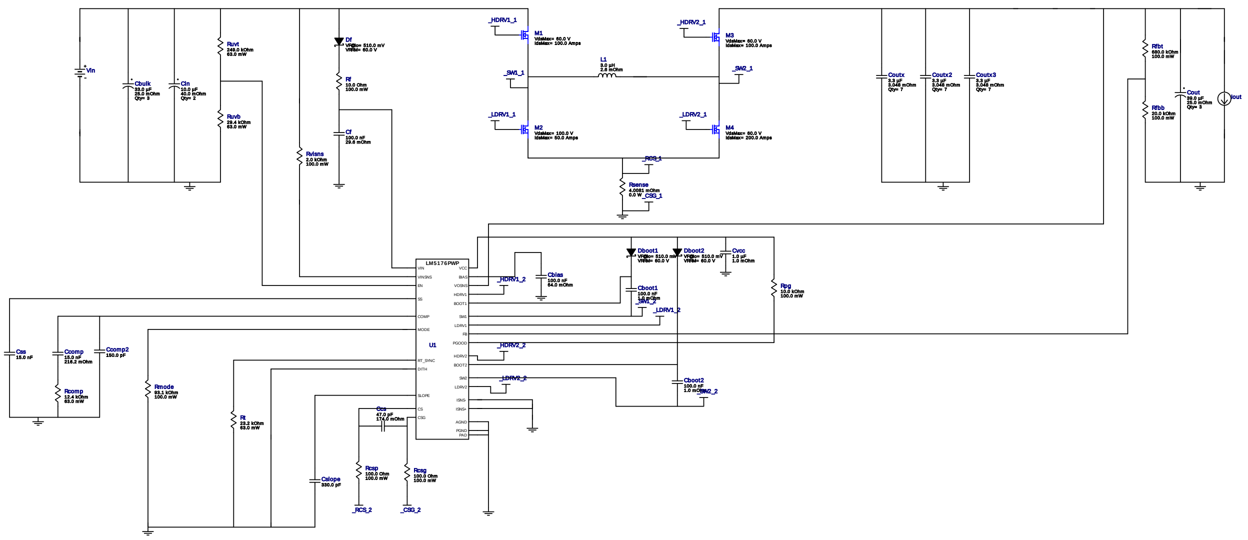
VinMin = 12.0V
VinMax = 36.0V
Vout = 28.0V
Iout = 8.0A

Device = LM5176PWPR
Topology = Buck_Boost
Created = 2021-04-21 21:15:18.525
BOM Cost = NA
BOM Count = 61
Total Pd = 3.28W

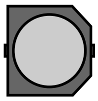
WEBENCH ® Design Report

Design : 61 LM5176PWPR
LM5176PWPR 12V-36V to 28.00V @ 8A



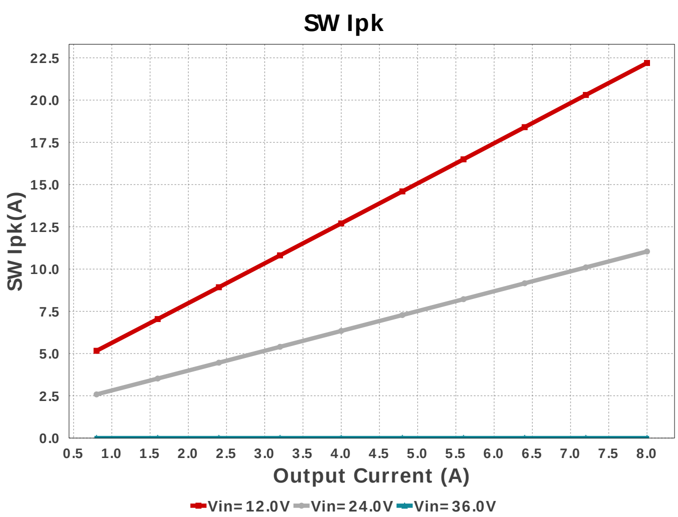
Electrical BOM

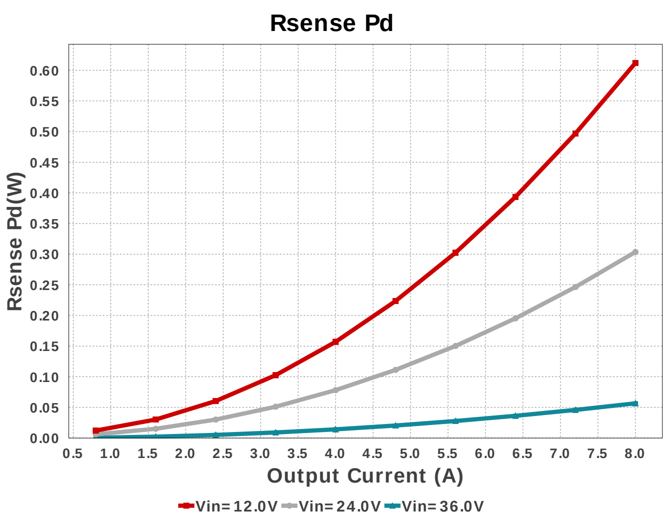
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cbias	Kemet	C0805C104M5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm^2
Cboot1	Kemet	C0603C104Z3VACTU Series= Y5V	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
Cboot2	Kemet	C0603C104Z3VACTU Series= Y5V	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
Cbulk	Panasonic	63SXV33M Series= SXV	Cap= 33.0 uF ESR= 25.0 mOhm VDC= 63.0 V IRMS= 2.95 A	3	$1.18	CAPSMT_62_E12 106 mm^2
Ccomp	TDK	CGA2B3X7R1H153K050BB Series= X7R	Cap= 15.0 nF ESR= 216.2 mOhm VDC= 50.0 V IRMS= 379.39 mA	1	$0.01	0402 3 mm^2
Ccomp2	Samsung Electro-Mechanics	CL21C151JBANNNC Series= C0G/NP0	Cap= 150.0 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	CGA3E2X7R1H104K080AA Series= X7R	Cap= 100.0 nF ESR= 29.6 mOhm VDC= 50.0 V IRMS= 971.99 mA	1	$0.01	0603 5 mm^2

