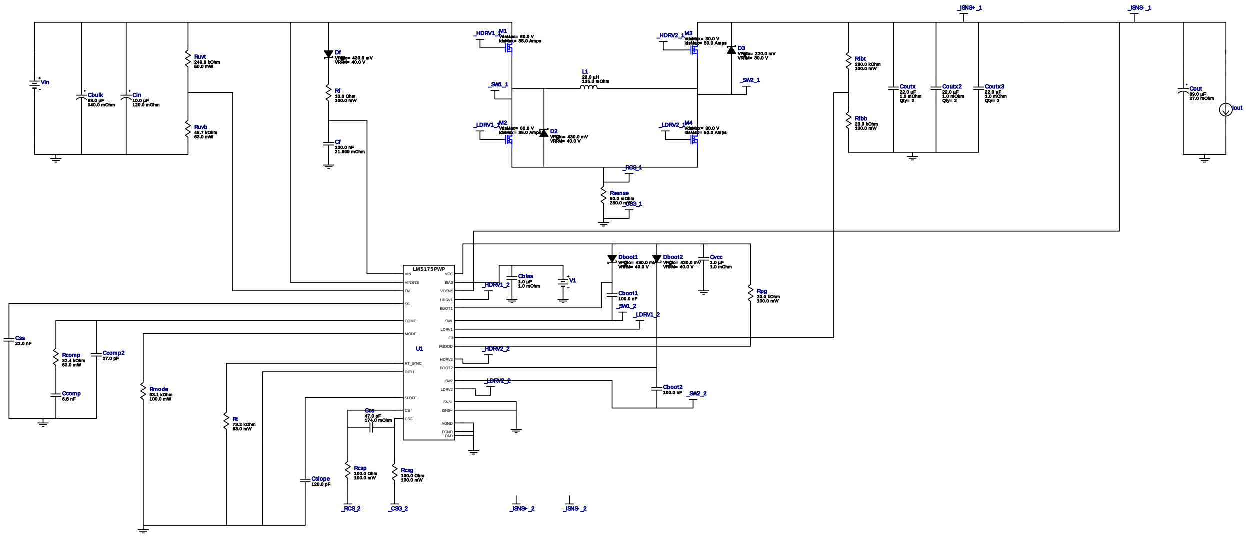
TEXAS INSTRUMENTS

WEBENCH ® Design Report

VinMin = 7.5V
VinMax = 30.0V
Vout = 12.0V
Iout = 1.0A

Device = LM5175PWPR
Topology = Buck_Boost
Created = 2018-12-19 11:46:51.358
BOM Cost = $9.21
BOM Count = 42
Total Pd = 0.6W

Design : 956 LM5175PWPR
LM5175PWPR 7.5V-30V to 12.00V @ 1A

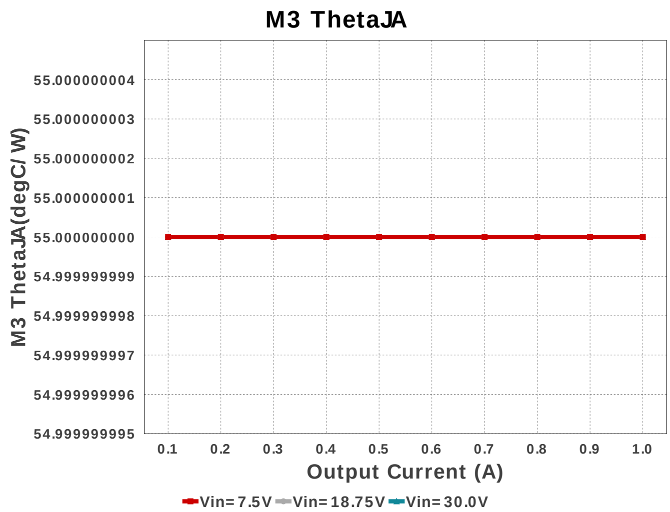


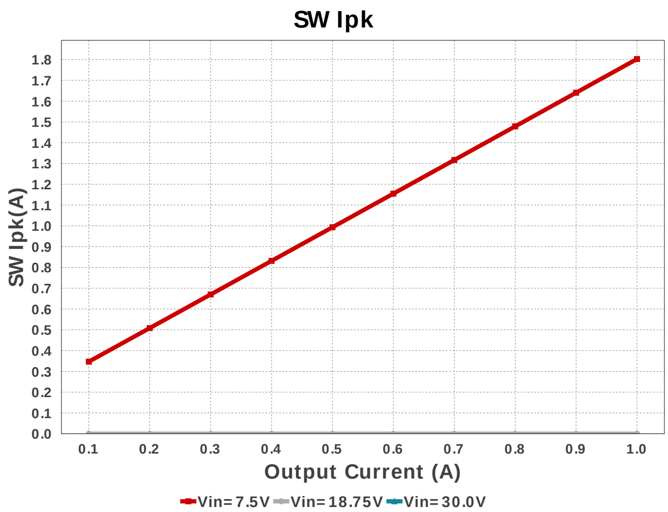
Electrical BOM

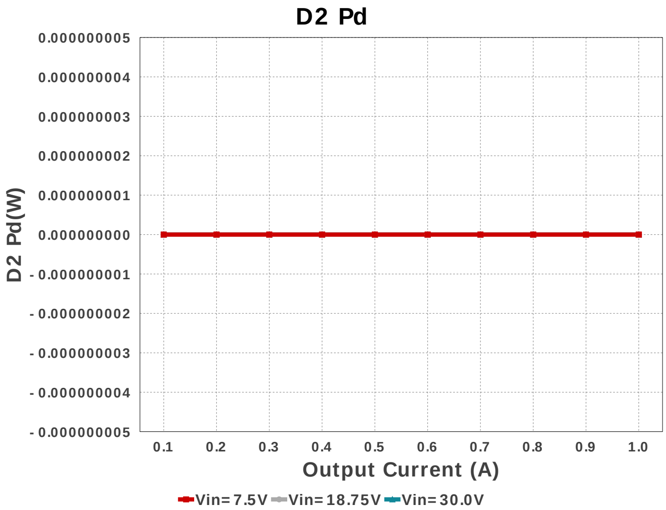
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cbias	Taiyo Yuden	TMK212BJ105KG-T Series= X5R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 20.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
Cboot1	TDK	CGA5L2C0G1H104J160AA Series= C0G/NP0	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.15	1206 11 mm²
Cboot2	TDK	CGA5L2C0G1H104J160AA Series= C0G/NP0	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.15	1206 11 mm²
Cbulk	Nichicon	UUD1V680MCL1GS Series= uD	Cap= 68.0 uF ESR= 340.0 mOhm VDC= 35.0 V IRMS= 280.0 mA	1	$0.13	SM_RADIAL_6.3BMM 80 mm²
Ccomp	Samsung Electro-Mechanics	CL21C682JBFNNNE Series= C0G/NP0	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.05	0805 7 mm²
Ccomp2	Samsung Electro-Mechanics	CL21C270JBANNNC Series= C0G/NP0	Cap= 27.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 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
Cf	TDK	CGA3E3X7R1H224K080AB Series= X7R	Cap= 220.0 nF ESR= 21.699 mOhm VDC= 50.0 V IRMS= 1.125 A	1	$0.04	0603 5 mm²
Cin	Panasonic	EEHZA1H100R Series= ZA	Cap= 10.0 uF ESR= 120.0 mOhm VDC= 50.0 V IRMS= 750.0 mA	1	$0.46	SM_RADIAL_5MM 58 mm²

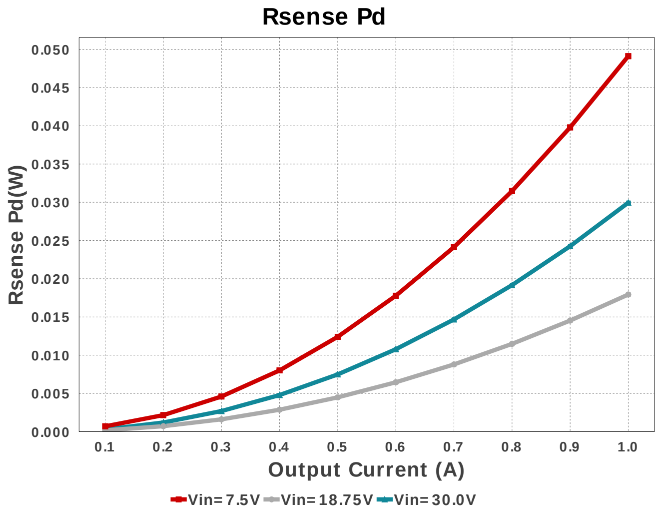
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cout	Panasonic	16SVPC39MV Series= SVPC	Cap= 39.0 uF ESR= 27.0 mOhm VDC= 16.0 V IRMS= 2.35 A	1	$0.31	SM_RADIAL_5MM 58 mm^2
Coutx	AVX	12103D226MAT2A Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	2	$0.31	1210 15 mm^2
Coutx2	AVX	12103D226MAT2A Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	2	$0.31	1210 15 mm^2
Coutx3	AVX	12103D226MAT2A Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	2	$0.31	1210 15 mm^2
Cslope	Samsung Electro-Mechanics	CL10C121JB8NNNC Series= C0G/NP0	Cap= 120.0 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	$0.09	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	Bourns	CD214A-B240LLF	VF@Io= 430.0 mV VRRM= 40.0 V	1	$0.14	SMA 37 mm^2
D3	Toshiba	CMS06	VF@Io= 320.0 mV VRRM= 30.0 V	1	$0.20	M-FLAT 19 mm^2
Dboot1	Bourns	CD214A-B240LLF	VF@Io= 430.0 mV VRRM= 40.0 V	1	$0.14	SMA 37 mm^2
Dboot2	Bourns	CD214A-B240LLF	VF@Io= 430.0 mV VRRM= 40.0 V	1	$0.14	SMA 37 mm^2
Df	Bourns	CD214A-B240LLF	VF@Io= 430.0 mV VRRM= 40.0 V	1	$0.14	SMA 37 mm^2
L1	Vishay-Dale	IHLP2525CZER220M11	L= 22.0 µH DCR= 135.0 mOhm	1	$0.74	IHLP-2525CZ 75 mm^2
M1	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	$0.27	DNH0008A 18 mm^2
M2	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	$0.27	DNH0008A 18 mm^2
M3	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 50.0 Amps	1	$0.25	DQG0008A 18 mm^2
M4	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 50.0 Amps	1	$0.25	DQG0008A 18 mm^2
Rcomp	Vishay-Dale	CRCW040232K4FKED Series= CRCW..e3	Res= 32.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
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

