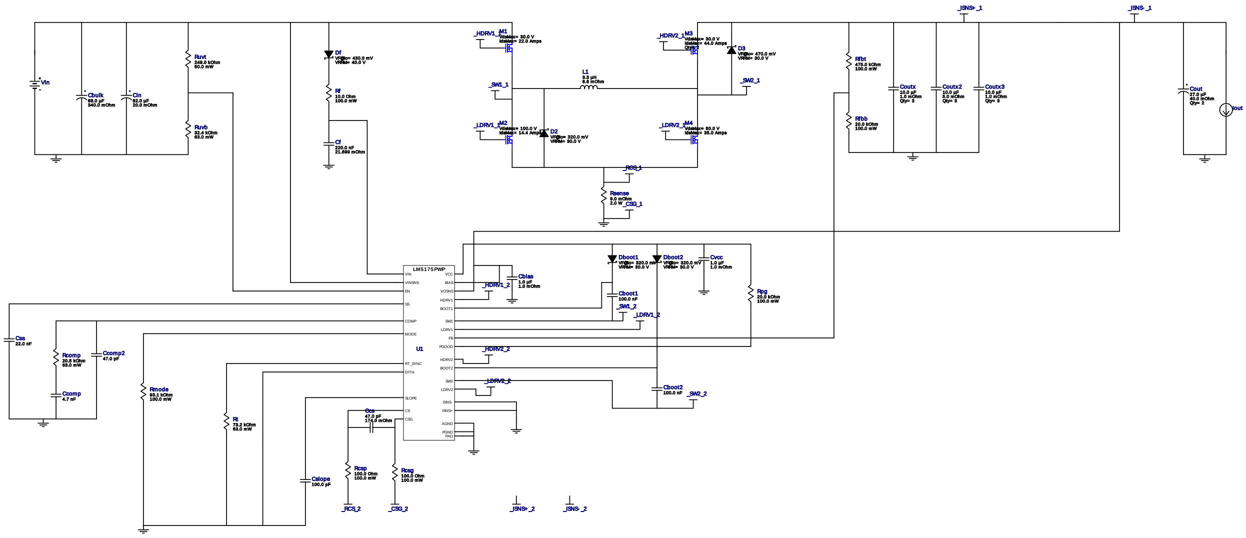
Texas Instruments

VinMin = 11.0V
VinMax = 24.0V
Vout = 20.0V
Iout = 5.0A

Device = LM5175PWPR
Topology = Buck_Boost
Created = 2020-07-25 08:59:42.576
BOM Cost = $12.10
BOM Count = 47
Total Pd = 2.09W

WEBENCH ® Design Report

Design : 5 LM5175PWPR
LM5175PWPR 11V-24V to 20.00V @ 5A

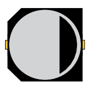


Design Alerts

Component Selection Information

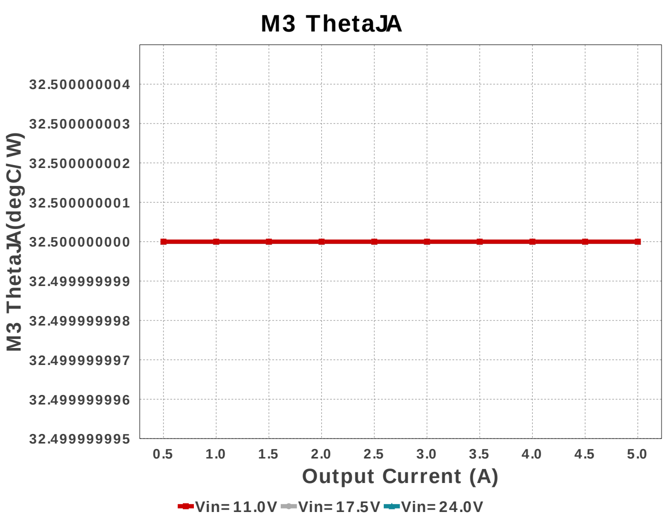
Please note that since parallel FETs have been chosen in this design, schematic and PCB export features will not work

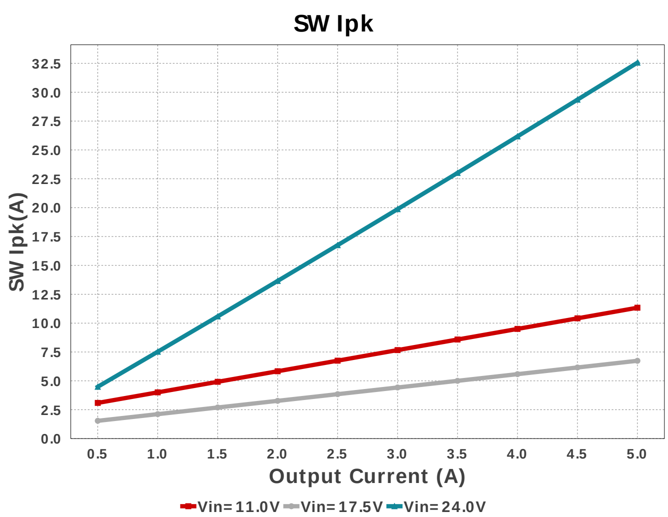
Electrical BOM

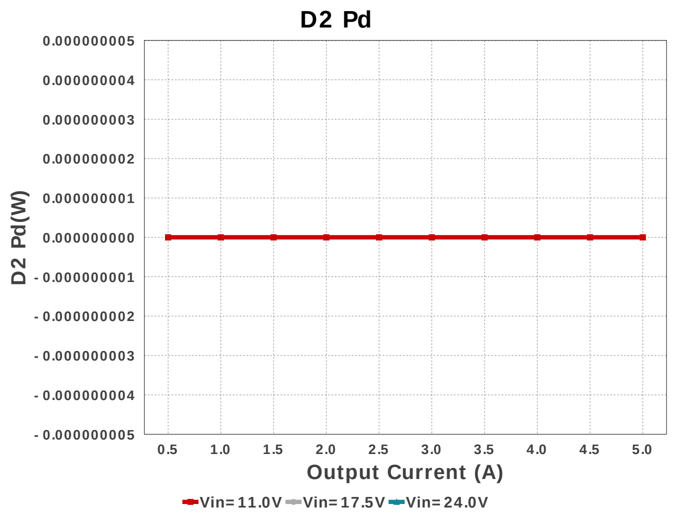
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cbias	Taiyo Yuden	GMK212B7105KG-T Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 35.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm^2
Cboot1	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.06	0805 7 mm^2
Cboot2	AVX	08053C104JAZ2A Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.06	0805 7 mm^2
Cbulk	Nichicon	UUD1V680MCL1GS Series= uD	Cap= 68.0 uF ESR= 340.0 mOhm VDC= 35.0 V IRMS= 280.0 mA	1	$0.12	 SM_RADIAL_6.3BMM 80 mm^2
Ccomp	TDK	CGA4C2C0G1H472J060AA Series= C0G/NP0	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.04	0805 7 mm^2
Ccomp2	Samsung Electro-Mechanics	CL21C470JBANNNC Series= C0G/NP0	Cap= 47.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
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 mm^2
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

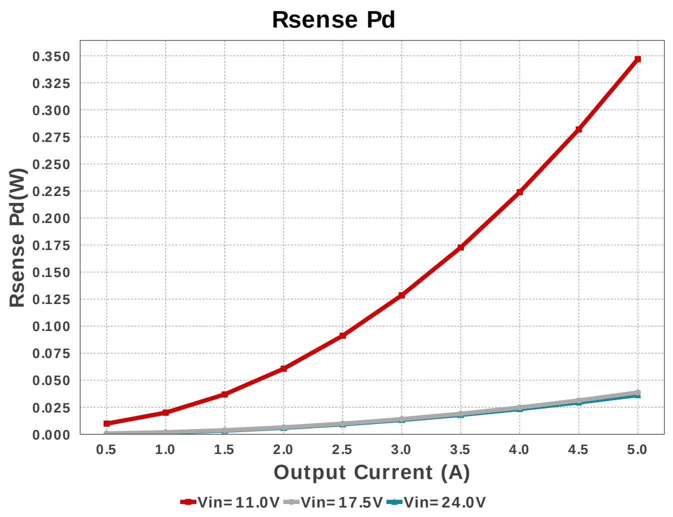
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	Panasonic	35SVPF82M Series= SVPF	Cap= 82.0 uF ESR= 20.0 mOhm VDC= 35.0 V IRMS= 4.0 A	1	$0.63	CAPSMT_62_E12 106 mm^2
Cout	Panasonic	25SVPF27MX Series= SVPF	Cap= 27.0 uF ESR= 40.0 mOhm VDC= 25.0 V IRMS= 2.45 A	2	$0.36	CAPSMT_62_E61 53 mm^2
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	C5750X7S2A106M230KB Series= X7S	Cap= 10.0 uF ESR= 5.0 mOhm VDC= 100.0 V IRMS= 6.45 A	3	$0.86	2220 54 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	CL10C101JB8NNNC Series= C0G/NP0	Cap= 100.0 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	Toshiba	CMS06	VF@Io= 320.0 mV VRRM= 30.0 V	1	$0.19	M-FLAT 19 mm^2
D3	Torex USA Corporation	XBS053V15R-G	VF@Io= 470.0 mV VRRM= 30.0 V	1	$0.12	SOD-523 5 mm^2
Dboot1	Toshiba	CMS06	VF@Io= 320.0 mV VRRM= 30.0 V	1	$0.19	M-FLAT 19 mm^2
Dboot2	Toshiba	CMS06	VF@Io= 320.0 mV VRRM= 30.0 V	1	$0.19	M-FLAT 19 mm^2
Df	Bourns	CD214A-B240LLF	VF@Io= 430.0 mV VRRM= 40.0 V	1	$0.13	SMA 37 mm^2
L1	Coilcraft	XAL7070-332MEB	L= 3.3 μH 8.6 mOhm	1	$1.19	XAL7070 87 mm^2
M1	Texas Instruments	CSD17571Q2	VdsMax= 30.0 V IdsMax= 22.0 Amps	1	$0.10	DQK0006C 9 mm^2
M2	Texas Instruments	CSD19538Q2	VdsMax= 100.0 V IdsMax= 14.4 Amps	1	$0.15	DQK0006C 9 mm^2
M3	Texas Instruments	CSD17571Q2	VdsMax= 30.0 V IdsMax= 44.0 Amps	2	$0.10	DQK0006C 9 mm^2
M4	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	$0.25	DNH0008A 18 mm^2
Rcomp	Vishay-Dale	CRCW040220K5FKED Series= CRCW..e3	Res= 20.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2