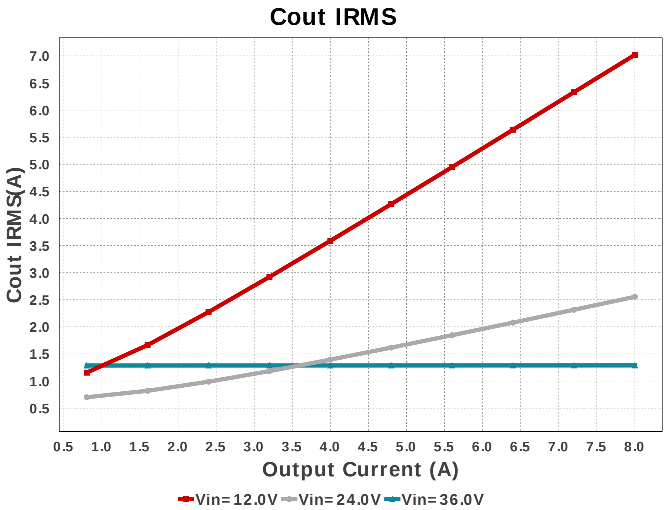


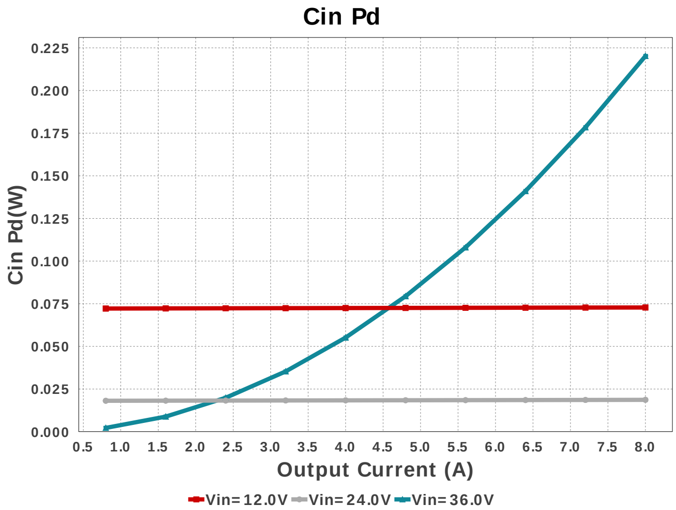
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	Panasonic	50SVPF10M Series= SVPF	Cap= 10.0 uF ESR= 40.0 mOhm VDC= 50.0 V IRMS= 2.5 A	2	$0.41	CAPSMT_62_F61 74 mm^2
Cout	Panasonic	50SVPF39M Series= SVPF	Cap= 39.0 uF ESR= 25.0 mOhm VDC= 50.0 V IRMS= 3.8 A	3	$0.74	CAPSMT_62_E12 106 mm^2
Coutx	TDK	C3216X7S2A335M160AB Series= X7S	Cap= 3.3 uF ESR= 3.048 mOhm VDC= 100.0 V IRMS= 4.157 A	7	$0.42	1206_190 11 mm^2
Coutx2	TDK	C3216X7S2A335M160AB Series= X7S	Cap= 3.3 uF ESR= 3.048 mOhm VDC= 100.0 V IRMS= 4.157 A	7	$0.42	1206_190 11 mm^2
Coutx3	TDK	C3216X7S2A335M160AB Series= X7S	Cap= 3.3 uF ESR= 3.048 mOhm VDC= 100.0 V IRMS= 4.157 A	7	$0.42	1206_190 11 mm^2
Cslope	Samsung Electro-Mechanics	CL10C331JB8NNNC Series= C0G/NP0	Cap= 330.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
Css	Kemet	C0603C153J3GACTU Series= C0G/NP0	Cap= 15.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.10	0603 5 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
Dboot1	ON Semiconductor	MBRA160T3G	VF@Io= 510.0 mV VRRM= 60.0 V	1	$0.09	SMA 37 mm^2
Dboot2	ON Semiconductor	MBRA160T3G	VF@Io= 510.0 mV VRRM= 60.0 V	1	$0.09	SMA 37 mm^2
Df	ON Semiconductor	MBRA160T3G	VF@Io= 510.0 mV VRRM= 60.0 V	1	$0.09	SMA 37 mm^2
L1	Coilcraft	XAL1580-302MEB	L= 3.0 µH 2.6 mOhm	1	$2.40	XAL1580 313 mm^2
M1	Texas Instruments	CSD18531Q5A	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	$0.56	TRANS_NexFET_Q5A 55 mm^2
M2	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	$0.32	TRANS_NexFET_Q5A 55 mm^2
M3	Texas Instruments	CSD18540Q5B	VdsMax= 60.0 V IdsMax= 100.0 Amps	1	$0.83	DNK0008A 56 mm^2
M4	Texas Instruments	CSD18536KCS	VdsMax= 60.0 V IdsMax= 200.0 Amps	1	$1.76	KCS0003B 80 mm^2

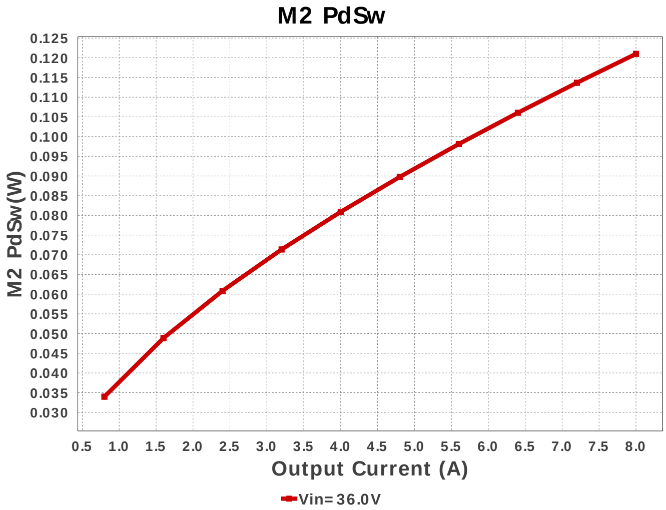
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rcomp	Vishay-Dale	CRCW040212K4FKED Series= CRCW..e3	Res= 12.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rcsg	Vishay-Dale	CRCW0603100RFKEA Series= CRCW..e3	Res= 100.0 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rcsp	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	Yageo	RC0603FR-07680KL Series= ?	Res= 680.0 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	CRCW060310K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rsense	CUSTOM	CUSTOM Series= ?	Res= 4.0081 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm^2
Rt	Vishay-Dale	CRCW040223K2FKED Series= CRCW..e3	Res= 23.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Ruvb	Vishay-Dale	CRCW040229K4FKED Series= CRCW..e3	Res= 29.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Ruvt	Vishay-Dale	CRCW0402249KFKED Series= CRCW..e3	Res= 249.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rvisns	Vishay-Dale	CRCW06032K00FKEA Series= CRCW..e3	Res= 2.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
U1	Texas Instruments	LM5176PWPR	Switcher	1	$2.64	PWP0028C_N 98 mm^2