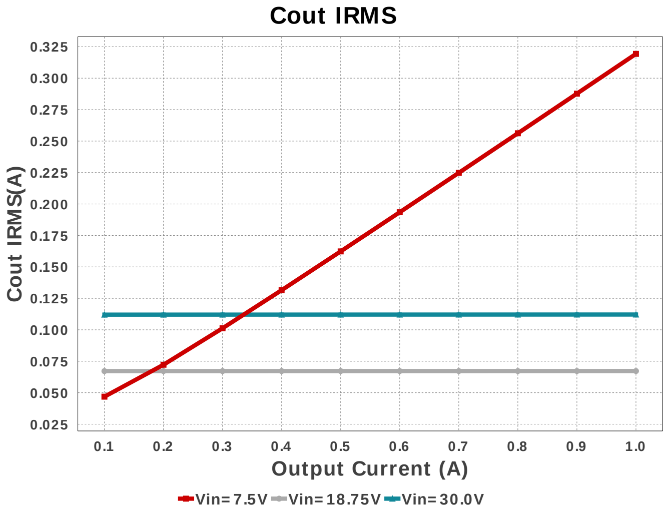
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rcsp	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rf	Yageo	RC0603FR-0710RL Series= ?	Res= 10.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rfbb	Yageo	RC0603FR-0720KL Series= ?	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rfbt	Yageo	RC0603FR-07280KL Series= ?	Res= 280.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rmode	Yageo	RC0603FR-0793K1L Series= ?	Res= 93.1 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rpg	Yageo	RC0603FR-0720KL Series= ?	Res= 20.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rsense	Bourns	CRM0805-FW-R050ELF Series= ?	Res= 50.0 mOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.14	0805 7 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	CRCW040248K7FKED Series= CRCW..e3	Res= 48.7 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	$3.10	PWP0028F_N 98 mm^2