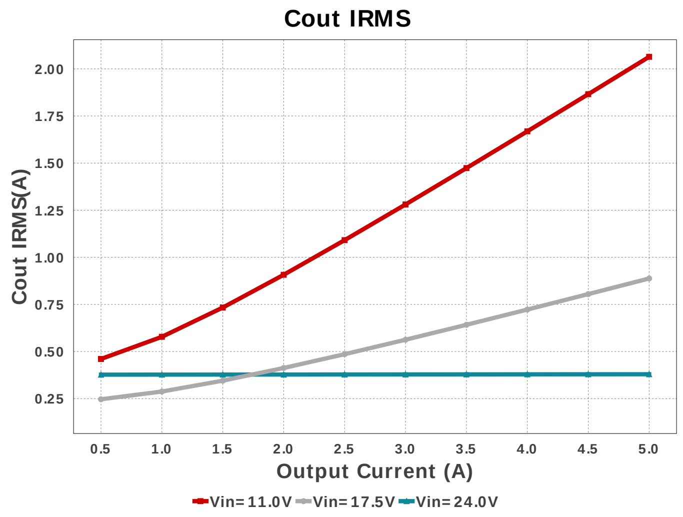
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rcsg	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rcsp	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rf	Vishay-Dale	CRCW060310R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rfbb	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rfbt	Vishay-Dale	CRCW0603475KFKEA Series= CRCW..e3	Res= 475.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rmode	Vishay-Dale	CRCW060393K1FKEA Series= CRCW..e3	Res= 93.1 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rpg	Vishay-Dale	CRCW060320K0FKEA Series= CRCW..e3	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rsense	Rohm	PMR100HZPFU9L00 Series= PMR100	Res= 9.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	$0.17	2512 43 mm^2
Rt	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Ruvb	Vishay-Dale	CRCW040232K4FKED Series= CRCW..e3	Res= 32.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Ruvt	Yageo	RC0201FR-07249KL Series= ?	Res= 249.0 kOhm Power= 50.0 mW Tolerance= 1.0%	1	$0.01	0201 2 mm^2
U1	Texas Instruments	LM5175PWPR	Switcher	1	$2.73	PWP0028F_N 98 mm^2

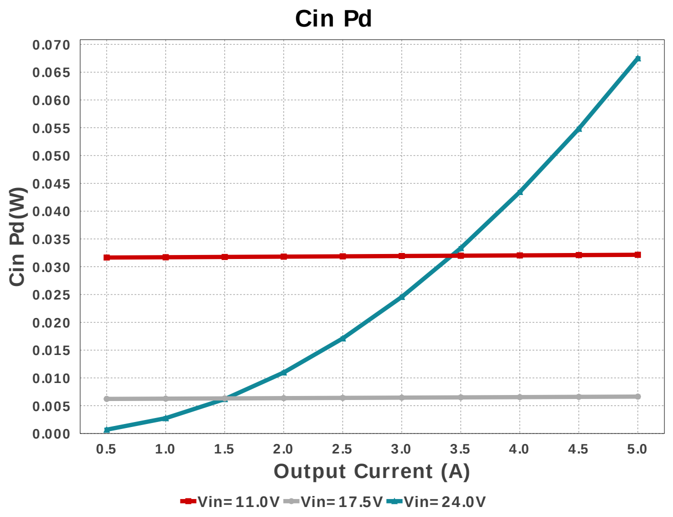


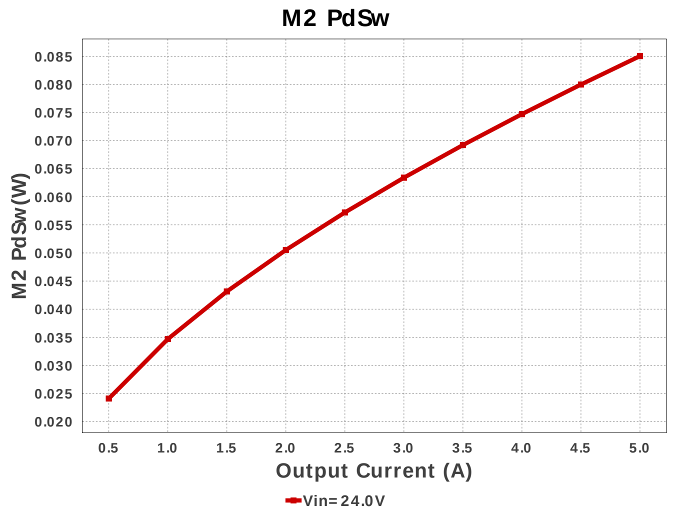


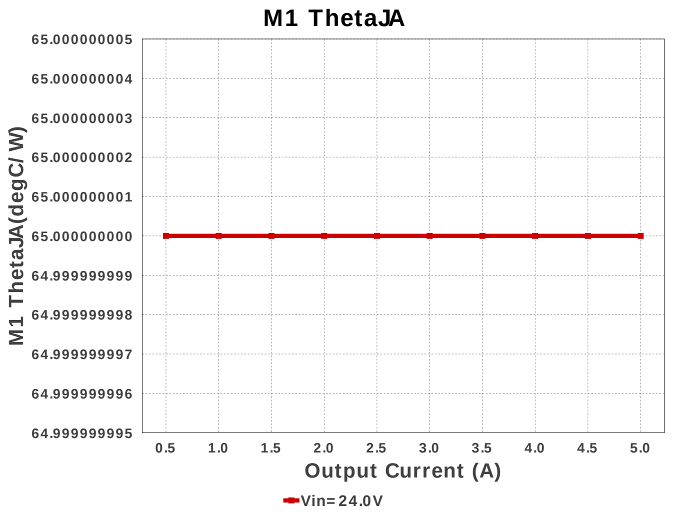

D2 Pd
0.000000005
0.000000004
0.000000003
0.000000002
0.000000001
0.000000000
-0.000000001
-0.000000002
-0.000000003
-0.000000004
-0.000000005
D2 Pd(W)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

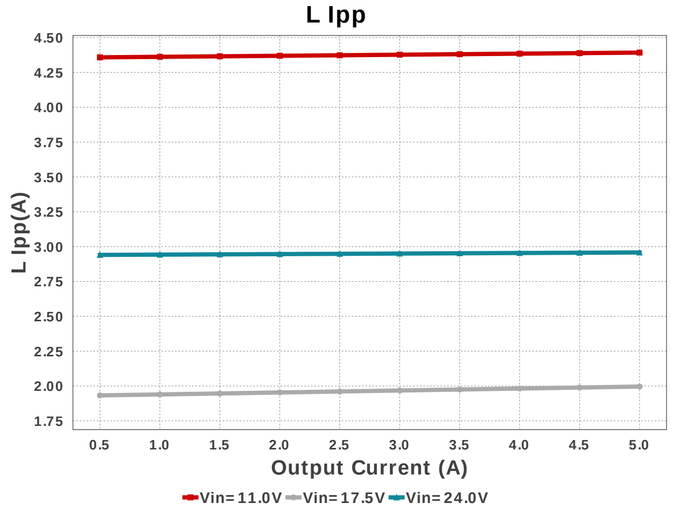

Rsense Pd
0.350
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
Rsense Pd(W)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

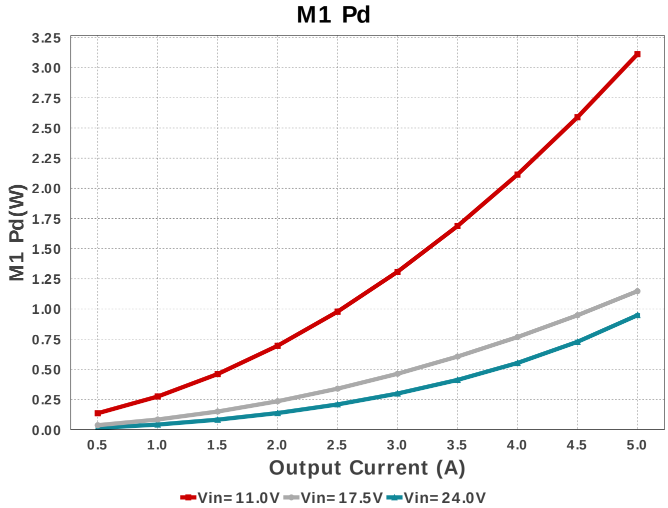

Cout IRMS
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
Cout IRMS(A)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