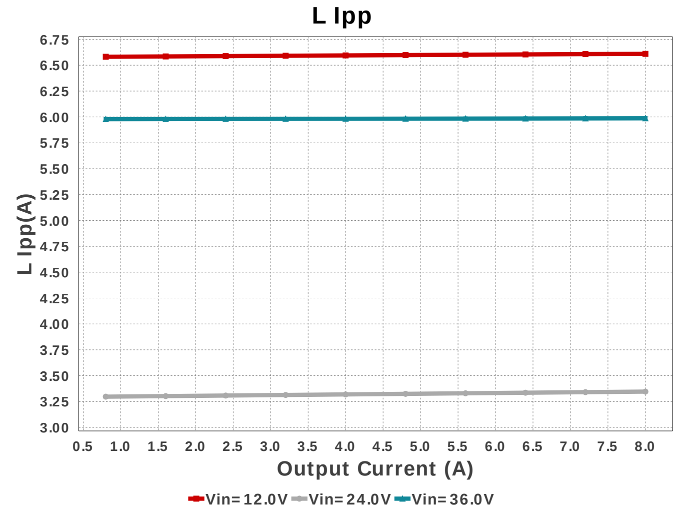


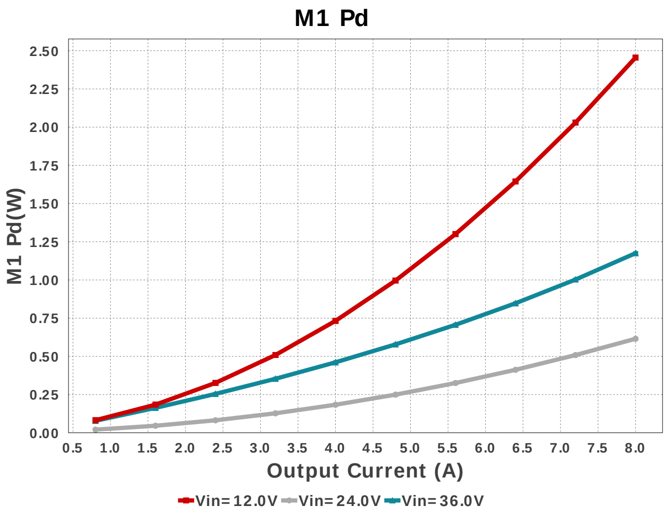


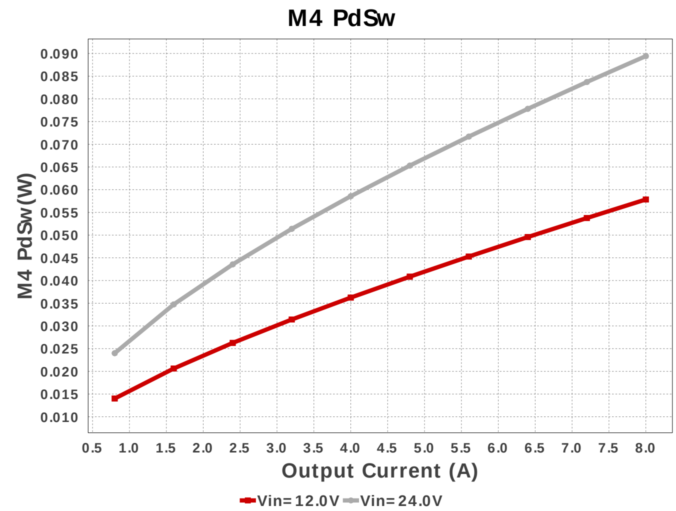

Cout IRMS
Cout IRMS(A)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

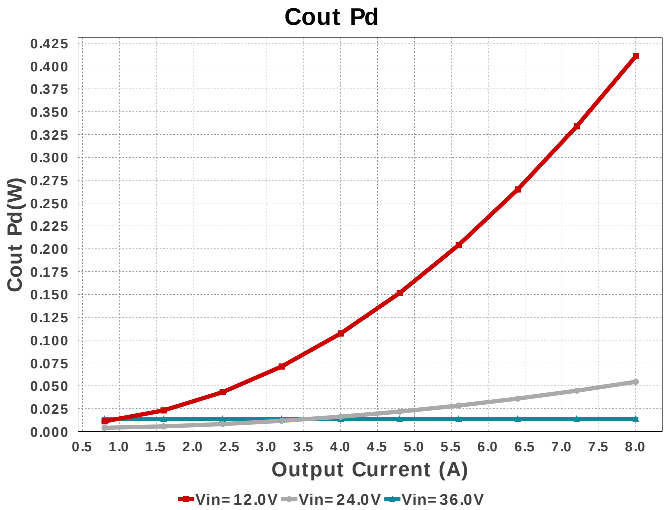

Cin Pd
Cin Pd(W)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

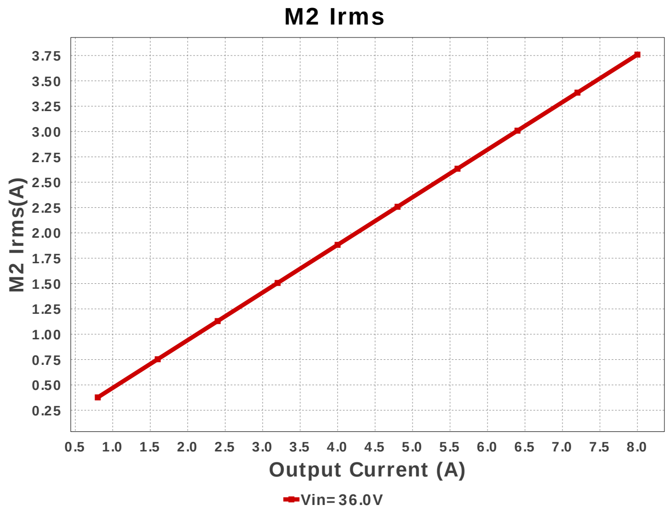

M2 PdSw
M2 PdSw(W)
Output Current (A)
Vin=36.0V

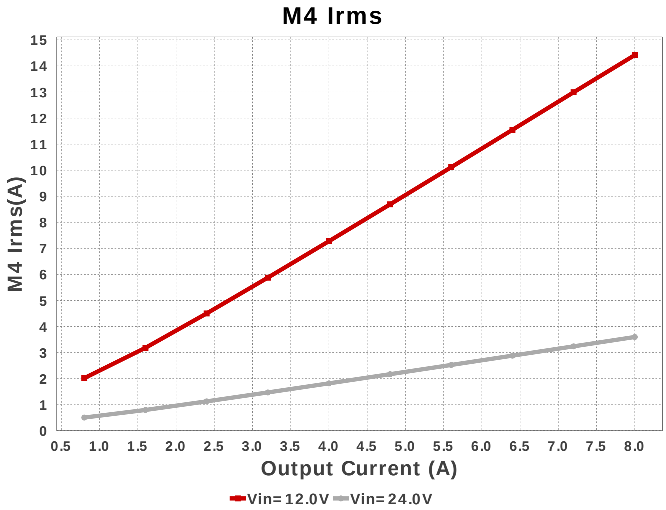

L Ipp
L Ipp(A)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

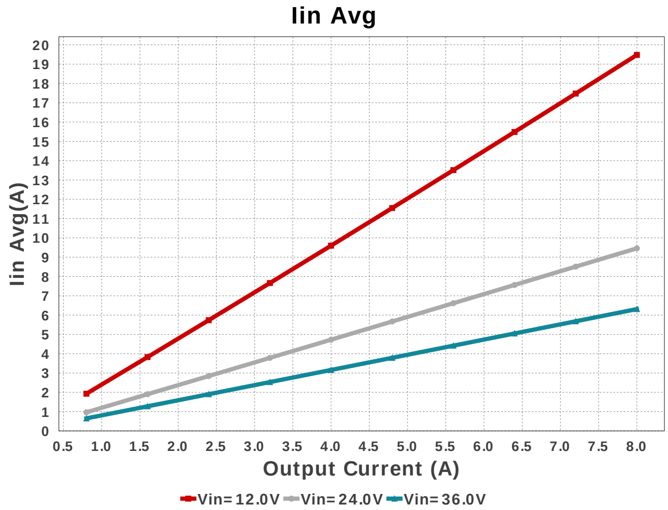

M1 Pd
M1 Pd(W)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

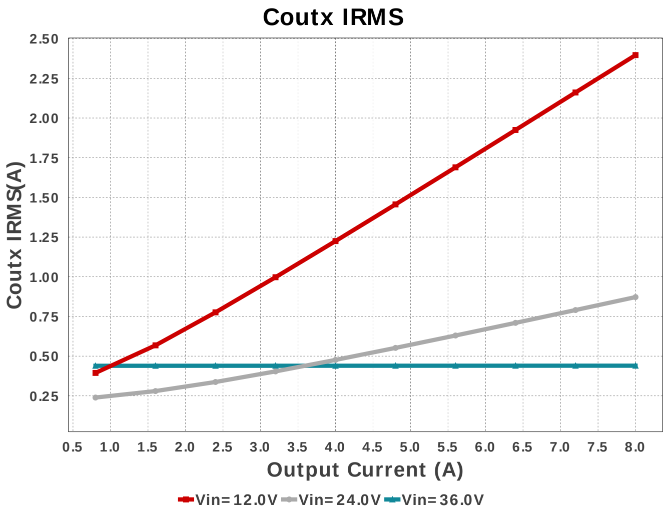

M4 PdSw
M4 PdSw(W)
Output Current (A)
Vin=12.0V Vin=24.0V

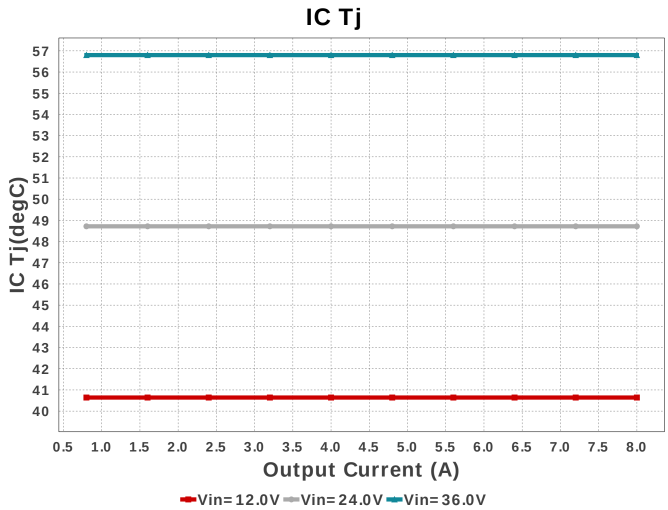

Cout Pd
Cout Pd(W)
0.425
0.400
0.375
0.350
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