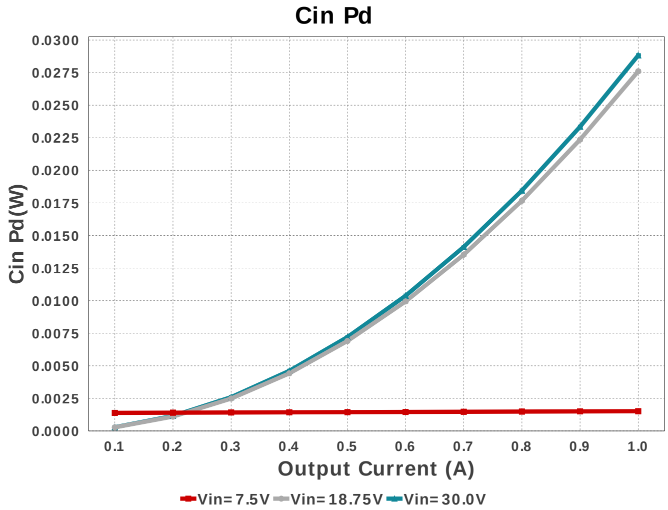


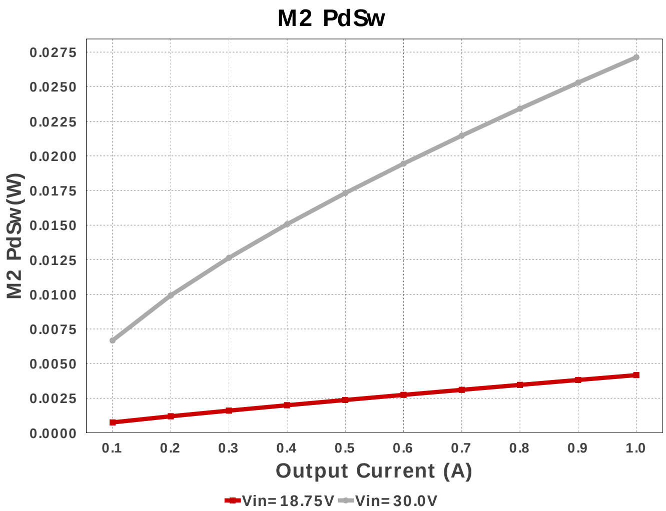


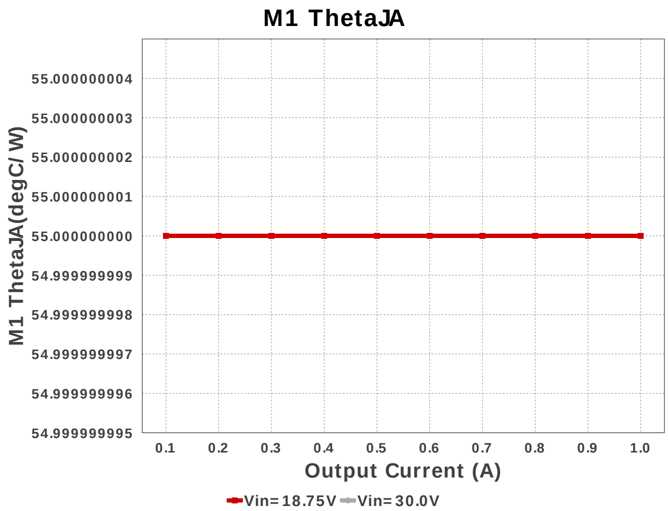

D2 Pd
D2 Pd(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

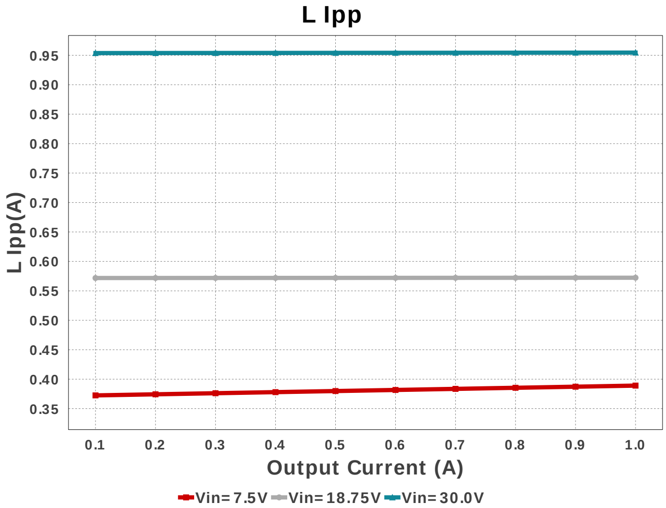

Rsense Pd
Rsense Pd(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

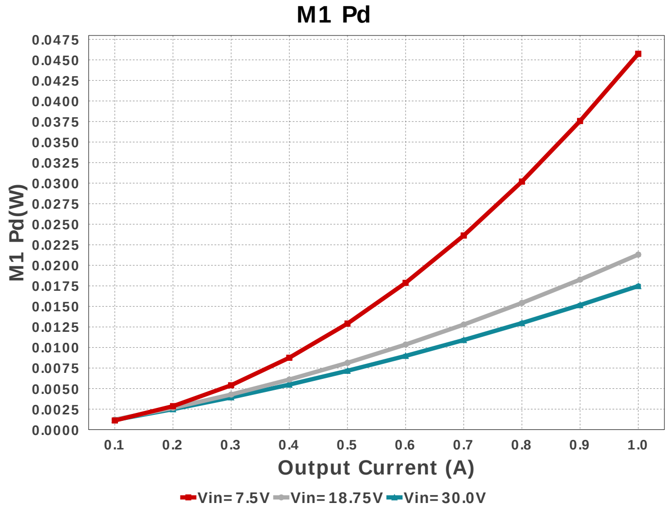

Cout IRMS
Cout IRMS(A)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

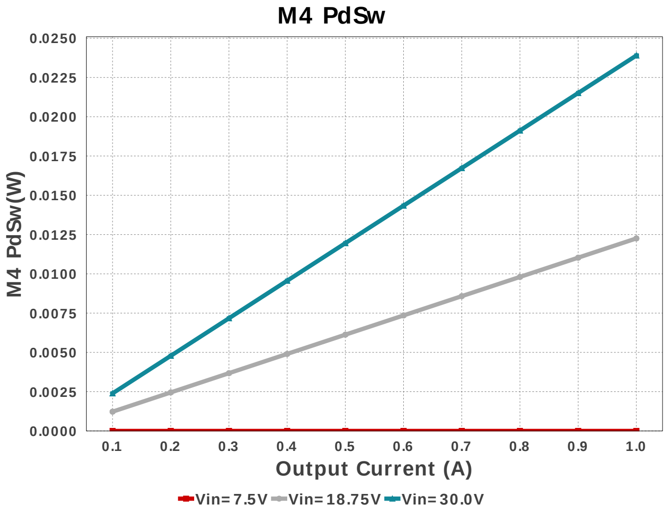

Cin Pd
Cin Pd(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

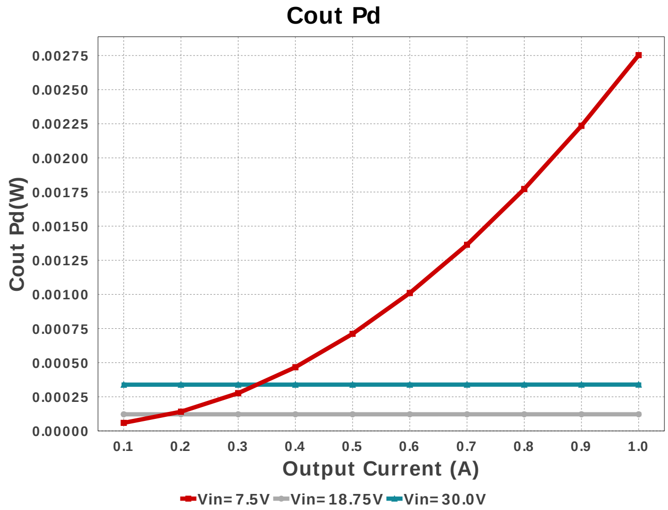

M2 PdSw
M2 PdSw(W)
Output Current (A)
Vin=18.75V Vin=30.0V

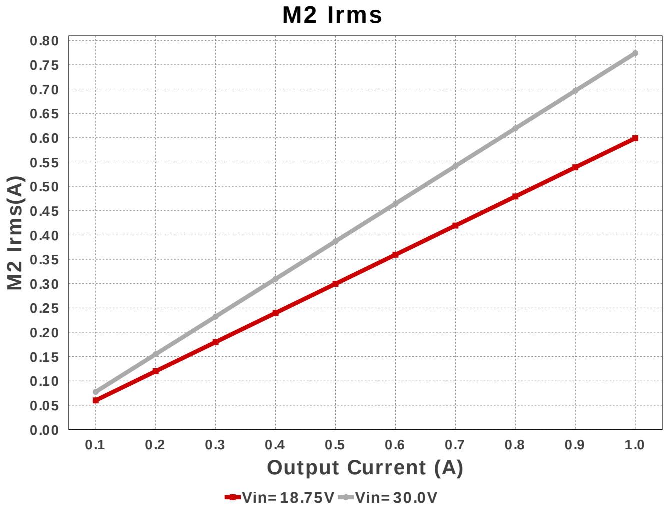

M1 ThetaJA
M1 ThetaJA(degC/W)
Output Current (A)
Vin=18.75V Vin=30.0V

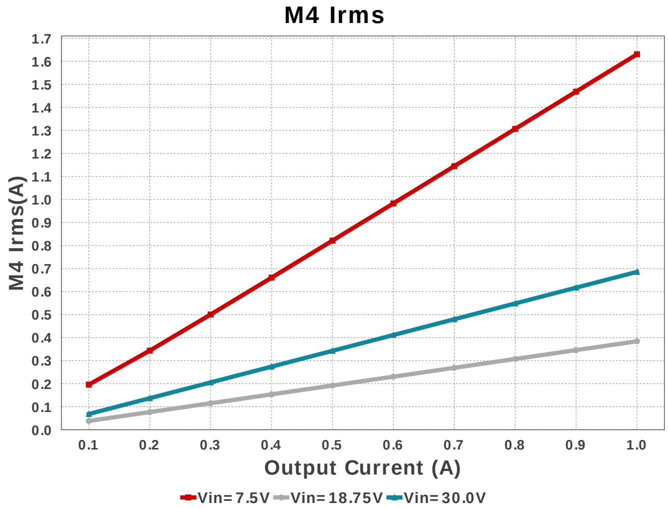

L Ipp
L Ipp(A)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

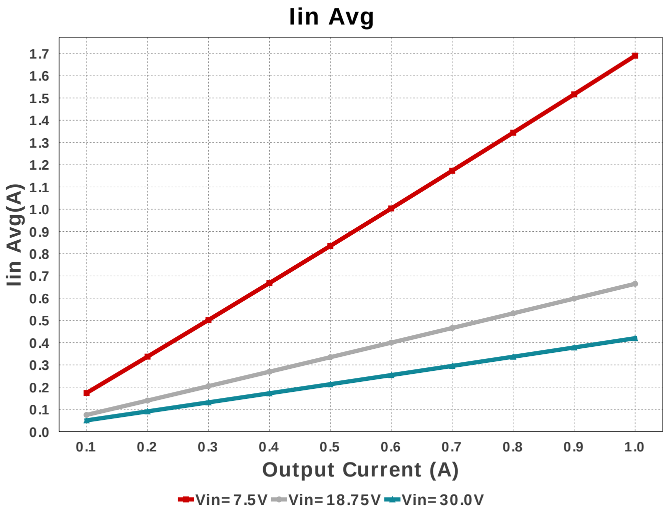

M1 Pd
M1 Pd(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

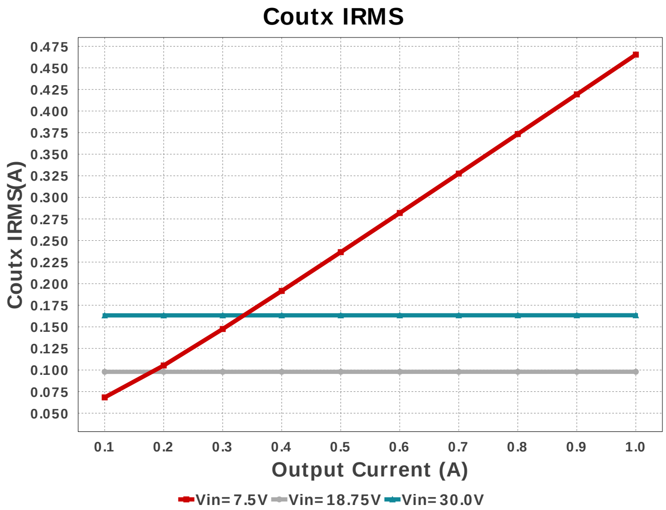

M4 PdSw
M4 PdSw(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

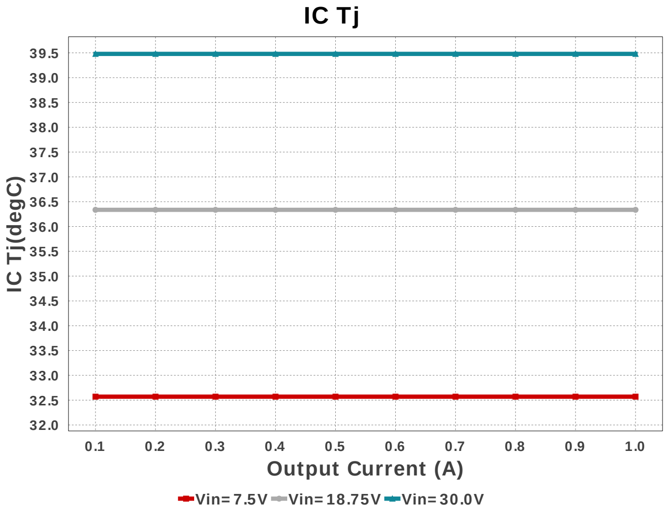

Cout Pd