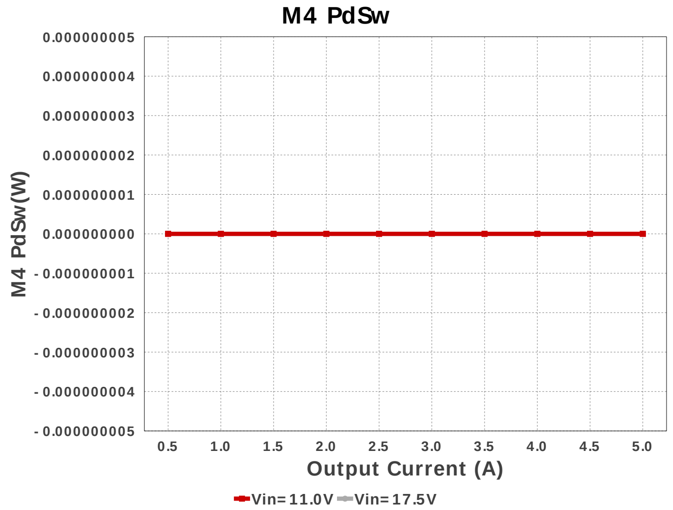

Cin Pd
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Cin Pd(W)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

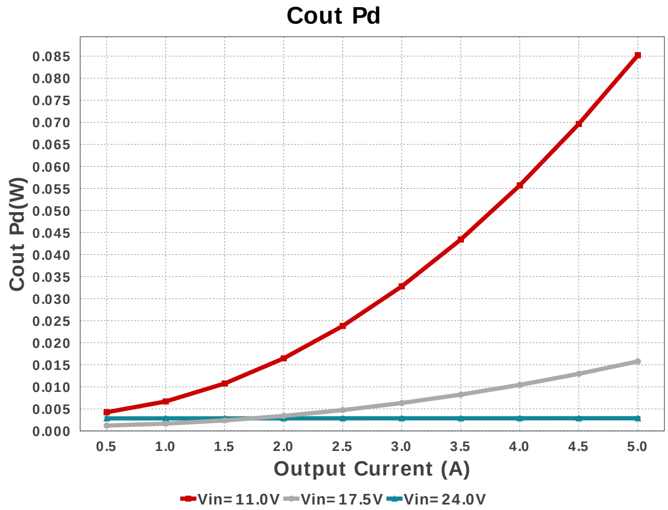

M2 PdSw
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
M2 PdSw(W)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=24.0V

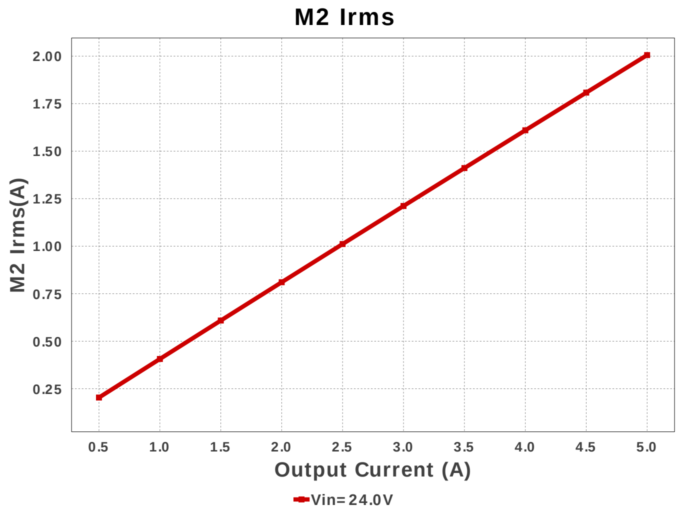

M1 ThetaJA
65.000000005
65.000000004
65.000000003
65.000000002
65.000000001
65.000000000
64.999999999
64.999999998
64.999999997
64.999999996
64.999999995
M1 ThetaJA(degC/W)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=24.0V