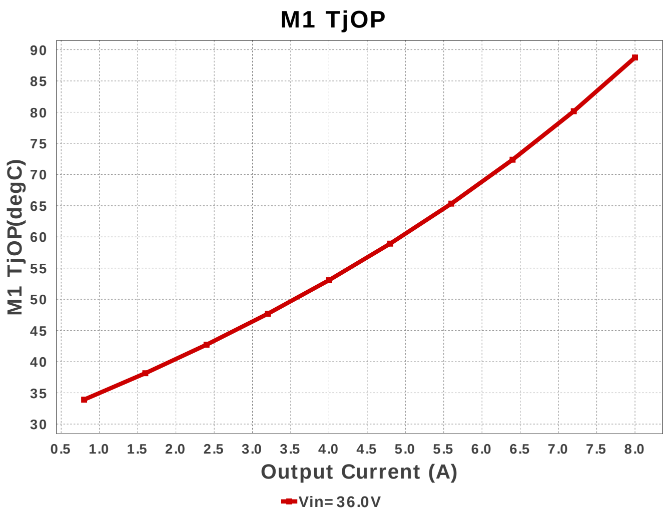

M2 Irms
M2 Irms(A)
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=36.0V

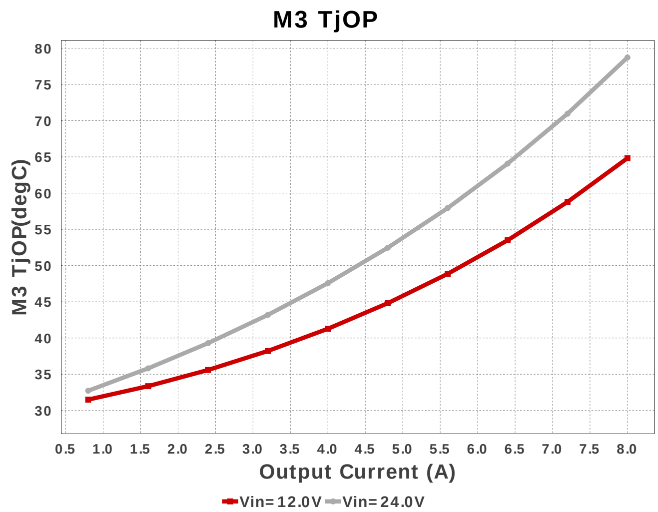

M4 Irms
M4 Irms(A)
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V

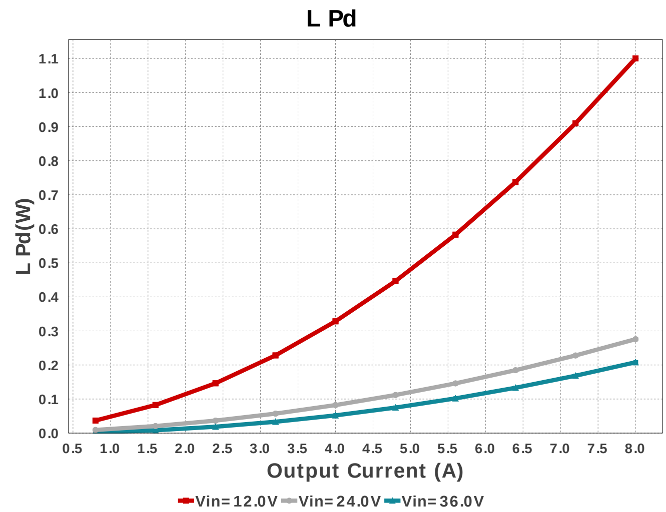

Iin Avg
Iin Avg(A)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

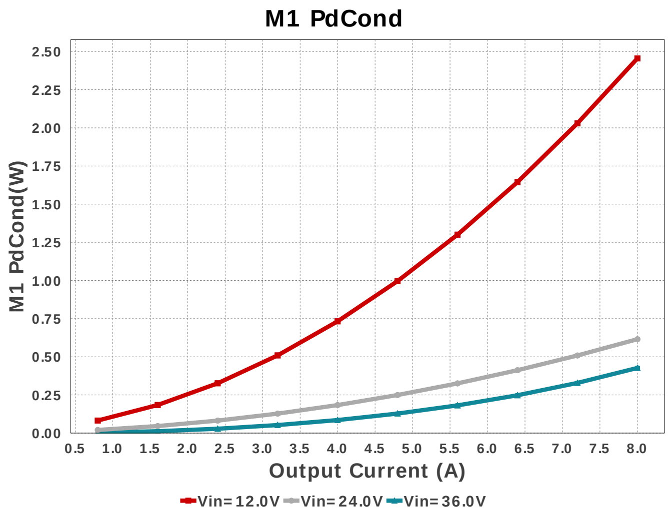

Coutx IRMS
Coutx IRMS(A)
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

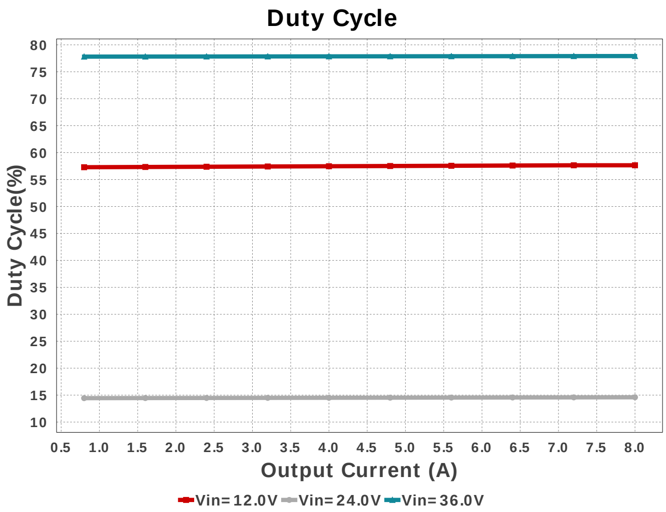

IC Tj
IC Tj(degC)
57
56
55
54
53
52
51
50
49
48
47
46
45
44
43
42
41
40
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