Cout Pd(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

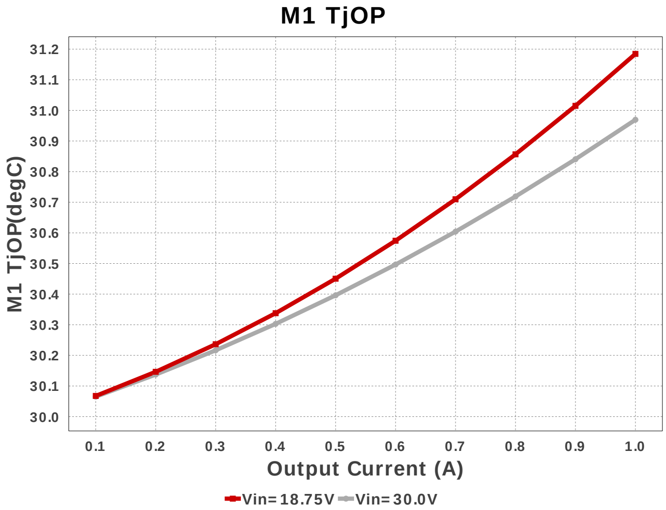

M2 Irms
M2 Irms(A)
Output Current (A)
Vin=18.75V Vin=30.0V

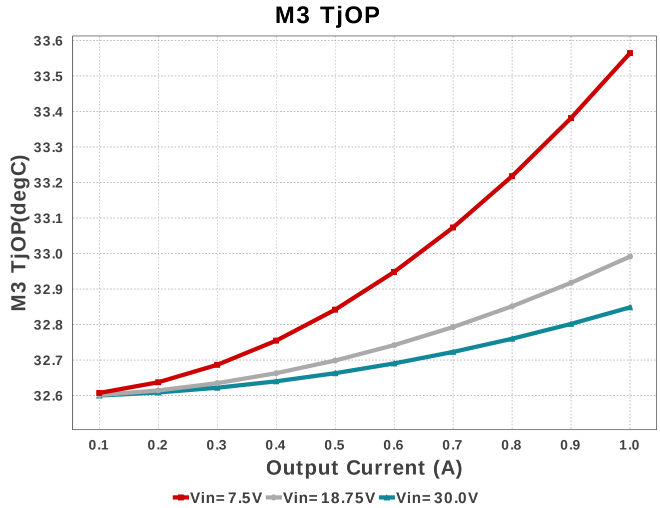

M4 Irms
M4 Irms(A)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

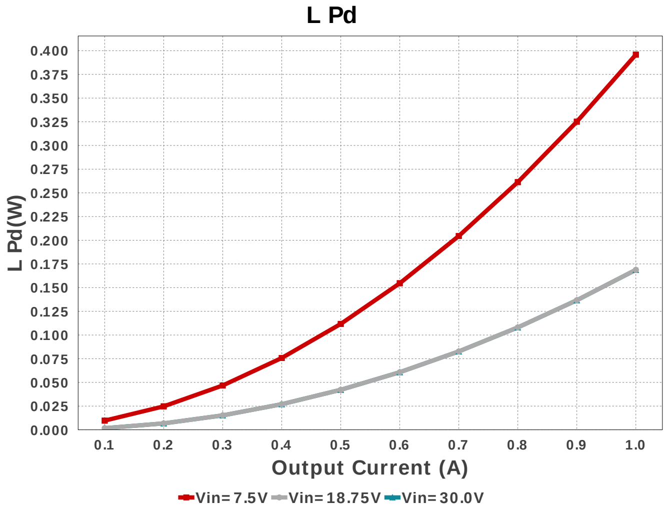

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

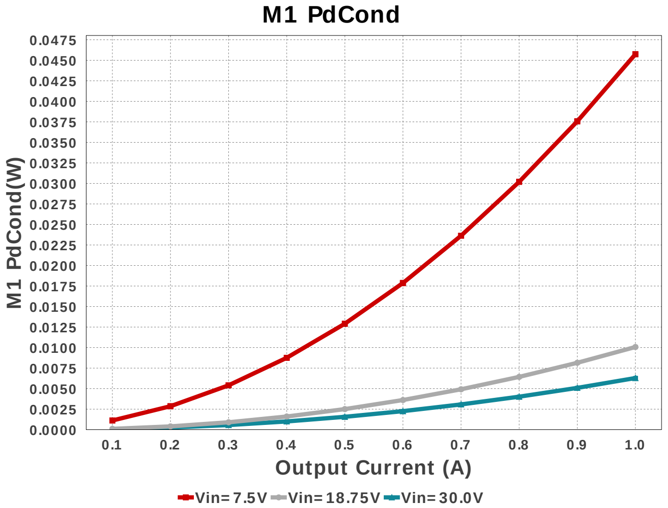

Coutx IRMS
Coutx IRMS(A)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

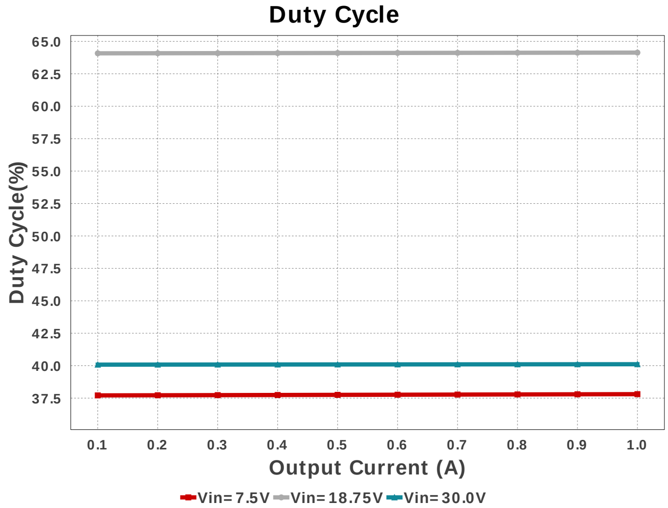

IC Tj
IC Tj(degC)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

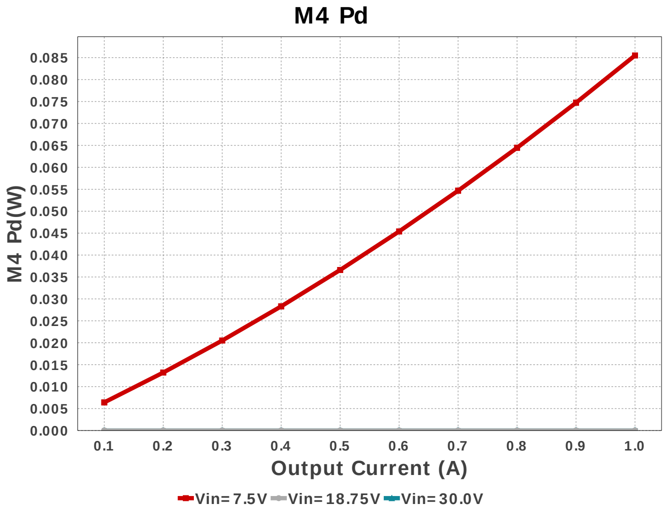

M1 TjOP
M1 TjOP(degC)
Output Current (A)
Vin=18.75V Vin=30.0V

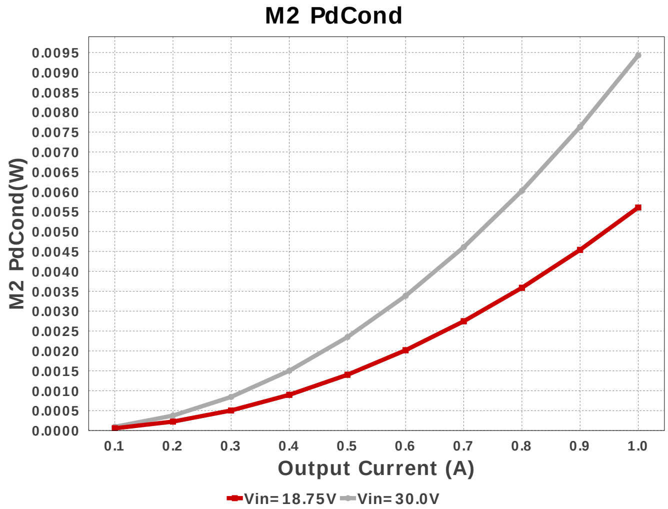

M3 TjOP
M3 TjOP(degC)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

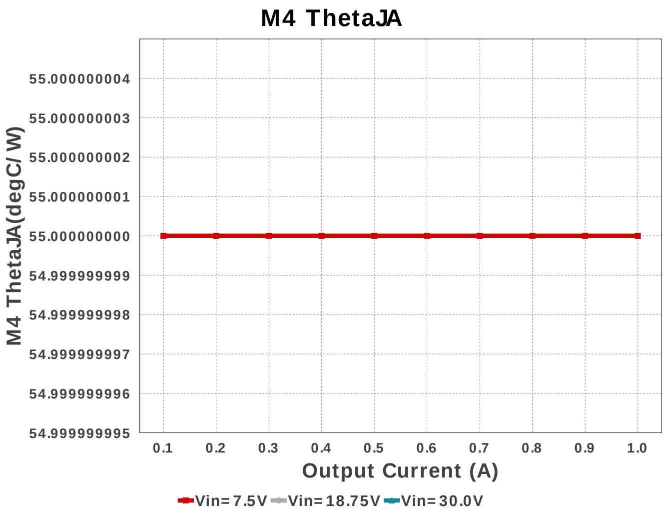

L Pd
L Pd(W)
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

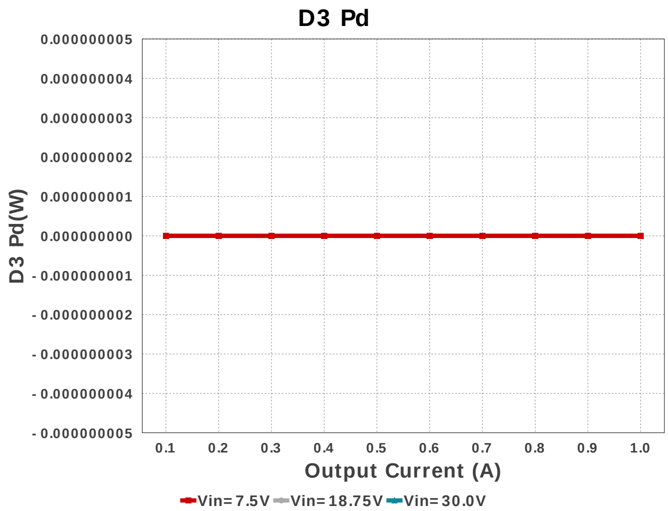

M1 PdCond
M1 PdCond(W)
0.0475
0.0450
0.0425
0.0400
0.0375
0.0350
0.0325
0.0300
0.0275
0.0250
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