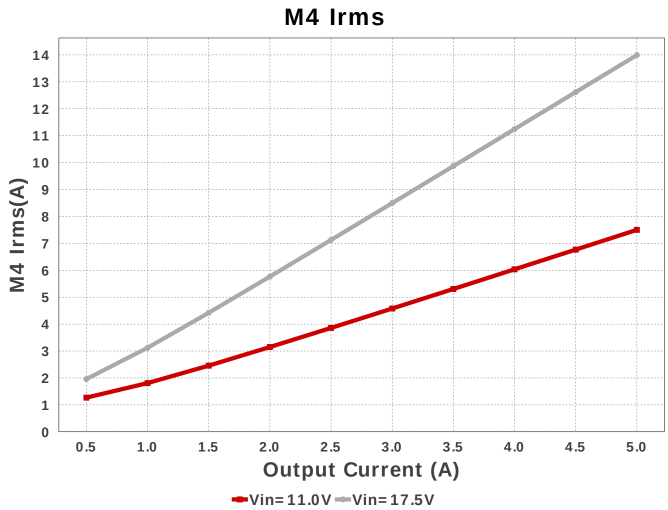

L Ipp
L Ipp(A)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

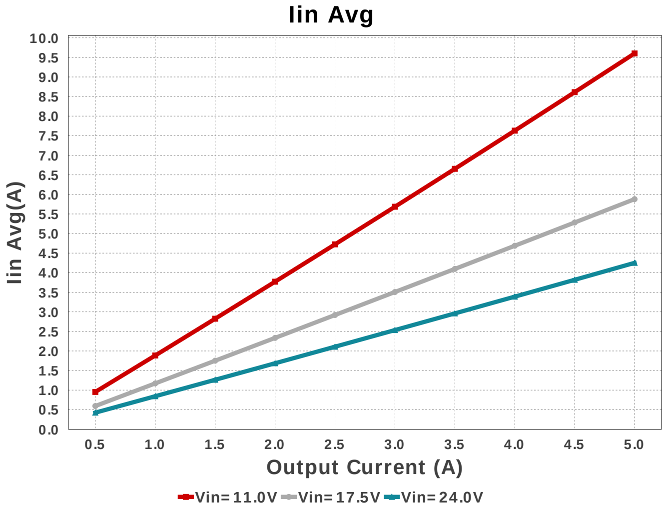

M1 Pd
M1 Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

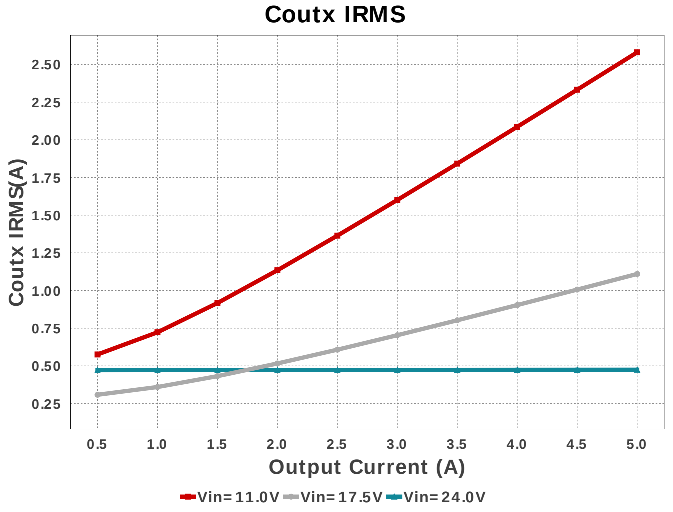

M4 PdSw
M4 PdSw(W)
Output Current (A)
Vin=11.0V Vin=17.5V

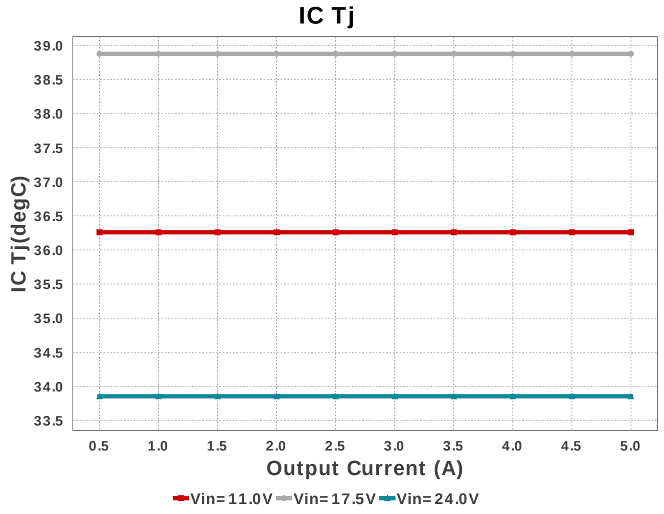

Cout Pd
Cout Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

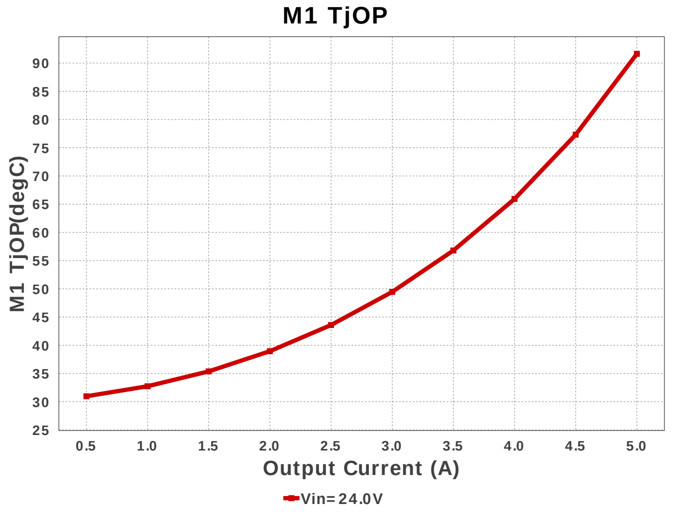

M2 Irms
M2 Irms(A)
Output Current (A)
Vin=24.0V

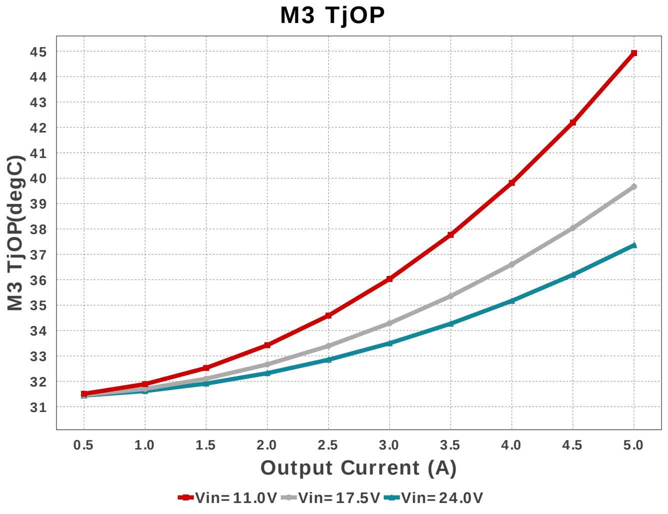

M4 Irms
M4 Irms(A)
Output Current (A)
Vin=11.0V Vin=17.5V

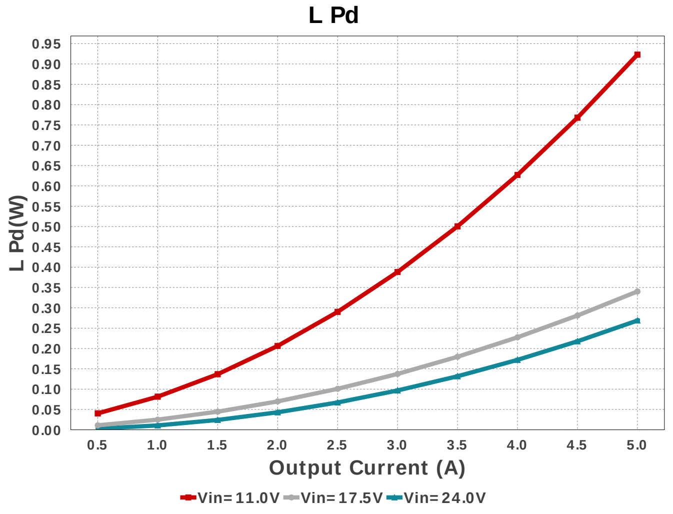

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

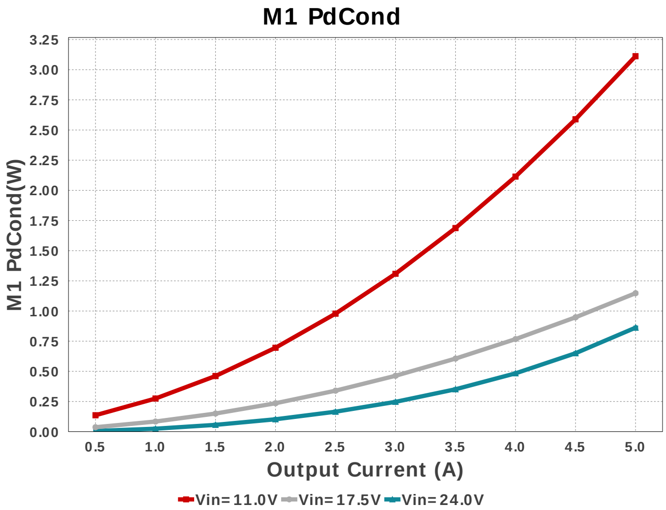

Coutx IRMS
Coutx IRMS(A)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

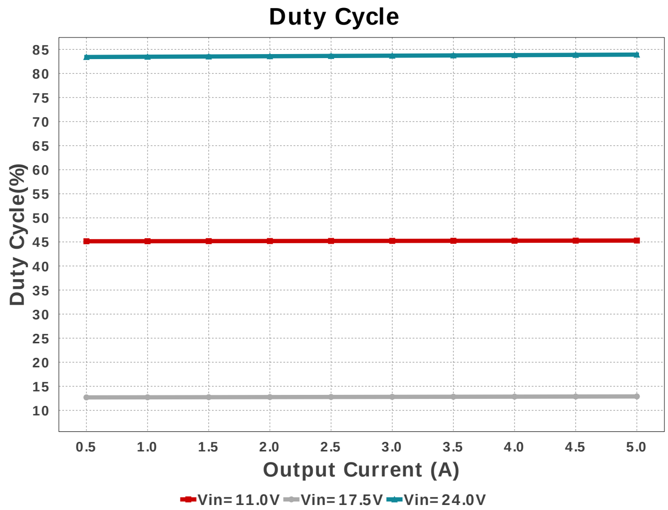

IC Tj
IC Tj(degC)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

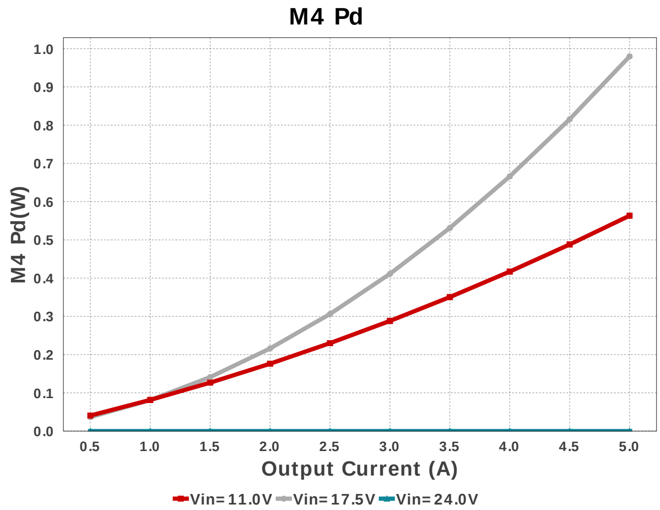

M1 TjOP
M1 TjOP(degC)
Output Current (A)
Vin=24.0V

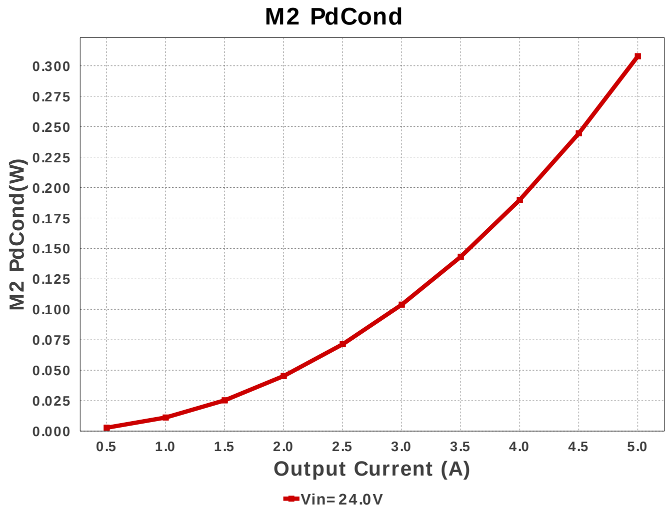

M3 TjOP