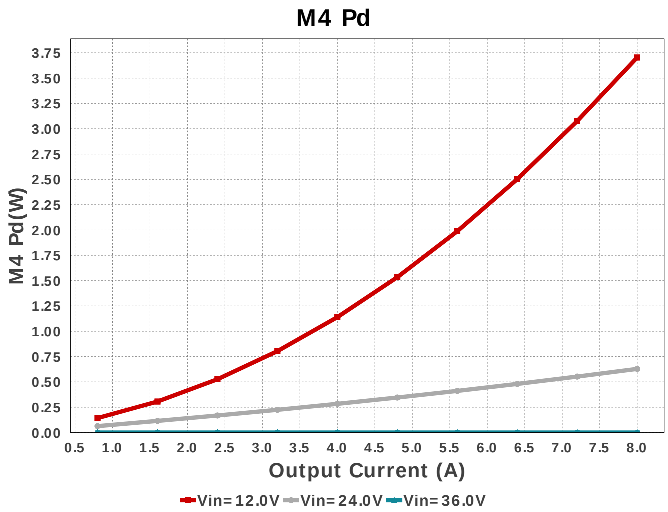

M1 TjOP
M1 TjOP(degC)
Output Current (A)
Vin=36.0V


M3 TjOP
M3 TjOP(degC)
Output Current (A)
Vin=12.0V
Vin=24.0V

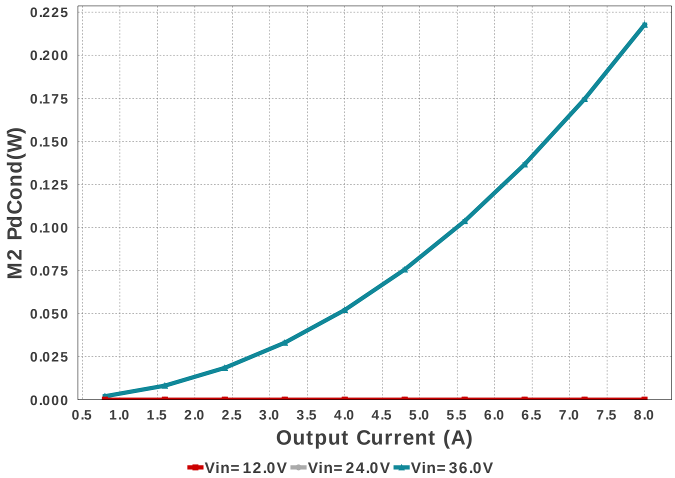

L Pd
L Pd(W)
Output Current (A)
Vin=12.0V
Vin=24.0V
Vin=36.0V


M1 PdCond
M1 PdCond(W)
Output Current (A)
Vin=12.0V
Vin=24.0V
Vin=36.0V

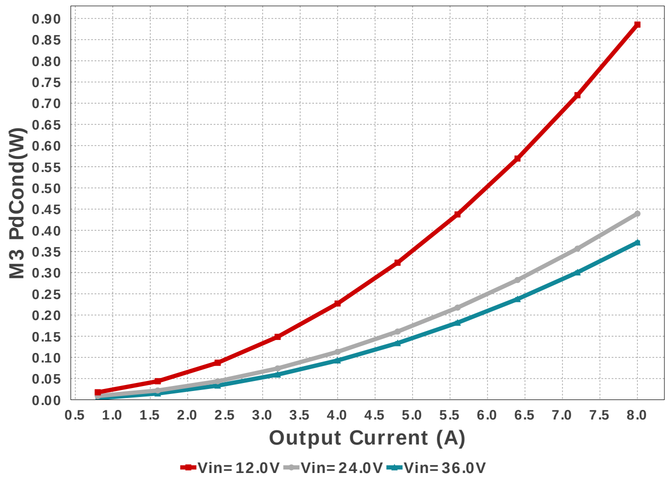

Duty Cycle
Duty Cycle(%)
Output Current (A)
Vin=12.0V
Vin=24.0V
Vin=36.0V


M4 Pd
M4 Pd(W)
Output Current (A)
Vin=12.0V
Vin=24.0V
Vin=36.0V

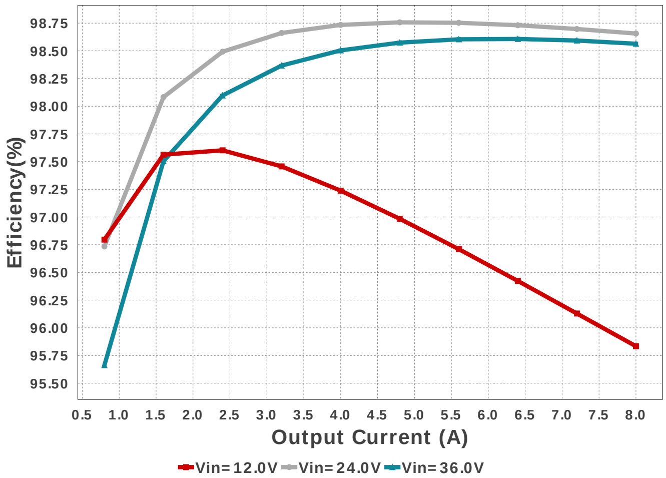
M2 PdCond



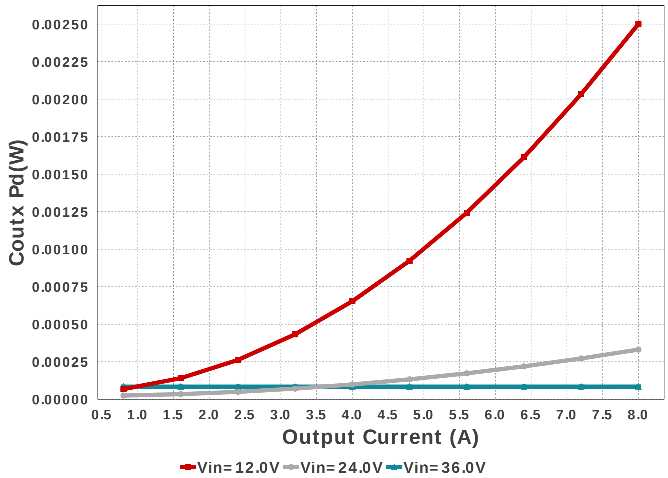
M3 PdCond



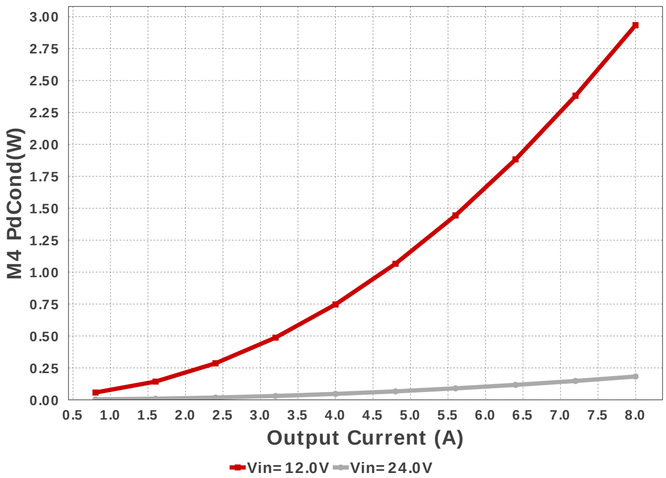