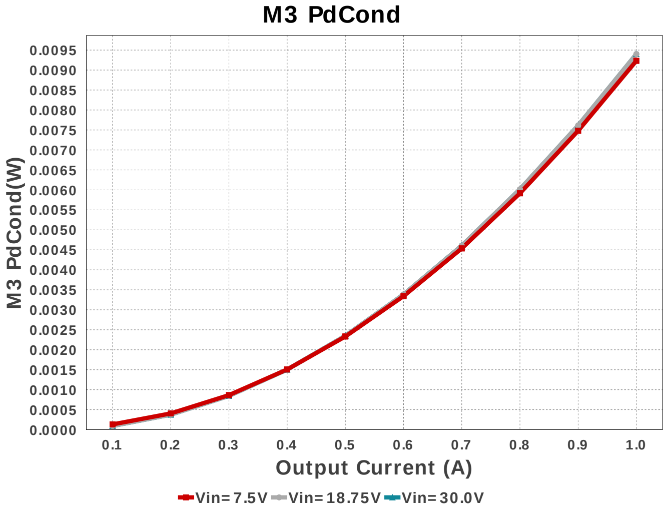

Duty Cycle
Duty Cycle(%)
65.0
62.5
60.0
57.5
55.0
52.5
50.0
47.5
45.0
42.5
40.0
37.5
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

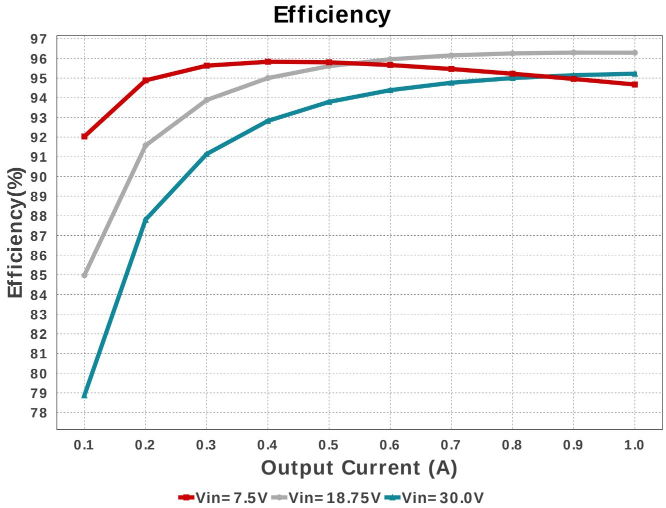

M4 Pd
M4 Pd(W)
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

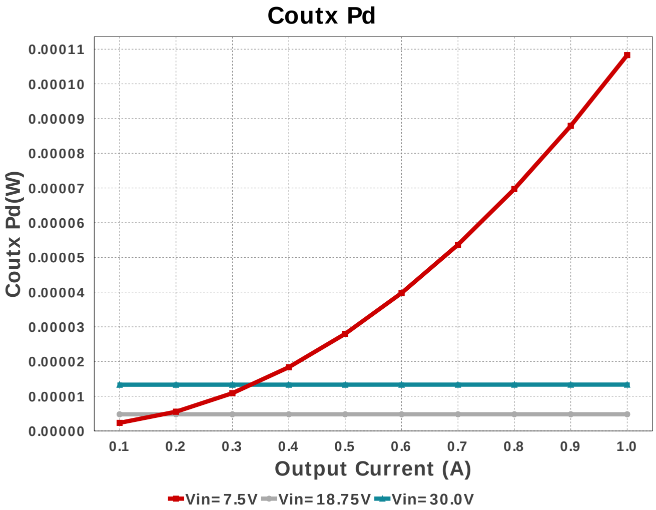

M2 PdCond
M2 PdCond(W)
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=18.75V Vin=30.0V

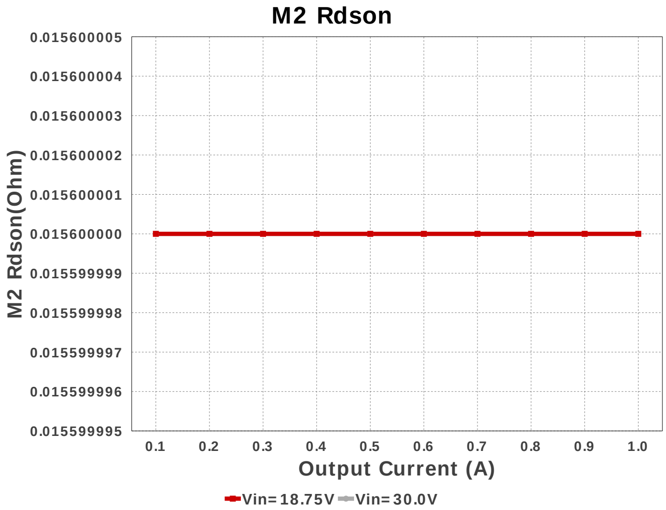

M4 ThetaJA
M4 ThetaJA(degC/W)
55.000000004
55.000000003
55.000000002
55.000000001
55.000000000
54.999999999
54.999999998
54.999999997
54.999999996
54.999999995
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

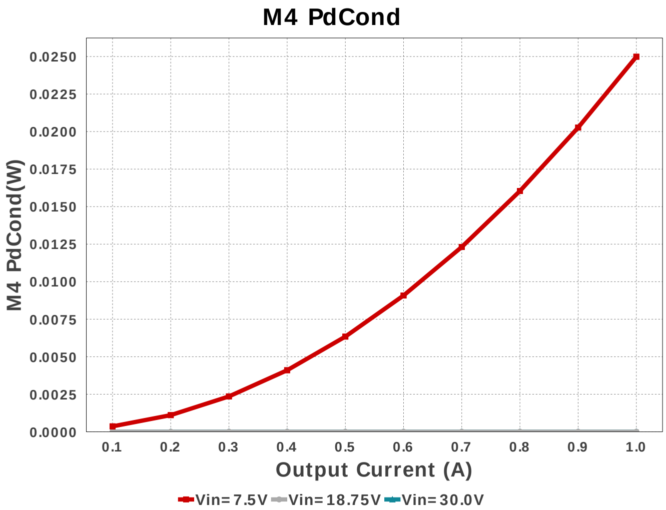

D3 Pd
D3 Pd(W)
0.000000005
0.000000004
0.000000003
0.000000002
0.000000001
0.000000000
-0.000000001
-0.000000002
-0.000000003
-0.000000004
-0.000000005
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

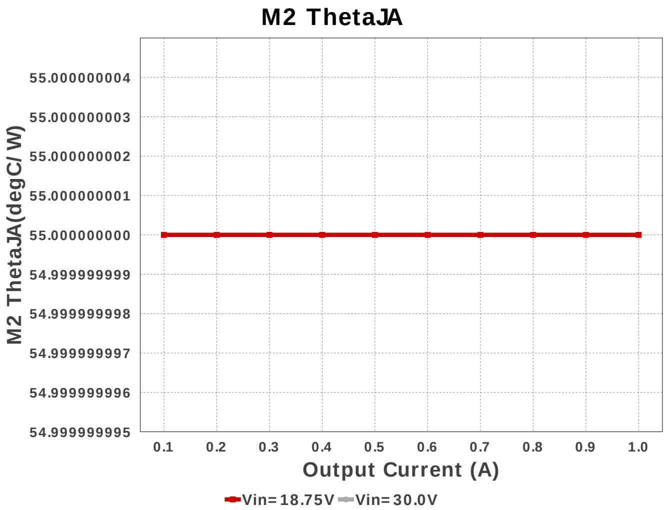

M3 PdCond
M3 PdCond(W)
0.0095
0.0090
0.0085
0.0080
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

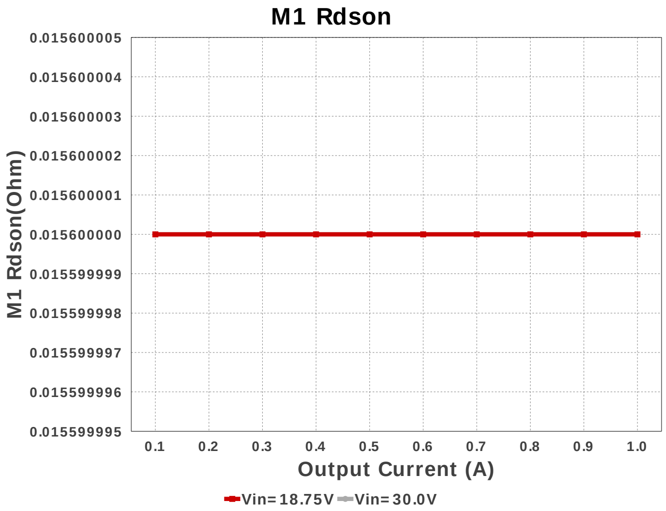

Efficiency
Efficiency(%)
97
96
95
94
93
92
91
90
89
88
87
86
85
84
83
82
81
80
79
78
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

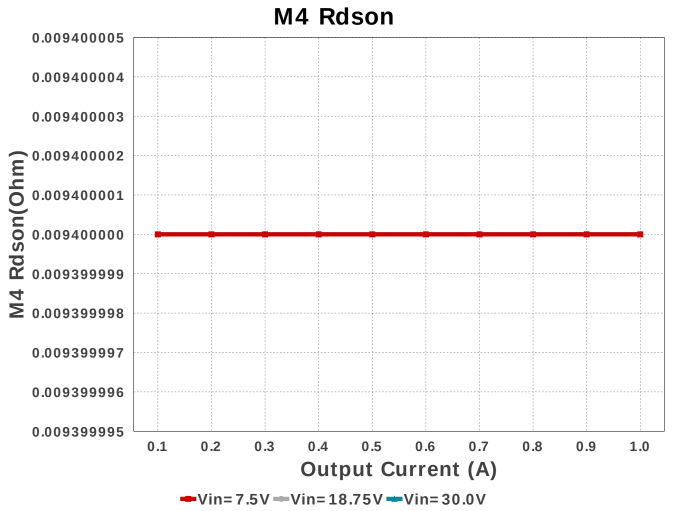

Coutx Pd
Coutx Pd(W)
0.00011
0.00010
0.00009
0.00008
0.00007
0.00006
0.00005
0.00004
0.00003
0.00002
0.00001
0.00000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