M3 TjOP(degC)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

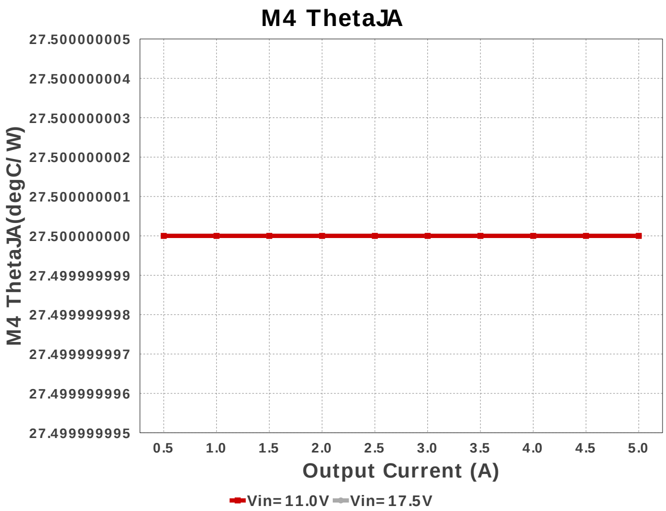

L Pd
L Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

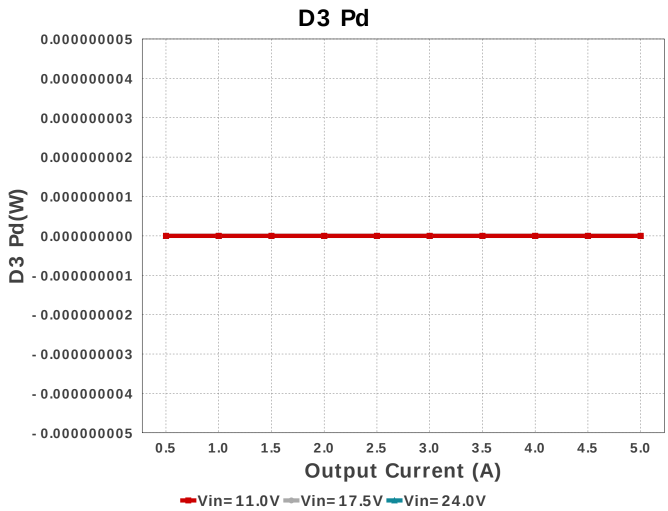

M1 PdCond
M1 PdCond(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

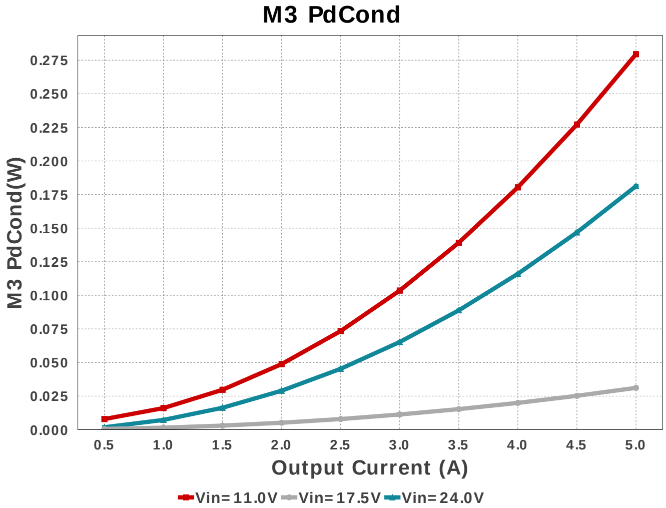

Duty Cycle
Duty Cycle(%)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

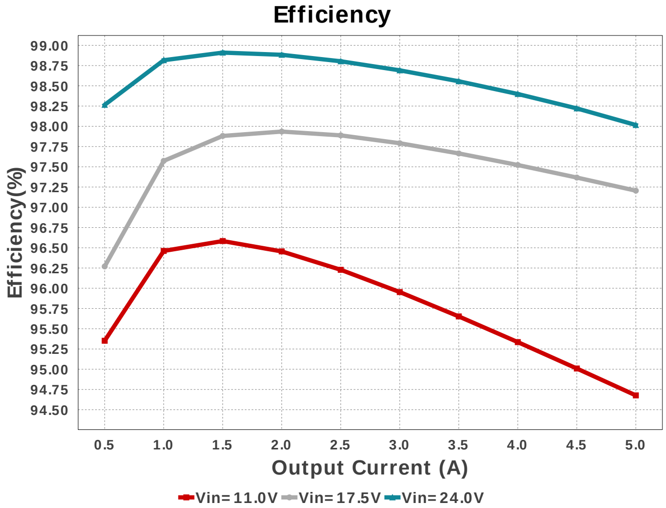

M4 Pd
M4 Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

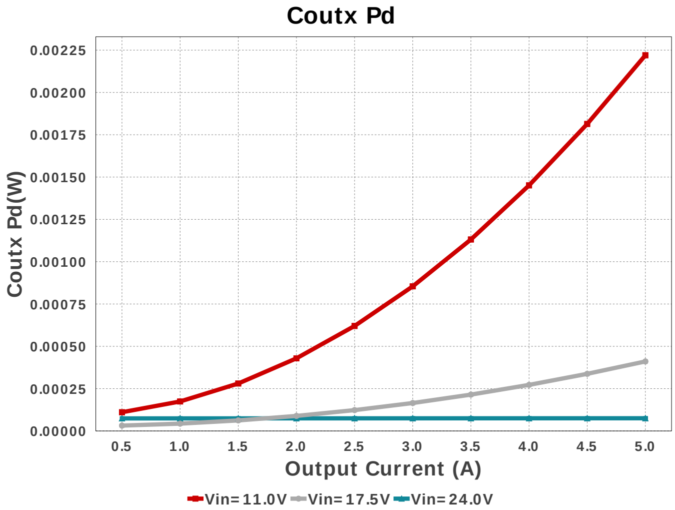

M2 PdCond
M2 PdCond(W)
Output Current (A)
Vin=24.0V

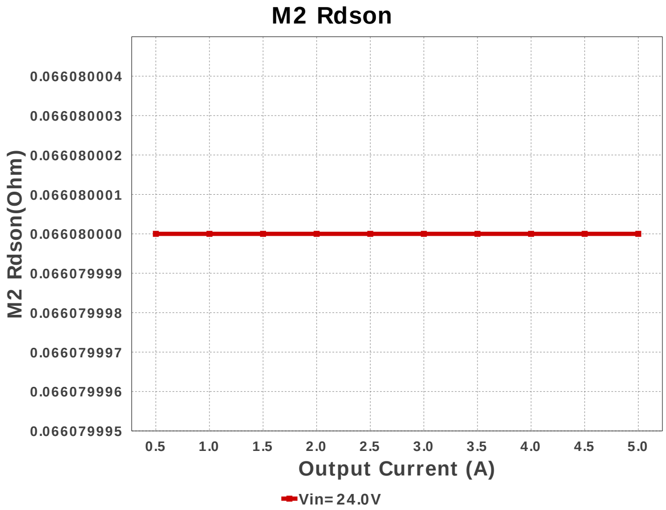

M4 ThetaJA
M4 ThetaJA(degC/W)
Output Current (A)
Vin=11.0V Vin=17.5V

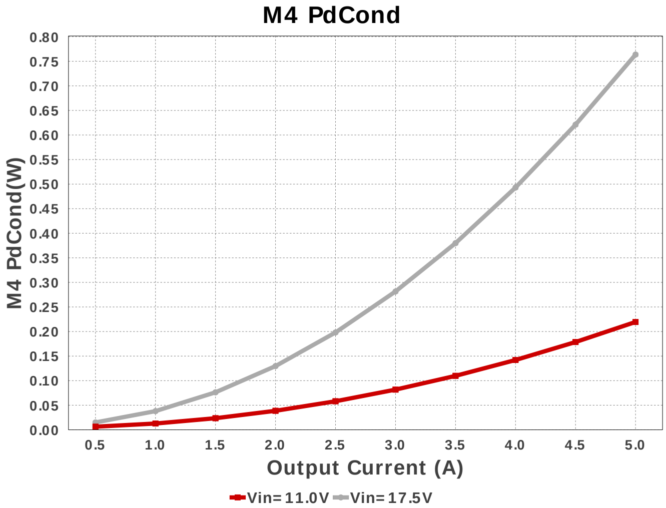

D3 Pd
D3 Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

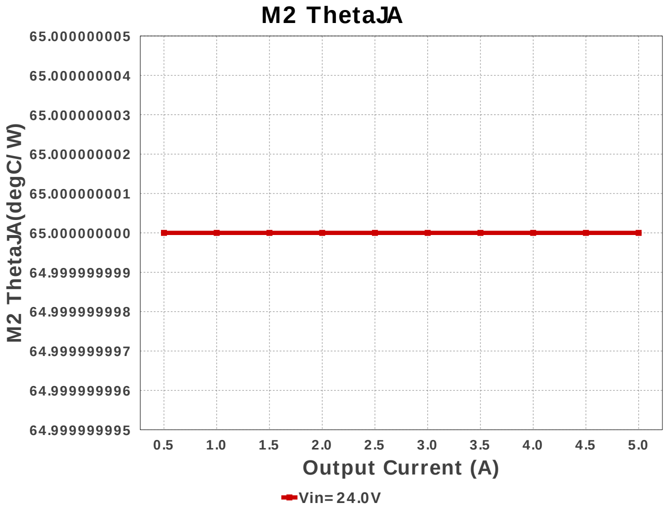

M3 PdCond
M3 PdCond(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

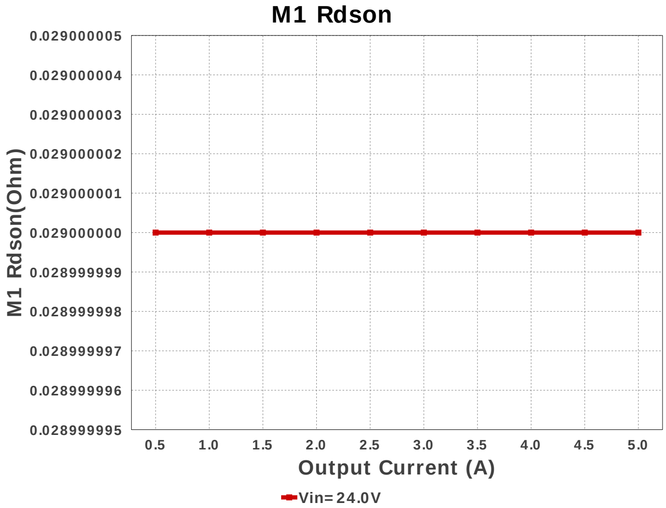

Efficiency
Efficiency(%)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

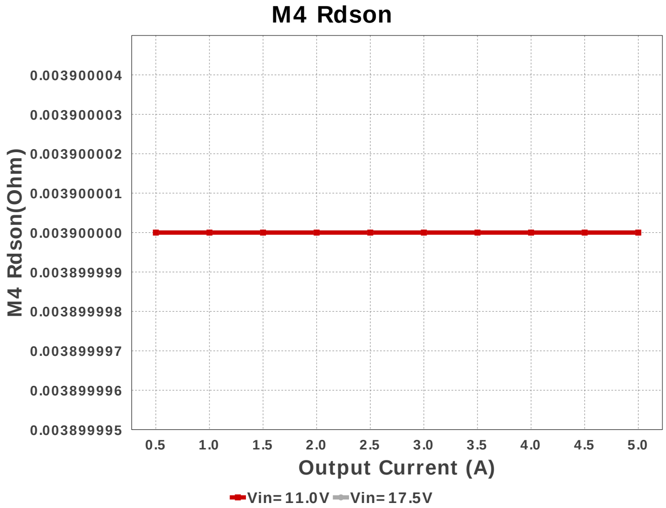

Coutx Pd