Efficiency



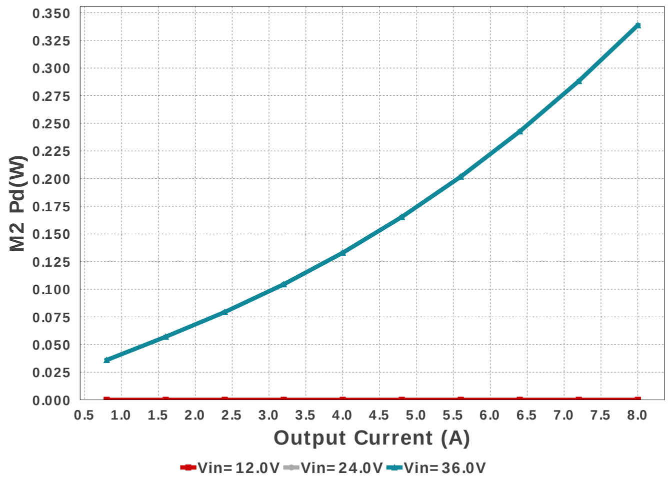
Coutx Pd

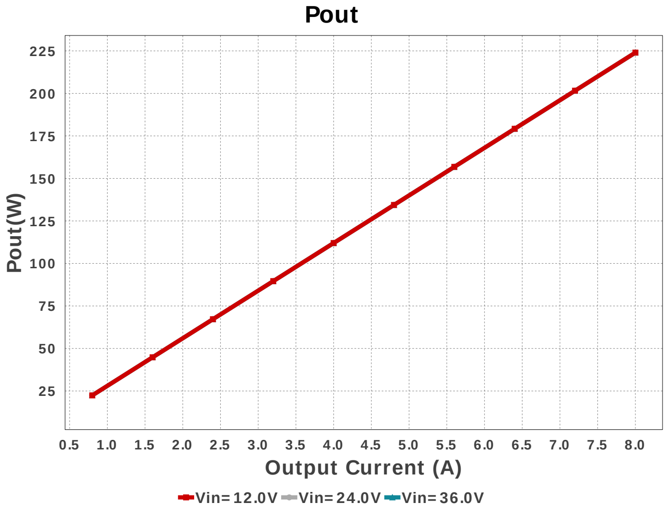


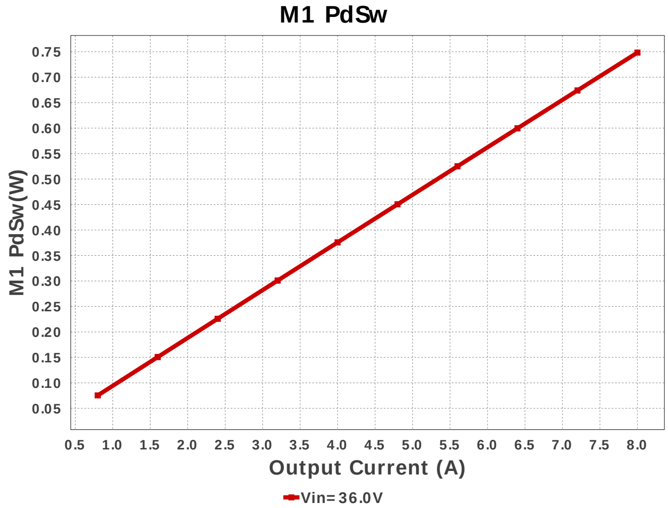
M4 PdCond

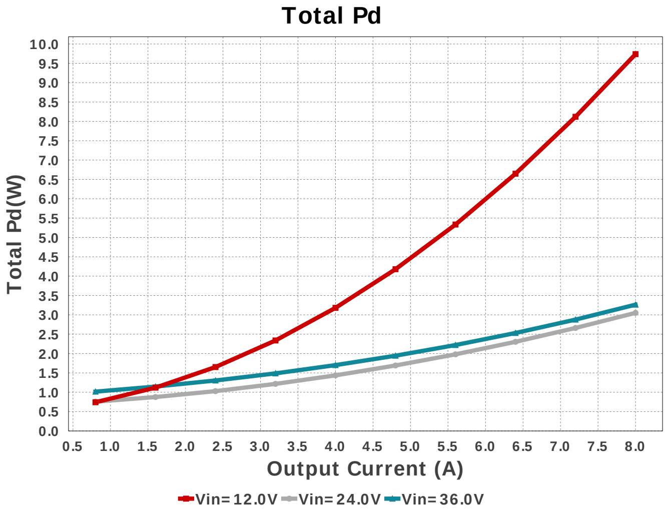


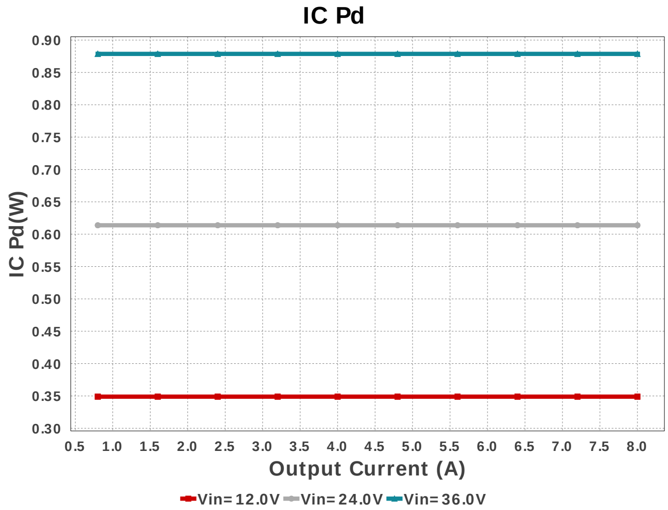
M2 Pd

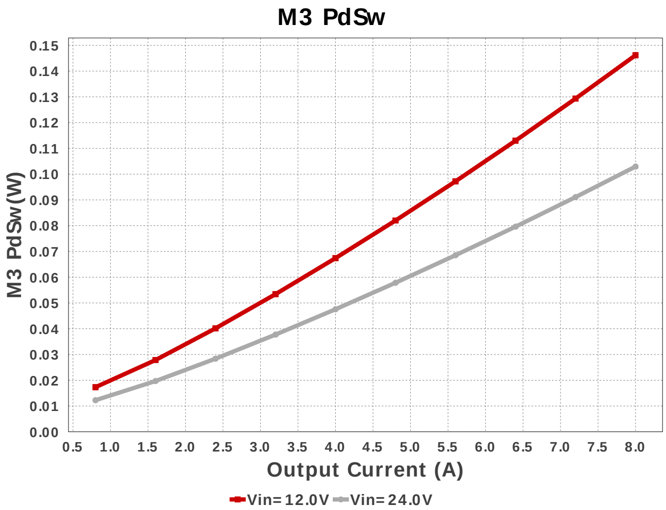


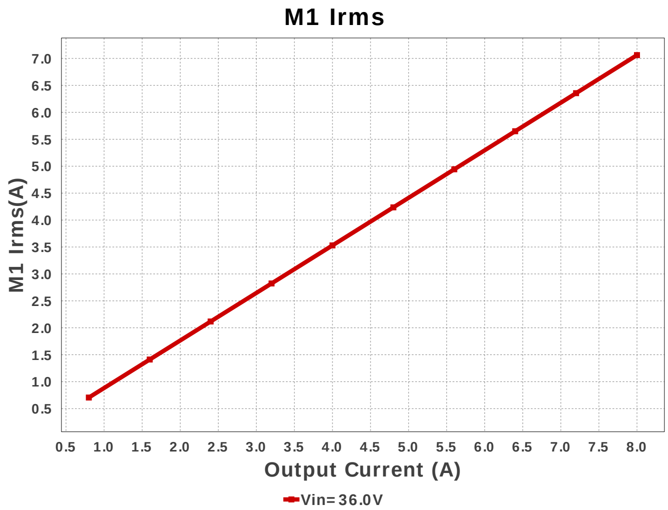

Pout
Pout(W)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

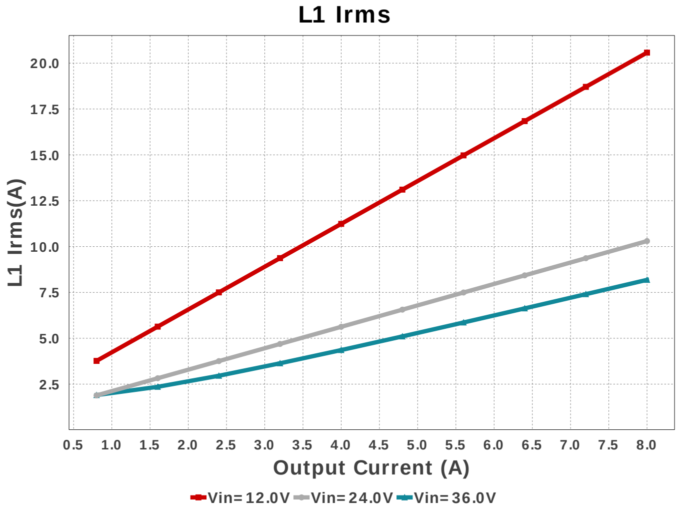

M1 PdSw
M1 PdSw(W)
Output Current (A)
Vin=36.0V

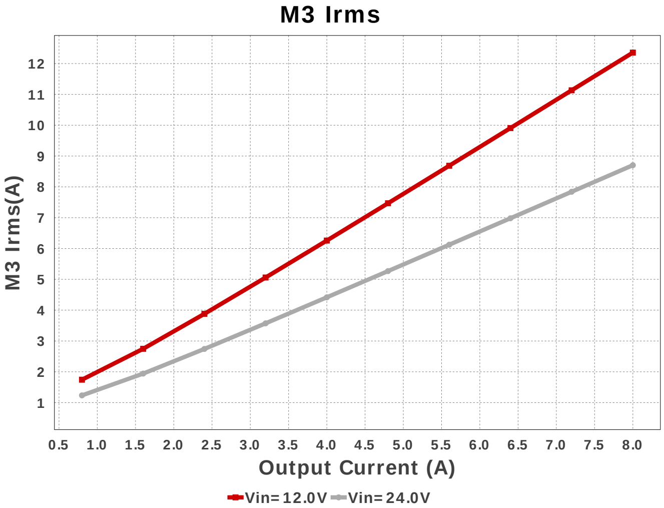

Total Pd
Total Pd(W)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

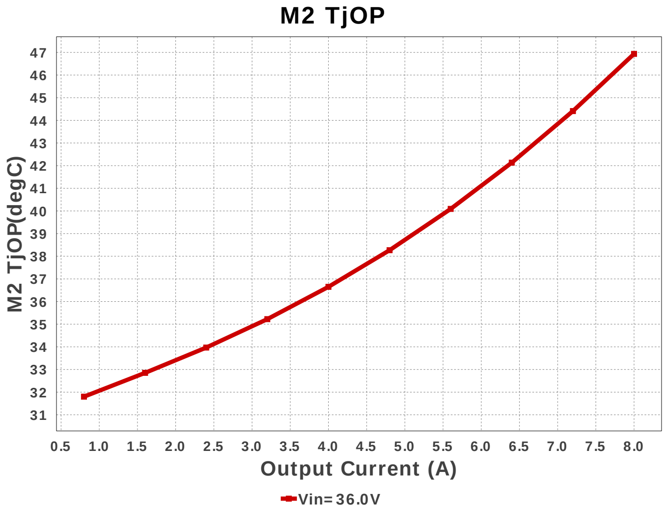