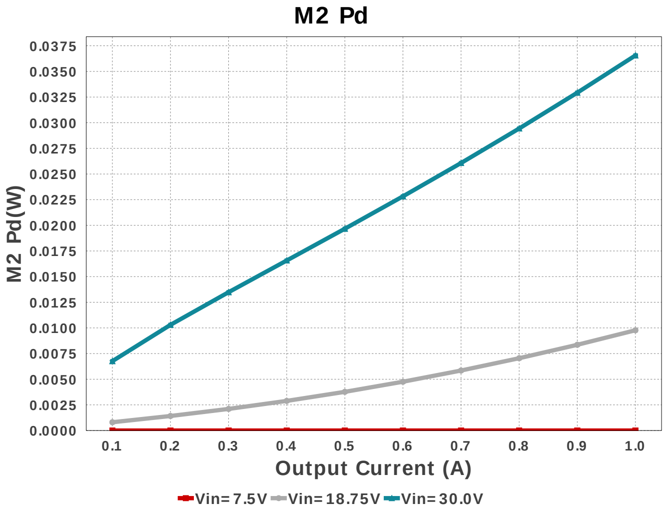

M2 Rdson
M2 Rdson(Ohm)
0.015600005
0.015600004
0.015600003
0.015600002
0.015600001
0.015600000
0.015599999
0.015599998
0.015599997
0.015599996
0.015599995
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=18.75V Vin=30.0V

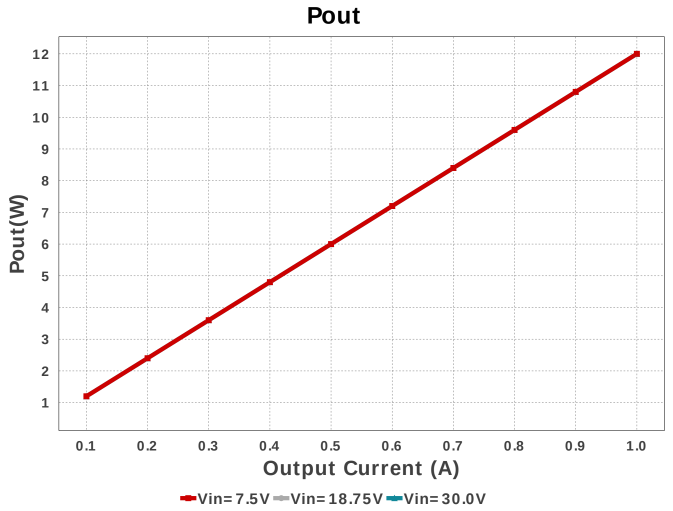

M4 PdCond
M4 PdCond(W)
0.0250
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

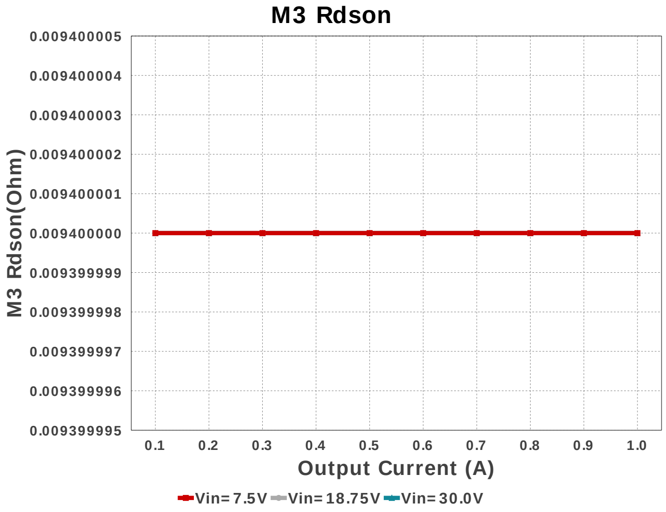

M2 ThetaJA
M2 ThetaJA(degC/W)
55.000000004
55.000000003
55.000000002
55.000000001
55.000000000
54.999999999
54.999999998
54.999999997
54.999999996
54.999999995
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=18.75V Vin=30.0V

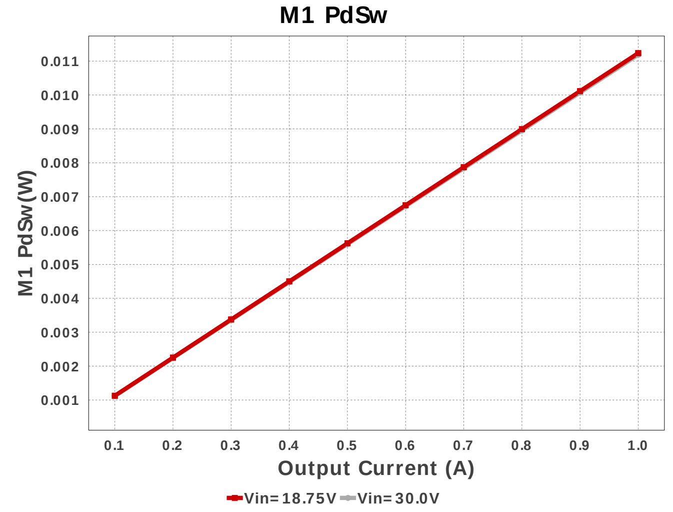

M1 Rdson
M1 Rdson(Ohm)
0.015600005
0.015600004
0.015600003
0.015600002
0.015600001
0.015600000
0.015599999
0.015599998
0.015599997
0.015599996
0.015599995
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=18.75V Vin=30.0V


M4 Rdson
M4 Rdson(Ohm)
0.009400005
0.009400004
0.009400003
0.009400002
0.009400001
0.009400000
0.009399999
0.009399998
0.009399997
0.009399996
0.009399995
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

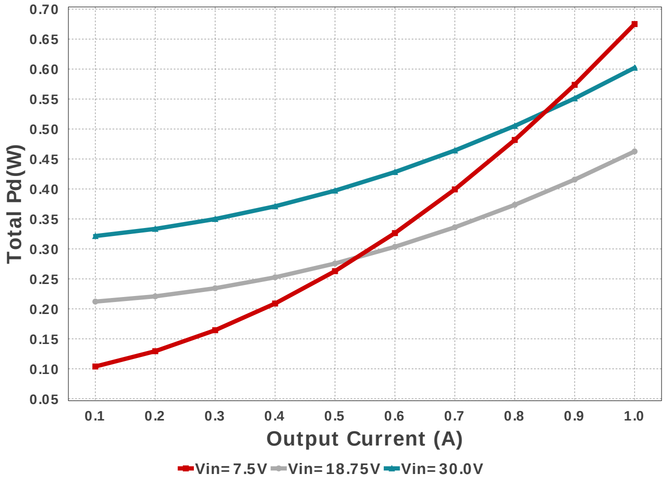

M2 Pd
M2 Pd(W)
0.0375
0.0350
0.0325
0.0300
0.0275
0.0250
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V


Pout
Pout(W)
12
11
10
9
8
7
6
5
4
3
2
1
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V

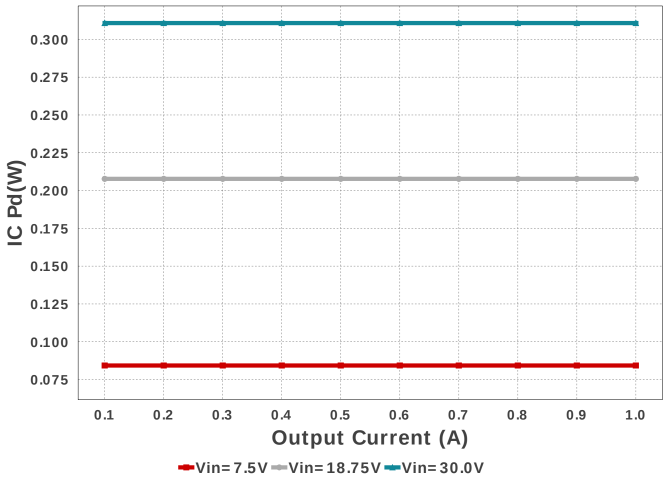

M3 Rdson
M3 Rdson(Ohm)
0.009400005
0.009400004
0.009400003
0.009400002
0.009400001
0.009400000
0.009399999
0.009399998
0.009399997
0.009399996
0.009399995
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=7.5V Vin=18.75V Vin=30.0V


M1 PdSw
M1 PdSw(W)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Output Current (A)
Vin=18.75V Vin=30.0V