Coutx Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

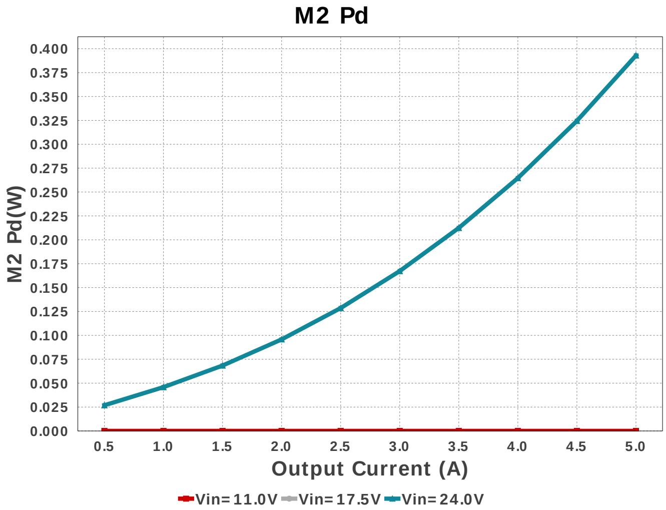

M2 Rdson
M2 Rdson(Ohm)
Output Current (A)
Vin=24.0V

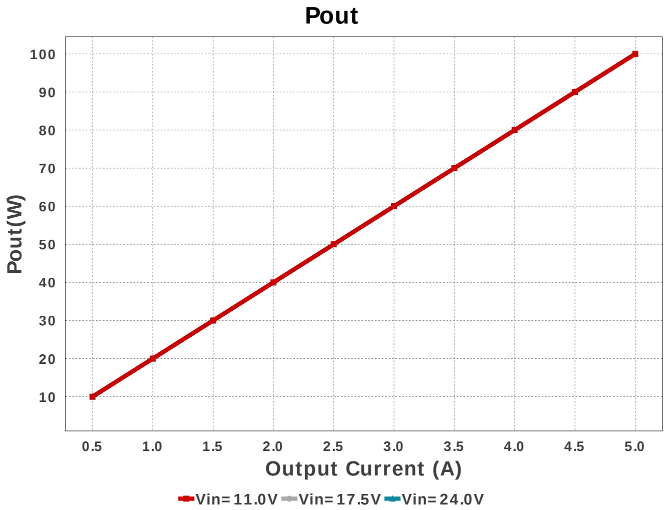

M4 PdCond
M4 PdCond(W)
Output Current (A)
Vin=11.0V Vin=17.5V

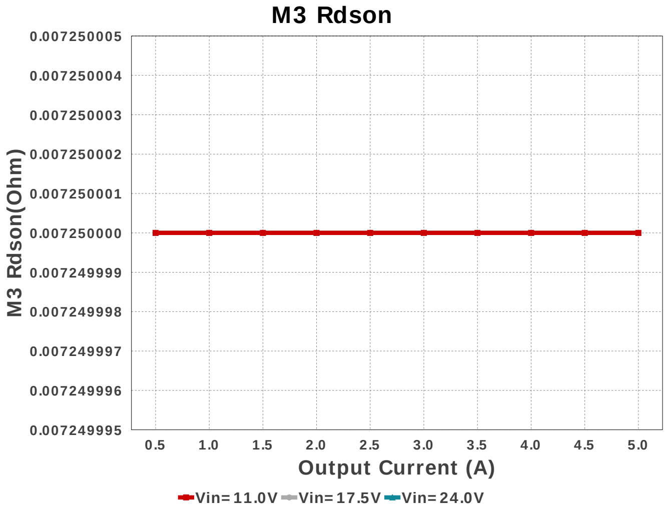

M2 ThetaJA
M2 ThetaJA(degC/W)
Output Current (A)
Vin=24.0V

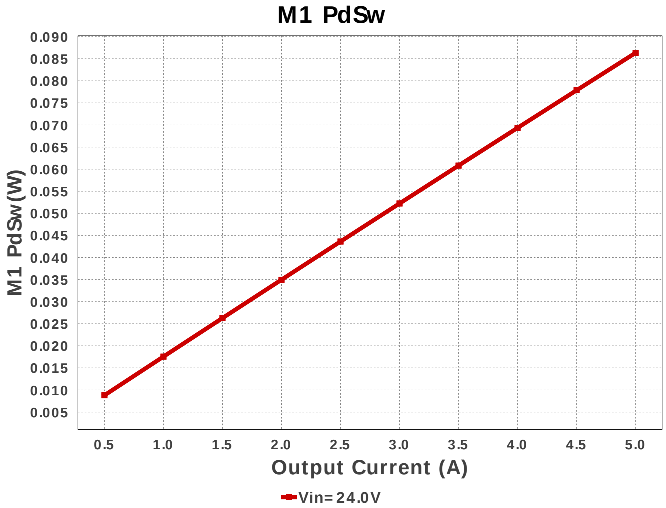

M1 Rdson
M1 Rdson(Ohm)
0.029000005
0.029000004
0.029000003
0.029000002
0.029000001
0.029000000
0.028999999
0.028999998
0.028999997
0.028999996
0.028999995
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=24.0V

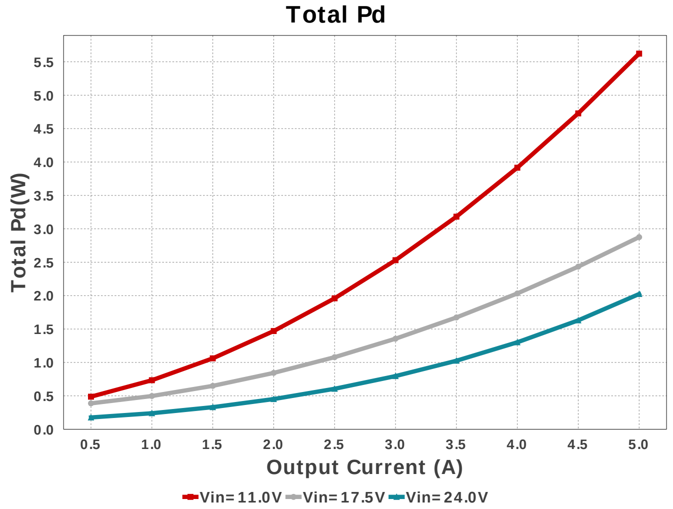

M4 Rdson
M4 Rdson(Ohm)
0.003900004
0.003900003
0.003900002
0.003900001
0.003900000
0.003899999
0.003899998
0.003899997
0.003899996
0.003899995
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V

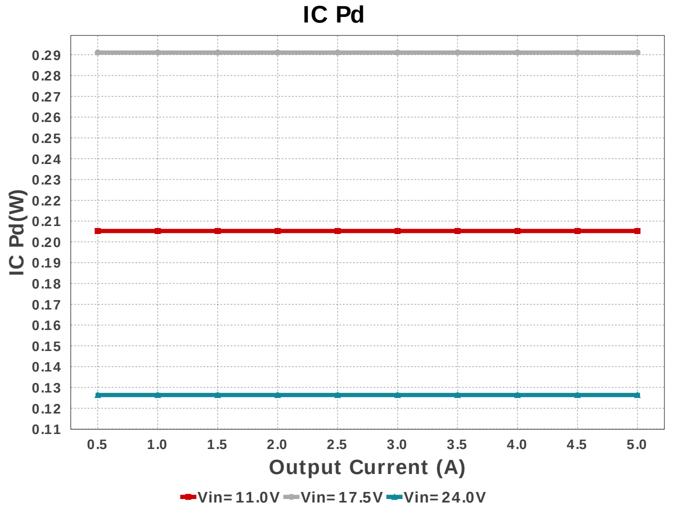

M2 Pd
M2 Pd(W)
0.400
0.375
0.350
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

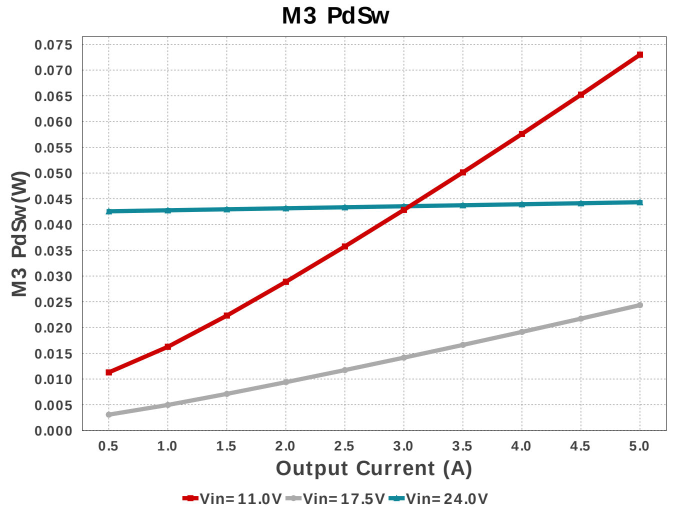

Pout
Pout(W)
100
90
80
70
60
50
40
30
20
10
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