IC Pd
IC Pd(W)
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

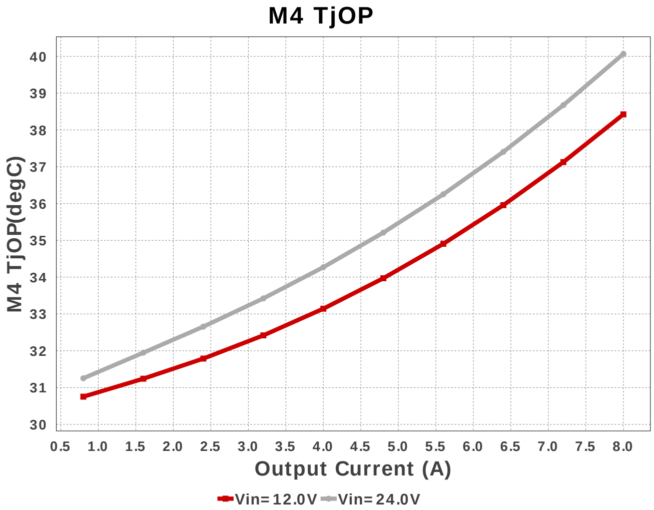

M3 PdSw
M3 PdSw(W)
Output Current (A)
Vin=12.0V Vin=24.0V

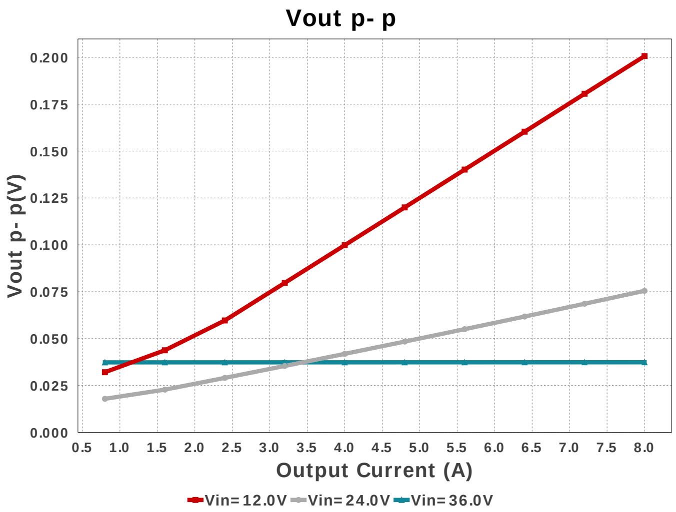

M1 Irms
M1 Irms(A)
Output Current (A)
Vin=36.0V

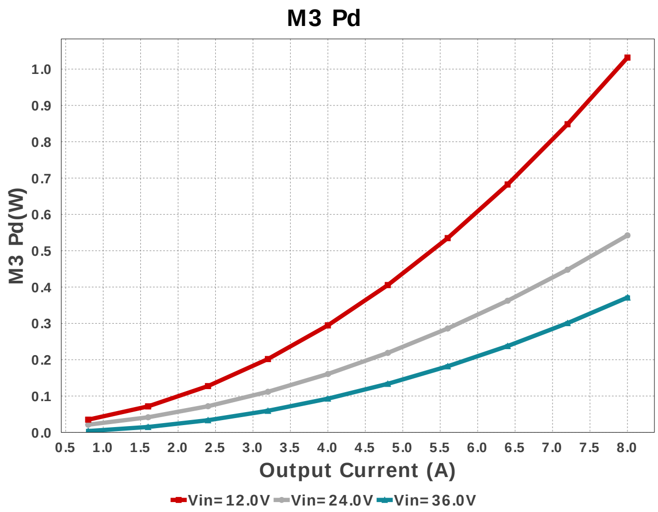

L1 Irms
L1 Irms(A)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V

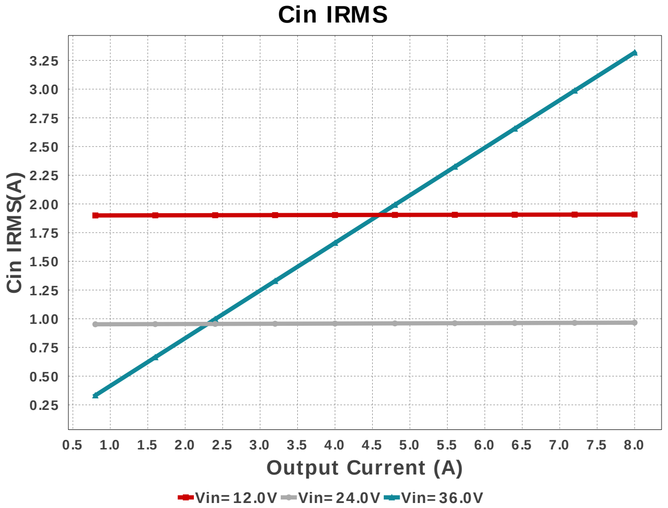

M3 Irms
M3 Irms(A)
12
11
10
9
8
7
6
5
4
3
2
1
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V

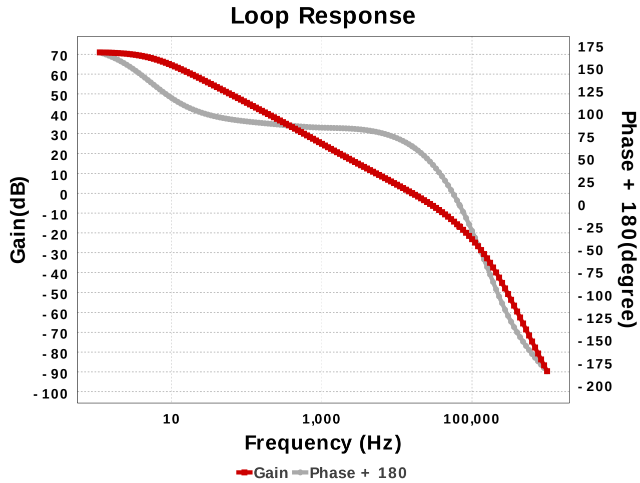

M2 TjOP
M2 TjOP(degC)
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=36.0V