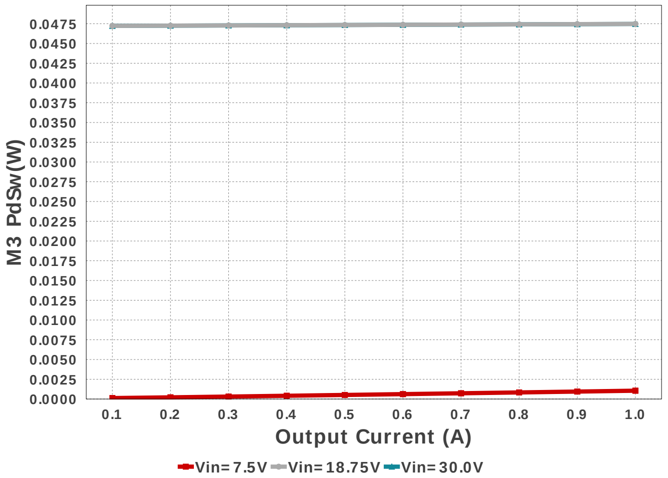
Total Pd



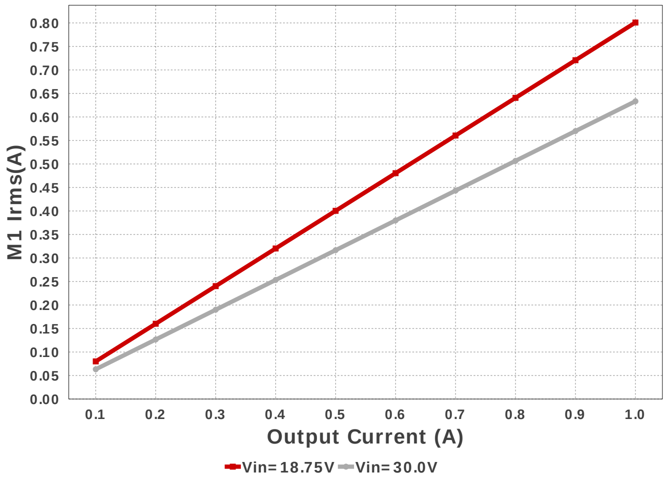
IC Pd



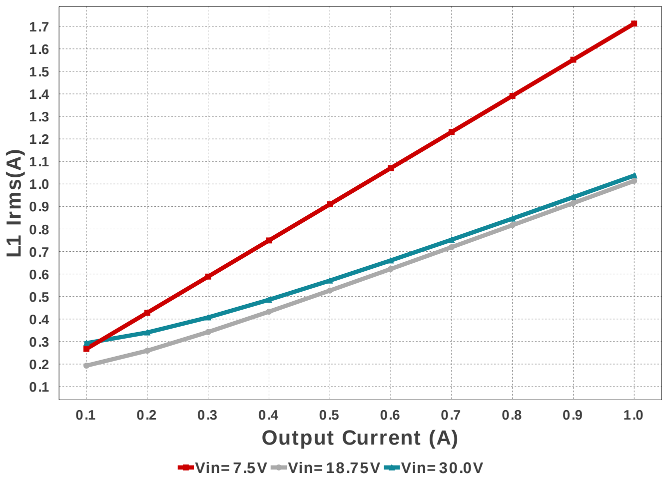
M3 PdSw



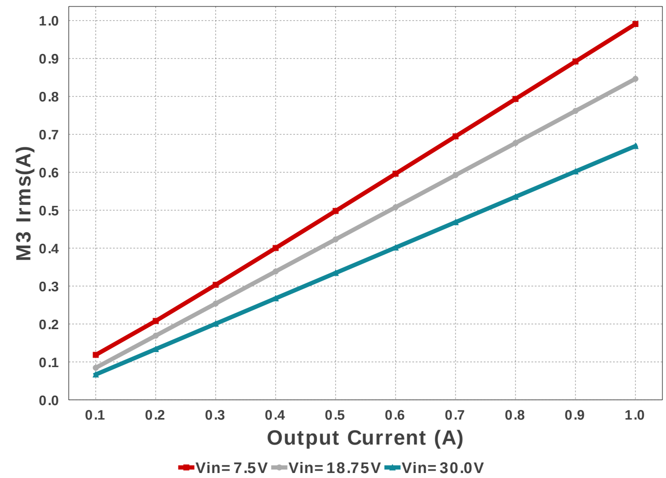
M1 Irms

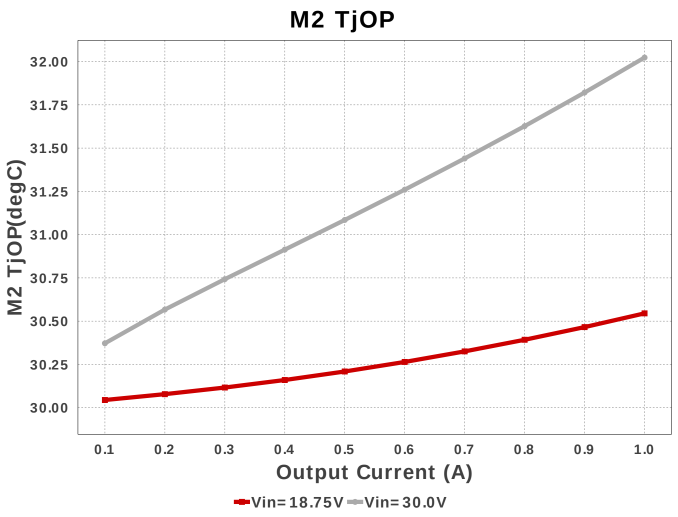


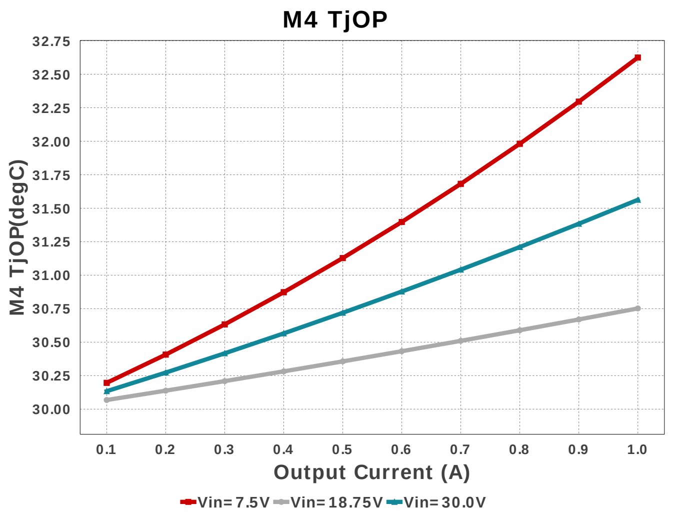
L1 Irms

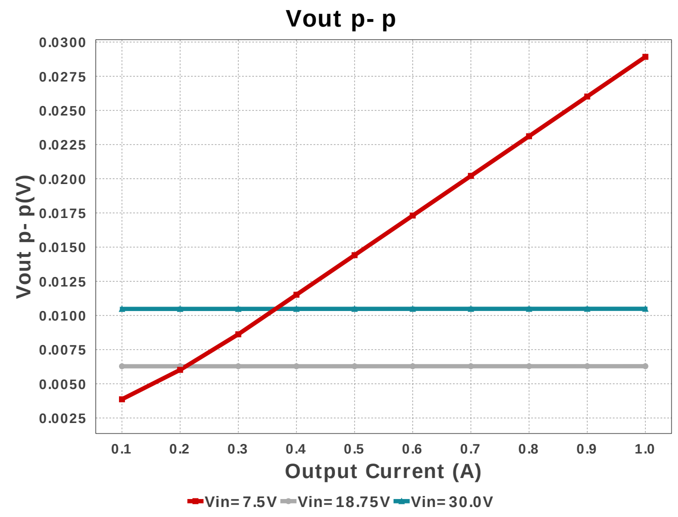


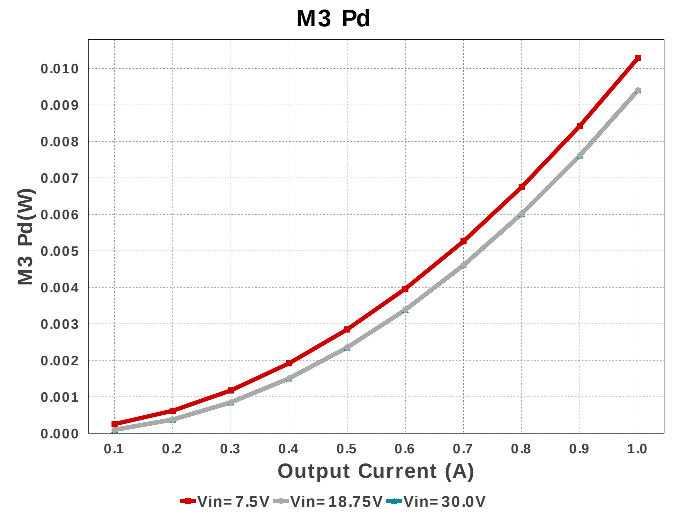
M3 Irms

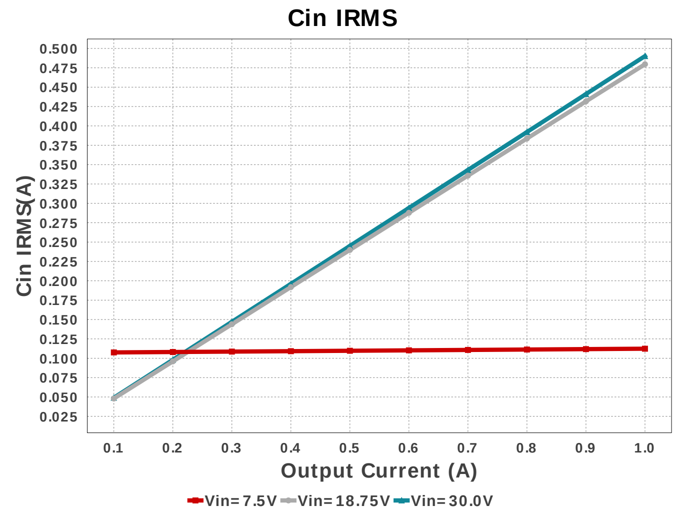


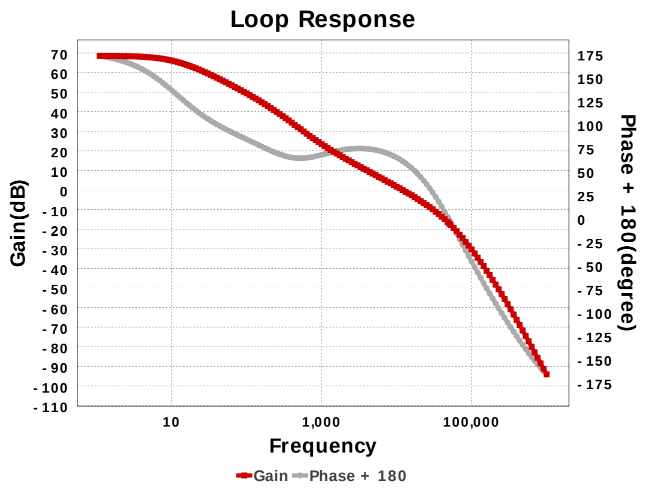












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	490.127 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	28.827 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	112.13 mA	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	339.47 µW	Capacitor	Output capacitor power dissipation
5.	Coutx IRMS	163.417 mA	Capacitor	Output capacitor_x RMS ripple current
6.	Coutx Pd	13.353 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	310.79 mW	IC	IC power dissipation
10.	IC Tj	39.479 degC	IC	IC junction temperature
11.	IC Tolerance	0.0 V	IC	IC Feedback Tolerance

#	Name	Value	Category	Description
12.	ICThetaJA	30.5 degC/W	IC	IC junction-to-ambient thermal resistance
13.	Iin Avg	420.07 mA	IC	Average input current
14.	L Ipp	954.52 mA	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	168.75 mW	Inductor	Inductor power dissipation
16.	L1 Irms	1.037 A	Inductor	Inductor ripple current
17.	M1 Irms	633.347 mA	Mosfet	MOSFET RMS ripple current
18.	M1 Pd	17.479 mW	Mosfet	MOSFET power dissipation
19.	M1 PdCond	6.29 mW	Mosfet	M1 MOSFET conduction losses
20.	M1 PdSw	11.189 mW	Mosfet	M1 MOSFET switching losses
21.	M1 Rdson	15.6 mOhm	Mosfet	Drain-Source On-resistance
22.	M1 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
23.	M1 TjOP	30.969 degC	Mosfet	MOSFET junction temperature
24.	M2 Irms	773.868 mA	Mosfet	MOSFET RMS ripple current
25.	M2 Pd	36.555 mW	Mosfet	MOSFET power dissipation
26.	M2 PdCond	9.428 mW	Mosfet	M2 MOSFET conduction losses
27.	M2 PdSw	27.127 mW	Mosfet	M2 MOSFET switching losses
28.	M2 Rdson	15.6 mOhm	Mosfet	Drain-Source On-resistance
29.	M2 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
30.	M2 TjOP	32.023 degC	Mosfet	MOSFET junction temperature
31.	M3 Irms	1.338 A	Mosfet	MOSFET RMS ripple current
32.	M3 Pd	9.4 mW	Mosfet	M3 MOSFET total power dissipation
33.	M3 PdCond	9.4 mW	Mosfet	M3 MOSFET conduction losses
34.	M3 PdSw	47.498 mW	Mosfet	M3 MOSFET switching losses
35.	M3 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
36.	M3 TjOP	33.564 degC	Mosfet	MOSFET junction temperature
37.	M4 Irms	685.687 mA	Mosfet	MOSFET RMS ripple current
38.	M4 Pd	0.0 W	Mosfet	M4 MOSFET total power dissipation
39.	M4 Pd	0.0 W	Mosfet	M4 MOSFET total power dissipation
40.	M4 PdCond	0.0 W	Mosfet	M4 MOSFET conduction losses
41.	M4 PdSw	34.298 mW	Mosfet	M4 MOSFET switching losses
42.	M4 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
43.	M4 TjOP	32.135 degC	Mosfet	MOSFET junction temperature
44.	Cin Pd	28.827 mW	Power	Input capacitor power dissipation
45.	Cout Pd	339.47 µW	Power	Output capacitor power dissipation