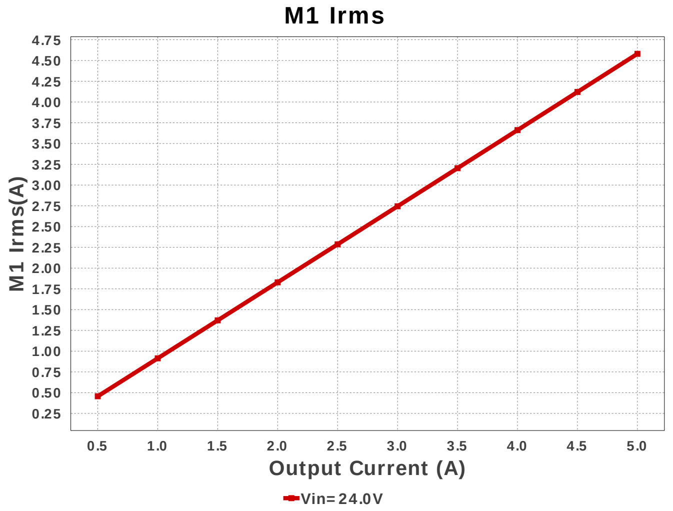

M3 Rdson
M3 Rdson(Ohm)
0.007250005
0.007250004
0.007250003
0.007250002
0.007250001
0.007250000
0.007249999
0.007249998
0.007249997
0.007249996
0.007249995
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

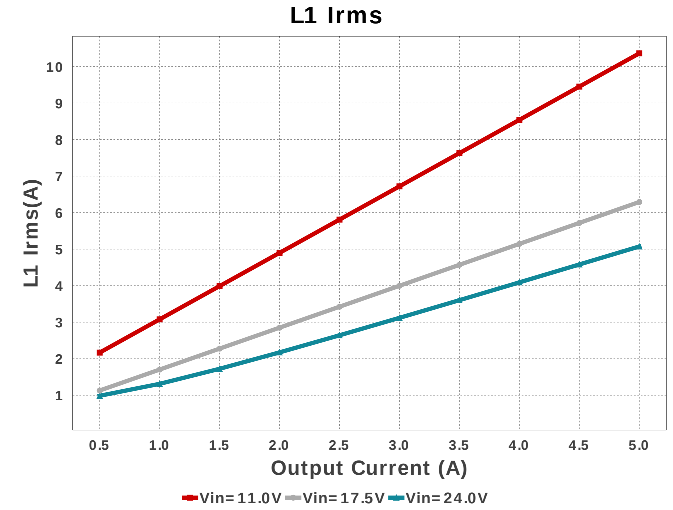

M1 PdSw
M1 PdSw(W)
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
Output Current (A)
Vin=24.0V