M4 TjOP
M4 TjOP(degC)
40
39
38
37
36
35
34
33
32
31
30
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V


Vout p- p
Vout p- p(V)
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 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V


M3 Pd
M3 Pd(W)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
Output Current (A)
Vin=12.0V Vin=24.0V Vin=36.0V





Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	3.318 A	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	220.2 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	1.296 A	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	13.988 mW	Capacitor	Output capacitor power dissipation
5.	Coutx IRMS	432.689 mA	Capacitor	Output capacitor_x RMS ripple current
6.	Coutx Pd	81.521 µW	Capacitor	Output capacitor_x power loss
7.	IC Pd	878.67 mW	IC	IC power dissipation
8.	IC Tj	56.799 degC	IC	IC junction temperature
9.	IC Tolerance	0.0 V	IC	IC Feedback Tolerance
10.	ICThetaJA	30.5 degC/W	IC	IC junction-to-ambient thermal resistance
11.	Iin Avg	6.313 A	IC	Average input current
12.	L Ipp	5.987 A	Inductor	Peak-to-peak inductor ripple current
13.	L Pd	208.0 mW	Inductor	Inductor power dissipation
14.	L1 Irms	8.185 A	Inductor	Inductor ripple current
15.	M1 Irms	7.062 A	Mosfet	MOSFET RMS ripple current
16.	M1 Pd	1.182 W	Mosfet	MOSFET power dissipation
17.	M1 PdCond	434.11 mW	Mosfet	M1 MOSFET conduction losses
18.	M1 PdSw	748.23 mW	Mosfet	M1 MOSFET switching losses
19.	M1 Rdson	5.8 mOhm	Mosfet	Drain-Source On-resistance
20.	M1 ThetaJA	50.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
21.	M1 TjOP	89.117 degC	Mosfet	MOSFET junction temperature
22.	M2 Irms	3.759 A	Mosfet	MOSFET RMS ripple current
23.	M2 Pd	347.39 mW	Mosfet	MOSFET power dissipation
24.	M2 PdCond	226.4 mW	Mosfet	M2 MOSFET conduction losses
25.	M2 PdSw	120.99 mW	Mosfet	M2 MOSFET switching losses
26.	M2 Rdson	14.112 mOhm	Mosfet	Drain-Source On-resistance
27.	M2 ThetaJA	50.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
28.	M2 TjOP	47.369 degC	Mosfet	MOSFET junction temperature
29.	M3 Pd	371.2 mW	Mosfet	M3 MOSFET total power dissipation
30.	M3 PdCond	371.2 mW	Mosfet	M3 MOSFET conduction losses
31.	M4 Pd	100.0 pW	Mosfet	M4 MOSFET total power dissipation
32.	Cin Pd	220.2 mW	Power	Input capacitor power dissipation
33.	Cout Pd	13.988 mW	Power	Output capacitor power dissipation
34.	Coutx Pd	81.521 µW	Power	Output capacitor_x power loss
35.	IC Pd	878.67 mW	Power	IC power dissipation
36.	L Pd	208.0 mW	Power	Inductor power dissipation
37.	M1 Pd	1.182 W	Power	MOSFET power dissipation
38.	M1 PdCond	434.11 mW	Power	M1 MOSFET conduction losses
39.	M1 PdSw	748.23 mW	Power	M1 MOSFET switching losses
40.	M2 Pd	347.39 mW	Power	MOSFET power dissipation
41.	M2 PdCond	226.4 mW	Power	M2 MOSFET conduction losses
42.	M2 PdSw	120.99 mW	Power	M2 MOSFET switching losses
43.	M3 Pd	371.2 mW	Power	M3 MOSFET total power dissipation
44.	M3 PdCond	371.2 mW	Power	M3 MOSFET conduction losses
45.	M4 Pd	100.0 pW	Power	M4 MOSFET total power dissipation
46.	Rsense Pd	56.632 mW	Power	LED Current Rsns Power Dissipation
47.	Total Pd	3.28 W	Power	Total Power Dissipation
48.	Rsense Pd	56.632 mW	Resistor	LED Current Rsns Power Dissipation
49.	BOM Count	61	System Information	Total Design BOM count
50.	Cross Freq	16.063 kHz	System Information	Bode plot crossover frequency

#	Name	Value	Category	Description
51.	Duty Cycle	77.922 %	System Information	Duty cycle
52.	Efficiency	98.557 %	System Information	Steady state efficiency
53.	FootPrint	1.887 k mm^2	System Information	Total Foot Print Area of BOM components
54.	Frequency	347.078 kHz	System Information	Switching frequency
55.	Gain Marg	-16.655 dB	System Information	Bode Plot Gain Margin
56.	Iout	8.0 A	System Information	Iout operating point
57.	Low Freq Gain	70.915 dB	System Information	Gain at 1Hz
58.	Mode	CCM	System Information	Conduction Mode
59.	Operating Topology	Buck	System Information	The current operating topology of the device
60.	Phase Marg	64.365 deg	System Information	Bode Plot Phase Margin
61.	Pout	224.0 W	System Information	Total output power
62.	SW Ipk	0.0 A	System Information	Peak switch current
63.	Total BOM	NA	System Information	Total BOM Cost
64.	Vin	36.0 V	System Information	Vin operating point
65.	Vout	28.0 V	System Information	Operational Output Voltage
66.	Vout Actual	28.0 V	System Information	Vout Actual calculated based on selected voltage divider resistors
67.	Vout Tolerance	1.962 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
68.	Vout p-p	37.586 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	8.0	Maximum Output Current
VinMax	36.0	Maximum input voltage
VinMin	12.0	Minimum input voltage
Vout	28.0	Output Voltage
base_pn	LM5176	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

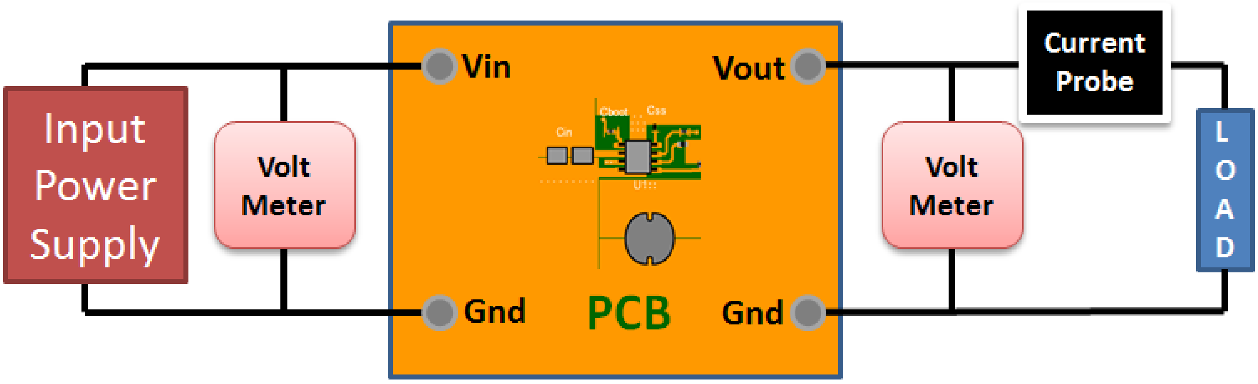
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 12.0V 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 : 2A46442EFC39C36F[v1]
4. **LM5176** Product Folder : http://www.ti.com/product/LM5176 : contains the data sheet and other resources.