46.	Coutx Pd	13.353 µW	Power	Output capacitor_x power loss
47.	D2 Pd	0.0 W	Power	Diode power dissipation
48.	D3 Pd	0.0 W	Power	Diode power dissipation
49.	IC Pd	310.79 mW	Power	IC power dissipation
50.	L Pd	168.75 mW	Power	Inductor power dissipation
51.	M1 Pd	17.479 mW	Power	MOSFET power dissipation
52.	M1 PdCond	6.29 mW	Power	M1 MOSFET conduction losses
53.	M1 PdSw	11.189 mW	Power	M1 MOSFET switching losses
54.	M2 Pd	36.555 mW	Power	MOSFET power dissipation
55.	M2 PdCond	9.428 mW	Power	M2 MOSFET conduction losses
56.	M2 PdSw	27.127 mW	Power	M2 MOSFET switching losses
57.	M3 Pd	9.4 mW	Power	M3 MOSFET total power dissipation
58.	M3 PdCond	9.4 mW	Power	M3 MOSFET conduction losses
59.	M3 PdSw	47.498 mW	Power	M3 MOSFET switching losses
60.	M3 Rdson	9.4 mOhm	Power	Drain-Source On-resistance
61.	M4 Pd	0.0 W	Power	M4 MOSFET total power dissipation
62.	M4 Pd	0.0 W	Power	M4 MOSFET total power dissipation
63.	M4 PdCond	0.0 W	Power	M4 MOSFET conduction losses
64.	M4 PdSw	34.298 mW	Power	M4 MOSFET switching losses
65.	M4 Rdson	9.4 mOhm	Power	Drain-Source On-resistance
66.	Rsense Pd	29.944 mW	Power	LED Current Rsns Power Dissipation
67.	Total Pd	602.128 mW	Power	Total Power Dissipation
68.	Rsense Pd	29.944 mW	Resistor	LED Current Rsns Power Dissipation
69.	BOM Count	42	System Information	Total Design BOM count
70.	Cross Freq	12.02 kHz	System Information	Bode plot crossover frequency
71.	Duty Cycle	40.113 %	System Information	Duty cycle
72.	Efficiency	95.222 %	System Information	Steady state efficiency
73.	FootPrint	819.0 mm²	System Information	Total Foot Print Area of BOM components
74.	Frequency	343.832 kHz	System Information	Switching frequency
75.	Gain Marg	-17.119 dB	System Information	Bode Plot Gain Margin
76.	Iout	1.0 A	System Information	Iout operating point
77.	Low Freq Gain	68.507 dB	System Information	Gain at 1Hz

#	Name	Value	Category	Description
78.	Mode	CCM	System Information	Conduction Mode
79.	Operating Topology	Buck	System Information	The current operating topology of the device
80.	Phase Marg	62.237 deg	System Information	Bode Plot Phase Margin
81.	Pout	12.0 W	System Information	Total output power
82.	SW Ipk	0.0 A	System Information	Peak switch current
83.	Total BOM	$9.21	System Information	Total BOM Cost
84.	Vin	30.0 V	System Information	Vin operating point
85.	Vout	12.0 V	System Information	Operational Output Voltage
86.	Vout Actual	12.0 V	System Information	Vout Actual calculated based on selected voltage divider resistors
87.	Vout Tolerance	1.886 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
88.	Vout p-p	10.488 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	1.0	Maximum Output Current
VinMax	30.0	Maximum input voltage
VinMin	7.5	Minimum input voltage
Vout	12.0	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

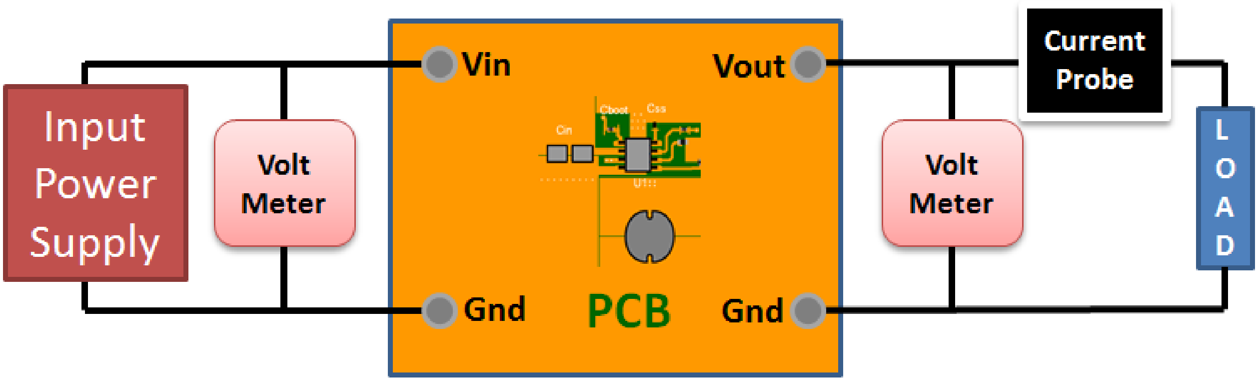
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 7.5V 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 : EF483DADD0DB6778[v1]

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