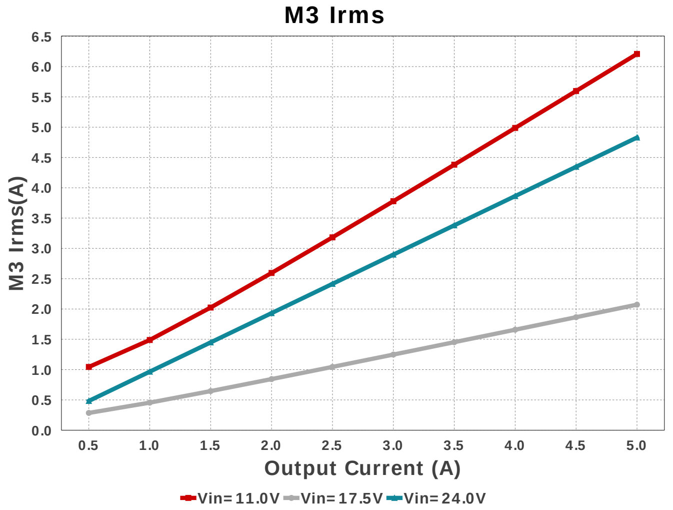

Total Pd
Total Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

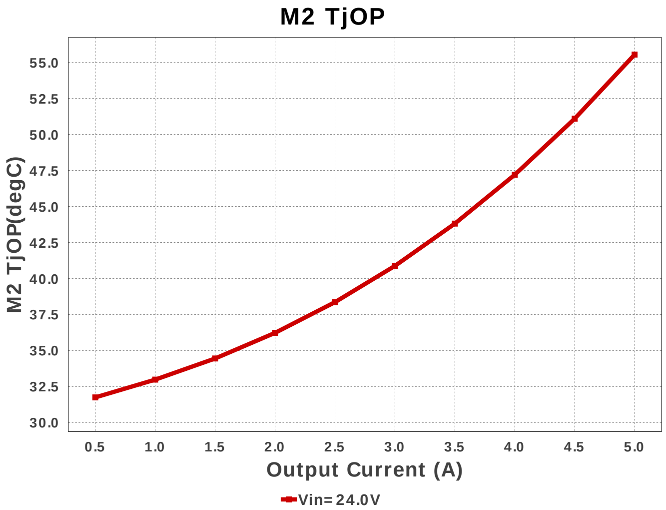

IC Pd
IC Pd(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

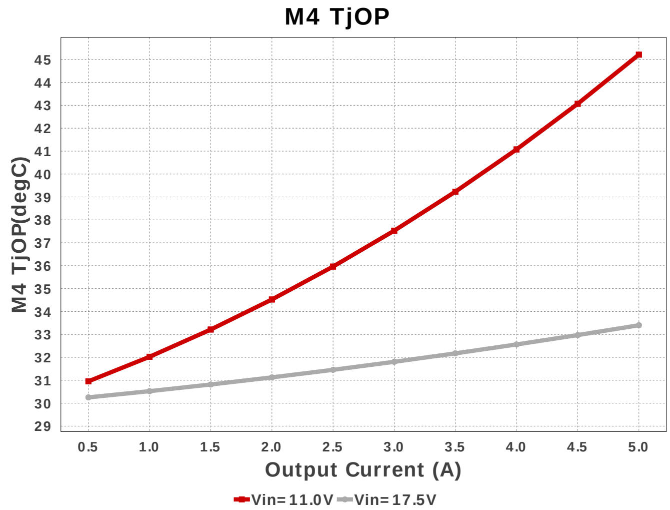

M3 PdSw
M3 PdSw(W)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

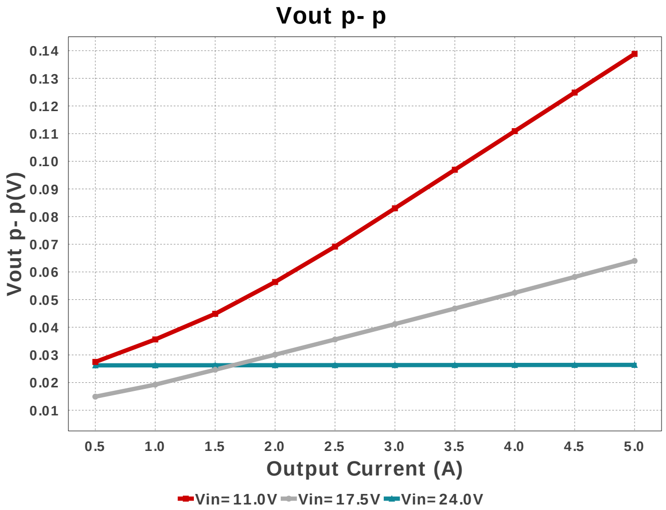

M1 Irms
M1 Irms(A)
Output Current (A)
Vin=24.0V

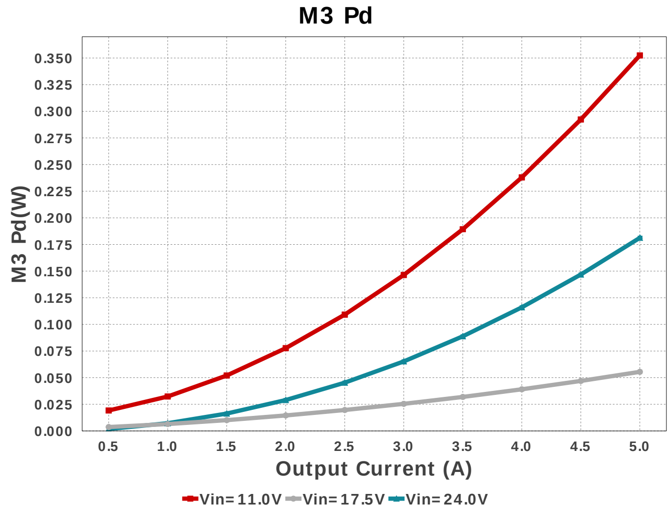

L1 Irms
L1 Irms(A)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

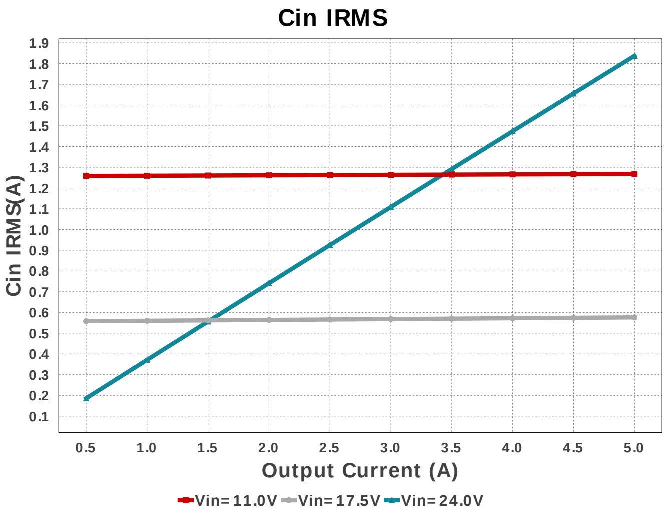

M3 Irms
M3 Irms(A)
Output Current (A)
Vin=11.0V Vin=17.5V Vin=24.0V

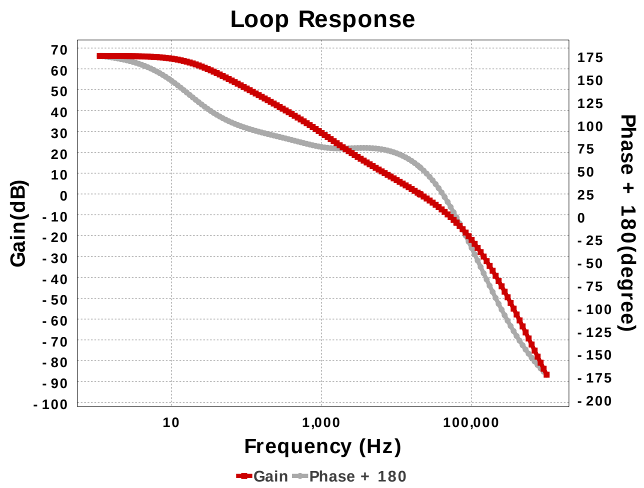












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.837 A	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	67.499 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	379.489 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	2.88 mW	Capacitor	Output capacitor power dissipation
5.	Coutx IRMS	474.463 mA	Capacitor	Output capacitor_x RMS ripple current
6.	Coutx Pd	75.038 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	126.35 mW	IC	IC power dissipation
10.	IC Tj	33.854 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	4.254 A	IC	Average input current
14.	L Ipp	2.958 A	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	268.75 mW	Inductor	Inductor power dissipation
16.	L1 Irms	5.072 A	Inductor	Inductor ripple current
17.	M1 Irms	4.58 A	Mosfet	MOSFET RMS ripple current
18.	M1 Pd	985.21 mW	Mosfet	MOSFET power dissipation
19.	M1 PdCond	898.87 mW	Mosfet	M1 MOSFET conduction losses
20.	M1 PdSw	86.333 mW	Mosfet	M1 MOSFET switching losses
21.	M1 Rdson	29.0 mOhm	Mosfet	Drain-Source On-resistance
22.	M1 ThetaJA	65.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
23.	M1 TjOP	94.038 degC	Mosfet	MOSFET junction temperature
24.	M2 Irms	2.005 A	Mosfet	MOSFET RMS ripple current
25.	M2 Pd	426.57 mW	Mosfet	MOSFET power dissipation
26.	M2 PdCond	341.53 mW	Mosfet	M2 MOSFET conduction losses
27.	M2 PdSw	85.032 mW	Mosfet	M2 MOSFET switching losses
28.	M2 Rdson	66.08 mOhm	Mosfet	Drain-Source On-resistance
29.	M2 ThetaJA	65.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
30.	M2 TjOP	57.727 degC	Mosfet	MOSFET junction temperature
31.	M3 Irms	7.133 A	Mosfet	MOSFET RMS ripple current
32.	M3 Pd	181.25 mW	Mosfet	M3 MOSFET total power dissipation
33.	M3 PdCond	181.25 mW	Mosfet	M3 MOSFET conduction losses
34.	M3 PdSw	44.469 mW	Mosfet	M3 MOSFET switching losses
35.	M3 ThetaJA	32.5 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
36.	M3 TjOP	44.925 degC	Mosfet	MOSFET junction temperature
37.	M4 Pd	0.0 W	Mosfet	M4 MOSFET total power dissipation
38.	Cin Pd	67.499 mW	Power	Input capacitor power dissipation
39.	Cout Pd	2.88 mW	Power	Output capacitor power dissipation
40.	Coutx Pd	75.038 µW	Power	Output capacitor_x power loss
41.	D2 Pd	0.0 W	Power	Diode power dissipation
42.	D3 Pd	0.0 W	Power	Diode power dissipation
43.	IC Pd	126.35 mW	Power	IC power dissipation
44.	L Pd	268.75 mW	Power	Inductor power dissipation
45.	M1 Pd	985.21 mW	Power	MOSFET power dissipation
46.	M1 PdCond	898.87 mW	Power	M1 MOSFET conduction losses
47.	M1 PdSw	86.333 mW	Power	M1 MOSFET switching losses
48.	M2 Pd	426.57 mW	Power	MOSFET power dissipation
49.	M2 PdCond	341.53 mW	Power	M2 MOSFET conduction losses
50.	M2 PdSw	85.032 mW	Power	M2 MOSFET switching losses
51.	M3 Pd	181.25 mW	Power	M3 MOSFET total power dissipation
52.	M3 PdCond	181.25 mW	Power	M3 MOSFET conduction losses
53.	M3 PdSw	44.469 mW	Power	M3 MOSFET switching losses
54.	M3 Rdson	7.25 mOhm	Power	Drain-Source On-resistance
55.	M4 Pd	0.0 W	Power	M4 MOSFET total power dissipation
56.	Rsense Pd	36.198 mW	Power	LED Current Rsns Power Dissipation
57.	Total Pd	2.095 W	Power	Total Power Dissipation
58.	Rsense Pd	36.198 mW	Resistor	LED Current Rsns Power Dissipation
59.	BOM Count	47	System Information	Total Design BOM count
60.	Cross Freq	20.312 kHz	System Information	Bode plot crossover frequency
61.	Duty Cycle	83.912 %	System Information	Duty cycle
62.	Efficiency	97.948 %	System Information	Steady state efficiency
63.	FootPrint	1.03 k mm^2	System Information	Total Foot Print Area of BOM components
64.	Frequency	343.832 kHz	System Information	Switching frequency
65.	Gain Marg	-13.692 dB	System Information	Bode Plot Gain Margin
66.	Iout	5.0 A	System Information	Iout operating point
67.	Low Freq Gain	66.219 dB	System Information	Gain at 1Hz
68.	Mode	CCM	System Information	Conduction Mode
69.	Operating Topology	Buck	System Information	The current operating topology of the device
70.	Phase Marg	54.847 deg	System Information	Bode Plot Phase Margin
71.	Pout	100.0 W	System Information	Total output power
72.	SW Ipk	32.558 A	System Information	Peak switch current

#	Name	Value	Category	Description
73.	Total BOM	$12.1	System Information	Total BOM Cost
74.	Vin	24.0 V	System Information	Vin operating point
75.	Vout	20.0 V	System Information	Operational Output Voltage
76.	Vout Actual	19.8 V	System Information	Vout Actual calculated based on selected voltage divider resistors
77.	Vout Tolerance	3.468 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
78.	Vout p-p	26.39 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	5.0	Maximum Output Current
VinMax	24.0	Maximum input voltage
VinMin	11.0	Minimum input voltage
Vout	20.0	Output Voltage
base_pn	LM5175	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

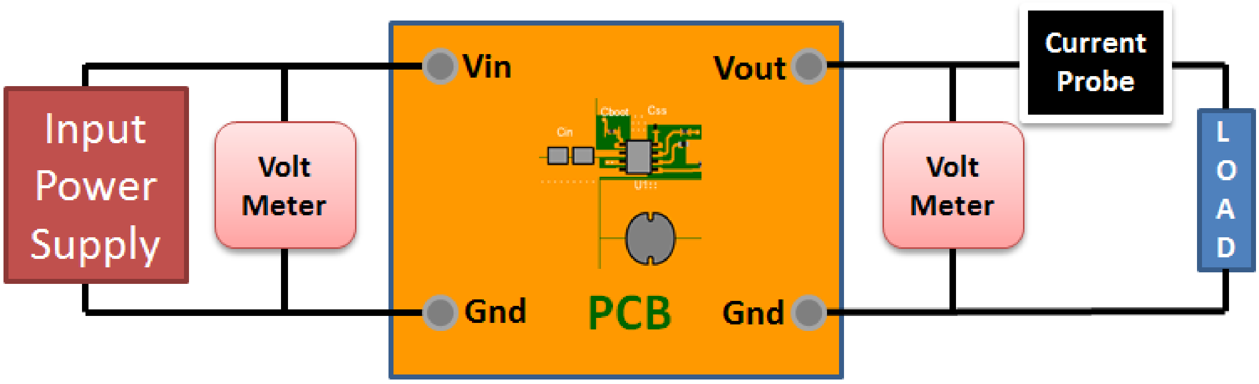
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 11.0V 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.



Design Assistance

1. 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.

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

3. Master key : E6E0BB7CA6960FFB[v1]

4. **LM5175** Product Folder : http://www.ti.com/product/LM5175 : contains the data sheet and other resources.